Smart Infrastructure for VLBI Software Correlation

A Pulsar is a rotating neutron star that emits electromagnetic radiation along its magnetic poles, analogous to a rotating lighthouse (Fig. 1).

The rotating beam is received on earth as a series of pulses (Fig. 2). The rotational period of the pulsars currently observed is between 1.56ms and 8.5s. Even though the individual pulses vary, the long term average pulse profile is highly stable.

Pulsars function as astronomical clocks, some have been observed to such high precision that their timing accuracy rivals that of terrestrial atomic clocks. This feature allows pulsars to be used as a tool study fundamental physics. Example applications include e.g. tests of general relativity and the search for gravitational waves.

A fundamental problem in detecting pulsar signals is that as a rule the pulsar duty cycle, defined as the ratio between pulse width and pulse period, is relatively short.

A significant improvement in signal to noise can be achieved by accumulating the correlation function only during pulse reception. This commonly is referred to as pulsar gating.

To obtain information about the pulse shape, the pulsar period is divided in a number of time bins. Each of these time bins is accumulated individually. This is referred to as pulsar binning.

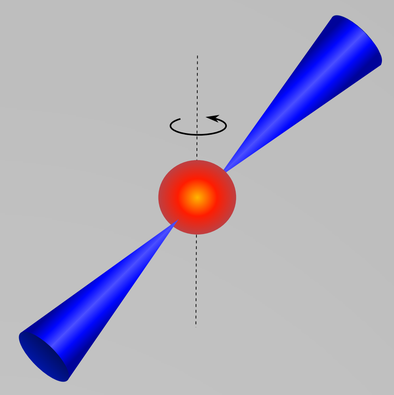


Fig. 1

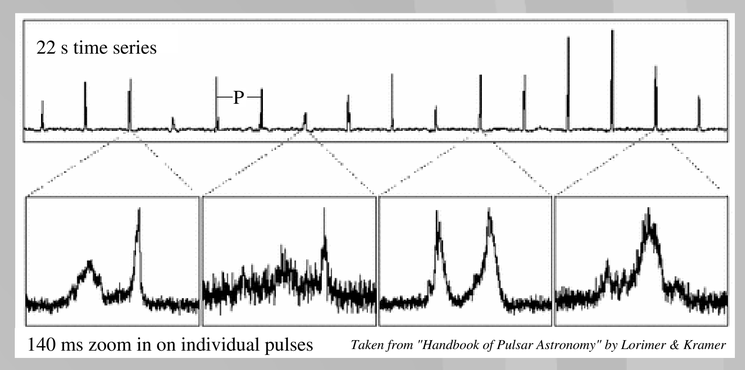
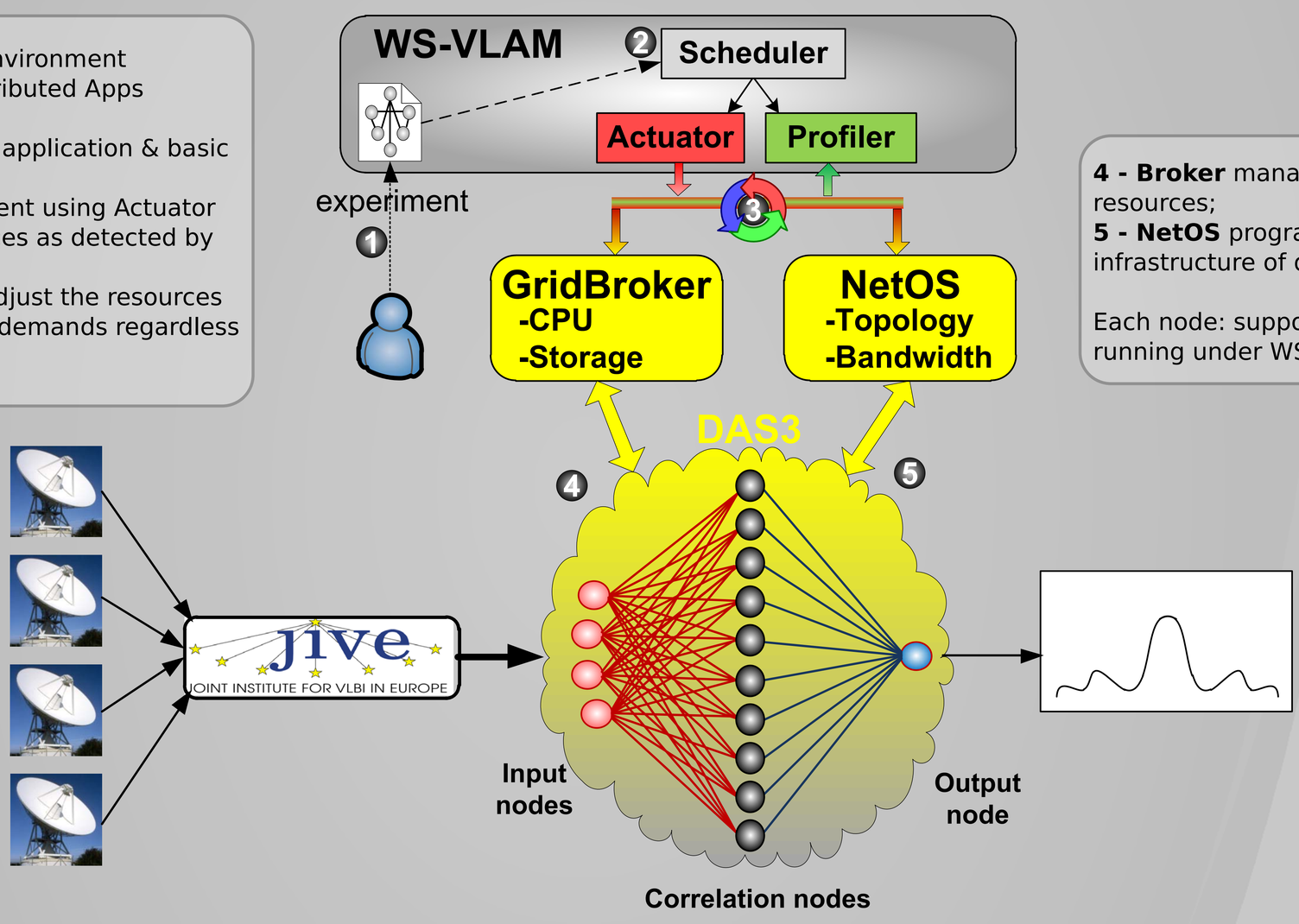


Fig. 2

WS-VLAM - workflow execution environment coordinates the execution of distributed Apps

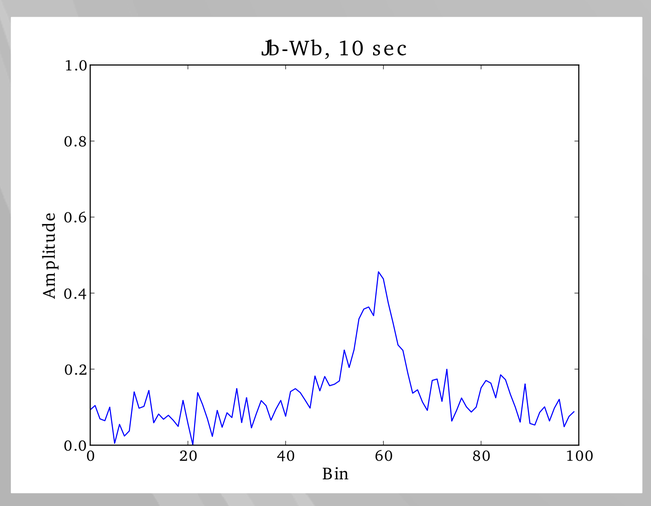
1 - User deploys an experiment: application & basic infrastructure requirements;
2 - WS-VLAM maps the experiment using Actuator onto available distributed resources as detected by Profiler;
3 - WS-VLAM is a controller to adjust the resources such as to solve the applications demands regardless of the environment changes;

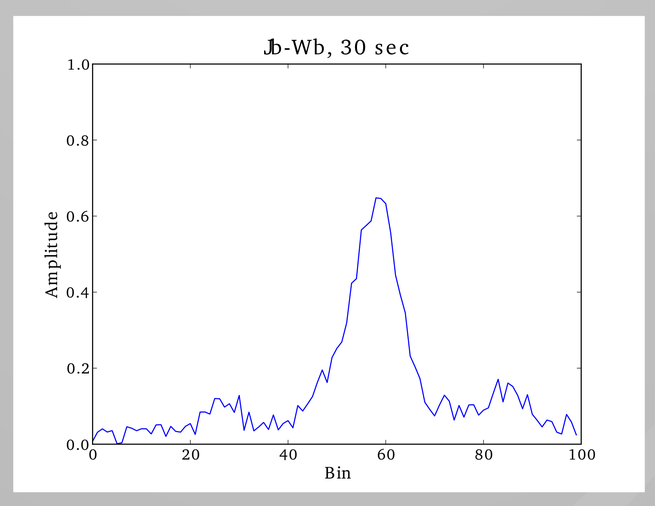


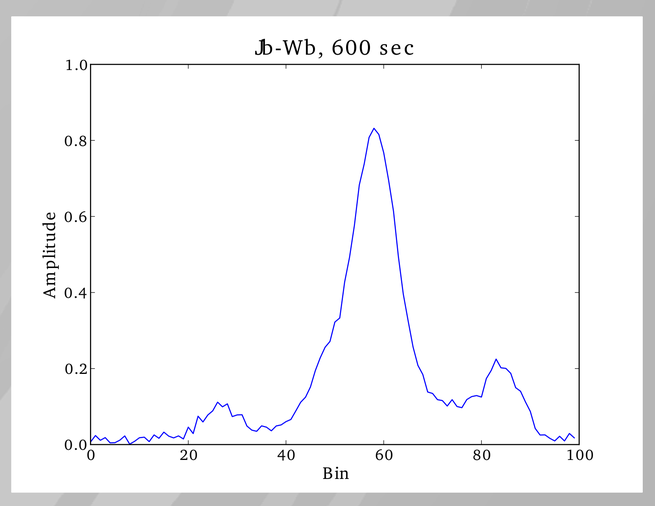
4 - Broker manages the computational resources;
5 - NetOS programs the networking infrastructure of distributed system;

Each node: supports the applications running under WS-VLAM supervision

Demo : accumulated pulse shape as a function of integration time







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