Implementing Parallel Algorithms

Swarm – Multithreaded Framework

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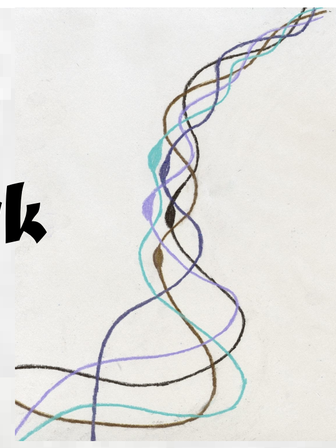
*continuation of **Minerva** project*



Basic principles:
- multithreading should not obscure the implementation of algorithms
- a user should see the program logic, not parallelisation artifacts
- thread scheduling and balancing should be automatic

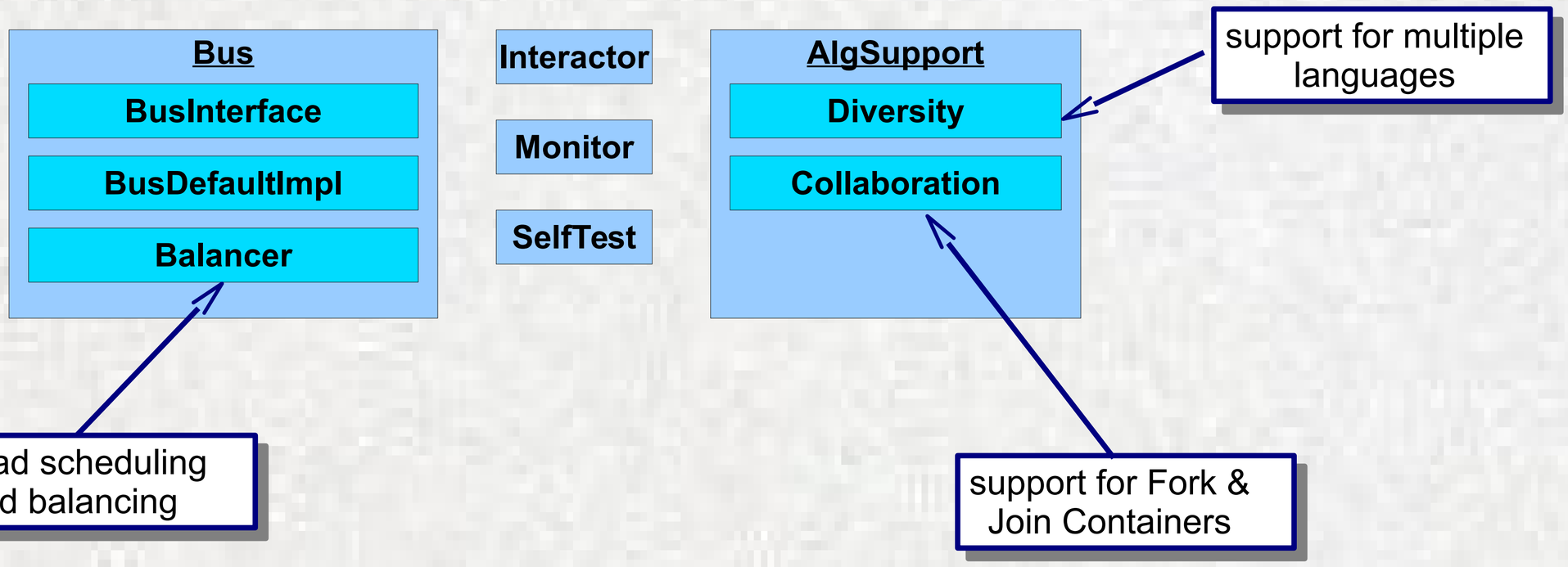
Two levels of parallelism:
- parallel Consumers/Producers
- *Fork&Join* algorithms on parallel containers

Uses:
- Java 7
- ObjectBrowser
- Colt
- JUNG
- BeanShell
- FreeHEP
- Generic Collections
- Concurrent
- Log4J
- Groovy
- Scala
- Clojure

Architecture:
- based on the classical *Producer-Consumer InfoBus* pattern
- all *BusMember*s declare their input/output *BusItem* types, including possible multiplicity (one BusItem processed by several Consumers)
- pluggable *Balancer* orchestrates Producer/Consumer threads to optimize performance

Design:
- based on advanced multithreaded architecture of Java 7
- allows BusMembers in JVM-compatible multithreaded languages (*Groovy*, *Scala*, *Clojure*)
  - possibility to re-write a part of the framework in those languages foreseen
- completely interactive with the graphical interface (various Observers)

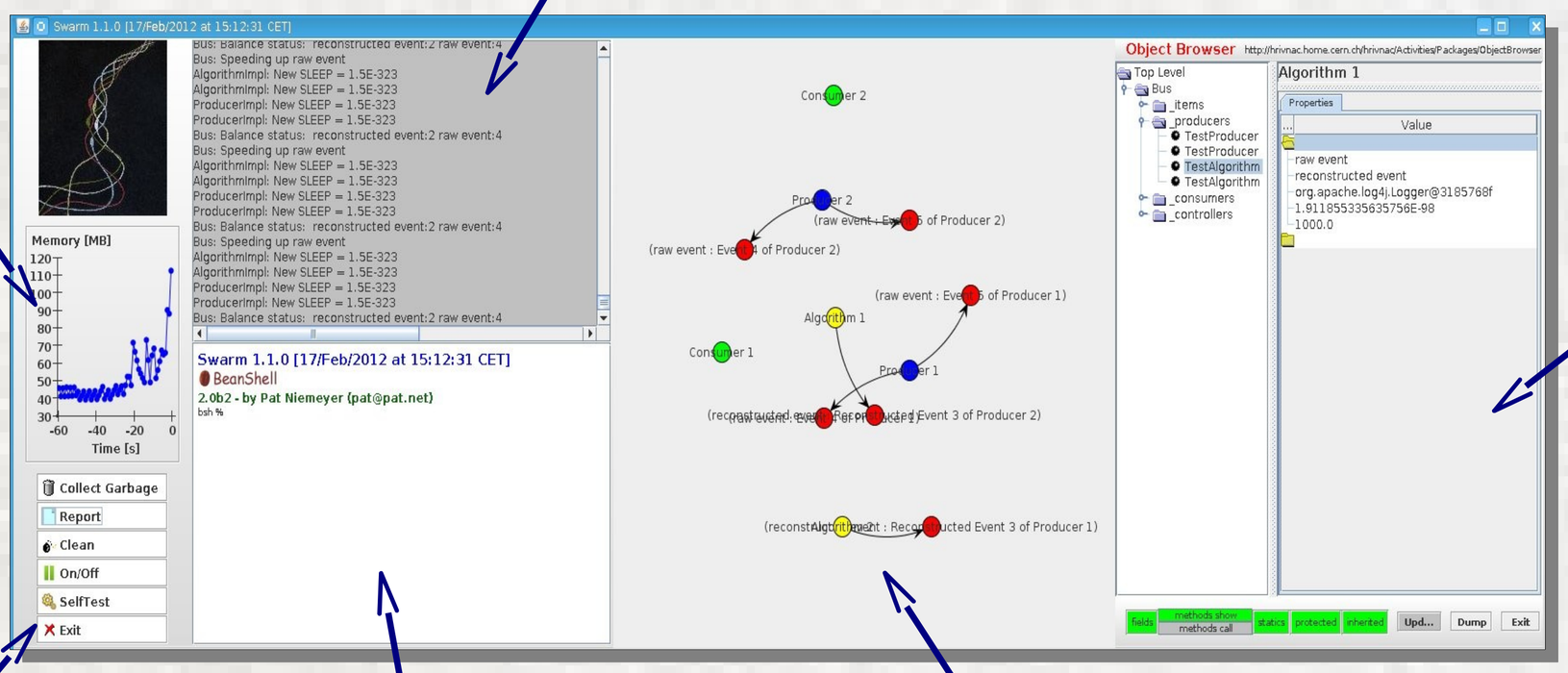
Future Evolution:
- persistency (Parallel IO)
- distributed operation



Memory consumption

Processing Log

Object Browser



Global Operations

Command Line
- full Java available

Dynamical Graphical view of
- Producers/Consumers/Algorithms
- BusItems
- calls

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