International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

J.299

(01/2022)

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

Cable set-top box

Functional requirements for remote management of a cable set-top box by auto configuration server

Recommendation ITU-T J.299

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Summary

Recommendation ITU-T J.299 describes the functional requirements for an auto configuration server (ACS) and a set-top box (STB) connected to each other for the purpose of remote maintenance. ACS is usually used to remotely set up and maintain customer premises equipment (CPE) such as an STB. The major purpose of the Recommendation is to specify basic requirements for remote maintenance in the cable television system.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T J.299	2020-05-29	9	11.1002/1000/14279
2.0	ITU-T J.299	2022-01-13	9	11.1002/1000/14867

Keywords

ACS, auto configuration server, cable, CPE, customer premises equipment, functional requirements, remote maintenance, set-top box, STB, TV.

* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

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Functional requirements for remote management of a cable set-top box by auto configuration server

1 Scope

This Recommendation defines the functional requirements for the interface between an auto configuration server (ACS) at the cable headend or other cable operator locations and a cable set-top box (STB) to remotely set up and maintain the STB and collect data from the STB. In addition, a function to enable network address translation (NAT) traversal and means to securely handle the collected data are also considered.

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.741.1] Recommendation ITU-T H.741.1 (2012), *IPTV application event handling: Audience measurement operations for IPTV services*.

[ITU-T H.741.2] Recommendation ITU-T H.741.2 (2012), *IPTV application event handling: Data structures of audience measurement for IPTV services*.

[ITU-T H.741.3] Recommendation ITU-T H.741.3 (2012), *IPTV application event handling: Audience measurement for IPTV distributed content services*.

[ITU-T H.741.4] Recommendation ITU-T H.741.4 (2012), *IPTV application event handling: Transport mechanisms for audience measurement*.

[BBF TR-069] Broadband Forum, *CPE WAN Management Protocol Issue: Amendment 6 Corrigendum 1, 2020/6*.

[BBF TR-135] Broadband Forum, *Data Model for a TR-069 Enabled STB Issue:1 Amendment 3, 2012/11*.

[BBF TR-369] Broadband Forum, *User Services Platform protocol Issue:1 Amendment 1, 2019/10*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following term defined elsewhere:

3.1.1 data model [BBF TR-069]: A hierarchical set of parameters that define managed objects for a particular device or service.

3.2 Terms defined in this Recommendation

This Recommendation defines the following term:

3.2.1 radio frequency log: Data log that consists of a record of the receive conditions at a radio frequency equivalent to the TV channel selected by the set-top box (STB) user.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ACS Auto Configuration Server

CM Cable Modem

CPE Customer Premises Equipment

CWMP CPE WAN Management Protocol

GDPR General Data Protection Regulation

NAT Network Address Translation

ONU Optical Network Unit

RF Radio Frequency

STB Set-Top Box

STUN Session Traversal Utilities for NATs

5 Conventions

In this Recommendation:

The keywords "**is required to**" indicate a requirement which must be strictly followed and from which no deviation is permitted if conformance to this document is to be claimed.

The keywords "**is recommended**" indicate a requirement which is recommended but which is not absolutely required. Thus, this requirement need not be present to claim conformance.

The keywords "**is prohibited from**" indicate a requirement which must be strictly followed and from which no deviation is permitted if conformance to this document is to be claimed.

The keywords "**can optionally**" indicate an optional requirement which is permissible, without implying any sense of being recommended. This term is not intended to imply that the vendor's implementation must provide the option and the feature can be optionally enabled by the network operator/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformance with the specification.

In the body of this Recommendation and its annexes, the words *shall*, *shall not*, *should*, and *may* sometimes appear, in which case they are to be interpreted, respectively, as *is required to*, *is prohibited from*, *is recommended*, and *can optionally*. The appearance of such phrases or keywords in an appendix or in material explicitly marked as *informative* are to be interpreted as having no normative intent.

6 Overview

The auto configuration server (ACS) is usually installed in the cable operators' premises and has functions for, for example, remotely setting up a new STB, remotely monitoring its status and modifying its parameters, etc. The ACS can also be used to collect data from STBs including audience measurement results. This is a good tool to alleviate the cable operators' workload.

However, most ACS are tailored to control STBs from one same manufacturer, while control functions and methods differ from one manufacturer to another. This limits the operators' possibility to purchase STBs from multiple vendors. The purpose of this Recommendation is to make ACS and

STBs from different manufactures interoperable with each other by defining requirements including a set of common data models to harmonize management from the ACS to the STB.

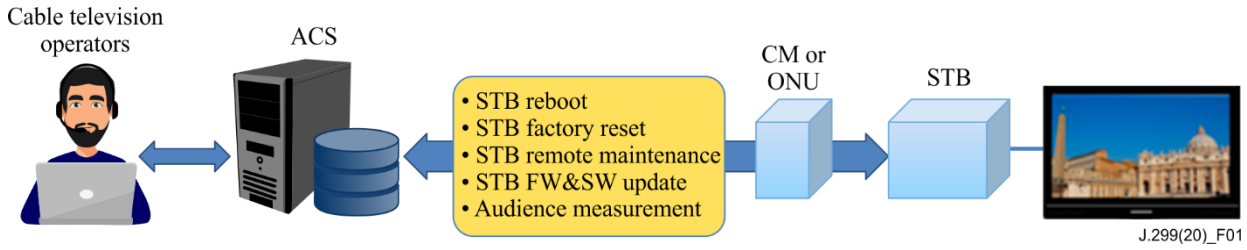

Figure 1 – Overview of ACS and STB configuration

Figure 1 shows the typical configuration of this system. There is usually a cable modem (CM) or an optical network unit (ONU) in front of the STB, which is installed in the user's residence and has a network address translation (NAT) function that works in an IPv4 environment.

The protocol between ACS and STB is not specified in this Recommendation, but one of the globally standardized protocols that are in use for this purpose is the CPE WAN management protocol (CWMP) [BBF TR-069]. [BBF TR-069] has evolved to [BBF TR-369] user services platform, but for CWMP it refers to [BBF TR-069]. [BBF TR-135] defines data models that specify objects and parameters used in messages between ACS and STB to conduct the functions. [b-JLabs SPEC-038] can be referred to as one of the regional standards that adopt [BBF TR-069] and [BBF TR-135]. With respect to audience measurement, ITU-T Recommendations for IPTV [ITU-T H.741.1], [ITU-T H.741.2], [ITU-T H.741.3] and [ITU-T H.741.4] can be referenced.

Information collected by the audience measurement function must be used within the cable operator the user subscribes to.

7 Requirements

7.1 General requirements

ACSstb-GenralReq-01 – ACS and STB are required to implement the functions of initial set-up of STB, remote maintenance, firmware and software upgrade and audience measurement.

A**CSstb-GenralReq-02** – ACS and STB are required to support IPv4 and IPv6 on the interface between them. If there are STBs working on an IPv4 private address, ACS is required to support NAT traversal. In the case of adopting existing mechanisms of NAT traversal such as STUN, ACS has to play in association with STUN to allow UDP connection requests as described in clause G.2.2.2 of [BBF TR-069].

ACSstb-GenralReq-03 – ACS should be able to be shared by cable operators if they agree to share it.

ACSstb-GenralReq-04 – ACS and STB are required to implement a security function to protect against fraudulent use.

ACSstb-GenralReq-05 – ACS and STB are required to have a mechanism to balance data traffic between them in order to avoid traffic congestion. As an example of the techniques used for balancing audience measurement reports from STBs, ACS can divide STBs into groups and assign a different report timing to each group.

7.2 Initial set-up of the STB

ACSstb-SetupReq-01 – At startup, STB is required to notify ACS of its firmware and software version. ACS may decide to conduct firmware and software upgrade under cable operator's policy

when the version of the STB is older than that of the firmware stored in ACS. The STB user may also decide to do so.

ACSstb-SetupReq-02 – At start-up, STB is required to have means to indicate the field engineer whether it has been set up with the data relevant to the cable operator to which the user subscribes.

ACSstb-SetupReq-03 – ACS is required to transfer set-up information to a new STB in case of STB replacement due to failure or change of user location.

ACSstb-SetupReq-04 – STB should have functions to avoid congestion caused by simultaneous access from a bulk of STBs in the same area to ACS after power or line failure.

7.3 Remote maintenance

ACSstb-RemoteReq-01 – At the request of ACS, STB is required to send ACS information of the STB and equipment connected to the STB, e.g., STB operation status and a list of connected devices.

ACSstb-RemoteReq-02 – At the request of ACS, STB is required to modify the initial parameter set, e.g., username and password used for connection set-up between ACS and STB.

ACSstb-RemoteReq-03 – At the request of ACS, STB is required to initialize STB to factory default values.

ACSstb-RemoteReq-04 – At the request of ACS, STB is required to reboot STB system. It is recommended to be able to reboot built-in Wi-Fi module or cable modem as well.

ACSstb-RemoteReq-05 – STB reboot should be avoided while video recording is in progress.

ACSstb-RemoteReq-06 – At the request of ACS, STB is required to perform frequency scan.

ACSstb-RemoteReq-07 – At the request of ACS, STB is required to send ACS radio frequency (RF) log which indicates conditions of RF signal reception.

ACSstb-RemoteReq-08 – ACS is required to be able to send STB a request message to start measurement along with measurement interval and time to end measurement. ACS is required to be able to send STB messages to stop measurement.

7.4 Firmware/Software upgrade

ACSstb-FirmUpReq-01 – STB is required to have a function to download firmware and software that are stored in ACS. The function is automatically and/or manually conducted. In the case of manual operation, it may need user's intervention to confirm the operation.

ACSstb-FirmUpReq-02 – At the request of ACS, STB is required to notify ACS its firmware and software version.

7.5 Audience measurement

ACSstb-AudienceReq-01 – At the request of ACS, STB is required to immediately or periodically send audience measurement data in store to ACS.

ACSstb-AudienceReq-02 – At the request of ACS, STB is required to modify the measurement items to be sent to ACS, e.g., information of TV program which user watched.

ACSstb-AudienceReq-03 – At the request of ACS, STB is required to modify the audience measurement parameters used for controlling the function, e.g., reporting interval.

ACSstb-AudienceReq-04 – ACS is required to have manners that information collected by audience measurement function is used only by the cable operator to which the user subscribes. It is recommended to follow the local region's or country's regulation for personal data protection such as General Data Protection Regulation (GDPR) of the European Union.

7.6 Remote diagnostics

ACSstb-RemoteDiagReq-01 – ACS is required to support a remote diagnostics function. If any trouble occurs in the STB, remote trouble shooting can be performed.

ACSstb-RemoteDiagReq-02 – STB is recommended to comprise basic diagnostic functions that may be remotely activated by the ACS. After activated, the STB will perform one or more diagnostic tests automatically, and the test results will be sent back to ACS.

Bibliography

[b-JLabs SPEC-038] JLabs SPEC-038 Ver. 1.0 (2019), *Cable Industry ACS Technical Specification for Third Generation Cable STB*.

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Printed in Switzerland
Geneva, 2022