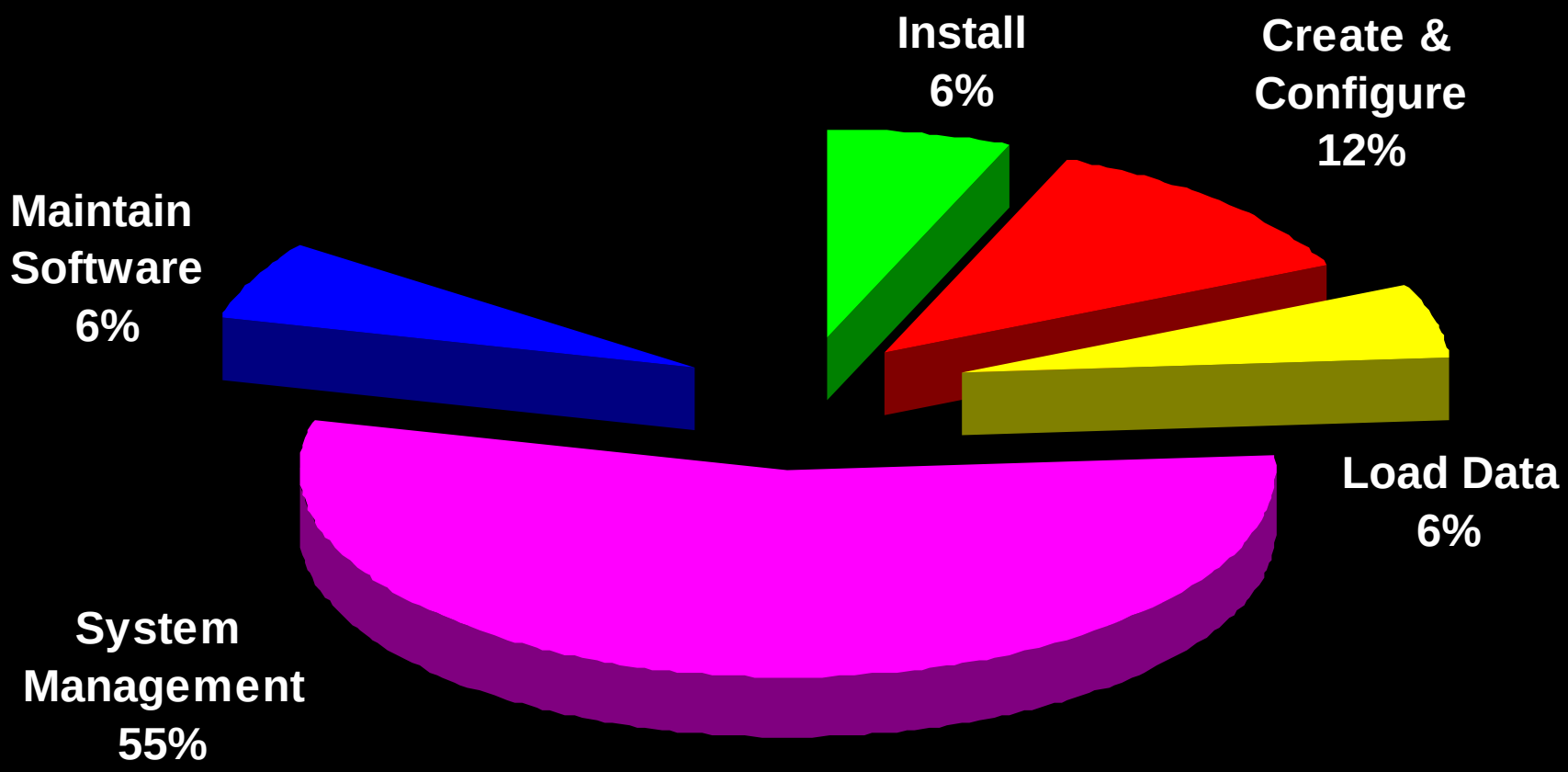
Oracle Database 10g: Managing the Self-Managing Database

הדר פיים

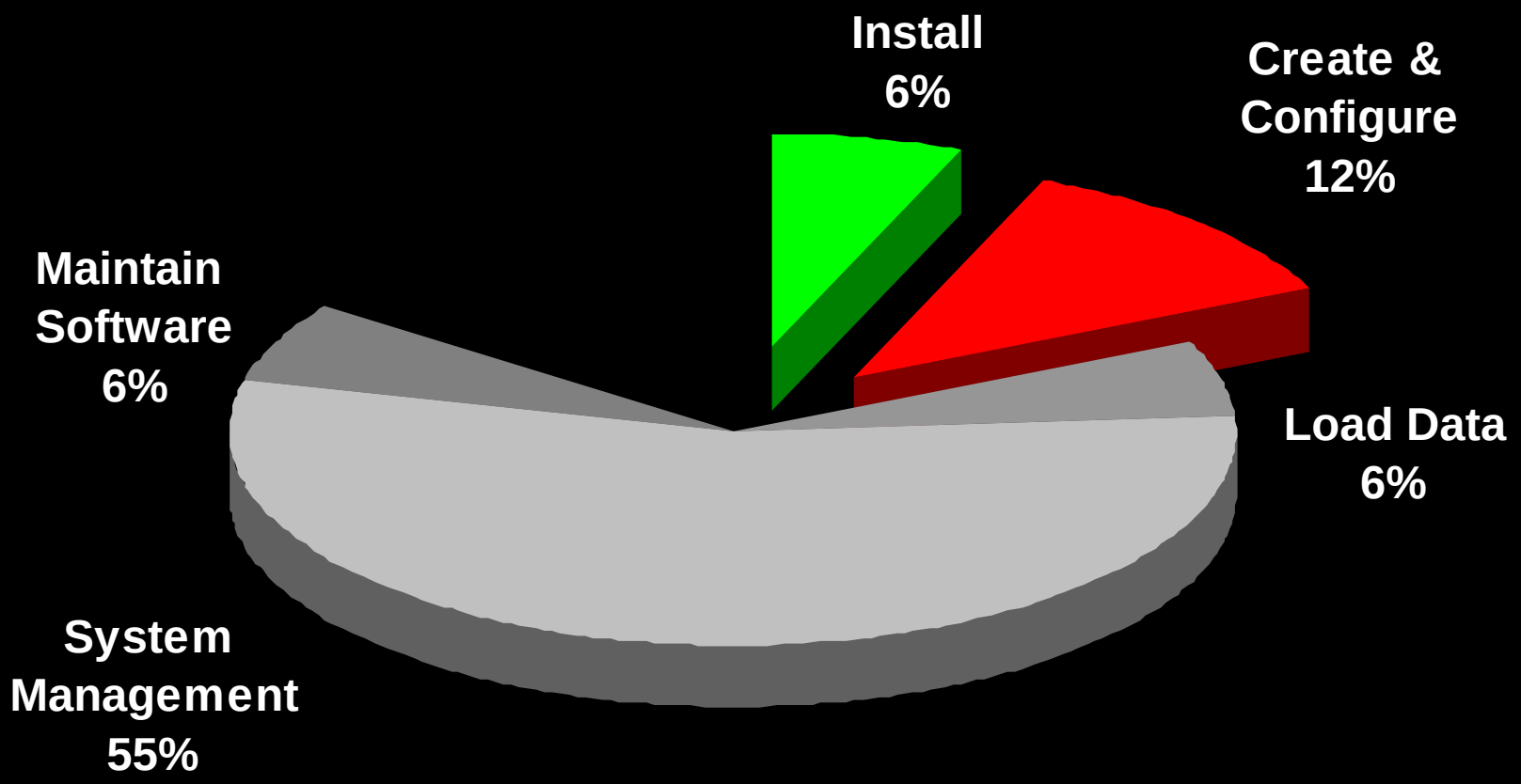
יונתן טולדנו

Certified Oracle 10g Technician

How DBAs Spend Their Time?



How DBAs Spend Their Time?



Software Installation

- Fast lightweight install
  - Major redesign of installation process
  - Single CD, 20 Minutes
  - CPU, memory, disk space consumption greatly reduced
  - Extremely lightweight client install (3 files) using Oracle Instant Client
- Automation of All Pre and Post Install Steps
  - Validate OS Configuration, patches, resource availability etc.
  - Configure all components (listeners, database, agent, OMS, OID etc.) for automatic startup and shutdown
- Enhanced silent install

Simplified Creation & Configuration

- Greatly reduced database creation time using pre-configured, ready-to-use database
- 90% reduction of initialization parameters: < 30 Basic parameters
- Automatically setup common tasks, e.g. backups
- Automatically configures LDAP server
- Automatic Shared Server Set-up
- Easy Connect Naming

Basic Parameters

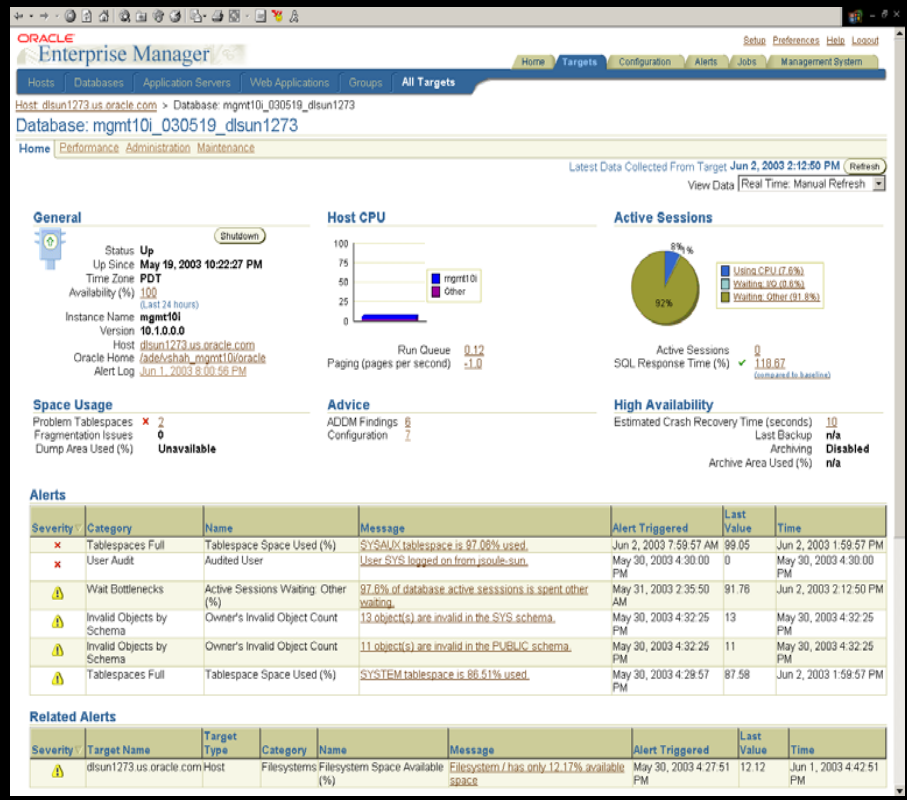
- compatible
- processes
- sessions
- pga_aggregate_target
- nls_language
- nls_territory
- db_domain
- shared_servers
- instance_number
- cluster_database
- db_block_size
- sga_target
- control_files
- db_name
- db_recovery_file_dest
- remote_listener
- db_recovery_file_dest_size
- db_create_online_log_dest_n
- db_create_file_dest
- log_archive_dest_n
- log_archive_dest_state_n
- remote_login_passwordfile
- db_unique_name

Simplified Upgrade

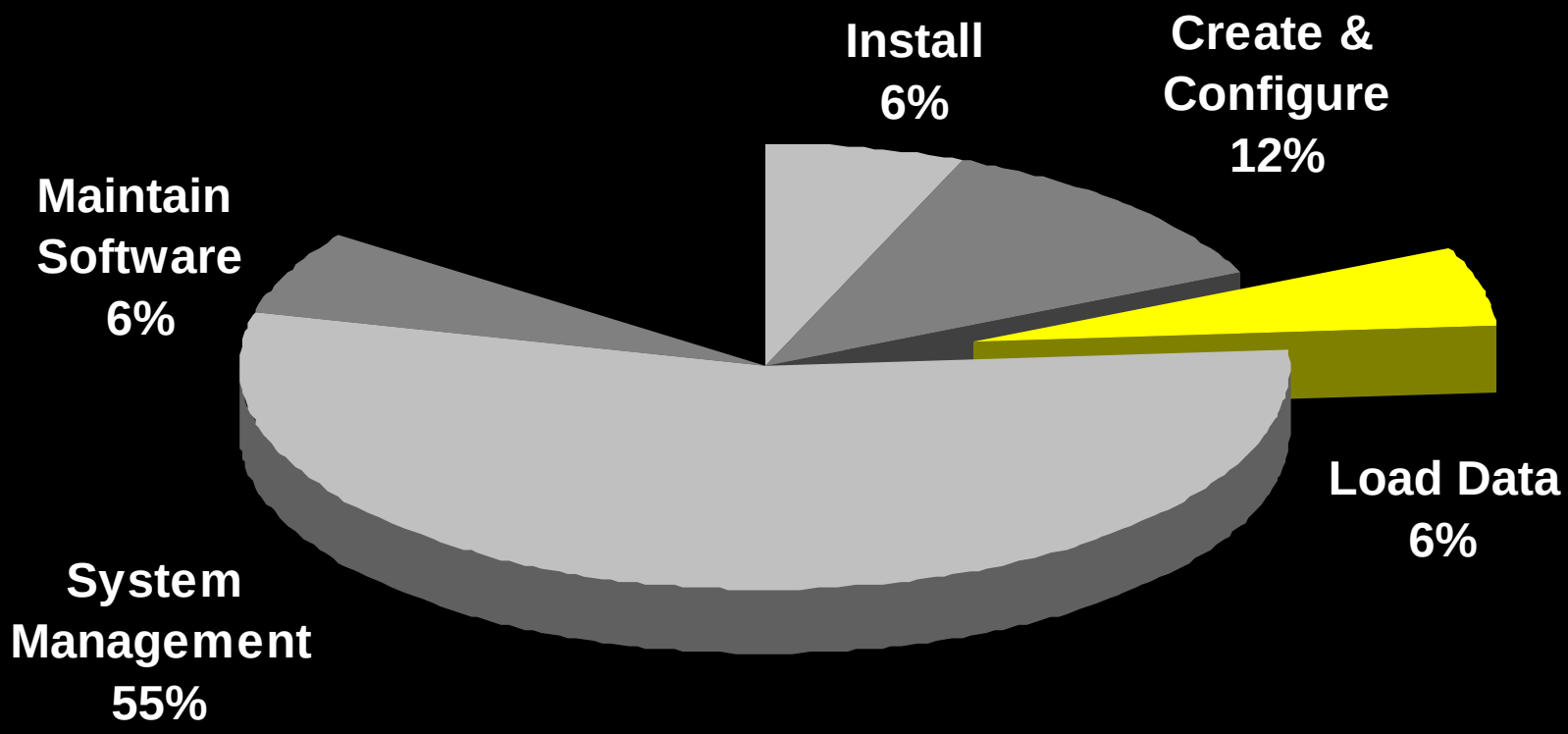
- Pre upgrade checks (e.g. parameter settings)
- Post upgrade status checks
- Time estimator
- Re-startable
- Guide administrators in using best practices

Out-of-the-Box Database Control

- No separate install
- Fully functional administration and monitoring after database creation
- Listener discovery, configuration & monitoring



How DBAs Spend Their Time?



Data Pump: What is it?

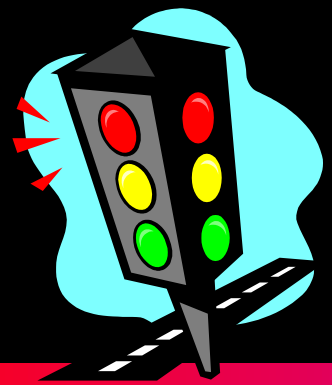
- Server-based facility for high performance loading and unloading of data and metadata
- Callable: DBMS_DATAPUMP. Internally uses DBMS_METADATA
- Data written in Direct Path stream format. Metadata written as XML
- New clients expdp and impdp: Supersets of original exp / imp.
- Foundation for Streams, Logical Standby, Grid, Transportable Tablespaces and Data Mining initial instantiation.

Features: Performance!!

- Automatic, two-level parallelism
  - Direct Path for inter-partition parallelism
  - External Tables for *intra*-partition parallelism
  - Simple: parallel=<number of active threads>
  - Dynamic: Workers can be added and removed from a running job in Enterprise Edition
  - Index builds automatically “parallelized” up to degree of job
- Simultaneous data and metadata unload
- Single thread of data unload: 1.5-2X exp
- Single thread of data load: 15X-40X imp
- With index builds: 4-10X imp

Features: Checkpoint / Restart

- Job progress recorded in a “Master Table”
- May be explicitly stopped and restarted later:
  - Stop after current item finishes or stop immediate
- Abnormally terminated job is also restartable
- Current objects can be skipped on restart if problematic



Features: Monitoring

- Flexible GET_STATUS call
- Per-worker status showing current object and percent done
- Initial job space estimate and overall percent done
- Job state and description
- Work-in-progress and errors

Features: Network Mode

- Network import: Load one database directly from another
- Network export: Unload a remote database to a local dumpfile set
  - Allows export of read-only databases
- Data Pump runs locally, Metadata API runs remotely.
- Uses DB links / listener service names, not pipes. Data is moved as ‘insert into <local table> select from <remote table>@service_name’
- Direct path engine is used on both ends
- It’s easy to swamp network bandwidth: Be careful!

Features: Fine-Grained Object Selection

- *All* object types are supported for *both* operations: export *and* import
- Exclude: Specified object types are excluded from the operation
- Include: *Only* the specified object types are included. E.g, just retrieve packages, functions and procedures
- More than one of each can be specified, but use of both is prohibited by new clients
- Both take an optional name filter for even finer granularity:
  - INCLUDE PACKAGE: “LIKE ‘PAYROLL%’ “
  - EXCLUDE TABLE: “IN (‘FOO’,’BAR’, …)’ “

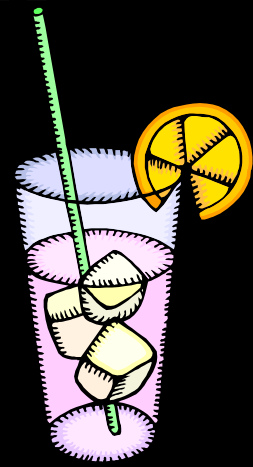
New Clients – expdp / impdp

- Similar (but not identical) look and feel to exp / imp
- All modes supported: full, schema, table, tablespace, transportable. Superset of exp / imp
- Flashback is supported
- Query supported by both expdp *and* impdp… *and* on a per-table basis!
- Detach from and attach to running jobs
- Multiple clients per job allowed; but a single client can attach to only one job at a time
- If privileged, attach to and control other users' jobs

New Clients – expdp / impdp

- Interactive mode entered via Ctl-C:
  - ADD_FILE: Add dump files and wildcard specs. to job
  - PARALLEL: Dynamically add or remove workers
  - STATUS: Get detailed per-worker status and change reporting interval
  - STOP_JOB{=IMMEDIATE}: Stop job, leaving it restartable. Immediate doesn't wait for workers to finish current work items… they'll be re-done at restart
  - START_JOB: Restart a previously stopped job
  - KILL_JOB: Stop job and delete all its resources (master table, dump files) leaving it unrestartable
  - CONTINUE: Leave interactive mode, continue logging
  - EXIT: Exit client, leave job running

Features: Other Cool Stuff...



- Can extract and load just data, just metadata or both
- SQLFILE operation generates executable DDL script
- If a table pre-exists at load time, you can: skip it (default), replace it, truncate then load or append to it.
- Space estimates based on allocated blocks (default) or statistics if available
- Enterprise Manager interface integrates 9***i*** and 10***g***
- Callable!

Large Internet Company

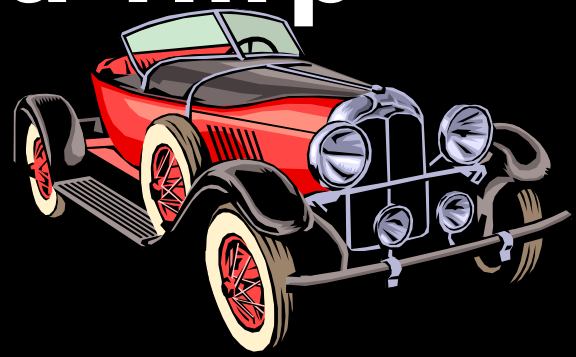
2 Fact Tables: 16.2M rows, 2 Gb

Program	Elapsed
exp out of the box: direct=y	0 hr 10 min 40 sec
exp tuned: direct=y buffer=2M recordlength=64K	0 hr 04 min 08 sec
expdp out of the box: Parallel=1	**0 hr 03 min 12 sec**
imp out of the box	2 hr 26 min 10 sec
imp tuned: buffer=2M recordlength=64K	2 hr 18 min 37 sec
impdp out of the box: Parallel=1	**0 hr 03 min 05 sec**

Keep in Mind:

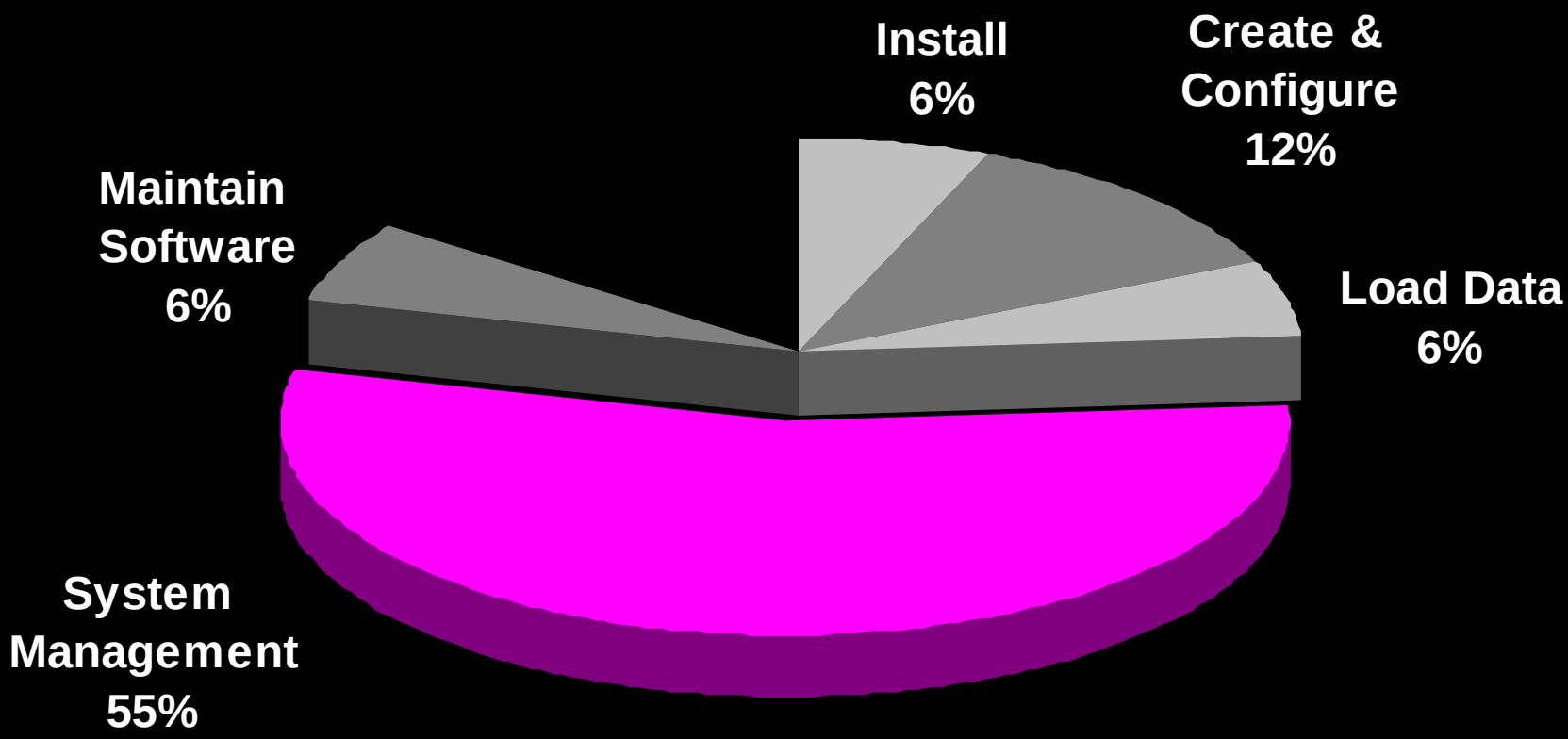
- Designed for *big* jobs with lots of data.
  - Metadata performance is about the same
  - More complex infrastructure, longer startup
- XML is bigger than DDL, but much more flexible
- Data format in dump files is ~15% more compact than exp
- Import subsetting is accomplished by pruning the Master Table

Original exp and imp

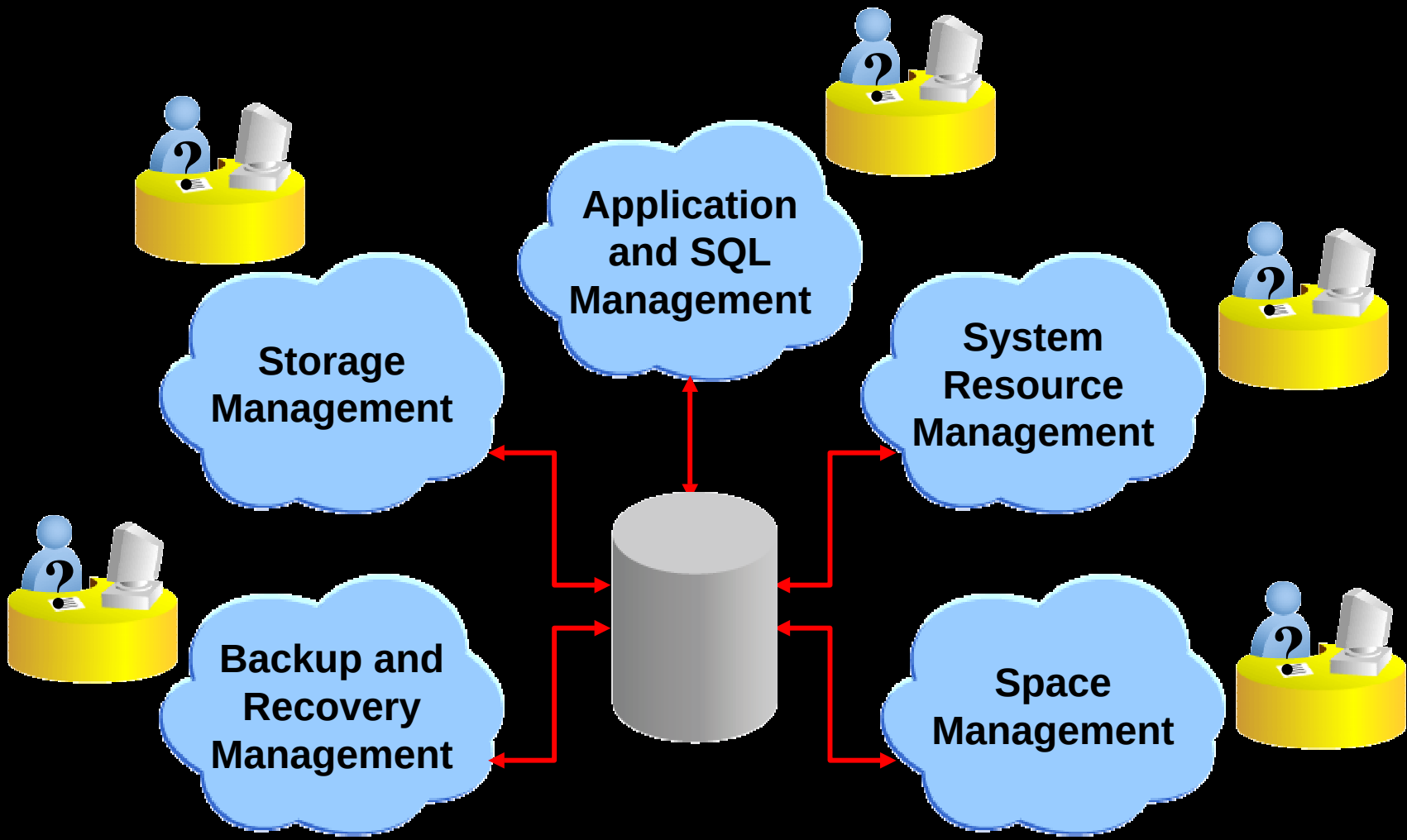


- Original imp will be supported forever to allow loading of V5 – V9*i* dump files
- Original exp will ship at least in 10*g*, but may not support all new functionality.
- 9*i* exp may be used for downgrades from 10*g*
- Original and Data Pump dump file formats are not compatible

How DBAs Spend Their Time?

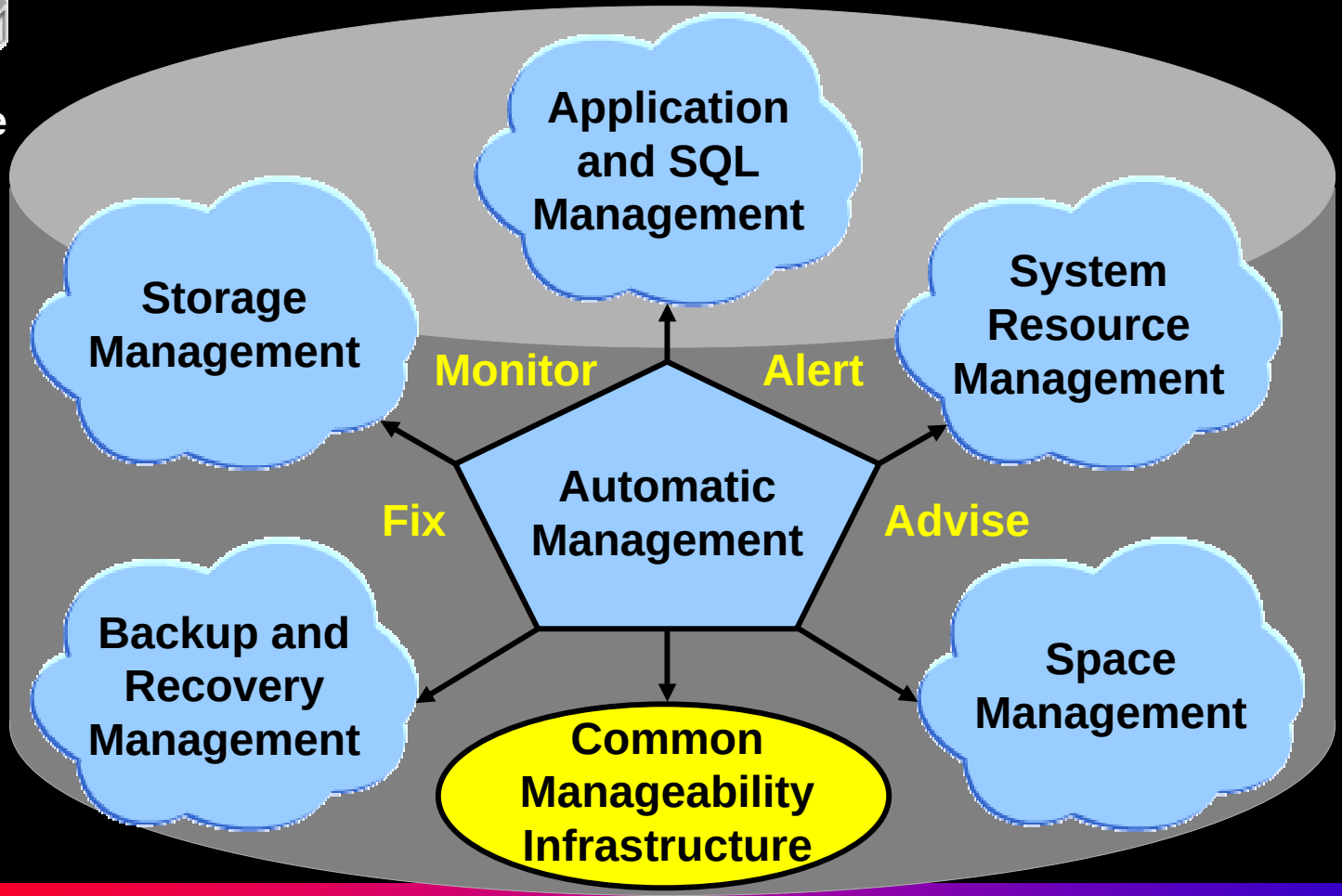


Database Management Challenges

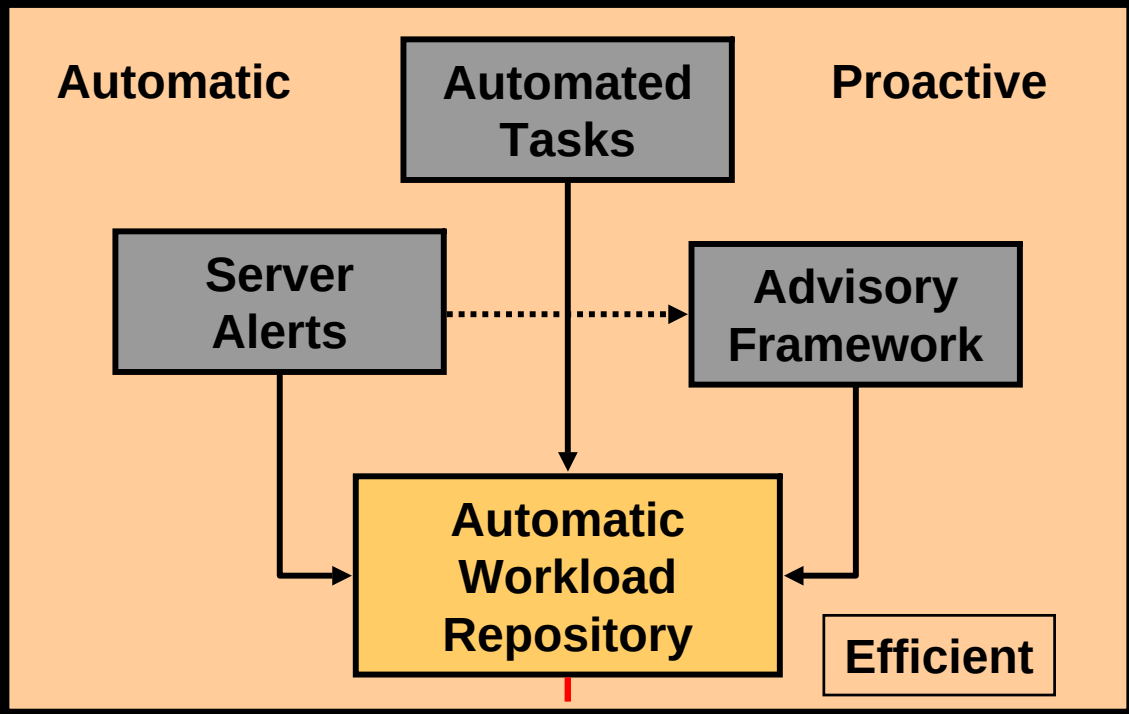


Solution: Self-Managing Database

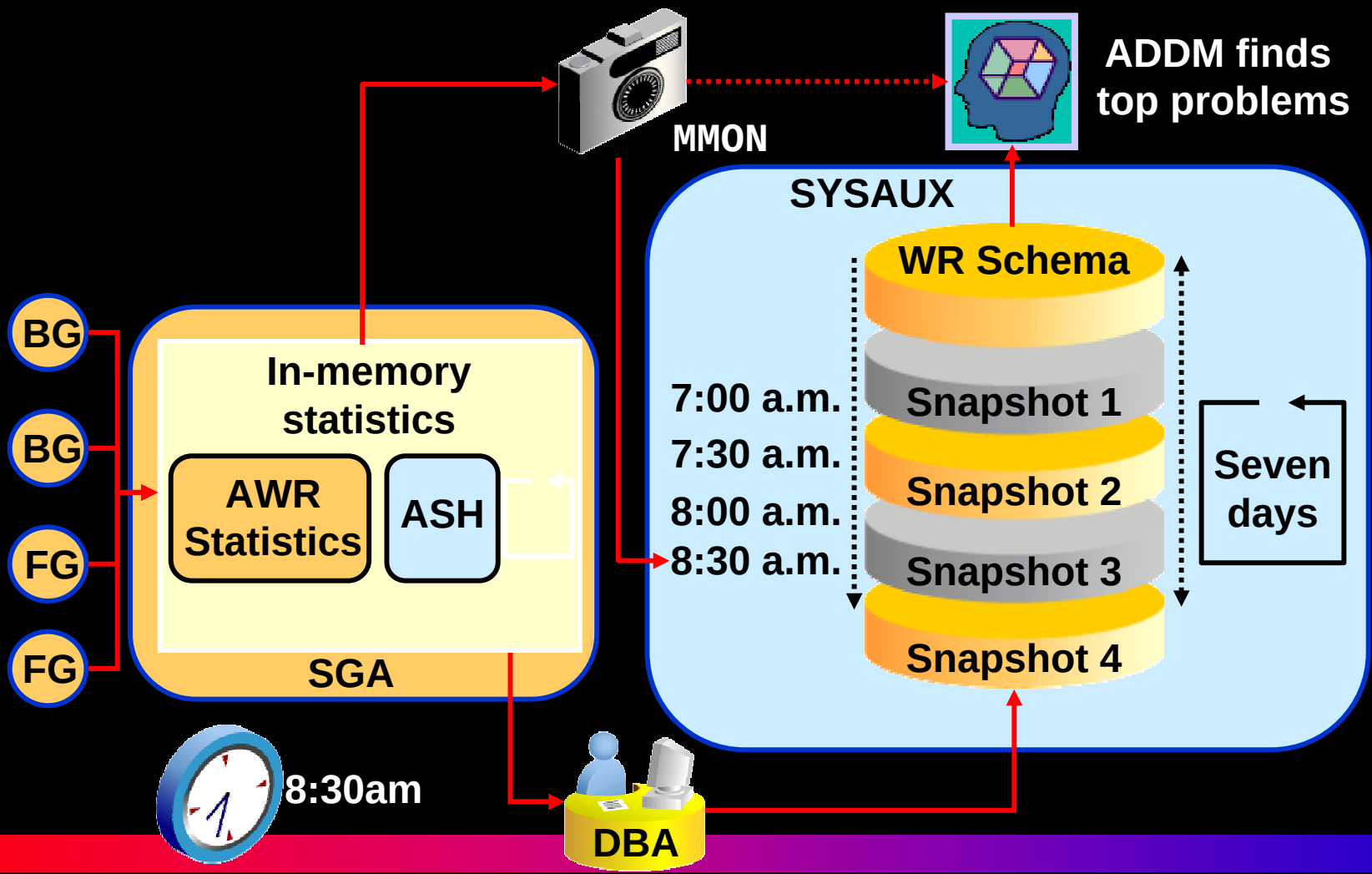
Enterprise Manager Database Console



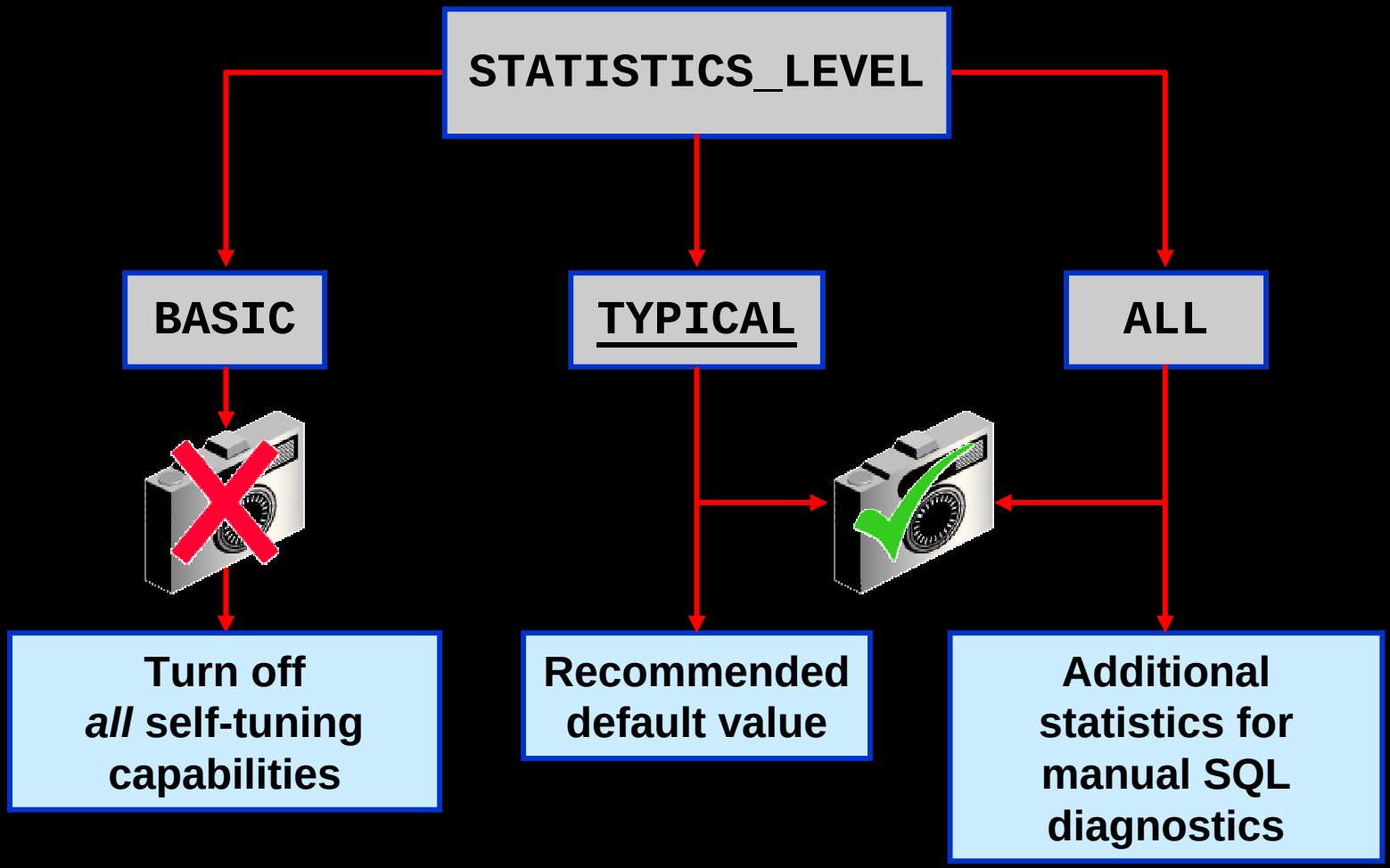
Common Manageability Infrastructure: Automatic Workload Repository



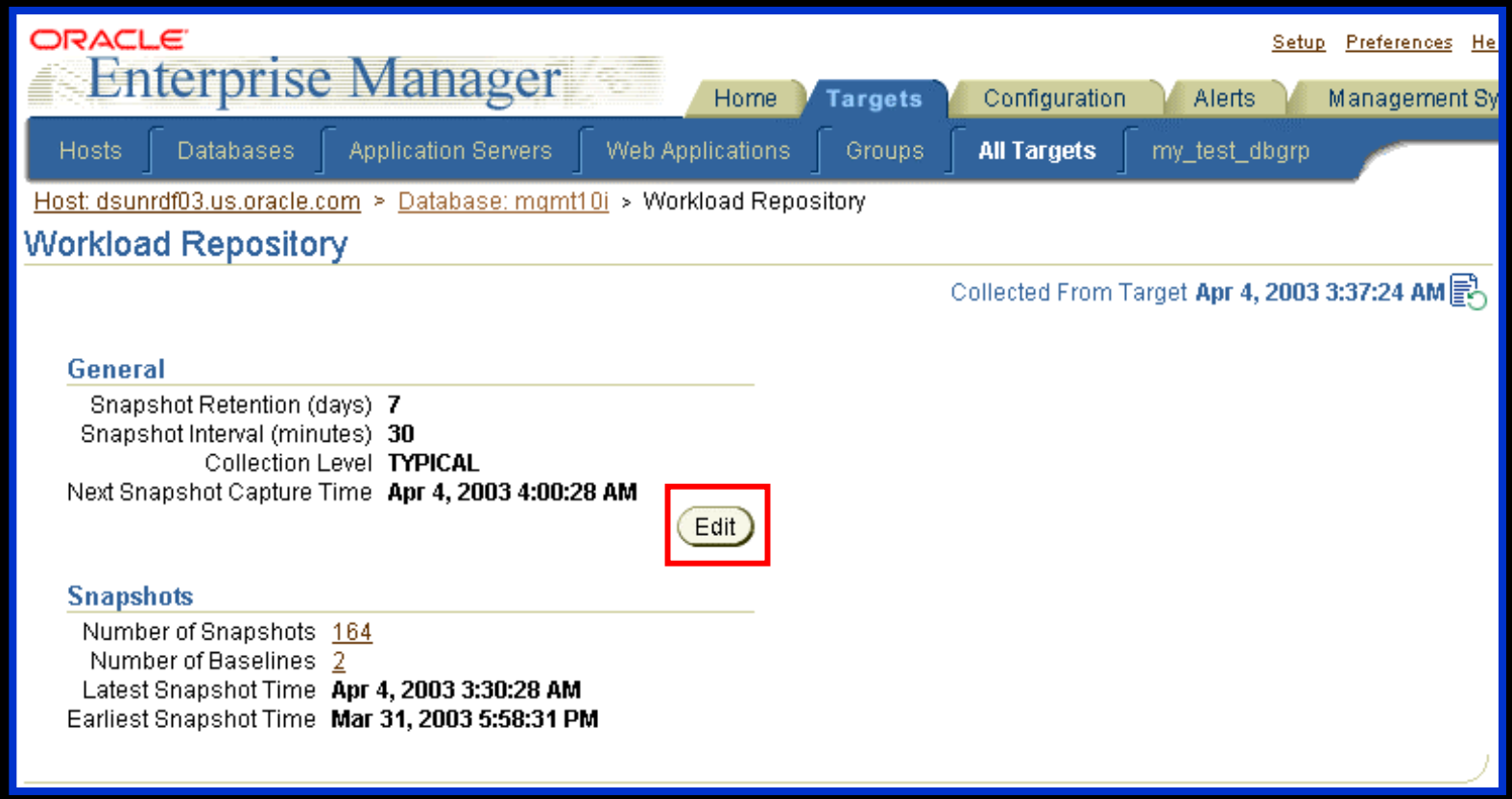
Automatic Workload Repository



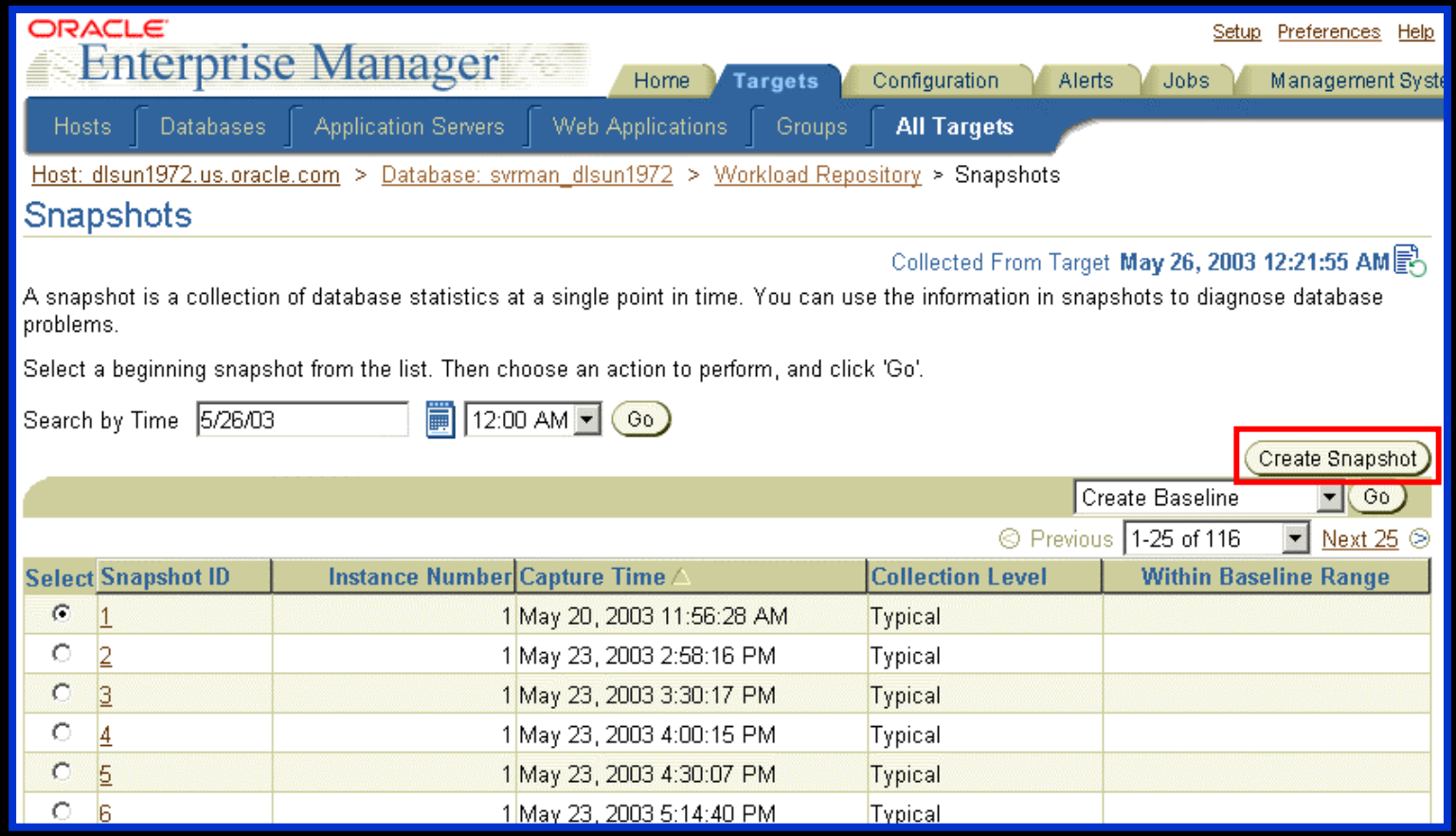
Statistics Level



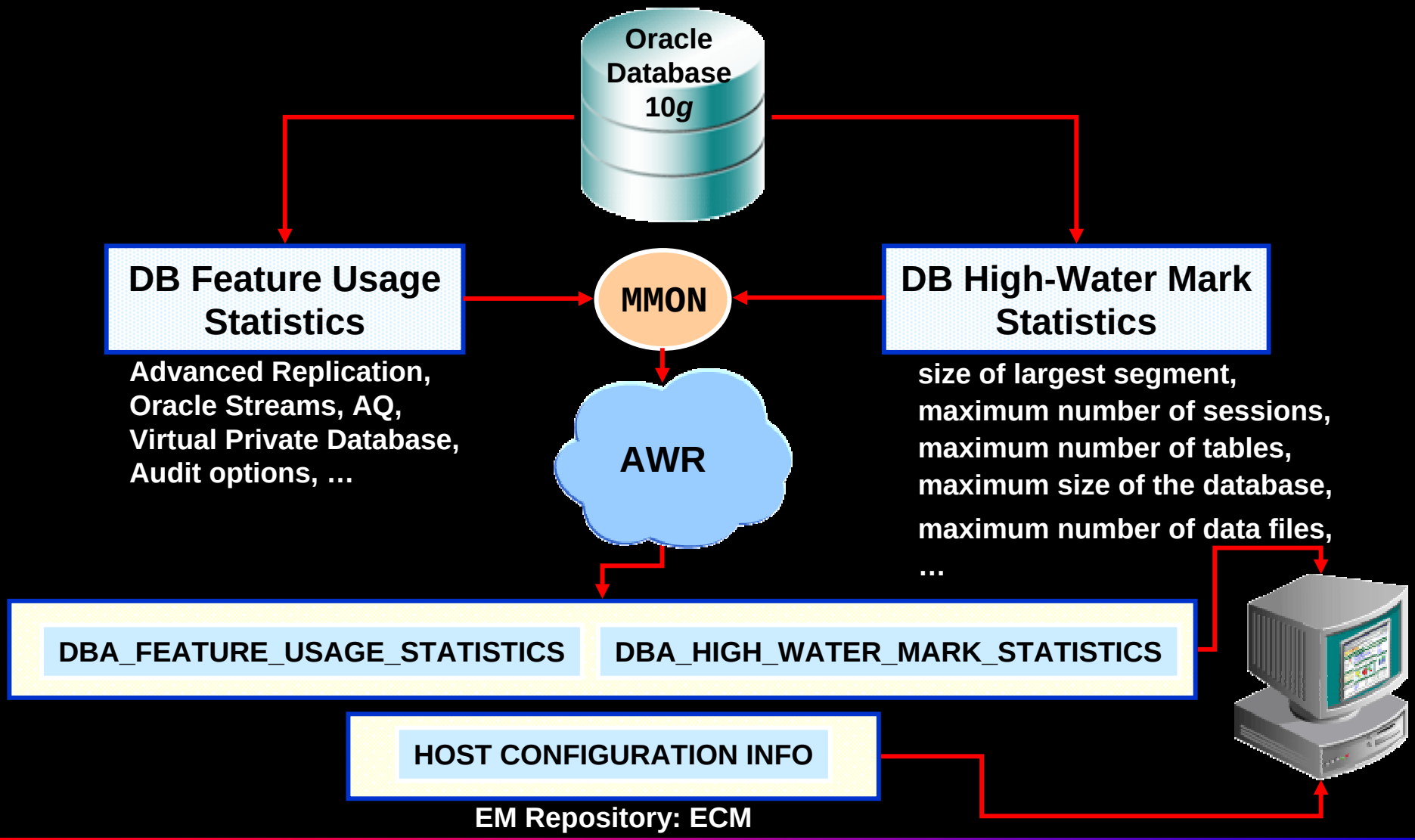
Configuring The Workload Repository



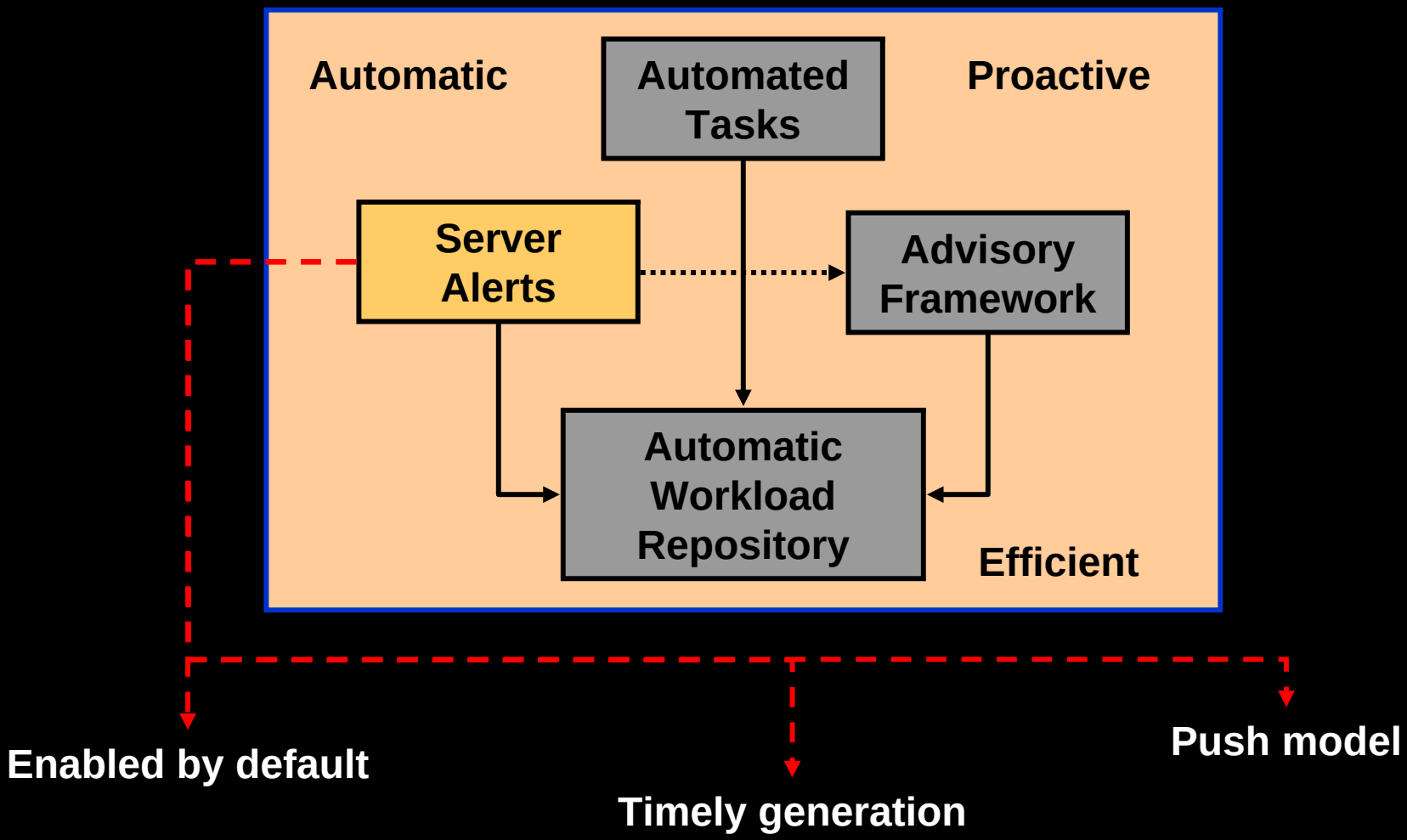
Manually Creating Snapshots



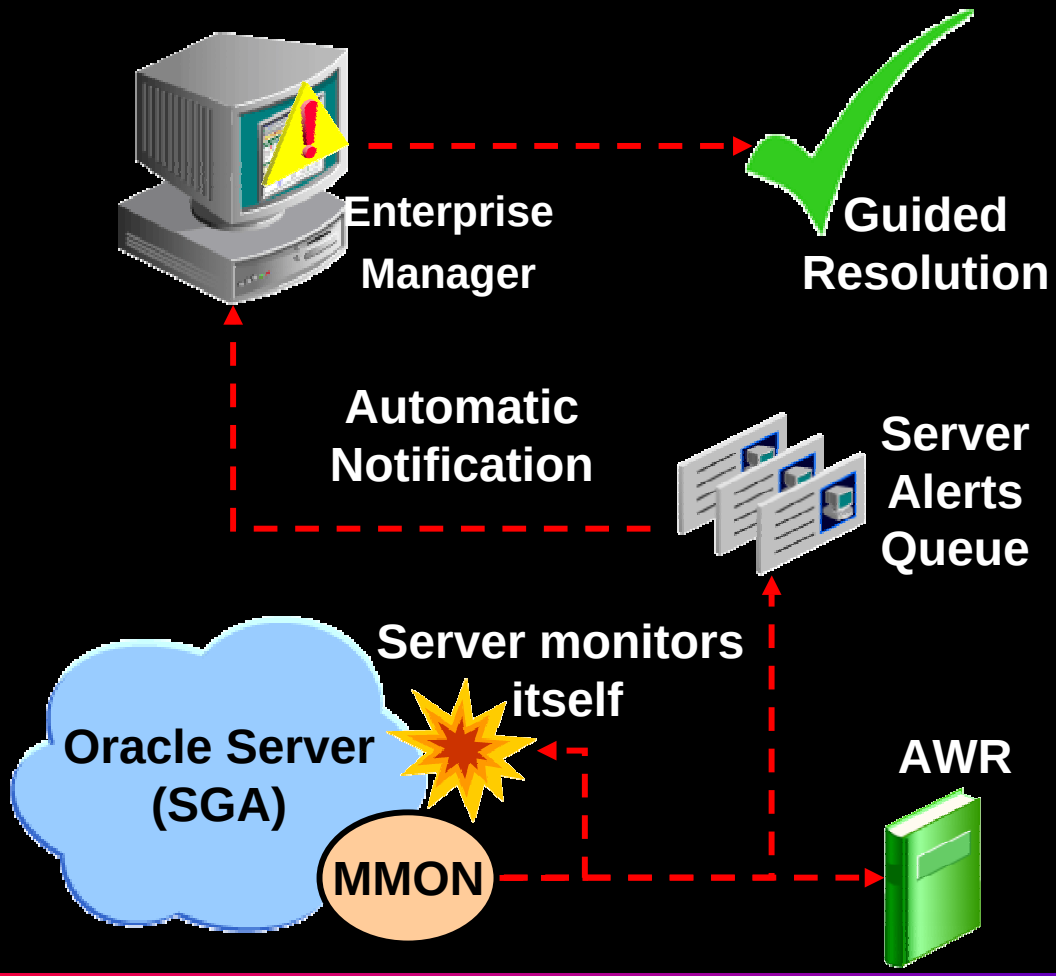
Database Feature Usage Metric Collection



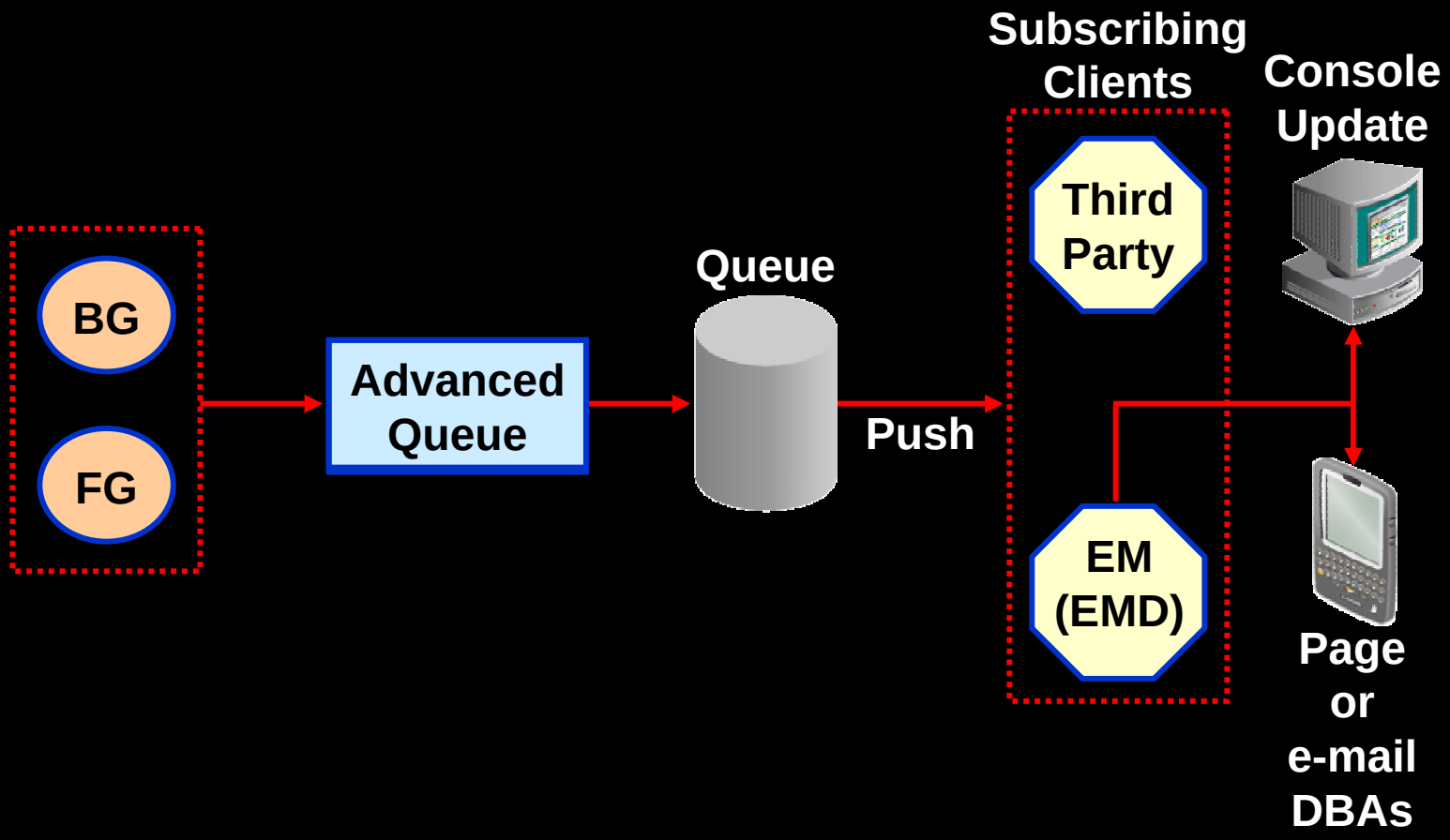
Common Manageability Infrastructure: Server Alerts



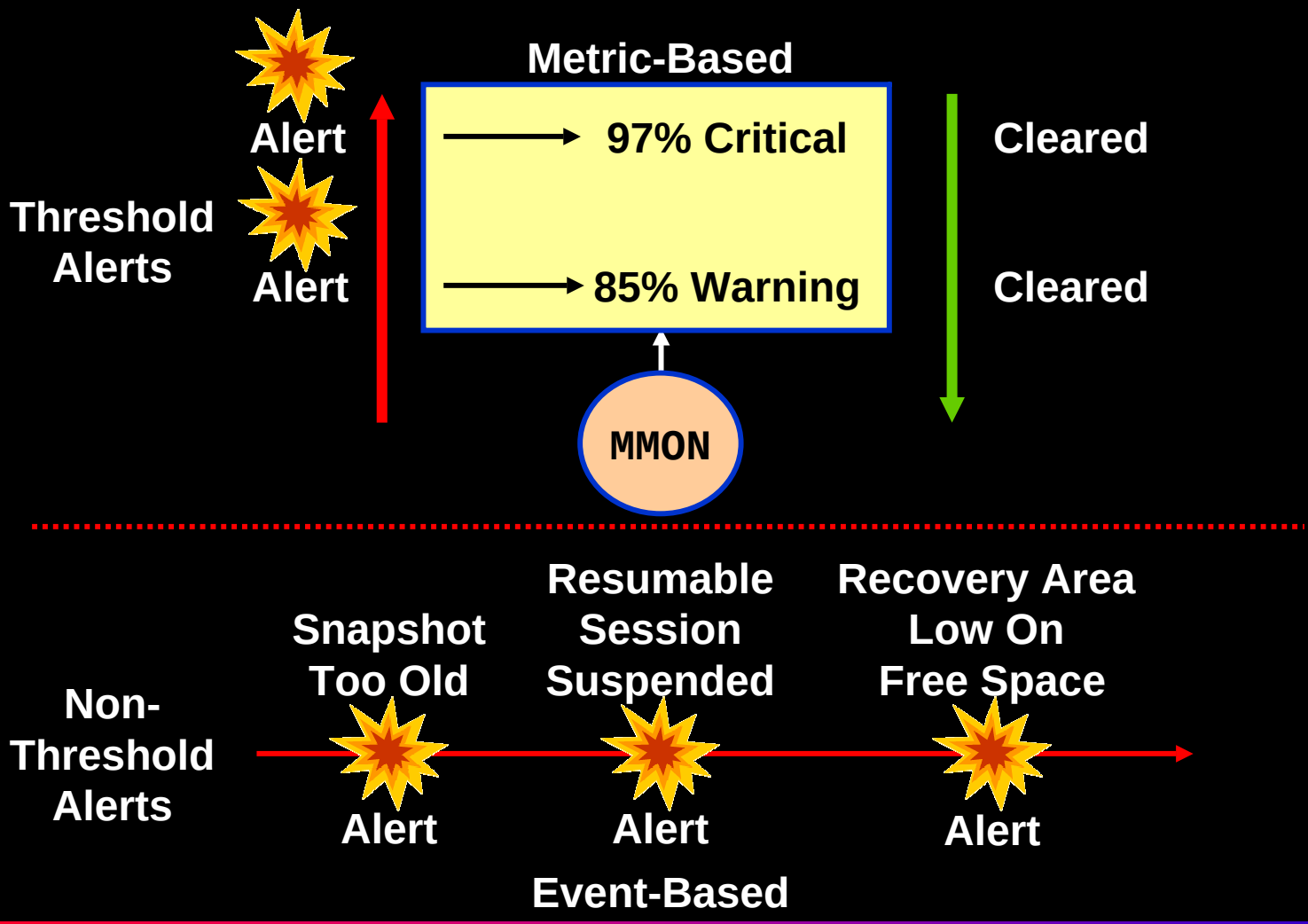
Server Alerts



Server Alerts Delivery Process

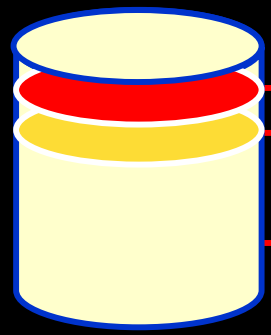


Server-Generated Alert Types



Out-of-the-box Alerts

Locally Managed



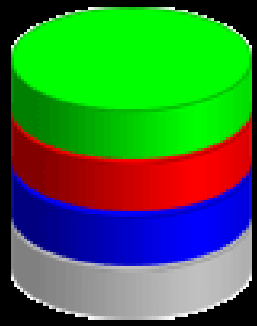
97% Critical

85% Warning

Tablespace

Tablespace Space Usage

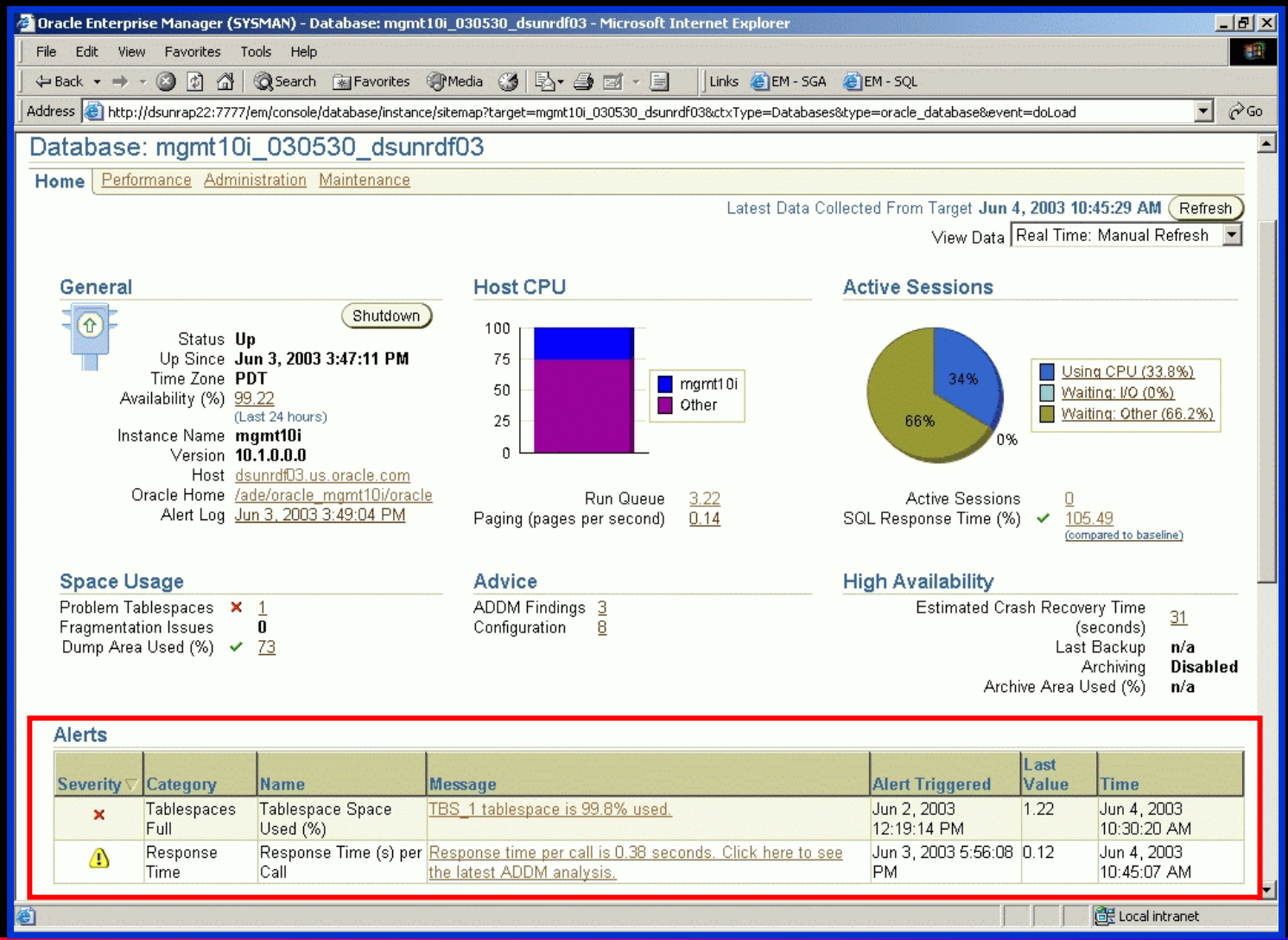
Resumable Session Suspended



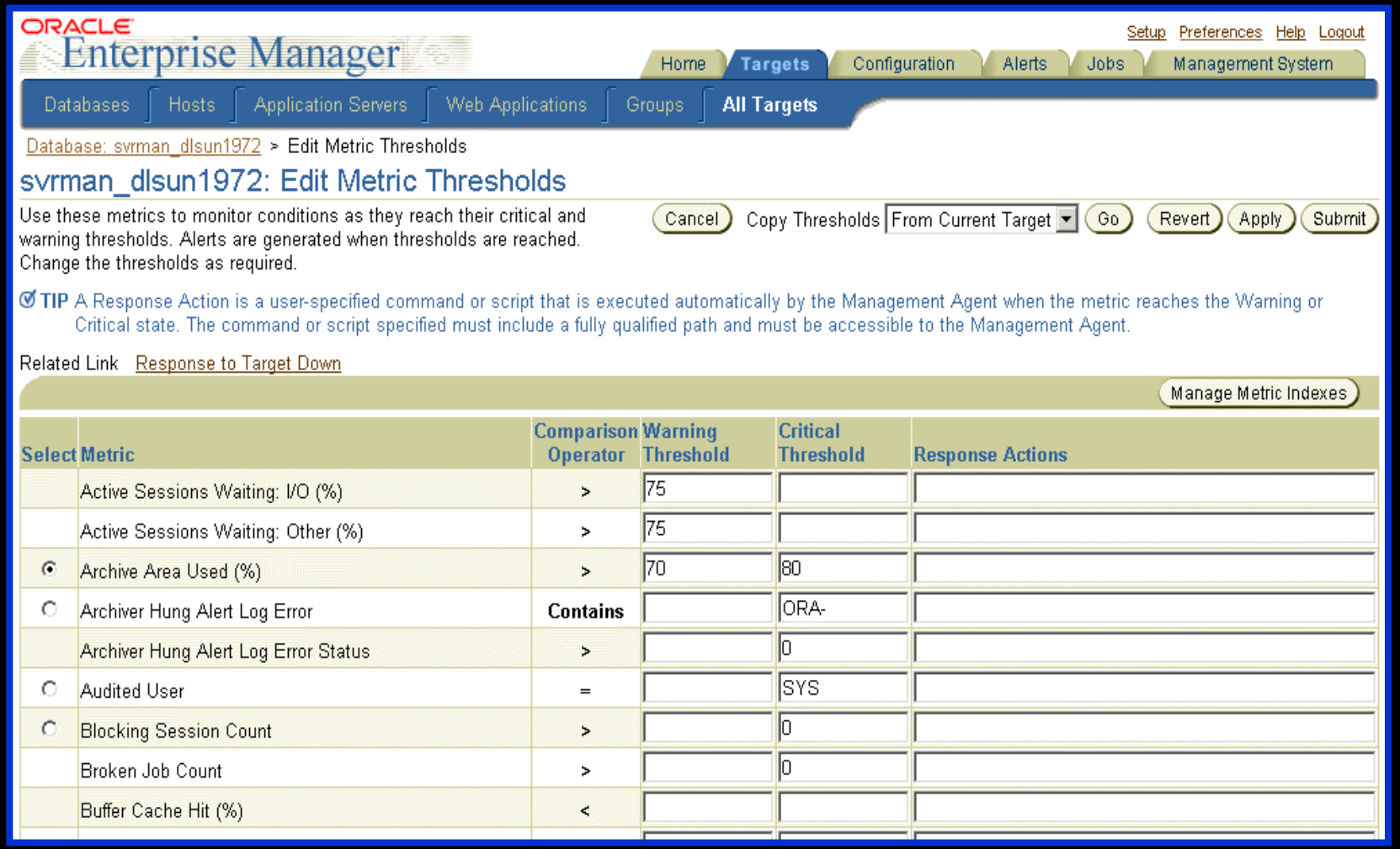
Recovery Area Low On Free Space

Snapshot Too Old

EM Interface to Alerts

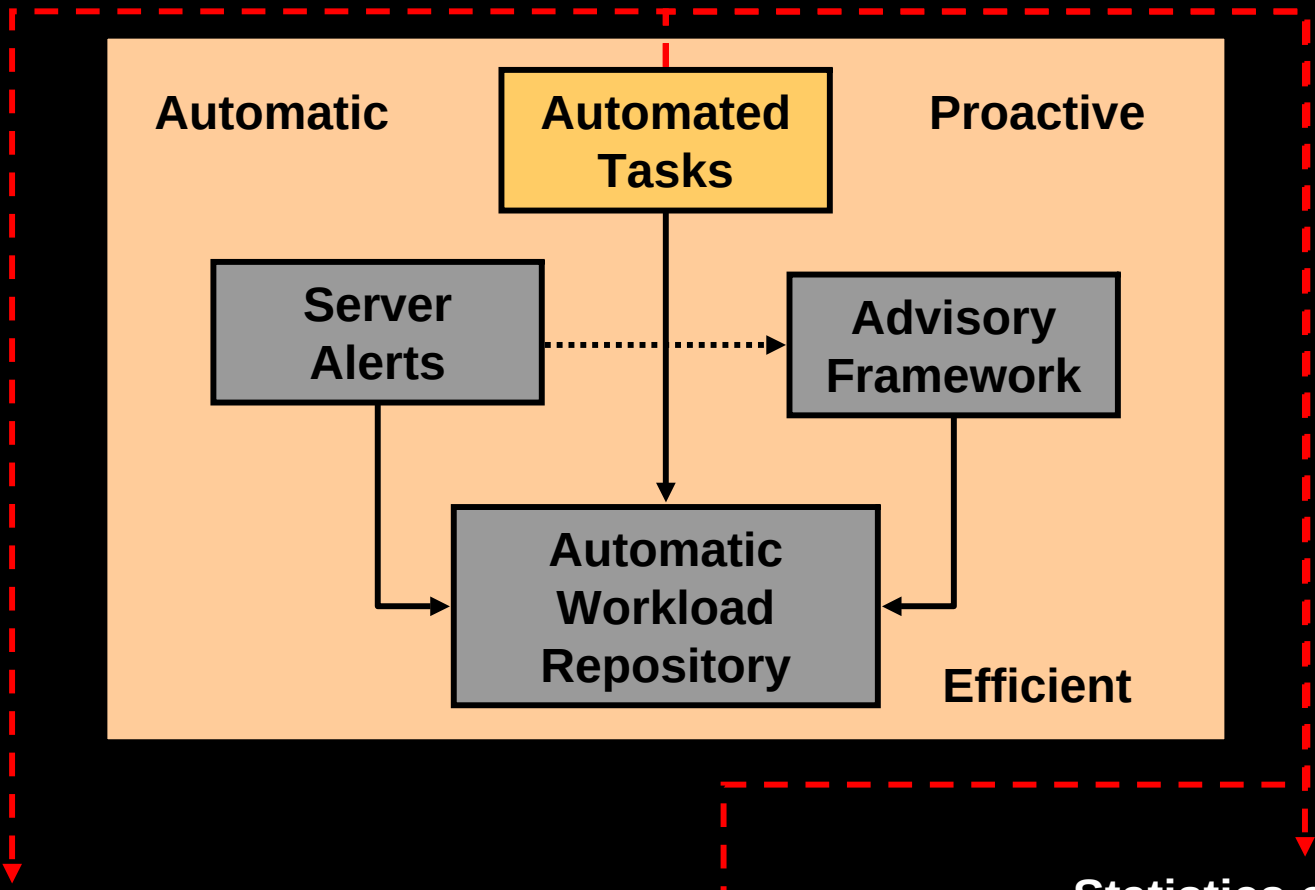


Setting Alert Thresholds

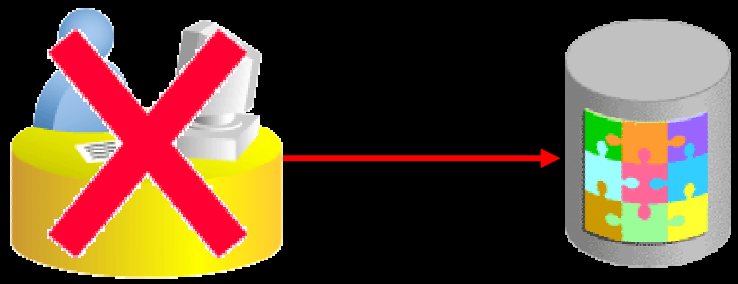


Select	Metric	Comparison Operator	Warning Threshold	Critical Threshold	Response Actions
	Active Sessions Waiting: I/O (%)	>	75		
	Active Sessions Waiting: Other (%)	>	75		
◉	Archive Area Used (%)	>	70	80	
○	Archiver Hung Alert Log Error	**Contains**		ORA-	
	Archiver Hung Alert Log Error Status	>		0	
○	Audited User	=		SYS	
○	Blocking Session Count	>		0	
	Broken Job Count	>		0	
	Buffer Cache Hit (%)	<			

Common Manageability Infrastructure: Automated Tasks



Automatic Optimizer Statistics Collection



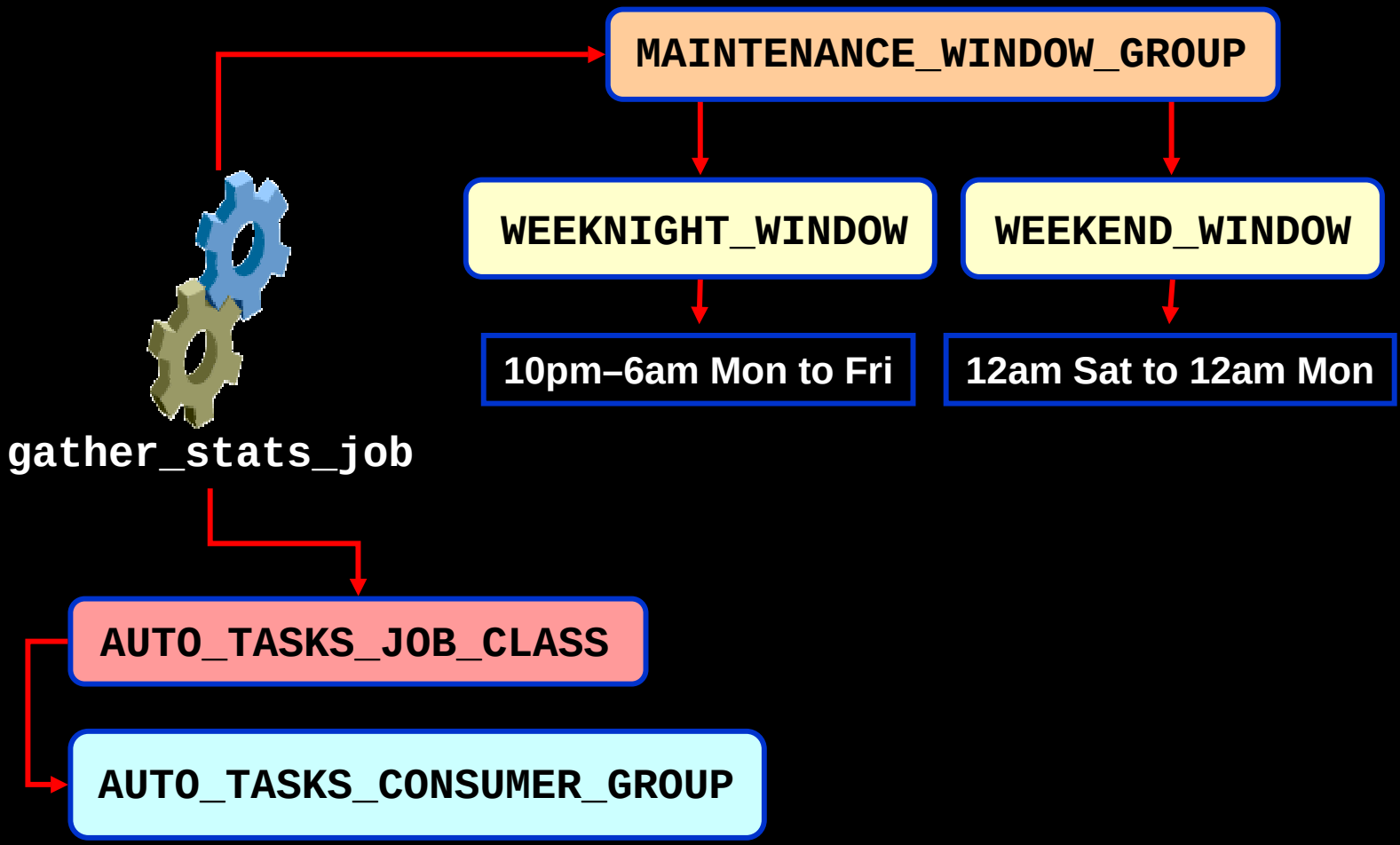
DBA tracks and gathers statistics

Automatic statistics collection

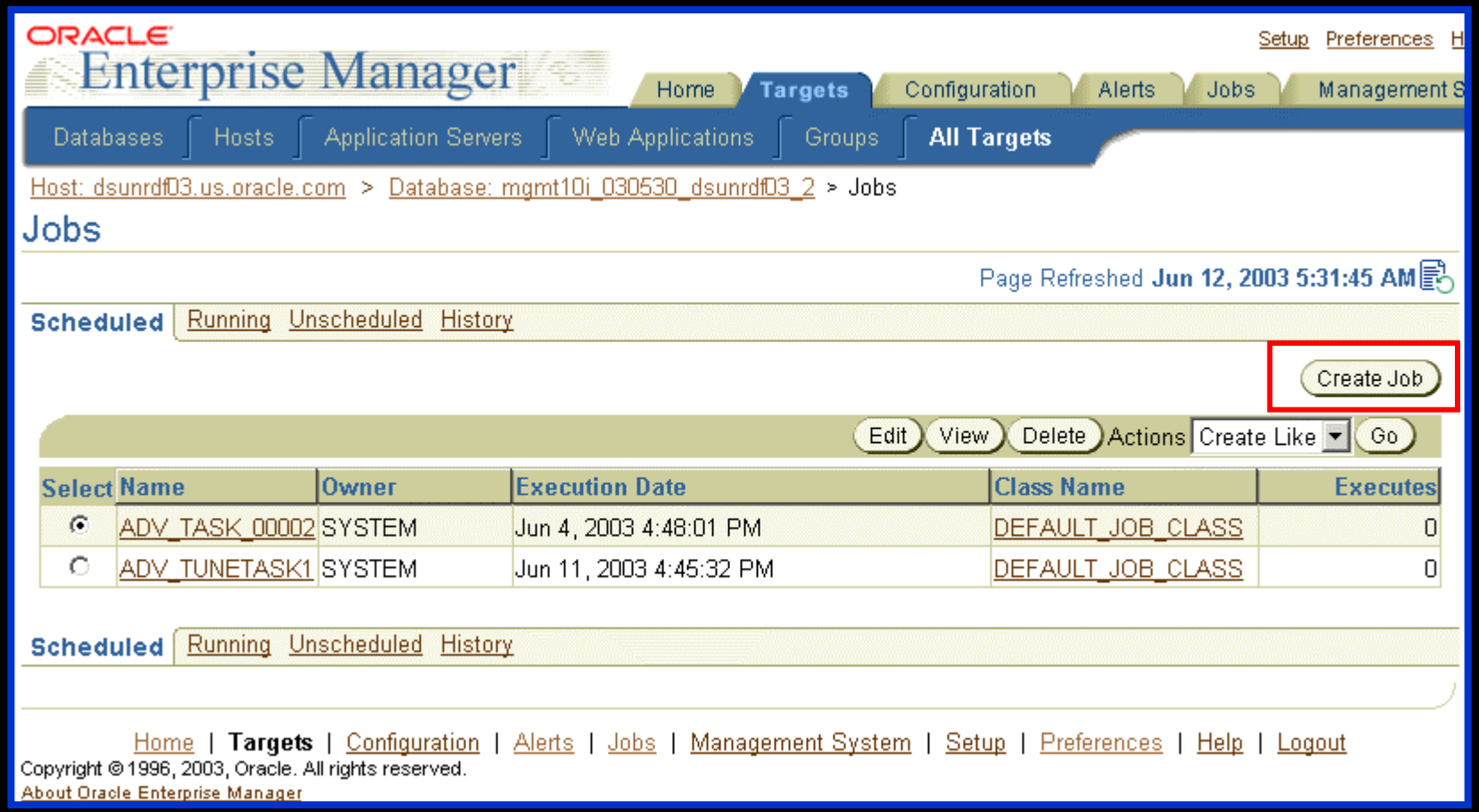
Resolves two issues

- Targets right objects
- Determines right samples

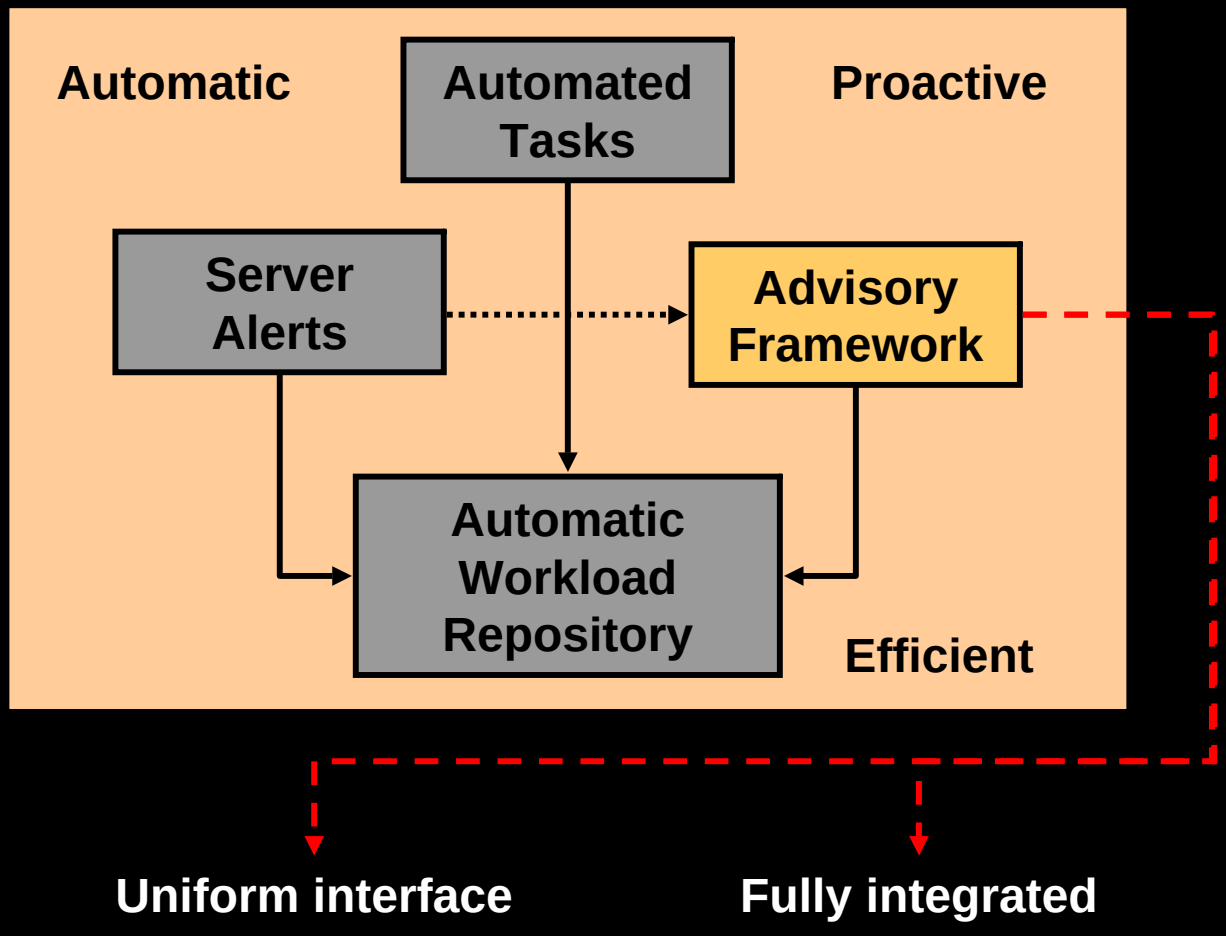
Gather Statistics Job



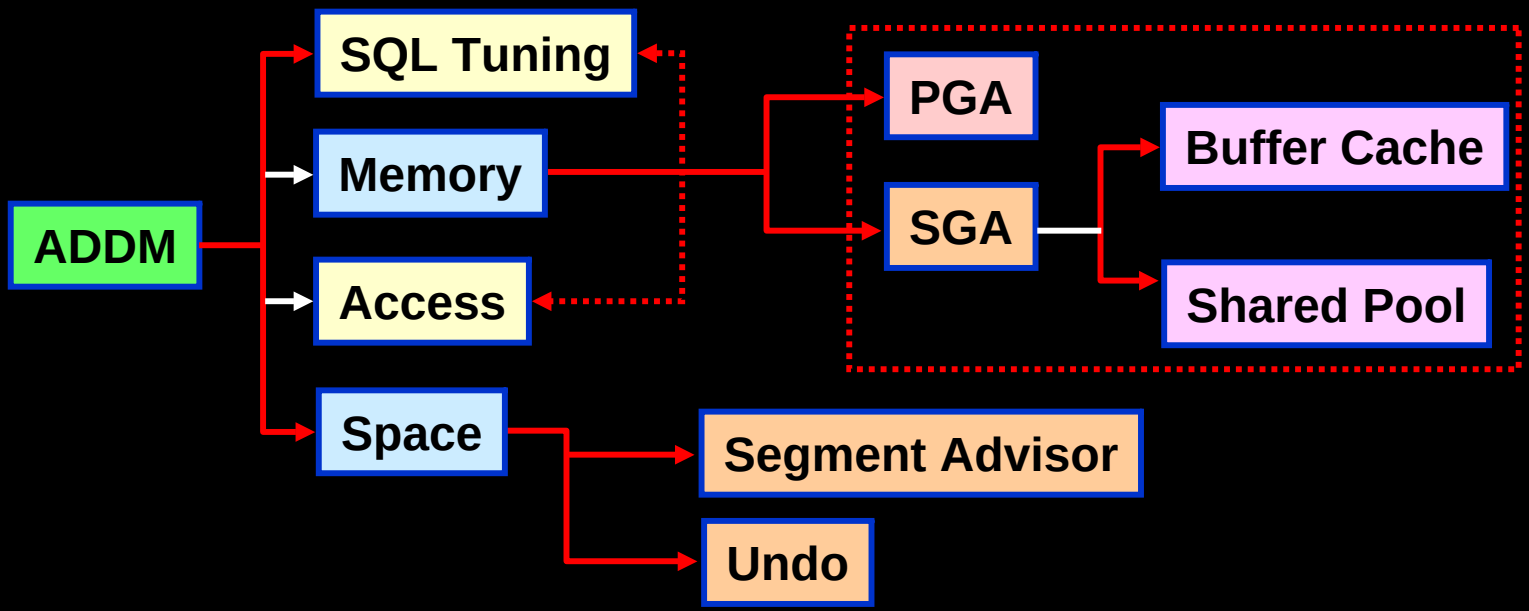
Adding New Tasks Using EM



Common Manageability Infrastructure: Advisory Framework



Advisory Framework

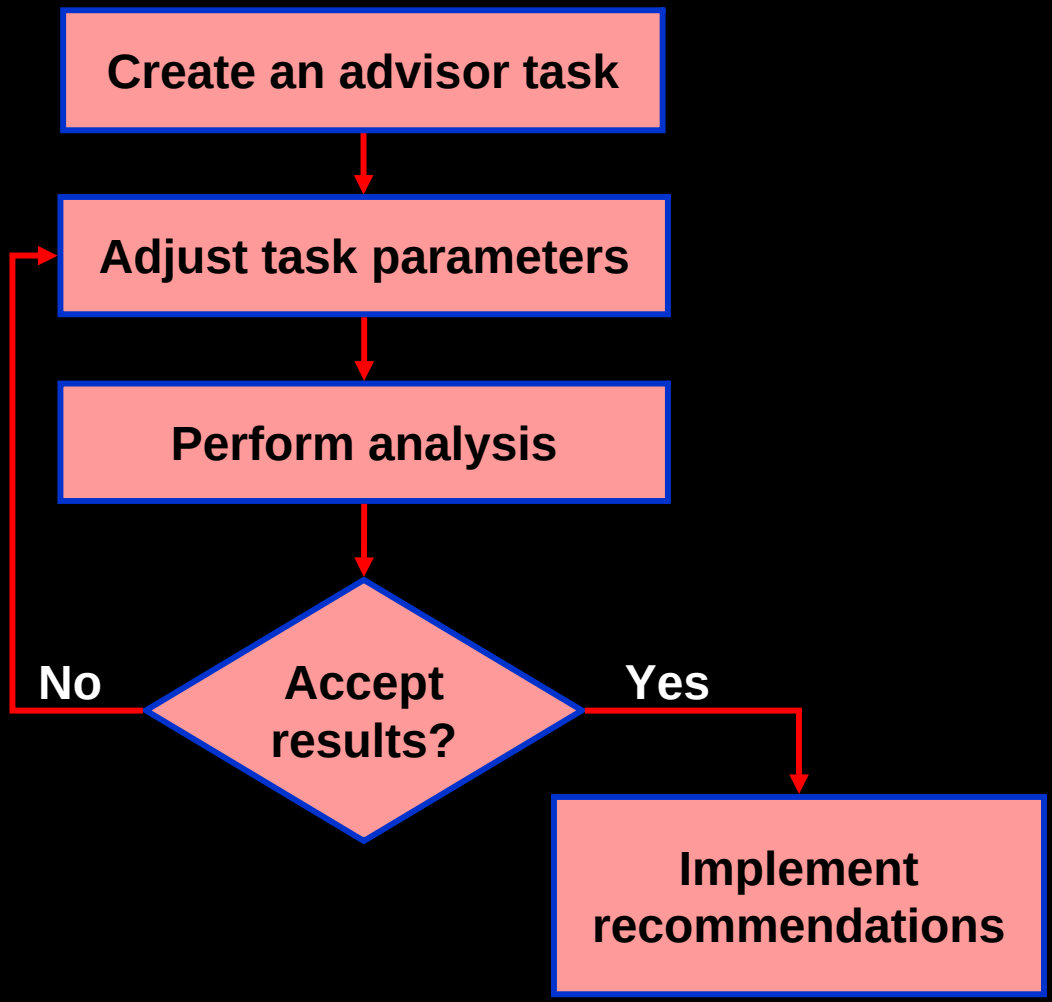


Common data source

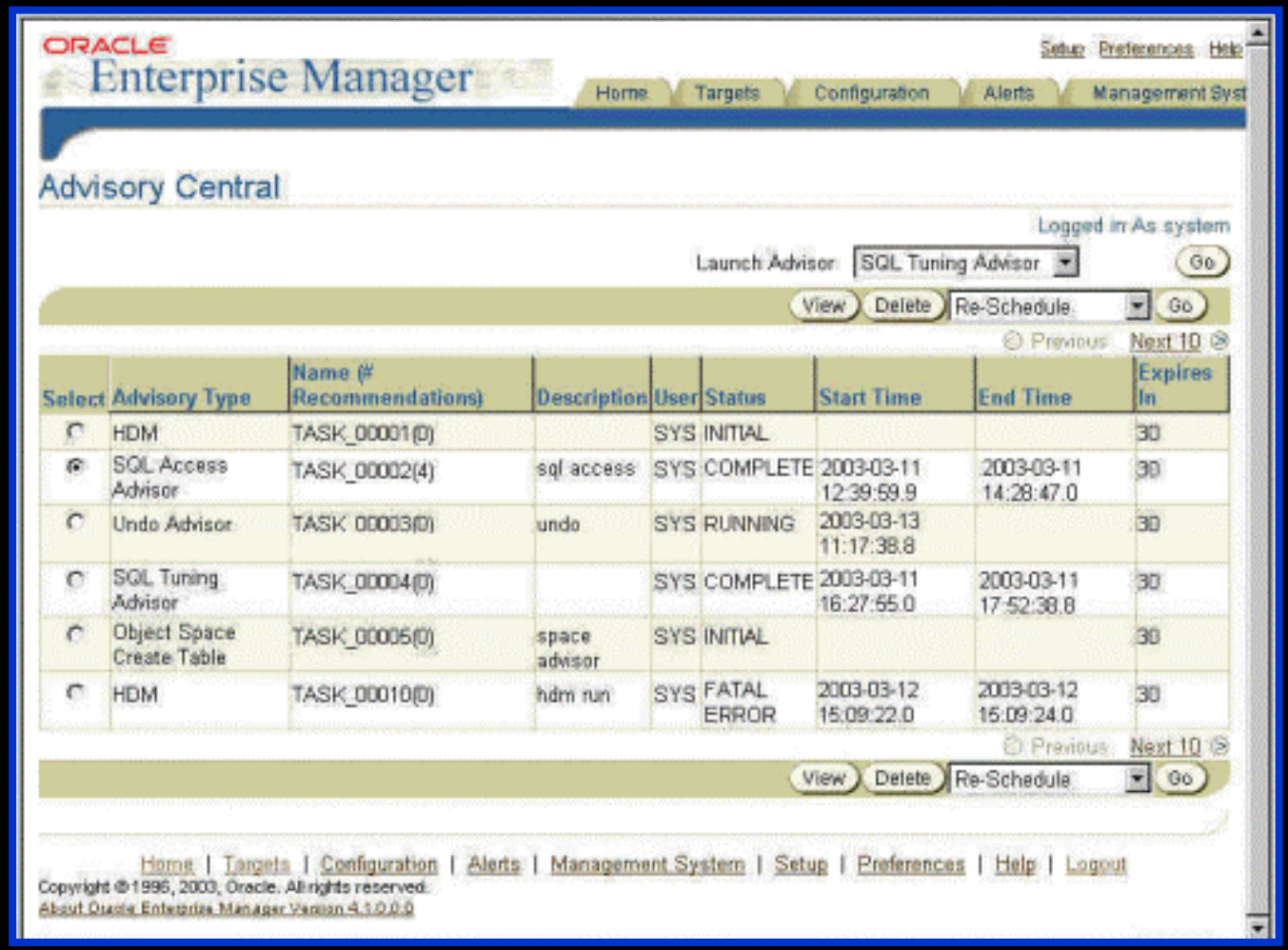
Seamless integration

Guided Tuning Session

Enterprise Manager Database Console

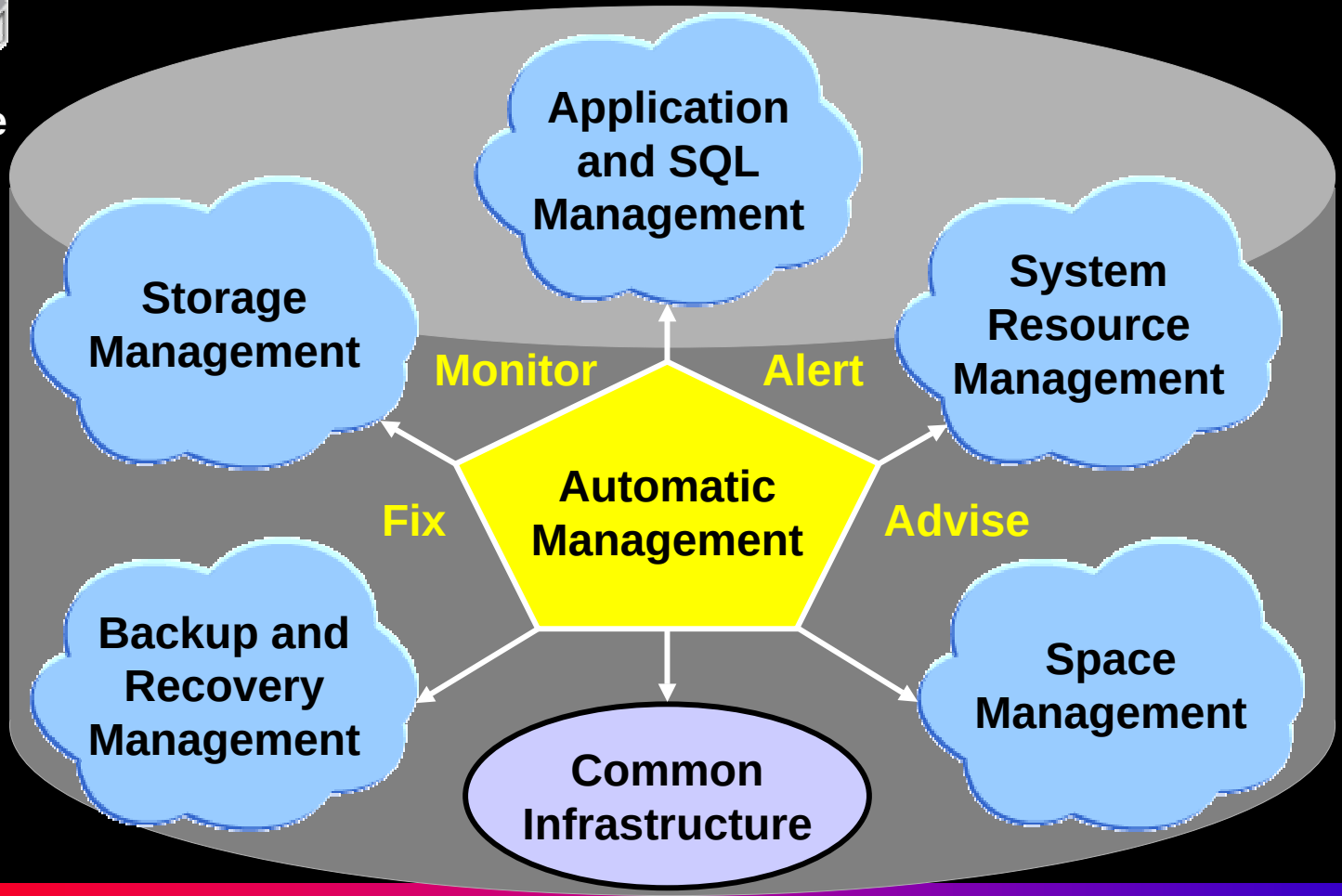


Advisory Central

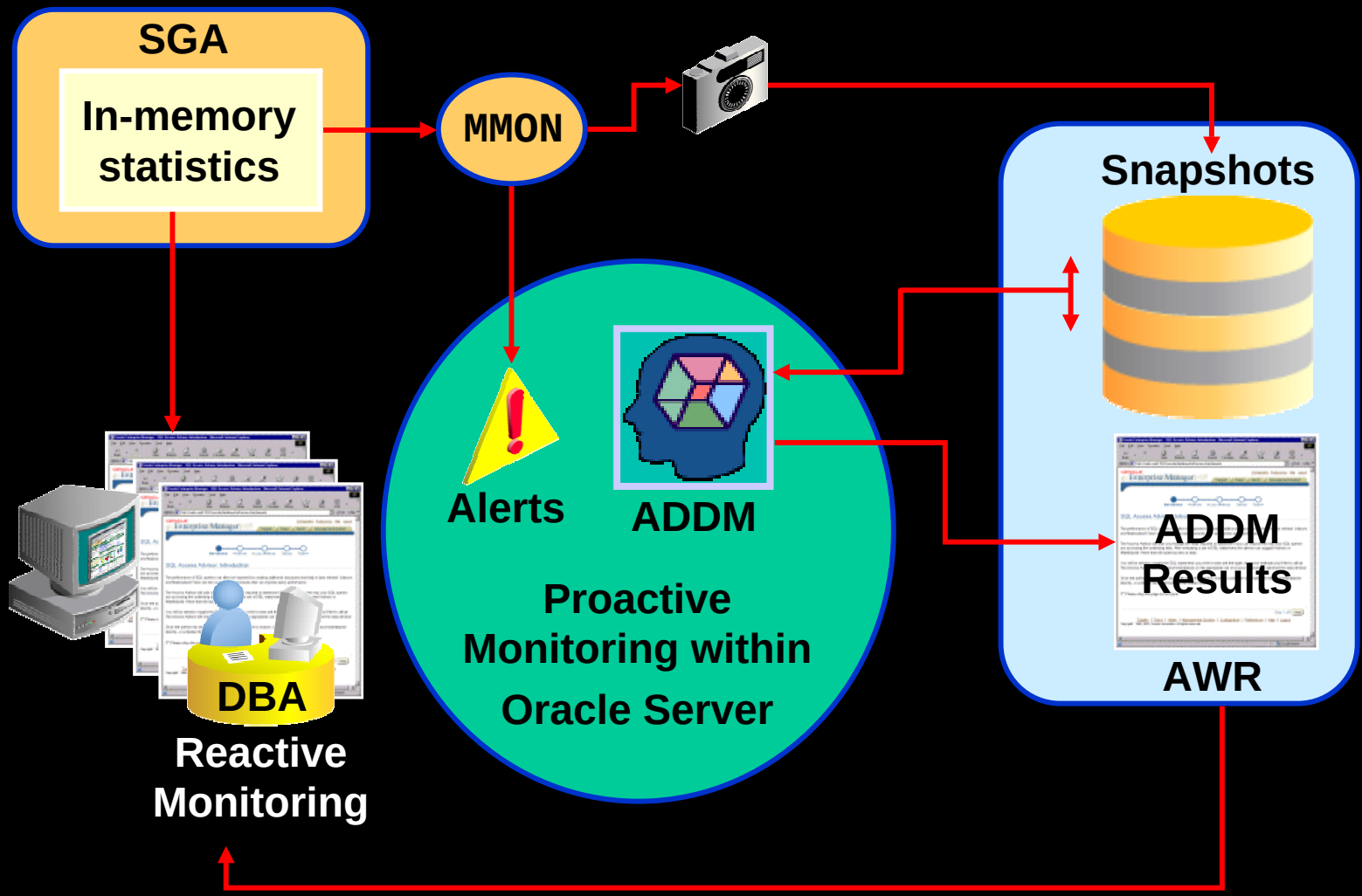


Solution: Self-Managing Database

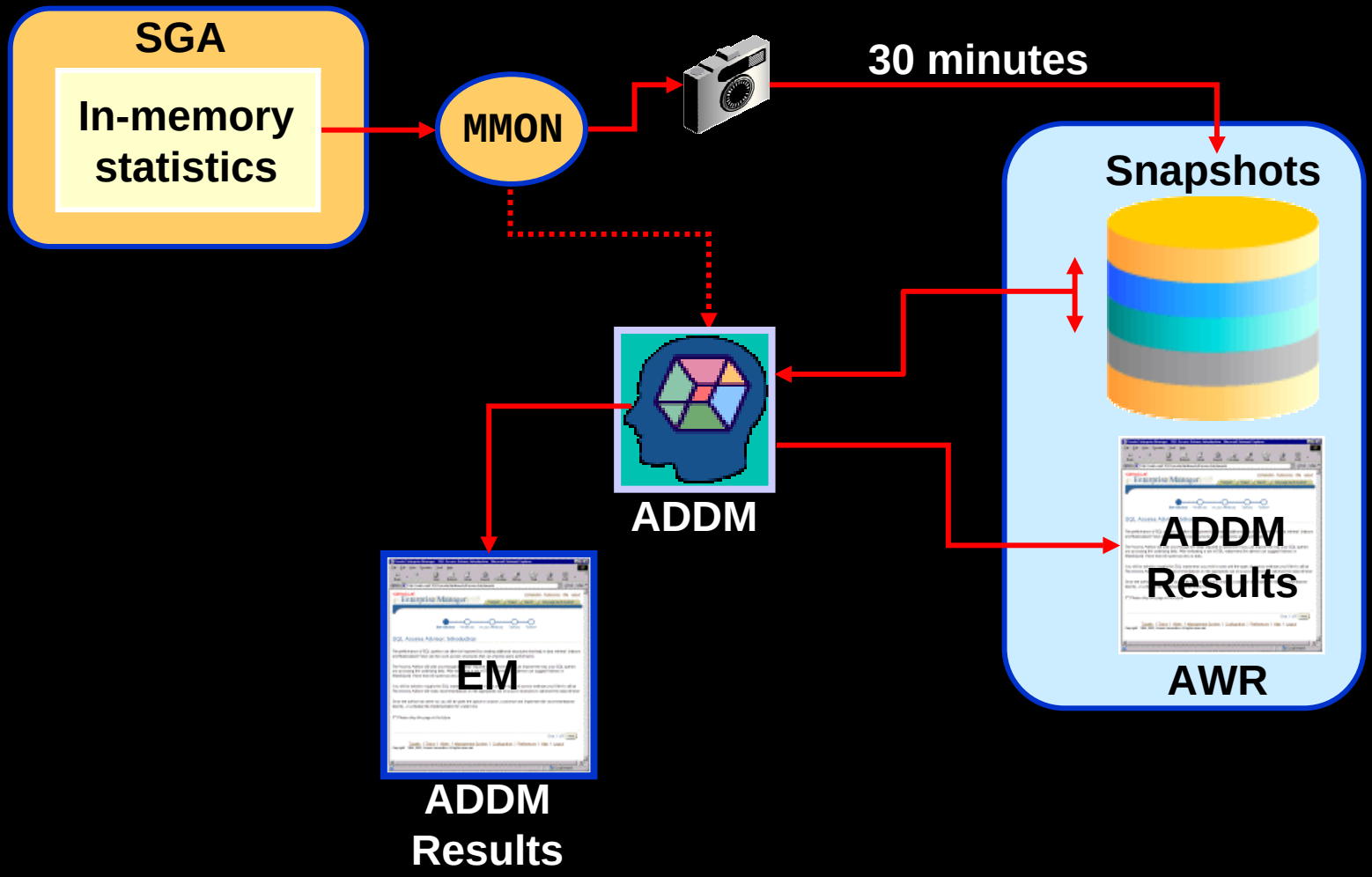
Enterprise Manager Database Console



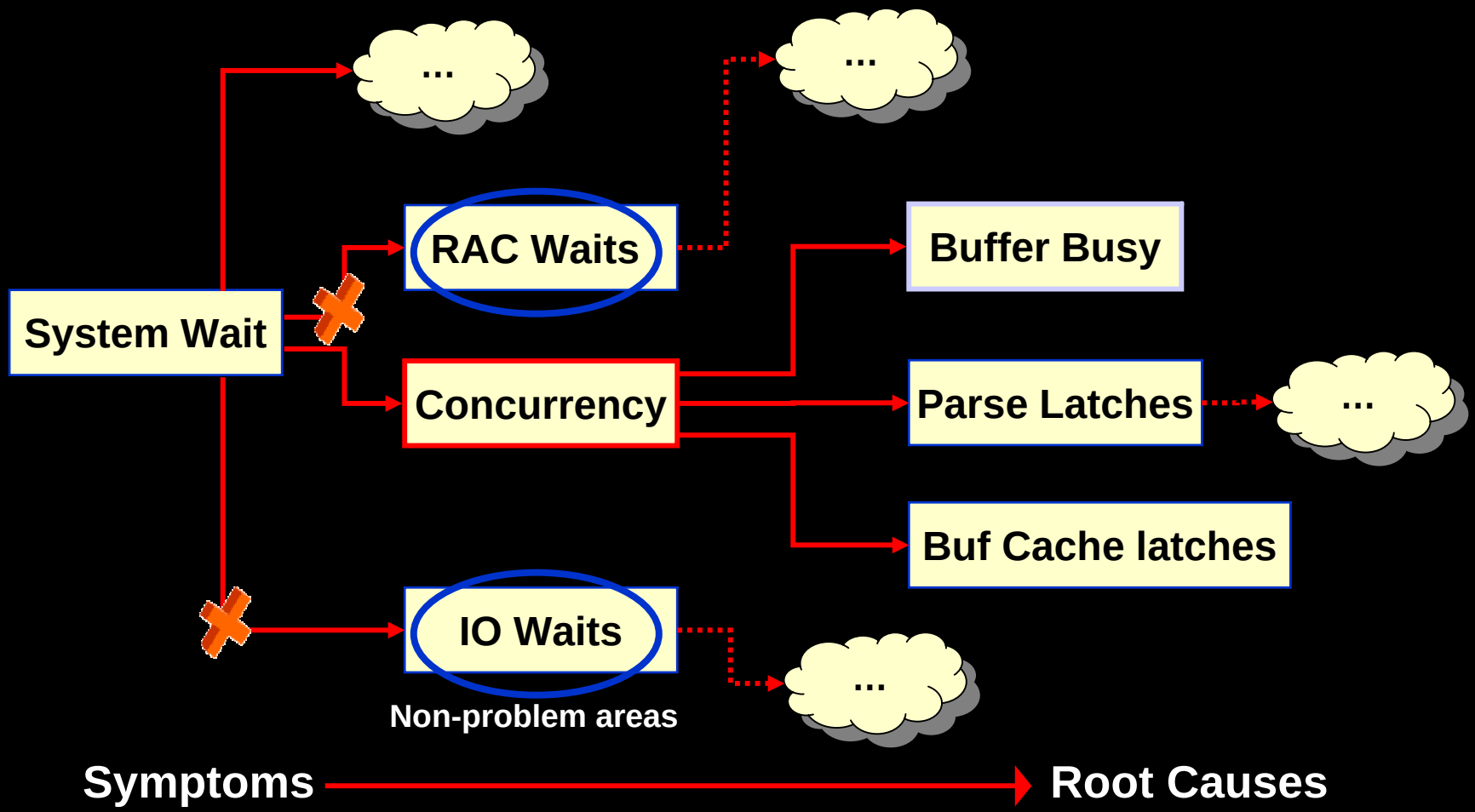
Performance Monitoring Solutions



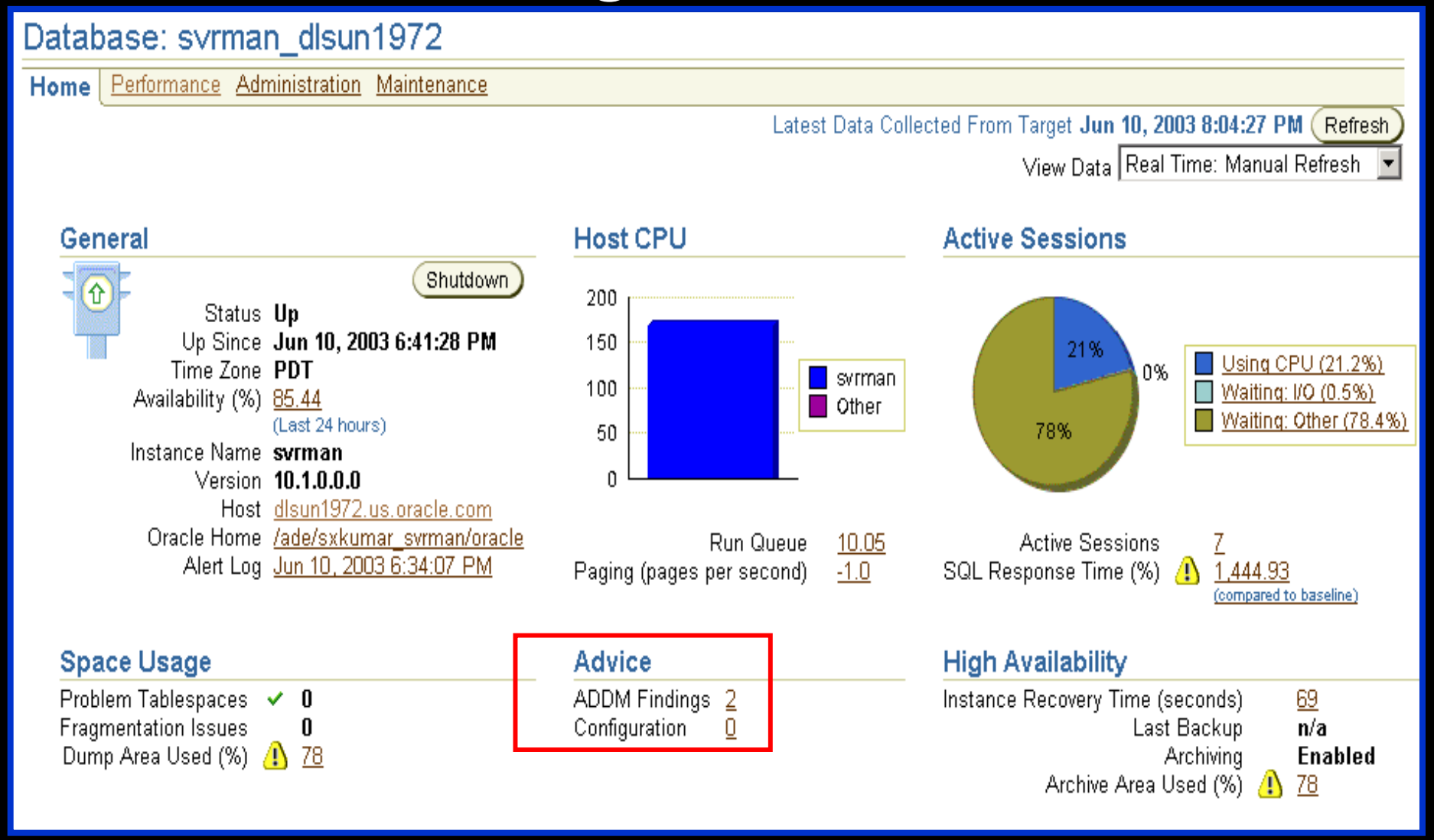
ADDM Performance Monitoring



ADDM Problem Classification System



Accessing ADDM Advice



ADDM Recommendations

Host: usunrdi20 > Database: mgmt10i_usunrdi20 > Advisor Central > ADDM Task > ADDM Finding Details

ADDM Finding Details

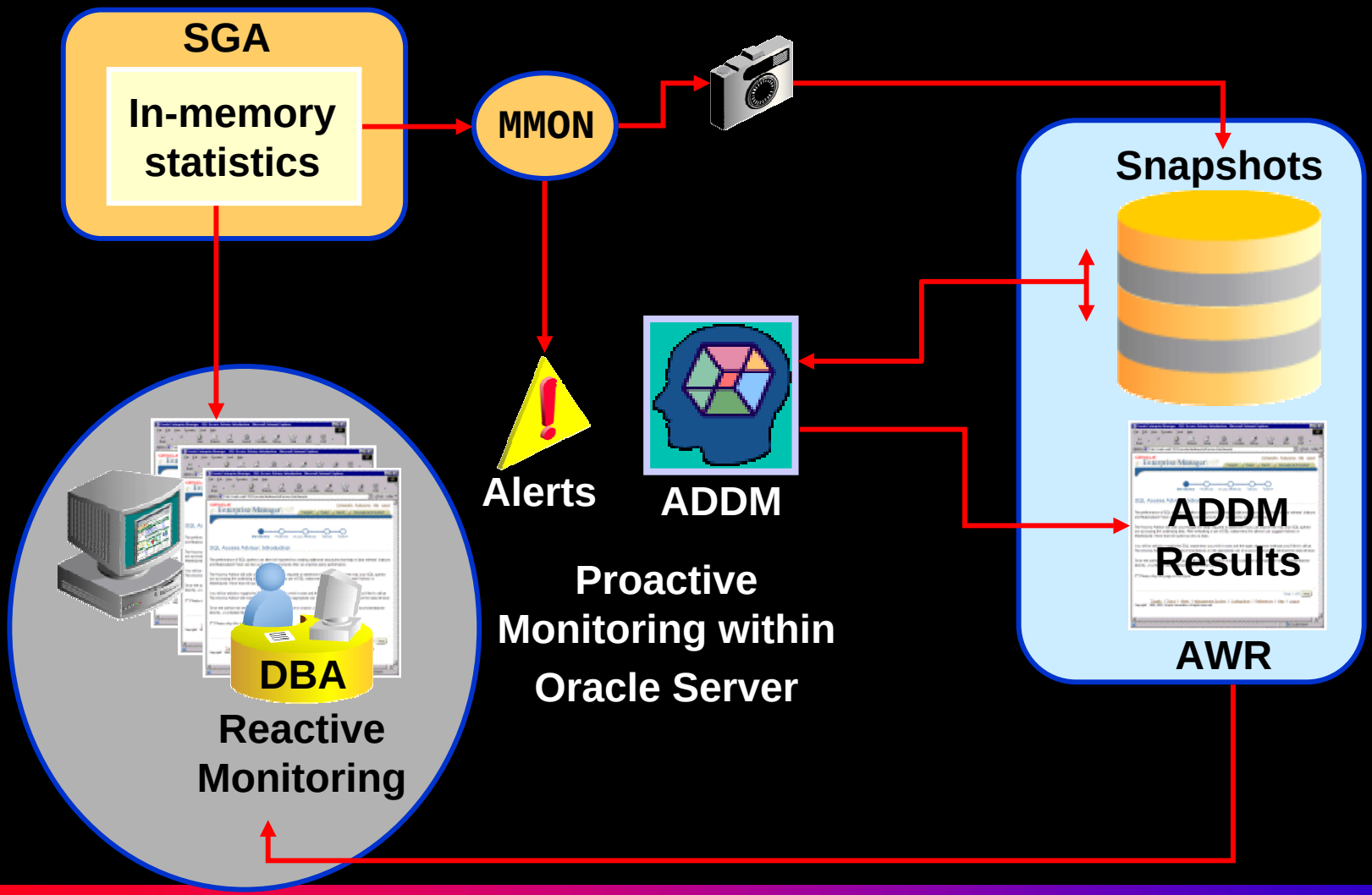
Analysis Start Time	**Jun 10, 2003 9:30:30 AM**
Analysis Duration (minutes)	**29.75**
Finding	**Read and write contention on database blocks was consuming significant database time.**
Database Time (minutes)	**274.16**
Impact (minutes)	**98.23**
Impact (%)	**35.83**

Recommendations

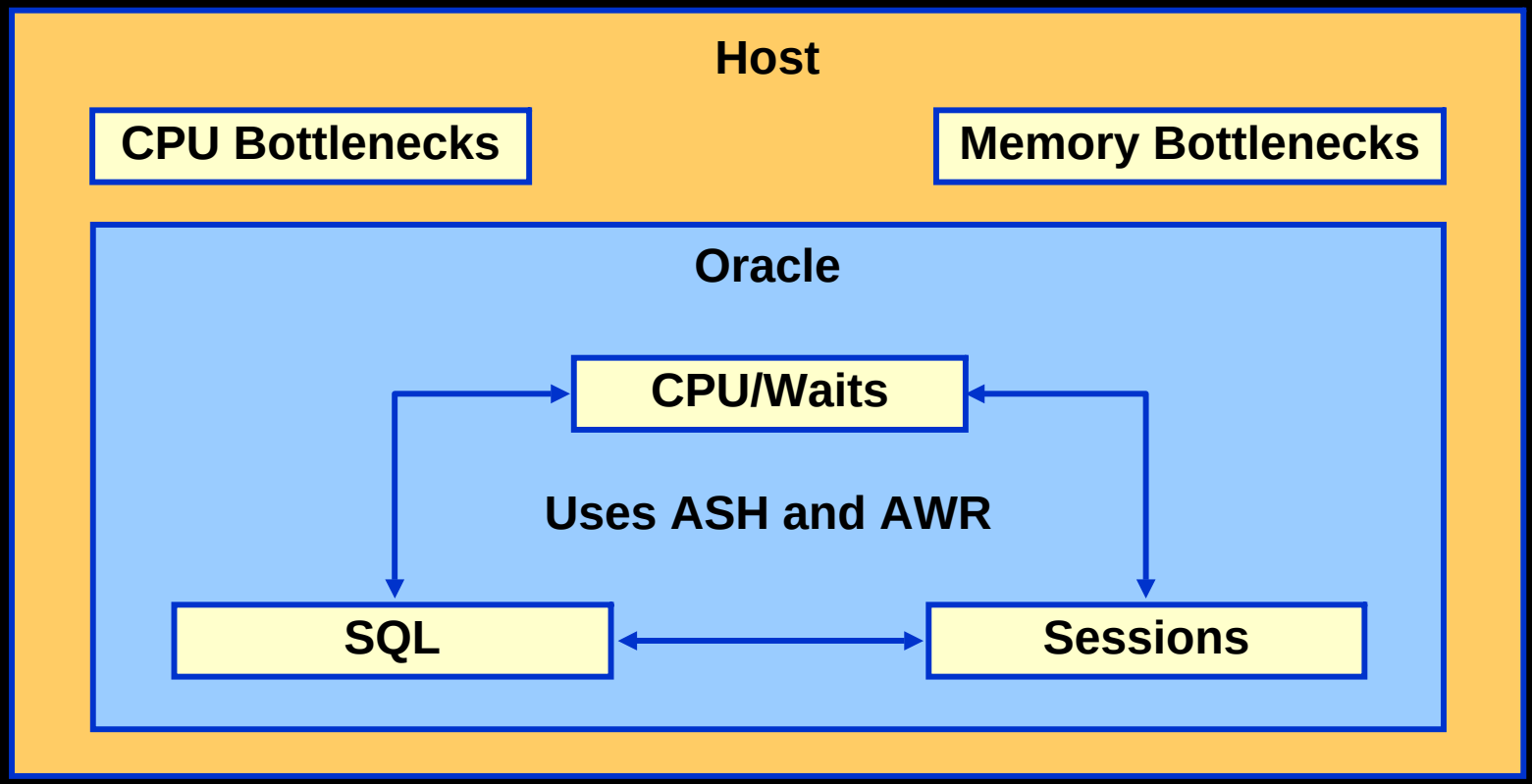
Show All Details | Hide All Details

Details	Category	Benefit (minutes)
Hide	SCHEMA	57.56
Action	**Consider using ORACLE's recommended solution of bitmapped segments in a locally managed tablespace for the tablespace "USERS" containing the database object "SCOTT.TOTO" with object id 41560.**	
Hide	SCHEMA	57.56
Action	**Consider partitioning "SCOTT.TOTO" with object id 41560 in a manner that will evenly distribute concurrent DML across multiple partitions.**	
Hide	SCHEMA	57.56
Action	**A temporary solution may be achieved by increasing the number of free lists in segment "SCOTT.TOTO".**	

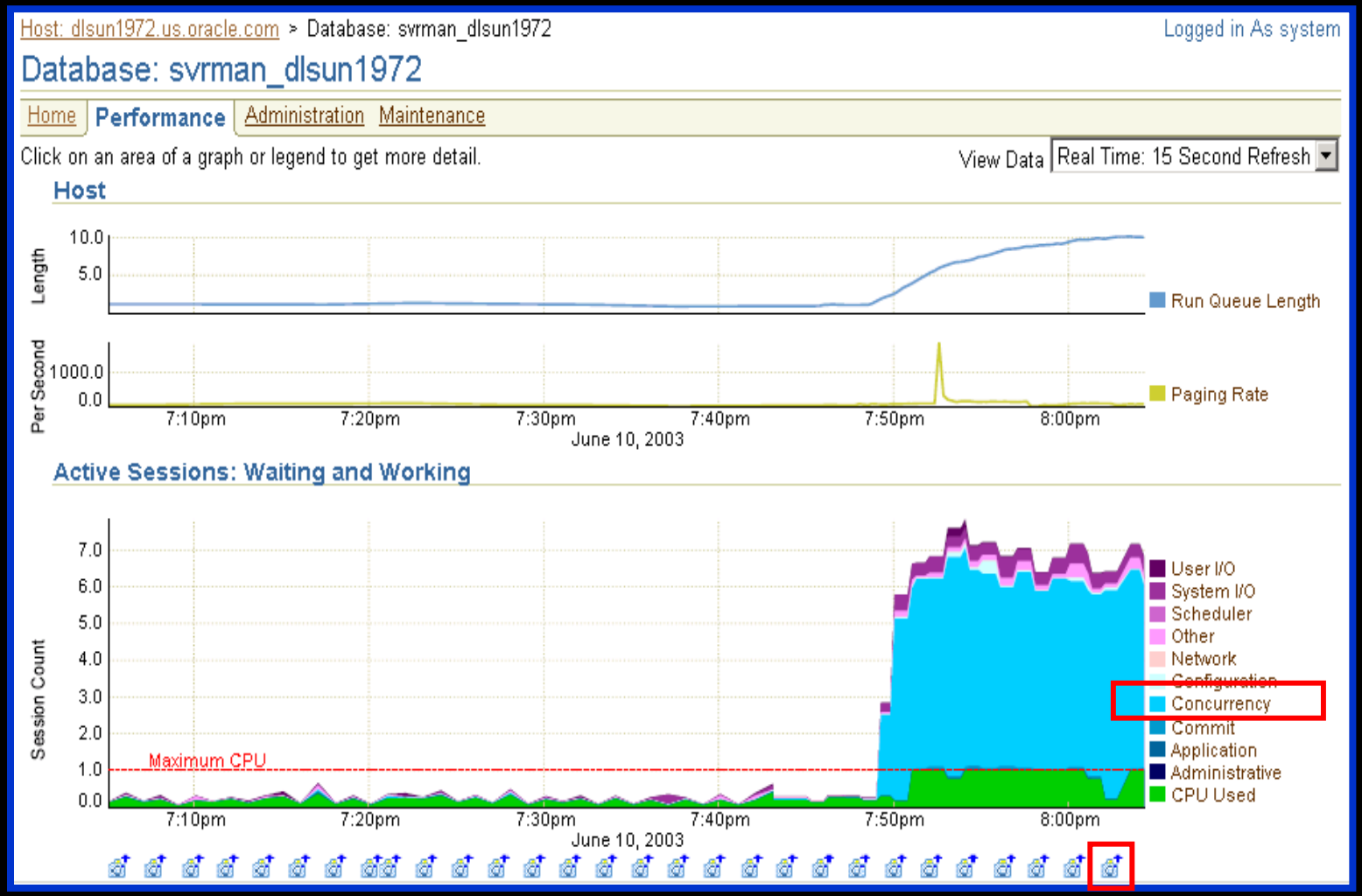
Performance Monitoring Solutions



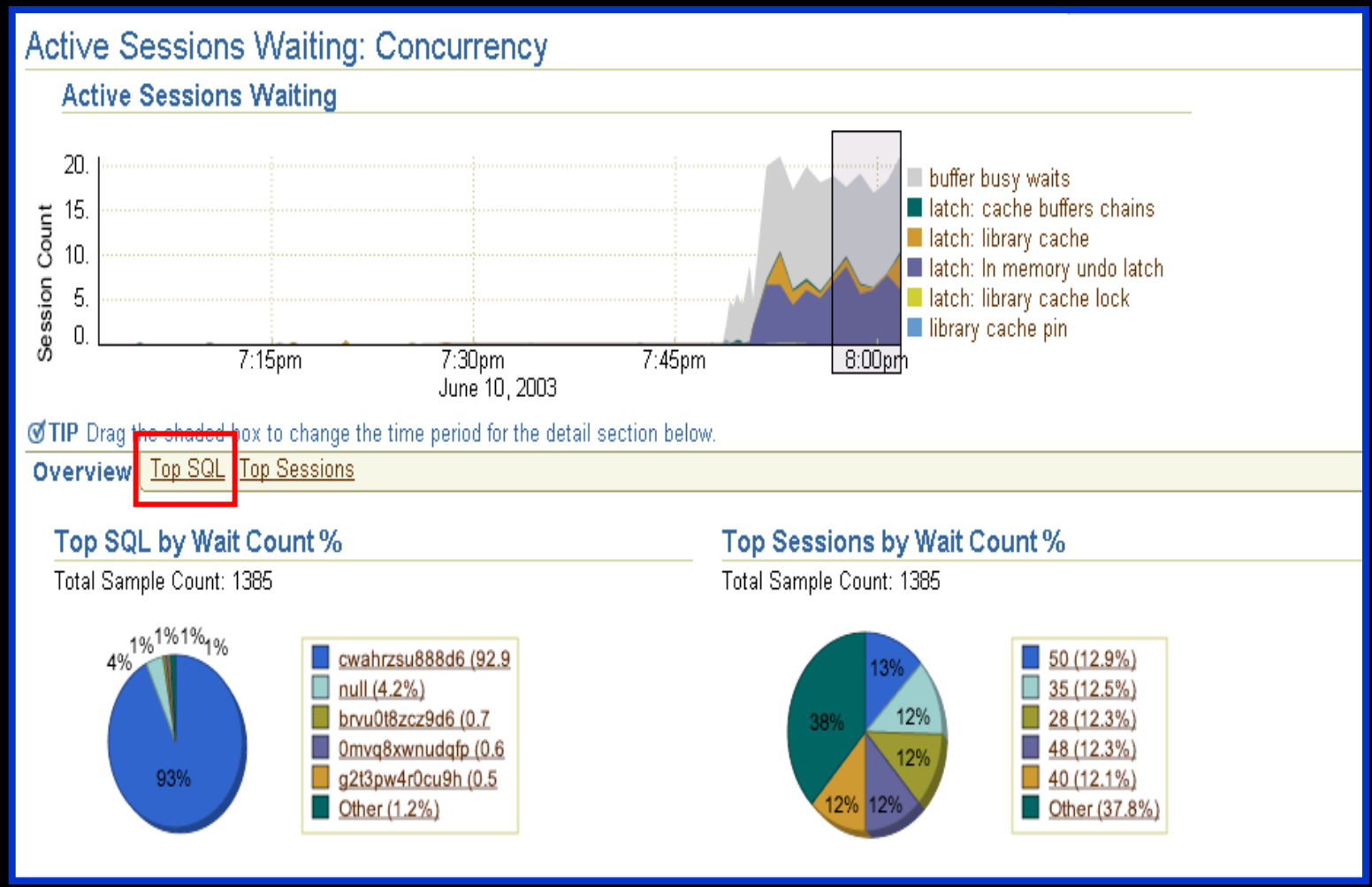
Performance Management Approach



Database Performance Page

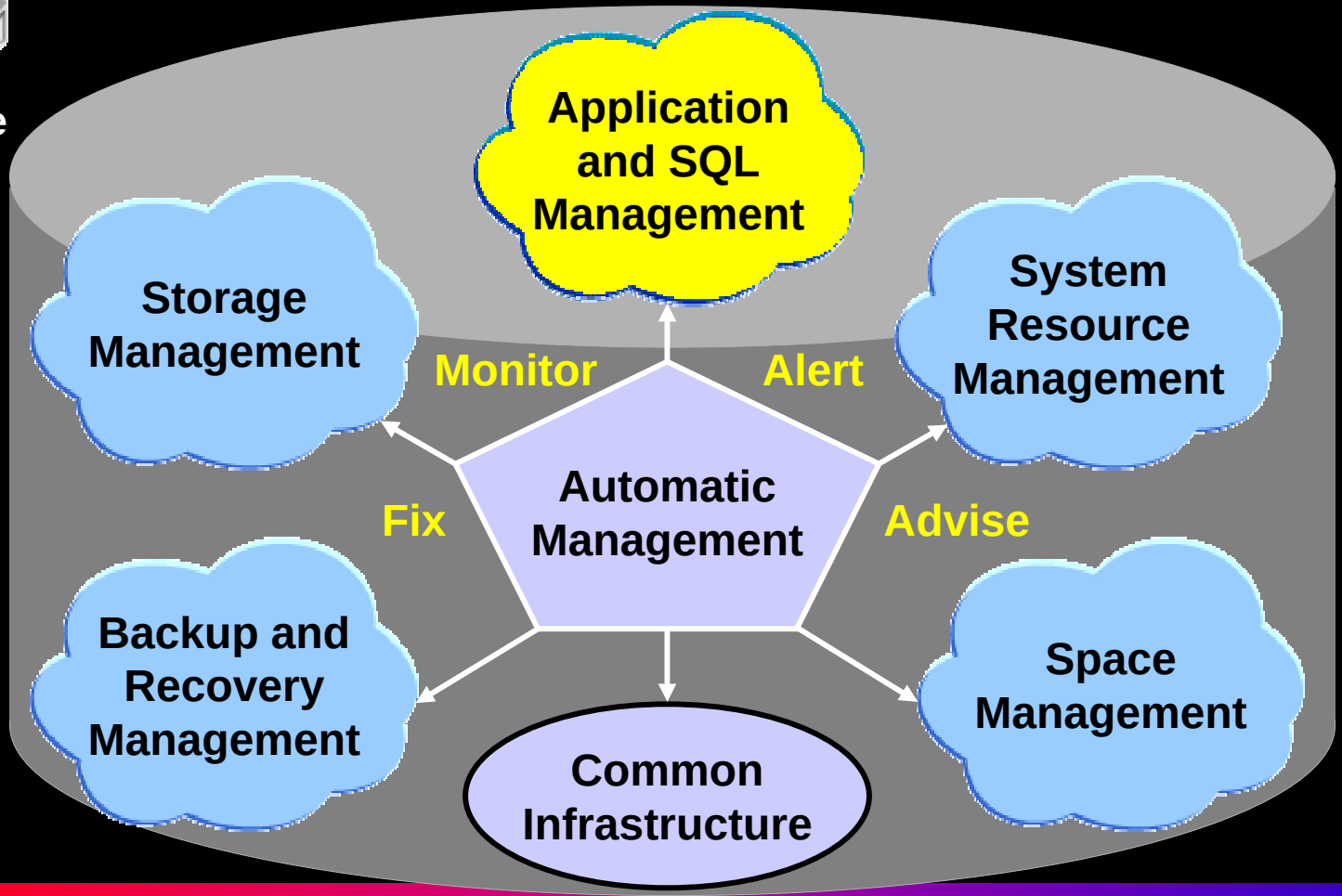


Concurrency Wait Class: Drill Down

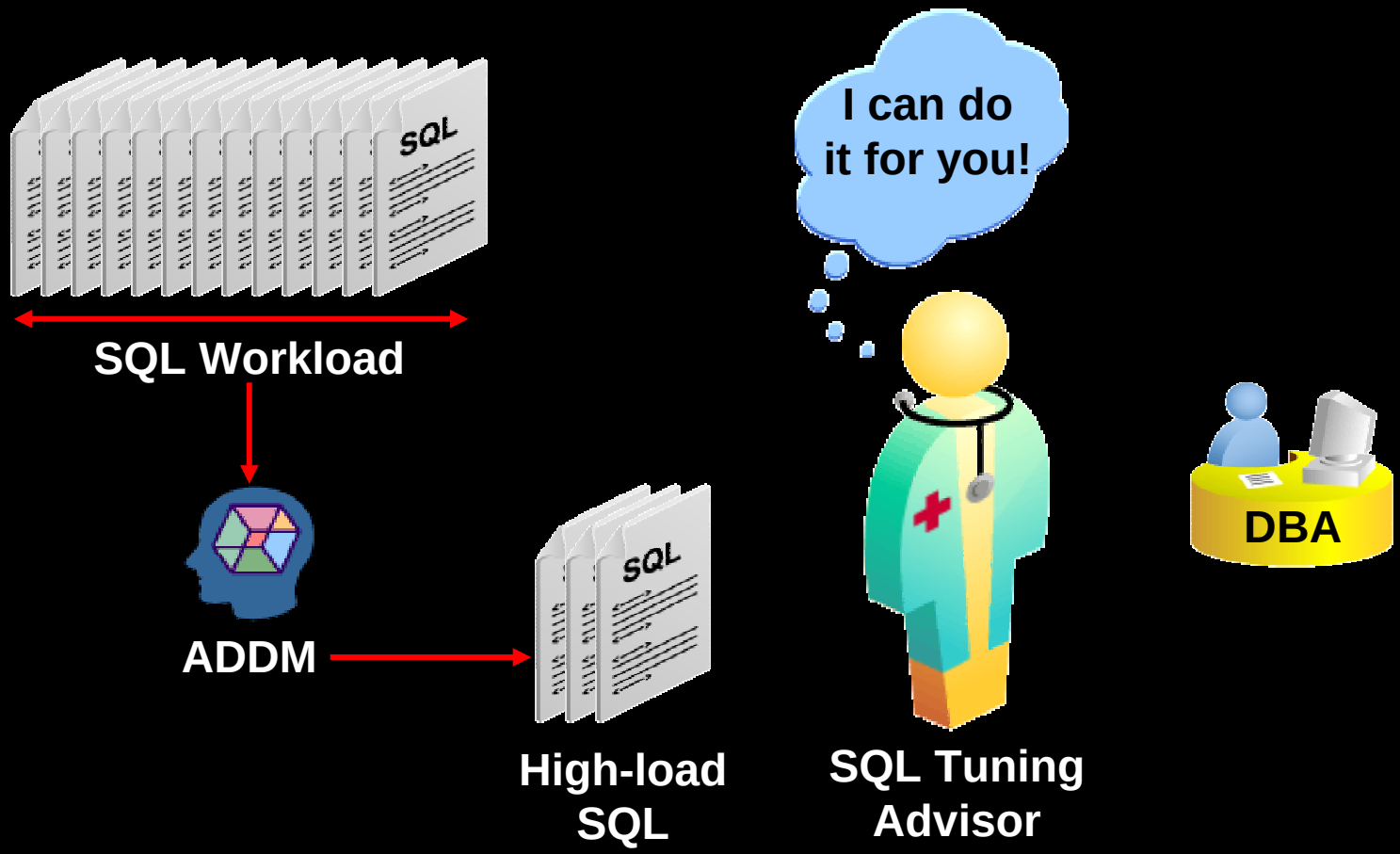


Solution: Self-Managing Database

Enterprise Manager Database Console



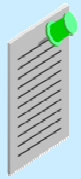
Automate the SQL Tuning Process



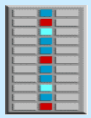
SQL Tuning Advisor Overview

Automatic Tuning Optimizer

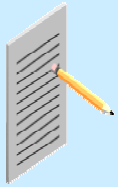
Statistics Check Optimization Mode



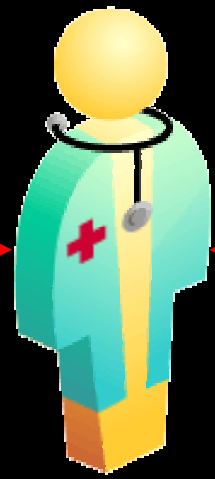
Plan Tuning Optimization Mode



Access Analysis Optimization Mode



SQL Analysis Optimization Mode



SQL Tuning Advisor

Comprehensive SQL Tuning

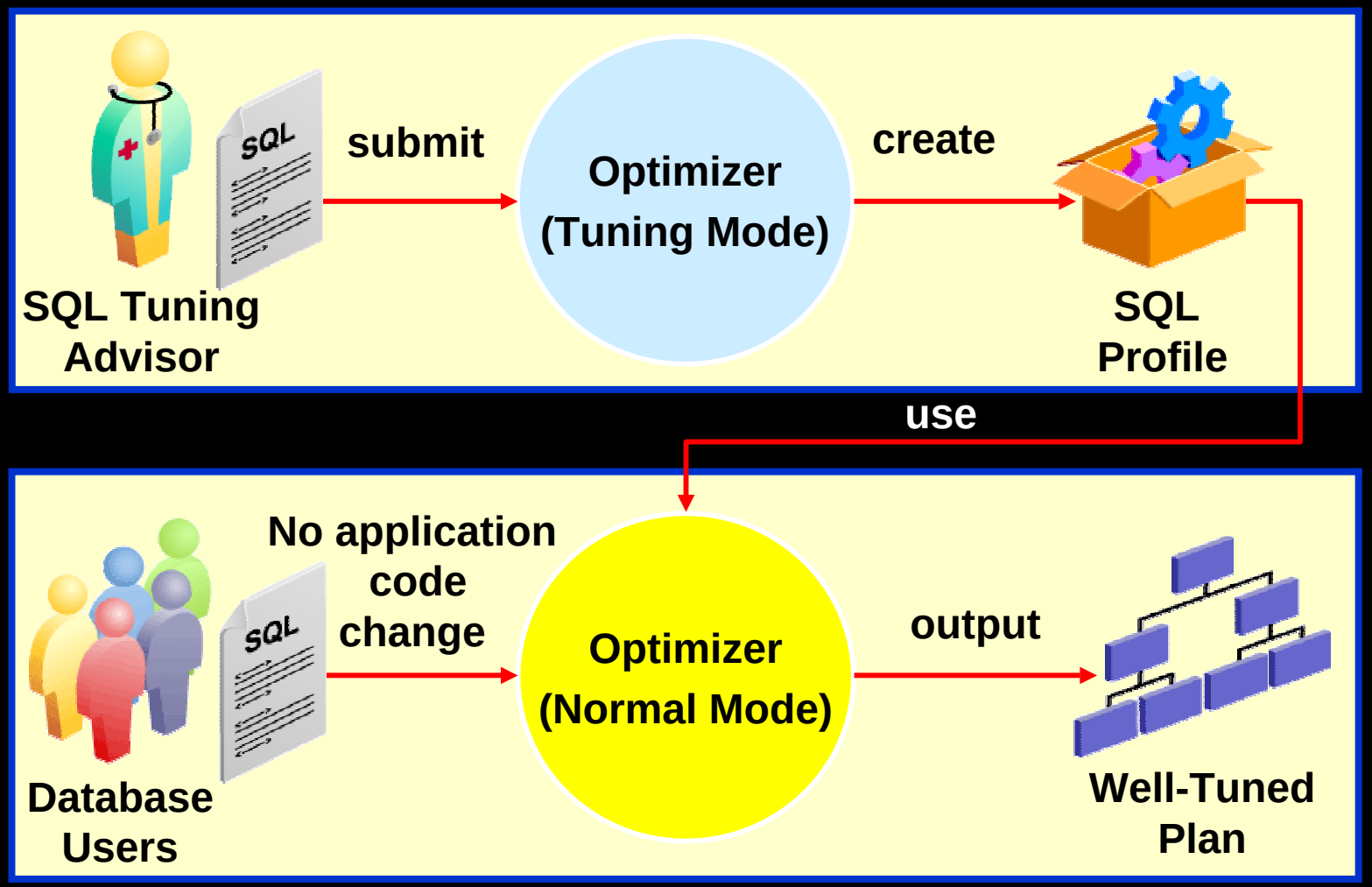
Detect Stale or Missing Statistics

Plan Tuning (SQL Profile)

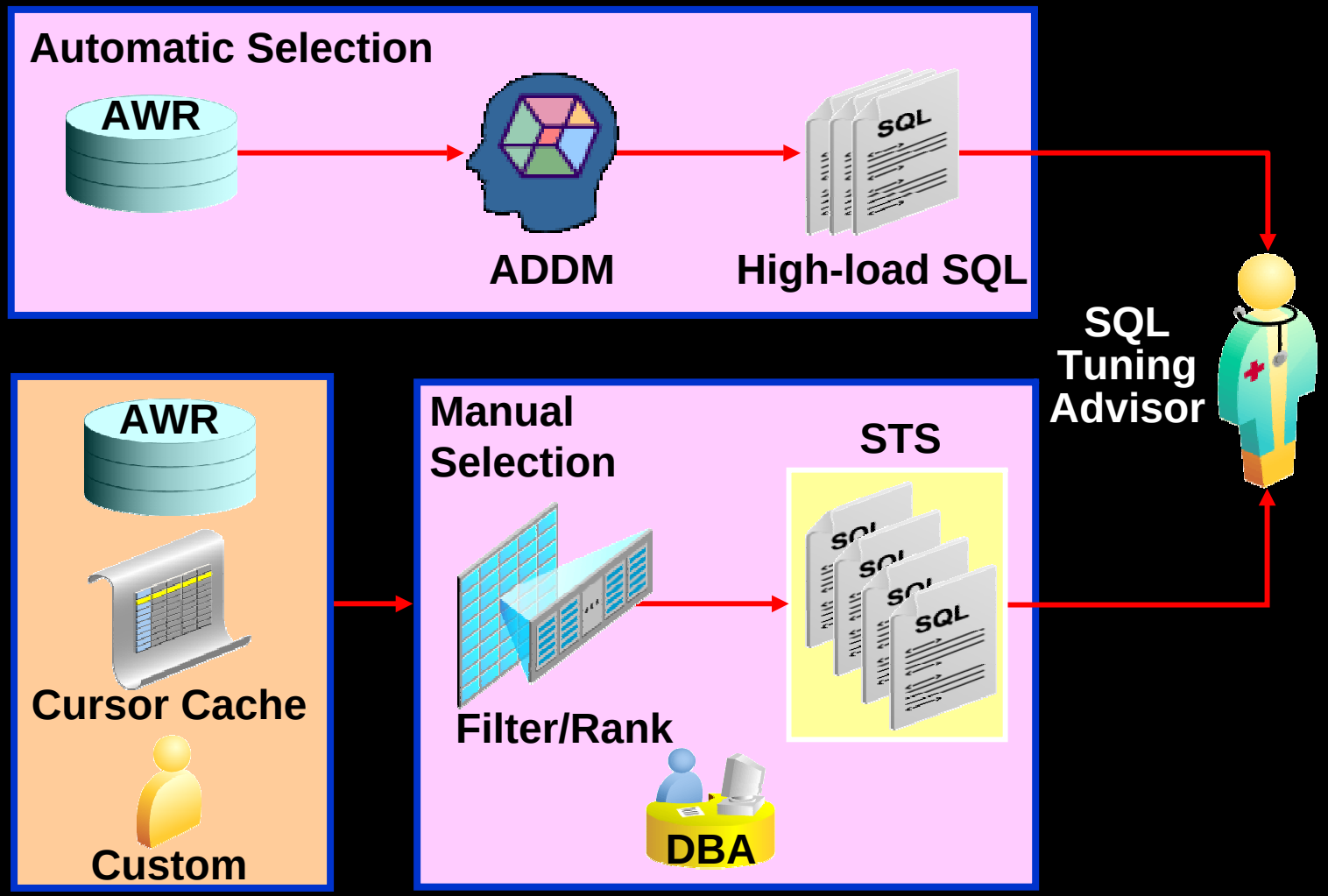
Add Missing Index Run Access Advisor

Restructure SQL

Plan Tuning Flow

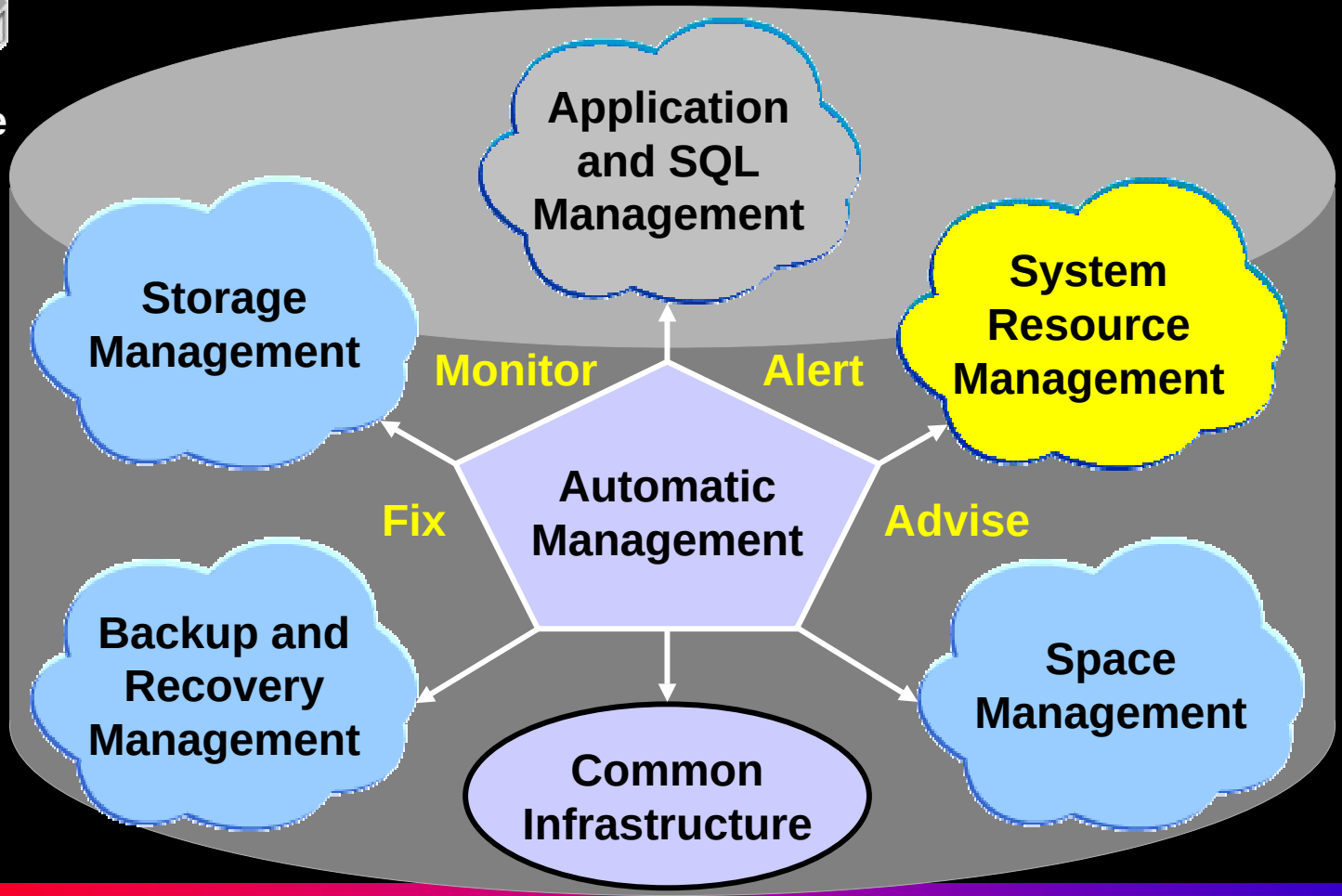


SQL Tuning Advisor Usage Model

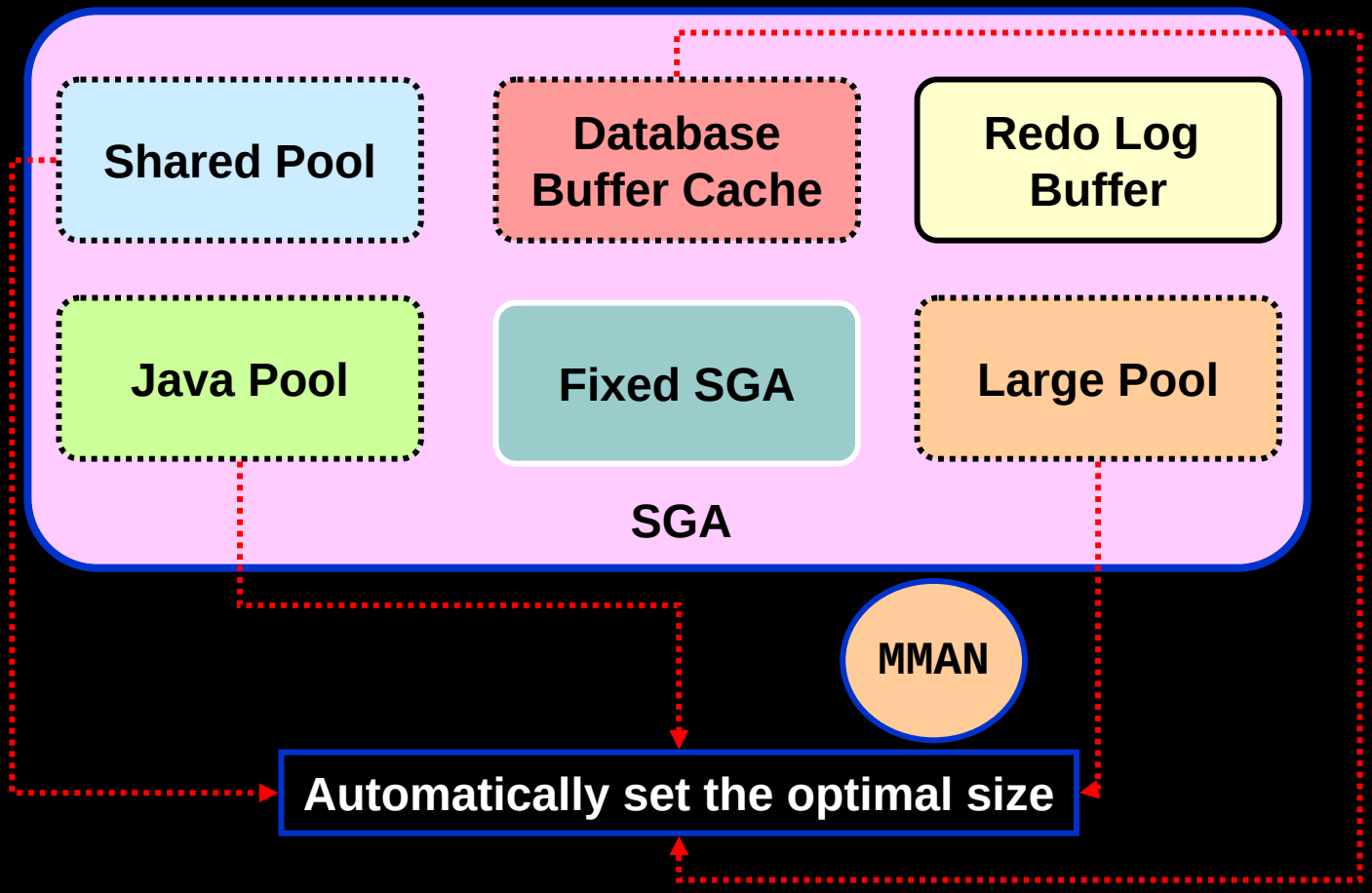


Solution: Self-Managing Database

Enterprise Manager Database Console

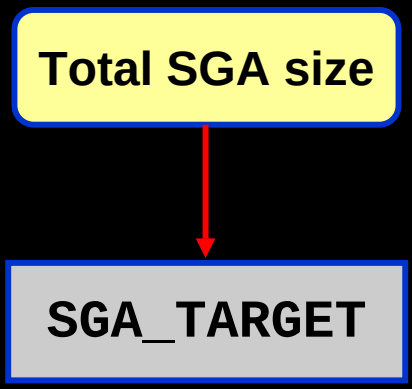


Overview of Automatic Shared Memory Management

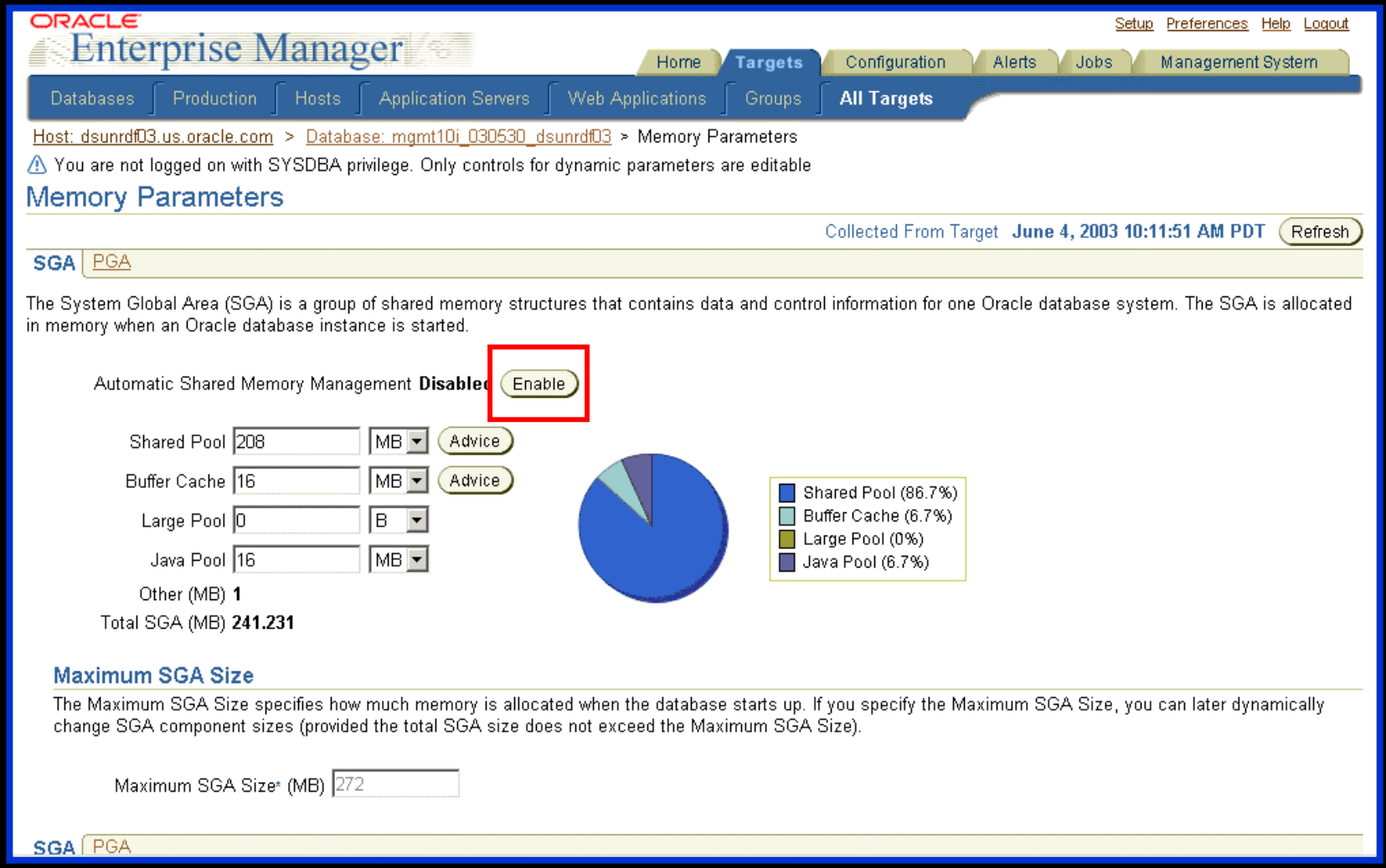


Benefits of Automatic Shared Memory Management

DB_CACHE_SIZE
SHARED_POOL_SIZE
LARGE_POOL_SIZE
JAVA_POOL_SIZE

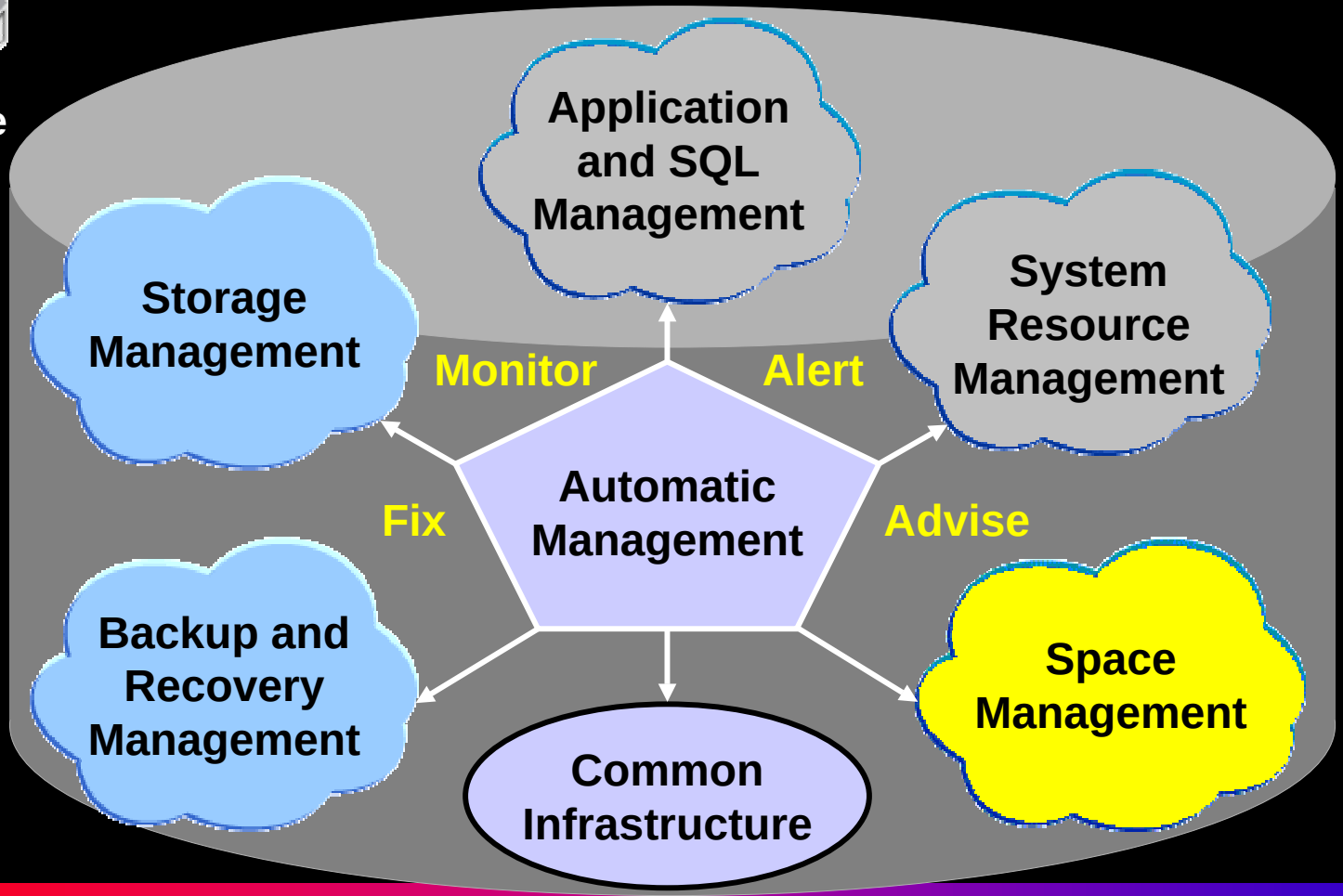


Using EM to Configure Automatic Shared Memory Management

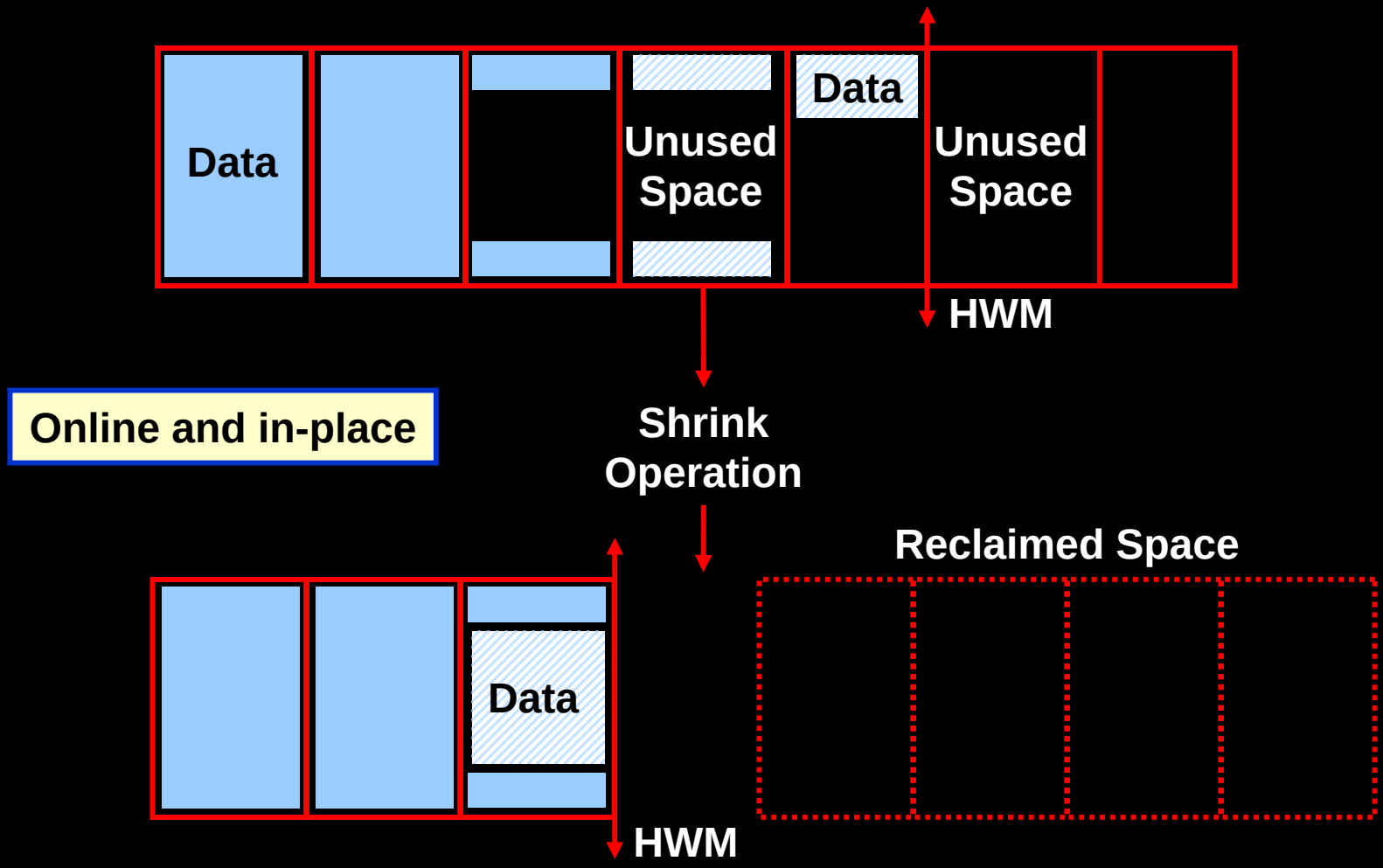


Solution: Self-Managing Database

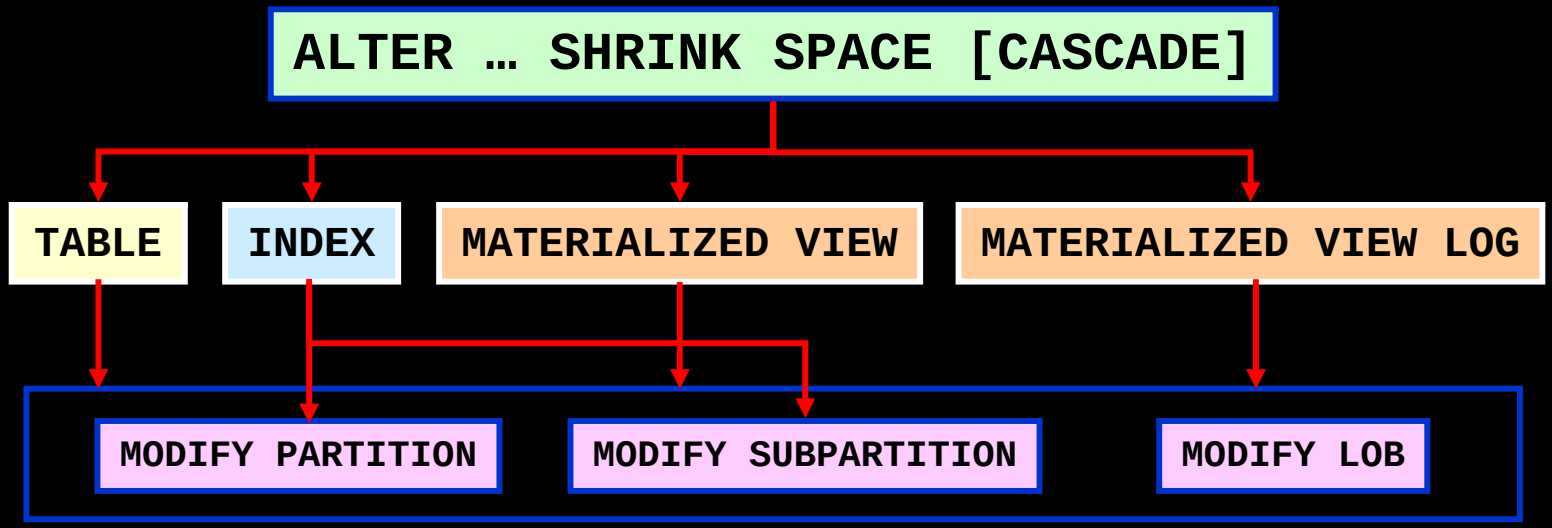
Enterprise Manager Database Console



Segment Shrink Overview



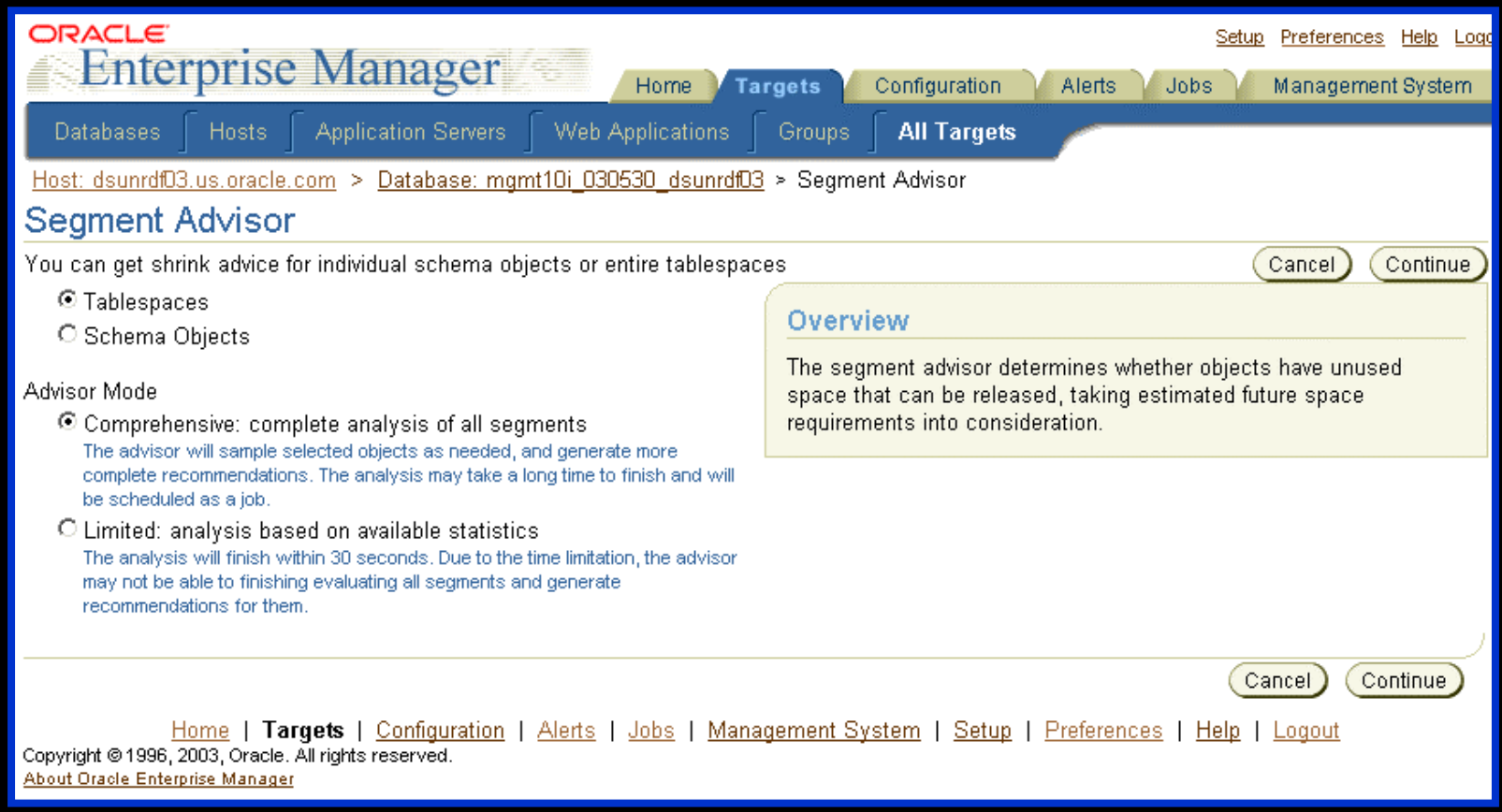
How Can I Shrink Segments?



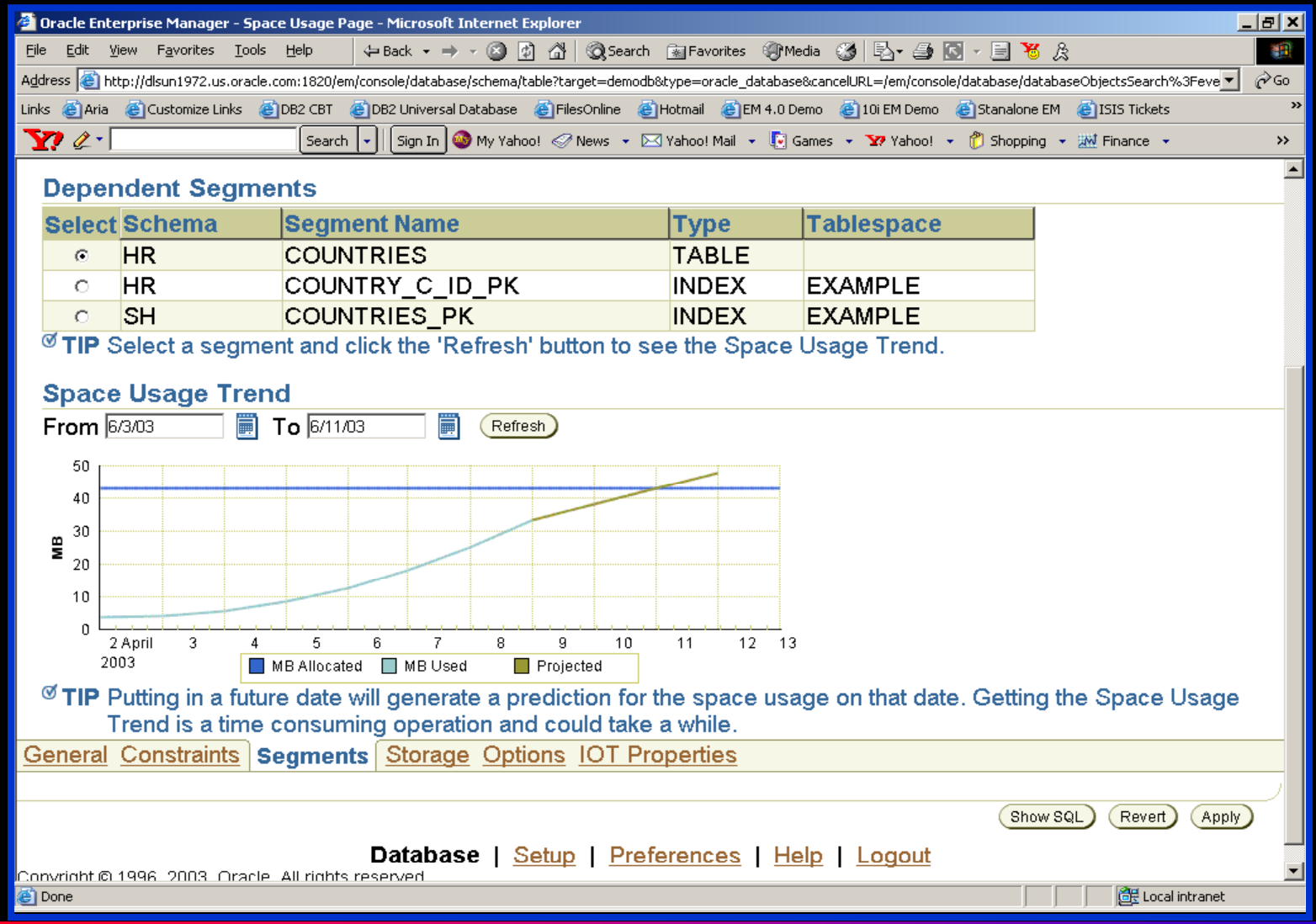

```
ALTER TABLE employees ENABLE ROW MOVEMENT;   1
```

```
ALTER TABLE employees SHRINK SPACE CASCADE;   2
```

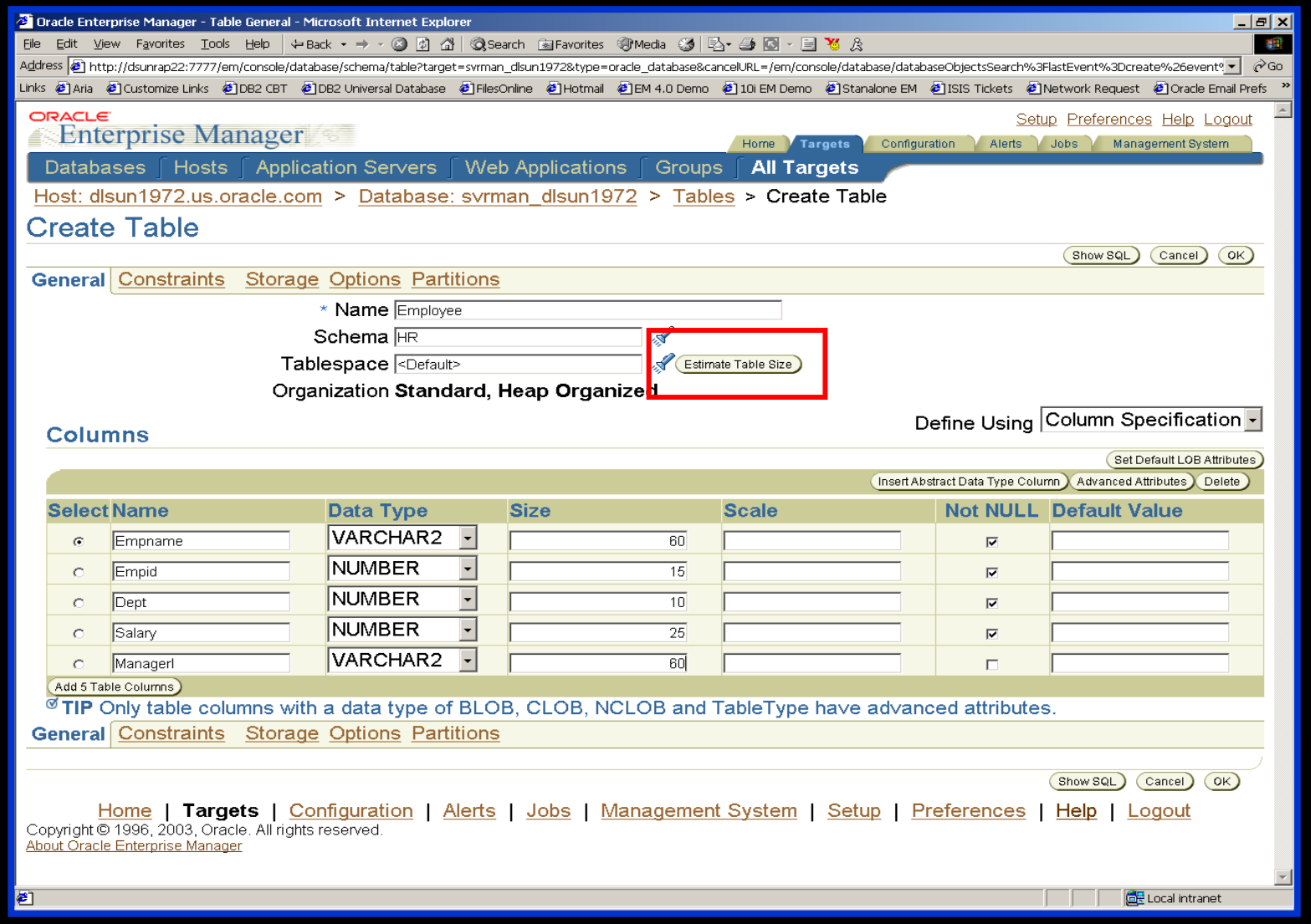
Segment Advisor



Growth Trend Report

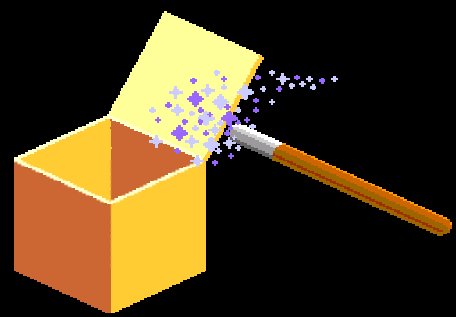


Segment Resource Estimation

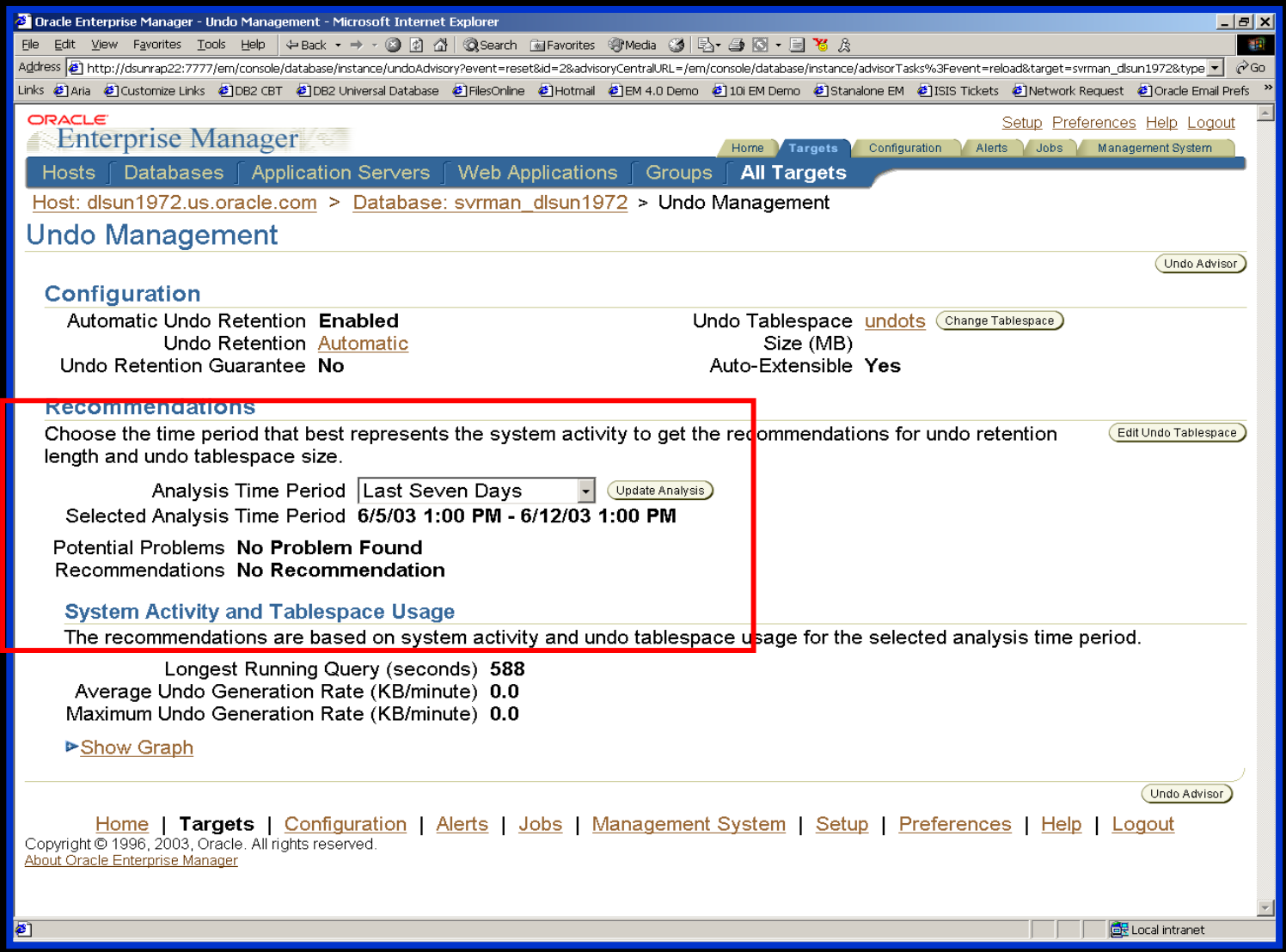


Automatic Undo Retention Tuning

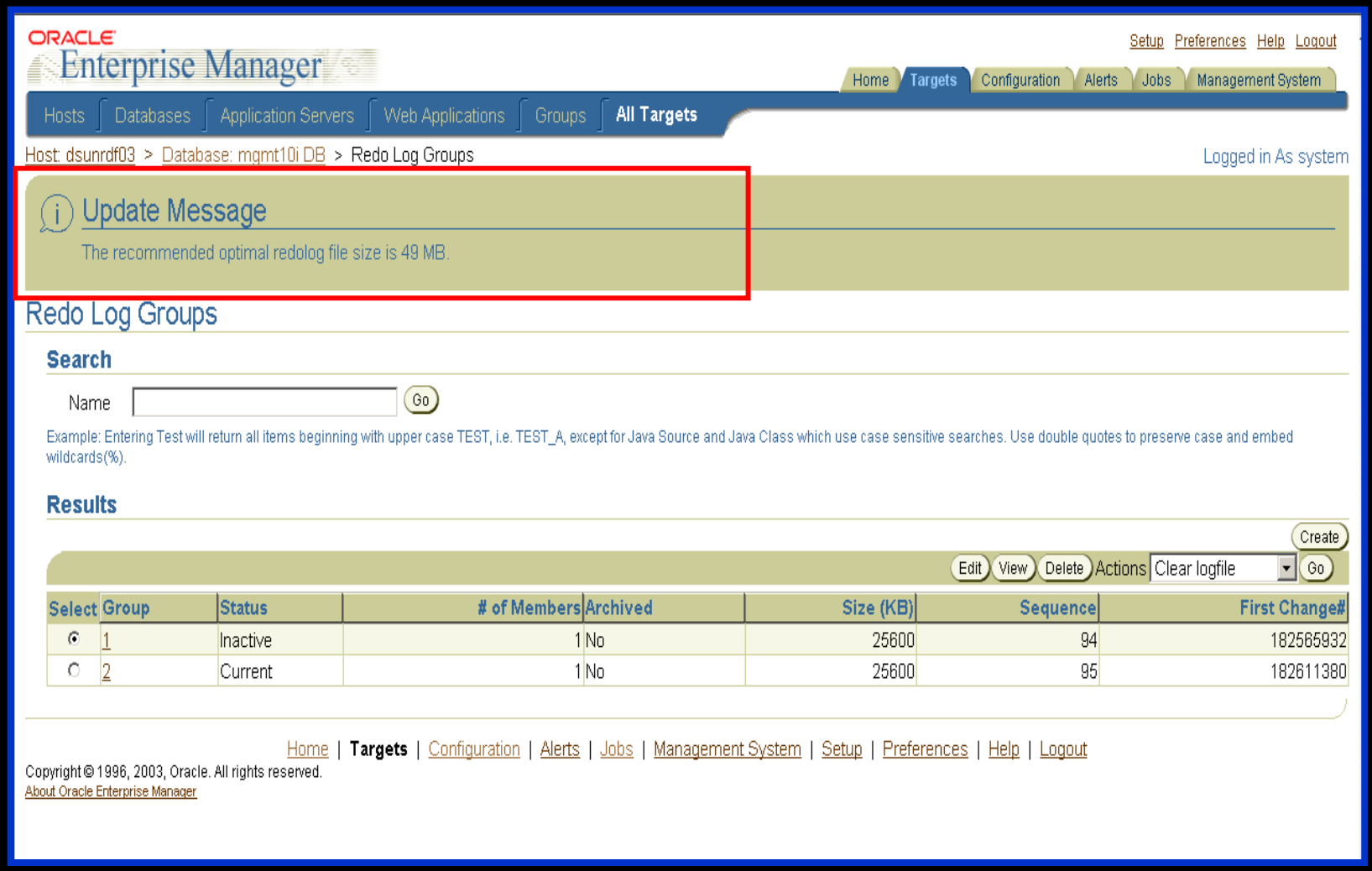
- Proactive tuning
  - Undo retention is tuned for longest-running query.
  - Query duration information is collected every 30 seconds.
- Reactive tuning
  - Undo retention is gradually lowered under space pressure.
  - Oldest unexpired extents are used first.
- Enabled by default



Undo Advisor

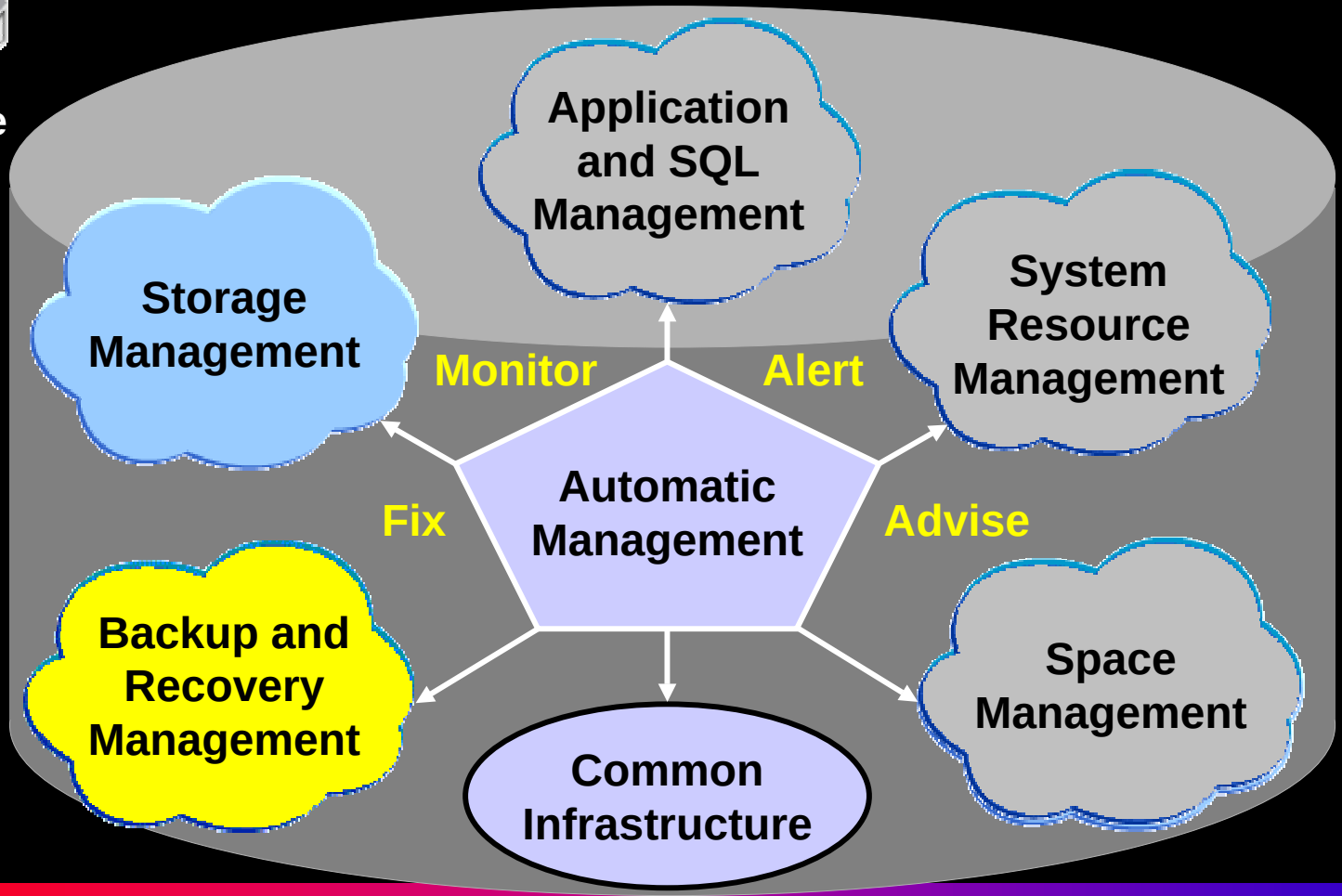


Redo Logfile Size Advisor

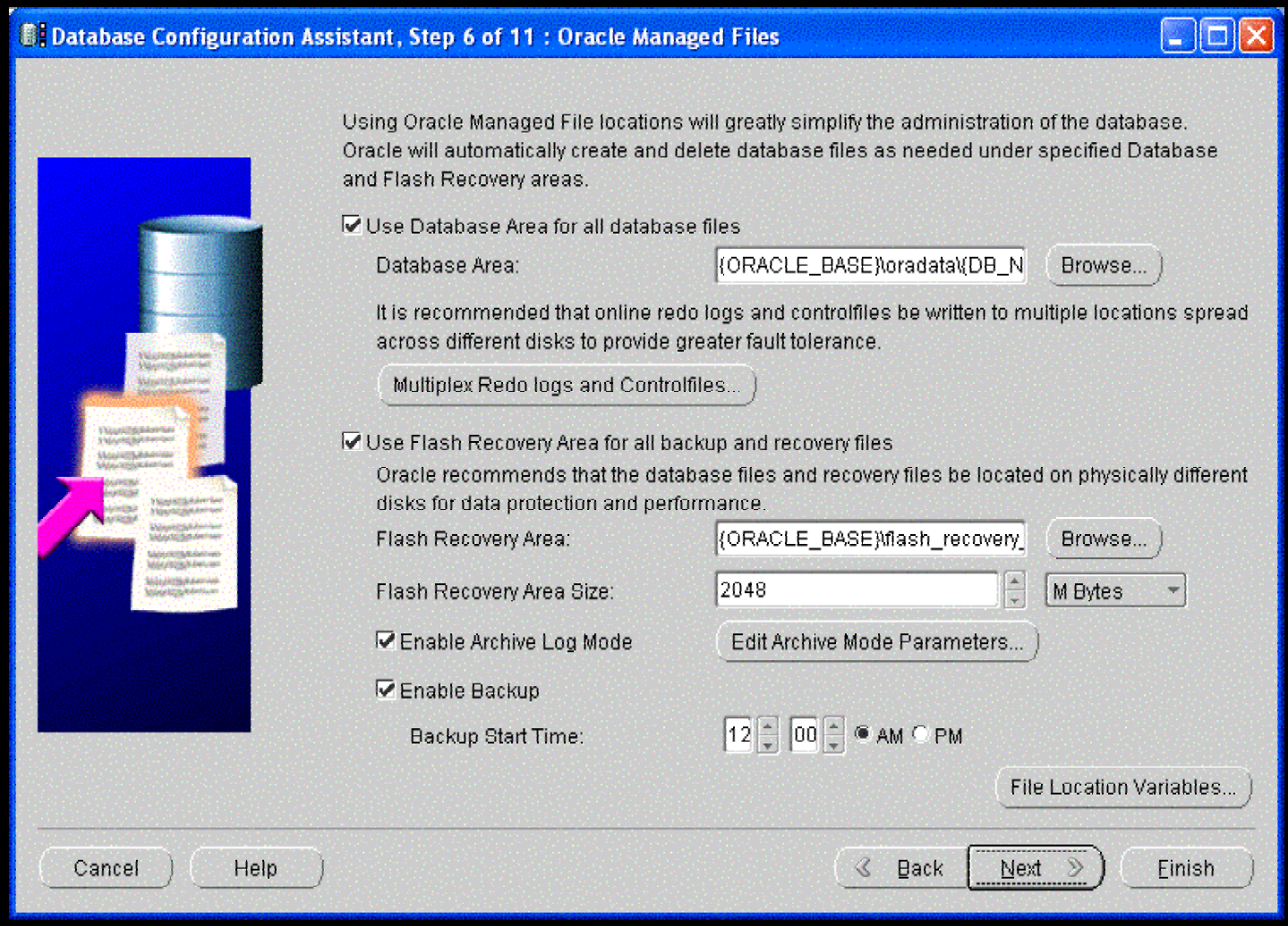


Solution: Self-Managing Database

Enterprise Manager Database Console

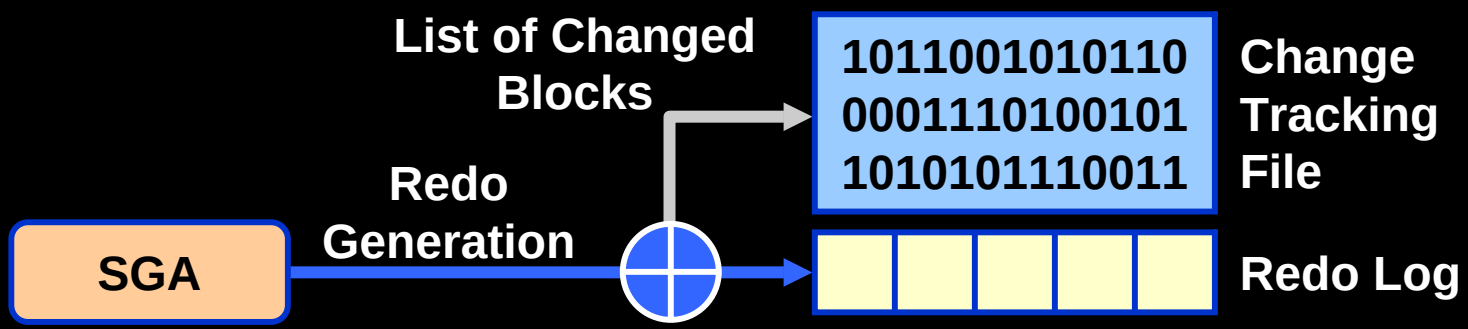


Automatic Backup (DBCA Setup)

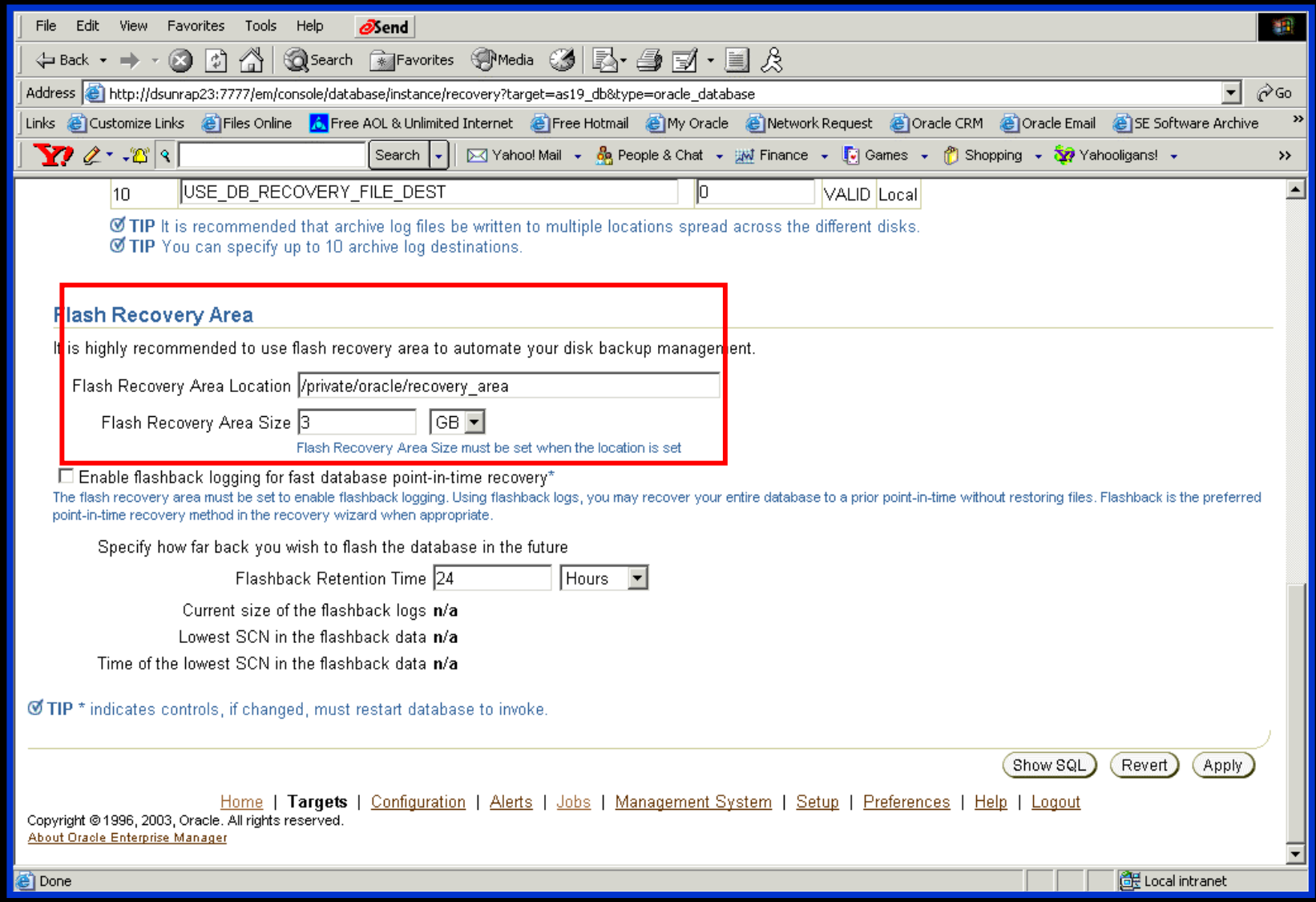


Optimized Incremental Backup

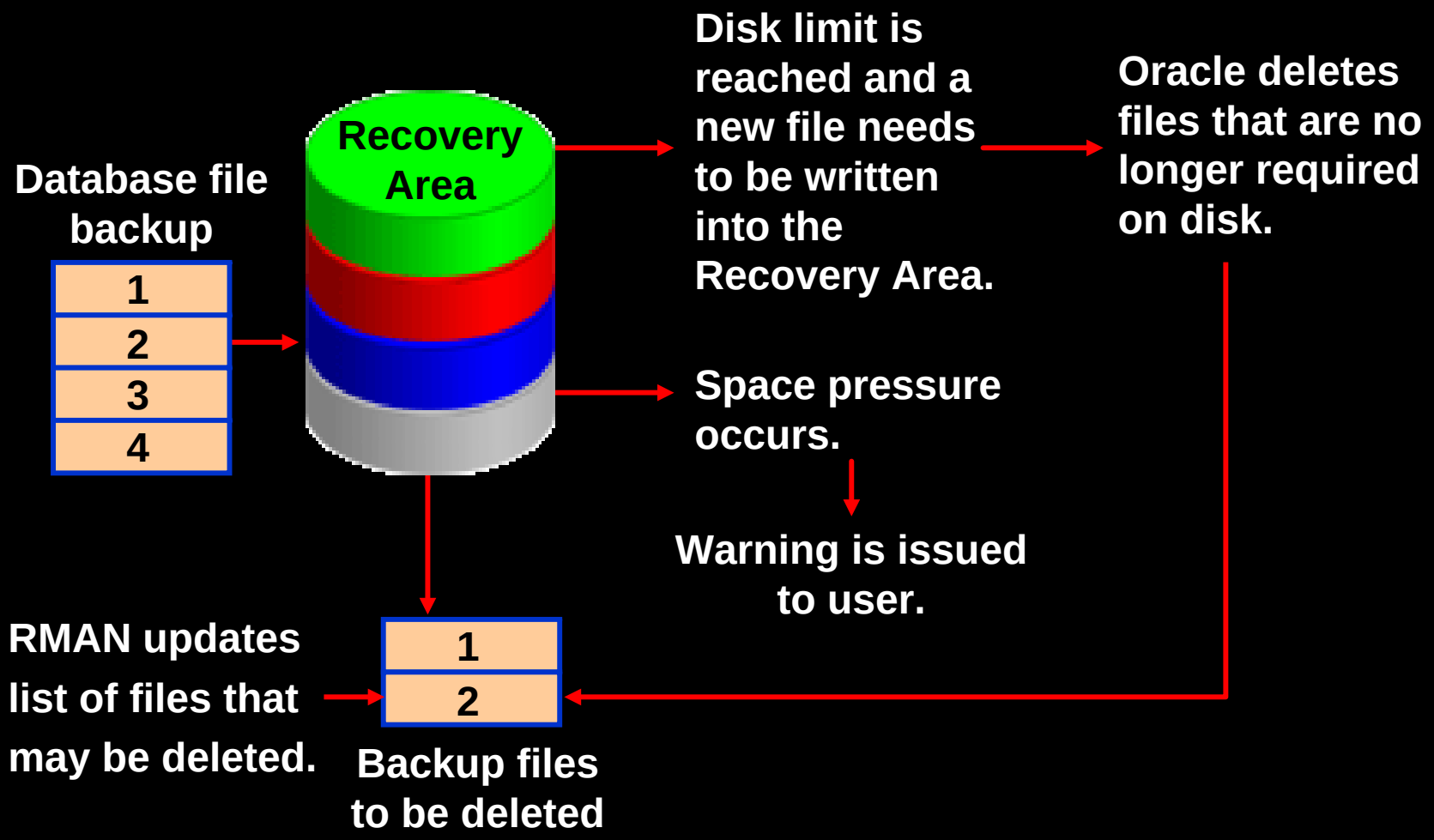
- Optimizes incremental backups
  - Tracks which blocks have changed since last backup
- Oracle Database 10*g* has integrated change tracking.
  - New Change Tracking File is introduced.
  - Changed blocks are tracked as redo is generated.
  - Database backup automatically uses changed block list.



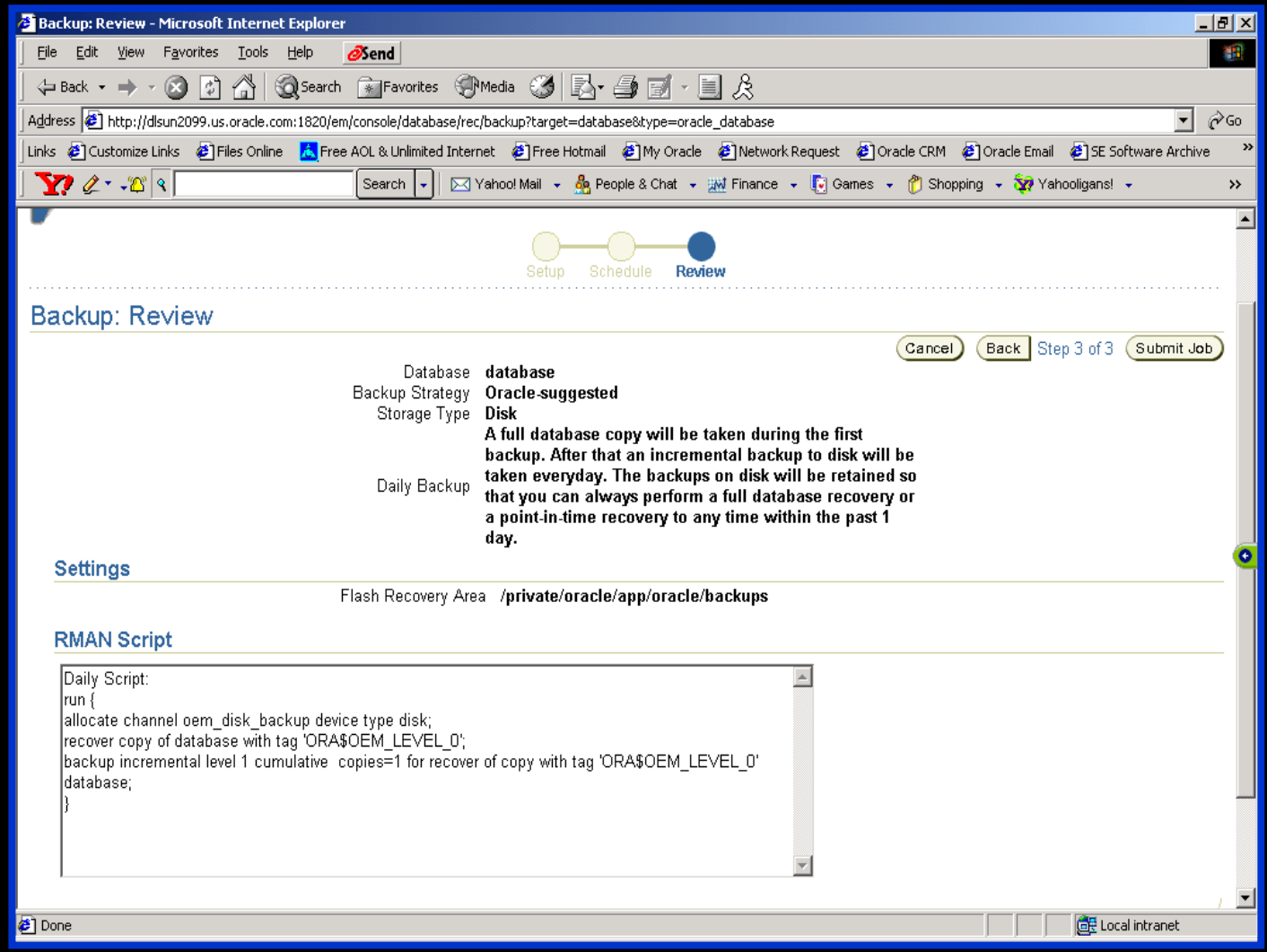
Defining Flash Recovery Area



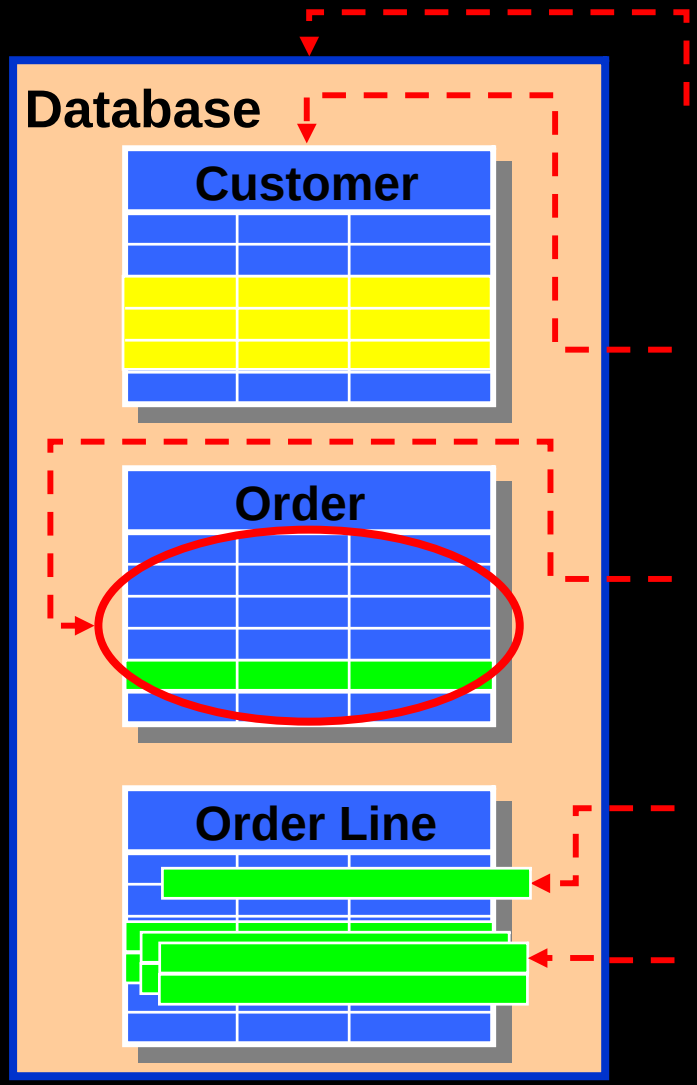
Flash Recovery Area Space Management



Suggested Strategy



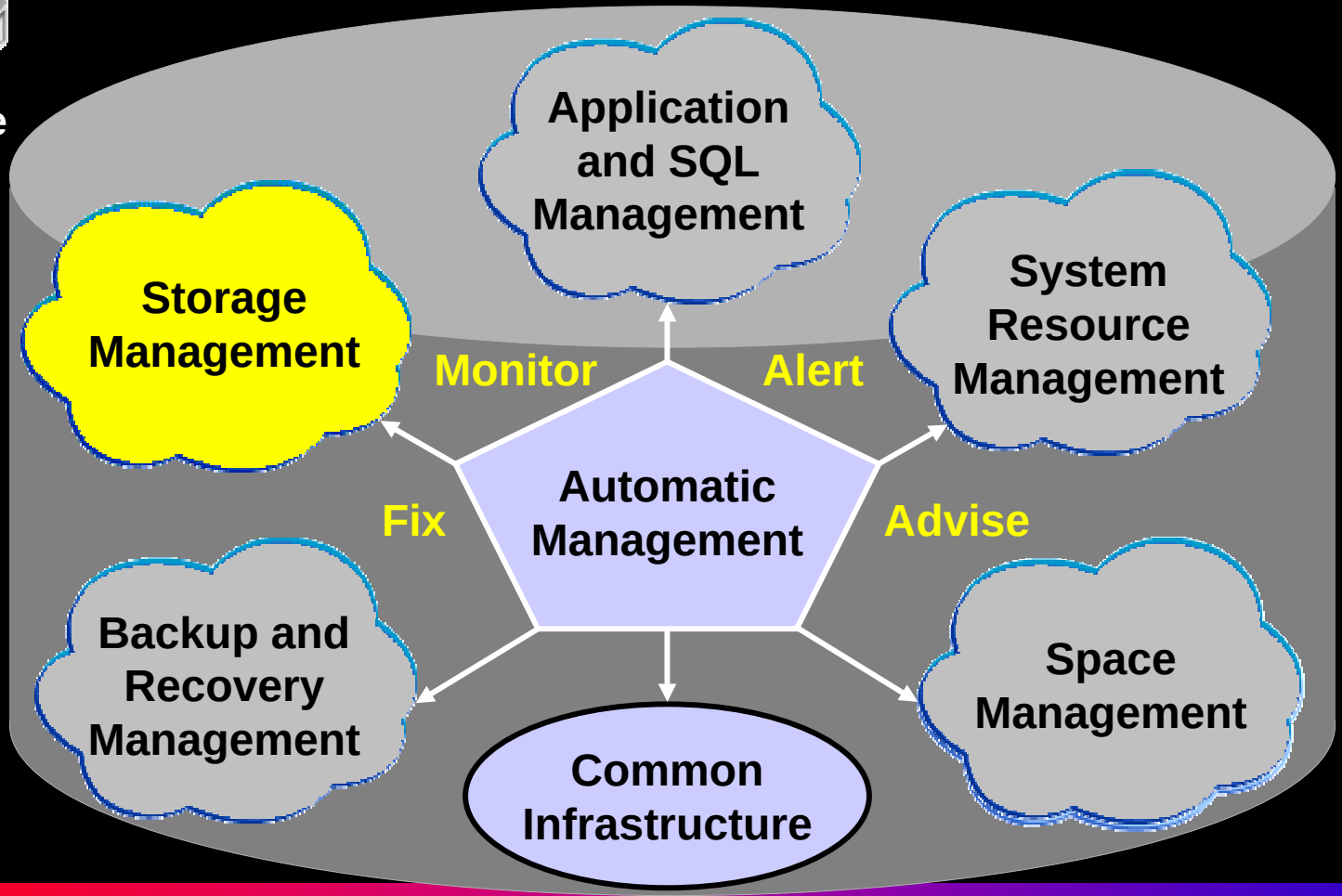
Flashback Error Correction



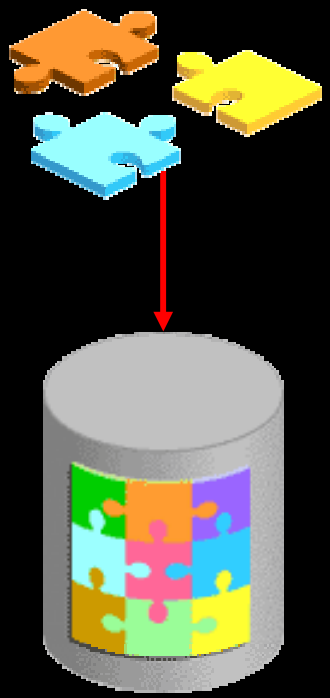
- Flashback Database
  - Restore database to time
  - Uses flashback logs
- Flashback Drop
  - Restore dropped table
  - Uses recycle bin
- Flashback Table
  - Restore all rows in table to time
  - Uses `UNDO` in database
- Flashback Transaction Query
  - Query a committed Txn
- Flashback Versions Query
  - Query changes to rows over time

Solution: Self-Managing Database

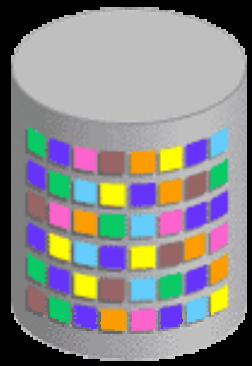
Enterprise Manager Database Console



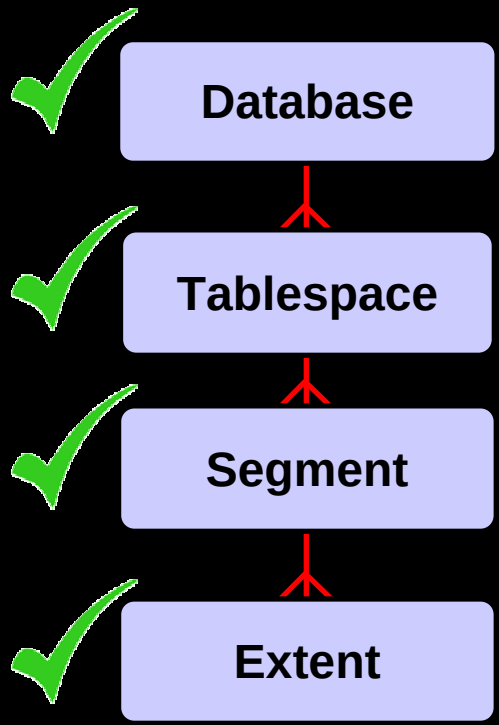
What Is Automatic Storage Management



ASM manages Oracle files.

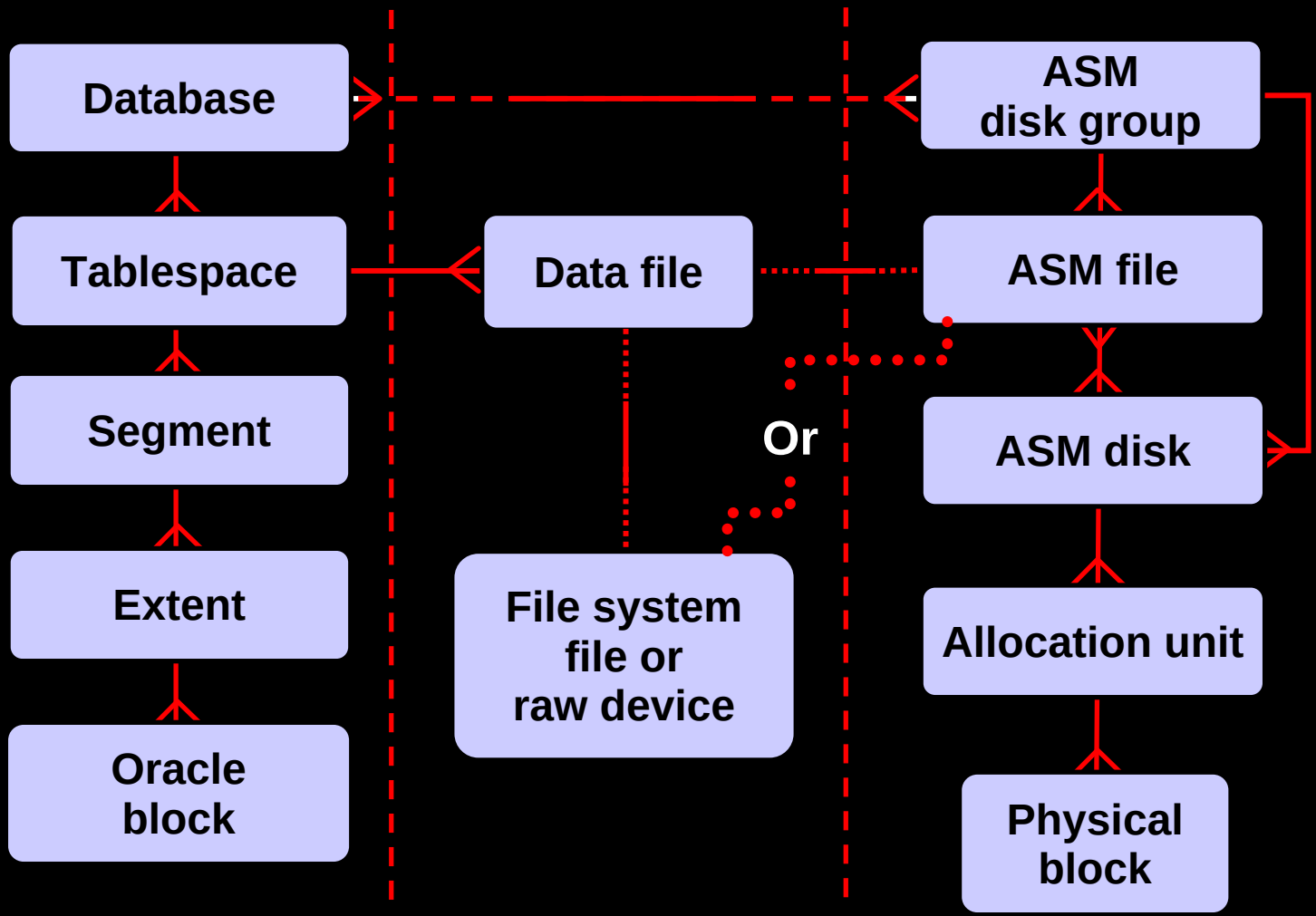


ASM solves management problems of Oracle databases.



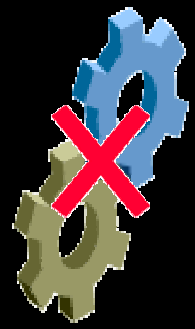
ASM does *not* replace existing concepts.

Hierarchy

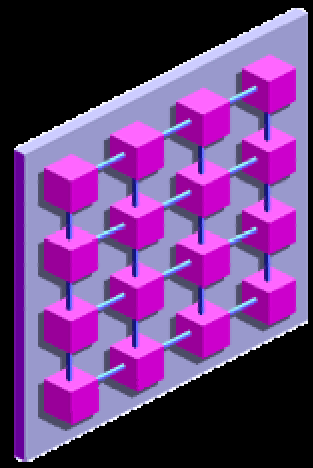

Database
Tablespace
Segment
Extent
Oracle block
Data file
File system file or raw device
Or
ASM disk group
ASM file
ASM disk
Allocation unit
Physical block

ASM Benefits

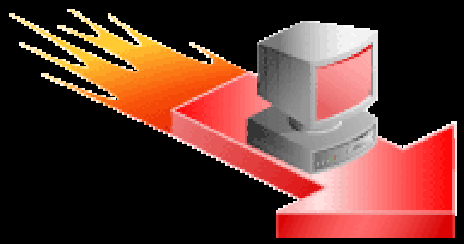
Reduces the cost of managing storage



Reduces administration complexity



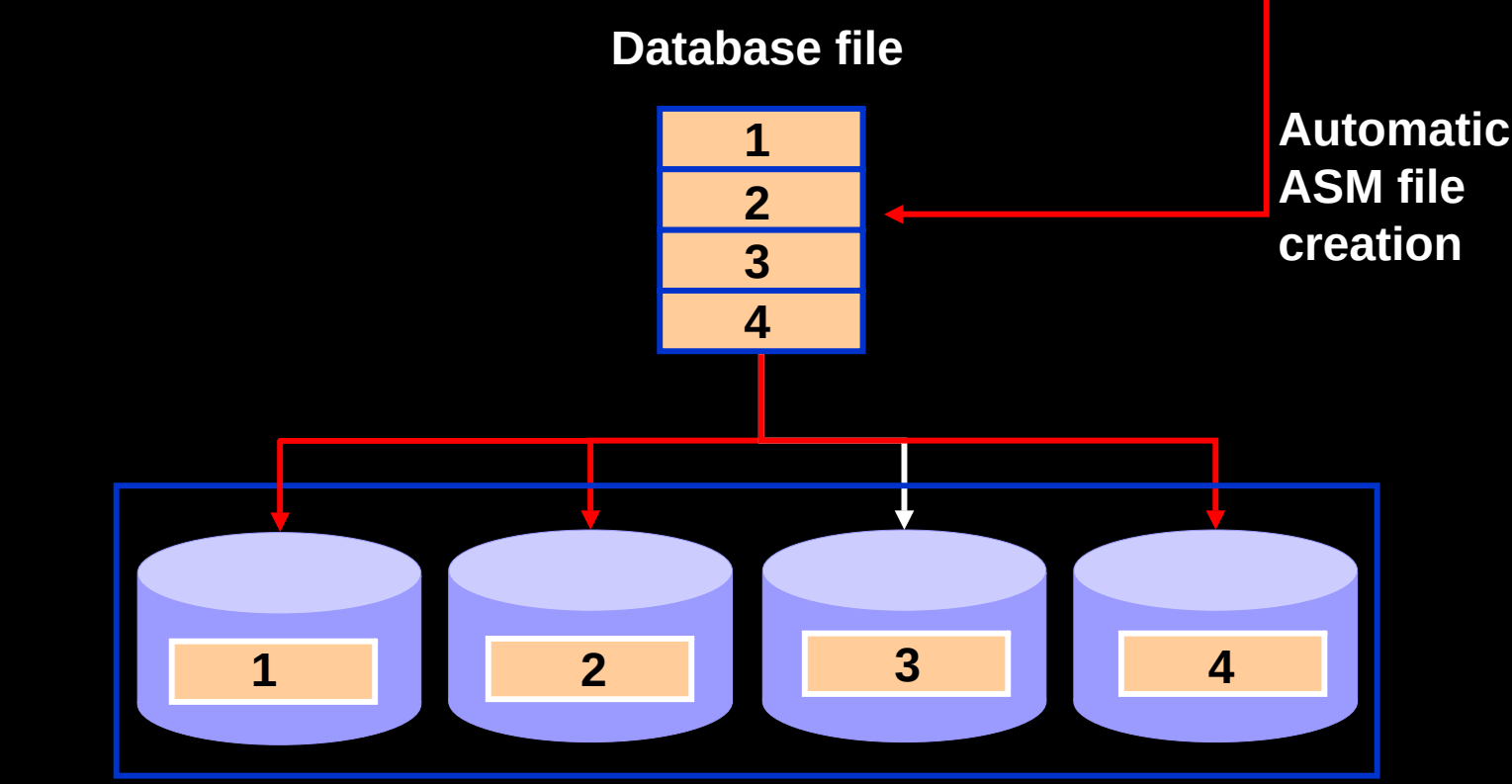
Supports RAC



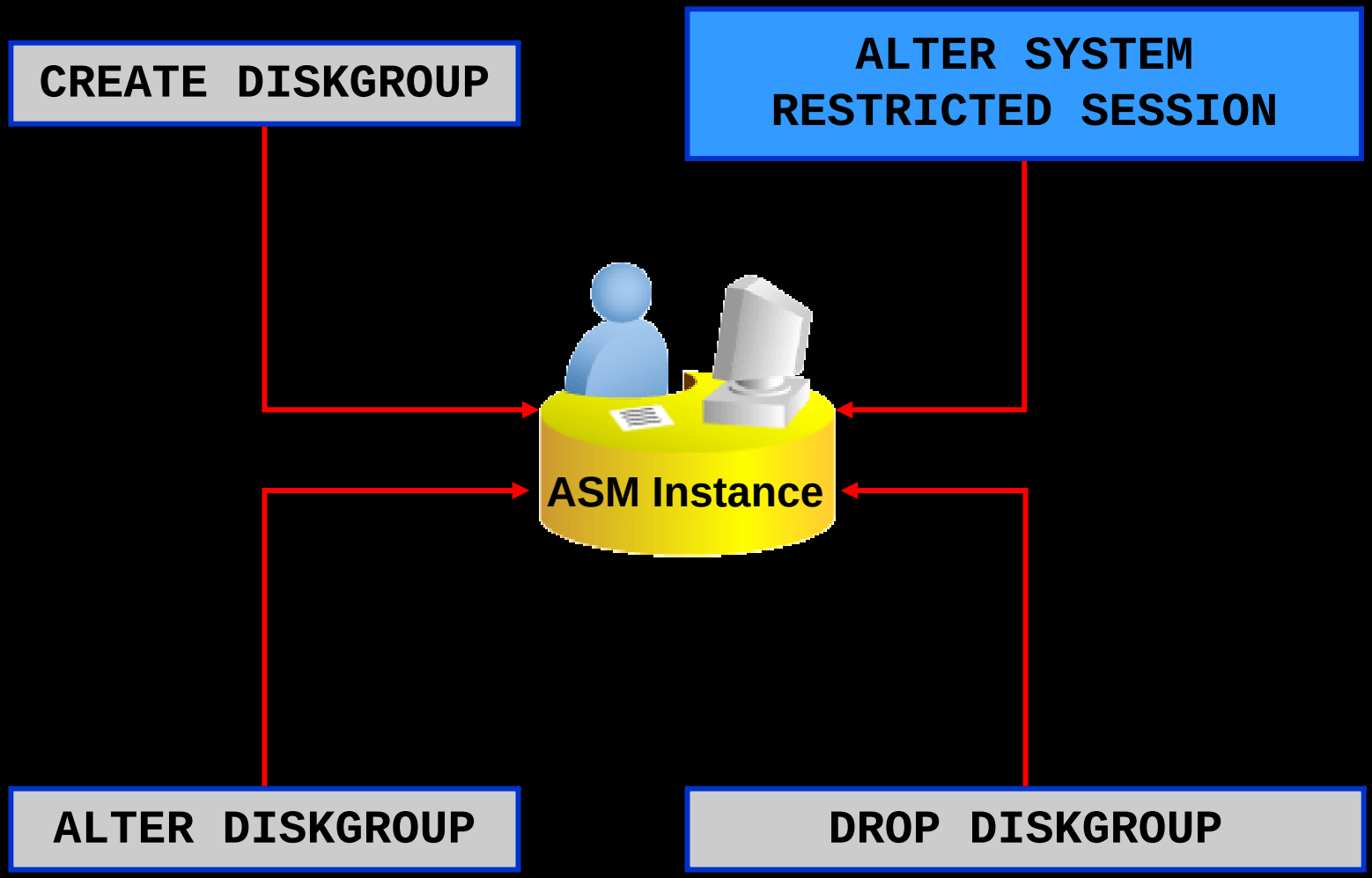
Improves performance, scalability, and reliability

ASM Files

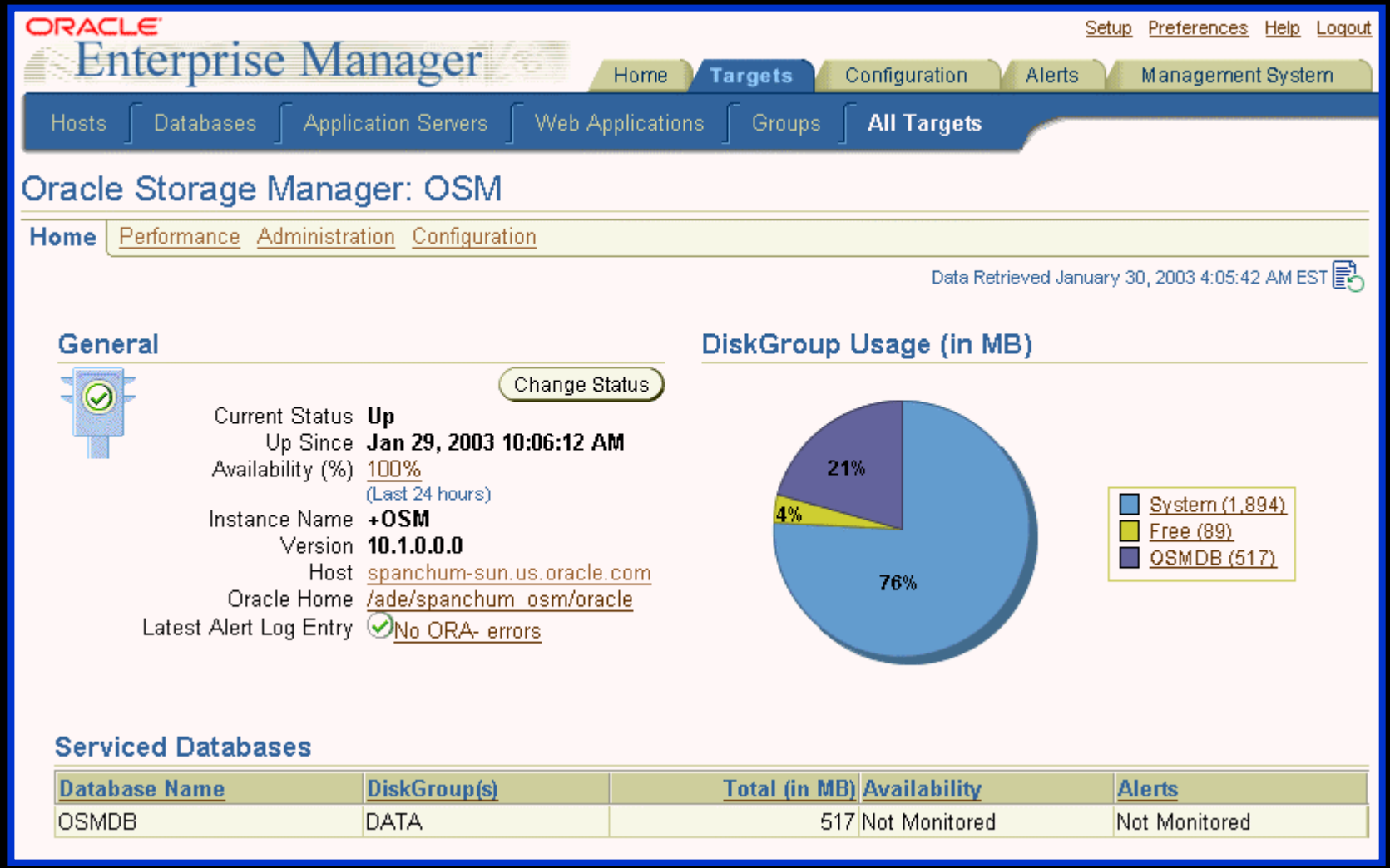
```
CREATE TABLESPACE sample DATAFILE '+dgroupA';
```



SQL Statements Issued to ASM Instances



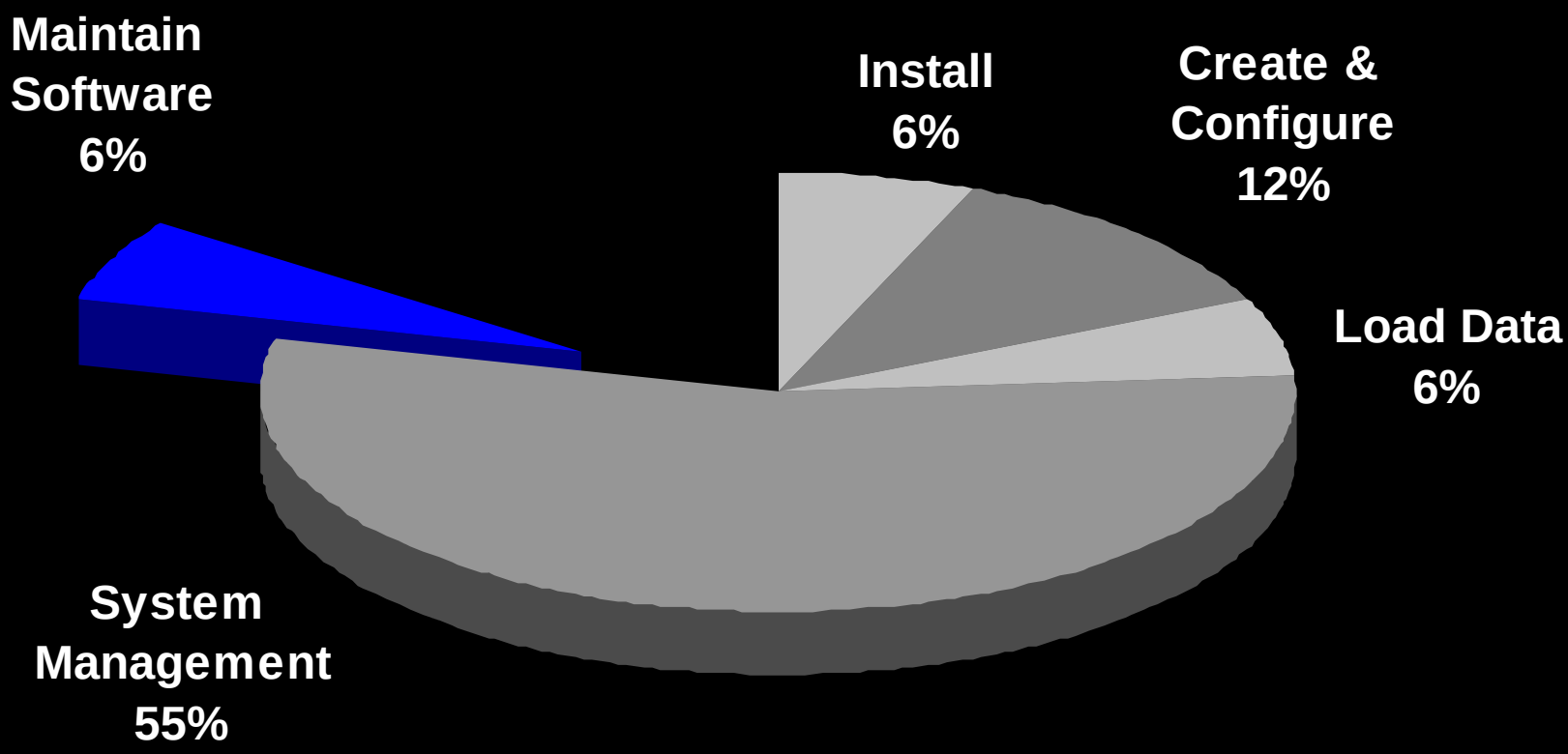
Enterprise Manager and ASM



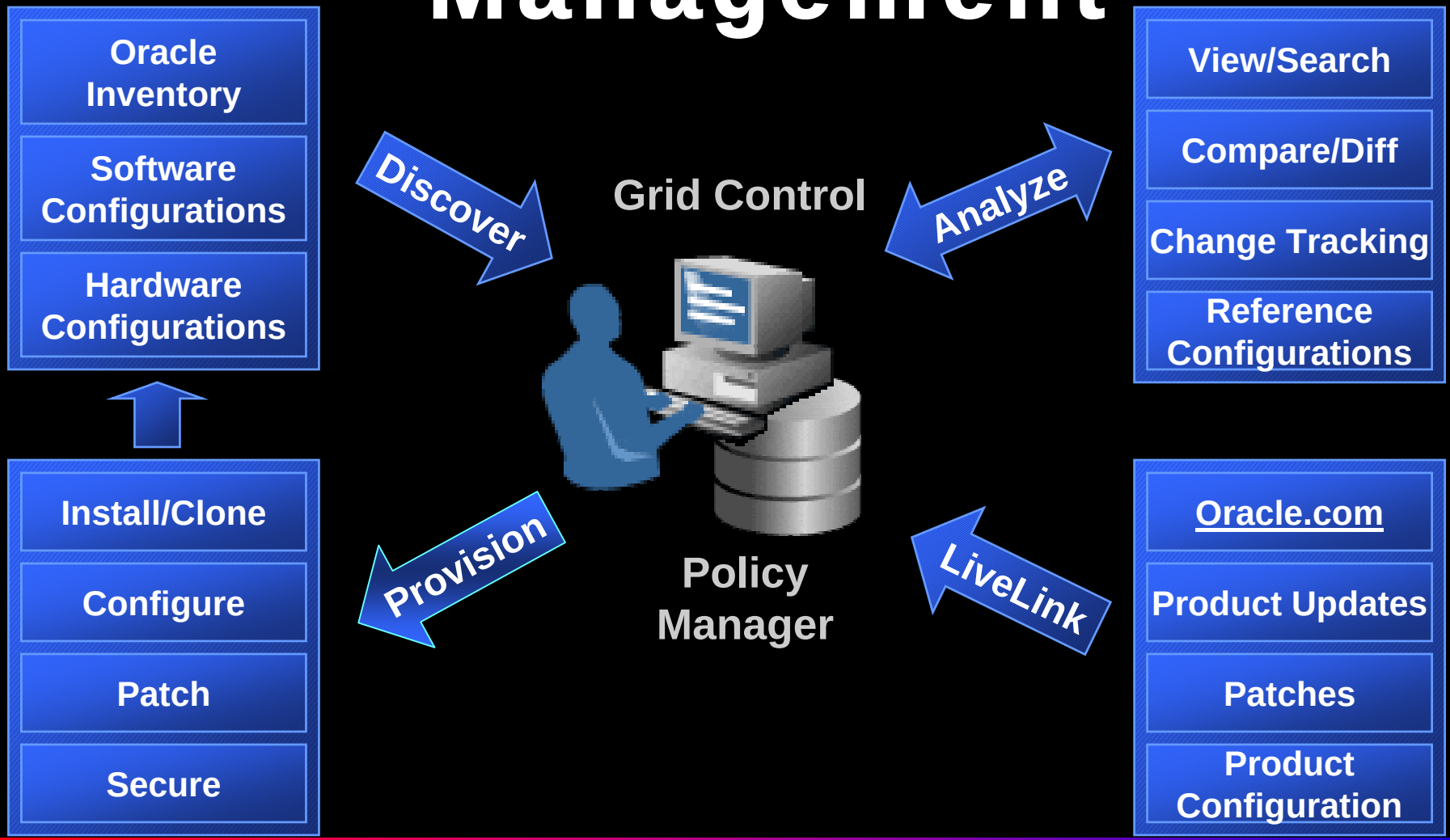
Summary

- Oracle Database 10g's self-management capabilities work out-of-the-box.
- Customization of Oracle Database 10g's self-management capabilities can be done through Enterprise Manager.
- Oracle Database 10g is a self-managing database which reduces administration overhead and enables DBAs to become proactive strategists.

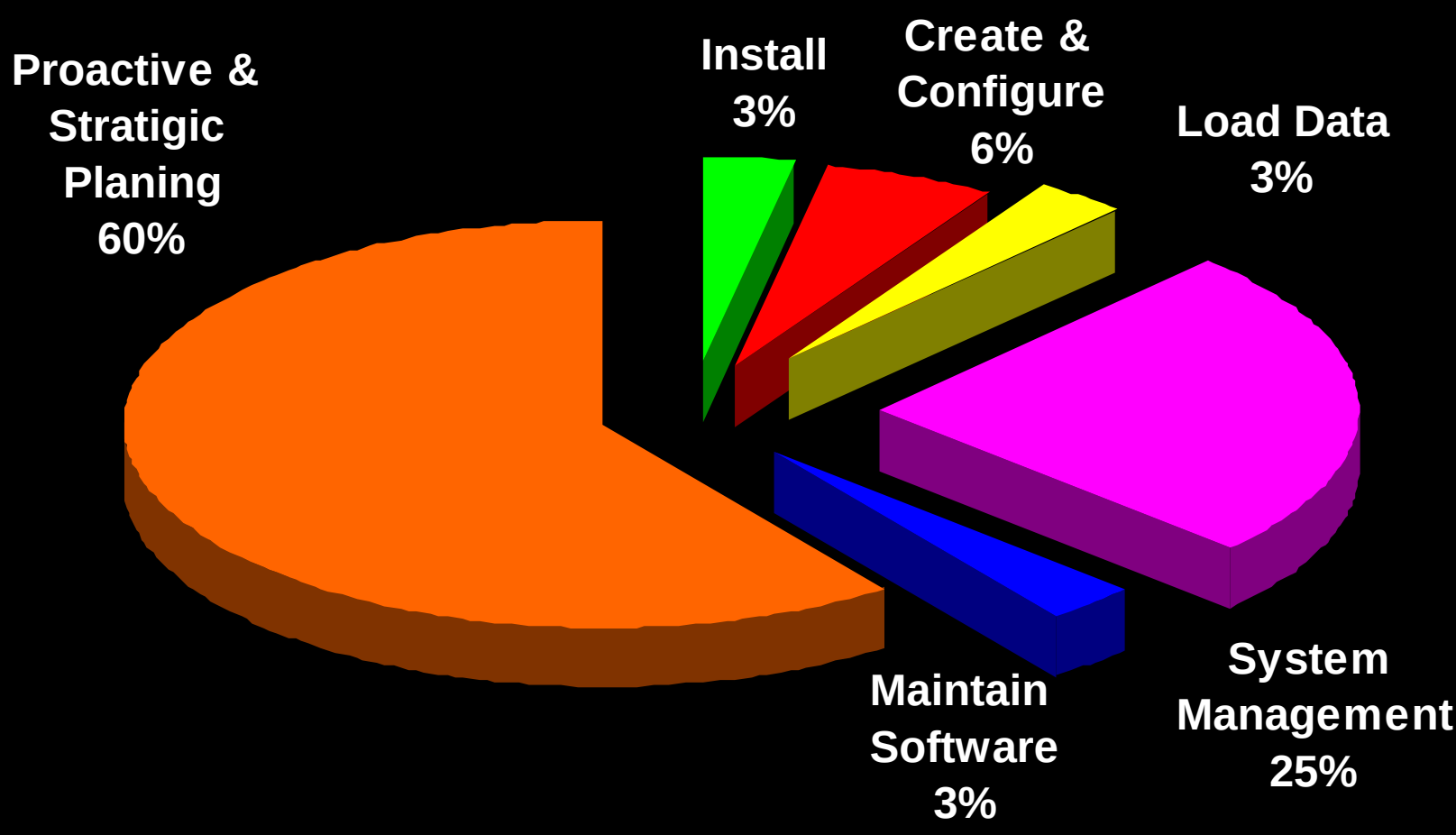
How DBAs Spend Their Time?



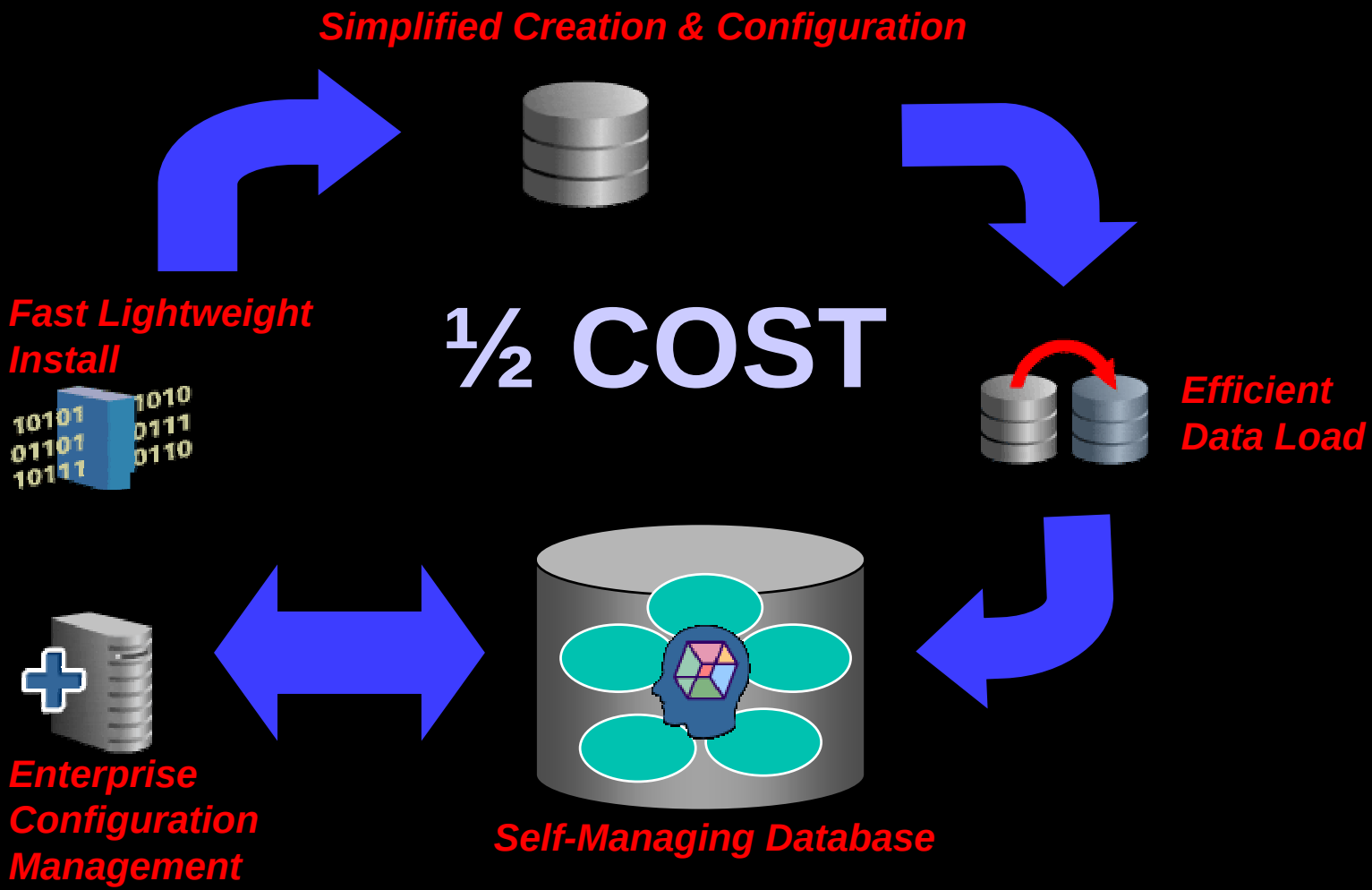
Enterprise Configuration Management



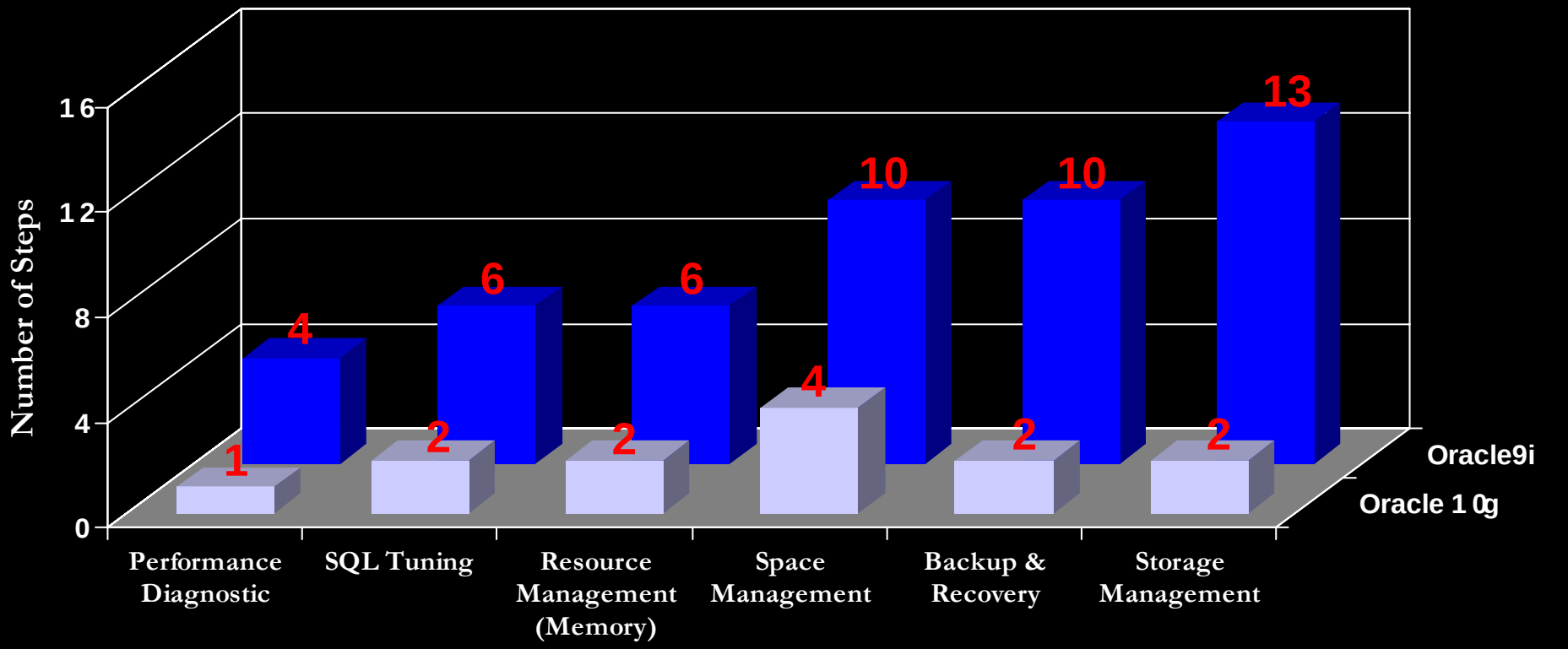
How Oracle Database 10^{g} DBAs Spend Their Time



Oracle Database 10*g*



Oracle 10*g* : Twice as Manageable as Oracle9*i*



Result Summary

Oracle 10*g* required **44%** less time and **47%** fewer steps than Oracle9*i*.

What Does It Mean to You?

DBA of the Future Does MORE

- **MORE** sleep at nights!
- **MORE** weekends off!
- **MORE** databases
- **MORE** applications: OLTP, DW, OCS, iAS
- **MORE** users, larger databases
- **MORE** mission-critical applications
- **MORE** proactive and strategic
- **MORE** important and valuable!

LESS Cost for Businesses

For customers

- Less Administration Cost
- Less Capital Expenditure
- Less Failures

For Application ISV Partners

- Less Deployment Cost
- Less Development Cost
- Less Support Cost

Summary

- Oracle Database 10g's self-management capabilities work out-of-the-box.
- Customization of Oracle Database 10g's self-management capabilities can be done through Enterprise Manager.
- Oracle Database 10g is a self-managing database which reduces administration overhead and enables DBAs to become proactive strategists.

FIN

Thank You

hpaiss@hpcc.co.il
toledano@hi-tech.co.il