Content Delivery Network Interconnection (CDNI) Request Routing: CDNI Footprint and Capabilities Advertisement using ALTO

draft-alto-cdni-request-routing-alto-01

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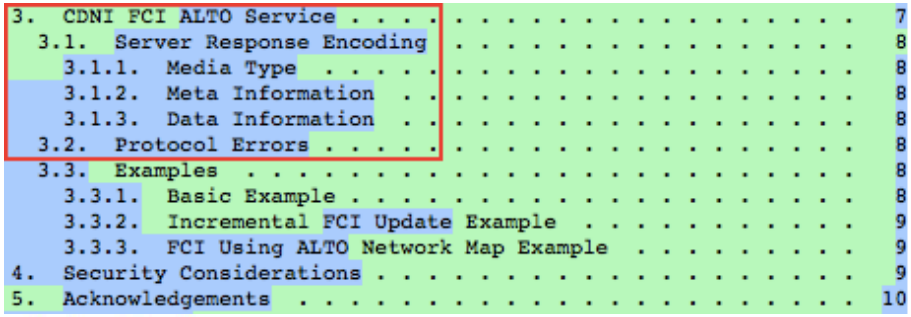
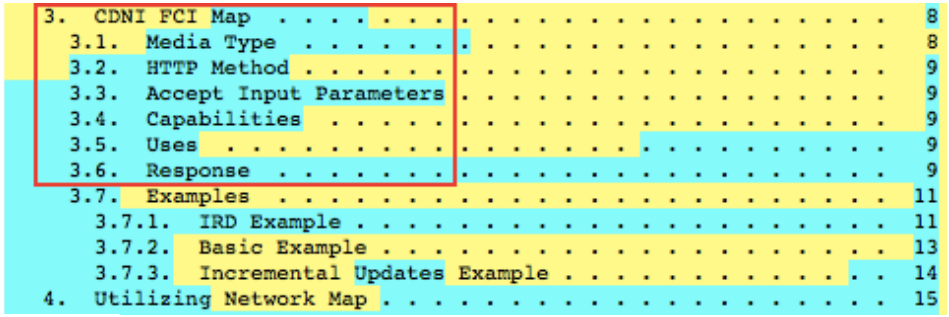
Summary of Changes

- Renamed CDNI FCI ALTO Service to CDNI FCI Map
- Introduced a precise definition for the CDNI FCI Map (Section 3)
- Refined Filter on Capabilities
  - Put in a new Section Filtered CDNI FCI Map Using Capabilities (Section 5)
- Refined Filter on Footprints
  - Put in a new Section Query Footprint Properties Using ALTO Unified Property Map Service (Section 6)
- Made extensive refinements to examples (Section 3.7/4.2/5.7/6.2)
  - IRD Example
  - Basic Example
  - Move "FCI Using ALTO Network Map Example" to "CDNI FCI Map Using ALTO Network Map" (Section 4)
  - Add Incremental Updates Examples
    - (Section 3.7.3/4.2.4/5.7.3/6.2.4)
- Add IANA considerations (Section 7)

A Precise Definition of CDNI FCI Map






```
object {
    CDNIFCIMapData cdnifci-map;
} InfoResourceCDNIFCIMap : ResponseEntityBase;

object {
    CDNIFCIObject capabilities<1..*>;
} CDNIFCIMapData

object {
    JSONString capability-type;
    JSONValue capability-value;
    CDNIFCIFootprint footprints<0..*>;
} CDNIFCIObject;

object {
    JSONString footprint-type;
    JSONString footprint-value<1..*>;
} CDNIFCIFootprint
```

- Added a schema for CDNI FCI Map response (Section 3.6)
- Two notes
  - The definition structure is the same as other previously defined maps
  - **Made clear that CDNIFCIMapData definition is defined by CDNI not ALTO. Hence, it is not normative.**

Filtered CDNI FCI Map Using Capabilities

- Clarify the semantic of Filtered CDNI FCI Map: Given some capabilities, which footprints have at least one of these capabilities?

```
object {
    JSONString capability-type;
    JSONValue capability-value;
} CDNIFCICapability;

object {
    CDNIFCICapability cdni-fci-capabilities<0..*>;
} ReqFilteredCDNIFCIMap;
```

```
POST /cdnifcimap/filtered HTTP/1.1
HOST: alto.example.com
Content-Type: application/cdnifilter+json
Accept: application/cdni

{
  "cdni-fci-capabilities": [
    {
      "capability-type": "FCI.DeliveryProtocol",
      "capability-value": {
        "delivery-protocols": [
          "http/1.1"
        ]
      }
    }
  ]
}
```

```
"cdnifci-map": {
  "capabilities": [
    {
      "capability-type": "FCI.DeliveryProtocol",
      "capability-value": {
        "delivery-protocols": [
          "http/1.1"
        ]
      },
      "footprints": [
        <Footprint objects>
      ]
    },
    {
      "capability-type": "FCI.DeliveryProtocol",
      "capability-value": {
        "delivery-protocols": [
          "https/1.1",
          "http/1.1"
        ]
      },
      "footprints": [
        <Footprint objects>
      ]
    },
    {
      "capability-type": "FCI.AcquisitionProtocol",
      "capability-value": {
        "acquisition-protocols": [
          "https/1.1"
        ]
      },
      "footprints": [
        <Footprint objects>
      ]
    }
  ]
}
```

Filtered CDNI FCI Map Using Capabilities

```
POST /cdnifcimap/filtered HTTP/1.1
HOST: alto.example.com
Content-Type: application/cdnifilter+json
Accept: application/cdni

{
  "cdni-fci-capabilities": [
    {
      "capability-type": "FCI.DeliveryProtocol",
      "capability-value": {
        "delivery-protocols": [
           "http/1.1"
        ]
      }
    }
  ]
}
```

Error handling

- E_SYNTAX
- E_MISSING_FIELD
  - Only have "capability-type"
  - Only have "capability-value"
  - The value of "capability-value" is null
- E_INVALID_FIELD_TYPE
- E_INVALID_FIELD_VALUE
  - The value of "capability-value" is inconsistent with "capability-type"

Special Case 1 (not error): If "cdni-fci-capabilities" is null or the value of it has no element, the ALTO server will return the related full CDNI FCI map.

Special Case 2 (not error): If "capability-type" is not defined, the ALTO server MUST ignore this capability. If it is the only capability in the list, the ALTO server MUST return nothing.

Integrating FCI w/ ALTO Network Map

- Introduce a new footprint type "altonetworkmap"
- Update the encoding of "altonetworkmap" footprint

```
{ "capability-type": "FCI.DeliveryProtocol",
  "capability-value": [
  "values": [
    "https1.1"
  ],
  "footprints": [
    { "footprint-type": "altonetworkmap",
      "footprint-value": [
        "http://alto.example.com/fcifootprint001",
        "germany",
        "south-france"
      ]
    }
  ]
}
```

```
{
  "dependent-vtags" : [
    {
      "resource-id": "my-eu-netmap",
      "tag": "3ee2cb7e8d63d9fab71b9b34cbf764436315542e"
    }
  ]
},
"cdnifci-map": {
  "capabilities": [
    { "capability-type": "FCI.DeliveryProtocol",
      "capability-value": [
        "http/1.1"
      ]
    },
    { "capability-type": "FCI.DeliveryProtocol",
      "capability-value": [
      "values": [
        "https/1.1"
      ],
      "footprints": [
        { "footprint-type": "altonetworkmap",
          "footprint-value": [
            "germany",
            "south-france"
          ]
        }
      ]
    }
  ]
}
```

Added IANA Considerations

- CDNI Metadata Footprint Type Registry
  - altonetworkmap
- ALTO Entity Domain Registry
  - asn
  - coutrycode
- ALTO CDNI FCI Property Type Registry
  - cdni-fci-capabilities

Clarification Items

- Media type of CDNI FCI map and filtered CDNI FCI map
  - Current: application/cdni
  - To be correct, we plan change to application/alto-cdni-fci-map+json
  - A generic problem: import embedding (current approach) or modular embedding (need new approaches such as multipart, which is tabled for now)

- The data component's name of CDNI FCI Map and Filtered CDNI FCI Map
  - Currently: cdnifci-map
  - Proposed Change: cdni-fci-map
  - Consist with network-map/cost-map/endpoint-cost-map

Next Steps

- More reviews will be appreciated
- Go to the WGLC

Make CDNI FCI Map Structure Consist with Network/Cost Map

- Rename "cdni-fcimap" → "cdni-fci-map"

Version 00

```
"cdni-fcimap": {
   "capabilities": [{
      "capability-type":  “FCI.DeliveryProtocol”,
      “capability-value”: {
         “delivery-protocols”: [“http/1.1”]
      }
      “footprints”: [<Footprint objects>]
   }]
}
```


Version 01

```
"cdni-fci-map": {
   "capabilities": [{
      "capability-type":  “FCI.DeliveryProtocol”,
      “capability-value”: {
         “delivery-protocols”: [“http/1.1”]
      }
      “footprints”: [<Footprint objects>]
   }]
}
```

Context

- CDNI WG has defined [RFC8008], which has defined precisely the semantics of Footprint & Capability advertisement Interface (FCI) and provided guidelines on the FCI protocol, but the exact protocol is explicitly outside the scope [RFC8008]
- ALTO charter item: define an FCI protocol based on ALTO
  - Consider FCI as a new ALTO service
  - Specification of transport of FCI JSON objects using ALTO
  - Investigate possibility to take advantage of both the ALTO base protocol [RFC 7285] and additional capabilities such as ALTO incremental updates (draft-ietf-alto-incr-update-sse-07)

FCI Examples

```
{
  "capabilities": [
    {
      "capability-type": "FCI.RedirectionMode",
      "capability-value": {
        "redirection-modes": [
          "DNS-I",
          "HTTP-I"
        ]
      }
      "footprints": [
        <Footprint objects>
      ]
    }
  ]
}
```

```
{
  "capabilities": [
    {
      "capability-type": "FCI.DeliveryProtocol",
      "capability-value": {
        "delivery-protocols": [
          "http/1.1",
        ]
      },
      "footprints": [
        <Footprint objects>
      ]
    }
  ]
}
```

Example Footprint object describing a footprint covering the IP address ranges 192.0.2.0/24 and 198.51.100.0/24:

```
{
  "footprint-type": "ipv4cidr",
  "footprint-value": ["192.0.2.0/24", "198.51.100.0/24"]
}
```

Query Footprint Properties using ALTO Unified Property Service

- The structure of this section is the same as we proposed in the last interim

- Error handling is the same as unified property map service

Revised Examples in Sections (3.7/4.2/5.7/6.2)