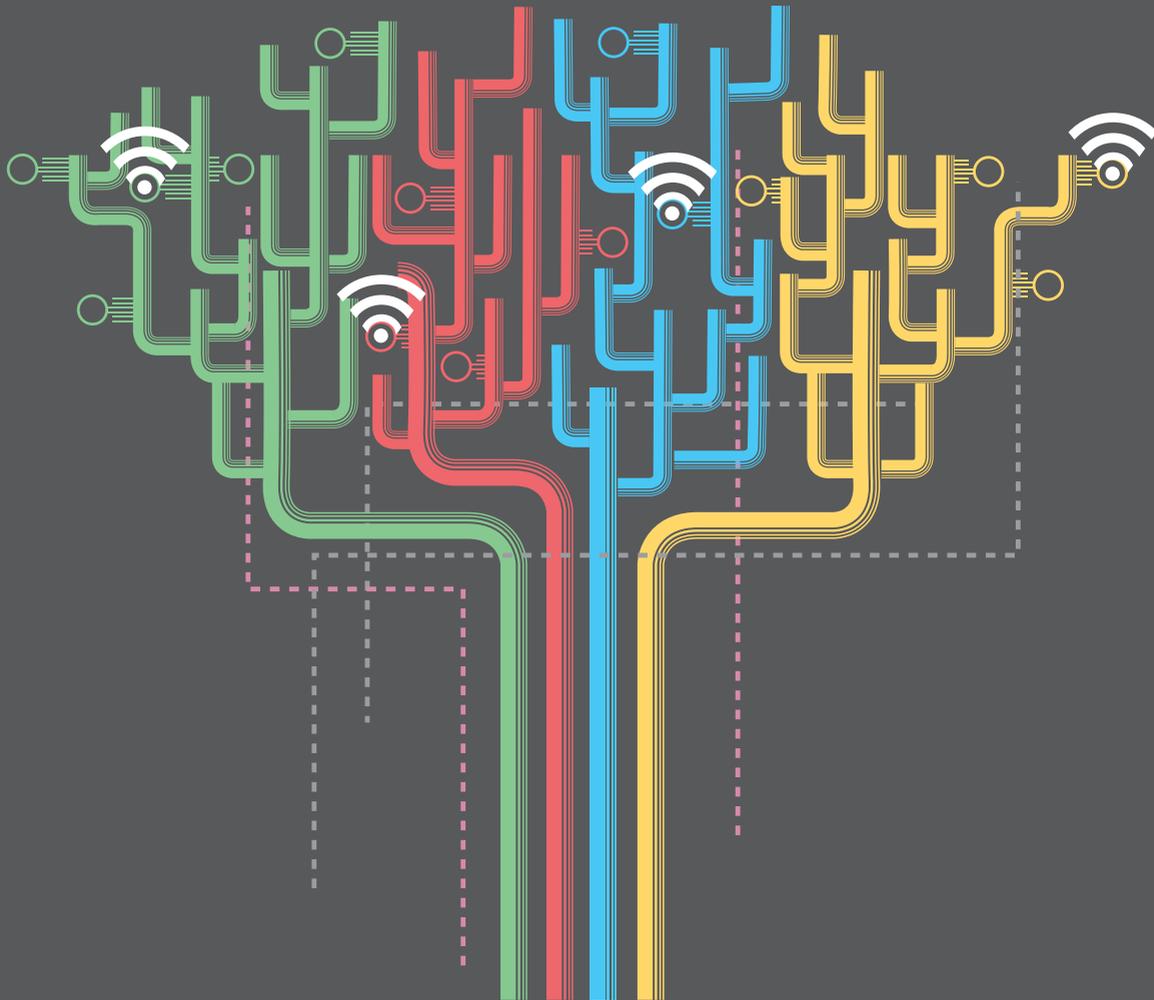


JOURNAL OF INTEGRATION



TOWARDS A SEAMLESS TOMORROW



ENTERPRISE BUSINESS INTEGRATION PRACTICE

BUSINESS APPLICATION SERVICES

## **About Wipro Technologies**

Wipro Technologies, the global IT business of Wipro Limited (NYSE:WIT) is a leading Information Technology, Consulting and Outsourcing company, that delivers solutions to enable its clients do business better. Wipro Technologies delivers winning business outcomes through its deep industry experience and a 360 degree view of “Business through Technology” helping clients create successful and adaptive businesses. A company recognized globally for its comprehensive portfolio of services, a practitioner’s approach to delivering innovation and an organization wide commitment to sustainability, Wipro Technologies has 130,000 employees and clients across 54 countries.

## **About Enterprise Business Integration Practice**

Wipro's Enterprise Business Integration (EBI) Practice is amongst the leaders in Business Integration solution providers. EBI Practice offers Consulting, Implementation and Managed solutions on all leading Integration platform technologies. Wipro with its deep industry expertise, industry solutions and innovative models offers best in class integration solution for a seamless tomorrow.



Single view of truth has been the holy grail of many enterprises. As systems became complex, sources of data became diverse, velocity of changes increased, integration has become central to achieve this. Today, companies that master the seamless integration of diverse applications and information sources, will achieve a higher level of process performance, operate on the basis of better insight and intelligence, and be well equipped to exploit new business possibilities. Technology and best practices have significantly evolved to support integration projects that span application-to-application (A2A), business-to-business (B2B) and cloud based applications. The convergence of application integration with service-oriented architecture (SOA), data integration, business process management (BPM), device integration along with applying integration best practices, technology architecture standards and appropriate governance are key to successful execution of complex integration projects. The analysis and research presented here is a successful attempt in providing the right experiential insights in this direction.

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**Bhanu Murthy B M**  
**Senior Vice President and**  
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**Wipro Technologies**

# INDEX

Business Relevance of Integration	01
Prologue	02
Design-Time SOA Governance	03
Runtime SOA Governance	10
SOA Value Measurement	19
Cloud Integration	28

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# BUSINESS RELEVANCE OF INTEGRATION

**BABAK HOSSEINZADEH**

Global Head of Integration Services, Group IT Services,  
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Customer behavior and preferences have undergone a dramatic change over the past decade. Increasingly, customers are asking for real-time information, 24x7 self-service capabilities, and overall, an enhanced experience with the business. On the business-to-business front, connectivity and collaboration between partners and suppliers have been growing faster and deeper to enable introduction of new products and business models.

For the business to remain competitive and relevant, IT must meet integration and transformation demands quickly and cost effectively. For many organizations, meeting these objectives involve integration of legacy applications, new packaged solutions, and other home grown distributed applications with new channels, partners and devices.

Evolution of open standards and integration middleware, and adoption of Service-Oriented Architecture (SOA) have played a key role in componentization, connectivity and interoperability between different applications and organizations. These trends continue strongly, as they offer proven flexibility and cost savings in rapid solution development and delivery.

Zurich Financial Services has been one of the early adopters of SOA and Service Oriented Integration.

By establishing Global SOA CoEs, we have standardized one common approach to service portfolio management, service design & modeling, and SOA Governance. These efforts have been critical in measuring and maximizing service reuse, and increasing agility in solution development and integration.

In my experience, institutionalizing SOA and SOI hinges heavily on effective and practical Design-time and Runtime Governance. As the adoption for Cloud Computing / Cloud Services, and demand for Mobile Computing grows, SOA Governance becomes even more important in the areas of service design, integration, security, and SLA management.

I am confident that architects, project managers, and CXOs will find Journal of Integration insightful and valuable for their integration and SOA initiatives.

# PROLOGUE

## GOVERNANCE EQUALS SUCCESS

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To succeed, organizations need to meet the key business objectives - increase revenue growth, enable customer & business partner relationships, optimization of business processes and enable faster product introductions. Integration technologies play a pivotal role in today's IT architecture for meeting these key business objectives. Evolution of Integration technologies based on Service-Oriented Architecture (SOA) principles have potential to seamlessly integrate processes, partners, services and business events through standardization and reuse of services, hence creating a seamless enterprise.

To maximize the benefits of integration based on SOA principles, organizations need to implement comprehensive SOA Governance processes and frameworks. While adoption of SOA Governance is currently limited to handful of organizations, Governance is getting renewed focus as service complexity, scope and cost is increasing. With adoption of cloud bringing additional complexity, greater governance and control will be needed.

Many organizations have built huge portfolio of services with limited focus for reuse which needs to be re-written or re-factored for enterprise wide usage. Point of view on **"Design-Time Governance"** highlights the processes and frameworks needed to identify and implement right set of services.

As consumers of service demand increased quality of service and stricter SLAs, runtime management

complexities have increased substantially. Point of views on **"Runtime Governance"** provides key recommendations towards effective runtime governance.

SOA program being a business technology initiative requires a comprehensive metrics framework to measure the value delivered. Third point of view on **"SOA Value Measurement"** recommends key SOA Metrics that enterprises need to measure and emphasizes on valuable insights they provide for improving SOA Maturity and operational efficiency across service lifecycle.

As cloud computing gains acceptability amongst IT organizations, it is expected to bring in new set of challenges and opportunities with respect to integration, quality of service, security and more. We believe that in future, many services will mature to industry services and will get exposed on cloud via SaaS model. Fourth point of view **"Cloud Integration"** will cover the cloud integration scenarios, associated challenges and solution patterns.

Hope this Journal of Integration helps you to assess your organization's existing governance practices to successfully implement integration programs and readiness to embrace cloud.

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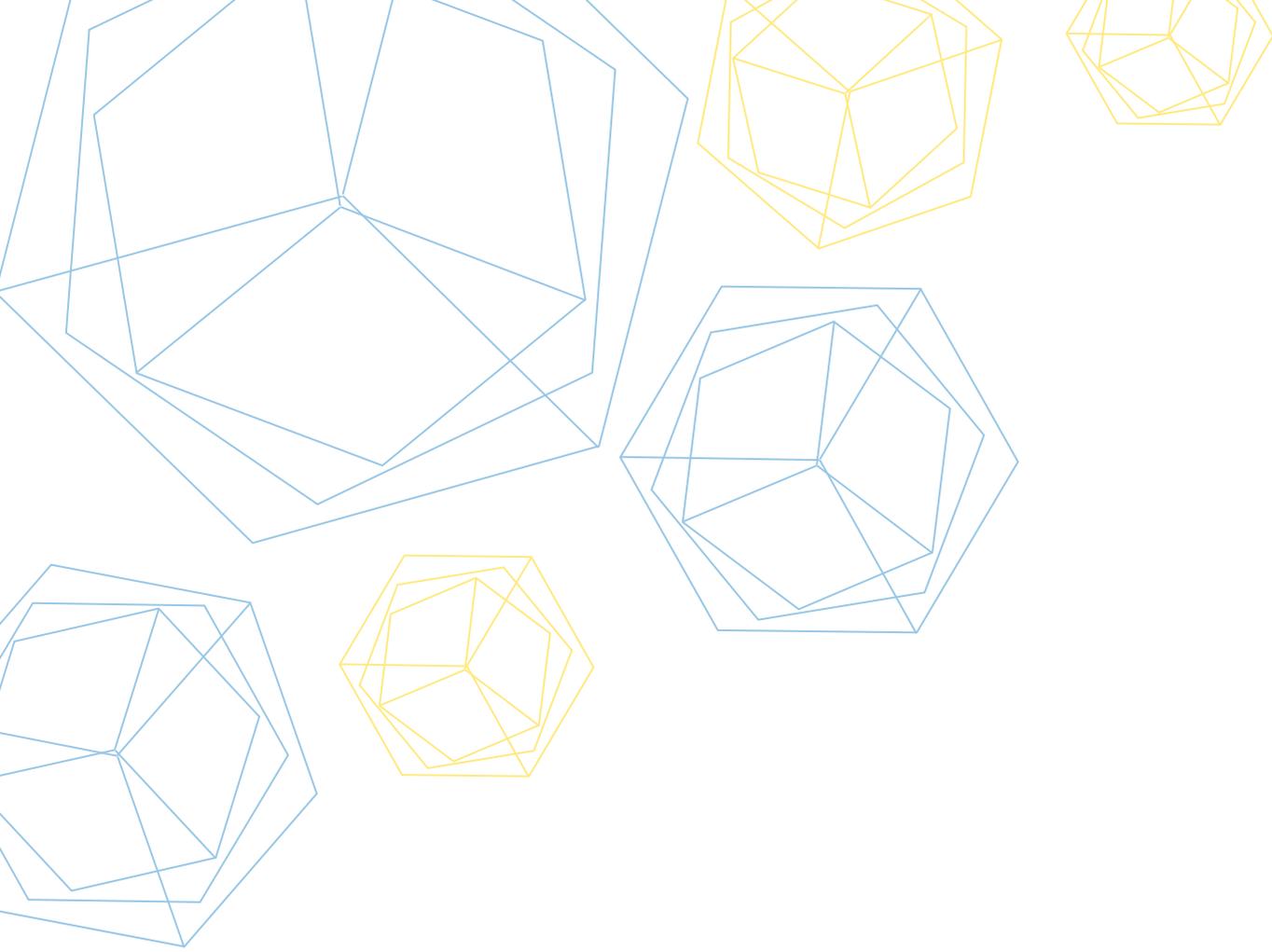


# DESIGN-TIME SOA GOVERNANCE - NEED FOR RENEWED FOCUS

## EXECUTIVE SUMMARY

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Design-time SOA Governance helps enterprises plan the complete service lifecycle and enables the creation of reusable service portfolios. While this kind of governance has evolved over a period of time, it is far from ideal primarily because of the tactical approach to meet project-specific needs. Proper Design-time Governance would lay down the ground rules for policy definition, lifecycle management and impact analysis. Model management must also be part of this governance scheme to ensure proper customizations to the service models at project level and reused as appropriate in a broader enterprise context.



## ABOUT THE AUTHOR

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Satyanarayana Sunkara is a Senior Consultant with Enterprise Business Integration Practice. He has 15+ years of experience in helping enterprises on their SOA journey by assessing requirements, selection of product suites, providing roadmap and measuring their success through SOA maturity assessment. He can be reached at [satyanarayana.sunkara@wipro.com](mailto:satyanarayana.sunkara@wipro.com)

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## Understanding Design-Time SOA Governance and its Importance

Design-time SOA Governance is a discipline of SOA Governance that helps enterprises plan, define and control the growth of services. It also includes policies to enable consistent service design, tools to model services and manage the service lifecycle.

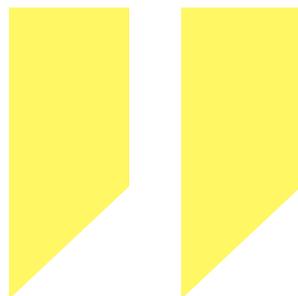
The benefits of Design-time SOA Governance include fostering standards adoption, providing visibility and controlling the integration of SOA within an enterprise. The economic slowdown and the need for cost optimization had caused enterprises to reconsider their current SOA strategies and look for other options.

### Definition of SOA Governance

SOA Governance is a subset of IT Governance, which ensures that enterprises fully realize the business benefits of SOA initiatives by addressing the People, Process and Technology aspects associated with such a change.

Types of SOA Governance

- Design-time
- Runtime



**With increasing adoption of services, enterprises have begun to realize the need for SOA Governance Framework with the right industry models and streamlined processes.**

## Current State of Design-Time SOA Governance

Design-time Governance in vast majority of enterprises have until now been limited to creation of technology standards, basic repository (or even spreadsheets in many cases) to publish services and little focus on capturing non-functional requirements at service level.

Adoption of Design-time SOA Governance methodologies and technologies has been limited, so far, either due to the belief that IT Governance is sufficient or the challenge in justifying additional investment for SOA Governance. However, without the proper SOA Governance framework, enterprises will create services without appropriate focus on service planning, analysis and modeling. This will result in granularity issues, uncontrolled service growth and reduced focus on reusing Canonical Data Models for message exchange.

With the proliferation of services, enterprises have begun to understand the importance of the right SOA Governance Framework. They have introduced specific roles to govern the service lifecycle and streamline services using the right governance processes. Many enterprises have therefore adopted industry canonical models to incorporate best practices and consistency in service analysis and design. Today, the usage of industry models for defining services is predominantly focused around interface and message models neglecting business process models. This is mostly because enterprises use several business process versions that lack proper documentation and are reluctant to change/standardize existing business processes.

## Wipro's Perspective on SOA Governance Technologies

While SOA Governance vendor offerings have evolved over a period of time, they are still far away from an ideal state. Earlier, service registry products which had been used for runtime discovery have now evolved into SOA Registry & Repository, a comprehensive product enabling service discovery, classification and compliance with design-time policies. The SOA Registry & Repository also offers flexibility in governance policy definition, lifecycle management and change impact analysis. However, most of the repositories today do not provide a complete solution to manage canonical schemas. Also, while the repositories provide basic reporting capabilities, support for advanced reporting remains limited.

The complexity and scale of SOA implementation has risen across enterprises over the last few years, leading to the need for advanced implementation of repositories to govern service components such as policies, contracts, schemas and standards. There are also specific products emerging in the market that enables model management and the mapping of canonical schemas to systems of record.

We also foresee increased adoption of modeling tools to enable top down design of service contracts beginning from the business capability model. These tools also provide a mechanism to generate service contracts and service implementation code (e.g. client proxy, service implementation classes).

## Adopting Design-Time SOA Governance: Challenges and Solutions

### Proliferation of Point-to-Point services

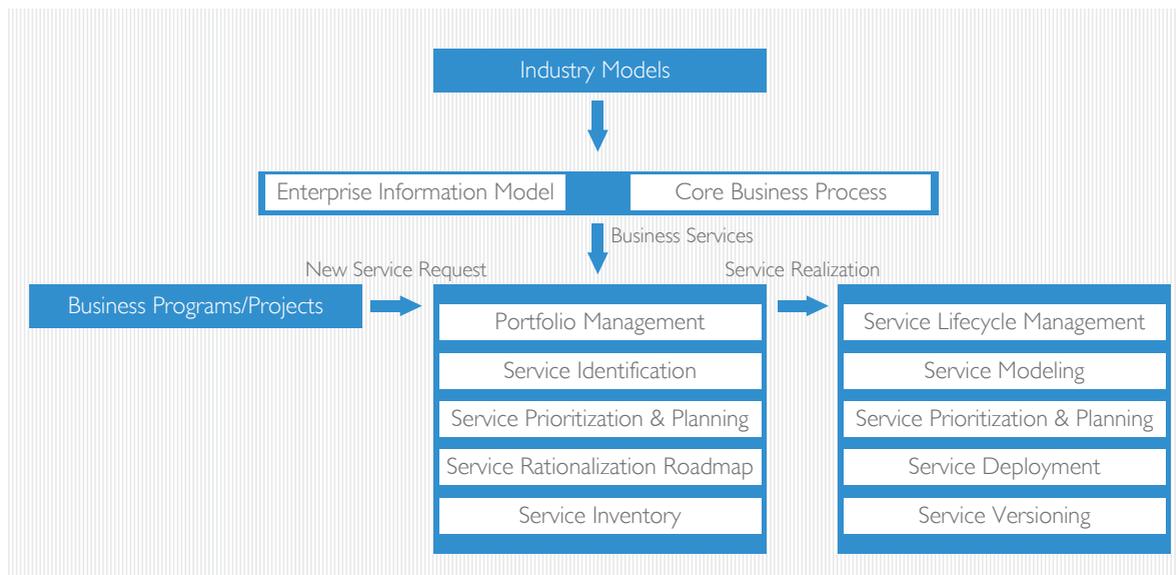
During transition from EAI to SOA, the majority of enterprises adopted web services for point-to-point integration which resulted in a wide proliferation of services.

## Recommended Solution: Service Portfolio Management

Service Portfolio Management is a process that enables organizations to plan, deliver and manage an optimal set of services as required by business programs and other strategic initiatives. Enterprises should adapt to continuous service portfolio management covering service identification, prioritization, assigning services to projects, ownership and funding to develop a comprehensive portfolio plan of services. This would reduce the growth of tactical point-to-point solutions and control the rapid proliferation of services. It would also create a conscious effort to track services that deviate from the overall portfolio plan.

Portfolio management is an activity which happens much before the start of the service lifecycle. An important element in this process is identification of services via decomposition of business processes and determining projects which will implement these services. Industry Models (e.g. ACORD, HL-7, TMF-SID, IFW, and IAA) can also help in identifying service candidates during the portfolio planning exercise. As part of overall portfolio management, enterprises should also identify service rationalization opportunities to address the issue of duplicate or fine grained services implemented earlier. As part of this exercise, existing services should be analyzed for consolidation and then matched with the service portfolio planned for synergies. This would then help align the rationalization exercise with project rollouts.

Service and Schema Repositories can both aid in the analysis of existing services and their dependencies to determine rationalization candidates.



## Changing Models

As enterprises start implementing Canonical Data Models, aligning the enterprise model with project specific versions is quite a challenge. For instance, while message models (XSDs) keep changing as per functional requirements of projects, these changes would then need to flow back into the enterprise model for consistency and wider reuse, if applicable. Enterprises following industry standard models would need to keep track of model version changes. For example, when a new version of the industry model is available, the Canonical Data Model version used by the enterprise needs to be upgraded. These two aspects become more complicated for global enterprises with multiple lines of business.

The changes to service models or schema models require extensive analysis to discern the impact of the change to other existing services or service consumers. Existing tools like SOA Registry and Repository cannot address this requirement completely and hence the need for a separate schema repository.

## Solution: Model Management

Model management encompasses a set of processes, tools and standards to enable the enterprise model

to synchronize with project specific or industry model changes. This is applicable to business process models, service models and Canonical Data Models.

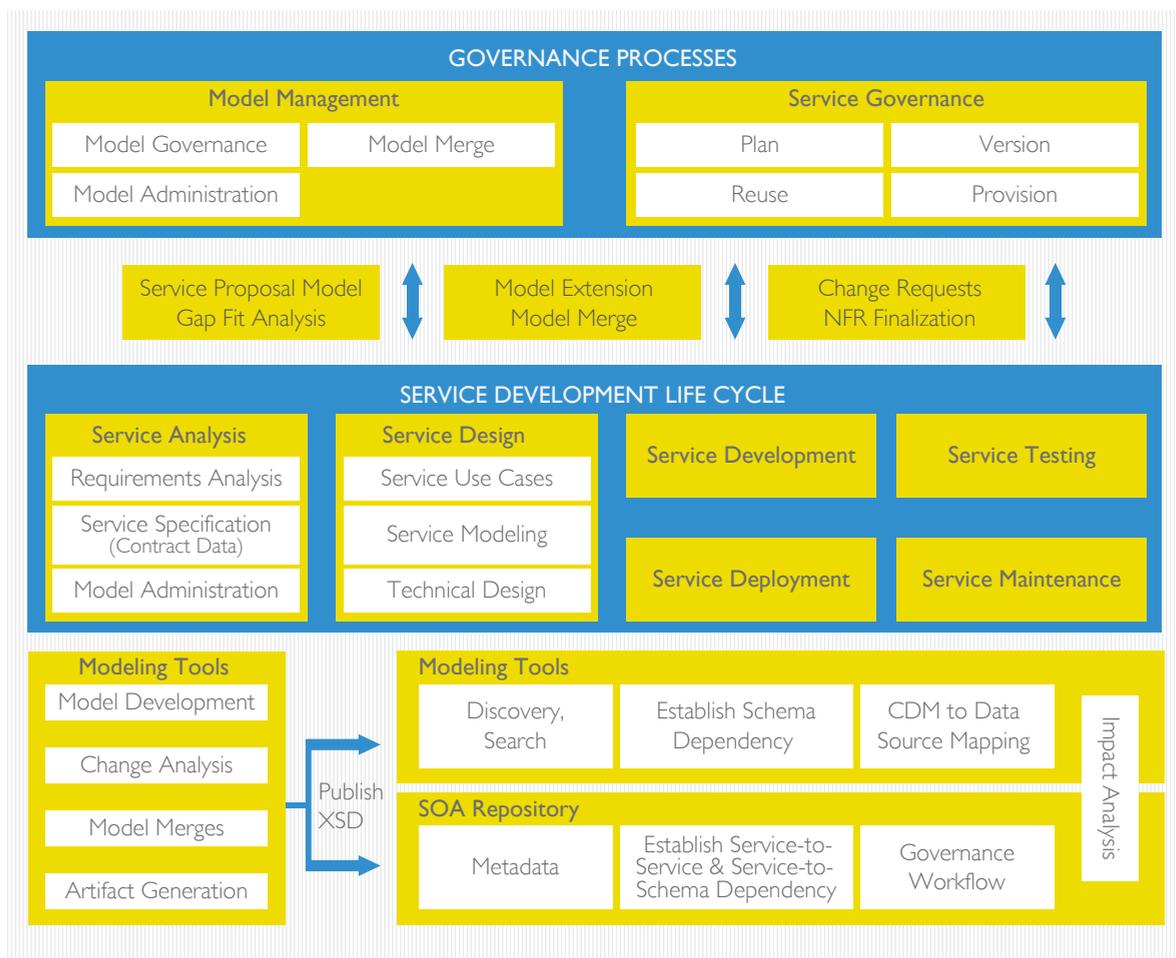
### Model Management processes would address:

- Model Governance roles (project level, LOB level, enterprise level)
- Model Governance process (addresses customization of the enterprise model to specific needs)
- Model Administration processes (addresses upgrade tools for the enterprise model)
- Model Merge process (analysis and approval process to merge project level changes to enterprise model)
- From a Tooling perspective, business process modeling tools have been around for a while seamlessly linking to service modeling and design tools. Service Models and Canonical Data Models are generally developed using UML and leverage tools like Enterprise Architect, RSA, IDA. These tools can help analyze changes between different versions of the model and enable model merge.

- From an Impact Analysis perspective, the Service Repository keeps track of schemas and their association with services. However, they don't directly link up to the Canonical Data Model changes or versions. One way is to extend the service metadata in repositories to capture the relationship of the service with the Canonical Model at entity level. This way whenever there is a change in the Canonical Model Entity, it is easy to understand the impact of the change on associated services. However, this process is cumbersome and is not comprehensive enough as the repository products do not provide out of the box support for managing Canonical Models. There are emerging products in the form of XML repositories which store XSD documents (generated from Canonical Models) in a granular form by converting the document into its basic

entities. It is easy to analyze various versions of the enterprise canonical model and service models side by side and conduct an impact analysis. Hence there has to be an integrated strategy to manage enterprise Canonical Data Models using SOA Registry & Repository, XML Repository and Service Modeling tools.

- It is also important to manage the relationship between Canonical Data Models and the system of record (back-end schemas). The challenge is to decipher the semantics of various existing back-end schema elements and mapping them onto Canonical Models. However XML repositories can maintain such a mapping and it contributes towards improving productivity during data mapping exercises and provides valuable insights during service rationalization exercises.



## Service Performance and Availability Issues

Performance issues crop up if one or more layers in the Service Oriented Architecture does not scale to meet the NFR expectation. Usually, service NFRs are not clearly captured and SLAs are not in place with service consumers. Conversely, the importance of capturing NFRs at the right granularity (for example peak loads for various periods, availability and performance during peak and non peak times) is realized only when there is a production issue.

The NFRs captured at use case level are not sufficient and they have to be further broken at the component level (i.e. presentation layer, service gateway layer, ESB layer, service provider layer) expectations. Also there has to be a monitoring strategy to track NFRs and detect bottlenecks in case of issues. Only a small percentage of enterprises take a holistic approach towards performance and capacity modeling based on service NFRs as part of their SOA adoption.

## Solution: Create Services While Considering NFRs

During service design-time, NFRs should be captured and assigned to each layer of the solution architecture. It is important to capture NFRs not only at the right level but also to govern them through the service design phase. It is also imperative to define monitoring and measurement parameters for defined NFRs to arrive onto SLAs.

For legacy components which may not be amenable to NFR expectations, break the NFR into the component level, which will at least help in understanding bottlenecks and rationalize expectations for service contracts.

## Summary

- To avoid proliferation of services and minimize point-to-point interfaces, a comprehensive service portfolio management function must be established.
- NFRs must be captured at a very granular level and then broken down to the component level expectations. NFRs should be governed from requirements through design phases to avoid performance and other expectation mismatch during service operations.
- Model management should be part of the Design-time Governance to ensure consistent customization and reuse of Canonical Data Model entities across projects.

## Glossary of Terms

**ACORD framework** Information model for insurance industry by Association for Cooperative Operations Research and Development

**EAI** Enterprise Application Integration

**ESB** Enterprise Service Bus

**CDM** Canonical Data Model

**SOA** Service-Oriented Architecture

**IAA** Insurance Application Architecture

**NFR** Non Functional Requirements

**RDBMS** Relational Database Management System

**RSA** Rational Software Architect

**IDA** InfoSphere Data Architect

**SLA** Service Level Agreement

**TMF (SID)** Information Framework from TM forum

**XSD-XML** Schema Definition

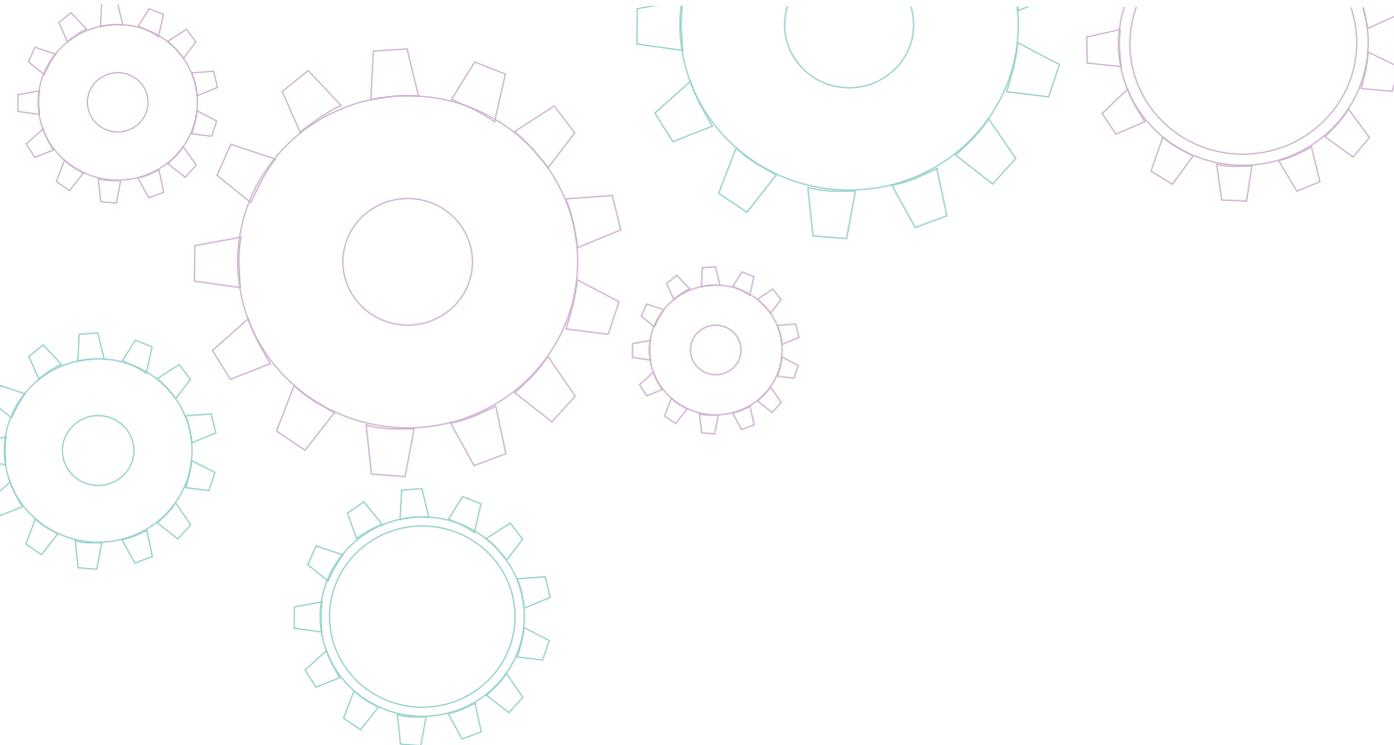


# SOA RUNTIME GOVERNANCE - MUST HAVE FOR SERVICE QoS

## EXECUTIVE SUMMARY

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With more enterprises turning to SOA to achieve greater business agility, there is a strong need for a disciplined approach to SOA Runtime Governance to ensure efficient deployment and management of SOA systems. This whitepaper discusses the various benefits of implementing Runtime Governance in SOA environments. It also outlines the key challenges that organizations face with implementing Runtime Governance and outlines best practices for effective implementation to overcome these issues.



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## Overview of Runtime SOA Governance

SOA Governance at Runtime involves defining and enforcing policies to control the deployment, utilization, operation and consumption of services. Runtime Governance ensures services compliance to policies by making sure all service policies are applied consistently across intermediaries, troubleshooting service failures, providing alerts on SLA violations and allowing for scalability to meet growing consumer needs.

The need for Runtime Governance capabilities has increased today due to an increase in number of services and the subsequent service complexity. This requires stringent performance or availability requirements for seamless service functionality. With widespread adoption of cloud computing, the need for Runtime SOA Governance is further accentuated, as there are contracts structured around service usage, policies and SLAs.



**SOA Governance at runtime ensures services compliance to policies and enables proactive actions in case of policy violations.**

## Current State of Adoption of Runtime SOA Governance

Majority of large enterprises today have critical services running in production, which connect with heterogeneous application platforms to deliver the functionality. The most commonly used middleware infrastructures include BPM, ESB, messaging and B2B layer. However with diversity of platforms and applications, organizations face new requirements for managing services at runtime as follows:

- Policy enforcement across intermediaries and provider end points
- Managing different set of policies for each service
- Handling varying security requirements such as B2B consumer and an internal consumer
- Planning and managing middleware capacity to fulfill service SLA, QoS requirements for different service consumers
- Visibility into services and their usage metrics
- Monitoring of services

Organizations are increasingly deploying shared SOA infrastructure (with executive level support) or utilizing a part of their existing IT infrastructure as a shared SOA infrastructure in order to reduce overall infrastructure TCO. It has become a huge challenge for organizations to charge back different business units for maintenance of services and their supporting infrastructure costs. One of the main reasons for this is the lack of well-defined funding models for shared services or incentives to support shared services.

## Runtime Governance Tooling

SOA Runtime Governance tools provide greater end-to-end visibility and enable organizations to address SOA Runtime Governance requirements. These tools address the three main customer scenarios as discussed in the following paragraphs:

- Many organizations have deployed service management and monitoring systems to enforce security policies, monitor service usage and availability. Over the past couple of years, there has been a significant increase in usage of tools to apply security policies especially for partner facing services.
- The lack of standard vendor implementations for service policy and metadata exchange between different infrastructure components has resulted in an absence of a central store and management for policies at runtime. Most organizations have implemented service registries to act as system of record for service policies and SLAs. However policies deployed on the SOA enforcement components are still manually configured and verified - a long and time consuming process. There is also limited automation provided by service infrastructure management tools/vendors to support the policy lifecycle i.e. defining, deploying and enforcing, verifying policies at runtime.
- Organizations typically find it complicated to perform capacity planning within a shared SOA infrastructure using traditional approaches by leveraging existing system management and monitoring tools. Additionally, significant integration efforts are required to implement a solution that can capture resource utilization per service across SOA layers.

From a process perspective capacity planning, funding and chargeback processes need to be clearly defined to consider runtime metrics feeding back into these processes.

## Challenges

Organizations in the process of establishing SOA Runtime Governance process face multiple challenges, some of which have been covered in the previous section. This paper focuses on the three main challenges faced by enterprises today:

- Consistent enforcement of service policies
- Managing service QoS and consumer specific SLAs
- Service capacity planning in a shared infrastructure

## Consistent Enforcement of Service Policies

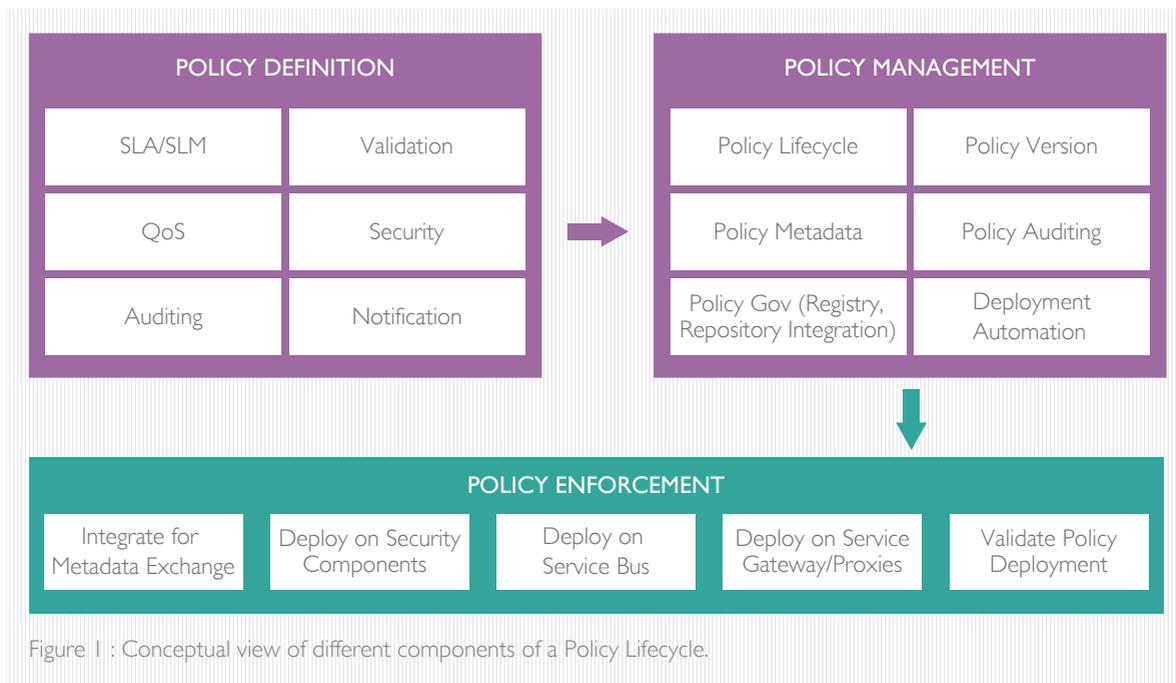
Organizations implementing Runtime Governance in their SOA environments can accordingly establish policies to govern the quality of a SOA system at runtime. It also enables organizations to execute activities necessary for seamless policy enforcement on various components of the SOA infrastructure.

Policies specified for runtime need to adhere to compliance standards. To accomplish this task, the policies should be distributed across the SOA infrastructure and its execution diligently monitored for successes and failures. Organizations need to ensure that their policy management for runtime continuously evaluates policy bindings and enforces them across SOA infrastructure.

A key challenge for organizations here is to automate policy enforcement at runtime while also ensuring uniform enforcement of runtime policies across SOA infrastructure.



**There is a strong need for organizations to automate policy enforcement at runtime.**



## Centralized Policy Enforcement and Automation

Organizations implementing centralized policy storage and management solutions typically follow certain patterns such as:

- Implementation of SOA infrastructure components that provide out-of-the-box support for the following areas:
  - >> Security policy enforcement
  - >> Message validation and filtering policies
  - >> Message logging and auditing policies
  - >> Service level management policies
- Deployment of appliance based Runtime Governance components for policy enforcement.

Organizations planning to implement centralized policy enforcement can leverage existing investments on appliances by integrating them with runtime tools such as service registry and identity management solutions to execute and manage their policies.



**SOA Governance tools do not integrate in a seamless fashion and end-to-end visibility of runtime metric is not available.**

The following diagram depicts a typical SOA architecture at a high level and key components involved in the policy enforcement. Service policy storage and management should be centralized as much as possible to enable quick viewing and easy management of policy changes. Centralized service policies also allow for easy auditing and reporting functionality.

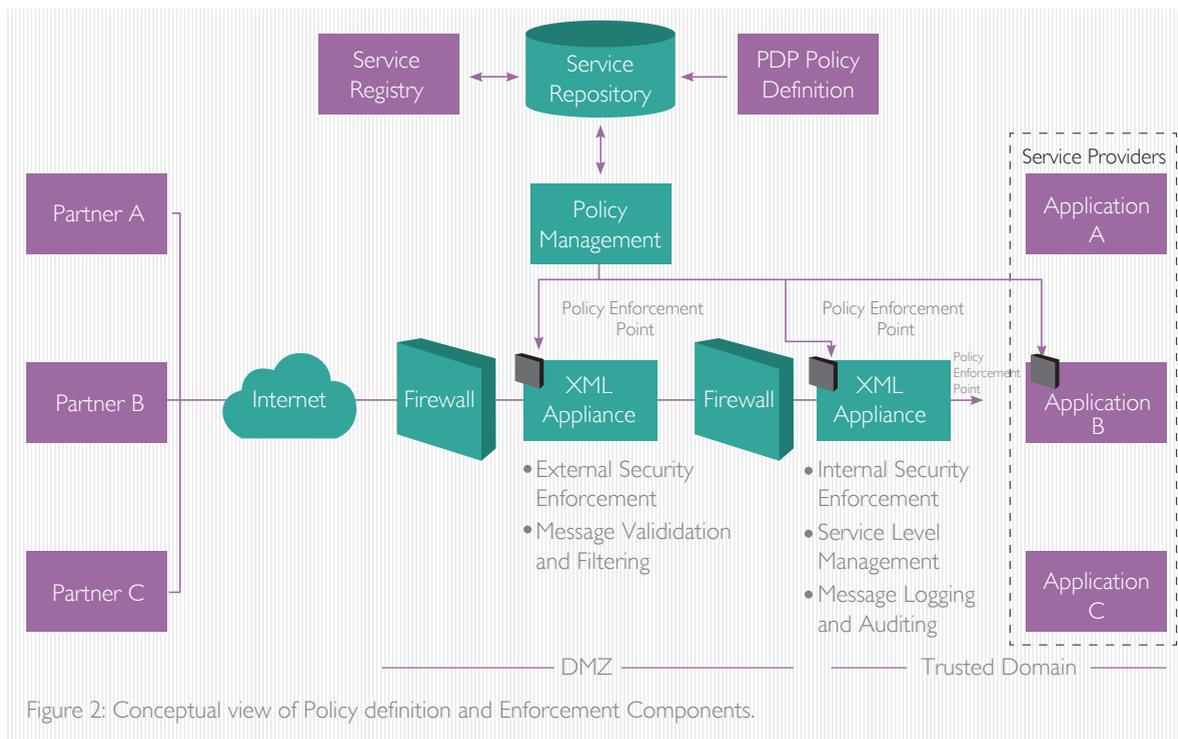


Figure 2: Conceptual view of Policy definition and Enforcement Components.

The following points highlight key areas to be considered in implementing central enforcement and automation of policies:

- Need to define a well-established SOA Governance process before tooling/automation
- Tool adoption for definition and management of service policies
- Implementation of a centralized policy definition and storage
- Centrally propagating service policies to each SOA infrastructure layer/nodes
- Emphasis and focus on automation of policy enforcement and metadata exchange

## Managing Service QoS and Consumer Specific SLAs

Services monitoring and metrics enables organizations to have full control over deployed services, while also allowing for flexibility with service deployment and interactions to meet business needs.

Most organizations have started their SOA deployments by using service runtime management systems to carry out the functions:

- Monitoring quality of service against service level agreements
- Managing and controlling services by deploying policies based on contracts
- Notifications/alert runtime SLA/QoS policy violations

Some of the key challenges that organizations face in managing policies related to monitoring are as follows:

- Managing a large number of policies defined for different consumer SLA, QoS, and alerts/notifications requirements for a service. This becomes a huge challenge as organizations have to manually manage policies and deployment without a proper tool.
- SOA monitoring tools available in the market today support different levels of integration with

different application platforms. This poses a challenge to organizations implementing end-to-end monitoring on a heterogeneous SOA infrastructure with different vendor tools.

However, it is easy to implement service monitoring on one specific platform using these tools. In this context, some of the solution considerations for managing policies while addressing the challenges mentioned earlier are outlined below:

- Implementation of service policy management, service registry, and repository tools to efficiently store and manage large number of policies.
- Integration of appliances, service registry and runtime service monitoring tools to deploy policies and configure them to dynamically route to different service endpoints based on different SLAs and QoSs.
- Implementation of notification/alert policies centrally and deployment at each SOA layer. The alerts/logs need to be aggregated to a central log area or a data warehouse to enable easy analysis of root causes which in turn helps implement a robust operational support system for services.
- End-to-end monitoring requires correlating messages for reporting requirements and this entails passing a global message identifier within message payload/context when the messages are logged at each layer. To ensure seamless implementation, organizations need to integrate efforts to process message structure with unique message identifier at each layer.
- Adoption of SOA appliances with extended capabilities to support cloud integration needs, and also policy support for security performance, QoS, etc.

## Service Capacity Planning In a Shared Infrastructure

It has become increasingly complex for organizations to perform capacity planning in a shared SOA infrastructure using existing system management and monitoring tools. In this context, capacity planning is very critical for devising funding and chargeback processes for a shared infrastructure to optimize costs. There is a strong need for runtime service metrics feeding back into these processes to efficiently manage service capacity.

Thus in order to determine and plan capacity, organizations need to leverage service Runtime Governance tools along with existing system management and monitoring tools to determine service workload characteristics. There is also a need to standardize capacity planning models for the shared infrastructures.



**Managing multiple policies related to service monitoring and metrics for SOA deployments is a huge challenge for many organizations.**

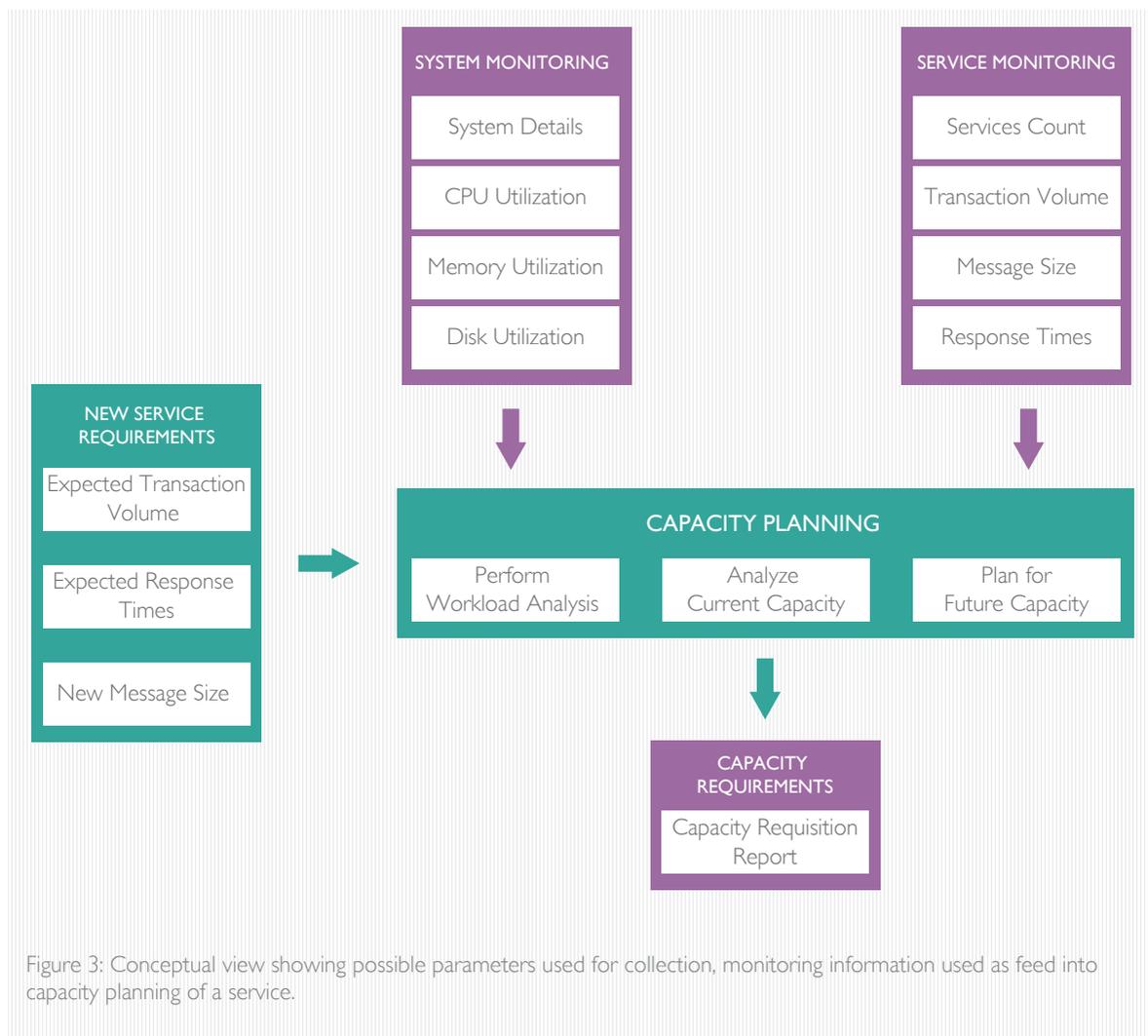


Figure 3: Conceptual view showing possible parameters used for collection, monitoring information used as feed into capacity planning of a service.

Key considerations for implementing end-to-end monitoring for capacity planning:

- Definition/introduction of a capacity and demand planning process as part of an organization's SOA Governance framework. It should also be part of service development lifecycle, which has input/feed from SOA Runtime and monitoring tools.
- End-to-end service monitoring to address service scalability and performance issues.
- Periodic service workload characteristics and runtime metrics to be fed to a data warehouse for analyzing usage trends and managing capacity.
- Leveraging service usage reports from service management/monitoring systems to define the charge back model for a Business Unit based on two criteria – (1) percentage of services being leveraged and (2) percentage of total service invocations.



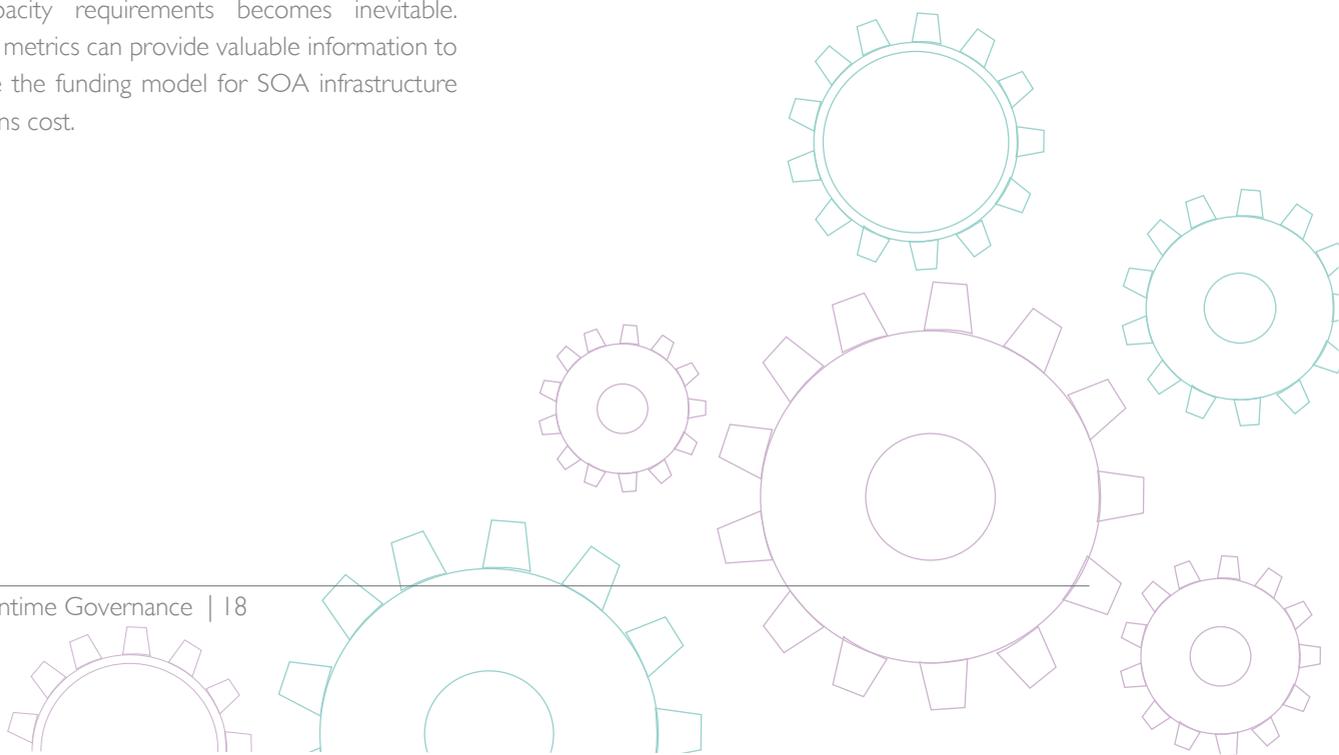
**Runtime service metrics and tools are required for capacity planning in order to optimize costs with shared infrastructures.**

### Summary

Enterprises are increasingly building composite services resulting in highly distributed SOA implementations and hence there is a strong need for Runtime Governance to manage these implementations effectively. Organizations need to adopt a comprehensive approach and tooling towards policy definition, consistent enforcement of policies across the nodes and end-to-end monitoring. End-to-end monitoring assists the organization in root cause analysis as well as capacity planning for shared infrastructure. As more and more enterprises shift to the cloud, the need for understanding service performance, SLA violations and capacity requirements becomes inevitable. Runtime metrics can provide valuable information to structure the funding model for SOA infrastructure operations cost.

### Glossary of Terms

- B2B** Business-to-Business
- BPM** Business Process Management
- ESB** Enterprise Service Bus
- ROI** Return on Investment
- SOA** Service-Oriented Architecture
- TCO** Total Cost of Ownership
- QoS** Quality of Service



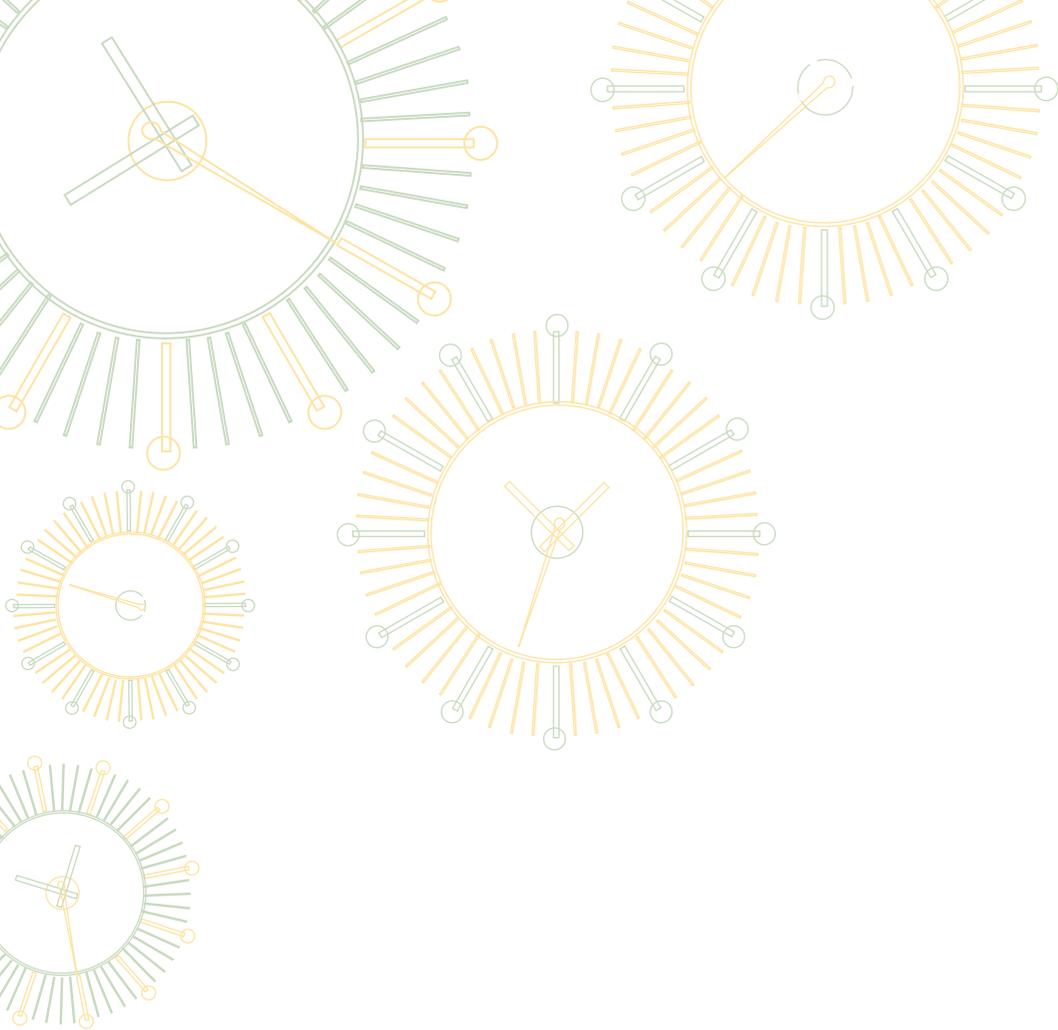


# SOA VALUE MEASUREMENT

## EXECUTIVE SUMMARY

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Service-Oriented Architectures (SOA) have widespread adoption today and is seen as a key accelerator for business agility and innovation. However in reality, most companies remain clueless in judging the success of their SOA initiatives. What companies need to realize now is that SOA value accumulates over a period of time and this is best reflected by implementing metrics to monitor progress and demonstrate continuous KPI improvement as part of any SOA initiative. The best combination of metrics is that which measures the efficiency and effectiveness of SOA-based solutions while ensuring alignment with business - both of which indicate the overall success of the SOA program.



## ABOUT THE AUTHOR

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## Introduction

The promise of reduced IT complexity and greater operational efficiency has brought SOA into the mainstream of current IT. The adoption of SOA was particularly seen beneficial for large enterprises with multitude of business applications and interfaces.

A study by an independent research firm reveals that while many enterprises believe SOA has been beneficial, only a few have actually reached a level of maturity that allows them to reap complete benefits. Our experiences with global fortune clients show that most of them have approached their SOA transformation journey by building their SOA capabilities incrementally, in a phased manner. The characteristics of SOA in many enterprises today can be described as an integration-centric approach that revolves around leveraging loosely coupled intermediaries such as an Enterprise Service Bus. This is a practical approach that enables them to solve immediate integration needs and enhances reuse as well. However, to maximize the benefits of SOA, enterprises need to build coarse-grained business services and business process services. The additional investments needed for this change can be established through KPI improvements that these initiatives will bring about.

A leading industry analyst recently noted that 35% of companies do not measure results or ROI for SOA projects. This resonates with our observation that many enterprises have not focused on quantification of benefits and its communication to the business due to the absence of a rigorous approach towards SOA Value Measurement. This has resulted in businesses questioning the value and the need for continued funding on SOA initiatives.

A SOA/Integration services department needs to establish the value of SOA through right measurements tools and communication channels. The SOA steering committee should review the SOA metrics regularly and determine if the benefits commensurate with the current maturity level or if there is scope for further optimization. A business

case can be proposed for further investment using current and projected Return-on-Investment (ROI) calculation leveraging SOA metrics. This whitepaper highlights some of the key metrics that organizations need to adopt to demonstrate the benefits of SOA (viz. reuse, standardization and simplification).

## Importance of SOA Metrics

SOA metrics help companies assess the status of their SOA initiative and determine corrective actions if needed.

Metrics are not only critical for assessing the status of a SOA initiative but also help determine the corrective course of action required. Once the metrics have been defined and captured, it can provide a comprehensive view on the ROI of the SOA implementation. ROI of any SOA rollout depends on several factors, the key ones being scope of the initiative, architecture chosen, SOA Governance, business alignment, delivery model and operational efficiency.

SOA metrics should be captured periodically and communicated to all the SOA program stakeholders. This helps in providing them a clear picture of the adoption status and value created in the SOA journey. SOA metrics further provides quantitative inputs that determine the SOA maturity of the organization.



**35% of companies do not measure results or ROI for SOA Projects.**

## Framework and Tools for Measuring SOA Metrics

A comprehensive framework defining the metrics, tools to record the metrics and a process to review the progress is necessary to ensure success of a SOA initiative.

It is imperative to define a framework with SOA metrics definitions, SOA Software Development Lifecycle (SDLC) with metrics collection activities, metrics review points and tools to capture and report metrics.

A combination of service repositories, service monitoring, schema repository and project management tools can assist in keeping track of SOA metrics. The captured SOA metrics can provide pointers to companies in terms of architecture or operational fine tuning that may be needed.

### Key SOA Metrics

- Reuse
- Standards compliance
- Service lifecycle metrics
- Project benefits
- Cost savings
- SOA adoption
- Runtime metrics

Key metrics have to be identified based on business and IT goals to define the KPIs which demonstrate SOA value. These KPIs should be associated with target values and industry benchmarks wherever possible to drive continuous improvements.

SOA metrics need to be captured from several dimensions and should cover the entire service lifecycle as well. This data when captured correctly at the service or service component level can provide sufficient information that help companies derive broader level insights.



**The captured SOA metrics can provide pointers to companies in terms of architecture or operational fine tuning that may be needed.**

Some of the key categories of SOA metrics have been discussed in rest of the paper. The categories covered here are a good indicative list to start with and do not cover a comprehensive list of all possible metrics.

### Reuse

This metric demonstrates the value of your SOA implementation and helps in determining whether the basic promise of SOA (ie- ability to reuse services) has been realized or not. (Refer figure 1)

Reuse can be measured based on the scope of reuse and the extent of reuse. This is measured at the following levels:

- Service reuse
- Schema reuse
- Policy reuse
- Service component reuse

Reuse scope indicates the organizational scope of reuse and is broadly measured under following categories:

- Enterprise reuse
- Department/LOB reuse
- Project level reuse

## REUSE SCOPE

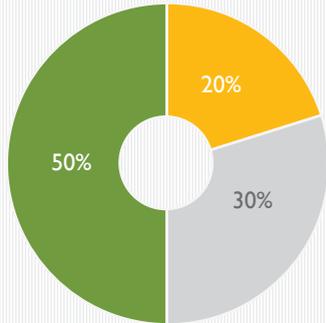


Figure 1



The extent of reuse within an organization can be measured using key parameters such as:

- Average number of consumers for services
- Average number of consumers for schemas
- Average number of consumers for policies
- Average number of consumers for service components

(Refer figure 2)

## REUSE DENSITY

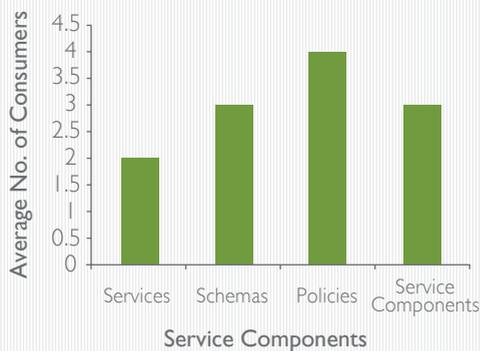


Figure 2

A service inventory level view classified by the amount of reuse gives a good indication of the number of services that are reused as well as those that are underutilized or not used at all.

This data provides valuable insights into the services that are potential candidates for retirement or consolidation.

(Refer figure 3)

## REUSE SPREAD

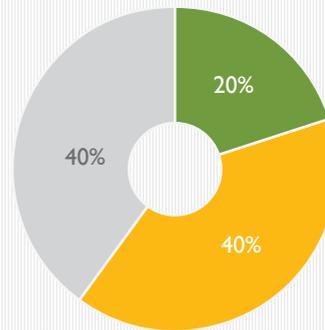
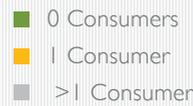


Figure 3



## Standards Compliance

Compliance to standards is one of the main factors that determine whether a particular service can be reused across platforms and its flexibility to adopt future changes. Effort must be made to classify the level of compliance to the enterprise standards.

(Refer figure 4)

The standards compliance can be broadly measured under three categories as follows:

- Not compliant to standards
- Partial compliance to standards such as
  - >> Compliant to technical standards
  - >> Compliant to interface standard
- Compliant to all standards

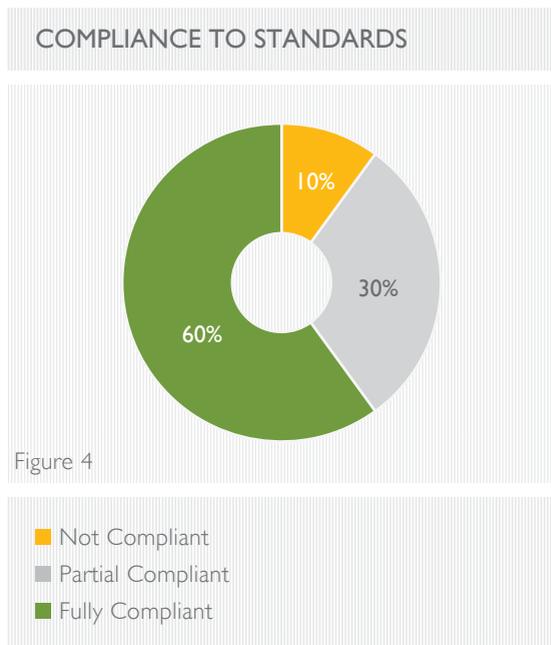


Figure 4

The evolution of service and its adherence to enterprise standards is necessary to ensure compliance of future releases and updates.

(Refer figure 5)

## IMPROVEMENT TO STANDARDS ADHERENCE



Figure 5

## Service Lifecycle Metrics

These are important metrics that measures the maturity of the service delivery process, model and the automation levels across the service lifecycle. These metrics can help improve operational efficiency and thereby enhance customer satisfaction. It also enables organizations to measure the cost benefits of implementing SOA.

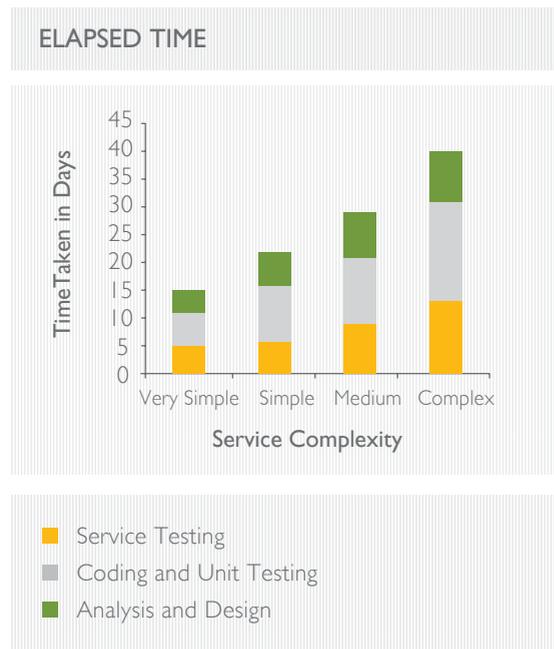
To ensure accurate calculations of cost benefits, it is important to record the initial effort undertaken while building a service so that it serves as a reference every time a service or a service component is reused. The key metrics that should be captured across lifecycle phases should cover effort, quality and schedule dimensions. The key measurement attributes for this metric includes:

- Elapsed time for all the service lifecycle phases (Requirements Analysis to Production Deployment)
- Service lifecycle phases that leverage automated tools
- Defect metrics (across phases)

Reuse of components and usage of automation tools help in improving these metrics. These metrics also provide feedback into estimation model.

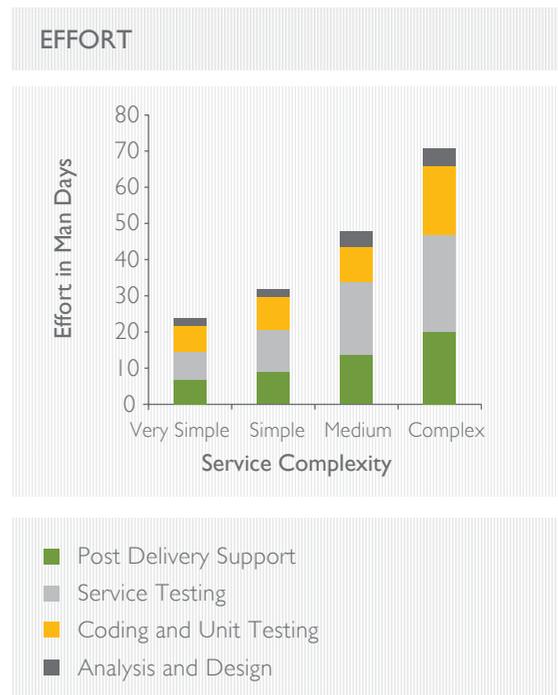
## Time-to-Market

The average elapsed time to deliver services should be measured at the minimum up to service testing and ideally all the way to deployment.

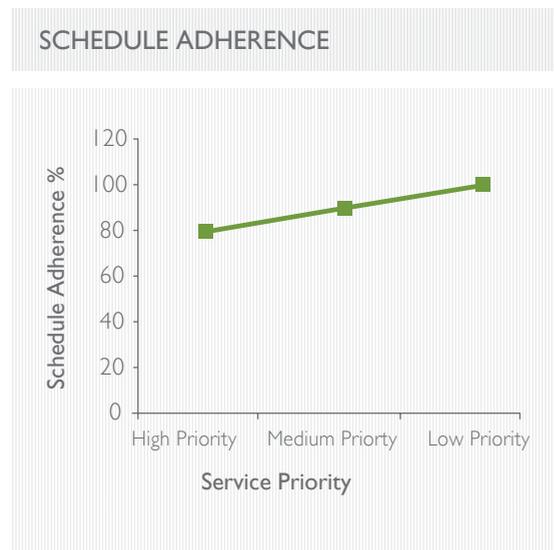


## Effort to Deliver

This should be measured at the minimum up to service testing and ideally all the way to deployment.

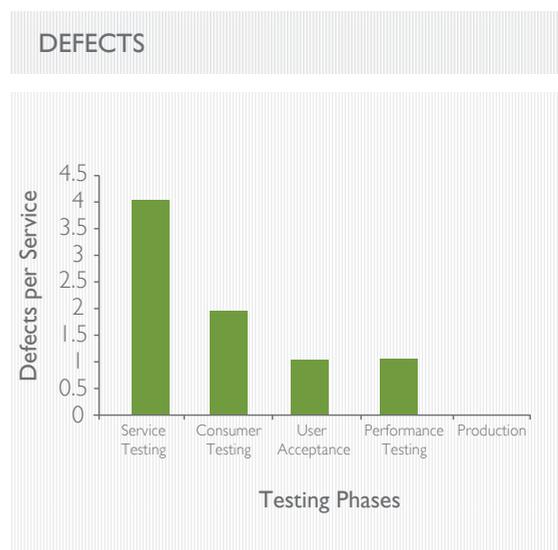


The ability to deliver business requirements on time should be measured. This is an indication of the organization's ability to prioritize services and its agility in responding to business needs.



## Delivery Quality

Defects should be measured across all the phases of testing up to deployment.



## Project Benefits

It is important to relate the benefits obtained by business projects leveraging SOA. These benefits can be evangelized to other lines of business to demonstrate the value of SOA adoption. The table below provides some examples of the quantitative

benefits that enterprises have to collect and embed in their SOA success stories to enable wider adoption. These measurements have to be viewed in the context of the benefits received in a particular program that leveraged SOA to deliver business functionality.

AREA	MEASUREMENT
Time-to-Market	<ul style="list-style-type: none"> <li>● Time to launch the same functionality in multiple channels. (Applicable for programs leveraging SOA for enabling multi-channel access capabilities for a specified business functionality)</li> <li>● Time to launch new product and services</li> </ul>
Information Availability & Consistency	<ul style="list-style-type: none"> <li>● % increase in the amount of information available real time</li> <li>● % reduction in issues reported due to information inconsistency across different channels</li> </ul>
Operational Efficiency	<ul style="list-style-type: none"> <li>● Increase in end-user efficiency due to single, integrated view of data and systems ( CSR, Branch Users)</li> </ul>
Cross-sell Opportunities	<ul style="list-style-type: none"> <li>● % increase in cross-sell opportunities created across lines of business or acquired entities</li> </ul>
Ease of switching Service Provider	<ul style="list-style-type: none"> <li>● % of interfaces unchanged when switching the service provider implementation (new application, 3rd party service)</li> </ul>

## Cost Saving

The cost savings realized by the usage of SOA has to be measured consistently so that the same can be projected as "Return on Investment". This can be derived based on effort metrics, reuse metrics and cost benefits of shared infrastructure. The effort metrics and reuse metrics described earlier form the key foundation for this metric.

- Service level ROI can be computed as Savings =  $\sum_{k=1}^n ED(K) - \sum_{k=1}^n EC(K)$ , where,

>> n is the total number of consumers and k is the counter

>> ED is the development cost saved due to reuse of the service for a consumer k

>> EC is the cost attributed to modifications or enhancements made to address the specific requirements of consumer k. (e.g. minor and major version upgrades)

- The savings obtained by leveraging a shared SOA infrastructure for middleware can be computed as a factor of:

>> Number of services migrated to shared SOA infrastructure from other existing middleware platforms in the enterprise

>> Hardware assets reused via virtualization

>> Support savings obtained by decommissioning of legacy and custom middleware solutions

## SOA Adoptions

It is also important to measure the adoption rate of SOA across the organization and in the respective programs/LOBs.

- Project adoption
  - >> Number of projects requiring real-time integration leveraged SOA
  - >> Number of projects not leveraging SOA after initial assessment, when the scope was there (technical or other reasons)
  - >> Number of projects claiming exception to SOA due to project constraints.
- Adoption of Business Domain & Geography
  - >> Number of services per Business Domain
  - >> Number of services per Geography
- Service portfolio implemented
  - >> Number of services implemented as per portfolio plan
  - >> Number of non-portfolio services implemented

## Runtime Metrics

Runtime metrics measure service usage to enable capacity planning and generation of proactive alerts that in turn prevent deterioration of service levels or indicate potential issues. These statistics can also be used to alleviate concerns on performance related to SOA from new programs and lines of businesses.

The key measurement attributes for this metric are as follows:

- Number of services on Virtual Environment, Cloud environment
- Performance of services within a Virtual Machine (VM)
- Utilization of the servers/VMs
- Average response times
- Service availability
- Transaction statistics (per sec/per consumer/ time spread)
- Maximum payload size

## Conclusion

Metrics provide a win-win situation for businesses that are able to fathom the benefits of SOA investment in quantitative terms. It also helps architecture teams prove the success of their SOA vision. In some situations, these metrics may paint a grim picture especially in cases where SOA was force-fit to an initiative or where the SOA definition was not laid out well, or where the scope of adoption was minimal as compared to the initial investment and so on. However at the same time, it helps in bringing attention to a fact that may have otherwise gone unnoticed or taken a long time to unearth. In conclusion, as W. Edwards Deming, the Father of the Japanese post-war industrial revival and one of the

leading quality gurus in the world wisely said, "You can't manage what you can't measure."

## Glossary of Terms

**ESB** Enterprise Service Bus

**LOB** Line of Business

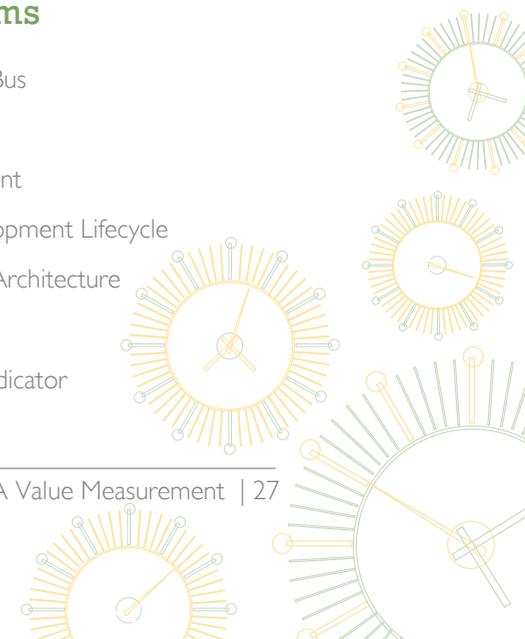
**ROI** Return on Investment

**SDLC** Software Development Lifecycle

**SOA** Service-Oriented Architecture

**VM** Virtual Machine

**KPI** Key Performance Indicator



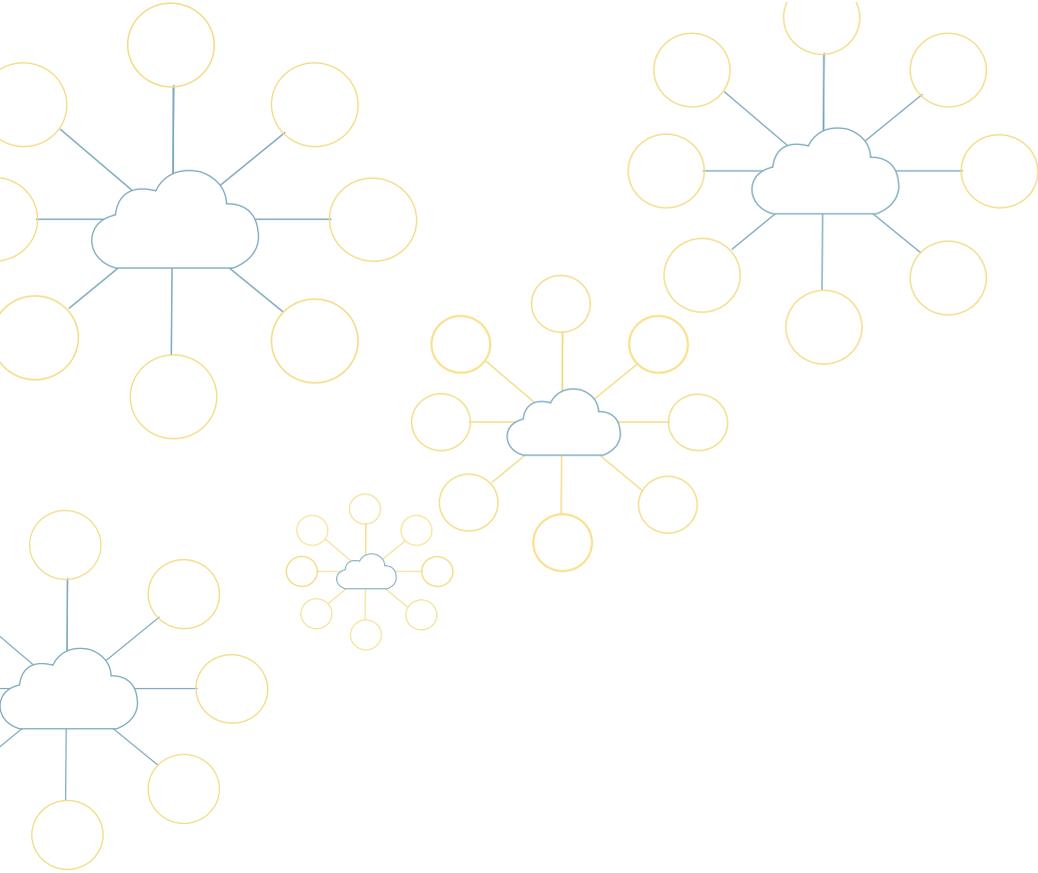


# CLOUD INTEGRATION - CHALLENGES AND SOLUTION APPROACHES

## EXECUTIVE SUMMARY

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The explosion of cloud applications in recent years has resulted in increased cloud adoption rates across enterprises. However despite the many advantages, the cloud comes with its own unique set of challenges especially with regard to integration. These challenges typically revolve around the complexities of securely connecting cloud services back to on-premise enterprise applications or to other cloud applications/platforms. Enterprises and vendors alike are increasingly looking at a number of approaches to resolve these integration challenges and to ensure a seamless journey to the cloud.



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### **RAMANI RAJARAM**

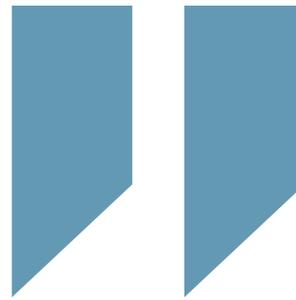
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## Introduction

Cloud computing is one of the most hyped concepts in IT today. According to leading independent research firms, cloud computing continues to be the number one technology priority for CIOs. Cloud computing has brought in a paradigm shift in IT services delivery and it is expected to become mainstream in the coming years as cloud adoption rates continue to gain traction.

There has been a significant surge in demand for cloud services from customers across the board. There are four main customer scenarios that require different cloud solutions as follows:



**Cloud computing is the number one priority for CIOs.**

Customer wants to implement a private cloud	<ul style="list-style-type: none"><li>● Customers need a strategy on how to setup the private cloud</li><li>● They also need a migration strategy for applications to be moved to the private cloud</li></ul>
Customer wants to move their applications to a public cloud infrastructure (typically referred to as Infrastructure as a Service platforms)	<ul style="list-style-type: none"><li>● Customers need assistance in choosing the best provider and should also consider:<ul style="list-style-type: none"><li>&gt;&gt; SLAs they should negotiate with the vendor</li><li>&gt;&gt; How to work with the vendor in terms of different subscription plans the cloud service provider offers and so on.</li></ul></li></ul>
Customer wants to build applications on a PaaS (Platform as a Service) model	<ul style="list-style-type: none"><li>● The customer is looking for help in deciding which PaaS platform they should go with</li><li>● They also need to take into consideration the various requirements that should go into building applications on the chosen platform</li></ul>
Customer wants to subscribe to a SaaS (Software as a Service) model	<ul style="list-style-type: none"><li>● Customers are looking for help in customizing the SaaS platform to their needs</li><li>● They also need to decide SLAs to negotiate with the vendor</li></ul>

The growing interest in cloud adoption notwithstanding, cloud computing as a paradigm presents a number of challenges to adopters. A study undertaken by a leading analyst revealed that the majority of enterprises and SMBs are hesitant to adopt SaaS largely due to security concerns and integration challenges with applications in particular. This is in line with Wipro's observations as part of its interactions with various customers.

This whitepaper discusses the various integration challenges that pose a serious concern for cloud adopters. This paper takes a deeper look at some challenges and outlines approaches to address them. The objective of this whitepaper is not to provide a clear-cut solution to every integration challenge but to explore the various options and possibilities that are emerging as potential answers to these integration issues.

## Challenges in Integration

Integration has always been a significant IT & business challenge even as enterprises grapple to cope with challenges such as diverse application data formats, connectivity mechanisms, security and network latencies.

Organizations which had hitherto managed the complexities of integrating applications within their enterprise boundaries and business partners now have to contend with the complexities of integrating with cloud-based applications that are outside the organization boundaries. This added dimension not only brings in new problems related to security and governance, but also accentuates the usual complexities of integration.

The table below illustrates some of the main integration challenges and possible approaches for re-mediation. As things stand today, not all approaches are enabled through tools and vendors are still exploring new ideas and technologies to tackle these issues. Hence in a number of cases manual interventions of varying extent are still required to address the integration challenges that the cloud presents.

## Emerging Patterns in Cloud Integration

Even as vendors attempt to address the various challenges related to cloud integrated as discussed in the previous section, there are a number of approaches emerging as possible solutions to the afore mentioned challenges. This section explores some emerging patterns in addressing integration with cloud applications.

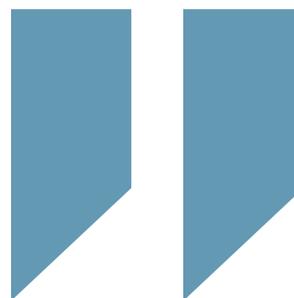
More often than not, most organizations have an Enterprise Service Bus (ESB) which integrates all on-premise applications. Many organizations also have a B2B gateway which enables them to connect with their partners. Adding an application to this ecosystem in the cloud adds a whole new dimension that goes beyond the boundaries of an organization.

## Patterns for End-Point Connectivity-Cloud Service Connectors

Cloud endpoints in the form of SaaS and PaaS are exploding by the day. In this scenario and depending on the level of cloud adoption, there are broadly two approaches for end-point connectivity under consideration.

For organizations with existing ESBs, where cloud adoption is limited to just a few applications on the cloud, existing ESBs are extended to provide connectivity to cloud endpoints, as most of them provide a web services (SOAP or REST) based interfacing mechanism.

Another approach being adopted is using Cloud Service Connectors. Vendors such as IBM-Cast Iron and Dell-Boomi are coming up with cloud service connectors for integration with a number of popular cloud endpoints. Efforts are also being made by product vendors to address the myriad issues of performance and security while ensuring seamless integration of on premise applications to cloud based end-points.



**Cloud integration issues can be safely addressed with some planning and good technology.**

CHALLENGE	DESCRIPTION	POSSIBLE REMEDIATION
SLA Management	When an on-premise business process spans across multiple services from different Cloud Service Providers [CSPs], it is possible that each service has a different SLA with the respective CSP.	Managing these variable SLAs in a given business process towards the end-user is a challenge which needs to be addressed upfront during the architecture phase. One approach to address this issue is to evaluate the respective CSPs and negotiate the SLAs with them accordingly.
Non-standard APIs / Interoperability Issues	Given that there are no defined standards within the cloud computing community, the on-premise applications are left to manage the APIs as exposed by each CSP. Any change to the APIs lifecycle of a given CSP has a reverberating impact on the consumers - one of the major impediments for a SaaS platform.	As the open standards in cloud computing evolve it is expected that the interoperability will mature and standard interfaces will be provided in future. An alternative approach in this case is to leverage cloud service connectors. (Further details on this in the next section - Emerging patterns in Cloud Integration).
Data Volumes	The ability to handle large volumes of data (spikes) during specific events or occasions is a huge challenge for businesses. Each service has a specific Quality of Service (QoS) attribute in the cloud and if the requirement is to handle sudden spikes in data, it could result in a fast producer and slow consumer syndrome.	This can be addressed using a good consumer design - either by using buffers or intermediary persistence stores or even better - Big Data capabilities. A possible alternative is to delegate the capacity management to Cloud Service gateways and cloud service connectors (Further details on this in the next section - Emerging patterns in Cloud Integration).
Regulatory Compliance	Regulations are region specific and conflicts can arise when CSPs and customers in different regions (for e.g. - a CSP in Belgium working with a banking customer in Switzerland. This is a highly common scenario given that there are many banking and insurance companies which are spread across multiple countries and these banking institutions need to access services from other regions). Each consumer is bound to local regulations and it is necessary to negotiate compliance standards especially when accessing services from a CSP in different region.	This continues to remain a challenge in a number of cases. One approach is to negotiate with the CSP to manage the regulatory compliance requirements for a specific geography.  CSPs are also coming out with collocated cloud service provider instances which are specific to a geography or region and adhere to the respective regulatory compliance model.
Operational Efficiency	Disaster recovery requirements are also driven by regional regulatory compliances as well as commitment of the enterprise towards its end-users.  For e.g. - in Belgium, all financial banking services need to perform the DR exercise every 6 months and the mandated downtime should be less than 2 hours.	It is necessary to negotiate the DR requirements with the CSP before integrating the cloud services with on-premise services.
Security Policies	The security policies are region specific and also dependent on the respective CSP as well. These security policies vary with organizations, business domain and the respective commitments from an enterprise towards its end users.	Security policies need to be worked out and consensus arrived at through negotiations with the CSPs.
Governance & Asset Ownership	When an on-premise business process collaborates with external services, the key issue is the governance of the interactions of on premise services with external services.	This can be managed by using a cloud service gateway, which is governed by the enterprise.

## Governance and Monitoring Patterns – Cloud Service Gateways

An organization typically has one of the following two requirements:

- It wants to consume services from cloud based applications.
- It wants to expose services based on its on-premise applications to the external world as APIs for them to build applications.

In both the above scenarios, it becomes critical for the organization to establish governance and monitoring related to how cloud services are consumed or exposed to the cloud. It requires organizations to have a mediation component that can provide governance, monitoring and security for exposing and consuming services to/from cloud. These components are referred to as cloud service gateways.

Cloud service gateways provide security, routing, governance for securely exposing services to the cloud and consuming services from the cloud. They become a gateway for all cloud interactions.

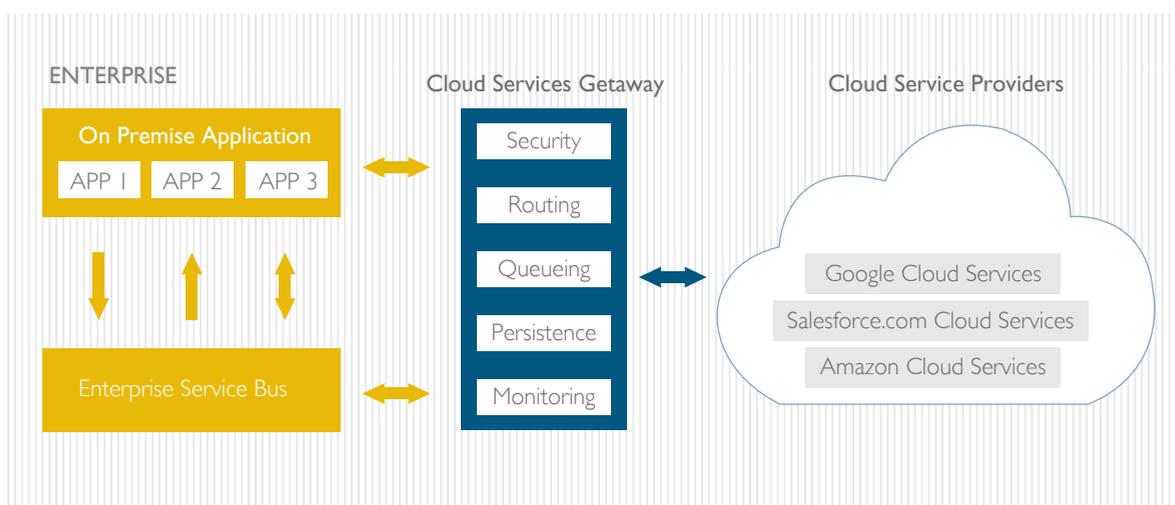
In some sense cloud service gateways perform similar functions as B2B gateways for B2B transactions.

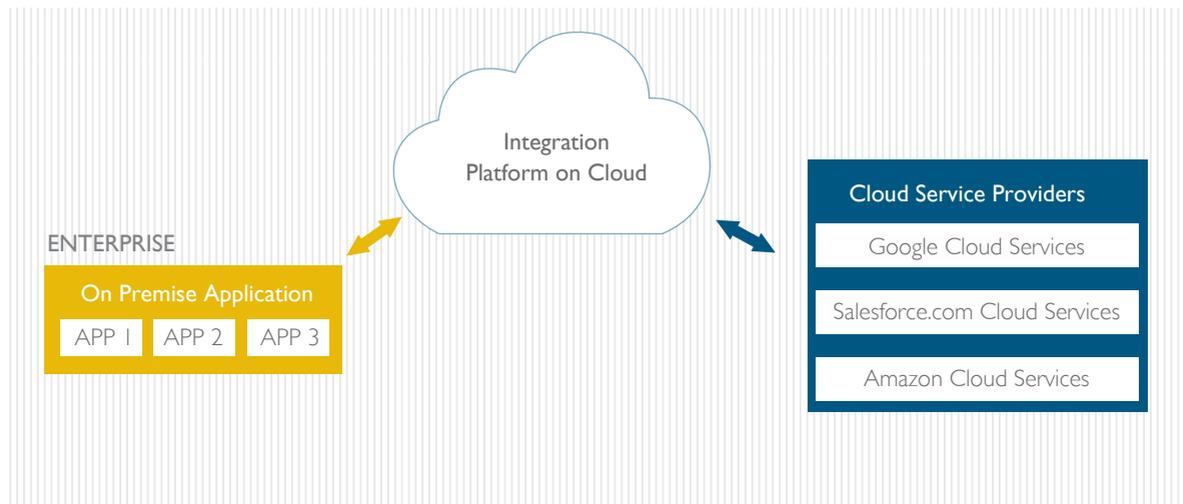
The Cloud Service Gateway pattern can be realized:

- Using ESBs. The ESB layer acts as a cloud service gateway with key capabilities such as routing, persistence and other functionalities required to manage cloud services. This approach is cost effective to setup since the organization already has the relevant skills and management capabilities.
- Using dedicated products available in the market. Vendors like Vordel, Layer7 and Intel are offering products for cloud service gateways. This approach is very useful if the organization is foreseeing a significant application footprint on the cloud or is planning to expose a number of on services to users on the cloud.

## Integration Platform-as-a Service (On Demand Integration Services)

The cloud has enabled a number of Small and Medium Enterprises (SMEs) to be able to build and connect with applications in the cloud. Acquiring and maintaining an ESB or a B2B gateway is an expensive proposition for such players. Vendors are now moving towards providing ESB and B2B gateways as a service on a subscription basis.





This approach makes a lot of economic sense for SMEs considering their strong need for ease-of-use, low budget spends and ease of maintenance. The entire integration aspect is managed by the IPaaS administrator. However for companies with a significant on-premise application footprint, or already have or can afford an ESB, this is not very appealing option for the immediate future.

## Conclusion

Given the rapid growth of emerging compliance standards, new cloud based platforms/services and exciting business models, it is imperative for companies to seriously consider cloud services as part of one's IT strategy. While integration challenges can definitely create serious impediments in cloud adoption, there are also a number of new/upcoming strategies and approaches in addressing these challenges. Organizations can adopt these strategies to build a middleware infrastructure that will enable seamless connectivity between on-premise and cloud based services.

## Glossary of Terms

**API** Application Programming Interface

**B2B** Business-to-Business

**CSP** Cloud Service Provider

**DR** Disaster Recovery

**ESB** Enterprise Service Bus

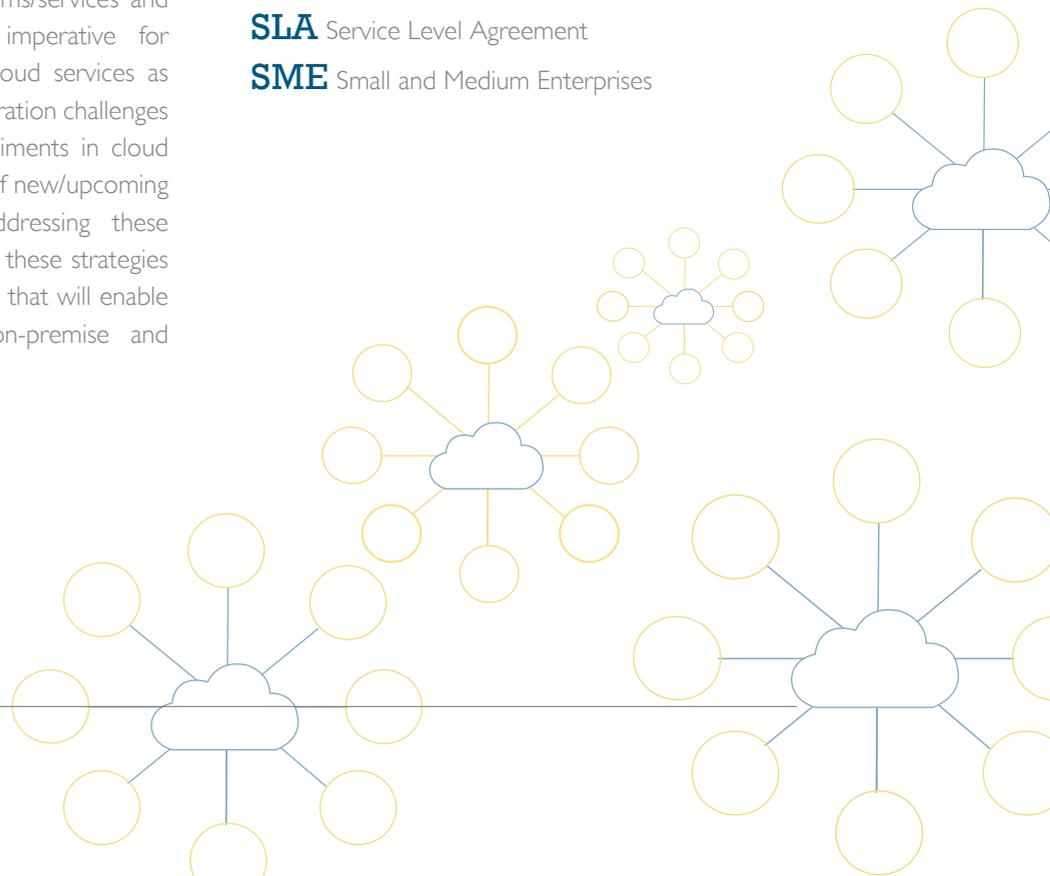
**IaaS** Infrastructure as a Service

**PaaS** Platform as a Service

**SaaS** Software as a Service

**SLA** Service Level Agreement

**SME** Small and Medium Enterprises



We hope you enjoyed reading this Journal as much as we did putting it together. We would like to continue in our pursuit to provide the best of knowledge to all our readers. And for that, we would like to hear your comments/suggestions or queries if any. Please do write to us at [ebi.query@wipro.com](mailto:ebi.query@wipro.com)



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