RADICAL-Cybertools: An Overview

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PLACEHOLDER LOGO

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What does RADICAL do?

RADICAL Cybertools is a collections abstraction-based tools that are architected for scalable, interoperable and sustainable operations on high-performance and distributed computing systems. The three main components of the suite are:

- RADICAL-SAGA
- RADICAL-Pilot (RP)
- EnsembleMD Toolkit

The RADICAL group develops these components as open source projects with the goal of providing application level control over high-performance resources, as in the case of RP, and abstracting common tasks and patterns across those resources, as in the case of EnsembleMD. The Cybertools account for the heterogeniety of distributed computing resources (DCRs) and expose simple interfaces to the user for work at various levels (rephrase?).

Why Pilots?

Currently, many scientific simulations are performed by submitting many similar executables to a DCR and then waiting for each to be scheduled, executed, and probed for output data. The time-to-completion for such simulations becomes impractical as the number of tasks increases, which hinders progress on those projects. To combat this, Pilot systems were introduced to obviate the need to schedule each task, and have the following properties:

- Submitting only the Pilot to circumvent the scheduler.
- Achieve spatial and temporal locality for related tasks.
- Decreased time-to-completion.

Projects

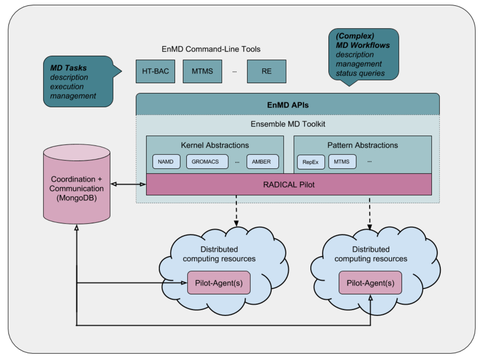

Figure 1: The EnsembleMD Architecture

Users of RADICAL-Pilot (RP) interact with the API by describing Compute Units, which represent the task, and a Pilot. Once instantiated and described, the Pilot is submitted to the Pilot Manager and the Compute Unit is submitted to the Unit Manager. These entities manage the launching of the Pilot and Compute Units onto the Distributed Computing Resources, where the Pilot Agent is instantiated and carries out the execution of the tasks.

The EnsembleMD Toolkit consists of a series of Execution Patterns and Kernels that provide a simple interface for running high-performance tasks on a distributed computing resource (DCR). Using the API, a user can avoid placing each task into the queue by specifying the target machine through the Execution Context interface, the simulation through the Kernel interface, and the Execution Pattern through the Pattern interface. Once these entities are specified, the RADICAL-Pilot API is invoked to translate the descriptions into a Pilot and its associated Compute Units, and then to execute the simulations on the desired resource.

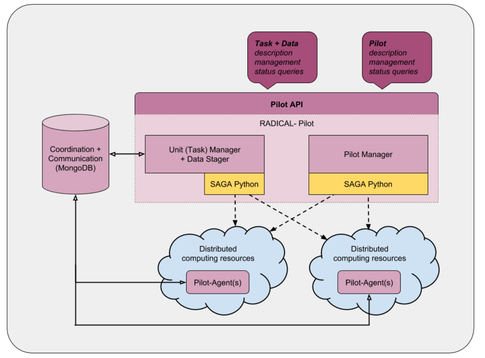

Figure 2: The RADICAL-Pilot Architecture

Additional Projects

(AIMES, etc.)

Using RADICAL-Pilot (RP)

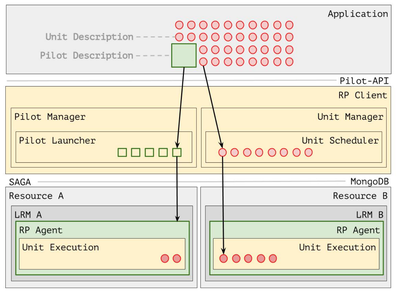

Figure 3: Figure caption

Who uses the Cybertools?

A number of groups around the globe use RADICAL-Cybertools. Some of our current collaborators are:
RADICAL-SAGA

- Atlas Experiment
- Super Kamiokande

RADICAL-Pilot

- Replica Exchange
- EnsembleMD Toolkit

References

Future Research

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Contact Information

Web radical.rutgers.edu
RP Docs http://radicalpilot.readthedocs.org/en/lat