

From Bandwidth on Demand to Networks on Demand – Bandwidth Trading in the Era of Network Virtualization (Panel)

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Bandwidth-on-Demand

- ❑ Most network traffic does not flow in steady and easily predictable streams, but in short bursts, separated by longer periods of inactivity.
- ❑ This pattern makes it difficult to predict peak loads.
- ❑ Bandwidth on demand is useful for applications, such as backups, file transfers, synchronization of data bases, and videoconferencing, and allows the user to pay for only the amount of bandwidth used.
- ❑ BoD: A technique that allows the user to add additional bandwidth as the application requires it.

Network Virtualization

- Network virtualization is a **method of combining available resources** in a network by **splitting up** available bandwidth into channels, each of which is independent from the others, and each of which can be assigned (or re-assigned) to a particular server or device in real-time.
 - Network virtualization requires the **monitoring** of the network and often encompasses storage virtualization.
 - Network virtualization treats **all servers and services in the network as a single pool of resources**.
 - Monitoring and managing an entire network from a **single network administrator's station** may happen.

Panel's Organization: Statement & Questions

- Panelist's point of view

- Two questions:
 - Is there any incentive of an ISP to offer BoD services as a bandwidth trading scenario, which can explicitly support virtualization concepts?
 - Is there any advantage for a customer (say SME, industry, or private) to utilize BoD instead of wired or wireless fixed bandwidth services?

Performance
Accounting Security

Panel
BoD Workshop @ NOMS2008

Aiko Pras
University of Twente
The Netherlands



Information Society
Technologies



Bandwidth-on-Demand in the Era of Virtualization

- Past: providers lease fibers for a 15 years period
- Present: in the backbone, Lambda switching allows the creation of dedicated “connections for super user:
 - Telescopes (Lofar), Tele-operation, HDTV (Olympics, football events, ..), etc.
- Future: for access lines, a small number of world-wide operating companies will force access providers to provide virtual network connectivity to the home:
 - You get network connectivity from Google (and others), instead of your ISP
 - Google ensures you get sufficient bandwidth
 - If you “contribute” more to Google, you’ll get more bandwidth
 - Vendor lock-in



Traditional Approach

- Is there any incentive of an ISP to offer BoD services as a bandwidth trading scenario, which can explicitly support virtualization concepts?
 - The ISPs are forced to deliver BoD by the application / content providers
- Is there any advantage for a customer (say SME, industry, or private) to utilize BoD instead of wired or wireless fixed bandwidth services?
 - End user doesn't care
 - The application / content provider takes the advantage





GENI, VINI,...VICI?

Prosper Chemouil

Orange Labs

Research & Development

Panel of "*Bandwidth on Demand*" Workshop – 11 April 2008, Salvador, Brazil



unrestricted



What I understand...



▪ Bandwidth on Demand

- * On-Demand has always been provided at the network level: usually Link Capacity
- * Deployment of heterogeneous networks providing diverse and additional capacity
- * Need of customers (enterprise) to have own traffic isolated → VPNs but...
 - * static & complex
 - * hardly scalable

* → Service on Demand, Content on Demand ?

▪ Virtualization

- * Initially at link level in the network but...
- * Existed in the edge: enterprise networks, data centers and CDNs → e.g. Grid
- * New paradigm supported by router virtualization allowing for new capabilities (GENI, VINI, VICI ?)

What I feel...

- ISP Viewpoint
 - Control performance
 - Optimize resources
 - Provide self-x capabilities
 - Offer new services (Content)
- Customer Viewpoint
 - Alleviate complexity
 - Access Networks
 - Terminals
 - Experience better reliability
- Questions yet to be solved?
 - End-to-end
 - Security issues
 - Role separation: Neutrality?
 - Business Model



**Panel: From Bandwidth on Demand to Networks on Demand –
Bandwidth Trading in the Era of Network Virtualization**

Network on Demand

– Bandwidth Trading in the Era of Network Virtualization–

April 11, 2008
BoD 2008 Panel

Kohei Shiomoto
NTT Network Service Systems Laboratories

Moderator: Burkhard Stiller (University of Zurich, Switzerland)

Aiko Pras (University of Twente, The Netherlands)

Prosper Chemouil (Orange-FT Research, France)

Kohei Shiomoto (NTT Labs, Japan)

Young Lee (Huawei, USA)

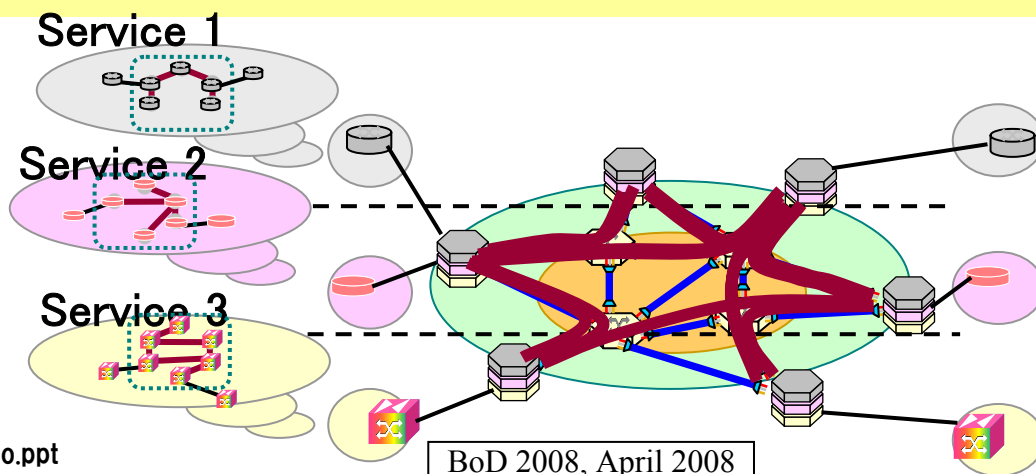
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BoD 2008, April 2008

Bandwidth-on-Demand in the Era of Virtualization

NTT Network Service Systems Laboratories

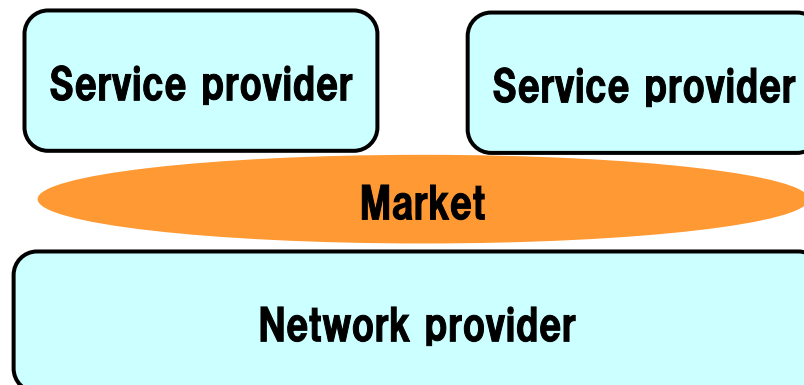
- **Network virtualization**
 - **Network provider**
 - Owns network facility.
 - May or may not provide network service.
 - **Service provider**
 - Does not own network facility.
 - Provides network service.
- **Examples**
 - **MVNO**
 - Lease mobile network facility from mobile network provider.
 - Provide mobile network service to end customer.
 - **Overlay network**
 - PlanetLab for advanced network research testbed.
- **Bandwidth-on-Demand to Network-on-Demand**



Questions

NTT Network Service Systems Laboratories

- Question-a) Is there any incentive of an ISP to offer BoD services as a bandwidth trading scenario, which can explicitly support virtualization concepts?
 - Reduce the risk of investment (Risk portfolio management)
 - Leverage underutilized resource (Extra revenue)
 - Creation of new market
 - Competition among service provider may lead to profitable market for network provider
- Question- b) Is there any advantage for a customer (say SME, industry, or private) to utilize BoD instead of wired or wireless fixed bandwidth services?
 - Avoid facility investment (No CAPEX)
 - Concentrate on end customer service
 - Quick service deployment
 - Adapt to unexpected change of traffic



Enabling Bandwidth On-Demand (BoD) in Multi-Domain Networks

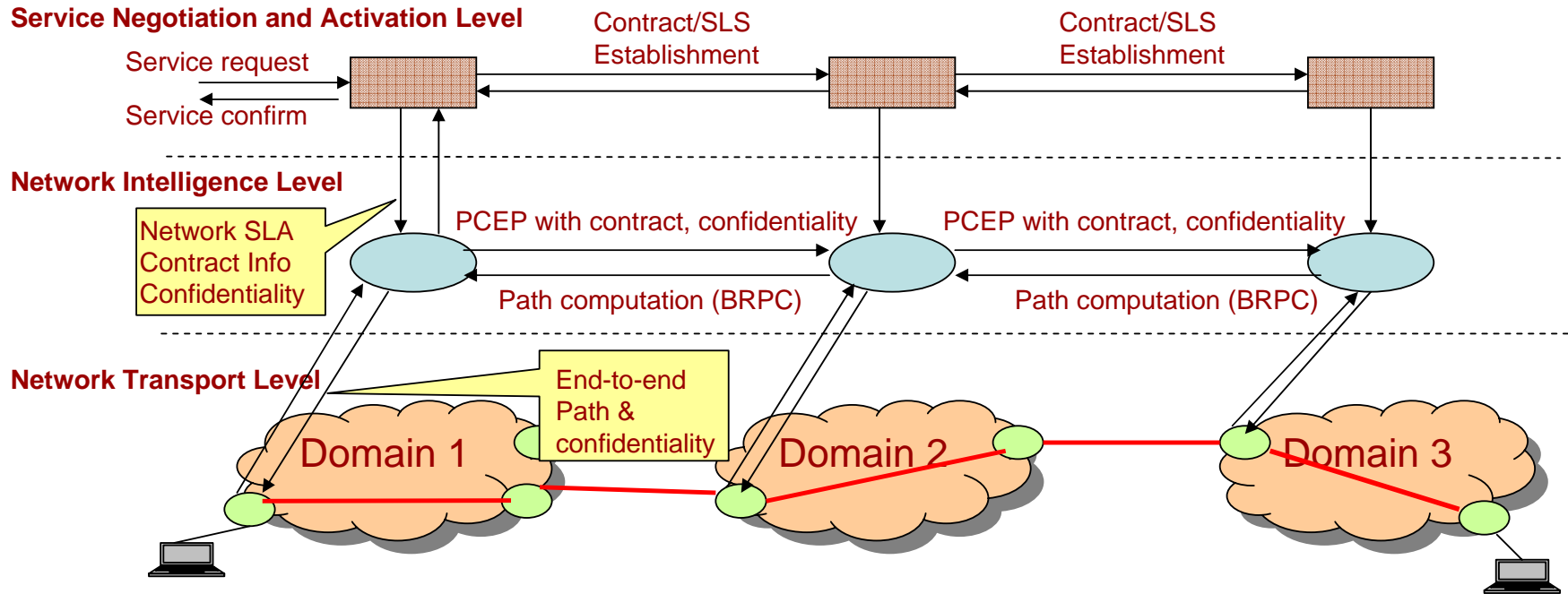
Young Lee

Huawei Technologies, USA
Research Division

www.huawei.com



Enabling Multi-Domain BoD Service



Key Enablers for Multi-Domain BoD:

- Inter-Level communications
 - Lack of standard protocol between Level 1 and Level 2
 - Translation of Level 1 lingo into Level 2 protocol is essential.
- Inter-Domain communications
 - Standard Control Plane (GMPLS/ASON, PCEP, etc.) is maturing to communicate confidentiality and contract information and policy, etc.
 - draft-ietf-pce-path-key-02.txt (Redford, et al.) draft-leroux-pce-contract-id-01.txt (J-L Leroux, et al.)

Question 1: Is there any incentive of an ISP to offer BoD services as a bandwidth trading scenario, which can explicitly support virtualization concepts?

- Yes. But it depends on the ISP's infrastructure that would allow dynamic resource management capability that enables BoD services as a bandwidth trading scenario in a cost-effective manner.

Question 2: Is there any advantage for a customer (say SME, industry, or private) to utilize BoD instead of wired or wireless fixed bandwidth services?

- It depends on the customer application and the need. For some BoD applications that require more flexibility in terms of bandwidth requirement and contract terms and faster service provisioning on the fly, BoD service can be more advantageous than traditional fixed bandwidth services for a customer.
- It also depends on the cost. If BoD can be offered at a lower rate than fixed bandwidth services, then customers will definitely consider BoD service.