

OpenADN: Mobile Apps on Global Clouds Using SDN



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1. Networking Application Trends
2. OpenFlow and SDN
3. OpenADN Vision and Extensions
4. Experimental Results
5. Key Features

Trend: Explosion of Mobile Apps



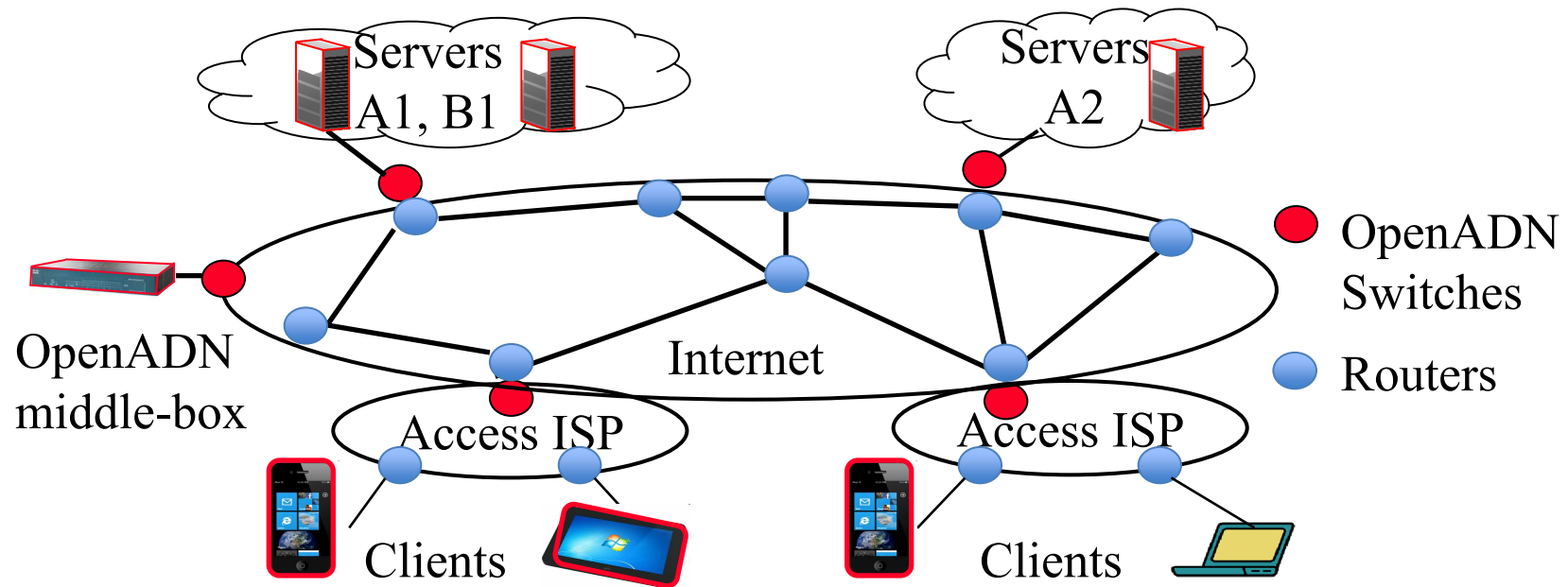
- ❑ All top 50 Internet sites are services [Alexa]
- ❑ Almost all services are now mobile apps: Google, Facebook, Bank of America, ...
- ❑ Almost all services need to be global (World is flat)
- ❑ Almost all services use cloud computing (Easy management)

Networks need to support efficient service setup and delivery

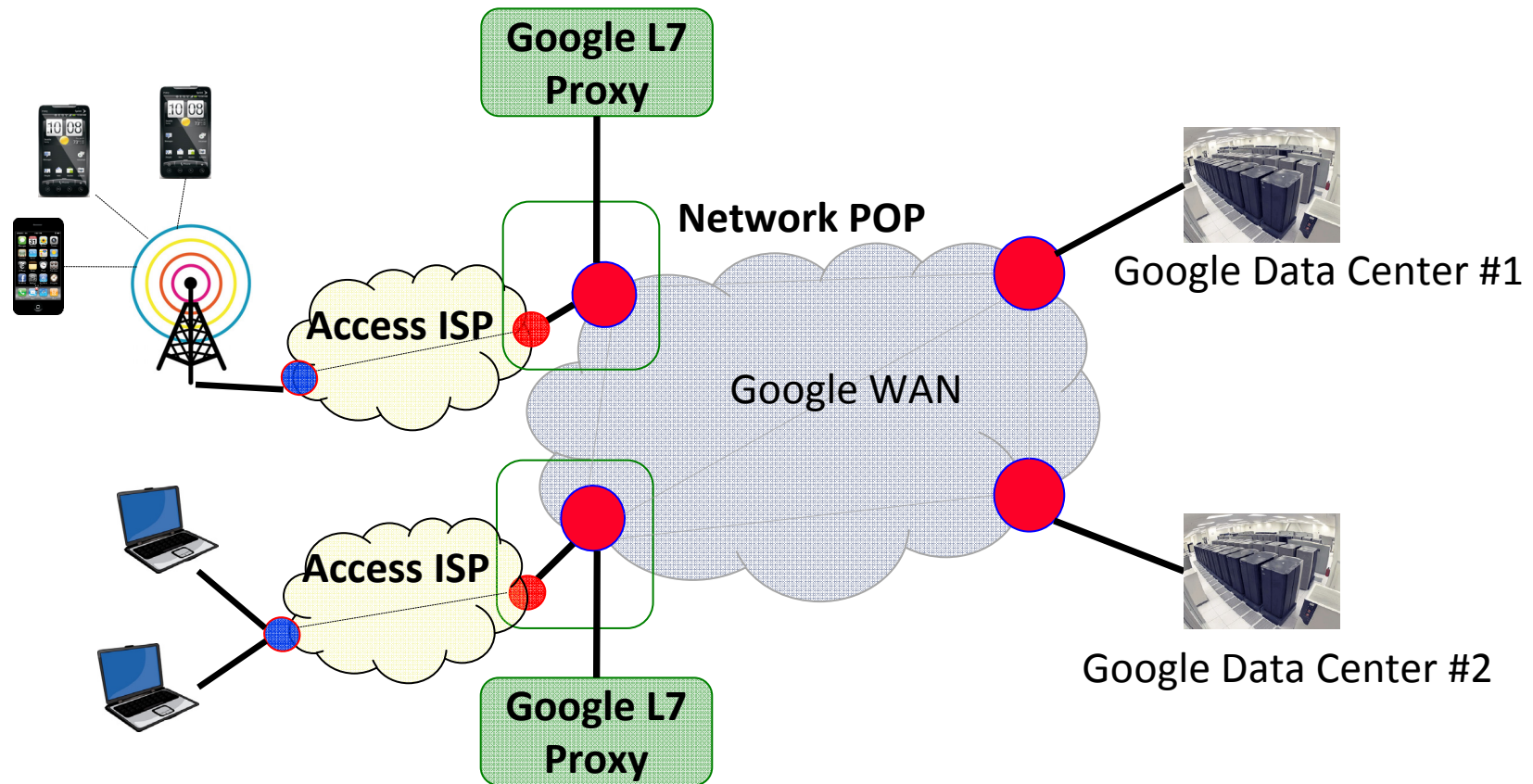
Ref: Top 500 sites on the web, <http://www.alexa.com/topsites>

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



Google WAN

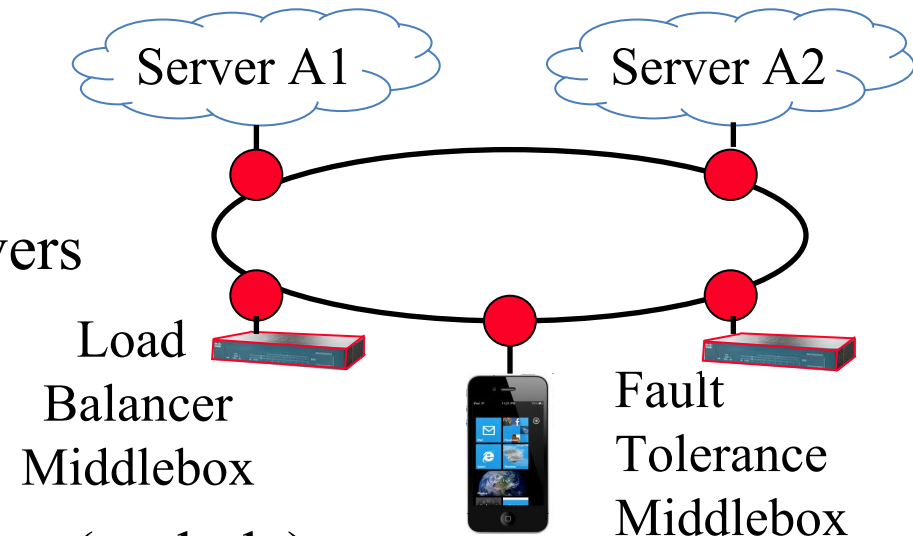


- ❑ OpenADN appliances are like Google appliances in Tier 3 ISPs
- ❑ Details of Google WAN are not public
- ❑ ISPs can not use it: L7 proxies require app msg reassembly

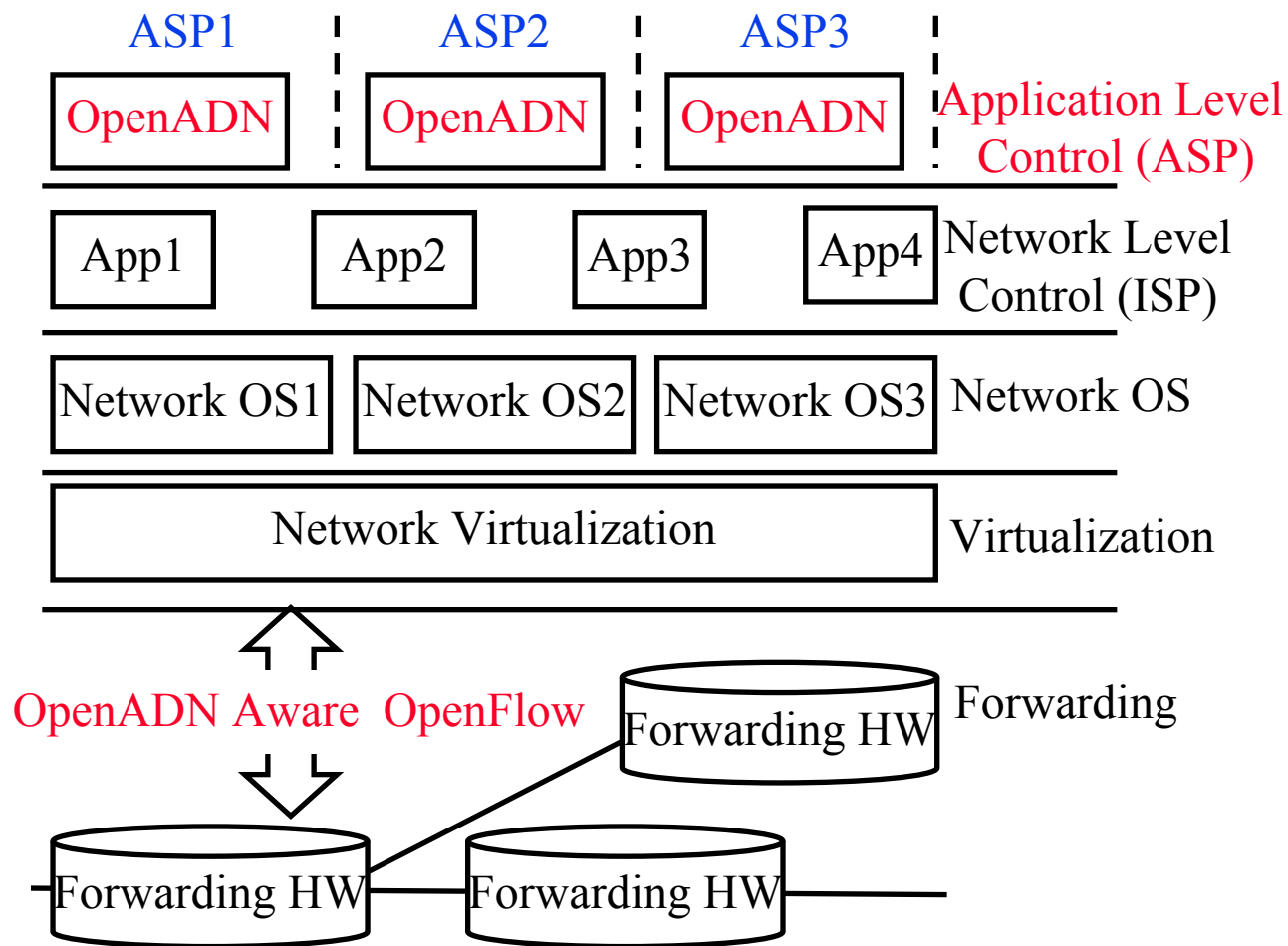
Extension 1: Application Level Policies

ASPs want:

- ❑ Server selection
- ❑ Load balancing between servers
- ❑ Fault tolerance
- ❑ Server mobility
- ❑ User Mobility
- ❑ Secure L5-L7 headers and data (rat hole)
- ❑ Middlebox services: Intrusion detection, Content based routers, application firewalls, ...
 - ❑ Control plane and data plane MBs
- ❑ Middlebox traversal sequence
- ❑ Message level policies
- ❑ TCP Splicing



OpenADN in SDN's Layered Abstraction



- SDN provides standardized mechanisms for distribution of control information

OpenADN Innovations

1. Extended OpenFlow flow-based handling, centralized policy control
2. Software Defined Networking: Standardized abstractions, Multi-Tenants, Control Plane programming for data plane
3. ID/Locator Split
4. Layer 7 Proxies (Similar to Google's proxies in Access PoPs)
5. Cross-Layer Communication
6. MPLS like Labels

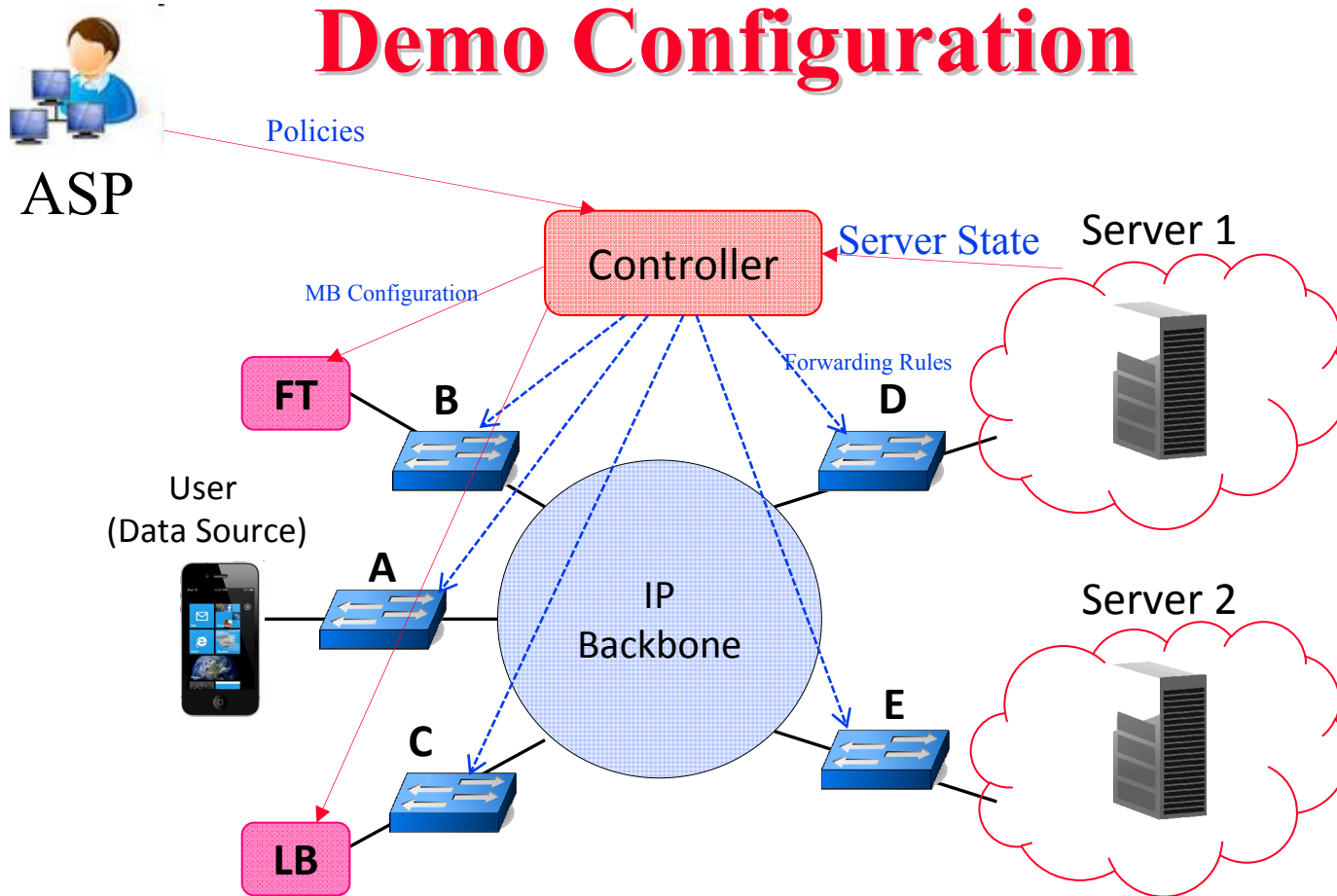
Key Features of OpenADN

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



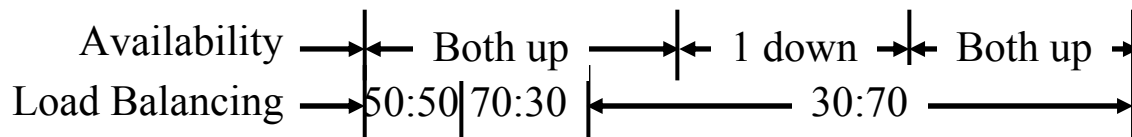
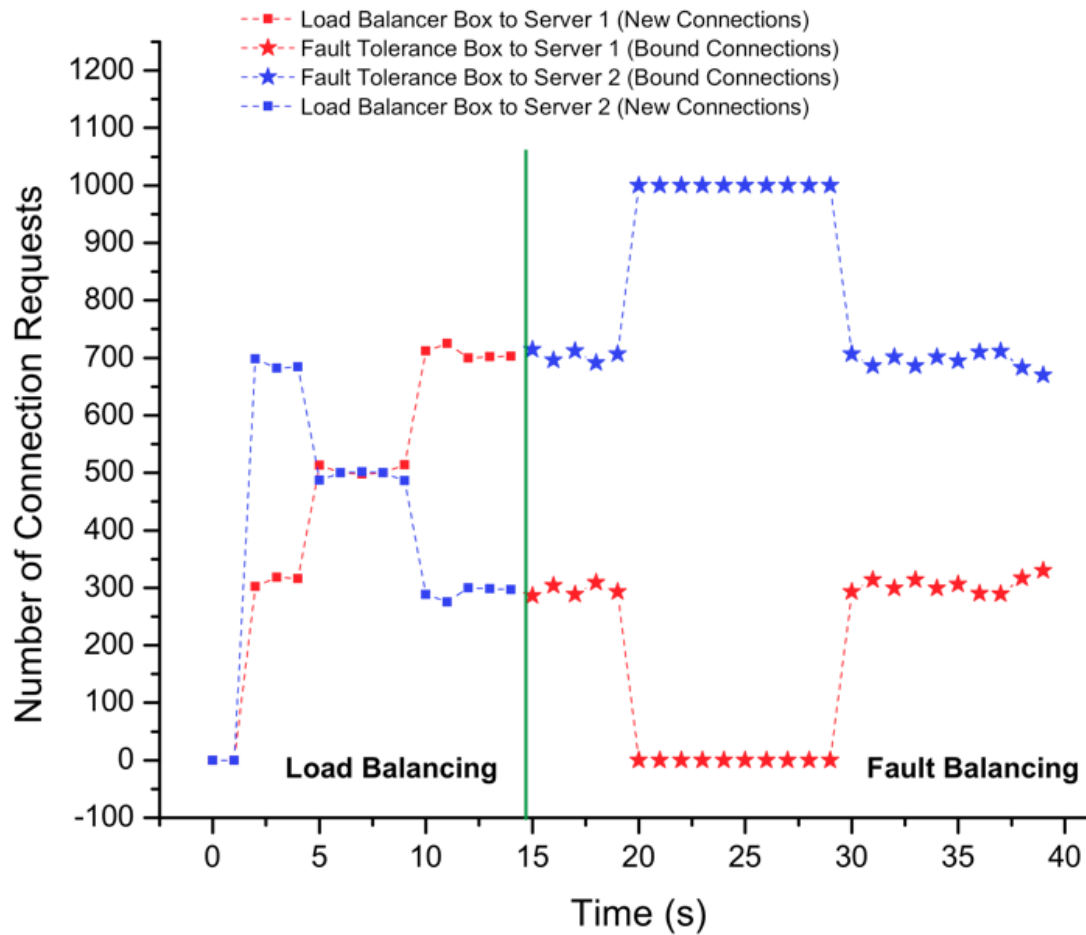
**Most versions of Ethernet followed these principles.
Many versions of IP did not.**

Demo Configuration



- ❑ Single user and single ASP with 2 servers
- ❑ OpenADN Appliances: A, B, C, D, E
- ❑ ISP offers ADN services: Fault tolerance and Load Balancing

Validation of Functionality

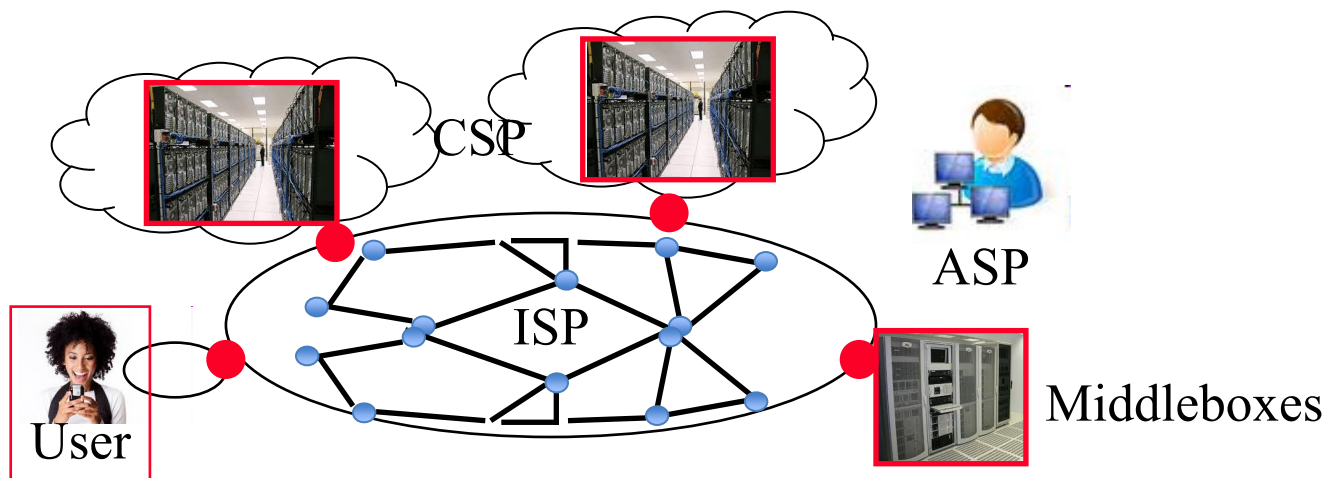


Resource Control

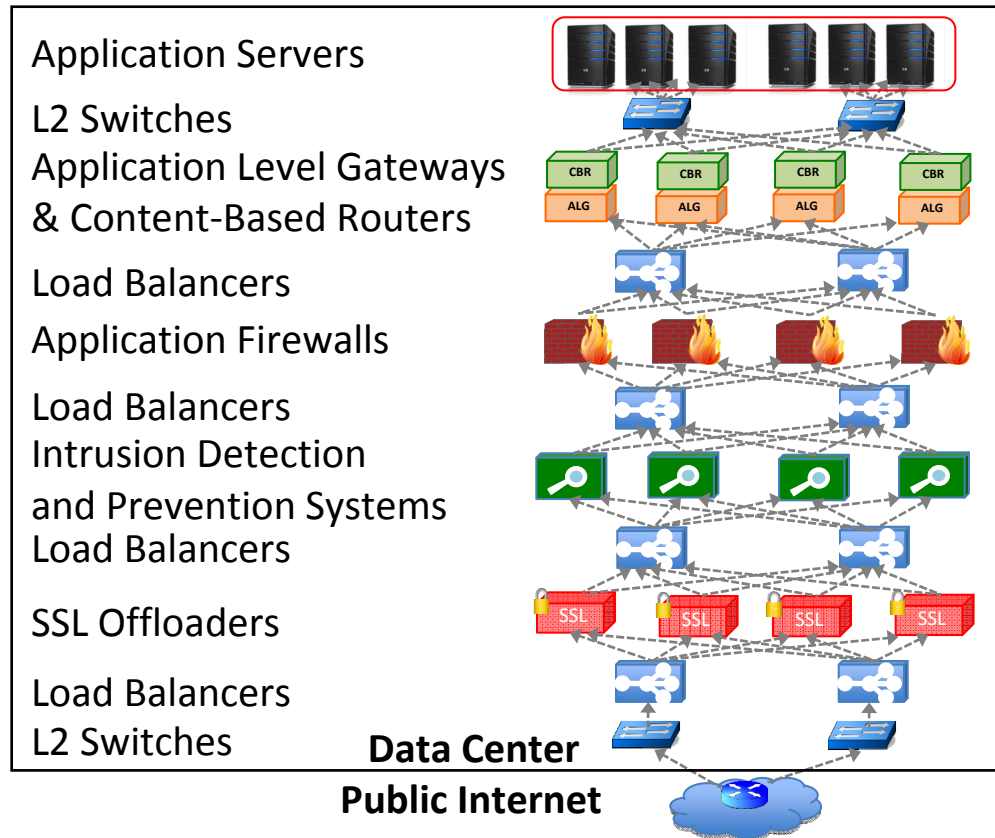
- ❑ ASPs keep complete control of their data.
ISP does not have to look at the application headers or data to enforce application level policies
- ❑ ISPs keep complete control of their equipment.
ASPs communicate their policies to ISP's control plane
- ❑ Middle boxes can be located anywhere on the global 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

Beneficiaries of This Technology

- ❑ Equipment/Software vendors: Sell openADN appliances, openADN-aware applications
- ❑ ASPs: Deploy servers anywhere and move them anytime
- ❑ ISPs: Offer new services
- ❑ Cloud Service Providers (CSPs): Freedom to move VMs, Less impact of downtime

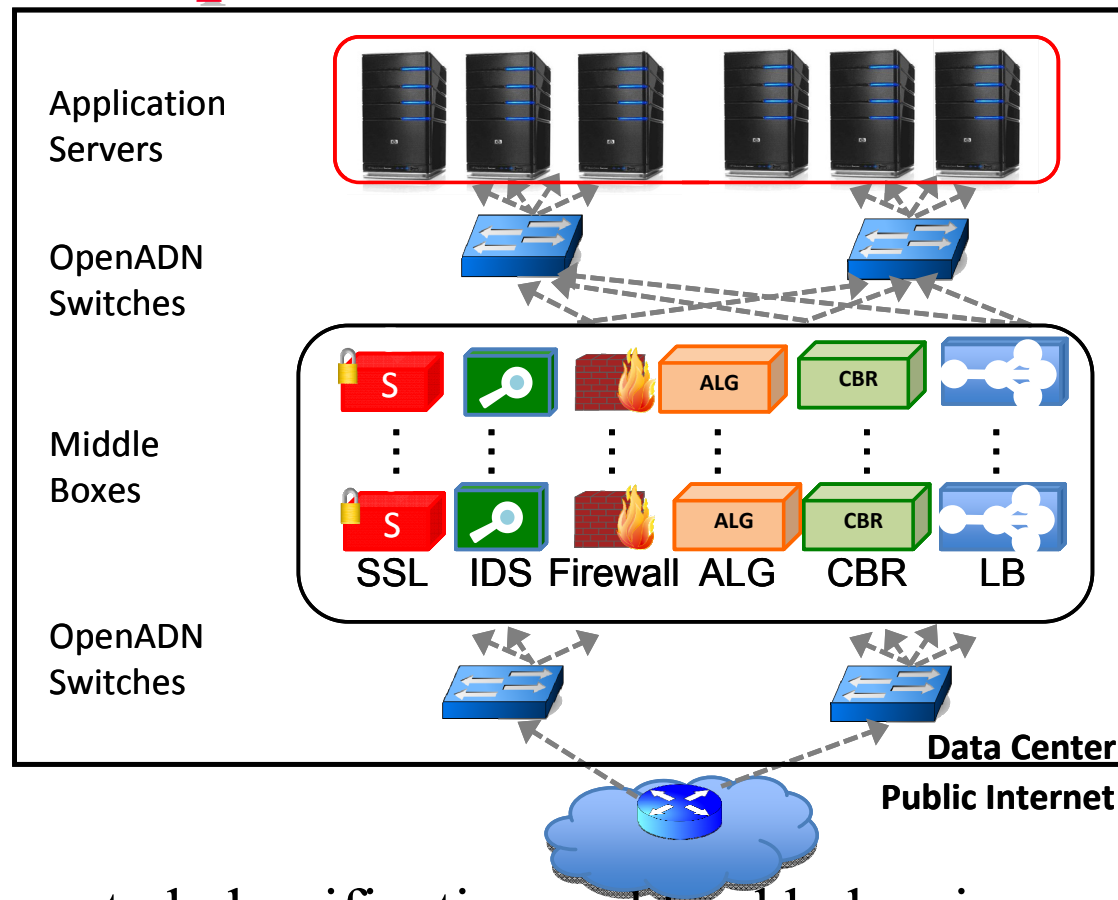


Data Center Applications



- ❑ Repeated classification and load balancing
- ❑ No application level control over MBs traversed
- ❑ Unnecessary traversals and reduced performance

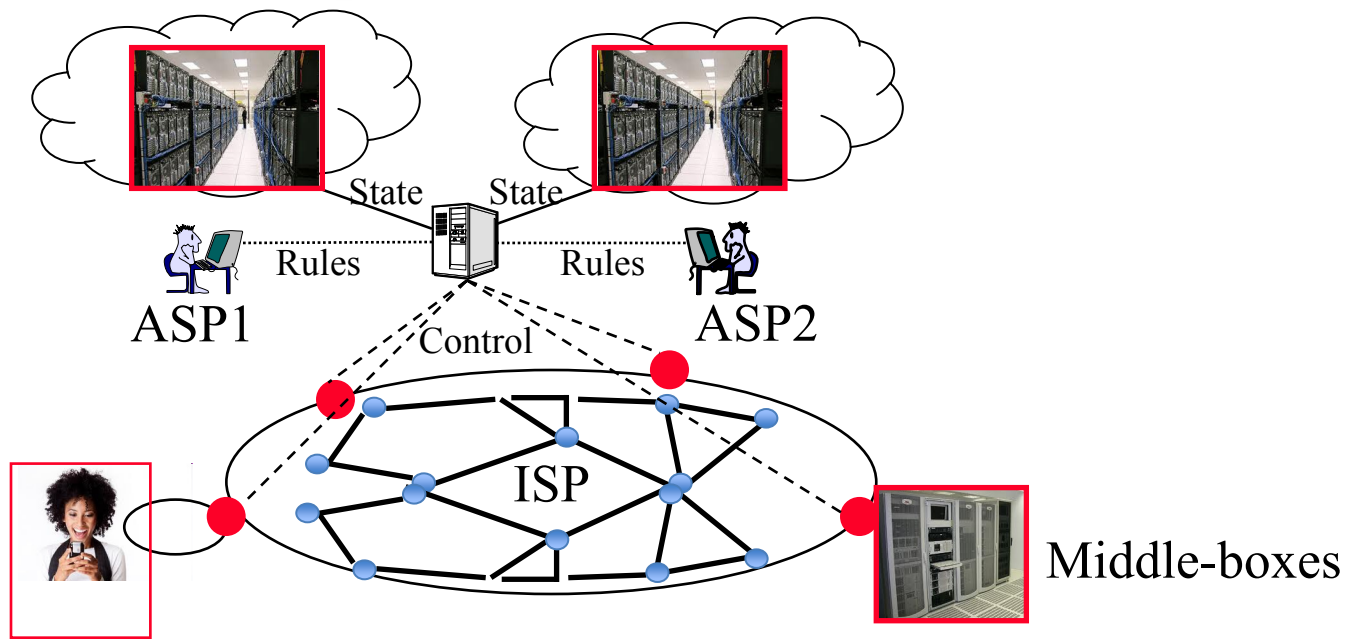
OpenADN in Data Center



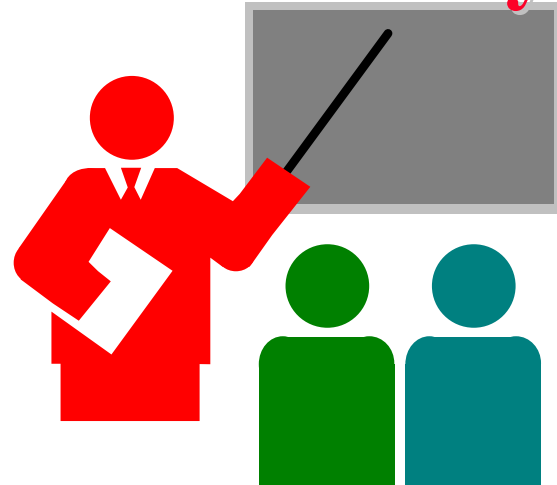
- ❑ No repeated classification and load balancing
- ❑ Application flow specific traversal through MBs
- ❑ Reduced number of appliances and increased performance

OpenADN Without OpenFlow/SDN

- ❑ OpenADN clients, servers, middle-boxes use only APLS labels.
- ❑ OpenADN aware devices need an API to communicate with controllers
- ❑ API can be vendor specific



Summary



1. 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
5. Can be implemented incrementally now