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# Evolve and optimize your network amidst changing demands

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# Did You Know?

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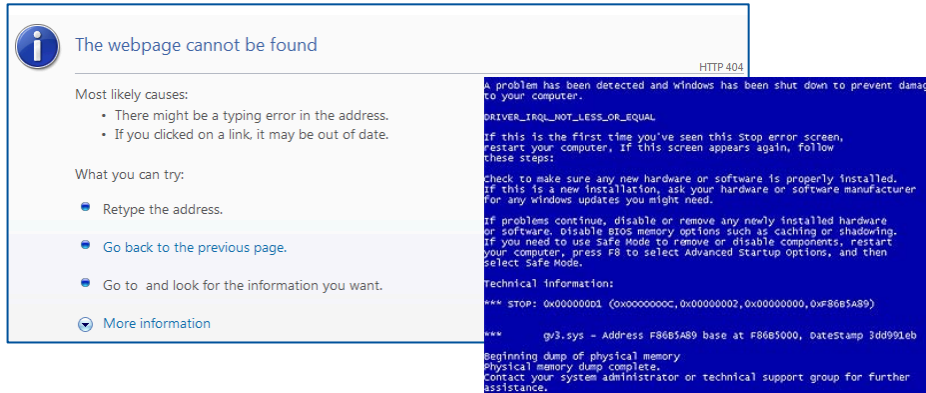
**Enterprise Network  
Traffic Doubles Every:**

**2.9 Years**

# but...

## The Cost of a Data Center Outage is

# \$336,000 / hr



The image shows two overlapping error messages. The top one is a white box with a blue border containing a message about a webpage not being found. The bottom one is a blue box with white text, a Windows Blue Screen of Death (BSOD) error.

**The webpage cannot be found**  
HTTP 404

Most likely causes:

- There might be a typing error in the address.
- If you clicked on a link, it may be out of date.

What you can try:

- Retype the address.
- Go back to the previous page.
- Go to and look for the information you want.
- More information

A problem has been detected and Windows has been shut down to prevent damage to your computer.

DRIVER\_IRQL\_NOT\_LESS\_OR\_EQUAL

If this is the first time you've seen this Stop error screen, restart your computer. If this screen appears again, follow these steps:

Check to make sure any new hardware or software is properly installed. If this is a new installation, ask your hardware or software manufacturer for any Windows updates you might need.

If problems continue, disable or remove any newly installed hardware or software. Disable BIOS memory options such as caching or shadowing. If you need to use Safe Mode to remove or disable components, restart your computer, press F8 to select Advanced Startup options, and then select Safe Mode.

Technical information:

\*\*\* STOP: 0x00000001 (0x0000000c, 0x00000002, 0x00000000, 0xF86B5A89)

\*\*\* gu3.sys - Address F86B5A89 base at F86B5000, DateStamp 3dd991eb

Beginning dump of physical memory  
Physical memory dump complete.  
Contact your system administrator or technical support group for further assistance.

# Key Issues

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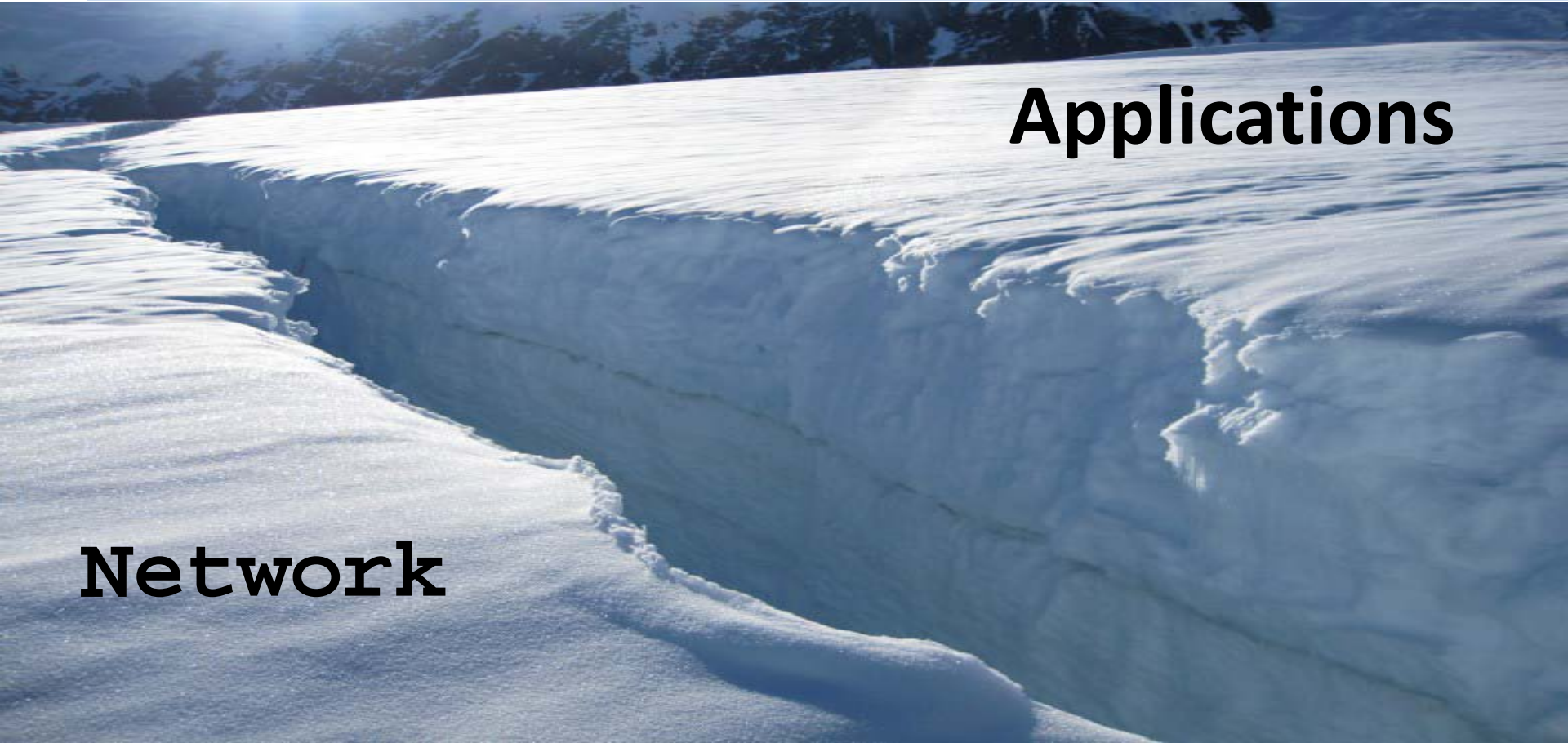
- **How to evolve network architectures amidst changing compute and application architectures?**
- *How to address virtualization, convergence, big data and other trends in the data center?*
- *What is software-defined networking (SDN) and why should I care about it?*

# Apps Have Changed – Networks Must Evolve

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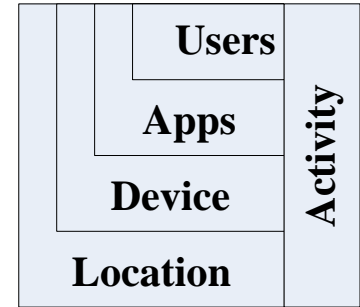
**Applications**

**Network**



# Rethinking Network Design

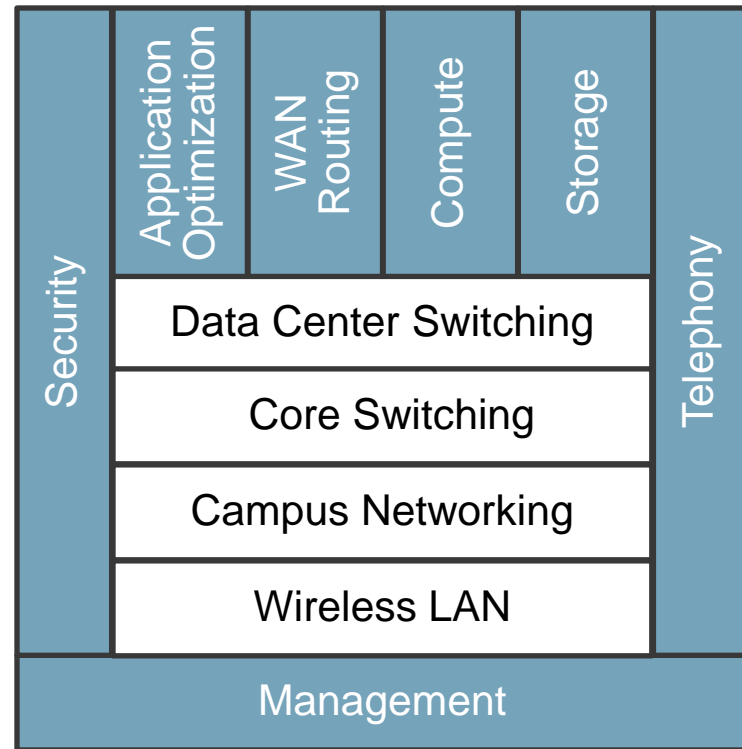
- Utilize the *five dimensions of design*
- Focus on requirements, not on products or vendors
  - Your Needs > Architectural Purity
  - Avoid "check the box" RFPs



**Related Research: [Five Dimensions of Network Design](#)**

# Segment Your Network To Optimize Performance and Cost

- Define your requirements within each building block
- Eliminate proprietary interfaces between building blocks
  - Saves 25-50+% CAPEX
  - Differentiation is key
  - Many solutions are more than “*good enough*”

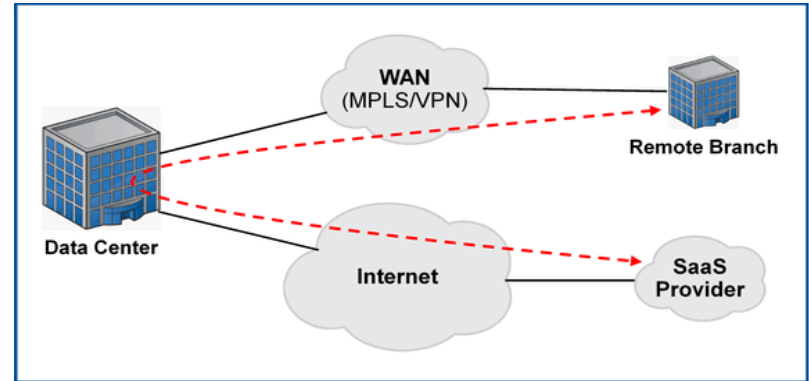


**Related Research: Clients That Don't Segment Their Network Infrastructure Will Have Higher Costs and Increased Vendor Lock-in**



# New Challenges in the WAN

- Expensive: *“My CxO can get 10X the BW at 1/10<sup>th</sup> the cost at his house”*
- You are no longer in control
  - Business picks SaaS
  - App Dev picks IaaS
  - Telework on the rise
- The “trombone effect”
- Wan Optimization helps isn’t always enough and doesn’t address public cloud
- Answers:
  - **Evolve Internet Breakout**
  - **App Delivery and Optimization**



# New Challenges in the Campus

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- Wireless is a requirement not a luxury
- Proliferation of devices
- BYOD is a *gray area* but is the new normal
- Answers:
  - Design for unified access layer versus separate Wired/WLAN networks
  - Identify WLAN usage scenarios, but 5M p/user suffices for most use-cases



# Key Issues

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- *How to evolve network architectures amidst changing compute and application architectures?*
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# Network Disruption *In* the Data Center

2005

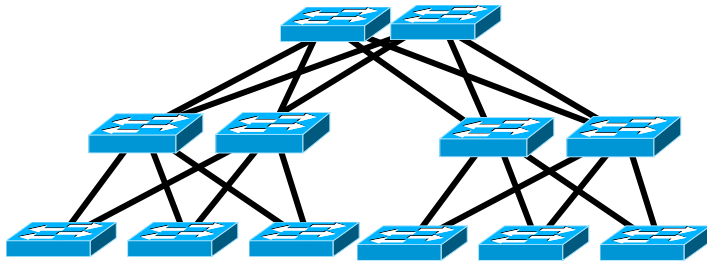
- Very limited virtualization
- Cost, performance, and availability
- Bandwidth
- North/South and hierarchical
- Bigger and faster

2014

- Virtualized 65%+
- Cost, agility, performance, availability, mgmt./orchestration
- Latency
- North/South and East/West
- App and virtualization integration



*Traditional*

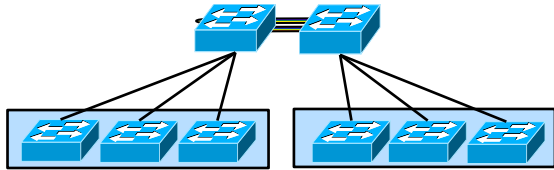


- Optimized for North/South
- CLI-based, no app awareness

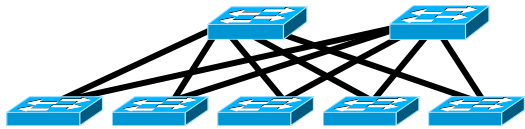


# Three Architectures Have Emerged

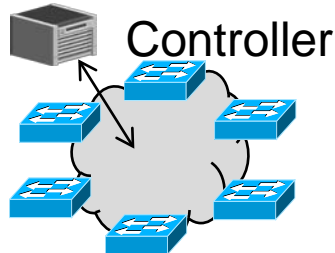
## Virtual Switch Clustering



## Network Fabric



## Software-defined Networking



**Incremental** improvement to traditional networks that overcomes key limitations

- Maintain existing architecture and switches.
- Can extend useful life via doubling capacity for nominal investment.

**One- or Two-tier Mesh or Partial mesh optimized for North/South and East/West**

- Deterministic latency and higher bandwidth
- Managed as a single entity and supports Scale-Out and.
- **Evolutionary**

**SDN: A revolutionary** approach to networking

Today

Tomorrow

# Virtualization is a Game Changer

*It is time to embrace it*

- **Virtualization changes everything:**
  - Access layer in software (vSwitch)
  - Bandwidth density increases
  - Workload mobility
- **Exposes limitations of traditional networks:**
  - Orchestration is difficult, which limits agility
  - Limited support for VM mobility/awareness
- **Answers: VM-awareness, Fabrics, SDN and network virtualization, app/workload integration**

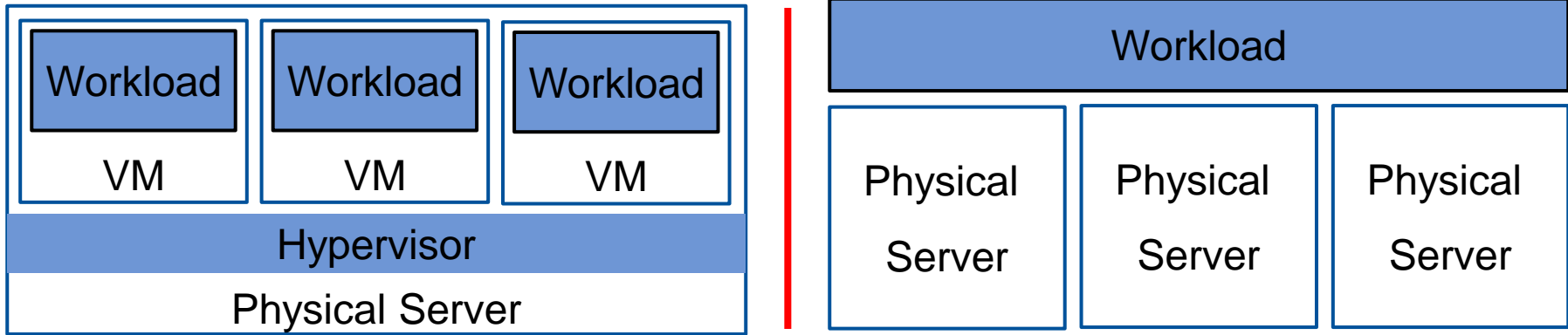
# Next Up...Storage Convergence

- Virtualization strikes again:
  - I/O characteristics are no longer predefined.
  - Increased bandwidth density further drives need and benefit of convergence.
- Savings of 30%+ but unified end-to-end fabrics are rare.
- Answers:
  - ✓ Consolidate I/O within the rack
  - ✓ Converge I/O within the rack
  - ✓ Connect ToR devices directly to core



*Related Research: Know When, Why and How to Converge Data and Storage Networks*

# What About Big Data?



- Big data = **opposite of virtualization**
- Where is your big data, Cloud or On-Prem?
- Bursty and high-bandwidth traffic patterns
- Answer: Isolate traffic and use high-performance networking gear

*Related Research: Is Your Network Ready for Big Data?*



# Key Issues

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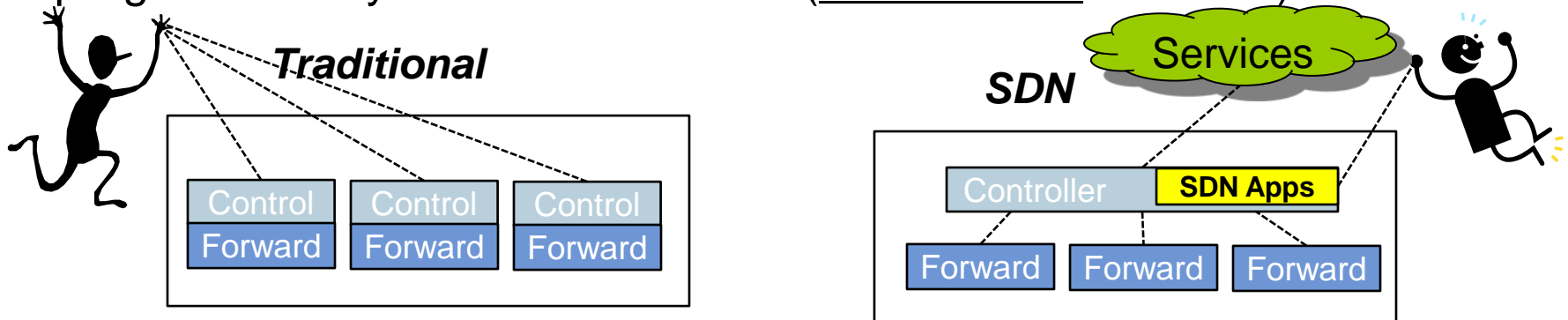
**The biggest benefit of virtualization and cloud:  
*Increased data center agility.***

**The biggest barrier to this agility:  
*Network provisioning time.***



# SDN Definition: A New Approach to Designing, Building, and Operating Networks

- Control plane is **decoupled** from the data plane and is logically centralized.
- Communication between network devices and the SDN controller via communication protocols (**southbound** interface).
- SDN controller supports an open interface to allow external programmability of the environment (**northbound** interface).



For more information, see: <http://www.gartner.com/newsroom/id/2386215>

# The Challenges of SDN

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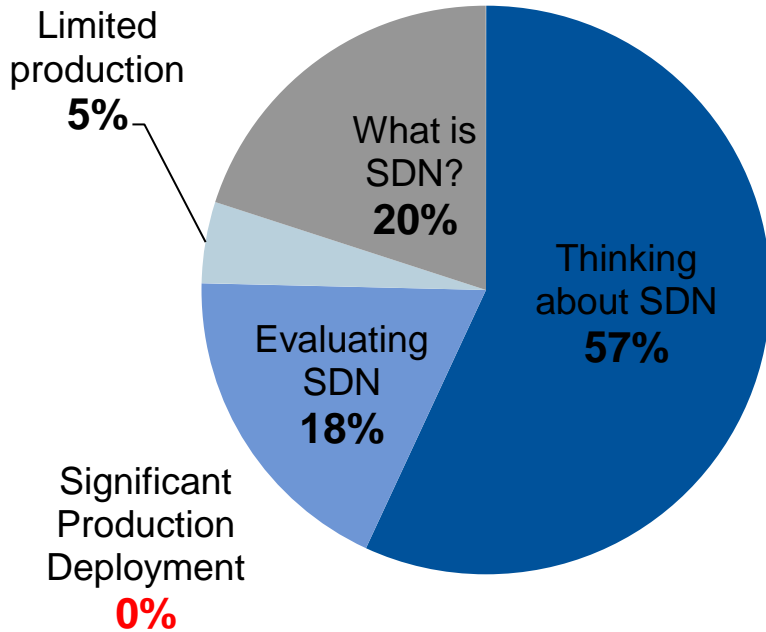
- Install based of \$40+ billion non-SDN compatible gear
  - Greenfield opportunities are the exception
  - Driver for overlay model
- Must incorporate physical, virtual devices and upper-layer services
- Potential for significant organizational disruption
- Unproven model due to limited adoption



# Is Anyone Doing SDN?

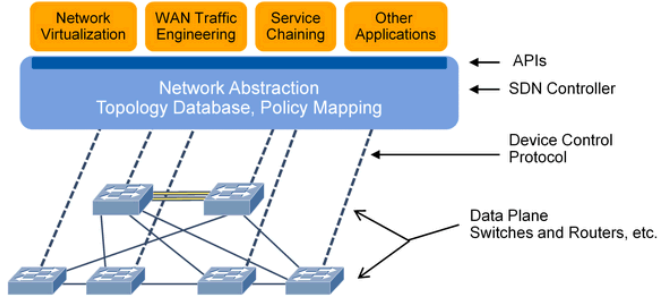


- Mega-Data Centers (Google, Facebook, Yahoo, Amazon, Rackspace)
- Service Providers, Fortune 25, Hi-Tech are on the bleeding Edge
- Mainstream organizations just starting to get interested

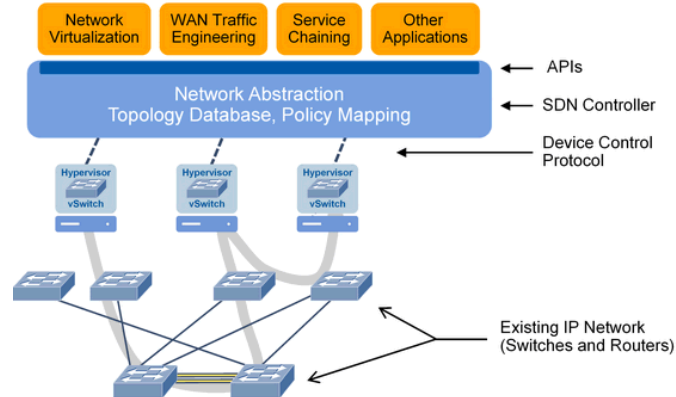


# SDN Deployment Models

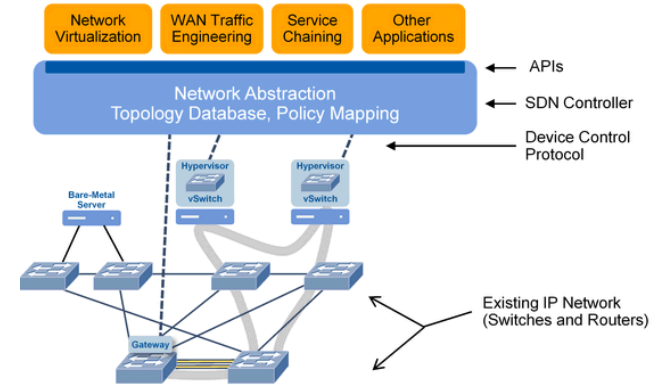
## 1 Device-based SDN deployment



## 2 Overlay-based SDN deployment



## 3 Hybrid-based SDN deployment



# SDN: What Should I do and How do I start?

## 1. Identify the issues or use-cases to be solved.

- Rapid provisioning for new workloads
- Reduce Costs
- Improve application performance
- Automated provisioning
- Traffic engineering
- Improved Security
- Improved Mgmt or Visibility



## 2. Establish the right team.

## 3. Ensure network investments are SDN-capable.

## 4. Talk to several vendors and start in Non-Production environments.

## 5. Deploy opportunistically.



# Recommendation: Four Questions to Ask Network Vendors

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1. How do your network solutions map to my organization's **functional, financial, and operational** requirements?
2. What is the **tangible differentiation** versus your competition?
3. What are the options and requirements to provide **zero-touch provisioning**?
4. Describe your road map and eco-system to support **SDN** and related technologies.

*Related Research: Four Questions to Ask Your Data Center Network Vendor*



# Related Gartner Research

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- [Magic Quadrant for Data Center Networking](#)  
Mark Fabbi, Andrew Lerner, Tim Zimmerman
- [Magic Quadrant for the Wired and WLAN Access Infrastructure](#)  
Mark Fabbi, Tim Zimmerman
- [Mainstream Organizations Should Prepare for SDN Now](#)  
Andrew Lerner, Ronni Colville
- [Technology Overview for Ethernet Switching Fabric](#)  
Caio Misticone, Evan Zeng
- [Ending the Confusion About SDN: A Taxonomy](#)  
Joe Skorupa, Mark Fabbi, Akshay Sharma
- [VMware's NSX Could Be a Small Step or Giant Leap for SDN](#)  
Joe Skorupa, Andrew Lerner



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