A Cost Perspective on Using Multiple CDNs
draft-liu-cdni-cost-00

Abstract

   This document describes several potential price and charge issues in
   CDN interconnection. It discusses some optional charge models when
   CDNs are interconnected and presents a need from Content Service
   Providers (CSP) or CDNs to optimize their cost locally and guarantee
   their performance. It finally shows how can CDNI frameworks and
   protocols support price, charge and policy information exchanging.

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[1](). Introduction

The cost optimization perspective so far has not been considered in inter-connecting multiple Content Delivery Networks (CDNs). Specifically, a Content Service Provider (CSP) with multiple CDNs may consider cost or conduct cost optimization, in addition to performance, when deciding how to direct a request when it has multiple candidate CDNs.

This draft discussses some potential charge/price models in CDNI and shows that CSPs and CDNs can optimize their benefit locally, based on charge and performance information. It also shows how to integrate the model into CDNI's protocol and architecture design.

[1.1](). Concepts

[1.1.1](). Content Customer (CC)

A content customer downloads and consume content from Internet.

[1.1.2](). Content Service Provider (CSP)

A content service provider leverages CDNs to delivery their content to content customers over Internet.

[1.1.3](). Upstream CDN (U-CDN)

Upstream CDNs are directly connected with CSPs. CSPs have commercial contract with upstream CDNs and can upload content objects into them. Upstream CDNs charge their CSPs according to the storage, number of requests and traffic usage.

[1.1.4](). Downstream CDN (D-CDN)

Downstream CDNs serve content customers directly. The content requests will be finally redirected to downstream CDNs.
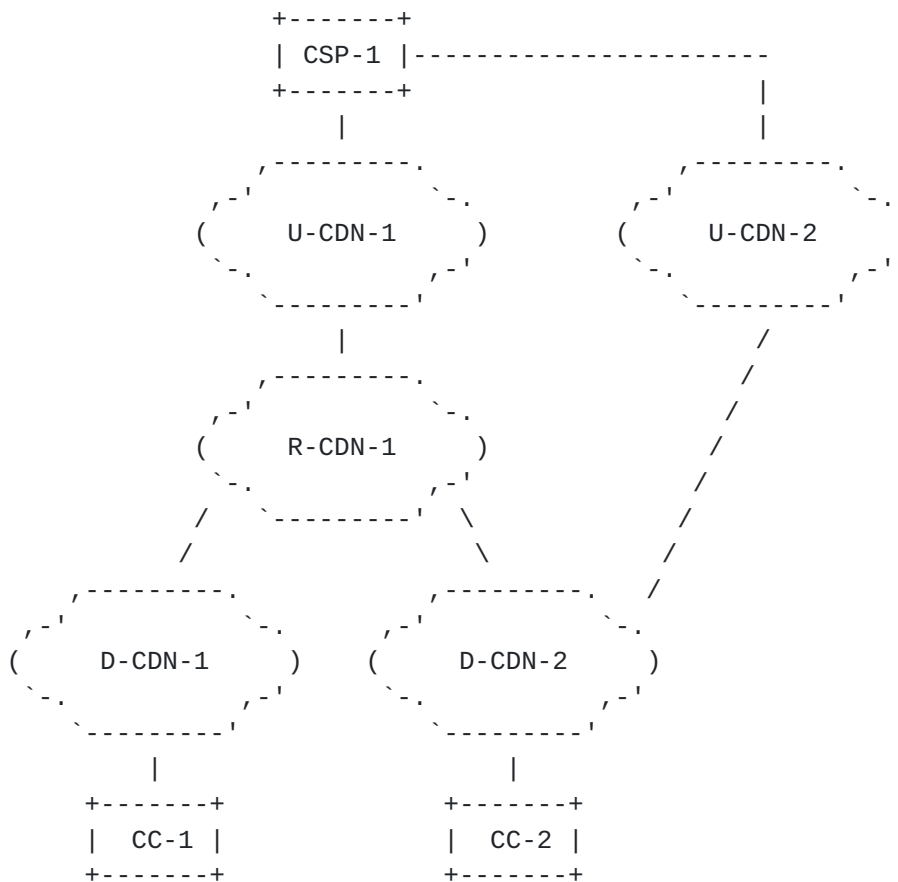
[1.1.5](). Relay CDN (R-CDN)

If a CDN is on the path of content delivery, but is neither an upstream CDN nor a downstream CDN, it is a relay CDN.

[2](). Charge Models in CDNI

2.1. CDNI Network

Figure 1 shows a simple case when CDNs are interconnected. CSP rents
two upstream CDNs, U-CDN-1 and U-CDN-2. To delivery content to CC-2,
CSP-1 can choose either U-CDN-1 or U-CDN-2 to carry the task.
Typically, the costs and performances of U-CDN-1 and U-CDN-2 are
different. CSP needs the price and performance information for the
decision. Next we present two potential and simple charge models in
CDNI.

```
                        +-------+
                        | CSP-1 |-----------------------
                        +-------+                      |
                            |                          |
                       ,---------.                ,---------.
                    ,-'           `-.          ,-'           `-.
                   (     U-CDN-1     )        (     U-CDN-2     )
                    `-.           ,-'          `-.           ,-'
                       `---------'                `---------'
                            |                          /
                       ,---------.                    /
                    ,-'           `-.                /
                   (     R-CDN-1     )              /
                    `-.           ,-'             /
                   /    `---------'  \           /
                  /                   \         /
             ,---------.            ,---------.  /
          ,-'           `-.      ,-'           `-./
         (     D-CDN-1     )    (     D-CDN-2     )
          `-.           ,-'      `-.           ,-'
             `---------'            `---------'
                  |                      |
             +-------+              +-------+
             | CC-1 |              | CC-2 |
             +-------+              +-------+
```

A Simple Case of CDN Interconnection

Figure 1

2.2. Recursive Charge Model

In this model, CSP-1 does not know about how U-CDN-1 and U-CDN-2 will
handle the content delivery tasks. It only redirects the requests
from CCs to U-CDN-1 or U-CDN-2, and the upstreaming CDNs will
response or redirect the requests. For CSP-1, it only knows about
the price and the performance to select U-CDN-1 or U-CDN-2. U-CDN-1

   will make contracts with R-CDN-1 and so does U-CDN-2 with D-CDN-2.

2.3. Interative Charge Model

   In this model, CSP-1 has the knowledge about the details of the
   content delivery paths. Interatively, U-CDN-1 tells CSP-1 about the
   price to R-CDN-1, R-CDN-1 tells CSP-1 about the prices of D-CDN-1 and
   D-CDN-2. When CSP-1 knows about all the options to delivery the
   content, it can choose an optimal one which can maximize its
   benefits.

3. Local Optimization

   With the price and performance information provided by CDNs, CSPs can
   locally perform an optimization. If its target is to minimize its
   CDN cost, it needs to consider the storage and traffic costs of all
   the options. It can smartly put populary content into CDNs whose
   traffic prices are cheaper and put cold content into CDNs whose
   storage prices are cheaper. If its targets is to get best delivery
   performance, it can choose the best delivery path according to the
   performance feedback information.

4. Protocol Considerations

   Given that CDN charge or price infomation is various with time and
   essential to CPs and CDNs, it is best to be considered in CDNI
   protocol design. The messages carrying this information can be
   exchanged among CPs and CDNs. The CDN performance information can be
   sent by CDNs themselves or CCs to CSPs. To select a U-CDN or a
   content delivery path, a CSP can leverage the request redirection
   mechanism.

5. Security Considerations

   This document does not contain any security considerations.

6. IANA Considerations

   This document does not have any IANA considerations.

7. Normative References

   [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate

Requirement Levels", BCP 14, RFC 2119, March 1997.

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