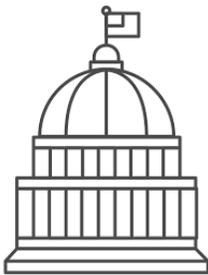


U.S. FEDERAL AGENCY DEPLOYS PLEXXI HCN™ AS DATA CENTER FABRIC

CUSTOMER CASE STUDY



By implementing Plexxi HCN for their data center fabric, this agency realized significant ROI improvements:

- » 30% less cost of acquisition compared to the customer's legacy network.
- » 30% boost in infrastructure resource utilization.
- » 30-40% reduction in operating costs.

A major agency of the U.S. federal government hosts a private, on-premises data center to deliver a diverse suite of applications and IT services to its very large and growing internal customer base. Routinely impacted by fluid budgets and the shifting winds of the government landscape, this agency required an IT infrastructure that was flexible enough to react quickly to change, but was also easily scalable in order to grow in lockstep with the agency's evolving responsibilities and focus.

Streamlining IT operations was a consistent theme in the agency's approach to modernizing their data center, and their overarching imperative was to maximize the efficiency of their IT infrastructure to get the most out of the agency's somewhat restrictive IT budget. The agency simply could not afford to continue deploying IT solutions that hampered agility, inhibited growth, were underutilized, and were costly to operate.

Challenges

The customer had built a large-scale data center infrastructure to support a very broad and expanding set of applications and services. However, they found that this legacy infrastructure simply could not deliver the agility they needed to react to change and efficiently sustain their future growth plans. To make matters worse, the IT organization was falling short on delivering on their internal customer Service Level Agreements (SLA). They were plagued with anemic utilization of their infrastructure assets, poor application performance (mainly because of infrastructure bottlenecks), and capacity issues due to their inability to easily scale. Their infrastructure required the constant churn of physical assets to ensure applications and services had sufficient capacity and resources, where and when they were needed.

As a major step to improve operational agility and boost the utilization of their infrastructure assets, the customer deployed VMware vSphere across their IT infrastructure. With vSphere, they were able to significantly improve utilization of their server resources, but they quickly realized that their existing enterprise network was getting in the way. It imposed a major infrastructure bottleneck that hampered their flexibility to easily add, expand, and move (vMotion) application workloads across their distributed, mixed workload environment. Further, network performance issues in the infrastructure were impacting the performance of their applications, and scaling network resources was disruptive and unpredictable.

Key Network Challenges

Many of the customer's IT challenges centered on their existing enterprise network, which was not designed or optimized to support their scale-out server and storage clusters. These clustered infrastructure and scale-out applications required east/west server-to-server and server-to-storage communication to synchronize cluster members and facilitate information sharing. Their existing network wasn't designed to optimally handle this east/west communication traffic and presented several specific challenges that the customer needed to address.

- » **No Workload Awareness** – The customer's existing network was a static set of physical communication pipes that connected their data center assets, but it had no awareness of the mixed workloads running across their virtualized IT infrastructure. As a result, the customer could not allocate specific network resources according to the needs of any given application. Their existing network's lack of awareness of specific application workload requirements meant that all application workloads were treated the same regardless of priority.
- » **No Workload-Responsive Load Sharing** – The existing network offered a one-size-fits-all performance profile for their network infrastructure to support their diverse mix of applications. This single-network performance profile forced them to take an "equal cost" approach to configuring the network, which essentially treated all workloads (regardless of business criticality) as equal, ensuring the lowest common denominator treatment. The customer needed a more granular workload management approach that could enable them to prioritize certain workloads and allocate network capacity based on the specific needs of the application.
- » **Inflexible Resource Provisioning** – The network was static and required significant manual intervention. Their best practice for guaranteeing workload performance was to deploy separate physical networks to ensure there was no workload contention for network capacity between applications. The customer wanted the ability to pool network resources and provision them to the specific needs of the application, ensuring that the most critical workloads and business relevance received the best access to network fabric resources.
- » **Complex Management** – Highly trained and certified network engineers were needed to manage and maintain the network infrastructure. In addition, the lack of application integration with the network prevented any configuration and management automation based on the network's awareness of the application and its associated workloads.
- » **VMware Separation** – The lack of network integration with vSphere posed several challenges for the customer. First, it forced a "multi-console" management experience that separated visualization of the virtual and physical management domains. This approach precluded the correlation of virtual and physical events in real time, which impacted the customer's ability to react quickly to changes in the environment. Further, this split management of physical and virtual worlds forced the creation of operational silos, with separate teams focused on applications, virtualization, servers/storage, and networking.
- » **Poor Performance** – The customer was very concerned about the poor performance of their applications and the inability of their infrastructure to support their internal customer SLAs. For example, their virtual desktop infrastructure (VDI) application could not support the required number of user desktops or meet their target boot time requirements. To make matters worse, their existing network made it difficult to identify where and when the workload bottlenecks were occurring and to ultimately diagnose the root cause of their performance problems.

In summary, the customer was struggling with their existing enterprise network, which was quickly becoming inadequate to deliver the performance, scale, and automation needed to cost-effectively support the demands of their mixed-workload environment and vast end-user population. The network was a major bottleneck, and something needed to be done.

Business Challenges and Requirements

From a return on investment (ROI) perspective, the customer was obviously not achieving the rates that they needed to maximize use of their IT budget dollars. To modernize and expand their data center, they first needed to reevaluate its design to offer a more streamlined approach that would ultimately lower the cost of building and maintaining their network and their overall IT infrastructure. From an ROI perspective, the customer focused on the following three key areas to maximize use of their budget dollars.

Capital Acquisition Costs

The customer needed to reevaluate their data center design to offer a more efficient approach to building out their physical network. Their current leaf/spine network topology was rigid and difficult to scale, and it required the addition of expensive spine switches to aggregate their top-of-rack switches. Moving forward, they wanted a physical switch topology that enabled them to standardize on a single switch type that offered a linear and predictable cost scale.

The customer's existing network could not scale cost-effectively to meet their anticipated growth demands. This forced them to purchase and deploy additional capacity up front to satisfy anticipated future needs. Anticipating the need for additional leaf/spine switches was challenging, given the rate of change in their environment. Also, the practice of "overprovisioning" the network not only created idle assets but, more important, wasted critical capital that could be used for other parts of their IT infrastructure.

Solution Efficiency

In addition to focusing on the initial network acquisition costs, the customer was very concerned about maximizing the utilization rates for the network solution they would choose. Overprovisioning, wasted network bandwidth, poor network/application performance, and stranded capacity were obvious problems the customer needed to address to optimize network efficiency.

The customer needed a network solution that would allow them to ensure that business-critical workloads (such as production transactional workloads or VDI) could meet their SLAs, while noncritical workloads (such as dev/test activities) were served with available resources, all without dedicating separate networks for each.

Paramount to boosting the efficient use of the customer's networking assets was the ability to incrementally, nondisruptively scale network capacity as required. They needed a "pay-as-you-grow" model that would allow them to bring additional capacity online when and where it was necessary.

The customer needed a converged infrastructure network fabric that would deliver greater infrastructure utilization, better precision to "dial up" capacity to meet specific workload needs, immediate feedback to quickly identify and react to changes in the infrastructure, and the ability to grow their network capacity incrementally over time. The efficiency of the solution was critical; they simply could no longer afford overprovisioned capacity, idle assets, and static, inflexible resources.

Operational Costs

The operational costs associated with the existing IT infrastructure were perhaps most troubling to the customer. Given the inefficiencies of the infrastructure, and the network in particular, these costs continued to explode. The customer could no longer address the shortcomings of their existing infrastructure with operational Band-Aids that did not fundamentally address their core infrastructure design issues.

The customer needed to consolidate operations and break down the functional stovepipes that required costly staffing. By consolidating management of the infrastructure to the vCenter management console, they could eliminate duplicate staffing and avoid relying on specialized/certified networking expertise. In addition, by automating network and infrastructure management operations, they could further reduce staffing requirements and the risk of user error that plagued their existing infrastructure.

The customer's infrastructure network also lacked any automation and required certified administrators to manage and troubleshoot, and ongoing management was a very heavy lift. In addition, they lacked the necessary visibility into network traffic and the necessary tools for troubleshooting. They realized that automation of network configuration and management operations was critical for them to achieve their consolidation and OPEX reduction goals.

Solution - Plexxi HCN for Data Center Fabrics

To meet their business goals and objectives, the customer realized they could no longer rely on their existing data center network, which was rigid, complex, costly, and difficult to manage and scale. They chose Plexxi HCN for Data Center Fabrics as their modern, scalable network fabric solution that could significantly reduce operating complexity and increase the customer's ability to deploy infrastructure resources (compute, storage, and network) dynamically as new projects came on line.

Plexxi HCN Key Attributes

The customer concluded that the Plexxi HCN for Data Center Fabrics solution could address their network challenges head-on, delivering the agility needed to support their mixed workload environment and modern scale-out applications, using a single, centrally controlled network fabric.

- » **Workload Aware** – Plexxi HCN is a network that is defined by software, not statically defined by its cabling. Via Plexxi Connect software and Plexxi's Application Integration packs, Plexxi HCN Control software becomes aware of applications and their specific workload requirements. Plexxi Control uses this workload awareness to change the bandwidth and latency characteristics (topology) of the underlying physical network to automatically implement that bandwidth, latency, or security requirement on the physical network. The customer recognized significant value in the fact that this could all be accomplished without re-cabling or using complex protocols or advanced network traffic engineering skills.
- » **Workload Path Diversity** – "Path diversity" means that the Plexxi network fabric offers many possible paths between any two points. Plexxi Control software manages all the possible paths/routes through the network, not by guessing about packet types, but based on application knowledge gathered from Plexxi Connect and Plexxi's Application Integration packs. This ensures that Plexxi HCN provides the requisite performance, workload isolation, and seamless management integration needed by the application. The key to this approach is the dynamic mesh fabric created with Plexxi Switches, which offers a multitude of direct and indirect paths, giving Plexxi Control many ways to solve a given set of workload needs.
- » **Resource Elasticity** – Unlike traditional leaf/spine networks, Plexxi HCN would provide the customer with a very flexible network resource pool that users can allocate to specific application workloads, either dynamically or explicitly, according to the specific requirements of the application. Plexxi HCN's resource elasticity would enable the customer to maximize the use of their network assets without overbuilding (or upgrading too soon). It could ensure that business-critical workloads have path priority to meet their SLAs, while workloads that are not specifically defined in Plexxi Control are automatically load-balanced efficiently across the remaining fabric resources. This ensures that priority workloads are serviced first and have deterministic performance without requiring the user to manage every specific workload or traffic type.
- » **Management Consolidation** – Plexxi's integration into VMware via Plexxi Connect and the Plexxi VMware Integration pack would enable the customer to manage the Plexxi network directly from the VMware vCenter console. It provides administrators with a single management interface to visualize and manage correlated information between vSphere and the Plexxi HCN network. The customer realized that a single, consolidated interface could simplify the day-to-day operations of the data center and make troubleshooting across the physical and virtual environments easier by allowing the VMware administrator to view everyday operational tasks from a single dashboard. Ultimately, this management consolidation would enable the customer to remove the artificial boundaries between the operational silos that developed around their legacy environment, which required separate teams focused on managing individual components of the infrastructure.

- » **VMware Automation** – Plexxi HCN’s tight integration with VMware vSphere would enable the customer to automate the configuration and management of their virtualized infrastructure. Through integration with vSphere at the API level, Plexxi HCN could provide life cycle automation for vSphere, automatically configuring port profiles, VLAN membership, and LAG settings. This automation would also enable the customer to alter traffic flows in real time, based on specific vSphere events (VM adds, moves, and changes). With Plexxi HCN, configuration is both automated and self-documenting, which eliminates complexity and reduces cost and risk. This was in stark contrast to the customer’s legacy network, in which life cycle management required manual configuration of hundreds of physical devices, impacting agility and introducing change management risk.
- » **Performance Optimization** – Plexxi HCN provides visualization into various workloads running on the network. With a small amount of information about these workloads, Plexxi Control can promote specific traffic to specific or lightly utilized paths, or if needed can allocate private, dedicated paths for highly sensitive or performance-critical workloads (e.g., storage workloads). This would enable the customer to more easily identify workload performance issues and bottlenecks that could impact the overall performance of the infrastructure and the applications that run on it. It would also eliminate the legacy practice of creating separate networks to segregate critical workload traffic. With Plexxi, the customer could deploy a single network fabric and isolate workloads through Plexxi Control software.

The customer realized that many of their issues related to performance, scale, and network path control could never be addressed by their existing data center network. They recognized that refactoring the network in their data center design was fundamental to their long-term success. Based on the capabilities described above, they chose Plexxi HCN as their new, modern network.

Results

The results of the customer’s Plexxi HCN for Data Center Fabrics deployment were clear and measurable in several dimensions. Most important, the Plexxi HCN solution delivered significant returns on the customer’s initial Plexxi HCN investment, and as the customer scales their IT infrastructure, they now have an economical and nondisruptive path for growth.

Some results of the customer’s deployment of the Plexxi solution immediately became apparent. For example, the customer was able to quickly identify the root cause of their VDI application performance and scaling issues, which had been a major cause of their customer SLA misses. With Plexxi HCN, they could visualize individual workloads running across the Plexxi HCN fabric, and they identified that communication traffic across their storage cluster had been contending for network bandwidth with other running applications on their legacy network. With the Plexxi HCN solution, they were able to identify and isolate this clustered-storage workload, allowing it exclusive use of the network bandwidth it needed to guarantee performance.

This was a major breakthrough for the customer in that it shattered the limits they were experiencing with the number of desktops they could support (going from 4,000 to >20,000) and improved desktop boot times by 5X.

Other results, such as operational costs and utilization rates, were realized over time as the customer restructured and fine-tuned their infrastructure. A major benefit that the customer eventually realized was the improved rack density they could achieve via finer-grained control of the network and Plexxi HCN’s ability to eliminate rack boundaries for applications. With Plexxi HCN, the customer could now span applications across multiple racks, improving not only their rack space efficiency but also their agility to support new applications and projects quickly without regard to physical placement of compute, storage, or network resources. The Plexxi HCN for Data Center Fabrics enabled the customer to implement a resource pooling model in which infrastructure resources (server, storage, network) could be dynamically allocated to applications as required.

Plexxi HCN's integration with VMware vSphere essentially changed the game for the customer, ushering in a new approach to managing the network (per-workload) and providing a correlated view of both the virtual and physical infrastructures from a single management pane-of-glass. Integration with vSphere also delivered on the value of management automation based on the network's awareness of the customer's vSphere environment. In essence, Plexxi HCN's integration with the infrastructure's virtualization layer allowed the customer's IT department to break down their legacy operational silos; consolidate management to a single, centralized tool; and eliminate the requirement to manage the network with costly trained and certified personnel. Now an IT generalist can manage their virtual and physical infrastructures, which frees up operational resources to focus on other IT tasks.

These are just a few examples of the specific impacts that refactoring the network and deploying Plexxi HCN had on the customer's IT infrastructure. Looking back at the customer's three principal business and ROI drivers, it is clear that the Plexxi HCN solution delivered outstanding value to the customer.

Capital Acquisition Costs

With Plexxi HCN, the customer was able to acquire and deploy a physical switch topology. Unlike the hierarchical design of their legacy leaf/spine network, that topology offers a flat physical fabric in which all switches are directly connected to one another and no expensive aggregation switches are used. Because a top-of-rack switch aggregation layer is no longer required, the Plexxi HCN solution involves significantly fewer switches, cables, and optical transceivers. The customer was also able to standardize on a single switch model, which provides a more linear and predictable cost model for future planning.

All of this translated to a significant ROI improvement of 30% less cost of acquisition compared to the customer's legacy leaf/spine network.

With Plexxi HCN, the customer can now scale their physical fabric incrementally. As they require more capacity, they can nondisruptively add more TOR switches into the Plexxi HCN flat physical fabric as needed. This eliminates the wasteful practice of overprovisioning and allows them to ultimately reallocate their "overprovisioning dollars" to other parts of the infrastructure.

Solution Efficiency

With Plexxi HCN, the customer realized a major boost in resource utilization rates – not just across the network but across the entire IT infrastructure, including compute and storage. Using Plexxi HCN to manage all of their applications and infrastructure on a per-workload basis, the customer was able to increase the utilization of their compute, storage, and networking assets by eliminating the need to overprovision resources that typically sat idle in their legacy environment.

In addition, because Plexxi's flat fabric eliminates the need for aggregation switches to link TOR switches in the infrastructure, the Plexxi design did not restrict the physical resources associated with a given application to reside in the same rack domain. This enabled the customer to more efficiently populate racks of compute and storage arbitrarily, pool those resources, and provision them out to applications regardless of where (on which rack) the supporting physical resources were located.

The net effect of Plexxi HCN's flat fabric, workload awareness, and arbitrary rack placement is that the customer was able to increase their rack density and, in the case of one application, reduce from 16 to three the number of racks to support the application.

Plexxi HCN's per-workload provisioning of network fabric resources boosted infrastructure utilization rates upwards of 30%.

The Plexxi HCN solution also maximized the use of their network bandwidth, which was dynamically allocated according to the needs of the applications running in the infrastructure. This allows the customer to ensure that all network resources are made available and business-critical workloads are given priority when necessary to meet their customer SLAs, while noncritical workloads, such as Dev/Ops projects, are served with remaining available resources as needed. The customer can also dedicate network bandwidth to specific applications where guaranteed performance is required.

In summary, Plexxi HCN provided the customer with a very flexible and agile network infrastructure that enabled them to get the most out of their IT infrastructure assets. Compared to their legacy infrastructure, their refactored infrastructure with Plexxi HCN delivers greater utilization (requiring less physical equipment, less idle capacity, and fewer upgrades), greater precision ("what you need is what you get"), immediate feedback (correlated visualization of the physical and virtual environments), and the ability to grow their network capacity incrementally over time.

Operational Costs

Plexxi HCN delivered operational cost savings immediately upon the customer's initial deployment and configuration. Integration with VMware vSphere enabled Plexxi HCN to easily discover virtual workloads and automatically configure network attributes – such as port profiles, VLAN membership, and LAG settings – based on information derived from the customer's defined vSphere configurations. As they added nodes or added, modified, or moved VMs, Plexxi HCN automatically adjusted to support these modifications without any manual intervention.

Plexxi HCN's integration with vSphere also enabled the customer to consolidate its operational infrastructure to focus on using vSphere as the total infrastructure management stack that could serve as the central point of management for server, storage, and network provisioning. By also integrating visualization of the Plexxi network, they can see exactly how and where workload traffic is distributed across the network. The customer now has a single, central point of management that provides a consolidated and correlated view of virtual and physical resources.

Plexxi HCN's automation and ease of deployment stand in direct contrast to the customer's legacy infrastructure, which gave the network no awareness of workloads and specific infrastructure participants, and required the manual configuration of physical resources. Because of Plexxi HCN's integration with vSphere, the customer was able to gradually eliminate the operational silos that had formed around their legacy infrastructure. Now their infrastructure can be managed by the IT generalist vCenter manager, and the requirements for specialized, highly trained network gurus have disappeared.

Although operational costs are difficult to quantify, the customer estimates a reduction in costs of between 30% and 40%. The customer anticipates that the operational costs will continue to improve as they bring new workloads online and continue to optimize their infrastructure.

Overall, Plexxi HCN improved operational efficiency on several fronts.

- » Plexxi's flat fabric physical topology requires fewer switches to manage.
- » Automation significantly increased the customer's agility, reduced the need for trained personnel, and significantly reduced the risk of operational errors.
- » The ability to incrementally scale makes it easier to grow network resources as needed without requiring disruptive and error-prone manual reconfiguration of the network.
- » Arbitrary placement of infrastructure resources enabled the customer to easily pool network, server, and storage resources without concern about the physical placement of those resources. This ability to pool and provision resources increased the customer's agility, enabling them to react to change and easily and quickly support new projects and workloads.
- » Plexxi HCN, under software control, provides the fine-grained workload control and workload path isolation that the customer had previously achieved by deploying separate, workload-specific networks. With Plexxi HCN, the customer consolidated their network resources into a single network domain managed through vSphere, which eliminated the requirement to manage multiple, separate networks.

Conclusion

The customer wanted a single, centrally managed infrastructure to meet the diverse needs of its users and applications. They set out to find a software-defined network solution that would allow them to respond rapidly to change and deploy new, differentiated services quickly. They wanted an infrastructure that was easier and less costly to deploy, operate, and maintain than their existing environment, and they needed the ability to identify critical bottlenecks and optimize workload performance, especially for their VDI clients. The Plexxi solution not only met their requirements, but also gave them confidence that they can easily scale and bring future applications and services online as their requirements evolve.