International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

J.705

(01/2011)

SERIES J: CABLE NETWORKS AND TRANSMISSION OF TELEVISION, SOUND PROGRAMME AND OTHER MULTIMEDIA SIGNALS

Secondary distribution of IPTV services

IPTV client provisioning, activation, configuration and management interface definition

Recommendation ITU-T J.705

Recommendation ITU-T J.705

IPTV client provisioning, activation, configuration and management interface definition

Summary

Recommendation ITU-T J.705 describes the i-2 interface, identified in Recommendation ITU-T J.700, that enables the service client in the customer network to interface with the operations support systems (OSS) functions in the operator network to provision and manage the IPTV client functions in the customer network. Examples of OSS functions include client provisioning, activation, configuration, and management (PACM).

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T J.705	2011-01-13	9

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

Table of Contents

Recommendation ITU-T J.705

IPTV client provisioning, activation, configuration and management interface definition

1 Scope

[ITU-T J.700] describes the service requirements and functional framework architecture for the support of broadcasting services enhanced by IP technology over secondary distribution (e.g., cable and optical, etc.) networks. It addresses the service requirements, use cases and functional components required to support these requirements. Where possible, [ITU-T J.700] utilizes material already developed or under development in ITU-T Recommendations that are related to video service delivery over secondary networks.

The scope of this Recommendation is the i-2 interface, identified in [ITU-T J.700] and in Figure 1, that enables the service client in the customer network to interface with the operations support systems (OSS) functions in the operator network to provision and manage the IPTV client functions in the customer network. Examples of OSS functions include client provisioning, activation, configuration, and management (PACM).

2 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 H.740] Recommendation ITU-T H.740 (2010), *Application event handling for IPTV services*.

[ITU-T J.222.2] Recommendation ITU-T J.222.2 (2007), *Third-generation transmission systems for interactive cable television services – IP cable modems: MAC and upper layer protocols.*

[ITU-T J.360] Recommendation ITU-T J.360 (2006), *IPCablecom2 architecture framework*.

[ITU-T J.700] Recommendation ITU-T J.700 (2009), *IPTV service requirements and framework for secondary distribution*.

[ITU-T J.702] Recommendation ITU-T J.702 (2008), *Enablement of current terminal devices for the support of IPTV services*.

[ATIS-0300092] ATIS-0300092 (2007), *High Level OSS/BSS Functional Requirements and Reference Architecture for IPTV*.

[ATIS-0800009] ATIS-0800009 (2009), *Remote Management of Devices in the Consumer Domain for IPTV Services*.

[ATIS-0800014] ATIS-0800014 (2009), *Secure Download and Messaging Interoperability Specification*.

[BBF TR-069] Broadband Forum TR-069 (2007), *CPE WAN Management Protocol v1.1*, *plus* Amendment 2.

[ETSI TS 102 824] ETSI TS 102 824 V1.2.1 (2010), *Digital Video Broadcasting (DVB); Remote Management and Firmware Update System for DVB IPTV Services (Phase 2)*.

[IETF RFC 793] IETF RFC 793 (1981), *Transmission Control Protocol*.

[IETF RFC 1350] IETF RFC 1350 (1992), *The TFTP Protocol (Revision 2)*.

[IETF RFC 1901] IETF RFC 1901 (1996), *Introduction to Community-based SNMPv2*.

[IETF RFC 2616] IETF RFC 2616 (1999), *Hypertext Transfer Protocol – HTTP/1.1*.

[IETF RFC 2818] IETF RFC 2818 (2000), *HTTP Over TLS*.

[IETF RFC 3411] IETF RFC 3411 (2002), *An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks*.

[IETF RFC 3418] IETF RFC 3418 (2002), *Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)*.

[IETF RFC 3584] IETF RFC 3584 (2003), *Coexistence between Version 1, Version 2, and Version 3 of the Internet-standard Network Management Framework*.

[ISO/IEC 13818-6] ISO/IEC 13818-6:1998, *Information technology – Generic coding of moving pictures and associated audio information – Part 6: Extensions for DSM-CC*.

[OMA DM FUMO] *Open Mobile Alliance*, OMA DM FUMO (2009), *Firmware Update Management Object V.1.0.2*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following term defined elsewhere:

3.1.1 Threshold crossing alerts [b-ITU-T M.2140]: A transient condition declared when a performance monitoring parameter reaches or exceeds a preset threshold.

3.2 Terms defined in this Recommendation

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ACS Auto Configuration Server

BSS Business Support System

CA Conditional Access

CAS Central Authentication Service

CPE Customer Premises Equipment

CVT Code Version Table

DHCP Dynamic Host Configuration Protocol

DM Device Management

DRM Digital Rights Management

DSM-CC Digital Storage Media Command and Control

DVB	Digital Video Broadcasting
EAS	Emergency Alert System
FUMO	Firmware Update Management Object
HTTP	HyperText Transfer Protocol
NAT	Network Address Translation
OSS	Operations Support Systems
PACM	Provisioning, Activation, Configuration, and Management
PPV	Pay Per View
QoS	Quality of Service
RG	Residential Gateway
RMS-FUS	Remote Management and Firmware Update Services
SCP	Service and Content Protection
SIP	Session Initiation Protocol
SLA	Service Level Agreement
SNMP	Simple Network Management Protocol
TCA	Threshold Crossing Alerts
TCP	Transmission Control Protocol
TD	Terminal Device
TFTP	Trivial File Transfer Protocol
TLS	Transport Layer Security
UPnP	Universal Plug and Play
VQE	Visual Quality Experience
XCAP	XML Configuration Access Protocol
XML	eXtensible Markup Language

5 Conventions

This clause is intentionally left blank.

6 IPTV network reference points

[ITU-T J.700] identifies significant reference points, shown in Figure 1 below, between the CPE and the various network functions with which it interfaces, between the session/resource/policy management functions and the IPTV application servers, and between the IP content sources and the content processing, distribution, and storage functions. The CPE reference points are meant to address IP interfaces for hybrid and IP CPE. Network interface points for MPEG CPE and the MPEG portion of hybrid CPE are of a legacy nature and therefore not addressed.

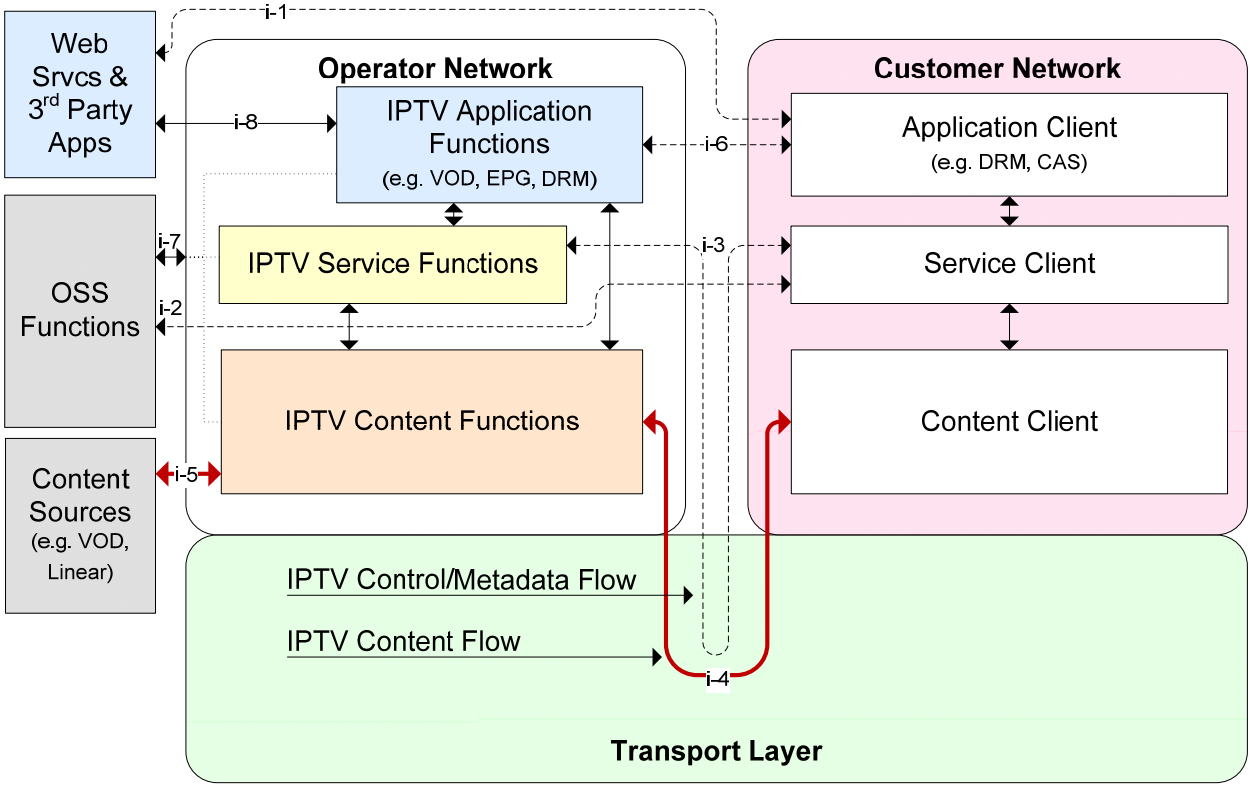

Figure 1 – IPTV network reference points

The focus of this Recommendation is the i-2 interface, OSS functions – service client. The i-2 interface enables the service client in the customer network to interface with the OSS functions in the operator network to provision and manage the IPTV client functions in the customer network. The customer network includes CPE and RG.

7 IPTV client provisioning, activation, configuration, and management interface

The IPTV client provisioning, activation, configuration, and management interface makes use of multiple protocols to access or implement several of the IPTV OSS and services functions, or portions thereof, identified in [ITU-T J.700].

7.1 Functions

The following types of functions are supported over the interface:

1) Configuration functions at the network level, including setting transport parameters, installing and initiating routing services and consumer specific policy management in the CPE as part of the providers' network.

2) Accounting management, including different commercial arrangements between the service providers and consumers, inter-carrier support, retail billing and QoS monitoring in support of SLA management.

3) Security management including CPE-based service and content protection, content control, and protection mechanisms for content in transit (within the CPE) and storage, if not addressed in the i-3 interface.

4) Fault management in the CPE, including assuring service reliability to reduce or eliminate packet loss and rerouting due to failure in the network. An example is VQE (Visual quality experience) on the client.

In particular, the following functions are supported, aligned with [ATIS-0300092]:

a) Service(s) management including messaging, and management of 3rd party applications.

b) CAS/DRM control processing and client handling (complementing i-3).

c) Event accounting, e.g., pay per view.

d) Subscriber resource management, such as QoS management, and resource performance management, such as statistical data collection and TCAs; performance statistics for managed IPTV services resources; resource performance metrics; IP layer metrics such as packet loss, delay, jitter, and packet sequencing or duplication.

e) Service quality and performance management, such as CPE performance data through [BBF TR-069] ACS or other probes (e.g., channel changes, dropped packets, MPEG); and VQE statistics.

f) CPE and RG management (remotely), including secure software download, protocol handling/processing, diagnostics/logging, provisioning, CPE/RG administrative settings, configuration settings, and NAT settings.

g) Service problem management and resource trouble management, including actively monitoring the CPE and RG to report alarms in the event of faults, and collecting status information from the CPE and RG remotely.

7.2 Protocols

Potential supporting protocols include the following:

1) Web services (HTTP, XML, XCAP)

2) SIP configuration framework

3) TFTP – for client configuration

4) TR-069

5) SNMP

6) OMA DM

7) DSM-CC – for data carousel; polling and report back for event accounting

8) DHCP – not strictly a management protocol, but used in discovery

9) UPnP – not strictly a management protocol, but used in discovery.

7.3 Provisioning of settings

See use of SIP in IPCablecom2 [ITU-T J.360].

Security and NAT traversal of management protocols in IPCablecom2 are specifically not specified [ITU-T J.360].

7.4 Reporting of faults and status

This clause defines protocols and functional requirements for the reporting of faults and status of CPE.

7.4.1 Protocols for reporting

At least one of the following protocols is required to be supported by the CPE if it is designed for the use with an embedded-DOCSIS cable modem.

- SNMPv3 defined in IETF Standard 62 [IETF RFC 3411] through [IETF RFC 3418]
- SNMPv1/v2c coexistence [IETF RFC 3584]
- SNMPv2 community-based access [IETF RFC 1901]

If the CPE uses a baseband IP communication method such as Ethernet, one of the following protocols is required to be used [ITU-T H.740].

- HTTP version 1.1 [IETF RFC 2616].
- HTTP over TLS [IETF RFC 2818].
- TFTP [IETF RFC 1350].
- TCP [IETF RFC 793].

7.4.2 Initiation of the collecting process

It is required that the process of collecting CPE report-backs be initiated and managed by the head-end controller. This means that a manager (for SNMP) or a client (for others) resides in the head-end controller, and an agent (for SNMP) or a server (for others) is implemented in the CPE.

It can be optionally initiated by the CPE in the form of an "unsolicited report-back". In this case, necessary components such as a server and a client will be installed in the head-end controller and the CPE, respectively.

7.5 Event accounting

There are several types of event accounting mechanisms, e.g., a service control layer and an application layer. As shown in Figure 1, service control layer event accounting will be performed over the i-2 interface, and application layer event accounting will be done over the i-1 or i-6 interface. As per the scope of this Recommendation, this clause defines service control layer event accounting. Application layer event accounting will be defined in future ITU-T J.700-series Recommendations based on [ITU-T H.740] entitled: "Application event handling for IPTV services".

It is required to support the following (service control layer) event accounting through the i-2 interface between a head-end controller and a CPE:

- PPV purchase information;
- CPE internal event, e.g., panic dump, system error;
- CPE internal log, e.g., keypad press history of remote control.

As a protocol for event accounting, it is required to use HTTP over TLS [IETF RFC 2818].

It should be noted that clause 5.3.3.3 "Polling and report-back" of [ITU-T J.700] describes the functional requirement of CPE implementation.

7.6 Secure software download

7.6.1 General

The software downloaded to the CPE may be classified into three types: firmware, middleware, and SCP. This clause is limited to firmware.

The CPE should support software download and upgrade capability via the remote download interface using methods such as in-band DSM-CC carousels, multicast IP, or TCP/IP. If secure downloads are needed, IPTV TD is recommended to support the decryption of encrypted code data.

7.6.2 Non-DSM-CC

The authentication aspects for secure software download shall follow [ATIS-0800014].

The protocols used by a terminal device for software download shall follow [ATIS-0800009] (which are based on [BBF TR-069] and [ETSI TS 102 824]) and align with clause III.1 of [ITU-T J.702], flow of upgrade.

7.6.3 DSM-CC

This clause describes mechanisms based on the DSM-CC [ISO/IEC 13818-6] protocols, carried in UDP over IP.

The CPE determines if a new component, as an IP CVT (code version table) entry, is available from the network that applies to the CPE. The CVT signals to the CPE the component for download. The CPE also determines if the component referenced is different from the installed component. The CPE establishes the criteria for when to download the associated component, as a trigger.

The OSS provides the information in two UNPassThru messages. The first is the CVT directory locator on the system-wide flow. The system-wide flow is associated with a well-known multicast IP address that all CPEs join first as they boot up. The second is the CVT on the cluster flow, associated with a unique multicast IP address. Each CPE joins its particular cluster flow and remains joined continuously. A cluster is defined by specific boundaries, e.g., EAS FIPS as used in the United States and certain other associated areas, and may comprise one or more CPE IP subnets.

The group ID contains the membership value that is associated with a group of CPEs. The OSS sends this value to the CPE in a prior message exchange.

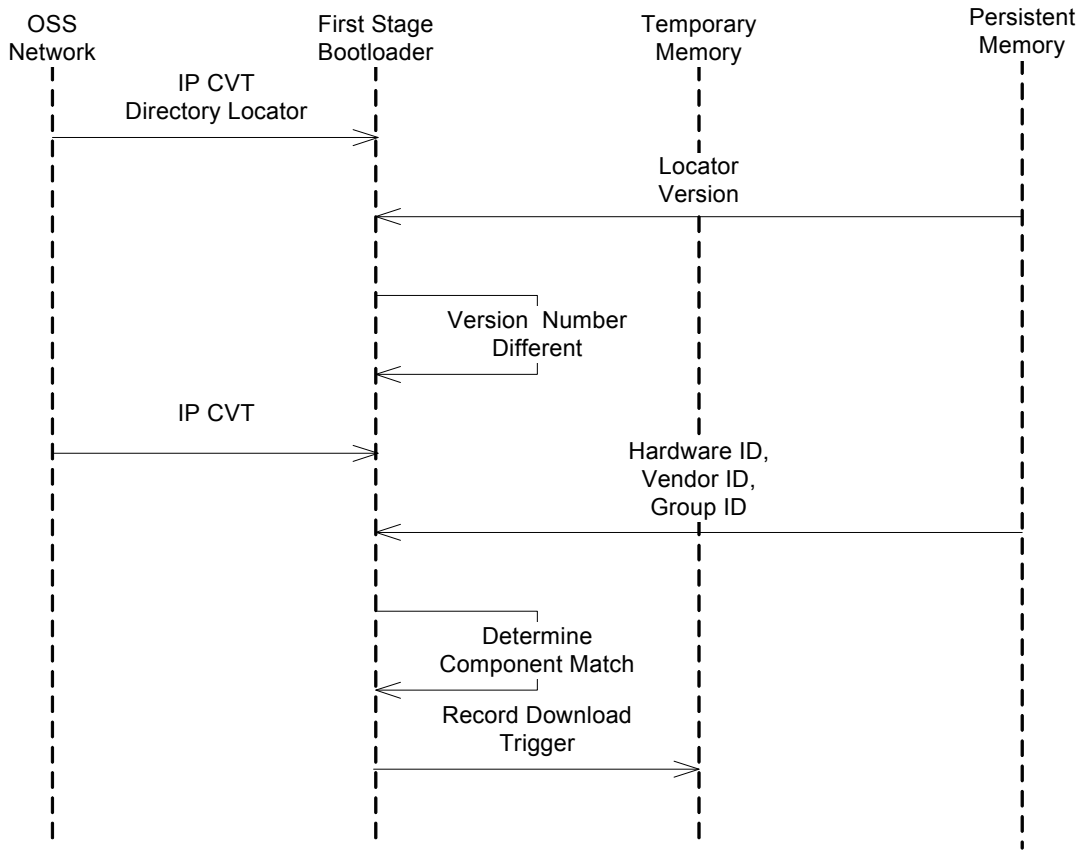

Figure 2 – CPE component version determination

The CPE downloads a new component and determines if that component is correctly formatted and signed. This capability is part of the first stage bootloader and the CPE application software.

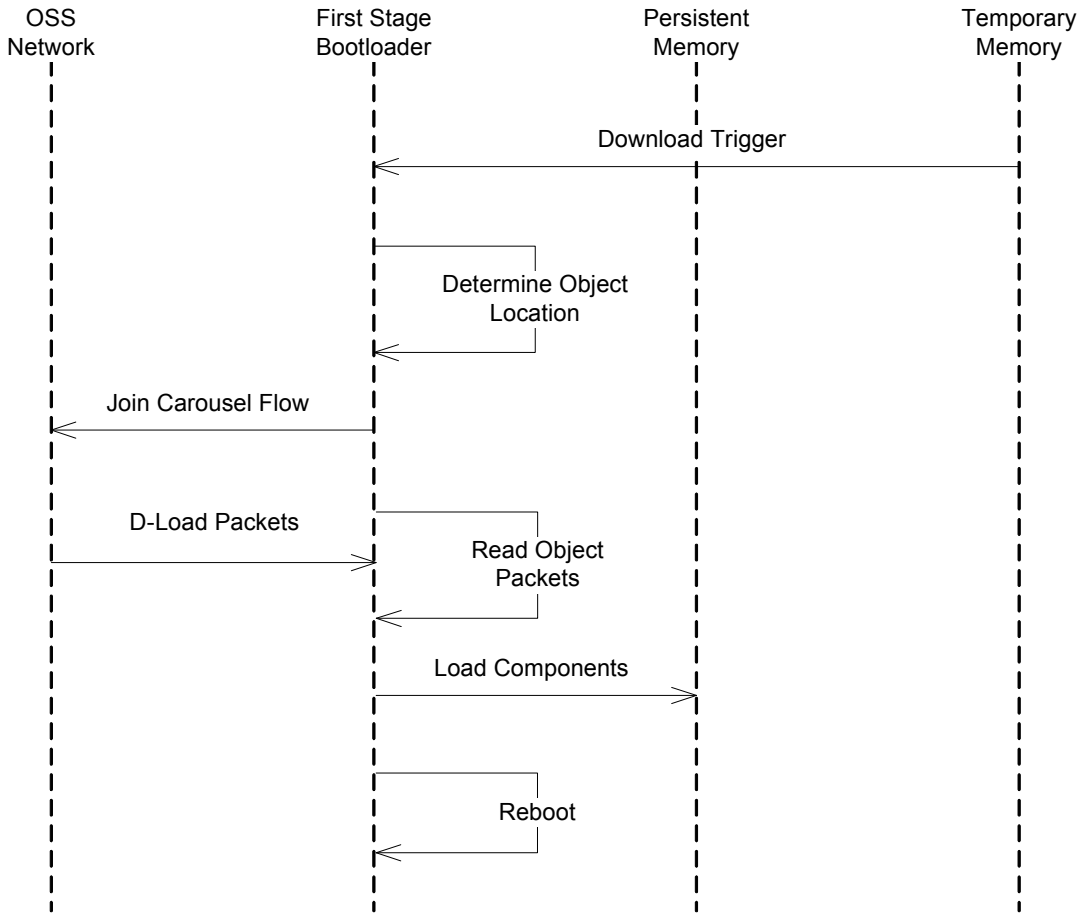

Figure 3 – CPE component download

The CPE validates a component prior to execution (to provide video service). Validity includes the application of a valid signature as well as a check on the integrity of the component structure. Multiple validation types are supported (e.g., vendor/hardware combinations).

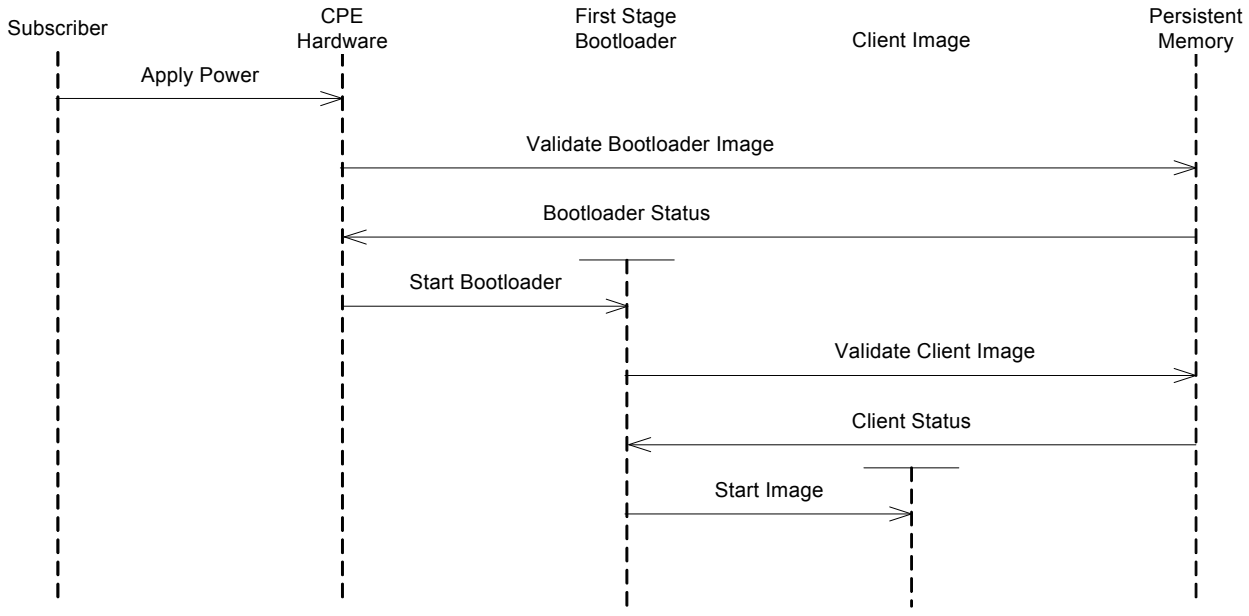

Figure 4 – CPE component validation

The CPE can recover from an error in the first stage bootloader stored in persistent memory.

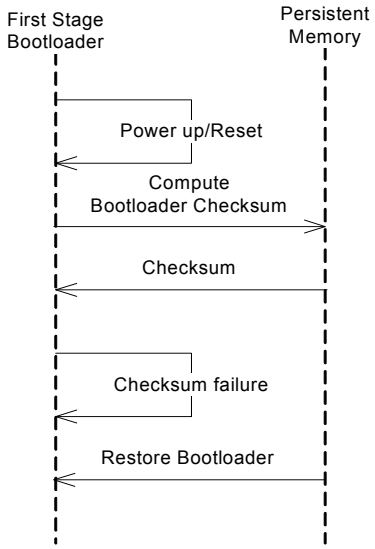

Figure 5 – CPE recovery from error

The CPE monitors download conditions by recording information on the download process and transmitting it to the OSS when requested.

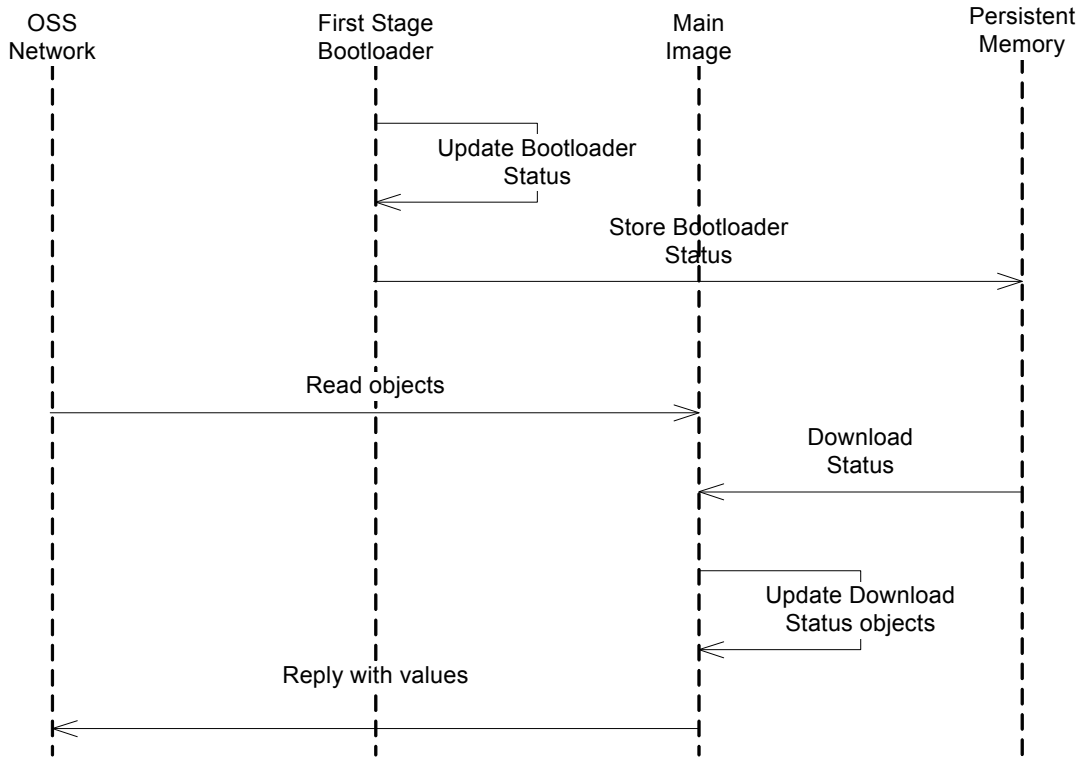

Figure 6 – CPE download monitoring

7.6.4 DOCSIS

In a cable TV network, CPE using DOCSIS software upgrade mechanisms should follow the specification for privacy on the DOCSIS channel and authentication of the software image. The cable modem (in terminal device or RG) shall follow the requirements of clause 12.1 of [ITU-T J.222.2], Downloading Cable Modem Operating Software.

7.6.5 Mobile

For a CPE with wireless WAN-based access (such as a hybrid set-top), the firmware upgrade protocol shall follow [OMA DM FUMO]. This inherently includes an authentication process.

Bibliography

[b-ITU-T J.293] Recommendation ITU-T J.293 (2008), *Component definition and interface specification for the next generation set-top box*.

[b-ITU-T M.2140] Recommendation ITU-T M.2140 (2000), *Transport network event correlation*.

[b-ATIS-0800017] ATIS-0800017 (2009), *Network Attachment and Initialization of Devices and Client Discovery of IPTV Services*.

[b-IETF RFC 3412] IETF RFC 3412 (2002), *Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)*.

[b-IETF RFC 3413] IETF RFC 3413 (2002), *Simple Network Management Protocol (SNMP) Applications*.

[b-IETF RFC 3414] IETF RFC 3414 (2002), *User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)*.

[b-IETF RFC 3415] IETF RFC 3415 (2002), *View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)*.

[b-IETF RFC 3416] IETF RFC 3416 (2002), *Version 2 of the Protocol Operations for the Simple Network Management Protocol (SNMP)*.

[b-IETF RFC 3417] IETF RFC 3417 (2002), *Transport Mappings for the Simple Network Management Protocol (SNMP)*.

SERIES OF ITU-T RECOMMENDATIONS

Series A	Organization of the work of ITU-T
Series D	General tariff principles
Series E	Overall network operation, telephone service, service operation and human factors
Series F	Non-telephone telecommunication services
Series G	Transmission systems and media, digital systems and networks
Series H	Audiovisual and multimedia systems
Series I	Integrated services digital network
Series J	**Cable networks and transmission of television, sound programme and other multimedia signals**
Series K	Protection against interference
Series L	Construction, installation and protection of cables and other elements of outside plant
Series M	Telecommunication management, including TMN and network maintenance
Series N	Maintenance: international sound programme and television transmission circuits
Series O	Specifications of measuring equipment
Series P	Terminals and subjective and objective assessment methods
Series Q	Switching and signalling
Series R	Telegraph transmission
Series S	Telegraph services terminal equipment
Series T	Terminals for telematic services
Series U	Telegraph switching
Series V	Data communication over the telephone network
Series X	Data networks, open system communications and security
Series Y	Global information infrastructure, Internet protocol aspects and next-generation networks
Series Z	Languages and general software aspects for telecommunication systems

Printed in Switzerland
Geneva, 2011