Abstract

This document specifies identifiers and challenges required to enable the Automated Certificate Management Environment (ACME) to issue certificates for IP addresses.

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1. Introduction

The Automatic Certificate Management Environment (ACME) [RFC8555] only defines challenges for validating control of DNS host name identifiers, which limits its use to being used for issuing certificates for DNS identifiers. In order to allow validation of IPv4 and IPv6 identifiers for inclusion in X.509 certificates, this document specifies how challenges defined in the original ACME specification and the TLS-ALPN extension specification [I-D.ietf-acme-tls-alpn] can be used to validate IP identifiers.

2. Terminology

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 BCP 14 [RFC2119] when, and only when, they appear in all capitals, as shown here.

3. IP Identifier

[RFC8555] only defines the identifier type "dns", which is used to refer to fully qualified domain names. If an ACME server wishes to request proof that a user controls a IPv4 or IPv6 address, it MUST create an authorization with the identifier type "ip". The value field of the identifier MUST contain the textual form of the address as defined in [RFC1123] Section 2.1 for IPv4 and in [RFC5952] Section 4 for IPv6.
An identifier for the IPv6 address 2001:db8::1 would be formatted like so:

{"type": "ip", "value": "2001:db8::1"}

4. Identifier Validation Challenges

IP identifiers MAY be used with the existing "http-01" (see Section 8.3 of [RFC8555]) and "tls-alpn-01" (see Section 3 of [I-D.ietf-acme-tls-alpn]). To use IP identifiers with these challenges, their initial DNS resolution step MUST be skipped, and the IP address used for validation MUST be the value of the identifier.

5. HTTP Challenge

For the "http-01" challenge, the Host header field MUST be set to the IP address being used for validation per [RFC7230]. The textual form of this address MUST be as defined in [RFC1123] Section 2.1 for IPv4 and in [RFC5952] Section 4 for IPv6.

6. TLS with Application Level Protocol Negotiation (TLS ALPN) Challenge

For the "tls-alpn-01" challenge, the subjectAltName extension in the validation certificate MUST contain a single iPAddress that matches the address being validated. As [RFC6066] does not permit IP addresses to be used in the SNI extension HostName field, the server MUST instead use the IN-ADDR.ARPA [RFC1034] or IP6.ARPA [RFC3596] reverse mapping of the IP address as the HostName field value instead of the IP address string representation itself. For example, if the IP address being validated is 2001:db8::1, the SNI HostName field should contain "1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.8.b.d.0.1.0.0.2.ip6.arpa".

7. DNS Challenge

The existing "dns-01" challenge MUST NOT be used to validate IP identifiers.

8. IANA Considerations

8.1. Identifier Types

Adds a new type to the "ACME Identifier Types" registry defined in Section 9.7.7 of [RFC8555] with Label "ip" and Reference "I-D.ietf-acme-ip".
8.2. Challenge Types

Adds two new entries to the "ACME Validation Methods" registry defined in Section 9.7.8 of [RFC8555]. These entries are defined below:

<table>
<thead>
<tr>
<th>Label</th>
<th>Identifier Type</th>
<th>ACME</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>http-01</td>
<td>ip</td>
<td>Y</td>
<td>I-D.ietf-acme-ip</td>
</tr>
<tr>
<td>tls-alpn-01</td>
<td>ip</td>
<td>Y</td>
<td>I-D.ietf-acme-ip</td>
</tr>
</tbody>
</table>

9. Security Considerations

The extensions to ACME described in this document do not deviate from the broader threat model described in [RFC8555] Section 10.1.

9.1. CA Policy Considerations

This document only specifies how an ACME server may validate that a certificate applicant controls a IP identifier at the time of validation. The CA may wish to perform additional checks not specified in this document. For example, if the CA believes an IP identifier belongs to a ISP or cloud service provider with short delegation periods, they may wish to impose additional restrictions on certificates requested for that identifier.

10. Acknowledgments

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11. Normative References

[I-D.ietf-acme-tls-alpn]


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