

To/MS: EES-16
From/MS: Carl W. Gable, EES-16, MS T003
Phone/Fax: 5-3533/Fax 5-6459
Symbol: EES-16-13-002
Date: July 9, 2013

memorandum

Earth and Environmental Sciences

Procedures for Archiving and Documenting SFT-developed and SFT-modified Software (Rev 1 replaces Rev 0, September 2012) – July 2013

The following documents procedures for archiving and controlling software developed or modified by EES-16's Subsurface Flow and Transport (SFT) team.

These procedures apply to SFT-developed or SFT-modified software that are intended to be used by more than one person or to support more than one SFT product (report, paper, data delivery to collaborator, etc.). Single-use software used by only one investigator to support one SFT project are exempt from these procedures, but should be documented in the investigator's scientific notebook or similar personal notes. Software in this context applies to stand-alone computer codes or to modules in large software systems. Granularity of control is at the discretion of the principal investigator of the applicable project. For example, the lead developer of a large multi-module system may control the entire system as a whole or may choose to control individual modules or subsystems separately.

Projects in the SFT involve both development and use of scientific software. A key requirement of these procedures is the use of named or "frozen" versions to support SFT projects, to the extent practicable. These procedures address the documentation and control of the frozen versions. Development practices – e.g. use of software repositories in the development process – are left to the lead developer and are not addressed here.

A software archive has been established on one of the shared drives used by SFT. The archive consists of a software inventory and a subdirectory for each entry in the inventory. Each controlled software will have a software custodian, who is responsible for updating the archive. Note that it is the responsibility of the PI or designated software custodian to specify the schedule for release of frozen versions.

Upon release of a frozen version of the software, the custodian will

- (1) Update the inventory list by adding a new entry for the new version and changing the status of any superseded versions to "inactive". The entry in the master list should include software name and number, release date, target operating systems, status of the code (beta, active or retired) and a list of any known issues.
- (2) Create a new subdirectory for the release, and place the new or modified software in that subdirectory. Items required for the software archive are described below.
- (3) Prepare and promulgate a software release memo to users of the code. The memo shall provide the software name and version number, release date, superseded versions. The memo must also describe the nature of the changes, regression tests and any new tests that

were performed, and any known issues. The memo must be distributed to primary users of the software application; notices of updates must also be posted on any web sites used to distribute the software product.

Certain information is required for each release. Note that level of detail is at the discretion of the PI, but should generally be sufficient to allow someone with relevant technical experience who was not involved with the work to understand proper functioning of the code. The following are required:

- (1) Documentation of the software requirements. Requirements in this context include code functionality, range of applicability, technical basis (assumptions, mathematical models, algorithms), interfaces with other software.
- (2) Documentation of testing and test input and output files. Tests should include verification tests, acceptance tests, and installation tests. A verification test establishes that the software produces correct results for a test problem with known solution. An acceptance test demonstrates that the software produces physically meaningful results in the application for which it is designed. An installation test should be included for each supported operating system. Input and output files for each test shall be archived.
- (3) Description of user inputs.
- (4) Executable for each target operating system.
- (5) Source code and associated build systems. These will be password and/or permissions protected for some codes.

In addition to the above-required information, a list of external users of the software with contact information shall be maintained in the software archive. This information is needed so that users can be notified when new releases become available or when significant issues are identified. In addition, a list of reported issues (limitations, bugs, errors in documentation, etc.) shall be maintained in the software archive. Each entry should contain a short description of the issue, when it was reported, and its current disposition. The software custodian shall update the list of external users and the list of known issues as needed.

Level of detail and form that the documentation takes are at the discretion of the PI. For example, requirements, testing and user input may be described in a single user's manual or may be separate documents.