

State of the Art IP and Optical Networking

Muse[™] Virtualized Business Communication Services

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SD-WAN on uCPE for Enterprise and SMB

Software-defined WANs continuously optimize WAN traffic between dedicated guaranteed facilities and shared broadband facilities, providing businesses with the best balance between performance and cost, tuned to their particular needs. Ribbon brings SD-WAN to the next level by combining it with a universal CPE (uCPE) platform. The solution integrates virtualized delivery of SD-WAN with a customizable suite of business communication services and related IT applications. Businesses and service providers both win. Businesses obtain a one-stop shop for all their business communication services, which they can modify on-demand as their needs change. SPs increase customer satisfaction and stickiness, while developing a pipeline for value-added service revenues.







Emergence of SD-WAN

Businesses are undergoing digital transformation. This process includes Enterprises and SMBs moving their major applications software to private clouds, on and off premises, and to public clouds. The Global Cloud Index forecast highlights the size of this shift, predicting, "By 2021, 94 percent of workloads and compute instances will be processed by cloud data centers."

This change affects WAN traffic, which in the past, ran primarily between business locations over SLA-guaranteed VPNs. In a digitally transformed world, WAN traffic still originates at business locations, but terminates both in private clouds, often located in corporate headquarter data centers for security reasons, and in public clouds.

There are three components to this WAN traffic, which uses a mix of SLA-guaranteed VPNs and non-guaranteed broadband networks.

- 1 Interactions between end-users and cloud-based applications software.
- 2 Data storage applications, including multi-site backup, running autonomously between data centers.
- 3 Vertical communications applications, like voice and video running over the WAN.

The net effect is higher business costs, due to more WAN traffic and greater complexity of managing WAN resources. The primary response has been the emergence of SD-WANs, which provide businesses with visibility and granular control over their WAN traffic.

SD-WANs allow businesses to create and manage policies that distribute traffic between higher-cost dedicated MPLS facilities and lower-cost shared broadband facilities. Typically, high-priority and low-latency applications, like Salesforce and Skype, are routed over MPLS facilities. Applications like web browsing are directed to broadband. Traffic distribution decisions are updateable anytime, based on factors like traffic load, MPLS SLA assurance, facility availability, and application priorities. The benefit of SD-WANs is continuously optimizing WAN resources to match business needs, providing the best balance between performance and cost.





Muse Virtualized Business Communication Services

Ribbon brings SD-WAN to the next level by combining it with a uCPE platform that runs virtualized communications applications. This 'SD-WAN on uCPE' combination lets SPs deliver a range of unified business communication services to business customers. Ribbon's approach is composed of three parts:

A suite of best-in-class, virtualized communication services

This starts with SD-WAN as the foundation and includes voice, video, security, WAN optimization, DDoS, encryption, and IT applications, such as storage services. Customers can select only the services they need, per location.

Powerful service orchestration and automation applications

Running on Ribbon's cloud-native Muse Orchestrator platform makes it easy and profitable for SPs to design, deploy, and manage the lifecycle of virtualized business communication services. SPs deliver the services themselves, or optionally, have Ribbon perform this as a Software-as-a-Service (SaaS) provider and share the revenues with the SPs.

A selection of white-box uCPE platforms that can run virtualized services

Ribbon provides an open uCPE operation system infrastructure that can run any mix of virtualized services. Either Ribbon or the service provider can supply the hardware platforms. This approach allows SPs to deploy uCPE in the most economical way and provides the flexibility to support next generation needs.

Muse Virtualized Business Communication Services deliver a true win-win offering. Business customers benefit in many ways. Firstly, they gain control over their WAN traffic, achieving the best match between performance and cost. Then, by leveraging the power of virtualization, they can add other WAN management and communication services seamlessly, as needed, and delivered via a single unified uCPE appliance. This provides a one-stop-shop for all their business communication services, which they can upgrade or modify on-demand, as needs change.

Businesses control their services via a self-service portal, and the SP handles all delivery and lifecycle management details. Businesses can be confident that their communications software is always up to date.

SPs win because they increase customer stickiness through a modular and customizable delivery solution. Concurrently, a pipeline for new revenues develops via value-added and premium services.





Best-of-Breed Virtualized Business Services

Ribbon's suite of best-in-class virtualized communication services cover most business communication needs. Ribbon tested them for coexistence, providing customers with complete freedom to select only the services they need, whether across all their locations or on a per-location basis. Moreover, Muse NFV Orchestrator provides SPs with an easy on-boarding process to expand this offering.

Virtualized Service		Supplier	Summary
•	SD-WAN	F:::RTINET.	Application-aware automatic WAN path control, replacing separate WAN routers, optimization, and security devices with a single integrated solution. Improves application performance, while reducing WAN operating expenses and management complexity.
	Next-Gen Firewall	FEBRUINET. Check Point SOFTWARE TECHNOLOGIES LTD	Comprehensive threat protection including intrusion prevention, web filtering, anti-malware and application control. Automates visibility into applications, users, and networks, and provides security ratings to adopt security best practices.
e.	Voice	noddin 🖏	Voice over IP (VoIP) with seamless connectivity, enhanced security, and quality assurance.
V	Edge Router	noddin 🔇	Full L3 underlay and overall routing, with a complete set of features, including: L2, encapsulations, IPv6, NAT, QoS, high availability, and more.
	WAN Optimization	•>>>> replify F====RTINET.	Accelerates delivery of any application across the hybrid WAN by combining network, application, and end-user performance metrics, enabling problems to be addressed before users are impacted.
	Storage	ctera	Manages the way files are stored, accessed, shared, and governed in a world where data flows between clouds, offices, and endpoints, and where users work and collaborate on the go.
0	DDoS	:: radware	Advanced and automated DDoS prevention, protection, and mitigation, from fast-moving, high-volume encrypted or very-short-duration threats, including IoT botnet-based attacks.
A	L2 Encryption	CERTES	Provides Ethernet frame encryption, compatible with Layer 2 unicast, multicast, P2P, and multipoint-to-multipoint topologies. Authenticates all Ethernet frames, preventing man-in-the-middle attacks.



MUSE Service Orchestration and Automation

Muse NFV Orchestrator makes it easy for SPs to monetize uCPE-delivered virtualized business communication services. Its rich set of capabilities includes:



Service design and catalog management

Integrates new VNFs, designs and saves service functions chains as templates, creating a variety of service packages.



Customer management with automatic zero-touch deployment

Handles service requests with pre-defined scripts, conducts 2-way detection and authentication of uCPE (following customer installation), downloads and configures VNFs and network connectivity, and activates services.



Host management

Manages remote uCPE hosts, upgrades VNFs remotely, performs backup and restore, keeps track of customer configuration and inventory.



Alarms and monitoring

Continuously monitors for hardware and software alarms and other events, provides tools for troubleshooting.



Scaling and high availability

Leverages the cloud-native PaaS that underlies Muse Orchestrator to deploy variant flavors of VNF at scale, and ensures high availability through automatic load balancing and geographic redundancy.



Intuitive portals

Features a rich web user interface for service provider operations centers and customer self-service portals.

Security

Offers multilayer hardware and software security, including: a Trusted Platform Module (TPM) cryptoprocessor on all platforms, secure boot and runtime, signature verification, IPsec tunnels for uCPE management, hardened OS, role-based access control (RBAC), and encrypted APIs.

Edge Cloud Universal CPE

Mercury uCPEs are superb proven appliances that create a 'pico-cloud' on customer premises for running virtualized communications services. They run Ribbon's NFVi operating system for open northbound interworking with Muse Orchestrator. This enables zero-touch service provisioning, lifecycle management applications, remote upgrades, and selfinstallation. Once a customer connects the appliance to the network, startup and provisioning takes place automatically.

Physically, uCPE appliances include MPLS and broadband network interfaces, GbE LAN connectivity, optional WiFi, and GbE management ports. They also include software acceleration for better performance with LTE, WiFi, and GPO.



Mercury NVE-100 thin tabletop uCPE appliance featuring Intel[®] Atom[®] C3000 system-on-a-chip, and 64GB memory.



Mercury NVE-1000 thick rack-mount uCPE appliance featuring Intel[®] Xeon[®] Skylake D family to meet the need for higher core count, and 256GB memory.



Use Case: SD-WAN Plus Orchestration

A business customer often has multiple locations, but depending on the activity level or even the time of day, the utilization of the WAN may vary. Some locations may have an occasional need for very high bandwidth, for high-resolution video, or intensive data backup.

The service offered to such a customer is a fixed amount of WAN bandwidth (perhaps several gigabits-per-second), which the customer allocates dynamically among the business locations, based on a set of customer-defined rules. Muse Orchestrator continually monitors the WAN traffic and regularly instructs the SD-WAN controller to make adjustments between MPLS and broadband facilities for each location.

In this fashion, the customer continually optimizes overall communications resources, rather than one location at a time. Customers can increase the overall bandwidth allocation if they cannot seem to find an optimal balance, such as when several locations are continuously low on bandwidth. This is more economical than negotiating bandwidth for each location individually.



Taking Business Communications to the Next Level

Ribbon's SD-WAN on uCPE solution starts with an industry-leading SD-WAN capability that addresses the core requirement of managing WAN resources effectively. Then, using the power of virtualization, businesses can add other WAN management and communications services seamlessly, as needed, all delivered via a single unified uCPE appliance.

Businesses benefit in many ways. They gain a tailored solution for each business location, management is outsourced, and WAN costs are reduced. Service providers increase stickiness with important business customers, while developing a pipeline for value-added revenues.

Lastly, the solution is based on ETSI standards, open architecture, and open software. It is the superior path to orchestrate additional NFV islands in the network and lay the foundation for 5G services.





About Ribbon

Ribbon Communications (Nasdaq: RBBN) delivers communications software, IP and optical networking solutions to service providers, enterprises and critical infrastructure sectors globally. We engage deeply with our customers, helping them modernize their networks for improved competitive positioning and business outcomes in today's smart, always-on and data-hungry world. Our innovative, end-to-end solutions portfolio delivers unparalleled scale, performance, and agility, including core to edge software-centric solutions, cloud-native offers, leading-edge security and analytics tools, along with IP and optical networking solutions for 5G. We maintain a keen focus on our commitments to Environmental, Social and Governance (ESG) matters, offering an annual Sustainability Report to our stakeholders. To learn more about Ribbon visit rbbn.com.