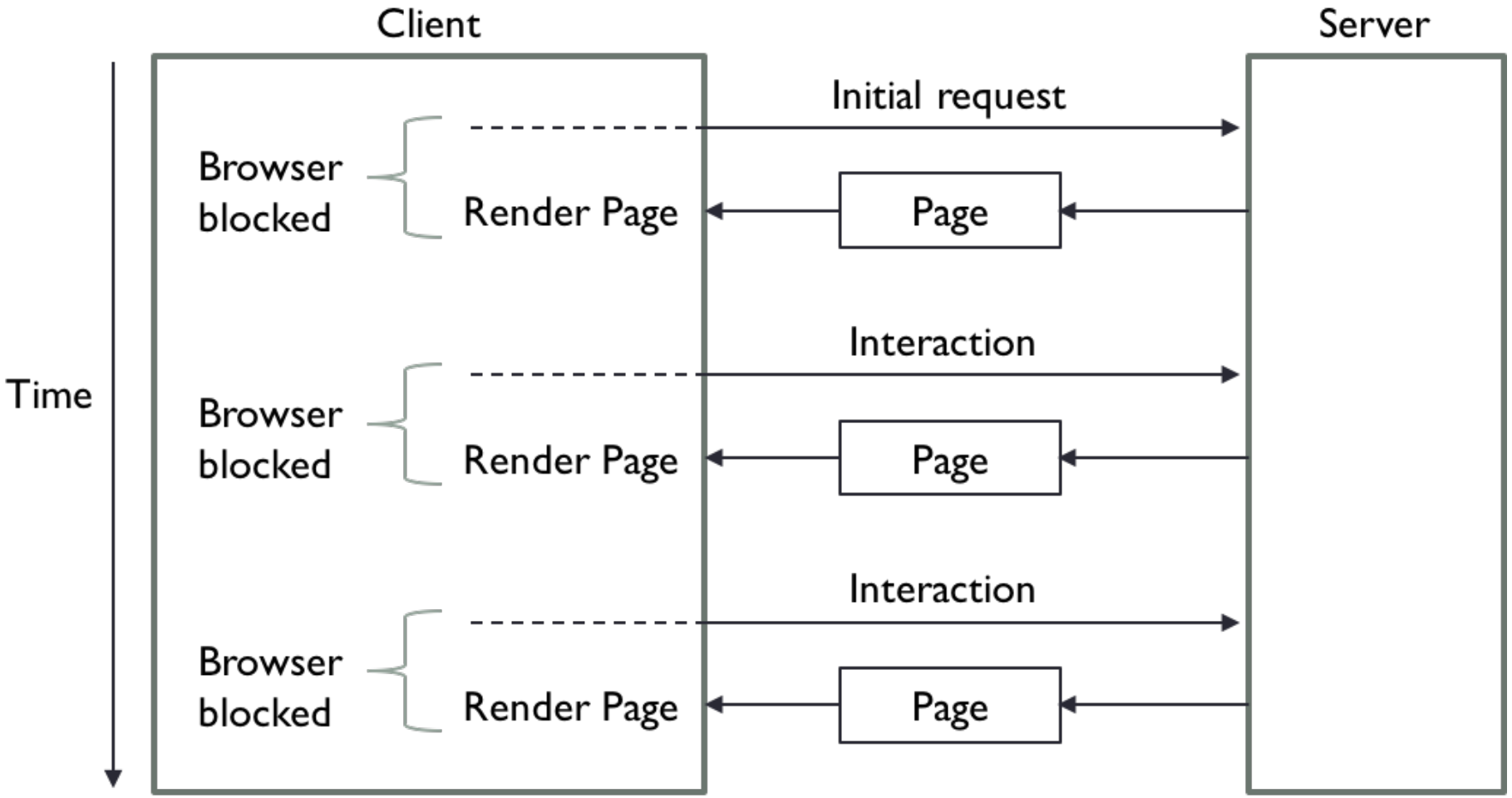
Asynchronous Programming

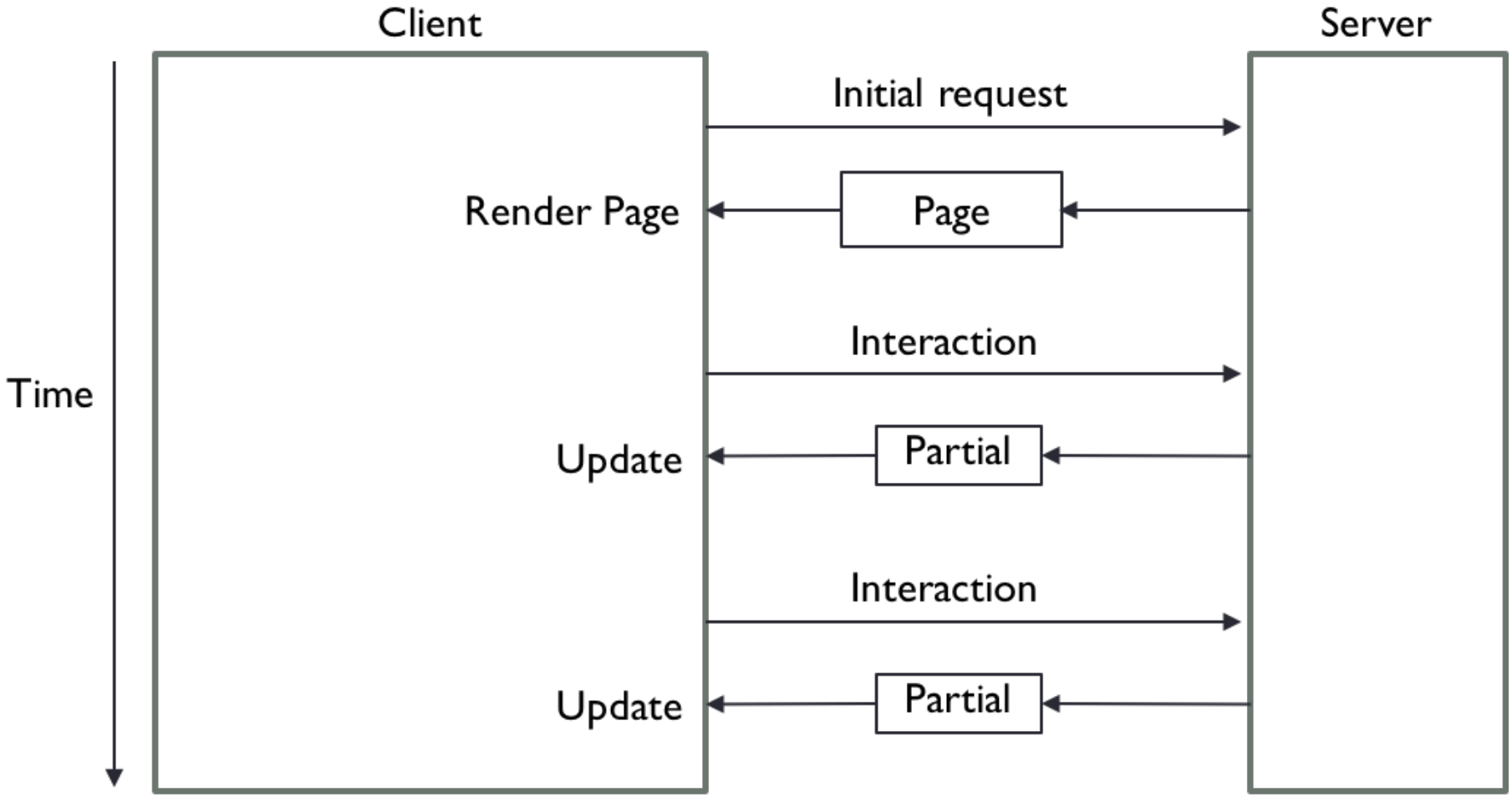
CS 4640
Programming Languages for Web Applications

[Joshua Bloch, "Effective Java"
Robert W. Sebesta, "Programming the World Wide Web
Based in part on GMU SWE 432 by Jeff Offutt, Thomas LaToza, and Jon Bell]

Synchronous Programming



Asynchronous Programming

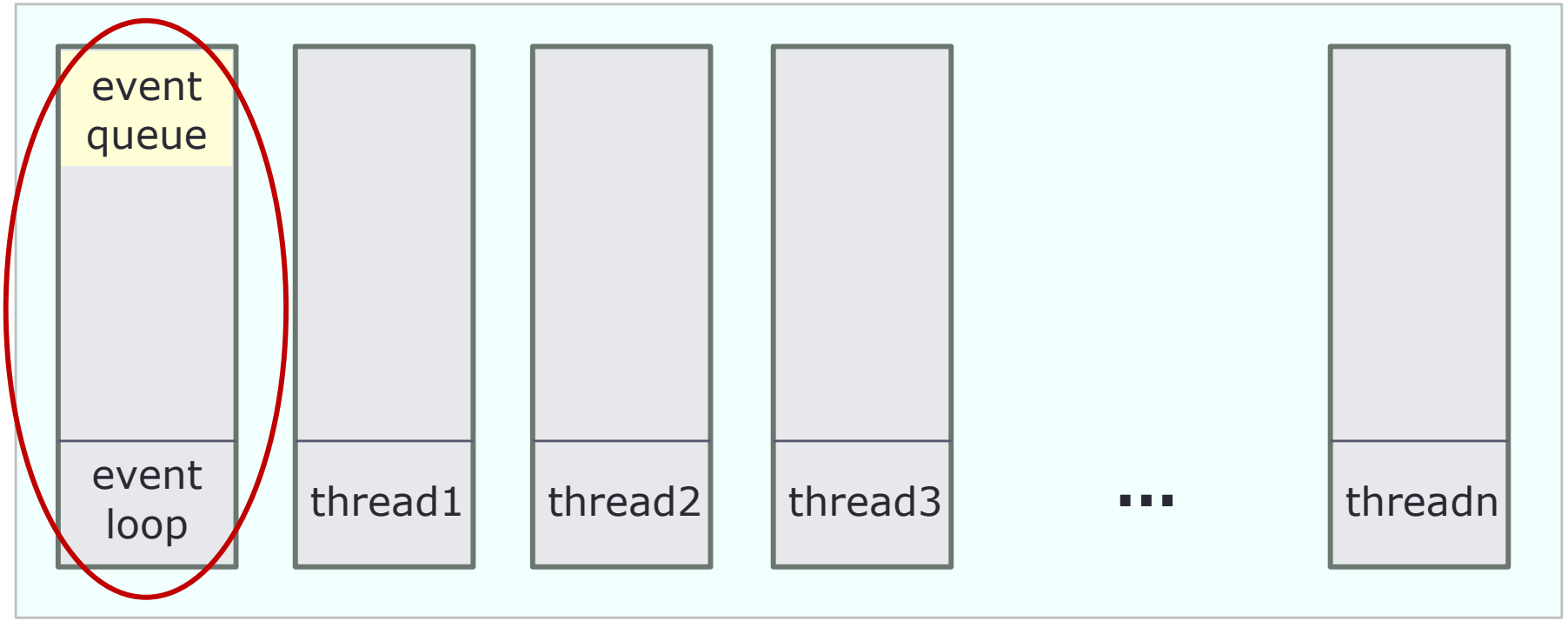


Asynchronous Programming

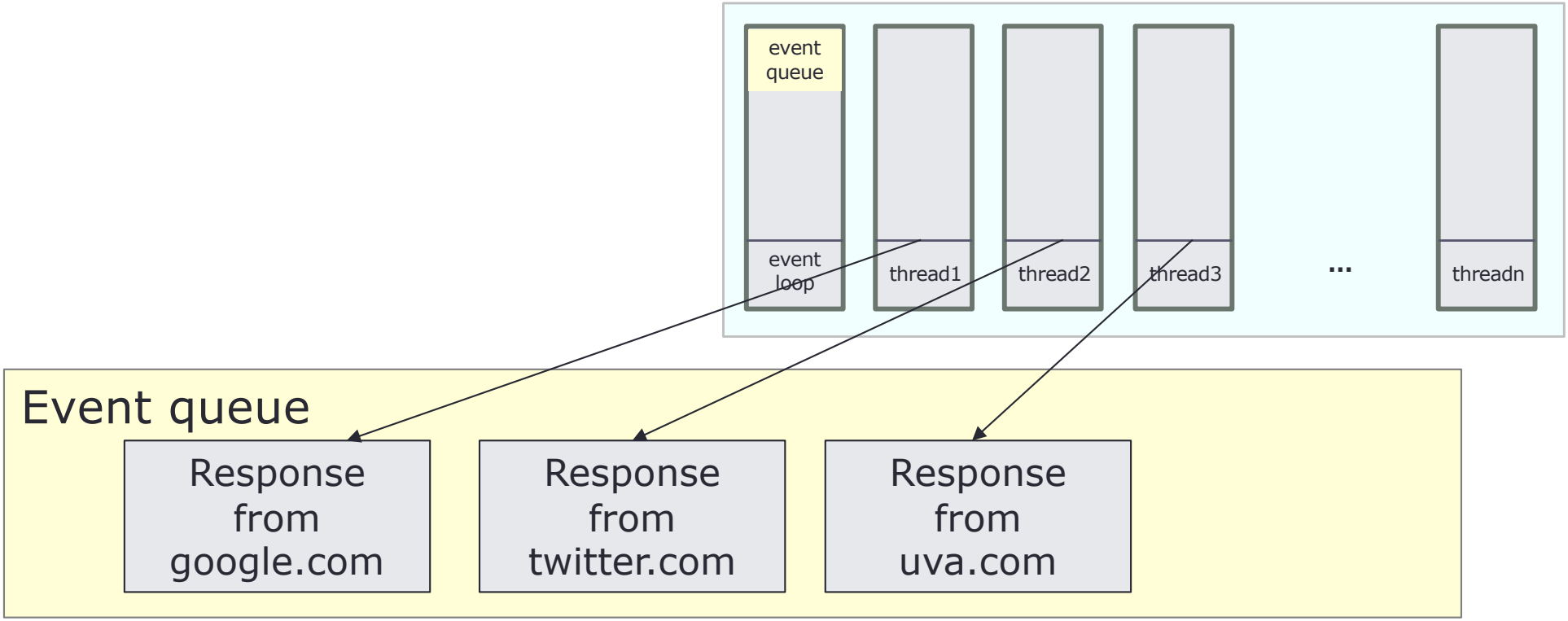
- Allow multiple things to happen at the same time
  - An app is doing more than one thing at a time
- Maintain an interactive application while still doing something
  - Processing data
  - Communicating with remote servers/hosts
- Use threads
  - A thread = a running program whose execution may be interleaved with other programs by the operating system

Multi-Threading

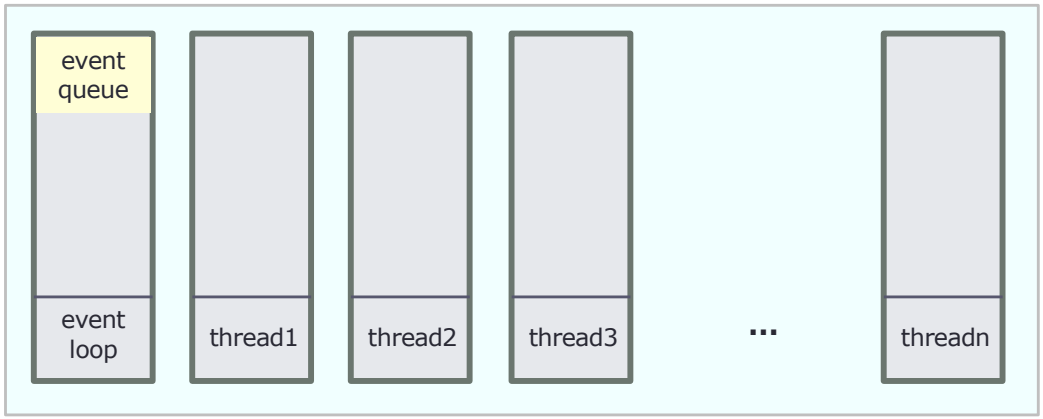
- Allow more than one things to be run at once (i.e., asynchronous)
- Typically handled by multiple OS scheduler
- Everything (you write) will run in a single thread (i.e., event loop)
- Event loop processes events and calls the callback functions



Event Loop


event queue
event loop
thread1
thread2
thread3
...
threadn
Event queue
Response from google.com
Response from twitter.com
Response from uva.com

Event Loop



Event queue

Response from twitter.com

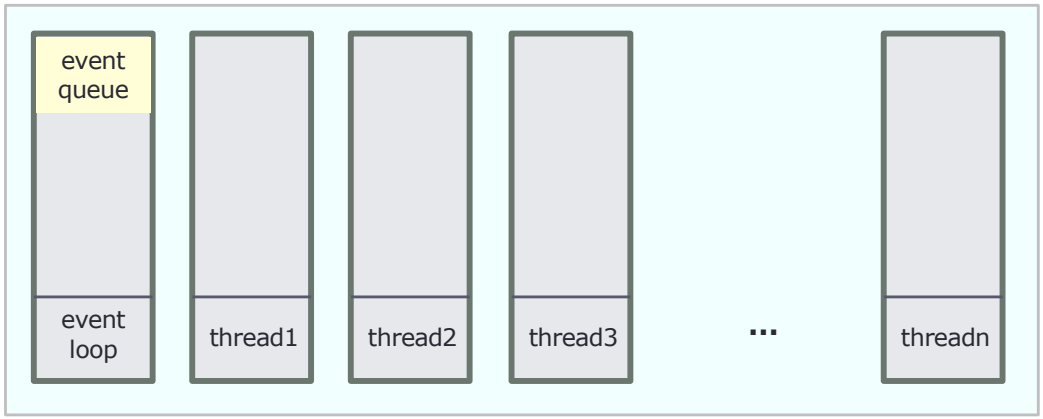
Response from uva.com

Event being processed

Response from google.com

Are there any listeners registered for this event? If so, call listener with event. After the listener is finished, repeat

Event Loop



Event queue

Response from uva.com

Event being processed

Response from twitter.com

Are there any listeners registered for this event? If so, call listener with event. After the listener is finished, repeat

Writing Good Event Handler

- Events are processed in the order they are received
- Events may arrive in unexpected order
- The next event will not be handled until your event handler finishes ("run-to-completion")
- Event must not block (stall or wait for inputs such as alert() or non-asynchronous request)
- If something that takes a long time must be done, split it up into multiple events