

Accelerating Network Transformation

# **Ribbon NOS**

## Summary

Telecoms services are becoming increasingly complex, demanding ever increasing bandwidth and service performance guarantees. To keep pace with this exponential traffic growth and complexity a better backhaul transport network is required. This new backhaul transport must have the agility to provide the scalability, fast convergence, ease of configuration and service performance required to support the new services cost effectively.

Economically achieving this agility requires a new approach to IP and Optical transport, one which is able to accelerate the innovation cycle for both hardware and software, allowing new innovation to be deployed much more rapidly and with much less network disruption. It is recognized by many vendors and operators that open, disaggregated, and standards-based technology solutions are a way of delivering this accelerated innovation cycle whilst still achieving the high quality connectivity required in the transport network.

Ribbon is addressing market demands for disaggregation and is developing a disaggregated, open, standards-based NOS portfolio for redundant, non-redundant, in-house and ODM-based products. The NOS software is flexible enough to support "right-size" scaling supporting multiple hardware sizes, 1RU to multi-RU and multiple hardware configurations; redundant and non-redundant, modular and fixed configurations. The NOS software is optimized to provide the multi-access edge platforms such as the distributed cell site gateway (DCSG) platforms and the larger platforms used for aggregation and transport.

## **Ribbons NOS Approach**

Ribbon's NOS approach is to create a unified NOS which is used across our entire portfolio. This ranges from1RU access devices through to higher capacity multi-RU aggregation and transport platforms, with each platform supporting open standards based Netconf interfaces. Ribbon's portfolio of NOS solutions are architected to meet a range different of requirements, providing redundant and no-redundant options and modular and fixed configuration.

The NOS software uses certified merchant silicon and runs on both NOS certified original device manufacturer (ODM) hardware.



Ribbon is evolving its proven OS to create the fully disaggregated, open NOS.





Ribbon supports all of the integration models required in this disaggregated approach. These models include:

- · Integrated, validated hardware, SDK and NOS, with flexibility of operation, support and services.
- System integrator for operator specified components and Ribbon components
- Supplier of NOS and supplier of Hardware to 3rd party system integrators

	Traditional Vendor	NOS Vendor
Service and Support	Vendor or 3rd Company	Vendor or 3rd Company
Verification	Vendor	NOS Vendor
Integration	Vendor	NOS Vendor
Software	Vendor	NOS Vendor
Hardware	Vendor	ODM HW Vendor

## Multiple scalability options and architectures

## What are the most important criteria in selecting a NOS supplier for open and disaggregated routing solution? (Select up to three)



Ribbon's strategy is to build open disaggregated systems which are scaled, both in terms of size and functionality, to meet their operational needs, providing multiple "elements" which support multiple functional building blocks and architectures as defined below:



## **Cell Site Router/ Access Router**

#### DCSG/CSR Today

The Ribbon NOS approach provides a cellsite router (CSR) using the disaggregated cellsite gateway (DCSG) approach. Today this is a 1RU non-redundant white box providing 300G capacity, GE/10GE/25GE/100GE interfaces and full layer-2, layer-3 and MPLS capabilities.



#### **DCSG/CSR Evolution**

Ribbon's NOS approach will support the DCSG as it evolves. For example, today, hardware technology has already evolved with Broadcom introducing the Qumran-Q2a which provides almost 3x the throughput and QSFP-DD pluggables providing double density interface capacity

At the same time cellsite routing requirements are evolving to support new 5G enhancements. There is now a need for the cellsite router to support eCPRI, TSN, network slicing, FlexE, increased capacity and larger fan-out.

The RAN is becoming increasingly complex and the access edge and aggregation network must support fronthaul, midhaul, backhaul and the services carried across these network segments. A single access and aggregation network maybe multitenant, meaning that different operator RANs, and even fixed network traffic, may use the same access and aggregation network to transport their network traffic (fronthaul, midhaul, backhaul) and user generated service traffic. The access and aggregation must be able to provide the correct network speration to support each RAN operators needs.

Each type of traffic has its own specific performance requirements (SLAs, SLOs) and transport network must guarantee to meet these. With Ribbon NOS and transport portfolio we are able to meet these evolving needs, with optimized software features sets and hardware capabilities such as higher throughput and fanout, service and slice-aware traffic steering gearbox and synchronization capabilities.

Ribbon flexible NOS approach, supports the new hardware required and provides the additional software to capabilities to achieve these new 5G requirements, resulting in an evolved DCSG. This evolved DCSG is still a 1RU white box but provides hardware redundancy 800G capacity with increased fan-out, GE/10GE/25GE/100GE/400GE interfaces, full layer-2, layer-3 and MPLS capabilities eCPRI, TSN, network slicing, FlexE,.



## **Aggregation and Transport Network**

There are many different architectures and approaches used for backhauling traffic from the access edge to the core, choice of these approaches is driven by service mix, availability of fiber, stage of network evolution, business strategy and more.

Regardless of the architecture and approach, the basic requirements on this connectivity remain similar:

- Dynamic Connectivity and SDN With the network evolving to become a dynamic cloud, the network must
  provide connectivity wherever and whenever it is required. This could be traditional architectures where backhaul is
  static connectivity to the Core of the network. Or highly dynamic architectures where connectivity is provided (and
  removed) to compute and applications instantiated on multi-access edge compute (MEC) or local datacentres, as it
  is required.
- **Multiservice** The aggregation and transport network must support the performance requirements (SLAs) for all the services it is transporting. With services such as AR/VR, remote medical consultations, online cloud gaming, these requirements are becoming ever more complex, and stringent in terms of guaranteeing capacity, low latency, reliability and security.
- **Multi-access Edge Compute** The aggregation and transport network maybe collocated with MEC and needs upto 1Tbits capacity to support full multiservice capabilities including supporting inter and intra MEC/DC connectivity.
- **Rapid service instantiation** The aggregation and transport network must be agile enough to allow new services to be introduced rapidly, whether this be adding new services to the operators service portfolio or providing new services to new and/or existing customers
- **SDN and Automation** With the ever increasing complexity, the aggregation and transport network must provide the programmability and open interfaces to support automation of all aspects of the service and network lifecycles
- **Multiple architectures** There is no one size fits all architecture, the aggregation and transport network must be flexible enough to support multiple architectures such as, access-aggregation-core, hub'n spoke, dual homed mesh and hybrids of all of these. It must also be able to understand the performance impact of the optical layer, when it is used, and route traffic over the most appropriate transport layer, whether this be single layer IP and IPoDWDM or multilayer IP and Optical.
- **Reliability and Redundancy** The aggregation and transport network must have the ability to provide redundancy in the IP layer, in the optical layer, in the network, in the network elements, or any combination of these depending on need.
- Accelerated innovation cycle It must be possible to reduce the innovation cycle time, allowing new innovations in both hardware and software to be introduced into the filed network rapidly, efficiently and cost-effectively (no fork lift upgrades).
- **Better economics** With ever increasing capacity and service complexity the aggregation and transport network plays a key role in keeping networks costs down. This can be by providing service convergence, supporting pay-as you grow architectures, supporting an accelerated innovation cycle



Ribbon's NOS approach provides the open, disaggregated, standards-based solutions required to meet all of these needs.

The Ribbon NOS is architected to scale to the size of the hardware platform required to meet the network architectural needs. This ranges from the 1RU boxes required for access and pre-aggregation to the multi-Tera boxes required in the aggregation and transport network.

With support for multiple hardware options the Ribbon NOS is designed to work on both redundant and non-redundant hardware and support both fixed configurations and the modular configurations required for pay-as-you grow.

With a truly open approach the Ribbon NOS solution supports accelerated innovation cycles and with open, standardsbased interfaces and APIs provides ease of integration into SDN and automation schemes.

The Ribbon NOS provides the IP transport features required to support all service types and operate in a multi-layer IP Optical network. The software stack is architected to allow rapid support of new service and new IP transport profiles.

## Conclusion

With the DCSG we have seen the first commercial availability of open, disaggregated, and standards-based technology approach for IP routing and according to OMDIA research, the DCSG looks set to achieve constant steady growth in the cell site router space.



Many vendors are now looking beyond their traditional approaches and analysts are predicting the strong uptake in open, disaggregated router deployment predicted in the CSR space to expand to cover the whole IP routing sector, but it still remains to be seen just how open and desegregated the hardware of software will actually be.



Ribbon are a strong believer in a true open approach, with a strategy which embraces use of any certified hardware and any certified merchant silicon vendor and a disaggregated, open, software stack.

With this approach to disaggregation and openness, Ribbon has a scalable NOS which can operate efficiently on whatever hardware configuration and size is required to meet the operation needs of the network. Whether this be a small 1RU box for access, the clustered architecture in a dual homed mesh or the aggregation functions which fit in between.

Ribbon's NOS long-term strategy is to truly disaggregate the NOS from the underlying hardware with the Ribbon NOS architected to operate on any certified white box, agnostic to the original design manufacturer (ODMs) used and operating using any certified merchant silicon. With this approach and an open scalable NOS, Ribbon is able to provide solutions with the "right-size" scaling to meet their architectural need, whether this be a 1RU platform for DCSG or a redundant modular platform for aggregation.



Going forward and next steps are a container-based protocol stack that can run on top of a variety of commercial silicon platforms. It leverages the adaptable capabilities of the Switch Abstraction Interface (SAI) and robust integration.

This provides an additional axis of flexibility in network solutions by allowing continuous design and improvement. SAI simplifies and accelerates the deployment of new platforms as chips evolve and new platforms are released.





### **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.