



Open Networking

USER GROUP

May 13-14, 2015



COLUMBIA
UNIVERSITY

Cisco SD-WAN Verification Testing

Steve Wood

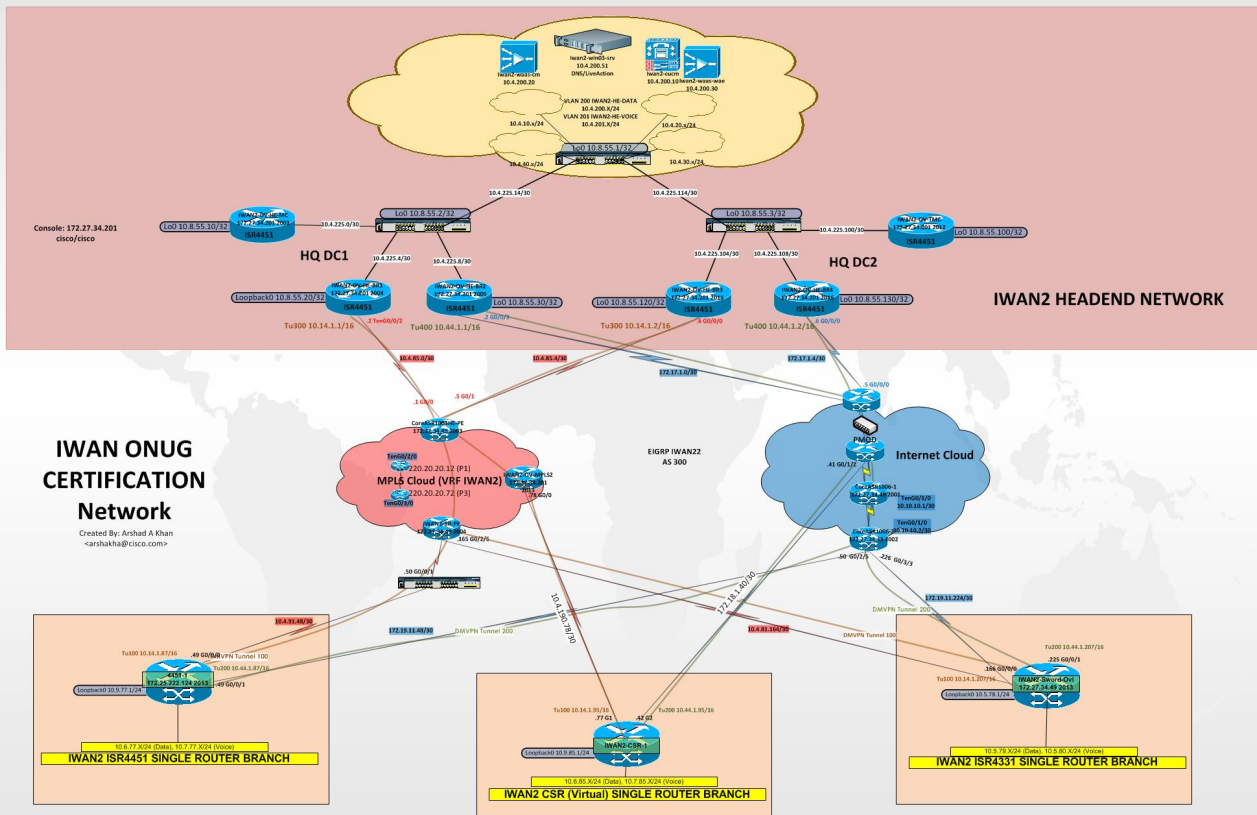
Principal TME

Cisco Enterprise Networking Group



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IWAN SD-WAN Verification Test Topology



Key Products Tested

ISR-4451/ ASR1000	IWAN DC/POP Border Router
ISR-4451	IWAN DC/POP Domain Controller
ISR-4451	IWAN Branch Border Router
ISR-4331	IWAN Branch Border Router
CSR-1000v	IWAN Virtual Branch Border Router

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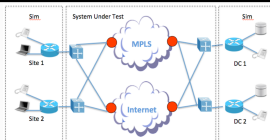
Top Ten Requirements
Verified



CISCO

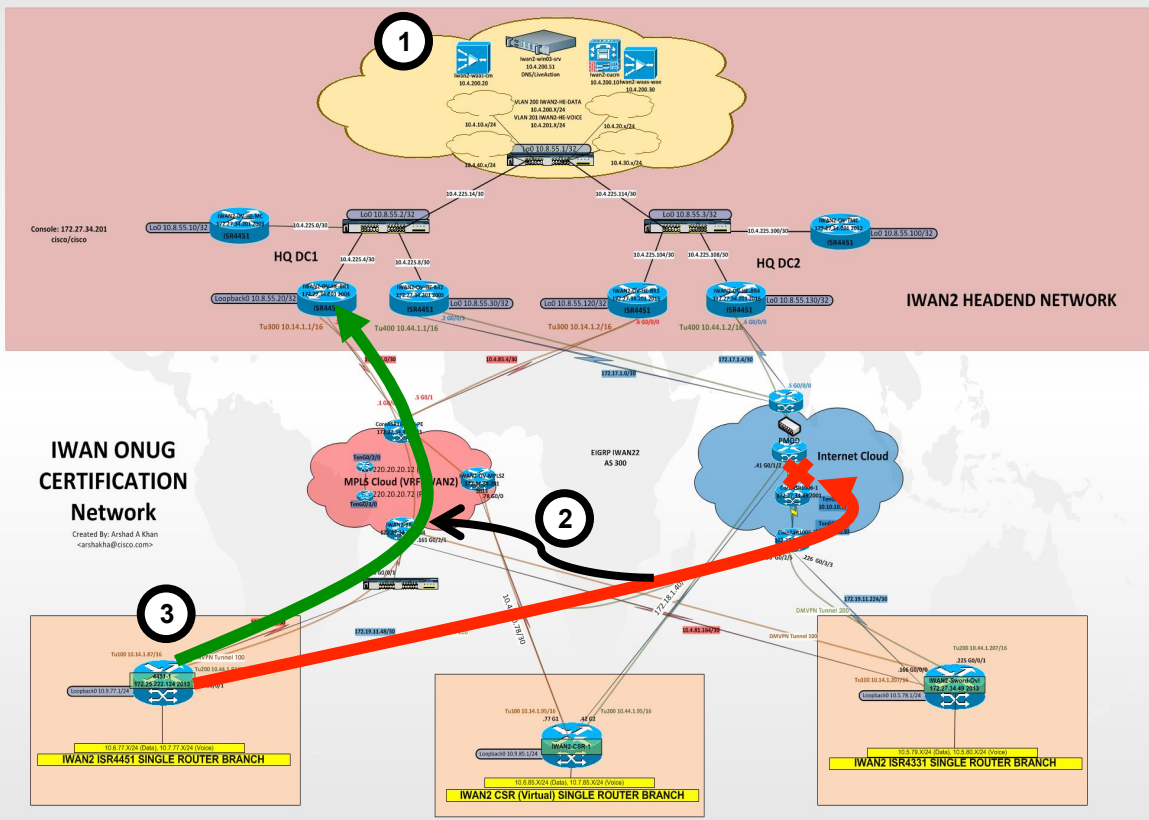
System Under Test

Products	Software Versions
ISR-4451/ ASR1000	IWAN DC/POP Border Router
ISR-4451	IWAN DC/POP Domain Controller
ISR-4451	IWAN Branch Border Router
ISR-4331	IWAN Branch Border Router
CSR-1000v	IWAN Virtual Branch Border Router



SD-WAN WG Use Case – Feature Verification of Top Ten Requirements	Pass	Fail	Omit
1. Remote site to leverage public/private WANs in an active-active mode	✓		
2. CPE in a p or v form factors on commodity h/w	✓		
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4. Visibility, prioritization and steering of biz critical and RT apps as per security and corporation governance and compliance policies	✓		
5. A highly available and resilient hybrid WAN	✓		
6. L2/L3 interoperability with directly connected switch and/or router	✓		
7. Site, Application, and VPN performance level dashboard reporting	✓		
8. Open north bound API for controller access and management. Log events to net event co-relation manager, SIEM	✓		
9. Zero touch deploy at branch site with min. to no configuration changes on directly connected infrastructure	✓		
10. FIPS-140-2 validation certification for cryptography.	✓		

Test #4: Prioritization & Steering of Biz Critical & RT traffic



1. Application policies pushed to device:

- Voice, Control, Critical Data -> Prioritize
- Bulk Data -> Best effort with WRED
- Path Control

2. Path Control:

PfR detects network problem and steers applications to the better performing path

3. Prioritization:

Traffic is prioritized based on policy

```
Class-map: VOICE (match-any)
  81908 packets, 25389304 bytes
  30 second offered rate 3749000 bps
  Match: ip dscp ef (46)
```

drop rate 0000 bps

```
Class-map: BULK-DATA (match-any)
  144332 packets, 22026136 bytes
  30 second offered rate 3260000 bps
  Match: ip dscp cs1 (8)
```

drop rate 204000 bps

Viptela SD-WAN Verification Testing

Ramesh Prabakaran

VP of Product Management & Marketing

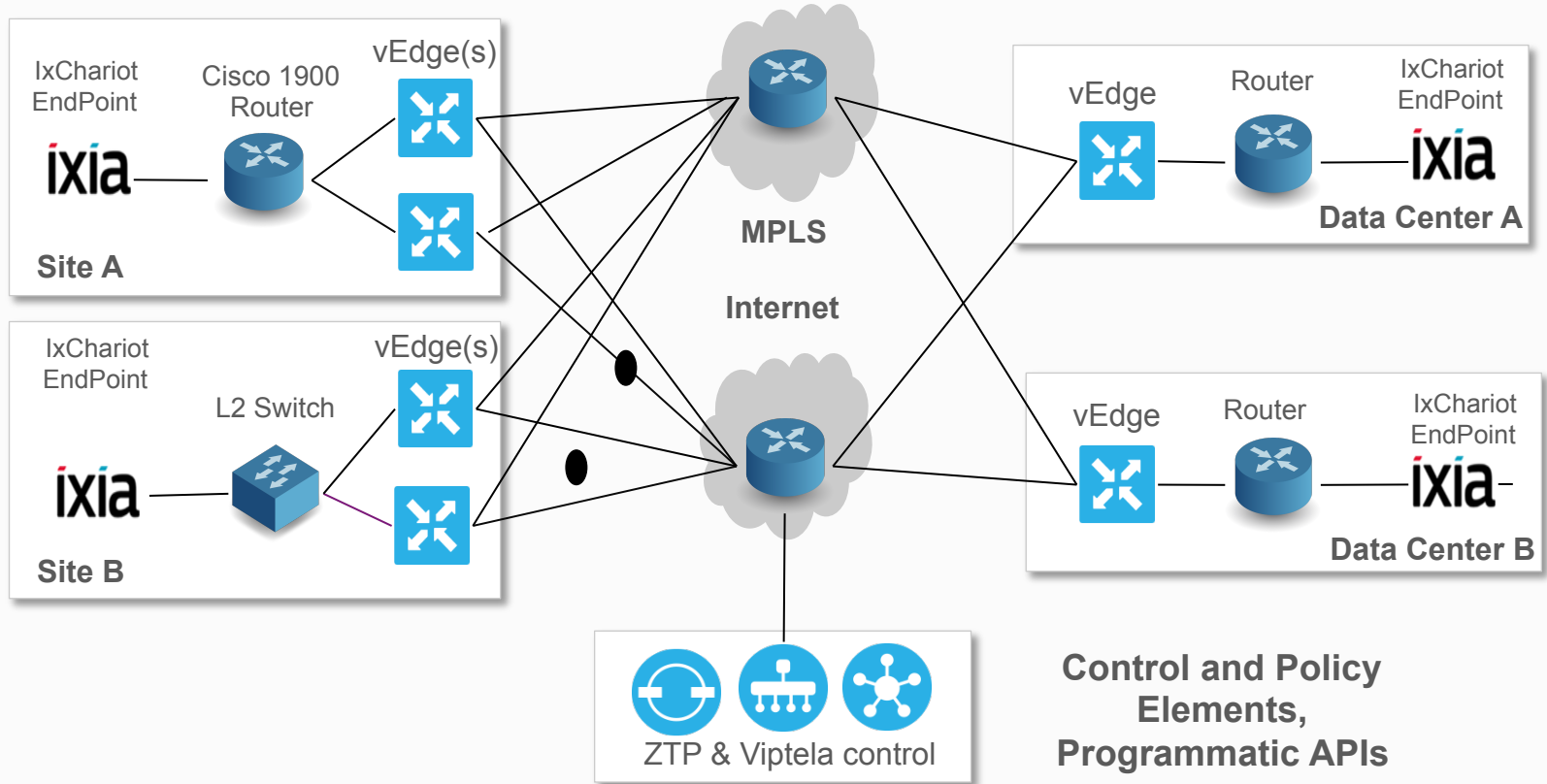
Viptela



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ONUG SD-WAN Testing

Topology Overview



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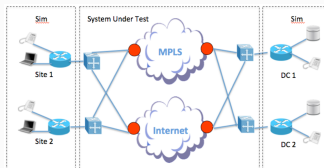
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viptela

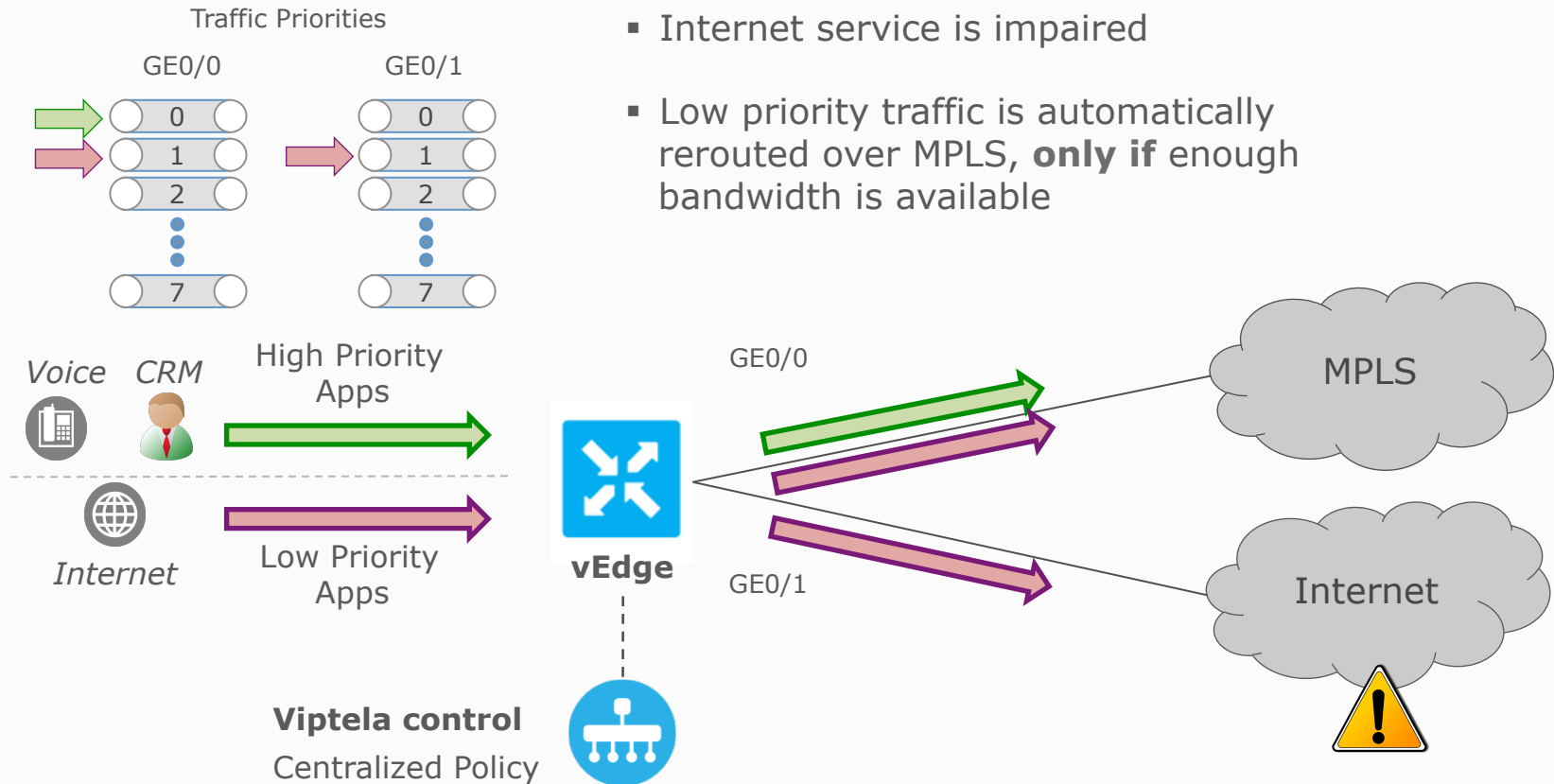
System Under Test

Products	Software Versions
vEdge 1000	15.1
ZTP Server	15.1
vBond	15.1
vSmart	15.1
vManage	15.1
IxChariot	9.0 EA



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10. FIPS-140-2 validation certification for cryptography.	✓		

Protecting Critical Applications With SD-WAN



Glue Networks SD-WAN Verification Testing

Jeff Gray

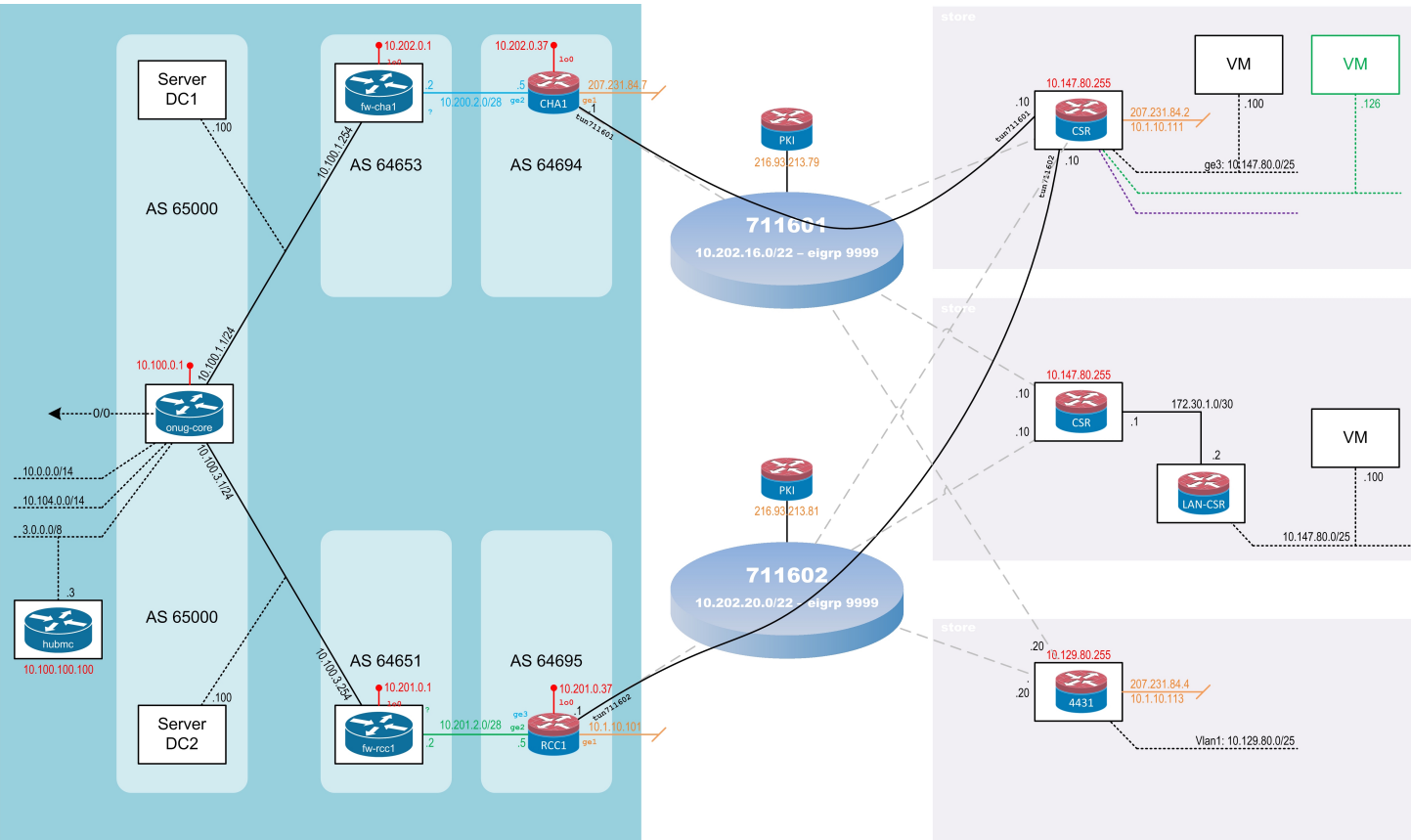
CEO

Glue Networks



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Glue Networks ONUG Test Topology



- Cisco IWAN
- ISR 4000-Series
- CSR 1000V

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glue
NETWORKS

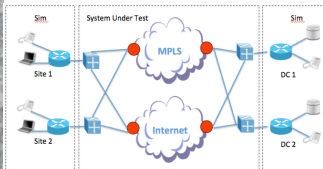
System Under Test

Products

Gluware®

Software Versions

Pre-Release



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Glue Networks ONUG Test Highlights

- Provisioning
 - Three zero-touch provisioning methods
 - Two-way dialogue with target device
 - Under 2 min for full SD-WAN/I-WAN feature set
- Life-Cycle Management
 - Changes to SD-WAN architecture in seconds
- Near Real-Time State Monitoring

Talari Networks SD-WAN Verification Testing

Keith Gillum

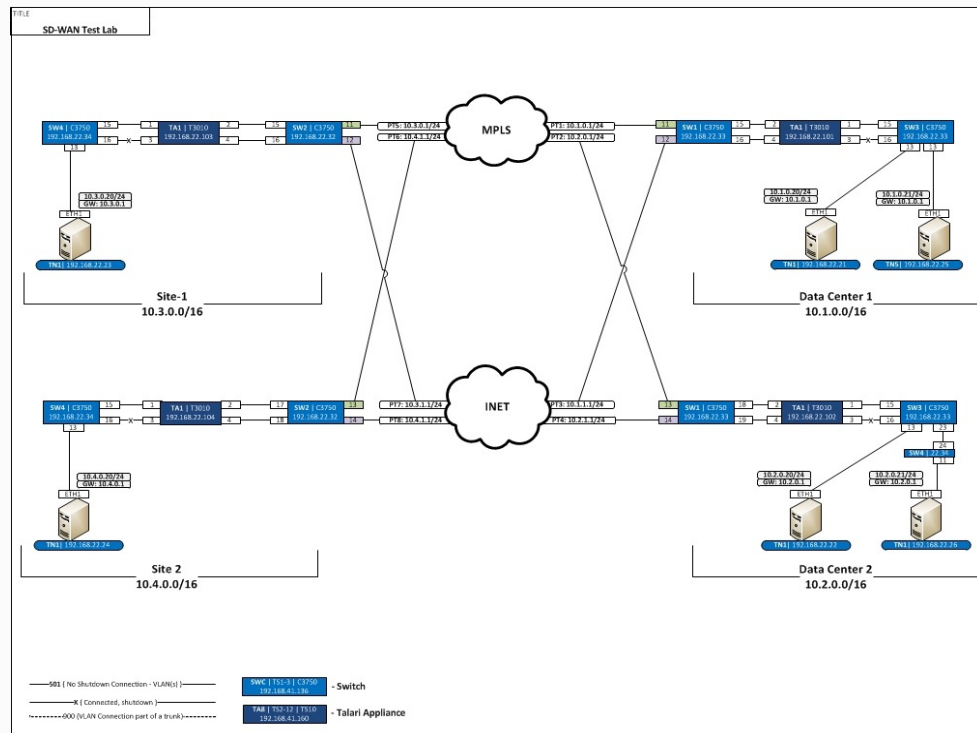
Principle Solutions Architect

Talari Networks



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Talari's Software Defined THINKING WAN



- Talari products used— Talari Appliance T3010 and Virtual Appliance VT500



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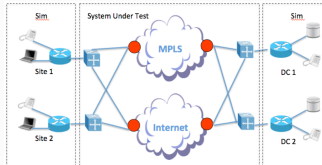
Top Ten Requirements
Verified



A better way to WAN

System Under Test

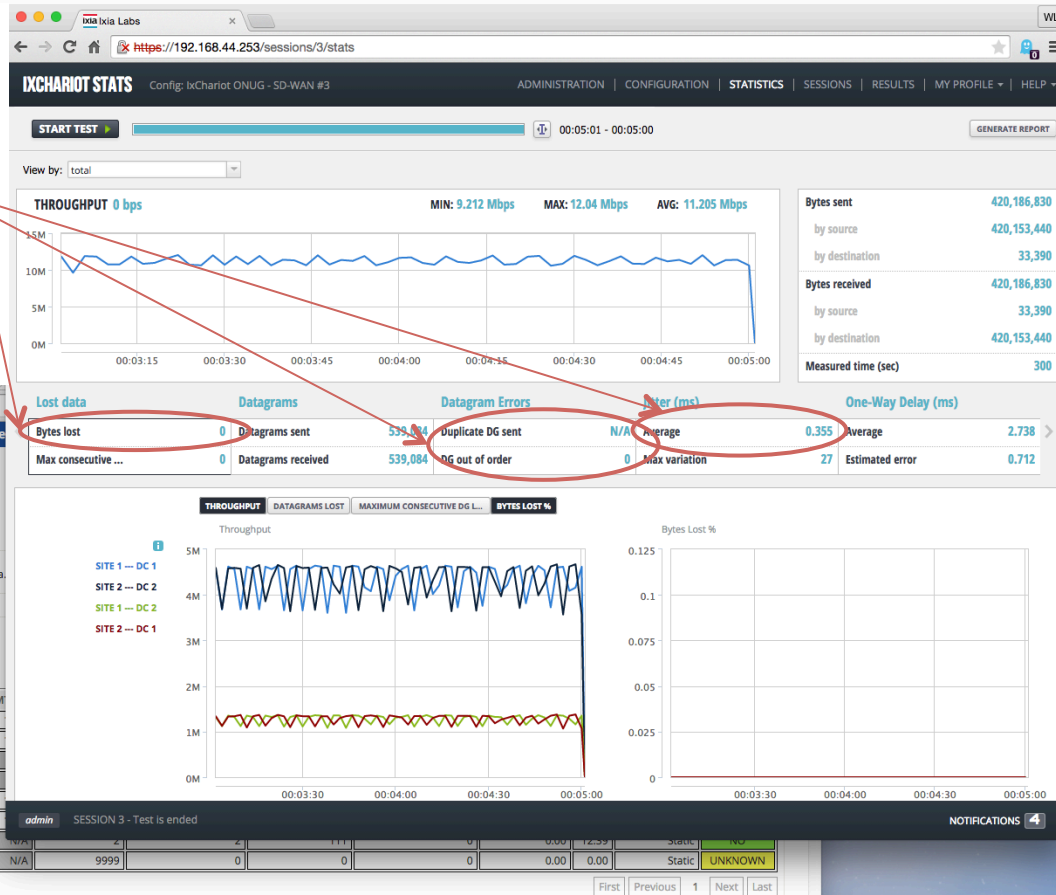
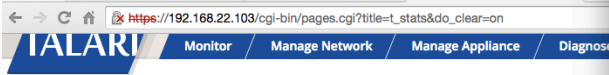
Products	Software Versions
Talari Appliance T3010 with APN	4.3
Talari Virtual Appliance VT500 with APN	4.3
IxChariot	9.0 EA



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Highlighting Test Case #5

- Instantaneous detection of the failed link and shift of traffic to the remaining link
- No loss, no out of order packets, no dips in throughput and virtually no jitter
- Ensures application continuity in a Hybrid WAN, even in the face of failed or degraded links



VeloCloud SD-WAN Verification Testing

Sanjay Uppal

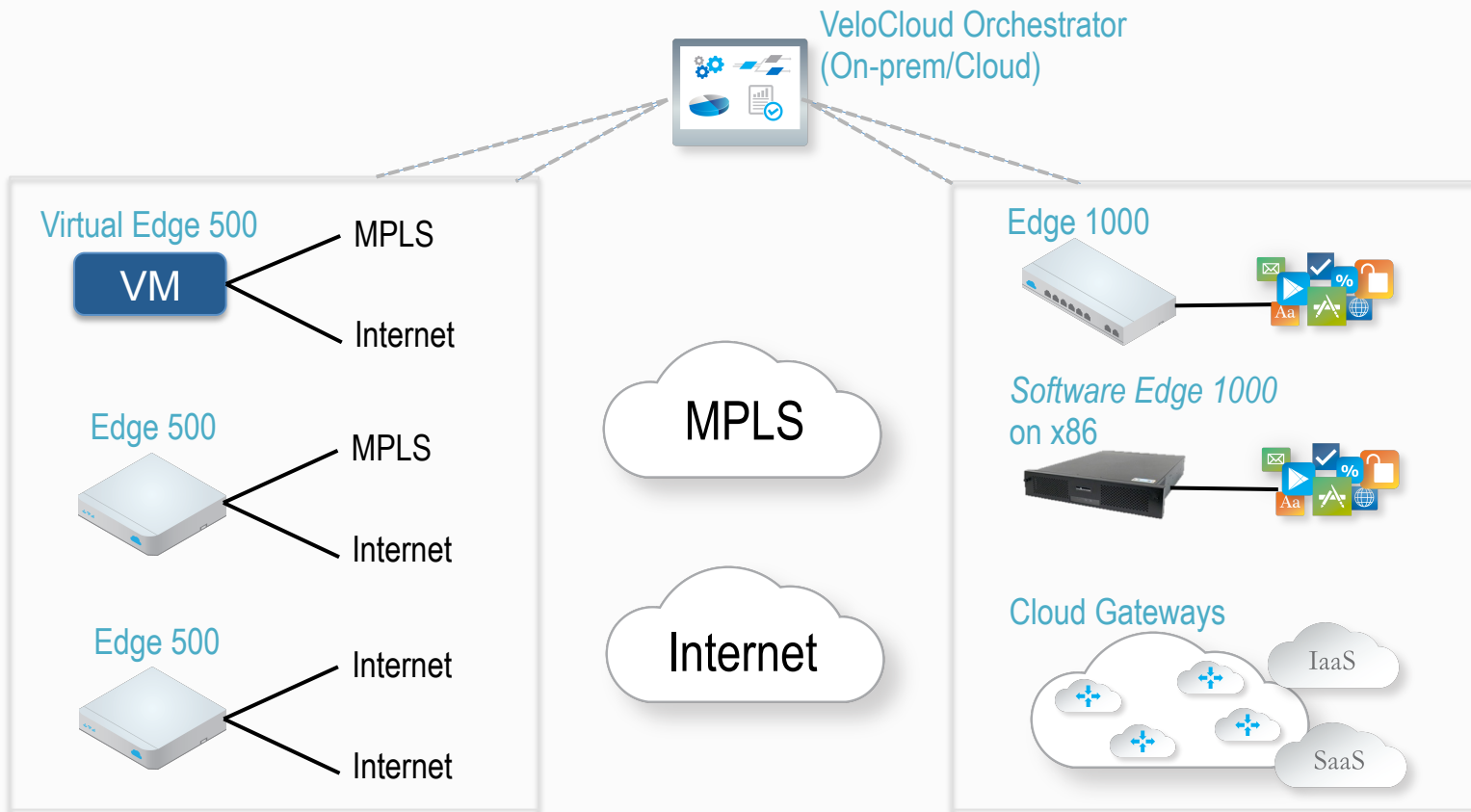
CEO

VeloCloud



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VeloCloud Test Topology



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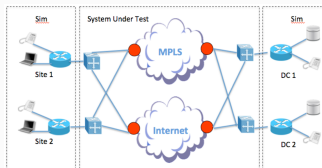
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velocloud

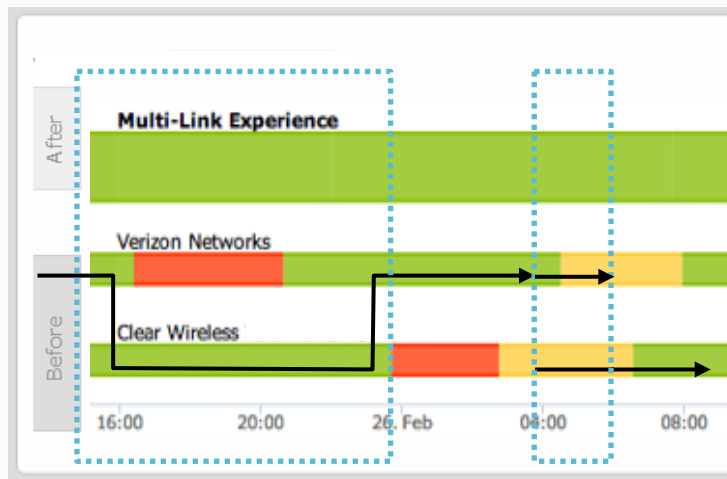
System Under Test

Products	Software Versions
VeloCloud Edge	R20-20150427
VeloCloud Orchestrator	R20-20150427
VeloCloud Gateway	R20-20150427
IxChariot	9.0 EA



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Test: Secure hybrid WAN architecture allowing dynamic traffic engineering specified by app policy, availability



#1 Brownout
single link

#2 Brownout
both links

No reset, no interruption
to the application

Rule	Match			Action		
	Source	Destination	Application	Network Service	Link	Priority
≡ 1	<input type="checkbox"/> Any	<input type="checkbox"/> Any	<input checked="" type="checkbox"/> Real Time Protocol (Business Collaboration)	<input type="checkbox"/> none	<input checked="" type="checkbox"/> Private (Preferred)	<input checked="" type="checkbox"/> High
≡ 2	<input checked="" type="checkbox"/> VLAN: 11 - PCI	<input type="checkbox"/> Any	<input type="checkbox"/> Any	<input type="checkbox"/> none	<input checked="" type="checkbox"/> Private (Mandatory)	<input type="checkbox"/> Normal
≡ 3	<input type="checkbox"/> Any	<input type="checkbox"/> Any	<input checked="" type="checkbox"/> Box.net (File Sharing)	<input type="checkbox"/> none	<input type="checkbox"/> auto	<input type="checkbox"/> Low
≡ 4	<input type="checkbox"/> Any	<input checked="" type="checkbox"/> Internet	<input type="checkbox"/> Any	<input checked="" type="checkbox"/> Cloud Proxy: ZScaler	<input checked="" type="checkbox"/> Public (Mandatory)	<input type="checkbox"/> Normal

#3 Ensure compliance, security,
and application performance

One-click business policy



Silver Peak SD-WAN Verification Testing

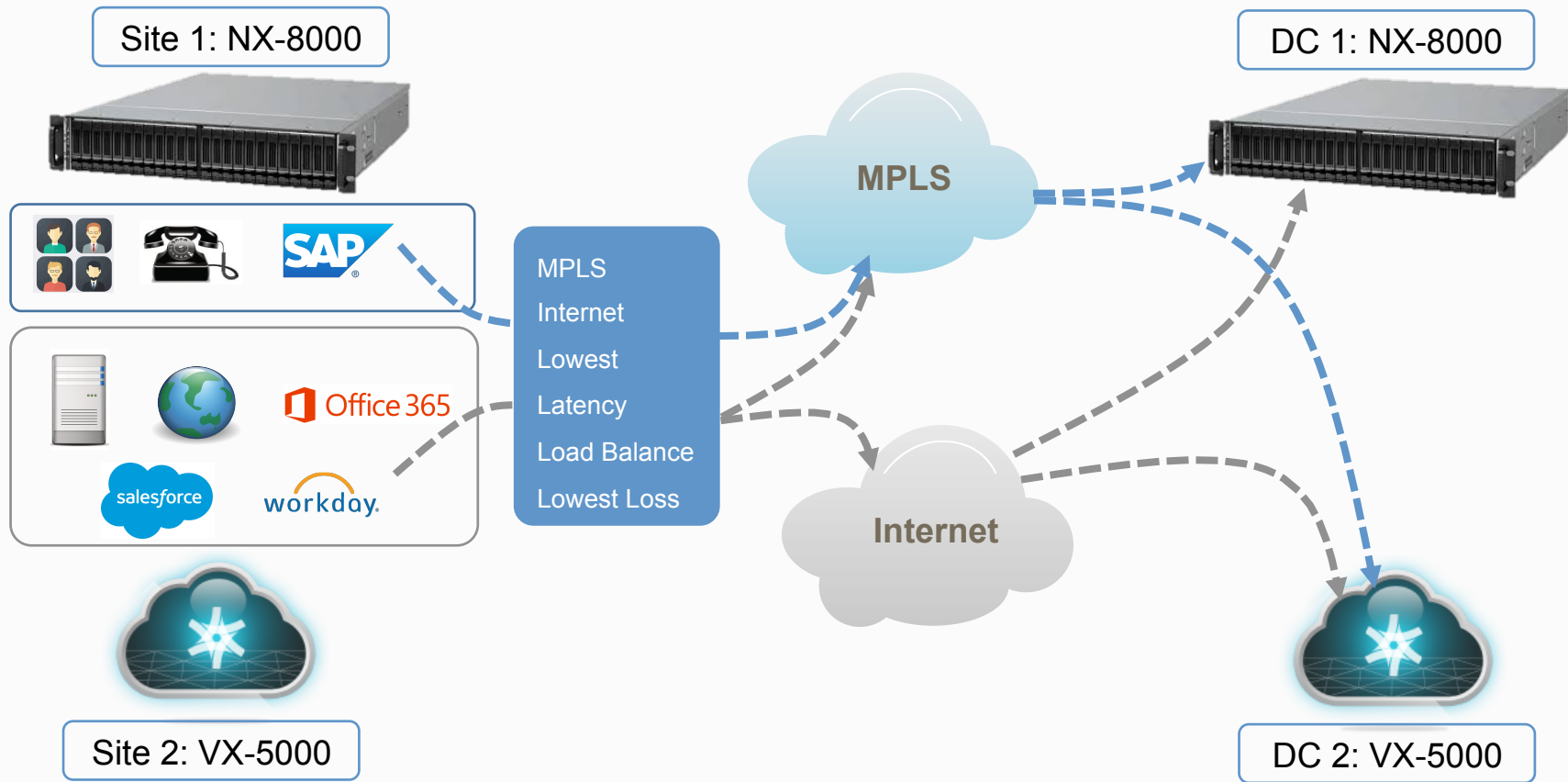
Rolf Muralt

Director

SD-WAN Product Management, Silver Peak



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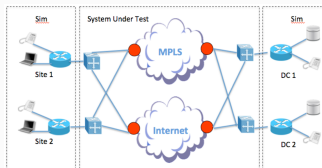
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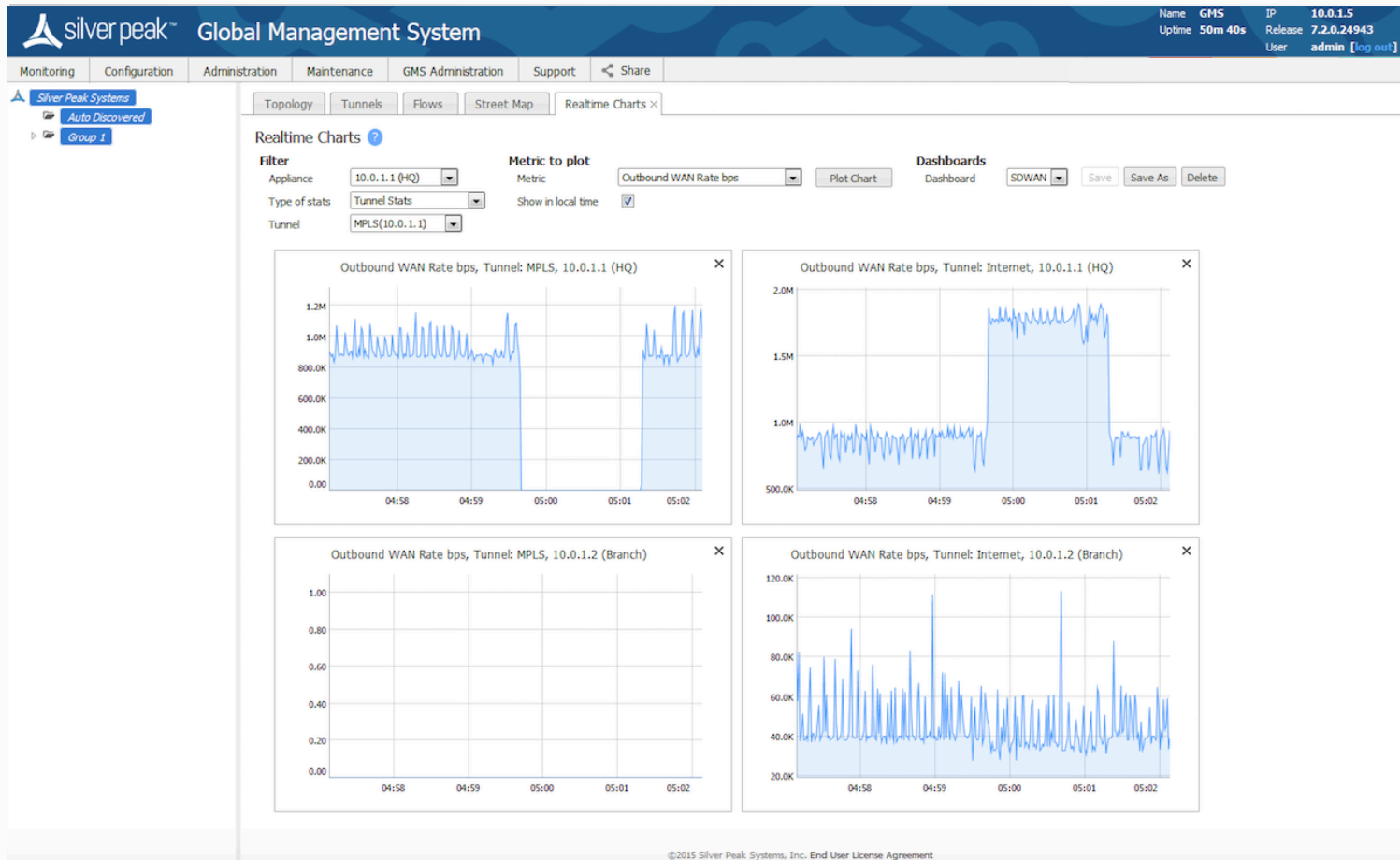
System Under Test

Products	Software Versions
NX-8000 Physical Appliances	VXOA_7.2.0.0
VX-5000 Virtual Appliance	VXOA_7.2.0.0
IxChariot	9.0 EA



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10. FIPS-140-2 validation certification for cryptography.			✓

Dashboard Visibility from Requirement #5 Test



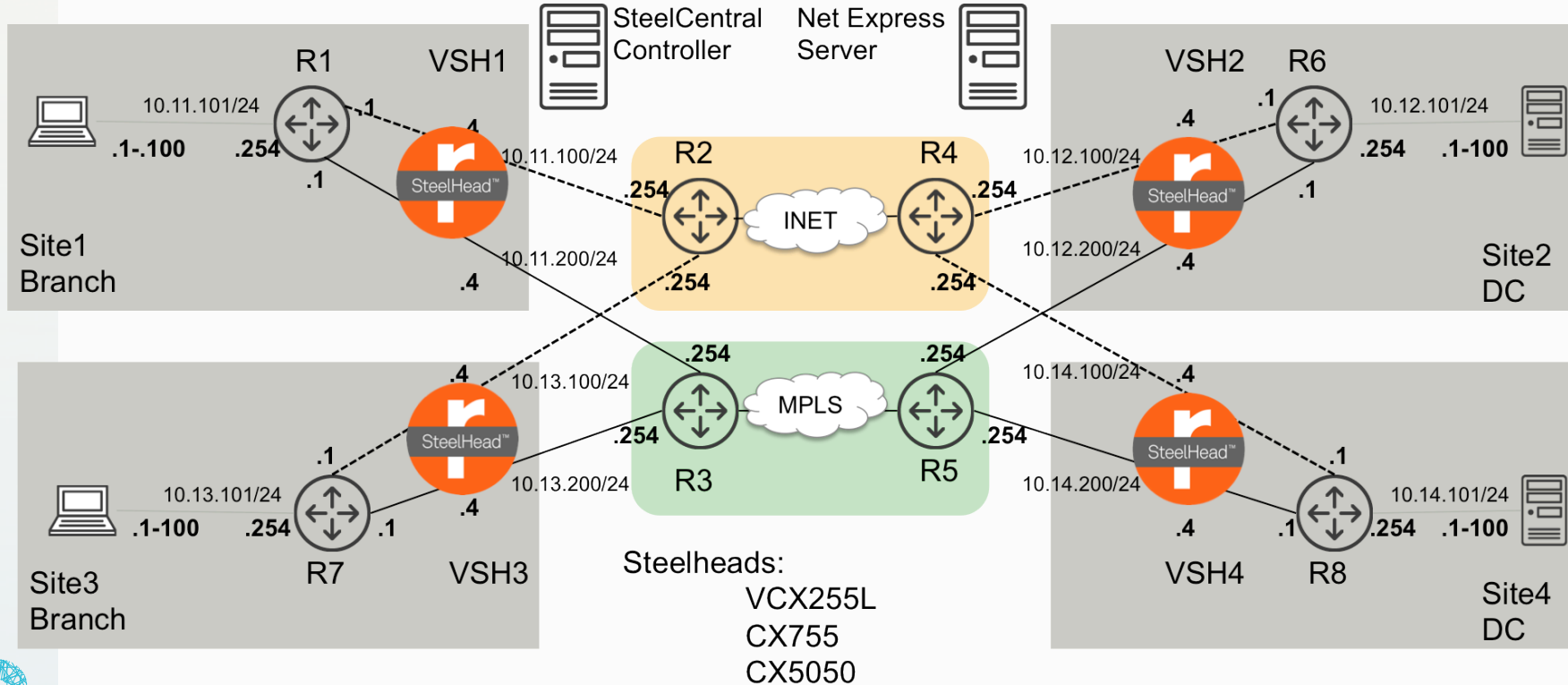
Riverbed SD-WAN Verification Testing

Kevin Glavin
Technical Director
Riverbed



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Riverbed ONUG SD-WAN Test Bed



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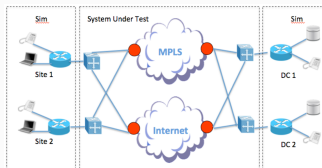
ixia



riverbed

System Under Test

Products	Software Versions
Steelhead (Virtual – VCX255L)	9.0.1
Physical (CX 755, CX5050)	9.0.1
IxChariot	9.0 EA



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Riverbed Application Performance Focus

Path Selection Rules

[Edit](#)

1. Internet Bound Traffic

Relay

2. Business Critical ✓ OK

✓ inpath1_0 via WAN2

Relay

3. Business Productivity ✓ OK

✓ inpath1_0 via WAN2

✓ inpath0_0 via WAN1

Relay

4. Business Voice ✓ OK

✓ inpath1_0 via WAN2

✓ inpath0_0 via WAN1

Relay

5. Standard Bulk ✓ OK

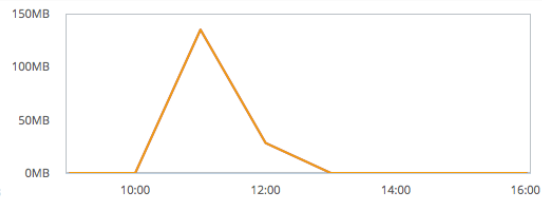
✓ inpath0_0 via WAN1

Drop

6. Recreational ✓ OK

✓ inpath0_0 via WAN1

Drop



Reachability

0/0 Sites Reachable via **0/0** Possible Paths

▲ No site available

▲ No path available

QoS

[Edit](#)

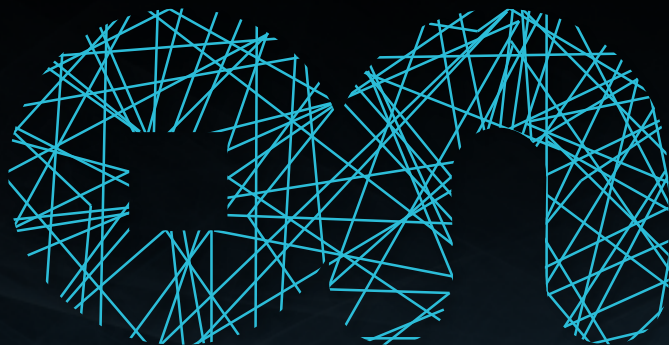
Any Site to Data Center

Class	BW Guaranteed	Latency Priority	Rules
LowPriority	9.0%	5	Any (1 of 1)

Any Site to Any Site

Class	BW Guaranteed	Latency Priority	Rules
LowPriority	9.0%	5	Any (1 of 1)





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[All Working Group Materials Can Now be Found Online](http://opennetworkingusergroup.com/spring-2015-downloads/)

<http://opennetworkingusergroup.com/spring-2015-downloads/>

