

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.

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- There is nothing else interesting about me.

Java.

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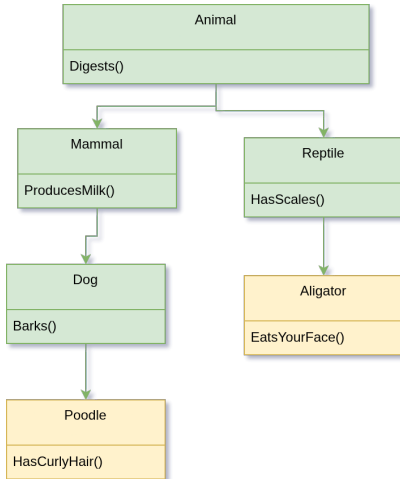
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synchronized is Evil.

```
public class DeadlockExample {  
    public void thread1() {  
        synchronized (lockA) {  
            sleep(100);  
            synchronized (lockB) {  
                System.out.println("Thread 1: Holding lockB");  
            }  
        }  
    }  
  
    public void thread2() {  
        synchronized (lockB) {  
            sleep(100);  
            synchronized (lockA) {  
                System.out.println("Thread 2: Holding lockA");  
            }  
        }  
    }  
}
```

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Storytime.

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**ColdFusion
Programming
Language**

Storytime.



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- (Can be) fast.

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- 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 incremental patches to a Java codebase.
- Many of us are stuck in this hell.

Modern Java

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Java 8 and 11 New features

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

Java 8 and 11 New features

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```

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

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


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```
public interface Greeter {  
    void greet(String name);  
  
    default void greetPolitely(String name) {  
        System.out.println("Hello, " + name + ". It's nice to m  
    }  
}
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BlockingQueue (`java.util.concurrent`)

- A thread-safe queue that blocks on put and take operations
- Useful for producer-consumer patterns
- Comes in several flavors: `ArrayBlockingQueue`, `LinkedBlockingQueue`, `PriorityBlockingQueue`, etc.

Old Underutilized Java Feature

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```
BlockingQueue<String> queue = new LinkedBlockingQueue<>();

// Producer
new Thread(() -> {
    queue.put("data");
}).start();

// Consumer
new Thread(() -> {
    String item = queue.take();
}).start();
```

Java 21 New Features.

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Pre-virtual-threads

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```
ExecutorService executor = Executors.newFixedThreadPool(4);

for (int i = 0; i < 10; i++) {
    int taskId = i;
    executor.submit(() -> {
        System.out.println("Running task " + taskId +
                           " on thread " + Thread.currentThread().getName());
    });
}

executor.shutdown();
```

Pre-virtual-threads

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Pre-virtual-threads

- Worked ok, but could break if you did any kind of blocking IO.
- Did not properly park IO blocking.

New Executors

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```
Executors.newVirtualThreadPerTaskExecutor()
```

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Before Records

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```
public class Point {  
    private final int x;  
    private final int y;  
  
    public Point(int x, int y) {  
        this.x = x;  
        this.y = y;  
    }  
  
    public int x() { return x; }  
    public int y() { return y; }  
  
    @Override  
    public boolean equals(Object o) {  
        if (this == o) return true;  
        if (!(o instanceof Point)) return false;  
        Point p = (Point) o;  
        return x == p.x && y == p.y;  
    }  
}
```

Sealed Interfaces

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Before Sealed Interfaces

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```
public interface Shape {}

public class Circle implements Shape {
    public final double radius;
    public Circle(double radius) { this.radius = radius; }
}

public class Rectangle implements Shape {
    public final double width, height;
    public Rectangle(double w, double h) {
        this.width = w;
        this.height = h;
    }
}
```

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Pattern Matching

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Before pattern matching.

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```
public void handle(Object obj) {  
    if (obj instanceof String) {  
        String s = (String) obj;  
        System.out.println("String length: " + s.length());  
    } else if (obj instanceof Integer) {  
        Integer i = (Integer) obj;  
        System.out.println("Squared: " + (i * i));  
    } else {  
        System.out.println("Unknown type");  
    }  
}
```

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- Provides constructs to handle local and distributed concurrency transparently.

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- Deployed with `vertx.deployVerticle(...)`

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Event Loop

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- Designed for minimal context switching and high throughput

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Event Bus

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Timer / Periodic Tasks

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

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SharedData

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- 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

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Example: Handling a slow WriteStream

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


Vert.x distributed concurrency example

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Deploying Verticles: Local vs Clustered

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```
public class MyVerticle extends AbstractVerticle {

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

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

        startPromise.complete();
    }
}
```

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Local Deployment

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

Vert.x Concurrency Example.

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Distributed Deployment

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();  
    }  
});
```

RxJava

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RxJava: Basics of Reactive Programming

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- Core idea: data flows over time, like a stream
- Common building block: `Observable<T>`

Creating an Observable

Creating an Observable

```
Observable<String> source = Observable.just("Alpha", "Beta")  
  
Observable<Integer> lengths = source  
    .map(str -> str.length())  
    .filter(len -> len >= 5);
```

Creating an Observable

Creating an Observable

```
lengths.subscribe(  
    item -> System.out.println("Received: " + item),  
    error -> System.err.println("Error: " + error),  
    () -> System.out.println("Stream complete")  
);
```


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- Ideal for event-driven pipelines, e.g. trading engines, telemetry processors.
- Achieved >25M messages/sec on commodity hardware.

LMAX Disruptor

```
Disruptor<MyEvent> disruptor = new Disruptor<>(  
    MyEvent::new,  
    1024,  
    Executors.defaultThreadFactory()  
);  
disruptor.handleEventsWith((event, seq, end) -> {  
    System.out.println("Handling: " + event);  
});  
disruptor.start();  
RingBuffer<MyEvent> buffer = disruptor.getRingBuffer();  
long seq = buffer.next();  
try {  
    MyEvent event = buffer.get(seq);  
    event.setValue("Hello");  
} finally {  
    buffer.publish(seq);  
}
```

Conclusion.

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- Java 21 isn't that bad.

Conclusion.

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- Use libraries like Vert.x and RxJava and Disruptor to make life simpler.

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