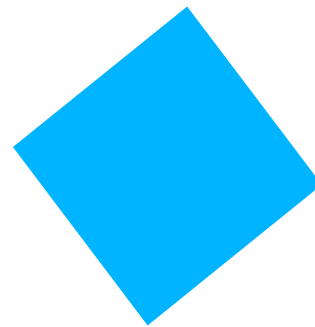




# UDB Training

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## Data Placement

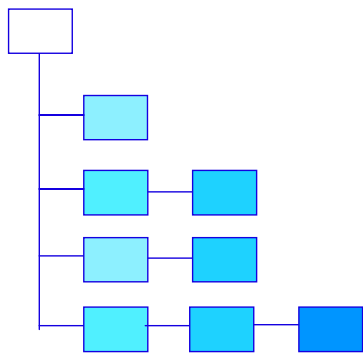


## Objectives

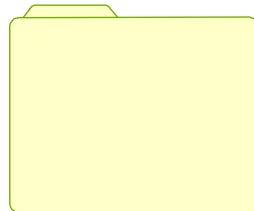
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- ▲ After completing this unit, you should be able to:
- Describe the physical placement of database objects
  - Describe the DB2 implementation of Table Spaces
  - Understand the performance considerations

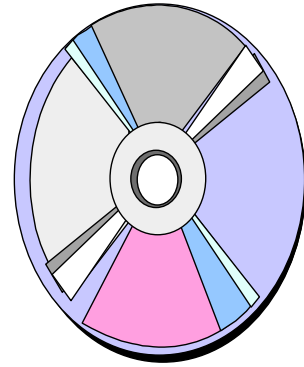
# Containers



**Directory**



**File**

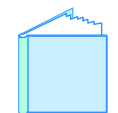


**Device**

# Containers and Table Spaces

- Container is an Allocation of Physical Space

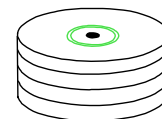
*What Does a Container Look Like?*



*Directory*



*File*

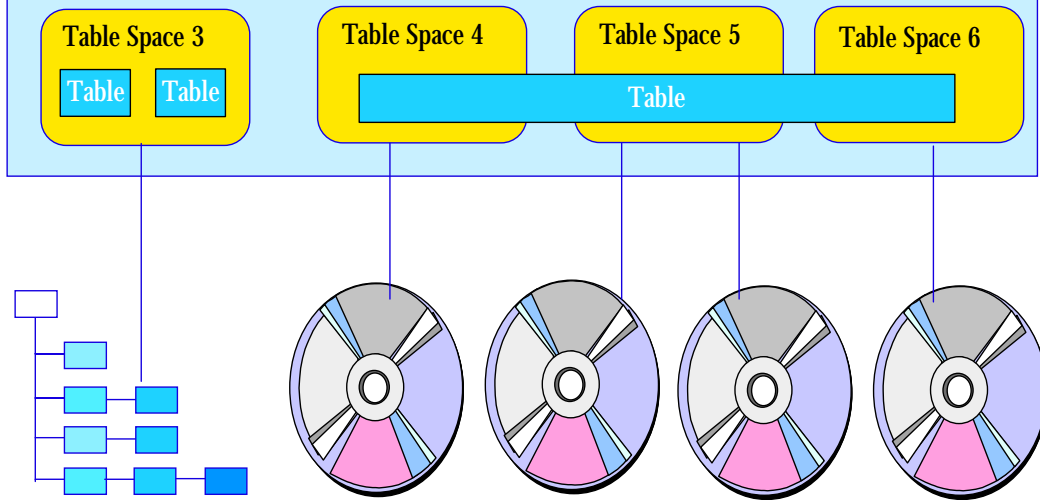


*Device*

	<i>File</i>	<i>Directory</i>	<i>Device</i>
<i>Intel</i>	DMS	SMS	N/A
<i>UNIX</i>	DMS	SMS	DMS
<i>Windows NT</i>	DMS	SMS	DMS

# Table Spaces & Containers

## Database 1

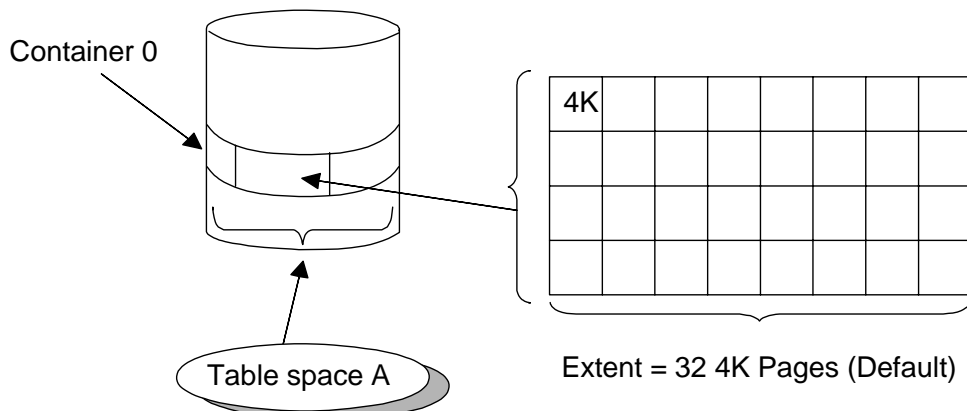


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# Containers and Extents

- Physical Mapping to Logical Table space
- Data Written to Containers in Pages
- Pages are Written into Extents



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# SMS Table Spaces

- ▲ SMS is based on the storage model where physical storage is acquired as needed from the System.
- The container does not pre-allocate its storage.
- Containers cannot be dynamically added after a Table Space has created.
- Containers must be specified when creating the table space
- SMS containers are represented by **directories**.

# Default Database Configuration

db2 create database ourdb ON path/drive

instance name

node0000

SQL00001

SQLT0000.0

SYSCATSPACE

SQLT0001.0

TEMPSPACE1

SQLT0002.0

USERSPACE1

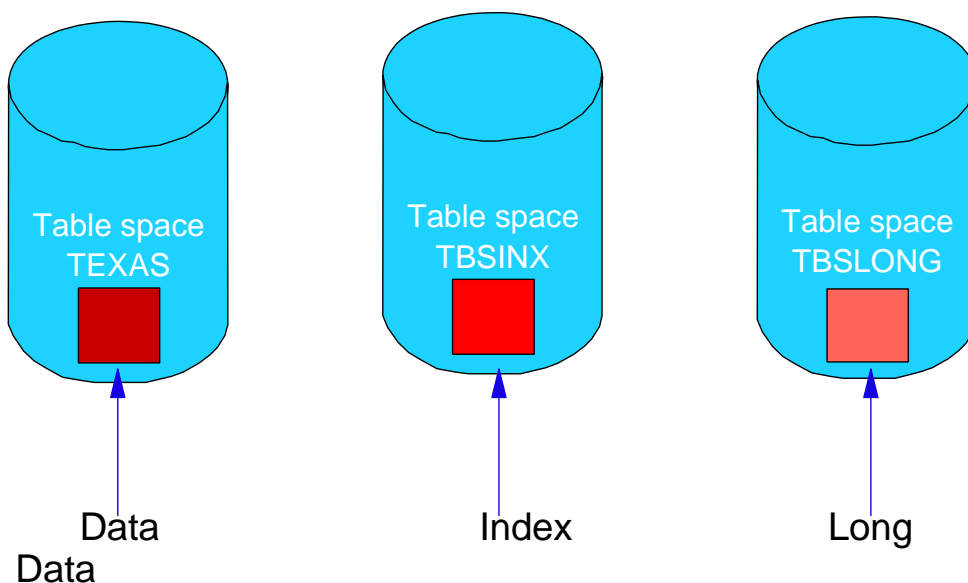
Physical Structure  
Containers

Logical Structure  
Table Spaces

## DMS Table Spaces

- ▲ DMS table spaces are assigned **pre-allocated** storage.  
This can be a file or a device.
  - The storage is pre-allocated when the tablespace is created.
  - If the container is a file, it is created & dropped with the table space.
  - Containers can be dynamically added.
- ▲ UNIX note - If container is a logical volume it must exist before creating the table space.

## Table Placement in DMS



## SMS Vs DMS Table Spaces

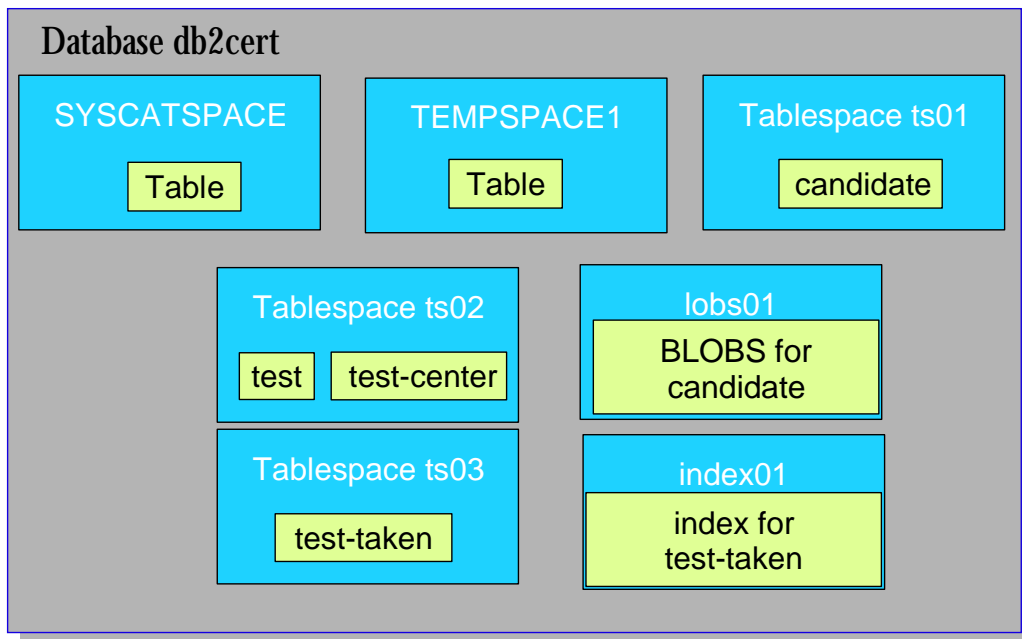
	SMS	DMS
Dynamically increase number of containers in tablespace	NO*	YES
Store index data in separate tablespace	NO	YES
Store long data in separate Tablespace	NO	YES
One table can span** several tablespaces	NO	YES
Pre-allocated Space	NO	YES
Space allocated only when needed	YES	NO
Table space can be directed to different disk types	YES	YES
Extent size can be changed after creation	NO	NO

\* *Redirected Restore can be used to Add containers*

## Planning the Environment

- ▲ Determine logical design
- ▲ Map design to Table spaces
- ▲ Create database
- ▲ Size the tables, indexes and table spaces
- ▲ Determine characteristics of containers
- ▲ Prepare physical environment
- ▲ Create table spaces
- ▲ Create tables and indexes

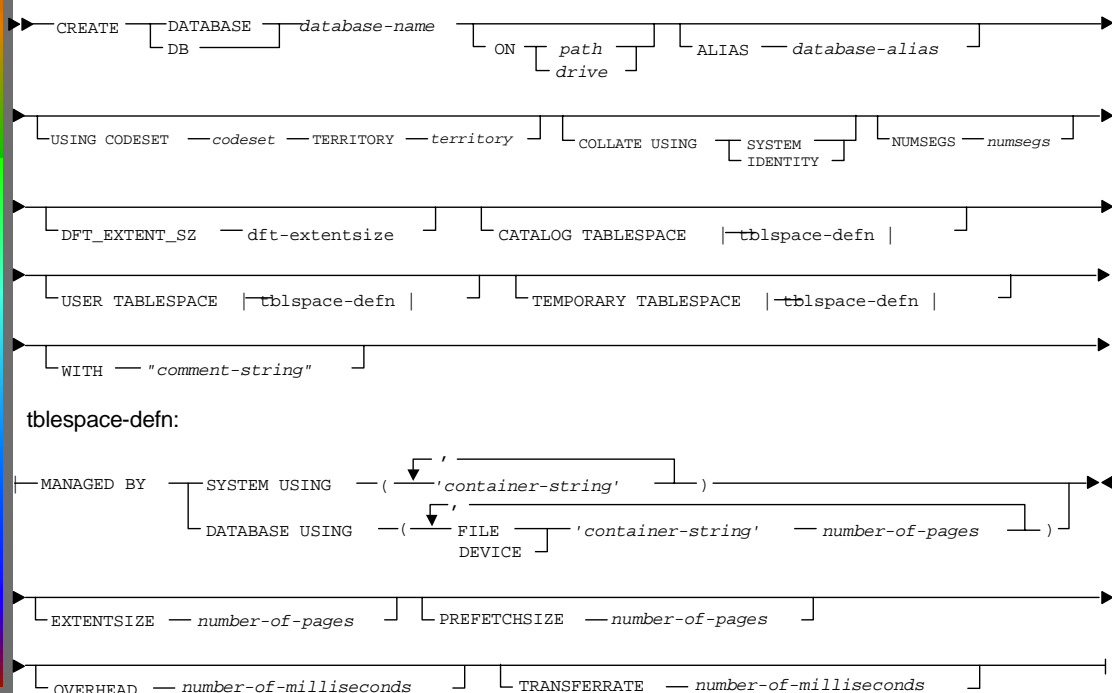
# Determine logical design



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# CREATE DATABASE Syntax



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# Creating SMS Table Spaces

UNIX: create tablespace enterprise managed by system using ('/database/firstcontain', '/database/secondcontain', '/database/thirdcontain')

Indicates SMS Table space

Container Definition

Intel: create tablespace enterprise managed by system using ('E:\db\firstcnt', 'F:\db\sndcnt', 'G:\thirdcnt')

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# Creating DMS Table Spaces

UNIX: create tablespace humanres managed by database using (device '/dev/rdata1' 1024, device '/dev/rdata2' 1024) EXTENTSIZE 8

UNIX: create *long* tablespace longtbs managed by database using (file '/home/me/dmslong.tbs' 500)

Intel: create tablespace indextbs managed by database using (file 'C:\database\index.tbs' 1000)

Indicates DMS Table space

Container Definition

Storage Type

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## Bufferpools

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- ▲ DB2 now supports multiple bufferpools
- ▲ A tablespace can be assigned to a bufferpool
  - Must alter tablespace to assign bufferpool
- ▲ IBMDEFAULTBP created by default with every database
- ▲ Can alter bufferpool to change size
- ▲ Bufferpool memory not freed if no tablespace(s) assigned to it.

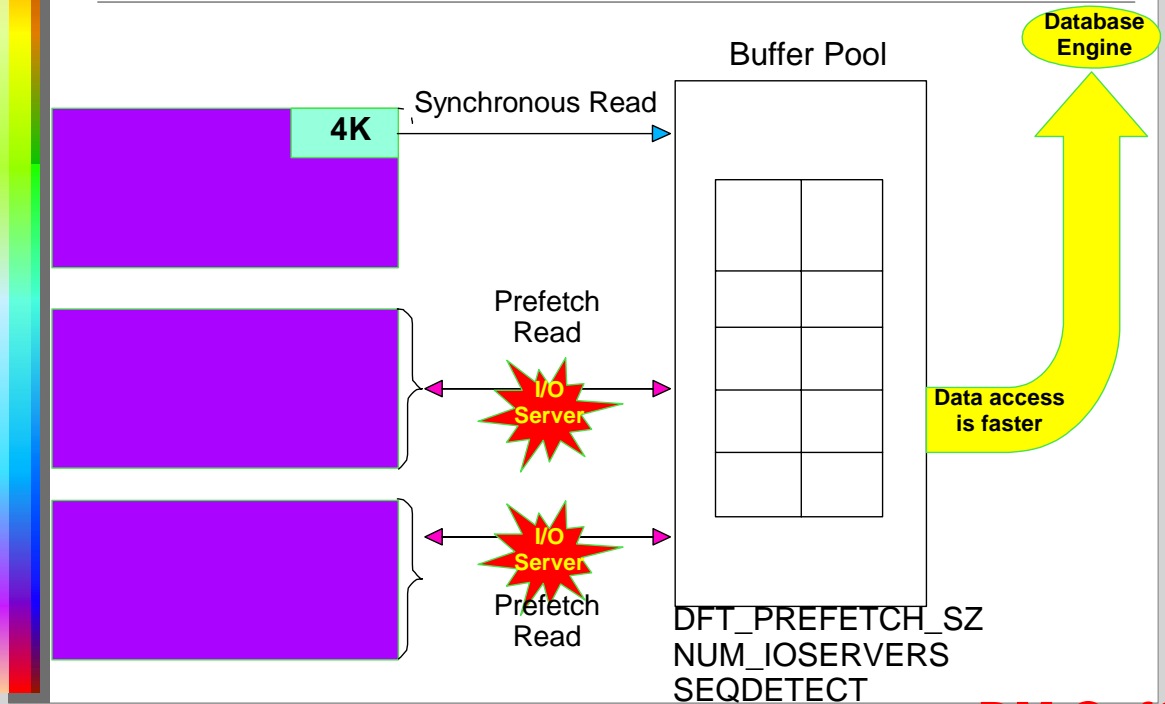


## Performance Improvements

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- ▲ If index scans are required:
  - Consider separate table spaces for index and data
- ▲ Consider placing index table space on fastest media available
- ▲ Consider placing entire table onto separate table space if accessed frequently
- ▲ Consider EXTENTSIZE
  - Trade-off between space and performance
- ▲ Optimizer will consider OVERHEAD and TRANSFERRATE
  - Overhead = I/O Controller Overhead + Disk Seek Time + Latency Time
  - Transfer Rate = Time to read one 4KB page into memory
- ▲ I/O Prefetch

# I/O Prefetch Example



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# "Roadmap" to the Catalogs

TABLE	VIEW	DESCRIPTION
SYSDBAUTH	DBAUTH	Authorities on database
SYSCHECKS	CHECKS	Check constraints
SYSCOLUMNS	COLUMNS	Column definitions
SYSCOLCHECKS	COLCHECKS	Columns referenced by check constraints
SYSCOLDIST	COLDIST	Detailed columns statistics
SYSKEYCOLUSE	KEYCOLUSE	Columns used in keys
SYSCONSTDEP	CONSTDEP	Constraint dependencies
SYSDATATYPES	DATATYPES	Datatype definitions (built-in & UDT)
SYSEVENTMONITORS	EVENTMONITORS	Event Monitor Definitions
SYSEVENTS	EVENTS	Events currently monitored
SYSFUNCPARMS	FUNCPARMS	Definitions of Parameters/Results of UDFs
SYSFUNCTIONS	FUNCTION S	UDF definitions
SYSINDEXAUTH	INDEXAUTH	Index privileges
SYSINDEXES	INDEXES	Index definitions

Schema:

Table = SYSIBM

View = SYSCAT

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# "Roadmap" to the Catalogs

TABLE	VIEW	DESCRIPTION
SYSPACKAGEAUTH	PACKAGEAUTH	Authorities on packages
SYSPACKAGEDEP	PACKAGEDEP	Package dependencies
SYSPACKAGES	PACKAGES	Package definitions
SYSREFERENCES	REFERENCES	Referential constraints definitions
SYSSTATEMENTS	STATEMENTS	Details of package SQL Statements
SYSTABAUTH	TABAUTH	Table Authorities
SYSTABCONST	TABCONST	Tableconstraint definitionss
SYSTABLES	TABLES	Table definitions
SYSTABLESPACES	TABLESPACES	Table Space Definitions
SYSTRIGDEP	TRIGDEPEVENTS	Trigger dependencies
SYSTRIGGERS	TRIGGERS	Definitions of triggers
SYSVIEWDEP	VIEWDEP	View dependencies
SYSVIEWS	VIEWS	View definitions

Schema:

Table = SYSIBM

View = SYSCAT

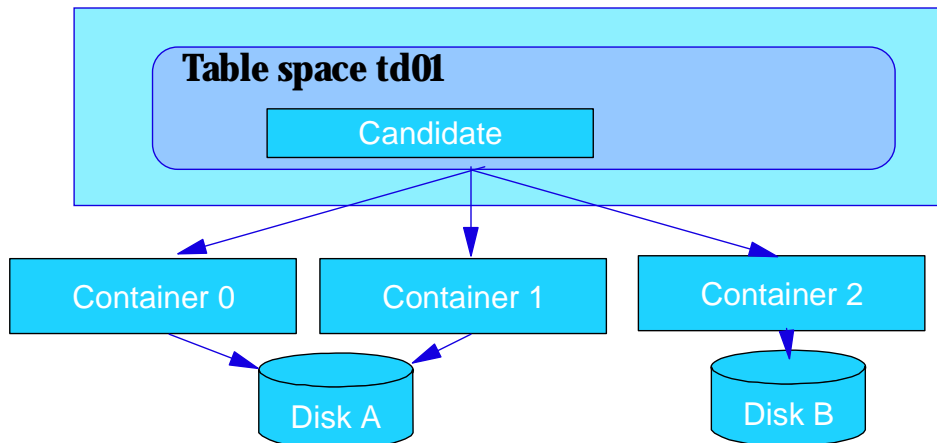
# Managing Table Spaces

- ▲ List tablespaces
  - lists all the tablespaces in the database
- ▲ List tablespace containers
  - lists all the containers for a table space
- ▲ Alter tablespace
  - Add container(s) to DMS tablespace and/or change **PREFETCHSIZE, OVERHEAD & TRANSFERRATE**
  - Assign a bufferpool
- ▲ Drop tablespace
  - Any dependent objects are deleted or marked as inoperative.

# Altering Table Spaces

UNIX: alter tablespace candidate  
add ('/dev/rdata3' 1024)

Intel: alter tablespace enterprise  
add ('H:\dev\rdata3' 1024)



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# Dropping Table Spaces

- ▲ When you drop a table space :-
  - all tables, indexes, keys(primary & foreign) and constraints are dropped.
  - Views, Triggers & Packages are marked invalid.
  - All catalog entries are removed.
  
- ▲ Where tables are split across table spaces then the table must be deleted first.

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## States of Table Spaces

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▲ DB2 maintains information about the states of table spaces. For access via SQL(DML) - state must (0x0000) - Normal

- (0x0000) - Normal
- (0x0001) - Quiesced share
- (0x0002) - Quiesced update
- (0x0004) - Quiesced exclusive
- (0x0008) - Load Pending
- (0x0010) - Delete Pending
- (0x0020) - Backup Pending
- (0x01000) - Restors Pending