Network Working Group
Internet-Draft
Intended status: Standards Track
Expires: August 26, 2013

M. Miller
P. Saint-Andre
Cisco Systems, Inc.

February 22, 2013

Using DNS Security Extensions (DNSSEC) and DNS-based Authentication of Named Entities (DANE) as a Prooftype for XMPP Domain Name Associations

draft-miller-xmpp-dnssec-prooftype-04

Abstract

This document defines a prooftype that uses DNS-based Authentication of Named Entities (DANE) for associating a domain name with an XML stream in the Extensible Messaging and Presence Protocol (XMPP). It also defines a method that uses DNS Security (DNSSEC) for securely delegating a source domain to a derived domain in XMPP.

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1. Introduction

The [XMPP-DNA] specification defines a framework for secure delegation and strong domain name associations (DNA) in the Extensible Messaging and Presence Protocol (XMPP). This document defines a secure delegation method that uses DNS Security (DNSSEC) [RFC4033] in conjuction with the standard DNS SRV records [RFC2782] employed in domain name resolution in XMPP, with the result that a client or peer server that inititates an XMPP stream can legitimately treat a derived domain as a reference identifier during stream negotiation. This document also defines a DNA prooftype that uses DNS-based Authentication of Named Entities [RFC6698] (DANE) to verify TLS certificates containing source domains or derived domains during stream negotiation.

2. Terminology

This document inherits XMPP terminology from [RFC6120], DNS terminology from [RFC1034], [RFC1035], [RFC2782] and [RFC4033], and

security terminology from [RFC4949] and [RFC5280]. The terms "source domain", "derived domain", "reference identifier", and "presented identifier" are used as defined in the "CertID" specification [RFC6125].

This document is applicable to connections made from an XMPP client to an XMPP server ("_xmpp-client._tcp") or between XMPP servers ("_xmpp-server._tcp"). In both cases, the XMPP initiating entity acts as a TLS client and the XMPP receiving entity acts as a TLS server. Therefore, to simplify discussion this document uses "_xmpp-client._tcp" to describe to both cases, unless otherwise indicated.

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. Requirements

An XMPP initiating entity (TLS client) that wishes to use the DNSSEC prooftype MUST do so before exchanging stanzas addressed to the source domain. In general, this means that the proof MUST be completed before the XMPP stream is restarted following STARTTLS negotiation (as specified in [RFC6120]). However, connections between XMPP servers MAY also use this prooftype to verify the addition of new source domains onto an existing connection, such as multiplexing or "piggybacking" via [XEP-0220].

4. Secure Delegation using DNS SRV

In order to determine if delegation using DNS SRV records is secure, an XMPP initiating entity (TLS client) performs the following actions:

1. Query for the appropriate SRV resource record for the source domain (e.g., "_xmpp-client._tcp.im.example.com").

2. If there is no SRV resource record, pursue the fallback methods described in [RFC6120].

3. If there is an SRV resource record, validate that the SRV record answer is secure according to [RFC4033]. If the answer is insecure, then delegation to the derived domain(s), as indicated by the "target host" field, is insecure and the TLS client MUST treat only the source domain as a reference identifier during certificate verification, as described in [RFC6120]; if the answer is bogus, the TLS client MUST abort.

4. If the answer is secure, the TLS client SHOULD consider any derived domain(s) in the answer as securely delegated; during certificate verification, the TLS client MUST treat both the source domain and the derived domain to which it has connected as reference identifiers.

The foregoing secure delegation method can be used with the DANE prooftype defined below, or with the PKIX prooftype specified in [RFC6120].

5. DANE Prooftype

DANE provides additional tools to verify the keys used in TLS connections. A TLS client MAY use DANE for TLS certificate verification; its use depends on the delegation status of the source domain, as described in the following sections.

5.1. No Service Records

If no SRV records are found for the source domain, then the TLS client MUST query for a TLSA resource record as described in [RFC6698], where the prepared domain name MUST contain the source domain and the IANA-registered port 5222 for client-to-server streams (e.g., "_5222._tcp.im.example.com") or the IANA-registered port 5269 for server-to-server streams (e.g., "_5269._tcp.im.example.com").

In this case, the TLS client MUST treat only the source domain as its reference identifier during certificate verification, as described in [RFC6120].

5.2. Insecure Delegation

If the delegation of a source domain to a derived domain is not secure, then the TLS client MUST NOT make a TLSA record query to the derived domain as described in [RFC6698]. Instead, the TLS client MUST treat only the source domain as its reference identifier during certificate verification, as described in [RFC6120], and MUST NOT use DANE.

5.3. Secure Delegation

If the source domain has been delegated to a derived domain in a secure manner as described under Section 4, then the TLS client MUST query for a TLSA resource record as described in [RFC6698], where the prepared domain name MUST contain the derived domain and a port obtained from the SRV answer (e.g., "_5555._tcp/hosting.example.net" for an SRV record such as "_xmpp-client._tcp.im.example.com IN TLSA 1 1 5555 hosting.example.net").

If no TLSA resource records exist for the specified service, then the TLS client MUST perform certificate verification as described under Section 4.

If TLSA resource records exist for the specified service, then the TLS client MUST treat the derived domain(s) as its reference identifier during certificate verification, using the information from the TLSA answer as the basis for verification as described in [RFC6698].

6. Order of Operations

The processes for the DANE prooftype MUST be complete before the TLS handshake over the XMPP connection finishes, so that the client can perform verification of reference identities. To that end, a TLS client SHOULD perform the processes for this prooftype as part of its normal DNS resolution of the source domain into a socket address. Validating secure delegation ought to be done immediately upon receiving the answers to the SRV and follow-up A/AAAA queries; queries for TLSA records ought to be done once the target service is determined (whether the source domain and IANA-registered port, or delegated domain and port).

Ideally a TLS client will perform the DNSSEC and DANE processes in parallel with other XMPP session establishment processes where possible (e.g., perform the TLSA resource queries as the socket connection is made to the server); this is sometimes called the "happy eyeballs" approach, similar to [RFC6555] for IPv4 and IPv6. However, a TLS client might delay as much of the XMPP session establishment as it needs to in order to gather all of the DNSSEC- and DANE-based verification material. For instance, a TLS client might not open the socket connection until it has validated the secure delegation, or it might delay beginning the TLS handshake until it has obtained the TLSA certificate verification material.

7. Internationalization Considerations

If the SRV, A/AAAA, and TLSA record queries are for an internationalized domain name, then they need to use the A-label form as defined in [RFC5890].

8. Security Considerations

This document supplements but does not supersede the security considerations provided in [RFC4033], [RFC6120], [RFC6125], and [RFC6698].

9. IANA Considerations

This document has no actions for the IANA.

10. References

10.1. Normative References

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Authors' Addresses

Matthew Miller
Cisco Systems, Inc.
1899 Wynkoop Street, Suite 600
Denver, CO 80202
USA

Email: mamille2@cisco.com

Peter Saint-Andre
Cisco Systems, Inc.
1899 Wynkoop Street, Suite 600
Denver, CO 80202
USA

Email: psaintan@cisco.com