Re-Defining Core and Access

A New, Two-Tier Network Model

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@ChrisGrundemann
Director of Strategy, Myriad360
Chris@Myriad360.com
Here we go...
Network Models

Huh, what?
You know what a network is

- Passing Packets
- Forwarding Frames
- Routers, Switches
- Middleboxen
- Connections
But what is a model?

.model
/ˈmædl/  
noun
1. a three-dimensional representation of a person or thing or of a proposed structure, typically on a smaller scale than the original.
   "a model of St. Paul's Cathedral"
   synonyms: replica, copy, representation, mock-up, dummy, imitation, duplicate, reproduction, facsimile
   More
2. a system or thing used as an example to follow or imitate.
   "the law became a model for dozens of laws banning nondegradable plastic products"
   synonyms: prototype, stereotype, archetype, type, version, mold, template, framework, pattern, design, blueprint
   "the Canadian model of health care"
   • prototypical, prototypal, archetypal
   "model farms"
A Conceptual Model...

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• is a set of concepts

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A Conceptual Model...

- is a set of concepts
- is an abstraction of real things
- is a representation of a system
- is used to help people know, understand, or simulate a subject

The Old Model

“Three-tier Hierarchical Network Model”
Three Tier Campus Network

Core

Aggregation

Access
Three Tier DC Network

Core

Distribution

Access
Why Agg & Dist?
The other 3

LAN

Clients

Aggregation

Distribution

WAN

DC

Servers
North/South
The Three Tiers

• Core
  • Fast forwarding

• Aggregation/Distribution
  • Routing, policy, ACL, load balancing...

• Access
  • Connect endpoints and applications
Leaf / Spine
Folding that Clos
Along came (server) virtualization

- East/West vs North/South...
- Turn up and turn down
- Mobile workloads
- Massive scale
Clos

- Name not acronym
- Telephony
- Fold it

- Nonblocking!
The Leaf-Spine Network Model
The Leaf-Spine Network Model

Not the Two Tiers We’re Talking about!
Problems with 3
Why the three-tiered model is a legacy model
Directionality

• North/South vs East/West
• Scale up vs scale out
Resiliency

• Spanning Tree Sucks
  • Half the BW

• Redundancy at all three layers
  • More (expensive) boxes
Hardware Centricity

• Hardware layer provides services
  • Dependent on service availability in box

• Physical connectivity dependent
  • Where do you put the FW/RTR/LB/etc.

• Slow!
  • Manual (box by box) configuration
  • Feature velocity?
Network Virtualization

Welcome to the new normal
NFV / VNF

- Virtualizing devices...
  - Virtual Switches
  - Virtual Routers
  - Virtual Firewalls
  - Virtual Load Balancers (ADCs)
Virtualizing the Network
Virtualizing the Network
Virtualizing the Network
Virtualizing the Network
On Overlays

• Not new...

• VLAN, MPLS, GRE

• Optical, Ethernet, IP
The New Model

Isn’t that what we were supposed to be talking about?
Two Ideas

- Switch Inception
- Router Explosion
Switch Inception

- Switches in Switches
- Folded Clos vs multi-chip switch
- Visibility and control (by exploding it)
Inception - Clos
Inception – Multi-Chip Switch

Fabric Chip

NPU
Inception – Multi-Chip Switch

Fabric Chip

NPU
Inception - Clos

Spine

Leaf
Router Explosion

• Controller as virtual RE (RP / Sup)
• VNF as virtual PFE (line card)
• Tunnels as virtual circuits
Explosion - Router

Routing Protocols

Routing Engine
  Routing Table

PFE / Line Card
  FWDing Table

Physical Interfaces

Routing Protocols

Physical Interfaces
Explosion - SDN

- Protocols & APIs
- Phy / Virt Interfaces
- Controller
  - Routing Table
- VNF
  - FWDing Table
- Protocols & APIs
  - Phy / Virt Interfaces
Lot’s of Routers
"Single" Distributed Router
The Two
The Two

- Underlay is Core Switch
- Overlay is Access Router
Characteristics

• Underlay
  • Non-Blocking ECMP
  • Resilient & High BW
  • Physical Devices

• Overlay
  • Tunnels (w/ hashing)
  • PBR/SBR
  • Virtual Devices
The Two-Tier Network Model

Routing, Policy, Services & Security (in SW)

Connectivity (in HW)
Who Cares?

Seriously, why are you still talking?
How this model helps (theory)

- Focus on what matters
- Church and State
How this model helps (practice)

• Scale
  • TCAM
  • Tables, policies, etc...

• Updates
  • Patching
  • Adding features
Universal Network Platform

• Consistency...
• Simplicity...
• Visibility...

• Unify the domains (WAN is new LAN)
Universal Network Platform

> A Cloud-Integrated Network <

- Embedding the cloud into the network (Edge Cloud)
- Embedding the network into the cloud (Multi Cloud)
- Disaggregation & Virtualization
- Automation & Orchestration
- Telemetry & Analytics
Use Cases

- **Service Provider**
  - Being done...
  - Dumb pipes, services OTT
  - SD-WAN / MSP

- **Enterprise**
  - Campus/Branch/Remote
  - DC & Multicloud
  - Unite the overlays
What if I don’t want a controller?

- EVVPN
What happened to OpenFlow?

• "Native" SDN vs Overlay SDN
• Underlay’s are already out there...
  • Have you heard of the Internet?
The return to End-to-End!

- Placed bets on IPv6
- Cashing in on network virtualization
- Kind of
Wrap-Up

Finally, he’s almost done
The map is not the terrain

- Model vs reality
- A tool
Summary:

- Overlays are normal
- Models are helpful
- It’s a digital world (software is king)
- Use the Two:
  - Core underlay to move bits
  - Access overlay to provide services
If you want to find new solutions, find new ways to see your problems.

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