

[MS-H245]:

H.245 Protocol: Microsoft Extensions

Intellectual Property Rights Notice for Open Specifications Documentation

- **Technical Documentation.** Microsoft publishes Open Specifications documentation (“this documentation”) for protocols, file formats, data portability, computer languages, and standards support. Additionally, overview documents cover inter-protocol relationships and interactions.
- **Copyrights.** This documentation is covered by Microsoft copyrights. Regardless of any other terms that are contained in the terms of use for the Microsoft website that hosts this documentation, you can make copies of it in order to develop implementations of the technologies that are described in this documentation and can distribute portions of it in your implementations that use these technologies or in your documentation as necessary to properly document the implementation. You can also distribute in your implementation, with or without modification, any schemas, IDLs, or code samples that are included in the documentation. This permission also applies to any documents that are referenced in the Open Specifications documentation.
- **No Trade Secrets.** Microsoft does not claim any trade secret rights in this documentation.
- **Patents.** Microsoft has patents that might cover your implementations of the technologies described in the Open Specifications documentation. Neither this notice nor Microsoft's delivery of this documentation grants any licenses under those patents or any other Microsoft patents. However, a given Open Specifications document might be covered by the Microsoft [Open Specifications Promise](#) or the [Microsoft Community Promise](#). If you would prefer a written license, or if the technologies described in this documentation are not covered by the Open Specifications Promise or Community Promise, as applicable, patent licenses are available by contacting iplg@microsoft.com.
- **License Programs.** To see all of the protocols in scope under a specific license program and the associated patents, visit the [Patent Map](#).
- **Trademarks.** The names of companies and products contained in this documentation might be covered by trademarks or similar intellectual property rights. This notice does not grant any licenses under those rights. For a list of Microsoft trademarks, visit www.microsoft.com/trademarks.
- **Fictitious Names.** The example companies, organizations, products, domain names, email addresses, logos, people, places, and events that are depicted in this documentation are fictitious. No association with any real company, organization, product, domain name, email address, logo, person, place, or event is intended or should be inferred.

Reservation of Rights. All other rights are reserved, and this notice does not grant any rights other than as specifically described above, whether by implication, estoppel, or otherwise.

Tools. The Open Specifications documentation does not require the use of Microsoft programming tools or programming environments in order for you to develop an implementation. If you have access to Microsoft programming tools and environments, you are free to take advantage of them. Certain Open Specifications documents are intended for use in conjunction with publicly available standards specifications and network programming art and, as such, assume that the reader either is familiar with the aforementioned material or has immediate access to it.

Support. For questions and support, please contact dochelp@microsoft.com.

Revision Summary

Date	Revision History	Revision Class	Comments
7/20/2007	0.1	Major	MCPPE Milestone 5 Initial Availability
9/28/2007	0.1.1	Editorial	Changed language and formatting in the technical content.
10/23/2007	0.2	Minor	Updated references.
11/30/2007	0.2.1	Editorial	Changed language and formatting in the technical content.
1/25/2008	0.2.2	Editorial	Changed language and formatting in the technical content.
3/14/2008	0.2.3	Editorial	Changed language and formatting in the technical content.
5/16/2008	0.2.4	Editorial	Changed language and formatting in the technical content.
6/20/2008	1.0	Major	Updated and revised the technical content.
7/25/2008	1.0.1	Editorial	Changed language and formatting in the technical content.
8/29/2008	1.0.2	Editorial	Fix capitalization issues.
10/24/2008	1.0.3	Editorial	Changed language and formatting in the technical content.
12/5/2008	1.0.4	Editorial	Editorial Update.
1/16/2009	1.0.5	Editorial	Changed language and formatting in the technical content.
2/27/2009	1.0.6	Editorial	Changed language and formatting in the technical content.
4/10/2009	1.0.7	Editorial	Changed language and formatting in the technical content.
5/22/2009	1.0.8	Editorial	Changed language and formatting in the technical content.
7/2/2009	1.0.9	Editorial	Changed language and formatting in the technical content.
8/14/2009	1.0.10	Editorial	Changed language and formatting in the technical content.
9/25/2009	1.1	Minor	Clarified the meaning of the technical content.
11/6/2009	2.0	Major	Updated and revised the technical content.
12/18/2009	2.0.1	Editorial	Changed language and formatting in the technical content.
1/29/2010	3.0	Major	Updated and revised the technical content.
3/12/2010	3.0.1	Editorial	Changed language and formatting in the technical content.
4/23/2010	3.0.2	Editorial	Changed language and formatting in the technical content.
6/4/2010	3.0.3	Editorial	Changed language and formatting in the technical content.
7/16/2010	3.0.3	None	No changes to the meaning, language, or formatting of the technical content.
8/27/2010	3.0.3	None	No changes to the meaning, language, or formatting of the technical content.
10/8/2010	3.0.3	None	No changes to the meaning, language, or formatting of the technical content.
11/19/2010	3.0.3	None	No changes to the meaning, language, or formatting of the

Date	Revision History	Revision Class	Comments
			technical content.
1/7/2011	3.0.3	None	No changes to the meaning, language, or formatting of the technical content.
2/11/2011	3.0.3	None	No changes to the meaning, language, or formatting of the technical content.
3/25/2011	3.0.3	None	No changes to the meaning, language, or formatting of the technical content.
5/6/2011	3.0.3	None	No changes to the meaning, language, or formatting of the technical content.
6/17/2011	3.1	Minor	Clarified the meaning of the technical content.
9/23/2011	3.1	None	No changes to the meaning, language, or formatting of the technical content.
12/16/2011	3.1	None	No changes to the meaning, language, or formatting of the technical content.
3/30/2012	3.1	None	No changes to the meaning, language, or formatting of the technical content.
7/12/2012	3.1	None	No changes to the meaning, language, or formatting of the technical content.
10/25/2012	3.1	None	No changes to the meaning, language, or formatting of the technical content.
1/31/2013	3.1	None	No changes to the meaning, language, or formatting of the technical content.
8/8/2013	3.1	None	No changes to the meaning, language, or formatting of the technical content.
11/14/2013	3.1	None	No changes to the meaning, language, or formatting of the technical content.
2/13/2014	3.1	None	No changes to the meaning, language, or formatting of the technical content.
5/15/2014	3.1	None	No changes to the meaning, language, or formatting of the technical content.
6/30/2015	3.1	None	No changes to the meaning, language, or formatting of the technical content.
10/16/2015	3.1	None	No changes to the meaning, language, or formatting of the technical content.
7/14/2016	3.1	None	No changes to the meaning, language, or formatting of the technical content.
6/1/2017	3.1	None	No changes to the meaning, language, or formatting of the technical content.

Table of Contents

1	Introduction	5
1.1	Glossary	5
1.2	References	5
1.2.1	Normative References	5
1.2.2	Informative References	5
1.3	Overview	6
1.4	Relationship to Other Protocols	6
1.5	Prerequisites/Preconditions	6
1.6	Applicability Statement	6
1.7	Versioning and Capability Negotiation	6
1.8	Vendor-Extensible Fields	6
1.9	Standards Assignments.....	6
2	Messages.....	7
2.1	Transport	7
2.2	Message Syntax	7
2.2.1	DVI4 Packet Format	7
2.2.2	logicalChannelSwitchingCapability	7
2.2.3	t120DynamicPortCapability	7
3	Protocol Details	9
3.1	Server Details.....	9
3.1.1	Abstract Data Model	9
3.1.2	Timers	9
3.1.3	Initialization	9
3.1.4	Higher-Layer Triggered Events	9
3.1.5	Processing Events and Sequencing Rules	9
3.1.6	Timer Events.....	9
3.1.7	Other Local Events.....	9
4	Protocol Examples	10
4.1	Network Capture.....	10
5	Security	11
5.1	Security Considerations for Implementers	11
5.2	Index of Security Parameters	11
6	Appendix A: Product Behavior	12
7	Change Tracking.....	13
8	Index.....	14

1 Introduction

This specification describes the Microsoft extensions for the H.245 Protocol. This document provides a differential view between the H.245 Protocol: Microsoft Extensions and the H.245 International Telecommunication Union (ITU) standards, as specified in [\[H245-1.3\]](#).

Sections 1.5, 1.8, 1.9, 2, and 3 of this specification are normative. All other sections and examples in this specification are informative.

1.1 Glossary

This document uses the following terms:

Digital Video Interactive 4 (DVI4): A file format used to transfer audio data. Also known as the DVI ADPCM Wave Type.

MAY, SHOULD, MUST, SHOULD NOT, MUST NOT: These terms (in all caps) are used as defined in [\[RFC2119\]](#). All statements of optional behavior use either MAY, SHOULD, or SHOULD NOT.

1.2 References

Links to a document in the Microsoft Open Specifications library point to the correct section in the most recently published version of the referenced document. However, because individual documents in the library are not updated at the same time, the section numbers in the documents may not match. You can confirm the correct section numbering by checking the [Errata](#).

1.2.1 Normative References

We conduct frequent surveys of the normative references to assure their continued availability. If you have any issue with finding a normative reference, please contact dochelp@microsoft.com. We will assist you in finding the relevant information.

[H245-1.3] ITU-T, "Control protocol for multimedia communication", Recommendation H.245, version 1.3, February 1998, <http://www.itu.int/rec/T-REC-H.245-199802-S/en>

[H323-1.2] ITU-T, "Packet-based multimedia communications systems", Recommendation H.323, version 1.2, February 1998, <http://www.itu.int/rec/T-REC-H.245-199802-S/en>

[RFC1890] Schulzrinne, H., "RTP Profile for Audio and Video Conferences with Minimal Control", RFC 1890, January 1996, <http://www.ietf.org/rfc/rfc1890.txt>

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997, <https://www.rfc-editor.org/rfc/rfc2119.html>

[T120] ITU-T, "Data protocols for multimedia conferencing", Recommendation T.120, January 2007, <http://www.itu.int/rec/T-REC-T.120/en>

Note There is a charge to download the specification.

[T123] ITU-T, "Network-Specific Data Protocol Stacks for Multimedia Conferencing", Recommendation T.123, May 1999, <http://www.itu.int/rec/T-REC-T.123/en>

Note There is a charge to download the specification.

1.2.2 Informative References

None.

1.3 Overview

The H.245 Protocol, as specified in [\[H245-1.3\]](#), is the control protocol for multimedia communication contained within the H.323 specification. H.323, as specified in [\[H323-1.2\]](#), is a protocol suite defined by the ITU and used for Voice over IP (VoIP) and video conferencing.

The Microsoft TAPI3.0 product (included in Windows 2000 operating system) implemented an H.323 endpoint following the ITU protocol specification. TAPI3.0 uses the **Digital Video Interactive 4 (DVI4)** audio codec, which is not one of the codecs defined in [\[H323-1.2\]](#). TAPI3.0 uses the H.245 Protocol: Microsoft Extensions to include DVI4 as one of the codecs available for negotiation during call setup time.[<1>](#)

The H.323 Protocol includes the H.245 terminal capability negotiation procedure, as specified in [\[H323-1.2\]](#) and [\[H245-1.3\]](#). Microsoft has added support to this procedure for the Digital Video Interactive 4 (DVI4) audio codec at the 16-kilohertz (kHz) sample rate. If the Abstract Syntax Notation One (ASN.1) **AudioCapability** message included in the H.245 negotiation procedure contains a *nonStandardParameter*, with *nonStandardIdentifier* set to the Object Identifier "{ 1 3 6 1 4 1 3 11 19 2 }", and data set to the Octet String "11 00 01 00 80 3E 00 00 40 1F 00 00 01 00 04 00 02 00 14 00", the 16-kHz DVI4 codec is supported.

[\[H245-1.3\]](#) has a capability that allows the client to change the logical channel that is rendered. The H.245 Protocol: Microsoft Extensions do not implement this functionality, as specified in section [2.2.2](#).

[\[H245-1.3\]](#) has a capability that allows the client to place a [\[T120\]](#) call to a dynamic transport address, instead of the standard well-known port address described in [\[T120\]](#). The H.245 Protocol: Microsoft Extensions do not implement this functionality as specified in section [2.2.3](#).

1.4 Relationship to Other Protocols

The H.245 Protocol is contained within the H.323 Protocol suite (as specified in [\[H323-1.2\]](#)) and uses TCP/IP as a transport.

1.5 Prerequisites/Preconditions

There are no prerequisites other than those specified in [\[H245-1.3\]](#) and [\[H323-1.2\]](#).

1.6 Applicability Statement

This protocol extension is applicable to any implementation that uses both the [\[H323-1.2\]](#) Protocol set (including [\[H245-1.3\]](#)) and the **DVI4** audio codec.

1.7 Versioning and Capability Negotiation

H.245 Protocol: Microsoft Extensions have no versioning or capability negotiation functionality.

1.8 Vendor-Extensible Fields

None.

1.9 Standards Assignments

None.

2 Messages

2.1 Transport

There are no changes to the transport mechanism defined in [\[H245-1.3\]](#) and [\[H323-1.2\]](#).

2.2 Message Syntax

This extension allows the **DVI4** audio codec to be utilized with the H.323 Protocol [\[H323-1.2\]](#). This extension is implemented according to the H.245 Extension Procedure, as specified in [\[H245-1.3\]](#) Appendix IV.

Microsoft has added support to the H.245 terminal capability negotiation procedure to allow for use of the Digital Video Interactive 4 (DVI4) audio codec at the 16-kHz sample rate.

Support for the 16-kHz DVI4 codec MUST be indicated via the following steps:

1. The Abstract Syntax Notation One (ASN.1) **AudioCapability** message included in the H.245 negotiation procedure MUST contain a **nonStandardData** of type **nonStandardParameter Sequence** as described in Annex A of [\[H245-1.3\]](#).
2. The *nonStandardParameter* MUST be set to include the following items:
 - The **OBJECT IDENTIFIER** (**nonStandardIdentifier**) MUST be set using the following ANS.1 value.

```
{ 1 3 6 1 4 1 311 19 2 }
```

- The *OCTET STRING* (**data**) portion MUST be set to the following value.

```
11 00 01 00 80 3E 00 00 40 1F 00 00 01 00 04 00 02 00 14 00
```

2.2.1 DVI4 Packet Format

The H.245 Protocol: Microsoft Extensions implement **DVI4** exactly as specified in [\[RFC1890\]](#) section 4.4.2.

2.2.2 logicalChannelSwitchingCapability

[\[H245-1.3\]](#) section 6, Messages: Syntax specifies an **H2250Capability** structure. This structure contains a **logicalChannelSwitchingCapability** field ([\[H245-1.3\]](#) section 7.2.2.4 Multiplex Capabilities). This field allows the client to change the logical channel that is rendered, based on criteria specified in [\[H245-1.3\]](#). The H.245 Protocol: Microsoft Extensions do not implement this functionality.

When the **H2250Capability** structure is sent using the H.245 Protocol: Microsoft Extensions, the **logicalChannelSwitchingCapability** field is EMPTY (NULL). This field MUST be set to NULL when sent, and MUST be ignored when received. This applies to client and server roles.

2.2.3 t120DynamicPortCapability

[\[H245-1.3\]](#) section 6, Messages: Syntax specifies an **H2250Capability** structure. This structure contains a **t120DynamicPortCapability** field ([\[H245-1.3\]](#) section 7.2.2.4 Multiplex Capabilities). This field allows the client to place a [\[T120\]](#) call to a dynamic transport address instead of the standard

well-known port address as defined in [\[T123\]](#). The H.245 Protocol: Microsoft Extensions do not implement this functionality.

When the **H2250Capability** structure is sent using the H.245 Protocol: Microsoft Extensions, the **t120DynamicPortCapability** field is EMPTY (NULL). This field MUST be set to NULL when sent, and MUST be ignored when received. This applies to client and server roles.

3 Protocol Details

3.1 Server Details

3.1.1 Abstract Data Model

H.245 Protocol: Microsoft Extensions do not change the data model specified in [\[H245-1.3\]](#).

3.1.2 Timers

The H.245 Protocol: Microsoft Extensions have no additional timers beyond those specified in [\[H245-1.3\]](#) and [\[H323-1.2\]](#).

3.1.3 Initialization

There are no additional initialization steps beyond those specified in [\[H245-1.3\]](#) and [\[H323-1.2\]](#).

3.1.4 Higher-Layer Triggered Events

The H.245 Protocol: Microsoft Extensions have no higher-layer triggered events beyond those specified in [\[H245-1.3\]](#) and [\[H323-1.2\]](#).

3.1.5 Processing Events and Sequencing Rules

The H.245 Protocol: Microsoft Extensions have no additional sequencing rules beyond those specified in [\[H245-1.3\]](#) and [\[H323-1.2\]](#).

3.1.6 Timer Events

None.

3.1.7 Other Local Events

None.

4 Protocol Examples

4.1 Network Capture

The information below illustrates a typical network traffic capture specifying the 16-kHz DVI4 codec capability between two nodes.

```
ReceiveAudioCapability : Microsoft Extension:
    the 16-kHz DVI4 codec is supported
    00 09 2B 06 01 04 01 82 37 13 02 14    ..+....7...
    11 00 01 00 80 3E 00 00 40 1F 00 00    ....>..@...
    01 00 04 00 02 00 14 00                .....

ChoiceValue: 0 -> 0
nonStandardData( NonStandardParameter): ->
    00 09 2B 06 01 04 01 82 37 13 02 14
    11 00 01 00 80 3E 00 00 40 1F 00 00
    01 00 04 00 02 00 14 00
Align: No Padding -> 00
ProtocolIdentifierLength: 9 (0x09) -> 09

object (OBJECT_IDENTIFIER) :
    1.3.6.1.4.1.311.19.2 -> 2B 06 01 04 01 82 37 13 02
First: 43 (0x2B) -> 2B
Final: 6 (0x06) -> 06
Final: 1 (0x01) -> 01
Final: 4 (0x04) -> 04
Final: 1 (0x01) -> 01
Part: 130 (0x82) -> 82
Final: 55 (0x37) -> 37
Final: 19 (0x13) -> 13
Final: 2 (0x02) -> 02

data: (length: 20) ->
    14 11 00 01 00 80 3E 00 00 40 1F 00
    00 01 00 04 00 02 00 14 00

Determinant Length: 20 -> 0x14
Value (OBJECT STRING): Binary Large Object (20 Bytes) ->
    11 00 01 00 80 3E 00 00 40 1F
    00 00 01 00 04 00 02 00 14 00
```

5 Security

5.1 Security Considerations for Implementers

The H.245 Protocol: Microsoft Extensions have no additional security considerations beyond those specified or implied in [\[H245-1.3\]](#) and [\[H323-1.2\]](#).

5.2 Index of Security Parameters

None.

6 Appendix A: Product Behavior

The information in this specification is applicable to the following Microsoft products or supplemental software. References to product versions include updates to those products.

- Windows NT operating system
- Windows 2000 operating system
- Windows XP operating system
- Windows Server 2003 operating system

Exceptions, if any, are noted in this section. If an update version, service pack or Knowledge Base (KB) number appears with a product name, the behavior changed in that update. The new behavior also applies to subsequent updates unless otherwise specified. If a product edition appears with the product version, behavior is different in that product edition.

Unless otherwise specified, any statement of optional behavior in this specification that is prescribed using the terms "SHOULD" or "SHOULD NOT" implies product behavior in accordance with the SHOULD or SHOULD NOT prescription. Unless otherwise specified, the term "MAY" implies that the product does not follow the prescription.

[<1> Section 1.3](#): Note that the **DVI4** codec, while part of other Microsoft APIs that are included in Windows, is used only in the Microsoft TAPI implementation.

7 Change Tracking

No table of changes is available. The document is either new or has had no changes since its last release.

8 Index

A

[Abstract data model](#) 9
 [server](#) 9
[Applicability](#) 6

C

[Capability negotiation](#) 6
[Change tracking](#) 13

D

[Data model - abstract](#) 9
 [server](#) 9
[DVI4 packet format](#) 7
[DVI4 Packet Format message](#) 7

E

[Examples - network capture](#) 10

F

[Fields - vendor-extensible](#) 6

G

[Glossary](#) 5

H

[Higher-layer triggered events](#) 9
 [server](#) 9

I

[Implementer - security considerations](#) 11
[Index of security parameters](#) 11
[Informative references](#) 5
[Initialization](#) 9
 [server](#) 9
[Introduction](#) 5

L

[Local events](#) 9
[logicalChannelSwitchingCapability](#) 7
[logicalChannelSwitchingCapability message](#) 7

M

[Message processing](#) 9
Messages
 [DVI4 Packet Format](#) 7
 [logicalChannelSwitchingCapability](#) 7
 [syntax](#) 7
 [t120DynamicPortCapability](#) 7
 [transport](#) 7

N

[Network capture example](#) 10
[Normative references](#) 5

O

Other local events
 [server](#) 9
[Overview \(synopsis\)](#) 6

P

[Parameters - security index](#) 11
[Preconditions](#) 6
[Prerequisites](#) 6
[Product behavior](#) 12

R

[References](#) 5
 [informative](#) 5
 [normative](#) 5
[Relationship to other protocols](#) 6

S

Security
 [implementer considerations](#) 11
 [parameter index](#) 11
 [Sequencing rules](#) 9
Server
 [abstract data model](#) 9
 [higher-layer triggered events](#) 9
 [initialization](#) 9
 [other local events](#) 9
 [timer events](#) 9
 [timers](#) 9
 [Standards assignments](#) 6
 [Syntax](#) 7

T

[t120DynamicPortCapability](#) 7
[t120DynamicPortCapability message](#) 7
[Timer events](#) 9
 [server](#) 9
[Timers](#) 9
 [server](#) 9
[Tracking changes](#) 13
[Transport](#) 7
[Triggered events - higher-layer](#) 9
 [server](#) 9

V

[Vendor-extensible fields](#) 6
[Versioning](#) 6