I n t e r n a t i o n a l   T e l e c o m m u n i c a t i o n   U n i o n

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

H.626.5

(05/2019)

SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

Broadband, triple-play and advanced multimedia services – Advanced multimedia services and applications

---

Architecture for intelligent visual surveillance systems

Recommendation ITU-T H.626.5

ITU-T

ITU-T H-SERIES RECOMMENDATIONS

AUDIOVISUAL AND MULTIMEDIA SYSTEMS

CHARACTERISTICS OF VISUAL TELEPHONE SYSTEMS	H.100–H.199
INFRASTRUCTURE OF AUDIOVISUAL SERVICES	
General	H.200–H.219
Transmission multiplexing and synchronization	H.220–H.229
Systems aspects	H.230–H.239
Communication procedures	H.240–H.259
Coding of moving video	H.260–H.279
Related systems aspects	H.280–H.299
Systems and terminal equipment for audiovisual services	H.300–H.349
Directory services architecture for audiovisual and multimedia services	H.350–H.359
Quality of service architecture for audiovisual and multimedia services	H.360–H.369
Telepresence, immersive environments, virtual and extended reality	H.420–H.439
Supplementary services for multimedia	H.450–H.499
MOBILITY AND COLLABORATION PROCEDURES	
Overview of Mobility and Collaboration, definitions, protocols and procedures	H.500–H.509
Mobility for H-Series multimedia systems and services	H.510–H.519
Mobile multimedia collaboration applications and services	H.520–H.529
Security for mobile multimedia systems and services	H.530–H.539
Security for mobile multimedia collaboration applications and services	H.540–H.549
VEHICULAR GATEWAYS AND INTELLIGENT TRANSPORTATION SYSTEMS (ITS)	
Architecture for vehicular gateways	H.550–H.559
Vehicular gateway interfaces	H.560–H.569
BROADBAND, TRIPLE-PLAY AND ADVANCED MULTIMEDIA SERVICES	
Broadband multimedia services over VDSL	H.610–H.619
Advanced multimedia services and applications	**H.620–H.629**
Ubiquitous sensor network applications and Internet of Things	H.640–H.649
IPTV MULTIMEDIA SERVICES AND APPLICATIONS FOR IPTV	
General aspects	H.700–H.719
IPTV terminal devices	H.720–H.729
IPTV middleware	H.730–H.739
IPTV application event handling	H.740–H.749
IPTV metadata	H.750–H.759
IPTV multimedia application frameworks	H.760–H.769
IPTV service discovery up to consumption	H.770–H.779
Digital Signage	H.780–H.789
E-HEALTH MULTIMEDIA SYSTEMS, SERVICES AND APPLICATIONS	
Personal health systems	H.810–H.819
Interoperability compliance testing of personal health systems (HRN, PAN, LAN, TAN and WAN)	H.820–H.859
Multimedia e-health data exchange services	H.860–H.869
Safe listening	H.870–H.879

For further details, please refer to the list of ITU-T Recommendations.

Recommendation ITU-T H.626.5

Architecture for intelligent visual surveillance systems

Summary

Recommendation ITU-T H.626.5 defines an architecture of intelligent visual surveillance systems, including the functional requirements, functional architecture, entities, service flows and reference points. The intelligent visual surveillance system provides intelligent analysis capabilities and services for users based on the images and video streams from surveillance cameras through the network. This Recommendation is based on Recommendation ITU-T F.743.1, "*Requirements for intelligent visual surveillance*".

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T H.626.5	2019-05-14	16	11.1002/1000/13905

Keywords

Architecture, intelligent, visual surveillance systems

* 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.

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 H.626.5

Architecture for intelligent visual surveillance systems

1 Scope

This Recommendation specifies architecture for intelligent visual surveillance systems.

The scope of this Recommendation includes:

– Functional architecture
– Entities
– Signalling
– Reference points

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 F.743] Recommendation ITU-T F.743 (2009), *Requirements and service description for visual surveillance.*

[ITU-T F.743.1] Recommendation ITU-T F.743.1 (2015), *Requirements for intelligent visual surveillance.*

[ITU-T H.626] Recommendation ITU-T H.626 (2011), *Architectural requirements for visual surveillance.*

[ITU-T H.626.1] Recommendation ITU-T H.626.1 (2013), *Architecture for mobile visual surveillance.*

[ITU-T H.627] Recommendation ITU-T H.627 (2012), *Signalling and protocols for visual surveillance.*

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

[IETF RFC 3261] IETF RFC 3261 (2002), *SIP: Session Initiation Protocol.*

[IETF RFC 3428] IETF RFC 3428 (2002), *Session Initiation Protocol (SIP) Extension for Instant Messaging.*

[IETF RFC 3550] IETF RFC 3550 (2003), *RTP: A Transport Protocol for Real-Time Applications.*

[IETF RFC 7826] IETF RFC 7826 (2016), *Real-Time Streaming Protocol Version 2.0.*

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 application [b-ITU-T Y.101]: A structured set of capabilities, which provide value-added functionality supported by one or more services.

3.1.2 functional architecture [b-ITU-T Y.2012]: A set of functional entities and the reference points between them used to describe the structure of an NGN. These functional entities are separated by reference points, and thus, they define the distribution of functions.

3.1.3 functional entity [b-ITU-T Y.2012]: An entity that comprises an indivisible set of specific functions. Functional entities are logical concepts, while groupings of functional entities are used to describe practical, physical implementations.

3.1.4 reference point [b-ITU-T Y.2012]: A conceptual point at the conjunction of two non-overlapping functional entities that can be used to identify the type of information passing between these functional entities.

3.1.5 service [b-ITU-T Y.101]: A structured set of capabilities intended to support applications.

3.1.6 customer unit [ITU-T H.626]: A device located at the customer part of a visual surveillance system and used to present multimedia information (such as audio, video, image, alarm signal, etc.) to the end user.

3.1.7 premises unit [ITU-T H.626]: A device located at the remote part of a visual surveillance system and used to capture multimedia information (such as audio, video, image, alarm signal, etc.) from a surveilled object.

3.1.8 service platform [ITU-T H.626]: A series of devices and subsystems located at the centred part of a visual surveillance system. It is used to integrate all of the capabilities and provide visual surveillance services to customers. The main functions include service control function, media switching, distribution, storage, and control and management functions.

3.1.9 surveilled object [ITU-T H.626]: The target (such as site, human, and related environment) on which surveillance is performed.

3.1.10 visual surveillance [ITU-T H.626]: A telecommunication service focusing on video (but including audio) application technology, which is used to remotely capture multimedia (such as audio, video, image, alarm signal, etc.) and present them to the end user in a user friendly manner, based on managed broadband network with ensured quality, security and reliability.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 intelligent video unit: The intelligent video unit (IVU) identifies specific objects automatically, and outputs recognition results to an intelligent video management (IVM) system. The recognition information includes triggered events and acquired data. One or more intelligent analysis algorithms can be loaded or unloaded on an intelligent video unit (IVU) according to different requirements.

3.2.2 intelligent video management: The intelligent video management (IVM) unit supports strategies configuration of intelligent application by users and video sources schedule dynamically. The IVM accepts registration, deletion, capability report from IVU and schedule IVU dynamically. It can also store, manage, and schedule those capabilities dynamically. IVM can be invoked by an intelligent application from the centre management unit (CMU).

3.2.3 APP: The application (APP) is the third-party data analysis system, which can be used to configure the data analysis algorithms and strategies. The APP receives and analyzes data from the visual surveillance platform, whereas it can send alarm information to the visual surveillance platform if needed.

3.2.4 intelligent customer unit: The intelligent customer unit (ICU) is the client subsystem within the intelligent visual surveillance system. The client intelligent video (CIV) is added to the customer unit (CU) in order to achieve comprehensive intelligent video analysis.

3.2.5 intelligent premises unit: The intelligent premises unit (IPU) is the premise subsystem within the intelligent visual surveillance system. The premises intelligent video (PIV) module is added to the premises unit (PU) for intelligent video analysis.

3.2.6 premises intelligent video: The premises intelligent video (PIV) unit is an intelligent identification module in the premises unit (PU). It identifies required information from input video and outputs the result.

3.2.7 client intelligent video: The client intelligent video (CIV) unit is an intelligent identification module in the customer unit (CU). It identifies required information from input video and outputs the result and retrieves the recorded video data with specified information.

3.2.8 media distribution unit: The media distribution unit (MDU) is used to transport media from the premises unit (PU) to the customer unit (CU). Its main functions include media receiving, media processing, media routing, media transmission, media forwarding and media replication.

3.2.9 media storage unit: The media storage unit (MSU) is used to retrieve, store media and provide media serving capability. Its main functions include media storage, media serving, media indexing and media downloading.

3.2.10 centre management unit: The centre management unit (CMU) is located at the centre of the visual surveillance (VS) system. Its main functions include centralized system management, service operation management, etc.

3.2.11 service control unit: The service control unit (SCU) is located at the centre of the visual surveillance (VS) system. It is distributed network equipment, fulfilling the access functions of the premises unit (PU) and the customer unit (CU). Its main functions include access registration, access authentication, identification, authorization, call control, location, presence and target media serving function selection.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

API Application Programming Interface

APP Application

C/S Client/Server

CIV Client Intelligent Video

CMU Centre Management Unit

CPU Central Processing Unit

CU Customer Unit

HTTP Hyper Text Transfer Protocol

ICU Intelligent Customer Unit

IPU Intelligent Premises Unit

IVM Intelligent Video Management

IVU Intelligent Video Unit

IVS Intelligent Visual Surveillance

MDU	Media Distribution Unit
MSU	Media Storage Unit
NTP	Network Time Protocol
OCX	OLE Control Extension
OLE	Object Linking and Embedding
OSD	On Screen Display
PIV	Premises Intelligent Video
PTZ	Pan/Tilt/Zoom
PU	Premises Unit
RTCP	Real-time Transport Control Protocol
RTP	Real-time Transport Protocol
RTSP	Real Time Streaming Protocol
SCU	Service Control Unit
SIP	Session Initiation Protocol
USB	Universal Serial Bus
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
VS	Visual Surveillance

5 Conventions

In this Recommendation, the following conventions apply:

The keywords "is required to" indicate a requirement which must be strictly followed and from which no deviation is permitted, if conformance to this Recommendation 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 "can optionally" indicate an optional requirement which is permissible, without implying any sense of being recommended.

6 Functional architecture

Figure 6-1 shows the composition of an intelligent visual surveillance system.

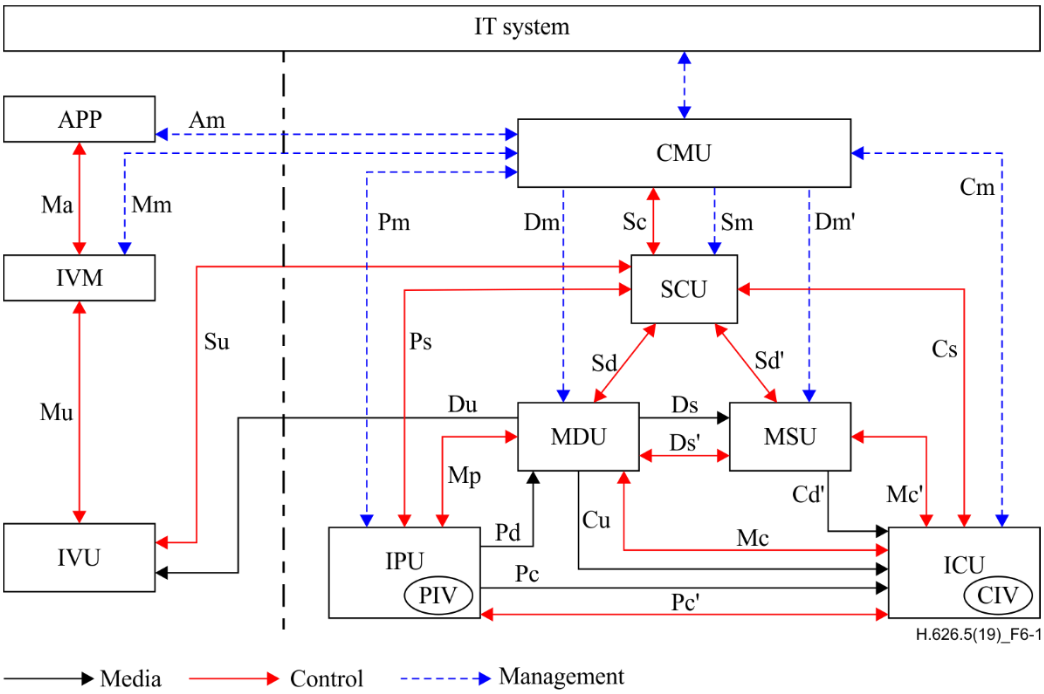

Figure 6-1 – Composition of an intelligent visual surveillance system

6.1 Functional architecture framework

The intelligent visual surveillance system is composed of the CMU, SCU, MDU, MSU, IVU, IVM, APP, ICU, IPU, PIV and CIV. The centre management unit (CMU), service control unit (SCU), media distribution unit (MDU) and media storage unit (MSU) are defined in [ITU-T H.626].

Intelligent video unit (IVU): The IVU performs the intelligent analysis automatically and outputs the analysis results to the IVM. The analysis information includes triggered event and acquired data. One or more intelligent analysis algorithms can be loaded or unloaded on IVU according to different requirements.

Intelligent video management (IVM): The IVM supports the strategies configuration of intelligent applications by users and video sources schedules dynamically. The IVM accepts registration, deletion and capability reports from the IVU and schedules IVUs dynamically. It can also store, manage and schedule those capabilities dynamically. IVM can be invoked by an intelligent application from the CMU.

APP: The application (APP) is a third-party data analysis system, which is used to configure analysis algorithms and strategies. The APP receives and analyzes data from the visual surveillance platform, whereas it sends alarm information to the visual surveillance platform if needed. With the consideration that alarm processing is mostly a heavy load function, it is consequently often stripped from the CMU to the third-party APP so as to make the function of the platform unit clear and extensible.

Intelligent customer unit (ICU): The ICU is the client subsystem within the intelligent visual surveillance system. The client intelligent video (CIV) is added to the CU in order to achieve comprehensive intelligent video analysis.

Intelligent premises unit (IPU): The IPU is the premise subsystem within the intelligent visual surveillance system.The PIV module is added to the PU for intelligent video analysis.

Premises intelligent video (PIV): The PIV is an intelligent identification module in the PU. It identifies required information from input video and outputs the analysis result. The PIV can search designated records from video files. The identifiable information includes triggered event and acquired data.

Client intelligent video (CIV): The CIV is an intelligent identification module in the CU. It identifies required information from the input video and outputs the analysis result. The CIV can search designated records from video files. The identifiable information includes triggered events and acaquired data.

6.2 Functional entities

6.2.1 Intelligent premises unit

Intelligent premises unit (IPU) is the premise subsystem within the intelligent visual surveillance system.

The IPU implements the following functions like a normal PU as defined in [ITU-T H.626], it:

– Captures multimedia information (such as audio, video, image, alarm signals, etc.) from the surveilled object.

– Encodes multimedia (audio, video and image) streams.

– Outputs alarm signals to an external linkage device.

– Parses pan/tilt/zoom (PTZ) commands and transmits them to the devices in order to control the camera.

– Provides network transportation and transmits bidirectional media streams and alarm signals to other entities.

The IPU also implements some additional functions for intelligent applications, it:

– Identifies required information from input videos and outputs analysis results.

– Reports the identified results such as triggered events and acquired data to the service platform.

Figure 6-2 shows the function modules of the IPU based on a PU as defined in [ITU-T H.626]. The premises intelligent video (PIV) module is the only new module to implement intelligent identification functions or corresponding operations.

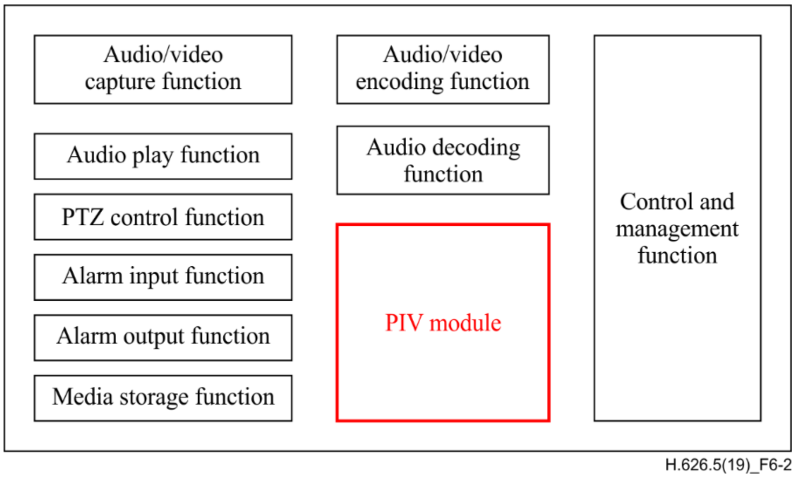

Figure 6-2 – Function modules of IPU

6.2.2 Intelligent customer unit

Intelligent customer unit (ICU) is the client subsystem within the intelligent visual surveillance system. It is used to present multimedia information (such as audio, video, image, alarm signal, etc.) to the end user and trigger the related actions.

It implements the following functions like a normal CU as defined in [ITU-T H.626]:

– Multimedia decoding function.

– Audio play and video/image display function.
– Console interface for end user to operate the VS system.

It also implements some additional functions for intelligent applications, including:

– Identifying required information from input video and outputting the analysis result.
– Retrieving the recorded video data with specified information.
– Reporting and presenting the analysis result to end users.

Figure 6-3 shows the function modules of the ICU based on the CU as defined in [ITU-T H.626]. The client intelligent video (CIV) module is the only new module to implement intelligent identification related functions.

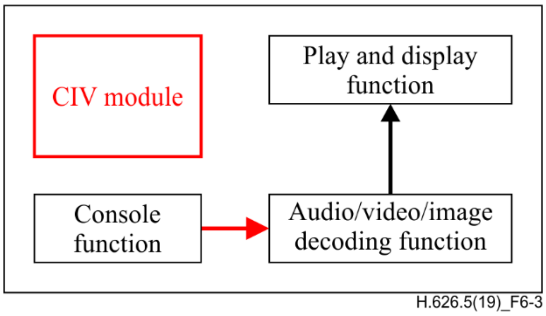

Figure 6-3 – Function modules of ICU

6.2.3 Intelligent video management

Intelligent video management (IVM) is the premise subsystem within the intelligent visual surveillance system. The IVM can be invoked by an intelligent application from the CMU and transfer the IVU address to the CMU.

The IVU implements some normal functions for intelligent application, including:

– Supports configuration of intelligent applications by users and video sources schedules dynamically.
– Accepts registration, deletion, capability report from IVU and schedules IVUs dynamically.
– Stores, manages and schedules IVU capabilities dynamically.
– Accepts intelligent capabilities querys from CMU and sends the response.
– Accepts intelligent strategies querys from CMU and sends the response.
– Supports the standard video streams.

It also implements some additional functions for intelligent applications, such as managing the IVU licenses using method such as USB keys and software keys.

6.2.4 Intelligent video unit

Intelligent video unit (IVU) is the premise subsystem within the intelligent visual surveillance system.

It implements some normal functions for intelligent applications to:

– Identify specific objects automatically and output recognition results to the IVM.
– Recognize information including triggered events and acquired data.
– Load or unload one or more intelligent analysis algorithms on IVU according to different requirements.
– Support the standard video stream transmition protocols, such as real time streaming protocol (RTSP) and session initiation protocol (SIP).

– Support acquiring video streams from the video surveillance platform using application programming interface (API).
– Support images analysis using hyper text transfer protocol (HTTP) protocol.

It also implements some additional functions for intelligent application, such as IVU capability extension and IVU virtualization.

6.3 Service function

6.3.1 IVU order and change

Users are recommended to order and change the category, supplier and capability of the IVU through the IVM.

6.3.2 IVU registration and configuration

The IVM is required to support strategic configuration of intelligent applications by users and video sources schedules dynamically. The IVM is required to accept registration, deletion and capability reports from IVU and schedule IVUs dynamically.

6.3.3 Task schedule

Users are recommended to manage intelligent analysis tasks such as query, start, pause and stop through the IVM.

6.3.4 Image and video acquisition

Users are recommended to acquire the device list and query the RTSP address of media streams. The IVU is recommended to load the local video or get media streams through the RTSP address from the video surveillance platform.

6.3.5 Intelligent event report

The IVU is required to identify specific objects automatically and output recognition results to the IVM. The recognition information includes triggered events and acquired data. One or more intelligent analysis algorithms are recommended to load or unload on the IVU according to different requirements.

6.3.6 Intelligent analysis result display

The IVU is recommended to send the intelligent analysis results to the APP. The APP displays the results using statistical charts, event-related video segments and so forth.

6.3.7 On screen display (OSD) parameters issuing

The CMU is recommended to send the designated text to the IPU to superimpose into the video.

6.4 Service management

6.4.1 IVM management

The IVM supports strategic configuration of intelligent applications by users and video sources schedules dynamically. The IVM is required to accept registration, deletion and capability reports from the IVU and schedule the IVU dynamically. The IVM is required to store, manage and schedule those capabilities dynamically. The IVM can optionally be invoked by an intelligent application from the CMU and check the validity of the IVU.

6.4.2 IVU management

The IVU is required to send capability lists and status to the IVM. The IVS system is required to have the ability to load new algorithms to the IVU, such as items left behind detection (to detect dangerous and suspicious items in a certain area), item preservation (to guard certain items from being moved), license plate recognition, etc.

The IVU is required to provide at least two types of algorithm parameter configurations for administrators and end users. The administrator configuration is used to start a service, which requires the configuration of the initial scene and advanced parameters, as well as other professional operations. The end user configuration is used to set or change speific rules under a fixed scene.

The configuration is required to be easy and convenient. Object linking and embedding control extension (OCX) controls are recommended in forms of web and C/S clients.

6.4.3 Network management

The IVS is required to manage the intelligent analysis and the central processing unit (CPU) resources. The IVM is required to have the ability to provide the network time protocol (NTP) clock synchronization service to the IVU.

The IVS system is recommended to classify users into several levels. Users of different levels have different operation rights. High-level users have more operation privileges than low-level ones. Low-level users can do basic operations while high-level users can do both basic and advanced operations.

6.4.4 Remote upgrade

The IVU is recommended to upgrate the software remotely at regular intervals.

7 Service control flow and signalling

7.1 Registration

7.1.1 IPU registration

Figure 7-1 shows the flow for IPU registration.

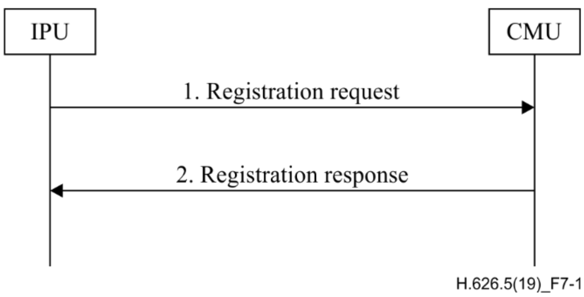

Figure 7-1 – Flow for IPU registration

Step 1: The IPU sends a registration request to the CMU.

Step 2: The CMU sends a registration response to the IPU including result with status code.

7.1.2 IVU registration

Figure 7-2 shows the flow for IVU registration.

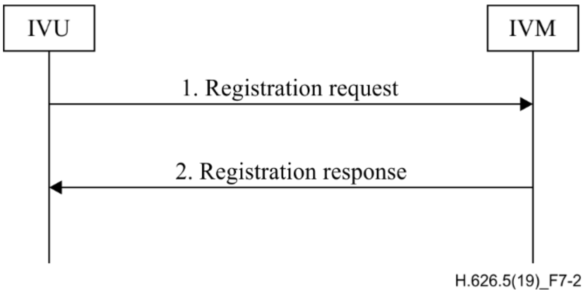

Figure 7-2 – Flow for IVU registration

Step 1: The IVU sends a registration request to the IVM.

Step 2: The IVM sends a registration response to the IVU including the result with status code.

7.1.3 ICU registration

Figure 7-3 shows the flow for ICU registration.

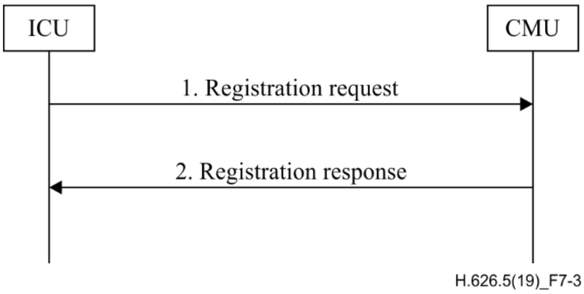

Figure 7-3 – Flow for ICU registration

Step 1: The ICU sends a registration request to the CMU.

Step 2: The CMU sends a registration response to the ICU including the result with status code.

7.2 IVU keep-alive

Figure 7-4 shows the flow for IVU keep-alive.

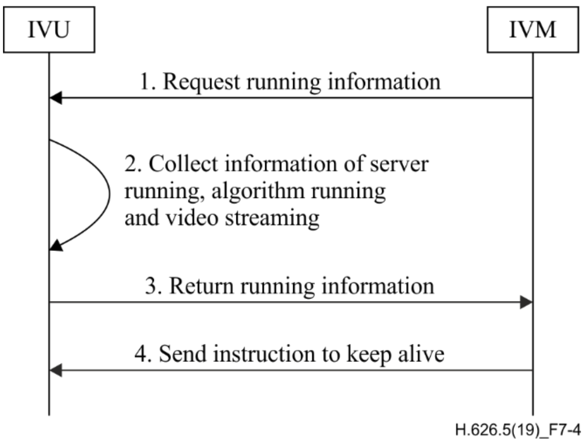

Figure 7-4 – Flow for IVU keep-alive

Step 1: The IVM sends a running information request to the IVU.

Step 2: The IVU collects information of server running, algorithm running and video streams

Step 3: The IVU sends a running information response to the IVM.

Step 4: The IVM sends a keep-alive instruction to the IVU.

7.3 IVU logout

Figure 7-5 shows the flow for IVU logout.

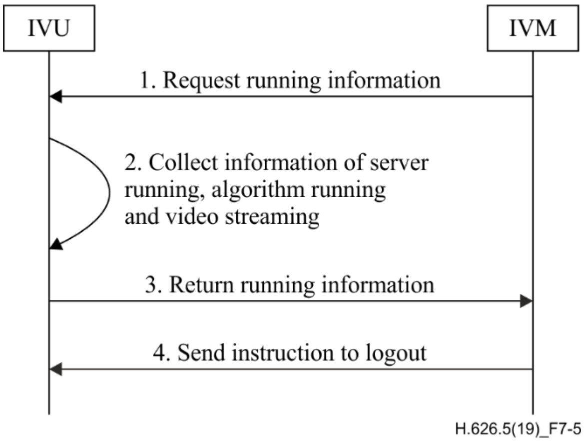

Figure 7-5 – Flow for IVU logout

Step 1: The IVM sends a running information request to the IVU.

Step 2: The IVU collects information of server running, algorithm running and video streams.

Step 3: The IVU sends a running information response to the IVM.

Step 4: The IVM sends a logout instruction to the IVU.

7.4 Configuration

7.4.1 IPU configuration

Figure 7-6 shows the flow for IPU configuration.

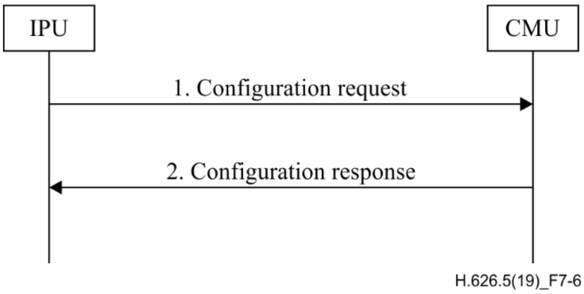

Figure 7-6 – Flow for IPU configuration

Step 1: The IPU sends a configuration request to the CMU.

Step 2: The CMU sends a configuration response to the IPU including the result with status code and controls of algorithm parameter configuration.

7.4.2 IVU configuration

Figure 7-7 shows the flow for IVU configuration.

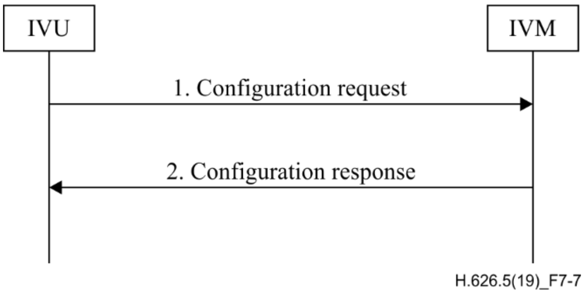

Figure 7-7 – Flow for IVU configuration

Step 1: The IVU sends a configuration request to the IVM.

Step 2: The IVM sends a configuration response to the IVU including the result with status code and controls of algorithm parameter configuration.

7.4.3 ICU configuration

Figure 7-8 shows the flow for ICU configuration

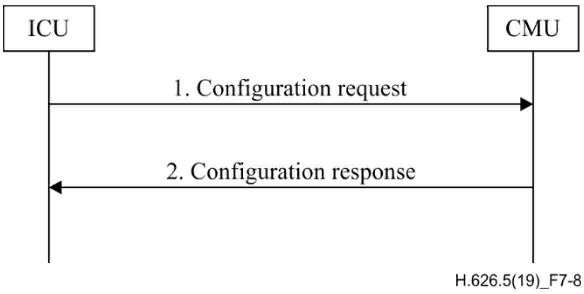

Figure 7-8 – Flow for ICU configuration

Step 1: The ICU sends a configuration request to the CMU.

Step 2: The CMU sends a configuration response to the ICU including the result with status code and controls of algorithm parameter configuration.

7.5 IVU calling

7.5.1 Start IVU manually

Figure 7-9 shows the flow for starting IVU manually.

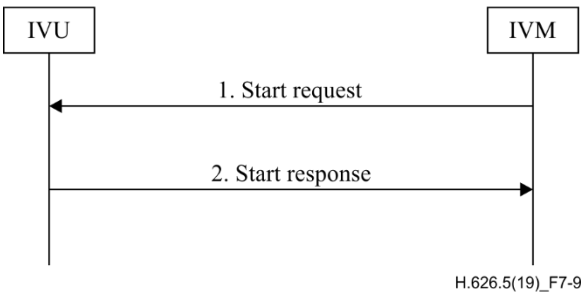

Figure 7-9 – Flow for starting IVU manually

Step 1: The IVM sends a start request to the IVU.

Step 2: The IVU starts intelligent analysis tasks and sends a response to the IVM including the result with status code.

7.5.2 Stop IVU manually

Figure 7-10 shows the flow for stop IVU manually.

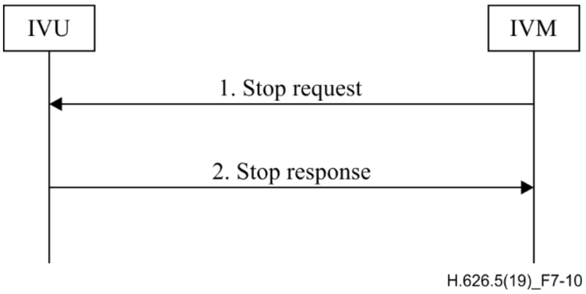

Figure 7-10 – Flow for stop IVU manually

Step 1: The IVM sends a stop request to the IVU.

Step 2: The IVU stops tasks and sends a response to the IVM including the result with status code.

7.5.3 Start IVU by event trigger

Figure 7-11 shows the flow for starting IVU by event trigger.

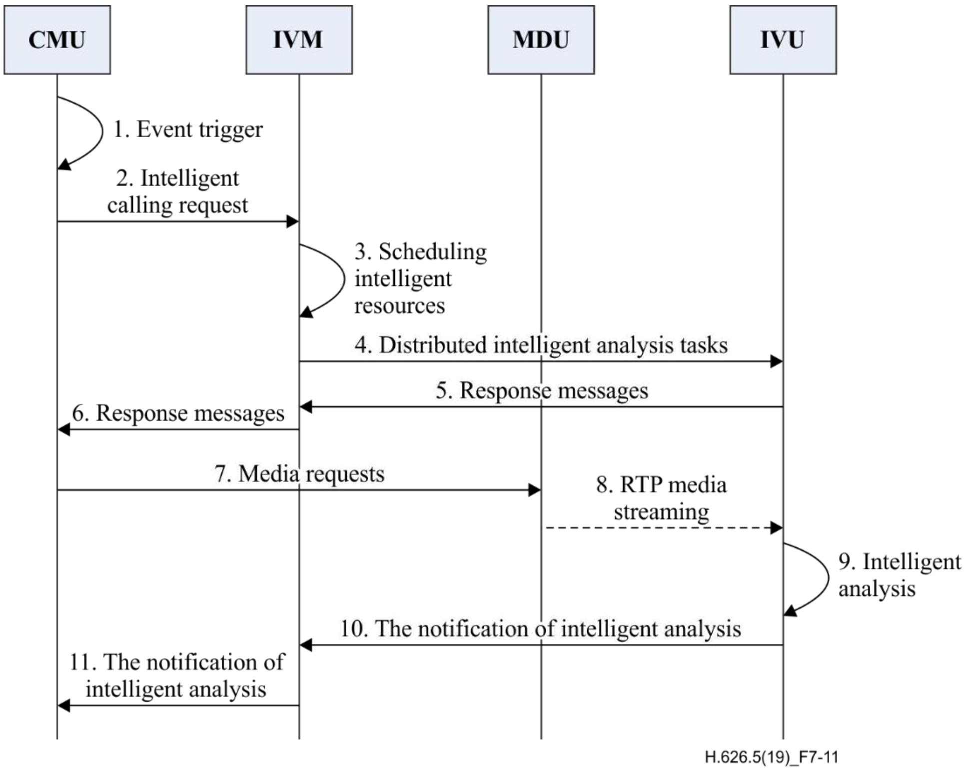

Figure 7-11 – Flow for starting IVU by event trigger

Step 1: The event triggers the CMU to start.

Step 2: The CMU sends intelligent calling requests to the IVM.

Step 3: The IVM schedules the intelligent resources.

Step 4: The IVM distributes the intelligent analysis tasks to the IVU.

Step 5: The IVU sends response messages to the IVM.

Step 6: The IVM sends response messages to the CMU.

Step 7: The CMU sends media requests to the MDU.

Step 8: The MDU sends RTP media streams to the IVU.

Step 9: The IVU does intelligent analysis.

Step 10: The IVU sends the notification of intelligent analysis starting to the IVM simultaneously.

Step 11: The IVM sends the notification of intelligent analysis to the CMU.

7.5.4 Stop IVU by event trigger

Figure 7-12 shows the flow for stopping IVU by event trigger.

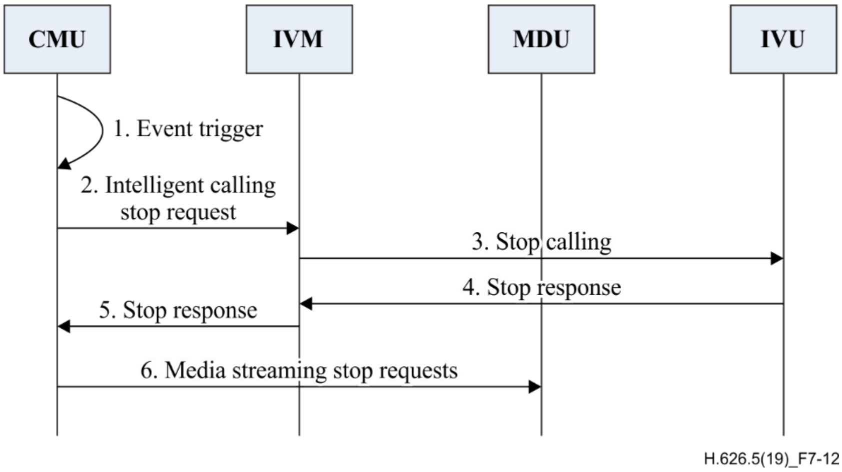

Figure 7-12 – Flow for stopping IVU by event trigger

Step 1: The event triggers the CMU to start.

Step 2: The CMU sends intelligent calling stop requests to the IVM.

Step 3: The IVM sends stop calling requests to the IVU.

Step 4: The IVU sends stop response messages to the IVM.

Step 5: The IVM sends stop response messages to the CMU.

Step 6: The CMU sends the media streams stop requests.

7.6 Intelligent event report

7.6.1 IVU report intelligent event

Figure 7-13 shows the flow for IVU reporting intelligent event.

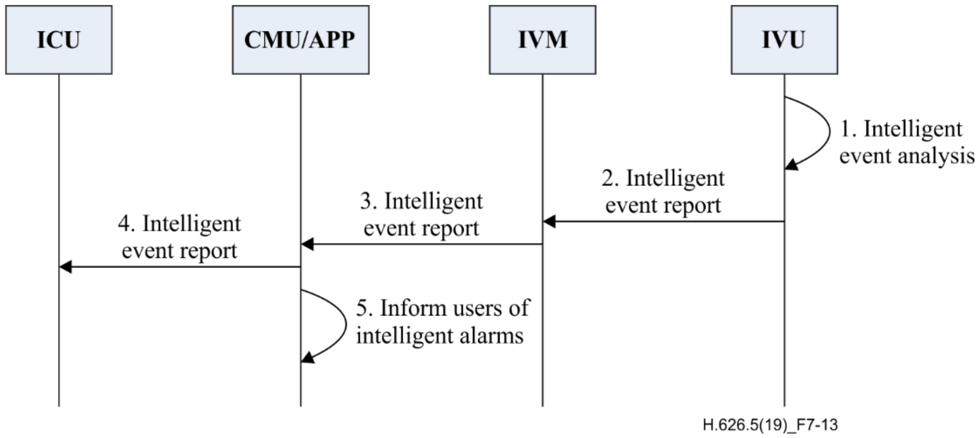

Figure 7-13 – Flow for IVU reporting intelligent event

Step 1: The IVU receives intelligent event results and stores them.

Step 2: The IVU reports intelligent event to the IVM.

Step 3: The IVM reports intelligent event to the CMU/APP.

Step 4: The CMU/APP reports intelligent event to the ICU.

Step 5: The CMU/APP informs users of intelligent alarms, informs of alarm light or alarm call, etc.

7.6.2 IPU report intelligent event

Figure 7-14 shows the flow for IPU reporting intelligent event.

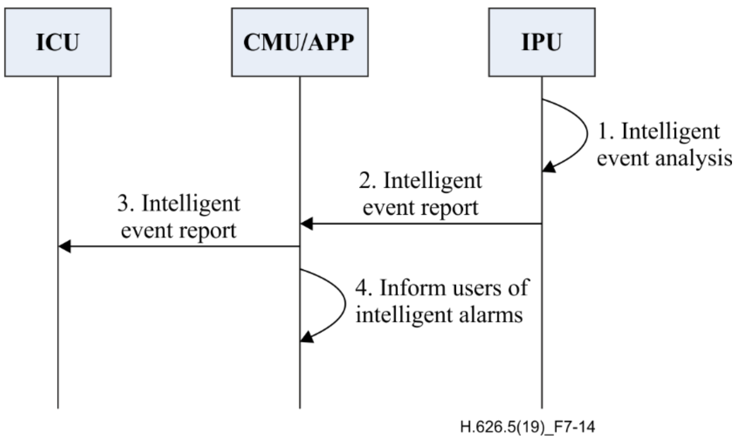

Figure 7-14 – Flow for IPU reporting intelligent event

Step 1: The IPU receives intelligent event results and stores them.

Step 2: The IPU reports intelligent event to the CMU/APP.

Step 3: The CMU/APP reports intelligent event to the ICU.

Step 4: The CMU/APP informs users of intelligent alarms, informs of alarm light and alarm call, etc.

7.7 OSD parameters issuing to IPU

7.7.1 Issuing procedure

Figure 7-15 shows the flow for issuing procedure.

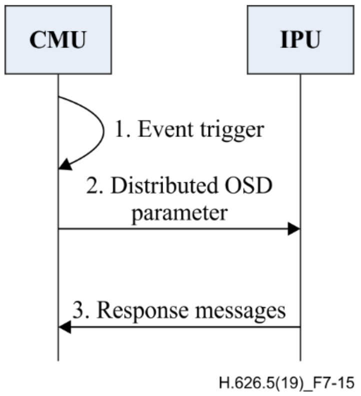

Figure 7-15 – Flow for issuing procedure

Step 1: The event triggers the CMU to start.

Step 2: The CMU distributes the OSD parameters to the IPU.

Step 3: The IPU sends response to the CMU.

7.7.2 OSD parameters profile

It adopts standard SIP protocol.

When an alarm of an intelligent event is triggered, the platform sends the designated text to the IPU to superimpose onto the video, it adopts the SIP RFC 3428 protocol.

The body of the XML message is as follows:

```
<?xml version="1.0" encoding="UTF-8" ?>
<Message Verison="1.0">
<IE_HEADER MessageType="MSG_OSD_PARAMETER"
     />
<!—IPU OSD parameter>
     < IE_IPU  PUID = "IPU No.">
       < IE_OSD  Parameter= "OSD parameter"
          ChannelName = " Channel Name "
          ChannelType = " Channel Type "
          VideoChannelNo = " Video Channel No. "
          OSD = "Message showed"
          OSDx =" The upper left corner of the screen is defined as the origin
          of coordinates, The X range is 0-1000,The IPU should be mapped
          according to the current resolution"
          OSDy =" The upper left corner of the screen is defined as the origin
          of coordinates, The Y range is 0-1000,The IPU should be mapped
          according to the current resolution"
       />
     </IE_IPU>
</Message>
```

8 Reference points

8.1 Reference point Pm: IPU – CMU

The reference point Pm is located between the IPU and the CMU. It is used for the following functions:

– For the IPU to make the registration to the CMU.

– For the IPU to report the identified results such as event trigger information or data acquisition information to the CMU.

– For the CMU to manage the IPU.

– For the CMU to query the running status of IPU.

– For the CMU to configure parameters and to upgrade the software version.

8.2 Reference point Ps: IPU – SCU

The reference point Ps is located between the IPU and the SCU. It is used for the following functions:

– For the IPU to report the identified result such as event triggers information or data acquisition information to the SCU.

– For the SCU to control the service of the IPU, to control the alarm and linkage action, media acquisition, instant image snapshot, recording and playback and voice (audio) communication

– For the SCU to manage the IPU device, to query running status of IPU devices, to configure parameters, to upgrade software version and to control PTZ by forwarding PTZ control operation commands and return result.

8.3 Reference point Pd/Mp: IPU – MDU

The reference points Pd and Mp are between the IPU and the MDU.

– Mp is used for the MDU to send requests of the video, audio and image to the IPU.

– Mp is used for the MDU and the IPU to support the recording in the service platform.

– Pd is used for the MDU and the IPU to send voice and audio streams.

8.4 Reference point Pc/Pc': IPU – ICU

The reference points Pc and Pc' are between the IPU and the ICU.

– Pc' is used to deliver interaction signals directly between the IPU and the ICU (such as an RTSP request or response).

– Pc is used to directly deliver media streams from the IPU to the ICU.

8.5 Reference point Cm: ICU – CMU

The reference point Cm is between the ICU and the CMU. It is used to:

– Send the user authentication request from the ICU to the CMU and return the authentication result.

– Acquire the IPU list that the user has been authorized to access and the configuration information of the specified IPU, the alarm information, the status information and the platform video storage information.

It uses the HTTP+XML protocol.

8.6 Reference point Cs: ICU – SCU

The reference point Cs is between the ICU and SCU. It is used for the ICU to:

– Send the real-time audio and video call request to the IPU through the SCU.

– Send the PTZ control request to the IPU through the SCU.

– Send retrieval request of the front-end storage video and pictures to the IPU through the SCU.

– Send parameter queries and setup requests to the IPU through the SCU.

It uses the SIP protocol.

8.7 Reference point Cu/Mc: ICU – MDU

The reference points Cu and Mc are between the ICU and the MDU.

– Cu is used for the ICU to acquire audio and video streams from the MDU through the RTP/RTCP protocol.

– Mc is used to send UDP private network packets to the MDU and acquire RTP/RTCP packets from the MDU through the TCP protocol.

8.8 Reference point Cd'/Mc': ICU – MSU

The reference points Cd' and Mc' are between the ICU and the MSU.

– Mc' is used to send storage video request from the ICU to MSU and drag, fast forward and control the play speed of video through RTSP protocol.

– Cd' is used to transmit media streams from MSU to the ICU through RTP/RTCP protocol.

8.9 Reference point Su: IVU – SCU

The reference point Su is between the IVU and the SCU. It is used for the ICU to:

– Send real-time audio and video requests to the IPU through the SCU.

– Send video storage and video requests to the IPU through the SCU.

It uses the SIP protocol.

8.10 Reference point Du: IVU – MDU

The reference point Du is between the IVU and the MDU. It is used for the IVU to:

– Acquire video and audio streams from the MDU through RTP/RTCP protocol.

– Send UDP private network packets to the MDU.

– Acquire RTP/RTCP packet from the MDU in the TCP mode.

8.11 Reference point Mu: IVU – IVM

The reference point Mu is between the IVU and the IVM. It is used to:

– Send the user request of an intelligence analysis task from the IVM to the IVU.

– Report the results of the intelligent analysis from the IVU to the IVM.

– Report the status of the intelligence analysis task from the IVU to the IVM.

– Report the intelligence analysis capabilities and resource usage status from the IVU to the IVM.

8.12 Reference point Mm: IVM – CMU

The reference point Mm is between the IVM and the CMU. It is used to:

– Send the user request of an intelligence analysis task from the CMU to the IVM.

– Report the result of the intelligent analysis from the IVM to the CMU.

– Report the status of the intelligence analysis task from the IVM to the CMU.

It uses the HTTP+XML protocol.

8.13 Reference point Ma: IVM – APP

The reference point Ma is between the IVM and the APP. It is used to:

– Send the user request of an intelligence analysis task from the APP to the IVM.

– Report the results of the intelligent analysis from the IVM to the APP.

– Report the status of the intelligence analysis task from the IVM to the APP.

It uses the HTTP+XML protocol.

8.14 Reference point Am: APP – CMU

The reference point Am is between the APP and the CMU. It is used for the APP to:

- Send the user authentication request from the APP to the CMU and return the authentication result.
- Acquire the IPU list that the user has been authorized to access, the configuration information of the specified IPU, the alarm information, the status information and the platform video storage information.

It uses the HTTP+XML protocol.

Bibliography

[b-ITU-T Y.101] Recommendation ITU-T Y.101 (2000), *Global Information Infrastructure terminology: Terms and definitions*.

[b-ITU-T Y.2012] Recommendation ITU-T Y.2012 (2010), *Functional requirements and architecture of next generation networks*.

[b-IETF RFC 768] IETF RFC 768 (1980), *User Datagram Protocol*.

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

SERIES OF ITU-T RECOMMENDATIONS

Series A	Organization of the work of ITU-T
Series D	Tariff and accounting principles and international telecommunication/ICT economic and policy issues
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	Environment and ICTs, climate change, e-waste, energy efficiency; 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	Telephone transmission quality, telephone installations, local line networks
Series Q	Switching and signalling, and associated measurements and tests
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, next-generation networks, Internet of Things and smart cities
Series Z	Languages and general software aspects for telecommunication systems

Printed in Switzerland
Geneva, 2019