GPUnit

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Overview

Introduction

Purpose
- Purpose of GPUnit
- Target Audiences

Components and Features

User Interface
- Experiment Editor
- Cluster Control
- Module Specification

Testing

Demo

Motivation

- Astrophysics researchers need to simulate star clusters and galaxies.
- Every star pulls on all of the others: $O\left(n^2\right)$ for the naive case.
- Stars evolve over time, mass changes.

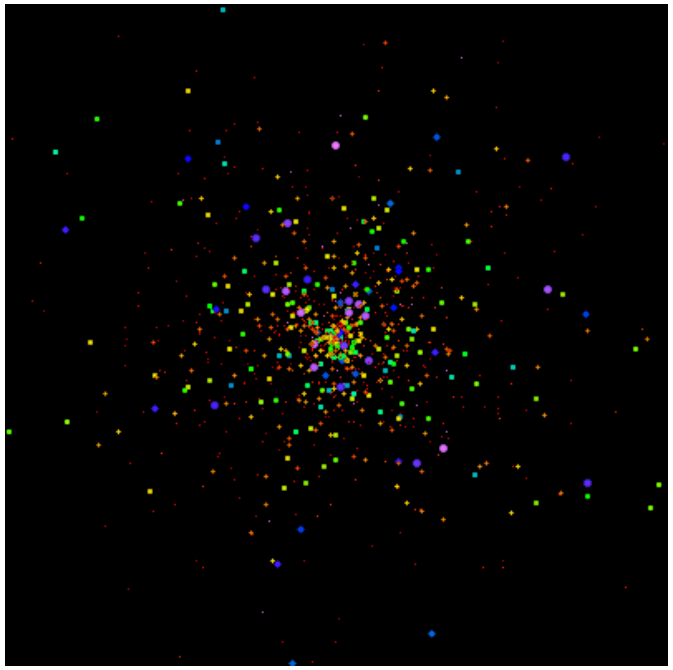


Figure: N-Body Simulation: 1024 Stars

http://www.sns.ias.edu/~starlab/animations/

Astrophysical Multipurpose Software Environment (AMUSE)

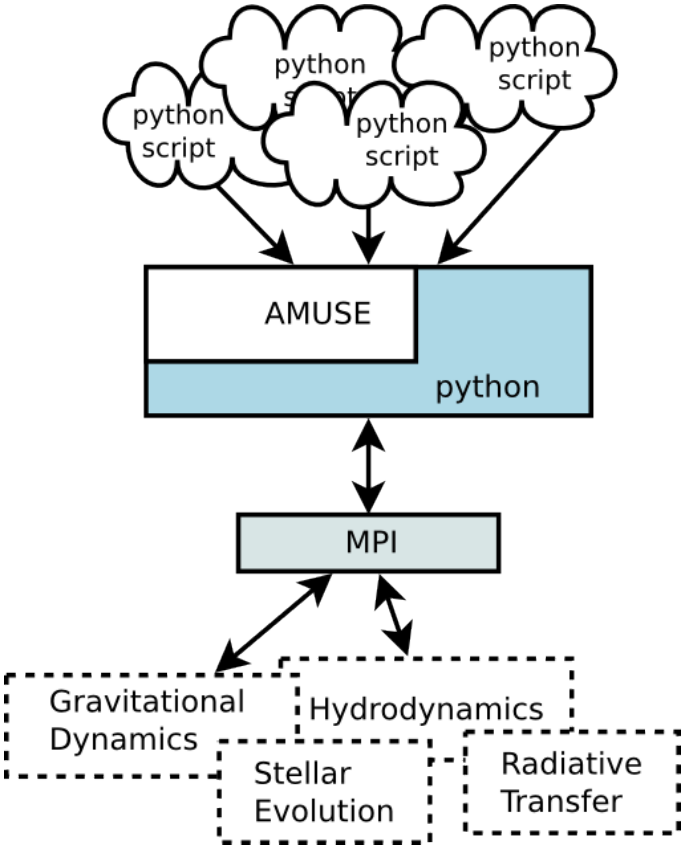


Figure: AMUSE Architecture

State of AMUSE

- Currently used by researchers to run large-scale simulations.
- Scripts, diagnostics, logging are all written by hand.
- AMUSE API/programming knowledge is required to create experiments.

Purpose of GPUnit

- Ease the use of AMUSE
- Create/Design/Modify experiments
- Select, configure, swap out modules and initial conditions
- Store and restore progress of running experiments.

Target Audiences

- Physics Students
- Observational Astrophysicists
- Theoretical Astrophysicists

Features and Design

- Configurable experiments that can be saved and shared.
- Diagnostic tools that compute useful metrics.
- Storage of experiment state in case of crashes.
- Interface for custom diagnostics and code.

Features and Design

- Written in Python using the PyQt4 GUI toolkit.
- AMUSE is written in Python, improves interaction.
- Provides a display of cluster usage to aid in scheduling.

Experiment Editor

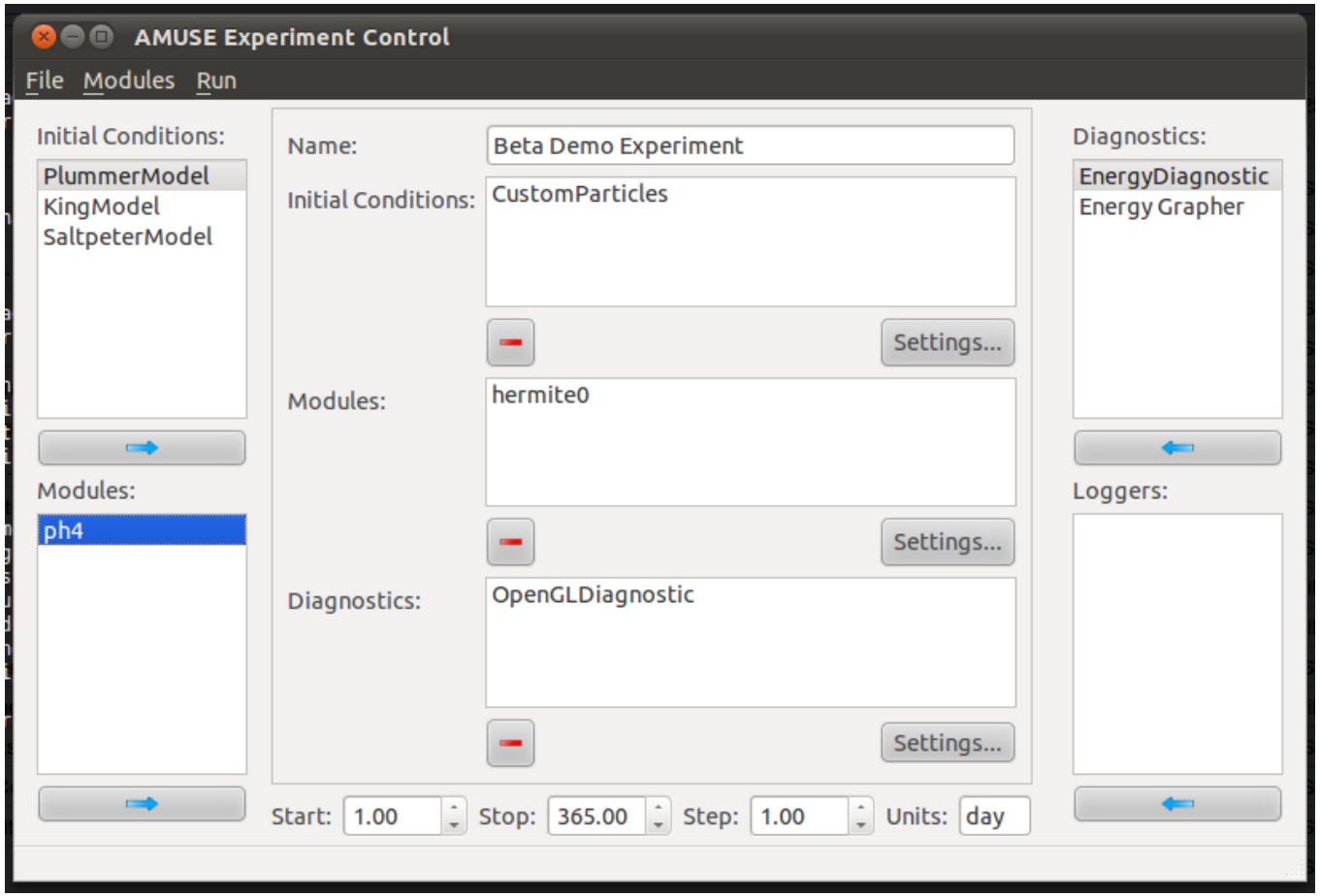


Figure: Experiment Editor

Cluster Control

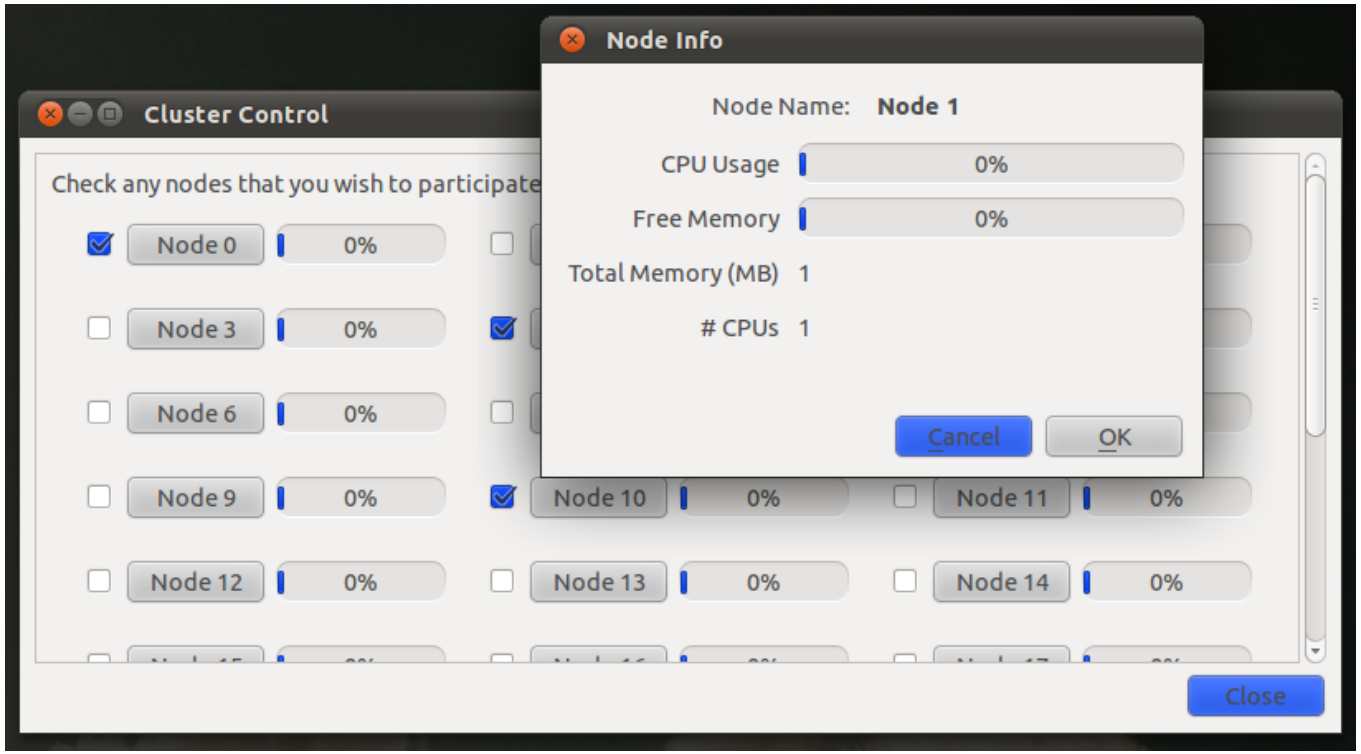


Figure: Cluster View

Module Specification

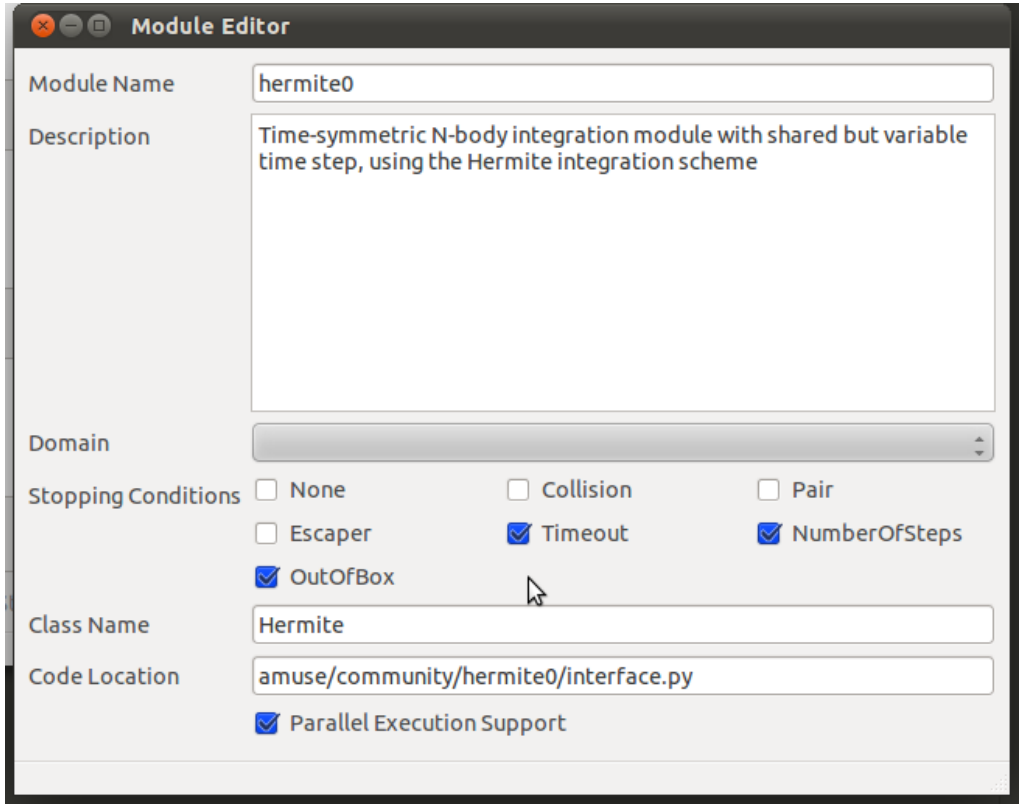


Figure: Module Editor

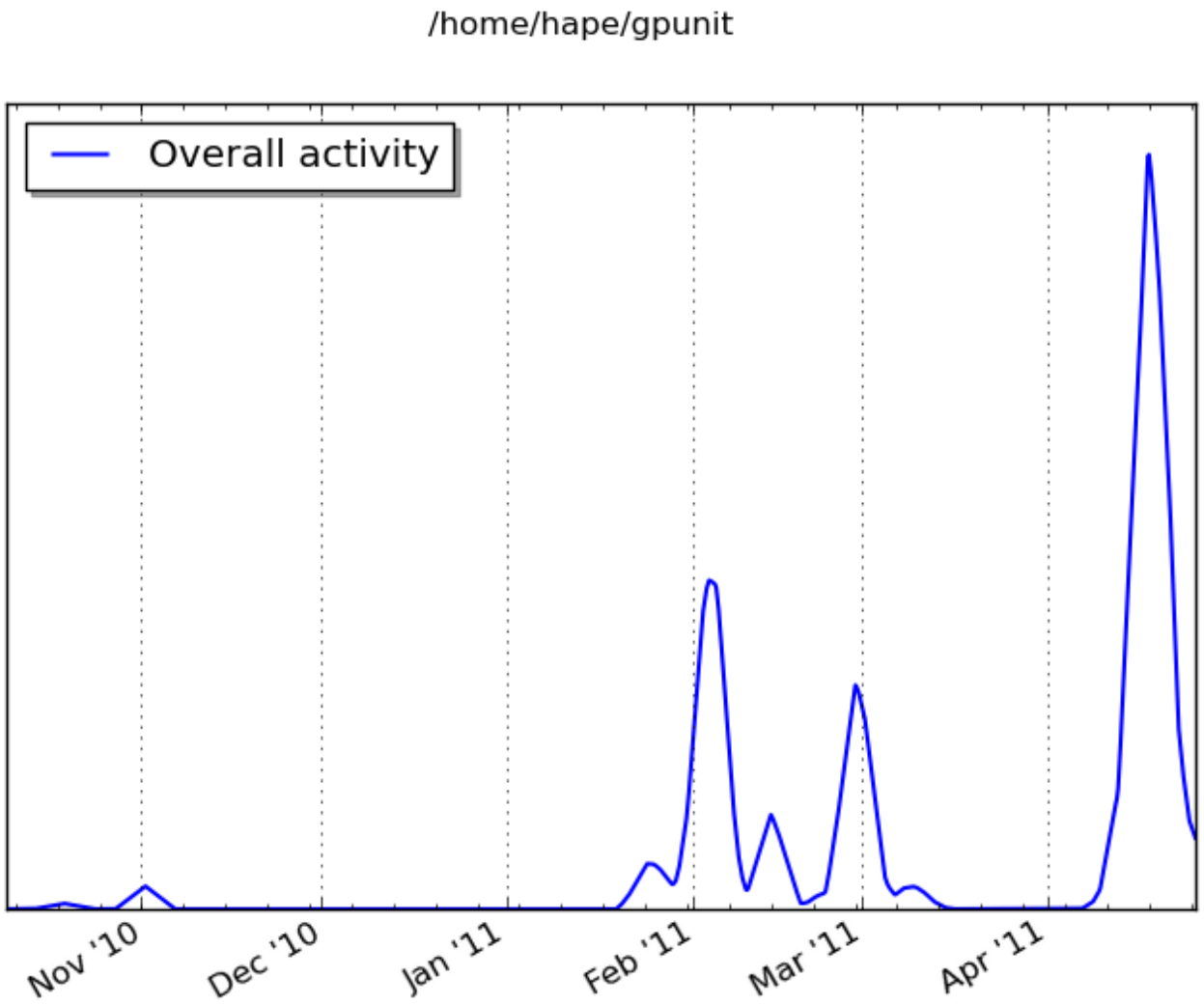
Tests

- Table of tests that pass.

Team Management

- Used Mercurial as our version control system.
  - Distributed, allows offline commits.
- Team met weekly.
  - Once to plan work, once to code.
- Bi-weekly advisor meetings.

Commit History



Demo

- Demonstrate a simulation from start to finish here.

Questions

- Questions?