SP 2.1 Interactive Problem-Solving Environments

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Subsubprograms

SP 2.1.1 Interactive Algorithms: Distributed Cellular Automata (LGA/LBE)

SP 2.1.2 Legacy code: HLA services

SP 2.1.3 Fault Tolerance: CheckPointing services

SP 2.1.4 Integration SimVisInt

SP 2.1.5 Dissimination & Technology Transfer

SP 2.1.6 Software Engineering for Certification

Dynamite

- User-space checkpoint-migrate-restart system for sequential and parallel (PVM and MPI) programs on Linux.
- Single process checkpointer
- PVM library, allowing the migration of a single process in a running job in a single cluster. Intended for load balancing.
- MPICH library allowing checkpoint-and-continue and checkpoint-and-stop checkpoints of entire MPI jobs. Intended for fault-tolerance.
- MPICH load-balancing library.
- Maintenance issues: kernel, glibc versioning.

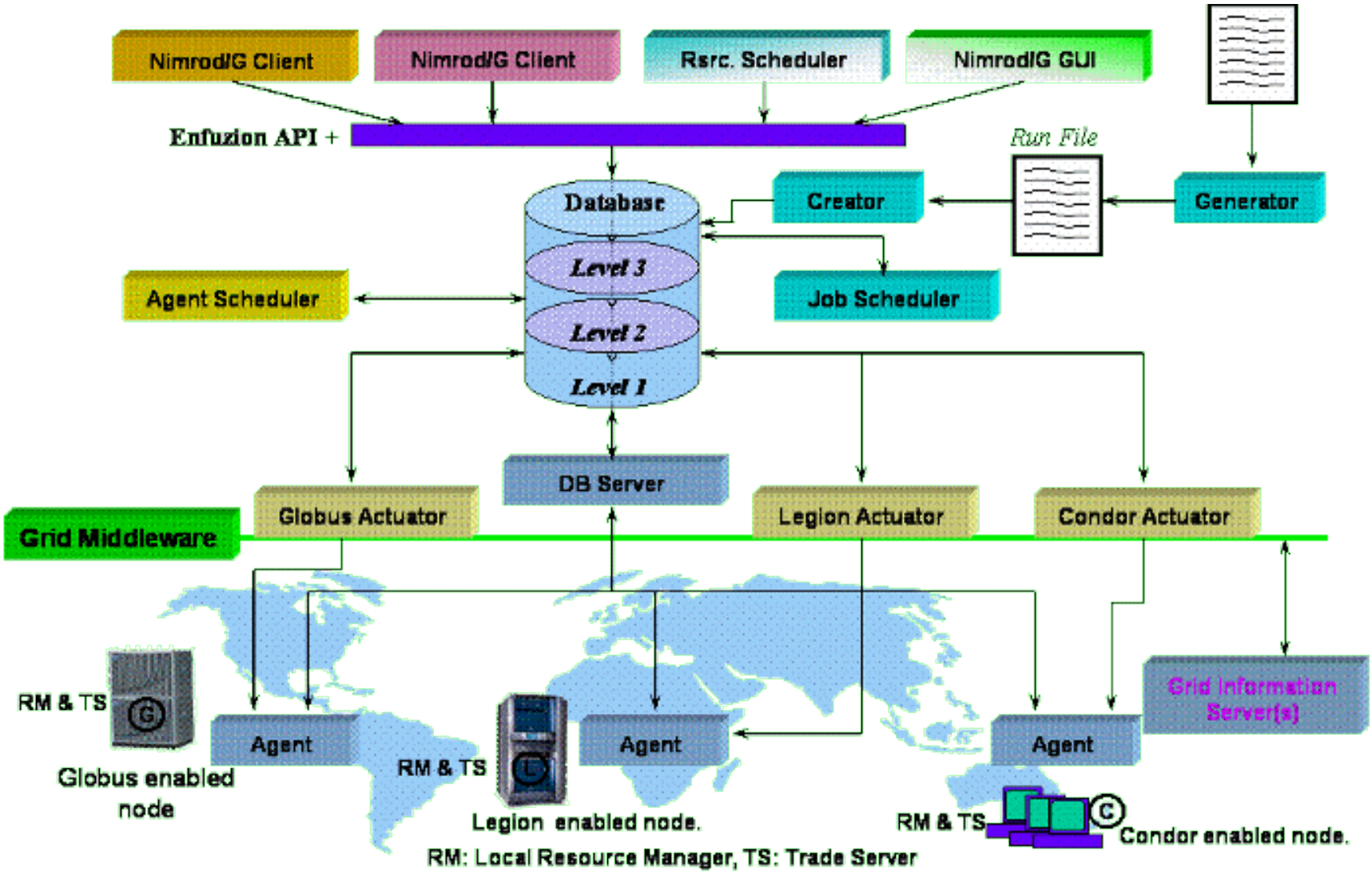
Parameter sweeping and multi-objective optimisation

- Collaboration with Abramson, Monash Univ. Melbourne.
- Exploration, optimisation, search.
- Computational experiments, simulations, etc.
- Applications to:
  - cellular developmental regulatory networks.
  - light scattering by interstellar dust particles, blood cells, etc.
  - inverse modelling of ground water models & flood warning.
  - bird migration routes.
  - coral growth patterns.
  - PECVD virtual reactor; optimising virtualisation.
  - image processing, pattern recognition.
  - text mining.

Nimrod

- manages execution of parameter studies across distributed computers.
- experiment management,
- manages distribution of files to remote systems, remote computation and gathering results.
- Architecture
  - Nimrod agents.
  - Nimcache database.
  - Python layer & SQL database.
  - Command-line interface.
  - Web portal.

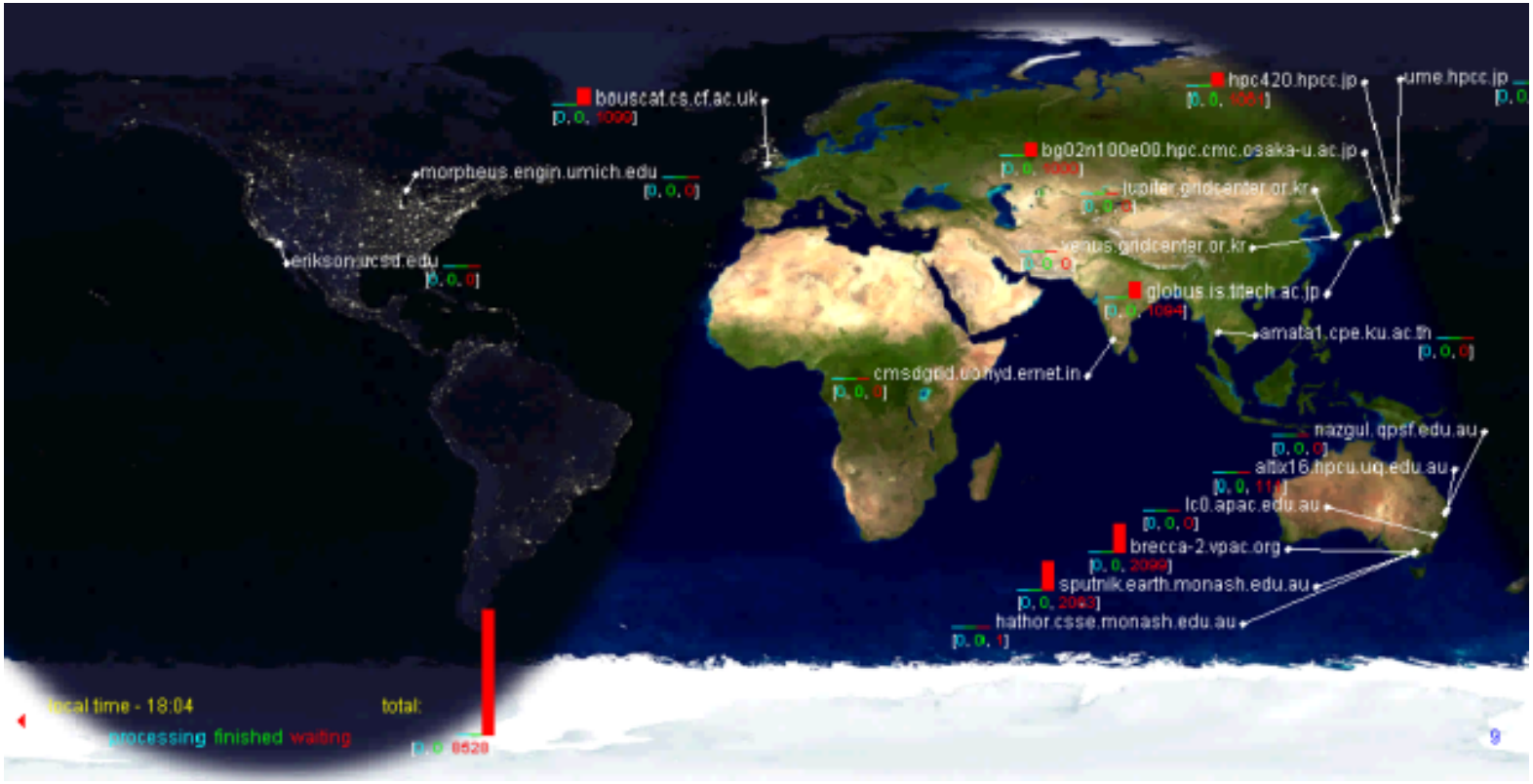
Nimrod architecture



Nimrod experiments

- parameter sweeps & optimisation.
- plan file & schedule file.
- experiments.
- computational resources.
- submission.
- monitoring.

Nimrod portal



Extending Nimrod

- parallel MPI tasks.
- computational steering of optimisation processes.
- more expressive plan language: multi-tiered, adaptable, strategy-switching.
- augmenting strategies; SCEM, Sim Ann cooling schedules, parameter selection and fusion.
- multi-objective optimisation.

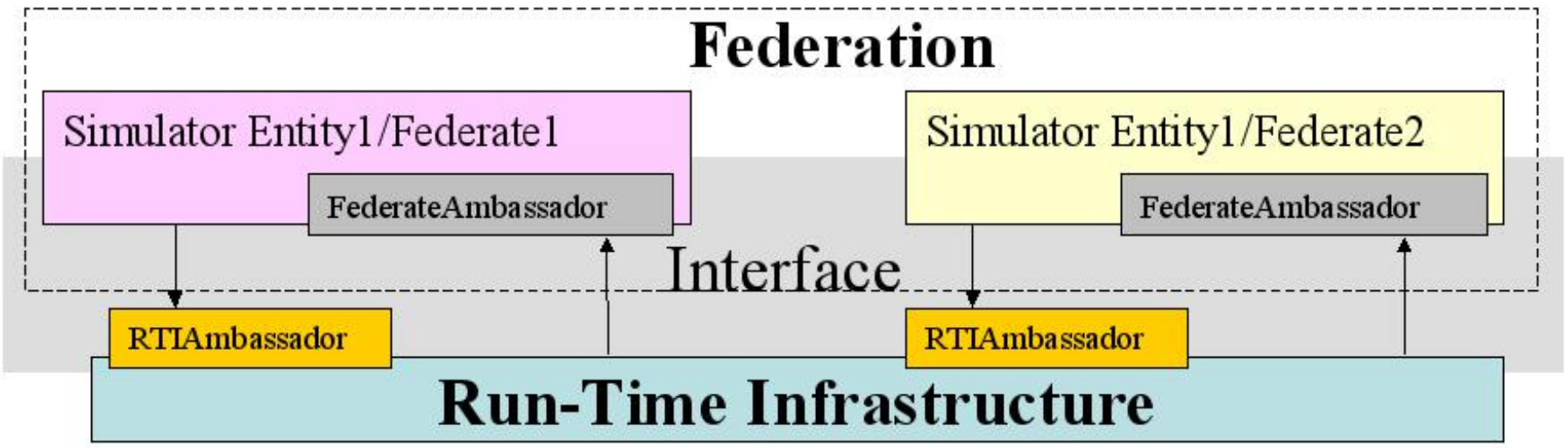
MPI Toolbox for Octave

- Need for parallelisation of Matlab/Octave code. Nature of applications.
  - medical imaging
  - biodiversity
  - biological
- MATLAB licensing issues.
- MPITB interface between MPI & Octave.
- Master/slave, job farming paradigm.
- SRB access.

High-level Architecture

- General purpose architecture for reuse and interoperability of computer simulation systems.
- Developed by the US Dept of Defense.
- Components
  - Interface specification to Runtime Infrastructure middleware (RTI).
  - The Object Model Template specifies what information is communicated between simulations.
  - Rules that simulations must obey to comply.
  - Base Object Models: reusable packages of information representing independent patterns of simulation interplay.
- Recently open-sourced: OHLA implements HLA RTI 1.3 and IEEE 1516.

HLA


Federation
Simulator Entity1/Federate1
FederateAmbassador
Simulator Entity1/Federate2
FederateAmbassador
Interface
RTIAmbassador
RTIAmbassador
Run-Time Infrastructure

The Grid HLA Management System

The Grid HLA Management System supports running HLA-based distributed interactive simulation applications in a Grid environment.
(Katarzyna Rycerz thesis defence 13 June)

HLA speaking service acts as interface to HLA legacy application code on its Grid site.

HLA migration service acts as a conductor for HLA speaking services on source and destination sites for required migrations. Uses GridFTP.

Grid HLA Controller Library interfaces HLA legacy code to the HLA speaking service. Enables checkpointing.

Benchmark services help make decisions about where to migrate.

OCM-G HLA wrappers to allow HLA legacy code to be monitored by the OCM-G monitoring system.

Versions: GT3.2 Globus GRAM v 2.4, tested with HLA RTI 1.3v5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