Enterprise Transformation and Network Architecture

Constructing a Platform for Business Value Acceleration

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Introduction

Whether your company is being strongly affected by globalization, outsourcing, private equity competition, increased regulation, or Web 2.0, it is clear that future requirements for enterprise computing will only be more demanding. To survive and prosper, companies must reduce operating costs, increase automation and control, and prepare to scale the number of business relationships they can support. Increasingly, the remedies to the challenging problems lead to one question: What is the role of the network? The transport-centric vision for the network is now giving way to a converged vision in which enterprise and network architecture meet separated by a framework called service-oriented architecture (SOA). But what does this really mean?

In every industry, a similar transformation is taking place. Agility and efficiency are no longer a matter of building solutions to support a specific business model. Rather, the ability to rapidly evolve to support innovation in business models must be part of the enterprise architecture strategy from the beginning of business process change. Companies need solutions provided by a platform that is ready to enable change and accelerate business value.

Everything starts with enterprise architecture, the global plan for how all processes in a company will be implemented. Of course, business strategy should be the foundation for the enterprise architecture. But, according to Anne Lapkin, Vice President of Research at Gartner, many enterprise architecture initiatives fail to engage the business. The first step to address this is to create the business context, which provides the foundational assumptions for the future-state architecture. During the process of developing this context, the enterprise's strategic requirements are analyzed, and a set of architecture principles is articulated. The process also includes analyzing the business functions the enterprise needs to fulfill the business strategy. As these requirements are articulated, enterprise architecture teams can identify the information and technology services that support the business functions and processes needed to achieve the business strategy.

As the ideas of SOA have penetrated the thinking of the enterprise architects who design the structure of the processes, systems, and applications that support a business, a new form of convergence has arisen. It is now unrealistic to approach enterprise architecture and the task of building a platform for change in terms of the applications alone. Companies are now realizing that traditional definitions of enterprise architecture are too small to contain the scope of the solution. Many of the services that are crucial in the world of SOA find their natural home in the network, not in the application.

To explain this phenomenon, this paper will focus the demands that Web 2.0, one of the leading transformational forces, places on a company. SOA has emerged as the technology architecture of the platform to support Web 2.0. Many current efforts at reshaping enterprise computing are focused on how to properly use SOA to create the maximum business value through Web 2.0 and Enterprise 2.0 models.

The task of using SOA to create an operationally robust platform requires that network architecture become part of the design process, not just an invisible transport layer. If business transformation is not supported by the right network design, the efforts will most likely not deliver on performance requirements. This paper explains why.

The focus on Web 2.0 is determined by the increased value companies are finding in opening up the boundaries of the enterprise and using services to harness collective intelligence, increase collaboration, and scale the number of business relationships that can be supported. Tim O'Reilly,

whose company, O'Reilly Media, coined the term Web 2.0, defines it as a business revolution in the computer industry caused by the move to the Internet as platform. O'Reilly's core advice: build applications that harness network effects so that the apps get better the more people use them.

Andrew McAfee of Harvard Business School defines Enterprise 2.0 as the use of emergent social software platforms within companies, or between companies and their partners or customers. Social software enables people to rendezvous, connect, or collaborate through computer-mediated communication and to form online communities. Platforms are digital environments in which contributions and interactions are globally visible and persistent over time. Emergent means that the software is freeform and that it contains mechanisms to let the patterns and structure inherent in people's interactions become visible over time. And freeform also means that the software has most of the following characteristics: optional, free of up-front workflow, accepting of many types of data, and egalitarian (meaning indifferent to formal organizational identities).

In presenting the explanation, this paper analyzes Web 2.0 and SOA and looks in detail at the way security functionality and other applications are being supported by the network. The content is based on interviews with more than 20 experts in SOA and networking from Cisco®, Capgemini, Dimension Data, and other enterprise firms. The paper concludes by examining the likely roadmap most companies will follow as they craft their network and applications into a platform for transformation.

The Network in a Service-Oriented World

For decades, the network operated in the background. Under the floor, inside the walls, through RJ45 jacks, the network was the two-way data pathway based on IP, the most completely and successfully standardized layer in all of IT. Now the network is prepared to play a larger, more strategic role.

"In the 1980s, the network was nothing more or less than a piece of intelligent string," said Andy Mulholland, Group CTO for Capgemini. "It was just there to connect things together. In the world of SOA, the network has gained the ability to execute services. It is the natural home for the most generic and standardized functions."

The endpoints on the network highway were at first enterprise applications, along with core services such as e-mail and Web servers, and personal computers running end-user productivity software.

SOA is breaking up the endpoints, converting them from individual applications into collections of Web services that are available to be combined into new forms of applications. It is this potential for recomposition that delivers the flexibility needed to support business transformation. But as these Web services become more vital to operational success, they must become more robust, scalable, and reliable. In other words, they must become more like the network. For many of these services, the network is the logical place to provide them. But why? And how? And when?

The architectural complexity of the information highway is also changing dramatically, from a simple two-lane road connected by switches and routers to one with a much more complex structure, featuring a variety of special-purpose checkpoints along the way. IP has become the

foundation for voice, telepresence, conferencing, instant messaging, virtualization, and a growing number of other applications and services. For voice or telepresence to work, the network must have dedicated high-speed pathways so that performance-sensitive traffic can move back and forth with the appropriate velocity.

Checkpoints on the data highway include well-established functions such as firewalls, which inspect traffic and allow only authorized, malware-free packets to go through, and encryption functionality such as Secure Sockets Layer (SSL), which protects the information inside a packet from unauthorized access.

But if we take a closer look at the services that are offered by the endpoints, it becomes clear that many common services for security and identity management are completely generic. They work identically in each and every application. This makes them perfect candidates to be provisioned in the network. Applications would be simpler and work better if they did not have to perform these generic functions.

“The first step for a service is software running on a network endpoint, then the functionality goes into a hardware component, and eventually into a network component,” said Stefan Dietrich, a consulting CTO. “Right now, you have a lot of services running at the endpoint doing a lot of things like virus protection that could have been done a lot earlier.”

It is also clear that the core functions of many sorts of applications, governance, risk, and compliance (GRC) in particular, can be enhanced by adding checkpoints that look inside the packets flowing through the network and recognize important events, which are then sent to applications. radio frequency identification (RFID) and other real-world awareness services that report on the location of people and things feed their information into a network, where it is consumed by applications that need it. Virtualization allows one point on a network to imitate many different devices and services.

Yet in the face of all of these demands and opportunities, the shape of the network architecture has changed very little, and enterprise architects give almost random thought to the potential of the network as a service delivery platform. The pathways may have gotten bigger, the topology more complicated, but the design principles of most IP networks, installed to provide connectivity for e-mail and Internet access, remain the same. Without some sort of evolution, loading more and more packet volume and IP-based services on the corporate network will lead to either a traffic jam or the inability to transform your business at a reasonable cost.

The optimal form of a network that provides a platform for transformation and avoids a potential mess is different for each company. Cisco has, however, worked out the shape of the network that can handle everything mentioned so far. This shape is called the Service-Oriented Network Architecture (SONA), the Cisco accelerator to successful SOA implementations. SONA is not architecture per se, but a style of architecture, one designed to allow the network to dynamically provision new services that will offer businesses maximum flexibility and reliability as they adapt their processes and put more and more reliance on IP.

“When we talk about service orientation, we don’t just mean rewriting an existing application in a new way,” said Andy Mulholland, Group CTO at Capgemini. “We actually mean that there have to be a set of fundamental services which are available to everyone and which are a part of the network environment or are exposed in a common way so that we all understand what everyone is doing and what role we want each other to play. That is what SONA gives at the very base level.”

The story of the creation of a business transformation platform has many parts and could be told many ways. This paper uses SOA as a way to organize all of the issues that surround the task, telling the story in three sections:

- The first section of this paper will analyze the arguments for SOA adoption, explore the implications of moving services into production, and analyze how enterprise architecture and network architecture are converging around services to enable IT to move faster to align with business strategies.
- The second section shows how security services are migrating to the network and examines the patterns that have emerged and how they may hold lessons as other services are provisioned from the networks.
- The third section of the paper will examine various ways to put these ideas into action and accelerate the creation of an enterprise architecture that amplifies business value and the velocity of change.

If your business is changing at a record-breaking pace, an evolved network architecture may be part of the answer to building a platform that allows you to keep up. Read on to learn more about the shape of that architecture, why it supports higher velocity business, and how Cisco can help take you there.

Questions for Further Analysis
How will your enterprise architecture be changed by services? What effect will Web 2.0 have on enterprise computing and business strategy? Is your company pursuing the long tail opportunity? If so, will a Web services architecture support it?

Getting Serious About Services

Although the concept of SOA has gained wide acceptance, most executives are still wondering about its long-term effect on their business. Each successive wave of vendor products comes with more services, more tools, and more capability to combine services into composite applications.

Few doubt SOA’s potential to create a more flexible IT infrastructure that can respond more rapidly to business needs and allow processes to be tuned and optimized with less effort than ever before. But important questions linger:

- How will SOA matter to my business? How will it transform my company?
- What is the path from preparing for and implementing SOA to business value?

- How can I accelerate my company's strategic velocity along this path?

The time for addressing these questions in the abstract is over. IDC predicts in its 2007 top 10 trends research that Web 2.0 will make enterprise applications more user-oriented and community-oriented for easier use and collaboration.

Companies all over the world are separating themselves into three groups:

- Those that are effectively ignoring SOA for now and are choosing to wait for its benefits to be delivered to them embedded in products
- Those that are experimenting by using SOA internally, without expecting to have services exposed outside the firewall
- Those that believe that by preparing a scalable and robust infrastructure for service delivery inside and outside the firewall, they will move with greater speed and certainty to increase business value and gain competitive advantage

This last group is made up of companies who see how Web 2.0 is rapidly becoming Enterprise 2.0. These pioneering companies understand that the entire foundation of this new wave of business value is reliable, manageable, and operationally robust services, which increasingly can only be delivered by the network.

The Business Value of SOA

To understand the effects that SOA will have on enterprise computing, one need look no further than Google, eBay, and Amazon, three of the leading companies in promoting business models that exemplify what has become known as Web 2.0. Each of these companies has created Web services APIs that have enabled other companies to build new applications. The APIs for Google Maps and other services have spawned an entire new form of application known as a mashup, named for the way that many Web services are combined to create something new. Web services APIs from eBay and Amazon have become important new channels for business. Both companies now receive a huge stream of transactions from applications and integrations based on these APIs. Web 2.0 Websites such as MySpace and Yahoo's Flickr are using collective intelligence and generating massive traffic and revenue by creating communities on a scale never before possible.

The application of these principles to business computing has become known as Enterprise 2.0. The core of Enterprise 2.0, like Web 2.0, is services, most frequently Web services. In the enterprise, services are used to allow business processes to be optimized and reconfigured more easily and more rapidly than ever before.

Like Google and Amazon, companies are also putting services in the hands of partners to optimize the flow of goods using models like vendor-managed inventory or to allow others to build channels to pursue niche markets (see the "The Long Tail Opportunity"). Services to recognize and publish important business events are the foundation of event-driven architectures.

The Long Tail Opportunity

After Chris Anderson, the editor of *Wired*, explained the concept of "the long tail" in his book of the same name. Many companies were impressed with the analysis but were puzzled at how exactly the idea applied to their business. The brief version of the long tail is this: Although most companies expend a large amount of effort for the mass market, an even larger opportunity over the long term can be found in thousands of niche markets. These niche markets, each representing buyers with different needs and characteristics, are potential sources of large profits. How will companies get at these niche markets? They are too small to pursue directly in the same way as the mass market. Web services APIs built according to the principles of SOA used by others who understand and have communication channels to the niches are the gateway to the long tail. Amazon and eBay both use Web services APIs as a gateway to significant transaction volume. In *Mashup Corporations* (Evolved Technologist Press, 2006), we tell the story of how a popcorn maker creates a suite of Web services to enable others to market its products to niches. In this way, Web services have created a new way of doing business at the intersection of marketing strategy and raw technology.

The emergence of services inside and outside the firewall has unleashed a wave of innovation by lowering barriers to change and experimentation. Just as Google uses the web of links to optimize its search algorithms and Amazon uses purchase histories to make product recommendations, so too do enterprise systems have the potential to improve their performance using a feedback loop based on data collected through use of the system or through other means such as location-based services.

Services that capture events are particularly important. In an extended event-driven business network, a supply chain event indicating a material shortage for a primary component might have tremendous downstream implications. But it is useless unless that event is communicated to all the business networks that need to be aware of it. The fire-and-forget, publish/subscribe nature of event-driven networks makes the network the natural platform for services that recognize and publish events.

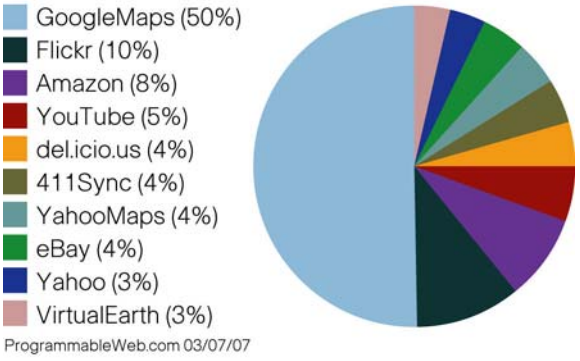
The services used in these contexts must have the operational characteristics of production systems to succeed.

Services Off the Shelf

By far most of the services that will be used to make SOA a reality will come from application and network vendors, although many companies are hard at work publishing their own versions of APIs as well. The growing collection of services available for enterprise computing falls into the following categories:

- Services that expose functions from applications
- Services that perform general-purpose application utility functions
- Services that perform generic infrastructure functions for security, identity management, virtualization, and so on
- Services that present events captured from network traffic, Extensible Markup Language (XML) message monitoring, and other information
- Custom-developed services and composite services created from other services

Figure 1. Growth of APIs Provided as Services



The Programmable Website documents a huge and accelerating number of APIs being provided as services. Figure 1 shows that the phenomenon of extending your business through services is not a future potential but an established fact.

But services sitting on the shelf are useless. They must be put to work to create any sort of value.

Composition: The Services Assembly Line

As the trend toward service-enabled enterprise applications continues, the primary differentiating skill will be the ability to combine these services into new composite applications. The core value created by SOA flows from the flexibility of reusable services to innovate, reconfigure, and optimize processes.

The enterprise versions of mashups are applications that reduce the context switching – the use of many different user interface screens to perform one task – that is too often a part of enterprise applications. Because application functionality is increasingly available through services, it is now possible to construct a composite application that presents information, supports analysis, and then allows the appropriate action to be taken in one environment.

The new tools for service composition are generally based on modeling or scripting rather than using more difficult languages such as Java and C++. This has widened the field and allows business process experts and superusers to compose applications for themselves, opening up a new source for innovation.

Many of the most valuable services are extensions of core systems at the hub of the enterprise, such as enterprise resource planning (ERP) and customer relationship management (CRM). As hub systems become available through services in ways that protect the transactional integrity of the data, the value of these systems is extended to the edge of the enterprise, where the information may be used in looser, more collaborative processes. For example, it is possible to have a service that displays the current orders for a large customer in an easily changed wiki-media page that allows all the sales representatives calling on that customer to add their own comments about what trends and opportunities can be discerned from analyzing the customer's past orders.

"The purpose of SOA was to provide a platform that was fairly standardized and that took the burden of complexity away from partners who wanted to do business with us," said Keith Woodcock, CIO of Galileo, an international travel services company. "SOA makes us more friendly."

Which Services in the Network?

What does it mean, exactly, for services to migrate to the network? For the most part, it means that code that was running in an application server is instead migrated to run on routers, switches, and other special-purpose devices used to run and manage the network.

This means applications themselves will have a simpler architecture and extended reach, as we explain in the next section. Applications will be able to siphon functions that can be better performed by network-based services and also allow themselves to be enhanced by services in the network that recognize important events and then feed them into the applications. Applications remain the brain; the network becomes an extended nervous system.

The network is the natural platform for a certain class of generic services for unified communications, authentication, virtualization, mobility, and voice, shown in Table 1. Because the network is the only ubiquitous component in the IT landscape, it is the natural home for the most generic services. Provisioning services that are used by every application in the same way from the

network is less costly, faster, and easier and is the only way to help ensure consistency and compliance. It is likely that the services described in Table 1 will migrate to the network, simplifying the nature of applications.

Table 1. Services Migrating to the Network

Service	Rationale for Network Provisioning
Backup	Knowing which data to back up is application-specific, but storing versions of that data is a general service.
Identity Management	Moving the task of authorizing access to applications into the network simplifies application architecture and provides a common standardized method.
Location-Based Services	Using wireless sensors or RFID to track the location of people or things can be distributed throughout a campus or factory, and then these devices report location events that can help applications do a better job.
Caching	Keeping caches of data that can be shared across many different applications takes advantage of the ability of network equipment to quickly and efficiently store and transmit data.
GRC-Related Events	The network can be infused with intelligence to dip into the packet stream and recognize events related to service-level agreement (SLA) compliance, distribution of confidential information, or security threats. These events can then be sent to one or many applications for disposition, monitoring, and management.

What all of these services have in common is that they are completely generic. They operate in the same way regardless of the application context.

The network is also the natural platform for another class of services that take advantage of the fact that the IP network is the one place where everything that happens in a company converges in to a stream of packets with a standardized form. Application-oriented services monitor the stream of IP traffic to collect information about the behavior of the enterprise and to transform that knowledge into events that can be provided to enterprise applications and increase their value. This is called application-oriented networking (AON).

Protocol conversion and data conversion are promising areas for network-based services. Instead of forcing companies to change applications to achieve interoperability, it is easy to imagine putting that conversion and transformation logic in network devices. In a similar way, network devices can also be placed in front of applications that generate excessive traffic to manage the interaction and avoid superfluous network traffic. RFID readers, for example, sometimes report a huge volume of events, but a network service designed to interact with those devices can just handle the high volume of messages over a local network and only report the meaningful events to the rest of the applications awaiting the information.

Another natural category of services with affinity for network delivery are those related to collaboration that provide location awareness, instant messaging, telepresence, voice conferencing, and other mechanisms such as wikis. For example, using such services would allow a hospital to deliver a multigigabyte digital x-ray image to the reader that is closest to a doctor who is location aware to the network. The same sort of intelligence could avoid delivering such a large file over a less optimal network location if the doctor were at home or to a mobile device that could not handle the file.

Developers, Convergence, and Standards

To improve our understanding of how the migration of services to the network will take place, it is useful to step back from our analysis and ask a simple question: How will all of this look to developers?

Developers in the SOA era are used to looking at functionality as Web services described using Web Services Description Language (WSDL) files. WSDL files are composed in XML format for

describing network services as a set of endpoints operating on messages containing either document-oriented or procedure-oriented information. Such developers are typically not accustomed to working in depth with interfaces of multifunction network equipment and using proprietary configuration mechanisms to make a service work the way they want. If services that migrate to the network are not invisible to developers, that way that SSL and firewalls should be, then they must look like any other Web service API, like services for identity management, sending and receiving events, or unified communications services to send notifications in various ways.

At first, it is likely that several classes of Web services will emerge for various services provisioned by the network, just as there are various service definitions for identity management and other general-purpose services. But over time, these services will converge on standards and then become part of the underlying fabric used for application development.

Ettienne Reinecke, CTO of Dimension Data, a global provider of systems integration consulting services for operations and networking, suggests that the convergence between the network and application services is all a matter of getting the standards right. After all, the network itself is interoperable only because it is completely standardized.

"Standardization leads to convergence between the network and the application," Ettienne Reinecke, CTO of Dimension Data. "Standard services become points of consolidation. Active Directory can be the repository for email addresses and phone numbers, but also for IM accounts, VoIP information, and so on."

As the change toward standards on every level continues, the network will be able to absorb those standards that are generic. From the Information Technology Infrastructure Library (ITIL®), which specifies high-level best practices for managing and delivering IT as a service, to creating a common form for events that can be recognized in one company's network and then passed to another, to the specific definitions of Web services for functions such as accepting information from RFID readers, the more standards exist, the more potential the network will have to provision them.

Intelligent Data

Another issue related to the migration of services to the network is the need for data to take a standardized and intelligent shape and describe itself as it travels through the network. With such metadata available, the network can realize its full potential to recognize important events and perform other services in an efficient manner.

Intelligent data means data that has a standardized form so that when a network device inspects the packet stream, it can quickly recognize the type of data being transmitted and quickly perform its job of inspecting, transforming, or publishing events based on the data. For example, a request for inventory availability about a particular part could be routed automatically to the vendors who supply that part based on a part code or manufacturer ID number. Without intelligent data, network services must spend many more processing cycles understanding what data they are looking for and what to do with it. The issue of intelligent data will become more and more urgent as more processing moves to network-based services.

“In order to have a really useful smart network, you need smart data,” says Richard Ross, of DSG Corp., a consulting CIO to private equity firms. “We need to start rearchitecting our applications and data so the metadata is attached and the network can do its job.”

Necessity of Service-Oriented Infrastructure

What, if anything, stands in the way of this service-enabled world of flexibility and innovation? In short: operational stability and maturity.

Most of us know from personal experience how quickly we abandon any service on the Internet that fails to work consistently and reliably. To take advantage of the potential of SOA, companies must make their services reliable, secure, and scalable, whether they are inside or outside the firewall.

Failure Through Success

A common problem for a company creating services is that nobody ever uses them. Another common problem is that everyone does, and a breakdown in scalability and operational performance turns success into failure. In about an hour, with modern development tools, almost anything can be exposed as a service. But just having some code running on an application server does not mean you have a service that supports transactions at volume. Depending on the nature of your service, you might need to configure load balancing, firewalls, SSL, and caching devices in different ways or change your network architecture in other ways to help ensure scalability.

“Now that partners are using our SOA platform, we now have less predictable traffic flows from less predicable sources, which means the network is much more integrated into the flow of the business application,” said Paul Lawler, VP of Technology Operations for Travelport, one of the largest travel services companies in the world. “If a partner runs a TV campaign that is driving traffic, the network must alert me when traffic is spiking so that I can do something about it.”

In most organizations, the IP network is the most mature, reliable, and standardized service provided. It is only natural in creating a new infrastructure to provide operationally robust services that the network should be the foundation.

Without the stable foundation of the network, problems such as debugging, reliability, and quality of service are amplified. Using network protocols avoids the problem of excessive traffic that can occur when applications of previous generations are service-enabled.

Without migration to the network, scalability becomes a larger problem. The network layer is a much more robust platform for scalable service delivery given the nature of the performance problems that have been addressed in successive generations of products. Network performance is measured in milliseconds, whereas application server performance is measured on much slower time scales.

In the long term, as more and more standardization proceeds, service delivery using a network-centric architectural framework will do for SOA what IP did for transport.

Architectural Implications

One major implication of providing these services through the network is a convergence of enterprise architectures and network architectures. CIOs will increasingly determine their network architecture based on the way that business objectives and strategy in pursuit of growth, agility, and brand awareness translate into functional needs, which then are provisioned and supported by the network. By using the network to provision more and more of what is needed to implement SOA, CIOs will become able to overcome perceptions of IT sluggishness and inability to foster greater customer collaboration.

For example, if virtualized services are used to support a new line of business, then the expected volume of traffic must be taken into account to properly provision the virtualization service. The volume of traffic will be determined by the amount of business activity generated by the department. So, as the network becomes a part of delivering primary services, business planning, enterprise architecture, and network architecture must be planned in tighter coordination than ever before. It is critical that organizations examine architecting the network to the business strategy before moving to the provisioning phases.

The capacity and capabilities of network devices must change as they are asked to do more. Network devices will become units of design in determining how services will be provisioned in an enterprise architecture.

Network topology will be influenced as well. Networks must be constructed to create the optimal number of points for information collection to recognize and capture application-oriented events and deliver other services. Each of these collection points must have appropriate access to traffic and processing capability. When topology becomes a business issue, without central points for virtualization, the cost savings of virtualization cannot be achieved.

It is important when facing these issues not to confuse a clear view and a short distance. The clear view is an enterprise and network architecture working in harmony. This is the grand vision of the network as the intelligent platform for business change enablement. Services in such an architecture are based on standards where possible and provisioned where it makes sense. Important events are recognized and fed to the applications that need them. Applications are simpler and more powerful. The network and enterprise applications provide more value working together than artificially separated.

To create such a platform for business transformation means examining networks that were designed sometimes decades ago and then incrementally enhanced. A vision will be required and then a roadmap to achieve that vision. It is vital to understand the steps along the way. The two most likely first steps, those steps in the short distance, will involve network provisioning of security and event recognition for applications.

Questions for Further Analysis
Has your enterprise and network architecture been adjusted to meet the needs of any planned SOA implementations?
How will you meet the operational challenges of implementing an SOA?
How could you benefit from increasing the role of the network in service delivery?
What services are most naturally delivered by the network?
How will exposing services outside the firewall change business relationships?

Security Services: Charting the Migration

Traditional network security functions such as firewalls, SSL encryption, and VPNs, along with newer capabilities for message-level and application-level security and reducing unwanted traffic, provide the most complete example of how services might eventually migrate to the network.

Many of the network security functions started as software that ran on an application server. In this form, the value of functionality such as firewalls and SSL was initially proven. Deployment of these functions at scale occurred through special-purpose devices that used custom-built, dedicated hardware to deliver maximum performance.

Based on this structure, the network landscape became layered with different sorts of devices serving different purposes. In some environments, each device was provided by a different vendor, at times complicating management, monitoring, and maintenance.

Distribution, Consolidation, and Integration

In a sense, all of these security functions started as part of the network. But just like the Web services that are now being delivered by applications at endpoints on the network, they are discrete units of functionality.

Now, instead of running on these discrete devices, security services are being distributed, consolidated, and integrated into the fabric of the network.

For example, special-purpose blades can be inserted into routers and switches to distribute firewall functionality wherever it needs to be in a network architecture. Cisco adaptive security appliances (ASAs) consolidate firewall, SSL, and intrusion detection into one integrated package.

The firewall functionality in Cisco ASAs also supports virtualization. This means that one device can imitate many different firewalls. This translates into huge savings, for example, if the individual firewalls for many different locations are consolidated onto one device. But this virtualization is only possible if the network architecture has a topology that routes connectivity for each of the locations through the ASA device with the virtualization capability.

After a consolidated device is in place, it is likely that device functionality will grow in scope. As virtualization is added to each of the functions in the integrated appliance, the potential for cost savings grows further. The integration of these devices in one appliance with one management console simplifies the tasks of monitoring and maintenance.

As other services become mature, they are likely to follow this same lifecycle:

1. Proof of concept in software
2. After maturity, deployable as a discrete unit
3. Consolidated into appliances or distributed as needed
4. Virtualized to achieve cost savings

The more completely the service in question is standardized, the faster this cycle will take place.

Security and SOA

As companies pursue Web 2.0 business models and start implementing Web services–based APIs as gateways to new flows of transactions, fresh security challenges arise that require new forms of architecture and the application of the flexible mechanisms just described.

In an SOA world, the traffic coming in and out of a company's network has a much more complex profile. Some Web services simply provide status information and have no power to change systems of record. (Think of FedEx's track and trace application, for example.) Other Web services enable e-commerce transactions or update supply chain information as part of a vendor-managed inventory process. Misuse of these services is far more damaging, and the protection provided by the network and other security mechanisms must be more robust.

For most companies, Web services arrive first slowly and then increase rapidly, and unless the network has been architected to allow flexible application of security techniques based on the risk profile of the services, difficult tradeoffs must be made, and the application of appropriate security becomes more cumbersome.

Infrastructure and IT Security

The network can also enhance the value of applications by capturing events and reporting them. One prominent example related to security is SAP's Governance Risk and Compliance application, which is enhanced by services in the form of xApps created by Cisco to capture important events in the network and post them to the application. The Infrastructure and IT Security xApp functionality with SAP's GRC applications, combined with Cisco network optimization of the SAP GRC underlying infrastructure, is focused on monitoring threats to network security and making sure any changes to the network or security parameters are authorized. The source of information for this application-oriented service is the Cisco Intrusion Detection Service (IDS) module. This module generates raw information about attacks on the network and configuration changes. The Cisco Security Monitoring, Analysis, and Response System (MARS) security monitoring device accepts the stream of information from the IDS module and is able to apply rules to determine if an important event such as a denial-of-service attack or an unauthorized change in network security has occurred. If a security incident is discovered, Cisco Security MARS uses software on an AON blade to send notification of an offending event to the SAP GRC.

Crafting a Service-Oriented Network Architecture

Applications can be made immensely more effective through AON. When more generic network-based services are added along with specialized services for location or unified communications, the character of an IT infrastructure changes and becomes more flexible and supple. But, as already noted, using these network-based services has significant implications for the architecture of your network. The questions then become:

- What is the right architecture that will allow your company to take advantage of the power of the network?
- How can you design such a network and implement it?

The answer in short is that by deploying enterprise architecture services from Cisco and partners, you can discover the right way to adapt your network architecture to maximize its business value.

The Cost of Looking the Other Way

Although it is easy to claim that improving your network architecture is a good thing, it is less clear to know how much of that good thing you need. In the past, network architecture was more like office space. You could see pretty clearly when the office was getting cramped or when the transport-oriented network was getting overloaded, and you could plan to expand capacity.

As more and more services are added to the IP network, however, network architecture and capacity planning become more complex. Within the stream of IP traffic, voice packets, for

example, must be given priority. Although services for security, identity management, and so on might have predictable growth curves, when a data center is provisioned with various virtualized services, the growth in traffic can be extremely irregular.

Application-oriented networking adds new requirements for topology. If a network is not constructed with the proper consolidation of traffic through a small number of points, then AON might require so many blades at so many points that it becomes intolerably latent. Virtualization requires a topology in which many endpoints are connected to a single location that performs the virtualization.

The Value of Getting It Right from the Start

Melding the network with enterprise architecture makes getting to the right architecture for network-based services more difficult still. This is usually an incremental journey of several coordinated steps.

One danger in pursuing a business strategy without incorporating network-centric principles at the origination of the idea is that the business value can be lost in the vast functional potential. The primary benefit of enterprise architecture strategies early on in the IT planning process is the ability to create more business value to keep pace with the ever-changing global marketplace.

Services-Led Acceleration: How Cisco Helps

The Cisco approach to helping a company design and evolve toward the best IT solution is based on customizing the general style of the enterprise architecture to the specifics of a company's business strategy. Cisco and its deep ecosystem of partners know about technology, architecture, and archetypical aspects of vertical industry markets. A company seeking advice from Cisco knows the state of its business and where it wants to go. From the combination of all of this knowledge, the right plan can emerge.

It is only through mastery of all of the details of how the current network is constructed, how the current and planned enterprise architecture employs the network, how network services will be exploited, and how the business strategy will affect all of this that the right architecture and roadmap can be constructed.

Enterprise Architecture Services and Business Value Acceleration

As the network becomes the vital foundation of the enterprise IT infrastructure, Cisco "strategic" enterprise architecture services, such as Advisory and Advanced Services and SONA-related collaborative discovery sessions, will play a vital role in helping customers align enterprise IT architectures with business strategy and process change.

"As intelligence migrates to the network, the way an organization designs its network architecture becomes fundamentally important," says Nick Earle, Vice President of Cisco Services for European Markets. "The network is no longer just the "plumbing" that provides data connectivity. It is the technology foundation to delivering services that enhance business performance and raise productivity."

When the customer has deployed intelligent network services such as security and presence, and when you have applications such as unified communications converging on the same network, strategic enterprise services compose the essential upfront strategic element to moving from the transactional economy to one based on more open, common standards of interactions.

Architecting the Network-Centric Enterprise

According to Bill Ruh, Vice President of Advanced Services at Cisco: “To provide forward-looking, network-centric strategies, it is ideal for Cisco to be directly involved in the network architecture design at the origination of the problem-solving phase or changes to business processes and corporate strategy, or to accommodate emerging technologies and applications often organically determined by consumer Internet adoption such as Web 2.0 tools.”

According to Ruh, the primary benefits of a service-led, SONA-framed Cisco services engagement are the ability to accelerate business value creation in the following ways:

- Increase internal process flexibility
- Reduce costs through standardization
- Foster innovation inside and outside a company
- Improve the value created by enterprise applications
- Boost adoption of Enterprise 2.0 business models

“Cisco enterprise architecture strategies illustrate to customers how Web 2.0 is rapidly becoming Enterprise 2.0,” says Ruh. “We help enterprise customers understand that the entire foundation of this new wave of business value is reliable, manageable, and operationally robust dynamic services, which can only be delivered by the strategically architected network.”

A Shift to a Services Business Model?

“We are sometimes asked whether this means Cisco will become a services company,” comments Karl Meulema, Vice President, Cisco Customer Advocacy Marketing and Channels. “The answer is an emphatic no! We have no ambitions to build a large consulting arm. Rather, we aim to engage with our customers at a higher level and to empower our partners to participate in the service-led acceleration of our mutual customers’ corporate objectives.”

Cisco has developed a robust program to educate partners about the process for delivering services and support. “We are helping our partners transform,” says Meulema, “by enhancing their abilities to introduce new services for implementation of advanced technologies and network-based architectures.”

Cisco is also working closely with application developers such as SAP and strategic alliance partners such as Capgemini as the emphasis shifts from applications that work *on* the network to applications working *with* the network. For example, functions such as security, mobility, and unified communications can be delivered as shared network utilities to achieve improved development and deployment.

Velocity Value Imperatives

“Enterprise architecture services from Cisco and partners increase the velocity of customers’ businesses, partners’ businesses, and, of course, Cisco’s business,” says Sheila Talton, Vice President, Cisco Customer Advocacy Advisory Services. As Cisco moves from supporting products to systems to architectures, the role and relevancy of strategic enterprise services increase. With architectures in particular, the amount of service and support needed to help ensure customer success increases.

“CIOs are continually challenged to align IT and business processes to achieve agility and responsiveness and a cost-effective strategy for business process transformation,” says Talton.

“While many enterprises today do not think of the network in those terms, Cisco enterprise architecture services help customers overcome structural hurdles such as too many IT layers and legacy systems, costly and lengthy custom development and systems integration, and poor resource allocation.”

This is crucial, according to Talton, because Cisco enterprise customers are experiencing a shift away from using the network as a pipeline for moving information and, instead, to use the network as a platform for integrating business strategies, processes, and goals. Essentially, it is about Cisco managing change with partners and customers in the fast-moving shift from transactions to interactions.

Questions for Analysis
What specific customer problems can be solved through network-centric strategic services and architecture design? How are enterprise architects training themselves to add the network as a services delivery platform? What skills are required to increase the role of the network in service delivery?

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