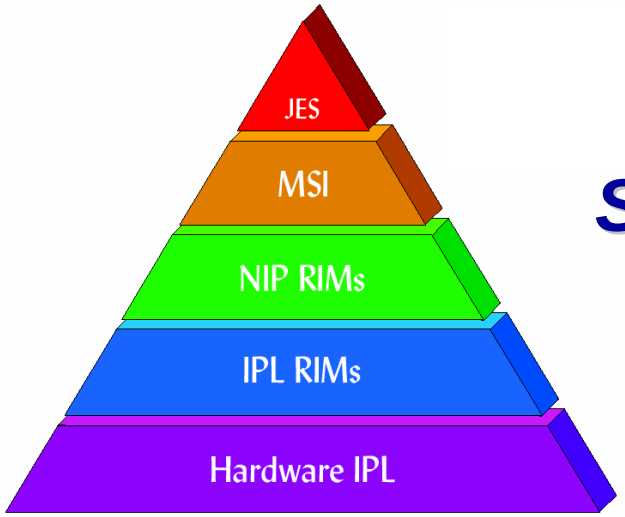

z/OS MVS
System Initialization Logic
Initial Program Load (IPL)

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Zürich | Mai 2006

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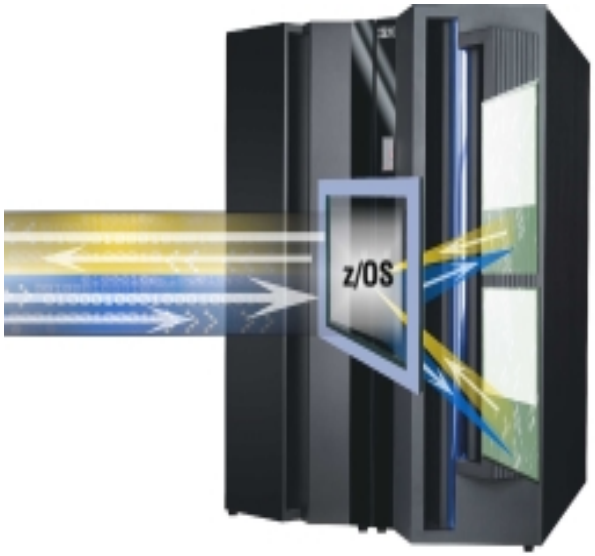
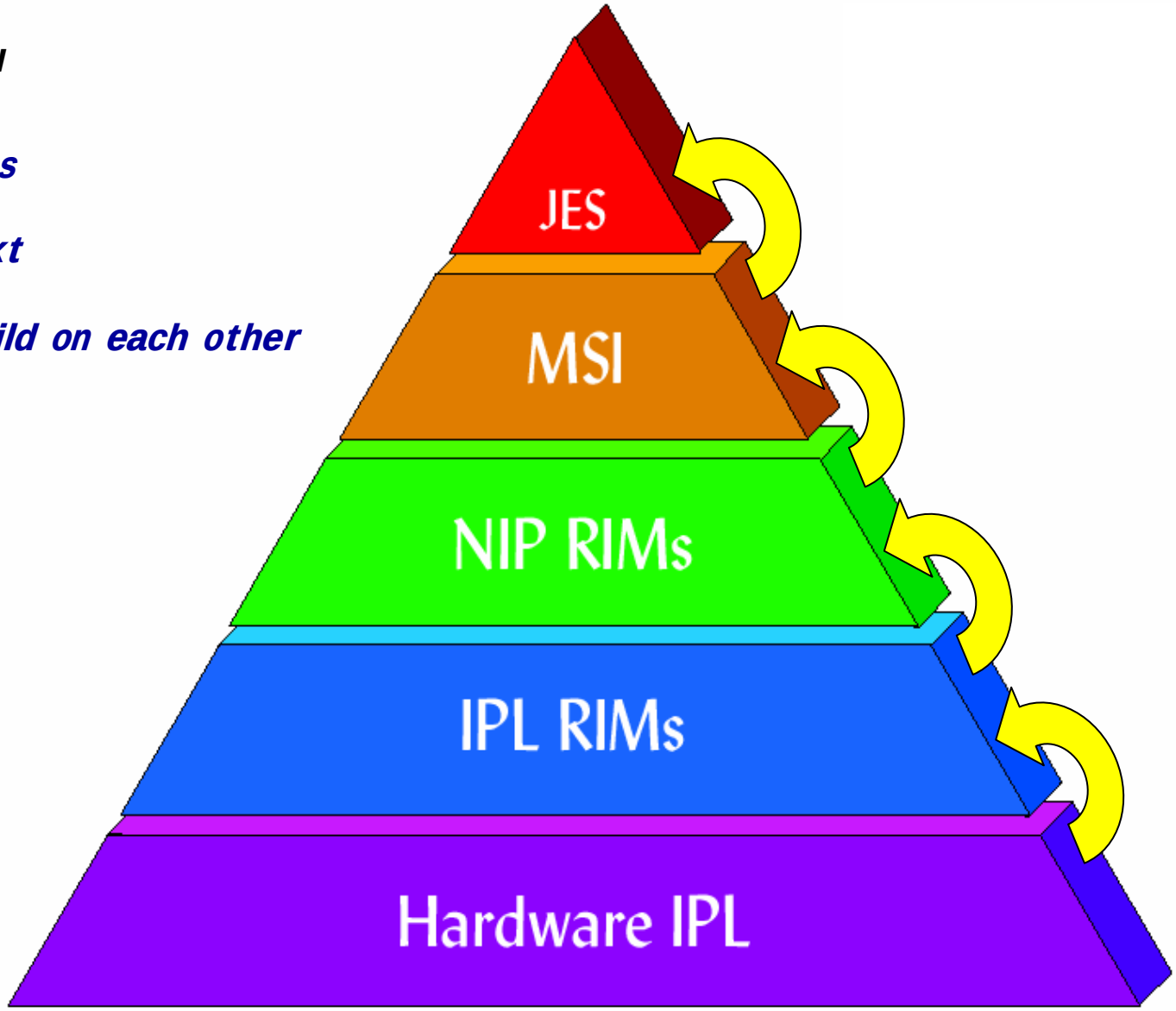
Abstract

- *This presentation will describe the general processing which is involved in initializing a z/OS system, from the IPL process until the system is ready to start either JES2 or JES3*
- *The major steps described are:*
  - *The hardware process of loading z/OS*
  - *The loading and initialization of the nucleus*
  - *The initialization of general system resources*
  - *Master Scheduler Initialization*
- *IBM may change the implementation of internal processing at any time with no prior notice*

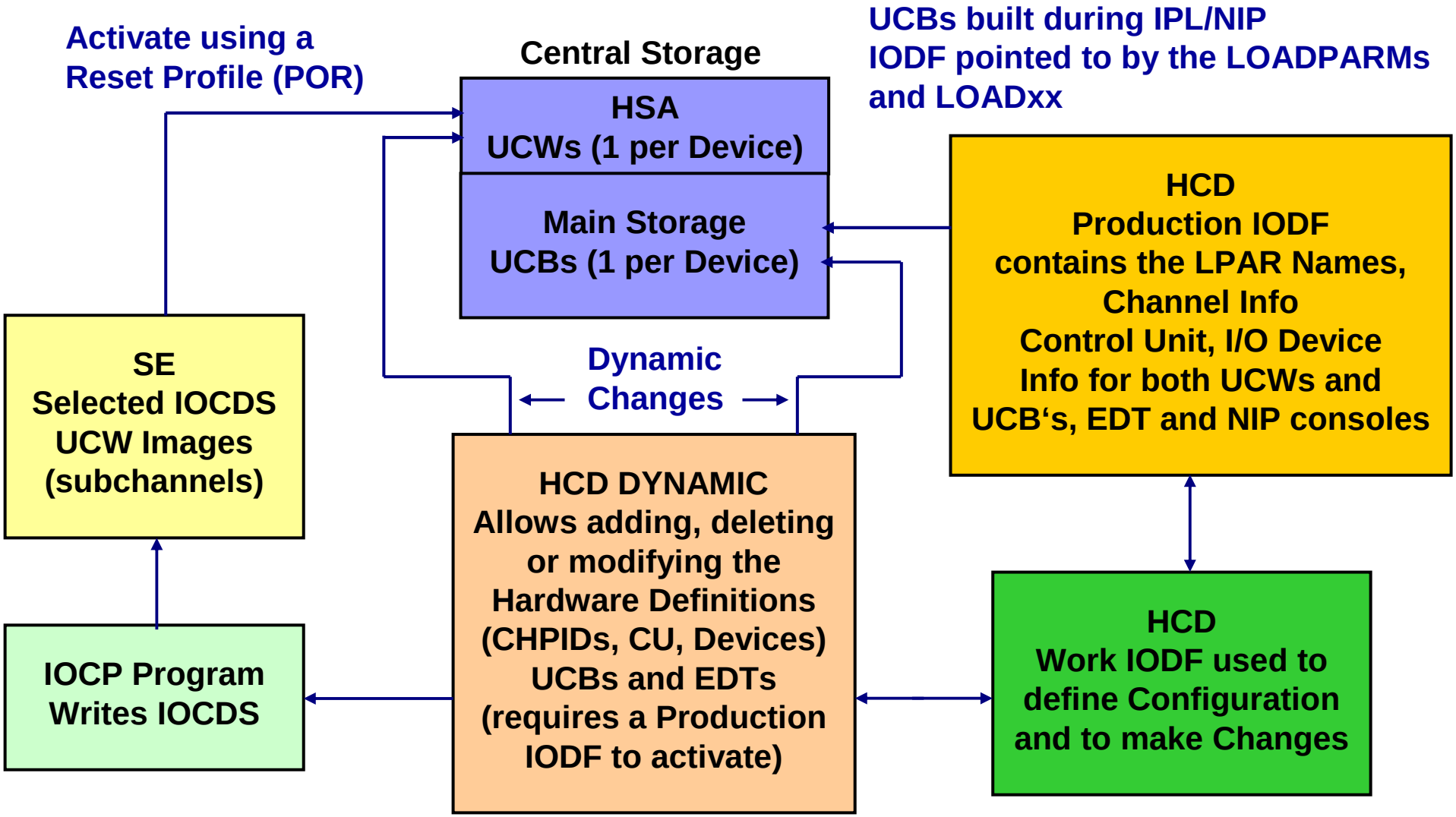
z/OS Initialization Overview

- *Processed in different phases*
- *Each phase builds on the next*
- *Within each phase, steps build on each other*

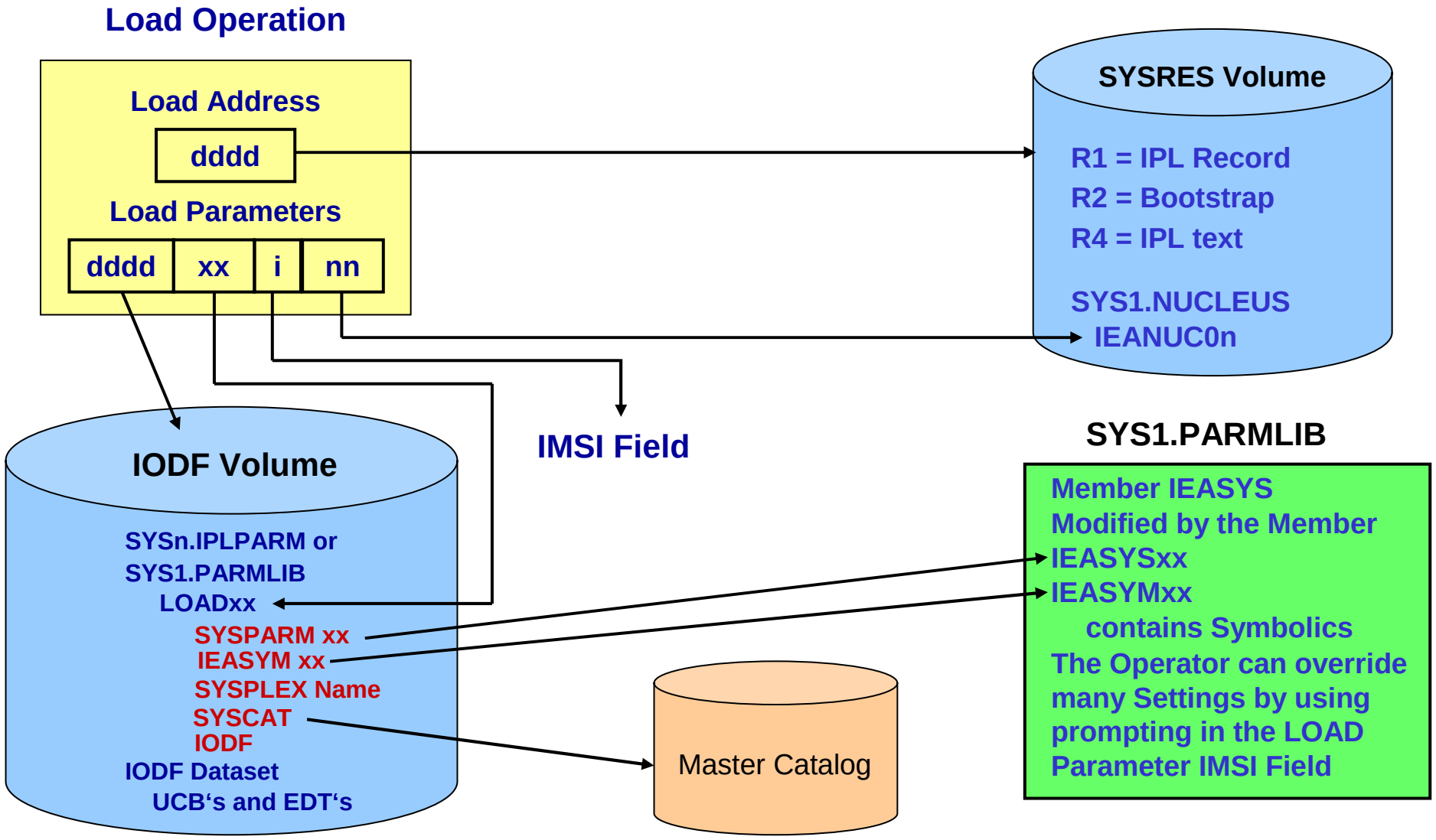




UCW and UCB Generation



Dataset Considerations – the big Picture



Load Parameters

IODF dddd	LOADxx xx	IMSI i	NUCx nn

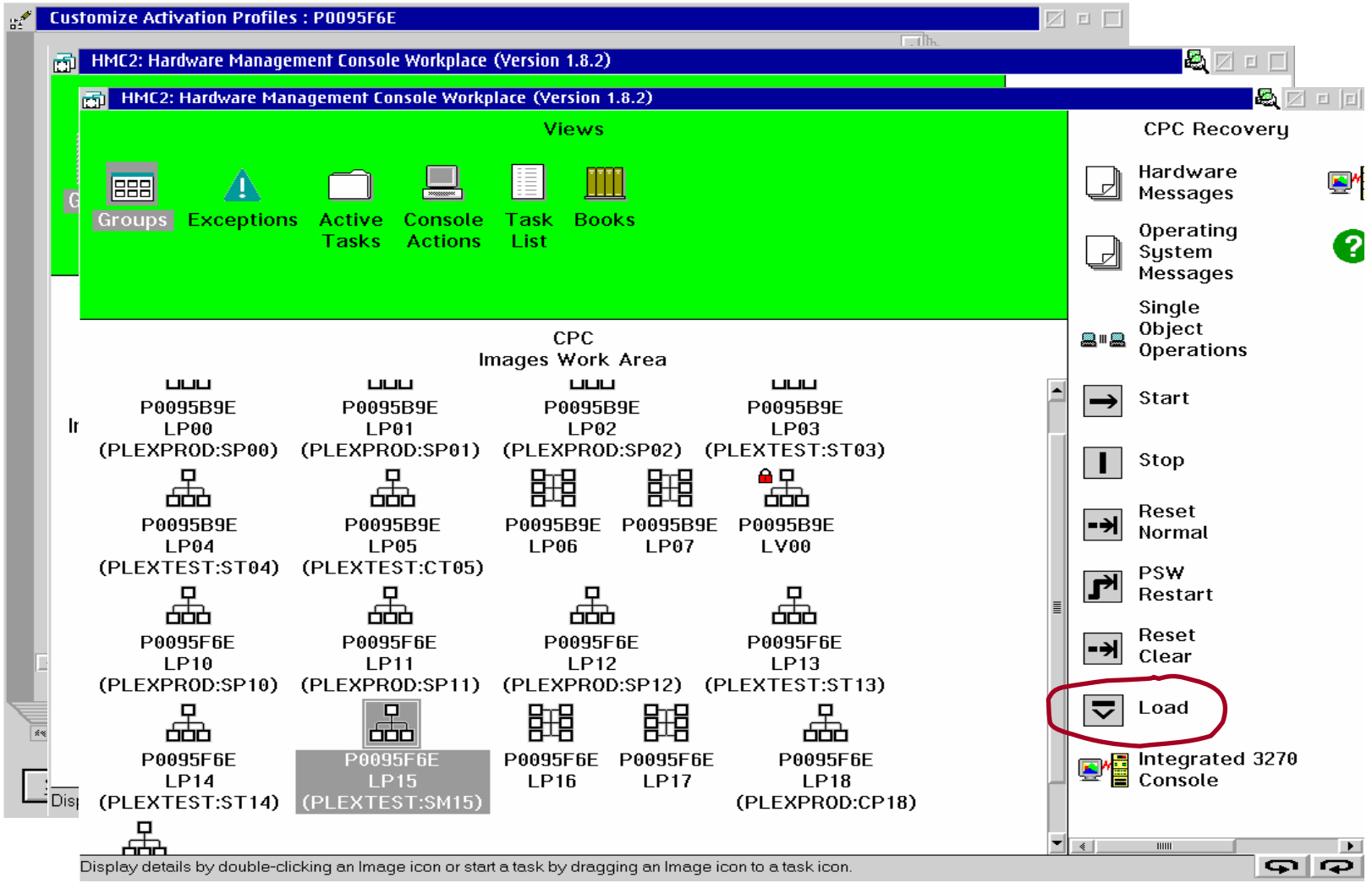
- ***DDDXXINN Load Parameter Values***
  - ***DDDD:*** *Device number of the volume containing the IODF dataset (Default is SYSRES)*
  - ***XX:*** *ID of the LOADxx member to be used (the default is LOAD00)*
  - ***I:*** *Initial Message Suppression Indicator (IMSI)*

    The default suppresses most informational messages and does not prompt for system parameters; will use the LOADxx values
  - ***NN:*** *Nucleus ID to be used (default is 1: IEANUC01)*

IMSI Character

IMSI Character	Display informational Messages	Prompt for Master Catalog Response	Prompt for System Parameter Response
Period (.) or blank	No	No	No
A	Yes	Yes	Yes
C	No	Yes	No
D	Yes	Yes	No
M	Yes	No	No
P	No	Yes	Yes
S	No	No	Yes
T	Yes	No	Yes

And all begins with a Mouse Click...

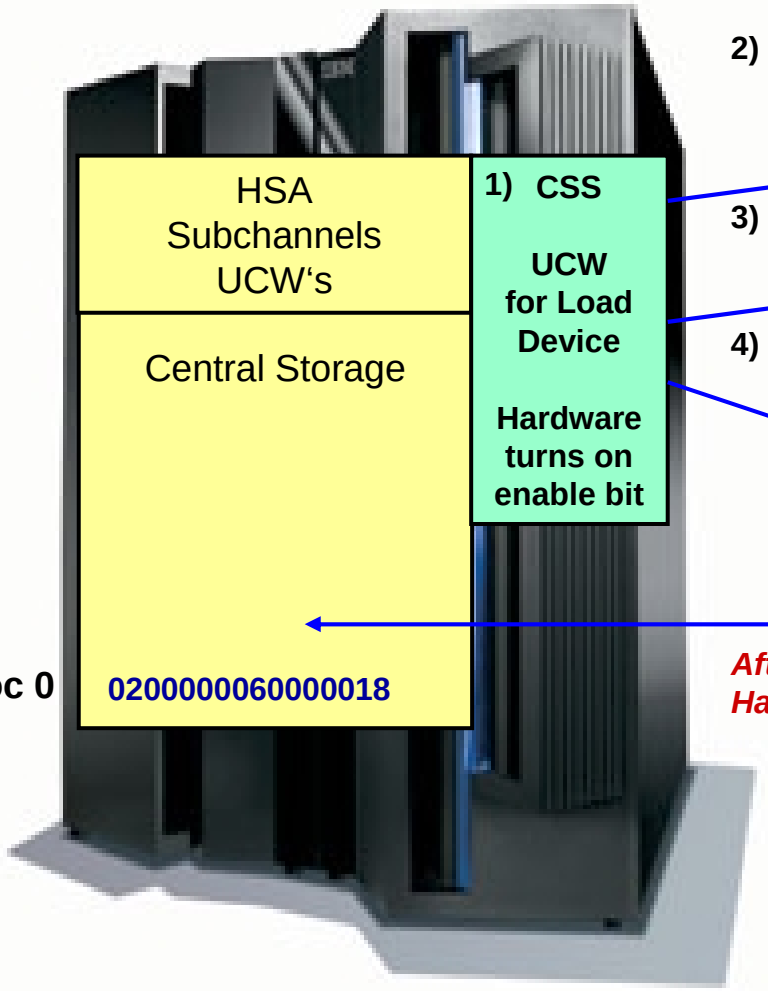


Hardware IPL Overview

- *Process is defined by the z/Architecture*
- *Controlled by hardware*
- *A single CPU is used for IPL - all other CPUs are placed into a manual (i.e. stopped) state*
- *A hardware system reset occurs before the process begins*
- *IPL records are written with ICKDSF*
  - *Cyl 0, Trk 0, R1, R2, IEAIPL00*

Hardware IPL Flow

Load Operation



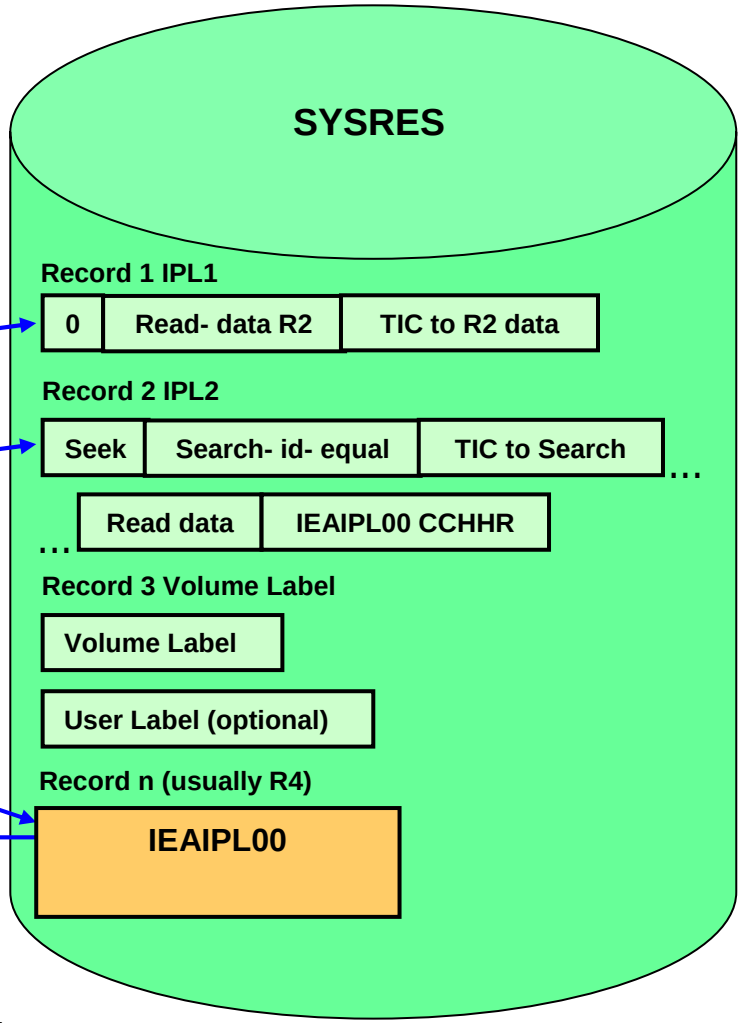
2) CSS sends IPL CCW to SYSRES DASD will seek to CYL 0, Head 0 and read Record 1

3) Record 1 will provide CCW's to read Record 2

4) Record 2 will provide CCW's to read Record 4

After Record 4 has been read the Hardware Portion of IPL is complete

5) IEAIPL00 Location 0 contains initial PSW



Hardware IPL Summary

- *Hardware generates an IPL read of 24 bytes into location 0*
  - *For DASD, this always reads cylinder 0, track 0, record 1*
- *Location 8 treated as a command chained CCW*
  - *Read record 2 into storage, command chain to next CCW*
  - *Transfer CCW execution to record 2 location*
  - *Seek and search for IEAIPL00 record*
  - *Read IEAIPL00 into location 0*
- *CCW chain completion, PSW is loaded from absolute 0 and execution begun*
  - *IEAIPL00 location 0 contains initial PSW*

- **Overview**
  - *Originally just loaded the Nucleus and set up the Master address space environment*
    - *Processing has gotten more complex with the XA architecture and Dynamic I/O support*
  - *Processing is single threaded*
  - *The IPL vector table (IVT) contains global information during this phase*
- **IEAIPL00**
  - *A mini operating system - non relocatable*
  - *Builds an initial virtual environment*
    - *IPL workspace located at X'20000000' virtual*
  - *Provides services to*
    - *Back virtual storage with real frames*
    - *Do I/O*
  - *Controls the IPL initialization process*
    - *Loads IPL Resource Initialization Modules (RIMs) into workspace*
    - *Gives them control*

IPL RIM Processing

1. *Test Block Instruction (clear Storage)*
2. *Read SCPINFO*
   - *Get loadparm*
   - *Set autostore status on*
3. *Locate usable real storage at top of memory*
4. *Get IPL load parameters, and set any defaults*
5. *Search LOADxx, process the information in LOADxx*

```
IEA371I SYS0.IPLPARM ON DEVICE 5411 SELECTED FOR IPL PARAMETERS ← first Message displayed on NIP Console
IEA246I LOAD   ID 00 SELECTED
```

6. *Search IODF, process the information in the IODF*

```
IEA246I NUCLST ID 00 SELECTED
IEA519I IODF DSN = SYSIOD.IODF24
IEA520I CONFIGURATION ID = SM15DPRI. IODF DEVICE NUMBER = 5411
```

- *Build a table of NIP consoles*
  - *max. number of NIP consoles supported by IPL RIM is 64 (HCD supports 128)*
    - *see APAR OA12877 for additional information*

IPL RIM Processing...

6. *process the information in the IODF (cont.)*
   - *Invoke the device UIMs to*
     - *Identify device specific nucleus and LPA modules*
     - *Calculate required SQA and ESQA*
     - *Build device control blocks in the workspace*
     - *Build the Allocation EDT in the workspace*
7. *Create a map of the DAT-on nucleus CSECTs*

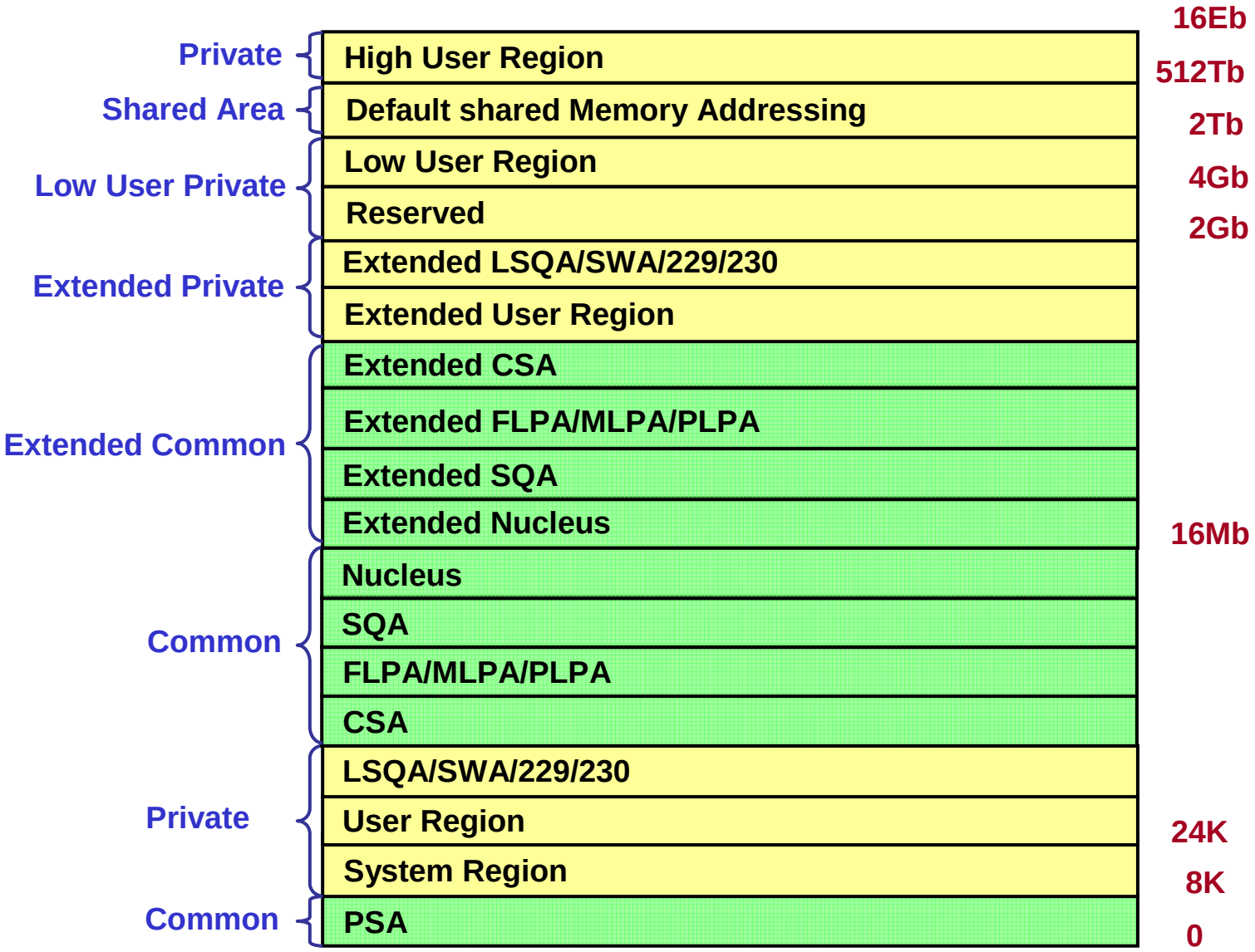
```
IEA091I NUCLEUS 1 SELECTED
IEA093I MODULE IEANUC01 CONTAINS UNRESOLVED WEAK EXTERNAL REFERENCE
IFFIOM
IEA093I MODULE IEANUC01 CONTAINS UNRESOLVED WEAK EXTERNAL REFERENCE
IEDQATTN
IEA093I MODULE IEANUC01 CONTAINS UNRESOLVED WEAK EXTERNAL REFERENCE
IECTATEN
```

   - *Includes modules identified by NMLs, NUCLSTxx, and UIMs*
   - *CSECTs are grouped/positioned by attributes, RMODE and read-only*
8. *Load modules, dynamically resolving external references*

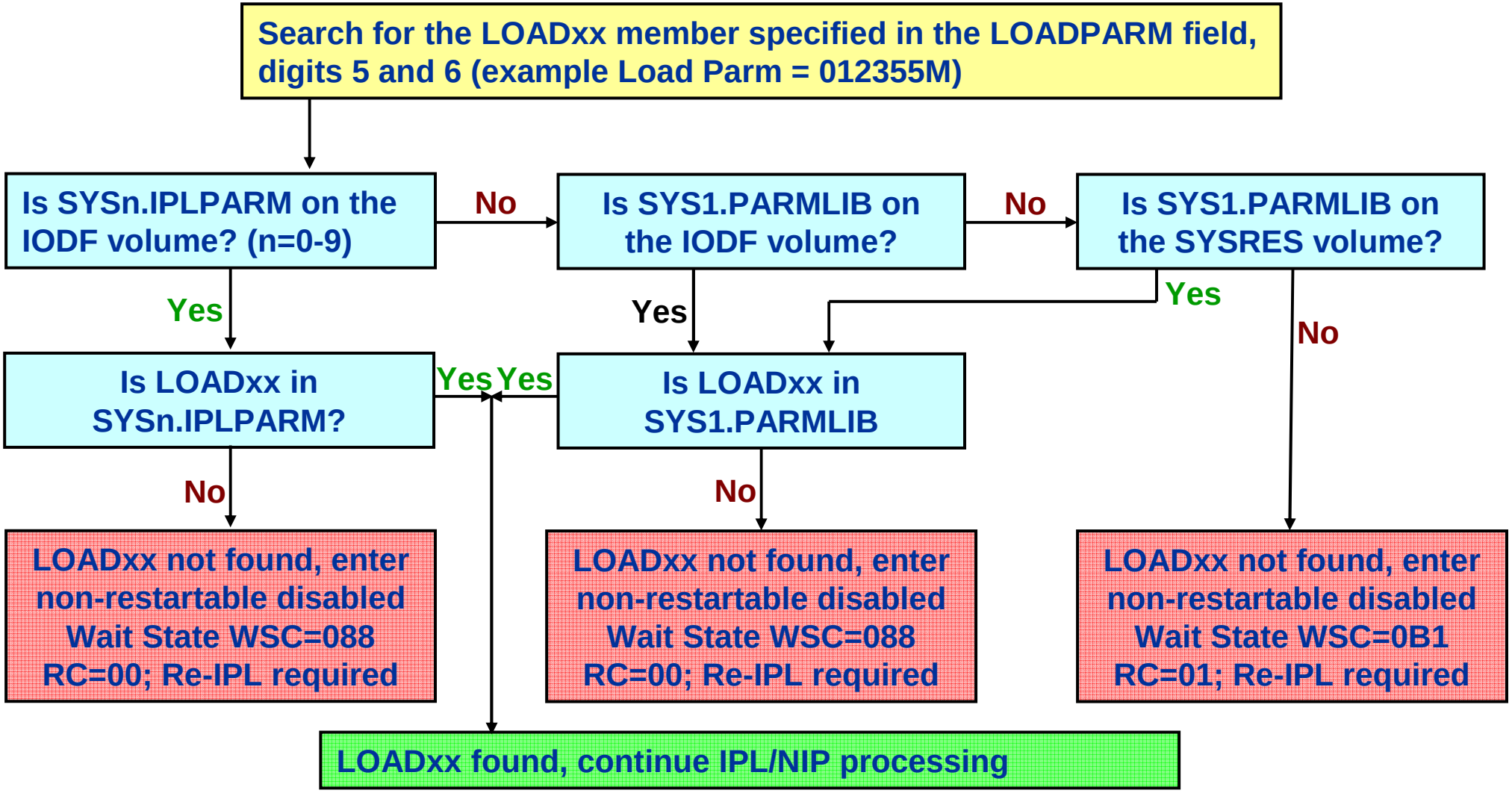
IPL RIM Processing...

9. Create the initial SQA/ESQA areas
   - Sum of IBM supplied value, LOADxx INITSQA, UIM determined value
10. Create Master's VSM control blocks and LSQA
11. Create Master's permanent page and segment tables
12. Move from the workspace into SQA/ESQA
    - Device control blocks
    - Allocation EDT
    - IPL Messages
    - LPA device support module list
13. Validate real storage, build available frame queue
    - IPL workspace is destroyed
14. Load Prefix Register
15. Switch to nucleus version of the PSA

Virtual Storage Layout

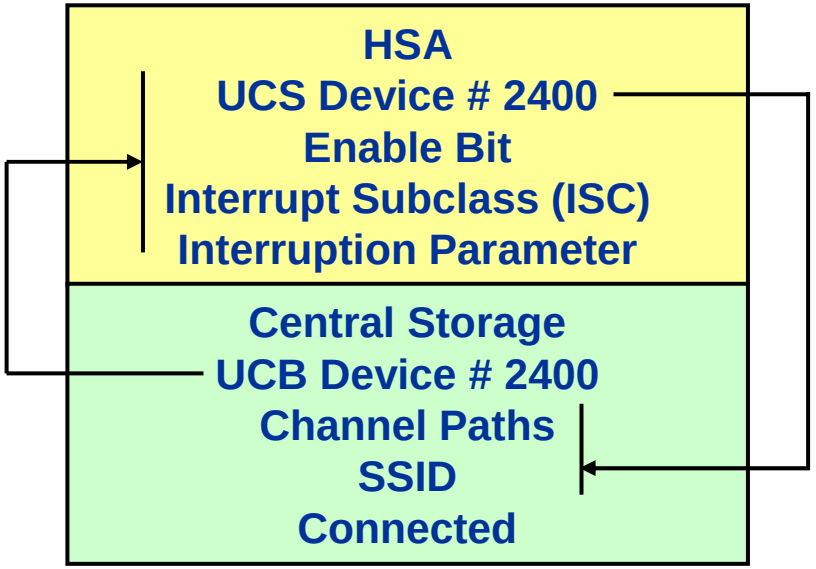


LOADxx Search Sequence



- **Overview**
  - *Initializes basic system resources*
  - *Processing is multithreaded - normal dispatching of work is done*
  - *Basic system service (SRBs, WAIT, POST, EXCP, ATTACH, etc.) are initially available*
  - *Additional services enabled as NIP RIMs run*
  - *The NIP vector table (NVT) contains global information during this phase*
- **Control routine**
  - *Sets traps for unexpected errors (no RTM support is available yet)*
  - *Verifies the hardware environment*
  - *Creates IPL processor control blocks*
  - *Creates global VSM control blocks*
  - *Creates I/O control block pools*
  - *Creates the initial system trace table*
  - *Opens SYS1.NUCLEUS as the LNKLST*
  - *Loads and invokes NIP RIM routines*

UCW to UCB Mapping



In order for MVS to use a device:

- ***a UCW for the device must exist***
- ***a UCB for the device must exist***

During device mapping:

- ***each matching UCW is enabled***
- ***each matching UCB is connected***

During the mapping process, the I/O configuration (UCWs) loaded into the HSA with a POR (or updated via dynamic I/O) is matched with the operating system configuration (UCBs) defined in the IODF

The UCWs are placed in the *disabled* state after POR or system reset

Initial UCB state:

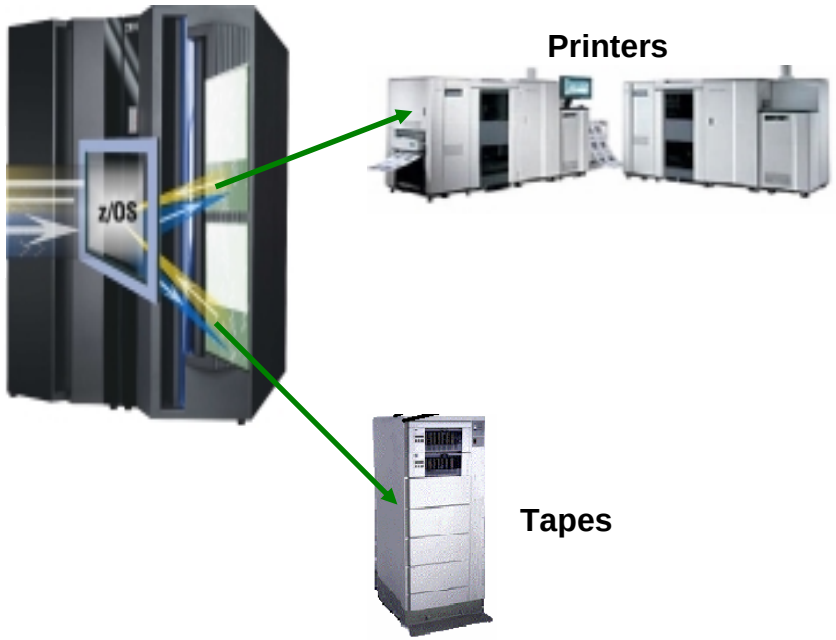
- **the UCBs are built with the "not connected" state bit = 1 (UCB byte 7, bit 2)**
- **at the completion of this mapping process all devices defined to both the channel subsystem (UCWs) and MVS (UCBs) will be enabled and connected**
  - ***any UCWs without corresponding UCBs will be left disabled***
  - ***any UCBs without corresponding UCWs will be left not connected***

Devices in either one of these states cannot be used by the system

Non-DASD Pathing

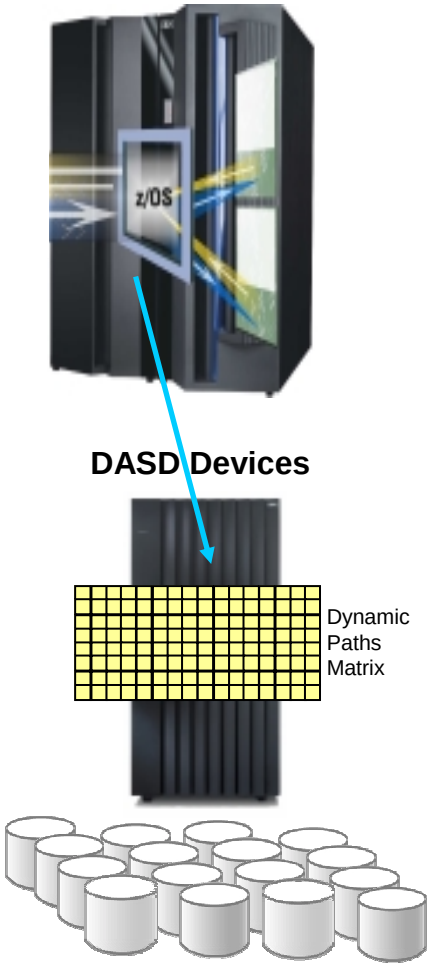
- The process of determining path availability is referred to as Pathing
  - during this process MVS will check all paths for devices genned to come up *online* by attempting to complete an I/O operation down each path defined to a device
  - if at least one path is operational the device will be online
  - Tapes are an exception: pathing is performed to offline tape devises

MVS does not report any paths or devices that are found to be not operational during pathing



DASD Pathing

- **A NIP console is required before DASD pathing takes place to allow the operator to respond to out-of-line conditions encountered during the DASD pathing**
  - **Issue SSCH to multiple devices (test multiple devices in parallel)**
  - **After each successful I/O another device is tested**
  - **Redrive another device if an I/O is complete for a device**
    - ***If an I/O fails to complete within 15 seconds, the I/O operation is purged***
  - **Perform path testing on each path**
    - ***no 1.5 sec. timeout (no IOS120A message during path testing)***
    - ***create PIM (Path Installed Mask), represents CHPID's defined in IOCDS***
    - ***create LPM (Logical Path Mask), used by UCB to control paths to be used for an I/O operation***
  - **Get device characteristics – one path**
  - **Self description – each path (msg IOS291I)**
  - **VOLSER checking – one path for SDP products (all paths for other DASD)**
    - ***duplicate VOLSER message (IEA213A – not SYSRES, IEA214A SYSRES)***
  - **at end of pathing wait 15 seconds for any outstanding I/O to complete**
    - ***mark any UCB with outstanding I/O to test later again***
    - ***purge all outstanding requests***



DASD Pathing...

1 (P)	2 (D)	3 (S)	4 (V)
Path Testing	UCB Device Characteristics Initialization	SDP	VOLSER
Each Path	One Path	Each Path	One Path SDP Device Each Paths non-SDP device
CCW: 94 Release	CCWs: E4 Sense Id; 64 RDC; 54 Subsystem; FA RCD	CCWs: E4 Sense Id (one Path) FA RCD (each Path)	
Messages: IGGN504A; IGGN505A; Required Dataset missing; IOS120A moved to MSI	Message: IEC334I (duplicate SSID)	Message: IOS291I (Configuration Mismatch)	Messages: IEA213A; IEA214A (Duplicate VOLSER)

DASD pathing consists of 4 different phases: path testing on each path (P), read device characteristics (D), self-describing product (S) and VOLSER processing (V)

Any error consitions detected during the DASD pathing steps are reported to the NIP console via messages IGGN504A, IGGN505A, IEC334I, IOS291I, IEA213A or IEA214A (*any A or action messages requires operator response*)

CCW = Channel Command Word
RCD = Read Configuration Data
RDC = Read Device Characteristics
SDP = Self-describing Product
SSID = Subsystem ID (DASD CUs)

DASD Pathing…

- **Dynamic Pathing Error Messages**

```
IOS291 CONFIGURATION DATA COULD NOT BE READ ON PATH (24C0,49) RC=21
```

- IOS291I messages with a RC of 21, 27 or 29 indicate a possible configuration error and should be investigated

```
IEC334I DUPLICATE SUBSYSTEM X‘0001‘,CCA X‘00‘, DEVIVE 24C0 NOT BROUGHT ONLINE
```

- In addition the the IOS291I messages, a misconfiguration problem to a DASD CU may also show up as a duplicate SSID condition

```
IEA213A DUPLICATE VOLUME ‘SPOOL1‘ FOUND ON DEVICES 2465 AND 28A0
IEA213A REPLY DEVICE NUMBER WHICH IS TO REMAIN OFFLINE

IEA214A DUPLICATE SYSRES ‘S15R21‘ FOUND ON DEVICE 22C4
IEA214A VERIFY THAT THE CORRECT DEVICE WAS USED FOR IPL
IEA214A DUPLICATE DEVICE WILL REMAIN OFFLINE
IEA214A REPLY ‘CONT‘ TO CONTINUE IPL
```

- The last step of dynamic pathing is Direct Access Volume Verification (DAVV)
- DAVV processing reads the volume label of each online DASD device and updates the UCB with the VOLSER
- If a duplicate VOLSER exists, either message IEA213A or IEA214A will be issued

DASD Pathing…

- **Dynamic Pathing Error Messages…**

```
IGGN505A SPECIFY UNIT FOR SYS1.PRODXY.LINKLIB ON DCSYS2 OR CANCEL

R 00,1A60
IEE600I REPLY TO 00 IS;1A60
```

- If the busy condition still exists IOS120A will be issued

```
*IOS120A DEVICE 1A60 SHARED, REPLY ‘CONT‘ OR ‘WAIT‘
 IOS600I REPLY TO 00 IS ‘WAIT‘
*IOS124A STILL WAITING FOR RESPONSE FROM DEVICE 1A60, TOTAL WAIT TIME
 IS 46 SECONDS, REPLY ‘CONT‘ OR ‘WAIT‘

*IOS120A DEVICE 1A60 SHARED, REPLY ‘CONT‘ OR ‘WAIT‘
 IOS600I REPLY TO 00 IS ‘WAIT‘
 IGGN306I 1A60,UNIT UNACCEPTABLE, 00000004
 IGGN505A SPECIFY UNIT FOR SYS1.PRODXY.LINKLIB ON DCSYS2 OR CANCEL
```

- IGGN504A or IGGN505A message issued if required dataset is on a volume that was busy during DASD pathing and the dataset is required for the IPL to complete
- Issue D U,VOL=vvvvvv on an active system that shares the DASD device to obtain the device number associated with the VOLSER

NIP RIM Processing

1. Create RTM recovery and control blocks
2. Create WTO control blocks and pools
   - WTOs issued now will be logged in SYSLOG
3. Initialize Machine Check handling (MCH)
4. Device mapping (UCWs to UCBs), test availability, and initialize non-DASD devices
5. Select and initialize NIP
   - WTOs will now be displayed on the NIP console
6. Test availability, and initialize DASD devices (DASD Pathing)
   - Operator can be prompted during validation
7. Open the master catalog
8. Create the system symbolics from IEASYMxx
9. Open SVCLIB, PARMLIB, and LOGREC
10. If required, prompt for system parameters (message IEA101A)
11. Merge and analyze the system parameters

NIP RIM Processing...

12. *Initialize ASM, opening page and swap datasets*
13. *Process SQA= parameter*
    - *On a quickstart (CLPA not specified), PLPA boundaries control SQA/ESQA boundaries*
    - *On a coldstart, expand initial SQA/ESQA*
14. *Create user SVC table entries from IEASVCxx*
15. *Create the PLPA if CLPA specified*
    - *LPALSTxx datasets*
    - *UIM specified device support from SYS1.NUCLEUS*
16. *Create FLPA and MLPA, fix FLPA area and protect both areas as requested*
17. *Complete type 3 and 4 SVC table entries*
18. *Process CSA= parameter*
19. *Initialize system resource manager (SRM)*
20. *Enable RTM for task termination / SRB purge*
    - *Limited Function Address spaces can now be created by master scheduler*
21. *Initialize Cross-memory services, creates PCAUTH address space*

NIP RIM Processing...

22. *Initialize RSM Dataspace services, creates RASP*
23. *Initialize System Trace services, creates TRACE*
24. *Initialize Timing services, sets TOD if needed*
25. *Initialize SVC dump services, creates DUMPSRV address space*
26. *Initialize XCF/XES services, creates XCFAS address space*
27. *Initialize GRS services, creates GRS address space*
28. *Initialize SMS and PDSE services, creates SMXC and SYSBMAS address spaces*
29. *Open LNKLST -- drops SYS1.NUCLEUS*
30. *Initialize Console services, creates CONSOLE address space*
    - *Full function console is still unavailable*
31. *Initialize WLM services, creates WLM address space*
32. *Initialize data management*
33. *Initialize Concurrent-copy, creates ANTMAIN and ANTAS000 address spaces*
34. *Initialize UNIX System Services, creates OMVS address space*

NIP RIM Processing...

35. *Close master catalog*
36. *Initialize Catalog services, creates CATALOG address space*
    - *Limited function, for use until MSI completes*
37. *Exit NIP processing*
    - *Create the IPL parameter area (IPA)*
    - *Free control blocks no longer needed by NIP*
    - *Reset traps for unexpected errors, enables full RTM recovery/retry*
    - *LINK to Master Scheduler processing*

- **Master Scheduler Initialization (MSI) Overview**
  - *Completes initialization of system functions*
  - *Coordinates final completion with primary subsystem (JES2/JES3)*
- **Basic Processing**
  - *Initialize Master Trace processing*
  - *Enable full function Console processing*
    - *All MCS consoles are now available*
  - *Initialize Sysplex-wide ENF services, creates IEFSCHAS address space*
  - *Initialize MSTR subsystem*
  - *Initialize Common JES services, creates JESXCF address space*
  - *Initialize Allocation services, creates ALLOCAS address space*
  - *Attach Initiator to start Master JCL*

MSI Processing Details

1. *Initialize MIH services*
2. *Complete ASM initialization*
3. *Initialize IOS dynamic pathing, create IOSAS*
4. *Initialize Master's security environment*
5. *Initialize Console attributes, DEL=RD etc.*
6. *Initialize APPC services*
7. *Initialize TSO services*
8. *Initialize LOGREC Logstream recording*
9. *Enable ENF services*
10. *Initialize System Logger services, creates IXGLOG address space*
11. *Vary all available CPs online*
    - *we are now multiprocessing*
12. *Initialize SMF services, creates SMF address space*

MSI Processing Details…

13. *Issue commands in IEACMD00 and COMMNDxx parmlib members*
    - *only commands processed by CONSOLE will execute now*
14. *Initialize RTM services*
    - *LOGREC recording*
    - *Address space termination*
    - *SVC dump processing*
15. *Initialize System security processing*
16. *Build defined subsystems*
    - *Invoke initialization routine*
    - *Issue START for primary JES subsystem, if requested*
17. *Hold primary JES STC and TSO processing*
18. *Indicate MSI is complete*
19. *Initialize Master command processing*
    - *Any pending commands that execute in Master will now be executed*
    - *Start commands are executed by Master*

MSI Processing Details…

Full function address spaces can be created - JES and other tasks started under MSTR will now start

20. *Issue command processing available message*
21. *Allow pending address space creates (not done by Master) to complete*
    - *Create full function CATALOG*
    - *Original CATALOG terminates*
    - *Address spaces may switchover from limited to full function*
22. *Wait for JES to indicate primary services are available*
    - *Release primary JES STC and TSO processing*
    - *Start the System Log Syslog/OPERLOG*

All IPL processing is now complete

The next and final step is to bring up and initialize the job entry subsystem (JES2 or JES3)

IPCS Display IPL Statistic

VERBX BLSAIPST

```
*** IPL Statistics ***

IEAIPL10  00:00:00.000  ISNIRIM - Read SCPINFO
IEAIPL20  00:00:01.257  Test Block storage to 2G
IEAIPL11  00:00:00.009  Fast FIND service
IEAIPL31  00:00:00.001  LOAD service
IEAIPL30  00:00:00.007  IPLWTO service
IEAIPL46  00:00:00.166  Read SCHIBs into IPL workspace
IEAIPL49  00:00:00.000  Process Load and Default parameters
IEAIPL50  00:00:01.784  IPL parmlib - process LOADxx and NUCLSTxx
IEAIPL51  00:00:00.012  System architecture
IEAIPL43  00:00:00.010  Find and Open IODF data set
IEAIPL60  00:00:00.000  Read NCRs from IODF
IEAIPL70  00:00:00.158  UIM environment - load CBD and IOS services
IEAIPL71  00:00:00.199  Build DFT for each device
IEAIPL08  00:00:00.029  Read EDT information from IODF
IEAIPL40  00:00:00.107  Read MLTs from nucleus
IEAIPL42  00:00:00.006  Read NMLs from nucleus (IEANynnn modules)
IEAIPL41  00:00:01.662  Read PDS directory entries and CESD records
IEAIPL05  00:00:00.595  Build and sort NUCMAP
IEAIPL02  00:00:06.357  Load nucleus modules
IEAIPL04  00:00:00.014  Allocate PFT and SQA/ESQA
IEAIPL14  00:00:00.000  Build LSQA/ELSQA for Master
IEAIPL06  00:00:00.000  IARMI - RSM blocks, master SGT
IEAIPL09  00:00:00.047  IAXMI - PFT, master RAB,  etc.
IEAIPL07  00:00:00.019  Update AMODE for nucleus resident SVCs
IEAIPL03  00:00:00.052  Build UCBs, ULUT, etc.
IEAIPL18  00:00:00.093  Copy and relocate EDT to ESQA
IEAIPL99  00:00:00.317  Page frame table and cleanup

Total IPL Time:  00:00:12.914
```

To determine the time required for an IPL in your installation, use

IPCS VERBX BLSAIPST

to display IPL statistics information

IPCS Display IPL Statistic...

```
*** NIP Statistics ***

IEAVNIP0  00:00:00.071  NIP Base
IEAVNIPM  00:00:00.114  Invoke NIP RIMs
IEAVNPE6  00:00:00.099  Service Processor Interface
IEAVNPFF  00:00:00.056  Loadwait/Restart
IEAVNPA6  00:00:00.032  RTM - RTCT and recording buffer
IEAVNPC6  00:00:00.018  WTO
IEAVNPC3  00:00:00.025  Issue messages from IPL message queue
IEAVNP24  00:00:00.072  SMS Open/Mount
IEAVNP06  00:00:00.034  Machine Check
IEAVNP27  00:00:00.029  Reconfiguration
IEAVNPA2  00:01:25.428  IOS - Non-DASD UCBs
IEAVNPCA  00:00:00.012  NIP Console
IEAVNPB2  00:00:08.569  IOS - DASD UCBs
IEAVNP11  00:00:00.032  Locate and Open master calalog
IEAVNPC7  00:00:00.008  Open SYS1.SVCLIB
IEAVNPOP  00:00:00.054  Open PARMLIB
IEAVNPIL  00:00:00.179  Process IEALSTxx
IEAVNPC4  00:00:00.015  Prompt for System Parameters
IEAVNP03  00:00:00.009  Merge and analyze system parameters
IEAVNPCF  00:00:04.189  Process system name and system variables
IEAVNP76  00:00:00.022  Open LOGREC
IEAVNPE8  00:00:00.039  RSM - Process REAL=
IEAVNP23  00:00:00.037  Build GRS blocks in SQA
IEAVNP04  00:00:00.102  ASM - Open page and swap data sets
IEAVNPA8  00:00:00.012  VSM - Expand SQA
IEAVNPC2  00:00:00.057  IOS - Move CDT to SQA
IEAVNP14  00:00:02.276  ASM part 2 - Build SQA control blocks
IEAVNPGD  00:00:00.004  Move console data to ESQA
IEAVNP25  00:00:00.033  Process SVC=
IEAVNP05  00:00:16.493  LPA, APF
IEAVNP44  00:00:00.003  ASA Reuse stuff
IEAVNPB1  00:00:00.002  Process CSCBLOC=
```

IPCS Display IPL Statistic...

```
IEAVNPE2  00:00:00.005  RACF SAF
IEAVNPB8  00:00:00.019  Create CSA
IEAVNP47  00:00:00.003  ENF
IEAVNPD6  00:00:00.002  RTM - SDUMP, ABDUMP, ESTAE
IEAVNP09  00:00:00.003  Build ASVT
IEAVNPD8  00:00:04.891  RSM - Frame queues, VRREGN= and RSU=
IEAVNP10  00:00:00.015  SRM - OPT=, IPS=, etc.
IEAVNPD1  00:00:00.023  ABDUMP
IEAVNPD2  00:00:00.030  SDUMP
IEAVNPCX  00:00:00.003  Context services, registration services
IEAVNPX1  00:00:00.021  NIP cleanup
IEAVNPF5  00:00:00.156  PCAUTH
IEAVNPF8  00:00:00.167  RASP
IEAVNP1F  00:00:00.232  SRM - I/O measurement blocks
IEAVNP51  00:00:00.262  TRACE
IEAVNP20  00:00:00.029  Process CLOCK=
IEAVNP21  00:00:13.894  TOD clock
IEAVNP57  00:00:00.026  SDUMP
IEAVNPF9  00:00:17.681  XCF
IEAVNP33  00:00:31.126  GRS
IEAVNPLM  00:00:00.017  License manager
IEAVNPED  00:00:00.033  PROD
IEAVNP26  00:00:01.683  SMS
IEAVNPE5  00:00:05.086  LNKLST
IEAVNPD5  00:00:00.718  Load pageable device support modules
IEAVNP88  00:00:00.269  Allocation move EDT II
IEAVNPA1  00:00:29.221  CONSOLE
IEAVNPDC  00:00:01.513  WLM
IEAVNP16  00:00:01.358  EXCP appendages
IEAVNP13  00:00:00.127  Prepare NIP/MSI interface
IEAVNP17  00:00:00.033  GTF Monitor Call interface
IEAVNPG8  00:00:00.048  VSM defined monitor call enablement
IEAVNP18  00:00:00.614  PARMLIB Scan Routine interface
IEAVNPF2  00:00:00.327  Process IOS=
```

IPCS Display IPL Statistic...

```
IEAVNP15  00:00:01.401  Process VATLST
IEAVNPRR  00:00:00.020  RRS
IEAVNPOE  00:00:01.512  USS
IEAVNPLE  00:00:00.112
IEAVNPUN  00:00:02.481  Unicode
IEAVNPXE  00:00:00.029
IEAVNP1B  00:00:00.381  Close catalog
IEAVNIPX  00:00:00.001  Nip final cleanup

Total NIP Time:  00:03:53.732
```

IPCS Display IPL Statistic...

```
*** IEEVIPL Statistics ***

IEETRACE  00:00:00.013  Master trace
ISNMSI    00:00:01.526  SPI
UCMPECBM  00:00:02.734  CONSOLE address space
ENFPC005  00:00:00.000  CONSOLE ready ENF
IEFSCHIN  00:00:00.872  IEFSCHAS address space
IEFJSINT  00:00:00.003  Subsystem interface
IEFSJLOD  00:00:00.134  JESCT
IAZINIT   00:00:00.250  JESXCF address space
IAZFSII   00:00:00.104  FSI trace
IEFQBINT  00:00:00.134  SWA manager
IEFAB4I0  00:00:00.673  ALLOCAS address space

IEEVIPL   00:00:06.448      Uncaptured time:  00:00:00.000

*** IEEMB860 Statistics ***

ILRTMRLG  00:00:00.687  ASM
IECVIOSI  00:00:38.264  IOS dynamic pathing
ATBINSYS  00:00:00.012  APPC
IKJEFXSR  00:00:00.194  TSO
IXGBLF00  00:00:00.029  Logger
ILMINITM  00:00:00.036  License manager
COMMNDXX  00:00:24.721  COMMANDxx processing
SMFWAIT   00:00:00.098  SMF
SECPROD   00:00:19.375  Security server
IEFJSIN2  00:00:10.062  SSN= subsystem
IEFHB4I2  00:00:00.019  ALLOCAS - UCB scan
CSRINIT   00:00:00.010  Windowing services
FINSHMSI  00:00:00.000  Wait for attached CMDs

IEEMB860  00:01:33.612      Uncaptured time:  00:00:00.098

Total Time:  00:05:46.708
```

Tip: in the IPCS dialog, to display the last IPL statistic using in-storage source rather than an SVC dump, proceed as follows:

1. Select IPCS option 6 (commands)
2. Issue DROPD MAIN
3. (delete data from a previous IPCS session using in-storage as source)
4. Issue VERBX BLSAIPST MAIN

Terms and Abbreviations

- **ASM** Auixiliary Storage Manager
- **ENF** Event Notification Facility
- **IOCP** I/O Configuration Program
- **IOS** Input/Output Supervisor
- **IRIM** IPL Resource Initialization Module
- **MCH** Machine Check Handler
- **MIH** Missing Interrupt Handler
- **NIP** Nucleus Initialization Phase
- **RIM** Resource Initialization Module
- **RTM** Recovery Termination Manager
- **SRM** System Resource Manager
- **SYSRES** System residence Volume
- **UCB** Unit Control Block
- **UIM** Unit Information Module

DAT Dynamic Address Translation
IOCDS I/O Configuration Data Set
IODF I/O Definition File
IPL Initial Program Load
JES Job Entry Subsystem
MCS Multiple Console Support
MSI Master Scheduler Initialization
POR Power-on-Reset
RSM Real Storage Manager
SMS System managed Storage
SVC Supervisor Call
TOD Time of Day Clock
UCW Unit Control Word
VSM Virtual Storage Management

The End...any Questions?