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IPCablecom CMS subscriber provisioning specification

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Summary

This Recommendation defines the interface used between the Call Management Server (CMS) and Provisioning Server (PS) for the exchange of service provisioning information. The interface employs a Web Service model. Specified in Web Service Description Language 1.1 (WSDL 1.1), the interface transports XML encoded objects within Simple Object Access Protocol 1.1 (SOAP 1.1) encoded messages over an HTTP 1.1 transport. This interface is secured via IPSec.

Source

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ITU-T Recommendation J.177

IPCablecom CMS subscriber provisioning specification

1 Scope

1.1 Purpose of this Recommendation

This Recommendation defines the interface used between the Call Management Server (CMS) and Provisioning Server (PS) for the exchange of service provisioning information. The interface employs a Web Service model. Specified in Web Service Description Language 1.1 (WSDL 1.1), the interface transports XML encoded objects within Simple Object Access Protocol 1.1 (SOAP 1.1) encoded messages over an HTTP 1.1 transport. This interface is secured via IPSec.

The data model transported upon this interface is specifically designed to be extensible, allowing incorporation of as yet undefined IPCablecom features and specific vendor extensions.

1.2 Scope of this Recommendation

The scope of this Recommendation is limited to the provisioning of an IPCablecom CMS by a single service provider. Additionally:

- The CMS provisioning interface is limited to the exchange of service activation data between the CMS and the PS. The interface between the PS and the back-office Operations Support System (OSS) is out of scope.
- CMS element management and network element provisioning (dial plans, etc.) are out of scope.
- Customer record creation/billing is considered part of the back-office OSS application and is currently out of scope.

2 References

2.1 Normative references

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- ITU-T Recommendation J.161 (2001), *Audio codec requirements for the provision of bidirectional audio service over cable television networks using cable modems*.
- ITU-T Recommendation J.162 (2005), *Network call signalling protocol for the delivery of time-critical services over cable television networks using cable modems*.
- ITU-T Recommendation J.170 (2005), *IPCablecom security specification*.
- IETF RFC 1123 (1989), *Requirements for Internet Hosts – Application and Support*.
- XML Protocol. <http://www.w3.org/2000/xml>.

2.2 Informative References

- ITU-T Recommendation J.160 (2005), *Architectural framework for the delivery of time-critical services over cable television networks using cable modems*.
- ITU-T Recommendation J.167 (2005), *Media terminal adapter (MTA) device provisioning requirements for the delivery of real-time services over cable television networks using cable modems*.
- IETF RFC 3588 (2003), *Diameter Base Protocol*.
- Simple Object Access Protocol. <http://www.w3.org/TR/SOAP>.
- Web Services Description Language. <http://www.w3.org/TR/wsdl>.

2.3 Reference acquisition

IETF RFCs:

- Internet Engineering Task Force (IETF) Secretariat c/o Corporation for National Research Initiatives, 1895 Preston White Drive, Suite 100, Reston, VA 20191-5434, Phone 703-620-8990, Fax 703-620-9071, internet: www.ietf.org/.

3 Terms and definitions

This Recommendation defines the following terms:

- 3.1 active:** A service flow is said to be "active" when it is permitted to forward data packets. A service flow must first be admitted before it is active.
- 3.2 endpoint:** A Terminal, Gateway or Multipoint Conference Unit.
- 3.3 Internet key exchange:** A key-management mechanism used to negotiate and derive keys for SAs in IPsec.
- 3.4 local number portability:** Allows a customer to retain the same number when switching from one local service provider to another.
- 3.5 media gateway:** Provides the bearer circuit interfaces to the PSTN and transcodes the media stream.
- 3.6 pre-shared key:** A shared secret key passed to both parties in a communication flow, using an unspecified manual or out-of-band mechanism.
- 3.7 registration, admissions and status:** RAS Channel is an unreliable channel used to convey the RAS messages and bandwidth changes between two H.323 entities.

4 Abbreviations, acronyms and conventions

4.1 Abbreviations and acronyms

This Recommendation uses the following abbreviations:

AAA	Authentication, Authorization and Accounting
BPP	Basic POTS Provisioning
CFP	Call Feature Provisioning
CID	Circuit ID
CM	DOCSIS Cable Modem
CMS	Cryptographic Message Syntax

CMS	Call Management Server
CMTS	Cable Modem Termination System
Codec	COder-DECoder
CSR	Customer Service Representative
DOCSIS™	Data-Over-Cable Service Interface Specifications
DQoS	Dynamic Quality of Service
ESP	IPSec Encapsulating Security Payload
FQDN	Fully Qualified Domain Name
HTTP	Hypertext Transfer Protocol
IC	Inter-exchange Carrier
IETF	Internet Engineering Task Force
IKE	Internet Key Exchange
IP	Internet Protocol
IPSec	Internet Protocol Security
ITU	International Telecommunication Union
ITU-T	International Telecommunication Union – Telecommunication Standardization Sector
LNP	Local Number Portability
MC	Multipoint Controller
MG	Media Gateway
MGC	Media Gateway Controller
MGCP	Media Gateway Control Protocol
MIB	Management Information Base
MTA	Multimedia Terminal Adapter
NCS	Network Call Signalling
OSS	Operations Support System
PCM	Pulse Code Modulation
PCSP	IPCablecom CMS Subscriber Provisioning
PS	Provisioning Server
PSTN	Public Switched Telephone Network
QCIF	Quarter Common Intermediate Format
RAS	Registration, Admissions and Status
RFC	Request for Comments
SDP	Session Description Protocol
SNMP	Simple Network Management Protocol
SOAP	Simple Object Access Protocol
STP	Signalling Transfer Point

TD	Timeout for Disconnect
TFTP	Trivial File Transfer Protocol
TLV	Type-Length-Value
UDP	User Datagram Protocol
VoIP	Voice over Internet Protocol

4.2 Conventions

Throughout this Recommendation, words that are used to define the significance of particular requirements are capitalized. These words are:

"MUST"	This word or the adjective "REQUIRED" means that the item is an absolute requirement of this Recommendation.
"MUST NOT"	This phrase means that the item is an absolute prohibition of this Recommendation.
"SHOULD"	This word or the adjective "RECOMMENDED" means that there may exist valid reasons in particular circumstances to ignore this item, but the full implications should be understood and the case carefully weighed before choosing a different course.
"SHOULD NOT"	This phrase means that there may exist valid reasons in particular circumstances when the listed behaviour is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behaviour described with this label.
"MAY"	This word or the adjective "OPTIONAL" means that this item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because it enhances the product, for example; another vendor may omit the same item.

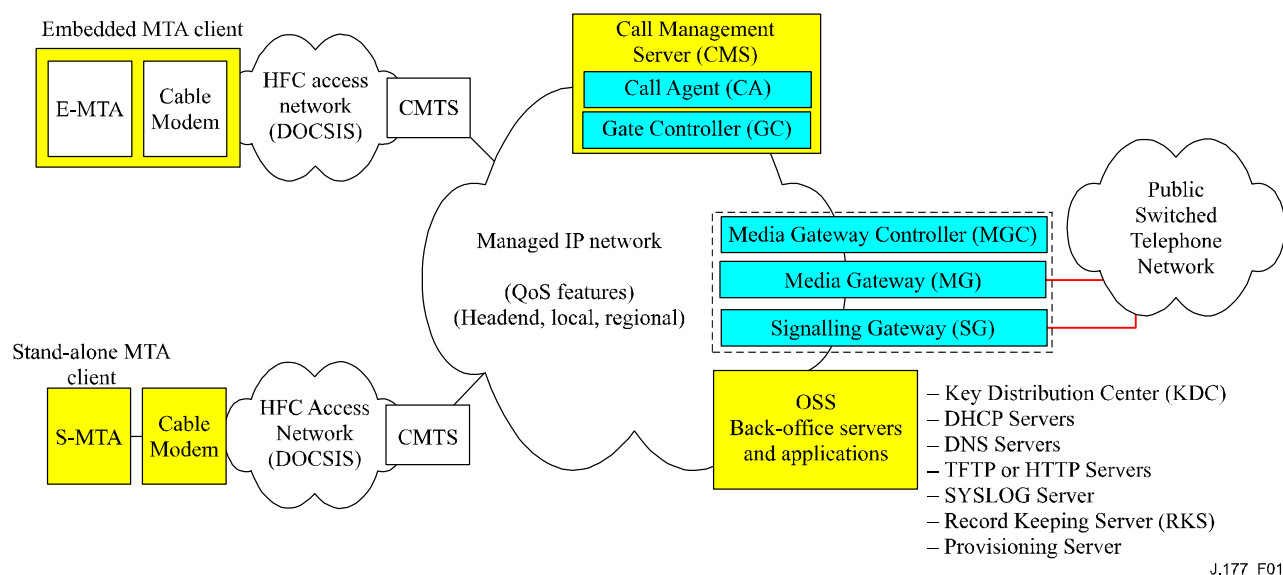
5 Background

5.1 Service goals

Text deleted.

5.2 IPCablecom reference architecture

Figure 1 shows the reference architecture for the IPCablecom Network. Refer to the IPCablecom Architecture Recommendation, ITU-T Rec. J.160, for more detailed information on this reference architecture.



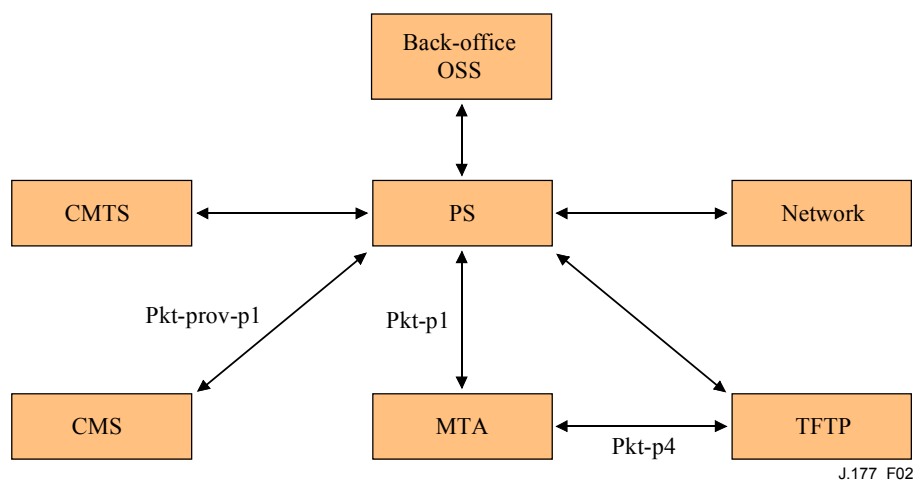
J.177_F01

Figure 1/J.177 – IPCablecom 1.0 network component reference model (partial)

5.3 Components and interfaces

Provisioning is defined as the operations necessary to provide a specified service to a customer. IPCablecom service provisioning can be viewed as two distinct operations: MTA provisioning and CMS subscriber provisioning. Figure 2 presents the provisioning-related interfaces maintained by the Provisioning Server (PS) and other authorized back-office components to various IPCablecom elements. Interfaces not explicitly labelled are undefined and out of scope for IPCablecom.

This Recommendation is intended to set the requirements for the provisioning interface between the CMS and the PS or, optionally, other authorized back-office components (Pkt-prov-p1).



J.177_F02

Figure 2/J.177 – Provisioning component interfaces

5.4 Components

5.4.1 Back-office components (Service Provider Business and Service Management Systems)

These are the back-office components that a service provider uses to manage customers and other components that make up their business. These systems provide the IPCablecom provisioning process with service orders or, optionally, individual workflow tasks to activate services for customers. These systems may also receive accounting or usage data used to create customer-billing events.

5.4.2 Provisioning Server

This system forms the interface between the provider's back-office components and some or all of the IPCablecom elements. IPCablecom does not address the implementation of this system or its relationship to other OSSs that a service provider might employ.

The Provisioning Server is defined in ITU-T Rec. J.167 as consisting of a provisioning application that contains provisioning logic and a provisioning SNMP entity that provides access to active components. Here we will refer to the Provisioning Server without distinguishing between these two entities.

5.4.3 CMS

The Call Management Server component is described in ITU-T Rec. J.160. This component provides call control and signalling-related services for the MTA and CMTS components in the IPCablecom network.

5.4.4 MTA

A Media Terminal Adapter is an IPCablecom client device that contains a subscriber-side interface to the customer's CPE (e.g., telephone) and a network-side signalling interface to call control elements in the network. This component is described in ITU-T Rec. J.160.

5.4.5 TFTP

A configuration file service that is the basis for most device configuration in an IPCablecom network. This could be a stand-alone TFTP Service that delivers statically-defined files to devices or a dynamic service that creates configurations on-the-fly from other data sources.

5.5 Interface descriptions

5.5.1 Pkt-p1

This interface is defined in ITU-T Rec. J.167.

5.5.2 Pkt-p4

This interface is defined in ITU-T Rec. J.167.

5.5.3 Pkt-prov-p1

The interface defined in this Recommendation.

6 Assumptions

- The back-office components are responsible for coordinating endpoint updates with affected network entities (MTAs, CMTSs, etc.) and the CMS.
- CMS will not play a manager role nor does it specify SNMP communications to an MTA during CMS provisioning.

- The CMS and PS reside in the same secure provisioning domain. Security related information will be outlined in the IPCablecom Security Recommendation, ITU-T Rec. J.170.

7 Subscriber provisioning

Subscriber provisioning consists of:

- customer record/billing support;
- equipment setup/configuration.

7.1 Customer records (billing)

Establishment of a customer record that contains the information needed to deliver services and bills to, and collect payment from, a customer. Customer record creation/billing is considered part of the back-office OSS application and is currently out of scope for IPCablecom.

7.2 Equipment set-up and configuration

This may include physical installation and/or connection of equipment as well as any software and/or database updates necessary to actually deliver the service to the customer. Equipment set-up affects two major components in an IPCablecom environment.

- Customer premises equipment. For IPCablecom, this is the MTA. The provisioning for the MTA is defined in ITU-T Rec. J.167 and is not discussed in this Recommendation.
- Call Management Server. Provisioning of the CMS itself can be broken down into two main areas: Basic POTS Provisioning and call feature provisioning.

7.2.1 CMS Basic POTS Provisioning (BPP)

BPP provides the CMS with the minimal set of data necessary for routing of simple telephony service (POTS) in the IPCablecom network. This minimal set of data consists of a telephone number mapped to its associated MTA's FQDN and NCS endpoint identifier. This data will be used to set up translation tables enabling the CMS to route calls to the appropriate device/port, given a specific telephone number. BPP for each customer is required before that customer can receive any calls in an IPCablecom network.

7.2.2 CMS Call Feature Provisioning (CFP)

In addition to BPP, CFP is performed to provide call features to a customer. CFP is more complicated than BPP as the parameters passed may vary on a feature-by-feature basis and may also be dependent on vendor-specific implementations.

7.3 Static versus Dynamic Subscriber Provisioning Data

Data required by the CMS for subscriber provisioning falls into two classifications:

- 1) Static, billed, permanently assigned service state. This data does not change from call to call. Examples would be DQoS settings, call feature subscribed/non-subscribed states, caller ID information, etc.
- 2) Dynamic, non-billed, semi-permanent service state. Often this information is subscriber alterable, either at an endpoint via *XX key code or via a web interface into the CMS. An example would be the user-settable parameters of a call feature, such as Call Forward Busy Line (CFBL). The CFBL forwarding number is dynamic, non-billed service state. The subscribed/non-subscribed state of CFBL is static data maintained by the PS.

In the IPCablecom CMS/PS scope, the PS owns all static provisioning state, and the CMS owns all dynamic provisioning state.

8 Requirements

8.1 General requirements

- The interface **MUST** make no assumptions regarding PS and CMS implementation technologies.

Multiple partnering vendors will undoubtedly provide CMS and PS implementations on various hardware, software, and development language platforms. A platform- and language-neutral interface is required.

- The interface **MUST** support Basic POTS Provisioning.

The interface's data model **MUST** include the minimum amount of information required to support basic POTS service.

- The interface **MUST** support Call Feature Provisioning.

The interface's data model **MUST** support subscription to any IPComcom call feature.

- The interface's data model **MUST** be extensible.

The present focus of the interface is telephony data. However, to the greatest extent possible, the interface **SHOULD** be extensible for future IPComcom multimedia services. It is desirable to have a single, extensible provisioning data model and transport to support all IPComcom features and capabilities, some of which are not yet defined.

- The interface **MUST NOT** impact any MTA operations in progress.

Endpoint specific data **MAY** be added, deleted, or modified on the MTA without affecting other MTA endpoints or sessions in progress. CMS endpoint provisioning scenarios that would result in an endpoint/MTA being taken out of service **MUST** be carefully documented.

- The interface **MUST** be capable of accommodating present (NCS) and future signalling protocols.

8.2 Transport requirements

- The transport **MUST** make no assumptions regarding the physical networking infrastructure between a PS and a CMS.

It is anticipated that multiple service providers will be interoperating over a single access network. Thus, multiple enterprises will be communicating, potentially using CMS and PS implementations from various vendors, over various network infrastructures (firewalls, proxies, etc.). The CMS/PS transport protocol **SHOULD** facilitate the ability to penetrate arbitrary network infrastructure.

- The transport **MUST** support unidirectional transfer of single data model objects from the PS to the CMS.
- The transport **MUST** support efficient streaming of multiple data model objects from the PS to the CMS.
- The transport **MAY** support unidirectional transfer of single data model objects from the CMS to the PS.
- The transport **MAY** support efficient streaming of multiple data model objects from the CMS to the PS.
- The transport **MUST** include semantics to support new, updated, and removed data model objects.
- The transport **MUST** support informational requests between PS and CMS.
- The transport **MUST** handle conditions such as CMS busy, errors, etc.

- The transport MUST provide positive/negative acknowledgement of operation received.
- The transport MUST implement an at-least-once type of message semantics. The sender MUST NOT discard its request until the receiver acknowledges it (acknowledgements are not acknowledged). The transport MUST be able to detect data corruption during transport, etc., and notify the sender of such conditions.
- The transport MUST provide positive/negative acknowledgement of operation handled.
- The PS MUST be able to initiate a transfer of data model objects ("push").
- The transport MUST be secure.

9 Data model

This clause provides a high-level description of the PCSP data model and its XML encoding. It is intended as descriptive and non-authoritative. The normative, authoritative definition of the data model and its encoding is found in the PCSP XML schema in Annex A.

9.1 Overview

The data model for IPCablecom CMS provisioning is displayed in Figure 3. It consists of two categories of entities:

- Objects;
- Relations between objects.

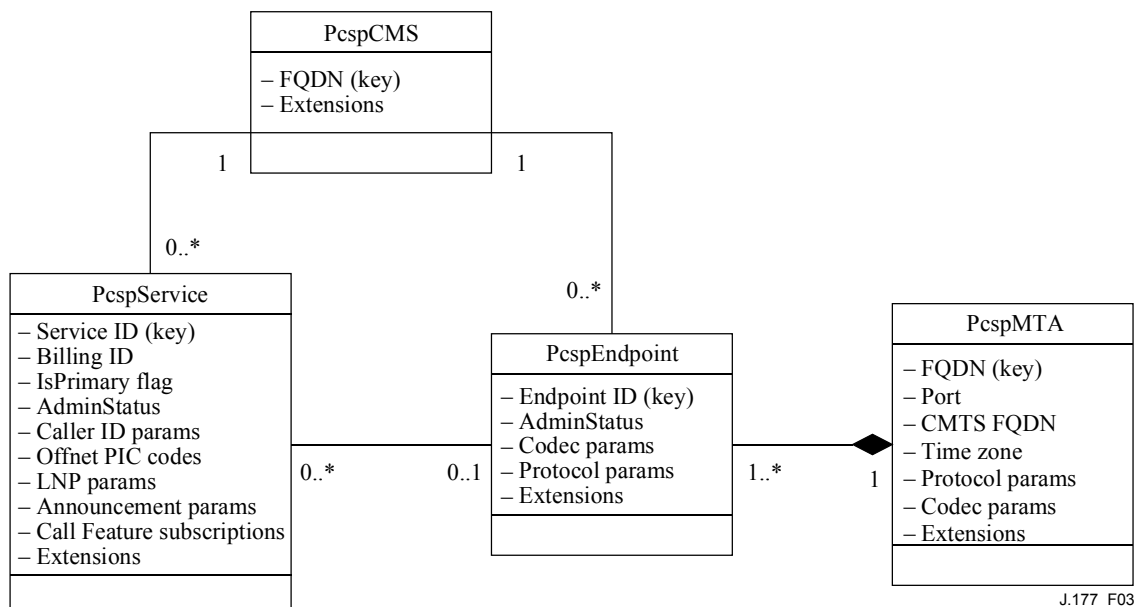


Figure 3/J.177 – CMS provisioning data model

The following entities MUST be supported:

- The PcspsService object is the entity to which an IPCablecom 1.0 customer subscribes. It represents a phone number and all related functionality (call features, etc.).
- A PcspsMTA object represents a Media Terminal Adapter, which aggregates one or more endpoints physically contained within the MTA.
- The PcspsEndpoint object represents a physical endpoint on an MTA/Gateway.

- A PcsCMS object maintains associations between endpoints/CMSs and services/CMSs.
- PcsRelations represent associations between objects. In Figure 3, they are presented as connections between objects.

PcsService and PcsEndpoint are distinct objects in order to support multiple services (phone numbers) per endpoint. Distinct PcsMta and PcsEndpoint objects allow an MTA's endpoint to be managed by different service providers. The PcsCms object essentially maintains a collection of endpoints and services.

All objects are extensible.

9.1.1 PcsService object

The service object is the entity to which an IPCablecom 1.0 customer subscribes. It represents a phone number and all related functionality. The data model allows more than one service to be provisioned to a single endpoint.

The PcsService object contains the following generic information (for complete details, see the PCSP XML schema):

- ServiceId – A unique identifier for the service;
- BillingId – The identifier of another service, which will be billed for activity on this service;
- IsPrimary flag – With multiple services provisioned upon an endpoint, one service MUST have this flag set to indicate the default service to use for outgoing calls;
- PrimaryRingPattern – Index into MTA cadence table, selecting a ring pattern for this service;
- Administrative status of this service (suspended, enabled, number has changed, etc.);
- DisplayName – The display information used for Call Name Delivery feature (CNAM);
- DisplayNumber – The display information used for Call Number Delivery feature (CND);
- Announcement settings (enable, language, time zone, etc.);
- Carrier codes (long-distance carrier code, intra-LATA carrier code, international carrier code);
- Local number portability control (porting status, STP lookup flag, etc.);
- Call features – A service includes a list of subscribed call feature objects;
- Extensions – This object is extensible in two locations: the main body of the object, and the call feature list.

9.1.2 PcsMta object

A Media Terminal Adapter aggregates one or more endpoints (physically contained within the MTA). It contains the following generic information (for complete details, see the PCSP XML schema):

- MTA's FQDN, uniquely identifying this MTA;
- MTA's NCS listener port (default: 2427);
- FQDN of controlling CMTS;
- Time zone within which this MTA is physically located;
- Signalling protocol designation – This is the default protocol selection for all contained endpoints, unless overridden by an individual endpoint;
- Codec designation – Default codec selection for all contained endpoints, unless overridden by an individual endpoint;