Web Services Management

Introduction

Traditional Enterprise Management Systems are having to adapt to managing whole new levels of complexity. This complexity comes from two different but migrating areas; one a move to tie IT needs to business goals thus introducing a business service concept and two being able to handle the whole new dynamics of web services that operate both inside and outside the enterprise infrastructure and beyond into the internet.
Enterprises are rapidly migrating from utilizing pure client-server applications to robust web applications and now to integrated web services. The adoption rate of these web services are increasing and they are promising to become a major part of the enterprise in the near future, bringing with them better integration between applications, applications and users, numerous devices and dynamic services. With this migration, management becomes a higher priority and IT managers must implement solutions that provide an end-to-end management of all business processes at agreed service levels whilst tracking transactions from beginning to end via numerous companies, IT environments, the internet, systems, applications and devices.

Traditional enterprise management solutions will not be enough to manage the dynamic web services environment because of its 'distributed and loosely coupled' nature. Thus while Web services brings integration benefits, they also bring management challenges for the Web Services environment. The industry is beginning to address these management solutions, which will open up the deployment of web services. A number of companies are working in concert with standards bodies to create the right framework to improve management of Web services platforms as well as management through Web services. The ability to manage Web services between companies and across numerous heterogeneous environments will offer clients greater adaptability, flexibility, security and reliability to monitor and measure processes.

In this paper we intend to highlight the migration of enterprise management solutions towards managing web services. We will take a closer look at its heritage in managing client-server environments, managing web applications environments and the benefits seen so far. We will show why web services are important and what benefits can be obtained. We will also discuss the need to manage these services and the challenges created. Finally we will look at the benefits of web services management. It must be emphasized that our goal here is to provide a high-level management discussion as to managing web services and not to provide a technical description. Thus much of our focus will be on the needs and benefits and not on in-depth migratory or technology.

Heritage of Management in Client-Server applications

As companies moved from a centralized mainframe centric model where management was easier, predictable and generally there was huge availability to a more distributed client-server environment, it introduced more complexity, more elements, more manpower and of course more expense. Managing the infrastructure meant managing networks with new communication technologies, systems with a wider range of architectures, more mission critical applications, desktops from personal computers to thin clients as well as PDAs, notebooks and even cellular phones, different type of end-users including remote and tele-workers. This introduced numerous points for failure and a headache for management. For client-server environments to become productive meant introducing a holistic integrated approach to management. The IT managers dream was to have end-to-end management within an increasingly complex infrastructure.

This introduced the concepts of "Frameworks" as well as the "best-of-breed" deployments and introduced more robust modules for each area of client-server. Many companies span to provide the right solutions but the level of maturity was still low as was the level of integration.

The main lesson learnt was that migrating a centralized management policy to a distributed environment did not work and that it was not only the technology that needed changing but also a more robust management policy tied to a business perspective. A solution was also needed to provide better integration globally, for resource planning, change management, monitoring and administration and performance analysis.

The client-server management solutions that evolved for managing distributed systems across multiple operating system platforms spanned management tools utilizing a variety of management modules that were broadly grouped under four categories.

Network Management solution managing complex network infrastructure; they proactively identify and resolve problems across the network.

Systems Management tools managing performance of hardware, software, networks and discrete applications as a whole. It focuses on providing optimum availability and performance of the system.

Application Management providing management of all applications and associated mechanisms from anywhere including sales automation, ERP, CRM, mail and databases. It also protects data with policy-based backup, anti-virus and security mechanisms.

Service Management helping organizations to deliver services at agreed quality and price. It integrates IT and business SLAs and ensures business objectives are continuously met.

Distributed systems management was more than a set of management applications; though complex and expensive, the client-server management provided increased operational effectiveness, provided better service levels and increased performance. Benefits of traditional client-server management are shown below in Table 1.

Table 1: Benefits of traditional client-server management
Raised user productivity
Increased operational effectiveness
Better service levels
Rapid ROI
Safety, security and reliability
Increased system availability
Lower total cost of ownership
Simplified administration tasks

Source: TekPlus

Current Management of Web applications

As the Internet took centre stage and web technology started to appear, the talk was all about e-commerce, e-business and e-services. Web sites were fast becoming company front stores and new classes of electronics services were mushrooming requiring accessibility across the enterprise and even globally. Information was available as never before with immediacy and was even highly personalised. In the e-business world, speed and flexibility became critical to organizational success with round the clock availability and a hundred percent uptime of mission critical resources. Any downtime resulted in significant loss of revenue and reputation. Add to this the migration of backbone networks to IP technology as well as the need for firewalls and other security measures, the need for more storage solutions, more agility in software, better service desks, convergence of voice and data, utilization of Virtual LANs, integration of new mission critical application categories of ERP, CRM, Supply Chain, Messaging and the “internet revolution” became a nightmare for IT managers.

Administrators needed new tools to be able to effectively manage the e-business systems as well as the corporate infrastructures whilst undergoing migration. The pace of business out ran the organizations ability to keep up and have control over the systems, networks and applications. Additionally, web related data, visitor numbers, response times, failures, customer characteristics, customer experience were all new measures to be addressed. Web Based Enterprise Management (WBEM) Schemes began to appear and were used to build the management infrastructure for end-to-end management of e-services, Java enabled applications took hold and terms like CORBA, CMIP, JMAPI became common place. Web enabled management together with a systematic approach to integration and more predictive analysis utilizing smart plug-ins took hold.

Anticipation of failures and bottlenecks before they can impact the business in this more complex environment is now a must. In addition, Web applications are helping enterprises to reduce costs and streamline business processes with improved efficiency, whilst helping to establish new partnerships and allow closer working with customers. However they tend to be resource intensive, which increases the workload on web servers and web application servers. Critical requirement for web application architecture is greater scalability, better load balancing and transaction management capabilities.

The benefits of Web Application management are illustrated below in Table 2.

Table 2: Benefits of web application management
Reliability
Increased performance
Greater scalability
Enhanced efficiency with faster development processes
Safe online transaction management
Availability of business information & other digital assets over the web
B2C interactions
Real-time business integration over Internet
Better website management
Higher customer satisfaction

Source: TekPlus

Future Management of Web Services

Why Web services are important and what benefits can be seen

Current economic situations are driving the trend to achieve maximum ROI from IT infrastructure with Machine-to-Machine (M2M) integration and Business-to-Business (B2B) collaboration. Today every enterprise has its own customized IT infrastructure, which is not necessarily identical to those of their business partners and thus creates barriers to B2B collaboration. Earlier technologies such as EDI and EAI promised to overcome this problem but most of them had limitations, were very expensive and inflexible to implement and made collaboration between businesses with different architectures virtually impossible unless you had deep pockets and numerous resources available. The growing need for a superior technology solution is evident for better integration and greater business collaboration and the evolution of web services promises to fulfil this need. It provides a culture where enterprises can expose their existing and future business applications via web services and these web services are then discovered and used by their business partners. It dynamically promotes and integrates one application to another regardless of the underlying hardware and software platforms and languages. This in turn offers improved time-to-integrate and lower Total Cost of Ownership compared to EDI, EAI and other B2B solutions.

Web services support integration of systems (inside and outside the corporate firewall) with customers, suppliers and business partners. As a result they open up new markets, deliver real-time information and improve supply chain dynamics. They have the ability to integrate devices, people and other web services in an excellent manner. Key characteristics and related benefits of web services are illustrated in Table 3.

Table 3: Web Services – key characteristics and benefits

Characteristics		Benefits
Integration	Better data and function sharing	Results in better application integration
Access	Provide access through different interfaces	Highly important for applications requiring multiple access methods; it also makes addition of new access methods much simpler
Flexibility	Communication with each other (different web services)	Machine-to-machine communication; links between different companies

Source: TekPlus

Web services are self-describing software components (XML) that are wrapped inside a specific set of Internet communication protocols and dynamically interact with each other in real time. The provider creates the web service and its service definition and registers the service using the UDDI specification with a service broker. A service requester may find the service via the UDDI registry, which provides it with a description of the service (WSDL) and location information. The requester uses this information to directly bind to the service.

Web services currently utilise four fundamental core sets of standards shown below but new standards are still being developed especially on security and management

XML	Extensible Mark-up Language	To provide platform-neutral method to represent data
SOAP	Simple Object Access Protocol	To define the data communication protocol for web services
WSDL	Web Services Description Language	Defines a standard mechanism to describe the web services
UDDI	Universal Description, Discovery and Integration	To provide the means to register and discover the web services; it speeds up interoperability and adoption for web services

Source: TekPlus

Most applications are designed to work within the boundaries of the corporate firewall and can't work beyond their operating systems – that's where web services build the bridges for interoperations and manages the interactions between systems. Web services improve the flow of information between businesses, applications and service components to provide excellent integration and interoperability. It intelligently ties enterprise applications running on heterogeneous platforms and fills the communication gap arising form using one development environment over another for business process automation. The web services promises to fulfil true e-business objective, of access to any information from any device at any time. The platform independence and loosely coupled nature of web services make them ideal for B2B commerce and system-to-system integration with business partners. As we observe in the next section, managing this type of infrastructure is going to require huge capability and traditional systems management

products will have to rapidly evolve as well as incorporate service management concepts whilst putting the right web services architecture in place.

We at TekPlus believe enterprises will adopt web services step by step. In the first phase they are deploying web services within the corporate firewall, the next phase will show integration outside the firewall with customers and business partners and ultimately it will be publicly accessible.

Web Applications	Person-to-person communication
Web browsers	Person-to-application communication
Web services	Person-to-application communication Application-to-application communication

Source: TekPlus

It is assumed that as they develop, different web services, build on agreed standards will easily communicate with each other over the Internet, such as .NET with J2EE in an open and flexible way. This offers great potential for B2B communication and integration. In addition, many web services will be incorporated to provide access to existing and legacy applications on the web and as this happens, thought will have to be given to openness and scalability issues of these applications. Other benefits of web services are shown below in Table 4.

Table 4: Web Service benefits
Improved integration of disparate assets
Improved accessibility to business services by a large number of communication devices
Formation of on-the-fly partnerships
Portability – ability to move the logical components of a solution from one platform to another
Real time processing
Enhanced productivity with collaborative commerce
Rapid deployment of services
Maximising use of automation
Streamlined operations with improved co-ordination between business processes and transaction

Source: TekPlus

The need to Manage Web Services and the challenges created

With increased usage in the business environment and the current popular coverage it is receiving, the benefits of incorporating web services are becoming evident. But unless managed actively, it is difficult to generate those 'tremendous business benefits'. Management of loosely coupled components is of utmost importance as these applications extend across networks and organisational boundaries. Performance management will be difficult and often the resource being accessed will not be under direct management.

The barrier holding back wider deployment of web services beyond the corporate infrastructure has till now been the lack of solutions for testing, performance management, and monitoring and service management. Thus certain applications are put on hold until web management solutions are deployed.

Web services offer extreme flexibility and efficiency to an enterprise, but have greater complexity. Traditional systems management programs designed for client-server architecture do not have the ability to work with loosely coupled web service components with their unique runtime dynamics and therefore raise the need for a separate web services management layer. Therefore, when thinking of managing this new dynamic web services environment, the traditional enterprise management solutions will have to evolve by incorporating solutions to this new level. Additionally, approaching web service management using the same policies and deployment as in client-server is also a recipe for chaos. As seen in our earlier client-server discussion (mainframe to client-server), a whole new approach is needed with different environments. In the case of web services, this approach should be structured around the concept of service-oriented management and utilize some of the principles discussed in the web service architecture articulated by some of the standards body. This new level of thinking also needs to be extended to adopting formal service management policies such as ITIL tied to business processes. Organisations have to realise they now have to think of managing services in a holistic end-to-end manner.

The traditional management solutions vendors have anticipated this change and are beginning to work with standard bodies like W3C and OASIS to create the right framework within the web service architecture for both management and security. The idea being to create more mission critical use of web services beyond the company's internal infrastructure and intranets and out to B2B and B2C environments on the Internet. As we are at an early stage, we anticipate there will still be some battles around standards. These evolving standards and management solutions will play an important role in driving the web services market.

We see the traditional enterprise management companies leading the space with reliable solutions as more robust mission critical usage occurs. Whilst this is beginning to happen they

are numerous niche players wholly focused on just providing best of breed products purely for the web services layer. Some are focusing on managing the web services platforms and some have moved beyond to focus on managing though web services by building systems that intercept Web-services requests and manage the actual services. The traditional enterprise management vendors have also started extending their product portfolio in this direction, e.g. Tivoli and HP. HP has articulated its Web Service Management Engine as the next step forward for OpenView to extend enterprise-class management capabilities to the web services realm. As time goes by we also expect the market to consolidate with a fewer number of vendors.

Challenges

Web services management needs arise across key areas like performance, security, accessibility, interfaces, collaborative and peer-to-peer environments and therefore should be designed to provide maximum business-centric benefits. The key challenges currently facing the development of such solutions are as follows.

- Web service standards are still emerging. Therefore to manage an emerging stack of web services with many variations by vendors and standards is difficult. We at TekPlus do not see any single set of agreed vendor supported standards for another two years.
- The technology is still in the state of infancy and full life cycle management needs will vary according to the growth and maturity of the technology. Much experience is still to be gotten.
- Right now the situation is chaotic, there is no recognised single body in charge of setting everything and although collaboration is occurring between bodies and vendors, the path is still foggy.
- Already the web services implemented in existing application infrastructure are making for a complex environment, and this complexity created makes the management environment much more challenging.

The above challenges and many more are currently being addressed and overtime will be nullified. Already Web Service Management solutions are beginning to appear and the benefits these solutions bring are explored in the next section.

The benefits of Web Services Management

Web services management will play a major role in obtaining positive Return On Investment (ROI) within an enterprise with performance and availability improvements. Web services with service-centric computing makes better utilization of resources, reduces Total Cost of Ownership (TCO), increases flexibility to meet changing business needs and achieves better levels of scalability. Through Web services management, enterprises will be able to coordinate the actions of Web services to better ensure reliability, performance, security and other management functions. Table 5 shows the Benefits of a Web Services Management solution.

Table 5: Benefits of Web Services Management
Business
Reduces Total Cost of Ownership
Simplified business processes
Improved time-to-market
Provides business consistency
Increases revenue
Improved interactions with Clients
Infrastructure
Improved Security
Optimisation of infrastructure
Provides End-to-End Management
Higher Availability
Greater Scalability
Better Reliability
Improves Performance

Source: TekPlus

While managing a web services environment, the key benefits an enterprise comes across are described below. These benefits are addressed both from an infrastructure viewpoint as well as a business viewpoint. One aspect to bear in mind is a lot of these benefits can be obtain immediately even while deploying limited management solution but as a full management solution become available and are deployed, the combination of benefits will drastically enhance the scope of deploying web services.

Security – Web services management provides the security required to expose business applications in an open environment to other web services over the Internet. These business applications, generally exposed only in a closed environment, when exposed to an open environment without any web services management, make the exchanges less secure and reliable.

Optimisation of infrastructure – Web services management optimises the web service architecture to yield optimum benefits; it supports efficient execution of business

processes via service-centric computing. It also leads to a reduction in the cost of integration and communication with customers and business partners. You can also map the relationships of service components as well as leverage existing infrastructure.

End-to-End Management – As the enterprises move more towards a holistic and comprehensive management approach that includes web services, the web service management solution will address end-to-end management as a whole, from storage management, configuration and operations, performance and availability and security management issues throughout the infrastructure. (servers, host systems, host databases to application servers, client terminals, web servers and browsers).

Availability – Web service management enables the enterprise to change the configuration (e.g. update) of the web services without taking it offline thus making it available to the users who can continue to interact with the service. Thus web service management enables the enterprise to preserve its 24x7 availability status. It also enables the deployment of new services without any disruption in service availability. Thus real time changes can occur on the fly.

Scalability – Web services management promises scalability by providing centralised (a single point of) control over all applications and services in the web services environment. It also provides flexibility to grow as per your business needs with scalable web services architecture whilst allowing re-use of the service components and thereby improving development time.

Reliability – Web services management highlights reliability of the business by ensuring full visibility and functionality of mission critical processes across multiple applications, platforms and organisations. It also enables enterprises to obtain data to enhance further improvements and provides added incentives to deploy full end-to-end solutions and to act on the information received.

Performance – Web services management improves performance of the web service architecture by providing monitoring and managing web services executions, event logs and error notifications. It enables monitoring of complex service networks; identifies service network independencies with performance statistics and helps in improving the service performance. The management solution also optimises the performance of the web service architecture for better investment returns and also coordinates the activities of the services real time.

The business benefits that directly flow from the above are highlighted below.

Reduced costs – Web services management enables an enterprise to significantly reduce or completely eliminate downtime with enhanced availability, performance and service levels. This in turn results in improved total cost of ownership.

Simplified business processes – Web services management simplifies business structures and provides extensive monitoring. This enables IT Managers to predict and respond to planned and unplanned changes.

Improved time-to-market – Web services management allows leverage and re-use of existing assets, components and services to build another web service which in turn improves time-to-market with additional benefit of reducing development costs.

Business consistency – Web services management lead to enhanced cross-platform interoperability and integrity and helps end-users deal with distributed nature of web services to keep the business working steadily.

Increased revenue – Web services management increases organisational revenue with tremendous savings in operational expenses. An example of a company using web services management to deploy web services to manage logistic capacity resulted in 20 percent improvement in cycle time and automated brokering process. The financial results were impressive with the web services providing new revenues of 50 million dollars and 1 million dollars savings in operating expenses. The company also had over 250,000 dollar savings in IT development costs.

Improved interactions with customers – Web services management offer substantial value to the enterprise by transforming the way it conducts business. The transformation is due to the management solution's ability for an enterprise to integrate business applications with others over the Internet. An example is of a financial services company with over 40,000 employees across 25 sites that build an application to provide clients with access to certain data. The Bank used a web services management solution and deployed web services so that all its systems will share a common method for retrieving data, creating updates and for presenting information to others. The Management solution will ensure availability levels and security policies are met.

Conclusion

We have shown you how enterprise management solutions have evolved from a client-server environment to managing web applications and now require to change again to manage web services. Web services, although still in its infancy offers substantial business value and will transform the middleware layers of the way we conduct business. Organizations will deploy and integrate web services dynamically across the enterprise and beyond with the benefits of automation of mission critical processes. This will facilitate better exchanges between clients and partners. The key to this will be the ability to manage such an environment across key functional areas as well as outside the corporate boundaries. This will mean deploying Web Services Management solutions that are fully integrated over time with the enterprise management solutions currently available. This integration will provide end-to-end management and should occur with service-oriented management in mind. The benefits obtained from solutions deployed already should be enhanced but with the new architectural framework in mind. Web service management will be complex compared to traditional client-server and web application management solutions but the benefits it will provide will have a huge impact on the business.

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