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RTP Payload Format for a 64 kbit/s Transparent Call

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Abstract

This document describes how to carry 64 kbit/s channel data transparently in RTP packets, using a pseudo-codec called "Clearmode". It also serves as registration for a related MIME type called "audio/clearmode".

"Clearmode" is a basic feature of VoIP Media Gateways.

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1. Introduction

Voice over IP (VoIP) Media Gateways need to carry all possible data streams generated by analog terminals or integrated services digital network (ISDN) terminals via an IP network. Within this document a

VoIP Media Gateway is a device that converts a (digital or analog) linear data stream to a digital packetized data stream or vice versa. Refer to RFC 2719 [10] for an introduction into the basic architecture of a Media Gateway based network.

Usually a VoIP Media Gateway does some processing on the data it converts besides packetization or depacketization; i.e. echo cancellation or dual tone multifrequency (DTMF) detection, and especially a coding/decoding. But there is a class of data streams that does not rely on or allow any data processing within the VoIP Media Gateway except for packetization or depacketization. ISDN data terminals i.e. will produce data streams that are not compatible with a non-linear encoding as used for voice.

For such applications, there is a necessity for a transparent relay of 64 kbit/s data streams in real-time transport protocol (RTP) [4] packets. This mode is often referred to as "clear-channel data" or "64 kbit/s unrestricted". No encoder/decoder is needed in that case, but a unique RTP payload type is necessary and a related MIME type is to be registered for signaling purposes.

Clearmode is not restricted to the examples described above. It can be used by any application, that does not need a special encoding/decoding for transfer via a RTP connection.

This payload format document describes a pseudo-codec called "Clearmode", for sample oriented 64 kbit/s data streams with 8 bits per sample. It is in accordance with RFC 2736 [1], which provides a guideline for the specification of new RTP payload formats.

Examples for the current use of Clearmode are the transfer of "ISDN 7 kHz voice" and "ISDN data" in VoIP Media Gateways.

This document also serves as the MIME type registration according to RFC 2045 [2] and RFC 2048 [3], which defines procedures for registration of new MIME types within the IETF tree.

2. Conventions Used in This Document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [8].

3. 64 kbit/s Data Stream Handling and RTP Header Parameters

Clearmode does not use any encoding or decoding. It just provides packetization.

Clearmode assumes that the data to be handled is sample oriented with one octet (8bits) per sample. There is no restriction on the number of samples per packet other than the 64 kbyte limit imposed by the IP protocol. The number of samples SHOULD be less than the path maximum transmission unit (MTU) minus combined packet header length. If the environment is expected to have tunnels or security encapsulation as part of operation, the number of samples SHOULD be reduced to allow for the extra header space.

The payload packetization/depacketization for Clearmode is similar to the Pulse Code Modulation (PCMU or PCMA) handling described in RFC 3551 [5]. Each Clearmode octet SHALL be octet-aligned in an RTP packet. The sign bit of each octet SHALL correspond to the most significant bit of the octet in the RTP packet.

A sample rate of 8000 Hz MUST be used.
This calculates to a 64 kbit/s transmission rate per channel.

The Timestamp SHALL be set as described in RFC 3550 [4].

The marker bit is always zero. Silence suppression is not applicable for Clearmode data streams.

The payload type is dynamically assigned and is not presented in this document.

RTP header fields not mentioned here SHALL be used as specified in RFC 3550 [4] and any applicable profile.

This document specifies the use of RTP over unicast and multicast UDP as well as TCP. (This does not preclude the use of this definition when RTP is carried by other lower-layer protocols.)

4. IANA Considerations

This document registers the following MIME subtype: audio/clearmode.

To: ietf-types@iana.org

Subject: Registration of MIME media type audio/clearmode

MIME media type name: audio

MIME subtype name: clearmode

Required parameters: none

Optional parameters: ptime, maxptime

"ptime" gives the length of time in milliseconds represented by the media in a packet, as described in RFC 2327 [6].

"maxptime" represents the maximum amount of media, which can be encapsulated in each packet, expressed as time in milliseconds, as described in RFC 3267 [9].

Encoding considerations:

This type is only defined for transfer via RTP [4].

Security considerations:

See Section 6 of RFC 4040

Interoperability considerations: none

Published specification: RFC 4040

Applications, which use this media type:

Voice over IP Media Gateways, transferring "ISDN 64 kb/s data", "ISDN 7 kHz voice", or other 64 kbit/s data streams via an RTP connection

Note: the choice of the "audio" top-level MIME type was made because the dominant uses of this pseudo-codec are expected to telephony and voice-gateway-related. The "audio" type allows the use of sharing of the port in the SDP "m=" line with codecs such as audio/g711 [6], [7], for one example. This sharing is an important application and would not be possible otherwise.

Additional information: none

Intended usage: COMMON

Author/Change controller:

IETF Audio/Video transport working group
delegated from the IESG

5. Mapping to Session Description Protocol (SDP) Parameters

Parameters are mapped to SDP [6] in a standard way.

- o The MIME type (audio) goes in SDP "m=" as the media name.
- o The MIME subtype (clearmode) goes in SDP "a=rtpmap" as the encoding name.
- o The optional parameters "ptime" and "maxptime" go in the SDP "a=ptime" and "a=maxptime" attributes, respectively.

An example mapping is as follows:

```
audio/clearmode; ptime=10

m=audio 12345 RTP/AVP 97
a=rtpmap:97 CLEARMODE/8000
a=ptime:10
```

Note that the payload format (encoding) names defined in the RTP Profile are commonly shown in upper case. MIME subtypes are commonly shown in lower case. These names are case-insensitive in both places.

6. Security Considerations

Implementations using the payload format defined in this specification are subject to the security considerations discussed in the RFC 3550 [4]. The payload format described in this document does not specify any different security services. The primary function of this payload format is to add a transparent transport for a 64 kbit/s data stream.

Confidentiality of the media streams is achieved by encryption, for example by application of the Secure RTP profile [11].

As with any IP-based protocol, in some circumstances a receiver may be overloaded simply by the receipt of too many packets, either desired or undesired. Network-layer authentication MAY be used to discard packets from undesired sources, but the processing cost of the authentication itself may be too high. Overload can also occur, if the sender chooses to use a smaller packetization period, than the receiver can process. The ptime parameter can be used to negotiate an appropriate packetization during session setup.

In general RTP is not an appropriate transfer protocol for reliable octet streams. TCP is better in those cases. Besides that, packet loss due to congestion is as much an issue for clearmode, as for other payload formats. Refer to RFC 3551 [5], section 2, for a discussion of this issue.

7. References

7.1. Normative References

[1] Handley, M. and C. Perkins, "Guidelines for Writers of RTP Payload Format Specifications", BCP 36, RFC 2736, December 1999.

[2] Freed, N. and N. Borenstein, "Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies", RFC 2045, November 1996.

[3] Freed, N., Klensin, J., and J. Postel, "Multipurpose Internet Mail Extensions (MIME) Part Four: Registration Procedures", BCP 13, RFC 2048, November 1996.

[4] Schulzrinne, H., Casner, S., Frederick, R., and V. Jacobson, "RTP: A Transport Protocol for Real-Time Applications", STD 64, RFC 3550, July 2003.

[5] Schulzrinne, H. and S. Casner, "RTP Profile for Audio and Video Conferences with Minimal Control", STD 65, RFC 3551, July 2003.

[6] Handley, M. and V. Jacobson, "SDP: Session Description Protocol", RFC 2327, April 1998.

[7] Rosenberg, J. and H. Schulzrinne, "An Offer/Answer Model with Session Description Protocol (SDP)", RFC 3264, June 2002.

[8] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[9] Sjoberg, J., Westerlund, M., Lakaniemi, A., and Q. Xie, "Real-Time Transport Protocol (RTP) Payload Format and File Storage Format for the Adaptive Multi-Rate (AMR) and Adaptive Multi-Rate Wideband (AMR-WB) Audio Codecs", RFC 3267, June 2002.

7.2. Informative References

[10] Ong, L., Rytina, I., Garcia, M., Schwarzbauer, H., Coene, L., Lin, H., Juhasz, I., Holdrege, M., and C. Sharp, "Framework Architecture for Signaling Transport", RFC 2719, October 1999.

[11] Baugher, M., McGrew, D., Naslund, M., Carrara, E., and K. Norrman, "The Secure Real-time Transport Protocol (SRTP)", RFC 3711, March 2004.

8. Acknowledgements

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