SOACON 2007
Where IT Aligns With Business

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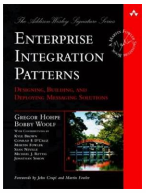
Gregor Hohpe | Google

Developing in a Service-oriented World

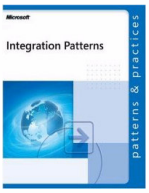
Who's Gregor?

- Distributed systems, enterprise integration, service-oriented architectures
- MQ, MSMQ, JMS, TIBCO, Web Services
- Write code every day. Share knowledge through patterns.

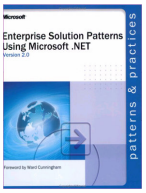
eaipatterns.com
- Patterns
- Articles
- Blog



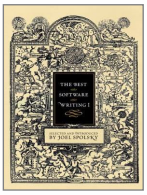
Enterprise Integration Patterns
Addison-Wesley



Integration Patterns
Microsoft Press



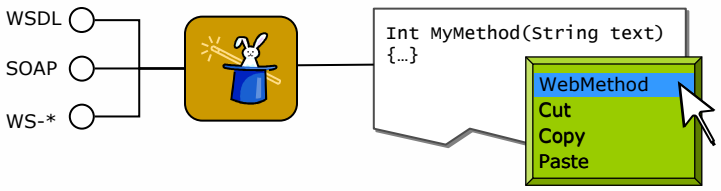
Enterprise Solution Patterns
Microsoft Press



Best Software Writing I
APress

SOA Experten-wissen
dpunkt Verlag

Could It Be So Easy?



- Buzzword compliant, but not a service-oriented architecture
- Synchronous call stack mentality
- No interface-implementation separation

Advice for Aspiring SOA Developers

- Forget about SOAP
- Become good at PowerPoint
- Pay close attention to Starbucks
- Shred “Design Patterns” (or eBay it)
- PROLOG rocks
- Replace MDA with ADM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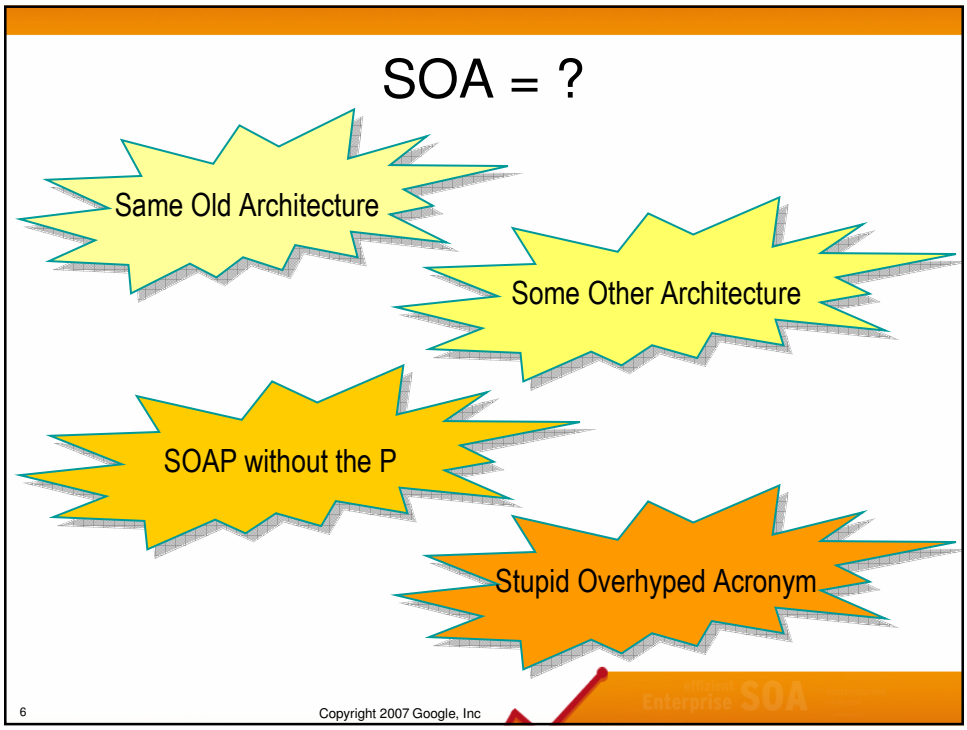
How Did We Get Here?
PART I


SOA = ?
Same Old Architecture
Some Other Architecture
SOAP without the P
Stupid Overhyped Acronym
6
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Service-Oriented Architecture

- Service
  - Well-defined, Self-contained
  - Independent of consumer context (mostly)
  - Universally accessible without individual deployment
- Service-Oriented Architecture
  - An architectural style
  - A simple, document-oriented interaction model
  - Loose(r) coupling
  - Interface contracts, registry
  - Functional assets reside in services, explicit orchestration across services

Distributed Component Architectures

- Main driver: transparency to developer
  - Remote code looks like local code
- The Distributed Object approach ignores:
  - Latency (network, marshalling, applications)
  - Disconnected or intermittently connected networks
  - Lack of shared memory access (pointers, references)
  - Partial failure and concurrency
  - Independent variability between systems (coupling)

Distributed Component Architectures

"The first law of distributed objects: Don't distribute your objects"
-- Martin Fowler

"Objects that interact in a distributed system need to be dealt with in ways that are intrinsically different from objects that interact in a single address space." -- Waldo et al, 1994

"95% transparent is not good enough. In fact, it is worse because it deceives developers."
-- Werner Vogels

Service Oriented Integration

Defining Characteristics

- Simplicity of interaction.
- No notion of inheritance, polymorphism, call stack, references etc.
- No lifecycle control. Service provider manages instances / allocations internally to suit its needs.
- Pass fewer, more self-contained documents. A tree structure (e.g., XML) is well suited for this.
- More amenable to asynchronous interaction.

Service Oriented Integration

Considerations

- Progress through Regress?
- Is the simplified interaction model sufficient? (WS-*)
- Are the contracts expressive enough?
- Are we getting it right this time around?
- When is SOA not appropriate?

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What Now?

PART II

The Human Side of Service-Orientation

- Architectural style is based on patterns and intent, not technology selection.
- SOAP vs. Binary is only a very small part of the SOA puzzle.
- Conversation models, asynchrony, document-orientation, granularity, decoupling, management, etc. are much more important.

The Human Side of Service-Orientation

- Loose coupling means shared architectural vision and intent are critical.
- SOA is primarily an agreement on what *not* to do.
- Your compiler can't tell you if you violated SOA principles.
- In the near term, this means documentation. Yes, PowerPoint!

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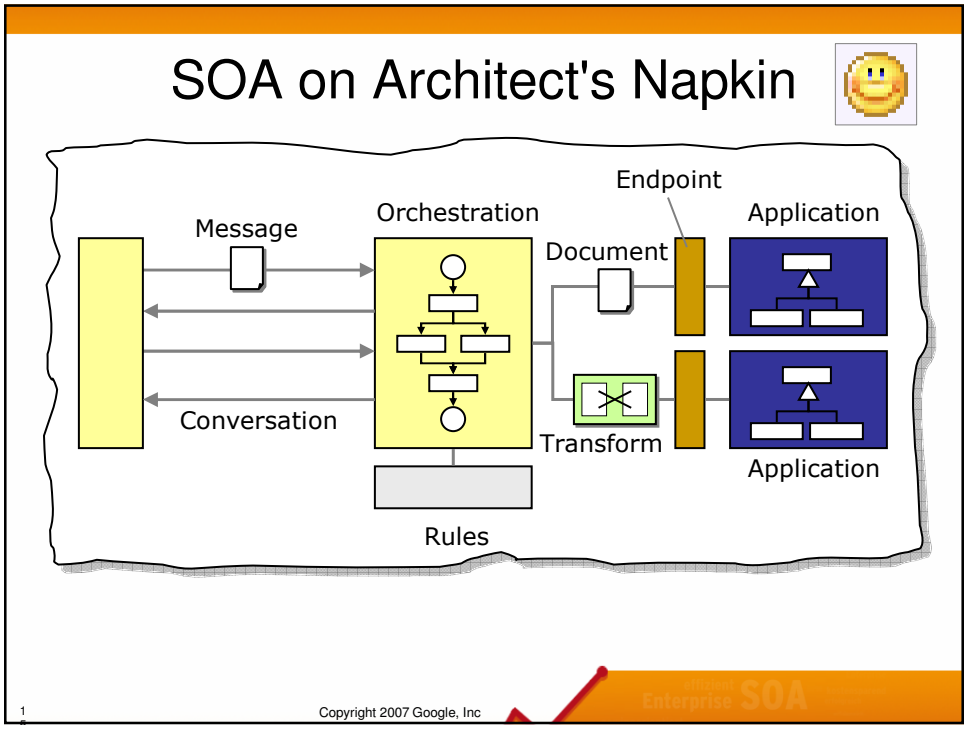
SOA on Architect's Napkin
Endpoint
Orchestration
Application
Message
Document
Conversation
Transform
Application
Rules
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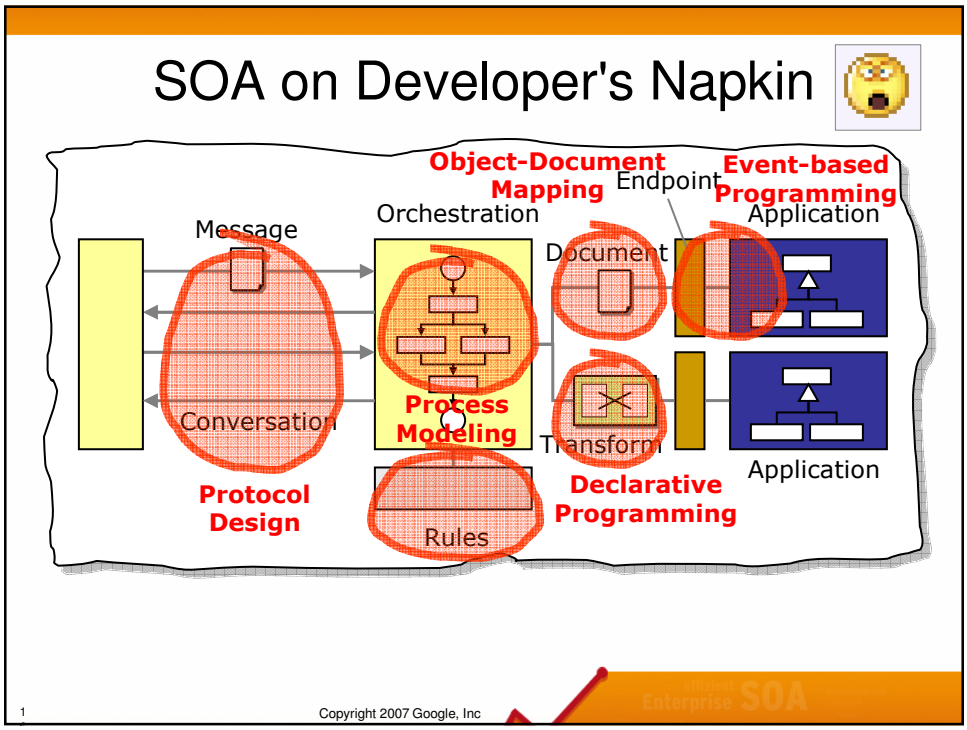
SOA on Developer's Napkin
Object-Document Mapping
Endpoint
Event-based Programming
Orchestration
Application
Message
Document
Process Modeling
Conversation
Transform
Application
Protocol Design
Declarative Programming
Rules
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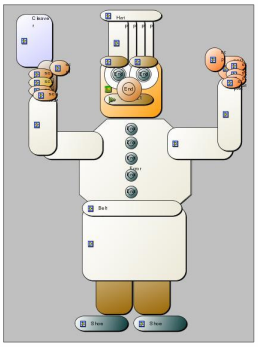
New Programming Models in SOA

- Event-based, Asynchronous Programming
  - Explicit state management
  - Sequencing, timing uncertainty
- Declarative Programming
  - Execution path chosen at run-time
  - XSLT, Rules engines
- Object-Document Mapping
  - Analogous to O-R mapping: subtle, but important
- Process Modeling
  - Many concurrent, long-running instances
  - No two-phase-commit style transactions

"Doodleware" Only Limited Help

- For example
  - Graphical process editors
  - Graphical transformation editors
- We love pictures
- Programming in pictures tedious
  - Scalability issues
  - Diff, Merge mostly unsupported
- Often a thin veneer over a complex (or unfamiliar) programming paradigm



"EAI Art"

Understanding Technology

- Syntax
  - Basic language mechanism
  - Artefact of crude input devices
- Constructs
  - "Vocabulary": Objects, Classes, Interfaces, Inheritance, etc.
  - Easily explained but no guidance on good design
- Principles
  - Separation of Concerns, Open-Closed, etc.
  - Help evaluate a solution
- Patterns
  - Null Object, Decorator, Model-View-Controller
  - Concrete design guidance based on principles

Patterns – 10 Years After GoF

- “Mind sized” chunks of information (Ward Cunningham)
- Human-to-human communication
- Good solution to a common problem within a specific context
- Expresses intent (the “why” vs. the “how”)
- Observed from actual experience
- NOT:
  - A firm rule –always a time when not to use
  - Copy-paste
  - Isolated. Part of a Pattern Language

Why Revisit Patterns?

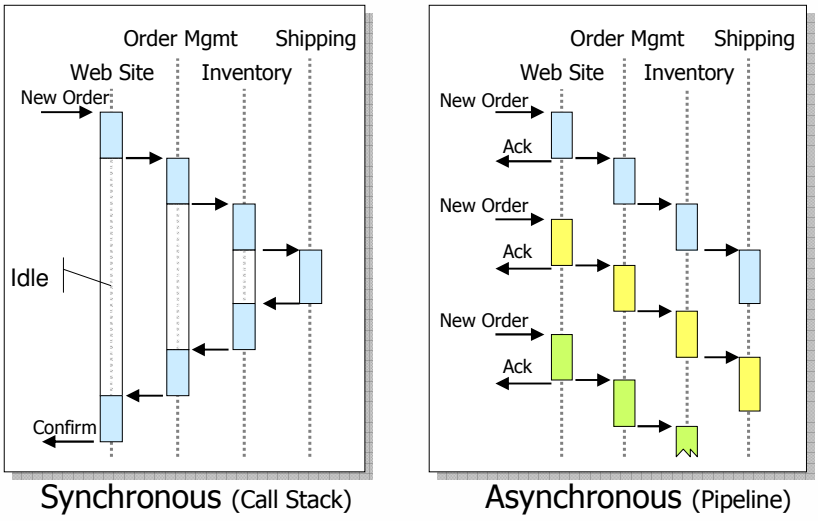
- New programming models bring new patterns.
- Patterns are expressed using the constructs of the underlying architectural style (e.g. OO, SOA).
- Patterns can help discover higher levels of abstraction.
- Ultimately some of these patterns can be implemented in the platform.
- This is usually an iterative process.

Focus on Interaction

- In the OO world interaction is essentially free
- Powerful structural mechanisms: inheritance, composition, aggregation
- In the SOA world more focus shifts to interaction. Structural composition mechanisms are limited.

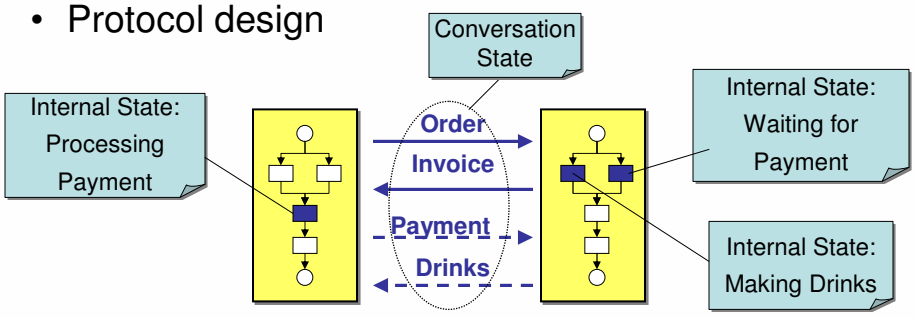
> "The lines are becoming boxes now."
> -- Ralf Westphal

Thinking Asynchronously



Conversations

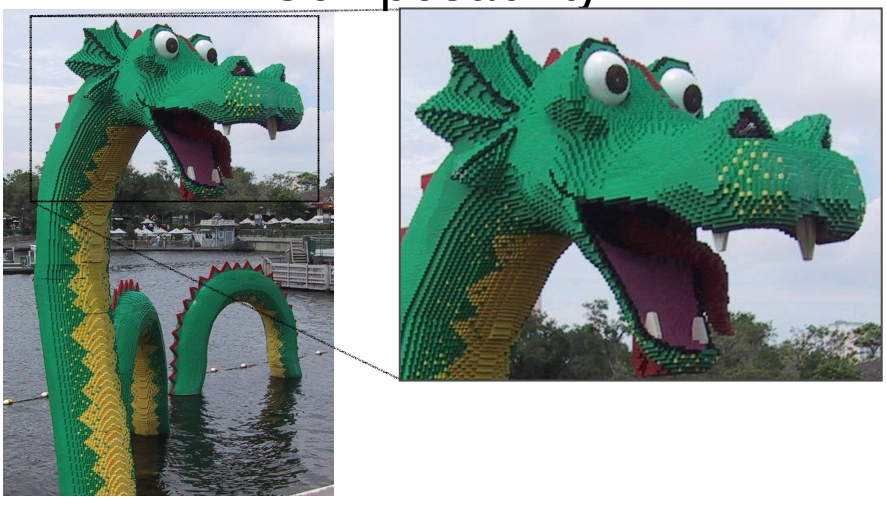
- Series of related messages between parties
- Choreography (e.g. WS-CDL)
- Describing conversation state and rules
- Protocol design



Exception Handling

- "Starbucks does not use two-phase commit"
  - Compensation
  - Retry
  - Write-off
- Throughput over latency
  - "Wider bridges, not faster cars"
- Optimize for happy day scenario

Composability



"The ability to build new things from existing pieces."

Composition Considerations

- Introduces a new layer into the system: the composition layer
- Deserves to be a 1st class citizen:
  - Language
  - Tools
  - Tests

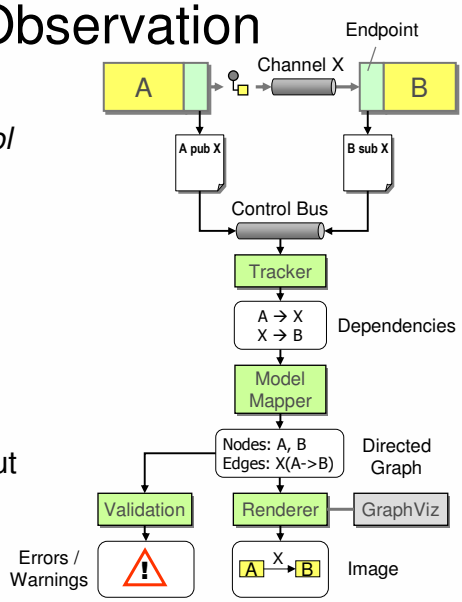
> *"Great composers are few and far in between."*
> -- Gregor's Ramblings

Bottom Up vs. Top Down

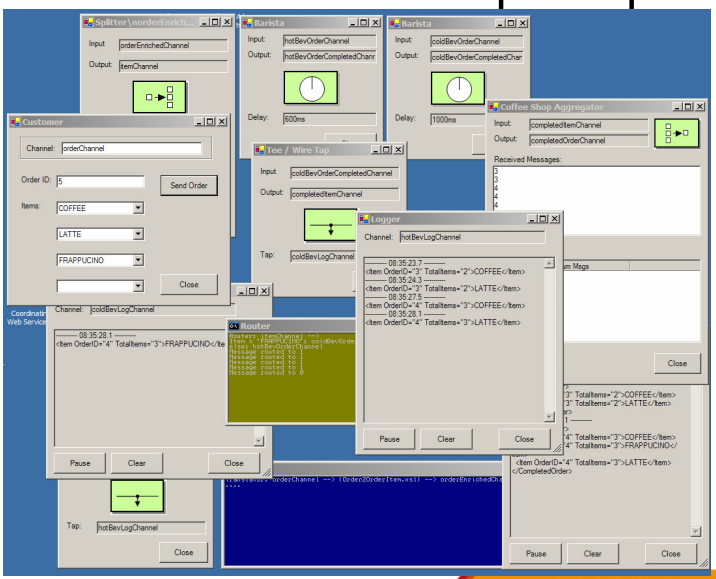
- Loosely coupled systems enable independent variability
- System can evolve locally without breaking
- Evolution can lead to surprises
- Therefore, extract accurate state of the system:
  - Design-time analysis
  - Run-time observation
- "Reverse" MDA

Run-time Observation

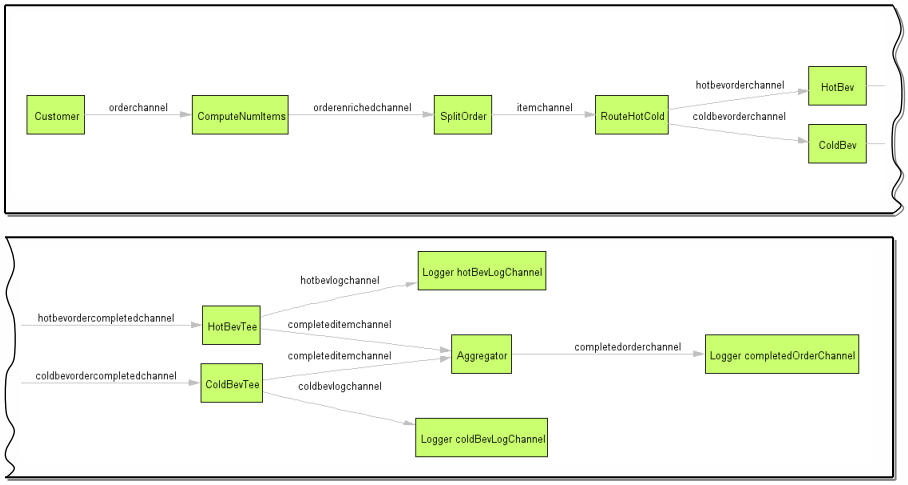
- Component endpoints send status messages to a *Control Bus*
- Invisible to applications
- Central component collects publication and subscription data
- Map onto a Directed Graph metamodel
- Use AT&T GraphViz to layout a visual representation



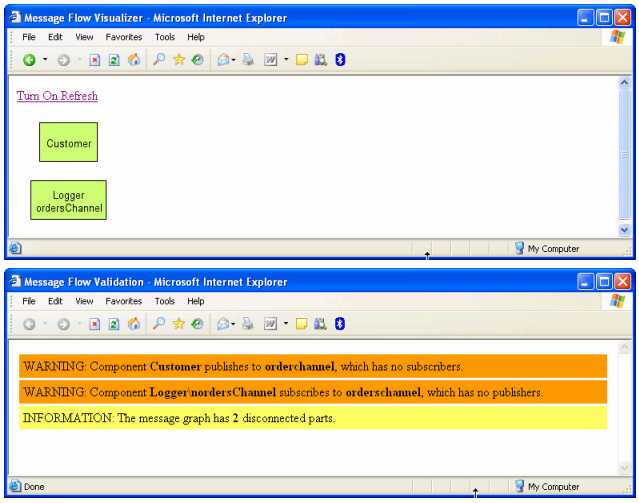
Visualization – Example Input

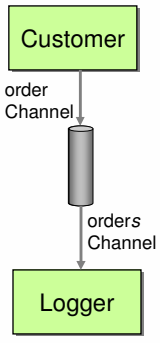


Visualization – Example Output



Model Validation





Domain-Specific Languages

- Finding generic languages to support these programming models is hard
- It also makes the languages complex and the learning curve steep (see XSLT)
- “Language Workbenches” may help us create our smaller domain-specific languages
- Intentional Programming
  - JetBrains Meta Programming System (MPS)
  - Visual Studio 2005
  - See article on http://www.martinfowler.com/

In Summary

- SOA brings new and unfamiliar:
  - Architectural Styles
  - Programming Models
  - Best Practices
  - Patterns
  - Testing Approaches
  - Management Approaches
- The collective learning cycle will take some time
- The vendors and specs are sometimes ahead (or amiss) of the real issues

Enterprise Integration Patterns

- Language of 65 patterns
- Consistent vocabulary and notation
- Focuses on asynchronous messaging
- Many more patterns to harvest:
  - Conversations
  - Orchestrations
  - Error Handling
  - Complex Transformations
  - Rules Engines
- www.EnterpriseIntegrationPatterns.com