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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Video surveillance systems for use in security applications – Part 2-1: Video transmission protocols – General requirements

Systèmes de vidéosurveillance destinés à être utilisés dans les applications de sécurité – Partie 2-1: Protocoles de transmission vidéo – Exigences générales

IEC 62676-2-1:2013

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VIDEO SURVEILLANCE SYSTEMS FOR USE IN SECURITY APPLICATIONS –

Part 2-1: Video transmission protocols – General requirements

FOREWORD

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International Standard IEC 62676-2-1 has been prepared by IEC technical committee 79: Alarm and electronic security systems.

The text of this standard is based on the following documents:

FDIS	Report on voting
79/435/FDIS	79/448/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62676 series, published under the general title *Video surveillance systems for use in security applications*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

The IEC Technical Committee 79 in charge of alarm and electronic security systems together with many governmental organisations, test houses and equipment manufacturers have defined a common framework for video surveillance transmission in order to achieve interoperability between products.

The IEC 62676 series of standards on video surveillance system is divided into 4 independent parts:

Part 1: System requirements

Part 2: Video transmission protocols

Part 3: Analog and digital video interfaces

Part 4: Application guidelines (to be published)

Each part has its own clauses on scope, references, definitions and requirements.

This IEC 62676-2 series consists of 3 subparts, numbered parts 2-1, 2-2 and 2-3 respectively:

IEC 62676-2-1, *Video transmission protocols – General requirements*

IEC 62676-2-2, *Video transmission protocols – IP interoperability implementation based on HTTP and REST services*

IEC 62676-2-3, *Video transmission protocols – IP interoperability implementation based on Web services*

The first subpart of this IEC 62676-2 series defines protocol requirements to be fulfilled by any high-level IP video device interface. The following two parts – Part 2-2 and Part 2-3 – define two alternative protocols, one is based on HTTP and REST services and the second is based on Web Services. It is based on the general requirements for video transmission of IEC 62676-1-2, which defines minimum IP connectivity requirements, basic video streaming, stream control, eventing, discovery and description functions.

The purpose of the transmission system in a video surveillance system installation is to provide reliable transmission of video signals between the different types of Video Surveillance System (VSS) so far called CCTV equipment in security, safety and monitoring applications.

Today VSS reside in security networks using IT infrastructure, equipment and connections within the protected site itself.

VIDEO SURVEILLANCE SYSTEMS FOR USE IN SECURITY APPLICATIONS –

Part 2-1: Video transmission protocols – General requirements

1 Scope

This part of IEC 62676 introduces an IP network interface for devices in surveillance applications. This International Standard specifies a network protocol for the full interoperability of video devices. On top of the basic layers protocols are defined to accomplish the full interoperability of video devices. In surveillance applications IP video devices have to use standardized protocols to accomplish following functionality: video streaming, stream control, event handling, discovery, capability description, device management, PTZ control, auxiliaries and other functions.

Some areas of this transmission standard are covered by more than one approach, e.g. ZeroConf and WS-Discovery.

The network protocols recommended and defined by this video transmission standard are selected with a sense for future relevance and further extensions.

Video transmission equipment may be combined with additional functions, e.g. for audio or metadata transmission.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62676-1-2, *Video surveillance systems for use in security applications – Part 1-2: System requirements – Performance requirements for video transmission*

IEC 62676-2-2, *Video surveillance systems for use in security applications – Part 2-2: Video transmission protocols – IP interoperability implementation based on HTTP and REST services*

IEC 62676-2-3, *Video surveillance systems for use in security applications – Part 2-3: Video transmission protocols – IP interoperability implementation based on web services*

IETF RFC 2326:1998, *Real Time Streaming Protocol (RTSP)*

IETF RFC 3016, *RTP Payload Format for MPEG-4 Audio-Visual Streams*

IETF RFC 3550, *A transport protocol for Real-Time Applications* (Replaces RFC 1889)

IETF RFC 3550, Standard 64, *RTP: A Transport Protocol for Real-Time Applications*

IETF RFC 3551, *Profile for audio and video conferences with minimal control* (Replaces RFC890)

IETF RFC 3551, Standard 65, *RTP Profile for Audio and Video Conferences with Minimal Control*

IETF RFC 3984, *RTP payload format for H.264/AVC*

IETF RFC 4566, *SDP: Session Description Protocol*

IETF RFC 4571, *Framing Real-time Transport Protocol and RTP Control Protocol [RTCP] Packets over Connection-Oriented Transport*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1.1
analog
a form of information that is represented by a continuous and smoothly varying amplitude or frequency changes over a certain range

3.1.2
analog video
video signal made of a continuous electrical signal

3.1.3
application program interface
a set of interfaces for developers to interact with a component or application

3.1.4
bandwidth
property of networks to describe the amount of data that can be carried from one point in the network to another in a given time period, usually a second, affected in video surveillance by frame rate, image resolution, compression ratio, image noise, complexity detail of a monitored scene

3.1.5
capability
a named piece of functionality (or feature) that is declared as supported or requested by an agent

3.1.6
capturing
process of transferring video from one source to another for use on a digital video device, network or storage, e.g. conversion of analog to digital

3.1.7
channel
one or more streams of video, audio and/or metadata that together constitute a unique entity for the purpose of surveillance

3.1.8
client
a software application or other entity that uses the services offered by a Video Transmission Device (VTD)

3.1.9
codec
abbreviation of compression/decompression algorithm, used to encode and decode, or compress and decompress data, such as video

3.1.10
component
a software or hardware object, meant to interact with other components, encapsulating certain functionality or a set of functionalities with clearly defined interfaces and conforming to a prescribed behavior common to all components within a standard

3.1.11
device description
formal definition of a network device, expressed in XML syntax, specified by a vendor

3.1.12
digital
information coded in discrete, separate pulses or signal levels

3.1.13
digital video recorder
DVR
network video device recording multiple analog video channels onto a hard disk in digital format, which allows viewing, replay and management remotely via a VT client

3.1.14
discovery
act of locating a network device or machine-processable description of a service-related resource that may have been previously unknown and that meets certain functional criteria

3.1.15
DNS
domain name system
protocol that enables hierarchical naming system in a network for identification and resolving symbolic names such as domain or computer names for example translate http://Videoserver1 or www.upnp.org into IP addresses

3.1.16
DTD
document type definition
document defining the format of the contents presented between the tags in an XML document, and the way they should be interpreted by the application reading the XML document

3.1.17
dynamic host configuration protocol
DHCP
protocol to automatically provide IP addresses and other network configuration information to network nodes

3.1.18
event
notification of one or more changes in state variables sent by a network device

3.1.19
eventing
the exchange of specially-formatted messages describing events of a event server e.g network device

3.1.20
frame
full frame of video as acquired in progressive mode or as combination of two image fields interlaced together

3.1.21
identifier
code associated with each object which uniquely identifies the object e.g. for SNMP in the global tree of objects

3.1.22
IETF
Internet engineering task force
standards body that forms Working Groups to develop technology for the Internet community

3.1.23
I-frame
independent frame coded as intraframe of an image sequence of differential coded frames

3.1.24
Internet protocol
IP
basic connectionless network-layer protocol

3.1.25
IP camera
device capturing and transmitting live video images over an IP network allowing remote viewing, recording, and management

3.1.26
Internet protocol video
IP video
transmission of video signals over an IP network: representation of sequential image information in digital (discrete level) formats that are transferred using IP data packets (datagrams) including associated protocols for discovery, description, streaming, stream control, eventing, control and configuration of video network devices

3.1.27
IP video Interface
software point of communication for IP video between a device and the network

3.1.28
IP video Network
collection of video transmission devices connected to each other allowing to communicate with each other, share resources and information over a variety of connection protocols

3.1.29
interoperability
ability of communication of systems and units to provide services and to accept services from other systems and units, in order to use the services for efficient operation;

ability for information or services to be exchanged directly and smoothly between providers and consumers

3.1.30
jitter
variation in a network delay that is perceived by the receiver of each packet

3.1.31
latency
delay in the response of far end participants, often a result of network congestion and geographic distance

3.1.32
link
relationship between two network nodes when one resource refers to the other resource e.g. by the means of a URI

3.1.33
message
the basic unit of communication containing the data to be transmitted between network nodes such as client and server

3.1.34
messaging
exchange of messages, which are specially formatted data packets, describing events, commands, status information, requests, replies, etc of a messaging source to a subscribing or listening client

3.1.35
moving picture experts group
MPEG
working committee that defines and develops industry standards for digital video systems, specifying the data compression and decompression processes and how they are delivered on digital video systems

Note 1 to entry: This note applies to the French language only.

3.1.36
network architecture
framework and technology foundation for the design, building and managing of a communication network, typically in a layered structure dividing the communication tasks into a number of smaller parts, each part accomplishing a particular sub-task and interacting with the other parts in a small number of well-defined ways

3.1.37
network connectivity
physical (wired or wireless) and logical (protocol) connection of multiple devices or a single device to a network, such as a IP video network

3.1.38
network interfaces
point of communication between a device and the network

3.1.39
network node
grouping of one or more network components which provides network related functions, administered as a single entity

3.1.40
network protocol
defined rules and procedures for the network communications

3.1.41
network video recorder
NVR
network video device recording multiple video streams onto a hard disk in digital format, which allows viewing, replay and management remotely via a VT client

3.1.42
OASIS
organization for the advancement of structured Information standards
a nonprofit, international consortium whose goal is to promote the adoption of product-independent standards for information formats such as Extensible Markup Languages (XML), Hypertext Markup Language (HTML) etc.

3.1.43
open systems interconnection
OSI
complete suite of network routing protocols developed by ISO including routing protocols between the different layers of the system

3.1.44
payload
true message data itself without protocol information

3.1.45
principle
fundamental rule applicable to a large number of situations and variations

3.1.46
protocol error
result and answer of an incorrectly formed protocol message, which may consist of illegal header values or payload, received unexpectedly or after a certain timeout

EXAMPLES: HTTP and RTSP define a set certain of standard status codes to notify about protocol errors.

3.1.47
quality of service
QoS
software-based ability to guarantee the required level of network resources for real-time video traffic;

a major performance indicator for networks especially for devices such as IP cameras, access control, and building management or security systems

3.1.48
recording
a single container for a set of video, audio and metadata tracks with an endless timeline holding data at certain time frames or gaps without any information from any kind of real-time video source or input including associated non-video data stored on any kind of media

3.1.49
representation
data about the actual state of a resource or component

3.1.50
RFC
request for comment
documents maintained by the IETF standards body containing standards in various stages of completion

Note 1 to entry: This note applies to the French language only.

3.1.51
RTCP packet
Real-Time Transport Control Protocol (RTCP) control packet that consists of a fixed header part similar to that of RTP data packets and structured elements that vary depending upon the RTCP packet type, as described in RFC 3550

3.1.52
RTP payload
data transported in a packet by using Real-Time Transport Protocol (RTP), as described in RFC 3550

3.1.53
RTP session
association among a set of participants who are communicating by using the Real-Time Transport Protocol (RTP), maintaining a full, separate space of Synchronization Source (SSRC) identifiers, transmitted to the same destination IP address and UDP port

Note 1 to entry: Typically, there is a one-to-one mapping between RTP streams and RTP sessions, but it is possible for multiple RTP streams to use the same RTP session (port multiplexing). The associated RTCP traffic is also part of that RTP session although the packets are sent to the next higher UDP port number.

3.1.54
RTP stream
video stream that is encapsulated in RTP

Note 1 to entry: All of the RTP packets have the same SSRC and are transmitted on the same RTP session.

3.1.55
RTSP session

session typically consisting of a VT client creating one or more RTP Sessions (SETUP) with a VT server, starting the stream with PLAY or RECORD, and closing the RTSP Session

3.1.56
secure hash algorithm
SHA1
algorithm which generates out of input data like a message of less than 264 bits in length a 160-bit hash code or fingerprint designed in a way that it hardly possible to find a matching text string

service abstract resource that represents capabilities to perform tasks

3.1.57
streaming
process of sending video over a network to allow instant operation as the video is received, rather than requiring the entire file to be downloaded prior to operation

3.1.58
transmission control protocol
TCP
connection-oriented transport-layer protocol establishing a connection between host and recipient, guaranteeing delivery and reliability through retransmission

3.1.59
TTL
time-to-live
specified length of time that information e.g. DNS is stored in a cache and after that the information is deleted, e.g. entry from the DNS name server's cache