   Use of Transport Layer Security (TLS) in the Extensible Messaging and
                        Presence Protocol (XMPP)
                        draft-ietf-uta-xmpp-00

Abstract

   This document provides recommendations for the use of Transport Layer
   Security (TLS) in the Extensible Messaging and Presence Protocol
   (XMPP). This document updates RFC 6120.

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1. Introduction

   The Extensible Messaging and Presence Protocol (XMPP) [RFC6120]
   (along with its precursor, the so-called "Jabber protocol") has used
   Transport Layer Security (TLS) [RFC5246] (along with its precursor,
   Secure Sockets Layer or SSL) since 1999. Both [RFC6120] and its
   predecessor [RFC3920] provided recommendations regarding the use of
   TLS in XMPP. In order to address the evolving threat model on the
   Internet today (see, for example, [I-D.trammell-perpass-ppa]), this
   document provides stronger recommendations (see also
   [I-D.ietf-uta-tls-bcp]). This document updates [RFC6120].

2. Terminology

   Various security-related terms are to be understood in the sense
   defined in [RFC4949].

   The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT",
   "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and
   "OPTIONAL" in this document are to be interpreted as described in
   [RFC2119].

3. Discussion Venue

   The discussion venue for this document is the mailing list of the
   XMPP Working Group, for which archives and subscription information
   can be found at [1]. Discussion might also occur on the mailing list
   of the UTA Working Group, for which archives and subscription
   information can be found at [2].

4. Recommendations

4.1. Support for TLS

   Support for TLS (specifically, the XMPP profile of STARTTLS) is
   mandatory for XMPP implementations, as already specified in [RFC6120]
   and its predecessor [RFC3920].

   If the server to which an XMPP client or peer server connects does
   not offer a stream feature of <starttls xmlns='urn:ietf:params:xml:ns
   :xmpp-tls'/> (thus indicating that it is an XMPP 1.0 server that
   supports TLS), the initiating entity MUST NOT proceed with the stream
   negotiation and MUST instead abort the connection attempt. Although
   XMPP servers SHOULD include the <required/> child element to indicate
   that negotiation of TLS is mandatory, clients and peer servers MUST
   NOT depend on receiving the <required/> flag in determining whether
   TLS will be enforced for the stream.

4.2. Protocol Versions

   Implementations MUST follow the recommendations in
   [I-D.ietf-uta-tls-bcp] as to supporting various TLS versions and
   avoiding fallback to SSL.

4.3. Cipher Suites

   Implementations MUST follow the recommendations in
   [I-D.ietf-uta-tls-bcp].

4.4. Public Key Length

   Implementations MUST follow the recommendations in
   [I-D.ietf-uta-tls-bcp].

4.5. Compression

   Implementations MUST follow the recommendations in
   [I-D.ietf-uta-tls-bcp].

XMPP supports an application-layer compression technology [XEP-0138],
which might have slightly stronger security properties than TLS (at
least because it is enabled after SASL authentication, as described
in [XEP-0170]).

4.6. Session Resumption

Implementations MUST follow the recommendations in
[I-D.ietf-uta-tls-bcp].

Use of session IDs [RFC5246] is RECOMMENDED instead of session
tickets [RFC5077], since XMPP does not in general use state
management technologies such as tickets or "cookies" [RFC6265].

Note that, in XMPP, TLS session resumption can be used in concert
with the XMPP Stream Management extension; see [XEP-0198] for further
details.

4.7. Authenticated Connections

Both the core XMPP specification [RFC6120] and the "CertID"
specification [RFC6125] provide recommendations and requirements for
certificate validation in the context of authenticated connections.
This document does not supersede those specifications. Wherever
possible, it is best to prefer authenticated connections (along with
SASL [RFC4422]), as already stated in the core XMPP specification
[RFC6120]. In particular, clients MUST authenticate servers.

4.8. Unauthenticated Connections

Given the pervasiveness of passive eavesdropping, even an
unauthenticated connection might be better than an unencrypted
connection (this is similar to the "better than nothing security"
approach for IPsec [RFC5386]). In particular, because of current
deployment challenges for authenticated connections between XMPP
servers (see [I-D.ietf-xmpp-dna] for details), it might be reasonable
for XMPP server implementations to accept unauthenticated connections
when the Server Dialback protocol [XEP-0220] is used for weak
identity verification; this will at least enable encryption of
server-to-server connections. Unauthenticated connections include
connections negotiated using anonymous Diffie-Hellman algorithms or
using self-signed certificates, among other scenarios.

4.9. Server Name Indication

Although there is no harm in supporting the TLS Server Name
Indication (SNI) extension [RFC6066], this is not necessary since the

same function is served in XMPP by the 'to' address of the initial
stream header as explained in Section 4.7.2 of [RFC6120].

4.10. Human Factors

It is RECOMMENDED that XMPP clients provide ways for end users (and
that XMPP servers provide ways for administators) to complete the
following tasks:

o Determine if a client-to-server or server-to-server connection is
   encrypted and authenticated.

o Determine the version of TLS used for a client-to-server or
   server-to-server connection.

o Inspect the certificate offered by an XMPP server.

o Determine the cipher suite used to encrypt a connection.

o Be warned if the certificate changes for a given server.

5. Implementation Notes

Some governments enforce legislation prohibiting the export of strong
cryptographic technologies. Nothing in this document ought to be
taken as advice to violate such prohibitions.

6. IANA Considerations

This document requests no actions of the IANA.

7. Security Considerations

As noted in "A Threat Model for Pervasive Passive Surveillance"
[I-D.trammell-perpass-ppa]), the use of TLS can help limit the
information available for correlation to the network and transport
layer headers as opposed to the application layer. As typically
deployed, XMPP technologies do not leave application-layer routing
data (such as XMPP 'to' and 'from' addresses) at rest on intermediate
systems, since there is only one hop between any two given XMPP
servers. As a result, encrypting all hops (sending client to
sender's server, sender's server to recipient's server, recipient's
server to recipient's client) can help to limit the amount of
"metadata" that might leak.

It is possible that XMPP servers themselves might be compromised. In
that case, per-hop encryption would not protect XMPP communications,
and even end-to-end encryption of (parts of) XMPP stanza payloads

would leave addressing information and XMPP roster data in the clear.
By the same token, it is possible that XMPP clients (or the end-user
devices on which such clients are installed) could also be
compromised, leaving users utterly at the mercy of an adversary.

This document, along with actions currently being taken to strenthen
the security of the XMPP network, do not assume widespread compromise
of XMPP servers and clients or their underlying operating systems or
hardware. Thus it is assumed that ubiquitous use of per-hop TLS
channel encryption and more significant deployment of end-to-end
object encryption technologies will serve to protect XMPP
communications to a measurable degree, compared to the alternatives.

8. References

8.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate
           Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC4949] Shirey, R., "Internet Security Glossary, Version 2", RFC
           4949, August 2007.

[RFC5077] Salowey, J., Zhou, H., Eronen, P., and H. Tschofenig,
           "Transport Layer Security (TLS) Session Resumption without
           Server-Side State", RFC 5077, January 2008.

[RFC5246] Dierks, T. and E. Rescorla, "The Transport Layer Security
           (TLS) Protocol Version 1.2", RFC 5246, August 2008.

[RFC6120] Saint-Andre, P., "Extensible Messaging and Presence
           Protocol (XMPP): Core", RFC 6120, March 2011.

[RFC6125] Saint-Andre, P. and J. Hodges, "Representation and
           Verification of Domain-Based Application Service Identity
           within Internet Public Key Infrastructure Using X.509
           (PKIX) Certificates in the Context of Transport Layer
           Security (TLS)", RFC 6125, March 2011.

8.2. Informative References

[I-D.ietf-uta-tls-bcp]
           Sheffer, Y., Holz, R., and P. Saint-Andre,
           "Recommendations for Secure Use of TLS and DTLS", draft-
           ietf-uta-tls-bcp-00 (work in progress), March 2014.

[I-D.ietf-xmpp-dna]
          Saint-Andre, P. and M. Miller, "Domain Name Associations
          (DNA) in the Extensible Messaging and Presence Protocol
          (XMPP)", draft-ietf-xmpp-dna-05 (work in progress),
          February 2014.

[I-D.trammell-perpass-ppa]
          Trammell, B., Borkmann, D., and C. Huitema, "A Threat
          Model for Pervasive Passive Surveillance", draft-trammell-
          perpass-ppa-01 (work in progress), November 2013.

[RFC3920] Saint-Andre, P., Ed., "Extensible Messaging and Presence
          Protocol (XMPP): Core", RFC 3920, October 2004.

[RFC4422] Melnikov, A. and K. Zeilenga, "Simple Authentication and
          Security Layer (SASL)", RFC 4422, June 2006.

[RFC5386] Williams, N. and M. Richardson, "Better-Than-Nothing
          Security: An Unauthenticated Mode of IPsec", RFC 5386,
          November 2008.

[RFC6066] Eastlake, D., "Transport Layer Security (TLS) Extensions:
          Extension Definitions", RFC 6066, January 2011.

[RFC6265] Barth, A., "HTTP State Management Mechanism", RFC 6265,
          April 2011.

[XEP-0138]
          Hildebrand, J. and P. Saint-Andre, "Stream Compression",
          XSF XEP 0138, May 2009.

[XEP-0170]
          Saint-Andre, P., "Recommended Order of Stream Feature
          Negotiation", XSF XEP 0170, January 2007.

[XEP-0198]
          Karneges, J., Saint-Andre, P., Hildebrand, J., Forno, F.,
          Cridland, D., and M. Wild, "Stream Management", XSF XEP
          0198, June 2011.

[XEP-0220]
          Miller, J., Saint-Andre, P., and P. Hancke, "Server
          Dialback", XSF XEP 0220, September 2013.

8.3. URIs

[1] https://www.ietf.org/mailman/listinfo/xmpp

[2] https://www.ietf.org/mailman/listinfo/uta

Appendix A. Acknowledgements

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