4. Service-Oriented Modeling

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SOA Principles

- Service-oriented architecture
- Service-oriented analysis and design
- Service-oriented modeling
- Service-oriented computing
- Service-oriented programming
- ... separation of concerns to services
Service-oriented Modeling

- Designing and specifying service-oriented business systems within a service-oriented architecture
- Includes a modeling language understandable by both business and technical people
- Comprehensive view of analysis, design, and architecture of 'Software Entities' in an organization
- Encourages viewing software entities as 'assets' referred as 'services'
Service-oriented Modeling

Service-Oriented Modeling and Architecture (SOMA) by IBM in 2004

- Targets service-oriented analyses and design (SOAD) – focus to service components and flows
- Extends traditional object-oriented and component-oriented analyses and design
- Three phases: identification, specification, and realization (+ implement, deploy, manage)
- Domain decomposition, goal-service modeling
Service-oriented Modeling

Service-Oriented Modeling Framework (SOMF)

Michael Bell

Sparx Enterprise Architect modeling platform

Modeling language for software development

Can be employed to design any application (application-level or enterprise-level, local or distributed, business or technological)

1 http://www.modelingconcepts.com
Methodology for service-oriented development (lifecycle management and modeling)

Intuitiveness of implementation and simplicity of usage

Number of modeling practices, environments, disciplines, and artifacts

http://www.modelingconcepts.com/pages/download.htm
SOMF

- Not based on any particular programming language, nor constrained to any implementation technology (e.g. Web Services)

- Model-driven analysis, design and architectural disciplines

- Software lifecycle and service portfolio management practices

- An easy to use notation for modeling the “used-to-be”, “as-is”, and “to-be” states of the enterprise service catalog
SOMF for Software Development

- Service-Oriented Conceptualization
- Conceptual Architecture
- Service-Oriented Discovery and Analysis
- Service-Oriented Business Integration
- Service-Oriented Design
- Logical Architecture
SOMF Modeling Language

- Analysis Model
  - Service-Oriented Analysis Proposition Diagram
  - Service-Oriented Logical Relationship Diagram

- Design Model
  - Service-Oriented Business Integration Diagram
  - Service-Oriented Logical Composition Diagram
  - Service-Oriented Transaction Diagram
SOMF Modeling Language

Architecture Model

- Service-Oriented Conceptual Architecture Diagram
- Service-Oriented Utilization Diagram - Logical Architecture
- Service-Oriented Transaction Directory Diagram - Logical Architecture
SOMF Modeling Patterns

SOMF PATTERNS

- Discovery and Analysis Road Map Patterns
- Service Identification Patterns
- Service Categorization Patterns
- Contextual Analysis and Modeling Patterns
- Structural Analysis and Modeling Patterns
SOMF Modeling Styles

- Network
- Circular
- Hierarchical
- Star
SOMF Notation

Service-Oriented Analysis and Modeling Asset Notation

<table>
<thead>
<tr>
<th>Formal Service-Oriented Modeling Asset Symbols</th>
<th>Informal Asset Symbols</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atomic Service</td>
<td>Service Cluster</td>
</tr>
<tr>
<td>Composite Service</td>
<td>Consumer</td>
</tr>
<tr>
<td>Service Cluster</td>
<td></td>
</tr>
<tr>
<td>Consumer</td>
<td></td>
</tr>
</tbody>
</table>

Service-Oriented Contextual Analysis and Modeling Notation

- Generalized
- Expanded
- Specified
- Contracted

Service-Oriented Structural Analysis and Modeling Notation

- Capability Reduction
  - Decomposed
  - Subtracted
- Capability Expansion
  - Aggregated
  - Unaggregated
- Service Isolation
  - Intersected
  - Overlapped
- Service Coupling
  - Coupled
  - Decoupled
- Service Cloning
  - Cloned
  - De-Cloned
- Service Binding
  - Bound
  - Unbound

Motivation: How to Discover and Analyze services for Granularity, Reusability, Interoperability Success, etc...
Contextual Modeling

- Simple way to describe the capabilities of a software component
- Describes service functionality, name, specialty, and role
- “Art” of manipulating the context of a service to perfect its offerings and performance
- Generalization, Specification, Expansion, and Contraction
Contextual Generalization

Raising the level of abstraction

Order Entry Service

Accounting Service

Generalized
Contextual Specification

- Reducing service abstraction level (trim down the functionality)
Contextual Expansion

- Increasing service influence and offerings across boundaries
- Increasing service’s consumer base
Contextual Contraction

- Reducing a service’s consumer base and decreasing its influence
- limits accessibility to the service
Examples of Diagrams

- Analysis Proposition Diagram
- Business Integration Diagram
- Logical Relationship Diagram
- Logical Composition Diagram
- Transaction Diagram
Atomic services “Standard” and “Luxury Car Reservation” were decomposed from composite Service “Car Reservation” (1), after which they were unified into a single atomic service (2) which represents the transformation of the original composite service (3). This atomic service was then aggregated into the composite “Travel Booking” (4).

Composite service “Event Booking” was subtracted from “Travel Booking”, for possible discontinuation.
The *Business Services* cluster has been integrated into the *Business* domain.

Business Tiers and Business Domain elements have been color coded for visual emphasis.

The *Event Bookings* business domain has been separated from the *Travel Bookings* domain.

The *Business Event Booking* composite service has been disintegrated from the *Travel Bookings* domain.

The *Leisure Tier* contains two business domains.
Service-Oriented Logical Design Relationship Diagram

The example on the left illustrates a “same-time”, asynchronous (non-blocking) design whereby messages can be sent & received in no particular order. To coordinate the messages an intermediary such as an ESB can be used.

The example on the right depicts an “in-order” sequential design whereby messages must be sent (and their reply received) in a particular order. This implies the calling service is blocked waiting for each response.

In EA, message sequencing can be documented using connector notes, as shown in this example.
In this example the “Event Booking” composite service delegates the request from the consumer to the first service in the chain, “Event Reservation”. The latter, in turn, passes the request (which may be altered along the way) to the “Event Booking Confirmation” service, and so forth, until the originator receives the final message in the sequence.

Note that in addition to the circular beam marker this style is also apparent via the unidirectional connectors of the message flow.
In this star design composition example “Customer Support” is the central service that, depending on the type of support request received, delegates the invocation to one of the star’s branches.
Service-Oriented Transaction Diagram

Transaction Section

Activity Section
1.0 eventCancelNotification(bookings : bookingRecord)
   <endingConnector>
2.0 eventCancelNotification(bookings : BookingRecord)
   <endingConnector>
3.0 updateBookingNotification(bookings : BookingRecord)
   <endingConnector>
4.0 eventCancelClientNotification(event : EventRecord)
   <endingConnector>
5.0 retrievePaymentRecordReq(bookings : bookingRecord)
   <originatingConnector>
   5.1 retrievePaymentRecordReply(payment : paymentRecord)
   <endingConnector>
   5.2 issueCreditToClient(payment : paymentRecord)

Tags:
Management = orchestration
Concurrency = synchronous

Tags:
Management = orchestration
Concurrency = asynchronous
SOAM in SOMF

Service-oriented analysis modeling example

http://www.modelingconcepts.com/pdf/SOMF_ANALYSIS_MODELING.pdf

Service-Oriented Modeling Framework (SOMF)
for Business & Technology

An SOA Implementation Framework

Service-Oriented Discovery & Analysis Example