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). 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. 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/>, but may also be used with <message/>. 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

```xml
<presence from='pgmillard@jabber.org/wj_dev2' to='jer@jabber.org'>
  <status>Online</status>
  <x xmlns='jabber:x:signed'>
    iQA/AwUBOjU5dno13d88qZ77EI2JACfRngLJ045brNnaCX78ykKNUZaTIOaPHI
    2uJxPMGR73EBIvEpcv0LRSy+
    =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

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='reatmon@jabber.org/jarl' from='pgmillard@jabber.org/wj_dev2'>
  <body>This message is encrypted.</body>
  <x xmlns='jabber:x:encrypted'>
    qANQR1DBwU4DX7jmYZnnmcUQB/9KuKBDdzzQH+tZ1ZywKK0yHKnq57kWq+RFTqDcj
    WpdWpR0uQsuJe7+vh3NWNn59/gTc5MD1X8dS9p0ovStmNcyLhxVgmqS8ZKhsblVeu
    IpQ0JgavABqibJo1c3BKrVtVv1igKix/N7P188tY1K18toaM0dhEfhBRzO/0B0+P
    AqhY1RjNacGcs1khXqNjK5V4atu0APy2n1Q8UurHbUd0g+xJ9Bm0G0LZXyvCWyKl
    kuNEHFQlLuCY6i8myq6iX6xjuHehZIFsh80b5BV9tNLwNR5eqz1k1xMnoghJOA
    w7R61cCptT8Ksd8Vc18K+StqOeM5kwhosVjUqvEu8uJ9RupdpB/4m9E3gOZCBsmq
    OsX4/jJhn2wlsFYYdqwkbNKnuYoKcnwr1mn6I+w72p0R8tTv8peNcwk9BEtL/XS
    mhn4bCxoUKC1Tv3k8a+Jdvbov9ucduKSFuC8q4/10fpHmPhHQkJkFosmawJvEFFF
    6l9NXyYyCoLtmWk2AaTHVCjtKdf1WmwcTa0vFfk8BuFHkdah6kJji7w/yNwa/E
    06CMymuZTr/LpckKWrWct/3Erxqxm8ekPI8h7oNwMxZBYAa70J1rWXKngL9pdNTI
    824Mf0mXj7q5N1eMHVx1QEOkLAdA/Ae33TTevOyeUK1DEgyvxFM2KRZ11Rzu+XTeIE
    My/bJk7EycAw8P/QkYene10fFxP58VEd6Gb8NCPqKOYn/LKh1o+c20ZVEPFFM4bNV
    XA4hB4UtFF7A0o8kpd1rUqdyWkw41EtmndemYQ6+iIIVPEarW19pxOMY90KAnZrSa
    qt9uRY/1rPg1eRaWb1MKxvgpR08++Y8VjdeEyGgM0xO0iE851V72ftGkSXDH8mW
    TgY3pf2aATmBp31agQ1C0KGS/xupovT5AQA3RzbCxDVC6s6eGYkmVVVqVj5vmsj1
    WULa65MB9K7DzZcm6FO5y63jNGBYYMWiejRvGlpoiJ4anJ9qO7r7TWmgv3RkYF
    0in8vDOhW7aC=Crng</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.
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).

7 XMPP Registrar Considerations

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

2The 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/>.

3The 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>
```