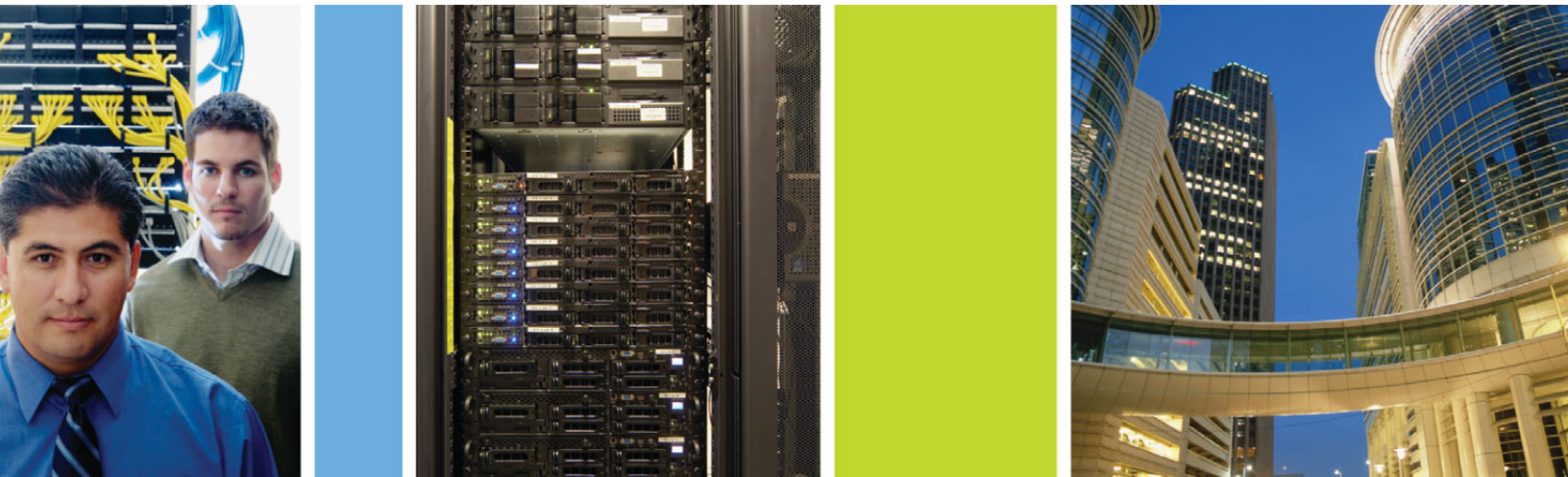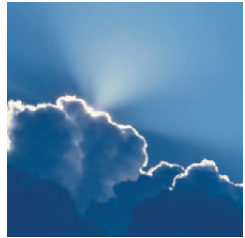**IBM**

Networking for a dynamic infrastructure: getting it right.

A guide for realizing the full potential of virtualization

June 2009

Networking for a dynamic infrastructure: getting it right.

Consolidating and virtualizing IT resources can provide the foundation for a dynamic infrastructure strategy that supports more cost-effective operations, faster services deployment and tighter alignment between business and IT. The evolution to a dynamic infrastructure requires a fundamental rethinking of the relationship between the network and the IT infrastructure components. Organizations need a holistic approach to plan and design the network together with the servers, storage and applications to ensure the flexibility, performance and manageability to deliver optimal value.

Promises, challenges and the role of networking

Demanding economic and marketplace conditions are leading organizations to seek a more efficient and responsive IT infrastructure. Many are consolidating and virtualizing their IT resources to make them available to applications as needed rather than requiring a dedicated server for each application. And with the addition of advanced automated provisioning capabilities to this virtualized environment, resources can be dynamically applied, providing organizations with an even more efficient, responsive and flexible infrastructure.

Consolidated and virtualized IT resources are the foundation of a dynamic infrastructure. Centralized and shared resources reduce costs, improve asset utilization and speed provisioning of new services. Networking plays an essential role in supporting virtualized IT resources and in enabling a dynamic infrastructure. So to reap the potential benefits from a dynamic infrastructure requires a highly flexible, responsive and security-rich network—along with a holistic management approach to the IT infrastructure—that looks very different from the standard, static network of today.

Evolving to a dynamic infrastructure: the changing role of the network

The IT infrastructure is evolving from a static, one-application-per-device approach to the dynamic infrastructure of the future. Throughout the evolution, the importance of stronger relationships among infrastructure components that were once separately planned and managed increases. In a dynamic infrastructure, the network, servers, storage and applications must be considered as a whole and managed and provisioned jointly for optimal function, and security integration is at every level and juncture.

A comprehensive network design to prepare for a dynamic infrastructure

To develop a more comprehensive approach to designing your network, you need to consider broad input from the multiple teams that manage the IT infrastructure today and build greater cohesion across those teams. This input can be gathered across the following five key areas of architectural considerations:

- **Design scope**—developing the central design principles based on planned virtualization capabilities, IT services and investment schedules

- **Security**—balancing the introduction of evolving capabilities, such as virtualization and provisioning, to provide the optimal relationship between business demands and risk tolerance

- **Management**—deciding on the right level of network and IT management integration

- **Organization**—addressing the existing organizational boundaries between the network, servers and storage teams for effective operations in virtualized and dynamic environments

- **Technology**—choosing the right networking technology options

IBM: supporting a lifecycle approach to networking

IBM is leading the way when it comes to developing a networking strategy for a dynamic infrastructure. IBM approaches the network as an integral part of the IT infrastructure and believes that to get the dynamic infrastructure right, you have to get the network right. Based on our internal experience as well as experience with clients around the world, IBM can help you move from a traditional, static network design for the data center to one that is integrated with other IT resources to provide dynamic, scalable network resources.

For more information

To learn how network optimization services from IBM can help you develop a comprehensive, future-ready network design, contact your IBM marketing representative or IBM Business Partner, or visit:

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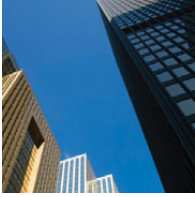
Networking for a dynamic infrastructure: getting it right.

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Promises, challenges and the role of networking

To respond to the forces of change in today's business environment, organizations need more efficient and responsive IT infrastructures. Many are taking a new approach by consolidating and virtualizing their IT resources—servers, storage, applications, networks and even desktops. Virtualization decouples the hardware and software resources from their physical implementation. It enables organizations to make IT resources available to applications as needed rather than requiring a dedicated server for each application. For example, applications can call on additional server processing power or storage capacity to meet changing demands. And with the addition of advanced, automated provisioning capabilities to this virtualized environment, resources can be dynamically applied, providing organizations with an even more efficient, responsive and flexible infrastructure. Companies that adopt this dynamic infrastructure approach poise themselves to achieve the following:

* **New economics.** Leveraging virtualization across all IT resources can help dramatically lower costs by uncoupling applications from underlying resources to improve portability and cost structures.
* **Rapid deployment of services.** Using a mature, robust and integrated service management strategy that incorporates automation helps manage the underlying infrastructure and service levels to quickly deliver high-quality services.
* **Tight alignment with the business.** Relying on a highly efficient and shared infrastructure can allow organizations to respond rapidly to new business needs—with easy access to the real-time information necessary for making sound decisions quickly and for anticipating challenges instead of simply reacting to them.[1]

Networking for a dynamic infrastructure: getting it right.

Consolidated and virtualized IT resources are the foundation of a dynamic infrastructure. Centralized and shared resources reduce costs, improve asset utilization and speed provisioning of new services.

The network plays an essential role in enabling a dynamic infrastructure, requiring built-in flexibility to achieve the full benefits.

Networking plays an essential role in supporting virtualized IT resources and in enabling a dynamic infrastructure. In dynamic environments, the network must do more than just carry traffic and support the provisioning of new IT services. It must have the built-in flexibility and capability to automatically change configurations while maintaining comprehensive security, visibility and management. Gone are the days of the static, manually configured infrastructure where network, server and storage environments were isolated and managed separately. Networks for a dynamic infrastructure must be flexible, responsive and managed together with the rest of the IT infrastructure.

Organizations moving toward a dynamic infrastructure to support their businesses must also evolve their approach to designing the network. Put simply, if your network is not designed correctly and cannot meet the changing requirements, you will never be able to achieve the full benefits. Flexibility, performance and manageability will suffer—at a potentially high cost to the business.

Network planning for a dynamic infrastructure must take a holistic, long-term view that considers the network, servers, storage and applications as well as their end-to-end manageability.

As a result, network planning can no longer focus on buying the latest switches, routers and specialized application devices in response to short-term bandwidth or performance issues. Instead, planning must take a holistic, long-term view that involves the network, servers, storage and applications as well as their end-to-end manageability.

Networking for a dynamic infrastructure: getting it right.
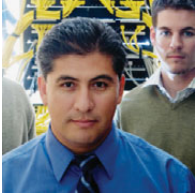
Evolving to a dynamic infrastructure: the changing role of the network

To understand how the network must respond to support a dynamic infrastructure, it is useful to look at how the IT infrastructure is evolving from the static, one-application-per-device past to the dynamic infrastructure of the future.
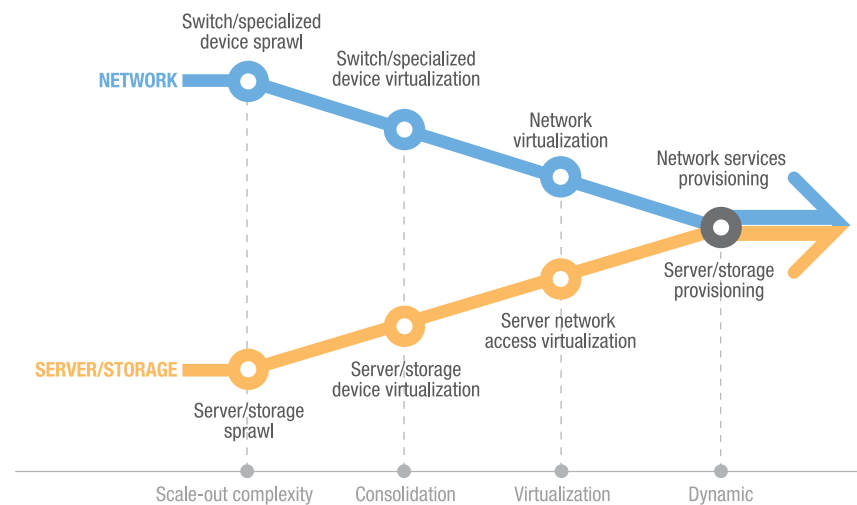

Figure 1
This image shows the evolution of the IT infrastructure from distributed to dynamic models.

In distributed computing, the data center network is static, is endpoint agnostic and relies on a wide array of switches and specialized devices.

In virtualized environments, the network must flexibly support the multiple layers of virtualization, connect virtual server and storage environments, and support platform-specific network requirements.

Phase 1: Scale-out complexity. In distributed computing, each environment is managed independently. This approach relies on a relatively simple data center network design that includes a wide array of switches and specialized devices that are static and endpoint agnostic. The result is growth in the number of specialized network, server and storage devices that are expensive, vastly underutilized and difficult to maintain.

Phase 2: Consolidation. In this phase of the evolution, IT organizations physically consolidate data centers, servers, storage and network devices and take advantage of device-specific virtualization to increase utilization and simplify management. The interrelationship between the network and the server and storage infrastructure grows in importance as focus shifts to efficiency and cost-effectiveness.

Phase 3: Virtualization. During this phase, network flexibility and responsiveness are critical as applications are virtualized across multiple platforms on virtual machines and data and storage adapters are converged. The network must support the multiple layers of virtualization, connect virtual server and storage environments, and support platform-specific network requirements.

Phase 4: Dynamic. The final phase is to realize the promise of dynamic network, server and storage resources across the infrastructure. In this phase, the network, server and storage resources are virtualized, integrated, scalable and security rich. Provisioning is automated through systems management, and multiple resource options are supported. The infrastructure also supports cross-platform virtual machine mobility.

Networking for a dynamic infrastructure: getting it right.

What does this evolution mean for the network?

Throughout the evolution of the IT infrastructure, you can see the increasing importance of stronger relationships between infrastructure components that were once separately planned and managed. In a dynamic infrastructure, the applications, servers, storage and network must be considered as a whole and managed and provisioned jointly for optimal function. Security integration is at every level and juncture to help provide effective protection across your infrastructure—and across your business.

Rapid innovation in virtualization, provisioning and systems automation necessitates expanding the considerations and trade-offs of network capabilities. Additionally, the ultimate direction for dynamic provisioning of server, storage and networking resources includes automatic responses to changes in business demands—such as end-user requests, business continuity and energy constraints—so your current network design decisions must be made within the context of your long-term IT and business strategies.

A comprehensive network design to prepare for a dynamic infrastructure

To develop a more comprehensive approach to designing your network, you need to consider broad input from the multiple teams that manage the IT infrastructure today. This input can be gathered across five key areas of architectural considerations:

- *Design scope*—developing the central design principles based on present and planned application workloads, server and storage platform virtualization capabilities, IT services for internal and external customers, and anticipated schedules for growth and investment
- *Security*—balancing the introduction of evolving capabilities, such as virtualization and provisioning, to provide the optimal relationship between business demands and risk tolerance, and creating a comprehensive view of the physical and virtualized infrastructure to provide robust security, visibility and segmentation based on best practices for security management and integration

- ***Management***—deciding on the right level of integration with the IT manage- ment environment to both enhance current operations and provide a path to emerging, policy-driven network configuration and provisioning standards, such as Network Configuration (NETCONF) and Open Virtualization Format (OVF)
- ***Organization***—addressing the existing boundaries between the network, servers and storage to establish better interfaces for operational teams to work effectively in virtualized and dynamic environments; creating a comprehensive design by requiring the network team to develop a greater operational awareness of server and storage virtualization technologies and capabilities
- ***Technology***—choosing from current and emerging networking technology options to make the best decision for executing your IT strategy while mini- mizing business disruption

Greater cohesion across teams is required to properly address the five architectural areas.

To properly address these architectural areas, greater cohesion across the differ- ent teams that manage the IT infrastructure will be required. Architectural consid- erations should be addressed in the context of the existing infrastructure, IT strategy and overall business goals. By carefully assessing the current state of the infrastructure, and by taking into account the desired future direction, you can determine the best answers to the following types of architectural questions.

Networking for a dynamic infrastructure: getting it right.

To get the network right for the evolution to a dynamic infrastructure, it's important to ask the right types of architectural questions.

Design scope

- What are the existing and planned unique and overlapping virtualization capabilities of your heterogeneous system and storage platforms?
- How does the network adjust and enhance the flow of traffic when virtual servers (in the form of virtual machines) can be created, moved or deleted at the click of a button?

Security

- Where will security devices such as firewalls and intrusion protection/ detection services be placed and managed? Will they be physical, virtual or both?
- How do you support different types and levels of security for different application workloads on a shared, virtualized infrastructure?
- How do you achieve fast provisioning and mobility of security services to match the speed of virtual machine creation, movement and deletion?

Management

- How do you define a smooth migration path from a static network to one that can respond to a highly automated and dynamic infrastructure?
- How do you manage the delivery of differentiated service levels to different application workloads on a shared infrastructure while meeting existing service level agreements with end users?
- What amount of monitoring is required, and at what level of granularity, for virtualized resources to enable required performance awareness, event correlation and reporting?

Organization

- Who will implement, configure, manage, maintain and support network resources that reside in virtualized platforms or exist as virtual appliances?
- How is the accountability and integrity of administration maintained when mobility of the resources is incorporated into the architecture?

Technology

- How do you decide where and when to adopt an emerging, disruptive technology such as Fibre Channel over Ethernet (FCoE), which enables the convergence of data and storage networks?
- Which network protocols and standards do you adopt to address the requirements of your dynamic infrastructure, for example Multiprotocol Label Switching (MPLS), virtual routing and forwarding (VRF), Internet Protocol version 6 (IPv6) or pseudowires?

Guiding your network design with the architectural considerations and the types of questions provided as examples can help you align and better integrate the network into the overall IT infrastructure strategy and roadmap for your evolution to a dynamic infrastructure.

IBM: supporting a lifecycle approach to networking

IBM is leading the way when it comes to developing networking approaches for a dynamic infrastructure. As a company, we face the same challenges related to networking for a dynamic infrastructure as you do. We've consolidated and virtualized thousands of servers in our data centers to cut costs and help optimize our return on investment. Moreover, we've cloud enabled on demand IT delivery solutions, providing self-service provisioning of virtual IT resources for 3,000 IBM employees across eight countries and delivering real-time integration of information and business services.

IBM approaches the network as an integral part of the IT infrastructure and believes that to get the dynamic infrastructure right, you have to get the network right. Based on our internal experience as well as experience with clients around the world, IBM can help you move from a traditional, static network design for the data center to one that is integrated with other IT resources to provide dynamic, scalable network resources. Regardless of the brands of technology in your environment, network optimization services from IBM are designed to offer guidance throughout the process—from developing your strategy and assessing your current infrastructure to designing and implementing a networking infrastructure that comprehensively supports a dynamic infrastructure.

Connecting to greater possibilities

A dynamic infrastructure enables the efficient and flexible IT delivery that is demanded by today's rapidly changing business environment, including cloud-computing models. Transitioning to these new models is a journey, and success requires a good plan. Rarely before has a holistic approach to planning an IT infrastructure been so critical, and the network must be an integral part. Getting the network right means helping to ensure that it is designed to provide the right levels of performance, security, availability, responsiveness and manageability so the dynamic infrastructure can deliver its extensive range of benefits.

For more information
To learn how network optimization services from IBM can help you develop a comprehensive, future-ready network design, contact your IBM marketing representative or visit:

ibm.com/virtualization/networking/

[1] IBM, *What IBM's vision for a Dynamic Infrastructure means for CIOs: The CIO's role in creating the Enterprise of the Future*, January 2009, www-935.ibm.com/services/us/cio/outsourcing/ciw03047-usen-01.pdf

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