CS 891: Scalable Microservices: Overview (Part 1)

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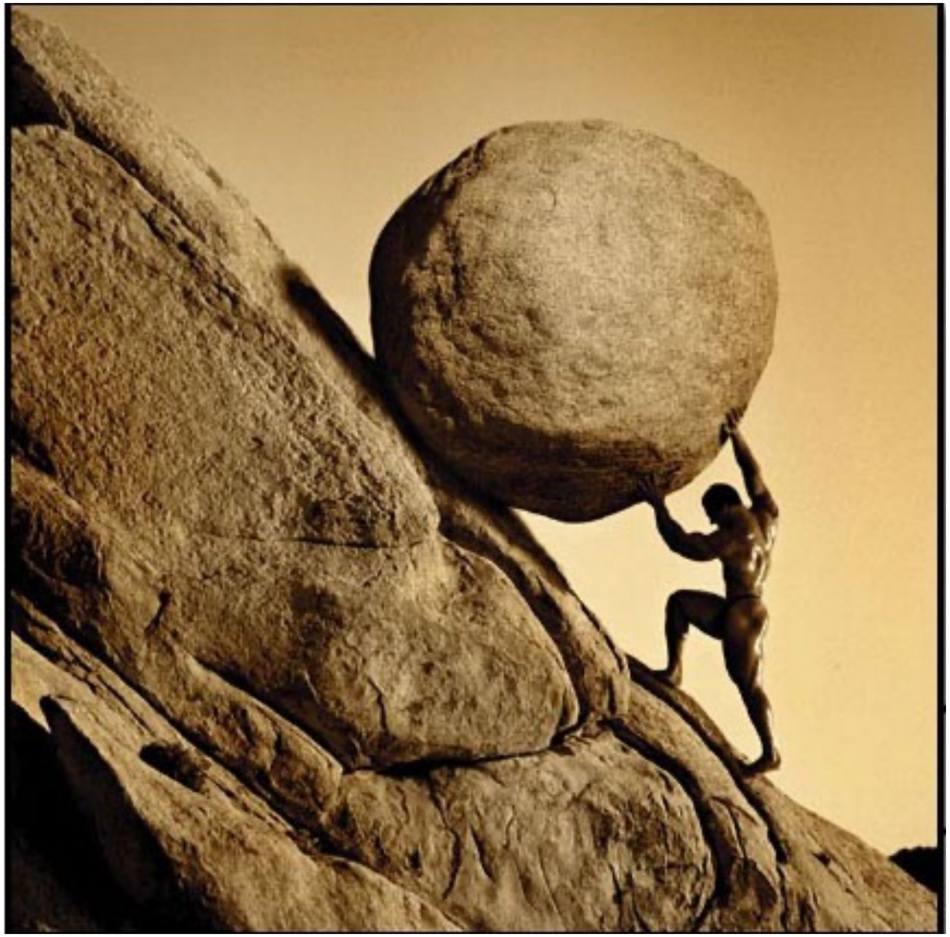
Learning Objectives in this Lesson

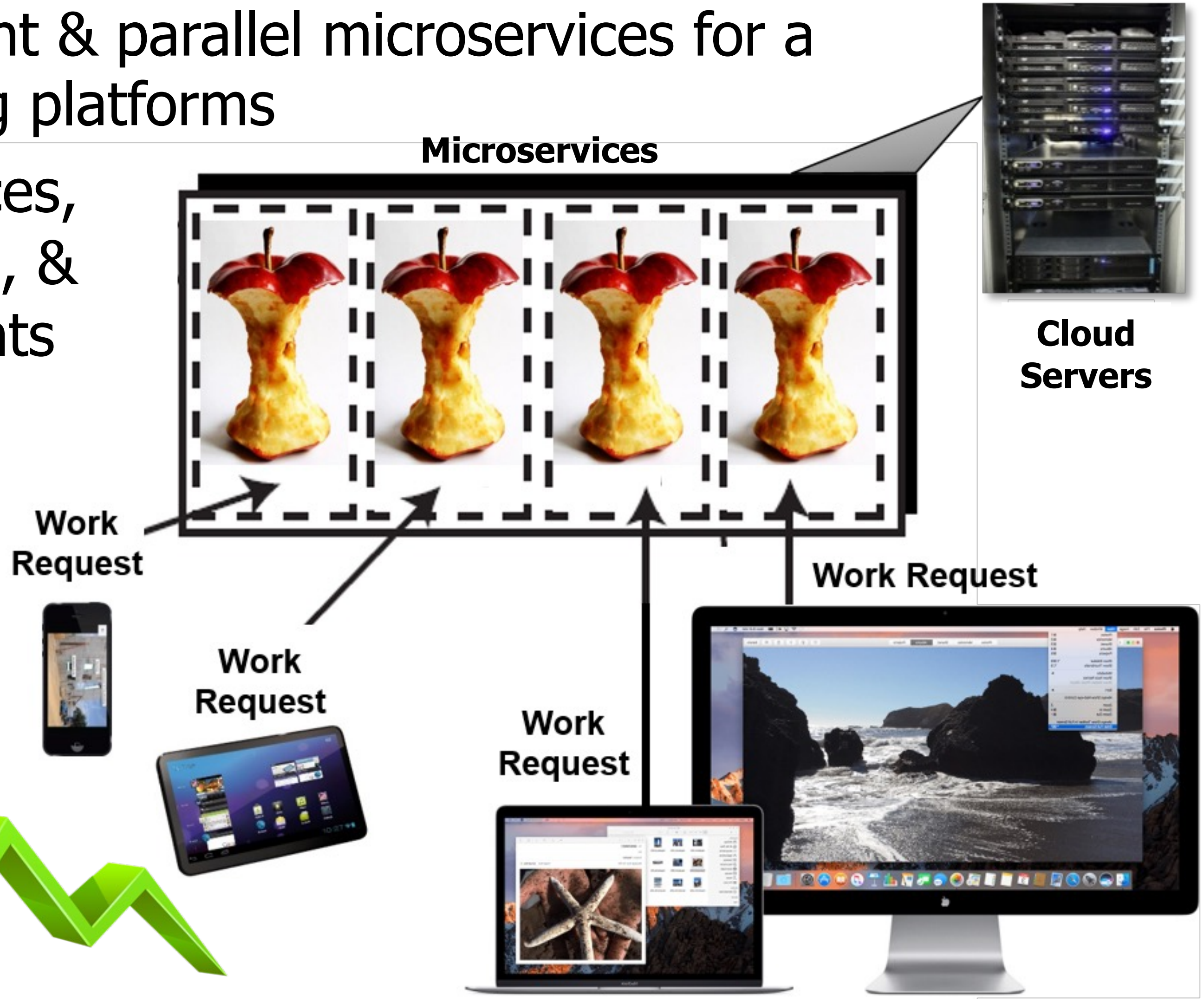
- Understand the course topics & logistics
  - Course philosophy
  - Course contents
  - Structure of the lecture material



Course Philosophy

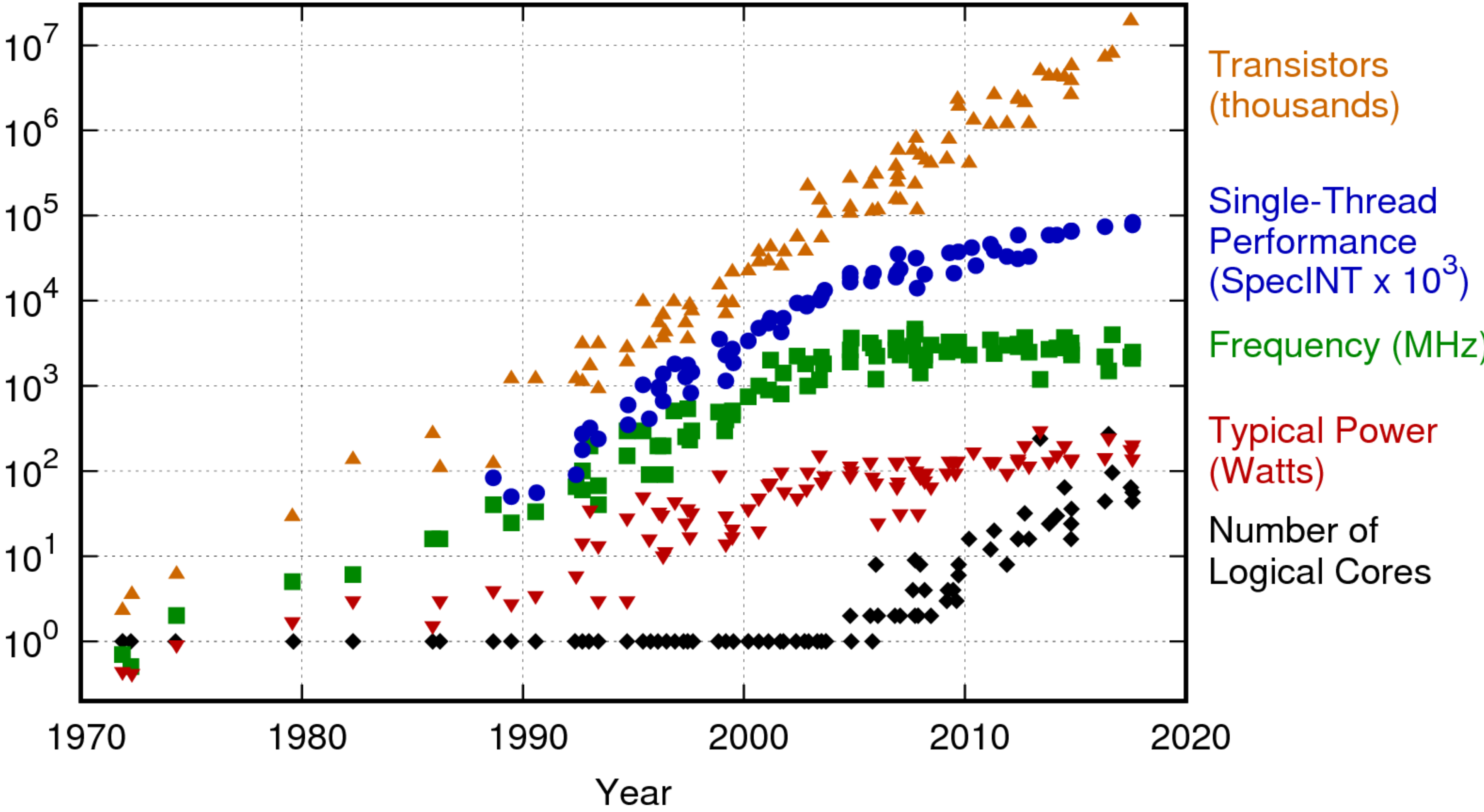
Course Philosophy

- There's a growing need for software developers who can write concurrent & parallel microservices for a range of computing platforms
  - e.g., mobile devices, laptops, desktops, & cloud environments



Course Philosophy

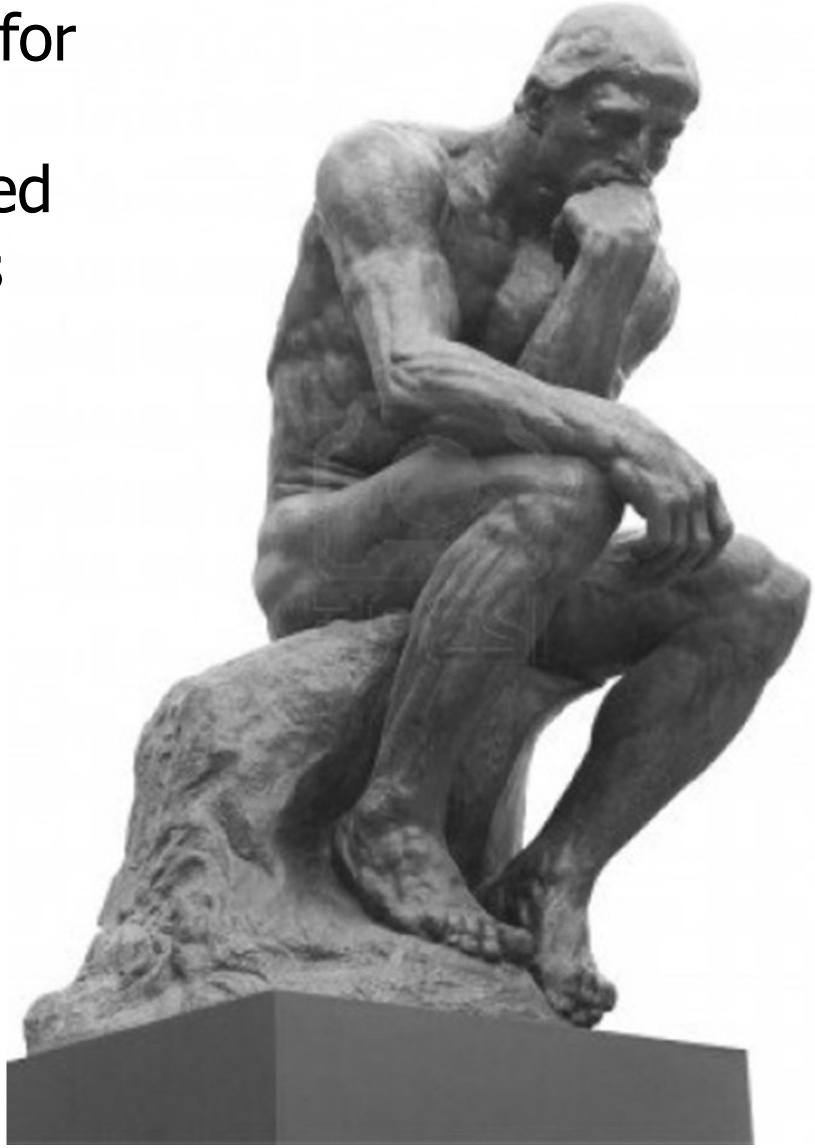
- Demand is driven by software/hardware infrastructure advances



See www.gotw.ca/publications/concurrency-ddj.htm

Course Philosophy

- Effective techniques & practices for developing concurrent & parallel microservices are *not* best learned through generalities & platitudes



"Sitting & thinking" is not sufficient…

Course Philosophy

- Instead, it's better to see *by example* how these programs can be made
  - *easier* to write & read,
  - *easier* to maintain & modify,
  - *more* efficient & resilient

  by applying time-proven software patterns & object-oriented, functional, & reactive design & programming techniques

This course involves lots of hands-on software development & testing!

Summary of the Course Contents

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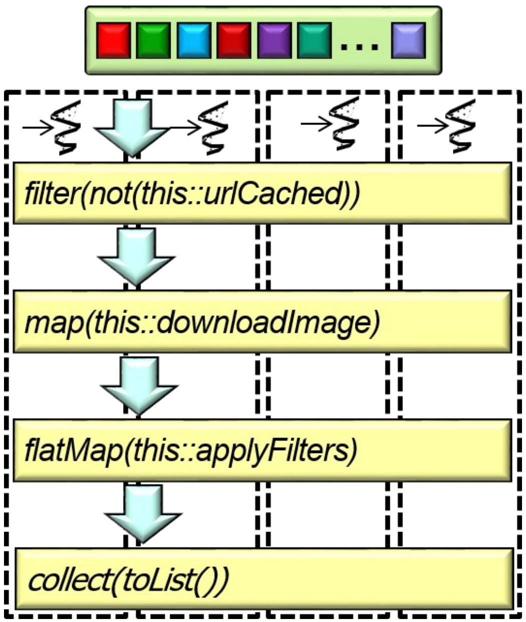
- Key Java frameworks

Streams



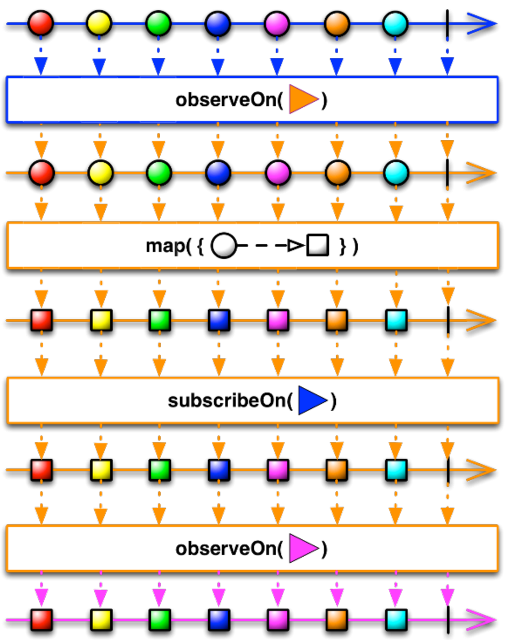
filter(not(this::urlCached))

map(this::downloadImage)

flatMap(this::applyFilters)

collect(toList())

Reactive Streams



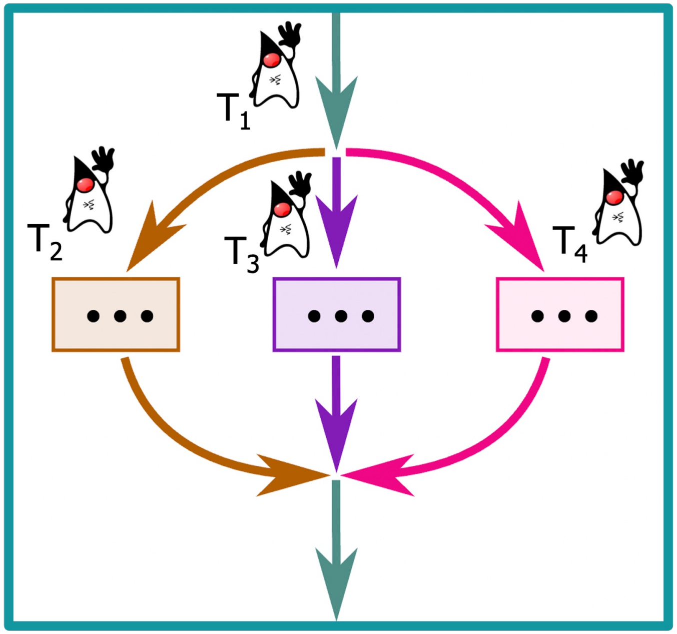
observeOn( )

map({ })

subscribeOn( )

observeOn( )

Structured Concurrency

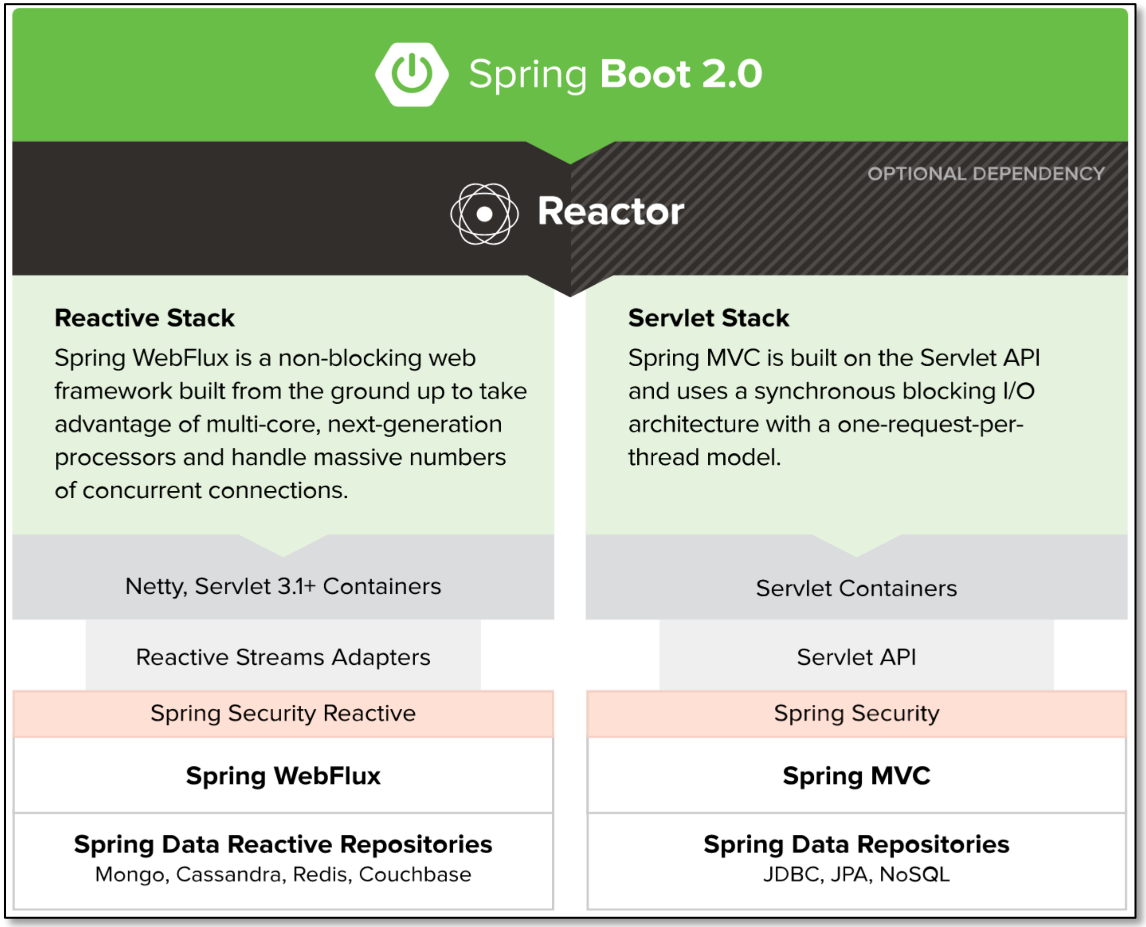


Assumes knowledge of Java object-oriented & functional language features

Summary of Course Contents

- Key Java parallelism frameworks
- Modern web programming platforms

Spring WebMVC & WebFlux



Spring **Boot 2.0**

Reactor

OPTIONAL DEPENDENCY

Reactive Stack

Spring WebFlux is a non-blocking web framework built from the ground up to take advantage of multi-core, next-generation processors and handle massive numbers of concurrent connections.

Netty, Servlet 3.1+ Containers

Reactive Streams Adapters

Spring Security Reactive

Spring WebFlux

Spring Data Reactive Repositories
Mongo, Cassandra, Redis, Couchbase

Servlet Stack

Spring MVC is built on the Servlet API and uses a synchronous blocking I/O architecture with a one-request-per-thread model.

Servlet Containers

Servlet API

Spring Security

Spring MVC

Spring Data Repositories
JDBC, JPA, NoSQL

See spring.io/projects/spring-boot

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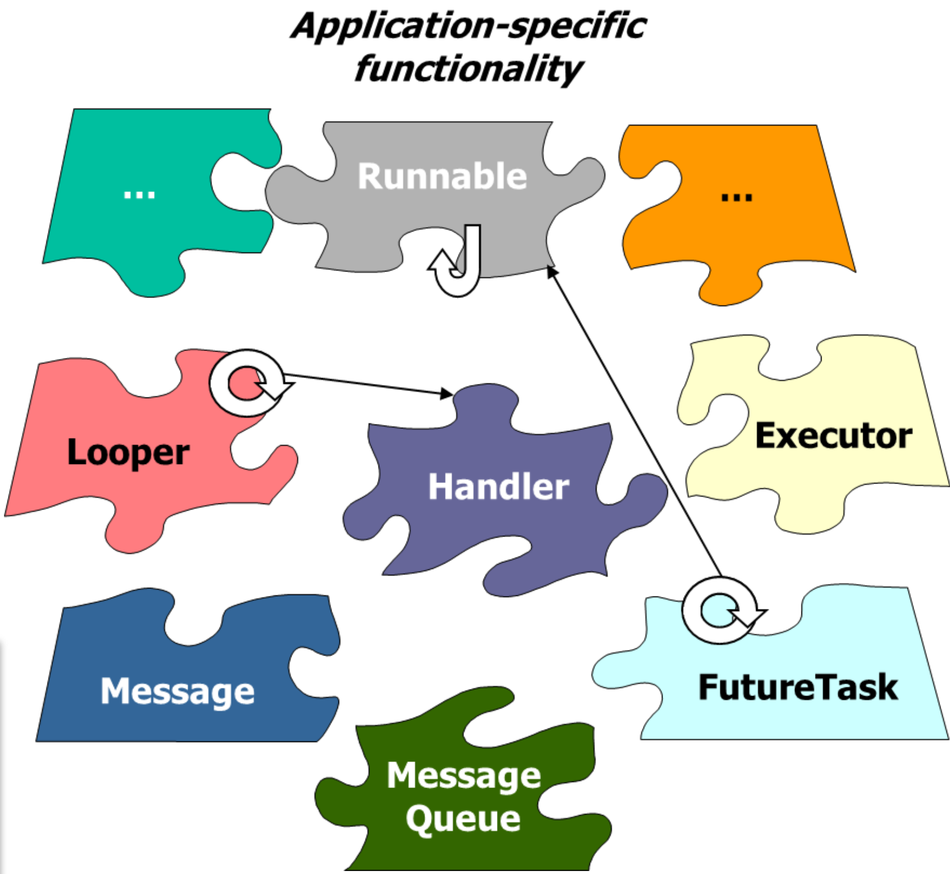
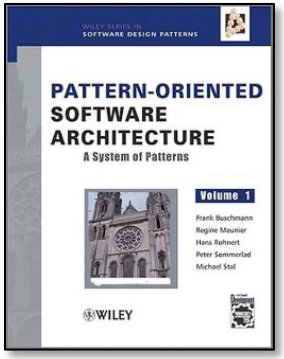
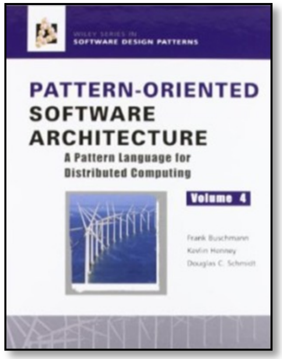
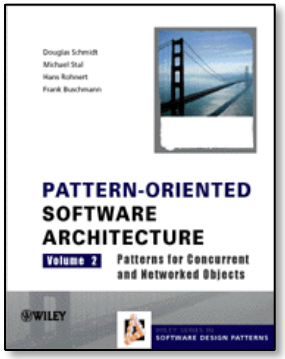
- Key Java parallelism frameworks
- Modern web programming platforms
- Patterns for parallel programming







WILEY SERIES IN SOFTWARE DESIGN PATTERNS
PATTERN-ORIENTED SOFTWARE ARCHITECTURE
A Pattern Language for Distributed Computing
Volume 4
Frank Buschmann
Kevlin Henney
Douglas C. Schmidt

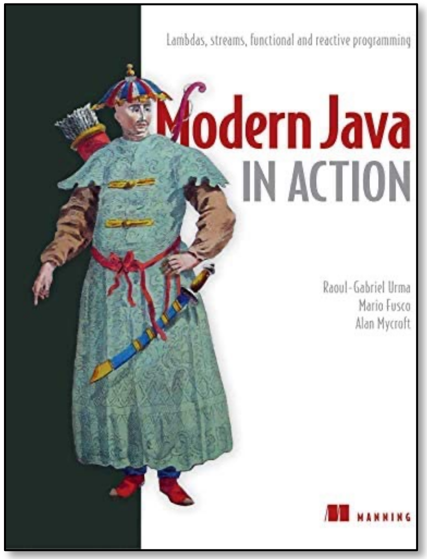


Douglas Schmidt
Michael Stal
Hans Rohnert
Frank Buschmann
PATTERN-ORIENTED SOFTWARE ARCHITECTURE
Volume 2
Patterns for Concurrent and Networked Objects
WILEY
WILEY SERIES IN SOFTWARE DESIGN PATTERNS

See www.dre.Vanderbilt.edu/~Schmidt/POSA

Summary of Course Contents

- Key Java parallelism frameworks
- Modern web programming platforms
- Patterns for parallel programming
- We assume you know (or can quickly learn) modern Java, IntelliJ, & Git



See item #12 at github.com/douglascraigschmidt/CS891/wiki/CS-891-FAQ

Structure of the Lecture Material

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- This course has three main modules

Section	Topics
Java Structured Concurrency & Reactive Streams	• Coverage of modern Java concurrency & parallelism frameworks, e.g. • Java structured concurrency • Reactive streams (e.g., Project Reactor)

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Sync & Async Web Communication	• Spring WebMVC & WebFlux

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Sync & Async Web Communication	• Spring WebMVC & WebFlux
Software Patterns	• Concurrent & parallel programming & communication patterns

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  - Each part is a single lecture

Screencasts of each lesson "part" & PDF versions of the slides will be uploaded to www.dre.vanderbilt.edu/~schmidt/cs891#lectures

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  - Each module is composed of lessons
  - Each lesson is composed of parts
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  - 1st quiz will be on Wednesday, January 18th

All quizzes are "closed book/note/Internet" & are given on Brightspace

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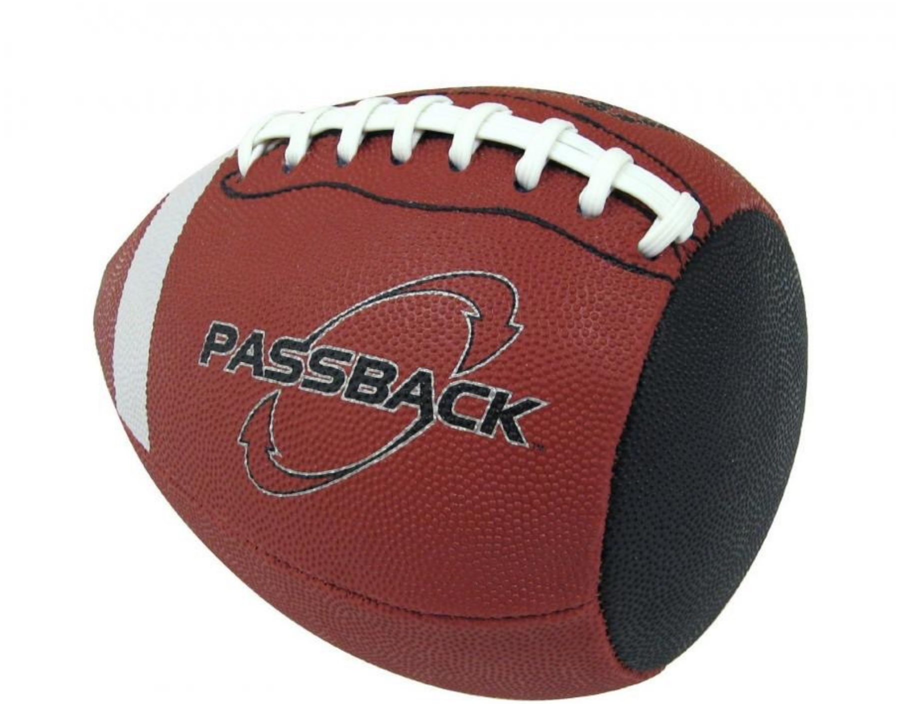
  - We strive to hand back & review quizzes at the start of next class



One of the benefits of a smaller class ;-)

Structure of the Lecture Material

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  - 1st quiz will be on Wednesday, January 18th
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I recommend that you study for quizzes by reviewing slides & watching screencasts available at www.dre.vanderbilt.edu/~schmidt/cs891#lectures

Structure of the Lecture Material

- There *may* be a cumulative final exam that covers all the lectures
  - The focus will be on the last week(s) of the semester

The final exam *may* be held 12 to 3pm, Friday, April 28th via Brightspace

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