Software Process
UV-CDAT Software Process

- **AGILE** software development
- Distributed version control and **topic based** workflow
- Sophisticated build system using **CMake**
- **Regression testing framework** and dashboards
AGILE Software Development

• AGILE software process is
  – A collection of software development methods based on iterative and incremental development
  – Key points: Iterative development, continuous integration, working software, frequent releases, priority based backlog, testing, regular scrums, strategy (funding, goals, vision).

• AGILE software process using Kitware's suite of tools
  – CMake
  – CTest
  – CDash
• Topic Workflow
Advantages

- Efficient management of contributions from a large number of developers located in different geographical locations
  - UV-CDAT uses Git, a well reputed distributed version control system (DVCS)
- Encourages continuous development
  - Developers can create a new topic branch from the master / published repository
- Supports test driven development
  - Maint (gatekeeper / published) branches are tested continuously and nightly
  - Each new feature branch should add a new test for the validation of that feature
CMake Build System

- UV-CDAT source code consists of various tightly and loosely coupled libraries and toolkits
- Sophisticated build system is required to build the entire package in a uniform environment
- Build system should provide flexibility to adapt to various computing environments and platforms
- Build system should log warnings and errors
- Build system needs to support regression and unit testing
- UV-CDAT build system uses CMake, the cross-platform, open-source build system
Build System Overview

- Root
- Python
  - Others
  - NUMPY
    - Matplotlib
    - mpi4py
  - python_pkg
  - python_deps
  - python_external

Build Order
External Packages

• Each package is considered an **external package**
• `name_pkg` adds package to the UV-CDAT build system
• `name_deps` defines package dependencies which are then used by the build system to perform topological sort and correct build order
• `name_external` defines the build steps which includes downloading (if not present in the cache), and building the package on the host system.
Key Features

- Fulfills core requirements (referred earlier)
- Provides option to skip individual packages as long as its not required by any other active package
- Provides option to skip a group of packages
  - For client side build, user can skip building parallel components
- Enables packages to be downloaded via various mechanisms; git://, Http, Ftp etc. via CMake External Project feature
- Enables optional build steps; pre and post which are used to patch a particular package or run post build cleanups
- Each build step for a package is logged to remove information clutter and to identify any subtle build failures
- Enables parallel build
Regression Testing Framework and Dashboard

- Integrate plugin more tightly into the UV-CDAT infrastructure
- Added automated regression testing framework to UV-CDAT
- Uses **CTest**, and **VisTrails** scripting interface
- For each recorded test, framework replays the test and compares the generated image with the baseline (correct) image within certain threshold.
- At the end of the tests run, results are submitted to the **UV-CDAT dashboard**.
- Currently we have multiple dashboards submissions covering various flavors of Linux and Mac OS X
## UV-CDAT Dashboard

### Nightly

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<th>Site</th>
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<th>Configure</th>
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