State of SDN

Where Are the Hot Spots & Why?
More Challenges for Networking

- Millions of virtual machines
- Zetabytes of data
- Billions of cell phones
- Trillions of things

Reduce provisioning time

Reducing time by over $1,000x$ through SDN
What is SDN

Open Platform

Network OS should abstract you from hardware
- Option to choose the HW independent from the OS
- Easy to install and configure & Automate
- vASIC® technology ensures ASIC flexibility

Tools & Automation

The right tool for the job / best of both worlds
- NetOps + DevOps – Linux shell or feature rich CLI
- Industry standard configuration management
- Unmodified Linux kernel

Networking SDN protocols

Seamless migration when and where you want
- Robust L2 + L3 stack on bare metal
- OpenFlow through OVS on bare metal
- CrossFlow interworking – true seamless migration
Today Market Trend

Big chassis  Commodityzed  Virtualize

Server Revolution and Innovation to Networking

Virtual, distributed, commoditized
The SDN Journey

Qualifying technology

Find killer application

Widely deploy and find new applications

“Innovators “Techies”

Early Adopters

“Early Majority

“Late Majority

“Laggards

“The Chasm

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Buying Bare Metal Switches

Today Bare Metal Switches can now be bought very easily.
Sometimes the Simplest Ideas…

Enterprise

Data Center

WAN

Controller

VB1

VB 2

VB 3

TAP 1

TAP 2

TAP 3

1 2 3 4

25 26 27 28

41 42 43 44

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Open is the Freedom to Choose!

Freedom to mix & match

Control Plane

vASIC

Linux Kernel

ASIC

HW ODM

Open Source Routing

xORP

BIRD

OVS L2 OSPF BGP

BASH CLI

Telnet SNMP NTP

Mellanox Technologies

Marvell

Broadcom

Intel

CAVIUM

Quanta Computer

Beta Networks

Accton

Celestica

FOXCONN
Simplification of OSI

Complexity as a barrier for innovation

SDN as Mixed of traditional and abstraction
Today – the Network Forces Behavior

The OSI model works for a lot of situations....

The Internet does work

However....

Switched (Layer-2) domain
• Allows broadcast
• Limited scale with the concern of storm
• Aggregated complexity at the core

Routed (Layer-3) Domain
• Can scale to millions of routes
• Requires any-to-any route table
• Long converging time
• Complex to set up or maintain
OpenFlow Drives Business Logic

Leveraging OSI model thinking does not make use of the new capabilities

Tailor the header and select what the business needs for a specific application

OSI Model

1. Physical
2. Data Link
3. Network
4. Transport
5. Session
6. Presentation
7. Application

OpenFlow Model
Traditional – switch/route based on IP and MAC headers
Need to control switched/L2 domains
Need to minimize routed/L3 lookups and convergence

OpenFlow – forward only if a rule matched
No need for controlling broadcast storms
No need for convergence
Fabric Design Options

- Traditional L2 With MLAG or Routing
- L2 over Layer 3 VXLAN Controlled By Openstack
- Full Openflow Network Same control plane for Virtual Switch and Physical Switch

Software Abstraction and Simplicity
Cloud Networking Landscape

Routing Options:
- OSPFv2 / OSPFv3
- BGPv6 for large Fabric
- OpenFlow 1.4

Overlay Options:
- VLAN (Q in Q)
- HW offload VXLAN
- GRE tunnels (L2 or L3)
- MPLS

Application embedded in ODL:
- Standard API
- Extendable
Bare Metal Switch & SDN "Hot Spots"

Traditional L2/L3

Software Defined Router

DC-to-DC

Internet Peering Points

Private WAN / NaaS

Data Centers

CLOS Fabrics

Private WAN / NaaS

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Data Center Battleground

DRIVERS
- Agility, like the server
- On demand dynamic connectivity
- Abstraction, application developers do not want to learn networking they just want the network to magically work
- Scalable and cost effective

TECHNOLOGY
- Open source, OpenStack has critical mass
- Tunneling / overlays
- Standard API and integration to orchestration
- Bare metal move, hardware and software separation
- Automation, lifecycle management

Diagram:
- Internet
- CLOS Fabrics
- Data Centers
DC-to-DC Thinking Differently

DRIVERS

- Private to public cloud transition
- Business logic intelligence in the pipe
- Application based SLA assurance
- Intelligent geo-based load balancing

TECHNOLOGY

- Tunneling / Overlays
- OpenFlow
- Open source
- Bare metal move, hardware and software separation
Disruption @ the Routed Edge

DRIVERS

- Service chaining
- Ultra-granular traffic grooming
- Business logic intelligence in the pipe
- Application based SLA assurance
- Service deployment velocity
- Cost savings

TECHNOLOGY

- OpenFlow
- L2 / L3 demarcation
- Tunneling / overlays
- Bare metal move, hardware and software separation
The Campus — SDN Beachhead or Lagger?

DRIVERS
- Business logic intelligence in the network
- Private to public cloud transition
- Centralized decision making
- Application based SLA assurance
- BYOD drives more dynamic security needs

TECHNOLOGY
- OpenFlow
- L2 / L3 demarcation
- Bare metal move, hardware and software separation
Bare Metal Switch & SDN “Hot Spots”

- **BM** (Bare Metal Switch)
- **SDN** (Software Defined Networking)
- **Traditional L2/L3**
- **MAN** (Metropolitan Area Network)
- **Private WAN / NaaS**
- **DC-to-DC**
- **Internet Peering Points**
- **CLOS Fabrics**
- **Data Centers**

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SDN State of the State

- L2 / L3 will be around for decades to come
- SDN should be about driving business logic into the network, not having the network constrain the business
- Business logic requires rethinking the stack
- SDN use cases that deliver business benefits will drive real revenue in 2015+
Thank You

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