GPars

Groovy Parallel Systems

Václav Pech

About me

['Passionate programmer',
'Concurrency enthusiast',
'GPars lead',
'Developer/technology evangelist @ JetBrains'
].eachParallel {say it}

http://www.jroller.com/vaclav
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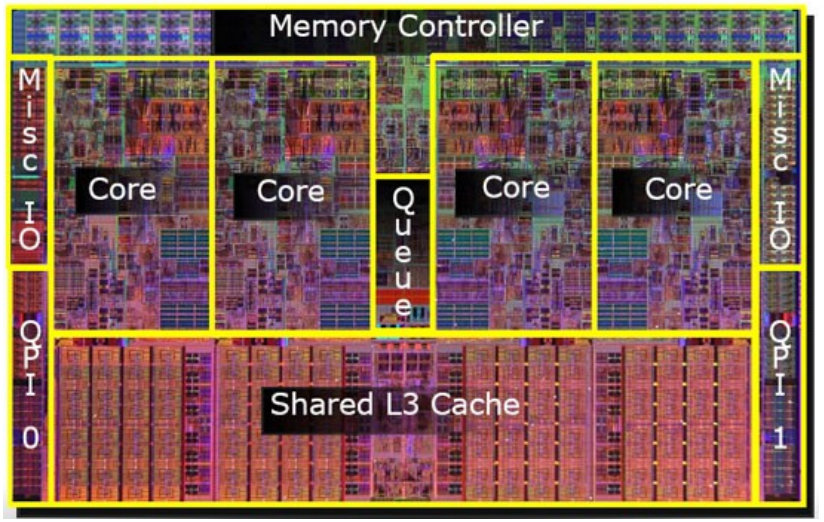
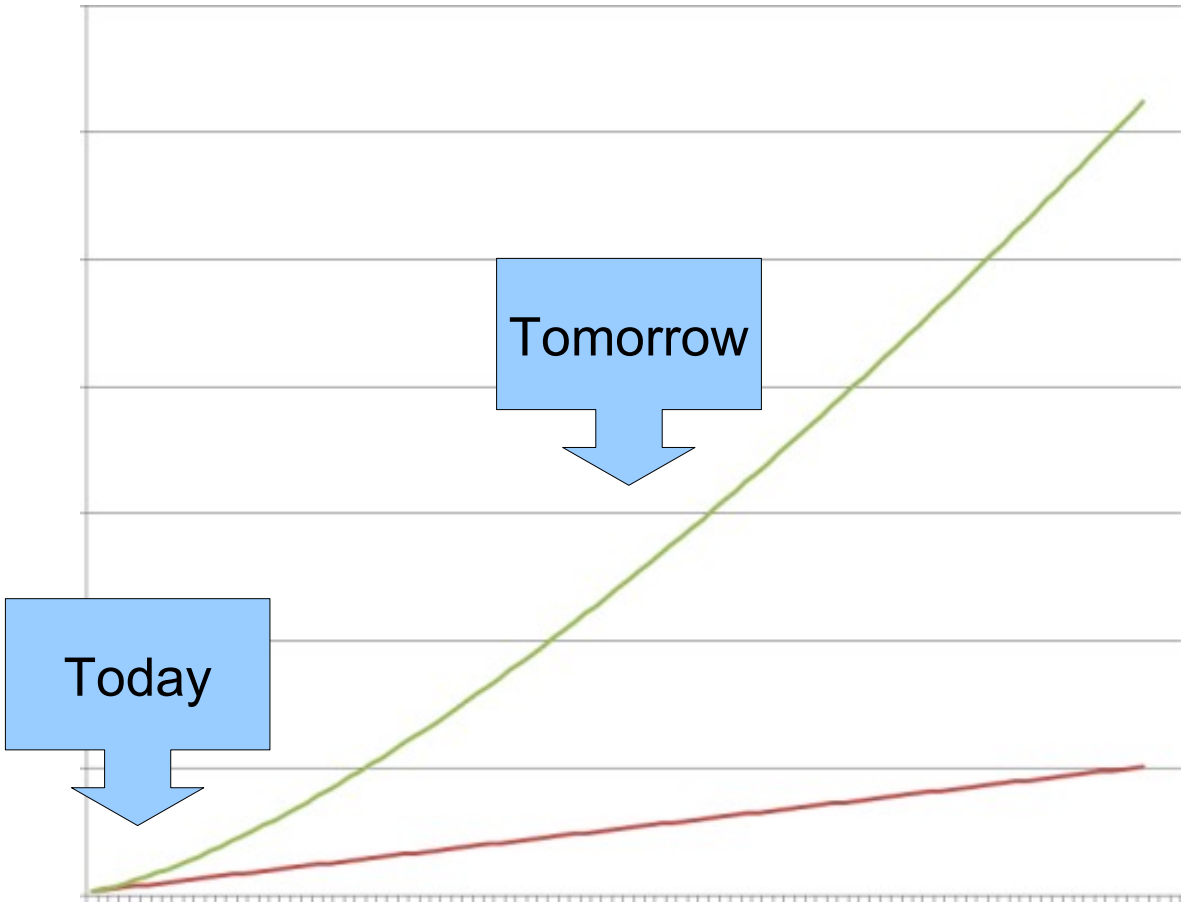
We're all parallel now



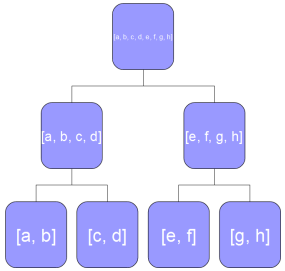
Use them or leave them!

of cores



Parallel Collections

images.eachParallel {it.process()}



documents.sumParallel()

candidates.maxParallel {it.salary}.marry()

Parallel Collections

```
progLanguages.parallel.filter {it.concurrent}
                      .max {it.javaInteroperability}
                      .map {it.logo}  ==
```

Languages are either concurrent or obsolete.

Java 5

Asynchronous calculations

Java 7

Asynchronous calculations

Fork/Join

Java 8

Asynchronous calculations

Fork/Join

Parallel collections

Scala

Asynchronous calculations

Fork/Join

Parallel collections

Actors

Clojure

Asynchronous calculations

Fork/Join

Parallel collections

Actors

Agents, Stm

Oz

Asynchronous calculations

Fork/Join

Parallel collections

Actors

Agents, Stm

Dataflow

Google's Go

Asynchronous calculations

Fork/Join

Parallel collections

Actors

Agents, Stm

Dataflow

CSP

- ✓ Asynchronous calculations
- ✓ Fork/Join
- ✓ Parallel collections
- ✓ Actors
- ✓ Agents, Stm
- ✓ Dataflow
- ✓ CSP

Agenda

- ✓ Asynchronous calculations
- ✓ Fork/Join
- ✓ Parallel collections
- ✓ Actors
- ✓ Agents, Stm
- ✓ Dataflow
- ✓ CSP

Actors

Processes with a mail-box

Share no data

Communicate by sending messages

Use a thread-pool

Active Objects

```
@ActiveObject
class MyCounter {
    private int counter = 0

 @ActiveMethod
    def incrementBy(int value) {
        println "Received an integer: $value"
        this.counter += value
    }
}
```

Composing async functions

```
int hash1 = hash(download('http://www.gpars.org'))
int hash2 = hash(loadFile('/gpars/website/index.html'))
boolean result = compare(hash1, hash2)
println result
```

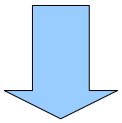
Composing async functions

```
@AsyncFun hash = oldHash
@AsyncFun compare = oldCompare
@AsyncFun download = oldDownload
@AsyncFun loadFile = oldLoadFile

def hash1 = hash(download('http://www.gpars.org'))
def hash2 = hash(loadFile('/gpars/website/index.html'))
def result = compare(hash1, hash2)
println result.get()
```

Composing async functions

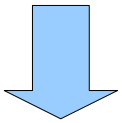
```
@AsyncFun hash = oldHash
@AsyncFun(blocking = true) compare = oldCompare
@AsyncFun download = oldDownload
@AsyncFun loadFile = oldLoadFile

def hash1 = hash(download('http://www.gpars.org'))
def hash2 = hash(loadFile('/gpars/website/index.html'))
boolean result = compare(hash1, hash2)
println result
```

int hash(String text) {…}



Promise<int> hash(*Promise<String>* | *String* text)

int hash(String text) {…}



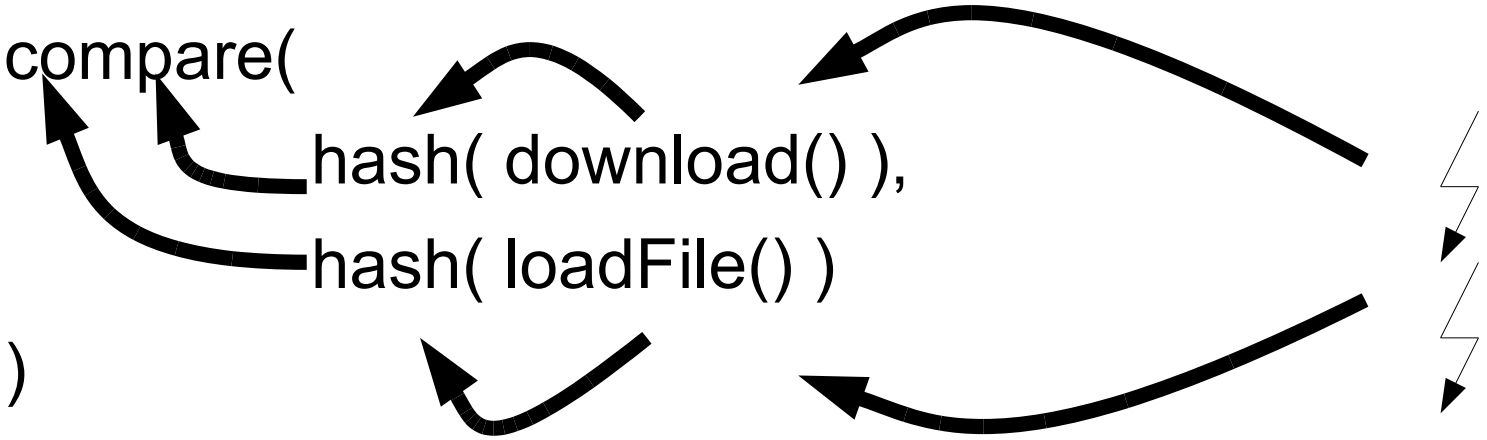
Promise<int> hash(*Promise<String>* | *String* text)

compare(

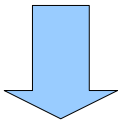
hash(download()),

hash(loadFile())

)



int hash(String text) {…}



Promise<int> hash(*Promise<String>* | *String* text) {

1. Return a Promise for the result
2. Wait (non-blocking) for the text param
3. Call the original *hash()*
4. Bind the result

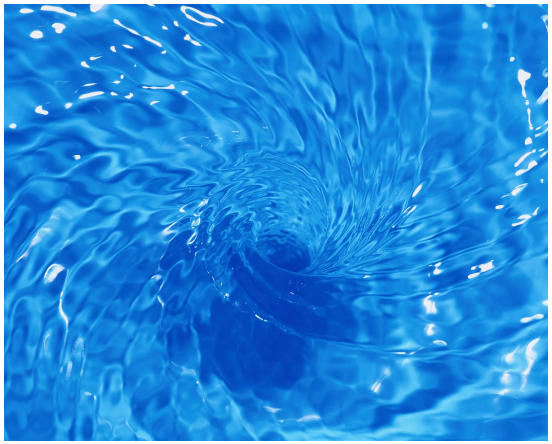
}

Composing async functions

Combine functions as usual

Parallelism is detected automatically

Dataflow Concurrency



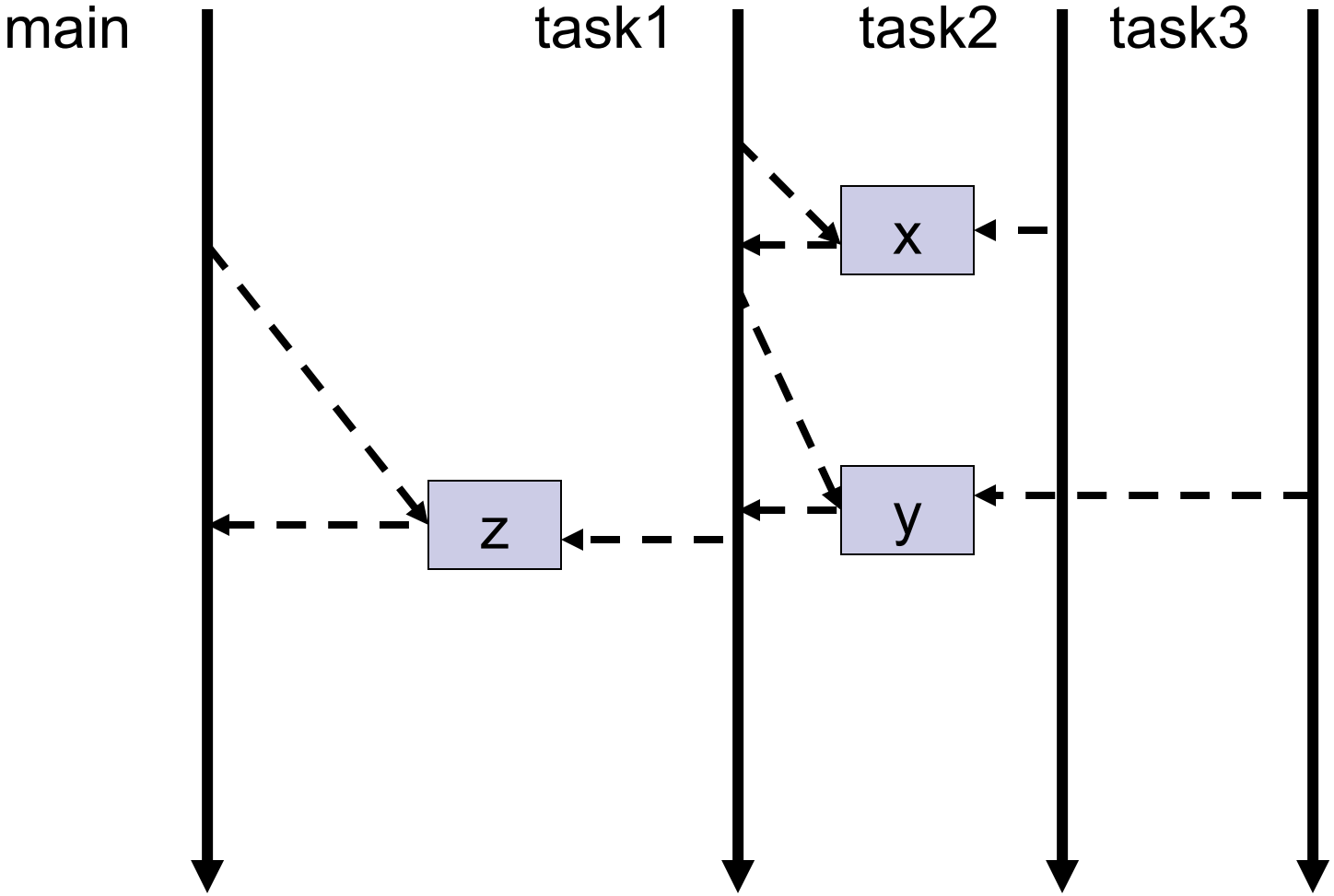
- No race-conditions
- No live-locks
- Deterministic deadlocks

  Completely deterministic programs

BEAUTIFUL code

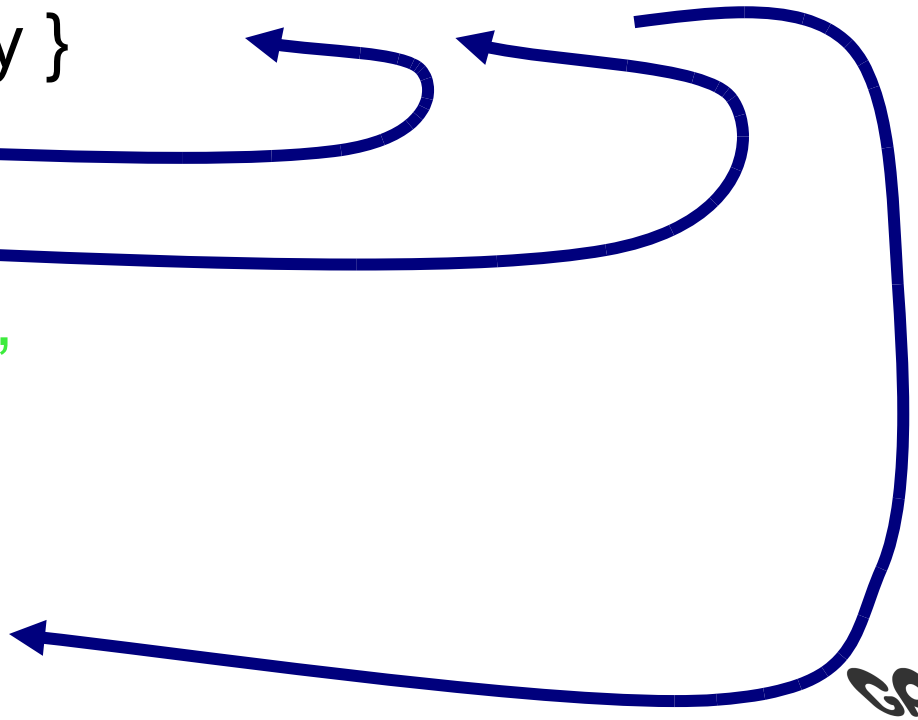
(Jonas Bonér)

Dataflow Variables / Promises



Dataflows

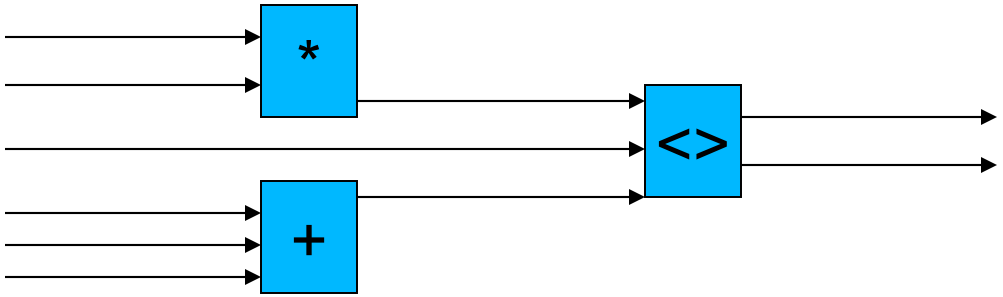
```
def df = new Dataflows()

task { df.z = df.x + df.y }
task { df.x = 10 }
task {
    println ”I am task 3”
    df.y = 5
}
assert 15 == df.z
```



GPars

Dataflow Operators

```
operator(inputs: [headers, bodies, footers],
         outputs: [articles, summaries])
    {header, body, footer ->
        def article = buildArticle(header, body, footer)
        bindOutput(0, article)
        bindOutput(1, buildSummary(article))
    }
```



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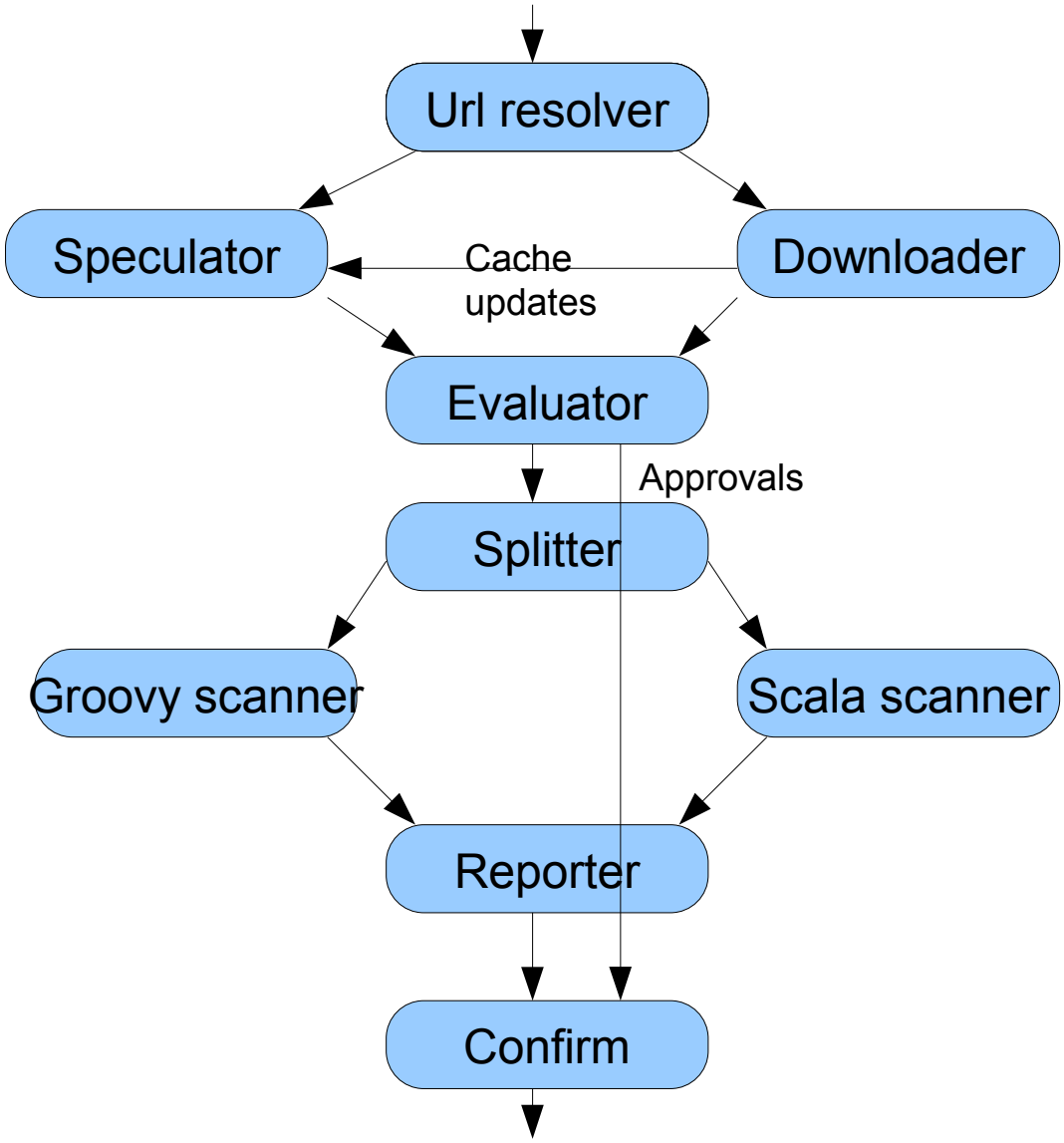
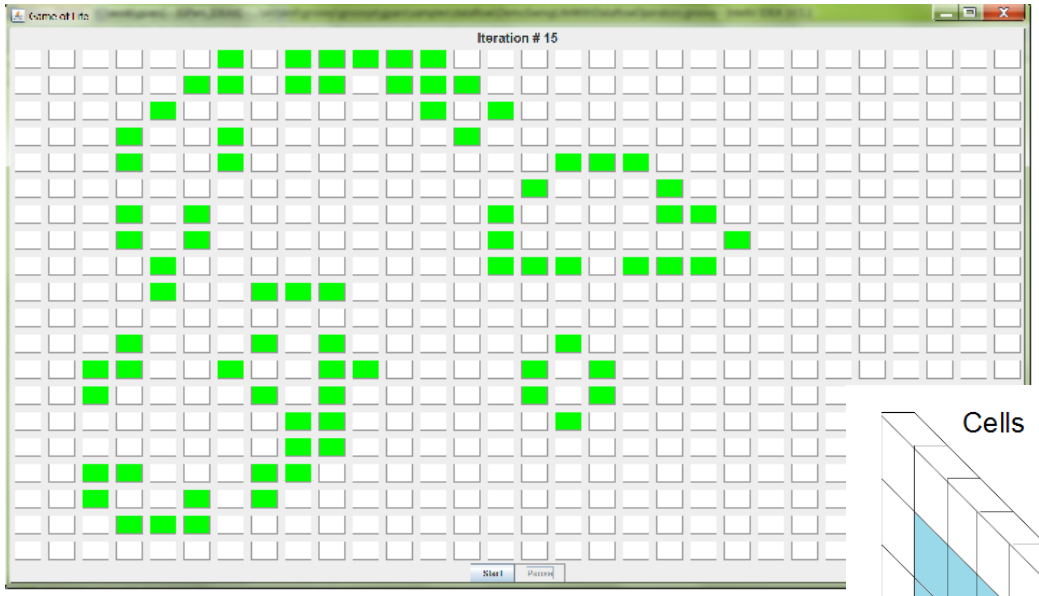
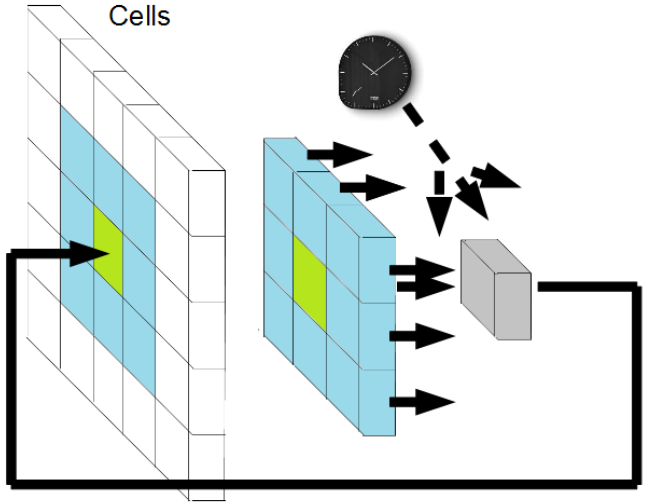
Dataflow Operators




Iteration # 15
Start
Pause


Cells

GPars

'coz concurrency is Groovy

Find more at:

http://gpars.codehaus.org

http://www.jroller.com/vaclav

http://twitter.com/vaclav_pech