

FROM SDN TO CLOUD NETWORKING

Bob Muglia

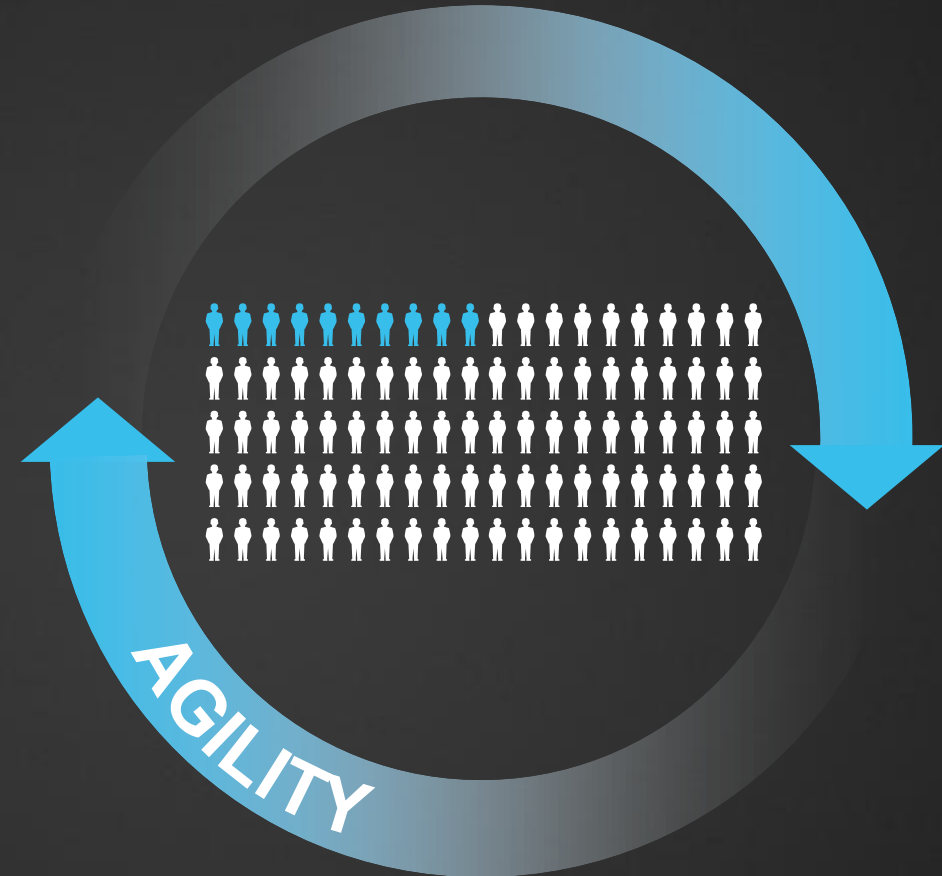
EXECUTIVE VICE PRESIDENT, SOFTWARE SOLUTIONS DIVISION

TODAY'S REALITY

Instability & Constant Change

10%

of CEOs feel confident in
their ability to plan for growth



DATA CENTER EVOLUTION



Physical
Data Center



Virtual
Data Center



Cloud
Data Center

BARRIER TO FULL CLOUD ADOPTION

CAN I VIRTUALIZE MY...



Compute



Storage



Network



7 MYTHS OF SDN

Truth:

It applies to all networking and networking services

Truth:

Opex reduction is more significant

Truth:

It will fuel hardware innovation

Truth:

Considerable intelligence stays decentralized

Truth:

OpenFlow is just a protocol and probably not the most important one for SDN

Truth:

It will happen step-by-step

Truth:

We will begin to see the impact in 2013

Myth:

It's only about datacenter networking

Myth:

It's only about reducing CAPEX

Myth:

It's only about software

Myth:

It's only about centralization

Myth:

It's only about OpenFlow

Myth:

It's going to happen immediately

Myth:

It's going to take forever

8th myth

SDN is a forklift upgrade

8th myth

Truth:

SDN will work with your existing network

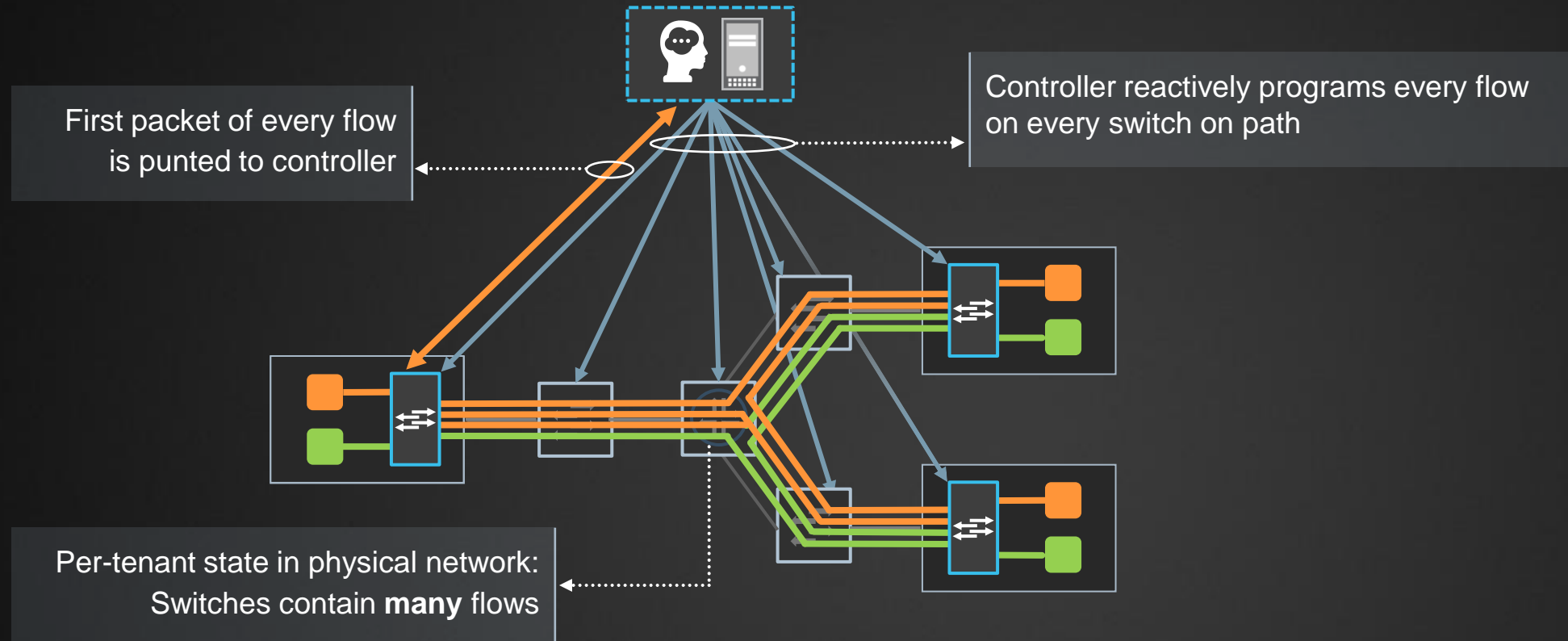
SDN is a forklift upgrade

INITIAL APPROACH TO SDN

REACTIVE END-TO-END NETWORK

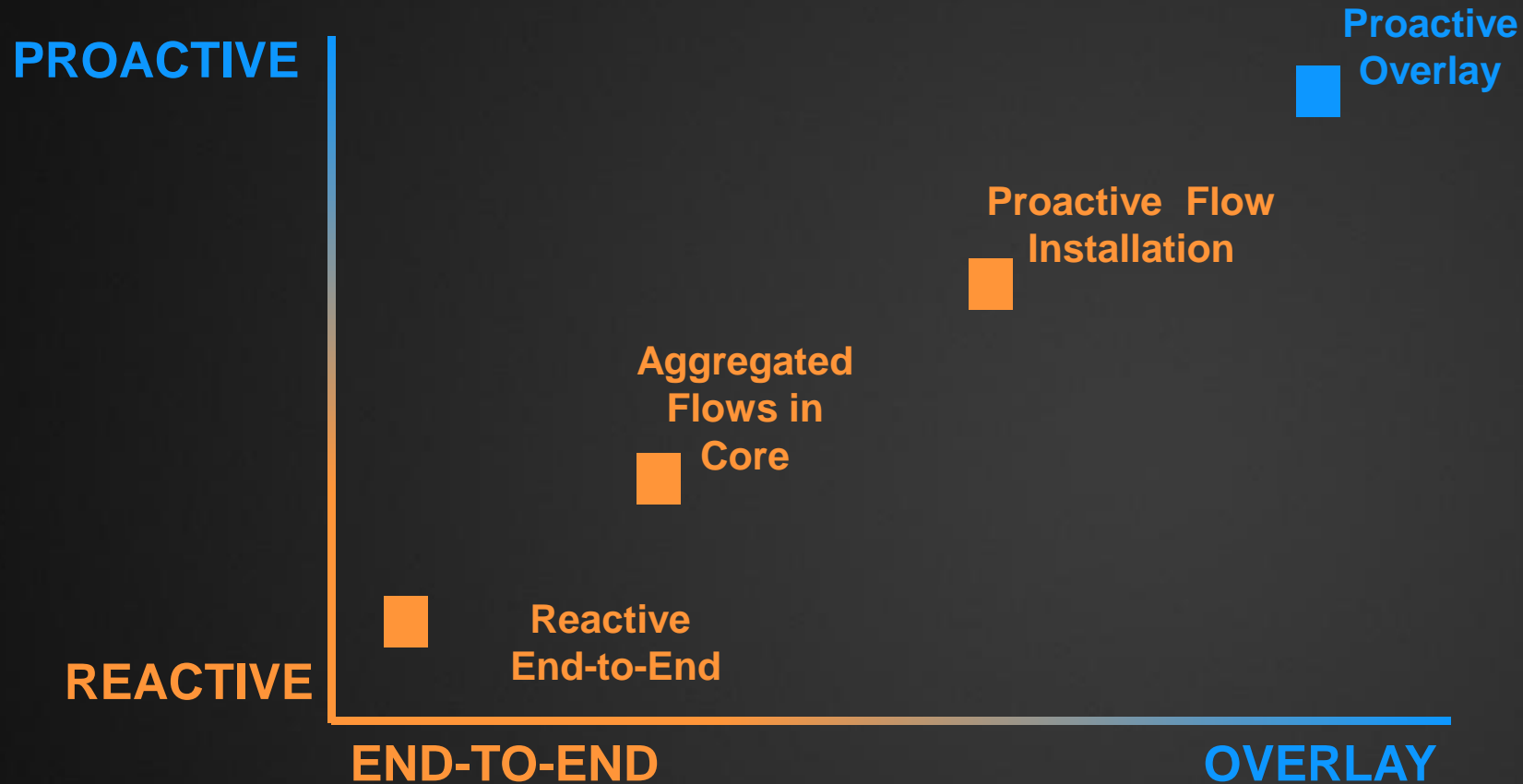
- Separates the data plane from the control plane
- Completely centralizes the control plane
- First packet of every flow is punted to the controller - reactive
- Uniform flat network
- Very large forwarding table in switches
- Tenant changes affects all switches in path
- Replaces existing network and protocols

REACTIVE END-TO-END NETWORKS



High latency. Low scalability. Fragile. Fork-lift upgrade.

A TWO DIMENSIONAL SPECTRUM

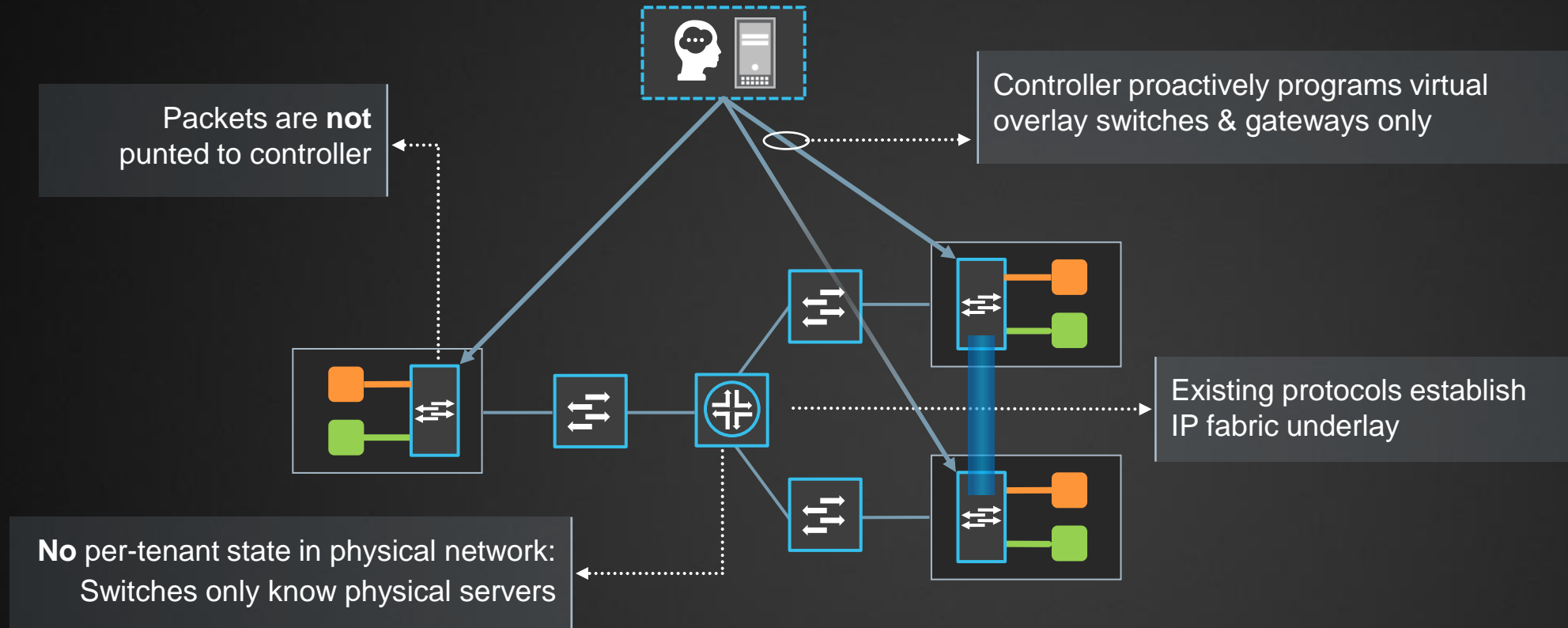


A BETTER APPROACH TO SDN

PROACTIVE OVERLAY NETWORK

- Underlay physical network provides industry standard L2 & L3 forwarding
- Tenant state only at the network edge – server hypervisors & gateways
- Controller proactively installs forwarding state
- Much smaller forwarding table in switches
- Tenant changes don't affect physical network
- Incremental evolution of existing network and protocols

PROACTIVE OVERLAY NETWORKS



Low latency. High scalability. Robust. Evolutionary.

WHAT ABOUT OPENFLOW?

- OpenFlow is a control protocol
- OpenFlow 1.3 was initially used for Reactive End-to-End networks
 - Very low level – i.e. programming hardware TCAM entries
 - Not ideally suited to establish high-level, proactive overlays
- That said, OpenFlow *can* be used for all SDN approaches:
 - Reactive End-to-End, Aggregated Flows in Core, Proactive Flow Installation, & Proactive Overlay
- Alternative control protocols better suited to the Proactive Overlay model
 - XMPP or OVS-DB

WANT MORE DETAIL?

END-TO-END VS. OVERLAY

Blog by Bruno Rijsman – Juniper SDN Architect

- Part One:

<http://forums.juniper.net/t5/The-New-Network/Applying-the-Goldilocks-principle-to-SDN/ba-p/190245>

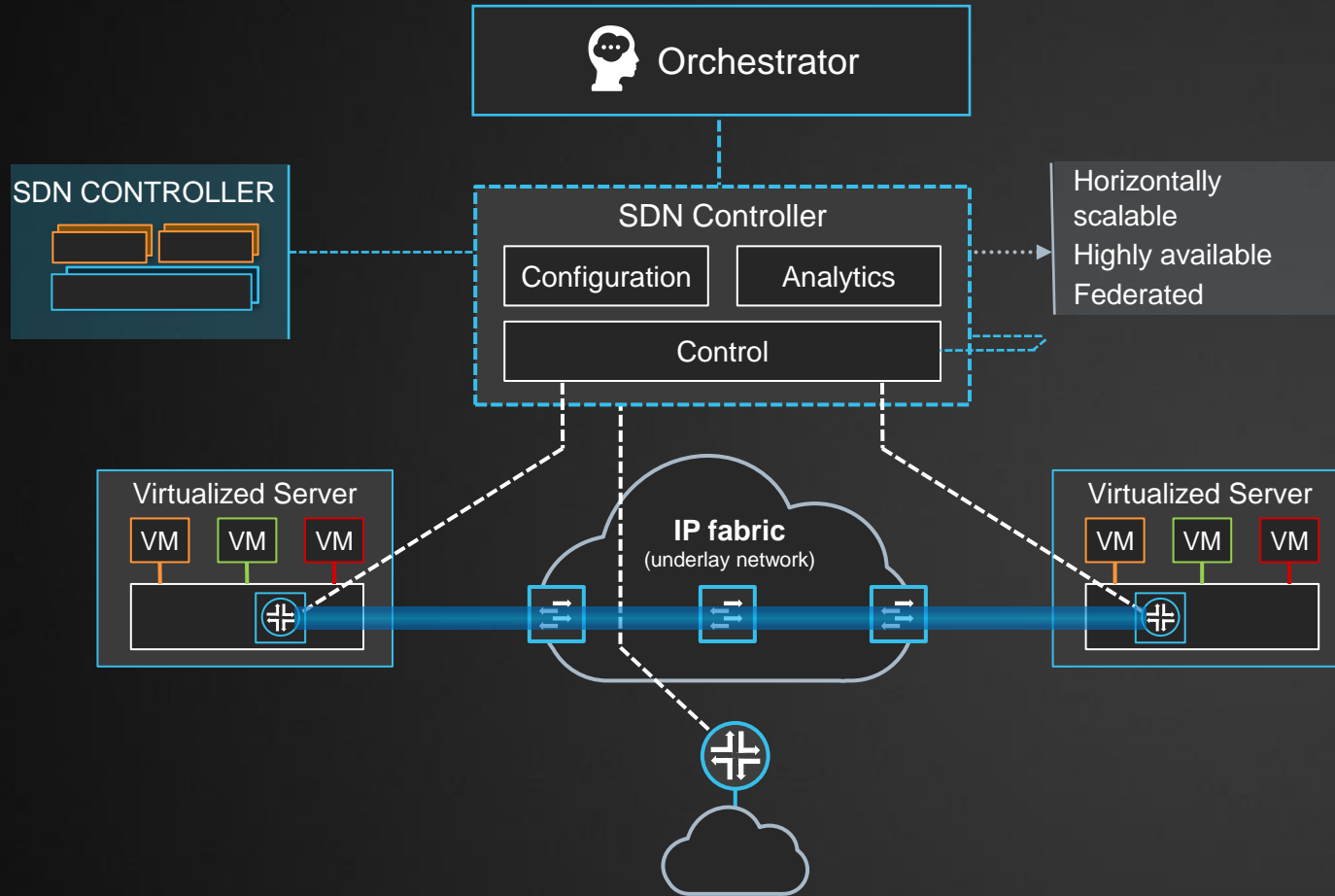
- Part Two:

<http://forums.juniper.net/t5/The-New-Network/Myth-8-Software-Defined-Networking-requires-a-forklift-upgrade/ba-p/190255>

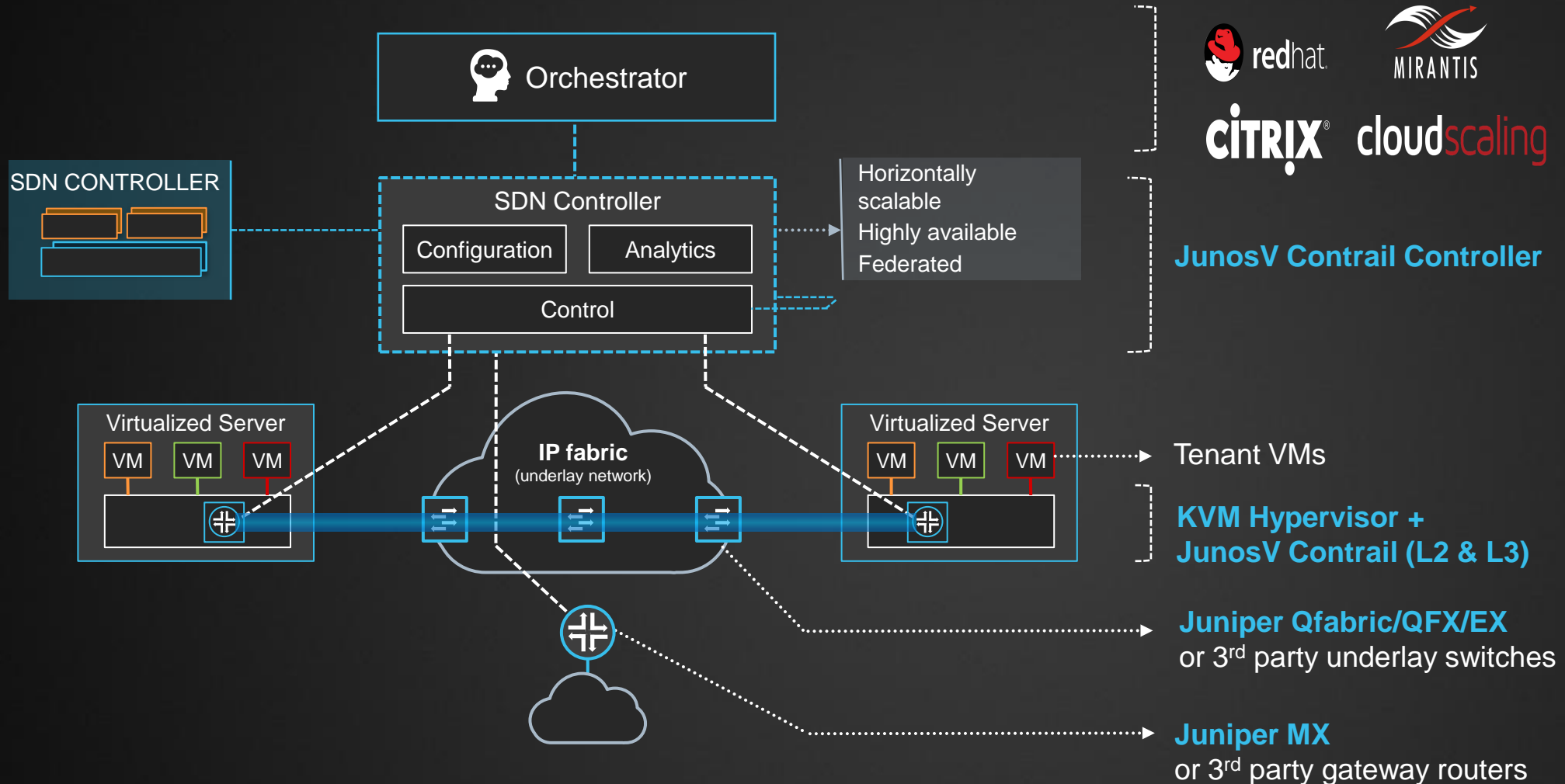
Whitepaper by Bruno Rijsman – Juniper SDN Architect

<http://www.juniper.net/us/en/local/pdf/whitepapers/2000515-en.pdf>

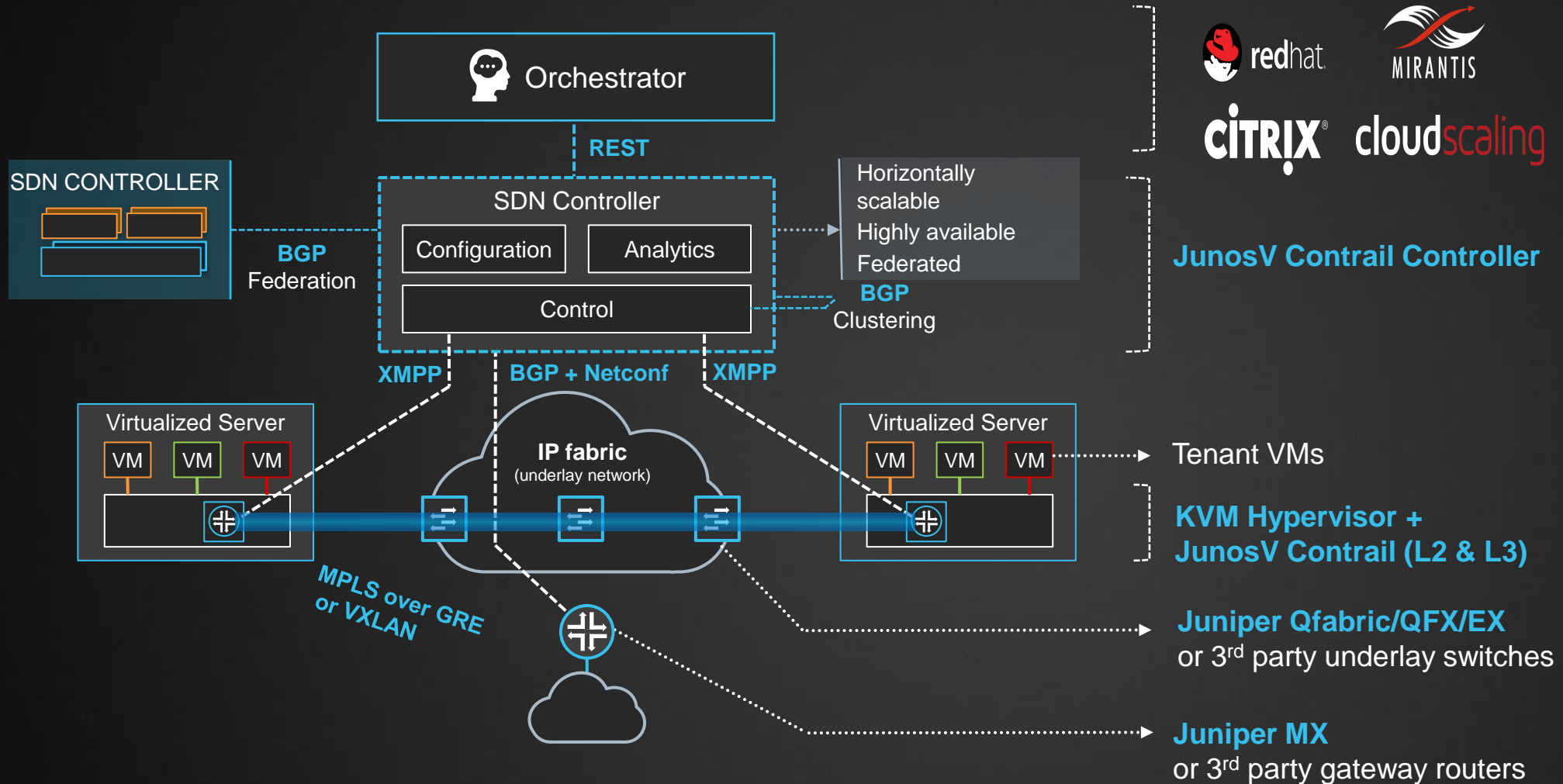
OVERLAY ARCHITECTURE



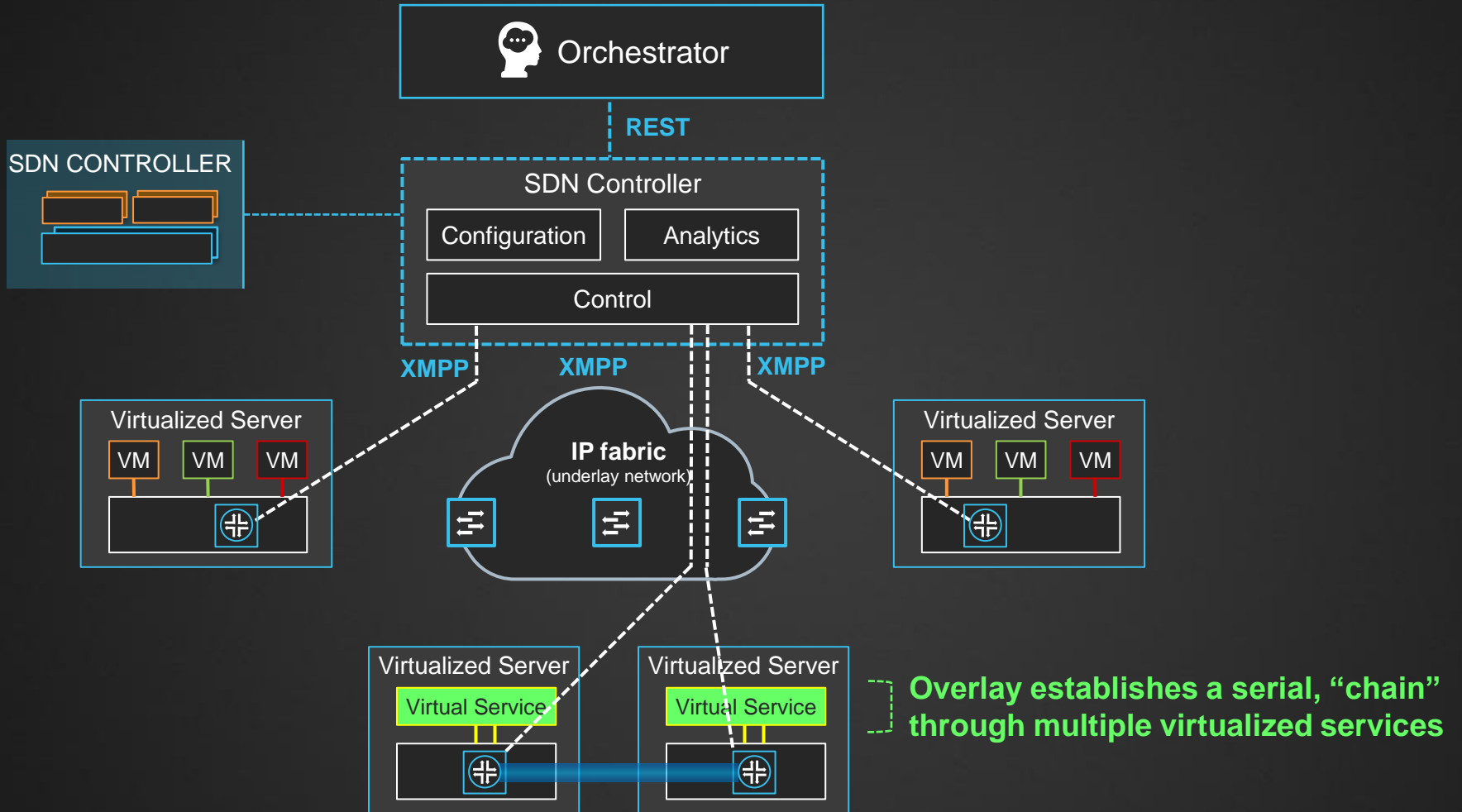
JUNOS-V CONTRAIL CONTROLLER



JUNOS-V CONTRAIL CONTROLLER



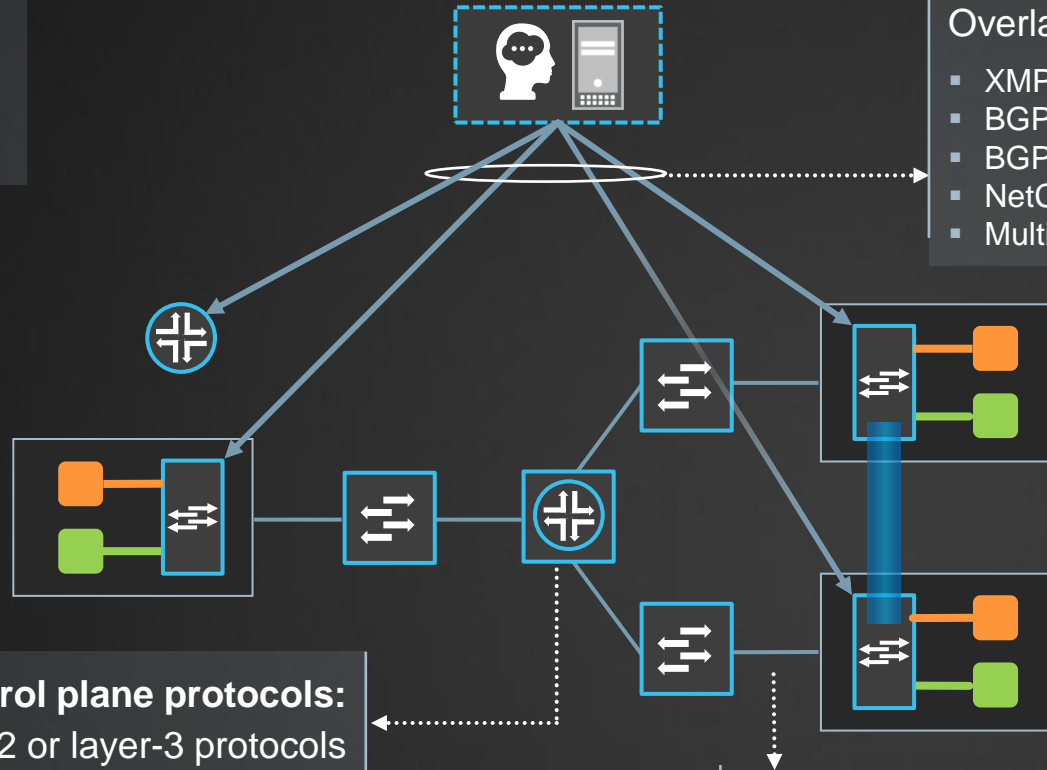
JUNOSV CONTRAIL SERVICE CHAINING



STANDARDS

Overall architecture

- IETF **NVO3** WG
- ETSI **NFV** ISG



Overlay control plane protocols:

- XMPP: **RFC 6120, draft-marques-l3vpn-end-system**
- BGP L3VPN: **RFC 4364**
- BGP EVPN: **draft-ietf-l2vpn-evpn**
- NetConf: **RFC 6241**
- Multicast: **draft-marques-l3vpn-mcast-edge**

Underlay control plane protocols:
Existing layer-2 or layer-3 protocols

Overlay data plane encapsulation:

- MPLS over GRE: **RFC 4797**
- VXLAN (encapsulation only): **draft-mahalingam-dutt-dcops-vxlan**

JUNIPER'S SDN STRATEGY: 6-4-1

6 PRINCIPLES



Separate
Networking Planes



Centralize



Use the cloud



Common Platform



Standard Protocols



Apply Broadly
Across Domains

4 STEP ROADMAP



Centralize Management



Extract Services



Centralize Controller



Optimize the Hardware

1 LICENSING MODEL

JUNIPER SOFTWARE ADVANTAGE

Full Use/Elastic

Transferable

Software
Lifetime Assurance

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