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Session id: 40090

# Oracle Database 10g : The Self-Managing Database

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# Agenda

- Key Manageability Challenges
- Oracle's Management Approach
- Manageability Revolution - Oracle Database 10g
- What Does It Mean to You?
- Q&A

# Why is Manageability Important?

# Managing IT is Managing the Business

## For Customers

- Increase in Size & Complexity
- High Administration Cost
- Unacceptable Failure Cost

## For ISV Partners

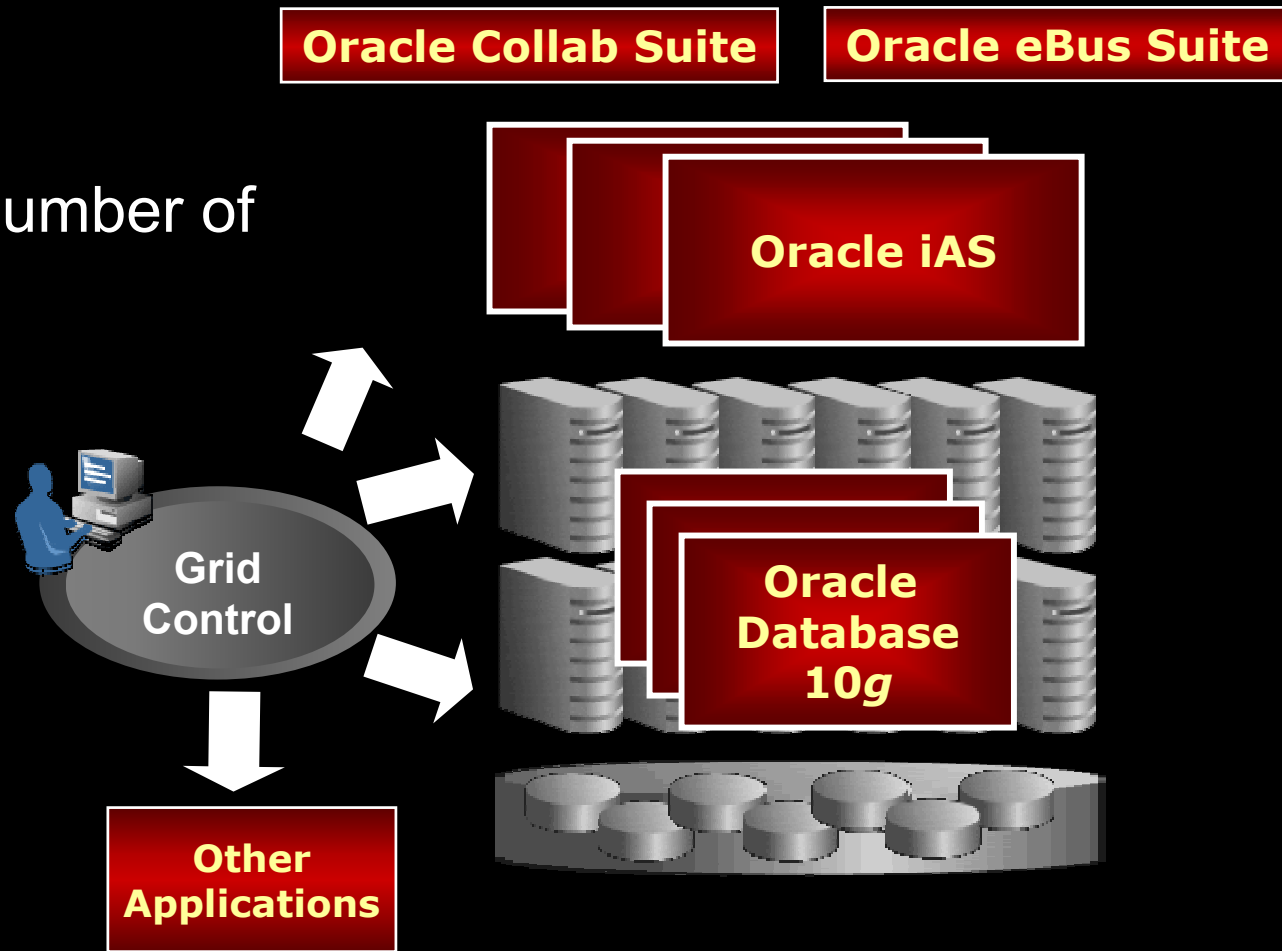
- Increase in Deployment Complexity
- Increase in Development Cost
- High Support Cost

.....and it is getting harder!

# Oracle's Management Approach

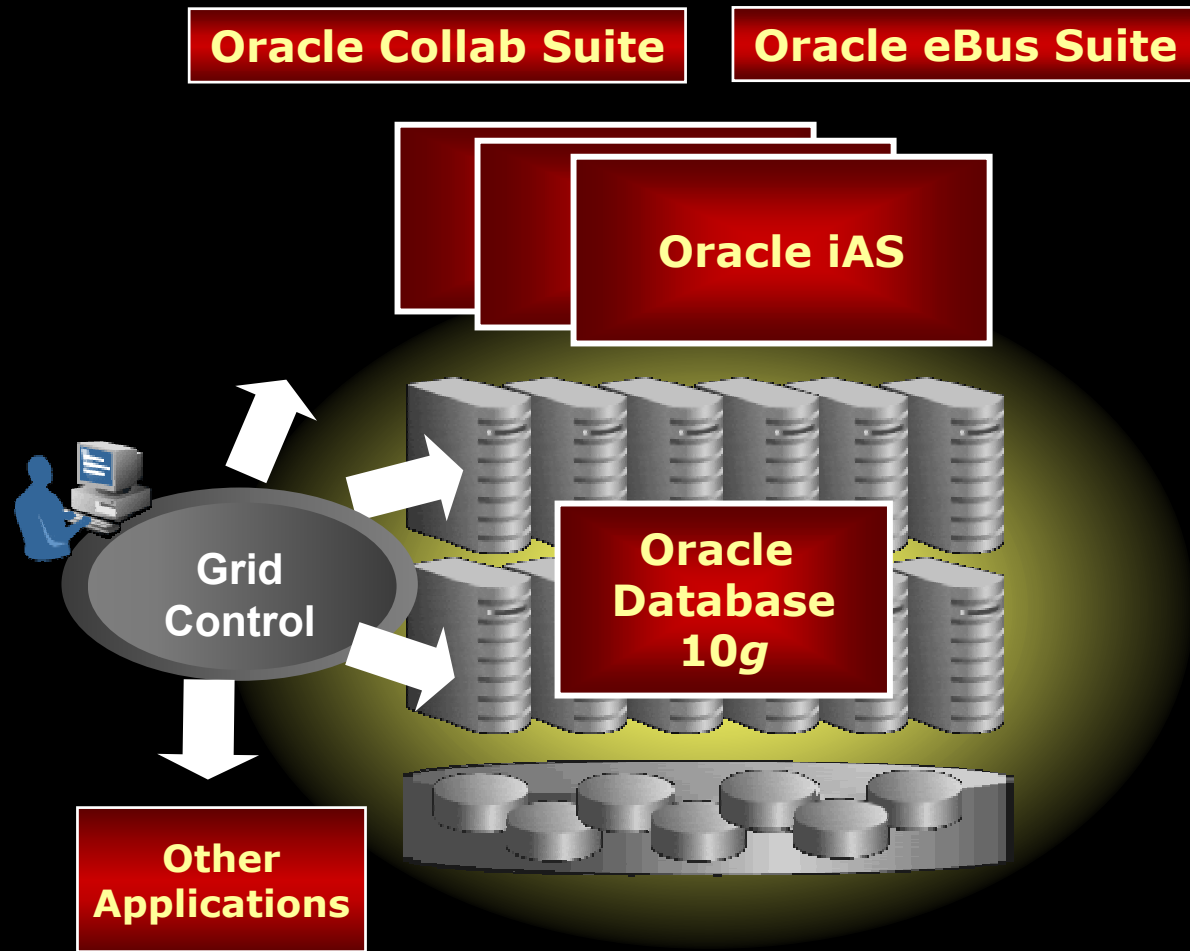
# Complete Manageability Solution

- Manage entire infrastructure
- Manage large number of systems



# Make Single Database Easy to Manage

- Make RAC Easy to Manage
- Enable the Grid
- For Application ISV Partners
- For End Users
- For All Types of Workload





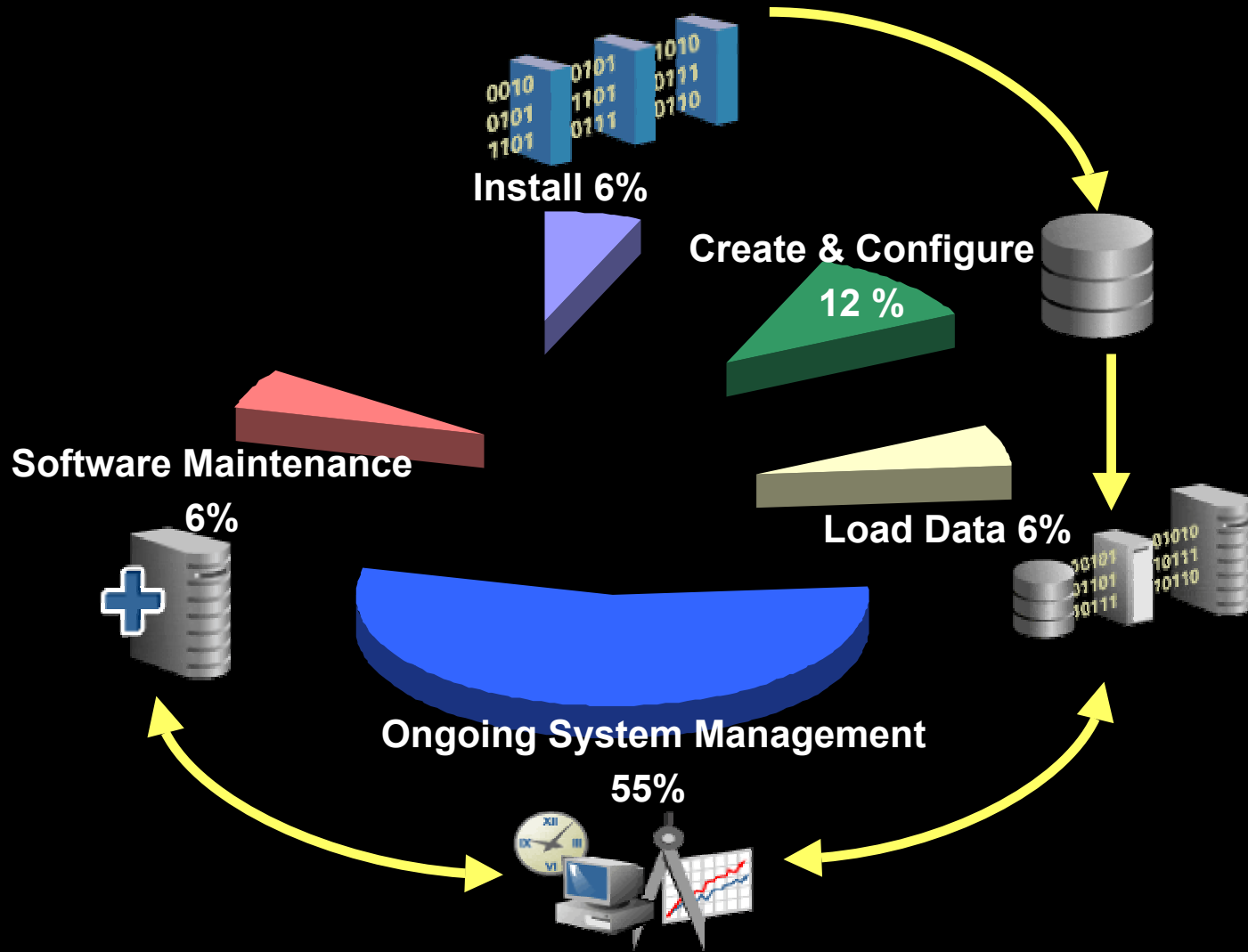
# Manageability Revolution



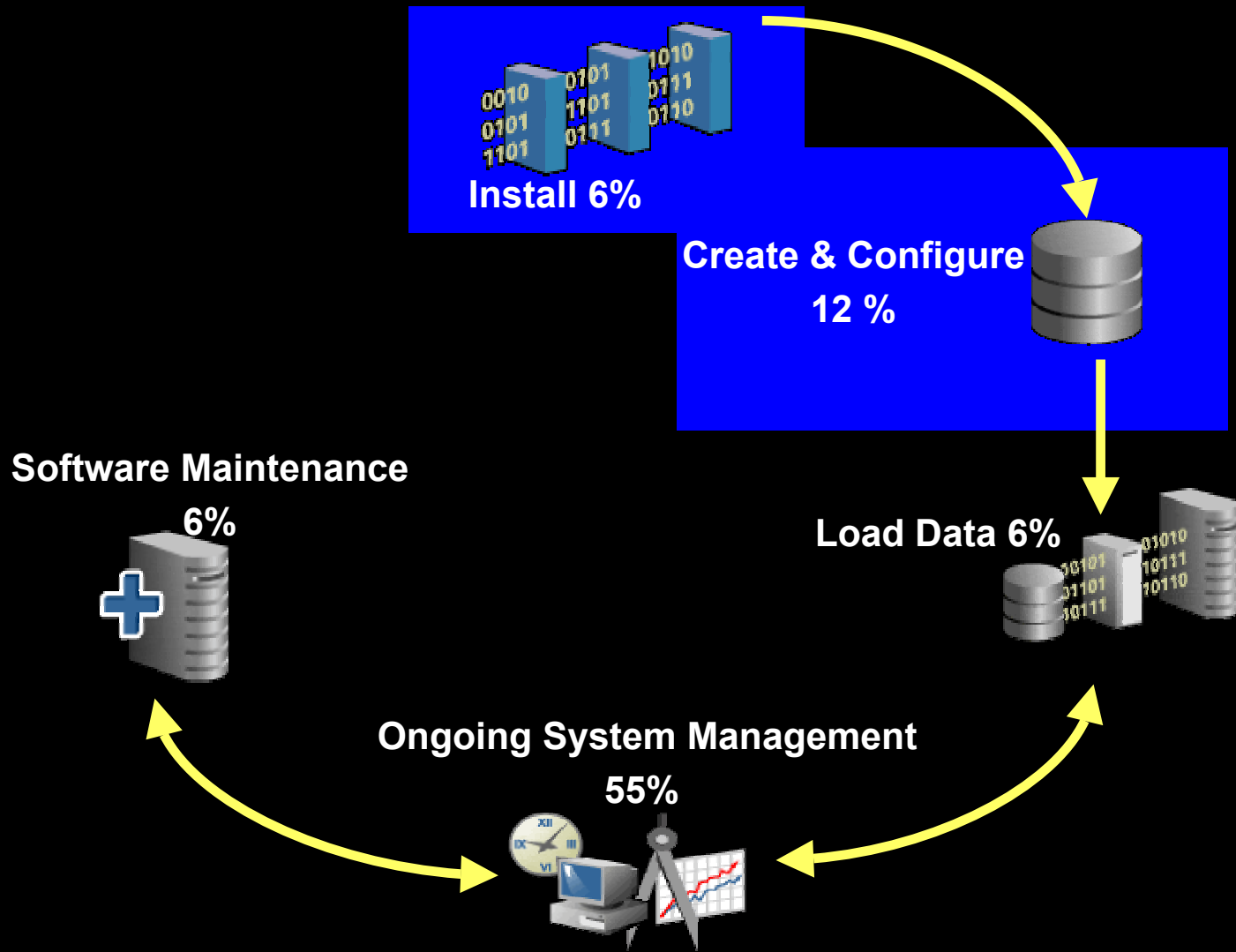
# Unprecedented Development Effort

- Single, biggest effort
  - 50% of the architects in the organization
  - 200+ engineers
  - Gathered customers feedback
  - Active, focused development
  - Not just research!
- Wide-spread effort
  - Projects span entire technology stack
- Long term commitment

# Where DBA's spend their time



# Where DBA's 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

The screenshot displays the Oracle Enterprise Manager interface for a database instance named 'mgmt10i\_030519\_dlsun1273'. The interface is divided into several sections:

- General:** Shows the database status as 'Up', with details on uptime, time zone, and instance name.
- Host CPU:** A bar chart showing CPU usage for the 'mgmt10i' instance and 'Other' processes.
- Active Sessions:** A pie chart showing the distribution of active sessions: 92% Waiting (IO) (8.8%), 8% User CPU (7.6%), and 0% Waiting, Other (0.6%).
- Space Usage:** A table showing 'Problem Tablespaces' (2), 'Fragmentation Issues' (0), and 'Dump Area Used (%)' (Unavailable).
- Advice:** Shows 'ADDM Findings' (6) and 'Configuration' (7).
- High Availability:** Displays 'Estimated Crash Recovery Time (seconds)' as 10, 'Last Backup' as n/a, and 'Archive Area Used (%)' as n/a.
- Alerts:** A table listing various alerts, including 'Tablespaces Full', 'User Audit', 'Wait Bottlenecks', and 'Invalid Objects by Schema'.
- Related Alerts:** A table listing alerts related to the current instance, such as 'Filesystems Filesystem Space Available'.

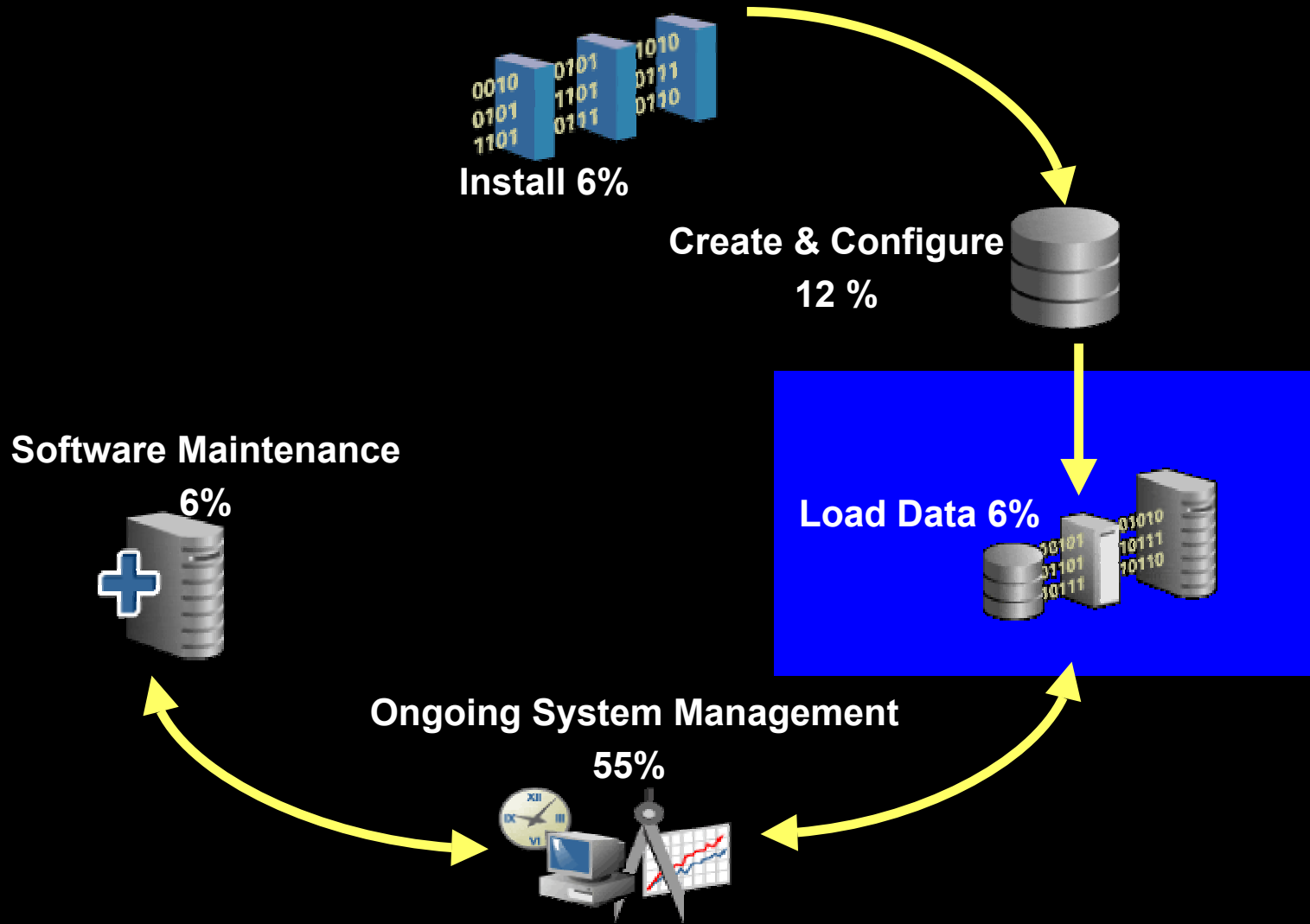
Severity	Category	Name	Message	Alert Triggered	Last Value	Time
x	Tablespaces Full	Tablespace Space Used (%)	SYSTEM tablespace is 97.06% used.	Jun 2, 2003 7:59:57 AM	99.05	Jun 2, 2003 1:59:57 PM
x	User Audit	Audited User	User SYS logged on from jsoule-sun.	May 30, 2003 4:30:00 PM	0	May 30, 2003 4:30:00 PM
!	Wait Bottlenecks	Active Sessions Waiting: Other (%)	97.6% of database active sessions is spent other waiting.	May 31, 2003 2:35:50 AM	91.76	Jun 2, 2003 2:12:50 PM
!	Invalid Objects by Schema	Owner's Invalid Object Count	13 object(s) are invalid in the SYS schema.	May 30, 2003 4:32:25 PM	13	May 30, 2003 4:32:25 PM
!	Invalid Objects by Schema	Owner's Invalid Object Count	11 object(s) are invalid in the PUBLIC schema.	May 30, 2003 4:32:25 PM	11	May 30, 2003 4:32:25 PM
!	Tablespaces Full	Tablespace Space Used (%)	SYSTEM tablespace is 98.51% used.	May 30, 2003 4:29:57 PM	87.58	Jun 2, 2003 1:59:57 PM

Severity	Target Name	Target Type	Category	Name	Message	Alert Triggered	Last Value	Time
!	dlsun1273.us.oracle.com/Host	Host	Filesystems	Filesystem Space Available (%)	Filesystem / has only 12.17% available space	May 30, 2003 4:27:51 PM	12.12	Jun 1, 2003 4:42:51 PM

# Seamless Out-of-the-Box Experience

- Fast, lightweight Install
- Simplified Create & Configure
- Simplified Upgrade
- Out-of-the-box Database Control

# Where DBA's spend their time

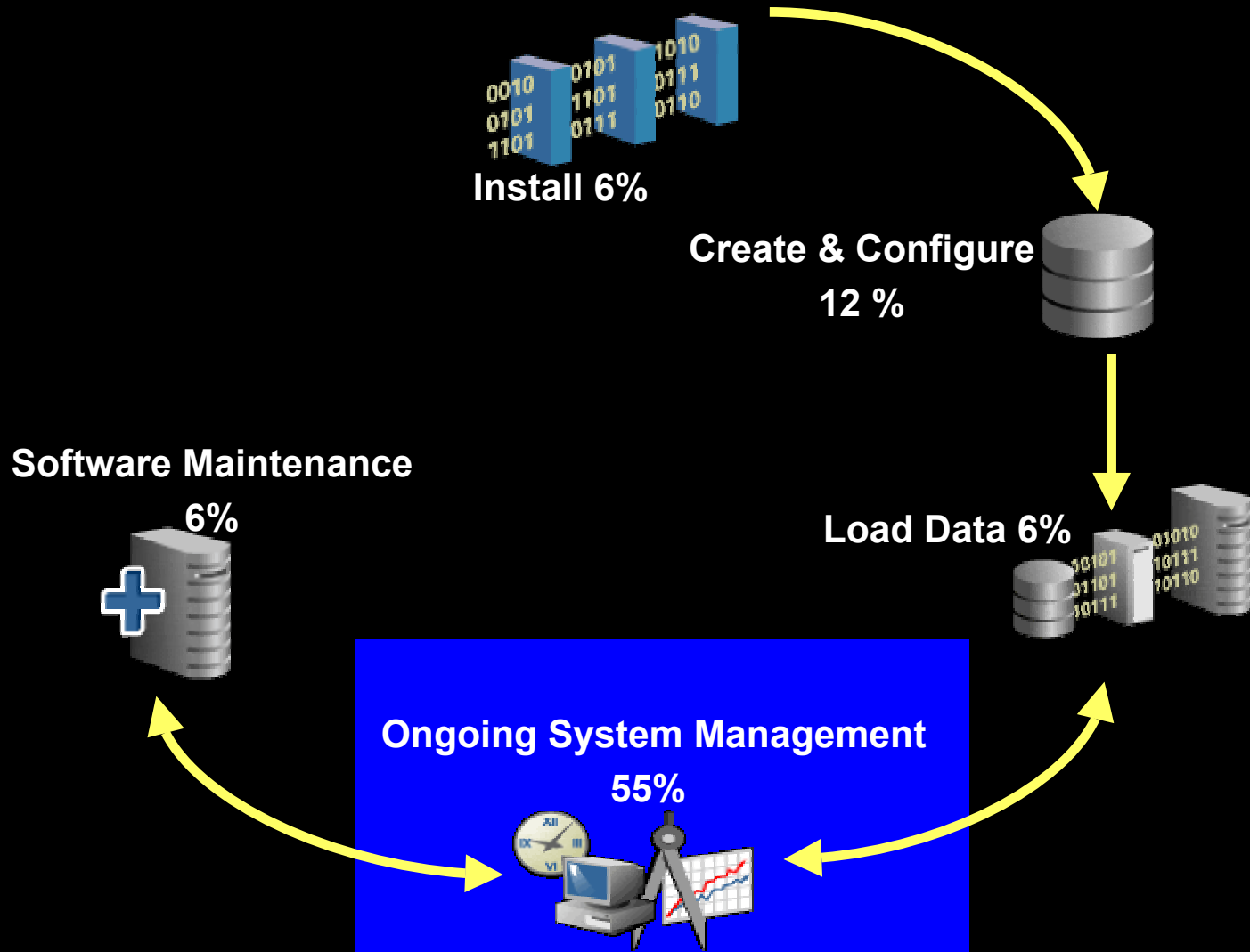


# Efficient Data Load

## Oracle Database 10g

- Data Pump
  - 60% faster than Export (single stream)
  - 15X-20X faster than Import (single stream)
  - Automatic Parallelism – multiple streams
  - Re-startable
  - Size estimation on export dumpfiles
- Cross Platform Transportable Tablespaces

# Where DBA's spend their time

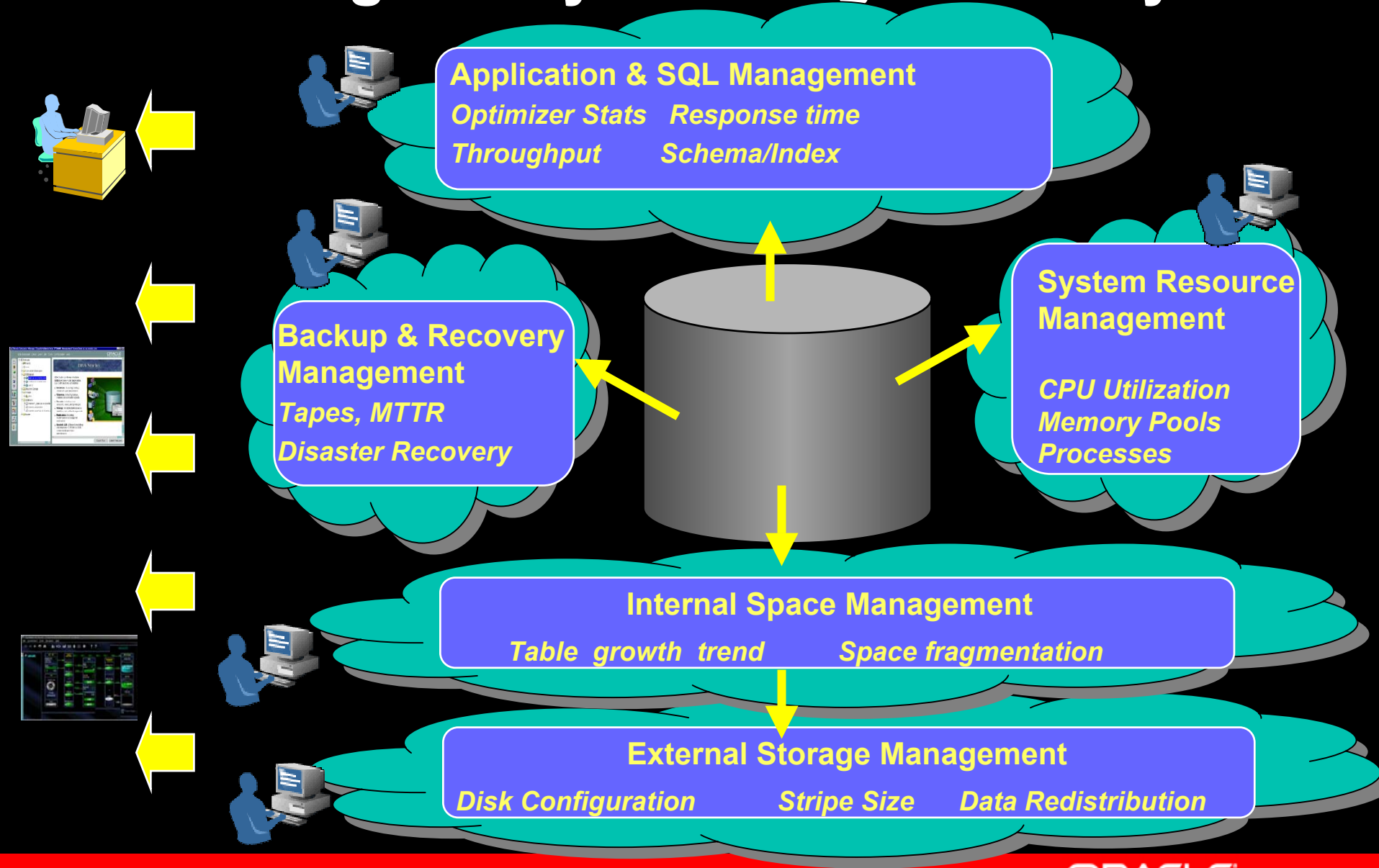


# Ongoing System Management

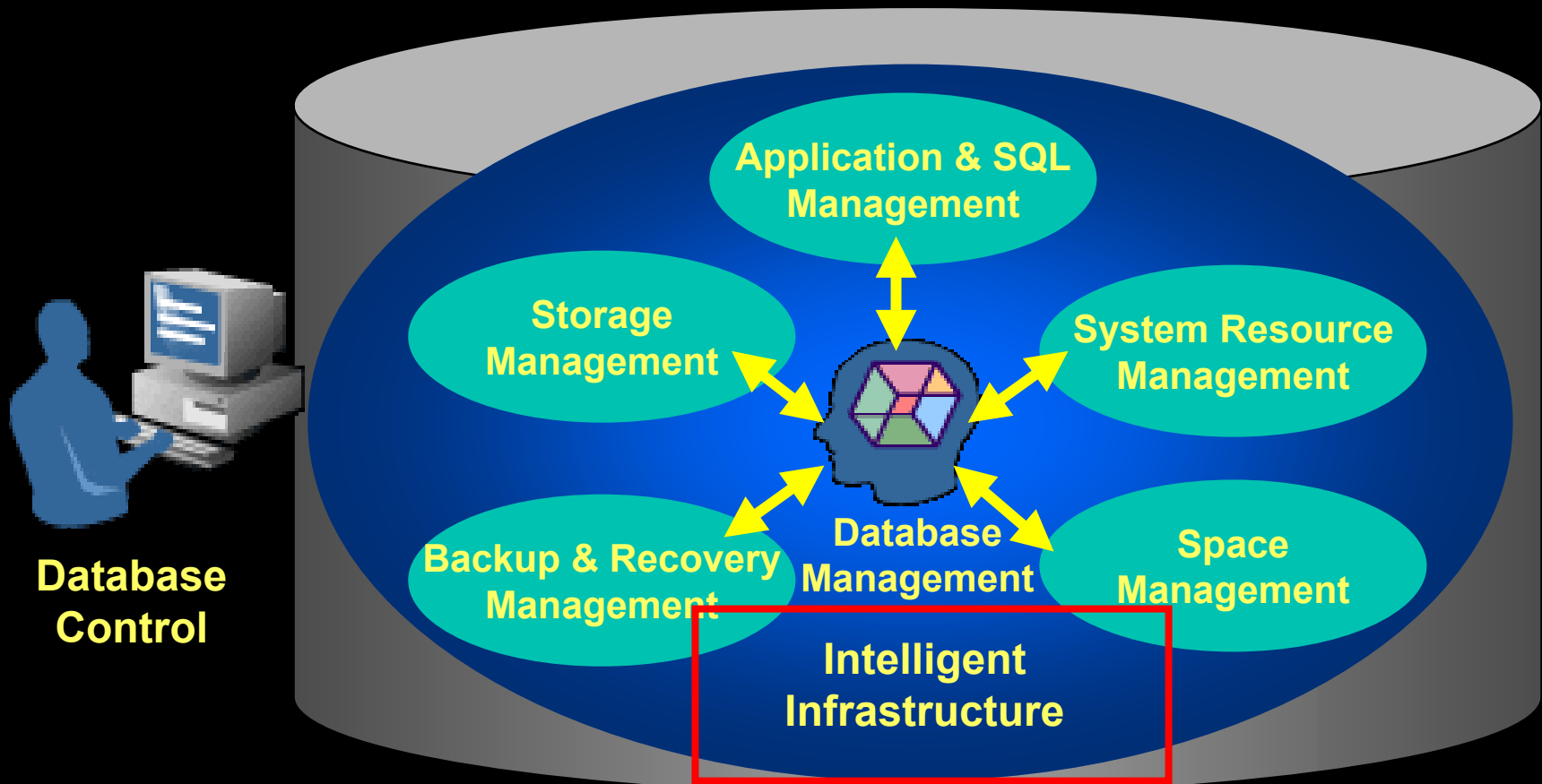
55% of DBA's time is spent in ongoing management, monitoring and tuning

1. Performance Diagnosis & Troubleshooting
2. Space & Object Management
3. SQL & Application Tuning
4. System Resource Tuning
5. Backup and Recovery

# Manageability Challenges - Today

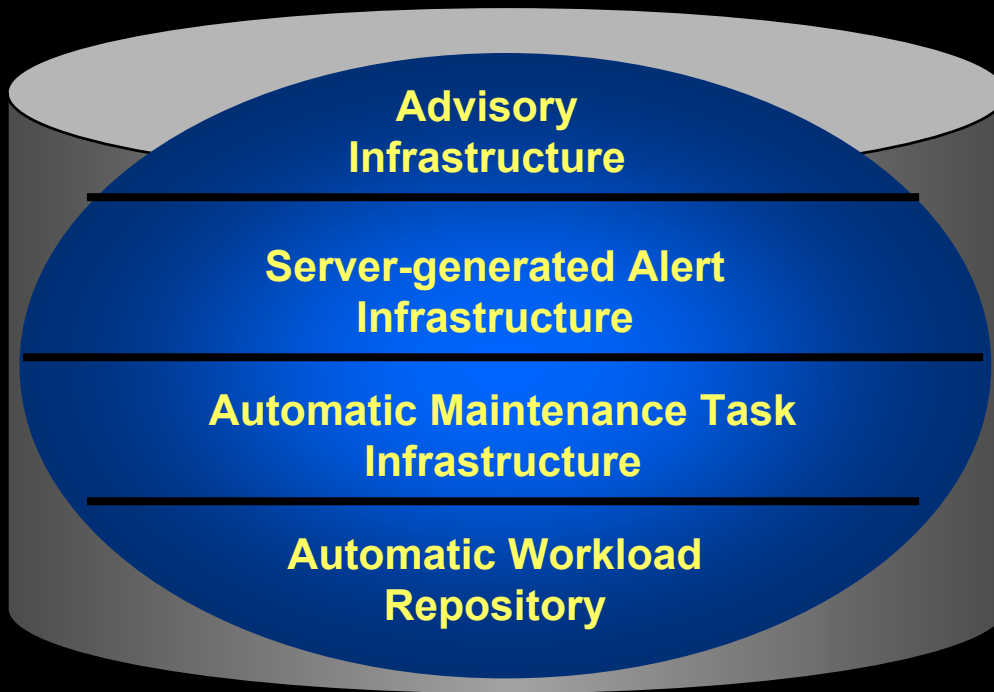


# Oracle Database 10g – Self-Managing Database



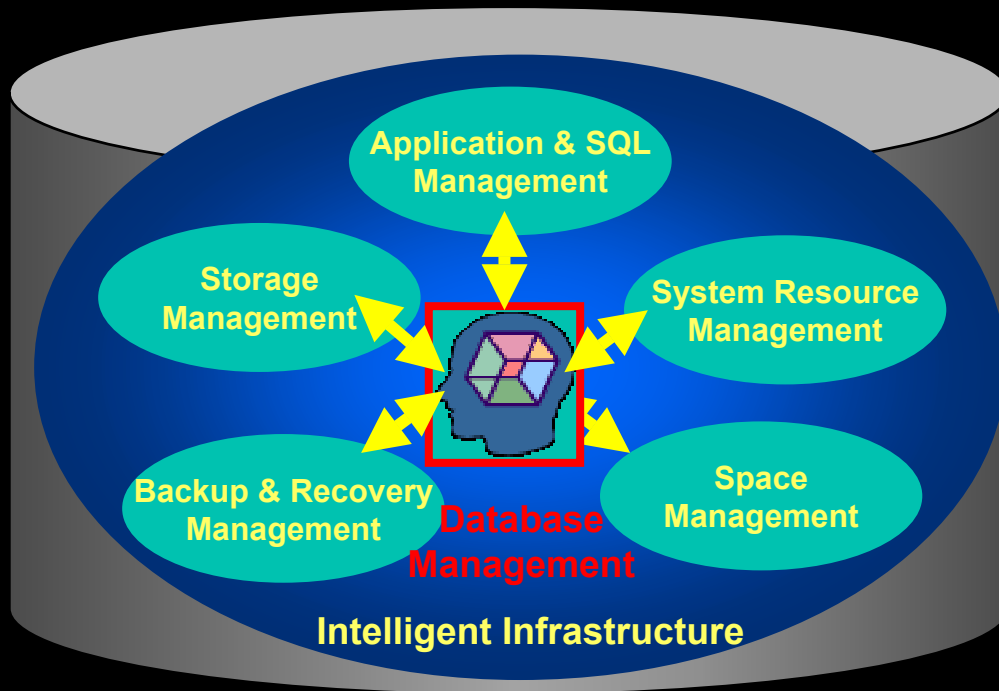


# Intelligent Infrastructure



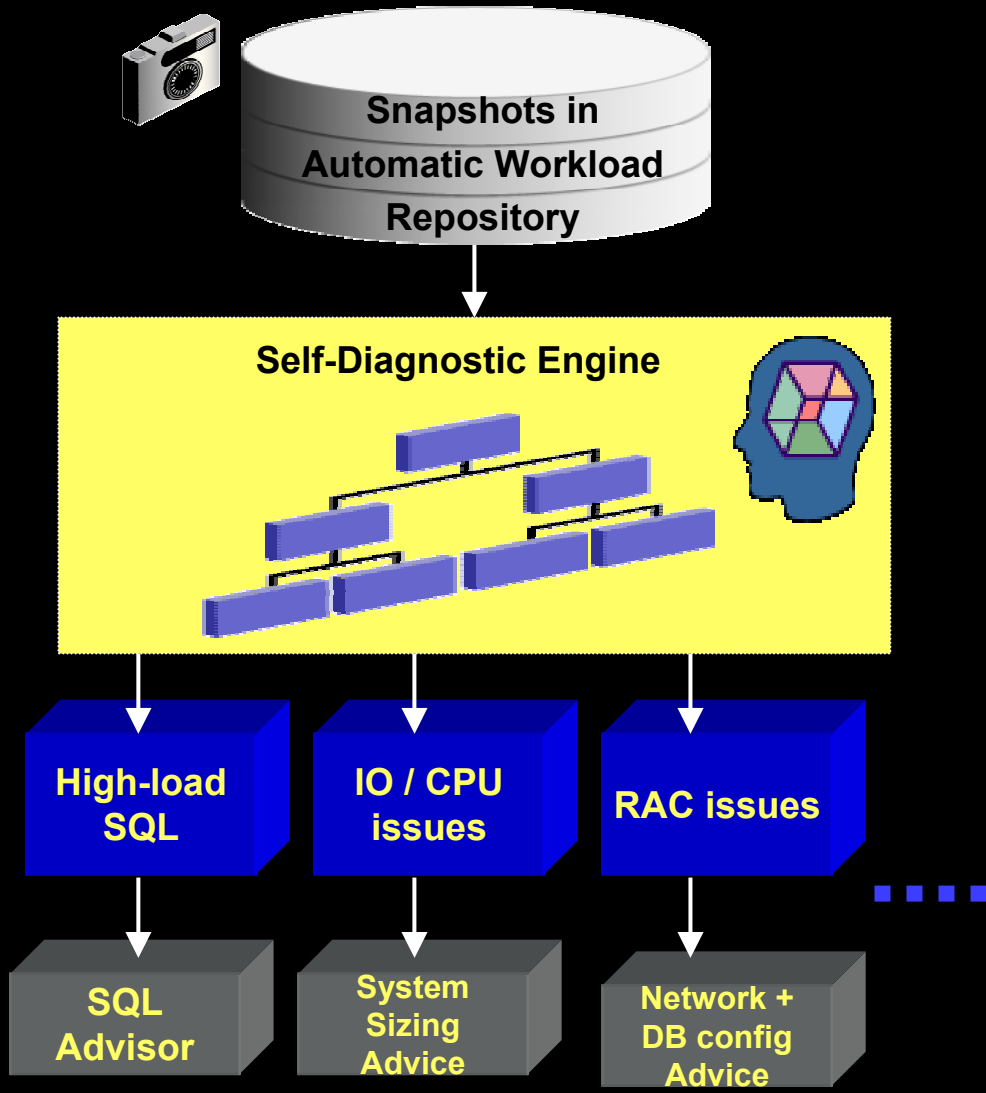
- **Automatic Workload Repository**
  - “Data Warehouse” of the Database
  - Code instrumentation
- **Automatic Maintenance Tasks**
  - Pre-packaged, resource controlled
- **Server-generated Alerts**
  - Push vs. Pull, Just-in-time, Out-of-the-box
- **Advisory Infrastructure**
  - Integrated, uniformity

# Automatic Database Diagnostic Monitor (ADDM)



- Performance expert in a box
- Integrate all components together
- Automatically provides database-wide performance diagnostic, including RAC
- Provides impact and benefit analysis
- Provides Information vs. raw data
- Runs proactively
- Real-time results using the Time Model

# ADDM's Architecture



- Instrument database code paths to produce Time & Wait Model
- Classification Tree is based on decades of Oracle performance tuning expertise
- Pinpoint root cause and non-problem areas
- Active Session History – snapshot of session activity every second
- Runs proactively & manually

# Performance Diagnostic: Before and Now

## *Scenario: Hard parse problems*

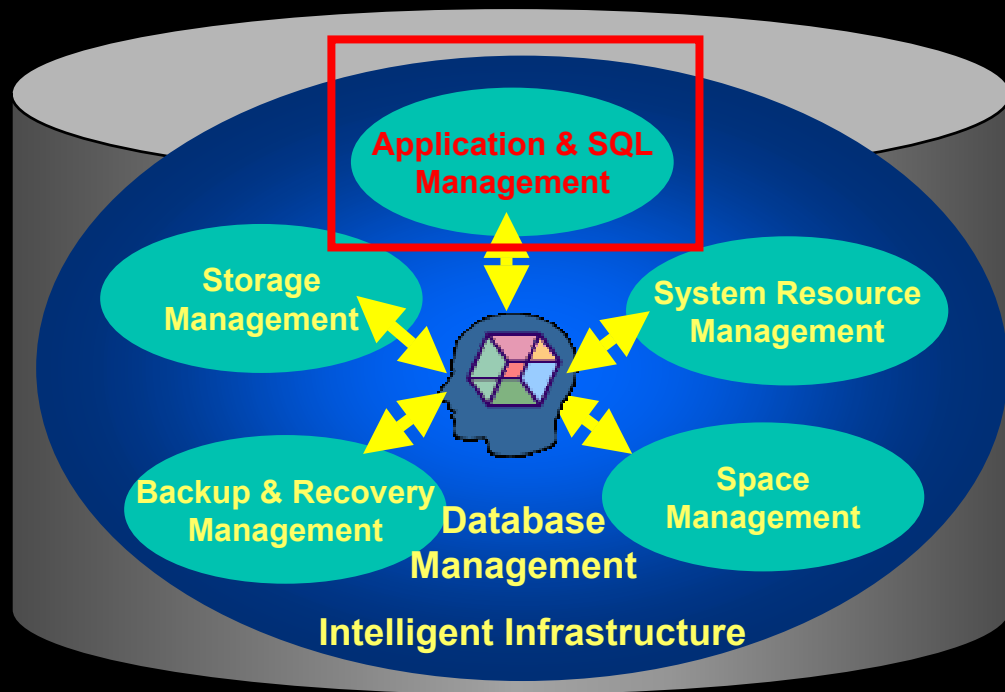
### Before

1. Examine system utilization
2. Look at wait events
3. Observe latch contention
4. See wait on shared pool and library cache latch
5. Review v\$sysstat (difficult)
6. See “parse time elapsed” > “parse time cpu” and #hard parses greater than normal
7. Identify SQL by..
  - Identifying sessions with many hard parses and trace them, or
  - Reviewing v\$sql for many statements with same hash plan (difficult)
8. Examine objects accessed and review SQL
9. Identify “hard parse” issue by observing the SQL contains literals
10. Enable cursor sharing

### Oracle10g

1. Review ADDM recommendations
2. ADDM recommends use of cursor\_sharing

# Application and SQL Management



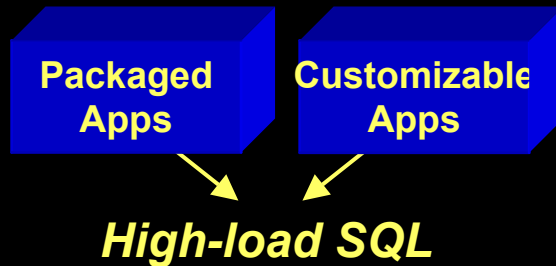
Key to efficient SQL execution:  
Oracle Cost-based Optimizer

- Proven Technology
  - Over 10 years of production usage
  - Adopted by all top-tier applications vendors
- Sophisticated functionality
  - Automatically-gathered object and system (CPU, IO, Caching) statistics
  - Comprehensive set of access paths, adaptive search strategy
  - Cost-based transformations
  - Automatic allocation of memory and parallelism
  - Versioned optimizer statistics

# Remaining Challenges

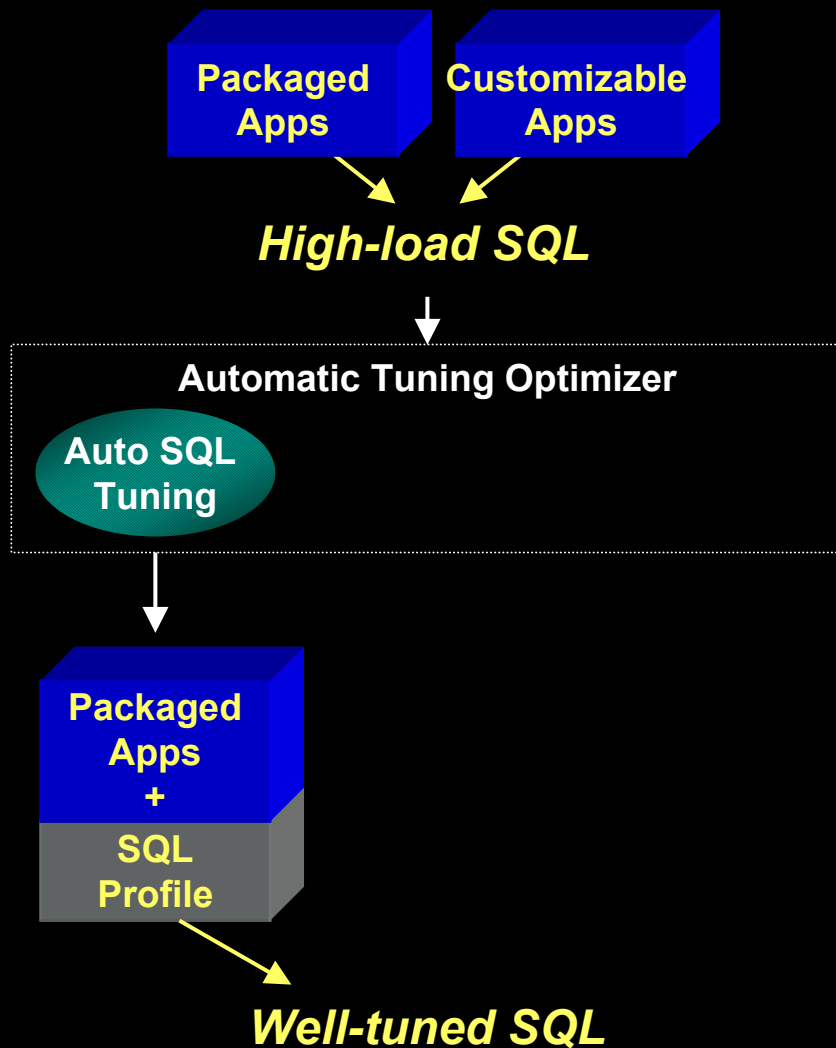
- How to quickly find optimal plans for complex queries?
  - Sub-optimal plans caused by correlations, complex predicate selectivity
- What is “bad” SQL?
- How to work-around ‘bad’ SQL in packaged applications?
- How to ‘globally’ optimize an entire application’s SQL statements?
  - Adding an index may help one statement, but what is the impact on the rest of the application

# Automatic Tuning Optimizer



- Identify 'bad' SQL
  - Automatic workload capture
  - Automatic identification of high-load SQL
  - Top N highest resource-consuming SQL Statements

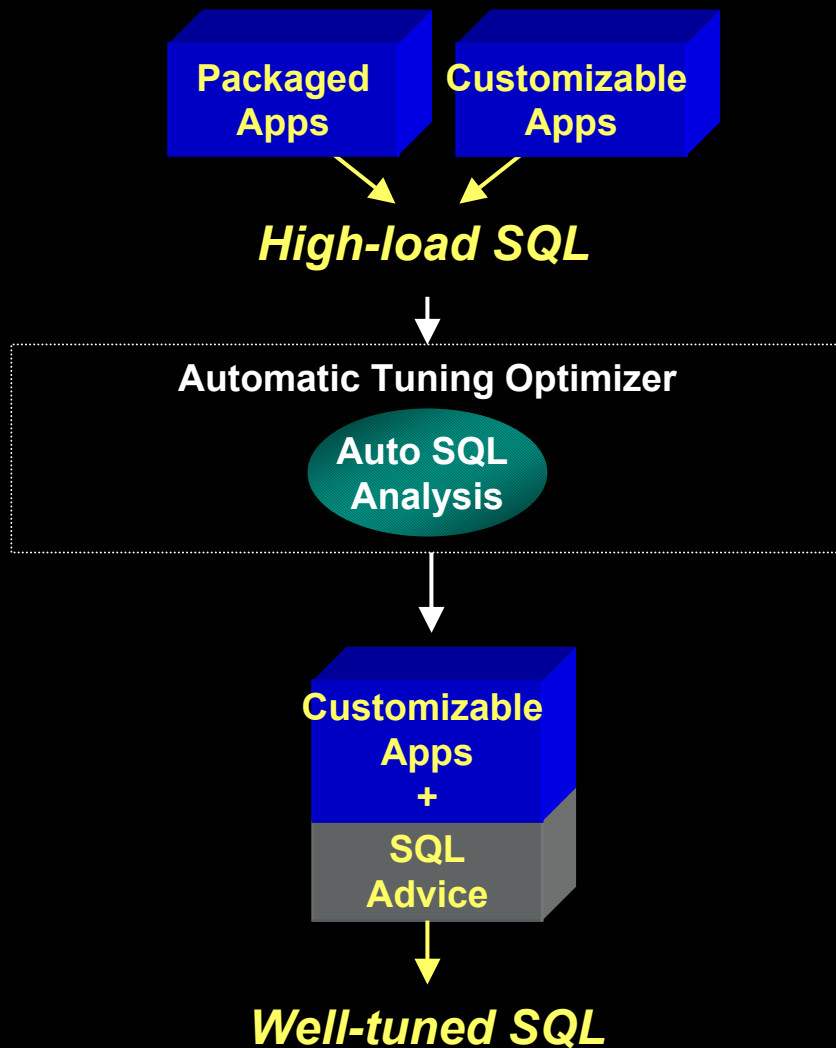
# Automatic Tuning Optimizer



- Automatic SQL Tuning
  - Learn from past executions
  - Dynamic sampling, partial execution techniques
  - Profile the SQL statement to feedback to optimizer
  - No change to SQL text

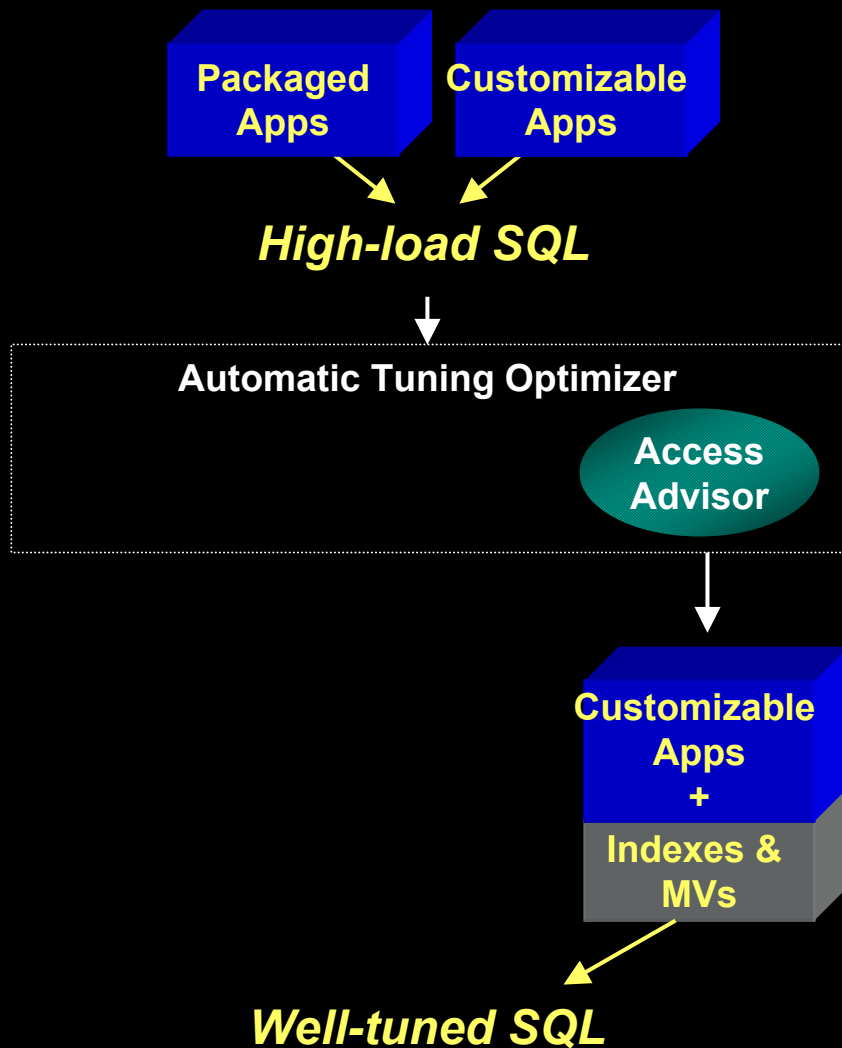


# Automatic Tuning Optimizer



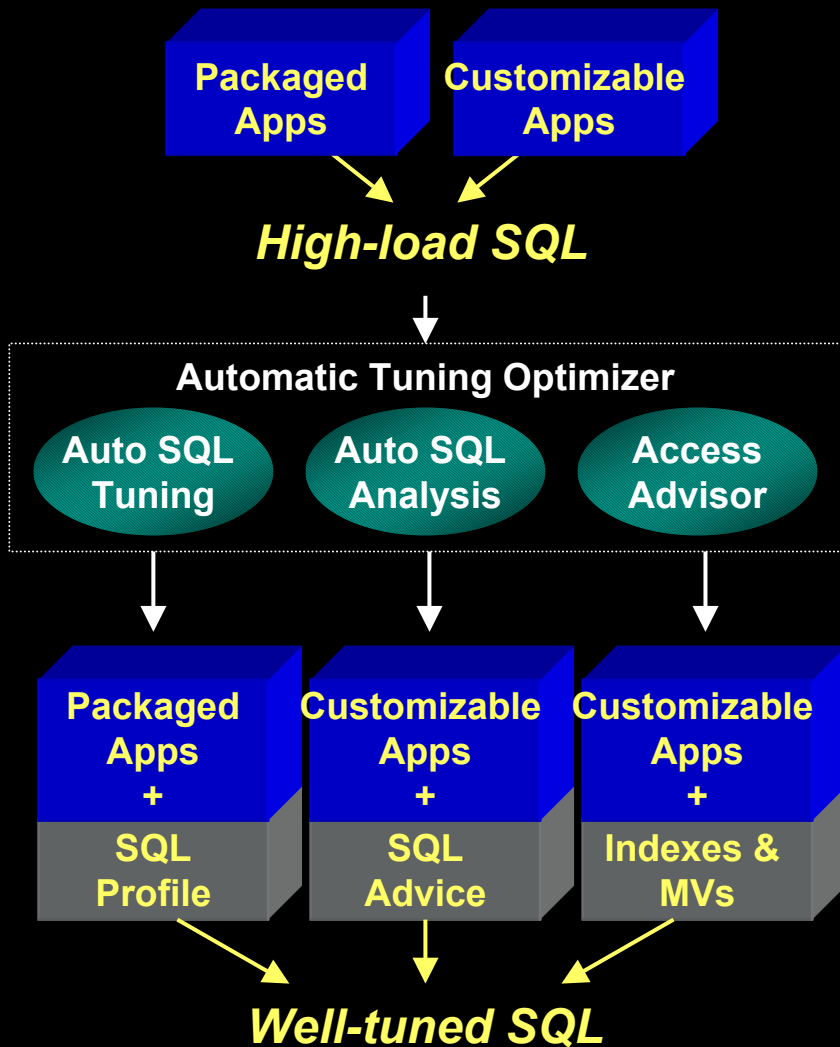
- Automatic SQL Analysis
  - Optimizer explains decision points
  - Advises on badly written SQL, stale statistics, bad schema

# Automatic Tuning Optimizer



- SQL Access Advisor
  - Advise on access paths
  - Indexes, Materialized Views, Indexes on Materialized Views
  - Consider entire workload
  - Consider Impact on insert/update/delete

# Automatic Tuning Optimizer



- Complete SQL Management
  - Automated workload capture, identification of high-load SQL
  - Automatic SQL Tuning
  - Automatic SQL Analysis
  - SQL Access Advisor

# SQL Tuning: Before and Now

## *Scenario: Bad SQL in Packaged Applications*

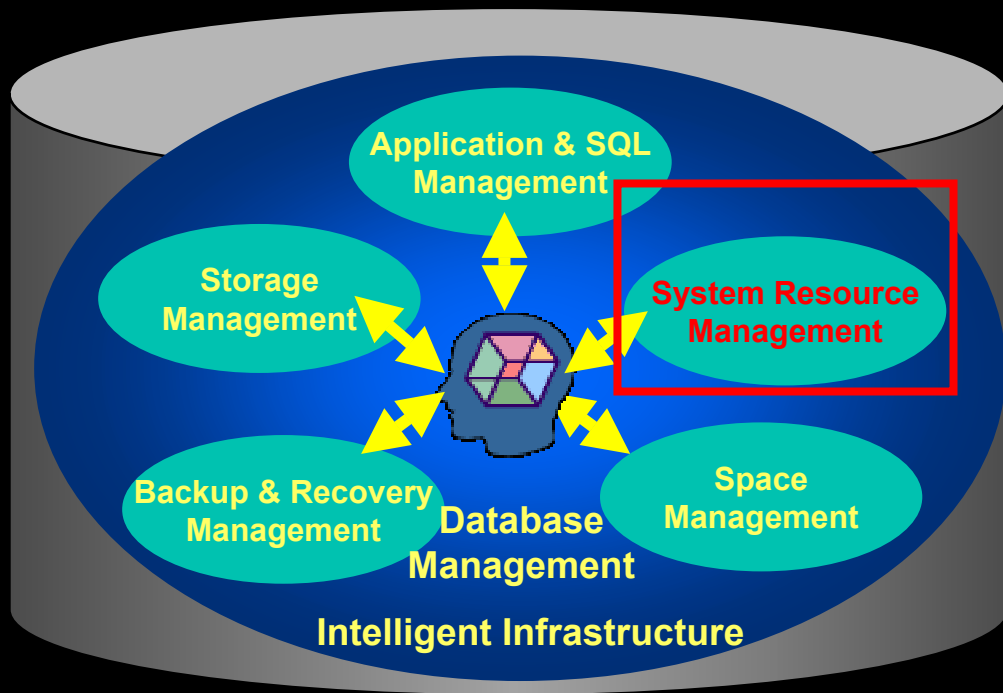
### Before

1. Examine system utilization
2. Look at wait events
3. See wait on DB scattered read
4. Determine scope – system wide, module-dependent, user-dependent?
5. Identify SQL by (difficult)
  - Identifying sessions with high DB scattered read waits and trace them, or
  - Reviewing Top Sessions in OEM
6. Get explain plan
7. Examine objects accessed (size/cardinality)
8. Review SQL statistics and/or compare to object statistics (v\$sql) (difficult)
9. Identify the problem
10. Contact packaged app vendor
11. Produce test case for vendor
12. Vendor produces patch/upgrade
13. Patch/upgrade installed in customer's next maintenance cycle

### Oracle10g

1. Review ADDM recommendations
2. Follow link to run Automatic SQL tuning
3. Accept SQL Profile recommendations from SQL Tuning

# System Resource Management



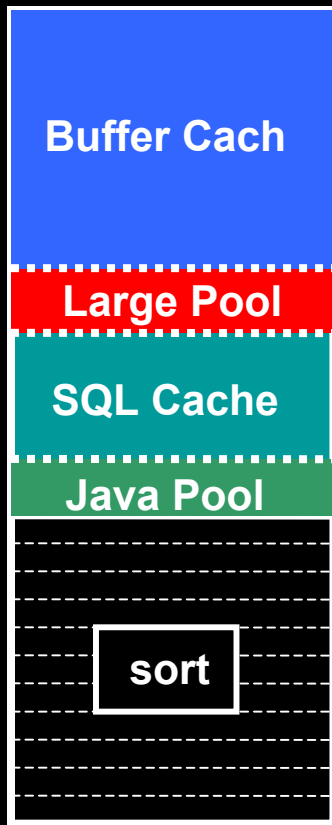
## Oracle 9i

- Resource Manager controls and prioritizes CPU usage
- Automatic SQL Memory Tuning

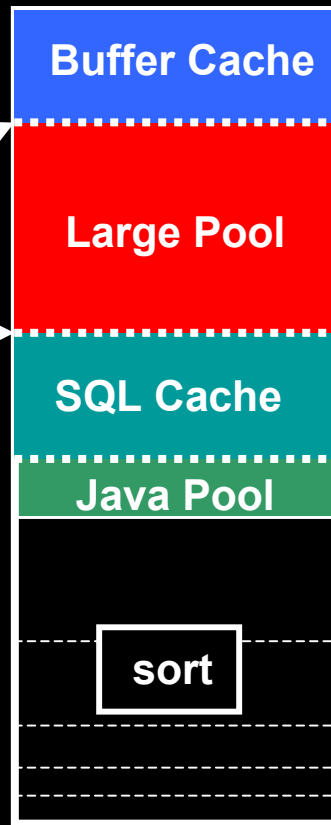
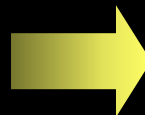
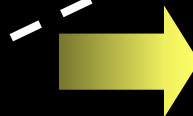
# Automatic Shared Memory Tuning



Online Users



Large Batch Jobs



SGA

PGA

- Automatically adapts to workload changes
- Maximizes memory utilization
- Single Parameter makes it easier to use
- Helps eliminate out of memory errors
- Can help improve performance

# SGA Memory Management: Before and Now

*Scenario: Out-of-memory Errors (ORA-4031)*

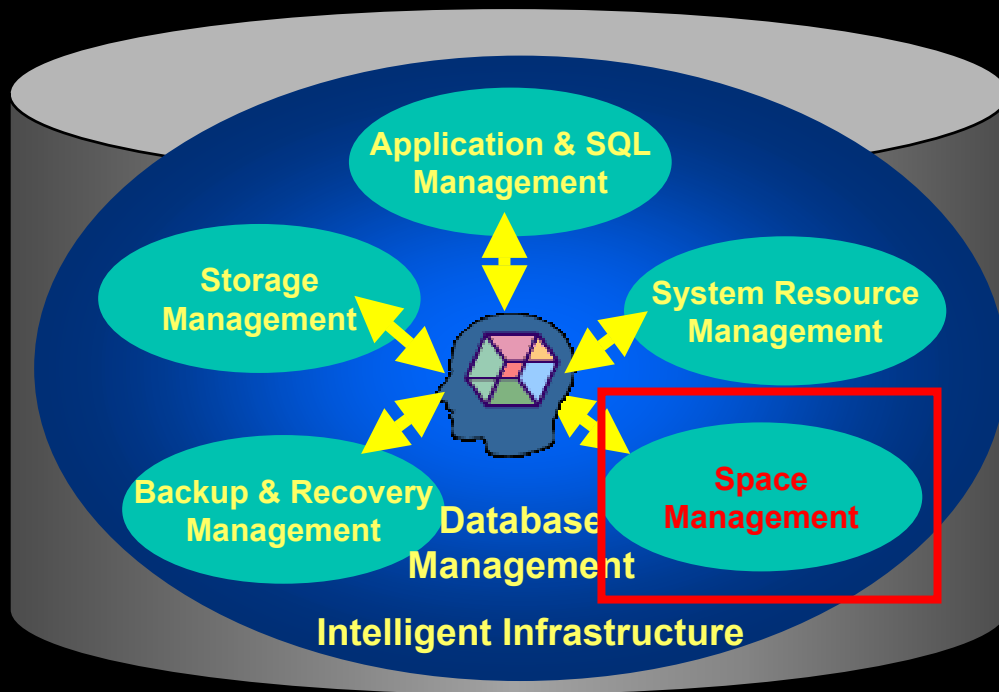
## Before

1. Launch Buffer Pool Advisor
2. Examine output; check if Buffer Pool is over allocated
3. If so, reduce size of Buffer Pool
4. Launch Shared Pool Advisor
5. Examine output; check if Shared Pool is under allocated
6. If so, increase size of Shared Pool

## Oracle10g

*(This space is intentionally left blank – No manual steps needed with Automatic Shared Memory Tuning)*

# Automatic Space Management



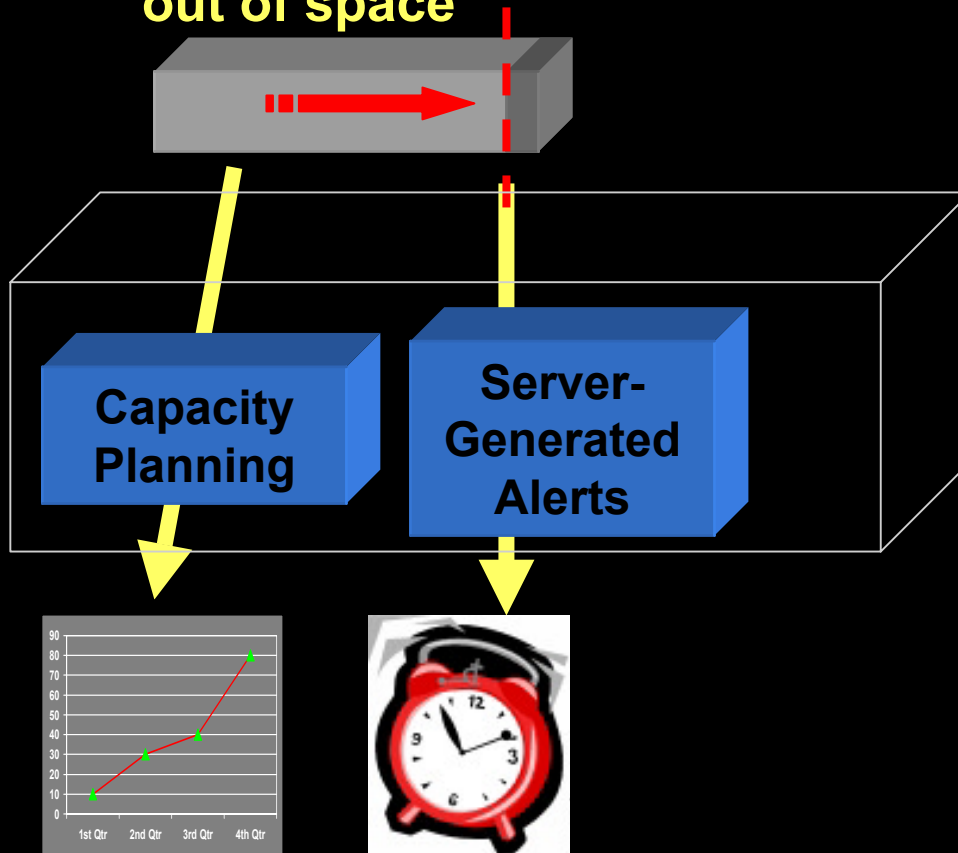
## Oracle9i

- Eliminates external space fragmentations
  - Locally Managed Tablespace
- Eliminates space allocation contention
  - Automatic Segment Space Management



# Proactive Space Management

Segment running  
out of space



- Automatically monitor, capture space usage at space allocation time - efficient
- Advise and predict space growth trend, fragmentation
- “Just-in-Time” Alerts on space pressure

# Proactive Space Management

Segment running out of space



Fragmented Segment



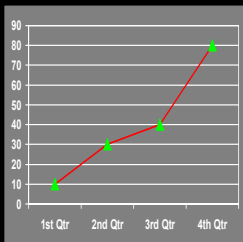
Online Segment Shrink

- Reclaim space from internal fragmentation
- Improve performance
- In-place shrinking of tables
- Wait on DML operations

Capacity Planning

Server-Generated Alerts

Online Segment Shrink



# Space Management : Before and Now

## *Scenario: Reclaim Wasted Space*

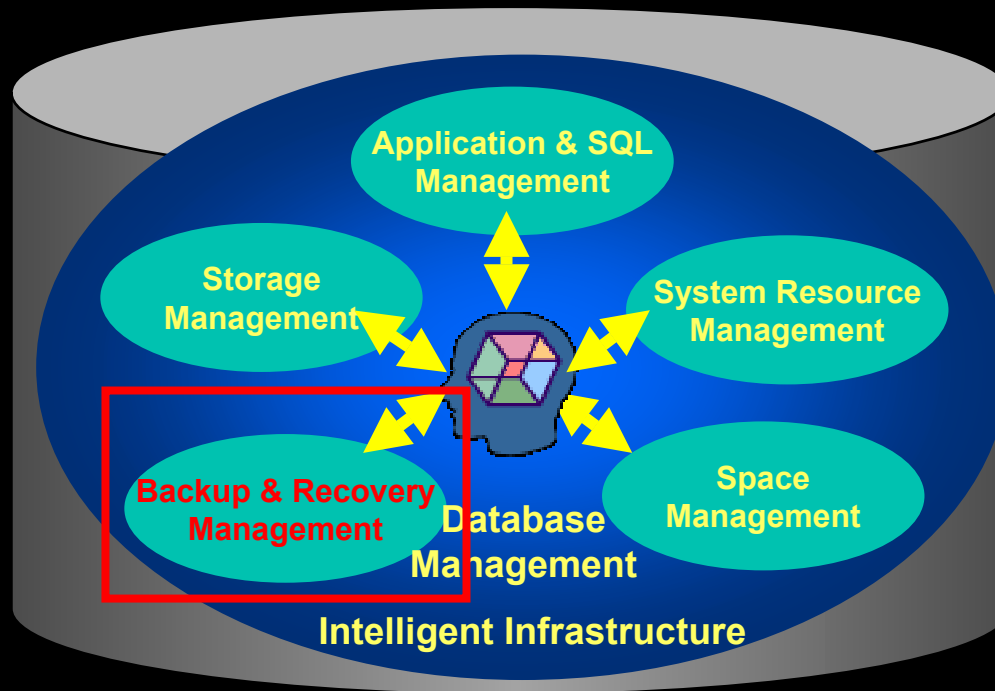
### Before

- Check to see which objects in the tablespace have pockets of wasted space due to deletion:
  1. Create a script that looks at DBA\_TABLES view to compare the total space allocated for each object (BLOCKS \* DB\_BLOCK\_SIZE) in a tablespace to the estimated space used by the object (AVG\_ROW\_LEN \* NUM\_ROWS)  
(assumes objects have been analyzed)
  2. Review script output and identify target objects for reorganization
- 3. Identify/Create “scratch” tablespace
- 4. For each object to be reorganized, use the Enterprise Manager Reorg wizard to recreate each object along with its dependencies

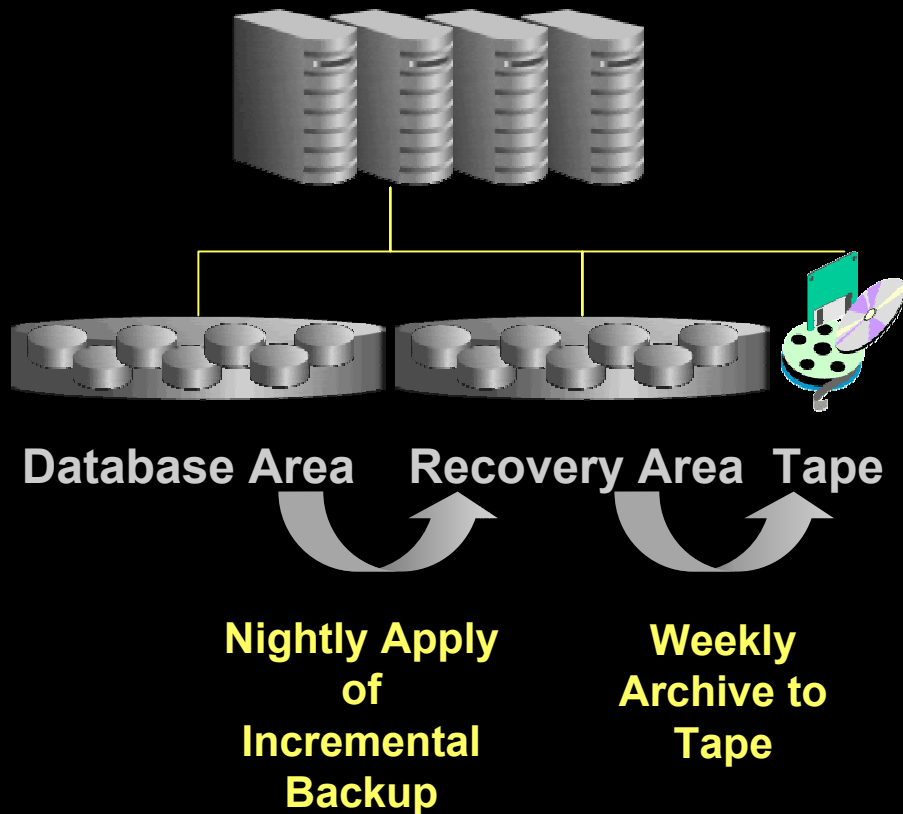
### Oracle10G

1. Launch Segment Advisor to advise on which object(s) to shrink
2. Accept the recommendations to shrink the objects online and in-place

# Automatic Backup & Recovery

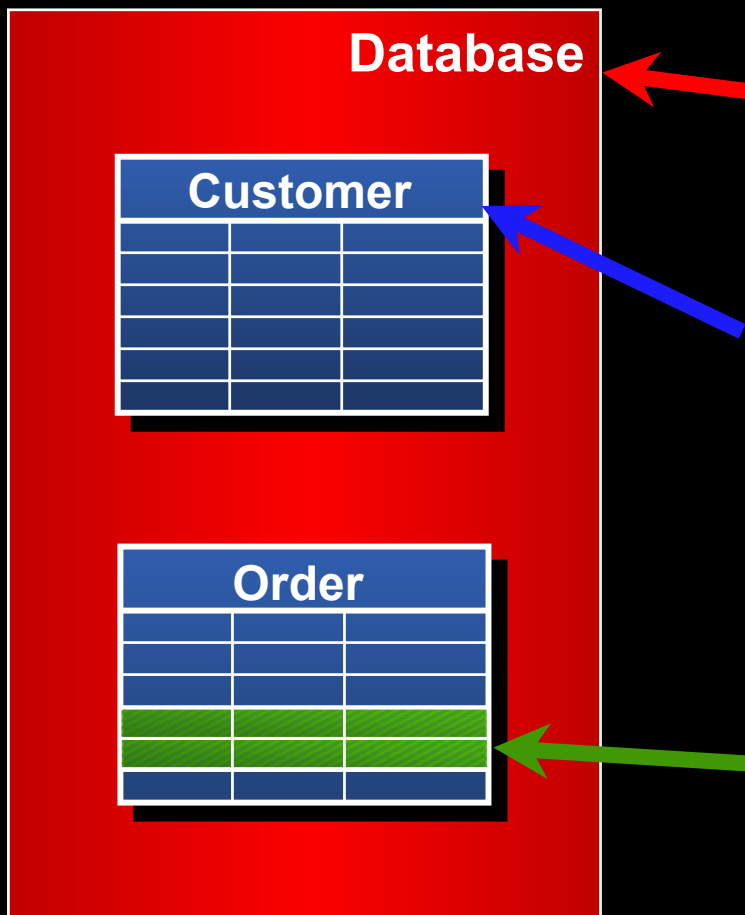


# Automatic Backup and Recovery



- Fully automatic disk based backup and recovery
  - Set and Forget
- Nightly incremental backup rolls forward recovery area backup
  - Changed blocks are tracked in production DB
  - Full scan is never needed
  - Dramatically faster (20x)
- Use low cost ATA disk array for recovery area

# Single-Command Recovery



- Easy recovery from human errors at all levels
- Database Level
  - **Flashback Database** restores the whole database to time
    - Uses Flashback Logs
- Table Level
  - **Flashback Table** restores rows in a set of tables to time
    - Uses UNDO in database
  - **Flashback Drop** restores a dropped table or a index
    - Recycle bin for DROPs
- Row Level
  - **Flashback Rows** restores rows to time
    - Uses Flashback Query

# Database Recovery: Before and Now

*Scenario: Recovering mistakenly dropped a Table*

## Before

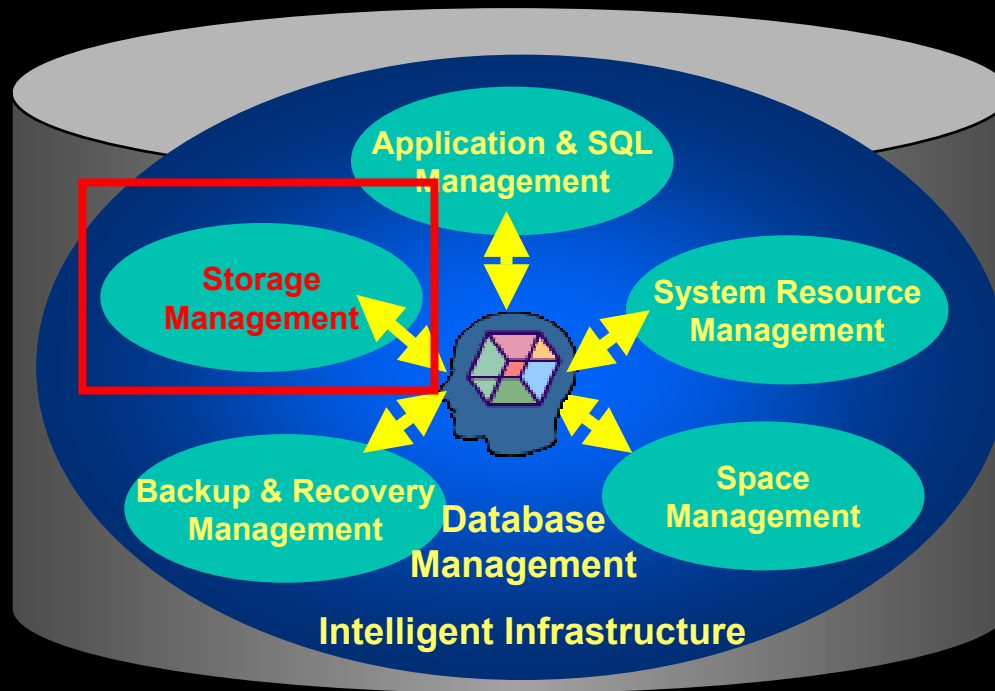
(Tablespace Point-in-time Recovery)

1. Prepare an auxiliary instance by first creating an Oracle password file
2. Create parameter file for auxiliary instance
3. Start auxiliary instance in NOMOUNT mode using SQL\*Plus
4. Using RMAN interface to perform TSPITR
5. Using RMAN, connect to target database and bring tablespace in question online
6. Shutdown the auxiliary instance
7. Delete auxiliary instance data files, control files, and redo log files

## Oracle10g

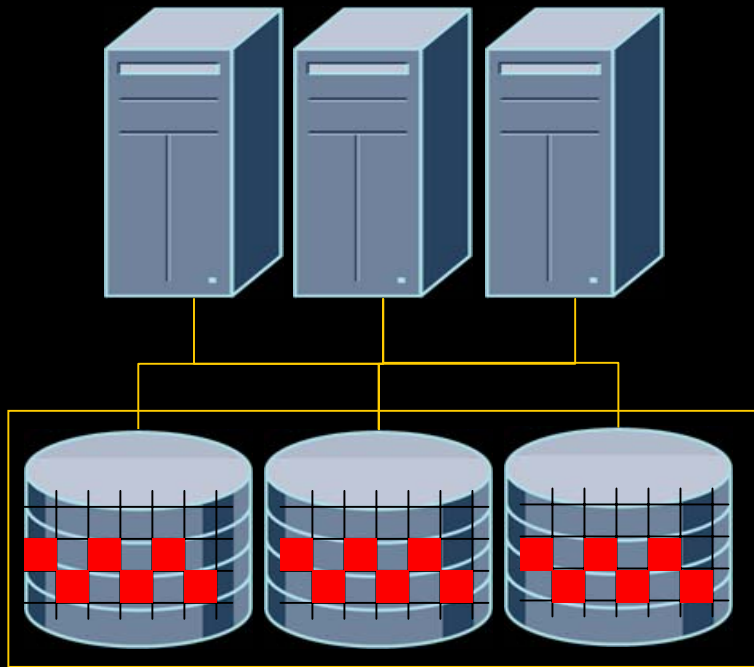
1. Single Command Recovery:  
FLASHBACK TABLE  
<table\_name> TO  
BEFORE DROP ;

# Automatic Storage Management





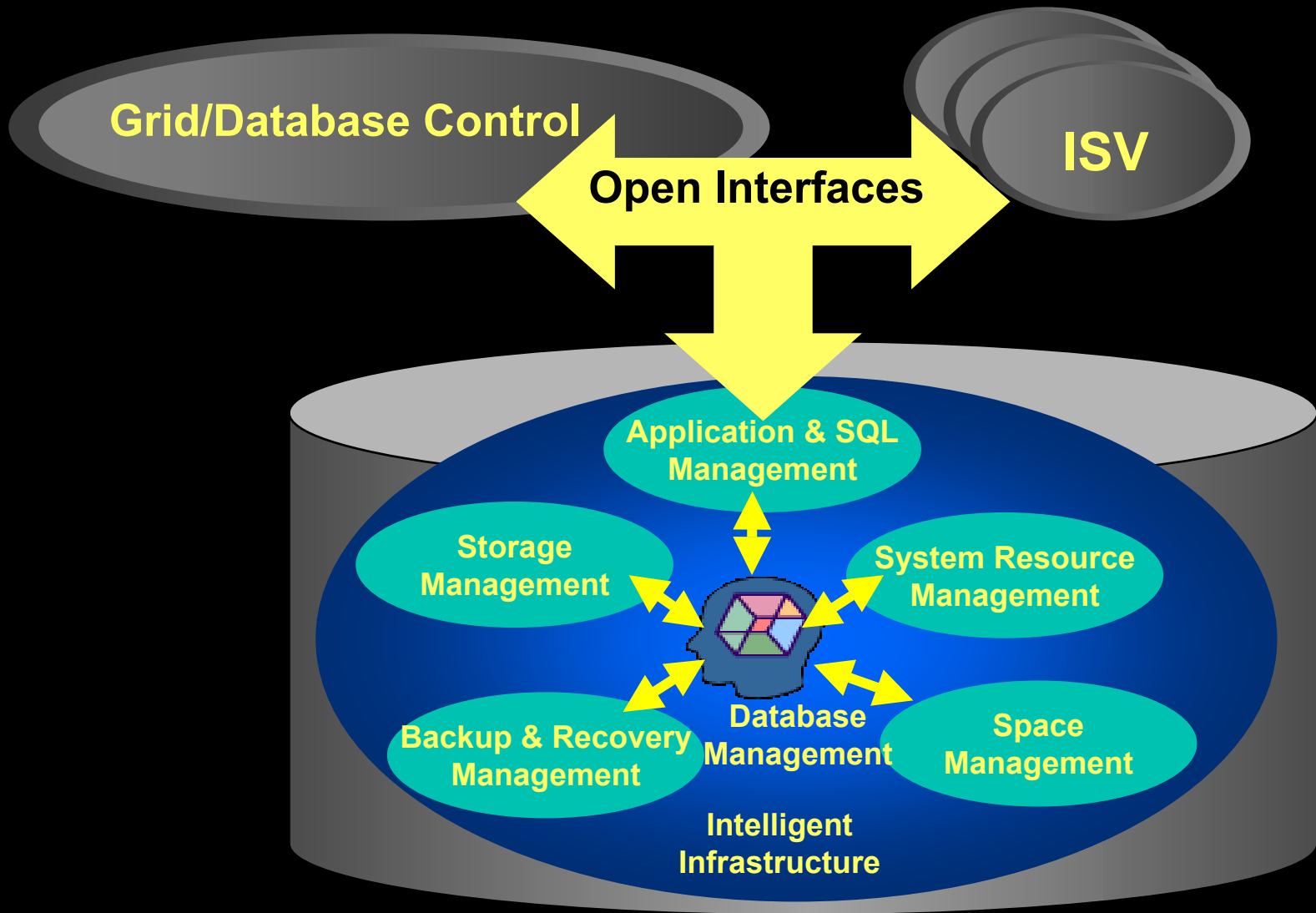
# Automatic Storage Management - Benefits



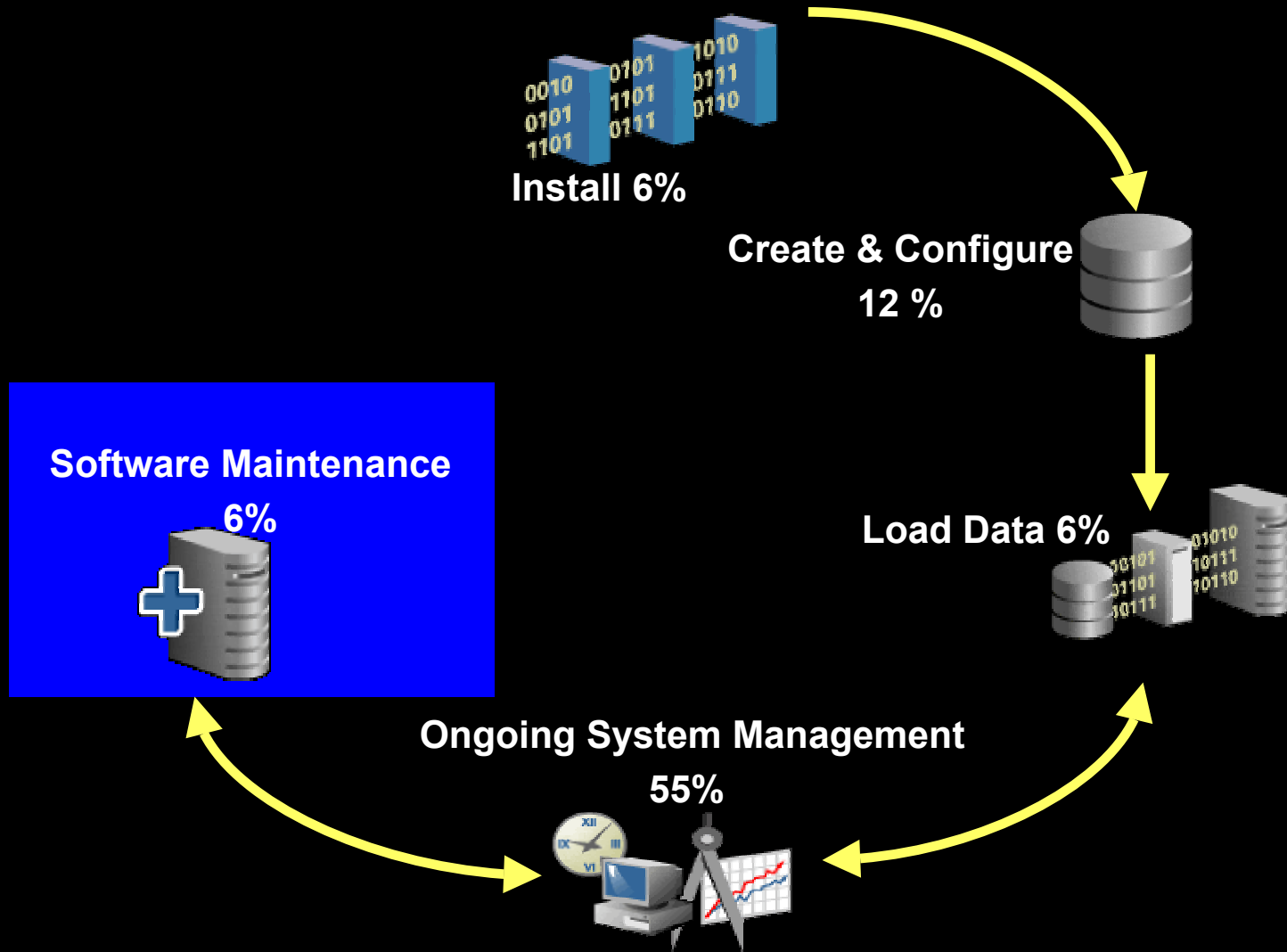
Automatic Storage Management

- **Automates daily storage administration**
  - Automatic I/O tuning
  - Eliminates disk fragmentation
  - Automatically selects allocation policy per Oracle file type
- **Automates storage re-configuration**
  - Automatic data copy on disk add/drop, no reconfiguring volume and re-striping
  - Online migration to new storage hardware

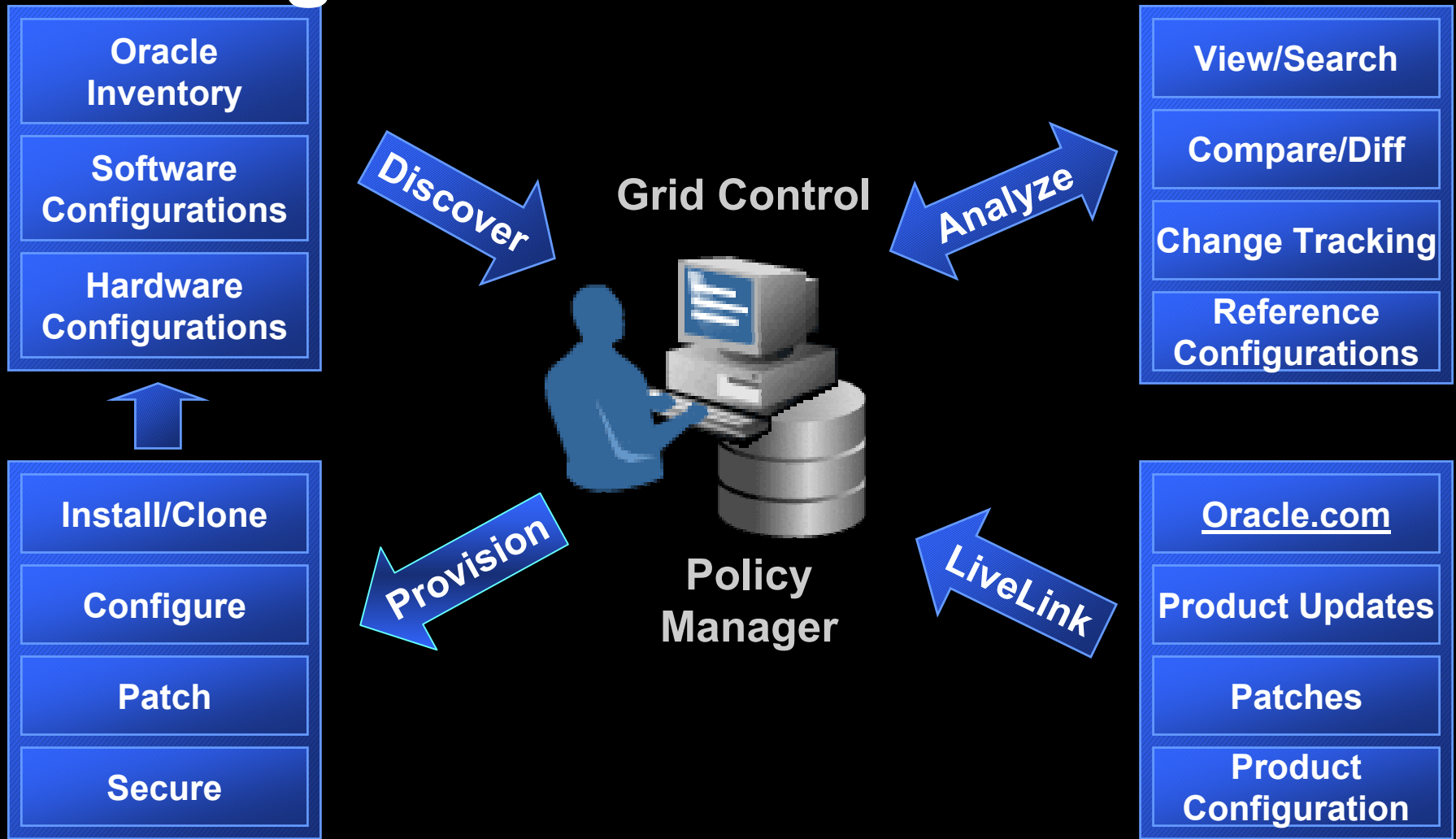
# Open Interfaces for ISV Partners



# Where DBA's spend their time

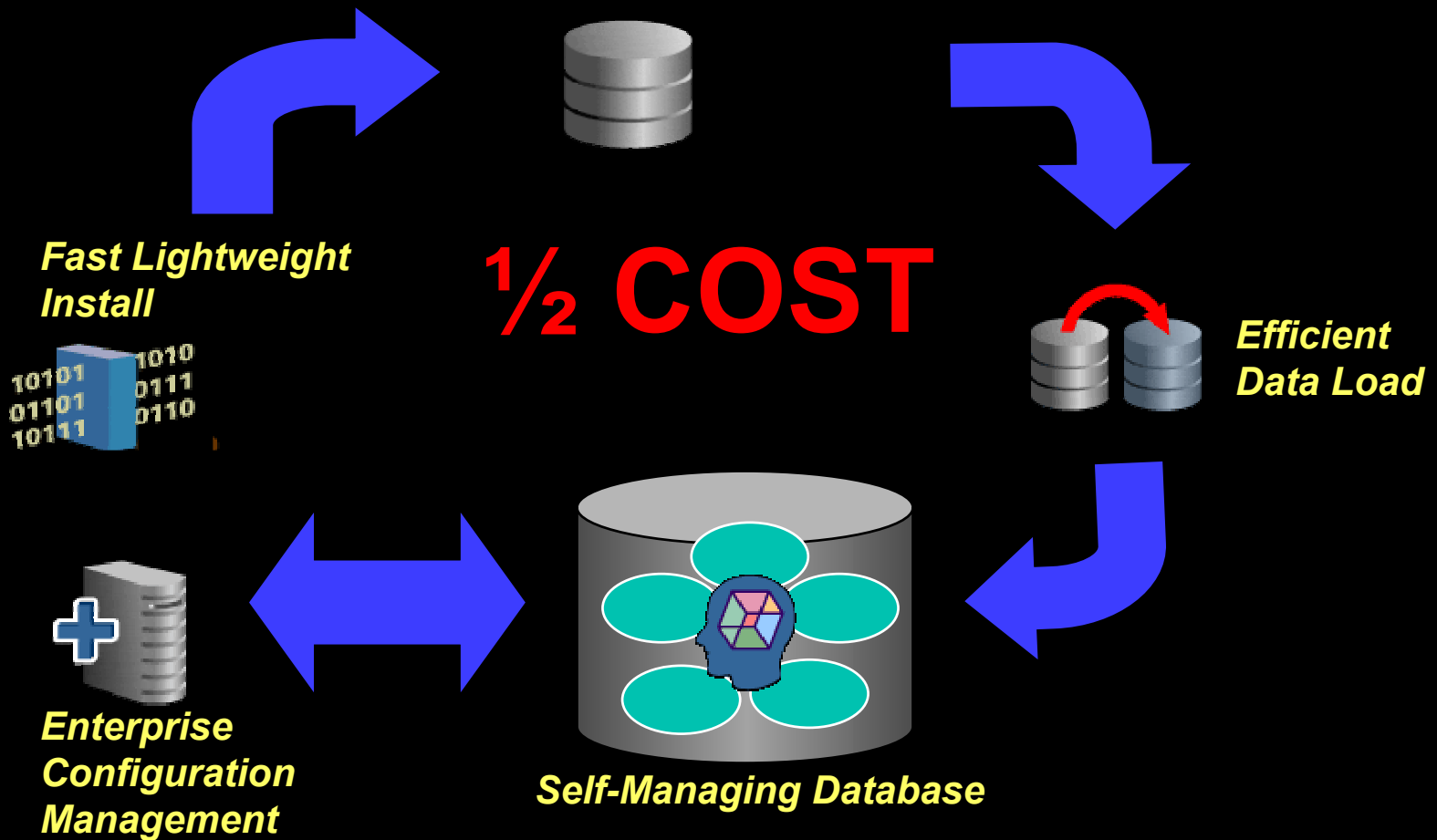


# Enterprise Configuration Management

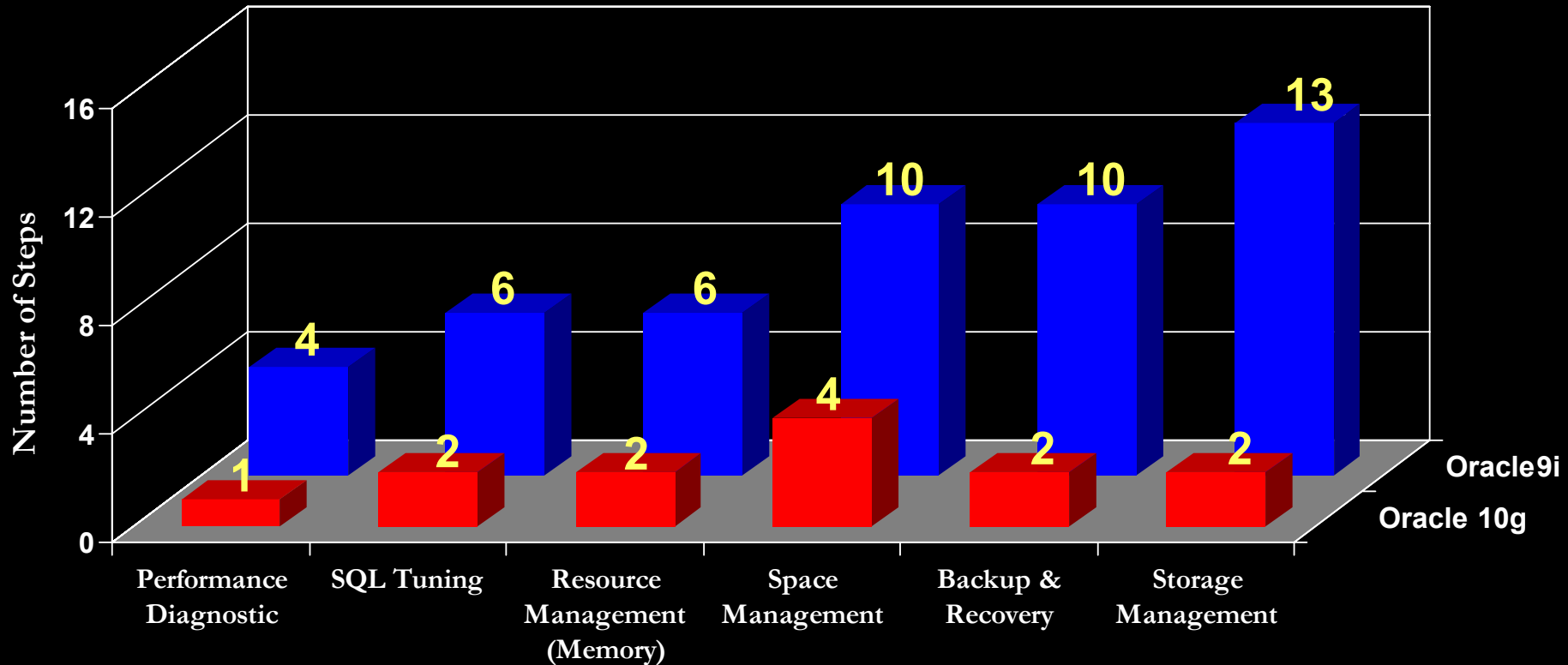


# Oracle Database 10g

*Simplified Creation & Configuration*



# Oracle 10g : Twice as Manageable as Oracle9i



## Result Summary

Oracle 10g required **44%** less time and **47%** fewer steps than Oracle9i.

**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

# Next Steps....

- Recommended hands-on labs
  - Oracle Database 10g : Manage the Oracle Environment Hands-On Lab
- Campground Demos
  - Self-Managing Database : Easy Upgrade
  - Self-Managing Database: Invisible Installation & Deployment
  - Self-Managing Database: Proactive Performance Management
  - Self-Managing Database: Automatic Memory Management
  - Self-Managing Database: Proactive Space Management
- Relevant web sites to visit for more information
  - <http://otn.oracle.com/products/manageability/database>

# Next Steps....

- Recommended sessions
  - The Self-Managing Database: Automatic Performance Diagnostic (Tuesday, 11 AM)
  - The Self-Managing Database: Guided Application & SQL Tuning (Tuesday, 3:30 PM)
  - The Self-Managing Database: Automatic SGA Memory Management (Tuesday, 5:00 PM)
  - The Invisible Oracle: Deploying Oracle Database in Embedded Environment (Wednesday, 4:30 PM)
  - The Self-Managing Database: Proactive Space and Schema Object Management (Thursday, 8:30 AM)
  - The Self-Managing Database: Automatic Health Monitoring (Thursday, 11 AM)

**Reminder –  
please complete the  
OracleWorld online session  
survey**

**Session ID : 40090**

**Thank you.**

A large, stylized graphic of the letters 'Q' and 'A' in a dark grey, serif font. A red ampersand is positioned between the 'Q' and 'A'. The text 'QUESTIONS' and 'ANSWERS' is overlaid on the graphic in white, bold, sans-serif font.

**QUESTIONS**  
**ANSWERS**

ORACLE®