



Journey to Software-Defined Cloud Networking

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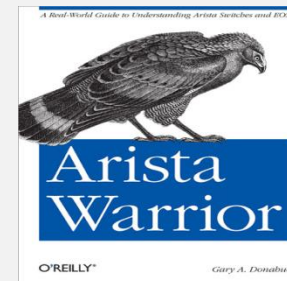
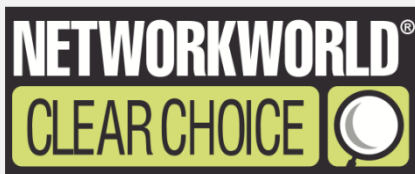
President and CEO, Arista Networks

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Introduction to Arista: Our DNA Is SDCN

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- 1 Arista pioneered SDN via EOS and leads in Low Latency, cloud, big data, web 2.0 and virtualized networks.
- 2 Arista EOS enables SDN with Modern Network OS.
- 3 Enables Cloud-Scale, Network-Programmability, Virtualization...while preserving IP.
- 4 1900+ Customers, One Million Ports, Award Winning.





Design Goals –Our Inspiration

1000 – 10K Servers

Non-Blocking Low latency

1/10 GE L2 Leaf,
10/40/100G L2/L3 Core

Migration of VM's Across Fabric

On Demand Capacity Per Workload

Workload Mobility

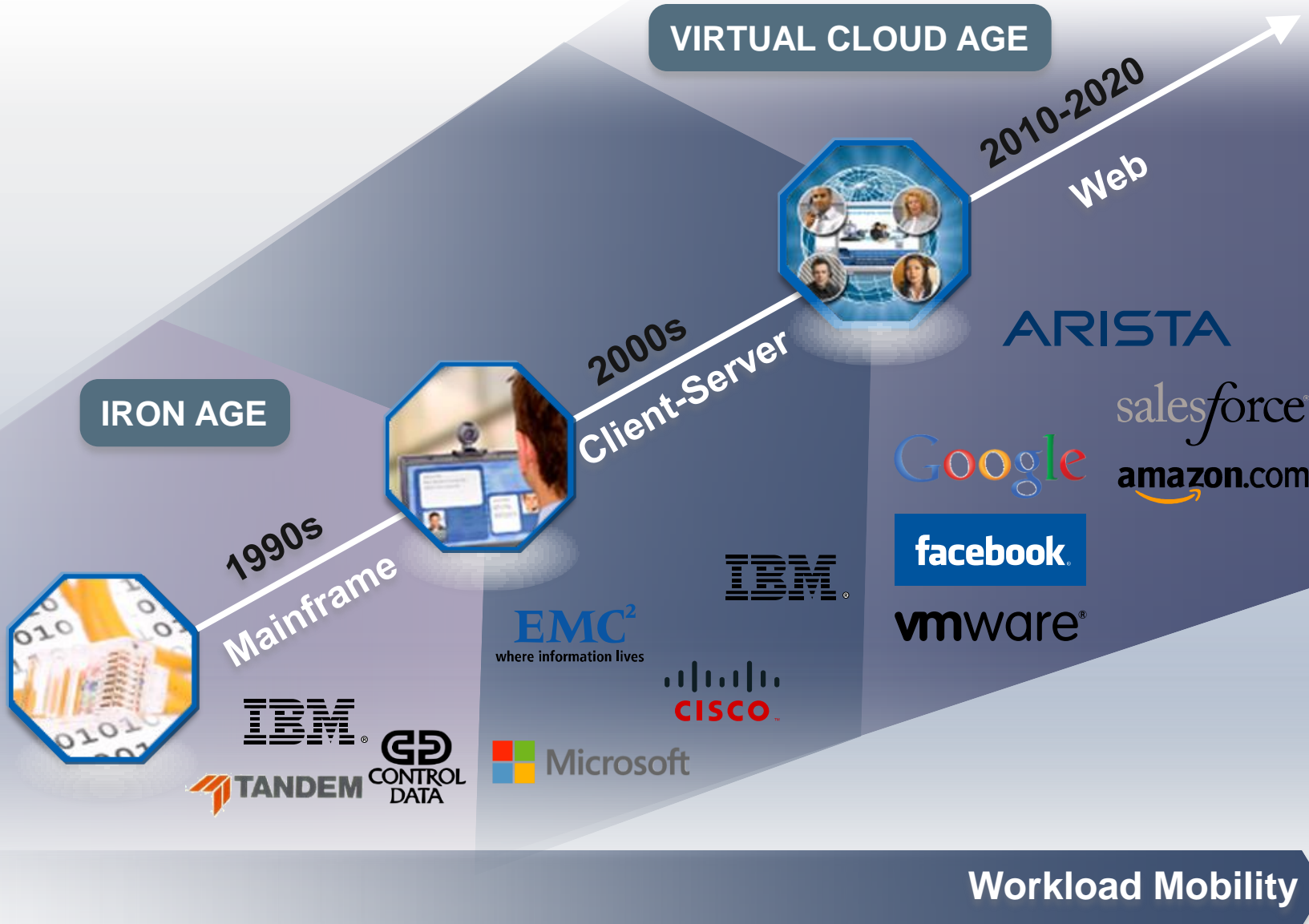
Simplified App and
Machine Provisioning

Uncompromised Resilience & Availability

The Next Disruptive Frontier in IT

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Application Mobility

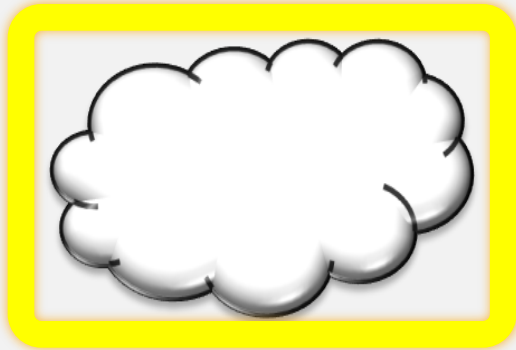


Workload Mobility

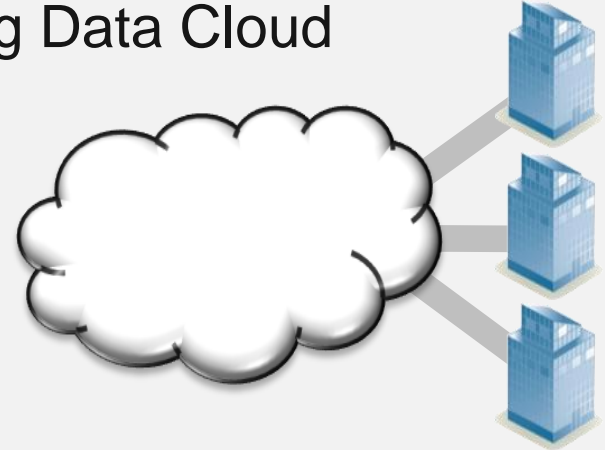
New Cloud Applications = New Cloud Networks

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Private Cloud



Big Data Cloud



Web 2.0 Cloud



Public Cloud



Hybrid Cloud



HFT Cloud

Networks Define IT Architecture



Programmable



Inter-connect



Connect



Programmatic @ Every Level = Programmability

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Routing Protocols

Interface Manager

CLI

Spanning Tree

ASIC Drivers

LED

XMPP Client

vCenter API

KVM - Virtual Machine

sysDB - Central State Database

Stock 2.6.31 x64 Linux Kernel

EOS - Next-Gen Network O/S



Partner Integration
- F5, Cloudera, Splunk, etc

Orchestration Extensions
- VMware & Nicira

Open Services
- OpenFlow, OpenStack etc

Open EOS API
- RESTful API

Local Scripts & Event Driven
- Python, PERL, TCL, Shell

Publish & Subscribe Model
Fault Containment / Repair

Our Software-Defined Cloud Networking (SDCN) Vision

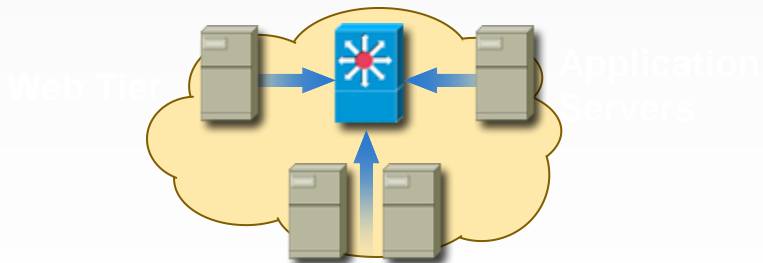
Applications -> Modern

Search, Compute,
Visualize, Analyze,
Decide, Email, XML,
HPC, HFT, Video

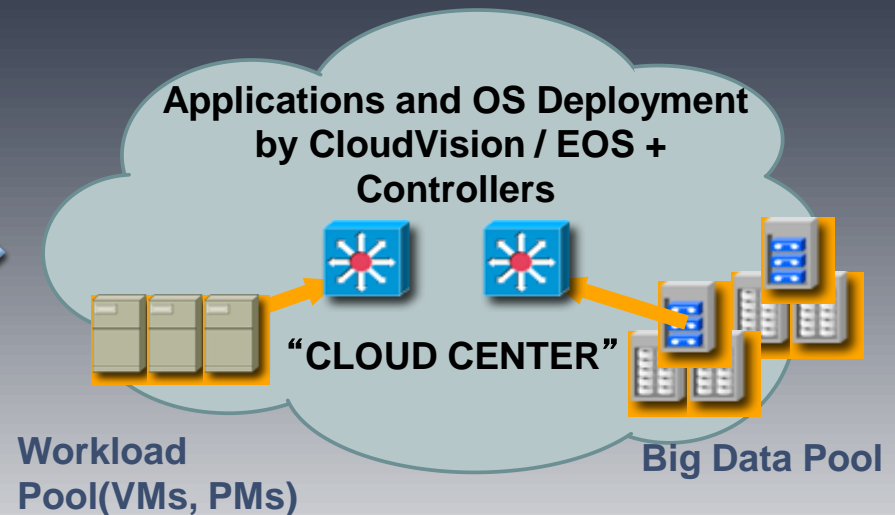
OS -> Hypervisor

Linux, Windows
Vmware, Hyper-V
KVM, XVM

Servers/ Storage -> Workload



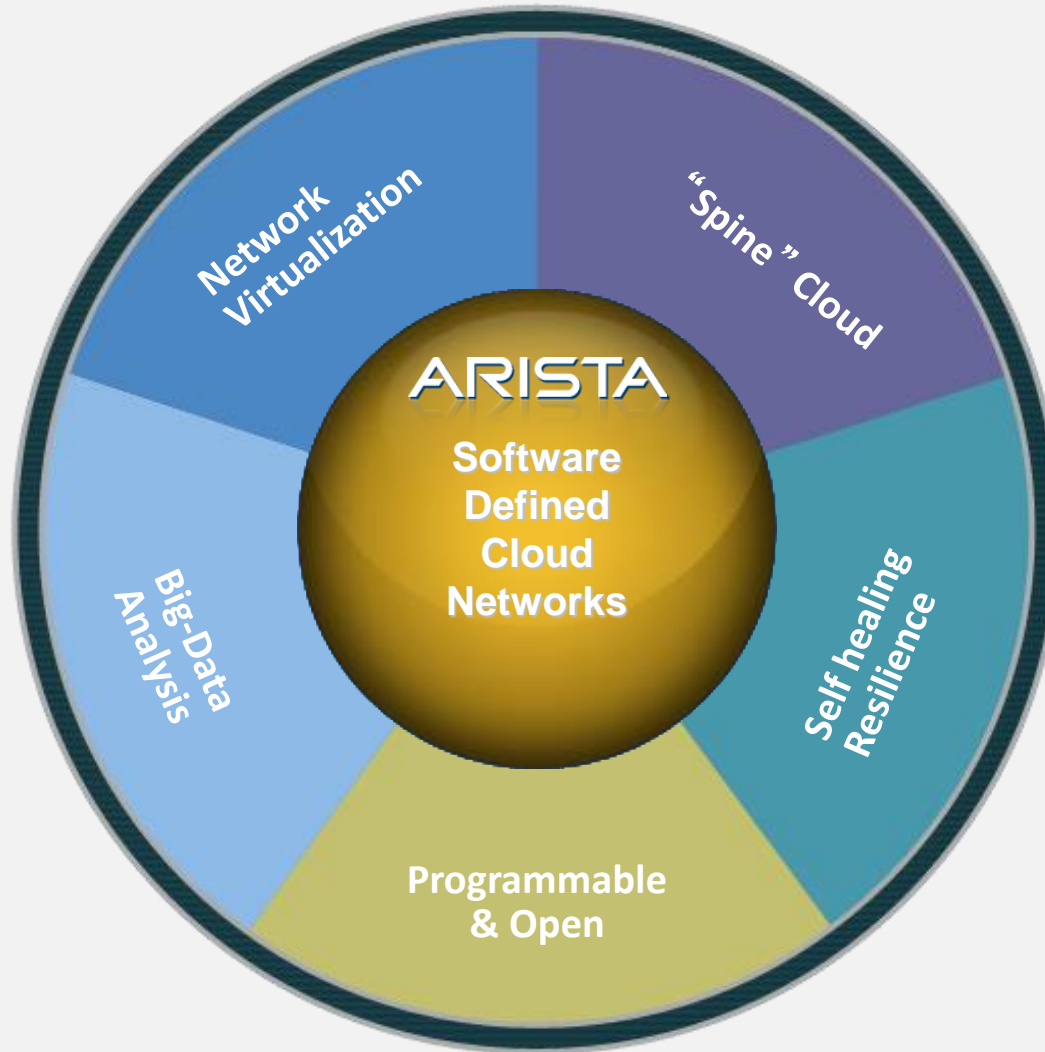
“ The Software-Defined Cloud Network ”



**Big Data, Network Virtualization,
Any-to-Any Workload Mobility**

Software-Defined Cloud Networks: Five “Forces” Directing Arista’s Strategy

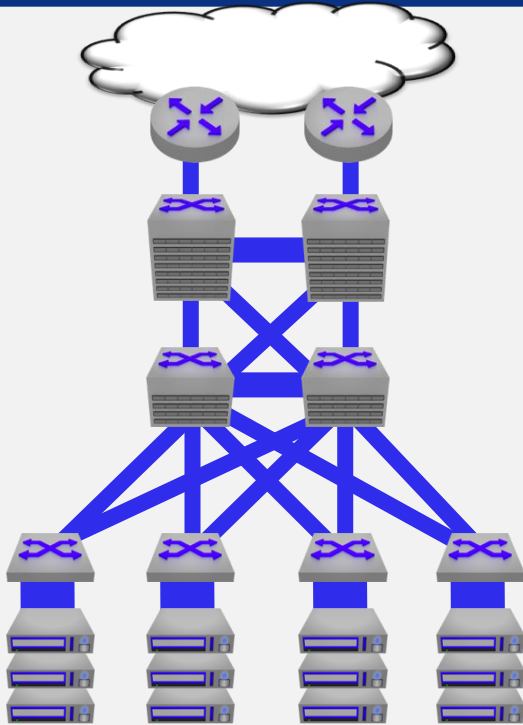
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#1: Scale & Performance: N Way Spline Network ...

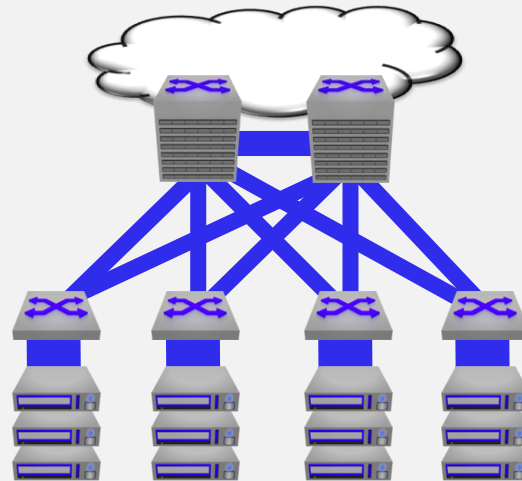
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Legacy Data Center
100s of nodes 2000-2010



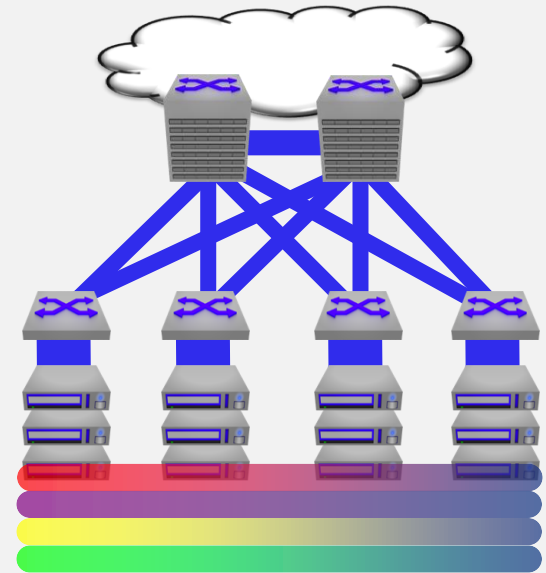
Multiple north-south points of management, oversubscription, wasteful cost model

“Leaf-Spine” 2010+
10k+ nodes



Simplified management, active-active links, optimized model

SDCN Network 2013+
100k+ nodes



One View CloudVision physical and virtual networking, any-to-any workload portability, programmable operations

An Open Cloud Networking Stack is emerging

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Stack Layer	Examples	Benefits
Application	3 rd Party Vendor or internally developed	On-Demand Real time Applications
SDN Controllers	OpenFlow, OpenStack, vSphere/vCloud, etc	Dynamic Provisioning and Orchestration
Network Virtualization	Scalable L2/L3 domains	Workload Mobility with VXLANs, NVGRE etc
Server/Hypervisor	Bare-Metal Stateless Server ESX, Hyper-V, KVM, OVS	PXEBoot, LLDP, Linux, Windows Decouples App + OS Boot Scripts
Storage	Network/Direct Attached Pools SSD, Hadoop	No separate Fibrechannel SAN needed. NFS/CFS/iSCSI,Hadoop
Network	Cloud Network Programmable Platform	Enables software-defined application provisioning and deployment with eAPIS

Industry needs Best of Both: IP + SDN



Architecture	Legacy IP Networking	Overlay Controllers	Best of Both IP+SDN "Set it, Forget it"
Strength	Proven architecture, Internet scale	Flexible control Software programming of services	Best of both worlds Survivable and Flexible Control and programmability
Weakness	Inflexible, Weak Control Plane New features often require new hardware	New model Single Point of Management	New Programmable model across Physical & Virtual Ex: OpenStack/VMware

Open to Many Controllers and Programming Models

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OpenFlow support with all major controller vendors



OpenStack support with contributions to Quantum to enable seamless provisioning



Native VMware integration into vCloud and NSX - VXLAN integration



Native API calls being developed with key partners. Enables network automation through event manager

Practical Example of SDN- Use Case #1

Major Online Cloud Provider

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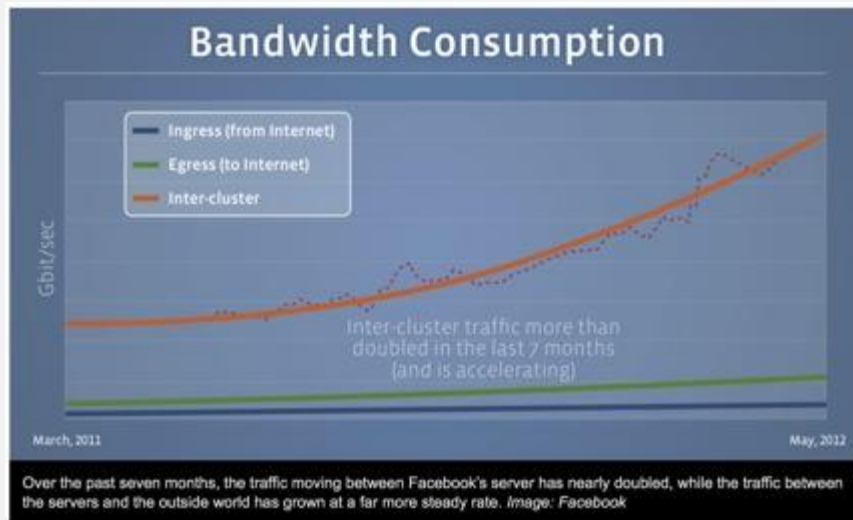
Company used SDN to simplify their operational process
SDN networking is at the heart of their online services
Significantly improved the size/scope/flexibility while reducing capex & opex.

	Before	After
Router Rollout	2-3 days	30 seconds
	2-3 engineers	1 engineer
	10-20% Errors	0%
Bill of Wrongs	~4-6/mon	~0/month
Change Velocity ROI	~50 a month	~1000/month

Arista EOS : ZTP, CloudVision, BGP, L3 ECMP, BGP

Practical Example of SDN #2

Major Social Networks Provider



“[..] the company is running its entire network at 10 gigabits per second. At the same time has overhauled the topology of the network. Previously, the company used what’s called a ‘layer 2’ network [..] This needed to change when it realized that traffic between its servers was growing so quickly.”

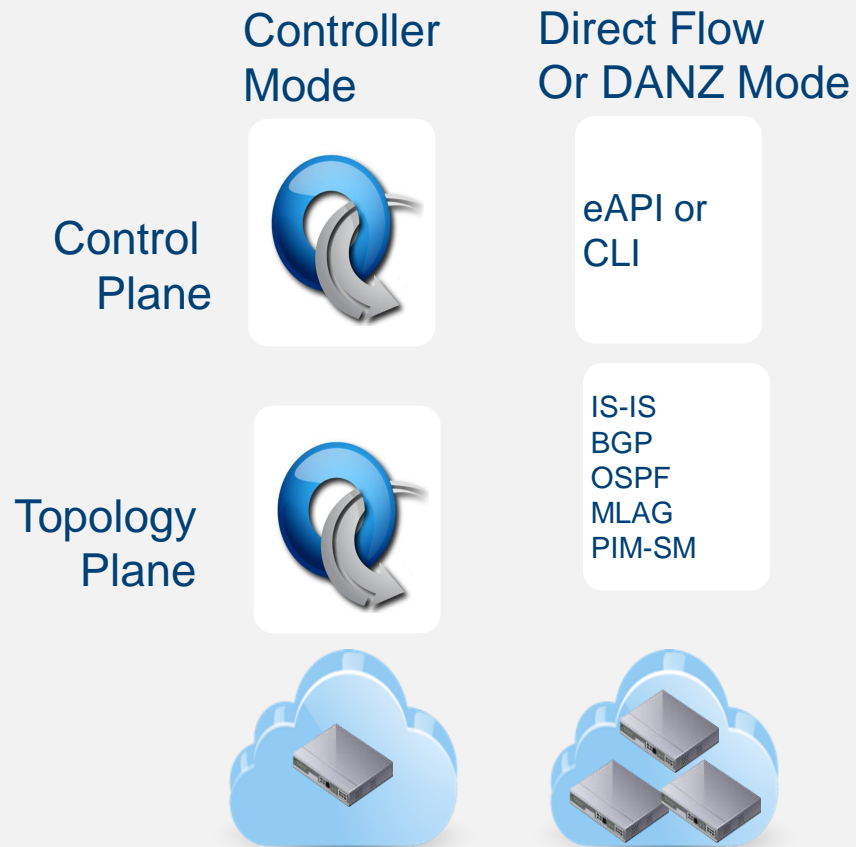
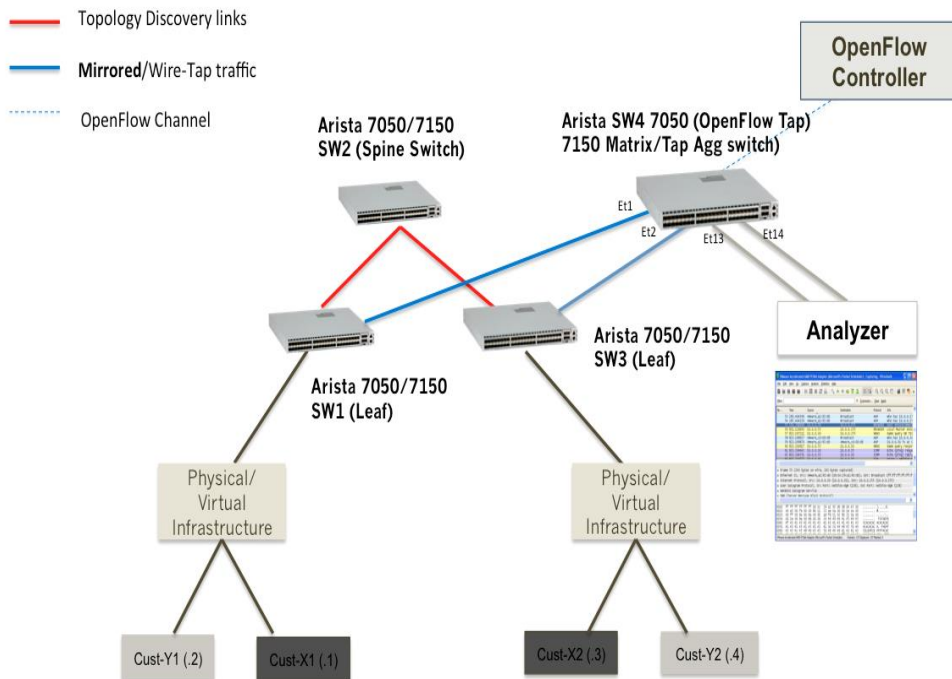
“[..] the company still needs only a single data center technician for every 15,000 servers.”

Arista Technologies: ZTP, CloudVision, eAPI, BGP, L3 ECMP, Python, ...

Practical SDN Example #3

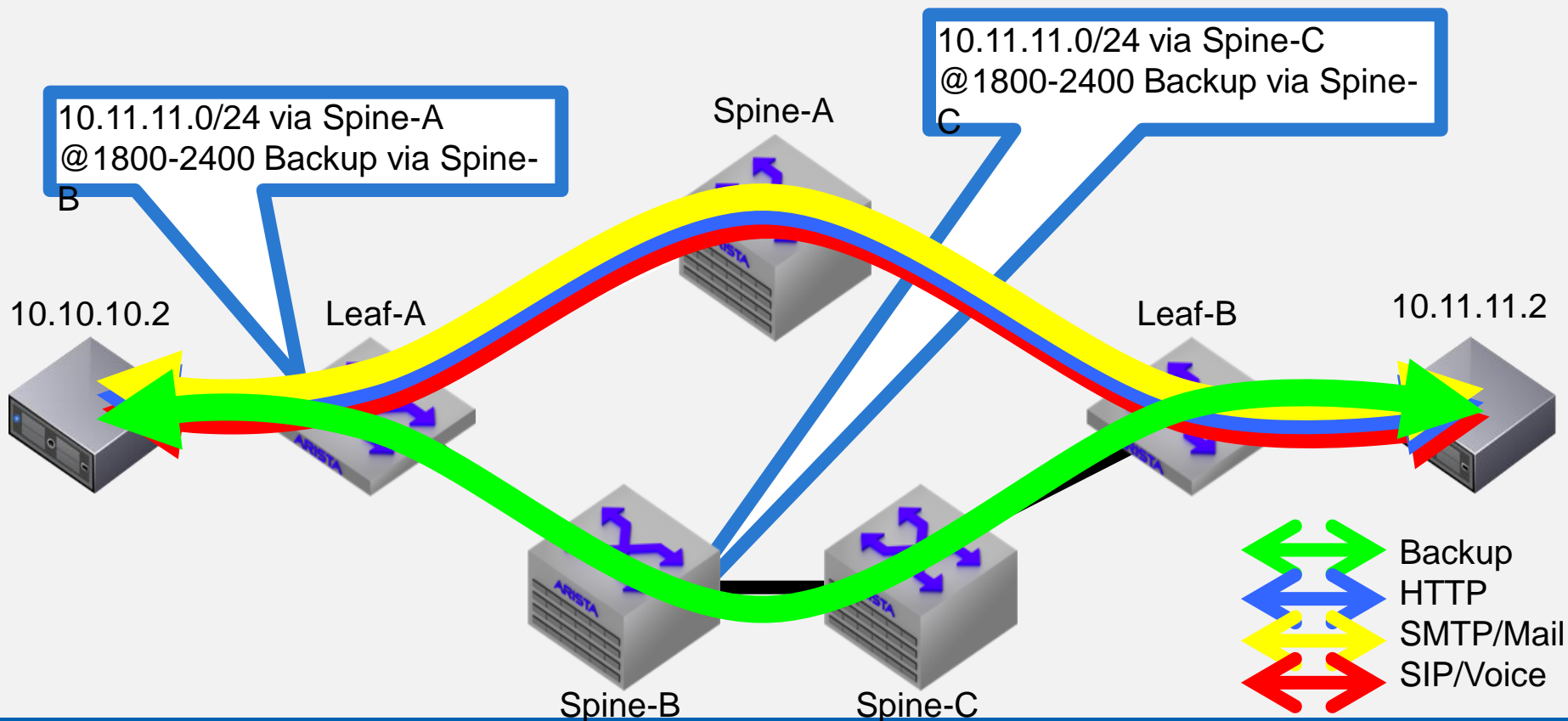
Network Tap Aggregation/Steering using DANZ or Openflow Modes

Hybrid OpenFlow + Advanced Mirroring TAP



Arista EOS: DANZ or Openflow-Enabled Tap Aggregation 7X50 switches

Practical SDN Use Case 3b: DirectFlow Programming



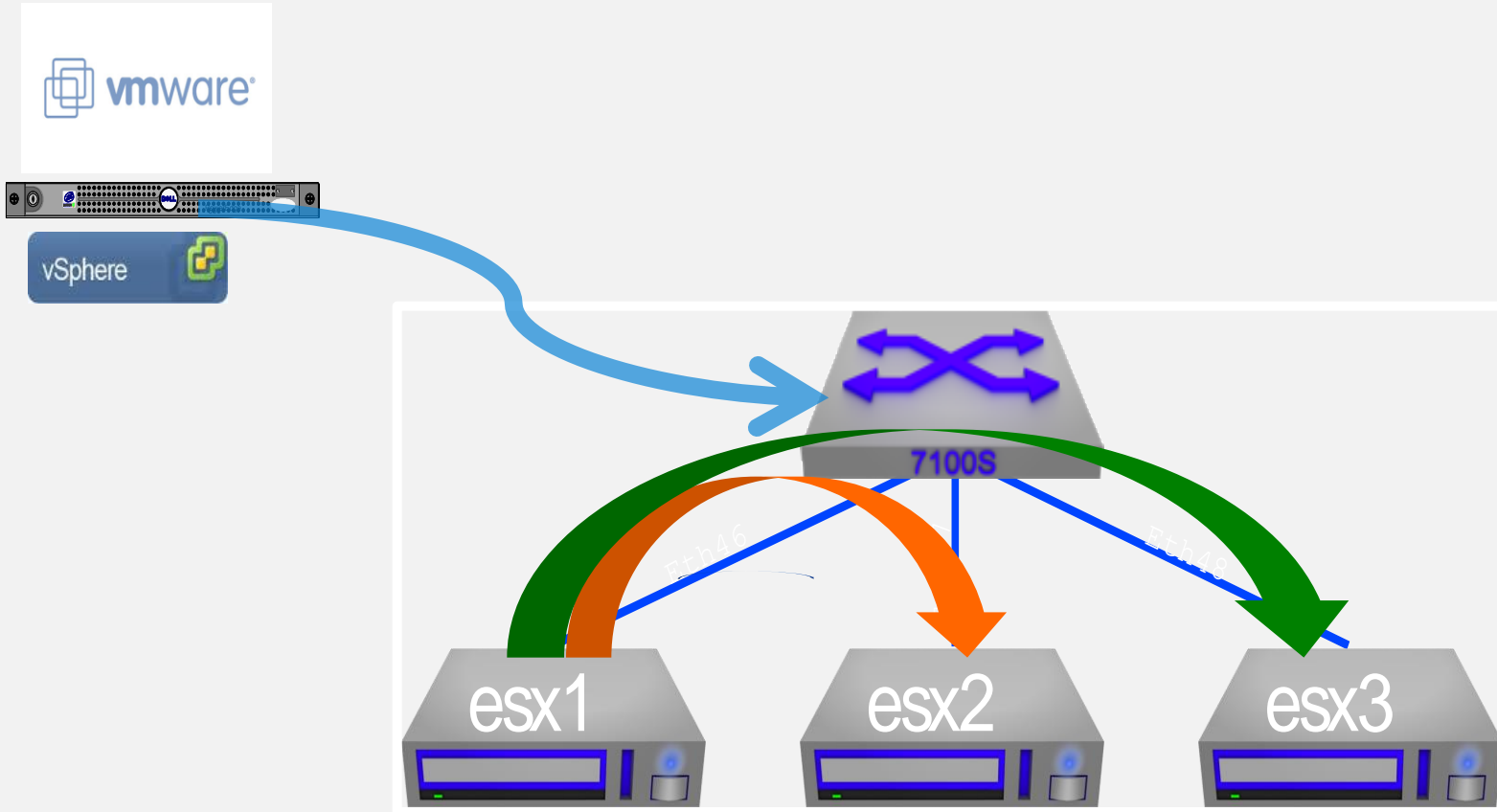
Practical SDN Example #4: Open APIs



Scales with predictable investment - does not compromise visibility

Practical SDN Example #5: Network Virtualization & VXLAN

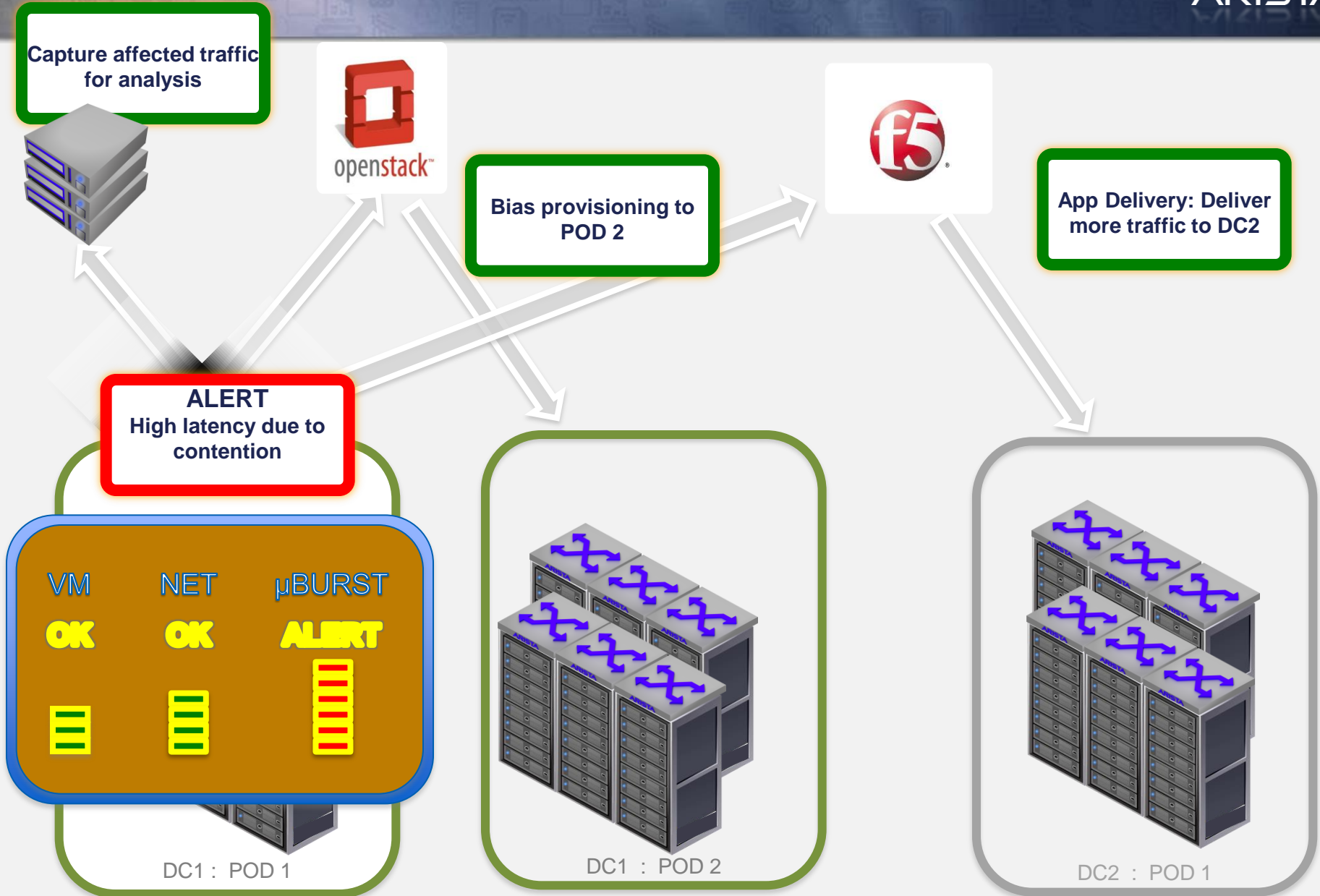
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VMWare NSX programs tunnels into Arista switches across L3 boundaries

- ▶ Integrating with VXLAN for scalable L3 live migration of dynamic connected workloads

Practical SDN Example #6: Cloud Elasticity



SDN Customers... its about operational excellence

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Opportunity

Problem Extensibility is Solving

Key Arista Driver

Human's don't obey
Moore's Law

Deliver network automation.
Scale without adding headcount.

A to Z automation
DANZ, VXLAN, etc

Scaling out Hadoop builds
at Big Data Customers

Allow deployments of large clusters.
Handle error conditions in less time.

Automate Big Data
deployments with limited
touching

Driving deals at Cloud
Providers

Integration of network into
business services (Billing, IPAM)

Cloud –Scale operations
& provisioning

Extending automation at
Web 2.0 Providers

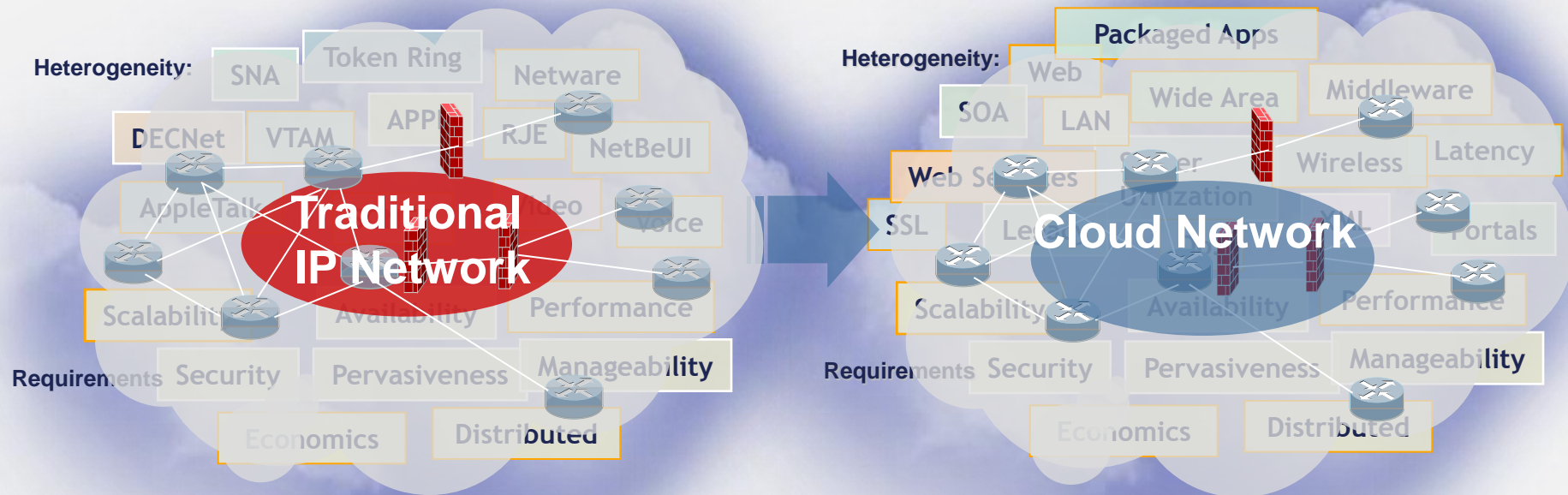
Extending automation tools
to include the network

Web 2.0 zero touch
operations model

“I had budgeted three weeks of my senior software engineers time to start the integration work, in three hours most of work had already been completed! Your approach to building an extensible platform just works!”

Multi-Protocol

Application Mobility



▪ **10 years ago:** Protocol Consolidation

▪ **Now:** Workload Consolidation (Virtual, Physical, Cloud)

SDN?

“Stanford-Defined Networking”

SDN?

“Sexy-Defined Networking – Networking is cool again”

SDN?

“Isn’t it OpenFlow? Or is it Nicira?”

SDN

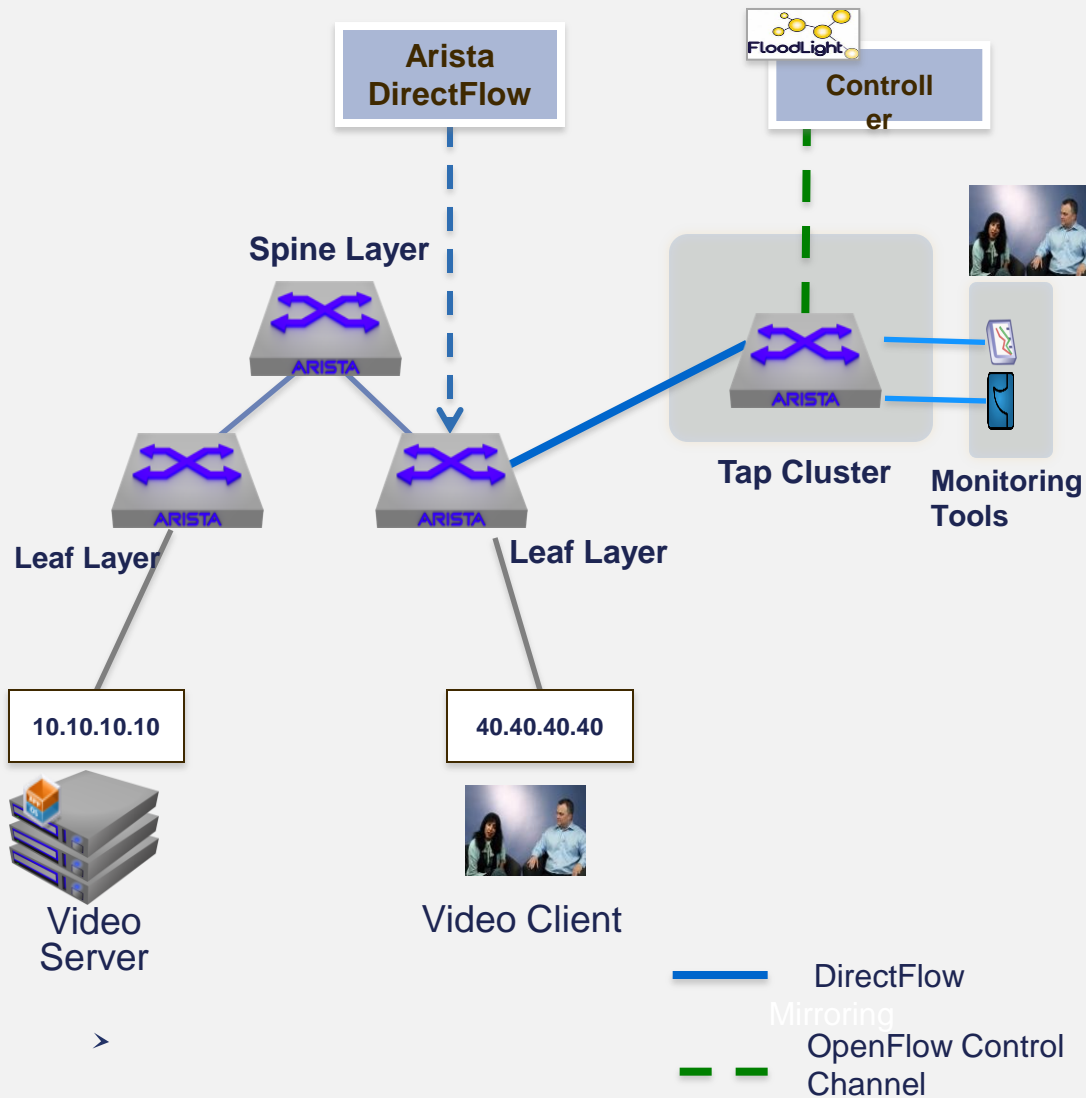
“Oh Yeah we’re building an SDN Chip”

SDN?

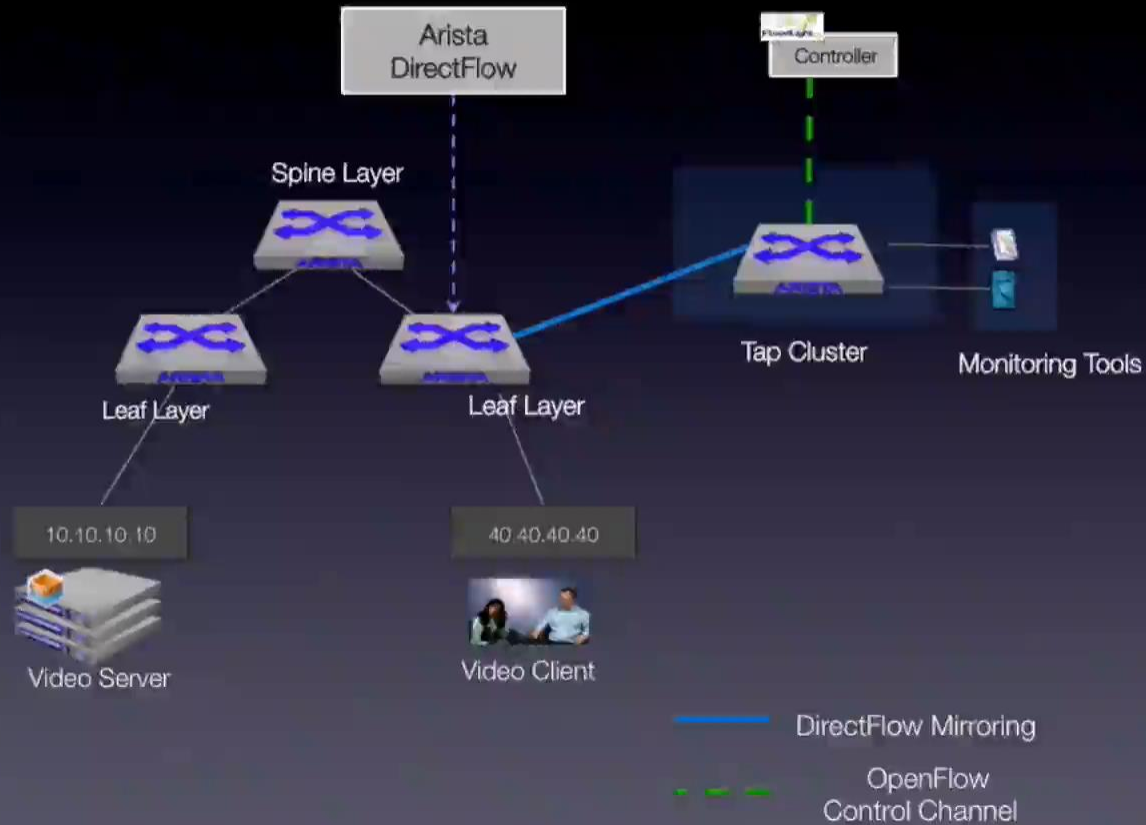
“Hmm... Still Don’t Know!”

Arista DirectFlow & OpenFlow Demo

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Arista DirectFlow & OpenFlow



Movement to Open & Programmable

