

[MS-H245]: H.245 Protocol: Microsoft Extensions

Intellectual Property Rights Notice for Open Specifications Documentation

- **Technical Documentation.** Microsoft publishes Open Specifications documentation for protocols, file formats, languages, standards as well as overviews of the interaction among each of these technologies.
- **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 may make copies of it in order to develop implementations of the technologies described in the Open Specifications and may distribute portions of it in your implementations using these technologies or your documentation as necessary to properly document the implementation. You may also distribute in your implementation, with or without modification, any schema, IDL's, or code samples that are included in the documentation. This permission also applies to any documents that are referenced in the Open Specifications.
- **No Trade Secrets.** Microsoft does not claim any trade secret rights in this documentation.
- **Patents.** Microsoft has patents that may cover your implementations of the technologies described in the Open Specifications. Neither this notice nor Microsoft's delivery of the documentation grants any licenses under those or any other Microsoft patents. However, a given Open Specification may be covered by Microsoft [Open Specification Promise](#) or the [Community Promise](#). If you would prefer a written license, or if the technologies described in the Open Specifications are not covered by the Open Specifications Promise or Community Promise, as applicable, patent licenses are available by contacting iplg@microsoft.com.
- **Trademarks.** The names of companies and products contained in this documentation may 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 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 specifically described above, whether by implication, estoppel, or otherwise.

Tools. The Open Specifications do 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 are intended for use in conjunction with publicly available standard specifications and network programming art, and assumes that the reader either is familiar with the aforementioned material or has immediate access to it.

Revision Summary

Date	Revision History	Revision Class	Comments
07/20/2007	0.1	Major	MCPP Milestone 5 Initial Availability
09/28/2007	0.1.1	Editorial	Revised and edited the technical content.
10/23/2007	0.2	Minor	Updated references.
11/30/2007	0.2.1	Editorial	Revised and edited the technical content.
01/25/2008	0.2.2	Editorial	Revised and edited the technical content.
03/14/2008	0.2.3	Editorial	Revised and edited the technical content.
05/16/2008	0.2.4	Editorial	Revised and edited the technical content.
06/20/2008	1.0	Major	Updated and revised the technical content.
07/25/2008	1.0.1	Editorial	Revised and edited the technical content.
08/29/2008	1.0.2	Editorial	Fix capitalization issues.
10/24/2008	1.0.3	Editorial	Revised and edited the technical content.
12/05/2008	1.0.4	Editorial	Editorial Update.
01/16/2009	1.0.5	Editorial	Revised and edited the technical content.
02/27/2009	1.0.6	Editorial	Revised and edited the technical content.
04/10/2009	1.0.7	Editorial	Revised and edited the technical content.
05/22/2009	1.0.8	Editorial	Revised and edited the technical content.
07/02/2009	1.0.9	Editorial	Revised and edited the technical content.
08/14/2009	1.0.10	Editorial	Revised and edited the technical content.
09/25/2009	1.1	Minor	Updated the technical content.
11/06/2009	2.0	Major	Updated and revised the technical content.
12/18/2009	2.0.1	Editorial	Revised and edited the technical content.
01/29/2010	3.0	Major	Updated and revised the technical content.
03/12/2010	3.0.1	Editorial	Revised and edited the technical content.
04/23/2010	3.0.2	Editorial	Revised and edited the technical content.
06/04/2010	3.0.3	Editorial	Revised and edited the technical content.
07/16/2010	3.0.3	No change	No changes to the meaning, language, or formatting of the technical content.

Date	Revision History	Revision Class	Comments
08/27/2010	3.0.3	No change	No changes to the meaning, language, or formatting of the technical content.
10/08/2010	3.0.3	No change	No changes to the meaning, language, or formatting of the technical content.
11/19/2010	3.0.3	No change	No changes to the meaning, language, or formatting of the technical content.
01/07/2011	3.0.3	No change	No changes to the meaning, language, or formatting of the technical content.
02/11/2011	3.0.3	No change	No changes to the meaning, language, or formatting of the technical content.
03/25/2011	3.0.3	No change	No changes to the meaning, language, or formatting of the technical content.
05/06/2011	3.0.3	No change	No changes to the meaning, language, or formatting of the technical content.
06/17/2011	3.1	Minor	Clarified the meaning of the technical content.
09/23/2011	3.1	No change	No changes to the meaning, language, or formatting of the technical content.
12/16/2011	3.1	No change	No changes to the meaning, language, or formatting of the technical content.
03/30/2012	3.1	No change	No changes to the meaning, language, or formatting of the technical content.
07/12/2012	3.1	No change	No changes to the meaning, language, or formatting of the technical content.
10/25/2012	3.1	No change	No changes to the meaning, language, or formatting of the technical content.
01/31/2013	3.1	No change	No changes to the meaning, language, or formatting of the technical content.
08/08/2013	3.1	No change	No changes to the meaning, language, or formatting of the technical content.
11/14/2013	3.1	No change	No changes to the meaning, language, or formatting of the technical content.

Contents

1 Introduction	5
1.1 Glossary	5
1.2 References	5
1.2.1 Normative References	5
1.2.2 Informative References	6
1.3 Overview	6
1.4 Relationship to Other Protocols	6
1.5 Prerequisites/Preconditions	7
1.6 Applicability Statement	7
1.7 Versioning and Capability Negotiation	7
1.8 Vendor-Extensible Fields	7
1.9 Standards Assignments	7
2 Messages	8
2.1 Transport	8
2.2 Message Syntax	8
2.2.1 DVI4 Packet Format	8
2.2.2 logicalChannelSwitchingCapability	8
2.2.3 t120DynamicPortCapability	8
3 Protocol Details	10
3.1 Server Details	10
3.1.1 Abstract Data Model	10
3.1.2 Timers	10
3.1.3 Initialization	10
3.1.4 Higher-Layer Triggered Events	10
3.1.5 Processing Events and Sequencing Rules	10
3.1.6 Timer Events	10
3.1.7 Other Local Events	10
4 Protocol Examples	11
4.1 Network Capture	11
5 Security	12
5.1 Security Considerations for Implementers	12
5.2 Index of Security Parameters	12
6 Appendix A: Product Behavior	13
7 Change Tracking	14
8 Index	15

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 [\[H245-v3\]](#).

Sections 1.8, 2, and 3 of this specification are normative and can contain the terms MAY, SHOULD, MUST, MUST NOT, and SHOULD NOT as defined in RFC 2119. Sections 1.5 and 1.9 are also normative but cannot contain those terms. All other sections and examples in this specification are informative.

1.1 Glossary

The following terms are defined in [\[MS-GLOS\]](#):

Active Directory
domain
domain controller (DC)
globally unique identifier (GUID)
little-endian
Unicode
Universal Naming Convention (UNC)

The following terms are specific to this document:

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

DVI ADPCM Wave Type: See **Digital Video Interactive 4 (DVI4)**.

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

1.2 References

References to Microsoft Open Specifications documentation do not include a publishing year because links are to the latest version of the documents, which are updated frequently. References to other documents include a publishing year when one is available.

A reference marked "(Archived)" means that the reference document was either retired and is no longer being maintained or was replaced with a new document that provides current implementation details. We archive our documents online [\[Windows Protocol\]](#).

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. Please check the archive site, <http://msdn2.microsoft.com/en-us/library/E4BD6494-06AD-4aed-9823-445E921C9624>, as an additional source.

[H245-v3] ITU-T, "Control protocol for multimedia communication", Recommendation H.245 (version 3), February 1998, <http://www.itu.int/rec/T-REC-H.245-199802-S/en>

[H323-v2] ITU-T, "Packet-based multimedia communications systems", Recommendation H.323 (version 2), February 1998, <http://www.itu.int/rec/T-REC-H.323-199802-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, <http://www.rfc-editor.org/rfc/rfc2119.txt>

[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

[MS-GLOS] Microsoft Corporation, "[Windows Protocols Master Glossary](#)".

1.3 Overview

The H.245 Protocol, as specified in [\[H245-v3\]](#), is the control protocol for multimedia communication contained within the H.323 specification. H.323, as specified in [\[H323-v2\]](#), 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 [\[H323-v2\]](#). 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 [\[H323-v2\]](#) and [\[H245-v3\]](#). 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 1 311 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.

[\[H245-v3\]](#) 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](#).

[\[H245-v3\]](#) 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 [\[H323-v2\]](#)) and uses TCP/IP as a transport.

1.5 Prerequisites/Preconditions

There are no prerequisites other than those specified in [\[H245-v3\]](#) and [\[H323-v2\]](#).

1.6 Applicability Statement

This protocol extension is applicable to any implementation that uses both the [\[H323-v2\]](#) Protocol set (including [\[H245-v3\]](#)) 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 [\[H245-v3\]](#) and [\[H323-v2\]](#).

2.2 Message Syntax

This extension allows the DVI4 audio codec to be utilized with the H.323 Protocol [\[H323-v2\]](#). This extension is implemented according to the H.245 Extension Procedure, as specified in [\[H245-v3\]](#) 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 [\[H245-v3\]](#).
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

[\[H245-v3\]](#) section 6, Messages: Syntax specifies an **H2250Capability** structure. This structure contains a **logicalChannelSwitchingCapability** field ([\[H245-v3\]](#) 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 [\[H245-v3\]](#). 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

[\[H245-v3\]](#) section 6, Messages: Syntax specifies an **H2250Capability** structure. This structure contains a **t120DynamicPortCapability** field ([\[H245-v3\]](#) 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 [\[H245-v3\]](#).

3.1.2 Timers

The H.245 Protocol: Microsoft Extensions have no additional timers beyond those specified in [\[H245-v3\]](#) and [\[H323-v2\]](#).

3.1.3 Initialization

There are no additional initialization steps beyond those specified in [\[H245-v3\]](#) and [\[H323-v2\]](#).

3.1.4 Higher-Layer Triggered Events

The H.245 Protocol: Microsoft Extensions have no higher-layer triggered events beyond those specified in [\[H245-v3\]](#) and [\[H323-v2\]](#).

3.1.5 Processing Events and Sequencing Rules

The H.245 Protocol: Microsoft Extensions have no additional sequencing rules beyond those specified in [\[H245-v3\]](#) and [\[H323-v2\]](#).

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 [\[H245-v3\]](#) and [\[H323-v2\]](#).

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 released service packs:

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

Exceptions, if any, are noted below. If a service pack or Quick Fix Engineering (QFE) number appears with the product version, behavior changed in that service pack or QFE. The new behavior also applies to subsequent service packs of the product 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](#) 10
[Applicability](#) 7

C

[Capability negotiation](#) 7
[Change tracking](#) 14

D

[Data model - abstract](#) 10
[DVI4 packet format](#) 8

E

[Examples - network capture](#) 11

F

[Fields - vendor-extensible](#) 7

G

[Glossary](#) 5

H

[Higher-layer triggered events](#) 10

I

[Implementer - security considerations](#) 12
[Index of security parameters](#) 12
[Informative references](#) 6
[Initialization](#) 10
[Introduction](#) 5

L

[Local events](#) 10
[logicalChannelSwitchingCapability](#) 8

M

[Message processing](#) 10
Messages
 [syntax](#) 8
 [transport](#) 8

N

[Network capture example](#) 11
[Normative references](#) 5

O

[Overview \(synopsis\)](#) 6

P

[Parameters - security index](#) 12
[Preconditions](#) 7
[Prerequisites](#) 7
[Product behavior](#) 13

R

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

S

Security
 [implementer considerations](#) 12
 [parameter index](#) 12
[Sequencing rules](#) 10
[Standards assignments](#) 7
[Syntax](#) 8

T

[t120DynamicPortCapability](#) 8
[Timer events](#) 10
[Timers](#) 10
[Tracking changes](#) 14
[Transport](#) 8
[Triggered events - higher-layer](#) 10

V

[Vendor-extensible fields](#) 7
[Versioning](#) 7