

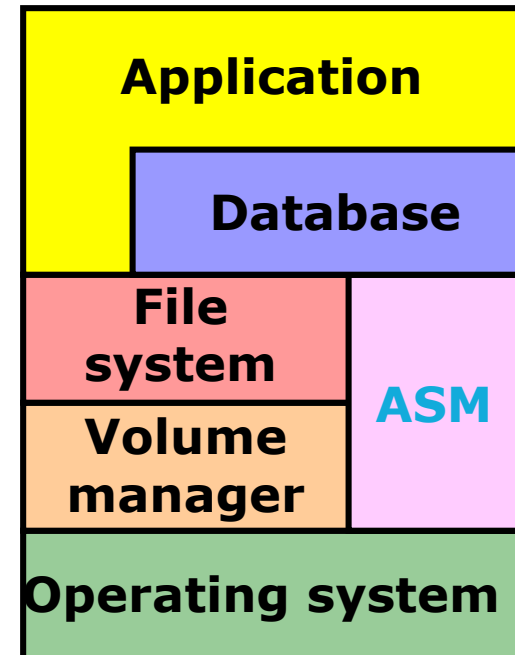
Oracle 11g DBA Fundamentals Overview

Lesson 08: Using Automatic Storage
Management

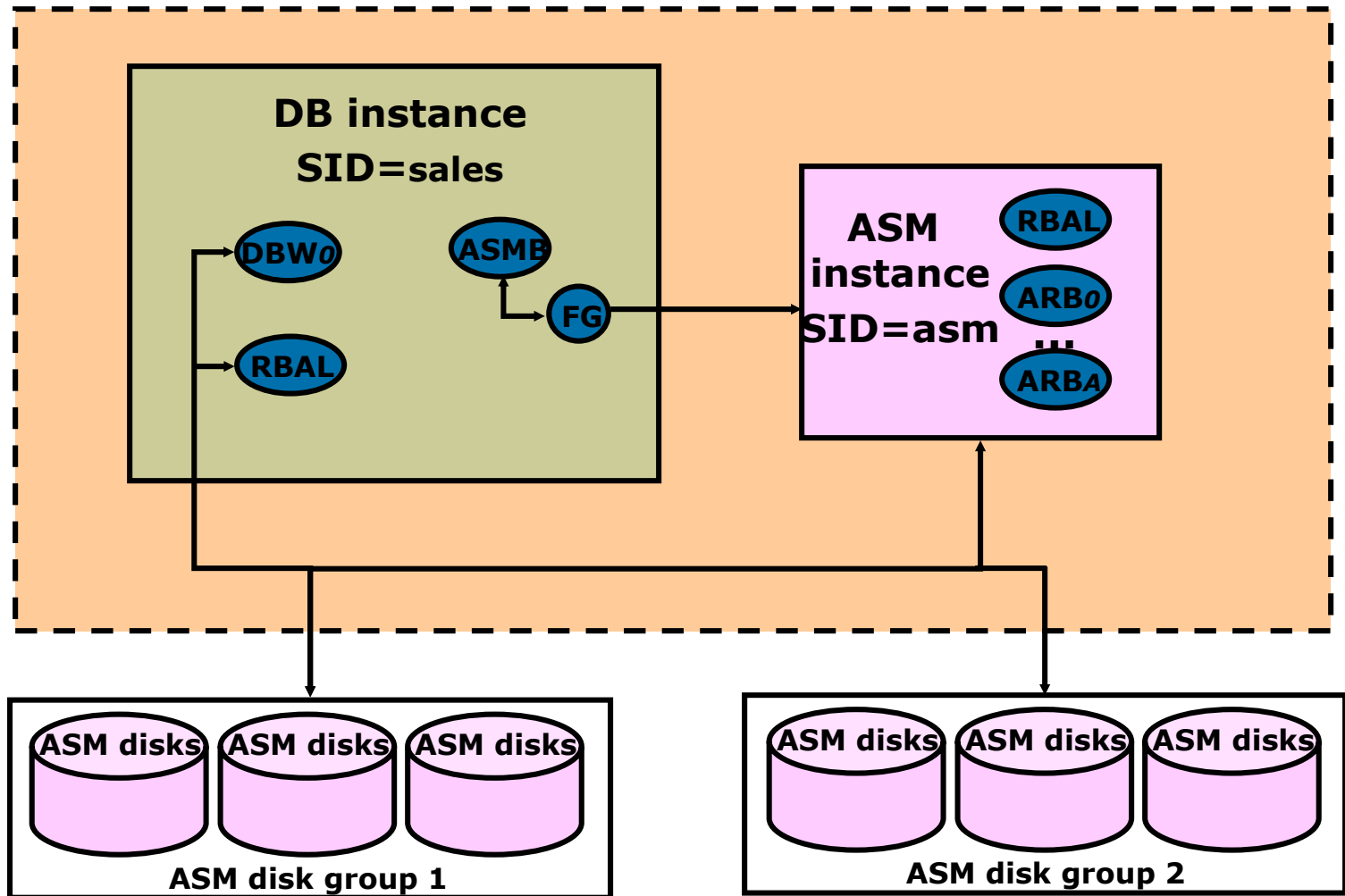


Automatic Storage Management: Review

- Portable and high-performance cluster file system
- Manages Oracle database files
- Data spread across disks to balance load
- Integrated mirroring across disks
- Solves many storage management challenges



ASM General Architecture



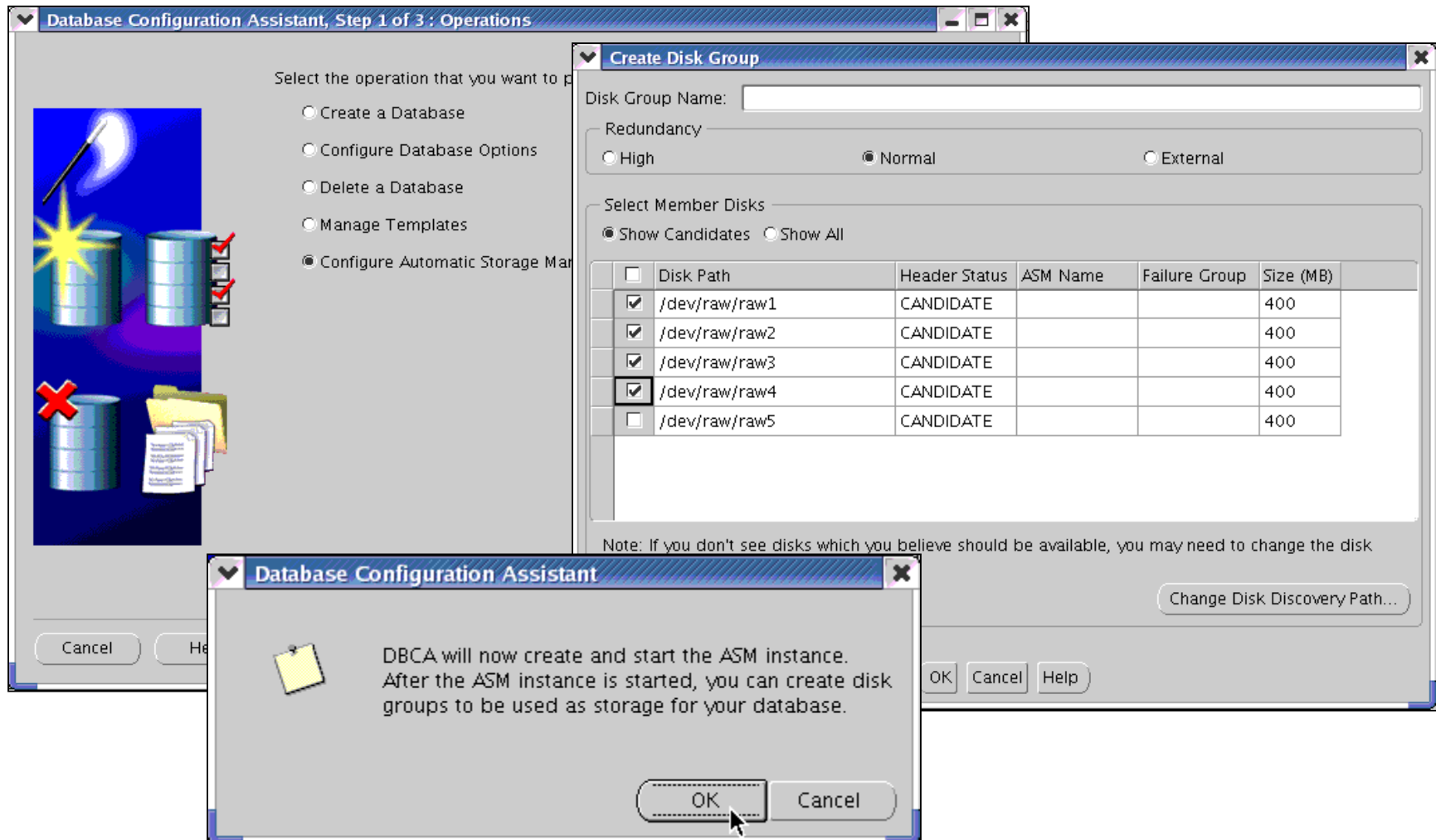


ASM Instance Tasks

The following are tasks that you need to be able to perform in order to use an ASM instance:

- Create the ASM instance
- Set the initialization parameters
- Start the ASM instance
- Manage the ASM instance
- Shut down the ASM instance

Creating an ASM Instance





ASM Instance Initialization Parameters

```
INSTANCE_TYPE = ASM  
DB_UNIQUE_NAME = +ASM  
ASM_POWER_LIMIT = 1  
ASM_DISKSTRING = '/dev/rdsd/*s2', '/dev/rdsd/c1*'  
ASM_DISKGROUPS = dgroupA, dgroupB  
LARGE_POOL_SIZE = 8MB
```



Database Instance Parameter Changes

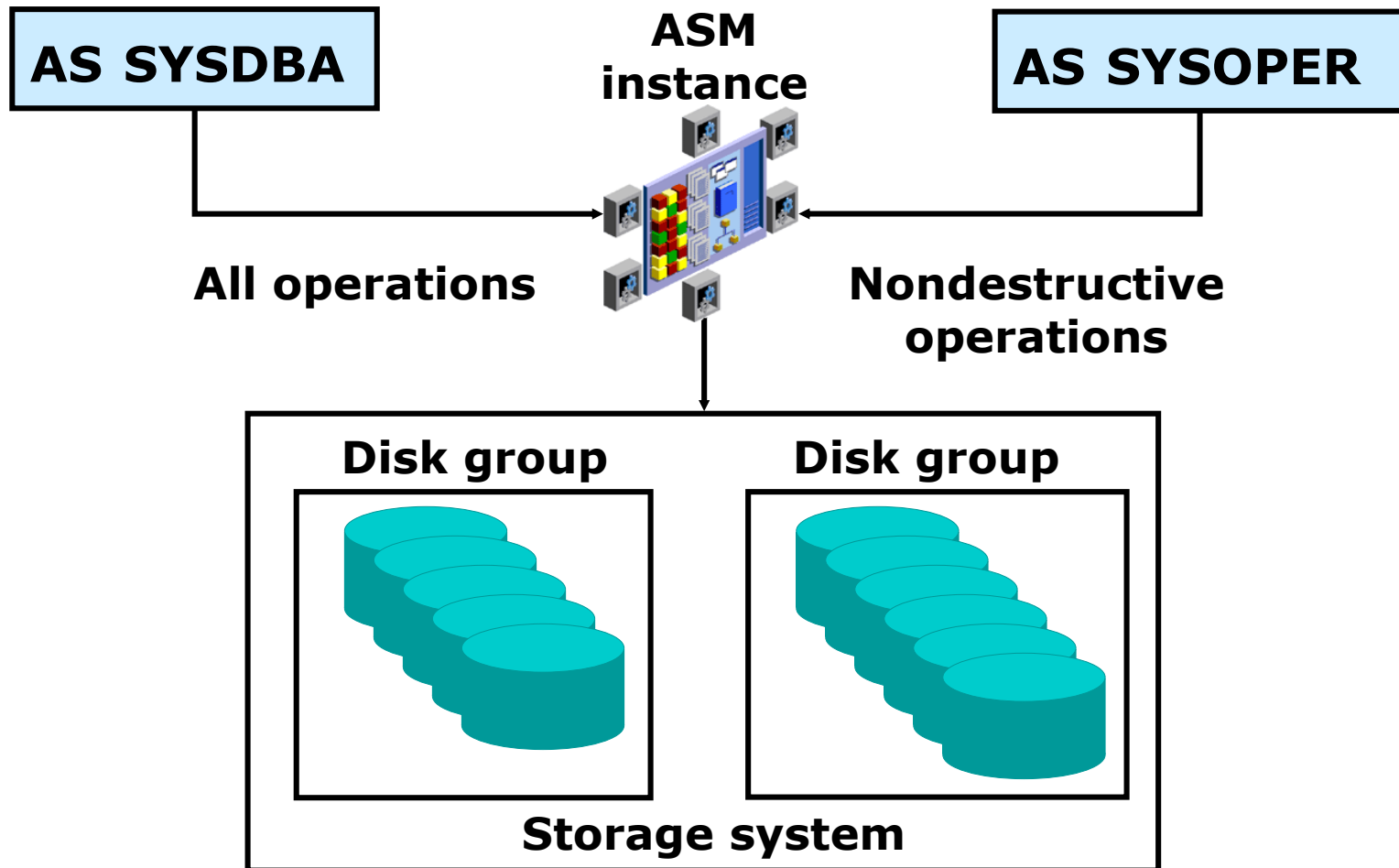
```
...  
INSTANCE_TYPE = RDBMS  
LOG_ARCHIVE_FORMAT  
DB_BLOCK_SIZE  
DB_CREATE_ONLINE_LOG_DEST_1  
DB_CREATE_FILE_DEST  
DB_RECOVERY_FILE_DEST  
CONTROL_FILES  
LOG_ARCHIVE_DEST_1  
LOG_ARCHIVE_DEST  
STANDBY_ARCHIVE_DEST  
LARGE_POOL_SIZE = 8MB  
...
```



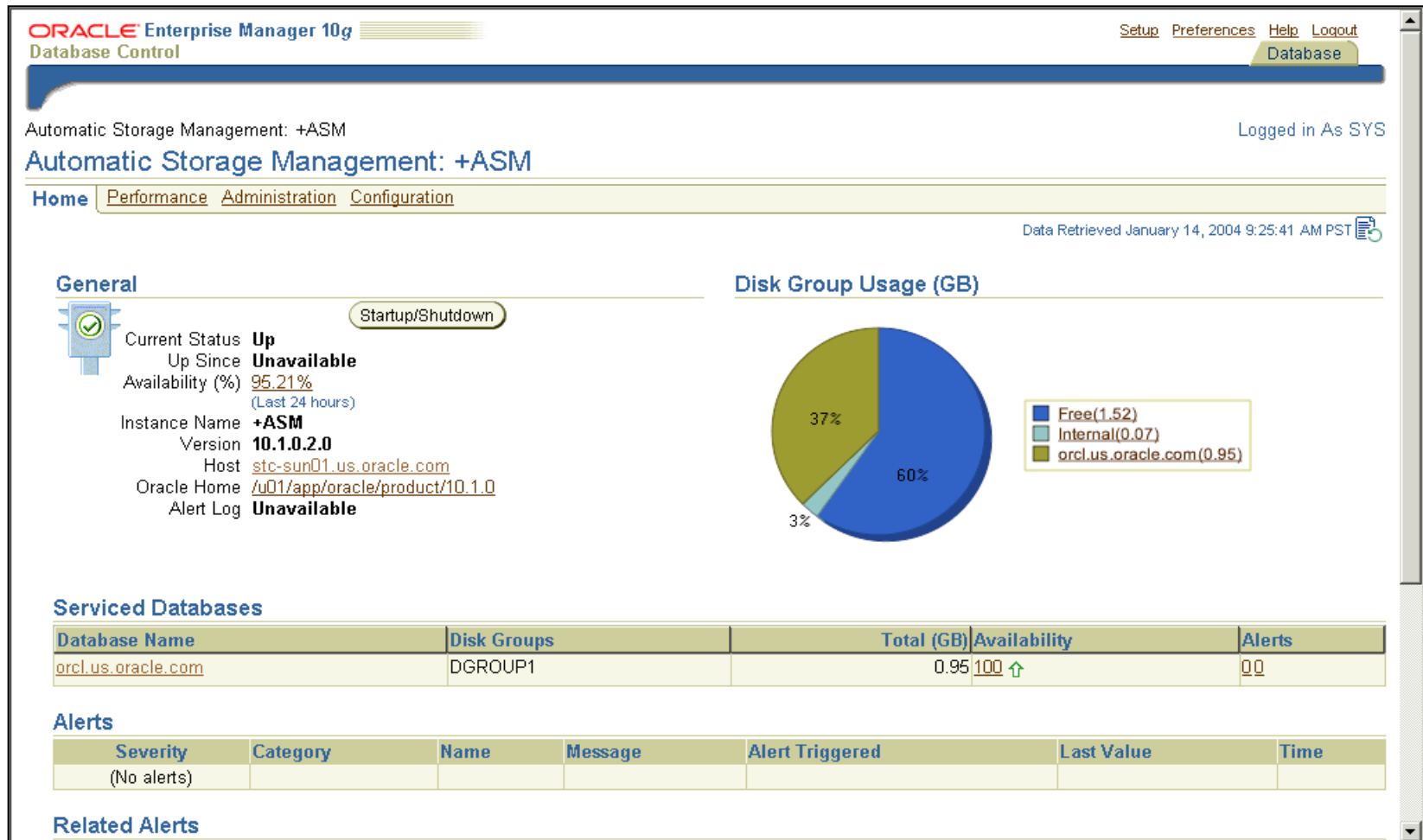
Starting Up an ASM Instance

```
$ export ORACLE_SID='+ASM'
$ sqlplus /nolog
SQL> CONNECT / AS sysdba
Connected to an idle instance.
SQL> STARTUP;
ASM instance started
Total System Global Area 147936196 bytes
Fixed Size                324548 bytes
Variable Size             96468992 bytes
Database Buffers          50331648 bytes
Redo Buffers              811008 bytes
ASM diskgroups mounted
```

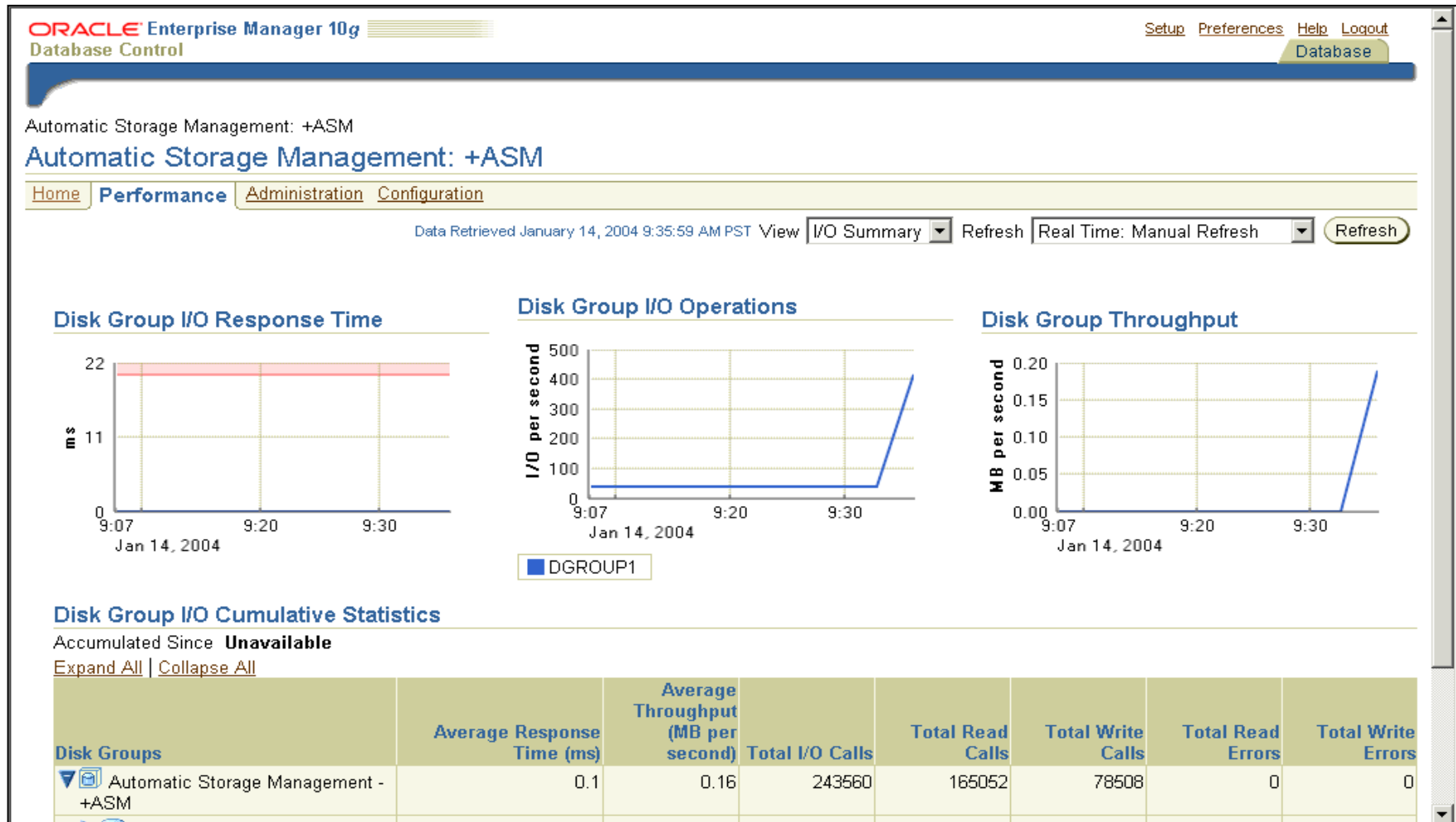

Accessing an ASM Instance



ASM Home Page



ASM Performance Page



ASM Configuration Page



ORACLE Enterprise Manager 10g
Database Control

Setup Preferences Help Logout
Database

Automatic Storage Management: +ASM

Automatic Storage Management: +ASM

Home Performance Administration **Configuration**

Configuration Parameters

Disk Discovery Path

Revert Apply

☒ **TIP** Limits the set of disks considered for discovery when a new disk is added to a Disk Group. The disk string should match the path of the disk, not the directory containing the disk. For example: /dev/rdisk/*.

Auto Mount Disk Groups

Revert Apply

☒ **TIP** The list of the Disk Group names to be mounted by the ASM at startup or when ALTER DISKGROUP ALL MOUNT command is used.

Rebalance Power

Revert Apply

☒ **TIP** Affects the speed of disk group rebalancing. Higher values use more I/O bandwidth and complete rebalance more quickly. Lower values cause rebalance to take longer, but use less I/O bandwidth. Values range from 1 to 11.

Home Performance Administration **Configuration**

Revert Apply

Database | Setup | Preferences | Help | Logout

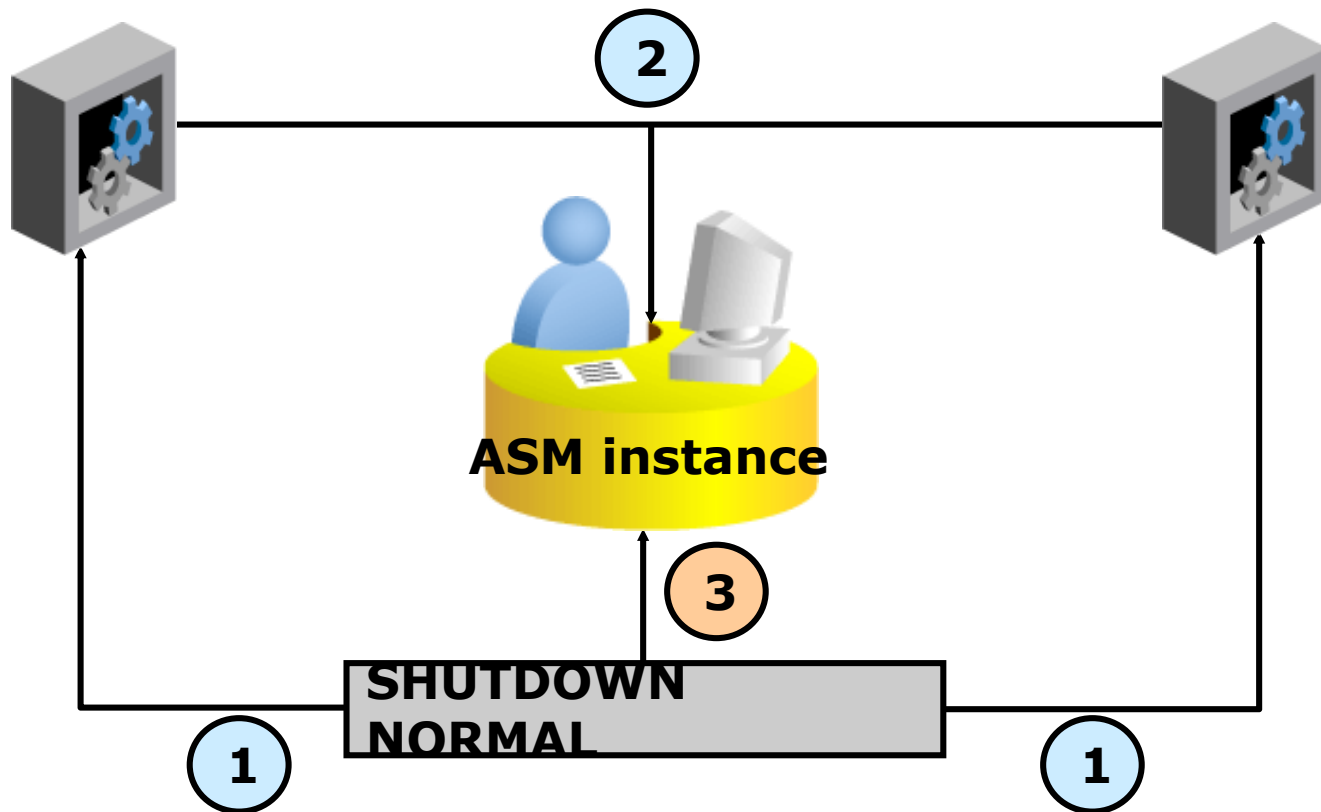
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[About Oracle Enterprise Manager 10g Database Control](#)

Shutting Down an ASM Instance

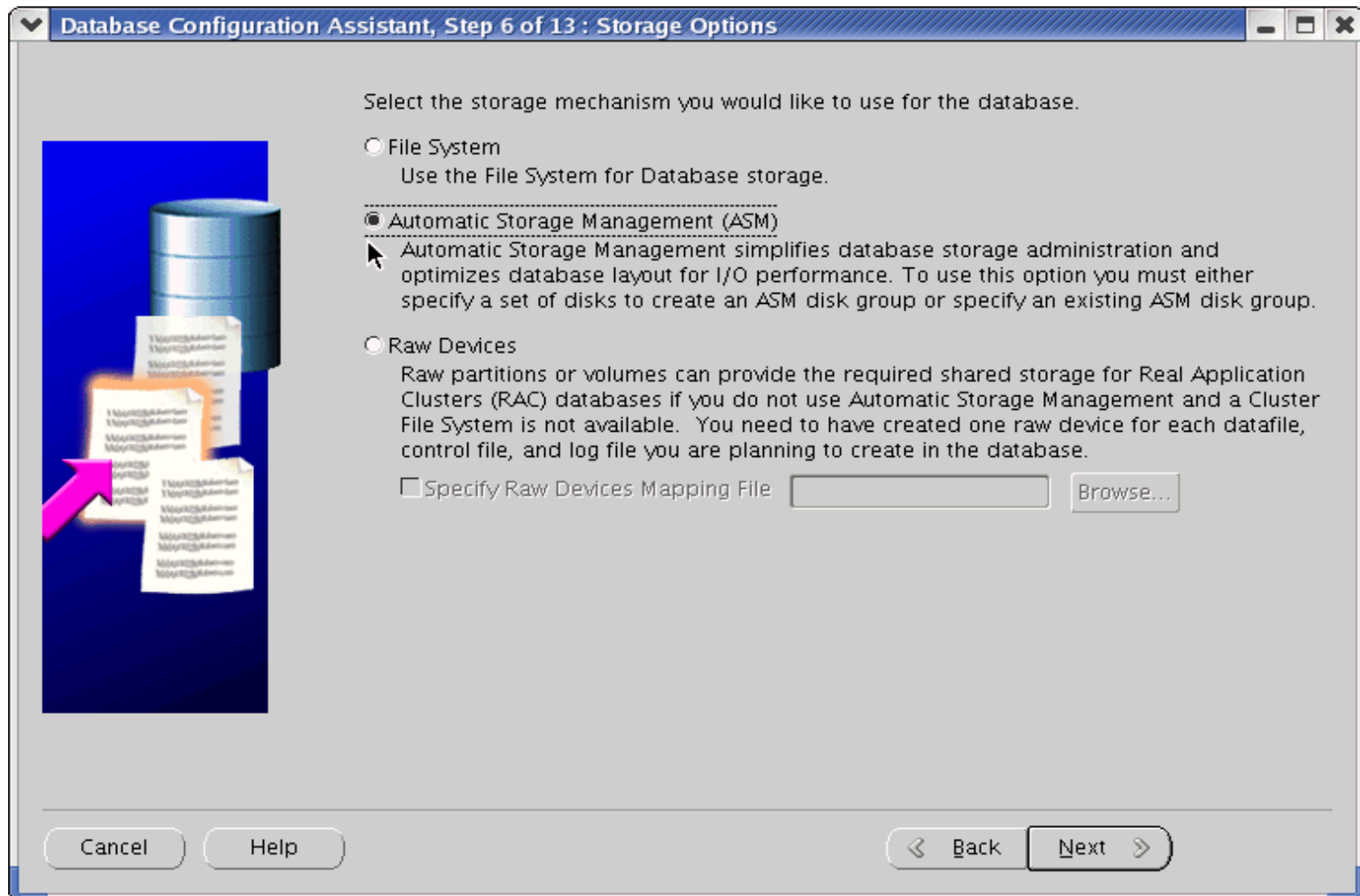


Database instance A

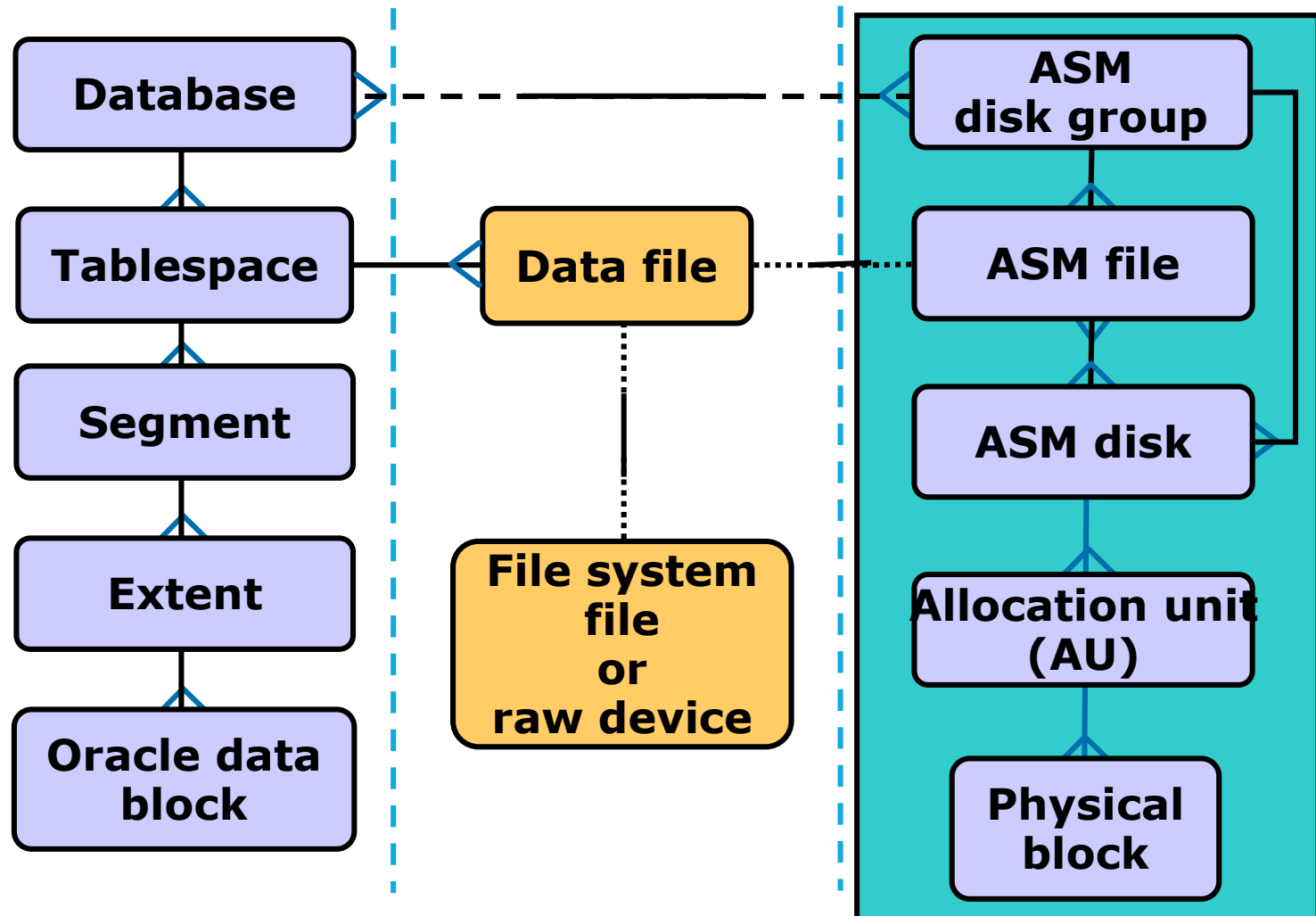
Database instance B



DBCA and Storage Options



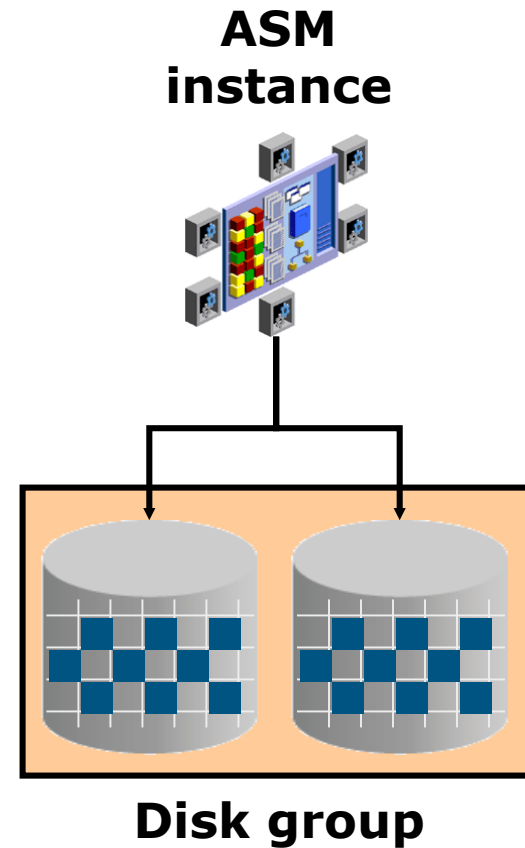
ASM Storage: Concepts



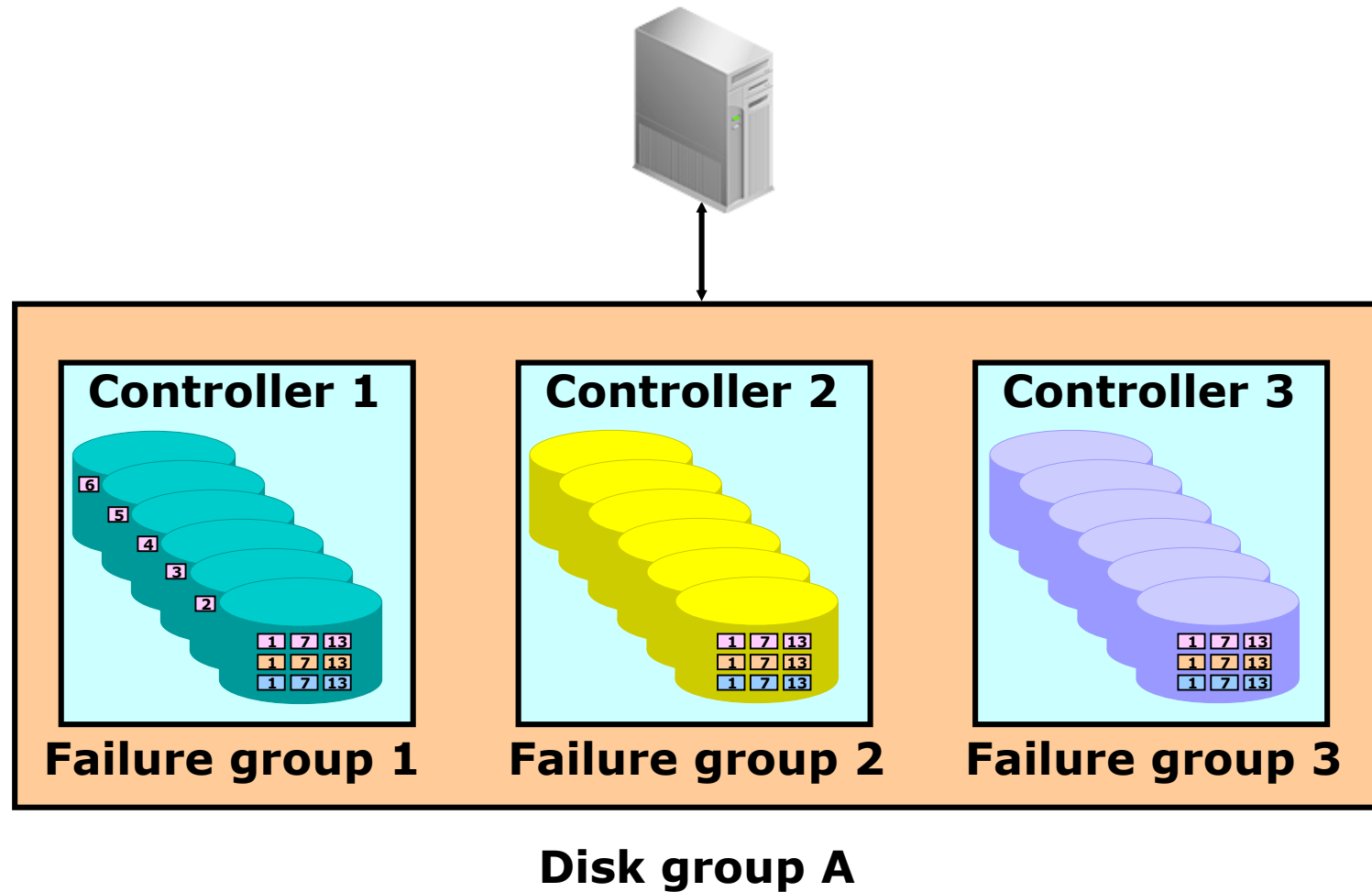


ASM Disk Groups

- A pool of disks managed as a logical unit
- Partitions total disk space into uniform sized units
- Spreads each file evenly across all disks
- Uses coarse- or fine-grain striping on the basis of file type
- Administers disk groups, not files



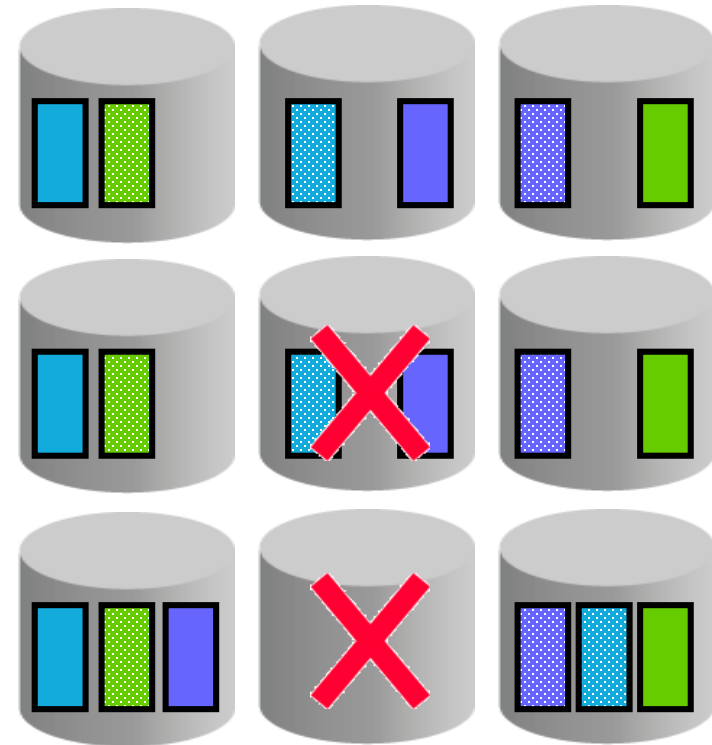
Failure Group





Disk Group Mirroring

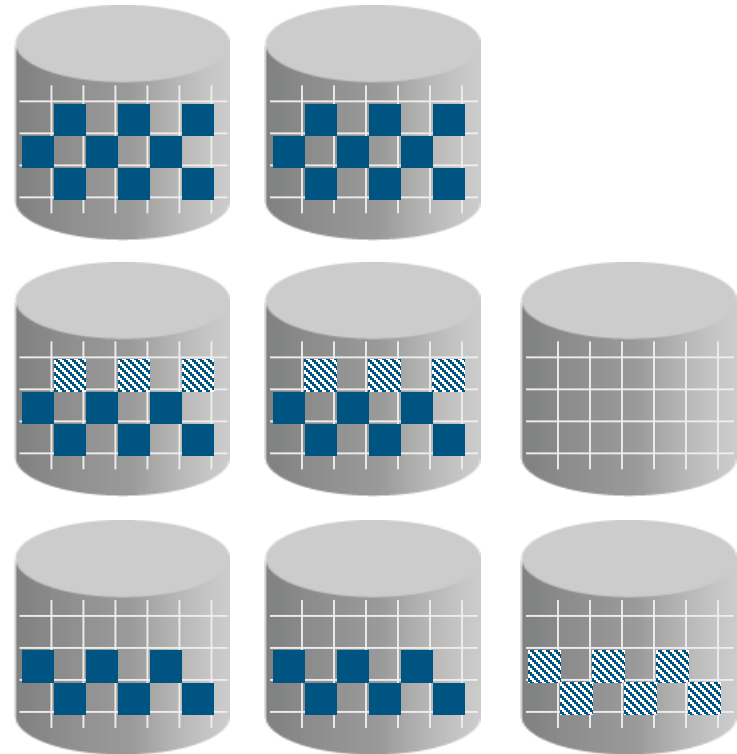
- Mirror at AU level
- Mix primary and mirror AUs on each disk
- External redundancy:
Defers to hardware mirroring
- Normal redundancy:
 - Two-way mirroring
 - At least two failure groups
- High redundancy:
 - Three-way mirroring
 - At least three failure groups



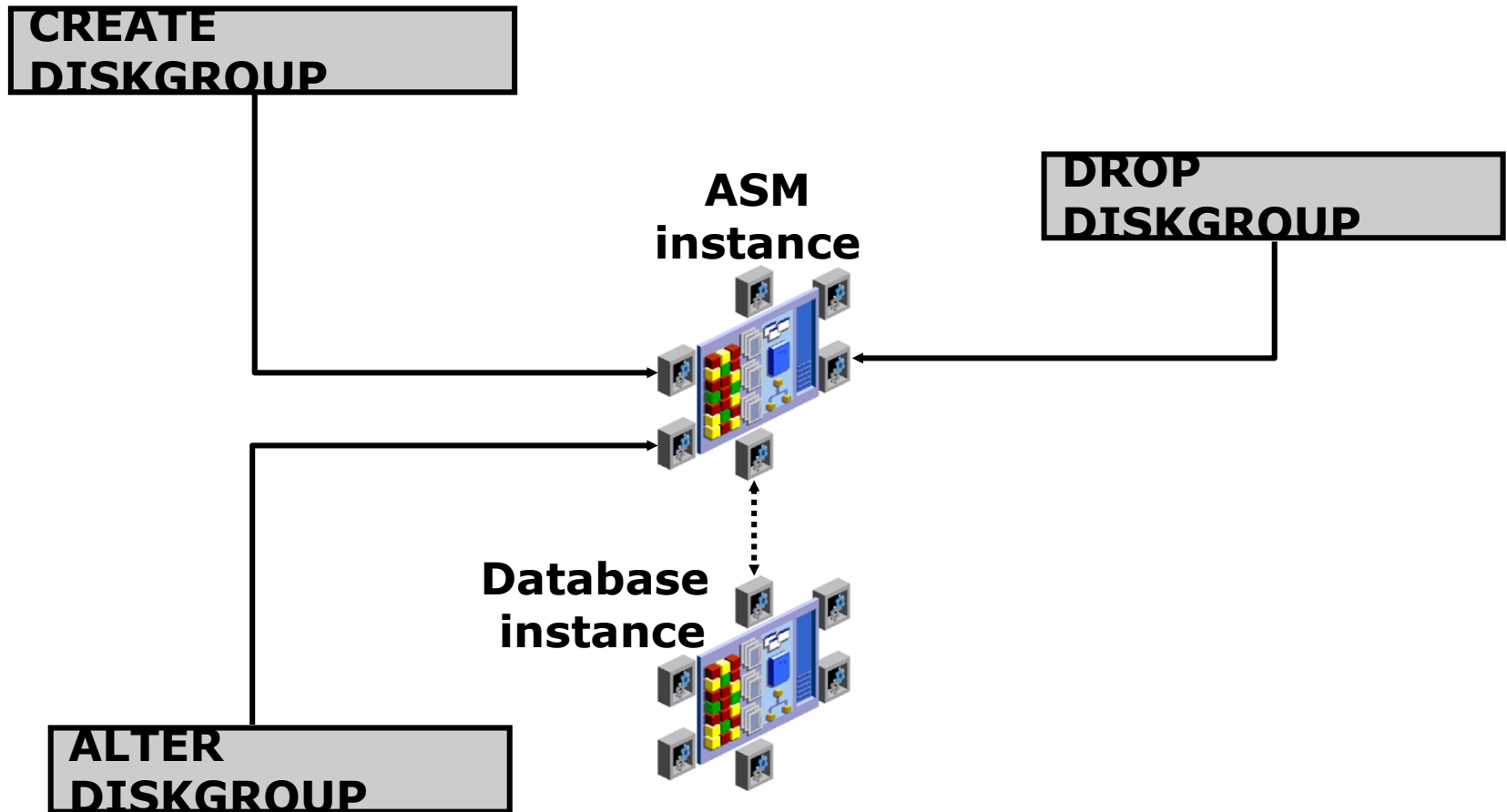


Disk Group Dynamic Rebalancing

- Automatic online rebalance whenever storage configuration changes
- Only move data proportional to storage added
- No need for manual I/O tuning
- Online migration to new storage
- Configurable load on system using `ASM_POWER_LIMIT`



Managing Disk Groups



ASM Administration Page



ORACLE Enterprise Manager 10g Database Control

Automatic Storage Management: +ASM

Automatic Storage Management: +ASM

Home Performance Administration Configuration

Disk Groups

Create Mount All Dismount All
Delete Mount Go

Select	Name	State	Redundancy	Size (MB)	Used (MB)	Used (%)	Member Disks	Pending Operations
<input checked="" type="radio"/>	DGROUP1							

Disk Group: DGROUP1

Home Performance Administration Configuration

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Name **DGROUP1**
State **MOUNTED**
Redundancy **EXTERN**
Total (GB) **2.54 GB**
Free (GB) **1.52 GB**
Pending Operations [Q](#)

Disk Group Usage (GB)

Category	Value (GB)	Percentage
Free	1.52	60%
Internal	0.07	3%
ORCL	0.95	37%

Disk Group Usage History (GB)

No data is currently available.

Member Disks

View Go Add Disks
Delete Check Go

Select	ASM Disk Name	By Failure Group	Path	Read/Write Errors	State	Size (GB)	Used (GB)	Used (%)
<input checked="" type="radio"/>	DGROUP1_0000	DGROUP1_0000	/u01/asmdisks/disk00	0	NORMAL	0.20	0.08	40.5
<input type="radio"/>	DGROUP1_0001	DGROUP1_0001	/u01/asmdisks/disk01	0	NORMAL	0.20	0.08	39.5

Create Disk Group Page



ORACLE Enterprise Manager 10g Database Control

Setup Preferences Help Logout Database

Automatic Storage Management: +ASM > Create Disk Group

Create Disk Group

Show SQL Cancel OK

* Name

Redundancy ☐ HIGH ☒ NORMAL ☐ EXTERNAL

☐ Automatically Mount During Startup

Select Member Disks

Select	Path	Header Status	Label	ASM Disk Name	Size	Size Unit	By Failure Group	Force Usage
<input type="checkbox"/>	/u01/asmdisks/disk00	MEMBER		DGROUP1_000	200	MB	DGROUP1_000	<input type="checkbox"/>
<input type="checkbox"/>	/u01/asmdisks/disk01	MEMBER		DGROUP1_000	200	MB	DGROUP1_000	<input type="checkbox"/>
<input type="checkbox"/>	/u01/asmdisks/disk02	MEMBER		DGROUP1_000	200	MB	DGROUP1_000	<input type="checkbox"/>
<input type="checkbox"/>	/u01/asmdisks/disk03	MEMBER		DGROUP1_000	200	MB	DGROUP1_000	<input type="checkbox"/>
<input type="checkbox"/>	/u01/asmdisks/disk04	MEMBER		DGROUP1_000	200	MB	DGROUP1_000	<input type="checkbox"/>
<input type="checkbox"/>	/u01/asmdisks/disk05	MEMBER		DGROUP1_000	200	MB	DGROUP1_000	<input type="checkbox"/>
<input type="checkbox"/>	/u01/asmdisks/disk06	MEMBER		DGROUP1_000	200	MB	DGROUP1_000	<input type="checkbox"/>
<input type="checkbox"/>	/u01/asmdisks/disk07	MEMBER		DGROUP1_000	200	MB	DGROUP1_000	<input type="checkbox"/>
<input type="checkbox"/>	/u01/asmdisks/disk08	MEMBER		DGROUP1_000	200	MB	DGROUP1_000	<input type="checkbox"/>
<input type="checkbox"/>	/u01/asmdisks/disk09	MEMBER		DGROUP1_000	200	MB	DGROUP1_000	<input type="checkbox"/>
<input type="checkbox"/>	/u01/asmdisks/disk10	MEMBER		DGROUP1_001	200	MB	DGROUP1_001	<input type="checkbox"/>
<input type="checkbox"/>	/u01/asmdisks/disk11	MEMBER		DGROUP1_001	200	MB	DGROUP1_001	<input type="checkbox"/>
<input type="checkbox"/>	/u01/asmdisks/disk12	MEMBER		DGROUP1_001	200	MB	DGROUP1_001	<input type="checkbox"/>



Creating and Dropping Disk Groups

```
CREATE DISKGROUP dgroupA NORMAL REDUNDANCY
FAILGROUP controller1 DISK
    '/devices/A1' NAME diskA1 SIZE 120G FORCE,
    '/devices/A2',
    '/devices/A3'
FAILGROUP controller2 DISK
    '/devices/B1',
    '/devices/B2',
    '/devices/B3';
```

```
DROP DISKGROUP dgroupA INCLUDING CONTENTS;
```



Adding Disks to Disk Groups

```
ALTER DISKGROUP dgroupA ADD DISK  
  '/dev/rdisk/c0t4d0s2' NAME A5,  
  '/dev/rdisk/c0t5d0s2' NAME A6,  
  '/dev/rdisk/c0t6d0s2' NAME A7,  
  '/dev/rdisk/c0t7d0s2' NAME A8;
```

```
ALTER DISKGROUP dgroupA ADD DISK '/devices/A*';
```

Disk formatting



Disk group rebalancing



Remove a disk from dgroupA:

```
ALTER DISKGROUP dgroupA DROP DISK A5;
```

Add and drop a disk in a single command:

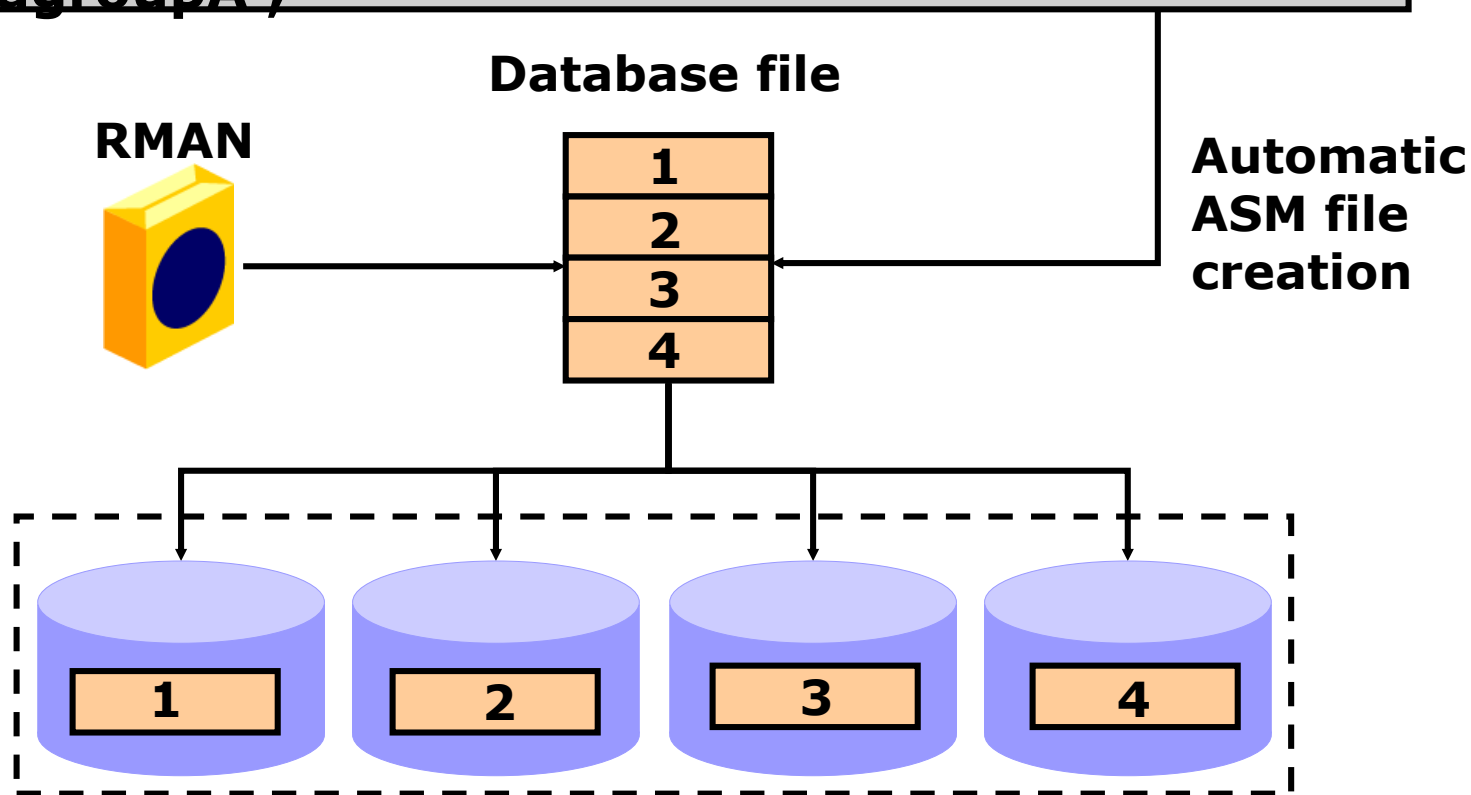
```
ALTER DISKGROUP dgroupA  
  DROP DISK A6  
  ADD FAILGROUP fred  
    DISK '/dev/rdisk/c0t8d0s2' NAME A9;
```

Cancel a disk drop operation:

```
ALTER DISKGROUP dgroupA UNDROP DISKS;
```



```
CREATE TABLESPACE sample DATAFILE  
'+dgroupA';
```



ASM file automatically spread inside disk group dgroupA



```
SQL> CREATE TABLESPACE tbsasm DATAFILE '+DGROUP1' SIZE 100M;  
Tablespace created.
```

```
SQL> CREATE TABLESPACE hrapps DATAFILE '+DGROUP1' SIZE 10M;  
Tablespace created.
```

```
$ asmcmd
```

```
ASMCMD> ls -l DGROUP1/ORCL/DATAFILE
```

Type	Redund	Striped	Time	Sys	Name
DATAFILE	MIRROR	COARSE	OCT 05 21:00:00	Y	HRAPPS.257.570923611
DATAFILE	MIRROR	COARSE	OCT 05 21:00:00	Y	TBSASM.256.570922917

```
ASMCMD>
```



Migrating Your Database to ASM Storage

1. Shut down your database cleanly.
2. Shut down the database and modify your server parameter file to use Oracle Managed Files (OMF).
3. Edit and execute the following RMAN script:

```
STARTUP NOMOUNT;  
RESTORE CONTROLFILE FROM '/u1/c1.ctl';  
ALTER DATABASE MOUNT;  
BACKUP AS COPY DATABASE FORMAT '+dgroup1';  
SWITCH DATABASE TO COPY;  
SQL "ALTER DATABASE RENAME '/u1/log1' TO '+dgroup1' ";  
# Repeat RENAME command for all online redo log members ...  
ALTER DATABASE OPEN RESETLOGS;  
SQL "ALTER DATABASE TEMPFILE '/u1/temp1' DROP";
```

SUMMARY

- In this lesson, you should have learned how to:
 - Describe the concepts of Automatic Storage Management (ASM)
 - Set up initialization parameter files for ASM and database instances
 - Execute SQL commands with ASM file names
 - Start up and shut down ASM instances
 - Administer ASM disk groups
 - Use RMAN to migrate your database to ASM