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Crawling the Web with Akka HTTP

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Biography

- 1981-1990 Software Developer @ PSI GmbH:
  Factory Automation, Software Engineering Tools

- 1990-… Prof. @ Beuth University of Applied Sciences Berlin:
  Teaches Software Engineering, Programming
  Main interests: Scala, Backend Development

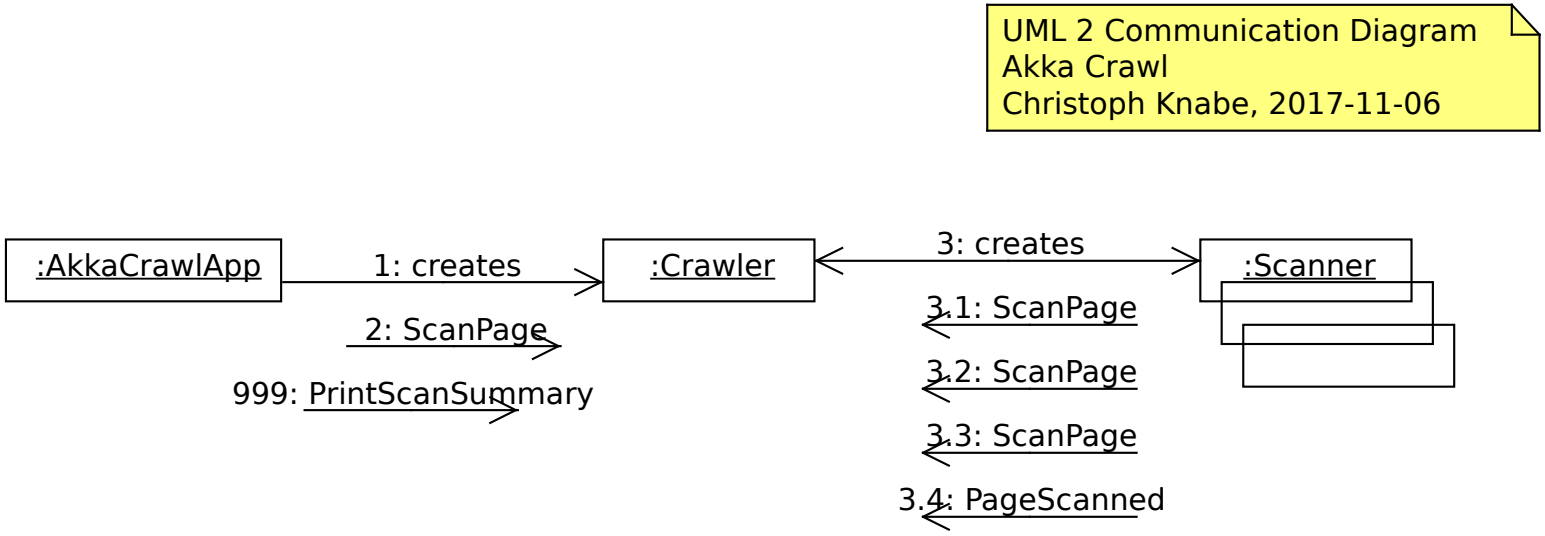
Motivation

- Learned in Coursera course „Reactive Programming“: Massive parallelization only possible by asynchronous, event-oriented processing, not by threaded processing.
- Wanted to demonstrate it for my students, who do not own big servers in the web.
- ⇒ Study massive parallelization on a web client.
- App: **Web Crawler**, which gets hold of as many working web page addresses as possible.

Technologies used

- **Akka Actors** for managing the web crawling, and the web page scanning.
- **Akka HTTP** for sending a page request, and receiving a Stream with the HTML text.
- **Akka Streams** for processing each web page.
- **Scala Futures** for
  - piping an `HttpResponse` into the `Scanner` Actor,
  - awaiting the actor system termination.

Communication



- See this in source code.
- Run it.

Lessons learned

- **Indeterministic**:
  - Run it often
  - Run it in different environments

  in order to understand the behavior.
- **Actors, Futures, Streams**: Fully interoperable!!!
  No problems with this.
  But don't publish state to another thread!
- **Always set Timeout** in order not to collect uncompleted actors:
  `context.setReceiveTimeout(responseTimeout)`
- Use property `akka.loglevel` in the beginning, switch to `off` in the end.

Measure Results

- **At home (Laptop@DSL)**:
  - Scanned 318 pages in 1 minute.
  - About 10 unprocessed `ScanPage` commands.
  - Page scans get slower and slower.
- **In University WLAN (Laptop@WLAN)**:
  - Scanned 2,917 pages in 1 minute
  - About 390 unprocessed `ScanPage` commands.
- **On University Server**:
  - Scanned 6,480 pages in 1 minute
  - About 800,000 unprocessed `ScanPage` commands.

Questions

- What is the limiting factor?
  - Network bandwitdth!
  - CPU?
  - Number of open ports?
  - JVM-RAM, …?
- Would a streamed solution (with backpressure) work better?
- Can I start an Akka HTTP request from a stream?
- Can I feed multiple response streams into one crawler stream?

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Thank You