An Introduction to CodeRunner

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What is CodeRunner?

- CodeRunner is a framework for the automated running and analysis of simulations.
- Because it is a modular system, it can easily be customised to work with any system and any simulation code.

Website: http://coderunner.sourceforge.net

Motivation

- Large amounts of computer time available allowing large parameter scans as well as just single “hero” calculations.
- “Human time” more valuable resource than computer time.
- Large amount of human time spent:
  - Editing and naming input files.
  - Performing standard analysis.
  - General faff.

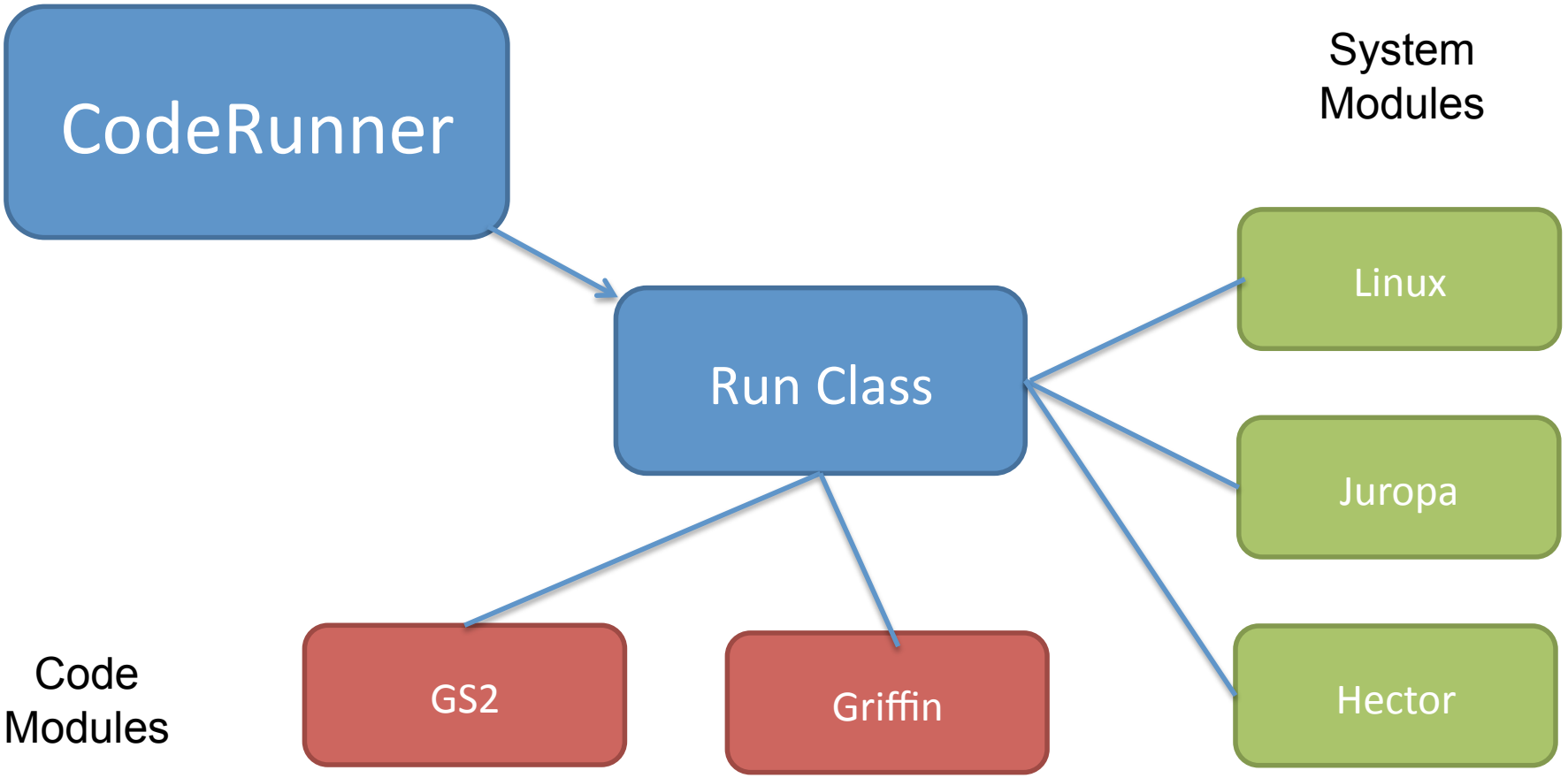
Motivation

- Many hundreds of simulation codes and HPC systems.
- Each has a different and sometimes complex interface.
- Lots of time spent learning each one.

CodeRunner

- CodeRunner provides a simple universal interface to submit jobs on any system for any code that it has been implemented on.
- CodeRunner does all the organising and sorting:
- It automatically generates any necessary input files, organises the output data and analyses it.

CodeRunner Structure



Making New Modules

- Making new system modules is easy.
  - Start with an existing one.
  - Duck typing
- Making new code modules is a little harder.
  - Can leverage pre-existing analysis code.
  - Can directly interface with Python libraries
  - A package exists for codes that use Fortran Namelists.
- Today just looking at a pre-existing code module: GS2crmod.

Interfaces

- CodeRunner has three interfaces.
  - Command line
  - Interactive mode
  - Ruby scripting API

CodeRunner Help and Documentation

- Command line manual.
- Online tutorials
- Dynamically available documentation for the API.

GS2crmod

- GS2crmod is the module that allows CodeRunner to run and analyse GS2.
- Knows about every GS2 input parameter and can provide help for each one.
- Generates GS2 Input files
  - With sanity checks
- Analyses GS2 ouput
  - Calculates Growth Rates
- Allows CodeRunner to plot many different graphs.
- Website: http://gs2crmod.sourceforge.net

Visualizations

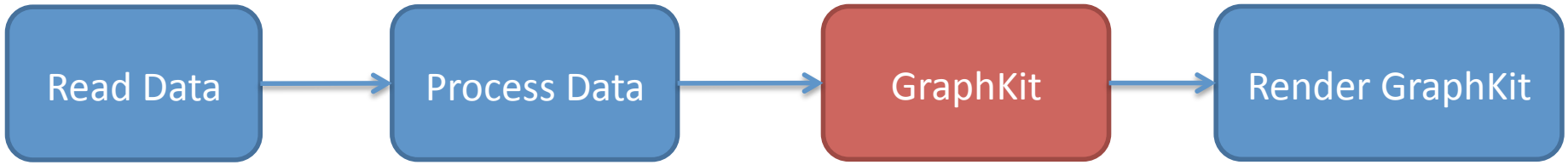
- GS2crmod provides a visualisation API for GS2

The Goal

- A simple, portable API for GS2 that will allow:
  - Easy data analysis
  - Easy visualisaton of GS2 results
  - Other systems to access GS2 data
- Other Goals:
  - Standardisation of GS2 results (definition of a namespace of visualisations)

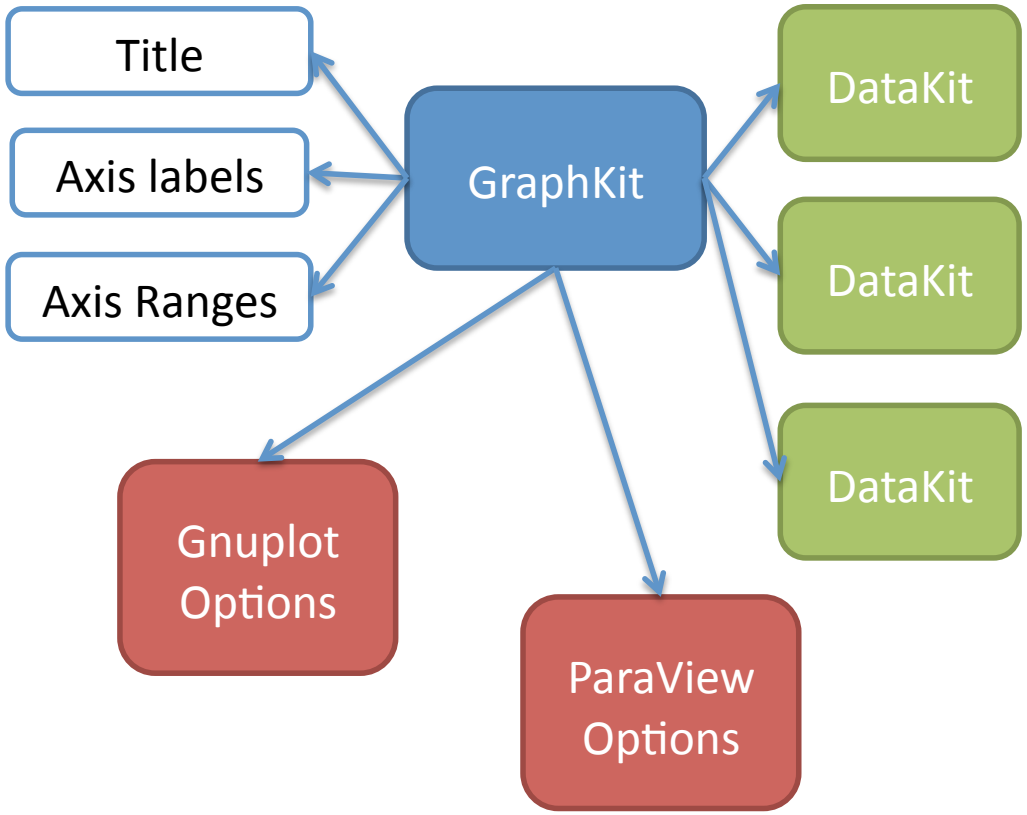
GraphKits

- A visualisation or graph is a rendering of a set of data points in 1-5 dimensions, (e.g 3 space, colour, time) into an image.
- A *GraphKit* is an object which contains *everything you need to make such a visualisation*.
- It is an intermediate stage:



GraphKit Structure

- GraphKits consist of three parts.
  - Standardized Data Container.
  - Standard basic graph options.
  - Non standard custom options for various pagcakges.



The API in Ruby

```
runner = CodeRunner.fetch_runner('a/folder/')

runner.conditions = 'g_exb==1.0'

graphkit = runner.run_graphkit('phi2tot_vs_time')

graphkit.gnuplot # plot in an X11 window

graphkit.gnuplot_write('phi_graph.eps')
```

All graphs can be plotted from the command line.