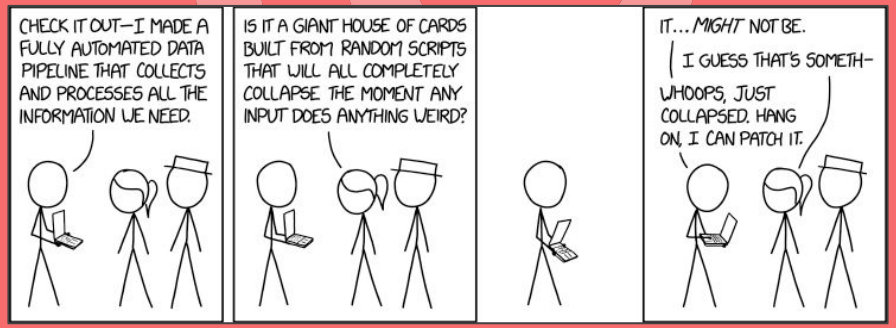
WILD CODE SCHOOL

Batch Processing in Modern Java

Data bulk processing with Spring Batch



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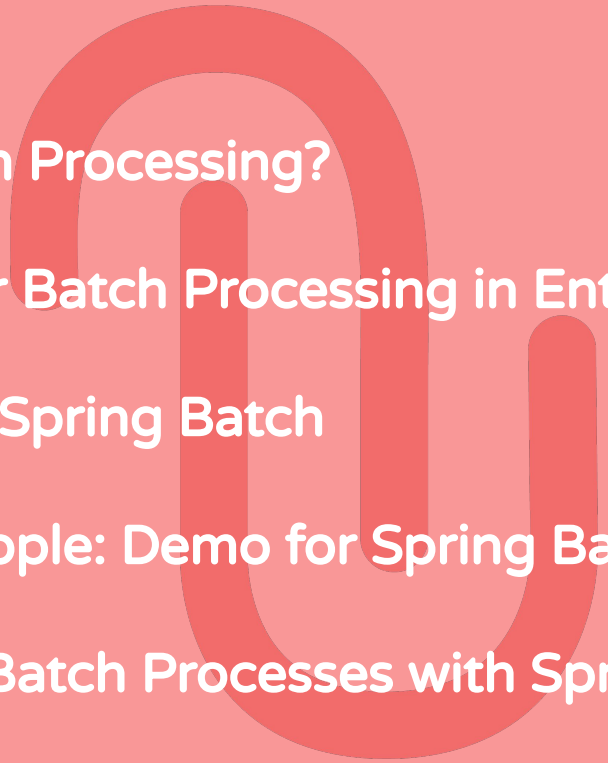


- What is Batch Processing?
- Use Cases for Batch Processing in Enterprises
- JSR 352 and Spring Batch
- Enriching People: Demo for Spring Batch
- Maintaining Batch Processes with Spring Data Flow

What is Batch Processing?

“Bulk processing to perform business operations in mission critical environments”

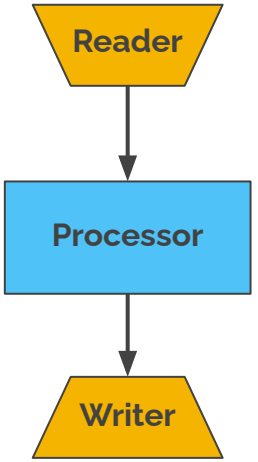
- **Automated, complex processing** of **large volumes** of information that is most efficiently processed **without user interaction**.
- **Periodic application** of complex **business rules processed repetitively** across very large data sets.
- **Integration of information** that is received from internal and external systems that typically requires formatting, validation, and processing in a **transactional manner into the system of record**.

https://docs.spring.io/spring-batch/docs/current/reference/html/spring-batch-intro.html#spring-batch-intro

Usage Scenarios of Batch Processing

A typical batch application generally:

- **Reads** a large number of records from a database, file, or queue.
- **Processes** the data in some fashion.
- **Writes** back data in a modified form.



https://docs.spring.io/spring-batch/docs/current/reference/html/spring-batch-intro.html#spring-batch-intro

What are Quality (non-functional) Requirements of Batch Processing?

“Batch processing is used to process billions of transactions every day for enterprises.”

- **Commit** batch process **periodically**
- **Concurrent** batch **processing**: parallel processing of a job
- **Staged**, enterprise message-driven processing
- **Massively parallel** batch processing
- Manual or scheduled **restart** after failure
- **Sequential processing** of **dependent** steps (with extensions to workflow-driven batches)
- **Partial processing**: skip records (for example, on rollback)

https://docs.spring.io/spring-batch/docs/current/reference/html/spring-batch-intro.html#spring-batch-intro

Batch Processing Options

- Normal processing during a **batch window** in **off-line mode**.
- **Concurrent** batch or **on-line** processing.
- **Parallel processing** of many different batch runs or jobs **at the same time**.
- Partitioning (processing of many instances of the **same job at the same time**).
- A combination of the preceding options.

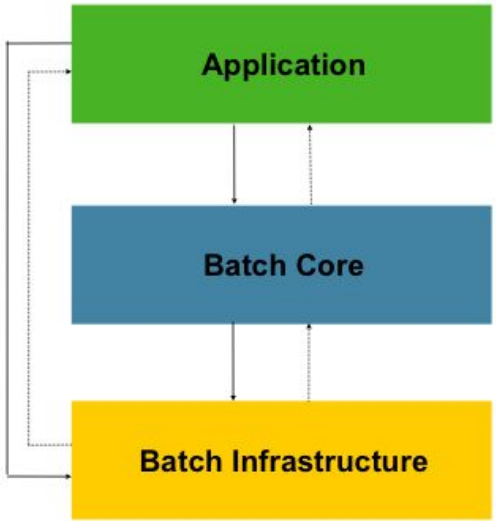
https://docs.spring.io/spring-batch/docs/current/reference/html/spring-batch-intro.html#spring-batch-intro

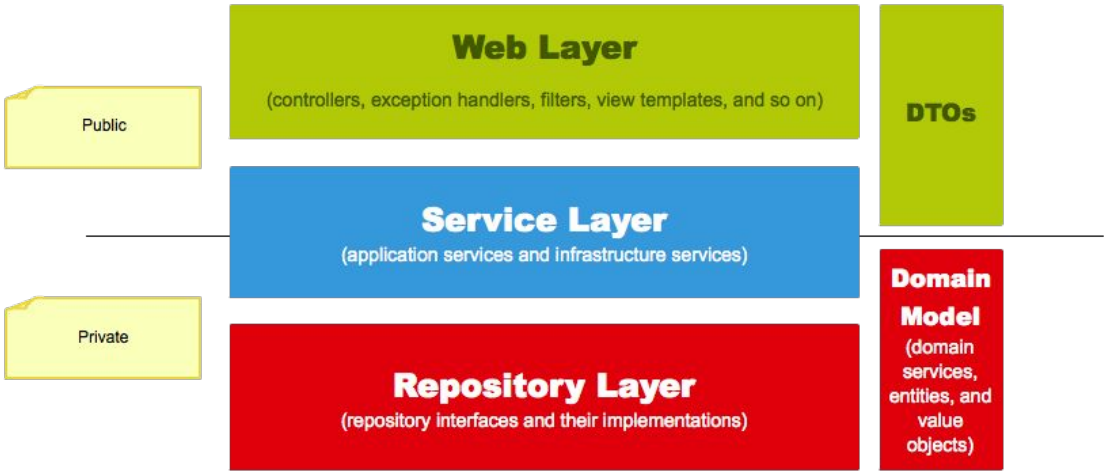
Spring Batch Functionality

- Batch developers use the Spring programming model:
  Concentrate on business logic and let the framework take care of infrastructure.
- Clear **separation of concerns** between the infrastructure, the batch execution environment, and the batch application.
- Provide **common, core execution services as interfaces** that all projects can implement.
- Provide **simple and default implementations** of the core execution interfaces that can be used 'out of the box'.
- Easy to configure, customize, and extend services, by **leveraging the spring framework** in all layers.
- All existing core services should be **easy to replace or extend**, without any impact to the infrastructure layer.
- Provide a **simple deployment model**, with the architecture JARs completely separate from the application, built using Maven or Gradle.

Spring Batch Architecture

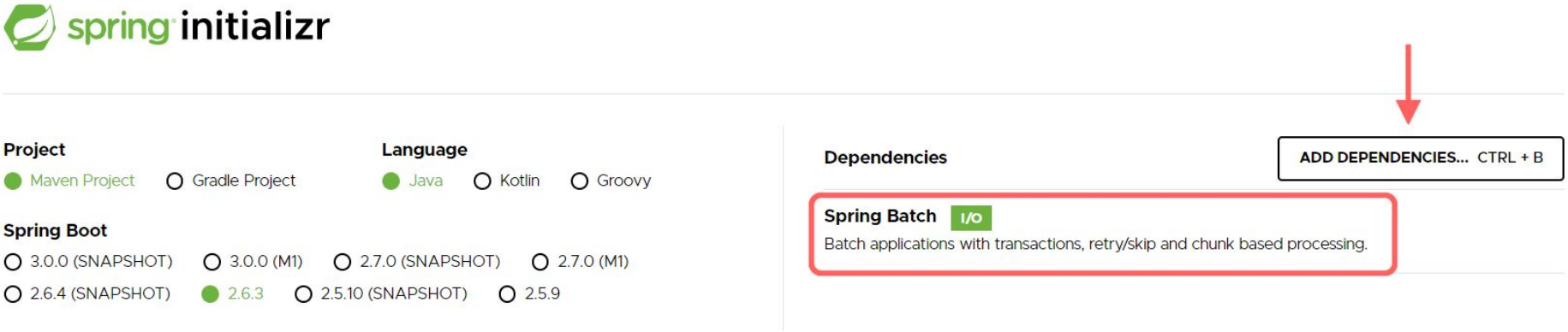
Spring Batch Component Model is layered, similar to Web Applications, to facilitate **Seperation of Concerns** and **Reusability**.





The **Batch Core** contains the core runtime classes necessary to launch and control a batch job.
It includes implementations for `JobLauncher`, `Job`, and `Step`. Both **Application** and **Core** are built on top of a common **infrastructure**. This **infrastructure** contains common readers and writers and services (such as the `RetryTemplate`), which are used both by application developers (readers and writers, such as `ItemReader` and `ItemWriter`) and the core framework itself (`Retry`, which is its own library).

Start with Spring Initializr



Try out Spring Batch Guide

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Creating a Batch Service

This guide walks you through the process of creating a basic batch-driven solution.

What You Will build

You will build a service that imports data from a CSV spreadsheet, transforms it with custom code, and stores the final results in a database.

Get the Code

Go To Repo

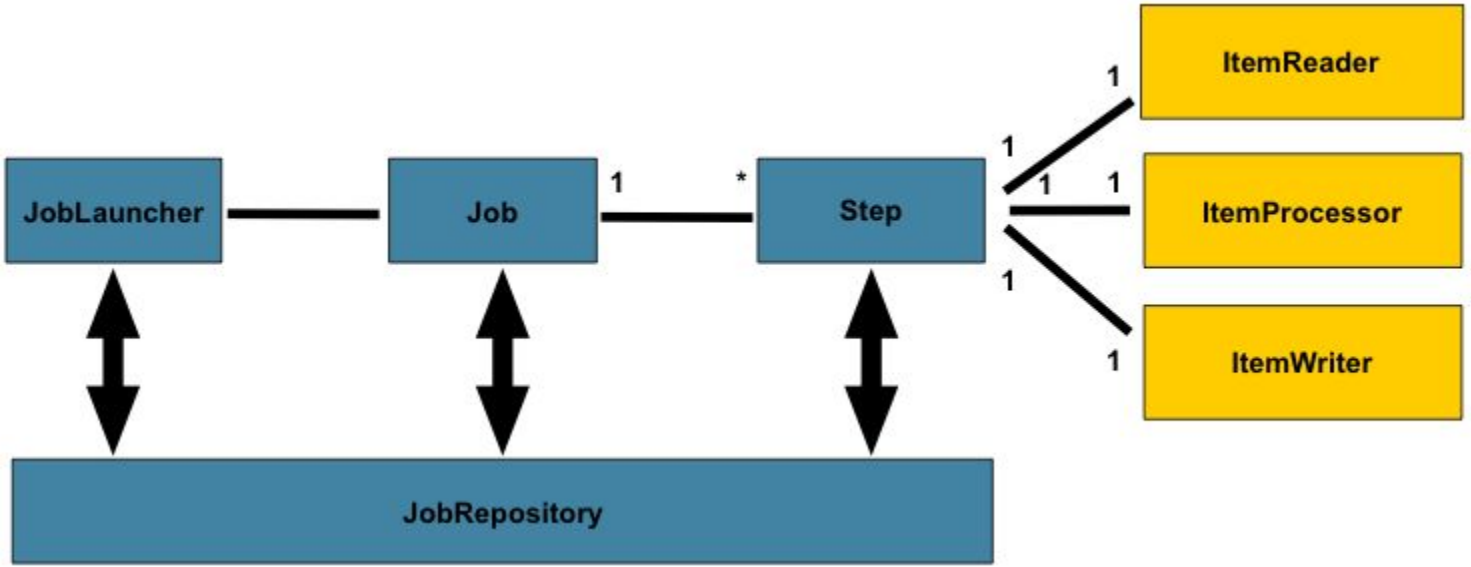
Projects

Spring Batch

Domain Language of Batch

- Significant improvement in adherence to a **clear separation of concerns**.
- Clearly delineated architectural layers and **services provided as interfaces**.
- **Simple and default implementations** that allow for quick adoption and ease of use out-of-the-box.
- Significantly **enhanced extensibility**.

Domain Language for Batch Processing



A **Job** has one to many **steps**, each of which has exactly one ItemReader, one ItemProcessor, and one ItemWriter. A job needs to be launched (with JobLauncher), and metadata about the currently running process needs to be stored (in JobRepository).

https://docs.spring.io/spring-batch/docs/current/reference/html/spring-batch-intro.html#spring-batch-intro

“Jobs” and “Steps”

In Spring Batch, a Job is simply a container for Step instances.

It combines **multiple steps** that belong logically together in a flow and allows for configuration of properties global to all steps, such as restartability. The job configuration contains:

- The simple name of the job.
- Definition and ordering of Step instances.
- Whether or not the job is restartable.

```
@Bean
public Job footballJob() {
    return this.jobBuilderFactory.get("footballJob")
                     .start(playerLoad())
                     .next(gameLoad())
                     .next(playerSummarization())
                     .build();
}
```

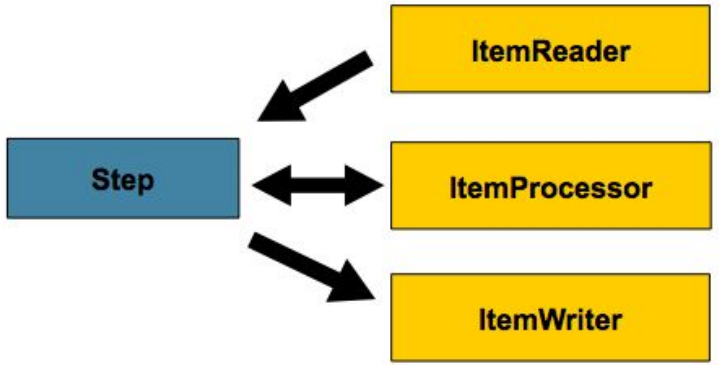
https://docs.spring.io/spring-batch/docs/current/reference/html/spring-batch-intro.html#spring-batch-intro

“Jobs” and “Steps”

In Spring Batch, a Step is a domain object that encapsulates an **independent, sequential phase** of a batch job and contains all of the information necessary **to define and control the actual batch processing**.

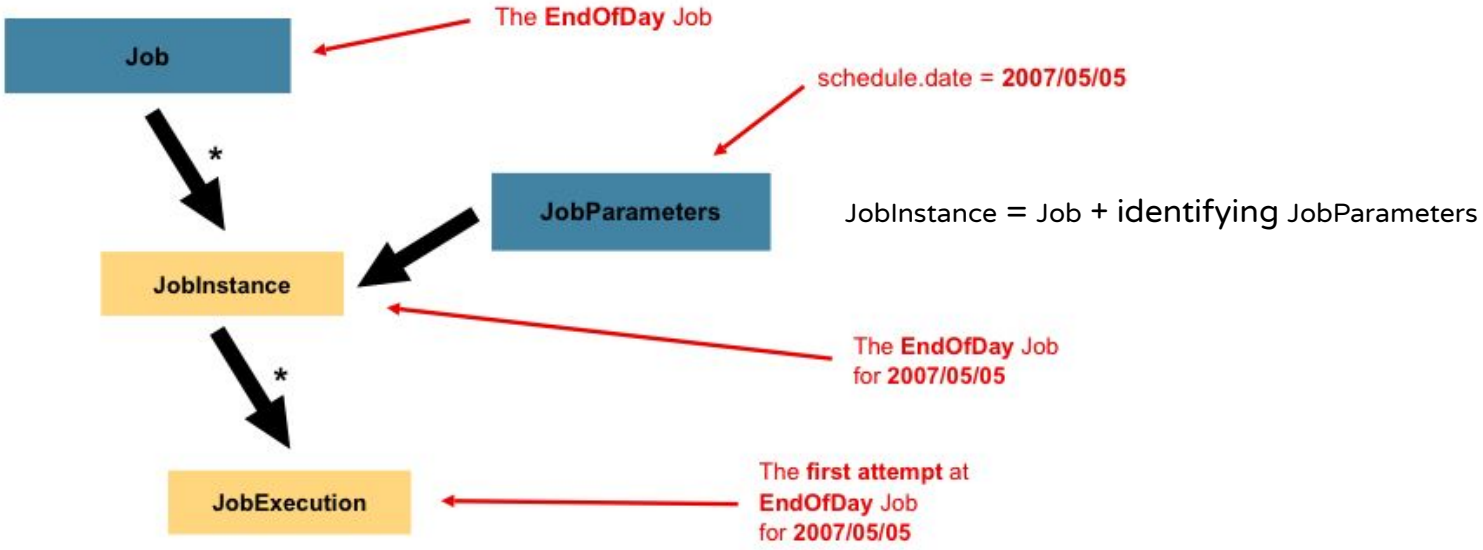
```
@Bean
public Step step1() {
    return
        this.stepBuilderFactory.get("step1")
            .<String, String>chunk(10)
            .reader(itemReader())
            .writer(itemWriter())
            .allowStartIfComplete(true)
            .build();
}
```

A simple Step might load data from a file into the database, requiring **little or no code** (depending upon the implementations used). A more complex Step might have **complicated business rules** that are applied as part of the processing.



https://docs.spring.io/spring-batch/docs/current/reference/html/spring-batch-intro.html#spring-batch-intro

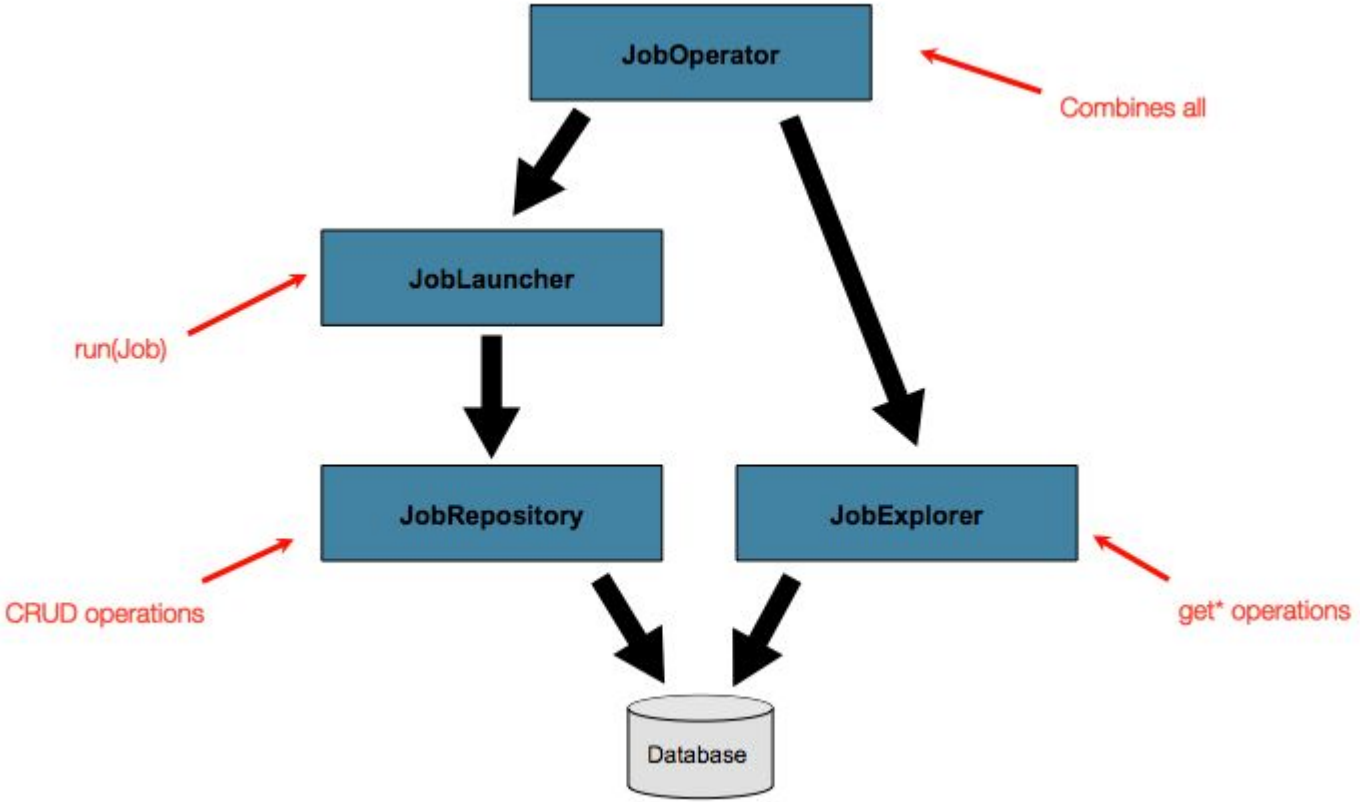
“Jobs”, “JobInstances” and “JobExecutions”



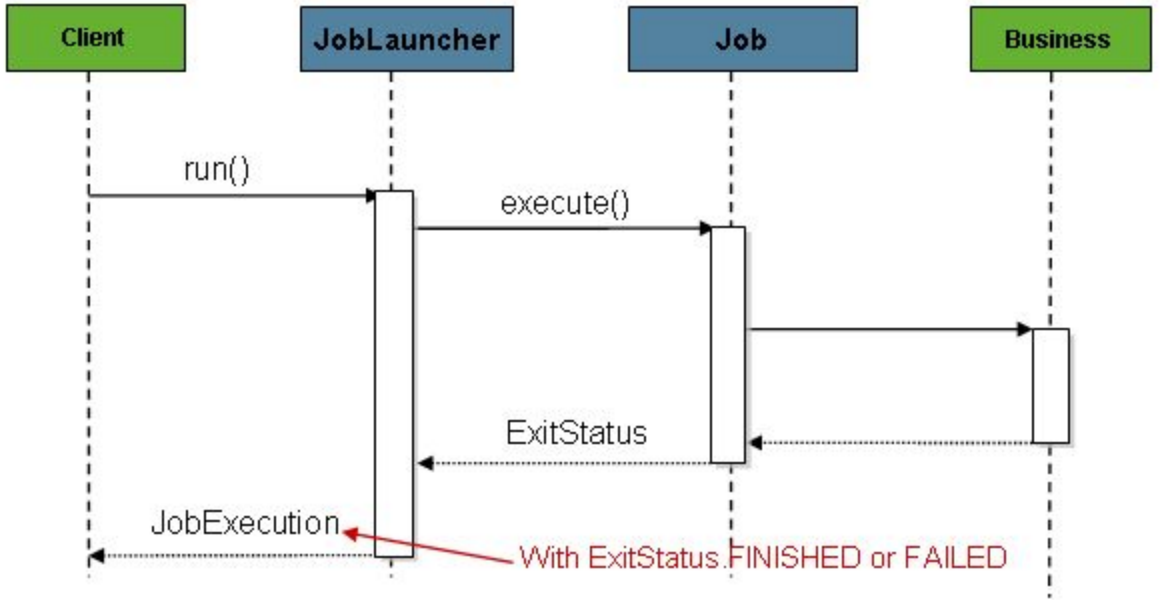
A JobExecution refers to the technical concept of a single attempt to run a Job

https://docs.spring.io/spring-batch/docs/current/reference/html/spring-batch-intro.html#spring-batch-intro

Batch Job Maintenance and Persistence



Batch Processing Flow from Client Perspective



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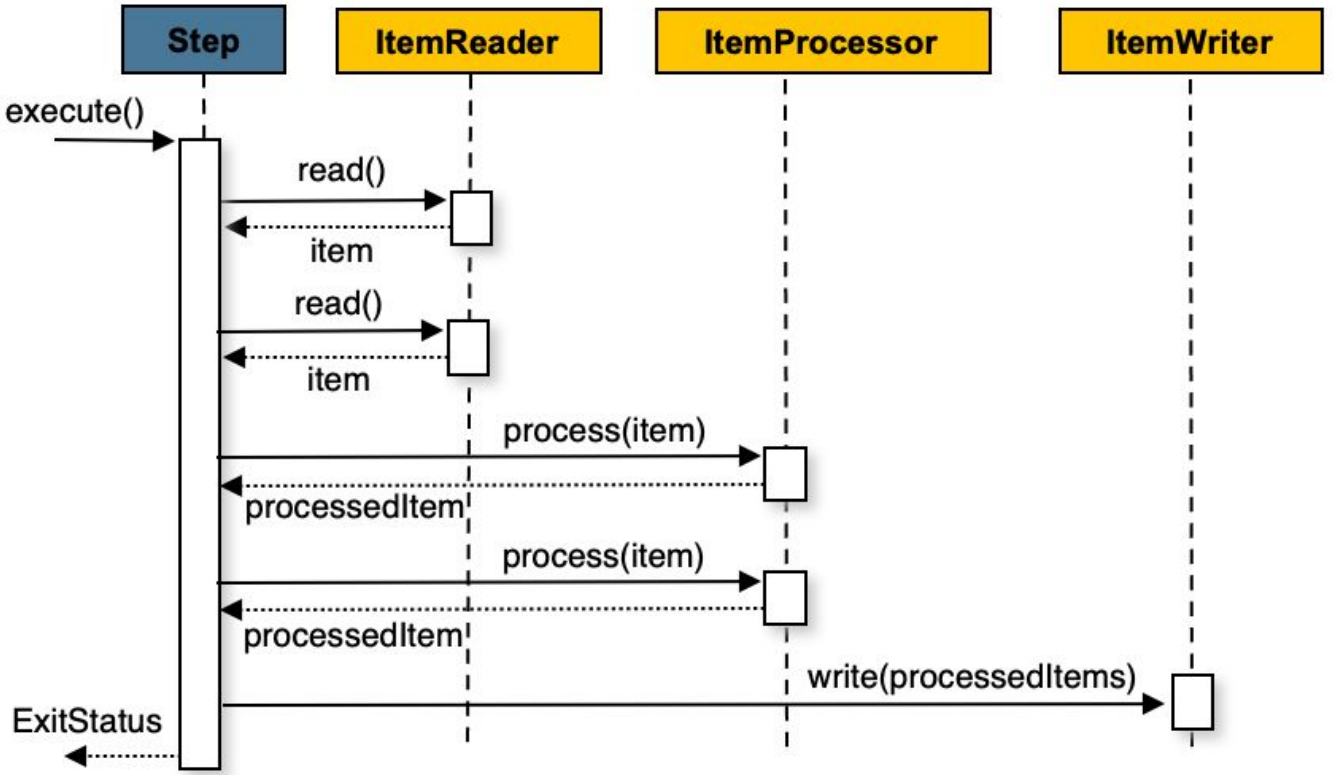
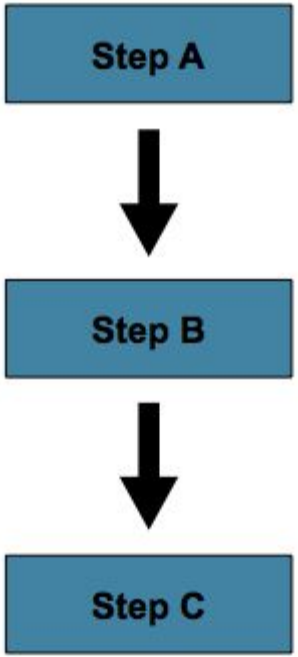
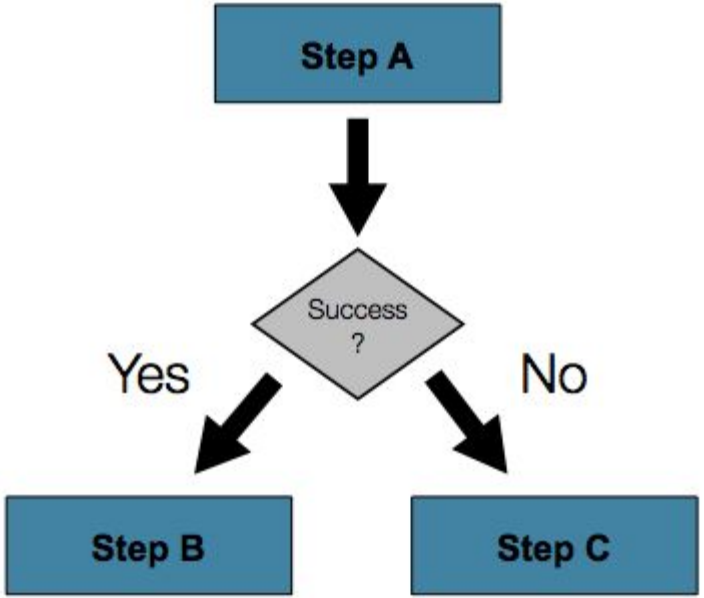
https://docs.spring.io/spring-batch/docs/current/reference/html/spring-batch-intro.html#spring-batch-intro

Batch Processing Internal Flow



Sequential vs Conditional Flows

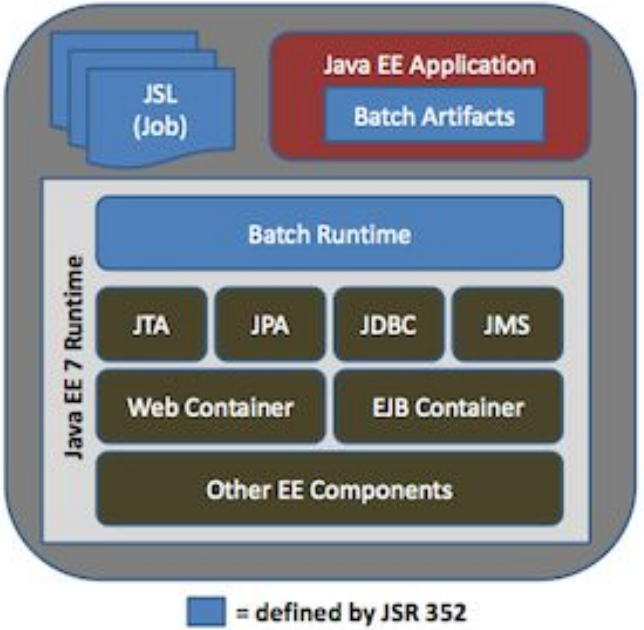




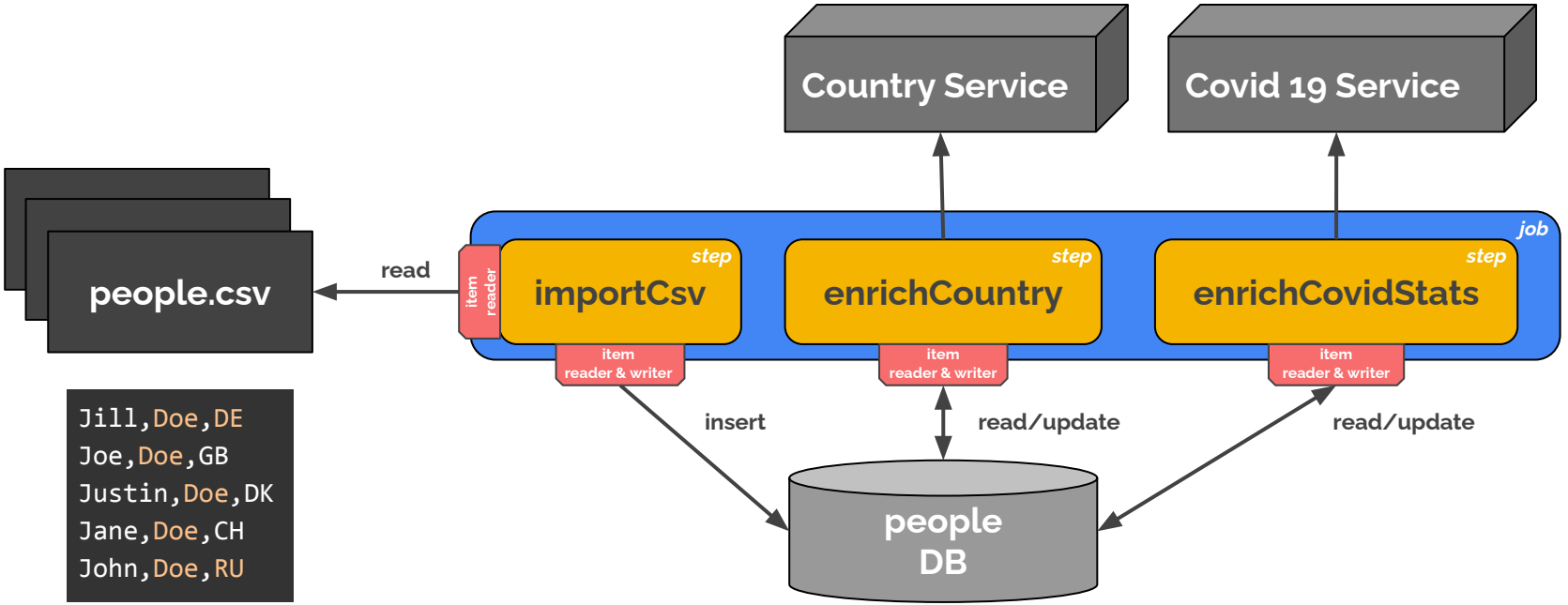
What is JSR 352?

JSR 352 defines a **Job Specification Language (JSL)** to define batch jobs, **a set of interfaces** that describes the artifacts that comprise the batch programming model to implement batch business logic, and a **batch runtime** for running batch jobs, according to a defined life cycle.

- As of Spring Batch 3.0 support for JSR-352 has been fully implemented
- Spring Batch and JSR-352 are structurally the same
- Final Standard JSR 352 was included in JEE 7



Demo: People Enrichment Batch Job




```
Jill,Doe,DE
Joe,Doe,GB
Justin,Doe,DK
Jane,Doe,CH
John,Doe,RU
```

FIRST_NAME	LAST_NAME	COUNTRY	CAPITAL	POPULATION	ACTIVE_COVID_CASES
JILL	DOE	DE	["Berlin"]	83240525	10025463
JOE	DOE	GB	["London"]	67215293	163
JUSTIN	DOE	DK	["Copenhagen"]	5831404	1742569
JANE	DOE	CH	["Bern"]	8654622	2220539
JOHN	DOE	RU	["Moscow"]	144104080	11670366

Links and other information

Spring Batch

- **Spring Initializr with Spring Batch**: https://start.spring.io/#!type=maven-project&language=java&platformVersion=2.6.3&packaging=jar&jvmVersion=11&groupId=dev.wcs.tutoring&artifactId=batch-demo&name=batch-demo&description=Demo%20project%20for%20Spring%20Batch&packageName=dev.wcs.tutoring&dependencies=batch,batch
- **Design Principles for Batch Jobs**: https://docs.spring.io/spring-batch/docs/current/reference/html/spring-batch-intro.html#batchArchitectureConsiderations

JSR 352

- **Jaxenter on JSR 352**: https://jaxenter.com/java-ee-7-introduction-to-batch-jsr-352-106192.html

Links and other information

Spring Cloud Data Flow

- **Spring Cloud Data Flow**: https://dataflow.spring.io/
- **Cloud Task vs. Spring Batch**: https://stackoverflow.com/questions/61579987/difference-between-spring-cloud-task-and-spring-batch
- **Migrate from Spring Batch Admin**: https://github.com/spring-attic/spring-batch-admin/blob/master/MIGRATION.md

Frameworks and Services used in Demo

- **REST CountryInformation**: https://restcountries.com/#api-endpoints-v3-code
- **REST COVID 19**: https://documenter.getpostman.com/view/10808728/SzS8rjbc#4b88f773-be9b-484f-b521-bb58dda0315c
- **Online JSON Formatter**: https://jsonformatter.curiousconcept.com/#
- **Jayway JSONPath**: https://www.baeldung.com/guide-to-jayway-jsonpath
- **Unirest HTTP Client**: https://www.baeldung.com/unirest

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