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Oracle 11g Partitioning new features and ILM

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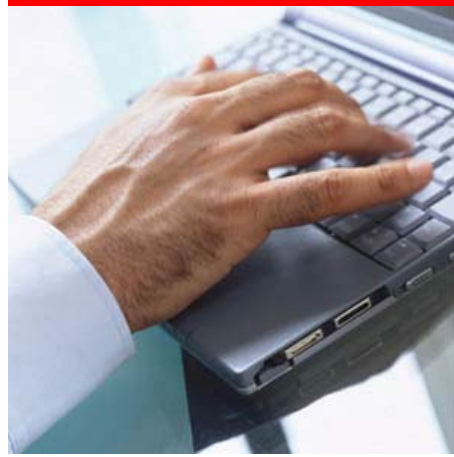
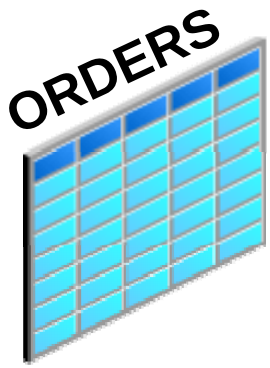
Agenda



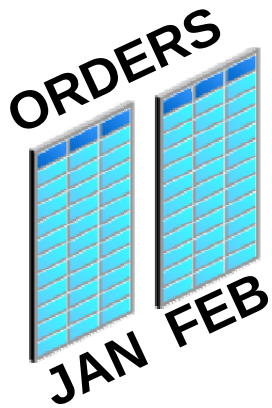
- Concepts
- Evolution of Oracle Partitioning
  - Proven functionality in 7th generation
- New functionality of Oracle database 11g in detail
- Partitioning and ILM
- Q&A

Oracle Partitioning
Transparent to applications



Large Table

Difficult to Manage

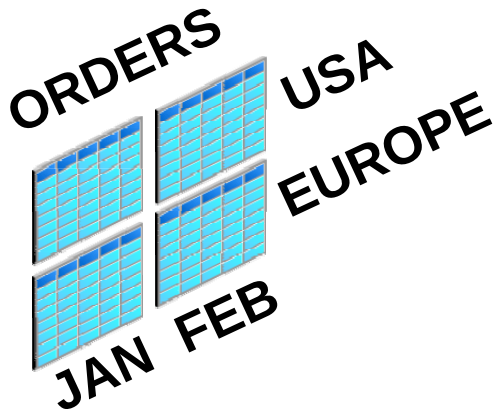


Partition

Divide and Conquer

Easier to Manage

Improve Performance



Composite Partition

Better Performance

More flexibility to match business needs

What is Oracle Partitioning?

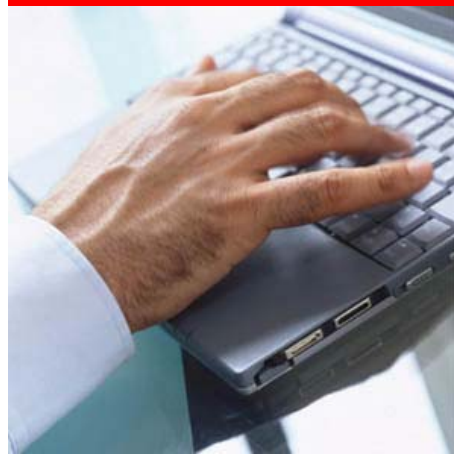
It is

- Powerful functionality to logically partition objects into smaller pieces
- Driven by business requirements
- Partitioning for Performance, Manageability, and Availability

It is not

- A way to physically divide – or clump - any large data set into smaller buckets
- A pre-requirement to support a specific hardware/software design
  - Hash mandatory for shared nothing systems

Agenda



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Oracle Partitioning:
Over Ten Years of Development

	Core functionality	Performance	Manageability
Oracle8	Range partitioning Global range indexes	"Static" partition pruning	Basic maintenance operations: add, drop, exchange
Oracle8*i*	Hash and composite range-hash partitioning	Partition-wise joins "Dynamic" pruning	Merge operation
Oracle9*i*	List partitioning		Global index maintenance
Oracle9*i* R2	Composite range-list partitioning	Fast partition split	
Oracle10*g*	Global hash indexes		Local Index maintenance
Oracle10*g* R2	1M partitions per table	"Multi-dimensional" pruning	Fast drop table

Oracle Partitioning:
Over Ten Years of Development

ORACLE DATABASE 11g

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Oracle10*g* R2	1M partitions per table	"Multi-dimensional" pruning	Fast drop table
Oracle Database 11*g*	More composite choices REF Partitioning Virtual Column Partitioning		Interval Partitioning Partition Advisor

Oracle Database 11g

Complete the basic partitioning strategies

- New composite partitioning methods
  - Range-range, list-range, list-list, list-hash

Enhanced Partitioning

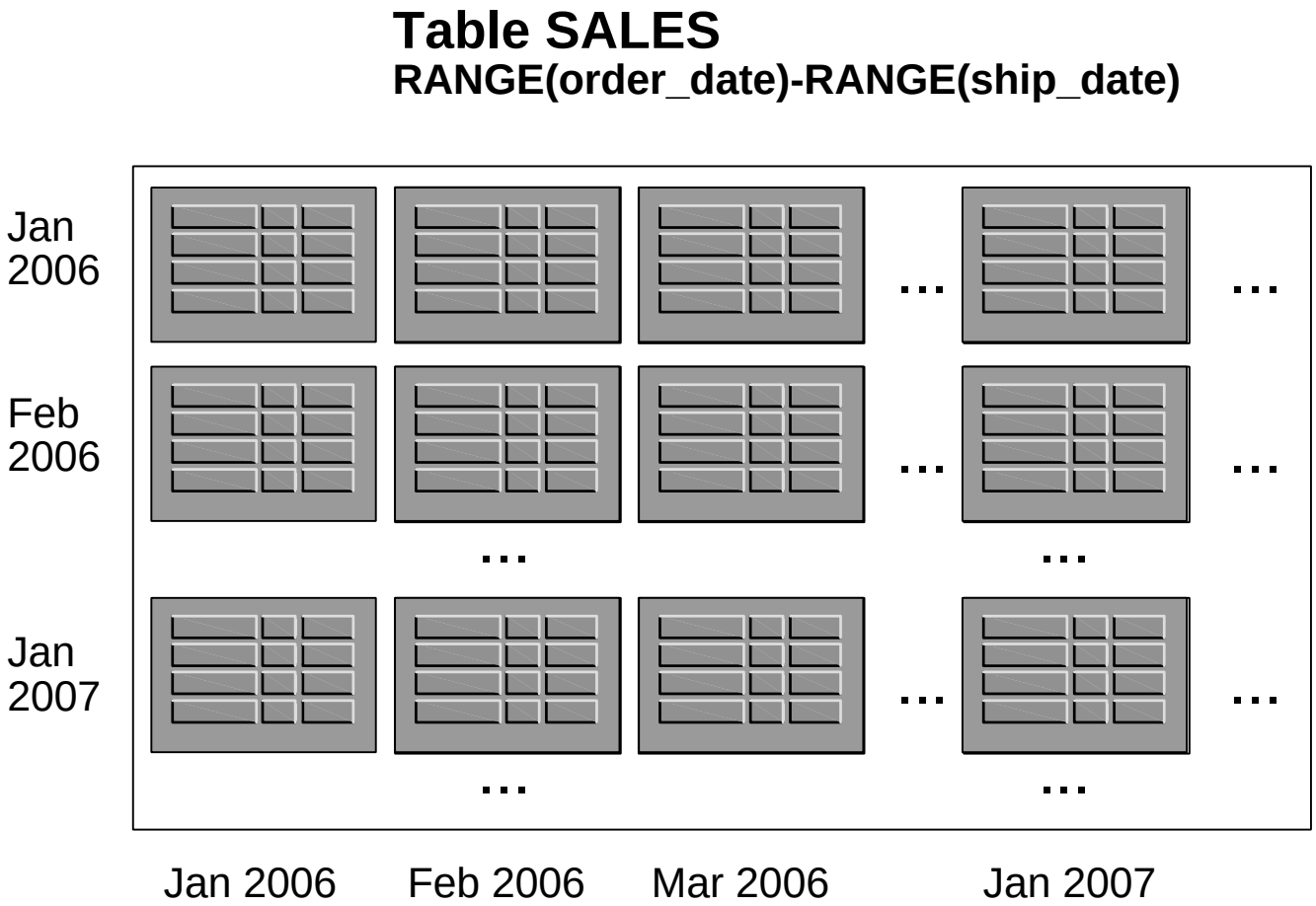
- Virtual column based partitioning
- REF Partitioning
- Interval Partitioning

Enhanced Manageability

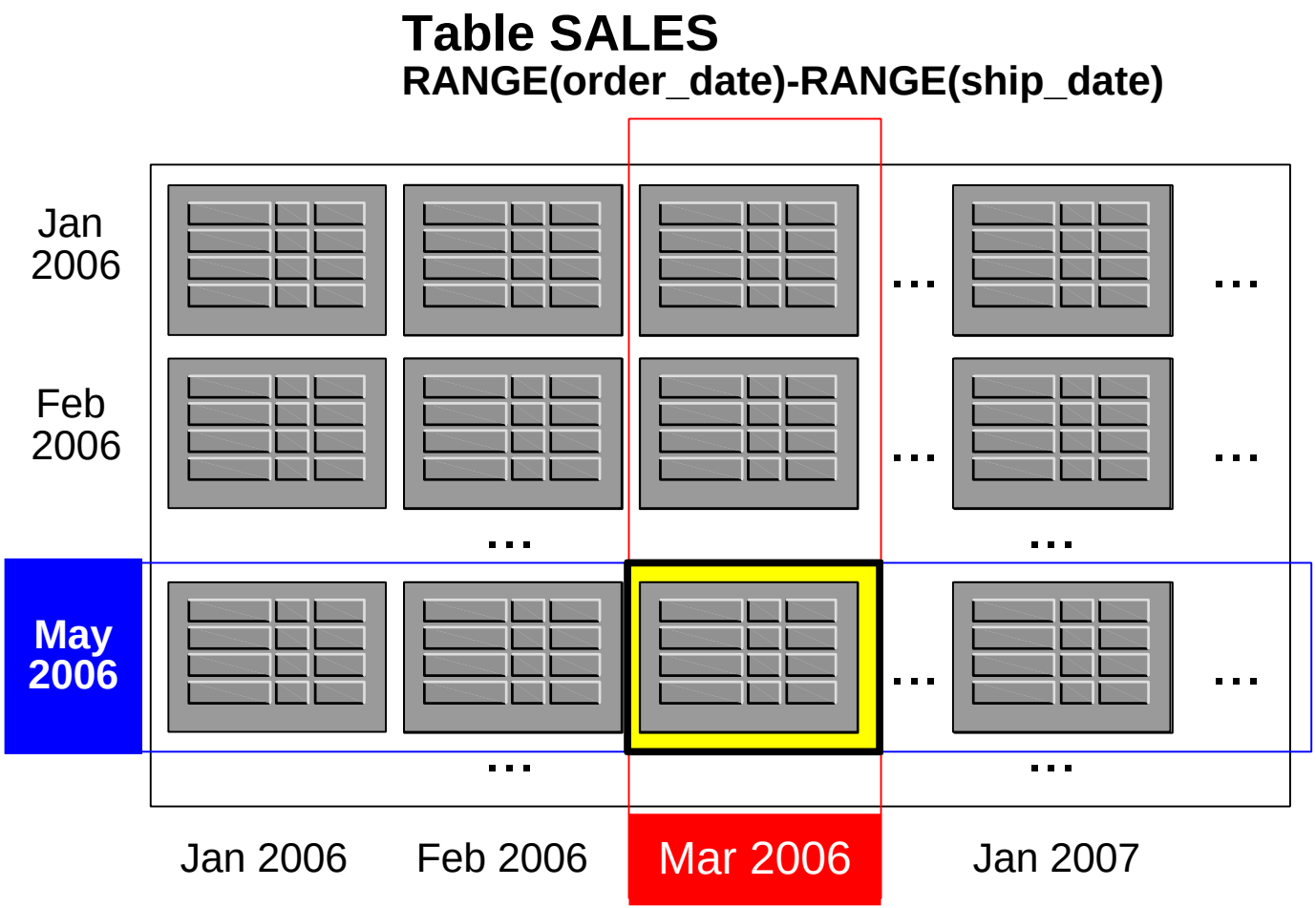
- Partition Advisor

Composite Partitioning in Oracle Database 11g

Composite Partitioning - Concept



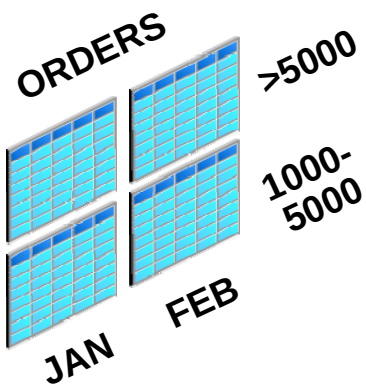
Composite Partitioning - Concept



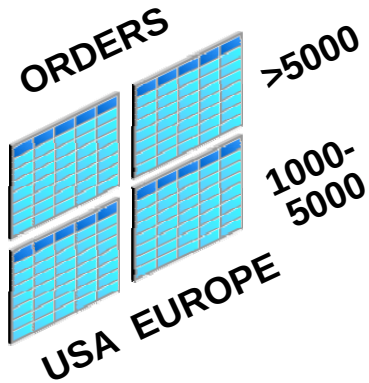
- All records with order_date in March 2006 **AND** ship_date in May 2006

Partitioning in Oracle Database 11g
Complete Composite Partitioning

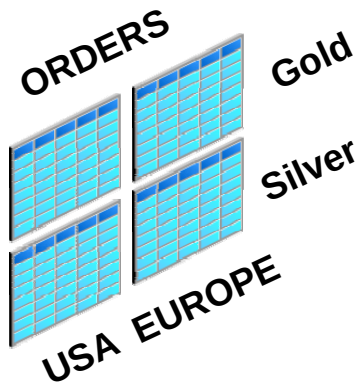
- Range – range
- List – list
- List – hash
- List – range



RANGE-RANGE
Order Date by
Order Value



LIST-RANGE
Region by
Order Value



LIST-LIST
Region by
Customer Type

Interval Partitioning

Interval Partitioning

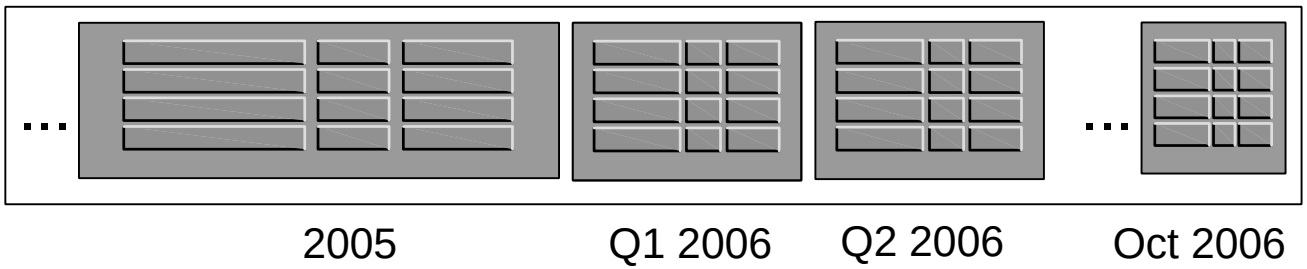
- Interval Partitioning
  - Extension to Range Partitioning
  - Full automation for equi-sized range partitions
- Partitions are created as metadata information only
  - Start Partition is made persistent
- Segments are allocated as soon as new data arrives
  - No need to create new partitions
  - Local indexes are created and maintained as well

No need for any partition management

Interval Partitioning

- Range partitioned tables can be extended into interval partitioned tables
  - Simple metadata command
  - Investment protection

Table SALES



Automate the partition management

Interval Partitioning

- Range partitioned tables can be extended into interval partitioned tables
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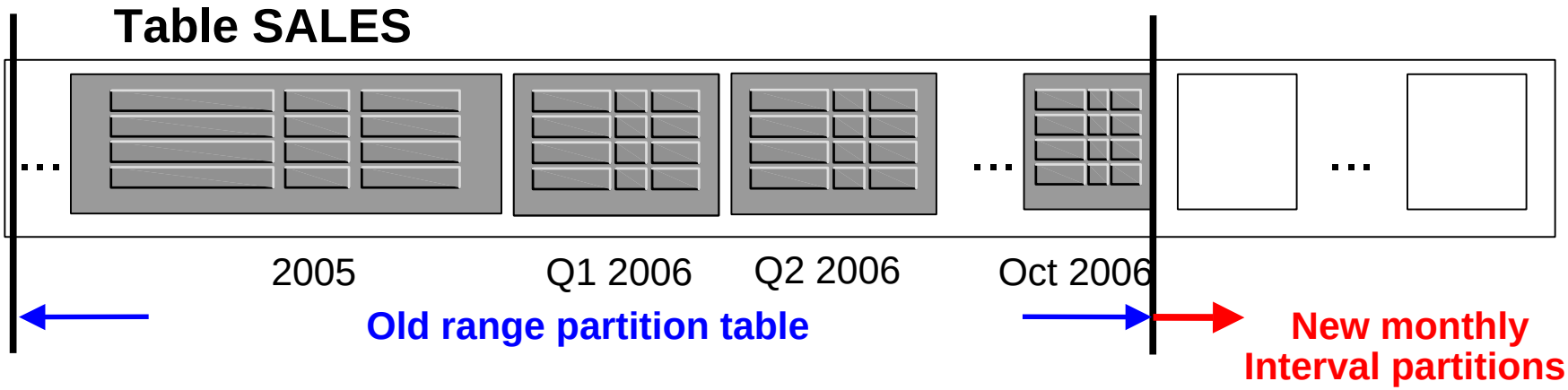



```
ALTER TABLE sales (order_date DATE, ...)
SET INTERVAL(NUMTOYMINTERVAL(1,'month');
```

REF Partitioning

REF Partitioning

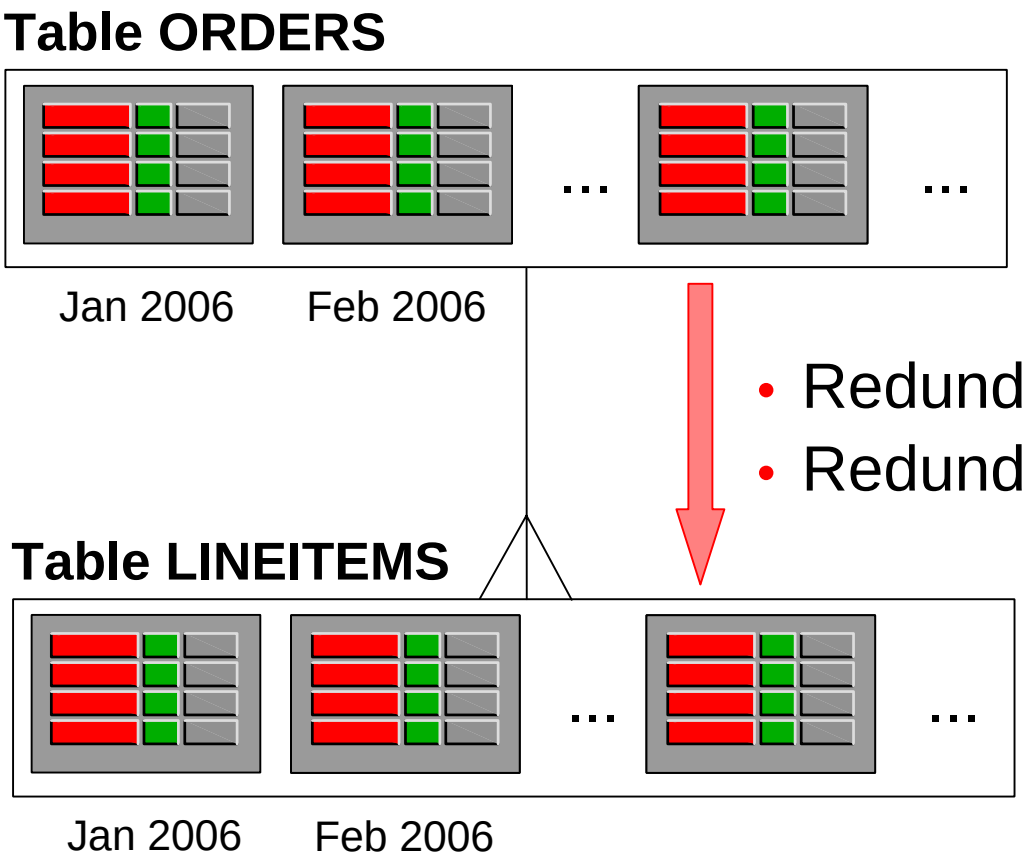
Business Problem

- Related tables benefit from same partitioning strategy
  - Sample 3NF order entry data model
- Redundant storage of the same information solves this problem
  - Data overhead
  - Maintenance overhead

Solution

- Oracle Database 11g introduces REF Partitioning
  - Child table inherits the partitioning strategy of parent table through PK-FK relationship
  - Intuitive modelling
- Enhanced Performance and Manageability

Before REF Partitioning

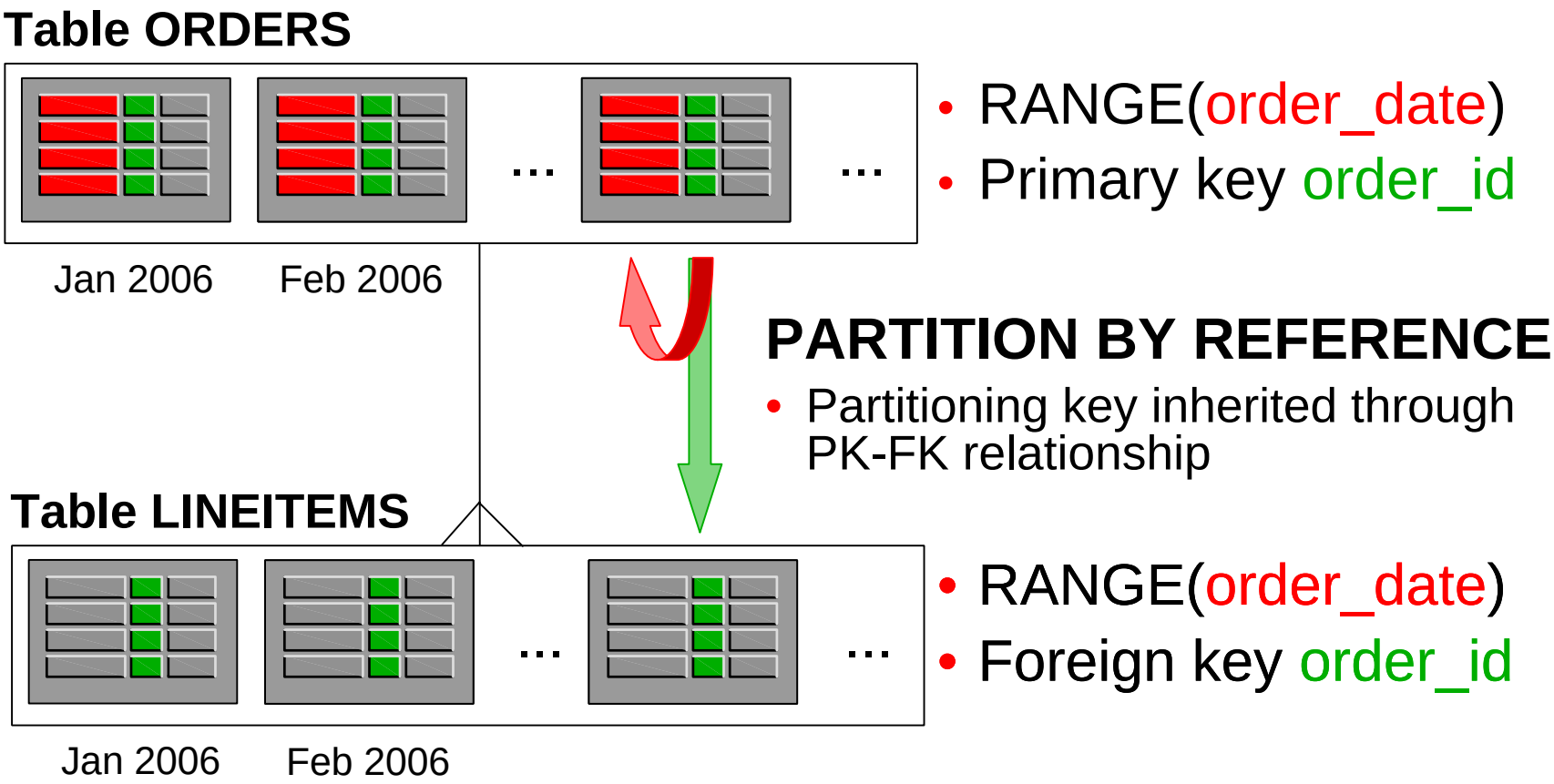


- RANGE(order_date)
- Primary key order_id

- Redundant storage of order_date
- Redundant maintenance

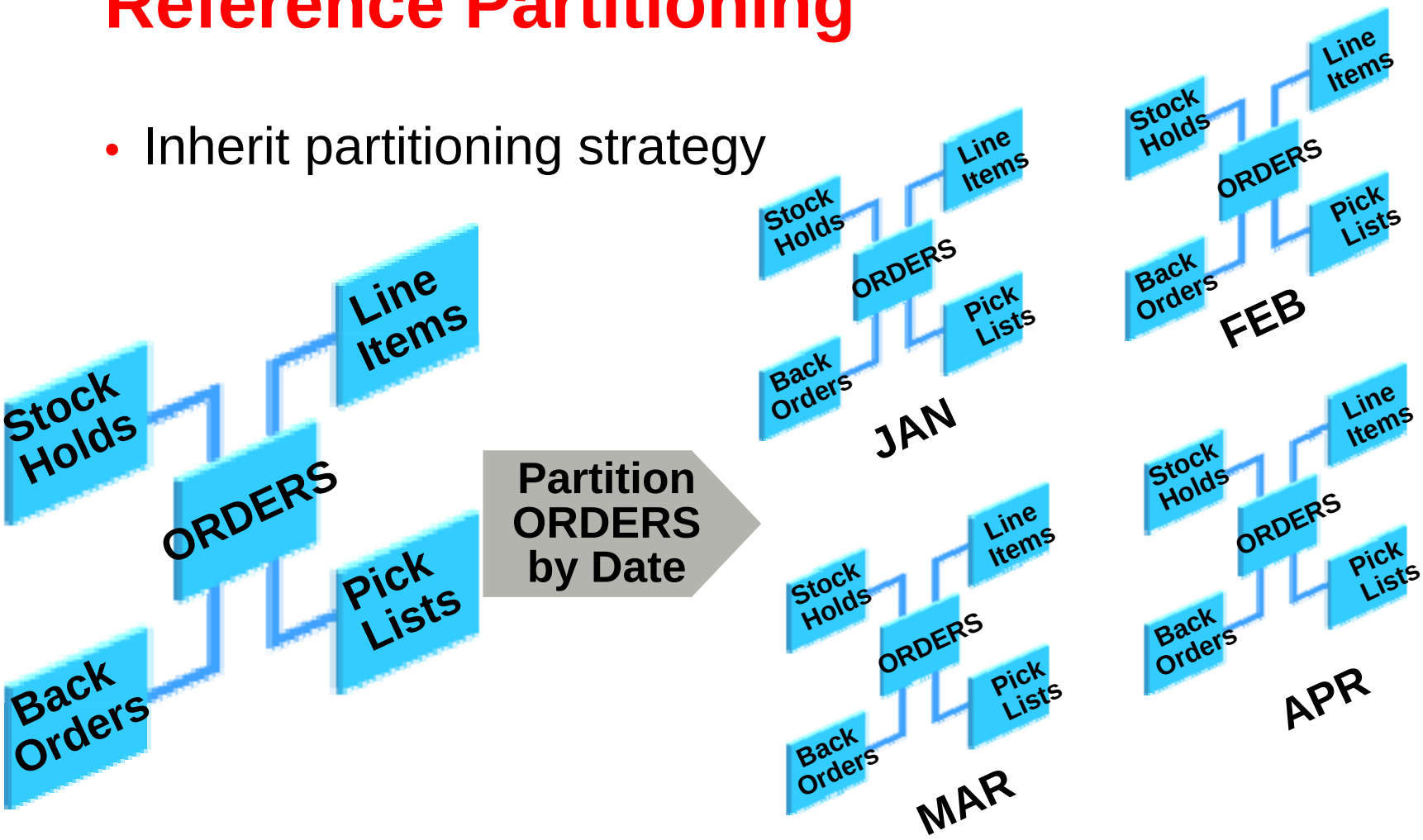
- RANGE(order_date)
- Foreign key order_id

REF Partitioning



Partitioning in Oracle Database 11g
Reference Partitioning

- Inherit partitioning strategy



Virtual Column based Partitioning

Virtual Columns

Business Problem

- Extended Schema attributes are fully derived and dependent on existing common data
- Redundant storage or extended view definitions are solving this problem today
  - Requires additional maintenance and creates overhead

Solution

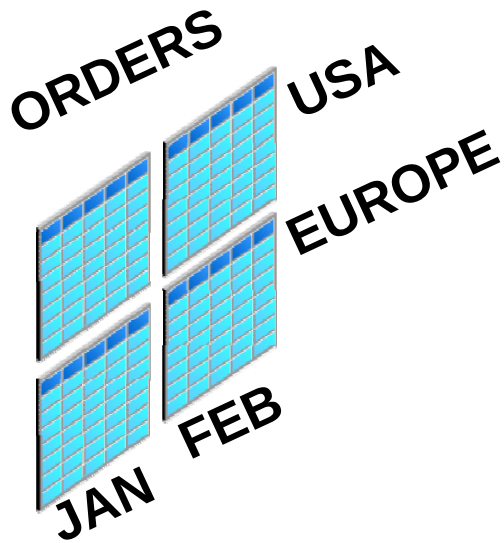
- Oracle Database 11g introduces virtual columns
  - Purely virtual, meta-data only
- Treated as real columns except no DML
  - Virtual columns can have statistics
  - Virtual columns are eligible as partitioning key
- Enhanced performance and manageability

Partitioning in Oracle Database 11g
Virtual Column-Based Partitioning

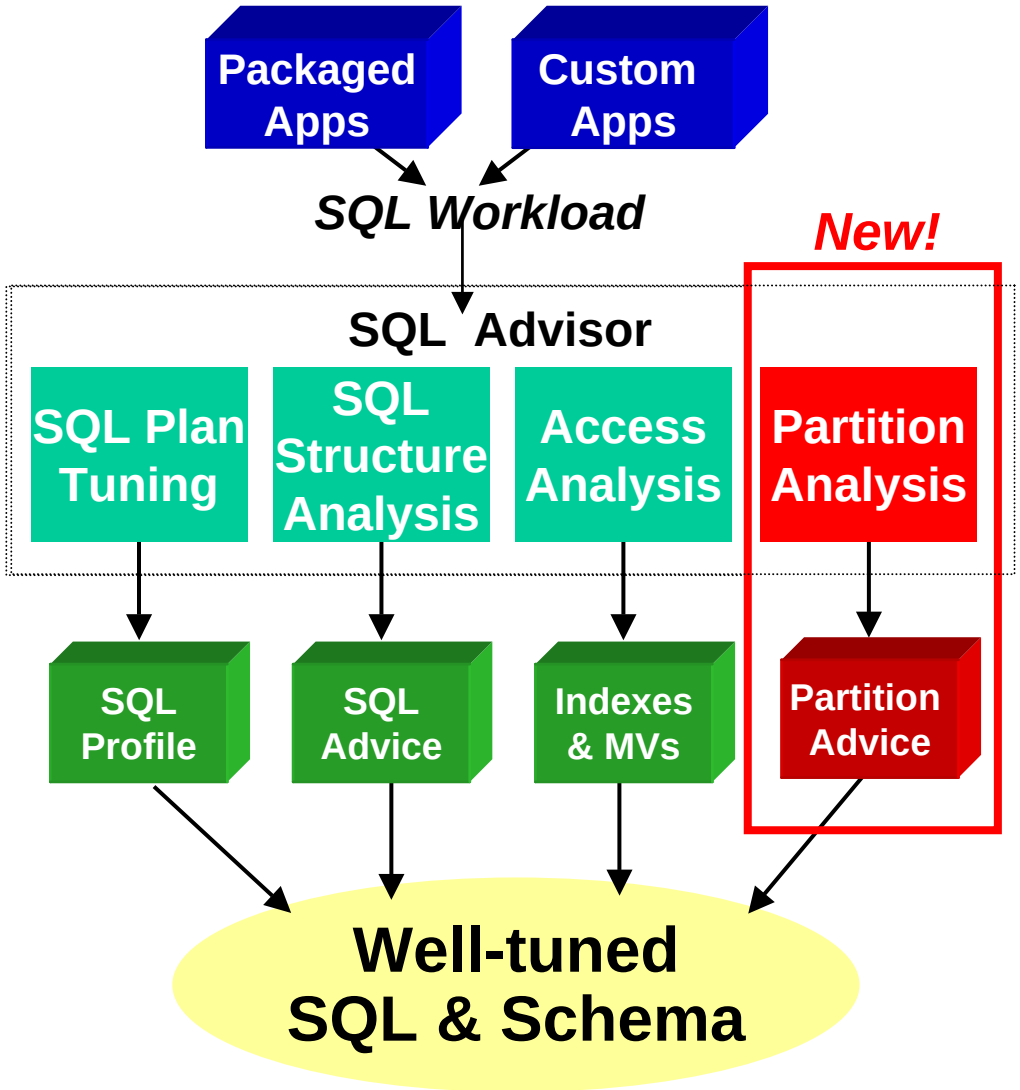
ORDERS

```
ORDER_ID   ORDER_DATE  CUSTOMER_ID...          REGION AS (SUBSTR(ORDER_ID,6,2))
---------- ----------- ----------- --          ------
9834-US-14 12-JAN-2007       65920              US
8300-EU-97 14-FEB-2007       39654              EU
3886-EU-02 16-JAN-2007        4529              EU
2566-US-94 19-JAN-2007       15327              US
3699-US-63 02-FEB-2007       18733              US
```

- REGION requires **no storage**
- Partition by ORDER_DATE, REGION

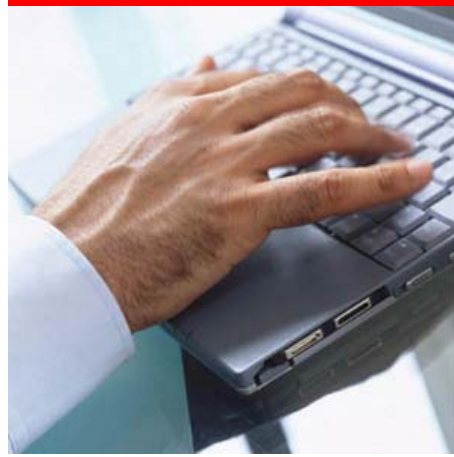


Partitioning Advisor



- Considers entire query workload to improve query performance
- Advises on partitioning methods
  - Range (equal-interval), range key and interval
  - Hash, hash key
- Integrated, non-conflicting advice with Indexes, MVs

Oracle Partitioning

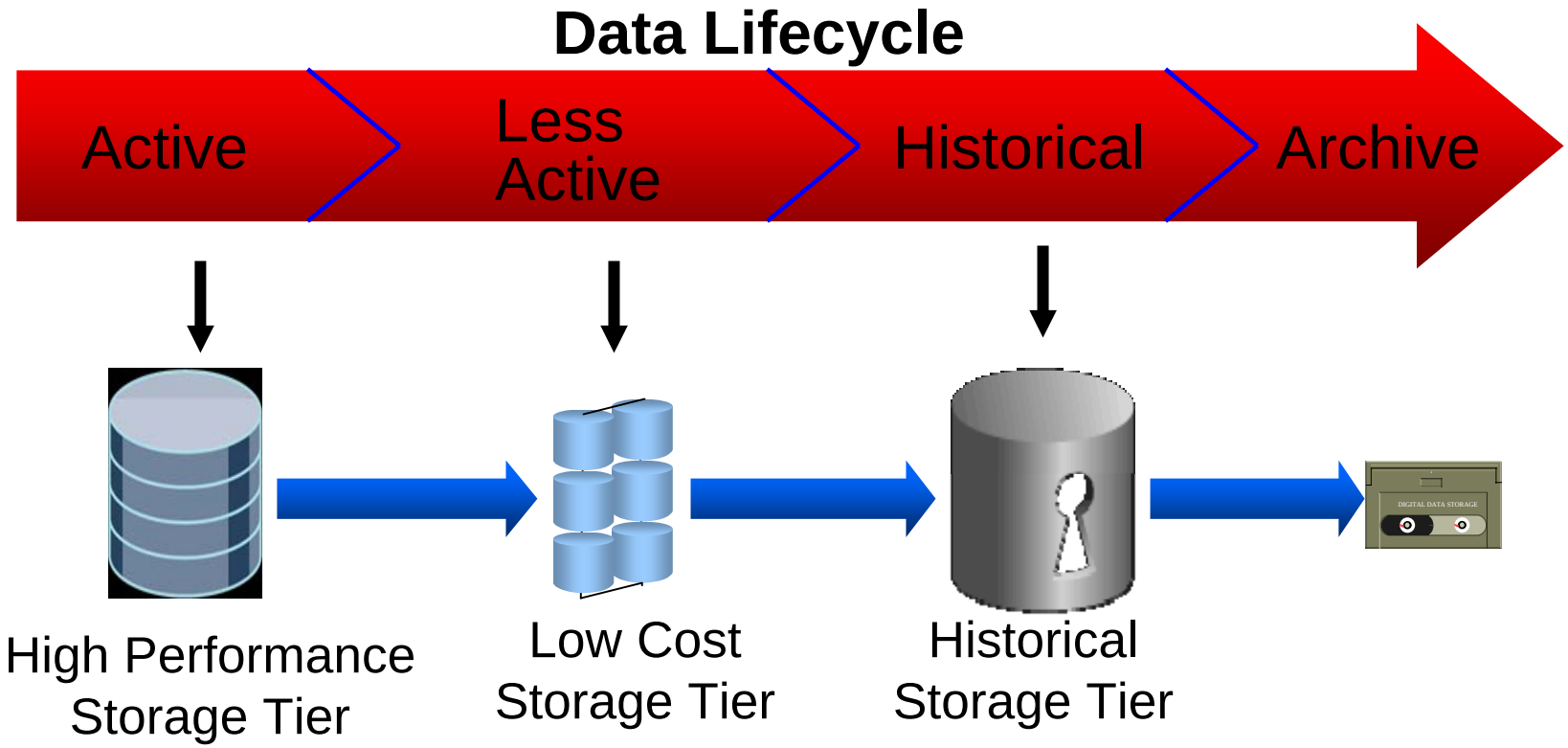


- Optimized performance
- One consistent way to manage all your data
- Reduced total cost of ownership

Information Lifecycle Management

Information Lifecycle Management

Match Lifecycle to Storage to Optimize Cost



What is ILM?

- Information Lifecycle Management encompasses the following:
  - Policies which define how to manage the data
  - Processes which actually manage the data
  - Software which implements the policies & processes
  - Hardware where the data is stored

Why is ILM Important

- Regulatory requirements are driving large increases in Retention of Historical Data
  - New types of data to retain
    - Email, voicemail, medical
  - Longer Retention Period
    - 7 to 30 years

Sarbanes-Oxley
HIPAA
European Data Privacy Directive
UK PRO
DOD5015.2-STD

- Very low cost retention is needed to prevent costs from skyrocketing

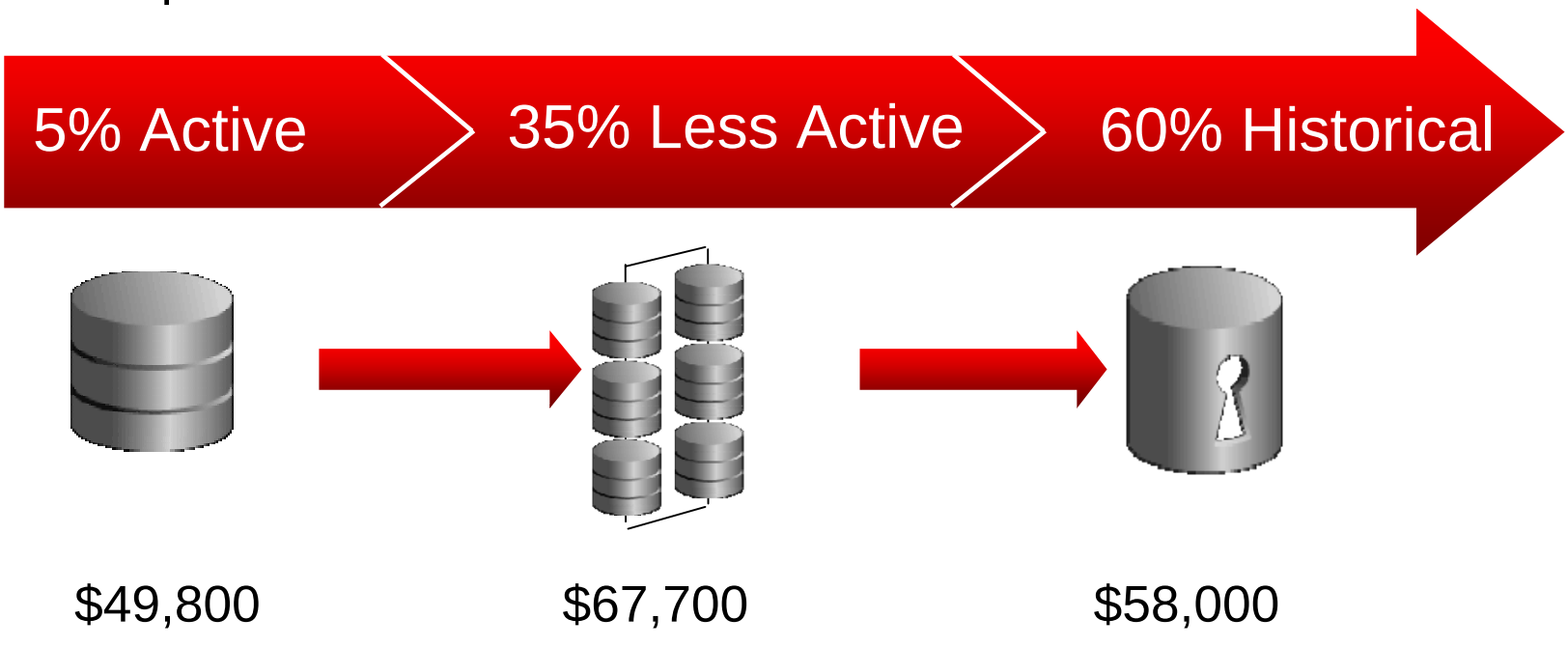
Information Lifecycle Management

Reduce storage costs accordingly

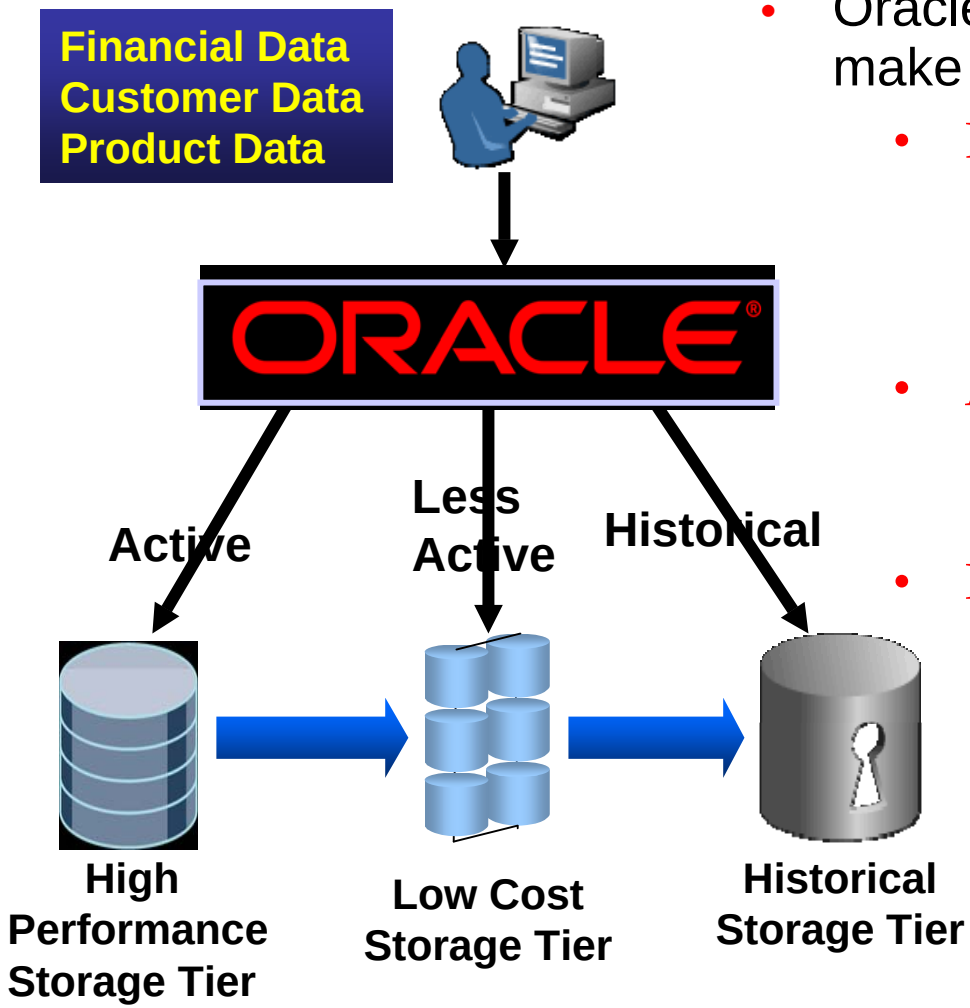
High Performance Storage Tier = $72 per Gb

Low cost Storage Tier = $14 per Gb

Read only Storage Tier = $7 per Gb



ILM Assistant is Ideal for your Business



- Oracle has unique capabilities that make it ideal for business ILM
  - Fine grained ILM
    - Oracle manages the lifecycle of groups of business data down to the level of individual rows
  - Application Transparent ILM
    - Oracle classifies business data transparently to the application
  - Low Cost ILM
    - Oracle can use low cost storage to greatly reduce the cost of retaining data

Optimize the Cost of Retaining Data

Implementing Oracle ILM

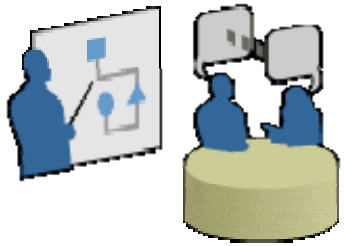
How Do You Implement Information Lifecycle Management?

Oracle ILM Assistant

- Tool download from OTN
  - http://www.oracle.com/goto/ilm
- Requirements
  - Oracle Application Express 2.2 (formerly HTML Db)
  - Oracle 9i or greater

3 Steps to Business ILM

1. Define Data Classes



3. Manage Access and Migration of Data by Class

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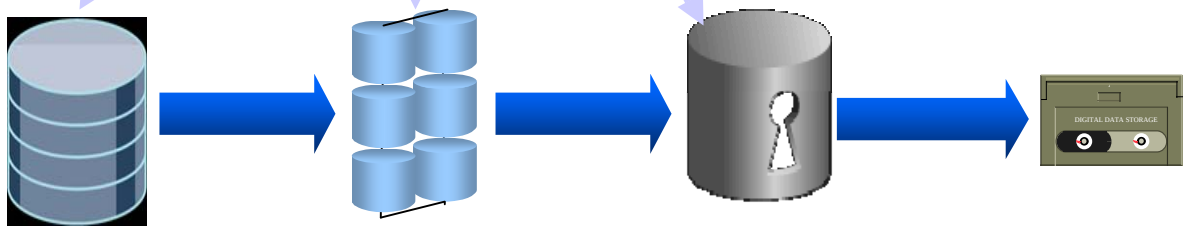
2. Create Storage Tiers for the Data Classes

Active

Less Active

Historical



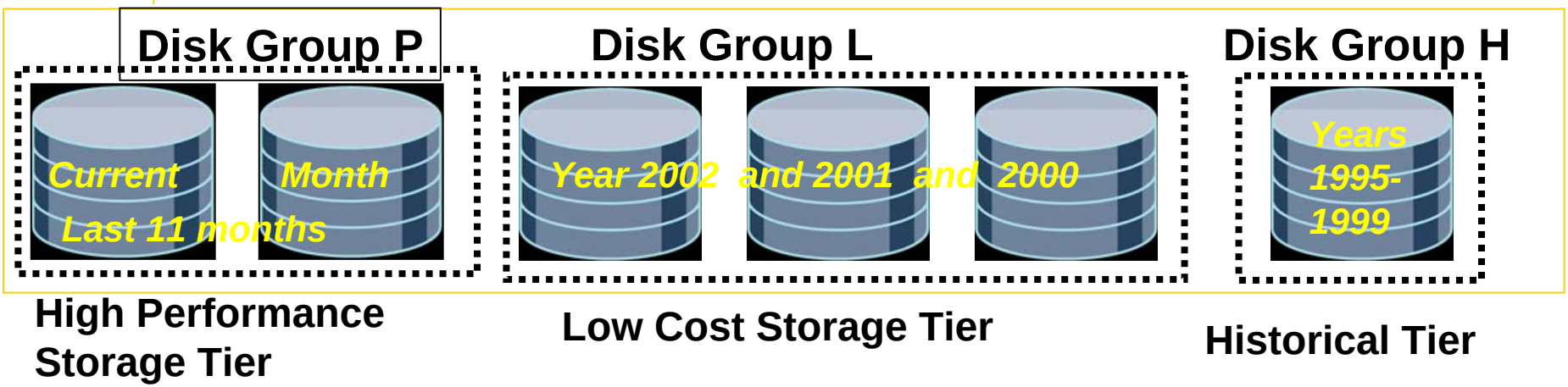
High Performance Storage Tier

Low Cost Storage Tier

Historical Storage Tier

ASM Disk Groups per Storage Tier & Partitions

- Each Tier uses ASM for load balancing within the tier
- Partitions are in different disk groups
- Data is moved between disk groups using
  - Partition Move Operation, or
  - Online Reorganization of tables, or
  - Tablespace Copy followed by “rename”



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