Network Control in Distributed Computing

Motivation: when over-dimension is unfeasible
- Large-scale observation systems monitor environmental objects such as dikes in order to prevent disasters, or watch radio wave emissions from stars;
- Large-scale observation systems are dynamic in their resource demands;
- Large-scale observation systems need distributed computing where the available resources are used in an optimum way. Hence, infrastructure topology matters;
- Distributed applications need specific network services and the ability to optimize themselves;
- Distributed computing platforms, such as Grids or Clouds need application support for network service development, deployment and management.

Applications that require specific network services that current distributed systems lack to deliver:
- **LoRes**: large scale sensor networks collect enormous amount of environmental data such as dikes and push the data into forecast models in order to predict dangerous events;
- **SCARLE**: a Grid-based software correlator for radio-telescope images requires high-throughput communication, but with specific services such as soft real-time or constant throughput.

Network services can be part of applications or stand-alone distributed programs.

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. Control loops may occur in which WS-VLAM is a controller to adjust the resources such as & priorizes 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;
- provides the application-specific network services through application components;
- ACo supported by network elements NEs.

Management of the programmable network services in a distributed computing leads to a dedicated operating system for network resources.

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