CDN Federation: Lessons from Phase 3 of the CDN Federation Pilot

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Discussion Topics

The Case for CDN Federation

What is the CDN Federation Pilot?

Pilot Findings and Conclusions
Content Provider only need contractual/technical relationship with 1 (or a few) Prime-CDN

Prime-CDN:
Owns the retail contract with the Content Provider. Can outsource some of the delivery to Sub-CDNs.

Sub-CDN:
Performs delivery on behalf of the Prime-CDN with whom he has a wholesale contract.

Content delivered to users by “best” CDN for each given request
Where “best” reflects Content Provider and CDN Operator policies, agreements, tariffs, current status..
CDN Federation Business Drivers

Touches across entire value chain

Consumers
- Better Quality of Experience and richer content services

Content Providers
- Improved delivery options with differentiated services, advanced analytics, and better control on the consumer experience across all access technologies

Service Providers
- Better control over transport costs
- Incremental revenue through new Interconnect model, complementing IP transit and peering, selling Internet-wide content delivery with differentiation in quality & scale

PurePlay CDNs
- Reduce capex and opex requirements for large scale and premium content delivery
- Extend partnership with SPs for resale of higher margin Value Added Services
Discussion Topics

The Case for CDN Federation
What is the CDN Federation Pilot?
Pilot Findings and Conclusions
CDN Federation Pilot

Background & Objectives

- An informal group of SPs, OTT CDNs and CPs willing to collaborate on CDN Federation
- An initiative lead by Cisco
- Accelerates CDN Federation Time-To-Market & open standards (e.g. IETF CDNI)
- Includes a Business Track and a Technical/Lab Track
- Execution in multiple phases:
  - Phase 1 (Feb 2011 – Oct 2011) : Baseline CDN Federation use cases and capabilities ✓
  - Phase 2 (Dec 2011 – Jun 2012) : Enhanced uses cases and capabilities ✓
  - Phase 3 (Feb 2013 – Jun 2013) : Broader ecosystem, advanced capabilities

Phase 1
- BT
- KDDI
- orange
- SFR
- Telecom Italia

Phase 2
- bics
- Bouygues
- KT
- SFR
- swisscom
- Telecom Italia
- T

Phase 3
- Limelight
- Pacnet
- SFR
- Telecom Italia
- SK Telecom
- KT
- Bouygues
- Equinix
- CenturyLink
- Rai
Discussion Topics

The Case for CDN Federation
What is the CDN Federation Pilot?

Pilot Findings and Conclusions
Findings from Business Track (Ph1 and Ph2):
CDN Federations will result in significant value for participants

- Provides Content Providers more choices and business alternatives for content delivery, offering different Quality of Experiences
- Enables Multiple Federation use cases: Country-level, International, SP Internal/Group...
- Requires Mix of member sizes/types for openness and global reach
  - ISP-CDNs, Mobile-CDNs, Pure Play CDNs, Echange Providers...
- Entitles each participant to take multiple roles to match their skills and capabilities
  - Retailer with a Prime-CDN role with, wholesaler with a Sub-CDN role, Exchange (optional in a CDN Federation)
- Differentiated offers, based on Federated ONnet capabilities, will accelerate market growth
- New revenues and network cost savings for Federation participants, including Mobile Operators facing mobile data explosion
Findings from Pilot (Ph1 and Ph2):
Multiple Federations driven by respective use cases
Findings from Business Track (Ph3):
Analysis of federation between Pure-Play CDNs and fixed/mobile SP CDNs to evaluate win/win scenarios

Business Decisions
- Should pure-play CDNs and SPs enter into a federated CDN model?

Resulting Financial Questions
- Can CDN Federation be economically viable for both parties (Pure play CDN and SP)?
- Under what circumstances does Federated CDN make sense to both players?
- What would be the value created in a typical scenario?
Findings from Business Track (Ph3):
Analysis of federation between Pure-Play CDNs and fixed/mobile SP CDNs to evaluate win/win scenarios

**Scope**
- Evaluate traffic delivery cost for typical players: large scale pure-play CDN, a fixed SP and a mobile SP
- Assume typical large country market
- Assume SP already has CDN assets

**End States, Sensitivities**
- **States**
  - No Federation (business as usual)
  - Federated CDN
- **Sensitivities**
  - Retail price
  - Traffic level/volume
  - Interconnect cost
  - Depth of caching in SP

**Result Metrics**
- Traffic delivery cost per Mbit/s (for each player, in both scenarios)
- All fixed costs amortized into an average cost per Mbit/s
CDN Federation Economics Model

- CDN Federation Economics, Tools and Advice available on request
Findings from Business Track (Ph3):
Analysis of federation between Pure-Play CDNs and fixed/mobile SP CDNs: Conclusions

• CDN Federation generates incremental economic value in all our scenarios

• This creates a win-win opportunity for both parties to split that incremental value through bi-lateral negotiations

• The pre-Federation interconnect regime between parties (transit/paid-peering/free-peering) has a significant impact on the incremental value of federation

• Situations where Transit or Paid-peering arrangements exist will result in the highest incremental value

• Absolute incremental value will also vary by theatres and mix of players, as some regions dictate higher Internet Interconnection fees, hence will result in higher incremental federated value
Findings from Technical Track (Ph3): Validated CDN Interconnections (13 May 2013 Status)

CDN Federation Pilot Phase 3

Delivery | Content Provider | CDN Interconnect
Findings from Technical Track

Proved basic (Phase1) and enhanced (Phase2) CDN Federation functionality for video on demand, live video and web delivery

Validated across single and multi-vendor environments, across ISP CDNs, Mobile SP CDNs and OTT CDNs
Validated Functionality

✓ Delivery of content on federated CDNs in arbitrary CDN meshes, including cascaded CDNs
✓ Single-vendor and multi-vendor operations, including SP CDNs and OTT CDNs
✓ Hierarchical dynamic acquisition of content across CDNs
✓ Transparency to Content Provider
✓ Manually-triggered inter-CDN Content Purge
✓ Exchange of transaction logs in bilateral mode or via CDN Exchange
✓ Scalable provisioning
✓ HTTP-based VoD streaming, including progressive download and adaptive streaming
✓ HTTP-based Live adaptive streaming (Microsoft Smooth, Apple HLS, Adobe Zeri/HDS)
✓ Time-Shifting video services
✓ Global, regional and in-country/domestic federations
✓ HTTP-based and DNS-based inter-CDN redirection
✓ Fine-grain access control policy via URI-signing
✓ Delivery performance gain of CDN federation
• Convergence can be reached on prioritized set of delivery features for base delivery service across CDN federation in OTT-CDN<-->SP-CDN use case

• Light-weight CDN Federation (offering regular delivery service) can be deployed today without standardized external APIs
  • only a pre-standard logging/reporting interface is required

• Richer services can be deployed with pre-standard external APIs
  • e.g. pre-standard URI signing, pre-standard Purge API

• Standards needed for deployment at scale and most advanced functionality
  • → Pilot expertise extensively leveraged to accelerate IETF CDNI standardization
Technical Track: Next steps in Phase 3

• Introducing advanced capabilities in Lab Pilot
  Flexible CDN Selection (including Business rules)
  Migration of CDN Fed functionality into Data Center
  Delivery Optimization and Content Adaptation for Mobile access
  URI signing across multi-vendor CDNs
  Real-Time reporting
  ...

• Evaluating a “Beta” content delivery service using production CDNs of Pilot members
With federation, the broader CDN ecosystem has an opportunity to deliver rich content delivery services to media and broadcasters matching the scale and high QoE expectations of end users.

Several innovative SPs, OTT CDNs and CPs are working with Cisco to validate key concepts and fundamentals required to make CDN federations a reality.

Completing open CDNI standards is essential to CDN Federation success, but light-weight federation deployment can start today (in fact it is already deployed in production).
Thank you.