SDN Approach to Large Scale Global Data Centers

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Welcome!

SDN : The New Frontier

Boldly going where no Network has gone before

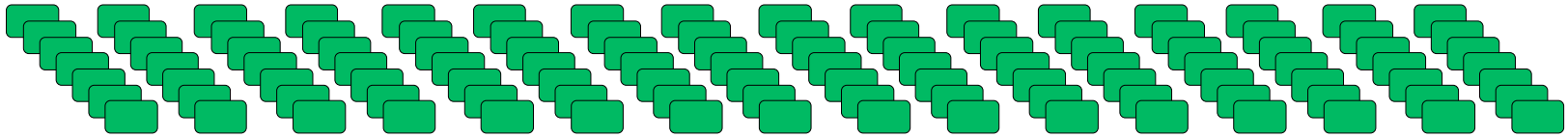
But where Servers and Storage have been living…

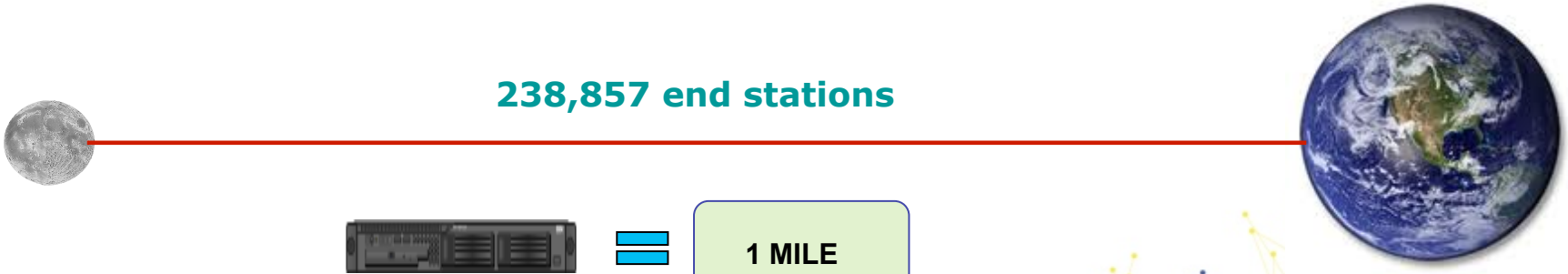
How Big is Your Data Center?

100 End Stations?

3200 End Stations?

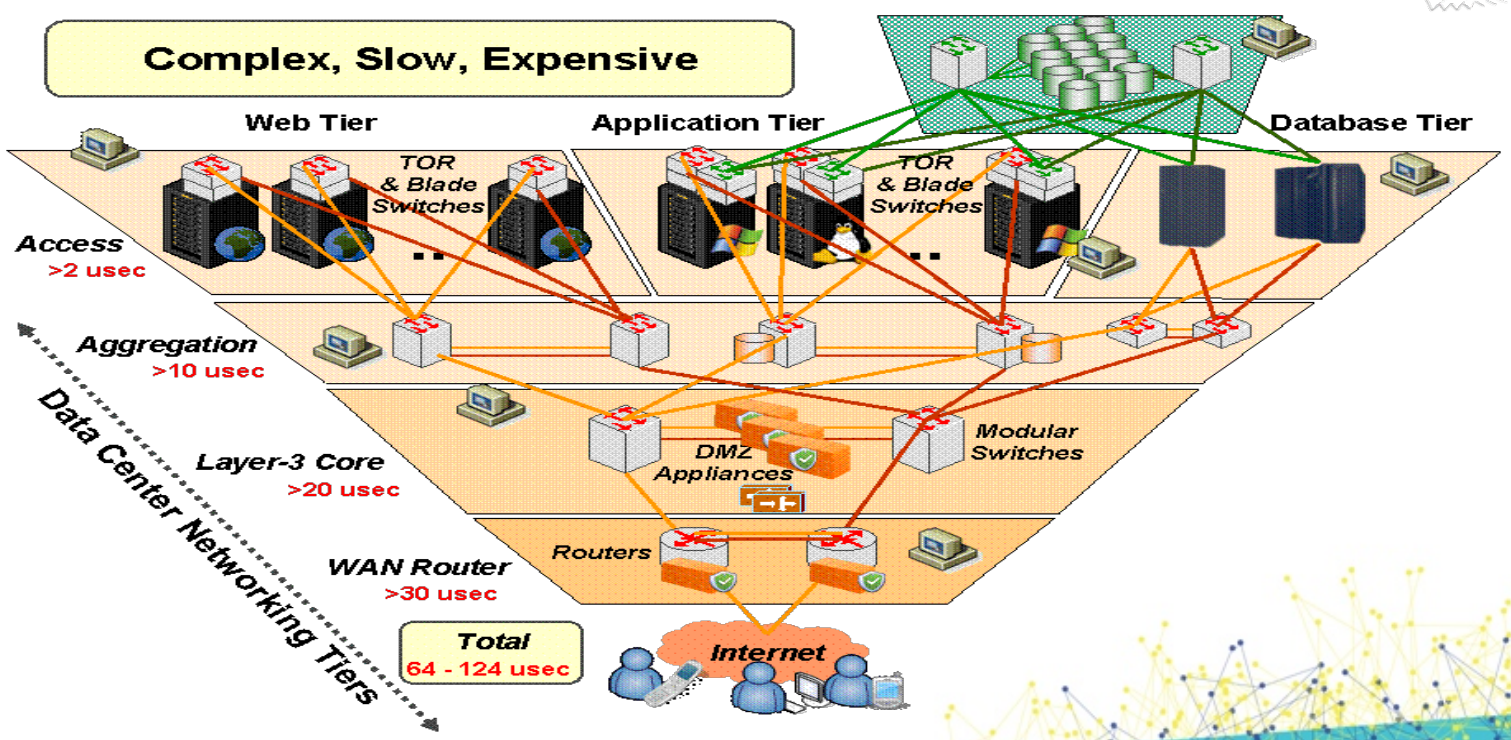
3000000 End Stations?





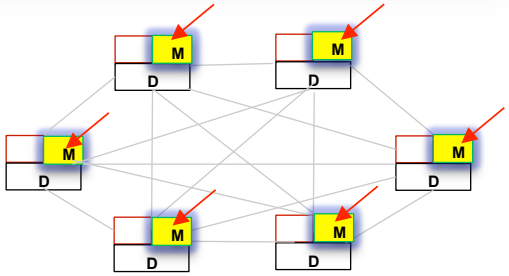
What's the network to do?

Business as usual?



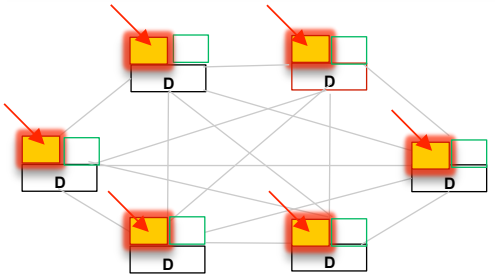
Data Centers at Large Scale

Configuration & Management



Every network element has Control (C), Management (M) and Data (D) plane

Complex Protocols



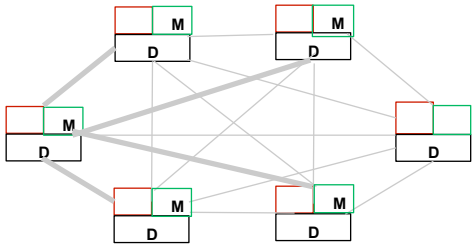
Simply not feasible to manage large networks based on current model

Very complex to build large scale stable networks

Server Virtualization adds tremendous complexity to the network

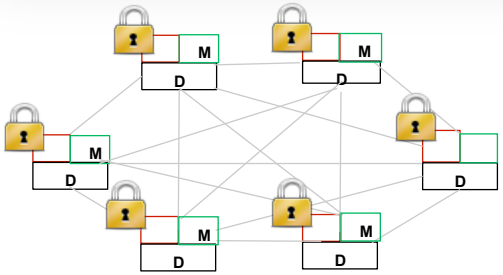
Why are Networks Inefficient?

Local View



Network is not able to make best use of available resources

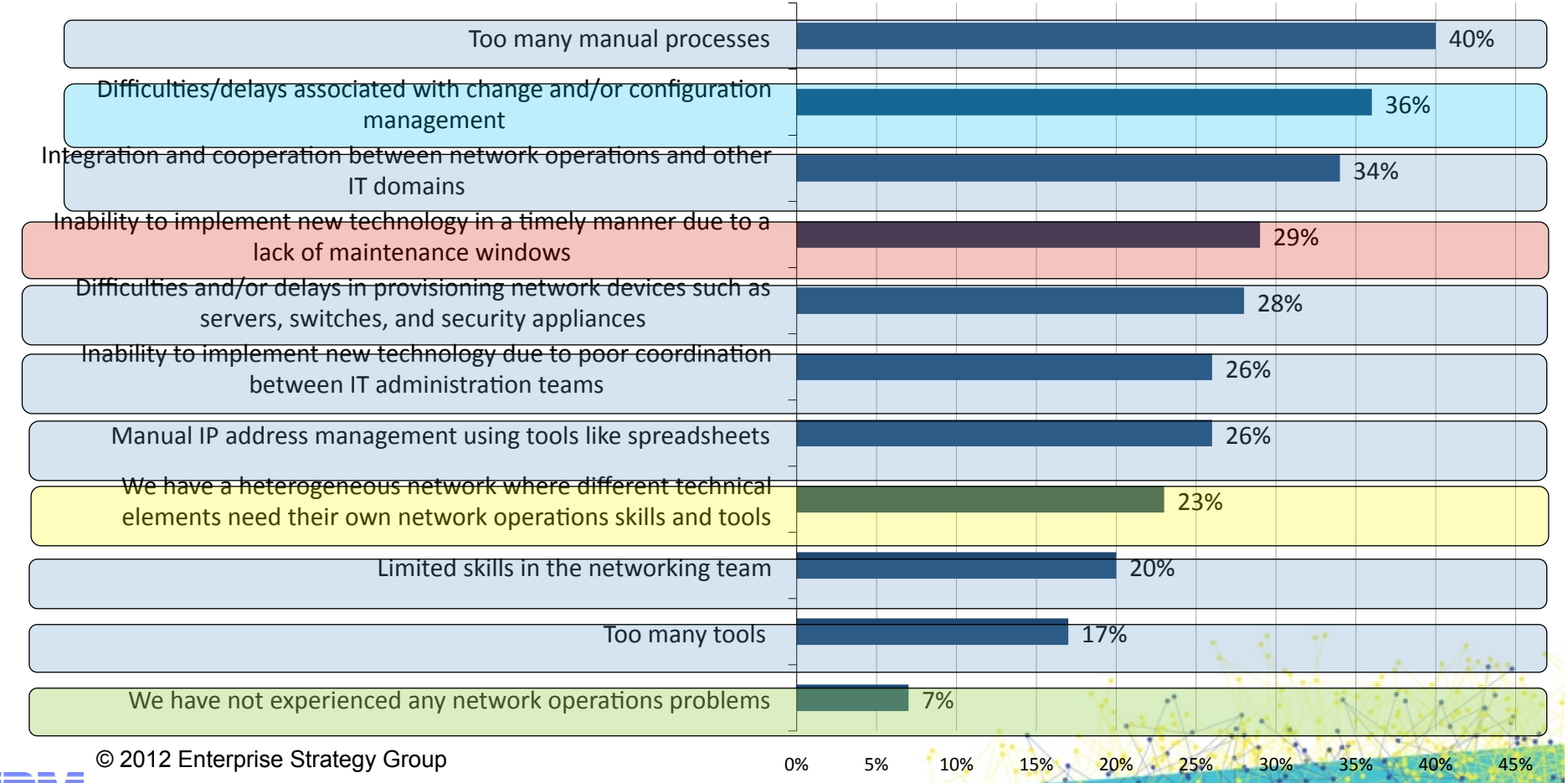
Closed Network



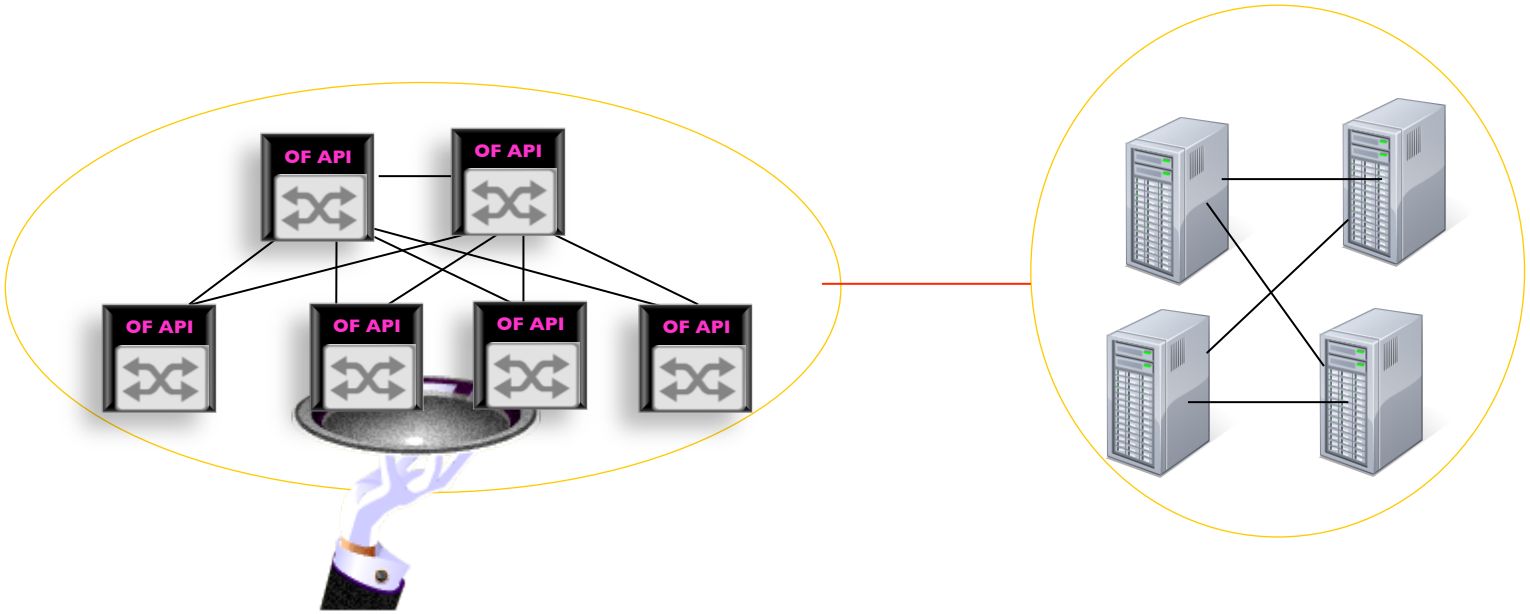
Closed networks are hard to change

Which is one is you?

Has your organization experienced any of the following network operations problems? (Percent of respondents, N=280, multiple responses accepted)

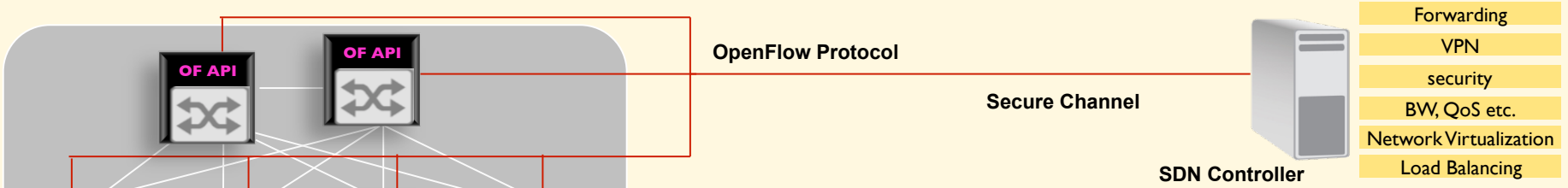


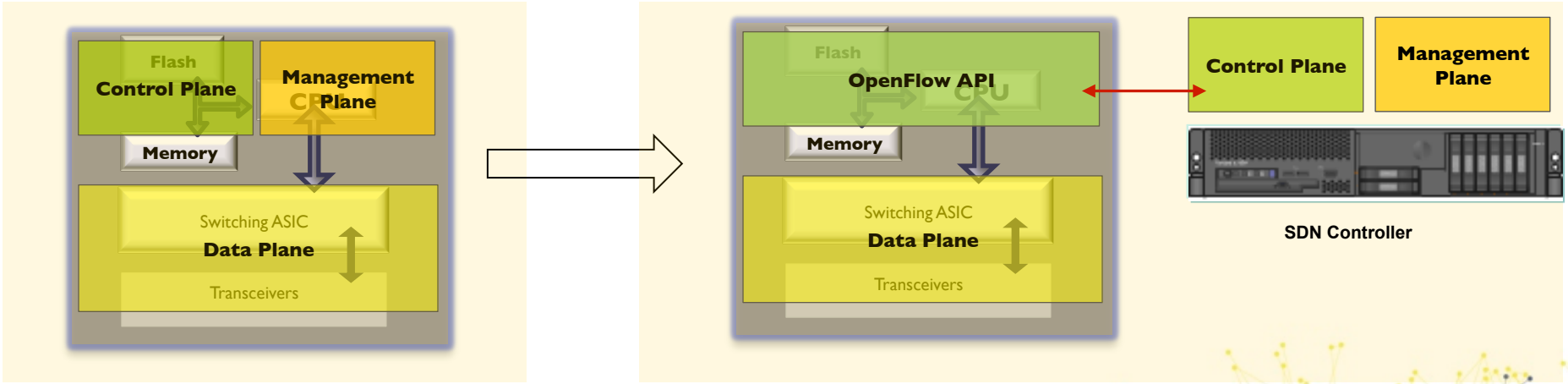
Network of the Future



- Easy to scale and manage
- Programmable to meet application needs in real time
- Open standards based programmable network elements
- Presents Network As A Service (NAAS) and Network As An Infrastructure (NAAI)

Software Defined Network: Let's build a smarter network



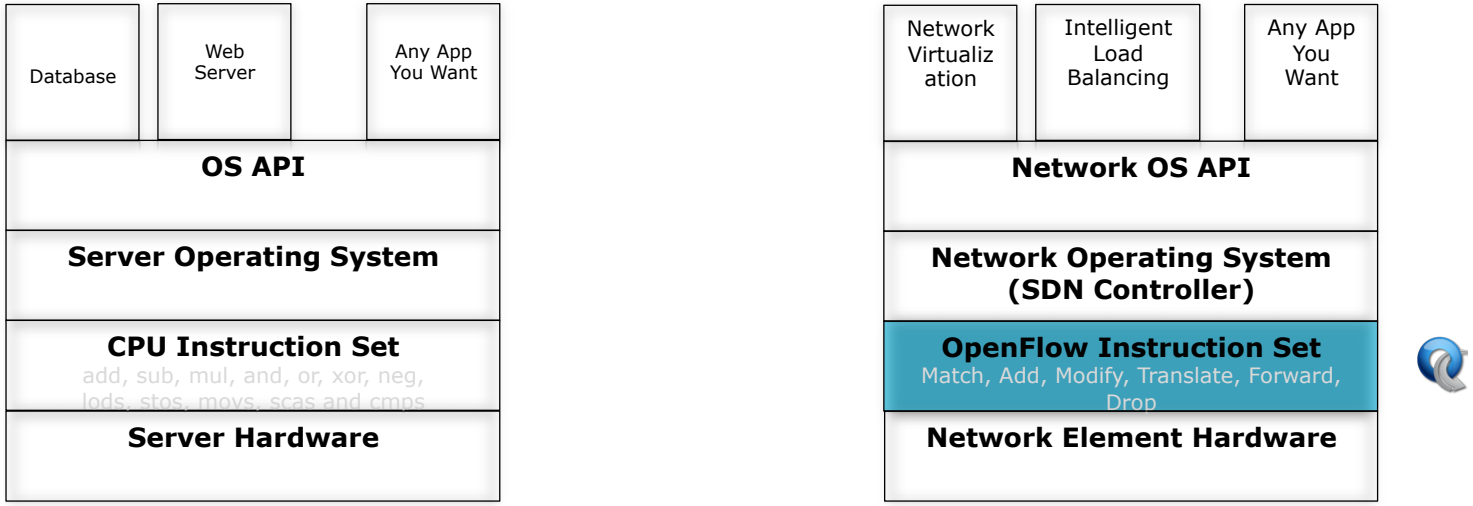


Traditional Network Element

OpenFlow Network Element

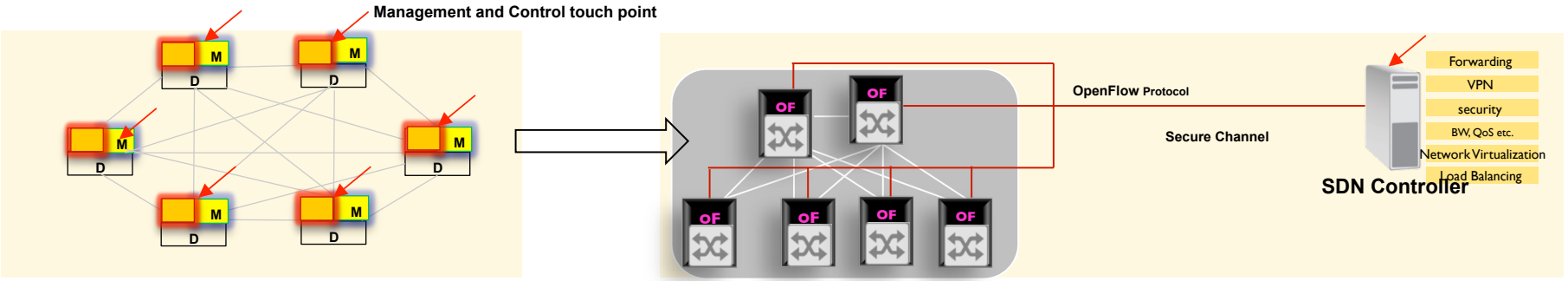
SDN with OpenFlow : An Architecture for large scale networks

An Analogy



Open programmable network

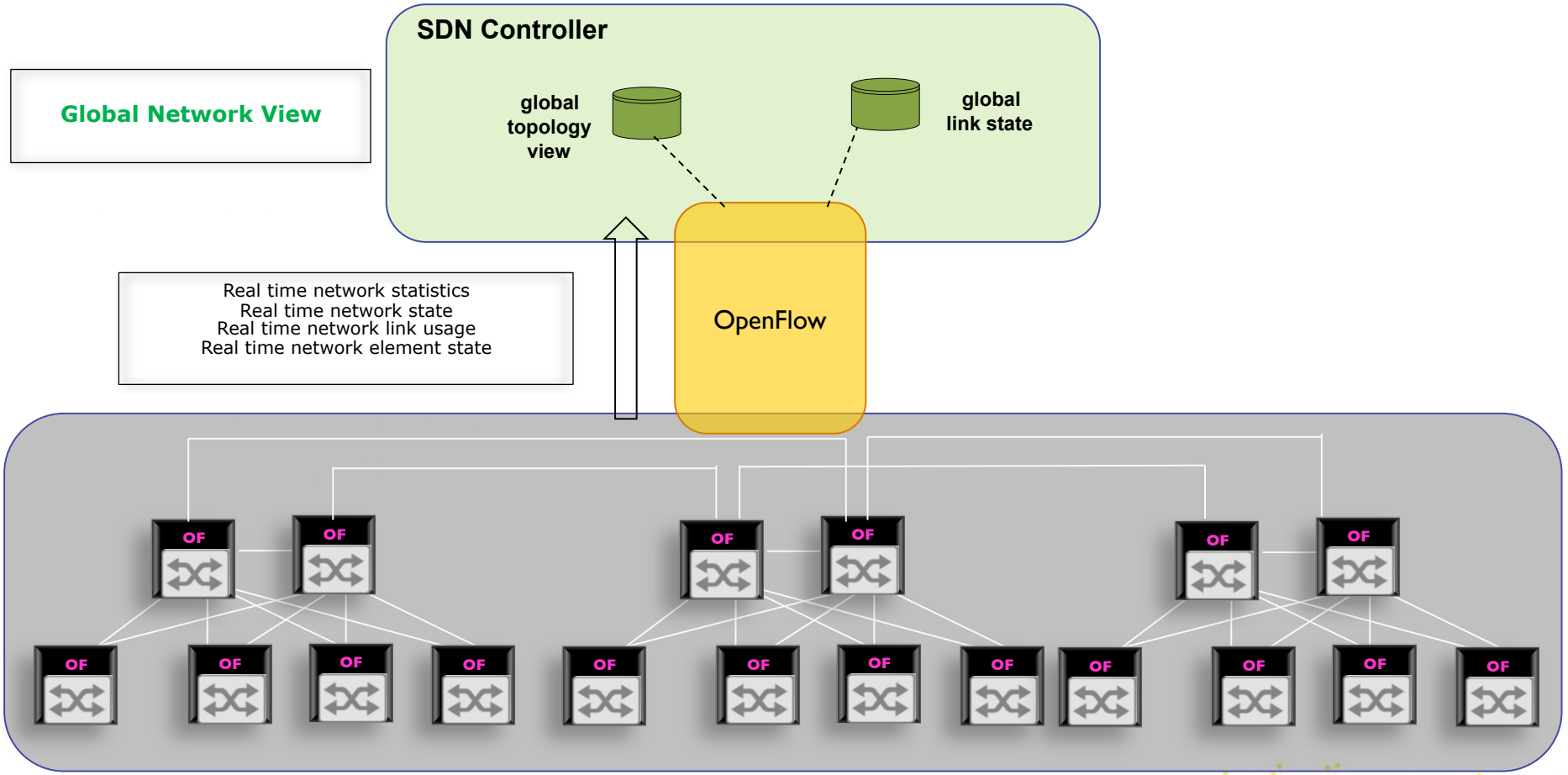
SDN: Simple, Scalable Network Management



- Standard based homogenous network
- Each element has same configuration, management and control interface
- Automated configuration, management and control of the network
- One touch point (SDN Controller) versus thousands of touch points (Network Elements)

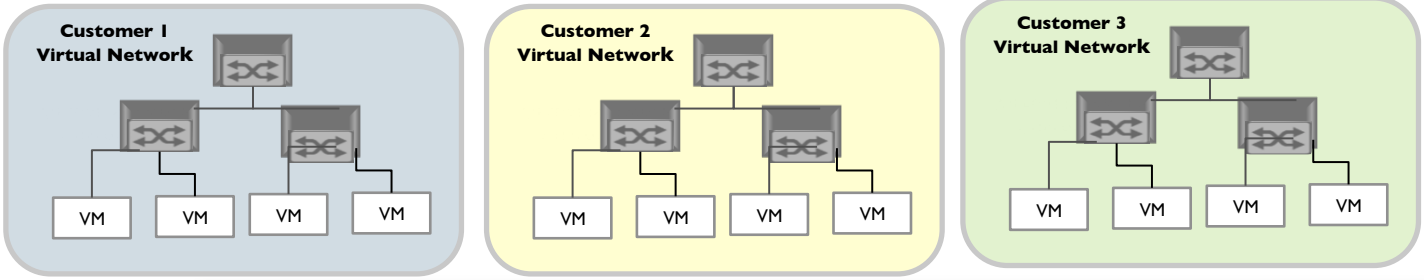
- Greatly reduce OPEX cost of the network
- Greatly reduce network management complexity
- Greatly reduce network downtime

SDN: Smarter Network for Large Scale Deployment



- Global view of the network allows for
  - quick network convergence
  - Efficient use of all available bandwidth
  - Easy addition or removal of network capacity

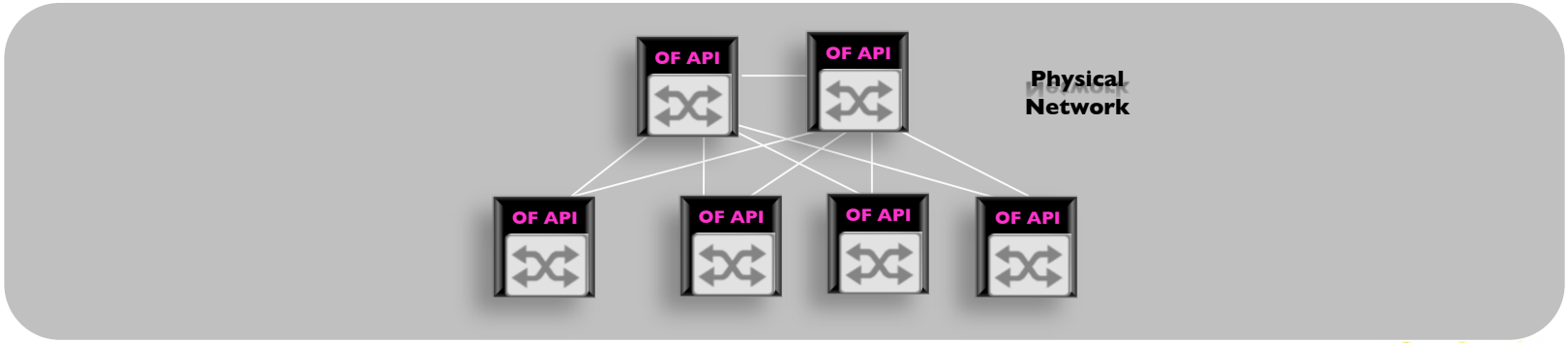
SDN: Virtualizing the Network



SDN Virtualization Plane

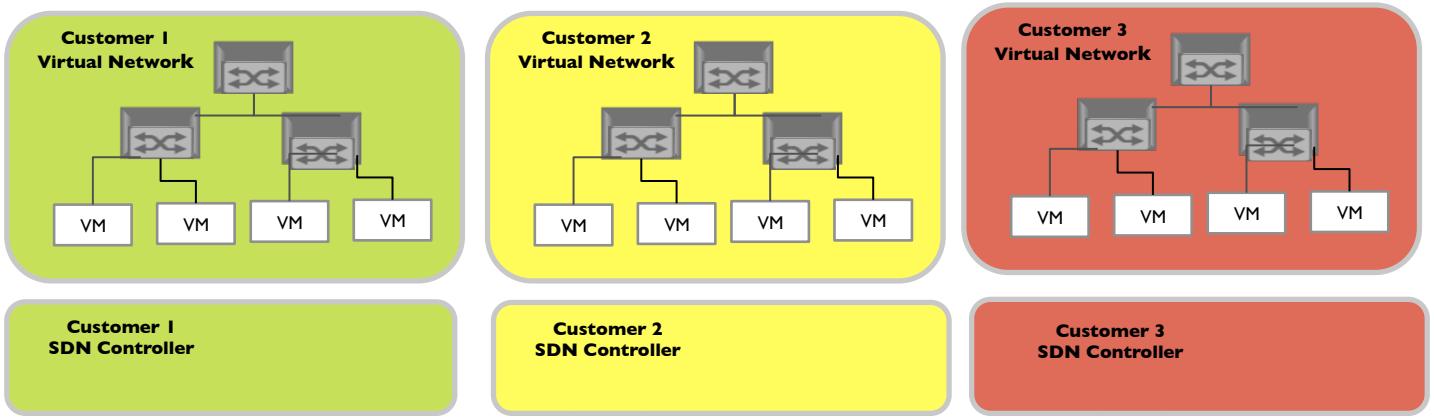
- OpenFlow virtualization of physical network infrastructure
- Wire once physical network
- Program as per business needs

SDN Controller

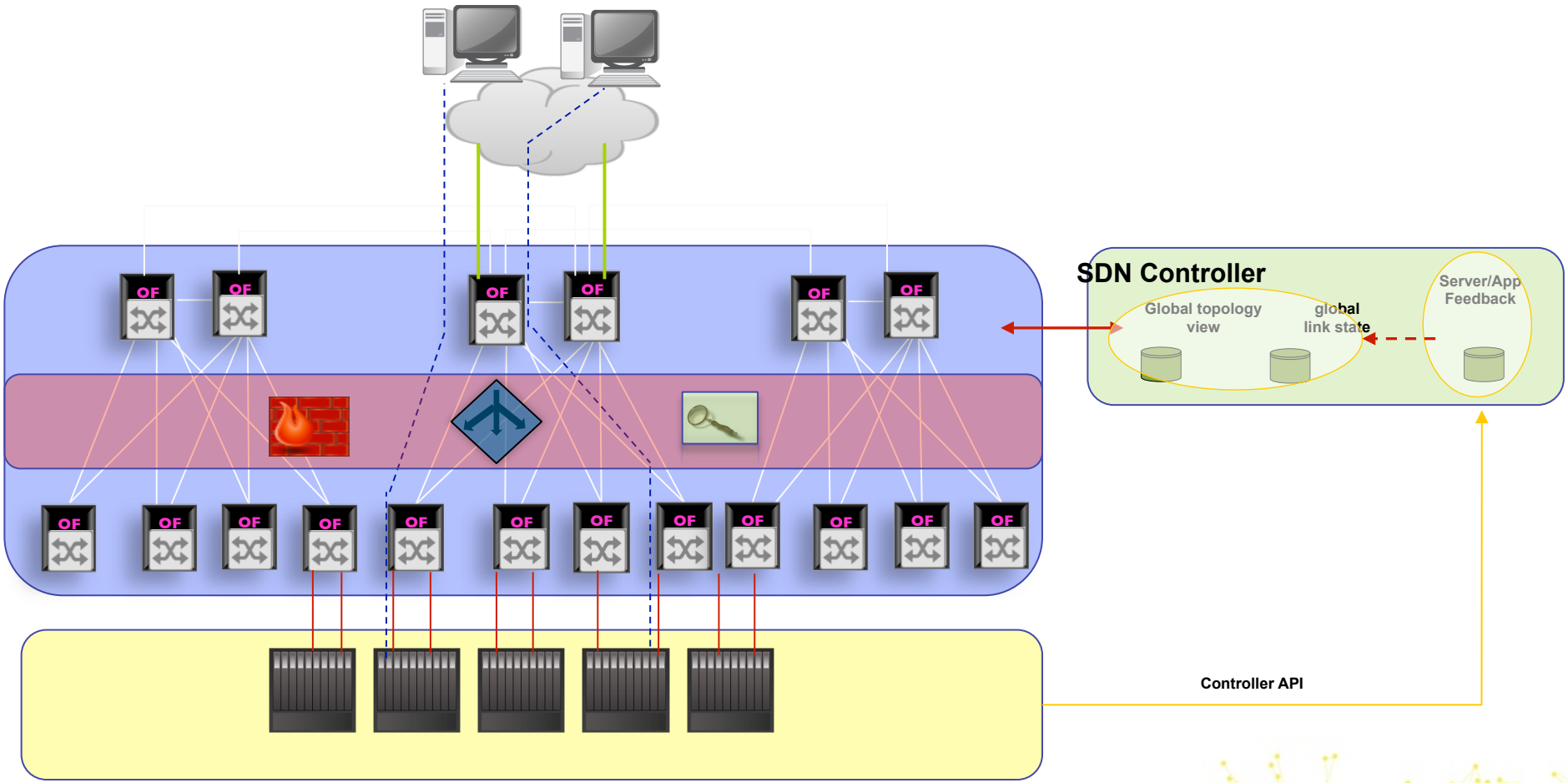


Network As An Infrastructure

SDN: Cloud Multi Tenancy – Build for Scale

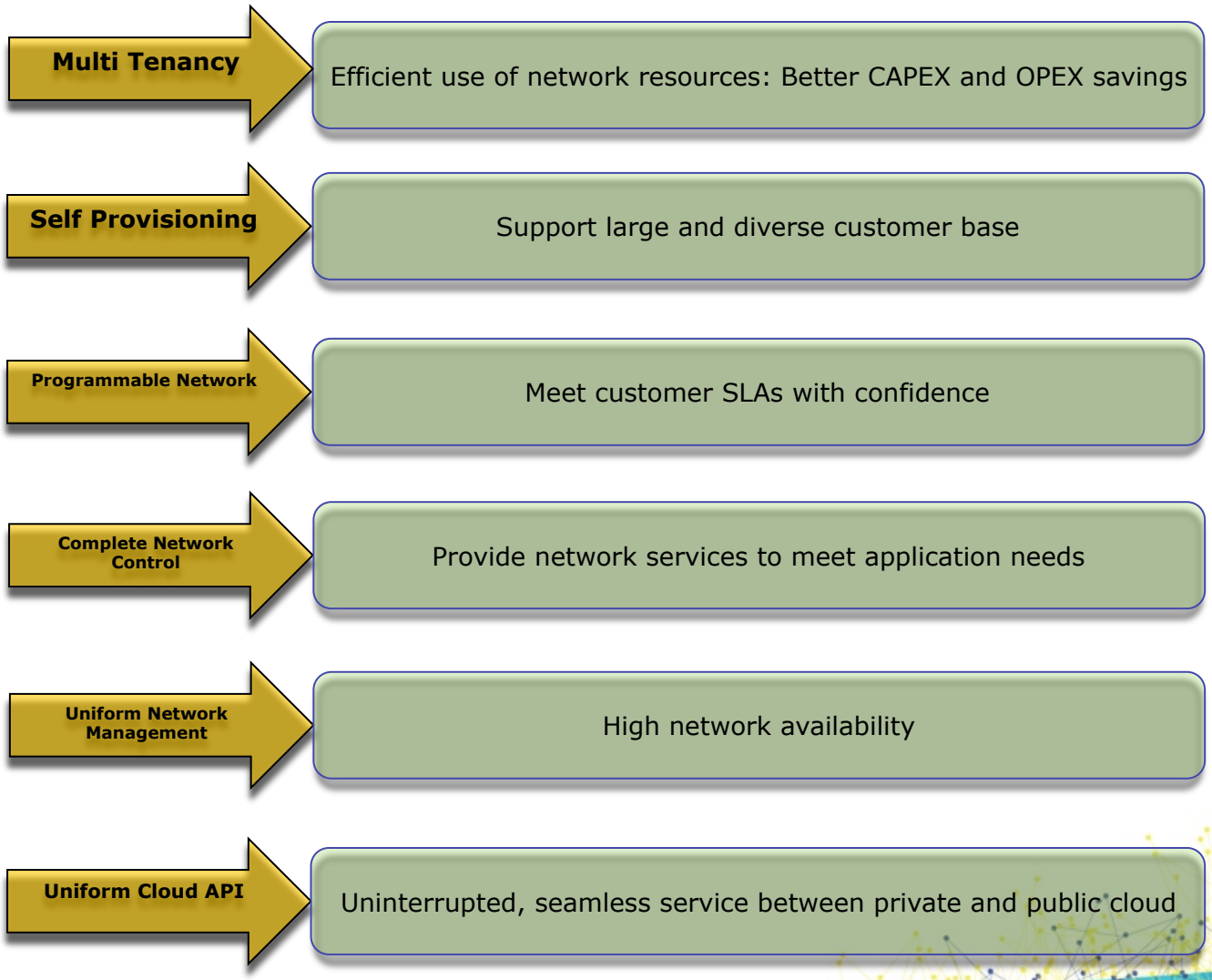


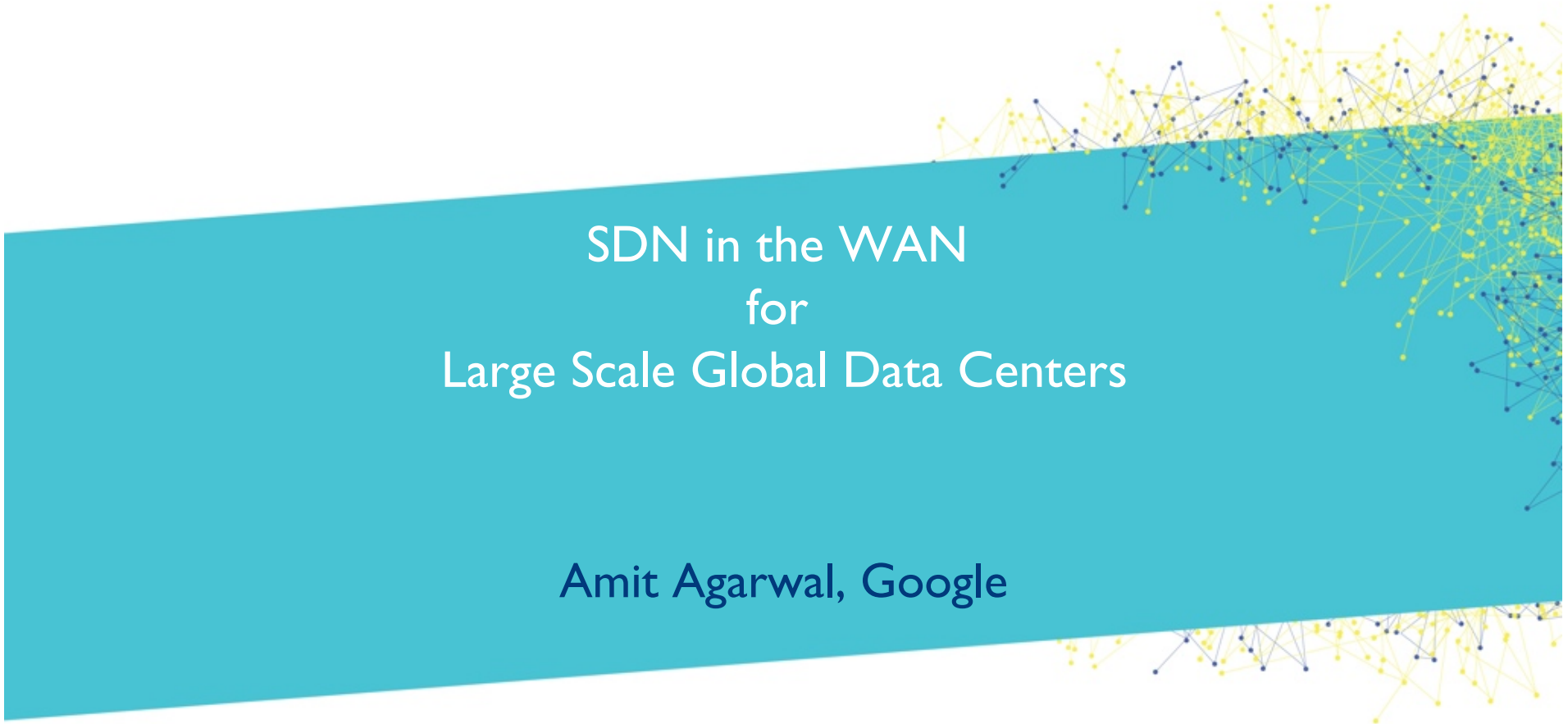
SDN: Smarter use of Network and Appliances



- **Appliance sharing let's network provider use the resources more effectively**
- **A very important attribute for large scale Data Centers**

OpenFlow Based SDN for Large Scale Data Centers





SDN in the WAN
for
Large Scale Global Data Centers

Amit Agarwal, Google

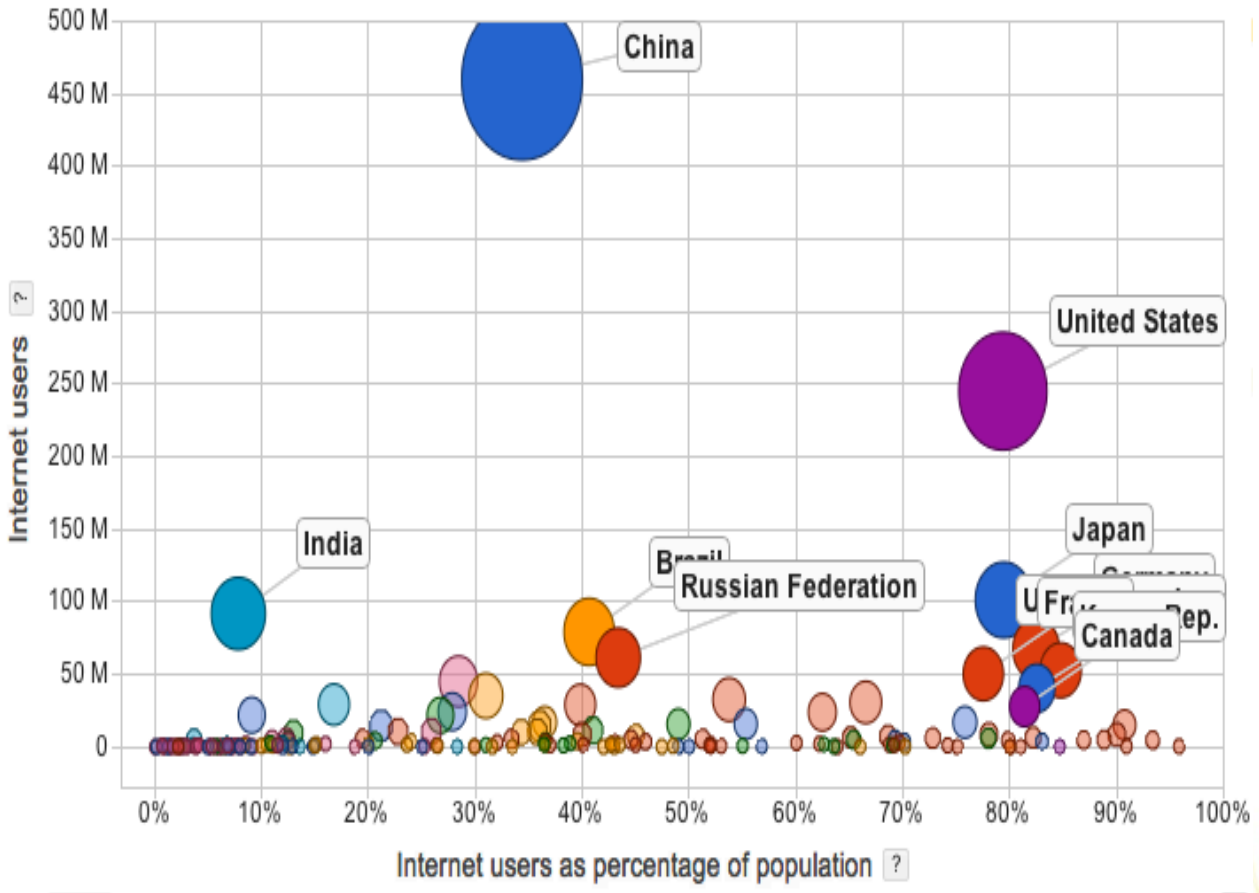
datacenter

No ~~man~~ is an island

Agenda

- Trends
- User requirements
- SDN Benefits

More global and a lot more users



2000

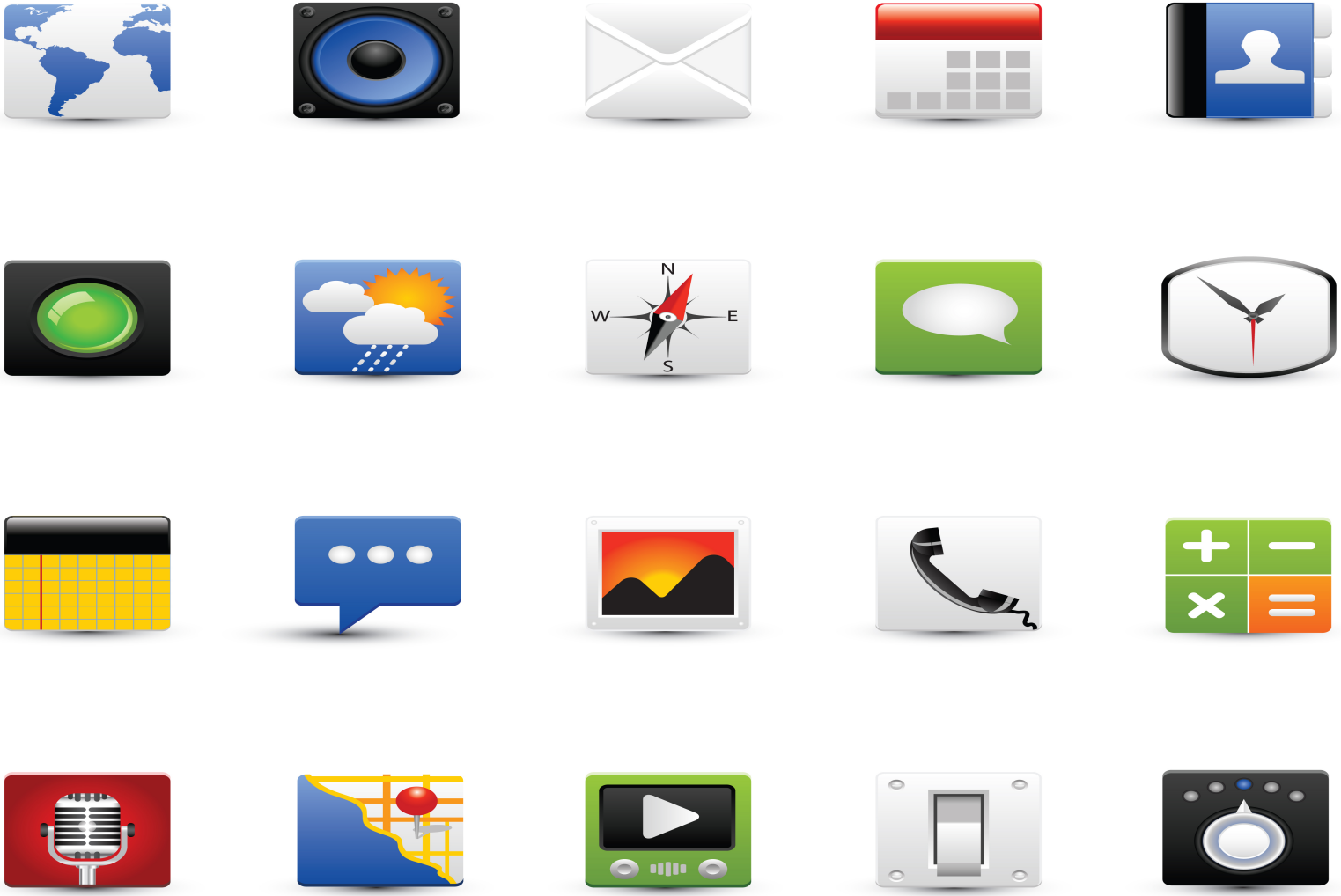
World Bank Data in Google Public Data Explore http://www.google.com/publicdata

Smarter and powerful end points

- As powerful as desktops few years ago
- 4G, HD videos, high resolution camera, NFC chips, …
- Ubiquitous
- Disposable

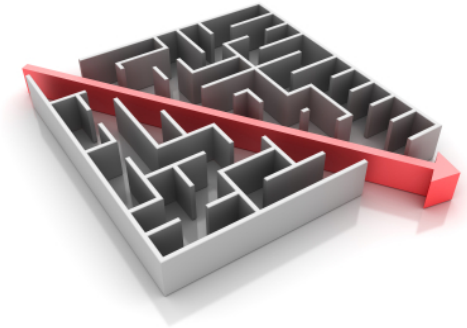
Lots of cellphones, too few toilets – Indian Census 2011

Apps & Services



More, more and more data

User Requirements



Fast
&
Interactive

Free
or
Low Price

24x7
availability

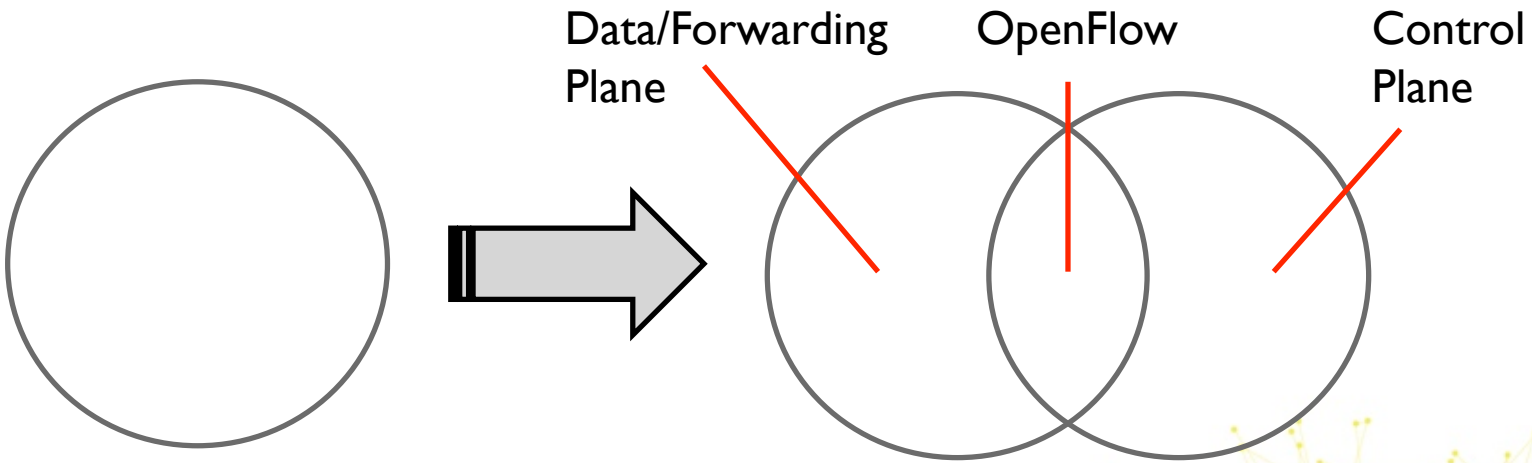
Faster Connection
Move data closer
to users

Lower cost
of
running service

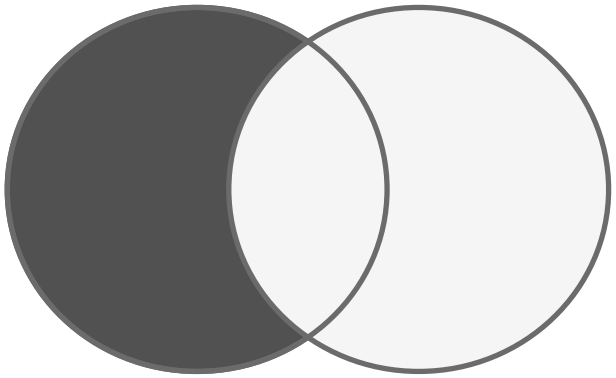
High
availability

Software Defined Networking

- Control plane decoupled from data plane
- Standard protocol for information exchange



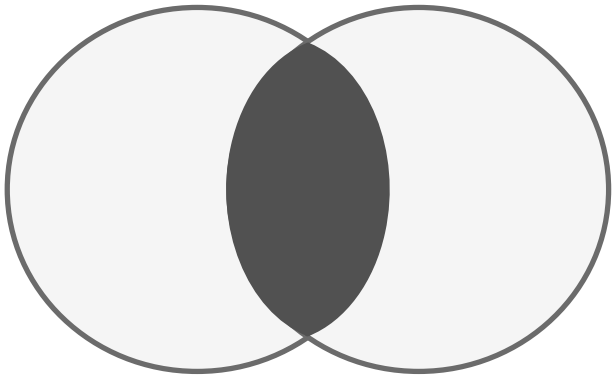
Network Devices (Data Plane)



- Simpler
- More Scalable
- Easier deployment & upgrades

- Lower Capex and Opex
- Higher availability

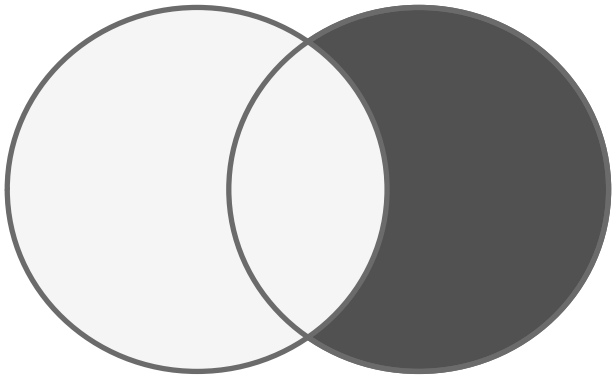
OpenFlow (Information Exchange Protocol)



- Interoperability

- Choice of gear from multiple vendors
- Decouples network device from management/ control software

Network OS (Management/Control Software)



- Centralized Management
- Global Optimization
- Application Driven Networking

- Lower downtime and Opex
- Higher utilization
- More network services

Summary

SDN has huge potential

- Better network management
- Higher utilization and availability
- Unleash innovation in network services

Enjoy the ride!

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