
Raytheon

# EMD Release Status Review

## October 6, 2004

716-EMD-001

# Release Status Review – Agenda

- Summary of Major Releases – 8/1/03 to 7/31/04
  - Description of new functionality and corrections per Release
  - Summary of Documentation Available for Release Baseline
  - Summary of Liens (NCRs) against the Release Baseline
- Results of Hardware and Software Physical Configuration Audits
- Assessment of Effectiveness of Development, Integration, and Test based on Test Results and NCR Analysis
- DAAC View of Release Success
- Review of Lessons Learned – EMD Year 1

# Summary of Releases

# 8/1/03 – 7/31/04

# Major Releases Delivered Under EMD

- **Release 6A.08 – 09/11/03**
  - Delivered software changes necessary for Sun Consolidation
  - Delivered 193 NCR fixes, of which 39 had been delivered in previous patches.
- **Release 7.0 – 04/28/04**
  - Delivered ECS Synergy IV functionality
  - Delivered 485 NCR fixes (Task 101), of which 225 had been delivered in previous patches

**In addition, minor Release 7.01 (7/1/04) delivered End to End Checksum (Task 105) and Multiple Volume Group (Task 102) functionality.**

# Enhancements/Major NCR Fixes Delivered Under EMD

- Sun Consolidation - 09/03/04 This activity replaced the 3000 and 4000 model Sun platforms with Sun Fire platforms and consolidated system functionality.
- WD S4 05 - ECHO Support Pre-Delete, Order Only and FTP and ECSed37243 - FTP Push of Bulk URL, Inserts/Deletes (Release 6A.08) ECS now allows FTP Push of Bulk URL metadata update XML files to ECHO, as opposed to ECHO having to figure out which URL XML files to FTP pull via anonymous FTP out of the DPL archive.
- ECSed36748 - Data Pool does not have option to display Quality Summary (Release 6A.08) Provides a new Data Pool Quality Summary to allow DAAC operators to associate the url of a pre--defined Quality Summary web page with any valid Data Pool collection.
- Secure Distribution - 10/31/04 (ESD 193, ECS ticket SD_A8_01). Supports AURA SIPS need for an additional distribution service for subscriptions, in order to mitigate non-secure exchange of the recipients FTP authentication information in an FTP Push scenario. Secure distribution of subscriptions was implemented as scp over ssh.

# Enhancements/Major NCR Fixes Delivered Under EMD

- CK_70_01 - End to End CheckSum Phase 1 & 2 (Release 7.00) This capability provides ingest, storage, verification and distribution of checksums associated with science granules. Two types of checksums were supported initially. Checksum type CKSUM is a 32-bit unsigned integer that is produced by the Unix cksum command
- CK_70_01 End to End CheckSum Phase 3 (Release 7.01) Phase 3 of End to End CheckSum verifies checksums on a DAAC-configurable number of files, as they are retrieved from the archive for distribution by ECS, or inserted into the Data Pool and checksums, generated using the cksum algorithm, after file transfer to the ingest staging area and before insertion into the ECS archive

# Enhancements/Major NCR Fixes Delivered Under EMD

- **VG 70 01 (Multiple Volume Group Histories Per Collection Version) (Release 7.01 (07/01/04)) Previously, the system wrote all granules for a given collection version to a single volume group. If forward processing and reprocessing of a collection version were performed concurrently, this caused granules from two different time ranges to be written to the same tape. This makes implementation of a rolling delete strategy (e.g., delete a granule 6 months after it has been reprocessed) difficult because tapes cannot be reused until both time ranges on the tape have been reprocessed. This capability enables the DAACs to direct the granules resulting from forward processing to one volume group and the granules resulting from reprocessing to a different volume group. This will enable tapes to be reused much faster since each tape will only contain a single time range, with only few exceptions, such as when forward processing needs to fill gaps that can arise for various reasons.**

# Enhancements/Major NCR Fixes Delivered Under EMD

- ECSed39206 - Near Term Data Hiding. (Release 7.0) This capability accommodates the need to designate some granules as "Hidden" or "Golden", by adding valid values of "H" or "G" to the DeleteFromArchive attribute in the SDSRV database.
- ECSed37393 - Capability needed to update SSS subscriptions in batches. (Release 7.01) This capability provides a batch option to the SSS command line interface.
- ECSed39806 – WebAccess: make HEG options configurable by data set. (Release 7.01)This capability enhances the Data Pool Web Drilldown GUI by making HEG options configurable by data set through the use of a new configuration table in the Data Pool database. This allows DAAC operations to configure which HEG options are made available for particular collections, which should be mandatory, and they types of warning messages that should be displayed.

# Enhancements/Major NCR Fixes Delivered Under EMD

- **ECSed39431 - Tool Needed to Update PlDataTypeMaster Tbl when Subscription expires. (Release 7.01)This capability adds an automatic subscription update function to PLS, by utilizing a new attribute for storing the subscription expiration date. The subscription expiration date is checked when a DPR is exploded..**

# Patch Summary: Patches Delivered 8/03–7/04

| Patch Name | Total |
|---|---|
| Patch_ESDT.51_GLAS | 2 |
| Patch_6A.07_ESDT.52_MISR | 1 |
| Patch_6A.07_ESDT.53_SAGEIII | 1 |
| Patch_6A.07.ESDT.56_MODIS | 1 |
| Patch.6A.08 | 154 |
| Patch_6A.08_BMGT.01 | 3 |
| Patch_6A.08_DMS.01 | 2 |
| Patch_6A.08_DPL_HEG.01A | 16 |
| Patch_6A.08_DPL_HEG.02A | 10 |
| Patch_6A.08_ESDT.13_Valids | 2 |
| Patch_6A.08_ESDT.20_MISR | 1 |
| Patch_6A.08_ESDT.23_MODIS | 5 |
| Patch_6A.08_ESDT.24_GLAS | 3 |
| Patch_6A.08_ESDT.25_MODIS | 2 |
| Patch_6A.08_ESDT.26_SORCE | 1 |
| Patch_6A.08_ESDT.27_HIRDLS | 1 |
| Patch_6A.08_ESDT.29_MODIS | 4 |
| Patch_6A.08_ESDT.30_MODIS | 4 |
| Patch_6A.08_ESDT.31_MODIS | 1 |
| Patch_6A08_HEG01 | 7 |
| Patch_6A.08_INGEST.01B | 9 |
| Patch_6A.08_SecureDist.01B | 40 |
| Patch_6A.08_ToolKit_LX.02 | 4 |
| Patch_6A.07_ESDT.55_MISR | 1 |
| Patch_6A.07_ESDT.56_MODIS | 1 |

| Patch Name | Total |
|---|---|
| Patch_6A.08_ESDT.14_LandSat | 3 |
| Patch_6A.08_ESDT.15_DAS | 2 |
| Patch_6A.08_ESDT.16_ASTER | 1 |
| Patch_6A.08_ESDT.17_LANSAT | 1 |
| Patch_6A.08_ESDT.18_MODIS | 1 |
| Patch_6A.08_ESDT.19_MODIS_Aqua | 7 |
| Patch_6A.08_ESDT.54_TES | 1 |
| Patch_6A.08_BMGT.02 | 5 |
| Patch_6A.08_DPL_HEG.03D | 11 |
| Patch_6A.08_DPL_HEG.04 | 10 |
| Patch_6A.08_ESDT_31_MODIS | 2 |
| Patch_6A.08_ESDT_32_MODIS | 1 |
| Patch_6A.08_ESDT_33_OMI | 6 |
| Patch_6A.08_ESDT_35_AIRS | 1 |
| Patch_6A.08_ESDT.36_GLAS | 2 |
| Patch_6A.08_ESDT.37_UARS | 2 |
| Patch_6A.08_ESDT.38_AMSR | 1 |
| Patch_6A.08_ESDT.39_MODIS | 1 |
| Patch_6A.08_ESDT.41_MODIS_Aqua | 2 |
| Patch_6A.08_ESDT.42_TOMS | 6 |
| Patch_6A.08_ESDT.44_MODIS_Aqua | 2 |
| Patch_6A.08_ESDT.45A_MODIS | 1 |
| Patch_6A.08_ESDT.46.DAS | 4 |
| Patch_6A.08_ESDT.47_MODIS_Aqua | 2 |
| Patch_6A.08_ESDT.48_TRMM | 2 |

| Patch Name | Total |
|---|---|
| Patch_6A.08_ESDT.49_MODIS_Aqua | 2 |
| Patch_6A.08_ESDT.50_MODIS | 3 |
| Patch_6A.08_ESDT.51_MODIS | 2 |
| Patch_6A.08_ESDT.51_Aster | 2 |
| Patch_6A.08_ESDT.54_SORCE | 2 |
| Patch_6A.08_PDS.03C | 8 |
| Patch_7.00_DPL-HEG.01 | 3 |
| Patch_7.00_ESDT.02_GLAS | 4 |
| Patch_7.00_ESDT.05_SAGE | 2 |
| Patch_7.00_ESDT.06_TRMM | 2 |
| Patch_7.00_ESDT.07 | 1 |
| Patch_7.00_System.04B | 54 |
| Patch_7.00_System.05A | 5 |
| Patch_7.00A | 270 |
| Patch_7.01 | 46 |
| Patch_7.00_ESDT.08_TES | 2 |
| Patch_7.00_ESDT.09_MODIS | 2 |
| Patch_7.00_ESDT.10_OMI | 1 |
| Patch_7.00_ESDT.11A_AIRS | 4 |
| Grand Total | 768 |

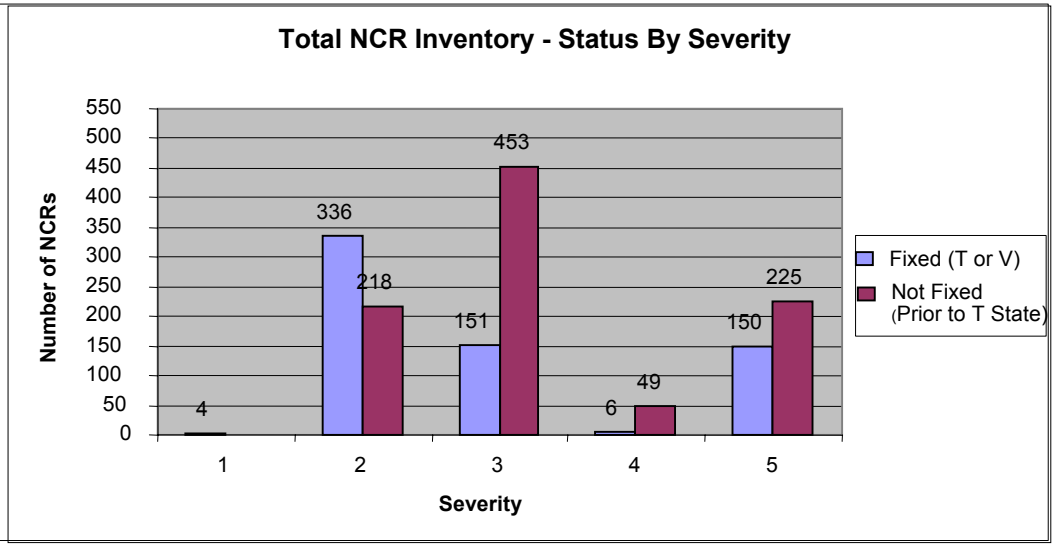
# Documentation Delivered To Support Release Baseline

| Document Number | Title | Delivery Date |
|---|---|---|
| 609-EMD-001 | Release 7 Operations Tools Manual | 4/28/2004 |
| 625-EMD-009 | Training Material Volume 9: Data distribution | 4/28/2004 |
| 625-EMD-010 | Training Material Volume 10: Archive | 4/28/2004 |
| 625-EMD-013 | Training Material Volume 13: User Services | 4/28/2004 |
| 625-EMD-017 | Training Material Volume 17: System Troubleshooting | 4/28/2004 |
| 611-EMD-001 | Mission Operations Procedures | 4/28/2004 |
| 305-EMD-001 | Release 7 Segment Design Specification | 7/29/2004 |
| 311-EMD-001 | Release 7 Data Management Subsystem Database Design and Database Scheme | 7/29/2004 |
| 311-EMD-002 | Release 7 Ingest Subsystem Database Design and Database Scheme | 7/29/2004 |
| 311-EMD-003 | Release 7 Planning & Data Processing Subsystem Database Design and Database Scheme | 7/29/2004 |
| 311-EMD-004 | Release 7 Science Data Server Subsystem Database Design and Database Scheme | 7/29/2004 |
| 311-EMD-005 | Release 7 Storage Management Database Design and Database Scheme | 7/29/2004 |
| 311-EMD-006 | Release 7 Subscription server Database Design and Database Scheme | 7/29/2004 |
| 311-EMD-007 | Release 7 System Management Subsystem Database Design and Database Scheme | 7/29/2004 |

# Documentation Delivered To Support Release Baseline

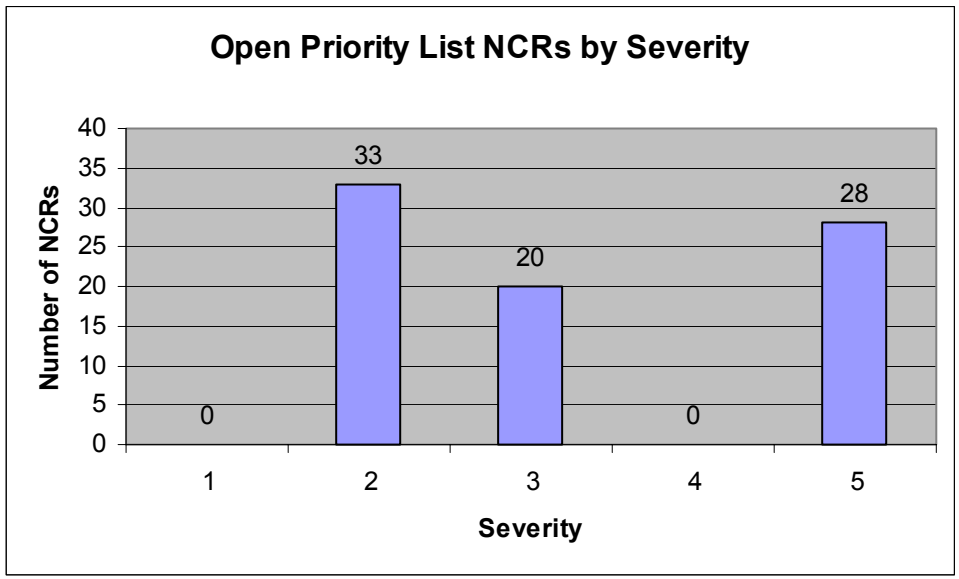
| Document Number | Title | Delivery Date |
|---|---|---|
| 311-EMD-008 | Release 7 Registry Subsystem Database Design and Database Scheme | 7/29/2004 |
| 311-EMD-009 | Release 7 Production Distribution Subsystem Database Design and Database Scheme | 7/29/2004 |
| 311-EMD-010 | Release 7 Name Server Subsystem Database Design and Database Scheme | 7/29/2004 |
| 311-EMD-011 | Release 7 Order Manager Subsystem Database Design and Database Scheme | 7/29/2004 |
| 313-EMD-001 | Release 7 Internal ICD | 7/29/2004 |
| 625-EMD-001 | Training Materials, Volume 1: Course Outline | 7/29/2004 |
| 625-EMD-002 | Training Materials, Volume 2A: Introduction & Detailed System Overview | 7/29/2004 |
| 625-EMD-003 | Training Material, Volume 3: Problem Management | 7/29/2004 |
| 625-EMD-004 | Training Material, Volume 4: System Administration | 7/29/2004 |
| 625-EMD-005 | Training Material, Volume 5: Network Administration | 7/29/2004 |
| 625-EMD-006 | Training Material, Volume 6: Production Planning | 7/29/2004 |
| 625-EMD-007 | Training Material, Volume 7: Resource Planning | 7/29/2004 |
| 625-EMD-008 | Training Material, Volume 8: Ingest | 7/29/2004 |
| 625-EMD-011 | Training Material, Volume11: Database Administration | 7/29/2004 |
| 625-EMD-012 | Training Material, Volume 12: Configuration Management | 7/29/2004 |
| 625-EMD-016 | Training Material, Volume 16: Science Software Integration & Test | 7/29/2004 |
| 625-EMD-018 | Training Material, Volume 18: Software Maintenance | 7/29/2004 |

# NCR Status Summary




**There are a total of 945 open NCRs in states other than T and V.**

**About 35% of the NCRs on the Program Priority List are Severity 5s. There are no open Severity 1 NCRs.**



# Hardware and Software Physical Configuration Audits (PCA)

# HW Physical Configuration Audit Results

- Purpose of PCA is to compare the ‘as built’ configuration to the ‘as approved baseline’ configuration to verify the integrity of the system
- On-site audits of equipment were performed to gather host configuration compliance information. Audit Results generated based on contents of the new ClearCase BLM baseline which is accurate for approved CCRs.
- Audits were conducted June-July 2004.
- CCR 04-0443, “Update Hardware Diagrams with PCA Audit Findings” was approved on 9/2/04 to correct bseline documentation and configuration category findings.

# HW COTS PCA Results - EDC

| Category | Finding |
|---|---|
| Missing | Rack 5 CAT 6006 (6000) EIN 8473 - Found in "Com Closet Two" |
| Missing | e0msp08 - 0msp08 is a PC in the OPS glass house which runs "what's up gold" and it is now called elpwd110.<br>elpwd110 changed to M&O - Not baselined (DAAC fix, in Terry Y. Cube) |
| Configuration | e0mss02 4x18 GB 1-18GB on diagram |
| Configuration | Rack 1717 not on diagram - empty excess |
| Configuration | Silo #2 (drives) – EIN change |
| Configuration | 18 GB Disks 14920, 14923 – removed |
| Documentation | OPS WS EIN 1842 – Not baselined |

# 5.a HW COTS PCA Results - GES

| Category | Finding |
|---|---|
| Missing | g0aix18, missing <in excess since '03) |
| Missing | g0aix04, missing <in Room C101 on shelf> |
| Configuration | g0spp12, "as-built", 1GB finding 2GB |
| Documentation | g0spx02, "as-built" EIN 4812, finding EIN 2096 |
| Documentation | g0aix13, "as-built" EIN 4602, finding EIN 2045 |
| Documentation | g0aix17, "as-built" EIN 2108, finding EIN 4594 |

# 5.a HW COTS PCA Results - NSIDC

| Category | Finding |
|---|---|
| Missing | n0fwi09 missing 36GB memory. Not shipped waiting for PSR |

# 5.a HW COTS PCA Results - LaRC

| Category | Finding |
|---|---|
| Missing | SUN 3000 File Server (l0mss10) Terminal Attached. (Shipped backed to Landover, but H/W diagram shows it is physically present at LaRC. Diagram needs to be updated and verified.) |
| Missing | Rack 3 EIN # 12330 (l0sak04s) EIN # 14334/STK 4116 (Never sent to LaRC, but H/W diagram shows it is physically present at LaRC. Needs to be verified.) |
| Configuration | Metadata Svr/SUN Ultra E45 (l0sas01) 4mm (external) drive to H/W diagram |
| Configuration | PDS QA PC (l0dip03) - Add CPU speed to H/W diagram |
| Configuration | Rimage Dell Host (l0dip07) Add to CPU Speed to H/W diagram |
| Configuration | TP9400/Rack 20251 (l0acg02) Removed. (Needs to be verified before updating H/W diagram.) |
| Documentation | EIN # 10113/Brocade 2800 - Add on H/W diagram (Physically present at LaRC, but not reflected on H/W diagram. Can be verified through shipping paperwork with Mike Gee) |

# SW Physical Configuration Audit

- Purpose of the PCA is to compare the ‘as built’ configurations to the ‘as approved baseline’ configurations to verify the integrity of the system
- Audit data was gathered by performing remote interrogations on all EMD baseline hosts. The data was compared to specific versioned technical documentation. Discrepancy reports were generated where differences were found, and post-processing was performed on the reports to provide percentage data shown.
- Audit results were based on the contents of the ClearCase BLM baseline which is accurate for approved CCRs
- All interrogation scripts were updated for Solaris 8, IRIX 6.5.22, and Netscape 7.0, Secure Shell 3.3.0, and new ‘C’ compiler.

# SW PCA Results Summary

- **Audit Results reported by 3 categories:**
  - **COTS: Baseline COTS S/W (hosts, versions, and paths are checked)**
  - **O/S Patches: Installed in accordance with baseline 920-TDx-014's**
  - **Custom Code: Executables on baseline hosts**
- **Last SW COTS PCA audit completed in July 17 2003 for ECS TRR**
- **Improvements since ECS TRR**
  - **Emphasis was placed on resolving discrepancies. PVC COTS stands at 96.2 % Baseline-Asbuilt agreement. 3.2 % are open ECOs, leaving only 0.6 % to be resolved.**
  - **DAACs have shown a significant increase in all audit compliance categories, except SGI O/S patches. Scripts check custom code compliance only to the version identifier level (e.g., REL7PTE) and checksums, traceable to Patches/Tes, or Engineering Software.**

# SW PCA Results

**Key Discrepancy Reasons:**

- **Not all approved CCRs have not been implemented (ECOs), in particular the IRIX 6.5.22 upgrade on certain hosts.**
- **Backlog of COTS upgrade implementation CCRs (10 % in some cases)**
- **Approximately 4% of the COTS S/W numbers attributable to sites installing in non-baseline paths, or assigning different file permissions to files/directories**
- **Some COTS S/W packages were not installed in accordance with Release Notes**

# SW PCA Results

- Observations:
  - There were no findings for Custom Code. This reflects three mature processes, including CCRs, EASI, and Engineering S/W releases.
  - The Sun O/S patch release process, including Technical Documentation and installation, is now stable, which is reflected in the audit results.
  - There is a significant amount of COTS S/W discrepancy resolution work for the DAAC sites. Most discrepancies result from the installation of COTS S/W in paths that are different than the Release Notes' paths. These differences need to be reconciled.
  - Once existing B/L discrepancies are resolved, the new CCR tool will make batch audits obsolete. All COTS S/S discrepancies except 3 have been resolved in the PVC, so with the new CCR tool, discrepancies can be addressed and resolved in real time.

# SW COTS PCA Results

- **LP DAAC:**
  - COTS from 68.5 % to 84.6 %
  - O/S Patches (Sun) from 86.1 % to 98.8 %
  - O/S Patches (SGI) from 76.1 % to 70.0 %
- **GSFC:**
  - COTS from 47.8 % to 56.8 %
  - O/S Patches (Sun) from 82.4 % to 97.4 %
  - O/S Patches (SGI) from 40.3 % to 81.6 %
- **LaRC:**
  - COTS from 44.1 % to 56.7 %
  - O/S Patches (Sun) from 80.5 % to 98.5 %
  - O/S Patches (SGI) from 56.3 % to 64.2 %
- **NSIDC:**
  - COTS from 61.9 % to 81.4 %
  - O/S Patches (Sun) from 88.5 % to 96.8 %
  - O/S Patches (SGI) from 74.5 % to 39.1 %

# SW COTS PCA Results

- **PVC:**
  - **COTS** **frpm 86.2 % to 96.2 %**
  - **O/S Patches (Sun)** **from 91.6 % to 98.6 %**
  - **O/S Patches (SGI)** **from 87.6 % to 99.6 %**
- **VATC:**
  - **COTS** **from 73.6 % to 84.2 %**
  - **O/S Patches (Sun)** **from 89.7 % to 98.4 %**
  - **O/S Patches (SGI)** **from 79.1 % to 94.5 %**

Note: The PVC and VATC are usually ahead of the DAACs, as the latest COTS S/W and Custom Code is placed there.

# SW PCA Results

- Recommendations:
  - The new Change Manager tool will track open ECOs; discrepancies should now account for unworked ECOs.
  - Monitor Custom Code installations and UNIX kernel parameters in real time. This audit had 0 findings for both categories.
  - Integrate DAAC CCBs databases (Remedy/DDTS) with Landover CCB's new Change Manager tool; that way, remote CCB ECO closures will be reflected in Landover's tool in real time.
  - Perform interrogations for custom code for OPS modes at DAACs on a daily basis.

# Assessment of Effectiveness of Development, Integration, and Test based on Test Results and NCR Analysis

# 6A.08 Test Summary (from PSR)

**Functional Testing** was performed on all 6A.08 enhancements (Sev 5) through verification of their associated NCRs.

**NCR Verification Testing** was performed on all NCR fixes fixed in the patch.
**Fault Recovery Testing** was performed with the objective of assessing the behavior of the 6A.08 release when servers are brought down or errors introduced. Fault Recovery testing included PDPS, Ingest, STMGT, Client, Machine-to-Machine Gateway, ASTER On-Demand via EDG, and Order Manager.

**Functional Regression Testing** was executed. Four scenarios were executed, one for each DAAC: GSFC, EDC, LaRC, and NSIDC. Each scenario is oriented towards the functionality and data associated with the respective DAAC and takes about four hours to complete. The basic functions associated with Subscription Processing, Ingest, Search and Order, Science Data Server, and Distribution were exercised in all scenarios. Additionally, Product Generation was tested in the EDC and LaRC scenarios, but not in the NSIDC scenario since it doesn't apply. For GSFC, Product Generation was tested via S4P as part of Performance Testing.
In addition to the four DAAC-oriented Regression test scenarios, the basic elements of the Order Manager (OMS), Data Pool (DPL), and Bulk Metadata Generation Tool (BMGT) were regression tested once. The results of these Regression tests are presented after the DAAC results. Three NCRs were written as a result of these Functional Regression tests.

**Performance and Load Stability Testing** was executed for the 6A.08 Release. This testing was accomplished in the Performance Verification Center (PVC)/OPS mode, which was configured with unconsolidated Sun platforms. Load Stability testing was exercised on a daily basis to find, document, and resolve problems associated with the system under heavy load or stress. Stability is determined largely by the number and severity of core dumps, hangs, and server restarts that interrupt ECS operations.

**Four 24-hour runs were executed**: two for the EDC scenario and two for the End-of-Contract (EOC) scenario. The EOC scenario utilizes GSFC data types. These scenarios simulate the ingest, production, distribution, and data storage and access workloads for the EDC and GSFC DAACs over an extended period. The EDC scenario uses real-sized granules and archiving to AMASS. The EOC scenario utilizes "tiny" granules (between 10,000 and 100,000 bytes each) and archiving on disc (rather than in AMASS) to maximize the load on Sybase and custom code servers. These runs assess the stability and workload performance, while the system is under heavy load for a 24-hour period. NCRs were written to document stability, performance, and functional problems.

# 7.00 Test Summary (from PSR)

**Functional Testing** was performed on all 6A.08 enhancements (Sev 5) through verification of their associated NCRs**.**

**NCR Verification Testing** was performed on all NCR fixes fixed in the patch.

**Fault Recovery Testing** was accomplished for Synergy IV in the PVC TS2 mode. The objective was to assess the behavior of the Release 7.00 when servers are brought down or errors introduced. The focus was on fault recovery associated with Synergy IV capabilities. 125 Synergy III test cases were executed with no errors.

**Functional Regression Testing** was executed for Release 7.00 in the PVC TS2 mode. There are four scenarios, one for each DAAC: GSFC, EDC, LaRC, and NSIDC. Each scenario is oriented towards the functionality and data associated with the respective DAAC and takes a minimum of four hours to complete. The basic functions associated with Subscription Processing, Ingest, Search and Order, Science Data Server, and Distribution are exercised in all scenarios. Additionally, Product Generation is tested for the GSFC, LP, and LaRC scenarios, but not for NSIDC, since it is not required. The Functional Regression Testing for Release 7.00 was completed with no errors.

**Performance Testing and Load Stability Testing** was executed daily for numerous iterations of the Release 7.00 deliveries to find, document, and resolve problems associated with the system under heavy load or stress. The Performance Verification Center (PVC)/TS1 mode was utilized for all these testing activities. NCRs were written to document performance problems.

**Formal 24 Hour Testing** was exercised on four occasions to find, document, and resolve problems associated with the system under heavy load or stress. Stability is determined largely by the number and severity of core dumps, hangs, and server restarts that interrupt ECS operations. The GSFC S4 scenario, which simulates the ingest, production, distribution, and search and order workloads for the GSFC DAAC over an extended period, was performed on March 8-9, 2004. The EDC S4 scenario was performed on March 24-25, 2004. The GSFC S3 scenario was performed on April 2-3, 2004, and a final GSFC S4 run was performed on April 4-5, 2004. Data volume and granule metrics were captured and are presented below for all 24 Hour Test periods. CPU and memory utilization, as well as traffic analysis data are also provided.

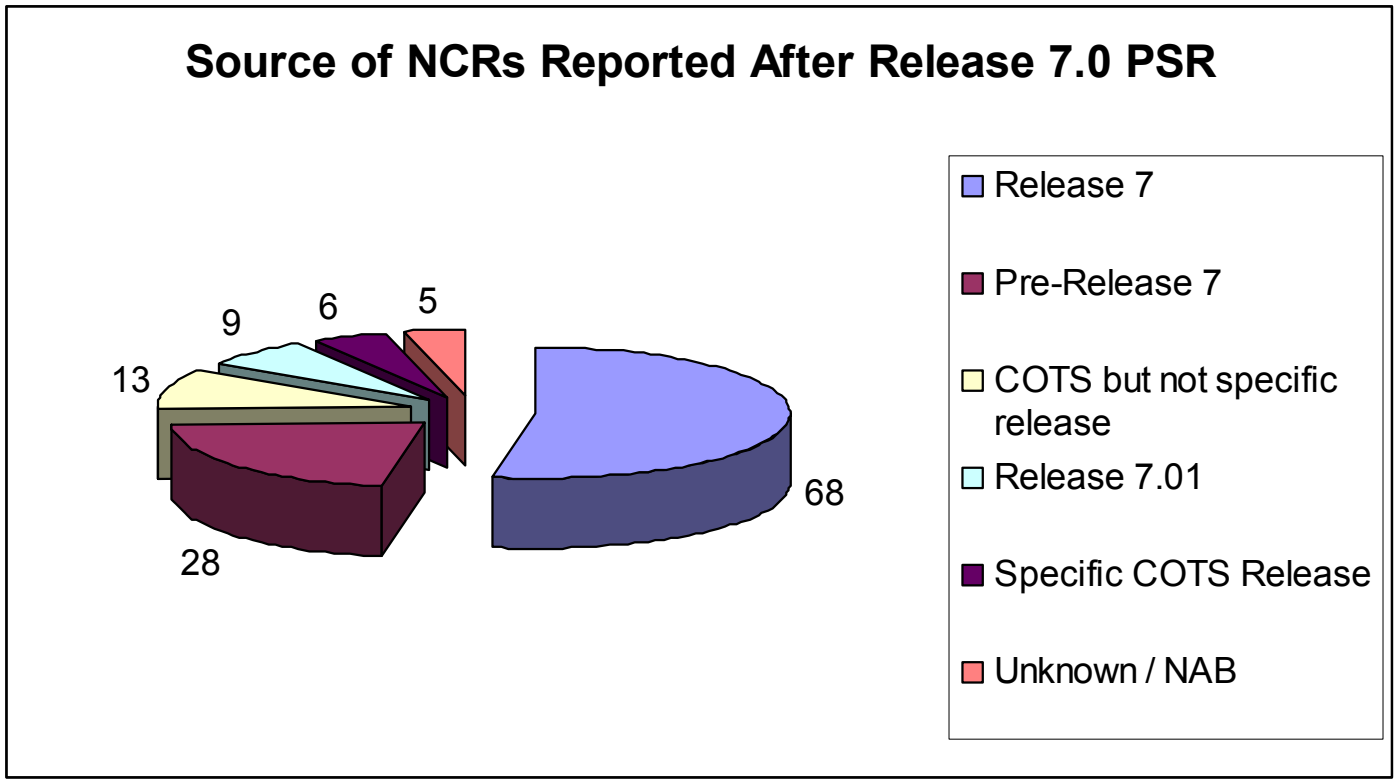
# 7.00 Functional Test Summary (Synergy)

**A final informal 72 Hour modified** GSFC (S3/S4) scenario was initiated on April 26, 2004 in the PVC TS1 mode using Release 7.00 + T.E. SYSTEM.02 custom code. This scenario also included elements of the EDC scenario.

**New Capability Verification** was successfully performed and witnessed by IV/V on the following enhancements:

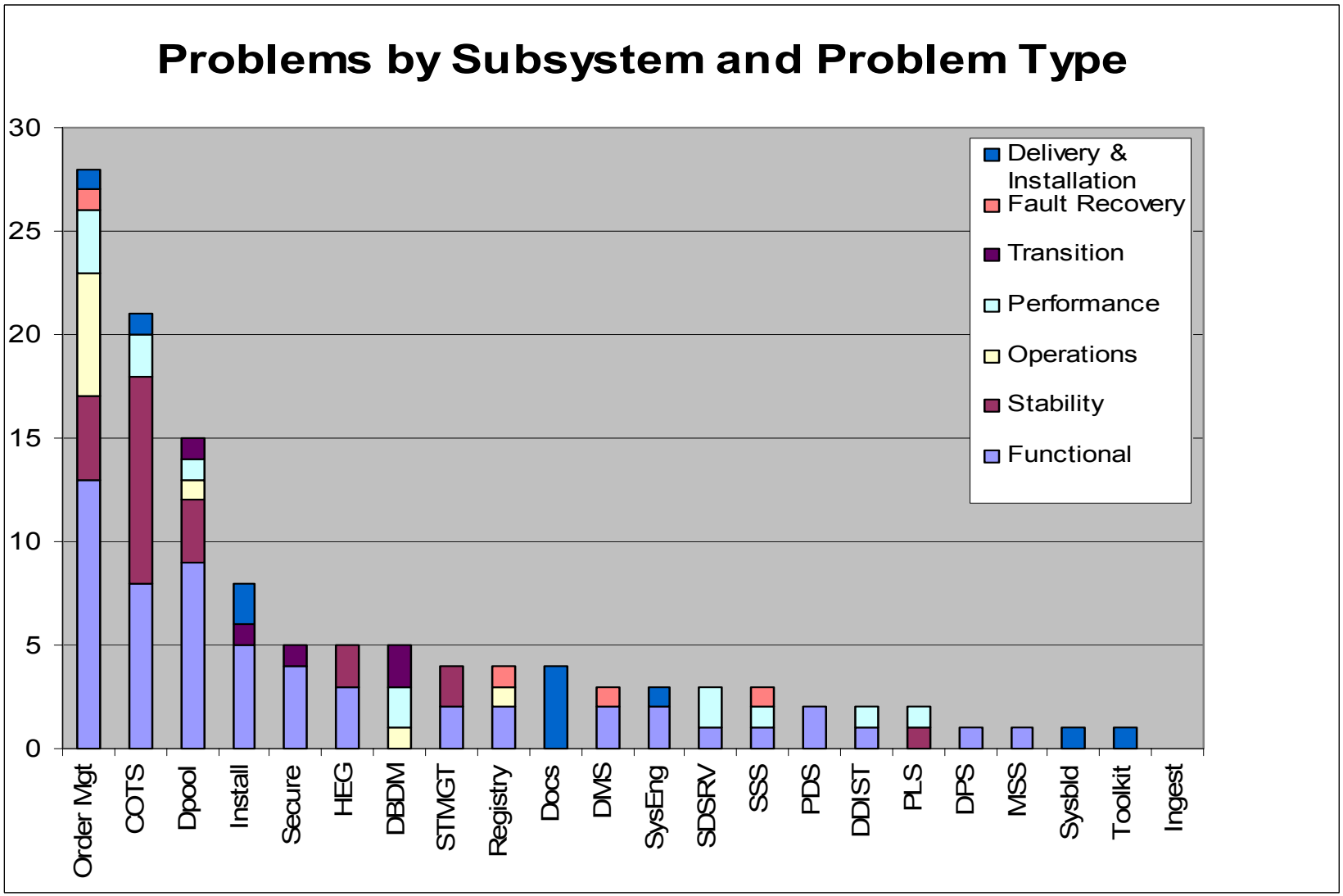
| Seq # | Ticket # | Test Case ID | Ticket Title |
|---|---|---|---|
| 1 | DP_S4_02 | S406020 | Support MISR Browse in the DataPool |
| 2 | DP_S4_03 | S406030 | Propagate ECS Granule Deletions to DataPool |
| 3 | DP_S4_04 | S406040 | Most Recent DataPool Inserts |
| 4 | DP_S4_05 | S406050 | Allow Operators to Update Group Collection Mappings |
| 5 | DP_S4_06 | S406060 | Allow Overwrites of DP Inserts |
| 6 | DP_S4_07 | S406070 | Compression on DP Insert |
| 7 | DP_S4_08 | S406080 | Lengthen DP Group ID |
| 8 | DP_S4_09 | S406090 | Propagation of QA Updates to the DataPool |
| 9 | OD_S4_01 | S407010 | Improve Distribution to End Users thru DataPool |
| 10 | OD_S4_02 | S407020 | Interface the Machine-To-Machine Gateway with Order Management |
| 11 | OP_S4_01 | S408010 | Add Security Features for Synergy Operator GUIs |
| 12 | OP_S4_02 | S408020 | Enhance DP Log Processing |
| 13 | OP_S4_06 | S408060 | Support Multiple DataPool File Systems |
| 14 | WD_S4_01 | S405010 | Improve DataPool Browsing |
| 15 | WD_S4_02 | S405020 | HEG Integration Enhancements |
| 16 | WD_S4_03 | S405030 | ECHO Support - QA Metadata Export |
| 17 | WD_S4_04 | S405040 | DAAC DataPool Home Page Customization |
| 18 | WD_S4_05 | S405050 | ECHO Support - Pre-Delete URLs and FTP |
| 19 | WL_S4_01 | S409010 | Synergy IV 24-HR Performance Workload |

# Analysis of NCRs Received 4/29/04 – 7/31/04

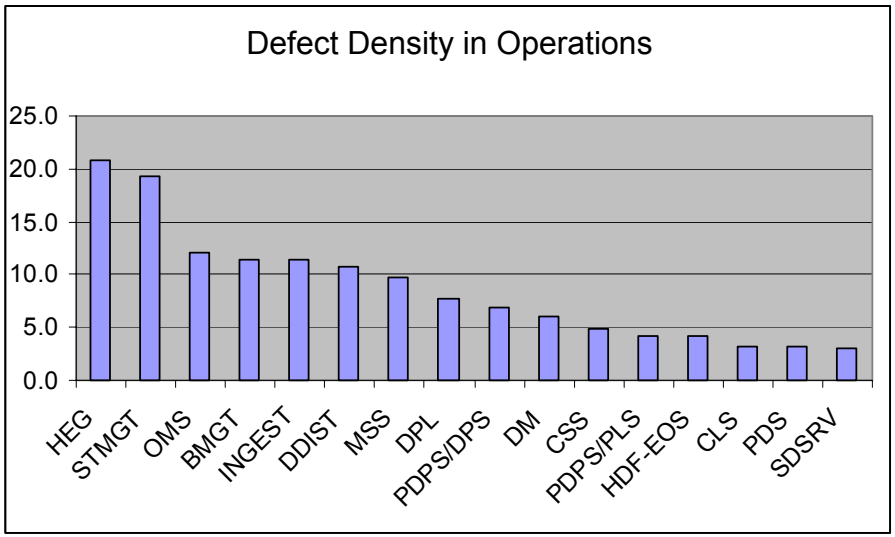



**In the two months after Release 7.0 PSR, 53% of the NCRs reported were directly associated with Release 7.**

# Analysis of NCRs Received after Release 7.0



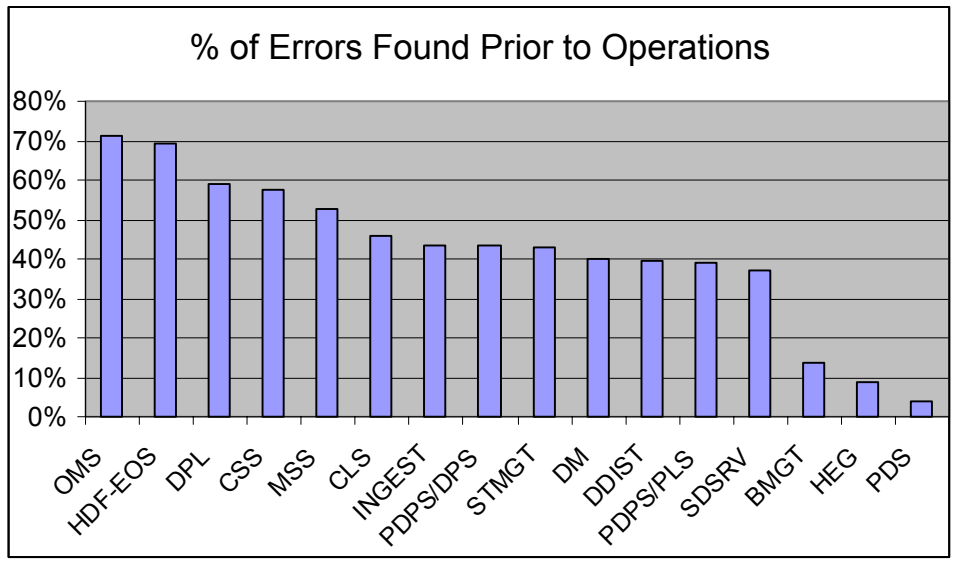
# Historical Error Density Data for Custom Code




OMS and DPL were the components with the greatest changes in Release 7. OMS is above average for Ops error density. DPL is below average.

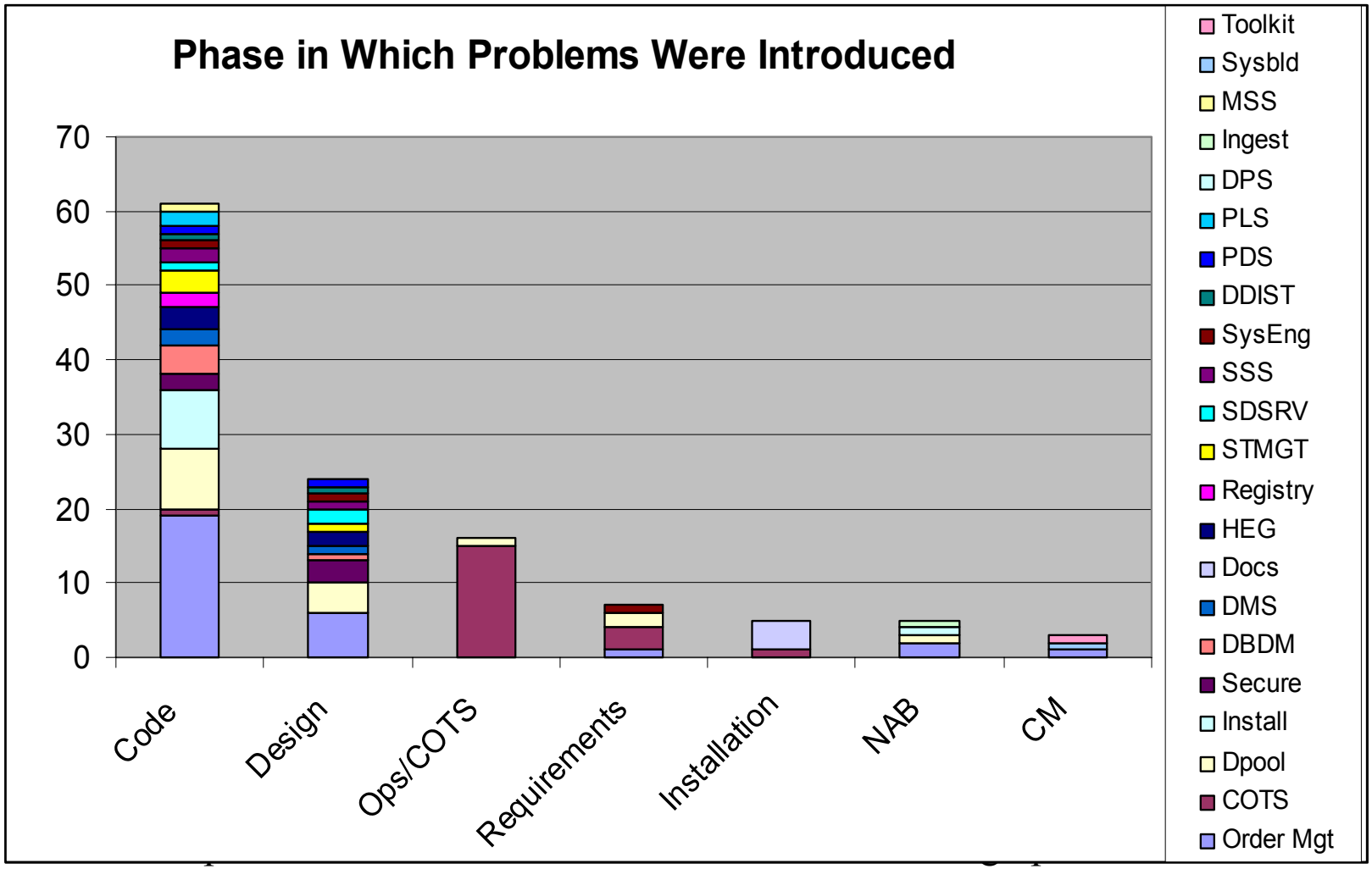
OMS and DPL have among the highest percentage of errors found prior to operations.

OMS: 71%. DPL: 59%



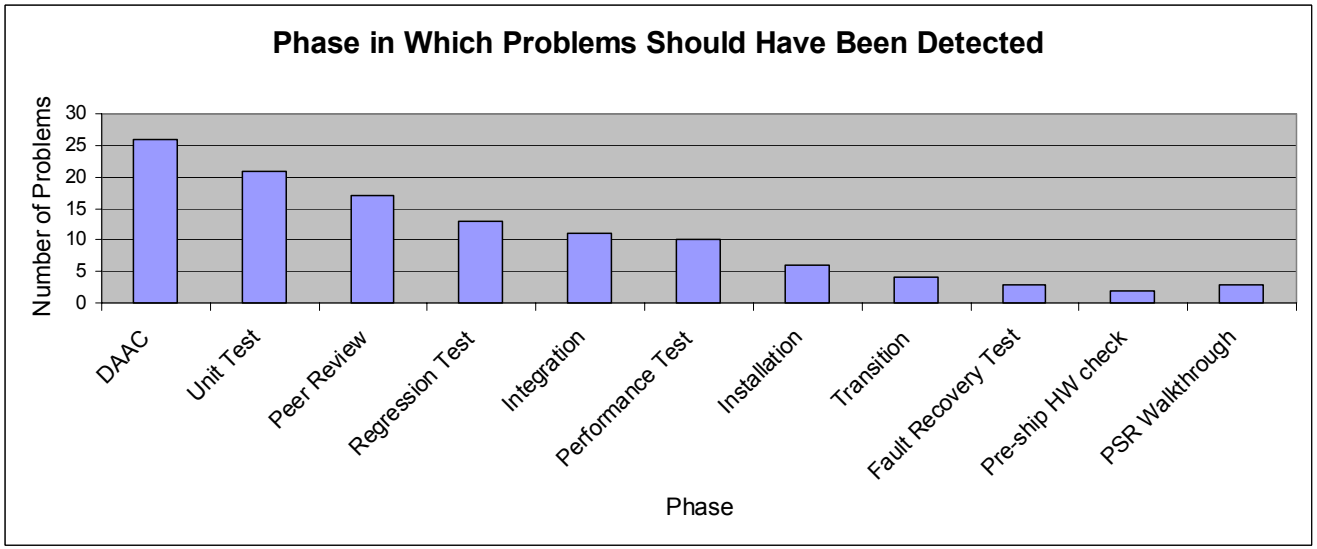

* Data provided by IV&V, and reflects NCRs per KSLOC, not including Severity 5s.

# Analysis of NCRs Received after Release 7.0

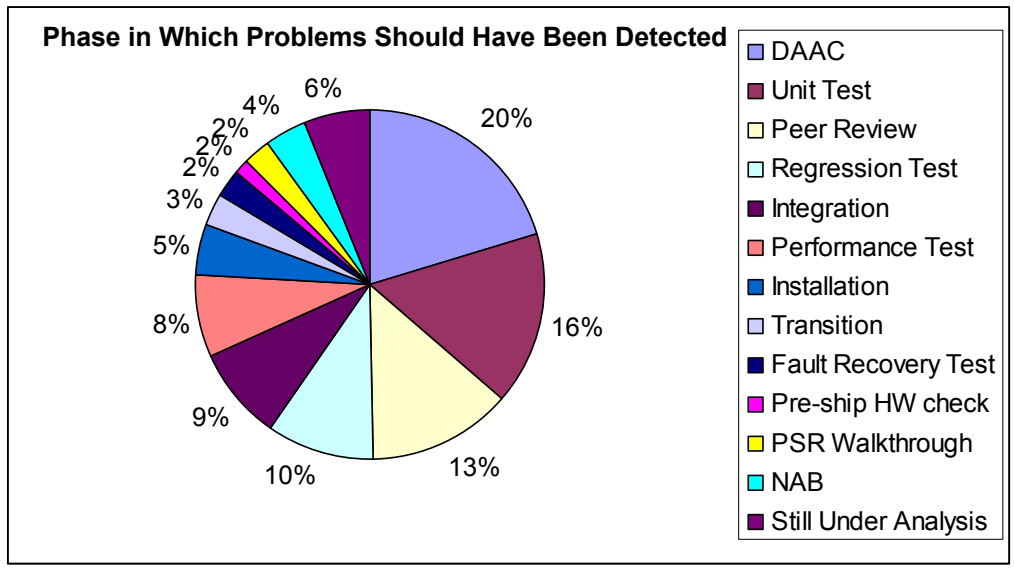



- Subsystem distribution does not suggest any specific issues.

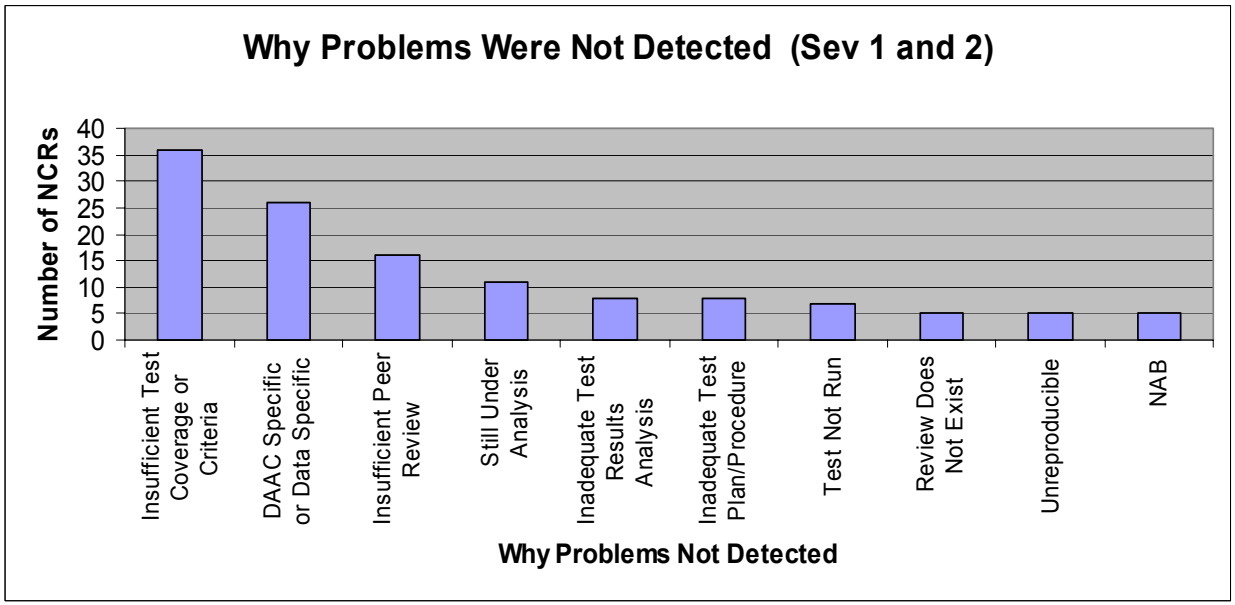
# Analysis of NCRs Received after Release 7.0



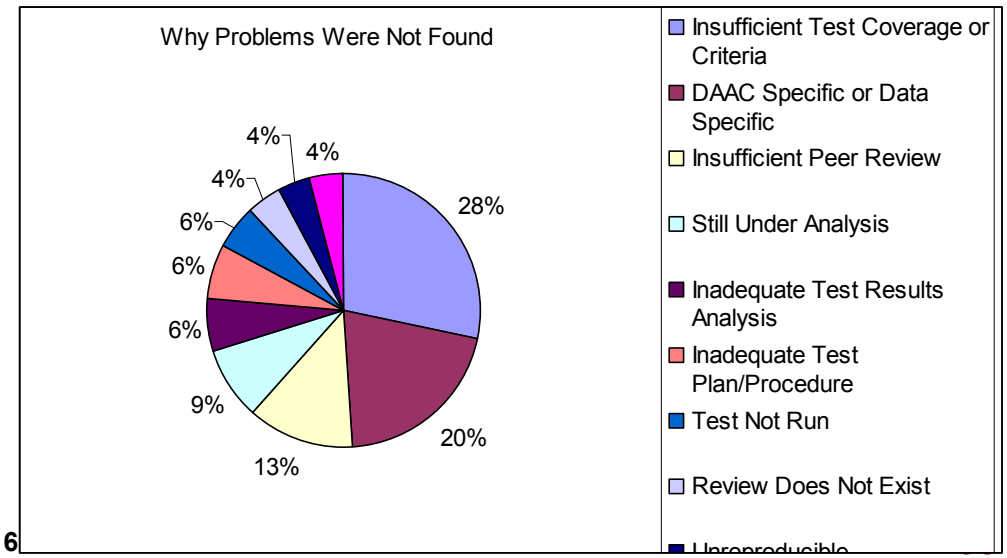

**Almost 50% of problems could have been caught in peer reviews, unit tests, regression test, and integration tests.**



# Analysis of NCRs Received after Release 7.0




**The main reasons that problems were not detected included insufficient test coverage (28%), insufficient peer review (13%), inadequate analysis of test results (6%) and inadequate test procedures (6%). Many problems are still being analyzed.**



# Conclusions Based on Analysis

- Testing overall appears to have been effective based on percentage of discrepancies found prior to PSR.
- However, analysis shows that more NCRs could have been caught through better unit testing, peer reviews, functional integration testing, and regression testing.
- Recommendations:
  - Additional training for unit testing to ensure that developers properly distinguish between unit testing and pre-integration
  - Revision of integration and test artifacts to improve functional test procedures as well as integration and fault-recovery tests
  - Review of design peer review artifacts for overall effectiveness.

# DAAC View of Release Success

# DAAC Survey Summary

- DAACs were surveyed in August, 2004, on their opinions of Release 6A.08 and Release 7.
- Questions addressed
  - Ease of installation
  - Ease of transition
  - Clarity of supporting documentation
  - Success of functionality
  - Stability
  - Performance
- Ratings
  - Excellent = minor issues with no measurable impact to DAAC operations
  - Nominal = some issues, but could be overcome with support from Landover, with only temporary impact to operations
  - Marginal = major issues requiring substantial support from Landover and having significant impact on operations in terms of its performance and response to users' needs.

# DAAC Survey Results Summary

| Release 6A.08 | EXCELLENT | NOMINAL | MARGINAL |
|---|---|---|---|
| Ease of installation (take into consideration installation instructions, degree of assistance from Landover) | LPDAAC<br>GDAAC | LaRC<br>NSIDC | |
| Ease of transition (transition instructions, transition complexity, transition feasibility) | LaRC<br>GDAAC | LPDAAC<br>NSIDC | |
| Clarity of other documentation (functionality description, test report) | | LaRC<br>GDAAC<br>NSIDC | |
| Post-installation functionality (Did the functionality work as advertised? For a sustaining engineering release, were the NCR fixes included the ones that were expected?) | LPDAAC<br>NSIDC | LaRC<br>GDAAC | |
| Post-installation stability (once installed in operations, were there more cores, hangs, or unexpected stability issues than prior to the release?) | LaRC<br>GDAAC<br>NSIDC | | LPDAAC |
| Post-installation performance (did the release cause performance to be degraded?) | LaRC<br>GDAAC<br>NSIDC | | LPDAAC |

# DAAC Survey Results Summary

| Release 7 | EXCELLENT | NOMINAL | MARGINAL |
|---|---|---|---|
| Ease of installation (take into consideration installation instructions, degree of assistance from Landover) | | LPDAAC GDAAC | LaRC NSIDC |
| Ease of transition (transition instructions, transition complexity, transition feasibility) | | NSIDC LaRC | LPDAAC GDAAC |
| Clarity of other documentation (functionality description, test report) | LPDAAC | | GDAAC LaRC |
| Post-installation functionality (Did the functionality work as advertised? For a sustaining engineering release, were the NCR fixes included the ones that were expected?) | LPDAAC | GDAAC NSIDC | LaRC |
| Post-installation stability (once installed in operations, were there more cores, hangs, or unexpected stability issues than prior to the release?) | LaRC | LPDAAC GDAAC NSIDC | |
| Post-installation performance (did the release cause performance to be degraded?) | LPDAAC LaRC NSIDC | | GDAAC |

# LPDAAC Response – 6A.08

| Release 6A.08 | EXCELLENT | NOMINAL | MARGINAL | COMMENTS |
|---|---|---|---|---|
| Ease of installation (take into consideration installation instructions, degree of assistance from Landover) | LPDAAC | | | Was a short install |
| Ease of transition (transition instructions, transition complexity, transition feasibility) | | LPDAAC | | Had to change the documentation in several places to reference different boxes to install software on. |
| Clarity of other documentation (functionality description, test report) | | | | |
| Post-installation functionality (Did the functionality work as advertised? For a sustaining engineering release, were the NCR fixes included the ones that were expected?) | LPDAAC | | | |
| Post-installation stability (once installed in operations, were there more cores, hangs, or unexpected stability issues than prior to the release?) | | | LPDAAC | See attached Word document. Ended up receiving Package 1, Package2, Package 3 for fixes |
| Post-installation performance (did the release cause performance to be degraded?) | | | LPDAAC | See attached Word document. DataPool inserts slowed down. Browse requests timed out. |

# LPDAAC Response – 7.0

| Release 7 | EXCELLENT | NOMINAL | MARGINAL | COMMENTS |
|---|---|---|---|---|
| Ease of installation (take into consideration installation instructions, degree of assistance from Landover) | | LPDAAC | | Install instructions were much better than in past releases, but many of the redlines we forwarded seemed to get lost. |
| Ease of transition (transition instructions, transition complexity, transition feasibility) | | | LPDAAC | A lot of different patches that were order dependent. The database transitions took a long time |
| Clarity of other documentation (functionality description, test report) | LPDAAC | | | Had Order Manager training in Landover |
| Post-installation functionality (Did the functionality work as advertised? For a sustaining engineering release, were the NCR fixes included the ones that were expected?) | LPDAAC | | | |
| Post-installation stability (once installed in operations, were there more cores, hangs, or unexpected stability issues than prior to the release?) | | LPDAAC | | Things seemed to work quite well considering that there was a lot of new Order Manager functionality. |
| Post-installation performance (did the release cause performance to be degraded?) | LPDAAC | | | Orders now process faster. |

# GDAAC Response – 6A.08

| Release 6A.08 | EXCELLENT | NOMINAL | MARGINAL | COMMENTS |
|---|---|---|---|---|
| Ease of installation (take into consideration installation instructions, degree of assistance from Landover) | GDAAC | | | |
| Ease of transition (transition instructions, transition complexity, transition feasibility) | GDAAC | | | |
| Clarity of other documentation (functionality description, test report) | | GDAAC | | |
| Post-installation functionality (Did the functionality work as advertised? For a sustaining engineering release, were the NCR fixes included the ones that were expected?) | | GDAAC | | NCR 37124 - Granule Deletion failed due to out of order patches (fixed in one patch, broken in next); NCRs to be verified by DAAC included several failures - 38025, 37613, 37083. |
| Post-installation stability (once installed in operations, were there more cores, hangs, or unexpected stability issues than prior to the release?) | GDAAC | | | |
| Post-installation performance (did the release cause performance to be degraded?) | GDAAC | | | |

# GDAAC Response – 7.0

| Release 7 | EXCELLENT | NOMINAL | MARGINAL | COMMENTS |
|---|---|---|---|---|
| Ease of installation (take into consideration installation instructions, degree of assistance from Landover) | | GDAAC | | |
| Ease of transition (transition instructions, transition complexity, transition feasibility) | | | GDAAC | Scripts were inefficient for transition of Databases. |
| Clarity of other documentation (functionality description, test report) | | | GDAAC | Executive summary of liens would have been helpful. |
| Post-installation functionality (Did the functionality work as advertised? For a sustaining engineering release, were the NCR fixes included the ones that were expected?) | | GDAAC | | Some of OMS GUI functionality lost; MFS moved out of release. Secure Ingest / Distribution required intensive interaction. |
| Post-installation stability (once installed in operations, were there more cores, hangs, or unexpected stability issues than prior to the release?) | | GDAAC | | |
| Post-installation performance (did the release cause performance to be degraded?) | | | GDAAC | Poorer performance under load |

# LaRC Response – 6A.08

| Release 6A.08 | EXCELLENT | NOMINAL | MARGINAL | COMMENTS |
|---|---|---|---|---|
| Ease of installation (take into consideration installation instructions, degree of assistance from Landover) | | LaRC | | |
| Ease of transition (transition instructions, transition complexity, transition feasibility) | LaRC | | | Best install the DAAC had to date for transition to OPS |
| Clarity of other documentation (functionality description, test report) | | LaRC | | |
| Post-installation functionality (Did the functionality work as advertised? For a sustaining engineering release, were the NCR fixes included the ones that were expected?) | | LaRC | | |
| Post-installation stability (once installed in operations, were there more cores, hangs, or unexpected stability issues than prior to the release?) | LaRC | | | System very stable |
| Post-installation performance (did the release cause performance to be degraded?) | LaRC | | | |

# LaRC Response – 7.0

| Release 7.0 | EXCELLENT | NOMINAL | MARGINAL | COMMENTS |
|---|---|---|---|---|
| Ease of installation (take into consideration installation instructions, degree of assistance from Landover) | | | LaRC | Installation instructions still need lots of work. A person that does not use the system daily should use the instructions - this would prove that the instructions are missing key steps. |
| Ease of transition (transition instructions, transition complexity, transition feasibility) | | LaRC | | As described above -- better instructions. |
| Clarity of other documentation (functionality description, test report) | | | LaRC | Having functionality descriptions is good. Test reports - not very essential. Spend more time including installation steps that are currently omitted. |
| Post-installation functionality (Did the functionality work as advertised? For a sustaining engineering release, were the NCR fixes included the ones that were expected?) | | | LaRC | Synergy III mode worked as advertised. Synergy IV mode had numerous isses that were not detected by test groups. |
| Post-installation stability (once installed in operations, were there more cores, hangs, or unexpected stability issues than prior to the release?) | LaRC | | | The system was very stable. |
| Post-installation performance (did the release cause performance to be degraded?) | LaRC | | | Performance was as good or better than previous release. |

# NSIDC Response – 6A.08

| Release 6A.08 | EXCELLENT | NOMINAL | MARGINAL | COMMENTS |
|---|---|---|---|---|
| Ease of installation (take into consideration installation instructions, degree of assistance from Landover) | | NSIDC | | |
| Ease of transition (transition instructions, transition complexity, transition feasibility) | | NSIDC | | |
| Clarity of other documentation (functionality description, test report) | | NSIDC | | Not used with much regularity |
| Post-installation functionality (Did the functionality work as advertised? For a sustaining engineering release, were the NCR fixes included the ones that were expected?) | NSIDC | | | |
| Post-installation stability (once installed in operations, were there more cores, hangs, or unexpected stability issues than prior to the release?) | NSIDC | | | |
| Post-installation performance (did the release cause performance to be degraded?) | NSIDC | | | |

# NSIDC Response – 7.0

| Release 7.0 | EXCELLENT | NOMINAL | MARGINAL | COMMENTS |
|---|---|---|---|---|
| Ease of installation (take into consideration installation instructions, degree of assistance from Landover) | | | NSIDC | Port addessing problems with doc, tomcat prob |
| Ease of transition (transition instructions, transition complexity, transition feasibility) | | NSIDC | | |
| Clarity of other documentation (functionality description, test report) | | | | No comment |
| Post-installation functionality (Did the functionality work as advertised? For a sustaining engineering release, were the NCR fixes included the ones that were expected?) | | NSIDC | | datapool deletion problem, NSIDC is still not using ESDT's in Syn 4 mode. |
| Post-installation stability (once installed in operations, were there more cores, hangs, or unexpected stability issues than prior to the release?) | | NSIDC | | PDS has some stability issues |
| Post-installation performance (did the release cause performance to be degraded?) | NSIDC | | | Ingest is fine but distribution could improve. (PDS issues), Have not seen the same Sybase issues as EDC. |

# EMD Lessons Learned

# EMD Program Management
# IPT Organization Transition Slower Than Expected

**EMD Experience:** Use of IPT Leads to manage Task Orders from start to finish quickly improved the alignment of authority and responsibility for technical, schedule, and budget issues. However, the perception of Task 101 COTS/Custom IPT leads as the "functional organization" has persisted and has caused confusion among subcontractors and support staff, who tend to look to these leads for decisions.

**Root Cause:** 10 years of ECS culture, as well as failure—even by IPT leads—to consistently communicate in the new paradigm

**Corrective Action:** With each new Task, clearly communicate roles and responsibilities for all aspects of the work. Reiterate throughout scheduling and staff assignments.

**Lesson Learned:** Moving from a functional organization to an IPT organization requires continuous reinforcement and consistent communication.

# EMD Program Management
# Task Order Management Offers Additional Challenges

EMD Experience: Task Orders can be great learning experiences for up-and-coming managers, but offer several challenges that will require additional training and improvement

- Proposal costs for small tasks may be disproportionate to the task
- Risk of over or under shooting budget by a significant amount is higher, since just a few hours may do it.
- There is significant overhead in managing staff allocations across tasks, since small tasks will not enable additional hiring, but must come from existing staff or other contracts.

Root Cause: Inexperience with Task Order management

Corrective Actions:

- Streamline proposals (done via Six Sigma)
- Train leads and staff to review charges and charging more closely.
- Use additional tools (Pivot reports, spreadsheets, P3) to manage staff across tasks.

**Lesson Learned: Task Order Contracts require additional tools and closer management oversight.**

# 6A.08 Integration and Test Inefficiency Due to Inadequate Preparation

**EMD Experience: Integration and Test suffered from lack of review and preparation prior to the I&T phase.**

- Review and update of the workload specification for EOC and EDC 24 hour scenarios was late
- Review of regression tests with DAACs was incomplete
- Test setup and configuration inadequately reviewed (re-experienced in Release 7)
- Test automation, scope and validation, and test evolution could improve

**Root Causes**

- Changing staff – lack of training
- Complexity of test environment workload (e.g., concurrent test activities)
- Inadequate configuration management

**Corrective Actions**

- Workload specification reviewed in advance of Release 7
- Yearly review of regression tests with DAACs instituted; additional artifacts to be added in peer reviews that will contribute to regression testing
- Six Sigma implemented to improve test environment management

**Lesson Learned: Better advance preparation for testing is required: people, environment, and test review.**

# 6A.08 Test and Deployment Strategy
# Use of Prototype, Pathfinder

**EMD Experience:**

- **Prototyping was beneficial in highlighting a number of aspects to the solution which needed further analysis (e.g. mail server move, security concerns), in addition to providing a better basis for performance benchmarks.**
- **Use of a Pathfinder DAAC continued to be a good strategy for both 6A08 and SUN Consolidation. The Pathfinder identified previously unforeseen issues, improved the installation instructions, and helped to build DAAC confidence in the release.**

**Lesson Learned: For substantial COTS architecture changes, an early prototype is advantageous to ensure that the technical solution is adequate. The use of a Pathfinder DAAC continues to be effective.**

# Synergy / Release 7
# Under-estimation of OM Development

**EMD Experience:** Order Manager capability was not developed on schedule. Functionality more complicated then expected

**Root Cause:** Estimation was not based on a similar activity and was not adequately reviewed

**Corrective Action(s):**

- Use Estimate Peer Review PI to ensure that inputs are complete prior to baseline (performed for Synergy V)
- Re-review estimates at each milestone (design, C&UT) to determine whether they should be modified, reflecting potential cost and schedule risk.

**Lesson Learned: If development is considered complicated, ensure estimate is based on a similar activity. Every estimate should be peer reviewed.**

# Inadequate Requirements Tracing for Order Manager

**EMD Experience: Order Manager functionalities/criteria were not discovered missing until during the Integration Test cycle**

**Root Cause: No effective traceability to requirements during design and coding cycle.**

**Corrective Action(s):**

- **Include traceability of design and code to requirements as a specific artifact for review in the requirements, design, CU&T, and I&T phases of development. Update VDB to include additional information that will facilitate analysis. (in progress)**

**Lesson Learned: Traceability to requirements must be performed at each stage in the development process, especially since tickets are updated throughout the process.**

# Integration of Order Manager Completed Behind Schedule

EMD Experience: Order Manager Integration took much longer than scheduled.

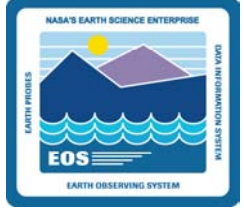
Root Cause: Functionality was more complicated then expected. The integration team was formed late in the development cycle. Tests were not adequately reviewed and required additional work throughout the integration and test process.

Corrective Action(s):

- Assign lead integrators at the same time as the development team.
- Train testers in integration and verification procedures.
- Add more senior resources with development skills to the integration team for complex capabilities.
- Experienced developers and/or integrators must review the integration schedule. Create a Test Architect position.
- Review test data as an artifact, and schedule a review that addresses it.

**Lesson Learned: Integration is an integral part of the product cycle and should be given the same priority**

# Installations in Integration Modes Overwhelmed Available Staff




**EMD Experience:** A small, dedicated, team performed all of the installations required during Synergy integration. While this resulted in very efficient installations, the team was overwhelmed and overworked.

**Root Cause:** Not enough staff trained to perform installations.

**Corrective Action(s):**

- Cross train test and development staff to perform installations in various environments.
- Develop a rotation program for new / junior staff so that they work in each integration environment

**Lesson Learned: Integration is an integral part of the product cycle and should be given the same priority**

# IV & V Scheduling Issues

**EMD Experience: IV & V personnel not satisfied with test verification process, which often seemed chaotic**

**Root Cause: Integration team was not fully activated early enough in the Development cycle. Integration was behind schedule.**

**Corrective Action(s):**

- **Assign a responsible engineer to confirm that all pre-demo activities (ticket in VDB, criteria log generation, incorporation of red-lines, dry run) are completed before a demo is scheduled.**
- **Test procedures should be re-reviewed if there are major changes.**
- **Pre-defined notice of scheduled demos given to IV & V witnesses.**
- **All changes communicated in a timely manner.**

**Lesson Learned: Demos should not be scheduled until all paperwork is completed, and the IV & V team should be timely notified of all demos and/or demo schedule changes.**

# Status of Improvements Resulting from Lessons Learned and NCR Analysis

| Process Improvement | Area | Status | Lead |
|---|---|---|---|
| Streamline Task Plan Proposal process | Planning | Complete | Ducharme |
| Develop better tools for performing planning across tasks | Planning | In progress | Armstrong |
| Implement SLOC and Effort Estimation Peer Reviews for Synergy V | Planning | Complete | Ortiz |
| Develop and use checklists for environmental readiness | I&T | In progress | Cohen / Brewster |
| Assign Integration and Test Architect | I&T | Complete | Fox |
| Revise Integration and Test artifacts and processes to provide better information earlier in development | I&T | In progress | Carr / Rettammel |
| Schedule separate I&T peer reviews early in the development phase | I&T | Complete | Duncan |
| Assign Integration Leads for capabilities at inception of development | I&T | Complete | Duncan |
| Cross-train test and development staff to perform installations | Installation & Transition | In progress | Johnson |
| Improve traceability of requirements to design, code, and integration artifacts | Development & I&T | In progress | Ortiz / Carr/ Duncan / Schessler |
| Perform DAAC review of regression tests | I&T | Done – '04. TBS – '05 | Brewster |
| Implement training – unit testing | Development | To be scheduled | Ortiz/Cohen |

# Conclusion

- RSR Analysis is worthwhile, possibly more so than CSR.
  - Two months past RSR is a reasonable point at which to perform analysis
  - DAAC survey is useful, but should be accompanied by interview to elicit better comments
  - NCR Analysis should be done by a small number of people to avoid calibration issues

- Most findings from NCR analysis echoed the more intuitive “lessons learned”
  - Areas that need the most improvement are test procedure development and peer reviews