# DATABASE ADMINISTRATION

**ECS Release 6A Training**

625-CD-611-001

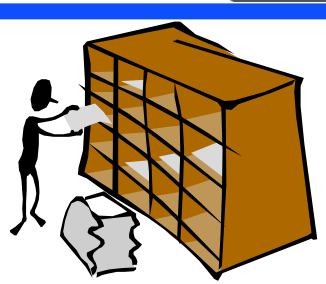
# Objectives

- Describe Basic Database Components
- Describe Release 6 Databases
- Describe ECS Database Environment
- Perform Database Administration Functions
  - Server start/stop
  - Permissions
  - Backup and Recovery
  - Passwords
  - System Procedures
- Describe ECS Sybase Replication Server Administration

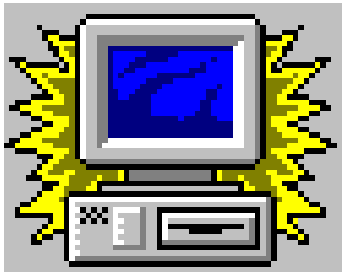
# Sybase Terms

| Term | Definition |
|---|---|
| SQL Server | The server in the Sybase client/server architecture. SQL Server manages multiple databases and multiple users, keeps track of the actual location of data on disks, maintains mapping of logical data description to physical data storage, and maintains data and procedure caches in memory. |
| Client | SYBASE Open Client software located in the /tools/sybOCv(TBD) directory for SUN and HP platforms<br>SYBASE Open Client software located in the /tools/sybOCv(TBD) directory for SGI platform |
| Backup Server | Similar to the dataserver, it uses a separate UNIX process to off load the cycles associated with DUMP and LOAD commands |
| backups | The set of UNIX files containing full database dumps, transaction log dumps, and dbcc output |
| dbcc | Database Consistency Checker - a utility program designed to check the logical and physical consistency of a database |
| sybase root directory | /usr/ecs/OPS/COTS/sybase, this is the home directory for all SYBASE software and related products and is referenced both in UNIX and in the rest of this document as **$SYBASE** |
| interfaces file | Lists the names and access paths for all servers and backup servers. This file is located in the **$SYBASE** |
| sa | System Administrator login, this is the superuser of the SQL Server |
| scripts | UNIX script programs located in **$SYBASE**/scripts and related subdirectories {$ecs_Home}/{mode}/custom/dbms/{subsystem} |
| showserver | A utility invoked at the UNIX command prompt to display active servers, located in **$SYBASE**/install. |
| SQL scripts | SQL and command statements located in **$SYBASE**/scripts and related subdirectories and /{$ecs_Home}/{mode}/custom/dbms/{subsystem} |
| Server Name | The name of the database server for a specific application in different modes<br>**EX. -** PDPS application database server in OPS mode<br>EX.- Pdps_TS1 in TS1 mode<br>EX. -pdps _TS2 in TS2 mode |
| Port Numbers | The port number to be utilized by the above listed servers. |
| Release Directory | $SYBASE |
| SQL | Structured Query Language |

# Database Device



- **Stores objects that make up databases**
- **May be:**
  - **a distinct physical device**
  - **a disk partition**
  - **a file**



- **Must be initialized first**

# Initializing a Database Device Command Script Template

```
/*****************************************/
/* name: [add_devices.sql]               */
/* purpose:                              */
/* written:                              */
/* revised:                              */
/* reason:                               */
/*****************************************/
disk init name = [device name],
physname = "/dev/[device name]",
vdevno = [#],
size = [size]
go
sp_helpdevice [device name}
go
```

# Completed database device creation script

```
/*****************************************************/
/* name: test_dev.sql                                */
/* purpose: allocate 3Mb device for testing          */
/* written: 12/18/97                                 */
/* revised:                                          */
/* reason:                                           */
/*****************************************************/
disk init name = test_dev,
physname =
"/usr/ecs/REL_A/COTS/sybase/studentdevices/test_dev.dat",
vdevno = 15,
size = 1536
go
sp_helpdevice test_dev
go
```

# Create New Database Command Script Template

```
/*****************************************/
/* name: [database name].sql             */
/* purpose:                              */
/* written:                              */
/* revised:                              */
/* reason:                               */
/*****************************************/
create database [database name]
on [data device name] = [#] /* size in Mb */
go
sp_helpdb [database name]
go
```

# Completed Create DatabaseScript

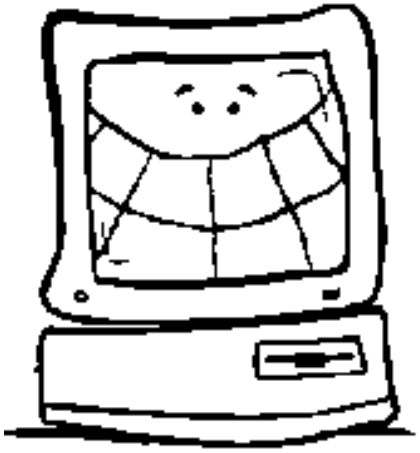
```
/*****************************************/
/* name: test_db.sql                     */
/* purpose: create a database for        */
/* testing                               */
/* written: 12/19/97                     */
/* revised:                              */
/* reason:                               */
/*****************************************/
create database test_db
on test_dev = 3
go
sp_helpdb test_db
go
```

# Database Segments

- **Collection of database devices or fragments available to a particular database**
- **Can have tables and indexes assigned to it**
- **Can span a set of physical devices**
- **Created when the database is created *or* when DBA deems necessary *or* as part of the database recovery procedure**

# Why Database Segments?

- **Reduces read/write access time**
- **Increases SQL Server performance**
- **Added administrative control over placement, size, and space usage of specific database objects**



# Database Segments Template File

```
/*****************************************/
/* name: [segment.sql]                   */
/* purpose:                              */
/* written:                              */
/* revised:                              */
/* reason:                               */
/*****************************************/

 sp_addsegment [seg_name], [DBname], [Device Name]
    [ B   i  ]
```

# Sample template.sql file for creation of a• database table•

```
/*********************************/
/* name: [table name].sql        */
/* purpose:                      */
/* written:                      */
/* revised:                      */
/* reason:                       */
/*********************************/
use [database name]
go
create table [table name] (
[column 1] [datatype] [null | not null]
[column 2] [datatype] [null | not null]
)
go
sp_help [table name]
go
/* for any other objects consult    */
/* appropriate documentation         */
```

# Completed Create Table Script•

```
/*****************************************/
/* name: test_table.sql                  */
/* purpose: create a database table for  */
/* testing                               */
/* written: 12/19/97                     */
/* revised:                              */
/* reason:                               */
/*****************************************/
use [database name]
go
create table test_table (
last_name varchar(30) not null,
first_name varchar(30) not null,
)
go
sp_helpdb test_table
go
```

# What is a Transaction Log?

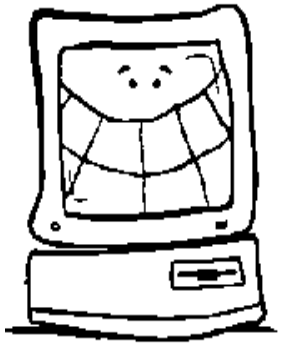
- Automatically records every transaction issued by each user of the DB.
- Keeps track of all changes to the database.
- Each database has its own transaction log.
- Cannot be turned off.
- Write-ahead file.  Changes are reversed if transaction fails to complete.
- Receive a dump transactions in seconds.

# Transaction Log Backup

- **Transaction Log - an expanding file that records all database transactions.**
- **Used for complete recovery of DB if media fails.**
- **Maintained on a different device than DB**
- **Backed up with regular system backups, but non-scheduled backups can be performed with permission.**

# ECS Databases

**ECS databases are divided into two categories:**



***Production Databases€***

***System Management Databases€***

# Release 6
# Production Databases

| Database | Content |
|---|---|
| Ingest DB | File types to be ingested, status of ingest production requests, historical summary. |
| Planning & Data Processing System (PDPS) | PGE information to plan production. |
| Metadata | Collection, granule, document, producer, and other descriptive information about science data. |
| MSS Management DB | System and application performance information, user profiles, and order tracking information. |
| Storage Management Pull Monitor | Staging disk usage, tape drives available, requests needing resources. |
| Data Dictionary | User descriptions of attributes and other terms in system |
| Document Database (WEB-based search only) | ECS-related science documents. |
| ASTER Lookup Table (LUT) | Atmospheric correction parameters |
| CSS Persistent Access Control List (ACL) | List of principals who can access components. |
| Advertising Database | Holdings and services available to users. |
| Subscription Database | Principals (users or servers) to be notified when a specified event occurs. |

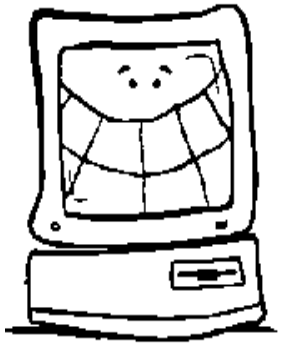
# Release 6 Management Databases

| Application | Tool | Server |
|---|---|---|
| Network Management | HP OpenView | MSS |
| System Performance Management | Tivoli TME/Sentry | MSS |
| Extensible SNMP Agent | Peer Networks Optima | All platforms |
| Trouble Ticketing | Remedy Corporation ARS | MSS |
| Physical Configuration Management | Accugraph Corporation (PNM) | MSS |
| Security/DCE Management | HAL DCE Cell Manager | CSS |
| Software Change Management | Clearcase | CM |
| Change Request Management | DDTS | CM |
| Baseline Manager | HTG XRP | CM |

# Release 6 SQL Servers at GSFC

| Database | Content |
|---|---|
| g0acg01_srvr | Data Subsystem Server (Science Dataserver and Storage Management) |
| g0acg01_backup | |
| g0ins01_srvr | Subscription Server |
| g0ins01_backup | |
| g0mss21_srvr | Management Subsystem Server (ACL and MSS Databases) |
| g0mss21_backup | |
| g0ins02_srvr | Data Management Server (Advertising and Data Dictionary) |
| g0ins02_backup | |
| g0pls02_srvr | Planning and Data Processing Server (Autosys) |
| g0pls02_backup | |
| g0icg01_srvr | Ingest Server |
| g0icg01_backup | |

# Naming Conventions



- **The file name should indicate the function and/or content of the object regardless of the length of the file name.**
- **Only easily understandable abbreviations should be used.**

  **Parts of names are separated by the underscore character(_).**

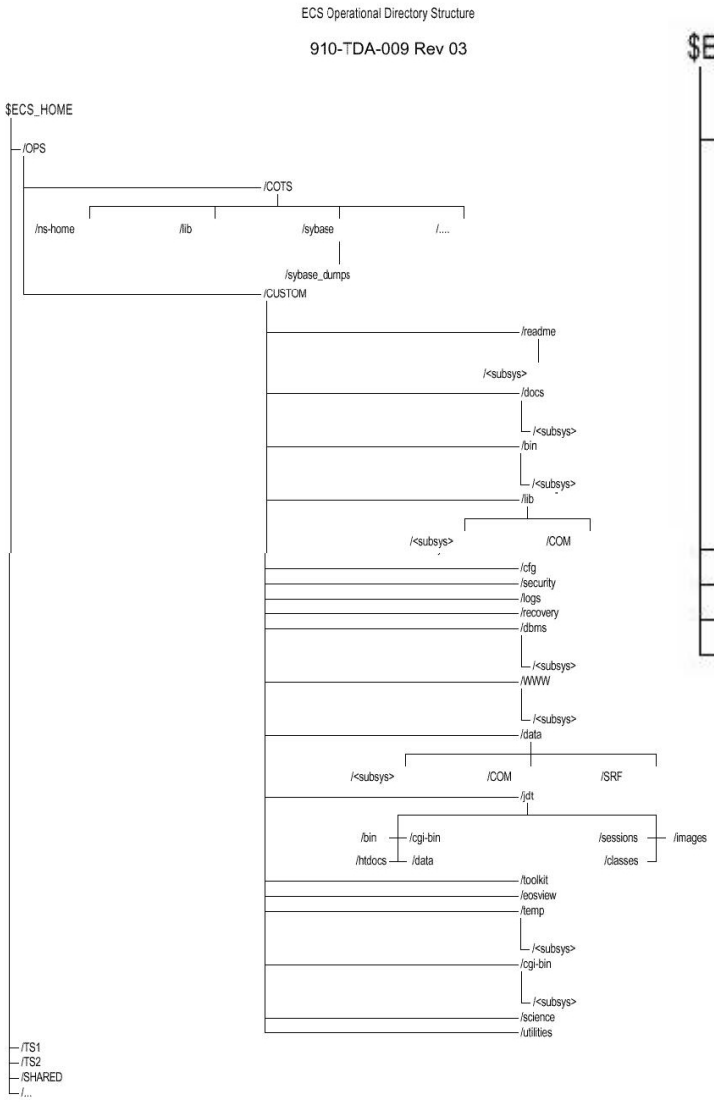
  **Only one optional suffix is permitted and is appended to the file name by a period (.).**
- **The full path of the object is considered to be part of the name.**

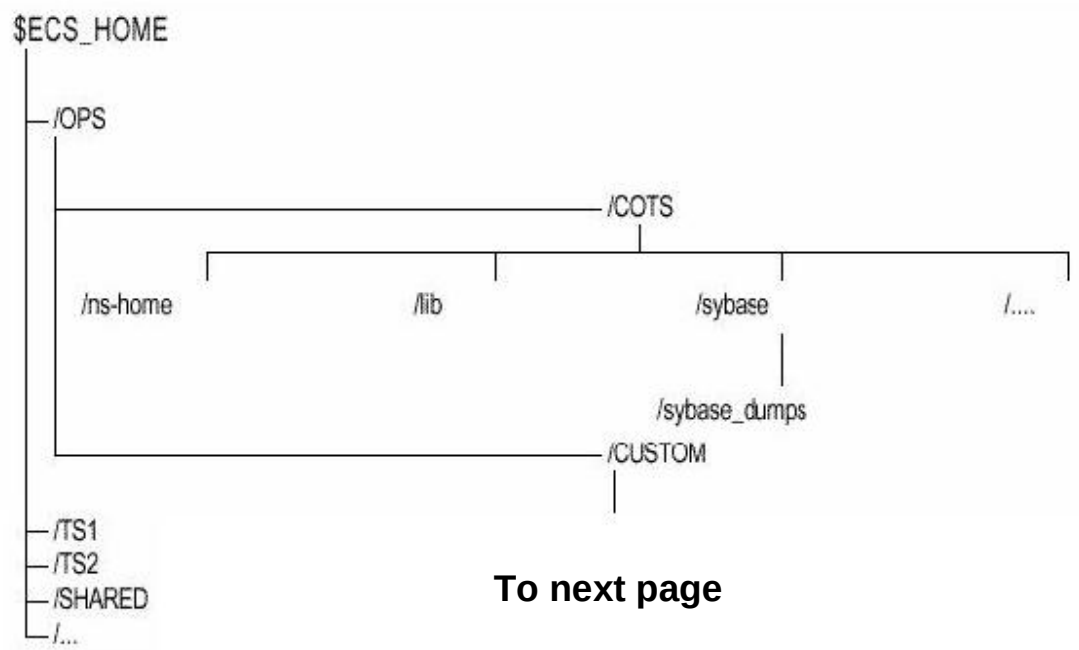
# ECS Database Environment

| Subsystem | DAAC Platform | DAAC Sybase Server | DAAC Database Names (1) | DB Size | Log Size | Index Size | Device Type | DBO Names |
|---|---|---|---|---|---|---|---|---|
| CLS | N/A | N/A | No databases | N/A | N/A | N/A | N/A | N/A |
| CSS/IDG ACL | N/A | N/A | No databases | N/A | N/A | N/A | N/A | N/A |
| CSS/IDG SUB | G0INS01 | g0ins01_srvr | SubServer | 120MB | 60MB | 60MB | raw | css_role |
| | | | SubServer_TS1 | 40MB | 20MB | 20MB | raw | css_role |
| | | | SubServer_TS2 | 40MB | 20MB | 20MB | raw | css_role |
| | | | tempdb | 100MB | N/A | N/A | filesystem | |
| | | | master | 50MB | N/A | N/A | raw | |
| | | | sybsystemprocs | 60MB | N/A | N/A | filesystem | |
| DMS | G0INS02 | g0ins02_srvr | EcDmDictService | 360MB | 180MB | 180MB | raw | dms_role |
| | | | EcDmDictService_TS1 | 120MB | 60MB | 60MB | raw | dms_role |
| | | | EcDmDictService_TS2 | 120MB | 60MB | 60MB | raw | dms_role |
| | | | tempdb | 100MB | N/A | N/A | filesystem | |
| | | | master | 50MB | N/A | N/A | raw | |
| | | | sybsystemprocs | 60MB | N/A | N/A | filesystem | |
| DSS/DDIST | G0ICG01 | g0icg01_srvr | (Moved into STMGT database) | N/A | N/A | N/A | N/A | N/A |
| DSS/DDSRV | N/A | N/A | No databases | N/A | N/A | N/A | N/A | N/A |
| DSS/SDSRV | G0ACG01 | g0acg01_srvr | EcDsScienceDataServer1 | 4,800MB | 1,200MB | 1,200MB | raw | sdsrv_role |
| | | | EcDsScienceDataServer1_TS1 | 1,600MB | 400MB | 400MB | raw | sdsrv_role |
| | | | EcDsScienceDataServer1_TS2 | 1,600MB | 400MB | 400MB | raw | sdsrv_role |
| | | | tempdb | 1,000MB | N/A | N/A | filesystem | |
| | | | master | 50MB | N/A | N/A | raw | |
| | | | sybsystemprocs | 60MB | N/A | N/A | filesystem | |
| DSS/STMGT | G0ACG01 | g0acg01_srvr | stmgtdb1 | 600MB | 300MB | 300MB | raw | stmgt_role |
| | | | stmgtdb1_TS1 | 160MB | 80MB | 80MB | raw | stmgt_role |
| | | | stmgtdb1_TS2 | 160MB | 80MB | 80MB | raw | stmgt_role |
| INGEST | G0ICG01 | g0icg01_srvr | Ingest | 480MB | 240MB | 240MB | raw | ingest_role |
| | | | Ingest_TS1 | 160MB | 80MB | 80MB | raw | ingest_role |
| | | | Ingest_TS2 | 160MB | 80MB | 80MB | raw | ingest_role |
| | | | tempdb | 100MB | N/A | N/A | filesystem | |
| | | | master | 50MB | N/A | N/A | raw | |
| | | | sybsystemprocs | 60MB | N/A | N/A | filesystem | |

**Baseline Hardware/Database Map**

# ECS Operational Directory Structure

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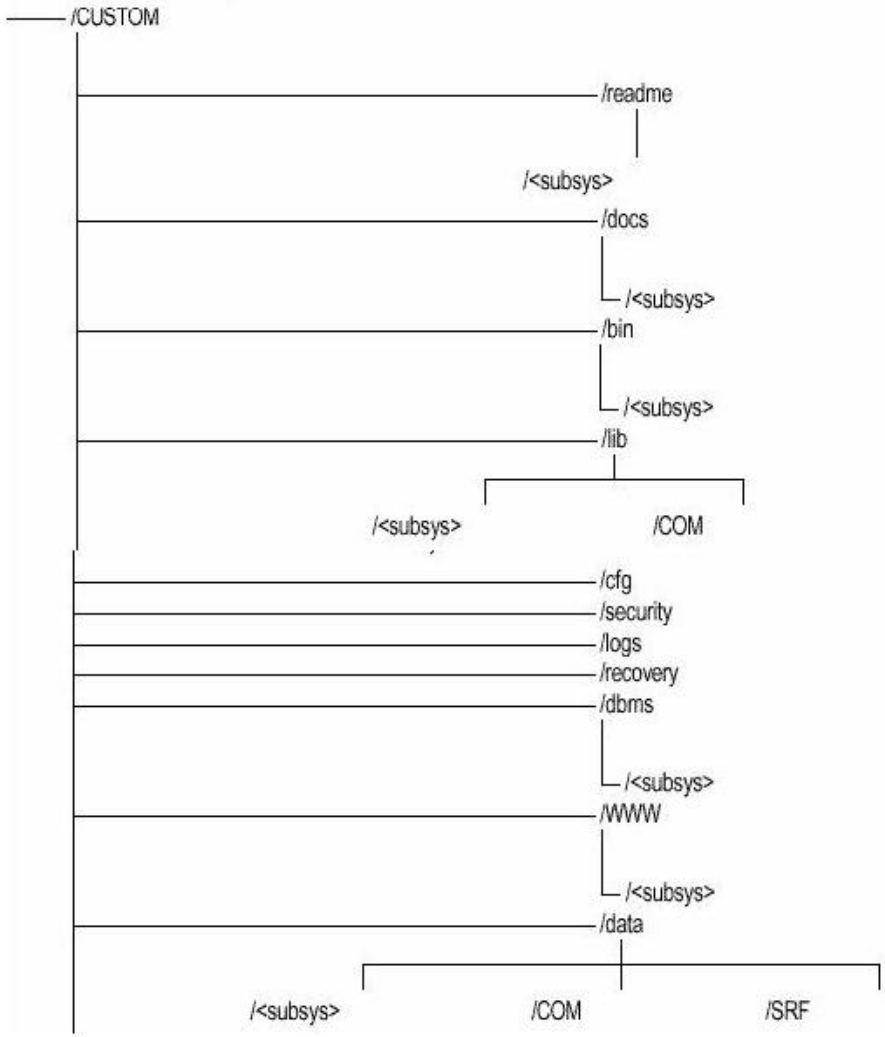
# ECS Operational Directory Structure, continued

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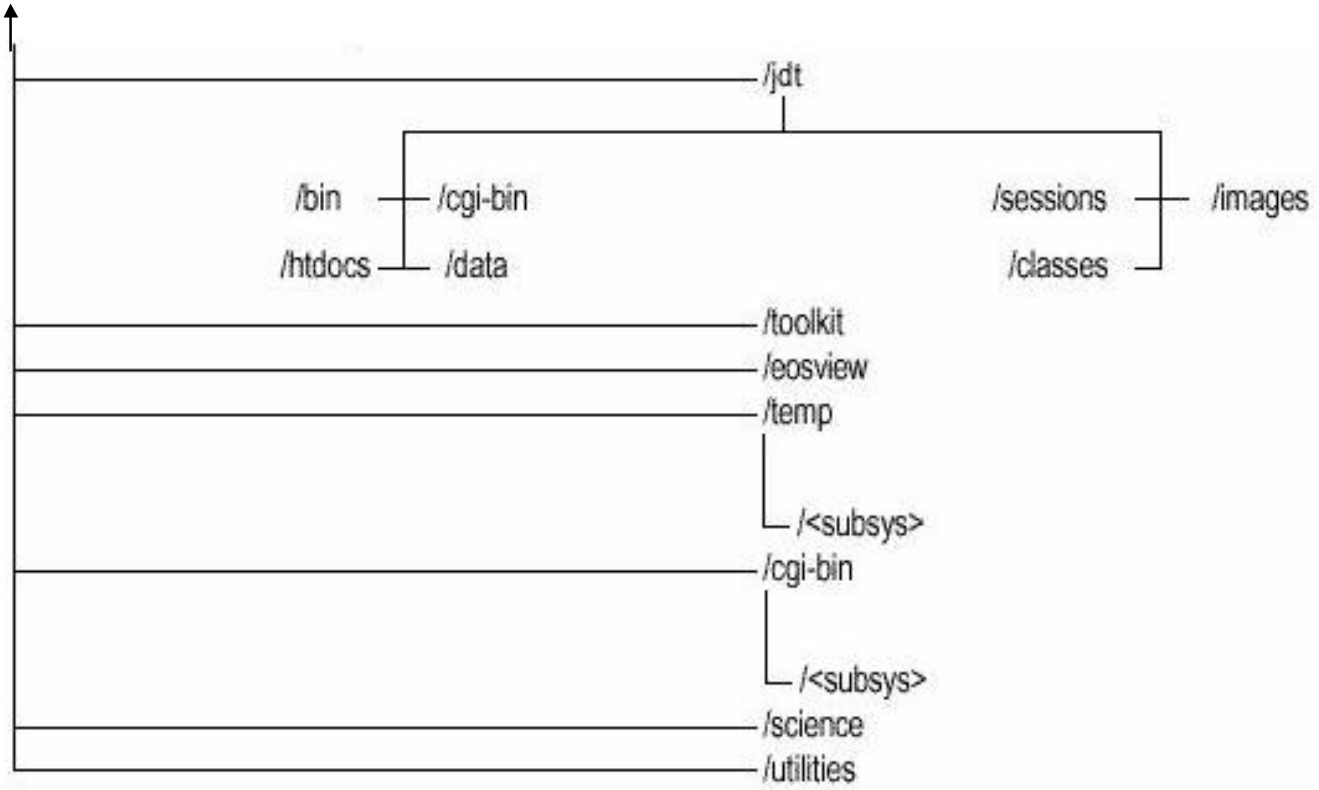
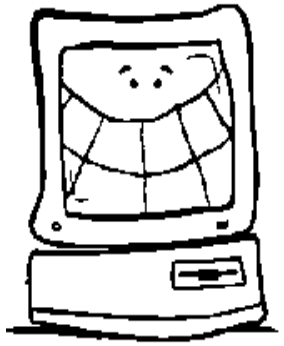
# ECS Operational Directory Structure, continued

**To CUSTOM**

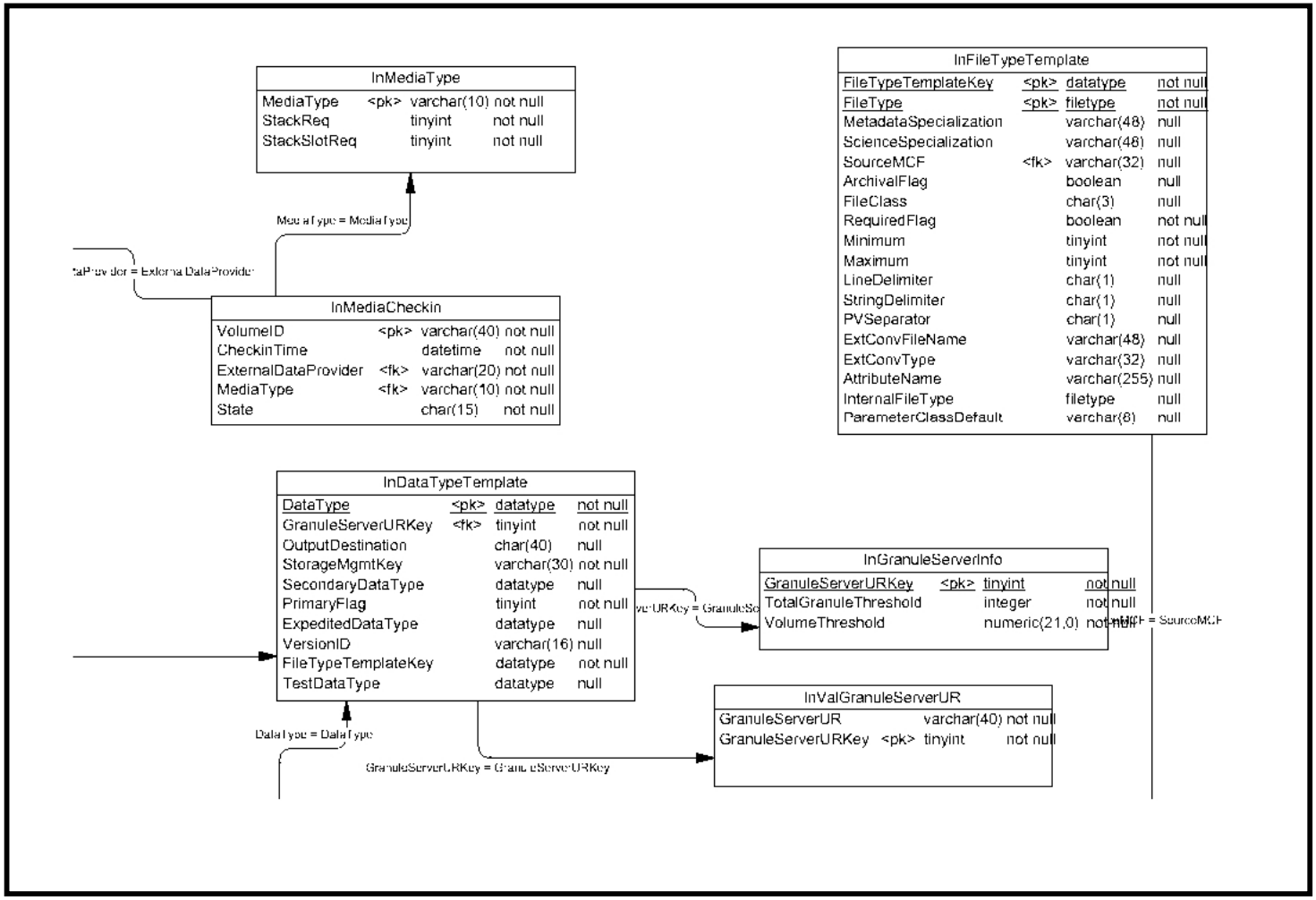


# Sybase Directory Structure



| Directory | Contains |
|---|---|
| $SYBASE/bin | Utilities necessary to load, run, and access the server |
| $SYBASE /install | Files used to start dataservers, backupserver and to record server messages ( errorlogs) |
| $SYBASE /scripts | Root directory for all script files executed on the server |
| $SYBASE/scripts/ mk_DB_database. sql (e.g. database = SubServer) | SQL script files used to create databases on the server |
| $SYBASE/scripts/ add_devices.sql | SQL script file (disk init) used to map physical storage to a logical name. |
| $SYBASE/scripts/ alter_DB_tempdb. sql | SQL script file used to alter the database. |
| $SYBASE /scripts/ del_user | Script file used to delete logins and remove them from the users database. |
| backup directory: $SYBASE/ sybase.dumps | Root directory that contains all backup subdirectories. It is recommended, but not required, that this directory be on a separate physical disk |

# Database Schemas



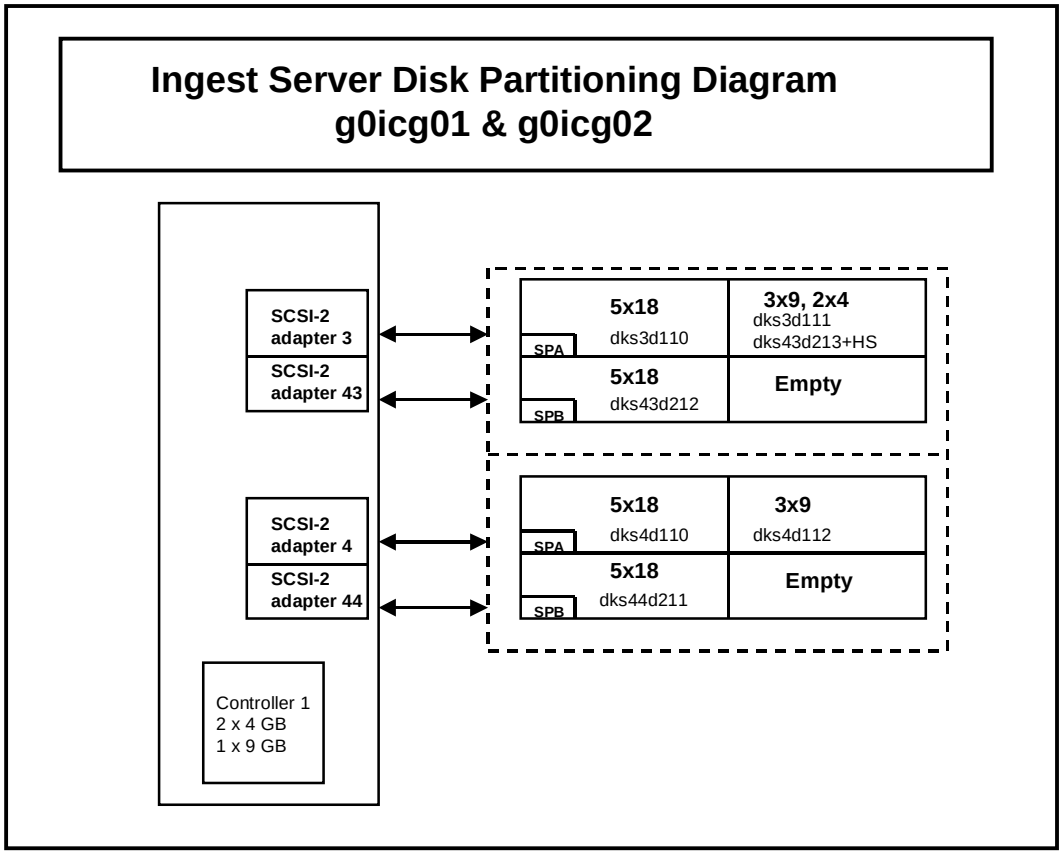

**Partial Entity Relationship Diagram - INGEST**

# DAAC-Specific Configuration Parameters

Host Name: g0msh08

| Parameter Name | Memory Used | Default Value | Configured Value | Run Value |
|---|---|---|---|---|
| number of devices | 8 | 10 | 20 | 20 |
| number of locks | 469 | 5000 | 5000 | 5000 |
| number of remote connections | 33 | 20 | 20 | 20 |
| number of remote logins | 22 | 20 | 20 | 20 |
| total memory | 15000 | 7500 | 7500 | 7500 |
| max online engines | 355 | 1 | 1 | 1 |
| number of user connections | 2121 | 25 | 25 | 25 |
| procedure cache percent | 838 | 20 | 20 | 20 |
| number of open databases | 396 | 12 | 12 | 12 |
| number of open objects | 489 | 500 | 500 | 500 |
| stack size | 2075 | 34816 | 34816 | 34816 |

# Server Disk Partitioning Block Diagram

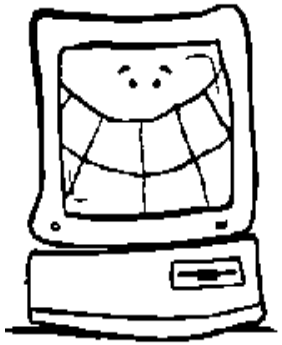


# Ingest Server Disk Partitioning Diagram

dks3d111, 2x0 GB Raid Level 1, Mirrored

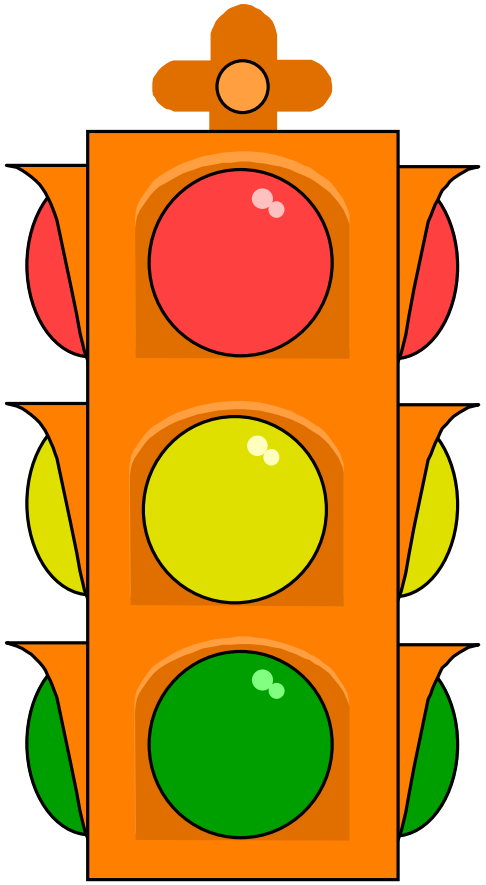
| Slice | Start Block | Total Blocks | Start MB | Total MB | XLV Name | Mount | Type |
|---|---|---|---|---|---|---|---|
| 0 | 2048 | 1024000 | 1 | 1 | ingestlog | | xlv |
| 1 | 1026048 | 512000 | 501 | 501 | sybsecurity | | xlv |
| 2 | 1538048 | 256000 | 751 | 125 | sybmaster | | xlv |
| 3 | 1794048 | 512000 | 876 | 250 | sybsecarchive | | xlv |
| 4 | 2306048 | 512000 | 1126 | 250 | ddistlog | | xlv |
| 5 | 2814048 | 1024000 | 1376 | 500 | stmgtlog | | xlv |
| 6 | 3842048 | 5120000 | 1876 | 2500 | sybase_dumps | | xlv |
| 7 | 9862048 | 8264978 | 4376 | 4036 | spare1 | | xlv |
| 8 | 0 | 2018 | 0 | 1 | n/a | | Volhdr |
| 10 | 0 | 17227026 | 0 | 8412 | n/a | | volume |

# DBA Tasks and Functions



- Perform database backup, transaction log maintenance, and database recovery.
- Monitor and tune the physical allocation of database resources.
- Maintain user accounts.
- Create user registration and account access control permissions in the security database.
- Work with data specialists on DB design, data sets, and metadata management.

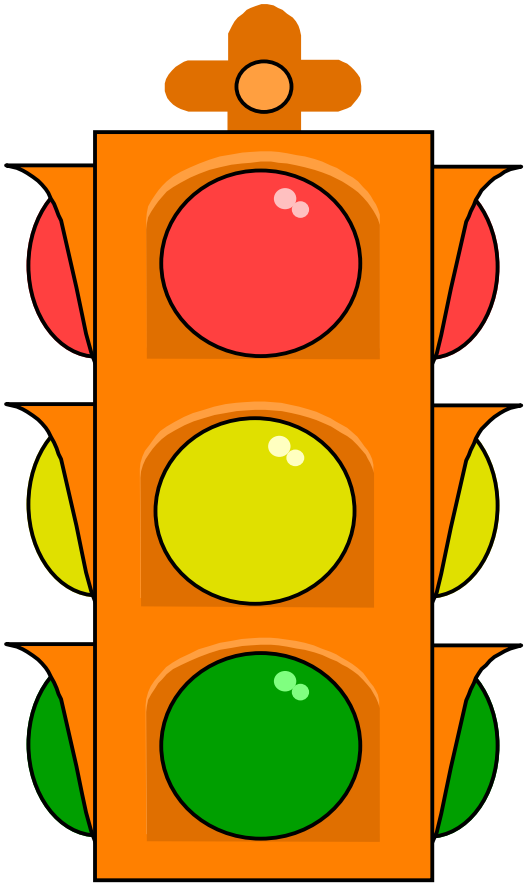
# Start & Stop SQL Server



**STOP! BACKUP** and **MONITOR Server** must be **STOPPED** before **STOPPING SQL Server**

**START** the **SQL Server** after installation, system outage or maintenance

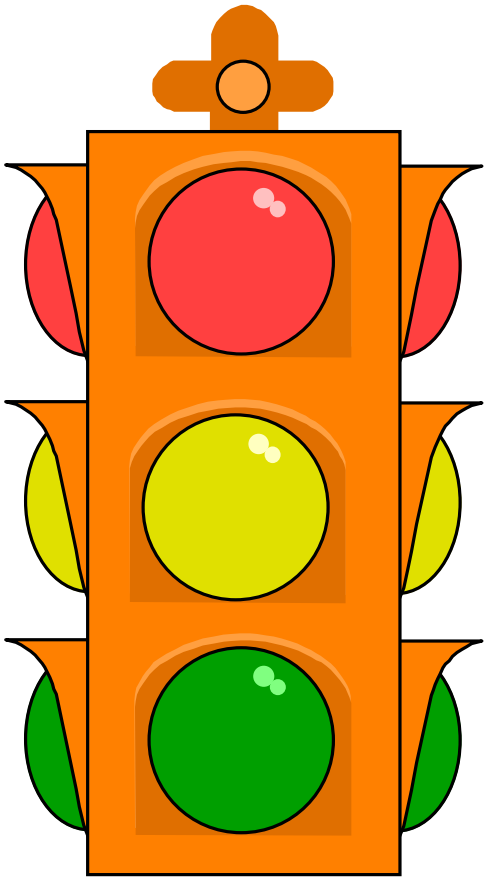
# Start & Stop SQL Backup Server



**STOP** the **BACKUP Server** before **STOPPING SQL Server**

**SQL Server** must be **Up** and **Running** in order to **START** the **BACKUP Server**

# Start & Stop SQL Monitor Server



**STOP** the MONITOR Server before stopping **SQL Server**

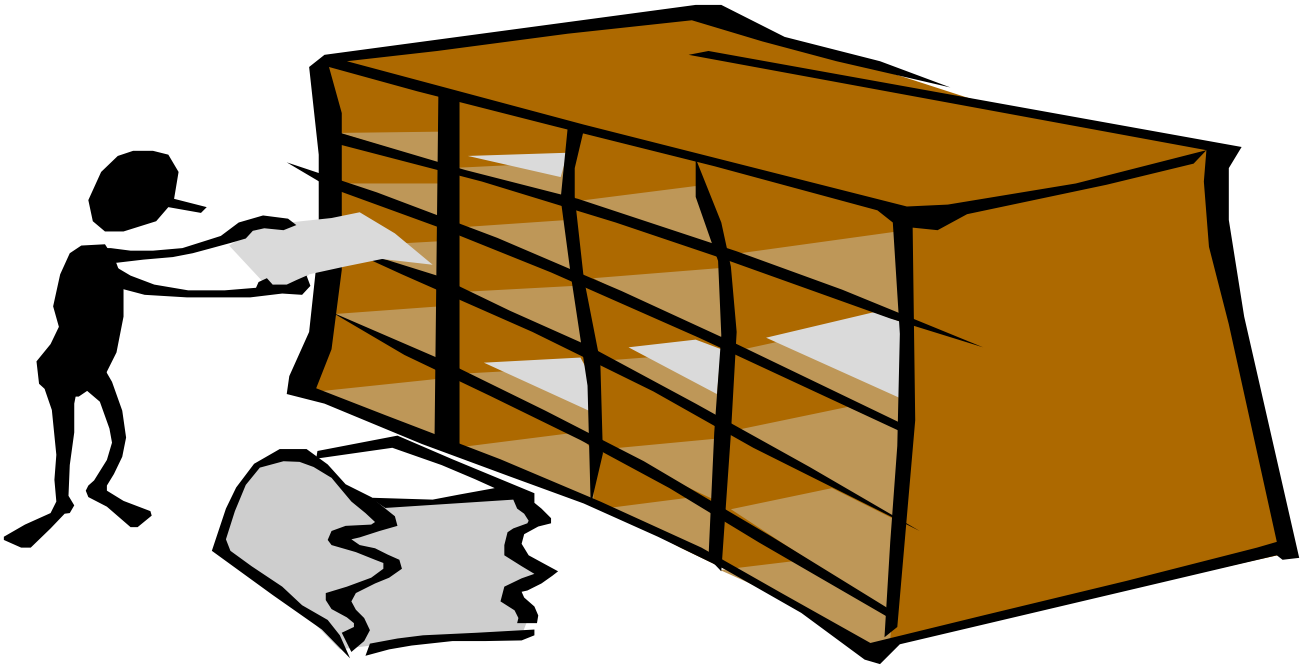
**SQL Server** must be up and running in order to **START** the MONITOR Server

# Renaming Database Command Sample

```
 /* Rename database Old-database-name to New-database-name */

sp_dboption Old-database-name, "single user", true
go
use Old-database-name
go
checkpoint
go
use master
go
sp_renamedb Old-database-name, New-database-name
go
sp_dboption New-database-name, "single user", false
go
use New-database-name
go
checkpoint
go
use master
go
```

# Backup and Recovery



# Database Data Backup

- Databases data are backed daily
- Can be requested at any time
- Need to know the following:
  - Name of DB to be backed up
  - Name of the server on which the DB resides
  - Name of the backup volume
  - Name of the dump file on the backup volume
- Run daily by a UNIX Cron Job

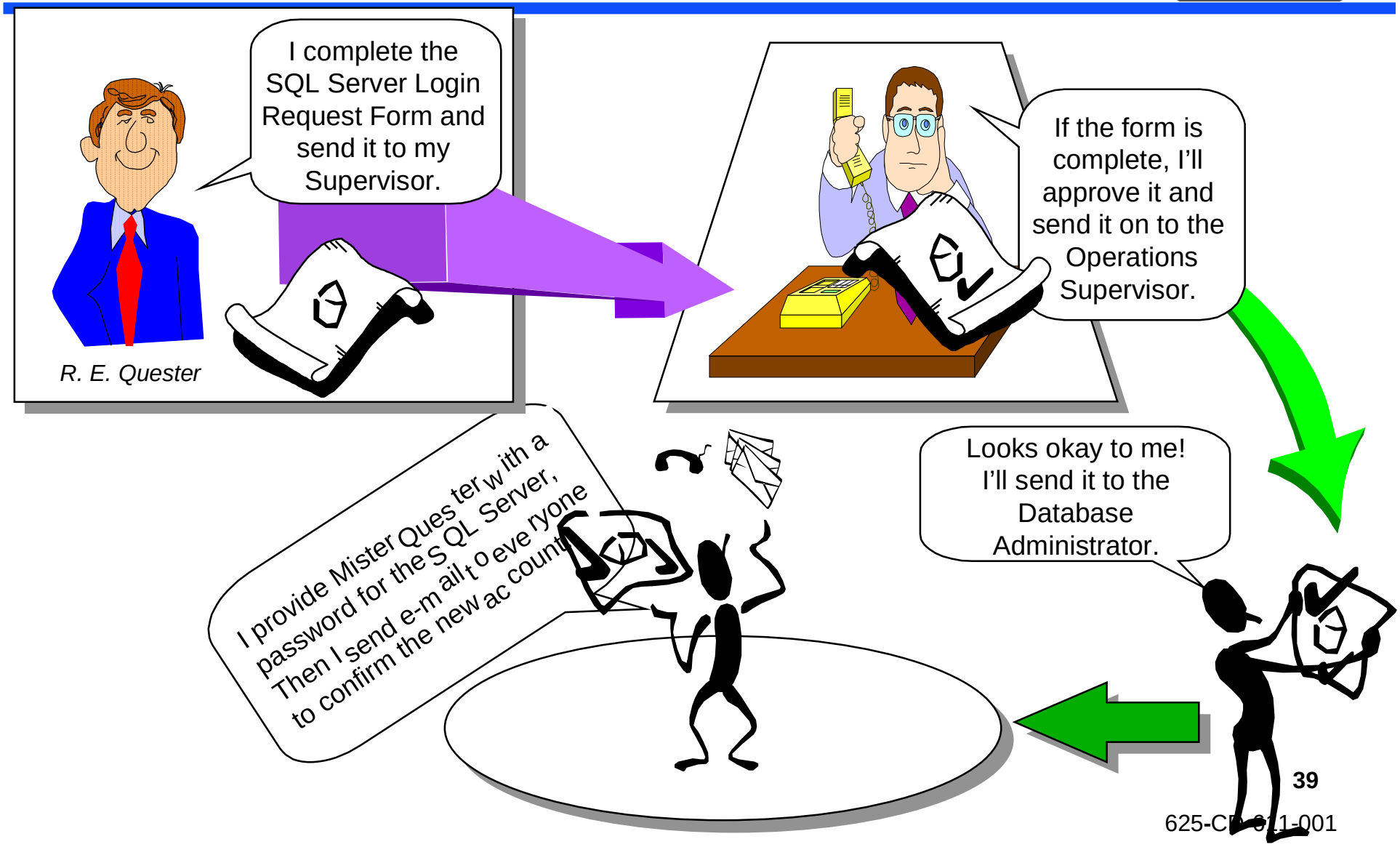
# Database Recovery/ Database Device Restoration

- Device Failure verified by SA
- SA requests a restoration from the DBA
- Transaction log for each DB on the failed device is backed up
- DBA examines space usage of each DB on failed device.
- DB(s) on the failed device are deleted; then device is deleted
- DBA initializes new DB device
- DBA recreates each user DB on the new device
- Each DB is restored from DB backups and transaction logs
- DBA notifies SA when restoration is complete.

# Changing Password Command Sample

sp_password *old-password, new-password, user-name*

# SQL Server Login Approval Process



# SQL Server Login Account Request Form

## SQL Server Login Account Request

**REQUESTER INFORMATION:**

Name: _____

UNIX ID: _____ Group: _____

Office Phone Number: _____

E-Mail Address: _____ Office Location: _____

Database(s) to be accessed: _____

_____

_____

Permissions required for database objects:_____

_____

Justification: _____

_____

_____

Date of Request: _____ Date Required: _____

Supervisor Approval: _____ Date: _____

Ops Supervisor Approval: _____ Date: _____

# Database Access Privileges

**Assign a user to a group that has specific access privileges.**

**Assign a user object permissions.**

**Assign a user command permissions.**

# Sample template.sql file for new database user login

```
/*****************************************/
/* name: [template.sql]                  */
/* purpose:                              */
/* written:                              */
/* revised:                              */
/* reason:                               */
/*****************************************/
sp_addlogin [login name], [password], [default
database]
go
use [default database]
go
sp_adduser [login name]
go
/* the following is optional, by database */
sp_changegroup [group name], [login name]
go
sp_helpuser
go
```

# Database Tuning and Performance Monitoring

- Use *sp_config* to determine current configuration parameters and set future run values.
- Use *dbcc memusage* to determine current memory usage.
- Use *sp_spaceused* to determine how much space has been used on the device.
- Running two event processors

# *sp_config* Sample Output

| name | minimum | maximum | config_value | run_value |
|---|---|---|---|---|
| recovery interval | 1 | 32767 | 0 | 5 |
| allow updates | 0 | 1 | 0 | 0 |
| user connections | 5 | 2147483647 | 0 | 25 |
| memory | 3850 | 2147483647 | 0 | 5120 |
| open databases | 5 | 2147483647 | 0 | 12 |
| locks | 5000 | 2147483647 | 0 | 5000 |
| open objects | 100 | 2147483647 | 0 | 500 |
| procedure cache | 1 | 99 | 0 | 20 |
| fill factor | 0 | 100 | 0 | 0 |
| time slice | 50 | 1000 | 0 | 100 |
| database size | 2 | 10000 | 0 | 2 |
| tape retention | 0 | 365 | 0 | 0 |
| recovery flags | 0 | 1 | 0 | 0 |
| nested triggers | 0 | 1 | 1 | 1 |
| devices | 4 | 256 | 0 | 10 |
| remote access | 0 | 1 | 1 | 1 |
| remote logins | 0 | 2147483647 | 0 | 20 |
| remote sites | 0 | 2147483647 | 0 | 10 |
| remote connections | 0 | 2147483647 | 0 | 20 |
| pre-read packets | 0 | 2147483647 | 0 | 3 |
| upgrade version | 0 | 2147483647 | 1002 | 1002 |
| default sortorder id | 0 | 255 | 50 | 50 |
| default language | 0 | 2147483647 | 0 | 0 |
| language in cache | 3 | 100 | 3 | 3 |
| max online engines | 1 | 32 | 1 | 1 |
| min online engines | 1 | 32 | 1 | 1 |
| engine adjust interval | 1 | 32 | 0 | 0 |
| cpu flush | 1 | 2147483647 | 200 | 200 |
| i/o flush | 1 | 2147483647 | 1000 | 1000 |
| default character set id | 0 | 255 | 1 | 1 |
| stack size | 20480 | 2147483647 | 0 | 28672 |
| password expiration interval | 0 | 32767 | 0 | 0 |
| audit queue size | 1 | 65535 | 100 | 100 |
| additional netmem | 0 | 2147483647 | 0 | 0 |
| default network packet size | 512 | 524288 | 0 | 512 |
| maximum network packet size | 512 | 524288 | 0 | 512 |
| extent i/o buffers | 0 | 2147483647 | 0 | 0 |
| identity burning set factor | 1 | 9999999 | 5000 | 5000 |
| allow sendmsg | 0 | 1 | 0 | 0 |
| sendmsg starting port number | 0 | 65535 | 0 | 0 |

# Sybase Security (Auditing)

```
1) Run sybinit and install auditing.
2) Add a login for auditing:
   sp_addlogin ssa, ssa_password, sybsecurity
   use sybsecurity
   sp_changedbowner ssa
   sp_role "grant", sso_role, ssa
3) Enable auditing:
   sp_auditoption "enable auditing", "on"
   sp_auditlogin loginname, "cmdtext", "on"
4) To Test:
   create a table in a database with one field
   grant all on the table for the loginname
   log into isql using the loginname
   insert a record into the table
   log into isql as ssa
   select * from sysaudits where loginname = "loginname"
```

# Integrity Monitoring

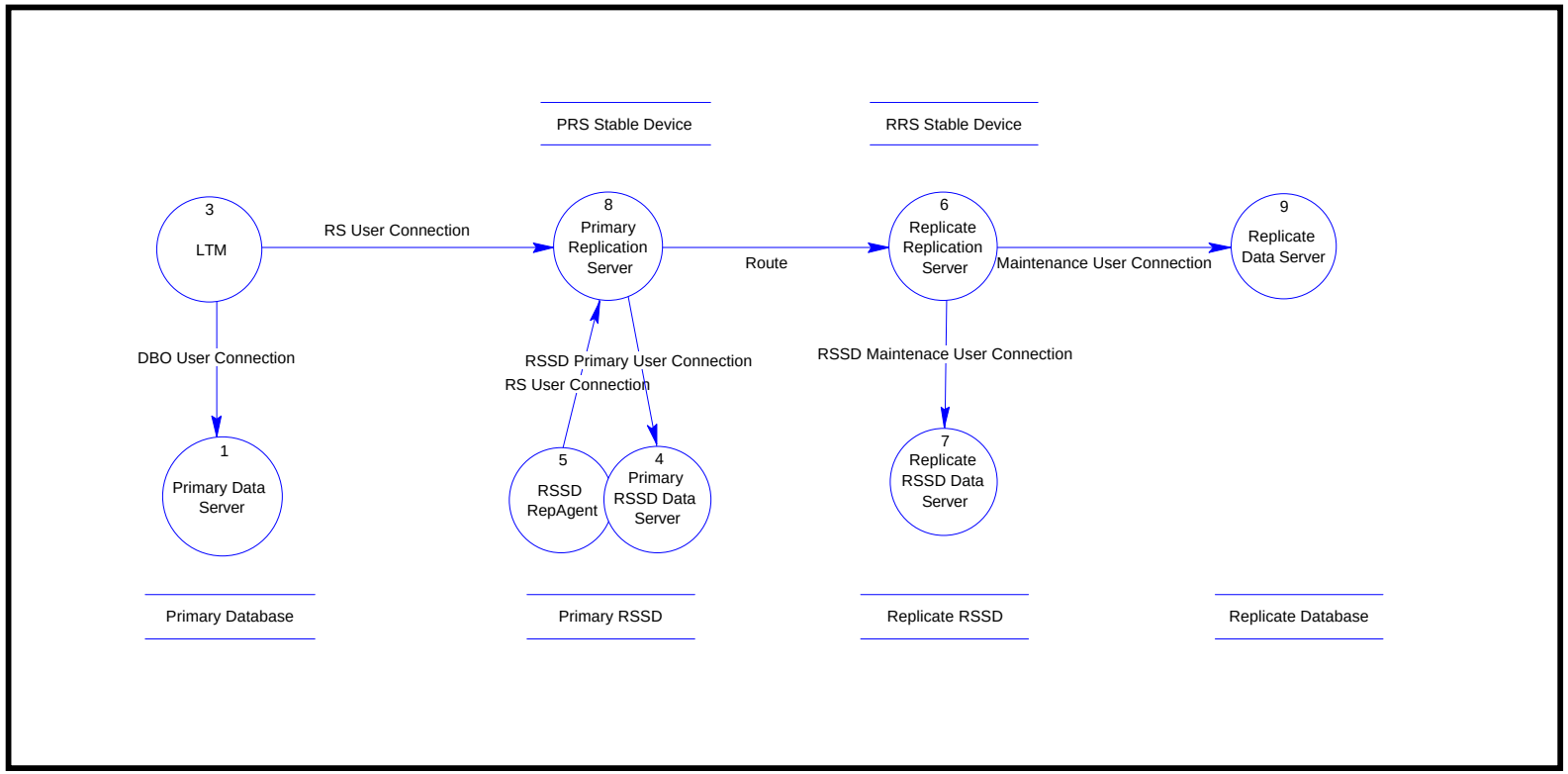
## *Database Consistency Checker*

*dbcc: is a set of utility commands for checking the logical and physical consistency of a database*

# *dbcc memusage* Sample Output

| | Meg . | 2K B lks | B ytes |
|---|---|---|---|
| Configured Memory: | 400.0000 | 204800 | 419430400 |
| Code size: | 3 .4259 | 1755 | 3592296 |
| Kernel Structures: | 5 .9769 | 3061 | 6267212 |
| Server Structures: | 13.9494 | 7143 | 14627040 |
| Cache Memory: | 357.0625 | 182816 | 374407168 |
| Proc Buffers: | 0 .6974 | 358 | 731272 |
| Proc Headers: | 18.8848 | 9669 | 19802112 |

# Replication Server




**Replication Server Components**