Service Re-factoring and Rationalization Technique Paper

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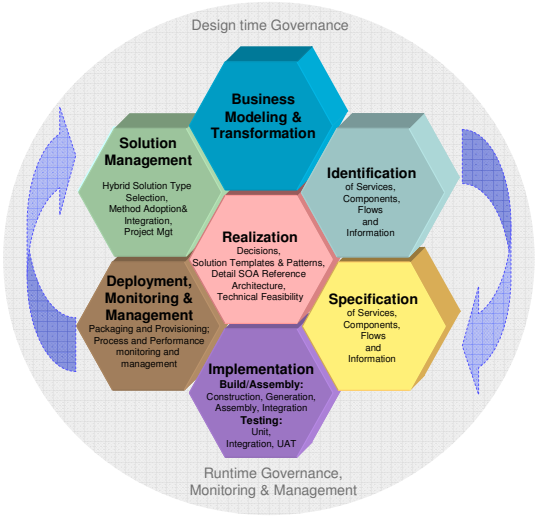
SOMA Core Team



Document History

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Revision History

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1. Introduction

It is not uncommon that a client engagement has a number of phases and sometimes, several Statement of Works (SOWs) or Project Change Requests (PCRs). A lot can happen from one PCR to the next; the client's management can change; they may react to a threat or market opportunity; they may re-prioritize their objectives and in all these cases, funding may be compromised or want to be redirected.

To be dedicated to every client's success, means in this context, to be sure we are building the right service portfolio for the client; that has the highest relevance to what they do, what their objectives are, and what they aspire to achieve.

Therefore, we need to periodically pause and review the service model as it stands: infant or mature and validate its relevance from a client's perspective.

This process is called rationalizing the service model (or portfolio). This review can lead to changes (called refactoring) in the service model due to a re-prioritization. Some services will become more important; others will sink in priority.

At any event, refactoring of this service model may be required.

Thus we have the Service Re-factoring and Rationalization capability pattern.

In Service Re-factoring and Rationalization, we review the service model, re-factor and refine the service portfolio and service hierarchy, make exposure decisions, and finally rationalize the service model and its constituent parts based on the re-factoring and exposure decisions.

In this capability pattern, we leverage another capability that is called the Service Litmus Test. This test or series of criteria are customized for relevance to the client. Services are tested against these criteria. The result is a re-factored service model.

This capability pattern is executed opportunistically in SOMA life cycle and at the beginning and end of every phase. In SOMA, we progressively elaborate the service model and gain more insight about the services both in terms of functional and qualitative aspects. The additional elaboration specified and insight gained in the SOMA life cycle since previous execution of the capability pattern is considered as input during re-factoring and rationalization.

Having eliminated duplicate services during the rationalization and refactoring we are in a better position to conduct SLTs as we have already eliminated some redundancy.

2. Purpose

The purpose of this capability pattern is to ensure continued alignment of the current service model with client priorities and objectives through review, rationalization and re-prioritization of services.

This leads to a possible change in the “quanta (chunk) of services” that get incorporated into a given release. Thus services are selected to form a release based on their priorities.

SRR should be done at the end of every phase in the SOMA life-cycle, and at the beginning of the next phase, to ensure continued alignment with client business and IT expectations and objectives.

SRR best practices and events that trigger SRR are :

1. During transition from one phase to another
2. During the early part of a phase if substantial gap of time between the previous phase and the current phase
3. At the beginning of a phase if there are substantial amount of existing services.
4. Apply SRR to evaluate an existing service portofolio and position it in the context of the current initiative.
5. When parallel development or identification of services is happening use SRR to consolidate the services identified or planned to be used by each of the streams of work.
6. As we gain more detailed knowledge of the details (specification) of services, we apply SRR during service evolution.
7. Apply SRR when the stakeholders change. Verify the current service model with the new stakeholders to determine if their priorities have changed. The business priorities and budget are likely to have an impact.
8. TFE could trigger SRR based on new options, patterns and non-functional aspects that are brought to light through TFE.

3. Description

In SOMA, services are identified using complimentary techniques such as Goal Service Modeling, Domain Modeling and Decomposition which includes Process Modeling and Decomposition, Information Analysis and Modeling, Rule and Policy Analysis, and Variation Oriented Analysis, and Existing Asset Analysis.

The complimentary techniques may result in duplicate services thereby confirming the need and value of the service.

In addition, overlapping or duplicate services are added in the service model in a typical engagement when multiple teams are working on service identification

and each team is focusing on a technique or specific areas of concern within a technique. Teams may be unaware of the services identified by others.

For example, when project scope includes multiple business process groups to analyze, typically a team of 1-2 business analyst and architect work on Process Modeling and Decomposition focusing on a process group. This capability pattern allows us to confirm the need and vale of a given service and to eliminate duplication and overlap in the service model by re-factoring and refining it.

All the services that are identified in SOMA are initially designated are “candidate services” representing a business aligned capability and decisions on building, deploying and publishing (aka exposing) the services are postponed till the execution of this capability pattern. Although, in theory, any candidate service could be built, deployed, and published (aka exposed) by exporting its interface as a service description but it may not be economical and practical (non-functional requirements may be compromised) feasible to do so. In particular, the naïve decision to expose “all methods from all classes” will result in an overwhelming and often unmanageable number of services leading to the “Service Proliferation Syndrome”. Reviewing and ensuring the service granularity is essential to control this proliferation syndrome.

Moreover, exposing all candidate services will be a daunting financial commitment for an enterprise because building and managing the service life cycle includes additional cost and resources over and above just building the business functionality encapsulated by the candidate service. Additionally, there is cost associated with every service in terms of its governance and underlying infrastructure (its security, performance, maintenance, monitoring & management, other SLAs). In SOMA, a set of gating criteria is introduced to select the service for exposure meaning for building, deploying, and publishing for discovery by consumers.

3.1.1 Service Granularity

Service granularity is essential characteristics of the Service Model. Services that are identified during Identification represent business capabilities and placed in a service hierarchy in the Service Model if functional areas are known and Service Hierarchy is already defined. If service hierarchy is not defined during the time of identification of the services, then the services are placed in service hierarchy later when Functional Area Analysis is conducted and functional areas are identified. Service Hierarchy in a Service Model represents service granularity. As you we go deeper in the hierarchy, granularity of the services is finer grained. The hierarchical Service Model provides a business oriented perspective of SOA representing a list of business capabilities organized and categorized in a hierarchy and relationship among these business capabilities in the hierarchy. Service granularity helps in transforming identification level Service Model

representing business oriented perspective on SOA to specification level Service Model representing IT concerns.

3.1.2 Service Litmus Test (SLT)

The set of gating criteria to select and filter a set of (candidate) services from the service portfolio for exposure is called Service Litmus Tests. These Service Litmus Tests help decide whether to expose a service and most importantly, whether to fund the creation of the service component that will provide the functionality of the service as well as the maintenance, monitoring, security, performance and other service level agreements of the service. This decision making process is referred to as the "Service Exposure Decisions".

On the one extreme, every business use case might be considered to be a candidate service. On the other, only a few services are selected for exposure. Applying the SLT usually gives something in the middle: a manageable set of services that the business wants to expose and that can later be used within compositions. The Service Litmus Test metaphor is used to denote a set of tests, that when applied, will determine if a given service should be eligible for exposure using a service description. These tests are employed together and help answer questions such as – "From the list of candidate services, which ones should be exposed? And thus, which ones should we fund? Which ones have business value?"

We apply these tests at the beginning and end of every phase and opportunistically in SOMA to the list of candidate services to rationalize on which of the candidate service may be exposed as services. These tests are applied first time at the end of SOMA Identification phase. While doing so, being very early on in the SOMA life cycle there are going to be certain litmus tests that may not be possible to be applied to the candidate services owing to the non-availability of information that is commensurate with the requirements of the test. However, as and when we go through the phases in SOMA life cycle we should expect to readdress the service litmus tests with the assumption that more information is available in subsequent phases to execute more aspects of the litmus test. The additive understanding of services that needs to be exposed will change as and when we get more information.

There are currently six universal Service Litmus Tests which collectively form the "gating criteria" for service exposure.

1. Business Alignment
2. Composability
3. Externalized Service Description
4. Redundancy Elimination/Reusability
5. Technical Feasibility
6. Business Entity based Information Services

SOMA Tip: *In addition to this universal SLT, we may define project or client specific SLT for an engagement to support the needs of the project or client.*

Each of Service Litmus Tests has set of questions which help decide whether a service passes the SLT. A negative response to any of the questions under a SLT results in a candidate service failing the SLT. A candidate service must pass all the universal and project or client specific SLT to be exposed. In certain cases, the client may override the exposure decision made systematically by applying the SLT. In cases where client override the exposure decision we must document the reason for the override by the client.

SOMA Tip: *Candidate services that do not meet the SLT and hence are no exposed will still have to be implemented in some fashion as they are often required to fulfill business needs. They may be implemented as methods on service components and will not require the generation of WSDL or other forms of service definitions; or they may be used as non-exposable entities*.

Table 1 contains the descriptions of the universal Service Litmus Test (SLT) and associated questions.

Service "Litmus" Test	Description

Service "Litmus" Test	Description
SLT1: Business Alignment	The first test of a service is about its Business Alignment. If the service is not traceable back to a business task or goal, it may not yield benefits required for SOA implementation. The following questions, if all are answered positively, mean the service is aligned with the business. SLT1-1. Does the service provide a required business functionality that supports business processes and goals? Is there a business goal that this service directly (versus "inherits" from its children) supports? SLT1-2. Is the business willing to fund the service through its lifecycle: provisioning, management, governance and maintenance? SLT1-3. Is the business willing to share the service internally or externally with clients or business partners? For example, implications may be additional costs, business secrets, security, etc.

Service "Litmus" Test	Description
SLT2: Composability	Composability is defined as an attribute that enables the service to participate in a service composition. Applications can be created using both types of composition – hardwired and loosely wired. SLT2-1. Does the service meet the required QoS attributes as defined in the composition's NFRs? SLT2-2. Is the service stateless? SLT2-3. Is the service self-contained? Can the service be deployed independently to meet a business goal although it may cooperate with other services at run-time to perform business processes? There are no implicit dependencies of the service on other embedded functionality. All dependent services are either replaceable or self-contained. SLT2-4. Is the service's implementation technology neutral? Technology neutral means that the service does not impose support of non-standard (and unknown to the consumer) protocols or devices, for example, the constituent component requires intervention through a non-standard application interface. This test applies only when the service is deployed in the consumer's environment. For example: A business provides an image retrieval service to its customers. It can provide this capability to its subscribed customers via a web service. Alternatively, the business can hand over to its customer the image retrieval capability exposed as a web service, and a collection of images. Here, the customer will be burdened by the implementation of the technology search.

Service "Litmus" Test	Description
SLT3: Externalized Service Description	The most basic property of a service is that it has an externalized service description. SLT3-1. Does the service have an externalized service description that is distinct and separate from the underlying physical implementation? A current example of this is WSDL. SLT3-2. Can the service be discovered and bound using the service description? SLT3-3. Does the service description contain meta-data about itself? That is, the service description must be self-sufficient, containing or referencing all of the information necessary to understand the message exchange between consumer and provider of a service.
SLT4: Redundancy Elimination/Reusability	SLT4-1. Can this service be used by the business stakeholder within all processes where its function is required?

Service "Litmus" Test	Description
SLT5: Technical Feasibility	SLT5-1. Is the service technically capable of fulfilling its non-functional as well as its functional requirements and characteristics? Will the service be favorable in meeting non-functional requirements for the overall SOA solutions? For example, would it meet SLA's if deployed? SLT5-2. Can it be implemented with a minimal number of providers (backend systems)? For example, if it has a larger number of systems it has to integrate with then it will be a more challenging service to implement. Does the service have a "large" number of embedded cascading dependencies? (composability issue related to non-functional and technical feasibility) SLT5-3. Are there explicitly known and anticipated technology challenges involved in implementing this service? (e.g., Product performance and scalability issues, etc.)

Service "Litmus" Test	Description
SLT6: Business Entity Based Information Services	Apply to information services. SLT6-1. Does the business entity undergo business relevant state changes? SLT6-2. Does the information service provide a consistent view of a set of key business entity with difference in underlying formats? SLT6-3. If the information service is identified to retrieve data required to evaluate the condition of a rule, is the rule exposed/realized as a service?

Table 1 Service Litmus Test

SOMA Tip: The questions for the (universal) Service Litmus Tests can be adapted to fit the needs of the client using the terminology that client is accustomed to.

Based on field experience, simple yes/no answer is not always sufficient to make exposure decision. In SOMA 3.2, we have devised a Service Exposure Assessment Toolkit (SEAT). This tool kit has key three main components

SLT Rating (SLTR) – The SLT Rating is the relative importance/priority that client/organization assigns to a SLT. It indicates how important a given SLT is for the client. It is a relative ranking of SLTs; one SLT is more important than the other. The recommended values for this rating are 1-5 where 1 = low priority, 3 = medium priority, 5 = high priority.

Scoring Table – Field experience shows that simply answering yes or not to a SLT question is not workable and that we need a scale to answer these questions. In SOMA 3.2, we have defined a scoring mechanism for answers to the questions similar to Analytic Rubrics used for making assessments in the industry. We have defined when to score 0 – 5 in the Scoring Table for each of the questions for the SLTs. The Scoring Table provides guidance how to answer the questions in a scale of 0-5 and can be adapted to meet client's need.

Service Rating (SR) – The Service Rating is the assessed applicability of the given SLT to a service. It indicates how to assess a service as satisfying the SLT. It is determined based on the answers and scoring given against the recommended values are 0-5; 0 = no applicability, 1 = low applicability, 3 = medium applicability, 5 = high applicability. It is calculated by taking average of the scores for each of the questions.

Weighted Service Rating (WSR) – Weighted Service Rating is service rating weighted by SLT priority as captured by SLT Rating (SLTR).

Total Weighted Service Rating (TWSR) - Total Weighted Service Rating of a service is the sum of Weighted Service Rating for all the SLTs.

Service Rating Threshold – It is threshold used to filter services for exposure based on Total Weighted Service Rating of the services. Any services having TWSR greater than the threshold are exposed. Best practices on how determine the threshold using medians and standard deviation is documented later in this document.

3.1.3 Service Exposure Scope

Designation of service exposure is not adequate to specify who can use the service. In addition to service exposure decision, we need to specify at what level of scope the service is being designed to be exposed. Service exposure scope identifies the scope of the exposure for the (exposed) services. The exposure scope affects the non-functional requirements e.g. security requirement of the services. The exposure scopes that are predefined in the method are:

1. Division/Department: Services that are exposed to only a division or a department of an enterprise.
2. Line of Business: Services that are exposed to a line of business of an enterprise
3. Enterprise: Services that are exposed to enterprise.
4. Ecosystem: Services that are exposed to entire ecosystem including enterprises and their trading partners.

4. Usage

4.1 When to Use It

Service Re-factoring and rationalization should be applied when we exit each phase. If there is a time lapse between the terminations of one phase, e.g., identification and the start of the next phase due to contractual issues, client environment and organizational changes, governance directives and mandates,

etc., then apply the Service Re-factoring and Rationalization capability pattern upon entry to the new phase also.

4.2 How to Use It

The following tasks are executed in Service Re-factoring and Rationalization capability pattern:

4.2.1 Review Service Granularity

Review the service model to ensure that the services are at the right level of granularity. The right or best granularity for a service can only be specified in the context of its function and foreseeable usage in processes and use cases (usage scenarios / service consumer view). The steps are:

1. Use Goal-Service Model to define the correct granularity
2. Use the service usage scenarios: To ensure service consumers will generally find the service to be at the right level of granularity
3. Use non-functional requirements to help drive the granularity: Finer grained services will tend to create more network chatter. Courser grained services will tend to perform better.

4.2.2 Re-factor and Refine Service Portfolio and Hierarchy

Re-factor, refine and redefine similar services into one or more meaningful services to eliminate duplication and multiple services with minor variations. Services providing same business functions can be consolidated into one service. Complimentary identification techniques results in duplicate services in service portfolio. The steps are:

1. Eliminate and consolidate duplication and multiple services with minor variations: All of the processes and sub-processes have potential value as services and are added to the Service Portfolio as candidate services. At the end of the identification phase a candidate service may appear to be a duplicate of some other candidate service or a slight variation of another service. An analysis of similar services needs to be done to avoid duplication or creating many similar services with minor variations. Services providing same business functions can be consolidated into one service.
2. Regroup and reorganize service hierarchy: Regroup and reorganize service hierarchy based on functional affinity and cohesiveness. Some times it may be necessary to reorganize a service portfolio. In a service portfolio it may be necessary to create a new group of services to better represent a set of related services.

3. Categorize services: Categorize services into process, rule, information services which will help us making realization decisions for the services primarily in terms of product and technology selection.

4.2.3 Adapt Service Litmus Test and Exposure Scope

Adapt the service litmus tests and service exposure scopes to support client/project needs and environment. Universal service litmus tests defined in SOMA may not sufficient to meet client's needs and hence additional project/client specific SLTs are defined and added. The questions asked to evaluate each of service litmus test may need to be adapted to meet client's environment. Client may not be accustomed to service exposure scopes pre-defined in SOMA and hence exposure scope may need to be adapted for the client's environment. The steps are:

1. Adapt the questions and scoring table for universal SLTs: Update the SLT questions for the universal SLTs to meet client environment and terminology. Update the scoring table and guidance around scoring level to meet client's environment.
2. Add additional project/client specific SLT: Add project/client specific SLT, define the corresponding questions, define the scoring table for newly added SLTs, and add guidance around scoring level for those questions in the scoring table.
3. Adapt the service exposure scope to client's environment: Update the service exposure scope pre-defined in SOMA and associated definition to fit into client's environment.

4.2.4 Apply Service Litmus Tests

Make service exposure decisions through applying the service litmus tests (SLT). The SLT assists in deciding whether a candidate service should actually be exposed – built, deployed, published for discovery. Apply the Service Exposure Assessment Toolkit (SEAT) to assess whether services are business aligned, composable, have externalized service description, reusable, technically feasible and so forth. The steps are:

1. Rate all the service litmus tests: Determine the SLT Rating (SLTR) for each of the SLTs – universal and project/client specific. The SLT Rating is the relative importance/priority that client/organization assigns to a SLT. It indicates how important a given SLT is for the client. It is a relative ranking of SLTs; one SLT is more important than the other. The recommended values for this rating are 1-5 where 1 = low priority, 3 = medium priority, 5 = high priority.
2. Apply all universal and project/client specific service litmus tests to all the services in the portfolio.
    a. Answer the questions for each of SLTs by scoring between 0 and 5. Put score of 0 if the question does not apply to the service or the answer is no. Use scoring table and guidance provided in the table to determine how to score the question between 0 – 5.

b. Average the scores for all the questions for a SLT to arrive at Service Rating (SR)

$$SR = Avg\ (Score_j)\ where,\ 1 < j < \#\ of\ questions\ for\ a\ given\ ST$$

c. Determine the Weighted Service Rating (WSR) by multiplying Service Rating (SR) with the corresponding SLT Rating (SLTR)

$$WSR = SLTR \times SR$$

d. Determine the Total Weighted Service Rating (TWSR) by summing Weighted Service Rating (WSR) for each of the SLTs for a service.

$$TWSR = \Sigma WSR_j \text{ where, } 1 < j < \#\ of\ SLTs$$

e. Repeat a-d for each of the services.
f. Determine threshold for Total Weighted Service Rating (TWSR) to make exposure decision for the services. The services having TWSR greater than threshold are exposed. As a best practice, sum of the medians of Weighted Service Rating across all services could or a deviation from the sum of the median can be used as a starting threshold.

$$Median_j = Median(WSR_i) \text{ where, } 1 < i < \#\ of\ Services,\ 1 < j < \#\ of\ SLTs$$

$$\text{Standard Deviation in TWSR} = \sigma\ (TWSR_i) \text{ where, } 1 < i < \#\ of\ Services$$

$$Threshold = \Sigma Median_j \text{ where, } 1 < j < \#\ of\ SLTs$$

Or

$$\Sigma Median_j \pm N \times \sigma\ (TWSR_i)$$

where, $1 < j < \#$ of SLTs

$1 < 1 < \#$ of Services

N = any positive integral number

g. Make exposure decision for the services if the Total Weighted Service Rating is greater than agreed threshold value.

h. Business may override the exposure decisions. If so, capture the reasons for the override.

SOMA Tip: All the above formulas have been codified in the Service Model Worksheet as macros.

4.2.5 Determine Service Exposure Scope

Capture the exposure scope of the exposed services. Use the exposure scopes adapted for the client or else use the pre-defined exposure scopes.

4.2.6 Rationalize Service Model

Verify the validity of service model. Take holistic look at the entire service model and validate and verify with the stake holders that the services collectively meet business and technical needs including alignment, relevance, granularity and feasibility of implementation. Baseline the service model and goal service model and process models in scope.

4.3 Examples

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4.4 Best Practices

SRR best practices and events that trigger SRR are:

1. During transition from one phase to another
2. During the early part of a phase if substantial gap of time between the previous phase and the current phase
3. At the beginning of a phase if there are substantial amount of existing services.
4. Apply SRR to evaluate an existing service portofolio and position it in the context of the current initiative.
5. When parallel development or identification of services is happening use SRR to consolidate the services identified or planned to be used by each of the streams of work.
6. As we gain more detailed knowledge of the details (specification) of services, we apply SRR during service evolution.
7. Apply SRR when the stakeholders change. Verify the current service model with the new stakeholders to determine if their priorities have changed. The business priorities and budget are likely to have an impact.

8. TFE could trigger SRR based on new options, patterns and non-functional aspects that are brought to light through TFE.

5. Key Considerations

Project in progress, services have been identified, we are at the end of a phase, or beginning of a new phase.

6. Estimation Considerations

7. Related Techniques

1. Service Re-factoring and Rationalization is executed opportunistically when applying Identification techniques such as Goal Service Modeling, Domain Modeling and Decomposition which includes Process Modeling and Decomposition, Information Analysis and Modeling, Rule and Policy Analysis and Variations Oriented Analysis.
2. Service Re-factoring and Rationalization uses Functional Areas identified in Functional Areas Analysis to re-factor and refine service hierarchy.
3. After service exposure decisions are made in Service Re-factoring and Rationalization, then service dependencies are modeled to perform Release Planning based on list of exposed services and service dependencies.
4. As SRR is applied in multiple phases, TFE can provide input. TFE provides analysis, assessment criteria and corrective action recommendations as input into SRR (rationalization).

8. Roles, Input & Output Work Products

Roles: SOA Architect
Input Work Products: Goal Service Model, Service Model, Functional Areas Description
Output Work Products: Service Model

9. Resources

10. Frequently Asked Questions

Find FAQ on Service Re-factoring and Rationalization at SOA wiki at **https://w3.webahead.ibm.com/w3ki2/display/SOA/SOMA+FAQ**

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