Introducing Spring Batch

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Overall presentation goal

An introduction to Spring Batch and how it is being used in projects today.

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Agenda

- **Introduction: batch patterns and typical use cases**
- Spring Batch overview: modeling the batch domain
- Case Studies
- Roadmap and product development process

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Batch Processing Patterns

- Close of business processing
  - Order processing
  - Business reporting
  - Account reconciliation
- Import/export handling
  - Instrument/position import
  - Trade/allocation export
- Large-scale output jobs
  - Loyalty scheme emails
  - Financial statements

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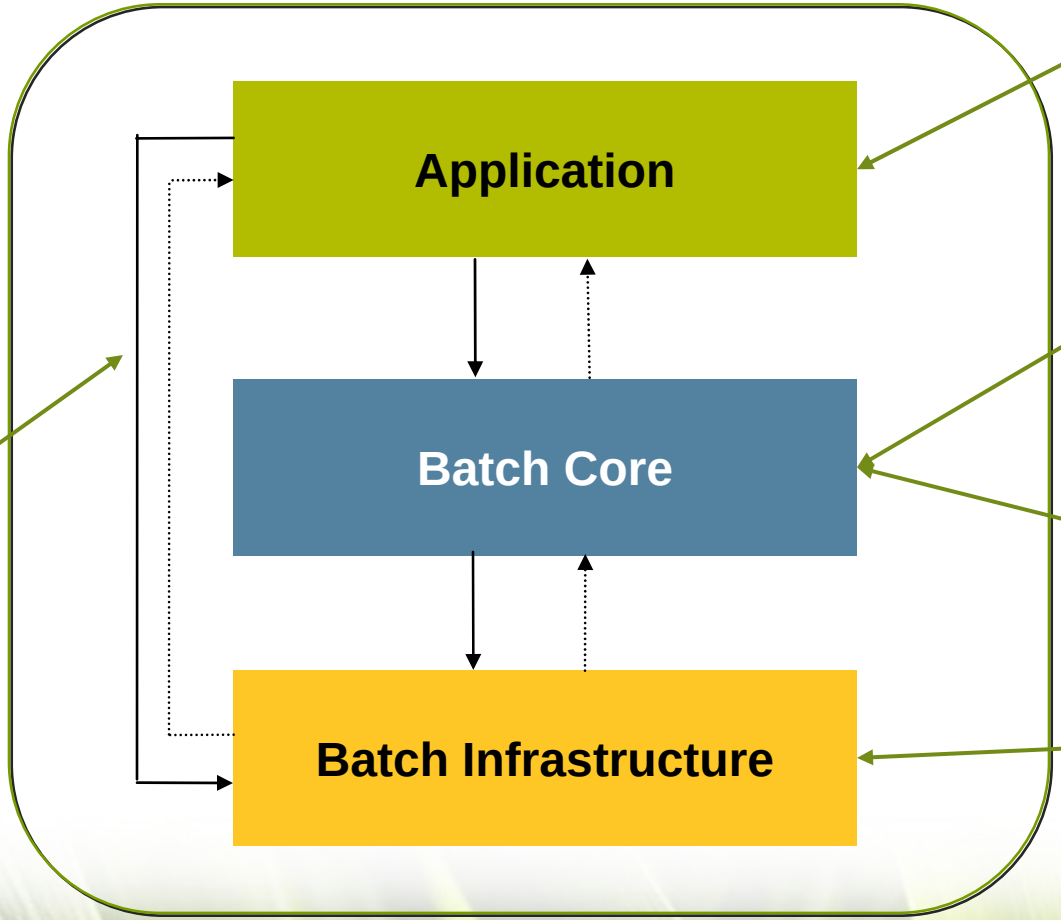
Spring Batch: Layered Architecture



Business Domain – Record-level data (e.g. Trade)

Job, Step, JobLauncher

JobLauncher, Implementations of Core API

Repeat, Retry, Transaction, Input, Output

Declarative, plus Abstractions and Extension Points

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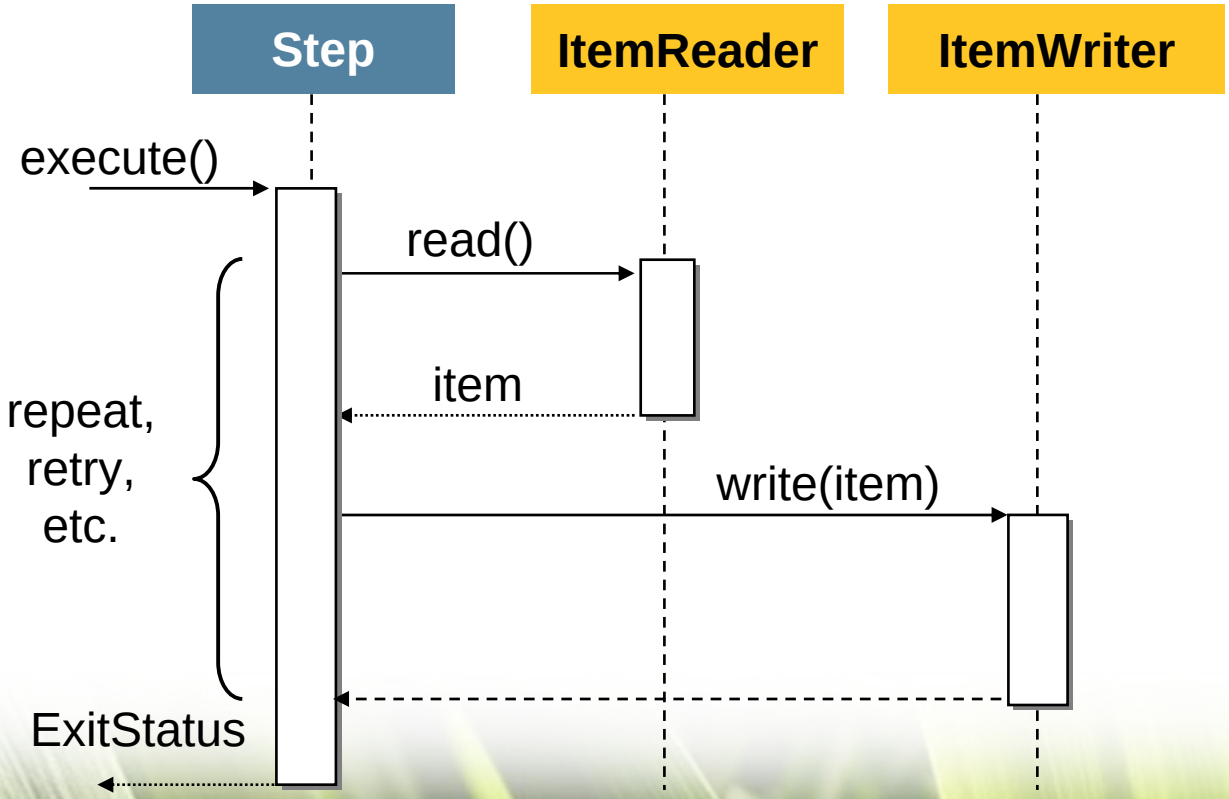
Item-Oriented Processing

- Input-output can be grouped together = Item-Oriented Processing



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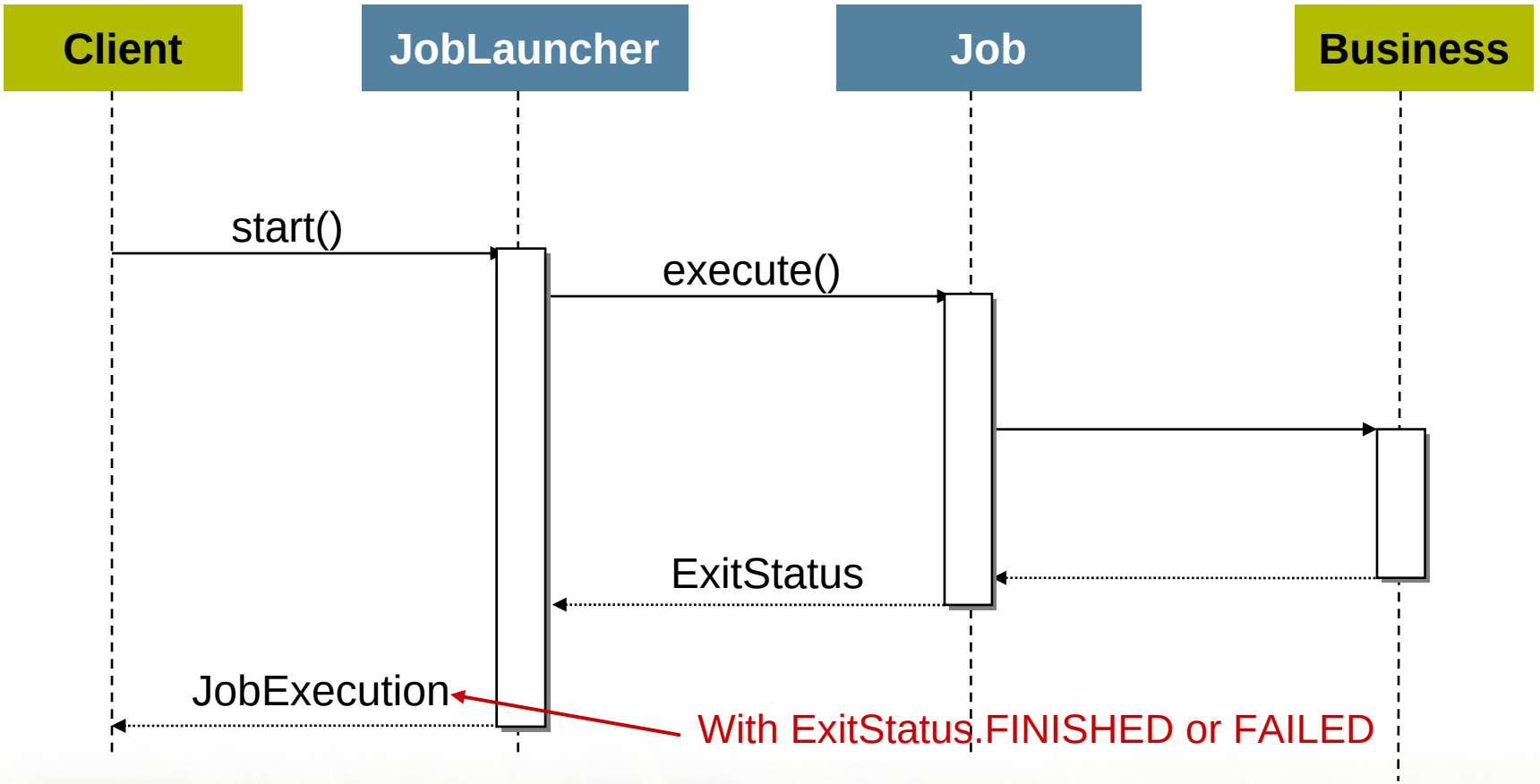
JobLauncher



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Batch Infrastructure and Batch Domain

- Batch infrastructure adds optimisation and low level abstractions
- The batch domain adds some value to a plain business process by introducing new concepts:
  - A **job** has an identity – not just a stream of bytes
  - A **job** has **steps**
  - A **job** can be restarted after a failure – a new **execution**
  - Each **execution** has a start time, stop time, status
  - The **job** has a status
  - Each **execution** can tell us how many **items** were processed, how many commits, rollbacks, skips

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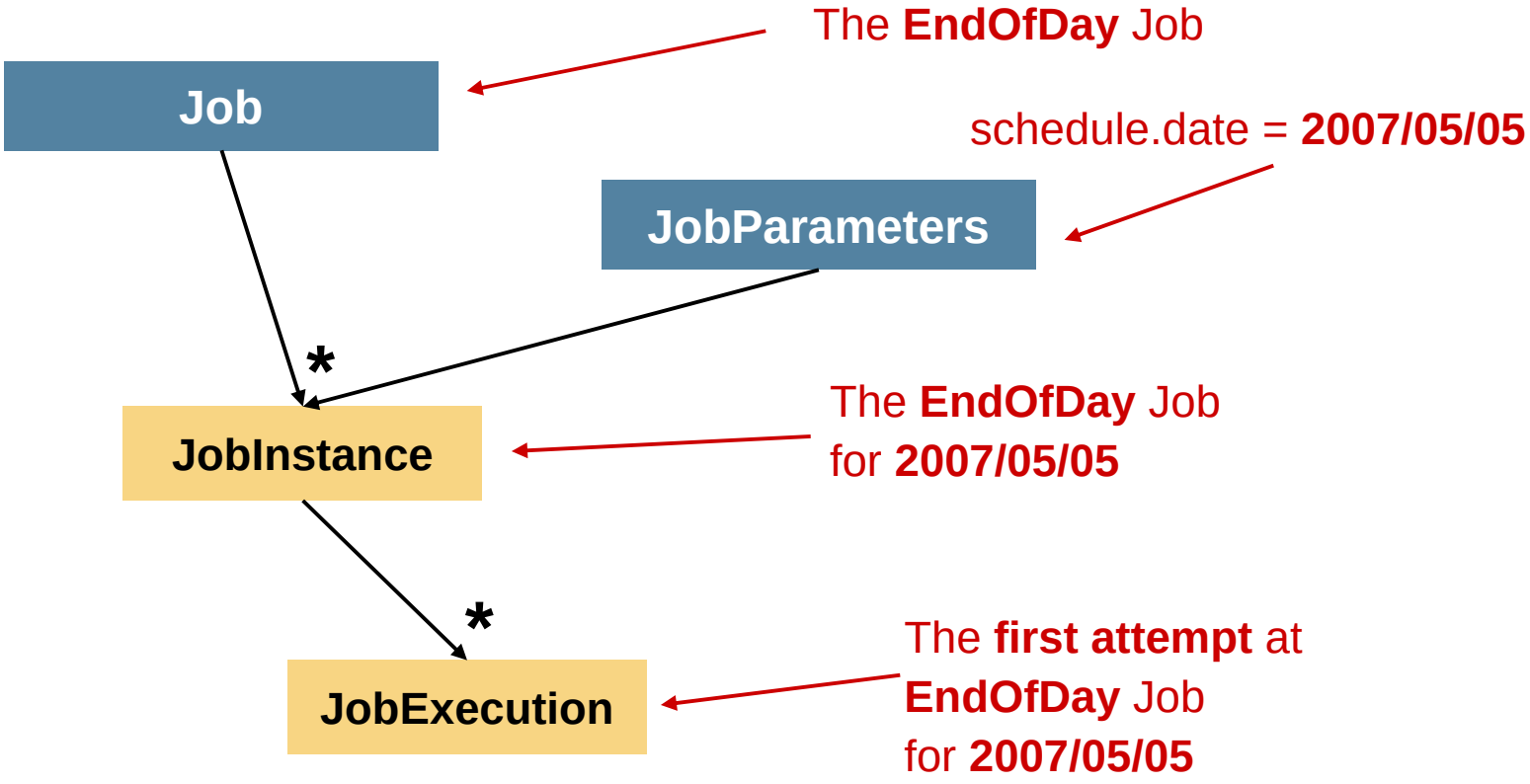
Job Configuration and Execution



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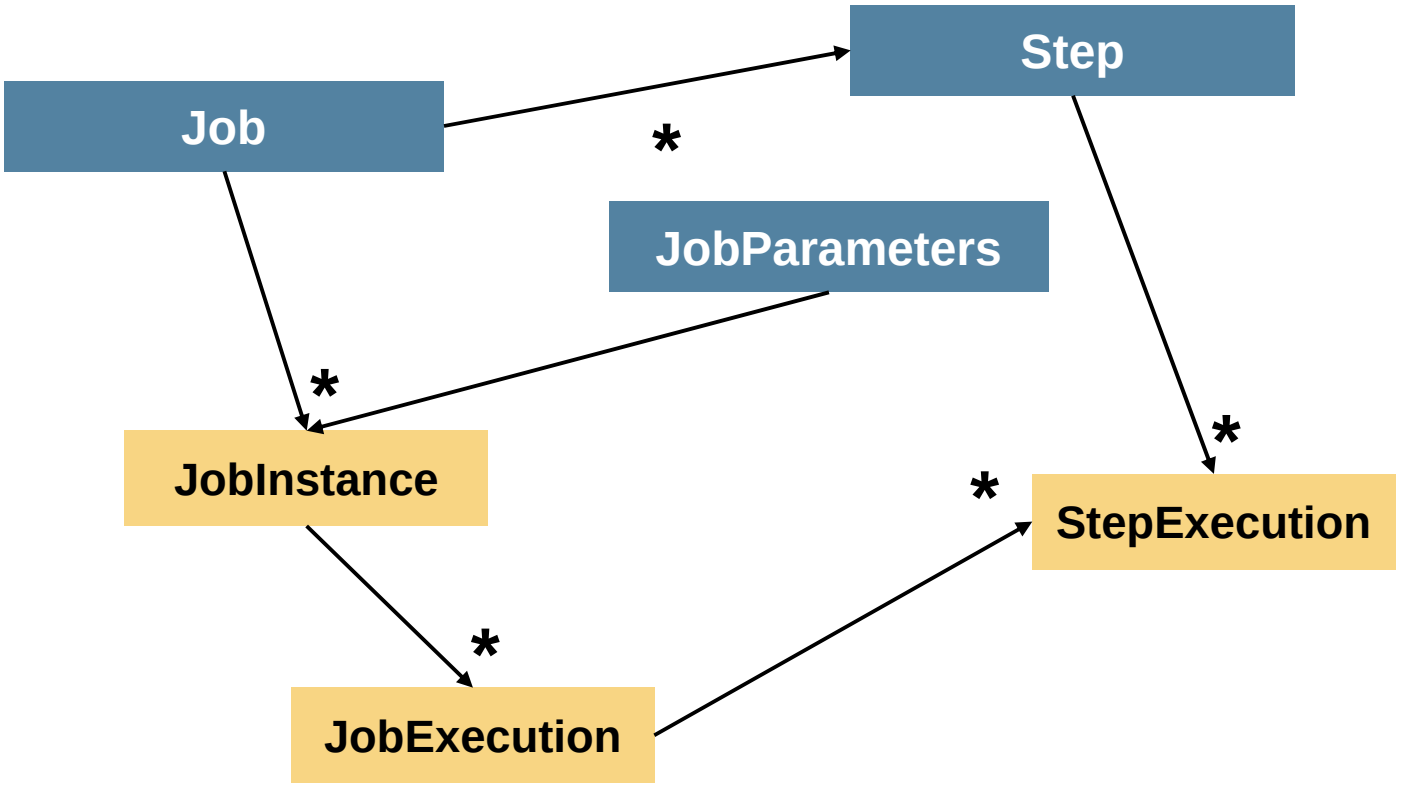
Job and Step



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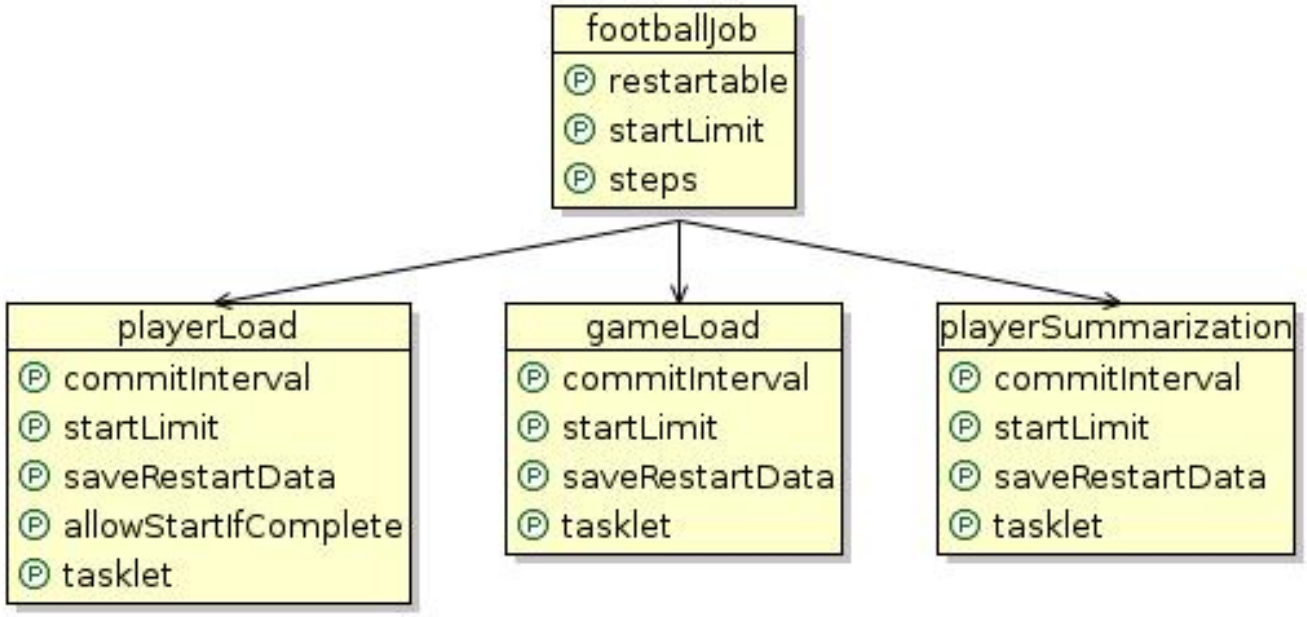
Job Configuration – football job sample



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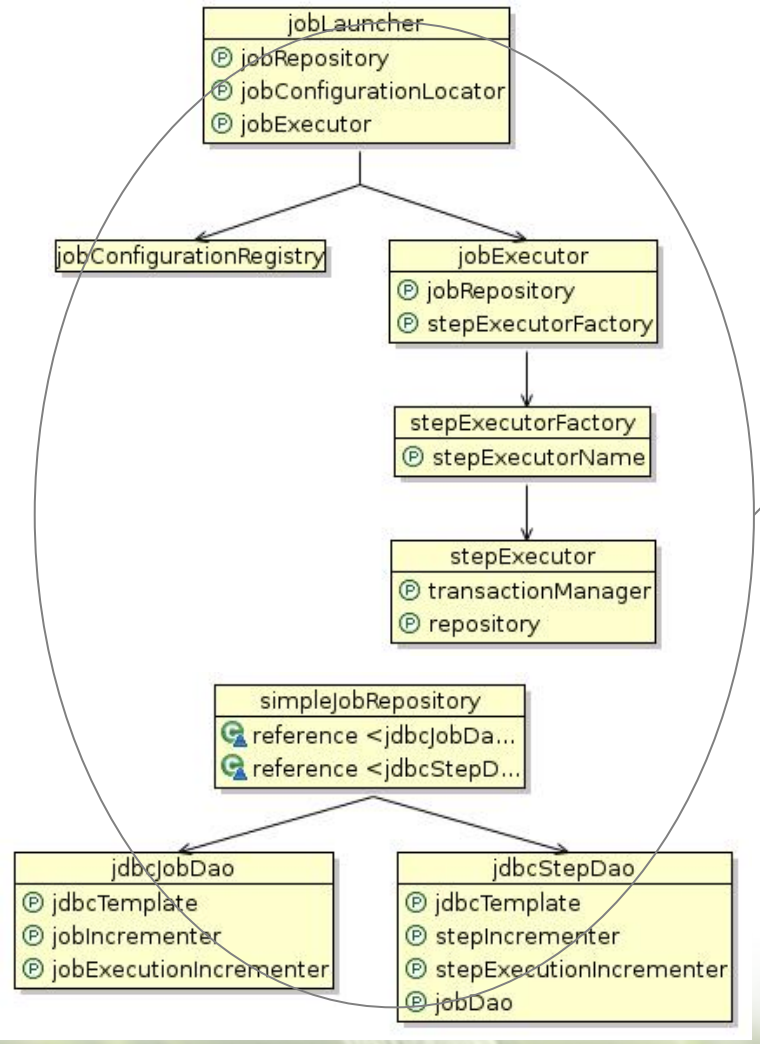
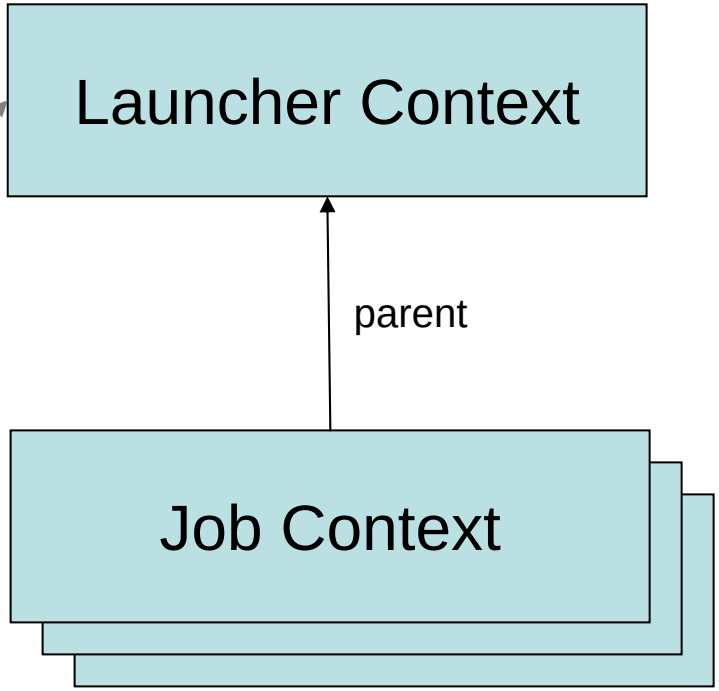
Job Launcher Configuration





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Sample Jobs

Job/Feature	delimited input	fixed-length input	xml input	multiline input	db driving query input	db curosr input	delimited output	fixed length output	xml output	multiline output	db output	skip	restart	quartz
fixedLengthImportJob		X									X			
multilineJob		X		X										
multilineOrderJob	X			X				X		X				
quartzBatch														X
simpleModuleJob		X									X			
simpleSkipSample												X		
skipWithRestartSample												X	X	
sqlCursorTradeJob						X								
tradeJob	X				X		X							
xmlJob			X						X					

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Case Studies

- Large European Healthcare
- State Government
- Leading Investment Bank

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Large European Healthcare

- Background: In order to align with the corporate strategy of using Java with Spring. COBOL mainframe batch processing partially migrated to Spring Batch.
- Solution:
  - Used XML Input Sources, allowing for a batch orientated approach to XML input.
  - Both input and output from the database used Hibernate, allowing online DAOs to be reused.
- Benefit
  - Allowed for a homogeneous development environment with online developers using Spring and Web Flow.

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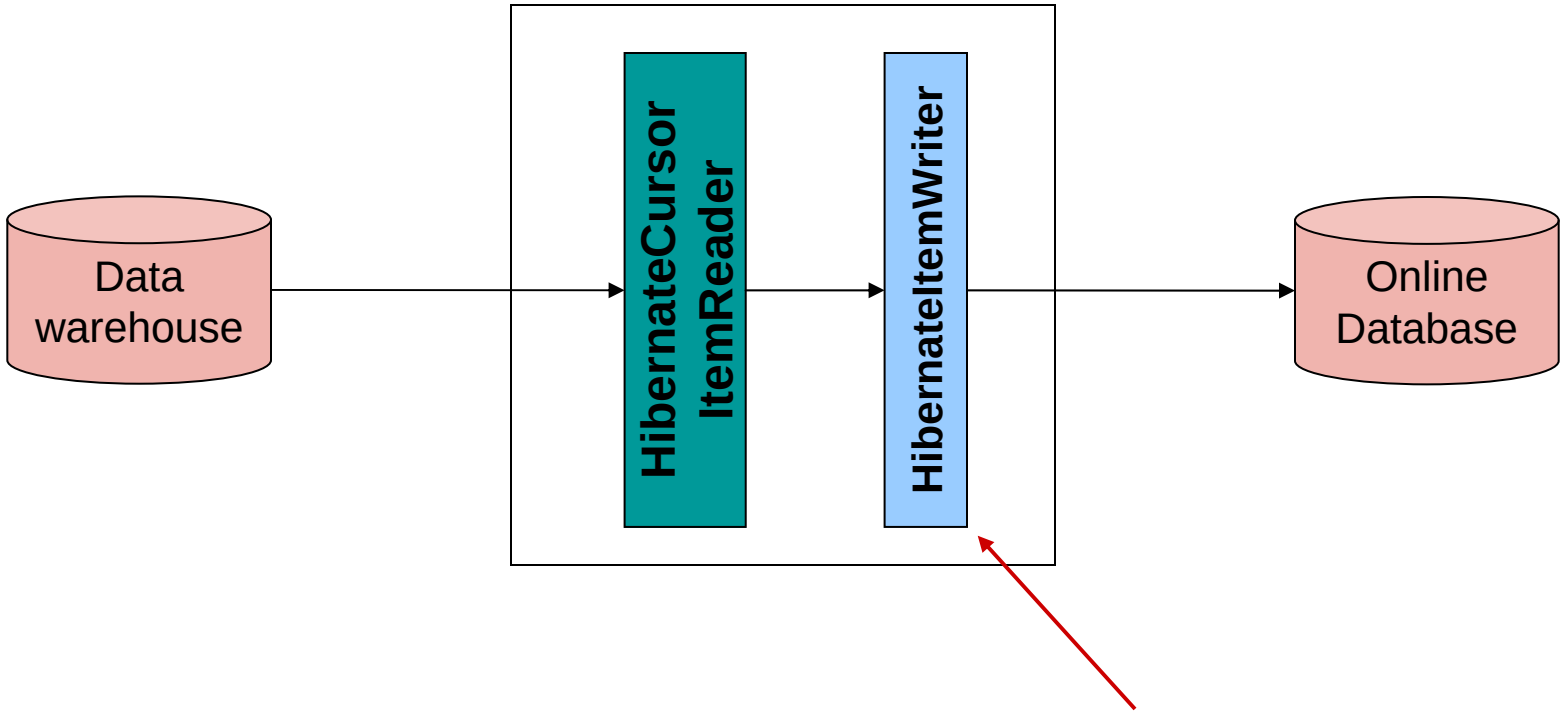
Typical Job: Updates for Online Database



Re-using business logic implementation from online system

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Hibernate Input

- Cursor Driven
- Stateless or standard Session.

```
<bean id="hibernateInputSource“
    class="....item.database.HibernateCursorInputSource"
    >
    <property name="queryString" value="from
    CustomerCredit" />
    <property name="sessionFactory"
    ref="sessionFactory" />
</bean>
```

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Hibernate Output

- Allows for Online DAOs to be reused by item processor
  - Flush per item
  - Inefficient
  - Allows for easy identification of failed items.
- Flush per chunk
  - Greatest efficiency
  - Failed records cannot be determined (requires search, e.g. binary)

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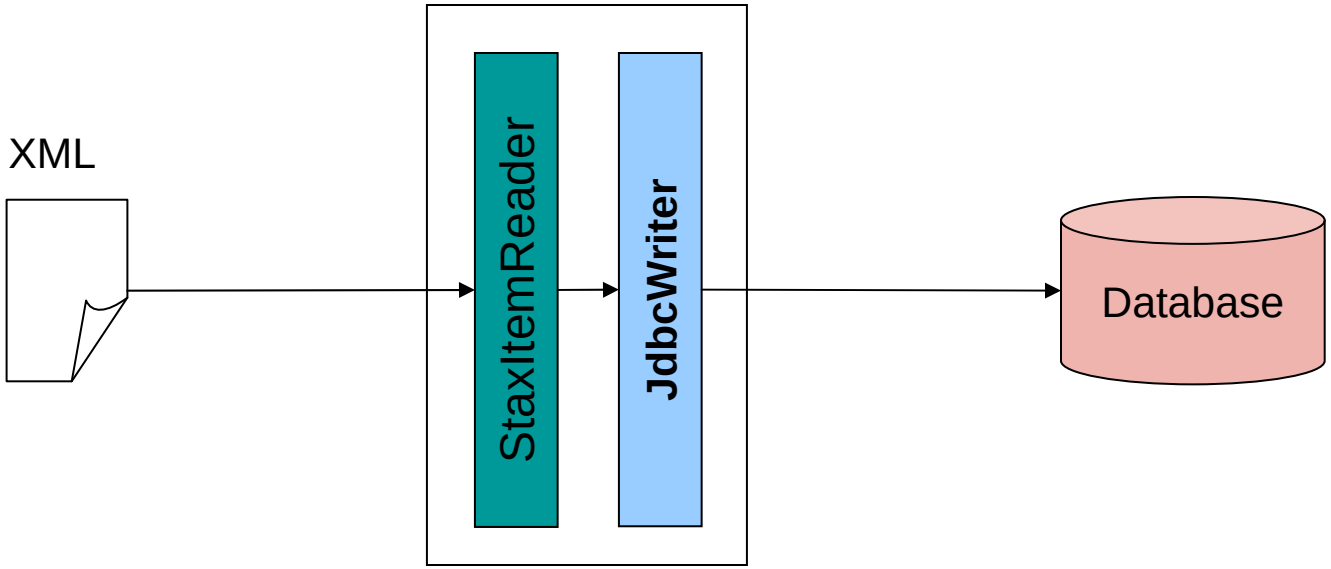
Integration Layer: Support Job



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XML I/O

- Built on StAX
  - Root element representing an ‘Item’ must be defined.
  - Each root element is read in via a StAX parser, then deserialized to an Item
- Uses Spring-OXM to bind event fragments to ‘Items’

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XML I/O

```
<bean class="...item.file.support.StaxEventReaderInputSource">
   <property name="fragmentRootElementName" value="trade" />
   <property name="fragmentDeserializer">
    <bean ...>
        <constructor-arg>
            <bean
   class="org.sfw.oxm.xstream.XStreamMarshaller">
                <property name="aliases" ref="aliases" />
            </bean>
        </constructor-arg>
    </bean>
   </property>
</bean>
```

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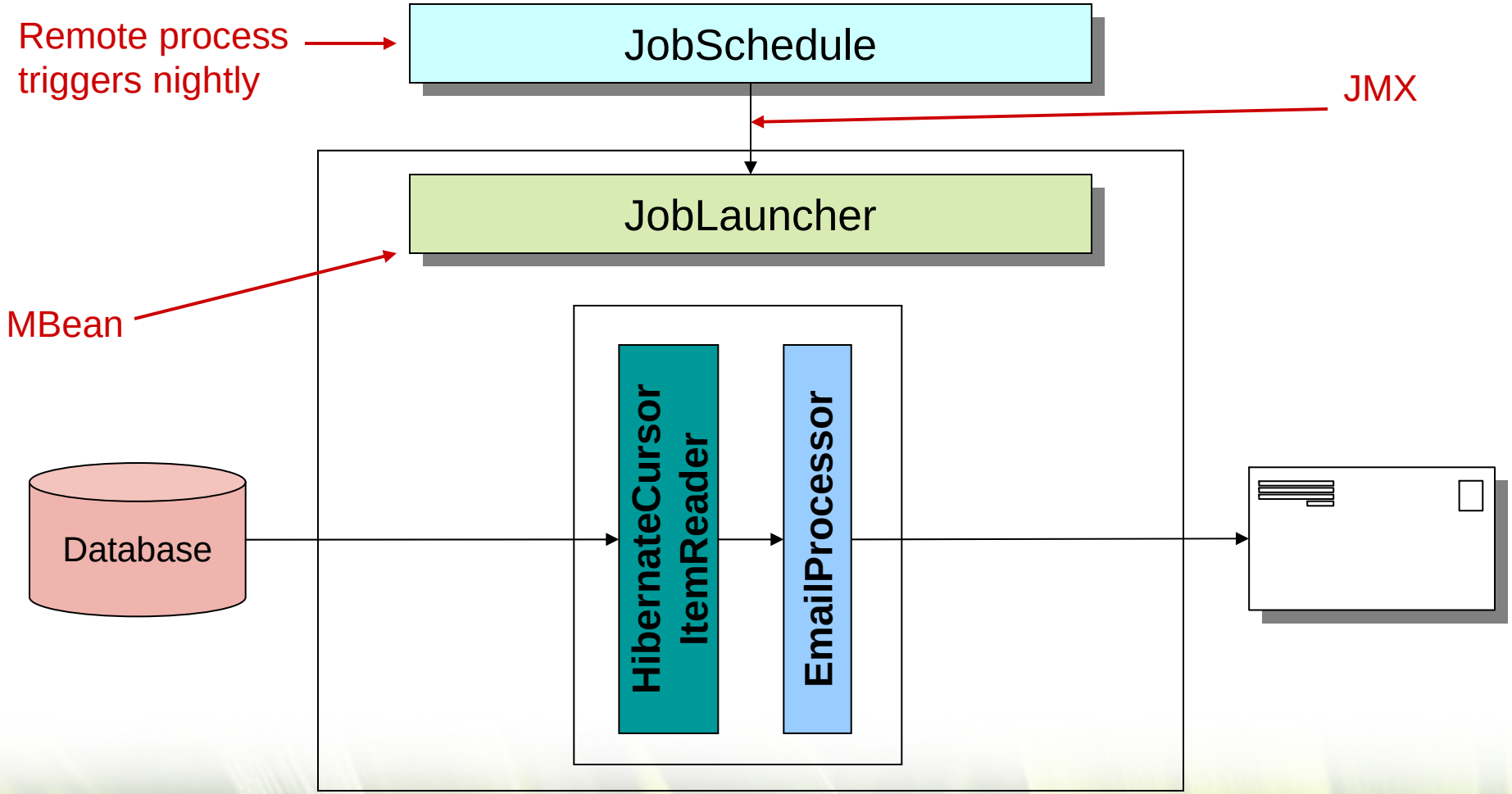
Notification E-Mails



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State Government

- Background: In-Progress IT Renewal project replacing mainframe batch jobs with Java in order to process unemployment claims.
- Solution:
  - Custom Item Readers for processing CopyBook and EBCDIC input
  - Custom LineTokenizer for specific Government flat file formats.
  - DrivingQuery ItemReader provided a better approach for using DB2 with online DAOs.
- Benefits
  - Batch job development is only piece ahead of schedule.

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Driving Query

- Requires an initial ‘driving’ SQL statement that will return a list of all the unique keys to be processed.
- Each call to read() returns one key
- Allows for reuse of other DAOs to return ‘details’.
- Smaller database footprint (than cursor) allowing for better concurrency with online systems, especially in database systems with pessimistic locking strategies.
- All DAOs using provided keys in a batch scenario should use PreparedStatements, to allow for caching that greatly improves performance.

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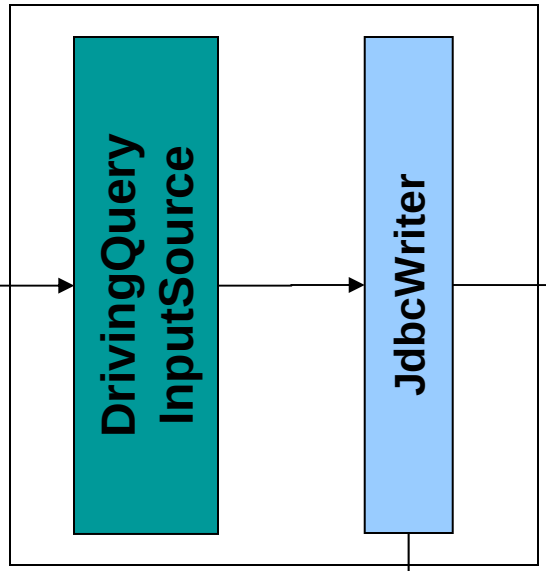
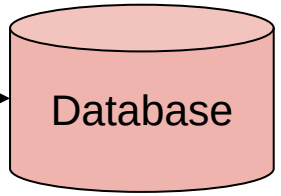
Driving Query





Keys obtained at step initialization

Existing DAO

Query for details using key as parameter

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Driving Query

```
<bean id="drivingQuery"
    class="...item.database.DrivingQueryInputSource"
    <property name="keyGenerator" ref="keyGenerator" />
</bean>
<bean id="keyGenerator"
    class="...item.database.support.SingleColumnJdbcKey
    Generator">
    <constructor-arg ref="jdbcTemplate" />
    <constructor-arg ref="select ID from TRADES" />
</bean>
```

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Restartability and Parallel Processing

- Challenge for restartability:
  - Chunks can be processed in any order
  - Chunk 1 can fail after Chunk 100 has completed
- Single VM, multi-threaded (Spring Batch 1.0)
- Batch Pattern: **Process Indicator**
  - Add column to input records
  - Mark “finished” on chunk boundary
  - Restart: initialise to only process unfinished records

SELECT * FROM T_INPUT WHERE PROCESSED=‘N’

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Leading Investment Bank

- Background: Large networks of message-driven pipelines processing orders, payments and other transactions.
- Solution:
  - Use RepeatTemplate to batch messages together transparently.
  - Use RetryTemplate to retry either
    - Whole transaction (batch)
    - Or an external webservice call
- Benefits:
  - Greatly increased throughput in high volume process.
  - Reduce burden on developers to understand optimisations.

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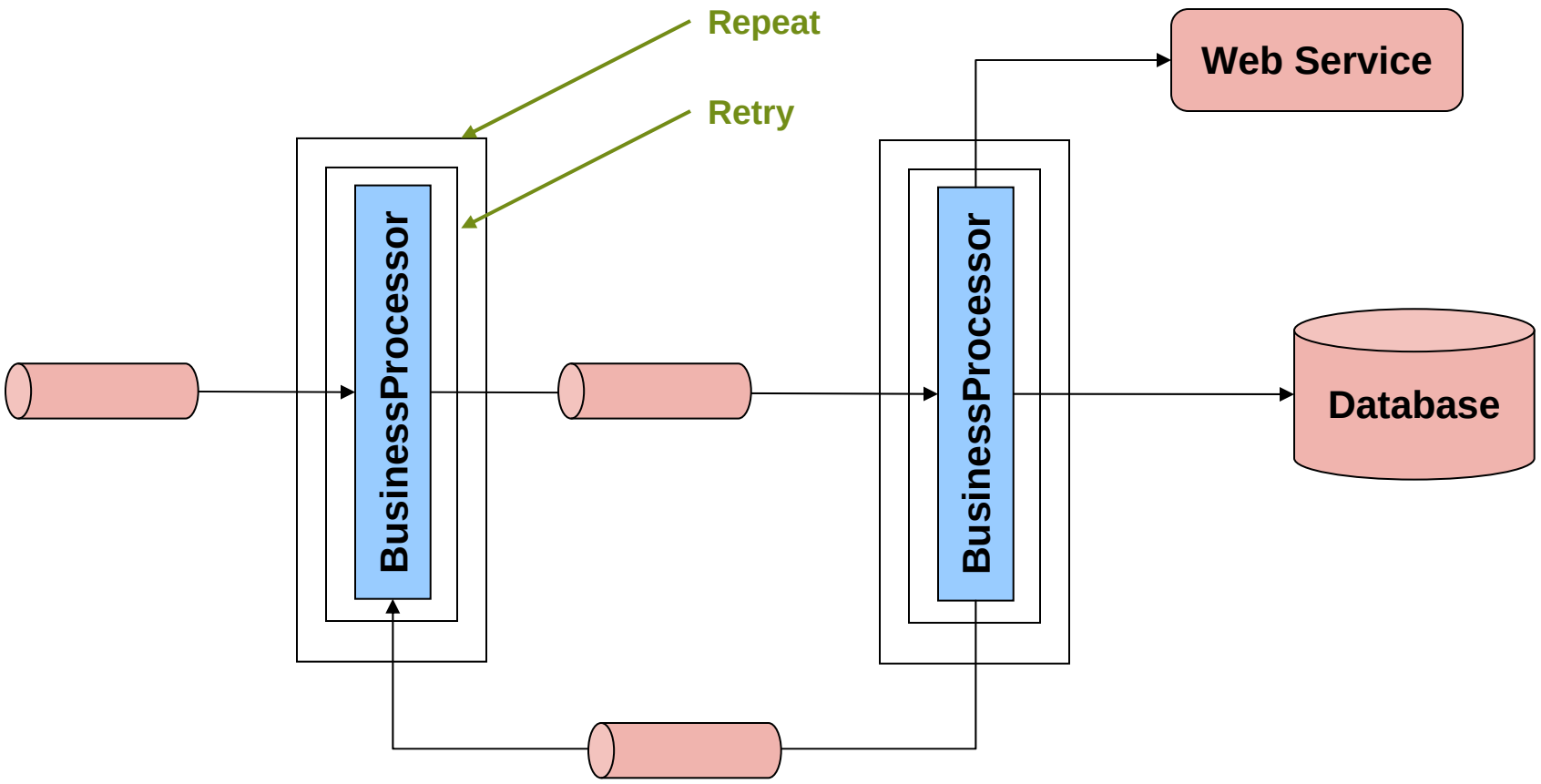
Message-driven Pipeline Optimisation



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Spring Batch—Road Map

- Release 1.0.1.FINAL released May 2008; themes:
  - Infrastructure support for
    - Flat files, XML, Database (JDBC + Hibernate)
    - Repeat, retry
  - Single-JVM, multi-threaded
- In use at roughly 40+ projects with at least 3 in production
- 1.1 July 2008; themes: shared state between Steps
- 2.0 target 2008Q4; themes:
    - Java 5
    - Scalability
    - Non-linear item processing
    - Dependencies between jobs or steps

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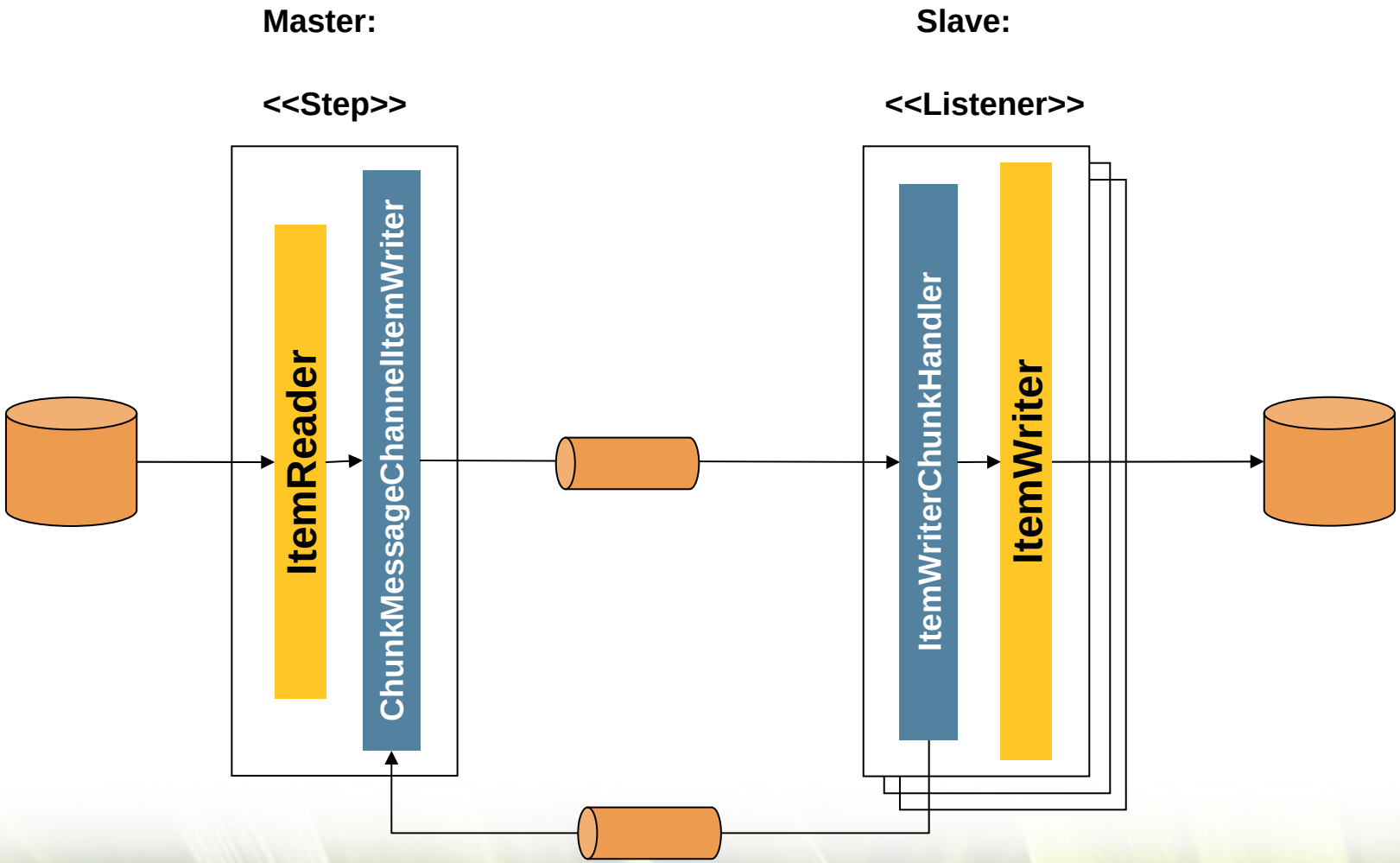
Scaling a Step



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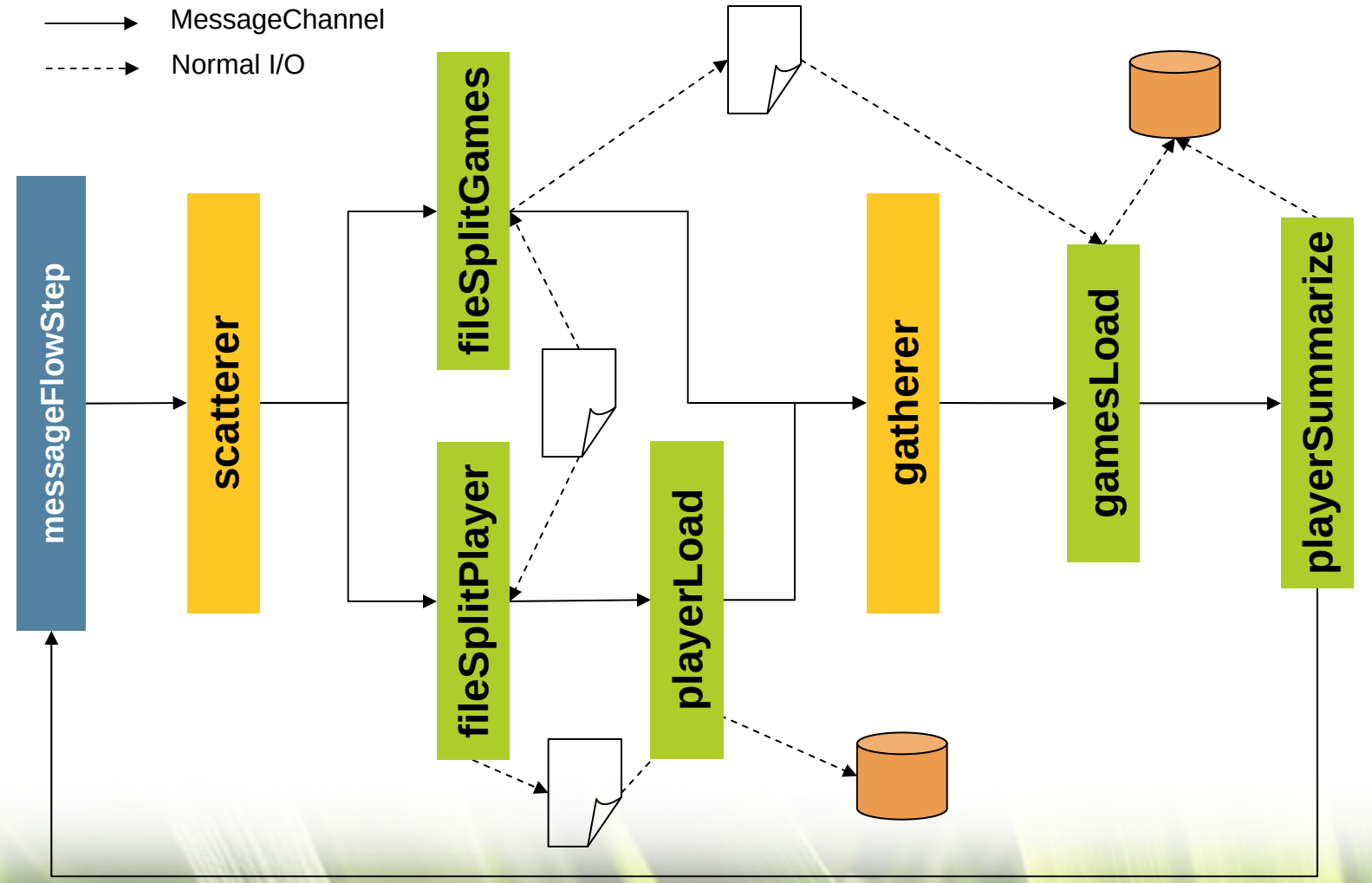
Non-linear Job



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Accenture and SpringSource Partnership

- Why is Accenture contributing to open source?
  - Consolidating decades worth of experience in building high-performance batch solutions
  - Driving standardization in batch processing
- Why Spring?
  - Established, active, and leading community with significant momentum
  - Logical home for a batch architecture framework as part of the Spring Portfolio
- End Goal
  - Provide a highly scalable, easy-to-use, customizable, industry-accepted Batch architecture framework

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Summary

- Lack of a standard enterprise batch architecture is resulting in higher costs associated with the quality and delivery of solutions.
- Spring Batch provides a highly scalable, easy-to-use, customizable, industry-accepted batch framework collaboratively developed by Accenture and SpringSource
- Spring patterns and practices have been leveraged allowing developers to focus on business logic, while enterprise architects can customize and extend architecture concerns

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Q&A

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