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SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

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

Architecture for a point-to-point visual surveillance system

Recommendation ITU-T H.626.4

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Recommendation ITU-T H.626.4

Architecture for a point-to-point visual surveillance system

Summary

Recommendation ITU-T H.626.4 defines the architecture of a P2P visual surveillance system, including its functional requirements, functional architecture, entities, service flows and interfaces. This is a type of visual surveillance system, which provides a way for users to access video streams directly from cameras through a network, without transferring video streams via a visual surveillance platform.

History

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Recommendation ITU-T H.626.4

Architecture for a point-to-point visual surveillance system

1 Scope

The visual surveillance service is a telecommunication service focusing on video (including audio) application technology, which is used to capture multimedia (such as audio, video, image and various alarm signal) and present them to end users in a user-friendly manner, based on a managed broadband network with ensured quality, security and reliability.

P2P visual surveillance is a type of video surveillance (VS) system, which provides a way for users to access video streams directly from cameras through the Internet, without transferring any video streams via the VS platform.

This Recommendation focuses on the architecture of a P2P visual surveillance system, including its functional requirements, functional architecture, entities, service flows and interfaces.

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 G.711] Recommendation ITU-T G.711 (1988), *Pulse code modulation (PCM) of voice frequencies*.
- [ITU-T G.722] Recommendation ITU-T G.722 (2012), *7 kHz audio-coding within 64 kbit/s*.
- [ITU-T H.264] Recommendation ITU-T H.264 (2017), *Advanced video coding for generic audiovisual services*.
- [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 customer unit** [b-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.
- 3.1.3 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.

NOTE 1 – The functional entities can be used to describe a set of reference configurations. These reference configurations identify which reference points are visible at the boundaries of equipment implementation and between administrative domains.

NOTE 2 – The definition is not only applicable to NGNs, but also to other IP packet switch based networks.

3.1.4 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.

3.1.5 interface [b-ITU-T Y.101]: A shared boundary between two functional units.

NOTE – An interface is defined by various characteristics pertaining to the functions, physical interconnections, signal exchanges and other characteristics as appropriate.

3.1.6 mobile customer unit [b-ITU-T H.626.1]: Mobile client software installed in customers' mobile devices. It is used to initiate the service and provide customers with video viewing.

3.1.7 premises unit [b-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 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.

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

3.1.10 service platform [b-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, control and management functions.

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

3.1.12 visual surveillance [b-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 a 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 centre management unit: The centre management unit is located at the centre of the P2P visual surveillance system. Its main functions include a centralized system management, service operation management, etc.

3.2.2 media transmission unit: The media transmission unit is located at the centre of the P2P visual surveillance system. It is used to transport media from the premises unit (PU) to the customer unit \ mobile customer unit (CUM_CU), when the P2P communication channel fails. It assists the media stream from the PU to traverse the private network to the CU; its main functions include media receiving, media processing, media routing, media transmission, media forwarding, etc.

3.2.3 mobile customer unit: A mobile device is 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.

3.2.4 P2P visual surveillance system: The P2P visual surveillance system is a new type of video surveillance system, which provides a way for users to access video streams directly from P2P cameras via networks, without transferring video streams by the visual surveillance platform.

3.2.5 service control unit: The service control unit is located at the centre of the P2P visual surveillance system. It is distributed network equipment, fulfilling access of the premises unit (PU), network video recorder (NVR), customer unit (CU) and mobile customer unit (M_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:

AAA	Authentication, Authorization and Accounting
CIF	Common Intermediate Format
CMU	Centre Management Unit
CRM	Customer Relationship Management
CU	Customer Unit
IP	Internet Protocol
IPC	Internet Protocol Camera
LAN	Local Area Network
M_CU	Mobile Customer Unit
MTU	Media Transmission Unit
NAT	Network Address Translator
NVR	Network Video Recorder
P2P	Point-to-Point
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
SD card	Secure Digital memory card
SMS	Short Message Service
STUN	Simple Traversal of UDP over NATs
TCP	Transmission Control Protocol
TURN	Traversal Using Relay NAT
URL	Uniform Resource Locator
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 that is permissible, without implying any sense of being recommended.

6 Functional requirements

6.1 Service requirements

6.1.1 Self-service of users

The user is required to register services using a mobile phone number, and a specified camera is assigned to the user's account, after the service has been approved by the telecommunication operator.

6.1.2 Plug and play

The system is required to connect the user to cameras through the internet directly, without any extra configurations for equipment, achieving the goal of zero configurations.

6.1.3 Diversified custom terminal devices

It is required to support a variety of terminal devices, including mobile phones, tablets and personal computers. A requirement for users is the ability to watch real-time video at anytime and anywhere, and with several choices of video formats, CIF, D1 and 720P for instance. The frame rate varies from 1 to 25 fps.

6.1.4 PTZ operation (optional)

It is recommended to support the ability to tilt the camera and zoom it in and out remotely over the CU/M_CU.

6.1.5 Night vision (optional)

The built-in infrared lamp is recommended to increase the light and then enhance the video resolution under low illumination environments, especially in the dark night scenario.

6.1.6 Video record and playback on SD card (optional)

It is recommended to support video storage, searching and playback on SD card. The record strategy is also configurable remotely.

6.1.7 Video record and playback on NVR

It is required to support video record on the NVR which is bound to a specified IPC. It is also required to support the record strategy setting and recorded video playback on the CU. The video files can be exported from the NVR, and they can be played quickly, slowly and reversely, even at the speed of one frame per second.

6.1.8 Audio intercommunication

The system is recommended to allow users to talk to each other, between the CU/M_CU and the IPC.

6.1.9 Alarm messaging

The system is recommended to send alarm messages to users' mobile phones, relating to events such as log in/out, full storage and IPC offline, etc. The content of messages can be set over the CU.

6.1.10 Video sharing

The system is recommended to allow users to share the surveillance video to its sub account.

6.1.11 Unified wireless LAN configuration

It is recommended to allow users to set the wireless LAN over the unified wireless LAN configuration interface in the CU/M_CU conveniently, or switch to another wireless LAN.

6.1.12 Fixed timing snapshot

The IPC is recommended to support image snapshots and send them to the specified phone according to given timings set by users.

6.1.13 Cloud storage

It is recommended to transfer and store, search and playback the video in the remote cloud storage. Users are recommended to pay for extra cloud storage, given that some fixed storage space is free.

6.1.14 Network management

It is required to support management of the IPCs, storage devices and network failures.

6.2 Platform requirements

- A portal is provided for users to access services such as self-service, video browsing, recorded video search and playback, alarm and IPC configuration. The portal also has functions of advertising and IPC subscribing.
- A portal is provided for administrators from telecommunication operators to access functions such as equipment management, user management, vendor management, system configuration, device remote upgrade, log management, statistics and report.
- The M_CU is required to access the platform.
- The system is required to interwork with cloud storage systems.
- An interface with an SMS gateway is required to be provided.
- The system is required to interwork with a CRM for user authentication and verification.

6.3 CU/M_CU requirements

6.3.1 M_CU

The M_CU supports:

- user login;
- displaying whether camera status is online or offline;
- real-time video browsing based on RTSP, RTP/RTCP over TCP;
- PTZ operation;
- instant image snapshot over M_CU;
- local record of video;
- audio and video simultaneously;
- remote setting of wireless LAN which an IPC connects to.

6.3.2 Web client

The web client supports:

- video based on standard codec including ITU-T H.264 and audio based on standard codec, including ITU-T G.711 and ITU-T G.722;
- user login;
- network control with digital signature, which upgrades to the latest versions automatically;
- PTZ operation;