Infinera DRX Programmable Carrier-class White Box Router

Bringing Unmatched Flexibility and Scalability to Carrier Networking from Access to Core

The emergence of 5G networks, with their completely new set of use cases and services, is forcing traditional carriers as well as cable operators to rethink their networks and infrastructures. The main challenges for any category of transport network include multiplying capacity and addressing stringent latency needs posed by specific use cases such as augmented reality and autonomous driving. In particular, latency requirements push applications and services such as multi-access edge computing (MEC) and security functions from the network core and large data centers closer to the access network, thus turning aggregation sites into small data centers. Transport networks must be able to adjust and scale quickly to meet growing demands and easily deploy new functionalities through software.

At the same time, carrier networks must ensure economic profitability while contending with evolving technical requirements. Like mobile operators, cable operators are moving toward similar network architectures that take fiber deep into the access and distribute network functions to enable higher-speed broadband services. This new architecture is called distributed access architecture (DAA), in which the headend gets virtualized and distributed into the access and aggregation network.

ENSURING SMOOTH MIGRATION TO DISAGGREGATED NETWORK ARCHITECTURES

Infinera addresses these needs with a new, open networking-based architecture in which hardware and software are disaggregated into separate functions. Disaggregated routing provides a flexible, programmable network architecture for service providers. Furthermore, the Infinera DRX Series relies on design principles that meet advanced demands for carrier networks like synchronization, temperature hardening, and resiliency. It leverages a larger ecosystem of elements to build and evolve the infrastructure of transport networks. The Infinera advanced solutions portfolio supports smooth migration toward open and disaggregated network architectures, with a range of white box routers including the Infinera DRX Series carrier-class white box portfolio, Infinera Converged Network Operating System (CNOS), and intelligent control based on the Infinera Transcend software-defined networking (SDN) controller and orchestration solutions.

EVOLVING FROM VENDOR-SPECIFIC SYSTEMS TO WHITE BOXES

Traditional carrier network routing elements, or black boxes, are closed vendor-specific systems in which hardware and software are tightly integrated. In contrast, white boxes are switch or router elements that are agnostic to the network operating system (NOS), enabling new carrier flexibility. The adoption of white boxes began with IT and data centers and is gradually achieving traction among telco carriers as well. Key drivers for white boxes are flexibility, lower capital expenses, and reduced operating costs through network automation. White boxes contain basic mechanics along with the network processor or fabric silicon depending on their role in multi-unit scaling nodes, together enabling customization with the NOS and other software for specific use cases.

BENEFITS OF INFINERA DRX WHITE BOX SERIES

- **Provides** a white box router designed for service provider networks and multiple locations

- **Eliminates** vendor lock-in by opening the hardware for multiple types of NOS

- **Offers** full resilience and incremental scaling with unique multi-unit concept

- **Fits** ideally into 5G networking with versatile synchronization capabilities

ELEVATING TRADITIONAL WHITE BOX CAPABILITIES

The white boxes today are predominantly focused on IT and data center use cases. However, there is a gap in white box offerings that can meet specific carrier requirements in terms of installation environments, form factors, and use cases, which currently prevents extensive white box adoption. In order to effectively address these service provider requirements, Infinera has designed the DRX white box series to meet specific carrier-grade requirements like:

- Extended memory buffer: Supporting specific routing and switching functions within transport networks

- High-performance synchronization: Institute of Electrical and Electronics Engineers (IEEE) 1588v2, Synchronous Ethernet, and robust and flexible Global Navigation Satellite System (GNSS) synchronization options

- Stacking option for incremental scaling and full redundancy

- Modularity to ensure maximum flexibility and high reliability

- Environmental hardening: Secured operation under challenging conditions

- Optimal form factor: Supporting typical telco-grade installations, including 300 mm-deep options

- External interfaces for alarm and synchronization: Adaptation to telco installations

The DRX routers are loaded with Open Network Install Environment (ONIE), which enables the installation of a compatible NOS. In addition, the DRX Series provides accurate synchronization as mandated by mobile networks, compact form factors, ideal mechanics for telco site installations and temperature hardening to sustain varying deployment locations. The DRX Series contains merchant switching silicon, a standard Intel processor, and a Linux operating system.
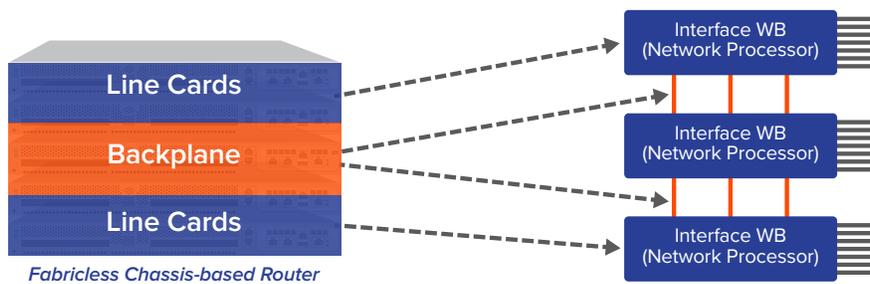

Figure 1: Infinera DRX Series multi-unit stacking

With its highly scalable architecture, the DRX Series can be positioned in the network from access to core. It provides the basis for building flexible and versatile networks for any carrier use case, from 4G/5G X-haul and the Internet of Things (IoT) to residential and enterprise services. The DRX Series encompasses a number of platform variants ranging from 300 gigabits per second (Gb/s) to 4.8 terabits per second (Tb/s) for a white box router that can be deployed as a standalone router or in a dual- or triple-stacked multi-unit node, as shown in Figure 1.
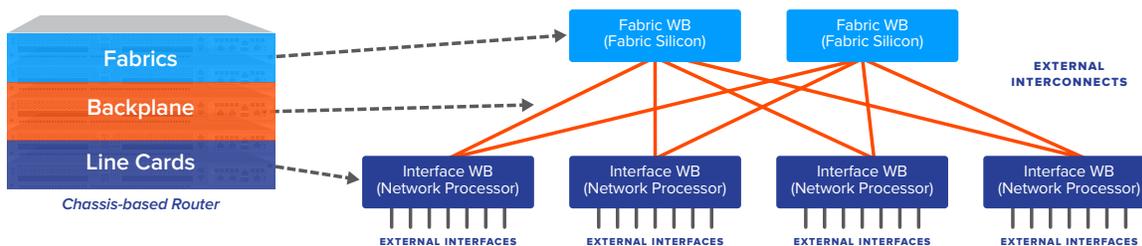

Figure 2: Infinera DRX Series fabric-based multi-unit stacking

Additionally, DRX routers provide a unique multi-unit concept for incremental scaling and full redundancy, fundamental capabilities for business continuity, enhanced service quality, and simplified operations. Fabric-based multi-unit stacking, also known as horizontally scalable routers (HSRs), enables horizontal scaling to achieve much greater capacity, with hundreds of Tb/s within a single managed node, and introduce new services.
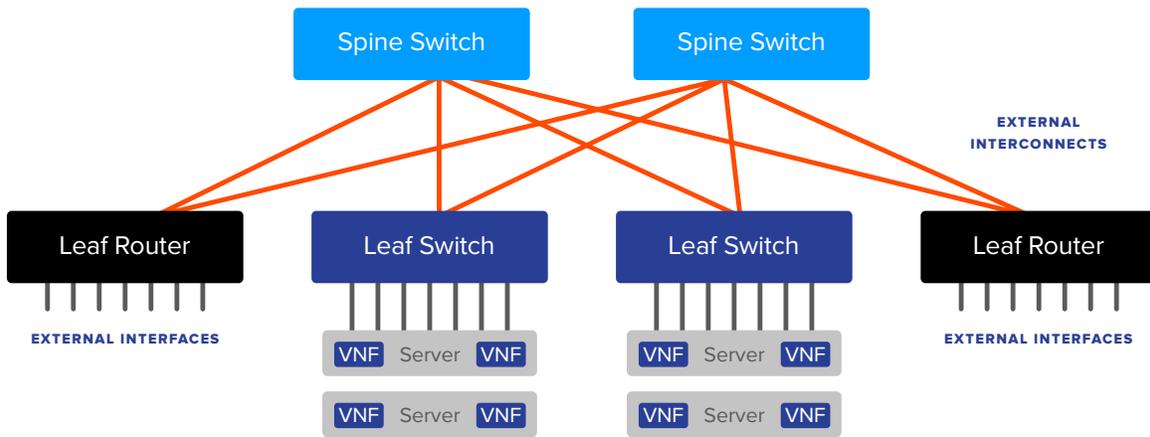
Figure 3: Spine-and-leaf for multi-access edge compute (MEC) POD

As shown in Figure 3, the DRX Series in a spine-and-leaf architecture supports the creation of a point of delivery (POD) where discrete switches and routers provide a fabric to support servers running virtual network functions (VNFs).

SELECTING SOFTWARE WITH VALUE-ADDED OPTIONS

The DRX Series provides maximum value when used together with the Infinera CNOS, which leverages the integrated carrier-class capabilities of DRX white box routers. Multi-unit stacking-related benefits are a good example, which CNOS enables. Nonetheless, as the DRX white box series is designed as an open hardware platform, it is also possible to run other NOSes available on the market.
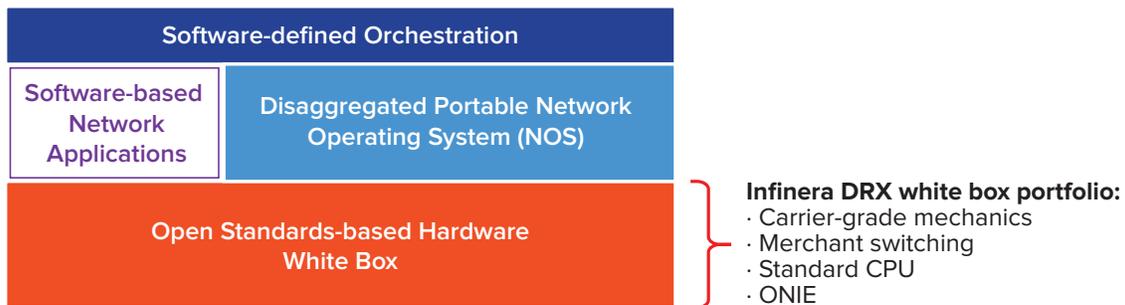

Figure 4: Infinera DRX white box flexible software options

Disaggregation naturally increases the number of network elements that require advanced management and control in order to ensure automation and network simplification. To support open networking, DRX routers provide open application programming interfaces and communication through industry-standard interfaces such as NETCONF. The Infinera Transcend solution, including controller and orchestration, hides network complexity by abstracting and automating operations across multi-vendor, multi-domain, and multi-technology networks.