

中華民國國家標準

C N S

**用戶端能源管理系統與電力管理系統間之
系統介面－第 10-1 部：開放式自動需量反應**

**Systems interface between customer
energy management system and the
power management system – Part 10-1:
Open automated demand response**

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前言

本標準係依據 2018 年發行之 IEC 62746-10-1，不變更技術內容，制定成為中華民國國家標準者。

本標準係依標準法之規定，經國家標準審查委員會審定，由主管機關公布之中華民國國家標準。

依標準法第四條之規定，國家標準採自願性方式實施。但經各該目的事業主管機關引用全部或部分內容為法規者，從其規定。

本標準並未建議所有安全事項，使用本標準前應適當建立相關維護安全與健康作業，並且遵守相關法規之規定。

本標準之部分內容，可能涉及專利權、商標權與著作權，主管機關及標準專責機關不負責任何或所有此類專利權、商標權與著作權之鑑別。

簡介

INTRODUCTION

需量反應(demand response, DR)市場之發展已由人工 DR 改變至自動化 DR(Auto-DR) 方案中之 OpenADR。2013 年之加州工商業用戶 Auto-DR 方案中，已有超過 250 MW 登記使用 OpenADR1.0⁽¹⁾。DR 定義為“...回應價格、金錢誘因或電力公司指示，而降低電力需量之行動，以維持可靠的電力服務或避免高電價。”⁽²⁾ 發展 OpenADR1.0 係為支持 Auto-DR 方案及加州之能源政策目標，透過推動動態電價以改進電網之經濟性及穩定度。

Development of the Demand Response (DR) market has resulted in a transition from manual DR to OpenADR in Automated DR (Auto-DR) programs. As of 2013, over 250 MW was enrolled in California commercial and industrial customers Auto-DR programs using OpenADR 1.0.¹ DR is defined as “...action taken to reduce electricity demand in response to price, monetary incentives, or utility directives so as to maintain reliable electric service or avoid high electricity prices.”² OpenADR 1.0 was developed to support Auto-DR programs and California’s energy policy objectives to move toward dynamic pricing to improve the economics and reliability of the electric grid.

註⁽¹⁾ Piette, Mary Ann, Girish Ghatikar, Sila Kiliccote, Ed Koch, Dan Hennage, Peter Palensky, and Charles McParland. 2009. Open Automated Demand Response Communications Specification (Version 1.0). California Energy Commission, PIER Program. CEC-500-2009-063.

⁽²⁾ U.S. Federal Energy Regulatory Commission (FERC), 2007 Assessment of Demand Response and Advanced Metering, Staff Report, available: <http://www.ferc.gov/legal/staff-reports/09-07-demand-response.pdf>

近年之發展已擴大 OpenADR 的用途，以滿足多樣化之市場需求，諸如輔助服務(快速 DR)、動態電價、間歇性再生能源、附屬電網級儲能(supplement grid-scale storage)及

電動車，以及負載當作發電。例：透過即時電價資訊，用戶設施內之自動化客戶端可設計成能連續監視價格，並將此資訊轉譯成連續自動控制及回應之策略。此理由闡述係美國智慧電網互運性標準之基礎，其發展係用以改善電力供需之動態最佳化。

The recent developments have expanded the use of OpenADR to meet diverse market needs such as ancillary services (Fast DR), dynamic prices, intermittent renewable resources, supplement grid-scale storage, electric vehicles, and load as generation. For example, with real-time price information, an automated client within the customer facility can be designed to continuously monitor these prices and translate this information into continuous automated control and response strategies. This rationale is a fundamental element of the United States (U.S.) Smart Grid interoperability standards, which are developed to improve dynamic optimization of electric supply and demand.

OpenADR 通訊具有下列定義之特徵。

OpenADR Communications have the following defining features:

- 連續、安全及可靠 – 提供連續、安全及可靠之雙向通訊基礎建設，其中終端使用場域的端點接收並確認收到由能源服務提供者所發出之 DR 信號。
- Continuous, Secure, and Reliable - Provides continuous, secure, and reliable two-way communications infrastructures where the end points at the end-use site receive and acknowledge the receipt of DR signals from the energy service providers.
- 轉譯 – 將 DR 事件資訊轉譯成連續之網際網路信號，以促進 DR 自動化。此等信號係設計為與能源管理及控制系統、照明或其他終端使用控制措施達成互運。
- Translation - Translates DR event information to continuous Internet signals to facilitate DR automation. These signals are designed to interoperate with energy management and control systems, lighting, or other end-use controls.
- 自動化 – 將外部信號之接收設計為透過終端使用行為者所決定及控制之預程設置量反應策略，初始自動化程序。
- Automation - Receipt of the external signal is designed to initiate automation through the use of pre-programmed demand response strategies determined and controlled by the end-use participant.
- 選擇退出(Opt-Out) – 當終端使用服務之變更非所欲時，可由 DR 事件之任何行為者選擇退出或撤銷(override)的功能。
- Opt-Out - Provides opt-out or override function to any participants for a DR event if the event comes at a time when changes in end-use services are not desirable.
- 完整資料模型 – 描述豐富資料模型及架構，用以進行價格、可靠性及其他 DR 動作信號之通訊。
- Complete Data Model - Describes a rich data model and architecture to communicate price, reliability, and other DR activation signals.
- 可縮放架構 – 針對不同形式之 DR 方案、終端使用建築及動態電價，提供可縮放

之通訊架構。

- Scalable Architecture - Provides scalable communications architecture to different forms of DR programs, end-use buildings, and dynamic pricing.
- 開放標準 – 諸如網際網路通訊協定(IP)及網頁服務等開放標準技術，形成通訊模型之基礎。
- Open Standards - Open standards-based technology such as Internet Protocol (IP) and Web services form the basis of the communications model.

OpenADR 是伴隨傳送及安全機制的“通訊資料模型”，促進電力服務提供者端與客戶端兩點間之資訊交換。其不像一些通訊協定規定“位元結構”，而是依賴諸如延伸標記語言(XML)及網際網路通訊協定(IP)等既有開放標準，做為交換 DR 信號之框架。於某些參考中，用語“系統”、“技術”或“服務”意指 OpenADR 之功能。

OpenADR is a communications data model, along with transport and security mechanisms, which facilitate information exchange between two end-points, the electricity service provider and the customer. It is not a protocol that specifies “bit-structures” as some communications protocols do, but instead relies upon existing open standards such as eXtensible Mark-up Language (XML) and Internet Protocol (IP) as the framework for exchanging DR signals. In some references the term “system,” “technology,” or “service” is used to refer to the features of OpenADR. OpenADR 係設計以促進於用戶所在位置之 DR 動作自動化，不論其涉及電力卸載或轉移。通訊資料模型可用於連續操作。許多緊急或可靠性 DR 事件發生於電網負載吃緊之特定時間。

OpenADR is designed to facilitate automation of DR actions at the customer location, whether it involves electric load shedding or load shifting. We are often asked if the communications data model can be used for continuous operations. The answer is **yes**. Many emergency or reliability DR events occur at specific times when the electric grid is strained.

OpenADR 通訊設計用以協調此種設施控制系統(商業、工業及住宅)之信號。OpenADR 亦設計提供連續動態電價信號，諸如“一日前每小時”或“當日即時”定價。透過此電價資訊，自動化客戶端可設定組態以連續監視此等價格，並於設施內將此資訊轉譯為連續自動控制及反應策略。有許多介紹 OpenADR1.0 沿革之報告⁽³⁾。OpenADR 2.0 剖繪規格(本標準)涵蓋適用於美國躉售及零售市場之價格與可靠性信號使用之信令(signaling)資料模型。

The OpenADR communications are designed to coordinate such signals with facility control systems (commercial, industrial, and residential). OpenADR is also designed to provide continuous dynamic price signals such as hourly day-ahead or day-of real time pricing. With such price information an automated client can be configured to continuously monitor these prices and translate this information into continuous automated control and response strategies within a facility. Several reports present the

history of OpenADR 1.0 research.³ This OpenADR 2.0 profile specification covers the signaling data models for price and reliability signals to both wholesale and retail markets in the U.S.

註⁽³⁾ 此等報告可經由以下網址獲得：<http://drrc.lbl.gov/drrc-pubsall.html>

Piette, M.A., S. Kiliccote, G. Ghatikar, Design and Implementation of an Open, Interoperable Automated Demand Response Infrastructure, Proceedings of the Grid-Interop Forum, October 2007, LBNL-63665.

Koch, E., M.A. Piette, Architecture Concepts and Technical Issues for an Open, Interoperable Automated Demand Response Infrastructure. Proceedings of the Grid-Interop Forum, . October 2007. LBNL-63664.

Piette, M.A, D. Watson, N. Motegi, S. Kiliccote Automated Critical Peak Pricing Field Tests: 2006 Pilot Program Description and Results. August, 2007. LBNL-62218.

Motegi, N., M.A. Piette, D.S. Watson, S. Kiliccote, P. Xu. Introduction to Commercial Building Control Strategies and Techniques for Demand Response. May 2007. LBNL-59975.

OpenADR 提供下列益處。

OpenADR provides the following benefits:

- 開放規格–提供標準化 DR 通訊及信令基礎架構，使用開放、非專屬及業界認可資料模型，其可供動態電價與 DR 緊急或可靠性事件實作。
- Open Specification–Provides a standardized DR communications and signaling infrastructure using open, non-proprietary, industry-approved data models that can be implemented for both dynamic prices and DR emergency or reliability events.
- 彈性 – 提供對端對端技術及軟體系統具彈性、平台獨立性、互運性及透通之開放通訊介面及協定。
- Flexibility–Provides open communications interfaces and protocols that are flexible, platform-independent, interoperable, and transparent to end-to-end technologies and software systems.
- 創新及互運性 – 鼓勵開放創新及互運性，依既有策略建立設施或企業內之控制及通訊，以降低設備操作及維護成本、閒置不用的資產，以及過時的技術。
- Innovation and Interoperability–Encourages open innovation and interoperability, and allows controls and communications within a facility or enterprise to build on existing strategies to reduce technology operation and maintenance costs, stranded assets, and obsolesce in technology.
- 易於整合 – 促進一般能源管理與控制系統(energy management and control systems, EMCS)、照明及其他可接收網際網路信號(諸如 XML)之終端使用裝置間之整合。
- Ease of Integration–Facilitates integration of common Energy Management and Control Systems (EMCS), centralized lighting, and other end-use devices that can

receive Internet signals (such as XML).

- 支援多元化資訊 – 可透過各種方式表示 DR 信號中之資訊，使由簡易端點裝置(例：恆溫器)至成熟的中介者(例：用戶群代表)等系統可接收最適合其運作的 DR 資訊。
- Supports Wide Range of Information Complexity – Can express the information in the DR signals in a variety of ways to allows for systems ranging from simple end devices (e.g. thermostats) to sophisticated intermediaries (e.g. aggregators) to receive the DR information that is best suited for its operations.
- 遠端存取 – 提供行為者選擇退出或撤銷功能，以管理標準化 DR 相關操作模式供 DR 策略及控制系統。
- Remote Access– Facilitates opt-out or override functions for participants to manage standardized DR-related operation modes to DR strategies and control systems.

OpenADR 聯盟係 OpenADR 開發及採用之主要權責機構，推動 OpenADR 1.0 活動以及 OASIS 能互運技術委員會的 EI 1.0 版標準⁽⁴⁾。OASIS EI 1.0 版標準為 OpenADR 剖面規格之基礎，並於本標準中適當地引用之。

The OpenADR Alliance is the primary authority for the development and adoption of OpenADR, leveraging the OpenADR 1.0 activities and OASIS Energy Interoperation (EI) Technical Committee's Version 1.0 standard.⁴ The OpenADR profile within OASIS EI Version 1.0 standard is the basis for the OpenADR 2.0 profile specification and is referenced as appropriate in this document.

註⁽⁴⁾ Energy Interoperation OASIS Committee Specification, Energy Interoperation Version 1.0, December 2011.

<http://www.oasis-open.org/committees/download.php/44364/energyinterop-v1.0-cs-prd03.zip>

1. 適用範圍

本標準係具彈性之資料模型，用以促進電力服務提供者、用戶群代表/聚合商 (aggregator)與終端使用者間之共同資訊交換。開放規格之概念旨在使所有人皆能實作雙向信令系統，提供伺服器(即虛擬頂節點(virtual top node, VTN))將資訊發布至訂用該資訊之自動化客戶端(即虛擬端末節點(virtual end node, VEN))。

1 Scope

The OpenADR 2.0 profile specification is a flexible data model to facilitate common information exchange between electricity service providers, aggregators, and end users. The concept of an open specification is intended to allow anyone to implement the two-way signaling systems, providing the servers, which publish information (Virtual Top Nodes or VTNs) to the automated clients, which subscribe the information (Virtual End Nodes, or VENs).

本標準涵蓋 VTN 與 VEN 間(或 VTN/VEN 配對)之信令資料模型，並包含設施所採取之特定 DR 電力縮減或轉移策略的相關資訊。本標準特別支援以下 OASIS EI 1.0 標準之服務與其子集。為迎合 DR 利害相關者及市場需求，此等服務之延伸亦予以納入。

This OpenADR 2.0 profile specification covers the signaling data models between VTN and VEN (or VTN/VEN pairs) and does include information related to specific DR electric reduction or shifting strategies, which are taken at the facility. In particular, OpenADR 2.0 supports the following services from OASIS EI Version 1.0 standard or subset thereof. Extensions to these services are included to meet the DR stakeholder and market requirements:

- (a) **註冊(EiRegisterParty)**：註冊係用以識別諸如 VEN 及相關各方之實體。此為行為者 (actor)與 VEN、VTN、投標者等各種角色進行互動前必須執行之步驟。
 1. Registration (EiRegisterParty): Register is used to identify entities such as VEN's and parties. This is necessary in advance of an actor interacting with other parties in various roles such as VEN, VTN, tenderer, and so forth.
- (b) **登錄(EiEnroll)**：用以登錄資源參與 DR 方案。此建立 2 個行為者間之關係，做為進一步互動之基礎。(納入未來版本)
 2. Enrollment (EiEnroll): Used to enroll a Resource for participation in DR programs. This establishes a relationship between two actors as a basis for further interactions. (Planned for future releases)
- (c) **市場全景(EiMarketContext)**：用以發現方案規則、標準報告等。市場全景係用以表示不常變動之市場資訊，因此不需於每個訊息進行聯繫。(納入未來版本)
 3. Market Contexts (EiMarketContext): Used to discover program rules, standard reports, etc. Market contexts are used to express market information that rarely changes, and thereafter need not be communicated with each message. (Planned

for future releases)

- (d) **事件 (EiEvent)**：電價反應式 DR 之核心 DR 事件功能及資訊模型。此服務係用以呼叫交易中之效能資訊。服務參數及事件資訊區別不同型式之事件。事件型式包括可靠性事件、緊急事件...等等。此外還可定義針對交易中其他動作之事件。
4. Event (EiEvent): The core DR event functions and information models for pricerresponsive DR. This service is used to call for performance under a transaction. The service parameters and event information distinguish different types of events. Event types include reliability events, emergency events, and more – and events MAY be defined for other actions under a transaction.
- (e) **報價或動態價格 (EiQuote)**：EiDistributeQuote 用以分送複雜的動態價格，諸如區段及時段費率(block and tier tariff)通訊。此有時係指價格信號；此等信號係可能的投標價格之指示，其非自己可動作的。此服務可用以實作功能供能源市場互動或能源交易。(規劃於未來版本提供)
5. Quote or Dynamic Prices (EiQuote): EiDistributeQuote for distributing complex dynamic prices such as block and tier tariff communication. These are sometimes referred to as *price signals*; such signals are indications of a possible tender price – they are not themselves actionable. Such services can be used to implement the functionality for energy market interactions or transactional energy. (Planned for future releases)
- (f) **報告或回饋 (EiReport)**：設定資源狀態(回應)之周期性或一次性資訊的能力。
6. Reporting or Feedback (EiReport): The ability to set periodic or one-time information on the state of a Resource (response).
- (g) **可用性 (EiAvail)**：資源可用性之限制條件。此資訊由端末節點設定，並指示對於市場全景，VEN 何時可(或無法)接受及執行事件。瞭解其 VEN 之可用性及選擇資訊，增進 VTN 評估對事件或請求之回應的能力。(納入未來版本)
7. Availability (EiAvail): Constraints on the availability of Resources. This information is set by the end node and indicates when an event may or may not be accepted and executed by the VEN with respect to a Market Context. Knowing the Availability and Opt information for its VENs improves the ability of the VTN to estimate response to an event or request. (Planned for future releases)
- (h) **選擇或撤銷 (EiOpt)**：撤銷 EiAvail；因應可用性之短期變動，以建立及溝通由 VEN 至 VTN 之選擇加入及選擇退出排程。
8. Opt or Override (EiOpt): Overrides the EiAvail; addresses short-term changes in availability to create and communicate Opt-in and Opt-out schedules from the VEN to the VTN.

本標準中之此等 OpenADR 2.0 服務提供與 DR、定價及 DER 通訊要求之相關資訊。

These OpenADR 2.0 services in this specification provide information that is pertinent to DR, pricing, and DER communication requirements.

此等服務無預設資源中之特定 DR 電力負載控制策略，或電力服務提供者與其用戶間之市場特定契約或商業協議。

These services make no assumption on specific DR electric load control strategies within the resource or market-specific contractual or business agreements between electricity service providers and their customers.

OpenADR 使用獨立於傳送機制之應用層資料模型。基於互運性目的，本標準提供基本傳送機制及其相關互動型樣(例：PUSH 資訊對照於 PULL 資訊)，以因應不同利害相關者之需求。

OpenADR uses an application-level data model, which is independent of transport mechanisms. For the purposes of interoperability, OpenADR 2.0 provides basic transport mechanisms and their relevant interaction patterns (e.g. PUSH information vs. PULL information) to address different stakeholder needs.

本標準規定必要之安全等級，其對符合美國網宇安全(cyber security)對於資料機密性、整合性、鑑別及訊息層級安全性的要求事項相當重要。此等安全要求對於不可否認性原則而言相當重要，並可降低任何產生之網宇安全風險。

OpenADR 2.0 specifies the necessary level of security that is essential to meet the U.S. Cyber Security requirements for such purposes as data confidentiality, integrity, authentication and message-level security. Such security requirements are essential for non-repudiation and to mitigate any resulting Cyber Security risks.

本標準對各服務提供一組清楚之必備及選項屬性，以符合範圍更廣的互運性、測試及驗證要求，同時並建立具有不同產品剖繪之功能集，以因應現今市場需要，以及緊密調和以符合 OpenADR 目標之未來要求與智慧電網標準之國家互運性要求事項。

OpenADR 2.0 provides a clear set of mandatory and optional attributes within each of the services to meet the broader interoperability, testing and certification requirements, while creating feature-sets with different product profiles to address today's market needs as well as future requirements that are closely aligned to meet OpenADR goals and national interoperability requirements for Smart Grid standards.

OpenADR 之不同產品驗證等級包括 OpenADR 2.0a、OpenADR 2.0b 及 OpenADR 2.0b “Energy Reporting only” VEN (描繪於圖 1)。VTN 之 2.0a 驗證將隨本標準之公布而結束，既有的 2.0a VTN 實作必須升級至 OpenADR 2.0b 標準。因此圖 1 中未出現 2.0a VTN 之欄位。2.0b VTN 必須支援 2.0a VEN (亦即符合 OpenADR 2.0a 標準)。

The different product certification levels for OpenADR include OpenADR 2.0a, OpenADR 2.0b, and OpenADR 2.0b “Energy Reporting only” VENs (depicted in Figure 1). VTN certification for 2.0a will end with publication of this document,

and existing implementations of 2.0a VTNs must upgrade to the OpenADR 2.0b standard. For this reason, Figure 1 has no column for 2.0a VTN. 2.0b VTNs must support 2.0a VENs (and therefore comply with the OpenADR 2.0a standard).

VEN 可使用 OpenADR 2.0a、OpenADR 2.0b 及 OpenADR 2.0b “Energy Reporting only” 剖繪驗證。未來可能規定 OpenADR 2.0c 或新的市場特定剖繪。本標準描述 OpenADR 2.0b。最終的 2.0a 功能請參照 OpenADR 聯盟網站(<http://www.openadr.org/>) 所提供之規格。

VENs can be certified using the 2.0a, the 2.0b, and a 2.0b “Energy reporting only” profile. An OpenADR 2.0c or new market-specific profiles may be specified in the future. This profile specification describes OpenADR 2.0b. For the final 2.0a features, please refer to the respective specification, which is available on the OpenADR Alliance’s website – <http://www.openadr.org/>.

	VTN	VEN		
	B	A	B	B (僅能源報告)
服務及功能支援				
EiEvent				
有限剖繪 (2.0a規格)	M	M	NA	NA
完整剖繪	M	NA	M	NA
EiOpt				
完整剖繪	M	NA	M	NA
EiReport				
完整剖繪	M	NA	M*	M*
EiRegisterParty				
完整剖繪	M	NA	M	M
傳送協定				
簡易HTTP	M	M	O-1	O-1
XMPP	M	O	O-1	O-1
安全等級				
標準	M	M	M	M
高	O	NA	O	O
		M - 必備 O - 選項 O-1 - 選項，但至少支援其中一項	NA - 剖繪不適用 * - 選項功能可用	

圖 1 OpenADR 2.0 驗證等級

	VTN	VEN		
	B	A	B	B (Energy Reporting only)
Services and Functions Support				
EiEvent				
Limited Profile (2.0a specification)	M	M	NA	NA
Full Profile	M	NA	M	NA
EiOpt				
Full Profile	M	NA	M	NA
EiReport				
Full Profile	M	NA	M*	M*
EiRegisterParty				
Full Profile	M	NA	M	M
Transport Protocols				
Simple HTTP	M	M	O-1	O-1
XMPP	M	O	O-1	O-1
Security Levels				
Standard	M	M	M	M
High	O	NA	O	O
M - Mandatory O - Optional O-1 - Optional, but at least one of them must be supported NA - Not available for profile * Optional features available				

Figure 1: OpenADR 2.0 Certification Levels

2. 引用標準

2 Normative References

本標準之內文，引用下列標準之部份或全部內容，構成本標準需求。有加註年日期，適用該日期之版次。無標註日期者，適用該最新版(包括補充修正)。

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8601, Data elements and interchange formats – Information interchange – Representation of dates and times

INTERNET ENGINEERING TASK FORCE (IETF). RFC 2616: Hypertext Transfer Protocol –HTTP/1.1 [online]. Edited by R. Fielding et al. June 1999 [viewed 2018-08-02]. available at: <http://www.ietf.org/rfc/rfc2616.txt>

INTERNET ENGINEERING TASK FORCE (IETF). RFC 3986: Uniform Resource Identifier (URI): Generic Syntax [online]. Edited by T. Berners-Lee et al. January 2005 [viewed 2018- 08-02]. available at: <http://www.ietf.org/rfc/rfc3986.txt>

INTERNET ENGINEERING TASK FORCE (IETF). RFC 5246: The Transport Layer Security (TLS) Protocol Version 1.2 [online]. Edited by T. Dierks et al. August 2008 [viewed 2018-08-02]. available at

<https://tools.ietf.org/html/rfc5246>

INTERNET ENGINEERING TASK FORCE (IETF). RFC 6120: Extensible Messaging and Presence Protocol (XMPP): Core [online]. Edited by P. Saint-Andre. March 2011 [viewed 2018-08-02]. available at:

<http://www.ietf.org/rfc/rfc6120.txt>

INTERNET ENGINEERING TASK FORCE (IETF). RFC 6121: Extensible Messaging and Presence Protocol (XMPP): Instant Messaging and Presence [online]. Edited by P. Saint-Andre. March 2011 [viewed 2018-08-02]. available at:

<http://www.ietf.org/rfc/rfc6121.txt>

XMPP Standards Foundation. XEP-0030: Service Discovery [online]. Edited by J. Hildebrand et al. October 2017 [viewed 2018-08-02]. available at:

<http://xmpp.org/extensions/xep-0030.html>

3. 用語、定義及縮寫

3.1 用語及定義

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

下列用語及定義適用於本標準。

For the purposes of this document, the following terms and definitions apply. ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1.1 OpenADR 2.0

為本標準提供基礎之規範

specification that provides the basis for this document

3.1.2 PUSH 及 PULL 操作 (PUSH and PULL operation)

可在 PULL 模式 (VEN 自 VTN 提取資訊) 或 PUSH 模式 (VTN 推送資訊到 VEN) 下使用本標準的操作模式

備考 1. 除使用 oadrPoll 之外，即使 VEN 仍可向 VTN 發出請求，XMPP 傳輸仍使用 PUSH 模式

mode of operation by which this document can be used in either PULL mode (VEN pulling information from VTN) or in a PUSH mode (VTN pushing information to the VEN)

Note 1 to entry: The XMPP transport uses a PUSH model, although VENs can still make requests of the VTN, excluding the use of oadrPoll.

3.1.3 簡單 HTTP (simple HTTP)

HTTP 實作在 TLS 上使用 HTTP POST 以傳播酬載

HTTP implementation that uses HTTP POST over TLS to propagate payloads

3.1.4 虛擬末端節點 (virtual end node, VEN)

行為者假設的技術角色，其中行為者為本文件所定義的訊息消費者及/或生產者

備考：虛擬末端節點(VEN)可與零個或多個資源相關聯。VEN 能接收 VTN 推送的訊息，或發送請求或事件到 VTN。一個 VEN 可與數個 VTN 通訊，其中每個 VTN 為不同通訊域的一部分。

technical role assumed by an actor where the actor is a consumer and/or producer of messages that are defined by this document

Note 1 to entry: A virtual end node (VEN) can be associated with zero or more resources. A VEN can receive messages pushed from a VTN or send requests or events to a VTN. A VEN may communicate with multiple VTNs, where each VTN is part of a different communication domain.

[SOURCE: IEC TS 62746-3:2015, 3.1.15, modified – Note 2 to entry has been omitted.]

3.1.5 虛擬頂端節點 (virtual top node, VTN)

由行為者假設負責於通訊域內協調各 VEN 之技術角色

備考：此為 VEN 之特殊情況，其中虛擬頂節點(VTN)為許多 VEN 的親節點，負責該等 VEN 間之協調。VTN 負責對數個 VEN 推送訊息或接收其訊息。市場運營者、電網營運者或用戶群代表皆為實作 VTN 介面的行為者示例

[來源：修改自 IEC TS 62746-3:2015, 3.1.17]

technical role assumed by an actor that is assuming responsibility for the coordination of

VENs within a communication domain

Note 1 to entry: This is a special case of a VEN, where a virtual top node (VTN) is effectively a parent of many VENs with the responsibility for coordination of those VENs. A VTN is responsible for pushing to or receiving messages from many VENs. A market operator, grid operator or aggregator are examples of actors which will typically implement a VTN interface.

[SOURCE: IEC TS 62746-3:2015, 3.1.17, modified – Note 2 to entry has been omitted.]

3.1.6 資源 (resource)

與負載設定檔相關的需求面商品

demand-side commodity that is associated with a load profile

3.1.7 契約方 (party)

簽訂某種營運關係或契約之個體

備考：附錄 D 提供更詳細的定義

entity that enters into some sort of business relationship or contract

Note 1 to entry: A more detailed definition can be found in Annex D.

3.1.8 RSA

由 RSA Data Security, Inc. 置於公開領域的公開金鑰密碼系統

public-key crypto system placed into the public domain by RSA Data Security, Inc.

3.2 縮寫

CA	憑證機構 (certificate authority)
DER	分散式能源 (distributed energy resources)
DR	需量反應 (demand response)
ECC	橢圓曲線密碼學 (elliptic curve cryptography)
EI	能源互運 (energy interoperation)
HTTP	超文字傳送協定 (hyper text transfer protocol)
ISO	獨立系統營運者 (independent systems operator)
JID	Jabber 識別符 (jabber identifiers)
OpenADR	開放自動需量反應 (open automated demand response)
PICS	協定實作符合性聲明 (protocol implementation conformance statement)
PKI	公開金鑰基礎建設 (public key infrastructure)
SASL	簡單鑑別及安全層 (simple authentication and security layer)
SOAP	簡單物件存取協定 (simple object access protocol)
TLS	傳送層安全性協定 (transport layer security)
UCAIug	UCA 國際使用者群組 (utilities communications architecture international user group)
VEN	虛擬末端節點 (virtual end node)
VTN	虛擬頂端節點 (virtual top node)
XML	可延伸標示語言 (Extensible Markup Language)
XMPP	XML 傳訊及表現協定 (XML messaging and presence protocol)

CA certificate authority

DER distributed energy resources

DR Demand Response

ECC elliptic curve cryptography

EI energy interoperation

HTTP Hypertext Transfer Protocol

ISO independent systems operator

JID jabber identifier

OpenADR Open Automated Demand Response

PICS protocol implementation conformance statement

PKI public key infrastructure

SASL Simple Authentication and Security Layer

SOAP Simple Object Access Protocol

TLS Transport Layer Security

UCAIug Utilities Communications Architecture International Users Group

VEN virtual end node

VTN virtual top node

XML Extensible Markup Language

XMPP XML Messaging and Presence Protocol

4. 概觀

4.1 一般

本節提供本標準內支援之訊息交換、角色及行為者之概觀。包含下列用以發展智慧電網與用戶系統互運性之測試及驗證框架元件。

Overview

4.1 General

Clause 4 gives an overview of the message exchanges, the roles, and actors supported within this document. It contains the following elements, used to develop test and certification framework for smart grid and customer systems interoperability:

- (a) 一組資料模型，用於描述訊息酬載通訊的資訊。
- (b) 一組服務，用以履行資料模型交換之各種功能及操作。
- (c) 一組傳送機制，用以實作服務。傳送機制依賴諸如 HTTP 及 XMPP 等標準 IP 通訊。
- (d) 一組安全機制，用以保護各傳送機制。
- (e) 一組 XML 綱要(參照附件 E)。

a set of data models that describe information communicated in message payloads;

A set of services for performing various functions and operations for the exchange of the data models;

A set transport mechanisms for implementing the services. The transport mechanisms rely upon standard-based IP communications such as HTTP and XML Messaging and Presence Protocol (XMPP).

A set of security mechanisms for securing each of the transport mechanisms.

a set of XML schemas (see Annex E)

本標準系統在於 IEC 標準框架內的之整合是係通過藉依據本系列標準第 10-3 部描述的所述之方法論生產的 CIM 接配接器來而完成。本文件本標準內的之訊息交換支持援需量反應事件相關的通信資訊的服務。節點的之網路應能查詢活動或擱

置未決事件，自行註冊、計劃排程事件及發送報告。節點亦應能完善並更新先前發送的信息。例：向下游節點報告需量反應事件的節點，應能在必要時取消先前計劃排定的事件。

Integration of IEC 62746-10-1 systems within the IEC's standards framework is done with a CIM adapter that may be produced in accordance with the methodology described in IEC 62746-10-3. Message exchanges in this document support services for communicating information about demand response events. Networks of nodes shall be able to query for active or pending events, register themselves, schedule events, and send reports. The nodes shall also be able to refine and update previously sent information. For instance, a node reporting DR events to nodes downstream shall be able to cancel a previously scheduled event if this becomes necessary.

此等網路中之節點可分成 2 個群組：一種係發布及傳輸關於事件之資訊予其他節點(例：公用事業)，另一種係接收通訊然後回應該資訊之節點(例：終端使用者)。發布關於即將到來事件之資訊的上游節點稱為“虛擬頂節點(VTN)”，接收此資訊之下游節點稱為“虛擬端末節點(VEN)”。

Nodes in these networks are divided into two groups: nodes, which publish and transmit information about events to other nodes (e.g. Utilities), and nodes that receive the communications and then respond to that information (e.g. end users). The upstream nodes that publish information about upcoming events are called Virtual Top Nodes (VTNs); the downstream nodes that receive this information are called Virtual End Nodes (VENs).

此等節點可能使用各種通訊協定進行通訊。其可能於 PUSH 模式(由 VTN 初始通訊)或 PULL 模式(VEN 向 VTN 要求資訊以啟始一連串訊息交換)中使用 HTTP 進行通訊。VTN/VEN 亦可透過其他諸如 XMPP(messaging and presence protocol)傳送機制進行通訊。

These nodes may communicate using a variety of protocols. They may communicate using HTTP in either PUSH mode (where the VTN initiates communication) or in a PULL mode (the VEN requests information from the VTN to begin a series of message exchanges). The VTNs/VENs may also communicate over other transport mechanisms such as XML Messaging and Presence Protocol (XMPP).

本標準支援持不同程度功能的終端設備。然而，為了實現互運性，所有的通信協定功能都是強制必備的。

本標準規定下列服務：

- (a) 註冊(Register)：註冊功能會以各種角色(例：VEN 及 VTN)在與其它方進行交互作用之前先行識別實體。
- (b) 事件(Event)：核心需量反應事件起作用且為價格反應 DR 提供信息模式。此服務用於在交易下提出執行要求。服務的參數及事件資訊能區分不同類型的

事件：可靠性事件、緊急事件、價格事件、監管事件以及將來可能發生的其它類型他型式。

(c) 報告(Report)：報告服務啟用對伺服器的之反饋，以提供資源狀態的定期或一次性資訊。

(d) 選擇(Opt)：凌駕 EiAvail 並解決針對可用性的短期變化，以建立並傳輸 VEN 到至 VTN 的請求加入及請求退出的排程。

表 1 說明本標準之必備及選項的實作。

This document supports end devices with a varying degree of capabilities. However, for interoperability, all protocol capabilities are mandatory.

IEC 62746-10-1 specifies the following services:

- 1) Register: Registration identifies entities in advance of interactions with other parties in various roles such as VEN and VTN.
- 2) Event: The core DR event functions and information models for price-responsive DR. This service is used to call for performance under a transaction. The service parameters and event information distinguish different types of events: reliability events, emergency events, price events, regulation events and possibly other types in the future.
- 3) Report: The report service enables feedback to the server in order to provide periodic or one-time information on the state of a resource.
- 4) Opt: Overrides the EiAvail and addresses short-term changes in availability to create and communicate opt-in and opt-out schedules from the VEN to the VTN.

Table 1 outlines the mandatory and optional implementation of this document.

表 1 本標準支援之服務

	VTN	VEN	
		完整	(僅能源報告)
服務及功能支援			
EiEvent			
完整剖繪	M	M	NA
EiOpt			
完整剖繪	M	M	NA
EiReport			
完整剖繪	M	M*	M*
EiRegisterParty			
完整剖繪	M	M	M

傳送協定			
簡易 HTTP	M	O-1	O-1
XMPP	M	O-1	O-1
安全等級			
標準	M	M	M
高	O	O	O
M：必備 O：選項 O-1：選項，但應至少支援一選項		NA：不可用 *：選項功能可用	

4.2 節點及裝置型式

對於使用 **本標準** 進行通訊之行為者間之互動，其中 1 個行為者被指定為虛擬頂節點，其餘行為者則為虛擬端末節點。此外，所有通訊均於 1 個 VTN 與 1 或多個 VEN 間進行。

4.2 Node and device types

For any interaction between actors using **this document** to communicate, one actor is designated the virtual top node and the remainder are the virtual end nodes. All communications are between a VTN and one or more VENs.

本標準 中並無同層間通訊，亦即 VTN 不直接與其他 VTN 通訊，同樣的，VEN 亦不直接與其他 VEN 通訊。

There is no peer-to-peer communication in **this document**, i.e. VTNs do not communicate directly with other VTNs, and, likewise, VENs do not communicate directly with other VENs.

VTN **通常** 扮演伺服器，提供資訊給 VEN，然後 VEN 對資訊作出回應。例如，VTN 會成為宣布 DR 事件的個體，VEN 得知 DR 事件並作反應。反應可能是減少某些裝置之用電。反應亦可能是將信號傳播至其他 VEN。於此情況，VEN 將變成新互動之 VTN，**例：圖 1 中之用戶群代表**。

The VTN **generally** acts as the server, providing information to the VEN, which respond to the information. For instance, a VTN would be the entity to announce a DR event; **then**, VENs hear about DR events and respond. The response **can** be to reduce power to some devices. The response could also be to propagate the signal further downstream to other VENs. In this case, the VEN would become the VTN for the new interaction (**e.g. the aggregator** in Figure 1).

為裝置開發之目的，**製造者宜** 恆測試 VTN 及 VEN 間之介面，任一節點皆可為待測裝置。內建於系統中但與訊息交換無關之智慧則非 **本標準** 的部分。

For the purpose of device development, the **manufacturer should** always test the

interface between a VTN and a VEN, where either node can be the device under test. Intelligence built into the systems not related to the message exchange is not part of **this document**.

綱要和符合性規則定義 VEN 及 VTN 的實作的授權要求事項。後續各節之說明與符合性規則分開，提供背景以及實作的示例，但並未包含實作要求的完整範圍。因此，強烈建議實作者在編碼前徹底瞭解所有符合性規則。

The authoritative requirements for implementation of VENs and VTNs are defined in the schema and the conformance rules. Narrative descriptions in later clauses separate from the conformance rules provide context and implementation examples, but do not contain the full breadth of implementation requirements. Therefore, it is strongly recommended that implementers thoroughly understand all the conformance rules prior to coding.

雖然在任何互動中，指定 1 個行為者為 VTN，其餘行為者為 VEN (多數互動僅有 1 個 VTN 及 1 個 VEN)，藉由允許行為者於某些互動中擔任 VEN，而於其他互動中擔任 VTN，能以任何階層安排一組行為者之角色。

Although within any interaction, one actor is designated the VTN and the remainder are VENs (moreover, most interactions have exactly one VTN and one VEN), sets of actors can be arranged in any hierarchy, by allowing actors to act as VENs for some interactions and VTNs for others.

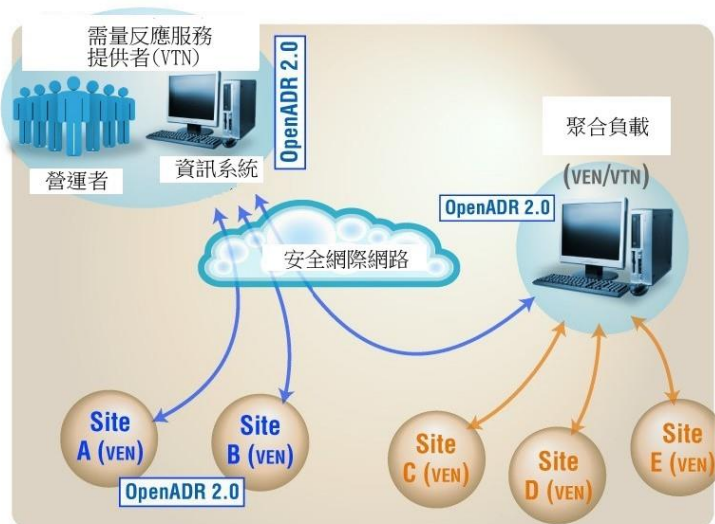


圖 1 VTN 與 VEN 間之可能關係

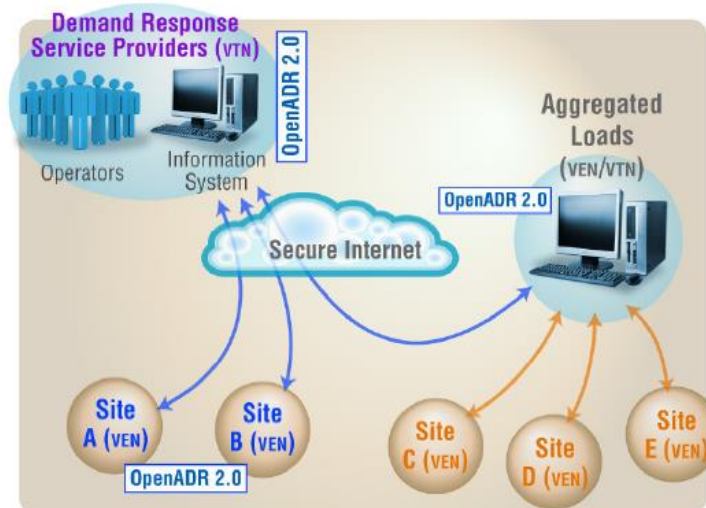


Figure 1 – Possible relationships of VTN and VEN

如圖 1 所示，由公用事業/ISO（服務提供者或伺服器）至場域（客戶）間，任何的 VTN 及 VEN 組合皆為可能。此外，如上圖所示，系統可對於較高階層之 VTN 扮演 VEN 角色，亦可以做為下級 VEN 之 VTN。於 2 者中任一種結構式情境中，操作可由 VTN 向 VEN 發起(PUSH 模式)，或可由 VEN 向 VTN(PULL 模式)請求之。

As illustrated in Figure 1, any combination of VTN and VEN is possible through a Utility/ISO (service provider or server) to Sites (customers). Also, as shown above, systems can function as a VEN to a VTN in a higher layer of the hierarchy and as a VTN to subordinate VENs. In either of these architectural scenarios, an operation can be initiated by the VTN to a VEN (PUSH pattern) or a VEN can request it from a VTN (PULL pattern).

於雙向中交換之事件可相互獨立，且本標準未定義此等節點回應資訊之方式。於同時支援 VTN 及 VEN 介面(例：用戶群代表)之節點中，無任何規格或限制條件，規定到達介接之 VEN 的訊息應如何配成對或轉譯為可由 VTN 介面發送之訊息(反之亦然)。

The exchanged events in either direction can be independent from each other and this document does not define how the nodes react to the information. In nodes that support both the VTN and VEN interfaces (e.g., aggregators), there are no specifications or constraints on how messages arriving at the VEN interface are coupled or translated into any subsequent messages that can be sent from the VTN interface, and vice versa.

其被視為完全獨立之介面，並分別進行評估與測試，以確保符合剖繪規格及互運性。特定部署情境依電力公司/ISO 與參與案場間之協議而定。

They are treated as completely independent interfaces and both will be evaluated and tested independently to assure adherence to the profile specification and interoperability. A specific deployment scenario depends on an agreement between the Utility/ISO and the participating Sites.

4.3 本標準之服務

4.3 IEC 62746-10-1 services

本標準使用 4 個定義之服務，各服務被裁適以滿足相對市場之需要。此等服務係 EiRegisterParty, EiEvent, EiReport, 及 EiOpt。此等服務之詳細資訊，參照第 6 節。

This document uses four defined services, each one profiled and tailored to meet the relevant

market needs. These services are EiRegisterParty, EiEvent, EiReport, and EiOpt. For further information on these services, consult section 6.

4.4 假設 (Assumption)

關於 VEN 與 VTN 間正確功能行為之操作假設如下：

- VTN 及 VEN 兩者皆應有現在時間之認知。時間同步要求由特定實作及需量反應方案決定。

4.4 Assumptions

Operating assumptions regarding correct functional behavior between VENs and VTNs are as follows:

- Both the VTN and VEN shall have awareness of the current time. Time synchronization requirements are determined by the specific implementation and demand response program.

5. 本標準之功能

5 IEC 62746-10-1 features

5.1 一般

5.1 General

本標準之功能集係為先進需量反應系統及市場(例：躉售及零售 DR 市場)而發展。其包括延伸 EiEvent 服務以及若干可用於需量反應方案及輔助服務之額外服務。

This document's feature set was developed for advanced demand response systems and markets (e.g. wholesale and retail DR markets). It includes an extended EiEvent service as well as several additional services usable in demand response programs and for ancillary services.

5.2 支援服務

5.2 Supported Services

- (a) EiEvent 服務。
- (b) EiReport 服務。
- (c) EiRegisterParty 服務。
- (d) EiOpt 服務。

5.3 僅報告之 VEN

5.3 Report Only VENs

某些如電表之裝置，沒有卸載能力。然而，此等型式之裝置能對 VTN 提供有價值之報告資訊。本標準含有稱為“Report Only”之 VEN 子剖繪，其包括對下列

服務之支援。

- (a) EiReport 服務。
- (b) EiRegisterParty 服務。

Some devices, such as meters, do not have the ability to shed load. However, these types of devices can provide valuable reporting information to the VTN. **This document** has a subprofile for VENs called Report Only, which includes support for the following services:

- a) EiReport Service
- EiRegisterParty Service

5.4 傳送機制

5.4 Transport Mechanism

支援之傳送機制如下。機制描述於第 7 節。

- (a) HTTP 為 VTN 必備；VEN 應支援 HTTP 或 XMPP 其中之一。
- (b) XMPP 為 VTN 必備；VEN 應支援 HTTP 或 XMPP 其中之一。

Supported transport mechanisms are as follows. The mechanisms are described in section 7.

HTTP is mandatory for VTNs; VENs shall either support HTTP or XMPP
XMPP is mandatory for VTNs; VENs shall either support HTTP or XMPP

5.5 安全

5.5 Security

支援安全細節概述於第 7 節及第 8 節。下列安全等級適用於本標準。

- (a) 標準安全 – 必備。
- (b) 高安全 – 選項。

Supported security details are outlined in sections 7 and 8. The following security levels apply to **this document**:

Standard Security – mandatory
High Security – optional

6. 服務及資料模型延伸

6 Services and Data Models Extensions

6.1 Event 服務

6.1.1 Event 互動

6.1 Event service

6.1.1 Event interactions

事件係由 VTN 產生，並使用 `oadrDistributeEvent` 酬載發送至 VEN，酬載包含 1 或多個由 `oadrEvent` 元件描述之事件。某些事件要求回應，而由事件描述中 `oadrResponseRequired` 元件指示之其他事件則不必。若要求回應，則 VEN 藉由回覆包含匹配各 `oadrEvent` 之 `eventResponse` 元件的 `oadrCreatedEvent` 酬載，確認其選擇加入或選擇不加入之安排。若不要求回應，則 VEN 不得就此事件回覆

oadrCreatedEvents (或 oadrCreateOpt) 酬載。

Events are generated by the VTN and sent to the VEN using the oadrDistributeEvent payload containing one or more events described by the oadrEvent element. Some events require a response and others do not, as indicated by the oadrResponseRequired element in the event description. If a response is required, the VEN acknowledges its opt-in or out-out disposition by responding with an oadrCreatedEvent payload containing eventResponse elements matching each oadrEvent. If no response is required, the VEN must not reply with oadrCreatedEvents (or oadrCreateOpt) payloads for this event.

可擇一使用 PUSH 或 PULL 互動型樣。針對 PUSH，VTN 應使用 oadrDistributeEvent 酬載遞送事件至 VEN。PULL 模式中，oadrDistributeEvent 應被從 VTN 發送至 VEN 作為對 oadrPoll 之回應(參照 6.5)。除定期發送 oadrPoll 外，為了自 VTN 獲取事件，VEN 亦可發送一次 oadrRequestEvent 酬載至 VTN。若要求應用層級回應，則 VEN 非同步地於下次訊息中回送 oadrCreatedEvent 至 VTN。此等序列於圖 2 中說明。注意，simpleHTTP PUSH 模式中，必要時 VEN 對 oadrDistributeEvent 之回應係傳送層確認(HTTP 情況中為 200 回應碼；XMPP 中為之空 IQ 區段)。

Either a PUSH or PULL interaction pattern may be used. For push, the VTN shall deliver events to the VEN using an oadrDistributeEvent payload. In PULL mode, the oadrDistributeEvent shall be sent from the VTN to the VEN as response to an oadrPoll (refer to 6.5). In addition to periodically sending oadrPoll, a VEN may also send one-time oadrRequestEvent payloads to the VTN in order to acquire events from the VTN. If an application level response is required, the VEN asynchronously sends an oadrCreatedEvent back to the VTN in a second message. These sequences are illustrated in Figure 2. Note that in simpleHTTP PUSH mode, the VEN's response to oadrDistributeEvent is a transport level acknowledgement if required (in the case of HTTP, a 200 response code; in XMPP, an empty IQ stanza).

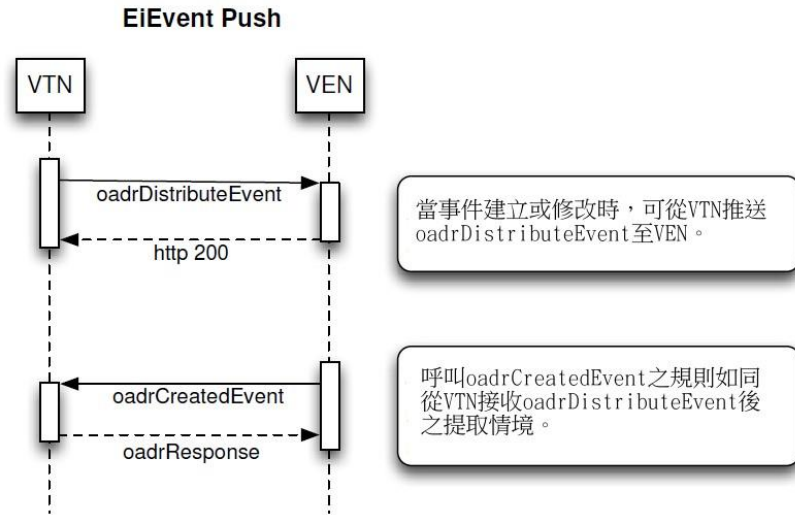


圖 2 EiEvent PUSH 型樣

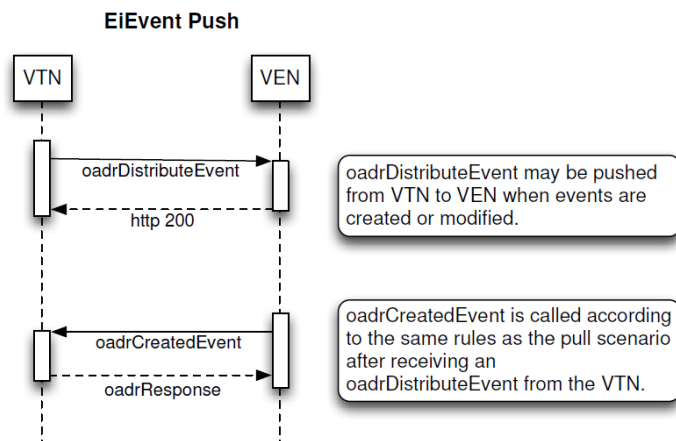


Figure 2 EiEvent PUSH Pattern

針對 PULL 情況，VEN 請求事件藉由發送 oadrPoll 至 VTN (參照 6.5)。VTN 回覆 oadrDistributeEvent。就此點而言，VEN 回應確切如同 PUSH 互動中者。此等序列於圖 3 中說明。

For the PULL case the VEN requests events by sending an oadrPoll to the VTN (see 6.5). The VTN responds with an oadrDistributeEvent. From this point the VEN response is exactly the same as in the PUSH interaction. These sequences are illustrated in Figure 3.

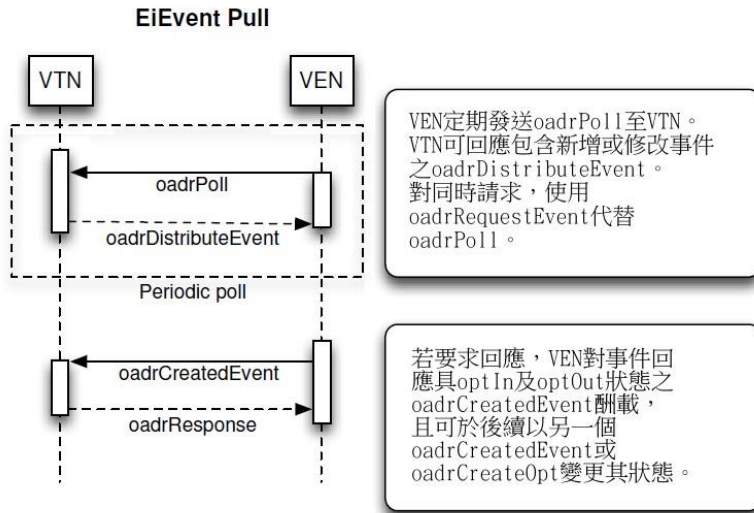


圖 3 EiEvent PULL 型樣

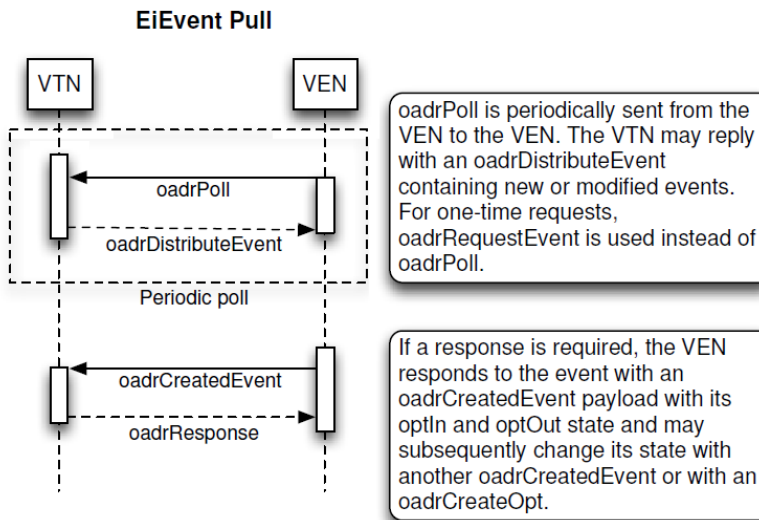


Figure 3 EiEvent PULL Pattern

第 7 節中涵蓋特定傳送機制之情境內，此等互動如何履行之細節。

The details of how these interactions are performed within the context of a specific transport mechanism are covered in **Clause 7**.

當事件要求回應時，恆自 VEN 發送初始 oadrCreatedEvent 至 VTN。若給定之程式允許 VEN 於事件期間稍後變更其選擇狀態(opt-state)，則其藉由發行包含給定事件新狀態之後續 oadrCreatedEvent (或 oadrCreateOpt) 訊息而為之。VTN 及 VEN 事件處理之詳細描述於下列段落中說明。

When an event requires a response, an initial oadrCreatedEvent is always sent from the VEN to the VTN. If a given program allows a VEN to later change its opt-state during an event, it may do so by issuing subsequent oadrCreatedEvent (or oadrCreateOpt) message containing the new state for a given event. Detailed

descriptions of VTN and VEN event processing are given in the following paragraphs.

注意，PUSH 及 PULL 兩者之操作，oadrDistributeEvent 酬載將恆包含適合與 VEN 通訊之所有事件。

Note that for both PUSH and PULL operations, an oadrDistributeEvent payload will always contain all events applicable to the VEN it is communicating with.

事件係於 oadrDistributeEvent 酬載中使用 1 或多個 oadrEvent 元件載送。oadrDistributeEvent 酬載具有下列組件。

Events are conveyed in the oadrDistributeEvent payload using one or more oadrEvent elements. The oadrDistributeEvent payload has the following components:

- 唯一地識別此請求及任何包含事件之 requestID。
- 識別發送請求之 VTN 的 vtnID。
- 0 或多個 oadrEvent 元件。

A requestID to uniquely identify this request and any contained events.

A vtnID identifying the VTN sending the request.

Zero or more oadrEvent elements.

requestID 唯一地識別請求及任何包含之事件。其值係由 VTN 使用任何其所欲方案而設定，若方案之使用非 VTN 所需，則包括每個請求中使用之相同值。接收 VEN 應於 oadrCreatedEvent 事件回應中使用此 requestID。

The requestID uniquely identifies the request and any contained events. Its value is set by the VTN using whatever scheme they desire, including using the same value in every request if its use is not needed by the VTN. The receiving VEN shall use this requestID in the oadrCreatedEvent event responses.

(a) oadrEvent 描述

a) oadrEvent Description

oadrEvent 元件描述個別事件、信號值，以及適用信號之期間。各 oadrEvent 具有包含詳細事件資訊之 eiEvent 元件，以及控制 VEN 是否應回覆 oadrCreatedEvent 之 oadrResponseRequired 元件。

oadrEvent elements describe individual events, signal values, and time periods that apply to signals. Each oadrEvent has an eiEvent element containing detailed event information and an oadrResponseRequired element that controls whether a VEN shall respond with an oadrCreatedEvent.

responseRequired 值域指示 VEN 應如何回應所包含事件。值為 "always" 指示 VEN 應回應各事件之事件狀態(eventID、modificationNumber)是否已變更。值為 "never" 意指 "broadcast" 事件，此情況中，VEN 不應發送任何回應。

The responseRequired field indicates how the VEN shall respond to contained

events. A value of "always" indicates that the VEN shall reply to each event whether or not the event state (eventID, modificationNumber) has changed. A value of "never" implies a "broadcast" event and the VEN shall not send any responses in this case.

eiEvent eventDescriptor 具有下列值域。

The eiEvent eventDescriptor has the following fields:

- eventID – 此事件之唯一 ID。ID 於 VTN 之全景內係唯一。
- modificationNumber – 以 0 起始且每次 VTN 修改事件即遞增 1 之序列。
- modificationDateTime – 事件已經修改之時間(僅於 2.0b 酬載中)。時間同步要求事項參引至 5.4。
- modificationReason – 為何事件已經修改之理由(僅於 2.0b 酬載中)。
- 優先序 – 事件優先序之指示，0 為無優先序。
- marketContext – 識別屬於事件之特別程式或應用定義分群。

eventID – a unique ID for this event. The ID is unique within the context of a VTN.

modificationNumber – A sequence that starts at zero and is incremented by 1 each time the VTN modifies the event.

modificationDateTime – The time the event has been modified (only in 2.0b payloads). Refer to 5.4 for time synchronization requirements.

modificationReason – The reason why the event has been modified (only in 2.0b payloads)

priority – An indication of the event priority with 0 being no priority

marketContext – Identifies a particular program or application-defined grouping that pertains to an event.

- createdDateTime – 包含事件之酬載的建立時間。注意，當酬載可能緩存且僅於事件修改時重建，故無須於每次傳輸酬載建立。事件酬載之任何變更要求 createdDateTime 之更新。時間同步要求事項參引至 5.4。
- eventStatus – 事件之狀態，指示事件係 "near"、"far"、"active" 或 "canceled"。
- testEvent – 若非 false，則指示此係測試事件。
- vtnComment – 由 VTN 提供之任意註解。

createdDateTime – The time the payload containing the event was created. Note that payloads are not necessarily created each time they are transmitted as they may be buffered and only recreated if the event is modified. Any change of the payload of the event requires an update of createdDateTime. Refer to 5.4 for time synchronization requirements.

eventStatus – The status of the event, indicating if the event is "near", "far", "active" or "canceled".

testEvent – If not false, indicates this is a test event.

vtnComment – Arbitrary comment provided by the VTN.

單一 eiActivePeriod 定義事件之啟始時間及期間。啟始時間係以 CNS 7648 時間描述符定義之，而 CNS 7648 期間串列則規定期間。實作要求支援 CNS 7648 表示法(包括支援小數秒)。

A single eiActivePeriod defines the start time and duration of the event. The start time is defined by an ISO 8601 time descriptor and an ISO 8601 duration string specifies the duration. Implementations are required to support the ISO 8601 representation (including support for fractional seconds).

通過 eiActivePeriod 內的容許物件可將起始時間隨機化。startafter 子元件定義 VEN 使用的隨機時窗以選擇添加到事件的起始時間的隨機值。在一個 1hr 事件的起始時間為 3:00，且隨機時窗為 5 min 的情況下；如 VEN 選擇 3 min 作為隨機值，則該事件將在 3:03 開始且於 4:03 終止。

Event start times can be randomized using the tolerance object in the eiActivePeriod. The sub-element startafter defines a randomization time window used by the VEN to select a random value that is added to the start time of the event. If the start time of a one-hour event is 3:00 and the randomization window is 5 min, if the VEN selected 3 min as the random value then the event would start at 3:03 and would end at 4:03.

適用於整個作用期間之事件信號定義於 eiEventSignals 元件中。此元件包含 1 或多個 eiEventSignal 元件，各具一序列之期間，其總和應等於作用期間之全部期間。各信號元件包含 signalType，諸如水準或價格。signalPayload 包含信號之值，依表 2 所列。

The event signals that get applied over the entire active period are defined in an eiEventSignals element. This element contains one or more eiEventSignal elements, each with a sequence of durations, the sum of which shall equal the full duration of the active period. Each signal element contains a signalType such as level or price. The signalPayload contains the value of the signal according to Table 2.

圖 4 描述事件之不同期間。此圖上之 2 個先前未討論之項目定義如下。

Figure 4 depicts the different time periods of an event. Two items on this figure not previously discussed are defined below.

Ramp Up Period (加速時期)

於表示為期間(duration)之作用時段(active interval)開始處的時期(period)，該期間內 VEN 自其先前狀態移動至其請求狀態。若為負，則加速發生於作用時段之邊界內，亦即其啟始與作用時段相同之時刻。若無加速時期，則

所有其他規則處理為零長度之加速時期。

Period at the beginning of the Active Interval expressed as a Duration, during which a VEN moves from its former state to its requested state. If negative, then the Ramp Up occurs within the bounds of the Active Interval, i.e., it starts at the same moment as the Active Interval. If there is no Ramp Up Period, then all other rules are processed as if there were a Ramp Up Period of zero length.

Recovery Period (復原時期)

於表示為期間之作用時段結束處的時期，該期間內回應之效應可能反轉而系統回復至其基礎狀態。例：系統於事件期間減少能源使用，藉由提升空氣溫度可在復原期間使用額外能量而將空氣冷卻至正常設定。若為負，則復原發生於作用時段之邊界內，亦即其結束與作用時段相同之時刻。

Period at the end of the Active Interval expressed as a Duration during which the effect of the response may be reversed while the system returns to its base state. For example, a system that reduces energy use during an Event by raising the air temperature may use additional energy during the recovery period while cooling the air to the normal setting. If negative, then the Recovery Period occurs within the bounds of the Active Interval, i.e., it ends at the same moment as does the Active Interval.

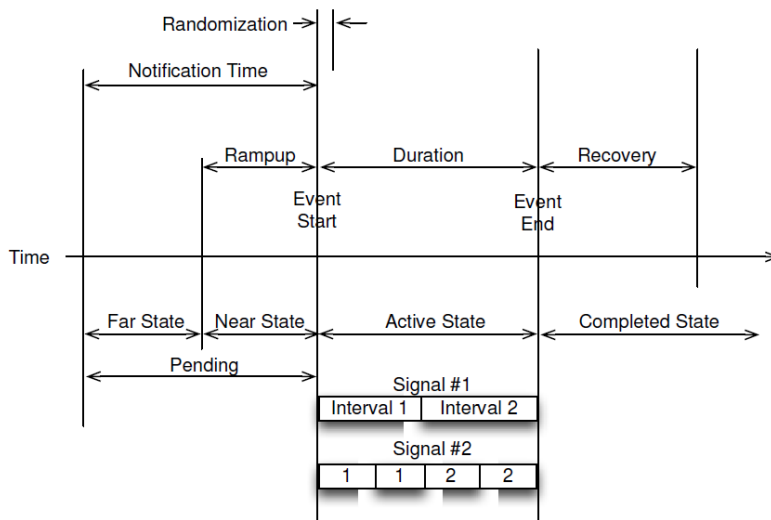


圖 4 事件之時段

Figure 4 Time intervals of an event

EiTarget 可用以提供資訊，明確規定適用於事件之個體。B 剖繪亦支援信號特定 EiTarget。EiTarget 可包含 1 或多個標的，諸如 groupID、resourceID 或 PartyID (尚有其他可用者)。當 VEN 扮演用戶群代表且背後具多種重資源

時，此等可被使用。此等 ID 如何精確處置超出本標準範圍，而應於 VEN 及 VTN 處理並提供。若 EiTarget 元件為空值，則 VEN 應假設其係主要且僅為事件標定之資源。

The EiTarget may be used to provide information to explicitly specify the entities that apply to events. The B profile also supports signal specific EiTargets. An EiTarget may contain one or more targets such as groupIDs, resourceIDs, or partyIDs (many others available). These may be used, for example, when a VEN is acting as an aggregator and has multiple resources behind it. Exactly how these IDs are handled is beyond the scope of this document and shall be dealt with by provisioning at the VEN and VTN. If the EiTarget element is empty, the VEN shall assume that it is the primary and only resource targeted by the events.

(b) oadrCreatedEvent 描述

b) oadrCreatedEvent Description

當 1 或多個接收之事件要求回應時，VEN 建立且填寫 oadrCreatedEvent 元件，並將其郵寄至 VTN。eiResponse 元件包含應用層級 responseCode 及 responseDescription 及 requestID。eiResponses 元件包含對應各事件之 1 或多個 eventResponse 元件。此等係匹配至使用 qualifiedEventID 之特定事件，其包含 eventID 及 modificationNumber。optType 可具有“optIn”或“optOut”之值，以指示給定事件之 VEN 安排。

When one or more received events require a response, the VEN creates and populates an oadrCreatedEvent element and posts it to the VTN. The eiResponse element contains an application level responseCode and responseDescription and a requestID. An eiResponses element contains one or more eventResponse elements corresponding to each event. These are matched to specific events using the qualifiedEventID, which contains an eventID and modificationNumber. The optType may have a value of “optIn” or “optOut” to indicate the VENs disposition for a given event.

初始 oadrCreatedEvent 回應應針對要求回應之各事件發送。當給定 marketContext 允許時，亦可發送後續 oadrCreatedEvent 訊息，以變更 VEN 之選擇狀態。

An initial oadrCreatedEvent response shall be sent for each event requiring a response. Subsequent oadrCreatedEvent messages may also be sent to change the opt-state of a VEN when this is allowed for a given marketContext.

oadrCreatedEvent 中之事件分群係完全在於 VEN，而無須對應 oadrDistributeEvent 中之事件分群。VEN 係藉由美事件傳輸 1 個 oadrCreatedEvent 酬載，或集合多個事件回應成單一 oadrCreatedEvent 酬載，自由發送其選擇狀況(opt-status)。

The grouping of events in an `oadrCreatedEvent` is completely up to the VEN and does not necessarily correspond to the grouping of events in an `oadrDistributeEvent`. The VEN is free to send its opt-statuses by transmitting one `oadrCreatedEvent` payload per event or group multiple event responses into a single `oadrCreatedEvent` payload.

6.1.2 `oadrEvent` 機制

6.1.2.1 一般

6.1.2 `oadrEvent` mechanism

6.1.2.1 General

- 事件信號型式能為 SIMPLE 或特定。支援 6.1.2.3 中描述之完整信號集。
- 事件可包含多個事件信號。
- 事件信號可包含 `EiTarget` 元件，不同於事件層級 `EiTarget`。然而，標的型式應限制為 `endDeviceAsset`，附帶符合性規則中顯示之裝置型式的列舉值。

Event signal type can be SIMPLE or specific. The full set of signals described in 6.1.2.3 is supported.

Events may contain multiple event signals.

Event signals may contain `EiTarget` elements, distinct from the event-level `EiTarget`. However, the target types shall be constrained to `endDeviceAsset` with the enumerated values for device type shown in the conformance rules.

- 事件信號可包含底線元件。底線整體期間及時段之規則與事件作用期間及事件信號時段之規則相同。
- 事件描述可包含 `modificationDateTime` 及 `modificationReason` 元件。
- 除了 `oadrCreatedEvent`，`EiOpt` 服務能用以自 VEN 發送排程至 VTN。
- `oadrPoll` 機制係用於簡易 HTTP PULL 交換中，以塑模 PUSH 實作之行為。更多資訊參照 6.5。

Event signals may contain baseline elements. The rules for baseline overall duration and intervals are the same as those between the event active period and event signal intervals.

The event description may contain `modificationDateTime` and `modificationReason` elements.

The `EiOpt` service can be used to send schedules from the VEN to the VTN, in addition to `oadrCreatedEvent`.

The `oadrPoll` mechanism is used in a simple HTTP PULL exchange to model the behavior of a PUSH implementation. For more information, refer to section 6.5.

6.1.2.2 事件標的及資源

6.1.2.2 Event Targets and Resources

本標準包括更多標的型式，且亦允許針對適用於信號層級之裝置類別標的。

VEN 係表示 1 或多個邏輯資源(個別可卸載負載、端點設備、電表等)之通訊

端點。事件標的選擇適用於事件之特定 VEN 資源。若未規定事件標的，則 VEN 宜假設其適用於所有資源。資源如何指派性質(位置、pnode 關聯、resourceID、groupID 等)超出本標準範圍，而倚賴 VTN 及 VEN 中之部署組態。然而，若 VEN 接收未組態之事件標的，則其宜以 6.6 中描述之適當錯誤碼拒絕訊息。

This document includes several more target types and also allows device class targeting to be applied at the signal level. A VEN is a communication endpoint that represents one or more logical resources (individual shedable loads, endpoint equipment, meters, etc.). Event targets select which specific VEN resources the event applies to. If an event target is not specified, the VEN should assume that it applies to all of its resources. How resources are assigned properties (location, pnode associations, resourceIDs, groupIDs, etc.) is outside the scope of this document and is up to deployment configurations in the VTN and VEN. However, if a VEN receives an event target that it is not configured for, it should reject the message with the appropriate error code described in 6.6.

6.1.2.3 事件信號定義

6.1.2.3 Event Signal Definitions

本標準允許事件訊息中更多各種集合之信號。eiEventSignal:signalName、eiEventSignal:signalType 及 eiEventSignal:itemBase 屬性係用以描述信號。表 2 列舉可使用之標準預定義信號。預定義信號旨在建立信號之共同集合及其互運性用途之屬性。為遵循目的，其不要求 VTN 或 VEN 支援表 2 中列舉之所有信號。IEC 62746-10-1 allows for a more diverse set of signals in the event messages. The eiEventSignal:signalName, eiEventSignal:signalType, and eiEventSignal:itemBase attributes are used to describe the signal. Table 2 lists standard pre-defined signals that may be used. The purpose of the pre-defined signals is to establish a common set of signals and their attributes for the purposes of interoperability. For compliance purposes, it is not a requirement that a VTN or VEN support all the signals listed in Table 2.

進一步特定部署係超越表 2 中所定義，自由地定義其自有客製信號，但不要求任何 VTN 或 VEN 支援此種信號之遵循目的的要求事項。

Furthermore specific deployments are free to define their own custom signals beyond what are defined in the table 2, but there are no requirements for compliance purposes that any VTN's or VEN's support such signals.

eiEventSignal:signalID 屬性之值係部署特定，且主要用以區分案例中之信號，其中可能有相同型式之多個信號。

The value of the eiEventSignal:signalID attribute is deployment specific and primarily used to differentiate signals in cases where there may be multiple

signals of the same type.

表 2 信號

Table 2 Signals

信號種類 Signal Category	名稱 Name (signalName)	型式 Type (signalType)	單位 Units (itemBase)	允許值 Allowed Values	描述 Description
簡單水準 Simple levels	SIMPLE	level	無	0、1、 2、3	簡單水準。 Simple levels
電力價格 Price electricity of	ELECTRICITY_PRICE	price	貨幣/kWh	任意	此係以絕對項目表示之電力成本。 This is the cost of electricity expressed in absolute terms
	ELECTRICITY_PRICE	priceRelative	貨幣/kWh	任意	此係電力既定價格之 delta 變化。 This is a delta change to the existing price of electricity
	ELECTRICITY_PRICE	priceMultiplier	無	任意	此係電力既定成本之倍數。 This is a multiplier to the existing cost of electricity
能量價格 Price energy of	ENERGY_PRICE	price	貨幣/kWh	任意	此係以絕對項目表示之能量成本。 This is the cost of energy expressed in absolute terms
	ENERGY_PRICE	priceRelative	貨幣/kWh	任意	此係能量既定價格之差值變化。 This is a delta change to the existing price of energy
	ENERGY_PRICE	priceMultiplier	無	任意	此係能量既定成本之倍數。 This is a multiplier to the existing cost of energy

需量計價 Demand charge	DEMAND_CHARGE	price	貨幣/kW	任意	此係以絕對項目表示之需量計價。 This is the demand charge expressed in absolute terms
	DEMAND_CHARGE	priceRelative	貨幣/kW	任意	此係既定需量計價之差值變化。 This is a delta change to the existing demand charge
	DEMAND_CHARGE	priceMultiplier	無	任意	此係既定需量計價之倍數。 This is a multiplier to the existing demand charge
客戶出價位 準 Customer bid levels	BID_PRICE	price	貨幣/XXX ^(b)	任意	此係資源投標之價格。 This is the price that was bid by the resource
	BID_LOAD	setpoint	功率 XXX ^(a)	任意	此係進入方案之資源所提供負載減少數量。正BID_LOAD係指減少，負BID_LOAD係指增加。 This is the amount of load reduction that was offered by a resource into a program. Positive BID_LOAD refers to curtailment, negative BID_LOAD refers to increase
	BID_ENERGY	setpoint	能量 XXX ^(a)	任意	此係進入方案之資源所提供能量源減少數量。正BID_ENERGY係指減少，負BID_ENERGY係指增加。 This is the amount

					of energy reduction that was offered by a resource into a program. Positive BID_ENERGY refers to curtailment, negative BID_ENERGY refers to increase
用以調度儲能資源 Used to dispatch storage resources	CHARGE_STATE	setpoint	能 XXX ^(a) 量	任意	此係用以自儲存資源充放某些數量之電能，直至其充電狀態到達某個位準。 This is used to either charge or discharge a certain amount of energy from a storage resource until its charge state reaches a certain level.
	CHARGE_STATE	delta	能 XXX ^(a) 量	任意	此係目前儲存資源宜包含能量容量與現況之差值。 This is the delta amount of energy that should be contained in a storage resource from where it currently is.
	CHARGE_STATE	multiplier	無	0.0 < 1.0	此係儲存資源宜完全充電之百分比。 This is the percentage of full charge that the storage resource should be at.
此等指令係用以將負載設定至能以所欲負載表示之值。 These instructions are used to set the load	LOAD_DISPATCH	setpoint	功 XXX ^(a) 率	任意	此係用以調度負載至特定數量。 This is used to dispatch loads to a specific amount
	LOAD_DISPATCH	delta	功 XXX ^(a) 率	任意	此係用以調度負載至議定基線之某些偏移。注意，基線可為目

to values that can be expressed in terms of the desired load					前功率消耗。 This is used to dispatch loads to some offset from an agreed upon baseline. Note that the baseline may be the current power consumption.
	LOAD_DISPATCH	multiplier	無	任意	此係用以調度負載為某些議定基線之某些功率的倍數功率。注意，基線可為目前功率消耗。 This is used to dispatch loads as some multiple of power against some agreed upon baseline. Note that the baseline may be the current power consumption.
	LOAD_DISPATCH	level	功率 XXX ^(a)	整數值至 -10 +10	此係用以離散水準規定負載。 This is used to specify the load in terms of discrete levels.
此等指令係用以將負載控制相對於負載控制器及其輸出容量值。此不要求VTN或VEN知悉精確負載消耗為準，而是以VTN能知悉負載消耗將增加或減少之信號值的方式表示，不論履行負載控制之特定裝置為何。藉由對	LOAD_CONTROL	x-LoadControl-Capacity	無	0 - 100% (0.0 - 1.0)	此係負載控制器之指令，於其最大負載消耗容量之某些百分比水準上操作。此能對映至特定負載控制器，以進行如任務循環之事務。注意，1.0表示100%消耗。若為簡單ON/OFF型式裝置，則0 = OFF而1 = ON。 This is an instruction for the load controller to operate at a level that is some percentage of its maximum load consumption capacity. This can

<p>映此等一般指令至 VEN 中之特定負載控制命令，其能使於某些層面之直接負載控制，無須 VTN 精確知悉消費信號之裝置為何。</p> <p>These instructions are used to set the load control to values that are relative to the load controller and its output capacity. This does not require the VTN or the VEN knowing precisely what the load consumption level is, but are expressed in ways that the VTN can know that the signal values will either increase or decrease the load consumption regardless of the specific type of device that is performing the load control. These instructions can be used for some aspects of direct load control by mapping</p>					<p>be mapped to specific load controllers to do things like duty cycling. Note that 1.0 refers to 100% consumption. In the case of simple ON/OFF type devices then 0 = OFF and 1 = ON.</p>
	LOAD_CON TROL	x-LoadControl-Level Offset	無	正或負之整數值	<p>離散整數水準係相對於正常操作，其中 0 為正常操作。不要求鏈結設定點至特定負載消耗值，但預期較高設定點消耗較少負載。注意，其係控制器設定點能於 VEN 側對映某些簡單如控溫器溫度設定點偏移。</p> <p>Discrete integer levels that are relative to normal operations where 0 is normal operations. There is no requirement to link the setpoints to specific load consumption values, but the intention is that the higher the setpoint the less load is consumed. Note that these are controller set points that can be mapped at the VEN side to something as simple as thermostat temperature set point offsets.</p>
	LOAD_CON TROL	x-LoadControl-Setpoint	無	任意值	<p>負載控制器設定點。不要求鏈結設定點至特定負載消耗值。注意，其係通用控</p>

<p>these general instructions to specific load control commands in the VEN without the VTN needing to know precisely what device may be consuming the signal.</p>					<p>制器設定點，且能於 VEN 側對映至某些簡單如特定控溫器溫度設定點。</p> <p>Load controller set points. There is no requirement to link the setpoints to specific load consumption values. Note that these are generic controller set points and can be mapped at the VEN side to something as simple as specific thermostat temperature set points.</p>
	LOAD_CONTROL	x-LoadControl-PercentageOffset	無	正或負之任意百分比	<p>相對於正常操作之百分比變化。百分比非指特定負載消耗值，而是負載控制操作水準。百分比低表示負載消耗較少。</p> <p>Percentage change from normal operations. The percentage does not refer to specific load consumption values, but to load control operation levels. The lower the percentage the less load is consumed.</p>

註^(a) 表格中之 XXX 表示功率或能量之有效、視在、無效版本。

註^(b) 表格中之 XX 表示貨幣單位，諸如新台幣。

a) The XXX in the table represents Real, Apparent, and Reactive versions of power or energy.

b) The XX in the table represents the currency unit, such as USD.

6.2 報告服務

6.2.1 一般

6.2.1.1 概觀

6.2 Report service

6.2.1 General

6.2.1.1 Overview

6.2 描述本標準之報告服務。詳細報告內容，參照附錄 A。

Subclause 6.2 describes the reporting service for IEC 62746-10-1. For detailed report content, see Annex A.

6.2.1.2 報告型式

6.2.1.2 Report Types

本標準支援若干已知報告型式。各報告型式擬表示某些集合之報告功能，其係由宣稱支援該型式之 VEN 或 VTN 所支援。圖 5 給予不同的報告型式之分類法。

This document supports several well-known report types. Each report type is intended to represent a certain set of reporting functionality that is supported by either a VEN or a VTN that claims to support that type. Figure 5 gives the taxonomy of the different report types.

就符合目的而言，VTN 及 VEN 不要求支援所有不同型式之報告(參照第 9 節中之符合性規則 510)。此外，針對特定部署，可能使用不符合任何標準報告剖繪進行報告，但此等皆與符合目的無關。

For compliance purposes VTNs and VENs are not required to support all the different types of reports (see conformance rule 510 in Clause 9). Furthermore, for specific deployments, there may be reports used that do not conform to any of the standard report profiles, but these are not relevant for compliance purposes.

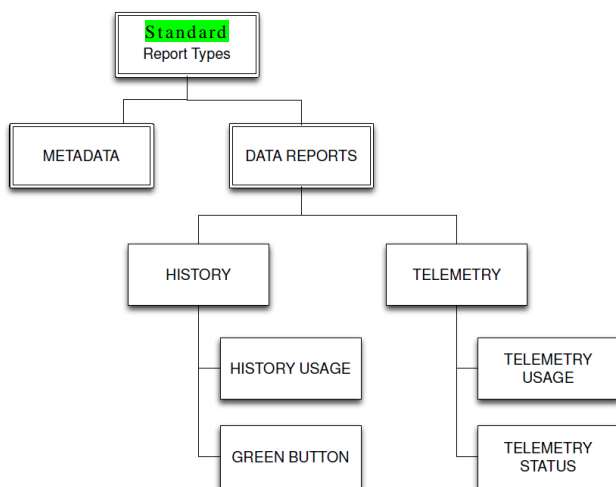


圖 5 報告型式

Figure 5 Report types

下列更詳細描述各報告型式。

Each of the report types is described in more detail below.

METADATA – 此報告型式係用以規定報告能力。其係如 6.2.2.2 中描述之報告註冊過程一部分般地交換。METADATA 報告能包含 1 或多個報告型式之規格，各報告具有其自有之一組報告描述符及規格。METADATA 報告中之各報告具有後續互動中用以參引報告規格的 reportSpecifierID。

METADATA – This report type is used to specify reporting capabilities. It is exchanged as part of the report registration process that is described in section 6.2.2.2. The METADATA report can contain a specification for one or more type of reports, each report having its own set of report descriptors and specifications. Each report in the METADATA report has a reportSpecifierID that is used in subsequent interactions to refer to that report specification.

METADATA 報告中之各報告規格將使用 reportName 屬性，指示其正參引之習知報告剖繪為何。符合本標準之所有 VTN 及 VEN 實作應支援 METADATA 報告，以及案例中 VTN 或 VEN 不支援任何報告能力者，為描繪其不支援任何報告能力之事實，其仍應就符合目的支援發送 METADATA 報告訊息。

Each report specification in the METADATA report will use the reportName attribute to indicate which of the well-known report profiles it is referring to. All VTN and VEN implementations that conform to this document shall support the METADATA report and, in the case where a VTN or VEN does not support any reporting capabilities, for compliance purposes it shall still support sending the METADATA report message in order to portray the fact that it does not support any reporting capabilities.

DATA REPORTS (非 METADATA 報告) – 此等報告係用以報告可被量測或計算之實際資料。資料報告之核心元件即所謂“資料點”。資料點表示作為報告一部分，可被量測或計算之某些數量。各資料點具有屬性，諸如單元等。資料報告可包含 1 或多個資料點。METADATA 報告將包含報告，連同能出現於該報告中之資料點集合，當請求實際報告時，由請求方規定宜出現於報告中之資料點集合。

DATA REPORTS (non-METADATA reports) – These reports are used to report actual data that can be measured or calculated. The core element of a DATA REPORT is the so called “data point”. A data point represents a certain quantity that can be measured or calculated as part of a report. Each data point has attributes such as units, etc. A DATA REPORT may contain one or more data points. The METADATA report will contain a report with a set of data points that can appear in that report and when an actual report is requested the set of data points that should appear in the report are specified by the

requesting party.

各資料點係以 rID 屬性表示於綱要中。例：假設 VEN 能將能源及電力兩者作為 2 個分隔資料點加以量測。VEN 可選擇規定其能產生 2 個各具單一資料點之個別報告，或是規定能產生具 2 個資料點之單一資料報告。VTN 將接著做成適當報告請求以取得資料。

Each data point is represented in the schema with the rID attribute. For example, assume a VEN can measure both energy and power as two separate data points. The VEN has the choice of either specifying that it can generate two separate reports, each with a single data point or it can specify that it can generate a single DATA REPORT with two data points. The VTN would then make the appropriate report request to get the data.

下列所述為資料報告之若干子類別。

There are several sub-categories of DATA REPORT as described below.

- HISTORY DATA REPORTS – 此係過往資料點值存錄於其中，且能被後續請求之資料報告型式，包括下列特定型式。
 - o HISTORY_USAGE – 此等係使用資料之日誌，其通常由 VEN 登錄，且能被 VTN 查詢。

HISTORY DATA REPORTS – This is a type of DATA REPORT in which the history of the data point values is logged and can be subsequently requested. This includes the following specific types:

- o HISTORY_USAGE – these are logs of usage data that are typically logged by VENs and can be queried by the VTN.
- TELEMETRY DATA REPORTS – 本標準之全景中的用語遙測(telemetry)參引定期即時報告之資料，包括下列特定報告型式。
 - o TELEMETRY_USAGE – 此係由 VEN 即時向 VTN 定期報告之使用資料。
 - o TELEMETRY_STATUS – 此係資源之狀態，其可由 VEN 向 VTN 定期報告。

TELEMETRY DATA REPORTS – The term telemetry in the context of this standard refers to data that is reported periodically in real time and includes the following specific report types:

- o TELEMETRY_USAGE – this is usage data that is periodically reported from the VEN to the VTN in real time.
- o TELEMETRY_STATUS – This is the status of a resource, which may be periodically reported from the VEN to the VTN.

6.2.2 核心報告操作

6.2.2.1 一般

6.2.2 Core Reporting Operations

6.2.2.1 General

報告服務支援 VEN 與 VTN 間報告之交換，反之亦然。VEN 與 VTN 間之所有

報告互動係由下列核心操作所建構：

The reporting service supports the exchange of reports between the VEN and VTN and vice versa. All report interactions between the VEN and the VTN are built upon the following core operations:

- 註冊報告能力；
- 請求報告；
- 發送報告；
- 取消報告。

Registering Reporting Capabilities;

Requesting Reports;

Sending Reports;

Canceling Reports.

圖 6 至 9 顯示支援各此等操作之邏輯酬載交換。

Figures 6 to 9 show the logical payload exchanges that support each of these operations.

6.2.2.2 註冊報告能力

6.2.2.2 Register Reporting Capabilities

此一般使用案例描述一方之報告能力如何向他方註冊。報告註冊於完成 VTN 對 VEN 及 VEN 對 VTN 雙方同伴註冊後履行之。此外，任何一方可於初始註冊後之任何時間發送報告註冊。

This general use case describes how one party's reporting capabilities are registered with the other party. Report registration is performed after completion of party registration, both from the VTN to the VEN and from the VEN to the VTN. In addition, any party may send report registrations at any time after the initial registration.

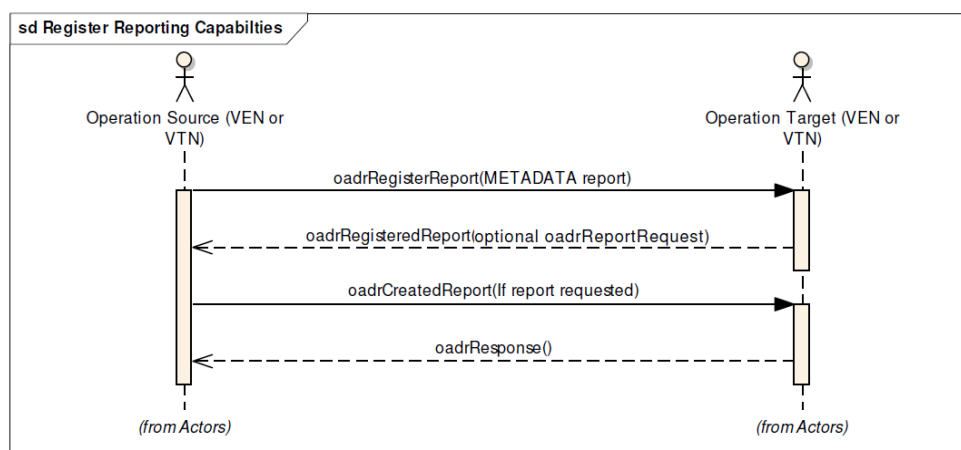


圖 6 互動圖：註冊報告能力

Figure 6 Interaction diagram: Register Reporting Capabilities

圖 6 所描述之使用情況中，來源方發送其報告能力至標的方。來源方之報告能力係使用稱為 METADATA 報告之特殊習知報告剖繪加以規定，其係使用與任何其他報告相同之綱要交換。

In this use case, depicted in Figure 6, the source party sends its reporting capabilities to the target party. The source party's reporting capabilities are specified using a special well-known report profile called the METADATA report, which is exchanged using the same schema as any other report.

METADATA 報告包含報告之所有不同型式的彙集，其能由產生報告之來源方 (VEN 或 VTN) 發送。METADATA 報告中規定之各報告能力可藉由使用 reportSpecifierID 屬性唯一地識別，當註冊報告時其係由來源方產生。reportSpecifierID 將允許標的方就該特定報告進行後續請求。

The METADATA report contains a collection of all the different types of reports that can be sent by the source party (VEN or VTN) that is generating the report. Each reporting capability specified in the METADATA report is uniquely identified by using the reportSpecifierID attribute, which is generated by the source party when registering the report. The reportSpecifierID will allow the target party to make subsequent requests for that specific report.

METADATA 報告中規定之各報告，係該報告中可出現之元件及屬性的規格，並以已知報告剖繪為基礎。藉由將報告之詮釋資料規定為此註冊過程一部分，將來交換實際報告僅需參引 reportSpecifierID 連同實際資料即可，無須發送所有其他報告描述屬性，諸如單元等。

Each report specified in the METADATA report is a specification for the elements and attributes that can appear in that report and is based upon one of the well-known report profiles. By specifying the metadata for the report as part of this registration process, the actual reports that can be exchanged in the future need only refer to the reportSpecifierID along with the actual data without the need to send all the other report description attributes such as units, etc.

使用下列步驟進行互動。

The interaction proceeds with the following steps:

- (a) 來源方首先藉由使用 oadrRegisterReport 酬載，發送其報告能力至標的方。通常，oadrRegisterReport 酬載除了包含 METADATA 報告外，與 oadrUpdateReport 酬載相同。來源方使用上述 oadrReport 綱要發送型式 METADATA 之特殊已知報告。
- (1) The source party first sends its reporting capabilities to the target party by using the oadrRegisterReport payload. In general the oadrRegisterReport payload is the same as the oadrUpdateReport payload except that it

contains a METADATA report. The source party sends the special well known report of type METADATA using the oadrReport schema as described above.

- (b) 標的方回應以 oadrRegisteredReport 酬載。標的方之回應可包含請求來源方宜產生哪個報告之 oadrRequestReport 物件。若標的方知悉有需接收自來源方之報告，則其宜使該等請求成為此步驟之一部分。此類似使用第 6.2.2.3 節中所規定 oadrCreateReport 之請求報告。
- (2) The target party responds with the oadrRegisteredReport payload. The target party's response may contain an oadrRequestReport object requesting which reports the source party should generate. If there are reports that the target party knows that it wants to receive from the source party, then it should make those requests as part of this step. This is similar to requesting a report using oadrCreateReport as specified in section 6.2.2.3.
- (c) 若標的方請求來源方建立作為步驟(2)一部分之任何報告，則來源方以 oadrCreatedReport 酬載回應之。
- (3) If the target party requests that the source party create any reports as part of step (2) then the source party responds with the oadrCreatedReport payload.

本質上，步驟(2)及(3)係等同，且使用相同資料結構作為互動，其中標的方使用 oadrCreateReport 向來源方請求報告，如第 6.2.2.3 節中之規定。

In essence, step (2) and (3) are equivalent to, and use the same data structures as, the interaction in which the target party requests reports from the source party using oadrCreateReport, as specified in section 6.2.2.3.

每次交換 METADATA 報告應供應來源方(VTN 或 VEN)之所有報告能力，且將因此取代任何先前交換之 METADATA 報告。此外，METADATA 報告之發送，意味著取消標的方先前請求之所有來源方報告的發送。

Every exchange of the METADATA report shall supply all the reporting capabilities of the source party (VTN or the VEN) and will therefore supplant any previously exchanged METADATA report. Furthermore the sending of the METADATA report implicitly cancels the sending of all reports that the source party may have previously requested from the target party.

METADATA 報告酬載中包含的關鍵元件有：

- reportSpecifierID：回報功能唯一的識別碼，用於後續請求。
- rid: 報告提供的每個資料點的唯一識別碼。
- 持續時間：收集資料之時間(或迄今已收集的歷程)。
- SamplingRate.oadrMinPeriod = 最大取樣頻率。
- SamplingRate.oadrMaxPeriod = 最小取樣頻率。
- SamplingRate.onChange = 是否於資料變更時取樣。

Key elements included in the metadata report payloads include:

- reportSpecifierID: a unique identifier for the reporting capability, used in subsequent requests;
- rid: a unique identifier for each data point offered by the report;
- Duration: the amount of time that data can be collected (or has been collected thus far for history);
- SamplingRate.oadrMinPeriod = maximum sampling frequency;
- SamplingRate.oadrMaxPeriod = minimum sampling frequency;
- SamplingRate.onChange = whether or not data is sampled as it changes.

若標的方不請求任何作為步驟(2)一部分之報告，則來源方宜假設無須產生發送至標的方之報告。因此，標的方若有任何來源方先前請求之報告，則其應使該等請求再次成為步驟(2)之一部分。

If the target party does not request any reports as part of step (2) then the source party should assume that there are no reports to be generated and sent to the target party. Therefore if there are any reports that the target party has previously requested from the source party then it shall make those requests again as part of step (2).

來源方因此能於任何時間使用此互動，請求標的方提示宜建立及發送任何報告之來源方。此為來源方及標的方提供機制，以同步來源方報告能力及標的方報告請求兩者。

The source party can therefore use this interaction at any time to request that the target party notify the source party of any reports that it should create and send. This provides a mechanism for the source and target party to synchronize both the reporting capabilities of the source party and the report requests of the target party.

6.2.2.3 請求報告

6.2.2.3 Request Reports

圖 7 中所述之此使用案例顯示一方可如何向其他方請求報告。注意，正被請求之任何報告應對應其他方先前發送之 METADATA 報告中所規定報告之一。This use case, depicted in Figure 7, shows how one party can request reports from the other party. Note that any reports that are being requested shall correspond to one of the reports that were previously specified in the METADATA report that was previously sent by the other party.

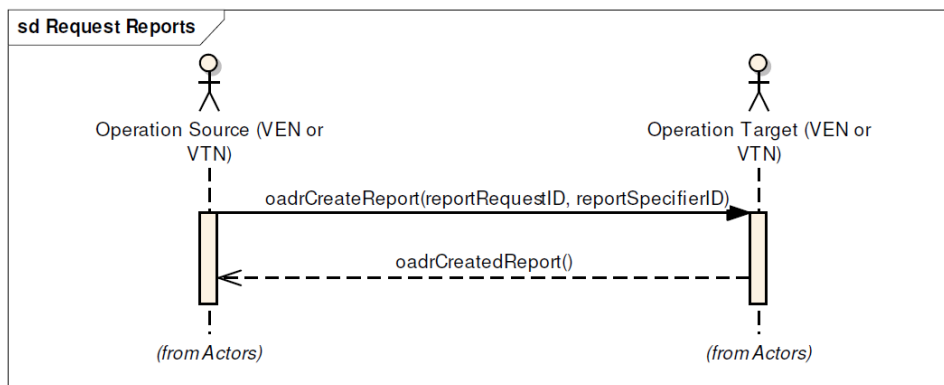


圖 7 互動圖：請求報告

Figure 7 Interaction diagram: Request Reports

來源方藉由使用 `oadrCreateReport` 酬載向標的方請求報告。該酬載包含一組 `reportSpecifierID`，其對應標的方先前發送，做為前述 `oadrRegisterReport` 互動一部分之 METADATA 報告中的報告能力(參照 6.2.2.2)。作為報告請求之一方，來源方規定用於此報告請求後續操作中之一組 `reportRequestID`。

The source party requests a report from the target party by using the `oadrCreateReport` payload. That payload contains a set of `reportSpecifierID`'s that correspond to reports capabilities in the METADATA report that was previously sent by the target party as part of the previously described `oadrRegisterReport` interaction (refer to 6.2.2.2). As part of the report request, the source party specifies a set of `reportRequestID`s that are used in subsequent operations on this report request.

簡言之，來源標的於報告註冊期間產生 `reportSpecifierID` (如第 6.2.2.2 節中所規定)，以唯一地識別 METADATA 報告之報告內容，而 `reportRequestID` 係由 `oadrCreateReport` (或註冊期間 `oadrRegisteredReport` 中之 `oadrReportRequest` 物件)之來源方所產生，並將 `reportSpecifierID` 與特定報告請求相關聯。例：來源請求報告可僅選擇已於 `reportSpecifierID` 所識別 METADATA 報告中註冊之所有資料點的某些子集(即 `rIDs`)。

In short, the `reportSpecifierID` is generated by the source target during report registration (as specified in section 6.2.2.2) to uniquely identify the report contents of a METADATA report, while the `reportRequestID` is generated by the source party of an `oadrCreateReport` (or `oadrReportRequest` object in an `oadrRegisteredReport` during registration) and associates the `reportSpecifierID` with a specific report request. For example, the source requesting a report can select only a certain subset of all data points (i.e. `rIDs`) that have been registered in the METADATA report identified by `reportSpecifierID`.

標的方為回覆此請求而發送之所有後續報告，使用 `reportRequestID` 識別報

告。對 oadrCreateReport 酬載之回應為 oadrCreatedReport 酬載。

All subsequent reports sent from the target party that are in response to this request use the reportRequestID to identify the report. The response to the oadrCreateReport payload is the oadrCreatedReport payload.

注意，標的方已發送其 METADATA 報告作為報告註冊過程一部分之後，來源方僅能發送 oadrCreateReport。但 METADATA 報告除外，其可於任何時間使用已知字串“METADATA”作為 reportSpecifierID 而請求。

Note that the source party can only send the oadrCreateReport after the target party has sent its METADATA report as part of the reporting registration process. The exception to this is the METADATA report, which can be requested at any time by using the well-known string “METADATA” as the reportSpecifierID.

雖然 reportSpecifierID 指示報告中可能出現之資料型式，但是於發出此請求時，由來源方規定某些報告參數，包含以下內容：

While the reportSpecifierID dictates the type of data that may appear in a report, there are some reporting parameters that are specified by the source party when making this request, including the following:

- 當來自對應之 METADATA 報告的 rID 規定時，出現於報告中之特定資料項目。rID 屬性係 METADATA 報告中之識別符，其係與可出現於報告中之特定值型式相關聯。此有時候稱為資料點，且允許於單一報告存在多個資料點。rID 允許來源方請求宜由標的方報告之可能資料點的子集。

The specific data items to appear in the report as specified by the rIDs from the corresponding METADATA report. The rID attribute is an identifier in the METADATA report that is associated with a specific type of value that may appear in the report. This is sometimes referred to as a data point and allows multiple data points to exist in a single report. The rIDs allow the source party to request a subset of possible data points that should be reported by the target party.

- 此係一次性報告或反覆性資料串流。
- 若其係反覆性資料串流，則亦規定下列時間性參數：宜產生報告之時框(亦即，下個月、不定期等)、將報告資料點之時間間隔及宜產生報告之頻率。

Whether this is a one-time report or a recurring data stream.

If it is a recurring data stream, the following temporal parameters are also specified: The time frame over which the report should be generated (i.e., next month, indefinitely, etc.), the frequency time intervals at which the data points should will be logged reported, and the frequency at which the report should be generated.

- 若其非遙測報告，則該請求規定報告宜涵蓋之時間跨度。

If it is **a onetime history not a telemetry report**, then the request specifies the span of time that the report should cover.

報告請求中 dtstart 之意義，**定義報告期間之啟動時間，而回傳報告中 dtstart 指示資料收集期間之啟動時間。**

The meaning of dtstart in the report request defines the start time **of the report period**, while the dtstart in the returned report indicates the start time of the **data collection period**.

針對包含點資料之定期遙測報告，若精細度及期間相同，則請求後立即發送報告。若精細度小於期間，則報告之遞送將延遲至收集足夠資料。

For periodic telemetry reports containing point data, if granularity and duration are the same, the report is sent immediately after the request. If granularity is smaller than duration, the delivery of the report will be delayed until enough data is collected.

報告請求酬載中包含的關鍵元件有：

- **起始時間/持續時間**：報告開始使用精細度作為取樣頻率的時間。如持續時間等於 0，應報告為無期限。
- **精細度**：報告資料的頻率。值應在 `SamplingRate.oadrMinPeriod` 及 `SamplingRate.oadrMaxPeriod` 之間。若為 0，則請求者請求報告以使用 `onChange` (**可用時**)。

reportBackDuration：將報告發送回請求者的區段 (`oadrUpdateReport` 或 `orderRegisterReport`)。若 `reportBackDuration == 0`，則僅為**一次性報告**。

Key elements included in the report request payloads include:

- **Start time/Duration**: when reporting should commence using granularity as sampling frequency. If Duration equals 0, it should report indefinitely.
- **Granularity**: Frequency of reported data. Value shall be between `SamplingRate.oadrMinPeriod` and `SamplingRate.oadrMaxPeriod`. If 0, the requester is requesting the report to use `onChange` (if available).
- **reportBackDuration**: the interval for sending reports (`oadrUpdateReport` or `orderRegisterReport`) back to the requester. If `reportBackDuration == 0`, then it's only a **one-shot report**.

關於各種屬性之更詳細資訊，參照**附件 E**中範例報告請求酬載。

See the example report request payloads **in Annex E** for more detailed information on the various attributes.

6.2.2.4 發送報告

6.2.2.4 Send Reports

此使用案例定義實際報告可如何交換。

This use case defines how the actual reports can be exchanged.

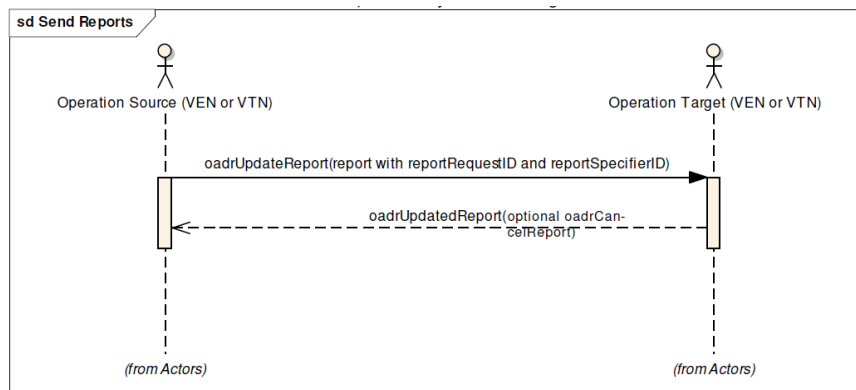


圖 8 互動圖：發送報告

Figure 8 Interaction diagram: Send Reports

圖 8 描述來源方發送報告至標的方。

來源方僅能於標的方履行先前報告請求互動之後履行此操作。

Figure 8 depicts the source party sending a report to the target party.

This operation can be performed by the source party only after a previous report request interaction is performed by the target party.

此操作使用與報告註冊操作相同之 `oadrReport` 物件，但用以不同於註冊過程中所使用 METADATA 報告之實際資料元件交換報告。

This operation uses the same `oadrReport` object as the report registration operation did, but is used to exchange a report with actual data elements as opposed to the METADATA report used in the registration process.

`oadrUpdateReport` 酬載中發送之報告，使用具有先前報告請求互動中標的方所定義 `requestReportID` 之 `EiReport` 綱要，提示此報告之發送。

The reports sent in the `oadrUpdateReport` payload use the `EiReport` schema with the `requestReportID` as defined by the target party in the previous report request interaction that prompted the sending of this report.

標的方發送之回應使用 `oadrUpdatedReport` 酬載以確認報告之接收。作為 `oadrUpdatedReport` 回應之一方，標的方可使用選項 `oadrCancelReport` 物件取消任何未來報告之發送，其包含 `requestReportID` 之串列。若 `oadrUpdatedReport` 酬載未包括取消之確認，而報告持續發送時，接收方宜使用 `oadrCancelReport` 取消報告。對於定期報告，若標的方於 `oadrCancelReport` 物件中將 `reportToFollow` 設置為 `true`，則預期來源方將發送 1 份最終額外報告。

The response sent by the target party uses the `oadrUpdatedReport` payload to acknowledge receipt of the report. As part of the `oadrUpdatedReport` response, the target party may cancel the sending of any future reports using the optional

oadrCancelReport object, which contains a list of reportRequestIDs. There is no confirmation of the cancellation if included in the oadrUpdatedReport payload, but if the report continues to be sent, the receiving party should use oadrCancelReport to cancel the report. **In the case of periodic reports, if reportToFollow is set to true in the oadrCancelReport object by the target party, the source party is expected to send one final additional report.**

關於報告屬性之更多詳情，參照各樣本報告酬載。

See the various sample report payloads for more details on the report attributes.

6.2.2.5 取消報告

6.2.2.5 Cancel Reports

圖 9 中所述之此互動，係由來源方用以取消標的方正產生之持續（亦即定期性）報告。

This interaction, depicted in Figure 9, is used by the source party to cancel ongoing (i.e., periodic) reports that are being generated by the target party.

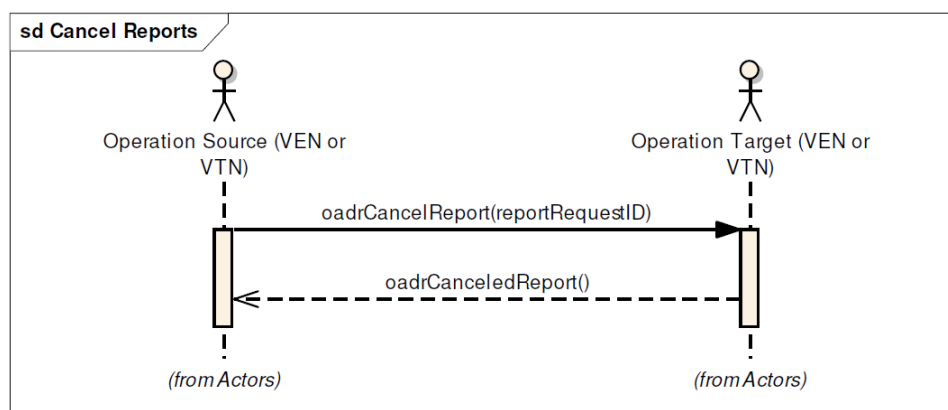


圖 9 互動圖：取消報告

Figure 9 Interaction diagram: Cancel Reports

來源方以先前請求報告互動中其規定之適宜 reportRequestID，使用 oadrCancelReport 酬載（參照 6.2.2.3）。當接收 oadrCancelReport 酬載時，標的方停止產生及發送對應 reportRequestID 之報告。

The source party uses the oadrCancelReport payload with the appropriate reportRequestIDs that were specified by the source party in a previous request report interaction (see 6.2.2.3). Upon receiving the oadrCancelReport payload, the target party stops generating and sending the reports corresponding to the reportRequestIDs.

對 oadrCancelReport 酬載之回應為標的方發送以確認報告取消之 oadrCanceledReport 酬載。

The response to the oadrCancelReport payload is the oadrCanceledReport

payload that is sent by the target party to acknowledge the **cancellation** of the report.

注意，oadrCanceledReport 及 oadrCreatedReport 兩者回傳 oadrPendingReports 物件中之擱置報告表列，其包括已排程待遞送之所有報告。

Note that both oadrCanceledReport and oadrCreatedReport return a list of pending reports in the oadrPendingReports object, which includes all reports that are scheduled for future delivery.

當標的方請求取消定期報告時，若於 oadrCancelReport 中將 reportToFollow 設置為 true，則預期來源方將發送 1 個最終額外報告。
報告。

When cancellation of the periodic report is requested by the target party, if reportToFollow is set to true in oadrCancelReport, the source party is expected to send one final additional report.

6.3 註冊服務

6.3 Registration service

6.3.1 服務操作

6.3.1 Service operations

本標準使用 EiRegisterParty 服務以支援 VEN 搭配 VTN 之帶內註冊，支援下列服務操作(表列於表 3 中)。

This document uses the EiRegisterParty service to support in-band registration of VENs with VTNs. The following service operations (listed in Table 3) are supported:

表 3 EiRegisterParty 酬載

Table 3 EiRegisterParty payloads

請求酬載 Request Payload	回應酬載 Response Payload	請求者 Requestor	回應者 Responder
oadrQueryRegistration	oadrCreatedPartyRegistration	VEN	VTN
oadrCreatePartyRegistration	oadrCreatedPartyRegistration	VEN	VTN
oadrCancelPartyRegistration	oadrCanceledPartyRegistration	VEN VTN	VTN VEN
oadrRequestReregistration	oadrResponse	VTN	VEN

註冊可選項地隨 VEN 查詢 VTN 開始，以決定其可使用 oadrQueryRegistration 酬載支援哪些剖繪、傳送及延伸(參照圖 10)。可使用任何支援傳送啟動此查詢

操作，然而為啟動此查詢，VEN 將需要以 VTN 之位址進行帶外組態。對查詢之回應為 `oadrCreatedPartyRegistration` 酬載，且除對剖繪之任何支援延伸外，包含關於 VTN 所支援之所有剖繪及傳送的資訊。VEN 接收之資訊可用以決定最佳組態以用於如第 6 節的平衡描述之正規註冊。

Registration **can** optionally begin with the VEN querying the VTN to determine what profiles, transports, and extensions it may support using the `oadrQueryRegistration` payload (see Figure 10). This query operation can be initiated using any of the support transports, however the VEN will need to be configured **out-of-band** with the address of the VTN in order to initiate the query. The response to the query is the `oadrCreatedPartyRegistration` payload and contains information on all the profiles and transports supported by the VTN in addition to any supported extensions to the profile. The information received by the VEN **can** be used to determine the best configuration to use when formally registering as described in balance of **Clause 6**.

附件 B 提供有關綱要延伸之規定訊息。

Annex B provides normative information on schema extensions.

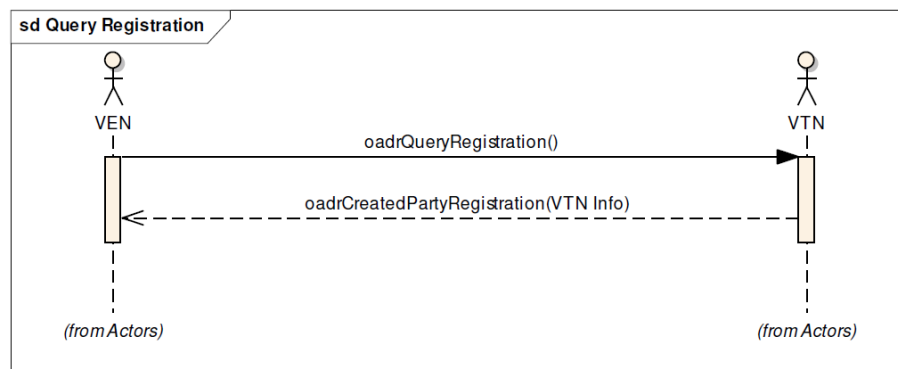


圖 10 互動圖：查詢註冊

Figure 10 Interaction diagram: Query Registration

註冊恆由 VEN 以 `oadrCreatePartyRegistration` 酬載啟動(參照圖 11)。此酬載提供關於 VEN 已決定用於與 VTN 通訊之剖繪及傳送的資訊，但其他註冊相關資訊除外(參照表 4)。VTN 回應附帶包含所有剖繪及 VTN 所支援傳送之 `oadrCreatedPartyRegistration`、ID，以及其他註冊相關資訊(參照表 5)。VTN 於其回應酬載中回傳 `registrationID`，其被用於此註冊實例之附屬後續操作。

Registration is always initiated by the VEN with the `oadrCreatePartyRegistration` payload (see Figure 11). This payload provides the information on the profile and transport the VEN has decided to use for communication with the VTN, in addition to other registration related information (see Table 4). The VTN responds with an `oadrCreatedPartyRegistration` containing all the profiles and

transports supported by the VTN, IDs, and other registration related information (see Table 5). The VTN returns a registrationID in its response payload, which is used for subsequent operations pertaining to this registration instance.

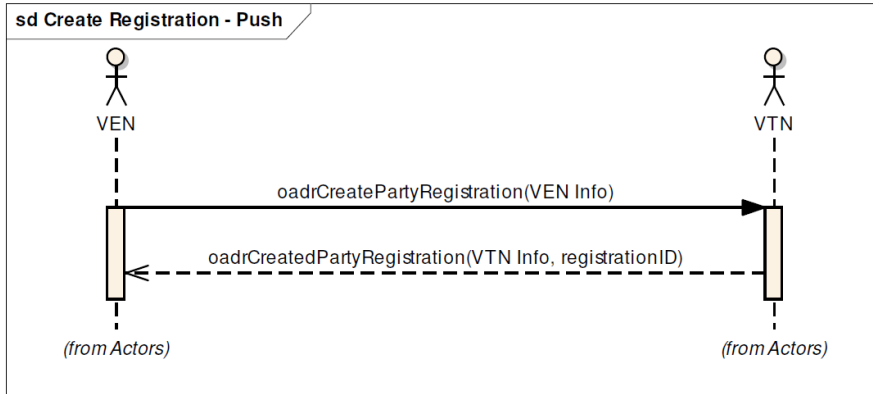


圖 11 互動圖：建立註冊

Figure 11 Interaction diagram: Create Registration

若 VEN 之註冊資訊變更，則 VEN 能於任何時間使用參引目前 registrationID 之 oadrCreatePartyRegistration 酬載重註冊(參照圖 12)。相同 registrationID 將維持跨重註冊，直至一方取消註冊。

If the VEN’s registration information changes, the VEN can reregister at any time using the oadrCreatePartyRegistration payload referencing the current registrationID (see Figure 12). The same registrationID will be maintained across reregistrations until one of the parties cancel the registration.

若 VTN 之註冊資訊變更，則 VTN 能使用 oadrRequestReregistration 酬載請求 VEN 重註冊。對此請求之回應為 oadrResponse 確認，跟隨著來自 VEN 之非同步 oadrCreatePartyRegistration 請求。

If the VTN’s registration information changes, the VTN can request the VEN to reregister using the oadrRequestReregistration payload. The response to this request is an oadrResponse acknowledgement followed by an asynchronous oadrCreatePartyRegistration request from the VEN.

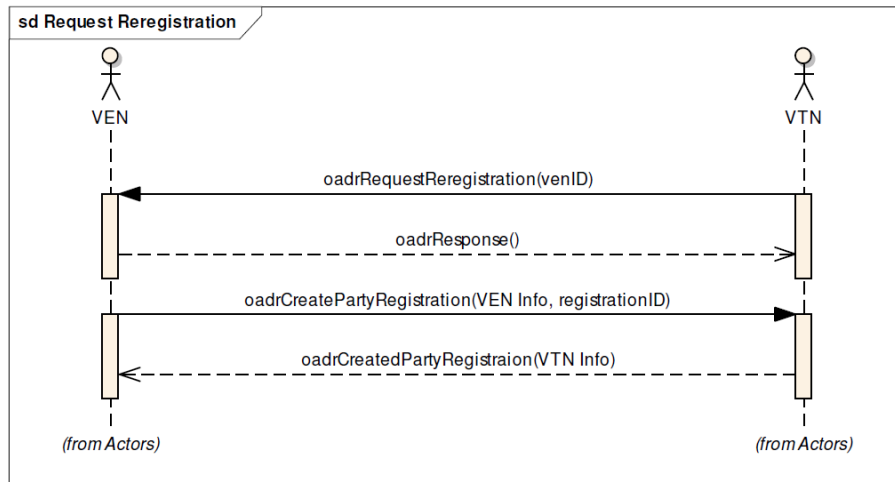


圖 12 互動圖：請求重註冊

Figure 12 Interaction diagram: Request Reregistration

VTN 或 VEN 可使用 `oadrCancelPartyRegistration` 酬載取消現用註冊，參引 `registrationID` (參照圖 13)。其他方以 `oadrCanceledRegistration` 酬載回應。

The VTN or VEN can cancel an active registration using the `oadrCancelPartyRegistration` payload, referencing the `registrationID` (see Figure 13). The other party responds with an `oadrCanceledRegistration` payload.

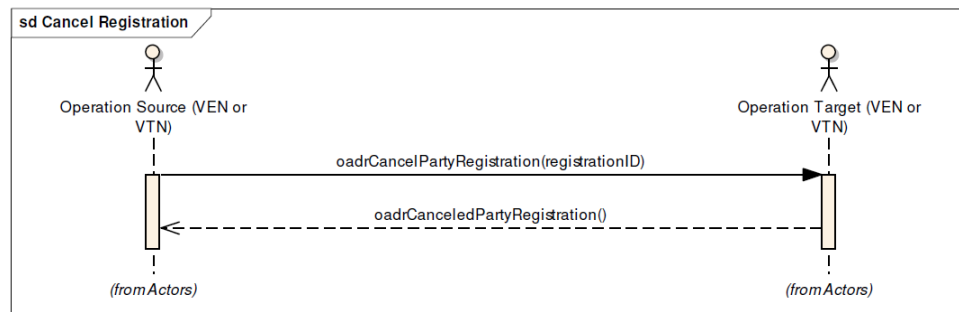


圖 13 互動圖：取消註冊

Figure 13 Interaction diagram: Cancel Registration

所示之序列圖係針對 PUSH 互動型樣。HTTP PULL 模型中，VEN 應使用 `oadrPoll` 定期輪詢 VTN，以提供機會讓 VTN 取消註冊或請求 VEN 重註冊。PULL 互動型樣之樣本序列圖參照 6.5 中 `oadrPoll` 之記載。

The sequence diagrams shown are for a PUSH interaction pattern. In an HTTP PULL model, the VEN shall periodically poll the VTN using `oadrPoll` to provide the VTN an opportunity to cancel the registration or request the VEN to reregister. Please refer to the documentation for `oadrPoll` in 6.5 for sample sequence diagrams of the PULL interaction pattern.

6.3.2 註冊資訊

6.3.2 Registration Information

表 4 及表 5 概述所定義註冊元件，以及資訊係出現於 VEN oadrCreatePartyRegistration 請求中，或是出現於 VTN oadrCreatedPartyRegistration 回應中。

Table 4 and Table 5 outline registration elements defined and whether the information appears in the VEN oadrCreatePartyRegistration request or the VTN oadrCreatedPartyRegistration response.

表 4 oadrCreatePartyRegistration 酬載之 VEN 訊息

Table4 VEN information in oadrCreatePartyRegistration payload

註冊項目 Registration Item	註釋 Comments
requestID	
registrationID	當重註冊時，註冊僅包括於此酬載中。 Registration is only included in this payload when re-registering.
venID	除非預設定組態，venID 不包括於初始註冊酬載中，但重註冊時應出現且正確。 Unless preconfigured, the venID is not included in the initial registration payload, but shall be present and correct for re-registration.
oadrProfileName	VEN 選擇用以與 VTN 通訊之剖繪。2.0a 或 2.0b。本標準僅參引 2.0b。 The profile the VEN selects to use for communication with the VTN. Either 2.0a or 2.0b. This document refers to 2.0b only.
oadrTransportName	VEN 選擇用以與 VTN 通訊之傳送。XMPP 或 simpleHTTP。 The transport the VEN selects to use for communication with the VTN. Either XMPP or simpleHTTP.
oadrTransportAddress	若選擇之傳送為 simpleHTTP 或 XMPP，且 oadrHttpPullModel 為 false，則此應包含 VEN 伺服器之位址。 If the selected transport is simpleHTTP or XMPP and the oadrHttpPullModel is false, this shall contain the address of the VEN server.
oadrReportOnly	此布林值元件係用以指示實作為 B 剖繪之 Report Only 實例。 This boolean element is used to indicate the implementation is a Report Only

	instance of the B profile.
oadrXmlSignature	此布林值元件係用以指示實作支援 XmlSignatures。 This boolean element is used to indicate the implementation supports XmlSignatures.
oadrVenName	此係 VEN 之選項人可讀名稱。 This is an optional human readable name for the VEN.
oadrHttpPullModel	此布林值元件係用以指示實作使用 simpleHTTP PULL 交換模型。 This boolean element is used to indicate the implementation uses the simpleHTTP PULL exchange model.

表 5 oadrCreatedPartyRegistration 酬載之 VTN 訊息

Table 5 VTN information oadrCreatedPartyRegistration payload

註冊項目 Registration Item	註釋 Comments
EiResponse Object	包含標準酬載回應狀態資訊。 Contains standard payload response status information.
RegistrationID	用以識別註冊實例之值。用於重註冊及取消。 A value used to identify the registration instance. Used for re-registration and cancelation.
venID	venID 係由 VTN 指派，並於註冊回應中回傳。 The venID is assigned by the VTN and returned in the registration response.
vtnID	提供給 VEN 以便包括於酬載中。 Provided to the VEN for inclusion in payloads.
oadrProfiles:oadrProfile:oadrProfileName	1 或多個剖繪及關聯剖繪名稱之彙集。 A collection of one or more profiles and the associated profile name.
巢套於各剖繪內.. Nested within each profile... oadrTransports:oadrTransport:oadrTransportName	1 或多個傳送及關聯傳送名稱之彙集。 A collection of one or more transports and the associated transport name.
oadrRequestedOadrPollFreq:duration	使用 oadrPoll 之輪詢問隔(亦即，2 個輪詢問之期間)，宜如 VTN 於註冊期間以 oadrRequestedOadrPollFreq 請求者。符合性規則 500 定義 oadrRequestedOadrPollFreq 之限制。 The polling interval (i.e., the duration between two polls) using oadrPoll should be as requested by the VTN during registration in oadrRequestedOadrPollFreq. Conformance rule 500 defines the constraints for oadrRequestedOadrPollFreq.
oadrServiceSpecificInfo:oadrService:oadrServiceName oadrServiceSpecificInfo:oadrService:oadrInfo:oadrKey	能包含特定於特別命名服務之鍵-值對資訊的物件。 An object that can contain key-value pair information specific to a particular named service.

oadrServiceSpecificInfo:oadrService:oadrInfo:oadrValue	
oadrExtensions:oadrExtension:oadrExtensionName	能包含特定於特別命名延伸之鍵-值對資訊的物件。
oadrExtensions:oadrExtension:oadrInfo:oadrKey	An object that can contain key-value pair information specific to a particular named extension.
oadrExtensions:oadrExtension:oadrInfo:oadrValue	

6.4 Opt 服務

6.4 Opt Service

6.4.1 服務操作

6.4.1 Service Operations

本標準規定 EiOpt 服務以建立及通訊從 VEN 至 VTN 之 Opt-In 及 Opt-Out 排程。此等排程以可用性定義暫時變更，並可與較長期可用性排程及 Market Context 要求事項組合，賦予 VEN 完整願景回應，以回應 VEN 所接收之 EiEvents。所支援服務操作條列於表 6 中。

This document specifies the EiOpt service to create and communicate Opt-In and Opt-Out schedules from the VEN to the VTN. These schedules define temporary changes in the availability, and may be combined with longer term availability schedules and the Market Context requirements to give a complete picture of the willingness of the VEN to respond to EiEvents received by the VEN. The service operations listed in Table 6 are supported.

表 6 EiOpt 酬載

Table 6 EiOpt payloads

請求酬載 Request Payload	回應酬載 Response Payload	請求者 Requestor	回應者 Responder
oadrCreateOpt	oadrCreatedOpt	VEN	VTN
oadrCancelOpt	oadrCanceledOpt	VEN	VTN

VEN 使用 oadrCreateOpt 酬載(參照圖 14)完成下列目標之一。

- 對 VTN 溝通特定 eiTargets 集之暫時可用性期間。
- 對 VTN 溝通特定 eiTargets 集之暫時不可用性期間。
- 對先前確認事件選擇加入或選擇不加入特定 eiTargets 集

The VEN uses the oadrCreateOpt payload (see Figure 14) to accomplish one of the following objectives:

To communicate to the VTN a period of temporary availability for a specific set of eiTargets,

To communicate to the VTN a period of temporary unavailability for a specific set of eiTargets,

To optIn or optOut of a previously acknowledged event for a specific set of eiTargets.

包括 optID 之 oadrCreateOpt 酬載，其能用於後續操作中以參考此排程。對 oadrCreateOpt 之 VTN 回應為包括 optID 之 oadrCreatedOpt 酬載，其能用於後續操作中以參考此排程。

oadrCreateOpt payload that includes an optID, which can be used in subsequence operations to reference this schedule. The VTN's response to oadrCreateOpt is an oadrCreatedOpt payload that includes an optID, which can be used in subsequence operations to reference this schedule.

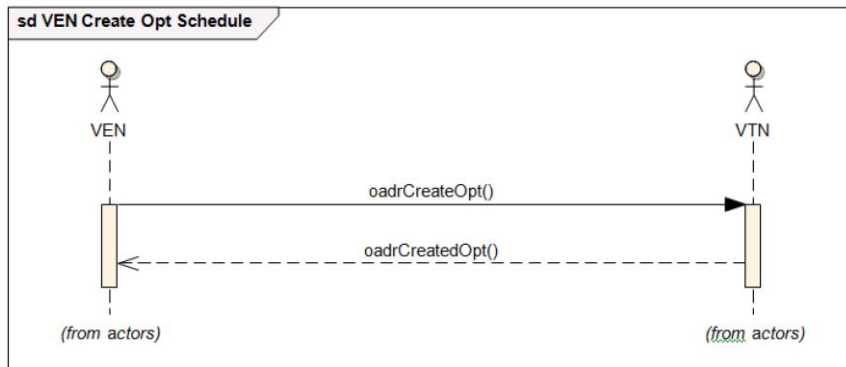


圖 14 互動圖：建立 Opt

Figure 14 Interaction diagram: Create Opt

VEN 可於任何時間使用具參引待取消排程之 optID 的 oadrCancelOpt 取消暫時可用性排程(參照圖 15)。

The VEN may at any time cancel a temporary availability schedule by using the oadrCancelOpt with an optID referencing the schedule to be cancelled (see Figure 15).

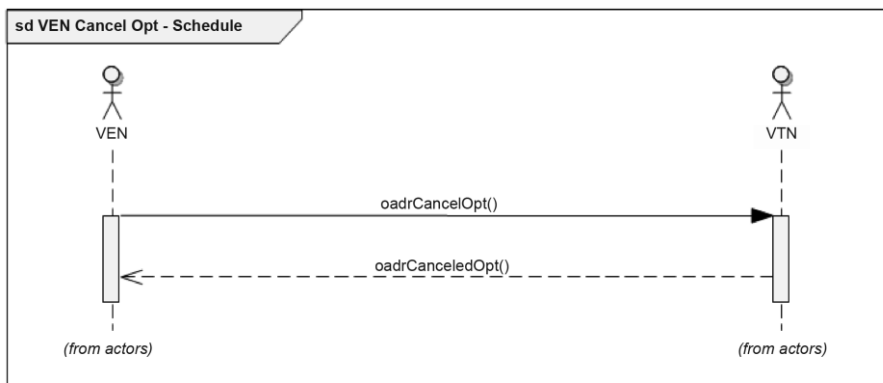


圖 15 互動圖：取消 Opt

Figure 15 Interaction diagram: Cancel Opt

6.4.2 詳細要求事項**6.4.2 Detail Requirements**

若 marketContext 出現於 oadrCreateOpt 酬載中，則選擇排程應僅適用於有關所規定之 marketContext 內所產生事件的 VEN 可用性。

If marketContext is present in the oadrCreateOpt payload, the opt schedule shall only apply to the VENs availability with respect to events generated within the specified marketContext.

VEN 應以回覆 oadrDistributeEvent 之 EiEvent oadrCreatedEvent 酬載回應。然而，事件 optType 狀態之進一步資格，能藉由發送 oadrCreatedEvent 或具所規定 eventID 之 EiOpt oadrCreateOpt 酬載完成之。一旦使用 oadrCreateOpt，其將取得優先權，而對 opt 狀態之後續變更則藉由 oadrCreatedEvent 忽略之。

A VEN shall respond with an EiEvent oadrCreatedEvent payload in response to an oadrDistributeEvent. However, further qualifications of the optType state for the event can be accomplished by sending either an oadrCreatedEvent or an EiOpt oadrCreateOpt payload with the eventID specified. Once oadrCreateOpt is used, it will take precedence and subsequent changes to the opt state by oadrCreatedEvent will be ignored.

oadrCreateOpt eiTarget 應包含 VEN 初始選擇排程之 venID。若僅 venID 規定於 eiTarget 中，則 then 選擇排程適用於與該 VEN 關聯之所有資源。若定義除 venID 外之額外 eiTarget 子元件，則此等子元件須 OR 在一起，以定義選擇排程應適用之 VEN 資源子集。注意，VEN 可針對 eiTarget 元件識別之不同資源集合，發送多個選擇排程。

The oadrCreateOpt eiTarget shall contain the venID of the VEN initiating the opt schedule. If only the venID is specified in eiTarget, then the opt schedule applies to all of the resources associated with that VEN. If additional eiTarget sub-elements are defined in addition to venID, these sub-elements must be OR'd together to define a subset of the VENs resources that the opt schedule shall apply. Note that the VEN may send multiple opt schedules for different sets of resources identified by the eiTarget element.

當先前發送之選擇排程仍作用時，經由 oadrCreateOpt 發送之新選擇排程(選擇加入或選擇不加入)應依下述處置。

A new opt schedule (optIn or optOut) sent via oadrCreateOpt shall be handled as follows when a previously sent opt schedule is still active:

- 若僅 venID 規定於 eiTarget 中，則針對與 VEN 關聯之所有資源，關於未來可用性之先前選擇排程完全替代為新選擇排程。
- 除 venID 外，若子元件規定於 eiTarget 中，則應針對此等資源產生選擇排程，必要時覆寫特定資源之任何先前定義排程。

- eiTarget 未規定之資源先前定義選擇排程應保持不變。

If only the venID is specified in eiTarget, the previous opt schedule with respect to future availability is replaced in its entirety by the new opt schedule for all resources associated with the VEN.

If sub elements are specified in eiTarget in addition to the venID, then an opt schedule shall be generated for these resources, overwriting as necessarily any previously defined schedules for specific resources.

Previously defined opt schedules for resources that are not specified by eiTarget shall remain unchanged.

許多選擇排程層面係程式特定，包括下列事項。

- VEN 被允許發出之排程型式：選擇加入、選擇不加入或兩者
- 期間之預設選擇狀態(選擇加入或選擇不加入)不由選擇或可用性排程定義(若定義)。

Many aspects of an opt schedule are program specific, including:

The type of schedules that a VEN is allowed to issue: optIn, optOut, or both

The default opt state (optIn or optOut) for time periods not defined by either an opt or avail schedule (if defined)

- 無論選擇加入或選擇不加入排程是否有情勢居先，其具重疊時框
- 無論相同排程(選擇加入或選擇不加入)內是否允許重疊時框，若不允許，則預期例外處置行為。
- 無論選擇不加入期間是否允許 VTN 發送事件。

Whether optIn or optOut schedules have precedence in the situation where they have overlapping time frames

Whether overlapping time frames are allowed within the same schedule (optIn or optOut) and if they are not allowed, the expected exception handling behavior

Whether the VTN is allowed to send events during an optOut period

6.5 輪詢服務

6.5 Poll service

當將新服務添加時，僅輪詢 VEN 需定期輪詢 VTN，尤其 VTN 啟動之使用案例，其資訊無須定期且 VEN 不能預期 VTN 何時可能發送某些資訊。PUSH 情況中，此非議題。然而 PULL 情況中，此要求 VEN 定期輪詢 VTN，可能於多個不同服務端點，檢索 VTN 可能需提供之所有資訊。oadrPoll 提供解決方案，允許 PULL VEN 模擬自 VTN 至 VEN 之 PUSH 訊息交換型樣。

As new services are added, there is a need for pull-only VENs to periodically poll the VTN, particularly for VTN-initiated use cases where the information is not necessarily periodic and the VEN cannot predict when a VTN might want to send some information. In the PUSH case this is a non-issue. However in the PULL case, this requires the VEN to periodically poll the VTN, possibly at multiple different

service endpoints, to retrieve all the information that the VTN might want to provide. oadrPoll provides a solution that allows the PULL VEN to emulate the PUSH message exchange pattern from VTN to VEN.

oadrPoll 係 VEN 用於 PULL 模型中之服務獨立輪詢機制，向 VTN 請求擱置服務操作。VEN 查詢輪詢端點而 VTN 以相同訊息回應，當其為 PUSH VEN 時將已“pushed”。若多個訊息擱置“push”，則 VEN 將繼續查詢輪詢端點，直至無新訊息且 VTN 以 eiResponse 酬載回應。

oadrPoll is a service-independent polling mechanism used by VENs in a PULL model to request pending service operations from the VTN. The VEN queries the poll endpoint and the VTN responds with the same message that it would have “pushed” had it been a PUSH VEN. If there are multiple messages pending a “push,” the VEN will continue to query the poll endpoint until there are no new messages and the VTN responds with an eiResponse payload.

VTN 為回應 oadrPoll 請求而發送的允許的回應酬載為：

- oadrResponse,
- oadrDistributeEvent,
- oadrCreateReport,
- oadrRegisterReport,
- oadrCancelReport,
- oadrUpdateReport,
- oadrCancelPartyRegistration,
- oadrRequestReregistration.

The allowed response payloads sent by the VTN in response to an oadrPoll request are:

- oadrResponse,
- oadrDistributeEvent,
- oadrCreateReport,
- oadrRegisterReport,
- oadrCancelReport,
- oadrUpdateReport,
- oadrCancelPartyRegistration,
- oadrRequestReregistration.

發酬載有效及其傳輸方法的規則與 VTN 啟動操作及將酬載推送到 VEN 相同。VTN 僅能送一個操作酬載以回應 oadrPoll 訊息。

The rules for which payloads are valid and how those payloads are delivered are the same as if the VTN had initiated the operations and pushed the payloads to the VEN. Only one operation payload may be sent by the VTN in response to the oadrPoll message.

如果 VTN 要求對其接收的酬載進行邏輯回應，VEN 應通過傳輸請求異步發送該邏輯回應。VTN 應使用 oadrResponse 酬載確認此邏輯回應。

If a logical response is required by the VTN to the received operational payload, the VEN shall send that logical response asynchronously via a transport request. The VTN should acknowledge this logical response with an oadrResponse payload.

如 VTN 未接收到作為先前輪詢的回應而傳遞的預期的邏輯回應，可選擇忽略 oadrPoll。VTN 應進行編碼，以便在逾時後放棄等待預期的回應並恢復對 oadrPoll 的回應。

The VTN can optionally ignore an oadrPoll if it has not received an expected logical response to a payload delivered as a response to a previous poll. The VTN should be coded such that after some timeout it gives up waiting for the expected response and resumes responding to oadrPoll.

oadrPoll 請求具有單一子元件，venID 發起 oadrPoll。下列為酬載之範例。

The oadrPoll request has a single sub-element, the venID initiating the oadrPoll. Below is an example payload:

```
<oadr:oadrPoll ei:schemaVersion=" 2.0b" > <ei:venID>VEN_123</ei:venID>
</oadr:oadrPoll>
```

下列圖 16 至 19 之序列圖解析使用 oadrPoll 之典型型樣。

The following sequence diagrams in Figures 16 to 19 illustrate typical patterns using oadrPoll:

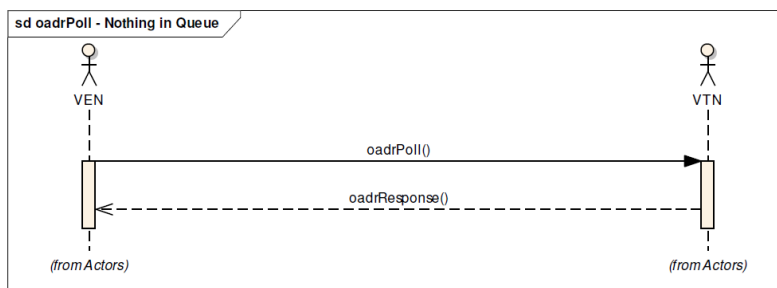


圖 16 互動圖：oadrPoll (空佇列)

Figure 16 Interaction diagram: oadrPoll (nothing in queue)

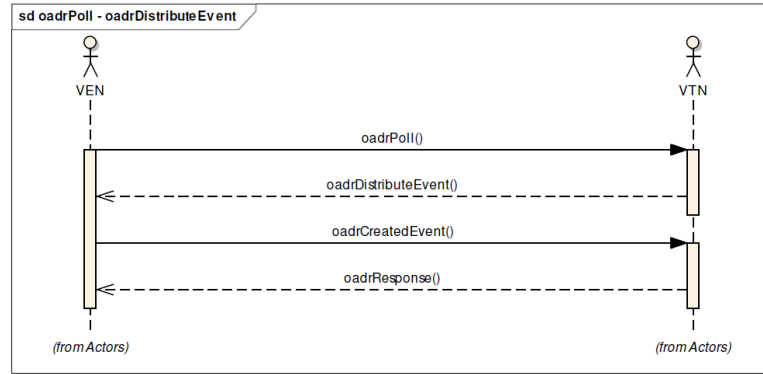


圖 17 互動圖：oadrPoll (oadrDistributeEvent 回應)

Figure 17 Interaction diagram: oadrPoll (oadrDistributeEvent reply)

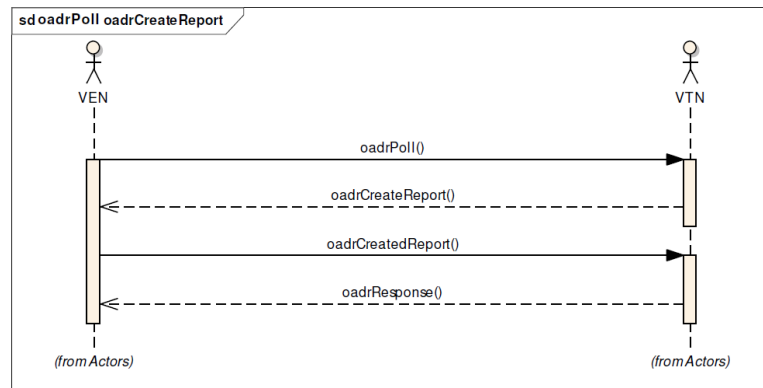


圖 18 互動圖：oadrPoll (oadrCreateReport 回應)

Figure 18 Interaction diagram: oadrPoll (oadrCreateReport reply)

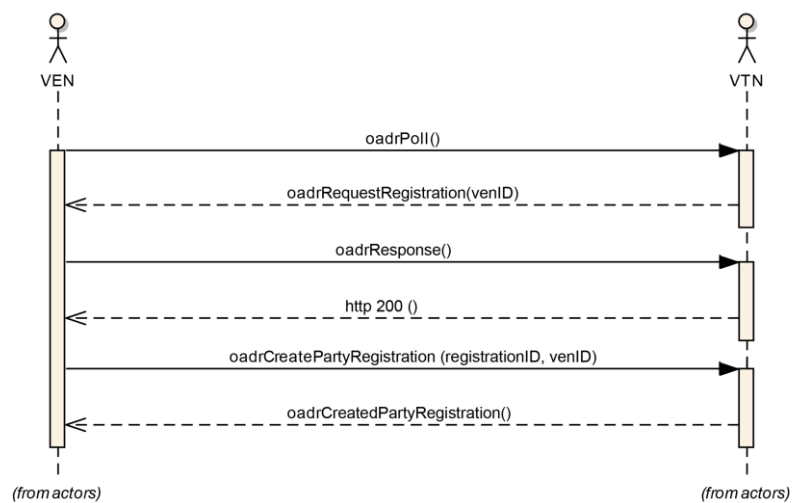


圖 19 互動圖：oadrPoll (請求重註冊回應)

Figure 19 Interaction diagram: oadrPoll (request reregistration reply)

附件 C 提供所有實現皆應支援之數種範例場景。

Annex C provides several example scenarios that shall be supported by all implementations.

6.6 應用錯誤碼

6.6 Application Error Codes

本標準使用數字“4”起始之 3 位數值錯誤碼，以通訊於綱要中各種回應物件之 responseCode 元件中的應用層錯誤。一般種類之錯誤有二：符合性錯誤及部署錯誤。錯誤碼之第 2 位數字應使用以區分此 2 個一般種類，“5”指示遵循性錯誤，而“6”指示部署錯誤。符合性規則中記載之錯誤情境將規定宜使用哪個下列錯誤碼。針對其他錯誤情境，VEN 或 VTN 實作者將須使用其最佳判定以決定所使用之合適應用層錯誤碼。

This document uses a three-digit numeric error code starting with the digit “4” to communicate application layer errors in the responseCode element of the various response objects in the schema. There are two general categories of errors: compliance errors and deployment errors. The second digit of the error code shall be used to differentiate between these two general categories with “5” indicating compliance errors and “6” indicating deployment errors. Error scenarios documented in the conformance rules will specify which of the error codes listed below should be used. For other error scenarios the VEN or VTN implementer will have to use their best judgment to determine the appropriate application layer error code to use.

遵循性錯誤碼

450－失序(事件定序、uid 定序、修改流水號)。

451－不允許(變更過去事件)。

452－無效 ID (eventID、optID、requestID、registrationID 等)。

453－不認可(reportName、signalName 等)。

454－無效資料(超出範圍信號或報告資料)。

455－開放。

456－開放。

457－開放。

458－開放。

459－遵循性錯誤-其他。

Compliance Error Codes

450 - Out of sequence (event ordering, uid ordering, modification number sequencing)

451 - Not Allowed (changing an event in the past)

452 - Invalid ID (eventID, optID, requestID, registrationID, etc.)

453 - Not recognized (reportName, signalName, etc.)

454 - Invalid Data (out of range signal or report data)

455 - Open

456 - Open

457 - Open

458 - Open

459 - Compliance Error - Other

部署錯誤

460 – 未支援之信號(認可，但不支援)。

461 – 未支援之報告(認可，但不支援)。

462 – 標的不匹配(無法對 VEN 或其資源解析標的/市場全景)。

463 – 未註冊/授權。

464 – 開放。

465 – 開放。

466 – 開放。

467 – 開放。

468 – 開放。

469 – 部署錯誤-其他。

Deployment Errors

460 - Signal not supported (recognized, but not supported)

461 - Report not supported (recognized, but not supported)

462 - Target mismatch (cannot resolve target/market context to VEN or its resources)

463 - Not Registered/Authorized

464 - Open

465 - Open

466 - Open

467 - Open

468 - Open

469 - Deployment Error - Other

7. 傳送協定

7.1 一般

7 Transport Protocol

7.1 General

本標準支援少數傳送協定以因應不同部署情境。2.0b VEN 可支援 HTTP 或 XMPP 二者之一，或同時支援二者。VTN 須支援 HTTP 及 XMPP 二者。

This document supports a small number of transport protocols to accommodate different deployment scenarios. 2.0b VENs can either support HTTP or XMPP, or may support both. VTNs must support both HTTP and XMPP.

7.2 簡易 HTTP

7.2.1 一般

7.2 Simple HTTP

7.2.1 General

本標準中之簡易 HTTP 係指經由 TLS 使用 HTTP POST 傳播酬載之 HTTP 實作。Simple HTTP in this document refers to an HTTP implementation that uses HTTP POST over TLS to propagate the payloads.

7.2.2 PUSH 及 PULL 實作

7.2.2 PUSH and PULL implementation

7.2.2.1 PUSH 定義

PUSH 模式中，訊息可由 VTN 發送(推送)至 VEN。為使用推送，VEN 須揭露 HTTP URI 端點(HTTP 伺服器)，使 VTN 可發送諸如 oadrDistributeEvent 之請求至該端點。儘管這是通過 HTTP 進行通訊最有效的方法，但由於 VEN 可以常駐在網路防火牆後，因此產生了技術難題。

7.2.2.1 PUSH Definition

In PUSH mode, messages may be sent from the VTN to VEN (pushed.) In order to use push, the VEN must expose HTTP URI endpoints (an HTTP server) to which the VTN may send requests such as oadrDistributeEvent. While this is the most efficient way to execute the communication over HTTP, it presents technical difficulties as the VEN can reside behind a network firewall.

7.2.2.2 PULL 定義

於 PULL 模式中，所有操作皆由 VEN 對 VTN 發起。此可視為“輪詢”模式，其中 VEN 定期向 VTN 詢問更新資料。提取(PULL)模式免除對 VEN 上之 HTTP 伺服器的要求，避免因處於 VEN 前方之網路防火牆可能存在的技術限制。然而，PULL 模式亦有其限制，即為潛時(由於有限之輪詢頻率)及頻寬要求增加。

7.2.2.2 PULL Definition

In PULL mode, all operations are initiated by the VEN to the VTN. This can be thought of as a ‘polling’ mode, where the VEN periodically asks for updates from the VTN. The PULL mode removes the requirement for an HTTP server on the VEN, avoiding the technical limitation presented by the possibility of a network firewall in front of a VEN. However, the PULL mode has its own limitations, namely latency (due to limited polling frequency) and increased bandwidth requirements.

PULL 模式可能涉及“2 階段”執行以完成某些操作。此係因啟始 HTTP 請求之 VEN 本質。於 PULL 模式中，VTN 可經由 oadrDistributeEvent 操作，通知 VEN 新事件。VTN 將發送具有 oadrDistributeEvent 酬載之請求，VEN 將以

HTTP 200 後隨非同步 oadrCreatedEvent 回應之。

The PULL mode may involve a ‘two-phase’ execution to complete some operations. This is due to the nature of the VEN initiating the HTTP request. In a PUSH mode, the VTN may notify a VEN of a new event via the oadrDistributeEvent operation. The VTN would send a request with an oadrDistributeEvent payload, to which the VEN responds with HTTP 200 followed by an asynchronous oadrCreatedEvent

然而，於 PULL 模式中，VEN 使用 oadrPoll 向 VTN 請求事件，VTN 於對其回應中發送 oadrDistributeEvent 酬載。剖析該回應後，VEN 仍需使用 VEN 上之 oadrCreatedEvent 操作進行第 2 次請求，以確認任何新事件之建立。

However in the PULL model, the VEN requests events from the VTN using oadrPoll, to which an oadrDistributeEvent payload is sent in the response. After parsing the response, the VEN still needs to acknowledge the creation of any new events by making a *second* request using the oadrCreatedEvent operation on the VEN.

7.2.3 服務端點 URI

端點名稱之形式如下。

https://<hostname>(:port)/(prefix)/OpenADR2/Simple/2.0b/<service>

7.2.3 Service endpoint URIs

The endpoint names will be of the form:
https://<hostname>(:port)/(prefix)/OpenADR2/Simple/2.0b/<service>

- “prefix” 係選項 URI 路徑前綴，可用以區分 IEC 62746-10-1 服務及相同 HTTP 伺服器中之其他服務。
- “Simple” 指示跨 HTTP 協定之簡易 XML。
- <service> 係服務之名稱（例：“EiEvent”、“EiReport”、“EiOpt”、“EiRegisterParty”、“OadrPoll”）。

“prefix” is an optional URI path prefix that may be used to separate IEC 62746-10-1 services from other services that may reside on the same HTTP server.

“Simple” indicates the simple XML over HTTP protocol

<service> is the name of the service (e.g., “EiEvent”, “EiReport”, “EiOpt”, “EiRegisterParty”, “OadrPoll”).

服務之“操作”部分係由請求中發送之 XML 酬載所定義。例：oadrDistributeEvent 酬載根元件規定 oadrDistributeEvent 操作。

The “operation” portion of a service is defined by the XML payload sent in a request. E.g., an oadrDistributeEvent payload root element specifies the oadrDistributeEvent operation.

當於相反方向通訊時，經由 HTTP 之 VTN 至 VEN 訊務宜流經所使用之已明確

定義的端點。oadrCreatePartyRegistraion:oadrTransportAddress 元件宜包含 VEN 使用之基底位址，諸如：“http://myaddress:8080/prefix/”。當發送訊務至 VEN 時，VTN 宜將基底位址串接至熟知服務端點，以形成完整端點位址，諸如：<http://129.6.252.49:8080/prefix/OpenADR2/Simple/2.0b/EiReport>、<https://mycompany.com/myVTN/OpenADR2/Simple/EiEvent> 及 <https://mycompany.com/myVEN/OpenADR2/Simple/EiEvent>。

VTN to VEN traffic via HTTP should flow through the same well-defined service endpoints used when communicating in the opposite direction. The oadrCreatePartyRegis-
traion:oadrTransportAddress element should contain the base address for the VEN, such as "http://myaddress:8080/prefix/". When sending traffic to the VEN, the VTN should concatenate the base address to the well known service endpoints to form a complete endpoint address such as <http://129.6.252.49:8080/prefix/OpenADR2/Simple/2.0b/EiReport>、

注意，對於揭露 VEN 及 VTN(諸如：[用戶群代表](#))二者 URI 之實作，此等實作應 VTN 及 VEN 介面使用不同 URI 端點。例：<https://mycompany.com/myVTN/OpenADR2/Simple/EiEvent> 及 <https://mycompany.com/myVEN/OpenADR2/Simple/EiEvent>。

Note that for implementations that expose both a VEN and VTN (such as an aggregator,) these implementations shall use different URI endpoints for their VTN and VEN interfaces, for example, <https://mycompany.com/myVTN/OpenADR2/Simple/2.0b/EiEvent> and <https://mycompany.com/myVEN/OpenADR2/Simple/2.0b/EiEvent>.

7.2.4 HTTP 方法

所有訊息將使用 HTTP POST 方法發送。此有助於避免快取(caching)，並允許所有操作於 HTTP 請求主體中包含酬載。

7.2.4 HTTP methods

All messages will be sent using the HTTP POST method. This helps to avoid caching and allows all operations to contain a payload in the HTTP request body.

7.2.5 失效情況

對於給定之操作，可能發生下列失效。

- TCP (或下層)失效。
- HTTP 失效(http 錯誤碼)。
- 應用確認失效(應用錯誤碼)。
- 回應失效(逾時或應用錯誤碼)。

7.2.5 Failure conditions

The following failures can occur for a given operation:

TCP (or below) fails

HTTP fails (http error code)

application acknowledgement fails (application error code)

response failure (timeout or application error code)

各失效情況之正確動作取決於應用及正被嘗試之操作。因所有操作具不變性 (idempotent)，故可安全地重試任何操作。

The proper action for each failure condition depends upon the application and the operation being attempted. Since all operations are idempotent, it is safe to retry any operation.

TCP 失效時，恆建議重試操作。

在 TCP 失效的情況下，建議重試該操作。

6.6 說明應用層錯誤的定義。

In the case of TCP failure, it is always recommended to retry the operation.

Application-level errors are defined in 6.6.

7.2.6 HTTP 回應碼

7.2.6 HTTP response codes

本標準使用定義於 IETF RFC 2616 之下列 HTTP 狀態碼。

The following HTTP status codes, defined in IETF RFC 2616, are used in document:

200 OK – 端點能完全處置並發送有效回應酬載之任何回應。此包括可指示應用層錯誤之回應(例：“您提供無效之事件 ID”)。指示傳送層失效之錯誤，由傳送層 HTTP 錯誤碼處置。

200 OK – any response that the endpoint was able to handle completely and send a valid response payload. This includes responses that may indicate an error at the application level (e.g., ‘you gave me an invalid event ID.’) Errors that indicate a failure at the transport level are handled by transport-level HTTP error codes:

404 Not Found – VEN 或 VTN 不支援所請求之操作。請求者不得重送請求。

404 Not Found – the VEN or VTN does not support the requested operation. The requestor must not re-send the request.

406 Not Acceptable – 發送之酬載未通過 EI 綱要之驗核，或請求內容型式未支援。請求者不得重送未經修改之請求。

406 Not Acceptable – If a payload is sent that does not validate against the EI schema, or if a request content-type is unsupported. The requestor MUST NOT re-send the request without first modifying it.

501 Not Implemented – 以未支援之 HTTP 方法進行之任何請求。請求者修正 HTTP 方法前不得重送請求。

501 Not Implemented – if any request is made with an unsupported HTTP method. The requestor shall not re-send the request without fixing the HTTP

method.

503 Service Unavailable – 指示伺服器暫時無法使用，可能因無法處理目前請求負載。此錯誤尤其須就其須執行靜止邏輯指示請求者，以避免對伺服器進一步施壓。請求者應於適當靜止期間過後重試請求。

503 Service Unavailable – indicates that the server is temporarily unavailable, possibly due to inability to handle the current request load. This error in particular must indicate to the requestor that it must execute quiesce logic in order to not put further strain on the server. The requestor shall retry the request after the proper quiesce period.

500 Internal Server Error – 未定義或非預期之伺服器錯誤。請求者可於靜止期間過後重試請求。

500 Internal Server Error – undefined or unexpected server error. The requestor MAY retry the request after a quiesce period.

就所有(non-200)之錯誤碼而言，回應之內容主體未定義。伺服器可選擇於回應中發送某些參考訊息，但請求者“無”義務剖析或瞭解該訊息。所有應用層之錯誤情況皆經由 oadrResponse 酬載狀態碼元件傳遞。

For all error (non-200) codes, the content body of the response is undefined. The server can choose to send some informational message in the response, but the requestor is not obligated to parse or understand it.

All application-level error conditions are conveyed through the status code element of oadrResponse payload.

7.2.7 訊息逾時

未指定本標準之連接或回應逾時臨限值。為隨不同潛時特性處置 IP 網路，實作應允許組態設定逾時。HTTP 客戶端應使用至少 5 秒之請求逾時。

7.2.7 Message timeouts

There are no prescribed connect or response timeout thresholds for document. Implementations shall allow configurable timeouts in order to handle IP networks with different latency characteristics. HTTP clients shall use a request timeout of at least 5 s.

7.2.8 訊息重試/靜止行為

當請求因任何原因失效時(實體或網路層失效或逾時)，請求者須制定“退讓機制”或靜止邏輯以避免以請求泛流攻擊網路或接收器。

7.2.8 Message retry/quiesce behaviour

When a request fails for any reason (either due to physical or network-level failure or a timeout) the requestor must institute ‘back-off’ or quiesce logic to avoid flooding the network or receiver with requests.

客戶端應以某些小間隔(例：1 秒)開始靜止，隨機加減“抖動”，其為該間隔之少數百分比(例：10%)。舉例而言，裝置之第 1 個靜止間隔可能介於 0.9 至 1.1

秒之間。然後裝置可重試請求。若後續重試失效，靜止間隔應為先前間隔之 2 倍，再加上該間隔 $\pm 10\%$ 之隨機抖動。此後續失效之加倍數應持續增加至某個最大值為止，該值視 VEN 輪詢 VTN 之間隔而定。此方法稱為“截尾二進指數退讓演算法”(truncated binary exponential back off algorithm)。

Clients shall begin quiesce at some small interval (say, 1 second) plus or minus some random ‘jitter,’ which is a small percentage of that interval (say, 10%). For example, the first quiesce interval for a device might be between 0.9 and 1.1 s. Then the device may retry the request. If subsequent retries fail, quiesce interval shall double from the prior interval, again adding a random jitter of $\pm 10\%$ of that interval. This doubling for subsequent failures shall continue up to some maximum, probably dependent on the poll interval in the case of a VEN polling a VTN. This is known as a “truncated binary exponential back off algorithm.”

7.2.9 PULL 時序

本標準未定義組態設定 PULL 模式輪詢間隔之能力，然而 VEN 實作須允許以毫秒之精確度組態設定輪詢間隔。此調整分辨率只對通訊協定而言是強制的，且此要求不能推斷建築系統需要毫秒級的控制。建築系統的回應能力取決於程序。

7.2.9 PULL timing

The ability to configure the poll interval for a PULL mode is not defined in this document, however VEN implementations shall allow the poll interval to be configurable at a millisecond resolution. This adjustment resolution is only mandatory for the communication protocol and this requirement does not infer that building systems require millisecond-level control. Responsiveness of building systems is program-dependent.

本標準中，VTN 可經由依據設定 `oadrCreatedPartyRegistration:oadrRequestedOadrPollFreq`，組態設定 VEN 之最小輪詢間隔。

In this document, a VTN may configure the minimum poll interval for the VEN by setting

`oadrCreatedPartyRegistration:oadrRequestedOadrPollFreq` accordingly.

為避免因許多 VEN 恰於輪詢間隔之相同瞬間啟動輪詢請求對 VTN 所造成之請求峰值，VEN 亦可組態設定以包括“抖動”(絕對輪詢間隔之隨機偏移)。

VENs shall also be configurable to induce some ‘jitter’ – a random offset from the absolute poll interval – in order to avoid request spikes on the VTN caused by many VENs initiating a PULL request at the exact same instant within the poll interval.

7.2.10 HTTP 標頭

7.2.10.1 一般

下列 HTTP 標頭於 7.2.10.2 to 7.2.10.8，應存在於請求或回應中(如已指示)。

7.2.10 HTTP headers

7.2.10.1 General

The HTTP headers in 7.2.10.2 to 7.2.10.8 shall appear in requests or responses (where indicated):

7.2.10.2 Accept(接受)

接受請求標頭規定回應之預期內容型式。因回應恆為“application/xml”，故可省略 Accept 標頭。然而，若其已被包括，Accept 請求標頭應恆為“application/xml”。

7.2.10.2 Accept

The accept request header specifies the expected content-type of a response. Since responses are always “application/xml”, the Accept header may be omitted. However, if it is included, the value of the Accept request header shall always be “application/xml”.

7.2.10.3 Accept-Encoding (接受編碼)

此標頭指示客戶端是否支援回應酬載之內容壓縮。若 VEN 支援諸如 gzip 或 deflate 之內容壓縮，則可包含此標頭。若 VEN 包括此標頭，則 VTN 應認可之，且使用請求標頭中指方法之一壓縮回應內容。

7.2.10.3 Accept-Encoding

This request header indicates if a client supports content compression of the response payload. A VEN may include this header in a request if it supports content compression such as gzip or deflate. If the VEN includes this header, the VTN shall honor it and compress the response content using one of the methods given in the request header.

7.2.10.4 Content-Encoding (內容編碼)

若 VTN 回應已壓縮酬載之請求，則其應包括指示正確編碼方法(諸如 gzip 或 deflate)之“Content-Encoding”回應標頭。來自 VTN 之推送操作不得於請求中使用內容編碼標頭，因其要求 VTN 有各 VEN 所支援內容編碼之先驗知識。

7.2.10.4 Content-Encoding

If a VTN is responding to a request for which it has a compressed payload, it shall include a content-encoding response header indicating the correct encoding method, such as gzip or deflate. PUSH operations from a VTN shall not utilize the content-encoding header in the request, since it would require the VTN to have a priori knowledge of which content-encodings are supported by each and every VEN.

7.2.10.5 Content-Length (內容長度)

依據 IETF RFC 2616，應使用“content-length”標頭指示所有請求及回應酬載之內容本體大小。

7.2.10.5 Content-Length

The content-length header shall be used according to IETF RFC 2616 to indicate content body size of all request and response payloads.

特別注意：“區塊”傳送編碼(其中內容長度未知)不得用於本標準。傳送回應標頭時，實作須假設內容本體總長度為已知，且不得發送區塊回應。

Note that 'chunked' transfer encoding (where content-length is unknown) shall not be used in this document. Implementers shall assume that the total content body length is known when the response headers are sent, and shall not send chunked responses.

7.2.10.6 Content-Type (內容型式)

應用於請求及回應訊息，以指示酬載 MIME 型式。適當值為“application/xml”。內容型式亦可規定字元編碼。就本標準而言，唯一支援之字元編碼為 UTF-8。若包括 charset，則整個標頭值應顯示為“application/xml; charset=utf-8”。

7.2.10.6 Content-Type

This shall be used for request and response messages, indicating payload MIME type. The appropriate value is “application/xml”. The content-type may also specify a character encoding. For this document, the only supported character encoding is UTF-8. If a charset is included, the entire header value shall appear as “application/xml; charset=utf-8”.

7.2.10.7 Host(主機)

依據 IETF RFC 2616 第 14.23 (3) 節，所有的請求中須包括“Host”標頭。

7.2.10.7 Host

The Host header shall be included in all requests in accordance with IETF RFC 2616, section 14.23 (3).

7.2.10.8 User-Agent (使用者代理)

請求者可包括“User-Agent”標頭，但其存在既不可靠，亦不得實際影響伺服器處置請求之行為。

7.2.10.8 User-agent

The requestor may include the User-Agent header, but its presence shall not be relied upon, nor shall it materially affect the behavior of the server handling the request.

7.3 傳送特定安全性**7.3.1 一般**

無論使用何種鑑別方法，TLS 應用以加密所有訊務。客戶端恆應驗證交握期間給予之伺服器 TLS 憑證。

7.3 Transport-specific security

7.3.1 General

TLS shall be used to encrypt all traffic. The client shall always validate the server's TLS certificate given during the handshake.

7.3.2 TLS 客戶端憑證

客戶端憑證須用於 HTTP 客戶端驗證。TLS 交握期間，發起請求之個體(客戶端)須有由伺服器驗證之 X.509 憑證。若未提供客戶端憑證，或憑證無效(例：未由受信任之 CA 簽署或已過期)，則伺服器應於 TLS 交握期間終止連線。

7.3.2 TLS client certificate

Client certificates must be used for HTTP client authentication. The entity initiating the request (the client) must have an X.509 certificate that is validated by the server during the TLS handshake. If no client certificate is supplied, or if the certificate is not valid (e.g. it is not signed by a trusted CA, or it is expired), the server shall terminate the connection during the TLS handshake.

若憑證於 TLS 交握中顯示為有效，則建立安全連線，並進行 HTTP 請求。一旦伺服器收到 HTTP 請求，伺服器須履行授權，以客戶端憑證給予信符。

If the certificate appears valid during the TLS handshake, the connection is established and the HTTP request proceeds. Once the server receives the HTTP request, it must perform authentication, given the credentials in the client certificate.

如該憑證在 TLS 交握時為有效，將建立連接且繼續 HTTP 的請求。伺服器應在接收到 HTTP 請求時依據客戶端憑證進行驗證。VTN 宜使用憑證公開金鑰做為主要識別機制。客戶端信符須比對，以確認其符合客戶端請求之 OpenADR 酬載中顯示的 venID。若信符不相符，或若伺服器判斷請求未獲授權，則須於適宜訊息之 eiResponse 物件中以應用層 463 錯誤回應(亦即若來至 VEN 之請求係 oadrCreatePartyRegistration，則係於 oadrCreatedPartyRegistration 回應中)。

If the certificate appears valid during the TLS handshake, the connection is established and the HTTP request proceeds. Once the server receives the HTTP request, it shall perform authentication, given the credentials in the client certificate. The VTN shall use the certificate public key as the primary identification mechanism and not the identity in the certificate. The client credentials shall be compared to ensure they match the venID that appears in the payload of the client request. If credentials do not match, or if the server otherwise determines that the request is not authorized, it shall respond with an application layer 463 error in the eiResponse object of an appropriate message (e.g. in an oadrCreatedPartyRegistration response if the request from the VEN

was an `oadrCreatePartyRegistration`).

為實作本標準，可使用 DR 程式運算子支援的所有可接受的安全憑證。其中一種選項為使用開放式自動需量反應聯盟認證政策 (OpenADR Alliance Certificate Policy) 的安全憑證。

To implement this document, any acceptable security certificate can be used as supported by

the DR program operator. One option is to use security certificates that are regulated by the

OpenADR Alliance Certificate Policy¹.

7.4 XMPP

7.4.1 一般

XMPP 具狀態的雙向通訊協定，且適合用於以 XML 格式傳輸訊息。IETF RFC 6120 規定核心協定，定址則由 IETF RFC 6122 定義，且為 61968-100:2013 之附錄 G 所引用。RFC 6120 之 13.7 說明以憑證式鑑別處理。為安全目的，在本標準的預期實作中，XMPP 伺服器為 VTN 伺服器基礎設施的一部份。若 XMPP 伺服器駐存於 VTN 的安全框架之外，則可能需額外安全措施。

7.4 XMPP

7.4.1 General

XMPP is a stateful, bi-directional protocol ideal for transmitting messages in XML format. The core protocol is specified in IETF RFC 6120, and addressing is defined in IETF RFC 6122 and is also referenced in Annex G of 61968-100:2013. RFC 6120 section 13.7 describes certificate-based authentication handling. It should be noted that in the intended implementation of this document, the XMPP server is part of the VTN server infrastructure for security purposes. If the XMPP server resides outside the VTN's security framework, additional security measures may be necessary.

7.4.2 交換模式執程序

本質上，XMPP 係雙向具狀態之協定。使用 XMPP 之任何客戶端本身能無縫地實作 PUSH 及 PULL 操作，但 `oadrPoll` 例外，因 XMP 不允許。PULL 操作係由 VEN 發起之操作，PUSH 操作則係由 VTN 發起之操作。

7.4.2 Exchange model implementation

By nature, XMPP is a bi-directional, stateful protocol. As such, any client utilizing XMPP can implement both PUSH and PULL operations seamlessly, with the exception of `oadrPoll`, which is disallowed over XMPP. PULL operations are simply those initiated by the VEN, and PUSH operations are initiated by the VTN.

7.4.3 服務端點

Jabber Identifier (JID) 定義了 VTN 及 VEN 服務端點，其類似於電子郵件位址。

完全合格之 JID 履行與 HTTP 實作中端點 URI 相同之功能。本標準 7.4.5.1 進一步說明 JID 之定義。

7.4.3 Service endpoints

A jabber identifier (JID), which is similar to an email address, defines both VTN and VEN service endpoints. The fully qualified JID performs the same function as an endpoint URI in an HTTP implementation. The definition of JIDs is further described in 7.4.5.1.

7.4.4 服務執行

因 XMPP 係訊息式協定，故藉由傳遞包含 OpenADR XML 酬載之 XMPP 訊息，發生 OpenADR 服務之執行。

7.4.4 Service execution

Because XMPP is a message-based protocol, execution of services occurs by passing XMPP messages that contain an XML payload.

7.4.5 XMPP 功能執行

7.4.5 Implementation of XMPP features

7.4.5.1 JIDs

雖然各 JID 具多資源使用之前景，開啟某些有趣之可能性(例：將場所之各建築視為不同資源)，但因其它傳送諸如 HTTP 不支援相同機制，故宜謹慎使用此策略。VEN 客戶端宜恆以全名之 JID 驗證(而非允許伺服器指派隨機資源 ID)。

7.4.5.1 JIDs

While the prospect of using multiple resources per JID opens some interesting possibilities (e.g. exposing each building at a facility as a different resource), this strategy should be used with some caution, as the same mechanism is not supported by other transports such as HTTP.

VEN clients should always authenticate with a fully qualified JID (rather than allow the server to assign a random resource ID.)

VTN 客戶端可選擇將 OpenADR 操作揭露為 XMPP 服務或客戶端 JID。雖然大部分 OpenADR 服務操作將自 VTN “推送”至 VEN，但 VEN 可能需要發送某些請求至 VTN。OpenADR 服務應於執行期間經(描述於 9.3.4.9)服務發現而發現，而非使用某些組態定義 VTN 服務之 JID。

VTN clients can choose to expose the operations either as an XMPP service or as a client JID. Although most service operations will be ‘pushed’ from VTN to VEN, a VEN can still need to send some requests to the VTN. Rather than use some configuration to define the JID for VTN services, services shall be discovered at runtime via service discovery (described in section 7.4.5.9)

經由 XMPP 之 VTN 至 VEN 訊務應流經已由單一全名稱 JID 所定義端點。此 VEN JID 將作為 oadrTransportAddress 元件中 oadrCreatePartyRegistration 酬

載之一部分與 VTN 通訊。用於 JID 之資源名稱可任意，諸如“客戶端”。例：
oadrTransportAddress 元件之內容可能像是“ven@domain/client”。

VTN to VEN traffic via XMPP **shall** flow through an endpoint defined by a single fully qualified JID. This VEN JID will be communicated to the VTN as part of the oadrCreatePartyRegistration payload in the oadrTransportAddress element. The resource name used for the JID can be arbitrary such as “client”. For instance, the contents of the oadrTransportAddress element might be something like “ven@domain/client”.

VEN 至 VEN 訊務係不允許的，且**應**由 XMPP 伺服器過濾。

VEN to VEN traffic is disallowed and **shall** be filtered by the XMPP server.

7.4.5.2 使用封包“type”屬性

所有操作**應**針對所有 OpenADR 服務操作使用“set”IQ 型式屬性。

7.4.5.2 Use of the packet 'type' attribute

All operations **shall** use the ‘set’ IQ type attribute for all service operations.

7.4.5.3 訊息之使用對 IQ 封包

任何要求應用層回應(例：OpenADR 2.0 回應酬載)或傳送層回應碼之 OpenADR 2.0 服務操作，**應**使用 IQ 封包。XMPP 協定接著要求來自接收者之回應 IQ。

7.4.5.3 Use of message versus IQ packets

Any service operations that require an application-level response (e.g. a response payload) or a transport-level response code shall use an IQ packet. The XMPP protocol then mandates a response IQ from the recipient.

任何無須回應之服務操作，諸如廣播操作(或可能之回饋)，可能使用訊息封包發送酬載。若封包為 IQ，則其處置宜完全相同，除非接收者未發送回應。對未預期回應且無須回應 IQ 之使用情況，此係頻寬最佳化。

Any service operations that do not require a response, such as a broadcast operation (or possibly feedback), **may** use a message packet to send the payload. Handling of the packet should be identical to if it were an IQ, except that the recipient sends no response. This is a bandwidth optimization for use cases where a response is not expected, and a response IQ would be unnecessary.

7.4.5.4 錯誤處置

7.4.5.4 Error handling

7.4.5.4.1 傳送層狀態碼

於正常狀況下，IQ 回應將具有 type = ‘result’之屬性。此類比於 HTTP 200 回應。定義 HTTP 200 回應之服務操作將看似無孩酬載元件之 IQ 元件十分相似。

```
<iq type='result'
to='ven1234@xmpp.myvo.net/client'
```

```
from='vtn.xmpp.somevtn.net'  
id='1'/>
```

7.4.5.4.1 Transport-level status codes

Under normal conditions, an IQ response will have a type='result' attribute. This is analogous to an HTTP 200 response. Service operations that define an empty HTTP 200 response will simply look like an IQ element with no child payload element:

```
<iq type='result' to='ven1234@xmpp.myvo.net/client'  
from='vtn.xmpp.somevtn.net'  
id='1' />
```

7.4.5.4.2 傳送層錯誤

產生傳送層錯誤之操作將具有 type='error' 及孩 <error> 元件，其指定依 IETF RFC 6120 之 8.3 所述之傳送層狀態碼。例：

```
<iq type='error'  
to='ven1234@xmpp.myco.net/client'  
from='vtn.xmpp.somevtn.net'  
id='2'>  
<error type='modify'>  
<bad-request xmlns='urn:ietf:params:xml:ns:xmpp-stanzas'/>  
</error>  
</iq>
```

7.4.5.4.2 Transport-level errors

Operations that result in a transport-level error will have a type='error' and a child <error> element that indicates the transport-level status code as described in IETF RFC 6120 section 8.3. For example:

```
<iq type='error' to='ven1234@xmpp.myco.net/client'  
from='vtn.xmpp.somevtn.net' id='2'>  
<error type='modify'>  
<bad-request xmlns='urn:ietf:params:xml:ns:xmpp-stanzas'/> </error>  
</iq>
```

因 XMPP 未使用數值狀態碼，故無法直接對映 HTTP 狀態碼，且處置傳送層錯誤之邏輯不屬本標準之範圍。處置不同 XMPP 錯誤之指導綱要可參照 IETF RFC 6120 之 8.3.3。

Since XMPP does not use numeric status codes, direct mapping of HTTP status codes is not possible, and logic for handling transport-level errors is outside the scope of this document. Guidelines for handling different types of XMPP errors can be found in IETF RFC 6120 section 8.3.3.

若客戶端接收未遵循綱要之酬載，則客戶端宜回應以 IETF RFC 6120 之 8.3.3.1 中定義之 bad-request 錯誤。

If a client receives a payload that does not adhere to the schema, a client should respond with a bad-request error as defined in IETF RFC 6120, section

8.3.3.1.

注意，應用層錯誤須以相同於 HTTP 之方式處置。亦即，正常‘result’ XMPP 回應宜回傳以酬載中之應用層錯誤細節。

Note that application-level errors must be handled the same as in HTTP. That is, a normal ‘result’ XMPP response should be returned with the application-level error details in the payload.

7.4.5.5 存在

VEN 客戶端應使用存在封包通知 IETF RFC 6121 第 4 節所述之上線或離線狀態之已訂閱個體。來自客戶端之所有其他狀態廣播宜視為參考性。

7.4.5.5 Presence

VEN clients shall use presence packets to notify subscribed entities of online and offline status as described in IETF RFC 6121, section 4. All other status broadcasts from a client should be considered informational.

VEN 完成會談協商後，其應發送依 IETF RFC 6121 之 4.2.1 中定義的“available”出現節次。

```
<presence />
```

After a VEN completes session negotiation, it shall send an ‘available’ presence stanza as defined in IETF RFC 6121, section 4.2.1:

```
<presence />
```

若 VEN 故意終止其 XMPP 連接(例：導因於非無預期，突然失去連接性之正常關機)，則應先發送依 IETF RFC 6121 之 4.5.1 中定義之“unavailable”出現節次。

```
<presence type='unavailable'/>
```

If VEN deliberately terminates its XMPP connection (e.g. due to a graceful shutdown, not an unexpected, sudden connectivity loss), it shall first send an ‘unavailable’ presence stanza

as defined in IETF RFC 6121, section 4.5.1:

```
<presence type='unavailable'/>
```

The VTN should not generally advertise its presence to the VENs. A VTN could subscribe to VENs and receive presence updates, but may cause scalability issues and should be used with caution.

7.4.5.6 XMPP ping**7.4.5.6 XMPP ping**

由 VEN 至 XMPP 伺服器，對 XMPP ping 之支援(依 XMPP 標準基金會規範 XEP-0199 第二版規定)係必備。VEN 可注意到 XMPP 伺服器之斷線，例如且若 1 或多個 ping 於某段時間內未回應，則可能重新建立連接或發送告警。XMPP ping 之間隔及與 XMPP ping 之其他參數相關之其他參數可於當地設定，而交換此等參數不要求作為註冊之一部分。

Support for XMPP ping (as specified in XMPP Standards Foundation specification XEP-0199 version 2) is mandated from the VEN to the XMPP server. The VEN can notice disconnection from XMPP server and, for example, reestablish connection or send an alarm if one or more pings are not replied within a certain time. XMPP ping intervals and other parameters related to XMPP ping may be set locally, and exchange of these parameters is not required as part of registration.

7.4.5.7 鑑別

所有客戶端應支援依 IETF RFC 6120 之 13.8 及 13.9.4 中定義之 SSL/TLS 及鑑別。

7.4.5.7 Authentication

All clients shall support SSL/TLS and authentication as defined in IETF RFC 6120, sections 13.8 and 13.9.4.

客戶端亦應實作簡易鑑別及安全層 (simple authentication and security layer) SASL EXTERNAL 以使用 IETF RFC 6120 中定義之憑證鑑別。

Clients shall also implement simple authentication and security layer SASL EXTERNAL in order to use certificate authentication as defined in IETF RFC 6120.

登入 XMPP 伺服器之 VTN/VEN 用戶名稱，應匹配用於鑑別過程中的 x509 憑證之常見名稱 (common name, CN) 欄位。

The username of the VTN/VEN logging in to the XMPP server shall match the Common Name (CN) field of the x509 certificate that is used in the authentication process.

7.4.5.8 名冊

雖然名冊為 XMPP 之核心功能，且經常出現於 XMPP 會談發起期間，但本標準中無經定義之角色，故其使用於本標準之範圍中未定義。客戶端可履行名冊請求，然而大部分情況中，伺服器可能只簡單回應以空名冊。最好是，客戶端 (尤其 VEN 客戶端) 不宜針對本標準之目的向伺服器請求名冊。

7.4.5.8 Rosters

While rosters are a core feature of XMPP and commonly occur during XMPP session initiation, they have no defined role within this document and therefore their use is undefined within the scope of this document. A roster request may be performed by a client; however under most circumstances, the server may simply respond with an empty roster. Optimally, a client (particularly VEN clients) should not request a roster from the server for the purposes of this document.

更具體而言，VEN 客戶端通常不宜將其他個體加至其名冊，如此將產生導因於存在廣播之網路額外負擔。

More specifically, VEN clients should not typically add other entities to its

roster, as this will result in additional network overhead due to presence broadcasts.

VTN 客戶端可能選擇使用名冊，作為追蹤線上 VEN 客戶端之存在的機制，然而此並非嚴格之 **本標準** 特徵或要求。

VTN clients might choose to use the roster as a mechanism to track presence of online VEN clients, however this is not strictly a feature or requirement of **this document**.

7.4.5.9 服務探索

7.4.5.9.1 一般

應使用 XMPP 服務探索 XEP0030 定義 VTN 上 **本標準** 服務之位址。此允許 VTN 如何實作服務之彈性，同時可免除 VEN 上額外組態設定之需要，其超出 **本標準** 之範圍。

7.4.5.9 Service discovery

7.4.5.9.1 General

XMPP Service Discovery XEP0030 **shall** be used to define the address for services on the VTN. This allows the VTN flexibility in how it implements services, while removing the need for additional configuration on the VEN, which would be outside the scope of **this document**.

7.4.5.9.2 特徵之探索

VEN 完成會談初始後，其可對 VEN 已鑑別之純網域履行 **XEP-0030** ‘info’ 查詢。例：若 VEN 已連接為 “ven1@xmpp.myco.net/client”，則其初始服務發現查詢應如下列所示。

```
<iq type='get'
  from='ven1@xmpp.myco.net/client'
  to='xmpp.somevtn.net'
  id='info1'>
  <query xmlns='http://jabber.org/protocol/disco#info'/>
</iq>
```

7.4.5.9.2 Discovery of the features

After a VEN has completed session initiation, it may perform an **XEP-0030** ‘info’ query to the bare domain to which the VEN has authenticated. For example, if a VEN has connected as ‘ven1@xmpp.myco.net/client’ then its initial service discovery query would look like the following:

```
<iq type='get' from='ven1@xmpp.myco.net/client' to='xmpp.somevtn.net'
  id='info1'>
<query xmlns='http://jabber.org/protocol/disco#info'/> </iq>
```

下列為伺服器之回應。

```
<iq type='result'
  from='xmpp.somevtn.net'
  to='ven1@xmpp.myco.net/client'
  id='info1'>
```

```

<query xmlns='http://jabber.org/protocol/disco#info'>
  <feature var='http://openadr.org/openadr2/'>
  <feature var='http://jabber.org/protocol/disco/'>
</query>
</iq>
To which the server would respond:
<iq type='result' from='xmpp.somevtn.net'
  to='ven1@xmpp.myco.net/client' id='info1'>
<query xmlns='http://jabber.org/protocol/disco#info'>
  <feature var='http://openadr.org/openadr2/'>
  <feature var='http://jabber.org/protocol/disco/'>
</query>
</iq>

```

此指出伺服器以符合 XMPP 之方式支援協定。

This indicates, in an XMPP-compliant fashion that the XMPP server supports the protocol.

7.4.5.9.3 服務端點之探索

然後 VEN 可接著履行“items”查詢，連同將“node”設為名稱空間(namespace) “http://openadr.org/openadr2#services”，如下列所示。

```

<iq type='get'
  from='ven1@xmpp.myco.net/client'
  to='xmpp.somevtn.net'
  id='items1'>
<query xmlns='http://jabber.org/protocol/disco#items'
  node='http://openadr.org/openadr2#services'>
</iq>

```

7.4.5.9.3 Discovery of service endpoints

Then VEN may then perform an ‘items’ query, with the ‘node’ set to the namespace 'http://openadr.org/openadr2#services' as such:

```

<iq type='get' from='ven1@xmpp.myco.net/client' to='xmpp.somevtn.net' id='items1'>
<query xmlns='http://jabber.org/protocol/disco#items'
  node='http://openadr.org/openadr2#services'>
</iq>

```

VTN 應接著以用於各服務之 JID 回應，例：

```

<iq type='result'
  from='xmpp.somevtn.net'
  to='ven1@xmpp.myco.net/client'
  id='items1'>
<query xmlns='http://jabber.org/protocol/disco#items'
  node='http://openadr.org/OpenADR2#services'>
<item jid='event.openadr2.xmpp.somevtn.net'
  node='http://openadr.org/OpenADR2/EiEvent' />

```

```

<item jid='feedback.openadr2.xmpp.somevtn.net'
      node='http://openadr.org/OpenADR2/EiFeedback' />
</query>
</iq>
The VTN shall then respond with the JIDs used for each service, for example:
<iq type='result'
    from='xmpp.somevtn.net'
    to='ven1@xmpp.myco.net/client'
    id='items1'>
<query xmlns='http://jabber.org/protocol/disco#items'
      node='http://openadr.org/OpenADR2#services'>
<item jid='event.openadr2.xmpp.somevtn.net'
      node='http://openadr.org/OpenADR2/EiEvent' />
<item jid='feedback.openadr2.xmpp.somevtn.net'
      node='http://openadr.org/OpenADR2/EiFeedback' />
</query>
</iq>

```

注意，所有服務能使用相同 JID 或不同 JID，且 JID 可為子網域(其常見於 XMPP 服務)或具有“localpart”及資源之完全合格網域。

Note that all services could use the same JID or different JIDs and JIDs may be subdomains (which are common for XMPP services) or fully-qualified with a ‘localpart’ and resource.

7.4.5.9.4 VEN 客戶端上之服務探索

VEN 客戶端可選擇服務發現以提供關於其客戶端之輔助資訊(例：客戶端 IP 位址、可用磁碟空間等)。然而此種輔助資訊超出本標準之範圍。

7.4.5.9.4 Service discovery on VEN clients

VEN clients may choose to implement service discovery to provide supplemental information about their client (such as client IP address, available disk space, etc.) However such supplemental information is outside the scope of this document.

最低限度，若 VEN 支援 XEP-0030 查詢，則須支援“http://openadr.org/openadr2”特徵，如 7.4.5.9.2 所述。

At the bare minimum, if a VEN supports XEP-0030 queries, it shall indicate support for the 'http://openadr.org/openadr2' feature, as described in 7.4.5.9.2.

7.4.6 安全考量

除鑑別(如 7.4.5.7 定義)外，要求額外步驟以保全 XMPP 網路。尤其是，不得允許 VEN 客戶端相互運訊(至少不在本標準範圍內)。客戶端可選擇實作某種白名單以控制不同 JID 之接取，其類似於實作 HTTP PUSH 情境中之防火牆。

7.4.6 Security considerations

Beyond authentication (as defined in 7.4.5.7), additional steps are required to secure an XMPP network. In particular, VEN clients shall not be allowed to communicate with each other (at least, not within the scope of this document). Clients may opt to implement some sort of whitelist to control access from different JIDs, which would be similar to implementing a firewall in an HTTP PUSH scenario.

然而，控制 XMPP 客戶端間之接取的最終責任應保留於 XMPP 伺服器層級。大多數情況中，XMPP 伺服器將邏輯地並肩部署，或整合為 VTN 一部分。XMPP 伺服器能接著實作接取控制，以保持 VEN 邏輯地隔離，以致其僅能與 VTN 通訊。

However, ultimate responsibility for controlling access between XMPP clients shall be held at the XMPP server level. In most cases, the XMPP server will be logically deployed alongside or as an integrated part of a VTN. The XMPP server can then implement access controls to keep VENs logically isolated so they can only communicate with the VTN.

假設 XMPP 伺服器和 VTN (伺服器)並置在同一個伺服器，或處於相同的安全網路上。確保 XMPP 伺服器和 VTN 之間的通訊安全為 VTN 實作者的責任。XMPP 伺服器為 VTN 的代理主機，就 VEN 的立場而言，其直接與與 VTN 通訊或通過 XMPP 伺服器進行通訊並無差別。

It is presumed that the XMPP server and the VTN (server) are either collocated in the same server or in the same secure network. Securing the communication between the XMPP server and the VTN is the responsibility of the VTN implementer. The XMPP server is a proxy of the VTN, so from the VEN's standpoint, there is no difference between whether it is communicating directly with the VTN or through the XMPP server.

8. 網路安全

8.1 一般

為符合本文件的要求，系統需實作 8.2 到 8.7 所述的安全功能。

8 Cyber security

8.1 General

Conformance to this document requires systems to implement security functionality as outlined in 8.2 to 8.7.

預期許多 OpenADR 2.0 實作將使用現有雲端計算服務及平台。OpenADR 聯盟業已決定允許目前可用之安全協定及加密套件，直到其就預期使用被廢棄為止。所有驗證之 OpenADR 2.0 產品須可升級。該升級機制留待製造者實作。

It is expected that many OpenADR 2.0 implementations will make use of existing

cloud computing services and platforms. The OpenADR Alliance has therefore decided to allow currently available security protocols and cipher suites until they are deprecated for the intended use. All certified OpenADR 2.0 Products must be upgradable. The mechanism of the upgradability is left to the manufacturers' implementation.

本標準使用共同安全性機制無須任何修訂。

This document uses common security mechanisms without any modification.

需量反應方案營運者(例：電力事業)需對其系統要求適當等級之安全性。

The demand response program operator (e.g., utility) will need to require the appropriate level of security for its system.

網路安全符合 IEC 62351-11 的要求。

The cyber security requirements conform to IEC 62351-11.

8.2 架構及憑證型式

8.2 Architecture and certificate types

為提供如鑑別、機密性及完整性等安全服務，VEN 及 VTN 須使用公開金鑰基礎建設(PKI)憑證。定義 2 個本標準安全等級，即“標準”及“高”。“標準”安全性於 VTN 與 VEN 之間，使用 TLS 建立通訊安全通道。“高”安全性額外使用 XML 簽章提供不可否認性(non-repudiation)供文件化目的(例：已簽署之事件，可儲存於供稍後記錄事件已確實接收之資料庫)。

To provide security services like authentication, confidentiality and integrity, VENs and VTNs must use Public Key Infrastructure (PKI) certificates. Two levels of security are defined for this document, called 'standard' and 'high'. The 'standard' security uses TLS for establishing secure channels between a VTN and a VEN for communication. 'High' security additionally uses XML signatures providing non-repudiation for documentation purposes (e.g., a signed event may be stored in a database for later documentation that an event has actually been received).

本標準採用安全性之開放架構，且不限制其自身只使用某些特定或專用技術。針對 PKI 憑證，主要有 2 種公開金鑰加密演算法選項，分別為 RSA 及 ECC。雖然 RSA 較廣泛使用，但 ECC 優點為提供如加密及數位簽章之更有效率密碼操作。

This document adopts an open architecture for security and will not restrict itself to some specific or proprietary technologies. There are primarily two public key cryptography algorithm options for using PKI certificates, namely RSA and ECC. While RSA is more widely accepted, ECC provides the benefits of more efficient cryptographic operations, such as encryption and digital signatures.

對於相同密碼強度，ECC 金鑰大小明顯小於 RSA 金鑰。此對於偏好有效率密碼系統之嵌入式裝置尤其重要。如前述，網際網路上較廣泛接受 RSA，且有多個憑證提供者使其更易於選取最符合要求之提供者。

For the same cryptographic strength, ECC key sizes are much shorter than RSA keys. This is especially important for embedded devices, that favor efficient cryptography. As mentioned, RSA is more widely accepted on the Internet and has multiple certificate providers making it easier to select a provider which best matches the requirements.

為保留 2 個選項優點，且為互運性目的，VTN 須同時支援分別來自知名憑證授權單位(CA)之 ECC 及 RSA 憑證 – 例如經 OpenADR 認證政策管理的數位憑證認證機構，除非 DR 計劃運營商另有決定。最終設計可能具有多於 2 個提供者，但其將確保至少包括 1 個以上 ECC 及 1 個 RSA 憑證授權單位。

To retain the benefits of both options and for the purposes of interoperability, the VTNs must support both, ECC and RSA certificates, each from a well-known certificate authority (CA) – for instance the one governed by the OpenADR Certificate Policy, unless otherwise determined by the DR program operator. The final design may have more than two providers but it will be ensured that at least more than one ECC and one RSA certificate authorities are included.

VEN 能選擇於裝置上使用 1 或多個 PKI 憑證。唯一限制即 VEN 應為 VTN 實作至少 1 個來自經認可之憑證及 CA 清單的憑證。

A VEN can choose to use one or more PKI certificates on the device. The only restriction is that a VEN shall implement at least one certificate from the approved list of certificate and CAs for the VTN.

此清單將事先決定且將公開可得。為建立 VTN 與 VEN 間之安全通訊通道，VTN 應支援經認可之憑證型式及 CA 清單中的所有憑證。啟動通訊時，VEN 將選擇使用其中任一憑證。

This list will be decided upon in advance and will be publicly available. To establish a secure communication channel between the VTNs and VENs, VTNs shall have to support all the certificates in the approved list of certificates types and CAs. Upon initiating the communication, a VEN will have the choice to use any one of them.

下列參數應用於憑證。

- **ECC** – 至少 256 個位元之金鑰。
- **RSA** – 至少 2048 個位元之金鑰。
- **憑證型式** – X.509v3。

The following parameters shall be used for the certificates:

- ECC – 256 bits or longer keys.
- RSA - 2048 bits or longer keys.
- Certificate types – X.509v3.

8.3 憑證機構

8.3 Certificate authorities

需量反應計劃的實作者可以選擇國際、國家或本地網路安全憑證提供者。選項包括公開可用的開放式自動需量反應聯盟認證政策及 OpenADR 規定的安全憑證。

Implementers of demand response programs can choose between international, national, or local cyber security certificate providers. Options include the use of the publicly available OpenADR Alliance Certificate Policy and the OpenADR Alliance specific security certificates.

8.4 憑證廢止

8.4 Certificate revocation

細節參照 OpenADR 2.0 Certificate Policy。

Please refer to the OpenADR 2.0 Certificate Policy for details.

8.5 TLS 及加密套件

8.5 TLS and cipher suites

製造商可以檢視 NIST SP 800-131A 的棄用日期和當前的安全要求。本文件要求 TLS1.2 及相應的加密套件。

要求事項(對互運性為必備)如下。

Manufacturers may review NIST SP 800-131A for deprecation dates and current security

requirements. This document requires TLS1.2 and the corresponding cipher suites.

Requirements (mandatory for interoperability):

傳輸層安全：TLS 1.2

加密套件：

– ECC – TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA256

– RSA – TLS_RSA_WITH_AES_128_CBC_SHA256

Transport Layer Security: TLS 1.2

Cipher Suites:

ECC – TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA256

RSA – TLS_RSA_WITH_AES_128_CBC_SHA256

TLS 客戶端應使用值為 {ECDSA, SHA 256; RSA, SHA256} 的簽章演算法擴展來確保應 SHA 256 用於交握中的簽章作業以及使用的憑證。如未發送此擴展，則 IETF RFC 5246 要求伺服器退回到預設值 SHA1。

TLS clients shall use the signature_algorithm extension with the values {ECDSA, SHA 256;

RSA, SHA256} to ensure application of SHA 256 for signature operation in the handshake and

also for the used certificates. If this extension is not sent, the server is required by IETF RFC 5246 to fall back to default, which is SHA1.

注意 VTN 或 VEN 可能組態設定以支援任何 TLS 版本，以及基於特定部署所需之加密套件組合。然而 VTN 或 VEN 之預設組態未改變時，裝置之行為須如上文所

提醒。

Note that a VTN or VEN may be configured to support any TLS version and cipher suite combination based on the needs of a specific deployment. However in the absence of changes to the default configuration of the VTN or VEN, the behavior of the devices must be as noted above.

不得使用過期的憑證。為避免因證書過期引起的服務中斷，部署的 VTN 及 VEN 實作應具有適當的程序或警告機制以識別未決的安全憑證是否過期。

Expired certificates shall not be used. To avoid service outage caused by expired certificates, deployed VTN and VEN implementations should have appropriate processes or warning mechanisms in place to identify pending security certificate expiration.

為符合 IEC TS 62351-4 的要求，製造商及 DR 程式實作者應至少使用 AES 256。

To comply with IEC TS 62351-4, a manufacturer and DR program implementer shall use AES 256 as a minimum.

8.6 系統註冊過程

8.6.1 一般

8.6 System registration process

8.6.1 General

註冊定義為 VTN 成為 VEN 所“意識”者，例：交換信符及其他可能之資訊以使 VTN 能正確驗證 VEN。注意，此明確不包括加入 DR 方案。雖特定部署可能選擇帶外之某些部分註冊過程，但本標準剖繪仍包含註冊服務。

Registration is defined as the VTN becoming “aware” of the VEN, e.g. exchange of credential and possibly other information so that the VTN can properly authenticate the VEN. Note that this specifically does not include enrolling in DR programs. This document includes a registration service, although specific deployments may elect to do some portions of the registration process out-of-band.

8.6.2 憑證特徵

8.6.2 Certificate fingerprints

VEN 應藉由提供易於帶外傳送至 VTN 之“憑證特徵”，以協助註冊。VTN 應有 venID 與憑證指紋之間的一對一映射。VTN 可接著使用此特徵，於 VEN 首次連接 VTN 時予以識別。

VENs shall facilitate registration by providing a “certificate fingerprint” which can be easily transmitted out-of-band to the VTN. On the VTN, there should be one-to-one mapping between venID and certificate fingerprint. The fingerprint may then be used by the VTN to identify a VEN when it first connects to the VTN.

下列為憑證特徵之產生方式。

- (a) 對 DER 編碼客戶端憑證之位元組履行 SHA-256 雜湊運算。
- (b) (由 32 個位元組之 SHA-256 雜湊)取出最後 10 個位元組，表示為 16 進制數字對，並以冒號(ASCII 58)字元分隔。

The certificate fingerprint will be generated as follows:

Perform a SHA-256 hash on the bytes of the DER-encoded client certificate

Take the last 10 bytes (from the 32-byte SHA-256 hash), represented as pairs of hexadecimal digits, separated by the colon (ASCII 58) character.

此特徵可如下所示，藉由常用 “openssl” 命令列工具由 PEM 憑證產生。

This fingerprint may be generated by the common ‘openssl’ command line tool from a PEM certificate as follows:

```
$ openssl x509 -in client_cert.pem -fingerprint SHA256
```

```
SHA256
```

```
Fingerprint=D8:40:F6:2B:9D:6D:91:E4:21:21:64:2B:A5:55:76:GB:9C:6C:6B:00:9B:B5:5E:71:FA: E4:61:75:9C:EF:A4:D6
```

須將 SHA256 雜湊 (5E:71:FA:E4:61:75:9C:EF:A4:D6) 之最後 29 個字元用作 “憑證特徵”。此特徵須列印，否則隨 VEN 散佈，其因而能於安裝期間帶外傳送至 VTN。

The last 29 characters of the SHA256 hash (5E:71:FA:E4:61:75:9C:EF:A4:D6) must be used as the “certificate fingerprint.” This fingerprint must be printed or otherwise distributed with the VEN so it can be transmitted out-of-band to the VTN during installation time.

特徵亦可能以 python 計算如下。

The fingerprint could also be computed in python as follows:

```
import ssl, hashlib
```

```
bin_cert = ssl.PEM_cert_to_DER_cert( open('client_cert.pem').read() )
```

```
sha_hash = hashlib.sha256(bin_cert).digest()
```

```
print ':'.join( '%02X' % ord(c) for c in sha_hash[-10:] )
```

在某些實作中，可使用憑證指紋的替代方法。

In some implementation cases, an alternative to certificate fingerprints may be used.

8.7 實作訊息酬載之 XML 簽章

8.7 Implementing XML signatures for message payloads

8.7.1 XML 簽章簡介

8.7.1 XML signature

XML 簽章使用公鑰密碼學以數位化簽署部分 XML 文件，對所簽署之 XML 文件部分提供完整性保護。此處提供 XML 簽署及簽章查證之簡述作為實作指引。完整 XML 簽章規格可由 <http://www.w3.org/Signature/> 取得。

An XML signature uses public key cryptography to digitally sign portions of an XML document for integrity protection of the signed portions of the XML document. A brief description of XML signing and signature verification is provided here for implementation guidance. The complete XML Signature Specification is available at <http://www.w3.org/Signature/>.

XML 簽章之基礎功能係簽署文件中之部分 XML 樹的能力。當整份文件於必要時仍可由不同個體增加附件，此於 XML 樹之某些部分需保持完整性時，至為重要。XML 簽章能應用於多種型式之資源，像是 XML 檔案之區段、以 XML 編碼資料、二進編碼影像、文字或字元編碼檔案。

A fundamental feature of the XML signature is the ability to sign individual portions of the XML tree in the document. This is important when the integrity of certain parts of the XML tree needs to be preserved, while the complete document may still be appended by different entities as required. XML signature can be applied to more than one type of resource like section of XML file, XML encoded data, binary-encoded images, text, or character-encoded files.

XML 簽章有 3 種型式 – (i) 被封裝，其中被簽署之被簽署元件為親元件而簽章元件為孩元件；(ii) 封裝，其中簽章元件係被簽署元件之親元件；(iii) 分離，其中簽章元件與被簽署元件無親孩關係。當內容被簽署時，分離式簽章能存在於同份 XML 文件中，基本上係作為兄弟元件，或者其可出現於內容被簽署之不同文件中。

XML signatures are of three types – i) enveloped, where the signed element being signed is a parent and the signature element is a child; ii) enveloping, where the signature element is the parent of the element being signed; and iii) detached, where the signature element and the signed element do not have a parent child relationship. Detached signatures can reside in the same XML document as the content being signed, essentially living as sibling element or they can be in a different documenting that the content being signed.

本標準中之“high security” 剖繪，使用具兄弟元件之分離式簽章。

For the “high security” profile in [this document](#), detached signatures with siblings are used.

8.7.2 XML 簽章之組件

8.7.2 Components of XML signatures

參考 URI：此元件提供對使用 URI 簽署資源的參考。

Reference URI: This element provides a reference to the resource that is being signed using a URI.

摘要值(Digest Value)：此元件包含被簽署之資源的摘要。

Digest Value: This element contains the digest of the resource that is being signed.

簽章值(Signature Value)：此元件包含由簽署機構之私鑰所簽署的資源摘要。

Signature Value: This element contains the resource digest signed by the private key of the signing authority.

金鑰資訊(Key Info)：金鑰資訊元件包含宜用以供簽章查證之金鑰資訊。此包含關於簽署機構之公鑰資訊。

Key Info: the key info element contains the information of the key that should be used for signature verification. This contains information on the public key of the signing authority.

8.7.3 建立 XML 簽章

8.7.3 Creating XML Signatures

建立 XML 簽章之第 1 個步驟係識別需被簽署之資源。對於本標準規格，須使用作為被簽署資料物件之兄弟元件存在於同份 XML 文件中的“分離式”簽章。VTN 及 VEN 裝置宜使用供 TLS 連接使用之加密套件。因此不需支援，用以建立及查證訊息摘要之額外加密套件。SHA-256 係建立訊息摘要所必備，而 for 公鑰憑證須使用 X.509。如何建立 XML 簽章之進一步細節參照 IETF RFC 3275。

The first step in creating XML signatures is to identify the resource that needs to be signed. For this document, ‘detached’ signatures living in the same XML document as sibling element to the data object being signed must be used. The VTN and VEN devices should use the cipher suites that are used for TLS connections. As such there will not be any need for supporting additional cipher suites for creating and verifying message digests. SHA-256 is mandatory for creating message digests and X.509 must be used for public key certificates. Refer to IETF RFC 3275 for further details how to create XML signatures.

圖 20 顯示 XML 簽章範例。

An example XML signature is shown in Figure 20


```

<oadr:oadrPayload>
  <ds:Signature>
    <ds:SignedInfo>
      <ds:CanonicalizationMethod
        Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315" />
      <ds:SignatureMethod
        Algorithm="http://www.w3.org/2001/04/xmldsig-more#rsa-sha256" />
      <ds:Reference URI="#signedObject">
        <ds:DigestMethod Algorithm="http://www.w3.org/2001/04/xmldsig-more#sha256" />
        <ds:DigestValue>5H8v6B/z+YMDBR61xKdUZVklvUnC/rVfEcrZ5IAFDY=</ds:DigestValue>
      </ds:Reference>
      <ds:Reference URI="#prop">
        <ds:DigestMethod Algorithm="http://www.w3.org/2001/04/xmldsig-more#sha256" />
        <ds:DigestValue>7H7U/}kg%yHHFD7jb^*jvR80KHfdR%7hHFVdEtGJU</ds:DigestValue>
      </ds:Reference>
    </ds:SignedInfo>
    <ds:SignatureValue>UjBsR09EbGhjZ0dTQUxNQUBUUNBRU1tQ1p0dU1GUXhEUzhi</ds:SignatureValue>
  </ds:Signature>
  <ds:KeyInfo>
    <ds:KeyName>key123</ds:KeyName>
  </ds:KeyInfo>
  <ds:Object Id="prop">
    <ds:SignatureProperties xmlns:dsp="http://openadr.org/oadr-2.0b/2012/07/xmldsig-properties">
      <ds:SignatureProperty>
        <dsp:ReplayProtect>
          <dsp:timestamp>2006-05-04T18:13:51.0</timestamp>
          <dsp:nonce>nonce0</nonce>
        </dsp:ReplayProtect>
      </ds:SignatureProperty>
    </ds:SignatureProperties>
  </ds:Object>
</ds:Signature>
<oadr:oadrSignedObject Id="signedObject">
  <oadr:oadrDistributeEvent ei:schemaVersion="2.0b">
    ...
  </oadr:oadrDistributeEvent>
</oadr:oadrSignedObject>
</oadr:oadrPayload>

```

圖 20 XML 簽章範例

Figure 20 – XML signature example

XML 簽章之不同欄位解釋如下。<oadrPayload>係 XML 文件之根元件。包含 2 個孩元件 - <Signature>及<oadrSignedObject>。<Signature>包含簽章元件，而 <oadrSignedObject>包含被簽署之 **本標準** 酬載。

The different fields of the XML signature are explained below. The <oadrPayload> is the root element for the XML document. It contains two children - <Signature> and <oadrSignedObject>. <Signature> contains the signature element, where as the <oadrSignedObject> contains the payload that is being signed.

<Signature> 元件包括整個 XML 簽章。<Reference> 元件包含指向 <oadrSignedObject>元件之 URI。<DigestMethod>指向建立被簽署資源之摘要使用的演算法。範例中，使用 SHA-256 建立訊息摘要。

<Signature> element includes the entire XML signature. The <Reference> element contains the URI pointing to the <oadrSignedObject> element. <DigestMethod> points to the algorithm for creating the digest of the resource being signed. In the example, SHA-256 is used for creating the message digest.

<DigestValue>係摘要之文數字值。元件<SignedInfo>包含所有此等資訊及所使用之正準化方法(canonicalization method)。具有 具有不同文字表示法之 XML

簽章的相同驗證，對正準化實屬重要。

<DigestValue> is the alpha-numeric value of the digest. The element <SignedInfo> contains all these information and the Canonicalization Method that was used. Canonicalization is important to have the same verification of XML signatures with different textual representations.

<KeyInfo>元件包含關於簽署機構之公鑰的資訊，查證簽章宜使用此公鑰。資訊包括<SubjectName>及簽署機構之包含公鑰的對應 X.509 憑證。

<KeyInfo> element contains the information about the public key of the signing authority that should be used to verify the signature. It contains information including <SubjectName> and the corresponding X.509 certificate of the signing authority that contains the public key.

<Object>元件包含<SignatureProperties>表列。支援 XML 簽章之**本標準**實作應至少插入<ReplayProtect>元件作為<SignatureProperty>。當發送酬載至其他方非於建立時，並使用隨機 nonce 時，<ReplayProtect>元件須包含 dateTime。注意，ReplayProtect 元件係 W3C “XML Signature Properties” 文件較早版本⁽⁶⁾之一部分，但因缺乏互運性實作，已移除。**本標準**使用相同元件，但位於其自身之名稱空間中。

The <Object> element contains a list of <SignatureProperties>. An implementation supporting XML signatures **shall** at least insert the <ReplayProtect> element as <SignatureProperty>. The ReplayProtect element must contain the dateTime when the payload is sent to the other party (not when it is created), as well as a random nonce. Note that the <ReplayProtect> element was part of an earlier version of the W3C “XML Signature Properties” document², but has been removed because of lack of interoperable implementations. This document uses the same element but in its own namespace. 使用簽署機構之私鑰建立及簽署整個<SignedInfo>元件之摘要。

A digest of the whole <SignedInfo> element is created and signed using the private key of the signing authority.

簽章方法可允許之演算法係：RSA-SHA256 及 ECDSA-SHA256。摘要方法可允許之演算法係：SHA256。細節參照**第 9 節**符合性規則 514。

The allowable algorithms for the signature method are: RSA-SHA256, and ECDSA-SHA256. The allowable algorithm for the digest method is: SHA256. Refer to conformance rule 514 in **Clause 9** for details.

8.7.4 查證 XML 簽章

8.7.4 Verifying XML Signatures

宜進行下列步驟查證 XML 簽章(參照 **IETF RFC 3275**)。

The following steps should be performed to verify an XML signature (refer to **IETF RFC 3275**)

1. 使用 <DigestMethod> 元件中指示之摘要機制 (亦即 SHA-256) 建立 <SignedInfo> 元件的摘要。使用 <KeyInfo> 元件中指出之金鑰，查證 <SignatureValue> 元件。若查證值與摘要相同，則第 1 個查證步驟完成。
1. Create a digest of the <SignedInfo> element using the digest mechanism indicated in the <DigestMethod> element (i.e., SHA-256). Verify the <SignatureValue> element using the key pointed out in the <KeyInfo> element. If the verification value is the same as the digest, the first verification step is complete.
2. 計算 <oadrSignedObject> 欄位之摘要並確認所計算摘要與 <DigestValue> 欄位中之值相同。
2. Calculate the digest of the <oadrSignedObject> field and make sure the calculated digest is the same as the value in the <DigestValue> field.
3. 查證是否包含 <ReplayProtect> 元件為 <SignatureProperty>。若裝置上之目前日期及時間與 <ReplayProtect> 中之值的差異大於預定義值，則拒絕酬載。此外，可使用臨時值 (nonce) 以進一步防範重演攻擊。
3. Verify if a <ReplayProtect> element is contained as <SignatureProperty>. Reject the payload if the current date and time on the device differs from the value in the <ReplayProtect> more than a predefined value. In addition, the nonce may be used for further protection against replay attacks.

9. 符合性

9 Conformance

9.1 符合性聲明

為宣稱符合本標準，VTN、VEN 或 VTN/VEN 組合須符合本標準。可於表 1 之產品矩陣中找到產品差異。

9.1 Conformance statement

In order to claim conformance to this profile specification, a VTN, VEN or VTN/VEN combination must conform to all statements made in this document.

Product variations can be found in the product matrix in Table 1.

9.2 符合性規則

9.2 Conformance Rules

9.2.1 EiEvent

9.2.1 EiEvent

表 7、8、9、10、11 及 12 列出所有適用的符合性規則。注意由於佔位或刪除的原因，符合性規則的編碼不一定是連續的。

Tables 7, 8, 9, 10, 11 and 12 list all applicable conformance rules. Note that the numbering of the conformance rules are not necessarily consecutive due to placeholders or deletions.

表 7 符合性規則

符合性規則	要求
1	<p>VEN/VTN 日期、時間及持續時間</p> <p>日期-時間值應使用 ISO 8601 規定的世界協調時間(亦稱為世界標準時間)。範例：2013-04-22T15:26:44.123Z。ISO 8601 允許使用日期-時間值中的小數秒，但必要時接收設備須負責將其截斷。儘管 ISO 8601 允許以零小時偏移量表示世界標準時間(例如：2013-04-22T15:26:44.123+0000)，但此處不得使用。</p> <p>持續時間的表示亦需遵循 ISO 8601 的要求。但是本文件中不得使用十進制值。</p>
2	<p>VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>針對各 eiEventSignal 區間 uid 元件為必要。於單一 oadrDistributeEvent eiEventSignal 內，針對各後續間隔，應 UID 表示成自 0 起每間隔遞增 1 之數字。</p>
3	<p>VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>oadrDistributeEvent 優先序元件 – 此為此事件相對於其他事件之優先序。數字越低，優先序越高。數值 0 表示無優先序，其依預設為最低優先序。</p>

Table 7 – Conformance rules

Conformance Rule	Requirement
1	<p>VEN/VTN, date-time and duration</p> <p>The date-time values shall be specified using ISO 8601 utc-time (also called zulu time). Example:2013-04-22T15:26:44.123Z. Fractional seconds in date-time values are allowed by ISO 8601, however it is the responsibility of the receiving device to truncate the fractional seconds if necessary. Although ISO 8601 allows representation of zulu time with a zero hour offset (e.g. 2013-04-22T15:26:44.123+0000), it shall not be used. Representation of duration also follows ISO 8601. However, use of decimal values shall not be used in this document.</p>
2	<p>VTN, EiEvent Service, oadrDistributeEvent Payload</p> <p>The uid element is REQUIRED for each eiEventSignal interval. Within a single oadrDistributeEvent eiEventSignal, uid shall be expressed as an interval number with a base of 0 and an increment of 1 for each subsequent interval.</p>
3	<p>VTN, EiEvent Service, oadrDistributeEvent Payload</p> <p>oadrDistributeEvent priority element – This is the priority of this event relative to other events. The lower the number higher the priority. A value of zero (0) indicates no priority, which is the lowest priority by default.</p>

4	<p>VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>新事件應以 modificationNumber 為 0 開始。</p>
5	<p>VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>除 createdDateTime、eventStatus 及 currentValue 外，每次修改</p>

	<p>oadrDistributeEvent eiEvent 物件，應使得 modificationNumber 遞增 1。</p> <p>例外狀況：將 eventStatus 變更為 “cancelled” 應使得修改數字遞增 1。</p>
6	<p>VEN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>於 oadrDistributeEvent testEvent 元件中，任何非 “false” 字串之存在，均應被視為測試事件之觸發。</p>

4	<p>VTN, EiEvent Service, oadrDistributeEvent Payload</p> <p>A new event shall start with a modificationNumber of 0.</p>
5	<p>VTN, EiEvent Service, oadrDistributeEvent Payload</p> <p>Each modification of the oadrDistributeEvent eiEvent object, excluding createdDateTime, eventStatus, and currentValue, shall cause the modificationNumber to increment by 1.</p> <p>Exception: An eventStatus change to “cancelled” shall cause the modification number to increment by 1.</p>
6	<p>VEN, EiEvent Service, oadrDistributeEvent Payload</p> <p>The presence of any string except “false” in the oadrDistributeEvent testEvent element shall be treated as a trigger for a test event.</p>

7 僅限 A 剖繪	<p>VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>oadrDistributeEvent eiEvent 物件應僅包含 1 個事件信號，且該信號之 signalName 應為 “SIMPLE” (大寫或小寫字母，即 “simple”)。</p>
8	<p>VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>針對給定事件，oadrDistributeEvent eventSignal 間隔持續時間，其總和應達到 eiEvent iActivePeriod 之持續時間。</p>
9	<p>VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>oadrDistributeEvent eiEventSignal 之 signalName 為 “simple” 時，其 signalPayload 值應使用 0=正常、1=中、2=高、3=特殊。</p>
10	<p>VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>當通知 VEN 事件取消時，VTN 應 oadrDistributeEvent eventStatus 變更為 “cancelled”。注意當發出取消動作時，將 modificationNumber 遞增 1。</p>

7 A Profile Only	<p>VTN, EiEvent Service, oadrDistributeEvent Payload</p> <p>The oadrDistributeEvent eiEvent object shall contain only one event signal and that signal shall have a signalName of “SIMPLE” (in either upper or lower case, i.e., “simple”).</p>
8	<p>VTN, EiEvent Service, oadrDistributeEvent Payload</p> <p>oadrDistributeEvent eventSignal interval durations for a given event shall add up to eiEvent iActivePeriod duration.</p>

9	VTN, EiEvent Service, oadrDistributeEvent Payload oadrDistributeEvent eiEventSignal's with a signalName of "SIMPLE" shall use signalPayload values of 0=normal; 1=moderate; 2=high; 3=special.
10	VTN, EiEvent Service, oadrDistributeEvent Payload The VTN shall change the oadrDistributeEvent eventStatus to "cancelled" when communicating an event cancellation to the VEN. Note that the modificationNumber is incremented by 1 when issuing a cancellation.

12	VEN、EiEvent 服務、oadrCreatedEvent 酬載 VEN 應根據各事件的 oadrResponseRequired 元件之值，以 oadrCreatedEvent 回應 oadrDistributeEvent 中該事件，如下所示。 Always - VEN 應藉由 oadrCreatedEvent eventResponse 回應事件，其中包括未修改、新增、已修改及被取消之事件。 Never - VEN 不得以 oadrCreatedEvent eventResponse 回應事件。 注意雖然 oadrCreatedEvent 事件回應宜以單一訊息回傳，但亦可以個別訊息回傳。
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12	VEN, EiEvent Service, oadrCreatedEvent Payload The VEN shall respond with an oadrCreatedEvent to an event in oadrDistributeEvent based upon the value in each event's oadrResponseRequired element as follows: Always – The VEN shall respond to the event with an oadrCreatedEvent eventResponse. This includes unchanged, new, changed, and cancelled events. Never – The VEN shall NOT respond to the event with a oadrCreatedEvent eventResponse Note that oadrCreatedEvent event responses should be returned in one message, but may be returned in separate messages.
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13	VTN、EiEvent 服務、oadrDistributeEvent 酬載 EventStatus 應恆由 "far" 至 "near" 至 "active" 依序轉變。若已定義 x-eiRampUp 期間，則轉變至 NEAR 發生於該期間之起始；若未定義，則於 dtStart 時間，自 "far" 轉變至 "active"。
14	VTN、EiEvent 服務、oadrDistributeEvent 酬載 針對 SIMPLE signalName，當事件狀態非 "active" 時，若 currentValue 包含於酬載中，則其應設定為 0(正常)。

13	VTN, EiEvent Service, oadrDistributeEvent Payload EventStatus shall always transition from "far" to "near" to "active". The transition to "near" occurs at the start of the x-eiRampUp period if defined. If x-eiRampUp is not defined the transition will move from "far" to "active" at the dtstart time.
14	VTN, EiEvent Service, oadrDistributeEvent Payload If currentValue is included in the payload, it shall be set to 0 (normal) when the event status is not "active" for the SIMPLE signalName.

15	VTN、EiEvent 服務、oadrDistributeEvent 酬載
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	<p>VTN 於 oadrDistributeEvent 酬載中所發送之事件清單應排序如下。</p> <p>(1) “active” 事件具高於擱置事件之優先序。</p> <p>(2) 於具 “active” 事件狀態之事件內，優先序由 Event Descriptor 中之 Priority 決定之。</p> <p>(3) 具相同優先序之 “active” 事件間，起始時間較早者優先序較高。</p> <p>(4) 於擱置(即 “far” 或 “near”)事件間，起始時間較早者優先序較高。</p> <p>(5) 處理規則(1)-(4)之後，若某一組事件內優先序仍無法確定，且若對小於擱置或 “active” 事件數量的值，VTN 正以 replyLimit 集回應 oadrRequestEvent，則該 VTN 於連續回答 oadrRequestEvent 時，應維持固定次序，且定序維持未確定。</p> <p>(6) 取消動作宜依事件取消前所適用之規則排序。</p>

15	<p>VTN, EiEvent Service, oadrDistributeEvent Payload</p> <p>A list of events sent by VTN in an oadrDistributeEvent payload shall be ordered as follows:</p> <ol style="list-style-type: none"> 1. “active” events have priority over pending events. 2. Within events with “active” event status, priority is determined by Priority in the Event Descriptor. 3. Between “active” events with the same priority, the one with the earlier start time has the higher priority. 4. Between pending (i.e., “far” or “near”) events the one with the earlier start time has the higher priority 5. After processing rules 1) to 4), if Priority is still indeterminate within a set of events and if the VTN is responding to an oadrRequestEvent with replyLimit set to a value less than the number of pending or “active” events, the VTN shall maintain a fixed order between successive replies to oadrRequestEvent while the ordering remains indeterminate. 6. A cancellation should be ordered according to whatever rules were applied before the event was cancelled.
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16	<p>VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>VTN 應就 optIn 與 optOut 兩者，辨識 eiCreatedEvent optType 元件之狀態，除非應適用符合性規則 206 之 B 剖繪 VEN 以 oadrCreateOpt 事件回應的情況。</p>
17	<p>VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>針對先前已確認之事件，VTN 應辨識非同步之 eiCreatedEvent optOut，除非應適用符合性規則 206 之 B 剖繪 VEN 以 oadrCreateOpt 事件回應的情況。</p>

16	<p>VTN, EiEvent Service, oadrDistributeEvent Payload</p> <p>The VTN shall recognize the state of the eiCreatedEvent optType element, both optIn and optOut, except when a B profile VEN responds to an event with oadrCreateOpt, in which</p>
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	case conformance rule 206 shall apply.
17	VTN, EiEvent Service, oadrDistributeEvent Payload The VTN shall recognize an asynchronous eiCreatedEvent optOut for a previously acknowledged event, except when a B profile VEN responds to an event with oadrCreateOpt, in which case conformance rule 206 shall apply.

18	<p>VEN/VTN、EiEvent 服務</p> <p>VTN 可發送重疊的事件。處理重疊事件時的 VEN 行為尚未定義。使用重疊事件進行部署之 DR 應定義預期的行為，且應確保 VEN 參與支援預行為的程式。</p> <p>確定事件是否重疊時應使用下列規則：</p> <p>事件 1 = 序列中的第一個事件；</p> <p>事件 2 = 序列中的第二個事件；</p> <p>起始時間 = 事件酬載中的 dtStart 值；</p> <p>持續時間 = 酬載中的總事件持續時間值；</p> <p>隨機視窗(Randomization Window) = 酬載中的 startafter 值。</p> <p>有效終止時間(Effective End Time) = 事件起始時間+事件持續時間+隨機視窗。</p> <p>如事件 2 的起始時間等於或大於事件 1 的有效終止時間，則事件 2 不視為重疊。如事件 2 的起始時間小於事件 1 的有效終止時間，則事件 2 即為重疊。</p> <p>當取消一事件時，其有效終止時間即為確認取消的時間加上隨機視窗以計算後續事件是否重疊。</p> <p>如果事件接近，則後續事件的超始時間等於當前事件的有效終止時間，VEN 應不包含該終止時間，而包括起始時間，以確定兩個並行事件信號中的哪個信號區段值應在兩個事件之間的瞬態轉換中使用。</p>
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18	<p>VEN/VTN, EiEvent Service</p> <p>VTNs may send overlapping events. The behaviour of VENs when processing overlapping events is undefined. DR deployments using overlapping events should define the expected behaviour and should ensure that VENs participating in the program support the expected behaviour.</p> <p>The following rules shall be used when determining if events are overlapping:</p> <p>Event 1 = first event in a sequence;</p> <p>Event 2 = second event in a sequence;</p> <p>Start Time = dtStart value in event payload;</p> <p>Duration = overall event duration value in payload;</p> <p>Randomization Window = startafter value in payload;</p> <p>Effective End Time = Event Start Time plus Event Duration plus Randomization Window.</p> <p>If Event 2 Start Time is equal to or greater than Event 1 Effective End Time, then Event 2 is not considered to be overlapping. If Event 2 Start Time is less than Event 1 Effective End Time, then Event 2 is overlapping.</p> <p>When an event is cancelled, the Effective End Time for the event becomes the time the cancellation is acknowledged plus the Randomization Window for the purpose of</p>
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	<p>calculating if a subsequent event is overlapping.</p> <p>If events are adjacent, where a subsequent event's Start Time is equal to the current event's Effective End Time, the VEN shall treat the end times as non-inclusive and the start times as inclusive for the purpose of determining which of the two concurrent event signal interval values to use at the instant of transition between the two events.</p>
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19	VEN、EiEvent 服務、oadrDistributeEvent 酬載 若 oadrDistributeEvent 酬載混雜有效與無效事件，則 VEN 實作上僅應回應相關有效事件，而非拒絕整個訊息。
20	VTN、EiEvent 服務、oadrDistributeEvent 酬載 VTN 可隨時改變擱置(即“far”或“near”)或“active”事件之任何元件或屬性，只要其與過往無關。

19	VEN, EiEvent Service, oadrDistributeEvent Payload If an oadrDistributeEvent payload has as mix of valid and invalid events, the VEN implementation shall only respond to the relevant valid events and not reject the entire message.
20	VTN, EiEvent Service, oadrDistributeEvent Payload At any time, a VTN may change any element or attribute of a pending (i.e., “far” or “near”) or “active” event as long as it does not pertain to the past.

21	VEN/VTN、EiEvent 服務、oadrDistributeEvent 酬載 若 venID、vtnID 或 EventID 包含於酬載中，則接收個體應驗證 ID 值是否為預期值，並於 ID 不存在或收到未預期值時產生錯誤。 例外狀況：VEN 應不得於收到未知 eventID 之已取消事件時，產生錯誤。
22	VEN、EiEvent 服務、oadrDistributeEvent 酬載 若 oadrDistributeEvent eiTarget 未存在子元件，則推測接受者係事件之預期標的。若 eiTarget 子元件有多個準則，則此等值一起以邏輯 OR 運算以判定 VEN 是否為事件之標的。然而，當其符合 EiTarget 準則中之一時，關於回應事件之 VEN 行為取決於實作。
23	VEN/VTN、EiEvent 服務、oadrRequestEvent 酬載 oadrRequestEvent 應僅由 VEN 至 VTN 方向發送。

21	VEN/VTN, EiEvent Service, oadrDistributeEvent Payload If venID, vtnID, or eventID is included in payloads, the receiving entity shall validate that the ID value is as expected and generate an error if no ID is present or an unexpected value is received. Exception: A VEN shall not generate an error upon receipt of a cancelled event whose eventID is not previously known.
22	VEN, EiEvent Service, oadrDistributeEvent Payload If no sub elements are present in oadrDistributeEvent eiTarget, the presumption is that the recipient is the intended target of the event. If multiple criteria are present in eiTarget sub-elements, the values are OR'd together to determine whether the VEN is a target for the event. However, the VENs behavior with respect to responding to an event when it matches one of the eiTarget criteria is implementation-dependent.
23	VEN/VTN, EiEvent Service, oadrRequestEvent Payload oadrRequestEvent shall only be sent in VEN to VTN direction.

25	VTN、EiEvent 服務
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	<p>oadrCreatedEvent 中多個事件相關之應用程式層級回應，應遵循下列規則。</p> <p>(1) 若 oadrCreatedEvent:eiResponse 指示失效，則無必要檢查 eventResponses 中之各元件(甚至在錯誤情況下 eventResponses 無須為 oadrCreatedEvent 酬載之一部分，如規則 35 所規定)。</p> <p>(2) 若 oadrCreatedEvent:eiResponse 指示成功，則 VTN 宜評估各 eventResponse:responseCode，以探索各事件所記錄之 VEN 的 optType 狀態及狀態代碼。</p>
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25	<p>VTN, EiEvent Service, oadrCreatedEvent Payload</p> <p>The following rules shall be followed with respect to application level responses for multiple events in an oadrCreatedEvent:</p> <p>1) If the oadrCreatedEvent:eiResponse indicates failure, there is no need to examine each element in the eventResponses (eventResponses is not even required to be part of the oadrCreatedEvent payload in an error condition, as specified in rule 35).</p> <p>2) If the oadrCreatedEvent:eiResponse indicates success, the VTN should evaluate each eventResponse:responseCode to discover which optType state and status codes the VEN recorded for each event.</p>
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27	<p>VTN、EiEvent 服務、oadrRequestEvent 酬載</p> <p>若於 oadrRequestEvent replyLimit 元件提供值，則 VTN 應僅回傳於其 oadrDistributeEvent 回應中之值所規定的事件數目。</p>
29	<p>VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>各 eiEvent signal 之 oadrDistributeEvent currentValue (若其包含於酬載中)應準確地反應執行中事件之該作用間隔的 signalPayload 值。</p>
30	<p>VEN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>若 startafter 元件存在值，則 VEN 應隨機化事件之 dtstart 時間。隨機化後的 dtStatrt 時間應在要求的 dtstart 及 dtstart 加上 startafter 之間。</p> <p>將隨機化 dtstart 時間，加上事件之持續時間，即可判定事件完成時間。除非修改 startafter 元件本身，否則修改事件宜維持相同隨機偏置。</p>

27	<p>VTN, EiEvent Service, oadrRequestEvent Payload</p> <p>If a value is provided in the oadrRequestEvent replyLimit element, the VTN shall only return the number of events specified by the value in its oadrDistributeEvent response.</p>
29	<p>VTN, EiEvent Service, oadrDistributeEvent Payload</p> <p>The oadrDistributeEvent currentValue, if included in the payload, for each eiEvent eiEventSignal shall accurately reflect the signalPayload value for the active interval in an executing event.</p>
30	<p>VEN, EiEvent Service, oadrDistributeEvent Payload</p> <p>The VEN shall randomize the dtstart time of the event if a value is present in the startafter element. The randomized dtStatrt time should be between the requested dtstart and dtstart plus startafter.</p> <p>Event completion times are determined by adding the event duration to the randomized dtstart time. Modifications to an event should maintain the same random offset, unless the</p>

	startafter element itself is modified.
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31	<p>VEN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>VEN 應辨識包含下列 activePeriod 之子元件所規定的值並據以作用。</p> <ul style="list-style-type: none"> • dtstart。 • duration。 • tolerance。 • x-eiRampUp (正數及負數)。 • x-eiRecovery (正數及負數)。 <p>備考：x-eiRampup 及 x-eiRecovery 皆非可測試之要求事項。</p>
32	<p>VEN/VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>VEN 應辨識包含下列 interval 之子元件所規定的值並據以作用。</p> <ul style="list-style-type: none"> • duration。 • signalPayload。
33	<p>VEN/VTN</p> <p>實作應針對下列狀況提供應用程式層錯誤指示。</p> <ul style="list-style-type: none"> • 遺失預期之資訊(459)。 • 酬載非預期型式(459)。 • ID 非預期(452)。 • 請求不合邏輯－新事件使用舊日期、持續時間無法正確加總等。 <p>注意，綱要驗證錯誤將可能導致傳送層，而非應用層之錯誤指示。</p>

31	<p>VEN, EiEvent Service, oadrDistributeEvent Payload</p> <p>The VEN shall recognize and act upon values specified in the subelements of activePeriod including:</p> <ul style="list-style-type: none"> • dtstart • duration • tolerance • x-eiRampUp (positive and negative) • x-eiRecovery (positive and negative) <p>Note: x-eiRampup and x-eiRecovery are not testable requirements.</p>
32	<p>VEN/VTN, EiEvent Service, oadrDistributeEvent Payload</p> <p>The VEN shall recognize and act upon values specified in the sub-elements of intervals including:</p> <ul style="list-style-type: none"> • duration • signalPayload

33	<p>VEN/VTN</p> <p>The implementation shall provide an application layer error indication as a result of the following conditions:</p> <ul style="list-style-type: none"> • Missing expected information (459) • Payload not of expected type (459) • ID not as expected (452) • Illogical request – Old date on new event, durations do not add up correctly, etc. <p>Note that a schema validation error will most likely cause a transport rather than application layer error indication.</p>
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35	<p>VEN、EiEvent 服務、oadrCreatedEvent 酬載</p> <p>oadrCreatedEvent 中之 eventResponse 為必要，但 eiResponse 中報告錯誤狀況時除外。</p>
36	<p>VEN、EiEvent 服務、oadrCreatedEvent 酬載</p> <p>除非 oadrResponseRequired 設定為 “never”，否則 VEN 接收到事件取消時，須藉由 oadrCreatedEvent 與 optType 元件予以認可，其設定如下。</p> <p>optIn = 確認取消。</p> <p>optOut = 無法取消。</p> <p>除非 VTN 於後續 oadrDistributeEvent 酬載中包含此事件，否則 VEN 一旦認可事件取消，則該事件不得包含於後續 oadrCreatedEvent 酬載中。</p>
37	<p>VEN</p> <p>簡易 HTTP 之 VEN 實作應支援 pull 模型，且亦可選項地支援 push 模型。</p>
38	<p>VTN</p> <p>VTN 應支援所有傳輸及交換模式，包括 HTTP PUSH、HTTP PULL 及 XMPP PUSH。</p>

35	<p>VEN, EiEvent Service, oadrCreatedEvent Payload</p> <p>The eventResponses element in oadrCreatedEvent is required,, except when an error condition is reported in eiResponse.</p>
36	<p>VEN, EiEvent Service, oadrCreatedEvent Payload</p> <p>An event cancellation received by the VEN shall be acknowledged with an oadrCreatedEvent with the optType element set as follows, unless the oadrResponseRequired is set to “never”:</p> <p>optIn = Confirm to cancellation</p> <p>optOut = Cannot cancel</p> <p>Once an event cancellation is acknowledged by the VEN, the event shall not be included in subsequent oadrCreatedEvent payloads unless the VTN includes this event in a subsequent oadrDistributeEvent payload.</p>
37	<p>VEN</p> <p>A simple HTTP VEN implementation shall support the PULL model and may optionally also support push.</p>
38	<p>VTN</p> <p>A VTN shall support all transports and exchange models including HTTP PUSH, HTTP</p>

	PULL, and XMPP PUSH.
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40	VTN、EiEvent 服務、oadrDistributeEvent 酬載 回應 oadrRequestEvent 或 oadrPoll 時，應包含 oadrDistributeEvent 中之選項 eiResponse 物件。
41	VTN、EiEvent 服務、oadrDistributeEvent 酬載 VTN 應發送 requestID 作為 oadrDistributeEvent 酬載一部分。 不要求 requestID 為唯一，且實際上所有 oadrDistributeEvent 酬載可能皆相同。oadrDistributeEvent 中存在 2 個 requestID 欄位，其中須植入 requestID 之欄位位於 oadrDistributeEvent:requested。
42	VEN/VTN、EiEvent 服務、oadrCreatedEvent 酬載 VEN 收到 oadrDistributeEvent eiEvent 時，應於 EiCreatedEvent eventResponse 中使用所接收之 requestID 值。此包括可能發送以變更 VEN 之 opt 狀態之任何及所有後續 EiCreatedEvent 訊息。若酬載包含 eventResponses，則 oadrCreatedEvent 中之 eiResponse:requestID 須為空。VTN 須於各 eventResponse 內尋找相關 requestID。

40	VTN, EiEvent Service, oadrDistributeEvent Payload The optional eiResponse object in oadrDistributeEvent shall be included when responding to oadrRequestEvent or to an oadrPoll.
41	VTN, EiEvent Service, oadrDistributeEvent Payload The VTN shall send a requestID value as part of the oadrDistributeEvent payload. The requestID value is not required to be unique, and in fact may be the same for all oadrDistributeEvent payloads. That there are two requestID fields in oadrDistributeEvent. The field that must be populated with a requestID is located at oadrDistributeEvent:requestID.
42	VEN/VTN, EiEvent Service, oadrCreatedEvent Payload A VEN receiving an oadrDistributeEvent eiEvent shall use the received requestID value in the EiCreatedEvent eventResponse when responding to the event. This includes any and all subsequent EiCreatedEvent messages that may be sent to change the opt status of the VEN. The eiResponse:requestID in oadrCreatedEvent MUST be left empty if the payload contains eventResponses. The VTN MUST look inside each eventResponse for the relevant requestID.

43	VEN、EiEvent 服務、oadrDistributeEvent 酬載 VEN 不得假設 oadrDistributePayload 中自 VTN 接收之 requestID 值係是唯一。
45	VEN/VTN 於 VEN 與 VTN 間發送之訊息不得包含 schemaLocation 屬性。
46	VEN/VTN 選項元件無須包含於輸出之酬載中，但若已包含於其中，則接受酬載之 VEN 或 VTN 須瞭解此等選項元件並據以作用。 除非符合性規則明確指出應從酬載中排除元件標籤，否則應空元

	件或省略的元件視為相等。
47	VEN/VTN、EiEvent 服務、oadrDistributeEvent 酬載 整體持續時間為 0 之事件指示該事件未定義結束時間且將維持作用，直至到明確取消為止。

43	VEN, EiEvent Service, oadrDistributeEvent Payload The VEN shall not make any assumptions regarding the uniqueness of requestID values received from the VTN in the oadrDistributePayload.
45	VEN/VTN Messages sent between VENs and VTNs shall not include a schemaLocation attribute.
46	VEN/VTN Optional elements do not need to be included in outbound payloads, but if they are, the VEN or VTN receiving the payload must understand and act upon those optional elements. Empty or omitted elements are considered equal unless a conformance rule explicitly states that element tags shall be excluded from the payload.
47	VEN/VTN, EiEvent Service, oadrDistributeEvent Payload An event with an overall duration of 0 indicates an event with no defined end time and will remain active until explicitly cancelled.

48	<p>VEN/VTN</p> <p>當 VTN 或 VEN 接收到符合綱要之酬載，但存在邏輯性錯誤時，接收裝置於酬載之 eiResponse 元件中應提供應用層錯誤指示 4xx。針對特定情境之回應，除非符合性規則中另有規定，否則詳細錯誤訊息編號僅供參考且非必要。</p> <p>若錯誤位於 oadrDistributeEvent 酬載所含之事件內，且 oadrDistributeEvent 中無其他應用錯誤，則 oadrCreatedResponse 宜設定 eiResponse:responseCode 為 200，且於 oadrCreatedEvent 之 eventResponse 元件中宜報告狀態代碼及 opt 狀態。若事件未檢測出邏輯錯誤，則將狀態代碼設定為 200 並將 opt 狀態包含於 oadrResponse 元件中。</p> <p>實作上應能檢測下列邏輯錯誤。</p> <ul style="list-style-type: none"> • VEN 接收到非匹配之市場全景(462)。 • VEN 接收到非匹配之 eiTarget (462)。 • VEN 接收到未不支援之 signalName (460)。 <p>就事件邏輯錯誤之情況，將 optType 設定為 optOut。</p> <p>例外：在特定部署的基礎上，可將 VEN 配置為可接受任何 marketContext。在此情況下，“任一(any)”有效的 URI 皆視為符合此要求。</p> <p>當 VTN 收到具 eventResponses 之一種邏輯錯誤的 oadrCreatedEvent 時，其宜設定 oadrResponse 中之 eiResponse:responseCode，以回答下列事項。</p> <ul style="list-style-type: none"> • VTN 至少於 oadrCreatedEvent (452)中 oadrResponses 之一接收到非匹配之 eventID。 • VTN 至少於 oadrCreatedEvent (450)中 oadrResponses 之一接收到
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	<p>不匹配之 modificationNumber。</p> <p>若有多個錯誤(例：1 個非匹配 eventID 與 1 個非匹配 modificationNumber)，則任何 4xx 錯誤代碼(例：452)皆可使用。當 VEN 接收 oadrResponse 時，其可重新發送 oadrCreatedEvents，每事件一次，而非多次 oadrCreatedEvent 組成一群。</p>
48	<p>VEN/VTN</p> <p>When a VTN or VEN receives schema-compliant payload that has logical errors, the receiving device shall provide an application layer error indication of 4xx in the eiResponse element of the payload. The detailed error message number is informational and not a requirement for response to a specific scenario, unless otherwise stated in the conformance rules.</p> <p>If the error is in an event contained in an oadrDistributeEvent payload and there are otherwise no application errors in the oadrDistributeEvent, the oadrCreatedResponse should set the eiResponse:responseCode to 200 and should report the status code and opt status for each event in the eventResponse element of oadrCreatedEvent. If no logical error is detected for an event, the status code is set to 200 and the opt status included in the oadrResponse element.</p> <p>The following logical errors shall be detected by implementations</p> <ul style="list-style-type: none"> • VEN receives non-matching market context (462) • VEN receives non-matching eiTarget (462) • VEN receives unsupported signalName (460) <p>In case of a logical error for an event, optType is set to optOut.</p> <p>Exception: on a deployment-specific basis, a VEN may be configured so that it accepts any marketContext. In this case, "any" valid URI will be considered matching with respect to this requirement.</p> <p>When the VTN receives an oadrCreatedEvent with logical errors in one of the eventResponses, it SHOULD set the eiResponse:responseCode in the oadrResponse reply to:</p> <ul style="list-style-type: none"> • VTN receives non-matching eventID in at least one of the oadrResponses in the oadrCreatedEvent (452) • VTN receives mismatched modificationNumber in at least one of the oadrResponses in the oadrCreatedEvent (450) <p>In case there are multiple errors (e.g., one non-matching eventID and one non-matching modificationNumber), any 4xx error code (e.g., 452) can be used. When the VEN receives the oadrResponse, it could resend oadrCreatedEvents, one for each event instead several grouped into one oadrCreatedEvent.</p>
50	<p>VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>push 及 pull 兩種模型中，oadrDistributeEvent 應包含具有 eventStatus 元件設為 FAR、NEAR 或 ACTIVE 之一所有現存事件。事件之 eventStatus 為 cancelled 時，應改變至 modificationNumber 而包含於酬載中；但是一旦 VEN 確認取消，後續酬載不得包括規則 36 中所述的事件。</p> <p>VTN 可能繼續發送 VEN 已請求退出的事件。</p>

51	<p>VEN/VTN</p> <p>提取實作僅使用傳輸層請求在 VEN 到 VTN 方向上的酬載。除 oadrPoll 外，HTTP 和 XMPP 的推送實作皆可使用有效交換序列中的任何酬載。</p>
52	<p>VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>若 VTN 恆以 oadrResponserequired 請求取消事件之認可，則 VTN 應持續發送取消事件給 VEN，直至事件被認可、eventStatus 轉變至完成狀態、或是嘗試重試達到明確定義之數目為止。</p>
53	<p>VEN/VTN</p> <p>VTN 及 VEN 支援簡易 HTTP 模式時須支援下列 HTTP 標頭。</p> <ul style="list-style-type: none"> • Host (僅在 HTTP 請求中需要)。 • Content-Length。 • application/xml 之 Content-Type。

50	<p>VTN, EiEvent Service, oadrDistributeEvent Payload</p> <p>In both the PUSH and PULL model, oadrDistributeEvent shall contain all existing events which have the eventStatus element set to either FAR, NEAR, or ACTIVE. Events with an eventStatus of "cancelled" shall be included in the payload upon change to the modificationNumber, but once the cancellation is acknowledged by the VEN, it shall not be included in subsequent payloads as stated in rule 36. VTN may continue to send events that the VEN has opted out of.</p>
51	<p>VEN/VTN</p> <p>PULL implementations may only use payloads where the transport layer request is in the VEN to VTN direction. PUSH implementations, both HTTP and XMPP, may use any payload in a valid exchange sequence except for oadrPoll</p>
52	<p>VTN, EiEvent Service, oadrDistributeEvent Payload</p> <p>If a VTN requests acknowledgment of a cancelled event with oadrResponserequired of always, the VTN shall continue to send the cancelled event to the VEN until the event is acknowledged, eventStatus transitions to the complete state, or some well defined number of retries is attempted.</p>
53	<p>VEN/VTN</p> <p>VTNs and VENs that support simple HTTP mode MUST support the following HTTP headers:</p> <ul style="list-style-type: none"> • Host (Only required in HTTP request); • Content-Length • Content-Type of application/xml

56	<p>VEN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>若 VTN 發送之 oadrEvent 含有 VEN 所未知的 eventID，則 VTN 宜處理該事件並將其加入已知事件清單中。</p>
57	<p>VEN/VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>若 VTN 發送之 oadrEvent 含有 VEN 已知的 eventID，但具有較高修改號碼，則 VEN 宜以已知事件清單中較新之事件替換先前事件。</p>

56	VEN, EiEvent Service, oadrDistributeEvent Payload If the VTN sends an oadrEvent with an eventID that the VEN is not aware then the VEN should process the event and add it to its list of known events.
57	VEN/VTN, EiEvent Service, oadrDistributeEvent Payload If the VTN sends an oadrEvent with an eventID that the VEN is already aware of, but with a higher modification number then the VEN should replace the previous event with the new one in its list of known events.

58	VEN、EiEvent 服務、oadrDistributeEvent 酬載 若 VTN 發送之 oadrEvent 含有 VEN 已知之 eventID，但其中 VEN 已知有低於 1 之修改號碼，則此為 ERROR，VEN 宜以適當錯誤碼 (450) 回應。注意，無論事件狀態為何(含已取消)，此為 true。
59	VEN、EiEvent 服務、oadrDistributeEvent 酬載 若 VTN 發送之 oadrEvent 物件含有設定為已取消之 eventStatus，且 VEN 知悉此 eventID，則 VEN 宜取消現存事件，並從已知事件清單中予以刪除。
60	VEN、EiEvent 服務、oadrDistributeEvent、oadrCreatedEvent 酬載 若 VTN 發送之 oadrEvent 物件含有設定為已取消之 eventStatus，且 VEN 不知此 eventID，則 VEN 宜忽略該事件，因其不在已知事件清單中。且若 oadrResponseRequired 要求如此，則仍應以 createdEvent 回應。
61	VEN、EiEvent 服務、oadrDistributeEvent 酬載 若 VTN 發送之 oadrDistributeEvent 酬載不包含 VEN 已知的事件(亦即於其已知事件清單中)，則 VEN 應從已知事件之清單中將其刪除(亦即隱含取消)。 例外狀況：若 VEN 作用中之事件，因操作原故而無法立即停止，則事件可被保留於資料儲存體中，直至事件過期或事件能停止為止。

58	VEN, EiEvent Service, oadrDistributeEvent Payload If the VTN sends an oadrEvent with an eventID that the VEN is already aware of, but which has a lower modification number than one in which the VEN is already aware then this is an error and the VEN SHOULD respond with the appropriate error code (450). Note that this is true regardless of the event state including cancelled.
59	VEN, EiEvent Service, oadrDistributeEvent Payload If the VTN sends an oadrEvent object with the eventStatus set to cancelled and has an eventID that the VEN is aware of then the VEN SHOULD cancel the existing event and delete it from its list of known events.
60	VEN, EiEvent Service, oadrDistributeEvent, oadrCreatedEvent Payload If the VTN sends an oadrEvent object with the eventStatus set to "cancelled" and has an eventID that the VEN is not aware of then the VEN should ignore the event since it is not currently in its list of known events, but still shall respond with the createdEvent if required to do so by oadrResponseRequired.

61	<p>VEN, EiEvent Service, oadrDistributeEvent Payload</p> <p>If the VTN sends the oadrDistributeEvent payload and it does not contain an event for which the VEN is aware (i.e. in its list of known events) then the VEN shall delete it from its list of known event (i.e. implied cancel).</p> <p>Exception: a VEN that has an active event that cannot be immediately stopped for operational reasons, may leave the event in its data store until the event expires or the event can be stopped.</p>
62	<p>VEN、EiEvent 服務、oadrDistributeEvent、oadrCreatedEvent 酬載</p> <p>VEN 須處理其接收自 VTN 之 oadrDistributeEvent 酬載中之各 oadrEvent 事件訊息（新增、已修改、已取消等）。若 responseRequired 設定為 always，VEN 應以 createdEvent 訊息回應各 EiEvent 訊息。此外，若 responseRequired 設定為 never，VEN 應不以 crateEvent 訊息回應。是否要求 VEN 回應，取決於 VTN。注意，此係通用規則，適用於下列所有情境。</p> <ul style="list-style-type: none"> • VEN 已知的事件之一。 • 正在取消之事件，而 VEN 甚至不知其存在。 • EiEvent 酬載之遞送方式不拘，可以是透過 PUSH、PULL 之方式，或是於 ALL 酬載中遞送。
63	<p>VTN</p> <p>VTN 不得於 oadrDistributeEvent eitarget 中包含多個 venID。</p>
62	<p>VEN, EiEvent Service, oadrDistributeEvent, oadrCreatedEvent Payload</p> <p>The VEN must process EVERY oadrEvent event message (new, modified, cancelled, etc.) that it receives from the VTN in an oadrDistributeEvent payload and it shall reply with a createdEvent message for every EiEvent message in which the responseRequired is set to " always" . Furthermore if the responseRequired is set to " never" , the VEN shall not respond with a createdEvent message. It is at the complete discretion of the VTN as to whether responses are required from the VEN. Note that this rule is universal and applies to all scenarios including the following:</p> <ul style="list-style-type: none"> • The event is one in which the VEN is already aware. • The event is being cancelled and the VEN did not even know it existed. • It does not matter how the EiEvent payloads were delivered, i.e. PUSH, PULL or as the result of being delivered in an ALL payload.
63	<p>VTN</p> <p>The VTN must not include more than one venID in the oadrDistributeEvent eitarget.</p>
64 僅限 A 剖繪	<p>VEN、EiEvent 服務</p> <p>pull VEN 應於啟動另一輪詢週期前，回應所有已接收事件。</p>
65	<p>VEN、EiEvent 服務、oadrDistributeEvent、oadrCreatedEvent 酬載</p> <p>當 startafter 元件中所包含隨機化值之事件被取消(無論明確或隱含)時，VEN 應隨機化其事件之終止。隨機化訊窗宜介於 0 與持續期間等於 startafter 中所規定值之間。</p>
66	<p>VEN/VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>若 VTN 發送之 oadrDistributeEvent 酬載包含具 startafter 元件及大於零值之事件，則即使該事件已完成，VTN 仍應於</p>

	oadrDistributeEvent 酬載中持續包含該事件，直至目前時間等於 dtStart 加上持續時間加上 startafter。相對於執行該事件，等於完成之 eventStatus 收受不得導致 VEN 改變其運作狀態。
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64 A Profile Only	VEN, EiEvent Service A pull VEN shall respond to all received events before initiating another polling cycle.
65	VEN, EiEvent Service, oadrDistributeEvent, oadrCreatedEvent Payload When an event containing a randomization value in the startafter element is cancelled, either explicitly or implicitly, the VEN shall randomize its termination of the event. The randomization window should be between 0 and a duration equal to the value specified in startafter.
66	VEN/VTN, EiEvent Service, oadrDistributeEvent, Payload If a VTN sends an oadrDistributeEvent payload containing an event with a startafter element with a value greater than zero, the VTN shall continue to include the event in oadrDistributeEvent payloads, even if the event is complete, until current time is equal to dtStart plus duration plus startafter. The receipt of an eventStatus equal to completed shall not cause the VEN to change its operational status with respect to executing the event.

67	<p>VEN/VTN</p> <p>VTN 及 VEN 應支援 TLS1.2。預設密碼套件之選擇應如下所示。</p> <ul style="list-style-type: none"> • VEN 客戶端至少應提供下列預設密碼套件之一。 • VEN 伺服器應至少支援下列預設密碼套件之一，無論 VTN 客戶端是否提供其他密碼套件，皆須選擇預設密碼套件。 • VTN 客戶端應同時提供下列 2 個預設密碼套件。 • VTN 伺服器應同時支援下列 2 個預設密碼套件，無論 VEN 客戶端是否提供其他密碼，皆須選擇所列預設密碼套件之一。 <p>TLS1.2 之預設密碼套件如下所示。</p> <p>TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA256</p> <p>TLS_RSA_WITH_AES_128_CBC_SHA256</p> <p>注意，VTN 或 VEN 可組態設定為支援基於特定部署需求之任何 TLS 版本與密碼套件之組合。但若不改變 VTN 或 VEN 之預設組態，則裝置之行為應如上所述。</p>
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67	<p>VEN/VTN</p> <p>VTN and VEN shall support TLS 1.2. The default cipher suite selection shall be as follows:</p> <ul style="list-style-type: none"> • The VEN client shall offer at least one of the default cipher suites listed below. • The VEN server shall support at least one of the default cipher suites listed below and shall select one of the default cipher suites regardless of other cipher suites that may be offered by the VTN client. • The VTN client shall offer both the default cipher suites listed below. • The VTN server shall support both of the default cipher suites listed below and shall select one of listed the default cipher suites regardless of other ciphers that can be offered by the VEN client. <p>Default cipher suites for TLS1.2:</p> <ul style="list-style-type: none"> • TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA256 • TLS_RSA_WITH_AES_128_CBC_SHA256 <p>Note that a VTN or VEN may be configured to support any TLS version and cipher suite combination based on the needs of a specific deployment. However in the absence of changes to the default configuration of the VTN or VEN, the behavior of the devices shall be as noted above.</p>
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68	<p>VEN/VTN</p> <p>VTN 及 VEN 兩者應支援客戶端及伺服器 X.509v3 憑證。VTN 應同時支援 ECC 及 RSA 憑證。VEN 須支援 RSA 或 ECC 憑證，亦可同時支援。RSA 憑證應以長度至少 2048 位元之金鑰簽署。ECC 憑證應以長度至少 224 位元之金鑰簽署。ECC 混合式憑證應以 RSA 2048 位元金鑰簽署過的 256 位元金鑰簽署。</p>
69 僅 A 剖繪	<p>VTN/VEN、EiEvent 服務、oadrDistributeEvent、酬載</p> <p>包含於簡易信號中之 signalType 元件可為任何所支援之列舉值。所使用之值係供參考，並提供提示作為 signalPayload 中所指定相對值之本質。</p>
70	<p>VEN, EiEvent 服務, ID</p> <p>VTN 應確保 venID 在其範圍內是唯一的，即所有 VEN 都分配有唯一的 ID。</p> <p>VTN 應確保 VEN 範圍內的 eventID 是唯一的，雖然 VTN 能將有相同 eventID 的事件分配給數個 VEN，但不得將兩個有相同 eventID 的不同的事件發送到同一個 VEN。</p>

68	<p>VEN/VTN</p> <p>Both VTNs and VENs shall support client and server X.509v3 certificates. A VTN shall support both an ECC and RSA certificate. A VEN shall support either an RSA or ECC certificate and may support both. RSA certificates must be signed with a minimum key length of 2048 bits. ECC certificates shall be signed with a minimum key length of 224 bits. ECC Hybrid certificates shall be signed with a 256 bit key signed with an RSA 2048 bit key.</p>
69	<p>VEN/VTN, EiEvent Service, oadrDistributeEvent, Payload</p>

A Profile Only	The signalType element contained in a SIMPLE signal may be any of the supported enumerated values. The value used is informational and provides a hint as to the nature of the relative values specified in the signalPayload.
70	<p>VTN, EiEvent service, IDs</p> <p>VTN shall ensure that venID is unique in the scope of VTN, namely, all VENs are assigned unique IDs.</p> <p>VTN shall ensure that eventID is unique in the scope of VEN, namely, while VTN can distribute events with the same eventID to multiple VENs, it cannot send two distinct events to the same VEN with the same eventID.</p>

9.2.2 EiEvent – 額外之 2.0b 符合性規則

9.2.2 EiEvent – Additional 2.0b conformance rules

表 8 其它符合性規則

Table 8 – Additional conformance rules

符合性規則	要求
100	<p>VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>針對 eiEventSignal 及 eiEventBaseline 兩者，應使用下列替代群組項目。</p> <ul style="list-style-type: none"> streamPayloadBase = signalPayload payloadBase = payloadFloat <p>於各間隔，signalPayload 元件之數目須等於 1。</p> <p>VTN, EiEvent Service, oadrDistributeEvent Payload</p> <p>For both eiEventSignal and eiEventBaseline the following substitution group items shall be used:</p> <ul style="list-style-type: none"> streamPayloadBase = signalPayload payloadBase = payloadFloat <p>The number of signalPayload elements in each interval shall be equal to 1.</p>
101	<p>VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>針對各 eiEventBaseline 間隔，uid 元件為必要。單一 eiEventBaseline 內，須應 uid 表示為自 0 起且各後續間隔遞增 1 之間隔數目。</p> <p>VTN, EiEvent Service, oadrDistributeEvent Payload</p> <p>The uid element is required for each eiEventBaseline interval. Within a single eiEventBaseline, uid shall be expressed as an interval number with a base of 0 and an increment of 1 for each subsequent interval.</p>
102	<p>VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>針對 eiEventSignal 及 eiEventBaseline 兩者，間隔期間元件應出現於各間隔中，且間隔期間之總和應加上於事件信號之</p>

	<p>eiActivePeriod:properties:duration 及 基 準 線 之 eiEventSignal:eiEventBaseline:duration 所規定全部期間元件。</p> <p>VTN, EiEvent Service, oadrDistributeEvent Payload</p> <p>For both eiEventSignal and eiEventBaseline, the interval duration element shall appear in each interval and the sum of interval durations shall add up to overall duration element specified in eiActivePeriod:properties:duration for event signals and eiEventSignal:eiEventBaseline:duration for baselines.</p>
103	<p>VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>針對 eiEventSignal 及 eiEventBaseline 兩者，dtstart 元件不得包括於間隔規格中。</p> <p>VTN, EiEvent Service, oadrDistributeEvent Payload</p> <p>For both eiEventSignal and eiEventBaseline, the dtstart element shall not be included in the interval specification.</p>
104	<p>VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>如 signalName 為已知聯盟信號之一，則 signalType、Units 和允許值應如表 2 所示。</p> <p>VTN, EiEvent Service, oadrDistributeEvent Payload</p> <p>If the signalName is one of the well-known alliance signals, then signalType, Units, and allows values shall be as shown in Table 2. 2.</p>
105	<p>VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>activePeriod 的子元件應包括 eiNotification 元件。</p> <p>VTN, EiEvent Service, oadrDistributeEvent Payload</p> <p>The eiNotification element shall be included as a sub element of activePeriod.</p>
106	<p>VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>B 剖繪 oadrDistributeEvent eiEvent 之內容除包含其他信號外，亦可包含簡易事件信號，然而該事件中，簡易信號與其他信號間之關係為部署特定。</p> <p>VTN, EiEvent Service, oadrDistributeEvent Payload</p> <p>B profile oadrDistributeEvent eiEvent's may contain the "SIMPLE" event signal in addition to other signals, however the relationship between the SIMPLE signal and other signals in the event are deployment-specific.</p>
107	<p>VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>若多個信號係針對某事件而出現，則各信號應有 signalID 值，其於事件之範圍內係唯一。</p> <p>VTN, EiEvent Service, oadrDistributeEvent Payload</p> <p>If multiple signals are present for an event, each signal shall have a signalID value that is unique within the scope of the event.</p>

108	<p>VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>若 1 或多個 resourceID 出現為 eiEventBaseline 之子元件，則基準線表示條列資源之聚合。針對 eiEvent:eiTarget 物件與基準線資料來源間之關係不宜作任何假設。</p> <p>VTN, EiEvent Service, oadrDistributeEvent Payload</p> <p>If one or more resourceIDs are present as sub-elements of eiEventBaseline, the baseline represents the aggregate of the listed resources. No assumptions should be made regarding the relationship between the eiEvent:eiTarget object and the source of the baseline data.</p>
109	<p>VEN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>若事件中不能支援任何所請求之信號，則 VEN 應產生 oadrCreatedEvent 應用層級 460 錯誤。支援意指目前不能支援之 signalType 與單元之請求組合。</p> <p>VEN, EiEvent Service, oadrDistributeEvent Payload</p> <p>A VEN shall generate an oadrCreatedEvent application level 460 error if any requested signal in an event cannot be supported. Supported means that the requested combination of signalType and Unit cannot be currently supported.</p>
110	<p>VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>當事件為不作用時，針對非屬簡易之事件信號，currentValue 值係未定義。針對簡易信號之 currentValue 要求事項，參照符合性規則 14。</p> <p>VTN, EiEvent Service, oadrDistributeEvent payload</p> <p>The value of currentValue when an event is not active is undefined for event signals other than SIMPLE. See conformance rule 14 for the currentValue requirements for the SIMPLE signal.</p>
111	<p>VTN/VEN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>eiTarget 定義於 oadrDistributeEvent 酬載之事件及信號兩個層級。於信號層級，只有 endDeviceAsset 可用作 eiTarget 子元件。下列為 eiEventSignal:eiTarget:endDeviceAsset:mrid 之允許值。</p> <p>VTN/VEN, EiEvent Service, oadrDistributeEvent payload</p> <p>eiTarget is defined at both the event and signal level of the oadrDistributeEvent payload. At the signal level, only the endDeviceAsset may be used as an eiTarget sub-element. The allowable values for the eiEventSignal:eiTarget:endDeviceAsset:mrid are as follows:</p> <ul style="list-style-type: none"> • Thermostat。 • Strip_Heater。 • Baseboard_Heater。 • Water_Heater。 • Pool_Pump。

	<ul style="list-style-type: none"> • Sauna ◦ • Hot_tub ◦ • Smart_Appliance ◦ • Irrigation_Pump ◦ • Managed_Commercial_and_Industrial_Loads ◦ • Simple_Residential_On_Off_Loads ◦ • Exterior_Lighting ◦ • Interior_Lighting ◦ • Electric_Vehicle ◦ • Generation_Systems ◦ • Load_Control_Switch ◦ • Smart_Inverter ◦ • EVSE ◦ • RESU ◦ • Energy_Management_System ◦ • Smart_Energy_Module ◦ • Storage ◦ • x- {使用者定義} ◦ <p>如信號層存在一個以上的 endDeviceAsset:mrid 值，該值應以 OR 運算以確定與 VEN 的資源匹配。</p> <p>若存在，則 eiEventSignal:eiTarget:endDeviceAsset:mrid 值與任何事件層級 eiTarget 值執行邏輯 AND 運算以決定特定信號之預期標的。</p> <p>若於 eiTarget 中不存在 eiTarget:endDeviceAsset 子元件，則 eiEventSignal:eiTarget 元件應自酬載中省略。</p> <p>If more that one endDeviceAsset:mrid value is present at the signal level, the values are OR'd together to determine a match with the VEN's resources.</p> <p>If present, eiEventSignal:eiTarget:endDeviceAsset:mrid values are AND'd with any event level eiTarget values to determine the intended target for the specific signal.</p> <p>If no eiTarget:endDeviceAsset sub-element is present in the eiTarget, the eiEventSignal:eiTarget element shall be omitted from the payload.</p>
112	<p>VEN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>若 VEN 接收事件，其中信號型式之本質導致 VEN 不能解決適用該事件之預期資源，則 VEN 應回傳 469 錯誤回應給 VTN。</p> <p>VEN, EiEvent Service, oadrDistributeEvent payload</p>

	<p>If a VEN receives an event where the nature of the signal type causes the VEN not to be able to resolve the intended resource apply the event to, the VEN shall return a 469 error response to the VTN.</p>
113	<p>VTN、EiEvent 服務、oadrDistributeEvent 酬載</p> <p>針對 B 服務，事件 currentValue 元件為選項，但應包含於發送至 A 剖繪 VEN 之酬載中。</p> <p>VTN, EiEvent Service, oadrDistributeEvent payload</p> <p>The event currentValue element is optional for the B service, but shall be included in payloads sent to A Profile VENs</p>
114	<p>VEN、EiEvent 服務、oadrDistribute 酬載</p> <p>VEN 應隨 VTN 具有合理同步之時鐘。其依據部署定義可接受之偏離。其超出 OpenADR 如何同步時鐘之範圍；可使用諸如 NTP 之機制。</p> <p>當 2.0b VEN 接收事件時，其可忽略包含於該事件(“cancelled”為例外)之 eventStatus，並計算基於目前時間、事件啟動時間、間隔期間等之 eventStatus。</p> <p>VEN, EiEvent Service, oadrDistribute payload</p> <p>A VEN shall have reasonably synchronized clocks with the VTN. It is up to the deployment to defined the acceptable skew. It is out of scope of OpenADR how to synchronize clocks; mechanisms such as NTP may be used.</p> <p>When a 2.0b VEN receives an event, it may ignore the eventStatus contained in the event (with the exception of “cancelled”) and calculate the eventStatus based on the current time, event start time, interval duration etc.</p>
115	<p>VTN、EiEvent 服務、oadrDistribute 酬載</p> <p>每次變更事件酬載之任何元件時，createdDateTime 須重新建立(例：於 PULL 模式，當事件保持於緩衝區時)。</p> <p>當 VTN 接收 oadrRequestEvent 時，於發送出該事件前須更新 ventStatus。當其接收 oadrPoll 時，其可更新狀態，但此非必要，因 2.0b VEN 能自動計算 eventStatus。</p> <p>VTN, EiEvent Service, oadrDistribute payload</p> <p>createdDateTime MUST be recreated each time any element of the event payload is changed (e.g., when the event is hold in a buffer in PULL mode).</p> <p>The eventStatus MUST be updated before sending out the event when a VTN receives an oadrRequestEvent. It MAY update the status when it receives an oadrPoll, but this is not required, as the 2.0b VEN can calculate the eventStatus automatically.</p>
116	<p>VTN/VEN、EiEvent 服務、oadrDistributeEvent、酬載</p> <p>簡易信號中所包含之 signalType 元件應為“level”(針對 2.0b 剖繪實作；針對 2.0a 剖繪 VEN 則參引規則 69)。</p>

	<p>VTN/VEN, EiEvent Service, oadrDistributeEvent, Payload</p> <p>The signalType element contained in a SIMPLE signal shall be "level" for the 2.0b profile implementations. Refer to rule 69 for 2.0a profile VENs.</p>
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9.2.3 EiOpt

200	<p>VEN/VTN、EiOpt 服務、oadrCreateOpt 酬載</p> <p>oadrCreateOpt 酬載 vavailability 性質不得包括下列元件。</p> <ul style="list-style-type: none"> • tolerance。 • eiRampUp。 • eiRecovery。 • eiNotification。 <p>VEN/VTN, EiOpt Service, oadrCreateOpt Payload</p> <p>oadrCreateOpt payload vavailability properties shall not include the following elements:</p> <ul style="list-style-type: none"> • tolerance • eiRampUp • eiRecovery • eiNotification
201	<p>VEN/VTN、EiOpt 服務、oadrCreateOpt 酬載</p> <p>下列 opt 排程之層面為程式特定。</p> <ul style="list-style-type: none"> • 允許 VEN 發出之排程式：optIn、optOut 或兩者。 • 時間期間之預設 opt 狀態(optIn 或 optOut)，不為 opt 或 Avail 排程所定義(若定義)。 • 當 optIn 或 optOut 排程具有重疊時框情況時，其是否具有優先權。 • 相同排程內(optIn 或 optOut)是否允許重疊時框，及若其不被允許，則為預期之例外處置行為。 • 是否允許 VTN 於 optOut 期間發送事件。 <p>VEN/VTN, EiOpt Service, oadrCreateOpt Payload</p> <p>The following aspects of an opt schedule are program-specific:</p> <ul style="list-style-type: none"> • the type of schedules that a VEN is allowed to issue: optIn, optOut, or both • the default opt state (optIn or optOut) for time periods not defined by either an opt or Avail schedule (if defined) • whether optIn or optOut schedules have precedence in the situation where they have overlapping time frames

	<ul style="list-style-type: none"> • whether overlapping time frames are allowed within the same schedule (optIn or optOut) and if they are not allowed, the expected exception handling behavior • whether the VTN is allowed to send events during an optOut period
202	<p>VEN、EiOpt 服務、oadrCreateOpt 酬載</p> <p>若 oadrCreateOpt eiTarget 為空，則 opt 排程適用於所有與該 VEN 關聯之資源。若定義 eiTarget 子元件，則此等子元件應一起執行邏輯 OR 運算，以定義 opt 排程須適用之 VEN 資源子集。注意，針對由 eiTarget 元件所識別之不同組資源，VEN 可發送多個 opt 排程。</p> <p>VEN, EiOpt Service, oadrCreateOpt Payload</p> <p>If the oadrCreateOpt eiTarget is empty, then the opt schedule applies to all of the resources associated with that VEN. If eiTarget sub elements are defined, these sub elements shall be OR'd together to define a subset of the VENs resources that the opt schedule must apply. Note that the VEN may send multiple opt schedules for different sets of resources identified by the eiTarget element.</p>
203	<p>VTN、EiOpt 服務、oadrCreateOpt 酬載</p> <p>當先前發送之 opt 排程仍有作用時，經由 oadrCreateOpt 發送之新 opt 排程(optIn 或 optOut)應由 VTN 以下列方式處理之。</p> <ul style="list-style-type: none"> • 針對 VEN 關聯之所有資源，若 eiTarget 中僅規定 venID，則先前 opt 排程對應之未來可用性由新 opt 排程整體性替換。 • 除 venID 外，若 eiTarget 中還規定子元件，則針對特定資源應產生 opt 排程以替代任何先前所定義排程之此等資源。 • 非由 eiTarget 規定之先前定義資源 opt 排程應保持不改變。 <p>如 optIn 及 optOut 排程同時專在，應按此規則的要求進行獨立處理。</p> <p>VTN, EiOpt Service, oadrCreateOpt Payload</p> <p>A new opt schedule (optIn or optOut) sent via oadrCreateOpt shall be handled by the VTN as follows when a previously sent opt schedule is still active:</p> <ul style="list-style-type: none"> • If only the venID is specified in eiTarget, the previous opt schedule with respect to future availability is replaced in its entirety by the new opt schedule for all resources associated with the VEN. • If sub-elements are specified in eiTarget in addition to the venID, then an opt schedule shall be generated for these resources superseding any previously defined schedules for specific resources. • Previously defined opt schedules for resources that are not specified by eiTarget shall remain unchanged. <p>Note that if both optIn and optOut schedules exist, they are treated independently with respect to this rule.</p>
204	<p>VEN、EiOpt 服務、oadrCreateOpt 酬載</p> <p>VEN 應發送 optID 值作為 oadrCreateOpt 酬載之一部分，然而 optID 值不要求為唯一，且針對所有 oadrCreateOpt 酬載，實際上可相</p>

	<p>同。注意，若使用同一 optID 以定義多組資源之 opt 排程，則 optID 之取消參引應取消所有資源之 opt 排程。</p> <p>VEN, EiOpt Service, oadrCreateOpt Payload</p> <p>The VEN shall send an optID value as part of the oadrCreateOpt payload, however the optID value is not required to be unique, and in fact may be the same for all oadrCreateOpt payloads. Note that if the same optID is used defining opt schedules for multiple sets of resources, a cancelation referencing the optID shall cancel the opt schedule for all the resources.</p>
<p>205</p>	<p>VTN、EiOpt 服務、oadrCreateOpt 酬載</p> <p>若 marketContext 係出現於 oadrCreateOpt 酬載中，則 opt 排程應僅適用於所規定 marketContext 內產生之 VEN 可用性相關事件。</p> <p>VTN, EiOpt Service, oadrCreateOpt Payload</p> <p>If marketContext is present in the oadrCreateOpt payload, the opt schedule shall only apply to the VENs availability with respect to events generated within the specified marketContext.</p>
<p>206</p>	<p>VTN/VEN、EiOpt 服務、oadrCreateOpt 酬載</p> <p>若 oadrResponseRequired 設定為 "always"，則 VEN 以 EiEvent oadrCreatedEvent 酬載回應 oadrDistributeEvent。然而，當事件最後自 VTN 接收時，假如 oadrResponseRequired 元件設定為 "always"，則針對該事件，optType 狀態進一步認可能藉由發送所規定具 eventID 之 oadrCreatedEvent 或 EiOpt oadrCreateOpt 酬載完成之。</p> <p>VTN/VEN, EiOpt Service, oadrCreateOpt Payload</p> <p>A VEN responds with an EiEvent oadrCreatedEvent payload in response to an oadrDistributeEvent if oadrResponseRequired is set to "always". However, further qualifications of the optType state for the event can be accomplished by sending either an oadrCreatedEvent or an EiOpt oadrCreateOpt payload with the eventID specified provided that the oadrResponseRequired element was set to 'always' when the event was last received from the VTN.</p> <p>當使用 oadrCreateOpt 限定了特定資源的 optType 狀態，該特定資源的 optType 狀態的後續變更只能通過另一個 oadrCreateOpt 酬載進行。oadrCreateOpt 酬載未特別針對的資源的 optType 狀態仍由隨後的 oadrCreateOpt optType 變更進行控制。對事件的修改不會變更此規則。</p> <p>注意，若於最近所接收之 oadrDistributeEvent 將 oadrResponseRequired 設定為 "never"，則不可發送 oadrCreateOpt 以限定事件。</p> <p>Once the optType state for a certain resource is qualified with oadrCreateOpt, subsequent changes to the optType state for the specific resource can only be made by another oadrCreateOpt payload. optType states for resources not specifically targeted in the oadrCreateOpt payload would still be controlled by subsequent oadrCreateEvent optType changes. Modifications to an event do not change this rule. Note that oadrCreateOpt may not be sent to qualify an event if oadrResponseRequired is set to "never" in the most</p>

recently received oadrDistributeEvent.

若使用 oadrCreateOpt 修改擱置或作用事件之 opt 狀態，則針對 eiTarget 及 oadrDeviceClass 標的元素，應適用下列規則。

- 若 oadrCreateOpt:eiTarget 中未出現標的，或若標的僅為 venID，則所有與 qualifiedEvent 關聯之資源應改變其 opt 狀態。
- 除隱含或明顯設標的之 VEN 外，針對給定之 qualifiedEvent，若 oadrCreateOpt:eiTarget 進一步限定 VEN 之任何資源，則所包括之資源須為於 qualifiedEvent 中資源標的之子集，且 opt 狀態應僅針對標的子集而改變。
- 於 oadrCreateOpt:eiTarget 酬載中，若 VEN 包括 1 或多個標的，其非為 qualifiedEvent 之一部分，則 VTN 應於其 oadrCreatedOpt:eiResponse 中產生 4xx 錯誤。
- 針對所規定之標的資源，若其不接受請求之 Opt 狀態變更，則 VTN 可於 oadrCreatedOpt 回應中以 4xx 錯誤回應。

If oadrCreateOpt is used to modify the opt state of a pending or active event, the following rules shall apply with regards to the eiTarget and oadrDeviceClass targeting elements:

- If no target is present in the oadrCreateOpt:eiTarget or if the only target is the venID, then all resources associated with the qualifiedEvent shall have its opt state altered.
- If the oadrCreateOpt:eiTarget further qualifies any resources of the VEN for the given qualifiedEvent (in addition to the implicitly or explicitly targeted VEN), the included resources MUST be a subset of the resources targeted in the qualifiedEvent, and the opt state will only be altered for the targeted subset.
- If the VEN includes one or more targets in the oadrCreateOpt:eiTarget payload that are not part of the qualifiedEvent, the VTN shall generate a 4xx error in its oadrCreatedOpt:eiResponse.
- The VTN may respond with a 4xx error in the oadrCreatedOpt response if it does not accept the requested opt state changes for the specified target resources.

注意，VEN 可發送具 eventID 之多個 oadrCreateOpt 酬載，該規定之 eventID 係針對不同組資源由 eiTarget 元件所識別。

當 oadrCreateOpt 中規定 eventID 時，VEN 於酬載中不得包括 vavailability 或 marketContext。當 oadrCreateOpt 中未規定 eventID 時，VEN 於酬載中應包括 vavailability，且可包括 marketContext。

注意，所規定具 eventID 之 oadrCreateOpt 亦可包括 oadrDeviceClass 以進一步限定資源標的。標的資源之解析度宜遵循符合性規則 209。

Note that the VEN may send multiple oadrCreateOpt payloads with eventID specified for different sets of resources identified by the eiTarget element.

When eventID is specified in oadrCreateOpt, the VEN may not include a vavailability or marketContext in the payload. When eventID is *not* specified in oadrCreateOpt, the VEN shall include a

	<p>vavailability and may include a marketContext in the payload.</p> <p>Note that oadrCreateOpt with an eventID specified may also include oadrDeviceClass to further qualify the resources targeted. Resolution of the targeted resources should follow conformance rule 209.</p>
207	<p>VTN/VEN、EiOpt 服務、oadrCreateOpt 酬載</p> <p>requestID 雖為 oadrCreateOpt 及 oadrCancelOpt 之必備酬載元件，但其可留置為空字串。然而，若針對 requestID 規定值，則 VTN 應於其 oadrCreatedOpt 或 oadrCanceledOpt 酬載中回傳該值。</p> <p>VTN/VEN, EiOpt Service, oadrCreateOpt Payload</p> <p>Although requestID is a mandatory payload element for oadrCreateOpt and oadrCancelOpt, it may be left as an empty string. However, if a value is specified for requestID, the VTN shall return that value in its oadrCreatedOpt or oadrCanceledOpt payload.</p>
208	<p>VTN/VEN、EiOpt 服務、IDs</p> <p>下列 ID 之內容宜由接收酬載之 VTN 驗核。若 ID 與預期 ID 不匹配，則裝置於 eiResponse 中宜包括 452 錯誤。</p> <ul style="list-style-type: none"> • venID。 • optID。 <p>VTN/VEN, EiOpt Service, IDs</p> <p>The following ID's shall be validated by the VTN receiving the payload. If the ID does not match the expected ID, the device should include a 452 error in eiResponse.</p> <ul style="list-style-type: none"> • venID • optID
209	<p>VEN/VTN、EiOpt 服務、oadrCreateOpt 酬載</p> <p>若 oadrCreateOpt:oadrDeviceClass 元件出現於酬載中，則該元件應僅包含 endDeviceAsset 子元件，其值應符合於符合性規則 111 中所顯示之裝置類別表列。</p> <p>若 oadrCreateOpt:oadrDeviceClass:endDeviceAsset 子元件未出現於 oadrCreateOpt 中，則 oadrCreateOpt:oadrDeviceClass 元件應自酬載中省略。</p> <p>oadrDeviceClass 中所規定之裝置類別宜與由 oadrCreateOpt:eiTarget 及 marketContext (規則 205)所定義之資源標的執行邏輯 AND 運算，以決定資源，其可用性受此 opt 排程衝擊。</p> <p>VEN/VTN, EiOpt Service, oadrCreateOpt Payload</p> <p>The oadrCreateOpt:oadrDeviceClass element, if present in a payload, shall contain only the endDeviceAsset sub-element whose values shall conform to the list of device classes shown in conformance rule 111.</p> <p>If no oadrCreateOpt:oadrDeviceClass:endDeviceAsset sub-element is present in the oadrCreateOpt, the oadrCreateOpt:oadrDeviceClass element shall be omitted from the payload.</p>

	<p>The device classes specified in oadrDeviceClass should be AND'd with the resource targets defined by oadrCreateOpt:eiTarget and marketContext (Rule 205), to determine the resources whose availability is impacted by this opt schedule.</p>
210	<p>VEN/VTN、oadrCreateOpt 酬載</p> <p>若 opt 可用性排程使用零期間，則應將其視為開放式結束之 opt 狀態。</p> <p>VEN/VTN, oadrCreateOpt Payload</p> <p>If an opt availability schedule uses a duration of zero it shall be treated as an open ended opt state.</p>
211	<p>VEN/VTN、oadrCancelOpt</p> <p>VEN 不得使用具 optID 之 oadrCancelOpt，其匹配用以限定有作用或擱置事件之 oadrCreateOpt。於此全景中，opt 取消將是不合邏輯。</p> <p>若 VTN 接收 opt 排程之取消，其已由較近之 opt 排程替換，則該 VTN 不得產生錯誤。</p> <p>VEN/VTN, oadrCancelOpt</p> <p>A VEN MUST NOT use oadrCancelOpt with an optID matching that of a oadrCreateOpt used to qualify an active or pending event. An opt cancellation in this context would be illogical.</p> <p>VTN shall not generate an error if it receives a cancellation for an opt schedule that has been superseded by a more recent opt schedule.</p>

9.2.4 EiReport

300	<p>VEN/VTN、EiReport 服務</p> <p>聯盟報告剖繪為所有可能 oadrReport 物件綱要元件之子集，其定義報告(歷史及遙測用途、遙測狀態)之特定型的特性(資料點)。</p> <p>詮釋資料報告定義特別實作能報告之特性。此應為習知聯盟報告剖繪所定義之特性子集。</p> <p>報告請求(oadrReportRequest 物件)定義特定特性，其實作將可能於報告中接收。若 reportName 與已知報告定義的特徵相匹配，此特性表列應為詮釋資料報告中所定義之特性子集。</p> <p>非詮釋資料報告(oadrReport 物件)於報告請求中應包含所請求之所有特性值。</p> <p>VEN/VTN, EiReport Service</p> <p>An alliance report profile is a subset of all the possible oadrReport object schema elements that define the characteristics (data points) of a specific type of report (history and telemetry usage, telemetry status).</p> <p>The metadata report defines the characteristics that a particular implementation is capable of reporting. This shall be a subset of the characteristics defined by a well-known alliance report profile if the</p>
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	<p>reportName matches that defined by a well-known report.</p> <p>A report request (oadrReportRequest object) defines the specific characteristics that an implementation would like to receive in a report. This list of characteristics shall be a subset of the characteristics defined in the metadata report.</p> <p>A non-Metadata report (oadrReport object) shall contain values for all the characteristics requested in the report request.</p>
<p>301</p>	<p>VEN/VTN、EiReport 服務</p> <p>即使實作不具任何可報告之資料，該實作將至少支援下列酬載互動。</p> <ul style="list-style-type: none"> • 通電(初始註冊後)、重置或重新註冊時發送 oadrRegisterReport 酬載。VTN 應返回推送執行程序的 oadrRegisterReport 以回應初始 oadrPoll 酬載。 • 發送 oadrCreatedReport 酬載，回應 oadrCreateReport 酬載請求詮釋資料報告。 • 發送包含詮釋資料報告之 oadrRegisterReport 酬載，宜為 oadrCreateReport 酬載請求詮釋資料報告。 <p>於實作不具任何可報告資料之各案例中，酬載中應省略 oadrReport 物件，如上文提示。</p> <p>VEN/VTN, EiReport Service</p> <p>Implementations shall at a minimum support the following payload interactions even if the implementation does not have any reportable data:</p> <ul style="list-style-type: none"> •send oadrRegisterReport payload on power up (after initial registration), reset, or reregistration. For push implementations oadrRegisterReport would be returned by the VTN in response to an initial oadrPoll payload; •send oadrCreatedReport payload in response to an oadrCreateReport payload requesting a Metadata report •send oadrRegisterReport payload containing a Metadata report should an oadrCreateReport payload request Metadata reports. <p>In each case where the implementation does not have any reportable data, the oadrReport object shall be omitted from the payloads noted above.</p>
<p>302</p>	<p>VEN/VTN、EiReport 服務</p> <p>所有報告係詮釋資料報告元件 reportDataSource 中所定義資源之聚合，於詮釋資料報告特性中，透過 marketContext 選項內含予以過濾。若於 reportDataSource 中規定多個標的型式，則此等型式標的資源一起執行邏輯 OR 運算。</p> <p>VEN/VTN, EiReport Service</p> <p>All reports are the aggregate of the resources defined in the Metadata report element reportDataSource, filtered by the optional inclusion of a marketContext in the Metadata report characteristics. If multiple target types are specified in reportDataSource, the resources targeted</p>

	by these types are OR'd together.
303	<p>VEN/VTN、EiReport 服務</p> <p>requestID 元件雖為請求酬載之必備酬載元件，但其可留置為空字串。然而，若於請求酬載中規定 requestID 值，則回應實作須於其回應酬載中回傳該值。</p> <p>VEN/VTN, EiReport Service</p> <p>Although requestID element is a mandatory payload element for request payloads, it may be left as an empty string. However, if a value is specified for requestID in the request payload, the responding implementation MUST return that value in its response payload.</p>
304	<p>VEN/VTN、EiReport 服務、IDs</p> <p>下列 ID 宜透過接收酬載之實作進行驗核。若 ID 與預期 ID 不匹配，則裝置宜於 eiResponse 酬載中包括 452 錯誤。</p> <ul style="list-style-type: none"> • venID。 • vtnID。 • rID。 • reportRequestID。 • reportSpecifierID。 <p>VEN/VTN, EiReport Service, IDs</p> <p>The following IDs should be validated by the implementations receiving the payload. If the ID does not match the expected ID, the device should include a 452 error in the eiResponse payload.</p> <ul style="list-style-type: none"> • venID • vtnID • rID • reportRequestID • reportSpecifierID
305	<p>VEN/VTN、EiReport 服務、詮釋資料 oadrReport 物件</p> <p>包含描述報告能力之詮釋資料報告的酬載，應包括下列選項酬載元件。</p> <ul style="list-style-type: none"> • reportDescription。 • reportDescription:itemBase 替代群組(單元)，如符合性規則 331 所指示。 <p>針對包含詮釋資料報告之酬載，描述支援無報告能力，應省略 oadrReport 物件。</p> <p>包含詮釋資料報告之酬載不得包括下列選項酬載元件。</p> <ul style="list-style-type: none"> • intervals。

	<ul style="list-style-type: none"> • dtstart。 • ei <p>VEN/VTN, EiReport Service, Metadata oadrReport Object</p> <p>Payloads containing a metadata report that describe reporting capabilities shall include the following optional payload elements:</p> <ul style="list-style-type: none"> • reportDescription • reportDescription:itemBase substitution group (Units) as indicated in conformance rule 331 <p>For payloads containing a metadata report that depicts that no reporting capabilities are supported, the oadrReport object shall be omitted.</p> <p>Payloads containing a metadata report shall not include the following optional payload elements:</p> <ul style="list-style-type: none"> • intervals • dtstart • ei.
306	<p>VEN/VTN、EiReport 服務、詮釋資料 oadrReport 物件</p> <p>實作(VEN 或 VTN)發送包含詮釋資料報告之酬載，應供應所有其報告能力。</p> <p>實作接收詮釋資料報告，應使用此報告以替換任何先前所接收之詮釋資料報告能力。其亦須隱含取消所有先前排程報告，除定期請求詮釋資料報告外，其應明確取消。</p> <p>若實作接收詮釋資料報告希望繼續接收先前請求報告，其於接收詮釋資料報告後應發送新報告請求。</p> <p>VEN/VTN, EiReport Service, Metadata oadrReport Object</p> <p>An implementation (VEN or VTN) sending a payload containing a metadata report shall supply all of its reporting capabilities.</p> <p>An implementation receiving a metadata report shall use this report to replace any previously received Metadata reporting capabilities. It shall also implicitly cancel all previously scheduled reports, except for periodic requests for metadata reports, which shall be explicitly cancelled.</p> <p>If implementations receiving a Metadata report wish to continue to receive a previously requested report(s), it shall send a new report request after the receipt of the metadata report.</p>
307	<p>VEN/VTN、EiReport 服務、詮釋資料 oadrReport 物件</p> <p>若詮釋資料 oadrReportDescription:reportSubject 元件出現於酬載中，則該元件應僅包含 endDeviceAsset 子元件，其值應符合於符合性規則 111 所示之裝置類別表列。</p> <p>若於 oadrReportDescription 中未出現 oadrReportDescription:reportSubject:endDeviceAsset 子元件，則 oadrReportDescription:reportSubject 元件應自酬載中省略。</p>

	<p>reportSubject 中所規定之裝置類別宜與由 reportDataSource 及 marketContext (規則 302)所定義之資源標的執行邏輯 AND 運算，以決定特定標的，其資料將針對該報告進行聚合。</p> <p>VEN/VTN, EiReport Service, Metadata oadrReport Object</p> <p>The metadata oadrReportDescription:reportSubject element, if present in a payload, shall contain only the endDeviceAsset sub-element whose values shall conform to the list of device classes shown in conformance rule 111.</p> <p>If no oadrReportDescription:reportSubject:endDeviceAsset sub-element is present in the oadrReportDescription, the oadrReportDescription:reportSubject element shall be omitted from the payload.</p> <p>The device classes specified in reportSubject should be AND'd with the resource targets defined by reportDataSource and marketContext (Rule 302), to determine the specific target whose data will be aggregated for the report.</p>
308	<p>VEN/VTN、EiReport 服務、詮釋資料 oadrReport 物件</p> <p>特定詮釋資料報告內，所有 reportSpecifierID 元件值應是唯一的。</p> <p>詮釋資料報告中，若 reportDescription 具有 reportName 元件，包含習知聯盟報告剖繪名稱，則資料點特性及允許值應符合於符合性規則 331 所示表格。</p> <p>特定 reportSpecifierID 內，所有 rID 元件值應唯一。</p> <p>透過發送 oadrCreateReport 請求詮釋資料報告時，rID 應設定為 0。oadrCreateReport 之接收方請求詮釋資料報告，應忽略 rID 值。</p> <p>VEN/VTN, EiReport Service, Metadata oadrReport Object</p> <p>All reportSpecifierID element values shall be unique within a specific metadata report.</p> <p>If a reportDescription in the metadata report has a reportName element that contains one of the well-known alliance report profile names, the data points characteristics and allowable values shall conform to the table shown in conformance rule 331.</p> <p>All rID element values shall be unique within a specific reportSpecifierID.</p> <p>When requesting a metadata report by sending an oadrCreateReport, rID shall be set to 0. The receiving party of the oadrCreateReport requesting a Metadata report, shall ignore the rID value.</p>
309	<p>VEN/VTN、EiReport、詮釋資料報告—開啟及重置</p> <p>一旦開啟或系統重置(後隨初始註冊)，VTN 及 VEN 兩者之 PUSH 及 PULL 實作應發送 oadrRegisterReport 酬載(亦即，詮釋資料報告)給其他方。其中排除可能在詮釋資料報告交換前已發送的 oartRequestEvent 酬載。</p> <p>VEN/VTN, EiReport, Metadata report – Power Up and Reset</p> <p>Upon power-up or after a system reset (followed by an initial registration) PUSH and PULL implementations of both VTN and VEN</p>

	<p>shall send an oadrRegisterReport payload (i.e., metadata reports) to the other party prior to initiating other non-registration service operations except an oadrRequestEvent payload, which may be sent prior to the exchange of metadata reports.</p>
<p>311</p>	<p>VEN/VTN、EiReport 服務、詮釋資料 oadrReport 物件</p> <p>所 包 含 之 各 詮 釋 資 料 報 告 中 ， 應 oadrRegisterReport.oadrReport.reportRequestID 元 件 設 為 零 。 若 因 oadrCreateReport 請 求 而 正 要 發 送 oadrRegisterReport 酬 載 ， 則 執 行 請 求 時 ， 選 項 oadrRegisterReport.reportRequestID 元 件 應 與 匹 配 reportRequestID 所 使 用 之 值 出 現 。 否 則 ， oadrRegisterReport.reportRequestID 不 得 包 括 於 oadrRegisterReport 酬 載 中 。</p> <p>VEN/VTN, EiReport Service, Metadata oadrReport Object</p> <p>The oadrRegisterReport.oadrReport.reportRequestID element in each contained metadata report shall be set to zero. If the oadrRegisterReport payload is being sent to as the result of a oadrCreateReport request, the optional oadrRegisterReport.reportRequestID element shall be present with a value that matches the reportRequestID used when the request was made. Otherwise, oadrRegisterReport.reportRequestID shall not be included in the oadrRegisterReport payload.</p>
<p>312</p>	<p>VEN/VTN、EiReport 服務、詮釋資料 oadrReport 物件</p> <p>oadrReport:duration 元 件 傳 輸 可 用 於 報 告 的 資 料 量 。 對 遙 測 回 報 而 言 ， 此 可 反 映 VEN 可 以 緩 衝 的 資 料 量 。 報 告 的 可 用 資 料 量 可 能 受 設 備 外 儲 存 的 限 制 。 此 元 件 應 包 含 在 詮 釋 資 料 報 告 中 。 因 期 間 為 時 間 參 數 ， 而 假 設 實 作 能 於 該 期 間 以 所 支 援 之 取 樣 率 (oadrSamplingRate:oadrMinPeriod) ， 最 快 速 儲 存 足 夠 之 資 料 。</p> <p>oadrSamplingRate:oadrMaxPeriod 不 得 大 於 如 上 註 記 之 期 間 值 。</p> <p>VEN/VTN, EiReport Service, Metadata oadrReport Object</p> <p>The oadrReport.duration element communicates the amount of data that is available for reporting. For telemetry reporting, this may reflect the amount of data that can be buffered by the VEN. For reports, the amount of available data is more likely bounded by off-device storage. This element shall be included in metadata reports. Since duration is a time parameter the assumption is that the implementation can store enough data at the fastest supported sampling rate (oadrSamplingRate:oadrMinPeriod) for that duration of time.</p> <p>The oadrSamplingRate:oadrMaxPeriod shall not be larger than the duration value noted above.</p>
<p>313</p>	<p>VEN/VTN、EiReport 服務、非詮釋資料 oadrReport 物件</p> <p>包 含 非 詮 釋 資 料 報 告 之 酬 載 應 包 括 下 列 選 項 酬 載 元 件 。</p> <ul style="list-style-type: none"> • dtstart。 • 間 隔 。 • reportName—報 告 自 其 中 衍 生 ， 除 不 具 METADATA 前 綴 外 ， 相 同 於 詮 釋 資 料 報 告 所 使 用 之 值 。

	<p>包含非詮釋資料報告之酬載不得包括下列選項酬載元件。</p> <ul style="list-style-type: none"> • oadrReportDescription <p>VEN/VTN, EiReport Service, Non-Metadata oadrReport Object</p> <p>Payloads containing a non-metadata report shall include the following optional payload elements:</p> <ul style="list-style-type: none"> • dtstart • Intervals • reportName – the same value as used as the metadata report from which the report is derived, except for without the METADATA prefix. <p>Payloads containing a non-metadata report shall not include the following optional payload elements:</p> <ul style="list-style-type: none"> • oadrReportDescription
314	<p>VEN/VTN、EiReport 服務、非詮釋資料 oadrReport 物件</p> <p>oadrReport:dtstart 元件為整體報告之開始時間，且由報告中之第 1 間隔繼承。若 oadrReport:dtstart 元件及間隔 dtstart 元件值兩者皆出現於酬載中，則 oadrReport:dtstart 元件須等於第 1 間隔之 dtstart 元件值。註所有 oadrUpdateReport 酬載皆需包含 oadrReport:dtstart。</p> <p>若間隔(oadrReport:interval:interval)包含 dtstart 元件，則所有間隔皆應包含 dtstart 元件。</p> <p>無論是繼承自 oadrReport:dtstart 或規定為間隔 dtstart 元件之部件，各間隔應具有有效 dtstart 時間。</p> <p>用於回報的間隔順序 (oadrReport:intervals:interval) 應視為從過去到應來的值的連續體。一順序內的第一個間隔應始終是最接近紀元 (1/1/1971) 的間隔，隨後的間隔應相對於第一個間隔的時間戳記向未來移動。例如，dtstart 為 17:00 且精細度為 10 分鐘的區段將覆蓋 17:00 到 17:10 的區間，之後由 dtstart 為 17:10 的間隔覆蓋 17:10 到 17:20 的區間。</p> <p>VEN/VTN, EiReport Service, Non-Metadata oadrReport Object</p> <p>oadrReport:dtstart element is the start time of the overall report and is inherited by the first interval in the report. If both the oadrReport:dtstart element and interval dtstart element values are present in the payload, then oadrReport:dtstart element shall equal the dtstart element value of the first interval. Note that oadrReport:dtstart shall be included in all oadrUpdateReport payloads.</p> <p>If one interval (oadrReport:intervals:interval) contains a dtstart element, all intervals shall contain a dtstart element.</p> <p>Each interval shall have an effective dtstart time, either inherited from oadrReport:dtstart or specified as part of the interval dtstart element.</p> <p>The sequence of interval (oadrReport:intervals:interval) available for reporting shall be viewed as a continuum of values from the past to</p>

	<p>the future. The first interval in a sequence shall always be the one closest to Epoch (1/1/1970), with subsequent intervals moving towards future relative to the time stamp of the first interval. For instance, an interval with a dtstart of 17:00 and a granularity of 10 min would cover the period from 17:00 to 17:10, followed by another interval with a dtstart 17:10 covering the period from 17:10 to 17:20.</p>
<p>315</p>	<p>VEN/VTN、EiReport 服務、非詮釋資料 oadrReport 物件</p> <p>oadrReport:duration 元件為整個報告之持續時間，且須於報告中反映所包含(若已包含)之第 1 間隔開始與最後間隔結束之期間。</p> <p>若酬載中不存在 oadrReport:interval:interval:duration 元件，則間隔資料包含資料點，其為時間特定點之邊界，而非時間跨距。</p> <p>當 oadrReport:intervals:interval:duration 存在時，報告的 dtstart 時間應代表給定資料點的資料收集周期的開始時間。例如：dtstart 為 17:00 且精細度為 10 分鐘的資料樣本將覆槩 17:00 到 17:10 的時間段。</p> <p>若間隔(oadrReport:intervals:interval)包含期間元件，則所有間隔皆應包含期間元件。</p> <p>若間隔不包含 dtstart 元件，而有多於 1 個間隔，則期間應於 oadrReport:interval:interval:duration 中規定之。</p> <p>VEN/VTN, EiReport Service, Non-Metadata oadrReport Object</p> <p>The oadrReport:duration element is the duration of the entire report and if included MUST reflect the time period beginning of the first interval and the end of the last interval included in the report.</p> <p>If oadrReport:intervals:interval:duration element is absent from the payload, then the interval data contains data points that are bound to a specific point in time as opposed to a span of time.</p> <p>When the oadrReport:intervals:interval:duration element is present, the reported dtstart time shall represent the beginning of the data collection period for a given data point. For instance, a data sample with a dtstart of 17:00 and a granularity of 10 min would cover the period from 17:00 to 17:10.</p> <p>If one interval (oadrReport:intervals:interval) contains a duration element, all intervals shall contain a duration element.</p> <p>If intervals do not contain dtstart elements and there is more than one interval, duration shall be specified in oadrReport:intervals:interval:duration.</p>
<p>316</p>	<p>VEN/VTN、EiReport 服務、非詮釋資料 oadrReport 物件</p> <p>若 dtstart 非間隔規格一部分，則各間隔中 uid 元件為必要。單一 oadrReport 物件內，當要求時，針對後續各間隔，uid 應表示為自 0 起每次遞增 1 之間隔數目。例外：綠色按鈕報告(Green Button Repor)不要求其具 uid 元件。</p> <p>VEN/VTN, EiReport Service, Non-Metadata oadrReport Object</p> <p>The uid element is required in each interval if dtstart is not part of the interval specification. Within a single oadrReport object, when required, uid shall be expressed as an interval number with a base of 0 and an increment of 1 for each subsequent interval. Exception:</p>

	<p>green button reports are not required to have a uid element.</p>
317	<p>VEN/VTN、EiReport 服務、非詮釋資料 oadrReportRequest 物件</p> <p>報告請求中所規定之 reportSpecifier:granularity 元件值定義所請求之間隔報告頻率。例：具精細度為 10 分鐘與 reportBackDuration 為 60 分鐘之遙測報告將產生具有 6 個間隔之報告。報告內的區段數可能與精細度和 reportBackDuration 之間的關係不完全匹配，即使該區段數通常應在此計算值的一個正負區段之內。</p> <p>若於詮釋資料報告中規定，則所請求之精細度不得小於 oadrSamplingRate:oadrMinPeriod。</p> <p>VEN/VTN, EiReport Service, Non-Metadata oadrReportRequest Object</p> <p>The reportSpecifier:granularity element value specified in the report request defines the requested interval reporting frequency. Example: Telemetry report with a granularity of 10 minutes with a reportBackDuration of 60 minutes would result in a report with 6 intervals. The number of intervals in a report may not exactly match the relationship between granularity and reportBackDuration, although in general it should be within plus or minus one interval of this calculated value.</p> <p>The requested granularity shall not be less than oadrSamplingRate:oadrMinPeriod, if specified in the metadata report. At the same time, granularity shall not be more than reportBackDuration.</p> <p>若 reportSpecifier:granularity 為 0，則所請求之資料宜包含於僅當其自先前值變更時且非正規間隔之報告中，報告係透過 reportBackDuration 所定義之正規間隔發送。報告中，介於後續值間之期間決不小於 oadrSamplingRate:oadrMinPeriod，即使其僅於變更時報告。因上次報告業已發送，故若所請求之資料未變更，則 oadrDataQualityType 須設為 “no new value – previous value used”。若 reportBackDuration 設為 0，則無論精細度是否為 0，所預期之行為定義於符合性規則 324。</p> <p>針對所有歷史報告(HISTORY_XXX)，精細度須設為 0，指示該資料宜以其被記錄之任何精細度進行報告。</p> <p>If reportSpecifier:granularity is zero then the requested data should be included in a report only when it changes from the previous value and not at regular intervals, while reports are to be sent at regular interval defined by reportBackDuration. In no case will the duration between subsequent values in a report be less than oadrSamplingRate:oadrMinPeriod, even if they are being reported only on change. In case the requested data has not changed since the last time a report has been sent out, the oadrDataQualityType shall be set to “no new value – previous value used”. If reportBackDuration is set to zero in the same report request, regardless of whether granularity is zero or not, the expected behavior is the one defined in Conformance Rule 324.</p> <p>For all history reports (HISTORY_XXX), granularity shall be set to 0 to signify that the data should be reported at whatever granularity it was recorded.</p>
318	<p>VEN/VTN、EiReport 服務、非詮釋資料 oadrReport 物件</p>

	<p>針對包含於其詮釋資料報告中之資料點，若實作不具有有效資料，且其已透過報告請求要求報告此值，則實作應於報告中包含佔位符 (placeholder) 值，並設定 intervals:interval:oadrReportPayload:dataQuality 元件為 “quality bad” 列舉值之一。</p> <p>VEN/VTN, EiReport Service, Non-Metadata oadrReport Object</p> <p>If an implementation has no valid data for a data point which was included in its metadata report and it has been asked to report this value via a report request, the implementation shall include a placeholder value in the report and set the intervals:interval:oadrReportPayload:dataQuality element to one of the “quality bad” enumerated values.</p>
<p>319</p>	<p>VEN/VTN、EiReport 服務、非詮釋資料 oadrReport 物件</p> <p>若包含於酬載中，則 intervals:interval:oadrReportPayload:accuracy 元件與間隔之 payloadFloat 值應為相同單位。當以信賴度 (confidence) 出現時，指示預測之可能變化。若 payloadResourceStatus 用於溝通酬載值，則此規則不適用。</p> <p>VEN/VTN, EiReport Service, Non-Metadata oadrReport Object</p> <p>If included in a payload, the intervals:interval:oadrReportPayload:accuracy element shall be in same units as the payloadFloat value for the Interval. When present with Confidence, indicates the likely variability of the prediction. This rule is not applicable if the payloadResourceStatus is used to communicate the payload value.</p>
<p>321</p>	<p>VEN/VTN、EiReport 服務、oadrReportRequest 物件</p> <p>包含 oadrReportRequest 物件之酬載不得包括下列選項元件。</p> <ul style="list-style-type: none"> • reportSpecifier:reportInterval:properties:tolerance。 • reportSpecifier:reportInterval:properties:eiNotification。 • reportSpecifier:reportInterval:properties:eiReampUp。 • reportSpecifier:reportInterval:properties:eiRecovery。 • reportSpecifier:specifierPayload:itembase。 <p>VEN/VTN, EiReport Service, oadrReportRequest Object</p> <p>Payloads containing the oadrReportRequest object shall not include the following optional element:</p> <ul style="list-style-type: none"> • reportSpecifier:reportInterval:properties:tolerance • reportSpecifier:reportInterval:properties:eiNotification • reportSpecifier:reportInterval:properties:eiReampUp • reportSpecifier:reportInterval:properties:eiRecovery • reportSpecifier:specifierPayload:itembase
<p>322</p>	<p>VEN/VTN、EiReport 服務、oadrReportRequest 物件</p> <p>於 VEN/VTN 範圍內，reportRequestID 元件值應是唯一。</p>

	<p>VEN/VTN, EiReport Service, oadrReportRequest object</p> <p>The reportRequestID element value shall be unique within the scope of the VEN/VTN.</p>
324	<p>VEN/VTN、EiReport 服務、oadrReportRequest 物件</p> <p>reportSpecifier:reportBackDuration 元件規定宜多頻繁地發送報告。若 reportBackDuration 為 0，則報告應立即發送，且僅使用一次 oadrUpdateReport 酬載。歷史報告應將 reportBackDuration 設定為 0。針對 reportBackDuration 為 0 之遙測報告，精細度值應予以忽略，且於報告中各資料點僅應回傳 1 個資料間隔。</p> <p>若 reportSpecifier:reportBackDuration 元件為非零，則報告應定期使用 oadrUpdateReport 酬載遞送。詮釋資料及非詮釋資料報告皆可定期遞送。在定期報告的生命週期內傳送的報告數量可能與請求的總體報告持續時間和 reportBackDuration 之間的關係不完全匹配。</p> <p>HISTORY_USAGE 及定期的 TELEMETRY_USAGE 及 TELEMETRY_STATUS 報告須規定 reportSpecifier:reportInterval dtstart 及期間子元件之值。含有點資料之一次性(One-off)遙測報告不要求此等元件，且若包含於報告之請求酬載中，則應予以忽略。</p> <p>VEN/VTN, EiReport Service, oadrReportRequest Object</p> <p>The reportSpecifier:reportBackDuration element specifies how frequently the report should be sent.</p> <p>If reportBackDuration is 0, then the report shall be sent immediately and only once using the oadrUpdateReport payload. History reports shall set reportBackDuration to 0. For Telemetry reports with a reportBackDuration of 0, the granularity value shall be ignored and only one interval of data for each data point shall be returned in the report.</p> <p>If the reportSpecifier:reportBackDuration element is non-zero, the report shall be delivered periodically using the oadrUpdateReport payload. Both metadata and non- metadata reports may be delivered periodically. The number of reports delivered over the lifetime of a periodic report may not exactly match the relationship between the requested overall reporting duration and reportBackDuration.</p> <p>HISTORY_USAGE and periodic TELEMETRY_USAGE and TELEMETRY_STATUS reports shall specify values for reportSpecifier:reportInterval dtstart and duration sub elements. One-off telemetry reports with point data do not require these elements and they MUST be ignored if included in the report request payload.</p>
325	<p>VEN/VTN、EiReport 服務、oadrReportRequest 物件</p> <p>針 對 TELEMETRY_XXX 報 告 ， reportSpecifier:reportInterval:properties:dtstart 元件值指示 1 或多個報告系列中的第 1 個何時須開始。</p> <p>reportSpecifier:reportInterval:properties:duration 元件值指示從 dtstart 時間起，此報告宜涵蓋之時間跨距。</p> <p>對於所有正在進行之遙測報告(TELEMERY_XXX)，此期間可能於未來，且一旦此時間跨距到期，則報告宜不再產生。若</p>

	<p>reportSpecifier:reportInterval:properties:duration 值為 0，則報告應不確定產生。</p> <p>對於所有歷史報告(HISTORY_XXX)，此期間係處於 PAST，並反映所請求之歷史資料。若此值為 0，則報告應包括從 dtstart 時間起之所有歷史。</p> <p>VEN/VTN, EiReport Service, oadrReportRequest Object</p> <p>For TELEMETRY_XXX reports the reportSpecifier:reportInterval:properties:dtstart element value indicates when the first in a series of one or more reports must begin.</p> <p>The reportSpecifier:reportInterval:properties:duration element value indicates the time span from the dtstart time that this report should cover.</p> <p>For all ongoing telemetry reports (TELEMERY_XXX), this duration may be in the future and once this time span has expired the report should no longer be generated. If reportSpecifier:reportInterval:properties:duration value is 0 then the report shall be generated indefinitely.</p> <p>For all history reports (HISTORY_XXX), this duration is in the past and reflects the historical data requested. If this value is 0 then the report shall include all the history from dtstart time.</p>
327	<p>VEN/VTN、EiReport 服務、oadrReportRequest 物件</p> <p>包含 oadrReportRequest 物件之酬載應使用習知字串“METADATA”作為 reportSpecifierID 元件值，以請求詮釋資料報告。</p> <p>VEN/VTN, EiReport Service, oadrReportRequest Object</p> <p>Payloads containing the oadrReportRequest object shall use the well-known string “METADATA” as the reportSpecifierID element value to request a Metadata report.</p>
328	<p>VEN/VTN、EiReport 服務、oadrUpdatedReport 酬載</p> <p>VTN 或 VEN 可在 oadrUpdatedReport 酬載中包含 oadrCancelReport 項目，以使接收報告的實作能夠取消報告作為其回應的一部分。在接收到此類酬載時，VTN 或 VEN 應依第 6.2.2.4 節的定義進行處理。出現在 oadrCancelReport 項目的 reportRequestIDs 應為來自於受回應的 oadrUpdateReport 的 reportRequestIDs 的子集。</p> <p>VEN/VTN, EiReport Service, oadrUpdatedReport Payload</p> <p>VTN or VEN may include an oadrCancelReport object in an oadrUpdatedReport payload to enable the implementation receiving the report to cancel a report as part of its response. When receiving such a payload, VTN or VEN shall process it as defined in 6.2.2.4. The reportRequestIDs that appear in the oadrCancelReport object shall be a subset of the reportRequestIDs from the oadrUpdateReport that is being responded to.</p>
329	<p>VEN/VTN、EiReport、oadrCanceledReport 及 oadrCreatedReport</p> <p>oadrPendingReports 元件應包含 reportRequestID 元件值之表列，其</p>

	<p>包括針對未來遞送所排程之所有報告。</p> <p>VEN/VTN, EiReport, oadrCanceledReport and oadrCreatedReport</p> <p>oadrPendingReports element shall contain a list of reportRequestID element values that includes all reports that are scheduled for future delivery.</p>															
330	<p>VEN/VTN、EiReport、oadrReport</p> <p>用於參引資料點之 rID 元件被定義為綱要中之字串。能源互運綱要限制 rID 之使用為 3 個數字。不關切使用描述性 rID 值之實作者可希望留置於能源互運限制之邊界內。</p> <p>VEN/VTN, EiReport, oadrReport</p> <p>The rID element used in referencing data points is defined as a string in the schema. The Energy Interoperation schema restricts the use of rID to three numeric digits. Implementers not concerned with using descriptive rID values may wish to stay within the bounds of the Energy Interoperation restrictions.</p>															
331	<p>VEN/VTN、EiReport、oadrReport</p> <p>本標準已定義許多習知之報告。此等報告可透過下表中於 reportName 欄下所示之習知名稱予以識別。當使用習知報告名稱作為 oadrRegisterReport 一部分時，其應附加“METADATA_”作為前綴，且顯示於表中之值應使用為所規定之報告。</p> <p>VEN/VTN, EiReport, oadrReport</p> <p>The document has defined a number of well-known reports. These reports are identified by the well-known names shown under the reportName column in the table below. When the well-known report names are used as part of the oadrRegisterReport, they shall be prefixed with “METADATA_” and the values shown in the table shall be used for the specified report.</p> <table border="1"> <thead> <tr> <th>reportName</th> <th>reportType</th> <th>Units</th> <th>readingType</th> <th>streamPayloadBase</th> </tr> </thead> <tbody> <tr> <td>TELEMETRY_USAGE</td> <td>usage</td> <td>powerReal energyReal</td> <td>DirectRead</td> <td>oadrReportPayloadFloat</td> </tr> <tr> <td>TELEMETRY_STATUSES</td> <td>x-resourceStatus</td> <td>None</td> <td>x-notApplicable</td> <td>oadrReportPayload-oadrPayload-</td> </tr> </tbody> </table>	reportName	reportType	Units	readingType	streamPayloadBase	TELEMETRY_USAGE	usage	powerReal energyReal	DirectRead	oadrReportPayloadFloat	TELEMETRY_STATUSES	x-resourceStatus	None	x-notApplicable	oadrReportPayload-oadrPayload-
reportName	reportType	Units	readingType	streamPayloadBase												
TELEMETRY_USAGE	usage	powerReal energyReal	DirectRead	oadrReportPayloadFloat												
TELEMETRY_STATUSES	x-resourceStatus	None	x-notApplicable	oadrReportPayload-oadrPayload-												

					ResourceSta- tus
	HISTO- RY_USAG E	usage	powerR eal energy Real	Direct Read	oadrRe- portPaylo ad payloadFl oat
	HISTO- RY_GREE NBUTTON	usage	oadrGB - DataDe scriptio n	x- notApplic able	oadrGBPa y- load n/a
	<p>使用者可透過定義唯一部署之 reportName 以定義其擁有訂用之報告，並透過使用此等值所支援之任何綱要以定義該報告。</p> <p>Users may define their own custom reports by defining a reportName that is unique to their deployment and by using any of the schema supported values to define the report.</p>				
333	<p>VEN、EiReport 服務、詮釋資料 oadrReport 物件</p> <p>針對任何遙測報告 (TELEMETRY_XXX)，reportDescription:oadrSamplingRate 元件為必要。</p> <p>VEN, EiReport Service, Metadata oadrReport Object</p> <p>The reportDescription:oadrSamplingRate element is required for any of the telemetry reports (TELEMETRY_XXX).</p>				
334	<p>VEN、EiReport 服務、TELEMERTY_STATUS 報告</p> <p>TELEMETRY_STATUS 報告於其詮釋資料規格中不明確列表單位。若適宜於標的資源，則 VEN 於 TELEMETRY_STATUS 報告中應包括下列各選項 oadrPayloadResourceStatus 子元件。</p> <ul style="list-style-type: none"> • oadrLoadControlState :oadrCapacity。 • oadrLoadControlState :oadrLevelOffset。 • oadrLoadControlState :oadrPercentOffset。 • oadrLoadControlState :oadrSetPoint。 <p>VEN, EiReport Service, TELEMERTY_STATUS reports</p> <p>TELEMETRY_STATUS reports do not explicitly list a Unit in their metadata specification. VENS should include each of the following optional oadrPayloadResourceStatus sub-elements in TELEMETRY_STATUS reports if appropriate for the targeted resource :</p> <ul style="list-style-type: none"> • oadrLoadControlState :oadrCapacity • oadrLoadControlState :oadrLevelOffset 				

	<ul style="list-style-type: none"> • oadrLoadControlState :oadrPercentOffset • oadrLoadControlState :oadrSetPoint <p>給定之報告中，所有間隔應有同一組 oadrLoadControlState 孩元件。</p> <p>LoadControlState 屬性對鏡射 LOAD_CONTROL 信號屬性甚為重要，意指對於各 LOAD_CONTROL 信號型式，於報告之 LoadControlState 中，有相對應之屬性。其預期之用途係使 VEN 於其負載控制狀態上對應於 LOAD_CONTROL 信號之報告能發送至 VEN。</p> <p>此等報告能被用以指示 VEN 之目前 LOAD_CONTROL 狀態，且 VTN 可能用以決定如何發送 LOAD_CONTROL 信號給將影響 VEN 之 VEN。若先前所發送之 LOAD_CONTROL 信號於 VEN 中想要的變更業已生效，則其亦能由 VTN 使用以作為查證工具。此類似於在 LOAD_DISPATCH 信號與來自 VEN 之使用報告間的對應。</p> <p>All intervals shall have the same set of oadrLoadControlState child elements in a given report.</p> <p>The LoadControlState attributes are meant to mirror the LOAD_CONTROL signal attributes meaning that for each LOAD_CONTROL signal type there is a corresponding attribute in the LoadControlState of a report. Their intended use is to enable a VEN to report on its load control state that corresponds to a LOAD_CONTROL signal that might be sent to a VEN.</p> <p>Such reports can be used to signify the VEN's current LOAD_CONTROL state and might be used by the VTN to determine how sending a LOAD_CONTROL signal to the VEN will affect the VEN. It can also be used by the VTN as a means to verify if previously sent LOAD_CONTROL signals have been effected desired changes in the VEN. This is analogous to the correspondence between LOAD_DISPATCH signals and usage reports from VEN.</p>
<p>335</p>	<p>VEN/VTN、EiReport 服務、oadrUpdatedReport</p> <p>報告取消可包含於 oadrUpdatedReport 回應中。取消之後，若其他方持續發送報告，則請求取消之一方應使用 oadrCancelReport 以重新請求取消。</p> <p>VEN/VTN, EiReport Service, oadrUpdatedReport</p> <p>A report cancellation may be included in the oadrUpdatedReport response. If the other party continues to send reports after this cancellation, the party requesting the cancellation shall use oadrCancelReport to rerequest the cancellation.</p>
<p>336</p>	<p>VEN/VTN、EiReport 服務、oadrCanceledReport</p> <p>oadrCancelReport 可包括多個 reportRequestID 值。若接收方不能成功地取消所有列出的報告或不辨識所包含的 reportRequestID 值之一，則其應於 oadrCanceledReport 之 responseCode 元件中回傳 4xx 錯誤。</p> <p>VEN/VTN, EiReport Service, oadrCanceledReport</p>

	<p>An oadrCancelReport may include multiple reportRequestID values. If the receiving party cannot successfully cancel all the reports listed or does not recognize one of the included reportRequestID values, it shall return a 4xx error in the responseCode element of oadrCanceledReport.</p>
337	<p>VEN/VTN、EiReport 服務</p> <p>若實作提供包含間隔資料點之 TELEMETRY_USAGE 報告(表示時間之累積值)，則實作須定期應樣此資料，使其能以其緩衝器中之最近樣本立即回應單次報告請求。若遙測報告之詮釋資料報告提供取樣頻率範圍，則於單次間隔報告中，報告應包括間隔期間。</p> <p>VEN/VTN, EiReport Service</p> <p>If an implementation offers a TELEMETRY_USAGE report that contains interval data points (representing a value accumulated over time), the implementation shall sample this data periodically such that it can respond to a one-shot report request immediately with the most recent sample it has in its buffer. If the metadata report for the telemetry report offered a range of sampling frequencies, the report shall include the interval duration in the one-shot interval report.</p>
338	<p>VEN/VTN、EiReport 服務、oadrReportRequest 物件</p> <p>reportSpecifier:specifierPayload:readingType 值應設為 x-notApplicable。於此位置中，readingType 元件由 EI 綱要要求之，但功能上並非由 OpenADR 使用。</p> <p>VEN/VTN, EiReport Service, oadrReportRequest object</p> <p>The reportSpecifier:specifierPayload:readingType values shall be set to x-notApplicable. The readingType element is required by the EI schema in this location, but is not functionally used by OpenADR.</p>
339	<p>VEN/VTN、EiReport 服務</p> <p>針對報告之特定實例，eiReportID 係唯一識別符。其並非由 OpenADR 使用，且宜由 VTN/VEN 忽略之。</p> <p>VEN/VTN, EiReport Service</p> <p>eiReportID is a unique identifier for a specific instance of a report. It is not used by OpenADR and should be ignored by VTN/VENS.</p>
340	<p>VEN/VTN、EiReport 服務</p> <p>來源方不應請求超出能夠供應的資料。例如：如目標方在 oadrReport:duration 中指示保留一天的資料，來源方不得請求兩天的資料。</p> <p>若來源方於 oadrReportRequest 中向標的方請求更多資料(例：基於所請求之期間)，則標的方應於 oadrCreatedReport:eiResponse 中回傳應用錯誤碼 454。</p> <p>VEN/VTN, EiReport Service</p> <p>A source party should not request more data than is offered. Example: if a target party indicates in oadrReport:duration that it maintains 1 day of data, a source party should not request 2 days of data.</p>

	<p>If a source party requests more data from the target party in an <code>oadrReportRequest</code> (e.g., based on the requested duration), the target party shall return an application error code 454 in an <code>oadrCreatedReport:eiResponse</code>.</p>
341	<p>VEN/VTN、EiReport 服務</p> <p><code>oadrCreateReport:reportInterval:dtstart</code> 應在最接近紀元時間的所需資料集中反映報告間隔。對應 <code>oadrUpdateReport</code> 酬載的第一個間隔 (<code>oadrReport:intervals:interval:dtstart</code>) 的 <code>dtstart</code> 時間可能與請求的 <code>dtstart</code> 時間 (<code>oadrCreateReport:reportInterval:dtstart</code>) 不完全匹配，儘管偏移量通常不會大於精細度值。</p> <p>在定期報告的情況下，最終報告的傳送時間可能稍微超出請求報告期的有效終止時間 (即總回報 <code>dtstart</code> 及持續時間的總和)。</p> <p>VEN/VTN, EiReport Service</p> <p><code>oadrCreateReport:reportInterval:dtstart</code> shall reflect the report interval in the desired set of data that is closest to Epoch time. The <code>dtstart</code> time of the first interval (<code>oadrReport:intervals:interval:dtstart</code>) in the corresponding <code>oadrUpdateReport</code> payload may not exactly match the requested <code>dtstart</code> time (<code>oadrCreateReport:reportInterval:dtstart</code>), although in general the offset should not be greater than the value of granularity.</p> <p>In the case of a periodic report, it is possible that a final report can be delivered slightly beyond the effective end time of the requested reporting period (i.e. the sum of overall reporting <code>dtstart</code> and duration).</p>
342	<p>VEN/VTN、EiReport 服務</p> <p>於 <code>oadrUpdateReport</code> 間隔中，不得使用下列 <code>dtstart</code> 與期間之組合 (否則實作將須針對間隔資料之點資料或時間組件衍生樣本時間)。</p> <ol style="list-style-type: none"> (1) 僅具 <code>dtstart</code> 值之間隔資料。 (2) 僅具期間值之點資料。 (3) 具 <code>dtstart</code> 及期間值之點資料。 <p>如間隔包括點資料及間隔資料，即可指定 <code>dtstart</code> 及持續時間。</p> <p>VEN/VTN, EiReport Service</p> <p>The following combinations of <code>dtstart</code> and duration in an <code>oadrUpdateReport</code> intervals shall not be used (otherwise an implementation would have to derive sample time for point data or the time component of interval data):</p> <ol style="list-style-type: none"> 1) Interval data with just <code>dtstart</code> values 2) Point data with just duration values 3) Point data with <code>dtstart</code> and duration values <p>If intervals contain both point data and interval data, both <code>dtstart</code> and duration can be specified.</p>
343	<p>VEN/VTN、EiReport 服務</p>

	<p>若於詮釋資料報告中未出現 reportDataSource、reportSubject 及 marketContext，則報告之來源適用於與發送詮釋資料報告之 VTN 或 VEN 關聯的所有資源。</p> <p>VEN/VTN, EiReport Service</p> <p>If none of reportDataSource, reportSubject, and marketContext is present in a metadata report, the source of the report applies to all resources associated with the VTN or VEN sending the metadata report.</p>
344	<p>VEN/VTN, EiReport 服務</p> <p>VTN 或 VEN 可於 oadrRegisteredReport 酬載(搭載報告請求)中包含 oadrReportRequest 物件。VEN 和 VTN 不需實作發送搭載報告請求，但它們應能夠接收此類請求並對其採取行動。</p> <p>VEN/VTN EiReportservice, oadrRegisteredReport payload</p> <p>VTN or VEN may include oadrReportRequest object in oadrRegisteredReport payload (Piggyback Report Request). VEN and VTNs are not required to implement sending Piggy-back Report Requests, but they shall be able to receive such a request and act upon it.</p>
345	<p>VEN/VTN EiReportservice, oadrCancelReport</p> <p>如在 oadrCancelReport 項目中取消定期報告的請求者將 reportToFollow 設定為 true，報告發送者應發送一個最終的附加報告給報告請求者。</p> <p>VEN/VTN EiReportservice, oadrCancelReport</p> <p>If reportToFollow is set to true by the report requester in oadrCancelReport object cancelling periodic reports, the report sender shall send one final additional report to the report requester.</p>
346	<p>VEN/VTN, EiReportservice, oadrUpdateReport</p> <p>在正常操作下，VEN 應能以可預測的順序發送 oadrUpdateReport 酬載，並以一一致的區段數發送每個定期報告。但是 VEN 可按需(以較 reportBackDuration 指定為短的區段)發送 oadrUpdateReport 酬載以提供正確的資料(例如：先前發送的值為不良)或丟失資料(例如：測量值延遲因此未包含在上一個報告中)給 VTN，條件是更正後的資料中的間隔數與原始報告請求相符，且報告中的所有資料將取代所有先前發送的報告的值。多次發送同一份報告並不違反通訊協定的要求。</p> <p>VEN/VTN, EiReportservice, oadrUpdateReport</p> <p>VEN should send oadrUpdateReport payloads in a predictable sequence and with a consistent number of intervals per periodic report under normal operations. However, the VEN may send oadrUpdateReport payloads as needed (at a shorter interval than one specified by) reportBackDuration) to provide corrected data (e.g. when previous value sent was of bad quality) or missing data (e.g. when measurement was delayed and thereby was not included in the previous report) to the VTN, provided that the number of intervals in the corrected data match the original report request and that all the data contained in the report replace any previously sent report values. It is not a protocol violation for the same report to be sent</p>

more than once.

9.2.5 EiRegisterParty

400	<p>VTN/VEN、EiRegisterParty 服務、IDs</p> <p>下列 ID 之內容宜由接收酬載之實作進行驗核。若 ID 與預期之 ID 不匹配，則裝置宜於 eiResponse 中包含 452 錯誤。</p> <ul style="list-style-type: none"> • venID。 • vtnID。 • registrationID。 <p>VTN/VEN, EiRegisterParty Service, IDs</p> <p>The following ID's should be validated by the implementations receiving the payload. If the ID does not match the expected ID, the device should include a 452 error in eiResponse.</p> <ul style="list-style-type: none"> • venID • vtnID • registrationID
401	<p>VEN/VTN、EiRegisterParty、oadrCreatePartyRegistration</p> <p>oadrQueryRegistration 及 oadrCreatePartyRegistration 應僅使用於 VEN 至 VTN 方向。</p> <p>oadrRequestReregistration 應僅使用於 VTN 至 VEN 方向。</p> <p>oadrCancelPartyRegistration 可使用於 VEN 至 VTN 或 VTN 至 VEN 方向。</p> <p>已取消註冊之 VEN 可試圖於部署特定間隔啟動新註冊。若適宜組態設定與 VTN 通訊，則已通電或重置但尚未註冊之 VEN 應試圖啟動註冊。</p> <p>VEN/VTN, EiRegisterParty, oadrCreatePartyRegistration</p> <p>oadrQueryRegistration and oadrCreatePartyRegistration shall only be used in the VEN to VTN direction.</p> <p>oadrRequestReregistration shall only be used in the VTN to VEN direction.</p> <p>oadrCancelPartyRegistration may be used in either the VEN to VTN or VTN to VEN direction.</p> <p>A VEN whose registration has been cancelled may attempt to initiate a new registration at a deployment specific interval. An unregistered VEN that is powered up or reset shall attempt to initiate a registration if appropriately configured to communicate with the VTN.</p>
402	<p>VEN/VTN、EiRegisterParty、oadrCreatePartyRegistration</p> <p>oadrCreatePartyRegistration 應包括下列酬載元件。</p>

	<ul style="list-style-type: none"> • 若 oadrTransportName 為 simpleHTTP，則 oadrHttpPullModel 應設為 true 或 false。 • 若 oadrHttpPullModel 設定為 false，指示 HTTP PUSH 交換模型，則應包括 oadrTransportAddress。 • registrationID-僅重新註冊時。 • venID-當重新註冊時。若 venID 包含於初始註冊酬載中，應假設為 VEN 已利用此值預先組態設定，且 VTN 宜驗核 venID，宛如其應驗核任何其他具 venID 之酬載般。 <p>oadrCreatePartyRegistration 不得包括下列酬載元件。</p> <ul style="list-style-type: none"> • registrationID-針對新註冊。 <p>VEN/VTN, EiRegisterParty, oadrCreatePartyRegistration</p> <p>oadrCreatePartyRegistration shall include the following payload elements:</p> <ul style="list-style-type: none"> • If the oadrTransportName is simpleHTTP, then oadrHttpPullModel shall be set to true or false • If oadrHttpPullModel is set to false, indicating a HTTP PUSH exchange model, the oadrTransportAddress shall be included • registrationID - when reregistering only • venID - when reregistering. If the venID is included in the initial registration payload, the assumption shall be that the VEN has been preconfigured with this value and the VTN should validate the venID just as it would any other payload with a venID. <p>oadrCreatePartyRegistration shall not include the following payload elements:</p> <ul style="list-style-type: none"> • registrationID - for a new registration
403	<p>VEN/VTN、EiRegisterParty、oadrCreatedPartyRegistration</p> <p>當回應 oadrCreatePartyRegistration....時，</p> <p>oadrCreatedPartyRegistration 應包括下列酬載元件。</p> <ul style="list-style-type: none"> • 於 oadrProfiles 物件中所有所支援之剖繪及傳送。 • 若 VEN 已利用 HTTP PULL 模型註冊，則 oadrRequestedOadrPollFreqFreq 應包含於酬載中。 • 要求任何 oadrServiceSpecificInfo 或 oadrExtensions 以確保正在使用之剖繪與傳送之互運性。 <p>此外，oadrCreatedPartyRegistration 應包括下列酬載元件，除非發送 oadrCreatedPartyRegistration 作為 oadrQueryRegistration 之回應（於此情況下，元件之包含內容為選項）。</p> <ul style="list-style-type: none"> • registrationID。 • venID。 <p>VEN/VTN, EiRegisterParty, oadrCreatedPartyRegistration</p> <p>When responding to an oadrCreatePartyRegistration,</p>

	<p>oadrCreatedPartyRegistration shall include the following payload elements:</p> <ul style="list-style-type: none"> • all supported profiles and transports in the oadrProfiles object • if the VEN has registered with an HTTP PULL model, then the oadrRequestedOadrPollFreq shall be included in the payload • any oadrServiceSpecificInfo or oadrExtensions required to insure interoperability over the profile and transport being utilized <p>In addition, oadrCreatedPartyRegistration shall include the following payload elements, unless the oadrCreatedPartyRegistration is sent as a response to an oadrQueryRegistration (in which case inclusion of the elements is optional):</p> <ul style="list-style-type: none"> • registrationID • venID
404	<p>VEN/VTN、EiRegisterParty、oadrCreatedPartyRegistration</p> <p>當回應 oadrQueryRegistration.... 時，oadrCreatedPartyRegistration 應包括下列酬載元件。</p> <ul style="list-style-type: none"> • 於 oadrProfiles 物件中所有所支援之剖繪及傳送。 • 所有相關之 oadrServiceSpecificInfo 或 oadrExtensions，其可影響 VEN 選擇剖繪或傳送。 <p>oadrCreatedPartyRegistration 不得包括下列酬載元件。</p> <ul style="list-style-type: none"> • registrationID–若 VEN 尚未向 VTN 註冊。 • venID–若 VEN 尚未向 VTN 註冊。 <p>VTN 無須於查詢回應中包括 oadrPoll 輪詢資訊，雖可如此做。</p> <p>VEN/VTN, EiRegisterParty, oadrCreatedPartyRegistration</p> <p>When responding to an oadrQueryRegistration, oadrCreatedPartyRegistration shall include the following payload elements:</p> <ul style="list-style-type: none"> • all supported profiles and transports in the oadrProfiles object • all relevant oadrServiceSpecificInfo or oadrExtensions that may influence the VENs choice of profile or transport. <p>oadrCreatedPartyRegistration shall not include the following payload elements:</p> <ul style="list-style-type: none"> • registrationID – if the VEN has not registered with the VTN yet • venID – if the VEN has not registered with the VTN yet <p>It is not necessary for the VTN to include the oadrPoll polling information in the query response, although it may do so.</p>
405	<p>VTN/VEN、EiRegisterParty、oadrCreatePartyRegistration</p> <p>2.0b VEN 應執行 EiRegisterParty 服務。當 2.0b VEN 啟動或重置時，於發送任何其他訊息給 VTN 或從 VTN 接受任何訊息之前，其宜啟動註冊(使用 EiRegisterParty 服務)。然而，VEN 可為帶外註</p>

	<p>冊，而非使用 EiRegisterParty。</p> <p>VEN 未處於已註冊狀態時，應忽略所有來自於 VTN 的酬載。關於 VEN 嘗試與未註冊的 VTN 通訊時的行為，參照規則 517。</p> <p>完成新的註冊後，VEN 及 VTN 應交換彼此的詮釋資料報告，且 VEN (PULL 和 PUSH 模式) 應在啟動其它酬載交換之前，使用 oadrRequestEvent 來獲得所有相關的事件。重新註冊不須要詮釋資料的交換及 oadrRequestEvents 的使用。</p> <p>VTN/VEN, EiRegisterParty, oadrCreatePartyRegistration</p> <p>2.0b VEN shall implement EiRegisterParty service. When a 2.0b VEN boots or is reset, it should initiate registration (using the EiRegisterParty service) before sending any other message to or accepting any message from a VTN. However, the VEN may be registered out-of-band instead of using EiRegisterParty.</p> <p>A VEN should ignore all payloads from a VTN when not in a registered state. Refer to rule 517 for behaviour when a VEN attempts to communicate with a VTN in an unregistered state.</p> <p>After a completed new registration, VENs and VTNs shall exchange their metadata reports, and VENs (both PULL and PUSH models) shall use oadrRequestEvent to obtain all relevant events prior to initiating other payload exchanges. The exchange of metadata reports and the use of oadrRequestEvents is not required for reregistration.</p>
406	<p>VTN/VEN, EiRegisterParty, oadrCreatePartyRegistration</p> <p>即使其已註冊，VEN 仍可發送 oadrCreatePartyRegistration (不具 venID 及 registrationID)。若 VTN 接收此新註冊(非請求之重新註冊)，其應抹除所有既有報告及註冊資訊，並啟動全新之註冊。其可再利用 VEN 於此新的註冊前即已擁有之同一 venID 及 registrationID。</p> <p>VTN/VEN, EiRegisterParty, oadrCreatePartyRegistration</p> <p>A VEN may send an oadrCreatePartyRegistration (without venID and registrationID) even if it is already registered. If a VTN receives such a new registration (that is not a requested reregistration), it shall erase all existing reporting and registration information and initiate a completely new registration. It may reuse the same venID and registrationID that the VEN had before this new registration.</p>
407	<p>VTN/VEN, EiRegisterParty, oadrCancelPartyRegistration</p> <p>若裝置從其他方接收 oadrCancelPartyRegistration，則其應忽略關於此裝置之所有資訊，包括交換之詮釋資料報告、請求之報告及註冊資訊。設備、事件、及其它交換項目之管理歷程記錄可以保留。</p> <p>VTN/VEN, EiRegisterParty, oadrCancelPartyRegistration</p> <p>If a device receives an oadrCancelPartyRegistration from the other party, it shall ignore all information about this device, including exchanged metadata reports, requested reports, and registration information for further protocol messaging. Administrative historic records of the device, events, and other exchanges may be retained.</p>

9.2.6 一般符合性規則

9.2.6 General Conformance Rules

500	<p>VEN/VTN、oadrPoll</p> <p>oadrPoll 係由 VEN 於 PULL 模型所使用之服務獨立的輪詢機制，自 VTN 請求擱置服務操作。oadrPoll 不得使用於 VTN 至 VEN 方向。</p> <p>當使用 oadrPoll 時，針對酬載為有效及該等酬載如何遞送等均相同之規則，猶如 VTN 已啟動操作並將酬載推給 VEN。VTN 僅可於回應 oadrPoll 訊息中發送操作酬載。當佇列中無額外操作酬載可用時，VTN 將以 oadrResponse 酬載回應。</p> <p>每次輪詢時，VEN 宜於不等待下一個輪詢區段的情況下，繼續發送 oadrPoll 訊息並處理酬載，直到返回 oadrResponse 酬載以發出空的 VTN 訊息佇列的信號為止。若 oadrPoll 包含不正確 venID，則 VTN 須以包含 452 錯誤碼之 oadrResponse 回應。</p> <p>VEN/VTN, oadrPoll</p> <p>oadrPoll is a service independent polling mechanism used by VENs in a PULL model to request pending service operations from the VTN. oadrPoll shall not be used in the VTN to VEN direction.</p> <p>When using oadrPoll, the rules for which payloads are valid and how those payloads delivered are the same as if the VTN had initiated the operations and pushed the payloads to the VEN. Only one operation payload may be sent by the VTN in response to the oadrPoll message. When no additional operational payloads are available in the queue, the VTN will respond with an oadrResponse payload.</p> <p>At each polling, VENs should, without waiting until the next polling interval, continue sending oadrPoll messages and processing payloads until an oadrResponse payload is returned to signal an empty VTN message queue. If the oadrPoll contains an incorrect venID, the VTN MUST respond with an oadrResponse containing a 452 error code.</p> <p>若 VEN 對所接收之操作酬載要求邏輯回應，則 VEN 應經由傳送請求發送非同步邏輯回應。VTN 宜以 oadrResponse 酬載確認此邏輯回應。</p> <p>若 VTN 未曾接收到預期之邏輯回應作為先前輪詢之回應所遞送之酬載，則該 VTN 可選項地忽略 oadrPoll。VTN 應進行編碼，以便在逾時後放棄等待預期的回應並恢復對 oadrPoll 的回應。</p> <p>VEN 應使用 oadrPoll 請求以檢索來自 VTN 之訊息。輪詢問隔(亦即，於 oadrRequestedOadrPollFreq 中，2 個連續輪詢問之時間量，參照 CNS 7648 “期間”之規定)宜為如同 VTN 於註冊期間所請求，但因 VEN 處理限制或其他因素，故可為較長的。除 VEN 正在清空 VTN 酬載時以外，輪詢問隔不宜小於 oadrRequestedOadrPollFreq 中所請求之期間。</p> <p>服務特定請求宜僅使用於必要之重新同步。</p> <p>儘管 VEN 輪詢問隔較 VTN 指定的 oadrRequestedOadrPollFreq 為長，但並不違反通訊協定，但 VEN 實際使用的輪詢問隔不得大於平均事件持續時間的 20%。此應使 VTN 能及時取消一個事件。</p> <p>If a logical response is required by the VEN to the received</p>
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	<p>operational payload, the VEN shall send that logical response asynchronously via a transport request. The VTN should acknowledge this logical response with an oadrResponse payload.</p> <p>The VTN may optionally ignore an oadrPoll if it has not received an expected logical response to a payload delivered as a response to a previous poll. The VTN should be coded such that after some timeout it gives up waiting for the expected response and resumes responding to oadrPoll.</p> <p>oadrPoll requests shall be used by a VEN to retrieve messages from the VTN. The polling interval (i.e., the amount of time between two successive polls, specified as ISO 8601 duration in oadrRequestedOadrPollFreq) should be as requested by the VTN during registration, but may be higher because of processing constraints of the VEN or other factors. The polling interval should not be lower than the requested duration in oadrRequestedOadrPollFreq, except when the VEN is emptying the VTN payload.</p> <p>Service specific requests should only be used for re-synchronization where necessary.</p> <p>While it is not a protocol violation for a VEN to poll at an interval longer than oadrRequestedOadrPollFreq specified by the VTN, the actual polling interval used by the VEN should not be greater than 20 % of the average event duration. This will allow the VTN to cancel an event in a timely manner.</p>
<p>501</p>	<p>VEN/VTN、oadrPoll</p> <p>所有 OpenADR B 剖面 VTN 實作及簡易 HTTP VEN 應 支援 oadrPoll。</p> <p>VEN/VTN, oadrPoll</p> <p>All OpenADR B profile VTN implementations as well as simple HTTP VENS shall support oadrPoll.</p>
<p>502</p>	<p>VEN/VTN、oadrPoll、EiEvent 服務</p> <p>自上次將 oadrDistributeEvent 傳輸至 VEN 起，若產生新事件或事件狀態已變更，則以 oadrPoll 輪詢 EiEvent 服務之 VTN 通常將僅回傳 oadrDistributeEvent。除了取消之外，eventStatus 的變遷不視為事件內容的變更。然而，針對 VTN 於回應 oadrPoll 中僅以其先前已溝通之事件回應 oadrPoll 而回傳 oadrDistributeEvent，此非錯誤。</p> <p>亦宜注意，oadrDistributeEvent 酬載須包含所有有作用及擱置之事件，無論其是否使用 oadrPoll 或 oadrRequestEvent 進行輪詢。上述行為係與既有符合性規則一致，且此處提供作為預期行為之澄清。</p> <p>VEN/VTN, oadrPoll, EiEvent Service</p> <p>A VTN that is polled with oadrPoll typically will only return a oadrDistributeEvent if a new event is generated or an event state has changed since the last oadrDistributeEvent was transmitted to the VEN. Transition of eventStatus, except for cancellation, should not be considered as change of event content. However, it is not an error for an VTN to return an oadrDistributeEvent in response to oadrPoll with only events that it has previously communicated. It should also be noted that the oadrDistributeEvent payload shall contain all active and pending events, regardless of whether it is polled using oadrPoll</p>

	<p>or oadrRequestEvent. The behavior described above is consistent with existing conformance rules and is provided here as clarification of expected behavior.</p>
506	<p>VEN/VTN</p> <p>支援 B 剖繪之 VTN 亦應同時支援 A 剖繪。</p> <p>支援 B 剖繪之 VEN 亦可支援 A 剖繪。此情況下，VEN 能組態設定使用下列任何選項以與 2.0a VTN 通訊。</p> <ul style="list-style-type: none"> – 人工組態(例：作為設定 VTN 之 URL 部件)。 – 自動落回(於 EiRegisterParty 期間)，當使用 2.0 名稱空間接收來自 VTN 之任何回應時。 – 基於 VTN 之 URL 自動組態(針對 B VTN，根據符合性規則 511，其包含 " 2.0b")。 <p>VEN/VTN</p> <p>A VTN that supports the B profile shall also concurrently support the A profile.</p> <p>A VEN that supports the B profile may also support the A profile. In that case, the VEN can be configured to communicate with a 2.0a VTN using, for example, any of the following options:</p> <ul style="list-style-type: none"> - manual configuration (e.g., as part of setting up the URL of the VTN) - automatic fallback (during EiRegisterParty) when receiving any reply from the VTN using the 2.0a namespace - automatic configuration based on the URL of the VTN (which contains " 2.0b" for B VTNs as per conformance rule 511)
507	<p>VEN/VTN、傳送</p> <p>除簡易 HTTP 傳送外，B 剖繪 VTN 亦應支援 XMPP。</p> <p>B 剖繪 VEN 可支援 HTTP、XMPP 或兩者。</p> <p>實作 XMPP 之 B 剖繪 VEN 及 VTN 應支援 PUSH 模型。XMPP VEN 可仍使 VTN 請求如同於 PULL 模型中，但不得使用 oadrPoll 請求。</p> <p>VEN/VTN, Transport</p> <p>B profile VTNs shall support XMPP in addition to the Simple HTTP transport.</p> <p>B profile VENs may support either HTTP or XMPP or both.</p> <p>B profile VEN and VTNs that implement XMPP shall support the PUSH model. XMPP VENs may still make requests of the VTN as in the PULL model, however they shall not use the oadrPoll request.</p>
508	<p>VEN、venID</p> <p>自 VEN 發送至 VTN 之所有酬載應包含有效 venID。此 venID 通常只出現於根酬載元件之下方，但於少數酬載中(例：oadrRequestEvent 及 oadrCreatedEvent)，venID 係於綱要中較深一層。若離開根，則包含此等 venID 元件之一的酬載改由 VTN 發送，</p>

	<p>酬載內容可省略 venID (若選項)。</p> <p>VEN, venID</p> <p>All payloads sent by a VEN to a VTN shall contain a valid venID. This venID typically appears just below the root payload element, but in a few payloads (e.g., oadrRequestEvent and oadrCreatedEvent), the venID is one layer deeper in the schema. If a payload containing one of these venID elements off the root is instead sent by the VTN, the venID (if optional) may be omitted from the payload contents.</p>
509	<p>VEN/VTN、綱要版本</p> <p>選項 schemaVersion 屬性應包含於所交換之所有酬載中。schemaVersion 屬性之值應為“2.0a”或“2.0b”以指示正使用之 OpenADR 剖繪版本。</p> <p>VEN/VTN, Schema Version</p> <p>The optional schemaVersion attribute shall be included in all payloads exchanged. The value of the schemaVersion attribute shall be either “2.0a” or “2.0b” to indicate the version of the OpenADR profile being used.</p>
510	<p>VEN/VTN – 最小 B 剖繪功能支援</p> <p>為便利互運性及行為之驗核，應支援下列功能。</p> <p>(1) VTN 應能發送且 VEN 應能接收下列標準事件信號。</p> <ul style="list-style-type: none"> • SIMPLE。 • 具價格 signalType 之 ELECTRICTY_PRICE。 • 具設定點 signalType 之 LOAD_DISPATCH。 <p>VEN/VTN – Minimum B Profile Feature Support</p> <p>In order to facilitate interoperability and validation of behavior, the following features shall be supported:</p> <p>1) A VTN shall be capable of sending and a VEN shall be capable of receiving the following standard event signals:</p> <ul style="list-style-type: none"> • SIMPLE • ELECTRICTY_PRICE with a signalType of price • LOAD_DISPATCH with a signalType of setpoint <p>(2) 除詮釋資料報告外，VEN 亦應能產生下列標準報告，VEN 及 VTN 兩者應支援下述事項。</p> <ul style="list-style-type: none"> • 針對以 resourceID 標的所識別之附接資源，oadrOnline 及 oadrManualOverride 之 TELEMETRY_STATUS 報告與必備資料點。 <p>2) A VEN shall be capable of producing the following standard report, in addition to the metadata report, which both VENs and VTNs shall support:</p> <ul style="list-style-type: none"> • TELEMETRY_STATUS report with the mandatory data points of oadrOnline and oadrManualOverride for an attached resource identified with a resourceID target

VEN 應能產生 TELEMETRY_USAGE 報告，至少供作驗證(及可提供其部署)。裝置應能發送某些遙測資料(亦即，假如其不附接任何計量資源，則其應提供樣本資料)。

A VEN shall be capable of producing TELEMETRY_USAGE reports, at least for certification (and may offer it in deployments). The device shall be able to send some telemetry data (i.e., in case it does not have any metering resources attached, it shall provide sample data).

VEN 可額外支援 HISTORY_USAGE 報告。

VEN 應提供足夠儲存空間以儲存近期資料，至少 100 個資料點。若 VTN 未收到最後讀數(例：因短暫通訊問題)，則 VTN 能從 VEN 請求近期歷史。

A VEN may in addition support HISTORY_USAGE reports.

A VEN shall provide sufficient storage to store recent data, at least 100 data points. In case the last reading has not been received by the VTN (e.g., because of transitory communication problems), recent history can be requested by the VTN from the VEN.

VTN 應支援報告註冊(亦即，詮釋資料報告之交換)，且可選項支援額外報告型式。若 VTN 無任何報告可提供，則該 VTN 無須支援詮釋資料報告之週期性報告。若 VTN 接收週期性詮釋資料報告請求但卻無報告可提供，則其宜猶如於一次請求般回應該請求，將 reportBackDuration 值設定為 0。

A VTN shall support report registration (i.e., exchange of metadata report), and may optionally support additional report types. VTNs are not required to support periodic reporting of metadata reports if they do not have any reports to offer. Should a VTN receive a request for a periodic metadata report and have no reports to offer, it should respond to the request as if it were a on-shot request with the reportBackDuration value set to 0.

(3) 僅 VEN 報告應能支援聯盟定義之所有標準報告，包括下述事項。

- TELEMETRY_USAGE
- TELEMETRY_STATUS
- HISTORY_USAGE

3) A Report Only VEN shall be capable of supporting all the Alliance defined standard reports including:

- TELEMETRY_USAGE
- TELEMETRY_STATUS
- HISTORY_USAGE

(4) VTN 應能使用 venID 及 resourceID 之 eiTarget 子元件。

4) A VTN shall be capable of utilizing the eiTarget sub-elements of venID and resourceID.

(5) VEN 應能使用 EiOpt 服務進一步認可事件之 opt 狀態。

5) A VEN shall be capable of utilizing the EiOpt service to further

	<p>qualify the opt state of an event.</p> <p>當期望完全功能之 VEN 將能產生 opt 排程，且完全功能之 VTN 將能產生基準線且恰多於詮釋資料報告，此等能力並未明確定義於此規則中。若此等能力能透過實作進行組態，則應作為驗證的部份施以測試。</p> <p>While there is the expectation that fully functional VENs will be able to generate opt schedules, and fully functional VTNs will be capable of generating baselines and more than just metadata reports, these capabilities are not explicitly defined in this rule. If these capabilities can be configured by implementations, they will be tested as part of certification.</p>
<p>511</p>	<p>VTN/VEN</p> <p>B 剖繪端末點應以簡易 HTTP 模式使用下列模板，而依據 IETF RFC 3986 (第 6.2.3 節)中規定之規則接受正規化 URI。埠及前綴皆為可選。</p> <ul style="list-style-type: none"> • https://<hostname>(:port)/(prefix/)OpenADR2/Simple/2.0b/<service> <p>含下列用於服務名稱之字串。</p> <ul style="list-style-type: none"> • EiEvent。 • EiOpt。 • EiReport。 • EiRegisterParty。 • OadrPoll (僅於 VTN 上)。 <p>當 VTN 及 VEN 在同一個 IP 位址上運行，應使用上述的路徑將其部署於不同的前綴。</p> <p>VTN/VEN</p> <p>B Profile endpoints shall use the following template in the Simple HTTP mode, while accepting normalized URIs according to the rules specified in IETF RFC 3986 (Section 6.2.3). Port and prefix are optional.</p> <p>https://<hostname>(:port)/(prefix/)OpenADR2/Simple/2.0b/<service></p> <p>The following strings used for the service name:</p> <ul style="list-style-type: none"> • EiEvent • EiOpt • EiReport • EiRegisterParty • OadrPoll (only on the VTN) <p>When VTN and VEN are running on the same IP address, they shall be deployed under different prefix while using the path under it as described above.</p>

512	<p>VTN/VEN</p> <p>venID 及 vtnID 應區分大小寫(例：當剖析輸入之訊息時，"vtnID1" 之 vtnID 與 "vtnid1" 不同)。</p> <p>針對 marketContext，應適用 IETF RFC 3986 (section 6.2.3)中規定之正規化規則，以允許主機名稱及方案(至少)為區分大小寫，且仍是相同。</p> <p>VTN/VEN</p> <p>venID and vtnID shall be case-sensitive (e.g., a vtnID of "vtnID1" is different from "vtnid1" when parsing an incoming message).</p> <p>For marketContext, the normalization rules specified in IETF RFC 3986 (section 6.2.3) shall be applied, allowing for hostname and scheme (at least) to be case insensitive and still be equivalent.</p>
514	<p>VEN/VTN、XML 簽章</p> <p>實作可選項支援 XML 簽章，如本標準 8.7.所定義。若將裝置組態設定為使用 XML 簽章，則其應忽略不包含有效簽章之輸入訊息，如 8.7.所定義。</p> <p>若支援，則當建立 XML 簽章時，實作應從下列方法選擇。</p> <p>canonicalizationMethod:</p> <p>http://www.w3.org/TR/2001/REC-xml-c14n-20010315</p> <p>http://www.w3.org/TR/2001/REC-xml-c14n-20010315#WithComments</p> <p>SignatureMethod:</p> <p>http://www.w3.org/2000/09/xmlsig#rsa-sha1</p> <p>http://www.w3.org/2001/04/xmlsig-more#rsa-sha256</p> <p>http://www.w3.org/2001/04/xmlsig-more#ecdsa-sha1</p> <p>http://www.w3.org/2001/04/xmlsig-more#ecdsa-sha256</p> <p>DigestMethod:</p> <p>http://www.w3.org/2000/09/xmlsig#sha1</p> <p>http://www.w3.org/2001/04/xmlenc#sha256</p> <p>VEN/VTN, XML signatures</p> <p>Implementations may optionally support XML signatures as defined in 8.7. If a device is configured to use XML Signatures, it shall ignore incoming messages that do not contain a valid signature, as defined in 8.7.</p> <p>If supported, implementation shall select from the following list of methods when creating the XML signature:</p> <p>canonicalizationMethod:</p> <p>http://www.w3.org/TR/2001/REC-xml-c14n-20010315</p> <p>http://www.w3.org/TR/2001/REC-xml-c14n-20010315#WithComments</p>

	<p>SignatureMethod:</p> <p>http://www.w3.org/2000/09/xmlsig#rsa-sha1</p> <p>http://www.w3.org/2001/04/xmlsig-more#rsa-sha256</p> <p>http://www.w3.org/2001/04/xmlsig-more#ecdsa-sha1</p> <p>http://www.w3.org/2001/04/xmlsig-more#ecdsa-sha256</p> <p>DigestMethod:</p> <p>http://www.w3.org/2000/09/xmlsig#sha1</p> <p>http://www.w3.org/2001/04/xmlenc#sha256</p> <p>所選擇之 SignatureMethod 及 DigestMethod 宜與所協商之 TLS 加密一致，且宜為 base64 編碼。</p> <p>注意，VTN 或 VEN 可組態設定以支援基於特定部署需要之任何方法。然而，若未變更 VTN 或 VEN 之預設組態，則裝置之行為應如上文提示。</p> <p>The SignatureMethod and DigestMethod selected should be consistent with the negotiated TLS cipher and should be base64 encoded.</p> <p>Note that a VTN or VEN may be configured to support any methods based on the needs of a specific deployment. However in the absence of changes to the default configuration of the VTN or VEN, the behavior of the devices shall be as noted above.</p> <p>使用 XML 簽章之裝置應包括作為 SignatureProperty 之 ReplayProtect 元件(參照 10.6 之例)。當發送酬載至其他方時(非當其建立時)，ReplayProtect 元件應包含 dateTime 及隨機單次數字(random nonce)。</p> <p>A device using XML signatures shall include a ReplayProtect element as SignatureProperty (refer to Section 10.6 for an example). The ReplayProtect element shall contain the dateTime when the payload is sent to the other party (not when it is created), as well as a random nonce.</p> <p>若 ReplayProtect 元件為 SignatureProperties 元件一部分，則以高安全模式接收酬載之裝置須查證，且若於裝置上之目前日期及時間與於 ReplayProtect 中之值不同，而大於預先定義之值，則須拒絕該酬載。此外，單次數字可用於進一步保護，以防範重演攻擊。</p> <p>A device receiving a payload in high-security mode shall verify if the ReplayProtect element is part of the SignatureProperties element and shall reject the payload if the current date and time on the device differs from the value in the ReplayProtect more than a predefined value. In addition, the nonce may be used for further protection against replay attacks.</p>
515	<p>VEN/VTN、XMPP</p> <p>XMPP 伺服器不得允許 VEN 對 VEN 通訊。</p> <p>XMPP 客戶端(VTN 及 VEN 兩者)應支援 XMPP 之存在(參照 7.4.5.5)。客戶端須實作 XMPP Ping，且其可用於部署(參照 7.4.5.6)。</p>

	<p>VEN 應僅使用由單一 JID 所定義之單一末端點。</p> <p>於對 XMPP 伺服器執行鑑別期間，x.509 憑證之共同名稱(CN) 應與客戶端之使用者名稱相匹配。</p> <p>VEN 應使用 XMPP 發現機制來確定 VTN 所提供的服務端點。</p> <p>VEN/VTN, XMPP</p> <p>VEN to VEN communication shall not be allowed by the XMPP server.</p> <p>An XMPP client (both VTN and VEN) shall support XMPP Presence (refer to 7.4.5.5). The client shall implement XMPP Ping and may use it in deployments (refer to 7.4.5.6).</p> <p>The VEN shall only use a single endpoint defined by a single JID.</p> <p>During authentication to the XMPP server, the Common Name (CN) of the x.509 certificate shall match the username of the client.</p> <p>VENs shall use the XMPP discovery mechanism to determine the service endpoints provided by the VTN.</p>
516	<p>VEN/VTN 及過期憑證</p> <p>VEN 及 VTN 不得在應用層與憑證過期的對方通訊。</p> <p>VEN/VTN, expired certificate</p> <p>VENs and VTNs shall not communicate at the application layer with a counter party that has an expired certificate.</p>
517	<p>VTN 及錯誤代碼</p> <p>為能與 VEN 通訊，VTN 須依以下定義的方法返回錯誤。</p> <p>如 TLS 交握失敗(例如因無效或過期的電子憑證)，VTN 應返回傳輸層錯誤代碼 403 (HTTP)，或<forbidden/>錯誤(XMPP)。</p> <p>如 TLS 交握成功，但 VEN 尚未註冊，應在適當(與請求相關)的酬載中回覆 463 應用錯誤代碼。</p> <p>如 TLS 交握成功且 VEN 已註冊，但 VEN 的酬載指定了錯誤的 ID (例如：venID 與註冊期間的一組 ID 不同)，應在適當(與請求相關)的酬載中回覆 452 應用錯誤代碼。</p> <p>VTN, error codes</p> <p>For communication with VEN, a VTN shall return errors in the ways defined below.</p> <p>If TLS handshake fails (e.g. because of invalid or expired digital certificate), the VTN shall return a transport layer error code of 403 for HTTP or a <forbidden/> error for XMPP.</p> <p>If TLS handshake is successful but the VEN is not yet registered, return a 463 application error code in an appropriate (relative to the request) payload.</p> <p>If TLS handshake is successful and the VEN is registered but a wrong ID is specified in the payload from the VEN (e.g. venID different from the one set during registration), return a 452 error</p>

	code in an appropriate (relative to the request) payload.
--	---

9.3 基數

表 13 說明本文件綱要的基數。

9.3 Cardinality

Cardinalities for the schema in this document are outlined in Table 13.

表 13 基數

Table 13 Cardinalities

物件 Object	元件 Element	OADR 2.0
EiEventType	eventDescriptor:eventStatus	1
EiEventType	eventDescriptor:createdDateTime	1
EiEventType	eiActivePeriod:properties	1
EiEventType	eiActivePeriod:properties/dtstart	1
EiEventType	eiActivePeriod: properties:duration	1
EiEventType	eiActivePeriod: properties:tolerance	0-1
EiEventType	eiActivePeriod:properties:x-eiNotification	1
EiEventType	eiActivePeriod: properties:x-eiRampUp	0-1
EiEventType	eiActivePeriod: properties:x-Recovery	0-1
EiEventType	eiEventSignals:eiEventSignal	1 (A 剖繪) 1 - 多(B 剖繪)
EiEventType	eiEventSignals:eiEventSignal:intervals	1
EiEventType	eiEventSignals:eiEventSignal:currentValue	1 (A 剖繪) 0 - 1 (B 剖繪)
EiEventType	eiEventSignals:eiEventSignal:intervals:interval	1 - 多
EiEventType	eiEventSignals:eiEventSignal:intervals:signalInterval:duration	1
EiEventType	eiEventSignals:eiEventSignal:intervals:signalInterval/uid	1
EiEventType	eiTarget	1

附錄 B

(規定)

剖繪延伸

Annex B

(normative)

Profile extensions

B.1 概觀

B.1 Overview

本標準綱要提供數種方法，其中各種列舉值及標準化值集(信號及報告)能延伸且不需要修改綱要。然而，使用延伸機制可能導致 VEN 及 VTN 間之互運性議題，除非兩者皆能曉得延伸。通常，延伸所依賴之綱要型式稱為 EiExtensionTokenType，其允許列舉值以“x-”前綴作延伸，不導致綱要驗核錯誤。

The schema of this document provide a number of ways in which various enumerated values and standardized sets of values (signal and reports) can be extended without the need to modify the schema. However, utilizing the extension mechanisms can cause interoperability issues between VEN and VTNs unless both are aware of the extensions. In general, the extensions rely on a schema type called EiExtensionTokenType, which allows enumerated values to be extended with a “x-” prefix without causing schema validation errors.

B.2 報告延伸

B.2 Report extension

本標準已定義一些標準化報告，預期符合大多數需要。必要時，能增加自訂報告，以附加“x-”前綴建立新的 reportName。既有的 reportType、單位(itemBase)及 readingType 值能用以建構新報告。必要時亦可在新值附加“x-”前綴，以定義自訂 reportType 及 readingType。

The document has defined a number of standardized reports that are intended to meet most needs. If necessary, custom reports can be added by creating a new reportName prefixed with “x-”. Existing reportType, units (itemBase), and readingType values can be utilized to construct the new report. Custom reportType and readingType's may also be defined if necessary by prefixing the new values with “x-”.

B.3 事件延伸

B.3 Event extension

本標準已定義一些標準化信號，預期符合大多數需要。必要時，能增加自訂信號，以附加“x-”前綴建立新的 signalName。既有的 signalType 及單元(itemBase)值能用以建構新信號。必要時亦可在新值附加“x-”前綴，以定義自訂 signalType。

The document has defined a number of standardized signals that are intended to

meet most needs. If necessary, custom signals can be added by creating a new signalName prefixed with "x-". Existing signalType and units (itemBase) values can be utilized to construct the new signal. Custom signalType can be defined if necessary by prefixing the new value with "x-".

B.4 其他延伸

B.4 Other Extensions

其他能經由 "x-" 前綴機制延伸之列舉綱要元件，包括 optReason、responseCode、oadrDataQuality、schemaVersion，以及裝置類別定義於包含在 EiEvent、EiOpt 及 EiReport 綱要之 endDeviceAsset 元件。

Other enumerated schema elements that can be extended via the "x-" prefix mechanism include optReason, responseCode, oadrDataQuality, schemaVersion, and device classes defined in the endDeviceAsset element contained in the EiEvent, EiOpt, and EiReport schemas.

VTN 可亦支援額外延伸機制，其能使用 oadrCreatedRegistration:oadrExtensions 物件與 VTN 通訊。此等延伸如何實作及可提供哪些功能非本標準之範圍。然而，宜特別注意任何延伸之實作與廣大 VEN 實作生態系統之互運性。

The VTN may also support additional extension mechanisms that can be communicated to the VEN using the oadrCreatedRegistration:oadrExtensions object. How these extensions are implemented and what functionality they may provide are outside the scope of this specification. However, great caution should be exercised in the implementation of any extension to insure interoperability with the large ecosystem of VEN implementations.

附錄 C

oadrPoll 情境

Annex C (normative)

oadrPoll scenarios

C.1 概觀

C.1 Overview

目前符合性規則允許 VTN 佇列中具多個酬載且從 VEN 接收 oadrPoll 之不同情境。附錄 C 列舉若干依據本標準且實作必須支援之情境。

The current conformance rules allow different scenarios when a VTN has multiple payloads in its queue and it receives oadrPoll from the VEN. Annex C exemplifies several scenarios that are in accordance with this document and thus have to be supported by implementations.

C.2 情境

C.2 Scenarios

情境 1：

1. VEN 發送 oadrPoll。
2. VTN 以應用層請求(oadrCreateReport)回應。
3. VEN 發送應用層回應(oadrCreatedReport)。
4. VTN 以確認(oadrResponse)回應。
5. VEN 發送另一個 oadrPoll。
6. VTN 以佇列中下一個項目回應。

Scenario 1:

1. VEN sends oadrPoll
2. VTN responds with application layer request (oadrCreateReport)
3. VEN sends application layer response (oadrCreatedReport)
4. VTN responds with acknowledgement (oadrResponse)
5. VEN sends another oadrPoll
6. VTN responds with next item in the queue

以上假設係屬典型行為。

It is assumed that this would be the typical behavior.

情境 2：

1. VEN 發送 oadrPoll。
2. VTN 以應用層請求(oadrCreateReport)回應。
3. VEN 發送另一個 oadrPoll。
4. VTN 忽略 oadrPoll 及不回應。
5. VEN 發送應用層回應(oadrCreatedReport)。
6. VTN 以確認(oadrResponse)回應。

7. VEN 發送另一個 oadrPoll。
8. VTN 以佇列中下一個項目回應。

Scenario 2:

1. VEN sends oadrPoll
2. VTN responds with application layer request (oadrCreateReport)
3. VEN sends another oadrPoll
4. VTN ignores the oadrPoll and does not respond
5. VEN sends application layer response (oadrCreatedReport)
6. VTN responds with acknowledgement (oadrResponse)
7. VEN sends another oadrPoll
8. VTN responds with next item in the queue

若擱置中之應用層回應可預期，則符合性規則允許 VTN 選項忽略 oadrPoll。

The conformance rules allow the VTN to optionally ignore oadrPoll if a pending application layer response is expected

情境 3：

1. VEN 發送 oadrPoll。
2. VTN 以應用層請求(oadrCreateReport)回應。
3. VEN 發送另一個 oadrPoll。
4. VTN 以應用層請求(oadrDistributeEvent)回應。
5. VEN 發送應用層回應(oadrCreatedReport)。
6. VTN 以確認(oadrResponse)回應。
7. VEN 發送應用層回應(oadrCreatedEvent)。
8. VTN 以確認(oadrResponse)回應。
9. VEN 發送另一個 oadrPoll。
10. VTN 佇列中下一個項目回應。

Scenario 3:

1. VEN sends oadrPoll
2. VTN responds with application layer request (oadrCreateReport)
3. VEN sends another oadrPoll
4. VTN responds with application layer request (oadrDistributeEvent)
5. VEN sends application layer response (oadrCreatedReport)
6. VTN responds with acknowledgement (oadrResponse)
7. VEN sends application layer response (oadrCreatedEvent)
8. VTN responds with acknowledgement (oadrResponse)
9. VEN sends another oadrPoll
10. VTN responds with next item in the queue

VEN 實作可能的行為類似情境 1 (雖然其他情境亦有效): VEN 將不再推送直至從 VTN 對最近期酬載提供應用層回應。

VEN implementations will likely behave like scenario 1 (although the other scenarios are also valid): the VEN will not poll again until being provided an application layer response to the most recent payload from the VTN.

附錄 D

VEN、VTN、resource、及 party 定義

Annex D

(normative)

Definition of VEN, VTN, resource, and party

典型 DR 互動中，電網側個體(例：服務提供者，諸如公共事業、ISO 等)有意嘗試通過稱為資源之邏輯結構修改需求面個體(例：用戶)的負載剖繪。

In typical DR interactions, grid side entities (e.g. service providers such as utilities, ISOs, etc.) intentionally try to modify the load profiles of demand-side entities (e.g. customers) through a logical construct known as a Resource.

資源係負載剖繪相關聯的需求面商品。資源之例包括：

- 單一負載，諸如熱水器；
- 建築物內的負載集合，以使整個建築成為資源；
- 校園建築之集合；
- 依聚合資源之情況，不同用戶的集合。

A Resource is a demand side commodity that is associated with a load profile.

Examples of Resources include the following:

- a single load such as a water heater;
- a collection of loads within a building such that the entire building is the Resource;
- a collection of buildings across a campus;
- a collection of disparate customers as in the case of aggregated Resources.

關鍵是資源與負載剖繪相關聯，該剖繪可能會受到電網側服務提供者所影響。資源可以階層式樣由其他資源組成。資產係資源之特殊類型，不包含任何子資源，通常指特定的實體負載。

The key is that a Resource is associated with a load profile that can be influenced by gridside service providers. Resources may be composed of other Resources in a hierarchical fashion. An Asset is a special type of a Resource that does not contain any sub-Resources and typically refers to specific physical loads.

服務提供者藉由發送“適用於”資源的“DR 信號”來影響資源的負載剖繪。注意，這並不意味著服務提供者與資源進行通訊。

A service provider influences the load profile of a Resource by sending out “DR signals” that are “applied” to Resources. Note that this does not imply that a service provider communicates with resources.

伙伴(partly)係訂立某種營運關係或契約之個體。服務提供者及用戶係伙伴。資源係伙伴所“擁有”之商品。

A Party is an entity that enters into some sort of business relationship or contract. Service providers and customers are Parties. Resources are commodities that are “

owned” by Parties.

VEN 是與方和資源關聯的需求方實體，並以服務的形式形成通訊端點，可用於促進與該 VEN 相關的需求方資源和方之間的通訊。注意，當資源和締約方與 VEN 相關聯時，它可能在那些關聯的背景下在系統級別上具有“含義”，但是 VEN 的主要功能是一種傳達與 VEN 相關聯的締約方和資源的手段。

A VEN is a demand-side entity that is associated with Parties and Resources and forms the communications endpoint in the form of services that can be used to facilitate communications concerning the demand-side Resources and Parties that are associated with that VEN. Note that when Resources and Parties are associated with a VEN, it may take on “meaning” at a system level within the context of those associations, but the primary function of the VEN is a means of communicating about the Parties and Resources associated with the VEN.

VTN 係與服務提供者關聯之電網側實體，並以服務形式形成通訊端點，該服務可用以促進與有關資源和各方的需求側實體的通訊。

A VTN is a grid-side entity that is associated with service providers and forms the communications endpoint in the form of services that can be used to facilitate communications with demand-side entities concerning Resources and Parties.

附錄 E

(規定)

本標準綱要

Annex E

(normative)

IEC 62746-10-1 Schema

本附件包含整體組成本標準綱要之 16 個綱要定義檔案之表列。根綱要檔案為 oadr_20b.xsd。所有其他綱要檔案係依要求匯入。

This annex contains listings of the 16 schema definition files that collectively comprise the IEC 62746-10-1 schema. The root schema file is oadr_20b.xsd. All other schema files are imported as required.

oadr_20b.xsd

```
<?xml version=" 1.0" encoding=" ISO-8859-1" ?>
<xs:schema xmlns:xs=" http://www.w3.org/2001/XMLSchema " xmlns:dsig11=" http://www.w3.org/2009/xmldsig11# " xmlns:ds=" http://www.w3.org/2000/09/xmldsig# " xmlns:oadr=" http://openadr.org/oadr-2.0b/2012/07 " xmlns:clm5ISO42173A=" urn:un:unece:uncefact:codelist:standard:5:ISO42173A:2010-04-07 " xmlns:pyld=" http://docs.oasis-open.org/ns/energyinterop/201110/payloads " xmlns:ei=" http://docs.oasis-open.org/ns/energyinterop/201110 " xmlns:scale=" http://docs.oasis-open.org/ns/emix/2011/06/siscale " xmlns:emix=" http://docs.oasis-open.org/ns/emix/2011/06 " xmlns:strm=" urn:ietf:params:xml:ns:icalendar-2.0:stream " xmlns:xcal=" urn:ietf:params:xml:ns:icalendar-2.0 " xmlns:power=" http://docs.oasis-open.org/ns/emix/2011/06/power " xmlns:gb=" http://naesb.org/espi " xmlns:atom=" http://www.w3.org/2005/Atom " targetNamespace=" http://openadr.org/oadr-2.0b/2012/07 " elementFormDefault=" qualified " attributeFormDefault=" qualified" >
  <xs:import namespace=" urn:ietf:params:xml:ns:icalendar-2.0:stream " schemaLocation=" oadr_strm_20b.xsd" />
  <xs:import namespace=" http://docs.oasis-open.org/ns/energyinterop/201110 " schemaLocation=" oadr_ei_20b.xsd" />
  <xs:import namespace=" http://docs.oasis-open.org/ns/energyinterop/201110/payloads " schemaLocation=" oadr_pyld_20b.xsd" />
  <xs:import namespace=" http://docs.oasis-open.org/ns/emix/2011/06 " schemaLocation=" oadr_emix_20b.xsd" />
  <xs:import namespace=" http://docs.oasis-open.org/ns/emix/2011/06/siscale " schemaLocation=" oadr_siscale_20b.xsd" />
  <xs:import namespace=" urn:ietf:params:xml:ns:icalendar-2.0 " schemaLocation=" oadr_xcal_20b.xsd" />
  <xs:import namespace=" urn:un:unece:uncefact:codelist:standard:5:ISO42173A:2010-04-07 " schemaLocation=" oadr_ISO_ISO3AlphaCurrencyCode_20100407.xsd" />
  <xs:import namespace=" http://naesb.org/espi" schemaLocation=" oadr_greenbutton.xsd" />
  <xs:import namespace=" http://www.w3.org/2005/Atom" schemaLocation=" oadr_atom.xsd" />
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    <xs:import namespace=" http://www.w3.org/2009/xmlsig11# " schemaLocation="
oadr_xmlsig11.xsd" />
    <xs:import namespace=" http://www.w3.org/2000/09/xmlsig# " schemaLocation="
oadr_xmlsig.xsd" />
    <xs:import namespace=" http://openadr.org/oadr-2.0b/2012/07/xmlsig-properties "
schemaLocation=" oadr_xmlsig-properties-schema.xsd" />
    <xs:element name=" oadrPayload" >
      <xs:complexType>
        <xs:sequence>
          <xs:element ref=" ds:Signature" minOccurs=" 0" />
          <xs:element ref=" oadr:oadrSignedObject" />
        </xs:sequence>
      </xs:complexType>
    </xs:element>
    <xs:element name=" oadrSignedObject" >
      <xs:complexType>
        <xs:choice>
          <xs:element ref=" oadr:oadrDistributeEvent" />
          <xs:element ref=" oadr:oadrCreatedEvent" />
          <xs:element ref=" oadr:oadrRequestEvent" />
          <xs:element ref=" oadr:oadrResponse" />
          <xs:element ref=" oadr:oadrCancelOpt" />
          <xs:element ref=" oadr:oadrCanceledOpt" />
          <xs:element ref=" oadr:oadrCreateOpt" />
          <xs:element ref=" oadr:oadrCreatedOpt" />
          <xs:element ref=" oadr:oadrCancelReport" />
          <xs:element ref=" oadr:oadrCanceledReport" />
          <xs:element ref=" oadr:oadrCreateReport" />
          <xs:element ref=" oadr:oadrCreatedReport" />
          <xs:element ref=" oadr:oadrRegisterReport" />
          <xs:element ref=" oadr:oadrRegisteredReport" />
          <xs:element ref=" oadr:oadrUpdateReport" />
          <xs:element ref=" oadr:oadrUpdatedReport" />
          <xs:element ref=" oadr:oadrCancelPartyRegistration" />
          <xs:element ref=" oadr:oadrCanceledPartyRegistration" />
          <xs:element ref=" oadr:oadrCreatePartyRegistration" />
          <xs:element ref=" oadr:oadrCreatedPartyRegistration" />
          <xs:element ref=" oadr:oadrRequestReregistration" />
          <xs:element ref=" oadr:oadrQueryRegistration" />
          <xs:element ref=" oadr:oadrPoll" />
        </xs:choice>
        <xs:attribute name=" Id" type=" xs:ID" use=" optional" />
      </xs:complexType>
    </xs:element>
    <xs:element name=" oadrDistributeEvent" type=" oadr:oadrDistributeEventType" >
      <xs:annotation>
        <xs:documentation>Send DR Events to a VEN</xs:documentation>
      </xs:annotation>
    </xs:element>

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</xs:annotation>
</xs:element>
<xs:complexType name=" oadrDistributeEventType" >
  <xs:sequence>
    <xs:element ref=" ei:eiResponse" minOccurs=" 0" />
    <xs:element ref=" pyld:requestID" />
    <xs:element ref=" ei:vtnID" />
    <xs:element name=" oadrEvent" minOccurs=" 0" maxOccurs=" unbounded" >
      <xs:annotation>
        <xs:documentation>An object containing a demand response event</xs:documentation>
      </xs:annotation>
      <xs:complexType>
        <xs:sequence>
          <xs:element ref=" ei:eiEvent" />
          <xs:element ref=" oadr:oadrResponseRequired" />
        </xs:sequence>
      </xs:complexType>
    </xs:element>
  </xs:sequence>
  <xs:attribute ref=" ei:schemaVersion" use=" optional" />
</xs:complexType>
<xs:element name=" oadrCreatedEvent" type=" oadr:oadrCreatedEventType" />
<xs:complexType name=" oadrCreatedEventType" >
  <xs:sequence>
    <xs:element ref=" pyld:eiCreatedEvent" />
  </xs:sequence>
  <xs:attribute ref=" ei:schemaVersion" use=" optional" />
</xs:complexType>
<xs:element name=" oadrRequestEvent" type=" oadr:oadrRequestEventType" />
<xs:complexType name=" oadrRequestEventType" >
  <xs:sequence>
    <xs:element ref=" pyld:eiRequestEvent" />
  </xs:sequence>
  <xs:attribute ref=" ei:schemaVersion" use=" optional" />
</xs:complexType>
<xs:element name=" oadrResponse" type=" oadr:oadrResponseType" />
<xs:complexType name=" oadrResponseType" >
  <xs:sequence>
    <xs:element ref=" ei:eiResponse" />
    <xs:element ref=" ei:venID" minOccurs=" 0" />
  </xs:sequence>
  <xs:attribute ref=" ei:schemaVersion" use=" optional" />
</xs:complexType>
<xs:element name=" oadrCancelOpt" type=" oadr:oadrCancelOptType" >
  <xs:annotation>
    <xs:documentation>Cancel an opt schedule</xs:documentation>
  </xs:annotation>
</xs:element>

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<xs:complexType name=" oadrCancelOptType" >
  <xs:sequence>
    <xs:element ref=" pyld:requestID" />
    <xs:element ref=" ei:optID" />
    <xs:element ref=" ei:venID" />
  </xs:sequence>
  <xs:attribute ref=" ei:schemaVersion" use=" optional" />
</xs:complexType>
<xs:element name=" oadrCanceledOpt" type=" oadr:oadrCanceledOptType" >
  <xs:annotation>
    <xs:documentation>Acknowledge cancelation of an opt schedule</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:complexType name=" oadrCanceledOptType" >
  <xs:sequence>
    <xs:element ref=" ei:eiResponse" />
    <xs:element ref=" ei:optID" minOccurs=" 0" />
  </xs:sequence>
  <xs:attribute ref=" ei:schemaVersion" use=" optional" />
</xs:complexType>
<xs:element name=" oadrCreateOpt" type=" oadr:oadrCreateOptType" >
  <xs:annotation>
    <xs:documentation>Create an optIn or optOut schedule</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:complexType name=" oadrCreateOptType" >
  <xs:complexContent>
    <xs:extension base=" ei:EiOptType" >
      <xs:sequence>
        <xs:element ref=" pyld:requestID" />
        <xs:element ref=" ei:qualifiedEventID" minOccurs=" 0" />
        <xs:element ref=" ei:eiTarget" />
        <xs:element ref=" oadr:oadrDeviceClass" minOccurs=" 0" />
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:element name=" oadrCreatedOpt" type=" oadr:oadrCreatedOptType" >
  <xs:annotation>
    <xs:documentation>Acknowledge receipt of an opt schedule</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:complexType name=" oadrCreatedOptType" >
  <xs:sequence>
    <xs:element ref=" ei:eiResponse" />
    <xs:element ref=" ei:optID" />
  </xs:sequence>
  <xs:attribute ref=" ei:schemaVersion" use=" optional" />
</xs:complexType>

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<xs:element name=" oadrCancelReport" type=" oadr:oadrCancelReportType" >
  <xs:annotation>
    <xs:documentation>Cancel a report</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:complexType name=" oadrCancelReportType" >
  <xs:sequence>
    <xs:element ref=" pyld:requestID" />
    <xs:element ref=" ei:reportRequestID" maxOccurs=" unbounded" />
    <xs:element ref=" pyld:reportToFollow" />
    <xs:element ref=" ei:venID" minOccurs=" 0" />
  </xs:sequence>
  <xs:attribute ref=" ei:schemaVersion" use=" optional" />
</xs:complexType>
<xs:element name=" oadrCanceledReport" type=" oadr:oadrCanceledReportType" />
<xs:complexType name=" oadrCanceledReportType" >
  <xs:sequence>
    <xs:element ref=" ei:eiResponse" />
    <xs:element ref=" oadr:oadrPendingReports" />
    <xs:element ref=" ei:venID" minOccurs=" 0" />
  </xs:sequence>
  <xs:attribute ref=" ei:schemaVersion" use=" optional" />
</xs:complexType>
<xs:element name=" oadrCreateReport" type=" oadr:oadrCreateReportType" >
  <xs:annotation>
    <xs:documentation>Request report from other party</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:complexType name=" oadrCreateReportType" >
  <xs:sequence>
    <xs:element ref=" pyld:requestID" />
    <xs:element ref=" oadr:oadrReportRequest" maxOccurs=" unbounded" >
      <xs:annotation>
        <xs:documentation>Request report</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element ref=" ei:venID" minOccurs=" 0" />
  </xs:sequence>
  <xs:attribute ref=" ei:schemaVersion" use=" optional" />
</xs:complexType>
<xs:element name=" oadrCreatedReport" type=" oadr:oadrCreatedReportType" >
  <xs:annotation>
    <xs:documentation>Acknowledge the request for report was received</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:complexType name=" oadrCreatedReportType" >
  <xs:sequence>
    <xs:element ref=" ei:eiResponse" />

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    <xs:element ref=" oadr:oadrPendingReports" >
      <xs:annotation>
        <xs:documentation>List of periodic reports that have not yet been
delivered</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element ref=" ei:venID" minOccurs=" 0" />
  </xs:sequence>
  <xs:attribute ref=" ei:schemaVersion" use=" optional" />
</xs:complexType>
<xs:element name=" oadrRegisterReport" type=" oadr:oadrRegisterReportType" >
  <xs:annotation>
    <xs:documentation>Register Metadata report settings with other party</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:complexType name=" oadrRegisterReportType" >
  <xs:sequence>
    <xs:element ref=" pyld:requestID" />
    <xs:element ref=" oadr:oadrReport" minOccurs=" 0" maxOccurs=" unbounded" />
    <xs:element ref=" ei:venID" minOccurs=" 0" />
    <xs:element ref=" ei:reportRequestID" minOccurs=" 0" />
  </xs:sequence>
  <xs:attribute ref=" ei:schemaVersion" use=" optional" />
</xs:complexType>
<xs:element name=" oadrRegisteredReport" type=" oadr:oadrRegisteredReportType" >
  <xs:annotation>
    <xs:documentation>Acknowledge registration of Metadata report by other
party</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:complexType name=" oadrRegisteredReportType" >
  <xs:sequence>
    <xs:element ref=" ei:eiResponse" />
    <xs:element ref=" oadr:oadrReportRequest" minOccurs=" 0" maxOccurs=" unbounded" />
    <xs:element ref=" ei:venID" minOccurs=" 0" />
  </xs:sequence>
  <xs:attribute ref=" ei:schemaVersion" use=" optional" />
</xs:complexType>
<xs:element name=" oadrUpdateReport" type=" oadr:oadrUpdateReportType" >
  <xs:annotation>
    <xs:documentation>Send a previously requested report</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:complexType name=" oadrUpdateReportType" >
  <xs:sequence>
    <xs:element ref=" pyld:requestID" />
    <xs:element ref=" oadr:oadrReport" minOccurs=" 0" maxOccurs=" unbounded" />
    <xs:element ref=" ei:venID" minOccurs=" 0" />
  </xs:sequence>

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    <xs:attribute ref=" ei:schemaVersion" use=" optional" />
</xs:complexType>
<xs:element name=" oadrUpdatedReport" type=" oadr:oadrUpdatedReportType" >
    <xs:annotation>
        <xs:documentation>Acknowledge receipt of a report</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:complexType name=" oadrUpdatedReportType" >
    <xs:sequence>
        <xs:element ref=" ei:eiResponse" />
        <xs:element ref=" oadr:oadrCancelReport" minOccurs=" 0" />
        <xs:element ref=" ei:venID" minOccurs=" 0" />
    </xs:sequence>
    <xs:attribute ref=" ei:schemaVersion" use=" optional" />
</xs:complexType>
<xs:element name=" oadrCancelPartyRegistration" type=" oadr:oadrCancelPartyRegistrationType" >
    <xs:annotation>
        <xs:documentation>Cancel a registration</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:complexType name=" oadrCancelPartyRegistrationType" >
    <xs:sequence>
        <xs:element ref=" pyld:requestID" />
        <xs:element ref=" ei:registrationID" />
        <xs:element ref=" ei:venID" minOccurs=" 0" />
    </xs:sequence>
    <xs:attribute ref=" ei:schemaVersion" use=" optional" />
</xs:complexType>
<xs:element name=" oadrCanceledPartyRegistration" type="
oadr:oadrCanceledPartyRegistrationType" >
    <xs:annotation>
        <xs:documentation>Acknowledge cancelation of registration</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:complexType name=" oadrCanceledPartyRegistrationType" >
    <xs:sequence>
        <xs:element ref=" ei:eiResponse" />
        <xs:element ref=" ei:registrationID" minOccurs=" 0" />
        <xs:element ref=" ei:venID" minOccurs=" 0" />
    </xs:sequence>
    <xs:attribute ref=" ei:schemaVersion" use=" optional" />
</xs:complexType>
<xs:element name=" oadrCreatePartyRegistration" type=" oadr:oadrCreatePartyRegistrationType" >
    <xs:annotation>
        <xs:documentation>Used by VEN to initiate registration with VTN</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:complexType name=" oadrCreatePartyRegistrationType" >
    <xs:sequence>

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<xs:element ref=" pyld:requestID" />
<xs:element ref=" ei:registrationID" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>Used for reregistering an existing registration</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element ref=" ei:venID" minOccurs=" 0" />
<xs:element ref=" oadr:oadrProfileName" />
<xs:element ref=" oadr:oadrTransportName" />
<xs:element ref=" oadr:oadrTransportAddress" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>Address of this VEN. Not required if http pull model</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element ref=" oadr:oadrReportOnly" >
  <xs:annotation>
    <xs:documentation>ReportOnlyDeviceFlag – True or False</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element ref=" oadr:oadrXmlSignature" >
  <xs:annotation>
    <xs:documentation>Implementation supports XML signatures – True or
False</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element ref=" oadr:oadrVenName" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>Human readable name for VEN</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element ref=" oadr:oadrHttpPullModel" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>If transport is simpleHttp indicate if VEN is operating in pull exchange
model – true or false</xs:documentation>
  </xs:annotation>
</xs:element>
</xs:sequence>
<xs:attribute ref=" ei:schemaVersion" use=" optional" />
</xs:complexType>
<xs:element name=" oadrCreatedPartyRegistration" type=" oadr:oadrCreatedPartyRegistrationType"
>
  <xs:annotation>
    <xs:documentation>Acknowledge receipt of VEN registration, provide VTN registration
info</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:complexType name=" oadrCreatedPartyRegistrationType" >
  <xs:sequence>
    <xs:element ref=" ei:eiResponse" />
    <xs:element ref=" ei:registrationID" minOccurs=" 0" />

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    <xs:element ref=" ei:venID" minOccurs=" 0" >
      <xs:annotation>
        <xs:documentation>venID not included in query unless already
registered</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element ref=" ei:vtnID" />
    <xs:element ref=" oadr:oadrProfiles" >
      <xs:annotation>
        <xs:documentation>VTN response to query registration returns all supported. This element is
not required for a registration response</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element ref=" oadr:oadrRequestedOadrPollFreq" minOccurs=" 0" >
      <xs:annotation>
        <xs:documentation>HTTP Pull Only – The VEN shall send an oadrPoll payload to the VTN at
most once for each duration specified by this element</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element ref=" oadr:oadrServiceSpecificInfo" minOccurs=" 0" />
    <xs:element name=" oadrExtensions" minOccurs=" 0" >
      <xs:complexType>
        <xs:sequence>
          <xs:element name=" oadrExtension" minOccurs=" 0" maxOccurs=" unbounded" >
            <xs:complexType>
              <xs:sequence>
                <xs:element name=" oadrExtensionName" type=" xs:string" />
                <xs:element ref=" oadr:oadrInfo" minOccurs=" 0" maxOccurs="
unbounded" />
              </xs:sequence>
            </xs:complexType>
          </xs:element>
        </xs:sequence>
      </xs:complexType>
    </xs:element>
    <xs:attribute ref=" ei:schemaVersion" use=" optional" />
  </xs:complexType>
  <xs:element name=" oadrRequestReregistration" type=" oadr:oadrRequestReregistrationType" >
    <xs:annotation>
      <xs:documentation>Used by VTN to request that the VEN reregister</xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:complexType name=" oadrRequestReregistrationType" >
    <xs:sequence>
      <xs:element ref=" ei:venID" />
    </xs:sequence>
    <xs:attribute ref=" ei:schemaVersion" use=" optional" />
  </xs:complexType>

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<xs:element name=" oadrQueryRegistration" type=" oadr:oadrQueryRegistrationType" >
  <xs:annotation>
    <xs:documentation>Query VTN for registration information without actually
registering</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:complexType name=" oadrQueryRegistrationType" >
  <xs:sequence>
    <xs:element ref=" pyld:requestID" />
  </xs:sequence>
  <xs:attribute ref=" ei:schemaVersion" use=" optional" />
</xs:complexType>
<xs:element name=" oadrPoll" type=" oadr:oadrPollType" >
  <xs:annotation>
    <xs:documentation>Query pull VTN for payloads with new or modified
information</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:complexType name=" oadrPollType" >
  <xs:sequence>
    <xs:element ref=" ei:venID" />
  </xs:sequence>
  <xs:attribute ref=" ei:schemaVersion" use=" optional" />
</xs:complexType>
<xs:element name=" oadrVenName" type=" xs:string" >
  <xs:annotation>
    <xs:documentation>VEN name. May be used in VTN GUI</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" oadrProfiles" >
  <xs:annotation>
    <xs:documentation>OpenADR profiles supported by the implementation</xs:documentation>
  </xs:annotation>
  <xs:complexType>
    <xs:sequence>
      <xs:element name=" oadrProfile" maxOccurs=" unbounded" >
        <xs:complexType>
          <xs:sequence>
            <xs:element ref=" oadr:oadrProfileName" />
            <xs:element ref=" oadr:oadrTransports" />
          </xs:sequence>
        </xs:complexType>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name=" oadrProfileName" type=" oadr:oadrProfileType" >
  <xs:annotation>
    <xs:documentation>OpenADR profile name such as 2.0a or 2.0b.</xs:documentation>
  </xs:annotation>

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</xs:element>
<xs:simpleType name=" oadrProfileType" >
  <xs:restriction base=" xs:token" >
    <xs:enumeration value=" 2.0a" />
    <xs:enumeration value=" 2.0b" />
  </xs:restriction>
</xs:simpleType>
<xs:element name=" oadrTransports" >
  <xs:annotation>
    <xs:documentation>OpenADR transports supported by implementation</xs:documentation>
  </xs:annotation>
  <xs:complexType>
    <xs:sequence>
      <xs:element name=" oadrTransport" maxOccurs=" unbounded" >
        <xs:complexType>
          <xs:sequence>
            <xs:element ref=" oadr:oadrTransportName" />
          </xs:sequence>
        </xs:complexType>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name=" oadrTransportName" type=" oadr:oadrTransportType" >
  <xs:annotation>
    <xs:documentation>OpenADR transport name such as simpleHttp or xmpp</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:simpleType name=" oadrTransportType" >
  <xs:restriction base=" xs:token" >
    <xs:enumeration value=" simpleHttp" />
    <xs:enumeration value=" xmpp" />
  </xs:restriction>
</xs:simpleType>
<xs:element name=" oadrHttpPullModel" type=" xs:boolean" />
<xs:element name=" oadrServiceSpecificInfo" >
  <xs:annotation>
    <xs:documentation>Service specific registration information</xs:documentation>
  </xs:annotation>
  <xs:complexType>
    <xs:sequence>
      <xs:element name=" oadrService" minOccurs=" 0" maxOccurs=" unbounded" >
        <xs:complexType>
          <xs:sequence>
            <xs:element ref=" oadr:oadrServiceName" />
            <xs:element ref=" oadr:oadrInfo" maxOccurs=" unbounded" />
          </xs:sequence>
        </xs:complexType>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
</xs:element>

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    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name=" oadrServiceName" type=" oadr:oadrServiceNameType" />
<xs:simpleType name=" oadrServiceNameType" >
  <xs:restriction base=" xs:token" >
    <xs:enumeration value=" EiEvent" />
    <xs:enumeration value=" EiOpt" />
    <xs:enumeration value=" EiReport" />
    <xs:enumeration value=" EiRegisterParty" />
    <xs:enumeration value=" OadrPoll" />
  </xs:restriction>
</xs:simpleType>
<xs:element name=" oadrInfo" >
  <xs:annotation>
    <xs:documentation>A key value pair of service specific registration
information</xs:documentation>
  </xs:annotation>
  <xs:complexType>
    <xs:sequence>
      <xs:element name=" oadrKey" type=" xs:string" />
      <xs:element name=" oadrValue" type=" xs:string" />
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name=" oadrXmlSignature" type=" xs:boolean" >
  <xs:annotation>
    <xs:documentation>Implementation supports XML signature</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" oadrReportOnly" type=" xs:boolean" >
  <xs:annotation>
    <xs:documentation>ReportOnlyDeviceFlag</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" oadrTransportAddress" type=" xs:string" >
  <xs:annotation>
    <xs:documentation>Root address used to communicate with other party. Should include port if
required</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" oadrRequestedOadrPollFreq" type=" xcal:DurationPropType" >
  <xs:annotation>
    <xs:documentation>The VEN shall send an oadrPoll payload to the VTN at most once for each
duration specified by this element</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" oadrResponseRequired" type=" oadr:ResponseRequiredType" >
  <xs:annotation>

```

```

    <xs:documentation>Controls when optIn/optOut response is required. Can be always or
never</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:simpleType name=" ResponseRequiredType" >
  <xs:annotation>
    <xs:documentation>Defines what type of response is required</xs:documentation>
  </xs:annotation>
  <xs:restriction base=" xs:string" >
    <xs:enumeration value=" always" >
      <xs:annotation>
        <xs:documentation>Always send a response for every event received.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value=" never" >
      <xs:annotation>
        <xs:documentation>Never respond.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
  </xs:restriction>
</xs:simpleType>
<xs:element name=" oadrPendingReports" type=" oadr:oadrPendingReportsType" />
<xs:complexType name=" oadrPendingReportsType" >
  <xs:sequence>
    <xs:element ref=" ei:reportRequestID" minOccurs=" 0" maxOccurs=" unbounded" />
  </xs:sequence>
</xs:complexType>
<xs:element name=" customUnit " type=" oadr:BaseUnitType " substitutionGroup="
emix:itemBase" />
<xs:complexType name=" BaseUnitType" mixed=" false" >
  <xs:annotation>
    <xs:documentation>Custom Units</xs:documentation>
  </xs:annotation>
  <xs:complexContent mixed=" false" >
    <xs:extension base=" emix:ItemBaseType" >
      <xs:sequence>
        <xs:element name=" itemDescription" type=" xs:string" />
        <xs:element name=" itemUnits" type=" xs:string" />
        <xs:element ref=" scale:siScaleCode" />
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:element name=" current" type=" oadr:CurrentType" substitutionGroup=" emix:itemBase" />
<xs:complexType name=" CurrentType" mixed=" false" >
  <xs:annotation>
    <xs:documentation>Current</xs:documentation>
  </xs:annotation>
  <xs:complexContent mixed=" false" >

```

```

<xs:extension base=" emix:ItemBaseType" >
  <xs:sequence>
    <xs:element name=" itemDescription" type=" xs:string" fixed=" Current" />
    <xs:element name=" itemUnits" type=" xs:string" fixed=" A" />
    <xs:element ref=" scale:siScaleCode" />
  </xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:element name=" currency" type=" oadr:currencyType" substitutionGroup=" emix:itemBase" />
<xs:element name=" currencyPerKWh" type=" oadr:currencyType" substitutionGroup="
emix:itemBase" />
<xs:element name=" currencyPerKW" type=" oadr:currencyType" substitutionGroup="
emix:itemBase" />
<xs:element name=" currencyPerThm" type=" oadr:currencyType" substitutionGroup="
emix:itemBase" />
<xs:complexType name=" currencyType" mixed=" false" >
  <xs:annotation>
    <xs:documentation>currency</xs:documentation>
  </xs:annotation>
  <xs:complexContent mixed=" false" >
    <xs:extension base=" emix:ItemBaseType" >
      <xs:sequence>
        <xs:element name=" itemDescription" type=" oadr:currencyItemDescriptionType" />
        <xs:element name=" itemUnits" type="
clm5ISO42173A:ISO3AlphaCurrencyCodeContentType" />
      <xs:annotation>
        <xs:documentation>ISO enumeration of currency types, such as
USD</xs:documentation>
      </xs:annotation>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:simpleType name=" currencyItemDescriptionType" >
  <xs:restriction base=" xs:token" >
    <xs:enumeration value=" currency" />
    <xs:enumeration value=" currencyPerKW" />
    <xs:enumeration value=" currencyPerKWh" />
  </xs:restriction>
</xs:simpleType>
<xs:element name=" frequency" type=" oadr:FrequencyType" substitutionGroup="
emix:itemBase" />
<xs:complexType name=" FrequencyType" mixed=" false" >
  <xs:annotation>
    <xs:documentation>Frequency</xs:documentation>

```

```

</xs:annotation>
<xs:complexContent mixed=" false" >
  <xs:extension base=" emix:ItemBaseType" >
    <xs:sequence>
      <xs:element name=" itemDescription" type=" xs:string" fixed=" Frequency" />
      <xs:element name=" itemUnits" type=" xs:string" fixed=" Hz" />
      <xs:element ref=" scale:siScaleCode" />
    </xs:sequence>
  </xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:element name=" Therm" type=" oadr:ThermType" substitutionGroup=" emix:itemBase" />
<xs:complexType name=" ThermType" mixed=" false" >
  <xs:annotation>
    <xs:documentation>Therm</xs:documentation>
  </xs:annotation>
  <xs:complexContent mixed=" false" >
    <xs:extension base=" emix:ItemBaseType" >
      <xs:sequence>
        <xs:element name=" itemDescription" type=" xs:string" fixed=" Therm" />
        <xs:element name=" itemUnits" type=" xs:string" fixed=" thm" />
        <xs:element ref=" scale:siScaleCode" />
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:element name=" temperature" type=" oadr:temperatureType" substitutionGroup="
emix:itemBase" />
<xs:complexType name=" temperatureType" mixed=" false" >
  <xs:annotation>
    <xs:documentation>temperature</xs:documentation>
  </xs:annotation>
  <xs:complexContent mixed=" false" >
    <xs:extension base=" emix:ItemBaseType" >
      <xs:sequence>
        <xs:element name=" itemDescription" type=" xs:string" fixed=" temperature" />
        <xs:element name=" itemUnits" type=" oadr:temperatureUnitType" >
          <xs:documentation>Temperature in Celsius or Fahrenheit</xs:documentation>
        </xs:element>
        <xs:element ref=" scale:siScaleCode" />
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:simpleType name=" temperatureUnitType" >
  <xs:restriction base=" xs:token" >
    <xs:enumeration value=" celsius" />
    <xs:enumeration value=" fahrenheit" />
  </xs:restriction>
</xs:simpleType>

```

```

    </xs:restriction>
  </xs:simpleType>
  <xs:element name=" pulseCount " type=" oadr:pulseCountType " substitutionGroup="
emix:itemBase" />
  <xs:element name=" pulseFactor" type=" xs:float " >
    <xs:annotation>
      <xs:documentation>kWh per count</xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:complexType name=" pulseCountType" mixed=" false" >
    <xs:annotation>
      <xs:documentation>Pulse Count</xs:documentation>
    </xs:annotation>
    <xs:complexContent mixed=" false" >
      <xs:extension base=" emix:ItemBaseType" >
        <xs:sequence>
          <xs:element name=" itemDescription" type=" xs:string" fixed=" pulse count" />
          <xs:element name=" itemUnits" type=" xs:string" fixed=" count" >
            <xs:annotation>
              <xs:documentation>Pulse count from meter</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element ref=" oadr:pulseFactor" />
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:element name=" oadrReportRequest" type=" oadr:oadrReportRequestType" />
  <xs:complexType name=" oadrReportRequestType" >
    <xs:annotation>
      <xs:documentation>This type is used to request an EiReport</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element ref=" ei:reportRequestID" />
      <xs:element ref=" ei:reportSpecifier" />
    </xs:sequence>
  </xs:complexType>
  <xs:element name=" oadrReport" type=" oadr:oadrReportType" />
  <xs:complexType name=" oadrReportType" >
    <xs:annotation>
      <xs:documentation>eiReport is a Stream of [measurements] recorded over time and delivered to the
requestor periodically. The readings may be actual, computed, summed if derived in some other
manner.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base=" strm:StreamBaseType" >
        <xs:sequence>
          <xs:element ref=" ei:eiReportID" minOccurs=" 0" >
            <xs:annotation>

```

```

        <xs:documentation>reference ID to this report.</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:element ref=" oadr:oadrReportDescription " minOccurs=" 0 " maxOccurs="
unbounded" >
    <xs:annotation>
        <xs:documentation>Define data points the implementation is capable of reporting on.
Only used in Metadata report</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:element ref=" ei:reportRequestID" >
    <xs:annotation>
        <xs:documentation>Reference to the oadrCreateReport request that defined this
report.</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:element ref=" ei:reportSpecifierID" >
    <xs:documentation>Reference to Metadata report from which this report was
derived.</xs:documentation>
</xs:element>
<xs:element ref=" ei:reportName" minOccurs=" 0" >
    <xs:annotation>
        <xs:documentation>Name possibly for use in a user interface.</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:element ref=" ei:createdDateTime" />
</xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:element name=" oadrReportDescription" type=" oadr:oadrReportDescriptionType" />
<xs:complexType name=" oadrReportDescriptionType" >
    <xs:annotation>
        <xs:documentation>Describes the subject and attributes of a report.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
        <xs:element ref=" ei:rID" />
        <xs:element ref=" ei:reportSubject" minOccurs=" 0" />
        <xs:element ref=" ei:reportDataSource" minOccurs=" 0" />
        <xs:element ref=" ei:reportType" />
        <xs:element ref=" emix:itemBase" minOccurs=" 0" >
            <xs:annotation>
                <xs:documentation>What is measured or tracked in this report (Units).</xs:documentation>
            </xs:annotation>
</xs:element>
        <xs:element ref=" ei:readingType" />
        <xs:element ref=" emix:marketContext" minOccurs=" 0" />
        <xs:element ref=" oadr:oadrSamplingRate" minOccurs=" 0" />
    </xs:sequence>

```

```

</xs:complexType>
<xs:complexType name=" oadrSamplingRateType" >
  <xs:sequence>
    <xs:element name=" oadrMinPeriod" type=" xcal:DurationValueType" >
      <xs:annotation>
        <xs:documentation>Minimum sampling period</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name=" oadrMaxPeriod" type=" xcal:DurationValueType" >
      <xs:annotation>
        <xs:documentation>Maximum sampling period</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name=" oadrOnChange" type=" xs:boolean" >
      <xs:annotation>
        <xs:documentation>If true then the data will be recorded when it changes, but at no greater a
frequency than that specified by minPeriod.</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
</xs:complexType>
<xs:element name=" oadrSamplingRate" type=" oadr:oadrSamplingRateType" >
  <xs:annotation>
    <xs:documentation>Sampling rate for telemetry type data</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" oadrPayloadResourceStatus" type=" oadr:oadrPayloadResourceStatusType "
substitutionGroup=" ei:payloadBase" >
  <xs:annotation>
    <xs:documentation>Current resource status information</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:complexType name=" oadrPayloadResourceStatusType" >
  <xs:annotation>
    <xs:documentation>This is the payload for reports that require a status.</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base=" ei:PayloadBaseType" >
      <xs:sequence>
        <xs:element name=" oadrOnline" type=" xs:boolean" >
          <xs:annotation>
            <xs:documentation>If true then resource/asset is online, if false then
offline.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name=" oadrManualOverride" type=" xs:boolean" >
          <xs:annotation>
            <xs:documentation>If true then the control of the load has been manually
overridden</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>

```

```

        </xs:element>
        <xs:element ref=" oadr:oadrLoadControlState" minOccurs=" 0" />
    </xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:element name=" oadrLoadControlState" type=" oadr:oadrLoadControlStateType" />
<xs:complexType name=" oadrLoadControlStateType" >
    <xs:sequence>
        <xs:element name=" oadrCapacity" type=" oadr:oadrLoadControlStateTypeType"
minOccurs=" 0" />
        <xs:element name=" oadrLevelOffset" type=" oadr:oadrLoadControlStateTypeType"
minOccurs=" 0" />
        <xs:element name=" oadrPercentOffset" type=" oadr:oadrLoadControlStateTypeType"
minOccurs=" 0" />
        <xs:element name=" oadrSetPoint" type=" oadr:oadrLoadControlStateTypeType"
minOccurs=" 0" />
    </xs:sequence>
</xs:complexType>
<xs:complexType name=" oadrLoadControlStateTypeType" >
    <xs:sequence>
        <xs:element name=" oadrMin" type=" xs:float" minOccurs=" 0" />
        <xs:element name=" oadrMax" type=" xs:float" minOccurs=" 0" />
        <xs:element name=" oadrCurrent" type=" xs:float" />
        <xs:element name=" oadrNormal" type=" xs:float" minOccurs=" 0" />
    </xs:sequence>
</xs:complexType>
<xs:complexType name=" oadrGBItemBase" >
    <xs:complexContent>
        <xs:extension base=" emix:ItemBaseType" >
            <xs:sequence>
                <xs:element ref=" atom:feed" />
            </xs:sequence>
        </xs:extension>
    </xs:complexContent>
</xs:complexType>
<xs:complexType name=" oadrGBStreamPayloadBase" >
    <xs:complexContent>
        <xs:extension base=" strm:StreamPayloadBaseType" >
            <xs:sequence>
                <xs:element ref=" atom:feed" />
            </xs:sequence>
        </xs:extension>
    </xs:complexContent>
</xs:complexType>
<xs:element name=" oadrGBPayload" type=" oadr:oadrGBStreamPayloadBase"
substitutionGroup=" strm:streamPayloadBase" />

```



```

<xs:element name=" oadrGBDataDescription" type=" oadr:oadrGBItemBase" substitutionGroup="
emix:itemBase" />
<xs:element name=" oadrDeviceClass" type=" ei: EiTargetType" >
  <xs:annotation>
    <xs:documentation>Device Class target – use only endDeviceAsset.</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" oadrReportPayload" type=" oadr:oadrReportPayloadType"
substitutionGroup=" strm:streamPayloadBase" >
  <xs:annotation>
    <xs:documentation>Data point values for reports</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:complexType name=" oadrReportPayloadType" >
  <xs:annotation>
    <xs:documentation>Report payload for use in reports.</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base=" ei:ReportPayloadType" >
      <xs:sequence>
        <xs:element ref=" oadr:oadrDataQuality" minOccurs=" 0" >
          <xs:annotation>
            <xs:documentation>Enumerated value for the quality of this data
item</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:element name=" oadrDataQuality" type=" oadr:oadrDataQualityTypeType" />
<xs:simpleType name=" oadrDataQualityTypeType" >
  <xs:union memberTypes=" oadr:oadrDataQualityType ei:EiExtensionTokenType" />
</xs:simpleType>
<xs:simpleType name=" oadrDataQualityType" >
  <xs:restriction base=" xs:token" >
    <xs:enumeration value=" No Quality – No Value" />
    <xs:enumeration value=" No New Value – Previous Value Used" />
    <xs:enumeration value=" Quality Bad – Non Specific" />
    <xs:enumeration value=" Quality Bad – Configuration Error" />
    <xs:enumeration value=" Quality Bad – Not Connected" />
    <xs:enumeration value=" Quality Bad – Device Failure" />
    <xs:enumeration value=" Quality Bad – Sensor Failure" />
    <xs:enumeration value=" Quality Bad – Last Known Value" />
    <xs:enumeration value=" Quality Bad – Comm Failure" />
    <xs:enumeration value=" Quality Bad – Out of Service" />
    <xs:enumeration value=" Quality Uncertain – Non Specific" />
    <xs:enumeration value=" Quality Uncertain – Last Usable Value" />
  </xs:restriction>
</xs:simpleType>

```

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```
<xs:enumeration value=" Quality Uncertain – Sensor Not Accurate" />
<xs:enumeration value=" Quality Uncertain – EU Units Exceeded" />
<xs:enumeration value=" Quality Uncertain – Sub Normal" />
<xs:enumeration value=" Quality Good – Non Specific" />
<xs:enumeration value=" Quality Good – Local Override" />
<xs:enumeration value=" Quality Limit – Field/Not" />
<xs:enumeration value=" Quality Limit – Field/Low" />
<xs:enumeration value=" Quality Limit – Field/High" />
<xs:enumeration value=" Quality Limit – Field/Constant" />
</xs:restriction>
</xs:simpleType>
</xs:schema>
```

oadr_atom.xsd

```

<?xml version=" 1.0" encoding=" utf-8" ?>
<xs:schema xmlns:xs=" http://www.w3.org/2001/XMLSchema " xmlns:atom="
http://www.w3.org/2005/Atom " targetNamespace=" http://www.w3.org/2005/Atom "
elementFormDefault=" qualified" attributeFormDefault=" unqualified" >
  <xs:annotation>
    <xs:documentation>This version of the Atom schema is based on version 1.0 of the format
specifications, found here
http://www.atomenabled.org/developers/syndication/atom-format-spec.php.</xs:documentation>
  </xs:annotation>
  <xs:import namespace=" http://www.w3.org/XML/1998/namespace " schemaLocation="
oadr_xml.xsd" />
  <xs:annotation>
    <xs:documentation>An Atom document may have two root elements, feed and entry, as defined in
section 2.</xs:documentation>
  </xs:annotation>
  <xs:element name=" feed" type=" atom:feedType" />
  <xs:element name=" entry" type=" atom:entryType" />
  <xs:complexType name=" textType" mixed=" true" >
    <xs:annotation>
      <xs:documentation>The Atom text construct is defined in section 3.1 of the format
spec.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:any namespace=" http://www.w3.org/1999/xhtml" minOccurs=" 0" />
    </xs:sequence>
    <xs:attribute name=" type" >
      <xs:simpleType>
        <xs:restriction base=" xs:token" >
          <xs:enumeration value=" text" />
          <xs:enumeration value=" html" />
          <xs:enumeration value=" xhtml" />
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
    <xs:attributeGroup ref=" atom:commonAttributes" />
  </xs:complexType>
  <xs:complexType name=" personType" >
    <xs:annotation>
      <xs:documentation>The Atom person construct is defined in section 3.2 of the format
spec.</xs:documentation>
    </xs:annotation>
    <xs:choice maxOccurs=" unbounded" >
      <xs:element name=" name" type=" xs:string" />
      <xs:element name=" uri" type=" atom:uriType" minOccurs=" 0" />
      <xs:element name=" email" type=" atom:emailType" minOccurs=" 0" />
      <xs:any namespace=" ##other" />
    </xs:choice>
  </xs:complexType>

```

```

</xs:choice>
<xs:attributeGroup ref=" atom:commonAttributes" />
</xs:complexType>
<xs:simpleType name=" emailType" >
  <xs:annotation>
    <xs:documentation>Schema definition for an email address.</xs:documentation>
  </xs:annotation>
  <xs:restriction base=" xs:normalizedString" >
    <xs:pattern value=" \w+@(\w+\.)+\w+" />
  </xs:restriction>
</xs:simpleType>
<xs:complexType name=" feedType" >
  <xs:annotation>
    <xs:documentation>The Atom feed construct is defined in section 4.1.1 of the format
spec.</xs:documentation>
  </xs:annotation>
  <xs:choice minOccurs=" 3" maxOccurs=" unbounded" >
    <xs:element name=" author" type=" atom:personType" minOccurs=" 0" maxOccurs="
unbounded" />
    <xs:element name=" category" type=" atom:categoryType" minOccurs=" 0" maxOccurs="
unbounded" />
    <xs:element name=" contributor" type=" atom:personType" minOccurs=" 0" maxOccurs="
unbounded" />
    <xs:element name=" generator" type=" atom:generatorType" minOccurs=" 0" />
    <xs:element name=" icon" type=" atom:iconType" minOccurs=" 0" />
    <xs:element name=" id" type=" atom:idType" />
    <xs:element name=" link" type=" atom:linkType" minOccurs=" 0" maxOccurs="
unbounded" />
    <xs:element name=" logo" type=" atom:logoType" minOccurs=" 0" />
    <xs:element name=" rights" type=" atom:textType" minOccurs=" 0" />
    <xs:element name=" subtitle" type=" atom:textType" minOccurs=" 0" />
    <xs:element name=" title" type=" atom:textType" />
    <xs:element name=" updated" type=" atom:dateTimeType" />
    <xs:element name=" entry" type=" atom:entryType" minOccurs=" 0" maxOccurs="
unbounded" />
    <xs:any namespace=" ##other" minOccurs=" 0" maxOccurs=" unbounded" />
  </xs:choice>
<xs:attributeGroup ref=" atom:commonAttributes" />
</xs:complexType>
<xs:complexType name=" entryType" >
  <xs:annotation>
    <xs:documentation>The Atom entry construct is defined in section 4.1.2 of the format
spec.</xs:documentation>
  </xs:annotation>
  <xs:choice maxOccurs=" unbounded" >
    <xs:element name=" author" type=" atom:personType" minOccurs=" 0" maxOccurs="
unbounded" />

```

```

    <xs:element name=" category" type=" atom:categoryType" minOccurs=" 0" maxOccurs="
unbounded" />
    <xs:element name=" content" type=" atom:contentType" minOccurs=" 0" />
    <xs:element name=" contributor" type=" atom:personType" minOccurs=" 0" maxOccurs="
unbounded" />
    <xs:element name=" id" type=" atom:idType" />
    <xs:element name=" link" type=" atom:linkType" minOccurs=" 0" maxOccurs="
unbounded" />
    <xs:element name=" published" type=" atom:dateTimeType" minOccurs=" 0" />
    <xs:element name=" rights" type=" atom:textType" minOccurs=" 0" />
    <xs:element name=" source" type=" atom:textType" minOccurs=" 0" />
    <xs:element name=" summary" type=" atom:textType" minOccurs=" 0" />
    <xs:element name=" title" type=" atom:textType" />
    <xs:element name=" updated" type=" atom:dateTimeType" />
    <xs:any namespace=" ##other" minOccurs=" 0" maxOccurs=" unbounded" />
</xs:choice>
<xs:attributeGroup ref=" atom:commonAttributes" />
</xs:complexType>
<xs:complexType name=" contentType" mixed=" true" >
  <xs:annotation>
    <xs:documentation>The Atom content construct is defined in section 4.1.3 of the format
spec.</xs:documentation>
  </xs:annotation>
<xs:sequence>
  <xs:any namespace=" ##other" minOccurs=" 0" maxOccurs=" unbounded" />
</xs:sequence>
<xs:attribute name=" type" type=" xs:string" />
<xs:attribute name=" src" type=" xs:anyURI" />
<xs:attributeGroup ref=" atom:commonAttributes" />
</xs:complexType>
<xs:complexType name=" categoryType" >
  <xs:annotation>
    <xs:documentation>The Atom category construct is defined in section 4.2.2 of the format
spec.</xs:documentation>
  </xs:annotation>
  <xs:attribute name=" term" type=" xs:string" use=" required" />
  <xs:attribute name=" scheme" type=" xs:anyURI" use=" optional" />
  <xs:attribute name=" label" type=" xs:string" use=" optional" />
  <xs:attributeGroup ref=" atom:commonAttributes" />
</xs:complexType>
<xs:complexType name=" generatorType" >
  <xs:annotation>
    <xs:documentation>The Atom generator element is defined in section 4.2.4 of the format
spec.</xs:documentation>
  </xs:annotation>
  <xs:simpleContent>
    <xs:extension base=" xs:string" >
      <xs:attribute name=" uri" type=" xs:anyURI" use=" optional" />

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```

        <xs:attribute name=" version" type=" xs:string" use=" optional" />
        <xs:attributeGroup ref=" atom:commonAttributes" />
    </xs:extension>
</xs:simpleContent>
</xs:complexType>
<xs:complexType name=" iconType" >
    <xs:annotation>
        <xs:documentation>The Atom icon construct is defined in section 4.2.5 of the format
spec.</xs:documentation>
    </xs:annotation>
    <xs:simpleContent>
        <xs:extension base=" xs:anyURI" >
            <xs:attributeGroup ref=" atom:commonAttributes" />
        </xs:extension>
    </xs:simpleContent>
</xs:complexType>
<xs:complexType name=" idType" >
    <xs:annotation>
        <xs:documentation>The Atom id construct is defined in section 4.2.6 of the format
spec.</xs:documentation>
    </xs:annotation>
    <xs:simpleContent>
        <xs:extension base=" xs:anyURI" >
            <xs:attributeGroup ref=" atom:commonAttributes" />
        </xs:extension>
    </xs:simpleContent>
</xs:complexType>
<xs:complexType name=" linkType" mixed=" true" >
    <xs:annotation>
        <xs:documentation>The Atom link construct is defined in section 3.4 of the format
spec.</xs:documentation>
    </xs:annotation>
    <xs:attribute name=" href" type=" xs:anyURI" use=" required" />
    <xs:attribute name=" rel" type=" xs:string" use=" optional" />
    <xs:attribute name=" type" type=" xs:string" use=" optional" />
    <xs:attribute name=" hreflang" type=" xs:NMTOKEN" use=" optional" />
    <xs:attribute name=" title" type=" xs:string" use=" optional" />
    <xs:attribute name=" length" type=" xs:positiveInteger" use=" optional" />
    <xs:attributeGroup ref=" atom:commonAttributes" />
</xs:complexType>
<xs:complexType name=" logoType" >
    <xs:annotation>
        <xs:documentation>The Atom logo construct is defined in section 4.2.8 of the format
spec.</xs:documentation>
    </xs:annotation>
    <xs:simpleContent>
        <xs:extension base=" xs:anyURI" >
            <xs:attributeGroup ref=" atom:commonAttributes" />
        </xs:extension>

```

```

    </xs:simpleContent>
</xs:complexType>
<xs:complexType name=" sourceType" >
  <xs:annotation>
    <xs:documentation>The Atom source construct is defined in section 4.2.11 of the format
spec.</xs:documentation>
  </xs:annotation>
  <xs:choice maxOccurs=" unbounded" >
    <xs:element name=" author" type=" atom:personType" minOccurs=" 0" maxOccurs="
unbounded" />
    <xs:element name=" category" type=" atom:categoryType" minOccurs=" 0" maxOccurs="
unbounded" />
    <xs:element name=" contributor" type=" atom:personType" minOccurs=" 0" maxOccurs="
unbounded" />
    <xs:element name=" generator" type=" atom:generatorType" minOccurs=" 0" />
    <xs:element name=" icon" type=" atom:iconType" minOccurs=" 0" />
    <xs:element name=" id" type=" atom:idType" minOccurs=" 0" />
    <xs:element name=" link" type=" atom:linkType" minOccurs=" 0" maxOccurs="
unbounded" />
    <xs:element name=" logo" type=" atom:logoType" minOccurs=" 0" />
    <xs:element name=" rights" type=" atom:textType" minOccurs=" 0" />
    <xs:element name=" subtitle" type=" atom:textType" minOccurs=" 0" />
    <xs:element name=" title" type=" atom:textType" minOccurs=" 0" />
    <xs:element name=" updated" type=" atom:dateTimeType" minOccurs=" 0" />
    <xs:any namespace=" ##other" minOccurs=" 0" maxOccurs=" unbounded" />
  </xs:choice>
  <xs:attributeGroup ref=" atom:commonAttributes" />
</xs:complexType>
<xs:complexType name=" uriType" >
  <xs:simpleContent>
    <xs:extension base=" xs:anyURI" >
      <xs:attributeGroup ref=" atom:commonAttributes" />
    </xs:extension>
  </xs:simpleContent>
</xs:complexType>
<xs:complexType name=" dateTimeType" >
  <xs:simpleContent>
    <xs:extension base=" xs:dateTime" >
      <xs:attributeGroup ref=" atom:commonAttributes" />
    </xs:extension>
  </xs:simpleContent>
</xs:complexType>
<xs:attributeGroup name=" commonAttributes" >
  <xs:attribute ref=" xml:base" />
  <xs:attribute ref=" xml:lang" />
  <xs:anyAttribute namespace=" ##other" />
</xs:attributeGroup>

```

</xs:schema>

oadr_ei_20b.xsd

```

<?xml version=" 1.0" encoding=" ISO-8859-1" ?>
<xs:schema xmlns:xs=" http://www.w3.org/2001/XMLSchema " xmlns:ei=" http://docs.oasis-
open.org/ns/energyinterop/201110 " xmlns:pyld=" http://docs.oasis-open.org/ns/energyinterop/201110/payloads "
xmlns:xcal=" urn:ietf:params:xml:ns:icalendar-2.0 " xmlns:emix=" http://docs.oasis-open.org/ns/emix/2011/06 "
xmlns:strm=" urn:ietf:params:xml:ns:icalendar-2.0:stream " xmlns:power=" http://docs.oasis-
open.org/ns/emix/2011/06/power " targetNamespace=" http://docs.oasis-open.org/ns/energyinterop/201110 "
elementFormDefault=" qualified" attributeFormDefault=" qualified" >
  <xs:import namespace=" http://docs.oasis-open.org/ns/emix/2011/06/power" schemaLocation=" oadr_power_20b.xsd" />
  <xs:import namespace=" urn:ietf:params:xml:ns:icalendar-2.0" schemaLocation=" oadr_xcal_20b.xsd" />
  <xs:import namespace=" urn:ietf:params:xml:ns:icalendar-2.0:stream" schemaLocation=" oadr_strm_20b.xsd" />
  <xs:import namespace=" http://docs.oasis-open.org/ns/emix/2011/06" schemaLocation=" oadr_emix_20b.xsd" />
  <xs:import namespace=" http://docs.oasis-open.org/ns/energyinterop/201110/payloads " schemaLocation="
oadr_pyld_20b.xsd" />
  <xs:element name=" eventStatus" type=" ei:EventStatusEnumeratedType" />
  <xs:simpleType name=" EventStatusEnumeratedType" >
    <xs:restriction base=" xs:token" >
      <xs:enumeration value=" none" >
        <xs:annotation>
          <xs:documentation>No event pending</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value=" far" >
        <xs:annotation>
          <xs:documentation>Event pending in the far future. The exact definition of how far in the future this refers is
dependent upon the market context, but typically means the next day.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value=" near" >
        <xs:annotation>
          <xs:documentation>Event pending in the near future. The exact definition of how near in the future the pending event
is active is dependent on the market context.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value=" active" >
        <xs:annotation>
          <xs:documentation>The event has been initiated and is currently active.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value=" completed" >
        <xs:annotation>
          <xs:documentation>The event has completed.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value=" cancelled" >
        <xs:annotation>

```

```

        <xs:documentation>The event has been canceled.</xs:documentation>
    </xs:annotation>
</xs:enumeration>
</xs:restriction>
</xs:simpleType>
<xs:element name=" resourceID" type=" xs:string" />
<xs:element name=" groupID" type=" xs:string" />
<xs:element name=" partyID" type=" xs:string" />
<xs:element name=" groupName" type=" xs:string" />
<xs:simpleType name=" EiExtensionTokenType" >
    <xs:annotation>
        <xs:documentation>Pattern used for extending string enumeration, where allowed.</xs:documentation>
    </xs:annotation>
    <xs:restriction base=" xs:token" >
        <xs:pattern value=" x-\S.*" />
    </xs:restriction>
</xs:simpleType>
<xs:element name=" venID" type=" xs:string" />
<xs:element name=" vtnID" type=" xs:string" />
<xs:element name=" eventID" type=" xs:string" >
    <xs:annotation>
        <xs:documentation>An ID value that identifies a specific DR event instance.</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:element name=" modificationNumber" type=" xs:unsignedInt" >
    <xs:annotation>
        <xs:documentation>Incremented each time an event is modified.</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:element name=" qualifiedEventID" type=" ei:QualifiedEventIDType" />
<xs:complexType name=" QualifiedEventIDType" >
    <xs:annotation>
        <xs:documentation>Fully qualified event ID includes the eventID and the modificationNumber.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
        <xs:element ref=" ei:eventID" />
        <xs:element ref=" ei:modificationNumber" />
    </xs:sequence>
</xs:complexType>
<xs:element name=" x-eiNotification" type=" xcal:DurationPropType" >
    <xs:annotation>
        <xs:documentation>The VEN should receive the DR event payload prior to dtstart minus this
duration.</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:element name=" x-eiRampUp" type=" xcal:DurationPropType" >
    <xs:annotation>
        <xs:documentation>A duration before or after the event start time during which load shed should
transit.</xs:documentation>

```

```

    </xs:annotation>
  </xs:element>
  <xs:element name=" x-eiRecovery" type=" xcal:DurationPropType" >
    <xs:annotation>
      <xs:documentation>A duration before or after the event end time during which load shed should
transit.</xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:element name=" interval" type=" ei:IntervalType" />
  <xs:complexType name=" IntervalType" >
    <xs:sequence>
      <xs:element ref=" xcal:dtstart" minOccurs=" 0" />
      <xs:element ref=" xcal:duration" minOccurs=" 0" />
      <xs:element ref=" xcal:uid" minOccurs=" 0" />
      <xs:element ref=" strm:streamPayloadBase" maxOccurs=" unbounded" />
    </xs:sequence>
  </xs:complexType>
  <xs:element name=" currentValue" type=" ei:currentValueType" >
    <xs:annotation>
      <xs:documentation>The payloadFloat value of the event interval currently executing.</xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:complexType name=" currentValueType" >
    <xs:choice>
      <xs:element ref=" ei:payloadFloat" />
    </xs:choice>
  </xs:complexType>
  <xs:element name=" payloadBase" type=" ei:PayloadBaseType" abstract=" true" />
  <xs:complexType name=" PayloadBaseType" abstract=" true" >
    <xs:annotation>
      <xs:documentation>Base for information in signal / baseline / report payloads</xs:documentation>
    </xs:annotation>
  </xs:complexType>
  <xs:element name=" payloadFloat" type=" ei:PayloadFloatType" substitutionGroup=" ei:payloadBase" >
    <xs:annotation>
      <xs:documentation>Data point value for event signals or for reporting current or historical values.</xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:complexType name=" PayloadFloatType" >
    <xs:annotation>
      <xs:documentation>This is the payload for signals that require a quantity.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base=" ei:PayloadBaseType" >
        <xs:sequence>
          <xs:element name=" value" type=" xs:float" />
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>

```

```

</xs:complexType>
<xs:element name=" responseCode" type=" ei:ResponseCodeType" >
  <xs:annotation>
    <xs:documentation>A 3 digit response code</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:simpleType name=" ResponseCodeType" >
  <xs:annotation>
    <xs:documentation>Similar to HTTP 1.1 Error Pattern, 1st digit sufficient for most error processing – 1xx: Informational – Request received, continuing process – 2xx: Success – The action was successfully received, understood, and accepted – 3xx: Pending – Further action must be taken in order to complete the request – 4xx: Requester Error – The request contains bad syntax or cannot be fulfilled – 5xx: Responder Error – The responder failed to fulfill an apparently valid request xx is used for defining more fine grained errors</xs:documentation>
  </xs:annotation>
  <xs:restriction base=" xs:string" >
    <xs:pattern value=" [0-9][0-9][0-9]" />
  </xs:restriction>
</xs:simpleType>
<xs:element name=" responseDescription" type=" xs:string" >
  <xs:annotation>
    <xs:documentation>Narrative description of response status</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" optType" type=" ei:OptTypeType" >
  <xs:annotation>
    <xs:documentation>optIn or optOut of an event</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:simpleType name=" OptTypeType" >
  <xs:restriction base=" xs:token" >
    <xs:enumeration value=" optIn" />
    <xs:enumeration value=" optOut" />
  </xs:restriction>
</xs:simpleType>
<xs:element name=" eiResponse" type=" ei:EiResponseType" >
  <xs:annotation>
    <xs:documentation>Indicate whether received payload is acceptable</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:complexType name=" EiResponseType" >
  <xs:sequence>
    <xs:element ref=" ei:responseCode" />
    <xs:element ref=" ei:responseDescription" minOccurs=" 0" />
    <xs:element ref=" pyld:requestID" />
  </xs:sequence>
</xs:complexType>
<xs:element name=" eventResponses" >
  <xs:annotation>
    <xs:documentation>optIn or optOut responses for received events</xs:documentation>

```

```

</xs:annotation>
<xs:complexType>
  <xs:sequence>
    <xs:element name=" eventResponse" minOccurs=" 0" maxOccurs=" unbounded" >
      <xs:complexType>
        <xs:sequence>
          <xs:element ref=" ei:responseCode" />
          <xs:element ref=" ei:responseDescription" minOccurs=" 0" />
          <xs:element ref=" pyld:requestID" />
          <xs:element ref=" ei:qualifiedEventID" />
          <xs:element ref=" ei:optType" />
        </xs:sequence>
      </xs:complexType>
    </xs:element>
  </xs:sequence>
</xs:complexType>
</xs:element>
<xs:element name=" eiEvent" type=" ei:eiEventType" />
<xs:complexType name=" eiEventType" >
  <xs:sequence>
    <xs:element ref=" ei:eventDescriptor" />
    <xs:element ref=" ei:eiActivePeriod" />
    <xs:element ref=" ei:eiEventSignals" />
    <xs:element ref=" ei:eiTarget" />
  </xs:sequence>
</xs:complexType>
<xs:element name=" eiActivePeriod" type=" ei:eiActivePeriodType" >
  <xs:annotation>
    <xs:documentation>Time frames relevant to the overall event</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:complexType name=" eiActivePeriodType" >
  <xs:sequence>
    <xs:element ref=" xcal:properties" />
    <xs:element ref=" xcal:components" />
  </xs:sequence>
</xs:complexType>
<xs:element name=" signalType" type=" ei:SignalTypeEnumeratedType" >
  <xs:annotation>
    <xs:documentation>An enumerated value describing the type of signal such as level or price</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:simpleType name=" SignalTypeEnumeratedType" >
  <xs:annotation>
    <xs:documentation>SignalTypeEnumerated lists the pre-defined types used to specify the payload types and conformance in
a stream</xs:documentation>
  </xs:annotation>
  <xs:restriction base=" xs:token" >
    <xs:enumeration value=" delta" >

```

```

    <xs:annotation>
      <xs:documentation>Signal indicates the amount to change from what one would have used without the
signal.</xs:documentation>
    </xs:annotation>
  </xs:enumeration>
  <xs:enumeration value=" level" >
    <xs:annotation>
      <xs:documentation>Signal indicates a program level.</xs:documentation>
    </xs:annotation>
  </xs:enumeration>
  <xs:enumeration value=" multiplier" >
    <xs:annotation>
      <xs:documentation>Signal indicates a multiplier applied to the current rate of delivery or usage from what one would
have used without the signal.</xs:documentation>
    </xs:annotation>
  </xs:enumeration>
  <xs:enumeration value=" price" >
    <xs:annotation>
      <xs:documentation>Signal indicates the price.</xs:documentation>
    </xs:annotation>
  </xs:enumeration>
  <xs:enumeration value=" priceMultiplier" >
    <xs:annotation>
      <xs:documentation>Signal indicates the price multiplier. Extended price is the computed price value multiplied by the
number of units.</xs:documentation>
    </xs:annotation>
  </xs:enumeration>
  <xs:enumeration value=" priceRelative" >
    <xs:annotation>
      <xs:documentation>Signal indicates the relative price.</xs:documentation>
    </xs:annotation>
  </xs:enumeration>
  <xs:enumeration value=" setpoint" >
    <xs:annotation>
      <xs:documentation>Signal indicates a target amount of units.</xs:documentation>
    </xs:annotation>
  </xs:enumeration>
  <xs:enumeration value=" x-loadControlCapacity" >
    <xs:annotation>
      <xs:documentation>This is an instruction for the load controller to operate at a level that is some percentage of its
maximum load consumption capacity. This can be mapped to specific load controllers to do things like duty cycling. Note that 1.0
refers to 100% consumption. In the case of simple ON/OFF type devices then 0 = OFF and 1 = ON.</xs:documentation>
    </xs:annotation>
  </xs:enumeration>
  <xs:enumeration value=" x-loadControlLevelOffset" >
    <xs:annotation>
      <xs:documentation>Discrete integer levels that are relative to normal operations where 0 is normal
operations.</xs:documentation>
    </xs:annotation>
  </xs:enumeration>

```

```

<xs:enumeration value=" x-loadControlPercentOffset" >
  <xs:annotation>
    <xs:documentation>Percentage change from normal load control operations.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" x-loadControlSetpoint" >
  <xs:annotation>
    <xs:documentation>Load controller set points.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
</xs:restriction>
</xs:simpleType>
<xs:element name=" responses" type=" ei:ArrayofResponses" />
<xs:complexType name=" ArrayofResponses" >
  <xs:annotation>
    <xs:documentation>Collection of Responses. When a service operation regards multiple referenceable items, each
referenced item may have its own response. Always accompanied by an overall Response Type.</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name=" response" type=" ei: EiResponseType" minOccurs=" 0" maxOccurs=" unbounded" />
  </xs:sequence>
</xs:complexType>
<xs:element name=" eventDescriptor" type=" ei:eventDescriptorType" >
  <xs:annotation>
    <xs:documentation>Information about the event</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:complexType name=" eventDescriptorType" >
  <xs:sequence>
    <xs:element ref=" ei:eventID" />
    <xs:element ref=" ei:modificationNumber" />
    <xs:element name=" modificationDateTime" type=" xcal:DateTimeType" minOccurs=" 0" >
      <xs:annotation>
        <xs:documentation>When an event is modified</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name=" modificationReason" type=" xs:string" minOccurs=" 0" >
      <xs:annotation>
        <xs:documentation>Why an event was modified</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name=" priority" type=" xs:unsignedInt" minOccurs=" 0" >
      <xs:annotation>
        <xs:documentation>The priority of the event in relation to other events (The lower the number higher the priority. A
value of zero (0) indicates no priority, which is the lowest priority by default).</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name=" eiMarketContext" >
      <xs:complexType>
        <xs:sequence>

```

```

        <xs:element ref=" emix:marketContext" />
    </xs:sequence>
</xs:complexType>
</xs:element>
<xs:element ref=" ei:createdDateTime" />
<xs:element ref=" ei:eventStatus" >
    <xs:annotation>
        <xs:documentation>An indication of the event state: far, near, active, canceled, completed</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:element name=" testEvent" type=" xs:string" minOccurs=" 0" >
    <xs:annotation>
        <xs:documentation>Anything other than false indicates a test event</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:element name=" vtnComment" type=" xs:string" minOccurs=" 0" >
    <xs:annotation>
        <xs:documentation>Any text</xs:documentation>
    </xs:annotation>
</xs:element>
</xs:sequence>
</xs:complexType>
<xs:element name=" signalPayload" type=" ei:signalPayloadType" substitutionGroup=" strm:streamPayloadBase" >
    <xs:annotation>
        <xs:documentation>Signal values for events and baselines</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:complexType name=" signalPayloadType" >
    <xs:complexContent>
        <xs:extension base=" strm:StreamPayloadBaseType" >
            <xs:choice>
                <xs:element ref=" ei:payloadBase" />
            </xs:choice>
        </xs:extension>
    </xs:complexContent>
</xs:complexType>
<xs:element name=" createdDateTime" type=" xcal:DateTimeType" >
    <xs:annotation>
        <xs:documentation>The dateTime the payload was created</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:element name=" eiTarget" type=" ei:EiTargetType" >
    <xs:annotation>
        <xs:documentation>Identifies the resources associated with the logical VEN interface. For events, the values specified are
the target for the event</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:complexType name=" EiTargetType" >
    <xs:sequence>
        <xs:element ref=" power:aggregatedPnode" minOccurs=" 0" maxOccurs=" unbounded" />

```



```

<xs:element ref=" power:endDeviceAsset" minOccurs=" 0" maxOccurs=" unbounded" />
<xs:element ref=" power:meterAsset" minOccurs=" 0" maxOccurs=" unbounded" />
<xs:element ref=" power:pnode" minOccurs=" 0" maxOccurs=" unbounded" />
<xs:element ref=" emix:serviceArea" minOccurs=" 0" maxOccurs=" unbounded" />
<xs:element ref=" power:serviceDeliveryPoint" minOccurs=" 0" maxOccurs=" unbounded" />
<xs:element ref=" power:serviceLocation" minOccurs=" 0" maxOccurs=" unbounded" />
<xs:element ref=" power:transportInterface" minOccurs=" 0" maxOccurs=" unbounded" />
<xs:element ref=" ei:groupID" minOccurs=" 0" maxOccurs=" unbounded" />
<xs:element ref=" ei:groupName" minOccurs=" 0" maxOccurs=" unbounded" />
<xs:element ref=" ei:resourceID" minOccurs=" 0" maxOccurs=" unbounded" />
<xs:element ref=" ei:venID" minOccurs=" 0" maxOccurs=" unbounded" />
<xs:element ref=" ei:partyID" minOccurs=" 0" maxOccurs=" unbounded" />
</xs:sequence>
</xs:complexType>
<xs:element name=" eiEventSignal" type=" ei:eiEventSignalType" />
<xs:complexType name=" eiEventSignalType" >
  <xs:sequence>
    <xs:element ref=" strm:intervals" />
    <xs:element ref=" ei:eiTarget" minOccurs=" 0" >
      <xs:annotation>
        <xs:documentation>Optionally identifies the device class associated with the signal. Only the endDeviceAsset
subelement is used</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element ref=" ei:signalName" >
      <xs:annotation>
        <xs:documentation>Descriptive name for signal.</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element ref=" ei:signalType" />
    <xs:element name=" signalID" type=" xs:string" >
      <xs:annotation>
        <xs:documentation>unique Identifier for a specific event signal</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element ref=" emix:itemBase" minOccurs=" 0" >
      <xs:annotation>
        <xs:documentation>This is the unit of the signal.</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element ref=" ei:currentValue" minOccurs=" 0" />
  </xs:sequence>
</xs:complexType>
<xs:element name=" signalName" type=" ei:signalNameType" />
<xs:simpleType name=" signalNameType" >
  <xs:annotation>
    <xs:documentation>Signal name.</xs:documentation>
  </xs:annotation>

```

```
<xs:union memberTypes=" ei:SignalNameEnumeratedType ei:EiExtensionTokenType" />
</xs:simpleType>
<xs:element name=" SignalNameEnumerated" type=" ei:SignalNameEnumeratedType" />
<xs:simpleType name=" SignalNameEnumeratedType" >
  <xs:restriction base=" xs:token" >
    <xs:enumeration value=" SIMPLE" >
      <xs:annotation>
        <xs:documentation>Simple levels (OpenADR 2.0a compliant)</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value=" simple" >
      <xs:annotation>
        <xs:documentation>deprecated – for backwards compatibility with A profile</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value=" ELECTRICITY_PRICE" >
      <xs:annotation>
        <xs:documentation>This is the cost of electricity</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value=" ENERGY_PRICE" >
      <xs:annotation>
        <xs:documentation>This is the cost of energy</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value=" DEMAND_CHARGE" >
      <xs:annotation>
        <xs:documentation>This is the demand charge</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value=" BID_PRICE" >
      <xs:annotation>
        <xs:documentation>This is the price that was bid by the resource</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value=" BID_LOAD" >
      <xs:annotation>
        <xs:documentation>This is the amount of load that was bid by a resource into a program</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value=" BID_ENERGY" >
      <xs:annotation>
        <xs:documentation>This is the amount of energy from a resource that was bid into a program</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value=" CHARGE_STATE" >
      <xs:annotation>
        <xs:documentation>State of energy storage resource</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
```

```

<xs:enumeration value=" LOAD_DISPATCH" >
  <xs:annotation>
    <xs:documentation>This is used to dispatch load</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" LOAD_CONTROL" >
  <xs:annotation>
    <xs:documentation>Set load output to relative values</xs:documentation>
  </xs:annotation>
</xs:enumeration>
</xs:restriction>
</xs:simpleType>
<xs:element name=" eiEventSignals" type=" ei:eiEventSignalsType" >
  <xs:annotation>
    <xs:documentation>Interval data for one or more event signals and/or baselines</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:complexType name=" eiEventSignalsType" >
  <xs:sequence>
    <xs:element ref=" ei:eiEventSignal" maxOccurs=" unbounded" >
      <xs:annotation>
        <xs:documentation>Interval data for an event</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element ref=" ei:eiEventBaseline" minOccurs=" 0" >
      <xs:annotation>
        <xs:documentation>Interval data for a baseline</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
</xs:complexType>
<xs:element name=" eiEventBaseline" type=" ei:eiEventBaselineType" >
  <xs:annotation>
    <xs:documentation>B profile</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:complexType name=" eiEventBaselineType" >
  <xs:sequence>
    <xs:element ref=" xcal:dtstart" />
    <xs:element ref=" xcal:duration" />
    <xs:element ref=" strm:intervals" />
    <xs:element name=" baselineID" type=" xs:string" >
      <xs:annotation>
        <xs:documentation>Unique ID for a specific baseline</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element ref=" ei:resourceID" minOccurs=" 0" maxOccurs=" unbounded" />
    <xs:element name=" baselineName" type=" xs:string" >
      <xs:annotation>
        <xs:documentation>Descriptive name for baseline</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
</xs:complexType>

```

```

    </xs:annotation>
</xs:element>
<xs:element ref=" emix:itemBase" minOccurs=" 0" >
    <xs:annotation>
        <xs:documentation>This is the unit of the signal.</xs:documentation>
    </xs:annotation>
</xs:element>
</xs:sequence>
</xs:complexType>
<xs:complexType name=" EiOptType" >
    <xs:annotation>
        <xs:documentation>Opts are used by the VEN to temporarily override the pre-existing agreement. For example, a VEN
may opt in to events during the evening, or opt out from events during the world series.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
        <xs:element ref=" ei:optID" />
        <xs:element ref=" ei:optType" />
        <xs:element ref=" ei:optReason" />
        <xs:element ref=" emix:marketContext" minOccurs=" 0" />
        <xs:element ref=" ei:venID" />
        <xs:element ref=" xcal:vavailability" minOccurs=" 0" />
        <xs:element ref=" ei:createdDateTime" />
    </xs:sequence>
    <xs:attribute ref=" ei:schemaVersion" use=" optional" />
</xs:complexType>
<xs:element name=" optReason" type=" ei:OptReasonType" >
    <xs:annotation>
        <xs:documentation>Enumerated value for the opt reason such as x-schedule</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:simpleType name=" OptReasonType" >
    <xs:annotation>
        <xs:documentation>Reason for opting.</xs:documentation>
    </xs:annotation>
    <xs:union memberTypes=" ei:OptReasonEnumeratedType ei:EiExtensionTokenType" />
</xs:simpleType>
<xs:element name=" optReasonEnumerated" type=" ei:OptReasonEnumeratedType" />
<xs:simpleType name=" OptReasonEnumeratedType" >
    <xs:annotation>
        <xs:documentation>Enumerated reasons for opting.</xs:documentation>
    </xs:annotation>
    <xs:restriction base=" xs:token" >
        <xs:enumeration value=" economic" />
        <xs:enumeration value=" emergency" />
        <xs:enumeration value=" mustRun" />
        <xs:enumeration value=" notParticipating" />
        <xs:enumeration value=" outageRunStatus" />
        <xs:enumeration value=" overrideStatus" />
    </xs:restriction>
</xs:simpleType>

```

```

    <xs:enumeration value=" participating" />
    <xs:enumeration value=" x-schedule" />
  </xs:restriction>
</xs:simpleType>
<xs:element name=" optID" type=" xs:string" >
  <xs:annotation>
    <xs:documentation>Identifier for an opt interaction</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" eiReportID" type=" xs:string" >
  <xs:annotation>
    <xs:documentation>Reference ID for a report</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" reportRequestID" type=" xs:string" >
  <xs:annotation>
    <xs:documentation>Identifier for a particular report request</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" reportSpecifierID" type=" xs:string" >
  <xs:annotation>
    <xs:documentation>Identifier for a particular Metadata report specification</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" reportName" type=" ei:reportNameType" >
  <xs:annotation>
    <xs:documentation>Optional name for a report.</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:simpleType name=" reportNameType" >
  <xs:union memberTypes=" ei:reportNameEnumeratedType ei:eiExtensionTokenType" />
</xs:simpleType>
<xs:simpleType name=" reportNameEnumeratedType" >
  <xs:restriction base=" xs:token" >
    <xs:enumeration value=" METADATA_HISTORY_USAGE" />
    <xs:enumeration value=" HISTORY_USAGE" />
    <xs:enumeration value=" METADATA_HISTORY_GREENBUTTON" />
    <xs:enumeration value=" HISTORY_GREENBUTTON" />
    <xs:enumeration value=" METADATA_TELEMETRY_USAGE" />
    <xs:enumeration value=" TELEMETRY_USAGE" />
    <xs:enumeration value=" METADATA_TELEMETRY_STATUS" />
    <xs:enumeration value=" TELEMETRY_STATUS" />
  </xs:restriction>
</xs:simpleType>
<xs:element name=" rID" type=" xs:string" >
  <xs:annotation>
    <xs:documentation>ReferenceID for this data point</xs:documentation>
  </xs:annotation>
</xs:element>

```

```

<xs:element name=" reportSubject" type=" ei: EiTargetType" >
  <xs:annotation>
    <xs:documentation>Device Class target – use only endDeviceAsset.</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" reportDataSource" type=" ei: EiTargetType" >
  <xs:annotation>
    <xs:documentation>Sources for data in this report. Examples include meters or submeters. For example, if a meter is
capable of providing two different types of measurements, then each measurement stream would be separately
identified.</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" statusDateTime" type=" xcal: DateTimeType" >
  <xs:annotation>
    <xs:documentation>Date and time this artifact references.</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" reportType" type=" ei: ReportTypeType" />
<xs:simpleType name=" ReportTypeType" >
  <xs:annotation>
    <xs:documentation>An enumerated value that gives the type of report being provided.</xs:documentation>
  </xs:annotation>
  <xs:union memberTypes=" ei: ReportEnumeratedType ei: EiExtensionTokenType" />
</xs:simpleType>
<xs:element name=" reportEnumerated" type=" ei: ReportEnumeratedType" />
<xs:simpleType name=" ReportEnumeratedType" >
  <xs:annotation>
    <xs:documentation>Enumerated report types</xs:documentation>
  </xs:annotation>
  <xs:restriction base=" xs: token" >
    <xs:enumeration value=" reading" >
      <xs:annotation>
        <xs:documentation>Report indicates a reading, as from a meter. Readings are moments in time- changes over time can
be computed from the difference between successive readings. Payload type is float</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value=" usage" >
      <xs:annotation>
        <xs:documentation>Report indicates an amount of units (denominated in ItemBase or in the EMIX Product) over a
period. Payload type is Quantity. A typical ItemBase is Real Energy.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value=" demand" >
      <xs:annotation>
        <xs:documentation>Report indicates an amount of units (denominated in ItemBase or in the EMIX Product). Payload
type is Quantity. A typical ItemBase is Real Power.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value=" setPoint" >
      <xs:annotation>

```

<xs:documentation>Report indicates the amount (denominated in ItemBase or in the EMIX Product) currently set. May be a confirmation/return of the setpoint control value sent from the VTN. Payload type is Quantity. A typical ItemBase is Real Power.</xs:documentation>

</xs:annotation>

</xs:enumeration>

<xs:enumeration value=" deltaUsage" >

<xs:annotation>

<xs:documentation>Change in usage as compared to the baseline. See usage for more information</xs:documentation>

</xs:annotation>

</xs:enumeration>

<xs:enumeration value=" deltaSetPoint" >

<xs:annotation>

<xs:documentation>Changes in setpoint from previous schedule.</xs:documentation>

</xs:annotation>

</xs:enumeration>

<xs:enumeration value=" deltaDemand" >

<xs:annotation>

<xs:documentation>Change in demand as compared to the baseline. See demand for more information</xs:documentation>

</xs:annotation>

</xs:enumeration>

<xs:enumeration value=" baseline" >

<xs:annotation>

<xs:documentation>Can be demand or usage, as indicated by ItemBase. Indicates what [measurement] would be if not for the event or regulation. Report is of the format Baseline.</xs:documentation>

</xs:annotation>

</xs:enumeration>

<xs:enumeration value=" deviation" >

<xs:annotation>

<xs:documentation>Difference between some instruction and actual state.</xs:documentation>

</xs:annotation>

</xs:enumeration>

<xs:enumeration value=" avgUsage" >

<xs:annotation>

<xs:documentation>Average usage over the duration indicated by the Granularity. See usage for more information.</xs:documentation>

</xs:annotation>

</xs:enumeration>

<xs:enumeration value=" avgDemand" >

<xs:annotation>

<xs:documentation>Average usage over the duration indicated by the Granularity. See demand for more information.</xs:documentation>

</xs:annotation>

</xs:enumeration>

<xs:enumeration value=" operatingState" >

<xs:annotation>

<xs:documentation>Generalized state of a resource such as on/off, occupancy of building, etc. No ItemBase is relevant. Requires an Application Specific Payload Extension.</xs:documentation>

</xs:annotation>

</xs:enumeration>

```
<xs:enumeration value=" upRegulationCapacityAvailable" >
  <xs:annotation>
    <xs:documentation>Up Regulation capacity available for dispatch, expressed in EMIX Real Power. Payload is always
expressed as positive Quantity.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" downRegulationCapacityAvailable" >
  <xs:annotation>
    <xs:documentation>Down Regulation capacity available for dispatch, expressed in EMIX Real Power. Payload is
always expressed as positive Quantity.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" regulationSetpoint" >
  <xs:annotation>
    <xs:documentation>Regulation setpoint as instructed as part of regulation services</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" storedEnergy" >
  <xs:annotation>
    <xs:documentation>Stored Energy is expressed as Real Energy and Payload is expressed as a
Quantity.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" targetEnergyStorage" >
  <xs:annotation>
    <xs:documentation>Target Energy is expressed as Real Energy and Payload is expressed as a
Quantity.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" availableEnergyStorage" >
  <xs:annotation>
    <xs:documentation>Capacity available for further energy storage, perhaps to get to Target Energy
Storage</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" price" >
  <xs:annotation>
    <xs:documentation>Price per ItemBase at each Interval</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" level" >
  <xs:annotation>
    <xs:documentation>Simple level from market at each Interval. Itembase is not relevant.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" powerFactor" >
  <xs:annotation>
    <xs:documentation>Power factor for the resource.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
```



```

<xs:enumeration value=" percentUsage" >
  <xs:annotation>
    <xs:documentation>Percentage of usage.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" percentDemand" >
  <xs:annotation>
    <xs:documentation>Percentage of demand</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" x-resourceStatus" >
  <xs:annotation>
    <xs:documentation>Percentage of demand</xs:documentation>
  </xs:annotation>
</xs:enumeration>
</xs:restriction>
</xs:simpleType>
<xs:element name=" readingType" type=" ei:ReadingTypeType" >
  <xs:annotation>
    <xs:documentation>Metadata about the Readings, such as mean or derived</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:simpleType name=" ReadingTypeType" >
  <xs:annotation>
    <xs:documentation>Type of Reading.</xs:documentation>
  </xs:annotation>
  <xs:union memberTypes=" ei:ReadingTypeEnumeratedType ei:EiExtensionTokenType" />
</xs:simpleType>
<xs:element name=" readingTypeEnumerated" type=" ei:ReadingTypeEnumeratedType" />
<xs:simpleType name=" ReadingTypeEnumeratedType" >
  <xs:restriction base=" xs:token" >
    <xs:enumeration value=" Direct Read" >
      <xs:annotation>
        <xs:documentation>Reading is read from a device that increases monotonically, and usage must be computed from
pairs of start and stop readings.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value=" Net" >
      <xs:annotation>
        <xs:documentation>Meter or [resource] prepares its own calculation of total use over time.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value=" Allocated" >
      <xs:annotation>
        <xs:documentation>Meter covers several [resources] and usage is inferred through some sort of pro data
computation.</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value=" Estimated" >
      <xs:annotation>

```

```

    <xs:documentation>Used when a reading is absent in a series in which most readings are present.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" Summed" >
  <xs:annotation>
    <xs:documentation>Several meters together provide the reading for this [resource]. This is specifically a different than
aggregated, which refers to multiple [resources] in the same payload. See also Hybrid.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" Derived" >
  <xs:annotation>
    <xs:documentation>Usage is inferred through knowledge of run-time, normal operation, etc.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" Mean" >
  <xs:annotation>
    <xs:documentation>Reading is the mean value over the period indicated in Granularity</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" Peak" >
  <xs:annotation>
    <xs:documentation>Reading is Peak (highest) value over the period indicated in granularity. For some measurements,
it may make more sense as the lowest value. May not be consistent with aggregate readings. Only valid for flow-rate Item Bases, i.e.
Power not Energy.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" Hybrid" >
  <xs:annotation>
    <xs:documentation>If aggregated, refers to different reading types in the aggregate number.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" Contract" >
  <xs:annotation>
    <xs:documentation>Indicates reading is pro forma, i.e. is reported at agreed upon rates</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" Projected" >
  <xs:annotation>
    <xs:documentation>Indicates reading is in the future, and has not yet been measured.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" x-RMS" >
  <xs:annotation>
    <xs:documentation>Root Mean Square</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" x-notApplicable" >
  <xs:annotation>
    <xs:documentation>Not Applicable</xs:documentation>
  </xs:annotation>

```

```

    </xs:enumeration>
  </xs:restriction>
</xs:simpleType>
<xs:element name=" confidence" type=" ei:ConfidenceType" />
<xs:simpleType name=" ConfidenceType" >
  <xs:restriction base=" xs:unsignedInt" >
    <xs:minInclusive value=" 0" />
    <xs:maxInclusive value=" 100" />
  </xs:restriction>
</xs:simpleType>
<xs:element name=" accuracy" type=" ei:AccuracyType" />
<xs:simpleType name=" AccuracyType" >
  <xs:annotation>
    <xs:documentation>Number is in same units as the payload variable for an Interval. When present with Confidence,
indicates the likely variability of the prediction. When present with ReadingType, indicates likely error of
Reading.</xs:documentation>
  </xs:annotation>
  <xs:restriction base=" xs:float" />
</xs:simpleType>
<xs:complexType name=" ReportPayloadType" >
  <xs:annotation>
    <xs:documentation>Report Payload for use in Reports, snaps, and projections.</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base=" strm:StreamPayloadBaseType" >
      <xs:sequence>
        <xs:element ref=" ei:rID" >
          <xs:annotation>
            <xs:documentation>A reference to a metadata data point description</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element ref=" ei:confidence" minOccurs=" 0" >
          <xs:annotation>
            <xs:documentation>Likely variability of prediction: 0-100</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element ref=" ei:accuracy" minOccurs=" 0" >
          <xs:annotation>
            <xs:documentation>Accuracy in same units as interval payload value</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element ref=" ei:payloadBase" />
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:element name=" numDataSources" type=" xs:unsignedInt" />
<xs:element name=" reportSpecifier" type=" ei:ReportSpecifierType" >
  <xs:annotation>

```

```

    <xs:documentation>Specify data points desired in a particular report instance</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:complexType name=" ReportSpecifierType" >
  <xs:annotation>
    <xs:documentation>Parameters that define the content of a Report Stream</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element ref=" ei:reportSpecifierID" />
    <xs:element ref=" xcal:granularity" >
      <xs:annotation>
        <xs:documentation>How frequently the [measurement] is to be recorded.</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name=" reportBackDuration" type=" xcal:DurationPropType" >
      <xs:annotation>
        <xs:documentation>Report back with the Report-To-Date for each passing of this Duration.</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name=" reportInterval" type=" xcal:WsCalendarIntervalType" minOccurs=" 0" >
      <xs:annotation>
        <xs:documentation>This is the overall period of reporting.</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element ref=" ei:specifierPayload" maxOccurs=" unbounded" />
  </xs:sequence>
</xs:complexType>
<xs:element name=" specifierPayload" type=" ei:SpecifierPayloadType" />
<xs:complexType name=" SpecifierPayloadType" >
  <xs:annotation>
    <xs:documentation>Payload for use in Report Specifiers.</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element ref=" ei:rID" />
    <xs:element ref=" emix:itemBase" minOccurs=" 0" >
      <xs:annotation>
        <xs:documentation>What is measured or tracked in this report (Units).</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element ref=" ei:readingType" />
  </xs:sequence>
</xs:complexType>
<xs:element name=" registrationID" substitutionGroup=" ei:refID" >
  <xs:annotation>
    <xs:documentation>Identifier for Registration transaction. Not included in response to query registration unless already
registered</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" refID" substitutionGroup=" ei:uid" >
  <xs:annotation>

```

<xs:documentation>Reference ID for a particular instance, transmittal, or artifact. Note: not the same as the native ID of the object being transmitted or shared.</xs:documentation>

```

</xs:annotation>
</xs:element>
<xs:element name=" uid" type=" ei:UidType" abstract=" true" />
<xs:simpleType name=" UidType" >
  <xs:annotation>
    <xs:documentation>Unique Identifier</xs:documentation>
  </xs:annotation>
  <xs:restriction base=" xs:string" />
</xs:simpleType>
<xs:attribute name=" schemaVersion" type=" ei:schemaVersionType" />
<xs:simpleType name=" schemaVersionType" >
  <xs:union memberTypes=" ei:schemaVersionEnumeratedType ei:EiExtensionTokenType" />
</xs:simpleType>
<xs:simpleType name=" schemaVersionEnumeratedType" >
  <xs:restriction base=" xs:token" >
    <xs:enumeration value=" 2.0a" />
    <xs:enumeration value=" 2.0b" />
  </xs:restriction>
</xs:simpleType>
</xs:schema>

```

oadr_emix_20b.xsd

```

<?xml version=" 1.0" encoding=" ISO-8859-1" ?>
<xs:schema xmlns:xs=" http://www.w3.org/2001/XMLSchema" xmlns:emix=" http://docs.oasis-open.org/ns/emix/2011/06"
xmlns:xcal=" urn:ietf:params:xml:ns:icalendar-2.0" xmlns:gml=" http://www.opengis.net/gml/3.2" xmlns:gmlsf="
http://www.opengis.net/gmlsf/2.0" xmlns:power=" http://docs.oasis-open.org/ns/emix/2011/06/power" xmlns:ei=" http://docs.oasis-
open.org/ns/energyinterop/201110" targetNamespace=" http://docs.oasis-open.org/ns/emix/2011/06" elementFormDefault="
qualified" attributeFormDefault=" qualified" >
  <xs:import namespace=" http://www.opengis.net/gml/3.2" schemaLocation=" oadr_gml_20b.xsd" />
  <xs:element name=" marketContext" type=" emix:MarketContextType" >
    <xs:annotation>
      <xs:documentation>A URI identifying a DR Program</xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:simpleType name=" MarketContextType" >
    <xs:restriction base=" xs:anyURI" />
  </xs:simpleType>
  <xs:element name=" serviceArea" type=" emix:ServiceAreaType" />
  <xs:complexType name=" ServiceAreaType" >
    <xs:annotation>
      <xs:documentation>The Service Area is the geographic region that is affected by the EMIX market condition</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element ref=" gml:FeatureCollection" />
    </xs:sequence>
  </xs:complexType>
  <xs:element name=" itemBase" type=" emix:ItemBaseType" abstract=" true" />
  <xs:complexType name=" ItemBaseType" abstract=" true" mixed=" false" >
    <xs:annotation>
      <xs:documentation>Abstract base type for units for EMIX Product delivery, measurement, and warrants.</xs:documentation>
    </xs:annotation>
  </xs:complexType>
</xs:schema>

```

oadr_gml_20b.xsd

```

<?xml version=" 1.0" encoding=" utf-8" ?>
<xs:schema xmlns:xs=" http://www.w3.org/2001/XMLSchema " xmlns:gml=" http://www.opengis.net/gml/3.2 " targetNamespace=" http://www.opengis.net/gml/3.2 " elementFormDefault=" qualified" attributeFormDefault=" unqualified" version=" 1.0" >
  <xs:element name=" FeatureCollection" >
    <xs:complexType>
      <xs:sequence>
        <xs:element name=" location" >
          <xs:complexType>
            <xs:sequence>
              <xs:element name=" Polygon" >
                <xs:complexType>
                  <xs:sequence>
                    <xs:element name=" exterior" >
                      <xs:complexType>
                        <xs:sequence>
                          <xs:element name=" LinearRing" >
                            <xs:complexType>
                              <xs:sequence>
                                <xs:element ref=" gml:posList" />
                              </xs:sequence>
                            </xs:complexType>
                          </xs:element>
                        </xs:sequence>
                      </xs:complexType>
                    </xs:element>
                  </xs:sequence>
                </xs:complexType>
              </xs:element>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:attribute name=" id" type=" xs:ID" />
  <xs:element name=" posList" type=" gml:doubleList" />
  <xs:simpleType name=" doubleList" >
    <xs:list itemType=" xs:double" />
  </xs:simpleType>
</xs:schema>

```

oadr_greenbutton.xsd

```

<?xml version=" 1.0" encoding=" utf-8" ?>
<xs:schema xmlns:xs=" http://www.w3.org/2001/XMLSchema" xmlns=" http://naesb.org/espi" xmlns:atom="
http://www.w3.org/2005/Atom" targetNamespace=" http://naesb.org/espi" elementFormDefault=" qualified"
attributeFormDefault=" unqualified" version=" 0.7.20121113" >
  <xs:import namespace=" http://www.w3.org/2005/Atom" schemaLocation=" oadr_atom.xsd" />
  <xs:complexType name=" IntervalBlock" >
    <xs:annotation>
      <xs:documentation>Time sequence of Readings of the same ReadingType.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base=" IdentifiedObject" >
        <xs:sequence>
          <xs:element name=" interval" type=" DateTimeInterval" minOccurs=" 0" >
            <xs:annotation>
              <xs:documentation>Specifies the time period during which the contained readings were taken.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name=" IntervalReading" type=" IntervalReading" minOccurs=" 0" maxOccurs=" unbounded" />
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name=" MeterReading" >
    <xs:annotation>
      <xs:documentation>Set of values obtained from the meter.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base=" IdentifiedObject" />
    </xs:complexContent>
  </xs:complexType>
  <xs:complexType name=" ReadingType" >
    <xs:annotation>
      <xs:documentation>Characteristics associated with all Readings included in a MeterReading.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
      <xs:extension base=" IdentifiedObject" >
        <xs:sequence>
          <xs:element name=" accumulationBehaviour" type=" AccumulationKind" minOccurs=" 0" >
            <xs:annotation>
              <xs:documentation>Code indicating how value is accumulated over time for Readings of
ReadingType.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name=" commodity" type=" CommodityKind" minOccurs=" 0" >
            <xs:annotation>
              <xs:documentation>Code for commodity classification of Readings of ReadingType.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name=" consumptionTier" type=" Int16" minOccurs=" 0" >
            <xs:annotation>
              <xs:documentation>Code for consumption tier associated with a Reading of ReadingType.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name=" currency" type=" Currency" minOccurs=" 0" >
            <xs:annotation>
              <xs:documentation>Code for the currency for costs associated with this ReadingType. The valid values per the standard are
defined in CurrencyCode.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name=" dataQualifier" type=" DataQualifierKind" minOccurs=" 0" >
            <xs:annotation>

```



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    <xs:documentation>Code describing a salient attribute of Readings of ReadingType.</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" defaultQuality" type=" QualityOfReading" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>Default value to be used if no value of ReadingQuality.quality is provided. Specific format and valid
values per the standard are specified in QualityOfReading.</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" flowDirection" type=" FlowDirectionKind" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>Direction associated with current related Readings.</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" intervalLength" type=" UInt32" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>Default interval length specified in seconds for Readings of ReadingType.</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" kind" type=" MeasurementKind" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>Code for general classification of a Reading of ReadingType.</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" phase" type=" PhaseCodeKind" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>Code for phase information associated with Readings of ReadingType.</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" powerOfTenMultiplier" type=" UnitMultiplierKind" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>Code for the power of ten multiplier which, when used in combination with the uom, specifies the
actual unit of measure for Readings of ReadingType.</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" timeAttribute" type=" TimePeriodOfInterest" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>Code used to specify a particular type of time interval method for Readings of
ReadingType.</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" tou" type=" Int16" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>Code for the TOU type of Readings of ReadingType.</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" uom" type=" UnitSymbolKind" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>Code for the base unit of measure for Readings of ReadingType. Used in combination with the
powerOfTenMultiplier to specify the actual unit of measure</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" cpp" type=" Int16" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>[extension] Critical peak period (CPP) bucket the reading value is attributed to. Value 0 means not
applicable. Even though CPP is usually considered a specialized form of time of use 'tou', this attribute is defined explicitly for
flexibility.</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" interharmonic" type=" ReadingInterharmonic" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>[extension] Indication of a " harmonic" or " interharmonic" basis for the measurement. Value 0
in 'numerator' and 'denominator' means not applicable.</xs:documentation>
  </xs:annotation>
</xs:element>

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```

    <xs:element name=" measuringPeriod" type=" TimeAttributeKind" minOccurs=" 0" >
      <xs:annotation>
        <xs:documentation>[extension] Time attribute inherent or fundamental to the reading value (as opposed to 'macroPeriod'
that supplies an " adjective" to describe aspects of a time period with regard to the measurement). It refers to the way the value was
originally measured and not to the frequency at which it is reported or presented. For example, an hourly interval of consumption data would
have value 'hourly' as an attribute. However in the case of an hourly sampled voltage value, the meterReadings schema would carry the
'hourly' interval size information. It is common for meters to report demand in a form that is measured over the course of a portion of an hour,
while enterprise applications however commonly assume the demand (in kW or kVAr) normalised to 1 hour. The sytem that receives readings
directly from the meter therefore must perform this transformation before publishing readings for use by the other enterprise systems. The
scalar used is chosen based on the block size (not any sub- interval size).</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name=" argument" type=" RationalNumber" minOccurs=" 0" >
      <xs:annotation>
        <xs:documentation>[extension] Argument used to introduce numbers into the unit of measure description where they are
needed (e.g. 4 where the measure needs an argument such as CEMI(n=4)). Most arguments used in practice however will be integers (i.e.
'denominator'=1). Value 0 in 'numerator' and 'denominator' means not applicable.</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:complexType name=" UsagePoint" >
  <xs:annotation>
    <xs:documentation>Logical point on a network at which consumption or production is either physically measured (e.g. metered) or
estimated (e.g. unmetered street lights).</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base=" IdentifiedObject" >
      <xs:sequence>
        <xs:element name=" roleFlags" type=" HexBinary16" minOccurs=" 0" >
          <xs:annotation>
            <xs:documentation>Specifies the roles that this usage point has been assigned. Bit 1 – isMirror Bit 2 –
isPremisesAggregationPoint Bit 3 – isPEV Bit 4 – isDER Bit 5 – isRevenueQuality Bit 6 – isDC Bit 7-16 – Reserved</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name=" ServiceCategory" type=" ServiceCategory" minOccurs=" 0" />
        <xs:element name=" status" type=" UInt8" minOccurs=" 0" >
          <xs:annotation>
            <xs:documentation>Specifies the current status of this usage point. Valid values include: 0 = off 1 = on</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name=" ServiceDeliveryPoint" type=" ServiceDeliveryPoint" minOccurs=" 0" >
          <xs:annotation>
            <xs:documentation>[extension] Contains service delivery point information about the UsagePoint if it does represent the
service delivery point.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:complexType name=" ElectricPowerQualitySummary" >
  <xs:annotation>
    <xs:documentation>A summary of power quality events. This information represents a summary of power quality information
typically required by customer facility energy management systems. It is not intended to satisfy the detailed requirements of power quality
monitoring. All values are as defined by measurementProtocol during the period. The standards typically also give ranges of allowed values;
the information attributes are the raw measurements, not the " yes/no" determination by the various standards. See referenced standards
for definition, measurement protocol and period.</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base=" IdentifiedObject" >
      <xs:sequence>
        <xs:element name=" flickerPlt" type=" Int48" minOccurs=" 0" >

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    <xs:annotation>
      <xs:documentation>A measurement of long term Rapid Voltage Change in hundredths of a Volt. flickerPlt is derived from 2
hours of Pst values (12 values combined in cubic relationship).</xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:element name=" flickerPst" type=" Int48" minOccurs=" 0" >
    <xs:annotation>
      <xs:documentation>flickerPst is a value measured over 10 minutes that characterizes the likelihood that the voltage
fluctuations would result in perceptible light flicker. A value of 1.0 is designed to represent the level that 50% of people would perceive
flicker in a 60 watt incandescent bulb. The value reported is represented as an integer in hundredths.</xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:element name=" harmonicVoltage" type=" Int48" minOccurs=" 0" >
    <xs:annotation>
      <xs:documentation>A measurement of the Harmonic Voltage during the period. For DC, distortion is with respect to a
signal of zero Hz.</xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:element name=" longInterruptions" type=" Int48" minOccurs=" 0" >
    <xs:annotation>
      <xs:documentation>A count of Long Interruption events (as defined by measurementProtocol) during the summary interval
period.</xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:element name=" mainsVoltage" type=" Int48" minOccurs=" 0" >
    <xs:annotation>
      <xs:documentation>A measurement of the Mains [Signaling] Voltage during the summary interval period in
uV.</xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:element name=" measurementProtocol" type=" UInt8" minOccurs=" 0" >
    <xs:annotation>
      <xs:documentation>A reference to the source standard used as the measurement protocol definition. Examples are: 0 = "
IEEE1519-2009" 1 = " EN50160" </xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:element name=" powerFrequency" type=" Int48" minOccurs=" 0" >
    <xs:annotation>
      <xs:documentation>A measurement of the power frequency during the summary interval period in
uHz.</xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:element name=" rapidVoltageChanges" type=" Int48" minOccurs=" 0" >
    <xs:annotation>
      <xs:documentation>A count of Rapid Voltage Change events during the summary interval period</xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:element name=" shortInterruptions" type=" Int48" minOccurs=" 0" >
    <xs:annotation>
      <xs:documentation>A count of Short Interruption events during the summary interval period</xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:element name=" summaryInterval" type=" DateTimeInterval" >
    <xs:annotation>
      <xs:documentation>Interval of summary period</xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:element name=" supplyVoltageDips" type=" Int48" minOccurs=" 0" >
    <xs:annotation>
      <xs:documentation>A count of Supply Voltage Dip events during the summary interval period</xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:element name=" supplyVoltageImbalance" type=" Int48" minOccurs=" 0" >
    <xs:annotation>
      <xs:documentation>A count of Supply Voltage Imbalance events during the summary interval period</xs:documentation>

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        </xs:annotation>
    </xs:element>
    <xs:element name=" supplyVoltageVariations" type=" Int48" minOccurs=" 0" >
        <xs:annotation>
            <xs:documentation>A count of Supply Voltage Variations during the summary interval period</xs:documentation>
        </xs:annotation>
    </xs:element>
    <xs:element name=" tempOvervoltage" type=" Int48" minOccurs=" 0" >
        <xs:annotation>
            <xs:documentation>A count of Temporary Overvoltage events (as defined by measurementProtocol) during the summary
interval period</xs:documentation>
        </xs:annotation>
    </xs:element>
</xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:complexType name=" ElectricPowerUsageSummary" >
    <xs:annotation>
        <xs:documentation>Summary of usage for a billing period</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
        <xs:extension base=" IdentifiedObject" >
            <xs:sequence>
                <xs:element name=" billingPeriod" type=" DateTimeInterval" minOccurs=" 0" >
                    <xs:annotation>
                        <xs:documentation>The billing period to which the included measurements apply</xs:documentation>
                    </xs:annotation>
                </xs:element>
                <xs:element name=" billLastPeriod" type=" Int48" minOccurs=" 0" >
                    <xs:annotation>
                        <xs:documentation>The amount of the bill for the previous billing period , in hundred- thousandths of the currency
specified in the ReadingType for this reading (e.g. 840 = USD, US dollar).</xs:documentation>
                    </xs:annotation>
                </xs:element>
                <xs:element name=" billToDate" type=" Int48" minOccurs=" 0" >
                    <xs:annotation>
                        <xs:documentation>The bill amount related to the billing period as of the date received, in hundred-thousandths of the
currency specified in the ReadingType for this reading. (e.g. 840 = USD, US dollar).</xs:documentation>
                    </xs:annotation>
                </xs:element>
                <xs:element name=" costAdditionalLastPeriod" type=" Int48" minOccurs=" 0" >
                    <xs:annotation>
                        <xs:documentation>Additional charges from the last billing period, in hundred-thousandths of the currency specified in the
ReadingType for this reading. (e.g. 840 = USD, US dollar).</xs:documentation>
                    </xs:annotation>
                </xs:element>
                <xs:element name=" costAdditionalDetailLastPeriod" type=" LineItem" minOccurs=" 0" maxOccurs=" unbounded"
>
                    <xs:annotation>
                        <xs:documentation>[extension] Additional charges from the last billing period which in total add up to
costAdditionalLastPeriod</xs:documentation>
                    </xs:annotation>
                </xs:element>
                <xs:element name=" currency" type=" Currency" minOccurs=" 0" >
                    <xs:annotation>
                        <xs:documentation>The ISO 4217 code indicating the currency applicable to the bill amounts in the summary. See list at
http://tiny.cc/4217</xs:documentation>
                    </xs:annotation>
                </xs:element>
                <xs:element name=" overallConsumptionLastPeriod" type=" SummaryMeasurement" minOccurs=" 0" >
                    <xs:annotation>
                        <xs:documentation>[extension] The amount of energy consumed in the last billing period.</xs:documentation>
                    </xs:annotation>
                </xs:element>
            </xs:sequence>
        </xs:extension>
    </xs:complexContent>
</xs:complexType>

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<xs:element name=" currentBillingPeriodOverAllConsumption" type=" SummaryMeasurement" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>The total consumption for the billing period</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" currentDayLastYearNetConsumption" type=" SummaryMeasurement" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>The amount of energy consumed one year ago interpreted as same day of week same week of year (see
ISO 8601).</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" currentDayNetConsumption" type=" SummaryMeasurement" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>Net consumption for the current day (delivered – received)</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" currentDayOverallConsumption" type=" SummaryMeasurement" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>Overall energy consumption for the current day</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" peakDemand" type=" SummaryMeasurement" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>Peak demand recorded for the current period</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" previousDayLastYearOverallConsumption" type=" SummaryMeasurement" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>The amount of energy consumed on the previous day one year ago interpreted as same day of week
same week of year (see ISO 8601).</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" previousDayNetConsumption" type=" SummaryMeasurement" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>Net consumption for the previous day</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" previousDayOverallConsumption" type=" SummaryMeasurement" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>The total consumption for the previous day</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" qualityOfReading" type=" QualityOfReading" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>Indication of the quality of the summary readings</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" ratchetDemand" type=" SummaryMeasurement" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>The current ratchet demand value for the ratchet demand period</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" ratchetDemandPeriod" type=" DateTimeInterval" minOccurs=" 0" >
  <xs:annotation>
    <xs:documentation>The period over which the ratchet demand applies</xs:documentation>
  </xs:annotation>
</xs:element>
<xs:element name=" statusTimeStamp" type=" TimeType" >
  <xs:annotation>
    <xs:documentation>Date/Time status of this UsageSummary</xs:documentation>
  </xs:annotation>
</xs:element>
</xs:sequence>
</xs:extension>
</xs:complexContent>

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```

</xs:complexType>
<xs:complexType name=" TimeConfiguration" >
  <xs:annotation>
    <xs:documentation>[extension] Contains attributes related to the configuration of the time service.</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base=" IdentifiedObject" >
      <xs:sequence>
        <xs:element name=" dstEndRule" type=" DstRuleType" >
          <xs:annotation>
            <xs:documentation>Rule to calculate end of daylight savings time in the current year. Result of dstEndRule must be greater
than result of dstStartRule.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name=" dstOffset" type=" TimeType" >
          <xs:annotation>
            <xs:documentation>Daylight savings time offset from local standard time.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name=" dstStartRule" type=" DstRuleType" >
          <xs:annotation>
            <xs:documentation>Rule to calculate start of daylight savings time in the current year. Result of dstEndRule must be
greater than result of dstStartRule.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name=" tzOffset" type=" TimeType" >
          <xs:annotation>
            <xs:documentation>Local time zone offset from UTCTime. Does not include any daylight savings time
offsets.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:complexType name=" IntervalReading" >
  <xs:annotation>
    <xs:documentation>Specific value measured by a meter or other asset. Each Reading is associated with a specific
ReadingType.</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base=" Object" >
      <xs:sequence>
        <xs:element name=" cost" type=" Int48" minOccurs=" 0" >
          <xs:annotation>
            <xs:documentation>[correction] Specifies a cost associated with this reading, in hundred- thousandths of the currency
specified in the ReadingType for this reading. (e.g. 840 = USD, US dollar)</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name=" ReadingQuality" type=" ReadingQuality" minOccurs=" 0" maxOccurs=" unbounded" />
        <xs:element name=" timePeriod" type=" DateTimeInterval" minOccurs=" 0" >
          <xs:annotation>
            <xs:documentation>The date time and duration of a reading. If not specified, readings for each " intervalLength" in
ReadingType are present.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name=" value" type=" Int48" minOccurs=" 0" >
          <xs:annotation>
            <xs:documentation>[correction] Value in units specified by ReadingType</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>

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<xs:complexType name=" ReadingQuality" >
  <xs:annotation>
    <xs:documentation>Quality of a specific reading value or interval reading value. Note that more than one Quality may be applicable
to a given Reading. Typically not used unless problems or unusual conditions occur (i.e. quality for each Reading is assumed to be 'Good'
(valid) unless stated otherwise in associated ReadingQuality).</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base=" Object" >
      <xs:sequence>
        <xs:element name=" quality" type=" QualityOfReading" >
          <xs:annotation>
            <xs:documentation>Quality, to be specified if different than ReadingType.defaultQuality. The specific format is specified
per the standard is defined in QualityOfReading.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:complexType name=" ServiceCategory" >
  <xs:annotation>
    <xs:documentation>Category of service provided to the customer.</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base=" Object" >
      <xs:sequence>
        <xs:element name=" kind" type=" ServiceKind" >
          <xs:annotation>
            <xs:documentation>Service classification Examples are: 0 – electricity 1 – gas The list of specific valid values per the
standard are itemized in ServiceKind.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:complexType name=" SummaryMeasurement" >
  <xs:annotation>
    <xs:documentation>An aggregated summary measurement reading.</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base=" Object" >
      <xs:sequence>
        <xs:element name=" powerOfTenMultiplier" type=" UnitMultiplierKind" minOccurs=" 0" >
          <xs:annotation>
            <xs:documentation>The multiplier part of the unit of measure, e.g. " kilo" (k)</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name=" timeStamp" type=" TimeType" minOccurs=" 0" >
          <xs:annotation>
            <xs:documentation>The date and time (if needed) of the summary measurement.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name=" uom" type=" UnitSymbolKind" minOccurs=" 0" >
          <xs:annotation>
            <xs:documentation>The units of the reading, e.g. " Wh" </xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name=" value" type=" Int48" minOccurs=" 0" >
          <xs:annotation>
            <xs:documentation>The value of the summary measurement.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>

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```

</xs:complexContent>
</xs:complexType>
<xs:complexType name=" BatchItemInfo" >
  <xs:annotation>
    <xs:documentation>Includes elements that make it possible to include multiple transactions in a single (batch)
request.</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base=" Object" >
      <xs:sequence>
        <xs:element name=" name" type=" HexBinary16" minOccurs=" 0" >
          <xs:annotation>
            <xs:documentation>An identifier for this object that is only unique within the containing collection.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name=" operation" type=" CRUDOperation" minOccurs=" 0" >
          <xs:annotation>
            <xs:documentation>Specifies the operation requested of this item.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name=" statusCode" type=" StatusCode" minOccurs=" 0" >
          <xs:annotation>
            <xs:documentation>Indicates the status code of the associated transaction.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name=" statusReason" type=" String256" minOccurs=" 0" >
          <xs:annotation>
            <xs:documentation>Indicates the reason for the indicated status code.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:complexType name=" ServiceDeliveryPoint" >
  <xs:annotation>
    <xs:documentation>[extension] Service Delivery Point is representation of revenue UsagePoint attributes</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base=" Object" >
      <xs:sequence>
        <xs:element name=" name" type=" String256" minOccurs=" 0" >
          <xs:annotation>
            <xs:documentation>The name is any free human readable and possibly non unique text naming the
object.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name=" tariffProfile" type=" String256" minOccurs=" 0" >
          <xs:annotation>
            <xs:documentation>A schedule of charges; structure associated with Tariff that allows the definition of complex tariff
structures such as step and time of use.</xs:documentation>
          </xs:annotation>
        </xs:element>
        <xs:element name=" customerAgreement" type=" String256" minOccurs=" 0" >
          <xs:annotation>
            <xs:documentation>Agreement between the customer and the ServiceSupplier to pay for service at a specific service
location. It provides for the recording of certain billing information about the type of service provided at the service location and is used
during charge creation to determine the type of service.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:simpleType name=" HexBinary128" >

```



```

<xs:annotation>
  <xs:documentation>A 128-bit field encoded as a hex string (32 characters / 16 octets)</xs:documentation>
</xs:annotation>
<xs:restriction base=" xs:hexBinary" >
  <xs:maxLength value=" 16" />
</xs:restriction>
</xs:simpleType>
<xs:simpleType name=" HexBinary32" >
  <xs:annotation>
    <xs:documentation>A 32-bit field encoded as a hex string (8 characters / 4 octets)</xs:documentation>
  </xs:annotation>
  <xs:restriction base=" xs:hexBinary" >
    <xs:maxLength value=" 4" />
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name=" HexBinary16" >
  <xs:annotation>
    <xs:documentation>A 16-bit field encoded as a hex string (4 characters / 2 octets)</xs:documentation>
  </xs:annotation>
  <xs:restriction base=" xs:hexBinary" >
    <xs:maxLength value=" 2" />
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name=" HexBinary8" >
  <xs:annotation>
    <xs:documentation>An 8-bit field encoded as a hex string (2 characters / 1 octets)</xs:documentation>
  </xs:annotation>
  <xs:restriction base=" xs:hexBinary" >
    <xs:maxLength value=" 1" />
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name=" String256" >
  <xs:annotation>
    <xs:documentation>Character string of max length 256</xs:documentation>
  </xs:annotation>
  <xs:restriction base=" xs:string" >
    <xs:maxLength value=" 256" />
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name=" String32" >
  <xs:annotation>
    <xs:documentation>Character string of max length 32</xs:documentation>
  </xs:annotation>
  <xs:restriction base=" xs:string" >
    <xs:maxLength value=" 32" />
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name=" String64" >
  <xs:annotation>
    <xs:documentation>Character string of max length 64</xs:documentation>
  </xs:annotation>
  <xs:restriction base=" xs:string" >
    <xs:maxLength value=" 64" />
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name=" UInt16" >
  <xs:annotation>
    <xs:documentation>Unsigned integer, max inclusive 65535 (2^16-1), same as xs:unsignedShort</xs:documentation>
  </xs:annotation>
  <xs:restriction base=" xs:unsignedShort" />
</xs:simpleType>
<xs:simpleType name=" UInt32" >
  <xs:annotation>
    <xs:documentation>Unsigned integer, max inclusive 4294967295 (2^32-1), same as xs:unsignedInt</xs:documentation>

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```

    </xs:annotation>
    <xs:restriction base=" xs:unsignedInt" />
</xs:simpleType>
<xs:simpleType name=" UInt48" >
    <xs:annotation>
        <xs:documentation>Unsigned integer, max inclusive 281474976710655 (2^48-1), restriction of
xs:unsignedLong</xs:documentation>
    </xs:annotation>
    <xs:restriction base=" xs:unsignedLong" >
        <xs:maxInclusive value=" 281474976710655" />
    </xs:restriction>
</xs:simpleType>
<xs:simpleType name=" UInt8" >
    <xs:annotation>
        <xs:documentation>Unsigned integer, max inclusive 255 (2^8-1), same as xs:unsignedByte</xs:documentation>
    </xs:annotation>
    <xs:restriction base=" xs:unsignedByte" />
</xs:simpleType>
<xs:simpleType name=" Int48" >
    <xs:annotation>
        <xs:documentation>Signed integer, max inclusive -140737488355327 to +140737488355327 (2^47-1), restriction of
xs:long</xs:documentation>
    </xs:annotation>
    <xs:restriction base=" xs:long" >
        <xs:minInclusive value=" -140737488355328" />
        <xs:maxInclusive value=" 140737488355328" />
    </xs:restriction>
</xs:simpleType>
<xs:simpleType name=" Int16" >
    <xs:annotation>
        <xs:documentation>Signed integer, max inclusive (2^16-1), restriction of xs:short</xs:documentation>
    </xs:annotation>
    <xs:restriction base=" xs:short" />
</xs:simpleType>
<xs:simpleType name=" TimeType" >
    <xs:annotation>
        <xs:documentation>Time is a signed 64-bit value representing the number of seconds since 0 hours, 0 minutes, 0 seconds, on the 1st
of January, 1970.</xs:documentation>
    </xs:annotation>
    <xs:restriction base=" xs:long" />
</xs:simpleType>
<xs:complexType name=" DateTimeInterval" >
    <xs:annotation>
        <xs:documentation>Interval of date and time. End is not included because it can be derived from the start and the
duration.</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
        <xs:extension base=" Object" >
            <xs:sequence>
                <xs:element name=" duration" type=" UInt32" minOccurs=" 0" >
                    <xs:annotation>
                        <xs:documentation>[correction] Duration of the interval, in seconds.</xs:documentation>
                    </xs:annotation>
                </xs:element>
                <xs:element name=" start" type=" TimeType" minOccurs=" 0" >
                    <xs:annotation>
                        <xs:documentation>[correction] Date and time that this interval started.</xs:documentation>
                    </xs:annotation>
                </xs:element>
            </xs:sequence>
        </xs:extension>
    </xs:complexContent>
</xs:complexType>
<xs:complexType name=" IdentifiedObject" >
    <xs:annotation>

```

```

    <xs:documentation>This is a root class to provide common naming attributes for all classes needing naming
attributes</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base=" Object" >
      <xs:sequence>
        <xs:element name=" batchItemInfo" type=" BatchItemInfo" minOccurs=" 0" />
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:simpleType name=" UUIDType" >
  <xs:annotation>
    <xs:documentation>This pattern defines a UUID</xs:documentation>
  </xs:annotation>
  <xs:restriction base=" xs:string" >
    <xs:pattern value=" [a-f0-9]{8}-[a-f0-9]{4}-[a-f0-9]{4}-[a-f0-9]{4}-[a-f0-9]{12}" />
  </xs:restriction>
</xs:simpleType>
<xs:complexType name=" Object" >
  <xs:annotation>
    <xs:documentation>Superclass of all object classes to allow extensions.</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name=" extension" type=" xs:anyType" minOccurs=" 0" maxOccurs=" unbounded" >
      <xs:annotation>
        <xs:documentation>Contains an extension.</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
</xs:complexType>
<xs:complexType name=" ServiceStatus" >
  <xs:annotation>
    <xs:documentation>Contains the current status of the service.</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base=" Object" >
      <xs:sequence>
        <xs:element name=" currentStatus" type=" ESPIServiceStatus" >
          <xs:annotation>
            <xs:documentation>The current status of the service.</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:complexType name=" RationalNumber" >
  <xs:annotation>
    <xs:documentation>[extension] Rational number = 'numerator' / 'denominator'.</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name=" numerator" type=" xs:integer" minOccurs=" 0" />
    <xs:element name=" denominator" minOccurs=" 0" />
  </xs:sequence>
</xs:complexType>
<xs:complexType name=" ReadingInterharmonic" >
  <xs:annotation>
    <xs:documentation>[extension] Interharmonics are represented as a rational number 'numerator' / 'denominator', and harmonics are
represented using the same mechanism and identified by 'denominator'=1.</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name=" numerator" type=" xs:integer" minOccurs=" 0" />
    <xs:element name=" denominator" minOccurs=" 0" />
  </xs:sequence>

```

```

</xs:complexType>
<xs:complexType name=" LineItem" >
  <xs:annotation>
    <xs:documentation>[extension] Line item of detail for additional cost</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name=" amount" type=" Int48" />
    <xs:element name=" rounding" type=" Int48" minOccurs=" 0" />
    <xs:element name=" dateTime" type=" TimeType" />
    <xs:element name=" note" type=" String256" />
  </xs:sequence>
</xs:complexType>
<xs:simpleType name=" AccumulationKind" >
  <xs:annotation>
    <xs:documentation>Code indicating how value is accumulated over time for Readings of ReadingType. The list of valid values per
the standard are defined in AccumulationBehaviorType.</xs:documentation>
  </xs:annotation>
  <xs:union memberTypes=" UInt16" >
    <xs:simpleType>
      <xs:restriction base=" UInt16" >
        <xs:enumeration value=" 0" >
          <xs:annotation>
            <xs:appinfo>none</xs:appinfo>
            <xs:documentation>Not Applicable, or implied by the unit of measure.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" 1" >
          <xs:annotation>
            <xs:appinfo>bulkQuantity</xs:appinfo>
            <xs:documentation>A value from a register which represents the bulk quantity of a commodity. This quantity is computed
as the integral of the commodity usage rate. This value is typically used as the basis for the dial reading at the meter, and as a result, will roll
over upon reaching a maximum dial value. Note 1: With the metering system, the roll-over behaviour typically implies a roll-under behaviour
so that the value presented is always a positive value (e.g. unsigned integer or positive decimal.) However, when communicating data
between enterprise applications a negative value might occur in a case such as net metering.Note 2: A BulkQuantity refers primarily to the
dial reading and not the consumption over a specific period of time.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" 2" >
          <xs:annotation>
            <xs:appinfo>continuousCumulative</xs:appinfo>
            <xs:documentation>The sum of the previous billing period values and the present period value. Note: "
ContinuousCumulative" is commonly used in conjunction with " demand." The " ContinuousCumulative Demand" would be the
cumulative sum of the previous billing period maximum demand values (as occurring with each demand reset) summed with the present
period maximum demand value (which has yet to be reset.)</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" 3" >
          <xs:annotation>
            <xs:appinfo>cumulative</xs:appinfo>
            <xs:documentation>The sum of the previous billing period values. Note: " Cumulative" is commonly used in
conjunction with " demand." Each demand reset causes the maximum demand value for the present billing period (since the last demand
reset) to accumulate as an accumulative total of all maximum demands. So instead of " zeroing" the demand register, a demand reset has
the affect of adding the present maximum demand to this accumulating total.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" 4" >
          <xs:annotation>
            <xs:appinfo>deltaData</xs:appinfo>
            <xs:documentation>The difference between the value at the end of the prescribed interval and the beginning of the interval.
This is used for incremental interval data. Note: One common application would be for load profile data, another use might be to report the
number of events within an interval (such as the number of equipment energizations within the specified period of time.)</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" 6" >
          <xs:annotation>

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```

    <xs:appinfo>indicating</xs:appinfo>
    <xs:documentation>As if a needle is swung out on the meter face to a value to indicate the current value. (Note: An "
indicating" value is typically measured over hundreds of milliseconds or greater, or may imply a " pusher" mechanism to capture a
value. Compare this to " instantaneous" which is measured over a shorter period of time.)</xs:documentation>
    </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 9" >
    <xs:annotation>
    <xs:appinfo>summation</xs:appinfo>
    <xs:documentation>A form of accumulation which is selective with respect to time. Note: " Summation" could be
considered a specialization of " Bulk Quantity" according to the rules of inheritance where " Summation" selectively accumulates
pulses over a timing pattern, and " BulkQuantity" accumulates pulses all of the time.</xs:documentation>
    </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 10" >
    <xs:annotation>
    <xs:appinfo>timeDelay</xs:appinfo>
    <xs:documentation>A form of computation which introduces a time delay characteristic to the data
value</xs:documentation>
    </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 12" >
    <xs:annotation>
    <xs:appinfo>instantaneous</xs:appinfo>
    <xs:documentation>Typically measured over the fastest period of time allowed by the definition of the metric (usually
milliseconds or tens of milliseconds.) (Note: " Instantaneous" was moved to attribute #3 in 61968-9Ed2 from attribute #1 in
61968-9Ed1.)</xs:documentation>
    </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 13" >
    <xs:annotation>
    <xs:appinfo>latchingQuantity</xs:appinfo>
    <xs:documentation>When this description is applied to a metered value, it implies that the value is a time-independent
cumulative quantity much a BulkQuantity, except that it latches upon the maximum value upon reaching that value. Any additional
accumulation (positive or negative) is discarded until a reset occurs. Note: A LatchingQuantity may also occur in the downward direction –
upon reaching a minimum value. The terms " maximum" or " minimum" will usually be included as an attribute when this type of
accumulation behaviour is present. When this description is applied to an encoded value (UOM= " Code" ), it implies that the value has one
or more bits which are latching. The condition that caused the bit to be set may have long since evaporated. In either case, the timestamp that
accompanies the value may not coincide with the moment the value was initially set. In both cases a system will need to perform an operation
to clear the latched value.</xs:documentation>
    </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 14" >
    <xs:annotation>
    <xs:appinfo>boundedQuantity</xs:appinfo>
    <xs:documentation>A time-independent cumulative quantity much a BulkQuantity or a LatchingQuantity, except that the
accumulation stops at the maximum or minimum values. When the maximum is reached, any additional positive accumulation is discarded,
but negative accumulation may be accepted (thus lowering the counter.) Likewise, when the negative bound is reached, any additional
negative accumulation is discarded, but positive accumulation is accepted (thus increasing the counter.)</xs:documentation>
    </xs:annotation>
</xs:enumeration>
</xs:restriction>
</xs:simpleType>
</xs:union>
</xs:simpleType>
<xs:simpleType name=" CommodityKind" >
    <xs:annotation>
    <xs:documentation>Code for commodity classification of Readings of ReadingType. The valid values per the standard are defined in
CommodityType.</xs:documentation>
    </xs:annotation>
<xs:union memberTypes=" UInt16" >
    <xs:simpleType>
    <xs:restriction base=" UInt16" >
    <xs:enumeration value=" 0" >
    <xs:annotation>

```

```

    <xs:appinfo>none</xs:appinfo>
    <xs:documentation>Not Applicable</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 1" >
  <xs:annotation>
    <xs:appinfo>electricity SecondaryMetered</xs:appinfo>
    <xs:documentation>All types of metered quantities. This type of reading comes from the meter and represents a "
secondary" metered value.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 2" >
  <xs:annotation>
    <xs:appinfo>electricity PrimaryMeter</xs:appinfo>
    <xs:documentation>It is possible for a meter to be outfitted with an external VT and/or CT. The meter might not be aware
of these devices, and the display not compensate for their presence. Ultimately, when these scalars are applied, the value that represents the
service value is called the " primary metered" value. The " index" in sub-category 3 mirrors those of sub-category
0.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 3" >
  <xs:annotation>
    <xs:appinfo>communication</xs:appinfo>
    <xs:documentation>A measurement of the communication infrastructure itself.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 4" >
  <xs:annotation>
    <xs:appinfo>air</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 5" >
  <xs:annotation>
    <xs:appinfo>insulativeGas</xs:appinfo>
    <xs:documentation>(SF6 is found separately below.)</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 6" >
  <xs:annotation>
    <xs:appinfo>insulativeOil</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 7" >
  <xs:annotation>
    <xs:appinfo>naturalGas</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 8" >
  <xs:annotation>
    <xs:appinfo>propane</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 9" >
  <xs:annotation>
    <xs:appinfo>potableWater</xs:appinfo>
    <xs:documentation>Drinkable water</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 10" >
  <xs:annotation>
    <xs:appinfo>steam</xs:appinfo>

```

```

    <xs:documentation>Water in steam form, usually used for heating.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 11" >
  <xs:annotation>
    <xs:appinfo>wasteWater</xs:appinfo>
    <xs:documentation>(Sewerage)</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 12" >
  <xs:annotation>
    <xs:appinfo>heatingFluid</xs:appinfo>
    <xs:documentation>This fluid is likely in liquid form. It is not necessarily water or water based. The warm fluid returns
cooler than when it was sent. The heat conveyed may be metered.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 13" >
  <xs:annotation>
    <xs:appinfo>coolingFluid</xs:appinfo>
    <xs:documentation>The cool fluid returns warmer than when it was sent. The heat conveyed may be
metered.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 14" >
  <xs:annotation>
    <xs:appinfo>nonpotableWater</xs:appinfo>
    <xs:documentation>Reclaimed water – possibly used for irrigation but not sufficiently treated to be considered safe for
drinking.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 15" >
  <xs:annotation>
    <xs:appinfo>nox</xs:appinfo>
    <xs:documentation>Nitrous Oxides NOX</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 16" >
  <xs:annotation>
    <xs:appinfo>so2</xs:appinfo>
    <xs:documentation>Sulfur Dioxide SO2</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 17" >
  <xs:annotation>
    <xs:appinfo>ch4</xs:appinfo>
    <xs:documentation>Methane CH4</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 18" >
  <xs:annotation>
    <xs:appinfo>co2</xs:appinfo>
    <xs:documentation>Carbon Dioxide CO2</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 19" >
  <xs:annotation>
    <xs:appinfo>carbon</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 20" >
  <xs:annotation>
    <xs:appinfo>hch</xs:appinfo>
    <xs:documentation>Hexachlorocyclohexane HCH</xs:documentation>
  </xs:annotation>
</xs:enumeration>

```

```

<xs:enumeration value=" 21" >
  <xs:annotation>
    <xs:appinfo>pfc</xs:appinfo>
    <xs:documentation>Perfluorocarbons PFC</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 22" >
  <xs:annotation>
    <xs:appinfo>sf6</xs:appinfo>
    <xs:documentation>Sulfurhexafluoride SF6</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 23" >
  <xs:annotation>
    <xs:appinfo>tvLicence</xs:appinfo>
    <xs:documentation>Television</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 24" >
  <xs:annotation>
    <xs:appinfo>internet</xs:appinfo>
    <xs:documentation>Internet service</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 25" >
  <xs:annotation>
    <xs:appinfo>refuse</xs:appinfo>
    <xs:documentation>trash</xs:documentation>
  </xs:annotation>
</xs:enumeration>
</xs:restriction>
</xs:simpleType>
</xs:union>
</xs:simpleType>
<xs:simpleType name=" Currency" >
  <xs:annotation>
    <xs:documentation>Code for the currency for costs associated with this ReadingType. The valid values per the standard are defined in
CurrencyCode.</xs:documentation>
  </xs:annotation>
<xs:union memberTypes=" UInt16" >
  <xs:simpleType>
    <xs:restriction base=" UInt16" >
      <xs:enumeration value=" 840" >
        <xs:annotation>
          <xs:appinfo>USD</xs:appinfo>
          <xs:documentation>US dollar</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value=" 978" >
        <xs:annotation>
          <xs:appinfo>EUR</xs:appinfo>
          <xs:documentation>European euro</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value=" 36" >
        <xs:annotation>
          <xs:appinfo>AUD</xs:appinfo>
          <xs:documentation>Australian dollar</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value=" 124" >
        <xs:annotation>
          <xs:appinfo>CAD</xs:appinfo>
          <xs:documentation>Canadian dollar</xs:documentation>
        </xs:annotation>

```



```

</xs:enumeration>
<xs:enumeration value=" 756" >
  <xs:annotation>
    <xs:appinfo>CHF</xs:appinfo>
    <xs:documentation>Swiss francs</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 156" >
  <xs:annotation>
    <xs:appinfo>CNY</xs:appinfo>
    <xs:documentation>Chinese yuan renminbi</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 208" >
  <xs:annotation>
    <xs:appinfo>DKK</xs:appinfo>
    <xs:documentation>Danish crown</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 826" >
  <xs:annotation>
    <xs:appinfo>GBP</xs:appinfo>
    <xs:documentation>British pound</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 392" >
  <xs:annotation>
    <xs:appinfo>JPY</xs:appinfo>
    <xs:documentation>Japanese yen</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 578" >
  <xs:annotation>
    <xs:appinfo>NOK</xs:appinfo>
    <xs:documentation>Norwegian crown</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 643" >
  <xs:annotation>
    <xs:appinfo>RUB</xs:appinfo>
    <xs:documentation>Russian ruble</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 752" >
  <xs:annotation>
    <xs:appinfo>SEK</xs:appinfo>
    <xs:documentation>Swedish crown</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 356" >
  <xs:annotation>
    <xs:appinfo>INR</xs:appinfo>
    <xs:documentation>India rupees</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 0" >
  <xs:annotation>
    <xs:appinfo>other</xs:appinfo>
    <xs:documentation>Another type of currency.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
</xs:restriction>
</xs:simpleType>
</xs:union>
</xs:simpleType>
<xs:simpleType name=" DataQualifierKind" >

```

```

<xs:annotation>
  <xs:documentation>Code describing a salient attribute of Readings of ReadingType. Valid values per the standard are defined in
DataQualifierType.</xs:documentation>
</xs:annotation>
<xs:union memberTypes=" UInt16" >
  <xs:simpleType>
    <xs:restriction base=" UInt16" >
      <xs:enumeration value=" 0" >
        <xs:annotation>
          <xs:appinfo>none</xs:appinfo>
          <xs:documentation>Not Applicable</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value=" 2" >
        <xs:annotation>
          <xs:appinfo>average</xs:appinfo>
          <xs:documentation>Average value</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value=" 4" >
        <xs:annotation>
          <xs:appinfo>excess</xs:appinfo>
          <xs:documentation>The value represents an amount over which a threshold was exceeded.</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value=" 5" >
        <xs:annotation>
          <xs:appinfo>highThreshold</xs:appinfo>
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          <xs:appinfo>secondMaximum</xs:appinfo>
          <xs:documentation>The second highest value observed</xs:documentation>

```

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as one would naturally expect to find as energy is supplied by the utility and consumed at the service.Forward Reactive Energy is a positive
VARh value as one would naturally expect to find in the presence of inductive loading.In polyphase metering, the forward energy register is
incremented when the sum of the phase energies is greater than zero.</xs:documentation>
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describe VA, " lagging" describes a form of measurement where reactive power is considered in all four quadrants, but real power is
considered only in quadrants I and IV.Note 2: When used to describe power factor, the term " Lagging" implies that the PF is negative.

```

The term "lagging" in this case takes the place of the negative sign. If a signed PF value is to be passed by the data producer, then the direction of flow enumeration zero (none) should be used in order to avoid the possibility of creating an expression that employs a double negative. The data consumer should be able to tell from the sign of the data if the PF is leading or lagging. This principle is analogous to the concept that "Reverse" energy is an implied negative value, and to publish a negative reverse value would be ambiguous. Note 3: Lagging power factors typically indicate inductive loading.

```

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factors typically indicate capacitive loading.</xs:documentation>
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become negative. In other systems the value passed as a " net" value is always a positive number, and rolls-over and rolls-under as
needed.</xs:documentation>
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```

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    <xs:appinfo>reverse</xs:appinfo>
    <xs:documentation>Reverse Active Energy is equivalent to " Received," or " Exported" as defined in
61968-2.Reverse Active Energy is a positive kWh value as one would expect to find when energy is backed by the service onto the utility
network.Reverse Reactive Energy is a positive VARh value as one would expect to find in the presence of capacitive loading and a leading
Power Factor.In polyphase metering, the reverse energy register is incremented when the sum of the phase energies is less than zero.Note: The
value passed as a reverse value is always a positive value. It is understood by the label " reverse" that it represents negative
flow.</xs:documentation>
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polyphase metering, the total energy register is incremented when the absolute value of the sum of the phase energies is greater than
zero.</xs:documentation>
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    <xs:documentation>In polyphase metering, the total by phase energy register is incremented when the sum of the absolute
values of the phase energies is greater than zero.In single phase metering, the formulas for " Total" and " Total by phase" collapse to
the same expression. For communication purposes however, the " Total" enumeration should be used with single phase meter
data.</xs:documentation>
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</xs:restriction>
</xs:simpleType>

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    <xs:appinfo>groupAddressType4</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 107" >
  <xs:annotation>
    <xs:appinfo>ipAddress</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 108" >
  <xs:annotation>
    <xs:appinfo>macAddress</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 109" >
  <xs:annotation>
    <xs:appinfo>mfgAssignedConfigurationID</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 110" >
  <xs:annotation>
    <xs:appinfo>mfgAssignedPhysicalSerialNumber</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 111" >
  <xs:annotation>
    <xs:appinfo>mfgAssignedProductNumber</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 112" >
  <xs:annotation>
    <xs:appinfo>mfgAssignedUniqueCommunicationAddress</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 113" >
  <xs:annotation>
    <xs:appinfo>multiCastAddress</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 114" >
  <xs:annotation>
    <xs:appinfo>oneWayAddress</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 115" >
  <xs:annotation>
    <xs:appinfo>signalStrength</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 116" >
  <xs:annotation>
    <xs:appinfo>twoWayAddress</xs:appinfo>
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  </xs:annotation>
</xs:enumeration>

```

```

<xs:enumeration value=" 117" >
  <xs:annotation>
    <xs:appinfo>signaltoNoiseRatio</xs:appinfo>
    <xs:documentation>Moved here from Attribute #9 UOM</xs:documentation>
  </xs:annotation>
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<xs:enumeration value=" 118" >
  <xs:annotation>
    <xs:appinfo>alarm</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 119" >
  <xs:annotation>
    <xs:appinfo>batteryCarryover</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 120" >
  <xs:annotation>
    <xs:appinfo>dataOverflowAlarm</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 121" >
  <xs:annotation>
    <xs:appinfo>demandLimit</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 122" >
  <xs:annotation>
    <xs:appinfo>demandReset</xs:appinfo>
    <xs:documentation>Usually expressed as a count as part of a billing cycle</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 123" >
  <xs:annotation>
    <xs:appinfo>diagnostic</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 124" >
  <xs:annotation>
    <xs:appinfo>emergencyLimit</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 125" >
  <xs:annotation>
    <xs:appinfo>encoderTamper</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 126" >
  <xs:annotation>
    <xs:appinfo>ieee1366MomentaryInterruption</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 127" >
  <xs:annotation>
    <xs:appinfo>ieee1366MomentaryInterruptionEvent</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>

```

```

<xs:enumeration value=" 128" >
  <xs:annotation>
    <xs:appinfo>ieee1366SustainedInterruption</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 129" >
  <xs:annotation>
    <xs:appinfo>interruptionBehaviour</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 130" >
  <xs:annotation>
    <xs:appinfo>inversionTamper</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 131" >
  <xs:annotation>
    <xs:appinfo>loadInterrupt</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 132" >
  <xs:annotation>
    <xs:appinfo>loadShed</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 133" >
  <xs:annotation>
    <xs:appinfo>maintenance</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 134" >
  <xs:annotation>
    <xs:appinfo>physicalTamper</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 135" >
  <xs:annotation>
    <xs:appinfo>powerLossTamper</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 136" >
  <xs:annotation>
    <xs:appinfo>powerOutage</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 137" >
  <xs:annotation>
    <xs:appinfo>powerQuality</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 138" >
  <xs:annotation>
    <xs:appinfo>powerRestoration</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>

```

```
<xs:enumeration value=" 139" >
  <xs:annotation>
    <xs:appinfo>programmed</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 140" >
  <xs:annotation>
    <xs:appinfo>pushbutton</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 141" >
  <xs:annotation>
    <xs:appinfo>relayActivation</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 142" >
  <xs:annotation>
    <xs:appinfo>relayCycle</xs:appinfo>
    <xs:documentation>Usually expressed as a count</xs:documentation>
  </xs:annotation>
</xs:enumeration>
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  <xs:annotation>
    <xs:appinfo>removalTamper</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 144" >
  <xs:annotation>
    <xs:appinfo>reprogrammingTamper</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 145" >
  <xs:annotation>
    <xs:appinfo>reverseRotationTamper</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 146" >
  <xs:annotation>
    <xs:appinfo>switchArmed</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 147" >
  <xs:annotation>
    <xs:appinfo>switchDisabled</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 148" >
  <xs:annotation>
    <xs:appinfo>tamper</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 149" >
  <xs:annotation>
    <xs:appinfo>watchdogTimeout</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
```



```

<xs:enumeration value=" 150" >
  <xs:annotation>
    <xs:appinfo>billLastPeriod</xs:appinfo>
    <xs:documentation>Customer's bill for the previous billing period (Currency)</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 151" >
  <xs:annotation>
    <xs:appinfo>billToDate</xs:appinfo>
    <xs:documentation>Customer's bill, as known thus far within the present billing period (Currency)</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 152" >
  <xs:annotation>
    <xs:appinfo>billCarryover</xs:appinfo>
    <xs:documentation>Customer's bill for the (Currency)</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 153" >
  <xs:annotation>
    <xs:appinfo>connectionFee</xs:appinfo>
    <xs:documentation>Monthly fee for connection to commodity.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 154" >
  <xs:annotation>
    <xs:appinfo>audibleVolume</xs:appinfo>
    <xs:documentation>Sound</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 155" >
  <xs:annotation>
    <xs:appinfo>volumetricFlow</xs:appinfo>
    <xs:documentation/>
  </xs:annotation>
</xs:enumeration>
</xs:restriction>
</xs:simpleType>
</xs:union>
</xs:simpleType>
<xs:simpleType name=" PhaseCodeKind" >
  <xs:annotation>
    <xs:documentation>Enumeration of phase identifiers. Allows designation of phases for both transmission and distribution equipment,
circuits and loads.Residential and small commercial loads are often served from single- phase, or split-phase, secondary circuits. Phases 1
and 2 refer to hot wires that are 180 degrees out of phase, while N refers to the neutral wire. Through single-phase transformer connections, these
secondary circuits may be served from one or two of the primary phases A, B, and C. For three-phase loads, use the A, B, C phase codes
instead of s12N.</xs:documentation>
  </xs:annotation>
  <xs:union memberTypes=" UInt16" >
    <xs:simpleType>
      <xs:restriction base=" UInt16" >
        <xs:enumeration value=" 225" >
          <xs:annotation>
            <xs:appinfo>ABCN</xs:appinfo>
            <xs:documentation>ABC to Neutral</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" 224" >
          <xs:annotation>
            <xs:appinfo>ABC</xs:appinfo>
            <xs:documentation>Involving all phases</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" 193" >
          <xs:annotation>

```

```

    <xs:appinfo>ABN</xs:appinfo>
    <xs:documentation>AB to Neutral</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 97" >
  <xs:annotation>
    <xs:appinfo>ACN</xs:appinfo>
    <xs:documentation>Phases A, C and neutral.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 97" >
  <xs:annotation>
    <xs:appinfo>BCN</xs:appinfo>
    <xs:documentation>BC to neutral.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 132" >
  <xs:annotation>
    <xs:appinfo>AB</xs:appinfo>
    <xs:documentation>Phases A to B</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 96" >
  <xs:annotation>
    <xs:appinfo>AC</xs:appinfo>
    <xs:documentation>Phases A and C</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 66" >
  <xs:annotation>
    <xs:appinfo>BC</xs:appinfo>
    <xs:documentation>Phases B to C</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 129" >
  <xs:annotation>
    <xs:appinfo>AN</xs:appinfo>
    <xs:documentation>Phases A to neutral.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 65" >
  <xs:annotation>
    <xs:appinfo>BN</xs:appinfo>
    <xs:documentation>Phases B to neutral.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 33" >
  <xs:annotation>
    <xs:appinfo>CN</xs:appinfo>
    <xs:documentation>Phases C to neutral.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 128" >
  <xs:annotation>
    <xs:appinfo>A</xs:appinfo>
    <xs:documentation>Phase A.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 64" >
  <xs:annotation>
    <xs:appinfo>B</xs:appinfo>
    <xs:documentation>Phase B.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 32" >
  <xs:annotation>

```

```

    <xs:appinfo>C</xs:appinfo>
    <xs:documentation>Phase C.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 16" >
  <xs:annotation>
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    <xs:documentation>Neutral</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 272" >
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    <xs:appinfo>S2N</xs:appinfo>
    <xs:documentation>Phase S2 to neutral.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 784" >
  <xs:annotation>
    <xs:appinfo>S12N</xs:appinfo>
    <xs:documentation>Phase S1, S2 to neutral.</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 528" >
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    <xs:appinfo>S1N</xs:appinfo>
    <xs:documentation>Phase S1 to Neutral</xs:documentation>
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<xs:enumeration value=" 256" >
  <xs:annotation>
    <xs:appinfo>S2</xs:appinfo>
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    <xs:documentation>Phase S1 to S2</xs:documentation>
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</xs:enumeration>
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  <xs:annotation>
    <xs:appinfo>none</xs:appinfo>
    <xs:documentation>Not applicable to any phase</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 136" >
  <xs:annotation>
    <xs:appinfo>AtoAv</xs:appinfo>
    <xs:documentation>Phase A current relative to Phase A voltage</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 72" >
  <xs:annotation>
    <xs:appinfo>BAv</xs:appinfo>
    <xs:documentation>Phase B current or voltage relative to Phase A voltage</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 41" >
  <xs:annotation>
    <xs:appinfo>CAN</xs:appinfo>
    <xs:documentation>CA to Neutral</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 40" >
  <xs:annotation>

```

```

    <xs:appinfo>CAv</xs:appinfo>
    <xs:documentation>hase C current or voltage relative to Phase A voltage</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 17" >
  <xs:annotation>
    <xs:appinfo>NG</xs:appinfo>
    <xs:documentation>Neutral to ground</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 512" >
  <xs:annotation>
    <xs:appinfo>S1</xs:appinfo>
    <xs:documentation>Phase S1</xs:documentation>
  </xs:annotation>
</xs:enumeration>
</xs:restriction>
</xs:simpleType>
</xs:union>
</xs:simpleType>
<xs:simpleType name=" UnitMultiplierKind" >
  <xs:annotation>
    <xs:documentation>The power of ten unit multipliers.</xs:documentation>
  </xs:annotation>
  <xs:union memberTypes=" Int16" >
    <xs:simpleType>
      <xs:restriction base=" Int16" >
        <xs:enumeration value=" -12" >
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            <xs:appinfo>p</xs:appinfo>
            <xs:documentation>Pico 10** $-12$ </xs:documentation>
          </xs:annotation>
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            <xs:appinfo>n</xs:appinfo>
            <xs:documentation>Nano 10** $-9$ </xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" -6" >
          <xs:annotation>
            <xs:appinfo>micro</xs:appinfo>
            <xs:documentation>Micro 10** $-6$ </xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" -3" >
          <xs:annotation>
            <xs:appinfo>m</xs:appinfo>
            <xs:documentation>Milli 10** $-3$ </xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" -2" >
          <xs:annotation>
            <xs:appinfo>c</xs:appinfo>
            <xs:documentation>Centi 10** $-2$ </xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" -1" >
          <xs:annotation>
            <xs:appinfo>d</xs:appinfo>
            <xs:documentation>Deci 10** $-1$ </xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" 3" >
          <xs:annotation>

```

```

        <xs:appinfo>k</xs:appinfo>
        <xs:documentation>Kilo 10**3</xs:documentation>
    </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 6" >
    <xs:annotation>
        <xs:appinfo>M</xs:appinfo>
        <xs:documentation>Mega 10**6</xs:documentation>
    </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 9" >
    <xs:annotation>
        <xs:appinfo>G</xs:appinfo>
        <xs:documentation>Giga 10**9</xs:documentation>
    </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 12" >
    <xs:annotation>
        <xs:appinfo>T</xs:appinfo>
        <xs:documentation>Tera 10**12</xs:documentation>
    </xs:annotation>
</xs:enumeration>
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    <xs:annotation>
        <xs:appinfo>none</xs:appinfo>
        <xs:documentation>Not Applicable or " x1" </xs:documentation>
    </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 1" >
    <xs:annotation>
        <xs:appinfo>da</xs:appinfo>
        <xs:documentation>deca 10**1</xs:documentation>
    </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 2" >
    <xs:annotation>
        <xs:appinfo>h</xs:appinfo>
        <xs:documentation>hecto 10**2</xs:documentation>
    </xs:annotation>
</xs:enumeration>
</xs:restriction>
</xs:simpleType>
</xs:union>
</xs:simpleType>
<xs:simpleType name=" QualityOfReading" >
    <xs:annotation>
        <xs:documentation>List of codes indicating the quality of the reading</xs:documentation>
    </xs:annotation>
    <xs:union memberTypes=" UInt16" >
        <xs:simpleType>
            <xs:restriction base=" UInt16" >
                <xs:enumeration value=" 0" >
                    <xs:annotation>
                        <xs:appinfo>valid</xs:appinfo>
                        <xs:documentation>data that has gone through all required validation checks and either passed them all or has been
verified</xs:documentation>
                    </xs:annotation>
                </xs:enumeration>
                <xs:enumeration value=" 7" >
                    <xs:annotation>
                        <xs:appinfo>manually edited</xs:appinfo>
                        <xs:documentation>Replaced or approved by a human</xs:documentation>
                    </xs:annotation>
                </xs:enumeration>
                <xs:enumeration value=" 8" >

```

```

    <xs:annotation>
      <xs:appinfo>estimated using reference day</xs:appinfo>
      <xs:documentation>data value was replaced by a machine computed value based on analysis of historical data using the
same type of measurement.</xs:documentation>
    </xs:annotation>
  </xs:enumeration>
  <xs:enumeration value=" 9" >
    <xs:annotation>
      <xs:appinfo>estimated using linear interpolation</xs:appinfo>
      <xs:documentation>data value was computed using linear interpolation based on the readings before and after
it</xs:documentation>
    </xs:annotation>
  </xs:enumeration>
  <xs:enumeration value=" 10" >
    <xs:annotation>
      <xs:appinfo>questionable</xs:appinfo>
      <xs:documentation>data that has failed one or more checks</xs:documentation>
    </xs:annotation>
  </xs:enumeration>
  <xs:enumeration value=" 11" >
    <xs:annotation>
      <xs:appinfo>derived</xs:appinfo>
      <xs:documentation>data that has been calculated (using logic or mathematical operations)</xs:documentation>
    </xs:annotation>
  </xs:enumeration>
  <xs:enumeration value=" 12" >
    <xs:annotation>
      <xs:appinfo>projected (forecast)</xs:appinfo>
      <xs:documentation>data that has been calculated as a projection or forecast of future readings</xs:documentation>
    </xs:annotation>
  </xs:enumeration>
  <xs:enumeration value=" 13" >
    <xs:annotation>
      <xs:appinfo>mixed</xs:appinfo>
      <xs:documentation>indicates that the quality of this reading has mixed characteristics</xs:documentation>
    </xs:annotation>
  </xs:enumeration>
  <xs:enumeration value=" 14" >
    <xs:annotation>
      <xs:appinfo>raw</xs:appinfo>
      <xs:documentation>data that has not gone through the validation</xs:documentation>
    </xs:annotation>
  </xs:enumeration>
  <xs:enumeration value=" 15" >
    <xs:annotation>
      <xs:appinfo>normalized for weather</xs:appinfo>
      <xs:documentation>the values have been adjusted to account for weather</xs:documentation>
    </xs:annotation>
  </xs:enumeration>
  <xs:enumeration value=" 16" >
    <xs:annotation>
      <xs:appinfo>other</xs:appinfo>
      <xs:documentation>specifies that a characteristic applies other than those defined</xs:documentation>
    </xs:annotation>
  </xs:enumeration>
  <xs:enumeration value=" 17" >
    <xs:annotation>
      <xs:appinfo>validated</xs:appinfo>
      <xs:documentation>data that has been validated and possibly edited and/or estimated in accordance with approved
procedures</xs:documentation>
    </xs:annotation>
  </xs:enumeration>
  <xs:enumeration value=" 18" >
    <xs:annotation>
      <xs:appinfo>verified</xs:appinfo>
      <xs:documentation>data that failed at least one of the required validation checks but was determined to represent actual

```

```

usage</xs:documentation>
  </xs:annotation>
</xs:enumeration>
</xs:restriction>
</xs:simpleType>
</xs:union>
</xs:simpleType>
<xs:simpleType name=" ServiceKind" >
  <xs:annotation>
    <xs:documentation>Kind of service represented by the UsagePoint</xs:documentation>
  </xs:annotation>
  <xs:union memberTypes=" UInt16" >
    <xs:simpleType>
      <xs:restriction base=" UInt16" >
        <xs:enumeration value=" 0" >
          <xs:annotation>
            <xs:appinfo>electricity</xs:appinfo>
            <xs:documentation>Electricity service.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" 1" >
          <xs:annotation>
            <xs:appinfo>gas</xs:appinfo>
            <xs:documentation>Gas service.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" 2" >
          <xs:annotation>
            <xs:appinfo>water</xs:appinfo>
            <xs:documentation>Water service.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" 3" >
          <xs:annotation>
            <xs:appinfo>time</xs:appinfo>
            <xs:documentation>Time service.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" 4" >
          <xs:annotation>
            <xs:appinfo>heat</xs:appinfo>
            <xs:documentation>Heat service.</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
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            <xs:appinfo>refuse</xs:appinfo>
            <xs:documentation>Refuse (waster) service.</xs:documentation>
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            <xs:appinfo>sewerage</xs:appinfo>
            <xs:documentation>Sewerage service.</xs:documentation>
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        <xs:enumeration value=" 7" >
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            <xs:appinfo>rates</xs:appinfo>
            <xs:documentation>Rates (e.g. tax, charge, toll, duty, tariff, etc.) service.</xs:documentation>
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```

```

        <xs:documentation>TV license service.</xs:documentation>
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standard are defined in TimeAttributeType.</xs:documentation>
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```

    <xs:appinfo>sixtyMinute</xs:appinfo>
    <xs:documentation>60-minute</xs:documentation>
  </xs:annotation>
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  <xs:annotation>

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                    </xs:annotation>
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by the billing cycle day). If during the current billing period, it specifies a period from the start of the current billing period until "
now" .</xs:documentation>
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specifies the period from the start of the month until " now." </xs:documentation>
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Winter" based cycle. If within the current season, it specifies the period from the start of the current season until " now."
</xs:documentation>
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    </xs:restriction>
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          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" 38" >
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            <xs:appinfo>W</xs:appinfo>
            <xs:documentation>Real power, Watt. By definition, one Watt equals oneJoule per second. Electrical power may have real
and reactive components. The real portion of electrical power ( $I^2R$ ) or  $VI\cos\phi$ , is expressed in Watts. (See also apparent power and reactive
power.), W</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" 63" >
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            <xs:appinfo>VAR</xs:appinfo>
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power ( $VI\sin\phi$ ). (See also real power and apparent power)., VAR</xs:documentation>
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        </xs:enumeration>
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            <xs:appinfo>Wh</xs:appinfo>
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    <xs:appinfo>H</xs:appinfo>
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entry. See below for more explicit forms.), Pa</xs:documentation>
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Pressure Level" dB (SPL)." , B (SPL)</xs:documentation>
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multiplier " d" . Bm</xs:documentation>
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```



```

    <xs:appinfo>char</xs:appinfo>
    <xs:documentation>Number of characters, characters, char</xs:documentation>
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    <xs:documentation>Rate of change of frequency, hertz per second, Hz/s</xs:documentation>
  </xs:annotation>
</xs:enumeration>
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    <xs:documentation>Application Value, encoded value, code</xs:documentation>
  </xs:annotation>
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  <xs:annotation>
    <xs:appinfo>cosTheta</xs:appinfo>
    <xs:documentation>Power factor, Dimensionless
      , cos?
    </xs:documentation>
  </xs:annotation>
</xs:enumeration>
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  <xs:annotation>
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</xs:enumeration>
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    <xs:documentation>Volume, cubic feet, ft3(compensated)</xs:documentation>
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    <xs:documentation>Volumetric flow rate, compensated cubic feet per hour, ft3(compensated)/h</xs:documentation>
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    <xs:documentation>Turbine inertia, gram-meter2 (Combine with multiplier prefix " k" to form kg·m2),
    gm2</xs:documentation>
  </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 144" >
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    <xs:appinfo>gPerG</xs:appinfo>
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    g/g</xs:documentation>
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        <xs:documentation>Absorbed dose, Gray (J/kg), GY</xs:documentation>
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</xs:enumeration>
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g/m³</xs:documentation>
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L/L</xs:documentation>
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L(uncompensated)</xs:documentation>
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```

```

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m3(compensated)</xs:documentation>
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m3(uncompensated)</xs:documentation>
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m3(uncompensated)/h</xs:documentation>
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mol/kg</xs:documentation>
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the volume of solution in m3., mol/ m3</xs:documentation>
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```

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amount of the solution.,mol/mol</xs:documentation>
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α</xs:documentation>
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e.g. " μs/s" ), s/s</xs:documentation>
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```

```

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dead" , " off" , " low" , " cleared" Note: A Boolean value is preferred but other values may be supported, status</xs:documentation>
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</xs:enumeration>

```

```

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```



```

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        <xs:documentation/>
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        <xs:appinfo>Gone</xs:appinfo>
        <xs:documentation/>
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  <xs:annotation>
    <xs:documentation>Specifies the operation requested of this item</xs:documentation>
  </xs:annotation>
  <xs:union memberTypes=" UInt16" >
    <xs:simpleType>
      <xs:restriction base=" UInt16" >
        <xs:enumeration value=" 0" >
          <xs:annotation>
            <xs:appinfo>Create</xs:appinfo>
            <xs:documentation/>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" 1" >
          <xs:annotation>
            <xs:appinfo>Read</xs:appinfo>
            <xs:documentation/>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" 2" >
          <xs:annotation>
            <xs:appinfo>Update</xs:appinfo>
            <xs:documentation/>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" 3" >
          <xs:annotation>
            <xs:appinfo>Delete</xs:appinfo>
            <xs:documentation/>
          </xs:annotation>
        </xs:enumeration>
      </xs:restriction>
    </xs:simpleType>
  </xs:union>
</xs:simpleType>
<xs:simpleType name=" DataCustodianApplicationStatus" >
  <xs:annotation>

```

```

    <xs:documentation/>
  </xs:annotation>
<xs:union memberTypes=" UInt16" >
  <xs:simpleType>
    <xs:restriction base=" UInt16" >
      <xs:enumeration value=" 1" >
        <xs:annotation>
          <xs:appinfo>Review</xs:appinfo>
          <xs:documentation/>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value=" 2" >
        <xs:annotation>
          <xs:appinfo>Production (Live)</xs:appinfo>
          <xs:documentation/>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value=" 3" >
        <xs:annotation>
          <xs:appinfo>On Hold</xs:appinfo>
          <xs:documentation/>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value=" 4" >
        <xs:annotation>
          <xs:appinfo>Revoked</xs:appinfo>
          <xs:documentation/>
        </xs:annotation>
      </xs:enumeration>
    </xs:restriction>
  </xs:simpleType>
</xs:union>
</xs:simpleType>
<xs:simpleType name=" ThirdPartyApplicatonStatus" >
  <xs:annotation>
    <xs:documentation/>
  </xs:annotation>
<xs:union memberTypes=" UInt16" >
  <xs:simpleType>
    <xs:restriction base=" UInt16" >
      <xs:enumeration value=" 1" >
        <xs:annotation>
          <xs:appinfo>Development</xs:appinfo>
          <xs:documentation/>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value=" 2" >
        <xs:annotation>
          <xs:appinfo>ReviewTest</xs:appinfo>
          <xs:documentation/>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value=" 3" >
        <xs:annotation>
          <xs:appinfo>Production</xs:appinfo>
          <xs:documentation>Live</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
      <xs:enumeration value=" 4" >
        <xs:annotation>
          <xs:appinfo>Retired</xs:appinfo>
          <xs:documentation>Remove</xs:documentation>
        </xs:annotation>
      </xs:enumeration>
    </xs:restriction>
  </xs:simpleType>
</xs:union>

```

```

    </xs:simpleType>
  </xs:union>
</xs:simpleType>
<xs:simpleType name=" ThirdPartyApplicationType" >
  <xs:annotation>
    <xs:documentation/>
  </xs:annotation>
  <xs:union memberTypes=" UInt16" >
    <xs:simpleType>
      <xs:restriction base=" UInt16" >
        <xs:enumeration value=" 1" >
          <xs:annotation>
            <xs:appinfo>Web</xs:appinfo>
            <xs:documentation>The application is on the web</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" 2" >
          <xs:annotation>
            <xs:appinfo>Desktop</xs:appinfo>
            <xs:documentation>The application is on a desktop</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" 3" >
          <xs:annotation>
            <xs:appinfo>Mobile</xs:appinfo>
            <xs:documentation>The application is on a mobil device</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" 4" >
          <xs:annotation>
            <xs:appinfo>Device</xs:appinfo>
            <xs:documentation>The application is on another device</xs:documentation>
          </xs:annotation>
        </xs:enumeration>
      </xs:restriction>
    </xs:simpleType>
  </xs:union>
</xs:simpleType>
<xs:simpleType name=" ThirdPartyApplicationUse" >
  <xs:annotation>
    <xs:documentation/>
  </xs:annotation>
  <xs:union memberTypes=" UInt16" >
    <xs:simpleType>
      <xs:restriction base=" UInt16" >
        <xs:enumeration value=" 1" >
          <xs:annotation>
            <xs:appinfo>EnergyManagement</xs:appinfo>
            <xs:documentation/>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" 2" >
          <xs:annotation>
            <xs:appinfo>Comparisons</xs:appinfo>
            <xs:documentation/>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" 3" >
          <xs:annotation>
            <xs:appinfo>Government</xs:appinfo>
            <xs:documentation/>
          </xs:annotation>
        </xs:enumeration>
        <xs:enumeration value=" 4" >
          <xs:annotation>

```

```

        <xs:appinfo>Academic</xs:appinfo>
        <xs:documentation/>
    </xs:annotation>
</xs:enumeration>
<xs:enumeration value=" 5" >
    <xs:annotation>
        <xs:appinfo>LawEnforcement</xs:appinfo>
        <xs:documentation/>
    </xs:annotation>
</xs:enumeration>
</xs:restriction>
</xs:simpleType>
</xs:union>
</xs:simpleType>
<xs:simpleType name=" AuthorizationStatus" >
    <xs:annotation>
        <xs:documentation/>
    </xs:annotation>
    <xs:union memberTypes=" UInt16" >
        <xs:simpleType>
            <xs:restriction base=" UInt16" >
                <xs:enumeration value=" 0" >
                    <xs:annotation>
                        <xs:appinfo>Revoked</xs:appinfo>
                        <xs:documentation/>
                    </xs:annotation>
                </xs:enumeration>
                <xs:enumeration value=" 1" >
                    <xs:annotation>
                        <xs:appinfo>Active</xs:appinfo>
                        <xs:documentation/>
                    </xs:annotation>
                </xs:enumeration>
            </xs:restriction>
        </xs:simpleType>
    </xs:union>
</xs:simpleType>
<xs:simpleType name=" ESPIServiceStatus" >
    <xs:annotation>
        <xs:documentation/>
    </xs:annotation>
    <xs:union memberTypes=" UInt16" >
        <xs:simpleType>
            <xs:restriction base=" UInt16" >
                <xs:enumeration value=" 0" >
                    <xs:annotation>
                        <xs:appinfo>Unavailable</xs:appinfo>
                        <xs:documentation/>
                    </xs:annotation>
                </xs:enumeration>
                <xs:enumeration value=" 1" >
                    <xs:annotation>
                        <xs:appinfo>Normal</xs:appinfo>
                        <xs:documentation/>
                    </xs:annotation>
                </xs:enumeration>
            </xs:restriction>
        </xs:simpleType>
    </xs:union>
</xs:simpleType>
<xs:simpleType name=" DstRuleType" >
    <xs:annotation>

```

<xs:documentation>[extension] Bit map encoded rule from which is calculated the start or end time, within the current year, to which daylight savings time offset must be applied. The rule encoding: Bits 0 – 11: seconds 0 – 3599 Bits 12 – 16: hours 0 – 23 Bits 17 – 19: day of the week 0 = not applicable, 1 – 7 (Monday = 1) Bits:20 – 24: day of the month 0 = not applicable, 1 – 31 Bits: 25 – 27: operator

CNS XXX:2022

(detailed below) Bits: 28 – 31: month 1 – 12 Rule value of 0xFFFFFFFF means rule processing/DST correction is disabled. The operators: 0: DST starts/ends on the Day of the Month 1: DST starts/ends on the Day of the Week that is on or after the Day of the Month 2: DST starts/ends on the first occurrence of the Day of the Week in a month 3: DST starts/ends on the second occurrence of the Day of the Week in a month 4: DST starts/ends on the third occurrence of the Day of the Week in a month 5: DST starts/ends on the fourth occurrence of the Day of the Week in a month 6: DST starts/ends on the fifth occurrence of the Day of the Week in a month 7: DST starts/ends on the last occurrence of the Day of the Week in a month An example: DST starts on third Friday in March at 1:45 AM. The rule... Seconds: 2700 Hours: 1 Day of Week: 5 Day of Month: 0 Operator: 4 Month: 3</xs:documentation>

```
</xs:annotation>
<xs:restriction base=" HexBinary32" />
</xs:simpleType>
<xs:element name=" IntervalBlock" type=" IntervalBlock" />
<xs:element name=" IntervalReading" type=" IntervalReading" />
<xs:element name=" MeterReading" type=" MeterReading" />
<xs:element name=" ReadingQuality" type=" ReadingQuality" />
<xs:element name=" ReadingType" type=" ReadingType" />
<xs:element name=" IdentifiedObject" type=" IdentifiedObject" />
<xs:element name=" UsagePoint" type=" UsagePoint" />
<xs:element name=" ElectricPowerQualitySummary" type=" ElectricPowerQualitySummary" />
<xs:element name=" ElectricPowerUsageSummary" type=" ElectricPowerUsageSummary" />
<xs:element name=" DateTimeInterval" type=" DateTimeInterval" />
<xs:element name=" SummaryMeasurement" type=" SummaryMeasurement" />
<xs:element name=" BatchItemInfo" type=" BatchItemInfo" />
<xs:element name=" Object" type=" Object" />
<xs:element name=" ServiceStatus" type=" ServiceStatus" />
<xs:element name=" LocalTimeParameters" type=" TimeConfiguration" />
</xs:schema>
```

oadr_ISO_ISO3AlphaCurrencyCode_20100407.xsd

```

<?xml version=" 1.0" encoding=" utf-8" ?>
<!-- ===== -->
<!-- ===== 5ISO 4217 3A - Code List Schema Module ===== -->
<!-- ===== -->
<!--
Schema agency: UN/CEFACT Schema version: 7.0
Schema date: 31 August 2010
Code list name: ISO 3 alpha currency code Code list agency: ISO
Code list version: 2010-04-07
Copyright (C) UN/CEFACT (2010). All Rights Reserved.
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DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO
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PURPOSE.
-->
<xsd:schema xmlns:xsd=" http://www.w3.org/2001/XMLSchema " xmlns:clm5ISO42173A="
urn:un:unece:unefact:codelist:standard:5:ISO42173A:2010-04-07 " xmlns:ccts="
urn:un:unece:unefact:documentation:standard:CoreComponentsTechnicalSpecification:2
targetNamespace=" urn:un:unece:unefact:codelist:standard:5:ISO42173A:2010-04-07 "
elementFormDefault=" qualified" attributeFormDefault=" unqualified" version=" 7.0" >
  <xsd:element name=" ISO3AlphaCurrencyCode " type="
clm5ISO42173A:ISO3AlphaCurrencyCodeContentType" />
  <xsd:simpleType name=" ISO3AlphaCurrencyCodeContentType" >
    <xsd:restriction base=" xsd:token" >
      <xsd:enumeration value=" AED" >
        <xsd:annotation>
          <xsd:documentation>
            <ccts:Name>UAE Dirham</ccts:Name>
          </xsd:documentation>
        </xsd:annotation>
      </xsd:enumeration>
      <xsd:enumeration value=" AFN" >
        <xsd:annotation>
          <xsd:documentation>
            <ccts:Name>Afghani</ccts:Name>
          </xsd:documentation>
        </xsd:annotation>
      </xsd:enumeration>
    </xsd:restriction>
  </xsd:simpleType>

```

```
</xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" ALL" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Lek</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" AMD" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Armenian Dram</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" ANG" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Netherlands Antillian Guilder</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" AOA" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Kwanza</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" ARS" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Argentine Peso</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" AUD" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Australian Dollar</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" AWG" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Aruban Guilder</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
```



```

</xsd:enumeration>
<xsd:enumeration value=" AZN" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Azerbaijani Manat</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" BAM" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Convertible Marks</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" BBD" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Barbados Dollar</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" BDT" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Taka</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" BGN" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Bulgarian Lev</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" BHD" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Bahraini Dinar</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" BIF" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Burundi Franc</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>

```

```

<xsd:enumeration value=" BMD" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Bermudian Dollar (customarily known as Bermuda Dollar)</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" BND" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Brunei Dollar</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" BOB" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Boliviano</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" BOV" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Mvdol</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" BRL" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Brazilian Real</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" BSD" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Bahamian Dollar</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" BTN" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Ngultrum</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" BWP" >

```

```

<xsd:annotation>
  <xsd:documentation>
    <ccts:Name>Pula</ccts:Name>
  </xsd:documentation>
</xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" BYR" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Belarussian Ruble</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" BZD" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Belize Dollar</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" CAD" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Canadian Dollar</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" CDF" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Congolese Franc</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" CHE" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>WIR Euro</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" CHF" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Swiss Franc</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" CHW" >
  <xsd:annotation>

```

```
<xsd:documentation>
  <ccts:Name>WIR Franc</ccts:Name>
</xsd:documentation>
</xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" CLF" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Unidades de fomento</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" CLP" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Chilean Peso</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" CNY" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Yuan Renminbi</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" COP" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Colombian Peso</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" COU" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Unidad de Valor Real</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" CRC" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Costa Rican Colon</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" CUC" >
  <xsd:annotation>
    <xsd:documentation>
```

```

        <ccts:Name>Peso Convertible</ccts:Name>
    </xsd:documentation>
</xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" CUP" >
    <xsd:annotation>
        <xsd:documentation>
            <ccts:Name>Cuban Peso</ccts:Name>
        </xsd:documentation>
    </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" CVE" >
    <xsd:annotation>
        <xsd:documentation>
            <ccts:Name>Cape Verde Escudo</ccts:Name>
        </xsd:documentation>
    </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" CZK" >
    <xsd:annotation>
        <xsd:documentation>
            <ccts:Name>Czech Koruna</ccts:Name>
        </xsd:documentation>
    </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" DJF" >
    <xsd:annotation>
        <xsd:documentation>
            <ccts:Name>Djibouti Franc</ccts:Name>
        </xsd:documentation>
    </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" DKK" >
    <xsd:annotation>
        <xsd:documentation>
            <ccts:Name>Danish Krone</ccts:Name>
        </xsd:documentation>
    </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" DOP" >
    <xsd:annotation>
        <xsd:documentation>
            <ccts:Name>Dominican Peso</ccts:Name>
        </xsd:documentation>
    </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" DZD" >
    <xsd:annotation>
        <xsd:documentation>
            <ccts:Name>Algerian Dinar</ccts:Name>

```

```

    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" EEK" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Kroon</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" EGP" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Egyptian Pound</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" ERN" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Nakfa</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" ETB" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Ethiopian Birr</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" EUR" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Euro</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" FJD" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Fiji Dollar</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" FKP" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Falkland Islands Pound</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>

```

```

    </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" GBP" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Pound Sterling</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" GEL" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Lari</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" GHS" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Cedi</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" GIP" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Gibraltar Pound</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" GMD" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Dalasi</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" GNF" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Guinea Franc</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
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  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>European Monetary Unit (E.M.U.-6)</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" XBC" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>European Unit of Account 9(E.U.A.-9)</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" XBD" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>European Unit of Account 17(E.U.A.-17)</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" XCD" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>East Caribbean Dollar</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" XDR" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>SDR</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" XFU" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>UIC-Franc</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" XOF" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>CFA Franc BCEAO †</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" XPD" >

```

```

    <xsd:annotation>
      <xsd:documentation>
        <ccts:Name>Palladium</ccts:Name>
      </xsd:documentation>
    </xsd:annotation>
  </xsd:enumeration>
  <xsd:enumeration value=" XPF" >
    <xsd:annotation>
      <xsd:documentation>
        <ccts:Name>CFP Franc</ccts:Name>
      </xsd:documentation>
    </xsd:annotation>
  </xsd:enumeration>
  <xsd:enumeration value=" XPF" >
    <xsd:annotation>
      <xsd:documentation>
        <ccts:Name>CFP Franc</ccts:Name>
      </xsd:documentation>
    </xsd:annotation>
  </xsd:enumeration>
  <xsd:enumeration value=" XPF" >
    <xsd:annotation>
      <xsd:documentation>
        <ccts:Name>CFP Franc</ccts:Name>
      </xsd:documentation>
    </xsd:annotation>
  </xsd:enumeration>
  <xsd:enumeration value=" XPT" >
    <xsd:annotation>
      <xsd:documentation>
        <ccts:Name>Platinum</ccts:Name>
      </xsd:documentation>
    </xsd:annotation>
  </xsd:enumeration>
  <xsd:enumeration value=" XTS" >
    <xsd:annotation>
      <xsd:documentation>
        <ccts:Name>Codes specifically reserved for testing purposes</ccts:Name>
      </xsd:documentation>
    </xsd:annotation>
  </xsd:enumeration>
  <xsd:enumeration value=" XXX" >
    <xsd:annotation>
      <xsd:documentation>
        <ccts:Name>The codes assigned for transactions where no currency is involved
are:</ccts:Name>
      </xsd:documentation>
    </xsd:annotation>
  </xsd:enumeration>
  <xsd:enumeration value=" YER" >

```



```
<xsd:annotation>
  <xsd:documentation>
    <ccts:Name>Yemeni Rial</ccts:Name>
  </xsd:documentation>
</xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" ZAR" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Rand</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" ZMK" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Zambian Kwacha</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
<xsd:enumeration value=" ZWL" >
  <xsd:annotation>
    <xsd:documentation>
      <ccts:Name>Zimbabwe Dollar</ccts:Name>
    </xsd:documentation>
  </xsd:annotation>
</xsd:enumeration>
</xsd:restriction>
</xsd:simpleType>
</xsd:schema>
```

oadr_power_20b.xsd

```

<?xml version=" 1.0" encoding=" ISO-8859-1" ?>
<xs:schema xmlns:xs= " http://www.w3.org/2001/XMLSchema " xmlns:power= " http://docs.oasis-
open.org/ns/emix/2011/06/power " xmlns:gml= " http://www.opengis.net/gml/3.2 " xmlns:gmlsf= "
http://www.opengis.net/gmlsf/2.0" xmlns:xcal= " urn:ietf:params:xml:ns:icalendar-2.0" xmlns:scale= "
http://docs.oasis-open.org/ns/emix/2011/06/siscale " xmlns:emix= " http://docs.oasis-
open.org/ns/emix/2011/06 " targetNamespace= " http://docs.oasis-open.org/ns/emix/2011/06/power "
elementFormDefault=" qualified" attributeFormDefault=" qualified" >
  <xs:import namespace=" http://www.opengis.net/gml/3.2" schemaLocation=" oadr_gml_20b.xsd" />
  <xs:import namespace= " http://docs.oasis-open.org/ns/emix/2011/06 " schemaLocation= "
oadr_emix_20b.xsd" />
  <xs:import namespace= " http://docs.oasis-open.org/ns/emix/2011/06/siscale " schemaLocation= "
oadr_siscale_20b.xsd" />
  <xs:element name=" endDeviceAsset" type=" power:EndDeviceAssetType" />
  <xs:complexType name=" EndDeviceAssetType" >
    <xs:annotation>
      <xs:documentation>The EndDeviceAssets are the physical device or devices which could be meters
or other types of devices that may be of interest</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element ref=" power:mrid" />
    </xs:sequence>
  </xs:complexType>
  <xs:element name=" meterAsset" type=" power:MeterAssetType" />
  <xs:complexType name=" MeterAssetType" >
    <xs:annotation>
      <xs:documentation>The MeterAsset is the physical device or devices that performs the role of the
meter</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element ref=" power:mrid" />
    </xs:sequence>
  </xs:complexType>
  <xs:element name=" pnode" type=" power:PnodeType" />
  <xs:complexType name=" PnodeType" mixed=" false" >
    <xs:annotation>
      <xs:documentation>A pricing node is directly associated with a connectivity node. It is a pricing
location for which market participants submit their bids, offers, buy/sell CRRs, and
settle.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element ref=" power:node" />
    </xs:sequence>
  </xs:complexType>
  <xs:element name=" aggregatedPnode" type=" power:AggregatedPnodeType" />
  <xs:complexType name=" AggregatedPnodeType" mixed=" false" >

```

```

    <xs:annotation>
      <xs:documentation>An aggregated pricing node is a specialized type of pricing node used to model
      items such as System Zone, Default Price Zone, Custom Price Zone, Control Area, Aggregated Generation,
      Aggregated Participating Load, Aggregated Non-Participating Load, Trading Hub, DCA
      Zone</xs:documentation>
    </xs:annotation>
  </xs:sequence>
  <xs:element ref=" power:node" />
</xs:sequence>
</xs:complexType>
<xs:element name=" serviceLocation" type=" power:ServiceLocationType" />
<xs:complexType name=" ServiceLocationType" mixed=" false" >
  <xs:annotation>
    <xs:documentation>A customer ServiceLocation has one or more ServiceDeliveryPoint(s), which in
    turn relate to Meters. The location may be a point or a polygon, depending on the specific circumstances.
    For distribution, the ServiceLocation is typically the location of the utility customer's
    premise.</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element ref=" gml:FeatureCollection" />
  </xs:sequence>
</xs:complexType>
<xs:element name=" serviceDeliveryPoint" type=" power:ServiceDeliveryPointType" />
<xs:complexType name=" ServiceDeliveryPointType" mixed=" false" >
  <xs:annotation>
    <xs:documentation>Logical point on the network where the ownership of the service changes hands.
    It is one of potentially many service points within a ServiceLocation, delivering service in accordance with
    a CustomerAgreement. Used at the place where a meter may be installed.</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element ref=" power:node" />
  </xs:sequence>
</xs:complexType>
<xs:element name=" transportInterface" type=" power:TransportInterfaceType" />
<xs:complexType name=" TransportInterfaceType" mixed=" false" >
  <xs:annotation>
    <xs:documentation>The Transport Interface delineates the edges at either end of a transport
    segment.</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name=" pointOfReceipt" type=" power:NodeType" />
    <xs:element name=" pointOfDelivery" type=" power:NodeType" />
  </xs:sequence>
</xs:complexType>
<xs:element name=" node" type=" power:NodeType" />
<xs:simpleType name=" NodeType" >
  <xs:annotation>
    <xs:documentation>The Node is a place where something changes (often ownership) or connects on
    the grid. Many nodes are associated with meters, but not all are.</xs:documentation>
  </xs:annotation>

```

```

    <xs:restriction base=" xs:string" />
</xs:simpleType>
<xs:element name=" mrid" type=" power:MridType" />
<xs:simpleType name=" MridType" >
    <xs:annotation>
        <xs:documentation>The mRID identifies the physical device that may be a CustomerMeter or other
types of EndDevices.</xs:documentation>
    </xs:annotation>
    <xs:restriction base=" xs:string" />
</xs:simpleType>
<xs:element name=" voltage" type=" power:VoltageType" substitutionGroup=" emix:itemBase" />
<xs:complexType name=" VoltageType" mixed=" false" >
    <xs:annotation>
        <xs:documentation>Voltage</xs:documentation>
    </xs:annotation>
    <xs:complexContent mixed=" false" >
        <xs:extension base=" emix:ItemBaseType" >
            <xs:sequence>
                <xs:element name=" itemDescription" type=" xs:string" fixed=" Voltage" />
                <xs:element name=" itemUnits" type=" xs:string" fixed=" V" />
                <xs:element ref=" scale:siScaleCode" />
            </xs:sequence>
        </xs:extension>
    </xs:complexContent>
</xs:complexType>
<xs:element name=" energyApparent" type=" power:EnergyApparentType" substitutionGroup="
power:energyItem" />
<xs:complexType name=" EnergyApparentType" mixed=" false" >
    <xs:annotation>
        <xs:documentation>Apparent Energy, measured in volt-ampere hours (VAh)</xs:documentation>
    </xs:annotation>
    <xs:complexContent mixed=" false" >
        <xs:restriction base=" power:EnergyItemType" >
            <xs:sequence>
                <xs:element name=" itemDescription" type=" xs:string" fixed=" ApparentEnergy" />
                <xs:element name=" itemUnits" type=" xs:string" fixed=" VAh" />
                <xs:element ref=" scale:siScaleCode" />
            </xs:sequence>
        </xs:restriction>
    </xs:complexContent>
</xs:complexType>
<xs:element name=" energyReactive" type=" power:EnergyReactiveType" substitutionGroup="
power:energyItem" />
<xs:complexType name=" EnergyReactiveType" mixed=" false" >
    <xs:annotation>
        <xs:documentation>Reactive Energy, volt-amperes reactive hours (VARh)</xs:documentation>
    </xs:annotation>
    <xs:complexContent mixed=" false" >

```

```

<xs:restriction base=" power:EnergyItemType" >
  <xs:sequence>
    <xs:element name=" itemDescription" type=" xs:string" fixed=" ReactiveEnergy" />
    <xs:element name=" itemUnits" type=" xs:string" fixed=" VARh" />
    <xs:element ref=" scale:siScaleCode" />
  </xs:sequence>
</xs:restriction>
</xs:complexContent>
</xs:complexType>
<xs:element name=" energyReal " type=" power:EnergyRealType " substitutionGroup="
power:energyItem" />
<xs:complexType name=" EnergyRealType" mixed=" false" >
  <xs:annotation>
    <xs:documentation>Real Energy, Watt Hours (Wh)</xs:documentation>
  </xs:annotation>
  <xs:complexContent mixed=" false" >
    <xs:restriction base=" power:EnergyItemType" >
      <xs:sequence>
        <xs:element name=" itemDescription" type=" xs:string" fixed=" RealEnergy" />
        <xs:element name=" itemUnits" type=" xs:string" fixed=" Wh" />
        <xs:element ref=" scale:siScaleCode" />
      </xs:sequence>
    </xs:restriction>
  </xs:complexContent>
</xs:complexType>
<xs:element name=" energyItem " type=" power:EnergyItemType " substitutionGroup="
emix:itemBase" />
<xs:complexType name=" EnergyItemType" abstract=" true" mixed=" false" >
  <xs:annotation>
    <xs:documentation>Base for the measurement of Energy</xs:documentation>
  </xs:annotation>
  <xs:complexContent mixed=" false" >
    <xs:extension base=" emix:ItemBaseType" >
      <xs:sequence>
        <xs:element name=" itemDescription" type=" xs:string" />
        <xs:element name=" itemUnits" type=" xs:string" />
        <xs:element ref=" scale:siScaleCode" />
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:element name=" powerApparent " type=" power:PowerApparentType " substitutionGroup="
power:powerItem" />
<xs:complexType name=" PowerApparentType" mixed=" false" >
  <xs:annotation>
    <xs:documentation>Apparent Power measured in volt-amperes (VA)</xs:documentation>
  </xs:annotation>
  <xs:complexContent mixed=" false" >

```

```

<xs:restriction base=" power:PowerItemType" >
  <xs:sequence>
    <xs:element name=" itemDescription" type=" xs:string" fixed=" ApparentPower" />
    <xs:element name=" itemUnits" type=" xs:string" fixed=" VA" />
    <xs:element ref=" scale:siScaleCode" />
    <xs:element ref=" power:powerAttributes" />
  </xs:sequence>
</xs:restriction>
</xs:complexContent>
</xs:complexType>
<xs:element name=" powerReactive" type=" power:PowerReactiveType" substitutionGroup="
power:powerItem" />
<xs:complexType name=" PowerReactiveType" mixed=" false" >
  <xs:annotation>
    <xs:documentation>Reactive power, measured in volt-amperes reactive (VAR)</xs:documentation>
  </xs:annotation>
  <xs:complexContent mixed=" false" >
    <xs:restriction base=" power:PowerItemType" >
      <xs:sequence>
        <xs:element name=" itemDescription" type=" xs:string" fixed=" ReactivePower" />
        <xs:element name=" itemUnits" type=" xs:string" fixed=" VAR" />
        <xs:element ref=" scale:siScaleCode" />
        <xs:element ref=" power:powerAttributes" />
      </xs:sequence>
    </xs:restriction>
  </xs:complexContent>
</xs:complexType>
<xs:element name=" powerReal" type=" power:PowerRealType" substitutionGroup="
power:powerItem" />
<xs:complexType name=" PowerRealType" mixed=" false" >
  <xs:annotation>
    <xs:documentation>Real power measured in Watts (W) or Joules/second (J/s)</xs:documentation>
  </xs:annotation>
  <xs:complexContent mixed=" false" >
    <xs:restriction base=" power:PowerItemType" >
      <xs:sequence>
        <xs:element name=" itemDescription" type=" xs:string" fixed=" RealPower" />
        <xs:element name=" itemUnits" >
          <xs:simpleType>
            <xs:restriction base=" xs:token" >
              <xs:enumeration value=" W" />
              <xs:enumeration value=" J/s" />
            </xs:restriction>
          </xs:simpleType>
        </xs:element>
        <xs:element ref=" scale:siScaleCode" />
        <xs:element ref=" power:powerAttributes" />
      </xs:sequence>
    </xs:restriction>
  </xs:complexContent>

```

```

        </xs:restriction>
    </xs:complexContent>
</xs:complexType>
<xs:element name=" powerItem " type=" power:PowerItemType " substitutionGroup="
emix:itemBase" />
<xs:complexType name=" PowerItemType" abstract=" true" mixed=" false" >
    <xs:annotation>
        <xs:documentation>Base for the measurement of Power</xs:documentation>
    </xs:annotation>
    <xs:complexContent mixed=" false" >
        <xs:extension base=" emix:ItemBaseType" >
            <xs:sequence>
                <xs:element name=" itemDescription" type=" xs:string" />
                <xs:element name=" itemUnits" type=" xs:string" />
                <xs:element ref=" scale:siScaleCode" />
                <xs:element ref=" power:powerAttributes" />
            </xs:sequence>
        </xs:extension>
    </xs:complexContent>
</xs:complexType>
<xs:element name=" powerAttributes" type=" power:PowerAttributesType" />
<xs:complexType name=" PowerAttributesType" >
    <xs:sequence>
        <xs:element name=" hertz" type=" xs:decimal" />
        <xs:element name=" voltage" type=" xs:decimal" />
        <xs:element name=" ac" type=" xs:boolean" />
    </xs:sequence>
</xs:complexType>
</xs:schema>

```

oadr_pyld_20b.xsd

```

<?xml version=" 1.0" encoding=" ISO-8859-1" ?>
<xs:schema xmlns:xs= " http://www.w3.org/2001/XMLSchema " xmlns:pyld= " http://docs.oasis-
open.org/ns/energyinterop/201110/payloads " xmlns:ical= " urn:ietf:params:xml:ns:calendar-2.0 "
xmlns:ei= " http://docs.oasis-open.org/ns/energyinterop/201110 " xmlns:emix= " http://docs.oasis-
open.org/ns/emix/2011/06 " xmlns:targetNamespace= "
http://docs.oasis-open.org/ns/energyinterop/201110/payloads " elementFormDefault= " qualified "
attributeFormDefault=" qualified" >
  <xs:import namespace= " http://docs.oasis-open.org/ns/emix/2011/06 " schemaLocation= "
oadr_emix_20b.xsd" />
  <xs:import namespace= " http://docs.oasis-open.org/ns/energyinterop/201110 " schemaLocation= "
oadr_ei_20b.xsd" />
  <xs:element name=" requestID" type=" xs:string" >
    <xs:annotation>
      <xs:documentation>A ID used to match up a logical transaction request and
response</xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:element name=" replyLimit" type=" xs:unsignedInt" />
  <xs:element name=" eiRequestEvent" >
    <xs:annotation>
      <xs:documentation>Request Event from a VTN in pull mode</xs:documentation>
    </xs:annotation>
    <xs:complexType>
      <xs:sequence>
        <xs:element ref=" pyld:requestID" />
        <xs:element ref=" ei:venID" />
        <xs:element ref=" pyld:replyLimit" minOccurs=" 0" >
          <xs:annotation>
            <xs:documentation>Limit the number of events contained in the oadrDistributeEvent
payload</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name=" eiCreatedEvent" >
    <xs:annotation>
      <xs:documentation>Respond to a DR Event with optIn or optOut</xs:documentation>
    </xs:annotation>
    <xs:complexType>
      <xs:sequence>
        <xs:element ref=" ei:eiResponse" />
        <xs:element ref=" ei:eventResponses" minOccurs=" 0" />
        <xs:element ref=" ei:venID" />
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name=" reportToFollow" type=" xs:boolean" >
    <xs:annotation>
      <xs:documentation>Indicates if report (in the form of UpdateReport) to be returned following
cancellation of Report</xs:documentation>
    </xs:annotation>
  </xs:element>
</xs:schema>

```


oadr_siscale_20b.xsd

```

<?xml version=" 1.0" encoding=" utf-8" ?>
<xs:schema xmlns:xs= " http://www.w3.org/2001/XMLSchema " xmlns:pyld= " http://docs.oasis-
open.org/ns/energyinterop/201110/payloads " xmlns:xcal= " urn:ietf:params:xml:ns:icalendar-2.0 "
xmlns:ei= " http://docs.oasis-open.org/ns/energyinterop/201110 " xmlns:emix= " http://docs.oasis-
open.org/ns/emix/2011/06 " targetNamespace= "
http://docs.oasis-open.org/ns/energyinterop/201110/payloads " elementFormDefault= " qualified "
attributeFormDefault= " qualified" >
  <xs:import namespace= " http://docs.oasis-open.org/ns/emix/2011/06 " schemaLocation= "
oadr_emix_20b.xsd" />
  <xs:import namespace= " http://docs.oasis-open.org/ns/energyinterop/201110 " schemaLocation= "
oadr_ei_20b.xsd" />
  <xs:element name=" requestID" type=" xs:string" >
    <xs:annotation>
      <xs:documentation>A ID used to match up a logical transaction request and
response</xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:element name=" replyLimit" type=" xs:unsignedInt" />
  <xs:element name=" eiRequestEvent" >
    <xs:annotation>
      <xs:documentation>Request Event from a VTN in pull mode</xs:documentation>
    </xs:annotation>
    <xs:complexType>
      <xs:sequence>
        <xs:element ref=" pyld:requestID" />
        <xs:element ref=" ei:venID" />
        <xs:element ref=" pyld:replyLimit" minOccurs=" 0" >
          <xs:annotation>
            <xs:documentation>Limit the number of events contained in the oadrDistributeEvent
payload</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name=" eiCreatedEvent" >
    <xs:annotation>
      <xs:documentation>Respond to a DR Event with optIn or optOut</xs:documentation>
    </xs:annotation>
    <xs:complexType>
      <xs:sequence>
        <xs:element ref=" ei:eiResponse" />
        <xs:element ref=" ei:eventResponses" minOccurs=" 0" />
        <xs:element ref=" ei:venID" />
      </xs:sequence>
    </xs:complexType>

```

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```
</xs:element>
<xs:element name=" reportToFollow" type=" xs:boolean" >
  <xs:annotation>
    <xs:documentation>Indicates if report (in the form of UpdateReport) to be returned following
cancellation of Report</xs:documentation>
  </xs:annotation>
</xs:element>
</xs:schema>
```

oadr_strm_20b.xsd

```

<?xml version=" 1.0" encoding=" ISO-8859-1" ?>
<xs:schema xmlns:xs=" http://www.w3.org/2001/XMLSchema " xmlns:strm="
urn:ietf:params:xml:ns:icalendar- 2.0:stream " xmlns:ei="
http://docs.oasis-open.org/ns/energyinterop/201110 " xmlns:xcal="
urn:ietf:params:xml:ns:icalendar-2.0" targetNamespace=" urn:ietf:params:xml:ns:icalendar-2.0:stream "
elementFormDefault=" qualified" attributeFormDefault=" qualified" >
  <xs:import namespace=" urn:ietf:params:xml:ns:icalendar-2.0 " schemaLocation="
oadr_xcal_20b.xsd" />
  <xs:import namespace=" http://docs.oasis-open.org/ns/energyinterop/201110 " schemaLocation="
oadr_ei_20b.xsd" />
  <xs:element name=" intervals" >
    <xs:annotation>
      <xs:documentation>Time intervals during which the DR event is active or report data is
available</xs:documentation>
    </xs:annotation>
    <xs:complexType>
      <xs:sequence>
        <xs:element ref=" ei:interval" maxOccurs=" unbounded" />
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name=" streamPayloadBase" type=" strm:StreamPayloadBaseType" abstract=" true"
/>
  <xs:complexType name=" StreamPayloadBaseType" abstract=" true" >
    <xs:annotation>
      <xs:documentation>Abstract class to convey a payload for a stream. When a Stream is transformed
to or from a WS-Calendar Interval, the contents of the Stream Payload defined element are transformed into
the contents of a WS-Calendar artifactBase.</xs:documentation>
    </xs:annotation>
  </xs:complexType>
  <xs:element name=" streamBase" type=" strm:StreamBaseType" abstract=" true" />
  <xs:complexType name=" StreamBaseType" abstract=" true" >
    <xs:annotation>
      <xs:documentation>abstract base for communication of schedules for signals and
observations</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element ref=" xcal:dtstart" minOccurs=" 0" />
      <xs:element ref=" xcal:duration" minOccurs=" 0" />
      <xs:element ref=" strm:intervals" minOccurs=" 0" />
    </xs:sequence>
  </xs:complexType>
</xs:schema>

```

oadr_xcal_20b.xsd

```

<?xml version=" 1.0" encoding=" ISO-8859-1" ?>
<xs:schema xmlns:xs=" http://www.w3.org/2001/XMLSchema " xmlns:xcal="
urn:ietf:params:xml:ns:icalendar-2.0" xmlns:ei=" http://docs.oasis-open.org/ns/energyinterop/201110"
targetNamespace=" urn:ietf:params:xml:ns:icalendar-2.0" elementFormDefault=" qualified "
attributeFormDefault=" qualified" >
  <xs:import namespace=" http://docs.oasis-open.org/ns/energyinterop/201110" schemaLocation="
oadr_ei_20b.xsd" />
  <xs:element name=" date-time" type=" xcal:DateTimeType" />
  <xs:simpleType name=" DateTimeType" >
    <xs:restriction base=" xs:dateTime" >
      <xs:pattern value=" (\-|\+)?\d{4}\-\d{2}\-\d{2}T\d{2}:\d{2}:\d{2}(\.\d*)?Z?" />
    </xs:restriction>
  </xs:simpleType>
  <xs:element name=" duration" type=" xcal:DurationPropType" >
    <xs:annotation>
      <xs:documentation>The duration of the activity, data, or state</xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:complexType name=" DurationPropType" mixed=" false" >
    <xs:sequence>
      <xs:element name=" duration" type=" xcal:DurationValueType" />
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name=" DurationValueType" >
    <xs:restriction base=" xs:string" >
      <xs:pattern value=" (\+|\-)?P((\d+Y)?(\d+M)?(\d+D)?T?(\d+H)?(\d+M)?(\d+S)?)(\d+W)" />
    </xs:restriction>
  </xs:simpleType>
  <xs:element name=" uid" >
    <xs:annotation>
      <xs:documentation>Used as an index to identify intervals</xs:documentation>
    </xs:annotation>
    <xs:complexType>
      <xs:sequence>
        <xs:element ref=" xcal:text" />
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name=" text" type=" xs:string" />
  <xs:element name=" dtstart" >
    <xs:annotation>
      <xs:documentation>The starting time for the activity, data, or state change</xs:documentation>
    </xs:annotation>
    <xs:complexType>
      <xs:sequence>
        <xs:element ref=" xcal:date-time" />

```

```

        </xs:sequence>
    </xs:complexType>
</xs:element>
<xs:element name=" properties" >
    <xs:complexType>
        <xs:sequence></xs:sequence>
    </xs:complexType>
</xs:element>
<xs:element name=" components" nillable=" true" />
<xs:element name=" dtend" >
    <xs:complexType>
        <xs:sequence>
            <xs:element ref=" xcal:date-time" />
        </xs:sequence>
    </xs:complexType>
</xs:element>
<xs:complexType name=" VavailabilityType" mixed=" false" >
    <xs:sequence>
        <xs:element name=" components" type=" xcal:ArrayOfVavailabilityContainedComponents" />
    </xs:sequence>
</xs:complexType>
<xs:element name=" vavailability" type=" xcal:VavailabilityType" >
    <xs:annotation>
        <xs:documentation>A schedule reflecting device availability for participating in DR
events</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:complexType name=" ArrayOfVavailabilityContainedComponents" >
    <xs:sequence>
        <xs:element ref=" xcal:available" minOccurs=" 0" maxOccurs=" unbounded" />
    </xs:sequence>
</xs:complexType>
<xs:complexType name=" AvailableType" mixed=" false" >
    <xs:sequence>
        <xs:element ref=" xcal:properties" />
    </xs:sequence>
</xs:complexType>
<xs:element name=" available" type=" xcal:AvailableType" />
<xs:element name=" granularity" type=" xcal:DurationPropType" />
<xs:element name=" interval" type=" xcal:WsCalendarIntervalType" />
<xs:complexType name=" WsCalendarIntervalType" >
    <xs:annotation>
        <xs:documentation xml:lang=" en" >An interval takes no sub-components.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
        <xs:element ref=" xcal:properties" />
    </xs:sequence>
</xs:complexType>
</xs:schema>

```

oadr_xml.xsd

```

<?xml version=" 1.0" encoding=" utf-8" ?>
<xs:schema xmlns:xs=" http://www.w3.org/2001/XMLSchema " targetNamespace="
http://www.w3.org/XML/1998/namespace" xml:lang=" en" >
  <xs:annotation>
    <xs:documentation>See http://www.w3.org/XML/1998/namespace.html and
http://www.w3.org/TR/REC-xml for information about this namespace. This schema document describes the
XML namespace, in a form suitable for import by other schema documents. Note that local names in this
namespace are intended to be defined only by the World Wide Web Consortium or its subgroups. The
following names are currently defined in this namespace and should not be used with conflicting semantics
by any Working Group, specification, or document instance: base (as an attribute name): denotes an
attribute whose value provides a URI to be used as the base for interpreting any relative URIs in the scope
of the element on which it appears; its value is inherited. This name is reserved by virtue of its definition
in the XML Base specification. lang (as an attribute name): denotes an attribute whose value is a language
code for the natural language of the content of any element; its value is inherited. This name is reserved
by virtue of its definition in the XML specification. space (as an attribute name): denotes an attribute whose
value is a keyword indicating what whitespace processing discipline is intended for the content of the
element; its value is inherited. This name is reserved by virtue of its definition in the XML specification.
Father (in any context at all): denotes Jon Bosak, the chair of the original XML Working Group. This name
is reserved by the following decision of the W3C XML Plenary and XML Coordination groups: In
appreciation for his vision, leadership and dedication the W3C XML Plenary on this 10th day of February,
2000 reserves for Jon Bosak in perpetuity the XML name xml:Father</xs:documentation>
  </xs:annotation>
  <xs:annotation>
    <xs:documentation>This schema defines attributes and an attribute group suitable for use by schemas
wishing to allow xml:base, xml:lang or xml:space attributes on elements they define. To enable this, such a
schema must import this schema for the XML namespace, e.g. as follows: &lt;schema . . .&gt; . . .
&lt;import namespace=" http://www.w3.org/XML/1998/namespace " schemaLocation="
http://www.w3.org/2001/03/xml.xsd" /&gt; Subsequently, qualified reference to any of the attributes or the
group defined below will have the desired effect, e.g. &lt;type . . .&gt; . . . &lt;attributeGroup ref="
xml:specialAttrs" /&gt; will define a type which will schema-validate an instance element with any of those
attributes</xs:documentation>
  </xs:annotation>
  <xs:annotation>
    <xs:documentation>In keeping with the XML Schema WG's standard versioning policy, this schema
document will persist at http://www.w3.org/2001/03/xml.xsd. At the date of issue it can also be found at
http://www.w3.org/2001/xml.xsd. The schema document at that URI may however change in the future, in
order to remain compatible with the latest version of XML Schema itself. In other words, if the XML
Schema namespace changes, the version of this document at http://www.w3.org/2001/xml.xsd will change
accordingly; the version at http://www.w3.org/2001/03/xml.xsd will not change.</xs:documentation>
  </xs:annotation>
  <xs:attribute name=" lang" type=" xs:language" >
    <xs:annotation>
      <xs:documentation>In due course, we should install the relevant ISO 2- and 3-letter codes as the
enumerated possible values . . .</xs:documentation>
    </xs:annotation>
  </xs:attribute>
  <xs:attribute name=" space" default=" preserve" >

```

```
<xs:simpleType>
  <xs:restriction base=" xs:NCName" >
    <xs:enumeration value=" default" />
    <xs:enumeration value=" preserve" />
  </xs:restriction>
</xs:simpleType>
</xs:attribute>
<xs:attribute name=" base" type=" xs:anyURI" >
  <xs:annotation>
    <xs:documentation>See http://www.w3.org/TR/xmlbase/ for information about this
attribute.</xs:documentation>
  </xs:annotation>
</xs:attribute>
<xs:attributeGroup name=" specialAttrs" >
  <xs:attribute ref=" xml:base" />
  <xs:attribute ref=" xml:lang" />
  <xs:attribute ref=" xml:space" />
</xs:attributeGroup>
</xs:schema>
```

oadr_xmldsig.xsd

```

<?xml version=" 1.0" encoding=" utf-8" ?>
<schema xmlns=" http://www.w3.org/2001/XMLSchema " xmlns:ds=" http://www.w3.org/2000/09/xmldsig# " targetNamespace=" http://www.w3.org/2000/09/xmldsig# " elementFormDefault=" qualified" version=" 0.1" >
  <simpleType name=" CryptoBinary" >
    <restriction base=" base64Binary" />
  </simpleType>
  <element name=" Signature" type=" ds:SignatureType" />
  <complexType name=" SignatureType" >
    <sequence>
      <element ref=" ds:SignedInfo" />
      <element ref=" ds:SignatureValue" />
      <element ref=" ds:KeyInfo" minOccurs=" 0" />
      <element ref=" ds:Object" minOccurs=" 0" maxOccurs=" unbounded" />
    </sequence>
    <attribute name=" Id" type=" ID" use=" optional" />
  </complexType>
  <element name=" SignatureValue" type=" ds:SignatureValueType" />
  <complexType name=" SignatureValueType" >
    <simpleContent>
      <extension base=" base64Binary" >
        <attribute name=" Id" type=" ID" use=" optional" />
      </extension>
    </simpleContent>
  </complexType>
  <element name=" SignedInfo" type=" ds:SignedInfoType" />
  <complexType name=" SignedInfoType" >
    <sequence>
      <element ref=" ds:CanonicalizationMethod" />
      <element ref=" ds:SignatureMethod" />
      <element ref=" ds:Reference" maxOccurs=" unbounded" />
    </sequence>
    <attribute name=" Id" type=" ID" use=" optional" />
  </complexType>
  <element name=" CanonicalizationMethod" type=" ds:CanonicalizationMethodType" />
  <complexType name=" CanonicalizationMethodType" mixed=" true" >
    <sequence>
      <any namespace=" ##any" minOccurs=" 0" maxOccurs=" unbounded" />
    </sequence>
    <attribute name=" Algorithm" type=" anyURI" use=" required" />
  </complexType>
  <element name=" SignatureMethod" type=" ds:SignatureMethodType" />
  <complexType name=" SignatureMethodType" mixed=" true" >
    <sequence>
      <element name=" HMACOutputLength" type=" ds:HMACOutputLengthType" minOccurs="
0" />

```



```

    <any namespace=" ##other" minOccurs=" 0" maxOccurs=" unbounded" />
  </sequence>
  <attribute name=" Algorithm" type=" anyURI" use=" required" />
</complexType>
<element name=" Reference" type=" ds:ReferenceType" />
<complexType name=" ReferenceType" >
  <sequence>
    <element ref=" ds:Transforms" minOccurs=" 0" />
    <element ref=" ds:DigestMethod" />
    <element ref=" ds:DigestValue" />
  </sequence>
  <attribute name=" Id" type=" ID" use=" optional" />
  <attribute name=" URI" type=" anyURI" use=" optional" />
  <attribute name=" Type" type=" anyURI" use=" optional" />
</complexType>
<element name=" Transforms" type=" ds:TransformsType" />
<complexType name=" TransformsType" >
  <sequence>
    <element ref=" ds:Transform" maxOccurs=" unbounded" />
  </sequence>
</complexType>
<element name=" Transform" type=" ds:TransformType" />
<complexType name=" TransformType" mixed=" true" >
  <choice minOccurs=" 0" maxOccurs=" unbounded" >
    <any namespace=" ##other" processContents=" lax" />
    <element name=" XPath" type=" string" />
  </choice>
  <attribute name=" Algorithm" type=" anyURI" use=" required" />
</complexType>
<element name=" DigestMethod" type=" ds:DigestMethodType" />
<complexType name=" DigestMethodType" mixed=" true" >
  <sequence>
    <any namespace=" ##other" processContents=" lax" minOccurs=" 0" maxOccurs="
unbounded" />
  </sequence>
  <attribute name=" Algorithm" type=" anyURI" use=" required" />
</complexType>
<element name=" DigestValue" type=" ds:DigestValueType" />
<simpleType name=" DigestValueType" >
  <restriction base=" base64Binary" />
</simpleType>
<element name=" KeyInfo" type=" ds:KeyInfoType" />
<complexType name=" KeyInfoType" mixed=" true" >
  <choice maxOccurs=" unbounded" >
    <element ref=" ds:KeyName" />
    <element ref=" ds:KeyValue" />
    <element ref=" ds:RetrievalMethod" />
  </choice>

```

```

    <element ref=" ds:X509Data" />
    <element ref=" ds:PGPData" />
    <element ref=" ds:SPKIData" />
    <element ref=" ds:MgmtData" />
    <any namespace=" ##other" processContents=" lax" />
</choice>
<attribute name=" Id" type=" ID" use=" optional" />
</complexType>
<element name=" KeyName" type=" string" />
<element name=" MgmtData" type=" string" />
<element name=" KeyValue" type=" ds:KeyValue" />
<complexType name=" KeyValue" mixed=" true" >
    <choice>
        <element ref=" ds:DSAKeyValue" />
        <element ref=" ds:RSAKeyValue" />
        <any namespace=" ##other" processContents=" lax" />
    </choice>
</complexType>
<element name=" RetrievalMethod" type=" ds:RetrievalMethod" />
<complexType name=" RetrievalMethod" >
    <sequence>
        <element ref=" ds:Transforms" minOccurs=" 0" />
    </sequence>
    <attribute name=" URI" type=" anyURI" />
    <attribute name=" Type" type=" anyURI" use=" optional" />
</complexType>
<element name=" X509Data" type=" ds:X509DataType" />
<complexType name=" X509DataType" >
    <sequence maxOccurs=" unbounded" >
        <choice>
            <element name=" X509IssuerSerial" type=" ds:X509IssuerSerial" />
            <element name=" X509SKI" type=" base64Binary" />
            <element name=" X509SubjectName" type=" string" />
            <element name=" X509Certificate" type=" base64Binary" />
            <element name=" X509CRL" type=" base64Binary" />
            <any namespace=" ##other" processContents=" lax" />
        </choice>
    </sequence>
</complexType>
<complexType name=" X509IssuerSerial" >
    <sequence>
        <element name=" X509IssuerName" type=" string" />
        <element name=" X509SerialNumber" type=" integer" />
    </sequence>
</complexType>
<element name=" PGPData" type=" ds:PGPDataType" />
<complexType name=" PGPDataType" >

```

```

    <choice>
      <sequence>
        <element name=" PGPKeyID" type=" base64Binary" />
        <element name=" PGPKeyPacket" type=" base64Binary" minOccurs=" 0" />
        <any namespace=" ##other" processContents=" lax" minOccurs=" 0" maxOccurs="
unbounded" />
      </sequence>
      <sequence>
        <element name=" PGPKeyPacket" type=" base64Binary" />
        <any namespace=" ##other" processContents=" lax" minOccurs=" 0" maxOccurs="
unbounded" />
      </sequence>
    </choice>
  </complexType>
  <element name=" SPKIData" type=" ds:SPKIDataType" />
  <complexType name=" SPKIDataType" >
    <sequence maxOccurs=" unbounded" >
      <element name=" SPKISexp" type=" base64Binary" />
      <any namespace=" ##other" processContents=" lax" minOccurs=" 0" />
    </sequence>
  </complexType>
  <element name=" Object" type=" ds:ObjectType" />
  <complexType name=" ObjectType" mixed=" true" >
    <sequence minOccurs=" 0" maxOccurs=" unbounded" >
      <any namespace=" ##any" processContents=" lax" />
    </sequence>
    <attribute name=" Id" type=" ID" use=" optional" />
    <attribute name=" MimeType" type=" string" use=" optional" />
    <attribute name=" Encoding" type=" anyURI" use=" optional" />
  </complexType>
  <element name=" Manifest" type=" ds:ManifestType" />
  <complexType name=" ManifestType" >
    <sequence>
      <element ref=" ds:Reference" maxOccurs=" unbounded" />
    </sequence>
    <attribute name=" Id" type=" ID" use=" optional" />
  </complexType>
  <element name=" SignatureProperties" type=" ds:SignaturePropertiesType" />
  <complexType name=" SignaturePropertiesType" >
    <sequence>
      <element ref=" ds:SignatureProperty" maxOccurs=" unbounded" />
    </sequence>
    <attribute name=" Id" type=" ID" use=" optional" />
  </complexType>
  <element name=" SignatureProperty" type=" ds:SignaturePropertyType" />
  <complexType name=" SignaturePropertyType" mixed=" true" >
    <choice maxOccurs=" unbounded" >

```

```

    <any namespace=" ##other" processContents=" lax" />
  </choice>
  <attribute name=" Target" type=" anyURI" use=" required" />
  <attribute name=" Id" type=" ID" use=" optional" />
</complexType>
<simpleType name=" HMACOutputLengthType" >
  <restriction base=" integer" />
</simpleType>
<element name=" DSAKeyValue" type=" ds:DSAPublicKey" />
<complexType name=" DSAKeyValue" >
  <sequence>
    <sequence minOccurs=" 0" >
      <element name=" P" type=" ds:CryptoBinary" />
      <element name=" Q" type=" ds:CryptoBinary" />
    </sequence>
    <element name=" G" type=" ds:CryptoBinary" minOccurs=" 0" />
    <element name=" Y" type=" ds:CryptoBinary" />
    <element name=" J" type=" ds:CryptoBinary" minOccurs=" 0" />
    <sequence minOccurs=" 0" >
      <element name=" Seed" type=" ds:CryptoBinary" />
      <element name=" PgenCounter" type=" ds:CryptoBinary" />
    </sequence>
  </sequence>
</complexType>
<element name=" RSAKeyValue" type=" ds:RSAPublicKey" />
<complexType name=" RSAKeyValue" >
  <sequence>
    <element name=" Modulus" type=" ds:CryptoBinary" />
    <element name=" Exponent" type=" ds:CryptoBinary" />
  </sequence>
</complexType>
</schema>

```

oadr_xmldsig11.xsd

```

<?xml version=" 1.0" encoding=" utf-8" ?>
<!-- #
# Copyright ©[2011] World Wide Web Consortium # (Massachusetts Institute of Technology,
# European Research Consortium for Informatics and Mathematics, # Keio University). All Rights
Reserved.
# This work is distributed under the W3C® Software License [1] in the
# hope that it will be useful, but WITHOUT ANY WARRANTY; without even
# the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR # PURPOSE.
# [1] http://www.w3.org/Consortium/Legal/2002/copyright-software-20021231 #
-->
<schema xmlns=" http://www.w3.org/2001/XMLSchema" xmlns:ds="
http://www.w3.org/2000/09/xmldsig#" xmlns:dsig11=" http://www.w3.org/2009/xmldsig11#"
targetNamespace=" http://www.w3.org/2009/xmldsig11#" elementFormDefault=" qualified "
version=" 0.1" >
  <import namespace=" http://www.w3.org/2000/09/xmldsig#" schemaLocation=" oadr_xmldsig.xsd" />
  <element name=" ECKeYValue" type=" dsig11:ECKeYValueType" />
  <complexType name=" ECKeYValueType" >
    <sequence>
      <choice>
        <element name=" ECParameters" type=" dsig11:ECParametersType" />
        <element name=" NamedCurve" type=" dsig11:NamedCurveType" />
      </choice>
      <element name=" PublicKey" type=" dsig11:ECPointType" />
    </sequence>
    <attribute name=" Id" type=" ID" use=" optional" />
  </complexType>
  <complexType name=" NamedCurveType" >
    <attribute name=" URI" type=" anyURI" use=" required" />
  </complexType>
  <simpleType name=" ECPointType" >
    <restriction base=" ds:CryptoBinary" />
  </simpleType>
  <complexType name=" ECParametersType" >
    <sequence>
      <element name=" FieldID" type=" dsig11:FieldIDType" />
      <element name=" Curve" type=" dsig11:CurveType" />
      <element name=" Base" type=" dsig11:ECPointType" />
      <element name=" Order" type=" ds:CryptoBinary" />
      <element name=" CoFactor" type=" integer" minOccurs=" 0" />
      <element name=" ValidationData" type=" dsig11:ECValidationDataType" minOccurs=" 0"
/ >
    </sequence>
  </complexType>
  <complexType name=" FieldIDType" >
    <choice>
      <element ref=" dsig11:Prime" />

```

```

    <element ref=" dsig11:TnB" />
    <element ref=" dsig11:PnB" />
    <element ref=" dsig11:GnB" />
    <any namespace=" ##other" processContents=" lax" />
</choice>
</complexType>
<complexType name=" CurveType" >
    <sequence>
        <element name=" A" type=" ds:CryptoBinary" />
        <element name=" B" type=" ds:CryptoBinary" />
    </sequence>
</complexType>
<complexType name=" ECValidationDataType" >
    <sequence>
        <element name=" seed" type=" ds:CryptoBinary" />
    </sequence>
    <attribute name=" hashAlgorithm" type=" anyURI" use=" required" />
</complexType>
<element name=" Prime" type=" dsig11:PrimeFieldParamsType" />
<complexType name=" PrimeFieldParamsType" >
    <sequence>
        <element name=" P" type=" ds:CryptoBinary" />
    </sequence>
</complexType>
<element name=" GnB" type=" dsig11:CharTwoFieldParamsType" />
<complexType name=" CharTwoFieldParamsType" >
    <sequence>
        <element name=" M" type=" positiveInteger" />
    </sequence>
</complexType>
<element name=" TnB" type=" dsig11:TnBFieldParamsType" />
<complexType name=" TnBFieldParamsType" >
    <complexContent>
        <extension base=" dsig11:CharTwoFieldParamsType" >
            <sequence>
                <element name=" K" type=" positiveInteger" />
            </sequence>
        </extension>
    </complexContent>
</complexType>
<element name=" PnB" type=" dsig11:PnBFieldParamsType" />
<complexType name=" PnBFieldParamsType" >
    <complexContent>
        <extension base=" dsig11:CharTwoFieldParamsType" >
            <sequence>
                <element name=" K1" type=" positiveInteger" />
                <element name=" K2" type=" positiveInteger" />
                <element name=" K3" type=" positiveInteger" />
            </sequence>
        </extension>
    </complexContent>
</complexType>

```

```

        </sequence>
    </extension>
</complexContent>
</complexType>
<element name=" DEREncodedKeyValue" type=" dsig11:DEREncodedKeyValue" />
<complexType name=" DEREncodedKeyValue" >
    <simpleContent>
        <extension base=" base64Binary" >
            <attribute name=" Id" type=" ID" use=" optional" />
        </extension>
    </simpleContent>
</complexType>
<element name=" KeyInfoReference" type=" dsig11:KeyInfoReference" />
<complexType name=" KeyInfoReference" >
    <attribute name=" URI" type=" anyURI" use=" required" />
    <attribute name=" Id" type=" ID" use=" optional" />
</complexType>
<element name=" X509Digest" type=" dsig11:X509Digest" />
<complexType name=" X509Digest" >
    <simpleContent>
        <extension base=" base64Binary" >
            <attribute name=" Algorithm" type=" anyURI" use=" required" />
        </extension>
    </simpleContent>
</complexType>
</schema>

```

oadr_xmldsig-properties-schema.xsd

```
<?xml version=" 1.0" encoding=" utf-8" ?>
<schema xmlns=" http://www.w3.org/2001/XMLSchema" xmlns:dsp=" http://openadr.org/oadr-2.0b/2012/07/xmldsig-properties" targetNamespace=" http://openadr.org/oadr-2.0b/2012/07/xmldsig-properties" elementFormDefault=" qualified" version=" 0.1" >
  <element name=" ReplayProtect" type=" dsp:ReplayProtectType" />
  <complexType name=" ReplayProtectType" >
    <sequence>
      <element name=" timestamp" type=" dateTime" />
      <element name=" nonce" type=" dsp:NonceValueType" />
    </sequence>
  </complexType>
  <complexType name=" NonceValueType" >
    <simpleContent>
      <extension base=" string" >
        <attribute name=" EncodingType" type=" anyURI" />
      </extension>
    </simpleContent>
  </complexType>
</schema>
```


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