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

draft-alto-cdni-request-routing-alto-00
replace draft-seedorf-cdni-request-routing-alto-10

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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)

Design Constraint: What are Fixed

- ALTO [RFC7285] + finishing items such as incremental updates
- FCI
  - Semantics
    - [RFC8008] integrates footprint and capabilities with an approach of "capabilities with footprint restrictions”
    - …
  - Syntax
    - [RFC7336] CDNI media type: application/cdni
    - [RFC8008] Capability-type, value, footprints restrictions structure:
      - capability-type:, capability-value:, footprints: []
    - [RFC8006] Footprint
      - type + value structure
        - » list of ISO country codes, list of AS numbers, set of IP-prefixes,

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

{ "footprint-type": "countrycode",
"footprint-value": ["us"] }

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

Basic Design

- Approach: ALTO as a generic information resource distribution framework, with FCI (cdni objects more generally) as an example
  - Information resource is largely opaque
- Why leverage ALTO?
  - Service discovery
    - Information resource directory
  - Information transport: transport envelop, version tag, and error handling
  - Information resource update: incremental updates

Basic Design: Information Resource Directory

RFC 7285:

Announce FCI information resources:

```
HTTP/1.1 200 OK
Content-Length: ####
Content-Type: application/alto-directory+json
{ "meta" : {},
  "resources" : {
    "my-fci-map" : {
        "uri" : "http://fcialto.example.com/fcimap",
        "media-type" : "application/cdni",
        "capabilities" : { // announce FCI capabilities?? }
        "accepts" : { // if allow filtering of FCI info? }
        "uses": [ "my-mapping-from-coutrycode-to-ip-addresses" ]
    },
    …
}
```

Basic Design: Information Resource Transport

FCI object envelop:

```
GET /fcimap HTTP/1.1
Host: fcialto.example.com
Accept: application/cdni,application/alto-error+json

HTTP/1.1 200 OK
Content-Length: ####
Content-Type: application/cdni
{
  "meta" : {
     "vtag": { "resource-id": "my-fci-map",
               "tag": "da65eca2eb7a10ce8b059740b0b2e3f8eb1d4785"}
   },
   "cdni" : {    // ← need to agree on the name of this envelop
      "capabilities": [
         {
            "capability-type": "FCI.DeliveryProtocol",
            "capability-value": {
               "delivery-protocols": [
                 "http/1.1",
               ]
            },
            "footprints": [
               <Footprint objects>
            ]
         }
         // other FCI objects
      ] // end of capabilities
      // it could carry other cdni objects
   }
}
```

Basic Design: Transport Error Handling

ALTO Error Code	Description
E_SYNTAX	Parsing error in request (including identifiers)
E_MISSING_FIELD	A required JSON field is missing
E_INVALID_FIELD_TYPE	The type of the value of a JSON field is invalid
E_INVALID_FIELD_VALUE	The value of a JSON field is invalid

- Design decision: The error codes look to be still enough, although we plan to add more text on error information for cdni objects

Basic Design: Incremental Updates

```
POST /updates/fci HTTP/1.1
Host: fcialtoupdate.example.com
Accept: text/event-stream,application/alto-error+json
Content-Type: application/alto-updatestreamparams+json
Content-Length: ###
{  "add": {
      "my-fci-stream": {
         "resource-id": "my-fci-map"
      }
}
```

```
HTTP/1.1 200 OK
Connection: keep-alive
Content-Type: text/event-stream
event: application/alto-updatestreamcontrol+json
data: {"control-uri": "http://fcialtocu.example.com/updates/streams/3141592653589"}

event: application/cdni,my-fci-stream
data: { ... full cdni message ... }

event: application/merge-patch+json,my-fci-stream
data: { ... Merge patch update of cdni objects ... }

event: application/json-patch+json,my-fci-stream
data: { ... JSON patch update of cdni objects, e.g., footprints entries ... }
```

Advanced Design

- Directions
  - Introduce filtering of FCI info
  - Integrate ALTO information resources w/ FCI information resources, e.g.,
    - Utilize ALTO network map to provide input to FCI footprint
    - Query capabilities of ALTO endpoints (inverted index of FCI objects)
    - …

Status and Planning

- Current draft focuses on Basic Design
- Planning
  - Aug. 4: initial version w/ details reflecting agreed items during WG meeting
  - Aug. 18: feedback from solicited reviewers
  - Aug. 30: update according to feedback, upload -01

Backup Slides

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"]
}
```