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The Transition Approach to the ECS Drop 5A System

Technical Paper

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Abstract

This document presents an approach to the ECS system transitions from the Drop 4Px baseline of the ECS Release 2.0 system to the Drop 5A baseline. It discusses the issues for the planning of the transition. This information will ultimately lead to the definition of detailed plans for transition.

The objectives, approach, and time scale are presented. Technical issues arising from changes between the releases are discussed. Issues are identified, leading to a statement of some candidate solutions.

The transition from Drop 4Px to Drop 5A is complex because it involves sharing hardware and software with an operational system, and migrating a significant amount of data. Mode management will be used to allow Drop 5A test and training activities to occur in parallel with Drop 4Px operations.

It is expected that any changes to the assumptions and plans that occur after the release of this paper will be reflected in the Transition Plan document, to be released after this document.

Keywords: Transition, Release 2.0, Drop 5A, plan, version, migration, mode management.

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1. Introduction

1.1 Purpose and Scope

This paper is intended to describe the problem of the transition from Drop 4Px to Drop 5A of the Release 2.0 baseline of the ECS system. It is a higher level document that is intended to define the scope and general strategies for transitioning. It is intended to identify the work that needs to be done to successfully complete the transition. Issues that are identified as a result of this work will be tracked as resolved as the transition planning process continues. The Transition Plan will be prepared subsequent to the release of this document and will define the details of that work. In it's final release, the Transition Plan will include references to the procedures that will be followed in the completion of the transition.

This paper is intended to define the activities needed to change the ECS system at each of the DAACs from one configuration or baseline to another one. Each baseline, before and after the transition, are expected to have defined and prepared operations documents, training materials and plans, procedures manuals, etc. This paper will not describe that material or provide references to it. Rather, the focus of this paper is limited to the actual transition activities as opposed to the state of affairs before and after the transition.

1.2 Organization

This paper is organized as follows:

- Section 1 - Introduction - Describes the purpose, scope and organization of the document.
- Section 2 - Transition Definition - Identifies in a summary fashion the changes that will occur to the system through the transition. A description of the specific changes in the developed software, COTS software, and hardware components is provided.
- Section 3 - Transition Operations Concept - Discusses the role of mode management in transitioning from one baseline to another. Provides an overview to the transition activities and steps, including assumptions. Identifies test activities during transition. Discusses roles and responsibilities during the transition period.
- Section 4 - Transition Strategy - Discusses issues and options with regard to transition strategies.
- Appendix A - Provides summary information from the ECS subsystems related to the Drop 5A transition.
- Appendix B - Provides a primer on mode management.

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2. Transition Definition

2.1 Top Level Schedule for Drop 5A

The top level schedule of key events associated with the Drop 5A transition is presented in Figure 2-1. The detailed, current schedule is maintained in the P3 (Primavera) schedule for the ECS Project and will take precedence over information presented here if there is a conflict.

2.2 Drop 5A Capabilities

The ECS system will support launch of the EOS AM-1 spacecraft with the Drop 4Px baseline of Release 2.0. This is the minimum system that can support launch and meet the critical needs of the EOS mission. The capabilities that are included in the ECS Drop 4Px system are defined in the P3 (Primavera) Schedule for the ECS Project. The deployed ECS system will be upgraded from the Drop 4Px baseline to the Drop 5A baseline beginning shortly after launch. The Drop 5A system will provide additional capabilities above those provided in the Drop 4Px system. These additional capabilities for Drop 5A as it is currently planned are identified in Table 2.2-1.

In addition to the new capabilities introduced in Drop 5A, the system will include modifications to address certain NCRs that have been written against the ECS system. The NCR fixes that will be provided in the Drop 5A system will be identified in the future based upon priorities and seventies of the NCRs.

2.3 Developed Components

The work associated with the changes or additions to the ECS custom software for the Drop 5A baseline is underway at this time. From the P3 schedule, the implementation of all of this capability will not be complete until early Fall, 1998. It is expected that the Drop 5A upgrade will reflect an update to a significant part of the complete system.

An ECS installation can be defined in terms of Installable Units (IUs). IUs are the basic installation elements that are used by the ECS Assist system to place appropriate software and data on to hosts at the DAACs, and configure that software for operations. The IUs themselves are text files that contain the definitions of the executables, libraries, configuration files, environment variables, etc., that are installed at the same time as a unit. The IUs are under configuration control with the subsystems that they are associated with. For a full installation, essentially all of the IUs would be required to accomplish the installation. The definition of the transition for 5A that will be presented in the Transition Plan may be presented most concisely in terms of the IUs.

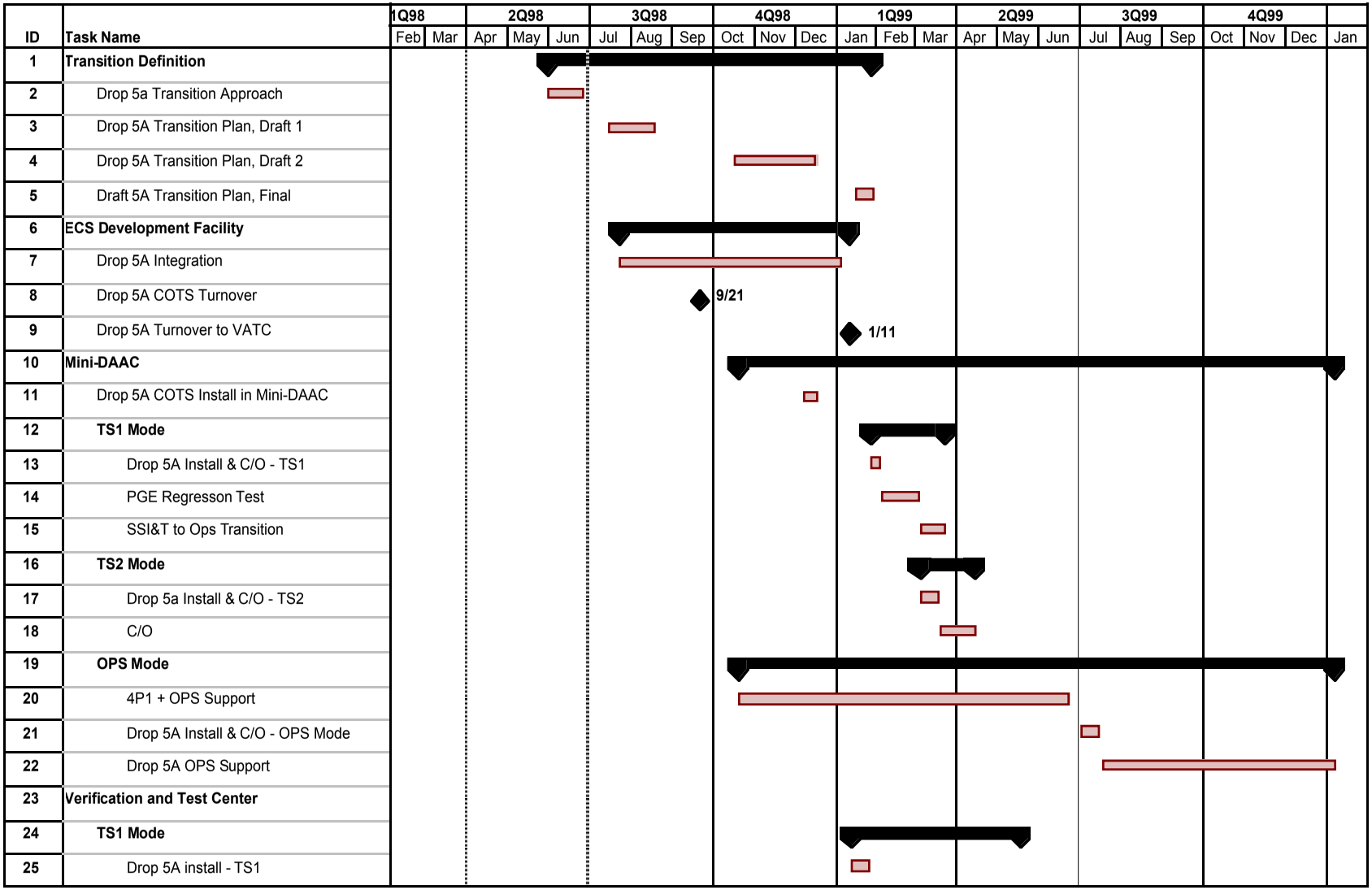

Figure 2.1-1. Drop 5A Mid Level Transition Schedule

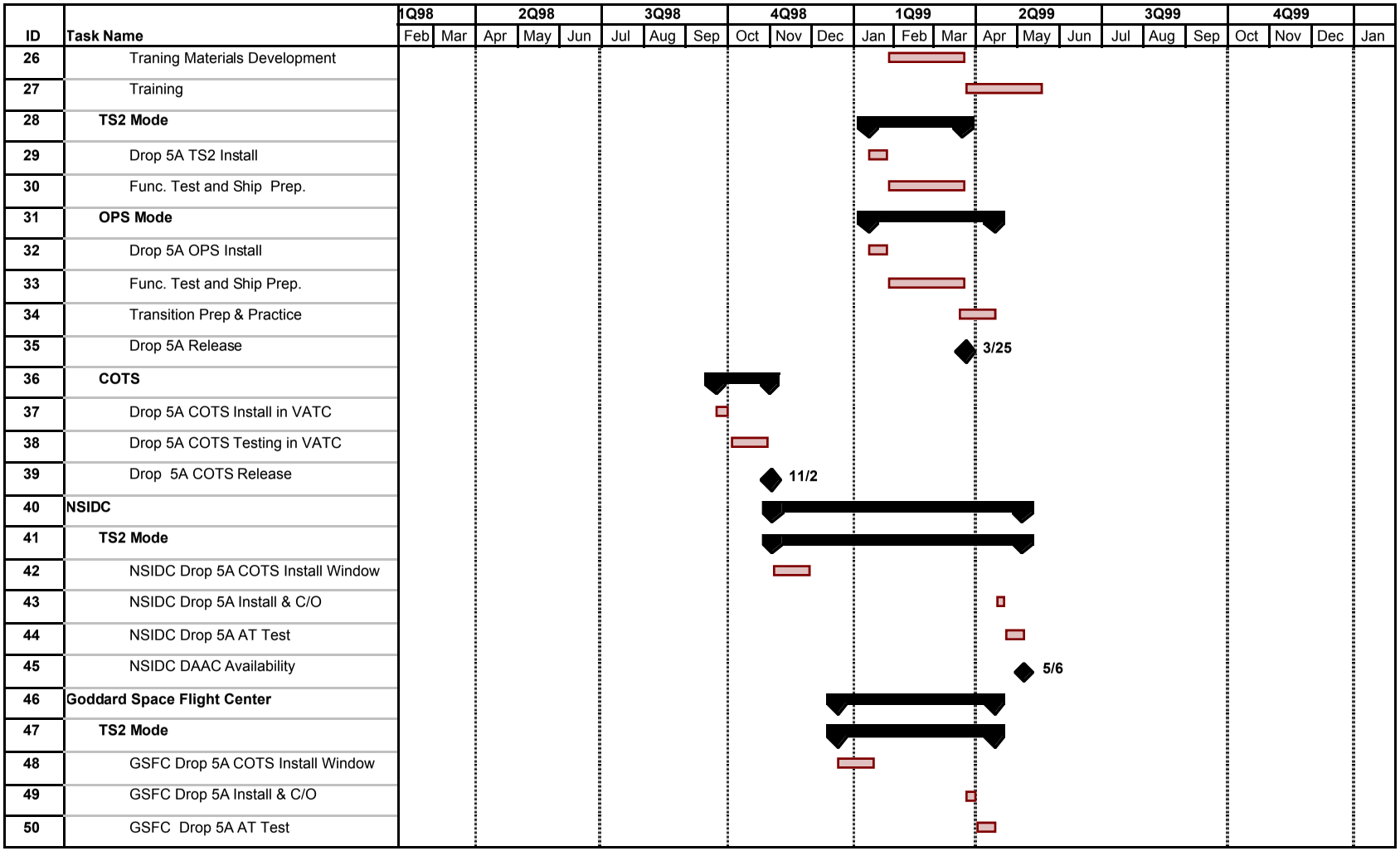

Figure 2.1-1. Drop 5A Mid Level Transition Schedule (Cont)

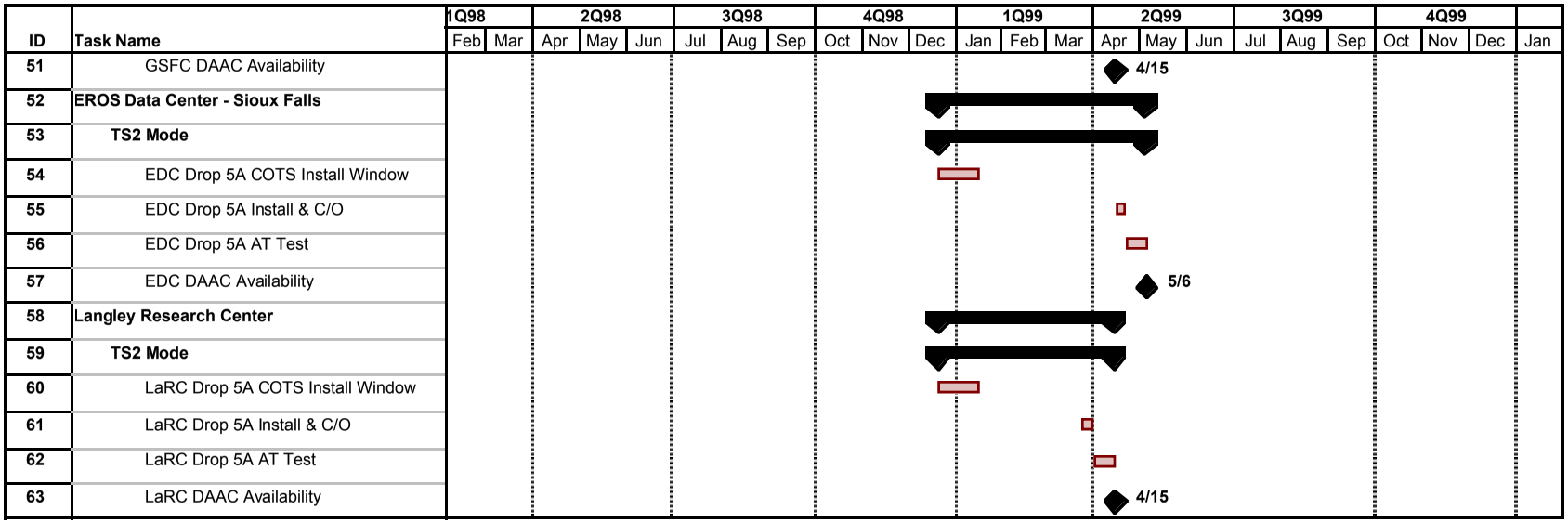

Figure 2.1-1. Drop 5A Mid Level Transition Schedule (Cont)

Table 2.2-1. Drop 5A Additional Capabilities (1 of 3)

Capability No.	Capability Title
N/A	L7 IGS metadata/browse
0120	ASTER L1A.L1B, Gpolygon
0171	Orbit FDD
0200	Sage III Data Types
0210	DAS Data Types
0215	Ingest LaTIS
0216	Distribution Ingest
0290	ASTER DEM 14K
0550	Production Rule: Tiling
0560	Production Rule: Data Day
0572	Production Rule: Tiling/Metadata based Query combination
0590	Production Rule: Optional DPRs
0600	Production Rule: Most Recent Granule
0620	Production Rule: Alternates based on min. # of granules
0640	Production Rule: Smart Start of Year
0661	Production Rule: Zonal Tiling
1062	Internal PGE Data Pointers
1405	Remote Insert Workaround
1540	Search Service
1551	Update, Delete of Data Dictionary contents
1562	DDICT Maint Tool, attribute editor, delete/create relationships, modify entries
1580	Acquire including order tracking
1590	Browse requests
1600	Basic site-specific search
1610	Acquire including order tracking
1620	Browse requests
2220	SDSRV Truncate results message
2235	Delete From Archive
2460	Variations on search areas and product specific spatial representations
2600	SDSRV support for zonal tiling (llbox)
2602	Zero Length File Checking
2603	Remote Insert
2604	Move EVT to the SDSRV
2615	Out of Memory Condition
3100	Login integrated with Home Page
3170	Project (navigate to all nodes, and hence, folders within a session)

Table 2.2-1. Drop 5A Additional Capabilities (2 of 3)

3180	Inventory search for science granules (keywords, spatial, temporal, dependent valids (keywords only) and product-specific attributes)
3190	Search Status
3200	Results Management, including chunking, sorting, and acquire services
3210	Product Order (metadata, media, services (DPR), integrated profile, dialogs (confirmation, rejection, acknowledgment))
3240	Basic Context-sensitive Help (tied to tabbed folder focus only)
3250	Model (session management)
3260	JESS (session management, search/results server, order servlet, DPR workaround servlet, subscription servlet)
3261	{No description}
3262	{No description}
3265	{No description}
3280	L-7 scene price estimate workaround
3290	SCF QA metadata support - provide access to result sets
3330	Integrated browse
3331	View Measured Parameter attributes
3340	Search/create result set of granules to be QA'ed (using JEST)
3350	Web server based application to process results set and update QA flags
3360	DAAC operator approval GUI for SCF QA metadata updates
3392	Granule UR Search
3393	Production History Acquire
3480	Database administration: ESSM Tool
3690	Management event recording to local logs
3700	Local log consolidation into MDA database
3710	MDA error and event log browser
3720	Archive of local logs and MDA database
3740	MSS Standard Administrative Reports
3790	Trouble ticket consolidation using Remedy
3880	Recovery from Faults identified in failure/recovery walkthrough - MDA Failover
4390	SBSRV encryption of ftp password
4410	SBSRV DDICT interface mod
4440	Main framework with session management and socket server
4450	Login proxy
4460	Logout Proxy
4470	DSS proxies: Search and Acquire
4480	MSS proxies: Profile, Order tracking and Order status
4530	MOJO: DSS Proxy, Browse

Table 2.2-1. Drop 5A Additional Capabilities (3 of 3)

4531	Hello proxy
COTS Upgrade	Sybase Open Client/SGI
COTS Upgrade	Netscape 4.04 - Mail, Bulletin Board
COTS Upgrade	Netscape Security
COTS Upgrade	HP O/S 10.20
COTS Upgrade	DCE Patch 37
COTS Upgrade	Builder Xcessory
COTS Upgrade	SQS 3.0.1

2.4 COTS Components

Several new COTS software components will be upgraded at the Drop 5A transition. As is indicated in the top level schedule of Figure 2.1-1, these components will be deployed to the DAAC sites several months in advance of the installation of the custom software components. The COTS software upgrades planned for Drop 5A are as follows:

- Sybase Open Client/SGI
- Netscape 4.04 - Mail, Bulletin Board
- Netscape Security
- HP O/S 10.20
- DCE Patch 37
- Builder Xcessory
- SQS 3.0.1

2.5 Hardware Components

At present there are no defined new hardware components that will be added to the DAAC systems in conjunction with Drop 5A upgrade. Component upgrades (e.g., additional memory, increase in RAID capacity) and/or some reconfiguration of hardware (e.g., repartitioning of disk systems) may occur in conjunction with Drop 5A depending on experience gained with the operating 4Px baseline. As a result, the need for them will not be identified until late in the transition process. However, experience has been that such upgrades can be accommodated with minimal impact to the rest of the system.

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3. Transition Operations Concepts

The higher level operations concepts for a transition are described in this section. Note that much of the content of this section may be applicable to future transitions as the operations concepts are not driven by the details of the Drop 5A transition.

3.1 Transitions and Modes

The management of multiple releases at the DAACs, as well as at the Landover development facility, depends upon the ECS mode management capability, in particular during the transition process. Briefly, mode management is the capability through which several versions of software can be executed at the same time on the same suite of hardware platforms without interfering with each other. Appendix B contains a mode management primer which describes in more detail how mode management is implemented. Mode management will be used to run the different versions of the software for testing, training, and/or simulations in the time frame of the transition.

Figure 3.1-1 provides a notional view of how mode management is used to run multiple concurrent releases of the ECS software on a single hardware resource set. It also indicates how the MiniDAAC system at Landover will be configured with modes and releases to support the activities at the DAACs.

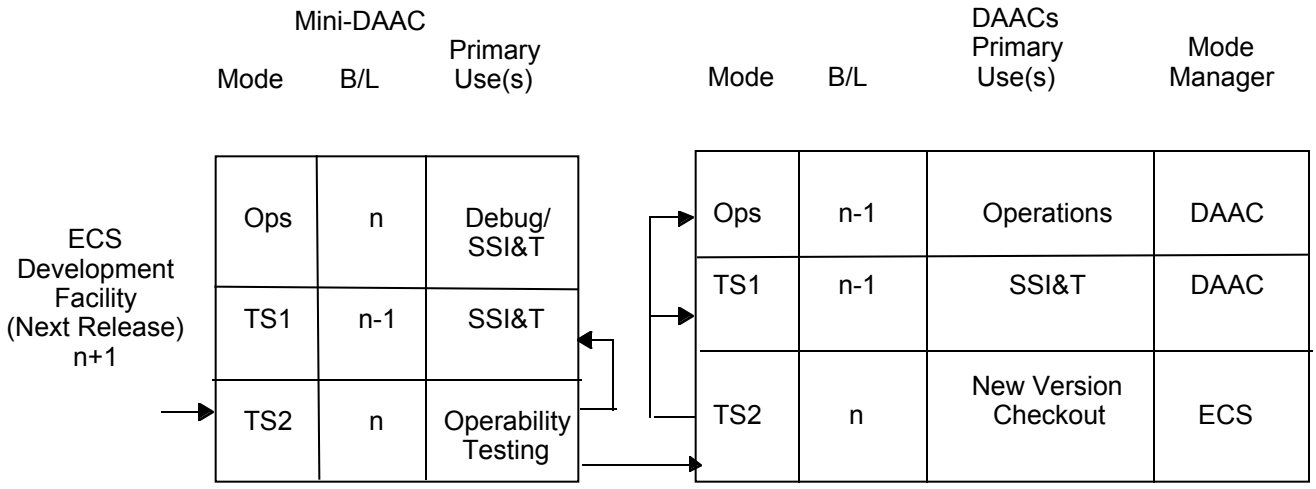

Figure 3.1-1. ECS Mode Management

To meet operational requirements, three modes will be created in each hardware suite - the Mini-DAAC, VATC, and at each DAAC. These three modes are identified as Ops, TS1, and TS2. Initially, disk partitions at the DAACs will be split 60% (Ops), 20% (TS1), and 20% (TS2) across these three modes. Therefore TS1 and TS2 will be about twice the size of the current Mini-DAAC (adequate for SSI&T) and Ops will be large enough to accommodate at launch

requirements. These percentages can be adjusted based upon actual experience at the DAACs with the operational system and with the PGEs by addition of additional hardware (disk) or repartitioning of existing resources.

Prior to deployment of a baseline "n" to the DAACs, system verification testing will be conducted on the new release in the VATC. At the completion of the system verification testing, the new mode will be deployed to the TS2 and Ops modes in the MiniDAAC. The baseline "n-1" will be maintained in the TS1 mode in the MiniDAAC to continue to support any ongoing SSI&T activities at the DAACs. Further testing, training and transition dry-runs will be conducted at that time with the new system. When these activities are complete, the "n" baseline will be deployed to the TS2 mode of the DAAC system. Additional tests will be applied to the deployed system at that time to insure the compatibility of the baseline as installed with the existing DAAC environment. Operations may continue concurrently with the "n-1" system in the Ops mode. SSI&T activities could continue with the "n-1" baseline in the TS1 mode, although this is unlikely. When checkout testing is complete, the "n" baseline can be installed to the Ops and TS1 modes and operations may resume under the new baseline.

3.2 Transition Overview

This section provides a general overview of the strategy to be used for the transition from Drop 4Px to Drop 5A. The details of the transition approach will be contained within the transition plan to be developed subsequent to this document.

3.2.1 Assumptions

Table 3.2.1-1 is a list of assumptions that apply to the Drop 5A transition. These are assumptions that may not be stated elsewhere in this text but are gathered together here for reference.

3.2.2 Constraints

Certain constraints on transition planning have been identified and will be used in the transition planning process. The following subsections present constraints on transition have been identified.

3.2.2.1 Complete within Processing Recovery Time

A transition step may require that processing be halted for some period of time while the appropriate software is reloaded and databases converted. When processing is resumed after the step, the backlog of processing must be worked off within one 24 hour period as a goal.

3.2.2.2 Maximum Transition Step Completion Time

During transition steps, some or all of the ECS system may need to be halted. Based upon interviews with DAAC management, this outage should be no more than 8 hours as a goal.

Table 3.2.1-1. Transition Assumptions

No.	Assumption
1	During the transition phase at each DAAC, 3 modes will exist: (1) the Ops mode for ongoing Drop 4Px operations; (2) the TS1 mode, in Drop 4Px, which will be used to support SSIT activities; (3) the TS2 mode which will be used to support the checkout of the Drop 5A system.
2	No separate strings of equipment will be allocated at the DAACs for running two drops in parallel concurrently.
3	During the actual transition, the TS1 mode, although established and reserved for SSIT, will likely not be used. The SSIT of PGEs in a soon-to-be-replaced mode is not efficient and the resources can be better applied to the other activities at that time.
4	Three modes will exist as indicated above at the DAACs, but activities may not be ongoing in the TS2 and Ops modes simultaneously. It is assumed that Drop 5A testing in TS2 will be accomplished in the portion of the day that is remaining after daily production is accomplished.
5	A downtime for the implementation of any single transition step can be, as a goal, no more than 8 hours.
6	There is no change in the hardware or software for Drop 5A that would affect the scientific results of a PGE and thereby require revalidation of the PGEs by the science teams.
7	For Drop 5A, transitions across DAACs do not need to be simultaneous.
8	For multiple step transitions, the deployed system at any point between steps will be in an interim, non-baseline state. Any interim state will be adequate to perform at least the capabilities of the 4Px system. Any data/information captured during an interim state will be retained after the transition is complete. Under these conditions, interim states are acceptable operational states.
9	All Drop 5A components will be backward compatible. That is, the 5A components will be able to support both 4Px interfaces as well as 5A interfaces without modification.
10	It is necessary to have the capability to backout an installation of the Drop 5A baseline from the Ops mode and to reinstall the previous Drop 4Px baseline without loss of data. However, this decision must be made during the checkout testing after installation into the mode, before restarting operations in this mode. Specifically, it is not required that data captured by the new Drop 5A system be translated into a Drop 4Px system.

3.2.3 Transition Step Sequence

The transition is expected to be accomplished in a number of steps. The present view of these steps is as follows:

1. Step 1 - Drop 4Px Patch - The 4Px system may require patches be applied so that the transition can be accomplished. This is distinguished from patches that are needed to fix problems in the previous baseline. The successful Drop 5A transition is dependent on these patches. Examples are patches that need to be applied to custom software so that it can properly co-exist with an upgrade to a COTS package which is not mode aware. Although these patches will not contribute to the functionality of Drop 5A, they are regarded here as part of the overall transition process. Further analysis will be required to determine if any such patches are necessary.

2. Step 2 - Hardware Upgrades - As noted above, no hardware additions in Drop 5A have been identified at this time. Hardware upgrades or reconfigurations may be required. The

upgrades such as memory or disk storage space increases will be transparent to the existing 4Px baseline. Any impact on the 4Px baseline resulting from reconfigurations such as disk repartitioning will be factored into any 4Px patch work.

3. Step 3 - COTS Upgrades - COTS upgrades are planned to occur in the Drop 5A transition. Section 2.4 identifies the COTS upgrades that are to occur in Drop 5A. Note that these upgrades do not need to be combined into a single step or, as is the case for Drop 5A, to be deployed well in advance of the custom code deployment. It is planned to have the upgrades to the COTS occur as early as possible, before launch of the EOS AM-1 spacecraft if possible.

4. Step 4 - Custom Software Transition - There can be one or more sub-steps devoted to the installation of ECS custom software. The decision on the number of steps involved and the allocation of software components to steps depend on considerations such as dependencies and time allocated for the custom software installation. More than one step can be defined if all of the software cannot be installed in a single installation event period, which is time constrained. For example, in one scenario, the Science Data Server (SDSRV), Data Distribution (DDIST), Storage Management (STMGT), and Ingest (INS) would be installed in one step. Several days latter, the remainder of the system would be installed in the next step. This is discussed further in Section 4.

Each of the steps described above do not need to occur one after another in the same time period. Instead, some time will elapse between the completion of one step and the start of another. In particular, for multiple step custom software transitions, several days can elapse between custom software installations so that backlogs of work which will have built up during the transition can be worked off.

The details of the transition activities of a single custom software installation step, are described in the next subsection.

3.2.4 Custom Software Transition Step Overview

This section is intended to describe the activities to be performed for a general custom software transition step (Step 4 in Sec. 3.2.3, above) at the DAAC. The procedures at a more detailed level will be provided in the Drop 5A Transition Plan.

3.2.4.1 Activity 1: Dependencies Resolved

As a precondition to entering into the transition step, all COTS and custom software upgrades upon which this step is dependent will need to be satisfied.

3.2.4.2 Activity 2: Install to Mode TS2

The drop will be installed in the TS2 mode at the DAAC. ECS Assist will be used to accomplish this installation. This installation step is not time constrained - it does not need to be accomplished within any particular time limit.

3.2.4.3 Activity 3: Checkout in Mode TS2

Following the installation, the system will be checked out using standard regression tests to insure that the installation was completed properly. In addition to running standard regression tests with test data sets prepared in advance, test scenarios may be run in which the data is "real" data, e.g., instrument level 0 data, which has been manually inserted into the appropriate locations to simulate insertion into the new ECS baseline in the TS2 mode.

3.2.4.4 Activity 4: Local DAAC Test & Training in Mode TS2

Following the checkout step, the ECS system in TS2 will be turned over to the local DAAC operations group for DAAC defined testing. In addition, the local DAAC operations group will conduct training for their personnel to familiarize them with the system changes. When this step is complete, the installation is ready to proceed to the Ops mode in which operational processing is ongoing.

3.2.4.5 Activity 5: Backups

In the operational mode, all data which must persist through the transition needs to be backed up. Should the installation step fail for some reason, the existing system as it was found prior to the transition step must be restored. For this reason all data must be available for re-installation. For the same reason, all software (binaries, configuration files, etc.) needed to run the existing system must be available if a reinstallation is necessary.

3.2.4.6 Activity 6: Halt Input Activity

As appropriate, requests for service of all kinds need to be suspended and pending requests worked off or eliminated. This depends on the specifics of the subsystem that is involved in the transition. User logins need to be suspended. Search and order requests received via the client need to be halted and worked off. Production Processing activities need to be suspended allowing in progress jobs to complete. Ingest processing must be suspended or alternative mechanisms to continue support to externals for Ingest be provided. Certain pending requests can be eliminated from queues if they can be adequately recovered after the transition. The local DAAC operations will notify the user community well in advance of service outage for the period.

3.2.4.7 Activity 7: Shutdown

ECS applications will need to be shutdown to continue the installation. Applications can be left running if they are not involved or affected by the components being upgraded. From this point to reactivation of the new ECS baseline, time constraints as identified earlier will apply.

3.2.4.8 Activity 8: Software Installation

ECS Assist will be used to install and configure all software onto the target system in the Ops mode. Installation definition files (i.e., IU files) associated with the components to be installed

are used by ECS Assist to copy necessary binaries, libraries, configuration files, etc. into the appropriate directories, creating directories as required.

3.2.4.9 Activity 9: Persistent Data Reorganization

As appropriate, persistent data files are reorganized to conform to the requirements of the new baseline. Scripts developed to accomplish this reorganization are executed by ECS Assist as a part of the software installation process. These data files and databases would need to then be saved for operations use after the installation checkout step which follows.

3.2.4.10 Activity 10: Installation Checkout

When the installation is complete, the standard regression tests, as described earlier for the TS2 mode installation, will be applied to the Ops baseline to insure proper installation.

3.2.4.11 Activity 11: Installation Backout

Should the installation checkout not succeed, it may be decided to backout the new baseline just installed and to reinstall the old baseline. ECS Assist will be able to provide this capability. Backups of databases and data files created before the transition can be used to recreate persistent data. Alternatively, if the problems encountered are decided to be not severe, the installation may be completed and the problems corrected with subsequent patches.

3.2.4.12 Activity 12: Persistent Data Installation

If the installation checkout is successful, any test data sets and database information resulting from the checkout will be deleted from the system, and the persistent data capture and reorganized from the previous operations baseline (in step 9) will be installed to the proper databases and directories.

3.2.4.13 Activity 13: Restart Queues

When the persistent data is restored, the new ECS baseline components can be restarted.

3.3 Transition and Test

This subsection discusses the test activities that occur in support of the transition activity.

Once the ECS Development organization has completed the integration of the Drop 5A baseline, the new baseline will be installed into TS1, TS2 and Ops modes of the VATC. The ECS Test organization will be responsible at that point for performing system verification tests of the baseline. In addition, the transition tools will be delivered with the Drop 5A baseline and will also be verified at that point to insure proper behavior during the transition. Transition tools include all of the software and data needed to support the installation of the ECS system. This includes the items needed to support the ECS Assist installation tool, scripts needed to store, retrieve and convert persistent data, and tools needed to support the backout of Drop 5A and reinstallation of Drop 4Px. It is planned that the transition tools will be tested first, beginning

with the installation and checkout of Drop 5A to get an early evaluation of the tools so that discrepancies can be identified early and provided to development as NCRs as soon as possible.

The installation team will begin preparation and practice activities for the transition before the system verification testing has completed. This is to confirm the validity of the detailed transition procedures and to familiarize the installation team with the actual steps of the transition process and with the tools used during transition.

When the system verification testing has completed, the installation team will begin to go to the DAAC sites to install and checkout the Drop 5A baseline according to the ECS schedule. As indicated in Section 3.2.4, the initial installation and checkout will be to the TS2 mode at each of the DAACs. The checkout will be limited to testing to insure proper installation. The acceptance testing will then be performed on the installed baseline in the TS2 mode. At the completion of the acceptance tests, the baseline system will be turned over to the local DAAC operations group. The local DAAC organization can continue to conduct tests and training activities. When this is complete, final installation and checkout will take place in the Ops mode at the DAAC, prior to releasing the system for operations.

3.4 Transition Roles and Responsibilities

Table 3.4-1 is a list of several of the transition related activities that have been identified in this paper and identifies the organization that is the lead for completion of that activity. Also indicated are the organizations that support the activity. Additional comments are provided for the activities with respect to roles and responsibilities.

Table 3.4-1. Roles and Responsibilities

Activity	Lead Organization	Comments
Transition Plan Development	ECS System Engineering	Support from all other ECS organizations.
Transition Tool Development	ECS Development	Includes all elements needed to support the ECS Assist installation, and to convert persistent data files, databases; includes scripts, etc. needed to accomplish backout of Drop 5A and reinstallation of Drop 4Px.
System Verification Test (at the VATC)	ECS Test	Includes all procedures, test drivers, test tools, test data sets required for verification test. Also includes verification of the tools required to support the transition activities at the DAACs.
System Acceptance Test (at the DAACs)	ECS Test	Includes all procedures, test drivers, test tools, test data sets required for acceptance test.
Installation (at Landover in all modes; at the DAACs in TS2 mode)	ECS M&O	With support from ECS Test and ECS Development. Includes development of all procedures to support the installation. Where installation is understood to mean those activities required to transition the system baseline from the 4Px drop to the 5A drop: backups, physical installation, executing conversion scripts, and initial checkout.
Installation (at the DAACs in Ops and TS1 mode)	Local DAAC Ops	With support from ECS M&O. Where installation is understood to mean those activities required to transition the system baseline from the 4Px drop to the 5A drop: backups, physical installation, executing conversion scripts, and initial checkout.
Transition Preparation & Practice (VATC)	ECS M&O	Definition of all activities involved here. With support from ECS Test and ECS Development.
Training	ECS M&O	Development of all training materials and documentation associated with transition.

3.5 Transition Training & Documentation

As indicated earlier, preparation for the actual transition activities will require that procedures for the transition be prepared, identifying the activities that occur in detail. Practice for the transitions will occur to confirm the accuracy of the transition procedures and to familiarize the operations staff with these activities.

4. Transition Strategy

4.1 Transition Alternatives

As has been described above, transition for Drop 5A will occur in a number of steps. The principal transition strategy alternatives are with respect to the upgrade of custom software - whether this should be accomplished in a single step transition or as a sequence of smaller steps. The following paragraphs look at these alternatives.

4.1.1 Multiple Step Custom Software Transition

In the multiple step transition, the ECS system at the Drop 5A baseline would be installed as a sequence of steps. Each step would provide for the installation of some subset of the system. The steps would in general not be contiguous in time with one another but occur, say, several days apart. One possible partitioning of the system is as follows:

1. Step 1 - SDSRV, STMGT, DDIST, INS, SBSRV, IDG
2. Step 2 - PDPS
3. Step 3 - CLS, DMS, IOS, MSS

Basic to this approach is that the new Drop 5A elements would coexist with and operate with the already installed Drop 4Px components of the system.

Some considerations, pro and con, with regard to this strategy are as follows:

1. Divide and Conquer - By dividing up the installation, configuration and testing of the installation into several parts, some degree of simplification can be achieved at least as a result of the smaller number of things to be considered in any step. Any anomalies that may arise during the installation can in general be isolated to a smaller number of elements.
2. Time Constraints - There are constraints on the amount of time that can be taken during an installation step - limited at present to 8 hours. The installation of the entire system software takes on the order of 2 - 2.5 hours at present. Preparation of the configuration files for the system, at present, takes a considerable amount of time as it is an entirely manual process. Conversion of the persistent data can be expected to take 1 to 2 hours for Drop 5A. For later drops, this conversion will take considerably longer. Subsequent checkout testing of the system to insure proper installation will require several hours. By subdividing the transition into a number of steps, it will be possible to achieve each step and return to operations within the 8 hour constraint.
3. Complexity in Number of Steps - Some degree of overhead is involved in preparing to accomplish the individual transition steps. Moreover, the transition will not be complete for several days, requiring the presence for that period of the installation and test team to support it at each DAAC.

4. Dependency Risk - Each step would need to be carefully defined to insure the proper, non-interfering configuration of old and new software components. The dependencies between subsystems are great and properly subdividing the system will be complex.

5. Testing Interim Configurations - When the transition is done in multiple steps with some period of time in between steps where the system is operational, the system will be in interim states between these steps. ECS Test will need to confirm during system verification that these states can operate correctly.

6. Precursor to Patches - It will be very desirable, particularly after launch, to be able to deliver a patch covering only a small portion of the system. The multiple step installation is essentially a form of patch, but covering greater functionality involving several subsystems. Addressing this approach to installation now will develop a patch capability for future use.

4.1.2 Single Step Custom Software Transition

In a single step transition, all ECS Drop 5A custom software will be installed in a single step. Considerations behind this strategy to transition are as follows:

1. Dependencies Satisfied - When the system is delivered in its entirety, all internal dependencies are necessarily satisfied. No further analysis of the matter is required and risk of inadvertently leaving something out is avoided.

2. Single Configuration Test - In contrast to the multiple step transition, only a single configuration will need to be tested through system verification.

3. Time Constraint - Under the single large delivery approach, it is possible that the installation cannot be achieved within the 8 hour constraint.

4.1.3 Further Analysis

The final decision on the strategy to be taken for the Drop 5A transition will be reflected in the Transition Plan. Several considerations and alternatives should be considered. These are discussed in the following paragraphs.

4.1.3.1 Patching for Partitioning

At the present time, there is a concern that it will not be possible to safely and reliably install the Drop 5A baseline in any way other than a full system installation. In particular, this is because of the significant number of dependencies between system binaries through the Shared Object (SO) libraries. These libraries contain objects or functionality that can be dynamically linked with executables at run-time. When the libraries and the components that reference them are built at the same time, they will work properly. When a SO library is built, for example as a part of a patch or to add functionality, after the corresponding executable, if the interfaces between the SO and the executable are unchanged, the system should still continue to operate correctly. However, there has been a significant amount of negative experience within the development organization in this area. Additionally, because of a known problem with the SGI software, it is not possible to build SOs at a later time than the executables that use them. Another issue in this

regard is that SOs are not use consistenly across the subsystem - some CIs link to libraries statically and others link dynamically with SO libraries.

It has been suggested that additional work may be required to insure that the SOs can be designed, built and installed without affecting the other system components that rely upon them. This will significantly improve the possibility of adopting the multiple step installation approach or the deployment of small patches.

4.1.3.2 Complete Automation of Installs

At the present time, the installation process requires a significant amount of manual activity. The ECS Assist tool has greatly improved the ability to quickly and accurately install binaries, libraries, data files, run scripts to create databases, and so on. At present, the creation of the config (CFG) files that are used by the system executables is a largely manual process aided by ECS Assist. A central, configuration controlled database containing all of the configuration parameters is nearly complete. With the completion of the database, additional capabilities may be added into ECS Assist to automatically build these configuration files. Finally, the checkout testing that is performed following installation to confirm correct installation by execution of several key test scenarios may be automated using tools such as Xrunner. It is estimated that a full system installation and configuration could be accomplished in approximately 4 hours, and all subsequent checkout testing could be completed within an additional 4 hours. This would make possible the complete system installation within the target install time, but would not allow enough time for backout should the checkout tests not complete properly.

4.1.3.3 Parallel Hardware Strings

One of the assumptions taken for the Drop 5A transition is that no additional hardware strings will be provided for the on site installation and checkout of the baseline. Instead mode management is used as the mechanism for operating parallel systems on the same hardware suite. An option to consider is the installation of a second parallel string of hardware at each DAAC where the Drop 5A baseline can be installed and checked out in complete isolation from the operational system. Although this is an option can be considered, the cost associated with it will be significant.

4.1.3.4 Additional Hardware

A lower cost option involving additional hardware is the deployment of only selected hardware elements. The 8 hour time limit is primarily dictated by the need to be able to receive data from external interfaces. An example is the Landsat 7 interface at the EDC. The external system providing the data to the ECS system has only limited capacity to store data before data will be lost. According to the estimates provided by EDC personnel, this occurs at approximately 8 hours for Landsat 7 data. An alternative to consider would be to either augment the storage capacity of that external system so that a longer time period of data can be held. A second alternative in this vein is to provide a limited capability stand-alone system at the front end of the ECS based upon the ECS Ingest system. This would provide some capacity for receipt and

storage of externally provided data during a transition. After the transition is complete, the data can be transferred to the primary system for further processing and storage.

Appendix A.
Development Transition Questionnaire Results

The ECS subsystem leads were given questionnaires to respond to on the Drop 5A transition. The questionnaire was intended to identify issues for each subsystem on the transition. Table A-1 below is a summary of information from those questionnaires.

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Table A-1. Drop 5A Transition Questionnaire Summary

ID	Component Name	Group ID	Capability No.	Mode Aware	Key Dependencies	Comments	Backward Compatible	External Interfaces	Persistent Data Reorg	Cross DAAC Issues	Backout Plans	Install Time Est. (mins)	Criticality	H/W Reconfig Required
1	SSIT Metadata Tools (EcDpAtRegisterPGE & EcDpAtCheckOdl	A	1405 1062 0550 0572 0590 0560 0661 0600	Y	• PDPS Database transition must occur with or prior to this transition	• PGE ODL changes may be required. Should occur post transition. A manual activity • Will attempt to be BWC for old ODL files. • Suggest all PDPS DB dependent components must be transitioned at the same time.	TBD	N	Y (PDPS DB)	N	N	35-40	L	N
2	QA Monitor GUI	A	1405 1062	Y	• PDPS Database transition must occur with or prior to this transition	• No new functionality. Change driven by changes to underlying libraries. • Suggest possibility of use of ECS Assist as a tool to backout components • Suggest all PDPS DB dependent components must be transitioned at the same time.	Y	N	Y (PDPS DB)	N	N	35-40	L	N
3	Processing Clients (EcDpPrEM & EcDpPrDM)	A	1405 1062	Y	• PDPS Database transition must occur with or prior to this transition	• All production jobs in AutoSys must be stopped before install • Remote Inserts will be made by this component • Suggest possibility of use of ECS Assist as a tool to backout components • Suggest all PDPS DB dependent components must be transitioned at the same time. • Questions on need for infrastructure changes to support Remote Insert WA.	Y	X	Y (PDPS DB)	Y	N	35-40	H	N

ID	Component Name	Group ID	Capability No.	Mode Aware	Key Dependencies	Comments	Backward Compatible	External Interfaces	Persistent Data Reorg	Cross DAAC Issues	Backout Plans	Install Time Est. (mins)	Criticality	H/W Reconfig Required
4	Processing Servers (Job Management & Deletion)	A	1405 1062	Y	• PDPS Database transition must occur with or prior to this transition	• JM interfaces with AutoSys which is not mode aware • No specific functionality changes, underlying libraries changed; only executables need to be replaced • Deletion Server will perform remote deletes • All processing shutdown while these servers are down • Suggest possibility of use of ECS Assist as a tool to backout components • Suggest all PDPS DB dependent components must be transitioned at the same time. • Questions on need for infrastructure changes to support Remote Insert WA.	Y	N	Y	Y	N	35-40	H	N
5	Production Request Editor (PRE)	A	0550 0572 0590 0560 0661 0600	Y	• PDPS Database transition must occur with or prior to this transition • IOS, SBSRV, SDSRV; no interface changes • PDPS Database transition must occur with or prior to this transition	• Allows for use of new production rules by PGEs • All processing shutdown while for this change to be made • Suggest possibility of use of ECS Assist as a tool to backout components • Suggest all PDPS DB dependent components must be transitioned at the same time.	Y	N	Y (PDPS DB)	N	N	35-40	M/H	N
6	PDPS Database	A	1405 1062 0550 0572 0590 0560 0661 0600	Y	• All PDPS components dependent on the PDPS database	• Suggest all PDPS DB dependent components must be transitioned at the same time. • Scripts delivered to build the 5A database from scratch • Scripts delivered to replace existing schema and transition data from old to new • New data needed in DB for new fields - from where? • Backout options exist, not developed.	N	N	Y	N	N	30	H	N

ID	Component Name	Group ID	Capability No.	Mode Aware	Key Dependencies	Comments	Backward Compatible	External Interfaces	Persistent Data Reorg	Cross DAAC Issues	Backout Plans	Install Time Est. (mins)	Criticality	H/W Reconfig Required
7	SDSRV: Zero Length File Checking	B	2602	N (?)	• Most of ECS is dependent on these affected components	• Capabilities oriented response; • Indicates not mode aware but part of SDSRV which is, need to check on this • Affected executables are EcDsScienceDataServer EcDsSdSrvGui, DistTest, EcDsDistributionServer; and libraries libDsGeSh.so • No backout plans; suggest would need to reinstall old exe's, lib's to do that	Y	N	N	N	N	-	H	N
8	SDSRV: Remote Insert	B	2603	N (?)	• Most of ECS is dependent on these affected components	• Capabilities oriented response; • Indicates not mode aware but part of SDSRV which is, need to check on this • Affected executables are EcDsScienceDataServer EcDsSdSrvGui, EcSbSubServer, DistTest, EcDsDistributionServer; and libraries libDsGeSh.so libDsSrSh.so; • ESDT impacts as well; goal is to get in 4PL descriptors. • No backout plans; suggest would need to reinstall old exe's, lib's to do that • Updates the interface to a SDSRV public interface	Y	N	N	N	N	240	H	N
9	SDSRV: Out of Memory Condition Handling	B	2615	N (?)	• TBD	• Capabilities oriented response; • Indicates not mode aware but part of SDSRV which is, need to check on this • Indicates to early in the design to answer many questions. Design scheduled to complete 7/8/98.	Y	N	N	N	N	TBD	L (?)	N
10	SDSRV: Delete from archive	B	2235	N (?)	• TBD	• Capabilities oriented response; • Indicates not mode aware but part of SDSRV which is, need to check on this • Indicates to early in the design to answer many questions. Design scheduled to complete 7/30/98. • Adds new SDSRV public interface	Y	N	Y	N	N	TBD	L	N

ID	Component Name	Group ID	Capa-bility No.	Mode Aware	Key Depend-encies	Comments	Back-ward Compat-ible	Exter-nal Inter-faces	Per-sis-tent Data Reorg	Cross DAAC Issues	Back-out Plans	Install Time Est. (mins)	Crit-ical-ity	H/W Re-con-fig Re-quired
11	SDSRV: Move EVT to the SDSRV	B	2604	N (?)	• SDSRV Database must be updated prior to installation/use of Event database • Dependent on the existing Event flat files; this information is only updated at the time of ESDT installation	• Capabilities oriented response; • Indicates not mode aware but part of SDSRV which is, need to check on this • Affected executables are EcDsScienceDataServer EcDsSdSrvGui, EcSbSubServer, DistTest, EcDsDistributionServer; and libraries libDsDe1Sh.so libDsDe2Sh.so libDsGeSh.so' libDsSrSh.so; • Also indicates ECS Assist files affected: EcDsScienceDataServer.iu, EcDsScienceDataServerMkcfg, EcDsSrRmesdt • Effectively combining one persistent data store (the event files) into another persistent data store (SDSRV database) • Calls out the need to verify that the load of event files has occured correctly • Backout could be difficult	Y	N	Y	N	N	240	H	N
12	Ingest	C	-	Y	• New/revised SDSRV interfaces used by Ingest (TBD) • Dependency on SDSRV for MCFs	• New component is eMail parser, other components are upgrades of existing components • Concern about changes impacting data already archived; need to clarify; possibly need to modify metadata already stored. • Ingest persistent data changes as well. • Non-polling data insert interfaces present a problem e.g., Landsat . Polling interfaces present a problem as well depending circumstances. • Such an ingest front-end is not planned for at this time • Identify use of ECS Assist for backout option	Y	N	Y	?	N	180	Y	N

ID	Component Name	Group ID	Capability No.	Mode Aware	Key Dependencies	Comments	Backward Compatible	External Interfaces	Persistent Data Reorg	Cross DAAC Issues	Backout Plans	Install Time Est. (mins)	Criticality	H/W Reconfig Required
13	SBSRV & SBSRV DB (persistent queueing)	D	4431	Y	• SBSRV GUI and PDPS have X-DAAC interfaces to SBSRV	• Backout approach indicated, possibly simple	Y	N	Y	Y	Y	120	M	N
14	SBSRV & SBSRV DB (Password Encryption)	D	4390	Y	• SBSRV GUI and PDPS have X-DAAC interfaces to SBSRV • DDIST dependent on new interface - API the same, content changed. • SDSRV not able to register or trigger events during outage, SBSRV GUI and PDPS will be unable to submit subscriptions	• DDIST must change to decrypt the password it receives from SBSRV before FTP of products to users. Inherently not backward compatible • Backout approach indicated, possibly simple	N	N	Y	Y	Y	120	M	N
15	DDICT Server & maintenance tools	E	1562	Y	• The changes in these two elements are dependent on one another • Following items dependent on availability of these: subscription inserts via SBSRV GUI	• Assume installation of all DDICT pkg (both servers) and assoc. cfg files but w/o change to the database. • Changes occur to the database only with the introduction of new collections (valids) • Backout feasible by re-installing old components but if database has been updated ?	Y	N	N	N	Y	120	L	N
16	DDIST (EcDsDistributionServer EcDsDdistGui)	B	-	N (?)	• No external dependencies • Other ECS components dependent on it	• Indicates backout is feasible, no plans for developing scripts for it	Y	N	N	N	N	60	H	N

ID	Component Name	Group ID	Capability No.	Mode Aware	Key Dependencies	Comments	Backward Compatible	External Interfaces	Persistent Data Reorg	Cross DAAC Issues	Backout Plans	Install Time Est. (mins)	Criticality	H/W Reconfig Required
17	STMGT Database Interface	B	-	Y		• STMGT configuration data maintained, possible schema changes for that info • All request specific info and on cache file usage will be lost • Indicates	Y	N	Y	N	Y	120	H	N
18	DAR Tool, User Registration, Desktop, User Profile Gateway	E	-	Y	• No external dependencies	• All of these are not new capabilities, only fixes to NCRs • Essentially installing upgraded (NCR driven) components over existing ones. • Backout plan is install previous versions of components again, no persistent data problems	Y	N	N	N	Y	60	L	N
19	llBox	B	-			• Not yet available								
20	Search Area	B	-			• Not yet available								
21	MOJO	E	4440 4450 4460 4470 4480 4530 4531			• Verbal from Doug Dotson • This is all new capability. Little transition issue as interacts with other servers as a client					N/A			
22	ESSM/DBVision	E	-	N		• These are new COTS components, no affect on existing components • Identifies that incorrect ESSM installation can corrupt Tivoli database, must be backed up • Need to bring down Tivoli during installation of ESSM • No backout plan, but identifies considerations for backout	N/A	N	N	N	N	-	L	N
23	Trouble Ticket Consolidation	E	-	N		• Add on to existing COTS • Options for this are still being considerd • Strong cross DAAC flavor • Exists outside the context of modes • Transition issues handled by the COTS • Concepts presented on backout, but seems unnecessary	Y	N	Y	Y	N	120	L	N
24	HPOV Command Line Startup Agruments	E	-	N		• Replaces some 4P components; HPOV is already available at this point. • Could install the new components while other apps are running but will lose monitoring doing so.	Y	N	N	N	Y	60	H	N

ID	Component Name	Group ID	Capability No.	Mode Aware	Key Dependencies	Comments	Backward Compatible	External Interfaces	Persistent Data Reorg	Cross DAAC Issues	Backout Plans	Install Time Est. (mins)	Criticality	H/W Reconfig Required
25	Remedy, HPOV, Tivoli	F	-	N		• COTS Upgrades • Possible impact, as a result of the upgrade, to the MSS customization work that has been done by MSS • Tivoli has a cross DAAC capability to be considered • During upgrades, system, network, application monitoring will be unavailable. • Need to evaluate the installation in the EDF to assess impacts under operational conditions	Y (TBD)	N	TBD	Y	N	TBD	M	N
26	XDAAC Order Tracking	E	-	Y	• Changes in interfaces to DM, STMGT, B0SOT, Client as a result of this change.	• Must be installed at the same time as the MSS database upgrade.	TBD	N	Y	Y	N	TBD	Y	N
27	AclEdit GUI	B	3971	Y	•	• Must be coord. with any schema changes for the ACL database, if any. Not clear if there will be impacts. • New component for drop 5A • No other components interface with this GUI • Although the ACL database exists now, it is inactive, although there is some minimal data captured there now.	Y	N	TBD	N	N/A	30	L	N

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Appendix B. Mode Management

Mode management enables ECS Maintenance and Operations (M&O) Staff to perform testing and/or training activities while production activities continue uninterrupted. Each unique activity that requires process and data separation is classified as a mode. Mode management enables the execution of multiple modes, such that each mode functions without interfering with the other modes and each mode maintains data integrity throughout it's execution.

The mode management design does not limit the number of concurrently executing modes, however, performance considerations need to be addressed prior to the initiation of an additional mode. The design will support multiple test and training mode instances, but due to concurrent data access and data preservation issues there can only be one operational mode of execution at any given time.

Mode management is the capability of running multiple versions of parts or all of the system software at the same time on the same hardware. Software components will be duplicated, and hardware resources will be isolated whenever possible, to support an additional mode. However, there are shared resources, both hardware and software, that require special consideration to enable mode management support. There are two predefined modes: SHARED, for these special shared software elements, and OPS for operational system use. Other modes for test and training can be added to the system, via configuration without any changes to source code, and there is no fixed limit to the number of modes that can be configured. The ability to monitor and control modes is built into the MSS management framework (HP Openview and the management agents), so that operators at the Local System Management (LSM) console can view the resources available in each mode.

B.1 Process And Data Connections

Mode management is achieved by executing a copy of the system processes and databases for each mode. Processes connect to other processes, data, and other resources. Each mode's copies of processes and data are distinguished by ECS naming conventions. The integrity of the connections is enforced via connection classes that are used by all applications to bind to a resource. The connection classes allow the application code to be unaware of mode management: an application simply requests a connection, and the connection class makes sure that the connection is to the appropriate resource for the mode. Additional safeguards are in place to make sure that non-OPS modes never gain write access to OPS databases (non-OPS applications use separate database accounts, so that access privileges can be set appropriately). The key connection classes are described below, together with a brief description of the resource to which they control access.

B.1.1 The Namespace Class

The Namespace class encapulates the DCE cell directory service. In the ECS design, the cell directory itself is partitioned into a client side and a server side. On the client side, a subtree is provided for each mode - OPS, TS1, and SHARED modes. Clients running in a particular mode access the subtree corresponding to that mode to bind to a server. Servers register on the server side, and links are established to the server side from all the client subtrees that are using the server.

This class enforces the “process distinction” property of mode management. Clients running in a given mode will bind only with servers that are appropriate for that mode.

B.1.2 The Database Connections Class

The database connections class is a common component which allocates connections to clients needing access to a database. Typically, clients specify their database list in the Process Framework (PF) configuration file. The names in this database list are root names, to which the connections class appends the mode identifier at run time (the mode identifier is passed to each process as a command line argument at startup). The ECS database naming convention is that mode is appended to the root database name, unless the mode is OPS (production). For example, the OPS version of the MSS database is called simply mss_db, while the version for mode TS1 would be called mss_db_TS1, and so on.

This class enforces the “data distinction” property of mode management. Clients running in a given mode can connect only to databases that are appropriate for that mode. However, because setting up physical copies of databases in support of multiple modes could be time-consuming and might exceed the resources available, the PF configuration file allows an alias for a database to be specified, so that a database can be used by more than one mode.

B.1.3 The Process Framework Classes

The ECS Process Framework (PF) supports mode management in several ways. When the management agent starts a process, it supplies the mode identifier as a command line argument. The PF reads the mode identifier and makes it available to all PF client code. The PF also encapsulates access to the ECS operational directory structure. All resources (files, data, executables, COTS, documents, and so on) that are accessed via the ECS operational directory structure are partitioned by mode. The root pathname used for ECS files is "/usr/ecs/mode/". The Process Framework provides a method PfMakeAbsPath() which prefixes this root to a relative path. All Release B code uses this method whenever a file or directory name is created.

Below /usr/ecs/mode/, all subdirectories are replicated for each mode, so that all aspects of the system (custom code, COTS, config files, data files, ...) can vary by mode. Any files or directories that are not specific to the mode would be either absent (for example, a test mode for PDPS might not contain code for some other subsystems), or would be symbolic links to another mode's files or directories (for example, a mode might use the OPS version of a COTS product).

For each mode the directory is subdivided into "CUSTOM/" and "COTS/". The COTS directory is reserved for the installation of COTS software and COTS related files. It is divided into subdirectories by product (indicated by (sybase), ((tivoli)...).

The CUSTOM directory is reserved for ECS custom developed items, including software and data. It is divided into subdirectories according to purpose, and some of these subdirectories are further divided by subsystem.

B.2 Shared Components

ECS components can be designed to support mode management in one of two ways:

- mode-specific: mode-specific components run as multiple copies, one copy in support of each mode.
- shared: shared components are designed to run as a single copy supporting all active modes. These components use a special pre-defined mode called SHARED. These components are usually part of the infrastructure.

An example of a shared component is the Management Agent. There is a single management framework for monitoring and controlling all modes, from HP OpenView at the LSM out to each platform, with a single agent on every platform to start processes in whatever mode is commanded by the LSM, and then to report status on all modes from the platform. Modes can be monitored individually from the single copy of OpenView, since the mode identifier is contained in all status reports to the LSM.

To the maximum extent possible, ECS software is made mode-specific rather than shared. There are two reasons for discouraging shared code:

1. Mode-specific code can be run in multiple copies, so test and training versions can be run in parallel with production.
2. Shared code, because there is only one copy, offers a single API to all modes. Therefore new releases of ECS must provide backward compatibility with all shared interfaces, or must patch previous releases to bring them up to the new interface.

Shared software components are typically part of the infrastructure. They include:

1. Operating Systems, DCE, and the namespace class
2. The management framework, including Tivoli, HP Openview, SNMP, and the agents
3. Various online COTS products, including:
    - security COTS (Kerberos, and so on)
    - license managers

B.3 Configuration Of A Mode

Release 2.0 will be delivered with the pre-defined modes OPS and SHARED, plus at least one configured mode already set up as an example. An unlimited number of additional modes can be configured into the system. The following list specifies the things to consider when setting up a mode.

B.3.1 Performance and RMA impacts

The first consideration is the hardware resources that the mode will use. Although modes can be run in parallel on the same hardware, usually it is better to make use of the redundancy built into the system in order to minimize performance and RMA impacts. For example, a trouble ticket for the Science Data Server could be worked by using the warm spare APC server to run a copy of the Science Data Server in a test mode.

The people that execute the mode have the responsibility of ensuring that the activity supported by the mode does not absorb undue amounts of shared resources (network bandwidth, CPU cycles, memory, and so on). They must also ensure that the software executing in the mode is mature enough that the chance of a failure affecting a shared resource is slim.

B.3.2 Drivers And Stubs

If the entire system is executing in some mode, and external systems such as EDOS are not part of the mode, then drivers and stubs must be placed at the system boundaries to supply input data flows and capture all output data flows. If only part of the system is executing in some mode, then drivers and stubs are needed to replace the missing parts of the system if they are involved in any threads of execution. For example, a test mode for Ingest might use a driver instead of an external interface, and a stub instead of Data Server.

B.3.3 Configuration

Databases: Either database copies must be physically created, and named in accordance with the convention of appending the mode to the database name, or aliases must be set up to allow another mode's databases to be used. If creating a copy, it may not be necessary to copy all records. The mechanism for setting up an alias is described above under the Database Connections Class.

Cell Directory Service Namespace: A branch for the mode must be set up in the DCE Cell Directory (see figure A.1 ECS CDS Directory Structure). When clients and servers are started in the mode, they will seek out the branch and bind to each other.

Mode Control Scripts: Optionally, startup and shutdown scripts for the mode can be written to avoid having to bring up and down all components of the mode manually at the LSM.

Unix Filesystem: A directory for the mode must be created under /usr/ecs on all machines that will participate when the mode executes. See figure A.2 Unix Directory Structure For Release B. Under the /usr/ecs/<MODE> directory, all subdirectories used by the mode must be populated. However, softlinks can be set up so that one mode can use COTS products, for example, from a

different mode. All the executables, scripts, libraries, configuration files, COTS products, and so on, that are to be used by the mode must be placed in the subdirectories under /usr/ecs/<MODE>.

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