Role of the Network in Creating a Path to the Cloud

Support government migration to the cloud with a tailored technology roadmap leveraging MetaFabric Architecture

Table of Contents

List of Figures

Executive Summary

Three megatrends—cloud computing, mobility, and data analytics—are fundamentally transforming government information technology. Modern IT needs to be agile, efficient, and cost-effective, and data centers need to be dynamic enough to meet new and legacy application requirements. When the mission demands it, applications are created, deployed, scaled up and down, moved, retired, and modified at an unprecedented pace.

Most federal agencies, however, still rely on legacy networks that traditionally have presented a number of obstacles to delivering on the vision for modernized, agile systems. Often installed data centers and the networks that support them are rigid and complex, difficult to manage and troubleshoot, not well integrated with the rest of the infrastructure, and do not have the ability to support new applications.

These real-world circumstances inspired the development of Juniper Networks® MetaFabric™ architecture, designed as a flexible pathway to the future data center—in the cloud, on-premise, or both—that enables agencies to move ahead with existing systems complemented by a means to create more modern IT environments for future mission and computing requirements.

Read this white paper to learn how federal agencies can create a tailored technology roadmap to support their eventual migration to the cloud, as well as the benefits of modernizing IT infrastructure to ease that transition. Government organizations can begin today by consolidating applications, simplifying IT operations, driving expanded automation, and gaining greater management control of networks to ensure more agile and trusted computing environments in the future.

Introduction—Designing a Path to the Cloud

There is a natural migration path to the cloud for most organizations. It usually begins with data center consolidation and server virtualization of legacy computing assets. The next step focuses on optimization of the virtual data center, to provide an architecture characterized by greater agility and network availability. The third step to self-provisioned cloud strategies—public, private, and hybrid models—requires orchestration within and among the hosted computing assets (see Figure 1.)

Traditionally, a robust physical data center architecture was considered foundational to an agency enterprise IT infrastructure. Today, there is pressure to "cloudify" everything where possible, and the definition of what cloud actually means remains confusing, at best. In parallel, once a hosted computing environment has been determined to be the desired approach for selected applications and functions, many have voiced concerns about how to "help the network" move to the cloud.

Given the complexity of networks and the expanding threat landscape, IT professionals must move beyond traditional "troubleshooting" of their dated infrastructures that cannot offer the tools to visualize and respond to network activity in near real time.

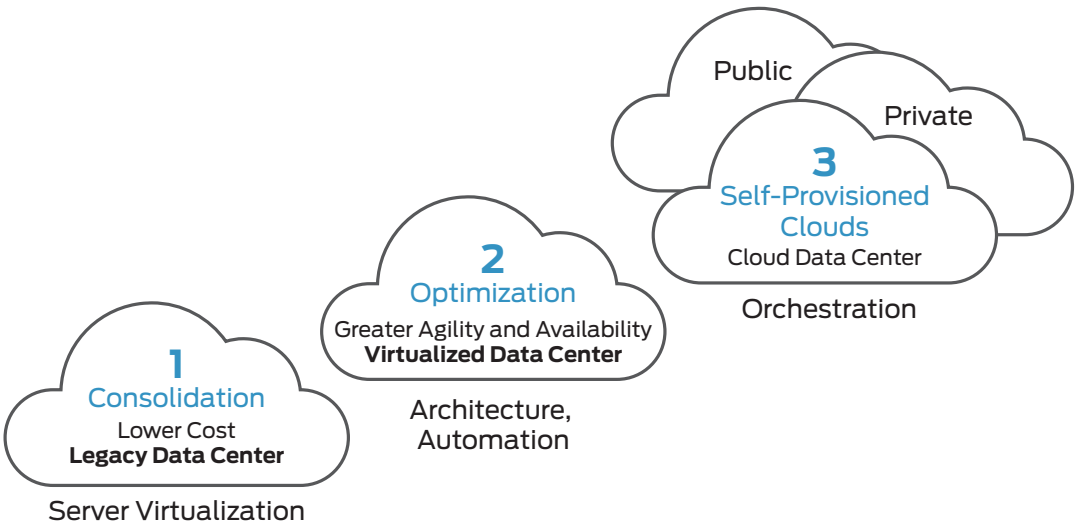

Figure 1: Many organizations follow this "natural migration path" of sequential steps to incorporate enterprise cloud computing with their existing IT infrastructure.

As an illustration of the agility delivered by using network orchestration, consider the time to provision. Traditionally, the norm for provisioning a new server could be up to two months, with two weeks required to provision the related networking and storage. But with the advent of server virtualization, that server provisioning time can be reduced to minutes or less. Now two weeks to provision networking and storage is a significant barrier.

To better align network provisioning time with the operational benefits of server virtualization, network orchestration is needed to enable agile, rapid provisioning. This is where software-defined networking (SDN) comes in.

Introducing MetaFabric Architecture—the Network Is the Foundation of Data Center and Cloud

At the heart of the data center and cloud architectures is the network. It provides application service delivery for connectivity, availability, and performance. The network enables agility with application-agnostic capabilities and the ability to rapidly provision new services. And the network can be the means to lowering costs by optimizing investments in installed architecture and reducing recurring operating expenses (see Figure 2).

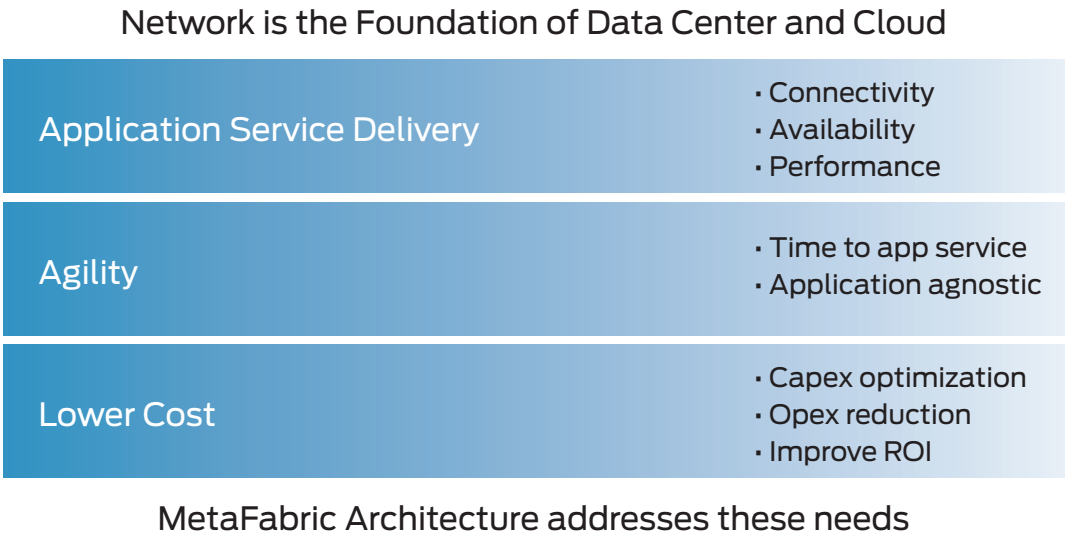

Figure 2: The network drives agency data centers and cloud architectures with connectivity, flexibility, and cost optimization to meet evolving mission demands.

Juniper's MetaFabric architecture is designed to address three universal and fundamental concerns: application service delivery, agility, and lower cost. Comprehensive SDN environments are supported by the MetaFabric architecture vision and by companion technologies, such as Juniper Networks Contrail Networking and the NorthStar Controller, to enable effective SDN and operations.

In essence, by applying a more intelligent network architecture like MetaFabric, the network is smarter and more efficient.

MetaFabric Architecture—Ideal for Building a Coherent Network Within and Between Data Centers

MetaFabric architecture is not a single product or technology—rather, it is a design to create repeatable models across multiple sources, including on-premise, cloud-based, and virtual data centers (see Figure 3).

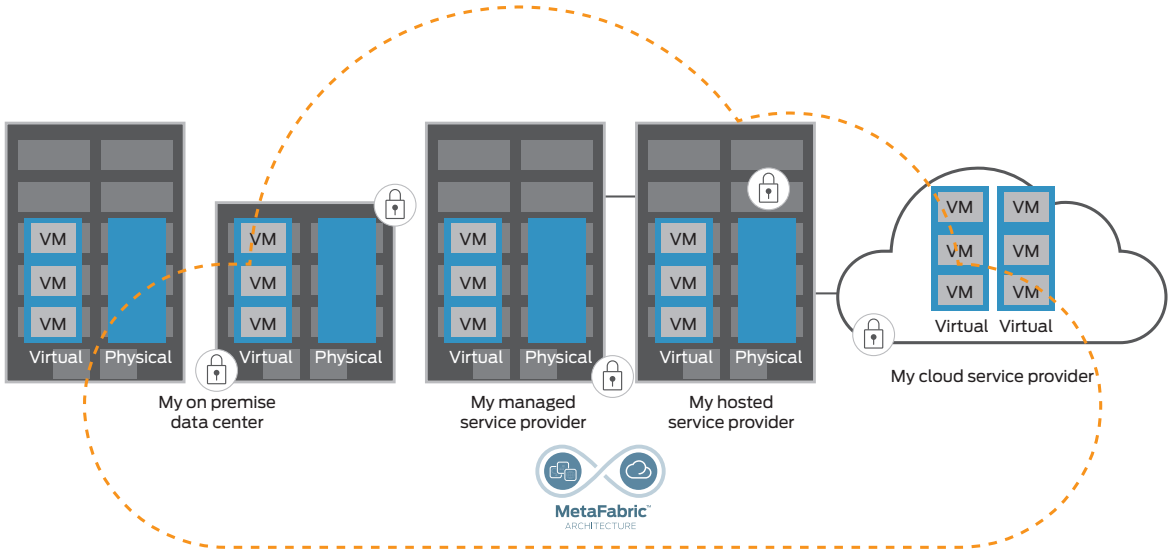

Figure 3: MetaFabric architecture encompasses the entire physical and virtual domain, regardless of data center location and host provider.

MetaFabric architecture provides a complete data center solution that includes a combination of powerful switching, routing, and security platforms leveraging feature-rich silicon, programmable systems, adaptable software, orchestration, Software-Defined Secure Networking (SDSN), and open APIs that enable integration with the technology ecosystem. MetaFabric architecture is a design for the future that simplifies the network, increases security, and enhances automation while reducing operational costs. It is based on three guiding principles (see Figure 4):

- **A simplified approach** across the physical infrastructure, virtual infrastructure, and network and security operations, reducing operating expenses and making the data center network and security easy to deploy, operate, integrate, and scale.
- **Open standards**, integrating with new and legacy applications in any heterogeneous data center environment and eliminating current and future vendor lock-in.
- **Smart technology**, using end-to-end visualization, correlation, analytics, and automation to give organizations insights that help make increasingly data-driven networking decisions.

Figure 4: MetaFabric architecture is not a single product or technology; it is a design that enables IT professionals to create repeatable models across multiple sources, including on-premise, cloud-based, and virtual data centers.

To leverage the power of MetaFabric architecture, three progressive steps are recommended:

1) Simplify the network

2) Secure the network

3) Automate operations with network orchestration (including automation, analytics, and network virtualization)

Simplifying the network requires reducing the network components from a multilayered tree structure to a spine-and-leaf structure that provides more consistent application performance and agility while being easier to manage and lowering cost (see Figure 5).

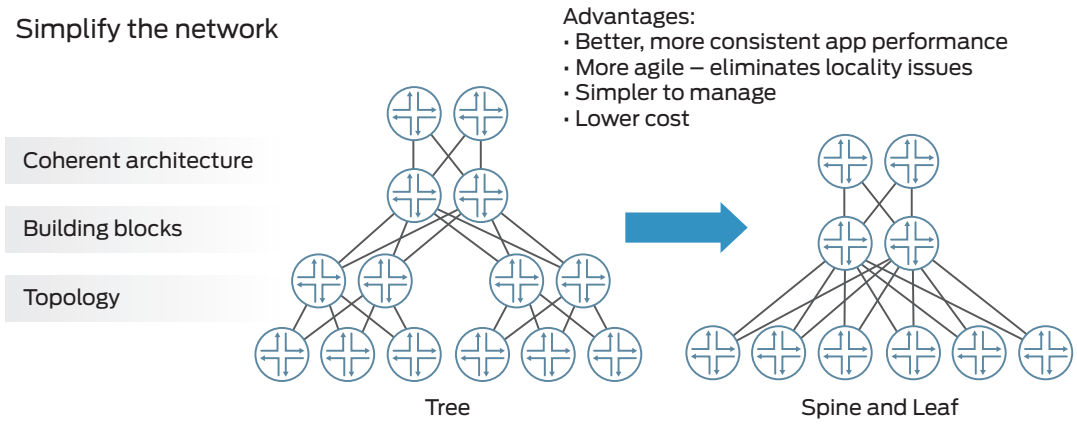

Figure 5: A logical first step towards cloud migration is network simplification to make the infrastructure easier to deploy, operate, and secure.

Securing the network for cloud environments requires a new model that addresses the threat landscape beyond the edge. In response, MetaFabric architecture provides for micro-perimeters, with multiple security policy enforcement points throughout the network, automated policy promulgation, and the incorporation of threat intelligence from multiple sources (see Figure 6).

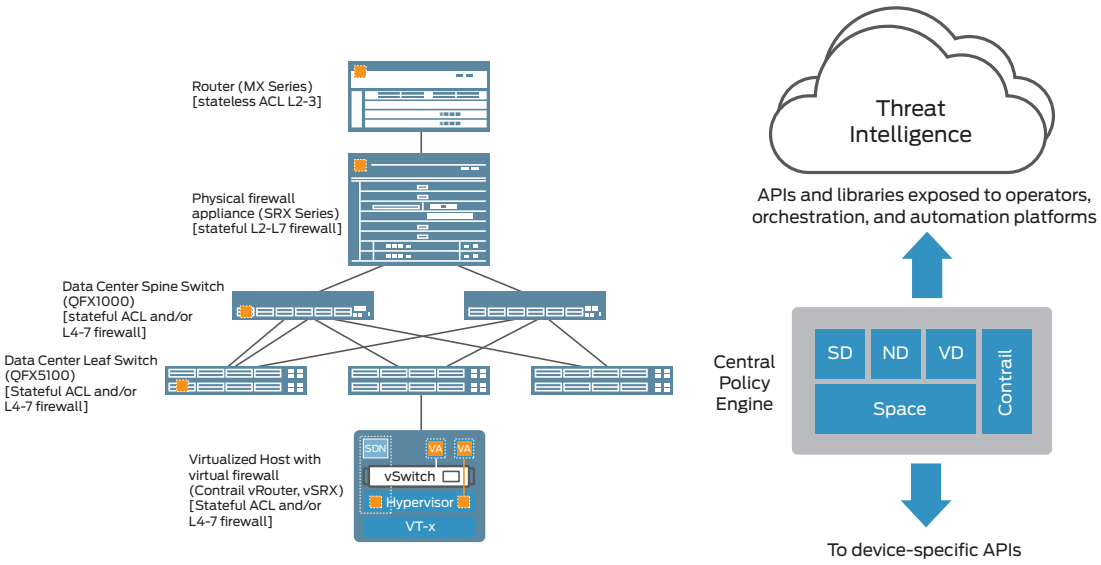

Figure 6: With the adoption of a new model for network security, agencies can improve their enterprise security postures and enforce dynamic security policy—with a focus on "Zero Trust Security," as it is no longer enough to defend the network perimeter.

Automating the network enables greater cost efficiency by leveraging more skilled human interaction only when and where needed. It facilitates network virtualization, which permits special use networks to be launched and disestablished at the push of a button; enables provisioning of new servers and installing network-wide applications in minutes rather than days or weeks; and reduces the potential errors from and time required for manual operations (see Figure 7).

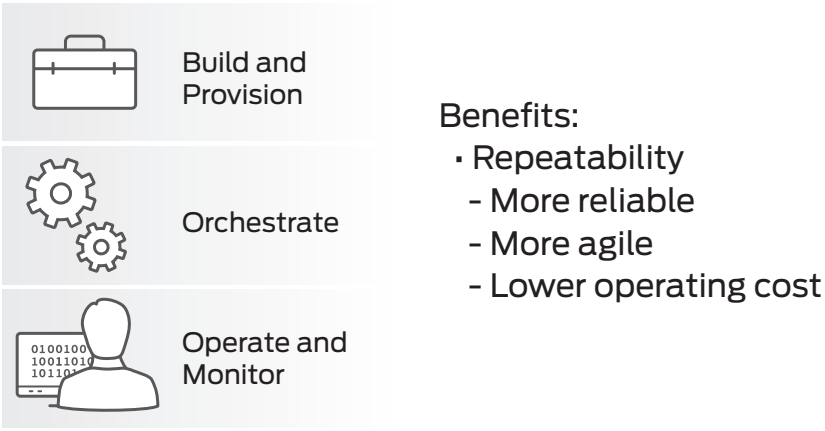

Figure 7: By automating many routine, repeatable, and rules-driven network management and maintenance operations, skilled IT staff can focus on planning, design, and new applications deployment.

Realizing the Benefits of MetaFabric Architecture

For organizations addressing cloud computing, mobility, and data analytics as opportunities to accelerate mission operations and responsiveness, MetaFabric architecture is the ideal strategy for achieving improved network agility and performance at reduced operational costs.

There are no limits to the size or type of data center that the MetaFabric architecture can enable. With the continued adoption of switching fabrics, automation, orchestration security technologies, and SDSN, the data center will continue to be driven by applications and the need for greater agility. MetaFabric architecture is flexible enough to meet those needs.

Conclusion

Juniper Networks helps its customers along their path to the cloud by delivering a simple, open, and smart foundation for aligning the network to business objectives now, while maintaining flexibility for the future. Today, that might mean delivering a better mobile user experience, or solving a data analytics problem, or creating flexible and elastic services within the cloud—making MetaFabric architecture preferred for the future. Whatever your agency requirements, Juniper offers the experience and latest technologies to help your organization design a trusted, reliable, and cost-effective cloud migration path.

Resources/Glossary:

For a more detailed discussion, see the white paper available for download: Juniper Networks MetaFabric Architecture: Enabling a Simple, Open, and Smart Data Center.

Future-proof for the cloud era with an open software-defined networking (SDN) solution that provides high performance, elasticity, and security.

Juniper's Software-Defined Secure Network (SDSN) provides end-to-end network visibility that secures the entire network, physical and virtual, and leverages cloud economics to find and stop threats faster.

Cloud networking and service orchestration is powered by open technology with Contrail Networking. From network virtualization to integrated cloud management, Contrail Networking delivers freedom of choice, intelligent automation, and always-on reliability for cloud, software-defined WAN (SD-WAN), and Network Functions Virtualization (NFV) environments.

Contrail Cloud Platform is a foundational element of Juniper's open cloud networking and NFV solutions. It combines the automation capabilities of Contrail Networking with Juniper's OpenStack distribution, providing a turnkey cloud orchestration platform for creating, scaling, and seamlessly joining open, intelligent, and reliable OpenStack clouds through intelligent and secure networks.

NorthStar Controller is a powerful and flexible traffic-engineering solution that enables granular visibility and control of IP/MPLS flows in large service provider and enterprise networks.

About Juniper Networks

Juniper Networks challenges the status quo with products, solutions and services that transform the economics of networking. Our team co-innovates with customers and partners to deliver automated, scalable and secure networks with agility, performance and value. Additional information can be found at Juniper Networks or connect with Juniper on Twitter and Facebook.

Corporate and Sales Headquarters
Juniper Networks, Inc.
1133 Innovation Way
Sunnyvale, CA 94089 USA
Phone: 888.JUNIPER (888.586.4737)
or +1.408.745.2000
Fax: +1.408.745.2100
www.juniper.net

APAC and EMEA Headquarters
Juniper Networks International B.V.
Boeing Avenue 240
1119 PZ Schiphol-Rijk
Amsterdam, The Netherlands
Phone: +31.0.207.125.700
Fax: +31.0.207.125.701

2000644-001-EN Aug 2016