# Intra-CDN Provider CDNi Experiment

http://www.ietf.org/id/draft-chen-cdni-intra-cdn-provider-cdni-experiment-00.txt

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# Outline

- Experiment Background

- Experiment Description

- Lessons Learned

- Proposed next steps for IETF CDNI WG

- Q&A and open Discussion

# Experiment Background

- China Telecom, as a CDN service provider:
  - Has established video CDNs in more than ten provinces in China;
  - These independent video CDNs, provided by different vendors, only provide services to the end users of their own provinces;
  - China Telecom launched the CDN interconnection trial network in 2011 where CDNs from six different vendors (ZTE, Huawei, Cisco, etc.) were used to conduct the interconnection experiment in three provinces.

- Scope and Aims:
  - Aims at testing the scenario where the operator provides autonomous services via CDN interconnection;
  - Not intended to cover all of the use cases within the scope of CDNi work;
  - Simply provides some practical information gathered from the actual network experiment as a reference to CDNi work;
  - Provides some lessons and experiences from the actual network experiment.

# Experiment Description
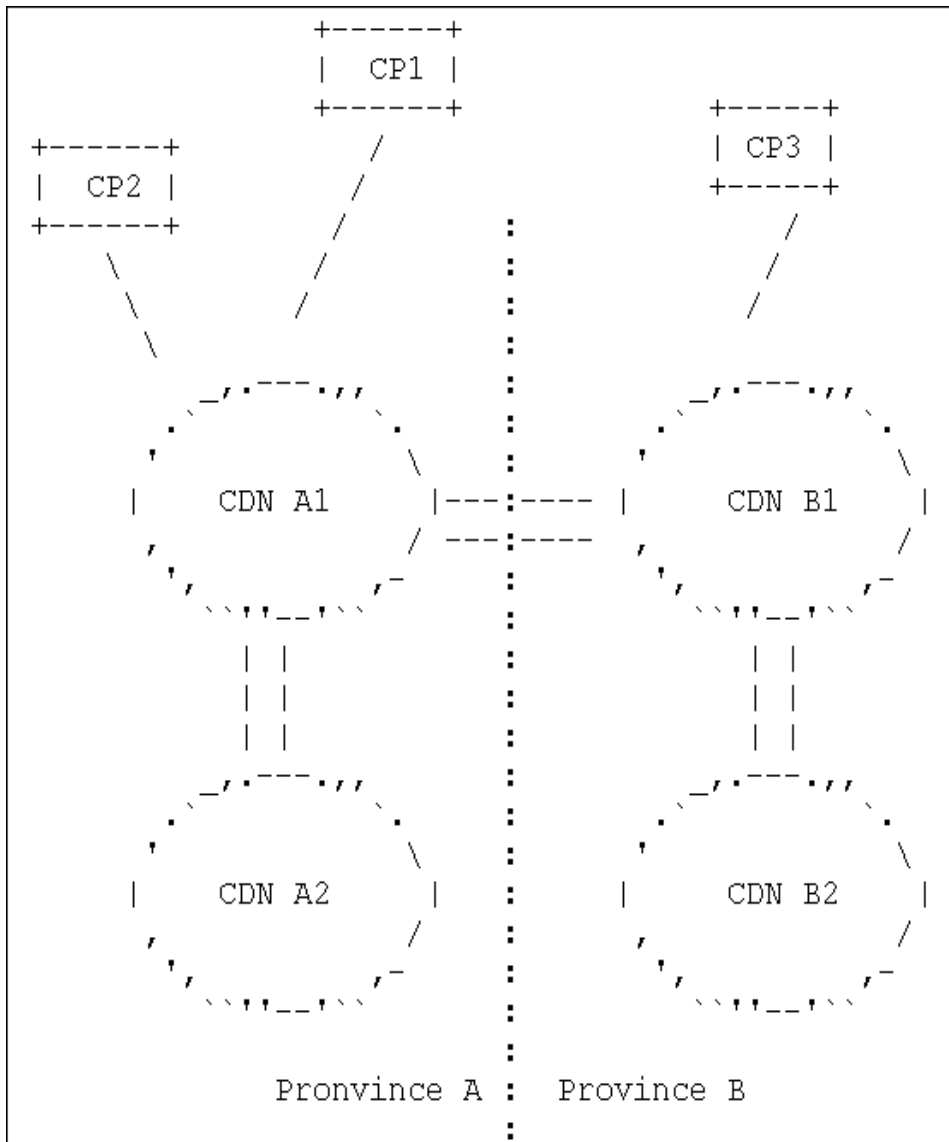


- The interconnection of four CDNs in two provinces has been tested;
- Two types of services are offered in the CDN Trial network: intra-province service and inter-province service;
- CDN A1 of Province A acts as the content storage center of the nation which is used in inter-province service;
- CDN A1 and CDN B1 are the sub-center CDNs of respective province;
- CDN A2 and CDN B2 are the regional CDNs of respective province;
- Provincial center CDN A1 and CDN B1 are interconnected with each other;
- The regional CDNs of the respective provinces do not interconnect with one another either.

# Experiment Description

- This experiment features:
  - Intra-province service is provided independently within the province;
  - When inter-province service is provided, content is ingested to the CDN in a single province and then distributed among the CDNs in all other provinces;
  - static configuration is used for dCDN selection, i.e. the national content storage center CDN A1 configures locally the relationship table of the end user's IP addresses and the load condition of dCDNs;
  - UniContentID (ProviderID, ContentID) is defined and used to uniquely identify a content item and for content acquisition;
  - Charging-related operations via Logging Interface are not required and thus not tested.
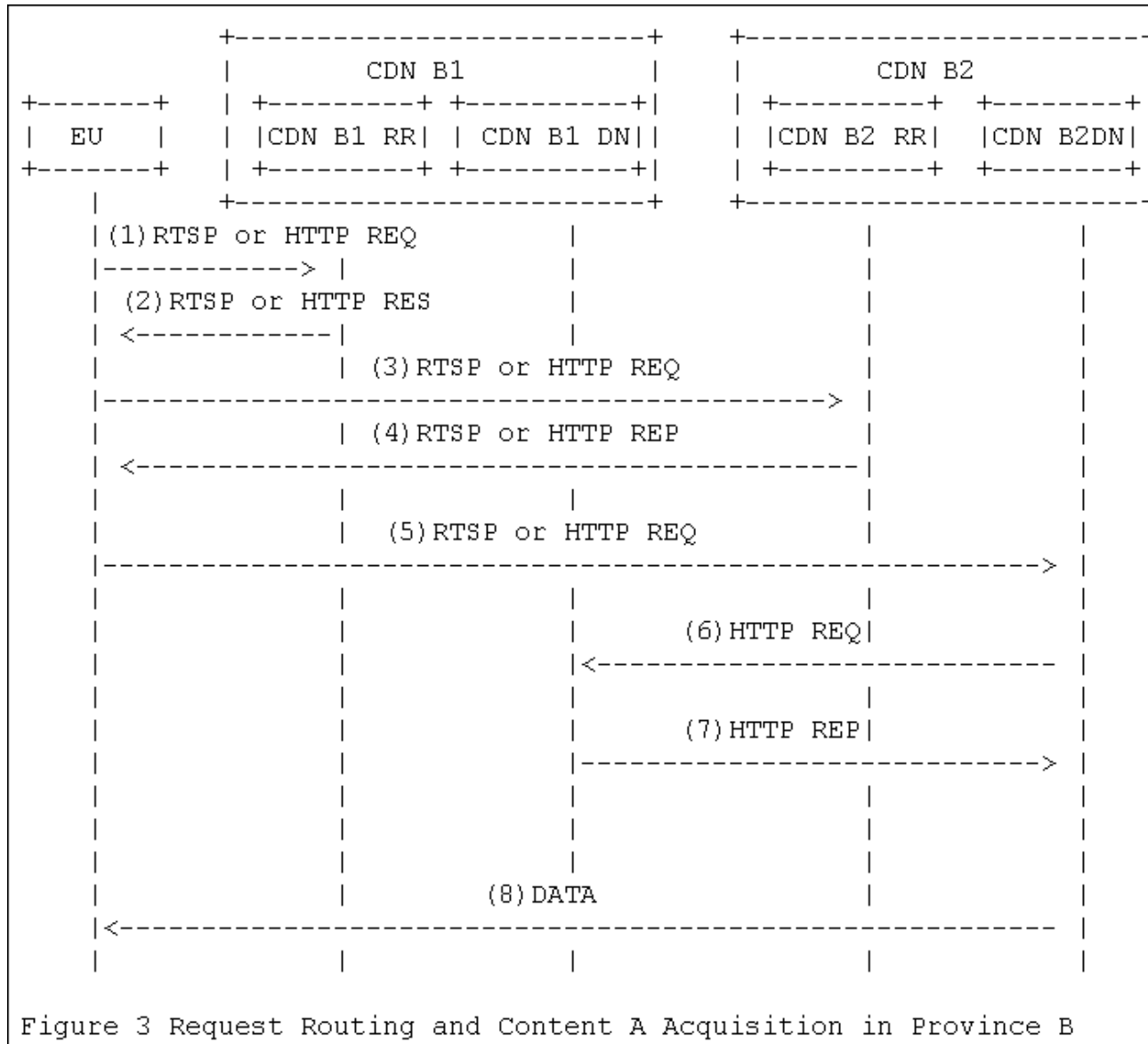
# Experiment Description

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                    +-------------------------+     +-----------------------+
                    |          CDN B1         |     |        CDN B2         |
+-------+           | +---------+ +----------+|     | +---------+ +--------+|
|  EU   |           | |CDN B1 RR| | CDN B1 DN||     | |CDN B2 RR| |CDN B2DN||
+-------+           | +---------+ +----------+|     | +---------+ +--------+|
    |               +-------------------------+     +-----------------------+
    |(1)RTSP or HTTP REQ                  |                  |              |
    |-----------> |              |        |                  |              |
    | (2)RTSP or HTTP RES        |        |                  |              |
    | <-----------|              |        |                  |              |
    |             |    (3)RTSP or HTTP REQ |                  |              |
    |-------------------------------------------------------> |              |
    |             |    (4)RTSP or HTTP REP |                  |              |
    | <-------------------------------------------------------|              |
    |             |              |        |                  |              |
    |             |    (5)RTSP or HTTP REQ |                  |              |
    |-----------------------------------------------------------------------> |
    |             |              |        |                  |              |
    |             |              |        |       (6)HTTP REQ|              |
    |             |              |        |<----------------------------- |
    |             |              |        |                  |              |
    |             |              |        |       (7)HTTP REP|              |
    |             |              |        |------------------------------> |
    |             |              |        |                  |              |
    |             |              |        |                  |              |
    |             |              |        |                  |              |
    |             |              |    (8)DATA               |              |
    |<----------------------------------------------------------------------- |
    |             |              |        |                  |              |

Figure 3 Request Routing and Content A Acquisition in Province B
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# Experiment Description



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        +----------------+  +----------------+  +----------------+
        |      CDN A1    |  |     CDN B1     |  |     CDN B2     |
+----+  |+------+ +------+ | |+------+ +------+ | |+------+ +------+ |
| EU |  ||CDN A1| |CDN A1| | ||CDN B1| |CDN B1| | ||CDN B2| |CDN B2| |
+----+  ||  RR  | |  DN  | | ||  RR  | |  DN  | | ||  RR  | |  DN  | |
  |     |+------+ +------+|| |+------+ +------+|| |+------+ +------+||
  |     +----------------+  +----------------+  +----------------+
  |(1)RTSP or HTTP REQ      |                |                |
  |----->  |        |       |                |                |
  |(2)RTSP or HTTP REP      |                |                |
  |  <-----|        |       |                |                |
  |        |  (3)RTSP or HTTP REQ            |                |
  |---------------------------------------------------->  |   |
  |        |  (4)RTSP or HTTP REP            |                |
  |  <---------------------------------------------------|   |
  |        |        |       |        |       |                |
  |        |        |   (5)RTSP or HTTP REQ  |                |
  |---------------------------------------------------------->|
  |        |        |       |        |       |                |
  |        |        |       |        |       |  (6)HTTP REQ   |
  |        |        |       |        |       |<---------------|
  |        |        |   (7)HTTP REQ  |       |                |
  |        |        |<---------------|       |                |
  |        |        |       |        |       |                |
  |        |        |   (8)HTTP REP  |       |                |
  |        |        |--------------->|       |                |
  |        |        |       |        |   (9)HTTP REP          |
  |        |        |       |        |--------------------->|
  |        |        |       |        |       |                |
  |        |        |  (10)DATA|     |       |                |
  |<---------------------------------------------------------|
  |        |        |       |        |       |                |
  |        |        |       |        |       |                |
Figure 4 RR and Content Acquisition between Province A and Province B
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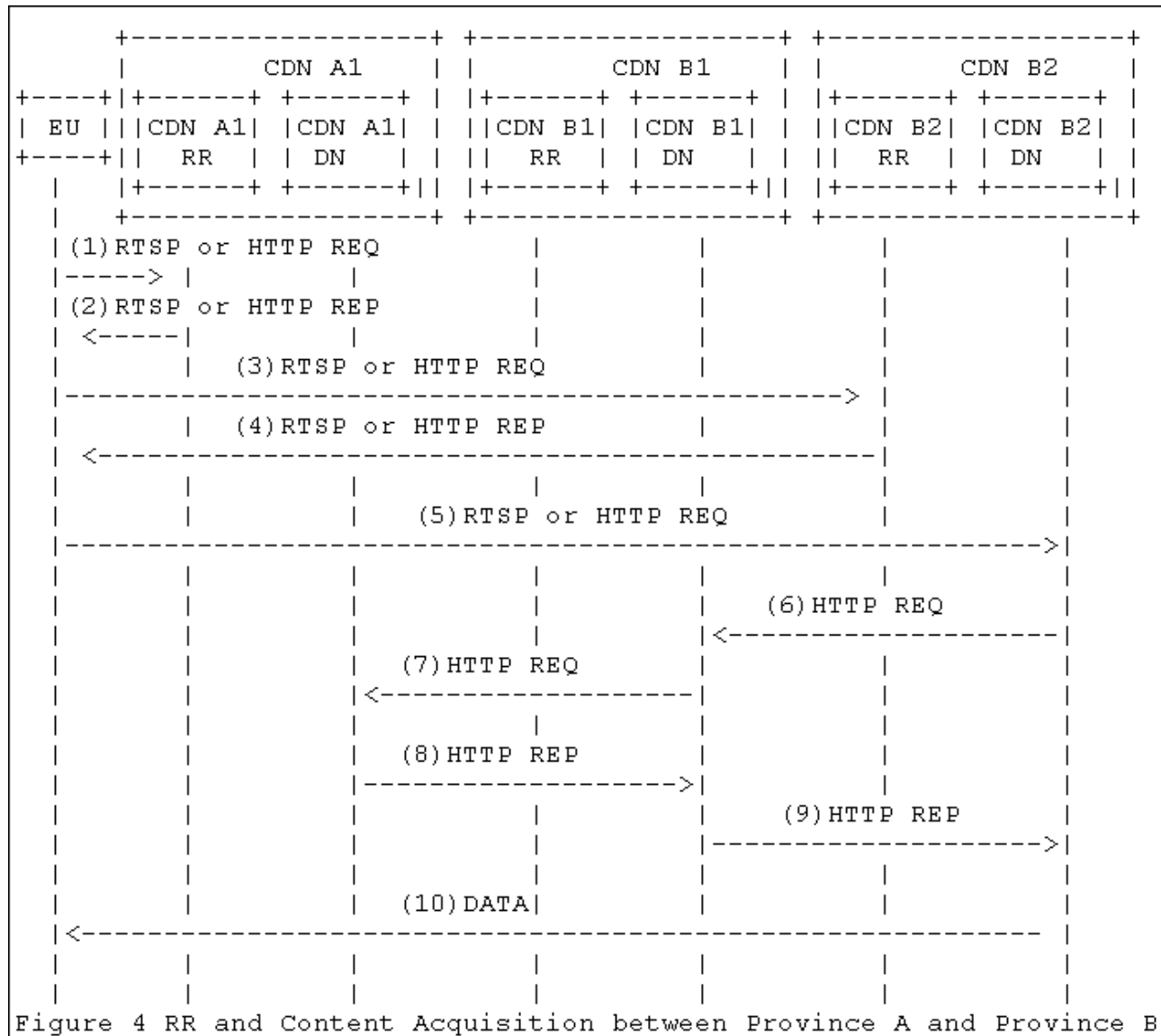
# Experiment Description

- Test Results:
  - The CDN interconnection scenario - 1 Gbps video traffic is not hit in the local cache and content acquisition is needed - has been tested;
  - Performance tests are done by using the tools from Shineck and Spirent;
  - Operations e.g. fast forward, fast rewind and positioning play etc were made;
  - The testing results show that the response time is less than one second and the Max DF is less than 50msec;
  - The test for a period of six hours for stability through complex operations has been tested;
  - The testing results show that the response time is less than one second and call loss is less than 0.1%;
  - During the performance tests, the play of the program with complex operations is smooth.

# Lessons Learned

- During the initial stage of CDNi standardization, the most practical scenario to be considered is the interconnection of CDNs distributed in different geographical regions within one operator

- Simplification of operation procedures:
  - Relatively simple methods can be used to simplify or optimize the Request Redirection, Content Acquisition, Content Control procedures;
  - Conducive to operators when they also act as service providers.

- Redirection:
  - Based on the local configuration of the relationship table of end users' IP addresses and load situation of dCDNs;
  - The routing selection can be largely simplified especially when operators have large-scale internal networking.

# Lessons Learned

- UniContentID:
  - Used to uniquely identify the content item ingested by the content provider;
  - Content source can be resolved from UniContentID contained in the end user's content request for content acquisition;
  - Need for defining a unique content identification for content item in CDNi framework.

- Metadata and Logging:
  - The metadata related to CDNi content delivery would be relatively simple;
  - Logging can be simplified or may not even be supported.

- Inter-Operator CDN Interconnection:
  - If the operators are clearly aware of each other's CDN framework (according to their agreements), this method can also be utilized as a reference.

# Proposed next steps for IETF CDNI WG

- Collect comments and feedback;

- Evaluate the value of applying this draft as a BCP draft;

- Determine the necessity of specifying a content naming mechanism to uniquely identify a content item and to be used in CDNi scope

# Q&A and Discussion