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# ECS Infrastructure/CSS Overview

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# Agenda For The Day



- **ECS Infrastructure/CSS Introduction**
- **CSS Services**
- **Process Framework**
- **Server Request Framework**
- **Subscription Service**
- **Universal Reference**

# Overview Agenda



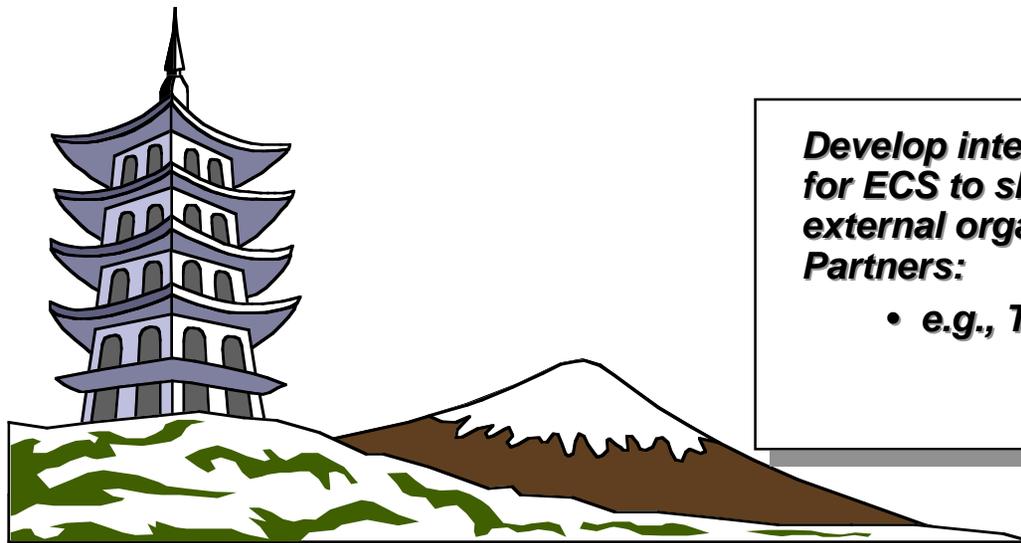
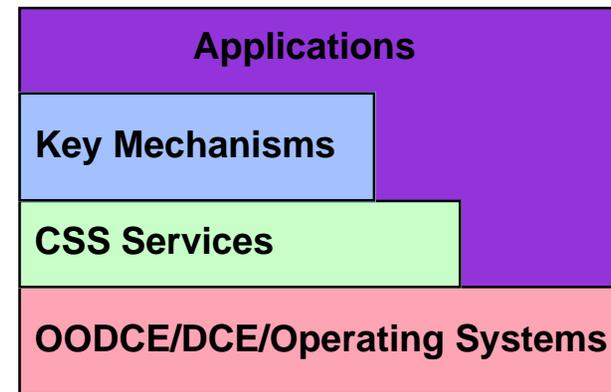
- Charter
- Design Approach/Drivers
- Architecture
- Trail from IDR
- CSS Technology
- Programmatic
- Summary



# IDG Charter

***Design and develop infrastructure software for ECS Application Use***

- ***CSS Services***
- ***Key Mechanisms***

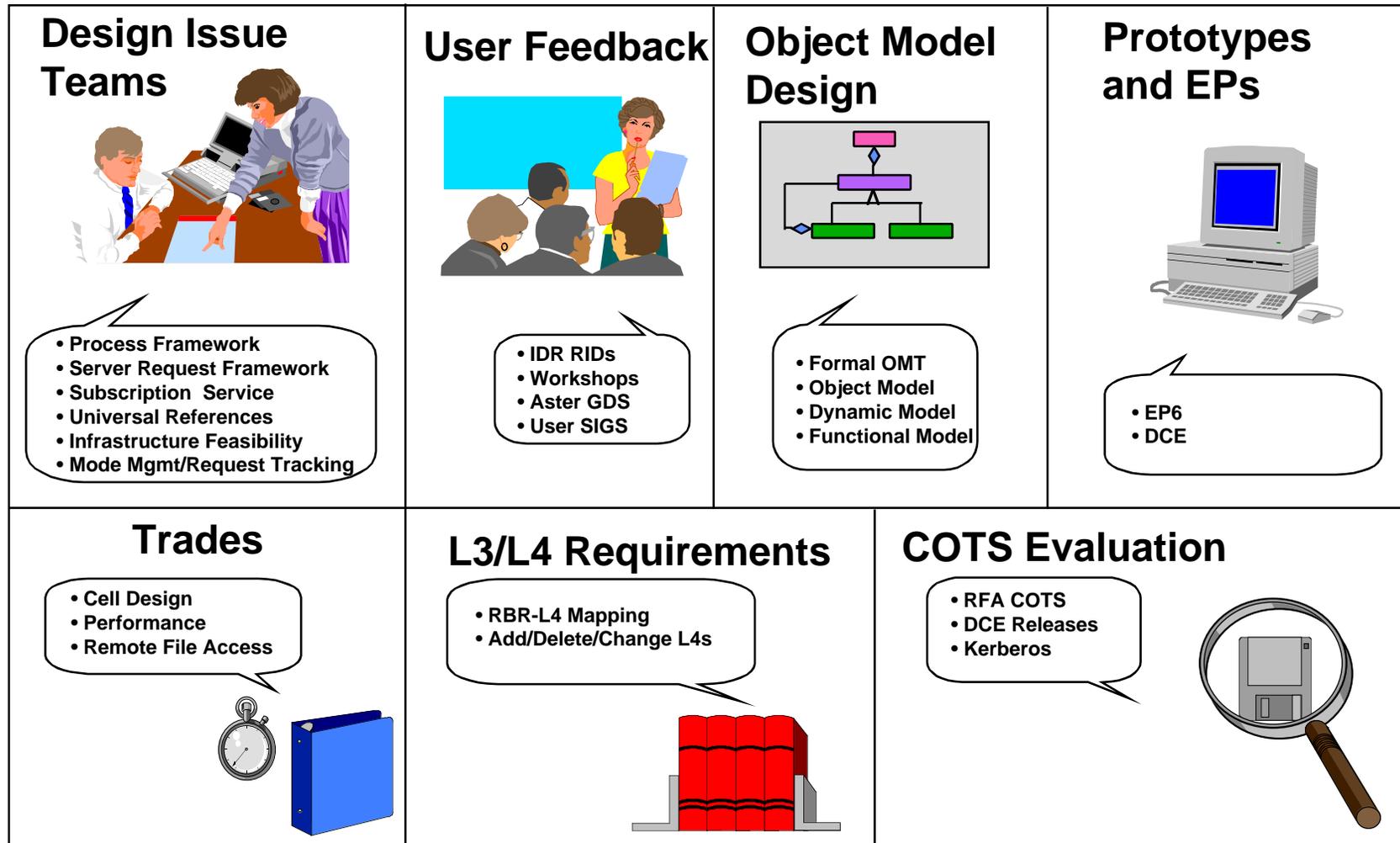


***Develop interoperability gateways for ECS to share data/services with external organizations/International Partners:***

- ***e.g., TSDIS, ASTER GDS***



# Design Inputs





# Design Drivers

## System level infrastructure drivers

- **ECS is a large-scale system that will last years, it must be**
  - standards based
  - technologically evolvable
  - extensibility & interoperability
- **Architecture must be enforced to ensure consistency and evolvability**
- **Maximize Software Reuse**
  - Common components used throughout ECS
  - COTS intensive implementation
- **Strong security model**

## Technical drivers

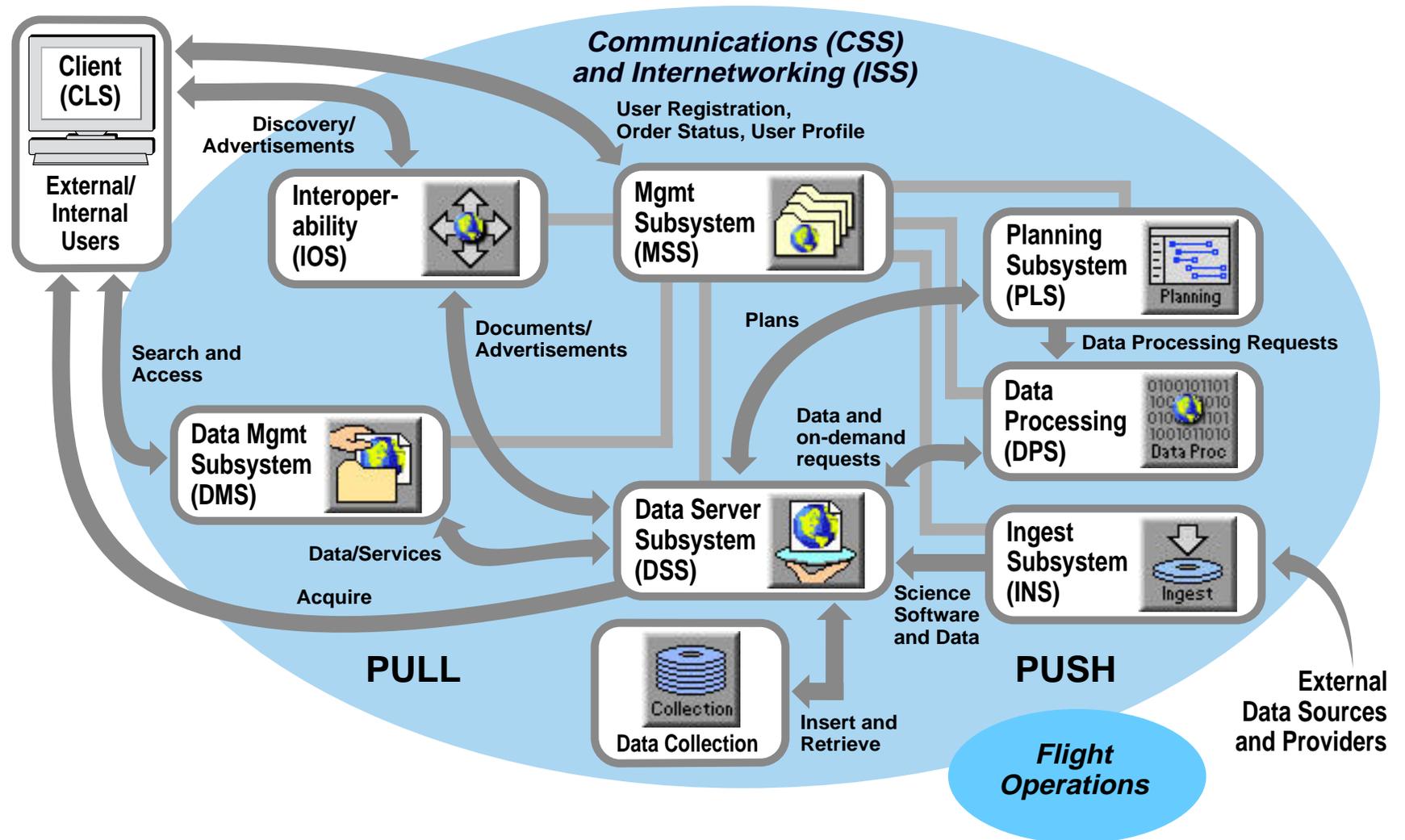
- **Large scale distributed system**
- **Performance**

# Architecture





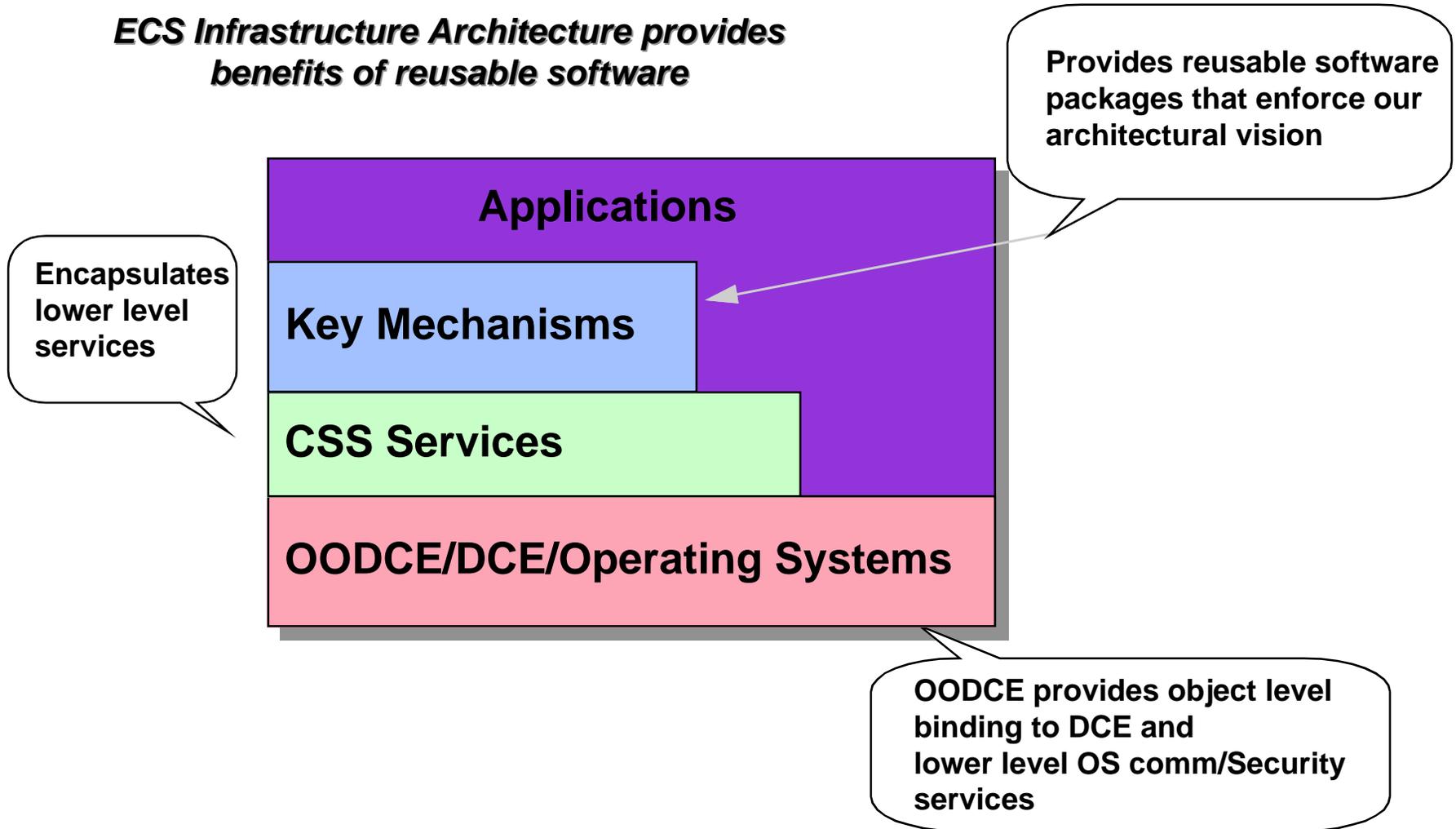
# ECS Context





# ECS Infrastructure Architecture

***ECS Infrastructure Architecture provides benefits of reusable software***



# Key Mechanisms



## Process Framework

### Features

- OODCE Init
- Config. File Support
- Mode Mgmt Support
- Event Handling
- Lifecycle Services
- Client Support

### Benefits

- Ease of use for application developers
- Support all ECS Applications

## Server Request Framework

- Persistent guaranteed
- Async. Msg Passing
- Server Functionality
- Client Functionality

- Provides client as well as server developers a common design pattern and implementation for server/request model

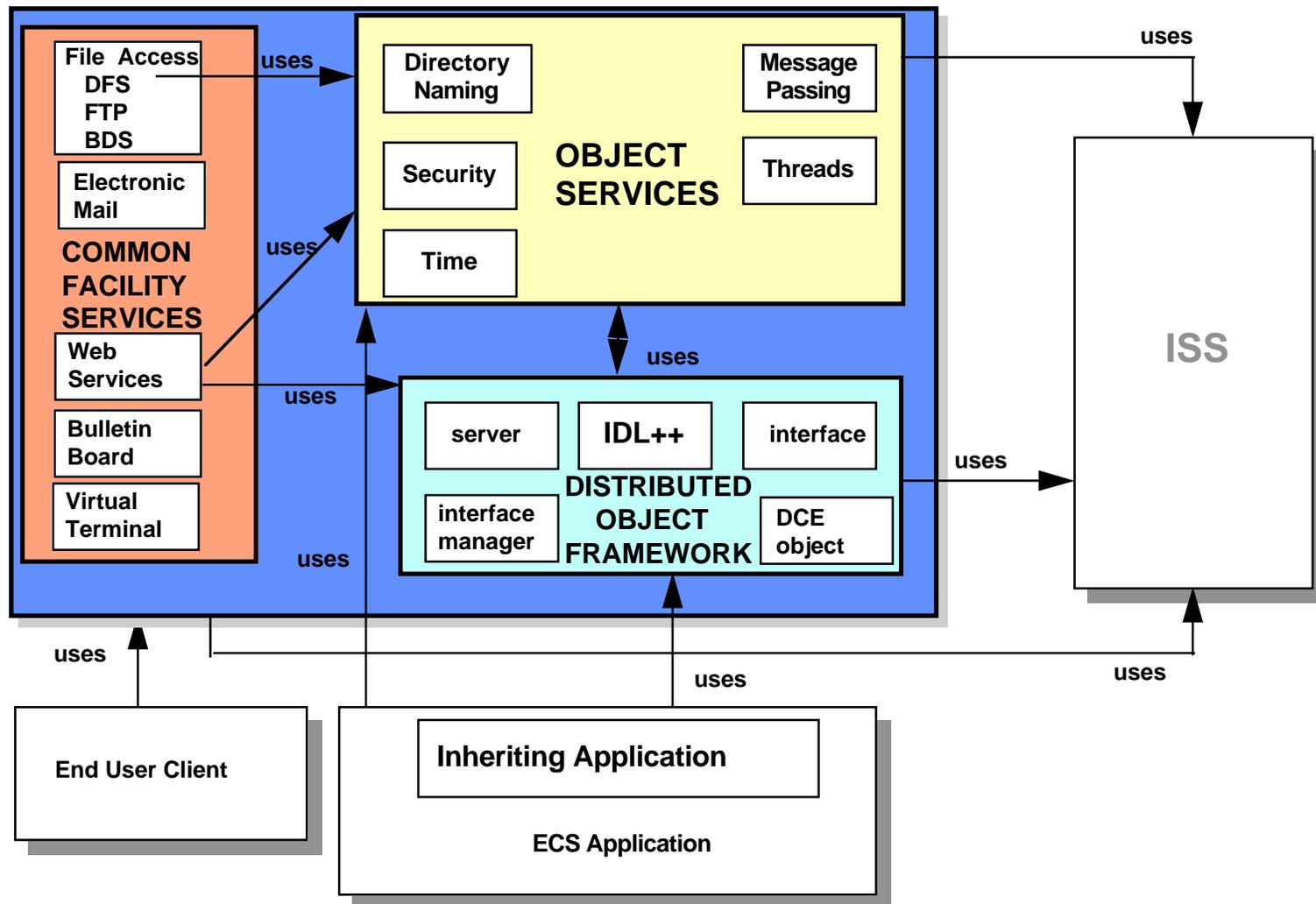
## Subscription Server

- Event/Action Model
- Producer/Consumer Paradigm

- Elevated from DSS to common framework to increase code reuse of subscription services



# CSS Services Design

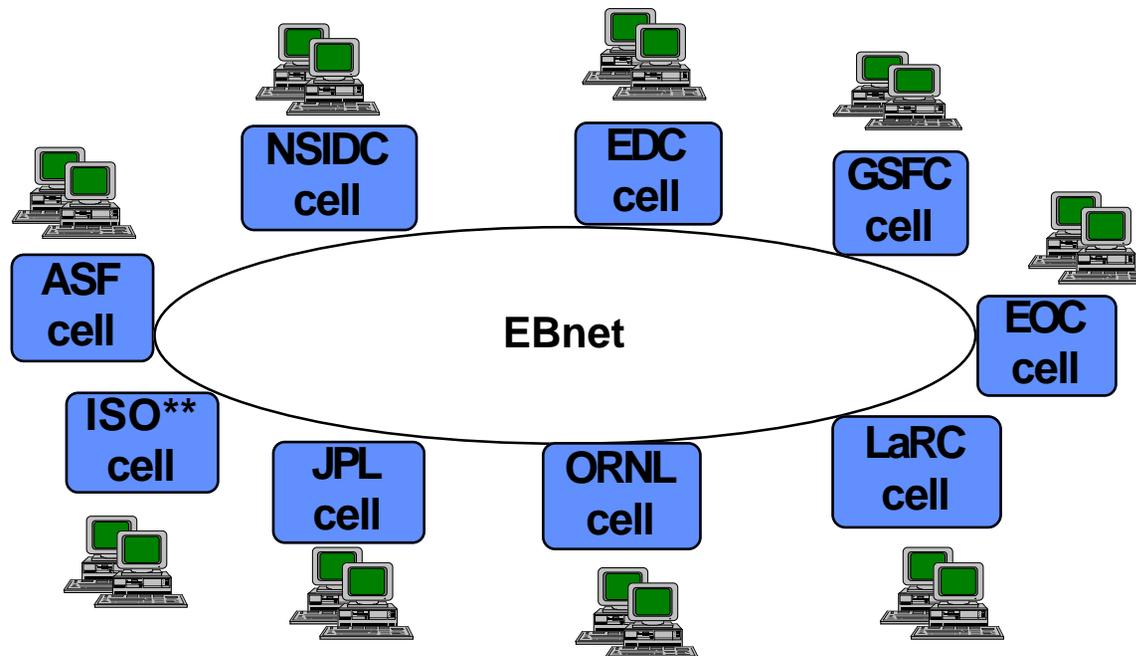


# Services to Subsystem Mapping



Services Subsystems	Client	MSS	PLS	DPS	DSS	IOS	DMS	INGEST
Directory Naming	X	X	X	X	X	X	X	X
Security	X	X	X	X	X	X	X	X
Message Passing	X	X	X	X	X	X	X	X
Thread	X	X	X	X	X	X	X	X
Time	X	X	X	X	X	X	X	X
DOF	X	X	X	X	X	X	X	X
Email	X	X	X	X	X			
FTP	X	X		X	X			X
DFS				X	X			
Bulletin Board	X	X		X				
Big Data Service				X	X			
Process Framework Services	X	X	X	X	X	X	X	X
Server Request Framework	X	X	X		X	X	X	X
Subscription Service	X	X	X		X	X	X	X
Universal Reference	X	X	X	X	X	X	X	X
Web Server	X	X		X	X	X		X

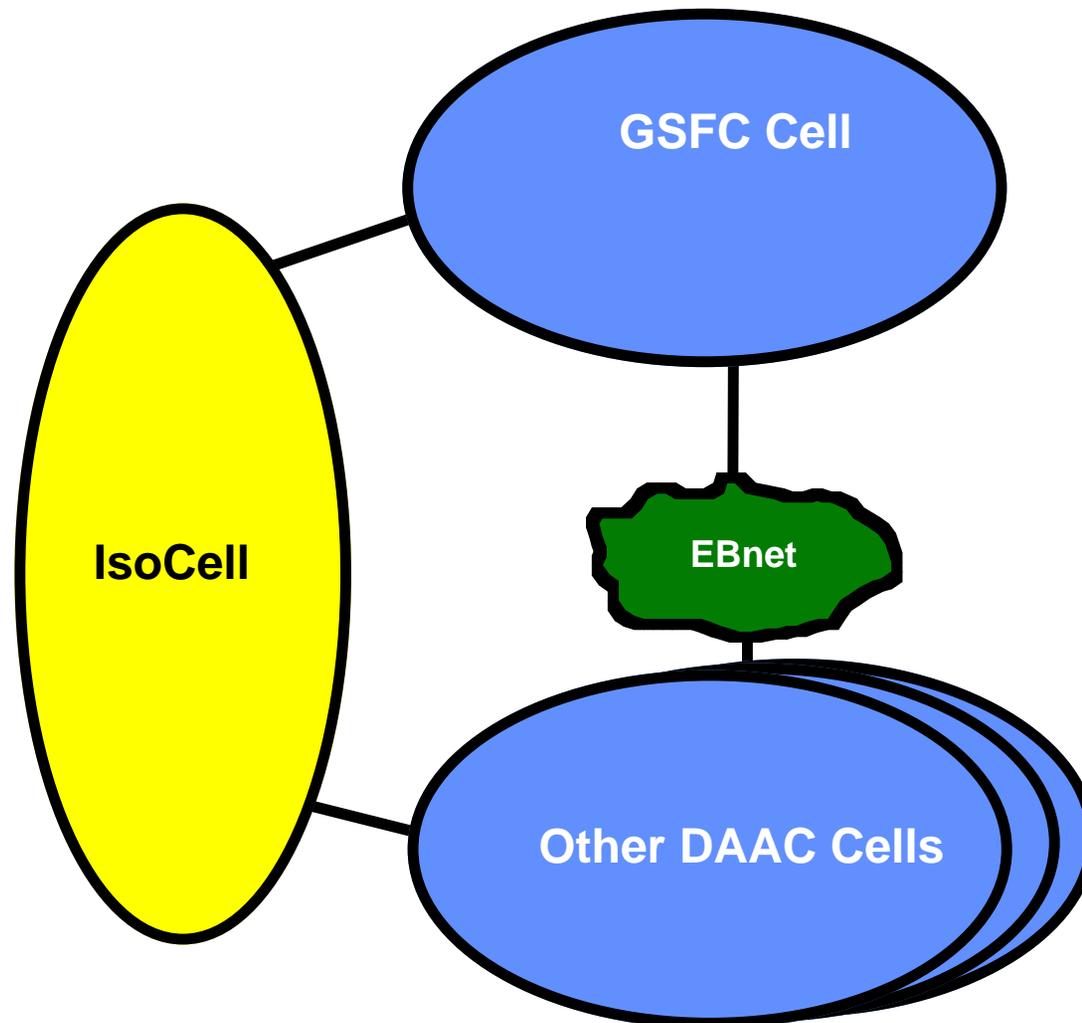
# Cell Topology



- **Rel B Cell Architecture Features:**
  - Replicated CDS & Security at each DAAC
  - External Time providers at every DAAC
  - DCE Clients on all ECS hosts
  - IsoCell for DCE enabled external users



# Multi- Cell Architecture



# General ECS Security Approach



**Use DCE & OODCE as the core for information security for ECS**

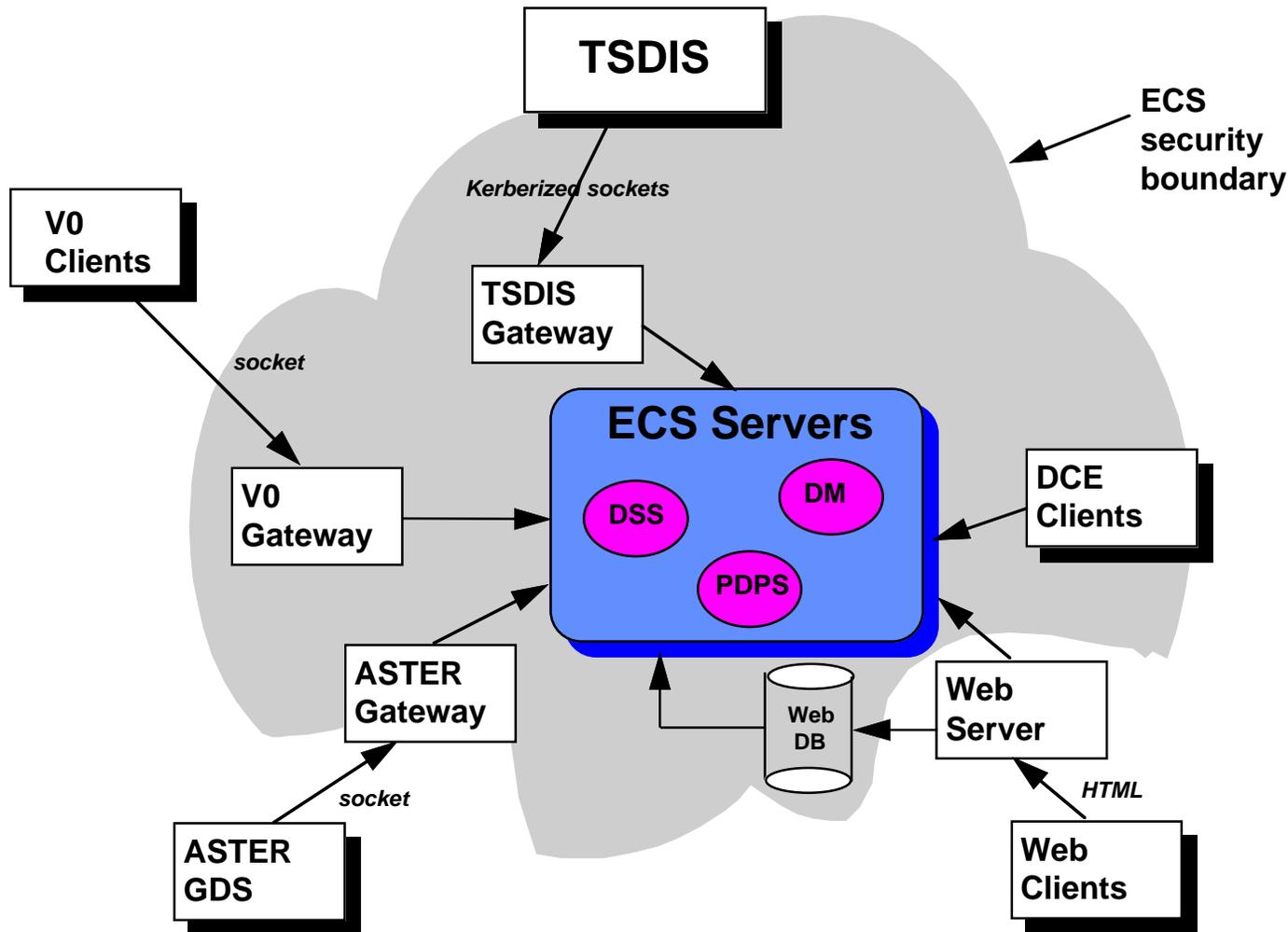
- **inside the ECS DAAC**
- **internal clients at Release A**
- **external clients at Releases B and beyond**

**For external ECS interfaces, and legacy systems (V0, TSDIS, ASTER) that will not have DCE/OODCE**

- **TSDIS gateway based on Kerberos**

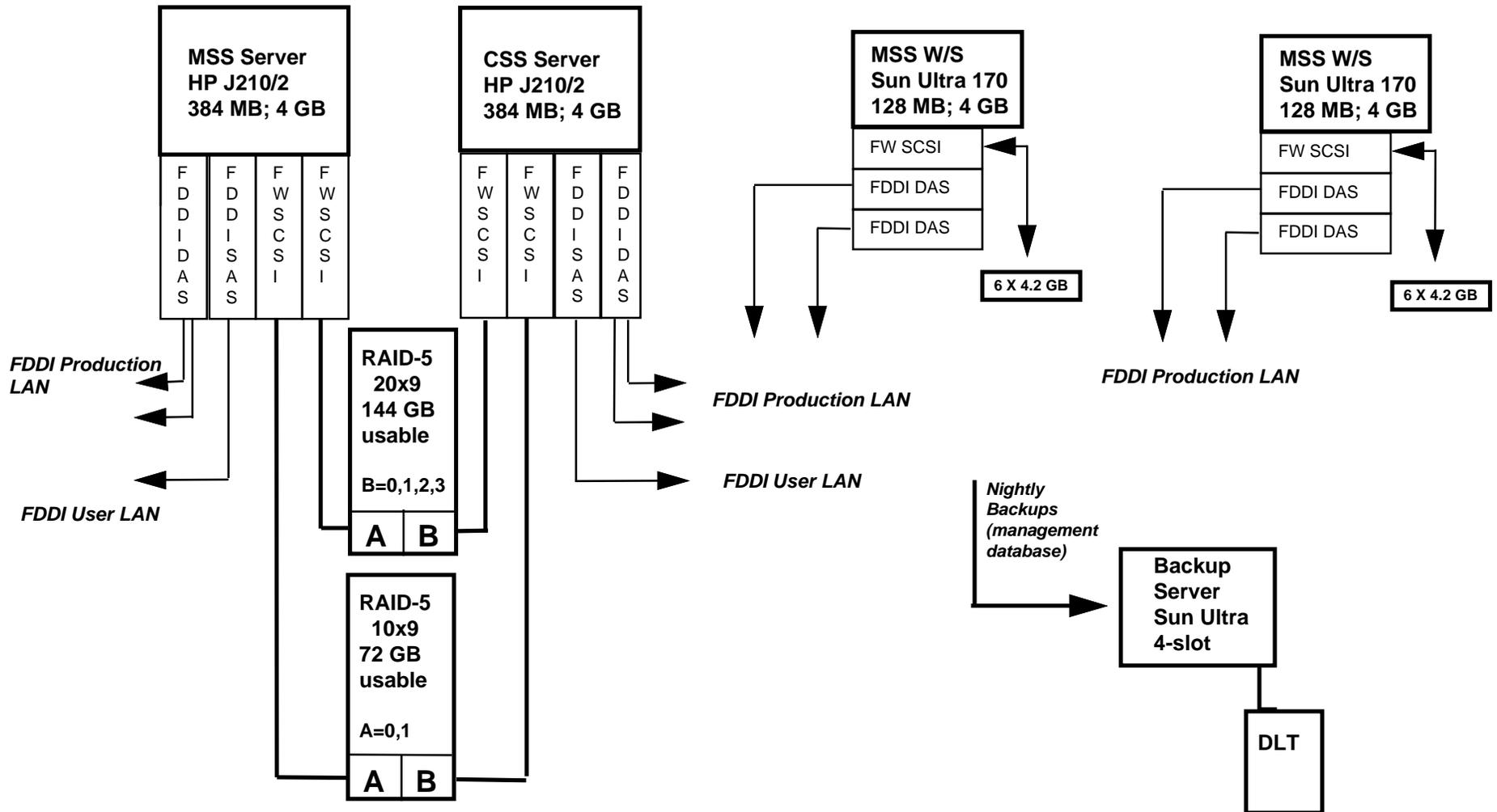


# General ECS Security Approach





# MSS/CSS H/W Configuration (GSFC DAAC)



# Sizing Approach (GSFC DAAC)



## MSS/CSS Server Load Sources

<u>Sources</u>	<u>CPU % Utilization</u>	<u>RAM</u> (MB)	<u>Application Disk Space</u> (MB)
• <u>HPOV &amp; DCE Client*</u>	20	96	2,000
HPOV Data Collection*	2	16	
Sybase Server & Client*	14	96	1,000
• <u>Tivoli*</u>	12	64	100
Remedy*	7	32	50
Accugraph*	2	8	50
MDA (log conv. to Sybase)	18	96	
MSS Agent*	1	4	
DCE Server*	2	32	200
Word Processor	.3	1	20
Spreadsheet	.3	1	20
Other Services (mail, ftp)*	2	8	40
<b>Total*</b>	<b>62%**</b>	<b>356</b>	<b>3,390</b>

\* These items were considered to be potentially active at the same time. For example, Tivoli and HPOV work interactively to build maps, monitor parameters, set thresholds and execute scripts. MDA database update is assumed to be run in off-peak hours, and not concurrently with Sybase report generation functions.

\*\* Based on two PA-7200 processors

• = conservative estimates

The above represents the worst case scenario, where only one machine HP J210/2 has been used for CSS/MSS. Ordinarily CSS and MSS share 2 machines.



# COTS Decisions

Functionality	Release A	Release B
DOF	DCE 1.0.3	DCE 1.1
DOF	OODCE on DCE 1.0.3	OODCE on DCE 1.1
File Access	ftp, kftp, DFS	SGI BDS added
Electronic Mail	Mail package	Release A baseline unchanged
Bulletin Board	rn and xrn (public domain packages based on NNTP)	
Directory/Naming	CDS - DCE, BIND - DNS	
Virtual Terminal	telnet, ktelnet	

# Trail from IDR



- **IDR RID / Issues**
- **Infrastructure Review Issues**
- **Ops Workshop Issues**
- **Decision Updates**



# IDR RID Report

- IDR Board concerns
- security policy
- Infrastructure review

## ***2 IDR RIDs issued***

### ***RID 8:***

Several services (for example, subscriptions, URs, session management) have been presented which will have a significant impact upon CSS services. The physical (hardware and network) impact of these services must be determined to ensure that the object-level design can be realized.

### ***ECS Response:***

Release B Infrastructure Development Group (IDG) agrees that various Release B subsystems use the infrastructure services (URs, subscriptions, session management, request tracking and other CSS services) and will have design/sizing impact on these services. ECS will examine these services and findings/results will be presented at an Infrastructure mini-review during early Feb 96.

## **Held Infrastructure Review 2/5/96 with Review Panel of:**

- Mike Moore - NASA; Art Gaylord - U MASS; and, Russ Heinselman - DEC

# Infrastructure Review Issues Resolution



## ***Issue:***

- 1. UR-- Use of Delimiters, how is parsing done?**
- 2. Subscriptions -- e-mail flow rate**
- 3. SRF -- layering, justify decision**
- 4. SRF -- registering clients in CDS is undesired**
- 5. SRF -- finish SRF design**
- 6. SRF -- understand impact of layering**
- 7. DCE Servers -- concerned about non-optimal load balancing between DCE servers**

## ***Resolution:***

- 1. UR-- use Rogue Wave classes for ASCII representation, delimiters encapsulated**
- 2. Subscriptions -- modeling performed, e-mail volume expected to be very low**
- 3. SRF -- estimate that SRF will save significant amount of code in "typical" ECS application. (Estimate of 2K to 3k SLOC saved per application) Minimal Performance overhead expected.**
- 4. SRF -- SRF design change, No CDS registration**
- 5. SRF -- see current design (SRF presentation)**
- 6. SRF -- see issue 3 above**
- 7. DCE Servers -- sharing 2 machines w/ MSS. MSS load low**



# IDR RID 36 - Uniqueness of UR

**Issue: UR's uniqueness not guaranteed**

***Will be addressed in the UR  
Presentation this afternoon***

# OPS Workshop Issues



**Issue:** DAACs would like information regarding the capabilities of the mail server.

**Response:** Open, to be resolved by the end of May.

**Issue:** Clarify which data elements are connected with restricted data security (PI & group) and how data elements function.

**Response:**

Data Element restrictions are ESDIS policy determination, so far: - Billing Information  
- Privacy Act Information

Implementation is ACLs

# CSS Technology

- Decision Updates
- DCE 1.1
- OODCE
- ORB



# Decision Updates



## Decisions since IDR

- **SGI Big Data Service ( BDS ) added**
  - Used for transfer of large quantities of data **More**
- **OSF/DCE “Secure Web” from CDR 305 dropped**
  - Buy decision to procure SSL based secure web server
- **Dropped COTS Transaction Processing**
  - CCR deletion after 03/01/96 baseline
- **DFS will be used by SDPS (inter-DAAC inserts)**
- **Compression will be used for inter-DAAC transfers** **More**
  - Required functionality provided by SRF

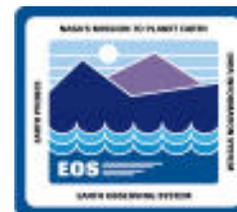
# Updates (cont.)



**All Key Mechanisms put under single implementation team to improve reuse**

- **Process Framework (PF)**
  - encapsulates ECS infrastructure
- **Server Request Framework (SRF)**
  - common communication layer for request handling
- **Generic Subscription Server**
  - common mechanism for event notification & actions based on events
- **URs**
  - common mechanism for identifying “stuff” in ECS

# DCE 1.1 Key Enhancements



Key Feature	Description	Impact/Resolution for Rel B
<b>Administration</b>	<ul style="list-style-type: none"> <li>• Centralized administration and consolidated tool dcecp</li> </ul>	<ul style="list-style-type: none"> <li>• Provides new operator I/F for DCE</li> </ul>
<b>Security</b>	<ul style="list-style-type: none"> <li>• Delegation</li> <li>• Hierarchical cells</li> </ul>	<ul style="list-style-type: none"> <li>• Plan to use Delegation</li> <li>• Investigating Hierarchical cells</li> </ul>
<b>Other</b>	<ul style="list-style-type: none"> <li>• dced server registration library</li> <li>• Auditing</li> </ul>	<ul style="list-style-type: none"> <li>• None</li> </ul>



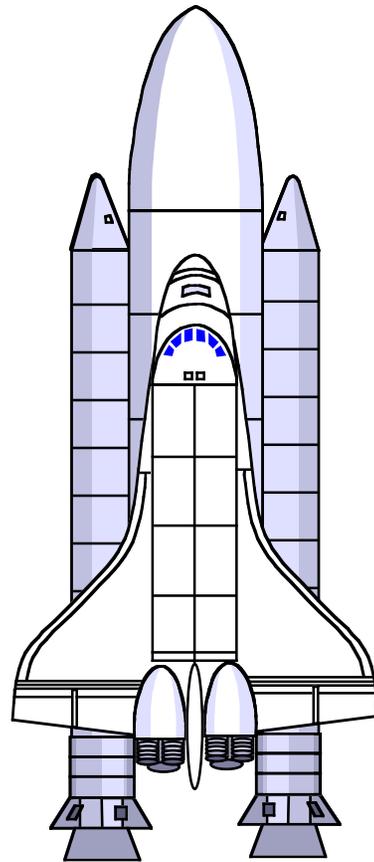
# OODCE Status

- Plan

- Phase I: use DCE 1.0.3 on Sun, DEC, IBM, SGI
- Drop dead date for DCE 1.1 port is Aug 1st, 1996 (start Phase II)

Product	HP-UX 10.0	Solaris 2.4	SGI Irix 6.2	DEC OSF 4.0	IBM AIX 4.x
DCE Client available	✓	✓	June 1996	April 1996	✓
in-house	✓	✓	no	no	no
DCE Server available	✓	✓	June 1996	April 1996	✓
in-house	✓	✓	no	no	no
DFS Client available	✓	✓	June 1996	April 1996	✓
in-house	✓	✓	no	no	no
DFS Server available	✓	✓	June 1996	April 1996	✓
in-house	✓	✓	no	no	no
OODCE for DCE 1.1 available	✓	in negotiation	in negotiation	in negotiation	in negotiation
in-house	✓	no	no	no	no

# “To ORB and Beyond”





# Evolution to ORB

## CSS encapsulates distributed service architecture

- Process Framework and Server Request Framework
- should ease migration issues

## Options

- CORBA /ORB
- DCE 1.2.1
  - C++ integration, interface inheritance, object reference passing
- Active Agents/ Spiders/ Crawlers/Bots

## Migration decision will be based on numerous factors, including

- interoperability
- portability
- security

# Programmatics



# Reused from Release A



## Object Services

- Directory Naming, Security, Message Passing, Multicast, Thread, Time, and Life Cycle

## Common Facility Services

- Electronic Mail, FTP, Bulletin Board, Virtual Terminal, and Event Logger

## Distributed Object Framework

## Infrastructure Services

- Process Framework, Server Request Framework, TSDIS Gateway, Universal References, and Subscription (significant modification in Release B)

# Transition to Release B



## Participate in Transition to Release B Working Group (TRBWG)

- Providing DCE and Infrastructure expertise to TRBWG because infrastructure is critical element to transition

See Week 2 presentation on Transition to B

See Transition White Paper



# SLOC Count

**Component:**

**Release B SLOC:**

**TBS...**



# Prototypes and Studies

Prototype	Status	Plan
<b>kftp and ktelnet</b>	<b>Successful testing with DCE 1.1</b>	<b>(1) Examine vendor products (e.g. HP)</b> <b>(2) Future: consider DCE 1.2.2 utilities</b>
<b>DCE 1.1 Security Features</b>	<b>DCE 1.1 cells installed &amp; configured</b>	<b>Delegation (intra-cell and inter-cell) &amp; OODCE authorization between cells</b>
<b>DCE 1.0.3 and 1.1 Portability &amp; Interoperability</b>	<b>(1) Some binary portability testing on solaris DCE 1.03 to 1.1</b> <b>(2) Some interoperability testing of DCE/OODCE 1.03 to 1.1</b>	<b>Complete testing on multiple cells and more hardware types; also security tests</b>
<b>Performance of RPCs</b>	<b>Measured for infrastructure review. Performance okay for SDPS</b>	<b>Work with FOS to determine if performance acceptable Benchmark SRF</b>

# Summary



- **CSS is ready to begin Release B implementation**
- **Key architectural decisions made**
- **All COTS selections completed**
- **Design is evolvable to support eventual technology changeout**

# BACKUP SLIDES



# Prototypes and Studies



- **KFTP and Ktelnet**
- **DCE1.1 security features**
- **Interoperability Testing**
- **Performance of RPCs**



# DCE 1.1 Security Features



## Current Results:

- Installed and configured two DCE 1.1 cells
- 

## Next Step

- delegation within and between cells
- verify OODCE support of foreign users in ACLs
- hierarchical cells
  - assess feasibility with vendors
  - prototype to determine advantages over non-hierarchical cells
  - not crucial to development timeline (admin issue)

# Interoperability and Inter-cell Communication



## Current Results:

- Servers with DCE 1.0.3 on Sun machine and HP machine; client with DCE 1.1 on a Sun machine
- Successful interoperability and inter-cell communication

## Next Step :

- Server and client (one in DCE 1.1 and the other in DCE 1.0.3) in the same cell
- Server and client in different cells (both are DCE 1.1)

?????need to re-work this & next 3-slides. Doesn't look good. How do we compress information?????



# DCE 1.1 Portability

Description of Testing	Status on HP and Sun Machines	w/ Security
OODCE 1.0.3 binary on DCE 1.1 platform	Done (on Sun)**	Authorization
OODCE 1.0.3 source recompiled on DCE 1.1 platform		
DCE 1.0.3 binary on DCE 1.1 platform	Done (on Sun)	Authentication only
DCE 1.0.3 source recompiled and run on DCE 1.1 platform	Done (on Sun)	Authentication only
OODCE 1.0.3 source recompiled on DCE 1.1 platform (*)		
DCE 1.0.3 source recompiled and run on DCE 1.1 platform (*)		

(\*) after OODCE 1.1 installed and Tools.h++ recompiled on HP machine

(\*\*) EP6 client to server communication

# DCE 1.1 Interoperability



To test DCE 1.1 to DCE 1.0.3 interoperability

Description of Testing	Status on c-HP/s-HP	Status on c-Sun/s-HP	Status on c-HP/s-Sun	Status on c-Sun/s-Sun
OODCE 1.0.3 client to OODCE 1.1 server				
OODCE 1.1 client to OODCE 1.0.3 server				
DCE 1.0.3 client to DCE 1.1 server				
DCE 1.1 client to DCE 1.0.3 server		done (without security)		done (without security)

# DCE 1.1 Inter-cell



To test DCE inter-cell communication

Description of Testing	Status on c-HP/s-HP	Status on c-Sun/s-HP	Status on c-HP/s-Sun	Status on c-Sun/s-Sun
Client in OODCE 1.0.3 to Server in OODCE 1.1				
Client in OODCE 1.1 to Server in OODCE 1.0.3				
Client in DCE 1.0.3 to Server in DCE 1.1				
Client in DCE 1.1 to Server in DCE 1.0.3		done (without security)		done (without security)

# Performance of RPCs



## Current Results

- Measured the cost (CPU) of the initial connect between a client and server (with security)
- Measured the cost (CPU) of making an RPC with various security levels
- ?????Measured the costs mentioned above for SRF ??????not done

## Next Step

- Validate benchmark results, expand to more complete infrastructure benchmarking
- feed benchmark info into FOS decision
  - FOS has stringent performance requirements
- ?????Show backup #'s from review - Sagar providing????