International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

F.743

(12/2009)

SERIES F: NON-TELEPHONE TELECOMMUNICATION SERVICES

Audiovisual services

Requirements and service description for visual surveillance

Recommendation ITU-T F.743

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Recommendation ITU-T F.743

Requirements and service description for visual surveillance

Summary

The purpose of Recommendation ITU-T F.743 is to define a visual surveillance service based on IP networks. The visual surveillance service provides the display and storage of the video captured by multiple remote cameras over an IP network for multiple users. It also provides other functionalities such as remote control and alarming. This Recommendation provides the service description, a brief functional model, application scenarios and requirements for the visual surveillance service. The requirements for the visual surveillance service are derived from the scenarios of different applications that a visual surveillance service can support. Therefore, the service requirements meet the needs of different kinds of users and enables interoperability among visual surveillance systems of different telecom operators and units of different vendors.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T F.743	2009-12-14	16

Keywords

Alarming, camera, IP, remote control, visual surveillance.

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.

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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/.

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Requirements and service description for visual surveillance

1 Scope

This Recommendation describes the visual surveillance system framework, service scenarios and specific service requirements which pertain to visual surveillance It fits within the framework of multimedia services defined by [ITU-T F.700], [ITU-T F.701] and [ITU-T F.702].

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.700] Recommendation ITU-T F.700 (2000), *Framework Recommendation for multimedia services*.

[ITU-T F.701] Recommendation ITU-T F.701 (2000), *Guideline Recommendation for identifying multimedia service requirements*.

[ITU-T F.702] Recommendation ITU-T F.702 (1996), *Multimedia conference services*.

3 Definitions

3.1 Terms defined elsewhere

None.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 closed user group: An aggregation of some users within which each user can do some special operations with others, such as sharing resources.

3.2.2 customer unit: A device located at the customer part of a visual surveillance system and used to present multimedia information (such as audio, video, image, alarm signals, etc.) to the end user.

3.2.3 premises unit: 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.

3.2.4 surveilled object: The target (such as site, human, and related environment) which is surveilled.

3.2.5 unique media ID: An identifier that identifies or names a media resource in a visual surveillance system.

3.2.6 visual surveillance: A telecommunication service focusing on video (but including audio) application technology, which is used to remotely capture multimedia (such as audio, video, image,

alarm signals, etc.) and present them to the end user in a friendly manner, based on a managed broadband network with quality, security and reliability ensured.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

CU Customer Unit

DRM Digital Rights Management

EPG Electronic Programme Guide

GIS Geographic Information System

GPS Global Positioning System

IM Instant Messaging

PC Personal Computer

PSTN Public Switched Telephone Network

PTZ Pan/Tilt/Zoom

PU Premises Unit

QoE Quality of Experience

QoS Quality of Service

SMS Short Message Service

VoD Video on Demand

VS Visual Surveillance

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 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. 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 to this Recommendation.

6 Prose description

Visual surveillance can provide real-time surveilled video from one or more cameras possibly located in large, complex and spatially distributed regions; hence, users can monitor and analyze remote sites. Further, the surveilled video can be recorded for replaying.

Visual surveillance systems connect users and premises units with cameras and other assistant functions by various access networks. Surveilled media flow can be delivered to any specified user terminal. Users can get surveilled video in any place whenever accessible.

The surveilled video is mainly delivered from surveilled sites or from a system platform to users in one direction; however, audio flow may be bidirectionally delivered for instant communication.

Premises units can be remotely controlled for the purposes such as object detection and recognition.

External alarm information can be directly introduced to the visual surveillance platform or by the premises unit. The system may also generate alarm information as a result of automated intelligent analysis. All alarm information should be processed by the system in time with operations such as triggered recording, sending notice to users and so on.

Figure 1 shows a simple visual surveillance system functional model.

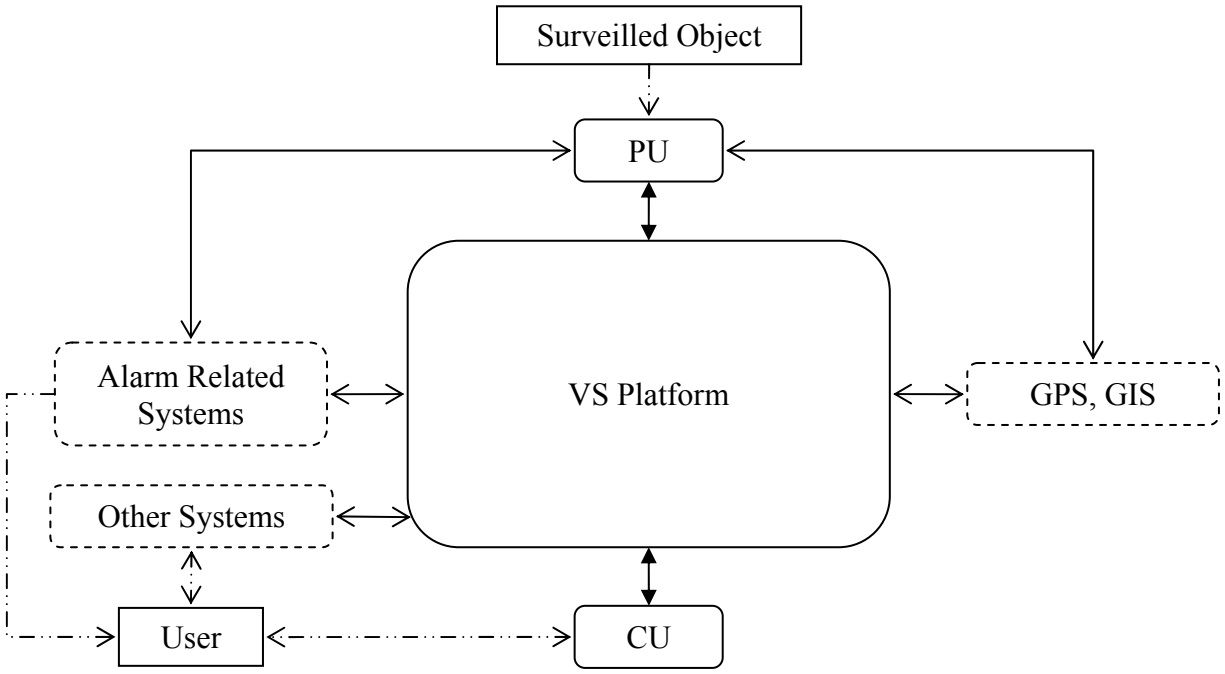

Figure 1 – VS system model

A visual surveillance service system consists of premises units (PUs), a VS platform and customer units (CUs). A PU is located at a surveilled site to collect video, audio, alarm signals and other information, which can be conveyed to the VS platform and is transmitted, delivered, stored or processed by the VS platform. VS service subscribers (or users) watch the video, control the PUs remotely, and receive alarm information via CUs wherever accessible.

PUs and CUs can access the VS system via a fixed or a mobile network.

A VS system may interwork with other systems or units such as alarm related systems, GPS, GIS, IPTV, video conference, PSTN, SMS, 3G, e-mail, IM systems, and so on. These systems are denoted by dashed rectangles in Figure 1. The alarm related systems can collect alarm signals and execute corresponding operations.

7 Scenarios

This clause describes typical service scenarios illustrating the visual surveillance service and deriving its service requirements.

7.1 Real-time surveillance

7.1.1 Scenario 1

Bob has subscribed to the VS service. Alice is Bob's wife. Bob, John and Smith are good friends.

Step 1: Bob logs into the VS system via his PC in his office. There is a camera list on the left side of the screen, which displays detailed information for each camera that Bob can access. On the right side of the screen, an electronic map of Bob's house is displayed, which can be zoomed in or zoomed out. Each camera is marked on this map. When Bob clicks a camera, a surveillance window which can be resized appears on the screen. There are also subtitles at the bottom of the surveillance window, displaying the current time, the name of the surveilled site and other information.

Step 2: While watching the surveillance video, Bob can save the current view as a still picture or begin to record the video at any time. The system will prompt Bob when he runs out of storage.

Step 3: Bob is not satisfied with the current position of the camera, so he clicks the direction buttons on the screen to pan/tilt/zoom (PTZ) the camera to meet his need. As Bob feels that some positions are used frequently, he saves them into the profile. Each of these positions is called a preset position. When a preset position is selected, the camera is panned/tilted/zoomed to that position. In addition, when Bob feels that the video is not bright enough, he turns on the auxiliary light near the camera by clicking the appropriate button on the screen.

Step 4: Meanwhile, Alice is accessing the same camera via her mobile phone. Alice is enabled to operate the PTZ control of this camera remotely as well as Bob. However, since only one user can pan/tilt/zoom the camera at one time, and Bob is now operating the PTZ control, Alice can only watch the video rather than control the camera. When Bob stops controlling, Alice begins to control the camera in the manner as Bob did.

Step 5: Bob, John and Smith want to share their cameras installed in their gardens, so they apply the VS system for a closed user group. Bob is the sponsor and organizer of this closed user group. After the group is created, Bob invites John and Smith to the group, and they accept Bob's invitation. Finally, they set their garden cameras "shared within closed user group". Now, they can mutually visit each other's garden cameras.

Step 6: In order to acquaint the citizens with up-to-date traffic conditions, a number of public cameras are installed on the streets. People can visit those cameras via the VS system. One day, Bob is going to go out. He wants to watch the traffic conditions of some streets simultaneously to help him decide the best route. Bob selects the multi-window mode, and then the screen is divided into several non-overlapped windows, with each window displaying a certain surveillance video. At the same time, many other users are visiting the public cameras as well as Bob. Hence, there are a lot of cameras, and each one of them may be visited by many users simultaneously.

Step 7: Bob wants to monitor 16 sites simultaneously. But he does not want each window to be too small, so he divides the screen into only four windows. In order not to select cameras continually, Bob decides to set his terminal to the "PATROL" mode. He selects a list of cameras, arranges them, and lets them enter the "PATROL" mode. As a result, the VS system automatically switches the current four surveillance windows to the subsequent four sites periodically and circularly. When Bob wants to watch the current sites for more time, he presses the "PAUSE PATROL" button. Then the system stops switching until Bob presses the "CONTINUE PATROL" button.

7.1.2 Scenario 2

Tom and his wife have to work in the office on Sunday; they leave their son at home alone. Their son is so young that they are worried about him. So Tom subscribed to the VS service in order to watch his son from anywhere.

Step 1: The VS system collects video and audio from Tom's house and Tom can receive this data via his terminal in the office. Usually, only the audio streaming is requested because it requires less bandwidth.

Step 2: The VS system will automatically detect abnormalities with the help of video and audio analysis, whereby video streaming is immediately requested in order to know what is happening. One day the VS system detects Tom's son crying, then video streaming is immediately requested.

Tom can know what his son is doing at any moment without having to constantly watch the monitoring screens.

7.2 Recording and alarming

Camera c2 is enabled to receive alarm signals. It is accompanied with an infrared sensor and a smog sensor.

The building where Bob resides is equipped with fire-extinguishing devices, which are connected to the VS system via standard interfaces.

Step 1: Bob sets his camera c1 to "Time-triggered Recording" mode with the start and end time designated, and sets his cameras c2 to "Alarm-triggered Recording" mode with the recording duration designated. When it is time to start recording, the VS system starts recording from the c1 camera. When it is time to stop recording, the VS system stops recording from the c1 camera.

Step 2: One day, there is no one in Bob's home. A candle is still burning due to Bob's carelessness. It is detected by the sensors related to camera c2. An alarm signal is transferred to the VS system. According to the information of camera c2, the VS system starts up the related fire-extinguisher to extinguish the burning candle. At the same time, an alarm message is sent to Bob via the mobile short message service.

Step 3: The VS system provides various ways to search for recorded video according to start time, duration, surveilled sites and/or the types of recording, etc. Bob searches for the records which were triggered by the alarm within the last three days. One record is found as a result.

Step 4: Bob chooses to watch the recorded video. It is very similar to watching a VoD programme. Besides the video, there is some detailed information on the screen such as the name of the surveilled object, recording start time, the kind of recording, etc. Bob can play in normal speed or fast forward/backward, pause, seek for specified position, stop, etc. Meanwhile, Bob's current action is written to the system log.

7.3 Convergence of the VS service and other services

7.3.1 Convergence of VS and sensor networks

Mike is an environment supervisor, and factory E is a chemical factory. In order to protect the environment when the factory is in operation, there are a number of sensors installed inside and around factory E. These sensors include: sewage detectors which detect pollutants in the rivers, polluted atmosphere detectors which detect pollutants in the atmosphere, and noise detectors which

detect the noise near factory E. These sensors are connected to a sensor network, reporting polluting indices to the sensor network periodically. Each sensor is usually associated to a camera.

Step 1: One day, the sensor network system detects that the river near factory E is polluted. It then sends an alarm signal to the VS system. Soon Mike receives alarm messages issued by the VS system via SMS, e-mail and/or telephone.

Step 2: The camera near the sewage detector is automatically started up by the VS system.

Step 3: On receipt of the alarm messages, Mike goes to the surveillance centre near his office. There is a big TV wall which is displaying the surveillance video of the polluted river. Mike monitors the video and takes the necessary action.

Figure 2 illustrates this scenario.

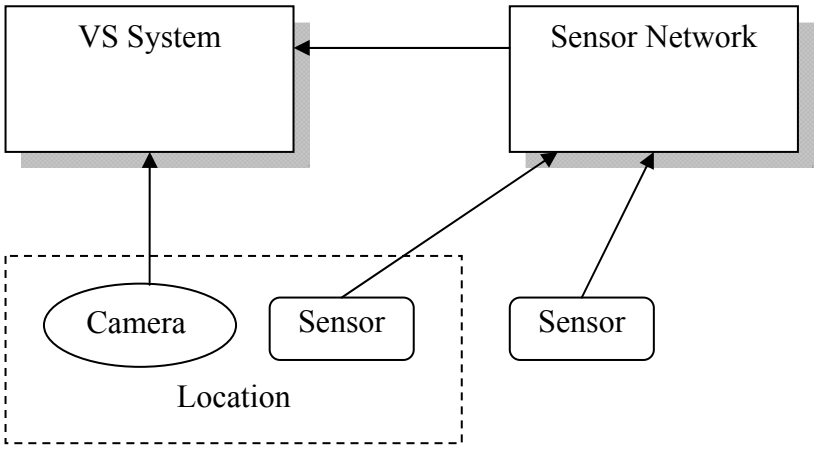

Figure 2 – Convergence of visual surveillance and sensor networks

7.3.2 Convergence of VS and multimedia conference

Jack works in company A, and Bob works in company B. One day, company A and company B are in a multimedia conference. Jack and Bob are participants. There are two meeting rooms located in two different cities. The participants are negotiating a business contract. The conference system can communicate with the VS system.

Step 1: In the meeting, Bob proposes to watch the production process and some sample products of company A. The chairman designates Jack as speaker, and the meeting room of company A now becomes active. Since Jack has subscribed to the extra VS service from the conference system, an additional VS user interface on Jack's terminal is displayed. Jack then selects the "Workshop" camera, and presses the "Switch to Surveillance" button. The screen switches to the surveillance video of the workshop of company A, meanwhile the voice is not affected.

Step 2: The participants of company B watch the surveillance video carefully. Meanwhile, Bob remotely operates the PTZ control of the camera. In this way, the participants of company B get further understanding of company A.

Step 3: Bob suggests stopping surveillance. So Jack closes the surveillance video and the screen switches to the video of the previous meeting room.

Figure 3 illustrates this scenario.

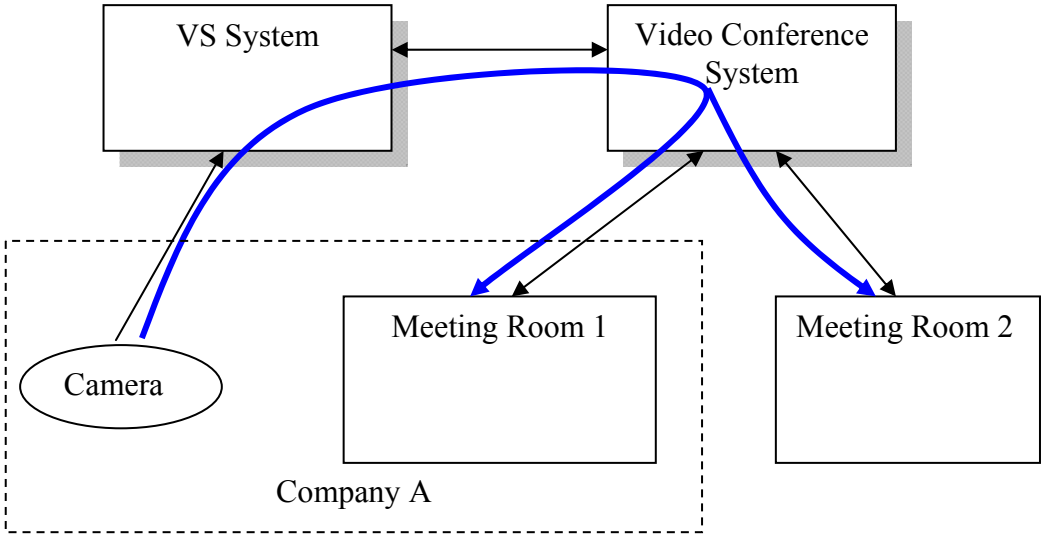

Figure 3 – Convergence of VS and multimedia conference

7.3.3 Convergence of VS and IPTV service

Step 1: Bob is watching an IPTV program which introduces a scenic spot, and is attracted by the program. He wants some current information of the scenic spot, such as its weather and the number of visitors, to determine whether and when it is suitable for him to have a trip to this place. There is a "Press to Real-time Watch" button on the bottom right corner of the screen. When Bob presses the button, the TV screen switches to an electronic map of the scenic spot. Each surveilled area is marked on the map. Bob clicks one area on the map, and then real-time surveillance video appears on the screen.

Step 2: Bob is not very satisfied with the current scenes. He wants to watch more scenes of this scenic spot in different seasons. He then enters into record-on-demand electronic programme guide (EPG). The EPG provides a list of the titles of the recorded video in different seasons. Bob selects and watches them one by one, and decides to travel there next summer.

Step 3: Finally, Bob exits from the surveillance window and continues watching the previous IPTV programme.

Figure 4 illustrates this scenario.

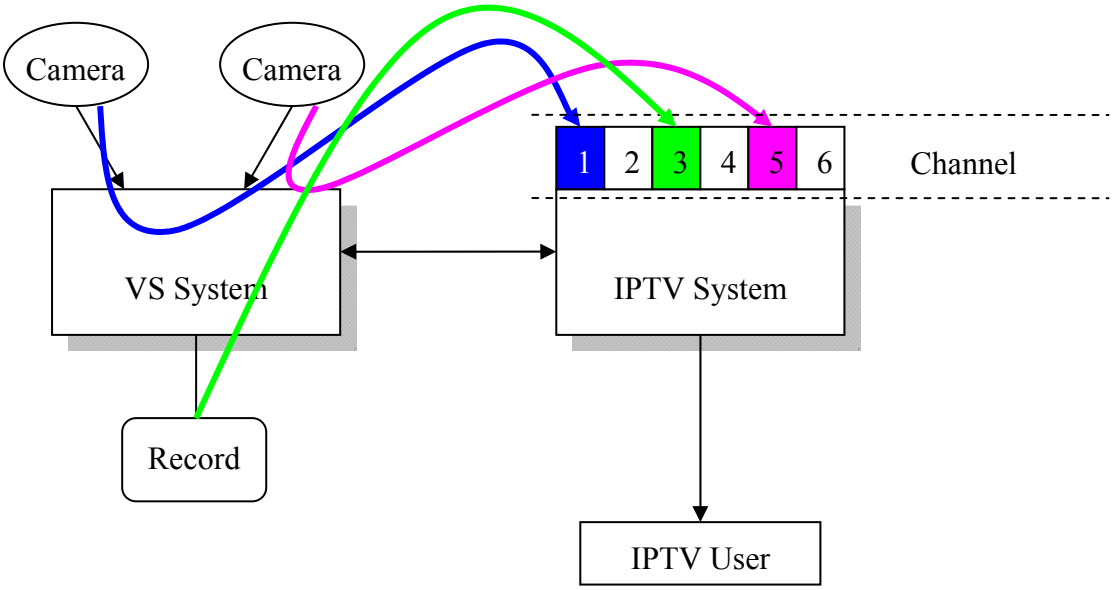

Figure 4 – Convergence of VS and IPTV service

7.4 Virtual special subsystem/rented subsystem

A virtual special subsystem is a logically closed subsystem of a VS system, with all its devices and channels logically shared exclusively by its users.

Company A consists of the parent company named A0 and two subsidiary companies named A1 and A2. Andy, Bill and Carl work in A0, A1 and A2 respectively.

The company wants to hire a subsystem from the VS service operator, to then administrate and maintain all services on its own, with no intervention from the service operator.

Step 1: The VS service operator installs the cameras, establishes a virtual special subsystem and rents it to company A. Then company A assigns Andy as an administrator to administrate this subsystem. Andy then assigns some users to use the VS service.

Step 2: Some time later, for the convenience of management, Andy logs into the management system and divides this subsystem into three independent subsystems which are administrated by Andy, Bill and Carl, respectively. Meanwhile, Andy becomes a super administrator who can manage all the three subsystems. This is illustrated in Figure 5.

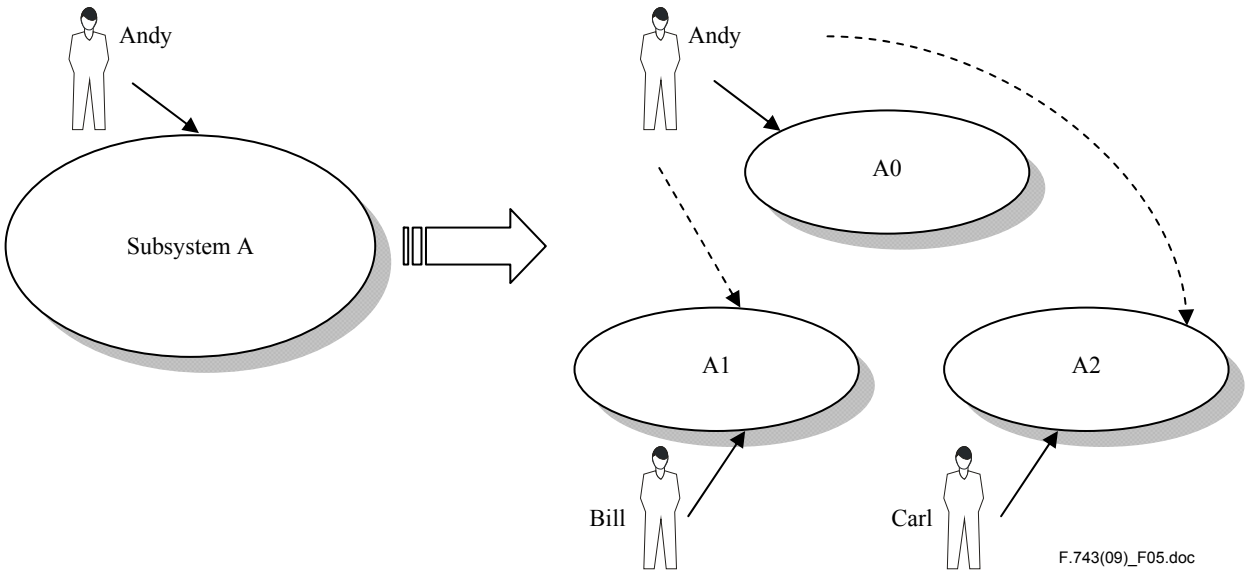

Figure 5 – Subsystem A is divided into three subsystems

Step 3: The managers of company A find that it is not convenient for sharing information and communicating so far. So Andy associates the three subsystems to form a hierarchical structure as shown in Figure 6. The lower level subsystems (A1, A2) are controlled by the higher level subsystem (A0).

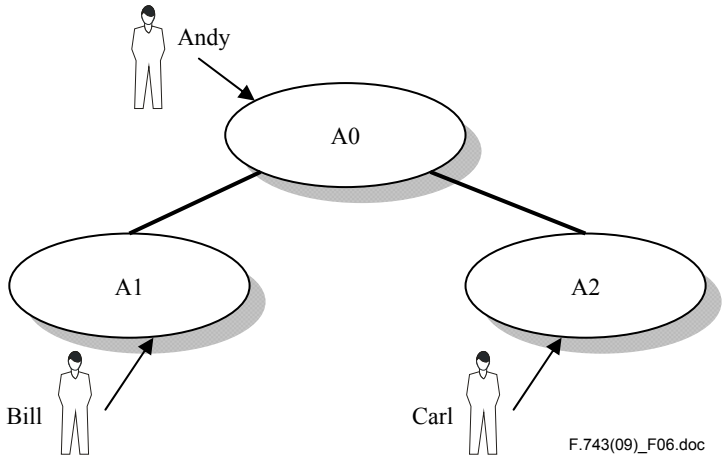

Figure 6 – Hierarchical structure of the three subsystems

Step 4: (Now Andy, Bill and Carl are looked upon as common users rather than the administrators.) Andy logs in, watches the surveillance video of either A0 or A1/A2 successfully. Bill watches the surveillance video of A1 successfully, but he fails to watch the video of A0.

Step 5: In subsystem A0, an alarm message is issued for some reason and sent to Andy, but Bill and Carl do not receive it.

Step 6: In subsystem A1, an alarm message is issued for some reason and sent to Bill. It is also sent to Andy.

8 Visual surveillance system requirements

8.1 User requirements

8.1.1 User level requirements

– USR-001: A VS system is recommended to classify users into several levels. Users of different levels have different operational rights; high-level users have more operation privileges than low-level ones. Low-level users can do basic operations which meet the following basic requirements, and high-level users can do advanced operations which meet the following advanced requirements. For example, users of level 1 can only watch real-time video, while users of level 2 can control the PUs remotely as well as watch real-time video.

8.1.2 Basic requirements

– USR-002: A VS system is required to support registration and de-registration of the end user through the interface provided by the platform, and whereby the end user can view and modify personal information.

– USR-003: A VS system is required to support end-user login and logout from the VS platform conveniently. The user name and password are required when an end user logs into the system.

– USR-004: A VS system is recommended to support end-user view of the user access logs or other system logs.

– USR-005: A VS system is required to support end-user view of the PU's information via the CU, including name, status, capabilities, location and other information of the PU.

– USR-006: A VS system is required to support CU's capability for description and negotiation, such as the decoding capability set by the end user.

– USR-007: A VS system is required to support the presentation of the real-time video captured by the PU for end users.

– USR-008: A VS system is required to support end users to order and cancel different services, including basic services and value-added services. The VS system is also required to support end users to view the personal account information and operation logs conveniently.

8.1.3 Advanced requirements

– USR-009: A VS system is recommended to simultaneously present the video of different channels, captured by different PUs, to the end user via CUs. The number of connected channels is recommended to be modified within a specified range. The VS system is recommended to support adjusting picture size, quality level, transmission rate and other parameters of each channel by the end user. When watching video, end users can optionally choose to pause or continue watching.

– USR-010: A VS system is recommended to support panning, tilting or zooming (i.e., PTZ) the PU by the end user. The restriction is that one PU can only be controlled by one end user at a time.

– USR-011: A VS system is recommended to support searching recorded video by diverse means, presenting the recorded video of different channels, and controlling various playing operations by the end user.

– USR-012: A VS system is recommended to support sending alarm messages via CU and/or other related terminals to end users in cases of alarm events.

– USR-013: A VS system is recommended to support remote control over PU (e.g., locking/unlocking, enabling/disabling, etc.) by end users.

8.2 Service requirements

8.2.1 Basic requirements

– SRV-001: A VS system is required to support peer-to-peer real-time video transfer directly from PU to CU.

– SRV-002: A VS system is required to support real-time video transfer from one PU to multiple CUs.

– SRV-003: A VS system is required to support real-time video transfer from multiple PUs to one CU.

– SRV-004: A VS system is recommended to support collecting the video from multiple channels and then transmitting it to multiple CUs.

– SRV-005: A VS system is recommended to receive status and alarm information of PUs and CUs, and support terminals status management.

– SRV-006: A VS system is recommended to support remote PTZ control over PU by end users via a CU or by the platform. The PTZ control should be compliant with end user's privileges.

– SRV-007: A VS system is required to provide alarm functions. Both the input of outer alarm signals and video motion detections which trigger alarm signals are required to be supported.

– SRV-008: The time synchronization mechanism is required to be supported, which will synchronize the clocks of all devices/units of the VS system.

8.2.2 Advanced requirements

– SRV-009: A VS system is required to support audio acquisition surveillance. Audio is required to be provided with video or provided separately if necessary.

– SRV-010: A VS system is required to provide audio communication between PU and CU.

– SRV-011: A VS system can optionally provide preset positions of pans and lenses of PUs. A preset position is set by the end user or by the system in advance. The pans can rotate and the lens can be zoomed to the preset position with a single operation.

– SRV-012: A VS system is recommended to support controlling wipers and auxiliary lamps of PUs remotely.

– SRV-013: A VS system is required to support the capability of recording, which can be triggered by time and/or alarm signals, or be manually turned on by users. In addition, a VS system is required to record for extra specified time before triggering events occur.

– SRV-014: A VS system is required to provide the capability of record searching by a variety of means. The recorded video is recommended to be searched by start time and stop time, duration of recording, or names of surveilled sites, etc.

– SRV-015: A VS system is required to provide the function of playing record, and provide the control functions of playing, such as fast playing, fast rewinding, pausing, locating, stopping, and so on.

– SRV-016: A VS system is required to support time-shift play.

– SRV-017: A VS system is required to support video record management. The locations and spaces of the storage can be specified, and the storage mechanism is required to be efficient and flexible. Extended storage devices can optionally be connected to the platform to enlarge the total storage space of the system.

– SRV-018: A VS system is required to provide recording logs.

– SRV-019: When an alarm signal is received, the platform is required to start recording for related PUs, and display this alarm information on related CUs.

– SRV-020: A VS system can optionally provide electronic maps with PUs marked and displayed on the maps.

– SRV-021: A VS system can optionally provide intelligent image identification, including number plate identification, face identification, motion target identification and tracking, etc. Alarm signals can optionally result from the intelligent identification. Additionally, more information can optionally be obtained by means of image identification technologies, which would result in new value-added applications in the future.

– SRV-022: A VS system is required to allow end users to deploy their PUs themselves. For example, enterprise users can optionally deploy PUs by themselves, and then the PUs would access the VS network of VS service provider.

– SRV-023: A VS system can optionally consist of multiple domains. A domain is a subsystem of the VS system physically or virtually. Each domain is a fully-functional subsystem. It can interwork with others, and is required to support the hierarchical structure. Each subsystem is a complete VS system. A lower level subsystem can be managed and controlled by its higher level parent subsystem.

– SRV-024: A VS system is required to support virtual special subsystems. A physical VS system or subsystem could be divided dynamically into various virtual special subsystems. Virtual special subsystems could also be created, adjusted, configured or removed dynamically. Like multiple domains mentioned above, virtual special subsystems also support the hierarchical structure.

– SRV-025: A VS system is recommended to support functions of instant image snapshot and the relevant image storage. An end user can search, view and manage the recorded and stored snapshot images.

– SRV-026: The instant image snapshot function can optionally be triggered in manual mode (i.e., according to the commands of the operator) and automatic mode (i.e., according to preset configuration conditions such as time, alarm and policy parameters).

– SRV-027: The real-time visual surveillance function is recommended to support the capabilities of multi-picture surveillance, multi-screen display, multi-screen alternation (e.g., auto-patrol), caption overlay, and designated-area-shielding.

– SRV-028: A VS system is recommended to support the capability of containing the detailed information for each recorded media segment, which includes the surveilled location, the recording start time, the reason why the recording triggered, etc.

– SRV-029: A VS system can optionally provide playback logs and the relevant statistics information.

8.2.3 Interworking with other service systems requirements

– SRV-030: A VS system is required to get alarm signals from alarm input devices or systems.

– SRV-031: A VS system is required to send alarm messages to end users by various means such as telephone, e-mail, SMS, instant message, etc., and inform the alarm output devices/systems to execute the corresponding operations in case of alarm events.

– SRV-032: A VS system can optionally support retrieving data information of electronic maps from an external GIS service.

– SRV-033: A VS system can optionally support retrieving location information of the PUs from the external GPS service.

8.3 Security requirements

8.3.1 Authentication security requirements

– SEC-001: A VS system is required to provide the mechanisms for authentication and authorization; it is required to only permit authorized users to access the system and use applications. A VS system is required to forbid an unauthorized user to handle any resource of the system.

8.3.2 Access security requirements

– SEC-002: A VS system is required to ensure the security of accessing and controlling PUs. Each PU has access attributes. Only authorized users can access PUs. The types of access include real-time surveillance, replaying the recorded video, remote controlling and so on. An end user can access a PU according to his/her access privilege of the PU.

– SEC-003: A VS system is required to ensure the security of resources such as recorded video, digital maps, etc.

– SEC-004: A VS system is required to be able to operate in environments where NAT and/or firewall devices are present at either or both ends between two communicating entities. It is recommended to utilize the specified firewall, gatekeeper and other network devices to ensure the security to access to some special visual surveillance services.

8.3.3 Content security requirements

– SEC-005: A VS system is required to ensure the security of media stream delivery. It is required to provide security mechanisms, such as video encryption for the media stream, to ensure the integrity and secrecy of the video stream.

– SEC-006: A VS system is required to ensure the security of the recorded video. It is required to provide the mechanisms to protect the copyrights of the recorded video, and to protect the video from being juggled.

– SEC-007: A VS system is required to protect user privacy.

8.3.4 System security requirements

– SEC-008: A VS system is required to have the capability of resisting vicious attacks.

– SEC-009: A VS system is required to provide the mechanisms for troubleshooting and data backup. It is required that a structural single-node problem be avoided (i.e., a problem at a node should not cause failure of the whole system).

8.3.5 Network security requirements

– SEC-010: The bearer network is recommended to provide network transmission for the visual surveillance service with high availability and high reliability.

– SEC-011: The bearer network is required to provide end-to-end security for media transport and signalling exchange.

– SEC-012: The bearer network is recommended to provide the capability of rapid error detection, fault-location and failure-recovery.

– SEC-013: Bearer network recovery is recommended to provide the capabilities for discovering and defending aggressive behaviour or traffic from network attacks.

– SEC-014: The bearer network is recommended to provide the confidentiality for information transmission if required.

– SEC-015: A VS system is recommended to support the capability for enhancing session security when the underlying network cannot provide an appropriate level security capability.

– SEC-016: A VS system is recommended to utilize the appropriate security mechanism (e.g., DRM and watermarking) for media storage.

8.4 Network and control requirements

– NET-001: PUs and CUs are required to access the VS network via a packet-switched network, i.e., an IP-based bearer network, such as LAN, WLAN, xDSL, GPRS, CDMA 1x, and so on.

– NET-002: The network is required to transmit service data accurately in real time, and to have multicast capability. End-to-end QoS is required to be guaranteed to deploy the real-time VS system over an IP network. The network is required to provide low delay, low jitter and low packet loss rate to transmit the audiovisual stream.

– NET-003: Control signals and media data are required to be transported in different channels. Control signals are required to be transported in real time and accurately, and the bandwidth of control signals is required to be as low as possible.

– NET-004: The audiovisual media data is required to be transported from the source to the destination quickly and effectively. The system is required to choose an appropriate mechanism of media control and distribution automatically depending on the network environment and user requirements.

– NET-005: Every PU has location information, which can optionally be automatically retrieved through the GPS system or set by an administrator. Each device of the VS system has a unique identification number. IP address and location of a device can optionally be obtained according to the identification number.

– NET-006: To authorize a user, a unique identification number for the authorized user is required to be assigned and accompanied with other necessary information. The number is required to be used as the destination indication when the end user is called, and as the identifier for accounting.

– NET-007: A VS system is required to support the mobility and nomadism for CU and/or PU, if necessary.

– NET-008: A VS system is required to support both unicast and multicast capabilities for media transmission.

8.5 QoS and QoE requirements

– QoS-001: The QoS strategies are recommended to be implemented on the service layer or on the bearer network layer, or both. In cases of delay, jitter, sequence error and packet loss, the service layer is required to be able to recover and repair the impairments, and adjust the data stream in response to the changes of the network bandwidth.

– QoS-002: A VS system is required to provide good quality audio and video media. When the real-time video or the recorded video is played, the pictures and the voice are required to be clear and fluent, and the audio and video media are required to be synchronized.

– QoS-003: The connection establishment time between CU and PU is required to be reasonable.

– QoS-004: The switching time from one surveillance channel to another one is required to be reasonable.

– QoS-005: A VS system is required to respond rapidly to the user's operation.

– QoS-006: A VS system is required to provide enough storage space for recording video.

– QoS-007: In cases of alarm events, response time is required to be short enough to ensure the events to be processed in time.

8.6 Management requirements

8.6.1 Terminal management requirements

– MAN-001: A VS system is required to manage registration/de-registration, authentication, connection and troubleshooting of PUs and CUs.

– MAN-002: A VS system is recommended to support PU management, such as capability parameters and property configuration, status control and monitoring (i.e., PU activation and deactivation).

8.6.2 Network management requirements

– MAN-003: A VS system is required to support remote configuration management, capability management, status detection, trouble alarm management and security management for the various kinds of devices in the network. The management privilege is required to be divided into different levels.

8.6.3 Service management requirements

– MAN-004: A VS system is required to provide various subscription means for users, and to provide the capabilities of querying, viewing and modifying their subscription information.

– MAN-005: A VS system is required to provide various alternative accounting modes, and to support the flexible combinations of payment mode, billing mode, billing cycle, preferential price, etc.

8.6.4 Content management requirements

– MAN-006: A VS system is required to support the management of storing, indexing, searching, code transforming and deleting for media content.

– MAN-007: A VS system is required to provide different query levels for contents. Only administrators who meet the query level requirement can view specific media contents.

8.7 Accounting, charging and billing requirements

– ACB-001: A VS system is recommended to provide the capability of accounting, charging and billing for the service operation.

– ACB-002: A VS system is recommended to provide the interfaces among the functional entities for accounting, charging and billing functions.

8.8 Convergence with other service system requirements

– CON-001: A VS system is recommended to provide the convergence capabilities and interworking interfaces for IPTV, videoconferencing, etc.

8.9 Output capabilities requirements

Visual surveillance systems should provide data output capabilities for other services that can use visual surveillance media resources. Thus, other services can be considered as external services to the visual surveillance service itself.

– OCR-001: A VS system is required to assign a unique media ID to each internal media resource. This ID can be used by other services. Each media resource is required to have some attributes to indicate whether or not this resource is real-time video, and any other necessary media features.

– OCR-002: A VS system can optionally output media streams from its library of media resources according to specified media IDs, where the encoding format of the media can be designated by external systems.

– OCR-003: A VS system is required to provide the specified media resource only to the authorized external systems.
– OCR-004: A VS system can optionally inform the alarm information to external systems.

8.10 Input capabilities requirements

Visual surveillance systems can optionally provide data input capabilities whereby they can receive input information from other services.

– ICR-001: A VS system can optionally get the resulting analyzed information input from an external system with intelligent analysis capability.
– ICR-002: A VS system can optionally get alarm signals from external alarm devices or systems.
– ICR-003: A VS system can optionally get additional media information input from an external system for a specified media resource, using the media ID as identifier.

8.11 Accessibility requirements

– ACS-001: CUs are recommended to be controllable through as many alternative forms of user interface interaction as possible. Similarly, the user interface feedback should be configurable to utilize as many forms of feedback as possible.
– ACS-002: A VS system is recommended to provide external and, possibly, internal interfaces that can handle device control, service control and media capture/rendering.
– ACS-003: A VS system is recommended to send alarm information by using different forms of media. It is recommended to send multimedia alarm information other than single-media alarm information.
– ACS-004: A VS system is required to provide configurable media properties, e.g., bit rate and frame rate, for both media transport and media presentation to meet accessibility requirements.
– ACS-005: A VS system is recommended to provide adjustable text display characteristics to meet the needs of users when text information is displayed. For example, the font and/or the size of the text may be adjustable.
– ACS-006: A VS system is recommended to include alternative ways to receive feedback from the control actions of CUs or service, using various modes and properties of presentation.

8.12 General design requirements

– GEN-001: The VS system architecture is recommended to support the hierarchical system design and deployment model in order to support flexibility and extensibility.
– GEN-002: The VS system architecture is recommended to be flexible and extensible enough to allow for unanticipated future requirements and integrate some more subsystems or other related external systems seamlessly.
– GEN-003: A VS system is required to assign the unique identity for CUs, PUs and other devices, and the relevant coding rules for identification are recommended to support the extensibility and uniqueness accordingly.
– GEN-004: A VS system is required to support the indication and negotiation of the media coding formats (e.g., the audio codec, video codec and media file formats) between CU and head-end (e.g., PU and/or media server).
– GEN-005: The VS system core functions are required to comprise: real-time video surveillance, PTZ control, alarming and linkage actions, recording, playback, instant image snapshot, audio acquisition and voice communication.

– GEN-006: The VS system design is recommended to use the hierarchical structure, and the communications between modules are recommended to use standard interfaces. The design, maintenance and updating of any modules as well as additional new modules are recommended not to affect other modules.

– GEN-007: The VS system design is recommended to support the capability of system parameters and user data. The system parameters, user data and their processing procedures are recommended to be relatively independent, in order to facilitate system maintenance and extension.

– GEN-008: The VS system architecture is recommended to support distributed structure as well as centralized structure.

– GEN-009: A VS system is recommended to provide a complete secondary development tool and user guide (such as SDK and APIs function description) to facilitate customization work.

Bibliography

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Printed in Switzerland
Geneva, 2010