Cloud-Grade Networking

The Principles, Requirements, and Philosophies Behind the Next Era of Networking

Introduction

Carrier-grade networking brought reach and reliability to the connected world. Enterprise-grade networking made those networks consumable for businesses. As the world continues to evolve, the next major era in IT will be defined by the cloud in all its forms—from large and centralized to small and distributed.

Cloud-Grade Networking builds on carrier-grade reach and reliability and enterprise-grade control and usability, bringing cloud-level agility and operational scale to networks everywhere. Cloud-Grade Networking essentially adds a new set of principles and capabilities to what the industry already knows, making networks less capital-intensive, more automated, and ultimately better suited for innovation, both on and within the network.

In many ways, Cloud-Grade Networking is an acknowledgement that the way networks are currently designed, built, and operated is changing. While these principles might have originated with the major cloud-scale properties, they are now transforming networks of all shapes and sizes, across all industry verticals.

Foundational Principles

As the IT industry continues its push towards cloud, there are certain foundational principles that guide adoption, regardless of the technology or vendor in question. These central tenets include:

- **Function over form:** While it's tempting to pursue the latest technology, the basic litmus test for all things new is simple: does it do what it is intended to do? Ultimately, what the new thing does is more important than what it is or how it is built.
- **Agility is everything:** For the past decade, most networking discussions have focused on lowering costs. While cost is important, agility is the new IT currency. If infrastructure is not actively contributing to speeding up the business, then it is falling short.
- **Security is pervasive:** Threats are everywhere. Every device, every interface, every user represents a potential attack surface, and the notion that the barbarians can be held at the gate is outdated. Security in the cloud era must be pervasive, with everything contributing to threat identification and policy enforcement.

- **Open is better than closed:** All things being equal, it is better that a solution be open rather than closed. While "open" can mean many things—from open standards to open source to open access—the ultimate goal is that solutions be composed of generally interchangeable components so that customers maintain freedom of choice.
- **About both networks and networking:** The networking industry is maniacally focused on building better networks. As technologies mature, however, this focus must expand beyond just this objective. The practice of networking—everything from designing to deploying to managing—also needs to be better.

These principles extend well beyond any individual technology or design philosophy. They guide transitions of all types, and they underpin networking's next major evolutionary turn.

What Is Cloud-Grade Networking?

To define Cloud-Grade Networking, it is critical to understand:

- Where it runs
- How it is managed
- How it is secured
- How services are built in and on the network

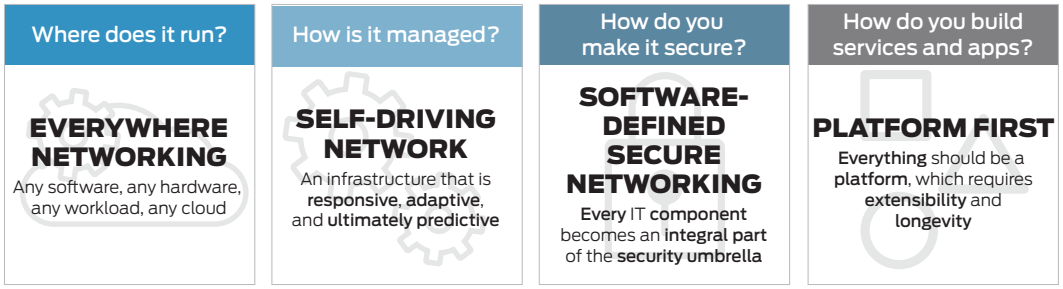

Figure 1: What is Cloud-Grade Networking?

Where It Runs: Everywhere Networking

Cloud-Grade Networks must be able to run anywhere—on any software, on any hardware, in any cloud. Juniper calls this requirement Everywhere Networking, and it refers specifically to the disaggregation of the networking technology stack so that applications can run in any cloud, cloud workloads can be run on any device, and software is not locked to hardware.

By disaggregating the network stack into discrete layers connected via open interfaces, operators can fundamentally alter the economics of the network by leveraging common building blocks and increasing competition within the stack.

Of course, anything that is disaggregated must eventually be integrated, and companies must have the freedom to choose between assembling individual components themselves or purchasing a set of disaggregated elements as an integrated solution. Cloud-Grade Networks, built on the Everywhere Networking foundation, support either path, allowing users to choose the solution that best serves their business.

How It Is Managed: The Self-Driving Network

The Self-Driving Network™ is the eventual result of combining telemetry, workflow automation, DevOps, and machine learning to create an infrastructure that is responsive, adaptive, and ultimately predictive. The journey to a self-driving future starts with today's human-driven environments and expands to include more event-driven operations, and then layering in machine learning algorithms en route to a full self-driving experience.

Networking is complex, and many networks are brittle. Heavy-handed change processes are the only means of defense for many companies. The future, though, demands a pliable network that can accommodate the evolving needs of users and applications. By integrating and automating—not just within the network but across the whole of IT—networks can move from immovable to adaptable, allowing network operations teams to spend less time fighting with the CLI and more time focused on business-driving and revenue-generating activities.

How It Is Secured: Software-Defined Secure Networking

Software-Defined Secure Networking (SDSN), a concept developed by Juniper Networks, is the application of software to drive pervasive detection and enforcement, making every IT component an integral part of the security umbrella. Using the SDSN approach, security teams can maintain centralized policy and control while surfacing threat intelligence across the whole of the infrastructure so that it can be analyzed in real time and enforced dynamically.

The days of simply securing the perimeter are over. Threats today are everywhere—both inside and outside the perimeter—shifting the focus of security from preventing attacks to detecting and quickly isolating them. This requires information to be centralized but enforcement distributed. SDSN gathers and analyzes relevant data from any source, then enacts enforcement at any point in the network. SDSN is about making every resource in the network an enforcement point for securing workloads.

How Services Are Built: Platform First

The Platform First concept acknowledges that the network is never the end goal. Companies—whether service providers, cloud providers, or enterprises—are deploying more than just a network. In fact, the network is merely an enabler for network services and applications. Every element within that network must ultimately be a platform: hardware is a platform for software; software is a platform for network functions; the network is a platform for services; and the cloud is a platform for applications.

The very nature of platforms is that they need to be designed explicitly for extensibility and longevity. A platform without anything built on top is not useful, and a platform that exists for only a moment is not practical. As a foundational element, platforms must be easily built upon, and they must be enduring. Building a corporate network demands that the underlying network be a solid platform.

Conclusion: Migrating to Cloud-Grade Networking

The migration from enterprise and carrier-grade networks to Cloud-Grade Networking involves not just products, but also people, processes, and tools. It's as much about first principles for cloud design as it is about the specific technologies that underpin the cloud. And to a large extent, those tools and best practices in building and maintaining Cloud-Grade Networks are immediately applicable to environments of varying forms and size.

The benefits of the cloud era—ushered in by companies such as Amazon and Google—will reshape an entire industry. Juniper Networks is committed to providing the solutions and tools—and also the services, support, and consultative assistance—that allow companies of all sizes to select the best that Cloud-Grade Networking has to offer.

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.

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