The Sprockell

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Programming Paradigms — End Project

- Define your own (imperative) programming language (including concurrency constructs).
- Compile your language (in Java or in Haskell) towards the instruction set of the *Sprockell* (may be changed).
- Demonstrate it on a shared memory system with a couple of *Sprockell*s.

- Tooling: Java + ANTLR or Haskell + ParSec or combination
  - When using Haskell: please use Stack for dependencies; submit your `.cabal` and `stack.yaml` files

- No pipelining, no cache memory, no interrupting, one instruction per clock cycle, $\cdots$
- Yet: Turing complete, pointer arithmetic

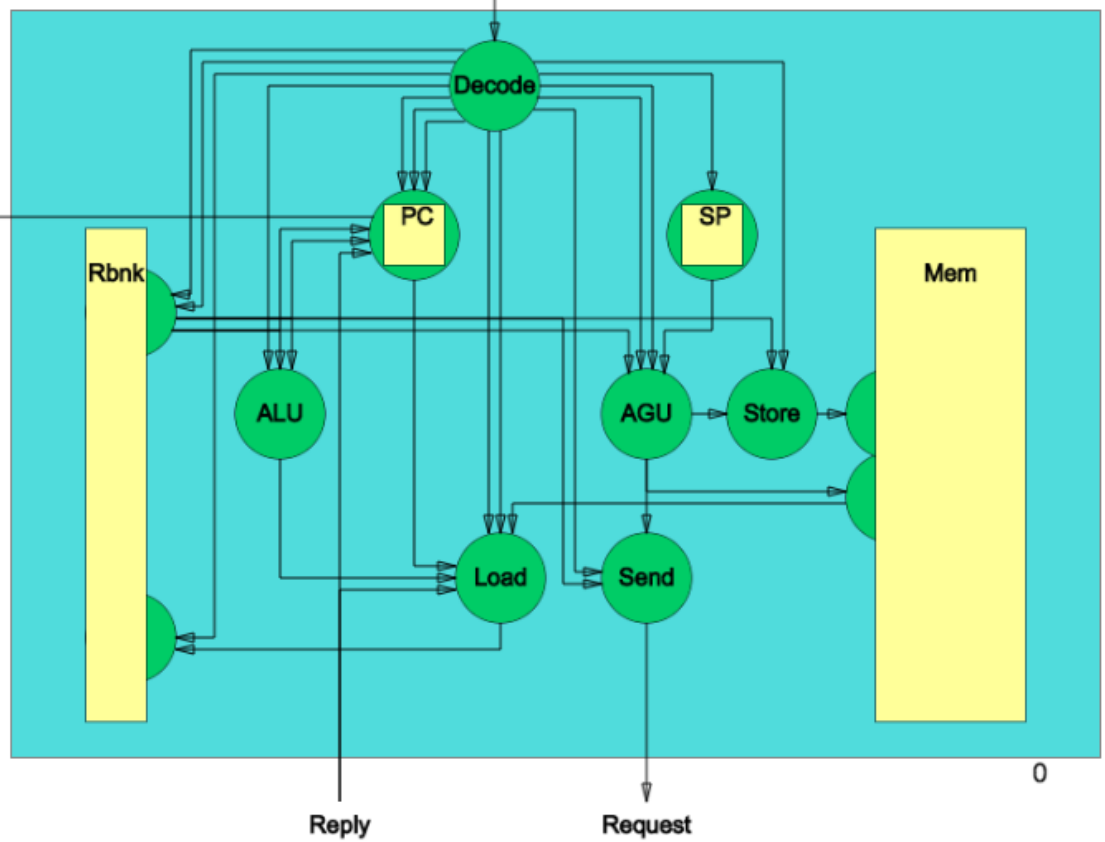
Sprockell: Small processor in Haskell

Demo

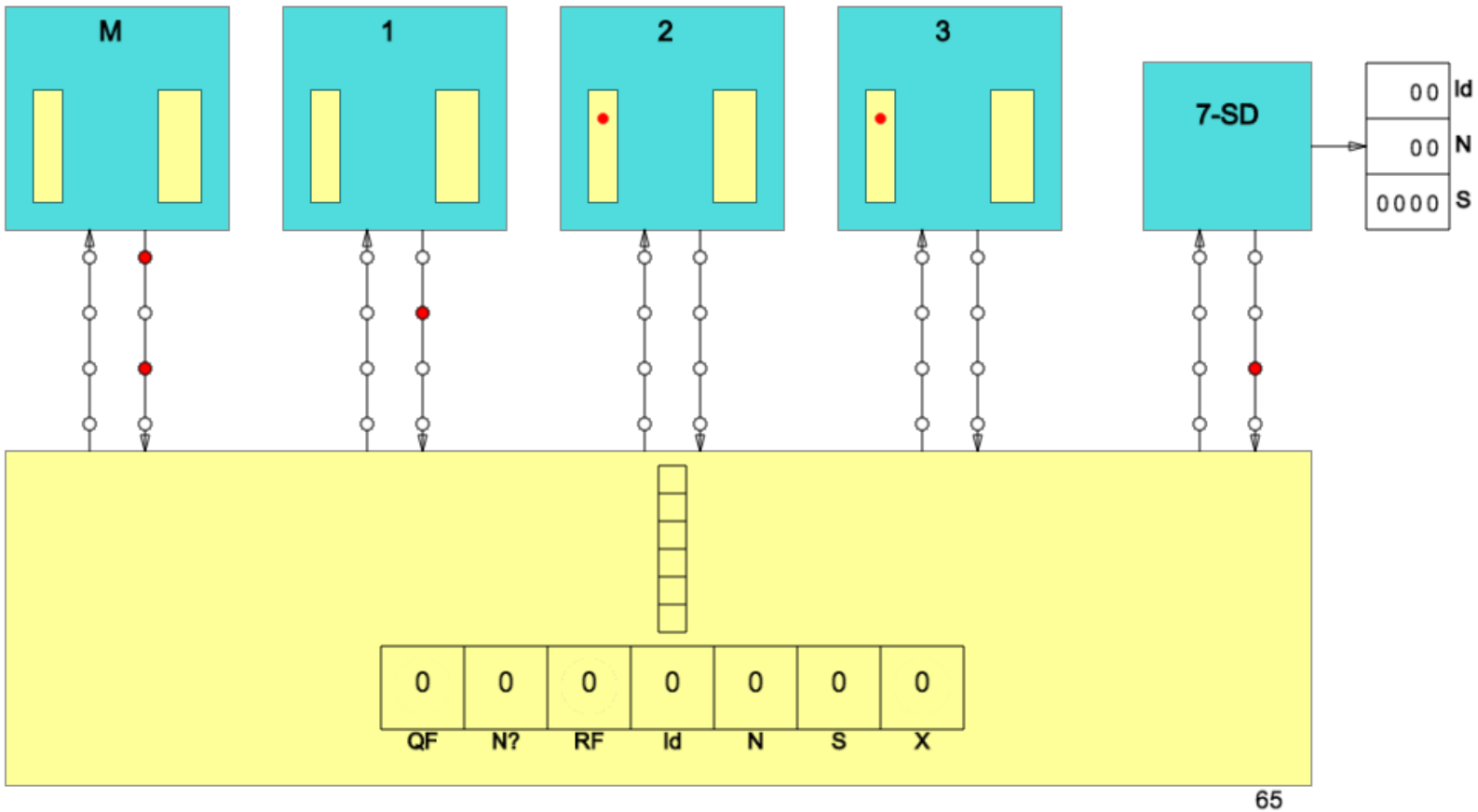
$$\sum_{i=0}^{12} i$$

The Sprockell

```
Load (ImmValue 0) 1
Store 1 (DirAddr 1)
Load (ImmValue 0) 1
Store 1 (DirAddr 3)
ReadInstr (DirAddr 0)
Receive 1
Store 1 (DirAddr 2)
Load (DirAddr 1) 1
Push 1
Load (DirAddr 2) 1
Pop 2
Compute Lt 2 1 1
Branch 1 (Rel 2)
Jump (Rel 14)
Load (DirAddr 1) 1
Push 1
Load (ImmValue 1) 1
Pop 2
Compute Add 2 1 1
Store 1 (DirAddr 1)
Load (DirAddr 3) 1
Push 1
Load (DirAddr 1) 1
Pop 2
Compute Add 2 1 1
Store 1 (DirAddr 3)
Jump (Rel (-19))
EndProg
```



Network with Shared Memory



Directories

- `https://github.com/leonschoorl/sprockell`

- Directory Structure
  - LICENSE
  - README.md
  - ▹ src
    - DemoCharIO.hs
    - DemoMandelbrot.hs
    - DemoFib.hs
    - DemoMultipleSprockells.hs
    - Sprockell.hs
    - ▹ Sprockell

Actual files in directory `src/Sprockell`

- BasicFunctions.hs
- HardwareTypes.hs

- Sprockell.hs

- System.hs

- Debugger.hs
- Simulation.hs

Compile Haskell for speed

```
$ ghc --make <File.hs>
$ ./<File>
```

Enjoy!