

## Zentrale Entscheidungen im SOA-Entwurf: Modellierung und Top 10

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## Agenda

- SOA principles and patterns
- Case studies
- Architectural decisions
- SOA Decision Modeling (SOAD) assets
- Discussion and summary

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## What is a Service-Oriented Architecture (SOA)?

No single definition – “SOA is different things to different people”

- A *set of services* that a business wants to expose to their customers and partners, or other portions of the organization.
- An architectural style which requires a *service provider* (a.k.a. server) and a *service requestor* (a.k.a. consumer or client).
- A set of architectural patterns such as *service consumer-provider contract*, *enterprise service bus*, *service composition*, and *service registry*, promoting principles such as *modularity*, *layering*, and *loose coupling* to achieve design goals such as separation of concerns, reuse, and flexibility.
- A *programming and deployment model* realized by standards, tools and technologies such as Web services and Service Component Architecture (SCA).

Business  
Domain  
Analyst

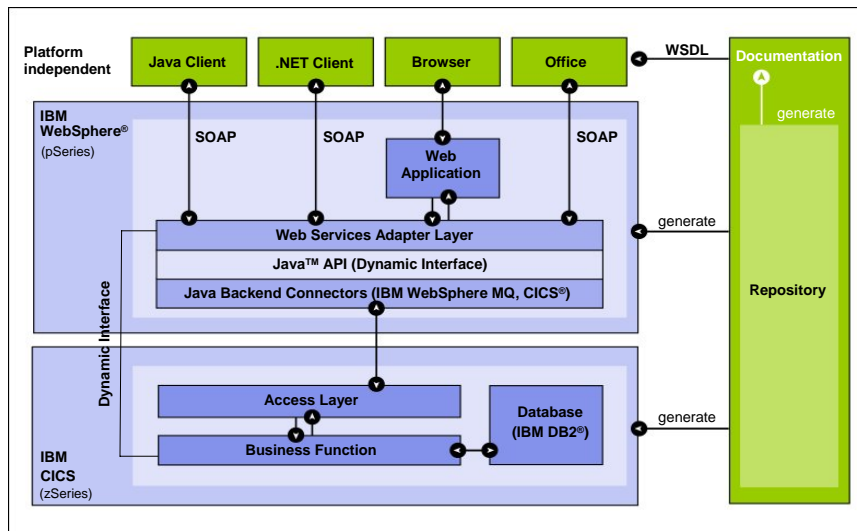
IT  
Architect

Developer,  
Administrator

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## Case 1: Core Banking SOA with Web Services



## Case 2: Multi-Channel Order Management (B2B)

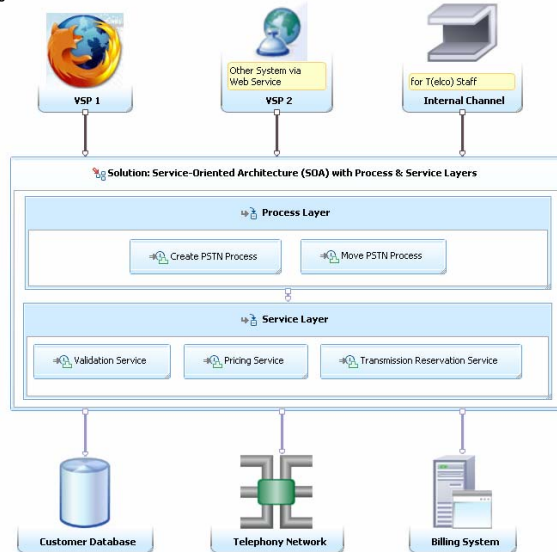
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### Functional domain

- Order entry management
- Two business processes:  
new customer, relocation
- Main SOA drivers: deeper  
automation grade, share  
services between domains

### Service design

- Top-down from requirement  
and bottom-up from existing  
wholesaler systems
- Recurring architectural  
decisions:
  - Protocol choices
  - Transactionality
  - Security policies
  - Interface granularity



7

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8

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## What are Architectural Decisions? Why Bother?

- “The design decisions that are costly to change” (Grady Booch, 2009)
  
- **Our definition (from IEEE Software article “Architectural Decisions as Reusable Design Assets”, <http://www.computer.org/portal/web/csdl/doi/10.1109/MS.2011.3>):**  
*“Architectural decisions capture key design issues and the rationale behind chosen solutions. They are conscious design decisions concerning a software-intensive system as a whole or one or more of its core components and connectors in any given view. The outcome of architectural decisions influences the system’s nonfunctional characteristics including its software quality attributes.”*
  
- **From IBM UMF work product description ART 0513 (previous name: ARC 100):**  
 “The purpose of the Architectural Decisions work product is to:
  - Provide a single place to find important architectural decisions
  - Make explicit the rationale and justification of architectural decisions
  - Preserve design integrity in the provision of functionality and its allocation to system components
  - Ensure that the architecture is extensible and can support an evolving system
  - Provide a reference of documented decisions for new people who join the project
  - Avoid unnecessary reconsideration of the same issues”

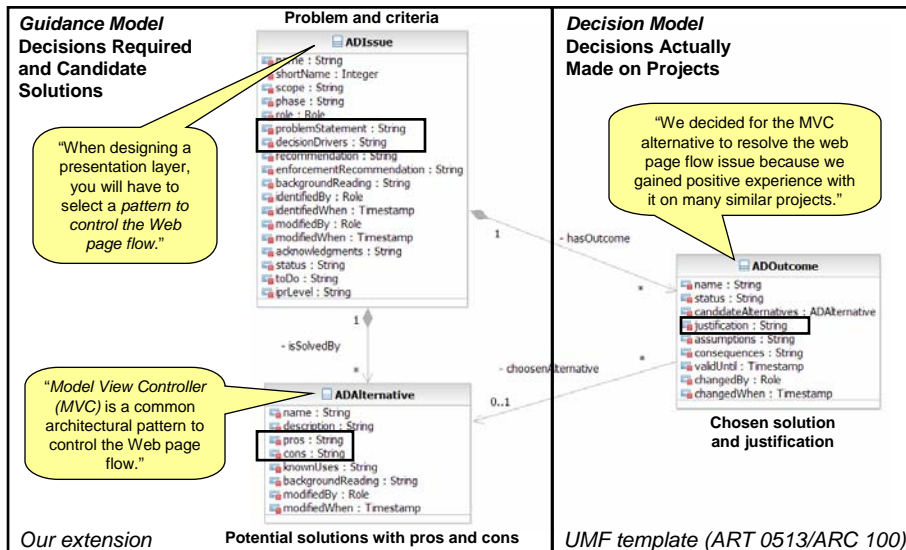
## Architectural Decision (AD) about Integration Style – Documented according to IBM Unified Method Framework (UMF)

Subject Area	Process and service layer design	Topic	<i>Integration</i>
Name	Integration Style	AD ID	<b>3</b>
Decision Made	We decided for RPC and the Messaging pattern (Enterprise Integration Patterns)		
Issue or Problem	How should process activities and underlying services communicate?		
Assumptions	Process model and requirements NFR 1 to NFR 7 are valid and stable		
Motivation	If logical layers are physically distributed, they must be integrated.		
Alternatives	File transfer, shared database, no physical distribution (local calls)		
Justification	This is an inherently synchronous scenario: VSP users as well as internal T staff expect immediate responses to their requests (NFR 5). Messaging will give us guaranteed delivery (NFR 3, NFR 6).		
Implications	Need to select, install, and configure a message-oriented middleware.		
Derived Requirements	Many finer grained patterns are now eligible and have to be decided upon: message construction, channel design, message routing, message transformation, system management (see Enterprise Integration Patterns book).		
Related Decisions	Next, we have to decide on one or more integration technologies implementing the selected two integration styles. Many alternatives exist, e.g., Java Message Service (JMS) providers.		

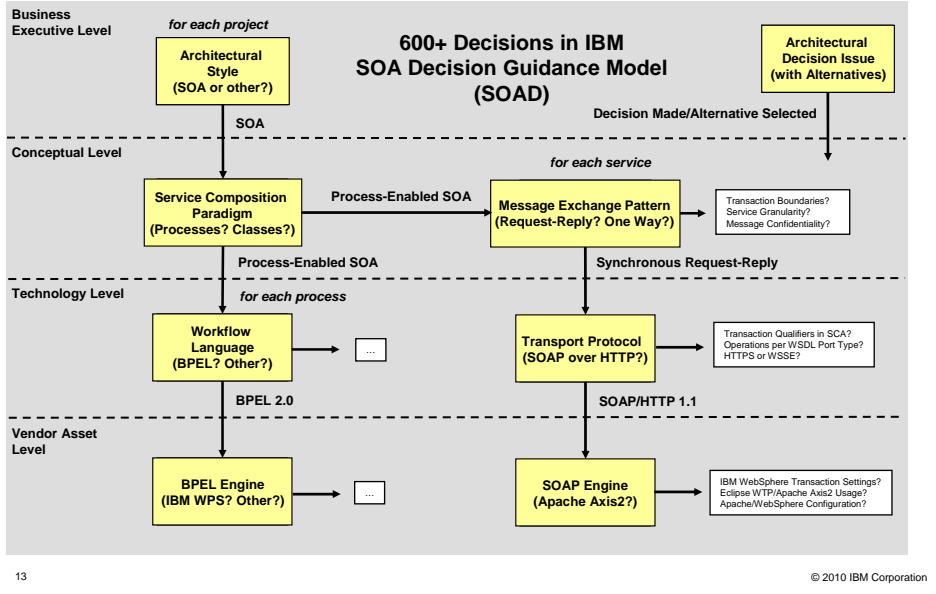
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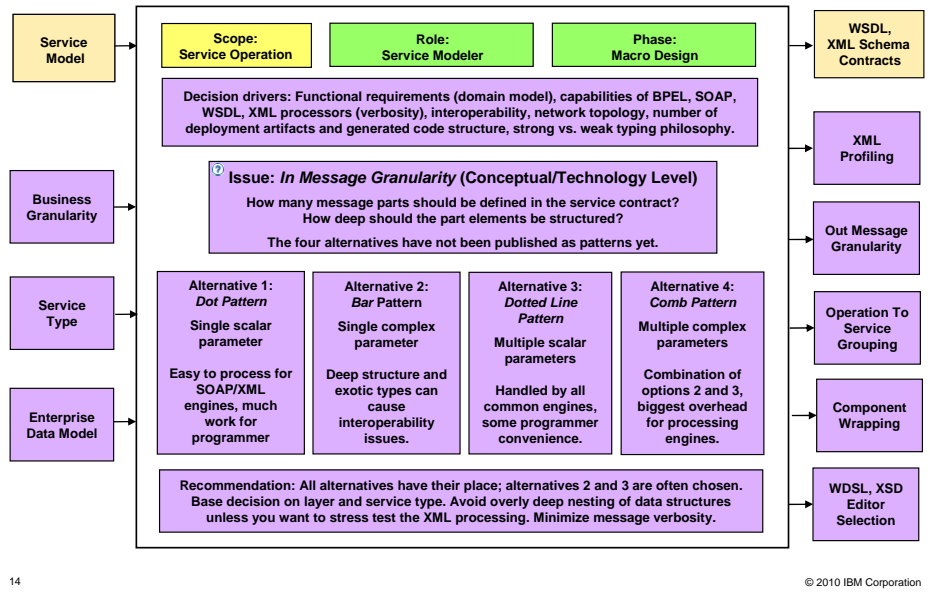
## Entity Types and Associations in UML Metamodel



## From AD Documentation to Active Method Guidance

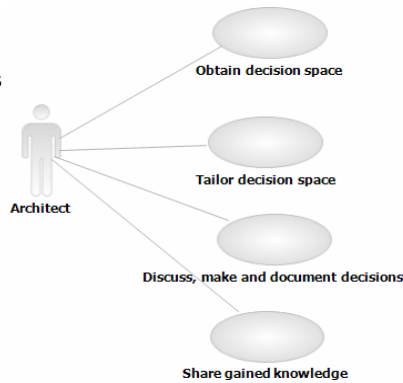


## AD Issue #1 – Addressing Service Granularity Topic

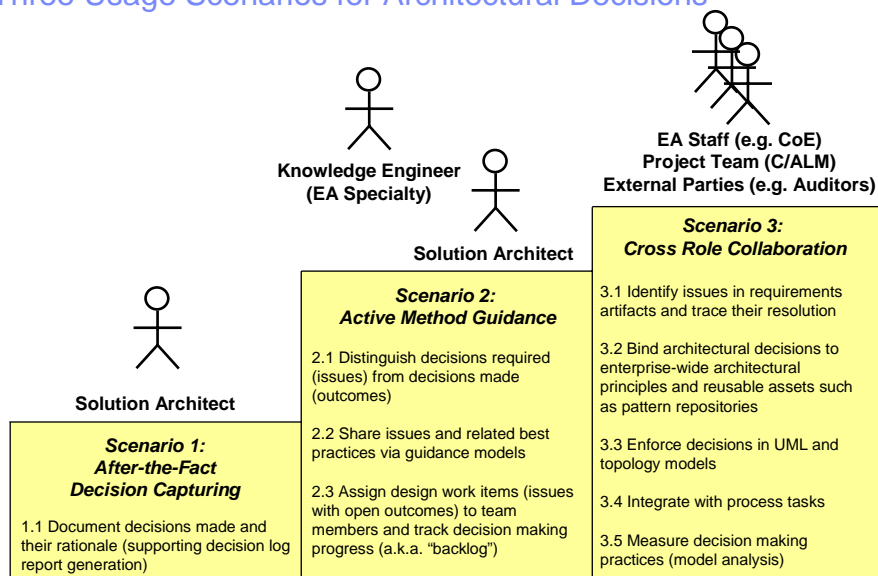


## Architectural Decisions Knowledge Tools Project (Rational/RES)

- Regulatory compliance
  - E.g., maturity models
- Collaboration
  - In geographically distributed teams
- Reuse
  - Of already gained knowledge
- Other required features:
  - Import and export
  - Searching and filtering
  - Dependency management
  - Report generation



## Three Usage Scenarios for Architectural Decisions



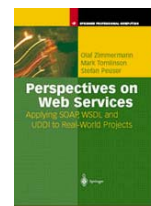


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## SOA Lessons Learned

- SOA concepts and Web services technologies work
  - Interoperability proven
  - Performance not an issue
- Same old architecture?
  - Broker vs. Enterprise Service Bus
  - Workflow vs. service composition
  - Directory service vs. registry
- Not all patterns always have to be used
  - Judge and decide on a pattern-by-pattern base
  - Decision making driven by (non-)functional project/program requirements
  - Don't confuse concepts and technology (SOA vs. Web services, REST)
- Follow a crawl, walk, run approach
  - As for any other non-trivial problem/solution
  - Don't over-engineer (e.g. complex XML schema)

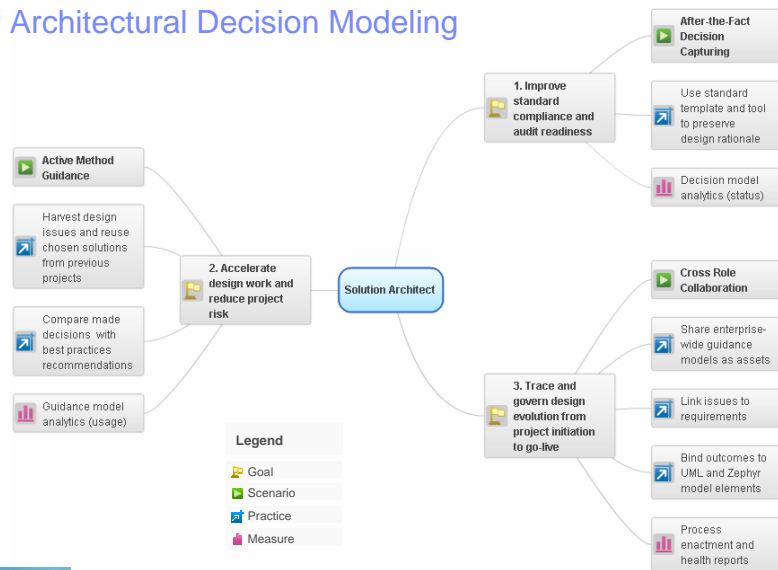


[www.soadecisions.org](http://www.soadecisions.org)

## Summary and Discussion

- Architectural decision making is a key responsibility of IT architects which is often underestimated and underrepresented in existing methods and tools.
- In SOA design, many decisions recur. This makes it possible to reduce the documentation effort and to share architectural decision knowledge including best practices (design acceleration and quality assurance).
- Prototypical tool support for decision modeling with reuse is available.
- We would like to hear from you now...
  - ... are the presented scenarios, concepts, and tool features useful and usable?
  - ... would you have additional requirements, e.g. collaboration and integration needs?

## Value of Architectural Decision Modeling



## More Information and Upcoming Events

- SOAD overview article:
  - Olaf Zimmermann, "[Architectural Decisions as Reusable Design Assets](#)," IEEE Software, vol. 28, no. 1, pp. 64-69, Jan./Feb. 2011, doi:10.1109/MS.2011.3
  
- SOAD tutorial and case study reports:
  - <http://soadecisions.org/soad.htm>
  
- Upcoming conferences with focus on architectural knowledge and SOA/Web services design:
  - SEI [SATURN](#) 2011 (May 16-20, Burlingame, California, USA)
  - IEEE [WICSA](#) 2011 (June 20-24, Boulder, Colorado, USA)
  - IEEE [ECOWS](#) 2011 (Sept 14-16, Lugano, Switzerland)

## Zentrale Entscheidungen im SOA-Entwurf REFERENCE MATERIAL (incl. Top 10 Design Issues)

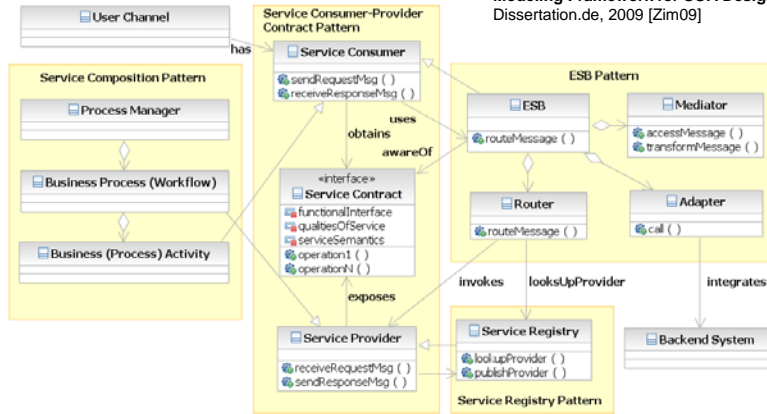
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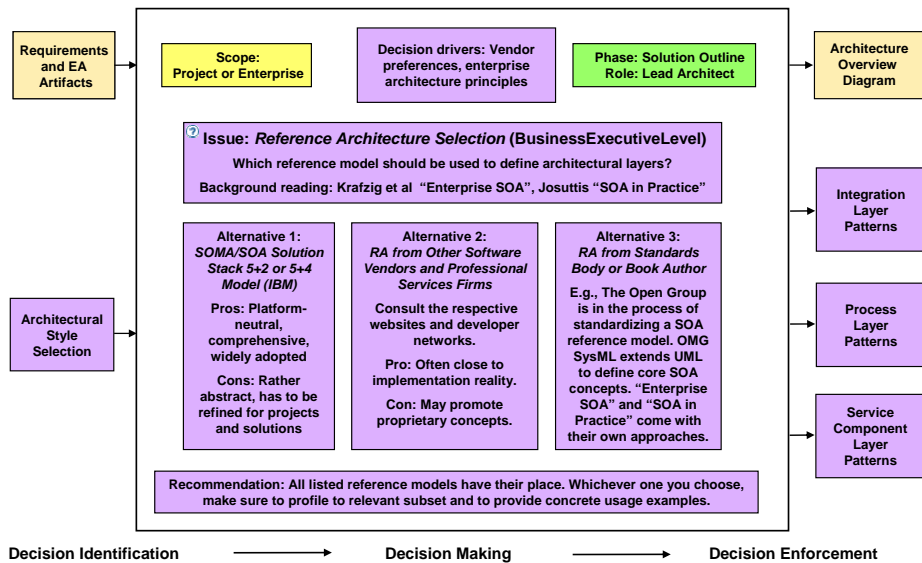
## SOA Patterns Overview

Zimmermann O., An Architectural Decision Modeling Framework for SOA Design. Dissertation.de, 2009 [Zim09]

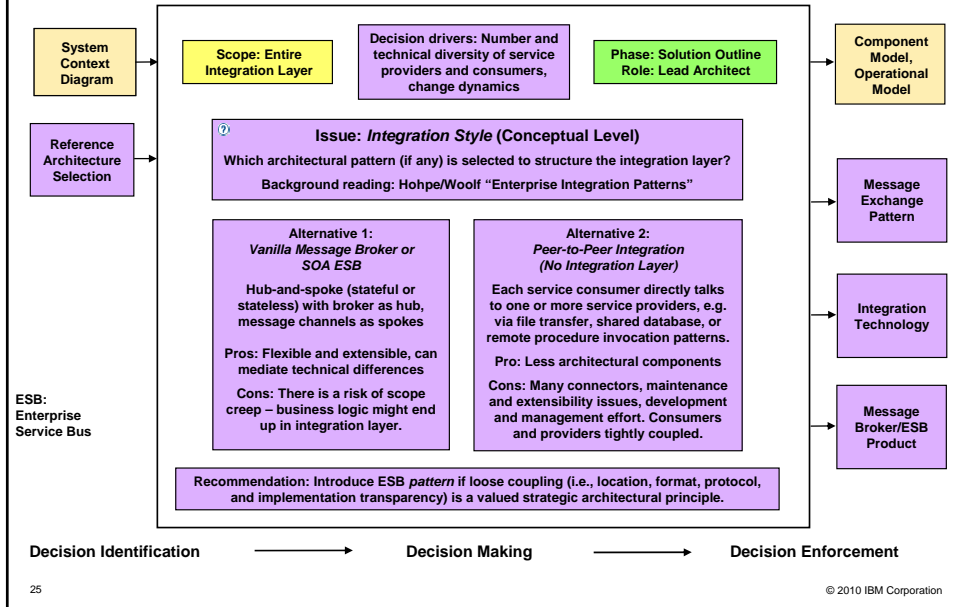


- No industry consensus on SOA principles and patterns yet:
- Each author defines his/her own – many terminology mismatches

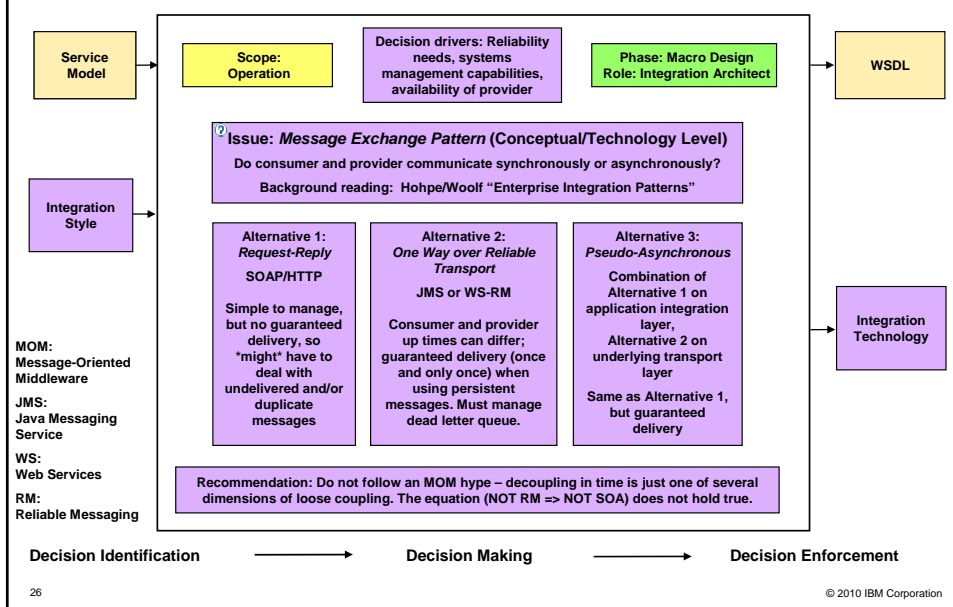
## AD Issue #10 – Reference Architecture (RA)



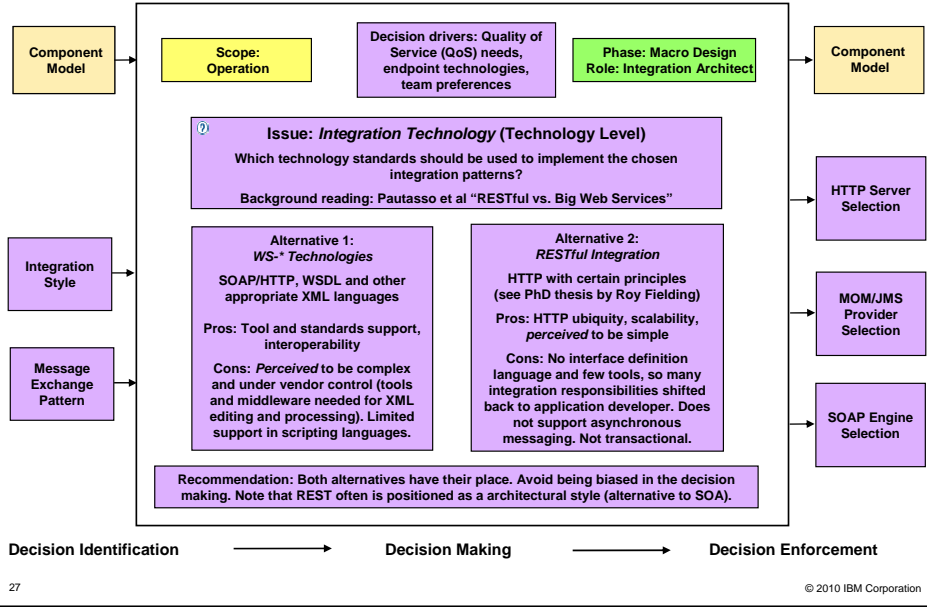
## AD Issue #9 – Overall Integration Layer Design Pattern



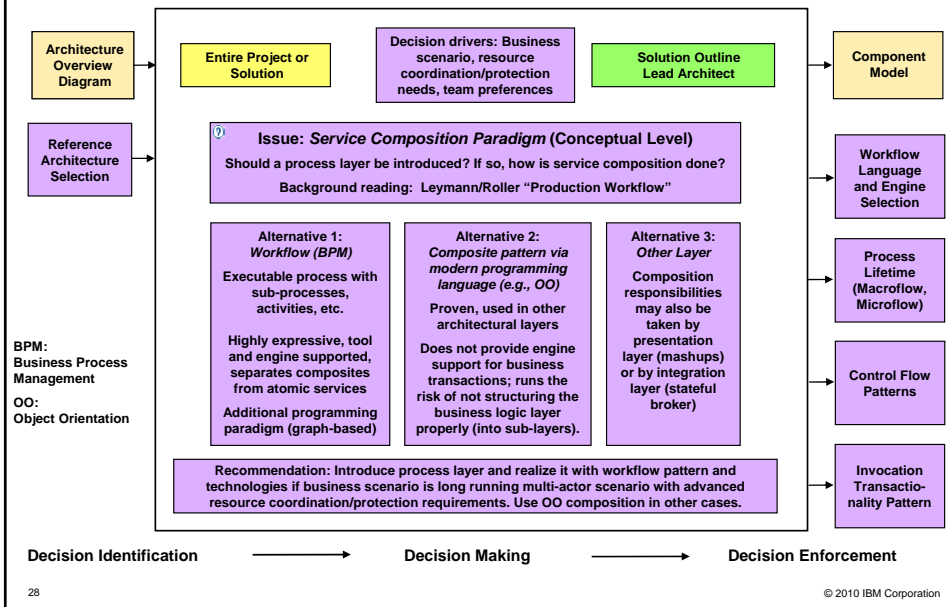
## AD Issue #8 – A Detailed Integration Layer Design Issue



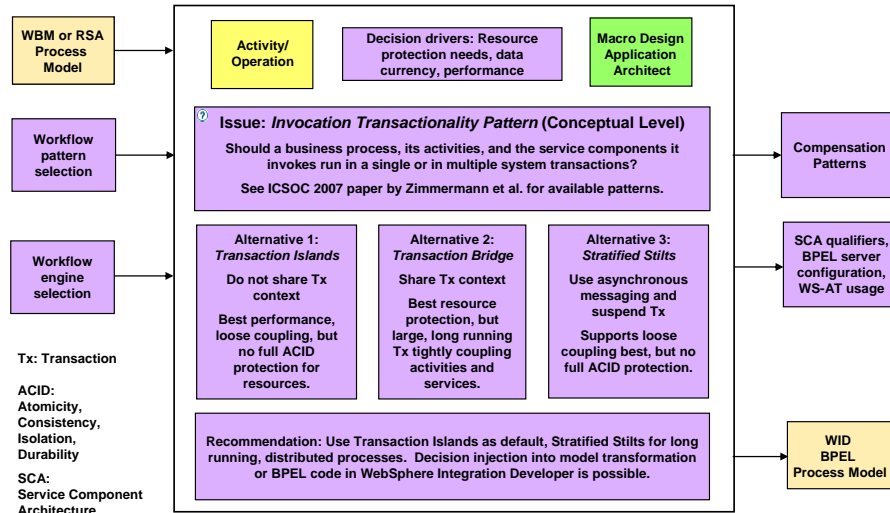
## AD Issue #7 – Integration Layer Technologies



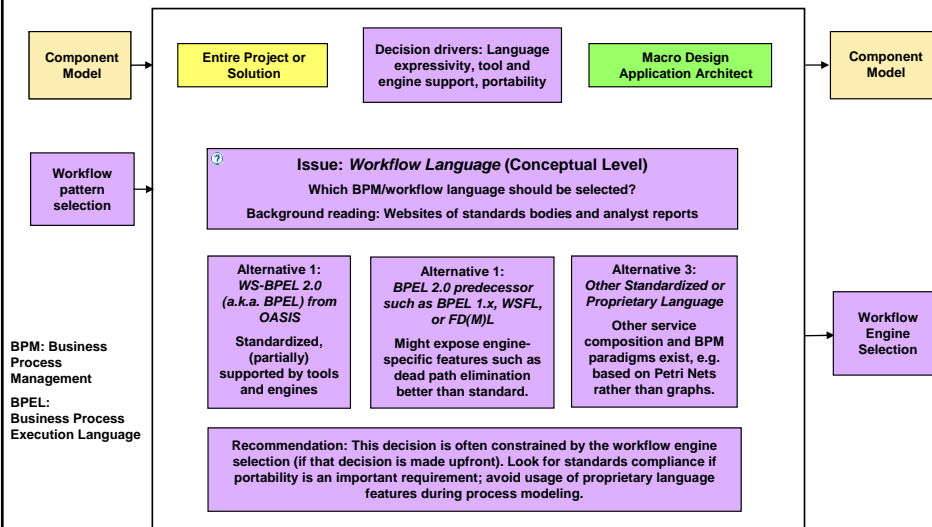
## AD Issue #6 – Overall Process Layer Design Pattern



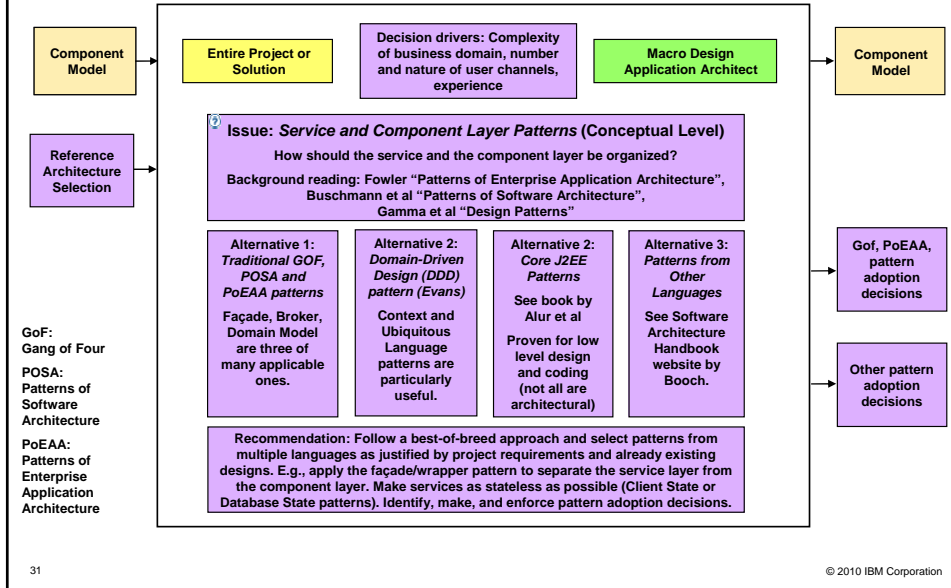
## AD Issue #5 – Transaction Management Topic



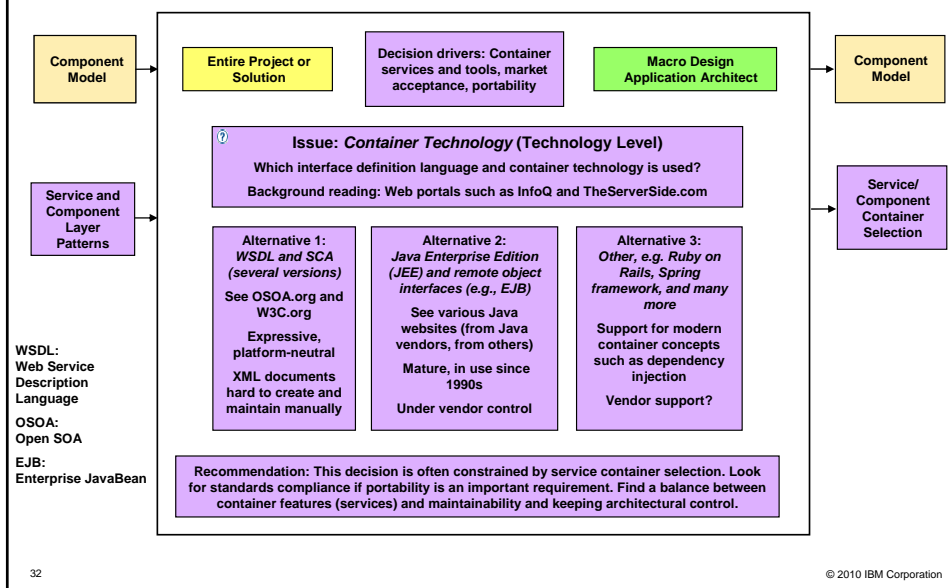
## AD Issue #4 – Process Layer Technologies



## AD Issue #3 – Service/Component Layer Design Patterns

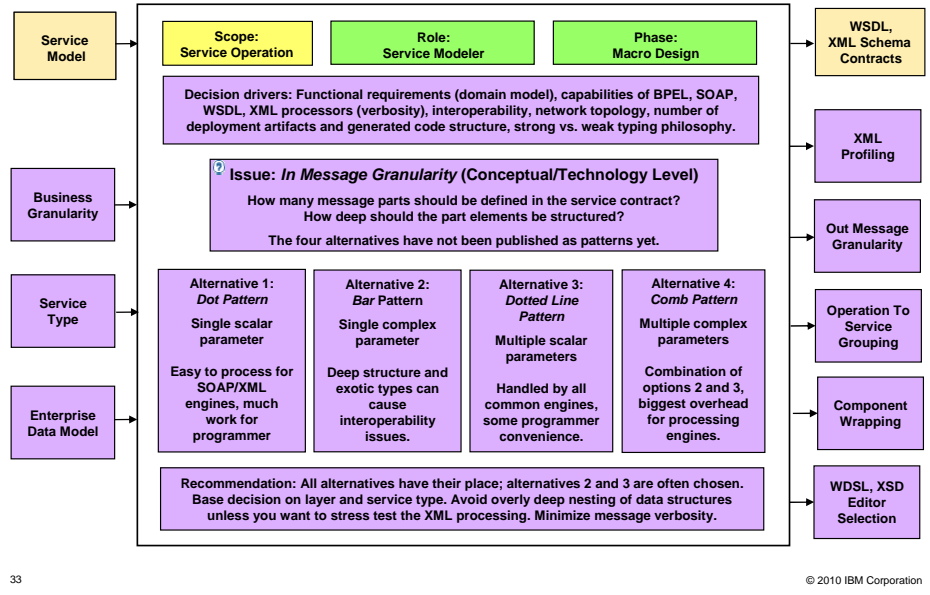


## AD Issue #2 – Service/Component Layer Technologies





## AD Issue #1 – Addressing Service Granularity Topic



## Vision: Enterprise-Wide Guidance Model

- Enterprise architecture group owns and maintains guidance model
  - Input comes from solution architects on development/integration projects
  - Quality assured, aligned with enterprise IT strategy
- Does not mandate a particular architecture, but frames design work
  - Recommend certain alternatives:
    - E.g. “always use document/literal SOAP”
  - Ban others:
    - E.g. “no open source assets can be used due to open legal issues”
  - Finding a balance between freedom-of-choice and freedom-from-choice
- Allows project teams to share lessons learned and best practices
  - Actionable enterprise architecture
  - Enterprise architects perceived as friends, not foes