IEC 62676-2-33

Edition 1.0 2022-07

INTERNATIONAL STANDARD

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Video surveillance systems for use in security applications – Part 2-33: Video transmission protocols – Cloud uplink and remote management system access

Systèmes de vidéosurveillance destinés à être utilisés dans les applications de sécurité – Partie 2-33: Protocoles de transmission vidéo – Liaison montante au nuage et accès au système de gestion à distance

IEC 62676-2-33:2022-07(en-fr)

IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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VIDEO SURVEILLANCE SYSTEMS FOR USE IN SECURITY APPLICATIONS –

Part 2-33: Video transmission protocols – Cloud uplink and remote management system access

FOREWORD

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The text of this International Standard is based on the following documents:

Draft	Report on voting
79/658/FDIS	79/666/RVD

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

The language used for the development of this International Standard is English.

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

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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- amended.

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INTRODUCTION

Surveillance systems are important in public safety projects to maintain law and order as well as public safety, and to assist the police to perform forensic analysis. Due to organizational and security reasons, large-scale surveillance systems are split in segments, which can lead to information silos. This document provides a standardized interface for management systems such that authorized entities can easily access remote information using the same mechanism they are using today for accessing local information.

VIDEO SURVEILLANCE SYSTEMS FOR USE IN SECURITY APPLICATIONS –

Part 2-33: Video transmission protocols - Cloud uplink and remote management system access

1 Scope

This document specifies management systems interfaces and mechanisms for remote operational access to physical security devices such as video surveillance devices and systems. For video surveillance, the use cases focus on accessing live video and retrieving recordings. The mechanisms defined in this document are not restricted to surveillance applications, but also cover remote access to security systems and electronic access control systems. Configuration of devices and management systems is out of the scope of this document.

Clause 4 introduces remote management access. Clause 5 defines a set of requirements that the protocol needs to fulfil. Clause 6 extends the token-based resource-addressing scheme of IEC 60839-11-31. Clause 7 describes how to retrieve information about remote resources. Clause 8 defines how to connect to devices that are not directly reachable because they are for instance located behind firewalls.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60839-11-31, *Alarm and electronic security systems – Part 11-31: Electronic access control systems – Core interoperability protocol based on Web services*

IETF RFC 4122, *A Universally Unique IDentifier (UUID) URN Namespace*

IETF RFC 5246, *The Transport Layer Security (TLS) Protocol*, Version 1.2

IETF RFC 6125, *Representation and Verification of Domain-Based Application Service Identity within Internet Public Key Infrastructure Using X.509 (PKIX) Certificates in the Context of Transport Layer Security (TLS)*

IETF RFC 7540, *Hypertext Transfer Protocol Version 2 (HTTP/2)*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
resource
IEC 62676-2 entity that can be addressed via a token

3.2
uplink
connection established by the local service to the remote client

4 Overview

4.1 General

IEC 62676-2-31 and IEC 62676-2-32 provide a detailed protocol definition for interacting with video surveillance devices such as cameras and digital recorders. Similarly, IEC 60839-11-32 and IEC 60839-11-33 describe how to monitor and configure electronic access control systems. These two parts are based on IEC 60839-11-31, which defines a communication mechanism based on web services. This document extends IEC 60839-11-31 by adding cloud connectivity and remote addressing to the framework. Note that this document does not contain any domain-specific details, since all interfaces defined in the above-mentioned parts are applicable without any modifications. Therefore, this document covers the integration of a wide range of physical security systems into any management system. This document describes how a remote client or management system connects to resources such as cameras. The approach shown here allows scaling over several hierarchies. The examples in 4.2 show the mechanism principle with two layers of video surveillance systems (VSS) called "lower level" and "higher level". In this system, a higher-level VSS can retrieve a resource like device information from a lower-level VSS, to trigger corresponding actions for different devices that are connected to the lower-level VSS.

Access to remote VSS can require strict authentication constraints. The related definitions are outside of the scope of this document.

4.2 Remote access

Figure 1 shows a typical management system topology as deployed for bigger installations. So-called lower-level video surveillance systems incorporate numerous surveillance cameras and other equipment to monitor a region of a premises or city district. Higher-level video management systems allow supervision of large compounds.

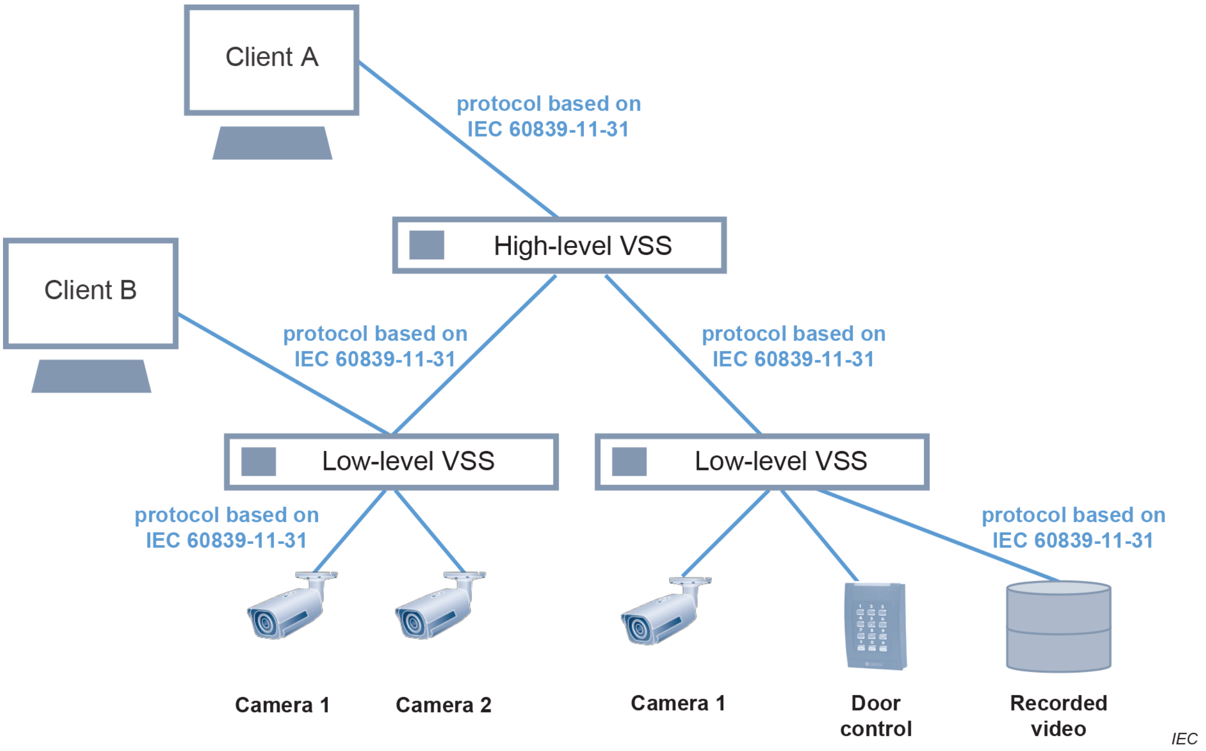
Client A
protocol based on IEC 60839-11-31
High-level VSS
Client B
protocol based on IEC 60839-11-31
protocol based on IEC 60839-11-31
Low-level VSS
Low-level VSS
protocol based on IEC 60839-11-31
protocol based on IEC 60839-11-31
Camera 1
Camera 2
Camera 1
Door control
Recorded video
IEC

Figure 1 – Hierarchical system example

In a way similar to the cameras shown in Figure 1, the VSSs expose an interface towards the higher layer via which a client can access any resource placed below. Typically, the VSS restricts the access to any of its associated resources depending on the authorization granted to the client.

Instead of defining a new interface, this document defines a small set of rules explaining how a VSS has to present resources to a higher-layer entity. Devices implementing IEC 60839-11-31 address resources via tokens for which this document defines a small set of mapping rules. In the example of Figure 1, both the high-level VSS as well as clients A and B can use exactly the same interface to control a camera as the lower-level VSS does today.

4.3 Cloud uplink

The IEC 60839-11-31 defines that the client initiates a connection to a device, as depicted in Figure 2.

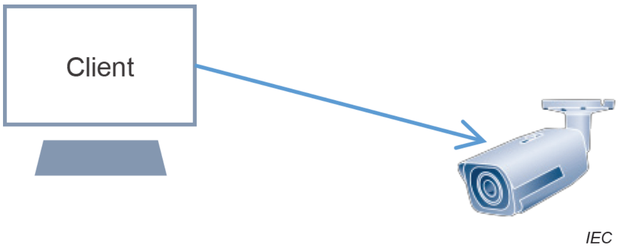

Figure 2 – Standard connection initiated from the client

This connection mechanism works very well within standard networks. However, in cases where the device is located behind a firewall and the client resides in the cloud, the client cannot establish the connection. In these cases, the device needs to establish the connection. Such a connection is called "uplink" and needs to be initiated from the device, as depicted in Figure 3.

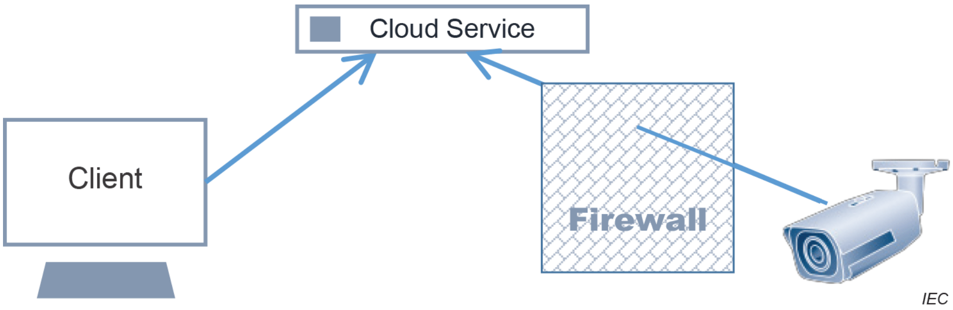

Figure 3 – Connection initiation from the device

This document specifies a solution that allows a camera or management system to use an uplink to facilitate existing web server functionality and RTSP server functionality using the HTTP/2 protocol.

5 Requirements

5.1 General

To achieve the interconnection between High-level VSS (H-VSS) and Low-level VSS (L-VSS), there are some basic requirements for the system.

5.2 Functional requirements

The detailed functional requirements of the interconnection between H-VSS and L-VSS are described in two aspects: resource usage and configuration.

For resource usage acquired from L-VSS to H-VSS, the following requirements are described:

a) Live streaming control. Live streaming on demand, supporting on-demand image display, zoom, capture and recording, and multi-user support for the same image resources on-demand at the same time.

b) Historical image retrieval and playback. Retrieve historical image data of the device in the network, according to the specified equipment, channel, time, alarm information, etc., playback and download. Playback supports the following methods: normal playback, fast playback, slow playback, picture pause, image capture and zoom display. The recording information is in the L-VSS.

c) Remote control. The remote operation of the device can be controlled remotely by manual or automatic operation, e.g. using pan, tilt or zoom (PTZ) functions. Optionally support locking to gain exclusive access.

d) Output of the decoded image. Real-time image decode, the output could be displayed. Remote control of video wall located in L-VSS.

e) Storage management. Hierarchical distributed storage management, combining device storage and client storage, to support the storage settings of location, time, backup strategy, finishing strategies, etc.

   - Content transfers from L-VSS and H-VSS.

f) Client management. L-VSS sends the management information to the H-VSS after receiving the request from the H-VSS.

   - When a new device enters the system, the L-VSS should notify the device information to the H-VSS.
   - Clock synchronization: the H-VSS and L-VSS should have clock synchronization, and the high-level clock source should be the backup of the low-level clock source.
   - Support the transport security between H-VSS and L-VSS.

- Query the equipment manufacturers, equipment model, version, and other basic information from H-VSS to L-VSS.

g) User management

- Support the function of user registration, authentication, authorization management, access control, transmission and audit of user identifier from L-VSS to H-VSS.
- Grant access control permissions of the appropriate resources to different users.

h) Log management: support the logging in L-VSS and query from H-VSS to L-VSS.

i) Access control: the VSS can support the access control service.

5.3 Protocol requirements

This section lists the requirements for web service protocols between two VSS in different levels:

- The L-VSS shall report its cameras. The L-VSS shall inform the H-VSS on any changes in its associated cameras.
- A L-VSS behind a firewall shall be able to connect to an H-VSS in the Internet.
- Device information query

  The protocol should support the hierarchical query to get the device directory information. The device directory information contains the device ID, device name, manufacturer name, device type, device address, device mode, device status, etc. A CameraID can be used to get the device information.
- Authority control

  Set different user names and passwords for different administrators, to limit the administrative rights, management scope, login time range and login IP address range of the administrator to achieve more detailed management authorization.
- Live streaming control

  As defined in the IEC 62676-2-32 media service document, the GetStreamUri command is used to define how the encoded data is expected to be streamed to the client. This command can be extended to support the hierarchical streaming.

6 Resource addressing

6.1 Token based addressing

Devices implementing IEC 60839-11-31 address resources by so-called tokens. Tokens are character strings of a defined length and are enumerated by the device to ease the devices' resource management. Similarly, this document assumes that a VSS enumerates its attached device resources in such a way that a unique token is assigned to each of its attached devices' resources.

Additionally, this document assumes that a VSS implements resource token mapping by adding a prefix delimited by a colon. Whether a VSS simply adds a prefix to a device token or does a complete remapping is outside of the scope of this document.

The following is an incomplete list of resources that can be handled:

- media profiles and configurations including OSD and masks,
- video and audio sources,
- digital inputs and relay outputs,
- door locks and card readers,
- recordings, recording tracks and recording jobs.

This document uses the property event mechanism defined in IEC 60839-11-31 to model global resources. A client or upper level VSS subscribes to a VSS pull point. In consecutive requests, it then pulls all resources it is interested in in order to get to know all relevant resources of a lower-level VSS. As soon as it receives a resource, it can apply an action on it.

Once all resources have been reported, further pull messages will either timeout when no changes happen or report changes. In this context, changes are added resources, modification of resource properties or removed resources. By applying the property event notification mechanism to resources, a client or upper level VSS has always up-to-date information about the lower level VSS resources it is interested in.

6.2 Remote tokens

IEC 60839-11-31 assumes that the device defines tokens, which are unique within a device and its context. This document extends the scheme to allow building globally unique tokens called remote tokens.

A remote token shall be constructed like a QName with a device-specific prefix and a local token.

RemoteToken = Prefix + ':' + LocalToken

The overall string length of the remote token is limited to 64 characters. A local token shall not exceed 36 characters and should contain no colon. The length limitation is chosen in such a way that it enables the use of UUIDs as defined in RFC 4122. Note that device implementations typically use compact tokens.

A VSS shall use the same prefix for all tokens of the same device. This allows a client to understand which tokens they can use for any web service API call.

A VSS can choose to simply use device local tokens as LocalToken part or create an internal mapping. A client may not assume that tokens received from a VSS can be used in device calls by stripping the prefix.

The naming conventions for the prefix part are outside of the scope of this document. Depending on the application area, implementers can choose different approaches. Therefore, this document does not require that remote tokens are globally unique between different VSSs. See Annex A for a country-specific definition of globally unique addresses.

See Annex B for a guide to token adaptation.

6.3 Token context

Clients talking to multiple servers at a time, such as VSSs and/or devices, shall address resources to a server only with tokens received from that same server. There is no guarantee that remote tokens received from one server can be used to address the same resource at another server.

7 Resource queries

7.1 General

This document models resources as so-called property events. A resource is a configuration item addressed via a token.

Resources are queried and reported via the event mechanism. This mechanism provides two advantages over a classical query interface. Firstly, the mechanism can cope with very large responses by chopping the response packets into multiple pull cycles. Secondly, the mechanism provides a real-time update facility so that services can inform clients very efficiently about resource changes.

A server supporting resource queries shall signal the supported resource queries via the GetEventProperties interface of the event service. The following resources can be enumerated:

For media configurations:

> VideoSourceConfiguration, AudioSourceConfiguration, VideoEncoderConfiguration, AudioEncoderConfiguration, AudioOutputConfiguration, AudioDecoderConfiguration, MetadataConfiguration, AnalyticsConfiguration, PTZConfiguration, OSDConfiguration, MaskConfiguration

For media profiles: MediaProfile

7.2 Resource event

Each resource maps to the following event definition;

```
Topic: tns1:Resource/<resource name>
<tt:MessageDescription IsProperty="true">
  <tt:Source>
    <tt:SimpleItemDescription Name="Token" Type="tt:ReferenceToken"/>
  </tt:Source>
  <tt:Data>
    <tt:SimpleItemDescription Name="Name" Type="xs:string"/>
    <tt:ElementItemDescription Name="Location" Type="tt:GeoLocation"/>
    <tt:SimpleItemDescription Name="Scope" Type="xs:string"/>
    <tt:SimpleItemDescription Name="Offline" Type="xs:boolean"/>  </tt:Data>
</tt:MessageDescription>
```

The source item Token is mandatory and shall contain a qualified token that is unique within the serving system.

The data items are optional.

The data item scope refers to the discovery scope entry defined in IEC 60839-11-31. It can occur multiple times for each scope entry supported by the device.

An event shall be generated with PropertyOperation set to Initialized whenever a resource is signaled the first time in a subscription or it is newly added to the system. An event with PropertyOperation set to Deleted shall be generated when a resource is removed from the system.

Note that a change from online to offline or vice versa shall only create a PropertyOperation of type Changed if the event contains an Offline state Boolean.

7.3 Location filter

A service supporting resource queries shall support the Location Filter.