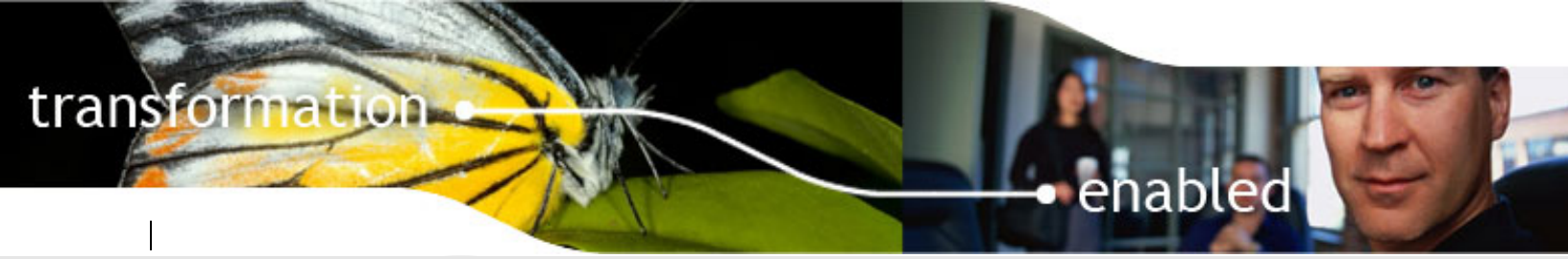

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SOA Management Landscape

Achieving Enterprise Service Management within the Modern IT Architecture

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Abstract

This whitepaper will describe the challenges faced by executive management and the challenges faced by IT in response to ever-changing business needs. Service Oriented Architecture (SOA) is proclaimed to be a panacea for business challenges and has often been implemented as a reaction to these challenges without consideration for its appropriate place as a corporate strategy. SOA is an integral part of corporate governance and must be considered a new paradigm for architecting business solutions. But, the layers of abstraction introduced by SOA pushes IT closer to the business processes and farther from the applications, effectively obscuring the IT infrastructure from the architects. Not only will this paper examine this phenomenon and the reasons SOA management is necessary for successful governance, it will highlight the features of each of five products that will help achieve an ideal SOA management solution.

To ultimately be successful with SOA, you must be able to not only monitor point-to-point Web services, but also to manage the relationships between all the components in an SOA. As you mature in your implementation of SOA, you will pass through five stages of maturity - from chaotic to value. During this journey, your management needs will evolve. As such, it is important to select a vendor/solution that will be able to meet your management needs throughout your journey to a fully-mature SOA.

Several SOA management products are available to help make this journey manageable. Some products focus on bottom-up Web service monitoring, others on a top-down, business service view, and some offer both. We summarize the offerings for five vendors in this space – Actional, AmberPoint, HP OpenView, IBM Tivoli, and Oracle WSM – and highlight the differences and potential synergies between vendor offerings, to help you make the best choice for your business.

1. Enterprise Challenges

1.1. Business Challenges

Each day, executives and senior managers face a myriad of challenges while working towards increasing stockholder value. Mergers and acquisitions alter our IT landscape by introducing disparate systems that complicate our ability to get meaningful aggregated information at the enterprise level.

All too frequently, we find ourselves trying to manage outsourcing without the ability to peer into the supply chain beyond the fringes of our companies. Distributing production and off-shoring operations, inadequate business intelligence, and ever-increasing regulatory compliance requirements all add to our information management challenge.

Before long, our ability to react to market fluctuations is inhibited and we miss critical growth opportunities. We find our market share slipping and see profits ebb. We find ourselves relying more and more on our IT resources but still seem to not get what we need. We begin to wonder if it will ever be possible to transform IT from a data processing cost center into an organic information management organization that anticipates business needs.

1.2. IT Challenges

Most corporations have silos of applications, platforms and data which serve specific business domains with very little reuse and almost no integration capabilities (Figure 1). This fact, coupled with the seemingly endless demands from the business, has caused IT organizations to adopt a "reactive" strategy. With this type of strategy, IT implements solutions that, by their very nature, are reactive (change management, configuration management, capacity monitoring, etc.)

Gaps in expectations are widening between business and IT. Service Level Agreements (SLAs) are being met, but what is being delivered to users is not meeting business needs or priorities. Business requirements are no longer stable, well-defined, or approved. There is now a single "meta-requirement" - to be able to change direction with speed and agility. For the first time, IT is expected to have a clear understanding of the business. One wonders how IT can become a "business-oriented" service.

With the promise of enabling agility and becoming more proactive, vendors are pushing an abundance of technology solutions, the most recent of these being web services and service oriented architectures (SOA). SOA (along with web services) has also gained attention as a way of aligning the business strategy and imperatives of an enterprise with its IT initiatives. IT managers, however, have begun to adopt SOA not as a new paradigm for systems design, but as an immediate coping mechanism. As a result, business managers begin to view SOA as a disruptive technology.

Unfortunately, it is not unusual for business leaders to dismiss the value of a disruptive technology such as SOA because it does not reinforce their current company goals. Then they are "left at the gate" as the technology matures, gains a larger audience, and threatens the status quo. As Henry Ford said, "If you need something and don't buy it, you'll eventually pay for it without having it."

1.3. SOA Challenges

It has been said that the key feature of an SOA is that it obscures the architecture and the infrastructure from the users and the architects and emphasizes process. Unfortunately, the key disadvantage of SOA is that it obscures the architecture and the infrastructure from the users and the architects and emphasizes process. Services act as a virtual layer of abstraction between the business and the technology. The "service-oriented" architect must understand the dynamic relationships between the needs of the business and the available services, as well as the technical underpinnings that offer the layer of abstraction required by the services.

Web services can now be enabled ad hoc with the touch of a "create service" button, but all this does is serve a department's immediate need and create potential redundancy and complexity for the enterprise. Without appropriate management controls, the propagation and misapplication of web services creates additional problems.

Einstein might well have been talking about the challenges of implementing SOA when he said, "No problem can be solved by the same level of consciousness that created it." SOA forces business analysts and IT architects to think in terms of dynamic operational needs; not simply a technical implementation of a single static requirement.

SOA is an agile architecture that forces designers and developers to focus on finding the "best" ways to improve operations and business processes. Building service-based systems involves a shift in thinking - from large-scale, centrally planned IT systems to smaller, modular development - that requires negotiation, collaboration and consensus among all of the stakeholders of an end-to-end *business* process.

2. The Road to SOA – A Maturity Model

The distinction between web services and SOA is an important one. They are two completely different things. Today, SOA cannot exist without web services and you wouldn't want to implement too many web services without an SOA. Web services are tactical in nature, while SOA is a way of thinking (paradigm) about building software components. SOA is not as simple as "standing-up" a collection of disparate web services. SOA offers a new way to exploit current technologies and inspires capabilities for future technologies.

In an effort to describe today's typical enterprise IT environment - and understand what it means to implement web services and adopt an SOA approach - consider the following maturity model. The levels of the model transition from typical organizational computing architectures to a full enterprise SOA solution.

To better understand the progression of the model, consider a typical product ordering process whereby a potential customer contacts a call center to place an order for a product. In this scenario, the call center uses common large-scale, off-the-shelf applications for Customer Relationship Management (CRM) and Enterprise Resource Planning (ERP).

The following narratives describe behavioral representations at each level of maturity and will illustrate the fundamental differences between implementing web services and implementing an SOA. Each will also demonstrate their effects on business processes and the necessity for an overarching management model.

2.1. Maturity Level 0 - Chaotic

Business Process: When a potential customer contacts the call center to place an order, a customer service representative (CSR) checks the CRM system to see if the customer is a returning customer. If not, a new customer record is created. Then the CSR has to cut and paste (duplicate) the CRM customer information into the ERP application, since that application also needs to know which products will be shipped, and their destination. Because each department is responsible for its own data and applications, the customer must be routed to different CSRs to process payments or ask questions.

Governance: IT governance is limited and does not align or support with corporate governance.

Management and Control: Project management tends to be weak and does not protect developers from the disruption created by unreasonable commitments or continuous requirements changes. Development processes are rarely defined. Sound practices are often sacrificed to meet unreasonable schedules.

Behavior: At this base level, communication, application development practices, and results are inconsistent throughout the IT organization. Even though developers are capable of performing their assignments, they work through individualized methods that show little consistency across their organization. Poor communication among developers causes common elements of functionality to be reinvented. Application integration is rare and conducted without a long-term goal. In essence, the organization lacks the capability to consistently meet its commitments and it cannot react quickly enough to changes in business tactics or strategy. Business processes are completely driven by the capability of the applications and technology. Manual work-around business processes abound.

2.2. Maturity Level 1 - Reactive

Business Process: This business process is identical to that described at Maturity Level 0.

Governance: The vertical nature of the architecture implies that each organization establishes its own governance standards. Each silo has developed its own IT culture, strategy, policies and budget. Management comes from within the confines of each silo and corporate governance may not exist. See Figure 1.

Management and Control: Management's focus is on the maintenance of each application and the necessity of reacting to the ever-changing needs of the business. Each organization typically owns its IT department and IT management occurs at the application layer. The advantage of this structure is that each department and organization can care for its own immediate needs, but at the expense of enterprise strategies.

Behavior: This is a common situation where enterprise assets and applications are owned or managed by different organizations, and the business process is entirely driven by the tools (applications). Communication between organizations is limited, and touch point integrations of applications are few. This management structure would have made it difficult to strike the deal between the Sales and Client Services organizations that provided the call center representative access to both the CRM and ERP applications since neither organization would gain any advantage. The only gain would be to the enterprise and the customer.

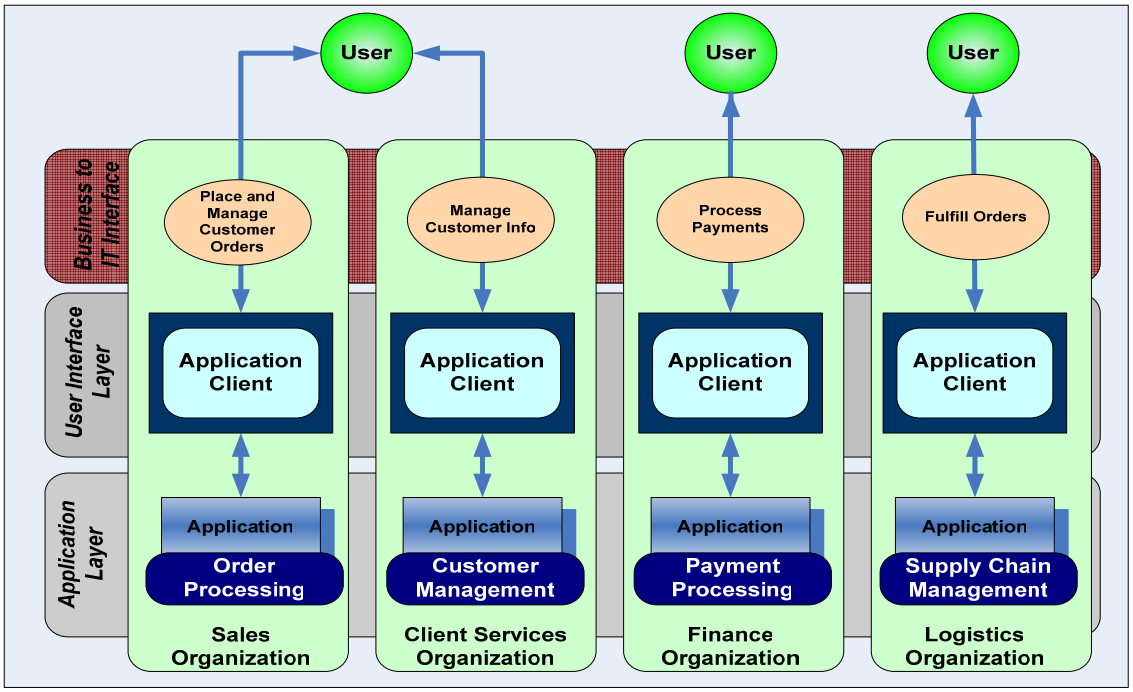

Figure 1 – SOA Maturity Level 1

2.3. Maturity Level 2 - Proactive

Business Process: This business process is identical to that described at Maturity Level 0.

Governance: Overarching corporate and IT standards and policies begin to be established and applied horizontally instead of vertically. The disciplines of ITIL and ITSM are beginning to take root. Some monitoring to ensure compliance to strategy, standards and policies is being done.

Management and Control: Management is directing its focus across the layers instead of on the individual applications. Some aspects of ITSM (configuration management, change management) are in place to reduce the impact of change to the users. Some tools, such as a rudimentary asset management data base, may begin to evolve into a configuration management database (CMDB).

Behavior: Organizational boundaries (silos) have been removed. IT has become an organization unto itself and serves the enterprise. Corporate and IT governance is emerging. The value and intent of ITIL and ITSM are being studied. Some application integration may occur but does not yet follow a business-centric strategy. Business systems are being realized as collections of applications. Even though this structure makes it easier, politically, to integrate applications and provide basic services, the business process is still entirely driven by the available tools (applications) and technology.

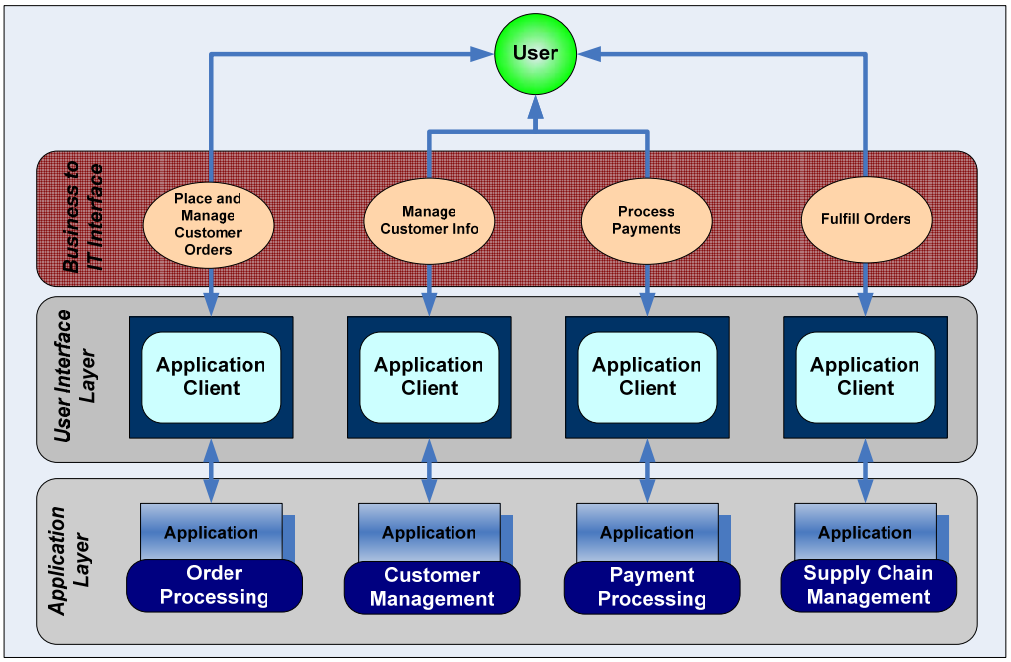

Figure 2 – SOA Maturity Level 2

2.4. Maturity Level 3 - Service

Business Process: When a potential customer contacts the call center to place an order, a customer service representative (CSR) checks their "composite" application, consisting of interconnected parts of existing applications, to see if the customer is a returning customer. If not, a new customer record is created. Then the CSR continues using the composite application to process the customer's order. The CSR must still access multiple systems and duplicate information to execute payment and fulfillment processes.

Governance: Overarching corporate and IT standards and policies are well established and maturing. The disciplines of ITIL and ITSM are understood and are being implemented. Monitoring to ensure compliance to strategy, standards and policies is being done. Composite applications are being designed to comply with corporate strategies and initiatives. Security management is uniform and mature. An application and resource catalog exists. A Configuration Management Database (CMDB) contains infrastructure meta-data for reference.

Management and Control: Management's focus is directed toward implementing ITIL/ITSM service management and has become more reactive when responding to requirements from the business. Without realizing it, web services introduced a layer of abstraction. This effectively pushed IT up the layers closer to the business process and farther away from the applications. That, in turn, brought new challenges that must be managed.

Behavior: Web services have been introduced into the architecture. Applications can be accessed via a web browser. The need for multiple client licenses has diminished. Tools are in place to help manage collections of web services. New composite applications are being designed to take advantage of the web services. Components can be reused and interfaces can be crafted to more closely favor business process. Flexibility with the interfaces has been introduced. Above all, the customer experience has been enhanced as the result of a single point of contact and reduced time required to process their request. Users have a process to request assistance or report problems. Yet, even with web services management and maturing IT service management, the business processes remain essentially the same and are still driven by the technology.

The introduction of web services has encouraged their use and consequent proliferation. Implementing a series of point-to-point services masquerading as an SOA has simply revived the old integration nightmare with just another layer of technology. With the proliferation of web services, it has become increasingly difficult for the people who need the services to find them. Services that cannot be found, in essence, do not exist. This increases the risk that developers will waste time creating services that have already been developed.

Management looks to tools and products to assist in managing their web services and monitoring their performance and availability. Management may be concerned with immediate goals (reaction) and may not consider the ability of these tools to support a longer term Maturity Level 4 solution. Implementing a tool that provides an immediate reactive solution without an ability to expand as the organization matures simply results in a cluster of services organized as well-managed spaghetti.

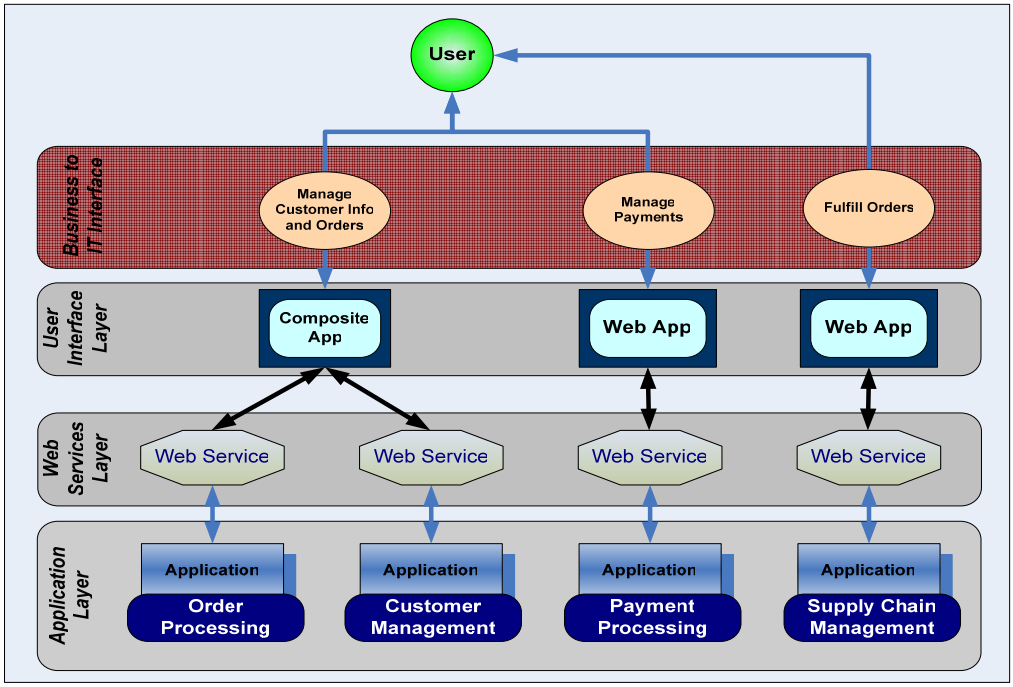

Figure 3 – SOA Maturity Level 3

2.5. Maturity Level 4 - Value

Business Process: When a potential customer contacts the call center to make a request (new order, payment, or fulfillment status), a customer service representative (CSR) manages the customer's request via a single interface.

Governance: SOA was implemented as part of a corporate governance strategy. The disciplines of ITIL and ITSM are implemented. Monitoring to ensure compliance to strategy, standards and policies is being done at all levels.

Management and Control: Management is focused on industry "best practices", repeatability, and continuous quality improvement of services. Management has become proactive and can anticipate business needs.

Behavior: The introduction of an SOA using web services has enabled a new service paradigm that directly supports a 'best practice" business process. The enterprise embraces business service management. Collections of business processes (Business Services) and the business processes themselves are modeled and linked to their infrastructure components via the CMDB. Tools are in place to manage an SOA, not just individual, point-to-point web services. A service catalog exists. Business service health and performance is monitored via executive dashboards. Dependencies between services are monitored. End-to-end auditing and accountability exists. Application design is driven totally by business process.

The introduction of yet another layer of abstraction (SOA on top of web services) completely obscures the applications from users and architects.

Once again, Management requires tools to manage their SOA and measure the performance and health of their services. Some progressive managers select tools from suppliers at Level 3 which could be augmented or expanded as maturity increases - a complete solution. Others select tools that provide web services management but just barely reach into the SOA management domain. Some select tools that will force them to adopt a "rip and replace" strategy to achieve a complete SOA management solution as their SOA maturity evolves.

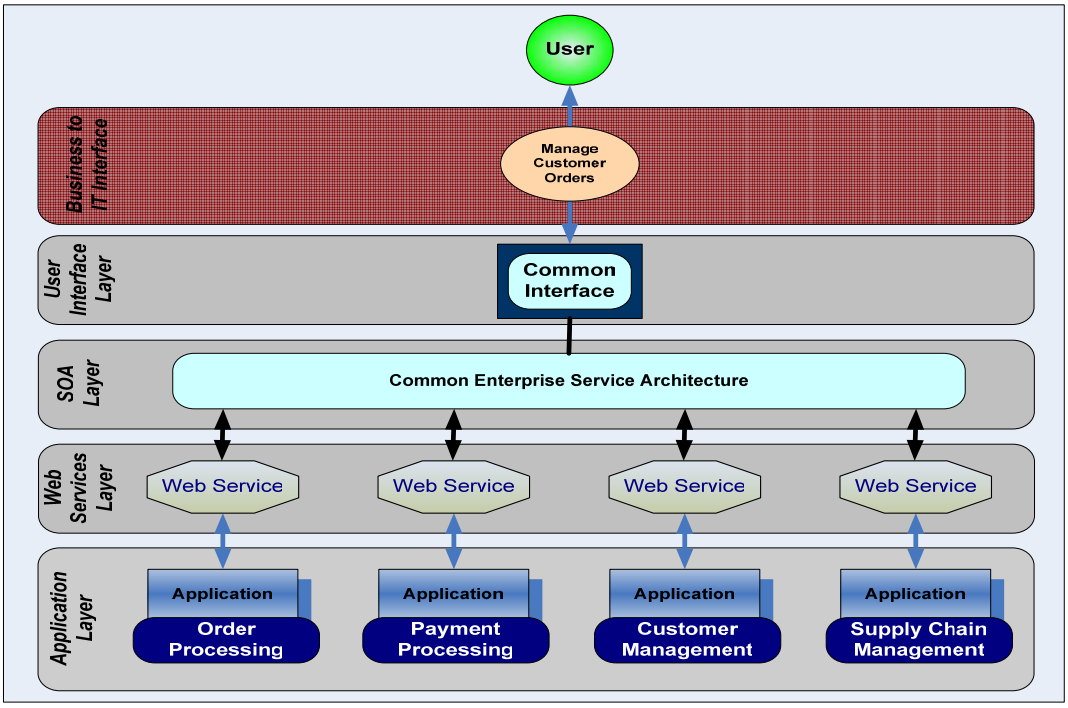

Figure 4 – SOA Maturity Level 4

2.6. Achieving Level 4

It is important to remember that the creation of an SOA is not a single large-scale corporate project, but rather the result of many independent projects that are all solving business problems and meeting technical requirements. This is much like rebuilding an engine while it is running and creates a major SOA challenge. How do you align all of these independent, isolated efforts into a stable, reliable, quality architecture that will serve the needs of the enterprise for years?

Consider the following:

- How can business and IT coordinate and work in concert to create new business opportunities?
- How can management ensure that services comply with technology, business policies, and application standards?
- How can loosely-coupled and course-grained services provide traceability and tamper-proof mechanisms for mandatory audit records?
- How can managers ensure business continuity in the event of service failure?
- How can business leaders limit corporate liabilities and ensure security?
- How can managers reduce redundancy, integration complexities and costs?
- How can IT and business leaders control how the services interoperate?
- How can service performance be monitored and measured?

2.7. Blueprint for Success

An enterprise will evolve its SOA maturity like any other paradigm. It will begin through experimentation and, over time, will pursue the ultimate goal of a continuously improving, optimized environment. The challenge for an evolutionary approach is to determine when each aspect of SOA needs to be mastered and how to build the foundation of success upon which SOA will flourish. Using a roadmap such as MW2's SOA Blueprint™ as a framework, your SOA paradigm can evolve in manageable stages.

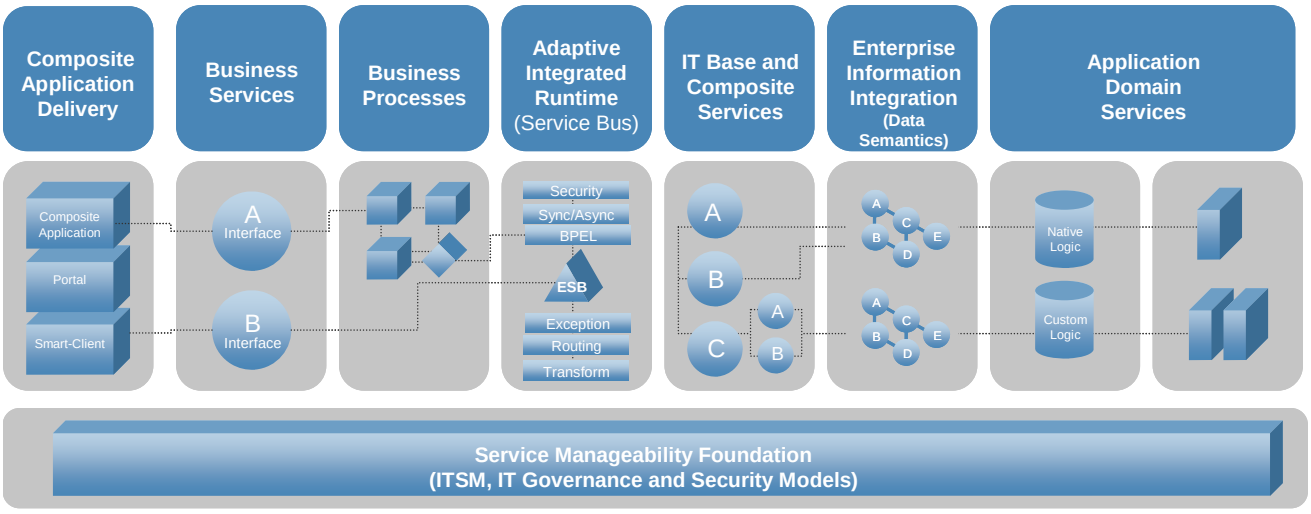

Figure 5 – MW2 SOA Blueprint™

3. Governance and Control

Governance is a decision and accountability framework. It does not prescribe how to manage an organization on a daily basis. Rather, it provides a collection of solutions and policies - coupled with a method - that encourages desirable strategic behavior. Implementing a governance solution requires well defined enterprise policies. But that is not enough; they must be managed with strong auditing, conformance and measurement processes to ensure compliance.

3.1. Corporate Governance

"Corporate governance is the system by which business corporations are directed and controlled. The corporate governance structure specifies the distribution of rights and responsibilities among different participants in the corporation, such as, the board, managers, shareholders and other stakeholders, and spells out the rules and procedures for making decisions on corporate affairs. By doing this, it also provides the structure through which the company objectives are set, and the means of attaining those objectives and monitoring performance", **OECD** April 1999.

SOA should not be an IT project; it should be a corporate initiative geared towards achieving a corporate strategy. The mission of an enterprise dictates its direction. To accomplish the mission, the enterprise must set goals and achieve them. Implementing SOA strategically results from mapping goals to areas of the enterprise that help achieve those goals.

3.2. IT Governance

The primary reason IT governance should be taken seriously is because of the distributed nature of services across the various lines of business of an enterprise. The proliferation of services that are developed and maintained by different organizations - both within and, possibly, outside the enterprise - make governance a challenge.

IT Service Management is usually known as the process and service-focused approach of what was originally known as IT Management. ITIL is the best known approach to IT Service Management. ITIL does not prescribe an ideal organization; instead, it describes the relationships between the activities and processes that are relevant to governing any organization. ITIL, therefore, is not a method, but a framework.

By following ITIL best practices, an IT organization can develop a clearer structure, and become more efficient and focused on corporate objectives. When IT is in control of its infrastructure and services, change becomes easier to manage. ITIL best practices bring a new paradigm in providing services and introducing quality management processes.

ITIL is based on the need to supply high-quality services with an emphasis on customer relationships. The cross-functional nature of business services and the development of services across organizational lines can be managed only if the services are effectively governed and compliance to standards, policies and requirements is monitored. If you've already got a strong IT governance process in place, it will serve you well as a foundation for SOA governance. If

you've relied on informal governance in the past, moving to SOA will likely require some changes in how you manage development and operations.

3.3. SOA Governance

SOA governance is part of IT governance and specifies the principles of SOA management. Having a registry does not mean you have SOA governance. It is not something you build or buy. SOA is about behavior. As with implementing the principles of ITIL, you have to change behavior to make SOA effective.

The development and enforcement of SOA policies and procedures is known as SOA governance. Governance and architecture must work in concert. Using the metaphor that gave system architecture its name - building codes, construction standards, and inspections - give building architects a context within which to work, and ensures that their designs will fit within the community. In much the same way, SOA governance provides context for system architects and designers. SOA governance policies and procedures give SOA its consistency and predictability.

The very mention of policies can be repugnant to many developers. The more innovative they are, the more concerned they are about being “hog-tied” by policies and rules. They also fear that governance will lead to bottlenecks and impractical ideological restrictions. It is essential to use communication, collaboration and Level 4-capable tools to create a governance process that promotes service enablement and earns a strong buy-in from the people who have to live with it.

Governance is easy to ignore in the beginning stages and many organizations don't begin to think about it until things are totally out of control. You must build your governance infrastructure early on. If not, bad habits will be built into your SOA. If no SOA management system is in place, developers will hardcode management logic into the service and waste time writing it. Worse yet, they will have no idea how to extract management information when they actually deploy using a real SOA management system. SOA governance starts with a vision of what the governance process will accomplish.

Construction standards and building codes would not be effective at creating safe, pleasant cities if there were no building inspectors. Similarly, SOA policies are worthless unless they're enforced. When using a web service management or development tool, some policies will be automatically codified and enforced. Other policies will focus on changing or regulating the behavior of people, such as a directive that all services used in production applications must be listed in a production registry. These are less easily codified and certainly cannot be enforced automatically.

3.4. Governance vs. Management

The following illustration depicts, from an IT Management perspective, the domain of management and governance. It illustrates the relationships of the disciplines, their touch points and areas of overlap as they pertain to the mission of IT Service Management. Notice the intersection of IT governance and corporate governance, and the foundation of web services in technology. Notice also the role of SOA Management expanding as it approaches corporate

governance, with Business Service Management bridging the final gap between IT, the business and ultimately, corporate governance. The key learning is the realization of how dependent the enterprise is on a total unified governance and management model.

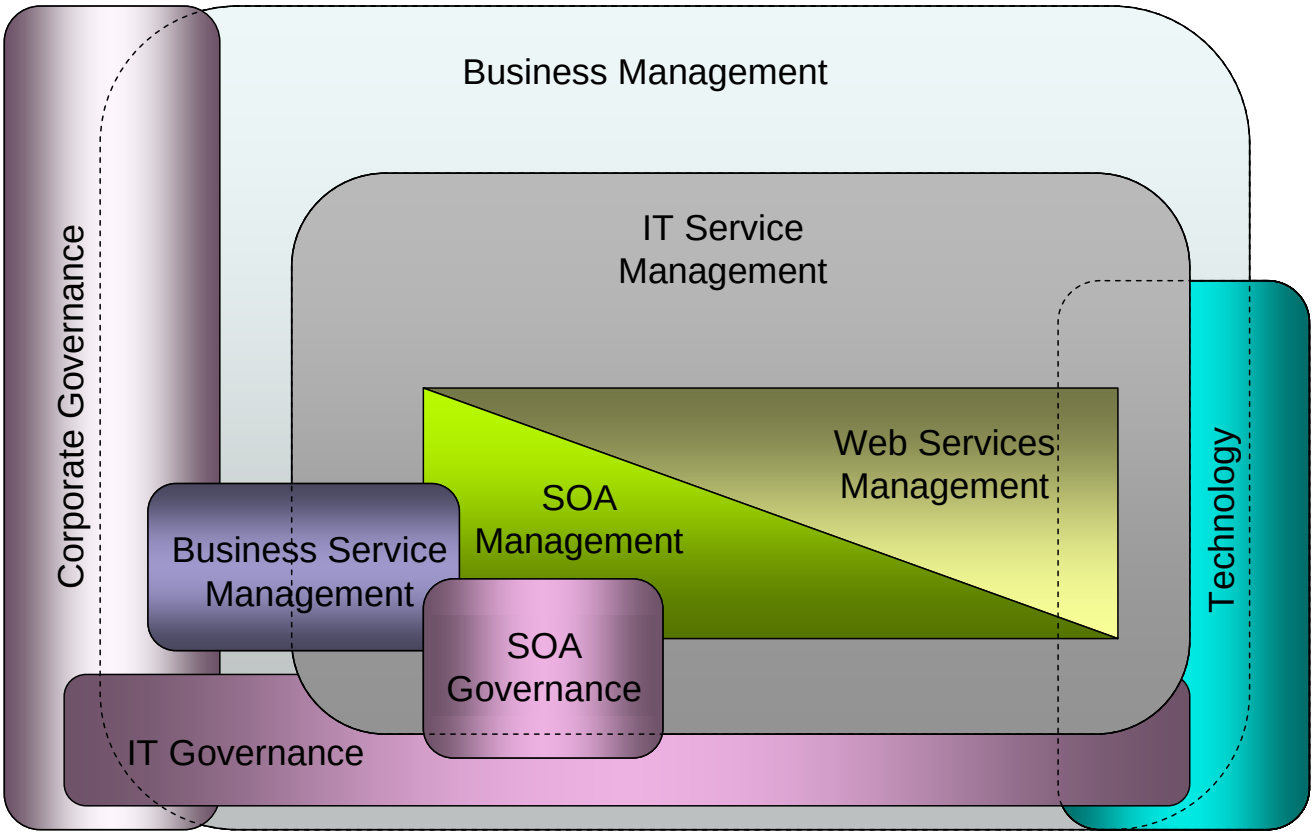

Figure 6 – Governance and Management Domain

3.5. SOA Governance Challenge

When you increase your dependency on complexity and abstraction, you are presented with a whole new set of problems. Ann Thomas Manes, vice president and research director at Burton Group in Cambridge, Mass. said in a recent interview, "What makes SOA work is policy-driven management and control." (http://www.eweek.com/article2/0,1895,1895917,00.asp)

Without management and control, there is no SOA - only an "Experience." The challenges presented by managing SOA within the parameters of IT and Corporate Governance are daunting when you consider the lack of visibility through the layers of the architecture (see Figure 4). To provide flexibility and real value to the business, you must have a means to:

- See through the architecture layers to manage
  - Business continuity
  - Dependencies between services
- Collect measurement information to assess
  - Process impact
  - User impact
  - Business Service availability and performance management
- Link business processes with the infrastructure that supports them
- Define meaningful KPIs
  - Establish SLAs / SLOs
  - Compliance
  - Auditing
- Manage Security
- Apply industry “best practices”
- Provide the business with visibility into message content (alerts, business impacts, etc.)
- Integrate SOA with your configuration management and service desk processes.
- Manage and document the business services.

4. Business Service Management

Quite simply, Business Service Management (BSM) combines separate, but totally integrated concepts that address risk management and change control. At its core, BSM is an approach to monitoring, managing and measuring the services that IT delivers to the business, ideally in real-time.

BSM is a means of communicating value to the business, in the language of the business. It means having enough connection to the business to be able to show measurable improvements, and insight into how the business is running. It helps IT understand exactly how much they have improved the business and prioritizes their actions based on real business impact. ITIL represents a set of established best practices for Information Technology Service Management (ITSM), and by logical extension, BSM. Perhaps the best way to understand BSM is to view it as ITSM wrapped around your business processes.

Complete control of the IT infrastructure has always been a daunting, resource-intensive task. An end-to-end service management initiative focuses on consolidating, monitoring, and managing business system information in real-time, through a single console. This goal serves as a typical starting point for most companies. Once better control is gained in managing their IT infrastructures, companies can then turn to controlling changes within that infrastructure and measuring the level of service they provide.

Business Service Level Management (BSLM) allows companies to monitor, measure, and report on IT's success in meeting its commitments to the business. Companies define key performance indicators (KPIs) that form the business metrics that drive BSM. This approach enables the visibility and consequent enforcement of those metrics. In other words, BSM brings accountability to IT. BSLM leverages BSM technology that allows companies to effectively define, monitor in real-time, and prevent service level compliance issues before they occur.

As a result, IT management requires tools that give business managers visibility into how their business services - and the processes dependent on them - are operating. To do this, there must be a relationship between the business processes and the users' experience as they work with the applications that the business provides. Presenting the health of this relationship in an easily "visualizable" form that links it to the business processes lies at the heart of BSM. Figure 7 illustrates the relationship between IT Service management and Business Service Management provided by SOA.

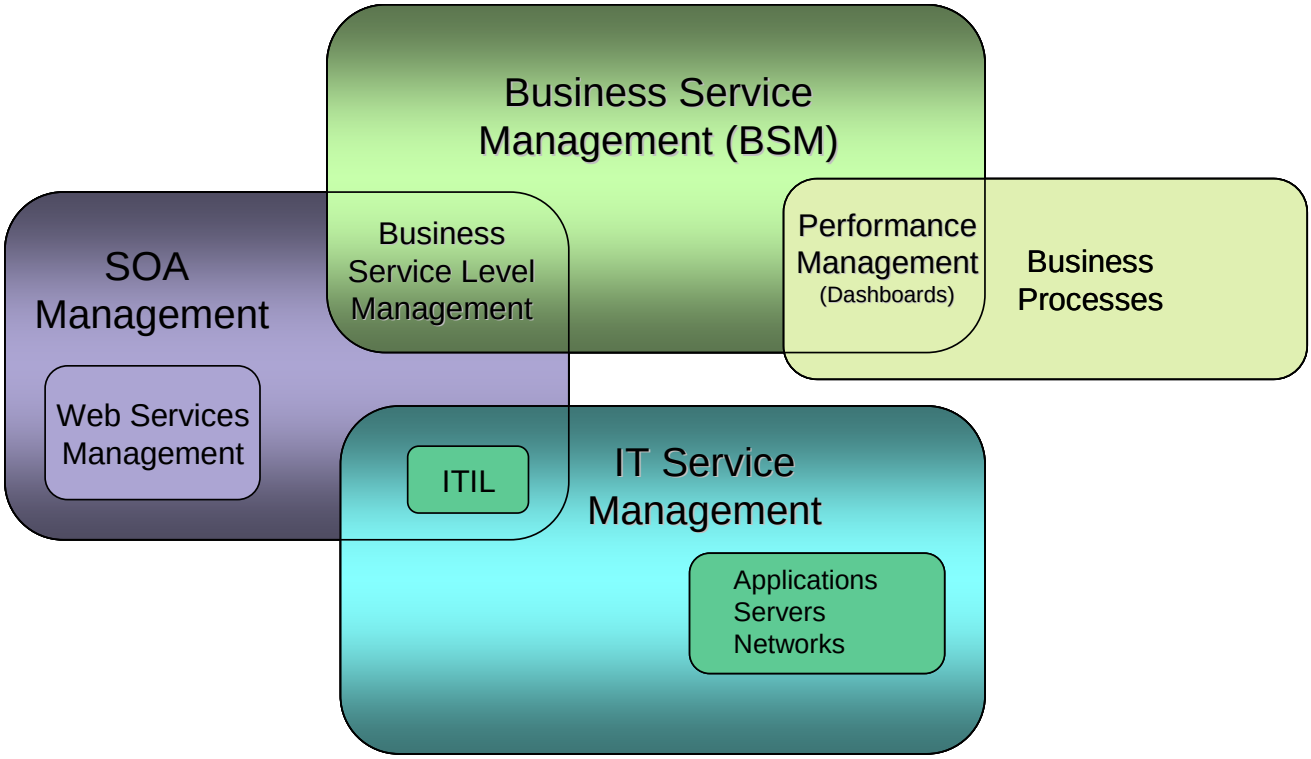

Figure 7 – SOA bridges the gap between IT and Business Processes

Visualization provides all levels of IT and business management with a transparent view into the quality of IT services. Through executive dashboards, IT and business management personnel can easily understand how IT is affecting the company's ability to conduct business.

5. The SOA Management (SOAM) Landscape

In the past, managing applications meant focusing on single applications, understanding individual web services, and providing point-to-point solutions. Today, that is not enough. It is necessary to view services holistically and to understand that these "50" web services support my Order Fulfillment business process. SOA means managing and orchestrating dozens of components. The sheer volume of what needs to be managed has become the challenge.

As we have discussed in the Maturity Model at Levels 3 and 4, managing SOA applications not only requires measuring the performance of components that make up a service, but it also requires monitoring of their overall performance. It means tracking which applications access the components and how frequently they do so. It also includes managing the availability of reusable components. BSM requires real-time monitoring of how all the components work in concert to support a business service.

We have seen that SOA governance specifies what decisions are to be made and who will make them. SOA Management, as illustrated in Figure 8, includes the process of making and implementing those decisions.

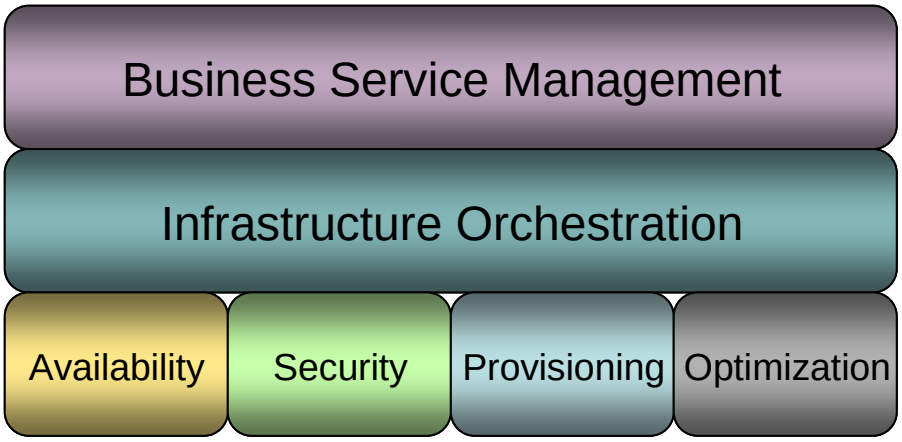

Figure 8 – Components of SOA Management

5.1. Web Services Management

Web Services management can be viewed as a set of lower level tools used as part of IT service management. Referring back to Maturity Levels 0, 1 and 2, IT Infrastructure management and developers interact directly with customers, making it impossible for a single point of contact to serve the customer's needs. This also makes it impossible for IT to deliver a unified and consistent message.

At Maturity Level 3, Web services are introduced as a method of integrating applications and speeding development without the need to reinvent common elements of functionality. Web Services management becomes a means for developers to better control their services, but they continue to interact directly with the customer. Of course, the customer's business processes are still driven by the capabilities and/or limitations of the technology. IT Operations introduces their own ITIL processes for configuration management and change management but this additional complexity adds confusion for the business customers. Figure 9 illustrates the paradigm of web services as part of technology. Note the multiple points of interaction between the IT Organization and their customers (as one would typically find at Maturity Level 3).

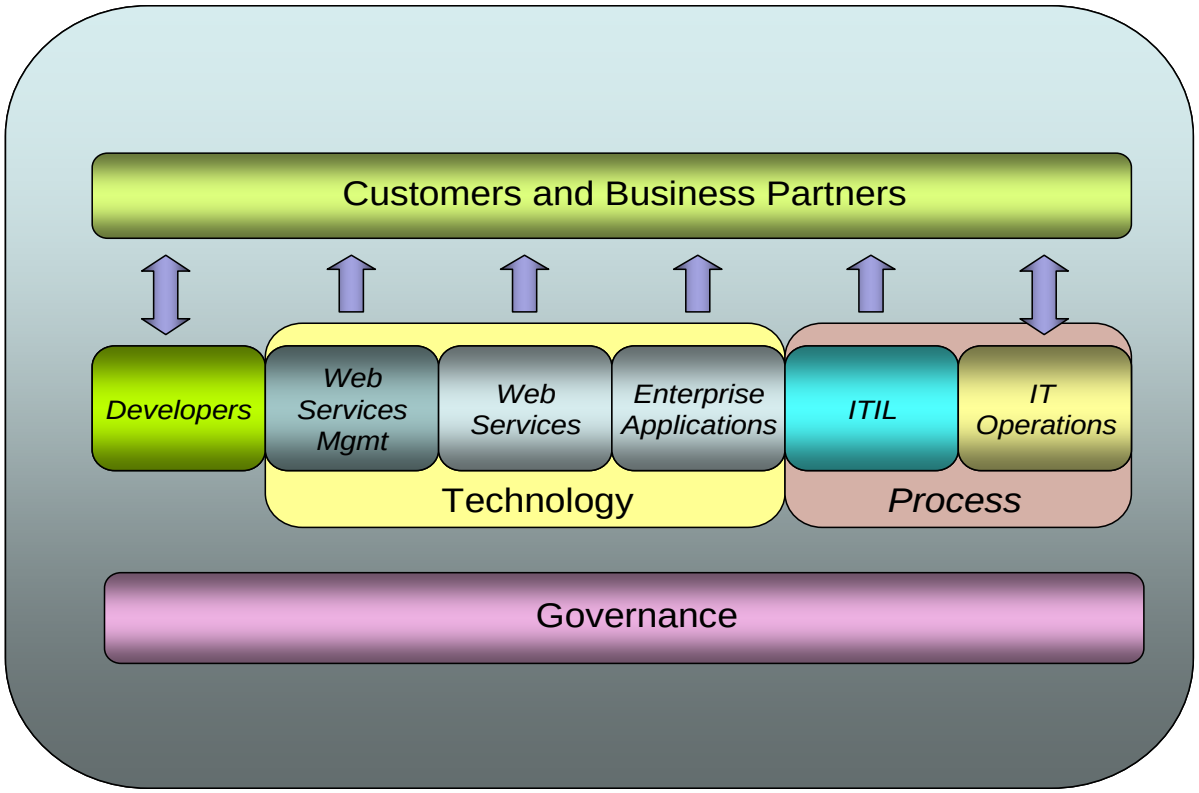

Figure 9 – Web Services Viewed as Technology Paradigm

5.2. SOA Management

If web services management can be viewed as a part of IT service management, then similarly, SOA management can be viewed as a portion of Business Service management. SOA includes both business and technology in its scope. This architecture exposes aspects of the enterprise that need to work together and identifies the gap between business operations and the IT systems that support them.

A key component of managing any SOA is the ability to map all its components to the business processes that they support. Not only will you know the health of the individual components, but also how they will affect the business processes. To effectively manage your SOA, it is also necessary to integrate all the existing monitoring and web services management tools in a plug-and-play fashion to manage the entire SOA as a single entity.

Figure 10 illustrates how SOA, coupled with Business Service Management, has enabled a single point of access for the customers.

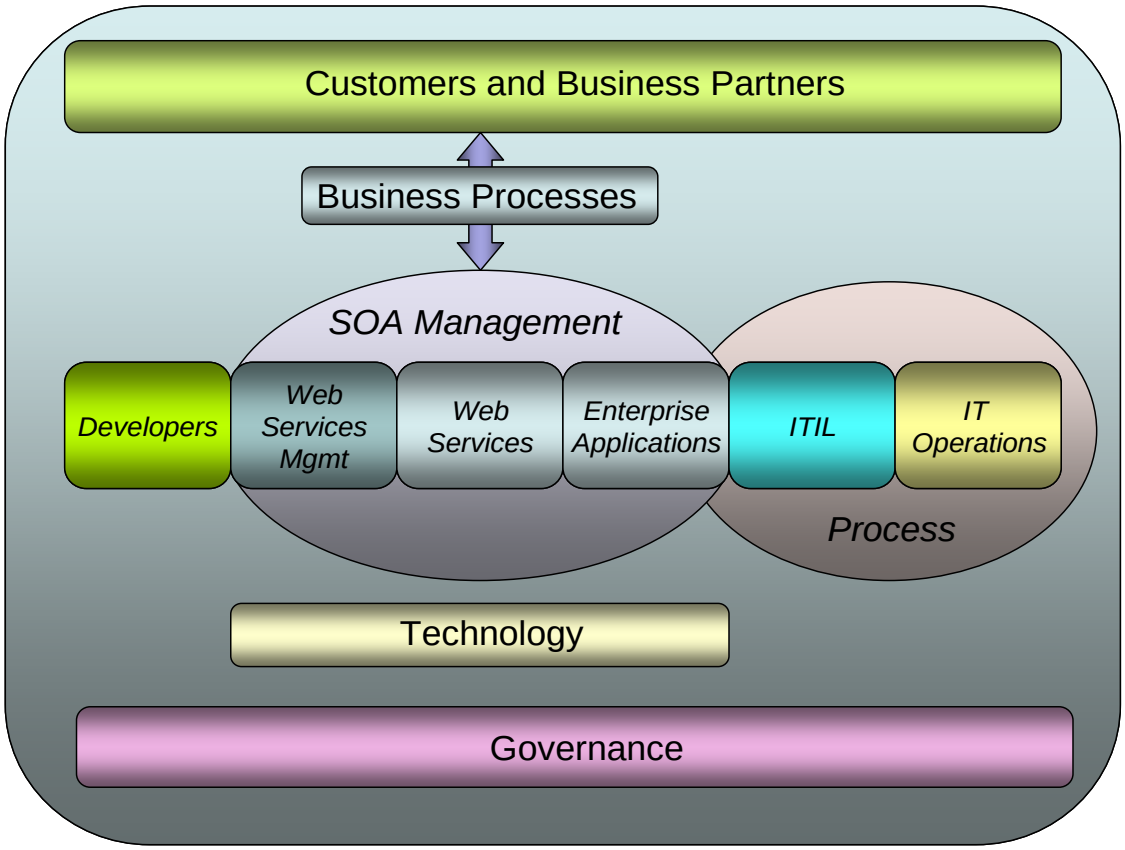

Figure 10 – The SOA Management Paradigm

5.3. Business to IT Interface

As you add layers of abstraction between the infrastructure and the business process, you also push the IT interface closer to the core business functions of the company. This phenomenon requires IT to become more process-focused and more aligned with the business drivers that lead process development. With an SOA, IT becomes a more integral part of corporate governance as it is more tightly woven into the fabric of the organization.

A pure definition of SOA Governance is as elusive as the architectural concepts of SOA. The core components of SOA governance measure the effectiveness of functional components of the architecture. As the IT interface point has moved upward to the level of core business processes, SOA governance comprises a key part of the overall corporate governance model. A difficulty in completing this interface of governance is the abstractive nature of SOA itself. By abstracting the infrastructure and application architecture of IT from the overall operational processes of the company, the ability to properly govern the infrastructure in terms of the business is likewise abstracted. SOA governance can be defined as the control measures that remove this abstraction and ensure cohesive governance of the overall IT architecture in line with the corporate governance model.

As an example, we can look at the elements of financial governance that comprise a factor of corporate governance. Within a corporate governance model, there may be controls in place to ensure that financial journal entries into the General Ledger are validated with the actual financials from operational budgets and revenue accounting (the linkage of forecasted sales/budgets to closed orders to accounts receivable to General Ledger, for example.) Such a control ensures that the general ledger is accurate, and serves as a key component of compliance with financial regulations. In the case of an SOA, the awareness that this data lies within three disparate applications and databases may be obscured from the users and auditors responsible for financial governance.

In this example, the overall application architecture may be designed as a unified financial system that ties to financial processes of the corporation. In this manner, the data may appear to the users and auditors to be cross-checked within a cohesive financial system. An outage in a single area of the underlying architecture may continue to allow financial activity within budgeting and revenue accounting, while general ledger cross-checks could be non-functional. Such a lapse in corporate governance could result in compliance issues and audit mistakes at a corporate level.

Within the mechanics of an SOA, these underlying applications, data points and logic functions must be governed as they relate to the complete business process around which they are built. As such, SOA governance includes the requirement (policy) to identify not only failures and status of various web services, but also the dependencies between these services as they work together to form a complete business service. In our example, proper SOA management would immediately recognize that a failure in general ledger services impacts the ability to validate ongoing budget and revenue accounting activity, as the dependencies would be known and documented within a SOA management tool. Having this type of end-to-end monitoring capability - automated alerting based on complete service models and the documented dependencies between multiple IT services - is essential to reconnecting the corporate governance model to the IT governance model once an SOA emerges within an organization.

5.4. Complete Solution

SOA is not about web services; it is about an approach that creates agility and responsiveness to both IT and business. As many IT organizations are leveraging the ITIL/ITSM models for process governance and architecture, this service-based approach to running an IT operation blends closely with the services-based approach to applications architecture brought through SOA.

Within SOA, the IT services delivered to the end-user closely map to core business processes and comprise true business services as described within the ITIL model. One of the fundamental misunderstandings of the ITIL/ITSM foundation is the concept of a service. Much time is devoted to talking about services, but insufficient time is spent in defining what services actually are. Understanding what your services are and where they touch the business is essential to implementing a true ITSM/ITIL-based process and governance architecture, since these services form the foundational element to which you will build management and control mechanisms.

In a modern SOA architecture, the services delivered to the business are more closely aligned with business processes than individual applications. Many companies pursuing an ITIL-based process model make the mistake of focusing on the process development components first, and assign lower priority to the service discovery and building of a service catalog, believing incorrectly that an inventory of applications constitutes a service catalog. To successfully move to Level 3 of the Maturity Model, it is essential to select a tool that will first enable building a service catalog and support your needs as your organization evolves and progresses to Level 4.

In order to get a complete view of a service (in the ITIL/ITSM sense), it is necessary to configure management controls at multiple levels of the architecture. This includes the traditional infrastructure management functions for networks, servers and operating systems as well as application level management. The introduction of web services to an environment brings with it the necessity to manage those web services as a new component of the overall service model. With the addition of a complete SOA-based approach to the enterprise architecture, the necessity to manage and govern these SOA-unique properties becomes an essential aspect to managing the end-to-end services as cohesive units and removing abstraction barriers to corporate governance.

The following diagram shows the multiple levels of management that need to work in parallel in order to provide the business with a complete ITSM-based management solution.

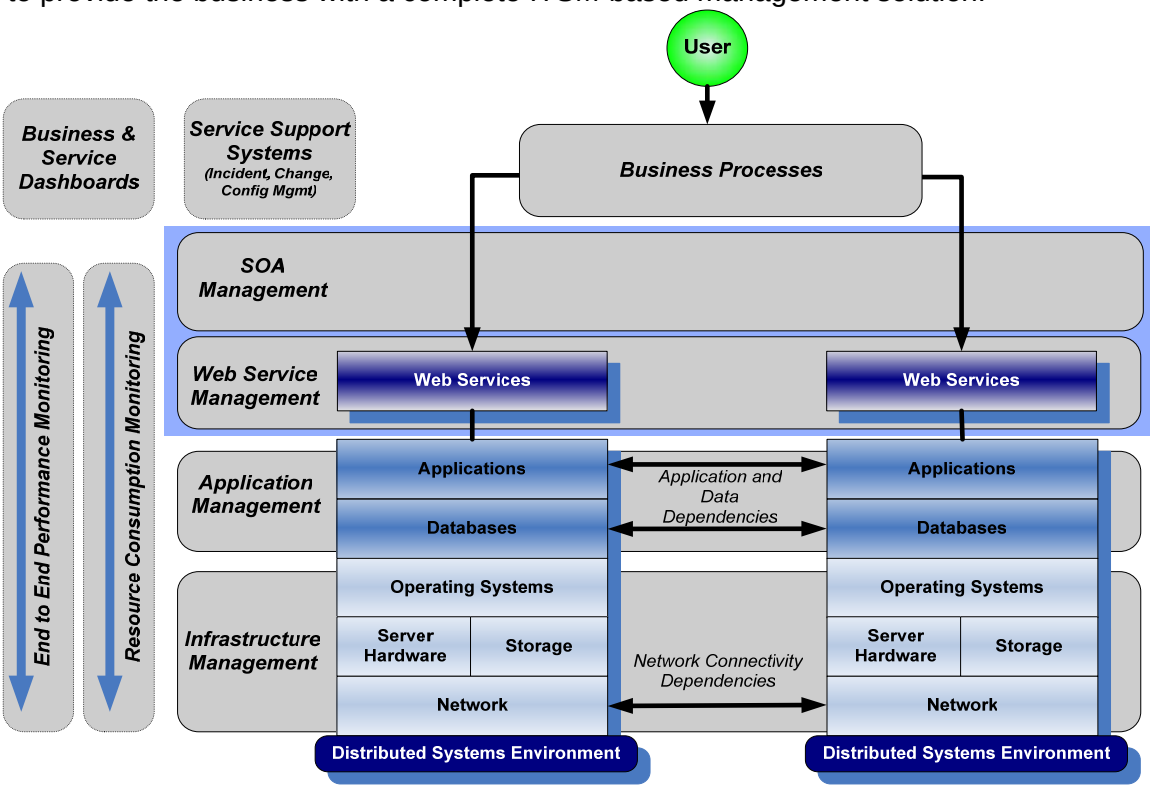

Figure 11 – SOA Management Product Perspective

6. The SOAM Product Landscape

There is a dichotomy of approaches to SOA management - from the top down, and from the bottom up. In the bottom-up approach, the focus is on how individual IT services (usually Web Services and JMS) are managed. This provides a more "IT-centric" view. With the top-down approach, the focus is on modeling business services and applying business rules which are then mapped to the underlying IT services, thus taking a more "business- centric" view.

Utilizing the bottom-up approach generally aligns with Level 3 of the SOA maturity model, because it focuses on monitoring the functionality and status of web services. Tools taking this approach tend to provide deep technical information and management of web services and the components thereof, which is necessary in an overall solution for service management. This type of approach gives highly flexible visibility to the web service performance and operation with strong depth at the technical details of running multiple web services within an overall architecture.

The top-down approach lends itself more to Level 4 of the maturity model as this pulls complete service information together at a level that corresponds with the business process interface and the overall corporate governance model. At this level, the true ITSM-level service catalogue begins to be managed within the architecture.

While the differences in approach imply various levels of functionality, the reality is that both areas of management are necessary for a complete solution. In the modern market of IT management tools, navigating the road to SOA requires an eye to reaching the final maturity level of this model. While bottom-up tools may offer enhanced functionality within the earlier maturity levels, they begin to lag at the highest maturity level where end-to-end process interface occurs. Likewise, the top-down approach tools provide the higher-level service-oriented management capability in line with business processes, but may lack certain technical functionality within the lower levels of the maturity model.

In this current market, the point solutions provided within web service management have a definite place in the overall architecture, but are limited by their ability to guide an organization through the complete road to SOA services. On the other hand, the top-down tools may be lacking in lower-maturity level technical functionality, but this can often be supplemented by niche tools to fill any gaps. The approach that most clearly matches a complete lifecycle of SOA enablement is to select a top-down vendor with the most flexibility for integration of point tools to provide the complete service management solution.

In reality, no SOA management tool fits neatly into one or the other of these approaches. Instead, most of the tools include feature sets spanning the range from low level IT service management to the higher level business management needs. Many of the tools can be mixed and matched to form a more comprehensive solution: using HP OpenView SOA Manager and AmberPoint, for example.

Regardless of the approach, however, SOA management always involves the following key aspects:

- Life-cycle management - the end to end management of the life of a service:
    - Discovery - how is the service discovered
    - Monitoring - how is the service performing, based on a set of predefined measurements
    - Metric collection - the actual collection of data to be used for monitoring

  - Logging - record keeping for traceability and auditing
  - Business level visibility into messages
- Security management - The ability to protect sensitive resources (services and/or data).

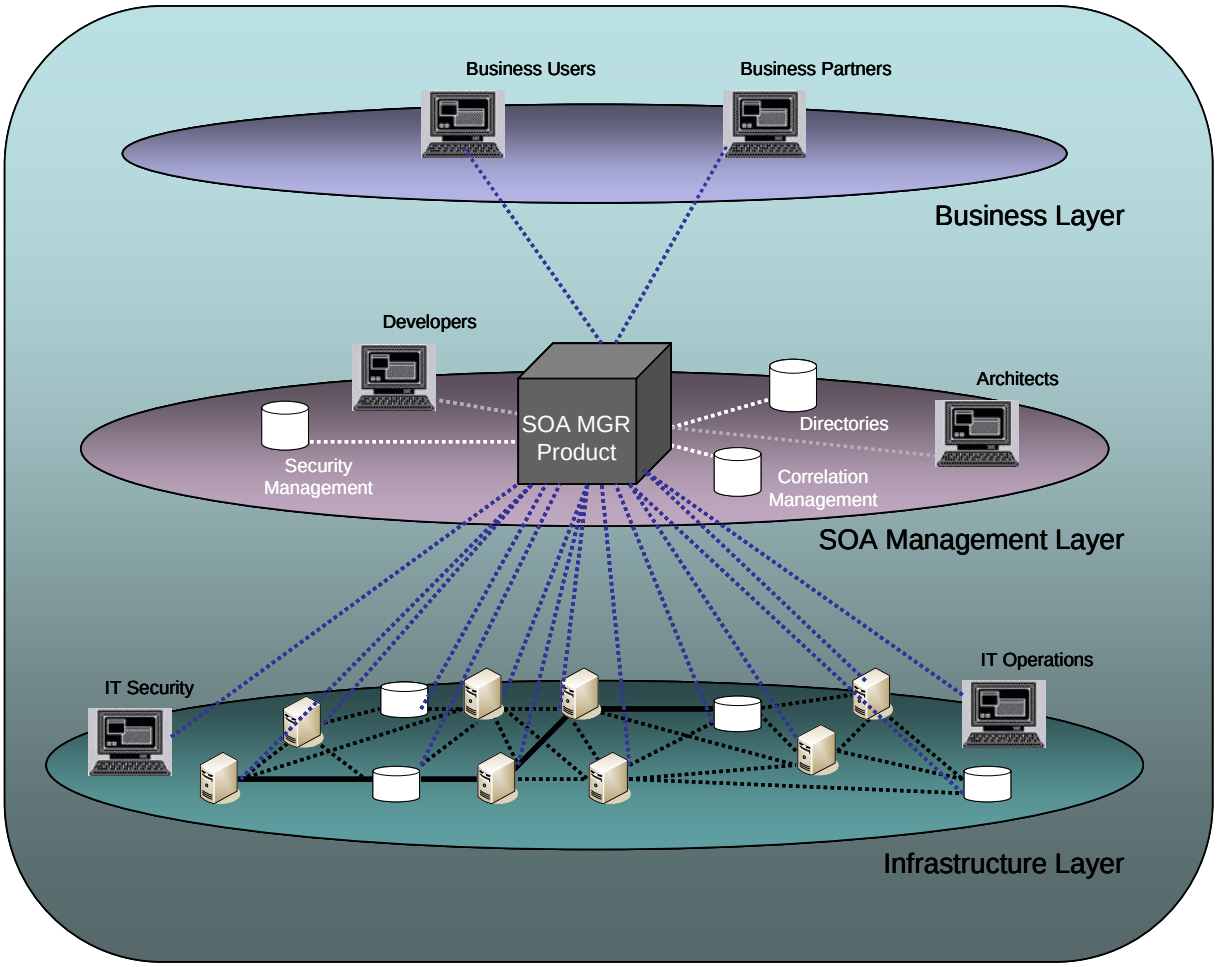

Figure 12 – SOA Management Tools Bridge the Gap

6.1. AmberPoint

AmberPoint offers a runtime SOA Governance solution. This offering is a comprehensive management tool covering everything from service discovery to the ability to replay service messages to aid in provisioning and QA testing. From the perspective of corporate management, however, two features in particular stand-out: runtime life-cycle and exception management components.

The SOA runtime life-cycle refers to the various stages of the SOA environment. These stages are: development, deployment, registering, monitoring, and testing. Life-cycle management refers to the application of policies and actions to these stages.
For corporate management, AmberPoint's key offerings in this area are:

- The ability to define logical collections of services for management. Such a feature has the potential to abstract the service offerings to a more business-centric view and thus bridge the gap between business and IT.
- Support for versioning and change control of service offerings, the ability to establish baselines of production deployments, and support for registries and databases. Within the product, a rich set of metadata can be defined and stored for each service. While this is not a true CMDB, it does provide key visibility into the deployment and allocation of services.
- Management of policies that address how management ensures services comply with business and operational policies.
    - Routing control and the ability to define business service levels. This feature addresses some of the issues around lack of visibility through the layers - in particular, business continuity by giving managers control of interoperation of services
    - Security policy definitions which ensure the integrity of the offering, and give direct fine-grain control of the security management
    - Logging policies, which ensure the ability to audit and add an additional layer of security monitoring
    - Pre-defined business policies which allows for quicker time to market, and aids with the application of best practices
- Extensive SLA, SLO, and threshold definitions that include time of day, day of week, multiple time intervals (hours, days, weeks) and the ability to independently manage users or groups of users (e.g. "Gold" vs. "Silver" users) of the same shared service
- Business level visibility into the message content. This is also important for bridging the gap between business and IT – why?
- Ability to integrate with existing enterprise management solutions (e.g. HP OpenView). This ability is critical for leveraging existing infrastructure and the application of industry best practices
- The ability to perform auto-discovery of services, and to map the interaction of those services. Such a feature is key to providing visibility through the layers, in particular giving the ability to identify dependencies between services.
- Service monitoring. This feature gives the user - both enterprise management and IT - visibility into how well the service is performing

At first glance, exception management may appear to be a concern of the lower-level IT workers; AmberPoint's implementation, however, provide a few key elements that are vital to the corporate management:

- Configurable, end-to-end logging which is important for auditing and traceability
- Root cause analysis and proactive detection of exceptions. This aids in ensuring business continuity
- Business level exceptions that can manage error conditions (missing data, incorrect formats, etc) and business events (orders > $10,000, orders that are canceled before completion).

- Automated exception handling, which again helps prevent continuity issues before they occur

AmberPoint approaches SOA management from the runtime perspective. While their offering has a strong emphasis on enabling the IT worker to effectively manage their SOA environment, there are key elements which are also applicable to corporate management and help bridge the gap between IT and Business.

6.2. Actional

Actional, recently acquired by Progress Software Corporation, offers their Looking Glass platform to provide visibility and run-time governance of SOA components. It focuses on real-time monitoring and analysis of business processes, enforces security, and manages the SOA by user-defined policies. Moreover, Looking Glass can be configured to identify and automatically correct undesirable Web service operating conditions before they become, potentially causing widespread system and application failures.

Key Features

- Management
  - Enables global service policy enforcement for control and risk management
  - Discovers and manages service interdependencies
  - Isolates root cause of issues for rapid triage
  - Monitors critical resources and balances load
- Visibility
  - View, manage and control Web service-based and non-Web service-based enterprise applications
- Performance
  - Defines Service Level Agreements (SLAs) by customer, transaction or service type
  - Measures and manages SLAs for compliance
  - Identifies Web service performance and interoperability issues
- Security
  - Defines re-usable security policies using Web Services standards for Access control and identity management
  - Enforces at the perimeter, and reinforces inside the perimeter of the Web Services network
  - Validates security strategy

The Looking Glass platform has three key components:

Looking Glass Server

The Looking Glass Server collects data from all SOA components and dynamically discovers the path of each individual process or transaction. A wide range of usage and performance metrics can then be captured and correlated for governance, root-cause analysis of application failures, and process optimization. Unlike its competitors, the reach of Looking Glass is not limited to Web services, but can also be used to automatically detect and monitor business transactions as they

flow across a wide variety of application servers, databases, and network appliances. Looking Glass gathers message data, creates flow maps on the fly and enforces policies as messages flow throughout the services network.

Looking Glass Console
The Looking Glass Console is a series of tools that allow IT administrators to view, manage and control the SOA. Users can manage service network status, interdependencies, activity, security and performance as well as define monitoring, security and in-flight policy. This multi-tiered administration enables custom views and controls for SOA stakeholders, including lines of business owners, operations and security administrators.

My Dashboard
"My Dashboard" is a browser-based dashboard providing highly-customizable views for monitoring Web service activity and SLA compliance, security enforcement data, etc. This portal can be configured to provide any individual within the organization - operations, application owners or business managers - useful information on specific service activity. Views can be constructed showing specific customers, services, agreements and alert categories of interest allowing an individual to limit the amount of information displayed to that set specifically of interest.

The strength of Actional's Looking Glass platform is its ability to monitor web services. Therefore, its core audience and user base is IT Operations. However, the "My Dashboard" component offers the potential to customize views of the enterprise that may interest business stakeholders.

6.3. HP OpenView SOA Manager

While many vendors in the SOA management field have focused on the lower-level needs of the IT worker, HP has approached the problem from both directions. Not only does their "top-down/bottom-up" approach allow for the management of services, but it also allows for the creation and maintenance of a dynamic service model that easily integrates management data from multiple *legacy* sources. HP's OpenView SOA Manager is designed with the goal of enabling IT to run as a service delivery business and to help bridge the gap between Business and the needs of IT.

The HP offering for SOA Management is a component of the HP OpenView suite of tools, giving strong integration opportunities to underlying infrastructure monitoring systems in other products of the OpenView suite, as well as IT Service Management processes through HP Service Desk integration. One primary advantage of the HP offering is the flexibility to integrate with products from other vendors in order to formulate the complete solution. This ability avoids the rip-and-replace approach to IT governance tools required by full framework tools that provide integration options only within their own product suites.

HP OpenView SOA Manager can be viewed as three integrated pieces:

- Service Management - encompassing the standard duties of a SOA Management solution:

  - Monitoring – giving visibility into service performance and helping with provisioning planning
  - Business level visibility into the message content
  - Security – A key to limiting corporate liabilities and presenting a security management layer
  - Auditing
  - SLA definition – A key component not only to service performance monitoring, but also to providing a link between business and IT needs, and ensuring compliance with technology, business policies, and application standards
  - Event Management – This feature helps services comply with business policies and application standards, as well as managing business continuity issues
  - Service auto-discovery - Key to preventing redundant service creation and providing visibility throughout the levels (see figure 4).
- Business Service Catalog and Designer: this is a unique feature which helps business users visualize the relevance of IT services to the business. This feature addresses many of the Governance challenges mentioned earlier; in particular, providing visibility throughout the various levels and bridging the gaps between business and IT.
- Management Integration Platform: providing an integration point, based on open standards, for other management tools to interact with HP OpenView SOA Manager. Such a feature allows HP OpenView SOA Manager to interact with the rich set of management solutions provided by the HP OpenView portfolio. HP OpenView SOA Manager was designed around the principle of integrating with the rich metadata information available in a SOA deployment. The result allows HP OpenView SOA Manager to not only collect data from its own set of agents and brokers, but to also integrate with other SOA management solutions, such as AmberPoint.

With the top-down approach used by HP OpenView SOA Manager, support for all layers of the maturity model is provided and a roadmap is established to implement the necessary functionality along the path. SOA Manager provides support for Web Services management natively, thus fulfilling certain lower-level technical requirements of the complete solution. However, the strong integration capabilities do not preclude the use of SOA Manager to reach the upper layers of the maturity model if other web service management tools are already in place.

One key benefit of the HP tool is the advanced capability to map infrastructure components into complete SOA services and monitor the service as a whole. This functionality is essential to enabling Business Service Management functionality and process measurement of the business. This capability allows the SOA Manager tool to extend beyond the SOA boundaries through integration with additional HP products such Business Process Insight (BPI) and OV Dashboard.

IT departments that are beginning their SOA journey can benefit from the HP tool, as it provides lower-level functionality out of the box while providing the growth potential to reach Level 4 of the maturity model without additional work. Because HP OpenView SOA Manager was designed with integration in mind, it offers unparalleled integration capabilities with other HP products and third-party tools. This makes HP OpenView SOA Manager a strong contender for those looking for a long-term solution.

6.4. IBM Tivoli Composite Application Manager for SOA

At its core, the IBM Tivoli Composite Application Manager for SOA (ITCAM for SOA) is a pure runtime SOA Governance solution, but when used with other Tivoli products, it provides a synthesis of bottom-up and top-down SOA management.

The ITCAM for SOA is part of the IBM Tivoli framework and requires deployment of at least the base components of the IBM Tivoli Monitoring suite (the Tivoli Enterprise Monitoring Server, Tivoli Enterprise Portal and Tivoli Data Warehouse) before ITCAM for SOA tools can be used. Once this infrastructure is in place, ITCAM for SOA can:

- Perform automated service mediation
- Proactively recognize and quickly isolate Web service performance problems
- Verify that Web services are available and performing to specification
- Alert you when Web service performance is degraded
- Report results against committed service levels
- Pinpoint source of service bottlenecks
- Visualize entire Web service flows, end-to-end, as they cross the enterprise

ITCAM for SOA emphasizes the management of message flow through a SOA environment and collects metrics for Web services. These metrics are viewed in the Tivoli Enterprise Portal and consists of a:

- Performance Summary that shows response time information for Web Services
- Message Summary that shows message statistics
- Fault Summary that shows failure analysis for Web services
- Service Management Configuration Summary that provides a summary of the Web services configuration

The context-rich views and inter-workspace linkages in the Tivoli Enterprise Portal allows users to drill down to IT resources and enables identification of Web service bottlenecks and failures. By providing built-in and extensible alerts, situations and workflows, users can create powerful automated mediation scenarios. Moreover, this information may to reduce the time and skills required for problem root-cause analysis and resolution.

ITCAM for SOA includes the Web Services Navigator that provides deep understanding of service flows, patterns and relationships using operational data from Tivoli Data Warehouse. With the Web Services Navigator, a user can construct:

- Service topologies on the fly
- Dynamic transaction flows
- Flow pattern analysis
- Message content views with additional tools included with the ITCAM for SOA.

To define and monitor service level agreements against the Web services monitored by ITCAM for SOA, you must leverage the integration with IBM Tivoli Service Level Advisor through the Tivoli Data Warehouse.

The ITCAM for SOA itself does not have a facility to enforce security across the SOA components it monitors. However, other tools in the IBM Tivoli framework supply entity management.

6.5. Oracle Web Services Manager

While entity management has typically been focused on securing and managing user-to-application interactions, most organizations also need to manage interactions between the applications themselves. Oracle Web Services Manager (OWSM) allows an organization to centrally define policies that govern Web services runtime operations, and then wrap these policies around new or existing Web services without requiring modification to those services. OWSM also collects monitoring statistics to ensure service levels and security, and displays them in a browser-based dashboard.

Key features of Oracle Web Services Manager are its:

- Policy Manager
- Enforcement
- Monitoring Dashboard

Policy Manager is a graphical tool that allows administrators to build security and operations policies that can be layered over new or existing applications and Web Services. For example, a security policy would govern encryption, decryption, message signing, signature validation, authentication, access control, logging, message transformation, and protocol conversions.

Enforcement entails runtime facilities for executing these policies across all Web Services.

The Monitoring Dashboard gathers data on these policies as they execute, to ensure service levels and flag potential problems.

OWSM has three primary components:

- A central management console used to configure and monitor the system
- Gateways that typically sit at the edge of the enterprise network and mediate interaction with outside services
- Agents that sit in front of a Web service

The management console is used to configure policies and alarms for each Web service. Users create alarms for specific performance conditions. This graphical dashboard shows overall statistics, including:

- Latency
- Availability
- Failure
- Unauthorized access attempts

Not only is security enforced across internal web services, but it is also enforced with externally-facing Web services as well. This is due, in large part, to the OWSM gateway component. Therefore the security of external business partners and internal stakeholders is centrally and consistently controlled.

Oracle Web Services Manager is a comprehensive policy-driven solution for managing service-oriented architectures. However, its Dashboard and associated reports are geared more toward IT professionals than the business they serve.

7. Summary

Part of the foundation of a prosperous SOA is the careful choice of a governance infrastructure. Each of the SOA Management products profiled here differs significantly in their approach and response to SOA governance. Unfortunately, a cursory review of their feature sets doesn't readily reveal that difference. The significant contrast lies in the metaphors they use for management and the presentation of their information. AmberPoint manages performance with service-level objectives, whereas Actional's approach is centered on service monitoring; HP OpenView SOA Manager provides functional depth and 3rd-party integration; IBM Tivoli Composite Application Management for SOA emphasizes core web services management and integration with the Tivoli Monitoring framework, while Oracle's thrust is entity management.

As an organization traverses the SOA maturity model described earlier, it is essential for a SOA management tool to grow with the organization and to address its needs at each maturity level. Determining the appropriateness of a particular tool requires knowledge of where your organization sits within the maturity model, as well as a vision of where your final goal of functionality lies. The recommended strategy is to select a vendor that can take you all the way through your SOA journey to Level 4 maturity, even if you decide to augment point features along the way with point Web Services Management (WSM) or Enterprise Service Bus (ESB) middleware vendors.

For those organizations with goals to reach full service alignment to business processes, the selection should start with a top-level tool that provides management of end-to-end services mapped to process functionality. This "end-state" tool can then be augmented as needed with point solutions for technical management of underlying components. Since this approach implies - if not requires - an amount of flexibility in integration amongst toolsets, it makes sense to select a tool that offers the most possibility for end-state functionality with the greatest flexibility for integration across disparate tool sets.

Although current pure-play or point solutions may be adequate in an immature SOA environment, those solutions offer little expansion as the SOA matures. This strategy requires the chosen tool to be capable of integration with others offered by different vendors. It makes sense to select a SOA management product that offers the best possibility for functionality needed at the higher SOA maturity levels and the greatest flexibility for integration across disparate tool sets.

Deciding which of these tools is right for your organization will require careful consideration of your needs and the relative strengths of each product. You must evaluate the management metaphor of each offering and compare it with your organization's operations philosophy. The tool must not only address your lower level management issues that are immediately required for Level 3, but the tool must also fulfill the ultimate goal of Level 4, which is to truly align the Business with IT.

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