XEP-0239: Binary XMPP

Pedro Melo [*] [†]
Peter Saint-Andre [‡] [§]
Fabio Forno [¶] [‖]

2008-04-01
Version 1.0

Status	Type	Short Name
Active	Humorous	N/A

This specification defines Binary XMPP, an obviously superior representation of the Extensible Messaging and Presence Protocol (XMPP).

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[*] mailto:01101101011001010110110001101111010000000111001101101001011011010111000001101100011010010110001101101001011001000110000101100100011001010010111001101111011100100110011 1

[†] xmpp:01101101011001010110110001101111010000000111001101101001011011010111000001101100011010010110001101101001011001000110000101100100011001010010111001101111011100100110011 1

[‡] mailto:01110011011110100011100000110010101110100011001010111001001000000011010100110000101100010011000100110010101110010001011100110111101110010011001 11

[§] xmpp:01110011011110100011100000110010101110100011001010111001001000000011010100110000101100010011000100110010101110010001011100110111101110010011001 11

[¶] mailto:01100110011000010110001001101001011101111001011100110011001101111011100100110111001101111010000000110011 101101101100001011010010110110000101110011000110110111101101101

[‖] xmpp:01100110011001100100000001101010011000010110001001100010011001010111001000101110011000100110110001110101011001010110111001100100011011110010111001100010011011101111011011 01

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Contents

1 Introduction 1

2 Protocol 1

3 Examples 2

4 Internationalization Considerations 14

5 Security Considerations 14

6 IANA Considerations 14

7 XMPP Registrar Considerations 15

8 XML Schema 15

9 Acknowledgements 15

1 Introduction

Everyone knows that binary data encodings are much more efficient than the Extensible Markup Language (XML). Given that XMPP is an application profile of XML, it is a wonder that XMPP works at all! Clearly, XMPP would benefit from a binary representation. Therefore, this specification defines Binary XMPP.

2 Protocol

XMPP Core [1] defines the traditional representation of XMPP. For instance, an empty presence stanza (such as might be provided on login) is as follows:

Listing 1: Traditional XMPP stanza

```
<presence/>
```

That string can be represented in binary as follows:

Listing 2: Binary representation

```
0011110001110000011100100110010101110011011001010110111001100011011001010010111100111
```

The bit sequence is therefore represented in Binary XMPP as follows (line breaks are provided only for the purpose of readability):

Listing 3: Binary XMPP representation

```
<zero/><zero/><one/><one/><one/><one/><zero/><zero/>
<zero/><one/><one/><one/><zero/><zero/><zero/><zero/>
<zero/><one/><one/><one/><zero/><zero/><one/><zero/>
<zero/><one/><one/><zero/><zero/><one/><zero/><one/>
<zero/><one/><one/><one/><zero/><zero/><one/><one/>
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<zero/><zero/><one/><zero/><one/><one/><one/><one/>
<zero/><zero/><one/><one/><one/><one/><one/><zero/>
```

This is an obvious improvement over the traditional representation.
It might be objected that the Binary XMPP representation requires a large number of XML elements. However, because all data is represented using only <zero/> and <one/>, the protocol can be significantly compressed using the standard ZLIB compression algorithm as

[1] RFC 6120: Extensible Messaging and Presence Protocol (XMPP): Core <http://tools.ietf.org/html/rfc6120>.

defined in RFC 1950 [2], which SHOULD be enabled by default on the bxmpp port. Evidence from preliminary testing indicates that compression of Binary XMPP results in a representation less than 2% of the original size!
As a further simplification, Binary XMPP gets rid of the complicated stream negotiation process defined in RFC 3920. Instead, if a server supports Binary XMPP it advertises a special DNS SRV record _bxmpp._tcp in accordance with RFC 2782 [3]. Furthermore, only one record is needed, thus saving precious port space. The RECOMMENDED port for Binary XMPP communication is 10110, but any port MAY be used.
To start a Binary XMPP stream, the sender simply connects via TCP at the advertised port and starts sending <zero/> and <one/> elements. The lack of a stream header simplifies XML parsing, introducing further performance improvements.

3 Examples

The following examples showcase the tremendous efficiency of Binary XMPP using a complete session between a client and a server.

Listing 4: Client sends initial stream header (XMPP)

```
<stream:stream
     from='juliet@example.com'
     to='example.com'
     version='1.0'
     xml:lang='en'
     xmlns='jabber:client'
     xmlns:stream='http://etherx.jabber.org/streams'>
```

Listing 5: Binary XMPP representation

```
<zero/><zero/><one/><one/><one/><one/><zero/><zero/><zero/><one/><one/
   ><one/><zero/><zero/><one/><one/><zero/><one/><one/><one/><zero/><
   one/><zero/><zero/><zero/><one/><one/><one/><zero/><zero/><one/><
   zero/><zero/><one/><one/><zero/><zero/><one/><zero/><one/><zero/><
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   zero/><zero/><zero/><one/><zero/><one/><zero/><zero/><zero/><one/>
   <zero/><zero/><zero/><zero/><zero/><zero/><zero/><one/><zero/><
```

[2] RFC 1950: ZLIB Compressed Data Format Specification version 3.3 <http://tools.ietf.org/html/rfc1950>.
[3] RFC 2782: A DNS RR for specifying the location of services (DNS SRV) <http://tools.ietf.org/html/rfc2782>.

```
zero/><zero/><zero/><zero/><zero/><zero/><one/><zero/><zero/><zero
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    one/><one/><zero/>
```

Listing 6: Server sends response stream header (XMPP)

```
<stream:stream
     from='example.com'
     id='t7AMCin9zjMNwQKDnplntZPIDEI='
     to='juliet@example.com'
```

```
    version='1.0'
    xml:lang='en'
    xmlns='jabber:client'
    xmlns:stream='http://etherx.jabber.org/streams'>
```

Listing 7: Binary XMPP representation

```
<zero/><zero/><one/><one/><one/><one/><zero/><zero/><zero/><one/><one/
  ><one/><zero/><zero/><one/><one/><zero/><one/><one/><one/><zero/><
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Listing 8: Server sends stream features (XMPP)

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<stream:features>
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    <required/>
  </starttls>
</stream:features>
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Listing 9: Binary XMPP representation

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<zero/><zero/><one/><zero/><one/><zero/><zero/><zero/><one/><zero/
```

```
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    one/><one/><one/><one/><zero/>
```

Listing 10: Client sends STARTTLS command to server

```
<starttls xmlns='urn:ietf:params:xml:ns:xmpp-tls'/>
```

Listing 11: Binary XMPP representation

```
<zero/><zero/><one/><one/><one/><one/><zero/><zero/><zero/><one/><one/
    ><one/><zero/><zero/><one/><one/><zero/><one/><one/><one/><zero/><
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    zero/><zero/><one/><one/><zero/><zero/><zero/><zero/><one/><zero/>
    <one/><one/><zero/><one/><one/><zero/><one/><zero/><one/><one/><
    one/><zero/><zero/><one/><one/><zero/><zero/><one/><one/><one/><
```

```
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zero/><one/><one/><one/><one/><one/><zero/>
```

Listing 12: Server informs client that it is allowed to proceed

```
<proceed xmlns='urn:ietf:params:xml:ns:xmpp-tls'/>
```

Listing 13: Binary XMPP representation

```
<zero/><zero/><one/><one/><one/><one/><zero/><zero/><zero/><one/><one/
   ><one/><zero/><zero/><zero/><zero/><zero/><one/><one/><one/><zero/
   ><zero/><one/><zero/><zero/><one/><one/><zero/><one/><one/><one/><
   one/><zero/><one/><one/><zero/><zero/><zero/><one/><one/><zero/><
   one/><one/><zero/><zero/><one/><zero/><one/><zero/><one/><one/><
   zero/><zero/><one/><zero/><one/><zero/><one/><one/><zero/><zero/><
   one/><zero/><zero/><zero/><zero/><one/><zero/><zero/><zero/><zero/
   ><zero/><zero/><one/><one/><one/><one/><zero/><zero/><zero/><zero/
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   one/><one/><zero/><zero/><one/><one/><one/><zero/><zero/><one/><
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```

```
zero/><one/><one/><one/><zero/><one/><zero/><zero/><one/><one/><
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one/><one/><one/><zero/><zero/><one/><zero/><one/><one/><one/><one
/><zero/><zero/><one/><one/><one/><one/><one/><zero/>
```

And so on. Much more efficient, eh?

4 Internationalization Considerations

The <zero/> and <one/> elements use English-language words as the element names. Clearly it would have been preferable to define an i18n-friendly binding, such that German-language applications could encode Binary XMPP using the <null/> and <eins/> elements, Greek-language applications could use the <□□□□□/> and <□□□/> elements, etc. Flexibility regarding internationalization of the element names may be added in Binary XMPP 2.0.

5 Security Considerations

Because it is simply an alternative representation of XMPP, Binary XMPP inherits all of the security characteristics of XMPP (the good, the bad, and the ugly).
Use of port 10110 is obviously secure, since 10110 in base 2 is 22 in base 10, the same default port as Secure Shell (see RFC 4251 [4]).

6 IANA Considerations

The XMPP Registrar [5] shall work with the Internet Assigned Numbers Authority (IANA) [6] to register "bxmpp" as a keyword for port 10111.

[4] RFC 4251: The Secure Shell (SSH) Protocol Architecture <http://tools.ietf.org/html/rfc4251>.

[5] 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/>.

[6] 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/>.

7 XMPP Registrar Considerations

The XMPP Registrar shall include 'urn:xmpp:bxmpp' in its registry of protocol namespaces (see <https://xmpp.org/registrar/namespaces.html>).

8 XML Schema

```
<?xml version='1.0' encoding='UTF-8'?>

<xs:schema
    xmlns:xs='http://www.w3.org/2001/XMLSchema'
    targetNamespace='urn:xmpp:bxmpp'
    xmlns='urn:xmpp:bxmpp'
    elementFormDefault='qualified'>

  <xs:element name='one' type='empty'/>
  <xs:element name='zero' type='empty'/>

  <xs:simpleType name='empty'>
    <xs:restriction base='xs:string'>
      <xs:enumeration value=''/>
    </xs:restriction>
  </xs:simpleType>

</xs:schema>
```

9 Acknowledgements

Thanks to Kevin Smith for his feedback.