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

Copyright

This XMPP Extension Protocol is copyright © 1999 – 2020 by the XMPP Standards Foundation (XSF).

Permissions

Permission is hereby granted, free of charge, to any person obtaining a copy of this specification (the "Specification"), to make use of the Specification without restriction, including without limitation the rights to implement the Specification in a software program, deploy the Specification in a network service, and copy, modify, merge, publish, translate, distribute, sublicense, or sell copies of the Specification, and to permit persons to whom the Specification is furnished to do so, subject to the condition that the foregoing copyright notice and this permission notice shall be included in all copies or substantial portions of the Specification. Unless separate permission is granted, modified works that are redistributed shall not contain misleading information regarding the authors, title, number, or publisher of the Specification, and shall not claim endorsement of the modified works by the authors, any organization or project to which the authors belong, or the XMPP Standards Foundation.

Warranty

## NOTE WELL: This Specification is provided on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. ##

Liability

In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall the XMPP Standards Foundation or any author of this Specification be liable for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising from, out of, or in connection with the Specification or the implementation, deployment, or other use of the Specification (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if the XMPP Standards Foundation or such author has been advised of the possibility of such damages.

Conformance

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 <https://xmpp.org/about/xsf/ipr-policy> or obtained by writing to XMPP Standards Foundation, P.O. Box 787, Parker, CO 80134 USA).
Contents

1 Introduction 1
2 Basic Considerations 1
3 Codecs 2
   3.1 Dirac ........................................ 2
   3.2 H.264 ........................................ 2
   3.3 Theora ....................................... 3
   3.4 VP8 .......................................... 3
4 Guidance for Implementers 4
5 Mandatory-to-Implement Codecs 4
6 Security Considerations 4
7 IANA Considerations 5
8 XMPP Registrar Considerations 5
9 Acknowledgements 5
1 Introduction

Jingle RTP Sessions (XEP-0167) \(^1\) defines the Jingle (XEP-0166) \(^2\) signalling exchanges needed to establish video sessions using the Real-time Transport Protocol RFC 3550 \(^3\); however, it does not say which video codecs are mandatory-to-implement, 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. This document does not yet provide binding recommendations to the XMPP developer community regarding mandatory-to-implement technologies; however, it provides input that the XMPP Standards Foundation (XSF) \(^4\) could use in making such recommendations.

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 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. (Although most XMPP developers would prefer to implement codecs that are patent-clear, such options are not always widely implemented and deployed.)

---

\(^4\) 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 <https://xmpp.org/about/xmpp-standards-foundation>.
Unfortunately, not all codecs meet those criteria. In the remainder of this document we discuss the video codecs that are most appropriate for implementation in Jingle RTP applications.

3 Codecs

3.1 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 devention for Dirac; however, such a format is under development.

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

3.2 H.264

H.264 is a technology for video compression jointly designed by the ITU and the International Organization for Standardization (ISO) ⁵. The following table summarizes the available information about H.264.

---

⁵The International Organization for Standardization develops standards a wide variety of technical domains. For further information, see <http://www.iso.org/>.
3 CODECS

<table>
<thead>
<tr>
<th>Quality</th>
<th>Packetization</th>
<th>Availability</th>
<th>Patents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="http://tools.ietf.org/html/rfc3984">http://tools.ietf.org/html/rfc3984</a></td>
<td>Not freely downloadable; both software implementa-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>tions and service deployments can be subject to</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>royalty payments for commercial use.</td>
<td></td>
</tr>
</tbody>
</table>

3.3 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.

<table>
<thead>
<tr>
<th>Quality</th>
<th>Packetization</th>
<th>Availability</th>
<th>Patents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptable quality.</td>
<td>See RTP Payload Format for Theora Encoded Video</td>
<td>Freely downloadable under BSD license at <a href="http://theora.org/">http://theora.org/</a>; not yet commonly deployed, especially on devices that have deployed H.264 instead.</td>
<td></td>
</tr>
</tbody>
</table>

3.4 VP8

VP8 is an open video compression format originally developed (as was Theora) by On2 Technologies and released by Google after it acquired On2 Technologies in 2010. The following table summarizes the available information about Theora.
6 SECURITY CONSIDERATIONS

<table>
<thead>
<tr>
<th>Quality</th>
<th>Packetization</th>
<th>Availability</th>
<th>Patents</th>
</tr>
</thead>
<tbody>
<tr>
<td>High quality.</td>
<td>See RTP Payload</td>
<td>Freely download-</td>
<td>Google released the VP8 bitstream format under an irrevocable free patent license in 2010.</td>
</tr>
<tr>
<td></td>
<td>Format for VP8 Video</td>
<td>able under BSD-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>like license at</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Work in progress.</td>
<td></td>
</tr>
</tbody>
</table>

4 Guidance for Implementers

The situation regarding video codecs is more murky, and implementers face difficult tradeoffs. Although Theora is patent-clear and freely implementable, it is not yet commonly deployed. Although Dirac is patent-clear and deployed fairly widely, no RTP packetization format has been defined for it. Although 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 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 Mandatory-to-Implement Codecs

Because video codecs are not as mature as audio codecs, it is not yet possible for the XSF to recommend a mandatory-to-implement technology for Jingle video. However, in the future it might be possible to recommend one of the codecs described in this document.

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 described in the relevant codec specifications.
7 IANA Considerations

This document requires no interaction with the Internet Assigned Numbers Authority (IANA) e.

8 XMPP Registrar Considerations

This document requires no interaction with the XMPP Registrar 7.

9 Acknowledgements

Thanks to Olivier Crête, Dave Cridland, Florian Jensen, Justin Karneges, Evgeniy Khramtsov, Marcus Lundblad, Tobias Markmann, Pedro Melo, Jack Moffitt, Jeff Muller, Jehan Pagès, Arc Riley, Kevin Smith, Remko Tronçon, Justin Uberti, and Paul Witty for their feedback.

---

eThe 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/>.

7The 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 <https://xmpp.org/registrar/>.