Welcome to:

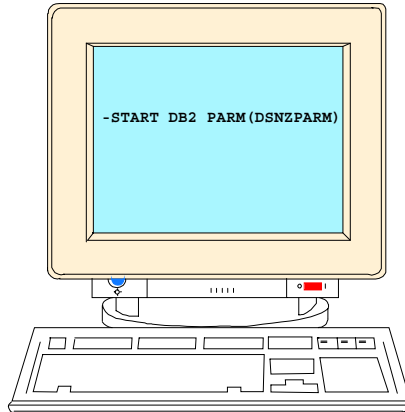# Basic Architecture and Fundamental Mechanisms

Unit Objectives

After completing this unit, you should be able to:

- Provide the initial knowledge we'll build on during the rest of the week to enable you to administer DB2 subsystems.

- Explain, at an elementary level, key processes like logging, committing, and DB2 start up.

Starting DB2

-START DB2 PARM(DSNZPARM) ACCESS(*)
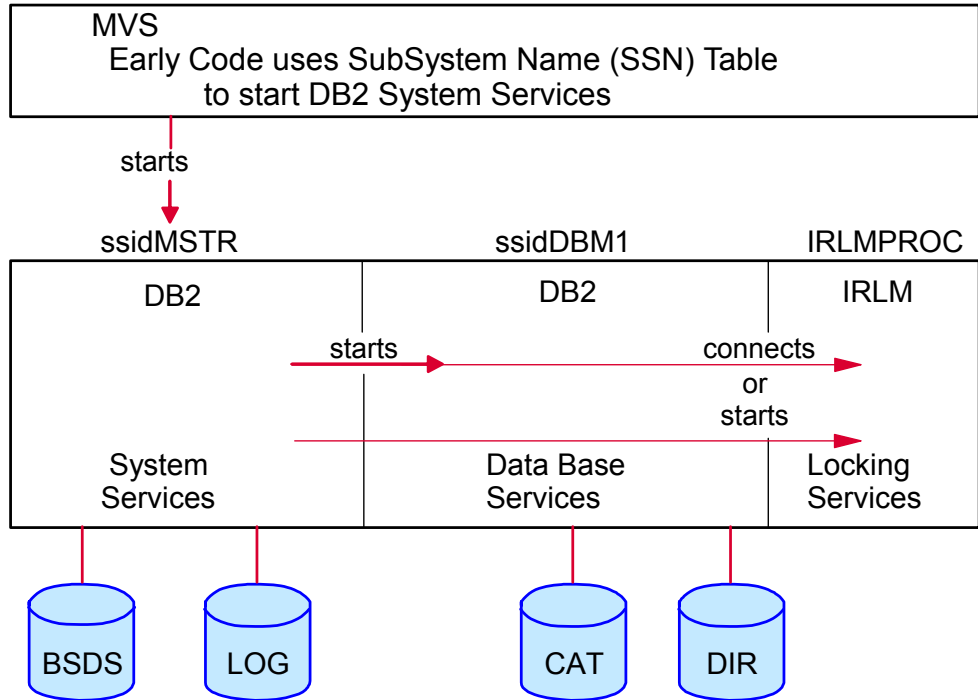
```
-START DB2 PARM(DSNZPARM)
```

- DSNZPARM module provides parameters for DB2 execution

- ACCESS (MAINT) restricts DB2 access to the SYSADMs and SYSOPRs named in DSNZPARM

DSNZPARM

```
DSN6LOGP  OUTBUFF=4000K,WRTHRSH=20
      TWOACTV=YES,TWOARCH=YES,
      MAXARCH=500
DSN6ARVP  ARCPFX1=DSNCAT.ARCHLOG1,
      ARCPFX2=DSNCAT.ARCHLOG2,
      TSTAMP=NO,BLKSIZE=28672,
      UNIT=TAPE,COMPACT=NO,CATALOG=NO,
      ARCWTOR=YES,ARCWRTC=(1,3,4)
DSN6SYSP  ROUTCODE=1,CHKFREQ=50000,RLF=NO,
      IDFORE=100,IDBACK=20,CTHREAD=70,
      AUDITST=NO,SMFACCT=1,SMFSTAT=YES,MON=NO
DSN6SPRM  RESTART,ALL,AUTH=YES,
      DSMAX=2000,CATALOG=dsncat,
      SITETYPE=LOCALSITE,EDMPOOL=1900,
      IRLMAUT=YES,IRLMPRC=IRLMPROC,
      IRLMSID=IRLM,IRLMRWT=60,
      SYSADM=SYSADM,SYSADM2=SYSADM,
      SYSOPR1=SYSOPR,SYSOPR2=SYSOPR,
      DEFLTID=IBMUSER,RELCURHL=YES
DSN6FAC  DDF=NO
```

- This is part of DSNTIJUZ in DSNx10.NEW.SDSNSAMP
- To update DSNZPARM:
  - Run install clist, Run DSNTIJUZ ... Stop/Start DB2 or
  - SET SYSPARM (V7)

DB2 - Address Spaces

```
MVS
   Early Code uses SubSystem Name (SSN) Table
      to start DB2 System Services
```

starts

ssidMSTR	ssidDBM1	IRLMPROC
DB2	DB2	IRLM

starts →   connects
                  or
                  starts →

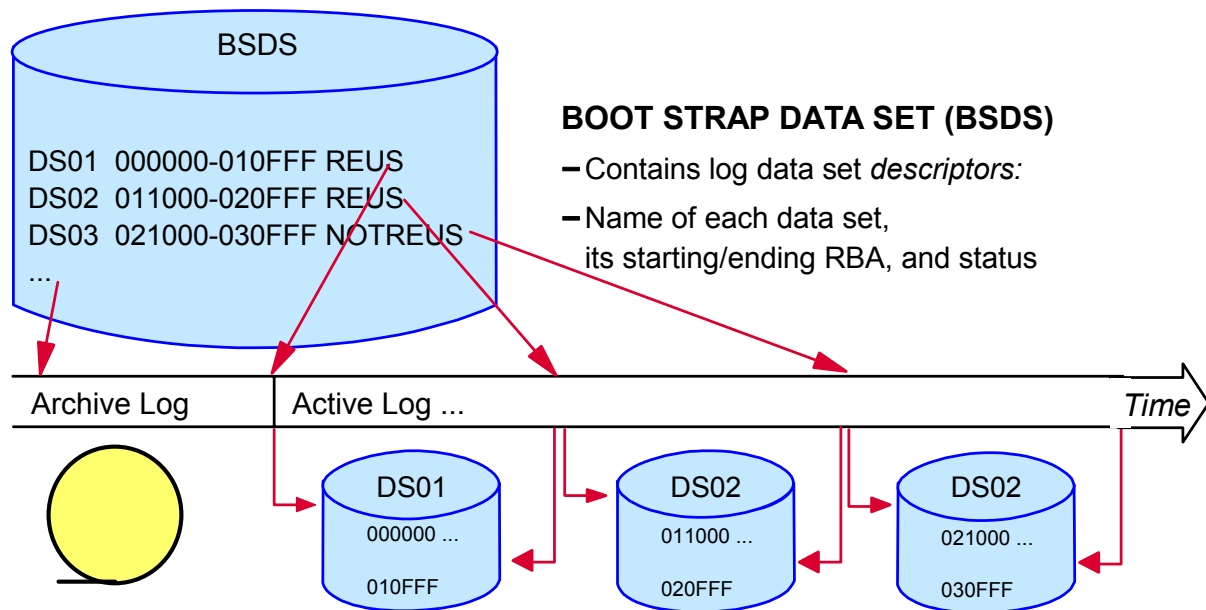| System Services	Data Base Services	Locking Services

BSDS   LOG   CAT   DIR

- SYS1.PARMLIB(IEFSSNxx) contains the SSID and the subsystem recognition string

- SYS1.PROCLIB contains Cataloged Procedures

DB2 Address Space Functions

System Services (Control) Address Space	Data Base Services Address Space	IRLM Address Space
Create and maintain connections	Data space management management	Locking
	Relational Data System	
Logging to active/ archive logs	Data management	
BSDS Processing	Buffer management	
Message/command processing	Locking via IRLM	
Storage management		
Accounting/stats/ performance traces		
Startup/shutdown checkpointing/ recovery		

BSDS and Log Relationship

BSDS

DS01 000000-010FFF REUS
DS02 011000-020FFF REUS
DS03 021000-030FFF NOTREUS
...

BOOT STRAP DATA SET (BSDS)

– Contains log data set *descriptors:*

– Name of each data set,
   its starting/ending RBA, and status

Archive Log | Active Log ... *Time*
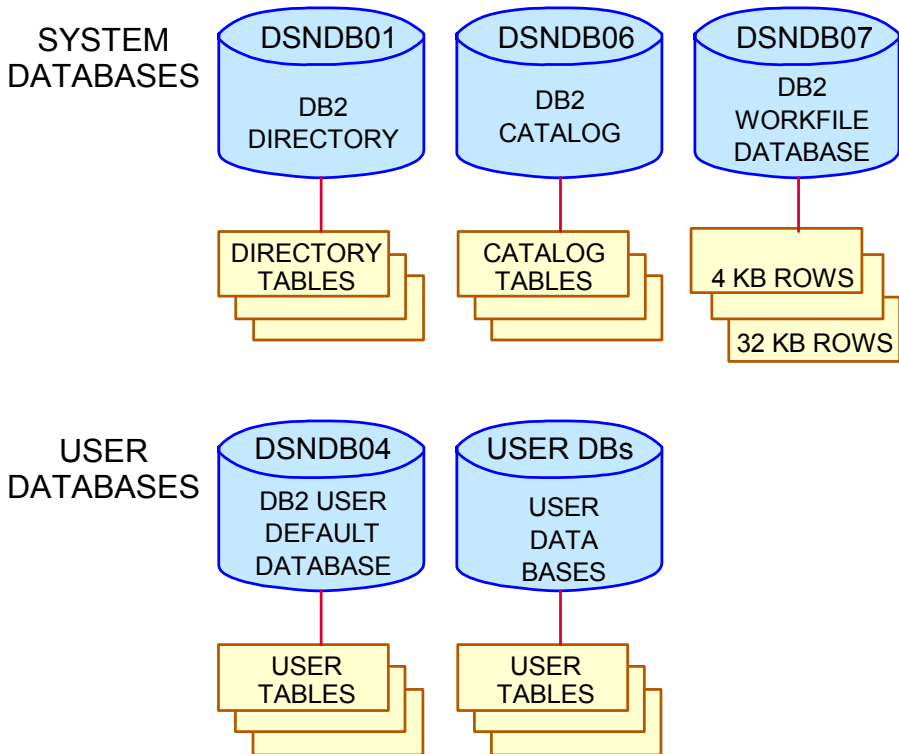
DS01
000000 ...
010FFF

DS02
011000 ...
020FFF

DS02
021000 ...
030FFF

- Active log data sets have recent portion of the log
- Archive data sets are further back in time

BSDS is "index" for locating a log record

DB2 Directory and Catalog Relationships

SYSTEM DATABASES

DSNDB01
DB2 DIRECTORY

DSNDB06
DB2 CATALOG

DSNDB07
DB2 WORKFILE DATABASE

DIRECTORY TABLES

CATALOG TABLES

4 KB ROWS

32 KB ROWS

USER DATABASES

DSNDB04
DB2 USER DEFAULT DATABASE

USER DBs
USER DATA BASES

USER TABLES

USER TABLES

The DB2 Catalog defines itself, DSNDB07, DSNDB04, and all user DBs

DB2 Directory and Data Sets

DSNCAT.DSNDBD.DSNDB01.spacename.I0001.A001

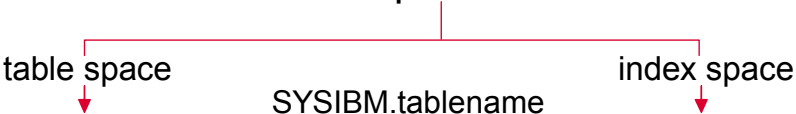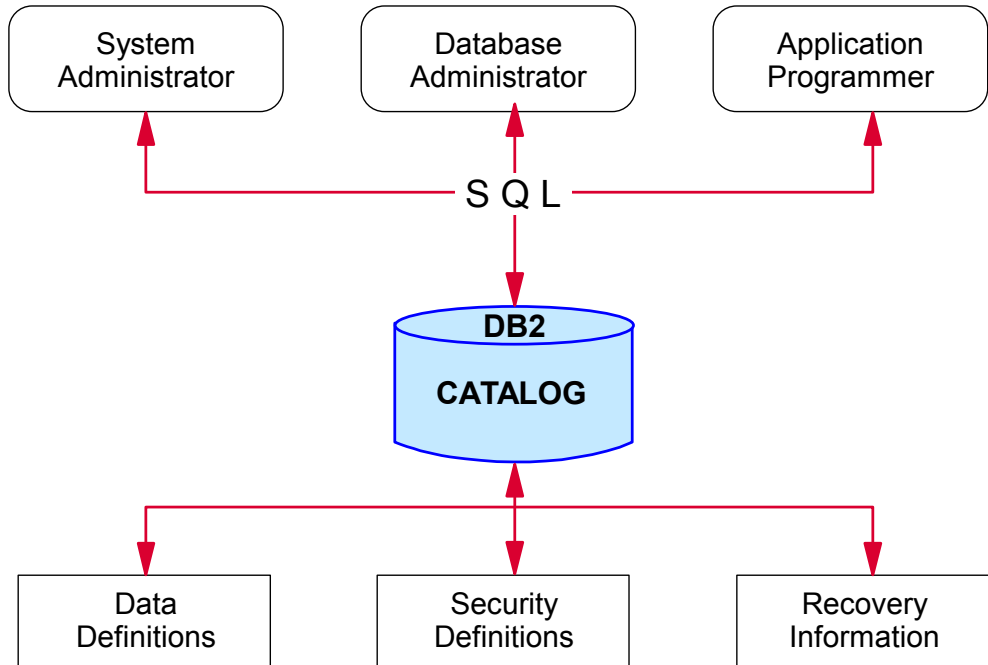table space   index space

SYSIBM.tablename

table space	SYSIBM.tablename	index space
SYSUTILX	SYSUTIL	DSNLUX01 DSNLUX02
DBD01	DBD01	none
SYSLGRNX	SYSLGRNX	DSNLLX01 DSNLLX02
SCT02	SCT02	DSNSCT02
SPT01	SPT01	DSNSPT01 DSNSPT02

- The DIRECTORY Tables cannot be accessed by SQL

- However, the contents can be determined by:

SYSUTIL	-DISP UTIL command or DIAGNOSE utility
DBD01	-DISP DB command or DIAGNOSE utility
SYSLGRNG	REPORT utility
SCT02	SQL on SYSPLAN in catalog
SPT01	SQL on SYSPACKAGE in catalog

DB2 Catalog - For All Users

THE DB2 CATALOG IS
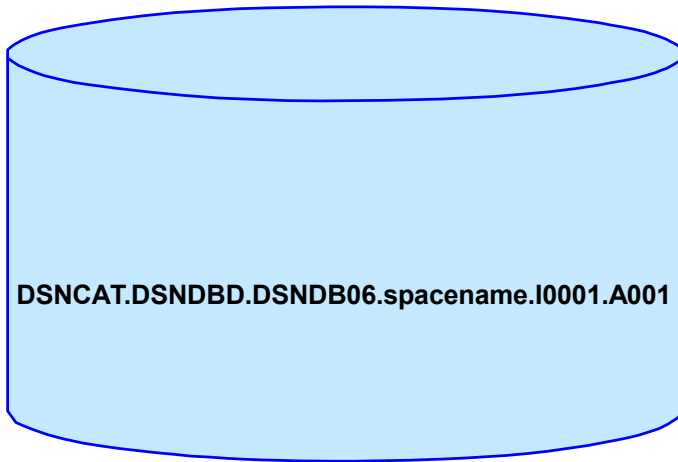AN INTEGRATED TOOL FOR ALL DP
PERSONNEL AND DB2 ITSELF

DB2 Catalog and Data Sets

DSNCAT.DSNDBD.DSNDB06.spacename.I0001.A001

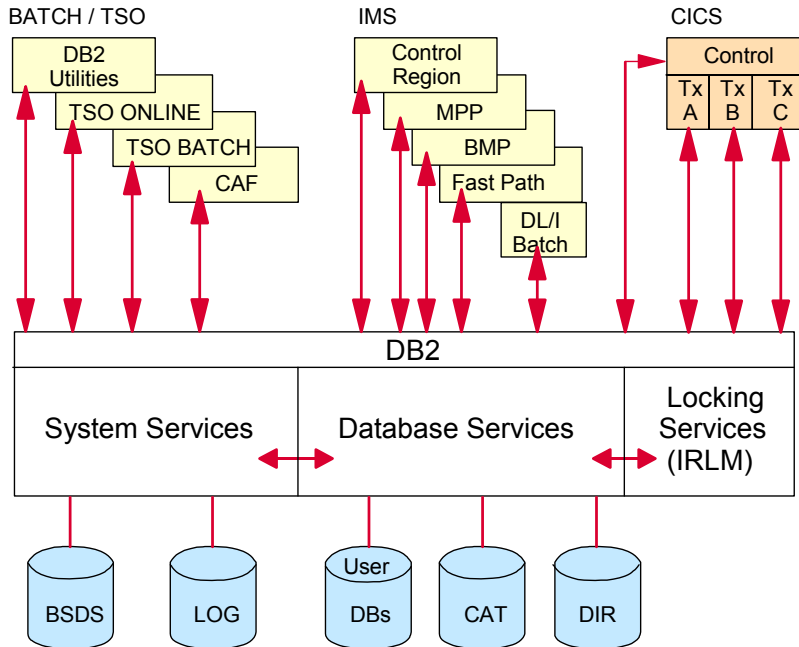| table space	SYSIBM.tablename	index space
SYSCOPY	SYSCOPY	DSNUCH01 DSNUCX01
SYSDBAUT	SYSDATABASE SYSDBAUTH	DSNDDH01 DSNDDX02 DSNADH01 DSNADX01
SYSUSER	SYSUSERAUTH	DSNAUH01 DSNAUX02
SYSDBASE	SYSCOLAUTH SYSCOLUMNS SYSINDEXES SYSINDEXPART SYSKEYS SYSFIELDS SYSFOREIGNKEYS SYSLINKS SYSRELS SYSSYNONYMS SYSTABAUTH SYSTABLEPART SYSTABLES SYSTABLESPACE	DSNDCX01 DSNDXX01 DSNDXX02 DSNDXX03 DSNDRX01 DSNDKX01 DSNDLX01 DSNDYX01 DSNATX01 DSNATX02 DSNATX03 DSNATZ02 DSNDPX01 DSNDTX01 DSNDTX02 DSNDSX01

DB2 Catalog Maintenance

DSNCAT.DSNDBD.DSNDB06.spacename.I0001.A001

Take good care of your catalog!

- Frequent image copies
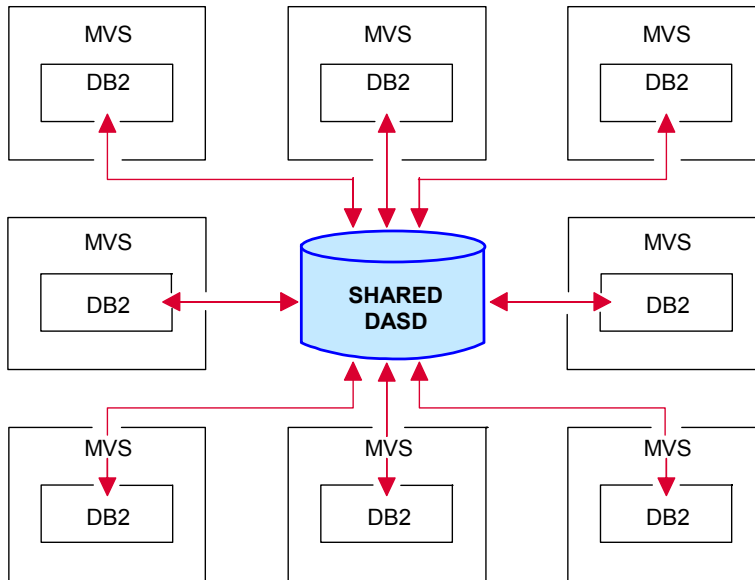- Runstats
- Reorg
- Checking utilities

DB2 - Allied Address Spaces

Every user has unique connection to DB2

- Maximum of one connection per MVS TCB.
- Connection to DB2 allows program to access DB2 code within DB2 address spaces.
- Controlling the type and number of connections is fundamental.

Data Sharing in the Sysplex

- High-speed Read/Write data sharing
- Huge queries feasible
- SYSPLEX hardware required
- Single shared catalog

Advantages of Data Sharing

- Improved price performance
- Incremental processing growth
- Improved availability
- Configuration flexibility
- Protects existing application investment
- Dynamic workload balancing
- Perfect environment for Data Mining

The DB2 CONNECTION Process

Will MVS let the user 'logon'?

Can the address space talk to DB2?
 IDENTIFY

Can the user talk to DB2?
 IDENTIFY (TSO and batch)
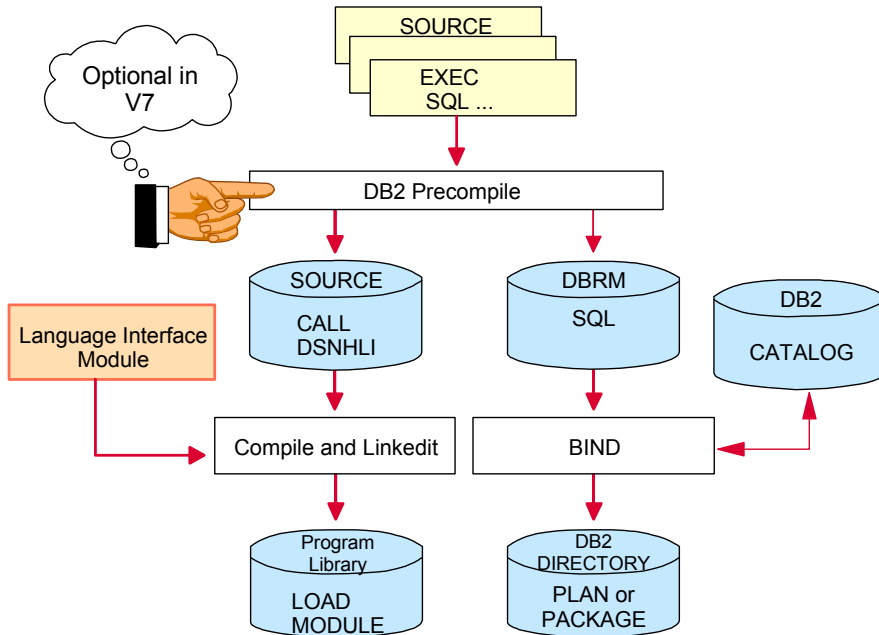 SIGNON   (IMS and CICS)

Can the user run the plan?
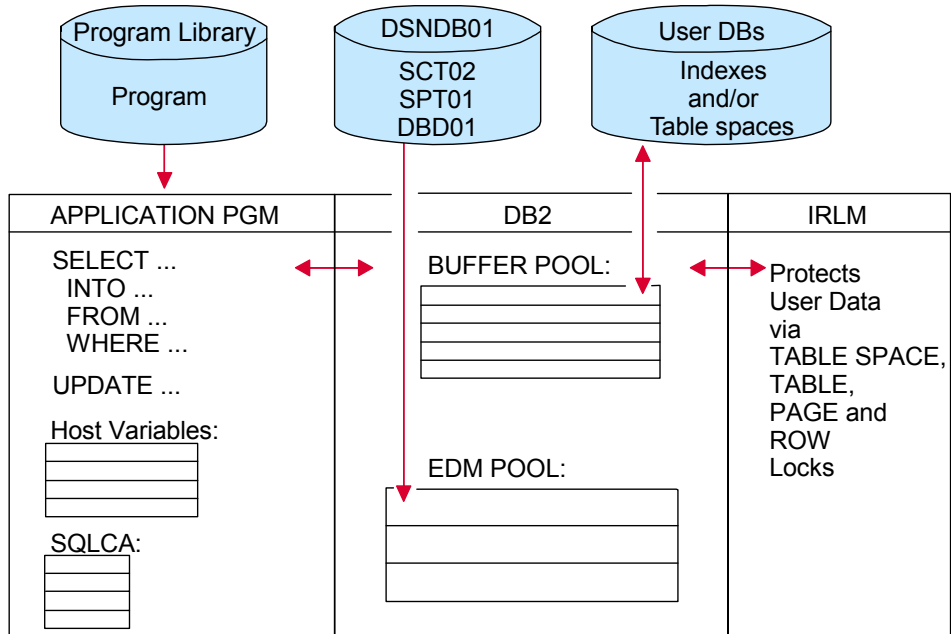 CREATE THREAD

Dynamic SQL only: Can
user access data?

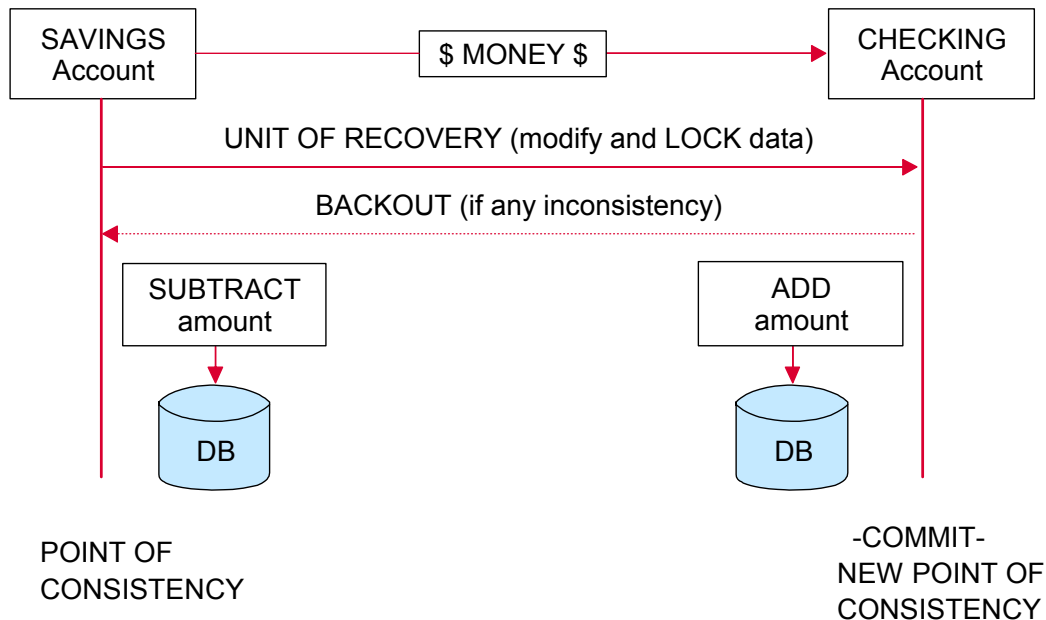**Work!**

Program Preparation

- Use batch for most prep - DB2I for light duty
- Language Interface depends upon execution environment
- BIND produces an optimized path to the data
- DCLGEN may provide table declarations

Program Execution

- Program execution uses bound DBRMs (in Package or Plan)
- DB2 buffer pool is used to access DB2 tables
  - For data in the DB2 Directory and Catalog
  - For user data

Transcription Execution

- DB2 guarantees data integrity
  - IRLM locks often serialize access to data
  - Locks can be shared and/or exclusive

- DB2 Log ensures that updated data is recoverable

DB2 Management Tools Package

These workstation-based tools come with DB2 at no extra charge:

- DB2 UDB Control Center - Centralizes management of DB2 for z/OS and OS/390 subsystems, but also DB2 UDB for Linux, AIX, and Windows. Runs utilities, issues commands from a PC.

- DB2 Development Center - Easy to use development environment for creating, installing, testing, and distributing stored procedures across the entire DB2 family.

- DB2 Installer - Installs, migrates, and updates one or many DB2s ... and even DB2 PM.

- DB2 Visual Explain - No more wrestling with plan_tables! Easy to read! Gives statement costs in milliseconds and service units. Displays subsystem parameters.

- DB2 Estimator - Estimate capacity impact of new transactions, table size increases, utilities ... before you make the changes. Does basic size calculations for tables and indexes.

- Net.data - Provides high performance access to DB2 data from the Internet

- REXX support - SQL processing

Additional DB2 Tools

These tools are available for an additional charge:

- DB2 Administration Tool - Comprehensive database manager that supports DB2 utilities, commands, dynamic SQL, EXPLAIN, catalog access, and so forth

- DB2 Performance Monitor - Batch and online facilities for monitoring the past and present. Works on multiple DB2 release levels and subsystems.

- DB2 Buffer Pool Analyzer - Easy to use buffer pool tuner and capacity planner. Lets you ask "What if ... ".

- DB2 SQL Performance Analyzer

- DB2 Query Monitor

- DB2 Automation Tool - Schedules utilities, builds and submits JCL.

- DB2 Log Analysis Tool

- Query Management Facility - Online dynamic and static SQL with a sophisticated report generator. Powerful!

- Many more ... DataJoiner, DataPropagator, VisualAge development environments. See the announce letter for more information.

Unit Summary

- Multiple address space architecture allows modularity and sufficient storage

- Connection management is your main workload control knob

- DSNZPARM, DSNDB01, and DSNDB06 are DB2 self-descriptions

- Program preparation and execution are different in the DB2 environment

- DB2 supports large transaction, query, and batch workloads in various environments:
  - Stand-alone MVS
  - Sysplex
  - Client/Server