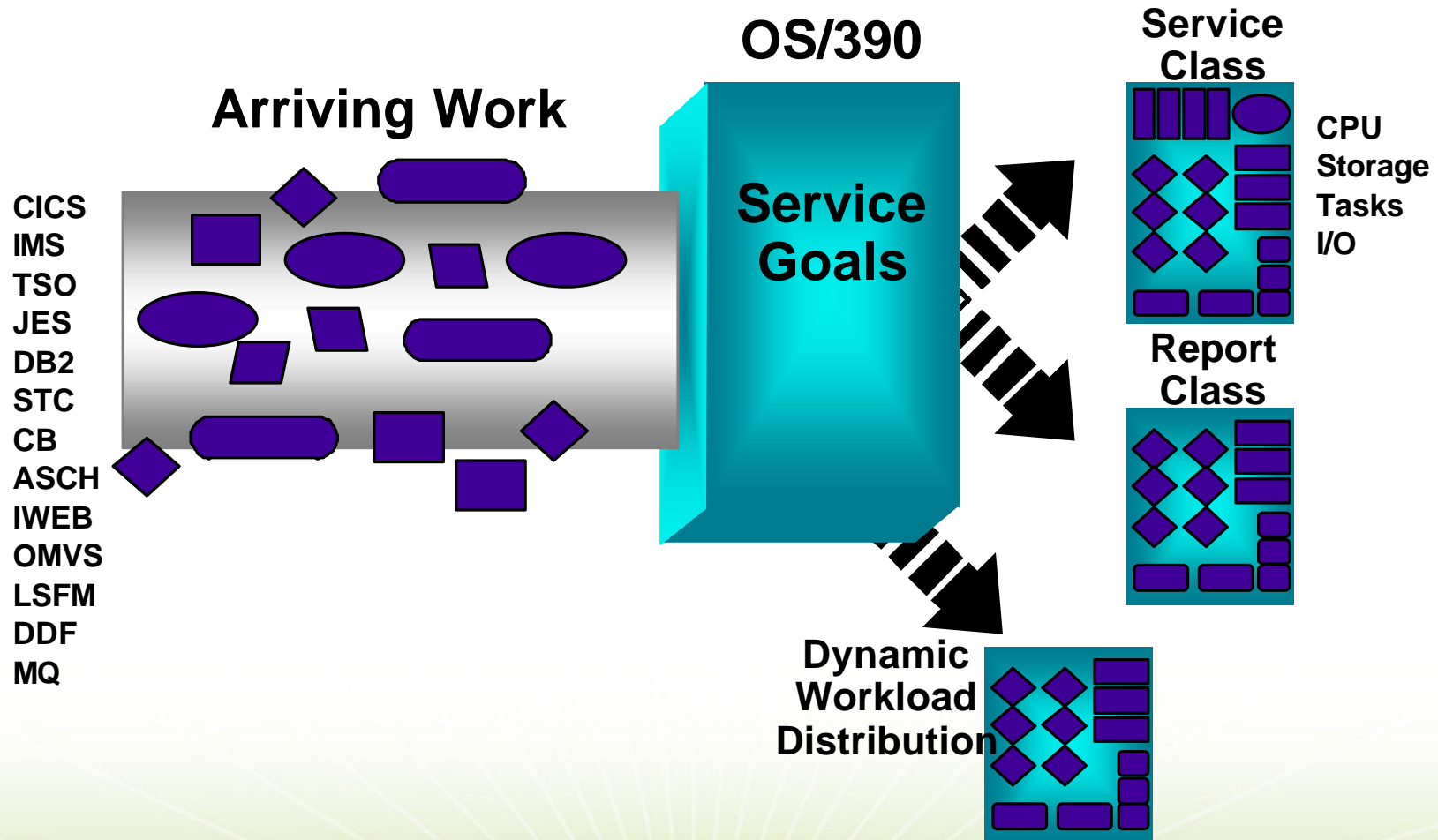


Using WLM with DB2 for z/OS

Hugh Smith (smithhj@us.ibm.com)

08/18/04 - 1344

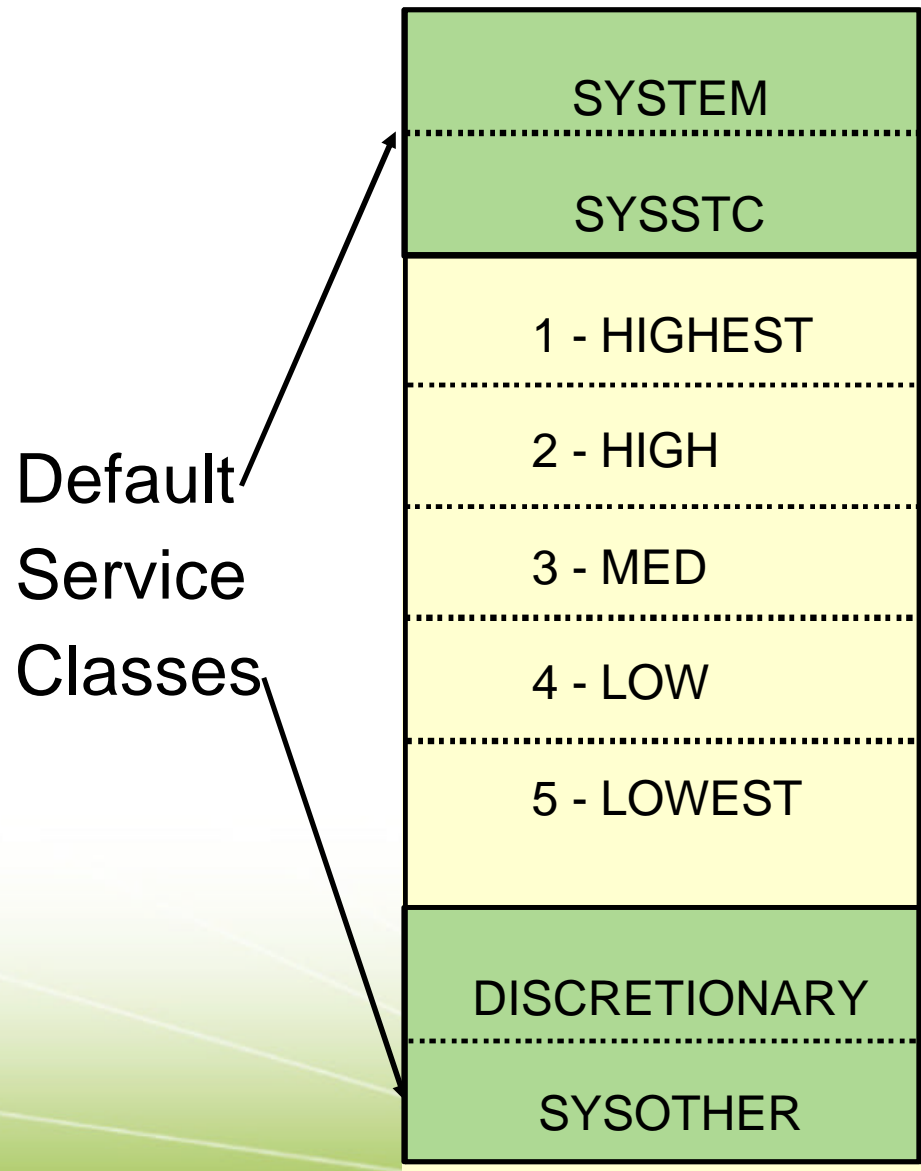
OS/390 Workload Management



WLM Concepts

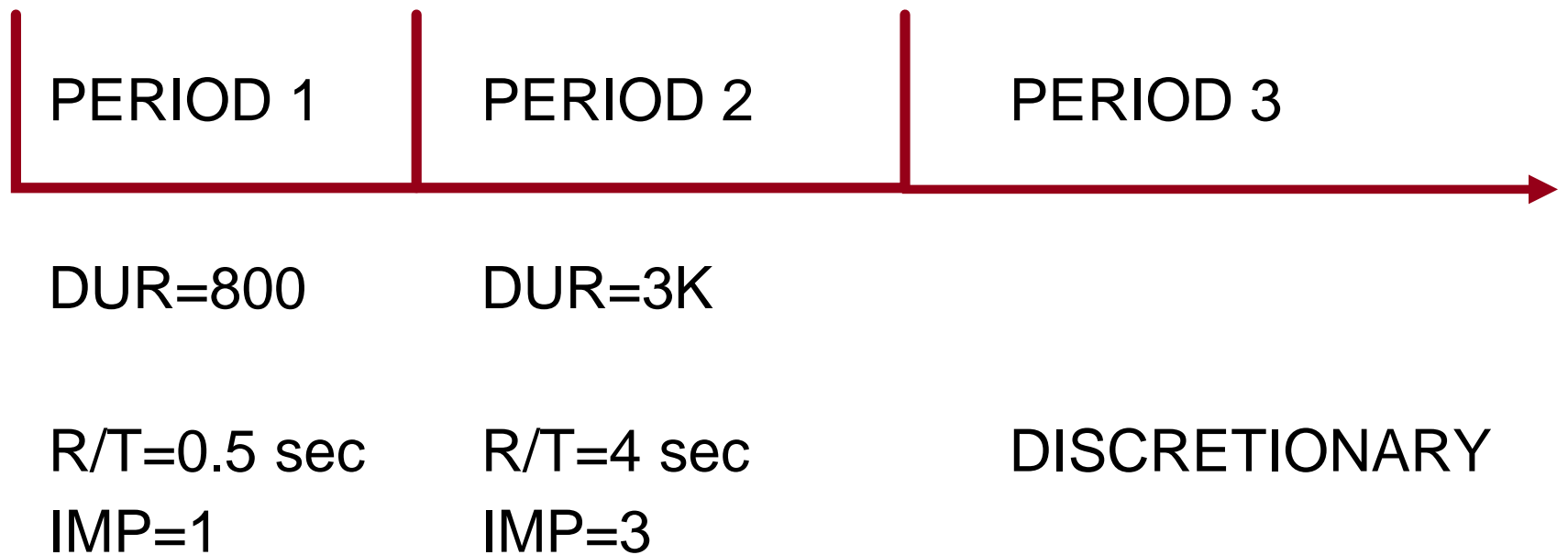
- Levels of importance (related to other work)
- Goal Types
 - f* Average response time
 - f* Percentile response time
 - f* Velocity
 - f* Discretionary
- Service classes can be combinations of goal types defined into periods
- Work must be classified (Classification rules)
- WLM Managed Delays
 - f* Processor
 - f* Non-paging DASD I/O (IOS queue, subchannel pending, control unit queue)
 - f* Storage (paging, swapping, MPL, server A/S creation, batch initiation)

WLM Importance Levels



- Similar to priority levels
- Used to state the importance of one kind of work to another

Period Switch



Enclaves

- Represents a "business unit of work"
 - f* and an individual SRM transaction
- Is managed separately from the address space
- Can include multiple SRBs/TCBs
 - f* SRBs are preemptible type
- Can span multiple address spaces
- Can have many enclaves in a single address space
- Exists in both goal and compatability mode
 - f* assigned to service class or PGN
 - f* managed separately from address space
- DB2 V4+ exploits the WLM Enclave Interfaces
 - f* create/delete the enclave, join an enclave, etc.

WLM Classification Rules Main Panel



Subsystem-Type View Notes Options Help

Subsystem Type Selection List for Rules Row 1 to 10 of 10

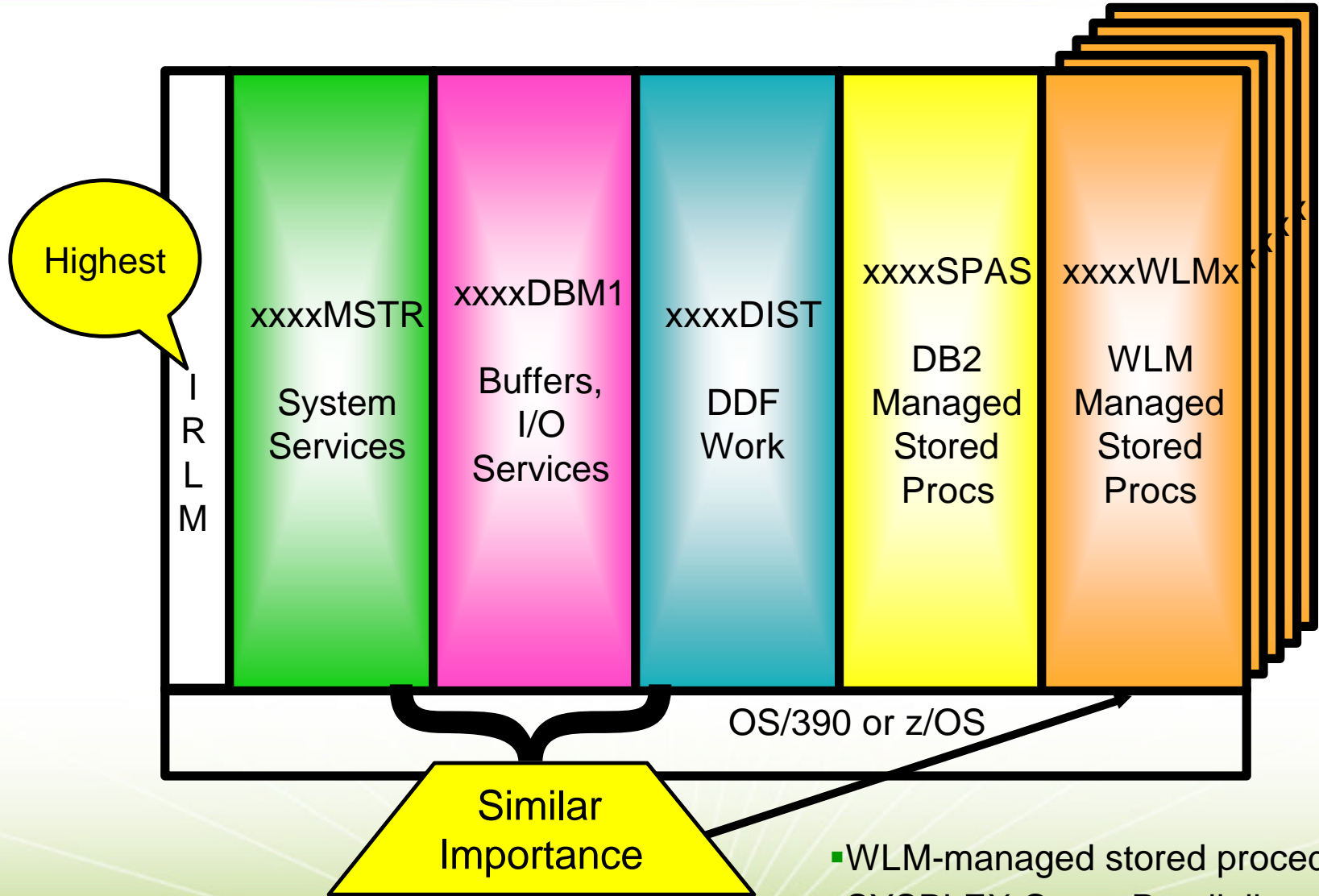
Command ====>

Action Codes: 1=Create, 2=Copy, 3=Modify, 4=Browse, 5=Print, 6=Delete,
/=Menu Bar

Action	Type	Description	Service	Report
___	ASCH	APPC Transactions	BATCH_M	
___	CICS	CICS Transactions	MI SC_2	
___	DB2	DB2 Transactions	MI SC_1	
___	DDF	DB2 Distributed Transactions	MI SC_1	
___	IMS	IMS Transactions	MI SC_2	
___	JES	Batch Jobs	BATCH_M	
___	OMVS	OpenEdition Forked Address Space	BATCH_M	
___	SOM	Not Used	MI SC_2	
___	STC	Started Tasks	SYSTEM	
___	TSO	TSO Users	TSO_M	

***** Bottom of data *****

DB2 Address Spaces

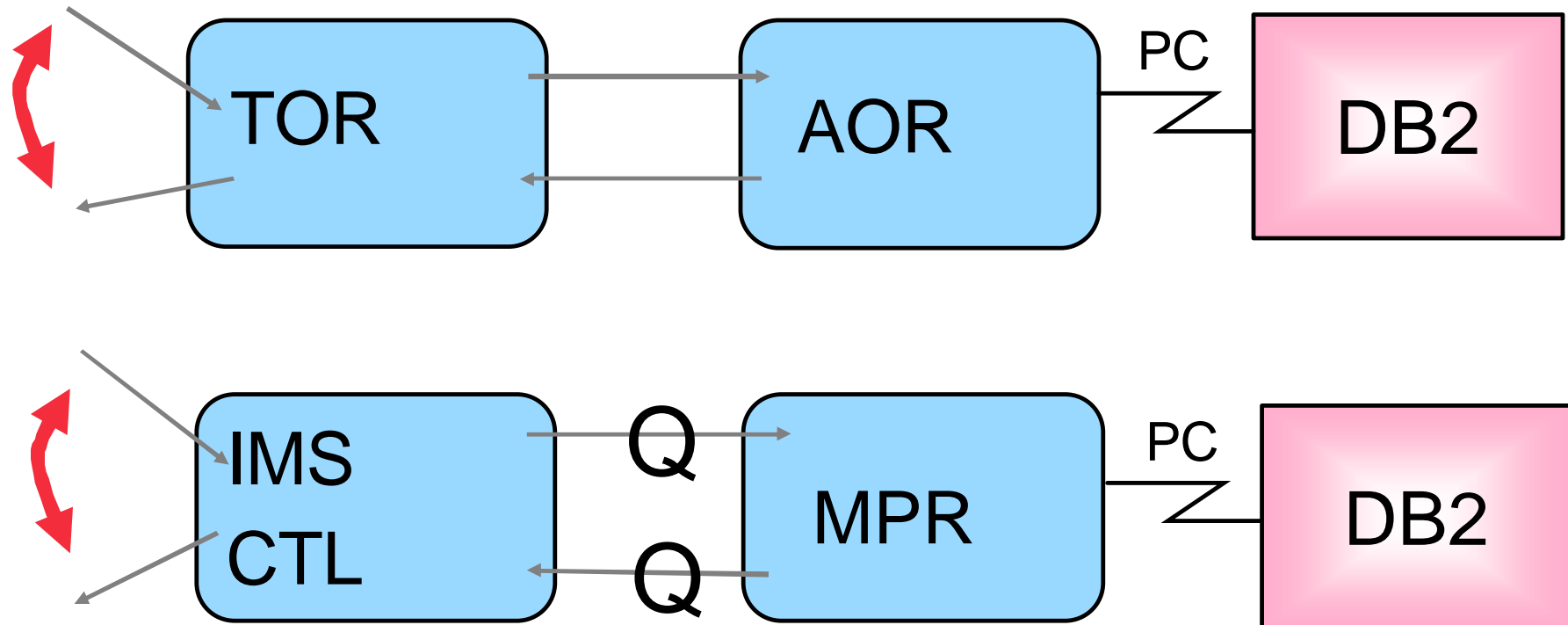


- WLM-managed stored procedures
- SYSPLEX Query Parallelism
- Local vs Distributed

WLM: 4 Types of DB2 Work

- DB2 work that originates in another subsystem
- DDF work requests
- Queries that DB2 creates by splitting a single, larger query and distributing it to remote systems in a sysplex
- DB2 Stored Procedure request
- Fast Log Apply tasks are enclaves!

Local Attach



DB2 SQL activity runs under dispatchable unit of invoker

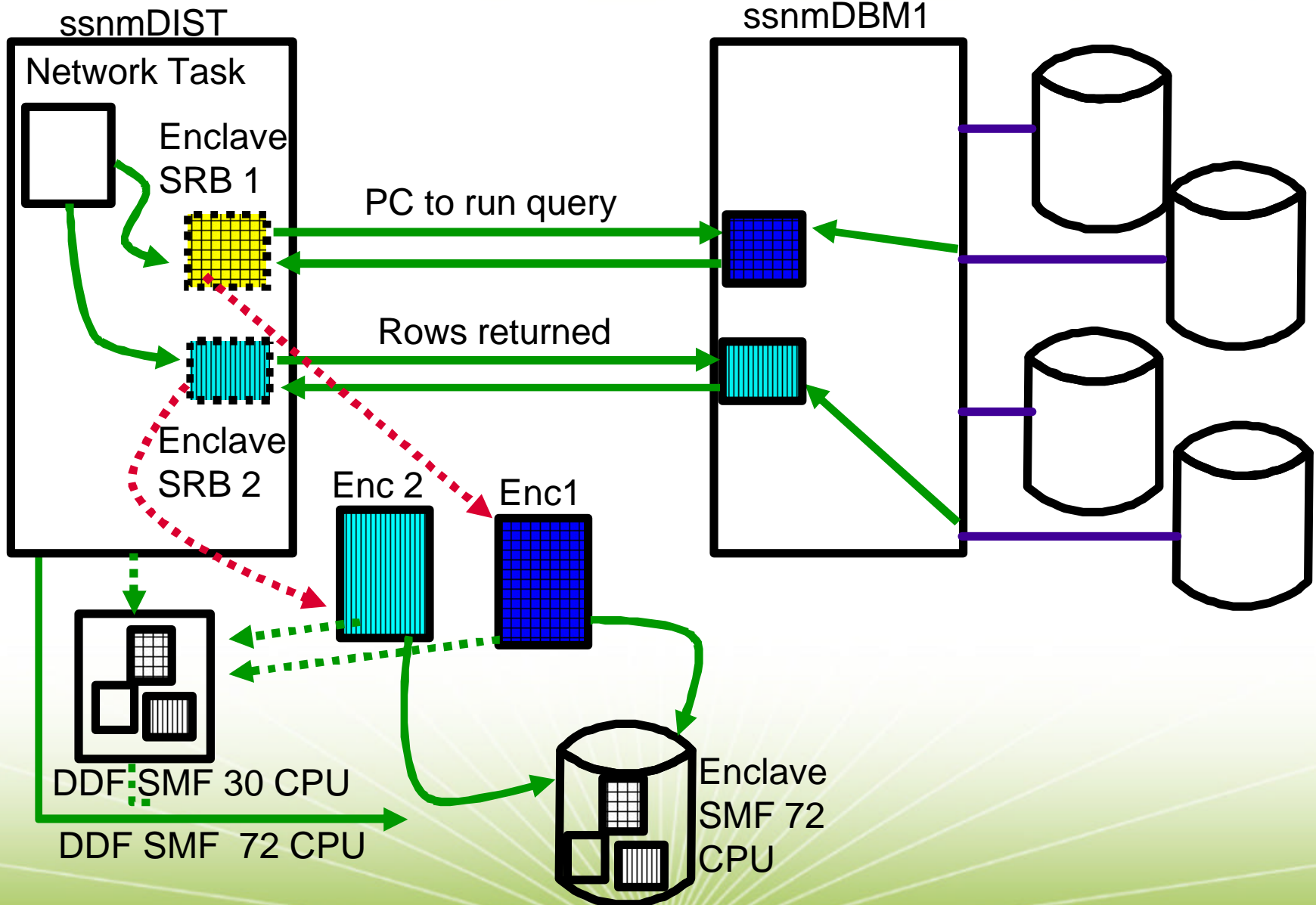
f IMS, CICS, TSO, Batch, etc.

f Inherited classification class of invoker

f Priority and management of home unit

f Service attributed back to invoker

Managing DDF Work in DB2



Classify DDF Transaction

- All enclaves, including DDF transactions, are classified using the active WLM policy in both compatibility and goal modes
- In compat mode the ICS can be used to map a service class to a performance group, and likewise for reporting

DDF Work Classification Panel



Subsystem-Type Xref Notes Options Help

Modify Rules for the Subsystem Type

Row 1 to 1 of 1

Command ===> _____ SCROLL ===> PAGE

Subsystem Type . : DDF Fold qualifier names? Y (Y or N)
 Description . . . DB2 Distributed Transactions

Action codes: A=After C=Copy M=Move I=Insert rule
 B=Before D>Delete row R=Repeat IS=Insert Sub-rule
 More ===>

Action	Type	Qualifier Name	Start	Service	Report
_____	1	_____	_____	DEFAULTS: MISC_1	_____

***** BOTTOM OF DATA *****

DDF Work Classification Attributes



Attribute	Type	Description
Accounting Information	AI	Can be passed from a DB2 Client via Client Information APIs
Correlation Information	CI	DB2 Connect assigns application program name by default but application can set via Client Information APIs
Collection Name	CN	Collection name of the first SQL package accessed by the DRDA requester in the unit of work
Connection Type	CT	Always 'DIST ' for DDF server threads
Package Name	PK	Name of the first DB2 package accessed by the DRDA requester in the unit of work
Plan Name	PN	Always 'DISTSERV' for DDF server threads accessed via DRDA requesters
Procedure Name	PR	Name of the procedure called as the first request in the unit of work
Process Name	PC	Client application name by default but can be set via Client Information APIs
Subsystem Collection Name	SSC	Usually the DB2 data sharing group name
Subsystem Instance	SI	DB2 server's MVS subsystem name
Sysplex Name	PX	Name assigned to sysplex at IPL
Userid	UI	DDF server thread's primary AUTHID
Subsystem Parameter	SPM	V8 only – will be the concatenation of client userid and workstation

DDF Classification Defaults



- **Goal mode**

- f* Enclaves default to the SYSOTHER service class which has a discretionary goal!

- **Compat mode**

- f* Any enclaves run in the pgn/rpgn of the owning address space (DDF) as they did before

- Defaults apply if you do not provide any classification rules for DDF work

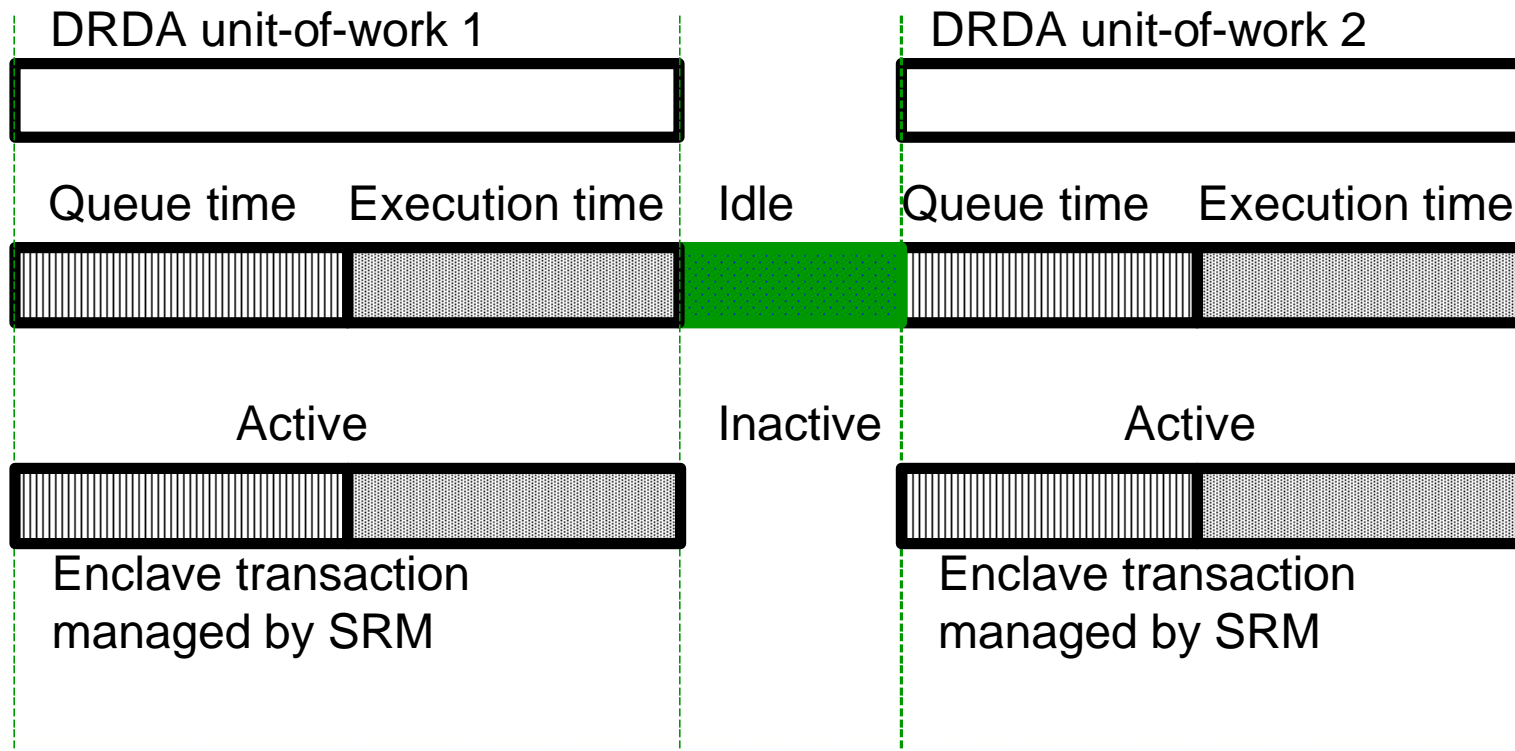
Managing DDF Work (Enclaves)



- Transactions are subject to period switch
- Goal mode:
 - f* All goal types allowed
 - f* WLM manages enclaves with its own dispatch priority, etc.
- Compat mode:
 - f* Performance groups and report performance groups can be assigned using SUBSYS=DDF
 - f* Limit of one rpgn
 - f* Time slicing is ignored
 - f* Domain is ignored

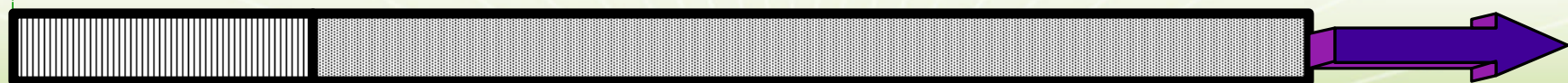
What is a Transaction?

Threads = Inactive



Threads = Active

Database thread is active from creation until termination



Enclave transaction managed by SRM exhibits conversational behavior

What Goals Should I Use?



- WLM compatibility mode

- f* Goal does not matter. Service class used only to associate an enclave with a performance group.

- WLM goal mode

- f* **THREADS=INACTIVE and RELEASE(COMMIT)**

- DDF creates one enclave per active interval
 - Response times do not include think time
 - Response time goals and multiple periods can be used

- f* **THREADS=ACTIVE**

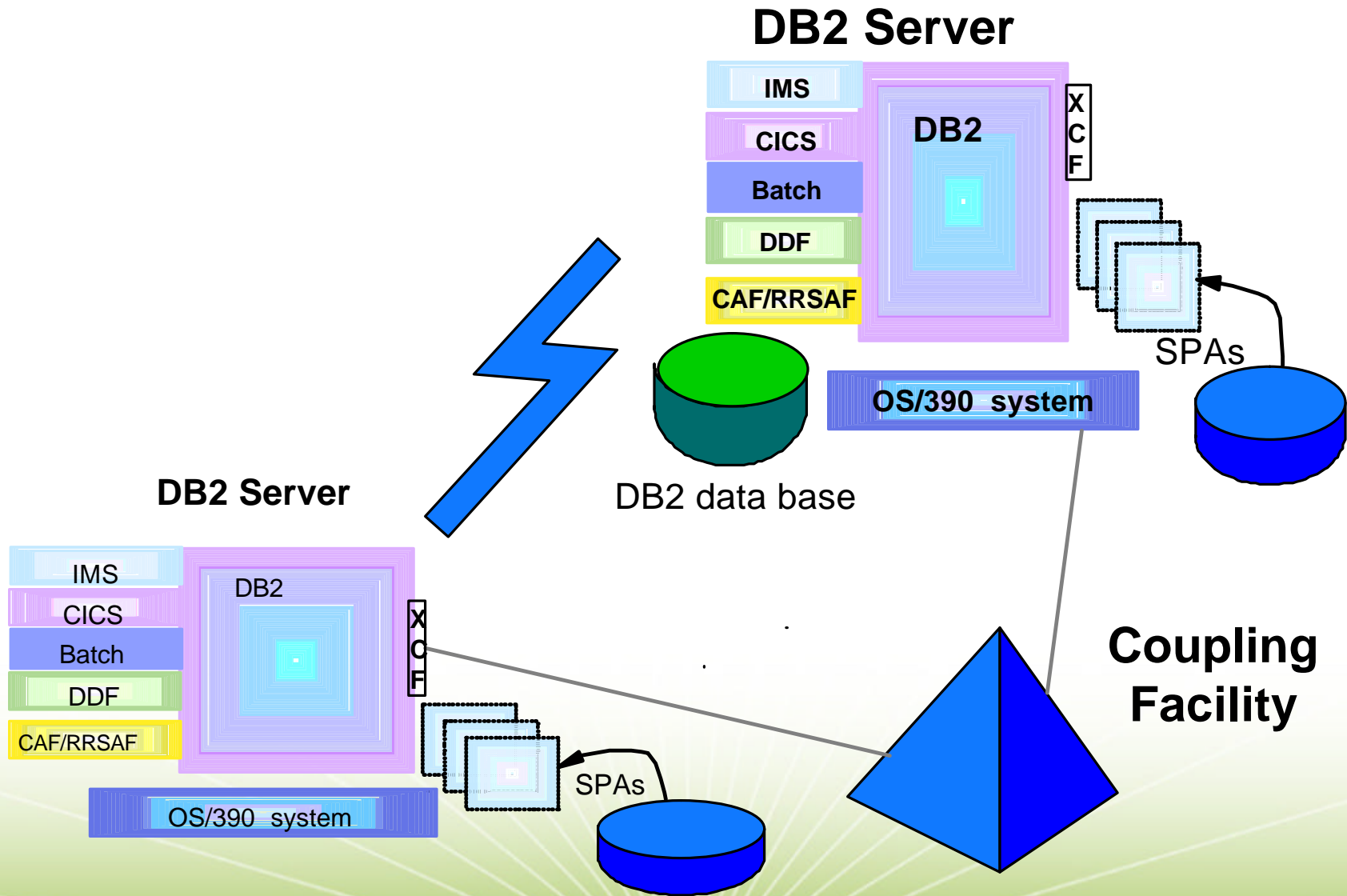
- DDF creates one enclave for the life of the thread
 - Enclave response time includes think time
 - Response time goals should not be used
 - Multiple periods should not be used

Enclave System Effects (DDF)



- Each DDF transaction used to be part of the DDF address space SRM transaction, now SRM sees each DDF transaction, i.e. lots more transactions
- Increased active time since more transactions exist
- Large decrease in DDF SRB time/service in SMF 30 record
- Corresponding increase in CPU time/service in the service classes/performance groups where enclaves are running
- MSO and I/O service is unchanged
- DDF logons are not held up by existing DDF work

Sysplex Query Parallelism



Sysplex Query Parallelism



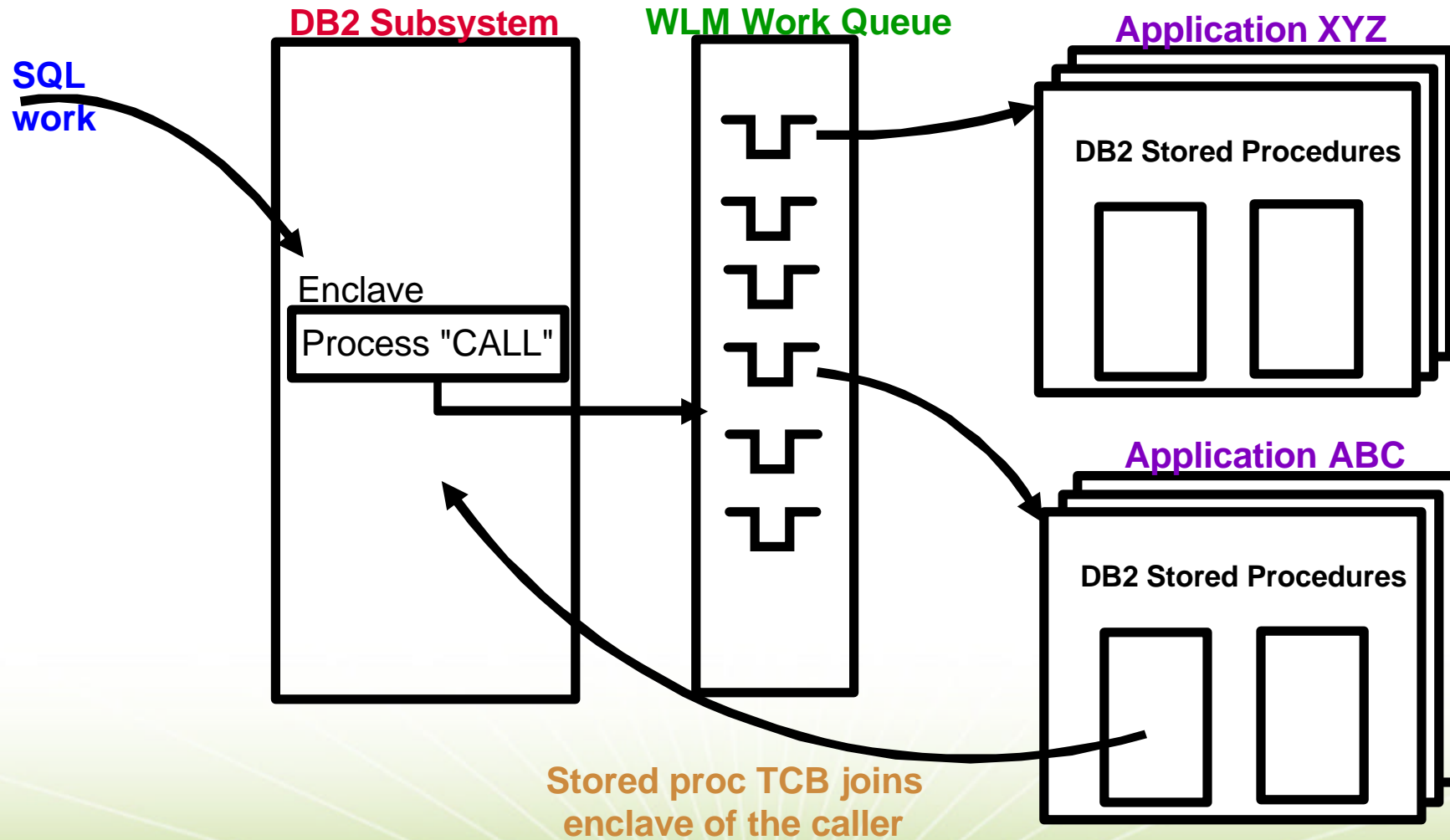
- Supports data mining applications
- DB2 query can be split across parallel sysplex
- Requires DB2 V5.1 and DB2 data sharing
- Classification of originator doesn't change
- Classification of participants is under 'DB2' rules
 - f* Classification attributes inherited from originator
- Accounting is done on the system where enclave runs
- Each remote piece starts in 1st period

Application Environment



- AKA "**scaleable servers**"
- WLM can dynamically manage the number of server address spaces
- Can be used with **DB2**, **CB**, and **IWEB** workloads
- Application environment can be used in goal or compatability modes
 - f* Servers will be started/stopped automatically only in goal mode
- WLM ISPF panels are used to define the JCL to be used

Stored Procedures



WLM Application Environment Assignment



- CREATE|ALTER PROCEDURE statement
 - f* WLM ENVIRONMENT wlm_name or NO WLM ENVIRONMENT
 - f* if not specified, then WLMENV ZPARM option used
- V8!!! - cannot CREATE or ALTER PROCEDURE with NO WLM ENVIRONMENT
 - f* V7 procedures will be migrated and you can alter definitions

Fast Log Apply Enclaves



- Fast Log Apply tasks at startup or during RECOVER utility jobs are classified into enclaves
- Guidance documentation not available on how to establish goals
- Workload type is DB2
 - f* Userid will always be SYSOPR
 - f* Correlation information will always be 014.DSNUTIL
- Fix to APAR PQ89297 will make Fast Log Apply tasks client SRBs and thus inherit goal of invoking address space (only for V7 and V8 – not available yet)

WLM: 4 Types of DB2 Work



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- Fast Log Apply enclaves