IEC 62676-2-3

Edition 1.0 2013-11

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



## Video surveillance systems for use in security applications – Part 2-3: Video transmission protocols – IP interoperability implementation based on Web services

## Systèmes de vidéosurveillance destinés à être utilisés dans les applications de sécurité – Partie 2-3: Protocoles de transmission vidéo – Mise en œuvre de l'interopérabilité IP en fonction des services Web

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

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

IEC 62676-2-3

Edition 1.0 2013-11

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

colour inside



## Video surveillance systems for use in security applications – Part 2-3: Video transmission protocols – IP interoperability implementation based on Web services

## Systèmes de vidéosurveillance destinés à être utilisés dans les applications de sécurité – Partie 2-3: Protocoles de transmission vidéo – Mise en œuvre de l'interopérabilité IP en fonction des services Web

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

PRICE CODE XH
CODE PRIX

ICS 13.320

ISBN 978-2-8322-1189-2

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

# VIDEO SURVEILLANCE SYSTEMS FOR USE IN SECURITY APPLICATIONS –

## Part 2-3: Video transmission protocols – IP interoperability implementation based on Web services

## FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62676-2-3 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 |
|---|---|
| 79/437/FDIS | 79/450/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.

**IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

# 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*

This third subpart of IEC 62676-2 covers IP Interoperability Implementation Based Web Services. It is based on the requirements for IP video transmission protocols covered in IEC 62676-2-1, which defines protocol requirements to be fulfilled by any high-level IP video device interface.

# VIDEO SURVEILLANCE SYSTEMS FOR USE IN SECURITY APPLICATIONS –

## Part 2-3: Video transmission protocols – IP interoperability implementation based on Web services

## 1 Scope

This part 2-3 of IEC 62676 defines procedures for communication between network video clients and video transmitter devices based on Web Services. This new set of specifications makes it possible to build network video systems with devices and receivers from different manufacturers using common and well defined interfaces. These interfaces cover functions such as device management, real-time streaming of audio and video, event handling, Pan, Tilt and Zoom (PTZ) control, video analytics as well as control, search and replay of recordings.

The management and control interfaces defined in this standard are described as Web services. This international standard also contains full XML schema and Web Service Description Language (WSDL) definitions for the introduced network video services.

In order to offer full plug-and-play interoperability, the standard defines procedures for device discovery. The device discovery mechanisms in the standard are based on the WS-Discovery specification with extensions. These extensions have been introduced in order to cover the specific network video discovery needs.

This standard is not limited to discovery, configuration and control functions, but defines precise formats for media and metadata streaming in IP networks using suitable profiling of IETF standards. Furthermore, appropriate protocol extensions have been introduced in order to make it possible for network video manufacturers to offer a fully standardized network video transfer solution to its customers and integrators.

A video transmission device supporting compliance to the requirements of this standard with the help of Web services according to the specification of this part is declared as compatible to IEC 62676-2 Web service Interoperability.

The goal of this standard is to realize a fully interoperable network video implementation comprised of products from different network video vendors. This standard describes the network video model, interfaces, data types and data exchange patterns. The standard reuses existing relevant standards where available, and introduces new specifications only where necessary to support the specific requirements for network video surveillance. This is the Open Network Video Interface Forum (ONVIF) core specification. In addition, ONVIF has released the following related specifications:

- ONVIF Schema [see C.15]
- ONVIF Analytics Service WSDL [see C.1]
- ONVIF Analytics Device Service [see C.2]
- ONVIF Device Service WSDL [see C.4]
- ONVIF DeviceIO Service WSDL [see C.3]
- ONVIF Display Service WSDL [see C.5]
- ONVIF Event Service WSDL [see C.6]
- ONVIF Imaging Service WSDL [see C.7]
- ONVIF Media Service WSDL [see C.8]

- ONVIF PTZ Service WSDL [see C.9]
- ONVIF Receiver Service WSDL [see C.10]
- ONVIF Recording Service WSDL [see C.11]
- ONVIF Remote Discovery WSDL [see C.12]
- ONVIF Replay Service WSDL [see C.13]
- ONVIF Search Service WSDL [see C.14]
- ONVIF Topic Namespace XML [see C.16]

The purpose of this standard is to define the ONVIF specification framework, and is divided into the following sections:

Specification overview: Gives an overview of the different specification parts and how they are related to each other.

Web Services Framework: Offers a brief introduction to Web Services and the Web Services basis for the ONVIF specifications.

IP configuration: Defines the ONVIF network video IP configuration requirements.

Device discovery: Describes how devices are discovered in local and remote networks.

Device management: Defines the network video transmitter management commands.

DeviceIO: Defines commands to handle physical inputs and outputs.

Display: Defines commands to deal with display devices.

Imaging and media: Defines the configuration commands related to imaging and media settings.

Real time streaming: Provides requirements for interoperable video, audio and metadata streaming.

Event handling: Defines how to subscribe to and receive data from network video events (notifications).

PTZ control: Provides commands for pan, tilt and zoom control.

Video analytics: Defines the ONVIF analytics model, analytics object description and analytics rules configurations.

Video analytics device: Defines commands to deal with a video analytics device.

Recording control: Defines mechanism for the configuring of recordings.

Recording search and replay control: Provides commands for retrieval of recorded media including metadata.

Security section: Defines the transport and message level security requirements on ONVIF compliant implementations.

## 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.

ITU-T G.711, *Pulse code modulation (PCM) of voice frequencies*

< http://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-G.711-198811-I!!PDF-E&type=items>

[X.680] ITU-T Recommendation X.680 (1997) | ISO/IEC 8824-1:2008, *Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation*

[X.681] ITU-T Recommendation X.681 (1997) | ISO/IEC 8824-2:2008, *Information technology – Abstract Syntax Notation One (ASN.1): Information object specification*

[X.682] ITU-T Recommendation X.682 (1997) | ISO/IEC 8824-3:2008, *Information technology – Abstract Syntax Notation One (ASN.1): Constraint specification*

[X.683] ITU-T Recommendation X.683 (1997) | ISO/IEC 8824-4:2008, *Information technology – Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specifications*

[X.690] ITU-T Recommendation X.690 (1997) | ISO/IEC 8825-1:2008, *Information technology – ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*

NIST FIPS 180-2, *SECURE HASH STANDARD*

<http://csrc.nist.gov/publications/fips/fips180-2/fips180-2.pdf>

RFC1305, *Network Time Protocol (Version 3), Specification, Implementation and Analysis*

<http://www.ietf.org/rfc/rfc1305.txt>

IETF RFC 2131, *Dynamic Host Configuration Protocol*

<http://www.ietf.org/rfc/rfc2131.txt>

IETF RFC 2136, *Dynamic Updates in the Domain Name System (DNS UPDATE)*

<http://www.ietf.org/rfc/rfc2136.txt>

IETF RFC 2246, *The TLS Protocol Version 1.0*

<http://www.ietf.org/rfc/rfc2246.txt>

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

<http://www.ietf.org/rfc/rfc2326.txt>

IETF RFC 2435, *RTP Payload Format for JPEG-compressed Video*

<http://www.ietf.org/rfc/rfc2435.txt>

IETF RFC 2616, *Hypertext Transfer Protocol – HTTP/1.1*

<http://www.ietf.org/rfc/rfc2616.txt>

IETF RFC 2617, *HTTP Authentication: Basic and Digest Access Authentication*

<http://www.ietf.org/rfc/rfc2617.txt>

IETF RFC 2782, *A DNS RR for specifying the location of services (DNS SRV)*

<http://www.ietf.org/rfc/rfc2782.txt>

IETF RFC 3268, *Advanced Encryption Standard (AES) Ciphersuites for Transport Layer Security (TLS)*

<http://www.ietf.org/rfc/rfc3268.txt>

IETF RFC 3315, *Dynamic Host Configuration Protocol for IPv6 (DHCPv6)*

<http://www.ietf.org/rfc/rfc3315.txt>

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

<http://www.ietf.org/rfc/rfc3550.txt>

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

<http://www.ietf.org/rfc/rfc3551.txt>

IETF RFC 3927, *Dynamic Configuration of IPv4 Link-Local Addresses*

<http://www.ietf.org/rfc/rfc3927.txt>

IETF RFC 3984, *RTP Payload Format for H.264 Video*

<http://www.ietf.org/rfc/rfc3984>

IETF RFC 3986, *Uniform Resource Identifier (URI): Generic Syntax*

<http://www.ietf.org/rfc/rfc3986.txt>

IETF RFC 4514, *Lightweight Directory Access Protocol (LDAP):String Representation of Distinguished Names*

<http://www.ietf.org/rfc/rfc4514.txt>

IETF RFC 4566, *SDP: Session Description Protocol*

<http://www.ietf.org/rfc/rfc4566.txt>

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

<http://www.ietf.org/rfc/rfc4571.txt>

IETF RFC 4702, *The Dynamic Host Configuration Protocol (DHCP) Client Fully Qualified Domain Name (FQDN) Option*

<http://www.ietf.org/rfc/rfc4702.txt>

IETF RFC 4861, *Neighbor Discovery for IP version 6 (IPv6)*

<http://www.ietf.org/rfc/rfc4861.txt>

IETF RFC 4862, *IPv6 Stateless Address Autoconfiguration*

<http://www.ietf.org/rfc/rfc4862.txt>

W3C SOAP 1.2, Part 1, *Messaging Framework*

<http://www.w3.org/TR/soap12-part1/>

W3C SOAP Version 1.2 Part 2: Adjuncts (Second Edition)

<http://www.w3.org/TR/2007/REC-soap12-part2-20070427/>

OASIS Web Services Base Notification 1.3

<http://docs.oasis-open.org/wsn/wsn-ws_base_notification-1.3-spec-os.pdf>

OASIS Web Services Security UsernameToken Profile 1.0

<http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-username-token-profile-1.0.pdf>

W3C XML Schema Part 1: Structures Second Edition

<http://www.w3.org/TR/xmlschema-1/>

W3C XML Schema Part 2: Datatypes Second Edition

<http://www.w3.org/TR/xmlschema-2/>

W3C XML-binary Optimized Packaging

<http://www.w3.org/TR/2005/REC-xop10-20050125/>

W3C XML Path Language (XPath) Version 1.0

<http://www.w3.org/TR/xpath/>

IEEE 802.11:2007, *IEEE Standard for Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications*

<http://standards.ieee.org/getieee802/download/802.11-2007.pdf>

IEEE 802.1X, Port-Based Network Access Control

<http://standards.ieee.org/getieee802/download/802.1X-2004.pdf>

[UDDI API ver2] "*UDDI Version 2.04 API Specification UDDI Committee Specification, 19 July 2002*", OASIS standard, 19 July 2002

<http://uddi.org/pubs/ProgrammersAPI-V2.04-Published-20020719.pdf>

[UDDI Data Structure ver2] "*UDDI Version 2.03 Data Structure Reference UDDI Committee Specification*", OASIS standard, 19 July 2002.

<http://uddi.org/pubs/DataStructure-V2.03-Published-20020719.pdf>

[WS-X.509Token] "*Web Services Security X.509 Certificate Token Profile 1.1*", OASIS Standard,1 February 2006.

<http://www.oasis-open.org/committees/download.php/16785/wss-v1.1-spec-os-x509TokenProfile.pdf>

## 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**
**ad-hoc network**
an independent basic service set

[SOURCE: IEEE 802.11:2007]

**3.1.2**
**basic service set**
a set of IEEE 802.11 stations that have successfully joined in a common network

[SOURCE: IEEE 802.11:2007]

**3.1.3**
**capability**
ability of a device that allows a client to ask for its services

**3.1.4**
**configuration entity**
a network video device media abstract component that is used to produce a media stream on the network

Note 1 to entry: The media stream is a video and/or an audio stream.

**3.1.5**
**control plane**
plane consisting of media control functions

Note 1 to entry: Media control functions are device control, media configuration and PTZ commands.

**3.1.6**
**digital PTZ**
function that diminishes or crops an image to adjust the image position and ratio