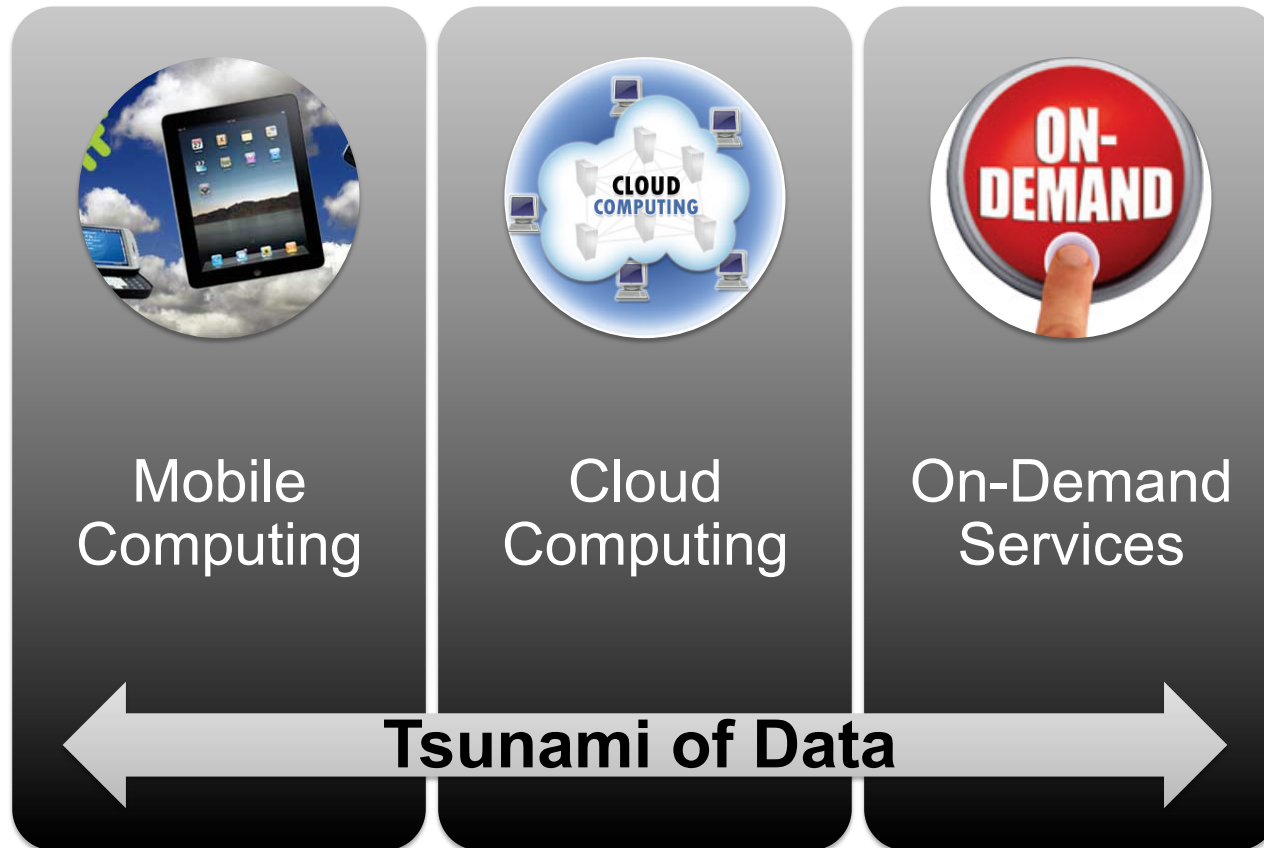
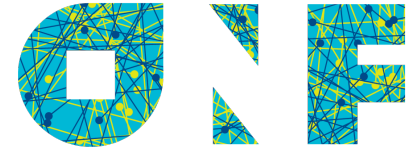




# SDN, OpenFlow, & ONF: Looking forward to 2013

Dan Pitt, Executive Director  
Open Networking Foundation  
[dan.pitt@opennetworking.org](mailto:dan.pitt@opennetworking.org)

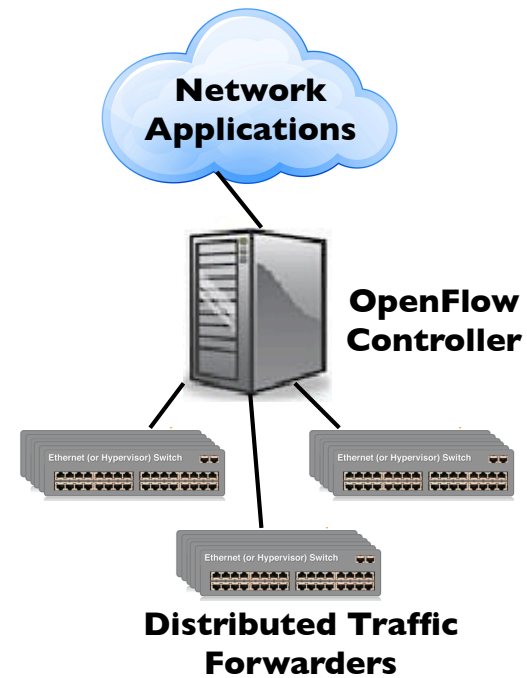
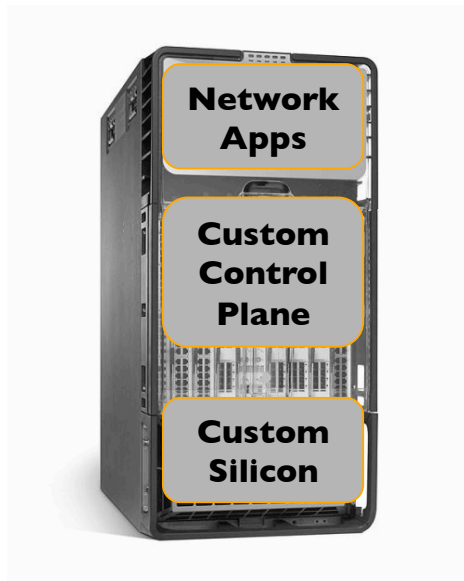
# Drivers for SDN



# New Networking Approach: SDN



Current network equipment design  
monolithic/tightly integrated



(remember mainframe computers?)

# Key SDN Principles



## Abstraction

- Decouple business applications
- Decouples control plane
- Decouple Virtualized configuration



## Programmability

- Enable innovation/differentiation
- Accelerates new feature and service introduction



## Centralized Intelligence

- Simplify provisioning
- Optimize performance
- Granular policy management



# OpenFlow: Instruction Set for SDN

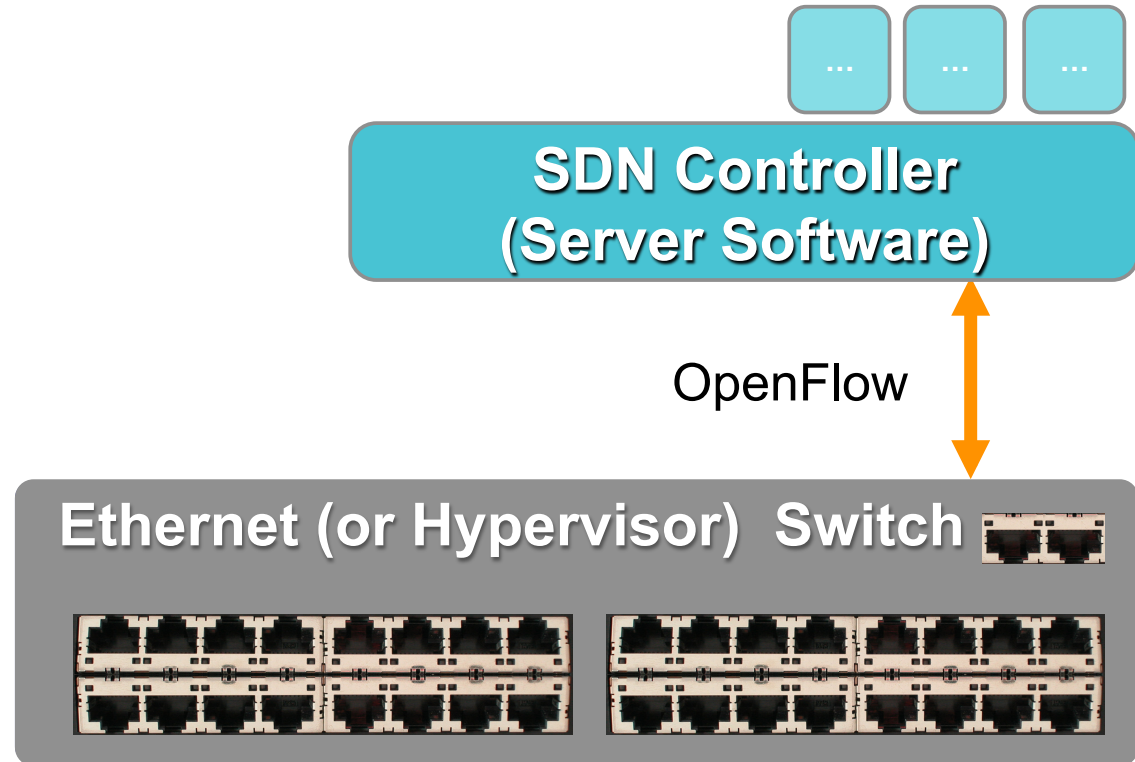


Programmable API that allows external software (“controller”) to control the data path of a switch

**OpenFlow Controller**

Programs the network, bypassing conventional L2/L3 protocols

Prepopulate or send instructions dynamically



# 2012—OpenFlow Brings Cloud Transformation for Nippon Express



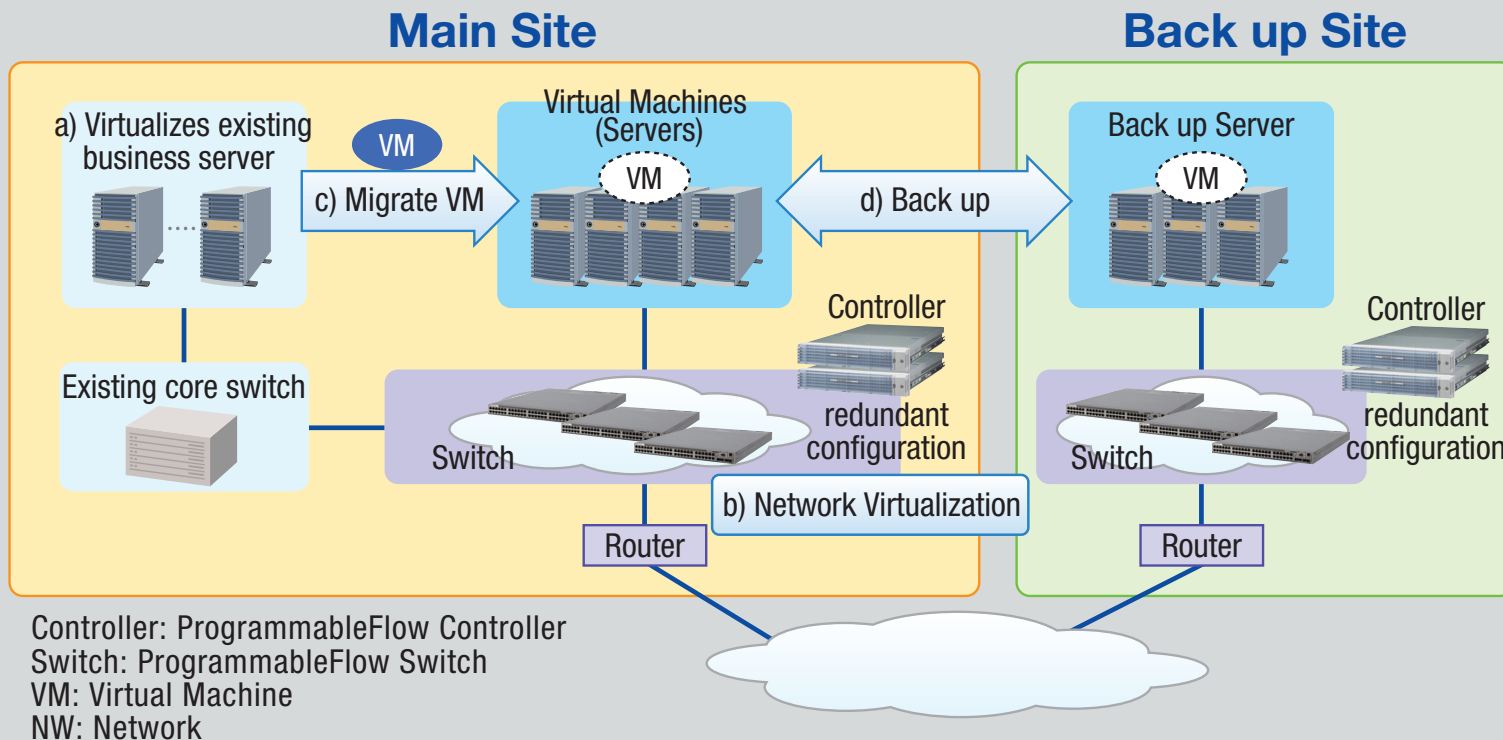
- **Challenge:** Design a private cloud to connect 388 locations, in 210 cities, in 37 countries
- **Design Considerations:**
  - Reduce costs and provide new source of revenue
  - Begin immediately with complete transition by 2014
  - Create a virtual environment that supports on-demand networking
  - Deliver a superior customer experience



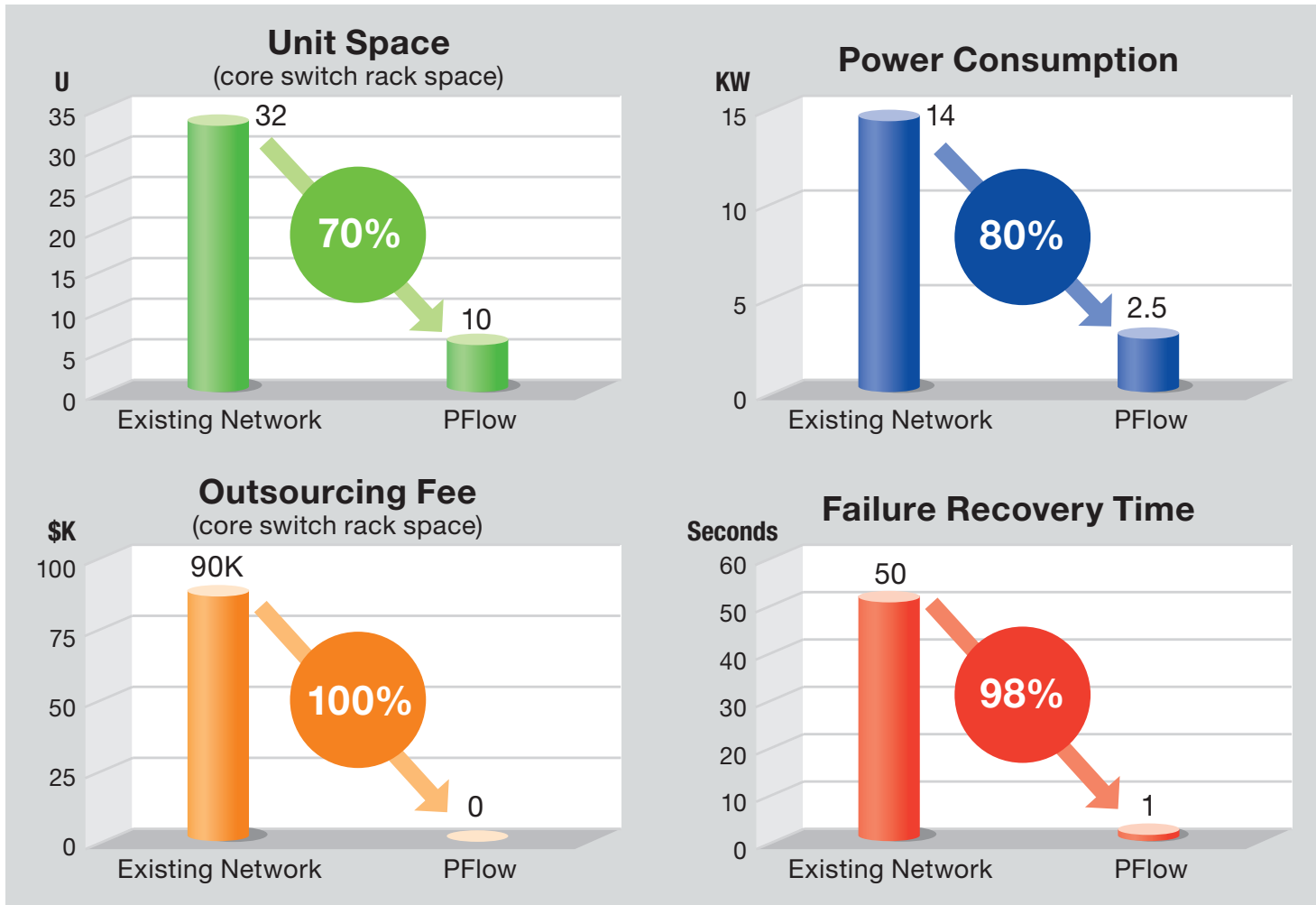
# The Solution: NEC UNIVERGE Programmable Flow Series



- a) Promote Server Virtualization to achieve private cloud (The network operation is challenge)
- b) Virtualizes network to achieve more flexible operational environment
- c) Migrate VM to virtual network environment sequentially
- d) Back up the priority business systems

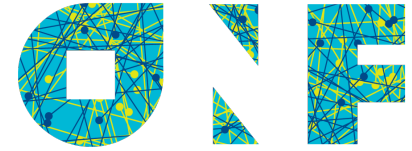


# Impressive Results with NEC Programmable Flow

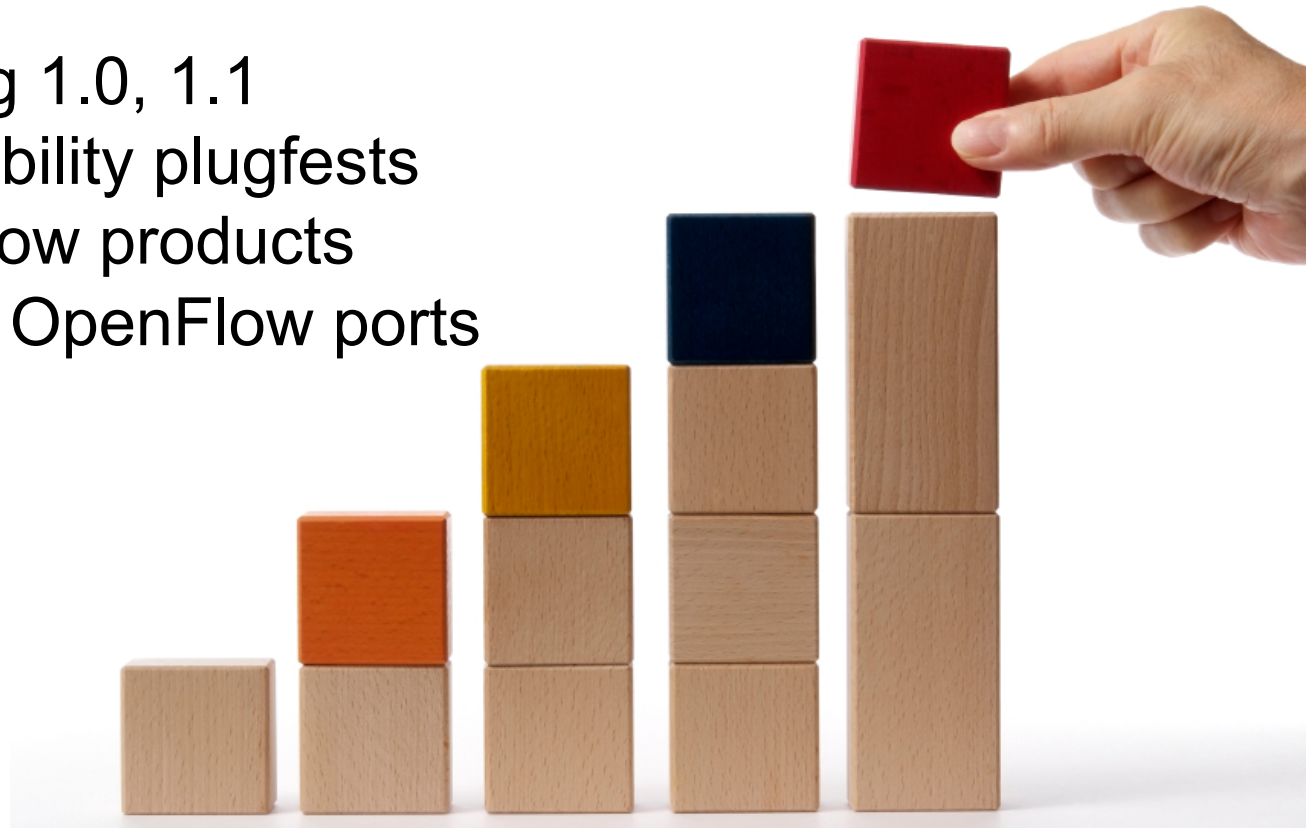




## 2012—Building the Foundation



- **68%** membership growth
- **2** major new standards
  - OF 1.3.x
  - OF-Config 1.0, 1.1
- **2** interoperability plugfests
- **64+** OpenFlow products
- **30+ million** OpenFlow ports



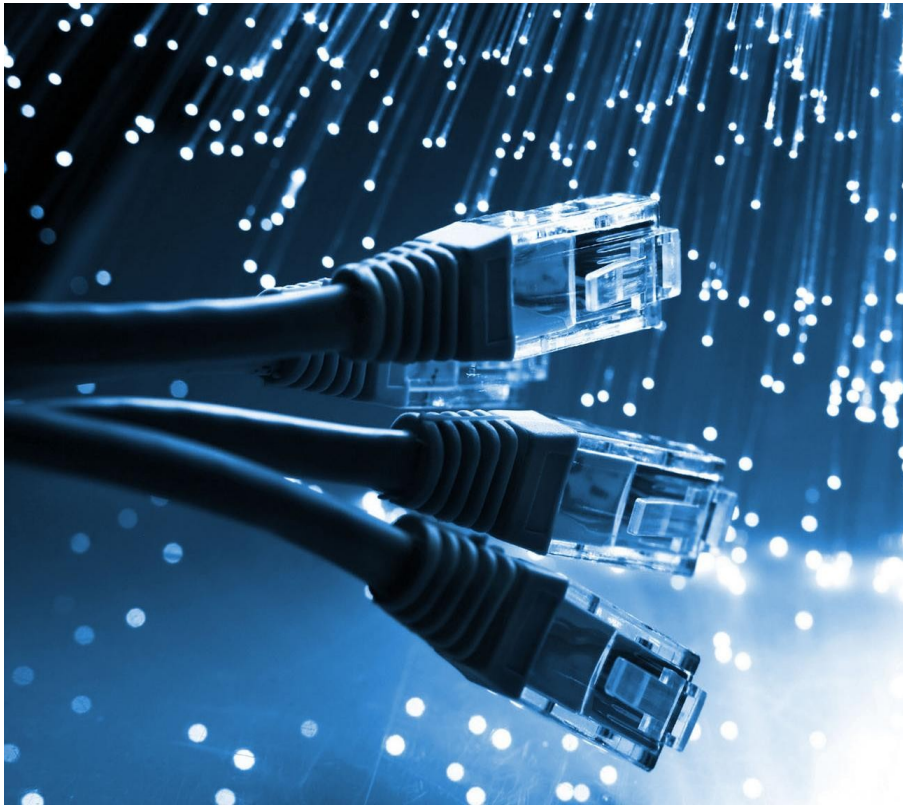
## 2013—Building *on* the Foundation



- Security
- OAM
- Conformance testing
- OpenFlow for optical transport
- Hardware-accelerated switching
- Migration from legacy to OpenFlow
- Architecture & Northbound API



# Switching and Transport—ONF Uniting SDN and Optical



- Benefits: scalability, bandwidth elasticity, service agility
- ONF New Transport Group
  - 25 companies, 250 members
  - Apply OpenFlow/SDN to:
    - Fiber-switched networks
    - Wavelength-switched networks
    - Circuit-switched networks
    - Packet/Optical Interconnection

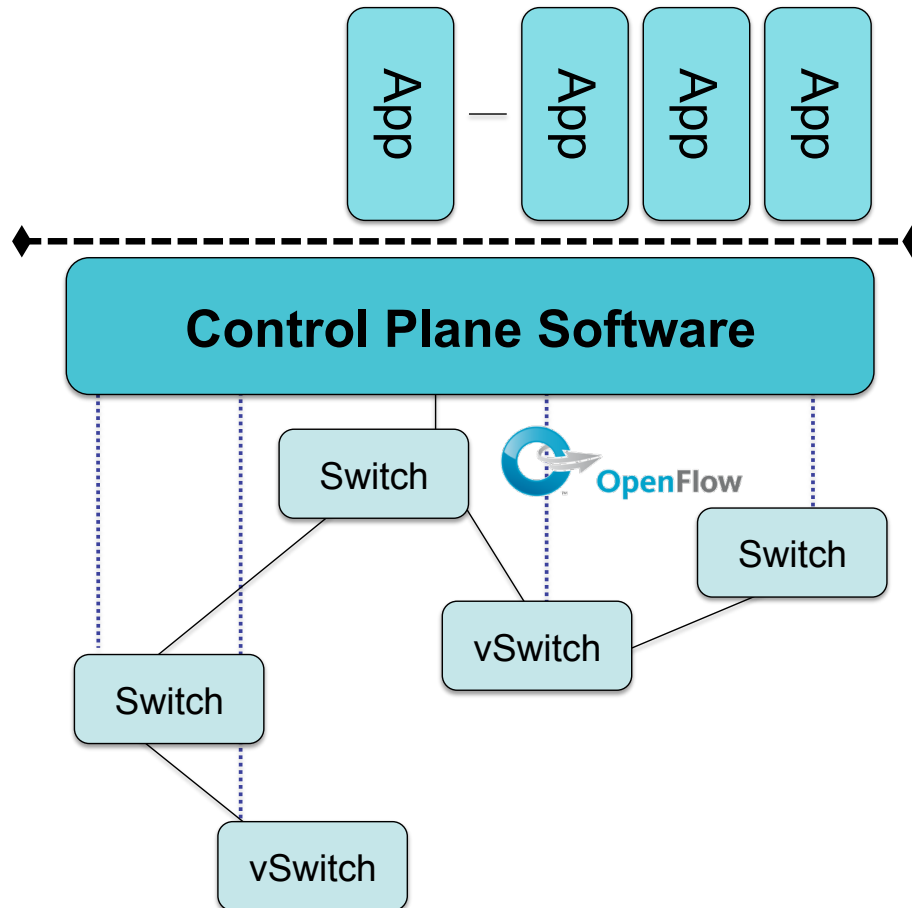
# Architecture/Framework to Span SDN and Legacy Networks



- Benefits: leverage existing investments, cost-effectively migrate to SDN
- ONF Architecture/Framework:
  - 400+ members
  - Drive a common framework:
    - Common architecture
    - Common terminology
    - Sample use cases:
      - VM multi-tenancy
      - L4-L7 aware forwarding
      - Transport diversity



# Northbound Interface: Programming Network Services



- Benefits: automation, manageability, service agility
- Northbound Interface Initiative:
  - Part of the Architecture/ Framework Working Group
  - Develop programming APIs:
    - Support a wide-range of apps
    - Driven by resource type
    - Develop use cases and survey existing NBI options for SDN

# ONF: Leading the SDN Revolution



- Single focus: SDN
- Success measure: commercial takeup
- Board: Google, Facebook, Yahoo!, Microsoft, Verizon, Deutsche Telekom, NTT Communications, **Goldman Sachs**
- Culture: Silicon Valley startup

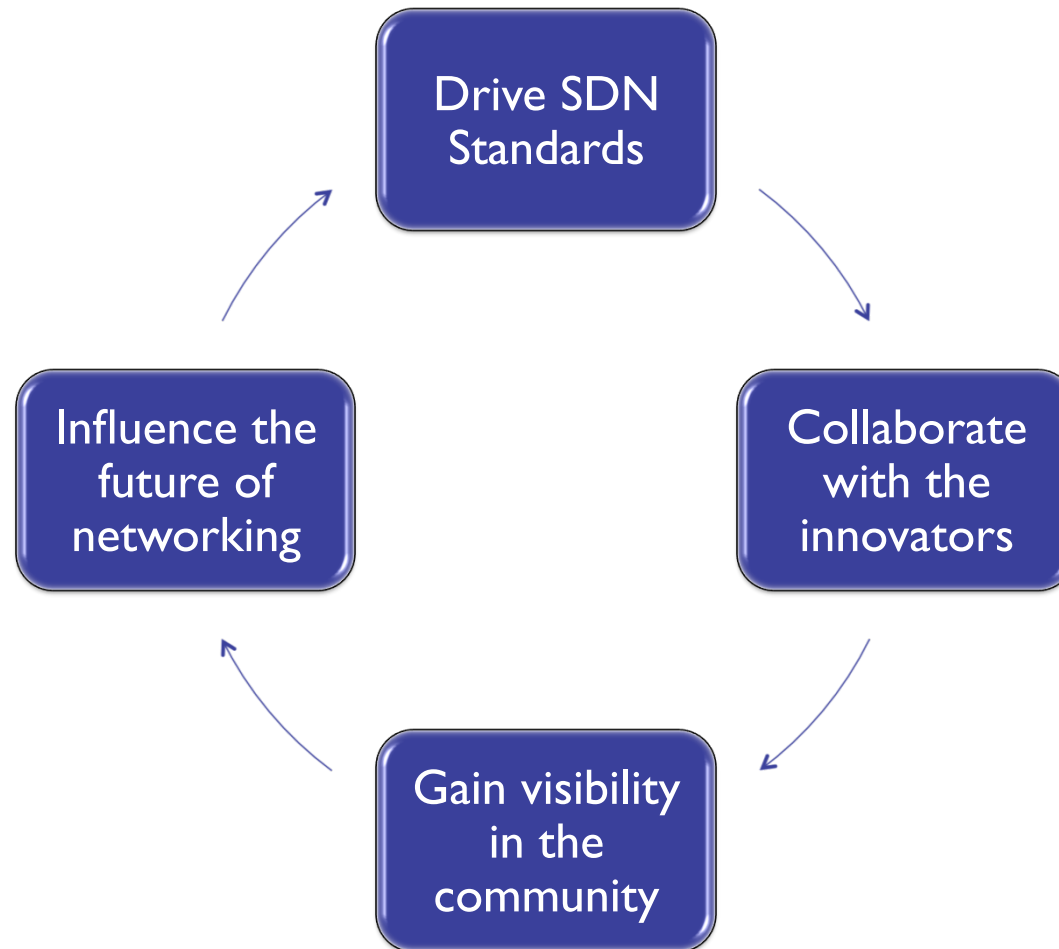
# 86 members

7 new since I was here in October



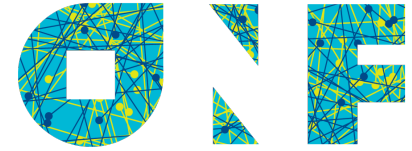
- 6Wind
- A10 Networks
- ADVA Optical
- Alcatel-Lucent
- Aricent
- Argela/Turk Telekom
- Big Switch Networks
- Broadcom
- Brocade
- Centec Networks
- **China Mobile**
- Ciena
- Cisco
- Citrix
- CohesiveFT
- Colt
- CompTIA
- Cyan Optics
- Dell/Force10
- Deutsche Telekom
- Elbrys
- Ericsson
- ETRI
- Extreme Networks
- EZchip
- F5 Networks
- Facebook
- Freescale Semi
- Fujitsu
- Gigamon
- Google
- Goldman Sachs
- Hitachi
- HP
- Huawei
- IBM
- Infinera
- Infoblox
- Intel
- IP Infusion
- Ixia
- Juniper Networks
- KDDI
- Korea Telecom
- Level3 Comms
- LineRate Systems
- LSI
- Luxoft
- Marvell
- Mellanox
- Metaswitch Networks
- Microsoft
- Midokura
- NCL Comms K.K.
- NEC
- Netgear
- Netronome
- Netscout
- Nokia Siemens Netw.
- NoviFlow
- NTT Communications
- Oracle
- Orange/France Telecom
- **Overture Networks**
- Pica8
- Plexxi
- **Qosmos**
- Radware
- Riverbed Technology
- Samsung
- SK Telecom
- Spirent
- **Sunbay AG**
- **Swisscom**
- **Tail-f Systems**
- Telecom Italia
- Tencent
- Texas Instruments
- **Transmode**
- Vello Systems
- Verisign
- Verizon
- Vmware/Nicira
- Xpliant
- Yahoo!
- ZTE

# Why join ONF?





# Summary



- SDN: no stopping it now
- ONF: making it happen



Join us

[www.OpenNetworking.org](http://www.OpenNetworking.org)