This specification defines an XMPP protocol extension for sending DNS queries and getting DNS responses over XML streams. Each DNS query-response pair is mapped into an IQ exchange.
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1 Introduction

This document defines a specific protocol, DNS over XMPP (DoX), for sending DNS RFC 1035 queries and getting DNS responses over XMPP Core (and therefore TLS RFC 8446 security for integrity and confidentiality).

The integration with XMPP provides a transport suitable for both existing DNS clients and native XMPP applications seeking access to the DNS.

This protocol is almost identical in scope to DNS Queries over HTTPS (DoH) RFC 8484.

2 Requirements

This specification addresses the following requirements:

1. Sending a DNS query.
2. Responding with a DNS response.

3 Protocol

The DoX protocol is extremely simple:

1. The requesting entity (requestor) sends an IQ-get containing a <dns/> element qualified by the 'urn:xmpp:dox:0' namespace, which contains the DNS query.
2. The resolving entity (resolver) returns either an IQ-result containing a <dns/> element qualified by the 'urn:xmpp:dox:0' namespace, which contains the DNS response (if it supports the namespace) or an IQ-error (if it does not).
3. In both the query and response, the content of the <dns/> element is the DNS on-the-wire format as defined in RFC 1035. The body MUST be encoded with base64 RFC 4648. Padding characters for base64 MUST NOT be included.

4 Use Cases

Sending a DNS query is done by sending an <iq/> get over the stream from the requestor to the resolver.

\[\text{RFC 8484: DNS Queries over HTTPS (DoH)} <\text{http://tools.ietf.org/html/rfc8484}.\]
\[\text{RFC 4648: The Base16, Base32, and Base64 Data Encodings}\ <\text{http://tools.ietf.org/html/rfc4648}.\]
5 Determining Support

If an entity supports the DoX protocol, it MUST report that fact by including a service discovery feature of "urn:xmpp:dox:0" in response to a Service Discovery (XEP-0030)\(^7\) information request:

7 Security Considerations

Listing 4: Service Discovery information request

```
<iq type='get'
    from='juliet@capulet.lit/balcony'
    to='capulet.lit'
    id='disco1'>
  <query xmlns='http://jabber.org/protocol/disco#info'/>
</iq>
```

Listing 5: Service Discovery information response

```
<iq type='result'
    from='capulet.lit'
    to='juliet@capulet.lit/balcony'
    id='disco1'>
  <query xmlns='http://jabber.org/protocol/disco#info'>
    ...
    <feature var='urn:xmpp:dox:0'/>
    ...
  </query>
</iq>
```

In order for an application to determine whether an entity supports this protocol, where possible it SHOULD use the dynamic, presence-based profile of service discovery defined in Entity Capabilities (XEP-0115)\(^8\). However, if an application has not received entity capabilities information from an entity, it SHOULD use explicit service discovery instead. Support could also be pre-arranged between parties by putting a resolver at a known JID, in which case the requestor can just start sending queries to the resolver.

6 Implementation Notes

Some XMPP clients do not respond to IQ stanzas containing unsupported payloads. Although this is in violation of XMPP Core\(^9\), this behavior can result in disconnection of clients that are in fact actively connected to the server.

7 Security Considerations

Running DNS over XMPP relies on the security of the underlying XMPP transport, therefore all queries and responses MUST use TLS or equivalent connection security. This mitigates classic amplification attacks for UDP-based DNS. Session-level encryption has well-known weaknesses with respect to traffic analysis, which might be particularly acute when dealing with DNS queries. DoX resolvers can also add DNS

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8 IANA Considerations

No interaction with the Internet Assigned Numbers Authority (IANA) \[12\] is necessary as a result of this document.

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12 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/>.
9 XMPP Registrar Considerations

9.1 Protocol Namespaces

The XMPP Registrar includes "urn:xmpp:dox:0" in its registry of protocol namespaces (see <https://xmpp.org/registrar/namespaces.html>).

10 XML Schema

```xml
<?xml version='1.0' encoding='UTF-8'?>
<xs:schema
   xmlns:xs='http://www.w3.org/2001/XMLSchema'
   targetNamespace='urn:xmpp:dox:0'
   xmlns='urn:xmpp:dox:0'
   elementFormDefault='qualified'>
  <xs:annotation>
    <xs:documentation>
      The protocol documented by this schema is defined in XEP-XXX: https://xmpp.org/extensions/inbox/dox.html
    </xs:documentation>
  </xs:annotation>

  <xs:element name='dns' type='base64Binary'/>
</xs:schema>
```

13The 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/>.