

Content Delivery Network Interconnection

Footprint versus Capabilities exchange

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Agenda

- Introduction
- Research Questions
- Footprint and Capabilities
- Purpose of Footprint and Capabilities
- Exchange protocols
- Conclusion

Please save questions until the end of the presentation

Introduction - CDN

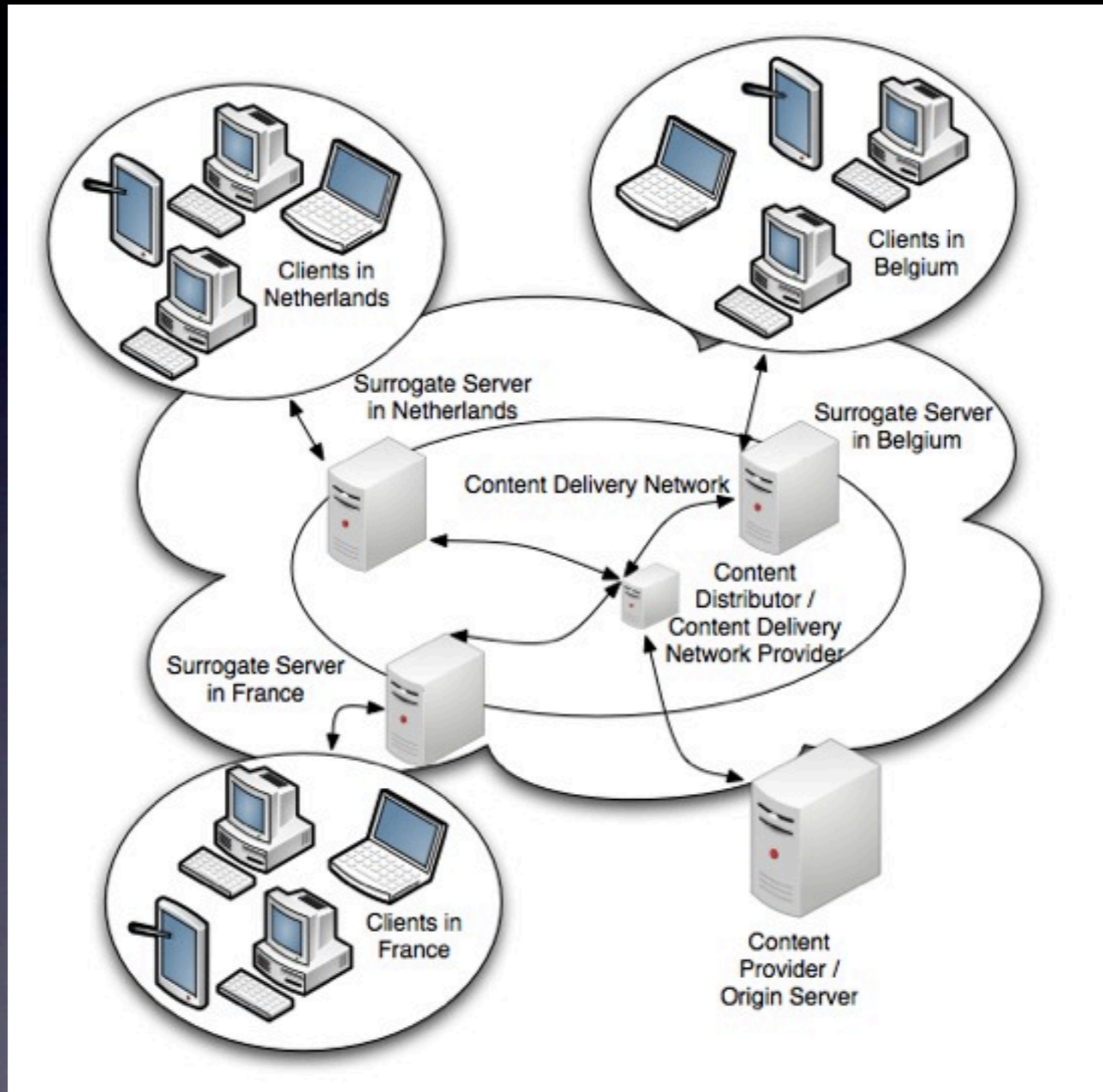


Illustration of a Content Delivery Network

Introduction - CDNi

- Multiple reasons to Interconnect different CDNs;
 - Extend on Footprint
 - Offload own network load
 - Extend on Capabilities
- Standardisation process by IETF CDNi Working Group

Introduction - CDNi

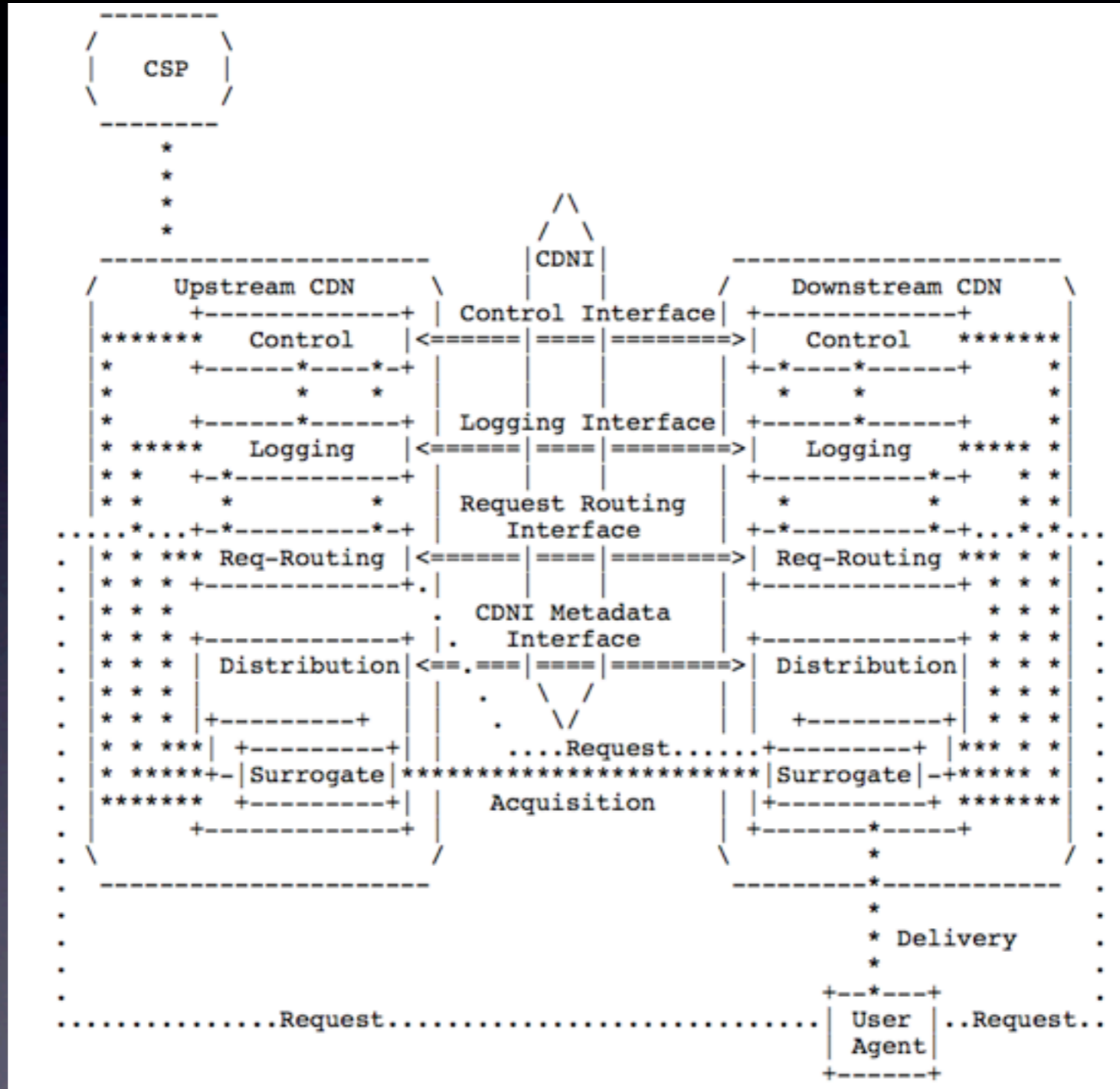


Illustration of CDNi Framework proposed by IETF CDNi Working Group

Picture source: <http://tools.ietf.org/id/draft-ietf-cdni-framework-00.txt>

Research Questions

- How can Footprint and Capabilities be defined?
- Which proposed method is more suitable for exchanging footprints and capabilities between different CDNs?

Footprint (FP)

- Region for which CDN is able to deliver content
- Three suggested candidates:
 - Set of country, state, city combinations
 - **Autonomous System numbers**
 - Set of IP subnets

Capabilities (CAP)

- Features, services and states CDN can/cannot meet
- Information about
 - Caches
 - Resources
 - Network capabilities
 - Administrative capabilities

Purpose of FP and CAP

- Let uCDN select proper dCDN to redirect end-user request.
- IETF idea based on Footprint, only when insufficient also on Capabilities
- Leads to incorrect decision
- Comparable with for example selecting supermarket for groceries
- Better to combine both in selection process

Exchange protocols

Protocol	Footprint Information	Capabilities Information
Standard BGP	X	
BGP Extended Communities Attribute	X	
BGP-TE	X	
BGP-AIGP	X	
HTTP		X
Extension to M-BGP for CDNi	X	X
ALTO	X	X

Exchange protocols suggested by IETF CDNi Working Group

M-BGP for CDNi

- Makes use of Multiprotocol extension to BGP
- M-BGP defines two new NLRI's
 - MP_REACH_NLRI
 - MP_UNREACH_NLRI
- Optional non-transitive
- Defines three MP NLRI's only for CDNi
 - FootPrint Element
 - FootPrint Reachability
 - CAPability

M-BGP for CDNi

- Elements exchanged via 3 messages:
 - Footprint Element Advertisement
 - Footprint Reachability Advertisement
 - Capabilities Advertisement
- For each element, separate database should be maintained

ALTO

- Application Layer Traffic Optimisation protocol
- Client - server architecture
- Server can provide operator policies, geographical location, network proximity and transmission costs.
 - Network Map (Footprint)
 - Cost Map (Capabilities)

ALTO

- Besides ALTO-Core, three services:
 - Map filtering service
 - Endpoint property service
 - Endpoint cost service
- No special additions needed for use with CDNi
- uCDN client of multiple servers in different dCDNs

M-BGP versus ALTO

M-BGP

- Pro:
 - Footprint layer-3 information
- Con:
 - Capabilities application layer information not layer-3
 - Optional non-transitive

ALTO

- Pro:
 - Still in draft stage
 - Flexible setup of framework
 - No special additions needed for CDNi
- Con:
 - Single point of failure possibility

Conclusion

- *How can Footprint and Capabilities be defined?*
 - Footprint is a region for which CDN is able to deliver content represented by AS numbers
 - Capabilities are features, services and states CDN can/cannot meet
 - Should be combined in selection process
- *Which proposed method is more suitable for exchanging footprints and capabilities between different CDNs?*
 - ALTO protocol better candidate for footprint and capabilities exchange

Future Research

- Decentralized ALTO version
- Other exchange protocols
- Framework standardisation by other organizations

Thank you for your attention!

Questions?