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OODCE in the Ir-1 Science Processor

Technical Paper

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Abstract

The ECS Interim Release 1 (Ir-1) system will be deployed in January 1996 at four DAACs - EDC, GSFC, LaRC, and MSFC. The Ir-1 Science Processor will be used for early science software integration and test in order to verify portability of science software between the SCF development environment and the DAAC processing environment. For the applications which will be hosted on the Ir-1 Science Processor, OODCE is not needed.

Keywords: COTS, DCE, Interim Release 1, OODCE, Science Processor, Science Software

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1. Introduction

The ECS Interim Release 1 (Ir-1) system will be deployed in January 1996 at four DAACs - EDC, GSFC, LaRC, and MSFC. Ir-1 is an incremental release with the primary objectives of (1) supporting science software integration and test (SSI&T), and (2) supporting early interface testing for the Tropical Rainfall Monitoring Mission (TRMM) project. In addition, Ir-1 will provide an infrastructure of basic hardware and system software that will be re-used in Release A, which is the first fully operational ECS system. Deployment of Ir-1 is intended to reduce overall ECS schedule risk.

The Open Software Foundation (OSF) Distributed Computing Environment (DCE) is an important part of the ECS infrastructure. The current plan is to encapsulate DCE for C++ applications using the Object-Oriented DCE (OODCE) class library developed by Hewlett-Packard Company. This encapsulation is intended to support truly object-oriented applications, while improving the productivity of applications development by reducing the complexity of the DCE applications program interface.

The Ir-1 Science Processor will be used for early SSI&T in order to verify portability of science software between the SCF development environment and the DAAC processing environment. As such, it is desirable for the Science Processor to utilize platforms which are similar to the expected Release A science data processing platforms. The Silicon Graphics Incorporated (SGI) Power Challenge XL series has been selected for the Science Processors in Ir-1 and Release A. This creates a potential problem in that OODCE will not be available for the SGI Power Challenge XL series in the Ir-1 time frame.

This technical paper examines the need for OODCE in the Science Processor, and concludes that the Science Processor does not require OODCE support in Ir-1.

2. Analysis

DCE encapsulation in the Ir-1 Science Processor is advantageous only if the applications to be hosted on this processor make direct use of DCE services. These applications consist of:

- science software developed by the ASTER, CERES, LIS, MISR, MODIS, and MOPITT instrument teams;
- the Science Data Processing (SDP) Toolkit which provides the interface between the science software and the ECS data processing environment;
- COTS math, graphics and statistics libraries utilized by the science software;
- COTS static and dynamic code checkers for examining compliance of the science software with standards mandated or recommended by the Earth System Data and Information System Project;
- COTS profiling tools for runtime monitoring of science software resource utilization;
- COTS visualization/graphics tools for input and output file examination; and
- public-domain utilities for comparing output files produced by the science software running at the DAAC with the corresponding versions produced at the SCFs.

The COTS and public-domain software have been developed for a generic Unix environment and do not utilize DCE services. Since the science software standards mandate that the SDP Toolkit provides the interface between the science software and the ECS data processing environment[1], any direct utilization of DCE services would originate within the Toolkit. DCE services include:

- Remote Procedure Calls (RPCs) to allow processes to communicate across a network;
- Multi-threading to allow a single process to initiate or serve many RPCs concurrently;
- Cell Directory Service to allow clients to locate servers at runtime;
- Authentication and authorization services for RPCs to allow servers to control access to their resources;
- Distributed File System to allow a process to remote-mount files; and
- Distributed Time Service to synchronize machine clocks across a network.

These services support non-local access to processes and files, as well as concurrent processing within a single platform. In Ir-1, all science processing will be confined to the Science Processor, which will access files on a local, attached disk. Concurrent processing may be supported by future versions of the SDP Toolkit, but these capabilities will not be available for the Ir-1 SSI&T.[2] During the March 1995 SSI&T workshop, the instrument teams participating in

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1 Data Production Software and Science Computing Facility (SCF) Standards and Guidelines (ESDIS Document 423-16-01).

2 SDP Toolkit Requirements Specification for the ECS Project, 193–801–SD4–001.

the Ir-1 SSI&T were asked whether they anticipated any multi-threaded applications. In all cases, the response was negative. However, some of the teams (MISR and MODIS, in particular) indicated that such capabilities will be required in future versions of the science software. Thus, concurrent processing have to be supported by future (post Ir-1) versions of the SDP Toolkit (and ECS is currently in discussions with vendors about porting OODCE to the SGI Power Challenge series for Release A).

3. Conclusions

COTS, ECS-custom, and science software applications to be hosted on the Ir-1 Science Processor will not directly access DCE services. Therefore, there is no need for encapsulation of DCE services, as provided by OODCE, for the Ir-1 Science Processor.

Abbreviations and Acronyms

ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
CERES	Clouds and the Earth's Radiant Energy System
COTS	Commercial Off the Shelf
DAAC	Distributed Active Archive Center
DCE	Distributed Computing Environment
ECS	EOSDIS Core System
EDC	EROS Data Center (Sioux Falls, South Dakota)
EOSDIS	Earth Observing System Data and Information System
GSFC	Goddard Space Flight Center (Greenbelt, Maryland)
Ir-1	Interim Release 1
LaRC	Langley Research Center (Hampton, Virginia)
LIS	Lightning Imaging Sensor
MISR	Multi-angle Imaging SpectroRadiometer
MODIS	Moderate-Resolution Imaging Spectroradiometer
MOPITT	Measurements Of Pollution In The Troposphere
MSFC	Marshall Space Flight Center (Huntsville, Alabama)
OODCE	Object-Oriented Distributed Computing Environment
RPC	Remote Procedure Call
SCDO	Science & Communications Development Organization
SCF	Science Computing Facility
SDP	Science Data Processing
SGI	Silicon Graphics Incorporated
SSI&T	science software integration and test
TRMM	Tropical Rainfall Monitoring Mission