Data Center Fabrics

Why the Right Choice is so Important to Your Business
Introduction

Data center fabrics are emerging as the preferred architecture for next-generation virtualized data centers, as well as providing the foundation for cloud computing. But what exactly is a data center fabric? Well, regardless of what you hear, there is no industry-standard definition yet because the concept is still relatively new. Even major analyst organizations like Gartner, Forrester, and others have slightly different perspectives. And yet, everyone seems to be in agreement that data center fabrics can add significant value to any organization where the flow of information is critical to business success.

There is also agreement that a fabric architecture is compelling because it provides dynamic, virtualized connectivity from any server to any storage or networking device in the data center – all over a converged, high-performance physical infrastructure. Properly implemented, a data center fabric architecture creates a pool of dynamic IT resources that can deliver several important benefits, including better resource utilization, lower capital and operating costs, improved application response time, and closer alignment between IT and changing business processes and priorities. In short, data center fabrics represent a sort of nirvana that many IT organizations aspire to achieve.

While everyone is in agreement on these aspirations, the real debate is the answer to the fundamental question – how do you get there from here? In other words, what products and vendors should you work with to build your data center fabric? Today, nearly all major networking vendors are aggressively promoting competing strategies to deliver on the promise of the data center fabric. And in the spirit of full disclosure, Xsigo Systems is one of the vendors advocating a data center fabric solution architecture – although ours is significantly different than offerings from legacy networking vendors. In fact, some of the most well known organizations in the world have already built their data center fabric with Xsigo solutions. But more on that later.

With so many competing voices, it creates more confusion than clarity for CIOs and data center architects that need to understand the best path forward for their business. So what we first need to do is help bring some clarity to this discussion. In this paper, we’ll take a brief look at some of the critical features and functional requirements necessary to fully leverage the benefits of a data center fabric in your organization. Along the way, we’ll highlight some of the key differences between Xsigo’s data center fabric and other solutions. In the end, our goal is simply to help you be better informed and equipped to make the best decisions for your own organization.

UNLOCKING THE POTENTIAL OF YOUR DATA CENTER

Before we go any further, let’s first step back and ask an important question: what is the purpose of your data center? This is not a trick question at all. In fact, there is really only one very obvious reason that your data center exists:

*To provide the computing resources necessary to ensure your users have fast, secure access to the mission-critical applications that run your business.*

You might think this statement to be too simplistic, but consider this. If there were zero applications hosted in your data center, then what value would your data center provide? Would it even exist? Probably not.
enable the sharing and processing of all your critical business information. No applications, means no data, so no need for servers or storage resources, and no need for networking gear to move the data around. At the end of the day, it really is this simple. It’s all about your applications.

With this perspective in mind, let’s define a data center fabric this way:

_A software-defined pool of server, storage, and networking resources from any vendor that can be easily configured and controlled to enable fast, simple, and agile provisioning and delivery of the mission-critical applications that run your business_

This definition implies certain capabilities and requirements within the fabric architecture. For example, fabric performance and security are obvious necessities that will never change. But application requirements do change – sometimes with very little warning – so agility (the ability to respond quickly to changes) is needed to ensure IT and business are in alignment. And of course, agility is difficult to achieve if the fabric is overly complex to manage, so simplicity is yet another essential requirement.

With these requirements in mind, it becomes easier to evaluate various vendors, products, and technologies and unlock the potential of your data center to support current business requirements – and provide a scalable fabric that can easily accommodate future requirements and growth opportunities. Just as important, the right data center fabric in combination with your virtualization initiatives will provide measurable cost savings and cost avoidance.

**EVOLUTION OF THE DATA CENTER INFRASTRUCTURE**

The ongoing adoption of virtualization technologies is, of course, one of the key drivers of the data center fabric and cloud computing. VMware, Citrix, Microsoft, Oracle, and others have all rolled out powerful technologies that enable data center applications to be run on virtual machines (VMs) distributed across multiple virtualized servers. This evolution has helped IT organizations extract a lot more value and utilization from their existing server and application infrastructures. And that has resulted in a direct, positive impact to the bottom line of IT budgets.

But there is another critical impact of server virtualization that also needs to be understood and addressed. It has to do with the way traffic flows in your data center. Simply stated, data flows “North-South” and “East-West” – and these directional flows need to be understood and properly managed to ensure performance and security requirements are being met.

North-South traffic refers to data moving out of the server infrastructure and onto the production network (usually Ethernet) for distribution to the ultimate end point outside the data center. This data flow is associated with applications that users inside and outside the organization require to do their jobs. For example, this is the kind of traffic generated by an employee in the Finance department while accessing an accounting application hosted in the data center. In other cases, North-South traffic might simply be server traffic routed to a separate storage network. This is often accomplished by diverting appropriate traffic over a separate FibreChannel connection.

North-South traffic flows represent the traditional way that data has moved through the network. But in a virtualized
data center, there is an increasing amount of traffic referred to as East-West traffic. These data flows – which Gartner estimates comprises 80% of total data center traffic – involves the movement of various pieces of virtualized applications and data from one server to another within the virtualized server infrastructure. This is traffic that does not need to be moved North-South through the network infrastructure – and yet, that is exactly what ends up happening.

Here’s why. Servers running multiple VMs often have a dedicated physical network cable and card to support each VM on the server. The physical cables from each server within a rack are connected to a network switch at the top of the rack. That switch is then connected to a higher density network switch at the end of the row, which aggregates connections from all top-of-rack switches. From there, the end-of-row switch connects to larger switch that distributes traffic onto the production network.

If this all sounds messy, it is. But it also impacts performance because this East-West server-to-server traffic typically has to first go North-South through two layers of network switches, then back down to the appropriate server. Every time an Ethernet switch processes traffic, it adds latency that ultimately slows performance and application response time. And that is not good for user productivity or for your business. As more mission-critical applications become virtualized, this problem will only get worse.

According to VMware, about 30-40% of data center applications have already been virtualized. The concept of virtualization has definitely proven itself to be valuable, although not without its complications. Now, according to VMware, comes the hard part – virtualizing the real mission-critical applications that run the business. That means more servers, and increasing VM density per server. It also means more physical cables and cards, more network switches, and more ports properly configured to map North, South, East, and West traffic flows. All of this adds more cost and complexity to a data center fabric that needs to be simple and agile.

So it’s not surprising that this next phase of virtualization also creates an interesting inflection point for CIOs and data center architects as they plan their next move forward – which might be why you are reading this white paper. In order to build a virtualized data center fabric that meets the requirements outlined earlier, IT organizations facing this inflection point have a decision to make based on two clear paths forward.

One option is to continue to build on the existing Ethernet infrastructure extending the architecture described above. It is certainly the most comfortable and familiar path forward. And virtually all major networking vendors are advocating variations on this theme using their proprietary products. So that must be the best path forward, right? Maybe the better question is, how does “more of the same” help you deliver requirements for performance, simplicity, agility, and security?

Let’s quickly go down this list of requirements. First, it is clear that multiple layers of switches introduce latency, which has a negative impact on performance. With this architecture, additional server stacks result in more physical cards, cables, switches, and management complexity – so you can forget about the objective of simplicity. And if you need to add, remove, or reconfigure servers or applications, it is a time-intensive, manual process that includes
changes to each network switch in the data path. So that eliminates the possibility of agility. And regarding security, this type of infrastructure relies on VLANs to separate all that virtual traffic. But the complexity of configuring VLANs can make it challenging to ensure everything is done right to isolate and protect your changing mission-critical traffic.

OK, so it seems that the legacy networking vendors have everything to gain here. More of their products deployed, more product training required to manage their complexity, more lock-in to their specific vendor architecture, and more of your budget in their pockets. Conversely, it looks like you’re not gaining too much. In fact, you’re compromising at every step to achieve a goal that will inevitably become less attainable.

AN OPEN PATH TO THE DATA CENTER FABRIC

Remember we said there were two paths forward from this critical inflection point? So far we only discussed option one – continuing down the path of a traditional, proprietary, multi-layer network architecture. Now it’s time to look at option two. Just as important, it’s time to think differently. Empty your memory buffer and start with a clean page. Now think about how to build a data center fabric that can deliver the capabilities defined earlier:

A software-defined pool of server, storage, and networking resources from any vendor that can be easily configured and controlled to enable fast, simple, and agile provisioning and delivery of the mission-critical applications that run your business.

The first requirement is that your data center fabric should be built on an open architecture, allowing you to select the best-of-breed products from any vendor you want – and feel confident that interoperability will not be an issue. Imagine the freedom to choose the specific server, storage, and networking resources you need to meet your technical and business requirements, without being locked into vendor architectures and product limitations.

OK, now you’ve got to connect all these resources. It’s not uncommon to have 10-15 cables and cards per server. So using the legacy technology described earlier, that could require dozens or hundreds more physical cables and cards to handle the increased number of servers and VMs per server. But what if you could virtualize the connectivity to these resources in the same way that you virtualized the servers themselves? For example, instead of 10-15 physical connections per server, what if there was only one physical cable and card – but up to 64 isolated virtual connections per server? Think of how that would simplify your cabling infrastructure (70% or more!) and reduce capital costs.

There’s another important benefit of fewer cables – it also reduces the need for network switch ports. In fact, it can eliminate the need for those top-of-rack and end-of-row network switches altogether. That not only provides significant cost savings, it also flattens the network. And a flatter network translates to lower network latency and improved response time for the applications that power your business.

To be more specific, let’s go back to the discussion of East-West, server-to-server traffic flows. With multiple layers of networks switches, that traffic ends up going North-South as well. But by eliminating those network layers, East-West flow is simplified and accelerated within the data center fabric, and that helps improve overall performance and response time.
In addition, a virtualized data center fabric also improves the security of applications and sensitive data. Rather than relying on complex VLANs to segment traffic and provide rudimentary protection, a virtualized fabric creates completely isolated network connections within the fabric, ensuring that each connection – and the data flowing through it – remains protected and secure.

Lastly, and perhaps most important, is that a virtualized data center fabric must include the ability to create Software-Defined Networks (SDN). This capability is what gives the fabric true agility. As a result, most adds, moves, and changes in the data center would no longer require IT staff to change the cabling infrastructure or reconfigure each switch port in the data path. Instead, provisioning new services or applications could be accomplished in minutes (or seconds) in software through simple point-and-click, drag-and-drop SDN capabilities. Likewise, granular QoS controls could be leveraged within the SDN to tune and optimize application performance. The power of SDNs allows IT to quickly adapt elastic data center resources to the changing requirements of the business, and enables IT to stay focused on the task of managing the core applications that run the business.

Now let’s go back to that inflection point for a moment. We’ve presented two clear paths forward: 1) business as usual, with all of its inherent limitations, and 2) an innovative strategy that extends the power of virtualization and delivers on five key requirements: open architecture, performance, security, simplicity, and agility. It should be clear by now that Xsigo Systems is an advocate of option 2, and all the values associated with that choice. More important, Xsigo has already built SDN-enabled data center fabrics for enterprises and cloud providers worldwide, and they are enjoying all of these benefits and more.

THE XSIGO DATA CENTER FABRIC

Xsigo data center fabric solutions are built on innovative, patented hardware and software technologies that virtualize connectivity from any server to any storage and network device over a converged, high-performance physical infrastructure at throughput of up to 56Gbps. Since the fabric is based on a completely open architecture, you can create a pool of elastic resources from any vendor that can be configured and delivered as secure, isolated services supporting critical business applications, processes and priorities. Cloud providers find these features particularly invaluable to support their ever-changing multi-tenancy requirements. And to ensure optimal performance, integrated QoS controls make it easy to apply guaranteed bandwidth to the specific applications that matter most to your business. All of these controls are part of Xsigo’s Software-Defined Networking capabilities that deliver on the promise of simplicity and agility.

As you consider your path forward, we invite you to learn more about Xsigo Systems and our innovative, virtualized data center fabrics that enables you to create:

A software-defined pool of server, storage, and networking resources from any vendor that can be easily configured and controlled to enable fast, simple, and agile provisioning and delivery of the mission-critical applications that run your business.

At the end of the day, isn’t that the kind of dynamic, intelligent fabric you want for growing and managing your core business applications? That’s why choosing the right data center fabric is so important to your business.
About Xsigo

Xsigo is the leader in data center connectivity virtualization, a solution that dramatically reduces operational expense by changing the way that servers are connected to networks and storage.

Headquarters:
Xsigo Systems
California, USA
Tel: +1-408-329-5600
www.xsigo.com

Japan:
Xsigo Systems Japan K.K.
Tokyo, Japan
Tel: +81-3-6202-7484
www.xsigo.co.jp

Europe:
Xsigo Systems Ltd.
London, UK
Tel: +44-0-7917-763156
www.xsigo.de

© 2012 Xsigo Systems, Inc. All rights reserved. Specifications are subject to change without notice. Xsigo, Fabric Director, IS36 Expansion Switch, and the Xsigo logo are trademarks of Xsigo Systems, Inc. in the U.S. and other countries.

WPDCFW-0612