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# SOFTWARE MAINTENANCE

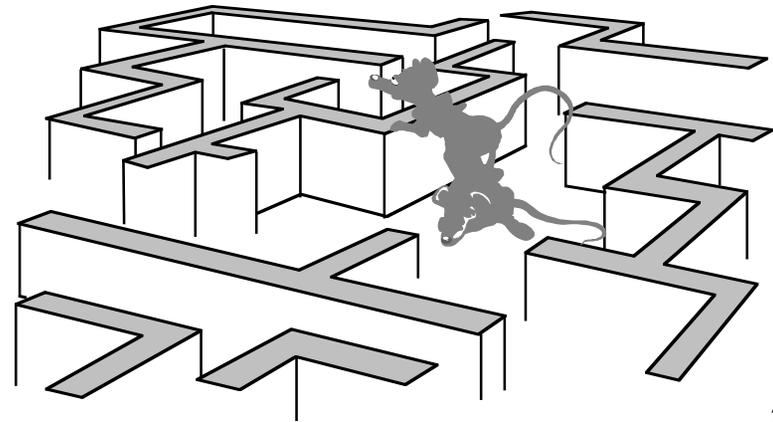
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**ECS Pre-Release B Testbed Training**

# Overview of Lesson



- **Introduction**
- **Software Maintenance Topics**
  - **Software Maintenance Objectives**
  - **Maintenance of COTS Software**
  - **Maintenance of Custom Software**
- **Practical Exercise**



# Objectives



- **Overall: Proficiency in methodology and procedures for installation, troubleshooting, and maintenance of ECS software**
  - Describe management of software maintenance contracts
  - Describe management of software licenses
  - Install, configure, and promote COTS software using ClearCase®
  - Obtain COTS software support
  - Describe safeguards for COTS software media
  - Install, configure, and promote custom software using ClearCase®
  - Obtain custom software support
  - Describe safeguards for custom software media

# Importance



**Lesson helps prepare several ECS roles for effective software installation, troubleshooting, maintenance, and problem resolution:**

- **DAAC System Administrator, Software Maintenance Engineer, and Maintenance Coordinator**
- **SEO System Administrator, Software Maintenance Engineers, System Engineers, System Test Engineer**
- **DAAC System Engineers, System Test Engineers, Maintenance Engineers**
- **ILS Logistics Engineer**



# Software Maintenance Objectives



- **Adaptive Maintenance (AdM)** - adapt software to changes in the data or processing environments (e.g., upgraded computer system)
- **Corrective Maintenance (CrM)** - identify and correct failures in software, performance, or implementation (e.g., design defect)
- **Perfective Maintenance (PfM)** - enhance performance, improve effectiveness, efficiency, or maintainability (e.g., improve productivity)
- **Preventive Maintenance (PvM)** - prevent or reduce impact of anticipated problems (e.g., reallocation of resources to meet projected demand)

# Maintenance Categories



## Elevated to Government Failure Review Board

- **Category 1: System/service cannot perform critical function or imposes major safety hazard**
- **Category 2: System/service substantially impaired**
- **Category 3: System/service slightly impaired**

## Additional SEO Categories

- **Category 4: Nuisance problem**
- **Category 5: Closed problem**

# Analysis of Maintenance Priorities



- Annual software maintenance effort
- Software age
- Programming language
- Error information and correlation data
- Software change information
- User satisfaction, perception of utility
- Effort required for fix or change
- Software conformance to performance/data models
- Interfacing difficulties
- Effect on mission success

# COTS Software Maintenance

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## Issues

- **Software use licenses**
- **Obtaining telephone assistance**
- **Obtaining software patches**
- **Obtaining software upgrades**

## Vendor support contracts

- **First year warranty**
- **Subsequent years contracts**
- **Database at ILS office**
- **Contact ILS Logistics Engineer**
  - E-mail: [ilsmaint@ecs.hitc.com](mailto:ilsmaint@ecs.hitc.com)
  - Telephone: 1-800-ECS-DATA (327-3282)

# COTS Software Licenses



**Maintained in a property database by ECS Property Administrator**

## *Major COTS Software License Restrictions*

<b>Software</b>	<b>Restriction</b>
HP OpenView	<i>TBD</i>
AutoSys	Only one instance at a time may be active
ClearCase®	Five users concurrently
DDTS	Virtually unlimited (10,000 users)

# COTS Software Installation



- **Configuration Management and tools required (e.g., ClearCase® for customized files)**
- **Final Version Description Document (VDD) published**
- **Build installed, with documentation**
  - **ClearCase®**
  - **Scripts for System Administrator**
- **Controlled document updates entered into CM**
- **CM baseline updated**

# COTS Software Support



- **Systematic initial troubleshooting**
  - Software Event Browser to review event sequence
  - Review error messages, prepare Trouble Ticket (TT)
  - Review system logs for previous occurrences
  - Attempt software reload
  - Report to Maintenance Coordinator (forward TT)
- **Additional troubleshooting**
  - Procedures in COTS manuals
  - Vendor site on World Wide Web
  - Software diagnostics
  - Local procedures
  - Adjustment of tunable parameters

# COTS Software Support (Cont.)



- **Organize available data, update TT**
  - Locate contact information for software vendor technical support center/help desk (telephone number, name, authorization code)
- **Contact technical support center/help desk**
  - Provide background data
  - Obtain case reference number
  - Update TT
  - Notify originator of the problem that help is initiated
- **Coordinate with vendor and CM, update TT**
  - Work with technical support center/help desk (e.g., troubleshooting, patch, work-around)
  - CCB authorization required for patch

# COTS Software Support (Cont.)



- **Escalation may be required**
  - Lack of timely solution
  - Unsatisfactory performance of technical support center/ help desk
- **Notify SEO**
  - Senior Systems Engineers
  - ILS Logistics Engineer coordination for escalation within vendor organization

# Safeguarding COTS Software Media

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- **Locked cabinets at DAAC for software and documentation**
- **Access through on-duty Operations Coordinator**

# Maintenance of Custom Software



- **Code maintained at ECS Development Facility**
- **ClearCase® for library storage and maintenance**
- **Module/component definitions defined by development organization**
- **CM requirements apply**
- **Sources of maintenance changes**
  - **ESDIS CCB directives**
  - **Site-level CCB directives**
  - **Developer modifications or upgrades**
  - **Trouble Tickets**

# Implementation of Modifications



- **Responsible Engineer (RE) selected by each ECS organization**
- **SEO RE establishes set of CCRs for build**
- **Site/Center RE determines site-unique extensions**
- **SEO RE maintains CCR lists and schedule**
- **Acceptance Test Organization (ATO) provides initial VDD**
- **SEO RE maintains VDD**
- **RE or team for CCR obtains source code/files, implements change, performs programmer testing, updates documentation**

# Test Plans and Procedures



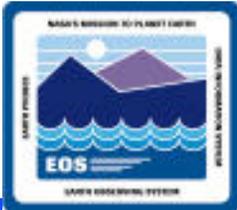
- **Test program addresses features (from CCR) and regression (revalidation of proper operation)**
- **Test team (programmers, vendors, users, originator of problem)**
- **Verification**
  - **Inspection**
  - **Analysis**
  - **Demonstration**
  - **Review of test data**
- **Testing**
  - **Feature (new test cases, data)**
  - **Regression (standard test cases, expected results)**
- **Test teams provide results to SEO and center REs**

# Installing Custom Software



- Requirements similar to those for COTS software, but configuration under ClearCase® control
- *Versioned Object Base (VOB)* holds controlled files (a virtual directory tree)
- *View* provides user-defined mapping to files in VOB

# ClearCase® View Tag Browser Screen



View Tag Browser

File View ConfigSpec Admin

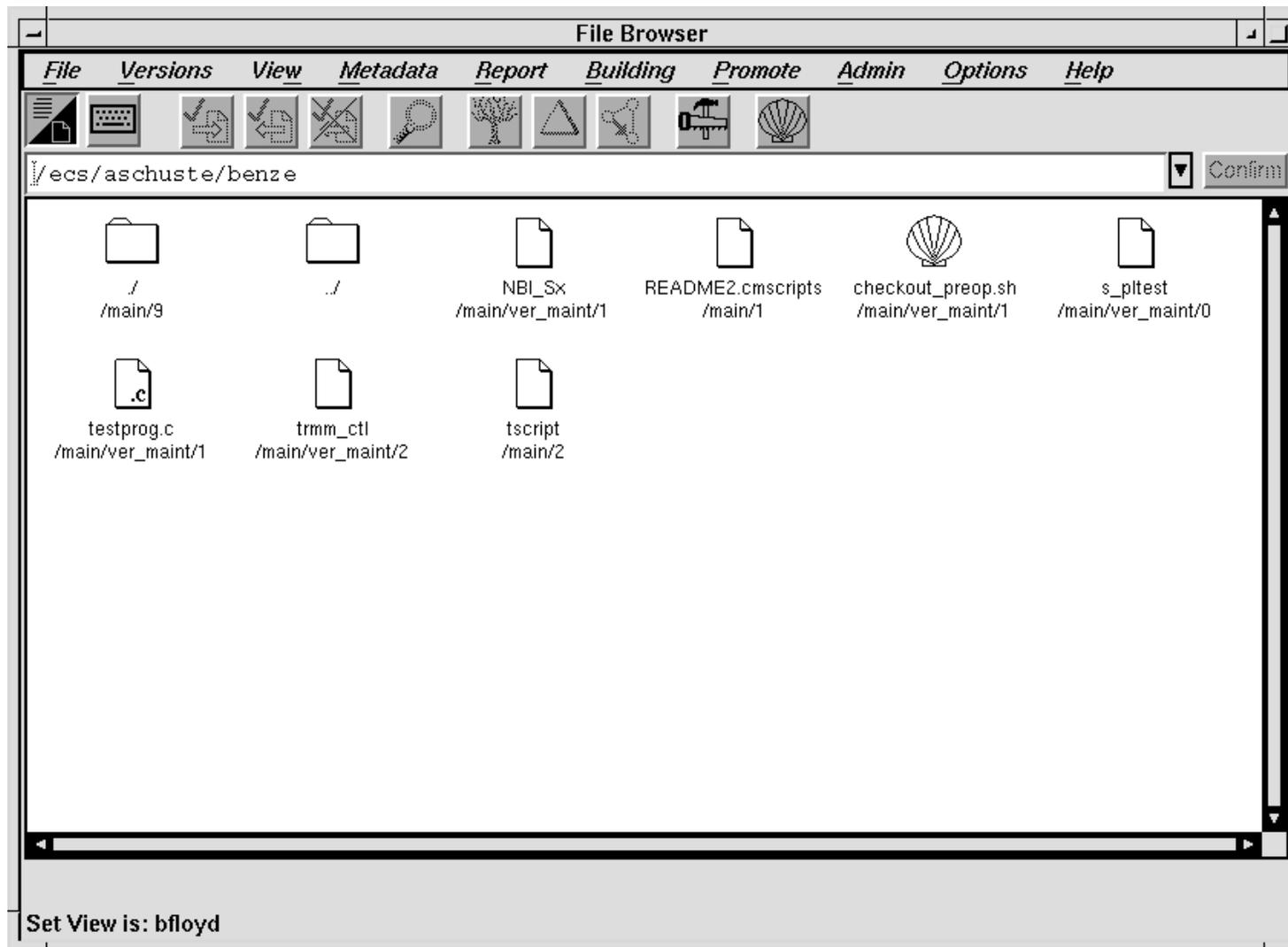
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You must select a viewtag

Set View is:

Ok Cancel

# ClearCase® File Browser Screen (Main Screen)



# Implementation and Test



- **Software Maintenance Engineer actions**
  - Software transfer to compiler hosts for make and build
  - Software distribution
  - Individual package tests
  - Final software run in operational environment
  - Notify SMC of results
- **Promote software into operational baseline**

# Controlling Maintenance for Custom Software



- **Scheduled maintenance approach**
  - Efficiency in updates, reduced disruption, decreased costs
  - Time for reflection on needed changes
  - Efficiency in assessment
  - Facilitated management and priority setting
  - Baseline management control

# Version Description Document



- **VDD is vehicle for communicating installation data to ECS operations and users**
  - Test plans, test procedures, test results are supplements to the VDD
  - Draft and final VDD published and distributed
- **Golden copy of ECS custom software maintained by the SEO CM Administrator**
- **Custom software also maintained by site CM Administrator**

# Custom Software Support



- **Responsible Engineers help with software configuration items**
- **Science software maintenance not responsibility of ECS on-site maintenance engineers**
- **Sources of Trouble Tickets for custom software**
  - **Anomalies**
  - **Apparent incorrect execution by software**
  - **Inefficiencies**
  - **Sub-optimal use of system resources**
  - **TTs may be submitted by users, operators, customers, analysts, maintenance personnel, management**
  - **TTs capture supporting information and data on problem**

# Custom Software Support (Cont.)



- **Troubleshooting is ad hoc, but systematic**
  - **Site Operations Supervisor assigns TT to problem investigator**
  - **Responsible Engineers available at SEO and ECS Development Facility (EDF)**
  - **EDF has software and computer equipment reflecting that at sites; may be able to duplicate problem and derive solution or work-arounds**
  - **Failure Review Board (in TT telecon) assigns priority to TT, and assigns TT to an organization**
  - **Assigned RE at organization conducts technical investigation**
- **For problem caused by non-ECS element, TT and data are provided to maintainer at that element**

# Custom Software Support (Cont.)



- **Potential TT results**
  - **Description of source of problem and recommended change to design/implementation or procedure**
  - **Modification to procedures**
  - **Tracking of problem for further technical investigation**
  - **Resetting of priorities for TT, higher or lower**
  - **Close TT with URDB input to document a recommendation for change in requirements**
  - **Close TT into existing TT or CCR**

# Safeguarding Custom Software Media

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- **Code maintained at ECS Development Facility**
- **Access through telnet**