Open ContEnt Aware Networks

New Generation Open Content Delivery Networks

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www.ict-ocean.eu

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Introduction

CDNs and the OCEAN project

CDN interconnection and multi-CDN systems

Focus on

3 topical items from IETF CDNI WG

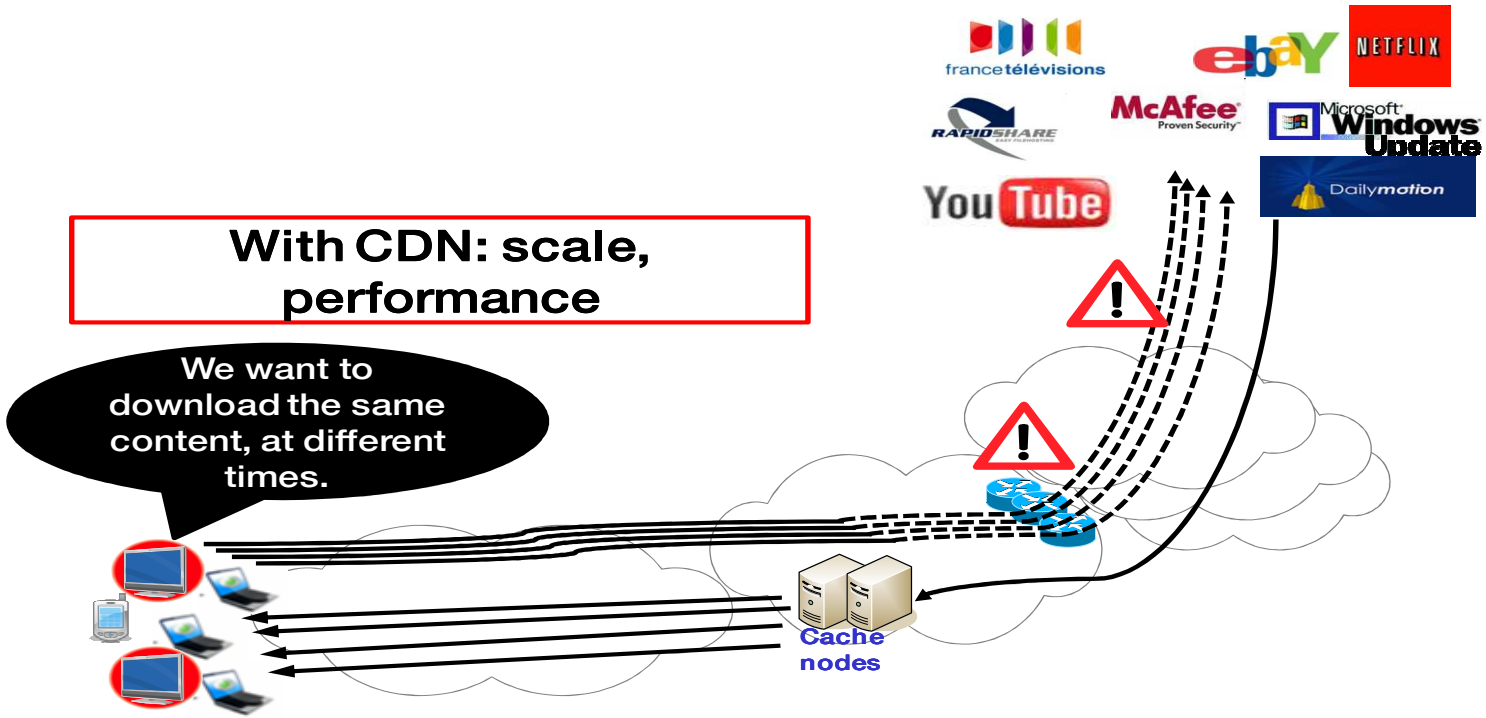
- IETF CDNi Use Cases and Advanced Use Cases proposed by FMN Cluster
- In-band vs. out of band signalling
- CDNi Metadata Interface

2 key messages

- Standards needed urgently
- We are entering a critical step in standardization works

Conclusion, Questions

Content Delivery Network
Principle



- Main Purposes:
  - Save bandwidth on core networks/peering points
  - Improve QoE (*e.g.*, lower latency)
  - Scale (*e.g.*, more servers, distributed architecture)

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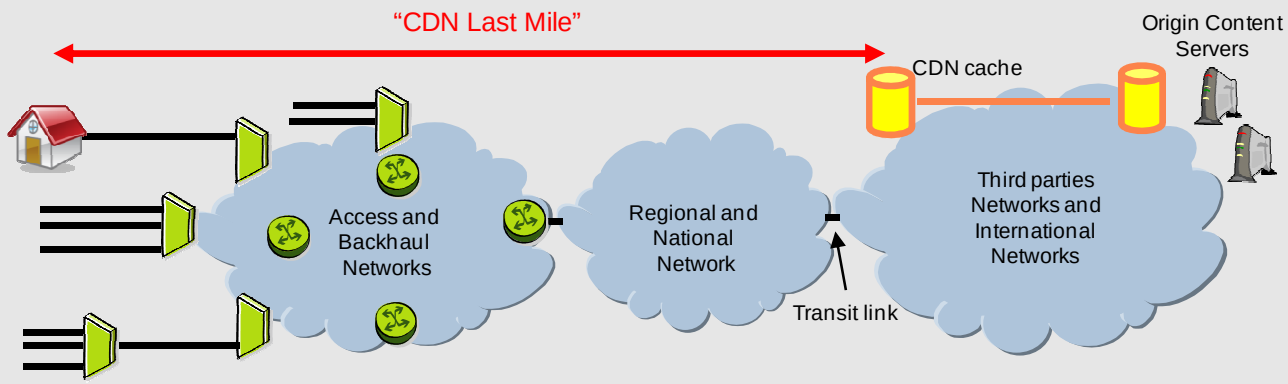
Project Context and Challenges

- Tremendous evolution of online multimedia content delivery
  + 50 to 60% traffic volume growth per year the last 5 years
- Key role of CDN players in the Internet
  1/3 of all Internet traffic delivered through a CDN
- ... And shortcomings
  QoS and network cost in the “CDN last mile”
  Lack of Openness in Content Delivery Systems
  Current state of the art leaves large space for innovation, traffic reduction and QoS improvement
  Business challenges (network & CDN intercos, services & regulation evolution)

Typical CDN deployment for online content delivery



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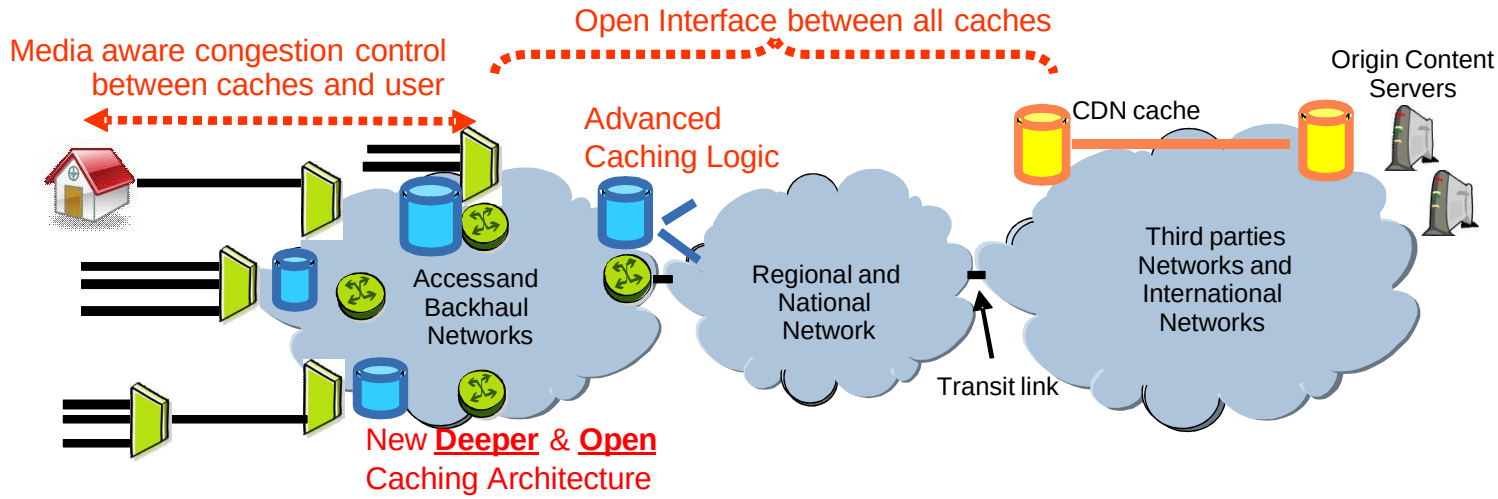
Vision

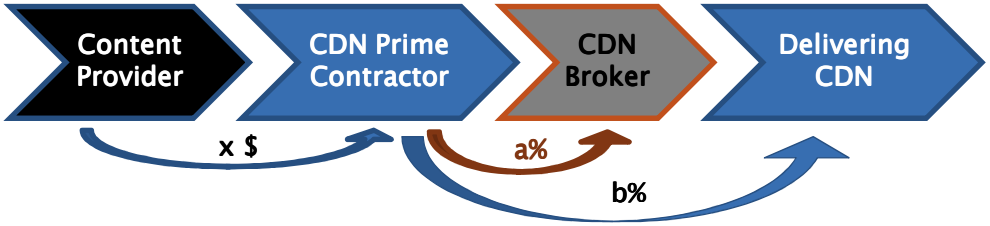


CDN interco & Multi-CDN systems

Business & technical challenges

- Multi-CDN systems, incl. CDN-Interconnection, is something new
  - Content delivery & Revenue sharing models are still to be defined
  - Multiple types of players involved (business roles) with different incentives & reqs

E.g. Delivery chain involving CDN Broker



- Multi-CDN system complexity must not affect content providers
  - Unified management, monitoring, billing, no performance degradation
- Content delivery must be controlled
  - Control of content rights all along the delivery chain, Efficient content removal, ...
  - Consistent Security, policy mechanisms & QoS all along the delivery chain
- Trust model, Multi-CDN systems introduce transitive trust
  - Need to enable the identification of the CDN at fault in a particular delivery chain
- Avoid reverse engineering
  - Content, service, network and business information
- Adequacy with / smooth evolution from legacy CDNs capabilities

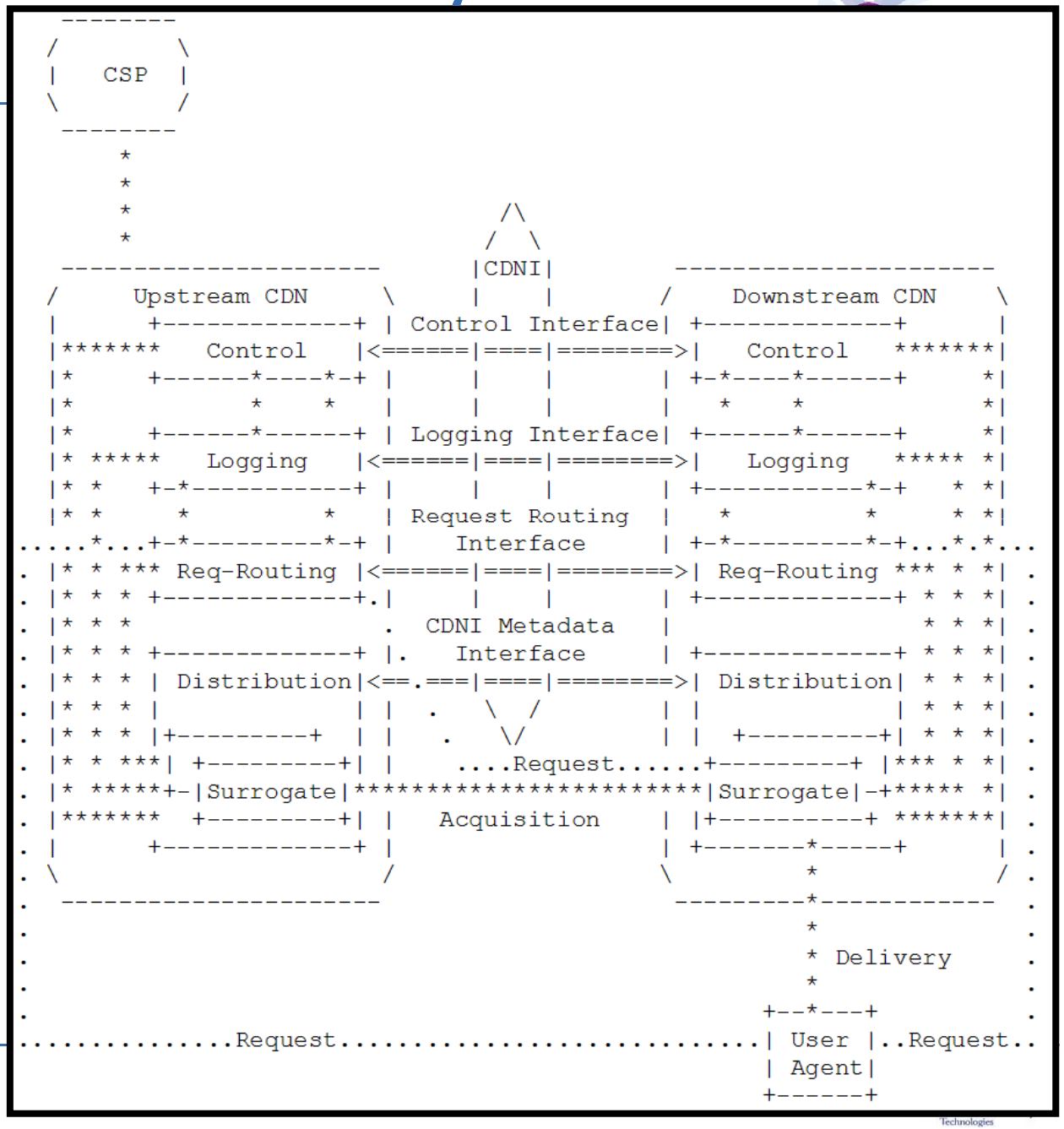
CDN interco & Multi-CDN systems

IETF CDNi

- Goal: Allow the interconnection of separately administered CDNs in support of the E2E delivery of content from Content Service Providers through multiple CDNs and ultimately to end users
- Significant involvement from OCEAN partners for CDNi WG creation (June 2011)

  Include co-edition of drafts draft-ietf-cdni-use-cases – Use cases (FT, BT), draft-bertrand-cdni-experiments – Experiments (Orange, Cisco, Verivue), draft-peterson-cdni-strawman – Strawman (TP, Verivue); Participation to requirements definition (draft-ietf-cdni-requirements)
- Aims at delivering a targeted, deployable solution within 18-24 months

Reference model from IETF CDNI WG (illustration from draft-davie-cdni-framework):



CDN interco & Multi-CDN systems

IETF CDNi. Overview of CDNI Operation

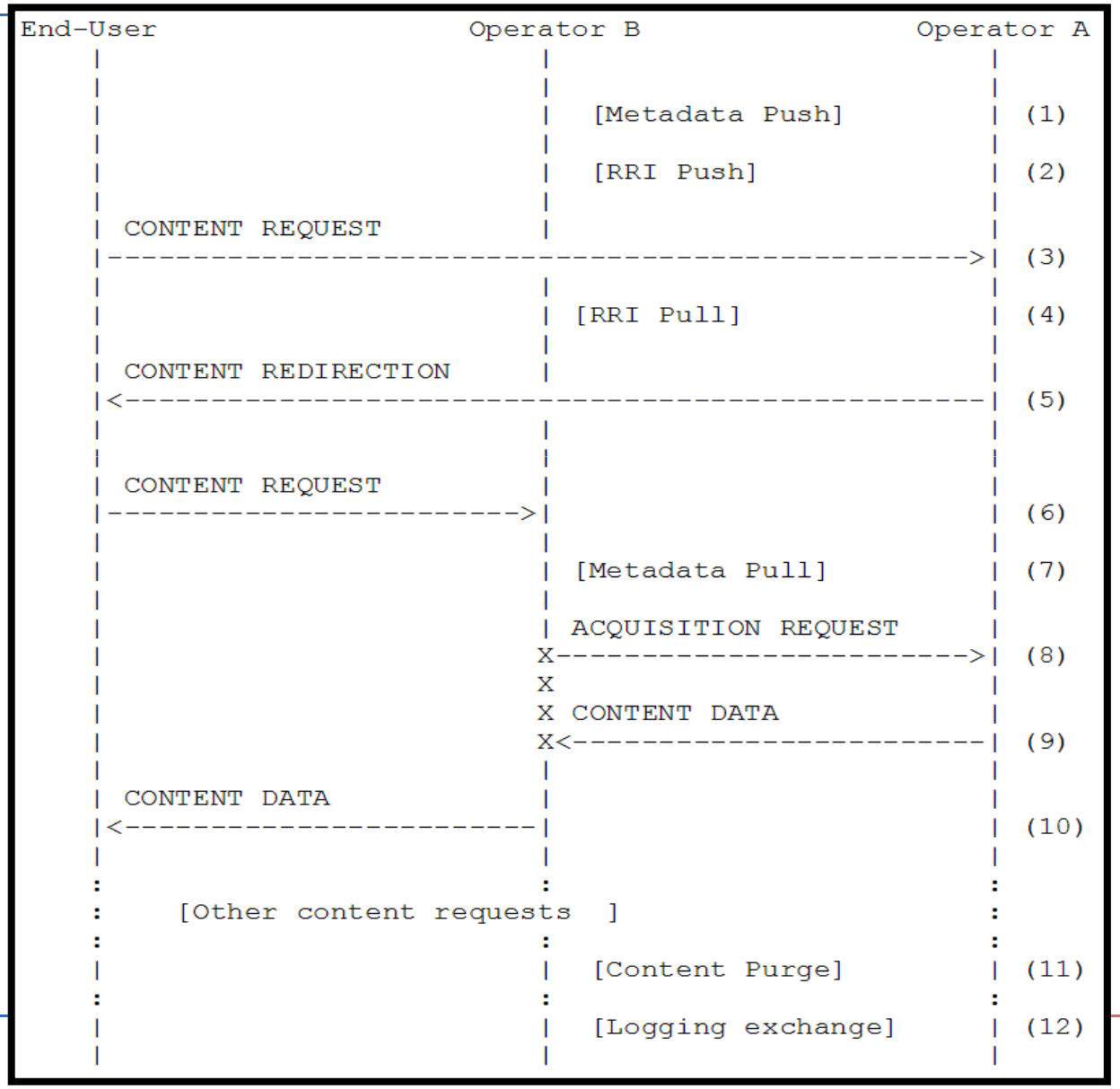


Illustration from draft-davie-cdni-framework

CDNi Use Cases & Advanced Use Cases

WG Use Cases draft (drafts draft-ietf-cdni-use-cases)	FMN Cluster Advanced Use Cases (draft-fmn-cdni-advanced-use-cases)
Footprint Extension Use Cases Geographic Extension Inter-affiliates interconnection Nomadic Users **Offload Use Cases** Overload Handling and Dimensioning Resiliency **CDN capability Use Cases** Device and Network Technology Extension Technology and Vendor Interoperability QoE and QoS improvement **Policy enforcement** Content availability (geo-location restrictions, temporal restrictions, content encoding restrictions) Branding Secure Access	Submitted by FMN cluster on Oct. 24, 2011 **Use Case 1: Caching-CDN interconnection** **Use Case 2: CDN-CDN interconnections at large scale** **Use Case 3: Dynamic adaptive streaming over HTTP in multi-CDNs** **Use Case 4: Dynamic expansion of CDN capacity and geographical reach** **Relationship between CDNI and Information-Centric Networking** **CDNi WG Chair's proposal:** • keep progressing this document as a standalone document investigating uses cases beyond current scope • potentially feed into ietf-cdni-usecases (and possibly ietf-cdni-requirements) the very specific subset of your document that relates to the current scope of the WG

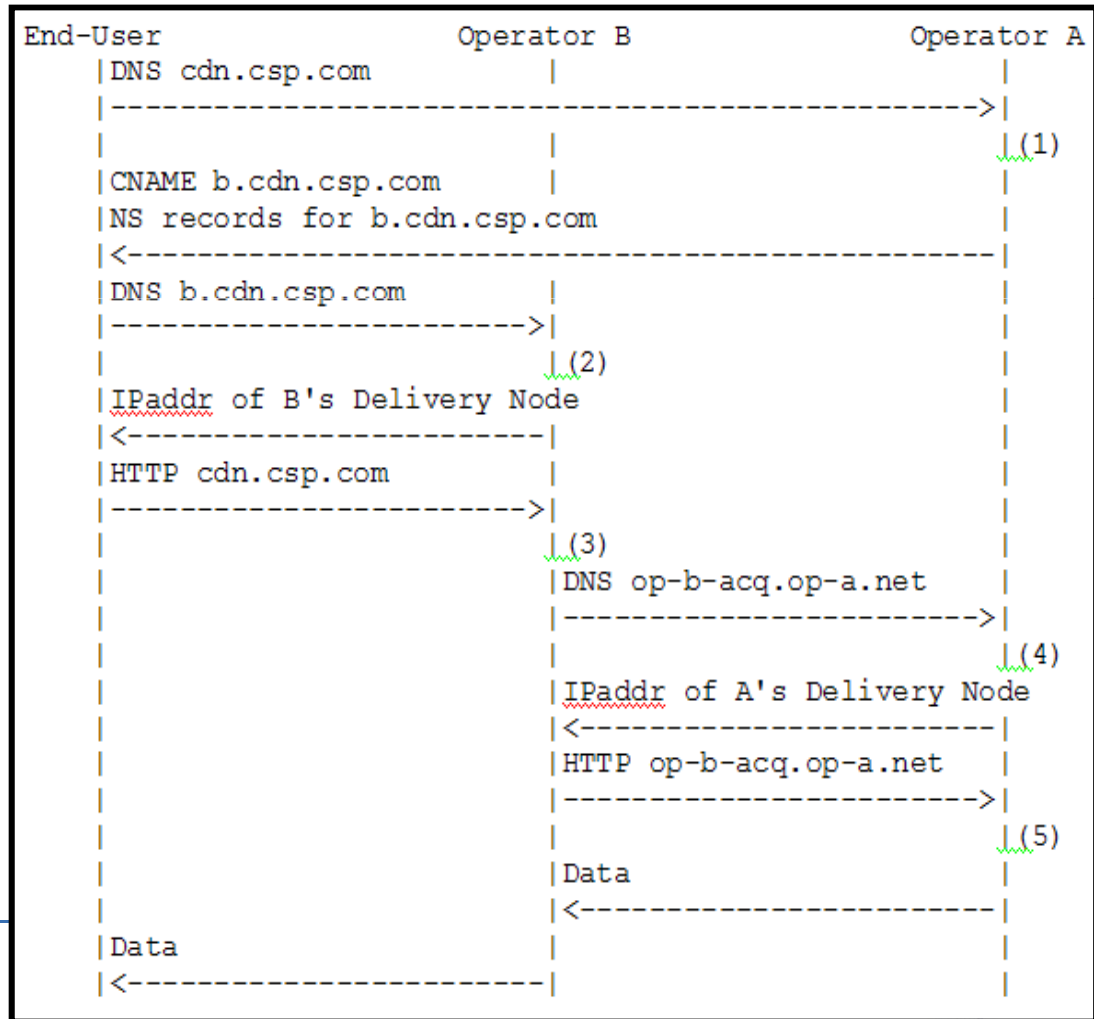
CDN interco & Multi-CDN systems

In-band signaling vs. out of band interfaces

- CDNi-related information is mainly exchanged across CDNs "in-band" in current experimentations of multi-CDN system (e.g. draft-bertrand-cdni-experiments)
  - I.e. using existing in-band protocols mechanisms; e.g. as part of HTTP, inside the URI or an HTTP header
  - Rather than through a specific interface (out-of-band)

- Illustration with DNS-based CDN and delivery node selection
  From draft-davie-cdni-framework (inspired from draft-peterson-cdni-strawman)

- HTTP-based CDN selection allows to modify the path component of the URL being accessed by the client
  E.g. URL signature/token



CDN interco
Out of band interfaces

➔ **Feasible to use existing in-band protocols mechanisms to experiment some of CDNi processes.**
- But significant limitations in terms of functionalities, scalability & security level
- Hardly usable in an operational context or for large scale deployments

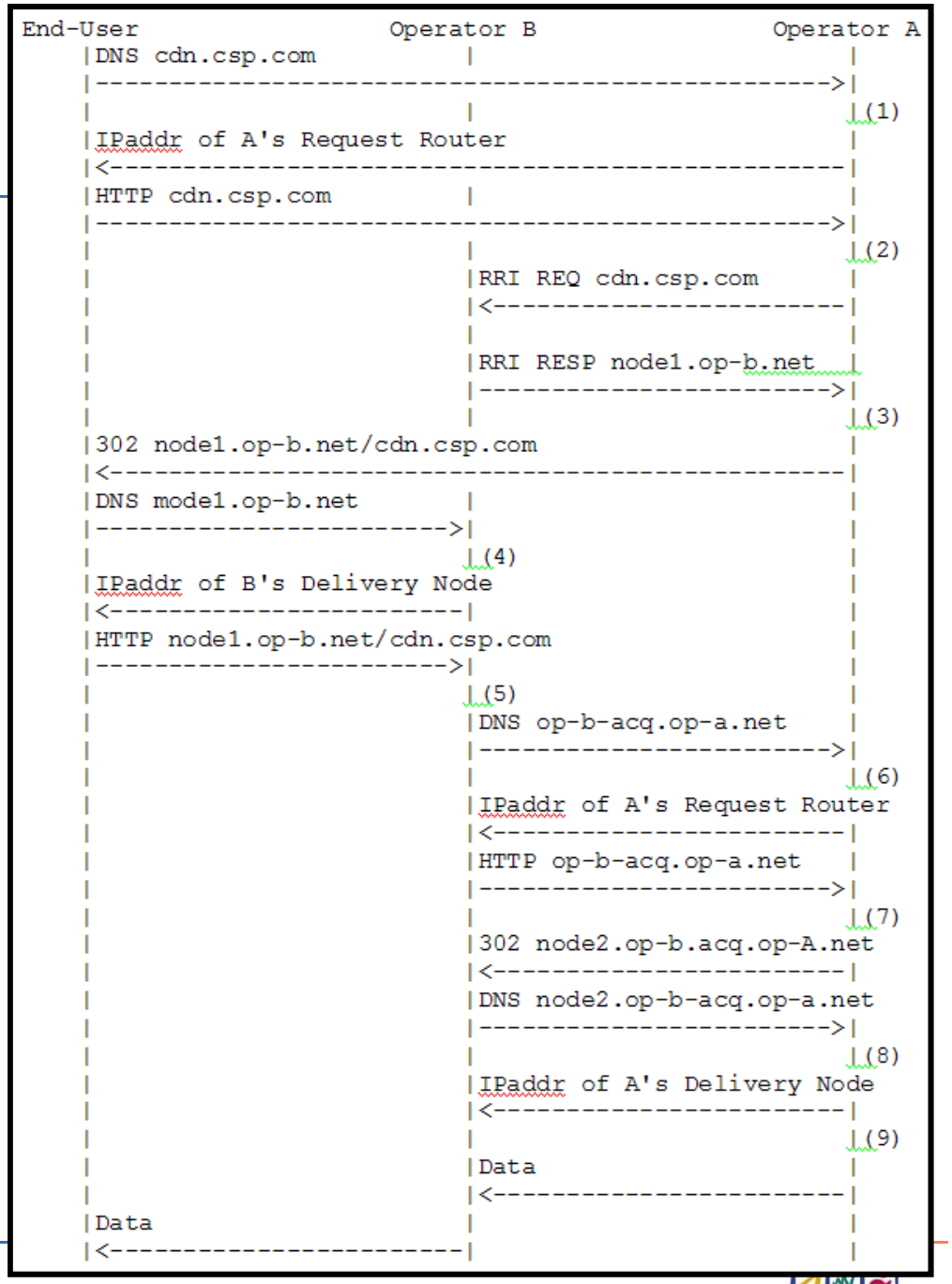
➔ **Need for out of band signalling**

- **Illustration with HTTP-based Recursive Redirection**
  - Need for specific RRI Request/ Response signaling

☺ Would remove aforementioned shortcomings from the existing experimentations

☹ Not available today

=> Works launched on out of band signaling specification



From draft-davie-cdni-framework

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CDN interco & Multi-CDN systems

CDNi Metadata Interface

- Hot topic
  - Enables the downstream CDN to obtain CDNI Metadata from an Upstream CDN so that the downstream CDN can properly process and respond to Redirection Requests received over the CDNI Request Routing interface, as well as to Request Routing and Content Requests received directly from User Agents
  - Need a standard on semantic, syntax & protocol implementation in line with WG use cases and requirements

- Several Internet drafts recently published
  - CDN Interconnect Metadata. draft-jenkins-cdni-metadata. B. Niven-Jenkins, D. Ferguson. Velocix (Alcatel-Lucent). G. Watson. BT. September 12, 2011.
  - Content Distribution Network Interconnection (CDNI) Metadata Interface. draft-ma-cdni-metadata. K. Ma. Azuki Systems, Inc. October 31, 2011.
  - Content Distribution Network Interconnection (CDNI) Core Metadata. draft-caulfield-cdni-metadata-core. M. Caulfield, K. Leung. Cisco. October 24, 2011.
  - Metadata for CDNs Interconnection. draft-stephan-cdni-usecases-metadata. E. Stephan, G. Bertrand, F. Fieau, R. Pages. France Telecom Orange. October 24, 2011.

➔ At the agenda of next week's IETF-82 meeting

Key "Take-Aways"

- CDN interconnection is a hot topic
  - Standards needed urgently
  - We are entering a critical step in standardization works on interfaces' structure and implementation
- ICT FP7 OCEAN project (Feb. 2010- Feb. 2013)
  - works on short and long term evolution of CDNs
  - *cf.* http://www.ict-ocean.eu/
- IETF CDNI
  - Newly created WG (June 2011)
  - Lively discussions on the (free to join) mailing list

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Thank you

Any Question?

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Consortium

France Telecom (Coordinator)	France	Telco
Alcatel-Lucent	Belgium	Industry
IBBT	Belgium	Research institute
Idate	France	Market Intelligence, SME
N2NSoft (Inria spin-off)	France	Research SME
PriSM (Univ. Versailles)	France	University
Fraunhofer HHI	Germany	Research Institute
Telekomunikacja Polska	Poland	Telco and CDN service provider
European Broadcasting Union (EBU)	Switzerland	Content Providers