DB2 Data Management Software

IBM

e business software

DB2 Version 8 Tablespaces & Buffer Pools

DB2 Quickstart Education

Maintained by Paul Yip (ypaul@ca.ibm.com)

February 2003

IBM Software Group

Database Objects

- Buffer pools
- Tablespaces
  - Tablespace Containers
- Performance Tips

Bufferpool Basics

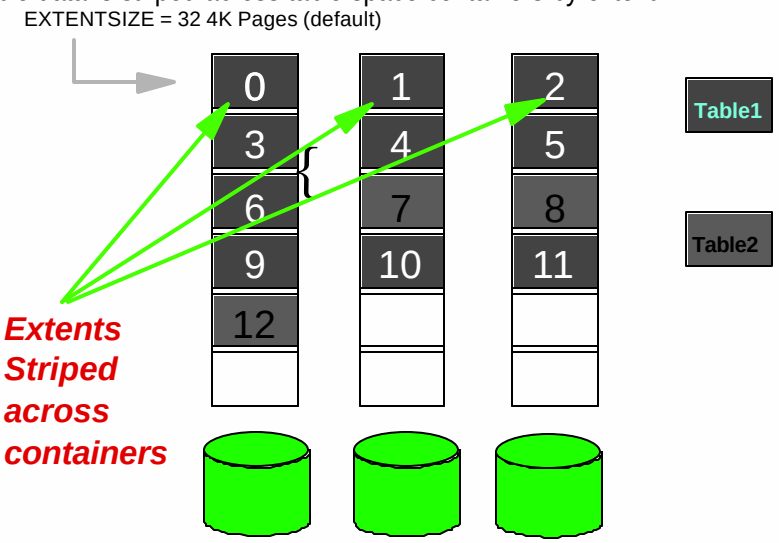
- The bufferpool caches table/index data into main memory
- reduces the need for direct I/O via prefetching and allows asychronous writing/reading
- Buffer pool allocates memory in units of 4K,8K,16K and 32K pages.
- One or more bufferpools required per database

Tablespaces Basics

- A place to store tables
- Tablespaces abstract the hardware details for tables and are composed of one or more "containers" (files, directories, or raw devices).
- Characteristics
  - a page size of 4KB, 8KB, 16KB, or 32KB
    - Must correspond to bufferpool with same page size
  - an extent size (different from Oracle extent)
    - the number of pages written to one container before writing to the next
  - a prefetch size
    - the number of pages read data prefetching is performed
  - a buffer pool
    - the bufferpool used for the tablespace

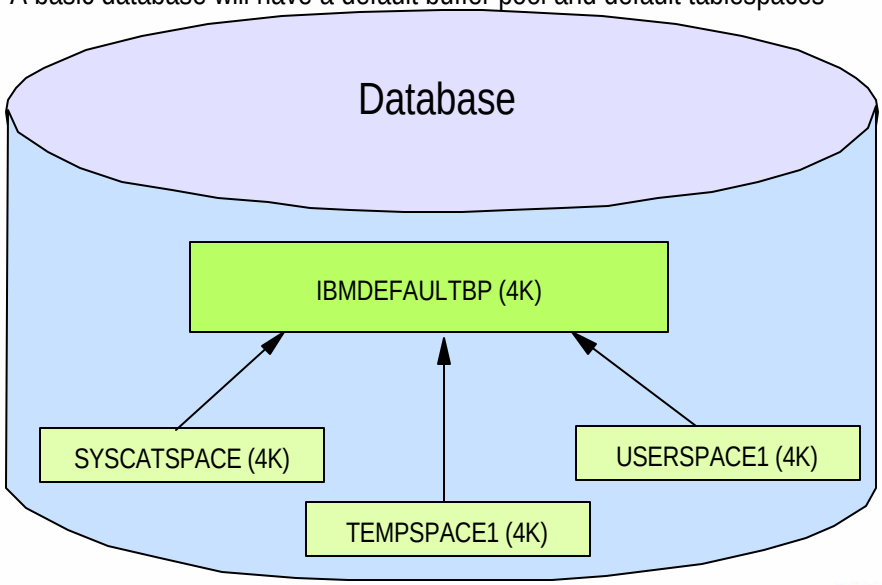
Pages and Extents

- Tables do not share extents
- Table data is striped across table space containers by extent



The Basic Database

- A basic database will have a default buffer pool and default tablespaces



Basic Database

- Tablespaces:
  - Exactly one system tablespace (SYSCATSPACE)
    - holds the system catalogs
  - Exactly one temporary tablespace (TEMPSPACE1)
    - for temporary objects created by the database engine
    - used for sorting that cannot be done in memory
  - User tablespace (USERSPACE1)
    - default location for user tables
- Bufferpool:
  - IBMDEFAULTBP, 4K

Managing Bufferpools and Tablespaces

CREATE BUFFERPOOL
DROP BUFFERPOOL
ALTER BUFFERPOOL

CREATE TABLESPACE
DROP TABLESPACE
ALTER TABLESPACE

- Tablespaces:
  - Highly Recommended: CREATE TABLESPACE wizard in Control Center

Tablespace Type

- REGULAR
  - for user tables
- LARGE
  - optionally separate out LOB data onto its own tablespace
- SYSTEM TEMPORARY
  - used by DB2 engine to perform sorts.
    - must have a temporary tablespace for each pagesize used.
      - i.e. If you use both 4K and 8K pagesize tablespaces, you need corresponding 4K and 8K system temporary tablespaces.
- USER TEMPORARY
  - Used for User Defined Global Temporary tables (in-memory)
  - Often confused with System Temporary Tablespaces

Tablespaces Types

- System Managed Tablespaces (SMS)
  - Containers are directories in the OS
    - containers specified only at creation time, containers cannot be dynamically added
  - Data is stored in files in the directories
    - space not pre-allocated, files grow dynamically
  - Index and Table data shares the same table space
- Database Managed Tablespaces (DMS)
  - Containers can be a raw device or a file
    - containers can be added/dropped/resized after tablespace creation.
    - Data re-balanced (optional: no-rebalance possible)
  - Data is written directly to the file or device
    - space is pre-allocated
  - Can place indexes, table and LOB data in separate tablespaces

SMS vs. DMS

Considerations	SMS	DMS
modifying # or size of containers in TS		✓
Separating indexes and long from data		✓
Space allocated as needed	✓	
No tuning of OS parameters		✓
High performance INSERT		✓
Ease of administration	✓	
Flexibility of administration		✓

Tablespace Containers

- A container can be
  - for DMS
    - file
    - raw device
  - for SMS
    - a directory

Useful Tablespace Commands

- LIST TABLESPACES [SHOW DETAIL]
  - lists all tablespaces for the current database
- LIST TABLESPACE CONTAINERS FOR <n>
  - Lists containers for a tablespace.
    - each tablespace has a tablespace id
- CREATE TABLESPACE
  - creates a new tablespace
- ALTER TABLESPACE
  - adjust prefetch, bufferpool assignment, disk properties, modify containers
- DROP TABLESPACE
  - all related objects in tablespace are dropped/invalidated

Basic Performance Tips

- For OLTP, use smaller pagesize. For OLAP/DSS, use larger pagesize
- DMS about 10-15% speed advantage of SMS
- Enable Multipage File Allocation (db2empfa) for SMS tablespaces
- Increase bufferpool sizes (default generally too small)
  - start with 50% for DSS/OLAP workloads, 70% for OLTP
  - autoconfigure is a good starting point
- Update disk speed specs for tablespaces
- db2set DB2_PARALLEL_IO=[*| <tsid_1, tsid_2>]
  - to tell DB2 that containers are striped
- Stripe tablespaces across as many disks as possible/reasonable