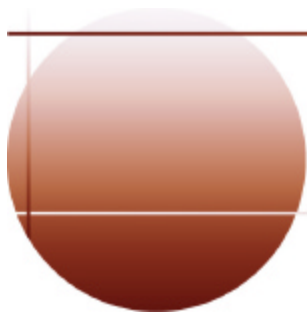E02

IMS for New Users

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IMS

technical conference

Las Vegas, NV **September 15 - September 18, 2003**
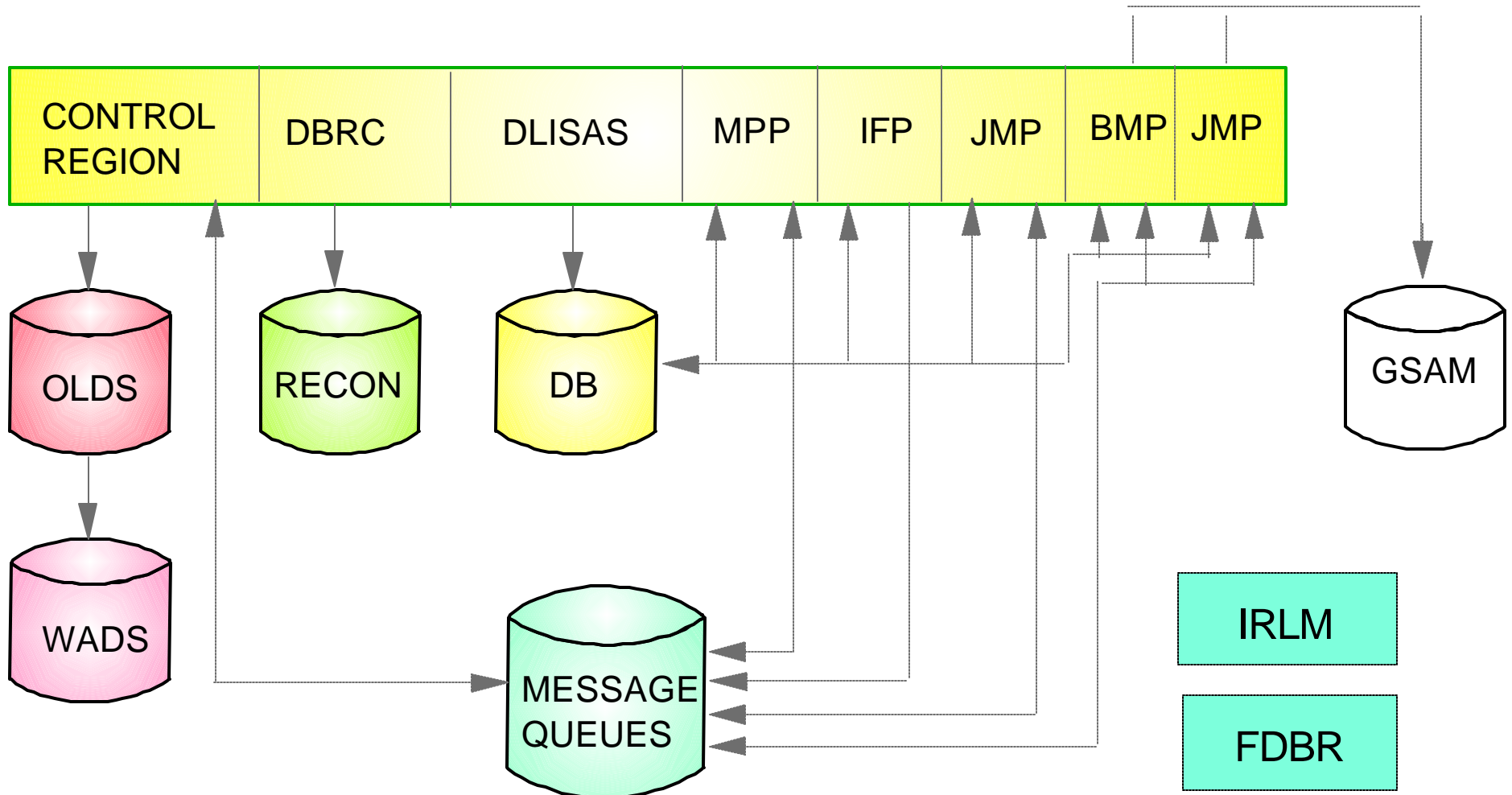
Topics

- IMS Structure

- IMS Transaction Flow

- IMS/Application Communications

- Message Format Services

- IMS Scheduling

- IMS Online Logging

- Archiving Overview

- DBRC Overview

- IMS Restart

- Full Function Databases

- Fast Path Databases

- IMS Utilities

- Batch

- IMS Security

IMS Structure - Simple System

⏃ **Single MVS Subsystem**
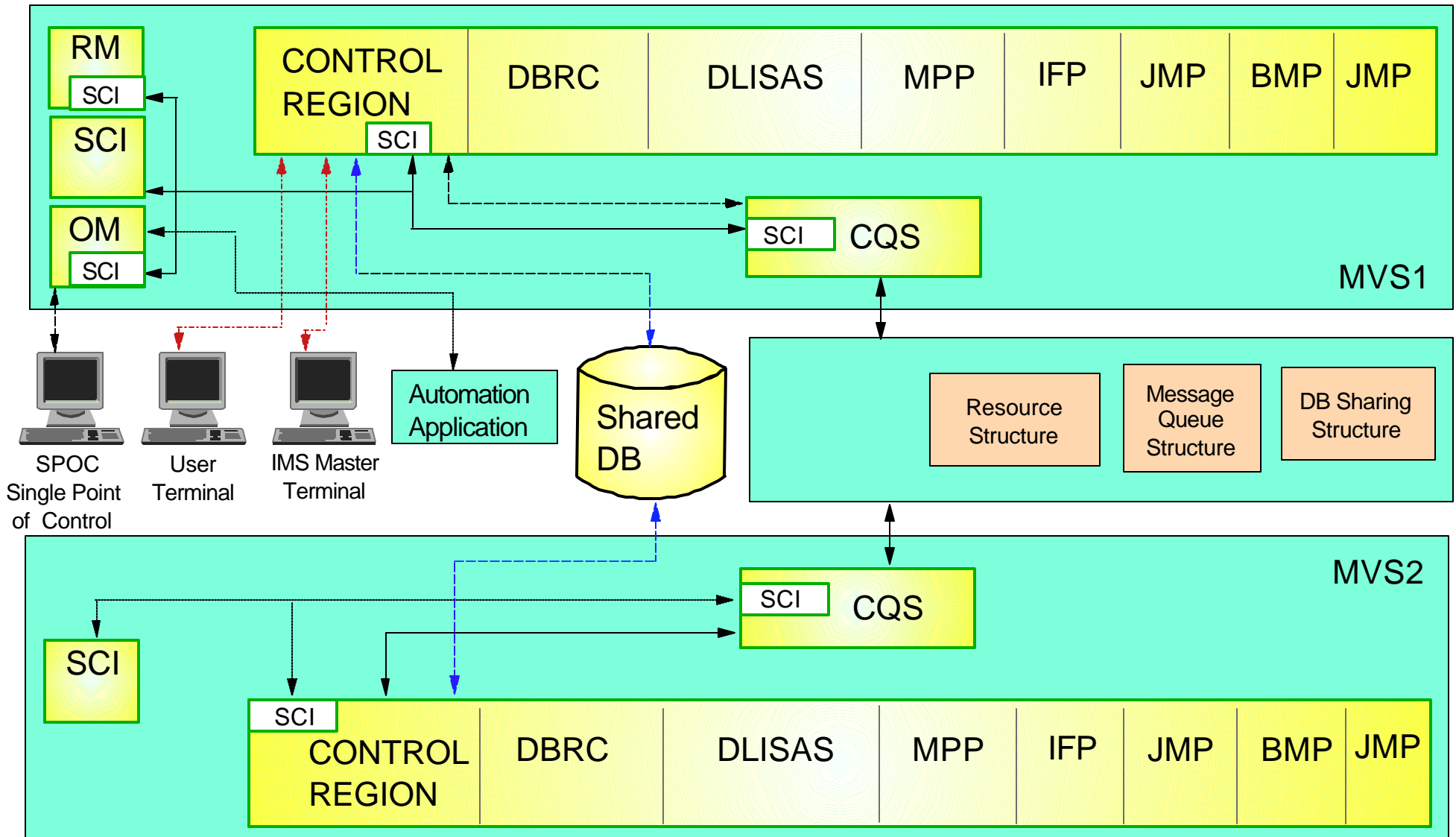
► Multiple Address Spaces

IMS Structure - SYSPLEX

- A possible SYSPLEX environment

MVS1

RM	CONTROL REGION	DBRC	DLISAS	MPP	IFP	JMP	BMP	JMP
SCI	SCI							
SCI								
OM								
SCI								

SCI CQS

SPOC
Single Point
of Control

User
Terminal

IMS Master
Terminal

Automation
Application

Shared
DB

Resource
Structure

Message
Queue
Structure

DB Sharing
Structure

MVS2

SCI CQS

SCI

| SCI | CONTROL REGION | DBRC | DLISAS | MPP | IFP | JMP | BMP | JMP |

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Notes for IMS Structure - SYSPLEX

- **New with IMS V8**
  - ► CSL - Common Service Layer
    - OM - Operations Manager
      - Used to control the operations of an IMSplex
      - Provides an Application Programming Interface (API) for IMSplex commands.
      - Used by TSO Single Point of Control (SPOC) application supplied by IMS
      - Users may also write their own applications using this API
    - RM - Resource Manager
      - Manages resources in an IMSplex
      - Coordinates IMSplex-wide processes such as global online change
    - SCI - Structured Call Interface
      - Provides Communication between IMSplex components
    - SPOC - Single Point of Control
      - Automated operator application programs which interact with OM

IMS Structure ...

▲ IMS Control Region

► Communicates with
  - Terminal Network - VTAM & BTAM
  - CICS systems (DBCTL)
  - External Subsystem Interface (DB2 or MQ)

► Manages
  - Messages Queues
  - Message Format Services
  - Logging
  - Scheduling
  - IMS Checkpoint Processing
  - Security Checking
  - Fast Path Databases
    Output Processing

IMS Structure ...

⚠ **DBRC - Data Base Recovery Control**

- ► Records
  - – Logging & Archiving Activity
- ► Manages
  - – Databases & Recovery
- ► Authorizes Database Access

⚠ **DLISAS**

- ► Database Support
  - – Database Management
    VSAM & OSAM
  - – Pool Management
    DMB & PSB
  - – Directory Management
    PDIR & DDIR

IMS Structure ...

◬ MPP - Message Processing Program

- ► Online Processing
  - – DL/I Interface
    - Input from Message Queue
    - DL/I Database
    - Output to Terminals or Programs
  - – IMS Controlled Program Execution

◬ JMP - JAVA Message Processing Program

- ► Similar to MPP except only JAVA applications can be scheduled

◬ IFP - Fast Path Program

- ► Online Processing
  - – DL/I Interface
    - Input from Expedited Message Handler
    - DL/I Database
    - Output to Terminals or Programs
  - – IMS Controlled Program Execution

IMS Structure ...

⚠ **BMP - Batch Message Processing**

► Batch Processing

‒ Job Management Controlled Execution

‒ GSAM Database Access

‒ Extended Checkpoint/Restart

‒ DL/I Interface

   DL/I Database

   Input from Message Queue

   Output to Terminals or Programs

⚠ **JBP - JAVA Batch Message Processing**

► Similar to non-message driven BMP except only JAVA applications can be scheduled.

IMS Structure ...

- Queued Application Interface
  - ► Simplified API (GU, GN, ISRT)
  - ► Application Ignores
    - Network Issues, Terminal Type, Recovery
- Multiple Address Space Design
  - ► Cross-Memory
    - DL/I Database Access
    - DBRC
  - ► CSA and ECSA
    - Common Blocks & Pools
- IMS Design Advantages
  - ► Application Integrity & Isolation
  - ► Data Security
    - Separate Program & Data Buffers
      Other Program's Area Not Accessible
  - ► Parallelism in n-Way Environments

IMS Transaction Flow

⚠ Message Input (VTAM)

- ► MFS Formatting

- ► Message Logged

- ► Placed on Message Queue

⚠ Transaction Scheduled

- ► PSB Located

- ► DMBs Located

- ► Program Located

- ► Scheduling Logged

IMS Transaction Flow ...

⚠ **Application Program Processing**

► Initialization

► Obtain Message (GU)

► Database Call(s)
  - Changes Logged

► Message Request(s)
  - Output Messages(s) Logged

► Obtain Next Message (Optional)
  - Queue Output to Destination
  - Database Write(s)
  - Sync-Point Logged

IMS Transaction Flow ...

⊿ Normal Transaction Termination

► Sync-Point

- Queue Output to Destination(s)
- Database Write(s)
- Termination Logged

⊿ IMS Output Message Process

► Take Message from Message Queue

- MFS Formatting

- Send Message to Terminal

- Send Completion Logged

IMS Transaction Flow ...

⚠ Abnormal Termination

► Database Changes Backed Out

► Output Message(s) Cancelled
  - Output messages to terminal
  - Messages to Non-EXPRESS PCBs

► Original Transaction

  - Message Deleted or Retained

    Depends on ABEND Type

    DFS555I Sent to Terminal

IMS/Application Communication

⚠ **MPP (Message Processing Program)   or
JMP (Java Message Processing Program)**

- ► Interactive Mode

- ► Input Message (Transaction)
  - – Schedule Region
    Program Loaded
    Message Processed
    Databases Accessed
    Transaction Termination

- ► Next Message
  - – Different Program Potential
  - – Repeat Process

- ► No Messages
  - – No Transactions
  - – Region remains idle until scheduled again

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Access to All Database Types

IMS/Application Communication

- Fast Path Processing
- IFP (Fast Path Region)
  - ▶ Wait for Input
  - ▶ Started by Operator
    - – PSB / Program JCL Defined
  - ▶ Parallel Scheduling Allowed
  - ▶ Processes Fast Path Transactions
- Fast Path Transactions
  - ▶ Entered from FP-eligible Terminal
    - – Dedicated Buffer (EMHB)
  - ▶ Single Segment Input / Output
  - ▶ Response Mode
  - ▶ Non-conversational

IMS/Application Communication ...
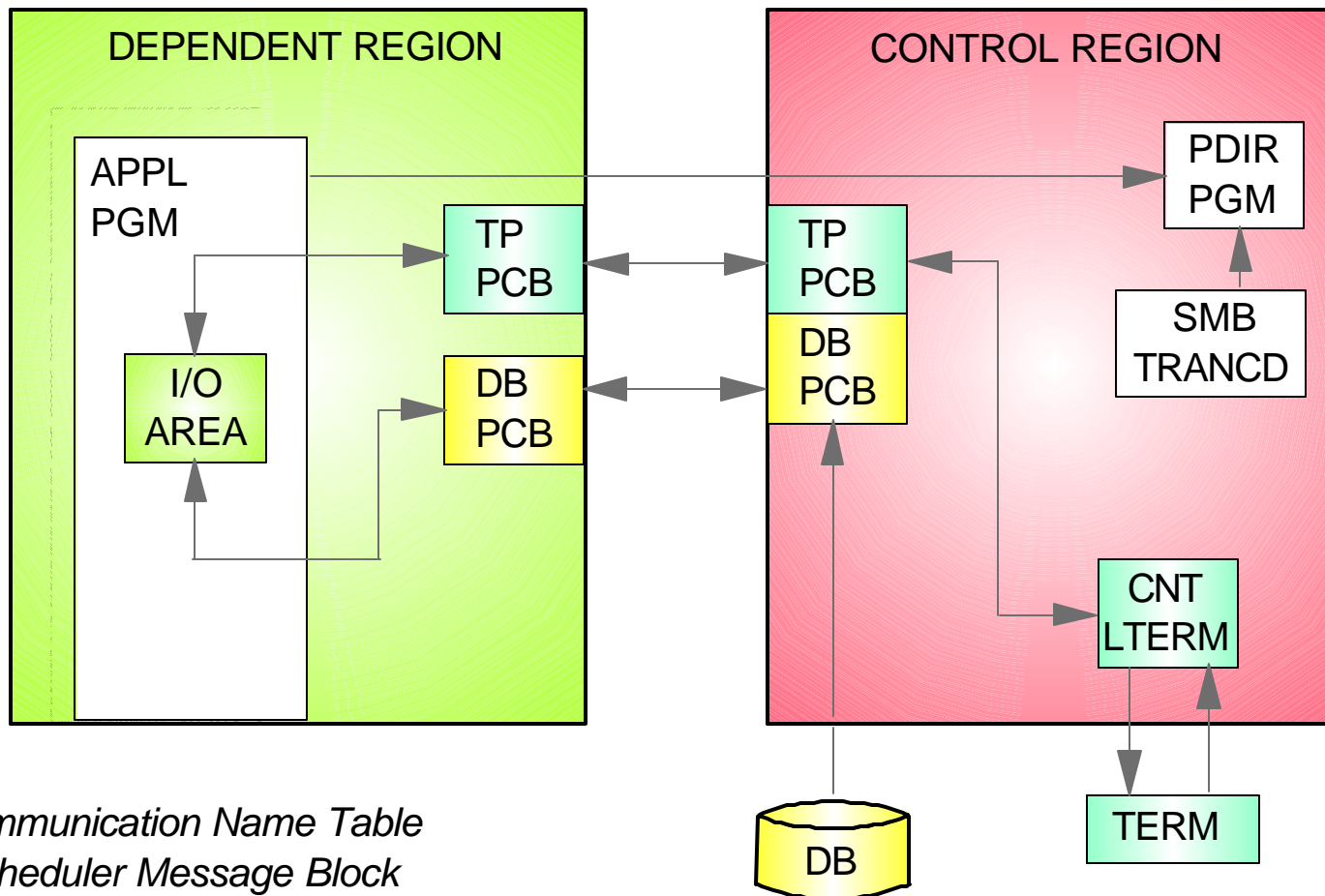
△ BMP (Batch Message Processing)

► MVS / JES Scheduled

► Initialization

– Control Region Connection

Access Message Queue *

Access Databases *

Access MVS Files *

► Termination

– Region by MVS / JES

*NOTE: * Optional*

IMS/Application Communication ...

CNT - Communication Name Table
SMB - Scheduler Message Block
PDIR - Program Directory
PSB - Program Specification Block
PCB - Program Communication Block

DB PCB - Database Access
TP PCB - Message Access
I/O PCB - Receive Messages
      - Send Message to Originator
ALT PCB - Send Message to Destination

IMS/Application Communication ...

⚠ Application Program Interface

- ► Calls to IMS
  - – Receive Message (GU, GN)
  - – Send Message (ISRT, CHNG)

⚠ Control Region

- ► Interface to Terminals
  - – VTAM and / or BTAM

- ► Scheduling
  - – SMB - Scheduler Message Block
    - – Information about online transactions
  - – PDIR - PSB Directory
    - – Information about online programs

- ► PSB
  - – Data Access Control
    - – TP - Message Destination
      - – another terminal
      - – another transaction
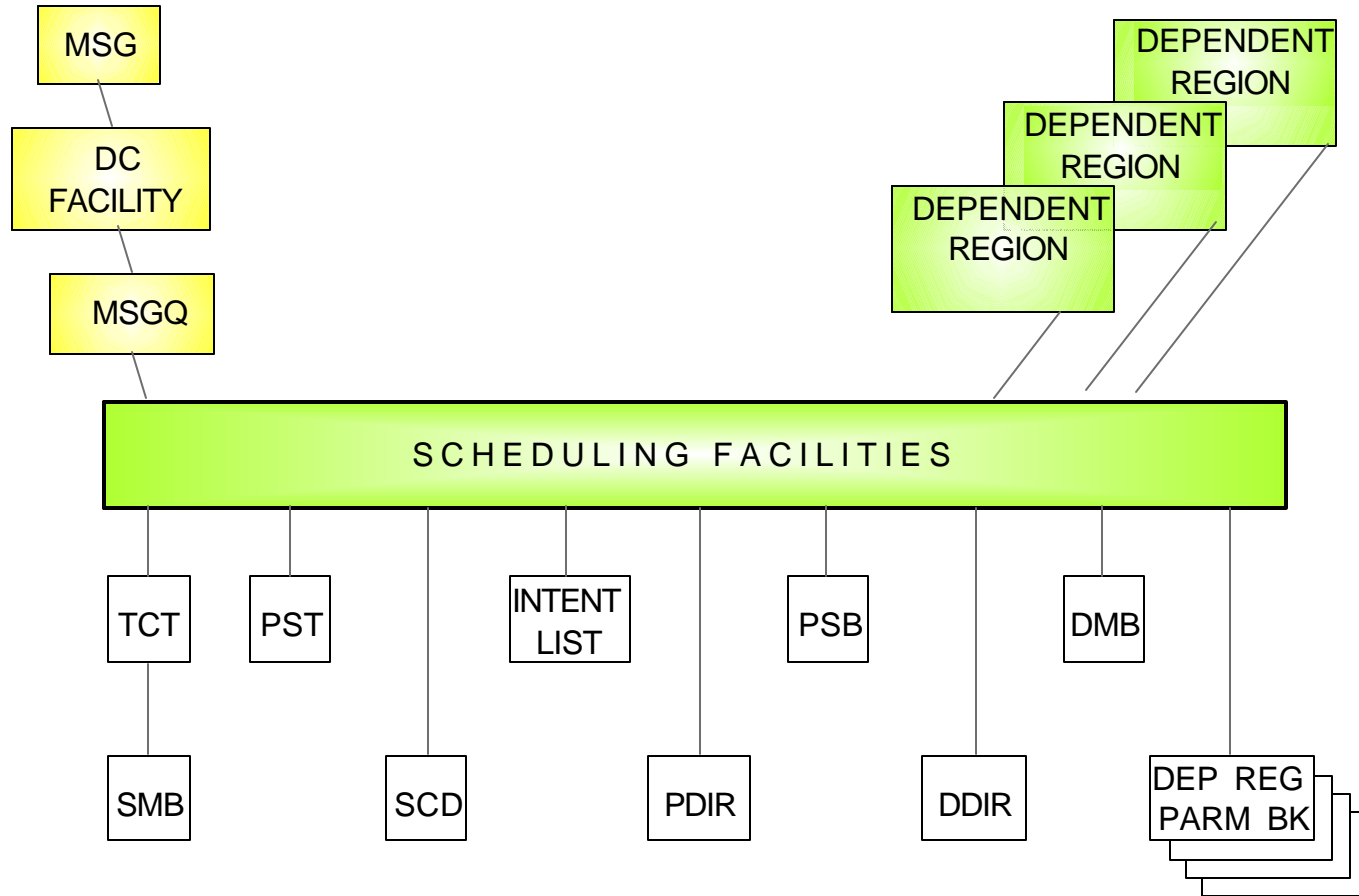   - – DB - Database View & Access

Message Format Services

⚠ **Message Editor**

- ► Input & Output Messages

- ► Device Independent Application

  - − Logical Messages

  - − Rearrange Screen Format

  - − New Printer Forms Design

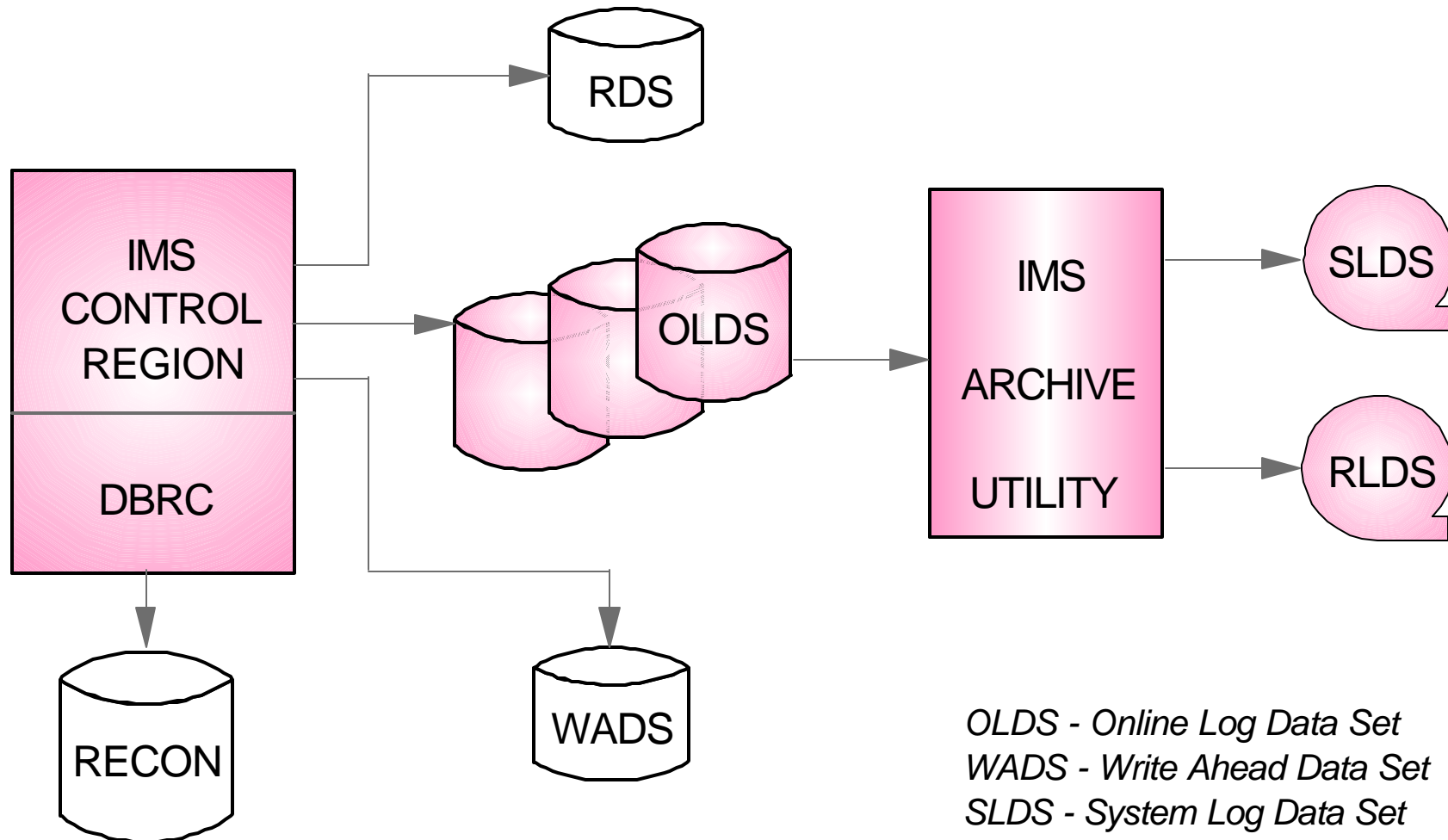- ► Physical & Logical Paging

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IMS Scheduling

▲ **Environment**

TCT - Transaction Class Table
SMB - Scheduler Message Block
PST - Program Status Table
DMB - Database Management Block
DDIR - Database Directory
PDIR - Program Directory
SCD - System Contents Directory

IMS Scheduling ...

⏶ Scheduling Phases

- ► Select Candidate Transaction

  - – By Class

  - – By Priority within Class

- ► Verify Resource Availability

  - – Allocate & Reserve

- ► Load Program

  - – Dependent Region

IMS Online Logging

OLDS - Online Log Data Set
WADS - Write Ahead Data Set
SLDS - System Log Data Set
RLDS - Recovery Log Data Set
RECON - Recovery Log Data Set
RDS - Restart Data Set

IMS Online Logging ...

⚠ **Online Log Data Set**

► Record of all System Activity

– System Checkpoints

– Schedule / Terminate PSB

– Database Changes

– Terminal Messages

– Sync-Point

– Trace / Diagnostics

– Accounting

IMS Online Logging ...

⚠ Write Ahead Data Set

- ► Used to Satisfy Log Write Ahead

- ► May be Used to Close the OLDS

⚠ System Log Data Set

- ► Copy of All OLDS Records

  - – Useable for Restart

⚠ Recovery Log Data Set

- ► Copy of All Database Records

  - – Required for Database Recovery

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Archiving Overview

⚠ Batch Utility - DFSUARC0

- ► Single Pass of OLDS

  - – Creates SLDS(s)

  - – Optionally Creates RLDS(s)

- ► Input of All Unarchived OLDS

- ► Invoked

  - – Automatically (ARC=n)

  - – GENJCL.ARCHIVE

DBRC Overview

⚠ Logging & Archiving

► Records Information
  - OLDS, SLDS, RLDS

⚠ Database Access

► Registered Databases
  - Record Utility Information
  - Checks Flags & Counters
  - Database Authorization

► GENJCL Support
  - May be used to generate JCL or Control Statements
    - Archive Online Log Dataset(s)
    - Change Accumulation
    - Image Copy
    - Recover Database
    - User Defined Functions
    - Other Functions

IMS Restart

- Automated Process
  - ► Type Determined During Restart
  - ► Can be Overridden
- COLD
  - ► Initial Installation
  - ► Change in IMS Configuration
- WARM
  - ► Normal Restart
  - ► Successful Termination
    /CHE FREEZE, PURGE, or DUMPQ
- EMERGENCY
  - ► After IMS system failure
    - – IMS ABEND
    - – MVS or hardware failure

Full Function Databases

⚠ **Hierarchic Structure**

⚠ **Sequential Organization**
- HSAM - Hierarchic Sequential

⚠ **Indexed Organization**

▶ Sequenced by Key
- HISAM   - Hierarchic Index Sequential
- HIDAM   - Hierarchic Index Direct
- PHIDAM   - Partitioned Hierarchic Index Direct

⚠ **Direct Organization**

▶ Random Sequence

▶ No Primary Index
- HDAM   - Hierarchic Direct
- PHDAM   - Partitioned Hierarchic Direct

⚠ **Secondary Index**

▶ Alternate Key Sequence

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Full Function Databases ...

⚠ **Database Access**

⚠ **Physical Access Method**

► Databases

  – VSAM - HISAM, HIDAM / PHIDAM, HDAM / PHDAM, GSAM

  – OSAM - HIDAM / PHIDAM, HDAM / PHDAM

  – BSAM - HSAM GSAM

  – QSAM - HSAM

► Secondary Indexes

  – VSAM

Fast Path Databases

⚠ **Hierarchic Structure**

- ► DEDB - Data Entry Data Base
  - – Similar to HDAM
  - – VSAM ESDS
  - – Partitioned
  - – Multiple Copies

- ► MSDB - Main Storage Data Base
  - – Root Segment Only Database
  - – Resides in Main Storage
  - – Insert and Delete Restrictions

⚠ **Access**

- ► MPP
- ► BMP
- ► Fast Path Application

Utilities ...

⚠ Full Function Databases ...

- ► Change Accumulation

- ► Recovery

- ► Batch Backout

⚠ Fast Path Databases

- ► Concurrent Image Copy

- ► DEDB Initialization

- ► DEDB Direct Reorganization

- ► DEDB Scan & Delete

- ► DEDB Create / Compare

- ► Change Accumulation

- ► Recovery

- ► MSDB Maintenance

Utilities...

- **HALDB**
  - ► DFSMAID0 - Migration Aid Utility
    - ▬ Assists in conversion of existing HDAM / HIDAM database
  - ► DFSUPNT0 - Partition Dataset Initialization Utility
    - ▬ Create structures for HALDB database
  - ► DFSPREC0 - Index / ILDS Rebuild Utility
    - ▬ Recovers HALDB Index or ILDS datasets used by HALDB

Batch

⚠ **Stand Alone MVS Job**

► No Message Access

► Control Region Not Needed

► Checkpoint / Restart Support

► GSAM Support

► DASD Logging Optional

► DBRC Optional

► NO DEDB / MSDB Access

⚠ **Private Database Access**

► No Locking

► Access by This Job Only

► Logging Optional

Batch ...

⚠ Shared Database Access

- ► IRLM Required
  - – Locking

- ► DBRC Required
  - – Database Access Control

- ► Logging Required
  - – If Update Intent

⚠ DB2 Support

- ► DB2 Batch Attach

- ► Checkpoint / Restart
  - – Logging Required

- ► GSAM

IMS Security

⚠ **Standard IMS Security (SMU)**

► LTERM

► Transaction

► Command

⚠ **Enhanced Security**

► RACF
  – Sign-on
    Verifies User Access
    Userid Logged With Changes
  – Transaction
    Verifies User Access
  – Dependent Region Connection
    Verifies Region Access to IMS

Further Information

- **IMS Manuals**
  - ► For detailed information about how IMS works
    - ▬ Administration Guide - System
    - ▬ Administration Guide - Database Manager
    - ▬ Administration Guide - Transaction Manager
  - ► Installation and System Definition
    - ▬ Installation Volume 1 - Installation information
    - ▬ Installation Volume 2 - System Definition information
  - ► Messages
    - ▬ Messages and Codes
      - • DFS and DSP messages or abend codes
    - ▬ Common Queue Server and Base Primitive Environment
      - • CQS and BPE messages or abend codes
- **Redbooks**
  - ► IMS Primer
    - ▬ A very useful introduction to IMS