Executive Summary

The first wave of IT consolidation moved services out of the remote office and into the data center and was enabled by a combination of WAN optimization and virtualization. The second wave is now beginning as vendors deliver solutions that extend the benefits of centralization beyond the data center and into the branch office to enable consolidation of services. The new wave consolidates infrastructure within a branch, using the Riverbed Services Platform (RSP) from Riverbed -- a slightly different combination of WAN optimization and virtualization that enables the construction of a multi-service branch office box (or BOB). Using WAN optimization as the core of a BOB positions the organization well to evolve to future cloud-gateway or storage-gateway functionality.

Introduction

IT departments are choosing to consolidate infrastructure by centralizing file and application servers in an effort to streamline infrastructure management across the enterprise. This architecture is sometimes labeled a “private cloud”.

Consolidation efforts typically center around:

- Reducing server sprawl in branch locations by moving these servers into a centralized data center
- Consolidating servers within the data center

Delivering data and applications across the wide area network (WAN) with “LAN-like” performance and efficiency is critical to making these consolidation efforts successful. CIOs are now employing WAN optimization to get the most out of their consolidated infrastructure. Enterprises no longer have to pay high premiums to upgrade bandwidth links in an attempt to get better performance, and can do more with their existing links.

Virtualization has allowed further consolidation within the data center by enabling each server to run multiple virtual machines. This consolidation provides tremendous cost savings by reducing the overall hardware footprint within the data center. However, while virtualization and its benefits have yielded tremendous cost savings within the data center, the same principles have not been adopted as widely within branch offices.

Streamlining the hardware footprint within a branch can yield similar benefits to those seen in the data center. Virtualizing branch infrastructure services such as print, authentication and security eases management requirements and obviates the need for dedicated hardware to run these services. Time, money and expertise saved here can be reallocated to fulfill more critical needs.

Looking ahead, as enterprises move toward hosting their IT infrastructure via public cloud services that are managed by service providers, a single branch office appliance – or “branch office box” – can deliver IT performance with lower cost and lower management overhead than deploying these services on multiple physical servers.

WAN optimization, Virtualization and Branch Office Consolidation

IT departments have relied on virtualization technologies to get the most out of hardware investment within
the data center, but the same approach has been less prevalent in branch offices. Most branches still have a lot of application and infrastructure servers residing on premise, which leads to server sprawl. More focus is now being devoted to claiming some of the same benefits as seen in data centers by employing virtualization technologies within the branch.

“In regards to server virtualization in the branch office, what are the expected results of the consolidation approaches your IT organization is currently undertaking?”

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reducing power and cooling consumption at branch offices</td>
<td>46%</td>
</tr>
<tr>
<td>Centralizing expertise in one location/headquarters</td>
<td>46%</td>
</tr>
<tr>
<td>Driving more efficiency among IT staff</td>
<td>44%</td>
</tr>
<tr>
<td>Reducing travel between sites</td>
<td>26%</td>
</tr>
<tr>
<td>Reducing the number of active licenses for servers</td>
<td>22%</td>
</tr>
<tr>
<td>Don’t know</td>
<td>2%</td>
</tr>
<tr>
<td>Other</td>
<td>0%</td>
</tr>
</tbody>
</table>

Base: 134 IT professionals indicating current pursuit of this IT initiative (multiple responses accepted)

Source: “Branch Consolidation,” a commissioned study conducted by Forrester Consulting on behalf of Riverbed Technologies, June 2009

Figure 1: Savings drive branch office virtualization

“On Average more than one-third of workers are based at branch offices, and most of those branch offices house more than 10 servers” – Forrester

While a lot of file and application servers can be consolidated to the data center, there remain local infrastructure services that need to remain at the branch. Printing, VPN termination and video delivery are examples of such services.

These local services are good candidates for virtualization. Using the same principles as in the data center, these services can be run as virtual machines on a standard virtualization platform.
Separately from virtualization, WAN optimization has been rapidly adopted as a way to enable consolidation into the data center by improving application performance across the network. WAN optimization allows organizations to centralize their IT infrastructure, by moving most file and application servers into the data center, without sacrificing end-user performance. Streamlining application protocols and eliminating redundant data over the network delivers superior performance to end-users at the branch who access centralized applications over the WAN. This obviates the need to upgrade bandwidth in an attempt to get better performance and is one of the most significant benefits of deploying WAN optimization appliances. Virtualizing and hosting branch infrastructure services on these appliances can further reduce costs within the branch.

A WAN optimization deployment typically includes appliances deployed at the branches. These appliances have become powerful compute platforms, with higher capacity CPU, memory and disk space for a given price, which allows for running of additional services on the appliances without impacting WAN optimization performance. The ubiquitous need for performance in the branch in a consolidated IT environment, combined with the processing power of the WAN optimization appliances, makes these devices the ideal standardized platform on which virtual branch services are deployed.

**How do I consolidate within the branch office?**

“On average, customers in this study are saving $979,973 per year in bandwidth costs since deploying Riverbed Steelhead appliances” – IDC²
Consolidating within the branch office should begin with identifying services that can either be eliminated (or moved to the data center) or can be run as virtual machines. Most file and application services fall into the former category and can be centralized.

In addition, a lot of local infrastructure services can be run as virtual machines. Typically these services are lightweight enough in terms of CPU and memory requirements such that they do not need their own dedicated hardware. Moreover, these services typically do not perform well when centralized (e.g., printing). Let’s look at each of these in detail:

**Commonly virtualized branch services**

*Windows Services* – These are the most common services that can be virtualized at the branch. While most file and application servers can be consolidated back to the data center, it is sometimes necessary to keep Windows Authentication Services (Active Directory), IP Address Management Services and Print Services at the branch. For instance, if a user needs to be authenticated by Active Directory to access network resources, the time to login is often greatly reduced if the Active Directory server is local. Moreover, these services are typically not CPU or memory intensive and can run in a virtual machine, rather than requiring their own dedicated hardware.

*Other Branch Services* – Apart from Windows Services, there are a lot of other services that a branch typically requires:

- **Security** – Most branches require a VPN concentrator to secure communication to the data center, as well as firewall/content inspection functionality to enforce local access control, especially in organizations that support branch-local access to the Internet instead of backhauling internet traffic to the data center. A number of security vendors today offer their products as virtual appliances, and this makes it easy to deploy them at a branch location.

- **Routing** – Branch office routers are relatively simple devices, and typically provide a simple uplink to the WAN. It may be desirable to run these routers as virtual machines as well since the functionality provided is relatively lightweight. There are vendors today that provide a routing stack in software form, that can then be ported onto hardware of the customer’s choice.

- **Multimedia** – Another set of services that can be virtualized at a branch, these services typically provide benefits such as video content delivery, VoIP call management, stream-splitting services etc.
**Further considerations for consolidating within the Branch:**

*Selecting a Platform to Consolidate on* – WAN optimization appliances are becoming more prevalent at branch office locations as companies deploy this solution to enable centralization of IT infrastructure. These appliances typically have higher CPU and memory capacity than other branch appliances such as routers and firewalls, which leaves a lot of headroom to host other services – such as branch infrastructure services as described above. These appliances are good candidates to host virtual machines to provide services that cannot be consolidated back to the data center.

*Platform versatility to deploy different types of Services* – The types of infrastructure servers usually deployed at a branch range from Windows services, which lie “out of band” to the flow of traffic, to media distribution and security that need to be “in band” to the traffic flow. Any appliance that would host these added services, needs the ability to granularly control the flow of traffic to these virtual machines via configurable data flow rules.

*Supportability for Virtual Services* – The vendors that provide these virtual machines are not the same as the vendor that “owns” the appliance that these services are hosted on. While this ensures best of breed functionality for a given service, all virtual machines need to be certified by both vendors to ensure performance. In addition, having support linkages between both vendors is a must, such that the customer gets seamless support.

**Introducing the Branch Office Box**

According to a recent survey conducted by Forrester (see fig.), implementation of WAN optimization appliances in the branch is growing and continues to show healthy promise for the future. Effectively, these appliances are a gateway for users at the branch to the rest of the enterprise and can host all branch office infrastructure as virtualized services. Some analysts refer to the resulting solution as a “Branch Office Box.”

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**“At what stage is your company in the adoption of WAN optimization technologies?”**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>We are in production, broadly throughout our infrastructure</td>
<td>2%</td>
</tr>
<tr>
<td>We are in production, limited to strategic areas</td>
<td>7%</td>
</tr>
<tr>
<td>We currently have a rollout underway</td>
<td>10%</td>
</tr>
<tr>
<td>We are tactically deploying where needed to fix problems</td>
<td>22%</td>
</tr>
<tr>
<td>We are considering adoption</td>
<td>45%</td>
</tr>
<tr>
<td>We have no plans to adopt</td>
<td>10%</td>
</tr>
<tr>
<td>Don't know</td>
<td>3%</td>
</tr>
</tbody>
</table>

Base: 300 IT professionals with responsibility for data center operations (percentages do not total 100 because of rounding)

Source: “Branch Consolidation,” a commissioned study conducted by Forrester Consulting on behalf of Riverbed, Technologies, June 2009

*Fig 4: Forty Five percent of survey respondents are ready to pull the trigger on WAN optimization*
Reducing infrastructure to a single appliance can yield physical benefits such as reduced space, power and cooling requirements at the branch. Reducing infrastructure can also yield organizational benefits, as IT staff previously required to manage individual servers can be re-deployed to more strategic initiatives within the company.

Another benefit of a branch office box is the ability to provision new branch offices quickly and efficiently. While physical servers need a considerable amount of work just to be “plugged in” to the network, virtual machines are much easier to provision and install, and deployment complexity for these services is greatly reduced.

Reaping the Benefits

“With the RSP, Strand can run local branch services like print server on the Steelhead appliance without the need for a dedicated server. This will save us $10 to $15k in equipment costs for new offices and that doesn’t include the continued cost of maintaining additional servers.” – Justin Marthaler, IT, Strand Associates Inc. ³

Just as server virtualization has helped streamline data center architecture, the same principle can now be extended into the branch as well. Multiple local servers that are currently needed in the branch can be consolidated into a single piece of hardware.

Infrastructure in a branch office can often be reduced to WAN optimization plus local virtualized services, giving users and administrators significant benefits. Users now get similar application and data performance as they would on a corporate LAN, while administrators reap the benefits of ease of manageability along with cost savings.

Leading WAN optimization vendors like Riverbed offer this functionality today, by enabling virtual services to run on their appliance via the Riverbed Services Platform (RSP). This platform is versatile enough to enable services ranging from local Windows services to security services such as Firewall/VPN and media distribution services such as stream-splitting and enabling content delivery within the enterprise.

Branch Office Box for Cloud Services

Companies are moving to public cloud-based services for a lot of the same reasons that they are centralizing IT infrastructure within their networks. This movement into the cloud allows companies to streamline their IT infrastructure and management requirements, and at the same time reduce capital expenditure (CapEx). No longer do companies need to provision and maintain everything in their own data centers – instead some or all of their infrastructure can be “outsourced” to a cloud service and hosted infrastructure provider.

As companies move infrastructure into the public cloud, some application performance problems remain and new ones arise. A branch office box with local infrastructure services and WAN optimization can overcome these performance issues, as well as achieving the consolidation at the edge that was described in the
previous section.

For cloud service providers that sell hosted infrastructure services to their customers, this single appliance will offer:

- Reduced hardware requirements at the branch – ideally just a single appliance to deliver WAN optimization plus local infrastructure services
- Efficient supportability and management of local infrastructure achieved by integration of best-of-breed branch services onto a single appliance
- Modular design based on virtualization – add and remove services based on requirements
- Subscription-based services for the consumer – pay only for the services you’d like to use
- Easier backup of branch servers, as they are now virtual
- WAN optimization to deliver “LAN-like” application performance despite cloud latencies

Building a Branch Office Box

While Riverbed offers branch office box functionality today via the Riverbed Services Platform (RSP), it is also possible to build an independent version of a branch office box, taking into consideration all the infrastructure services that are needed along with WAN optimization.

To this end, running WAN optimization as a virtual appliance in addition to branch infrastructure services on a dedicated hardware appliance, it is possible to build a custom branch office box using generic hardware.

While a virtual appliance can offer flexible deployment options – i.e., if a customer has made a lot of investment in virtualization and deploying physical appliances is not an option, or for service providers looking to offer wan optimization as an on-demand/premium service, the appliance model is scalable within the enterprise, and all infrastructure services running on this appliance are validated for this specific platform.

Riverbed optimizes your infrastructure

For over 7,700 customers today, Riverbed delivers on the promise of optimizing IT performance while keeping costs low, as companies scale their organization to meet their growth. Without WAN optimization, it’s impossible to deliver application performance economically to geographically distributed end users.

Because WAN optimization is becoming a critical part of enterprise architecture, vendors like Riverbed occupy an important part of branch office network real estate. It is from this position that Riverbed’s track record of enabling consolidation to the data center and vision of being a gateway to enterprise cloud services makes Steelhead appliance the ideal platform to host branch infrastructure services and ultimately deliver a branch office in a box. Regardless of the evolution of enterprise IT infrastructure into public, private, or hybrid clouds, this kind of branch office box will be key to delivering “LAN-like” performance and low-cost local services.
Enabling Branch Office Consolidation

1 Forrester Consulting ‘A Standard Branch Office IT Platform to Optimize and Consolidate’, August 2009
2 IDC ‘Improving the Business Value of WAN Optimization’, January 2010
3 Riverbed Case Study: Strand Associates Inc.

About Riverbed

Riverbed is the IT performance company. WAN optimization solutions from Riverbed liberate businesses from common IT constraints by increasing application performance, enabling consolidation, and providing enterprise-wide network and application visibility – all while eliminating the need to increase bandwidth, storage or servers.