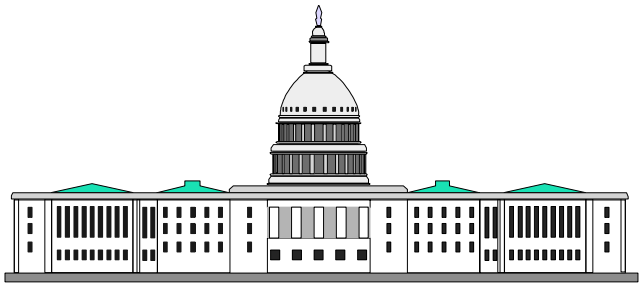
LPAR Advanced Topics

IBM z/OS and OS/390 Expo
October 7 - 11, 2002
Session T09



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LPAR Advanced Topics

Introduction to z800 and Running z/OS.e

zSeries PR/SM Workload Pricing Support

zSeries PR/SM IRD Support

- CPU Management for z/OS
- CPU Management for z/VM and Linux
- CSS I/O Priority Queuing
- Dynamic Channel Path Management

HiperSockets (z/OS V1.2 & up)

Fibre Channel Protocol (FCP)

zSeries Coupling Facility Support

Capacity Upgrade on Demand (G5/6 and zSeries)

- Concurrent Memory Upgrade (z900 Dr 3C)
- Nondisruptive CBU CP Downgrade (z900 Dr 3C and z800)

Memory Configuration and Reconfiguration

- Support for CUoD - CIU, CBU and MES Upgrade
- MVS Storage Reconfiguration

Ref: zSeries PR/SM Planning, SB10-7033-03a (July 2002)

IBM zSeries 800

Complete z/Architecture (64 bit)

- OS/390 V2.8 & up, z/OS all, z/OS.e
- VM/ESA V2.4 & up, z/VM all
- VSE/ESA V2.4 & up, TPF 4.1
- Linux Kernel 2.2 & 2.4 (31 and 64 bit)

Flexible Model Structure

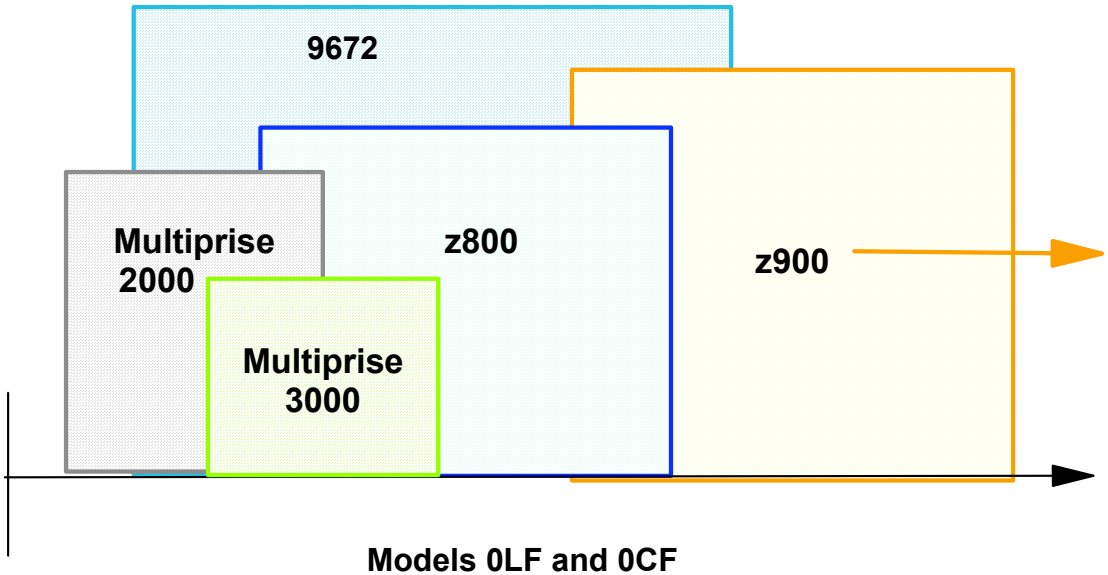
- 1 to 4-way
- z800-001 ITRR close to G6-X17
- 3 sub-uni, 1 sub-dyadic
- CUoD and CBU
- Linux Model 0LF, CF Model 0CF
- z800-004 upgrades to z900-104

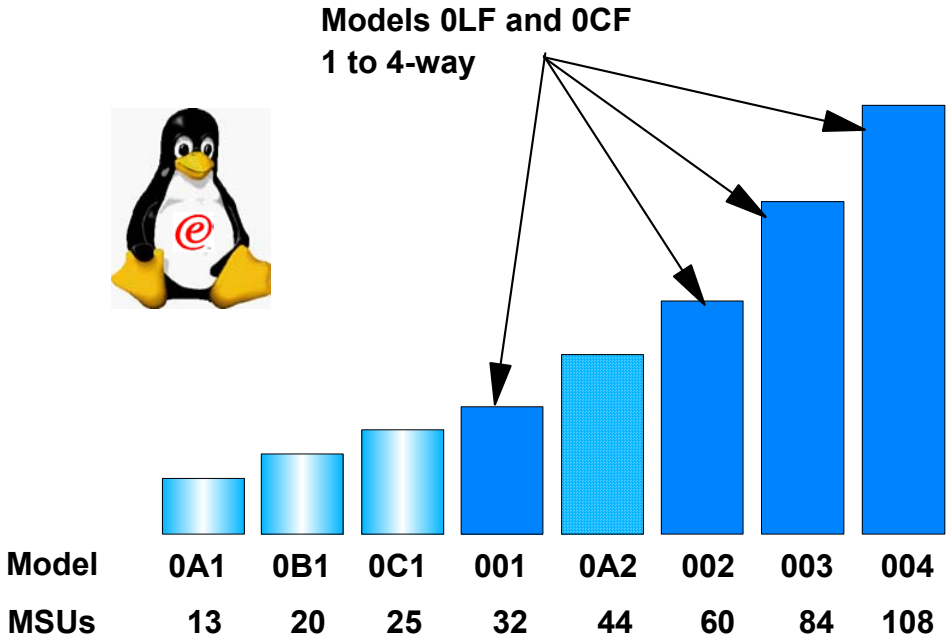
8, 16, 24 or 32 GB memory

- No concurrent upgrade

zSeries I/O Subsystem supports

- All zSeries I/O cards (16 max)
  - Up to 240 Escon
    - No Parallel, OSA-2 FDDI, or ICB-2
- SOD: Linux FCP support





z800 LPAR Mode Exclusive: z/OS.e

z/OS.e Machine Support

- z/Architecture required - 64-bit only
- z800 - YES
- z900 - No! Will detect and fail.

z/OS.e Operating Mode

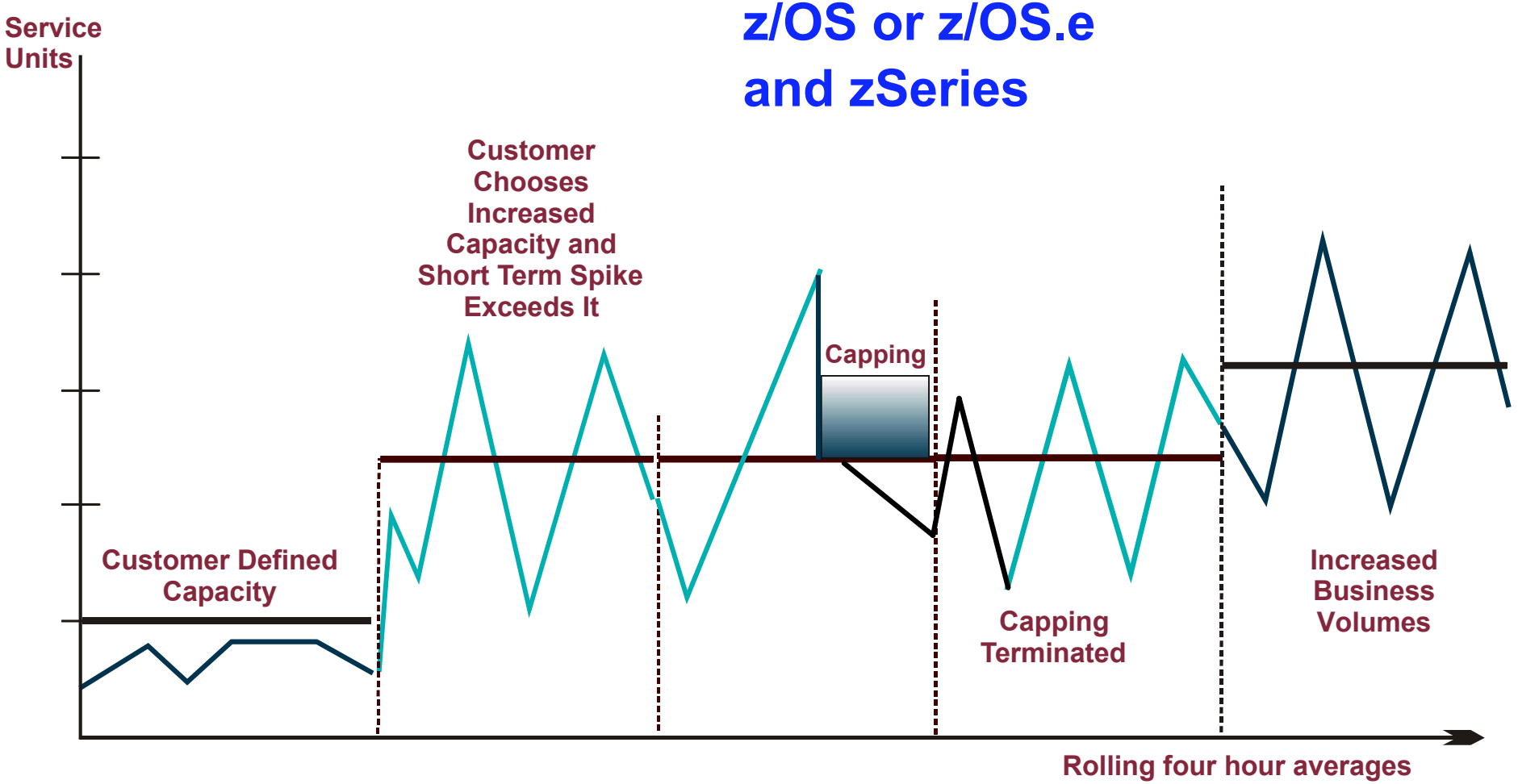
- LPAR Mode - YES
- Basic Mode - No! Will detect and fail.

z/OS.e LPAR Requirements

- Name in IOCDS must start with "ZOSE"
- "ZOSE" named LPAR on z800:
  - z/OS.e and z/OS.e under z/VM will run
  - z/OS and OS/390 will NOT run, even under z/VM
- "ZOSE" named LPAR on S/390 or z900:
  - Name has NO effect, z/OS or OS/390 will run
- Shared CP - OK, Requires WLM "Defined Capacity"
- Dedicated CP - OK

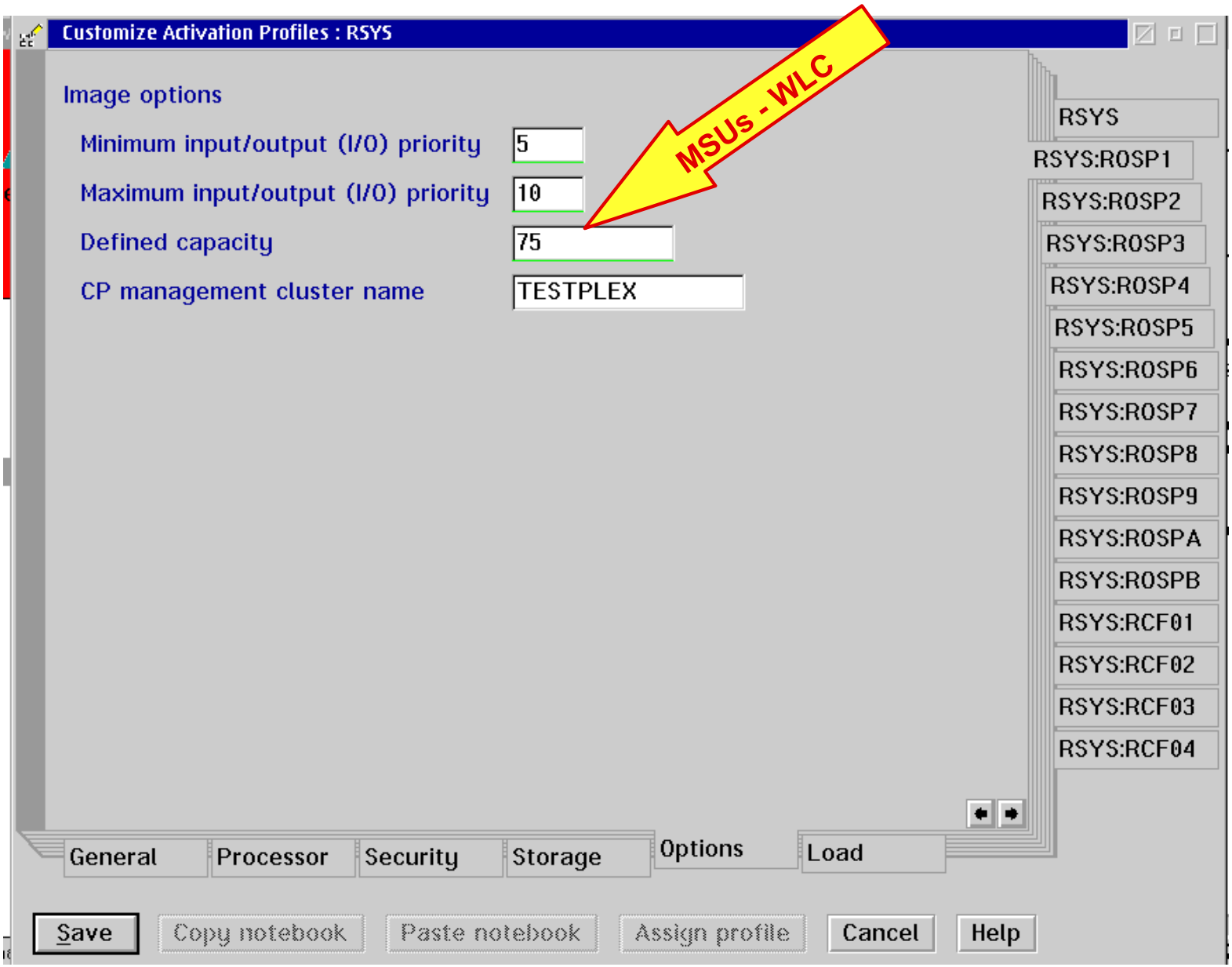
Variable Workload License Charge
PR/SM Management to Defined Capacity

z/OS or z/OS.e and zSeries

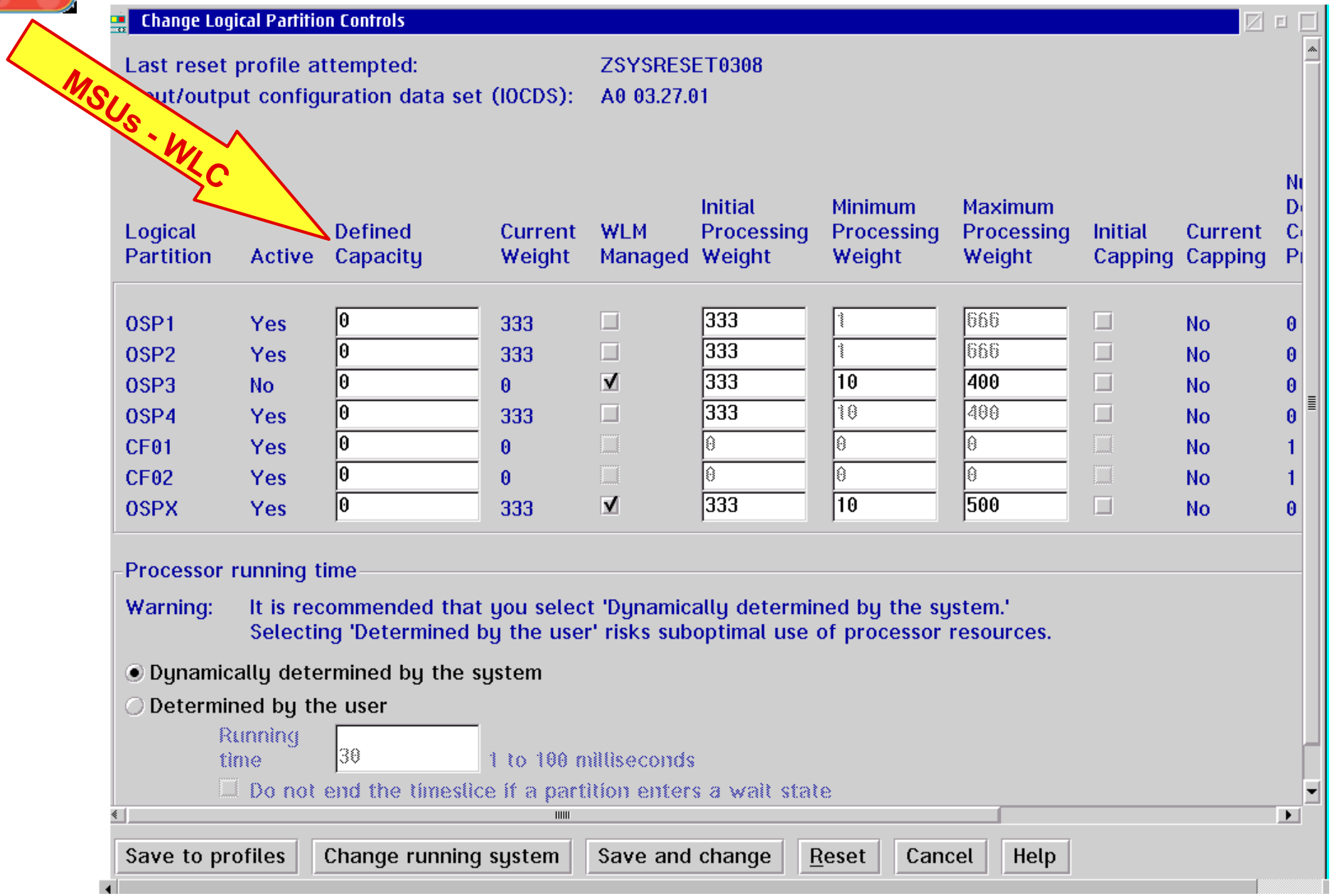


Pay for what you define!

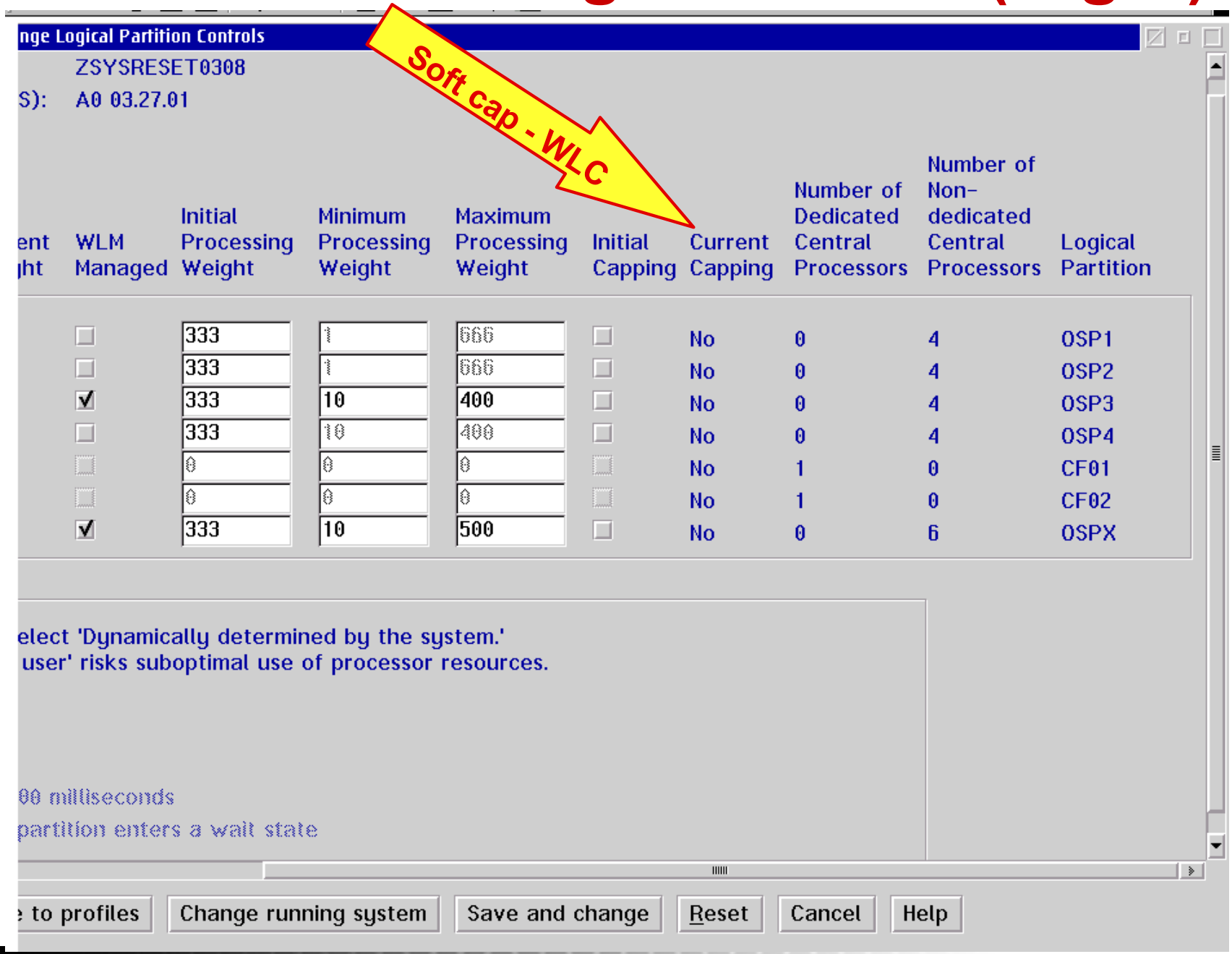
Image Profile Options Tab



HMC/SE Change Controls (Left)



HMC/SE Change Controls (Right)



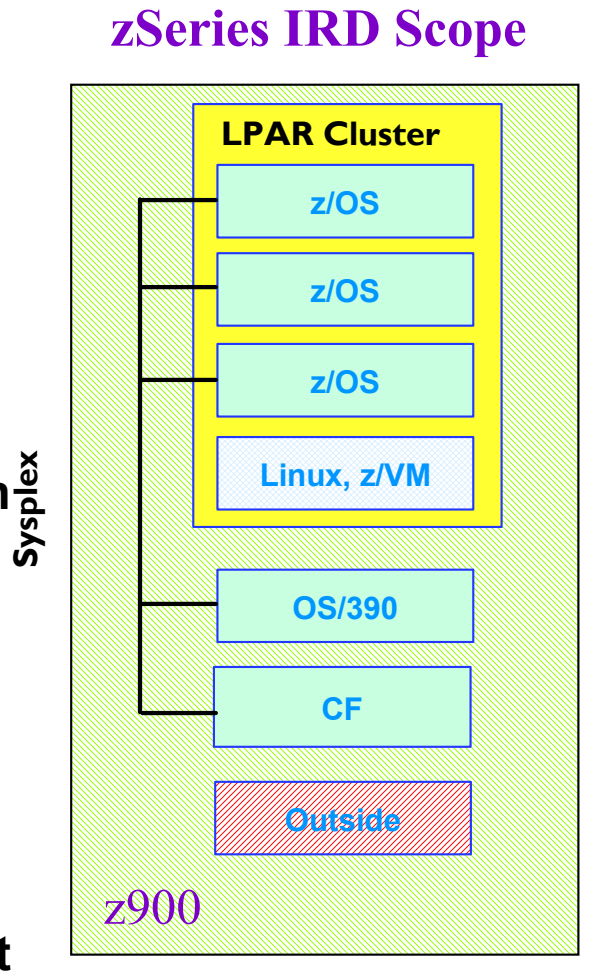
Intelligent Resource Director

Leverage platform strengths through integration

- Workload Manager
- Parallel Sysplex
- PR/SM
- Channel Subsystem

View a cluster of LPs on a zSeries as single pool of computing resource

- Move physical resource to priority workloads in an LPAR cluster
- Extend goal oriented resource management across logical partitions transparently to application subsystems
- Initial resources managed: CPU and I/O
- Requires Parallel Sysplex, WLM Goal Mode, WLM Structure and Level 9 Coupling Facility
- z/OS V1.2 adds z/VM and Linux for zSeries support for LPAR weight management



Intelligent Resource Director

LPAR CPU Management

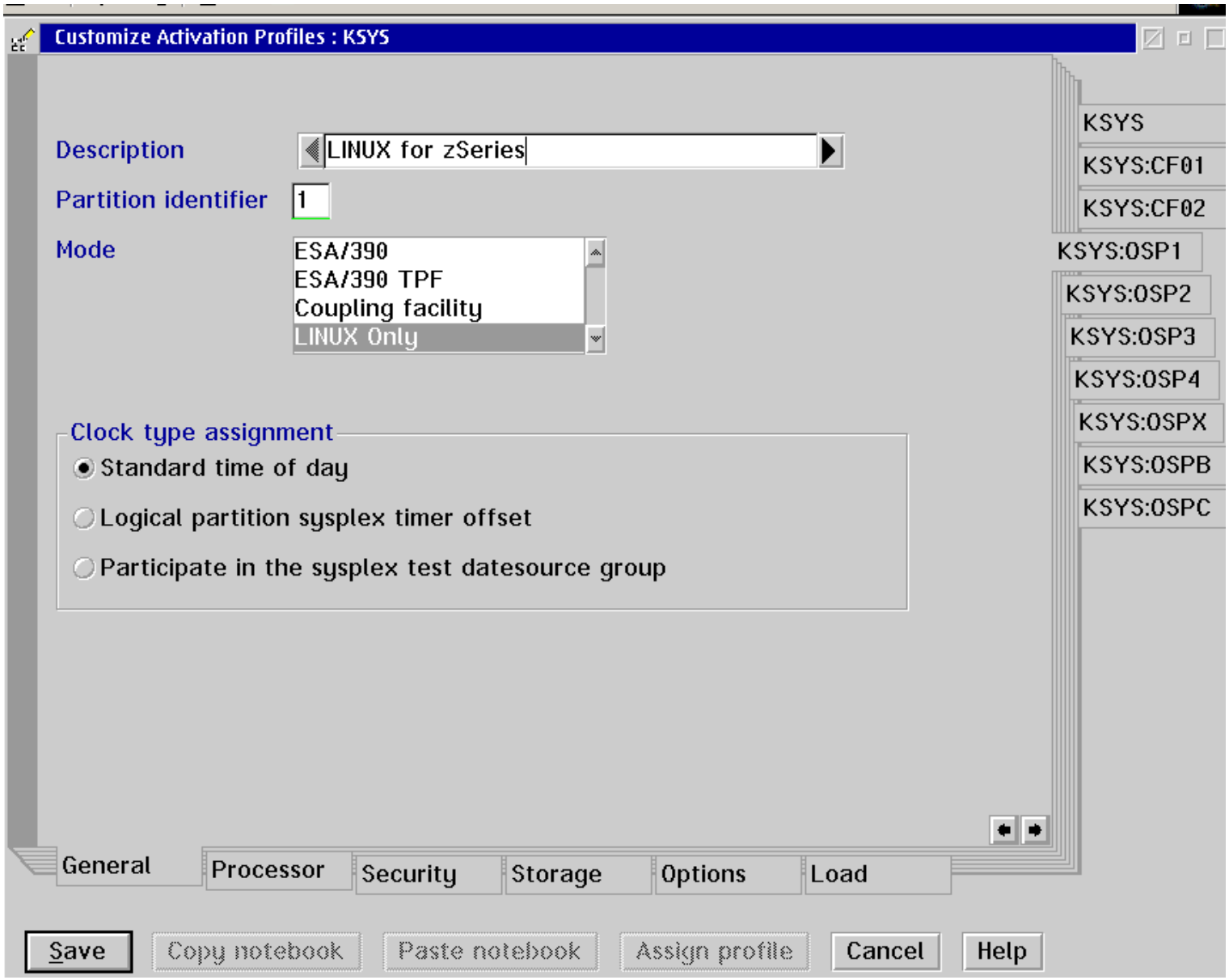
Description

- **LPAR Weight Management - z/OS, z/VM and Linux for zSeries**
  - Dynamically manages a partition's CPU access based on workload demands and goals (z/VM and Linux on shared CPs only)
- **Vary Logical CPU Management - z/OS Only**
  - Optimizes number of logical CPs based on partition's current weight and CPU consumption

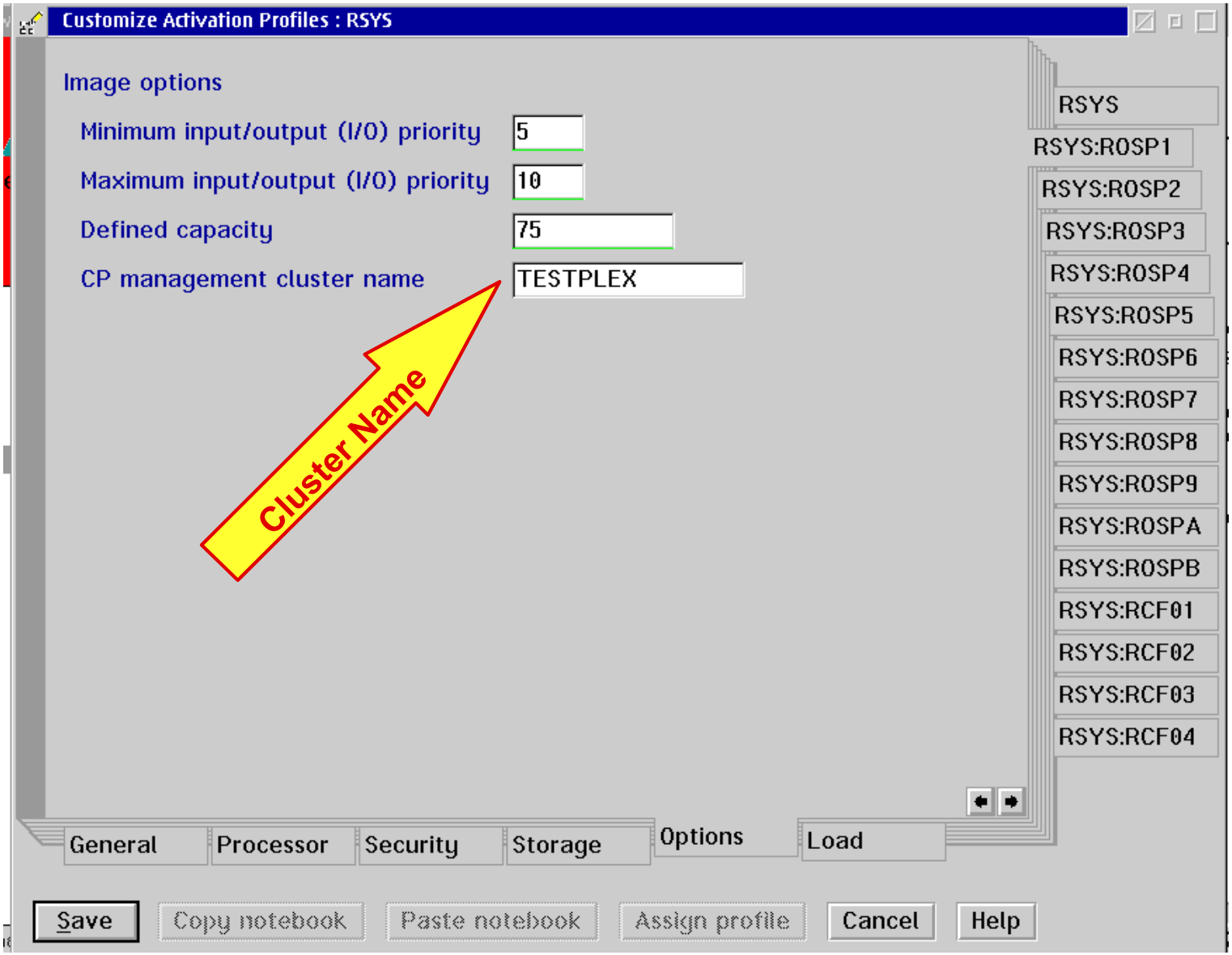
Benefits

- **Provides flexibility in managing** CPU **resources across logical partitions in accordance with workload goals.**
  - Dynamic change of LPAR weights
  - Manage tradeoffs between meeting service goals for work and making efficient use of a system's resource
  - Prevent or mitigate possible problems
  - Provides the fastest Uniprocessor speed for single tasking workloads
  - Reduces LPAR overhead

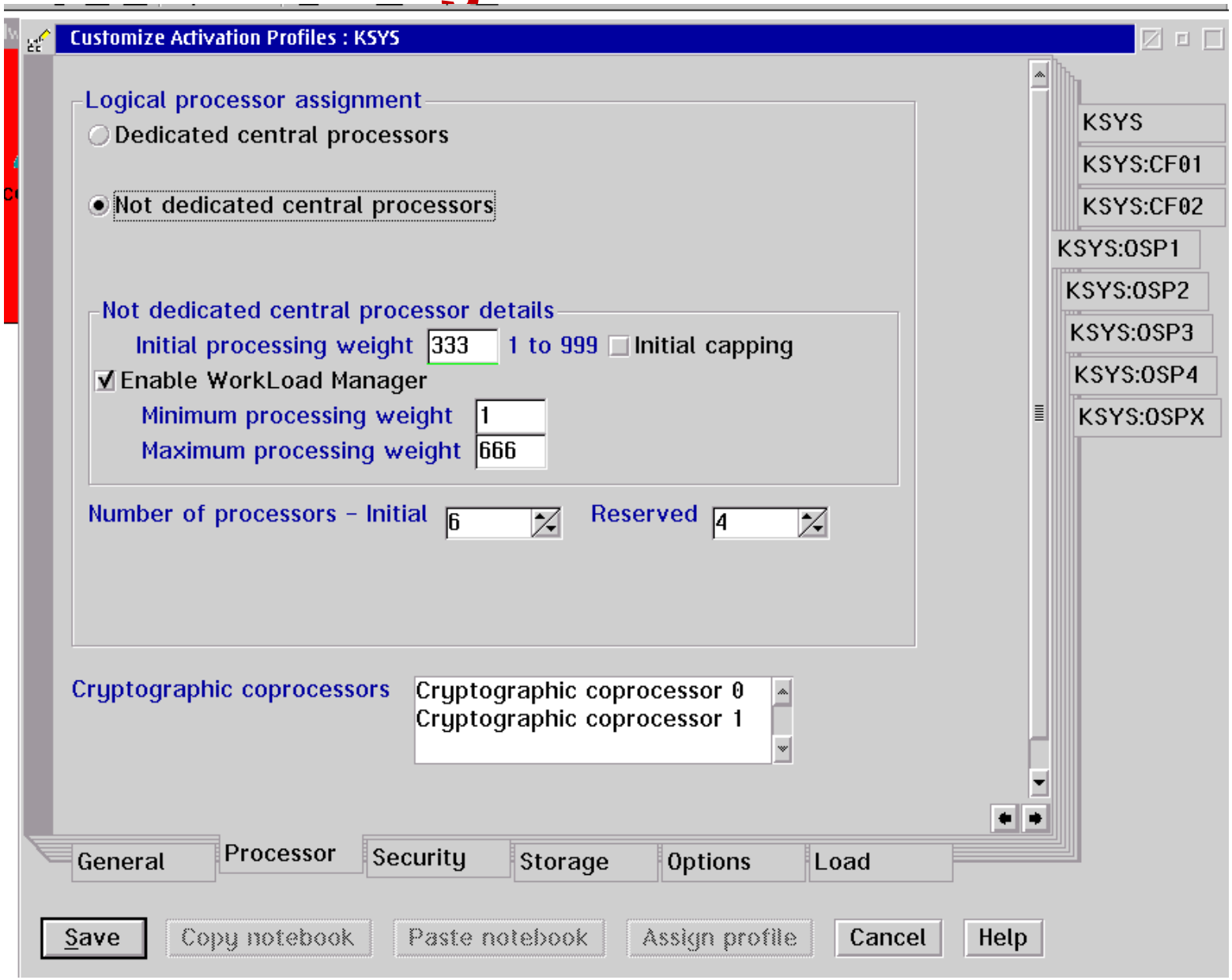
zSeries Image Profile Control Partition Mode Selection



zSeries Image Profile Control CP Management Cluster

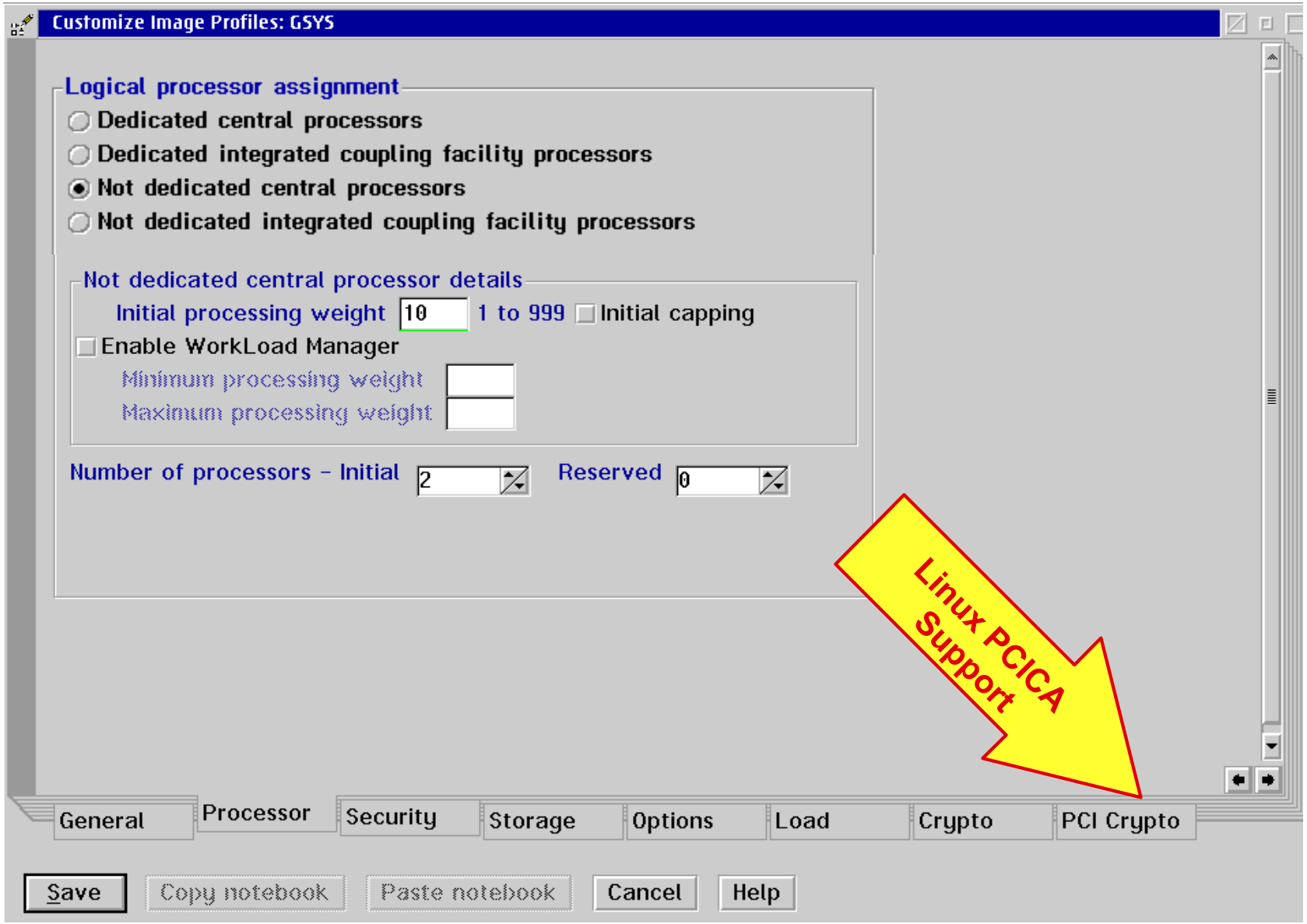


zSeries Image Profile Control
LP Assignment - ESA/390 Mode

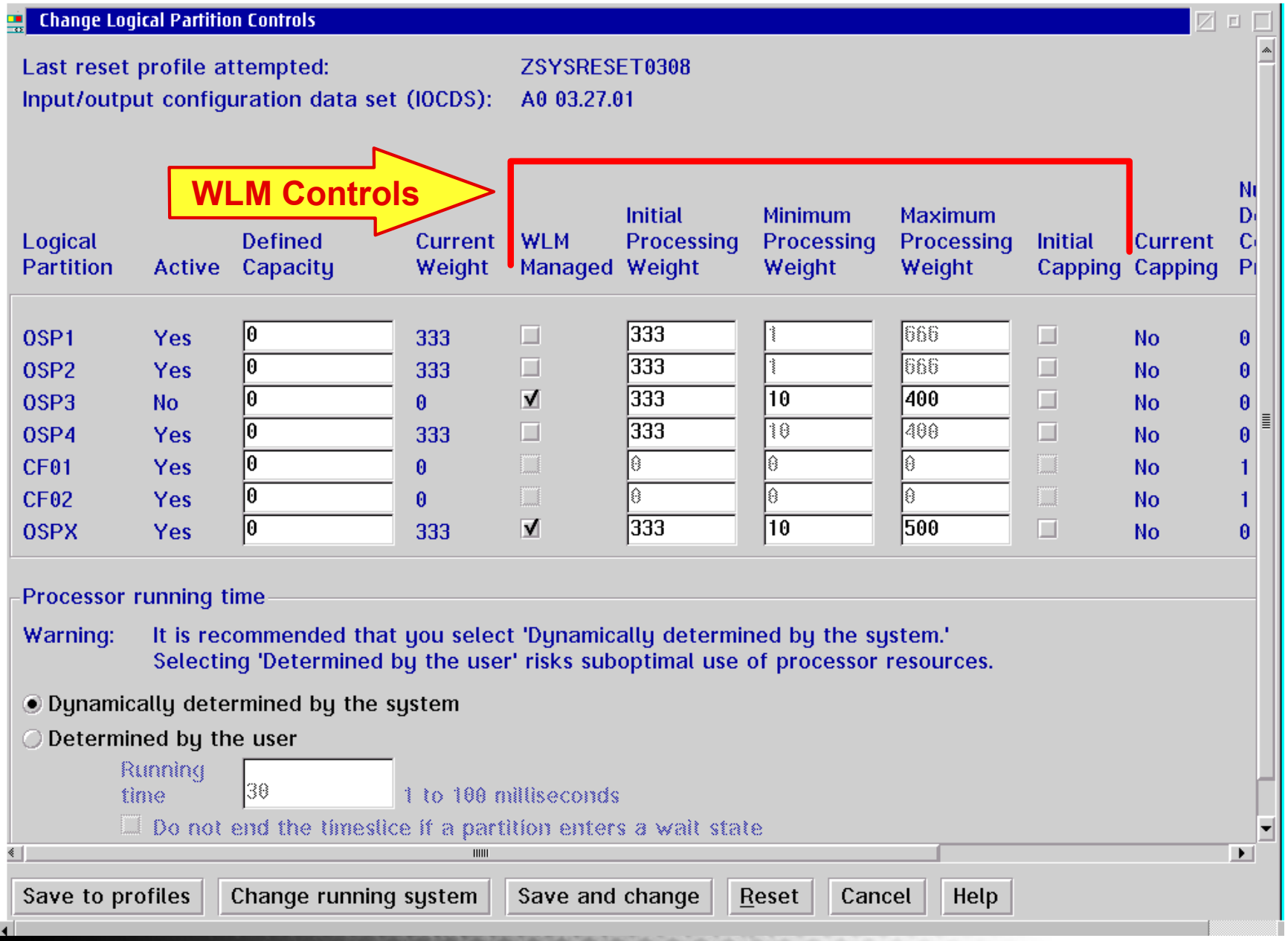


zSeries Image Profile Control LP Assignment - Linux Mode

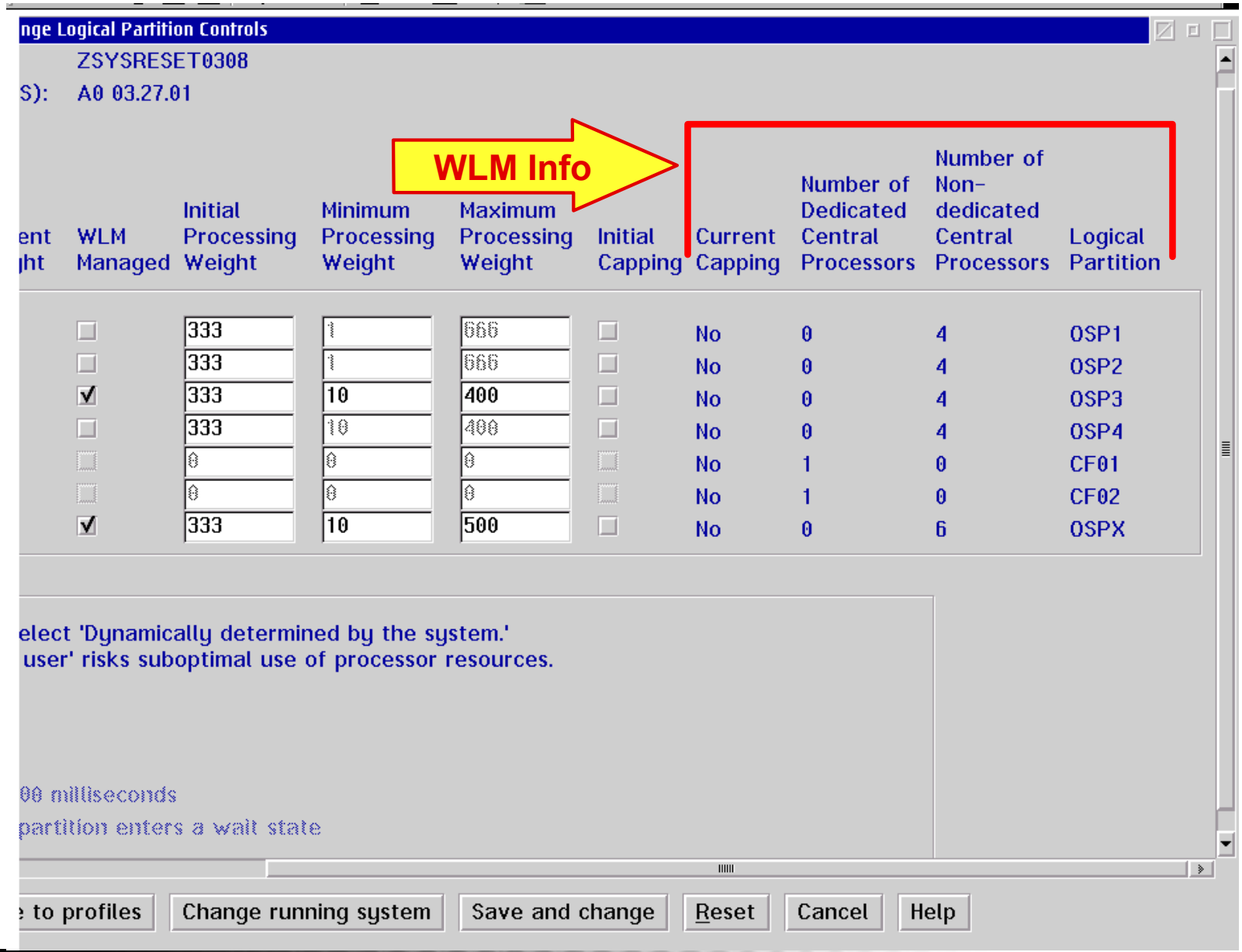
Note: To PR/SM IFL = ICF



zSeries Change Logical Partition Controls CPU Management



zSeries Change Logical Partition Controls CPU Management



Intelligent Resource Director

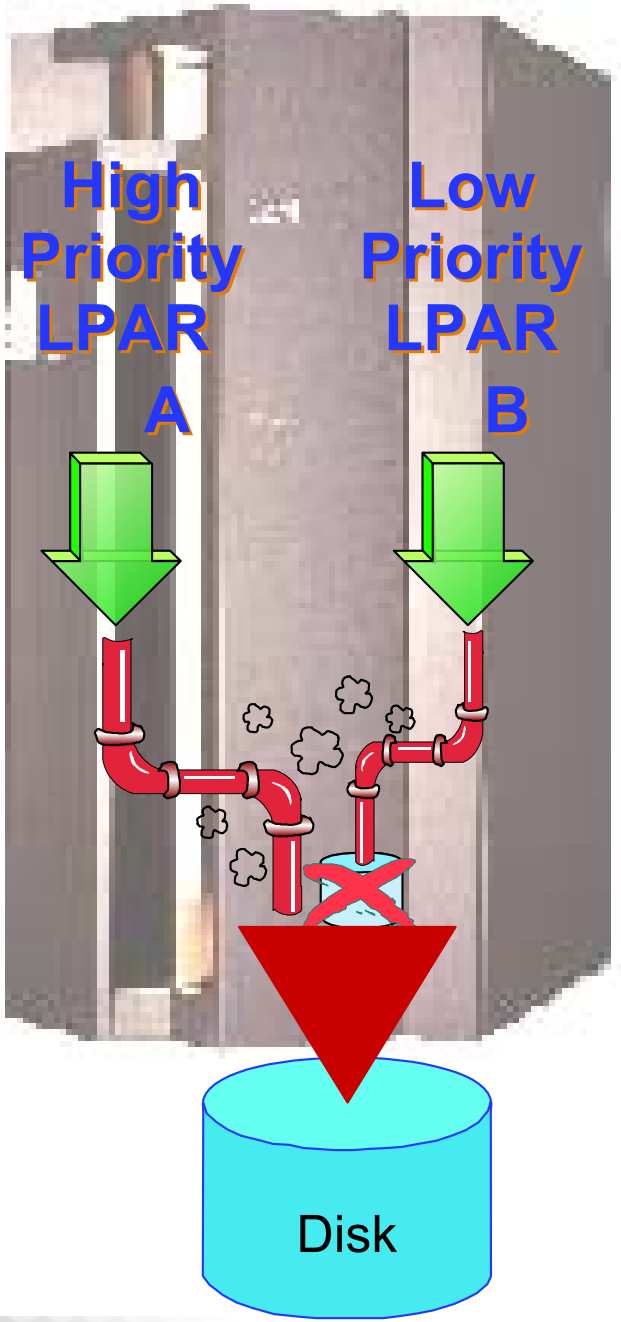
Channel Subsystem Priority Queuing

Description

- I/O Priority Queuing prioritizes I/O within an LPAR across workloads
  - Available since OS/390 V1.3
- Channel Subsystem Priority Queuing prioritizes I/O within an LPAR cluster
  - LPAR priorities based on workload goals
  - Exclusive to zSeries
- z/VM and Linux for zSeries - static only

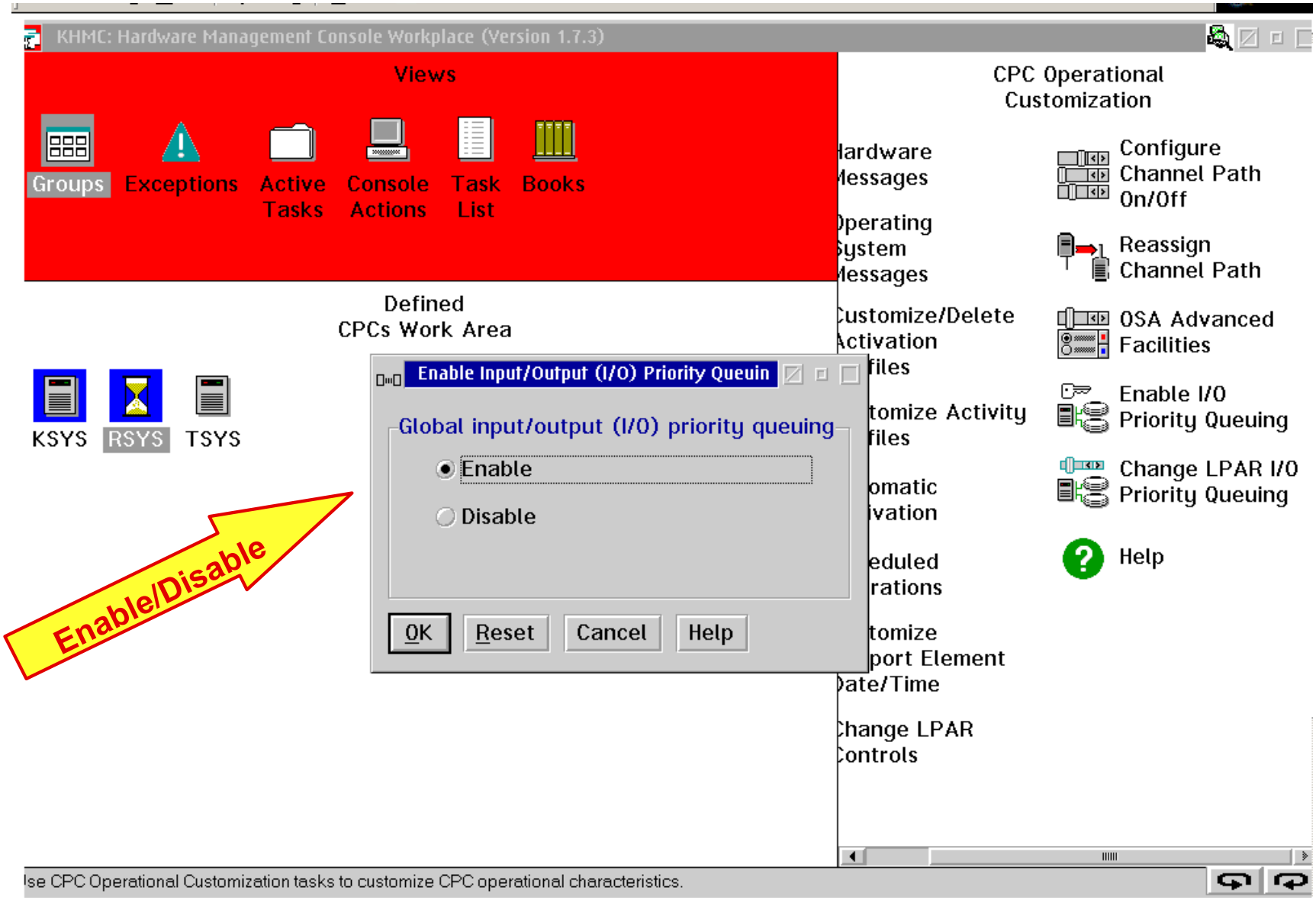
Benefits

- Allows better channel resource management with EMIF
  - Low priority work will not preempt high priority work from other LPARs

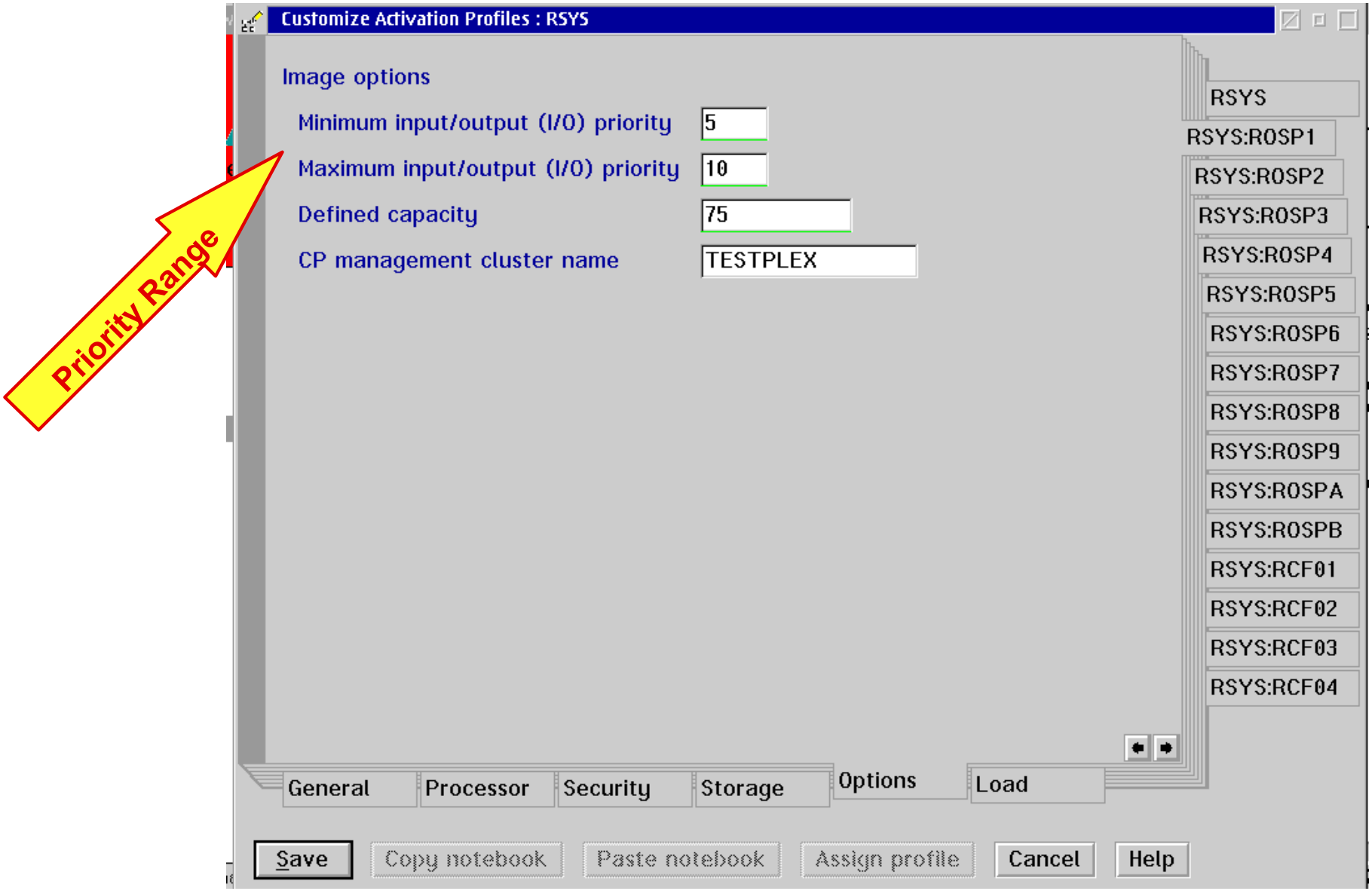


zSeries Reset Profile Control
CSS I/O Priority Queuing

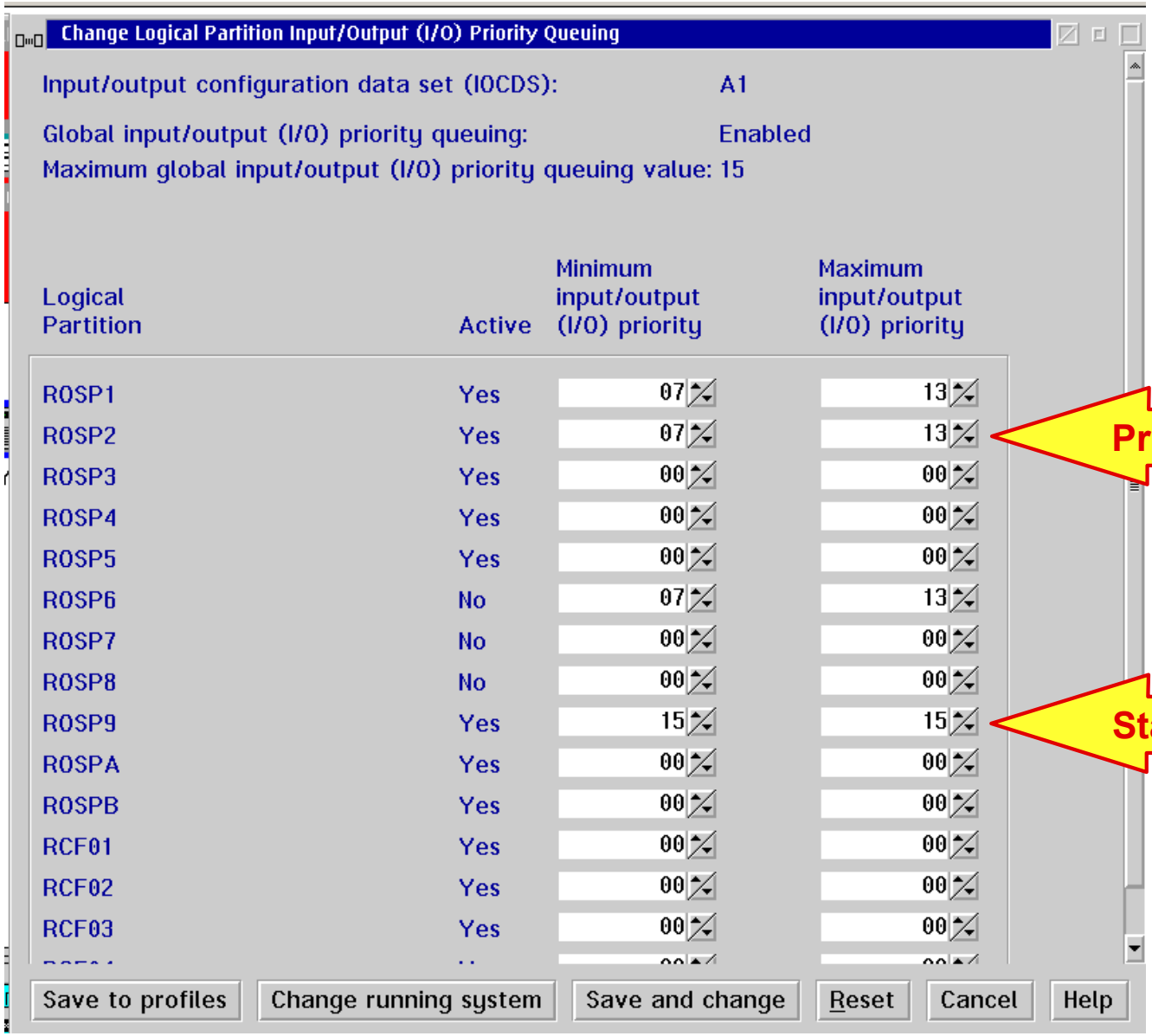
zSeries System-wide Control CSS I/O Priority Queuing



zSeries Image Profile Control CSS I/O Priority Queuing



zSeries Change Logical Partition CSS I/O Priority Queuing



Priority Range

Static Priority

Intelligent Resource Director

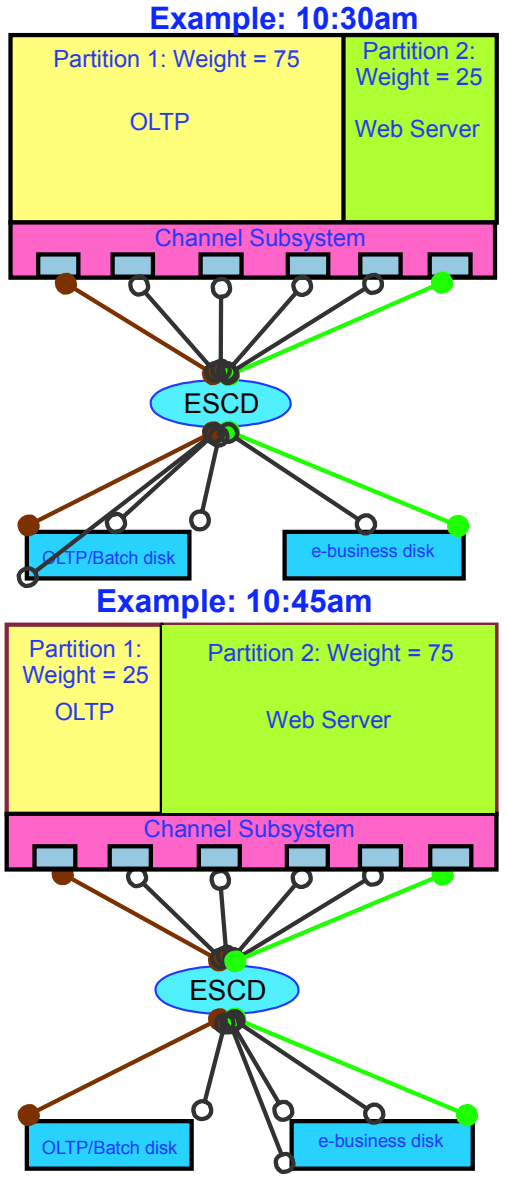
Dynamic Channel Path Management

Description

- Allows the system to dynamically manage channel paths in response to changing workload demands
- Moves channel capacity (bandwidth) to the disk subsystem(s) experiencing need based on workload requirements
- Optimized with Channel Subsystem Priority Queuing
- Exclusive to zSeries and z/OS

Benefits

- More efficient use of hardware resource
- Reduces channel requirements
- Simplifies I/O configuration planning and definition
- Dynamically balances I/O connectivity based on workload demand



I/O Definition for DCM

Rules for managed channels:

- zSeries CEC only
- DCM supports ESCON (CNC) and FICON Conversion (FCV)
- ESCON Director attachment is required
- Specify the I/O cluster name to "own and operate"
- Do NOT specify a candidate list, candidates are IOCLUSTER members
- Do NOT specify as a PATH for any Control unit

Rules for CUs to accept managed paths:

- Specify some shared, "static" paths, these will be the only paths at IPL
- Specify placeholder asterisks for managed paths

Examples (IOCP output from HCD)

- Managed ESCON channel 40 attached to ESCON director 1B:

```
CHAN40   CHPID     PATH=40,TYPE=CNC,SWITCH=1B,
         OS=01,IOCLUSTER=TESTPLEX
```

- Control unit 1234 with two static, two managed paths:

```
CU1234   CNTLUNIT CUNUMBR=1234,UNIT=2105,.......
         PATH=(20,30,**,**),LINK=(C0,C0,**,**)
```

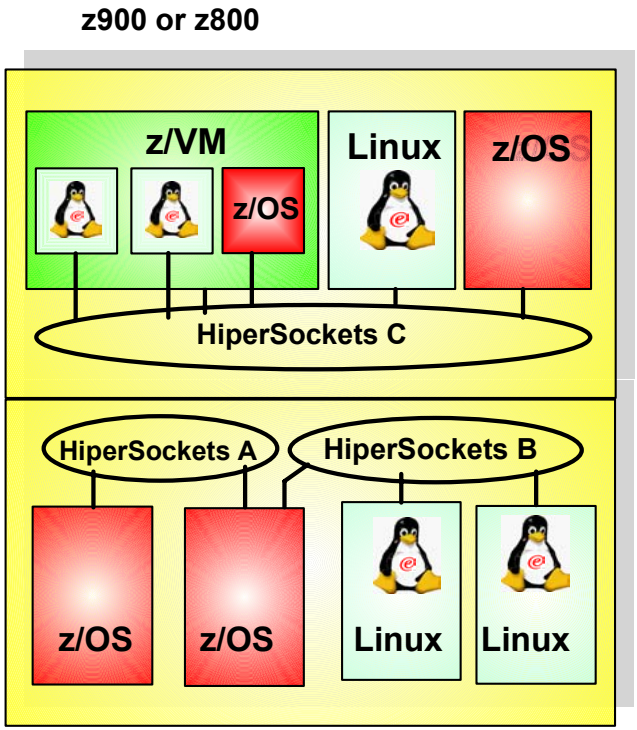
HiperSockets - The Network in the Box

IP networking among virtual servers in a zSeries

- Up to four HiperSockets IQD channels - "internal LANs" accessible by all partitions
- LAN frame size configurable - 16K, 24K, 40K, 64K
- Up to 1,024 TCP/IP stacks across all four HiperSockets
- iQDIO data transfer (similar to cross-address-space memory move) using memory bus does not use CP cache = minimal performance impact
- Each partition configures its own usage as it would another type of IP network.

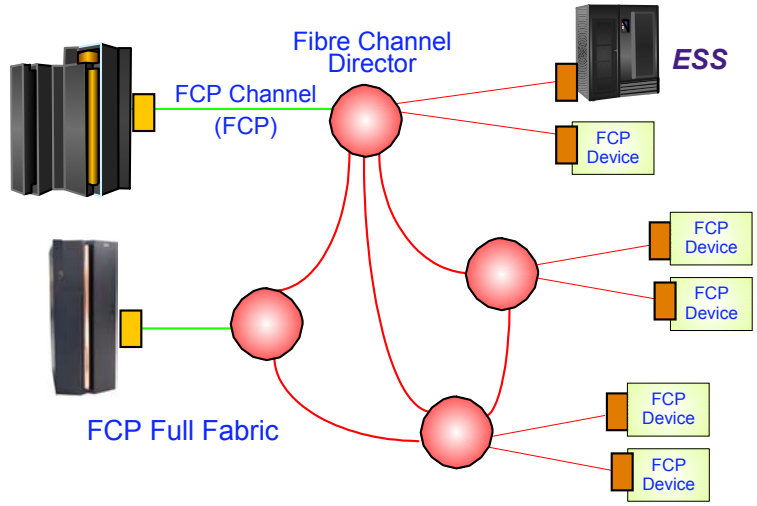
Prerequisites

- z/OS 1.2 & up or z/OS.e (z800 only)
- z/VM 4.2
- Linux kernel 2.4 (64- and 31-bit)
- z900 (Driver 3C or 3G) or z800

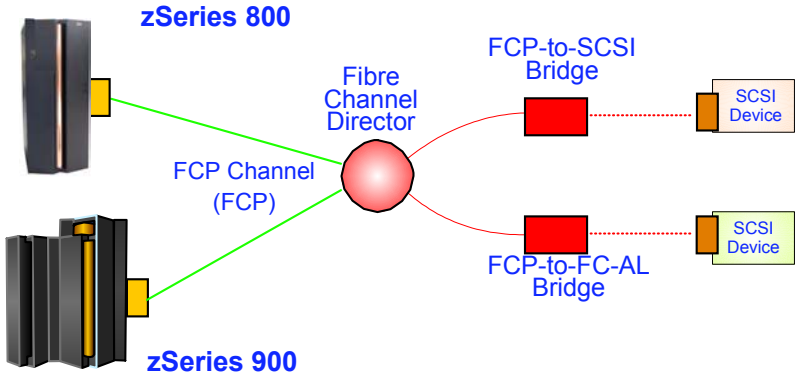


zSeries FCP for Linux Limited Availability

Initially, FCP support with limited availability



- **FCP Full Fabric Connectivity**
  - Homogeneous, single vendor fabric
  - Fibre channel directors
    - INRANGE FC/9000 (IBM 2042)
    - McDATA ED-6064/ 5000 (IBM 2032-064/ 2032-001)
    - IBM 2109-F16/F08/S16/S08 (Brocade 3800/3200/2800/2400)
  - Devices
    - Enterprise Storage Server

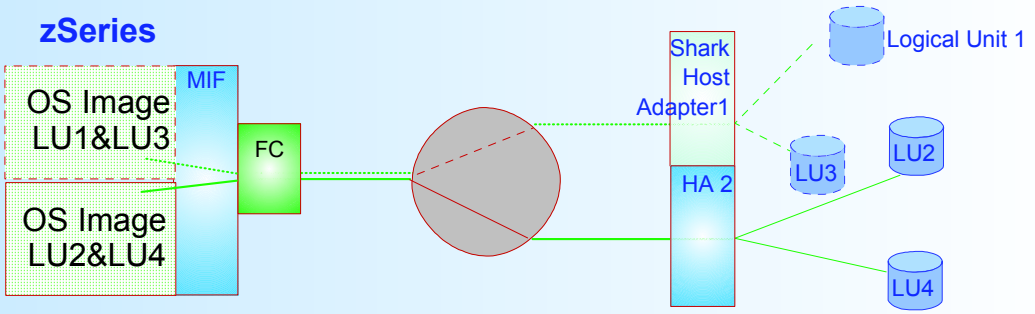


- **FCP to SCSI Bridge**
  - FCP-to-SCSI Bridges (via switch)
    - IBM 2108-G07 SAN Data Gateway
  - FCP-to-FC-AL bridge (via switch)
    - McDATA ES-1000 Loop Switch (IBM ES-2031-L00)

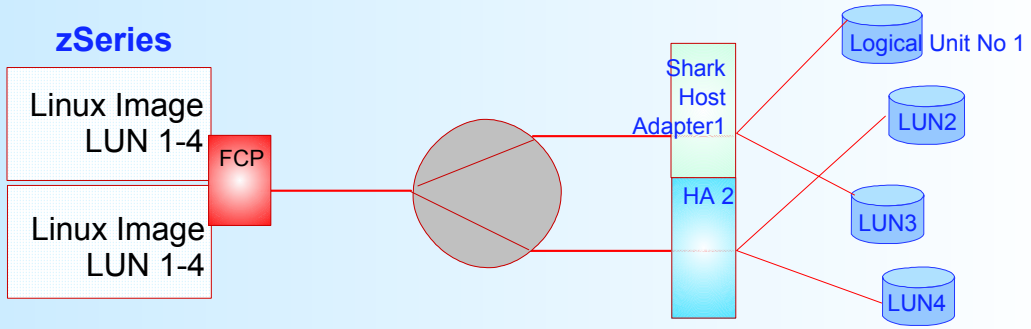
Initially, no direct attachment to device or bridge

FCP and MIF Channel Sharing

- MIF can ensure data integrity and security when FICON or ESCON channels are shared if device candidate lists (DCLs) are used.

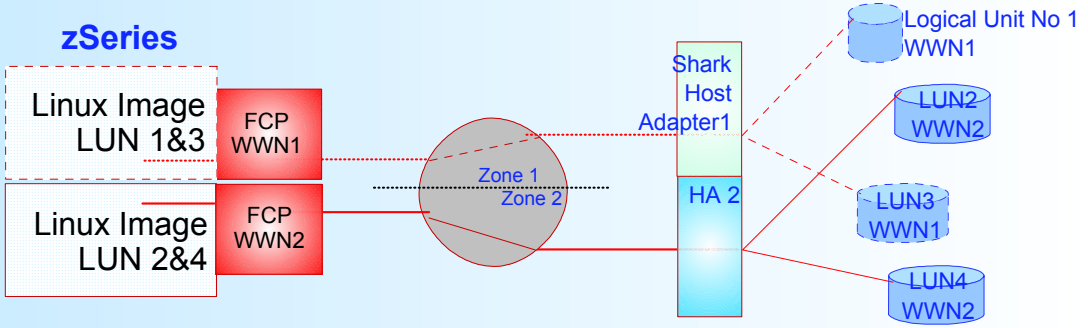


- MIF cannot ensure data integrity and security when FCP channels are shared - FCP/SCSI does not allow.
- All Linux images can define and access all LUNs
- One image at a time, first-come, first-served.



- Data integrity for Linux and FCP requires the use of separate FCP channels, switch zoning, and LUN masking

WWN1 = World Wide Port Name 1 = LUN1 and LUN3
WWN2 = World Wide Port Name 2 = LUN2 and LUN4



IBM Coupling Facility Control Code

Dynamic ICF Expansion into shared ICFs
Structure rebuild

Level 8 (6/99)
G3/4 Last Level

Shared ICF
IBM Concurrent Conditioning for S/390

Level 7 (3/99)

CF Resource Mgmt
- IC Channel
- ICB
- TPF support

Level 6

- DB2 CACHE Duplexing
- Dynamic ICF Expansion

DB2 Availability

Level 5 - G2 Last Level

MQSeries V2.2
Multi-system Enclaves
IRD Support

Level 9 (6/00)

z900 GA
G5/6 Dr 26

Initial CF HW and Functions

Level 0

Level 1

- Dynamic Alter
- CICS TSQ
- System Logger

Continuous Operations

- Dynamic CF Dispatch
- ICF Support

Level 4 - G1 Last Level

Dynamic I/O Peer and Receiver Structure Changes Sender in CF

Level 10 (10/01)

z900 Dr 3C

List KEY and List cursor Enhancements

Level 1

IMS Shared Message Queue Base

Level 3

Level 2

64-bit
48 internal tasks
CF Duplexing

Level 12 (3/02)

z800 GA
z900 Dr 3G

Register Name List and Batch Unlock

Level 2
DB2 Performance

Structure Enhancements (255/Structure & 1023 Structure/CF

CF Duplexing

Level 11 (4Q/02)

G5/6

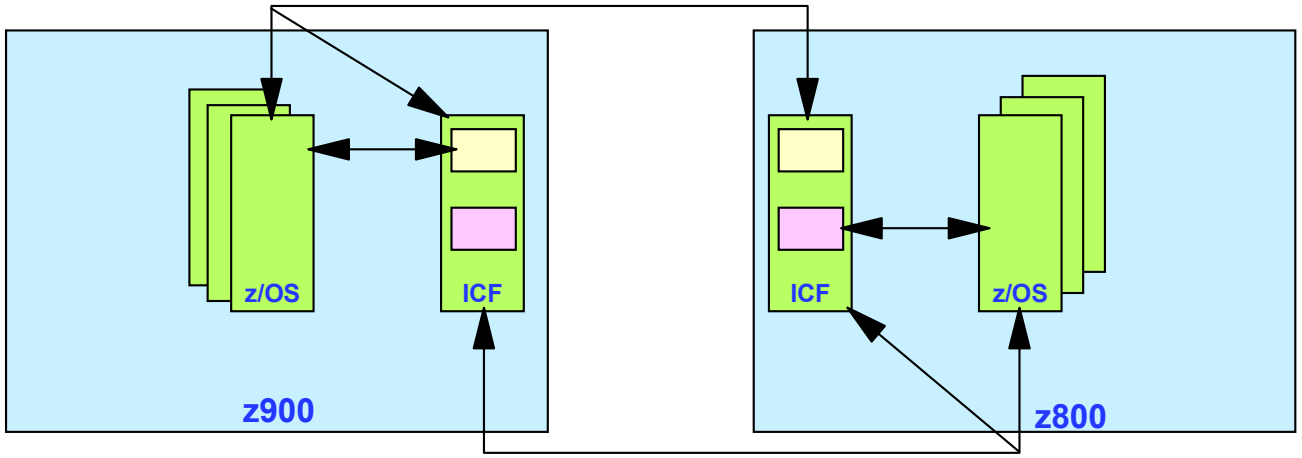
Cache Vector index Comparison Enhancement

VSAM RLS
Level 2

Systems Management

World's Leading and Unrivaled Coupling Technology

System Managed CF Structure Duplexing



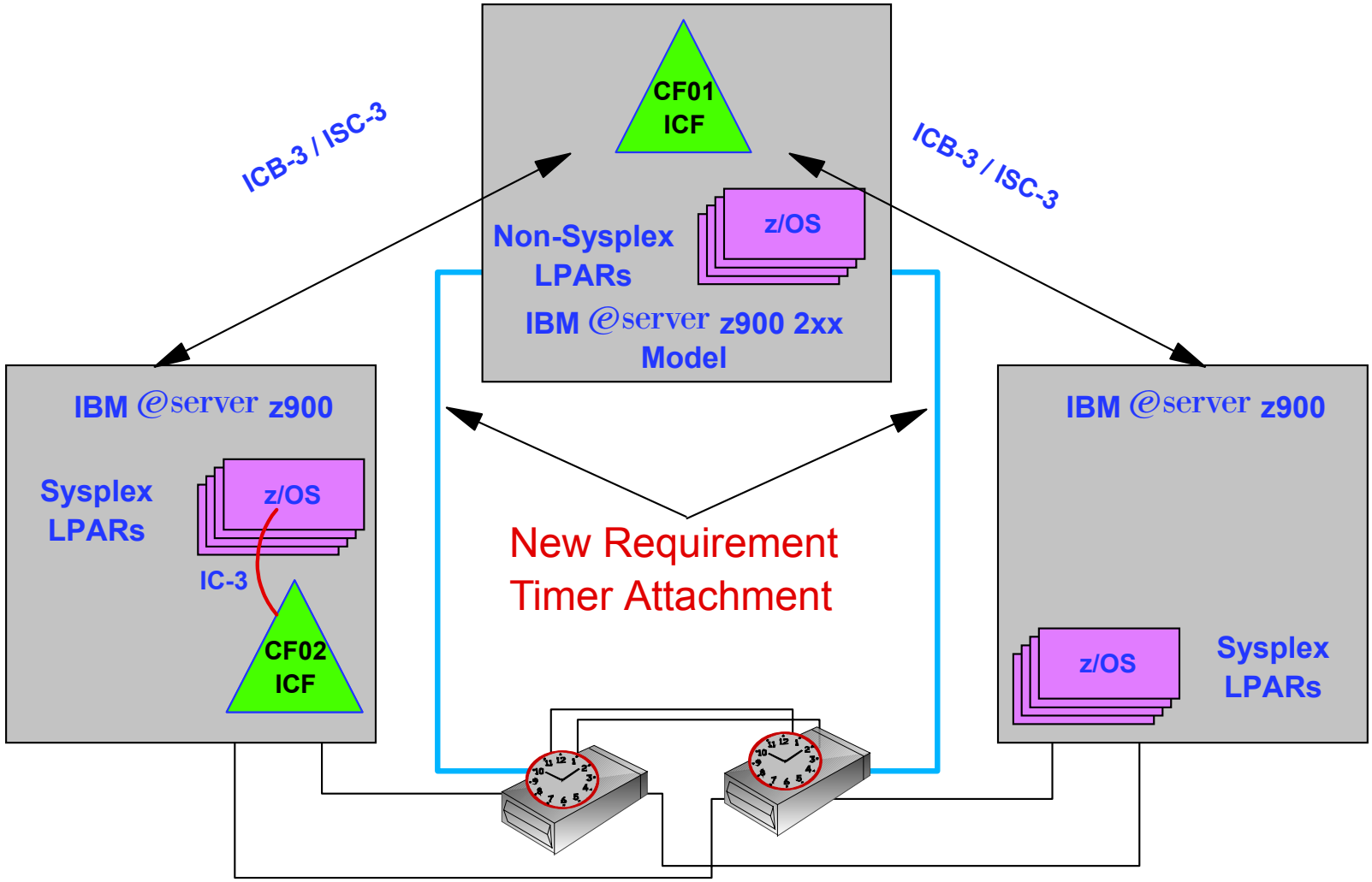
Robust, standard recovery capability
- Ease of use for middleware and ISVs
- Eliminates rebuild delay
- Reduces need for standalone CF

Considerations
- Not all structures supported
- Overhead to duplex
- Storage required to duplex
- See Announcement 102-181 (06/02)

Requirements:
- Sysplex Images -
  - **z/OS v1.2 & up**
  - **APAR OW41617**
- Coupling Facilities -
  - ICF or standalone
  - **zSeries with CFCC Level 12**
  - **S/390 G5/6 with CFCC Level 11**
  - **CF - CF link connectivity**

Message Time Ordering - Fast CF Connection to Sysplex Timer

z900 New 2xx Model with ICF and non-Parallel Sysplex LPARS



- **Required z/OS and OS/390 New Function APAR - OW53831**

LPAR Support for CUoD and CBU zSeries and G5/6

Nondisruptive CIU/CBU/MES Upgrade

- Add physical CPs to shared CP Pool
- Add physical ICFs to shared ICF Pool (Not supported for CBU))
- Added physical engines become available and visible (STSI and event)

LP Profile: Initial and Reserved Processors (G5/6 Dr 26 6/2000)

- Support for ESA/390, LINUX (CP or IFL), and CF (ICF and/or CP)
- Initial - On at Activation
- Reserved - Can be configured on if resource is available
- Initial + Reserved can equal maximum engines possible for the MCM

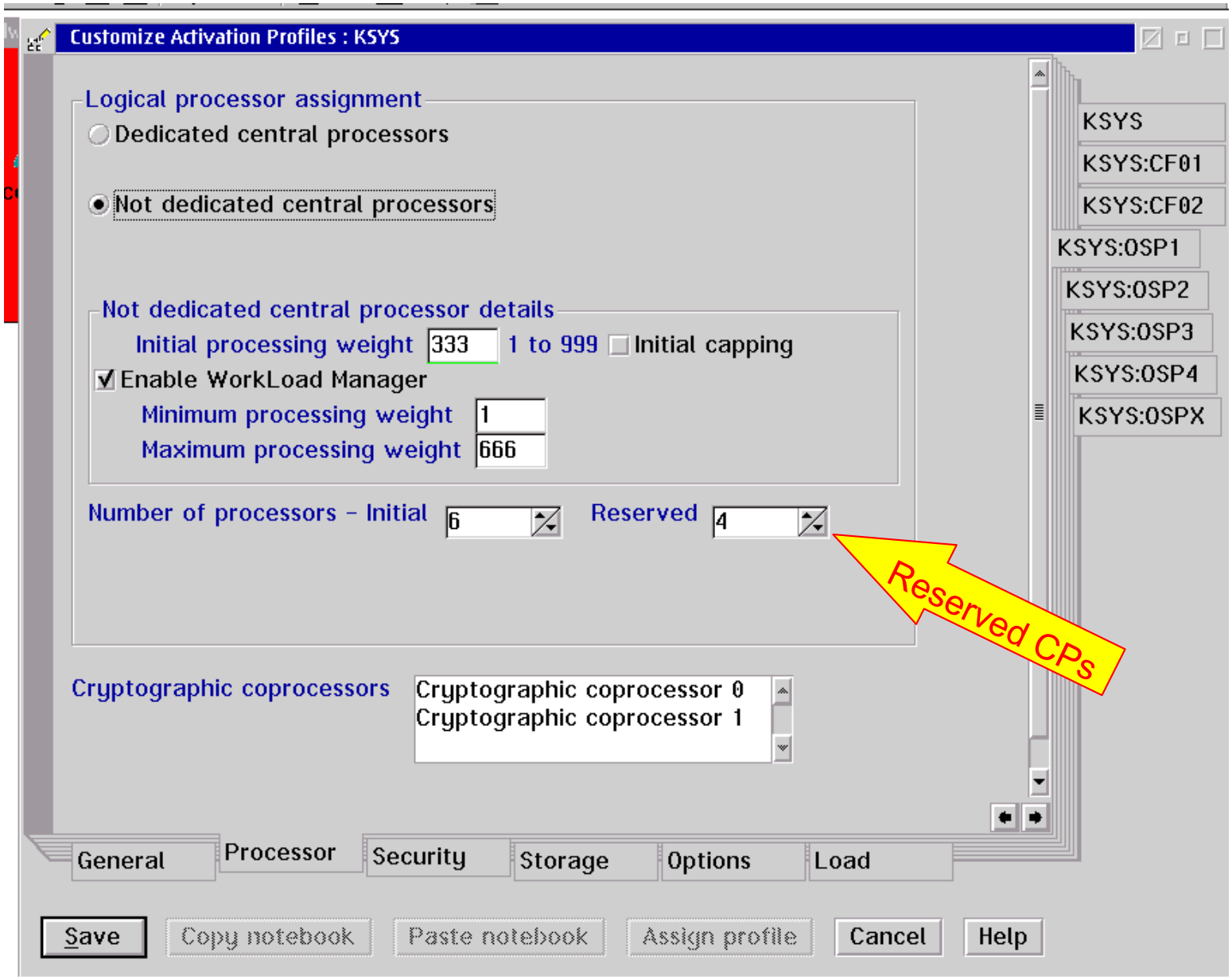
Nondisruptive CBU CP Downgrade (z900 Dr 3C and z800)

LP Activation and Processor Config Rules

- Can't activate LP with more initial shared logicals than shared pool contains.
- Can't activate LP with initial dedicated logicals if physicals taken from shared pool would "starve" an active LP with shared logicals.
- z900 nondisruptive CBU CP downgrade takes CPs ONLY from the shared CP pool, will not take the last CP.

Initial and Reserved CP Support

zSeries at GA
S/390 G5 or G6 (Dr 26w)



zSeries Storage Granularity

zSeries and G5/6 (Dr 22e and later)

- Single Storage Pool - All central storage
- ES configured as needed from CS - No POR needed

Earlier Machines

- POR required to change CS/ES split

Granularity

- Note: LPAR Mode ONLY, 1 MB in BASIC mode for HSA
- Was 1 MB prior to G3 Dr 88 for LPAR, too

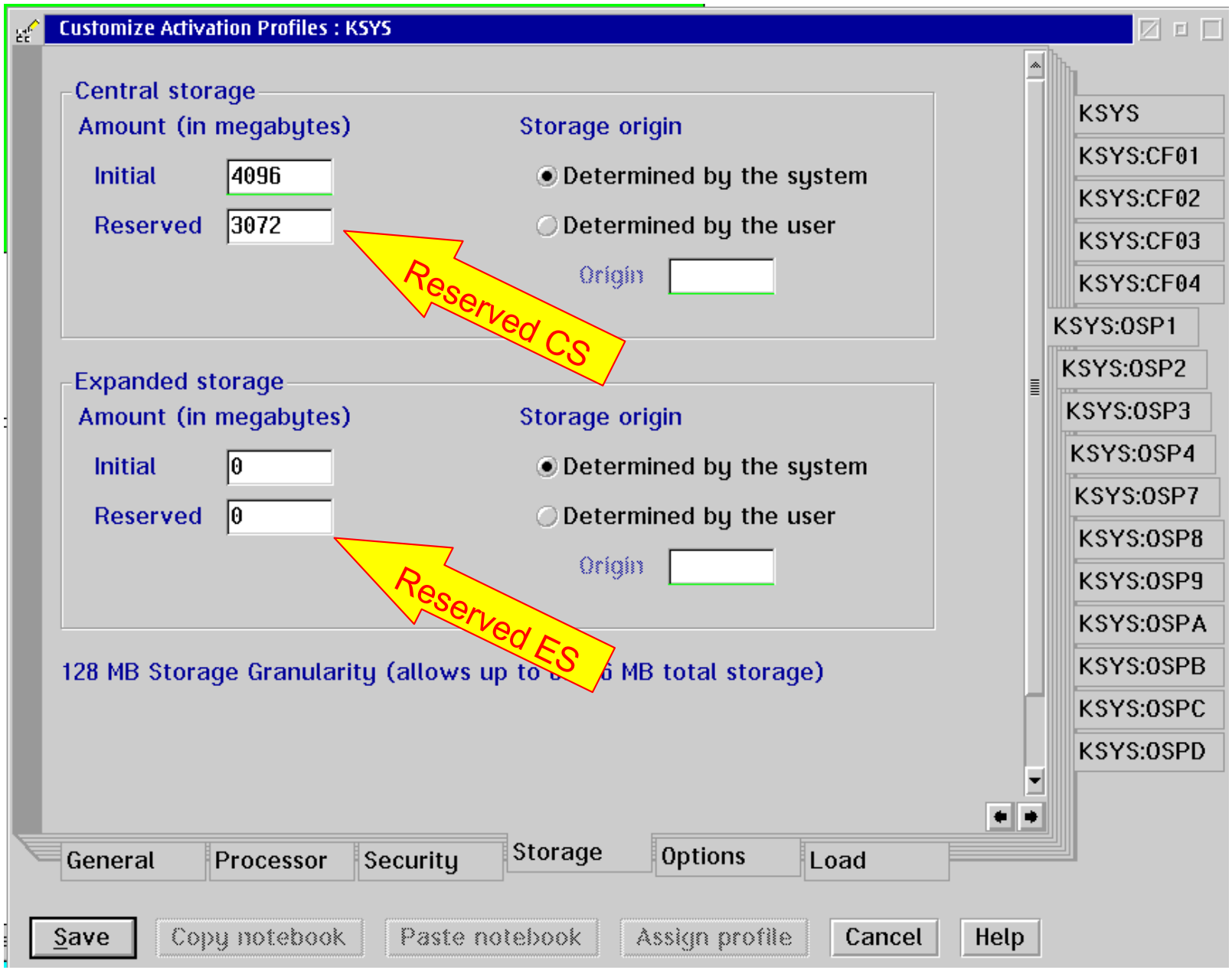
Total Storage G5/6 or zSeries	Granularity CS & ES
5 - 8 GB	16 MB
10 - 16 GB	32 MB
18 - 32 GB	64 MB
40 - 64 GB	128 MB

RSU Increment Size!!!

Initial and Reserved Storage

Expanded Storage

- Supported by z/Architecture
- Not used - zSeries CFCC, 64-bit OS/390, z/OS, or z/OS.e



z900 Concurrent Memory Upgrade

Concurrent Memory Upgrade

- LIC CC memory activation
- From current size to any size supported by cards installed (card change is disruptive)
- Add to partition using DSR/2 (MVS only) - Central or Expanded

Prerequisites

- z900 Server, LPAR mode
- Must have spare memory capacity on installed cards, otherwise disruptive
- Must predefine additional memory to partition as "Reserved Storage"

Note: No CBU for memory

Memory Card Size and Number

Storage	Models 100-109	Models 110-116 210-216	Models 1C1-1C9 2C1-2C9
5 6 7 8	4 GB x 2	Not Offered	Not Offered
10 12 14 16	8 GB x 2	4 GB x 4	4 GB x 4
18 20 24 28 32	16 GB x 2	8 GB x 4	8 GB x 4
40 48 56 64	Not Offered	16 GB x 4	16 GB x 4

MVS RSU Parameter

In IEASYSxx. Specifies the number of central storage increments to be made available for central storage reconfiguration

- MVS attempts to keep this area free of long term fixed pages

$$RSU = \frac{\text{CS amount to be reconfigured}}{\text{storage increment size}}$$

Or: Storage to be kept free = RSU * increment

- If memory is upgraded, check the RSU parameter!

OS/390 V2.10 and z/OS - Better RSU Options

- All OFFLINE storage (Reserved Storage)
- An amount (%, MB or GB) - System calculates increments