Airport Networks in the "Cloud":

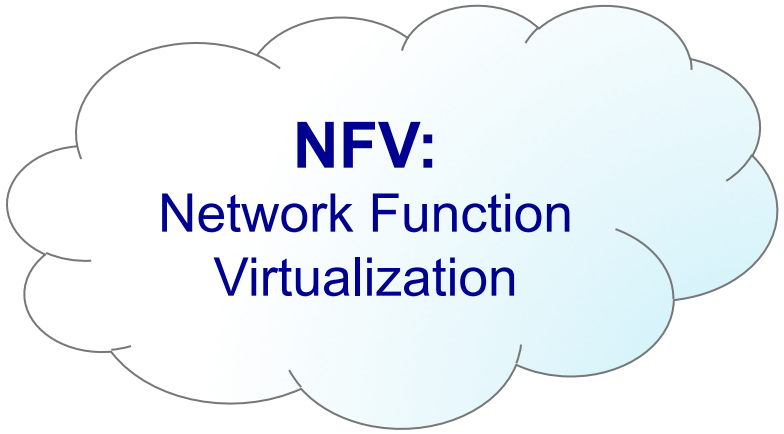
NFV, SDN, and what they mean to Airport IT

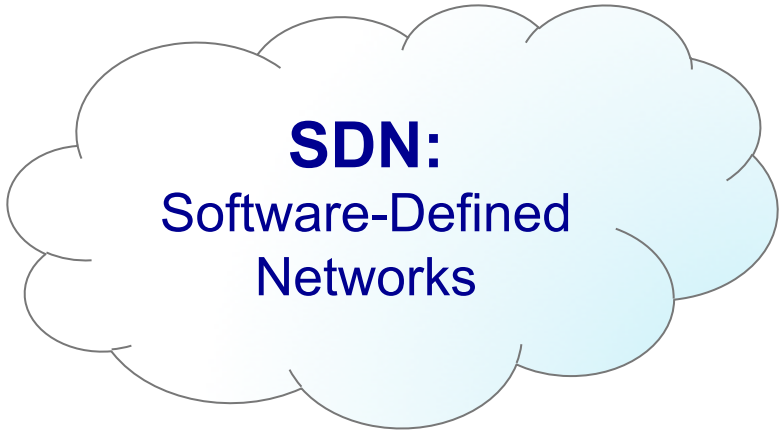
Scott Phillips, VP of Business Development, Boingo Wireless

March 25, 2015

Why Are We Here?

- Understand NFV & SDN
- The “Mobile Mind Shift”
  - More devices
  - More apps & services
  - More inter-connectivity
  - More challenges & threats
- Airport response & adaptation
  - IT tied to nearly every project
  - Multi-service networks require flexibility & scalability
  - Information security & consistency





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The “Mobile Mind Shift”

Mobile data traffic to **increase by 11x** between 2013-2018

9.2GB
Average monthly data usage

80%
consumed via Wi-Fi

93%
say Internet most important in daily life

91%
mobile devices most important in daily life

200%
increase in “Digital Elites” in last two years

Sources: Cisco VNI: http://bit.ly/Msevdw ; Nielsen - The Digital Consumer: http://bit.ly/1fUAX7I ; Informa Telecoms and Media: http://bit.ly/1j3YPKs

The Value of Virtualization

Today's Panelists

Marc Patterson

Vice President, Product Management

Boingo Wireless

"Re-Imagining the Airport Network"

Cam Cullen

Vice President, Global Marketing

Procera Networks

"Managing the Wi-Fi Quality of Experience (QoE)"

Houman Modarres

Marketing

Nuage Networks

"Is SDN Cleared to Land in your Network?"

The Value of Virtualization:

Re-Imagining the Airport Network

Marc Patterson, Vice President of Products, Boingo Wireless

March 25, 2015

Solutions for Today's Wireless World

A global wireless leader, Boingo provides comprehensive solutions for consumers, large venues, network operators/wireless carriers, and advertisers.

Simply put, we help the world stay connected.

Retail Solutions

Boingo Wi-Fi
Boingo Broadband

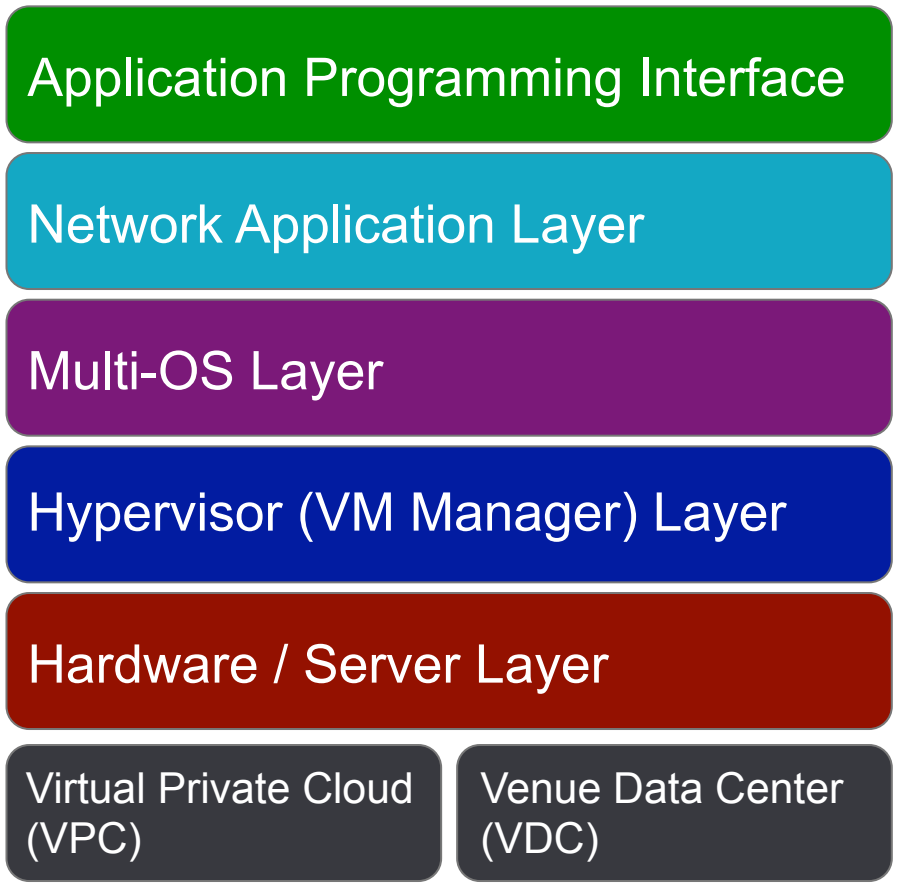
Wholesale Solutions

DAS, Wi-Fi, Roaming, Private-Label, Bundling, Location-Based Services, Broadband & Digital TV

Media Solutions

Advertising & Sponsorships
Boingo Media Platform

Basic NFV Architecture



Benefits:

- Decouples network functions from proprietary hardware
- Network functions run as software, improving scalability
- Increased data visibility
- Distributed data centers
- Faster rollout of services and applications
- Information integrity & protection
- Airport impacts:
  - Network expansion/control
  - Segmentation
  - Analytics/policy control
  - Data center design
  - Flexibility to test apps/systems

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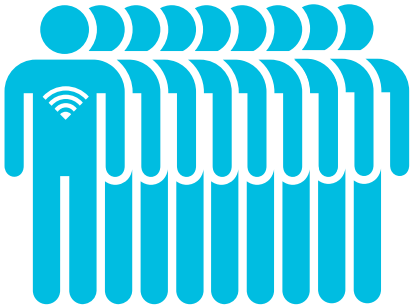
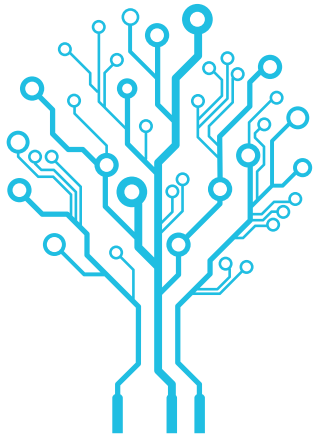
Re-imagined Network: Characteristics



High density, high capacity
Flexible and scalable



Heterogeneous networks

Analytics and Location
Based Service Support

Network & System
Virtualization

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Re-imagined Network: Objectives

- Provide a scalable, converged infrastructure
- Prepare for large scale mobile offloading
- Improve design flexibility to address increased AP counts
- Support higher bandwidth networks
- Increase the agility of policy control in venues
- Increase depth and breadth of analytical data/reporting
- Address increasing variability of venue size & demand
- Increase reliability and resiliency of network and systems
- Support new services & capabilities
  - Bandwidth on-demand
  - Dynamic content delivery

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Re-imagined Network: Service Definition

S.M.A.R.T. Networks™

Secure

All S.M.A.R.T. Networks will be Passpoint-enabled, supporting WPA2 encrypted connections for some classes of service, in addition to employing security configurations that protect the core network.

Multi-Platform

S.M.A.R.T. Networks are designed to optimize the Wi-Fi experience, platform-by-platform. Boingo's classes of service help users and service providers pick the experience they desire, while the network intelligently optimizes that experience for the platform itself.

Analytics-Driven

S.M.A.R.T. Networks are location-aware, enabling venues to better serve customers with actionable business intelligence derived from historic and predictive analytics.

Responsive

S.M.A.R.T. Networks balance flexibility, capacity and connection performance with an adaptable network infrastructure. S.M.A.R.T. Networks continually evaluate the service being provided, ensuring that it's delivering the defined user experience for each class of service.

Tiered

S.M.A.R.T. Networks support multiple classes of service that can be tuned for a defined user experience. The tiers of service classes create user experiences that meet the needs of casual and power users alike.

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Thank you!

Marc Patterson, Vice President of Products, Boingo Wireless
mpatterson@boingo.com

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Managing the WiFi Quality of Experience
Airport WiFi Challenges

Cam Cullen
VP of Global Marketing

Modified Maslow's Hierarchy of Needs

What is Unique about Airport WiFi?

Managing the Wi-Fi Subscriber Experience

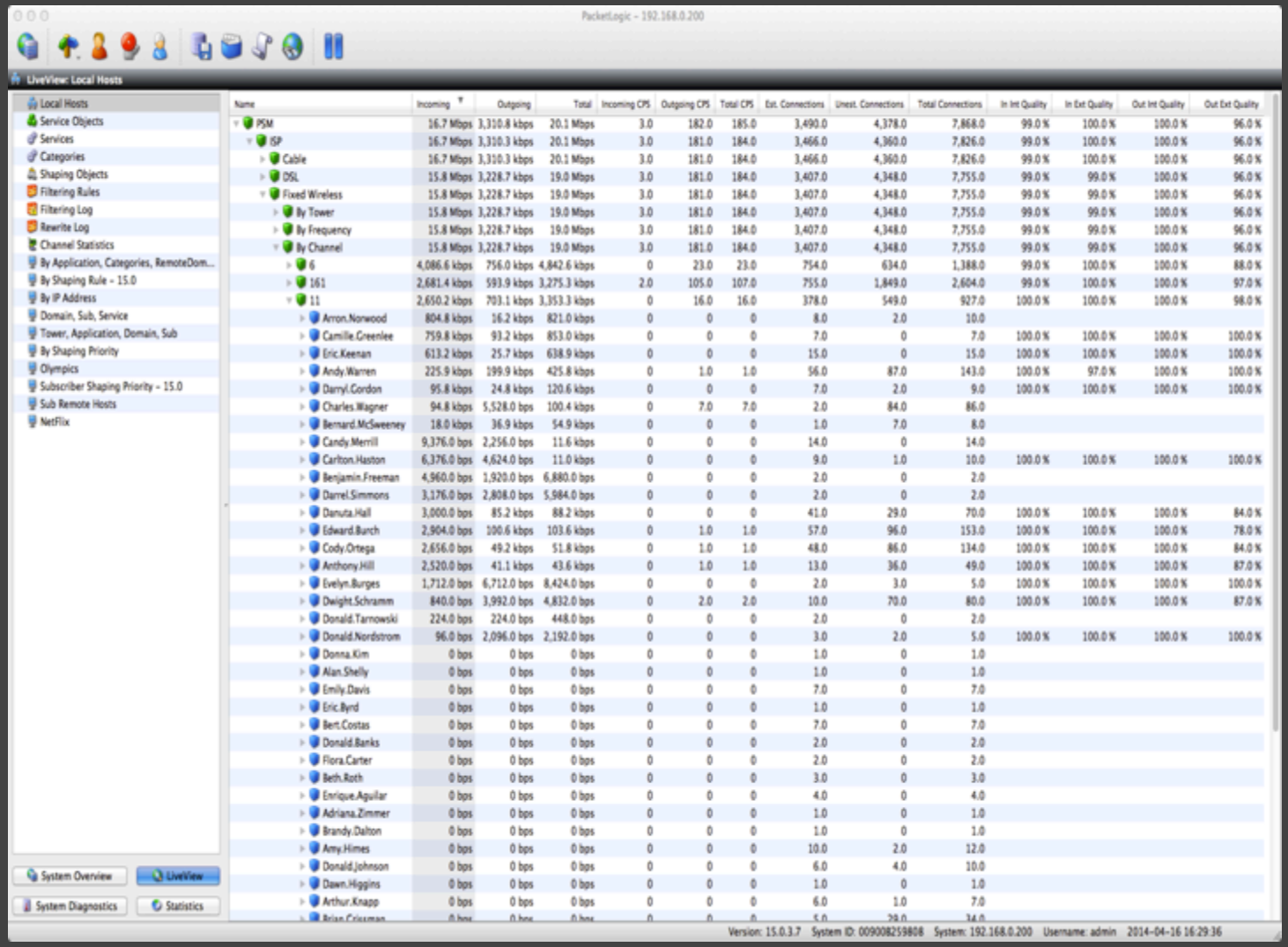
Real-Time Visibility

Name	Incoming	Outgoing	Incoming CPS	Outgoing CPS	Est. Connections
PSM	222.1 kbps	17.9 kbps	0	0	406.0
All Subscribers	222.1 kbps	17.9 kbps	0	0	406.0
By AP	222.1 kbps	17.9 kbps	0	0	396.0
1.1.1.3	189.9 kbps	5,264.0 bps	0	0	38.0
1.1.1.5	17.2 kbps	5,712.0 bps	0	0	17.0
1.1.2.1	12.3 kbps	5,792.0 bps	0	0	47.0
1.1.3.1	1,984.0 bps	592.0 bps	0	0	24.0
1.1.1.4	576.0 bps	0 bps	0	0	97.0
1.1.1.1	144.0 bps	88.0 bps	0	0	40.0
cc:3a:61:21:0c:09	104.0 bps	0 bps	0	0	12.0
1c:ab:a7:b2:b0:b3	40.0 bps	88.0 bps	0	0	1.0
b0:ec:71:b0:bd:d3	0 bps	0 bps	0	0	3.0
ac:fd:ec:87:e4:70	0 bps	0 bps	0	0	1.0
90:72:40:c6:93:a9	0 bps	0 bps	0	0	0
7c:11:be:1f:81:9b	0 bps	0 bps	0	0	1.0
34:e2:fd:c1:8e:4d	0 bps	0 bps	0	0	7.0
20:c9:d0:81:42:2f	0 bps	0 bps	0	0	4.0
20:64:32:c6:04:4d	0 bps	0 bps	0	0	0
1c:b0:94:b7:a9:7d	0 bps	0 bps	0	0	2.0
10:40:f3:96:8a:d4	0 bps	0 bps	0	0	9.0
1.1.1.2	0 bps	0 bps	0	0	11.0
1.1.2.2	0 bps	0 bps	0	0	10.0
1.1.1.6	0 bps	0 bps	0	0	18.0
1.1.3.2	0 bps	408.0 bps	0	0	94.0
By AP Channel	222.1 kbps	17.9 kbps	0	0	396.0
By AP Mode	222.1 kbps	17.9 kbps	0	0	396.0
By AP Mode Channel	222.1 kbps	17.9 kbps	0	0	396.0
By Channel	222.1 kbps	17.9 kbps	0	0	406.0
By Location AP	222.1 kbps	17.9 kbps	0	0	396.0

How is the network performing in these sections right now compared to historical averages?

What is the real-time usage for each AP?

Real-Time Visibility

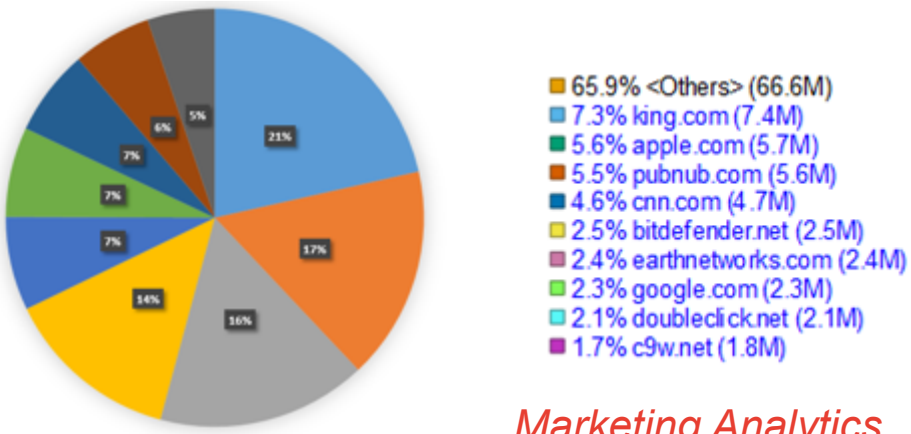


How are individual subscriber connections performing?

Historical & Trends

Band	Num. Sub.	↓ Vol.	↓ Peak Thr.	↑ Peak Thr.
802.11n 2.4GHz	913	8.26 GiB	14.5 Mbps	9.20 Mbps
802.11n 5GHz	428	6.03 GiB	10.9 Mbps	21.1 Mbps

Usage Analytics



Marketing Analytics

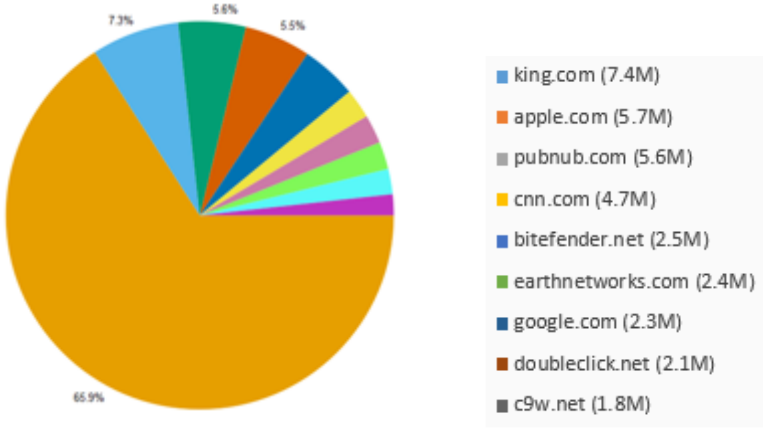


Table 6. The most used devices on 802.11n 2.4GHz. Total number of subscribers is 913. Downstream volume is 8.26 GiB.

Device	↓ Vol.	Num. Sub.	Int.RTT
Android (Phone)	11 %	214 (23 %)	180 ms
iPhone (Phone)	24 %	158 (17 %)	250 ms
iPad (Tablet)	2.7 %	9 (0.99 %)	65 ms
Mac (Computer)	6.0 %	7 (0.77 %)	44 ms

Device & QoE Analytics

Table 7. The most used devices on 802.11n 5GHz. Total number of subscribers is 428. Downstream volume is 6.03 GiB.

Device	↓ Vol.	Num. Sub.	Int.RTT
Android (Phone)	17 %	105 (25 %)	78 ms
iPhone (Phone)	32 %	84 (20 %)	160 ms
iPad (Tablet)	2.9 %	13 (3.0 %)	20 ms
Mac (Computer)	0.51 %	4 (0.93 %)	1.9 ms

Table 8. The most used devices on 802.11g. Total number of subscribers is 11. Downstream volume is 237 MiB.

Device	↓ Vol.	Num. Sub.	Int.RTT
iPhone (Phone)	96 %	5 (45 %)	8.3 ms

Wi-Fi Quality Management

Service Flexibility

- “Free”/Ad-Supported Services
- Premium Services
- Video-Friendly Services
- Turbo Services
- Usage Management & Tiers
- Application-Controlled Services

Virtualization is Natural for Airport Wi-Fi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Is SDN Cleared to Land in your Network?

Houman Modarres
Marketing, Nuage Networks

Airports Council International

Spring Business Information Technology

March 2015

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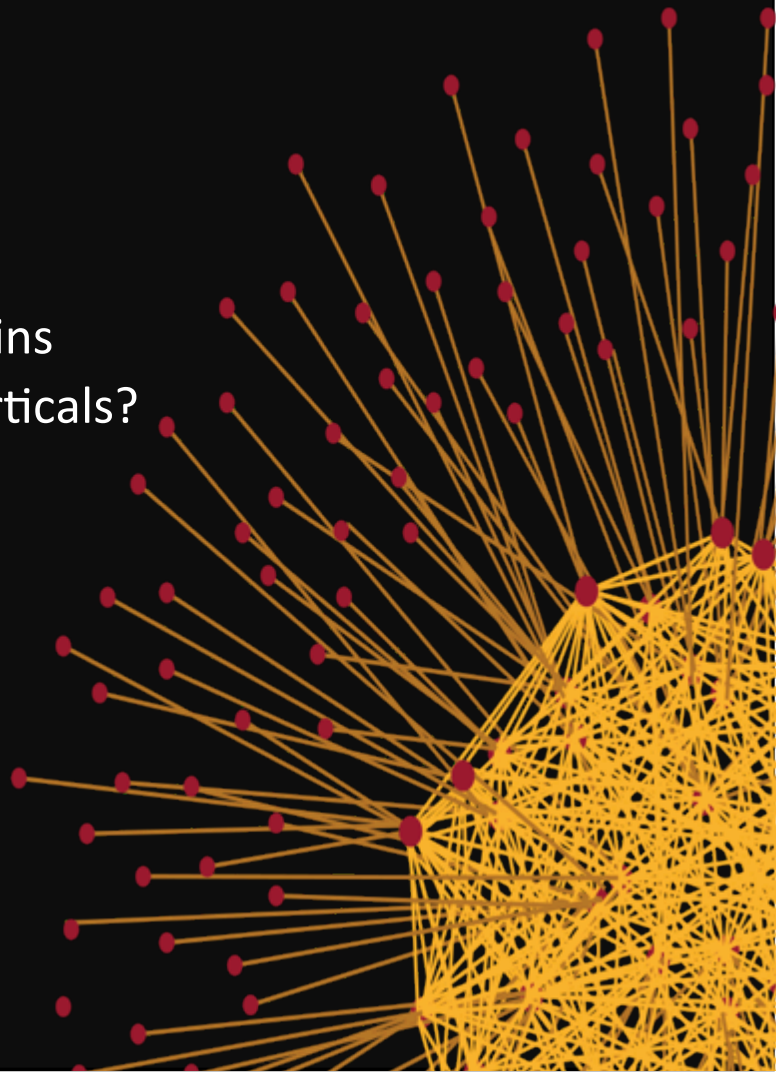
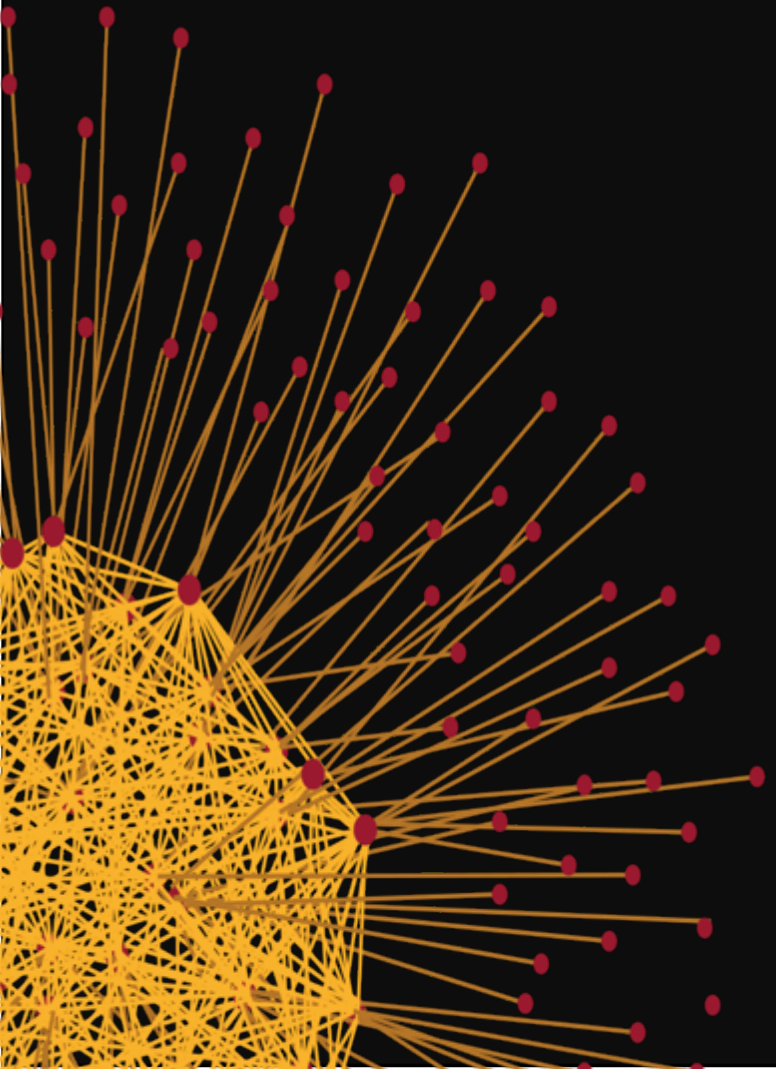
The Cloud & Your Business

- What has changed?
- What needs to be re-thought as a result?
  (as far as networking is concerned)
- What does this mean to CIOs & network admins
  in the transportation industry & other key verticals?
- What's possible?



The Big Change



- The **Marriage of "IP" & "IT"**
- Shift in Operational Mindset
- Network Services on demand, in support of cloud applications
- Any application, any cloud, every time

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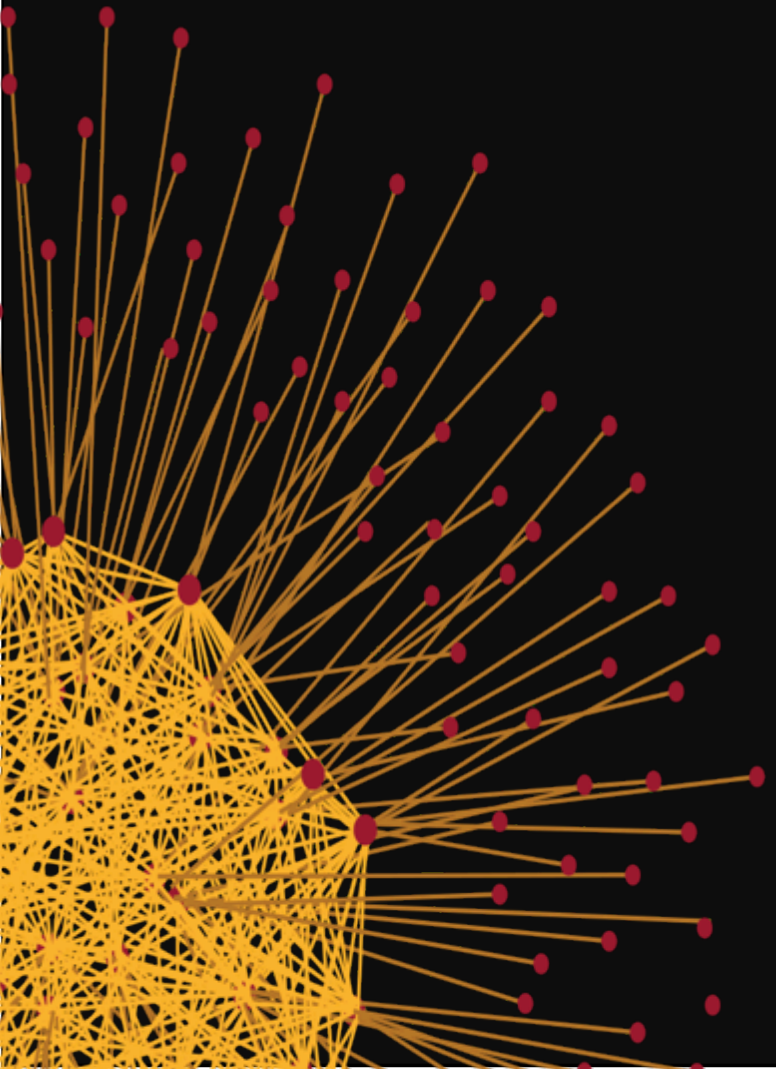
The Big Idea



Networking every bit as instantaneous and readily consumable as compute

- **Open:** Preserve choice
- **Boundary-less:** Networks, not islands
- **Policy-Driven:** Security & visibility

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The Fundamental Shift

A shift in **ABSTRACTION**

How applications interact with the network

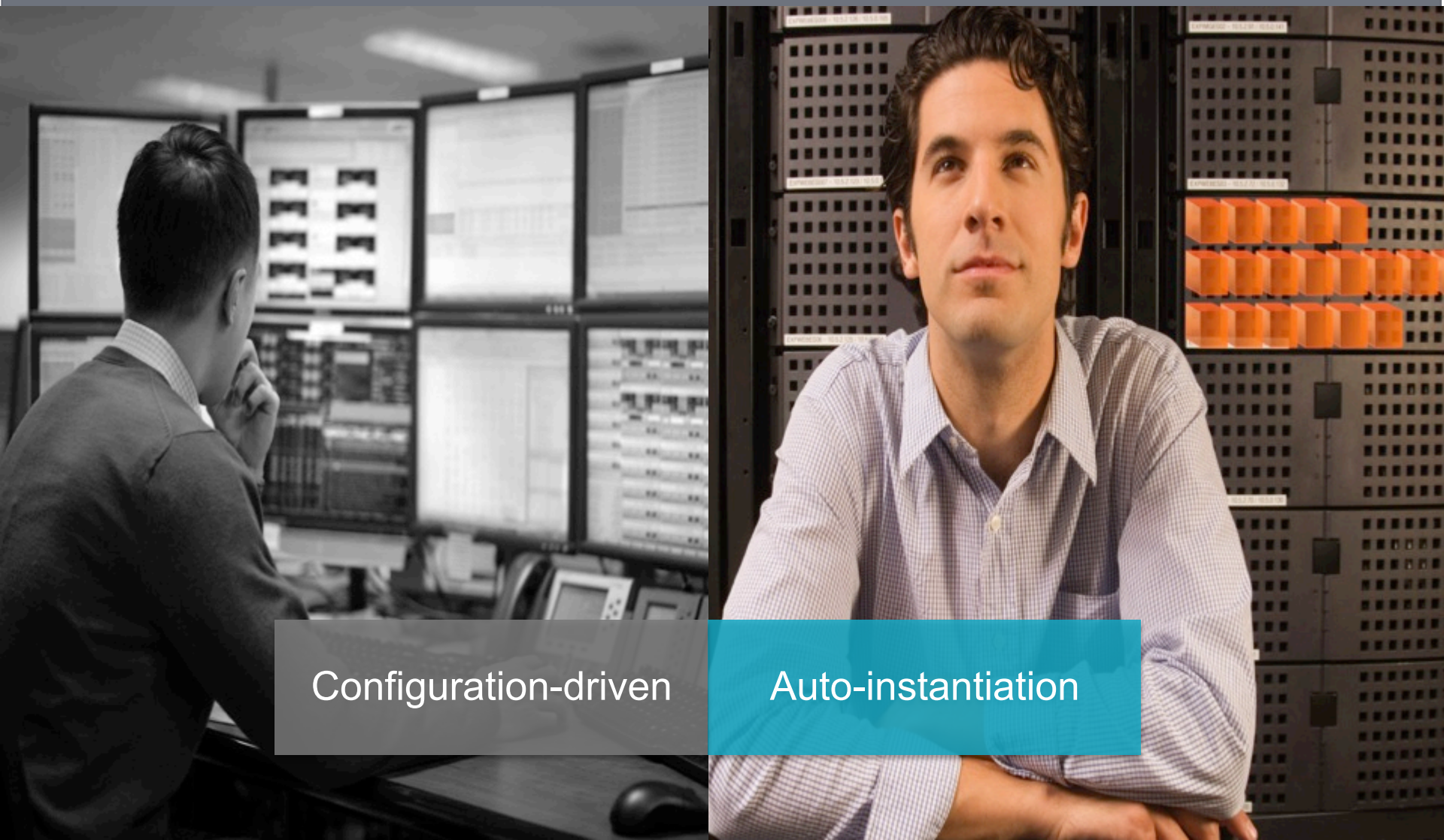
Lost in Translation

IT-Friendly Definition

A Fundamental Shift

A shift in **AUTOMATION**

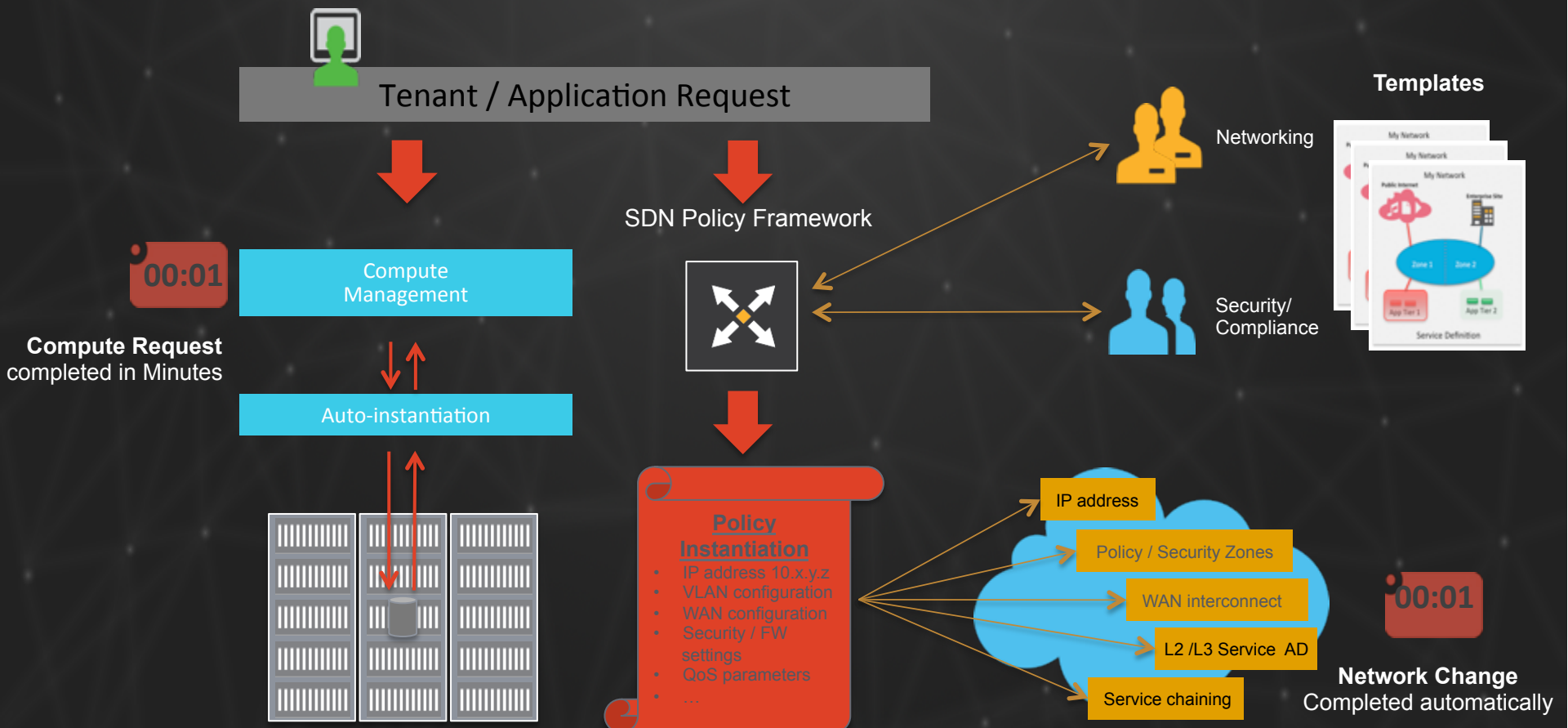
How network services are instantiated



Configuration-driven

Auto-instantiation

Policy-Driven Network Automation



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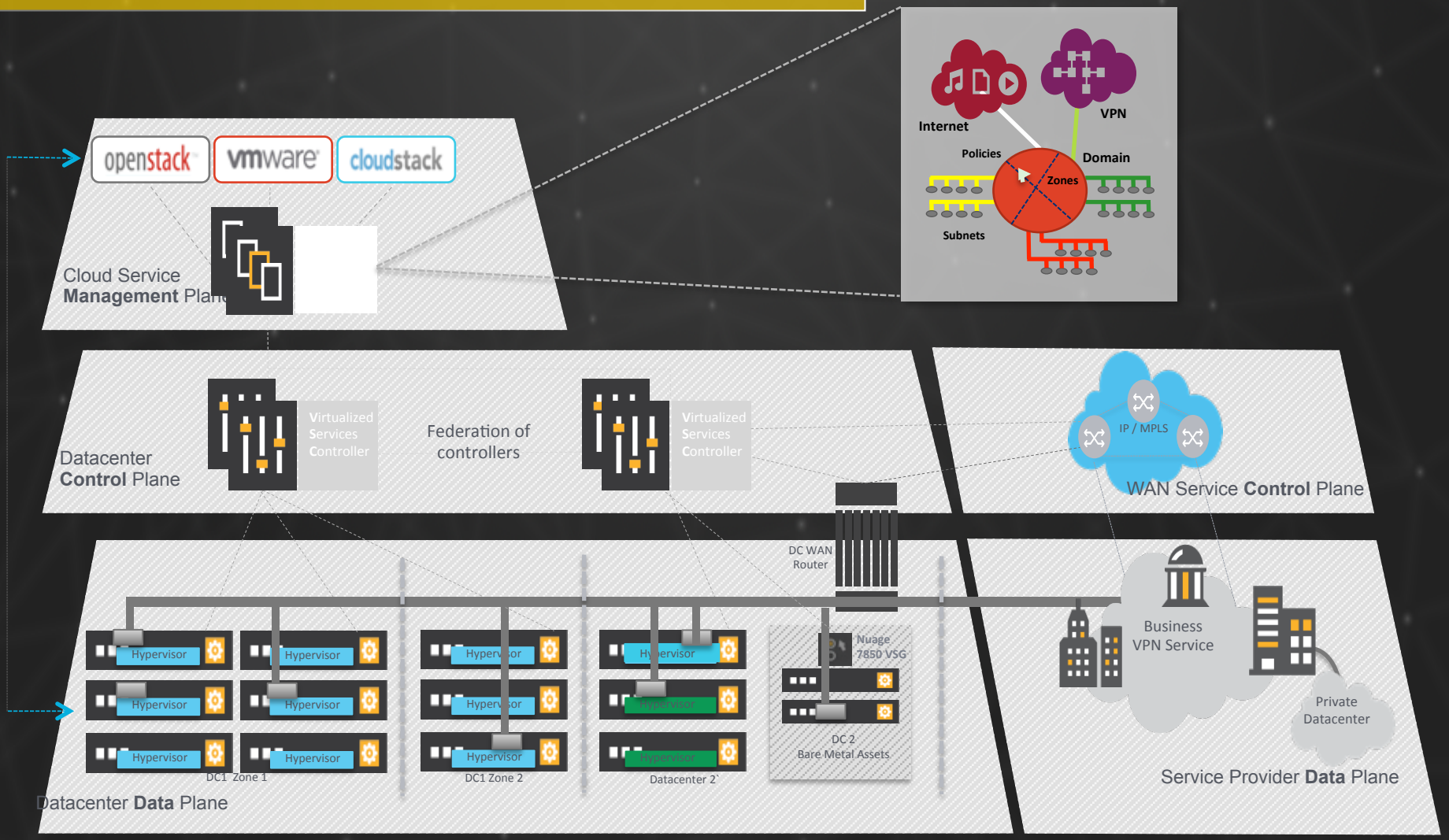
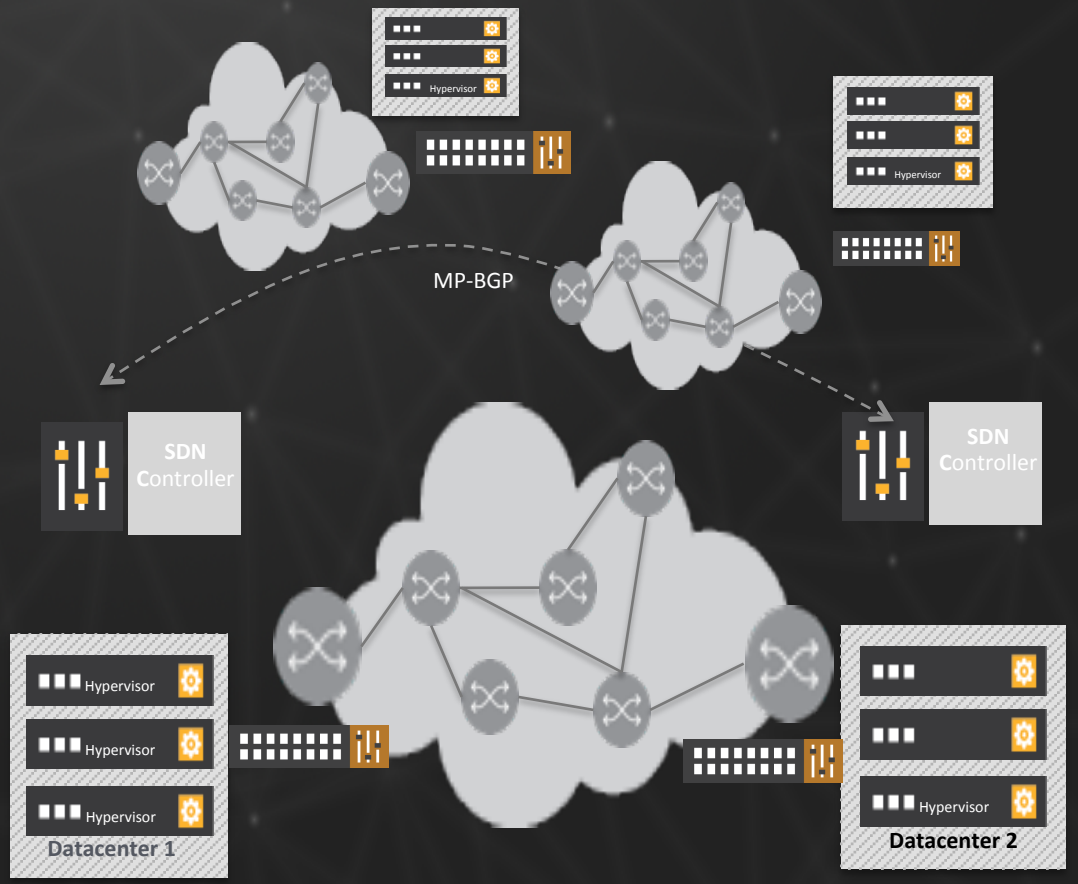
SDN Automation across all Assets



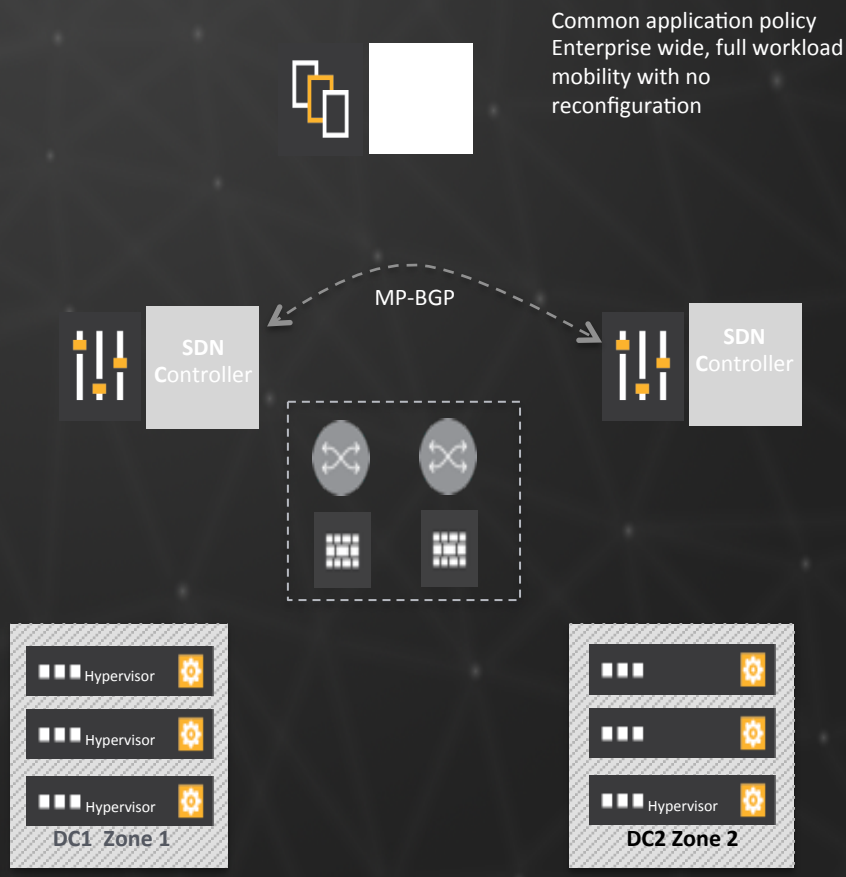
Use Case: Datacenter Interconnection

- Move workloads over existing network infrastructure
- Virtual networks span across physical locations
- Workloads inherit the same policy & attributes regardless of location
- Control and visibility across separate physical locations
- Ideal for traversing private, public or hybrid clouds



Implicit Benefit: Disaster Recovery

- Move or mirror applications to backup sites in private or hybrid cloud
- Virtual networks scale between physical locations
- Application servers inherit configurations, are instantiated based on policy
- Control and visibility across disparate physical locations



Derived Benefit: Compliance & Audit

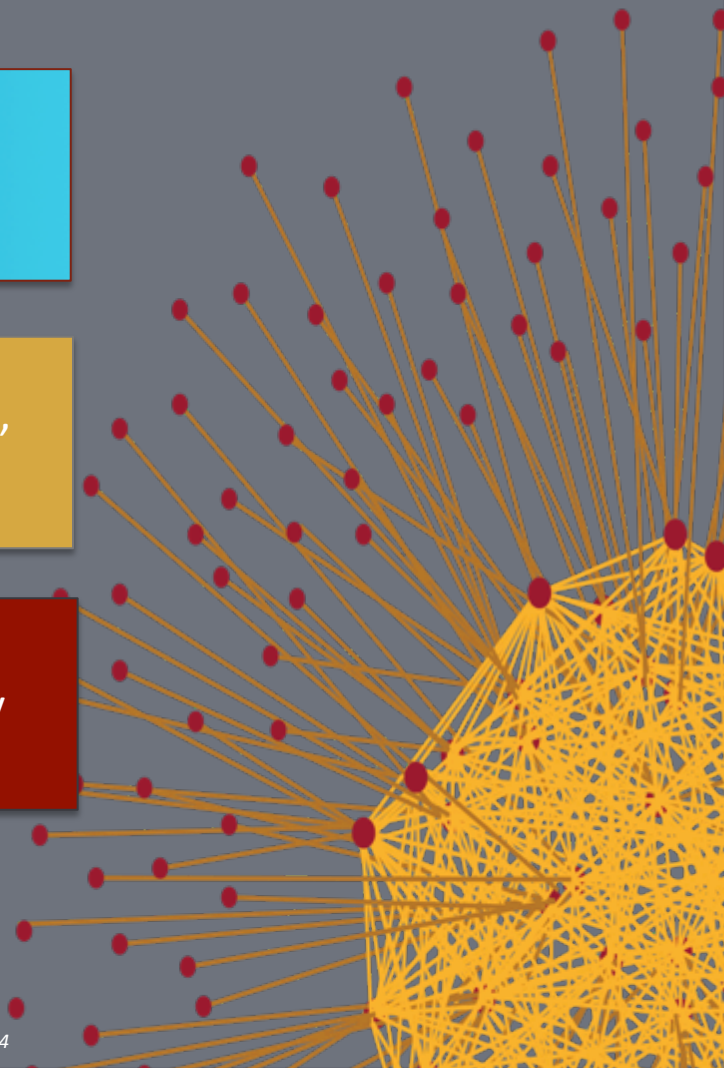
- Update security policy once, centrally.
- Deploys across all appropriate endpoints
- Adhere to changes across the infrastructure implicitly
  - Compliance with global security policy
  - Configuration consistency

Bottom Line for the CIO

50% Reduction in Operational Expense (Equipment, Power, Cooling, Space)

10x Improvement in turn-up response time, Reduction in configuration errors

40% Increase in asset utilization & flexibility



Source: Alcatel-Lucent Analysis, customer survey feedback 2013-2014

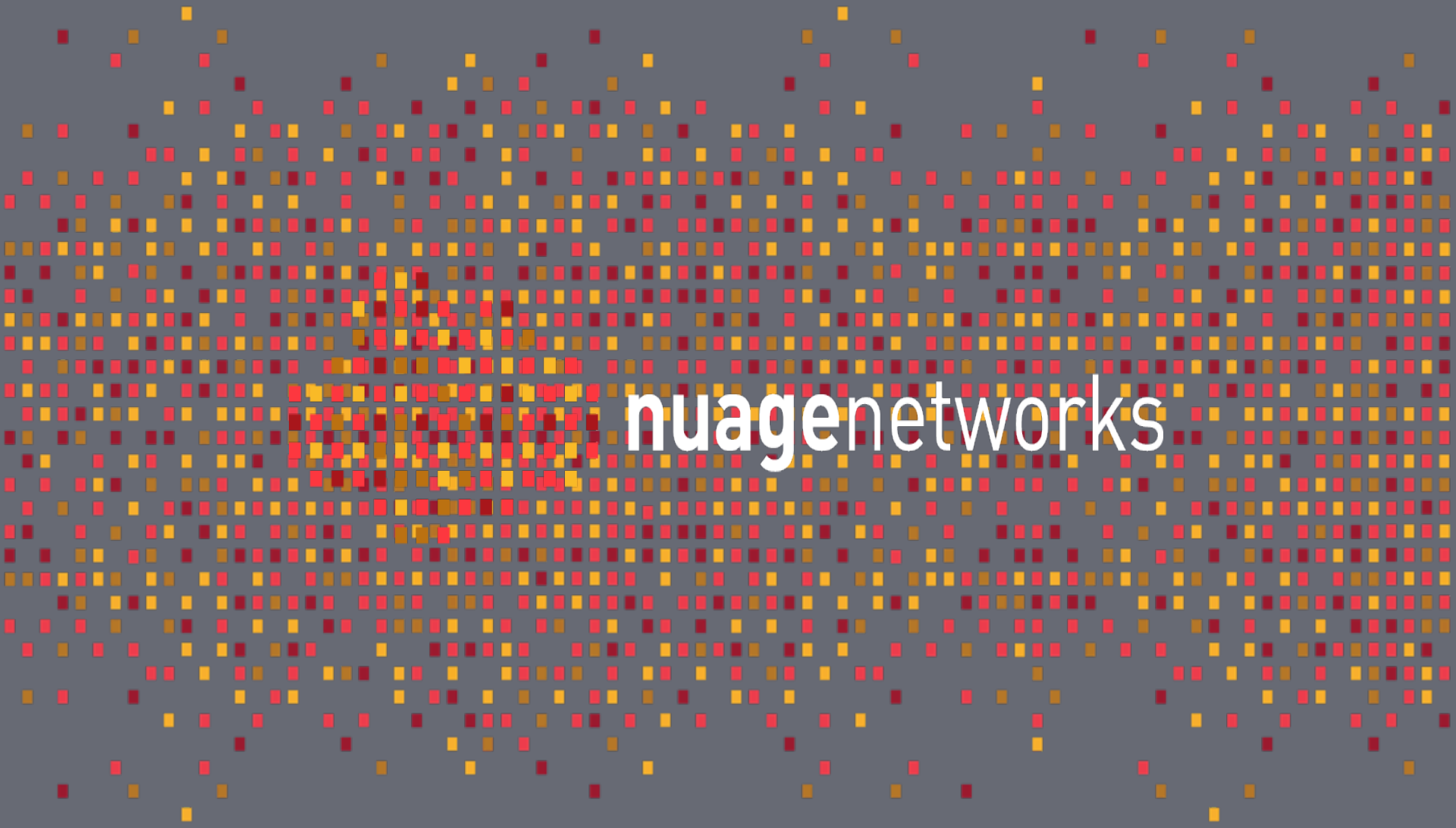
What's Possible

- Taking the datacenter as it stands
- Policy-Based Network Auto-instantiation
- Agility without losing control & visibility
- Virtualizing Networks not islands
- Within & across datacenters & branches

ANY APPLICATION,
ANY CLOUD,
EVERY TIME.

Key Points

- Networks should follow at speed of cloud apps
- SDN = Abstraction + Automation
  (& its principles really can drive more agility & less lock-in)
- Policy-driven auto-instantiation
  in lieu of device-by-device configuration
  (like mobile networks)
- Peering without boundaries, inclusive of branches
  (like the internet & VPNs)
- Benefits must extend across all assets
  (virtualized & bare metal, as many of your critical apps require)



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Wrap-Up

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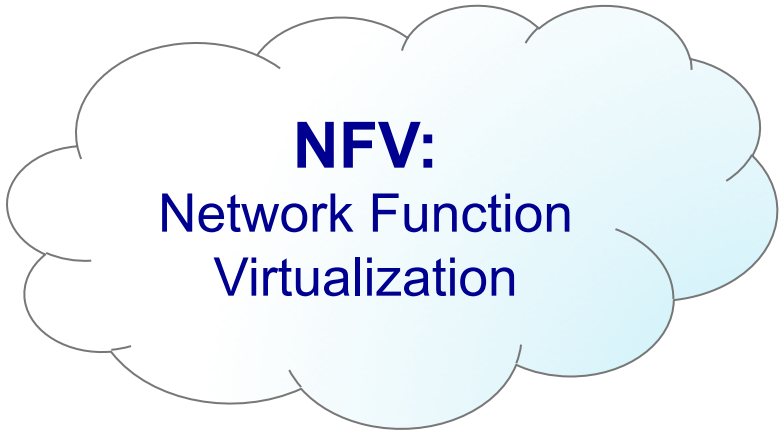

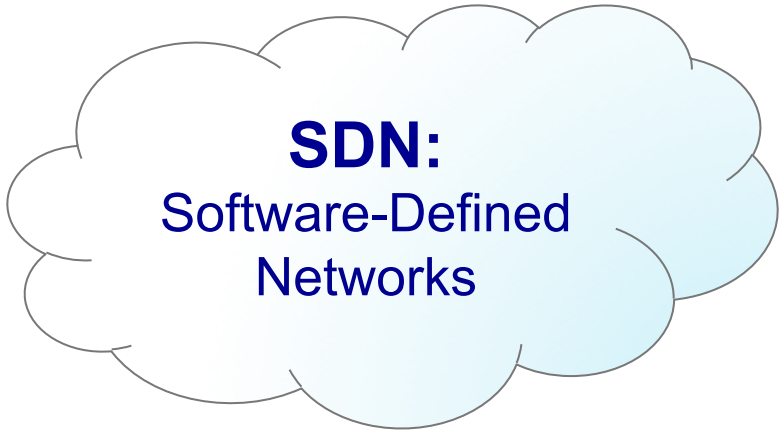

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Thank you!

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