Testing Guidelines for GRASS Ports and Drivers

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1. Introduction

GRASS, the Geographic Resources Analysis Support System, is public domain software distributed by several public and private organizations. The organizations that develop and support GRASS (represented by the GRASS Inter-Agency Steering Committee) want to insure that the software is reliable, consistent, and efficient, and that new versions of the code; ports to new hardware platforms; and new digitizer, monitor and printer drivers, are reasonably and consistently tested before general distribution. This document provides guidance for testing new hardware platforms and drivers.

The GRASS Hardware Configuration Guide

The *GRASS Hardware Configuration Guide* identifies all hardware configurations that support GRASS software, and all peripherals for which digitizer, monitor, or printer drivers have been written. There are two configuration sections to this guide - (1) configurations that are fully tested and supported for GRASS, and (2) configurations that are in beta testing. For hardware configurations (including new drivers) to move from the beta testing section to the tested and supported section, the beta test program must be completed, and some site(s) that distributes GRASS software must accept responsibility for support of this new configuration and/or driver.

The *GRASS Hardware Configuration Guide* is maintained and updated by the U.S. Army Construction Engineering Research Laboratory (USACERL) GRASS Hardware Coordinator (Doug Brooks). Beta test sponsors should notify the GRASS Hardware Coordinator at least twice during this testing process:

- When a new configuration or driver is ready for testing *(Beta Test Initiation Notice).*

- When a beta test has been successfully completed *(Test Completion Report).*

Configuration information and benchmarks should be provided to to the GRASS Hardware Coordinator both before and after (if there are any changes) the beta testing process. Benchmarks should follow the instructions in the document entitled *Guidelines for Running GRASS Benchmarks* authored by Mark Johnson of USACERL. These documents are available upon request from the GRASS Information Center. The Center can also provide contacts for all sites that distribute or support GRASS software, or that are currently involved in beta tests.

2. Alpha Testing

After an initial port of GRASS has first been completed, or a new driver written, alpha testing should be conducted. A significant effort should be made, during alpha testing, to identify and correct problems and limitations resulting from the new code. Alpha testing should also include running the initial GRASS benchmarks.

There are several characteristics that distinguish **alpha** from **beta** testing.

• Alpha testing precedes beta testing.
• During alpha testing, programmers and testers work in close coordination, and programmers can change code to correct problems on a frequent and informal basis, at the request of the testers.
• No written documentation is required for the alpha testing process.
• Usually alpha testing is internal, within the organization that created the new port or driver.

In contrast, the beta test follows the alpha test, involves sites external to the originating organization, requires formal notification and documentation, and changes should only be made to the code after the completion of the testing process.

3. Beta Testing

During alpha testing, plans should be made for the beta testing process. The following are guidelines to provide developers, supporters, testers and users with a set of "common" procedures. There are three types of participants in this beta testing process, (1) the test coordinator, (2) the beta testing sites, and (3) the GRASS Hardware Coordinator. The beta testing is initiated by the test coordinator, conducted by the beta test sites, and verified, both before and after the testing, by the GRASS Hardware Coordinator.

Generally, there should be at least three beta test sites, although in some circumstances this number will be greater or smaller. Any decision to use less than three sites should be approved by the GRASS Hardware Coordinator. Sites selected for beta testing should already be familiar with GRASS software.

The Beta Test Coordinator

Beta tests will be coordinated by a single site, usually the developer or sponsor of the new driver or port. This site will be called the Beta Test Coordinator. The Beta Test Coordinator will prepare three documents before the beta testing begins. These documents are (1) Configuration Specifications, (2) Installation Instructions, and (3) Test Report Forms.

(1) Configuration Specifications:
Exact hardware configuration information should be provided by the test coordinator to all potential beta test candidates, and to the GRASS Hardware Coordinator.

This information should include details on all elements of a configuration, including memory, disk, storage devices, special boards and any other requirements. For new ports, information should also be provided on which peripherals were tested, and information on how there peripherals were connected. For driver ports, information should be provided as to which computers and operating systems (and releases of operating systems) and compilers were used during development of a driver, and any special switch settings and cable configurations relevant to the operation of the printer, digitizer or other device. When forwarded to the GRASS Hardware Coordinator, configuration information should include configuration options (e.g. comparable workstation in a series, such as the Sun 386i 150 and the Sun 386i 250) and list prices for each item in the configuration.

(2) Installation Instructions:
Full installation instructions should be developed by the test coordinator before tests can be conducted. Installing the software on a new machine is one of the key elements in the test. Also, test coordinators should identify any changes that might be required to standard GRASS user or programmer documentation, because of this new hardware. (Such changes should be minimal, to insure portability of GRASS software between different hardware platforms). Installation documentation is already included for some hardware platforms in the *GRASS User's Reference Manual.* An addendum to these existing installation instructions may be sufficient. However, in some cases, installation instructions will need to discuss such matters as the insertion of new boards into a hardware bus. The installation instructions should also identify any software requirements for GRASS on the hardware platform, such as GKS, Sunview, X or other graphic libraries.

(3) Test Report Forms
This form is simply a listing of all programs to be tested, with places for the testing sites to check each program and note any problems. For new ports, **all programs in the current release version of GRASS should be tested.** For new drivers, all GRASS programs and functions within programs that relate to the device (e.g. digitizer or printer or plotter) should be tested. This form is to be returned at the completion of the testing process.

Some public notice should be made, if possible, to inform potential beta test candidates that a product will be available for beta testing. This notice should identify the organization conducting this test, the intended timeframe for and duration of the test, and the anticipated requirements (e.g. hardware configurations and/or software or technical expertise) of potential sites. Forums for such announcements include [1] GRASS Clippings newsletter, [2] direct mailing to GRASS user sites, [3] technical journals and meetings and [4] GRASSNET and other electronic notes/bulletin boards.

Frequently, hardware vendors will help facilitate beta testing, and some vendors will provide equipment to selected beta testing sites. It is recommended that Beta Test Coordinators involve the vendors, to whatever extend appropriate, to confirm information on configurations, pricing and hardware availability and to develop plans for software support. Arrangements with vendors, however, are the primary responsibility

of the Beta Test Coordinators, not the testing sites or the GRASS Hardware Coordinator.

Before the code is released to the testing sites, the Beta Test Coordinator should send a *Beta Test Initiation Notice* to the GRASS Hardware Coordinator identifying the intent to begin the test, the equipment to be tested, list prices for each item in the configuration, initial benchmarks (if appropriate), any vendor arrangements, and the names and points of contact for beta testing sites. The GRASS Hardware Coordinator will then list this configuration, and the test coordinator, in the next version of the *GRASS Hardware Configuration Guide.*

When the beta testing is completed, all software bugs and documentation errors, identified during the beta testing, should be addressed and corrected, before the code and documentation are released. However, no new functions should be added between beta testing and final release. If critical functions were omitted, they should be added and retested. If non-critical functions are desired, they should be included in future software releases or driver enhancements.

Then, the Beta Test Coordinator should file a *Test Completion Report* with the GRASS Hardware Coordinator. This report should include (1) copies of the *Test Report Forms* from each beta test site, (2) confirmation that each problem identified by the testing sites has been identified and corrected, (3) any new relevant configuration or benchmark information, and (4) plans for distribution and support of this new hardware. Distribution of code for this new hardware should not begin until the GRASS Hardware Coordinator confirms to the Beta Test Coordinator receipt and acceptance of this *Beta Test Completion Report.*

Beta Testing Sites

Sites that wish to participate in beta tests should notify the Beta Test Coordinator. In this request notice, these sites will need to verify that they have the correct equipment, necessary skills (knowledge of UNIX, GRASS, and the hardware) and resources to perform this test.

Beta tests must be performed on the same or equivalent hardware as was used for developing the software. Testing software on different hardware constitutes "porting" the code, and bugs discovered during this process could result from the software port or the original code. As the beta test is designed to discover (and correct) bugs in the original code, testing should be kept as simple as possible. Once the original driver or port is fully tested, tests of hardware variations might also be conducted.

The beta testing procedures are as follows:

1. Upon receiving the new software, review the installation instructions, and begin the software installation process. Note any problems with the procedures or the documentation.

2. Perform a systematic testing of each program listed in the Test Report, and note any problems encountered. There notes should include details about any system error messages.

3. After testing the programs, run the GRASS benchmarks to confirm the Test Coordinators results and identify any performance problems.

4. Make every effort to complete the testing process, and return the test results, within the specified timeframe. Often, the Test Coordinator is under time pressure to have the test completed and to begin distribution of the code.

GRASS Hardware Coordinator

Before the testing begins, the GRASS Hardware Coordinator (GHC) will need to verify that the information from the Beta Test Coordinator is correct. Then, the GHC will update the beta testing section of the *GRASS Hardware Configuration Guide,* and notify the editor of *GRASS Clippings* about the planned test. Next, the Hardware Coordinator will contact each testing sites, and confirm, with the point of contact, that the testing procedures are understood.

When the testing is completed, the GHC should receive and review the Completion Report from the Beta Test Coordinator, and confirm from the report contents that all known problems have been corrected. Then, the benchmarks and configurations should be updated, and the new configuration should be moved to the "tested and supported" section of the hardware configuration guide. The Beta Test Coordinator needs to arrange for ongoing support of the new port or driver, through an existing or new support organization.[1] Finally, a notice of the completed port should be made in *GRASSClippings,* and the GRASS Information Center records should be updated.