NETWORKS THAT KNOW SIMPLICITY

Your ideas. Connected.

Copyright © March 2015, Juniper Networks, Inc.
Preface

The exponential growth of cloud continues, from the adoption of public and private cloud to the mass consumerization of IT and the emergence of the Internet of Things (IoT). The rapid pace of this change is posing a challenge for your business, as increasing volumes of traffic place greater demands on network infrastructure.

Yet decisions made today about the network must be sufficiently future-proofed to ensure your organization benefits from the evolving cloud eco-system. This eBook for business decision-makers will help you understand how network construction and switch choices can deliver both immediate and future strategic and commercial benefits.
Section 1

KNOW THE LAY OF THE LAND


Realizing the full potential of the cloud is both an ongoing challenge and an opportunity for enterprises and service providers operating data centers and public or private clouds. While the huge volumes of workloads currently being trafficked across networks have not appeared overnight, the growth has certainly been off the scale. This has placed high expectations on the network – expectations that are often met with knee-jerk solutions and building on the fly. Tied in to proprietary architecture yet needing to increase network capacity quickly, organizations are faced with either costly and time-consuming rip and replace or continuing to invest in quick-fix, closed and under-engineered add-ons. What is really needed is investment in network infrastructure now, that maximizes value over time. This is where open architecture can deliver significant benefits and needs to be a key consideration when making any network investment decision.

As the backbone of a successful cloud or data center strategy, how the network is constructed really matters. Only by understanding what is used to build it, can a network be developed that meets the demands of today while providing a foundation for building well into the future. It is about flexibility and a future-proof design, creating a network that can meet the high growth demands of a rapidly evolving industry. By giving the network the appropriate level of attention, and building in openness, responsiveness and scalability in a cost-effective way, long-term investment protection can be a reality. It is about having the right building blocks for your business to future-proof your network and avoid expensive rip and replace.

Networks are the foundation of a data center, and switches are the foundation of a network. Today more than ever, various switching options are available to suit differing business requirements. Understanding how these impact your network is important, as making the right choice now will impact operating and capital expenses in the future. For example, in the core or aggregation layer of the network, where high density and high performance are absolutely critical, switches leveraging custom silicon have significant performance advantages over switches built on a merchant chip design. Similarly, specifying switch functionality to cope with present and future workloads, and the flexibility needed to grow from today’s 10GbE and 40GbE interfaces to tomorrow’s 100GbE and even 400GbE, ensures a multi-generational life span and therefore investment protection.

As more enterprises and consumers place an increasing amount of data and applications in private or public data centers and clouds, the importance of data centers will only continue to grow. These demands make it critical that the data center network of the future has open, flexible architecture so you can increase capacity – without increasing complexity.
Section 2

KNOW YOUR CHALLENGES

“The network is critical both within the data center and as public cloud adoption increases, requiring more in-depth monitoring of the network performance.”


Cloud and data center environments are evolving. Successfully enhancing network performance is about balancing the need to build an agile architecture based on open standards within the context of existing legacy systems. This is a challenging equation.

The ability to be forward-looking is a key driver. Short-term thinking and knee-jerk reactions to meet rapid growth in the “now”, result in legacy multi-tier network designs not optimized for future growth. This in turn leads to bolt-on solutions and overly complex network design as performance-compromising layers are added. Building in scalability as a prerequisite mitigates the impact of this piecemeal approach and protects future growth.

Vendor lock-in also manifests itself in switching specifications where businesses are faced with the high cost of tightly integrated and interdependent switches and operating systems. These proprietary architectures may no longer be able to keep up with demand but vendor lock-in can be a powerful force to overcome. It is an inflexible structure that adds costs, complicates the network architecture and increases the difficulty of keeping up with business demands. As multiple components are introduced, performance is compromised, latency increases, and deployment and configuration operations slow.

Commercial performance is similarly compromised. Short-term thinking creates a continuous cycle of spending and outlay, with only immediate issues resolved through a more-of-the-same attitude. This reactive approach is expensive, as it inevitably means further disruptive upgrades will be required to meet future business growth. Open, flexible network architectures build in scalability to ensure long-term investment protection and maximum value over time.

Open, flexible network architectures build in scalability.
Section 3
KNOW YOUR OPPORTUNITIES

“The data center market is poised for another transformation...large cloud service providers (are) looking to migrate from 10GE switching and server connectivity to 100GE switching and 25GE server connectivity.” Infonetics Research, now part of IHS Inc. (NYSE: IHS).

Cliff Grossner, Ph.D, directing analyst for data center, cloud and SDN at Infonetics Research, January 2015.

Not all networks and not all switches are made equal. Having the right switch design and the right network architecture in the right situation is essential to construct a network that is right for your business. From traditional switches to “white box” solutions to purpose-built high performance core switches, there are more options available than ever before. This makes choosing the most appropriate switch for a given application challenging. By understanding where to save costs with a white box switch and where to guarantee the performance that’s only possible with purpose-built high-end systems, business needs are cost-effectively met.

THE RIGHT NETWORK FOR THE RIGHT JOB

The data center network – and the switches that support it – are all about maximizing the balance between performance and efficiency for your business. Network efficiency for a hyperscale, multi-site data center differs from that of a mid-sized or even a large enterprise. The critical step is determining individual business needs.

High-performance data center networks need high-performance switches. Increasingly this means interface speeds of at least 40GbE and, more frequently, 100GbE – at high densities – at the spine or core layer where traffic and application demands are highest. With the continuing growth in traffic volumes and 100GbE switch capability now beginning to ramp, data centers are turning to this increased capacity to address both current and future needs. To achieve the levels of performance required for the backbone of the network, how the switches are built and architected is also crucial: there is a big difference between the performance of custom-built switches leveraging purpose built ASICs and merchant silicon.

Custom-built silicon switches deliver additional value in terms of improved performance, reliability, durability and capacity – and therefore deliver a longer life-cycle over many years. In scenarios where high latency will have a significant detrimental impact – such as financial services transactions – custom-built silicon also has additional significant advantages, eliminating the compromises between logical scale and physical scale that come with lesser designs.

But it is not a case of either/or. Custom-built silicon, merchant silicon and white box switches are complementary. Using custom-built silicon with 40GbE or even 100GbE capacity as a multi-layer spine switch for a large network is a sound investment. At the access layer, where performance demands are less, having traditional switches based on merchant silicon or white boxes makes sense both commercially and operationally. In very large data centers with in-house installation and support capabilities, white box switches can be used in a high volume / low price / high product turnover function at the leaf layer where performance quality is less of a priority. Likewise for an enterprise with a smaller-scale core, using a small or medium-density traditional 10GbE or 40GbE merchant switch is appropriate for the size of the network.

High performance DC networks need high performance switches.
INVESTMENT PROTECTION
To be truly future-proof, switching solutions should deliver value over time. By building in scalability now, you can be free from worry about whether the network can keep pace. The norm for interface speeds in the core of the data center network is rapidly moving from 10GbE to 40GbE and heading towards 100GbE, with 400GbE on the not-so-distant horizon. As global network connections enter the tens of billions, the ability to scale up from dozens to thousands of ports with existing infrastructure provides long-term value for the money.

Network topology is also critical. A simple, coherent network architecture is a key factor in successful data center network expansion. Not only do they ensure a simple, fast data path now, but network simplicity and ease of management reduce configuration errors and generally make the network more agile and flexible. Deploying and delivering new applications and services simply and cheaply within and across multiple data center sites and clouds becomes straightforward. And with intercloud and IoT expected to drive not only North-South data center traffic to new levels but also to impact East-West traffic too, scalability becomes a must-have.

Choosing an open switch able to support multiple fabric architectures locks-in flexibility for future growth while removing vendor lock-in. Clos, Spine or Leaf, L2/L3, or a single control plane – an open switch can support multiple fabric architectures within multiple deployment scenarios. This is investment protection with genuine business benefits.

BETTER PERFORMANCE
You need a switch that meets today’s network needs but that can also grow with your business. There are additional performance criteria that need to be taken into account when deciding on a switch. Look for ease of configuration and low maintenance – if it’s a high-quality switch; disruptive upgrades should be a thing of the past. Expect management simplicity too – an open, single building block architecture allows a single dashboard view of the network, making it easy to manage centrally and also providing more robust security.

Improved data center and cloud network analytics also becomes possible through switches that are built with the highest levels of performance in mind. Smart network analytics can identify network hotspots, monitor microburst and latency details to eliminate congestion and maximize network reliability. In larger data center networks, the deep buffer sizes of switches leveraging custom-built silicon have the added advantage of alleviating application performance issues in times of congestion – a challenge for some legacy switches.

Consider port density too, as not all 100GbE switches will deliver the same scalability. Increasing switch port density improves network simplicity by allowing you to do “more with less”, converging multiple interfaces or fibers on a single high-speed connection.
Section 4

KNOW YOUR CHECKLIST

To get maximum value from your data center and cloud network switches, consider the following:

- Right tool for the right job: Is the switch for the core or access layer? For a large data center network or an enterprise? This will determine whether a custom-built silicon switch, traditional merchant or white box solution is required.

- Open: Does the switch lock you into a particular vendor or operating system? The answer should be no. Look for open switches that support multiple fabric architectures and don’t add layers to the network.

- Scalable: Does the switch meet tomorrow’s as well as today’s needs? Find one with the density needed to grow with your business and deliver improved ROI.

- Performance: Lower latency and lower jitter means more predictable delivery. Deep buffers remove traffic spikes. Quality is critical. Demand it.

- Analytics capability: A single dashboard view of the network enhances its efficiency. Identify hotspots and improve security through specific, real-time network analytics capabilities.