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A Cost Perspective on Using Multiple CDNs
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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.

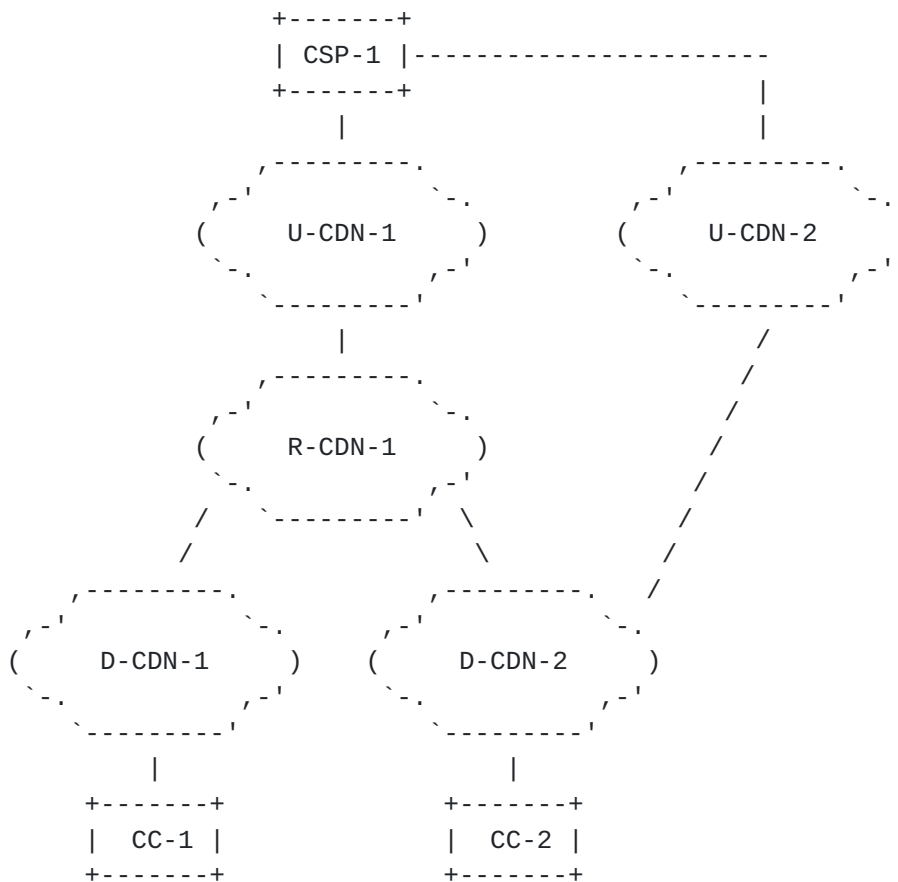
1.1.5. Relay CDN (R-CDN)

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.



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. Interactive Charge Model

In this model, CSP-1 has the knowledge about the details of the content delivery paths. Interactively, 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 popular 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 information 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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