XEP-0266: Codecs for Jingle RTP Sessions

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2009-04-23
Version 0.2

Status	Type	Short Name
Experimental	Informational	N/A

This document describes implementation considerations related to voice and video codecs for use in Jingle RTP sessions.

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This XMPP Extension Protocol has been contributed in full conformance with the XSF’s Intellectual Property Rights Policy (a copy of which can be found at <http://xmpp.org/extensions/ipr-policy.shtml> or obtained by writing to XMPP Standards Foundation, 1899 Wynkoop Street, Suite 600, Denver, CO 80202 USA).

Contents

1 Introduction

Jingle RTP Sessions [1] defines the Jingle [2] signalling exchanges needed to establish voice and video chat using the Real-time Transport Protocol RFC 3550 [3]; however, it does not discuss the matter of voice and video codecs, since the state of codec technologies is more fluid than the signalling interactions. This document fills that gap by providing guidance to Jingle developers regarding voice and video codecs.

Because codec technologies are typically subject to patents, the topics discussed here are controversial. This document attempts to steer a middle path between (1) specifying mandatory-to-implement technologies that realistically will not be implemented and deployed and (2) providing guidelines that, while realistic, do not encourage the implementation and deployment of patent-clear technologies.

Please note that this document is strictly informational and does not (yet) provide binding recommendations to the XMPP developer community regarding mandatory-to-implement technologies; however, it is expected that this document will provide input that the XMPP Standards Foundation (XSF) [4] could use in making such recommendations. Furthermore, it is expected that any recommendations that might be made by the XSF would need to be modified over time as the technology landscape changes.

2 Basic Considerations

The ideal codec would meet the following criteria:

Quality The encoding quality is acceptable for deployment among XMPP users.

Packetization The specification of the codec clearly defines packetization of data for sending over RTP.

Availability The codec can be implemented on a wide variety of computing platforms and is commonly used in Internet or other systems.

Patents The codec is patent-clear. The term patent-clear does not necessarily mean that no patents have ever been applied for or granted regarding a technology, or that the technology is completely free from patents (since such a judgment is nearly impossible to make, and is outside the purview of the XMPP developer community and the XMPP Standards Foundation); the term means only that those who implement the technology are

[1] XEP-0167: Jingle RTP Sessions <http://xmpp.org/extensions/xep-0167.html>.
[2] XEP-0166: Jingle <http://xmpp.org/extensions/xep-0166.html>.
[3] RFC 3550: RTP: A Transport Protocol for Real-Time Applications <http://tools.ietf.org/html/rfc3550>.
[4] The XMPP Standards Foundation (XSF) is an independent, non-profit membership organization that develops open extensions to the IETF's Extensible Messaging and Presence Protocol (XMPP). For further information, see <http://xmpp.org/xsf/>.

generally understood to be relatively safe from the threat of patent litigation, either because any relevant patents have expired, were filed in a defensive manner, or are made available under suitable royalty-free licenses.

Unfortunately, not all codecs are ideal. In the next section we discuss the audio and video codecs that are most attractive for implementation in Jingle RTP applications.
Note: In general, audio codecs are more mature than video codecs. As a result, there are more patent-clear options for audio than for video. Although most XMPP developers would prefer to implement codecs that are patent-clear (both for ethical reasons and to produce free or at least affordable software), such options are not always widely implemented and deployed. This document takes these factors into account.

3 Codec Summary

3.1 Audio

3.1.1 Speex

According to the speex.org website, the Speex codec is "an Open Source/Free Software patent-free audio compression format designed for speech". Speex was developed by Jean-Marc Valin and is maintained by the Xiph.org Foundation. The following table summarizes the available information about Speex.

Quality	Packetization	Availability	Patents
Good quality; optimized for voice; can be used for wide-band audio.	See RFC 5574 RTP Payload Format for the Speex Codec <http://tools.ietf.org/html/rfc5574>..	Freely downloadable under a revised BSD license at <http://speex.org/>, and commonly deployed on Internet (VoIP) systems; not commonly deployed on non-Internet systems.	Designed to be patent-clear.

3.1.2 G.711

G.711 refers to the Pulse Code Modulation (PCM) codec defined in International Telecommunication Union (ITU) [5] recommendation G.711, which is widely used on the public switched telephone network (PSTN) and by many voice over Internet Protocol (VoIP) providers. There

[5] The International Telecommunication Union develops technical and operating standards (such as H.323) for international telecommunication services. For further information, see <http://www.itu.int/>.

are two versions: the μ-law ("U-law") version is widely deployed in North America and in Japan and the A-law version is widely deployed in the rest of the world. The following table summarizes the available information about G.711.

Quality	Packetization	Availability	Patents
Good quality; no wide-band mode.	See RFC 5391 RFC 5391: RTP Payload Format for ITU-T Recommendation G.711.1 <http://tools.ietf.org/html/rfc5391>..	Commonly deployed in both PSTN and VoIP systems.	Developed in 1972; patents have expired.

3.2 Video

3.2.1 Theora

According to the theora.org website, the Theora codec is "a free and open video compression format". Theora is based on the VP3 codec originally developed by On2 Technologies and is now maintained by the Xiph.org Foundation. The following table summarizes the available information about Theora.

Quality	Packetization	Availability	Patents
Acceptable quality.	See RTP Payload Format for Theora Encoded Video RTP Payload Format for Theora Encoded Video <http://tools.ietf.org/html/draft-barbato-avt-rtp-theora>. Work in progress..	Freely downloadable under BSD license at <http://theora.org/>; not yet commonly deployed, especially on devices that have deployed H.264 instead.	On2's patents over VP3 were contributed to the Xiph.org Foundation in 2001.

3.2.2 Dirac

Dirac is a general-purpose video compression technology developed by the BBC that has been licensed in the open. It is used for everything from Internet streaming to HDTV. To date there is no RTP packetization deveintion for Dirac; however, such a format is under development.

Quality	Packetization	Availability	Patents
High quality.	Not yet defined.	Freely downloadable under both GPL and LGPL at <http://diracvideo.org/>; commonly deployed but not yet in video over IP systems because of the lack of an RTP packetization format.	Dirac is patent-clear, and the BBC has allowed its related patents to lapse.

3.2.3 H.264

H.264 is a technology for video compression jointly designed by the ITU and the International Organization for Standardization (ISO) [6]. The following table summarizes the available information about H.264.

Quality	Packetization	Availability	Patents
High quality.	See RFC 3984 RFC 3984: RTP Payload Format for H.264 Video <http://tools.ietf.org/html/rfc3984>.	Commonly deployed in commercial video systems. Not freely downloadable; both software implementations and service deployments can be subject to royalty payments for commercial use.	Patented.

4 Guidance for Implementors

Given that both Speex and G.711 are patent-clear, freely implementable, and commonly deployed, this document suggests that implementors strongly consider including support for both codecs in audio applications of Jingle RTP sessions.

The situation regarding video codecs is more murky, and implementors face difficult tradeoffs. While Theora is patent-clear and freely implementable, it is not yet commonly deployed. While Dirac is patent-clear and deployed fairly widely, no RTP packetization format has been defined for it. While deployment of H.264 is fairly common, it is not patent-clear or freely implementable. For many open-source / free software projects and smaller technology vendors, implementation of H.264 is either impossible (because of patents and licensing

[6] The International Organization for Standardization develops standards a wide variety of technical domains. For further information, see <http://www.iso.org/>.

restrictions) or prohibitively expensive (because of royalty payments). These developers are strongly encouraged to implement Theora or Dirac and also to urge wider adoption of Theora and Dirac among larger technology vendors. However, this document acknowledges that it may take some time before Theora and Dirac are commonly deployed (especially on mobile devices) and that systems based on H.264 might be dominant in the marketplace for several years. This situation is unfortunate but cannot be directly changed by the XMPP developer community.

5 Recommendations to the XSF

This document suggests that both Speex and G.711 could be recommended as mandatory-to-implement technologies for audio codecs, should the XSF decide to make such recommendations.
This document suggests that at this time it is not possible for the XSF to recommend a mandatory-to-implement technology for video codecs, but that it might be possible for the XSF to recommend Theora or Dirac in the future if they are more widely adopted.

6 Security Considerations

For security considerations related to Jingle RTP sessions, refer to XEP-0167. This document introduces no new security considerations. See also the security considerations sections of the relevant codec specifications.

7 IANA Considerations

This document requires no interaction with the Internet Assigned Numbers Authority (IANA) [7].

8 XMPP Registrar Considerations

This document requires no interaction with the XMPP Registrar [8].

[7] The Internet Assigned Numbers Authority (IANA) is the central coordinator for the assignment of unique parameter values for Internet protocols, such as port numbers and URI schemes. For further information, see <http://www.iana.org/>.

[8] The XMPP Registrar maintains a list of reserved protocol namespaces as well as registries of parameters used in the context of XMPP extension protocols approved by the XMPP Standards Foundation. For further information, see <http://xmpp.org/registrar/>.

9 Acknowledgements

Thanks to Olivier Crête, Dave Cridland, Justin Karneges, Tobias Markmann, Jack Moffitt, Jeff Muller, Arc Riley, Kevin Smith, Justin Uberti, and Paul Witty for their feedback.