

Updates of ALTO CDNI FCI

[draft-ietf-alto-cdni-request-routing-alto-06](#)

J. Seedorf

Y. Richard Yang

Kevin Ma

J. Peterson

X. Lin

Speaker: [J. Jensen Zhang](#)

Overview of CDNI FCI -06

- Major Updates:
 - Changed naming, for "cdni-fci-map" and "altonetworkmap"
 - Updated CDNI Capabilities Property Map using the latest unified properties specification (-08)
 - Improved the wording
 - Revised protocol specification and examples
 - Corrected examples of CDNI FCI updates using the JSON merge patch
 - Clarified protocol error handling

Remaining Issues and Solutions

- Issue 1: CDNI FCI is not a key-value store format
 - Solution: keep the message schema but rename CDNI FCI Map service to CDNI FCI service

Map (Key-Value Store):

```
{
  "PID1": {
    "ipv4": [ "192.0.1.0/24", ... ]
  },
  ...
}
```

Table:

```
[
  {
    "pid-name": "PID1",
    "pid-value": { "ipv4": [ "192.0.1.0/24", ... ] }
  },
  ...
]
```

- Issue 2: Current design allows query only by footprint or only by capability
 - WG has no strong opinion to allow joint footprint and capability query
 - Solution: Do not address it
 - People can propose another extension if necessary

Rename CDNI FCI Map as CDNI FCI Service

Still keep the request/response schema, but do not claim it is a map service.

"application/alto-cdnifcimap+json" -> "application/alto-cdnifci+json"

3. CDNI FCI Map

The ALTO protocol is based on an ALTO Information Service Framework which consists of several services, where all ALTO services are "provided through a common transport protocol, messaging structure and encoding, and transaction model" [RFC7285]. The ALTO protocol specification [RFC7285] defines several such services, e.g. the ALTO map service.

This document defines a new ALTO Map Service called "CDNI FCI Map Service" which conveys JSON objects of media type "application/alto-cdnifcimap+json". These JSON objects are used to transport BaseAdvertisementObject objects defined in [RFC8008]; this document specifies how to transport such BaseAdvertisementObject objects via the ALTO protocol with the ALTO "CDNI FCI Map Service". Given that the "CDNI FCI Map Service" is very similar in structure to the two already defined map services (network maps and cost maps), the specification of CDNI FCI Map below uses the same specification structure for Cost Map specification in Section 11.2.3 of [RFC7285] when specifying cost maps.

3. CDNI FCI Service

The ALTO protocol is based on an ALTO Information Service Framework which consists of several services, where all ALTO services are "provided through a common transport protocol, messaging structure and encoding, and transaction model" [RFC7285]. The ALTO protocol specification [RFC7285] defines several such services, e.g., the ALTO map service.

This document defines a new ALTO Service called "CDNI FCI Service" which conveys JSON objects of media type "application/alto-cdnifci+json". These JSON objects are used to transport BaseAdvertisementObject objects defined in [RFC8008]; this document specifies how to transport such BaseAdvertisementObject objects via the ALTO protocol with the ALTO "CDNI FCI Service". Similar to other ALTO services, this document defines the ALTO information resource for the "CDNI FCI Service" as follows.

Rename "altonetworkmap" as "altopid"

- Define a new footprint type "altopid" so that the ALTO server can use PIDs in an ALTO network map as footprints.
- If "altopid" is used, the CDNI FCI service MUST use one and only one dependent network map resource.

4. CDNI FCI Map using ALTO Network Map

4.1. Network Map Footprint Type: altonetworkmap

In addition to the already defined CDNI footprint types (e.g., ipv4cidr, ipv6cidr, asn, countrycode), ALTO network maps can be a type of FCI footprint.

Specifically, CDNI footprints using ALTO network maps should use a new CDNI Footprint Type called "altonetworkmap".

"altonetworkmap" footprint type indicates that the corresponding footprint value is a list of PIDNames as defined in [RFC7285]. These PIDNames are references of PIDs in a network map resource. Hence a CDNI FCI map with "altonetworkmap" footprints depends on a network map. For such a CDNI FCI map, the "dependent-vtag" field with a reference to a network map it depends on MUST be included in it (see the example in Section 4.2.3).

4. CDNI FCI Service using ALTO Network Map

4.1. Network Map Footprint Type: altopid

The ALTO protocol defines a concept called PID to represent a group of IPv4 or IPv6 addresses which can be applied the same management policy. The PID is an alternative to the pre-defined CDNI footprint types (i.e., ipv4cidr, ipv6cidr, asn, and countrycode).

Specifically, a CDNI FCI resource can depend on an ALTO network map resource and use a new CDNI Footprint Type called "altopid" to compress its CDNI Footprint Payload.

"altopid" footprint type indicates that the corresponding footprint value is a list of PIDNames as defined in [RFC7285]. These PIDNames are references of PIDs in a network map resource. Hence a CDNI FCI map with "altopid" footprints depends on a network map. For such a CDNI FCI map, the resource id of its dependent network map MUST be included in the "uses" field of its IRD entry, and the "dependent-vtag" field with a reference to this network map MUST be included in its response (see the example in Section 4.2.3).

Update: IRD of CDNI FCI Using Property Map

- Define new entity domain types "countrycode" and "asn".
- Define a new property type "cdni-fci-capabilities".
- Use resource-specific entity properties.

```
"filtered-cdnifci-property-map" : {  
  "uri" : "http://alto.example.com/propmap/lookup/cdnifci-pid",  
  "media-type" : "application/alto-propmap+json",  
  "accepts" : "application/alto-propmapparams+json",  
  
  "capabilities" : {  
    "domain-types" : [ "ipv4", "ipv6", "countrycode", "asn" ],  
    "prop-types" : [ "cdni-fci-capabilities", "pid" ]  
  }  
},
```

```
"filtered-cdnifci-property-map" : {  
  "uri" : "http://alto.example.com/propmap/lookup/cdnifci-pid",  
  "media-type" : "application/alto-propmap+json",  
  "accepts" : "application/alto-propmapparams+json",  
  "uses" : [ "my-default-cdni", "my-default-network-map" ],  
  "capabilities" : {  
    "mappings" : {  
      "ipv4" : [ "my-default-cdni.cdni-fci-capabilities",  
                "my-default-network-map.pid" ],  
      "ipv6" : [ "my-default-cdni.cdni-fci-capabilities",  
                "my-default-network-map.pid" ],  
      "countrycode" : [ "my-default-cdni.cdni-fci-capabilities" ],  
      "asn" : [ "my-default-cdni.cdni-fci-capabilities" ],  
    }  
  }  
},
```


Update: Query of CDNI FCI Using Property Map

```
{
  "entities": [
    "ipv4:192.0.2.0/24",
    "ipv6:2001:db8::/32"
  ],
  "properties": [ "cdn-fci-capabilities", "pid" ]
}
```

```
{
  "entities": [
    "ipv4:192.0.2.0/24",
    "ipv6:2001:db8::/32"
  ],
  "properties": [ "my-default-cdnifci.cdn-fci-capabilities",
                  "my-default-networkmap.pid" ]
}
```

```
{
  "property-map": {
    "meta": {
      "dependent-vtags": [
        {"resource-id": "my-default-cdnifci-map",
         "tag": "7915dc0290c2705481c491a2b4ffbec482b3cf62"},
        {"resource-id": "my-default-networkmap",
         "tag": "7915dc0290c2705481c491a2b4ffbec482b3cf63"}
      ]
    },
    "ipv4:192.0.2.0/24": {
      "cdn-fci-capabilities": [
        {"capability-type": "FCI.DeliveryProtocol",
         "capability-value": {"delivery-protocols": ["http/1.1"]}},
        {"resource-id": "my-default-networkmap",
         "tag": "7915dc0290c2705481c491a2b4ffbec482b3cf63"}
      ],
      "pid": "pid1"
    },
    "ipv6:2001:db8::/32": {
      "cdn-fci-capabilities": [
        {"capability-type": "FCI.DeliveryProtocol",
         "capability-value": {"delivery-protocols": ["http/1.1"]}},
        {"resource-id": "my-default-networkmap",
         "tag": "7915dc0290c2705481c491a2b4ffbec482b3cf63"}
      ],
      "pid": "pid3"
    }
  }
}
```

```
{
  "property-map": {
    "meta": {
      "dependent-vtags": [
        {"resource-id": "my-default-cdnifci",
         "tag": "7915dc0290c2705481c491a2b4ffbec482b3cf62"},
        {"resource-id": "my-default-networkmap",
         "tag": "7915dc0290c2705481c491a2b4ffbec482b3cf63"}
      ]
    },
    "ipv4:192.0.2.0/24": {
      "my-default-cdnifci.cdn-fci-capabilities": [
        {"capability-type": "FCI.DeliveryProtocol",
         "capability-value": {"delivery-protocols": ["http/1.1"]}},
        {"resource-id": "my-default-networkmap",
         "tag": "7915dc0290c2705481c491a2b4ffbec482b3cf63"}
      ],
      "my-default-networkmap.pid": "pid1"
    },
    "ipv6:2001:db8::/32": {
      "my-default-cdnifci.cdn-fci-capabilities": [
        {"capability-type": "FCI.DeliveryProtocol",
         "capability-value": {"delivery-protocols": ["http/1.1"]}},
        {"resource-id": "my-default-networkmap",
         "tag": "7915dc0290c2705481c491a2b4ffbec482b3cf63"}
      ],
      "my-default-networkmap.pid": "pid3"
    }
  }
}
```

Update: Example of CDNI FCI Incremental Updates

Note that the JSON merge patch always includes the whole CDNI FCI resource.

So it is *not recommended* to use the JSON merge patch to update CDNI FCI.

```
event: application/merge-patch+json,my-default-cdnifci-map
data: {
  data: {
    data: "meta": {
      data: "vtag": {
        data: "tag": "dasdfa10ce8b059740bddsfasd8eb1d47853716"
      data: }
    data: },
  data: {
    data: "capability-type": "FCI.DeliveryProtocol",
    data: "capability-value": {
      data: "delivery-protocols": [
        data: "http/1.1"
      data: ]
    data: },
    data: "footprints": [
      data: <Footprint objects that are different from
    data: footprint objects in delivery-protocols http/1.1>
  data: ]
data: }
data: }
```

```
event: application/merge-patch+json,my-default-cdnifci
data: {
  data: {
    data: "meta": {
      data: "vtag": {
        data: "tag": "dasdfa10ce8b059740bddsfasd8eb1d47853716"
      data: }
    data: },
  data: {
    data: "cdnifci": {
      data: "capabilities": [
        data: {
          data: "capability-type": "FCI.DeliveryProtocol",
          data: "capability-value": {
            data: "delivery-protocols": [
              data: "http/1.1"
            data: ]
          data: },
        data: }
      data: ],
      data: "footprints": [
        data: <Footprint objects in only http/1.1>
      data: ]
    data: }
  data: }
data: }
```


Clarification: Request Process of Filtered CDNI FCI

Based on the protocol errors defined in Sec 5.6, undefined "capability-type" or "capability-value" is invalid in the request, so the ALTO server MUST return an "E_INVALID_FIELD_VALUE" error in this case.

For a valid CDNI capability, if the ALTO server does not define any footprints for it, it MUST be omitted from the response.

```
cdni-fci-capabilities: A list of CDNI FCI capabilities defined in
Section 5.1 of [RFC8008] for which footprints are to be returned.
If a list is empty or not appearing, the ALTO server MUST
interpret it as a request for the full CDNI FCI Map. The ALTO
server MUST interpret entries appearing in a list multiple times
as if they appeared only once. If a "capability-type" or a
"capability-value" is not defined, the ALTO server MUST ignore
this capability. If there is only one capability in the list and
its "capability-type" or "capability-value" is not defined, the
ALTO server MUST return nothing.
```

```
cdni-fci-capabilities: A list of CDNI FCI capabilities defined in
Section 5.1 of [RFC8008] for which footprints are to be returned.
If a list is empty or not appearing, the ALTO server MUST
interpret it as a request for the full CDNI FCI resource. The
ALTO server MUST interpret entries appearing in a list multiple
times as if they appeared only once. If the ALTO server does not
define any footprints for a CDNI capability, it MUST omit this
capability from the response.
```

Discussion

- Shall a CDNI FCI service announce its supported CDNI capability-types and capability-values in its IRD entry?
 - RFC 8006 (Sec 7.3) and RFC 8008 (Sec 5.3) only defines "http/1.1" and "https/1.1" as the initial capability-values for capability-type "FCI.DeliveryProtocol"
 - A new protocol type "http/2" may be registered, but an old ALTO server may not be upgraded to support it
 - When an ALTO client request this new registered capability-value, according to Sec 5.6, the ALTO server will consider it is undefined and return an "E_INVALID_FIELD_VALUE" error, which will surprise the client
 - Announcing supported capability-types and capability-values can prevent the client from sending wasted requests

"CDNI Metadata Protocol Types" Registry
(Sec 7.3 of RFC 8006)

Protocol Type	Description	Type Specification	Protocol Specifications
http/1.1	Hypertext Transfer Protocol -- HTTP/1.1	RFC 8006	RFC 7230
https/1.1	HTTP/1.1 over TLS	RFC 8006	RFC 7230 , RFC 2818

Next Steps

- Call for reviews from WG
- Go to WGLC Request?

Backup