『推動 IPv4/IPv6 雙軌普行方案』

附錄十一
『物聯網、5G 與 IPv6 之國際技術標準』
摘要翻譯

物聯網、5G 與 IPv6 之國際技術標準
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編號	RFC	名稱	狀態	時間
1	4919	IPv6 over Low-Power Wireless Personal Area Networks (6LoWPANs): Overview, Assumptions, Problem Statement, and Goals	Informational	2007/04
2	4944	Transmission of IPv6 Packets over IEEE 802.15.4 Networks	Standards Track Updates by RFC 6282, 6775, 8025, 8066	2007/09
3	5548	Routing Requirements for Urban Low-Power and Lossy Networks	Informational	2009/05
4	5673	Industrial Routing Requirements in Low-Power and Lossy Networks	Informational	2009/10
5	5826	Home Automation Routing Requirements in Low-Power and Lossy Networks	Informational	2010/04
6	5867	Building Automation Routing Requirements in Low-Power and Lossy Networks	Informational	2010/06
7	6206	The Trickle Algorithm	Informational	2011/03
8	6282	Compression Format for IPv6 Datagrams over IEEE 802.15.4-Based Networks	Standards Track Updates RFC 4944	2011/09
9	6550	RPL: IPv6 Routing Protocol for Low-Power and Lossy Networks	Standards Track	2012/03
10	6551	Routing Metrics Used for Path Calculation in Low-Power and Lossy Networks	Standards Track	2012/03
11	6552	Objective Function Zero for the Routing Protocol for	Standards Track	2012

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13	6554	An IPv6 Routing Header for Source Routes with the Routing Protocol for Low-Power and Lossy Networks (RPL)	Standards Track	2012 /03
14	6568	Design and Application Spaces for IPv6 over Low-Power Wireless Personal Area Networks (6LoWPANs)	Informational	2012 /04
15	6574	Report from the Smart Object Workshop	Informational	2012 /04
16	6606	Problem Statement and Requirements for IPv6 over Low-Power Wireless Personal Area Network (6LoWPAN) Routing	Informational	2012 /05
17	6687	Performance Evaluation of the Routing Protocol for Low-Power and Lossy Networks (RPL)	Informational	2012 /10
18	6690	Constrained RESTful Environments (CoRE) Link Format	Standards Track	2012 /08
19	6719	The Minimum Rank with Hysteresis Objective Function	Standards Track	2012 /09
20	6775	Neighbor Discovery Optimization for IPv6 over Low-Power Wireless Personal Area Networks (6LoWPANs)	Standards Track Update 4944	2012 /11
21	6997	Reactive Discovery of Point-to-Point Routes in Low-Power and Lossy Networks	Experimental	2013 /08
22	6998	A Mechanism to Measure the Routing Metrics along a Point-to-Point Route in a Low-Power and Lossy Network	Experimental	2013 /08
23	7049	Concise Binary Object Representation (CBOR)	Standards Track	2013 /10
24	7102	Terms Used in Routing for Low-Power and Lossy Networks	Informational	2014 /01
25	7228	Terminology for Constrained-Node Networks	Informational	2014 /05
26	7252	The Constrained Application Protocol (CoAP)	Standards Track	2014

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27	7368	IPv6 Home Networking Architecture Principles	Informational	2014/10
28	7388	Definition of Managed Objects for IPv6 over Low-Power Wireless Personal Area Networks (6LoWPANs)	Standards Track	2012/07
29	7390	Group Communication for the Constrained Application Protocol (CoAP)	Experimental	2014/10
30	7397	Report from the Smart Object Security Workshop	Informational	2014/12
31	7400	6LoWPAN-GHC: Generic Header Compression for IPv6 over Low-Power Wireless Personal Area Networks (6LoWPANs)	Standards Track	2014/12
32	7416	A Security Threat Analysis for the Routing Protocol for Low-Power and Lossy Networks (RPLs)	Informational	2015/01
33	7428	Transmission of IPv6 Packets over ITU-T G.9959 Networks	Standards Track	2015/02
34	7452	Architectural Considerations in Smart Object Networking	Informational	2015/03
35	7547	Management of Networks with Constrained Devices: Problem Statement and Requirements	Informational	2015/05
36	7548	Management of Networks with Constrained Devices: Use Cases	Informational	2015/05
37	7554	Using IEEE 802.15.4e Time-Slotted Channel Hopping (TSCH) in the Internet of Things (IoT): Problem Statement	Informational	2015/09
38	7641	Observing Resources in the Constrained Application Protocol (CoAP)	Standards Track	2015/09
39	7650	A Constrained Application Protocol (CoAP) Usage for REsource LOcation And Discovery (RELOAD)	Standards Track	2015/09
40	7668	IPv6 over BLUETOOTH(R) Low Energy	Standards Track	2015/10
41	7695	Distributed Prefix Assignment Algorithm	Standards Track	2015/11
42	7731	Multicast Protocol for Low-Power and Lossy Networks (MPL)	Standards Track	2016/02

43	7732	Forwarder Policy for Multicast with Admin-Local Scope in the Multicast Protocol for Low-Power and Lossy Networks (MPL)	Informational	2016/02
44	7733	Applicability Statement: The Use of the Routing Protocol for Low-Power and Lossy Networks (RPL) Protocol Suite in Home Automation and Building Control	Standards Track	2016/02
45	7744	Use Cases for Authentication and Authorization in Constrained Environments	Informational	2016/01
46	7774	Multicast Protocol for Low-Power and Lossy Networks (MPL) Parameter Configuration Option for DHCPv6	Standards Track	2016/03
47	7787	Distributed Node Consensus Protocol	Standards Track	2016/04
48	7788	Home Networking Control Protocol	Standards Track	2016/04
49	7815	Minimal Internet Key Exchange Version 2 (IKEv2) Initiator Implementation	Informational	2016/03
50	7925	Transport Layer Security (TLS) / Datagram Transport Layer Security (DTLS) Profiles for the Internet of Things	Standards Track	2016/07
51	7959	Block-Wise Transfers in the Constrained Application Protocol (CoAP)	Standards Track Updates 7252	2016/08
52	7967	Constrained Application Protocol (CoAP) Option for No Server Response	Informational	2016/08
53	7973	Assignment of an Ethertype for IPv6 with Low-Power Wireless Personal Area Network (LoWPAN) Encapsulation	Informational	2016/11
54	8025	IPv6 over Low-Power Wireless Personal Area Network (6LoWPAN) Paging Dispatch	Standards Track Update RFC 4944	2016/11
55	8036	Applicability Statement for the Routing Protocol for Low-Power and Lossy Networks (RPL) in Advanced Metering Infrastructure (AMI) Networks	Standards Track	2017/01
56	8065	Privacy Considerations for IPv6 Adaptation-Layer Mechanisms	Informational	2017/02

57	8066	IPv6 over Low-Power Wireless Personal Area Network (6LoWPAN) ESC Dispatch Code Points and Guidelines	Standards Track Updates RFC 4944, RFC 6282	2017 /02
58	8075	Guidelines for Mapping Implementations: HTTP to the Constrained Application Protocol (CoAP)	Standards Track	2017 /02
59	8105	Transmission of IPv6 Packets over Digital Enhanced Cordless Telecommunications (DECT) Ultra Low Energy (ULE)	Standards Track	2017 /05
60	8132	PATCH and FETCH Methods for the Constrained Application Protocol (CoAP)	Standards Track	2017 /04
61	8138	IPv6 over Low-Power Wireless Personal Area Network (6LoWPAN) Routing Header	Standards Track	2017 /04
62	8148	Next-Generation Vehicle-Initiated Emergency Calls	Standards Track	2017 /05
63	8152	CBOR Object Signing and Encryption (COSE)	Standards Track Possible Obsolete soon	2017 /07
64	8163	Transmission of IPv6 over Master-Slave/Token-Passing (MS/TP) Networks	Standards Track	2017 /05
65	8180	Minimal IPv6 over the TSCH Mode of IEEE 802.15.4e (6TiSCH) Configuration	Best Current Practice BCP 210	2017 /05
66	8230	Using RSA Algorithms with CBOR Object Signing and Encryption (COSE) Messages	Standards Track	2017 /09
67	8240	Report from the Internet of Things Software Update (IoTSU) Workshop 2016	Informational	2017 /09
68	8272	TinyIPFIX for Smart Meters in Constrained Networks	Informational	2017 /11
69	8323	CoAP (Constrained Application Protocol) over TCP, TLS, and WebSockets	Standards Track Updates RFC 7641, RFC 7959	2018 /02
70	8352	Energy-Efficient Features of Internet of Things Protocols	Informational	2018 /04
71	8375	Special-Use Domain 'home.arpa.'	Standards Track	2018 /05
72	8376	Low-Power Wide Area Network (LPWAN)	Informational	2018

		Overview		/05
73	8387	Practical Considerations and Implementation Experiences in Securing Smart Object Networks	Informational	2018 /05
74	8392	CBOR Web Token (CWT)	Standards Track	2018 /05
75	8428	Sensor Measurement Lists (SenML)	Standards Track	2018 /08
76	8477	Report from the Internet of Things (IoT) Semantic Interoperability (IOTSI) Workshop 2016	Informational	2018 /10
77	8480	6TiSCH Operation Sublayer (6top) Protocol (6P)	Standards Track	2018 /11
78	8505	Registration Extensions for IPv6 over Low-Power Wireless Personal Area Network (6LoWPAN) Neighbor Discovery	Standards Track Updates RFC 6775	2018 /09
79	8539	Softwire Provisioning Using DHCPv4 over DHCPv6	Proposed Standard	2019 /03
80	8576	Internet of Things (IoT) Security: State of the Art and Challenges	Informational	2019 /04
81	8585	Requirements for IPv6 Customer Edge Routers to Support IPv4-as-a-Service	Informational	2019 /05

各篇 RFC 之中英文摘要依 RFC 編號順序編排如後。

1. RFC 4919: IPv6 over Low-Power Wireless Personal Area Networks (6LoWPANs): Overview, Assumptions, Problem Statement, and Goals.

Abstract

This document describes the assumptions, problem statement, and goals for transmitting IP over IEEE 802.15.4 networks. The set of goals enumerated in this document form an initial set only.

中文摘要

本文描述了在 IEEE 802.15.4 網路上傳輸 IP 的假設，問題陳述和目標。本文列舉的目標僅形成一個初始集合。

2. RFC 4944: Transmission of IPv6 Packets over IEEE 802.15.4 Networks

Abstract

This document describes the frame format for transmission of IPv6 packets and the method of forming IPv6 link-local addresses and statelessly autoconfigured addresses on IEEE 802.15.4 networks. Additional specifications include a simple header compression scheme using shared context and provisions for packet delivery in IEEE 802.15.4 meshes.

中文摘要

本文描述 IPv6 封包的訊號框格式，以及在 IEEE 802.15.4 網路上形成 IPv6 本地鏈路位址和無狀態自動配置位址的方法。

其他規範包括使用共享上下文的簡單標頭壓縮方案和 IEEE 802.15.4 網格中的資料封包傳送規定。

3. RFC 5673: Industrial Routing Requirements in Low-Power and Lossy Networks

Abstract

The wide deployment of lower-cost wireless devices will significantly improve the productivity and safety of industrial plants while increasing the efficiency of plant workers by extending the information set available about the plant operations. The aim of this document is to analyze the functional requirements for a routing protocol used in industrial Low-power and Lossy Networks (LLNs) of field devices.

中文摘要

低成本無線設備的廣泛部署將顯著提高工業設備的產能和安全性，同時通過擴充關於工廠運作的可用資訊集來提高工廠工人的效率。本文的目的是分析工業用低功耗有損網路(LLN)場域設備使用的路由協定的功能需求。

4. RFC 5548: Routing Requirements for Urban Low-Power and Lossy Networks

Abstract

The application-specific routing requirements for Urban Low-Power and Lossy Networks (U-LLNs) are presented in this document. In the near future, sensing and actuating nodes will be placed outdoors in urban environments so as to improve people's living conditions as well as to monitor compliance with increasingly strict environmental laws.

These field nodes are expected to measure and report a wide gamut of data (for example, the data required by applications that perform smart-metering or that monitor meteorological, pollution, and allergy conditions). The majority of these nodes are expected to communicate wirelessly over a variety of links such as IEEE 802.15.4, low-power IEEE 802.11, or IEEE 802.15.1 (Bluetooth), which given the limited radio range and the large number of nodes requires the use of suitable routing protocols. The design of such protocols will be mainly impacted by the limited resources of the nodes (memory, processing power, battery, etc.) and the particularities of the outdoor urban application scenarios. As such, for a wireless solution for Routing Over Low-Power and Lossy (ROLL) networks to be useful, the protocol(s) ought to be energy-efficient, scalable, and autonomous. This documents aims to specify a set of

IPv6 routing requirements reflecting these and further U-LLNs' tailored characteristics.

中文摘要

本文介紹都會低功耗有損網路(U-LLN)應用的路由要求。在不久的將來，傳感節點和啟動節點將被放置在室外的都會環境中，以改善人們的生活條件，以及監督日益嚴格的環境法律是否被遵守。

這些場域節點可望測量和報告各種資料(例如，執行智慧度量或監測氣象、污染和過敏條件等應用所需的資料)。預計這些節點中的大多數節點將通過各種連結進行無線通訊，例如 IEEE 802.15.4，低功率 IEEE 802.11 或 IEEE 802.15.1 (藍牙)，這些連結的無線電範圍有限，這些數量眾多的節點需要使用合適的路由協定。這些協定的設計主要受節點的有限資源(記憶體，計算能力，電池等)以及室外都會應用場景的特殊性所影響。因此，要說一個低功耗有損網路路由(ROLL)的無線解決方案是有用的，這個協定應該是節能的、可擴充的、自治的。本文旨在指定一組 IPv6 路由需求，以反映這些和其他 U-LLN 的特定特徵。

5. RFC 5826: Home Automation Routing Requirements in Low-Power and Lossy Networks

Abstract

This document presents requirements specific to home control and automation applications for Routing Over Low power and Lossy (ROLL) networks. In the near future, many homes will contain high numbers of wireless devices for a wide set of purposes. Examples include actuators (relay, light dimmer, heating valve), sensors (wall switch, water leak, blood pressure), and advanced controllers (radio-frequency-based AV remote control, central server for light and heat control). Because such devices only cover a limited radio range, routing is often required. The aim of this document is to specify the routing requirements for networks comprising such constrained devices in a home-control and automation environment.

中文摘要

本文介紹低功耗有損網路路由(ROLL)於家庭控制和自動化應用的特定需求。在不久的將來，許多家庭將包含大量無線設備，用於各種用途。例子包括啟動器(繼電器，調光器，加熱閥)，傳感器(牆壁開關，漏水，血壓)和進階控制器(基於射頻的 AV 遙控器，用於照明和加熱控制的中央伺服器)。由於此類設備僅覆蓋有限的

無線電範圍，通常需要路由。本文的目的是在家庭控制和自動化環境中指定包含此類受限制設備的網路路由要求。

6. RFC 5867: Building Automation Routing Requirements in Low-Power and Lossy Networks

Abstract

The Routing Over Low-Power and Lossy (ROLL) networks Working Group has been chartered to work on routing solutions for Low-Power and Lossy Networks (LLNs) in various markets: industrial, commercial (building), home, and urban networks. Pursuant to this effort, this document defines the IPv6 routing requirements for building automation.

中文摘要

低功耗有損網路路由(ROLL)工作組已經建立，致力於各種市場中的低功耗有損網路(LLN)的路由解決方案：包含工業，商業(大樓)，家庭和都會網路。根據這項工作，本文定義了大樓自動化的 IPv6 路由要求。

7. RFC 6206: The Trickle Algorithm

Abstract

The Trickle algorithm allows nodes in a lossy shared medium (e.g., low-power and lossy networks) to exchange information in a highly robust, energy efficient, simple, and scalable manner. Dynamically adjusting transmission windows allows Trickle to spread new information on the scale of link-layer transmission times while sending only a few messages per hour when information does not change. A simple suppression mechanism and transmission point selection allow Trickle's communication rate to scale logarithmically with density. This document describes the Trickle algorithm and considerations in its use.

中文摘要

Trickle 演算法允許有損共享媒體(例如，低功耗有損網路)中的節點能以高強度，節能，簡單和可擴充的方式交換資訊。在資訊不變的情況下，動態調整傳輸視窗允許 Trickle 演算法在連結層傳輸的時間等級上傳播新資訊，每小時僅發送幾條訊息。簡單的抑制機制和傳輸點選擇允許 Trickle 演算法的通信速率與密度成對數比例。本文描述了 Trickle 演算法及其使用的注意事項。

8. RFC 6282: Compression Format for IPv6 Datagrams over IEEE 802.15.4-Based Networks

Abstract

This document updates RFC 4944, "Transmission of IPv6 Packets over IEEE 802.15.4 Networks". This document specifies an IPv6 header compression format for IPv6 packet delivery in Low Power Wireless Personal Area Networks (6LoWPANs). The compression format relies on shared context to allow compression of arbitrary prefixes. How the information is maintained in that shared context is out of scope. This document specifies compression of multicast addresses and a framework for compressing next headers. UDP header compression is specified within this framework.

中文摘要

本文更新 RFC 4944，“通過 IEEE 802.15.4 網路傳輸 IPv6 資料封包”。本文規定了低功率無線個人網路(6LoWPAN)中 IPv6 資料封包傳輸的 IPv6 標頭壓縮格式。依賴於共享的上下文，壓縮格式允許壓縮任意前綴。如何在共享上下文中維護資訊不在本文的範圍。本文指定了群播位址的壓縮和壓縮下一個標頭的框架。在此框架中指定了 UDP 標頭壓縮。

9. RFC 6550: RPL: IPv6 Routing Protocol for Low-Power and Lossy Networks

Abstract

Low-Power and Lossy Networks (LLNs) are a class of network in which both the routers and their interconnect are constrained. LLN routers typically operate with constraints on processing power, memory, and energy (battery power). Their interconnects are characterized by high loss rates, low data rates, and instability. LLNs are comprised of anything from a few dozen to thousands of routers. Supported traffic flows include point-to-point (between devices inside the LLN), point-to-multipoint (from a central control point to a subset of devices inside the LLN), and multipoint-to-point (from devices inside the LLN towards a central control point). This document specifies the IPv6 Routing Protocol for Low-Power and Lossy Networks (RPL), which provides a mechanism whereby multipoint-to-point traffic from devices inside the LLN towards a central control point as well as point-to-multipoint traffic from the central control point to the devices inside the LLN are supported. Support for point-to-point traffic is also available.

中文摘要

低功耗有損網路(LLN)是一種網路，其中路由器及其互連都受到限制。LLN 路由器通常在處理能力，記憶體和能量(電池電量)方面受到限制。它們的互連具有高損耗率，低資料速率和不穩定性的特點。LLN 由幾十個到幾千個路由器組成。支援的流量包括點對點(LLN 內部的設備之間)，點對多點(從中央控制點到 LLN 內部設備的子集)，以及多點到點(來自 LLN 內部的設備)朝向中央控制點)。本文規定了低功耗有損網路(RPL)的 IPv6 路由協定，它提供了一種機制，從 LLN 內部的設備到中央控制點的多點到點流量以及來自中央控制點的點到多點流量。支援 LLN 內部設備的中央控制點。還提供對點對點流量的支援。

10. RFC 6551: Routing Metrics Used for Path Calculation in Low-Power and Lossy Networks

Abstract

Low-Power and Lossy Networks (LLNs) have unique characteristics compared with traditional wired and ad hoc networks that require the specification of new routing metrics and constraints. By contrast, with typical Interior Gateway Protocol (IGP) routing metrics using hop counts or link metrics, this document specifies a set of link and node routing metrics and constraints suitable to LLNs to be used by the Routing Protocol for Low-Power and Lossy Networks (RPL).

中文摘要

與需要規範新路由度量和限制的傳統有線和 ad hoc 網路相比，低功耗有損網路(LLN)具有獨特的特性。相比之下，使用跳數或連結的典型內部閘道器協定(IGP)路由度量度量標準，本文規定了一組適合低功耗有損網路(LLN)路由協定(RPL)使用的鏈路和節點路由度量和其使用限制。

11. RFC 6552: Objective Function Zero for the Routing Protocol for Low-Power and Lossy Networks (RPL)

Abstract

The Routing Protocol for Low-Power and Lossy Networks (RPL) specification defines a generic Distance Vector protocol that is adapted to a variety of network types by the application of specific Objective Functions (OFs). An OF states the outcome of the process used by a RPL node to select and optimize routes within a RPL Instance based on the Information Objects available; an OF is not an algorithm.

This document specifies a basic Objective Function that relies only on the objects that are defined in the RPL and does not use any protocol extensions.

中文摘要

低功耗有損網路路由協定(RPL)規範定義了一種通用距離向量協定，它透過應用特定目標函數(OFs)來適應各種網路類型。基於可用的資訊物件，RPL 節點在一個 RPL 實例內選擇和優化路由，目標函數表示這個過程的結果；目標函數不是演算法。

本文指定了一個基本的目標函數，該函數僅依賴於 RPL 中定義的物件，並且不使用任何擴充協定。

12. RFC 6553: The Routing Protocol for Low-Power and Lossy Networks (RPL) Option for Carrying RPL Information in Data-Plane Datagrams

Abstract

The Routing Protocol for Low-Power and Lossy Networks (RPL) includes routing information in data-plane datagrams to quickly identify inconsistencies in the routing topology. This document describes the RPL Option for use among RPL routers to include such routing information.

中文摘要

為了快速識別路由拓撲中的不一致性，低功耗有損網路路由協定(RPL)在資料平面資料封包中引入路由資訊。本文描述了可在RPL 路由器中使用的 RPL 選項，從而引入此類路由資訊。

13. RFC 6554: An IPv6 Routing Header for Source Routes with the Routing Protocol for Low-Power and Lossy Networks (RPL)

Abstract

In Low-Power and Lossy Networks (LLNs), memory constraints on routers may limit them to maintaining, at most, a few routes. In some configurations, it is necessary to use these memory-constrained routers to deliver datagrams to nodes within the LLN. The Routing Protocol for Low-Power and Lossy Networks (RPL) can be used in some deployments to store most, if not all, routes on one (e.g., the Directed Acyclic Graph (DAG) root) or a few routers and forward the IPv6 datagram using a source routing technique to avoid large routing tables on memory-constrained routers. This document specifies a new IPv6 Routing header type for delivering datagrams within a RPL routing domain.

中文摘要

在低功耗有損網路(LLN)中，路由器上的記憶體可能會限制了它們最多能維持幾條路由。在某些配置中，必須使用這些記憶體受限制路由器來將資料封包傳送到 LLN 內的節點。在某些部署下，低功耗有損網路路由協定(RPL)可以在一個(例如，有向無環圖

(DAG)根)或數個路由器上儲存大多數的路由，即使不是全部，並使用來源路由技術來轉發 IPv6 資料封包，藉此避免在記憶體受限制路由器上產生大型路由表。本文指定了一種新的 IPv6 路由標頭類型，用於在 RPL 路由領域內傳遞資料封包。

14. RFC 6568: Design and Application Spaces for IPv6 over Low-Power Wireless Personal Area Networks (6LoWPANs)

Abstract

This document investigates potential application scenarios and use cases for low-power wireless personal area networks (LoWPANs). This document provides dimensions of design space for LoWPAN applications. A list of use cases and market domains that may benefit and motivate the work currently done in the 6LoWPAN Working Group is provided with the characteristics of each dimension. A complete list of practical use cases is not the goal of this document.

中文摘要

本文研究低功耗無線個人網路(LoWPAN)的潛在應用場景和案例。本文提供了 LoWPAN 應用程序的設計空間維度。可以使 6LoWPAN 工作組目前所做工作受益和激勵的案例和市場領域列表具有每個維度的特徵。完整的實際案例列表不是本文的目標。

15. RFC 6574: Report from the Smart Object Workshop

Abstract

This document provides an overview of a workshop held by the Internet Architecture Board (IAB) on 'Interconnecting Smart Objects with the Internet'. The workshop took place in Prague on 25 March 2011. The main goal of the workshop was to solicit feedback from the wider community on their experience with deploying IETF protocols in constrained environments. This report summarizes the discussions and lists the conclusions and recommendations to the Internet Engineering Task Force (IETF) community.

Note that this document is a report on the proceedings of the workshop. The views and positions documented in this report are those of the workshop participants and do not necessarily reflect IAB views and positions.

中文摘要

本文概述了網際網路架構委員會(IAB)舉辦的關於將智慧物件與網際網路連接“的研討會。研討會於 2011 年 3 月 25 日在布拉格舉行。研討會的主要目標是徵求反饋意見。更廣泛的社區在有限的環境中部署 IETF 協定的經驗。本報告總結了討論，並列出了網際網路工程任務組(IETF)社區的結論和建議。請注意，本文是關

於會議記錄的報告作坊。本報告中記錄的觀點和立場是研討會參與者的觀點和立場，並不一定反映 IAB 的觀點和立場。

16. RFC 6606: Problem Statement and Requirements for IPv6 over Low-Power Wireless Personal Area Network (6LoWPAN) Routing

Abstract

IPv6 over Low-Power Wireless Personal Area Networks (6LoWPANs) are formed by devices that are compatible with the IEEE 802.15.4 standard. However, neither the IEEE 802.15.4 standard nor the 6LoWPAN format specification defines how mesh topologies could be obtained and maintained. Thus, it should be considered how 6LoWPAN formation and multi-hop routing could be supported.

This document provides the problem statement and design space for 6LoWPAN routing. It defines the routing requirements for 6LoWPANs, considering the low-power and other particular characteristics of the devices and links. The purpose of this document is not to recommend specific solutions but to provide general, layer-agnostic guidelines about the design of 6LoWPAN routing that can lead to further analysis and protocol design. This document is intended as input to groups working on routing protocols relevant to 6LoWPANs, such as the IETF ROLL WG.

中文摘要

低功耗無線個人網路(6LoWPAN)上的 IPv6 由與 IEEE 802.15.4 標準兼容的設備構成。但是，IEEE 802.15.4 標準和 6LoWPAN 格式規範都沒有定義如何獲得網狀拓撲和因此，應該考慮如何支援 6LoWPAN 形成和多跳路由。本文提供了 6LoWPAN 路由的問題陳述和設計空間。考慮到設備和連結的低功耗和其他特定特性，它定義了 6LoWPAN 的路由要求。本文的目的不是推薦特定的解決方案，而是提供有關 6LoWPAN 路由設計的一般的，層不可知的指南，這些指南可以導致進一步的分析和協定設計。本文旨在作為與 6LoWPAN 相關的路由協定的組的輸入，例如 IETF ROLL WG。

17. RFC 6687: Performance Evaluation of the Routing Protocol for Low-Power and Lossy Networks (RPL)

Abstract

This document presents a performance evaluation of the Routing Protocol for Low-Power and Lossy Networks (RPL) for a small outdoor deployment of sensor nodes and for a large-scale smart meter network. Detailed simulations are carried out to produce several routing performance metrics using these real-life deployment scenarios. Please refer to the PDF version of this document, which includes several plots for the performance metrics not shown in the plain-text version.

中文摘要

本文介紹了低功耗有損網路路由協定(RPL)的性能評估，用於小型室外部署傳感器節點和大規模智慧電錶網路。使用這些實際部署方案執行詳細的模擬以產生若干路由性能度量。請參閱本文的PDF 版本，其中包括未顯示在純文本版本中的性能指標的幾個圖表。

18. RFC 6690: Constrained RESTful Environments (CoRE) Link Format

Abstract

This specification defines Web Linking using a link format for use by constrained web servers to describe hosted resources, their attributes, and other relationships between links. Based on the HTTP Link Header field defined in RFC 5988, the Constrained RESTful Environments (CoRE) Link Format is carried as a payload and is assigned an Internet media type. "RESTful" refers to the Representational State Transfer (REST) architecture. A well-known URI is defined as a default entry point for requesting the links hosted by a server.

中文摘要

此規範使用鏈接格式定義 Web 鏈接，以供受限制的 Web 服務器用於描述託管資源，其屬性以及鏈接之間的其他關係。基於 RFC 5988 中定義的 HTTP 鏈接標頭字段，限制 RESTful 環境(CoRE)鏈接格式作為有效負載攜帶，並被分配 Internet 媒體類型。“RESTful”是指 Representational State Transfer(REST)架構。眾所周知的 URI 被定義為用於請求服務器託管的鏈接的默認入口點。

19. RFC 6719: The Minimum Rank with Hysteresis Objective Function

Abstract

The Routing Protocol for Low-Power and Lossy Networks (RPL) constructs routes by using Objective Functions that optimize or constrain the routes it selects and uses. This specification describes the Minimum Rank with Hysteresis Objective Function (MRHOF), an Objective Function that selects routes that minimize a metric, while using hysteresis to reduce churn in response to small metric changes. MRHOF works with additive metrics along a route, and the metrics it uses are determined by the metrics that the RPL Destination Information Object (DIO) messages advertise.

中文摘要

低功耗有損網路路由協定(RPL)通過使用優化或限制其選擇和使用的路由的目標函數來構造路由。該規範描述了具有最小秩的遲滯目標函數(Minimum Rank with Hysteresis Objective Function, MRHOF)，該目標函數選擇最小化度量的路由，同時使用滯後來減少響應於小度量變化的流失。MRHOF 使用沿路徑的附加度量，其使用的度量由 RPL 目的地資訊物件(DIO)訊息通告的度量來確定。

20. RFC 6775: Neighbor Discovery Optimization for IPv6 over Low-Power Wireless Personal Area Networks (6LoWPANs)

Abstract

The IETF work in IPv6 over Low-power Wireless Personal Area Network (6LoWPAN) defines 6LoWPANs such as IEEE 802.15.4. This and other similar link technologies have limited or no usage of multicast signaling due to energy conservation. In addition, the wireless network may not strictly follow the traditional concept of IP subnets and IP links. IPv6 Neighbor Discovery was not designed for non-transitive wireless links, as its reliance on the traditional IPv6 link concept and its heavy use of multicast make it inefficient and sometimes impractical in a low-power and lossy network. This document describes simple optimizations to IPv6 Neighbor Discovery, its addressing mechanisms, and duplicate address detection for Low-power Wireless Personal Area Networks and similar networks. The document thus updates RFC 4944 to specify the use of the optimizations defined here.

中文摘要

IETF 通過低功耗無線個人網路(6LoWPAN)在 IPv6 中工作，定義了 6LoWPAN，例如 IEEE 802.15.4。由於節能，該和其他類似的

連結技術限製或不使用群播信號。此外，無線網路可能不嚴格遵循傳統的 IP 子網和 IP 連結概念。IPv6 鄰居發現並非設計用於非傳遞性無線連結，因為它依賴於傳統的 IPv6 連結概念及其大量使用群播使其效率低下，有時在低功耗有損網路中不切實際。本文描述了對 IPv6 鄰居發現的簡單優化，其尋址機制以及針對低功耗無線個人網路和類似網路的重複位址檢測。因此，該文更新了 RFC 4944，以指定使用此處定義的優化。

21. RFC 6997: Reactive Discovery of Point-to-Point Routes in Low-Power and Lossy Networks

Abstract

This document specifies a point-to-point route discovery mechanism, complementary to the Routing Protocol for Low-power and Lossy Networks (RPL) core functionality. This mechanism allows an IPv6 router to discover “on demand” routes to one or more IPv6 routers in a Low-power and Lossy Network (LLN) such that the discovered routes meet specified metrics constraints.

中文摘要

本文規定了一種點對點路由發現機制，是對低功耗有損網路路由協定(RPL)核心功能的補充。該機制允許 IPv6 路由器“按需”發現滿足指定度量限制的路由，可以到達一個或多個在低功耗有損網路(LLN)中的 IPv6 路由器。

22. RFC 6998: A Mechanism to Measure the Routing Metrics along a Point-to-Point Route in a Low-Power and Lossy Network

Abstract

This document specifies a mechanism that enables a Routing Protocol for Low-power and Lossy Networks (RPL) router to measure the aggregated values of given routing metrics along an existing route towards another RPL router, thereby allowing the router to decide if it wants to initiate the discovery of a better route.

中文摘要

本文規定了一種機制，得以讓低功耗有損網路路由協定(RPL)路由器可以延著已經存在的一條到另外一個 RPL 路由器的路由測量指定度量的聚合值，從而讓該路由器決定是否要啟動路由發現機制去尋找一條更好的路由。

23. RFC 7049: Concise Binary Object Representation (CBOR)

Abstract

The Concise Binary Object Representation (CBOR) is a data format whose design goals include the possibility of extremely small code size, fairly small message size, and extensibility without the need for version negotiation. These design goals make it different from earlier binary serializations such as ASN.1 and MessagePack.

中文摘要

簡明二進制物件表示(CBOR)是一種資料格式，其設計目標包括極小代碼大小，相當小的訊息大小和可擴充性的可能性，而無需版本協商。這些設計目標使其與早期的二進制序列化(如 ASN.1 和 MessagePack)不同。

24. RFC 7102: Terms Used in Routing for Low-Power and Lossy Networks

Abstract

This document provides a glossary of terminology used in routing requirements and solutions for networks referred to as Low-Power and Lossy Networks (LLNs). An LLN is typically composed of many embedded devices with limited power, memory, and processing resources interconnected by a variety of links. There is a wide scope of application areas for LLNs, including industrial monitoring, building automation (e.g., heating, ventilation, air conditioning, lighting, access control, fire), connected home, health care, environmental monitoring, urban sensor networks, energy management, assets tracking, and refrigeration.

中文摘要

本文提供了路由要求和術語解決方案中使用的術語表，稱為低功耗有損網路(LLN)。LLN 通常由許多嵌入式設備組成，這些嵌入式設備具有通過各種連結互連的有限功率，記憶體和處理資源。LLN 有廣泛的應用領域，包括工業監控，大樓自動化(如供暖，通風，空調，照明，門禁，火災)，聯網家庭，醫療保健，環境監測，城市傳感器網路，能源管理，資產跟踪和製冷。

25. RFC 7228: Terminology for Constrained-Node Networks

Abstract

The Internet Protocol Suite is increasingly used on small devices with severe constraints on power, memory, and processing resources, creating constrained-node networks. This document provides a number of basic terms that have been useful in the standardization work for constrained-node networks.

中文摘要

Internet 協定套件越來越多地用於對功耗,記憶體和處理資源有嚴格限制的小型設備上，從而創建限制節點網路。本文提供了許多在限制節點網路的標準化工作中有用的基本術語。

26. RFC 7252: The Constrained Application Protocol (CoAP)

Abstract

The Constrained Application Protocol (CoAP) is a specialized web transfer protocol for use with constrained nodes and constrained (e.g., low-power, lossy) networks. The nodes often have 8-bit microcontrollers with small amounts of ROM and RAM, while constrained networks such as IPv6 over Low-Power Wireless Personal Area Networks (6LoWPANs) often have high packet error rates and a typical throughput of 10s of kbit/s. The protocol is designed for machine-to-machine (M2M) applications such as smart energy and building automation.

CoAP provides a request/response interaction model between application endpoints, supports built-in discovery of services and resources, and includes key concepts of the Web such as URIs and Internet media types. CoAP is designed to easily interface with HTTP for integration with the Web while meeting specialized requirements such as multicast support, very low overhead, and simplicity for constrained environments.

中文摘要

受限制應用協定(CoAP)是一種專用的網路傳輸協定，用於受限節點和受限制(例如，低功耗，有損耗)網路。節點通常具有 8 位微

控制器，具有少量 ROM 和 RAM，同時受限制低功耗無線個人網路(6LoWPAN)等 IPv6 網路通常具有較高的資料封包錯誤率和 10 kbit / s 的典型吞吐量。該協定專為智慧能源等機器對機器(M2M)應用而設計和大樓自動化。

CoAP 在應用程序端點之間提供請求/響應交互模型，支援內置的服務和資源發現，並包括 Web 的關鍵概念，如 URI 和 Internet 媒體類型。CoAP 旨在輕鬆與 HTTP 進行交互以與 Web 集成，同時滿足特殊要求，例如群播支援，極低開銷和受限環境的簡單性。

27. RFC 7368: IPv6 Home Networking Architecture Principles

Abstract

This text describes evolving networking technology within residential home networks with increasing numbers of devices and a trend towards increased internal routing. The goal of this document is to define a general architecture for IPv6-based home networking, describing the associated principles, considerations, and requirements. The text briefly highlights specific implications of the introduction of IPv6 for home networking, discusses the elements of the architecture, and suggests how standard IPv6 mechanisms and addressing can be employed in home networking. The architecture describes the need for specific protocol extensions for certain additional functionality. It is assumed that the IPv6 home network is not actively managed and runs as an IPv6-only or dual-stack network. There are no recommendations in this text for the IPv4 part of the network.

中文摘要

本文描述了住宅家庭網路中不斷發展的網路技術，其中設備數量越來越多，內部路由越來越多。本文的目標是定義基於 IPv6 的家庭網路的通用架構，描述相關的原則，注意事項和要求。本文簡要強調了 IPv6 引入家庭網路的具體含義，討論了該架構的各個要

素，並建議如何在家庭網路中採用標準的 IPv6 機制和尋址。該體系結構描述了對特定附加功能的特定協定擴充的需求。假設 IPv6 家庭網路不是主動管理的，並且作為僅 IPv6 或雙堆疊網路運行。本文中沒有針對網路的 IPv4 部分的建議。

28. RFC 7388: Definition of Managed Objects for IPv6 over Low-Power Wireless Personal Area Networks (6LoWPANs)

Abstract

This document defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it defines objects for managing IPv6 over Low-Power Wireless Personal Area Networks (6LoWPANs).

中文摘要

本文定義了管理資訊庫(MIB)的一部分，用於 Internet 社區中的網路管理協定。特別是，它定義了通過低功耗無線個人網路(6LoWPAN)管理 IPv6 的物件。

29. RFC 7390: Group Communication for the Constrained Application Protocol (CoAP)

Abstract

The Constrained Application Protocol (CoAP) is a specialized web transfer protocol for constrained devices and constrained networks. It is anticipated that constrained devices will often naturally operate in groups (e.g., in a building automation scenario, all lights in a given room may need to be switched on/off as a group). This specification defines how CoAP should be used in a group communication context. An approach for using CoAP on top of IP multicast is detailed based on existing CoAP functionality as well as new features introduced in this specification. Also, various use cases and corresponding protocol flows are provided to illustrate important concepts. Finally, guidance is provided for deployment in various network topologies.

中文摘要

受限制應用協定(CoAP)是用於受限制設備和受限制網路的專用 Web 傳輸協定。預期中，受限制設備通常會很自然地在群組裡操作(例如，在建築物自動化場景中，指定房間裡的所有燈光可能需要作為一組來開啟/關閉)。這個規範定義在群組通訊情境中如何使用 CoAP。基於現有 CoAP 功能以及本規範中引入的新特徵，

本文描述了在 IP 群播之上使用 CoAP 的方法。本文也提供了多種案例和對應的協定流程來說明重要概念。最後，本文提供了在各種網路拓撲中部署的指導。

30. RFC 7397: Report from the Smart Object Security Workshop

Abstract

This document provides a summary of a workshop on 'Smart Object Security' that took place in Paris on March 23, 2012. The main goal of the workshop was to allow participants to share their thoughts about the ability to utilize existing and widely deployed security mechanisms for smart objects.This report summarizes the discussions and lists the conclusions and recommendations to the Internet Engineering Task Force (IETF) community.

中文摘要

本文概述了 2012 年 3 月 23 日在巴黎舉行的'智慧物件安全'研討會。研討會的主要目標是讓與會者分享他們對利用現有和廣泛部署的安全性的能力的看法。智慧物件的機制。本報告總結了討論情況，並列出了網際網路工程任務組(IETF)社區的結論和建議。

31. RFC 7400: 6LoWPAN-GHC: Generic Header Compression for IPv6 over Low-Power Wireless Personal Area Networks (6LoWPANs)

Abstract

RFC 6282 defines header compression in 6LoWPAN packets (where "6LoWPAN" refers to "IPv6 over Low-Power Wireless Personal Area Network"). The present document specifies a simple addition that enables the compression of generic headers and header-like payloads, without a need to define a new header compression scheme for each such new header or header-like payload.

中文摘要

RFC 6282 定義了 6LoWPAN 資料封包中的標頭壓縮(其中“6LoWPAN”指的是“低功耗無線個人區域網路上的 IPv6”)。本文規定了一種簡單的附加，它能夠壓縮通用標頭和類似標頭的有效載荷，而無需為每個這樣的新標頭或類似標頭的有效負載定義新的標頭壓縮方案。

32. RFC 7416: A Security Threat Analysis for the Routing Protocol for Low-Power and Lossy Networks (RPLs)

Abstract

This document presents a security threat analysis for the Routing Protocol for Low-Power and Lossy Networks (RPLs). The development builds upon previous work on routing security and adapts the assessments to the issues and constraints specific to low-power and lossy networks. A systematic approach is used in defining and evaluating the security threats. Applicable countermeasures are application specific and are addressed in relevant applicability statements.

中文摘要

本文介紹了針對低功耗有損網路(RPL)的路由協定的安全威脅分析。該開發基於之前關於路由安全性的工作，並使評估適應低功耗有損網路特有的問題和限制。系統方法用於定義和評估安全威脅。適用的對策是特定於應用的，並在相關的適用性聲明中予以解決。

33. RFC 7428: Transmission of IPv6 Packets over ITU-T G.9959 Networks

Abstract

This document describes the frame format for transmission of IPv6 packets as well as a method of forming IPv6 link-local addresses and statelessly autoconfigured IPv6 addresses on ITU-T G.9959 networks.

中文摘要

本文描述了用於傳輸 IPv6 封包的幀格式以及在 ITU-T G.9959 網路上形成 IPv6 連結本地位址和無狀態自動配置的 IPv6 位址的方法。

34. RFC 7452: Architectural Considerations in Smart Object Networking

Abstract

The term "Internet of Things" (IoT) denotes a trend where a large number of embedded devices employ communication services offered by Internet protocols. Many of these devices, often called "smart objects", are not directly operated by humans but exist as components in buildings or vehicles, or are spread out in the environment.

Following the theme "Everything that can be connected will be connected", engineers and researchers designing smart object networks need to decide how to achieve this in practice.

This document offers guidance to engineers designing Internet-connected smart objects.

中文摘要

“物聯網”(IoT)這一術語表示大量嵌入式設備採用網際網路協定提供的通信服務的趨勢。許多這些設備(通常稱為“智慧物件”)不是直接由人類但作為建築物或車輛中的組件存在，或者在環境中展開。

在主題“可以連接的所有東西將被連接”之後，設計智慧物件網路的工程師和研究人員需要決定如何在實踐中實現這一點。

本文為工程師設計連接網際網路的智慧物件提供指導。

35. RFC 7547: Management of Networks with Constrained Devices: Problem Statement and Requirements

Abstract

This document provides a problem statement, deployment and management topology options, as well as requirements addressing the different use cases of the management of networks where constrained devices are involved.

中文摘要

本文獻提供了問題說明，部署和管理拓撲選項，以及針對涉及受限設備的網路管理的不同用例的要求。

36. RFC 7548: Management of Networks with Constrained Devices: Use Cases

Abstract

This document discusses use cases concerning the management of networks in which constrained devices are involved. A problem statement, deployment options, and the requirements on the networks with constrained devices can be found in the companion document on "Management of Networks with Constrained Devices: Problem Statement and Requirements" (RFC 7547).

中文摘要

本文討論了涉及受限制設備的網路管理的案例。有關受限設備的網路的問題陳述，部署選項和要求可在“帶有限制設備的網路管理：問題陳述和要求”(RFC 7547)的配套文中找到。

37. RFC 7554: Using IEEE 802.15.4e Time-Slotted Channel Hopping (TSCH) in the Internet of Things (IoT): Problem Statement

Abstract

This document describes the environment, problem statement, and goals for using the Time-Slotted Channel Hopping (TSCH) Medium Access Control (MAC) protocol of IEEE 802.14.4e in the context of Low-Power and Lossy Networks (LLNs). The set of goals enumerated in this document form an initial set only.

中文摘要

本文描述了在低功耗有損網路(LLN)環境中使用 IEEE 802.14.4e 的時隙通道跳頻(TSCH)媒體訪問控制(MAC)協定的環境，問題陳述和目標。本文中列舉的目標集僅形成初始集。

38. RFC 7641: Observing Resources in the Constrained Application Protocol (CoAP)

Abstract

The Constrained Application Protocol (CoAP) is a RESTful application protocol for constrained nodes and networks. The state of a resource on a CoAP server can change over time. This document specifies a simple protocol extension for CoAP that enables CoAP clients to "observe" resources, i.e., to retrieve a representation of a resource and keep this representation updated by the server over a period of time. The protocol follows a best-effort approach for sending new representations to clients and provides eventual consistency between the state observed by each client and the actual resource state at the server.

中文摘要

受限制應用協定(CoAP)是用於受限制節點和網路的RESTful應用協定。CoAP 服務器上的資源狀態可能會隨時間而變化。該文規定了 CoAP 的簡單協定擴充，使 CoAP 客戶端能夠“觀察”資源，即檢索資源的表示並在一段時間內保持服務器更新該表示。該協定遵循盡力而為的方法向客戶端發送新的表示，並提供每個客戶

端觀察到的狀態與服務器上的實際資源狀態之間的最終一致性。

39. RFC 7650: A Constrained Application Protocol (CoAP) Usage for REsource LOcation And Discovery (RELOAD)

Abstract

This document defines a Constrained Application Protocol (CoAP) Usage for REsource LOcation And Discovery (RELOAD). The CoAP Usage provides the functionality to federate Wireless Sensor Networks (WSNs) in a peer-to-peer fashion. The CoAP Usage for RELOAD allows CoAP nodes to store resources in a RELOAD peer-to-peer overlay, provides a lookup service, and enables the use of RELOAD overlay as a cache for sensor data. This functionality is implemented in the RELOAD overlay itself, without the use of centralized servers. The RELOAD AppAttach method is used to establish a direct connection between nodes through which CoAP messages are exchanged.

中文摘要

本文定義了 REsource LOcation And Discovery(RELOAD)的限制應用程序協定(CoAP)用法。CoAP Usage 提供以對等方式聯合無線傳感器網路(WSN)的功能。RELOAD 的 CoAP 使用允許 CoAP 節點在 RELOAD 對等覆蓋中存儲資源，提供查找服務，並允許使用 RELOAD 覆蓋作為傳感器資料的緩存。此功能在 RELOAD

覆蓋本身中實現，無需使用集中式服務器。RELOAD AppAttach 方法用於在通過其交換 CoAP 訊息的節點之間建立直接連接。

40. RFC 7668: IPv6 over BLUETOOTH(R) Low Energy

Abstract

Bluetooth Smart is the brand name for the Bluetooth low energy feature in the Bluetooth specification defined by the Bluetooth Special Interest Group. The standard Bluetooth radio has been widely implemented and available in mobile phones, notebook computers, audio headsets, and many other devices. The low-power version of Bluetooth is a specification that enables the use of this air interface with devices such as sensors, smart meters, appliances, etc. The low-power variant of Bluetooth has been standardized since revision 4.0 of the Bluetooth specifications, although version 4.1 or newer is required for IPv6. This document describes how IPv6 is transported over Bluetooth low energy using IPv6 over Low-power Wireless Personal Area Network (6LoWPAN) techniques.

中文摘要

Bluetooth Smart 是 Bluetooth 特別興趣小組定義的藍牙規範中藍牙低功耗特性的品牌名稱。標準藍牙無線電已廣泛實施，可用於行動電話，筆記本電腦，音頻耳機和許多其他設備。藍牙的低功耗版本是一種規範，可以將此空中介面與傳感器，智慧電錶，電器等設備結合使用。藍牙的低功耗版本自藍牙規範的 4.0 版本開始

標準化，儘管 IPv6 需要 4.1 或更高版本。本文描述如何使用 IPv6 通過低功耗無線個人網路(6LoWPAN)技術通過藍牙低功耗傳輸 IPv6。

41. RFC 7695: Distributed Prefix Assignment Algorithm

Abstract

This document specifies a distributed algorithm for dividing a set of prefixes in a manner that allows for automatic assignment of sub-prefixes that are unique and non-overlapping. Used in conjunction with a protocol that provides flooding of information among a set of participating nodes, prefix configuration within a network may be automated.

中文摘要

本文規定了一種分散式演算法，用於以允許自動分配唯一且不重疊的子前綴的方式劃分一組前綴。與在一組參與節點之間提供資訊氾濫的協定結合使用，網路內的前綴配置可以是自動化的。

42. RFC 7731: Multicast Protocol for Low-Power and Lossy Networks (MPL)

Abstract

This document specifies the Multicast Protocol for Low-Power and Lossy Networks (MPL), which provides IPv6 multicast forwarding in constrained networks. MPL avoids the need to construct or maintain any multicast forwarding topology, disseminating messages to all MPL Forwarders in an MPL Domain.

MPL has two modes of operation. One mode uses the Trickle algorithm to manage control-plane and data-plane message transmissions and is applicable for deployments with few multicast sources. The other mode uses classic flooding. By providing both modes and parameterization of the Trickle algorithm, an MPL implementation can be used in a variety of multicast deployments and can trade between dissemination latency and transmission efficiency.

中文摘要

本文描述在低功率有損耗網路上群播協定，提供在受限制網路上 IPv6 群播轉送。MPL 避免建立與維護群播轉送拓樸，轉送訊息給 x 在一個 Domain 裡所有的 MPL 群播轉送器。

MPL 有兩種操作模式。一種使用 Trickle 演算法來管理控制平面和資料平面訊息傳送,可應用在少量群播源的佈署。另一種模式，使用經典的泛濫傳送法。提供兩種模式與 Trickle 演算法參數化，MPL 實作可以用在多樣的群播佈署,在不同的延遲和傳輸效率上取捨。

43. RFC 7732: Forwarder Policy for Multicast with Admin-Local Scope in the Multicast Protocol for Low-Power and Lossy Networks (MPL)

Abstract

The purpose of this document is to specify an automated policy for the routing of Multicast Protocol for Low-Power and Lossy Networks (MPL) multicast messages with Admin-Local scope in a border router.

中文摘要

本文的目的是為邊界路由器中具有 Admin-Local 範圍的低功耗有損網路(MPL)群播訊息的群播協定路由指定自動策略。

44. RFC 7733: Applicability Statement: The Use of the Routing Protocol for Low-Power and Lossy Networks (RPL) Protocol Suite in Home Automation and Building Control

Abstract

The purpose of this document is to provide guidance in the selection and use of protocols from the Routing Protocol for Low-Power and Lossy Networks (RPL) protocol suite to implement the features required for control in building and home environments.

中文摘要

本文的目的是為選擇和使用低功耗有損網路路由協定(RPL)協定套件中的協定提供指導，以實現建築和家庭環境中控制所需的功能。

45. RFC 7744: Use Cases for Authentication and Authorization in Constrained Environments

Abstract

Constrained devices are nodes with limited processing power, storage space, and transmission capacities. In many cases, these devices do not provide user interfaces, and they are often intended to interact without human intervention.

This document includes a collection of representative use cases for authentication and authorization in constrained environments. These use cases aim at identifying authorization problems that arise during the life cycle of a constrained device and are intended to provide a guideline for developing a comprehensive authentication and authorization solution for this class of scenarios.

Where specific details are relevant, it is assumed that the devices use the Constrained Application Protocol (CoAP) as a communication protocol. However, most conclusions apply generally.

中文摘要

受限制的設備是具有有限處理能力，存儲空間和傳輸容量的節點。在許多情況下，這些設備不提供用戶界面，並且它們通常用於在沒有人為乾預的情況下進行交互。

本文包含一組代表性案例，用於在受限環境中進行身份驗證和授權。這些案例旨在識別受限制設備生命週期中出現的授權問題，旨在為此類場景開發全面的身份驗證和授權解決方案提供指導。

在具體細節相關的情況下，假設設備使用受限制應用協定(CoAP)作為通信協定。但是，大多數結論都適用。

46. RFC 7774: Multicast Protocol for Low-Power and Lossy Networks (MPL) Parameter Configuration Option for DHCPv6

Abstract

This document defines a way to configure a parameter set for MPL (Multicast Protocol for Low-Power and Lossy Networks) via a DHCPv6 option. MPL has a set of parameters to control its behavior, and the parameter set is often configured as a network-wide parameter because the parameter set should be identical for each MPL Forwarder in an MPL Domain. Using the MPL Parameter Configuration Option defined in this document, a network can easily be configured with a single set of MPL parameters.

中文摘要

本文定義了一種通過 DHCPv6 選項為 MPL(低功耗有損網路的群播協定)配置參數集的方法。 MPL 具有一組用於控制其行為的參數，並且參數集通常配置為網路範圍的參數，因為 MPL 域中的每個 MPL 轉發器的參數集應該相同。使用本文中定義的 MPL 參數配置選項，可以使用一組 MPL 參數輕鬆配置網路。

47. RFC 7787: Distributed Node Consensus Protocol

Abstract

This document describes the Distributed Node Consensus Protocol (DNCP), a generic state synchronization protocol that uses the Trickle algorithm and hash trees. DNCP is an abstract protocol and must be combined with a specific profile to make a complete implementable protocol.

中文摘要

本文描述分散式節點共識協定(DNCP)，這是一種使用 Trickle 演算法和雜湊樹的通用狀態同步協定。DNCP 是一種抽象協定，必須與特定的配置文件結合才能生成完整的可實現協定。

48. RFC 7788: Home Networking Control Protocol

Abstract

This document describes the Home Networking Control Protocol (HNCP), an extensible configuration protocol, and a set of requirements for home network devices. HNCP is described as a profile of and extension to the Distributed Node Consensus Protocol (DNCP). HNCP enables discovery of network borders, automated configuration of addresses, name resolution, service discovery, and the use of any routing protocol that supports routing based on both the source and destination address.

中文摘要

本文介紹家庭網路控制協定(HNCP)，一個可擴充的配置協定，以及一組家庭網路設備的要求。HNCP 被描述為分散式節點共識協定(DNCP)的一種和擴充。 HNCP 支援網路邊界發現，位址自動配置，名稱解析，服務發現，並可使用基於來源位址和目標位址的路由協定。

49. RFC 7851: Minimal Internet Key Exchange Version 2 (IKEv2) Initiator Implementation

Abstract

This document describes a minimal initiator version of the Internet Key Exchange version 2 (IKEv2) protocol for constrained nodes. IKEv2 is a component of IPsec used for performing mutual authentication and establishing and maintaining Security Associations (SAs). IKEv2 includes several optional features, which are not needed in minimal implementations. This document describes what is required from the minimal implementation and also describes various optimizations that can be done. The protocol described here is interoperable with a full IKEv2 implementation using shared secret authentication (IKEv2 does not require the use of certificate authentication). This minimal initiator implementation can only talk to a full IKEv2 implementation acting as the responder; thus, two minimal initiator implementations cannot talk to each other.This document does not update or modify RFC 7296 but provides a more compact description of the minimal version of the protocol. If this document and RFC 7296 conflict, then RFC 7296 is the authoritative description.

中文摘要

本文描述了受限制節點的 Internet 密鑰交換版本 2(IKEv2)協定的最小啟動器版本.IKEv2 是 IPsec 的一個組件，用於執行相互身份驗證以及建立和維護安全關聯(SA).IKEv2 包括幾個可選功能，這個文描述了最小實現所需要的內容，並描述了可以完成的各種優化。這裡描述的協定可以與使用共享秘密身份驗證的完整 IKEv2 實現互操作(IKEv2 不需要使用)證書認證)。這個最小的發起者實現只能與作為響應者的完整 IKEv2 實現進行通信；因此，兩個最小的發起者實現不能相互通信。本文不更新或修改 RFC 7296，但提供了協定最小版本的更緊湊的描述。如果本文與 RFC 7296 發生衝突，則 RFC 7296 是權威性描述。

50. RFC 7925: Transport Layer Security (TLS) / Datagram Transport Layer Security (DTLS) Profiles for the Internet of Things

Abstract

A common design pattern in Internet of Things (IoT) deployments is the use of a constrained device that collects data via sensors or controls actuators for use in home automation, industrial control systems, smart cities, and other IoT deployments.This document defines a Transport Layer Security (TLS) and Datagram Transport Layer Security (DTLS) 1.2 profile that offers communications security for this data exchange thereby preventing eavesdropping, tampering, and message forgery. The lack of communication security is a common vulnerability in IoT products that can easily be solved by using these well-researched and widely deployed Internet security protocols.

中文摘要

物聯網(IoT)部署中的一種常見設計模式是使用受限設備，該設備通過傳感器或控制執行器收集資料，以用於家庭自動化，工業控制系統，智慧城市和其他物聯網部署。本文定義了傳輸層安全性(TLS)和資料封包傳輸層安全性(DTLS)1.2 配置文件，為此資料交換提供通信安全性，從而防止竊聽，篡改和訊息偽造。缺乏通信

安全性是物聯網產品中的常見漏洞，可以通過使用這些經過充分研究和廣泛部署的網際網路安全協定輕鬆解決。

51. RFC 7959: Block-Wise Transfers in the Constrained Application Protocol (CoAP)

Abstract

The Constrained Application Protocol (CoAP) is a RESTful transfer protocol for constrained nodes and networks. Basic CoAP messages work well for small payloads from sensors and actuators; however, applications will need to transfer larger payloads occasionally -- for instance, for firmware updates. In contrast to HTTP, where TCP does the grunt work of segmenting and resequencing, CoAP is based on datagram transports such as UDP or Datagram Transport Layer Security (DTLS). These transports only offer fragmentation, which is even more problematic in constrained nodes and networks, limiting the maximum size of resource representations that can practically be transferred.

Instead of relying on IP fragmentation, this specification extends basic CoAP with a pair of "Block" options for transferring multiple blocks of information from a resource representation in multiple request-response pairs. In many important cases, the Block options enable a server to be truly stateless: the server can handle each block transfer separately, with no need for a connection setup or other server-side memory of previous block transfers. Essentially, the Block options provide a minimal way to transfer larger representations in a block-wise fashion.

A CoAP implementation that does not support these options generally is limited in the size of the representations that can be exchanged, so there is an expectation that the Block options will be widely used in CoAP implementations. Therefore, this specification updates RFC 7252.

中文摘要

受限制應用協定(CoAP)是用於限制節點和網路的RESTful傳輸協定。基本 CoAP 訊息適用於來自傳感器和執行器的小型有效載荷；但是，應用程序需要偶爾傳輸更大的有效載荷 - 例如，用於韌體更新與 HTTP 相比，TCP 執行分段和重新排序的繁重工作，CoAP 基於資料封包傳輸，如 UDP 或資料封包傳輸層安全(DTLS)。這些傳輸僅提供碎片，這在受限制的節點和問題中更成問題。網路，限制實際可以傳輸的資源表示的最大大小。該規範不是依賴於 IP 分片，而是通過一對“塊”選項擴充基本 CoAP，以便從多個請求 - 響應對中的資源表示中傳輸多個資訊塊。在許多重要的情況下，Block 選項使服務器真正無狀態：服務器可以單獨處理每個塊傳輸，而不需要連接設置或先前塊傳輸的其他服務器端記憶體。從本質上講，塊選項提供了一種以塊為單位傳輸更大表示的最小方法。

不支援這些選項的 CoAP 實現通常受限於可交換的表示的大小，因此期望塊選項將在 CoAP 實現中廣泛使用。因此，此規範更新了 RFC 7252。

52. RFC 7967: Constrained Application Protocol (CoAP) Option for No Server Response

Abstract

There can be machine-to-machine (M2M) scenarios where server responses to client requests are redundant. This kind of open-loop exchange (with no response path from the server to the client) may be desired to minimize resource consumption in constrained systems while updating many resources simultaneously or performing high-frequency updates. CoAP already provides Non-confirmable (NON) messages that are not acknowledged by the recipient.However, the request/response semantics still require the server to respond with a status code indicating "the result of the attempt to understand and satisfy the request", per RFC 7252.

This specification introduces a CoAP option called 'No-Response'. Using this option, the client can explicitly express to the server its disinterest in all responses against the particular request. This option also provides granular control to enable expression of disinterest to a particular response class or a combination of response classes. The server MAY decide to suppress the response by not transmitting it back to the client according to the value of the No-Response option in the request. This option may be effective for both unicast and multicast requests. This document also discusses a few examples of applications that benefit from this option.

中文摘要

可能存在機器對機器(M2M)場景，其中服務器對客戶端請求的響應是冗餘的。這種開環交換(沒有從服務器到客戶端的響應路徑)可能需要在受限制的情況下最小化資源消耗系統同時更新許多資源或執行高頻更新.CoAP 已經提供了接收方無法確認的不可確認(NON)訊息。但是，請求/響應語義仍然要求服務器響應狀態代碼，指示“根據 RFC 7252，嘗試理解和滿足請求的結果”。

該規範引入了一個名為“無響應”的 CoAP 選項。使用此選項，客戶端可以明確地向服務器表達其對針對特定請求的所有響應中的不感興趣。此選項還提供粒度控制，以便將不感興趣的表達式表達到特定響應類或響應類組合。服務器可以根據請求中的“無響應”選項的值，通過不將響應發送回客戶端來決定抑制響應。此選項可能對單播和群播請求都有效。本文還討論了一些受益於此選項的應用程序示例。

53. RFC 7973: Assignment of an Ethertype for IPv6 with Low-Power Wireless Personal Area Network (LoWPAN) Encapsulation

Abstract

When carried over Layer 2 technologies such as Ethernet, IPv6 datagrams using Low-Power Wireless Personal Area Network (LoWPAN) encapsulation as defined in RFC 4944 must be identified so the receiver can correctly interpret the encoded IPv6 datagram. The IETF officially requested the assignment of an Ethertype for that purpose and this document reports that assignment.

中文摘要

當通過以太網等第 2 層技術承載時，必須識別使用 RFC 4944 中定義的低功耗無線個人網路(LoWPAN)封裝的 IPv6 資料封包，以便接收器能夠正確解釋編碼的 IPv6 資料封包。IETF 正式要求為此目的分配 Ethertype，本文報告該分配。

54. RFC 8025: IPv6 over Low-Power Wireless Personal Area Network (6LoWPAN) Paging Dispatch

Abstract

This specification updates RFC 4944 to introduce a new context switch mechanism for IPv6 over Low-Power Wireless Personal Area Network (6LoWPAN) compression, expressed in terms of Pages and signaled by a new Paging Dispatch.

中文摘要

此規範更新了 RFC 4944，以便通過低功耗無線個人網路(6LoWPAN)壓縮為 IPv6 引入新的上下文切換機制，以 Pages 表示並通過新的 Paging Dispatch 發出信號。

55. RFC 8036: Applicability Statement for the Routing Protocol for Low-Power and Lossy Networks (RPL) in Advanced Metering Infrastructure (AMI) Networks

Abstract

This document discusses the applicability of the Routing Protocol for Low-Power and Lossy Networks (RPL) in Advanced Metering Infrastructure (AMI) networks.

中文摘要

本文討論了低功耗有損網路(RPL)路由協定在高級計量基礎設施(AMI)網路中的適用性。

56. RFC 8065: Privacy Considerations for IPv6 Adaptation-Layer Mechanisms

Abstract

This document discusses how a number of privacy threats apply to technologies designed for IPv6 over various link-layer protocols, and it provides advice to protocol designers on how to address such threats in adaptation-layer specifications for IPv6 over such links.

This document discusses how a number of privacy threats apply to technologies designed for IPv6 over various link-layer protocols, and it provides advice to protocol designers on how to address such threats in adaptation-layer specifications for IPv6 over such links.

中文摘要

本文討論了許多隱私威脅如何應用於通過各種連結層協定為 IPv6 設計的技術，並為協定設計者提供了有關如何通過此類連結解決 IPv6 適配層規範中的此類威脅的建議。

本文討論了許多隱私威脅如何應用於通過各種連結層協定為 IPv6 設計的技術，並為協定設計者提供了有關如何通過此類連結解決 IPv6 適配層規範中的此類威脅的建議。

57. RFC 8066: IPv6 over Low-Power Wireless Personal Area Network (6LoWPAN) ESC Dispatch Code Points and Guidelines

Abstract

RFC 4944 defines the ESC dispatch type to allow additional dispatch octets in the 6LoWPAN header. The value of the ESC dispatch type was updated by RFC 6282; however, its usage was not defined in either RFC 6282 or RFC 4944. This document updates RFC 4944 and RFC 6282 by defining the ESC extension octet code points and listing registration entries for known use cases at the time of writing of this document.

中文摘要

RFC 4944 定義了 ESC 調度類型，以允許 6LoWPAN 標頭中的額外調度位元組。ESC 調度類型的值由 RFC 6282 更新；但是，它的用法未在 RFC 6282 或 RFC 4944 中定義。在編寫本文時，本文通過定義 ESC 擴充位元組碼點和列出已知案例的註冊條目來更新 RFC 4944 和 RFC 6282。

58. RFC 8075: Guidelines for Mapping Implementations: HTTP to the Constrained Application Protocol (CoAP)

Abstract

This document provides reference information for implementing a cross-protocol network proxy that performs translation from the HTTP protocol to the Constrained Application Protocol (CoAP). This will enable an HTTP client to access resources on a CoAP server through the proxy. This document describes how an HTTP request is mapped to a CoAP request and how a CoAP response is mapped back to an HTTP response. This includes guidelines for status code, URI, and media type mappings, as well as additional interworking advice.

中文摘要

本文提供了實現跨協定網路代理的參考資訊，該代理執行從 HTTP 協定到受限制應用協定(CoAP)的轉換。這將使 HTTP 客戶端能夠通過代理訪問 CoAP 服務器上的資源。本文描述了 HTTP 請求如何映射到 CoAP 請求以及 CoAP 響應如何映射回 HTTP 響應。這包括狀態代碼，URI 和媒體類型映射的指南，以及其他交互操作建議。

59. RFC 8105: Transmission of IPv6 Packets over Digital Enhanced Cordless Telecommunications (DECT) Ultra Low Energy (ULE)

Abstract

Digital Enhanced Cordless Telecommunications (DECT) Ultra Low Energy (ULE) is a low-power air interface technology that is proposed by the DECT Forum and is defined and specified by ETSI.

The DECT air interface technology has been used worldwide in communication devices for more than 20 years. It has primarily been used to carry voice for cordless telephony but has also been deployed for data-centric services.

DECT ULE is a recent addition to the DECT interface primarily intended for low-bandwidth, low-power applications such as sensor devices, smart meters, home automation, etc. As the DECT ULE interface inherits many of the capabilities from DECT, it benefits from operation that is long-range and interference-free, worldwide-reserved frequency band, low silicon prices, and maturity. There is an added value in the ability to communicate with IPv6 over DECT ULE, such as for Internet of Things applications.

This document describes how IPv6 is transported over DECT ULE using IPv6 over Low-Power Wireless Personal Area Network (6LoWPAN) techniques.

中文摘要

數字增強型無繩電信(DECT)超低能耗(ULE)是一種低功率空中介面技術，由 DECT 論壇提出，由 ETSI 定義和指定。

DECT 空中介面技術已在全球通信設備中使用了 20 多年。它主要用於承載無線電話語音，但也已部署用於以資料為中心的服務。DECT ULE 是 DECT 介面的最新成員，主要用於低頻寬，低功耗應用，如傳感器設備，智慧電錶，家庭自動化等。由於 DECT ULE 介面繼承了 DECT 的許多功能，因此它受益於具有長距離，無干擾，全球保留的頻段，低矽價格和成熟度的操作。通過 DECT ULE 與 IPv6 通信的能力具有附加價值，例如物聯網應用程序。

本文描述如何使用 IPv6 通過低功耗無線個人網路(6LoWPAN)技術在 DECT ULE 上傳輸 IPv6。

60. RFC 8132: PATCH and FETCH Methods for the Constrained Application Protocol (CoAP)

Abstract

The methods defined in RFC 7252 for the Constrained Application Protocol (CoAP) only allow access to a complete resource, not to parts of a resource. In case of resources with larger or complex data, or in situations where resource continuity is required, replacing or requesting the whole resource is undesirable. Several applications using CoAP need to access parts of the resources.

This specification defines the new CoAP methods, FETCH, PATCH, and iPATCH, which are used to access and update parts of a resource.

中文摘要

RFC 7252 中為受限制應用協定(CoAP)定義的方法僅允許訪問完整資源，而不允許訪問資源的某些部分。如果資源具有更大或更複雜的資料，或者在需要資源連續性的情況下，則替換或者請求整個資源是不可取的。使用 CoAP 的幾個應用程序需要訪問部分資源。

該規範定義了新的 CoAP 方法，FETCH，PATCH 和 iPATCH，它們用於訪問和更新資源的一部分。

61. RFC 8138: IPv6 over Low-Power Wireless Personal Area Network (6LoWPAN) Routing Header

Abstract

This specification introduces a new IPv6 over Low-Power Wireless Personal Area Network (6LoWPAN) dispatch type for use in 6LoWPAN route-over topologies, which initially covers the needs of Routing Protocol for Low-Power and Lossy Networks (RPL) data packet compression (RFC 6550). Using this dispatch type, this specification defines a method to compress the RPL Option (RFC 6553) information and Routing Header type 3 (RFC 6554), an efficient IP-in-IP technique, and is extensible for more applications.

中文摘要

該規範引入了一種新的 IPv6 over Low Power 無線個人網路(6LoWPAN)調度類型，用於 6LoWPAN 路由拓撲，最初涵蓋了低功耗有損網路(RPL)資料封包壓縮路由協定的需求(RFC 6550)。使用此分派類型，此規範定義了一種壓縮 RPL 選項(RFC 6553)資訊和路由標頭類型 3(RFC 6554)的方法，這是一種高效的 IP-in-IP 技術，並且可擴充用於更多應用程序。

62. RFC 8148: Next-Generation Vehicle-Initiated Emergency Calls

Abstract

This document describes how to use IP-based emergency services mechanisms to support the next generation of emergency calls placed by vehicles (automatically in the event of a crash or serious incident, or manually invoked by a vehicle occupant) and conveying vehicle, sensor, and location data related to the crash or incident. Such calls are often referred to as "Automatic Crash Notification" (ACN), or "Advanced Automatic Crash Notification" (AACN), even in the case of manual trigger. The "Advanced" qualifier refers to the ability to carry a richer set of data.

This document also registers a MIME media type and Emergency Call Data Type for the vehicle, sensor, and location data (often referred to as "crash data" even though there is not necessarily a crash) and an INFO package to enable carrying this and related data in SIP INFO requests. An external specification for the data format, contents, and structure is referenced in this document.

This document reuses the technical aspects of next-generation Pan-European eCall (a mandated and standardized system for emergency calls by in-vehicle systems (IVSs) within Europe and other regions).

However, this document specifies use of a different set of vehicle (crash) data, specifically, the Vehicle Emergency Data Set (VEDS)

rather than the eCall Minimum Set of Data (MSD). This document is an extension of the IETF eCall document, with the primary differences being that this document makes the MSD data set optional and VEDS mandatory, and it adds attribute values to the metadata/control object to permit greater functionality. This document registers a new INFO package (identical to that registered for eCall but with the addition of the VEDS MIME type). This document also describes legacy (circuit-switched) ACN systems and their migration to next-generation emergency calling, to provide background information and context.

中文摘要

本文描述如何使用基於 IP 的緊急服務機制來支援車輛發出的下一代緊急呼叫(在發生碰撞或嚴重事故時自動發生，或由車輛乘員手動調用)並運輸車輛，傳感器，這些呼叫通常被稱為“自動崩潰通知”(ACN)或“高級自動崩潰通知”(AACN)，即使在手動觸發的情況下也是如此。“高級”限定符是指攜帶更豐富資料集的能力。本文還為車輛，傳感器和位置資料(通常稱為“崩潰資料”，即使不一定發生崩潰)註冊 MIME 媒體類型和緊急呼叫資料類型，以及一個 INFO 包來啟用此功能和 SIP INFO 請求中的相關資料。本文中引用了資料格式，內容和結構的外部規範。

本文重用了下一代泛歐 eCall 的技術方面(歐洲和其他地區的車載系統(IVS)緊急呼叫的強制和標準化系統)。然而，本文規定了使用不同的車輛(碰撞)資料集，特別是車輛緊急資料集(VEDS)而不是 eCall 最小資料集(MSD)。本文是 IETF eCall 文的擴充，主要區別在於此文使 MSD 資料集成為可選項且 VEDS 是必需的，並且它將屬性值添加到元資料/控件對像以允許更多功能。此文註冊了一個新的 INFO 包(與為 eCall 註冊的包相同，但添加了 VEDS MIME 類型)。本文還描述了傳統(電路交換)ACN 系統及其向下一代緊急呼叫的遷移，以提供背景資訊和背景。

63. RFC 8152: CBOR Object Signing and Encryption (COSE)

Abstract

Concise Binary Object Representation (CBOR) is a data format designed for small code size and small message size. There is a need for the ability to have basic security services defined for this data format.

This document defines the CBOR Object Signing and Encryption (COSE) protocol. This specification describes how to create and process signatures, message authentication codes, and encryption using CBOR for serialization. This specification additionally describes how to represent cryptographic keys using CBOR.

中文摘要

簡潔二進位物件表示法(CBOR)是一種針對小編碼和小訊息設計的資料格式。對於這種格式，有基本安全服務能力的需求。

本文定義 CBOR 物件簽章和加密協定。這個規格描述建立和處理簽章、訊息驗證碼、和使用 COBR 序列化的加密。這個規格另外描述如何使用 COBR 表示加密金鑰。

64. RFC 8163: Transmission of IPv6 over Master-Slave/Token-Passing (MS/TP) Networks

Abstract

Master-Slave/Token-Passing (MS/TP) is a medium access control method for the RS-485 physical layer and is used primarily in building automation networks. This specification defines the frame format for transmission of IPv6 packets and the method of forming link-local and statelessly autoconfigured IPv6 addresses on MS/TP networks.

中文摘要

主從/令牌傳遞(MS/TP)是用於 RS-485 物理層的媒體訪問控制方法，主要用於大樓自動化網路。該規範定義了用於傳輸 IPv6 封包的幀格式以及在 MS/TP 網路上形成連結本地和無狀態自動配置的 IPv6 位址的方法。

65. RFC 8180: Minimal IPv6 over the TSCH Mode of IEEE 802.15.4e (6TiSCH) Configuration

Abstract

This document describes a minimal mode of operation for an IPv6 over the TSCH mode of IEEE 802.15.4e (6TiSCH) network. This minimal mode of operation specifies the baseline set of protocols that need to be supported and the recommended configurations and modes of operation sufficient to enable a 6TiSCH functional network. 6TiSCH provides IPv6 connectivity over a Time-Slotted Channel Hopping (TSCH) mesh composed of IEEE Std 802.15.4 TSCH links. This minimal mode uses a collection of protocols with the respective configurations, including the IPv6 Low-Power Wireless Personal Area Network (6LoWPAN) framework, enabling interoperable IPv6 connectivity over IEEE Std 802.15.4 TSCH. This minimal configuration provides the necessary bandwidth for network and security bootstrapping and defines the proper link between the IETF protocols that interface to IEEE Std 802.15.4 TSCH. This minimal mode of operation should be implemented by all 6TiSCH-compliant devices.

中文摘要

本文描述在 IEEE 802.15.4e (6TiSCH)網路 TSCH 模式上 IPv6 的最小操作模式。這個最小操作模式指定了必需支援的協定基準集合，以及足以啟用 6TiSCH 功能網路的設定和操作模式的推薦。由 IEEE 802.15.4 TSCH (Time-Slotted Channel Hopping)網路連結組成的 TSCH 網格之上，6TiSCH 提供 IPv6 連接能力。這個最小模式使用具有相應配置的協定集合，包括 IPv6 6LoWPAN 框架，通過 IEEE 802.15.4 TSCH 實現可相互合作的 IPv6 連接。這個最小配置提供了網路必要頻寬和安全導引，並為 IETF 協定與 IEEE 802.15.4 TSCH 之間的介面定義了適當的連結。所有符合 6TiSCH 標準的設備都應實現這個最小操作模式。

66. RFC 8230: Using RSA Algorithms with CBOR Object Signing and Encryption (COSE) Messages

Abstract

The CBOR Object Signing and Encryption (COSE) specification defines cryptographic message encodings using Concise Binary Object Representation (CBOR). This specification defines algorithm encodings and representations enabling RSA algorithms to be used for COSE messages. Encodings are specified for the use of RSA Probabilistic Signature Scheme (RSASSA-PSS) signatures, RSA Encryption Scheme - Optimal Asymmetric Encryption Padding (RSAES-OAEP) encryption, and RSA keys.

中文摘要

CBOR 物件簽章與加密(COSE)規格定義使用 COBR 加密訊息。這個規格定義演算編碼與表示法，使得 RSA 演算法可以在 COSE 中使用。編碼使用 RSA 機率簽名法(RSA Probabilistic Signature Scheme，RSASSA-PSS)簽名，RSA 加密法-最佳非對稱加密填充(RSA Encryption Scheme - Optimal Asymmetric Encryption Padding，RSAES-OAEP)加密，以及 RSA 金鑰。

67. RFC 8240: Report from the Internet of Things Software Update (IoTSU) Workshop 2016

Abstract

This document provides a summary of the Internet of Things Software Update (IoTSU) Workshop that took place at Trinity College Dublin, Ireland on the 13th and 14th of June, 2016. The main goal of the workshop was to foster a discussion on requirements, challenges, and solutions for bringing software and firmware updates to IoT devices. This report summarizes the discussions and lists recommendations to the standards community.

Note that this document is a report on the proceedings of the workshop. The views and positions documented in this report are those of the workshop participants and do not necessarily reflect IAB views and positions.

中文摘要

本文概述了 2016 年 6 月 13 日和 14 日在愛爾蘭都柏林聖三一學院舉辦的物聯網軟體更新(IoTSU)研討會。研討會的主要目標是促進對需求的討論，挑戰以及為物聯網設備帶來軟體和韌體更新的解決方案。本報告總結了討論並向標準社群列出了建議。

請注意，本文是關於研討會會議記錄的報告。本報告中記錄的觀點和立場是研討會參與者的觀點和立場，並不一定反映 IAB 的觀點和立場。

68. RFC 8272: TinyIPFIX for Smart Meters in Constrained Networks

Abstract

This document specifies the TinyIPFIX protocol that is used for transmitting smart-metering data in constrained networks such as IPv6 over Low-Power Wireless Personal Area Networks (6LoWPAN, RFC 4944). TinyIPFIX is derived from IP Flow Information Export (RFC 7011) and adopted to the needs of constrained networks. This document specifies how the TinyIPFIX Data and Template Records are transmitted in constrained networks such as 6LoWPAN and how TinyIPFIX data can be converted into data that is not TinyIPFIX in a proxy device.

中文摘要

本文規定了 TinyIPFIX 協定，該協定用於通過低功耗無線個人網路(6LoWPAN，RFC 4944)在受限網路(如 IPv6)中傳輸智慧計量資料。 TinyIPFIX 源自 IP 資訊流導出(RFC 7011)，並且適用於受限制網路的需求。本文規定如何在限制網路(如 6LoWPAN)中傳輸 TinyIPFIX 資料和模板記錄，以及如何將 TinyIPFIX 資料轉換為代理設備中不是 TinyIPFIX 的資料。

69. RFC 8323: CoAP (Constrained Application Protocol) over TCP, TLS, and WebSockets

Abstract

The Constrained Application Protocol (CoAP), although inspired by HTTP, was designed to use UDP instead of TCP. The message layer of CoAP over UDP includes support for reliable delivery, simple congestion control, and flow control.

Some environments benefit from the availability of CoAP carried over reliable transports such as TCP or Transport Layer Security (TLS). This document outlines the changes required to use CoAP over TCP, TLS, and WebSockets transports. It also formally updates RFC 7641 for use with these transports and RFC 7959 to enable the use of larger messages over a reliable transport.

中文摘要

雖然受限制應用協定(CoAP)受到 HTTP 的啟發，但它被設計為使用 UDP 而不是 TCP。通過 UDP 的 CoAP 訊息層包括對可靠傳送，簡單擁塞控制和流量控制的支援。

某些環境受益於可靠傳輸 CoAP 的可用性，如承載於 TCP 或傳輸層安全性(TLS)之上的 CoAP。本文概述了在 TCP、TLS 和 WebSockets 傳輸上使用 CoAP 所需的更改。它還正式更新了 RFC

7641 以使用這些傳輸，和 RFC7959，以便在可靠傳輸上致能更大訊息的使用。

70. RFC 8352: Energy-Efficient Features of Internet of Things Protocols

Abstract

This document describes the challenges for energy-efficient protocol operation on constrained devices and the current practices used to overcome those challenges. It summarizes the main link-layer techniques used for energy-efficient networking, and it highlights the impact of such techniques on the upper-layer protocols so that they can together achieve an energy-efficient behavior. The document also provides an overview of energy-efficient mechanisms available at each layer of the IETF protocol suite specified for constrained-node networks.

中文摘要

本文描述了在受限設備上實現節能協定操作的挑戰以及用於克服這些挑戰的當前實踐。它總結了用於節能網路的主要連結層技術，並強調了這些技術對上層協定的影響，以便它們能夠共同實現節能行為。該文還概述了為限制節點網路指定的 IETF 協定套件的每一層可用的節能機制。

71. RFC 8375: Special-Use Domain 'home.arpa.'

Abstract

This document specifies the behavior that is expected from the Domain Name System with regard to DNS queries for names ending with '.home.arpa.' and designates this domain as a special-use domain name. 'home.arpa.' is designated for non-unique use in residential home networks. The Home Networking Control Protocol (HNCP) is updated to use the 'home.arpa.' domain instead of '.home'.

中文摘要

本文指定了域名系統對於以“.home.arpa”結尾的名稱的 DNS 查詢所期望的行為。並將此域名指定為特殊用途域名。“home.arpa。”被指定用於住宅家庭網路中的非獨特用途。家庭網路控制協定(HNCP)已更新為使用“home.arpa”。域而不是'.home'。

72. RFC 8376: Low-Power Wide Area Network (LPWAN) Overview

Abstract

Low-Power Wide Area Networks (LPWANs) are wireless technologies with characteristics such as large coverage areas, low bandwidth, possibly very small packet and application-layer data sizes, and long battery life operation. This memo is an informational overview of the set of LPWAN technologies being considered in the IETF and of the gaps that exist between the needs of those technologies and the goal of running IP in LPWANs.

中文摘要

LPWAN 為一種無線技術，具有大範圍、低頻寬、極小封包和應用層資料大小、長電池壽命操作的特性。本文概述在 IETF 中考慮的 LPWAN 技術集合，及以目前這些技術與在 LPWAN 上運行 IP 這個目標之間的差距。

73. RFC 8387: Practical Considerations and Implementation Experiences in Securing Smart Object Networks

Abstract

This memo describes challenges associated with securing resource-constrained smart object devices. The memo describes a possible deployment model where resource-constrained devices sign message objects, discusses the availability of cryptographic libraries for resource-constrained devices, and presents some preliminary experiences with those libraries for message signing on resource-constrained devices. Lastly, the memo discusses trade-offs involving different types of security approaches.

中文摘要

本文描述關於資源受限制智慧物件上的安全挑戰。描述一個可能的佈署模式，資源受限制對訊息物件簽章，討論加密函數庫的可用性，和演示一些前導實驗。最後，本文描述不安全措施型態上面的權衡。

74. RFC 8392: CBOR Web Token (CWT)

Abstract

CBOR Web Token (CWT) is a compact means of representing claims to be transferred between two parties. The claims in a CWT are encoded in the Concise Binary Object Representation (CBOR), and CBOR Object Signing and Encryption (COSE) is used for added application-layer security protection. A claim is a piece of information asserted about a subject and is represented as a name/value pair consisting of a claim name and a claim value. CWT is derived from JSON Web Token (JWT) but uses CBOR rather than JSON.

中文摘要

COBR Web Token (CWT)是一種緊湊的表示方法，用於表達在兩方之間傳遞的宣言。在一個 CWT 中的宣言，使用 CBOR 編碼，CBOR 物件簽章與加密(COSE)用於增加應用層的安全保護。一個宣言是一個關於某個主題資訊的片段，可以表示一個 name/value 對，組合成宣言名(name)，與宣言值(value)。CWT 由 JSON Web Token (JWT)衍生，使用 CBOR 而非 JSON。

75. RFC 8428: Sensor Measurement Lists (SenML)

Abstract

This specification defines a format for representing simple sensor measurements and device parameters in Sensor Measurement Lists (SenML). Representations are defined in JavaScript Object Notation (JSON), Concise Binary Object Representation (CBOR), Extensible Markup Language (XML), and Efficient XML Interchange (EXI), which share the common SenML data model. A simple sensor, such as a temperature sensor, could use one of these media types in protocols such as HTTP or the Constrained Application Protocol (CoAP) to transport the measurements of the sensor or to be configured.

中文摘要

該規範定義了一種格式，用於表示傳感器測量列表(SenML)中的簡單傳感器測量和設備參數。表示在 JavaScript 物件表示法(JSON)，簡明二進制物件表示(CBOR)，可擴充標記語言(XML)和高效 XML 交換(EXI)中定義，它們共享公共 SenML 資料模型。諸如溫度傳感器之類的簡單傳感器可以在諸如 HTTP 或受限制應用協定(CoAP)之類的協定中使用這些媒體類型中的一種來傳輸傳感器的測量值或者被配置。

76. RFC 8477: Report from the Internet of Things (IoT) Semantic Interoperability (IOTSI) Workshop

Abstract

This document provides a summary of the "Workshop on Internet of Things (IoT) Semantic Interoperability (IOTSI)", which took place in Santa Clara, California March 17-18, 2016. The main goal of the workshop was to foster a discussion on the different approaches used by companies and Standards Developing Organizations (SDOs) to accomplish interoperability at the application layer. This report summarizes the discussions and lists recommendations to the standards community. The views and positions in this report are those of the workshop participants and do not necessarily reflect those of the authors or the Internet Architecture Board (IAB), which organized the workshop. Note that this document is a report on the proceedings of the workshop. The views and positions documented in this report are those of the workshop participants and do not necessarily reflect IAB views and positions.

中文摘要

本文概述了物聯網(IoT)語義互操作性(IOTSI)研討會，該研討會於2016 年 3 月 17 日至 18 日在加利福尼亞州聖克拉拉舉行。研討會的主要目標是促進討論公司和標准開發組織(SDO)用於在應用層

實現互操作性的不同方法。本報告總結了討論並列出了對標準社區的建議。本報告中的觀點和立場是研討會參與者的觀點和立場，並不一定反映作者或組織研討會的網際網路架構委員會(IAB)的觀點和立場。請注意，本文是關於研討會會議記錄的報告。本報告中記錄的觀點和立場是研討會參與者的觀點和立場，不一定反映 IAB 的觀點和立場。

77. RFC 8480: 6TiSCH Operation Sublayer (6top) Protocol (6P)

Abstract

This document defines the "IPv6 over the TSCH mode of IEEE 802.15.4e" (6TiSCH) Operation Sublayer (6top) Protocol (6P), which enables distributed scheduling in 6TiSCH networks. 6P allows neighbor nodes to add/delete Time-Slotted Channel Hopping (TSCH) cells to/on one another. 6P is part of the 6TiSCH Operation Sublayer (6top), the layer just above the IEEE Std 802.15.4 TSCH Medium Access Control layer. 6top is composed of one or more Scheduling Functions (SFs) and the 6top Protocol defined in this document. A 6top SF decides when to add/delete cells, and it triggers 6P Transactions. The definition of SFs is out of scope for this document; however, this document provides the requirements for an SF.

中文摘要

本文定義在 IEEE 802.15.4e TSCH mode 上的 IPv6。6TiSCH 操作子層(6top)協定(6P)，在 6TiSCH 網路上啟用分散式排程。6P 協定允許鄰居結點可以增加/刪除 TSCH 細胞到另一個節點。6P 協定是 6TiSCH 操作子層的一部份，在 IEEE Std 802.15.4 TSCH MAC 層上。6top 包含一個或多個排程(Scheduling Functions，SF)功能，

6top 協定定義在這個文件中。當 6top SF 裝置要增加/刪除細胞時，啟用 6P 交易。SF 的定義不在本文範圍，然而，本文提供了 SF 的需求。

78. RFC 8505: Registration Extensions for IPv6 over Low-Power Wireless Personal Area Network (6LoWPAN) Neighbor Discovery

Abstract

This specification updates RFC 6775 -- the Low-Power Wireless Personal Area Network (6LoWPAN) Neighbor Discovery specification -- to clarify the role of the protocol as a registration technique and simplify the registration operation in 6LoWPAN routers, as well as to provide enhancements to the registration capabilities and mobility detection for different network topologies, including the Routing Registrars performing routing for host routes and/or proxy Neighbor Discovery in a low-power network.

中文摘要

本規範更新 RFC 6775 -- 低功耗無線個人網路(6LoWPAN)鄰居發現規範 - 以闡明協定作為註冊技術的作用，簡化 6LoWPAN 路由器中的註冊操作，同時提供增強功能。針對不同網路拓撲的註冊功能和移動性檢測，包括路由註冊器在低功率網路中執行主機路由和/或代理鄰居發現的路由。

79. RFC 8539: Softwire Provisioning Using DHCPv4 over DHCPv6

Abstract

DHCPv4 over DHCPv6 (RFC 7341) is a mechanism for dynamically configuring IPv4 for use as an over-the-top service in an IPv6-only network. Softwires are an example of such a service. For DHCPv4 over DHCPv6 (DHCP 4o6) to function with some IPv4-over-IPv6 softwire mechanisms and deployment scenarios (e.g., RFC 7596 or RFC 7597), the operator needs to know the IPv6 address that the client will use as the source of an IPv4-in-IPv6 softwire tunnel. This address, in conjunction with the client's IPv4 address, and (in some deployments) the Port Set ID are used to create a binding table entry in the operator's softwire tunnel concentrator. This memo defines a DHCPv6 option to convey IPv6 parameters for establishing the softwire tunnel and a DHCPv4 option (to be used only with DHCP 4o6) to communicate the source tunnel IPv6 address between the DHCP 4o6 client and server. It is designed to work in conjunction with the IPv4 address allocation process.

"DHCPv6 Options for Configuration of Softwire Address and Port-Mapped Clients" (RFC 7598) describes a deterministic DHCPv6-based mechanism for provisioning softwires. This document updates RFC 7598, allowing OPTION_S46_BR (90) to be enumerated in the DHCPv6 client's Option Request Option (ORO)

request and to appear directly within subsequent messages sent by the DHCPv6 server.

中文摘要

DHCPv4 over DHCPv6 (RFC 7341)是一種動態配置 IPv4 的機制，可視為在 IPv6-only 網路中之上的一個服務。Softwires 是這種服務的一個例子。為了讓 DHCPv4 over DHCPv6 (DHCP 4o6)能與一些 IPv4-over-IPv6 Softwires 機制和部署方案(例如，RFC 7596 或 RFC 7597)一起運行，營運商需要知道客戶端使用 IPv4-in-IPv6 Softwires 通道時的來源 IPv6 位址。此位址與客戶端的 IPv4 位址，和(在某些部署中) Port Set ID 一起用於在營運商的 Softwires 通道集中器內創建一個綁定表格中的條目。本備忘錄定義了一個 DHCPv6 選項，用於傳達建立 Softwires 通道的 IPv6 參數，和一個 DHCPv4 選項(僅用於 DHCP 4o6)，以讓 DHCP 4o6 客戶端和服務器之間傳輸通道的來源 IPv6 位址。它旨在與 IPv4 位址的分配協同工作。

“用於配置 Softwires 位址和端口映射客戶端的 DHCPv6 選項”(RFC 7598)描述了用於提供 Softwires 的基於 DHCPv6 確定性機制。本文更新了 RFC 7598，允許在 DHCPv6 客戶端的 Option

Request Option (ORO)請求中列舉 OPTION_S46_BR (90)，並直接出現在 DHCPv6 服務器發送的後續訊息中。

80. RFC 8576: Internet of Things (IoT) Security: State of the Art and Challenges

Abstract

The Internet of Things (IoT) concept refers to the usage of standard Internet protocols to allow for human-to-thing and thing-to-thing communication. The security needs for IoT systems are well recognized, and many standardization steps to provide security have been taken -- for example, the specification of the Constrained Application Protocol (CoAP) secured with Datagram Transport Layer Security (DTLS). However, security challenges still exist, not only because there are some use cases that lack a suitable solution, but also because many IoT devices and systems have been designed and deployed with very limited security capabilities. In this document, we first discuss the various stages in the lifecycle of a thing. Next, we document the security threats to a thing and the challenges that one might face to protect against these threats. Lastly, we discuss the next steps needed to facilitate the deployment of secure IoT systems. This document can be used by implementers and authors of IoT specifications as a reference for details about security considerations while documenting their specific security challenges, threat models, and mitigations.

This document is a product of the IRTF Thing-to-Thing Research Group (T2TRG).

中文摘要

物聯網(IoT)概念指的是使用標準網際網路協定來實現人與物之間以及物與物之間的通訊。物聯網系統的安全需求已得到充分的認可，許多用以提供安全的標準化步驟已經被採用 - 例如，使用資料封包安全傳輸協定(DTLS)保護受限制應用協定(CoAP)的規範。然而，安全性的挑戰仍然存在，不僅因為有一些實務案例缺乏合適的解決方案，更因為許多物聯網設備和系統的設計和部署都只有非常有限的安全能力。在本文中，我們首先討論物的生命週期中的各個階段。接下來，我們會記錄物的安全威脅以及人們可能面臨這些威脅時的挑戰。最後，我們將討論促進安全物聯網系統部署所需的後續步驟。在記錄物聯網特定的安全性挑戰、威脅模型和緩解措施的同時，本文可提供物聯網規範的實施者和作者參考，以取得有關安全考量的詳細資訊。

本文是 IRTF Thing-to-Thing Research Group (T2TRG)的作品。

81. RFC 8585: Requirements for IPv6 Customer Edge Routers to Support IPv4-as-a-Service

Abstract

This document specifies the IPv4 service continuity requirements for IPv6 Customer Edge (CE) routers that are provided either by the service provider or by vendors who sell through the retail market. Specifically, this document extends the basic requirements for IPv6 CE routers as described in RFC 7084 to allow the provisioning of IPv6 transition services for the support of IPv4-as-a-Service (IPv4aaS) by means of new transition mechanisms. The document only covers IPv4aaS, i.e., transition technologies for delivering IPv4 in IPv6-only access networks. IPv4aaS is necessary because there aren't sufficient IPv4 addresses available for every possible customer/ device. However, devices or applications in the customer Local Area Networks (LANs) may be IPv4-only or IPv6-only and still need to communicate with IPv4-only services on the Internet.

中文摘要

本文規範了 IPv6 客戶邊緣(CE)路由器的 IPv4 服務連續性要求，這些路由器由服務供應商或透過零售市場銷售的供應商提供。具體而言，本文擴充了 RFC 7084 中描述的 IPv6 CE 路由器的基本要求，以允許透過新的轉換機制為 IPv4-as-a-Service (IPv4aaS)

提供 IPv6 轉換服務。本文僅涉及 IPv4aaS，用於 IPv6-only 存取網路中遞交 IPv4 的轉換技術。IPv4aaS 是必要的，因為沒有足夠的 IPv4 位址可用於每個可能的客戶/設備。但是，客戶區域網路(LAN)中的設備或應用程序可能只能使用 IPv4 或 Pv6，並且仍然需要在 Internet 上與 IPv4-only 伺服器進行交流。