Executive Summary

IT organizations are looking to private clouds to improve business agility and simplify operations. Many are introducing converged infrastructure and hyperconverged infrastructure solutions to support cloud initiatives and agile development practices. But legacy data center networks often stand in the way.

Private clouds require a new multipurpose data center network, designed from the ground up to support diverse applications and workloads without sacrificing performance or service quality. Fully programmable and highly adaptable, the next-generation network easily integrates with service orchestration tools and DevOps systems to enable elastic services and self-serve IT. And it supports seamless workload mobility within and across data centers to fully exploit economies of scale and ensure high availability for business-critical applications.

Intended for private cloud planners, architects and implementers, this white paper explains how next-generation multipurpose networks help bring public cloud agility, elasticity and cost savings to the private cloud.

Introduction: Private Clouds Improve Business Agility and Economics

Businesses are turning to cloud-based services to accelerate the pace of innovation and avoid capital equipment expense and complexity. Many are initially drawn to public cloud offerings like Amazon Web Services. With low entry-level fees, public clouds like AWS may appear quite attractive at first blush. But upon closer examination the ad hoc monthly charges — data request fees, data transfer fees, performance acceleration fees, support fees — can quickly add up.

Most midsize businesses and larger enterprises can save money over the long run by implementing a private cloud. And when considerations like system uptime, security and regulatory compliance are factored in, the advantages of the private cloud option become even more compelling.
Private clouds have the potential to deliver the service agility and economics of a public cloud, while providing the enterprise-class security, availability and service quality business-critical applications demand. But to win over line-of-business managers and application developers, private cloud services must be as convenient and easy to consume as public cloud services.

Building a private cloud that offers internal customers the simplicity and cost models of a public cloud is not a simple endeavor. Conventional enterprise compute, storage and networking solutions weren’t designed to support on-demand applications and services. Enterprise IT planners must identify new technology platforms, network and system architectures, and service orchestration tools to support today’s cloud-based services and agile development practices.

Enterprise cloud builder functional requirements and business objectives include:

- Enable self-serve, on-demand IT services throughout the entire application lifecycle: development, build, test and production.
- Automate the configuration and provisioning of all IT infrastructure in concert — compute, storage and networking resources.
- Provide universal resource pools that span geographies to balance performance, enable continuous availability, and fully exploit economies of scale.
- Adjust compute, storage and networking capacity in real-time to satisfy dynamic demands.
- Ensure high performance, reliability and service quality for any application or workload.
- Provide linear, pay-as-you-grow, scalability to tightly align expenses with usage.

Legacy Enterprise Data Centers Can’t Deliver Cloud Economics or Agility

Conventional enterprise data centers aren’t well suited for private clouds. Legacy data centers are typically composed of discrete servers and storage arrays with separate Ethernet LANs for data traffic and storage area networks (SANs) for storage traffic. These siloed architectures are inherently costly to operate (each technology platform consumes power, cooling and rack space) and notoriously complex to manage and automate (each platform supports unique, often low-level, administrative interfaces and APIs).

One of the first steps most IT organizations take when building a private cloud is move storage traffic to IP to eliminate the SAN from the equation. Some organizations simply replace SANs with network-attached storage (NAS). Leveraging a single IP network for data and storage traffic reduces infrastructure cost and complexity, solving at least part of the problem.

Many organizations take consolidation a step further by introducing converged infrastructure solutions (VCE Vblock, HPE ConvergedSystem, Lenovo Converged System, etc.) or newer hyperconverged infrastructure solutions (Nutanix, SimpliVity, Nimboxx, etc.). Converged infrastructure (CI) solutions accelerate time-to-value and simplify operations by bundling discrete server and storage components into pre-integrated technology blocks (sometimes called pods) with common administrative interfaces and APIs. Most CI solutions support NAS for collapsing data and storage traffic onto the same IP network.
Hyperconverged infrastructure (HCI) solutions take convergence to the next level, combining software-defined, virtualized compute and storage resources into compact and scalable x86 building blocks for ultimate simplicity and TCO savings. HCI appliances are interconnected over IP networks, eliminating the need for SANs.

Many CI and HCI solutions integrate with hypervisor management systems like VMware vCenter and service orchestration tools like VMware vRealize Automation to streamline system administration and operations — often for compute and storage functions only.

Converged Infrastructure Requires a Fresh Approach to Networking

IT organizations often introduce CI/HCI solutions to support a specific technology initiative or workload type. Over time, most organizations attempt to move additional applications onto the new infrastructure to reap additional cost savings. But they often run into networking impediments.

Conventional data center networking solutions aren’t well suited for supporting diverse workloads and application types. Traditional data center networks are not highly adaptable or easily programmable. Most legacy switches and routers provide low-level command line interfaces and configuration files that inhibit automation. As a result, data center networks are usually statically configured to support peak traffic demands — an inefficient approach that squanders bandwidth and hampers service agility. And because all workloads are treated equally, a bandwidth-hungry or bursty application can monopolize network capacity, impairing the performance of other applications (the so-called noisy neighbor problem).

In practice, many organizations are forced to implement parallel networks to ensure adequate performance and service quality for all applications and traffic types. Common segmentation strategies include implementing distinct networks based on:

- Traffic type: i.e. storage, data or management traffic (some storage vendors recommend this approach as a standard practice).
- Application: i.e. VDI, Dev/Test, Tier-1 production apps, Big Data.
- Workload characteristics: i.e. bursty, delay-sensitive, low priority.

Adaptable Multipurpose Networks Unleash Cloud Economics and Agility

Deploying and administering multiple networks is inherently expensive and inefficient. Cloud builders can reduce cost and complexity by collapsing all traffic onto a common network, but they must find a way to support different applications and workloads, without sacrificing performance or service quality.

A fully converged multipurpose data center requires a fully converged multipurpose data center network. Not a general purpose network, but a segment-able network that effectively isolates and prioritizes traffic by workload class and type. A software-defined, fully programmable network, designed from the ground up to enable cloud agility, scalability, simplicity and economics.
The next-generation converged network must:

- **Offer cloud scale and resiliency**: provide a universal network fabric that spans data centers; efficiently accommodate north-south and east-west traffic flows to support traditional and next-generation applications; easily move workloads within and across data centers to balance performance and enable business continuity.

- **Support heterogeneous workloads**: dynamically adapt the network fabric to satisfy the unique characteristics of individual workloads in real-time; avoid noisy neighbor issues by isolating workloads and dedicating resources to specific tenants; enable SLA assurances based on latency or bandwidth commitments.

- **Unleash automation**: provide tight integration with service orchestration tools; support self-service IT with consumer-like ease-of-use; instantaneously provision virtual compute, storage and networking resources in concert to enable on-demand IT services.

- **Streamline agile development and test**: provide a flexible framework for creating, building, testing and deploying cloud-based applications; enable developers to easily move applications from development to test to production without involving the corporate networking group.

- **Deliver cloud economics**: employ a scale-out architecture that minimizes upfront investments and enables cost-effective, pay-as-you-grow expansion.

- **Exploit the cloud ecosystem to avoid vendor lock-in**: integrate seamlessly with other cloud applications and building blocks including service orchestration tools, DevOps systems, and infrastructure components.

**Plexxi: Simply a Better Network for Cloud Builders**

**Plexxi Control Software**

**Plexxi Network Switches**

**Plexxi Connect API**

**Application Defined Networking**

Automation, Orchestration Visualization, Management and Control for Cloud deployments

**Converged Network Infrastructure**

Single tier, scale-out networking solution for Cloud deployments

**Open Integration Platform for Cloud deployments**
Plexxi networking solutions bring public cloud simplicity, agility and economics to the private cloud. Plexxi’s next-generation cloud data center networking product portfolio includes:

- **Plexxi Switch** – a family of compact, high performance scale-out switches built for the cloud. A unique product design combines Ethernet switching with programmable optical multiplexing to create a highly resilient, agile and scalable data center network fabric. Deployed as a single tier, Plexxi Switches eliminate cost and complexity, while enabling high bandwidth, low-latency machine-to-machine connectivity within and across data centers.

- **Plexxi Control** – a software-based distributed control plane that reconfigures the network fabric in real-time to satisfy fluctuating workloads. Plexxi Control models workloads and automatically reprograms the network topology to optimize application performance and service quality.

- **Plexxi Connect** – an open framework for tightly integrating Plexxi Control software with external service orchestration solutions, DevOps tools, and policy stores. Plexxi Connect eliminates manually intensive, error-prone configuration and scripting processes, delivering a comprehensive development environment for fully automating the network infrastructure and treating it as a code. A standards-based publish-subscribe message bus makes it easy for external applications to exchange policy, configuration and state data with Plexxi Control. Orchestration systems can provision virtualized compute, storage and networking resources in a holistic manner to accelerate service velocity and enable self-serve IT.

Plexxi offers integration packs for popular converged infrastructure and hyperconverged infrastructure solutions. These pre-validated packs minimize system integration and test efforts, helping cloud builders accelerate time-to-value and reduce implementation expenses.

Cloud builders leverage Plexxi solutions to create an agile, multipurpose network fabric that efficiently supports diverse applications and workloads. The fully converged network extends across the entire cloud footprint — within and between data centers — ensuring high service quality, reliability and performance for traditional enterprise applications and next-generation workloads. Comprehensive development tools and integration packs help IT organizations streamline automation and jumpstart private cloud initiatives. And a scale-out architecture minimizes upfront capital outlays and aligns TCO with usage.
Conclusion: Multipurpose Networks Unlock Private Cloud Potential

IT organizations are implementing converged infrastructure and hyperconverged infrastructure solutions to support private cloud initiatives. CI and HCI platforms contain CAPEX and OPEX by consolidating compute and storage resources, eliminating SANs, and unifying system administration. Legacy data center networks, designed to support conventional siloed IT architectures, aren’t well suited for converged environments. A fully converged multipurpose data center requires a fully converged multipurpose data center network.

The next-generation data center network must:

- Support diverse applications and workloads with SLA assurances.
- Enable workload mobility within and across data centers to balance performance and ensure high availability.
- Support self-service IT with consumer-like ease-of-use for agile development.
- Scale incrementally to enable pay-as-you-grow economics.

Adaptable, multipurpose data center networks unleash public cloud agility, scalability and economics while providing the enterprise-class performance, availability and service quality business-critical applications demand.

For more information on Plexxi products and services, please visit www.plexxi.com.