Overview of the Juniper Networks Mobile Cloud Architecture

Laying the Foundation for a Next-Generation Secure Distributed Telco Cloud

White Paper

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Juniper Networks, Inc.
1133 Innovation Way
Sunnyvale, California 94089
USA
408-745-2000
www.juniper.net

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Executive Summary

This white paper provides an overview of the Juniper Networks Mobile Cloud Architecture, a cloud-based IP platform that lays the foundation for a next-generation, secure, distributed, telco cloud. The five solution areas that make up the Mobile Cloud Architecture will future-proof a service provider's mobile network for 5G and IoT.

The content in this white paper is also available in PPT (blueprint) and video formats at Network Design and Architecture Center: Mobile Cloud.

Challenges and Trends

Service providers are trying to find ways to enable new revenue opportunities and manage both CapEx and OpEx with the shift to a 5G and IoT environment. Figure 1 shows a summary of mobile network challenges and trends these providers face.

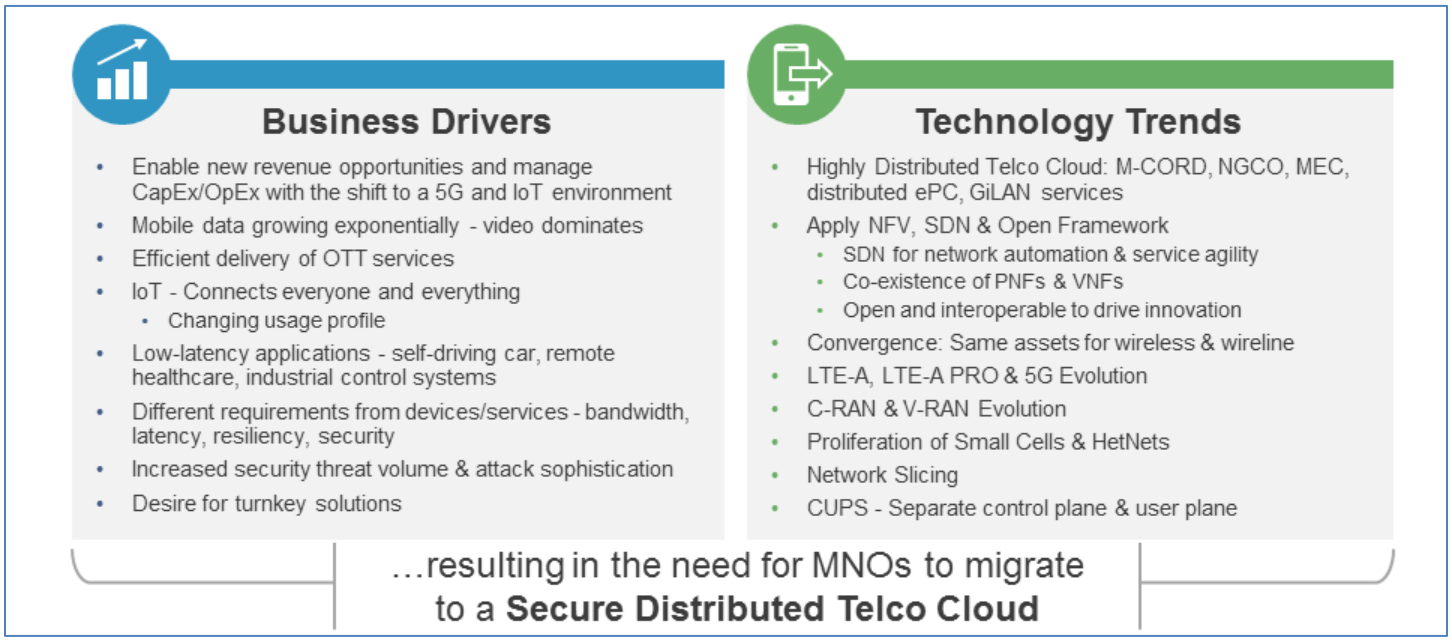

Figure 1: Mobile Network Challenges and Trends

Low-latency applications, such as those for self-driving cars, remote healthcare, and industrial control systems, are pushing service providers toward a more distributed architecture. Increasing the distributed nature of their networks also reduces the need to backhaul huge amounts of traffic to a centralized location.

Service providers must also protect against ever-increasing security threats. Traditional perimeter security is no longer sufficient to deal with the sophistication and volume of modern day attacks.

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In response to these drivers, new technology trends are appearing. One trend in particular centers around migration to a highly distributed telco cloud. Juniper is confident that service providers are well positioned for 5G and IoT, in large part due to their existing footprint of central offices and switching centers located near end users. However, this network transformation also presents significant challenges. Juniper can help with these challenges by providing solutions, including products and services, that support the transformation to a mobile cloud architecture.

Convergence is another notable trend in today's networks. Wireless and wireline networks are increasingly being blended to use the same network equipment. Juniper's product lines are extensively deployed with wireline service providers, making it well positioned for future mobile infrastructure deployments.

Moving Towards a Secure, Distributed Telco Cloud

As shown in Figure 2, service providers are feeling the constant pressure of mobile traffic growth, which requires them to upgrade and advance their network infrastructure to provide ever-higher bandwidth with ever-lower latency. Likewise, providers are feeling the pressure of reduced margins, which requires them to look for ways to lower costs while increasing service revenues.

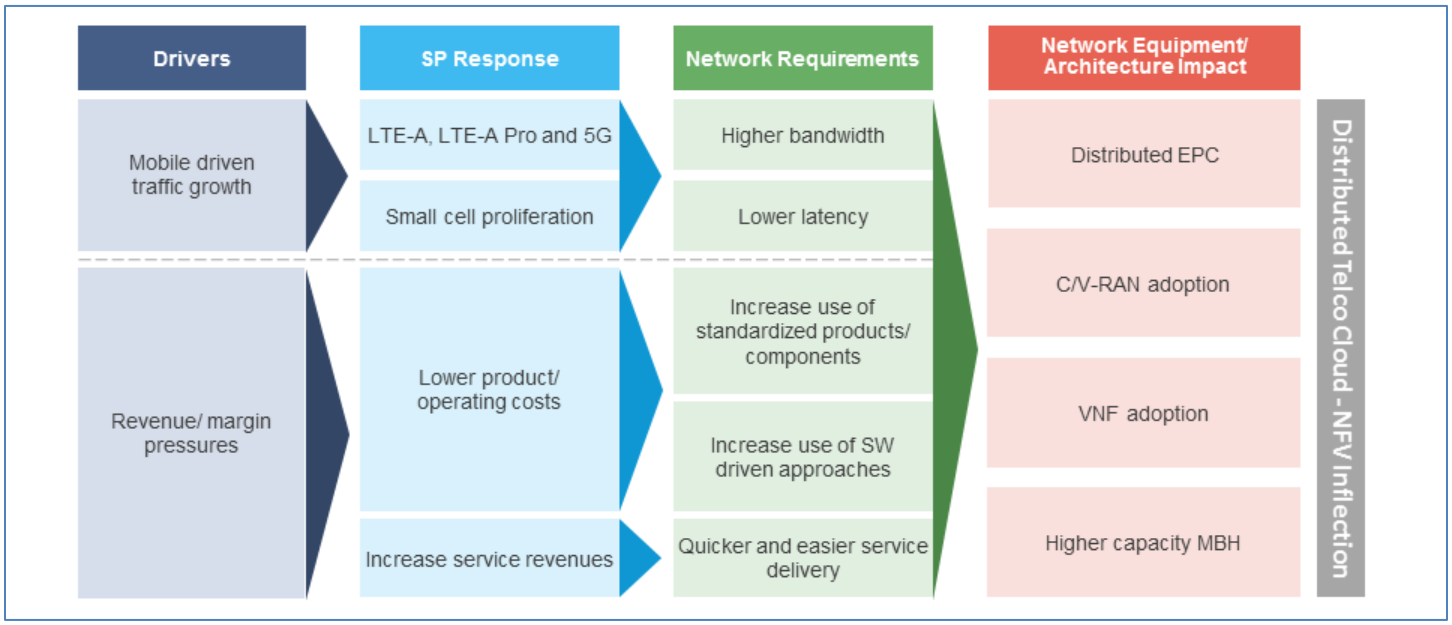

Figure 2: Driving Towards a Distributed Telco Cloud

These pressures are pushing providers towards a major network transformation, which can be met through Juniper's distributed telco cloud architecture.

Mobile Network Evolution

Mobile Networks Today

Mobile network architectures today can vary in their specifics, but generally resemble the diagram shown in Figure 3. Typically, the network includes enterprise and heterogeneous network (Het-Net) sites, which are backhauled to an

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access and aggregation (A&A) network. The A&A network may include a mobile telephone switching office (MTSO) that provides some network functions, and is attached to a core network. The core network may include both regional data centers (DCs) and centralized DCs, and is attached to the Internet and other roaming networks.

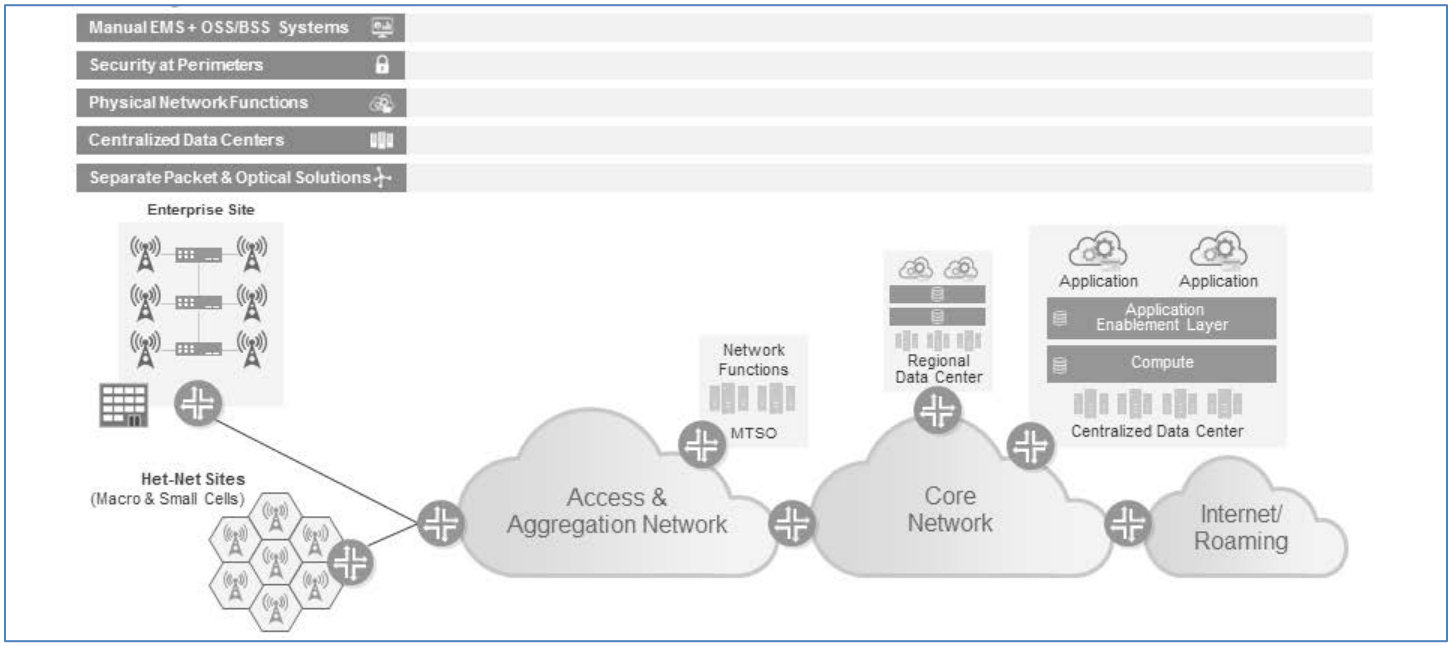

Figure 3: Mobile Networks Today

Typically, service provider architectures today include the solution areas shown in Figure 3, including separate packet and optical networks, centralized data centers, and so on.

LTE-A, 5G, and IoT Network Evolution

With the introduction of LTE Advanced (LTE-A), and the promise of 5G and IoT, a major network evolution is underway.

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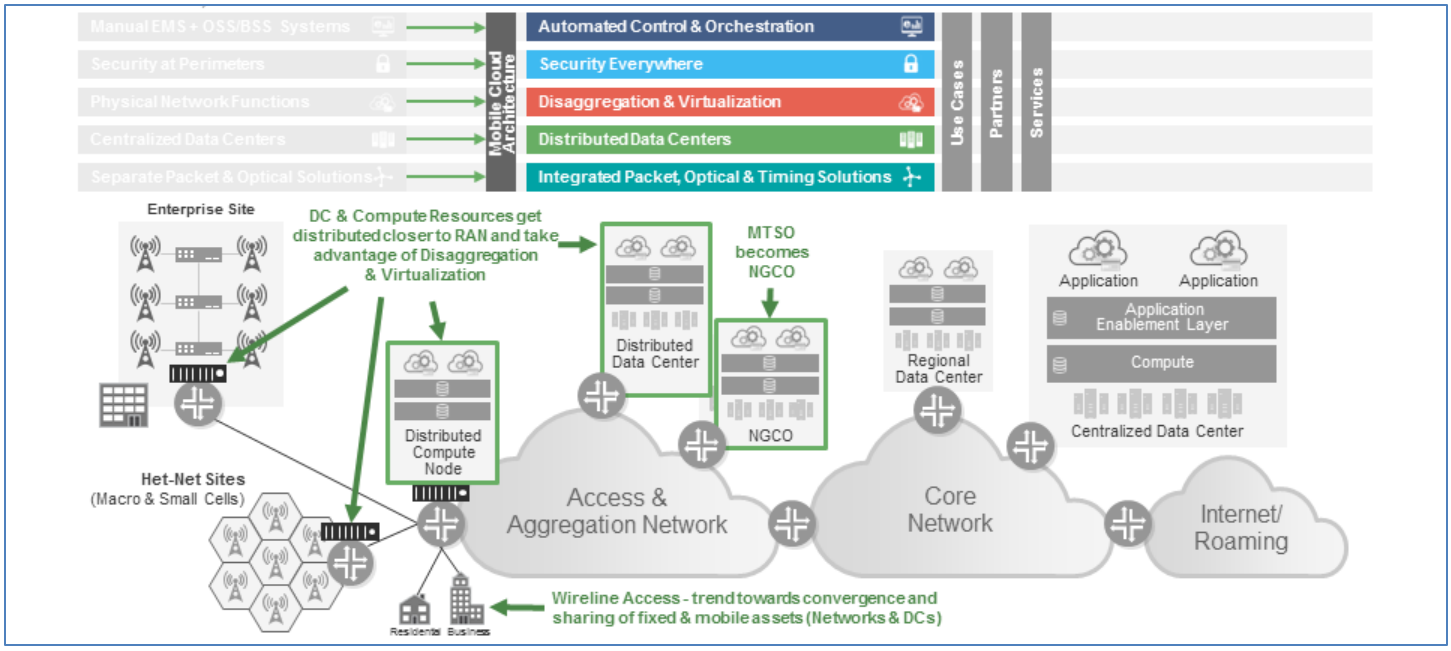

Figure 4: LTE-A, 5G, and IoT Network Evolution

As shown in Figure 4, DC and compute resources are being moved closer to the radio access network (RAN), in smaller form factor devices, to take full advantage of disaggregation and virtualization. The A&A network includes one or more distributed DCs, and the MTSO is being migrated to a next-generation central office (NGCO). The trend towards convergence also plays a role, with the merging of wireline and wireless networks and DCs.

As the network itself evolves, so do the solution areas noted earlier:

- The separate packet and optical networks are becoming more integrated, with new timing requirements
- Centralized DCs are becoming more distributed
- Physical network functions are becoming disaggregated and virtualized, leveraging the distributed DCs
- Security at the perimeters is moving to an approach that offers all-encompassing ‘security everywhere’
- Manual management and orchestration systems are evolving to become more automated

Mobile Cloud Architecture

These solution areas make up the Juniper Networks Mobile Cloud Architecture, shown in Figure 5.

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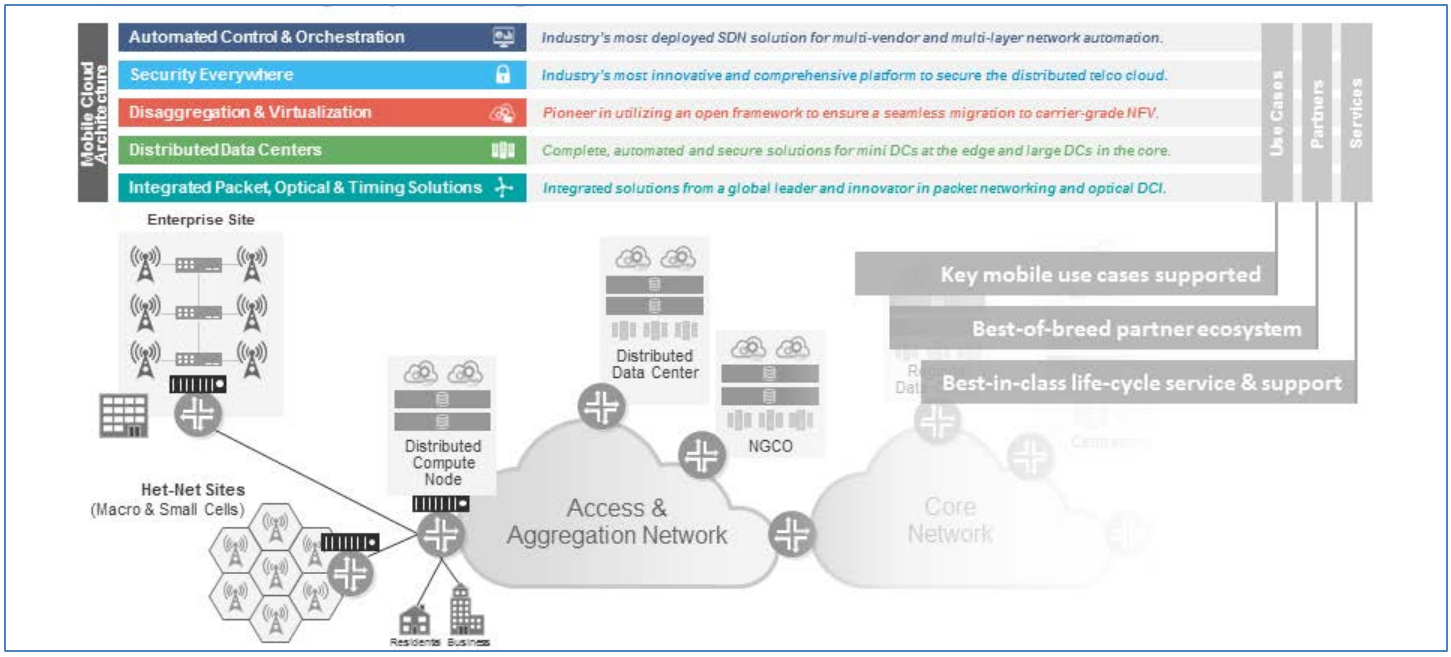

Figure 5: Juniper Networks End-to-End Mobile Cloud Architecture

The value proposition of Juniper's Mobile Cloud Architecture includes:

- Integrated solutions from a global leader and innovator in packet networking and optical data center interconnect (DCI)
- Complete automated and secure solutions for mini DCs at the edge, and large DCs in the core
- Pioneer in utilizing an open framework to ensure a seamless migration to carrier-grade network functions virtualization (NFV)
- Industry's most innovative and comprehensive platform to secure the distributed telco cloud
- Industry's most deployed SDN solution for multi-vendor and multi-layer network automation

Juniper's Mobile Cloud Architecture supports all the key mobile use cases today and in the future. Juniper also offers a best-of-breed partner ecosystem to complement these solutions, as well as best-in-class lifecycle service and support.

Solution Areas

As noted earlier, the Juniper Networks Mobile Cloud Architecture consists of five solution areas.

For more detail on each solution area, see Network Design and Architecture Center: Mobile Cloud.

Integrated Packet, Optical, and Timing

This solution area plays a role in the areas of the network shown in blue in Figure 6, including the Enterprise and Het-Net sites, the A&A network, core network, and Internet/roaming networks.

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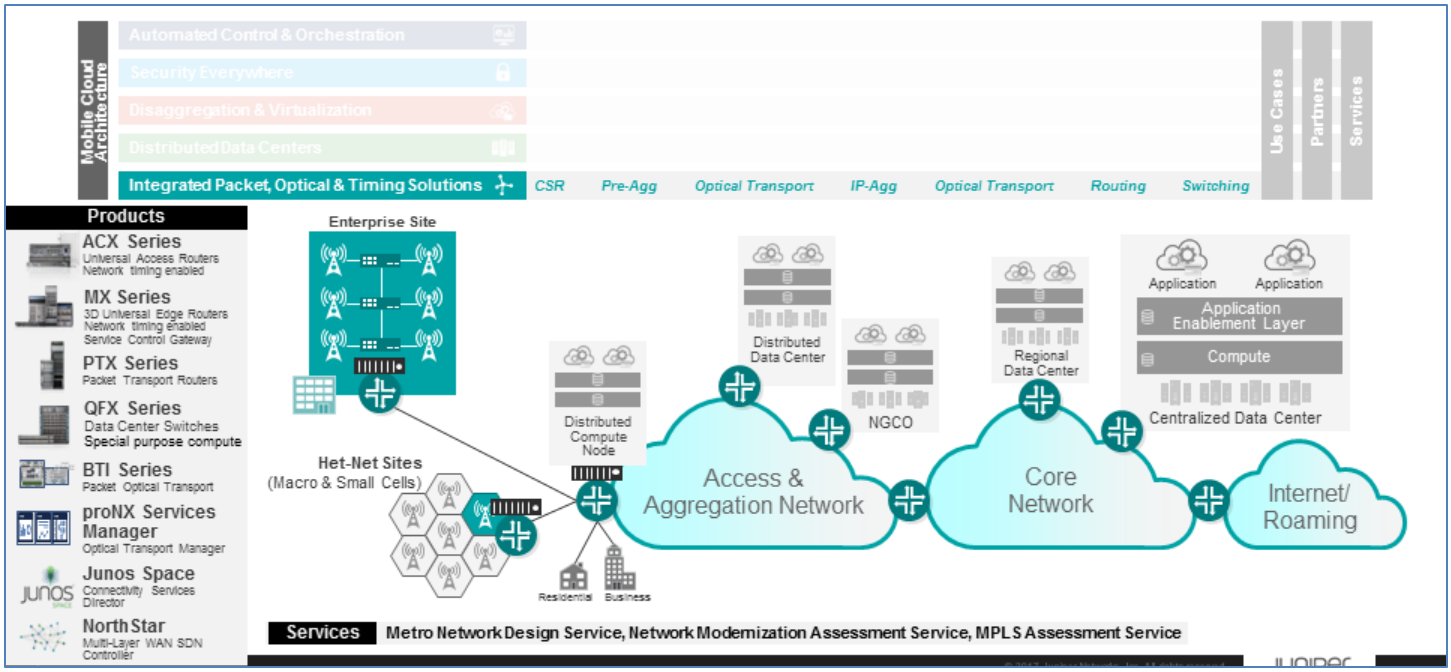

Figure 6: Integrated Packet, Optical, and Timing Solutions

Network functions enabled with this solution area include:

- Cell site routing (CSR)
- Pre-aggregation and aggregation routing
- Optical transport
- Core routing and switching

The Juniper product lines that support this solution area include:

- ACX Series Universal Access Routers
- MX Series 3D Universal Edge Routers
- PTX Series Packet Transport Core Routers
- QFX Series Data Center Switches
- BTI Series Packet Optical Transport Platforms
- proNX Service Manager – Optical Transport Manager
- Junos Space – Connectivity Services Director
- NorthStar WAN SDN Network Controller

Juniper services available for this solution area include:

- Metro network design
- Network modernization assessment
- MPLS assessment

Distributed Data Centers

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This solution area plays a role in the parts of the network shown in green in Figure 7, with micro DCs at the Enterprise and Het-Net sites, distributed compute nodes at the edge, distributed DCs and NGCOs in the A&A network, and regional and centralized DCs in the core network.

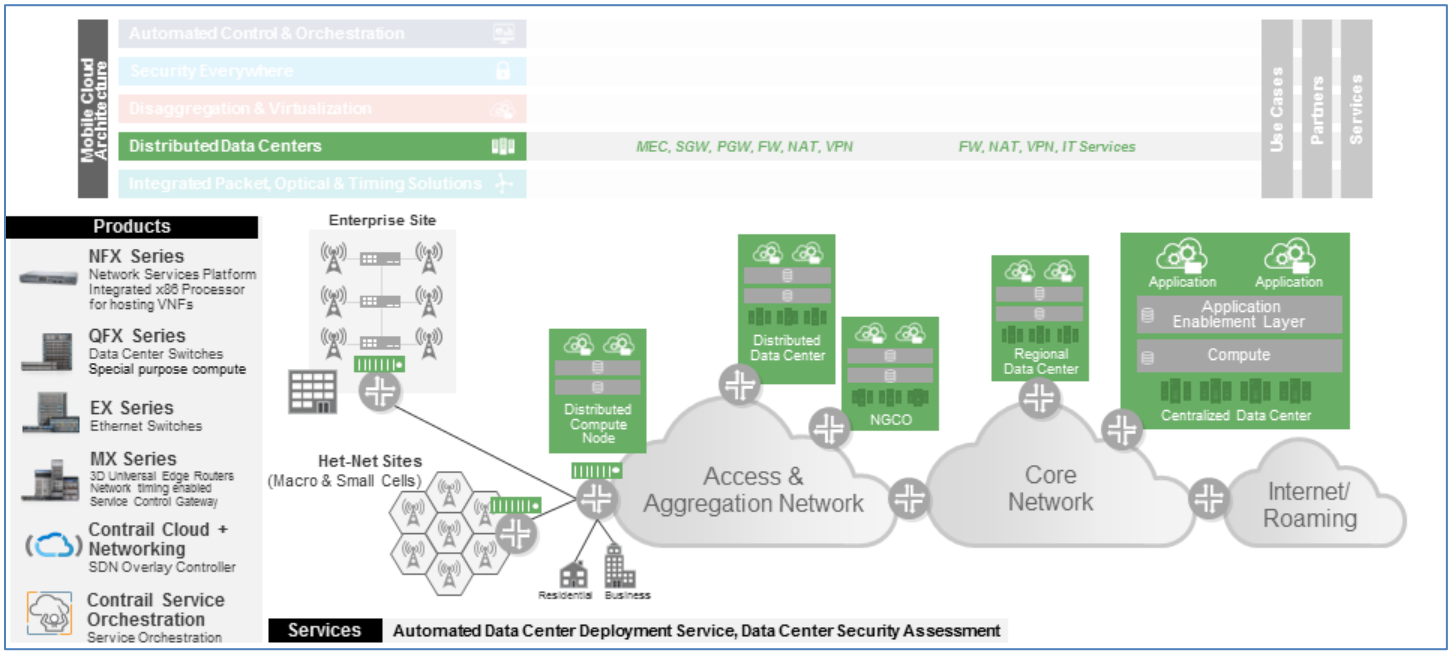

Figure 7: Distributed Data Centers

Network functions enabled with this solution area include:

- Multi-access Edge Computing (MEC)
- Serving Gateway (SGW)
- Packet Data Network Gateway (PGW)
- Firewall
- NAT
- IPsec VPN

The Juniper product lines that support this solution area include:

- NFX Series Network Services Platforms
- QFX Series Data Center Switches
- EX Series Ethernet Switches
- MX Series 3D Universal Edge Routers
- Contrail Cloud Platform, Contrail Networking
- Contrail Service Orchestration

Juniper services available for this solution area include:

- Automated DC deployment
- DC security assessment

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Disaggregation and Virtualization

This solution area plays a role at the application layer across the entire network, as shown in red in Figure 8.

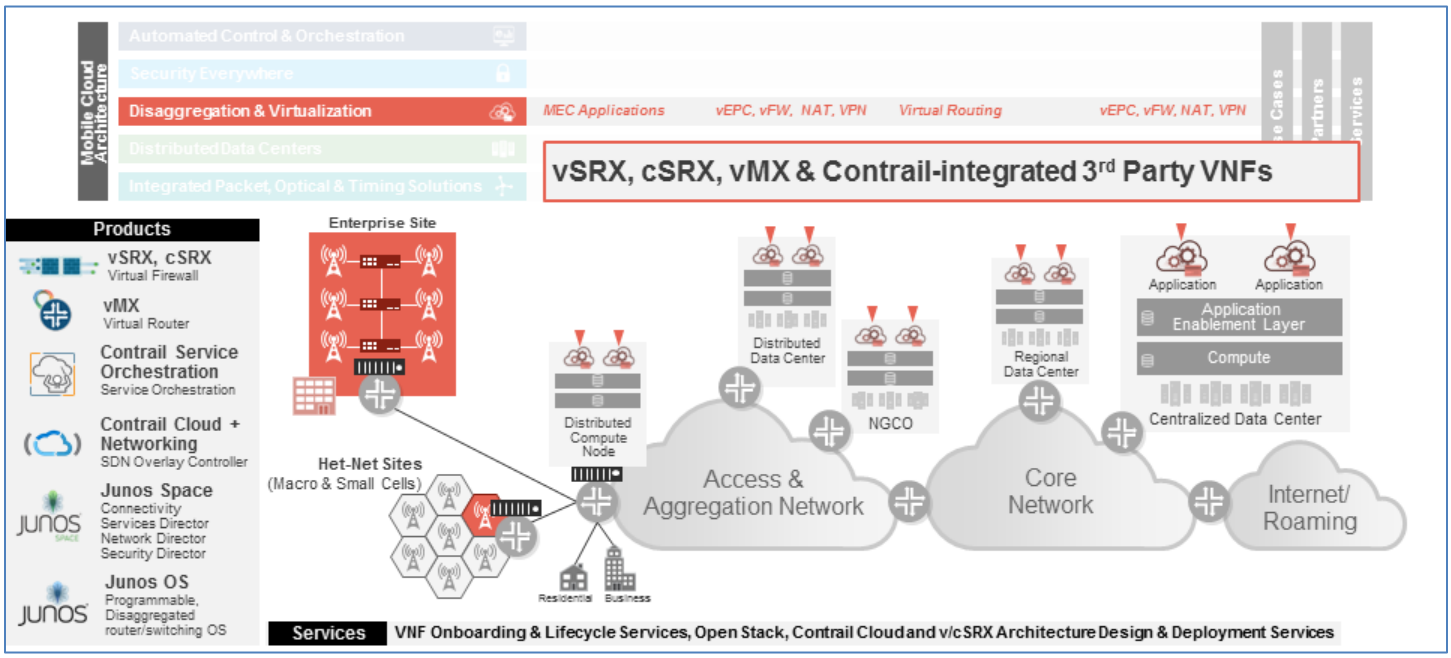

Figure 8: Disaggregation and Virtualization

Network functions enabled with this solution area include:

- MEC
- Virtualized evolved packet core (vEPC)
- Virtualized firewall (vFW)
- NAT
- IPsec VPN
- Virtual routing

The Juniper product lines that support this solution area include:

- vSRX Integrated Virtual Firewall and cSRX Container Firewall
- vMX (virtual MX Series router)
- Contrail Service Orchestration
- Contrail Cloud Platform, Contrail Networking
- Junos Space – Connectivity Services Director, Network Director, Security Director
- Junos OS – programmable, disaggregated

Juniper services available for this solution area include:

- VNF onboarding and lifecycle
- OpenStack
- Contrail Cloud and vSRX/cSRX architecture design and deployment

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Security Everywhere

This solution area plays a role at the application enablement layer across the entire network, as shown in light blue in Figure 9. Juniper's Software-Defined Secure Network (SDSN) provides end-to-end network visibility that secures the entire network, physical and virtual.

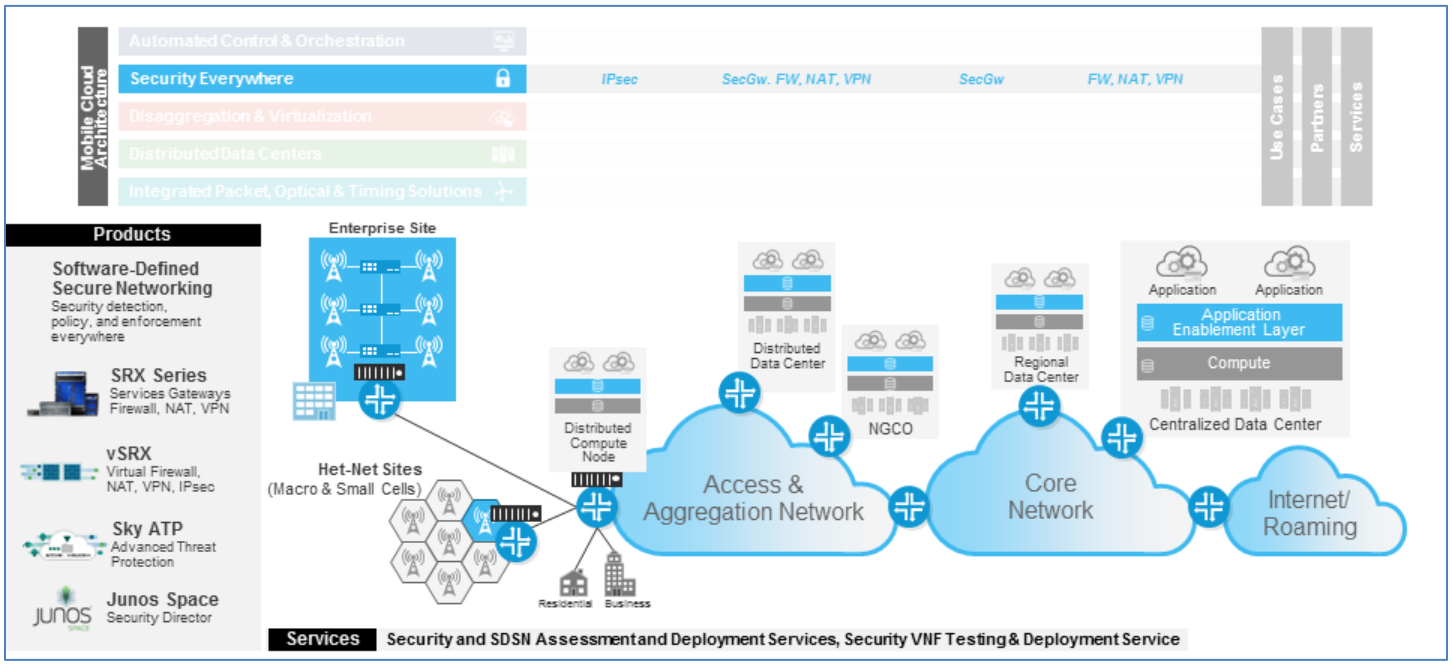

Figure 9: Security Everywhere

Network functions enabled with this solution area include:

- LTE Security Gateway (SecGW)
- IPsec VPN
- Firewall
- NAT

The Juniper product lines that support this solution area include:

- SRX Series Services Gateways
- vSRX Integrated Virtual Firewall and cSRX Container Firewall
- Sky Advanced Threat Protection (ATP)
- Junos Space – Security Director

Juniper services available for this solution area include:

- Security and SDSN assessment and deployment
- Security VNF testing and deployment

Automated Control and Orchestration

This solution area plays a role in all areas of the network, as shown in dark blue in Figure 10.

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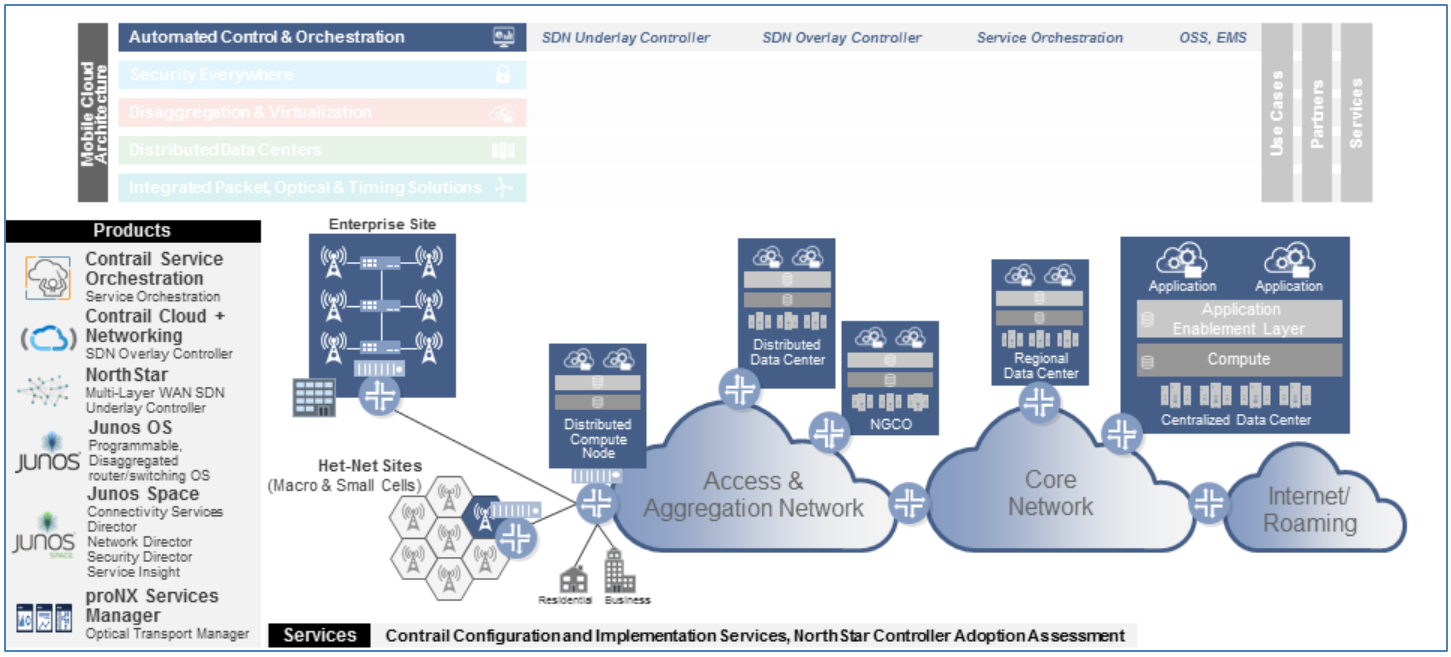

Figure 10: Automated Control and Orchestration

Network functions enabled with this solution area include:

- SDN underlay controller
- SDN overlay controller
- Service orchestration
- OSS, EMS

The Juniper product lines that support this solution area include:

- Contrail Service Orchestration
- Contrail Cloud Platform, Contrail Networking
- NorthStar WAN SDN Network Controller
- Junos OS – programmable, disaggregated
- Junos Space – Connectivity Services Director, Network Director, Security Director, Security Insight
- proNX Service Manager – Optical Transport Manager

Juniper services available for this solution area include:

- Contrail configuration and implementation
- NorthStar controller adoption assessment

Use Cases

Juniper's Mobile Cloud Architecture supports the key use cases that are part of the mobile industry today.

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Figure 11: Mobile Cloud Architecture Use Cases

As shown in Figure 11, some of these use cases include:

- Multi-access Edge Computing (MEC): support for both wireline and wireless edge computing environments
- Distributed RAN: current predominant backhaul model
- Centralized RAN: emerging RAN model, centralizing the broadband base units (BBUs)
- Virtual RAN: virtualization of the centralized RAN model, moving some of the BBU functions onto x86 processors
- SDN and automation

Partners

Juniper complements its Mobile Cloud Architecture solutions by working with many best-of-breed partners. Figure 12 lists some of these partners, along with further detail on the capabilities they bring to a joint solution with Juniper.

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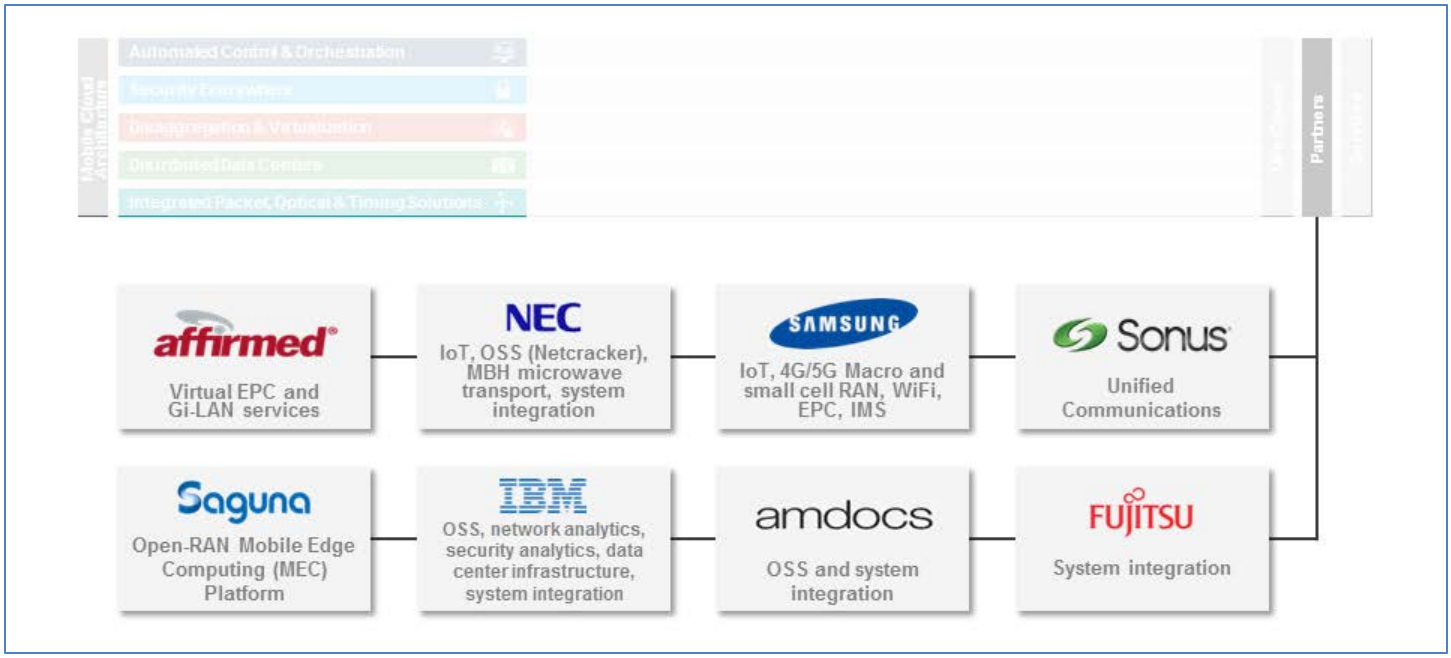

Figure 12: Mobile Cloud Architecture Partners

Two current leading partnerships include Affirmed Networks, with their solutions for virtual EPC and Gi-LAN services, and Saguna, with their Open-RAN MEC platform.

Services

With the major transformations mobile networks are undergoing, vendors' services organizations will play a key role in helping service providers evolve their networks as seamlessly as possible towards a distributed telco cloud-type architecture. Service providers will need to team up with vendors they trust to help find their way through the migration challenges ahead.

Juniper Networks offers a full portfolio of services, as shown in Figure 13, from the planning stage through to the build and operate phases, as well as education services.

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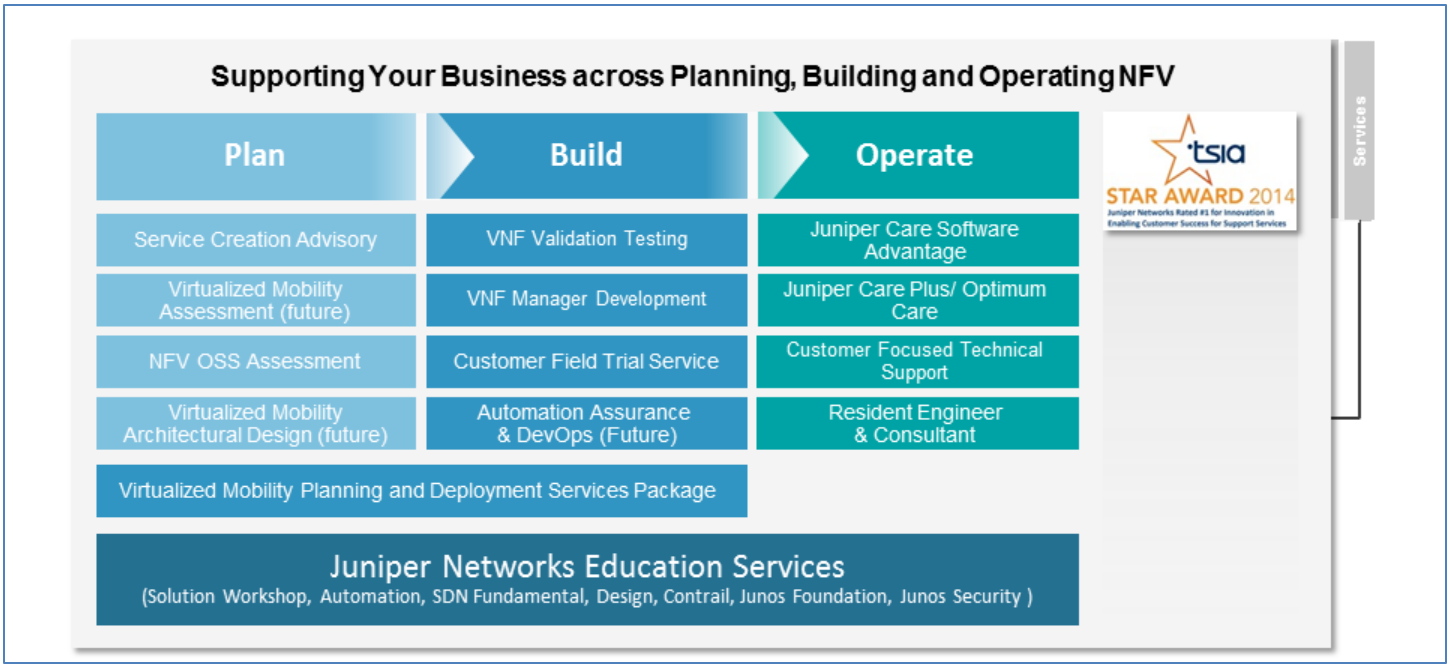

Figure 13: Services

Juniper aims to collaborate closely with service providers to help them successfully navigate this transformation.

For More Information

For additional information about the Juniper Networks Mobile Cloud Architecture, including further detail on the five solution areas identified in this white paper, see Network Design and Architecture Center: Mobile Cloud.

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