

CDNI  
Internet Draft  
Intended status: Informational  
Expires: January 30 2013

R. Krishnan  
Brocade Communications  
M. Li  
B. Khasnabish  
ZTE Corporation  
C. Ge  
China Telecom  
September 26, 2012

**Best practices and Requirements for delivering Long Tail personalized content delivery over CDN Interconnections**

[draft-krishnan-cdni-long-tail-04.txt](#)

Status of this Memo

This Internet-Draft is submitted in full conformance with the provisions of [BCP 78](#) and [BCP 79](#).

This Internet-Draft is submitted in full conformance with the provisions of [BCP 78](#) and [BCP 79](#). This document may not be modified, and derivative works of it may not be created, and it may not be published except as an Internet-Draft.

This Internet-Draft is submitted in full conformance with the provisions of [BCP 78](#) and [BCP 79](#). This document may not be modified, and derivative works of it may not be created, except to publish it as an RFC and to translate it into languages other than English.

This document may contain material from IETF Documents or IETF Contributions published or made publicly available before November 10, 2008. The person(s) controlling the copyright in some of this material may not have granted the IETF Trust the right to allow modifications of such material outside the IETF Standards Process. Without obtaining an adequate license from the person(s) controlling the copyright in such materials, this document may not be modified outside the IETF Standards Process, and derivative works of it may not be created outside the IETF Standards Process, except to format it for publication as an RFC or to translate it into languages other than English.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF), its areas, and its working groups. Note that other groups may also distribute working documents as Internet-Drafts.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

The list of current Internet-Drafts can be accessed at  
<http://www.ietf.org/ietf/1id-abstracts.txt>

The list of Internet-Draft Shadow Directories can be accessed at  
<http://www.ietf.org/shadow.html>

This Internet-Draft will expire on March 26, 2009.

#### Copyright Notice

Copyright (c) 2012 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to [BCP 78](#) and the IETF Trust's Legal Provisions Relating to IETF Documents (<http://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

This document is subject to [BCP 78](#) and the IETF Trust's Legal Provisions Relating to IETF Documents (<http://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document.

#### Abstract

The content desire of users is evolving from most popular to long tail personalized content. This document discusses the best practices and requirements for delivering long tail personalized content in CDN Interconnection scenarios.

#### Table of Contents

<a href="#">1. Introduction.....</a>	<a href="#">3</a>
<a href="#">2. Conventions used in this document.....</a>	<a href="#">3</a>



<a href="#">3. No Caching in CDNs.....</a>	<a href="#">4</a>
<a href="#">4. Benefits of HTTP Adaptive Streaming.....</a>	<a href="#">6</a>
5. Other techniques for delivering long tail personalized content.	7
<a href="#">6. Acknowledgements.....</a>	<a href="#">8</a>
<a href="#">7. References.....</a>	<a href="#">8</a>
<a href="#">7.1. Normative References.....</a>	<a href="#">8</a>
<a href="#">7.2. Informative References.....</a>	<a href="#">8</a>

## [1. Introduction](#)

Typically, the CDNI interface between CDNs is a long-haul backbone network where bandwidth is premium. For user content requests from the downstream CDN (dCDN), a cache in the dCDN addresses the CDNI bandwidth challenge by being able to serve the content from the dCDN and avoiding accessing the content from the upstream CDN (uCDN). The cache has limited storage space/processing power and relies on the fact that the same piece of content is of interest to a lot of users.

Most popular content is of interest to a lot of users; examples are latest movies, latest catch-up episodes etc. A single copy of the content is delivered across CDNI to the cache; the content is delivered to multiple users from the cache. Thus, most popular content is very amenable to caching.

Long tail personalized content is of interest to only a few users; examples are documentaries, very old movies etc. Long tail personalized content is typically not shared by many users and caching of long tail personalized content could lead to cache thrashing issues. Thus, long tail personalized content is not amenable to caching.

This document discusses the best practices and requirements for delivering long tail personalized content in CDN Interconnection scenarios.

## [2. Conventions used in this document](#)

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC 2119](#) [[RFC2119](#)].

This document reuses the terminology defined in:

[I-D.ietf-cdni-problem-statement-06],

[I-D.ietf-cdni-requirements-03],



[I-D.ietf-cdni-framework-00], and

[I-D.ietf-cdni-use-cases-08].

### **3. No Caching in CDNs**

Long tail personalized content is typically not shared by many users and not amenable to caching. Avoiding caching in the CDNs has the following benefits 1) Better cache utilization 2) Avoid unnecessary HTTP redirection.

Each CDN has a local monitoring server which monitors the end user content usage in the CDN. By monitoring the content usage, each CDN determines whether or not the content should be cached locally in the CDN. Through the CDNI interface, each dCDN propagates this information to the uCDN(s). Thus, the uCDN(s) determine the dCDNs in which the content should be cached/not cached. This results in the following CDNI metadata interface requirement and request routing interface changes which are described in this draft.

An example interconnected CDN topology is depicted in Figure 1; CDN-A and CDN-B are uCDNs which have a relationship with the Content Service Provider(CSP). CDN-C, where the end users are connected, is a dCDN and has a local monitoring server.

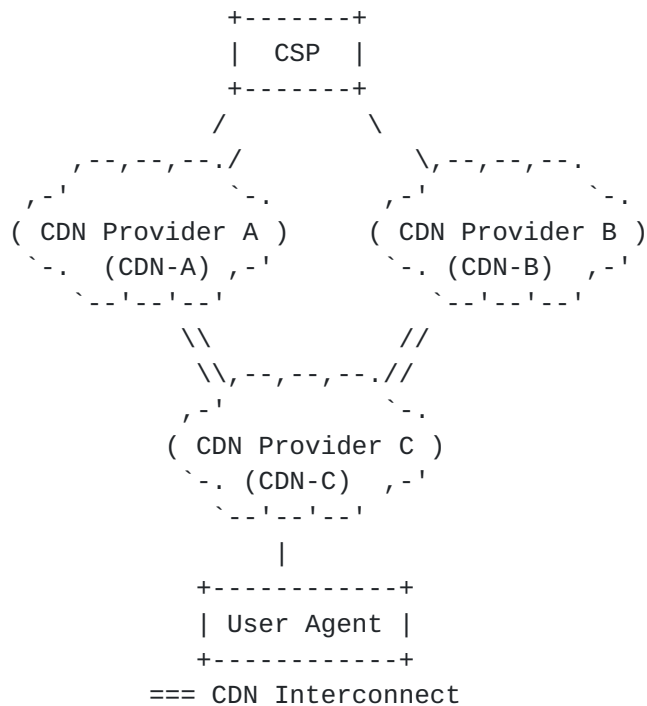


Figure 1: Interconnected CDNs with one dCDN

## Metadata interface requirement

The CDNI Metadata Distribution interface shall provide indication by the dCDN to the uCDN whether the content should be cached or not cached in the dCDN. This information should be on a per URL basis. The default behavior would be to cache the content in the dCDN

Referring to the example in Fig. 2, [Section 3](#) [I-D.ietf-cdni-framework]; it shows Operator A as the uCDN and Operator B as the dCDN, where the former has a relationship with a content provider and the latter being the best CDN to deliver content to the end-user. Referring to the HTTP example in Fig. 3, [Section 3.2](#) [I-D.ietf-cdni-framework];

## Request routing interface changes

Step 2: A Request Router for Operator A (which is the uCDN) processes the HTTP request. The HTTP URL metadata is looked up in a metadata database. For long tail personalized content, the metadata database lookup result indicates that the content should not be cached by the dCDN. The Request Router for Operator A recognizes that the end-user is best served by the uCDN without



any caching the in dCDN and returns a 302 redirect message with the URL of Operator A delivery node. The end-user proceeds to retrieve the data from Operator A delivery node. This is illustrated in Figure 2 below.

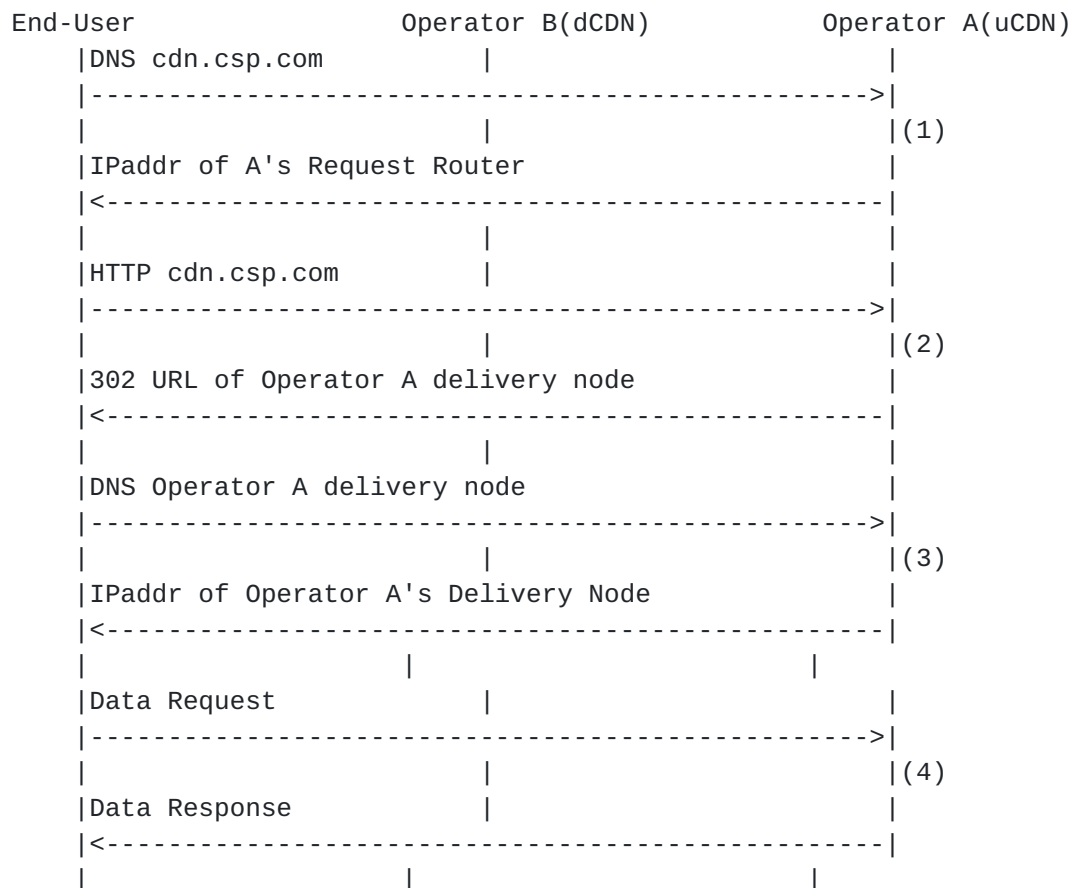


Figure 2: Request Routing interface for long tail personalized content

Logging and Auditing requirements

Work in progress

#### 4. Benefits of HTTP Adaptive Streaming

As discussed before, long tail personalized content is not amenable to caching. Also, there is heavy asymmetric usage of the network between peak and quiet hours, where the peak hour load is much higher than the quiet hour load. These create unique bandwidth challenges across CDNI. HTTP Adaptive Streaming (HAS), which can adapt to



network congestion, is ideally suited for delivering long tail personalized content across interconnected CDNs.

## **5. Other techniques for delivering long tail personalized content**

### **Approach 1**

If the uCDN has a charging agreement with the dCDN that the dCDN pays fixed monthly money to uCDN (no matter how much traffic they exchange each month) and the CDN has enough storage capacity, the cache control of the long tail content is not that necessary, but let each CDN decide whether to cache the content or not locally. If the user request is redirected to dCDN but the dCDN does not cache the content, the dCDN can acquire the content from its uCDN.

### **Approach 2**

If static control is desired for long tail content, the CSP can assign a second-level domain name for such kind of content, e.g. `nocache.example.com/contentID`, so that when this content is injected into CDNI system, CDN would determine whether to cache it or not according to this domain name.

### **Approach 3**

So far, what has been discussed is streaming delivery of long tail personalized content. Caching in the end user device is another technique which can be used to address the bandwidth challenges created by streaming delivery of long tail personalized content over CDNI. This introduces a new model for long tail personalized content delivery. The various components of this model can be defined as 1)End user chooses the content to watch 2) The content is downloaded in the background and cached in the end user device 3)End user is notified of content availability. This model is typically applicable for long form content where the overhead in managing a background download is justifiable.

Caching in the end user device can have potential DRM issues which can be addressed using the following techniques 1) The content can be accessed by the end user only for playback 2) The content has a time expiry after which it destructs itself 3) In the case of end user device loss, the content destructs itself.

## **6. Acknowledgements**

The authors would like to thank Francois Le Faucheur, Kevin Ma, Jin Weiyi and Ben Niven-Jenkins for their input.

## **7. References**

### **7.1. Normative References**

- [1] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [2] Crocker, D. and Overell, P.(Editors), "Augmented BNF for Syntax Specifications: ABNF", [RFC 2234](#), Internet Mail Consortium and Demon Internet Ltd., November 1997.
- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC2234] Crocker, D. and Overell, P.(Editors), "Augmented BNF for Syntax Specifications: ABNF", [RFC 2234](#), Internet Mail Consortium and Demon Internet Ltd., November 1997.

### **7.2. Informative References**

- [I-D.ietf-cdni-framework]L. Peterson et al., "Framework for CDN Interconnection", April 2012.
- [I-D.ietf-cdni-problem-statement]B. Niven-Jenkins et al., "Content Distribution Network Interconnection (CDNI) Problem Statement", May 2012.
- [I-D.ietf-cdni-requirements]K. Leung et al., "Content Distribution Network Interconnection (CDNI) Requirements", December 2011.
- [I-D.ietf-cdni-use-cases]Bertrand, G. et al., "Use Cases for Content Delivery Network Interconnection", June 2012.

#### **Authors' Addresses**

Ram Krishnan  
Brocade Communications  
San Jose, 95134, USA

Phone: +001-408-406-7890

Email: ramk@brocade.com

Mian Li

ZTE Corporation

Nanjing,    210012

China

Phone:

Email: li.mian@zte.com.cn

Bhumip Khasnabish

ZTE Corporation

New Jersey, 07960, USA

Phone: +001-781-752-8003

Email: bhumip.khasnabish@zteusa.com

Chen Ge

China Telecom

109 West Zhongshan Ave

Guangzhou, Tianhe District, China

Phone:

Email: [cheng@gsta.com](mailto:cheng@gsta.com)