

Software Defined Networking -SDN-Concepts, Trends and Use cases





Let's start our exciting Trip to do Enterprise Networking





Just Relax....

And enjoy your flight!





Background

Before we start... What are Networks?



Pipes that transport data!

How it works?

- Information split on smaller chunks
- Chunks are called packets
- Packets are sent over the wire
- Multiple protocols for transmission
- Protocols are "languages"
- Most widely protocol used: TCP/IP
- Tons of other protocols used



Information Highway!



Network Services Providers view as plumbers!

- **3 Types of Networks:**
- Wide Area Network (WAN)
- Metropolitan Area Network (MAN)
 - Local Area Network (LAN)



Network Services Providers view as Road builders!



NSP are Both!

Network Technology History and Evolution

Local Area Network -LAN-



LAN Evolution Details:

- From flat networks (Bus, Hub and Ring topologies) to multi tier networks (Physical and/or logical / VLANs)
- From multiple protocols like SNA, IPX/SPX and IP to IP only (IPv4).
 - Today's focus should be deploying IPv6
- Layer 2 transport only to complex Layer 3 and 4 environments.
- Used for branch offices and datacenters alike.
- ✓ From Coax \rightarrow Copper \rightarrow Copper/Fiber

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Network Technology History and Evolution (ContWAN Evolution Details:

Metropolitan & Wide Area Network -MAN & WAN-



✓ From Point to point → Frame Relay /
 ATM → MPLS over TDM → MPLS
 over Ethernet

- ✓ From dedicated infrastructure →
 Share infrastructure model.
- MPLS as the main standard for WAN Connectivity.
- From multiple routing protocols (RIP, IS-IS) mainly to BGP
- From single routing table to multiple / virtual ones (VRFs)
- From private WAN networks to use shared / public one (Internet!).
- Virtual Private Networks over
 Internet as cheaper transport

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Challenges of traditional Network Technologies on today's world!



Slow Innovation! - Not evolved much since the 90s



Complex!

- Multiple protocols
- Multiple Configurations
- Multiple Versions
- High Skills xP Level



Manually Intensive! - Intelligence built-in Manually on each device - Bottom up Approach



Slow! - Compared with Virtualized Environments like Servers and Cloud



And the list can go a lot longer....



Expensive! - Dedicated Hardware - Dedicated circuit(s)



Rigid! - Predefined path(s) to enable pass data between 2 endpoints





Software Defined Networking -SDN-

Software Defined Networking -SDN- What it is?



Some Interesting and open questions that IBM clients typically have:

- · What it is? Why do I need it?
- How that works?
- Practical uses?
- How can be deployed in my organization?
- · What problems it solves?
- Is it Secure? Reliable? Cost Effective / Cheaper?
- · What technologies can be used?
- Impact on my Operational Model
- · Return of Investment (ROI)



Software Defined Networking -SDN- Architectural Principles



Virtualization Functionality

3 Main Design Principles



Central Management Functionality



Automation Functionality

Bottom Line:



- Speed
- Agility
- Simplification



IBM view on SDN end-to-end



WANx

Typical Client's Business enablers



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Software Defined Networking @Datacenter –SDN-DC

SDN-DC Overview

Hypervisor Based SDN-DC Type:

- Implemented via Software in Server Hypervisors
- No changes to the existing physical network
- Technology examples:
 - VMWare NSX
 - Juniper Contrail
 - Nuage Networks SDN

Fabric Based SDN-DC Type:

- · Operate physical network in more efficient manner
- Involves modifying / upgrading physical switches
- Technology examples:
 - Cisco ACI
 - Brocade SDN

Which one to use?

- Short answer: Depending on your business needs
- Cloud providers: Probably a mix of the 2 + some proprietary developments (Hardware and/or Software)
- Enterprises: Hypervisor Type is more recommended if Hybrid Cloud is required (laaS)



SDN-DC - Multi Hybrid Cloud Approach using Hypervisor type – laaS-

Features:

√

✓

 \checkmark

✓

✓





Software Defined Networking @WAN -SD-WAN

SD-WAN Overview



Example of Players in the market: Viptela, Velocloud, Fatpipe, Talari, Cisco iWAN, Cisco Meraki MX



SD-WAN Application Steering Approach & Benefits







Multiprotocol Label Switching (MPLS)

- Traditional WAN
 - Private circuits (Guaranteed Bandwidth)
 - · Expensive Solution

Hybrid WAN

- · MPLS & Internet as transport
- · Less expensive than traditional
- Select best path manually (static deterministic routing)
- · Still expensive
- · Complex to manage and support

SD-WAN Approach

- · MPLS as transport is possible
- · Decouple physical layer from logical
- Select best path automatically based on BW availability and latency
- Multiple inexpensive Internet circuits





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Software Defined Networking @Campus -SD-LAN

SDN-LAN Overview



Cloud Controlled



Simplicity





Analytics Built-in



Savings





Ubiquitous Access





- Automatic patch management & monitoring

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Summary

SDN Overall:

- Cloud adoption has triggered that networks becomes specialized (end user / branches / campus and datacenter)
- SDN market focus has been primarily on the Datacenter space, specially inside of Cloud providers (SDN-DC)
- The concept has expanded to the Wide Area Network in recent years and getting a lot of traction (SD-WAN)
- SD-LAN has been available for years mainly on the retail space but this technology is getting a lot of traction on the Enterprise space.
 - Started mainly on Wireless Access Point.
 - Expanded to LAN Switching as well.

SD-LAN:

- Use cases are totally different if the site is a datacenter or a branch office.
- Sites that are datacenter and branch combined can have a hybrid stack for SD-LAN (Traditional / Datacenter network for the applications hosting portion and Cloud Networking for the end user segments)
- Pushing a wireless first strategy for devices including laptops, tablets, smartphones and even VoIP phones (or switch to softphones) as this technology is a lot more reliable than before
 will complement the automation savings that the technology will bring avoiding costs on additional switches, cabling and potential brank is stable brank.

SDN-DC:

- 2 types: Fabric base or Hypervisor base
- For Hybrid Cloud (IaaS) is recommended to go with Hypervisor base (No Physical HW dependencies)
- Hypervisor base uses VXLAN encapsulation protocol and can run on any existing datacenter LAN.

SD-WAN:

- Hybrid WAN will drive the hard dollar savings on an enterprise by replacing expensive MPLS circuits with Internet circuits.
 - Internet BW almost doubles every couple years at the same cost compared with MPLS that is not.
- Deploying Hybrid WAN without Application Steering (SD-WAN routing) will make the operational aspects a nightmare with complex routing configurations.
- Network Function Virtualization makes sense for large branches that requires additional functions like Load balancers, Firewalls, WAN optimization, etc. in top of the SD-WAN routing.
 - SD-WAN can run without NFV but NFV shouldn't run without SD-WAN routing (Application Steering)

Questions & Wrap-Up

Questions:





Wrap-Up:

Let's Switch to something Better!





Thank you.

IBM