Application Delivery Using SDN

Project Leader: Subharthi Paul
Washington University in Saint Louis
Saint Louis, MO 63130
Jain@cse.wustl.edu

These slides and audio/video recordings are available at:
http://www.cse.wustl.edu/~jain/talks/sdn_gc12.htm
SDN’s Layered Abstraction

- SDN provides standardized mechanisms for distribution of control information

Network Virtualization

Virtualization

OpenFlow

Forwarding HW

Forwarding HW

Forwarding HW

Network OS

Network Level Control (ISP)

Application Level Control (ASP)

ASP1

ASP2

ASP3

Network OS1

Network OS2

Network OS3

Net App1

Net App2

Net App3

OpenADN

OpenADN

OpenADN

Northbound

Forwarding HW

http://www.cse.wustl.edu/~jain/talks/sdn_gc12.htm

©2012 Raj Jain
**Trend: Explosion of Mobile Apps and Clouds**

- All top 50 Internet sites are services [Alexa]
- Almost all services are now mobile apps: Google, Facebook, Bank of America, …
- Almost all services need to be global (World is flat)
- Almost all services use cloud computing (Easy management)

**Networks need to support efficient service setup and delivery**

Service Center Evolution

1. Single Server

2. Data Center
   - Load Balancers
   - SSL Offloaders

3. Global Clouds

Global Internet

Need to make the global Internet look like a data center
- Google appliances in Tier 3 ISPs
- Details of Google WAN are not public
- ISPs can not use it: L7 proxies require app msg reassembly
Our Solution: OpenADN

- Open Application Delivery Networking Platform
  Platform = OpenADN aware clients, servers, switches, and middle-boxes
- Allows Application Service Providers (ASPs) to quickly setup services on Internet using cloud computing ⇒ Global datacenter
Resource Control

- ASPs keep complete control of their data. ISP does not have to look at the application headers or data to enforce application level policies.
- ISPs keep complete control of their equipment. ASPs communicate their policies to ISP’s control plane.
- Middle boxes can be located anywhere on the global Internet (Of course, performance is best when they are close by).
- ISPs own OpenADN switches and offer them as a service.
- ASPs or ISPs can own OpenADN middle boxes.
- No changes to the core Internet.

http://www.cse.wustl.edu/~jain/talks/sdn_gc12.htm

©2012 Raj Jain
Application Delivery

Message level:
- Server selection
- Load balancing between servers
- Fault tolerance
- Server mobility
- User Mobility
- Secure L5-L7 headers and data
- Middlebox services: Intrusion detection, Content based routers, application firewalls, …
  - Control plane and data plane MBs
- Middlebox traversal sequence
- Message level policies
- TCP Splicing
Key Features of OpenADN

1. Edge devices only. Core network can be current TCP/IP based, OpenFlow or future SDN based
2. Coexistence (Backward compatibility): Old on New. New on Old
3. Incremental Deployment
4. Economic Incentive for first adopters
5. Resource owners (ISPs) keep complete control over their resources

Most versions of Ethernet followed these principles. Many versions of IP did not.
Summary

1. Knee of mobile internet paradigm shift
   Explosion of Apps using cloud services
2. OpenADN appliances can provide ASPs networking services they need
3. OpenADN extends using best of OpenFlow, SDN, MPLS, ID/Locator Split, Cross-layer communications, middle box appliances
4. Keeps resource control under resource owners.
   Can be implemented incrementally now
5. Trend is towards simplifying and standardizing router interfaces \[\Rightarrow\] Software defined networking

Application Delivery: Opportunity for ISP’s