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Abstract

This document defines a new Footprint and Capabilities metadata objects to support HTTPS delegation between two or more interconnected CDNs. Specifically, this document outlines CDNI Metadata interface objects for delegation method as published in the ACME-STAR document [[RFC9115](#)].

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[1.](#) Introduction

Content delivery over HTTPS using one or more CDNs along the path requires credential management. This specifically applies when an entity delegates delivery of encrypted content to another trusted entity.

[RFC9115] defines a mechanism where an upstream entity, that is, holder of an X.509 certificate can give a temporary delegated authority, via issuing a certificate to one or more downstream entities for the purposes of delivering content on its behalf. Furthermore, the upstream entity has the ability to extend the duration of the certificate automatically and iteratively until it allows the last renewal to end and therefore terminate the use of the certificate authority to the downstream entity.

More specifically, [\[RFC9115\]](#) defines a process where the upstream Content Delivery Network (uCDN), the holder of the domain, generates on-demand an X.509 certificate for the downstream CDN (dCDN). The certificate generation process ensures that the certified public key

corresponds to a private key controlled by the downstream CDN. [RFC9115] follows [RFC8739] for Short-Term, Automatically Renewed Certificate (STAR) in the Automated Certificate Management Environment (ACME).

This document defines CDNI Metadata to make use of HTTPS delegation between an uCDN and a dCDN based on the mechanism specified in [RFC9115]. Furthermore, it includes a proposal of IANA registry to enable adding of delegation methods.

[Section 2](#) defines terminology used in this document. [Section 3](#) presents delegation metadata for the FCI interface. [Section 4](#) addresses the metadata for handling HTTPS delegation with the Metadata Interface. [Section 5](#) addresses IANA registry for delegation methods. [Section 6](#) covers the security considerations.

2. Terminology

This document uses terminology from CDNI framework documents such as: CDNI framework document [RFC7336], CDNI requirements [RFC7337] and CDNI interface specifications documents: CDNI Metadata interface [RFC8006] and CDNI Footprint and capabilities [RFC8008].

3. Advertising delegation metadata for CDNI through FCI

The Footprint and Capabilities interface as defined in [RFC8008], allows a dCDN to send a FCI capability type object to a uCDN.

The FCI.Metadata object shall allow a dCDN to advertise the capabilities regarding the supported delegation methods and their configuration.

The following is an example of the supported delegated methods capability object for a CDN supporting STAR delegation method.

```
{
  "capabilities": [
    {
      "capability-type": "FCI.Metadata",
      "capability-value": {
        "delegation-methods": [
```

```

        "AcmeStarDelegationDelegationMethod",
        "... Other supported delegation methods ..."
    ]
}
"footprints": [
    <Footprint objects>
]
}
]
}

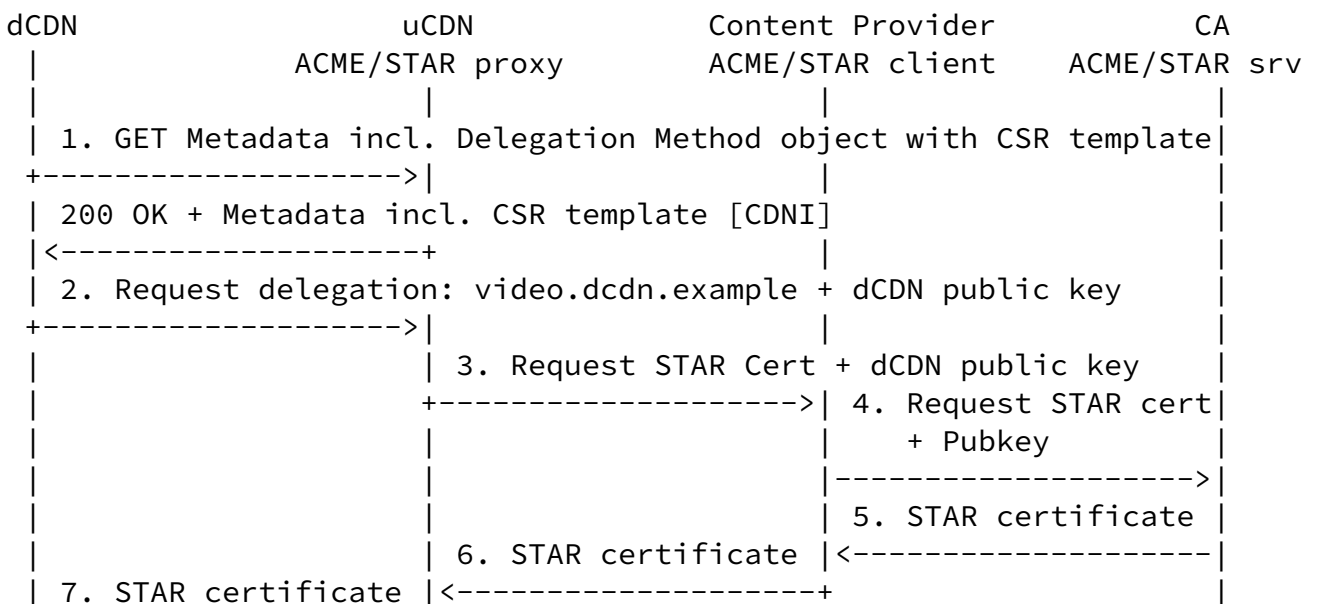
```

4. ACME Delegation metadata for CDNI

This section defines the `AcmeStarDelegationMethod` object which describes metadata related to the use of ACME/STAR API presented in [\[RFC9115\]](#)

This allows bootstrapping ACME delegation method between a uCDN and a delegate dCDN.

As expressed in [\[RFC9115\]](#), when an origin has set a delegation to a specific domain (i.e., dCDN), the dCDN should present to the end-user client a short-term certificate bound to the master certificate.



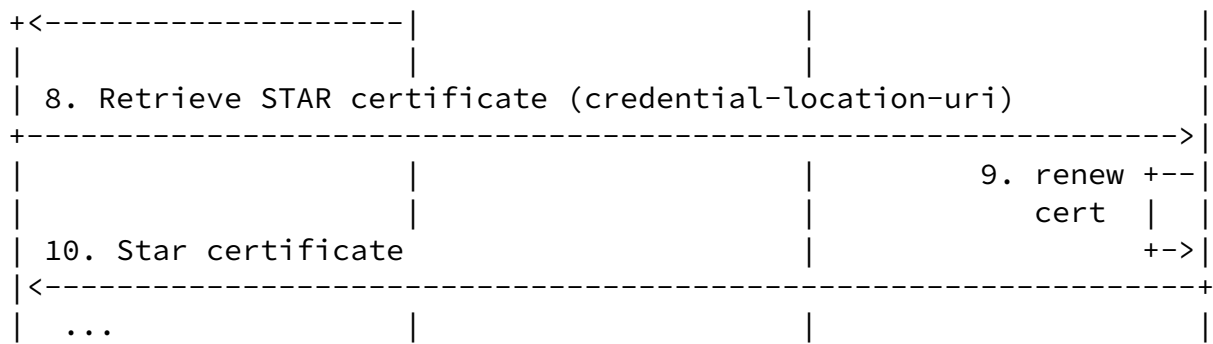


Figure 1: Example call-flow of STAR delegation in CDNI showing 2 levels of delegation

Property: acme-delegations

Description: an array of delegation objects associated with the dCDN account on the uCDN ACME server (see [Section 2.3.1 of \[RFC9115\]](#) for the details).

Type: Objects

Mandatory-to-Specify: Yes

Below shows both HostMatch and its Metadata related to a host, for example, here is a HostMatch object referencing "video.example.com" and a list of 2 acme-delegation objects.

HostMatch:

```

{
  "host": "video.example.com",
  "host-metadata": {
    "type": "MI.HostMetadata",
    "href": "https://metadata.ucdn.example/host1234"
  }
}

```

Following the example above, the metadata is modeled for ACMEStarDelegationMethod as follows:

```

"generic-metadata-value": {
  "acme-delegations": [

```

```
    "https://acme.ucdn.example/acme/delegation/ogfr8EcolOT",
    "https://acme.ucdn.example/acme/delegation/wSi5Lbb61E4"
  ]
}
```

5. IANA considerations

This document requests the registration of the following entries under the "CDNI Payload Types" registry hosted by IANA regarding "CDNI delegation":

Payload Type	Specification
MI.AcmeStarDelegationMethod	RFCthis

[RFC Editor: Please replace RFCthis with the published RFC number for this document.]

5.1. CDNI MI AcmeStarDelegationMethod Payload Type

Purpose: The purpose of this Payload Type is to distinguish AcmeStarDelegationMethod MI objects (and any associated capability advertisement)

Interface: MI

Encoding: see [Section 4](#)

6. Security considerations

Delegation metadata proposed here do not alter nor change Security Considerations as outlined in the following RFCs: An Automatic Certificate Management Environment (ACME) Profile for Generating

Delegated Certificates [[RFC9115](#)]; the CDNI Metadata [[RFC8006](#)] and CDNI Footprint and Capabilities [[RFC8008](#)].

The delegation objects properties that are critical should be protected by the proper/mandated encryption and authentication.

[7.](#) References

[7.1.](#) Normative References

- [RFC8006] Niven-Jenkins, B., Murray, R., Caulfield, M., and K. Ma, "Content Delivery Network Interconnection (CDNI) Metadata", [RFC 8006](#), DOI 10.17487/RFC8006, December 2016, <<https://www.rfc-editor.org/info/rfc8006>>.
- [RFC8008] Seedorf, J., Peterson, J., Previdi, S., van Brandenburg, R., and K. Ma, "Content Delivery Network Interconnection (CDNI) Request Routing: Footprint and Capabilities Semantics", [RFC 8008](#), DOI 10.17487/RFC8008, December 2016, <<https://www.rfc-editor.org/info/rfc8008>>.
- [RFC8739] Sheffer, Y., Lopez, D., Gonzalez de Dios, O., Pastor Perales, A., and T. Fossati, "Support for Short-Term, Automatically Renewed (STAR) Certificates in the Automated Certificate Management Environment (ACME)", [RFC 8739](#), DOI 10.17487/RFC8739, March 2020, <<https://www.rfc-editor.org/info/rfc8739>>.
- [RFC9115] Sheffer, Y., López, D., Pastor Perales, A., and T. Fossati, "An Automatic Certificate Management Environment (ACME) Profile for Generating Delegated Certificates", [RFC 9115](#), DOI 10.17487/RFC9115, September 2021, <<https://www.rfc-editor.org/info/rfc9115>>.

[7.2.](#) Informative References

- [RFC7336] Peterson, L., Davie, B., and R. van Brandenburg, Ed., "Framework for Content Distribution Network Interconnection (CDNI)", [RFC 7336](#), DOI 10.17487/RFC7336, August 2014, <<https://www.rfc-editor.org/info/rfc7336>>.
- [RFC7337] Leung, K., Ed. and Y. Lee, Ed., "Content Distribution

Network Interconnection (CDNI) Requirements", [RFC 7337](#),
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