Maximizing SD-WAN with Service Insertion/Chaining Architectures

Steve Woo, VP Products & Co-founder
Service chaining

verb / serv-ice chain-ing

: interconnecting a set of services through the network

: simplified with both SDN [SD-WAN] and NFV

: meet expectations of dynamic insertion without topology reconfigurations
Businesses Blocked by WAN Challenges

- Branch deployment Complexity
- App Performance / Bandwidth Expense & Constraint Issues
- Cloud migration Not supported by static architectures
• Network topology based physical service insertion
• Complex routing – difficult to distribute / disaggregate services to regional “service” hubs
• Internet traffic backhauled – not optimal for migration to cloud
Alternative to Backhaul: Direct Internet Breakout

- “Direct” to Internet
- Cost and operational support for hardware services in branch
- Or complexity of forwarding to cloud based security
- Best effort for availability and performance
## Why Software-Defined WAN?

<table>
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<tr>
<th>Requirement</th>
<th>Description</th>
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<tr>
<td>Simplicity &amp; Manageability</td>
<td>• Simplify and expedite new branch rollouts, and configuration across large number of sites</td>
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<td>App performance</td>
<td>• Ensure performance and availability of apps, especially real-time</td>
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<td>Bandwidth &amp; Transport cost</td>
<td>• Leverage economical bandwidth additions</td>
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<td>Cloud migration</td>
<td>• Optimize access to multiple cloud destinations, with performance, security and manageability</td>
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<td>Services delivery</td>
<td>• Virtual services delivery including SD-WAN</td>
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<td>• Simplify service chaining to distributed services</td>
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<td>Flexible / Incremental deployment</td>
<td>• Incremental migration, and legacy interoperability</td>
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<td>• Avoid capex, proprietary hardware</td>
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SD-WANs Simplify Network Architecture

How do you think SD-WAN can help your company? (Check up to three)

- Simplify network architecture
- Increase network agility
- Optimized for cloud traffic
- Save my organization money
- Better network visibility
- Improved network management
- Enable better network security management
- Replace many hardware components
- Provide a more programmable network

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SD-WANs Simplify Network Architecture

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SD-WAN Service Insertion & Chaining benefits

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SD-WAN Advantages

- Zero touch deployments, simplified operations, **one-click service insertion**
- Transport independent performance for the most demanding apps, leverages economical bandwidth
- Direct cloud access with performance, reliability and security

Simplified WAN Management

Assured Application Performance

Managed on-ramp to the cloud
Service Insertion at Branch
**Multiple CPE options:**

- **SD-WAN CPE**
  - with virtualized services

- **SD-WAN Virtual Services Platform**

- **General Purpose Virtual CPE**

**Embedded Services**

- Services on / off
- Granular policies by L7 traffic profile

**HW = hardware; vCPE = virtualized CPE; OS = operating system**
SD-WAN Policy-Based Service Chaining

- Different service chains applied by policy
- Services can be at branch only or dual ended
Multi-Path Optimization Service

Assured Application performance over MPLS, Internet broadband and LTE circuits

**Continuous Link Monitoring**
- Drives automation and optimization

**Dynamic Per Packet Steering**
- Sub-second steering without session drops
- Aggregated bandwidth for single flows

**On Demand Remediation**
- Protects against concurrent degradation
- Enables single link performance
Cloud VPN Service

- Unified VPN over all transports
- Cloud VPN eliminates backhaul
- Automated VPN to cloud via gateway

INTERNET

Branch Site
Branch Edge
Enterprise DC
Traditional Private Datacenters

Private - MPLS

Cloud Gateways

IPsec VPN

Unified VPN over all transports
Cloud VPN eliminates backhaul
Automated VPN to cloud via gateway
Extensible Virtual Services

Secure Overlay

- **Cloud VPN**
  Auto IPsec VPN between Edges and 3rd party devices

- **Hybrid VPN**
  IPsec VPN and MPLS

Automated Monitoring

- **Deep Application Recognition**
  Packet inspection for application recognition

- **Application & Link Visibility**
  Link status and application usage

- **Application Performance**
  Application network performance statistics

Assured WAN Performance

- **Dynamic Multi-Path Optimization**
  Application steering and link remediation

- **Business Policy**
  Application prioritization and network service insertion

Security Services

- **Application Firewall**
  L7 stateful firewall

- **Cloud Web Security**
  Identity Based Access Control
  802.1x authenticated access

Comprehensive LAN Services

- **Auto IP Address Management**
  By sites and profiles

- **DHCP, DNS, WLAN...**
  LAN network services

- **Policy Based NAT**
  Source and destination based

3rd Party

- **Ecosystem partner apps**
Regional / Enterprise Services
Challenges with Traditional WAN

- Not performance-aware
- Policy definition at L3 only
- Requires touching every branch
- Per-application tuning difficult
- More complex with multiple links
Policy-based Internet Backhaul to Regional DCs

- Backhaul ALL or subset of Internet traffic
- Flexible link steering policy
Distributed Service Insertion

- SD-WAN one-click app aware service insertion
- Enables disaggregation and distribution of services to multiple regional mini-datacenters
- Same or different service chains by DC
- SD-WAN optimal for SDN instantiated virtual services in DC
- Reduces branch complexity and attack surface
Distributed Service Insertion

- Regionalize services even for branch to branch traffic
- Next gen firewall can apply rules by application
Multi-DC Service Insertion

- Dynamic routing for service insertion
Cloud / SP Services
SD-WAN Hybrid Services Insertion

SD-WAN service chaining for hybrid services
- Backhaul to on-premises services
  - Regional and central
- SD-WAN performance service-chained to cloud security services
- One-click, by application
Cloud Services Chaining

- Services by Enterprise – VRF mapping
- Services granularity by VLAN tag
QoE Service Chaining

- WAN edge QoS (prioritization, bandwidth allocation)
- SD-WAN multi-path optimization with MPLS CoS
- MPLS core with CoS
- Interoperable data plane signaling
Summary: Service Chaining Use Cases

- At branch CPE, enterprise DC, or cloud service
- Within SD-WAN CPE, or SD-WAN as VNF
- Distributed regional service centers
- Branch-to-branch and branch-to-Internet traffic
- Multi-hop service centers
- Hybrid on-premises and cloud services
- Cloud services by enterprise and segment
- SD-WAN to SP optimization
**SD-WAN policy-based interoperability support:**

- **Data plane**
  - TOS/CoS
  - VLANs
  - Upcoming: IETF draft: NSH

- **Orchestration**
  - MEF OpenLSO
  - CORD
  - Linux Foundation OPEN-O
  - ONUG Open SDWAN Exchange