

WORKLOAD MANAGER et DB2

Guide/Share DB2 : session du 25
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Conseil ■

Expertise technique ■

Solutions ■

Formation ■



Sommaire

- Workload Manager : Objectifs et Classifications
- Les Cycles, Ressources et Algorithmes
- Les Classes de Service
- Le Performance Index
- Les Transactions Server, Queue Server, DDF
- Les procédures stockées
- WebSphere, CICS et DB2
- Les Enclaves et le Dispatcher
- Etude de cas sur DRDA
- Nouveautés : Zaaps, Ziips, routage



WLM : Objectifs Globaux

Maintenir la qualité de service demandée par les Classes de Service dans un SYSPLEX

Gérer tous les types de transactions sur OS/390 et Z/os par des classes de service

Hiérarchiser l'atteinte des objectifs des classes de service par Importance

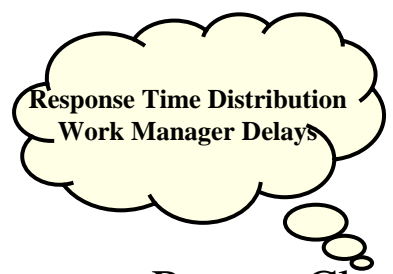
Ajuster dynamiquement les ressources Hardware et Software pour atteindre ces objectifs

WORKLOAD MANAGER : Objets et Définitions

Service Définition → Couple Dataset WLM

Goal Policy' ← Goal Policy

Workload
Workload
Workload



Report Class

Workload

Service Class

Resource Group

Homogeneous

Service Class

Heterogeneous

Service Class

Multiple Periods Inheritance

Period

Importance/Goal

Period

Period

Sysplex-Name
Sysname
Sous-system
Transaction
Account
Userid
Job



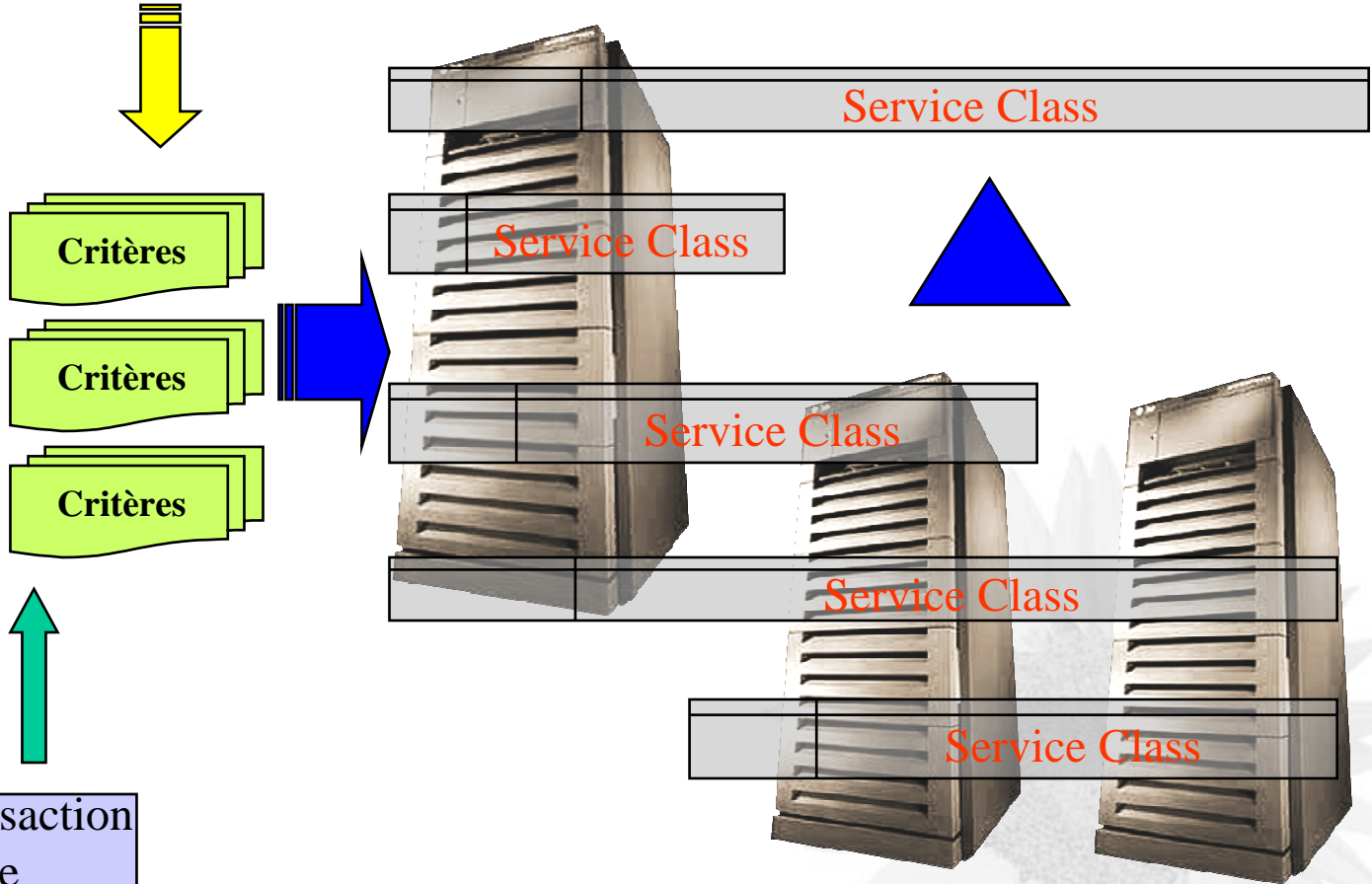
WLM Classifications - Principes

IWMCLSFY

Enclave
Transaction
Category

Connection
CorrelationId
Package

WEB Transaction
Name
Method
Html Template
Httpd .conf
Was.conf



Espaces Adresses passifs : (Tso,Batch,Stc,Omvs)

Transactions Servers : (CICS,IMS) Routage des transactions

Ajustement des ressources fonction des External Service Class Goals

WLM Managed Initiators : ajustement dynamique du Queue Time Batch

Routage des Batches et Parallélisation + SCHENV

Queue Servers : WLM Managed Queues avec APPLENV associée

IWEB Scalable Webserver : WebSphere HTTP Servers clonable

WebSphere Application Servers Clonable

CB : Component Broker Region Clonable utilisé par Websphere services

DDF Stored SQL Proc : SPAS SQL Server Address Space Clonable

Enclaves « Hôtes » : DB2,LSFM,SAP R/3,MQ (Workflow),CB,WAS V4

	JES2	TSO	STC	OMVS	DDF	CICS	IMS	DB2	LSFM	ASCH	CB	IWEB	SAP	MQ	SOM
SYSPLEX															
SYSTEM															
SUBSYS															
Collection															
SI															
USERID															
TRNNAME															
ACCOUNT															
TRXCLASS															
PACKAGE															
COLLECTION															
CONNECTION															
CORRELATION															
ProcedureName															
PLAN															
LU															
NETID															
Subsystemparam															
Perform															
Priority															
SCHENV															
ProcessName															

	SYSH	NETV
SYSPLEX		
SYSTEM		
LU		
Priority		
SI		
TRXCLASS		
TRNNAME		
USERID		

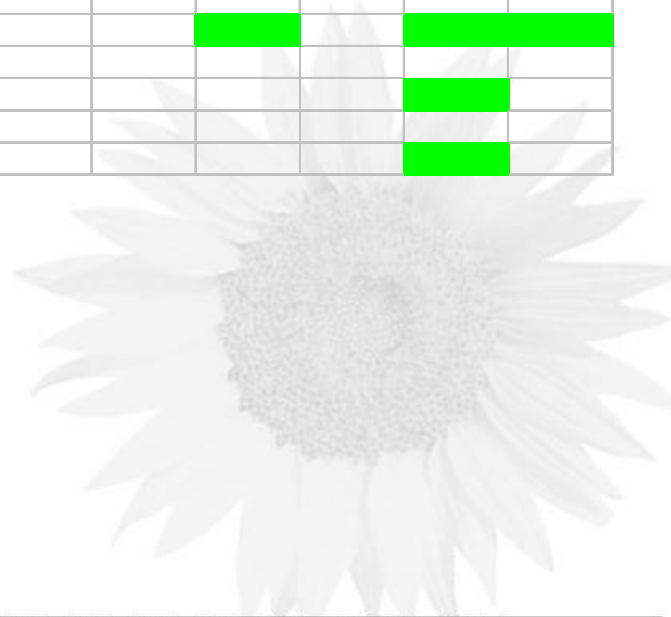


Table 8. Work Qualifiers Supported by Each IBM-Defined Subsystem Type

	A S C H	C B	C I C S	D B 2	D D F	E W L M	I M S	I W E B	J E S	L S F M	M Q	N E T V	O M V S	S O M	S T C	T S O	S Y S H
Accounting Information	●			●	●				●				●		●	●	
Collection Name		●		●	●									●			
Connection Type				●	●												
Correlation Information				●	●												
EWLM Service Class						●											
EWLM Transaction Class						●											
LU Name			●	●	●		●					●					
Netid				●	●		●										
Package Name				●	●												
Perform				●					●							●	●
Plan Name				●	●												
Priority				●					●		●	●					
Procedure Name				●	●												
Process Name				●	●						●						
Scheduling Environment Name				●					●								
Subsystem Collection Name				●	●				●								
Subsystem Instance		●	●	●	●		●	●	●	●	●	●					
Subsystem Parameter				●	●			●			●			●	●		
Sysplex Name	●	●	●	●	●		●	●	●	●	●		●	●	●	●	●
System Name	●												●		●	●	●
Transaction Class/Job Class	●	●		●			●	●	●		●	●					
Transaction Name/Job Name	●	●	●	●			●	●	●	●	●	●			●		
Userid	●	●	●	●	●		●	●	●		●	●	●	●	●	●	

- Echantillonnage général : **1/4 seconde**
- Policy Adjustment Routine : **10 secondes (Calcul des PI Local et Sysplex)**
- Transaction Longue : **2 x Policy Interval = 20 secondes**
- LPAR Weight Management Change : **jusque 6 x Policy interval**
- Révision de la Topologie des Transactions Servers : **6 x Policy interval (1 minute)**
- Sysplex Routing Services Weight Calculation Interval : **60 à 180 secondes**
- Démarrage et Fermeture des Inits WLM dynamiques : **Policy + Historique + Capacité**
- Révisions des Devices Clusters et I/O Queueing Priority : **10 minutes (minimum 3 min)**
- Dynamic PAV Goal algorithm : **30 secondes**
- Dynamic PAV Efficiency algorithm : **1 minute**

Cpu : Dispatching Priority (service Class/Period), LPAR Cpu Management

Mémoire : Pagination interne et externe, Swap Logique (Service Class/Period)

Mpl : Taux de Multiprogrammation (Service Class/Period)

IRD : CSS Priority Queueing(ESCP), Dynamic Channelpath Mgt (Global)

Queueing I/O sur UCB (disques) : I/O Queueing Priority (même granularité)

UCB Dynamic PAV : (+ sur ESS internal Control Unit Priority)

Queueing des Batchs avec Init WLM dynamiques : (scope Sysplex ou systemid)

Load Balancing des Logon Applid (CICS) avec VTAM et Goals en Sysplex

Load Balancing des Sessions TCP/UDP par DNS/Sysplex Distributor/MNLB Cisco

WLM Managed Queue servers (IWEB,DDF,CB....) : démarrage dynamique de clône

WAS Load Balancing : Servlet Redirector (WLM + IIOP),WLM/DNS

EJB Load Balancing WLM Policy : Round-Robin options (DNS/WLM CB en V4)

Policy Adjustment Routine (10 Secondes)

Donneurs

External sc/per or internal

Resource Group > Max

Discretionary Ressources

Imp 5

Performance Index <<< 1

Performance Index < 1

Performance Index <= 1

Imp 4

Imp 3

Imp 2

Imp 1

Seuil de rentabilité = 10% du PI initial +/- et impact sur autres Goals

Pour chaque importance et chaque période: calcul des SPI puis des LPI 1 action sinon importance suivante

Receveurs

External sc/per or internal

Resource Group < Min

Imp 0
Imp 1

Performance Index >> 1

Performance Index > 1

Performance Index 1

Imp 2

Performance Index >> 1

Imp 3

Imp 4

Imp 5

Discretionary

Impact/granularité

External sc/per ou internal ou Ad Space

External SC/PER

Internal Service Class : **DISC**

Gestion individuelle par Espace-Address si Transactions longues (> 2 x Policy interval) ,Discretionary , Server Ad Space, pour les ressources CPU et Isolation Mémoire

CPU = 1

SRB = 1

IOC = 0,5

MSO = 0

$$Q_{us} = ((cpu * T_{cbtime}) + (srb * S_{rbtime})) * K_{us/sec/proc} + (ioc * I_{ocount})$$

ASM communique à SRM le nombre Minimum d'Alias nécessaires pour optimiser les Paging Devices (**Z/os 1.3**)

I/O Priority Management = Yes

WLMPAV = Yes (Dynamic UCB Alias)

Priority byte dans CCW if Yes

Channel Subsystem
Priority Queueing if Yes

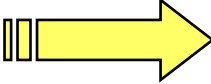
Goal Alorythm : **30 sec**
Help SCPER Goal (move Alias en utilisant un Token dans Sysplex)
> à Efficiency Alorythm

Efficiency Alorythm : **60 sec**
Reduit IOSQ Time si des Alias sont disponibles et aucun Impact sur l'Objectif du DONOR

WLM Service Class/Period Goals

WORKLOAD TSO

Service Class TSOPROD



CPU Critical = Yes
CPU Critical = no
Resource Group =

Period 1

DUR = 5000

Percentile 70% < 1 sec Importance 1

Period 2

DUR = 10000

Percentile 70% < 5 sec Importance 1

Period 3

Percentile 50% < 10 sec Importance 2

Goal : + Importance (1- 5)
 ⇒ Average Resp Time
 ⇒ Resp Time Percentile
 ⇒ Velocity
 ⇒ Discretionary (Imp 6)



Connect or Disconnect

VELOCITY

=

Uproc

+

Uio

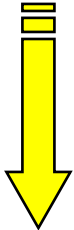
X

100 %

Using

+

Total Wlm managed delay samples



Address Space

Work Manager Address Space

Queue Server Address Space

Enclave "Hôte" Address Space

Enclave

Ucp + UZaap

Delaycp + DelayZaap

Processor Queueing delay

IOS Queueing delay

Subchannel Queueing delay

Cu busy Queueing delay

MPL delay

Paging delay (and Xmem)

Swap-in delay

Initiator Queueing delay

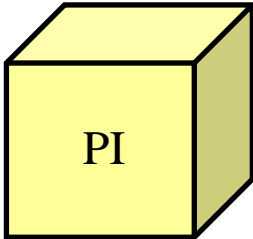
ServerCreation delay

Channel Queueing Management

IRD LPAR Cpu Management

Average Response Time Goal

ESCP



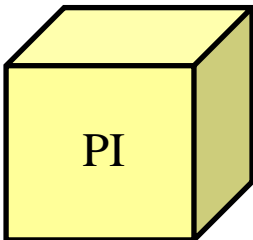
=

Actuel Temps de réponse

Avg Resp Time Goal

Percentile Response Time Goal

ESCP



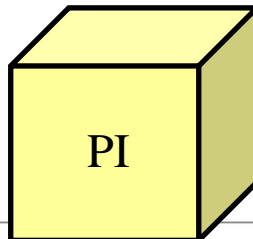
=

Percentile Actual Resp Time

Percentile Resp Time Goal

Velocity Goal

ESCP



=

Velocity Goal

Actual Velocity

WLM Calcul des Temps de Réponses ,Distributions

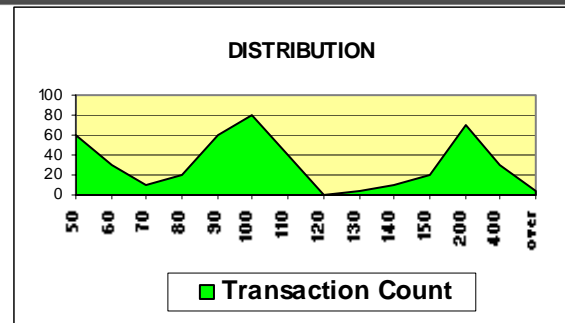
IWMRPT

Déclaration de fin de transaction

ESCP

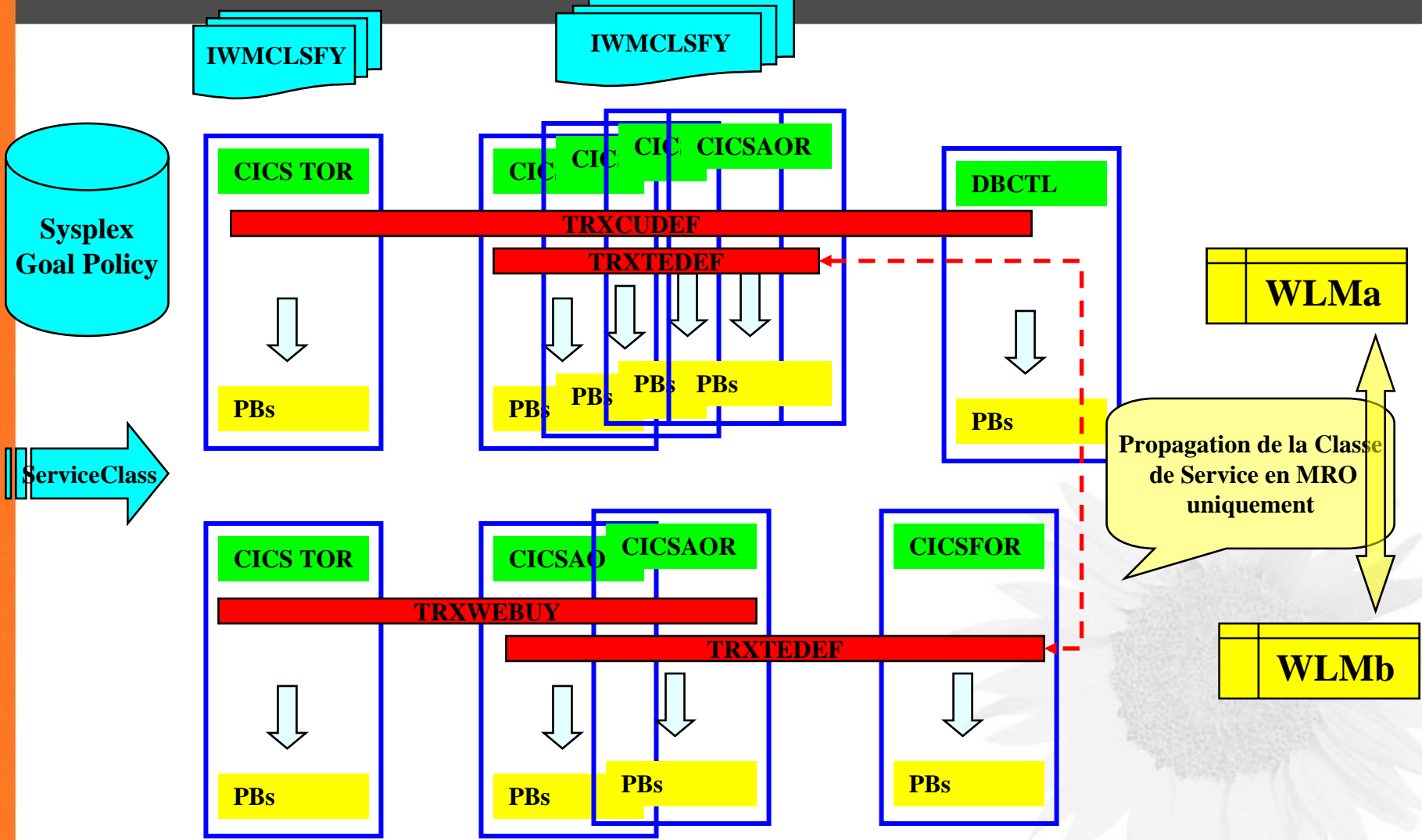
Goal Type Avg Resp ou Percentile

Exemple : 70% < 0,8 sec



Bucket	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Percent of Goal	50	60	70	80	90	100	110	120	130	140	150	200	400	over
Transaction Count	60	30	10	20	60	80	40	0	5	10	20	70	30	5
Percentile	14	20	23	27	41	59	68	68	69	72	76	92	99	100

Résultat : 72% < 1,12 sec

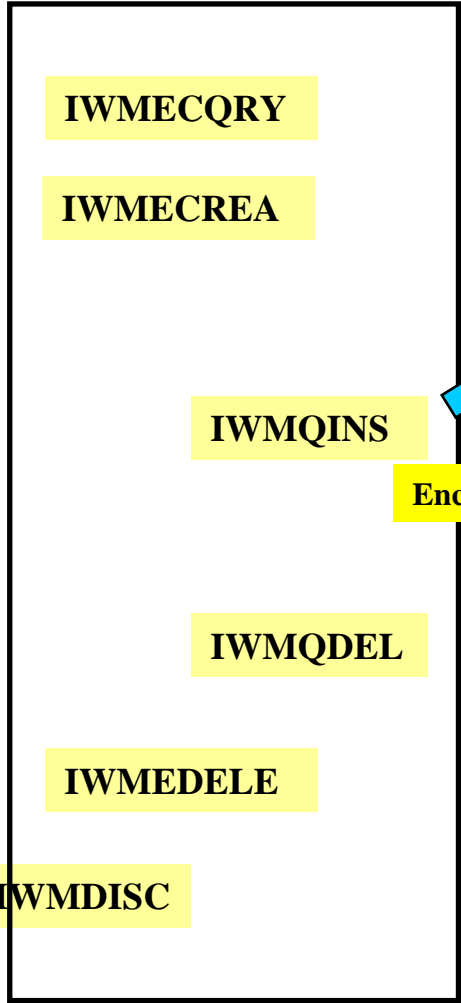


LOCK	waiting for lock.
I/O	waiting for I/O indicates that the work manager is waiting on an activity related to an I/O request. This may either be an actual I/O operation or some function associated with an I/O request.
CONV	waiting for conversation could have been used in conjunction with IWMMSWCH to identify where the target is located.
DIST	waiting for distributed request indicates at a high level that some function or data must be routed prior to resumption of the work request. This is to be contrasted with 'waiting on conversation', which is a low level view of the precise resource that is needed. A distributed request could involve 'waiting on conversation' as part of its processing.
LOCL	waiting for a session to be established locally, for example, on the current MVS image.
SYSP	waiting for a session to be established somewhere in the sysplex.
REMT	waiting for a session to be established somewhere in the network.
TIME	waiting for timer.
LTCH	waiting for a latch.
PROD	waiting for another product.
MISC	waiting for unidentified resource, possibly among another specific category, but which may not be readily determined.
SSLT	waiting for an SSL thread.
REGT	waiting for a regular thread.
WORK	waiting for registration to a work table.
BPMI	waiting for I/O resulting from a DB2 buffer pool miss.

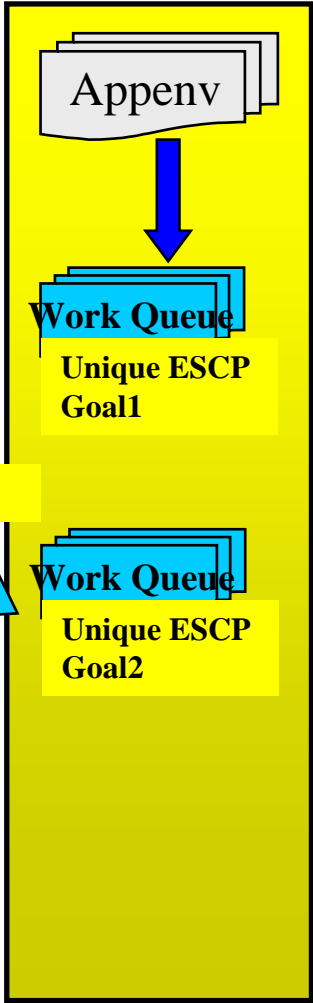
Non Swappable Ad Space for Dependent Enclaves

IWMCONN Queue_Manager = Yes

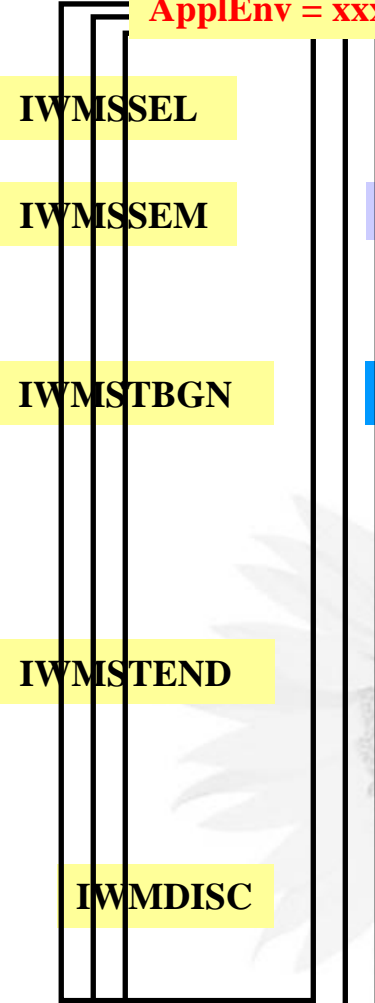
**IWMCONN Server_Manager = Yes,
AppEnv = xxx , Server_Type =Queue**



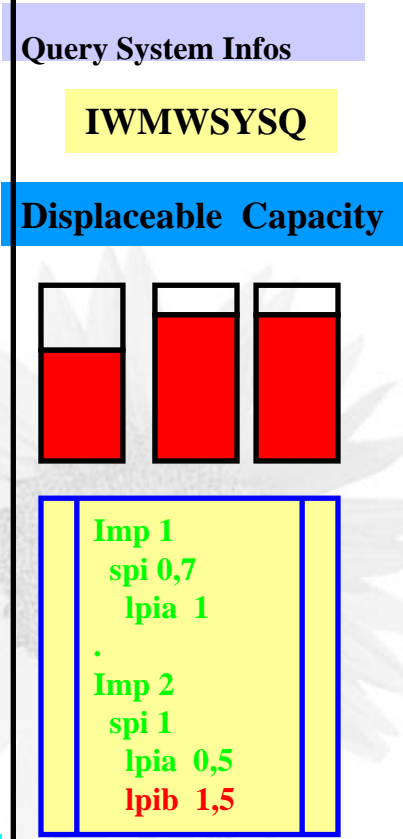
Queuing Manager Ad Space



WLM Ad Space



Server Ad Spaces



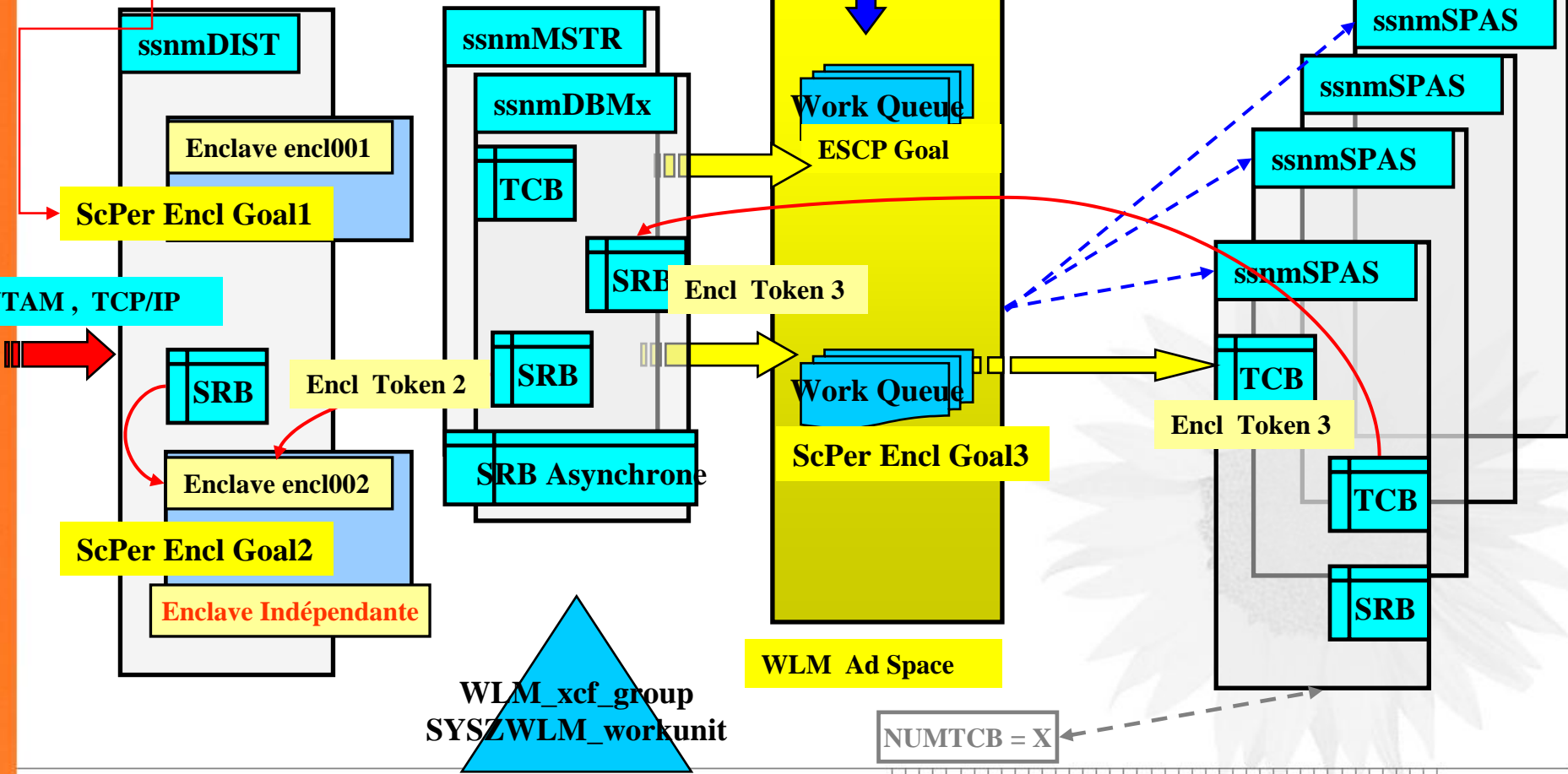
SubsystemType DDF

WLM DDF Queue Manager & Enclaves

SYSPLEX
Subsystem Instance
Correlation ID

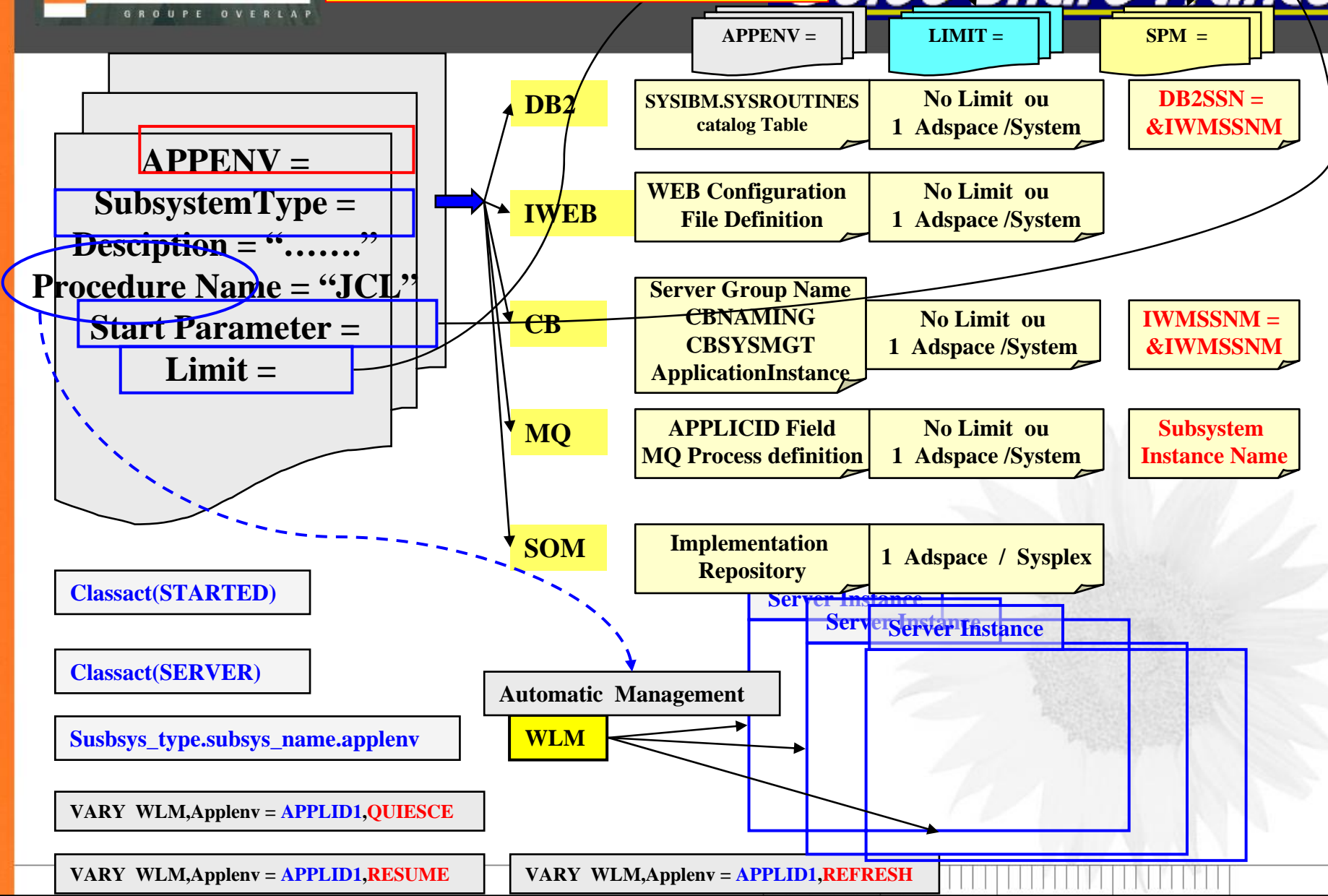
Appenv
SYSIBM.SYSROUTINES
catalog Table

SubsystemType DDF



WLM_xcf_group
SYSZWLM_workunit

NUMTCB = X



APPENV =

LIMIT =

SPM =

DB2

SYSIBM.SYSROUTINES
catalog Table

No Limit ou
1 Adspace /System

DB2SSN =
&IWMSSNM

IWEB

WEB Configuration
File Definition

No Limit ou
1 Adspace /System

CB

Server Group Name
CBNAMING
CBSYSMGT
ApplicationInstance

No Limit ou
1 Adspace /System

IWMSSNM =
&IWMSSNM

MQ

APPLICID Field
MQ Process definition

No Limit ou
1 Adspace /System

Subsystem
Instance Name

SOM

Implementation
Repository

1 Adspace / Sysplex

Classact(STARTED)

Classact(SERVER)

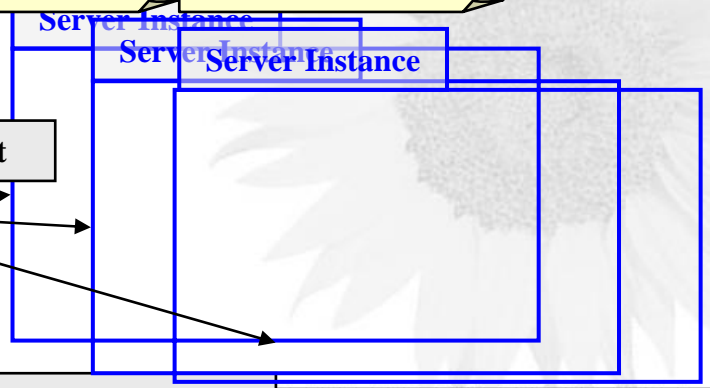
Susbsys_type.subsys_name.applenv

VARY WLM,Applenv = APPLID1, QUIESCE

VARY WLM,Applenv = APPLID1, RESUME

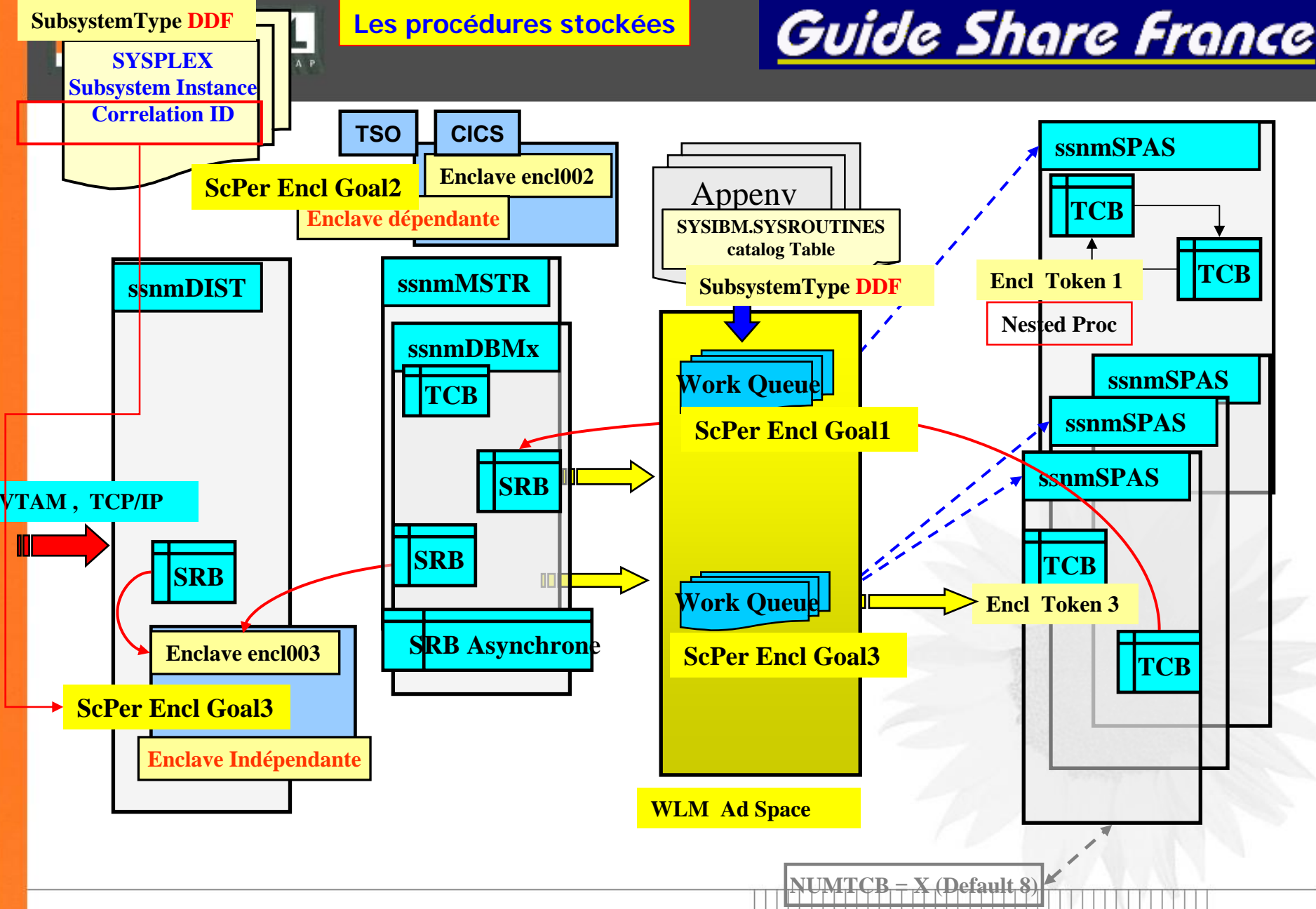
Automatic Management

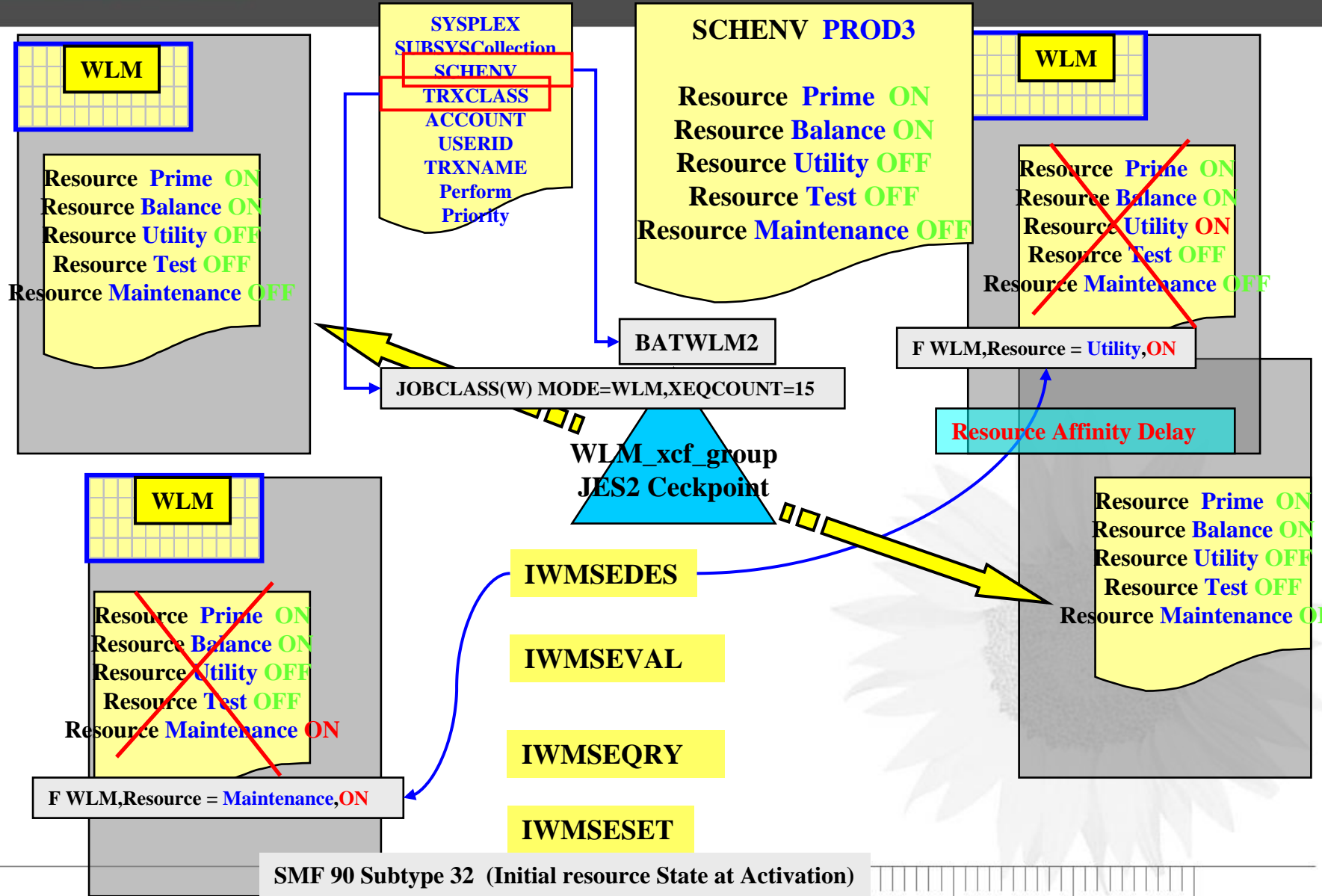
WLM



VARY WLM,Applenv = APPLID1, REFRESH

Les procédures stockées





IWMECREA

SCPE switch

SMF 30 Owner Ad space

SMF 72 Encl SC/PER

Type = Independent

ScPer Encl Goal

SMF 72 Owner SC/PER

Owner may have SCPE switch

Type = Dependent

ScPer Home Goal

TCB

ENCASSOC

Type = Monenv

ScPer Encl Goal

SRB

SMF 97 Foreign Enclaves Accounting

IWMMRELA

IWMMINIT

SMF 30 Original Enclaves Accounting (Total)

IWMCONN Exptimpt = Yes

IWMCONN Exptimpt = Yes

IWMIMPT

IWMESQRY

IWMEXPT

IWMEJOIN

WLM_xcf_group
SYSZWLM_workunit

IWMEQTME

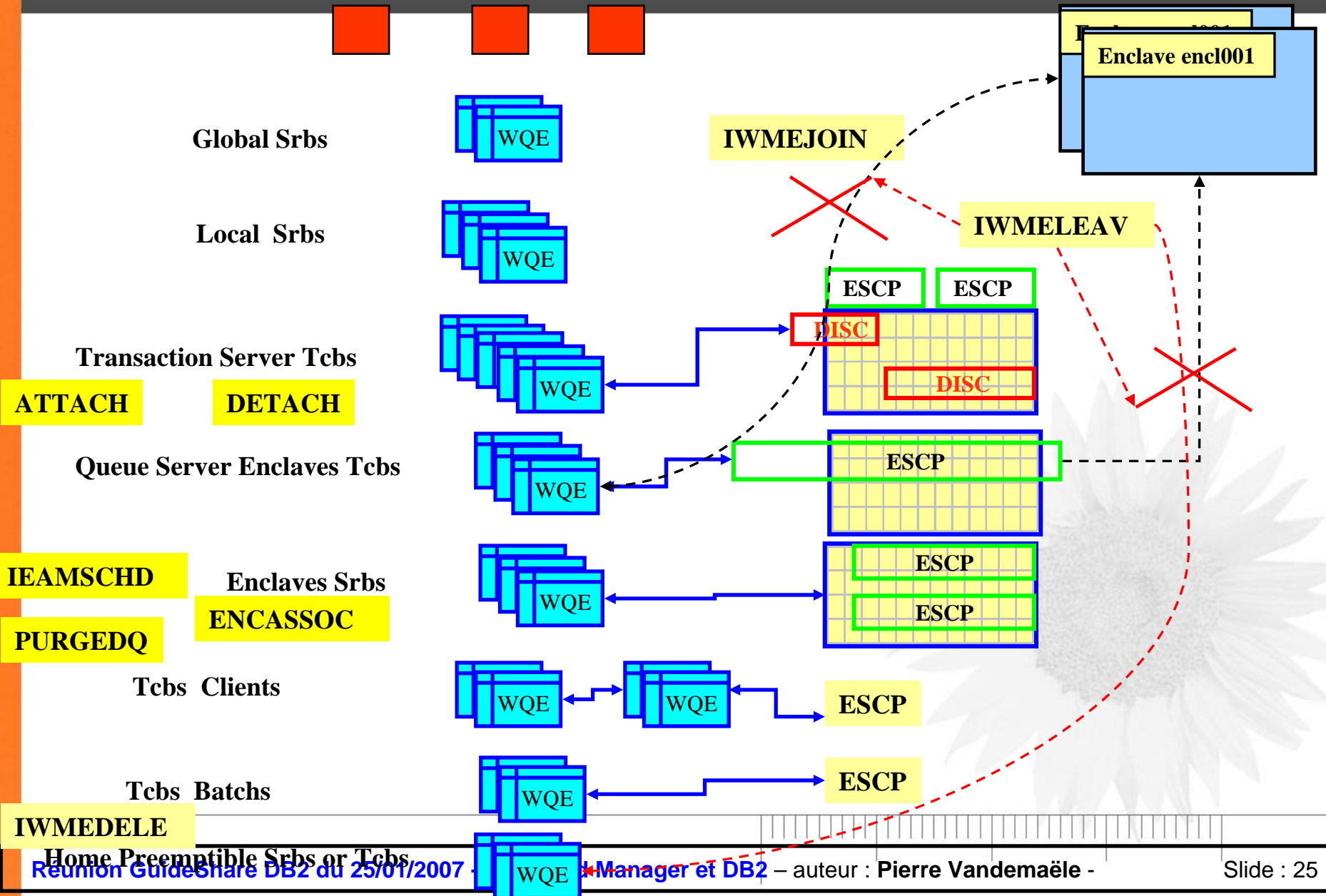
- IWEB
- LSFM
- SAP
- CB
- MQ
- DDF
- NETV

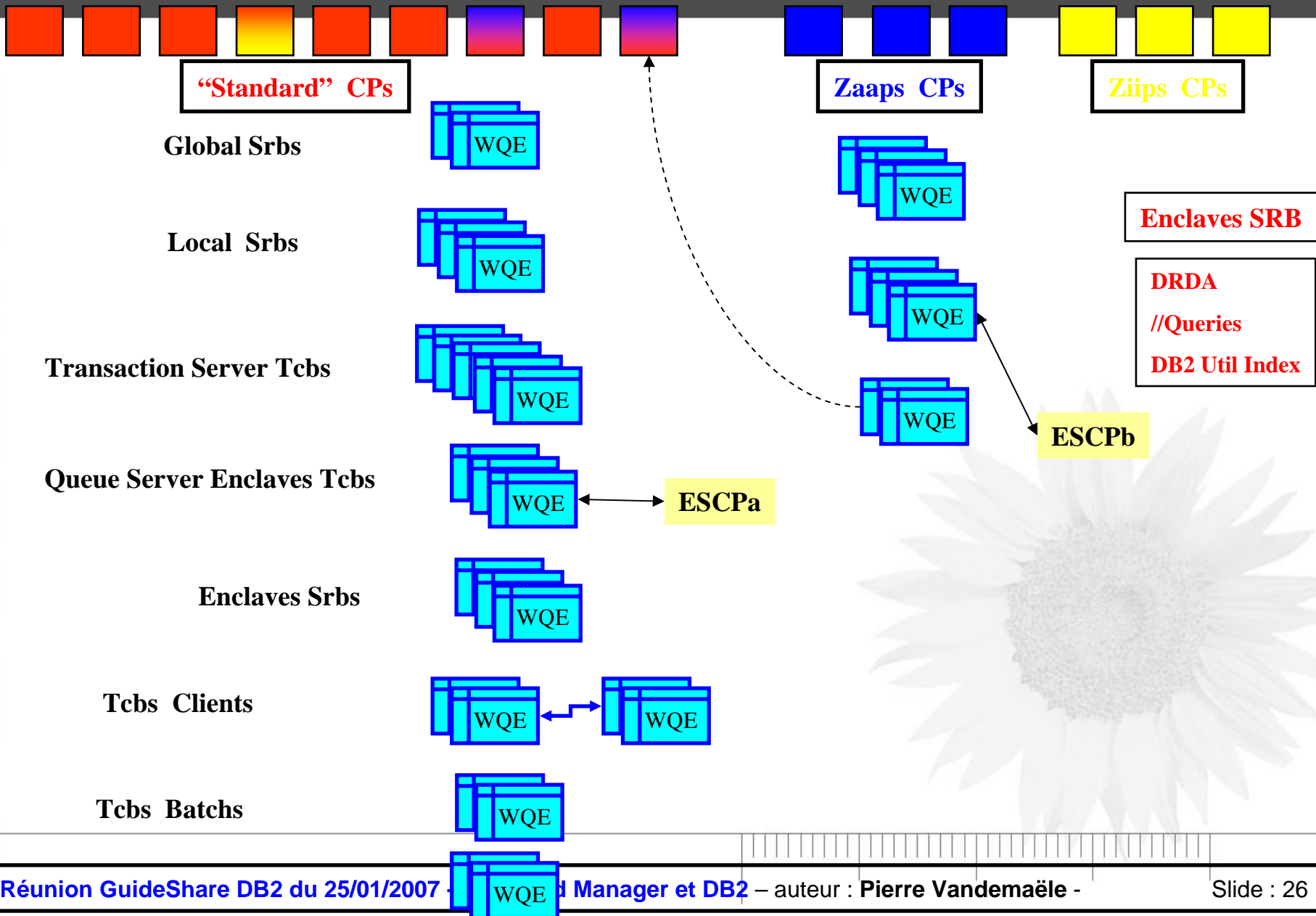
IWMUEXPT

IWMELEAV

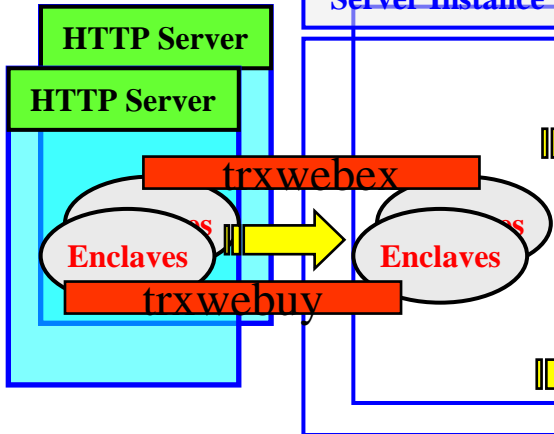
IWMEDELE

IWMUIMPT

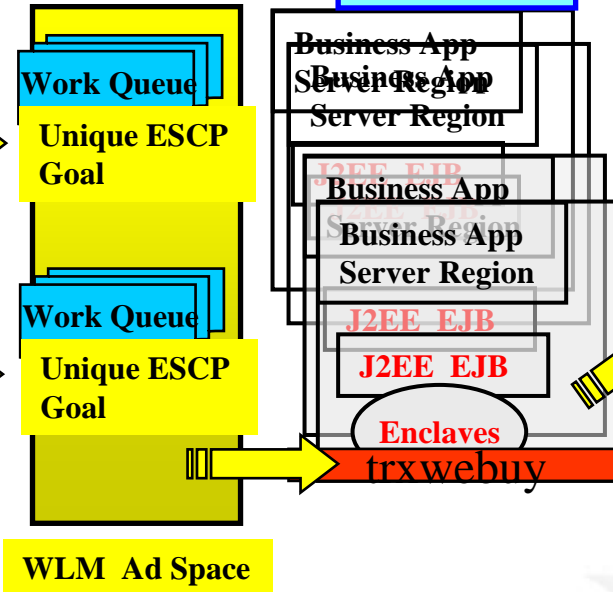




SubsystemType **IWEB**

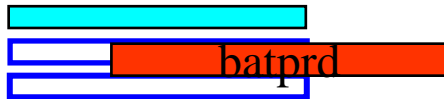


SubsystemType **CB**

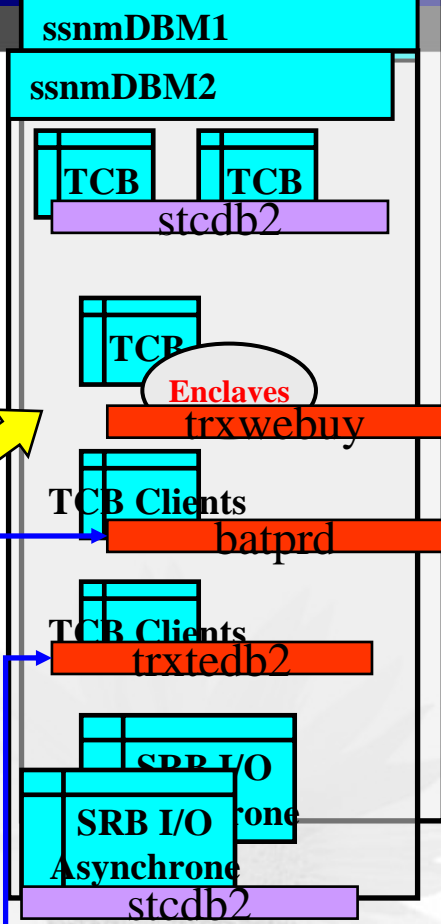
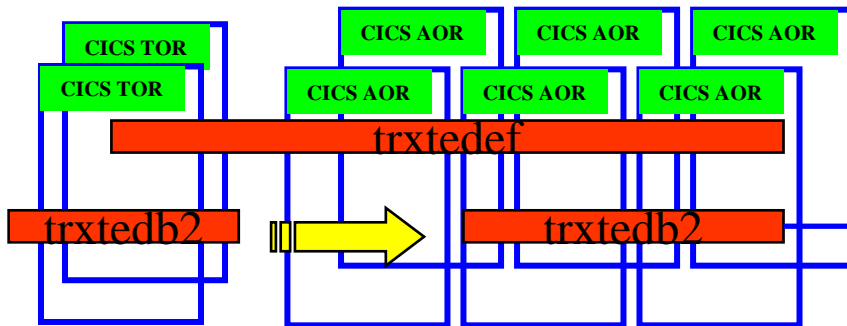


WLM Started

SubsystemType **JES2**

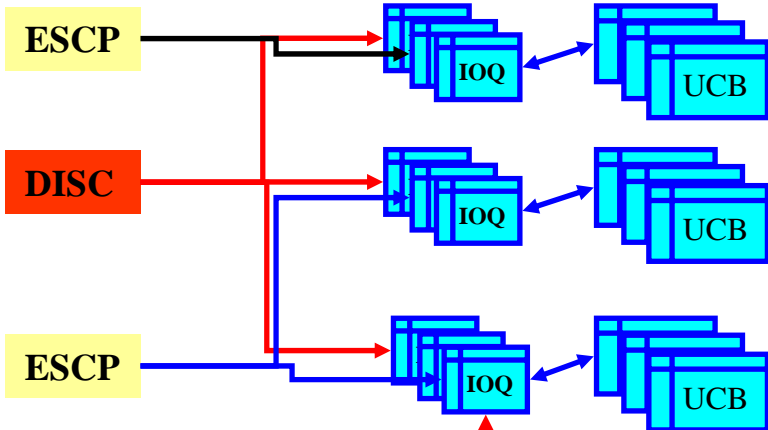


SubsystemType **CICS**



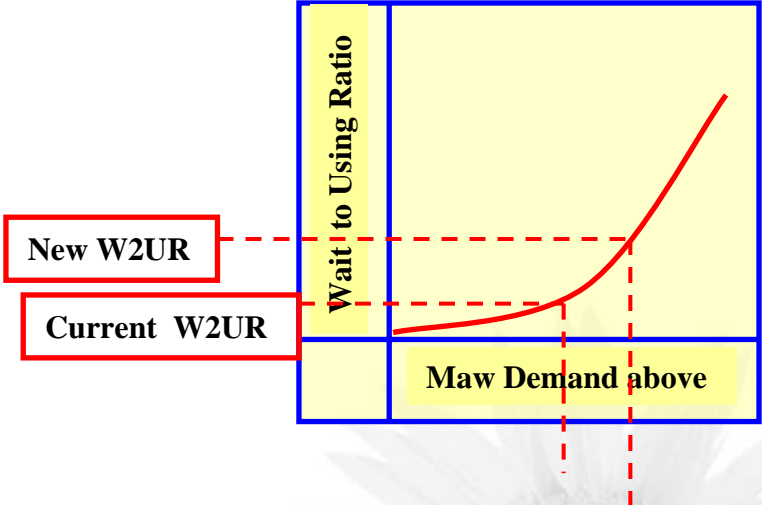
Sysplex I/O Priority BROADCASTING

Device Cluster Control Block



IOPDT

I/O Delay Plot

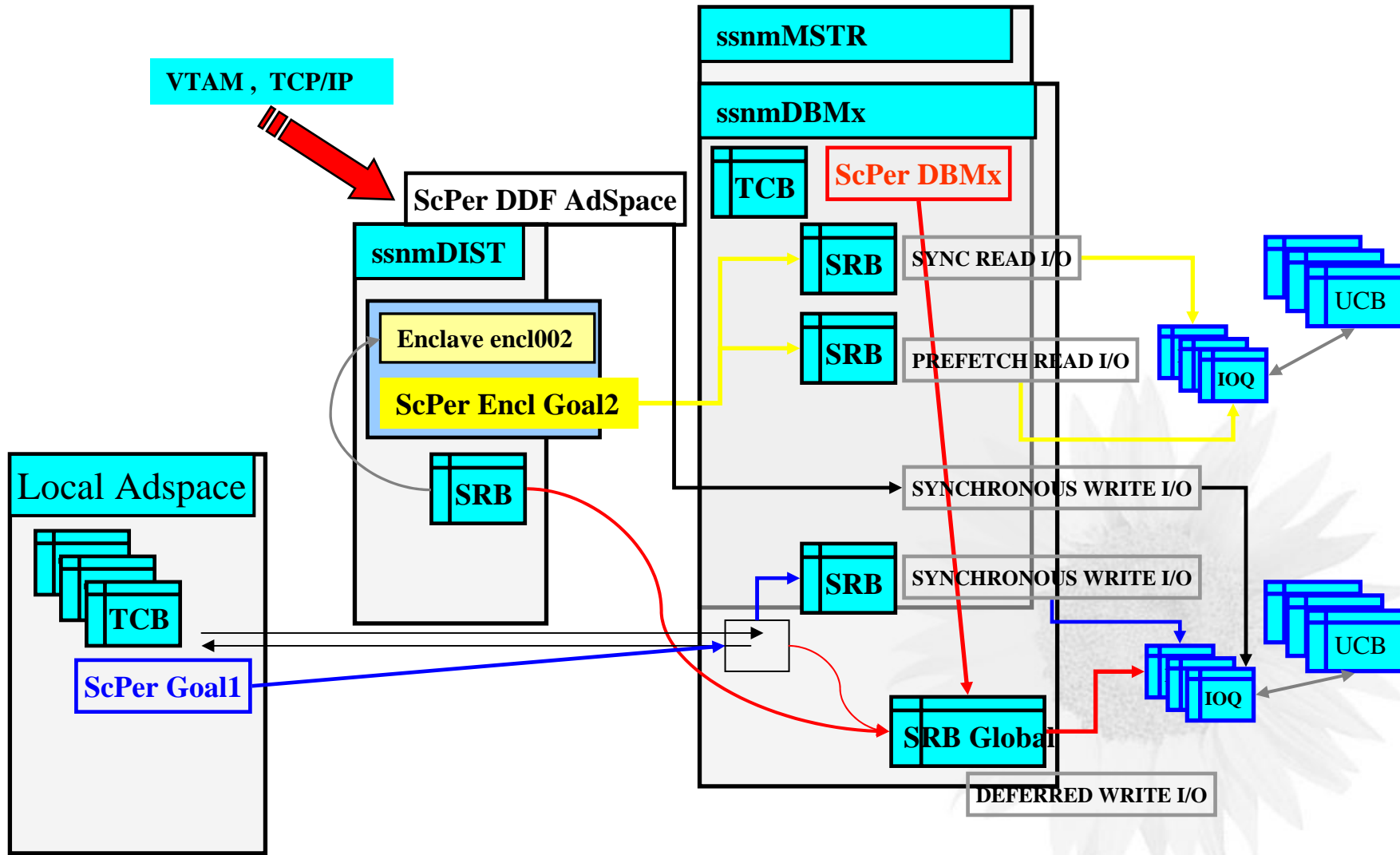


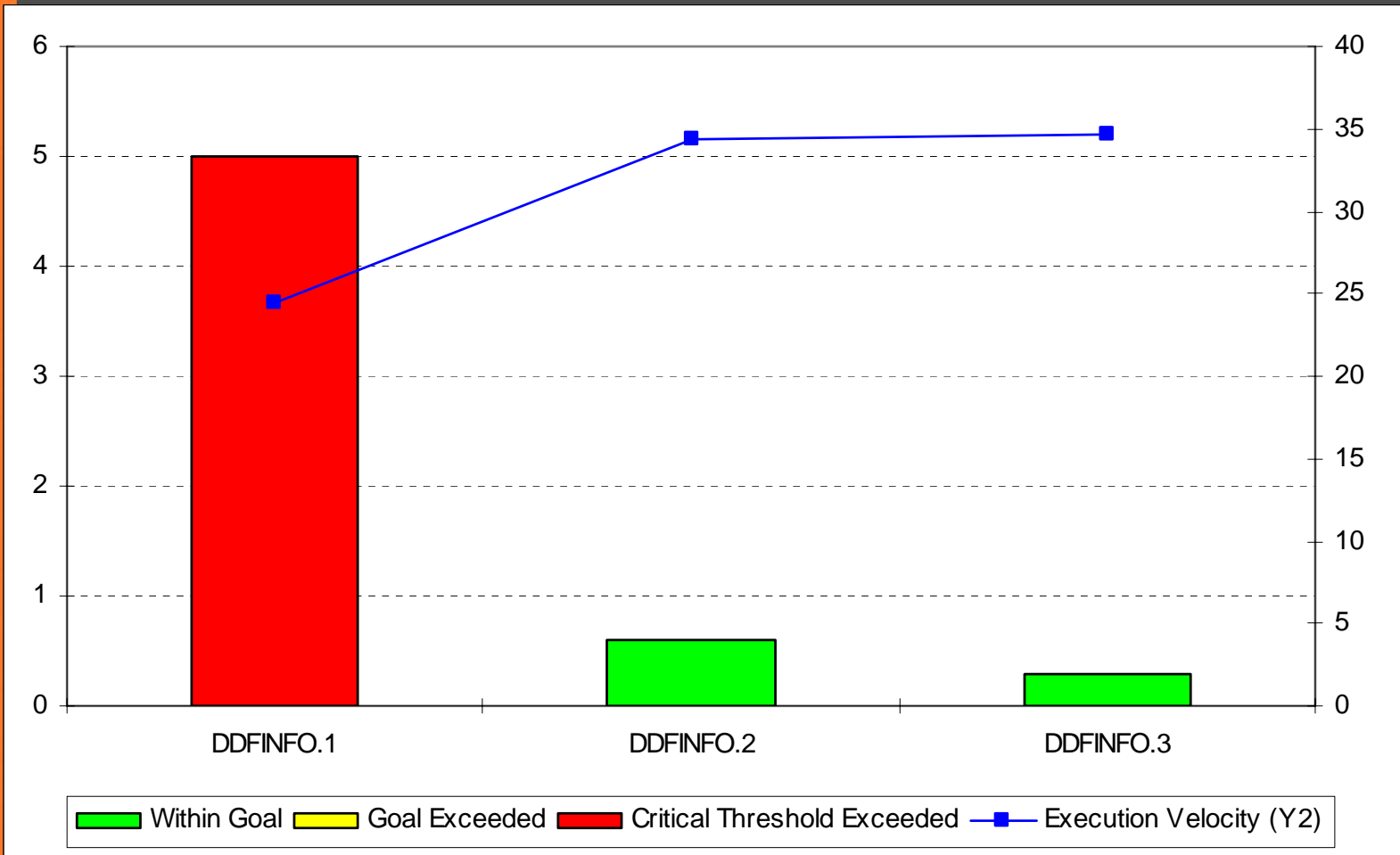
SPTe Sysplex I/O Priority

FF	SYSTEM
FE	SYSSTC
FD	Policy Adjustment Range
F9	
F8	Discretionary

$$\text{New PI} = F \cdot \text{Old PI} \cdot \text{New I/O Delay}$$

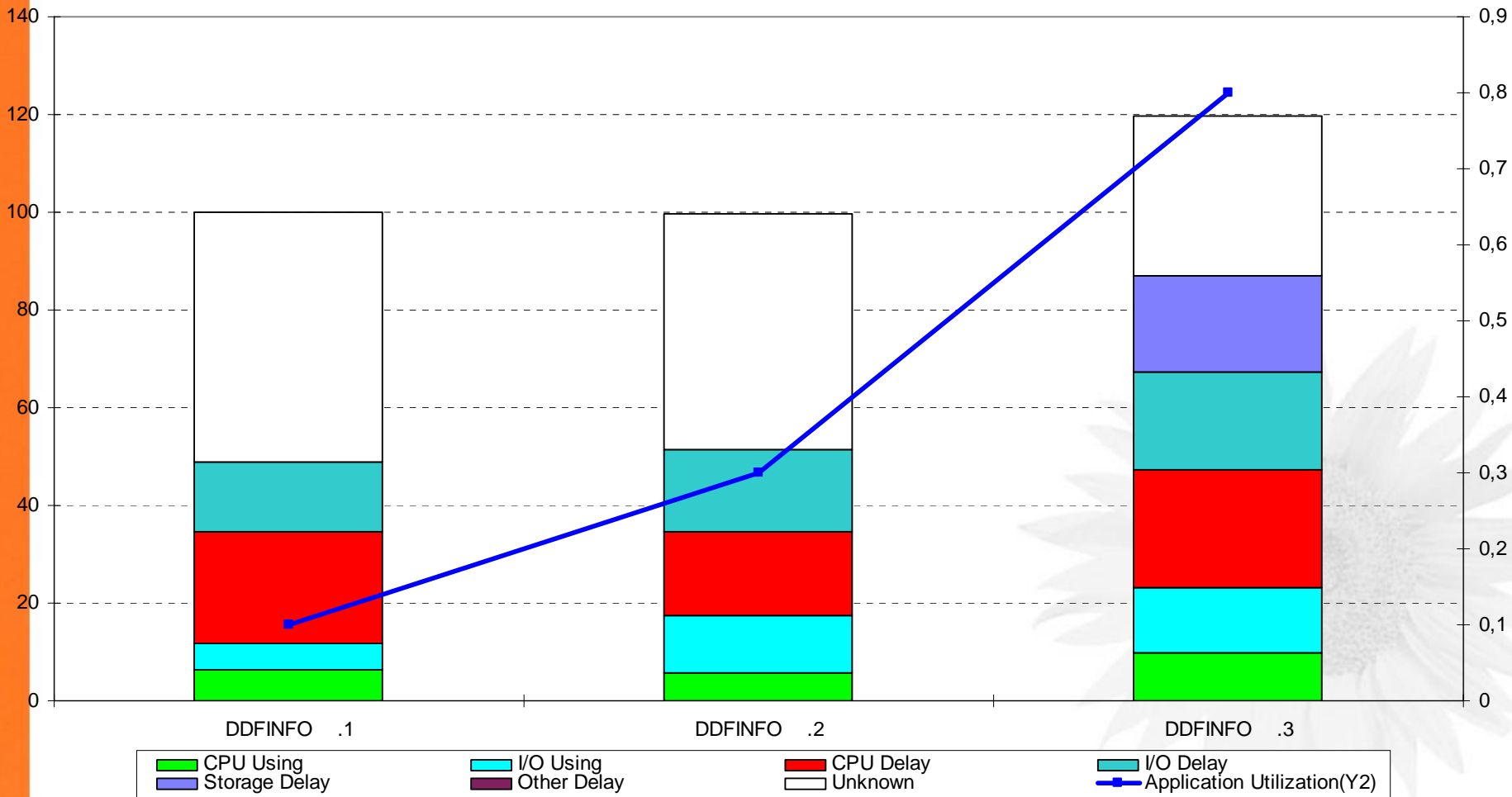
$$\text{New I/O Delay Samples} = \frac{\text{New Wait to Using ratio}}{\text{Current Wait to Using ratio}} * \text{Current I/O Delay Samples}$$



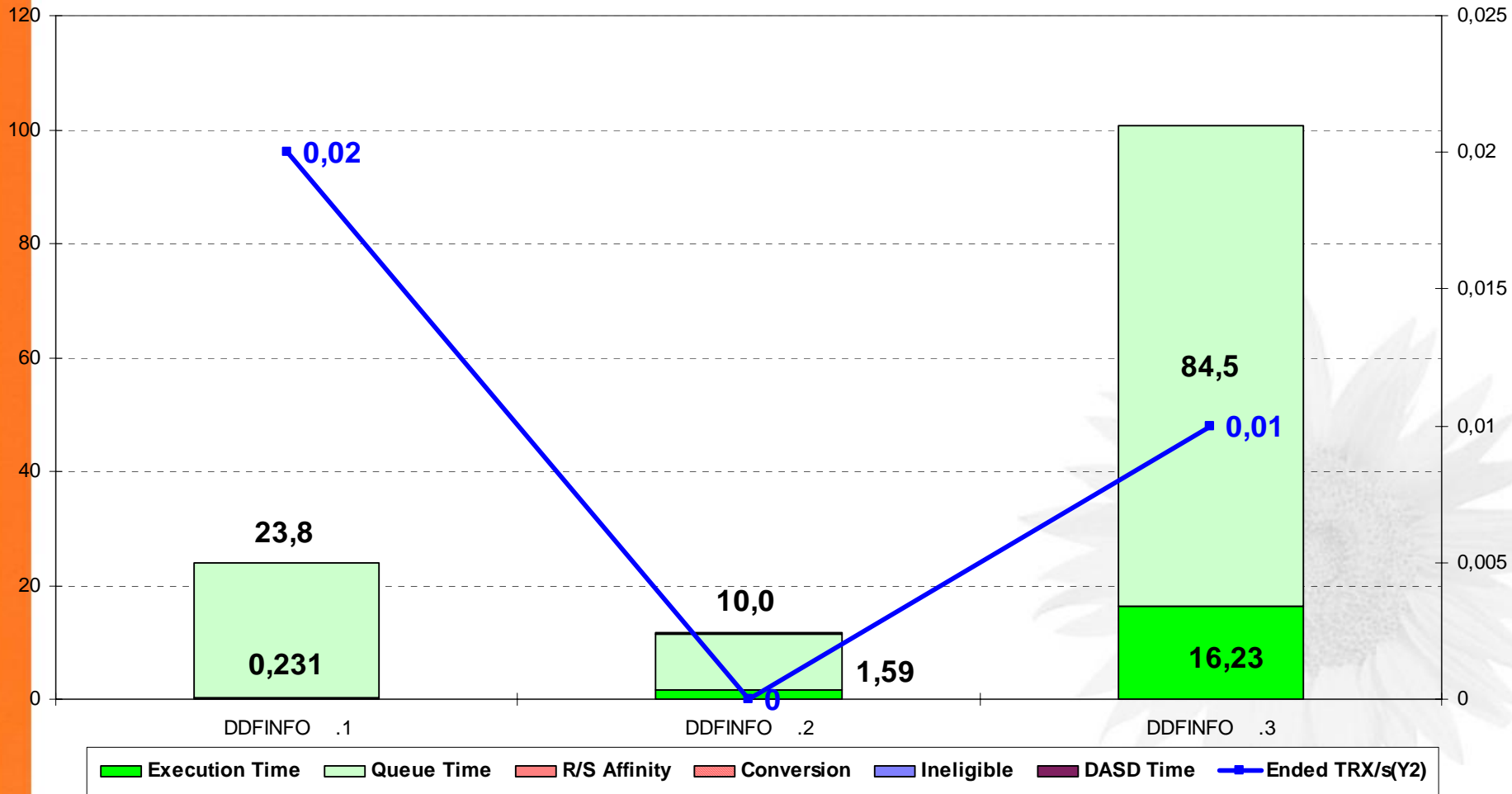


Workload	Service Class		Resource		Goal Definition			Actuals				Perform.		
	Name	Period	Group	Import.	Type	RspTime	[%]	ExVel	Syst.	End Trx	RspTime	[%]	ExVel	Index
DRDA	DDFINFO	1	*NONE	3	Percentile	00.00.00.500	80		PROD1	0,02		51,2	24,4	5
DRDA	DDFINFO	2	*NONE	4	Percentile	00.00.10.000	50		PROD1	0		66,7	34,3	0,6
DRDA	DDFINFO	3	*NONE	4	ExVel			10	PROD1	0,01			34,6	0,3

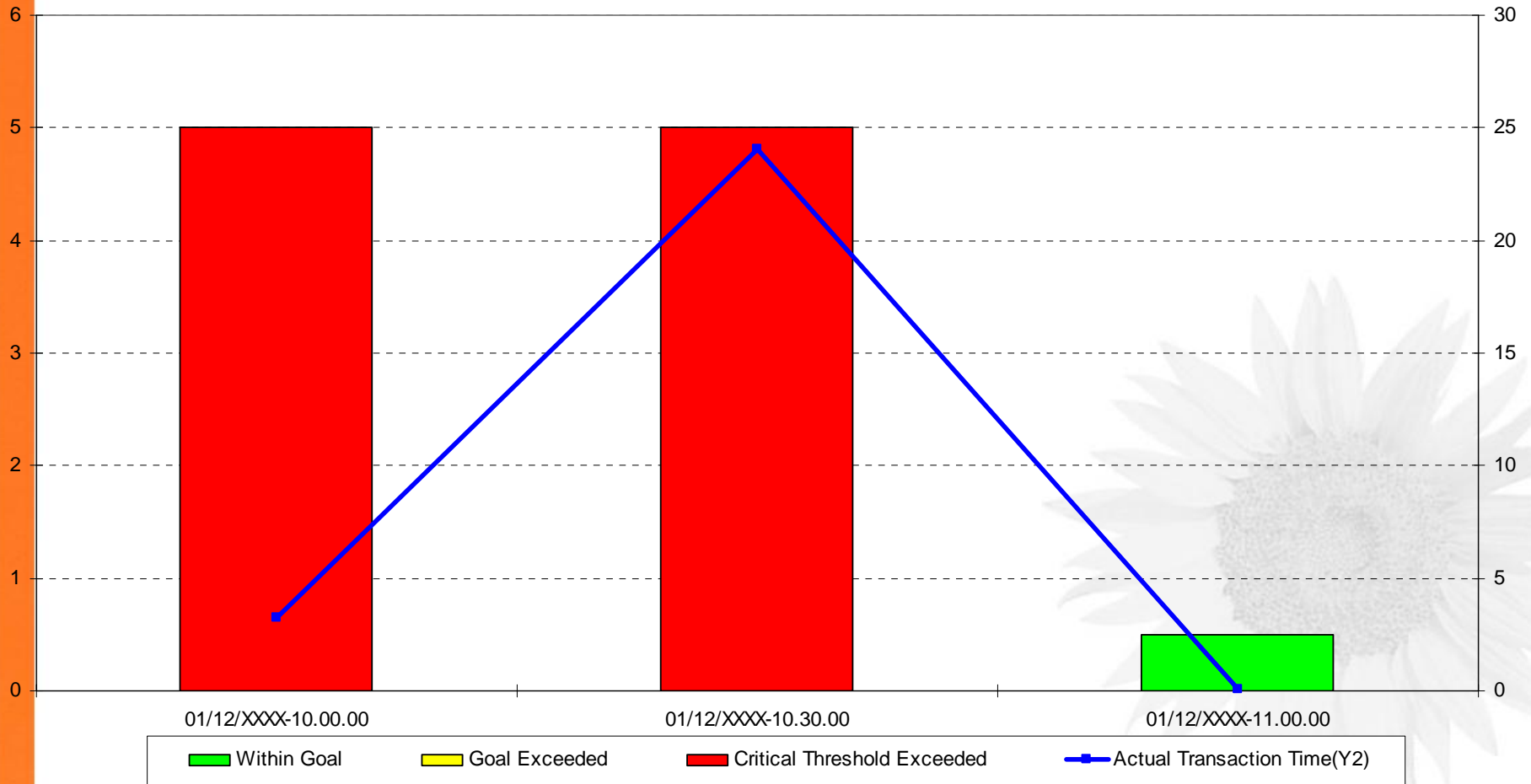
Execution Delays: All Service Classes
Sysplex Id: PLEXPROD Date/Time: 01/12/XXXX-10.30.00



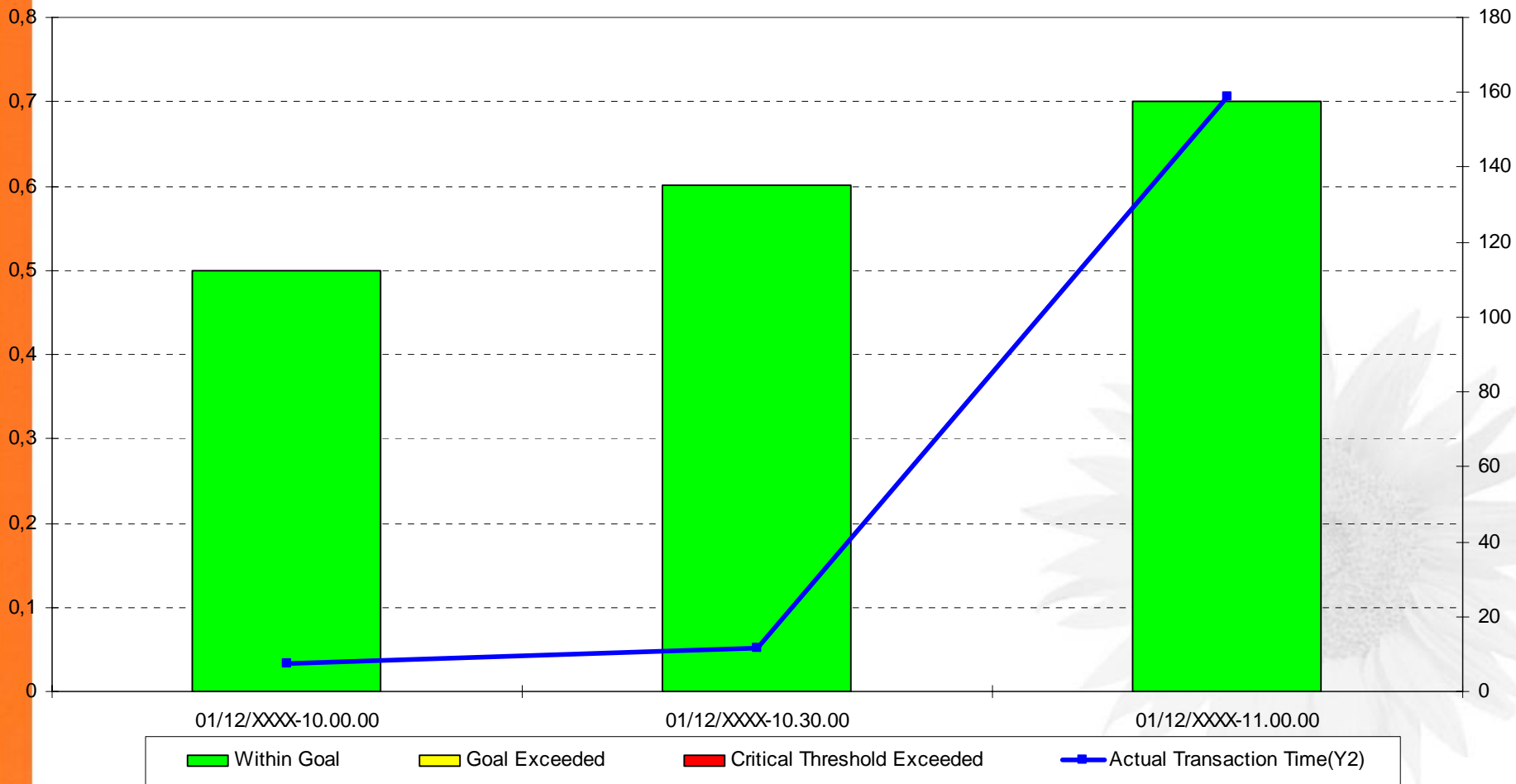
Transaction Time: All Service Classes
Sysplex Id: PLEXPROD Date/Time: 01/12/XXXX-10.30.00



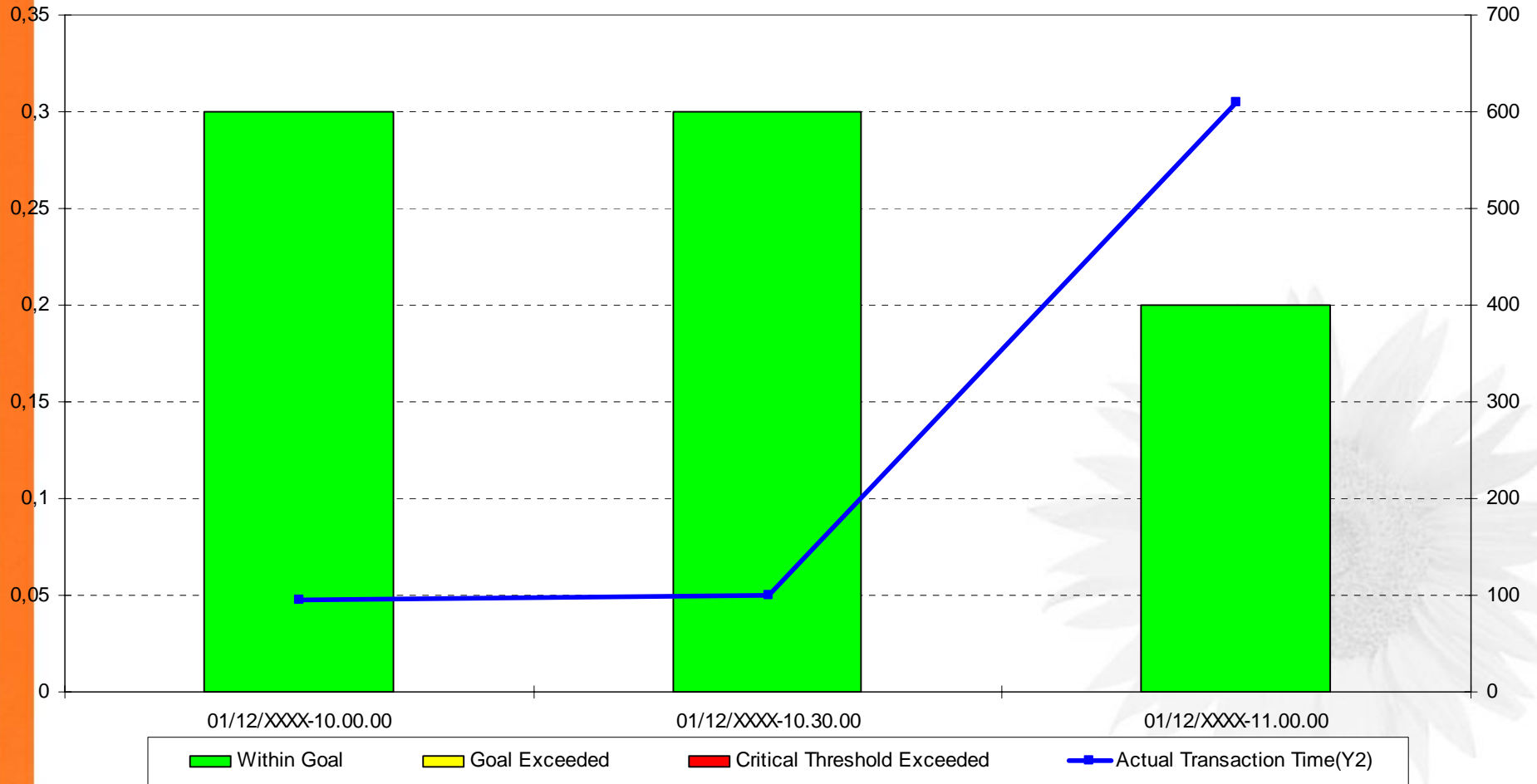
**Goal Attainment for Service Class DDFINFO Period: 1
Importance: 3**



**Goal Attainment for Service Class DDFINFO Period: 2
Importance: 4**



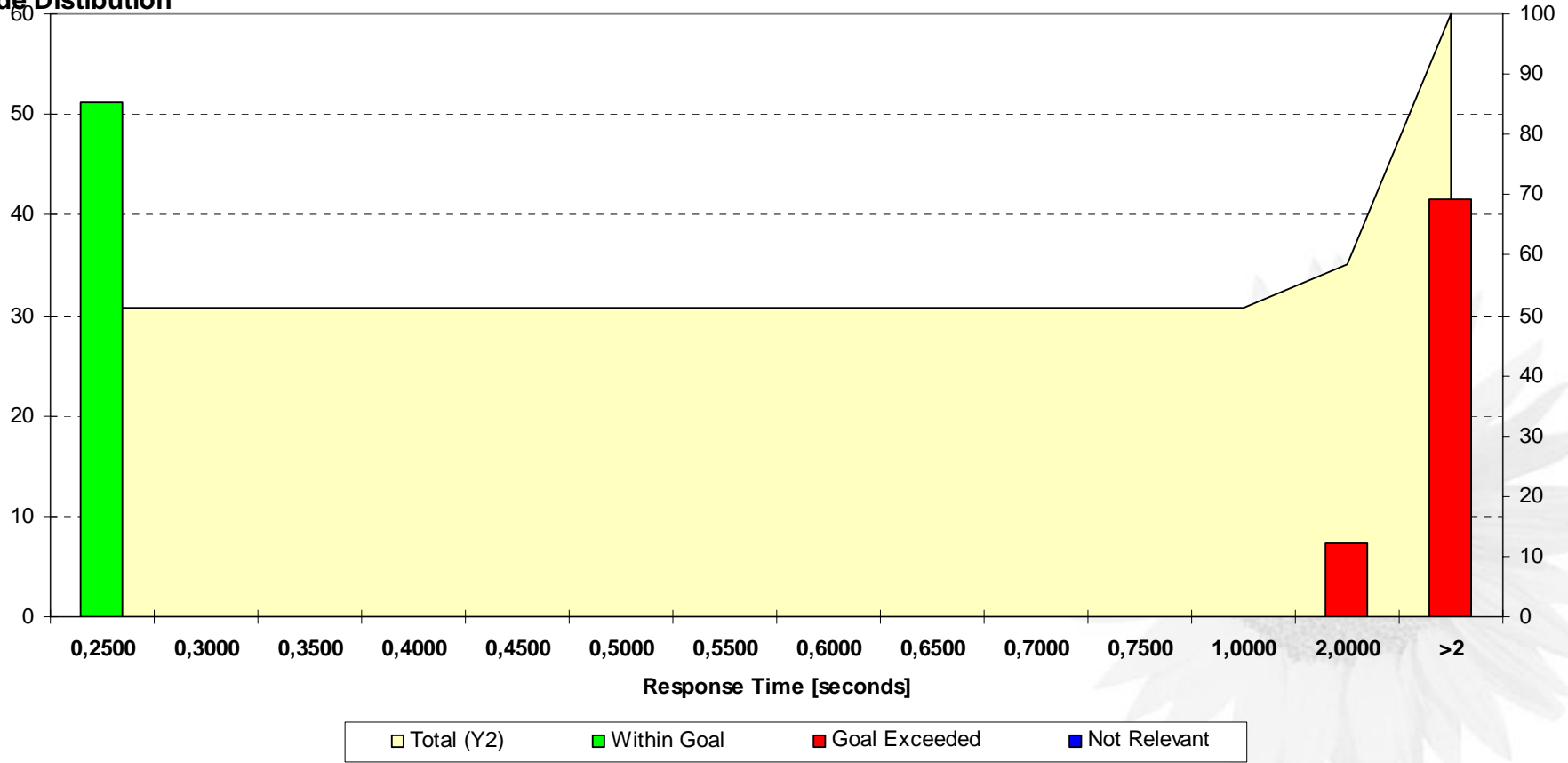
**Goal Attainment for Service Class DDFINFO Period: 3
Importance: 4**



Response Time Distribution
 Service Class: DDFINFO Period: 1
 Goal: 80% in 0,5s Actual: 51,2% achieved
 Date/Time: 01/12/XXXX-10.30.00

Pourcentage de
 Transactions par Classe
 de Distribution

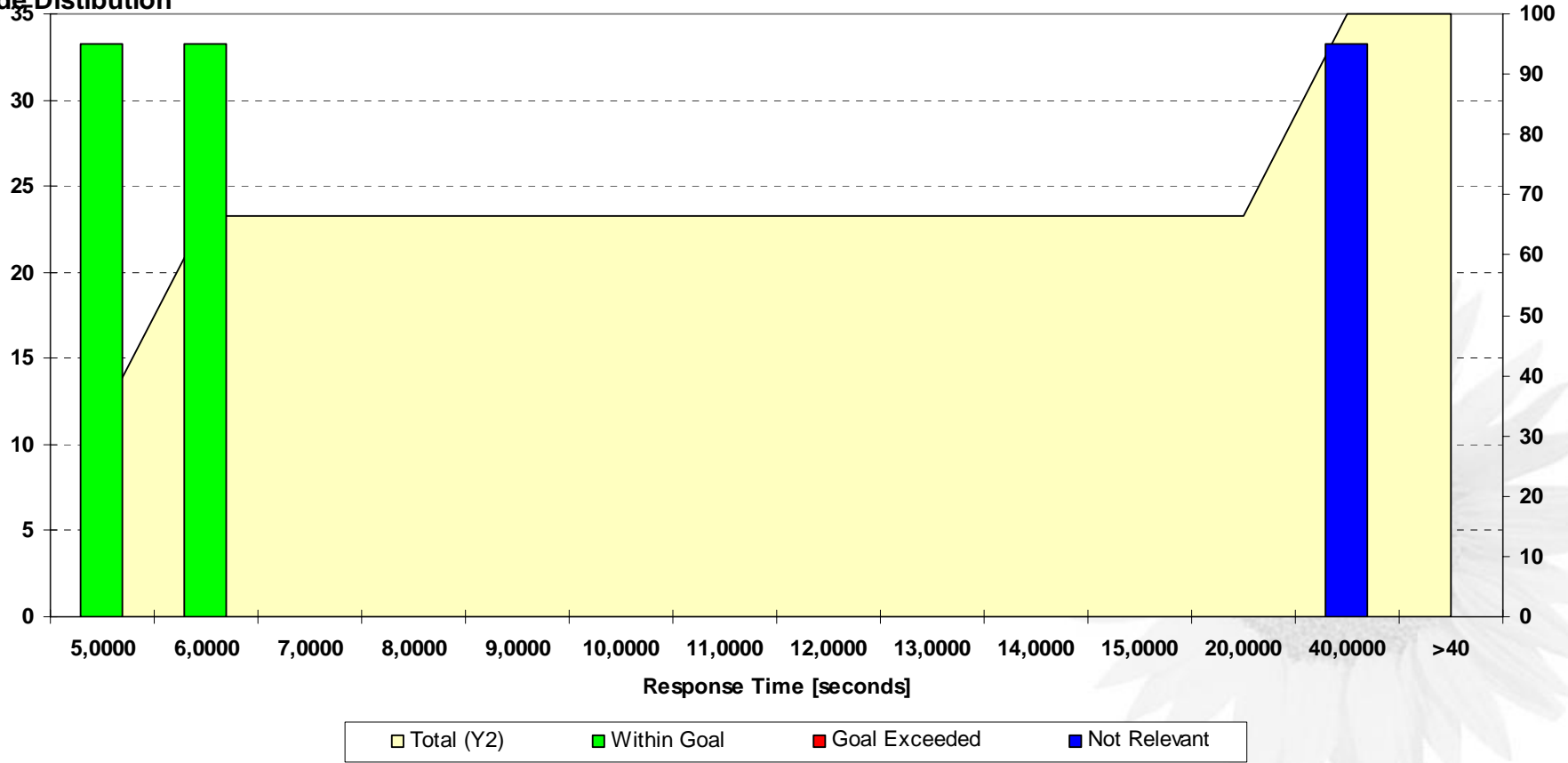
Pourcentage Cumulé de
 Transactions

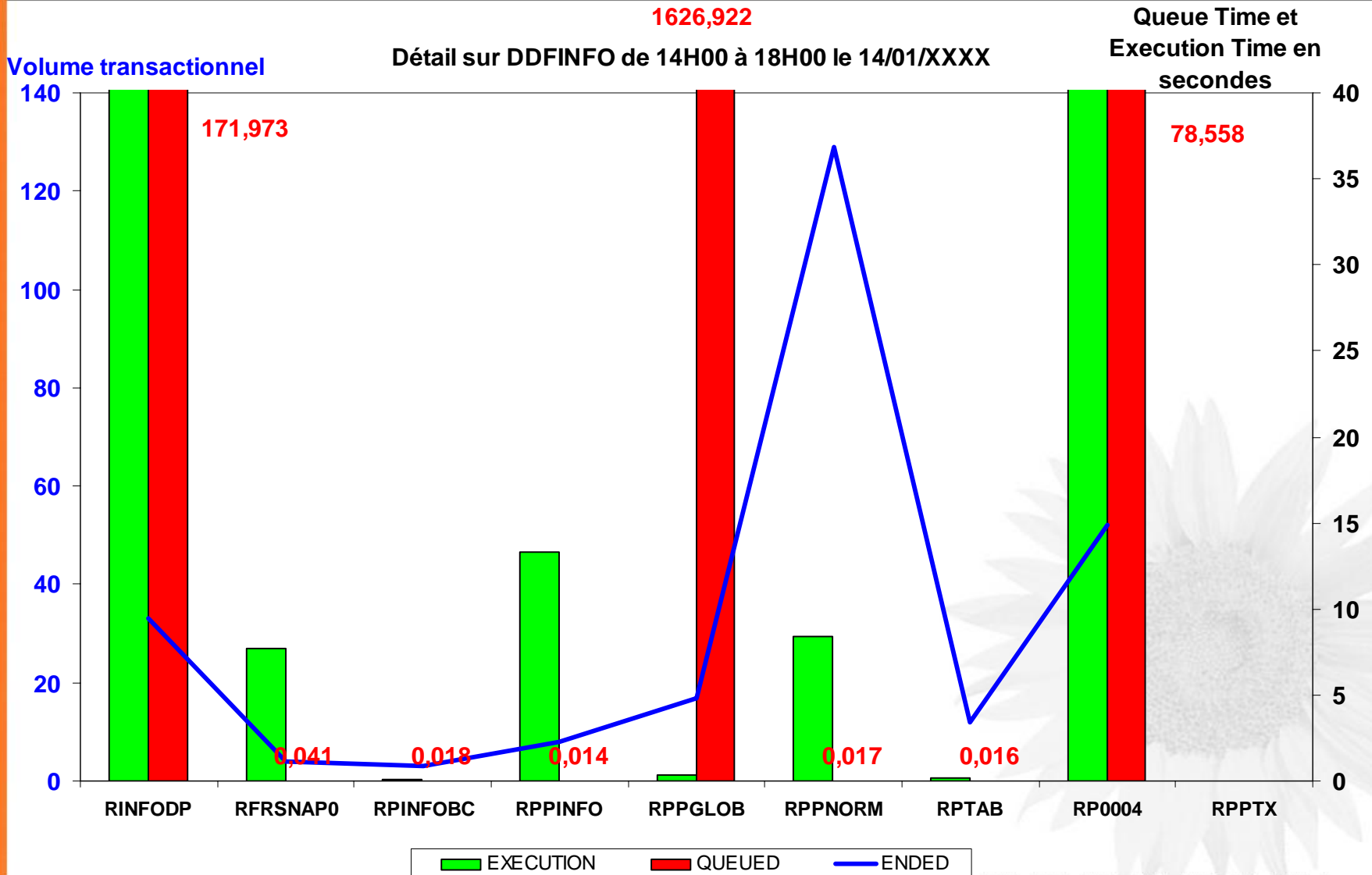


Response Time Distribution
 Service Class: DDFINFO Period: 2
 Goal: 50% in 10s Actual: 66,7% achieved
 Date/Time: 01/12/XXXX-10.30.00

Pourcentage de
 Transactions par Classe
 de Distribution

Pourcentage Cumulé de
 Transactions





Workload DRDA - workload DRDA
Service Class DDFDEFT – défaut

Période	Duration	Imp	Goal description
1	800	3	80% complete within 00:00:00.500
2	5000	4	50% complete within 00:00:10.000
3		4	Execution velocity of 5

Service Class DDFINFO – DB2 Info

Période	Duration	Imp	Goal description
1	800	3	80% complete within 00:00:00.500
2	5000	4	50% complete within 00:00:10.000
3		4	Execution velocity of 10

Service Class DDFPRD - Production

Période	Duration	Imp	Goal description
1	800	2	85% complete within 00:00:00.200
2	5000	3	70% complete within 00:00:02.000
3		3	Execution velocity of 10

Subsystem Type DDF

Default service class is DDFDEFT

Qualifier type	Qualifier name	Starting position	Service Class	Report Class
1 SI	DBPR		DDFPRD	
1 SI	DBPI		DDFINFO	
2. CI	. Baseqry*	1		
3 .. UI	.. PPNORM			RPPNORM
3 .. UI	.. PPINFOBC			RPINFOBC
3 .. UI	.. PPINFO			RPPINFO
3 .. UI	.. PPGLOB			RPPGLOB
3 .. UI	.. DP%%%%%%%%%			RINFODP

- **THREAD = INACTIVE(ddf) ET RELEASE(COMMIT)(package)**
 - DDF crée une Enclave par interval actif
 - Le Temps de Réponse n'inclut pas le User Think Time
 - Multiples périodes et Objectifs type temps de réponse

KEEPDYNAMIC(NO) : durée de l'Enclave = Active Time du THREAD
Sinon : durée de l'Enclave = Toute la transaction (inactive Time inclus)

THREAD ACTIVE ou POOLED : Record RMF 72 pour chaque UOW
Idle Time = Temps entre 2 requêtes
- **THREAD = ACTIVE OU RELEASE(DEALLOCATE)**
 - DDF crée une Enclave pour la vie du THREAD
 - Le Temps de Réponse de l'Enclave inclut le User Think Time
 - Multiples périodes déconseillées
 - Objectifs type temps de réponse déconseillés

Workload DRDA - workload DRDA
Service Class DDFDEFT – défaut

Période	Duration	Imp	Goal description
1		4	Execution velocity of 5

Service Class DDFINFO – DB2 Info

Période	Duration	Imp	Goal description
1	800	3	80% complete within 00:00:00.500
2	5000	4	50% complete within 00:00:10.000
3		4	Execution velocity of 10

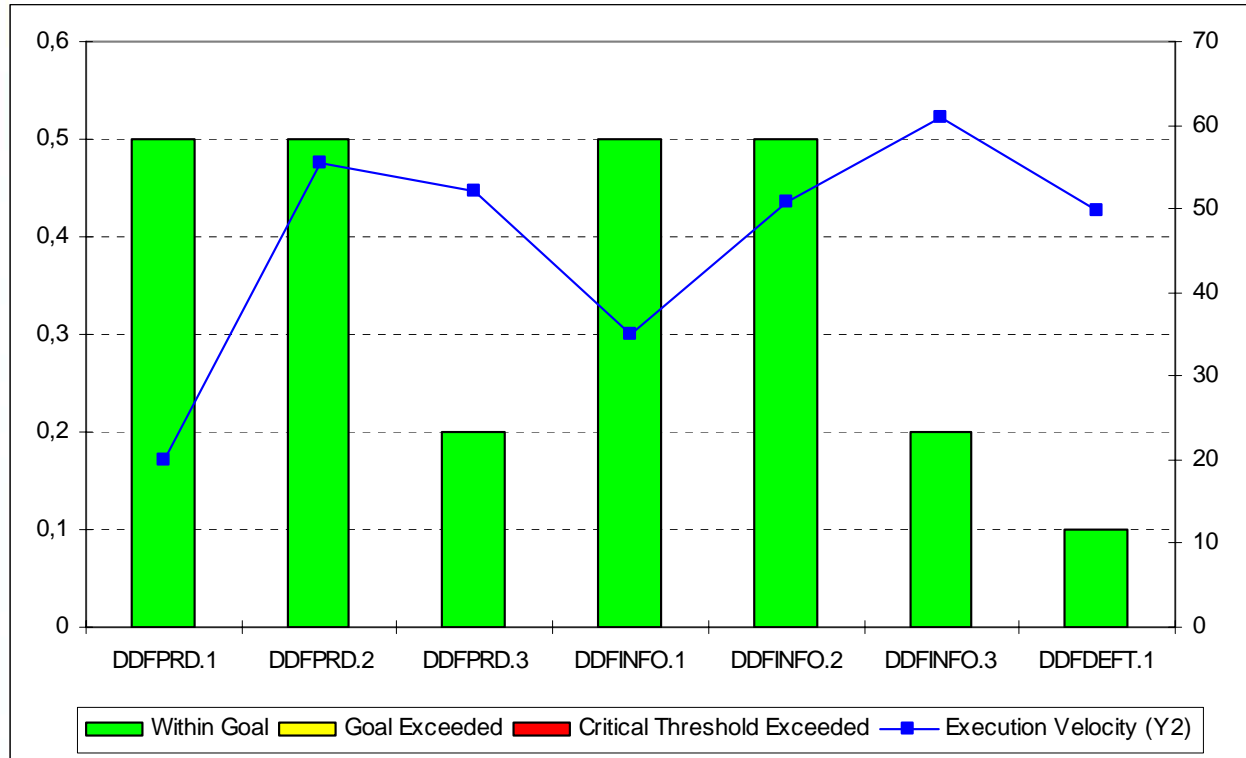
Service Class DDFPRD - Production

Période	Duration	Imp	Goal description
1	800	2	85% complete within 00:00:00.200
2	5000	3	70% complete within 00:00:02.000
3		3	Execution velocity of 10

Subsystem Type DDF
Default service class is DDFDEFT

Qualifier type	Qualifier name	Starting position	Service Class	Report Class
1 SI	DBPR		DDFPRD	
1 SI	DBPI		DDFINFO	
2. UI	.00%%%%%%%%%		DDFDEFT	
2 . UI	. PPNORM			RPPNORM
2 . UI	. PPINFOBC			RPINFOBC
2 . UI	. PPINFO			RPPINFO
2 . UI	. PPGLOB		DDFDEFT	RPPGLOB
2 . UI	. DP%%%%%%%%%		DDFDEFT	RINFODP
2 . UI	. PPTAB			RPTAB
2 . UI	. PPTX			RPTX

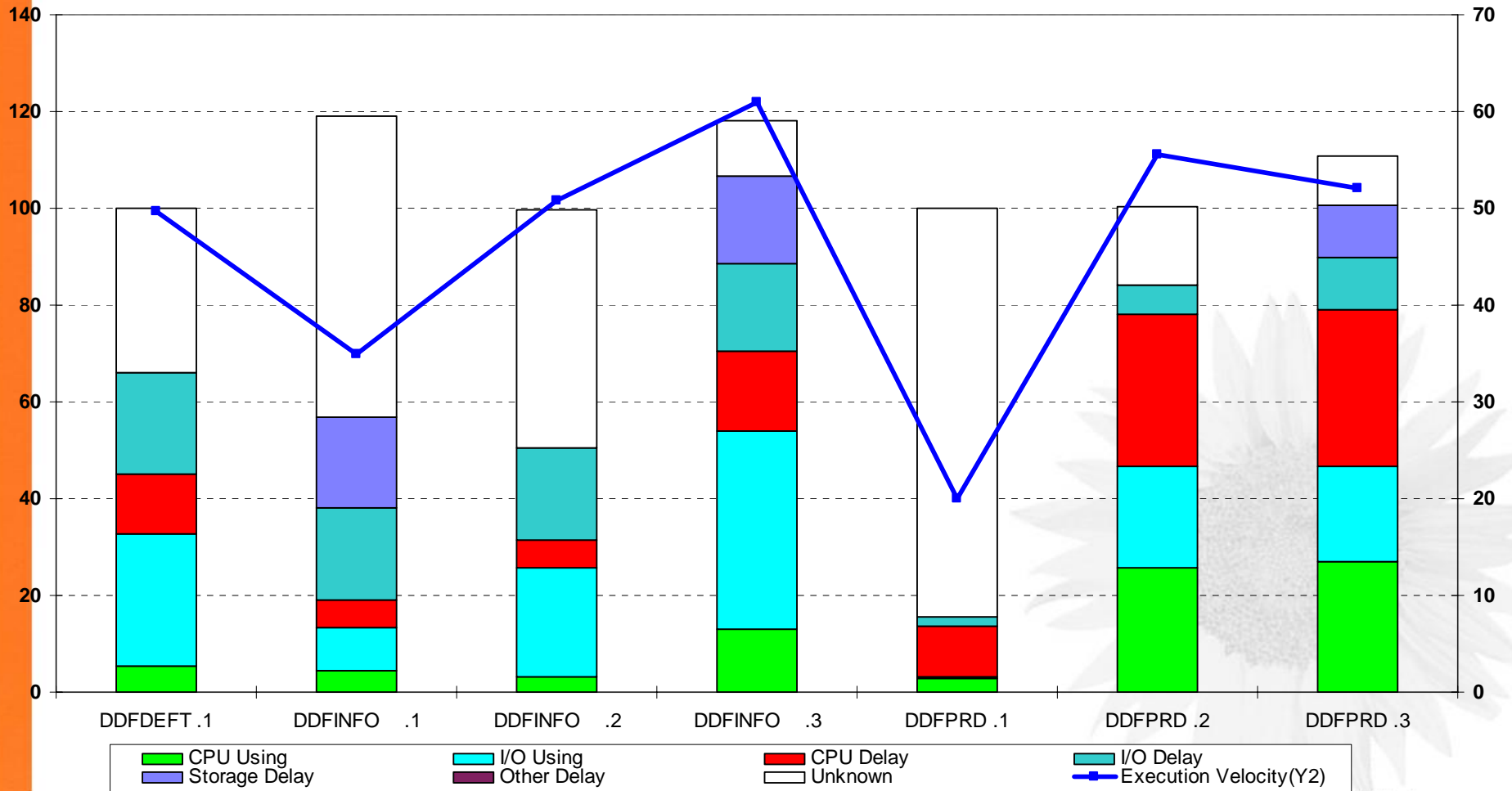
DRDA – Bilan après Ajustement de la Policy WLM - 1



Workload	Service Class		Resource		Goal Definition			Actuals				Perform.		
	Name	Period	Group	Import.	Type	RspTime	[%]	ExVel	Syst.	End Trx	RspTime	[%]	ExVel	Index
DRDA	DDFPRD	1	*NONE	2	Percentile	00.00.00.200	85		IPO1	3,24		96,4	20	0,5
DRDA	DDFPRD	2	*NONE	3	Percentile	00.00.02.000	70		IPO1	0,02		98,1	55,5	0,5
DRDA	DDFPRD	3	*NONE	3	ExVel			10	IPO1	0,01			52,1	0,2
DRDA	DDFINFO	1	*NONE	3	Percentile	00.00.00.500	80		IPO1	0,02		98,6	35	0,5
DRDA	DDFINFO	2	*NONE	4	Percentile	00.00.10.000	50		IPO1	0		93,8	50,8	0,5
DRDA	DDFINFO	3	*NONE	4	ExVel			10	IPO1	0			61	0,2
DRDA	DDFDEFT	1	*NONE	4	ExVel			5	IPO1	0,15			49,7	0,1

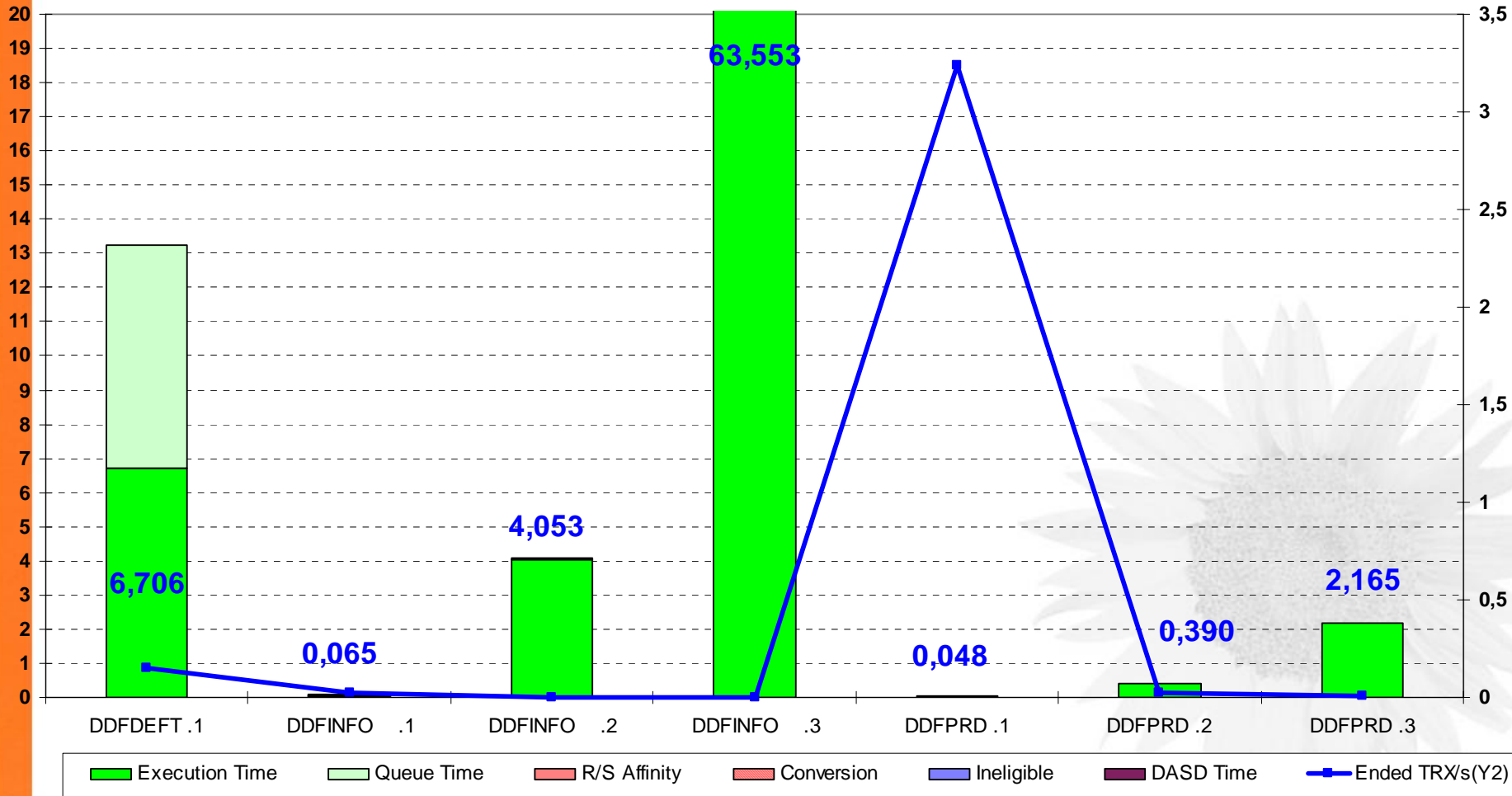
DRDA – Bilan après Ajustement de la Policy WLM - 2

Execution Delays: Service Classes of Workload: DRDA
Sysplex Id: PLEXPROD Date/Time: 01/29/XXXX-10.00.00



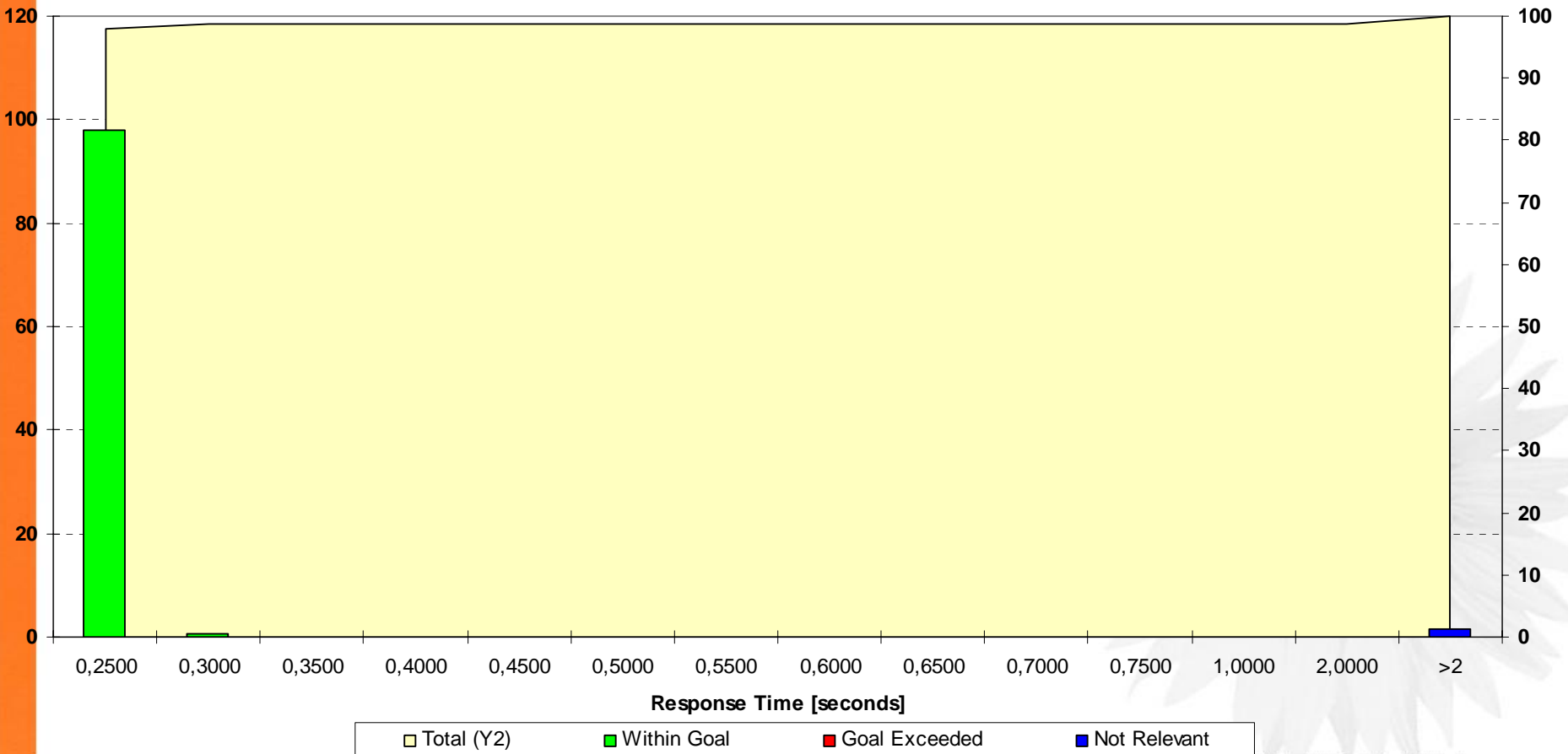
DRDA – Bilan après Ajustement de la Policy WLM – 3

Transaction Time: Service Classes of Workload: DRDA
Sysplex Id: PLEXPROD Date/Time: 01/29/XXXX-10.00.00



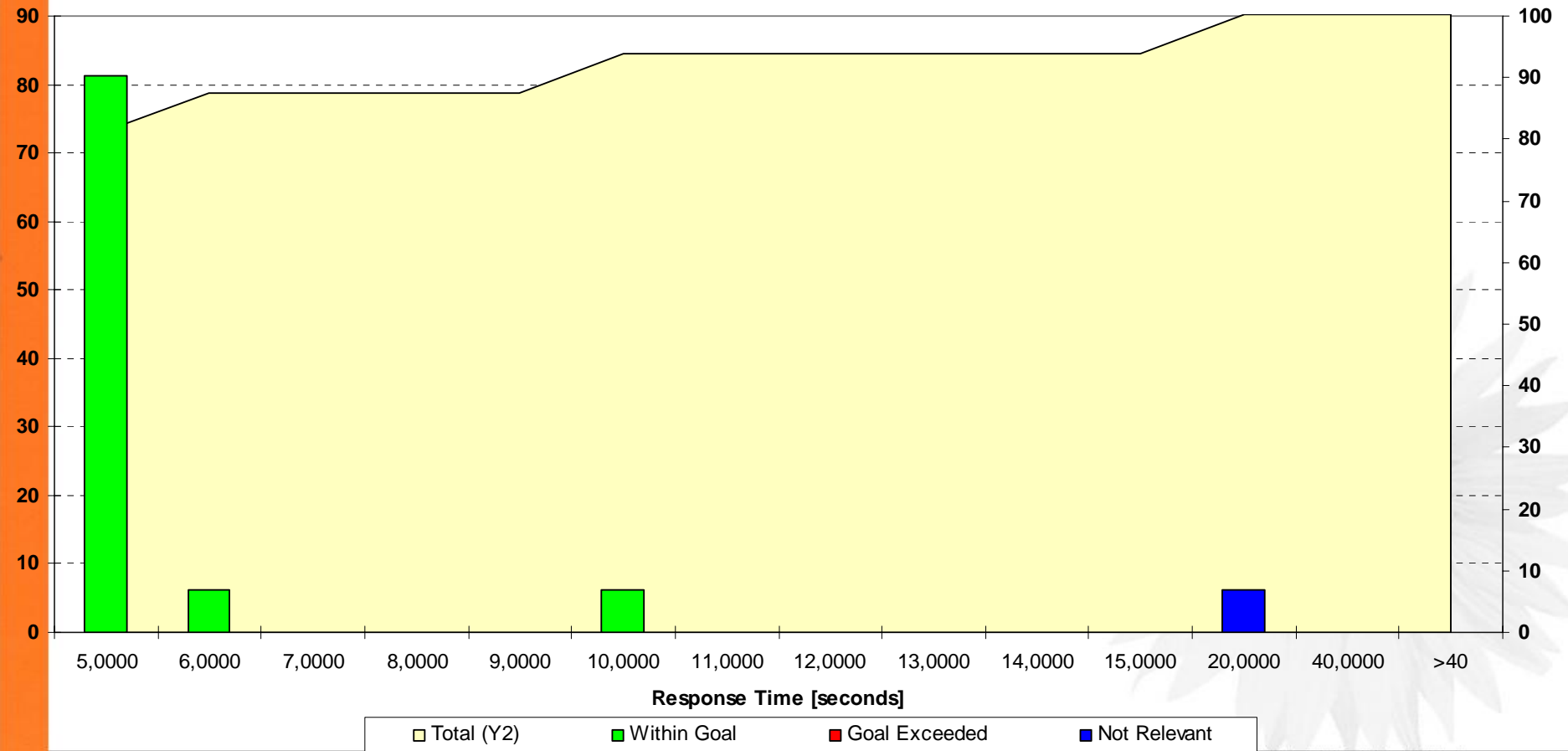
DRDA – Bilan après Ajustement de la Policy WLM - 4

Response Time Distribution
 Service Class: DDFINFO Period: 1
 Goal: 80% in 0,5s Actual: 98,6% achieved
 Date/Time: 01/29/2004-10.00.00



DRDA – Bilan après Ajustement de la Policy WLM - 5

Response Time Distribution
 Service Class: DDFINFO Period: 2
 Goal: 50% in 10s Actual: 93,8% achieved
 Date/Time: 01/29/2004-10.00.00



IEAOPTxx

IFACROSSOVER = Yes

Zaaps et Standard CP autorisés pour les Appli Java

IFACROSSOVER = No

Zaaps seulement

IFAHONORPRIORITY = Yes

Gestion des Dps par objectifs pour Java aussi sur les CP

IFAHONORPRIORITY = No

Appli Java toujours avec Dps inférieures aux autres sur les standard CP

PROJECTCPU= Yes

Informations sur candidats aux Zaaps-Ziips

CCCAWMT =

Recommandé si IFAHONORPRIORITY = yes

ZAAPAWMT =

ZIIPAWMT =

Processeurs Zaaps non gérés par IRD

Processeurs Ziips non gérés par IRD

Paramètres associés à WLM en z/OS

IEAOPTxx

MCCAFCTH

Page Replacement Routine changée en z/OS 1.8
Calcul de l'UIC changé en z/OS 1.8

VARYCPU = YES/NO

Swaps Physiques remplacé par des Frames Exchange

VARYCPUMIN =

MCCFXEPR

VARYCPUMAX =

MCCFXTPR

RMPTTOM

RCCFXET

RCCFXTT



$$RG_{[SU8]} = \begin{cases} \text{Softcap}_{[SU8]} \bullet RG_{Limit(\%)} & \text{if softcap} < \text{ShareCapacity or LCPCCapacity} \\ \text{LCPCCapacity}_{[SU8]} \bullet RG_{Limit(\%)} & \text{if LCPCCapacity} < \text{ShareCapacity or softcap} \\ \text{ShareCapacity}_{[SU8]} \bullet RG_{Limit(\%)} & \text{if ShareCapacity} < \text{LCPCCapacity or softcap} \end{cases}$$

$$\text{ShareCapacity}_{[SU8]} = \text{CECCapacity}_{[SU8]} \bullet \text{LPARShare}$$

CECCapacity_[SU8] = Capacity based on shared physical processors for the CEC

$$\text{LPARShare} = \frac{\text{Weight}(\text{Current Partition})}{\sum_i \text{Weight}(i)}$$

LCPCapacity_[SU8] = Capacity based on shared processors available to the LPAR

Figure 15. Working With A Resource Type 2 - Sample Calculation

Percentage of CPU time used by transactions running on standard CPs in the service or report class period.

The calculation is:

$$\text{APPL\% CP} = \frac{\text{CPU} + \text{SRB} + \text{RCT} + \text{IIT} + \text{HST} - \text{AAP} - \text{IIP}}{\text{Interval length}} * 100$$

Notes:

1. The interval length in a sysplex is the common interval length.
2. The AAP and IIP times may be normalized from a faster zAAP or zIIP.

AAPCP

Percentage of CPU time used by zAAP eligible transactions running on standard CPs. This is a subset of APPL% CP.

IIPCP

Percentage of CPU time used by zIIP eligible transactions running on standard CPs. This is a subset of APPL% CP.

AAP

Percentage of CPU time used by transactions executed on zAAPs in the service or report class period.

IIP

Percentage of CPU time used by transactions executed on zIIPs in the service or report class period.

Notes:

1. APPL% shows CPU utilization based on uniprocessor capacity. This means that the values can exceed 100% in systems with more than one processor.
2. In a sysplex, the values for seconds and CPU time percentage are meaningful only if all processors have the same speed.
3. AAPCP or IIPCP may report values greater than zero even if no special purpose processors are configured or if they are varied offline, because the PROJECTCPU option is specified in the active IEAOPT parmlib member. This information can be used to understand the benefit of adding special purpose processors to your system.



CPU	Task and preemptible-class SRB (enclave) time in seconds consumed on standard CPs and special purpose processors.
SRB	Service request block time in seconds.
RCT	Region control task time in seconds.
IIT	I/O interrupt time in seconds.
HST	Hiperspace service time in seconds.
AAP	zAAP service time in seconds.
IIP	zIIP service time in seconds.

The following using samples are measured as percentages of the total samples:

CPU Standard CP using samples. If zAAP-eligible work is dispatched in priority order (IEAOPTxx member specifies IFAHONORPRIORITY=YES), this value includes using samples of zAAP work executing on standard CPs. In addition, this value includes using samples of zIIP work executing on standard CPs.

AAP zAAP using samples. If zAAP-eligible work is not dispatched in priority order (IEAOPTxx member specifies IFAHONORPRIORITY=NO), this value includes using samples of zAAP work executing on standard CPs.

IIP zIIP using samples.

I/O I/O using samples.

Notes:

1. Use the APCUSGP (AAP on CP Using%) overview condition to format the using samples of zAAP work executing on standard CPs.
2. Use the IPCUSGP (IIP on CP Using%) overview condition to format the using samples of zIIP work executing on standard CPs.

TOT	Total delay used by SRM in its execution velocity calculation.
CPU	CPU delay. A TCB or SRB is waiting to be dispatched (other than the first in-line behind sampler), or a TCB is waiting for a local lock.
AAP	zAAP-eligible work is delayed because it is waiting for a processor that can run zAAP work.
IIP	zIIP-eligible work is delayed because it is waiting for a processor that can run zIIP work.
I/O	I/O delay. A TCB or SRB has initiated an I/O request that is delayed obtaining a path to the device. This includes IOSQ and Q+PEND components (see 494 for a description). Note: It depends on the definition in WLM whether this value is part of the TOTAL value or not, by default it is not contained in TOTAL.
CAPP	CPU capping delay. A TCB or SRB is marked non-dispatchable because <ul style="list-style-type: none"> • a resource group maximum is being enforced • or because of discretionary goal management. That is, if certain types of work are overachieving their goals, that work may be capped so that the resources may be diverted to run discretionary work (see also section 'Using Discretionary Goals' in <i>z/OS MVS Planning: Workload Management</i>). <p>This value is NOT part of the CPU delay.</p>
SWIN	Swap-In delay. Swap-In has started but not completed.
MPL	MPL delay. Ready but swap-in has not started.
QMPL	Queue MPL - work is waiting for a server address space or batch initiator.

