From ‘Java Sucks’ to ‘Java…Eh, Not Bad’

How Vert.x & Java 21 Made Me Stop Complaining

Thomas Gebert

Who Am I?

- Software Engineer in New York City.
- There is nothing else interesting about me.

Java.

- If you are at this conference, you probably have an opinion of Java
- Likely very negative.

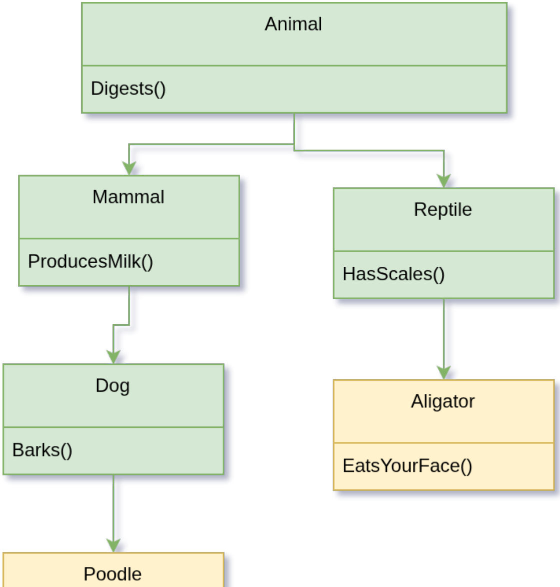
Why the Java Hate?

- Java is bloated and verbose.
- Encourages bad practices.
- Java progammers…

Examples of (Historically) Bad Things In Java.

- IO is blocking by default
- `synchronized` is evil.

Examples of (Historically) Bad Things In Java.



So Why Would We Want To Even Use Java?

- A metric ton of well-tested and supported libraries and guides online.
- Relatively portable, even still.
- Lots of great tooling around the language in the form of IDEs and benchmarking tools available.
- (Can be) fast.

Storytime.

CF ColdFusion Programming Language

. . .

Why Not Kotlin? Or Clojure?

- You should use Clojure if you can!
- Java is inescapable.
- A lot of companies still have tens of thousands of lines of Java that already exist.
- Many companies will find it infeasible to migrate to a better language, and would rather spend infinitely more money hiring dozens of engineers to write a million incrementatal patches to a Java codebase.
- Many of us are stuck in this hell.

Modern Java

- In 2024 I took a job doing Java full-time.
- They were unreceptive to my pleas to use Clojure, no matter how much I complained.
- Eventually, I realized that I wasn’t going to win this fight and instead I should at least figure out what Java 21 had to offer.
- Much to my astonishment, I actually enjoyed it!

What Changed?

- Since Java 8 and Java 11, there has been a much higher emphasis on functional programming concepts and updated syntax to facilitate it.
- Java programmers have finally joined the 21st century and will occasionally use non-blocking IO.
- Concurrency is an even bigger part of the language, and a lot of the features from concurrent-first languages have been brought over.

Java 8 and 11 New features

```
int count = 0;
for (String word : words) {
  if (word.length() > 10) {
    count++;
  }
}
System.out.println("Long words: " + count);
```

```
long count = words.stream()
                  .filter(w -> w.length() > 10)
                  .count();

System.out.println("Long words: " + count);
```

Java 8 and 11 New features

```
public interface Greeter {
  void greet(String name);

  default void greetPolitely(String name) {
    System.out.println("Hello, " + name + ". It's nice to 
  }
}
```

Java 21 New Features.

Virtual Threads.

- Virtual Threads are what should have been in Java twenty years ago.
- Roughly analogous to goroutines in Go.
- Allow you to have blocking code inside the thread without it breaking the pool.
  - The JVM will park the thread upon seeing a blocking call. . . .
- Extremely lightweight, hundreds of thousands can easily be spun up guilt-free.
- Implements the same interfaces as regular threads and thus are drop-in replacement.

Java 21 New Features*

* (Actually a Java 15 feature that I wasn't aware of until Java 21)

ZGC

- Low-latency garbage collector.
- Pause times are generally sub-millisecond and almost never exceed ten milliseconds.
- Configurable, can be enabled or disabled per-project.

Java 21 New Features.

Records

- Much simpler than a class.
- Doesn’t require its own dedicated file.
- Can be pattern-matched.

Java 21 New Features*

* (Actually a Java 17 feature that I wasn’t aware of until Java 21)

Sealed Interfaces

- Basically Algebraic Data Types
- Can be recursive.
- Can be pattern matched.

Java 21 New Features.

Pattern Matching

- FINALLY! FINALLY!
- Can be done inside `if` statements and `switch` cases.

Java NIO

- Java New IO.
- Gives fine-grained control over IO, both blocking and non-blocking.
- Not new at all, but underutilized.

Vert.x

- (In a hand-wavey way) a port of Node.js to Java.
- High performance.
- Provides constructs to handle local and distributed concurrency transparently.

Vert.x Core Primitives

Verticle

- Units of deployment and concurrency
- Two types: StandardVerticle (blocking) and WorkerVerticle (non-blocking optional)
- Deployed with `vertx.deployVerticle(...)`

Vert.x Core Primitives

Event Loop

- Single or multi-threaded, async task execution
- Based on Netty
- Designed for minimal context switching and high throughput

Vert.x Core Primitives

Event Bus

- Lightweight messaging system
- Supports publish/subscribe, point-to-point, and request-response
- Accepts JSON, POJOs (with codec), and buffers

Vert.x Core Primitives

Future & Promise

- Asynchronous result handling
- `Future<T>` is the result placeholder
- `Promise<T>` is the result provider
- Supports chaining with `.compose(...)` and `.map(...)`

Vert.x Core Primitives

Context

- Execution environment for a Verticle
- Ensures thread-affinity
- Helps avoid shared-state concurrency bugs

Vert.x Core Primitives

Buffer

- Efficient binary data container
- Higher-level alternative to Netty’s ByteBuf
- Used in I/O and message passing

Vert.x Core Primitives

WebClient / HttpClient

- Non-blocking HTTP clients
- Built-in connection pooling and retry logic
- Supports JSON, form data, and streaming

Vert.x Core Primitives

Timer / Periodic Tasks

- Use `setTimer(...)` for delayed execution
- Use `setPeriodic(...)` for recurring tasks
- Executes on the event loop thread

```
void doSomethingAsync(Promise<String> promise) {
  vertx.setTimer(500, id -> {
    promise.complete("Hello, future!");
  });
}
```

Vert.x Core Primitives

SharedData

- Minimal shared-state coordination mechanism
- Offers maps, locks, and counters
- Supports clustered and local modes

Backpressure in Vert.x

- Vert.x models backpressure using `ReadStream` and `WriteStream`
- Data is paused/resumed automatically when the receiver can’t keep up
- Useful when handling large streams (e.g., file uploads, HTTP bodies)

Backpressure in Vert.x

Example: Handling a slow `WriteStream`

```java
source.pipeTo(slowSink, res -> {
  if (res.succeeded()) {
    System.out.println("All data written.");
  } else {
    res.cause().printStackTrace();
  }
});
```

Vert.x distributed concurrency example

Deploying Verticles: Local vs Clustered

- Verticles are the basic unit of deployment and concurrency
- Deployment is nearly identical across local and clustered environments

Vert.x Concurrency Example.

```java
public class MyVerticle extends AbstractVerticle {

  @Override
  public void start(Promise<Void> startPromise) {
    System.out.println("Verticle started on thread: " + Thr

    vertx.setTimer(1000, id -> {
      System.out.println("Timer fired after 1 second");
    });

    startPromise.complete();
  }
}
```

Vert.x Concurrency Example.

Local Deployment

```
Vertx vertx = Vertx.vertx();
vertx.deployVerticle(new MyVerticle());
```

Vert.x Concurrency Example.

Distributed Deployment

```
Vertx.clusteredVertx(new VertxOptions(), res -> {
  if (res.succeeded()) {
    Vertx vertx = res.result();
    vertx.deployVerticle(new MyVerticle());
  } else {
    res.cause().printStackTrace();
  }
});
```

Conclusion.

- Java 21 isn’t that bad.
- Convince your employers to upgrade if you want to reclaim your sanity.
- Blah . . .
- Use libraries like Vert.x and Disruptor to make life simpler.

Conclusion.

- thomas@gebert.app
- blog.tombert.com

-