



BRANCH OFFICE BLUEPRINT

SUMMARY

- Simplify branch deployments with a single appliance providing all compute, storage, and networking needs
- Lower operational costs
- Avoid forced hardware upgrades
- Be ready for thin-clients and the cloud
- Half the cost of proprietary “all-in-one” appliances



COMBINING SILVER PEAK WITH PARTNERING TECHNOLOGIES PROVIDES A POWERFUL AND AFFORDABLE SOLUTION FOR THE NEW GENERATION BRANCH OFFICE

Branch offices have long posed a challenge for distributed organizations, a challenge that will only grow as organizations enter new markets and expand into existing ones. It is not efficient or cost effective to maintain IT staff and resources at every location. While server consolidation initiatives and cloud services have reduced much of physical infrastructure in the branch, some offices still require local compute, storage and networking resources to meet business requirements.

Attempts at delivering the “lean” branch office have either resorted to public cloud services that may fail to meet IT requirements for control, security and more; or appliance vendors attempting to integrate the required branch functions into their appliances. To varying degrees, such proprietary “all-in-one” appliances package the physical infrastructure (server, storage, and/or networking) needed for the branch with the vendor’s core capabilities – be it storage, security, routing or WAN optimization. Deployment is made simpler, but often at the expense of two or three times the capital and operational costs.

Silver Peak has devised a different approach for branch offices, one that leverages advances in data acceleration, server design, and hypervisor technologies. Organizations gain maximum freedom by being able to consolidate all branch office services into the data center, or where necessary, maintain them locally without sacrificing on ease of deployment or agility at a third of the cost of proprietary “all-in-one” appliances.

DYNAMICS IN THE BRANCH

While the details of remote offices will differ from one another, the challenges they pose for delivering enterprise-grade application services are remarkably similar across all organizations. More specifically, IT professionals must address the following:

- **Performance degradation** due to the increased distance, inferior network quality and limited bandwidth between the branch office and the data center.
- **Branch survivability** as dependency on the data center exposes organizations to lost productivity in the event of a failure of the wide area network (WAN).
- **Network security** as data in-flight to the data center must be secured from eavesdropping and attack. Protecting against Internet-based attacks is also important to branch offices with local Internet access.
- **Deployment costs** due to the lack of IT expertise on-site, the limited wiring closet space, and increased shipping-related fees as related of the office’s remote location.

1. Latency, network congestion, and bandwidth limitations limit the performance of applications over distance.
2. Individual WAN connections leave the branch vulnerable to network outages.
3. Firewalls and network security becomes critical, particularly if the office has local Internet access.
4. Local infrastructure must be installed and managed – difficult when there are no local IT resources.
5. Remote branch management tools needed to compensate for lack of local IT expertise.
6. Local server hardware and storage are typically underutilized and more difficult to manage than those in the data center.
7. Improper data protection exposes the organization to risk and extended data restoration times.

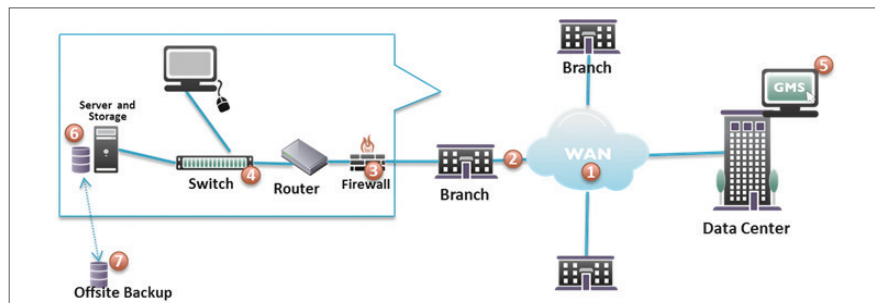


Figure 1: Branch offices pose numerous challenges to IT.



- **Management** due to the lack of local IT expertise, increasing the need for remote management tools.
- **Higher compute and storage costs** than in the data center due to the inability to leverage economies of scale.
- **Data protection and data security** as branches often back up data to tape or local disks, which are stored on-site or off-site in unsecure locations.
- **Data restoration** may take far too long for branch offices, particularly those with tape-based backup where restoration is typically four-times longer than the time needed to protect the original data assets.

IMPACT OF DATA ACCELERATION ARCHITECTURES

Most organizations address these challenges with successful data center consolidation efforts. Silver Peak has been the catalyst today behind many such efforts involving organizations, such as AutoDesk, Linklaters, and United Drug. The decision to consolidate resources into the data center, or not, in part stems from the capability of acceleration architectures to enable that consolidation.

While there are organizations that must retain server and storage functionality within branch offices, many organizations could just as easily locate those services in the data center with the right acceleration architectures. However, the limitations in the acceleration layer constrain branch deployment. Specific problems include:

- **Limited Application Support** – Most acceleration architectures are limited to optimizing well-known TCP applications, but cannot optimize UDP or proprietary applications, such as an internally-developed banking application. Unoptimized applications may perform poorly across the WAN, requiring local delivery.
- **Unable to Correct for Network Quality Problems** – Today's networks are highly congested, which results in packet loss and out-of-order packets, factors that severely disrupt real-time applications and undermine the throughput of any application. As such, particularly sensitive applications, such as desktop virtualization or VoIP, must run locally within the branch because they lack an optimized path back to the data center.
- **Inefficient Site-to-Site Security** – Protecting data between the branch office and data center is a requirement for many organizations. Most WAN optimization providers may claim to encrypt data in-flight, but practically fail to enable that capability as it degrades their system performance. As such, sensitive applications are forced to be maintained within the remote branch. The additional cost and complexity of VPN hardware may be incurred, but often with severe impact on application performance.
- **Inability to Improve Branch Office Availability** – Branch office productivity depends on branch office survivability. Most application acceleration solutions are unable to intelligently select between multiple paths, making survivability of the diverse types of applications servicing the branch impossible. As such, WAN optimization providers must locate all services within the branch to ensure availability.

To address these and other problems, acceleration architectures require organizations to run applications within the branch if they are to achieve the necessary performance, availability and quality that an enterprise class service requires.

LIMITATIONS OF PROPRIETARY ALL-IN-ONE APPLIANCES

Whether a decentralized deployment is driven by organization dynamics or imposed by limitations of acceleration architectures, proprietary all-in-one appliances face a number of limitations.

Capital costs are increased as proprietary appliances are unable to leverage the benefits of server commoditization. Proprietary hardware comes at an enormous premium from appliance vendors. The research and development, production, packaging, quality assurance testing and more contribute to the cost of proprietary hardware. Even then, High Availability (HA) features are often lacking, forcing organizations to double the number of appliances for maximum uptime. The result: the cost on a proprietary all-in-one appliance can double that of off-the-shelf servers.



The capital costs of specialized appliances are particularly significant given that they're often unnecessary. Most organizations have a surplus of compute cycles that can be used for optimization, which is a major catalyst behind the adoption of virtualization. IT functions can often share existing server platforms with other virtual appliances, and still deliver comparable performance to stand alone appliances. HA can be achieved relatively inexpensively by clustering virtual appliances.

Long term costs are also driven by the inherent scaling problems of some application acceleration software. These vendors are forced to add memory and storage to support more simultaneous users increasing their appliances costs. To remain competitive, some vendors will instead choose to undersize their software, supporting fewer concurrent sessions. Customers then face the burden of having to upgrade the branch office appliances as users and application usage increase at the branch, despite having plenty of available WAN bandwidth. End of Life (EoL) actions, which leave components unsupported by the vendors, also force customers into unexpected hardware upgrades.

Operationally, proprietary hardware extracts a heavy penalty. Sparing becomes more difficult and costly as components must be acquired from the vendors, typically costing 30 percent or more than comparable equipment on the market. Choice is limited to the applications and services available on these platforms, whether due to the constraints of the hardware or the business strategy of the manufacturer.

Even the perceived benefits of simplified delivery and deployment may not be fully realized. Proprietary appliances may still lack some core function, such as switching and routing, which force organizations to still deploy multiple appliances in the branch.

THE SILVER PEAK BRANCH OFFICE ARCHITECTURE

Silver Peak's approach to the branch office avoids the problems of proprietary appliances, delivering all of the flexibility and cost benefits of off-the-shelf systems with the convenience of an all-in-one appliance – at a third of the price. This is possible because as a virtual, data-acceleration software, Silver Peak capitalizes on the power of off-the-shelf hardware, virtualization, and a rich ecosystem of best-of-breed software. Specific branch office and data components in this architecture include the following:

Hardware - Silver Peak software is hardware-independent, running across many types of implementations. For most branch offices, off-the-shelf servers with a standard hypervisor offer sufficient compute capacity. The Silver Peak software accelerates, secures and ensures the connection back to the data center for all protocols. Local storage can be provided locally through a variety of means, such as VMware vSAN (virtual SAN) cluster, Dell EqualLogic, EMC VNXe, or NetApp. Uptime can be further improved by creating an HA cluster. In this way, organizations lose none of the cost or agility benefits of mass-produced servers.

For organizations intending to consolidate all functions into a single, purpose-built appliance, a shared infrastructure platform, such as Dell's PowerEdge VRTX, combines the convenience of a single appliance with the affordability of mass-produced server platforms. This data center-in-a-box combines compute, storage and networking branch functions while leveraging the manufacturing and domain expertise of the server vendors. A Dell VRTX gives IT remote management and control of the underlying infrastructure and shorter deployment times as the platform can be pre-configured and shipped to the branch, but still runs off-the-shelf compute nodes. (See "Dell PowerEdge VRTX WAN Optimization with Silver Peak")

But as a hardware-independent architecture, Silver Peak has also been deployed within alternative hardware platforms, such as Cisco Integrated Services Routers (ISRs) or the Avaya Secure Router (SR) routers, or even a user's PC. In all cases, the branch office benefits from the performance, security, and availability afforded by Silver Peak software.

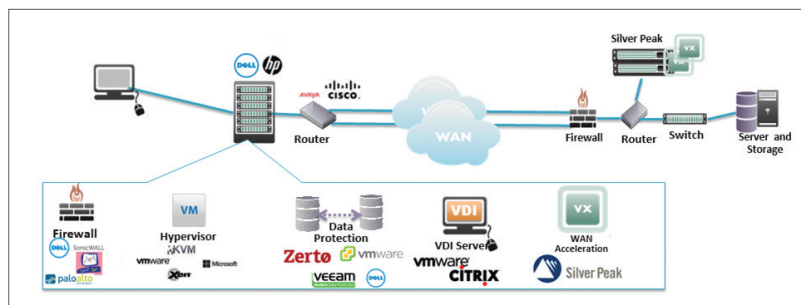


Figure 3: The Silver Peak Branch Office Architecture leverages best-of-breed software and hardware.



Hypervisor – As mentioned, all branch software will run on a leading hypervisor, such as Citrix Xen, KVM, Microsoft Hyper-V, or VMware vSphere. Host and infrastructure management continues to be performed via the same native tools that exist in the data center, such as VMware vCenter.

Management – Change and configuration management, performance management and more remain unaffected. Hypervisor tools can continue to be used to manage remote users. Silver Peak's Global Management System (GMS) provides detailed insight into the WAN operations.

File Services – For maximum efficiencies, IT delivers file and storage services from the data center. Silver Peak compensates for the underlying performance problems introduced by distance, giving LAN-like access to file servers thousands of miles away.

Data Protection – Virtual data protection software, such as VMware vCenter Site Recovery Manager (SRM), Veeam Backup and Replication, and Zerto Virtual Replication allows IT to easily backup and restore their branch office locations in the event of a disaster. Virtual data protection software works at the hypervisor level, capturing I/O requests and replicating them in real-time or near real-time off-site. Restoration can be done randomly as well so offices can get to work in minutes, not hours, after an event.

Perimeter Security – Distributed firewalls, such as those from Checkpoint, Cisco, Dell, Juniper, and Palo Alto Networks allow the IT organization to secure branch network access. A consolidated platform provides the necessary security policy management and control.

Thin Clients and More – For maximum control and security at the desktop, IT can use virtual desktop infrastructure (VDI) such as Citrix XenApp, Dell Wyse Thin Clients, Windows RDP, and VMware Horizon View.

Additional services are available from other Silver Peak partners, such as VoIP and unified communications from Avaya. These technologies, in particular, benefit from Silver Peak's unique ability to correct for packet loss and out-of-order packets in real-time, major contributors to poor voice and video quality.

IMPLEMENTATION

Specifics around the deployment will vary with organizational requirements. While full resource consolidation may be technically possible, it's not always feasible in every instance. Where compute cycles must be located in the branch, organizations can use conventional servers, though they can reduce their management costs and shorten their deployment cycles by using shared infrastructure platforms.

Branch resources run within the shared infrastructure platform as virtual machines on a standard hypervisor. IT can enforce best practices while still locating critical resources at the branch. The hypervisor management platform can be used for automating server maintenance tasks and monitoring resources. These remote management capabilities minimize the need to troubleshoot remote servers and desktops in person.

Data protection is provided through a virtual data protection engine, which allows IT to backup and replicate data in the background to the data center. Not only can IT then restore the data in minutes or even seconds in the event of an outage, but can also be granular in providing users with specific versions of lost files. And since the data is replicated to the data center, best practices can be used to protect that data, such as off-site storage and making double or even triplicate copies of files.

Network security is ensured on multiple levels. A distributed firewall, such as Palo Alto Networks' VM series or a Dell SonicWall SRA virtual appliance, secures the branch office from external attack. An IPSec VPN, included in Palo Alto's VM series or Silver Peak's VX or VRX software, allows for secure transmission of all data back to the data center. E-mail services and the necessary security technologies, such as anti-virus and malware protection, are still provided through the data center. The accompanying definition updates can be accelerated to the branch by Silver Peak.

Clients may be a mix of fat- and thin-clients. For fat-clients, Windows servers typically run remotely in the data center, leveraging Silver Peak WAN acceleration to give LAN-like file performance across the WAN. File services can also be delivered locally from the shared infrastructure platform. By hosting virtual desktops locally in the office, the remote office can continue business operations in the event that network connectivity to the data center is lost. Thin-clients can also access virtual desktop servers located in the data center, relying on Silver Peak to correct the network congestion problems and bandwidth limitations that undermine the thin-client experience.



Organizations can also choose a distributed thin-client deployment where the thin-client server resides within the branch communicating with a back-end in the data center. In this design, Silver Peak's ability to overcome bandwidth, latency, and network congestion all improve the thin-client deployment. Availability is also improved by dual-homing offices with low-cost Internet access lines and relying on Silver Peak's software to maximize the investment in those connections. (For further information about distributed and centralized thin-client architectures see the [“Dell Wyse Datacenter Branch Office Desktop with Silver Peak”](#) whitepaper.)

ANALYSIS

The flexibility of deployment is in large part possible because of Silver Peak's unique approach to virtual data acceleration. Silver Peak software addresses the core performance, availability and security challenges of delivering services to the branch for any protocol across any WAN at incredible scale and yet without requiring any proprietary hardware.

Performance

WAN performance is addressed by Silver Peak software, which addresses the three factors that undermine performance across the WAN – latency, congestion and bandwidth:

- **Latency** is mitigated by streamlining the protocols underlying enterprise applications. TCP applications are improved through window scaling, HighSpeed TCP, and other technologies. Windows file sharing and other CIFS-based applications are improved using technologies such as CIFS read-ahead and CIFS write-behind. Packet coalescing helps by re-packaging multiple smaller packets into a single larger one, minimizing protocol exchanges that increase delay. Dynamic Path Control selects the fastest path to a remote location.
- **Congestion** is overcome by dynamically choosing the least-congested path to a location for an application. Lost or out-of-order packets are recovered and resequenced in real time, avoiding retransmission delays. Traffic shaping and QoS mechanisms ensure applications, such as voice, data protection and thin clients, receive the necessary bandwidth.
- **Bandwidth** usage is minimized with real-time, byte-level deduplication. The Silver Peak software in each location inspects, compresses, and stores a single local copy of all outgoing traffic in real time. Subsequent instances of the traffic are never sent across the WAN, but delivered from the local Silver Peak instance, saving bandwidth.

Compute performance is addressed by shared infrastructure platforms, such as Dell VRTX, which deliver far more server and storage capacities than comparable priced proprietary all-in-one appliances.

Availability

Silver Peak improves branch survivability by enhancing dual-homed network configurations. In the past, equipping branch offices with an MPLS and a backup Internet connection meant paying for an unused access line, underutilizing a connection, or risking application performance, as traffic may be directed across a network path lacking the necessary performance characteristics.

The Silver Peak software, though, dynamically assesses the availability, loss and latency characteristics of all paths between locations. IT may choose to balance traffic across all connections for maximum usage and / or ensure applications are sent down a path with the necessary performance characteristics. Less-critical or less-sensitive site-to-site traffic might be directed across an Internet VPN, leaving the MPLS network for mission-critical or VoIP traffic. In addition, Silver Peak's real time intelligence monitors paths for marked increase in packet loss or latency, which often indicates a failing connection, and can then switch traffic to an alternative line before the failure occurs and users notice.

An HA cluster or a shared infrastructure platform, such as Dell's PowerEdge VRTX, provides a degree of uptime that exceeds most branch requirements without significantly increasing hardware costs. They also reduce software costs, as only one software license is needed in an HA cluster. Proprietary appliances require twice the hardware and software costs to deliver comparable availability.



Security

Being able to use the Internet as an alternative path is only possible if the data is secured from wiretaps or theft. Silver Peak provides accelerated IPSec that protects data through VPN tunnels between locations. The tunnels are encrypted with AES-256 and can be established in seconds by anyone without any performance degradation. Firewalls are still necessary, but by offloading site-to-site VPN processing onto Silver Peak, they can more efficiently process and filter network traffic.

THE ANSWER TO BRANCH PROBLEMS

In all deployment scenarios, Silver Peak enables IT to leverage its existing tools and realize the benefits of consolidation without giving up on the flexibility or cost benefits of off-the-shelf servers. Each layer – the underlying hardware, hypervisor and software – are distinct so IT continues to benefit from the domain expertise of the various vendors. Separation also allows IT to switch vendors, if necessary, and select solutions that best meet their needs.

This philosophy of agility through layered software drives Silver Peak's approach to WAN acceleration. The application remains distinct from the acceleration layer, enabling IT to migrate the application infrastructure independently of the acceleration hardware. Proprietary all-in-one appliances generally require IT to at least verify that application upgrades will not be constrained or interfered with by the acceleration layer.

Openness, choice, and cost savings are values that the IT industry long-ago internalized. Mainframes were replaced by personal computers. Proprietary networks gave way to open standards. Custom, all-in-one solutions violate these principles and ultimately fail the customer. IT needs branch office architectures with the flexibility and price-point they have come to expect from open systems.

