



오픈플로우 기반 Network Optimized Application 및 서비스 구현 전략

Extreme Networks Korea

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What is SDN?



https://en.wikipedia.org/wiki/Blind_men_and_an_elephant

Open Network Era: Fertile Ground for Change

Adoption of Open Architectures

- **Grow** “as needed” and “where needed”
- **Adapt** 10, 40 & 100GbE, Network OS
- **Manage** and learn the new technologies
- **Avoid** proprietary vendor architectures

Centralized Resources & Applications

- **Drive** Lower OPEX, Higher TCO
- **Deploy** cloud-based services where they make sense
- **Erode** silo'd IT departments,
- **Acquire** performance - reliability - scale

Software Defined Networking (SDN) Model

Make Control and Management Plane Programmable

Centralize Network Intelligence; Control at Scale

Abstract Network Infrastructure for Applications

Separate Control Plane from Data Plane

OpenFlow

OpenFlow basic building blocks as defined by ONF

OpenFlow *switch* with internal flow table (Data plane)

Remote *controller* to manipulate flow entries (Control plane)

Standardized “*OpenFlow protocol*” from controller-switch communication using SSL/TCP

Flow Table

Match Condition

Match Action

Counters

Ingress
Port

VLAN ID &
Priority

Ethernet

SA

DA

Type

IP

SA

DA

Proto

TCP

SRC

DST

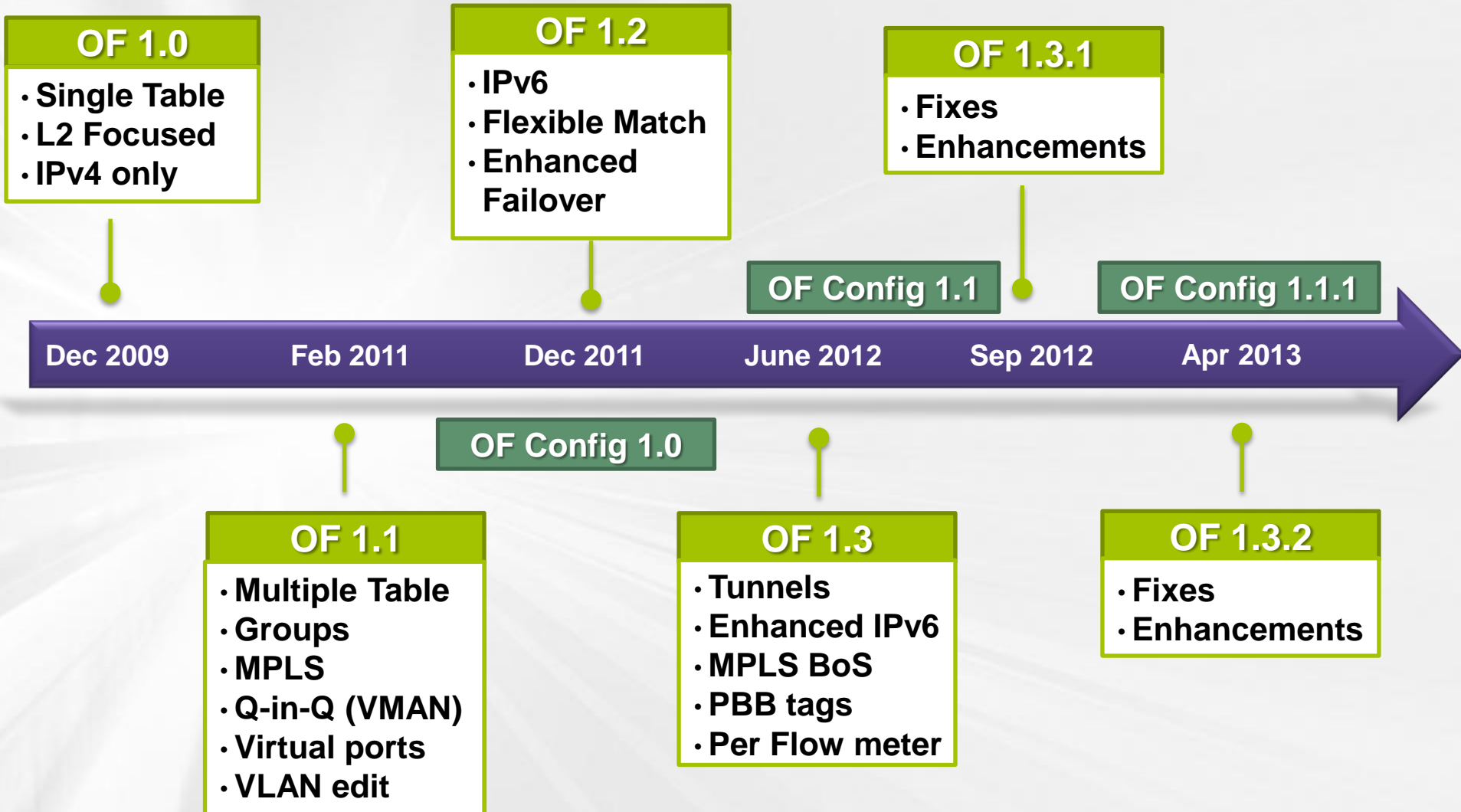
Actions

- Forward Out-port/Enqueue/Controller
- Drop: Drop a packet (Security)
- Modify a packet (Source/Destination MAC, VLAN ID etc)
-

Counters

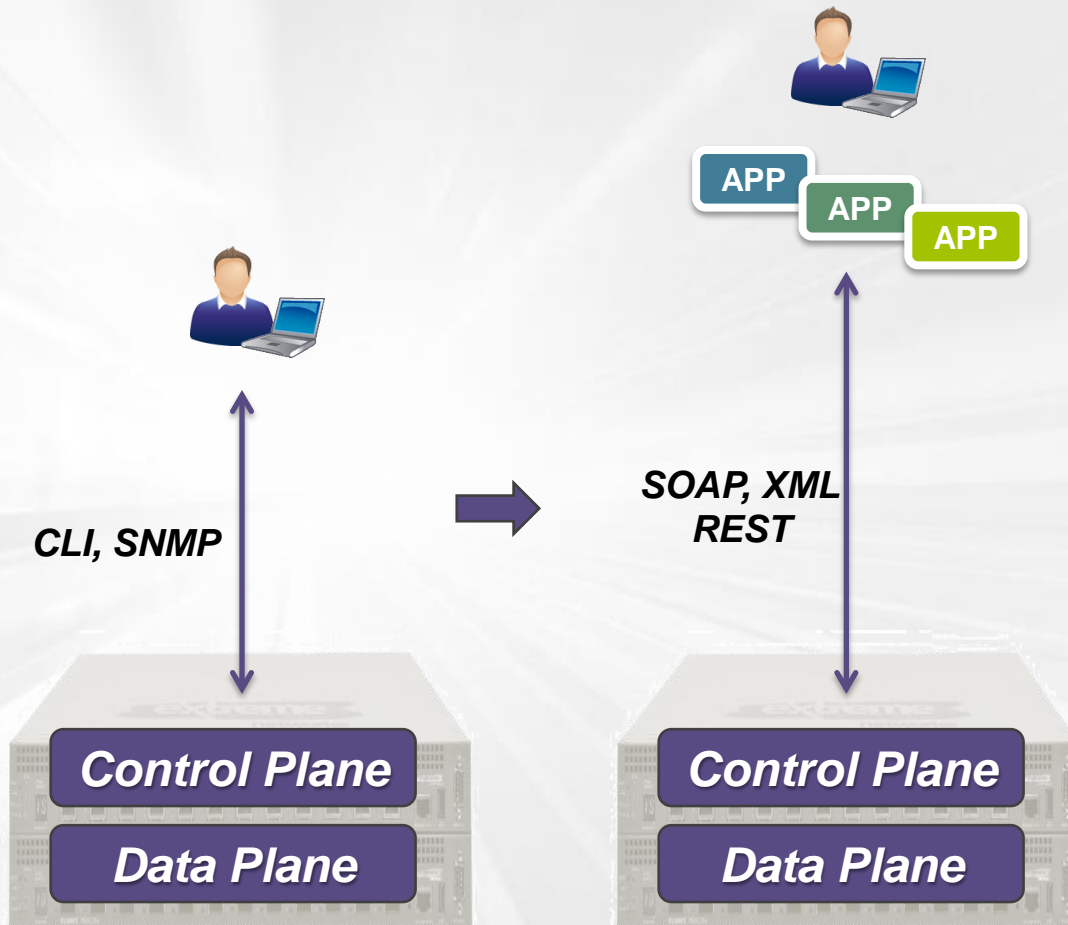
- Per Table
- Per Flow
- Per Port

Industry OpenFlow Evolution



Evolving Architecture with SDN

Programmability



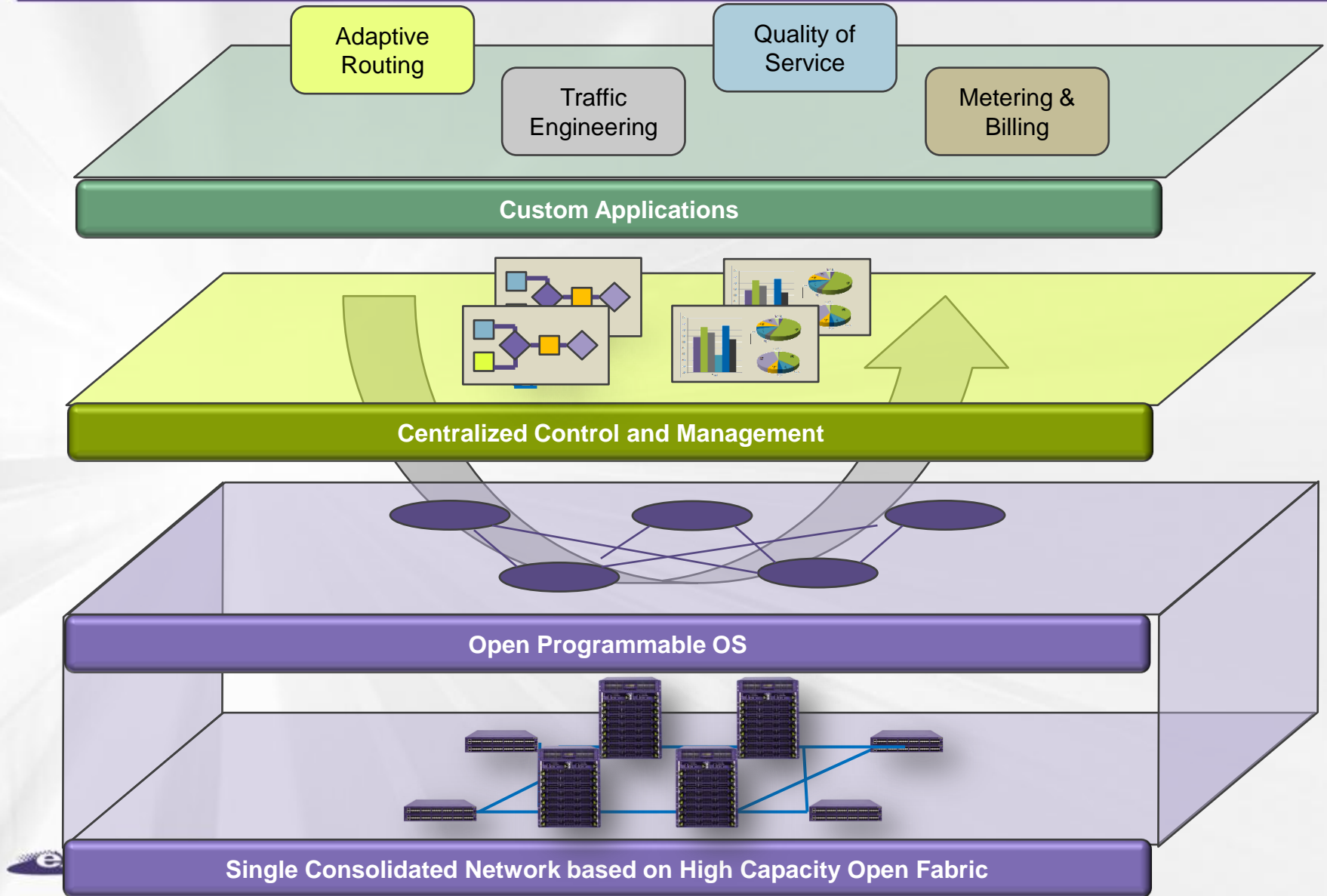
Programmability - SDN



Challenges:

- Optimize
- Customize
- Operationalize?

High Level Architecture



Evolving Architecture @ Extreme

Applications & Portals

XNV

IDM

Cloud
Application

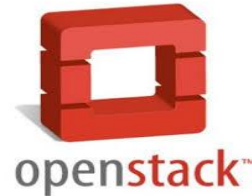
BVS

MediLight

BigTap

.....

Management & Controller Platforms



Extreme XOS

CLI

Scripts

SOAP/XML

OpenFlow

NBI (*Future*)

Hardware Abstraction

Modular

Memory Protection

High Performance Infrastructure

Low
Latency

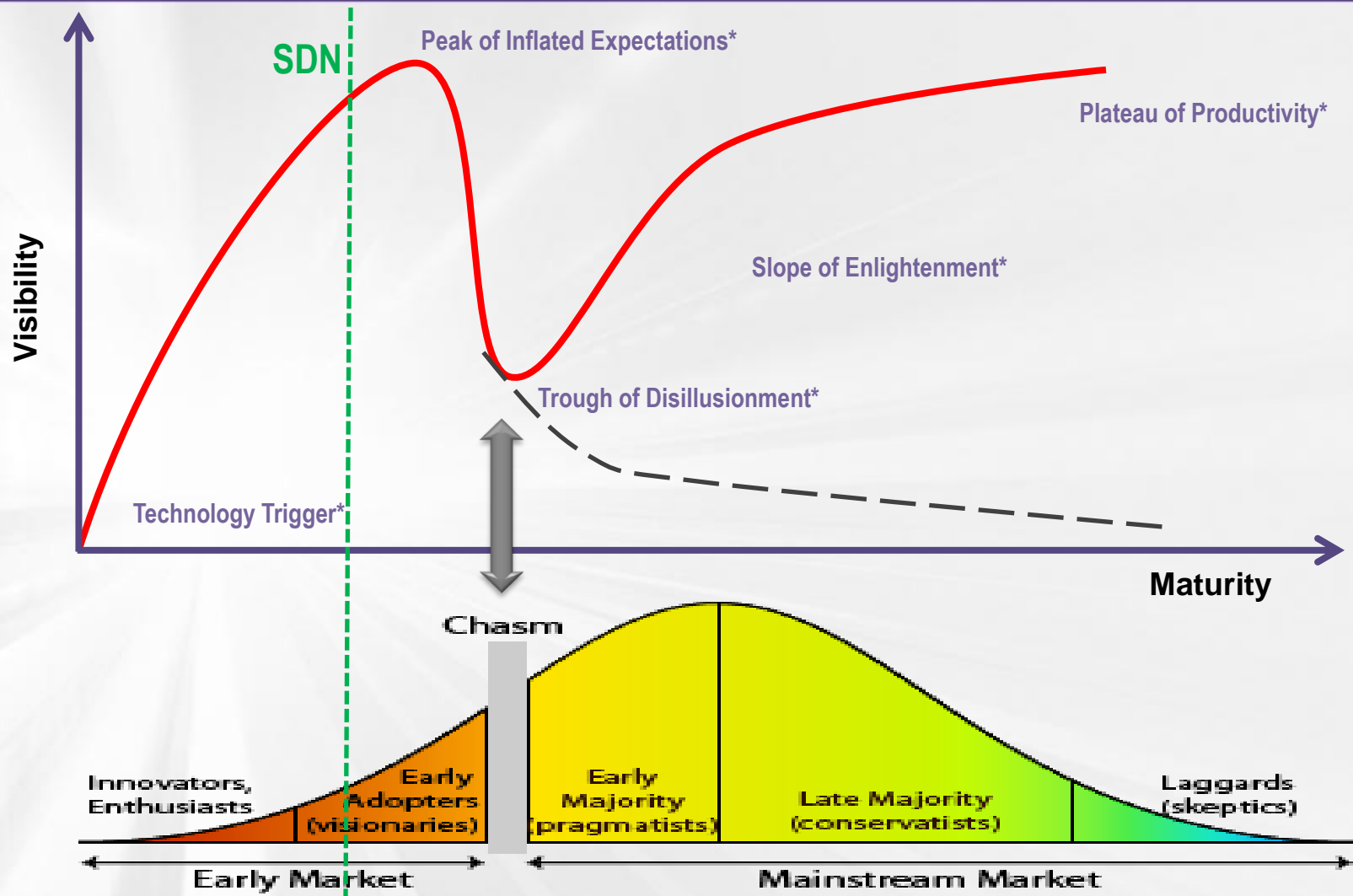
Multi-
Pathing

Low
Power

Lossless
Ethernet

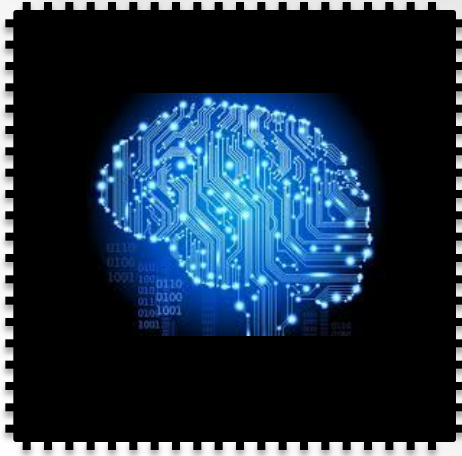


SDN Technology in the Adoption Cycle



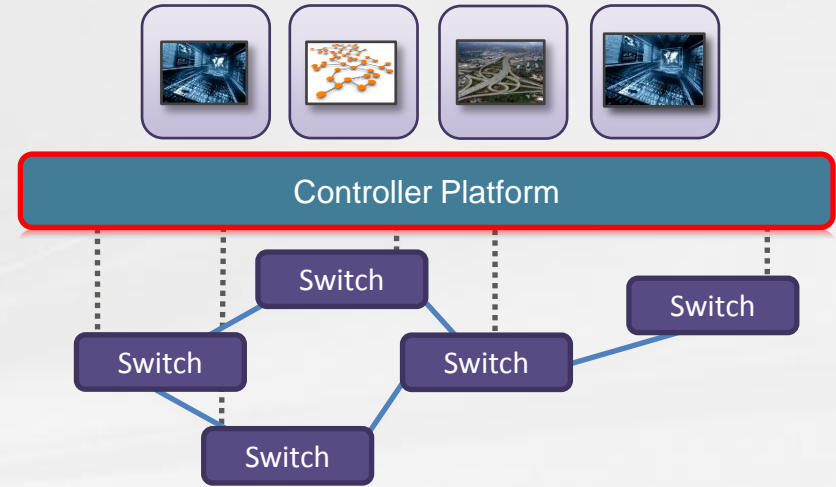
* Terminology From Wikipedia – Gartner Technology Hype Cycle

Stability issue : Networks Process and Controller



Networks Process

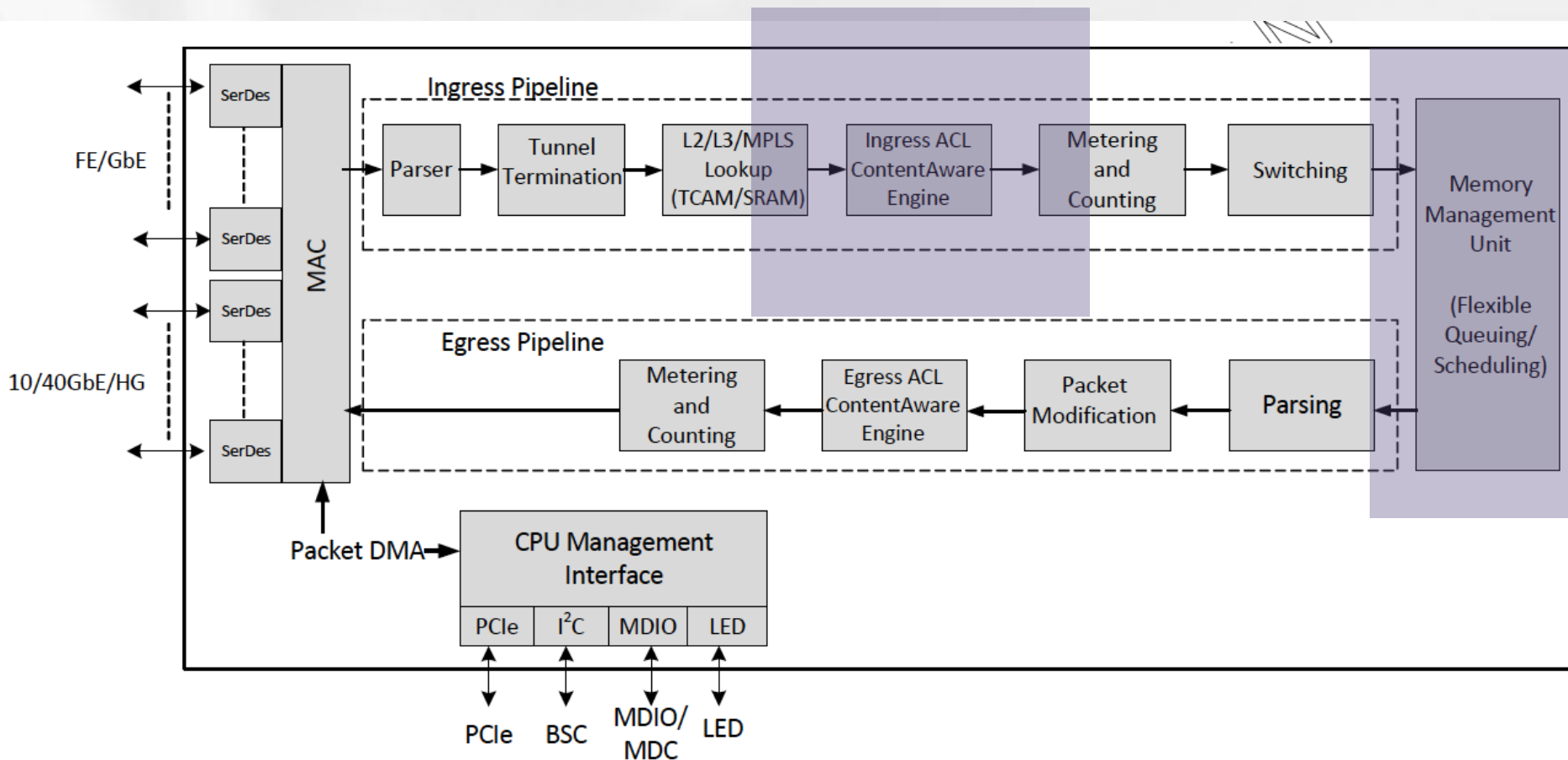
- Fast Path vs. Slow Path
 - Speeds and Feeds
 - Protocol and Feature Support



Centralized Controller

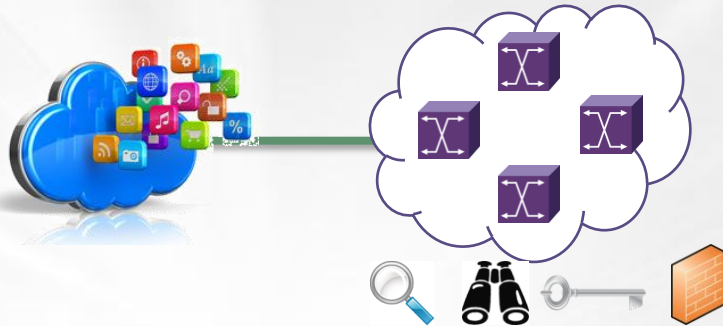
- Pro-active vs. Re-active
 - Packet-In/Packet-out
 - Flow-mod

Architecture – Inside Network Processor



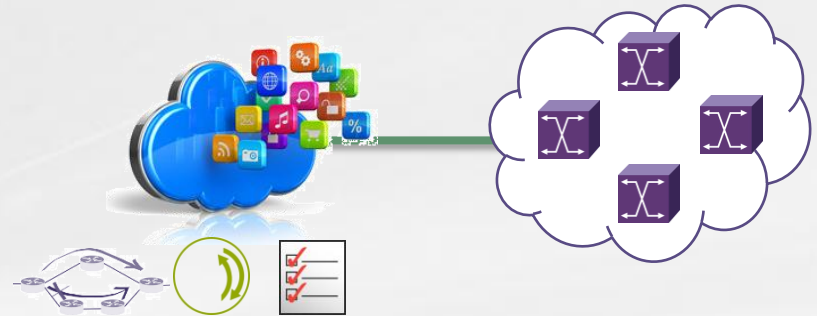
SDN: *Something New Under the Sun?*

Application Aware Networks



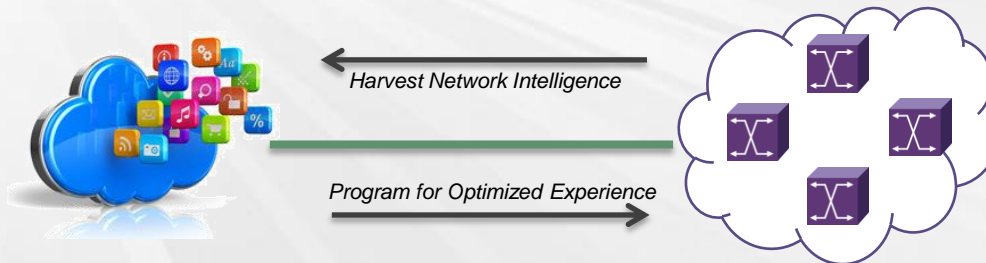
Networks provides application services

Network Aware Applications



Applications are aware of the Network state

SDN is about mutual awareness between Applications & Networks



Media Evolution on Internet : Video Contents

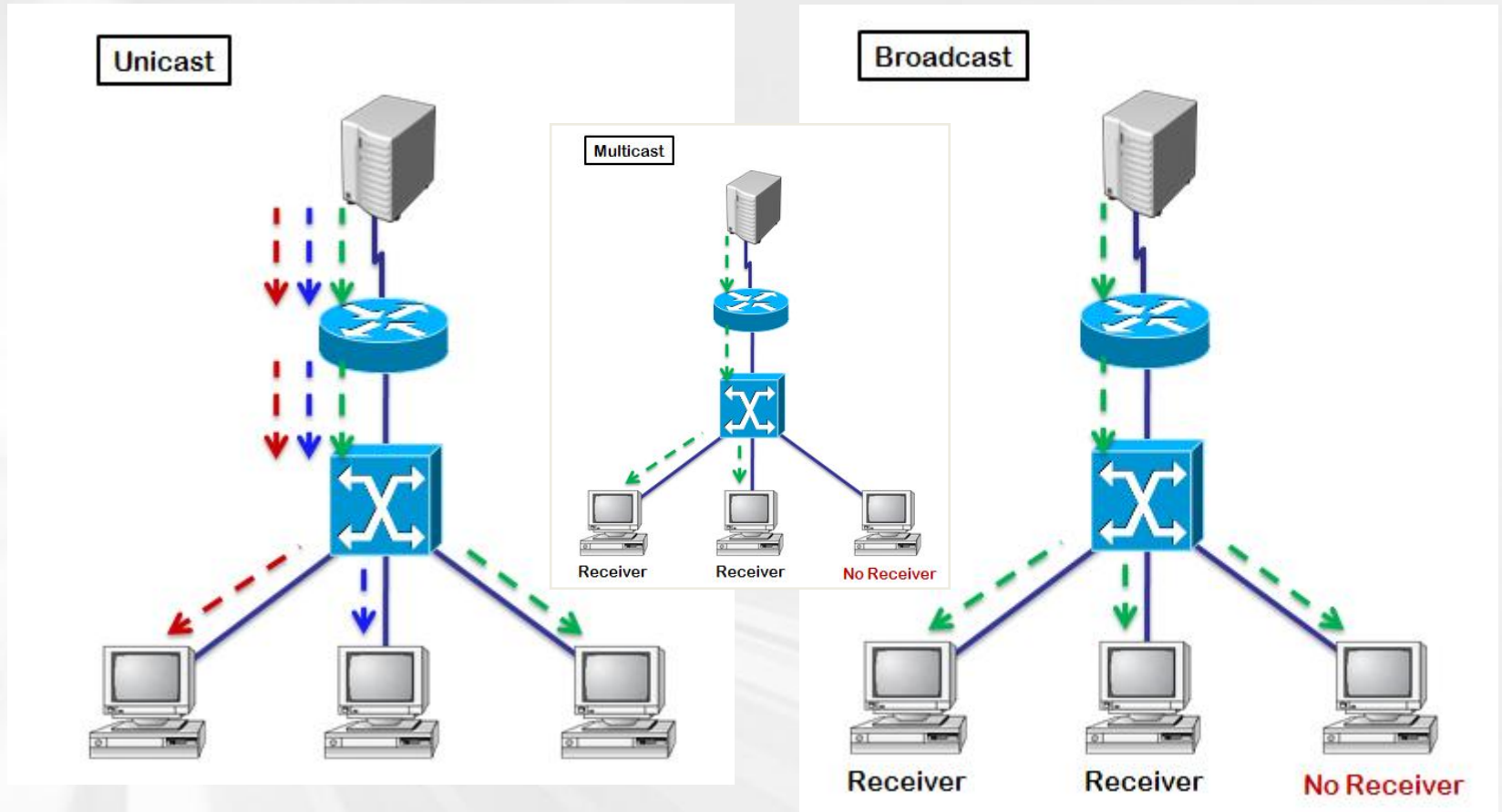
HD 급 영상 : 3-10 Mbps (High resolution)



Just in Time Delivery



IP Packet Forwarding

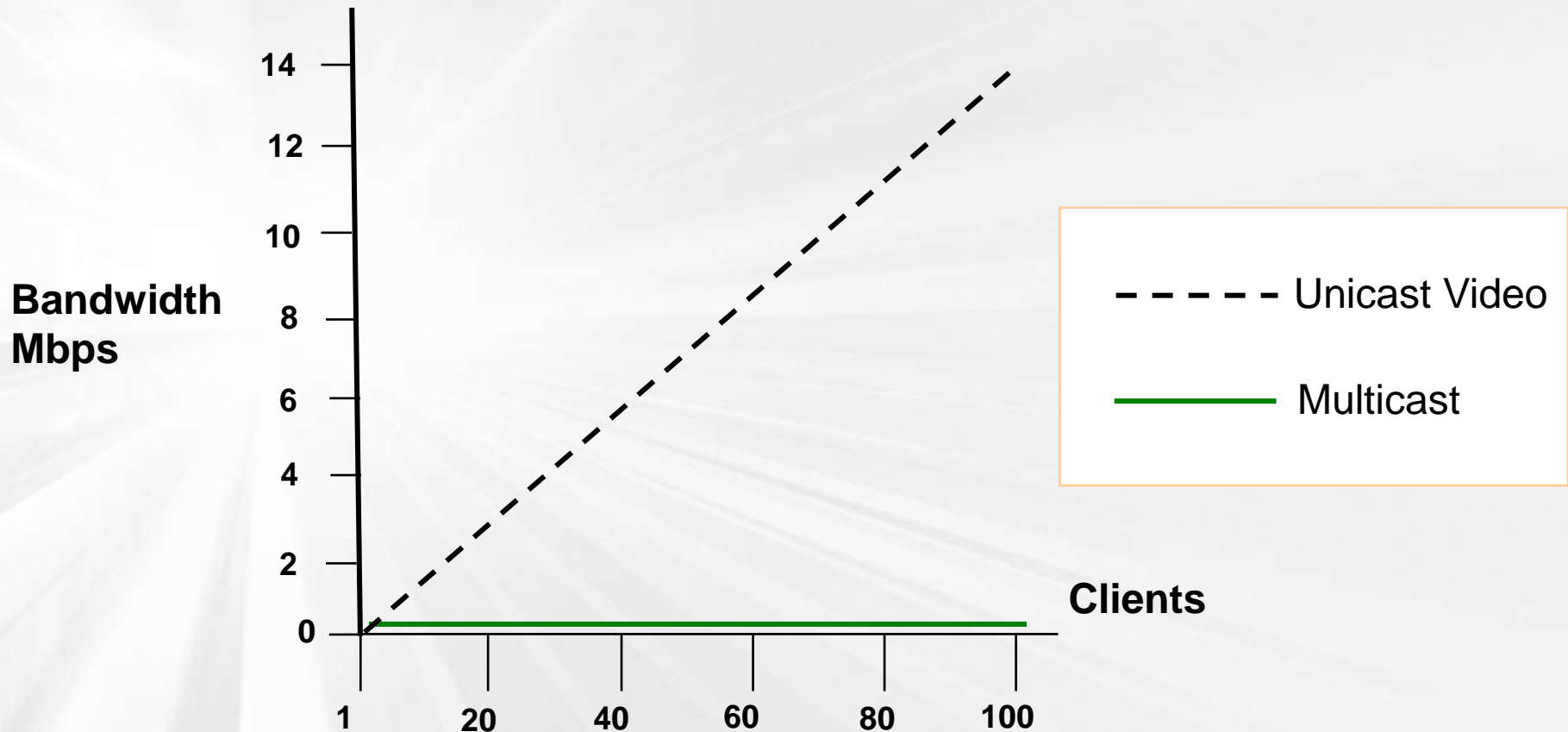


신뢰성 vs 회선 부담

회선 절약 vs 불필요한 트래픽

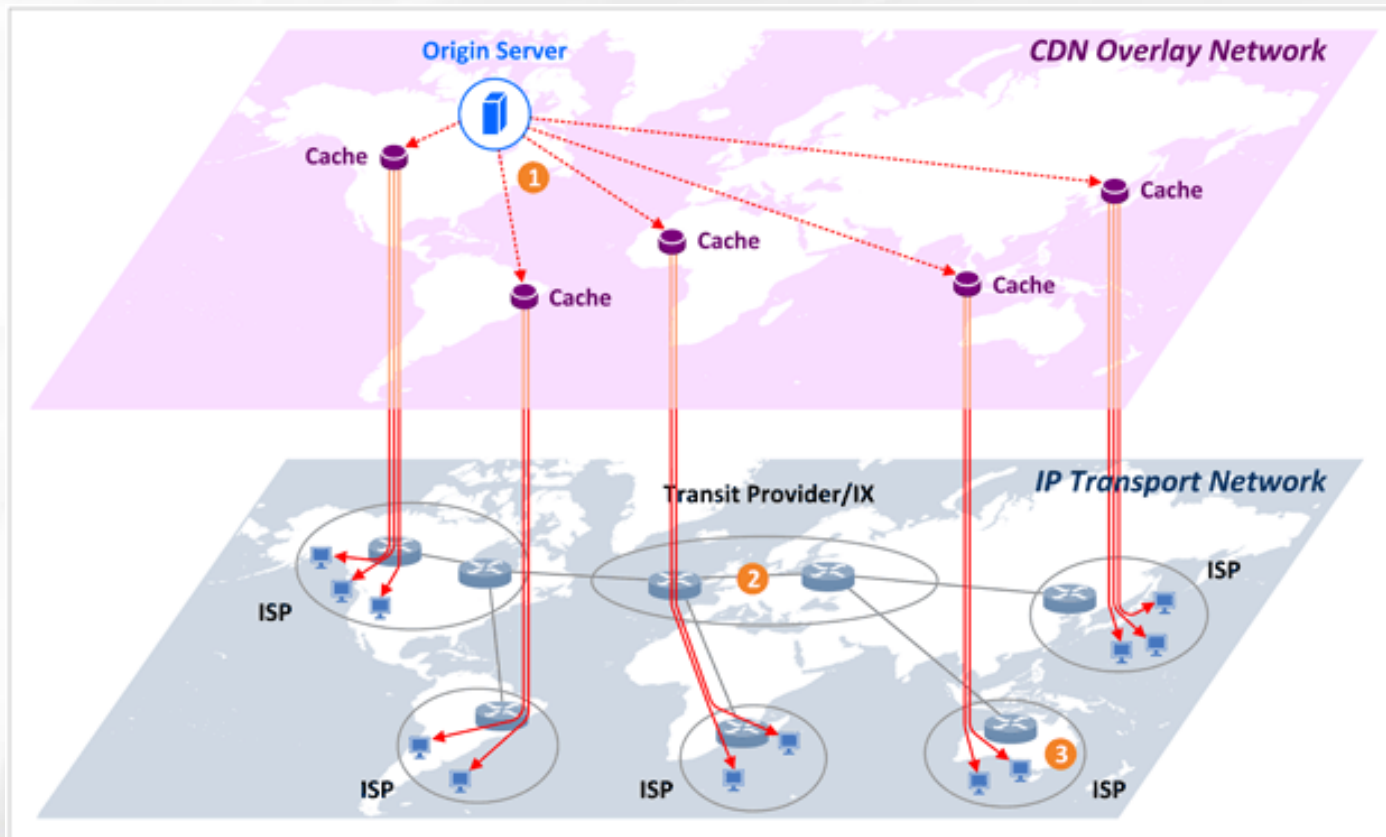
Multicast : Network resource(Bandwidth)

Unicast versus Multicast Bandwidth for Audio and Video



CDN (Content Delivery Network)

- : /
- : Content Delivery Quality – speed and reliability

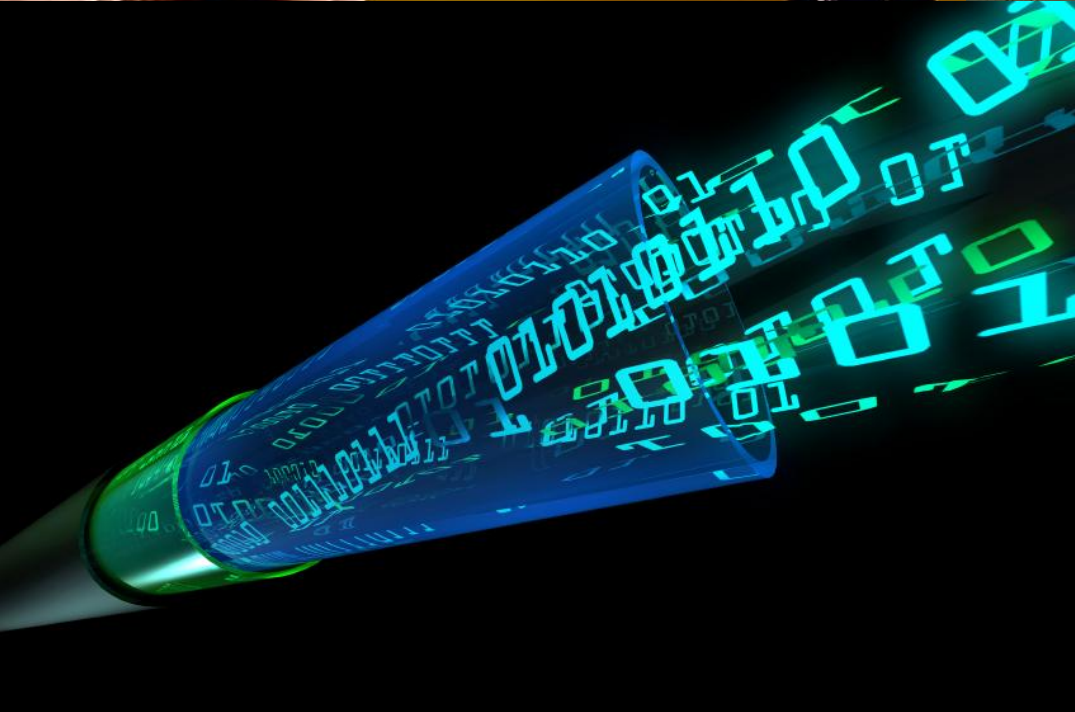


SDN Apps



<http://tinyurl.com/aqp3to2>

The Fascinating World of SDN Apps



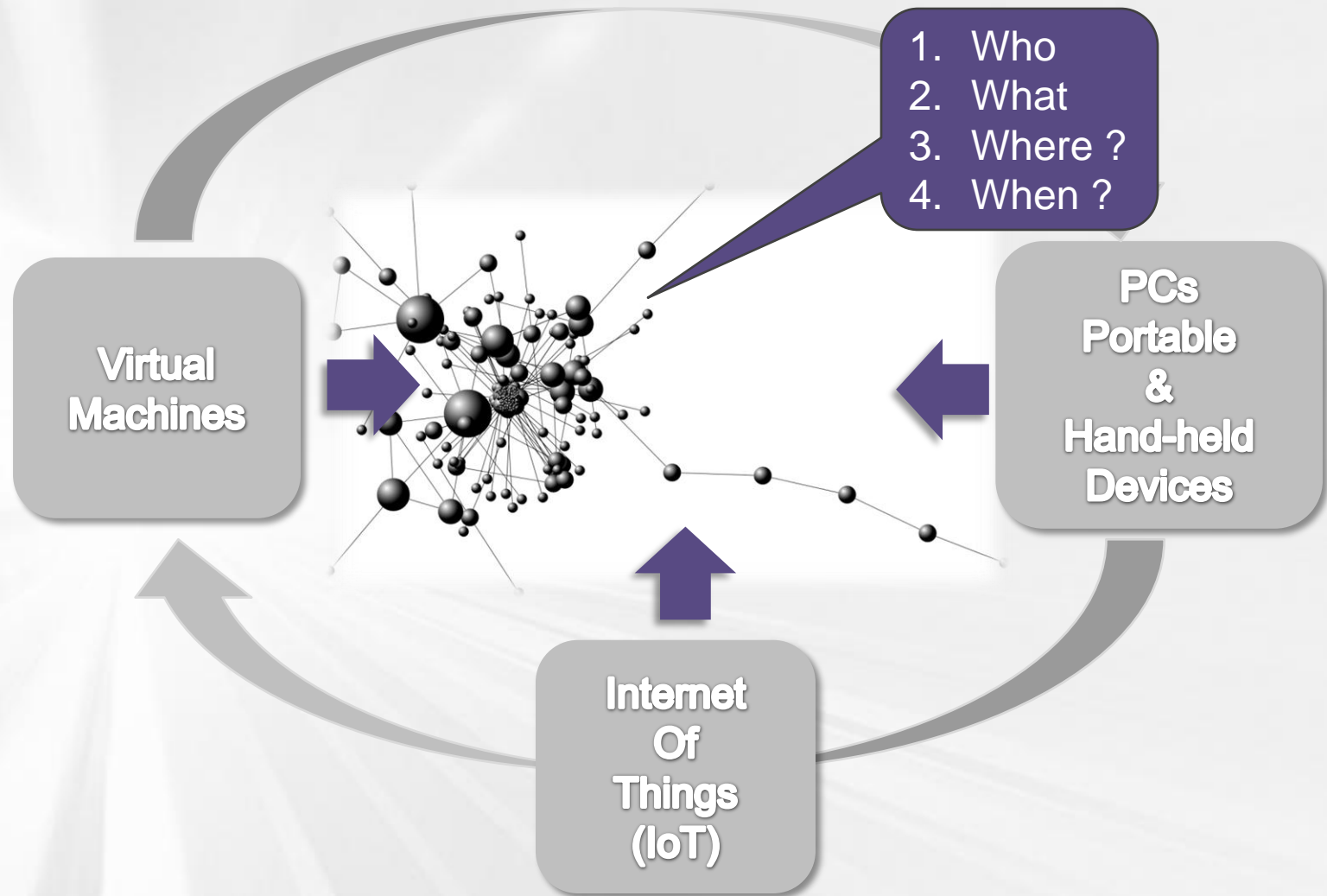
Optimal Experience ?

Turn the tap

Flip the switch

What about the Network?

SDN Redefines Programmability

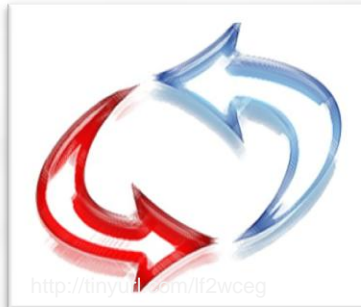


The Age of Semantic APIs

Apps from the Future



Policy-optimized Networks



Feedback-optimized Networks



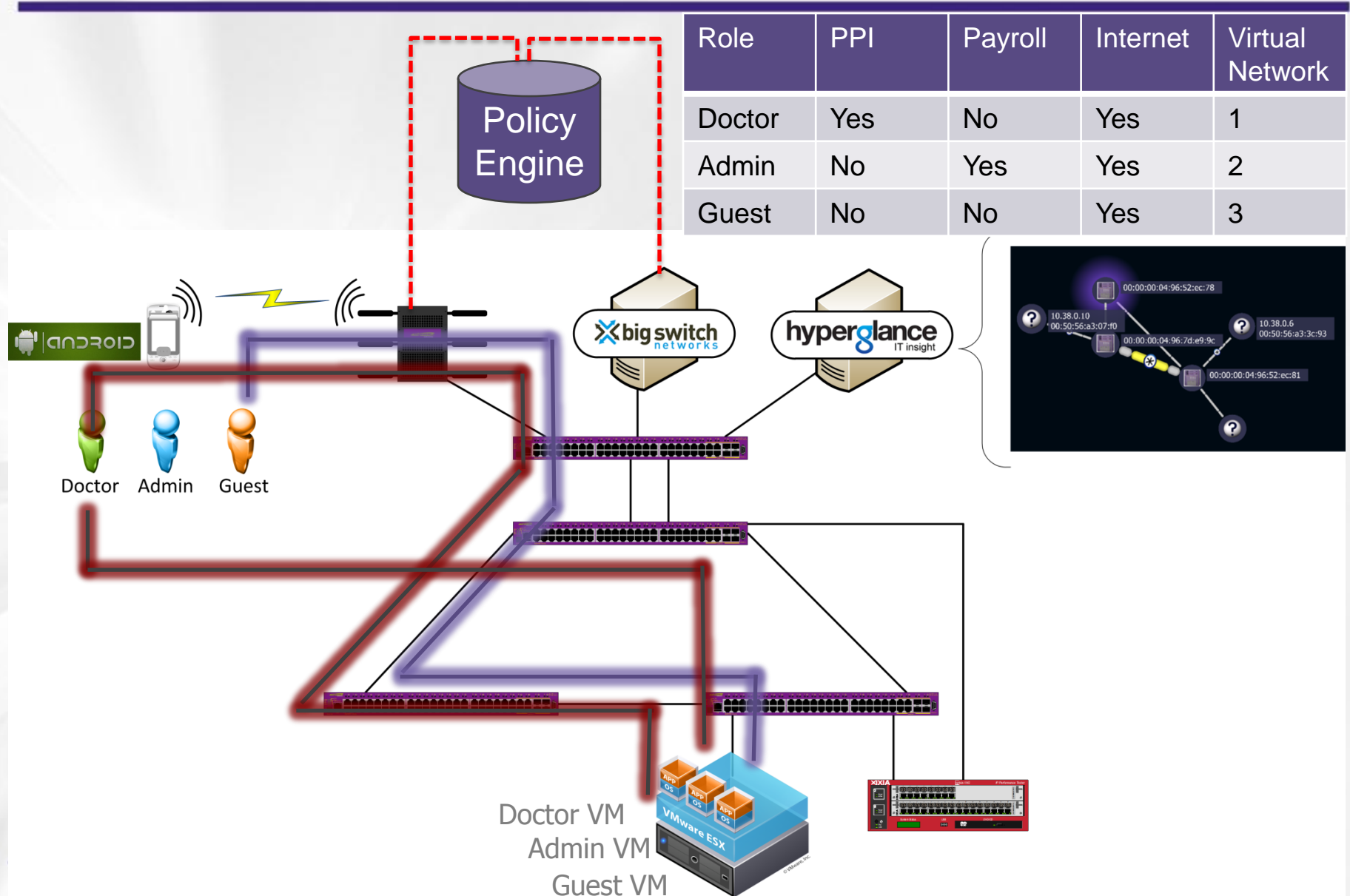
Economy-optimized Networks

MediLight: Elevate Enterprise User-Experience

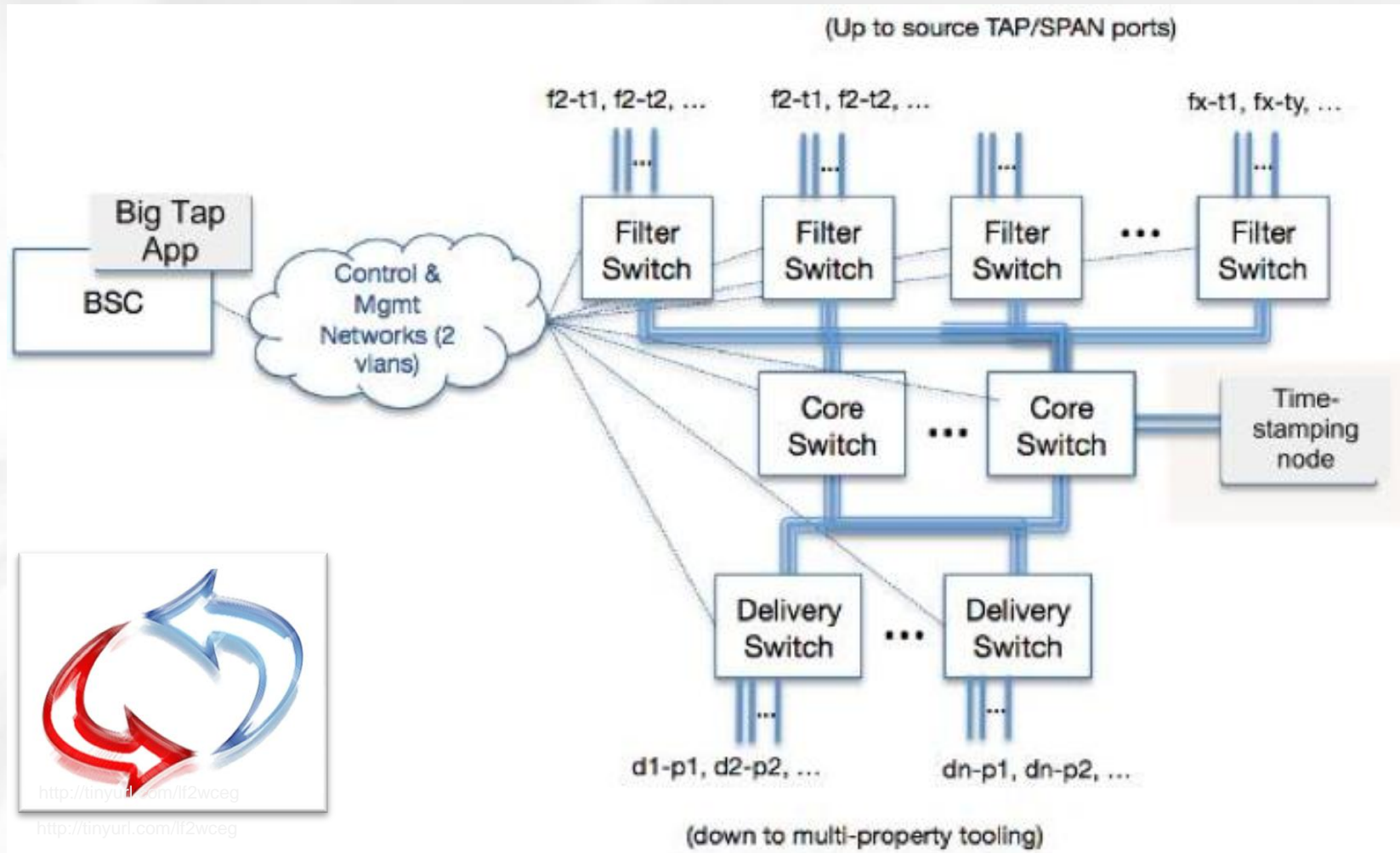
Secure & Tiered-Access to Resources Over a Network that **Adapts-On-Demand** based on

1. **Who** you are?
2. **What** application you are using?
3. **When** and for how long?
4. **Where** you are accessing it from?

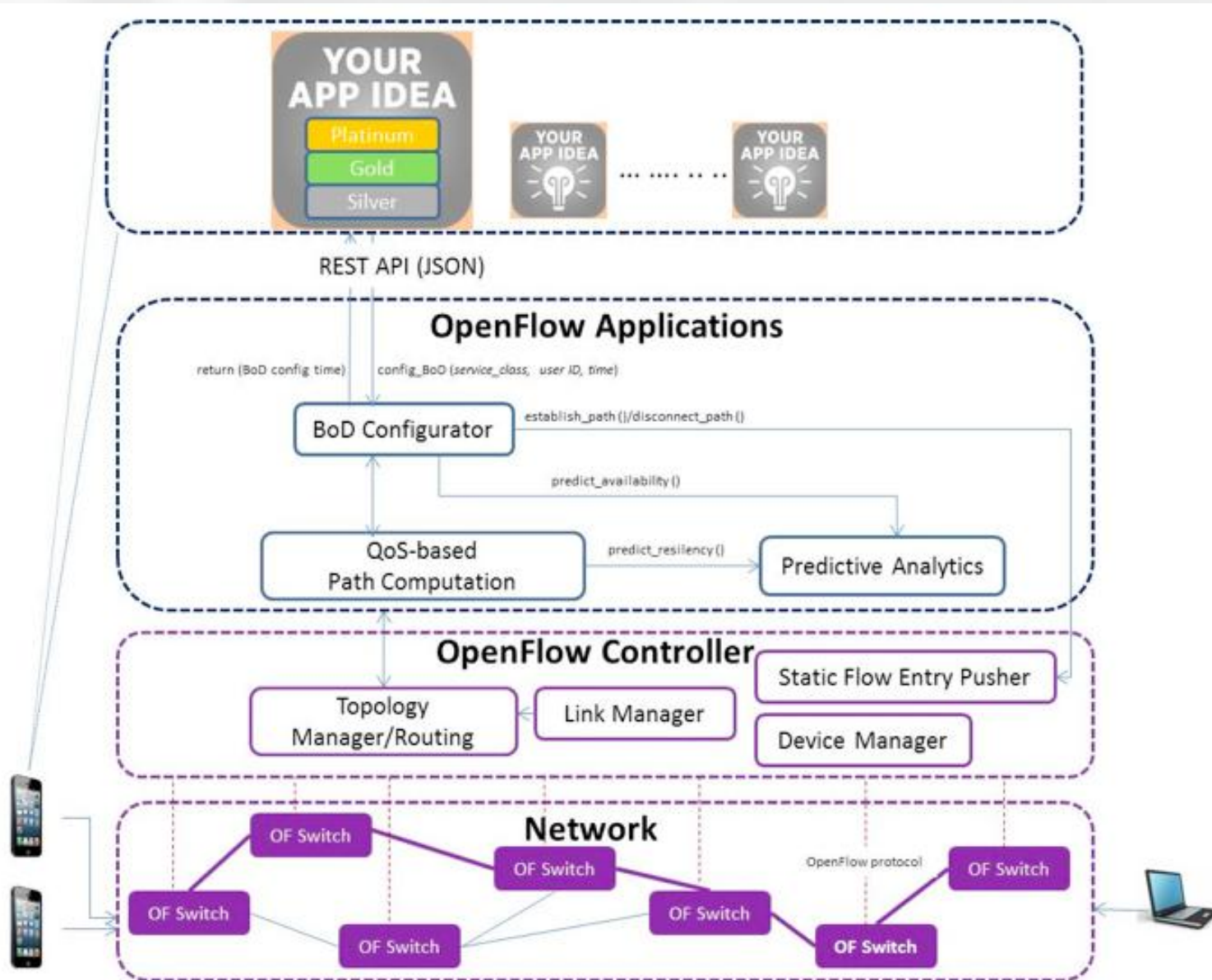
Demo Setup @ USIgnite, June 2013



Big Tap: Ubiquitous Network Monitoring



ServLight: Service-Levels Delivered On-Demand



Looking Into The Future

The Era of Game-Changing Transformative Apps in Networking



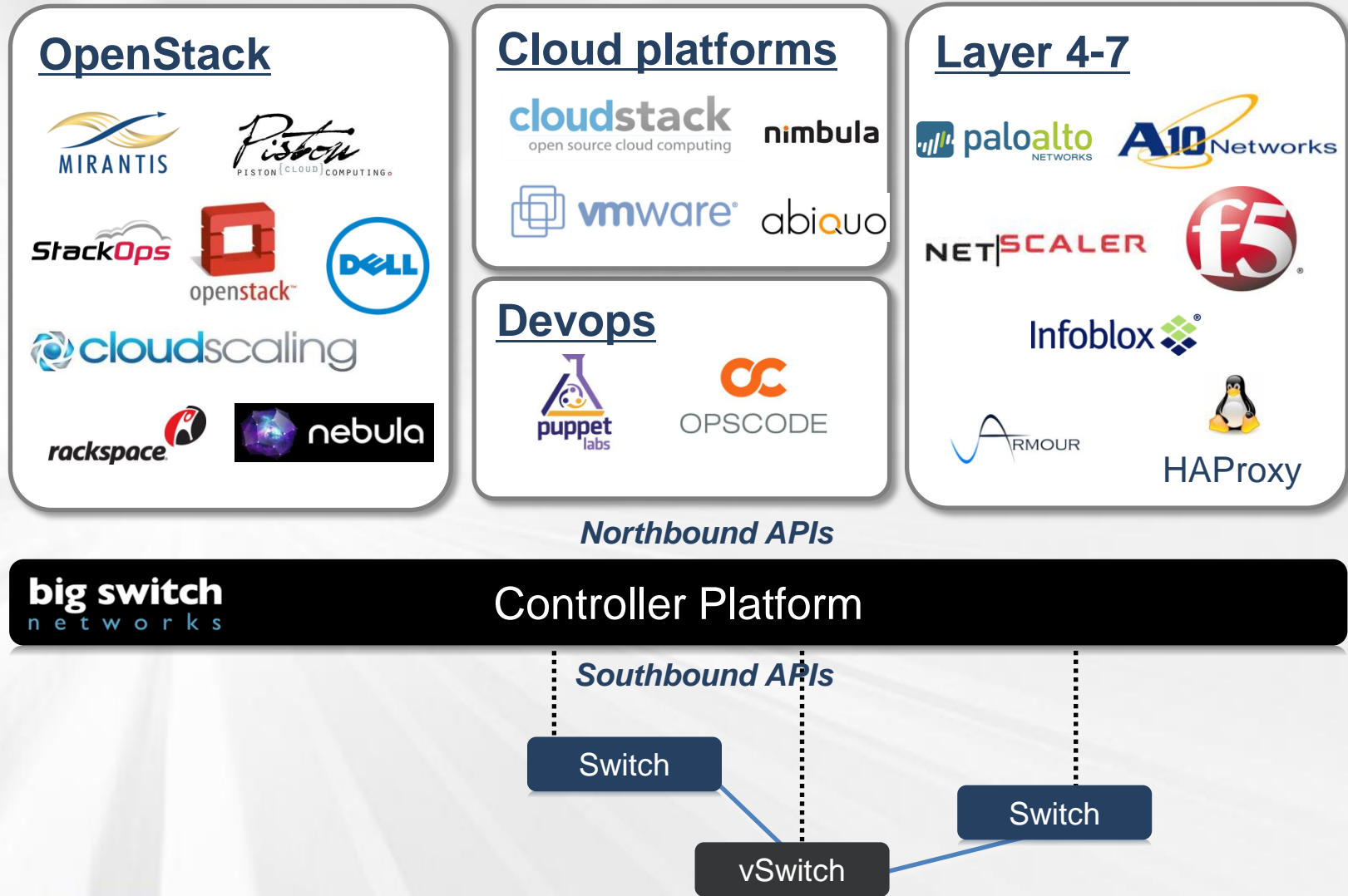
<http://tinyurl.com/amtv852>



<http://tinyurl.com/att5gvj>

Network
App Store

Legacy Application



SDN Economics

Application Automation & Simplicity

SDN Enables Comprehensive Seamless Networking

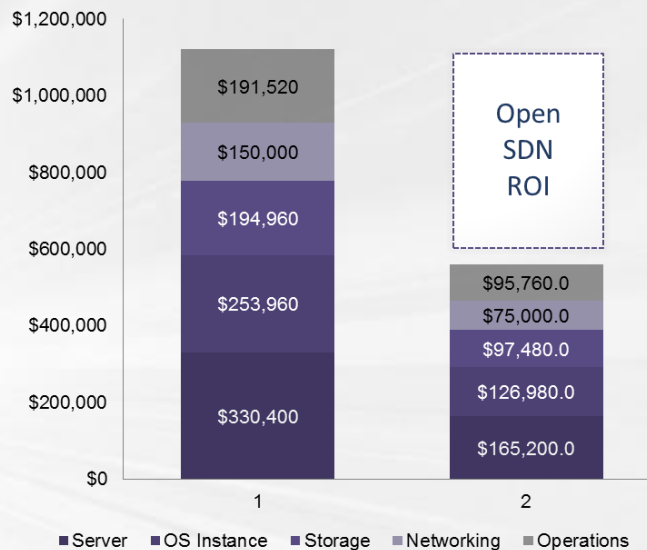


CAPEX
Savings :
\$500K/rack

OPEX
Savings:
\$30K/rack/year

Network Virtualization

L2/L3 Virtualization enables up to 50% more VMs per rack.



References:

Cappuccio, David J.; Use a TCO Model to Estimate the Costs of Your Data Center, 2012.

Patel, Chandrakant D; Cost Model for Planning, Development and Operation of a Data Center, Internet Systems and Storage Laboratory HP Laboratories Palo Alto, 2005.

2012: Gartner IT Key Metrics data, Gartner, 2012.

**Application-Based Networking
Drives Lower TCO**

Some More Industry Proof points

**Problem:**

Legal requirement to isolate certain types of data in its DC from certain class of user
Isolate networks to support ongoing mergers and acquisitions

Solution:

SDN automates network configuration, expands/contracts bandwidth as needed; Internally developed applications with Linux API for load balancing, High availability, policy management

**Problem:**

Continuous introduction of new network-connected medical devices
Different departments needed to isolate their data and connectivity from other divisions

Solution:

SDN provided visibility into the networks physical and logical configurations; Association of devices to single virtual tenant networks of the department that owns the device

**Problem:**

BYOD initiative resulted in increased incidence of malware and infections

Solution:

SDN provided a security applications that provided real time threat detection, increasing visibility to threats and enabling more proactive IT response to those threats



Looking to the Future of SDN

SDN becomes the Android of networking

- Open network OS and controller for Ethernet switches and routers
- OpenFlow and related specifications all available as Open Source

Apps for every need

- From QoS, to PBR, to Identity Management, to Mobility Management, to multi-tenancy and so on

Controller vendors eventually become application developers

- Apps come in free, premium, and freemium models

Switch vendors continue to build and sell switches

- Much like phone vendors continue to sell phones

App Stores and Marketplaces for SDN Apps



POWER OF
PERFORMANCE

Thank You

