

# INTERNATIONAL STANDARD



**Digital living network alliance (DLNA) home networked device interoperability  
guidelines –  
Part 3: Link protection**

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# INTERNATIONAL STANDARD



**Digital living network alliance (DLNA) home networked device interoperability  
guidelines –  
Part 3: Link protection**

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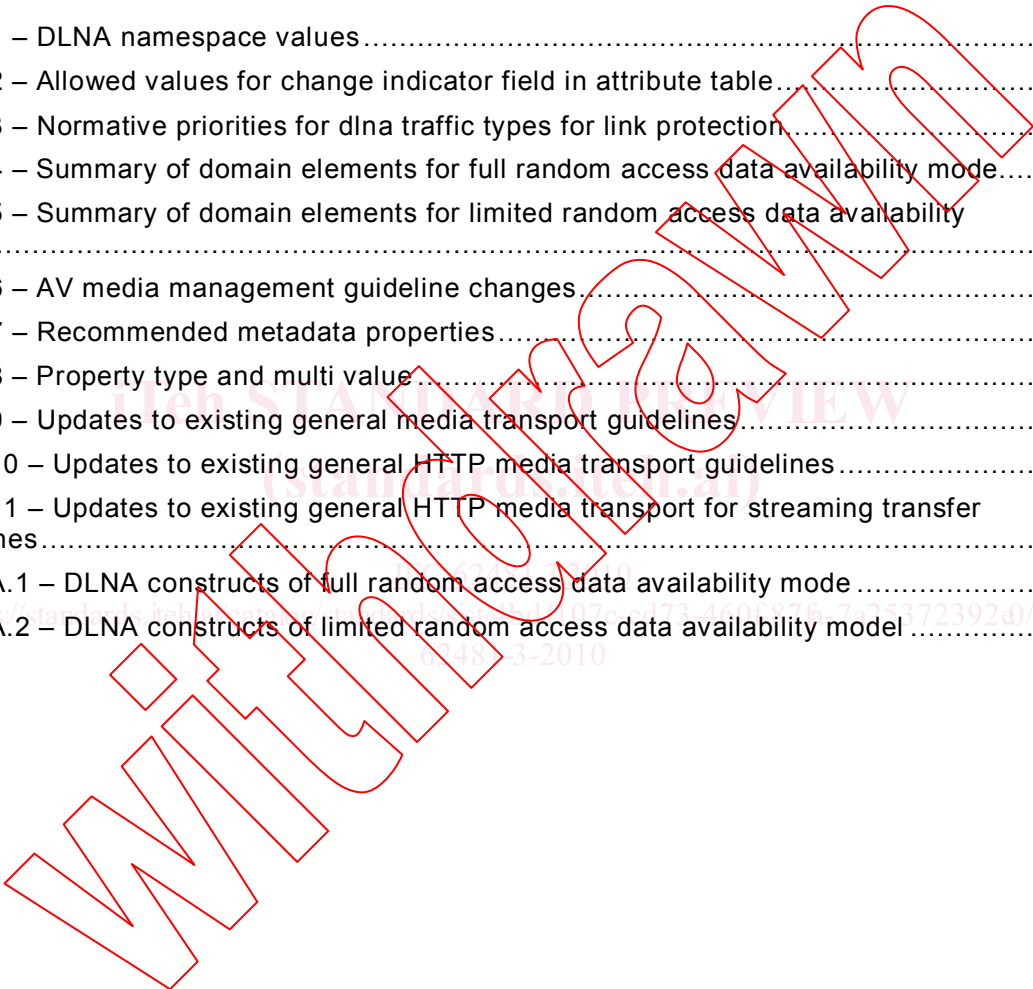
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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**DIGITAL LIVING NETWORK ALLIANCE (DLNA) HOME  
NETWORKED DEVICE INTEROPERABILITY GUIDELINES –**
**Part 3: Link protection**

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

CDV	Report on voting
100/1617/CDV	100/1739/RVC

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.

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# DIGITAL LIVING NETWORK ALLIANCE (DLNA) HOME NETWORKED DEVICE INTEROPERABILITY GUIDELINES –

## Part 3: Link protection

### 1 Scope

This part of IEC 62481 specifies the DLNA link protection guidelines, which are an extension of the DLNA guidelines. DLNA link protection is defined as the protection of a content stream between two devices on a DLNA network from illegitimate observation or interception using the protocols defined within this standard.

Content protection is an important mechanism for ensuring that commercial content is protected from piracy and illegitimate redistribution. Link protection is a technique that enables distribution of protected commercial content on a home network, thus resulting in greater consumer flexibility while still preserving the rights of copyright holders and content providers.

The guidelines in this standard reference existing technologies for link protection and provide mechanisms for interoperability between different implementations as well as integration with the DLNA architecture.

This standard is organized to align with the overall structure of IEC 62481-1 and IEC 62481-2.

### 2 Normative reference

The following referenced documents are indispensable for the application 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 62481-1:2007, *Digital living network alliance (DLNA) home networked device interoperability guidelines – Part 1: Architecture and protocols*

IEC 62481-2:2007, *Digital living network alliance (DLNA) home networked device interoperability guidelines – Part 2: DLNA media formats*

ISO/IEC 13818-1:2007, *Information technology – Generic coding of moving pictures and associated audio information: Systems*

ISO/IEC 13818-2:2007, *Information technology – Generic coding of moving pictures and associated audio information: Video*

ISO/IEC 14496-2:2004 *Information technology – Coding of audio-visual objects – Part 2: Visual*

Amendment 1 (2004), *Error resilient simple scalable profile*

ISO/IEC 29341-3-10:2008, *Information technology – UPnP device architecture – Part 3-10: Audio video device control protocol – Audio video transport service*

ISO/IEC 29341-3-11:2008, *Information technology – UPnP device architecture – Part 3-11: Audio video device control protocol – Connection manager service*

ISO/IEC 29341-3-12:2008, *Information technology – UPnP device architecture – Part 3-12: Audio video device control protocol – Content directory service*

DTCP Volume 1 (informational version), *Digital transmission content protection specification*  
Volume 1, Revision 1.4: February 28, 2005  
[http://www.dtcp.com/data/info\\_20050228\\_dtcp\\_vol\\_1\\_1p4.pdf](http://www.dtcp.com/data/info_20050228_dtcp_vol_1_1p4.pdf)

DTCP Volume 1 Supplement E (informational version)  
*Mapping DTCP to IP*, Revision 1.1: February 28, 2005  
[http://www.dtcp.com/data/info\\_20050228\\_dtcp\\_VISE\\_1p1.pdf](http://www.dtcp.com/data/info_20050228_dtcp_VISE_1p1.pdf)

DTCP Audio Compliance Rules EXHIBIT B-2:  
*Compliance rules for licensed products that receive or transmit commercial audio works*,  
June 2002  
[http://www.dtcp.com/data/Compliance\\_Rules\\_Audio\\_020610.pdf](http://www.dtcp.com/data/Compliance_Rules_Audio_020610.pdf)

IEEE 802.1Q, *IEEE standard for information technology – Telecommunications and information exchange between systems – IEEE standard for local and metropolitan area networks – Common specifications – Virtual Bridged Local Area Networks*

IEEE 802.11, *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*

### **3 Terms, definitions and acronyms**

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

#### **3.1 Terms and definition**

##### **3.1.1 authentication and key exchange AKE**

step in a link protection system where the receiving device is authenticated and given the correct keys for the content

##### **3.1.2 advanced system format ASF**

media format encapsulation for the transmission of content

##### **3.1.3 audio with video AV**

any media content that contains both moving picture and sound

##### **3.1.4 AV transport AVT**

UPnP service that provides network-based control for common transport operations such as play, stop, pause, next, previous, and seek, a standard UPnP DCP

##### **3.1.5 cleartext**

unencrypted content stream after decryption by the upstream content protection system and before encryption by the link protection system

**3.1.6****cleartext byte domain**

specification of a byte position in the cleartext content stream for a complete explanation of seek operations on link protected content, see Annex A

**3.1.7****cleartext byte seek request header**

used to signify any of those transport layer request headers; implies that the guideline applies to all uses of any of the request headers

**3.1.8****cleartext byte seek response header**

used to signify any of those transport layer response headers; implies that the guideline applies to all uses of any of the request headers

**3.1.9****connection manager service****CMS**

UPnP service that provides information about the supported transport protocols and media formats of a UPnP device, a standard UPnP DCP

**3.1.10****contributing source****CSRC**

source used for the RTP media transport

**3.1.11****decoder friendly alignment position**

position in the bitstream defined for decoder friendly alignment; always the start of a media format alignment element that can begin to process data without any other internal state information about the stream so that the decoder can begin processing at that point and create a valid output rendering

**3.1.12****digital living network alliance****DLNA**

organization that originally developed this standard

**3.1.13****DLNA link protection**

protection, using DLNA protocol elements as defined in these guidelines, of a content stream between two devices on a DLNA network from illegitimate observation or interception

**3.1.14****DLNA QoS user priority****DLNAQOS\_UP**

DLNA-defined QoS label used to correlate an underlying IEEE 802.1Q user priority and WMM access category to a DLNA traffic type(s)

**3.1.15****digital transmission content protection****DTCP**

one of the link protection system

**3.1.16****digital transmission content protection over IP networks****DTCP-IP**

DTCP as applied IP based network

**3.1.17**  
**group of pictures**  
**GOP**

defined grouping of information in the MPEG 2 media format

**3.1.18**  
**hyper text transfer protocol**  
**HTTP**

protocol for transferring files across the Internet

NOTE Requires an HTTP client program on one end, and an HTTP server program on the other end.

**3.1.19**  
**link protection alignment element**

unit of content carried within a link protected content stream starts with a packet header that is defined by the link protection system and contains bytes of the link protected stream

**3.1.20**  
**link protection**

protection of a content stream between two devices on a DLNA network from illegitimate observation or interception

**3.1.21**  
**link protection system**

specific collection of technologies with corresponding rules that enable secure content transfer between two endpoints

**3.1.22**  
**media format alignment element**

unit of content carried within an unprotected content stream, starts at a decoder friendly alignment position for the given media format and contains an integral number of units of content as defined by the media format in use

**3.1.23**  
**multipurpose internet mail extension**  
**MIME**

standard system for identifying the type of data contained in a file

NOTE MIME is an Internet protocol that allows sending binary files across the Internet as attachments to e-mail messages. This includes graphics, photos, sound, video files, and formatted text documents.

**3.1.24**  
**network byte domain**

specification of a byte position in the content stream as it is carried on the network transport

NOTE For content binaries that use a link protection system, this will include encryption and any necessary headers or padding required by the link protection system.

**3.1.25**  
**network connectivity – power saving**  
**NC-PS**

power saving modes of operations, as defined in IEC 62481-1

**3.1.26**  
**protected content packet**  
**PCP**

packet format for DTCP-IP link protected content, as defined in DTCP Volume 1 and DTCP Volume 1 Supplement E

**3.1.27****program stream****PS**

content binary stream usually in reference to an MPEG-2 AV stream format

**3.1.28****real time protocol****RTP**

media transport that provides end-to-end network transport functions for transmitting real-time data, such as AV

NOTE It provides services such as payload type identification, sequence numbering, time-stamping, and delivery monitoring.

**3.1.29****real time streaming protocol****RTSP**

protocol within the RTP protocol suite

**3.1.30****round trip time****RTT**

time between sending a network packet to a remote host and the time that the response is received

**3.1.31****session description protocol****SDP**

protocol within the RTP protocol suite

**3.1.32****simple object access protocol****SOAP**

XML based messaging protocol used to exchange service requests and responses over a network

**3.1.33****time domain**

specification of a position in the content stream in time units

**3.1.34****transport stream****TS**

content binary stream usually in reference to an MPEG-2 AV stream format

**3.1.35****uniform client data availability model****UCDAM**

model for representing which bytes of a content binary are available on a server for seek operations

NOTE See 7.5 of IEC 62481-1 for a full definition.

**3.1.36****UPnP**

architecture for pervasive peer-to-peer network connectivity of devices of all form factors

NOTE 1 See ISO/IEC 29341-1 for architecture description.

NOTE 2 It is designed to bring easy-to-use, flexible, standards-based connectivity to ad-hoc or unmanaged networks whether in the home, in a small business, public spaces, or attached to the Internet. It is a distributed, open networking architecture that leverages TCP/IP and Web technologies to enable seamless proximity networking in addition to control and data transfer among networked devices in the home, office, and public spaces.

**3.1.37  
uniform resource identifier**

**URI**

W3C's codification of the name and address syntax of present and future objects on the Internet

NOTE In its most basic form, a URI consists of a scheme name (such as file, http, ftp, news, mailto, gopher) followed by a colon, followed by a path whose nature is determined by the scheme that precedes it. URI is the umbrella term for URNs, URLs, and all other uniform resource identifiers.

**3.1.38  
video object unit**

**VOBU**

defined grouping of information in the MPEG 2 media format

**3.1.39  
wired equivalency privacy**

**WEP**

wireless privacy standard used in conjunction with IEEE 802.11 networks

**3.1.40  
Windows media audio**

**WMA**

audio compression binary format

**3.1.41  
Windows media DRM for network device**

**WM DRM-ND**

one of the link protection system

**3.1.42  
Windows media video**

**WMV**

AV compression binary format

**3.1.43  
WiFi protected access**

**WPA**

system to secure a wireless IEEE 802.11 network

**3.1.44  
WiFi protected access version 2**

**WPA2**

system to secure a wireless IEEE 802.11 network version 2

**3.2 Abbreviation terms**

BNF	Backus Naur Form
LWS	Linear WhiteSpace
MPEG-2	Moving Picture Experts Group phase 2
MIU	Media Interoperability Unit
MTU	Maximum Transmission Unit

UCDAM	Uniform Content Data Availability Model
UPnP	Universal Plug and Play
W3C	World Wide Web Consortium

#### 4 DLNA home network architecture

Refer to IEC 62481-1, Clause 4 for detailed descriptions of the DLNA home networking architecture.

#### 5 DLNA device model

Refer to IEC 62481-1, Clause 5 for detailed descriptions of the DLNA home networking architecture. This standard extends the existing DLNA devices and system usages to include link protected content used for the following:

- 2 box pull system usage;
- 2 box push system usage;
- 3 box system usage;

for the transfer and rendering of content items. These are the only system usages that are currently in scope for the use of DLNA link protection.

#### 6 Guideline terminology and conventions

##### 6.1 Guideline compliance classifiers

Reference [9]<sup>1</sup> provides a description of terminology conventions used in all IETF RFC documents. The terminology and conventions used by the DLNA home networked device interoperability guidelines are adapted from this reference. The details of each guideline will carry a compliance classifier from the following set.

[M]ust, Required, Shall: This is the minimum set of requirements that will ensure interoperability and/or robust operation between devices. All devices are expected to comply with these requirements when expressed in unconditional form. A conditional requirement expressed in the form, "If X, then Y shall be implemented", means that the requirement "Y" shall be met when the conditional aspect "X" applies to a given implementation.

[S]hould, Recommended: Recommended items are optional items that are strongly recommended for inclusion in products. The difference between "recommended" items and "optional" items, see below, is one of priority. When considering features for inclusion in a product, recommended items should be included first.

[O]ptional, May: Optional items are suggestions for features that will enhance the user experience or are offered as a less preferred choice relative to another recommended feature. If optional features are included, they shall comply with the requirement to ensure interoperability with other implementations.

##### 6.2 Standard of specification usage classifiers

When specifying guideline details, it is often useful to reiterate or clarify certain aspects of a standard or specification that are often violated or misunderstood. Furthermore, there may be guideline requirements that intentionally contradict or restrict implementation of certain

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<sup>1</sup> Figures in square brackets refer to the Bibliography.