SDN, SD-WAN, NFV, VNF – I'm confused!

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Introduction to Coevolve

Coevolve was established in 2014 to help drive enterprise adoption of next-generation networking technologies such as SD-WAN. We currently provide services to global enterprises in more than 42 countries on six continents

Our services:

- Professional services and ongoing management services in a range of network-related practice areas
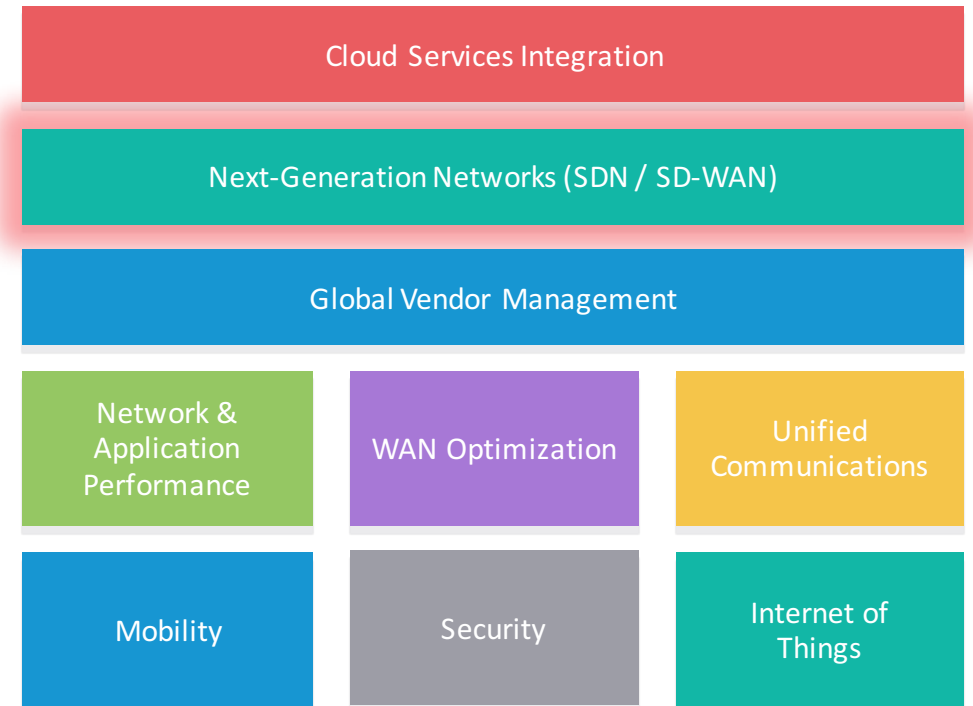- Integrate best of breed vendors and services for our clients

Our target market:

- We work directly with enterprise clients and as a specialist partner sitting behind channel partners playing a pivotal role in the SD-WAN ecosystem
- Key industry verticals: Professional Services, Manufacturing, Technology, Engineering, Construction, Mining, Logistics, Retail

Our team:

- Experienced team based in US, Australia, Singapore & Malaysia
- Extensive global contractor network
- Enterprise network experience gained at global service providers, integrators, consulting firms, vendors, analysts

Our Practice Areas

Cloud Services Integration

Next-Generation Networks (SDN / SD-WAN)

Global Vendor Management

Network & Application Performance

WAN Optimization

Unified Communications

Mobility

Security

Internet of Things

ABCs of SDN – where do we start?

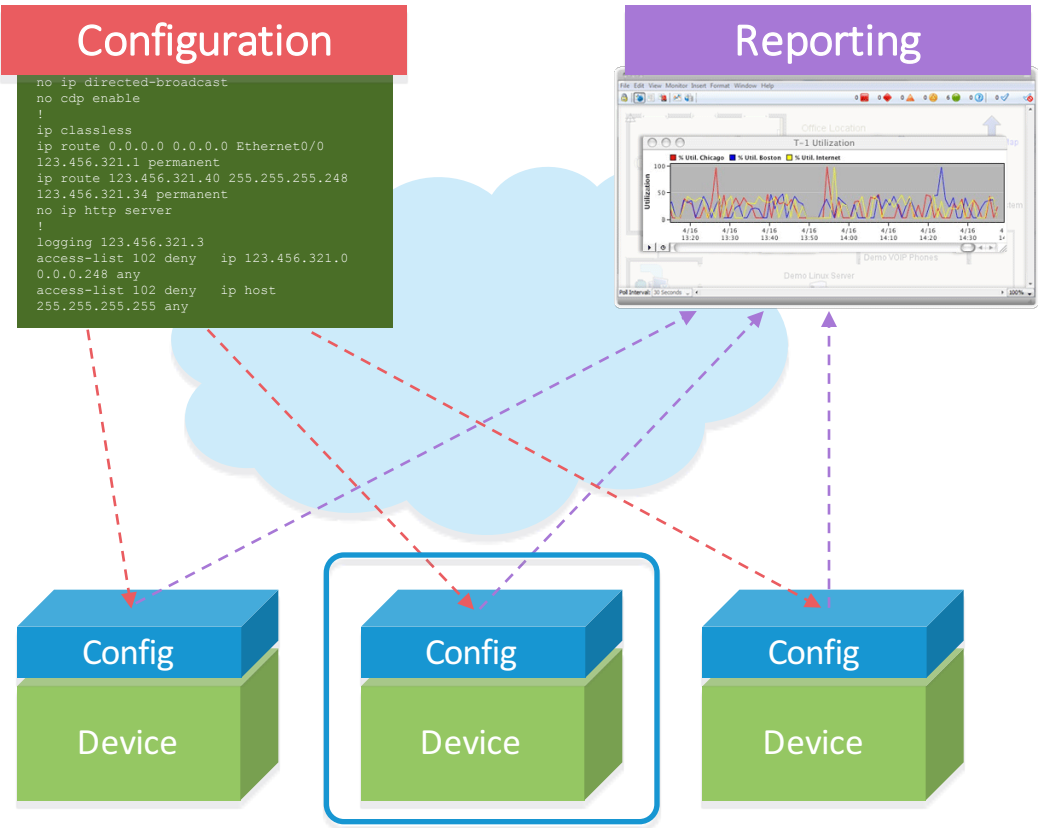|	**What does the acronym stand for?**	**What does it mean?**
SDN	**S**oftware-**D**efined **N**etworking	Separating the **control and data planes** to create centrally-controlled, programmable networks
SD-WAN	**S**oftware-**D**efined **W**ide **A**rea **N**etwork	Loosely applying SDN concepts to the WAN to create a **centrally-controlled overlay network** that intelligently uses a variety of infrastructure options
NFV / VNF	**N**etwork **F**unction **V**irtualization / **V**irtual **N**etwork **F**unction	A Virtual Network Function is a **virtualized task** formerly performed on proprietary, dedicated hardware. NFV is the practice of utilizing VNFs

What does SDN actually mean?

Traditional networks – without SDN

Configuration

```
no ip directed-broadcast
no cdp enable
!
ip classless
ip route 0.0.0.0 0.0.0.0 Ethernet0/0
123.456.321.1 permanent
ip route 123.456.321.40 255.255.255.248
123.456.321.34 permanent
no ip http server
!
logging 123.456.321.3
access-list 102 deny   ip 123.456.321.0
0.0.0.248 any
access-list 102 deny   ip host
255.255.255.255 any
```

Reporting

Config Device

Config Device

Config Device

SDN-based networks

Application Layer

Control Layer

Infrastructure Layer

Control Plane

Data Plane

Business Applications

Reporting | Threshold Alerts | SLA Tracking | Capacity Planning

API | API | API

Network Services | Service Templates

Programmable Interface
(OpenFlow, proprietary)

Why separating the control and data planes matters

1. Transitions the architecture from being **device-centric** to **network-centric**

1.2. Creates the ability to **program** the network

1.3. Enables significant improvements in **control** and **visibility**

1.4. **Simplifies** the network – even as traffic flows become more complex

1.5. Facilitates the creation of **services** within the network

1.6. Establishes a framework to **virtualize** components of the network

SDN is constantly in the news – but very little enterprise focus

Heard much about SD-WAN recently?

SD-WAN has quickly emerged as an easily accessible application of SDN that is relevant for the enterprise, not just in very large scale / carrier-like environments

- More than **$500M in VC funding** in last 5 years

- More than **25 vendors** now claim to have SD-WAN products

- Existing vendors have **reinvented themselves** to focus on SD-WAN

- Several vendors claim deployments **in excess of 50,000 units**

SD-WAN has quickly dominated SDN discussions

SDN / NFV: 5-6 years

SD-WAN: <2 years

SD-WAN

SDN

NFV

100

75

50

25

Jan 1, 2011   Mar 1, 2013   May 1, 2015

Source: Google Trends
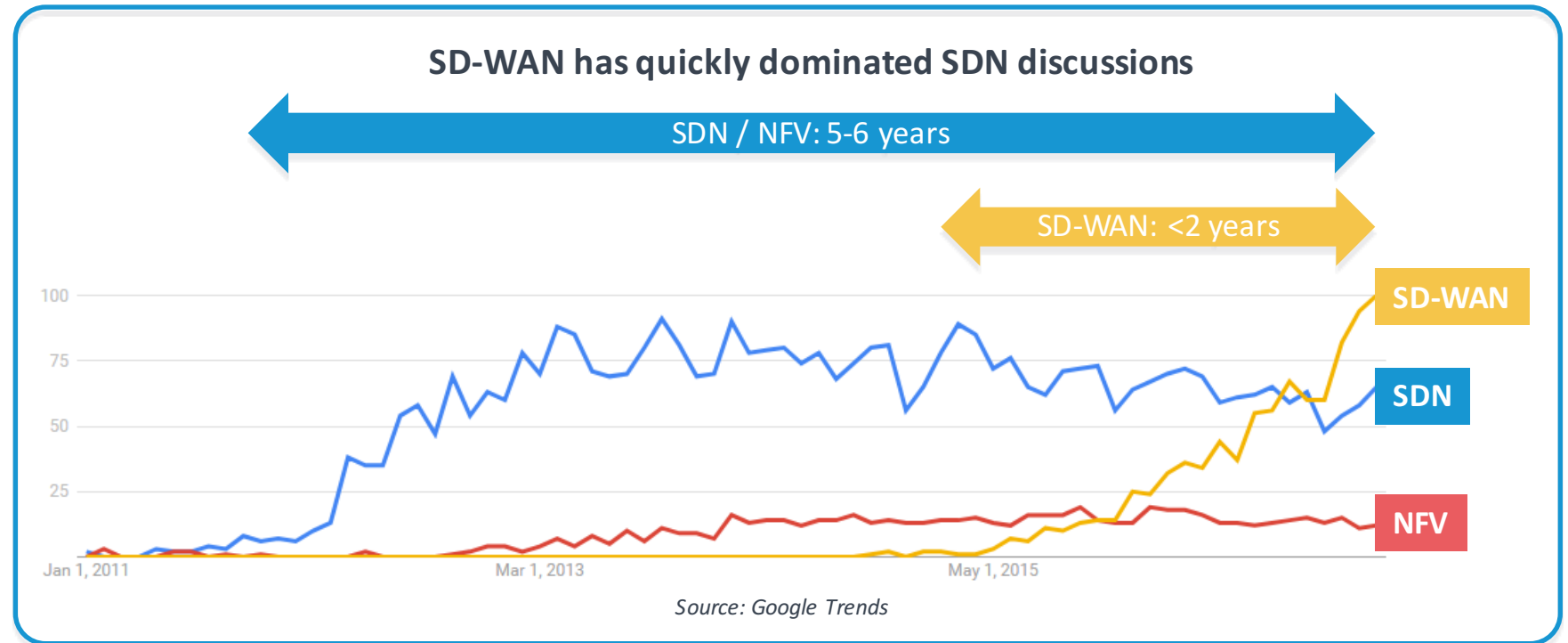
SD-WAN: Overlay networks

Overlay

Branch office

Office 365 · salesforce

Data center

Branch office
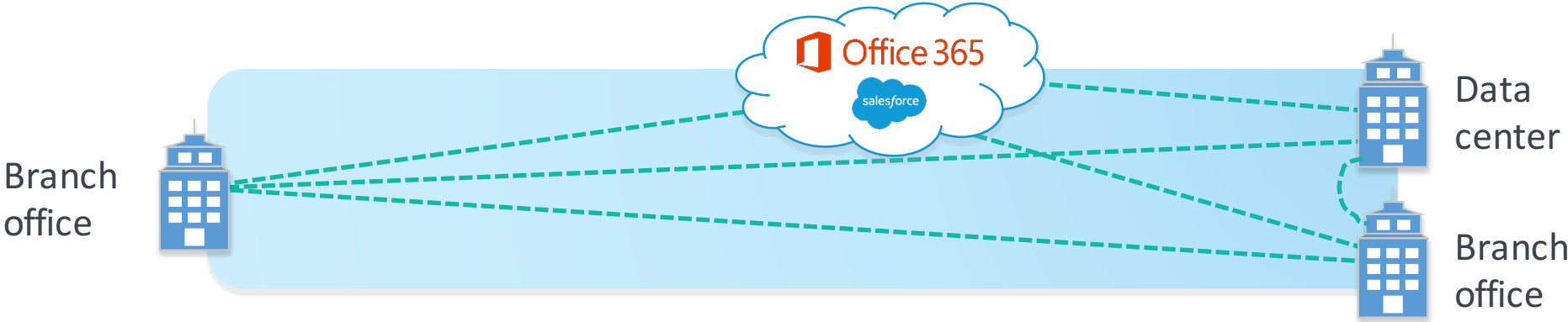
Infrastructure ("Underlay")

Branch office

- Fiber
- Ethernet
- Broadband
- TDM
- 4G
- Satellite
- WiMAX
- Microwave

Internet

MPLS

Office 365 · salesforce

Data center

Branch office
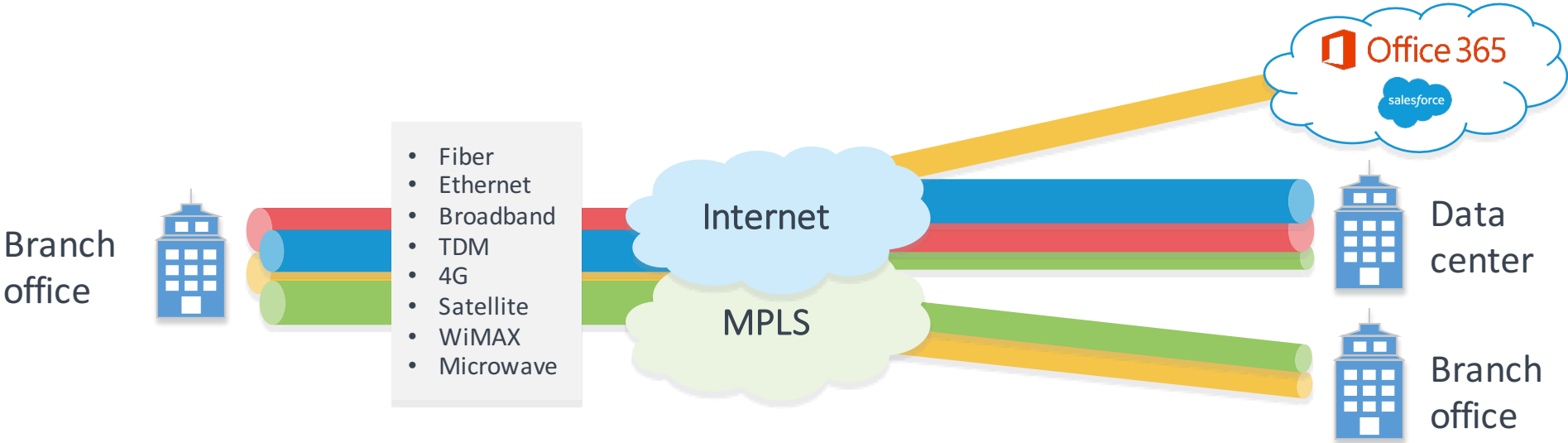
What's driving enterprise interest in SD-WAN?

Many SD-WAN benefits come from better packaging! It's not all new. We hear the following drivers on a regular basis:

1. **Cost savings** from the ability to use low-cost Internet circuits for enterprise WAN

2. **Simplified, secure branch office connectivity** over any (and all) transport types

3. **No manual VPN** key / certificate / IP address management

4. **Transport agnostic,** with the **ability to intelligently use circuits simultaneously** without traditional PBR / ACLs / object tracking complexity

5. **Application-layer policies** and forwarding decisions

6. **Centralized configuration and management** of entire WAN

7. **Detailed insights** into path performance, application usage, top talkers, etc.

VNFs and service chaining

Traffic from LAN → **Deep Packet Inspection engine** → Traffic forwarded with no VNF → **Forwarding engine** → Overlay / Internet / MPLS
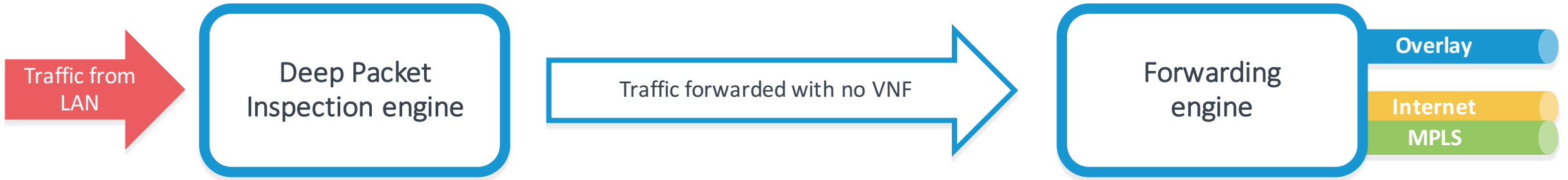
- Centrally-defined policy applied
- Any traffic matching policy will be automatically pushed to the VNF
- Non-matching traffic bypasses VNF

Security policy

VNF integrated using Service Chaining – next-gen firewall

Traffic from LAN → **Deep Packet Inspection engine** → **Forwarding engine** → Overlay / Internet / MPLS
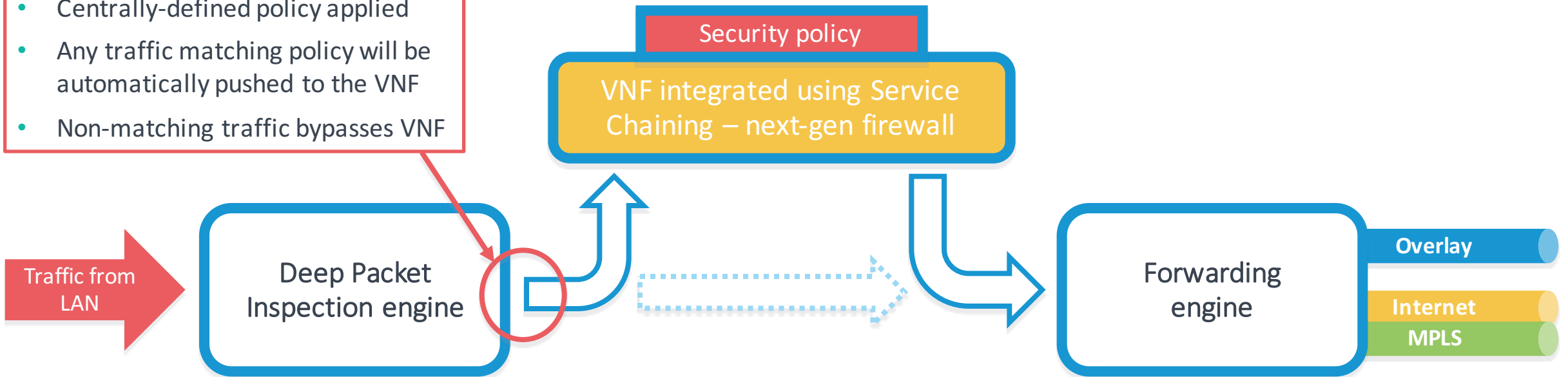
Old vs. new world of networking

Switch	→	Programmable, high port density whitebox appliance
Router	→	Programmable software image running on dedicated or virtual edge hardware
Firewall / WANOp	→	Virtual Network Function integrated using service chaining
Netflow / IPFIX	→	Network-wide reporting data extracted from control plane using API calls
SNMP alerts	→	Network-wide alert data pushed from control plane using API based on a variety of thresholds and conditions
Network-based QoS	→	Business policies implemented through control plane and real-time communication between devices

Conclusion

- SDN is driving significant changes in how networks are **architected, managed and updated**

- "True" SDN deployments have mostly been in carrier or very large enterprise environments where there is a return on the engineering investment

- SD-WAN has seen a **rapid increase in enterprise adoption** but is only loosely related to the textbook definition of SDN; it is delivering a different set of benefits in many cases

- Virtualization in the network is **long overdue** – it is one of the last components of the IT stack to see this change

- Network-based services will become **increasingly sophisticated** as enterprises adopt more SD-WAN at the edge, combined with other NFVs for common functions

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Thank you

Read our CTO's latest posts on NetworkWorld : networkworld.com/author/Ciaran-Roche

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