

**Clouds and the Earth's Radiant Energy System
(CERES)**

Data Management System

**CATALYST
Test Plan
Version 3**

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Document Revision Record

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1.0 Introduction

CERES is a key component of EOS and NPP. The first CERES instrument (PFM) flew on TRMM, four instruments are currently operating on the EOS Terra (FM1 and FM2) and Aqua (FM3 and FM4) platforms, and NPP (FM5) platform. CERES measures radiances in three broadband channels: a shortwave channel (0.3 - 5 μm), a total channel (0.3 - 200 μm), and an infrared window channel (8 - 12 μm). The last data processed from the PFM instrument aboard TRMM was March 2000; no additional data are expected. Until June 2005, one instrument on each EOS platform operated in a fixed azimuth scanning mode and the other operated in a rotating azimuth scanning mode; now all are typically operating in the fixed azimuth scanning mode. The NPP platform carries the FM5 instrument, which operates in the fixed azimuth scanning mode though it has the capability to operate in a rotating azimuth scanning mode.

CERES climate data records involve an unprecedented level of data fusion: CERES measurements are combined with imager data (e.g., MODIS on Terra and Aqua, VIIRS on NPP), 4-D weather assimilation data, microwave sea-ice observations, and measurements from five geostationary satellites to produce climate-quality radiative fluxes at the top-of-atmosphere, within the atmosphere and at the surface, together with the associated cloud and aerosol properties.

The CERES project management and implementation responsibility is at NASA Langley. The CERES Science Team is responsible for the instrument design and the derivation and validation of the scientific algorithms used to produce the data products distributed to the atmospheric sciences community. The CERES DMT is responsible for the development and maintenance of the software that implements the science team's algorithms in the production environment to produce CERES data products. The Langley ASDC is responsible for the production environment, data ingest, and the processing, archival, and distribution of the CERES data products.

1.1 Document Overview

This document, [CATALYST Test Plan](#), is part of the CATALYST delivery package provided to the Langley Distributed Active Archive Center (DAAC). It provides procedures for installing and testing the CATALYST software. A list of acronyms and abbreviations is provided in [Appendix A](#), a directory structure diagram is contained in [Appendix B](#) and a description of the software and data files is contained in [Appendix C](#).

This document is organized as follows:

- [Section 1.0](#) - Introduction
- [Section 2.0](#) - Software Installation Procedures
- [Section 3.0](#) - Test and Evaluation Procedures
- [Section 4.0](#) - CATALYST File Promotion into Production
- [Appendix A](#) - Acronyms and Abbreviations
- [Appendix B](#) - Directory Structure Diagram
- [Appendix C](#) - File Description Tables

1.2 CATALYST Overview

The CATALYST service contains no PGEs. Rather it is a framework for coordinating the execution of CERES PGEs in the ASDC production environment. This build of CATALYST contains the functionality necessary for running the Clouds and Inversion Edition 4 processing chain as well as the login interface required for the PR Web Tool.

1.2.1 Perl Library Modules

CATALYST is written primarily in Perl. Many of the routines required by CATALYST are located in CERES's Perl_Lib. The **\$PERL5LIB** environment variable must be defined before attempting to run the CATALYST server. **\$PERL5LIB** can be set using **\$CERESENV**.

1.2.2 Architecture/Location Dependent Code

There is only one location that CATALYST is to be installed: the *AMI-P X86_64* cluster head node. This requirement exists because CATALYST must be able to communicate both internally, within the *AMI-P* cluster for job coordination, and externally to the PR Web Application, CATALYST Operator's Console, and sub-programs built using the CATALYST XML-RPC API for operator interaction and control.

2.0 Software Installation Procedures

This section describes how to install the CATALYST software in preparation for making the necessary test runs at the Langley DAAC. The installation procedures include an executable installation script which unpacks CATALYST software, configures run time environments, and adjusts the logging database as necessary.

2.1 Installation

1. The scripts and makefiles in the CATALYST delivery package expect the CERES environment variable, **\$CERESENV**, to point to a file which sets the following environment variables:

CERESHOME - Top directory for CERES software
CERESLIB - Top directory for CERESlib software (this location will be different for the different CERESlib versions)
PERL5LIB - Directory containing CERES Perl module

2. In addition to the above, set the following environment variable by running:

```
setenv CATALYST_HOME $CERESHOME/catalyst
```

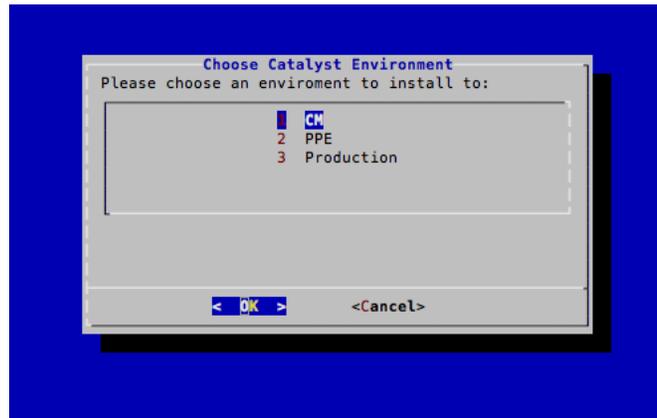
This environment variable is the directory for the CATALYST installation.

3. Uncompress and untar all delivered tar files in **\$CERESHOME**.
4. Follow the steps below to start the CATALYST installation software, where “x.x.x” is the CATALYST version and “XXX” is the CERES SCCR number.

```
source $CERESENV (x86_64 version)
cd $CATALYST_HOME
./catalyst_x.x.x-XXX.sh
```

NOTE: Steps 5 through 8 apply to base installations of CATALYST. Installing server updates is a very similar process to the base installer. It is also a self-contained installer which updates only the server code and related scripts, but unlike the base installer it is much more lightweight and does not require the user to choose an install environment. Furthermore, it does not interact with the logging database and does not modify the contents of **\$CATALYST_HOME/data/**.

5. Upon launching the CATALYST installer, the operator will be presented with the following dialog:



Using the arrow keys, select the appropriate environment for the installation. If in doubt, contact the CATALYST developers. Press the 'enter' key to proceed with the installation.

6. The next dialog requires the user to enter the activation code for the environment in which he/she is installing CATALYST. These codes are provided by the CATALYST development team. Enter this case-sensitive code into the dialog; you must type the dashes in as well. Press the 'enter' key to proceed.
7. The next dialog is a warning that the CATALYST 1.0.x installer overwrites the CATALYST logging database. This is your last opportunity to opt-out of the installation. If you are 100% sure that you want to proceed, type "ERASE" into the dialog box. Press 'enter' to proceed.
8. The installation may take several minutes depending on system, network, and database load, so please be patient. When the installer has completed, the user will be returned to the command prompt.

Notes:

- Report any and all installation warnings/errors to CATALYST developers when encountered.

3.0 Test and Evaluation Procedures

This section provides instructions for compiling and executing the CATALYST test suite. (See Section 2.1 for an explanation of the CERESENV environment variable.)

The test suite will be executed once on the *AMI-P* head node, on which CATALYST has been installed. If problems are encountered in any of the tests, immediately contact one of the CATALYST developers.

3.1 Executing the *AMI-P* X86_64 (ab01) CATALYST Test Suite

3.1.1 Starting the CATALYST server

Change directory to the CATALYST directory and initialize the server by running the following commands.

NOTE: The following commands should be run in a “screen” session.

```
source $CERESENV
setenv CATALYST_HOME $CERESHOME/catalyst
cd $CERESHOME/catalyst/bin
./run_catalyst.sh -daemonize
```

All of the other tests should be run in a different window.

3.1.2 Testing login to the server

The server is now running as a daemon. That is, it is running independently of your shell and therefore remains running after you have logged out. Now, the server can be tested.

```
cd $CERESHOME/catalyst/conf
source catalyst_env.csh
```

If in the production environment:

```
setenv CATALYST_URL http://localhost:4020
```

If in the PPE:

```
setenv CATALYST_URL http://localhost:4021
```

If in the SSI&T environment:

```
setenv CATALYST_URL http://localhost:8020
```

```
cd $CERESHOME/catalyst/test_suites
./test_login.pl $CATALYST_URL
```

The “**test_login.pl**” application will prompt you for your *AMI* username and password. Upon entering them you should see that the following actions have been performed:

- a. Logged into server and received a token.
- b. Verify the server acknowledges your token as being valid.
- c. Logged out of the server.
- d. Verify that the server no longer acknowledges your token as being valid.
- e. Verify that a falsified token is not accepted by the server.

3.1.3 Submitting Test Production Requests to the server

Now that it has been verified that the server can accept incoming requests, test processing requests (PRs) can be submitted. The steps below submit a month of Terra and Aqua Beta 1 - Edition 4 Clouds and Inversion to CATALYST:

Follow the steps below to launch all the test PRs. Each time you run a file it will prompt you for your AMI username and password. The following assumes the login function has been tested, CATALYST is running, and `catalyst_env.csh` has been sourced.

The file `$CATALYST_HOME/conf/users.conf` will need to be edited before PRs are submitted. Please follow the directions in the CATALYST Operator’s Manual for modifying the `users.conf` file.

If in the production environment:

```
setenv CATALYST_URL http://localhost:4020
```

If in the PPE:

```
setenv CATALYST_URL http://localhost:4021
```

If in the SSI&T environment:

```
setenv CATALYST_URL http://localhost:8020
```

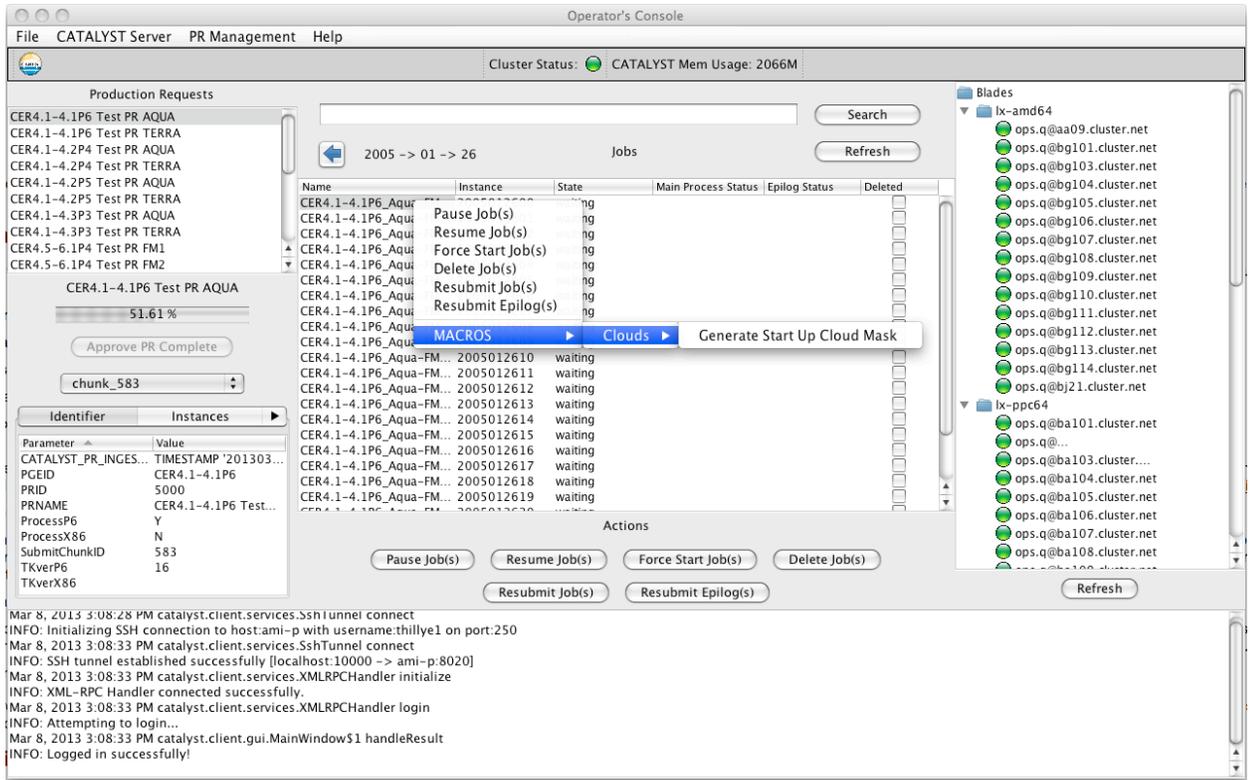
```
cd $CATALYST_HOME/test_suites
./test_load_4_1_4_1P6_aqua.pl $CATALYST_URL
./test_load_4_1_4_1P6_terra.pl $CATALYST_URL
./test_load_4_1_4_1P6_terra_2002.pl $CATALYST_URL
./test_load_4_1_4_2P4_aqua.pl $CATALYST_URL
./test_load_4_1_4_2P4_terra.pl $CATALYST_URL
./test_load_4_1_4_2P4_terra_2002.pl $CATALYST_URL
./test_load_4_1_4_2P5_aqua.pl $CATALYST_URL
```

```
./test_load_4_1_4_2P5_terra.pl $CATALYST_URL  
./test_load_4_1_4_2P5_terra_2002.pl $CATALYST_URL  
./test_load_4_1_4_3P3_aqua.pl $CATALYST_URL  
./test_load_4_1_4_3P3_terra.pl $CATALYST_URL  
./test_load_4_1_4_3P3_terra_2002.pl $CATALYST_URL  
./test_load_4_5_6_1P4_fm1.pl $CATALYST_URL  
./test_load_4_5_6_1P4_fm2.pl $CATALYST_URL  
./test_load_4_5_6_1P4_fm1_2002.pl $CATALYST_URL  
./test_load_4_5_6_1P4_fm2_2002.pl $CATALYST_URL  
./test_load_4_5_6_1P5_fm3.pl $CATALYST_URL  
./test_load_4_5_6_1P5_fm4.pl $CATALYST_URL  
./test_load_4_5_6_2P3_fm1.pl $CATALYST_URL  
./test_load_4_5_6_2P3_fm2.pl $CATALYST_URL  
./test_load_4_5_6_2P3_fm1_2002.pl $CATALYST_URL  
./test_load_4_5_6_2P3_fm2_2002.pl $CATALYST_URL  
./test_load_4_5_6_2P3_fm3.pl $CATALYST_URL  
./test_load_4_5_6_2P3_fm4.pl $CATALYST_URL  
./test_load_4_5_6_4P2_fm1.pl $CATALYST_URL  
./test_load_4_5_6_4P2_fm2.pl $CATALYST_URL  
./test_load_4_5_6_4P2_fm1_2002.pl $CATALYST_URL  
./test_load_4_5_6_4P2_fm2_2002.pl $CATALYST_URL  
./test_load_4_5_6_4P2_fm3.pl $CATALYST_URL  
./test_load_4_5_6_4P2_fm4.pl $CATALYST_URL
```

All PR test programs should have a status of 0 in its output. If you get a 5, try running the file again – you may have typed your password incorrectly. For any other status codes contact the CATALYST development team.

After the PRs have been submitted, follow the instructions in the CATALYST Operator's Manual to use the Operator's Console to observe and manage those PRs in CATALYST.

In order to start the Clouds/Inversion processing chain in CATALYST, the Clear-Sky startup mask generator must be run. This step has been scripted into a macro that is accessible in the Operator's Console. Left-click on the first CER4.1-4.1P6 hourly job in the PR, then right-click on that job. Navigate to MACROS->Clouds->Generate Start Up Cloud Mask on the pop-up menu. This macro only applies to the currently selected PR; you must perform this operation for any other CER4.1-4.1P6 PRs. Below is an example:



If all PRs complete successfully this test can be considered successful.

Once all of the planned tests have completed, the CATALYST server can now be shut down. The shut down operation can be instantiated by a user who is marked as a CATALYST administrator. The shutdown operation can be invoked in the CATALYST Operator’s Console via “CATALYST Server” -> “Shutdown”.

3.1.4 JIRA Ticket CER-146 Test Steps

Issue summary: Caused by CATALYST server catching JSS_ERRORS (exit code 70), skipping their broadcasts to follow-ons and also skipping their removal from the broadcast queue.

Preliminary Steps:

```
source $CERESENV
setenv CATALYST_HOME $CERESHOME/catalyst
```

Start the CATALYST Server if it is not already running (see Section 3.1.1).

```
source $CATALYST_HOME/conf/catalyst_env.csh
```

Do one of the following:

If in the production environment:

```
setenv CATALYST_URL http://localhost:4020
```

If in the PPE:

```
setenv CATALYST_URL http://localhost:4021
```

If in the SSI&T environment:

```
setenv CATALYST_URL http://localhost:8020
```

Run the following commands:

```
$CATALYST_HOME/test_suites/jira-cer-146/jira-cer-146-01.pl $CATALYST_URL  
$CATALYST_HOME/test_suites/jira-cer-146/jira-cer-146-02.pl $CATALYST_URL  
$CATALYST_HOME/test_suites/jira-cer-146/jira-cer-146-03.pl $CATALYST_URL  
$CATALYST_HOME/test_suites/jira-cer-146/jira-cer-146-04.pl $CATALYST_URL
```

In the Operator's Console, run the clouds macro for the two jira-cer-146 CER4.1-4.1P6 PRs.

Observe that the PRs marked with "(bad)" in the PR name result in JSS_ERRORS.

The test is successful if the set of PRs without "(bad)" in the PR name run to completion successfully.

3.1.5 JIRA Ticket CER-122 Test Steps

Issue summary: Fixes bug in the event an entire day's worth of CATALYST "waiting" hourly jobs are resubmitted, causing the resubmit status event to trickle down to the successor PGEs triggering the successor PGE to erroneously reach a CATALYST_WONT_RUN condition.

Preliminary Steps:

```
source $CERESENV  
setenv CATALYST_HOME $CERESHOME/catalyst
```

Start the CATALYST Server if it is not already running (see Section 3.1.1).

```
source $CATALYST_HOME/conf/catalyst_env.csh
```

Do one of the following:

If in the production environment:

```
setenv CATALYST_URL http://localhost:4020
```

If in the PPE:

```
setenv CATALYST_URL http://localhost:4021
```

If in the SSI&T environment:

```
setenv CATALYST_URL http://localhost:8020
```

Run the following commands:

```
$CATALYST_HOME/test_suites/jira-cer-122/jira-cer-122-01.pl $CATALYST_URL  
$CATALYST_HOME/test_suites/jira-cer-122/jira-cer-122-02.pl $CATALYST_URL  
$CATALYST_HOME/test_suites/jira-cer-122/jira-cer-122-03.pl $CATALYST_URL
```

Wait for all the jobs from the 3 PRs to get to the “waiting” state, observed in the Operator’s Console.

From the Operator’s Console resubmit all of the jobs for both days of the jira-cer-122-01 PR.

Using the Operator’s Console, open the job details of several jobs in the jira-cer-122-02 and jira-cer-122-03 PRs by double clicking the jobs. Observe the exit status of the items in the product_table of the job details.

The test was successful if no JOB_RESUBMIT statuses show up in the job details.

3.1.6 JIRA Ticket CER-83 Test Steps

Issue summary: Fixes bug in the event that CATALYST is not running Clouds and Inversion together, such as when the Clouds PR has been completed and marked as such through the Operator’s Console, Inversion may not have the opportunity to examine the Clouds 4.1P6 job’s IES availability when trying to determine the cause of exit status 1. Not being able to intelligently determine which IES(s) was/were missing, the Inversion jobs may throw JSS_ERRORS when it could have marked them as CATALYST_WONT_RUN.

Preliminary Steps:

```
source $CERESENV  
setenv CATALYST_HOME $CERESHOME/catalyst
```

Start the CATALYST Server if it is not already running (see Section 3.1.1).

```
source $CATALYST_HOME/conf/catalyst_env.csh
```

Do one of the following:

If in the production environment:

```
setenv CATALYST_URL http://localhost:4020
```

If in the PPE:

```
setenv CATALYST_URL http://localhost:4021
```

If in the SSI&T environment:

```
setenv CATALYST_URL http://localhost:8020
```

Run the following command:

```
$CATALYST_HOME/test_suites/jira-cer-83/jira-cer-83-01.pl $CATALYST_URL
```

In the Operator's Console, run the macro for the jira-cer-83-01 PR.

Wait for the PR to finish completely.

In the Console, click the "Approve PR Complete" button and wait for the "Pending PR Approvals" count to return to 0.

Run the following commands:

```
$CATALYST_HOME/test_suites/jira-cer-83/jira-cer-83-02.pl $CATALYST_URL  
$CATALYST_HOME/test_suites/jira-cer-83/jira-cer-83-03.pl $CATALYST_URL
```

The test was successful if the PRs jira-cer—8302 and jira-cer-83-03 ran to completion successfully.

4.0 CATALYST File Promotion into Production

After CATALYST testing is complete, the installer script should be copied to the production directory and subsequently run by the designated user for production. See the Promoted Directories document on the CERES Configuration Management Home page (<http://earth-www.larc.nasa.gov/cgi-bin/cerescm/mysql/cerescm.pl>) for additional CATALYST promotion information.

Appendix A

Acronyms and Abbreviations

API	Application Programming Interface
ASDC	Atmospheric Science Data Center
CATALYST	CERES AuTomAteD job Loading sYSTEM
CERES	Clouds and the Earth's Radiant Energy System
CERESlib	CERES library
DAAC	Distributed Active Archive Center
LDAP	Lightweight Directory Access Protocol
NASA	National Aeronautics and Space Administration
Perl_Lib	CERES's Perl module library
PR	Processing Request
TRMM	Tropical Rainfall Measuring Mission
XML-RPC	Extensible Markup Language – Remote Procedure Call

Appendix B CATALYST Directory Structure Diagram

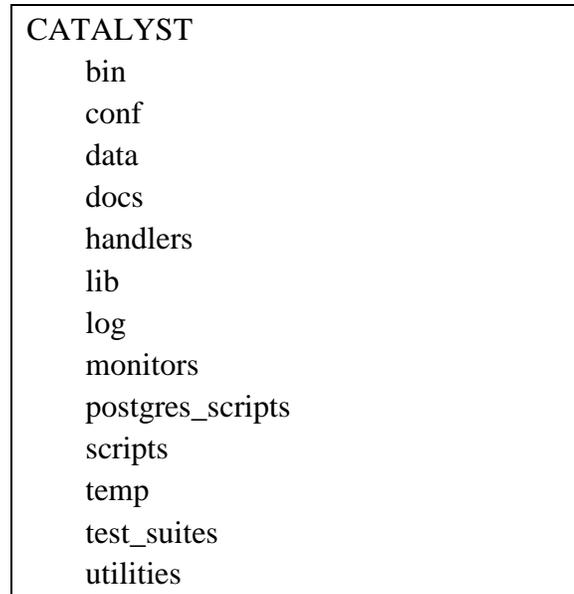


Figure B-1. CATALYST Directory Structure

Appendix C File Description Table

C.1 Executable Scripts

Table C-1. \$CATALYST/bin directory

File Name	Format	Description
run_catalyst.sh	ASCII	Executes the catalyst process. Add "-daemonize" to detach (background) the process.