draft-bertrand-cdni-cdn-footprint

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WG CDNi

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Draft overview

- Purposes:
  1. present **use cases for CDN Footprint Discovery** in CDNI
  2. **clarify the terminology**
  3. identify **additional requirements** for controlling the exchange of Footprint information.
  4. provide a **survey of existing work** on the subject

Terminology (1/2)

- Aggregate CDN Footprint:
  - a set of User-Agent reachability information for which a CDN claims that it can deliver content in good conditions, by itself or through one of its dCDNs.
- High-Level CDN Footprint:
  - the part of the footprint information that reflects rather static and business-level information.
- On-Net Footprint:
  - a set of User-Agent reachability information for which a CDN claims that it can deliver content directly. For instance, a given Access CDN may assert that its On-Net CDN Footprint encompasses all end-users in two ASes (AS 64496 and AS 64497).

Terminology (2/2)

- CDN Delivery Proximity:
  - Information on the network distance between a set of end-users in the CDN Footprint and a close Surrogates of the considered CDN or of one of its dCDNs. Various metrics can be considered.
- CDN Footprint Discovery:
  - Discovery of information on CDN Footprint and CDN Delivery Proximity.
    1. **High-Level Footprint Discovery** permits discovering groups of end-users/Surrogates and interconnection costs between them.
    2. **Detailed Footprint Discovery** permits exchanging information that is subject to more scalability and confidentiality constraints. The level of information sharing must be tightly controlled.

Use cases for footprint discovery

- **In some cases, High-Level CDN Footprint Discovery does not require a protocol: uCDN knows the dCDN's footprint** as in the following examples:
  - High-Level CDN Footprint is Germany
  - High-Level CDN Footprint is AS 64496
- **Special cases only**:
  1. When the dCDNs' High-Level Footprints overlap.
  2. When end-users outside the dCDNs' High-Level Footprints can request content.
  - => uCDN needs additional criteria than the dCDNs' Footprint to select a dCDN.

- Cases where a protocol is potentially interesting:
  - when uCDN needs **dCDNs' Delivery Proximity information** to determine which dCDN is the "best" to serve a given set of end- users.

Additional requirements

- Existing requirements related to Footprint Discovery: REQ-2 and REQ-3
- Additional requirements:
  - FPT-1 [MED] A uCDN must be able to discover CDN Footprint and CDN Delivery Proximity information about dCDNs.
  - FPT-2 [HIGH] A dCDN MUST be able to control what other CDNs can discover about its CDN Footprint and CDN Delivery Proximity.
  - FPT-3 [MED] A uCDN should not forward to any other CDN the Footprint and Delivery Proximity information that it has discovered about a dCDN without the explicit agreement of this dCDN.
  - FPT-4 [HIGH] A Footprint Discovery protocol should not affect network stability and scalability.

Survey (1/3)

- **Legacy BGP provides useful data**
  - AS_path
    - if CDN1 knows that CDN2's footprint is AS 64496, then BGP information enables CDN1 to map requests to CDN2: src IP @ => AS 64496 => CDN2
    - CDN Delivery Proximity information: number of ASes crossed between a BGP listener and IP prefixes
  - Community tag
    - NSP filter and gather the prefixes in stable groups that are then used by an internal CDN for fine-grained request routing based on these groups;
    - this grouping is part of the detailed Footprint information; it may disclose information on the network's organization.
- **BGP Extension for CDNI**
  - [I-D.previdi-cdni-footprint-advertisement] extends Multiprotocol- BGP (MP-BGP [RFC4760]) in order for CDNs and/or ISPs to advertise their connectivity to footprints.

Survey (2/3)

- **BGP-TE**
  - [I-D.gredler-idr-ls-distribution] proposes a BGP-based mechanism by which link state and traffic engineering information can be collected from networks and shared with external components.

- **BGP AIGP (restricted applicability)**
  - The Accumulated IGP Metric Attribute for BGP [I-D.ietf-idr-aigp] defines a new TLV attribute in BGP that allows redistribution/ accumulation of IGP costs between ASes managed by the same NSP.

Survey (3/3)

- **ALTO Footprint**
  - [I-D.jenkins-alto-cdn-use-cases] NSP CDN acts as a dCDN ALTO server filters and sends prefix groups to uCDN ALTO clients according to its policies and with respect to a separate agreement it has with each uCDN. A group may appear as a PID in ALTO network and cost maps.
  - [I-D.penno-alto-cdn] (Section 7.1.) ALTO can be used by CDNs in a different administrative domain than the ISP to provide the cost from each CDN node to all known Subscriber PIDs.
  - [I-D.seedorf-alto-for-cdni] mentions that ALTO could support selection of downstream CDN but does not indicate the way ALTO server is fed.
- **Generic Capability Advertisement**
  - [I-D.he-cdni-cap-info-advertising] HTTP/1.1-based protocol used to communicate capability information (e.g., resources, footprint, load) "to facilitate selection of the Downstream CDN by the Upstream CDN".

Conclusion / Next steps

- The need for a Footprint Discovery Protocol is limited to specific use cases.

- Key building blocks for a Footprint Discovery protocol :
  1. Information on the network-level connectivity to groups of prefixes
  2. A mechanism to group end-users that must be served from the same set of Surrogates . Scalability/confidentiality => CDNs/NSPs are likely to provide the groups' definitions only to their trusted partners.
  3. A mechanism to discover generic cost information (uCDN Delivery Proximity) for the delivery from a given set of to a given set of end-users

- More work is needed to fulfill the specific requirements that arise in the context of CDNI.