# [MS-DTMF]:
# RTP Payload for DTMF Digits, Telephony Tones, and Telephony Signals 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 |
|---|---|---|---|
| 04/04/2008 | 0.1 | | Initial version |
| 04/25/2008 | 0.2 | | Updated based on feedback |
| 06/27/2008 | 1.0 | | Updated based on feedback |
| 08/15/2008 | 1.01 | | Updated based on feedback |
| 12/12/2008 | 2.0 | | Updated with latest template bug fixes (redlined) |
| 02/13/2009 | 2.01 | | Updated with latest template bug fixes (redlined) |
| 03/13/2009 | 2.02 | | Updated with latest template bug fixes (redlined) |
| 07/13/2009 | 2.03 | Major | Revised and edited the technical content |
| 08/28/2009 | 2.04 | Editorial | Revised and edited the technical content |
| 11/06/2009 | 2.05 | Editorial | Revised and edited the technical content |
| 02/19/2010 | 2.06 | Editorial | Revised and edited the technical content |
| 03/31/2010 | 2.07 | Major | Updated and revised the technical content |
| 04/30/2010 | 2.08 | Editorial | Revised and edited the technical content |
| 06/07/2010 | 2.09 | Editorial | Revised and edited the technical content |
| 06/29/2010 | 2.10 | Editorial | Changed language and formatting in the technical content. |
| 07/23/2010 | 2.10 | No change | No changes to the meaning, language, or formatting of the technical content. |
| 09/27/2010 | 3.0 | Major | Significantly changed the technical content. |
| 11/15/2010 | 3.0 | No change | No changes to the meaning, language, or formatting of the technical content. |
| 12/17/2010 | 3.0 | No change | No changes to the meaning, language, or formatting of the technical content. |
| 03/18/2011 | 3.0 | No change | No changes to the meaning, language, or formatting of the technical content. |
| 06/10/2011 | 3.0 | No change | No changes to the meaning, language, or formatting of the technical content. |
| 01/20/2012 | 3.1 | Minor | Clarified the meaning of the technical content. |
| 04/11/2012 | 3.1 | No change | No changes to the meaning, language, or formatting of the technical content. |

| Date | Revision History | Revision Class | Comments |
|---|---|---|---|
| 07/16/2012 | 3.1 | No change | No changes to the meaning, language, or formatting of the technical content. |
| 10/08/2012 | 4.0 | Major | Significantly changed the technical content. |
| 02/11/2013 | 4.0 | No change | No changes to the meaning, language, or formatting of the technical content. |
| 07/30/2013 | 4.0 | No change | No changes to the meaning, language, or formatting of the technical content. |
| 11/18/2013 | 4.0 | No change | No changes to the meaning, language, or formatting of the technical content. |
| 02/10/2014 | 4.0 | No change | No changes to the meaning, language, or formatting of the technical content. |
| 04/30/2014 | 4.1 | Minor | Clarified the meaning of the technical content. |
| 07/31/2014 | 4.1 | No change | No changes to the meaning, language, or formatting of the technical content. |
| 10/30/2014 | 4.1 | No change | No changes to the meaning, language, or formatting of the technical content. |

# Table of Contents

# 1 Introduction

This document specifies the RTP Payload for DTMF Digits, Telephony Tones, and Telephony Signals Extensions. This protocol, which consists of a set of proprietary extensions to the protocol described in [RFC4733], specifies the payload format needed to carry **dual-tone multi-frequency (DTMF)** digits, tones, and signals in **Real-Time Transport Protocol (RTP)** packets over a network transport.

Any behavior not explicitly defined in this document is described in [RFC4733].

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 [RFC2119]. Sections 1.5 and 1.9 are also normative but do not contain those terms. All other sections and examples in this specification are informative.

## 1.1 Glossary

The following terms are defined in [MS-OFCGLOS]:

**dual-tone multi-frequency (DTMF)**
**Real-Time Transport Protocol (RTP)**
**RTP packet**
**RTP payload**
**RTP session**
**Session Description Protocol (SDP)**

The following terms are specific to this document:

**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

References to Microsoft Open Specification documents 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.

### 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.

[MS-RTP] Microsoft Corporation, "Real-time Transport Protocol (RTP) Extensions".

[MS-RTPRADEX] Microsoft Corporation, "RTP Payload for Redundant Audio Data Extensions".

[MS-SDPEXT] Microsoft Corporation, "Session Description Protocol (SDP) Version 2.0 Extensions".

[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

[RFC4733] Schulzrinne, H., and Taylor, T., "RTP Payload for DTMF Digits, Telephony Tones and Telephony Signals", RFC 4733, December 2006, http://www.ietf.org/rfc/rfc4733.txt

### 1.2.2 Informative References

[MS-OFCGLOS] Microsoft Corporation, "Microsoft Office Master Glossary".

## 1.3 Overview

This protocol extends the protocol described in [RFC4733], which describes a mechanism for the transmission of in-band and out-of-band telephony signals.

An in-band telephony signal is where the events or tones are mixed directly into the media stream (typically, audio data). An out-of-band telephony signal is where the events or tones are transmitted through a separate band.

Telephony tones represent the DTMF tones mixed into the audio signal of the media stream. Telephony events represent the different call control events (such as an off-hook event or a specific digit being dialed).

The scope of this protocol is limited to telephony signals using out-of-band transmission. The in-band transmission of digits and tones is not supported by this protocol.

## 1.4 Relationship to Other Protocols

This protocol relies on RTP, as described in [MS-RTP], as its transport mechanism. This protocol can be used to communicate signaling DTMF telephony events between clients and gateways using the **RTP payload**.

## 1.5 Prerequisites/Preconditions

This protocol is a payload of the RTP; therefore, a valid **RTP session** is established between the client and the gateway.

Furthermore, because of the dynamic payload typing of the telephony events, some form of out-of-band negotiation to bind the payload type of the RTP payload to the telephony events is required.

## 1.6 Applicability Statement

This protocol is applicable wherever telephony digits, tones, or signals need to be sent or consumed either by remote clients or through gateways.

## 1.7 Versioning and Capability Negotiation

This document covers versioning issues in the following areas:

- **Supported Transports:** This protocol is sent using the RTP transport mechanism.
- **Protocol Versions:** This protocol, as a format of an RTP payload, does not provide versioning information within the scope of the protocol itself. However, as a part of the RTP payload, any versioning information about the RTP level applies.
- **Security and Authentication Methods:** This document does not describe any security or authentication methods. Security and authentication is dependent on the security method, authentication method, or both methods used by the RTP version 2 protocol and is beyond the scope of this document.

## 1.8 Vendor-Extensible Fields

None.

## 1.9 Standards Assignments

None.

# 2 Messages

## 2.1 Transport

This protocol MUST be sent by using RTP, as specified in [MS-RTP], as its transport. This protocol assumes that a successful RTP session has been established with valid payload information.

The **SDP** MUST be used to negotiate the payload type information, as specified in [MS-SDPEXT] section 3.1.5.3 and [MS-SDPEXT] section 3.1.5.5.

## 2.2 Message Syntax

The structure and syntax of this protocol is specified in [RFC4733] section 2.3.

### 2.2.1 DTMF Telephony Event

The DTMF telephony event is specified in the **event** field, as specified in [RFC4733] section 2.3.1, of the DTMF message. In addition to events 0 through 15 (as defined in [RFC4733]), event 16, which is reserved (as defined in [RFC4733]), is also supported. The following is an example of an SDP invite that specifies DTMF event type 0-16 at the end:

```
v=0
o=- 0 1 IN IP4 10.131.32.127
s=session
c=IN IP4 10.131.32.127
b=CT:99980
t=0 0
a=x-devicecaps:audio:send,recv;video:send,recv
m=audio 50006 RTP/AVP 117 114 9 112 111 0 8 116 115 97 13 118 101
a=x-ssrc-range:727739136-727739136
a=rtcp-fb:* x-message app send:dsh recv:dsh a=rtcp-rsize a=label:main-audio a=x-source:main-
audio a=ice-ufrag:6Gjo a=ice-pwd:NvUIAlyBYxK0xQ+VCXYRc2L/
a=candidate:1 1 UDP 2130706431 10.131.32.127 50006 typ host
a=candidate:1 2 UDP 2130705918 10.131.32.127 50007 typ host
a=x-candidate-ipv6:2 1 UDP 2130705919 2001:4898:1:12:6d0f:ce6a:35a9:c5e0 50002 typ host
a=x-candidate-ipv6:2 2 UDP 2130705406 2001:4898:1:12:6d0f:ce6a:35a9:c5e0 50003 typ host
a=x-candidate-ipv6:3 1 UDP 2130705407 2001:4898:0:fff:0:5efe:10.131.32.127 50012 typ host
a=x-candidate-ipv6:3 2 UDP 2130704894 2001:4898:0:fff:0:5efe:10.131.32.127 50013 typ host
a=candidate:4 1 TCP-PASS 174455295 131.107.1.53 58849 typ relay raddr 10.131.32.127 rport
50016
a=candidate:4 2 TCP-PASS 174454782 131.107.1.53 58849 typ relay raddr 10.131.32.127 rport
50016
a=candidate:5 1 UDP 184547327 131.107.1.53 58555 typ relay raddr 10.131.32.127 rport 50004
a=candidate:5 2 UDP 184546814 131.107.1.53 59208 typ relay raddr 10.131.32.127 rport 50005
a=x-candidate-ipv6:6 1 UDP 184546815 2001:4898:9000:6000:fe:1311:700:1053 54003 typ relay
raddr 10.131.32.127 rport 50004
a=x-candidate-ipv6:6 2 UDP 184546302 2001:4898:9000:6000:fe:1311:700:1053 52204 typ relay
raddr 10.131.32.127 rport 50005
a=candidate:7 1 TCP-ACT 174846975 131.107.1.53 58849 typ relay raddr 10.131.32.127 rport
50016
a=candidate:7 2 TCP-ACT 174846462 131.107.1.53 58849 typ relay raddr 10.131.32.127 rport
50016
a=x-candidate-ipv6:8 1 TCP-PASS 174453247 2001:4898:9000:6000:fe:1311:700:1053 50226 typ
relay raddr 10.131.32.127 rport 50016
a=x-candidate-ipv6:8 2 TCP-PASS 174452734 2001:4898:9000:6000:fe:1311:700:1053 50226 typ
relay raddr 10.131.32.127 rport 50016
a=x-candidate-ipv6:9 1 TCP-ACT 174845951 2001:4898:9000:6000:fe:1311:700:1053 50226 typ relay
raddr 10.131.32.127 rport 50016
```

```
a=x-candidate-ipv6:9 2 TCP-ACT 174845438 2001:4898:9000:6000:fe:1311:700:1053 50226 typ relay
raddr 10.131.32.127 rport 50016
a=candidate:10 1 TCP-ACT 1684794879 10.131.32.127 50016 typ srflx raddr 10.131.32.127 rport
50016
a=candidate:10 2 TCP-ACT 1684794366 10.131.32.127 50016 typ srflx raddr 10.131.32.127 rport
50016
a=cryptoscale:1 client AES_CM_128_HMAC_SHA1_80
inline:sW8VgUkKL9a0xVLoRWctybbka87hwg16KknLeyY7|2^31|1:1
a=crypto:2 AES_CM_128_HMAC_SHA1_80 inline:f29SH3+v3rWEj0hgb3+2a5/a1LG9cW1Yyjma24f3|2^31|1:1
a=crypto:3 AES_CM_128_HMAC_SHA1_80 inline:a3n9t4OaoJLkwtu9F69U691Xtw8y5fRZikREQlQb|2^31
a=maxptime:200
a=rtpmap:117 G722/8000/2
a=rtpmap:114 x-msrta/16000
a=fmtp:114 bitrate=29000
a=rtpmap:9 G722/8000
a=rtpmap:112 G7221/16000
a=fmtp:112 bitrate=24000
a=rtpmap:111 SIREN/16000
a=fmtp:111 bitrate=16000
a=rtpmap:0 PCMU/8000
a=rtpmap:8 PCMA/8000
a=rtpmap:116 AAL2-G726-32/8000
a=rtpmap:115 x-msrta/8000
a=fmtp:115 bitrate=11800
a=rtpmap:97 RED/8000
a=rtpmap:13 CN/8000
a=rtpmap:118 CN/16000
a=rtpmap:101 telephone-event/8000
a=fmtp:101 0-16
```

# 3 Protocol Details

## 3.1 Common Details

This protocol conforms more to the "sender-receiver" paradigm, rather than the classic "client-server" paradigm. More specifically, it is appropriate to discuss in terms of the receiver of the telephony signals and the sender of the telephony signals.

This section covers the common details between the sender and receiver. Subsequent sections provide the specifics for the sender and the receiver.

Out-of-band negotiation of telephony signal information is required to establish a session as specified in [RFC4733]. During this negotiation, both payload types and the clock rate of the telephony signals are negotiated as specified in [RFC4733] section 2.5.1.1 using SDP for out-of-band negotiation. While dynamic payload type binding is required, both the sender and receiver of message blocks conforming to this protocol MUST fix the telephony signaling information at 8000 Hertz. Dynamic negotiation of the clock frequency of the DTMF payload MUST NOT be used.

Multiple payload type binding for different telephony events MUST NOT be used. There MUST be only one telephony event binding for a payload type. The payload type binding MUST be symmetrical. This means the received payload type and sent payload type MUST be the same. Asymmetrical payload type information MUST NOT be used.

This protocol supports only the out-of-band telephony event. An in-band telephony tone transmission MUST NOT be used.

### 3.1.1 Abstract Data Model

None.

### 3.1.2 Timers

None.

### 3.1.3 Initialization

None.

### 3.1.4 Higher-Layer Triggered Events

None.

### 3.1.5 Message Processing Events and Sequencing Rules

None.

### 3.1.6 Timer Events

None.

### 3.1.7 Other Local Events

None.

## 3.2 Receiver Details

Redundant payload support, as specified in [MS-RTPRADEX], MUST NOT be used.

Multiple events per RTP block MUST NOT be used.

### 3.2.1 Abstract Data Model

None.

### 3.2.2 Timers

None.

### 3.2.3 Initialization

None.

### 3.2.4 Higher-Layer Triggered Events

None.

### 3.2.5 Message Processing Events and Sequencing Rules

None.

### 3.2.6 Timer Events

None.

### 3.2.7 Other Local Events

None.

## 3.3 Sender Details

Implementation for this protocol MUST NOT generate redundant blocks, as specified in [MS-RTPRADEX].

The sender MUST NOT pack multiple DTMF payloads into a single **RTP packet**.

The sender MUST NOT generate a DTMF event whose duration exceeds the maximum expressible duration, as specified in [RFC4733] section 2.3.5.

The sender MUST NOT generate a DTMF event payload with a zero duration.

### 3.3.1 Abstract Data Model

None.

### 3.3.2 Timers

None.

### 3.3.3 Initialization

None.

### 3.3.4 Higher-Layer Triggered Events

None.

### 3.3.5 Message Processing Events and Sequencing Rules

None.

### 3.3.6 Timer Events

None.

### 3.3.7 Other Local Events

None.

# 4 Protocol Examples

Examples of the DTMF telephony signal blocks are as described in [RFC4733] section 5.

# 5 Security

## 5.1 Security Considerations for Implementers

None.

## 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:

- Microsoft Office Communications Server 2007
- Microsoft Office Communications Server 2007 R2
- Microsoft Lync Server 2010
- Microsoft Lync Server 2013
- Microsoft Office Communicator 2007
- Microsoft Office Communicator 2007 R2
- Microsoft Lync 2010
- Microsoft Lync 2013

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.

# 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

## T



## V