This document outlines the current usage of OpenPGP for messaging and presence.
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1 Introduction

The Jabber community has long acknowledged the need for privacy and security features in a well-rounded instant messaging system. Unfortunately, finding a consensus solution to the problem of end-to-end encryption during the community’s younger days was not easy. Eventually, early contributors created a quick solution using OpenPGP ([RFC 4880](http://tools.ietf.org/html/rfc4880)). This specification documents the OpenPGP solution as it is used today, so that others may interoperate with clients that support it. This document is not intended to present a standard, because more complete solutions are being investigated.

All operations described here are done with standard OpenPGP software such as [GnuPG](http://www.gnupg.org). All program output is US-ASCII armored output with the headers removed. This allows for easy transportation of the program output directly in the XML. All keys are exchanged using OpenPGP key servers, and usually are retrieved when a signed <presence/> stanza is received (key retrieval does not happen in-band).

2 Signing

Signing enables a sender to verify that they sent a certain block of text. In Jabber, signing uses the 'jabber:x:signed' namespace, and is primarily used with <presence/> stanzas, but may also be used with <message/> stanzas. The text that is signed MAY be the empty string. When signing presence, the sender SHOULD sign the XML character data of the <status> element. The sender SHOULD sign presence using the private key whose KeyID corresponds to the public key to be used in encrypting messages (see below).

```
Listing 1: A signed presence stanza
<presence from='pgmillard@jabber.org/wj_dev2' to='jer@jabber.org'>
  <status>Online</status>
  <x xmlns='jabber:x:signed'>
    iQA/AwUB0jUSdno13d88qZ77EQI2JACfRngLJ045brNnaCX78ykKNUZaTIOoPHI
    2uJxPMGR73E1vEpcv0LRSy+
    =45f8
  </x>
</presence>
```

3 Encrypting

Encryption enables the sender to encrypt a message to a specific recipient. This is accomplished using the 'jabber:x:encrypted' namespace in conjunction with <message/> stanzas. Because a block of text is necessary in order to have something to encrypt, <message/> stanzas intended to be encrypted have the same restrictions as signing (see above). The data

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4 Security Considerations

encrypted MUST be the XML character data of the <body> element. The sender SHOULD encrypt the message body using the public key whose KeyID corresponds to the private key used in signing presence (see above).

Listing 2: An encrypted message stanza

```
<message to='reamon@jabber.org/jarl' from='pgmillard@jabber.org/wj_dev2'>
  <body>This message is encrypted.</body>
  <x xmlns='jabber:x:encrypted'>
    qANQR1DBwU4DX7jmYZnncmUQB/9KnKuKbbdzQH+tz1ZywkK0yHKnqS7kWq+RFQrtQdCJ
    WpdpWPr0uQsuJe7+vh3NWn59/gTcSM18dS9p0ovSrmClyLhxVgmqS8ZKhsblVe
    1pQ8JgavABqibJo1c3BKvTtvV1gKiX/N7P18RtY1K18toaMDhEfhB2zO/XB0+P
    AqhyIRjNCacGcs1khXqNjK5V44uAPy2u1Q8UUrHbUd0g+xJ9BmO0LZxyvCWhK
    kuNEHFQIfLuCY61v0mynq6iX6tjuHehZlFSn80b5BV9tNLwNR5eqz1kxeM5ohgoYJ
    w7R61cCv88Svcl8K+StqZM5khosVjUvqEu8uJ9RupdpB/4m9E3gOQCBsm
    OsX4/jJhn2wsfYFwqkBNkuY0Cnwr1mn6I+w72p0R8Ttv8peNCWK9BeTL/XS
    mhn4bCxoUKCIy3k8a+Jdvbov9ucuK5SFucBq4/10fpHmPhQfKJfomxaWJeFF
    619NxyYyCf0LtmWk2AaTHVCjtKdf1WmwcTa0vFf48BuFhdah6kJji7w/yNwa/E
    06CMymuZTr/LpckKKWvCt+SERrxml8ekpi8h7oNwMxZBYAa70J1rWXKNg9LpDTN1
    824MF0mXj7q5N1eMHvX10EOLKAda/Ar33TEEeVyeUK1DEgvXM2KZR1Rzu+XtIE
    My/bJk7EycAw8P/QkYeN101fX58VE6G6B8NPCPQYn/LKv1+co2ZNPVPFM4bNV
    XA4hB4UffF7Ao8kpd1RqKw41EnmmdmYQ0+iIIVPEarLW9POMY90KAnzRsAq
    bt9uRY/1PpGRlRaWb1KvxpGR08++Y8VjEdEyGgMDxX0iE851VE72ftGskSxH8wM
    TgY3pf2aATmBp31lagQ1COKGS/xupovT5AQA3RzbCxDvc6s66GKmVQVv5vmSj1
    WULad5MB9KT1DzCm6F05y063nWGBYYMWEiejRvGLpolj4eAnj9qOt7rTWmgv3RkYF
    0in0VDoW7aC
    =CvnG</x>
</message>
```

It is considered polite to include an unencrypted message <body/> explaining that the actual message body is encrypted. This helps if the client experiences an error while decrypting the message, or if the user’s client does not support encryption (although generally this should not happen, since the signed presence can be used to indicate that a client accepts encrypted messages).

4 Security Considerations

The method defined herein has the following security issues:

- Key exchange relies on the web of trust model used on the OpenPGP keys network.
- There is no mechanism for checking a fingerprint or ownership of a key other than checking the user IDs on a key.
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- When the recipient is not mentioned in the encrypted body, replay attacks are possible on messages.
- Replay of the signed <presence/> status is possible.
- It relies on signing or encryption of XML character data; therefore, it does not support signing or encryption of <iq/> stanzas, and it allows signing of the presence <status/> element and encryption of the message <body/> element only. Thus the method is not acceptable when signing or encryption of full stanzas is required.
- It does not enable both signing and encryption of a stanza, only signing of the presence status and encryption of the message body.

5 Other Known Issues

In addition to the security considerations listed above, there are several other known issues with this method:

- It is limited to PGP keys and does not support X.509 certificates, Kerberos, RSA keys, etc.
- It does not include feature negotiation; instead, signed <presence/> is used as an indicator of support. Because of the lack of negotiation it is possible for encrypted <message/> elements to be stored offline and then read by a client that cannot support them.
- It is verbose (the example encrypted <message/> is "Hi").

6 IANA Considerations

This document requires no interaction with the Internet Assigned Numbers Authority (IANA). 2

7 XMPP Registrar Considerations

The XMPP Registrar 3 shall register the 'jabber:x:encrypted' and 'jabber:x:signed' namespaces as a result of this document.

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2 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/>.

3 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 <https://xmpp.org/registrar/>.
8 XML Schemas

8.1 jabber:x:encrypted

```xml
<?xml version='1.0' encoding='UTF-8'?>
<xs:schema
   xmlns:xs='http://www.w3.org/2001/XMLSchema'
   targetNamespace='jabber:x:encrypted'
   xmlns='jabber:x:encrypted'
   elementFormDefault='qualified'>
<xs:annotation>
  <xs:documentation>
    The protocol documented by this schema is defined in XEP-0027: http://www.xmpp.org/extensions/xep-0027.html
  </xs:documentation>
</xs:annotation>
<xs:element name='x' type='xs:string'/>
</xs:schema>
```

8.2 jabber:x:signed

```xml
<?xml version='1.0' encoding='UTF-8'?>
<xs:schema
   xmlns:xs='http://www.w3.org/2001/XMLSchema'
   targetNamespace='jabber:x:signed'
   xmlns='jabber:x:signed'
   elementFormDefault='qualified'>
<xs:annotation>
  <xs:documentation>
    The protocol documented by this schema is defined in XEP-0027: http://www.xmpp.org/extensions/xep-0027.html
  </xs:documentation>
</xs:annotation>
<xs:element name='x' type='xs:string'/>
</xs:schema>
```