The Latest and Greatest in Java

Features, Bells and Whistles from Java 8 and beyond...

Who am I

- Johnny Egeland – Senior Developer
- Work at Storebrand – Doing the Taxes
- Have worked with Software Development for 21 years
- 10+ years of experience in C# and .Net
- … and only 4+ years of experience in Java :-D

What will we look into

The most useful new features after Java 8
up to features announced for future releases.

Moving forward from Java 8

- I assume Java 8 features is familiar stuff?
  - Lambda functions, Stream API, Optional, etc…
- Have you moved forward yet?
- XML processing and Old dependencies where pain points
  - All built in XML stuff is dropped after Java 8
  - Hard to find the correct replacements. But doable…
  - **Hint!** Jakarta and Glassfish has compatible API and Implementation
- Getting up to 11 was tedious… Moving on from there was simple.

New stuff Java 9 to 17 (current LTS)

- Interface default, static and private methods (8 - 9)
- Try-with-resources (9)
- Local Variable type inference (11)
- Files.readString and Files.writeString (11)
- Collectors.Teeing (12)
- Switch Expressions (14)
- Text Blocks (15)
- InstanceOf pattern matching, Records (16)
- Sealed Classes (17)

Beyond Java 17 ...

- Switch Pattern Matching (Preview in 18)
- Project Loom (Preview in 19)

Honorable mentions...

- Project Jigsaw, aka. Java modules (9)

01. Interface default, static and private methods

- Default and static methods introduced in Java 8
- Allowing Private keyword introduced in Java 9
- Place functionality related to the Interface, in the interface itself.
- Allows for code re-use without exposing internal details
- … live demo ...

02. Try-with-resources

- Introduced in Java 9
- Automatic closing of opened resources
- Reduce verboseness and “ugly” code
- … live demo ...

03. Local Variable Type inference

- Introduced in Java 11
- Reduced typing – less repetition of types
  - Useful for long class names or verbose generics
- Can only be used “locally” (for variables in methods)
- Frowned upon by some devs
  - Automatic -2 on reviews in Storebrand
- … live heresy ...

04. Files.readString / .writeString

- Files API additions added in Java 11
- Old method was tedious and verbose
- Reduces code complexity for handling text IO
- … live demo ...

05. Collectors.teeing()

- Introduced in Java 12
- Splits a stream and provides it to two Collectors
- … and then you must **merge** the results at the end
- I believed I would use this a lot, but I really haven’t
- … live demo ...

06. Switch expressions

- Introduced in Java 14
- Simplifies switch expression that produce values
- Enables you to assign or return the result without a variable
- The basis for the upcoming switch pattern matching features
- … live demo ...

07. Text blocks

- Introduced in Java 15
- Makes it much cleaner to embed multi-line text in Java code
- Removes the need for concatenation operators (+)
- Removes the need for newline chars in strings (\n)
- … live demo …
- AdHoc Bonus example: informative NullPointerException

08. InstanceOf pattern matching

- Introduced in Java 16
- Removes the need for type casts after type check
- Properties of objects can be used immediately
- … live demo …

09. Records

- Introduced in Java 16
- Create fully featured Data objects with very little code
- Are immutable and auto implements “getters”, equals() and hashCode()
- Provides default toString() that describes the contained data
- Can implement Interfaces, but not extend other classes
- Be careful with Records containing complex objects, Lists, Maps etc.
- … live demo …

10. Sealed Classes

- Introduced in Java 17
- Specify who is allowed to extend or implement
- Similar to final class/interface, with
- Sub-classes must be either also be Sealed or Final
- … live demo …

Next – To the future...

The following features are Preview features available from Java 18 and beyond

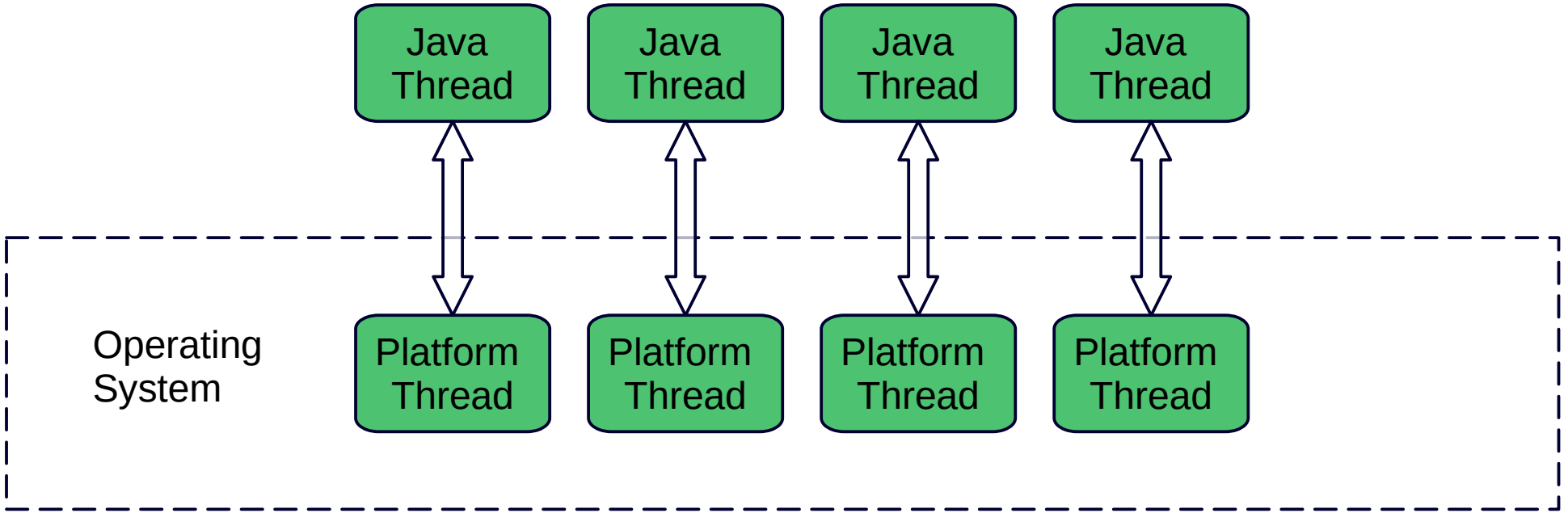
11. Extended switch expressions

- In preview from Java 17
- Makes it possible to match types in Switch
- Makes it possible to add expressions in Switch
- … live demo …

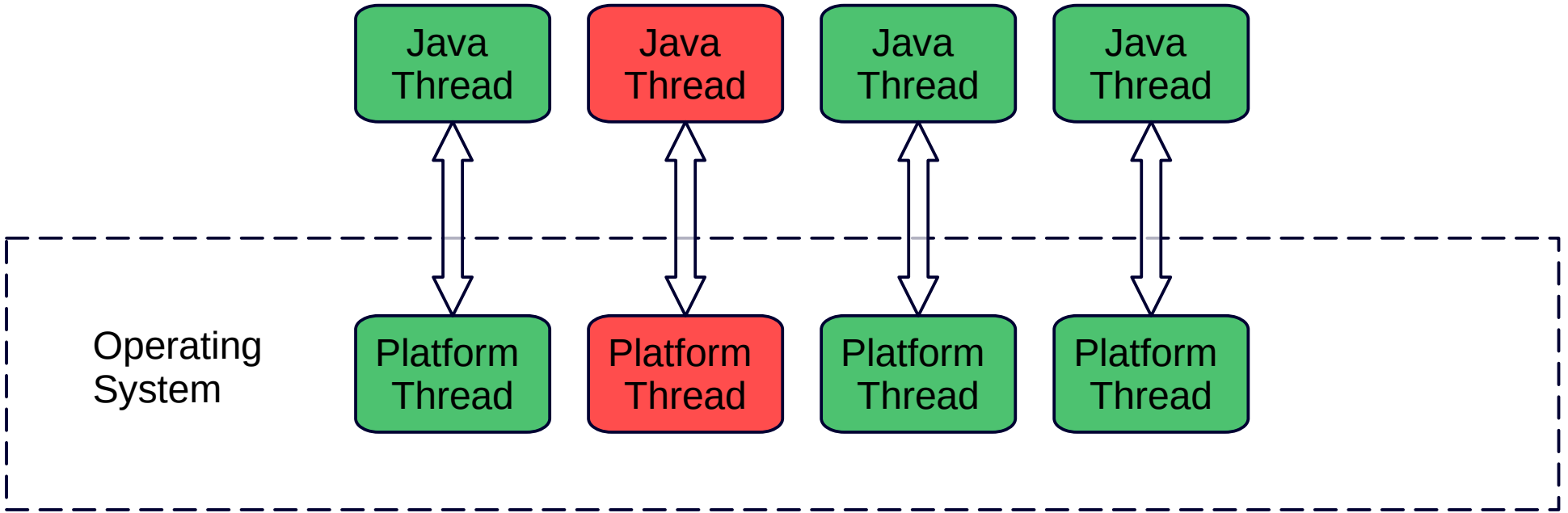
Project Loom

- Experimental release of Java 19
  - https://jdk.java.net/loom/
- In short: async/await (co-routines) for Java
- … but much easier to use (transparent)
- … and with more concurrency features
- Avoid blocking of Platform threads, and instead re-purpose the thread for other tasks
- We will just scratch the surface...

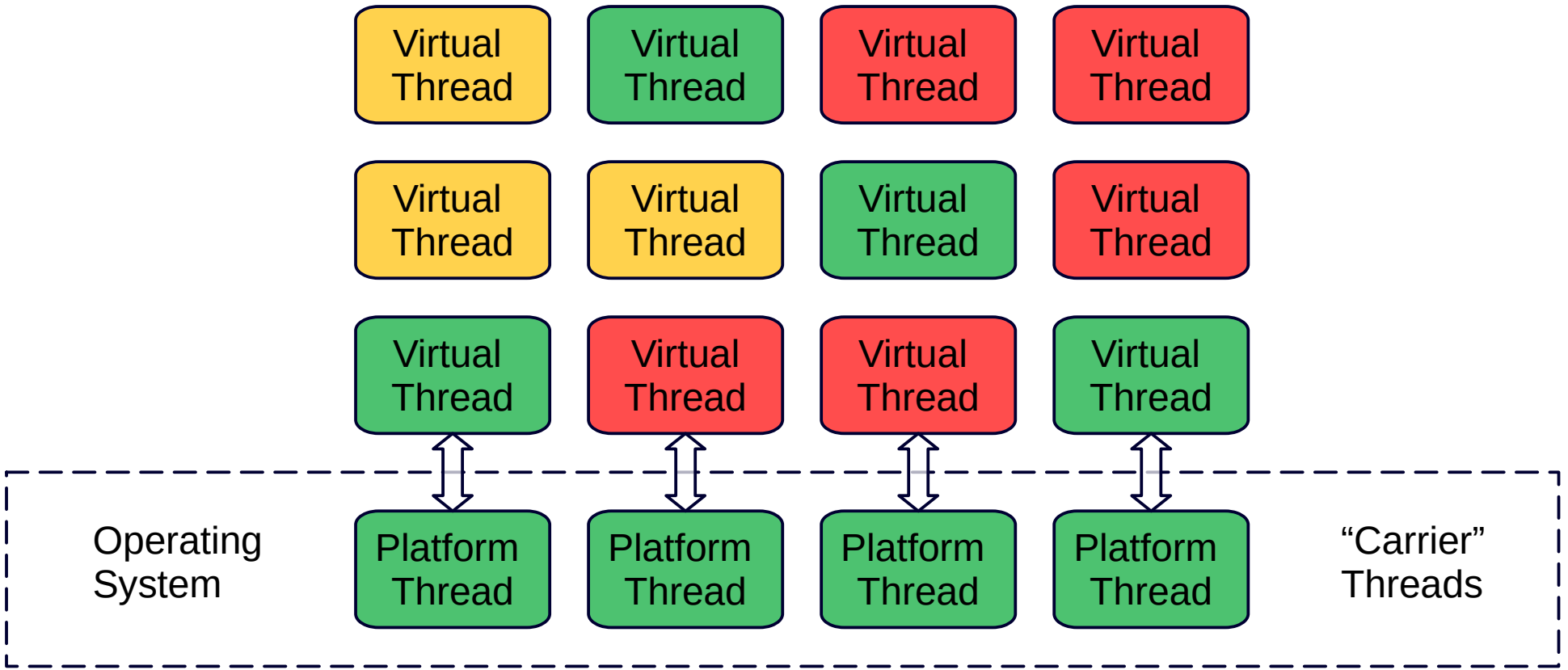
Traditional Java Thread model



Traditional Java Thread model



Loom Virtual Threads



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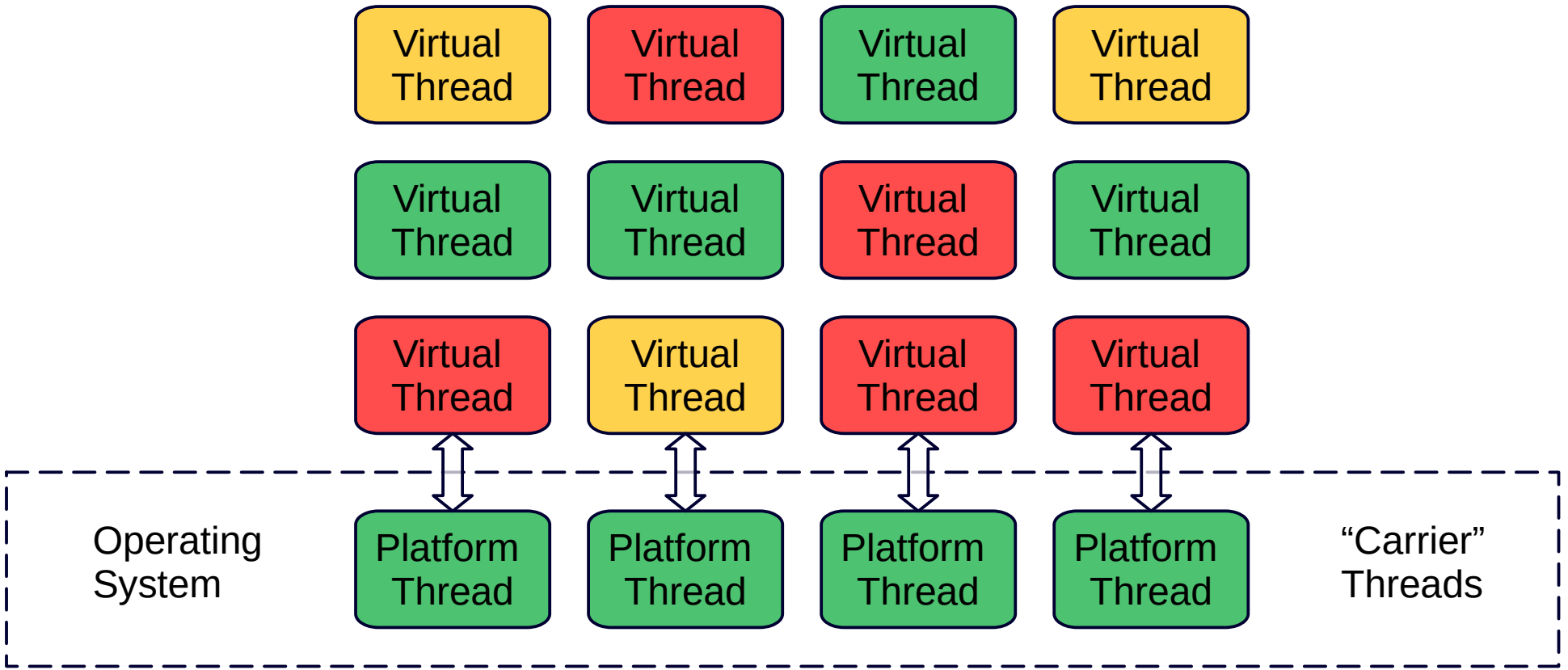

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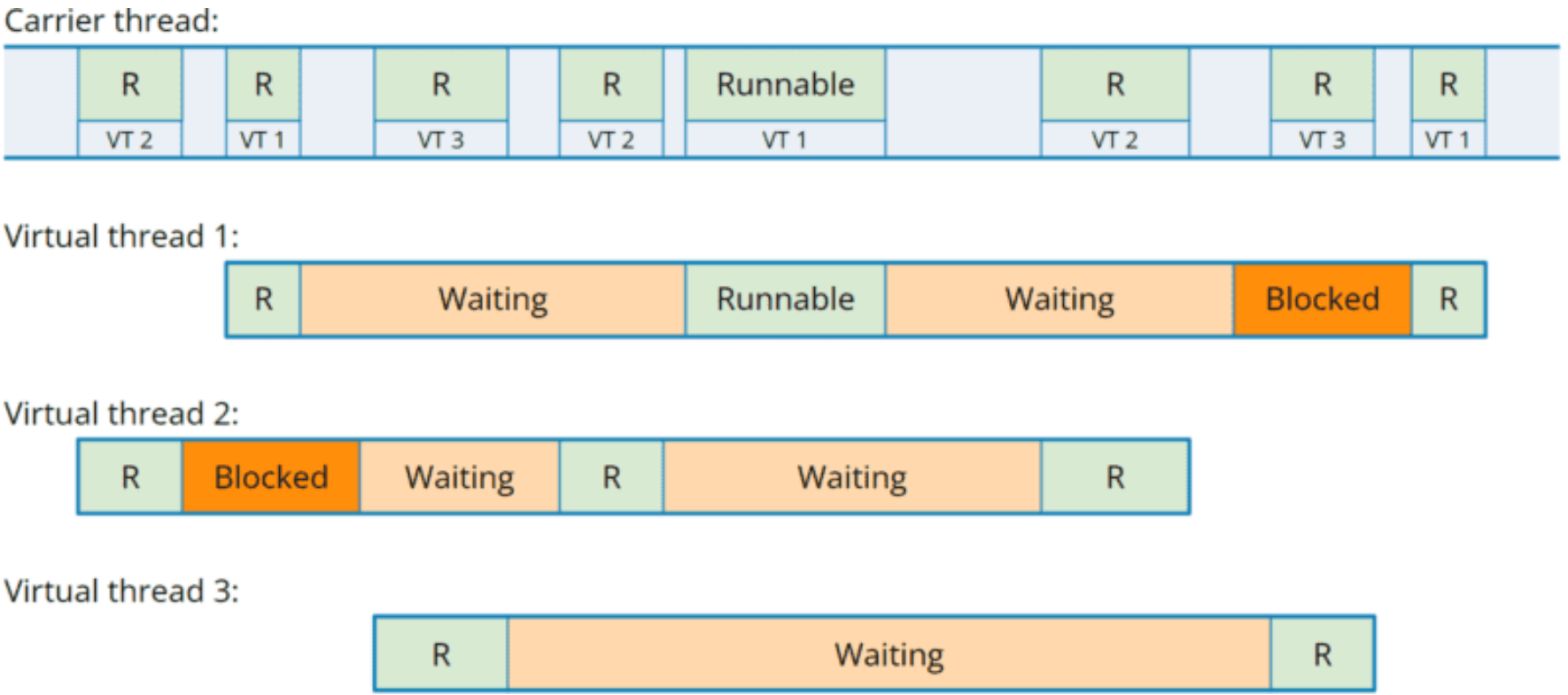

Loom 01 and 02: Virtual Threads

- Prevents Platform Threads from being blocked
- Light weight context switching at JVM level
- Java IO rewritten to take advantage automatically
- Go from Thousands of threads to Millions of threads
- … let’s scratch the surface ...

Loom 03: Async programming

- Sequential code is easy and readable. But…
- Blocking calls (I/O) blocks the thread down to OS
- Solvable using CompletableFuture. But…
- Async code is hard to write **and** to read. Bad stack traces.
- Virtual Threads makes sequential code behave as async.
  - No async / await keywords needed
  - Completely transparent (as long as API supports Virtual Threads)
- Sadly, hard to actually demonstrate effect of Virtual Thread blocking. But here is an example anyway...

Loom 03: Gotchas...

- There is no such thing as Magic!
- APIs must be “Virtual Thread Aware” and explicitly yield control instead of blocking
- Existing blocking code _can_ still block OS threads, unless…
- … they rely on java.io or other built in Java functionality, as...
- All built in Java APIs will be updated to be Virtual Thread aware (which should automatically make most libraries take advantage of Loom :-D)

Loom 04: Structured Concurrency

- Using Thread.ofVirtual() is low level and tedious
- New API for running Async Tasks
- Progression from the old Executor Service APIs
- Provide functionality where async sub-tasks are dependent
- For instance a parent task can only complete once a set of sub-tasks are all complete
- … one final example ...