Overview: End-User Computing

End-user computing (EUC) as we know it is undergoing a major transformation. EUC is no longer about the end-point devices, but about flexibility, productivity and the overall experience. Today, end-users demand always available access to applications and data from any device and from any location. And more than ever, IT is tasked with providing technologies that enable ultimate end-user productivity, while also protecting the organization from security risks associated with loss or theft of end-user devices and data.

This white paper describes why a next-generation hyperconverged infrastructure (HCI) with a right architecture and a policy-based approach can provide an ideal infrastructure foundation for EUC technology deployments. This modern approach to building scalable infrastructure accelerates time-to-value, drastically improves performance and user experience, increases virtual desktop density, simplifies deployment and management, and overcomes many of the limitations inherent in traditional infrastructure approaches.

VDI is driving key IT Objectives

Virtual Desktop Infrastructure (VDI) first gained popularity as an effective way to simplify management of large numbers of desktops, making it easier to manage complex process such as patching and upgrading. As it turns out, VDI also provides an excellent platform for addressing the mobility, security, and data protection demands of modern EUC environments. By centralizing and consolidating all the distributed user desktop operating environments into a virtualized datacenter, VDI allows IT to effectively protect critical corporate assets, while also allowing users to access their desktops and applications from anywhere on any device. Finally, VDI simplifies mundane but cumbersome maintenance tasks such as patching and upgrades of operating environments and applications, thus boosting IT staff efficiency.

Critical Factors for VDI Implementations

While VDI can transform how users access their applications and how IT protects and secures critical corporate assets, VDI implementations have been notorious for their challenges around user experience, costs, and scalability. There are three factors that determine the success of your VDI deployment:

- It delivers an uncompromising end-user experience
- It provides a compelling ROI that justifies the shift from physical to virtual desktops
- Its underlying infrastructure offers simple, predictable scalability to accommodate growth

It is critical to realize that VDI is an IO-intensive workload with extreme burst conditions. As you virtualize many client desktops and move them into a centralized datacenter as virtual machines (VM), all these desktop VMs share a common storage pool. In this dense environment, as the desktops start accessing storage during periods of high and concurrent activity, they create a massive storm of random IO requests for the underlying storage infrastructure. Most traditional storage architectures are not designed for this kind of access pattern, and as a result introduce unacceptable amounts of latency, which degrades the user experience.
Additionally, virtualizing desktops entails moving data from inexpensive client devices to enterprise class infrastructure in the datacenter, which often proves to be cost prohibitive. Add to that the complexity of managing the traditional three-tier Server-Network-Storage infrastructure stack, and positive ROI starts to look illusive. Finally, most initial VDI projects start small, but as the initiative is expanded to accommodate more users across the organization, infrastructure scalability issues can become complex and unpredictable.

Fundamentally, traditional and outdated infrastructure architectures are the primary reasons for these challenges. Traditional three-tier architectures comprised of isolated servers, storage and networking hardware silos are not designed for this new reality, and they often introduce complexities, performance bottlenecks, and cost-inefficiencies.

**Modern Infrastructure for the Next Phase of End-user Computing**

Hyperconverged Infrastructure (HCI) is rapidly becoming the infrastructure of choice for VDI implementations. HCI collapses the traditional siloes of the three-tier infrastructure by combining compute, storage and virtualization in modular building blocks based on industry-standard hardware. It also eliminates infrastructure complexities, simplifies infrastructure management and scaling. This modern approach to building scalable infrastructure is ideal for deploying VDI because it accelerates time-to-value without the cost of traditional infrastructure approaches.

However, close attention to the underlying architecture is paramount for successful VDI deployments. Most HCI architectures limit performance by confining the data sets to a limited number of resources. They also introduce compute and storage inefficiencies that result in a higher infrastructure footprint, and are often just as unpredictable as traditional IT infrastructure.

**Comparing Traditional Infrastructure to HCI**

![Diagram comparing Traditional IT Infrastructure to Hyperconverged Infrastructure](image)

**Simplify Your VDI with Pivot3 Policy-based Priority-aware Hyperconverged Infrastructure**

Pivot3’s unique architecture and innovative software capabilities enable you to deliver on the promise of virtual desktops by achieving a compelling ROI, predictable scalability and an uncompromising end-user experience. Cost is often one of the reasons VDI deployments fail to achieve positive ROI. Pivot3 delivers cost-effective VDI by delivering up to 2X to 3X the desktop density per node. Pivot3’s interoperability, flexible deployment options and rich ecosystem of VDI solution providers can accommodate diverse needs and criteria.
Lower TCO with Up to 3X VM Density Per Node

Pivot3 is designed to deliver up to 3X the desktop density compared to other HCI solutions. It does so by effectively and efficiently utilizing an ultra-low latency NVMe flash storage tier to eliminate storage IO bottleneck. Two accelerator nodes in each cluster can have up to 6.4TB NVMe flash storage that the system intelligently and efficiently manages both as a cache and a persistent storage tier. Pivot3 also allows you to use cost-effective Hybrid nodes with predominantly high-capacity HDD storage while still providing the required IO performance so you can lower to TCO of the solution while ensuring you are getting the highly responsive IO performance when you need by it utilizing NVMe flash tier. The result is more users per node, allowing you to slash your infrastructure footprint and optimize your cost structure.

Additionally, Pivot3 does not use the common, inefficient replication-based fault tolerance and high availability methods. Instead, Pivot3 has pioneered its patented erasure coding (EC) through years of research and development. Pivot3 EC is both high-performance and low overhead. EC complements the distributed scale-out architecture and improves efficiency of data protection while providing high availability. With Pivot3’s patented EC, you can achieve up to 82 percent effective capacity utilization while ensuring protection against node or drives failures. This compares to less than 50 percent usable capacity in most HCI designs. Further, EC eliminates duplication of write IOs, substantially improving IO performance of the entire environment. Finally, Pivot3’s rich data services that are offered at no additional cost include data reduction, thin provisioning and space-efficient snapshots and clones. These services help reduce the total capacity needs.
Deliver an Uncompromising End-User Experience

A superior end-user VDI experience is closely tied to the storage IO performance of the underlying infrastructure. Many VDI implementations slow or come to a screeching halt during periods of high IO activities, such as boot or login events. Pivot3’s unique distributed scale-out architecture that aggregates resources across all nodes in the cluster delivers outstanding IO performance at lower latencies by ensuring all drives in a cluster participate in all IO activities simultaneously. Any volume or data set that is created spans across the entire cluster – all nodes and all drives. Pivot3 HCI clusters can scale up to 16 nodes, with up to 144 drives per cluster. All data is uniformly distributed across all of these drives, resulting in optimal IO performance as the large pool of drives serves IOs simultaneously. Additionally, Pivot3 aggregates part of the RAM resources from each node to create a global read/write cache.

Additionally, Pivot3 provides advanced policy-based Quality of Service (QoS) that is tightly integrated with the NVMe flash storage tier. The QoS prioritizes resources based on user defined policies, ensuring consistently high IO performance for your critical and demanding users. Lastly, performance-enhancing features like global read/write cache and hypervisor pass-through also help deliver superior response times. These capabilities combined, enable blazing fast response times for end-users. All these capabilities combine to easily bust boot, login and IO storms without any spindle-counting, storage optimization or tuning, and delivers a consistent, predictable user experience.

Simple Management and Predictable Scalability

Pivot3 advanced QoS enables policy-based hands-free performance management so you can prioritize your users based on their criticality and business needs. This ensures mission-critical SLAs are always guaranteed, with the ability to schedule policy changes on the fly. You are now able to individually manage the experiences of power, knowledge and task worker desktops, each with their different performance profiles that range from non-critical to mission-critical. With its hands-free, automated approach to managing performance, Pivot3 QoS lets you specify your performance policy, effectively aligning your infrastructure with your business imperatives. Additionally, Pivot3’s seamless integration with VMware vCenter further extends ease-of-use with the ability to manage all clusters as a single domain from one user interface through vCenter console.
Policy-based Performance Management with Advanced Quality of Service

Pivot3 distributed scale-out architecture simplifies scaling in a predictable manner by aggregating resources from all nodes in the cluster. As you add more nodes to accommodate growing virtual desktop users, the existing datastores and volumes are automatically redistributed to make use of the added drive resources, thus boosting IO performance. Each node also adds 20Gbps of effective bandwidth, helping scale throughput in tandem. As a result, you can confidently predict your incremental hardware requirements to accommodate the desired growth for effective, efficient scalability.

Further, Pivot3 interoperability is enabled by integration through standard iSCSI storage presentations so you can utilize existing SAN or NAS with VMs on Pivot HCI, and provision Pivot3 HCI to external VMs on existing servers, which simplify workflows by eliminating silos in the infrastructure and providing an easy migration path. Lastly, Pivot3 solutions are validated with leading VDI software platforms that include VMware Horizon View and Citrix XenDesktop, as well as leading VDI technology partners such as NVIDIA, Teradici, Amulet Hotkey, Liquidware, Login VSI, and Imprivata. Pivot3 rigorously tests its solutions with key VDI platforms using industry standard tools to simplify infrastructure deployment, sizing and scaling.

Summary

While VDI can transform end-user computing, organizations must pay close attention to the underlying infrastructure architecture. With the desire to simplify deployments and the total cost of the solution, many organizations are increasingly turning to HCI. Pivot3’s advanced policy-based QoS coupled with NVMe flash storage tier, distributed scale-out architecture, patented EC, and broad ecosystem of VDI solution providers can help you achieve VDI success by proving cost-effective high performance VDI that is easy to deploy, manage and scale.