CDNI Request Routing: Footprint and Capabilities Semantics Draft (draft-spp-cdni-rr-foot-cap-semantics-04) and Progress report from the "Footprint and Capabilities Advertisement" Design Team

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Background & Goals

- Discussion at IETF-82/83 on Footprint and Capabilities Advertisement (as part of CDNI request routing)
  - Agreement at IETF-82 that we first need to work out **what** this interface is intended to do before we can decide on a suitable protocol solution (i.e. the **how**)
    - Several people volunteered to write a draft about the semantics of “Footprint and Capabilities Advertisement”
    - Design team on CDNI “Footprint and Capabilities Advertisement” formed at IETF-83
    - Several phone calls, mailing list discussions, and side meetings at IETF-84/85/86 since then
- Goals of **draft-spp-cdni-rr-foot-cap-semantics**
  - Capture the semantics of the "Footprint and Capabilities Advertisement" part of the CDNI Request Routing interface, i.e. the desired meaning and what "Footprint and Capabilities Advertisement" is expected to offer within CDNI
    - Capture discussions and outcome of design team
    - Foster discussions by asking the right questions that are currently open
    - Eventually facilitate the choosing of one or more suitable protocols for "Footprint and Capabilities Advertisement" within CDNI Request Routing

Status Quo: Agreements in Design Team

- **convergence on the fact that highly dynamic QoS advertisement is unrealistic for the CDNI WG timeframe**
  - agreement that within the CDNI charter timeframe, real-time per request QoS advertisment is not realistic to standardise
  - but: somewhat dynamically changing information (on low timescales) might be useful to advertise
- **agreement that many things will be pre-agreed in CDNI contracts**
  - agreement that however there is still a need for advertisement to account for changes in dCDN capabilities/footprint
  - e.g. "when part of your CDN gets upgraded, you do not want to set up a new contract“
- **agreement to focus discussions on key use case**
  - Use case provided by Anne & Emile
- **agreement that footprint and capabilities are tied together**
  - given capabilities may apply only to a certain sub-part of the dCDN footprint

Status Quo: Agreements in Design Team

Capabilities

- Agreement that actual CDNI details / concrete contracts not known at this point in time, therefore should go for flexible protocol with few mandatory capabilities
- Agreement on small set of mandatory capabilities
  - Delivery Protocol (e.g., HTTP vs. RTMP)
  - Acquisition Protocol (for acquiring content from a uCDN)
  - Redirection Mode (e.g., DNS Redirection vs. HTTP Redirection as discussed in [I-D.ietf-cdni-framework])
  - Capabilities related to CDNI Logging (e.g., supported logging mechanisms)
  - Capabilities related to CDNI Metadata (e.g., authorization algorithms or support for proprietary vendor metadata)
- Agreement to have a registries for mandatory capabilities, where the registry and how to fill the registry would be defined by CDNI documents

Status Quo: Open Issues (prior to IETF-86)

Footprint

- Agreement that IP-address range, ASN, and geographical location are all good and useful candidates for footprint

- Lengthy discussions about difference between advertising reachability (what end user locations can dCDN serve?) or advertising resources (where does a dCDN have caches/surrogates?)
  - Decision made to either only support reachability type of advertisement or both types of advertisement (reachability and resource)
  - **Whether to support reachability only or both types is an open issue**

Side Meeting at IETF-86

- Agreement that for capabilities the design team is close to being done
- Agreement that for footprint there will be a small set of mandatory identifier types with a clear sematic, and the protocol will be open for future optional types of footprints (similar as with capabilities)
  → see more next slides
- Agreement on mandatory types of footprint
  - ISO Country Code (potentially also DVD-Region)
  - AS number
  - IP-prefixes

Footprint as a constraint

- For all of the mandatory-to-implement footprint types, dCDN footprint advertisements tell the uCDN to limit when it would delegate a request to the dCDN
- IP prefixes or ASN(s)
  - Signals to the uCDN that it should consider the dCDN a candidate only if the IP address of the request routing source falls within the prefix set or ASN
  - How the uCDN determines what address ranges are in an ASN will remain undefined
- Similar for country codes
  - uCDN should only consider the dCDN a candidate if it covers the country of the request routing source
  - How the uCDN determines the country of the request routing source will remain undefined
- Constraints are additive
  - Advertise both types and it narrows the dCDN candidacy cumulatively

Optional footprint types

- Our base spec will need to define:
  - A process for specifying optional footprint types
    - IANA registry, but with what level of oversight?
      - Should the WG decide, or an expert reviewer, or just a free-for-all?
    - A template that all optional footprint types must include in their specification
      - What design choices need to be captured?
  - The protocol mechanism for negotiating them
    - Should optional footprint types be ignored if not understood?
    - Should it be possible to specify footprint types that must be understood or the advertisement will be rejected
      - What would happen when an advertisement is rejected?

Discussion & Outlook

Semantics Draft

- Will be revised to document latest agreement (discussions here at IETF-86)
- Should it become a WG item?

When to close of design team and bring work back to CDNI WG?

- On most (initially open) issues agreement could be found
- Guidance for concrete protocol proposals is there

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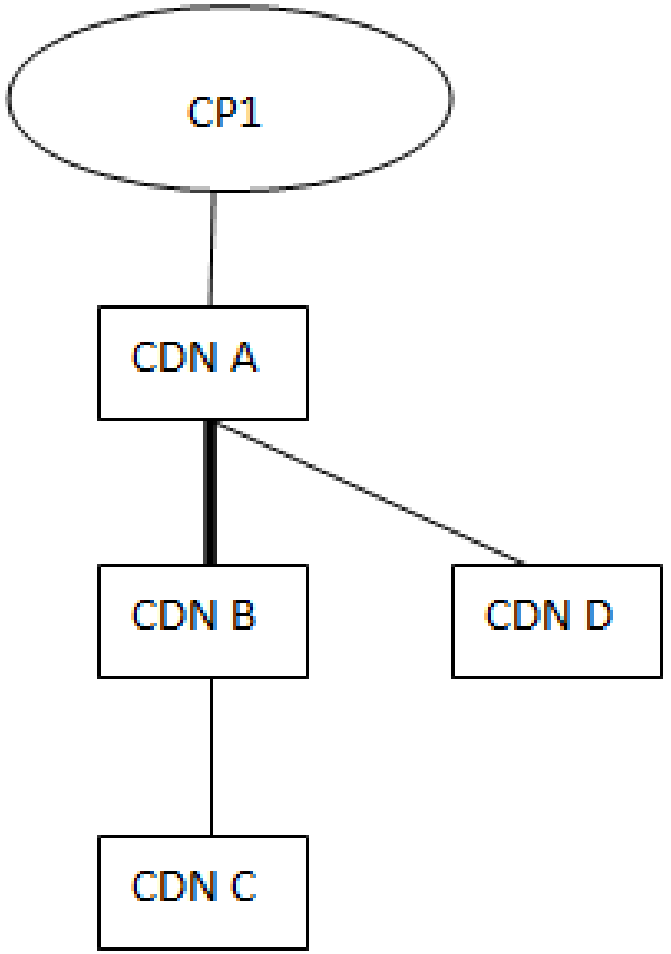
BACKUP SLIDES

Focus on Use Case to drive discussion

- Agreement on use case proposed by Anne and Emile
  - Contains delivery via different dCDNs (B and D) by uCDN A for different footprints and different delivery protocols
  - Contains transitive dCDN delivery (CDN C)
  - Considers partial changes in dCDN capabilities and what needs to be advertised in such cases



Status Quo at IETF-84

- **Agreement in the Design Team**
  - A footprint can probably be defined as "willingness to serve", but other information is needed by the uCDN to judge the delivery quality associated with choosing a given dCDN for a given end user request
    - Otherwise, any dCDN can claim it can deliver to the whole world
  - Part of the Footprint Advertisement will happen in contractual agreements
    - E.g. additional information to judge the delivery quality associated with a given dCDN footprint might be defined in contractual agreements (i.e. outside of the CDNI RR interface)
    - dCDN contractual agreements about "delivery quality" will probably be based on high-level aggregated statistics (i.e. not too detailed)
  - dCDN advertisement shall not contain *highly* dynamic QoS information
    - E.g. real-time delivery performance metrics, CDN resource load, ...
    - Hard to agree on this, and certainly not feasible to specify within charter time-frame
  - Monetary costs are out of scope of dCDN advertisement

Status Quo at IETF-84

- **Open Issues regarding Footprint**
  - What exactly is a footprint based on?
    - prefix, geographic area, ASN, or location of surrogates/resources?

    (agreement in design team that at least some reachability type (e.g. prefix) needs to be supported, but potentially also advertisement of dCDN resources can be useful)
  - How exactly can a given dCDN derive its footprint?
  - Given that a big part of footprint advertisement will actually happen in contractual agreements, what exactly still needs to be advertised by the CDNI RR interface?
    - E.g. updates about temporal failures?

- **Open Issues regarding Capabilities**
  - What capabilities are useful and how can we express them?
    - Should capability advertisement include only static attributes of the CDN, or should it factor in dynamic attributes as well?

Discussions in the Design Team since IETF-84

- Discussion has mostly focused on capabilities
- What is the exact relationship between contractual agreements and CDNI advertisement?
  - e.g. is advertisement supposed to “update” contractual information?
  - How independent is advertisement from contracts?
- Details of CDNI contracts are not clear at this point in time
  - What does this imply for standardizing advertisement?
  - Should the protocol have a small subset of mandatory capabilities and in addition allow for flexibility to exchange more information?
- dCDN resource capabilities seem most important type of capabilities
  - i.e. supported range of playback devices, supported range of delivery technologies, specific delivery protocols, ...
- Need to find out what types of capabilities are definitely needed and which ones should be optional
  - Focus on key use case(s) should drive this discussion

Discussions in the Design Team at IETF-85

- Agreement that the following capabilities must be supported
  - "delivery protocol“
    - agreement to have a registry for "delivery protocol" where the registry and how to fill the registry would be defined by CDNI documents
  - “acquisition protocol”
    - acquisition protocol may be dependent on delivery protocol
    - probably the same registry can be used for delivery protocol and aquisition protocol
  - “redirection mode”
    - I.e. DNS iterative, DNS recursive, HTTP iterative, HTTP recursive
  - Capabilities that refer to other CDNI interfaces
    - Logging: needed, but details not clear yet
    - Metadata: for some metadata actual supported values need to be advertised as capabilities
    - ➢ need to align the work between metadata / logging / request routing interfaces with capabilities advertisement
- Overall: good progress, but still some open issues
  - How do different capabilities depend on each other (cascading / matrix)?
  - URI signing: how many details need to be advertised?
  - What about versioning (e.g. metadata v.1 vs. metadata v.2)?