



The Addison-Wesley Signature Series

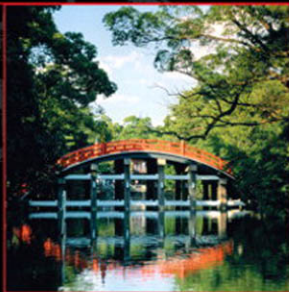
A MARTIN FOWLER SIGNATURE
BOOK
Martin

ENTERPRISE INTEGRATION PATTERNS

DESIGNING, BUILDING, AND
DEPLOYING MESSAGING SOLUTIONS

GREGOR HOHPE
BOBBY WOOLF

WITH CONTRIBUTIONS BY
KYLE BROWN
CONRAD F. D'CRUZ
MARTIN FOWLER
SEAN NEVILLE
MICHAEL J. RETTIG
JONATHAN SIMON



Forewords by John Crupi and Martin Fowler

List of Patterns



Aggregator (268) How do we combine the results of individual but related messages so that they can be processed as a whole?

Canonical Data Model (355) How can you minimize dependencies when integrating applications that use different data formats?



Channel Adapter (127) How can you connect an application to the messaging system so that it can send and receive messages?



Channel Purger (572) How can you keep leftover messages on a channel from disturbing tests or running systems?



Claim Check (346) How can we reduce the data volume of message sent across the system without sacrificing information content?



Command Message (145) How can messaging be used to invoke a procedure in another application?



Competing Consumers (502) How can a messaging client process multiple messages concurrently?



Composited Message Processor (294) How can you maintain the overall message flow when processing a message consisting of multiple elements, each of which may require different processing?



Content Enricher (336) How do we communicate with another system if the message originator does not have all the required data items available?



Content Filter (342) How do you simplify dealing with a large message when you are interested only in a few data items?



Content-Based Router (230) How do we handle a situation in which the implementation of a single logical function is spread across multiple physical systems?



Control Bus (540) How can we effectively administer a messaging system that is distributed across multiple platforms and a wide geographic area?



Correlation Identifier (163) How does a requestor that has received a reply know which request this is the reply for?



Datatype Channel (111) How can the application send a data item such that the receiver will know how to process it?



Dead Letter Channel (119) What will the messaging system do with a message it cannot deliver?



Detour (545) How can you route a message through intermediate steps to perform validation, testing, or debugging functions?



Document Message (147) How can messaging be used to transfer data between applications?



Durable Subscriber (522) How can a subscriber avoid missing messages while it's not listening for them?



Dynamic Router (243) How can you avoid the dependency of the router on all possible destinations while maintaining its efficiency?



Envelope Wrapper (330) How can existing systems participate in a messaging exchange that places specific requirements, such as message header fields or encryption, on the message format?



Event Message (151) How can messaging be used to transmit events from one application to another?



Event-Driven Consumer (498) How can an application automatically consume messages as they become available?



File Transfer (43) How can I integrate multiple applications so that they work together and can exchange information?

Format Indicator (180) How can a message's data format be designed to allow for possible future changes?



Guaranteed Delivery (122) How can the sender make sure that a message will be delivered even if the messaging system fails?



Idempotent Receiver (528) How can a message receiver deal with duplicate messages?



Invalid Message Channel (115) How can a messaging receiver gracefully handle receiving a message that makes no sense?



Message Broker (322) How can you decouple the destination of a message from the sender and maintain central control over the flow of messages?



Message Bus (137) What architecture enables separate applications to work together but in a decoupled fashion such that applications can be easily added or removed without affecting the others?



Message Channel (60) How does one application communicate with another using messaging?



Message Dispatcher (508) How can multiple consumers on a single channel coordinate their message processing?



Message Endpoint (95) How does an application connect to a messaging channel to send and receive Messages?



Message Expiration (176) How can a sender indicate when a message should be considered stale and thus shouldn't be processed?

Enterprise Integration Patterns: Designing, Building, and Deploying Messaging Solutions

Table of Contents

Contents

Foreword

Foreword

Preface

Acknowledgments

Introduction

Chapter 1: Solving Integration Problems Using Patterns

 The Need for Integration

 Integration Challenges

 How Integration Patterns Can Help

 The Wide World of Integration

 Loose Coupling

 One-Minute EAI

 A Loosely Coupled Integration Solution

 Widgets & Gadgets R Us: An Example

 Internal Systems

 Taking Orders

 Processing Orders

 Checking Status

 Change Address

Table of Contents

New Catalog

Announcements

Testing and Monitoring

Summary

Chapter 2: Integration Styles

Introduction

File Transfer

Shared Database

Remote Procedure Invocation

Messaging

Chapter 3: Messaging Systems

Introduction

Message Channel

Message

Pipes and Filters

Message Router

Message Translator

Message Endpoint

Chapter 4: Messaging Channels

Introduction

Point-to-Point Channel

Publish-Subscribe Channel

Datatype Channel

Invalid Message Channel

Dead Letter Channel

Guaranteed Delivery

Table of Contents

Channel Adapter

Messaging Bridge

Message Bus

Chapter 5: Message Construction

Introduction

Command Message

Document Message

Event Message

Request-Reply

Return Address

Correlation Identifier

Message Sequence

Message Expiration

Format Indicator

Chapter 6: Interlude: Simple Messaging

Introduction

Request-Reply Example

Publish-Subscribe Example

JMS Request-Reply Example

Request-Reply Example

Request-Reply Code

Invalid Message Example

Conclusions

.NET Request-Reply Example

Request-Reply Example

Request-Reply Code

Invalid Message Example

Table of Contents

Conclusions

JMS Publish-Subscribe Example

The Observer Pattern

Distributed Observer

Publish-Subscribe

Comparisons

Push and Pull Models

Channel Design

Conclusions

Chapter 7: Message Routing

Introduction

Content-Based Router

Message Filter

Dynamic Router

Recipient List

Splitter

Aggregator

Resequencer

Composed Message Processor

Scatter-Gather

Routing Slip

Process Manager

Message Broker

Chapter 8: Message Transformation

Introduction

Envelope Wrapper

Content Enricher

Table of Contents

Content Filter

Claim Check

Normalizer

Canonical Data Model

Chapter 9: Interlude: Composed Messaging

Loan Broker Example

Obtaining a Loan Quote

Designing the Message Flow

Sequencing: Synchronous versus Asynchronous

Addressing: Distribution versus Auction

Aggregating Strategies: Multiple Channels versus Single Channel

Managing Concurrency

Three Implementations

Synchronous Implementation Using Web Services

Solution Architecture

Web Services Design Considerations

Apache Axis

Service Discovery

The Loan Broker Application

Components of the Loan Broker Application

Client Application

Running the Solution

Performance Limitations

Limitations of This Example

Summary

Asynchronous Implementation with MSMQ

Loan Broker Ecosystem

Laying the Groundwork: A Messaging Gateway

Table of Contents

Base Classes for Common Functionality

Designing the Bank

Designing the Credit Bureau

Designing the Loan Broker

Refactoring the Loan Broker

Putting it All Together

Improving Performance

A Few Words on Testing

Limitations of This Example

Summary

Asynchronous Implementation with TIBCO ActiveEnterprise

Solution Architecture

The Implementation Toolset

The Interfaces

Implementing the Synchronous Services

The Loan Broker Process

Managing Concurrent Auctions

Execution

Conclusions

Chapter 10: Messaging Endpoints

Introduction

Messaging Gateway

Messaging Mapper

Transactional Client

Polling Consumer

Event-Driven Consumer

Competing Consumers

Message Dispatcher

Table of Contents

- Selective Consumer
- Durable Subscriber
- Idempotent Receiver
- Service Activator

Chapter 11: System Management

- Introduction
- Control Bus
- Detour
- Wire Tap
- Message History
- Message Store
- Smart Proxy
- Test Message
- Channel Purger

Chapter 12: Interlude: System Management Example

Loan Broker System Management

- Instrumenting the Loan Broker
- Management Console
- Loan Broker Quality of Service
- Verify the Credit Bureau Operation
- Credit Bureau Failover
- Enhancing the Management Console
- Limitations of This Example

Chapter 13: Integration Patterns in Practice

Case Study: Bond Pricing System

- Building a System
- Architecture with Patterns

Table of Contents

Structuring Channels
Selecting a Message Channel
Problem Solving with Patterns
Flashing Market Data Updates
Major Production Crash
Summary

Chapter 14: Concluding Remarks

Emerging Standards and Futures in Enterprise Integration

The Relationship between Standards and Design Patterns
Survey of Standards Processes and Organizations
Business Process Components and Intra-Web Service Messaging
ebXML and the Electronic Business Messaging Service (ebMS)
Business Process Execution Language for Web Services (BEPL4WS)
Web Service Choreography Interface (WSCI)
Java Business Process Component Standards
WS-*
Conclusions

Bibliography

Index