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Managing I/O Configuration from z/VM

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Agenda

In this session, we will cover an overview of,

- What is an I/O Configuration?
- HCD for z/VM & HCM
- IOCP & z/VM Dynamic I/O Configuration Commands

Disclaimer - The content of this presentation is for information only. Each site is responsible for their own use of the concepts and examples presented.

What is an I/O Configuration?

I/O Configuration

- Definition of devices/resources that are available in the processor complex
- Resources include Logical Channel Subsystems (LCSS), Logical Partitions (LPARs), channels, DASD & tape devices, etc.
- **Definition of resources include**
  - How to identify a resource
  - Resource characteristic like Type/Model
  - How to reach a resource
  - Relationship between resources (if any)
- Channel Subsystem (CSS) & Operating System (OS) must know about the resources they will be working with

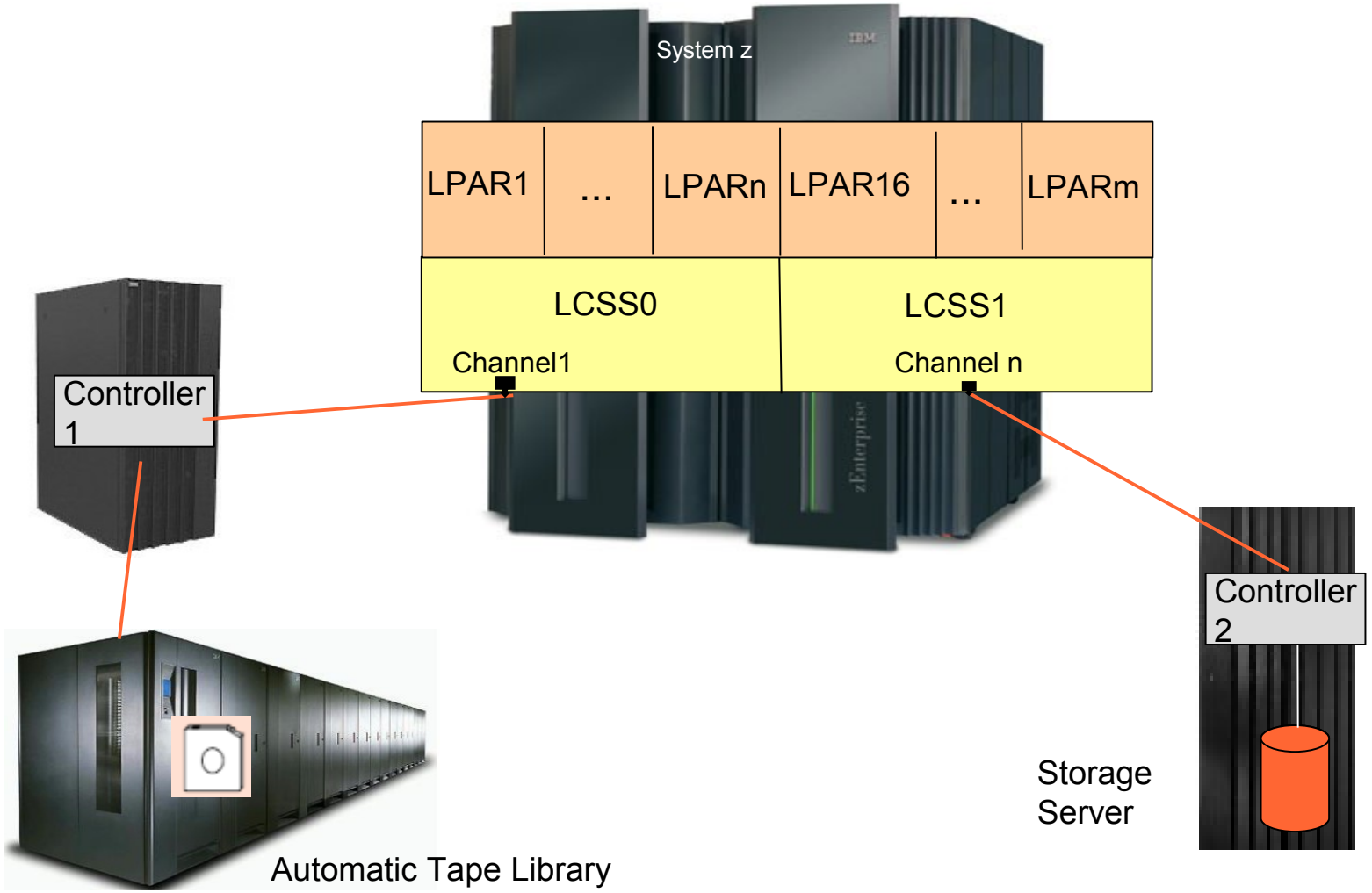
I/O Configuration - cont

- Specified to CSS in the form of a file, Input Output Configuration Data Set (IOCDS), during POR
    - IOCDS is referred to as hardware I/O configuration
- Specified to OS in different forms depending on the OS, during IPL. Specification to OS is called software I/O configuration.
  - z/OS: Specified as Input Output Definition File (IODF)
  - z/VM: Specified using one of the two ways

    1) RDEVICE/Device statements

    2) Input Output Definition File (IODF)

I/O Configuration Perspective of System z & its Peripherals



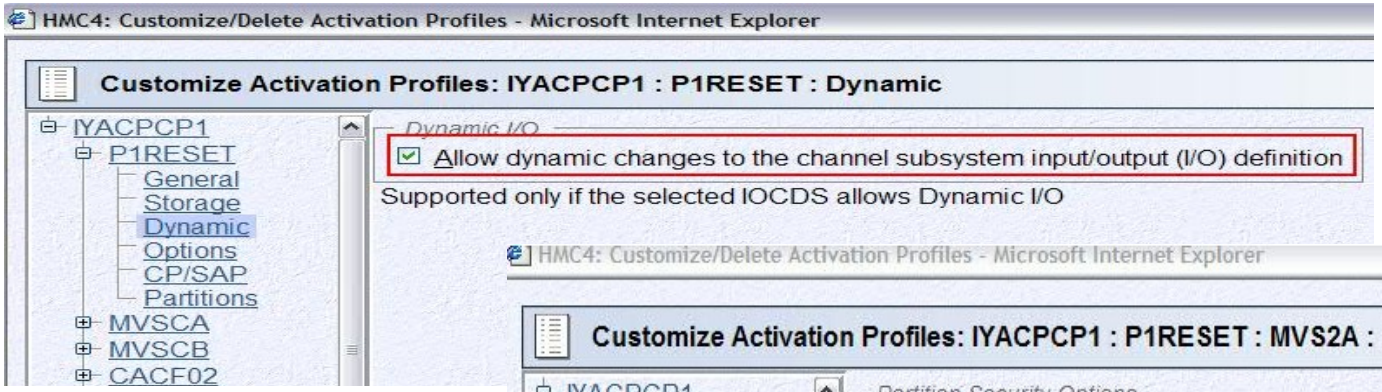
Layout of I/O Configuration Definitions

- Processors
  - Logical Channel Subsystems 0
    - Partitions
      - *...*
      - *Channels*
        - > *Controllers*
          - *Devices*
  - Logical Channel Subsystems 1
    - Partitions
      - *Channels*
        - > *Controllers*
          - *Devices*
  - ...

Dynamic Changes to I/O Configuration

- It is possible to dynamically change
  - Software I/O configuration only
    - Modifies related control blocks at OS level
    - No need of IPL
    - LPAR must be enabled for dynamic changes
  - Both software & hardware I/O configuration
    - Simultaneously modifies related control blocks at OS & CSS level
    - No need of POR & IPL to get to new I/O configuration for hardware & software
    - Possible, only when hardware I/O configuration matches software I/O configuration
    - LPAR & processor must be enabled for dynamic changes

HMC Profiles – Enabling Dynamic Capability



Reset Profile

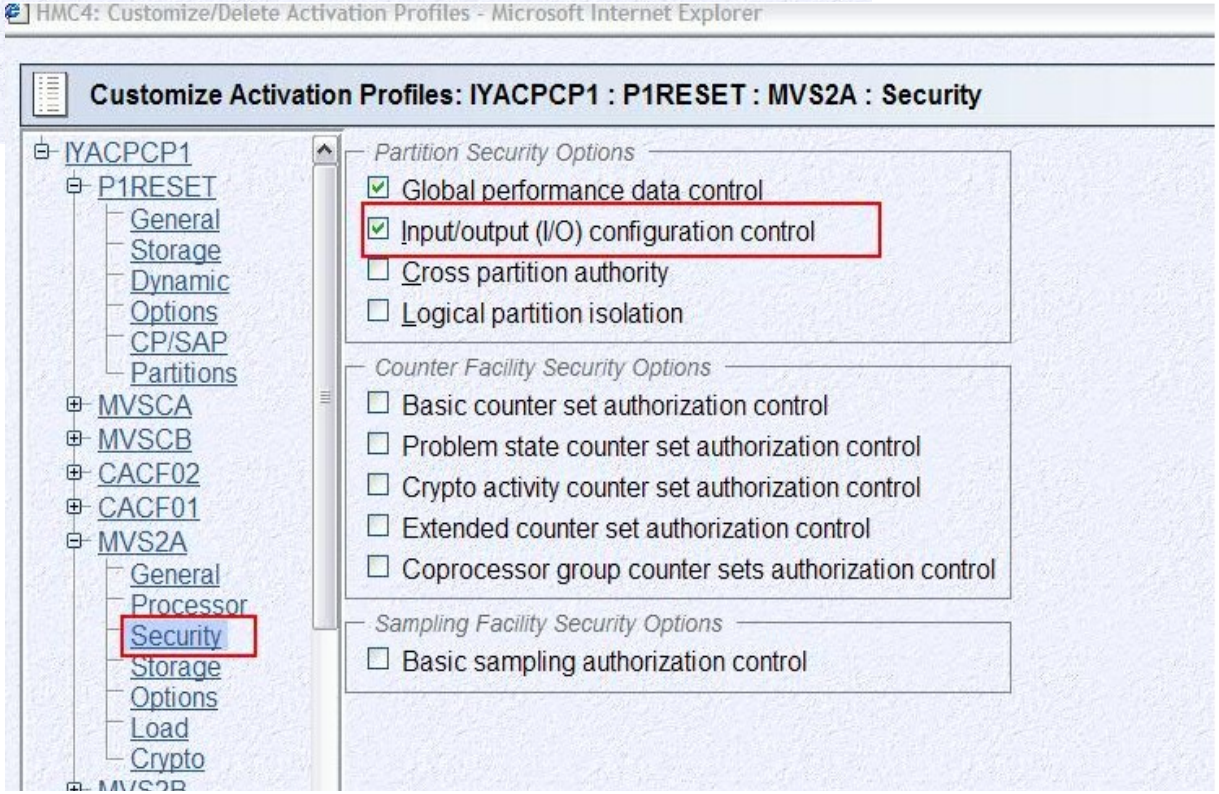


Image Profile

Not required to be done for z196 & z114, they have dynamic capability by default

I/O Configuration Definition from z/VM

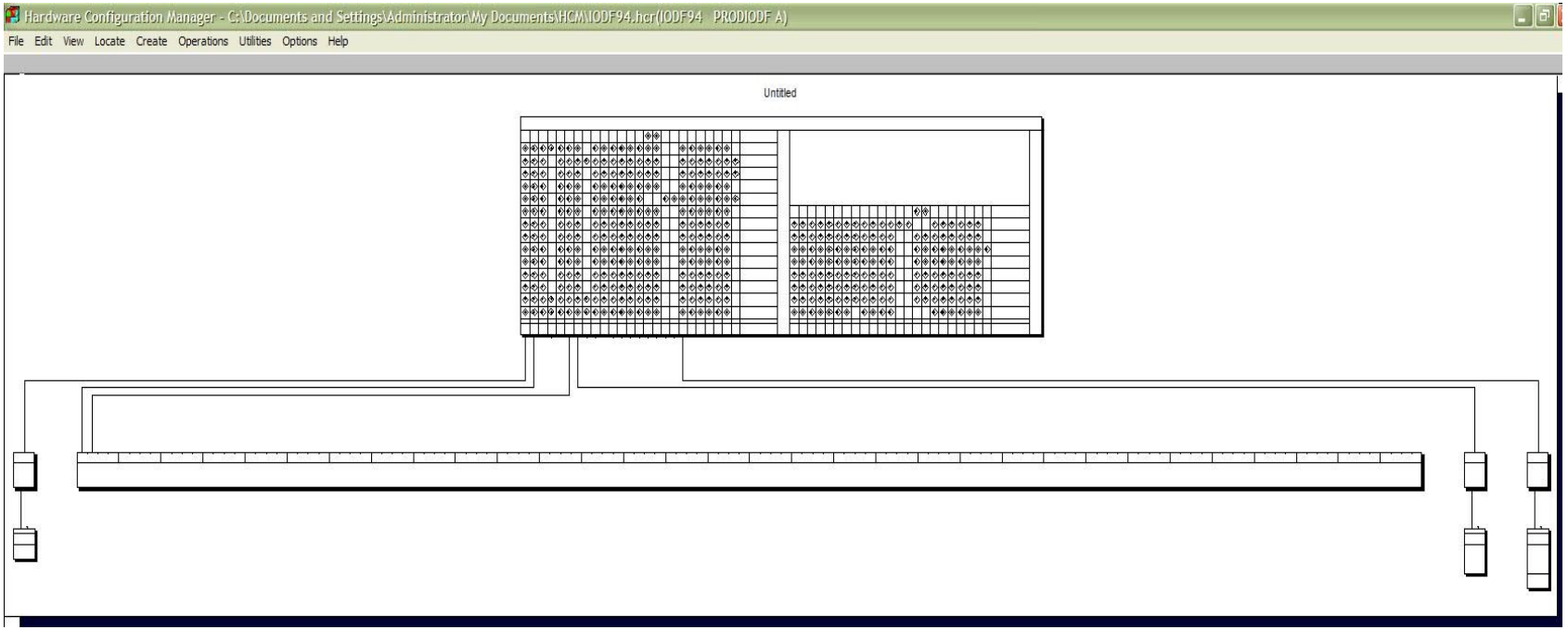
- It is possible to define both hardware & software configuration from z/VM
- It is also possible to dynamically modify hardware & software configuration from z/VM
- z/VM I/O configuration methods
  - Using HCD for z/VM & HCM
  - Using IOCP utility & z/VM dynamic I/O configuration commands
- The above two methods can't be mixed

HCD for z/VM & HCM

Hardware Configuration Definition (HCD) for z/VM

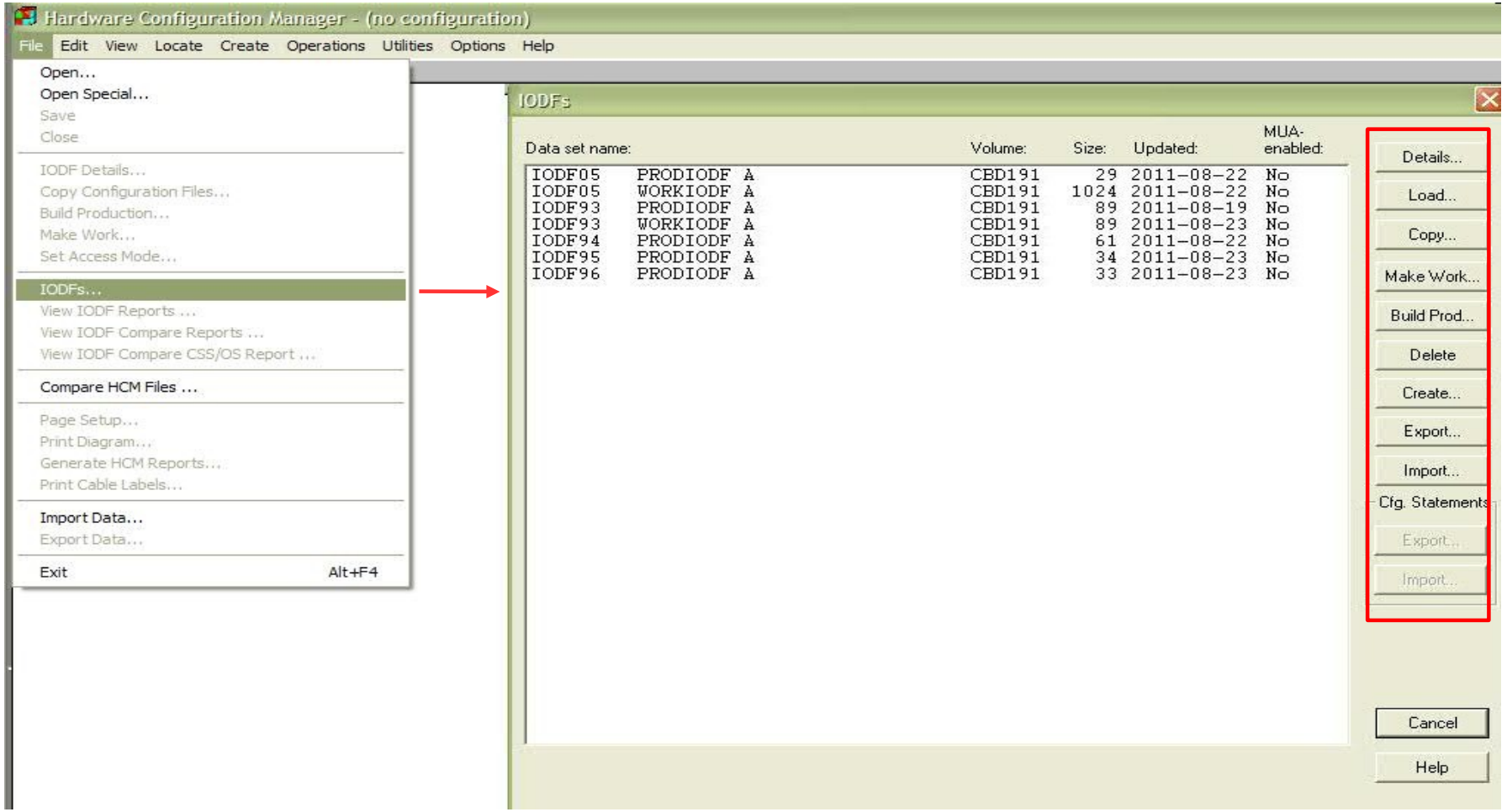
- Base element in both z/VM and z/OS
- Integrates I/O configuration definitions for hardware & software
- I/O configuration data is stored in a repository called Input Output Definition File (IODF)
- Dynamic activation of I/O configuration changes non-disruptively
- HCM is the primary user interface to HCD, but certain tasks cannot be performed by HCM & can only be performed directly from HCD using commands

Hardware Configuration Manager (HCM)



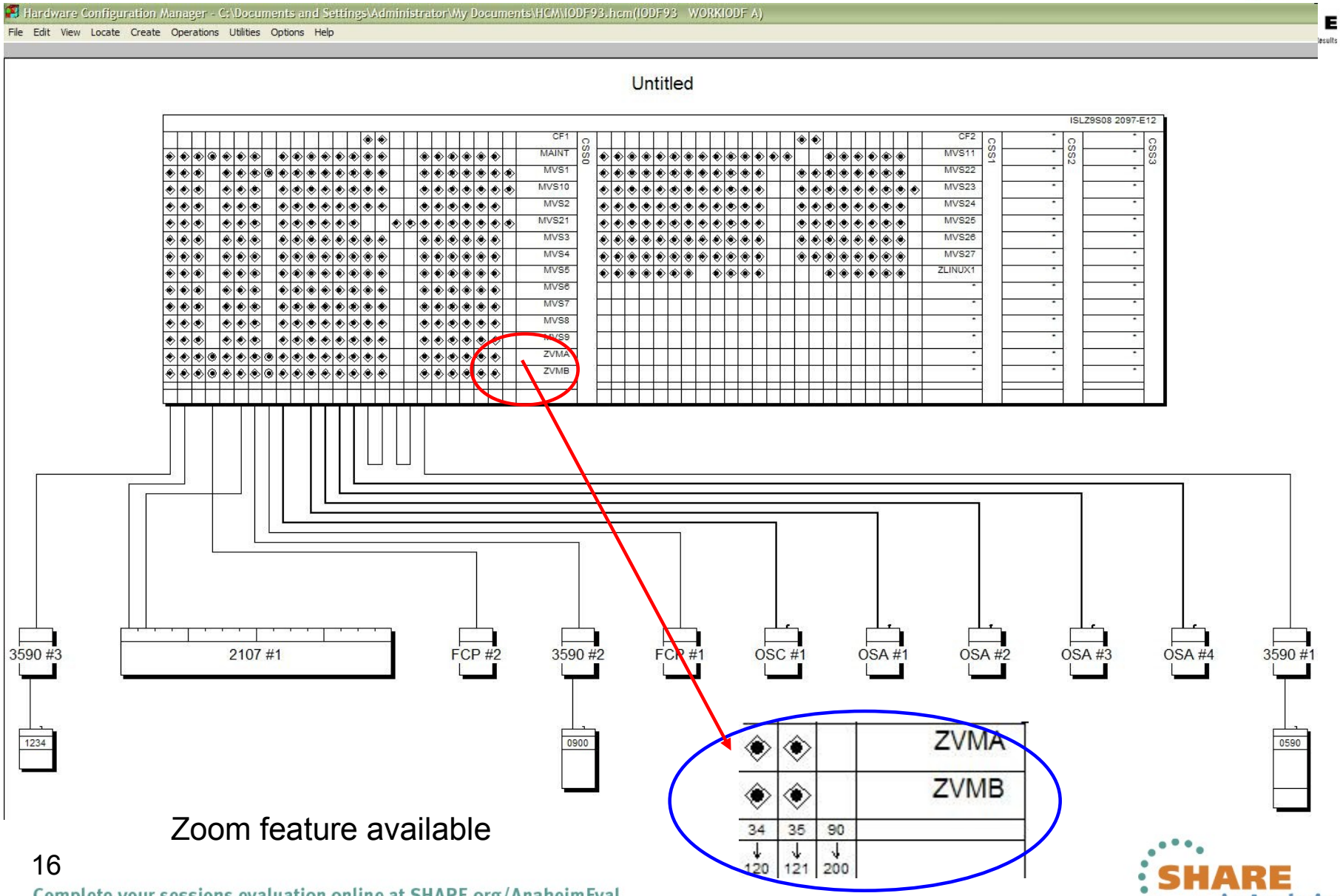
- An intuitive graphical user interface
- Definitions entered via HCM are immediately entered in the IODF
- Access to IODF & validation of IODF are done by HCD
- Most of the I/O configuration definition are done using HCM

Define I/O Configuration using HCM



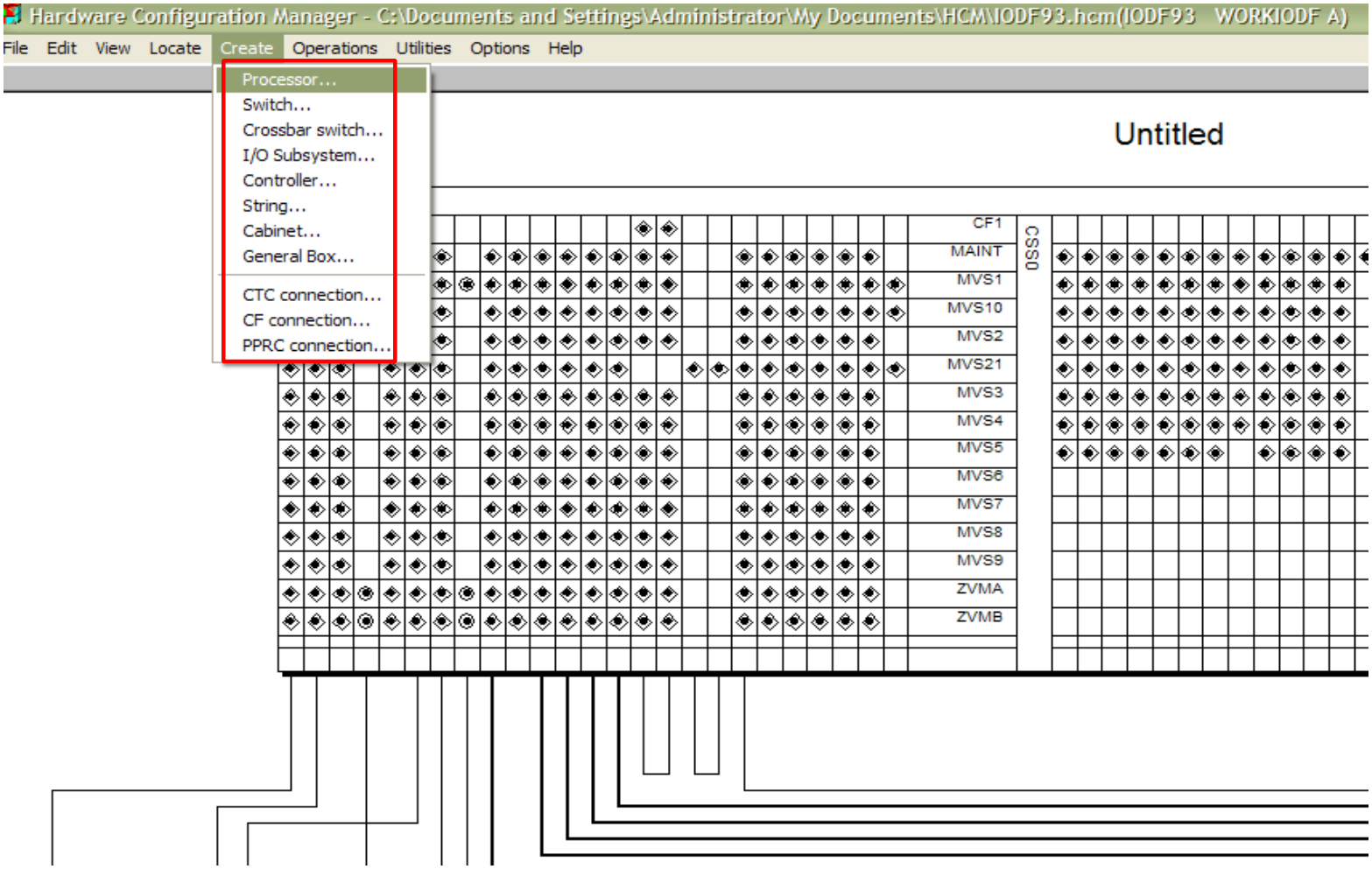
Use these options to create/work with a particular IODFs

Define I/O Configuration using HCM -cont



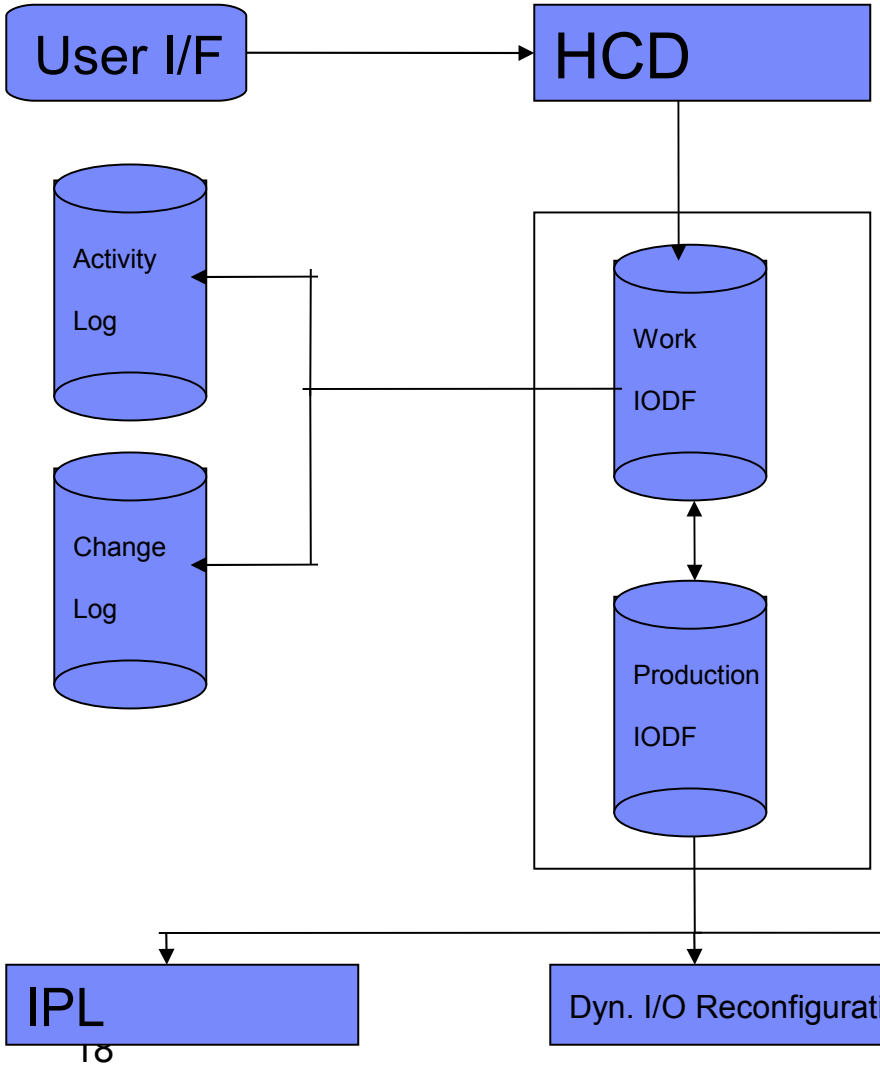
Zoom feature available

Define I/O Configuration using HCM -cont



Use these options to define various resources

Concept of work and production IODF



Work IODF:

- used to store data entered during definition
- the work IODF must follow the naming conventions:
  - VM: IODFxx WORKIODF fm

Production IODF:

- created from work IODF after completeness validation
- the production IODF can only be accessed in READ mode
- used for activation purposes (IPL, IOCDS download, dynamic activate)
- the production IODF must follow the naming convention:
  - VM: IODFxx PRODIODF fm

What can be done with IODF?

- Build a production IODF from work IODF
  - `cbdsprod iodf01 workiodf a iodf01 prodiodf a`
- Write an IOCDS
  - `cbdsiocp iodf01 prodiodf a islz10 i a1`
- Dynamically activate software/hardware configuration
  - `cbdsact iodf01 proc1 vm1 a1`
- IPL z/VM with a statement like this in SYSTEM CONFIG
  - `iodf iodf01 zvm system_cons system_3270`

Useful Commands

- How to find out which IODF is used by z/VM?
  - **query hcd**

```
HCD is currently active: IODF = IODF71 PRODIODF
HCD is enabled for dynamic hardware changes
HCD is controlling the software configuration
HCD recover is not currently required
```

- How to find out from which IODF active IOCDS was created?
  - **query token**

```
PROC1…m.o……10-03-1007:50:15SYS4    IODF71
```

Useful information

- Issue all HCD commands from user ID, CBDIODSP
- Command to start HCD TCPIP dispatcher for HCM
  - **cbdsdisp**

```
...
CBDD200I z/VM 5.4.0 HCD TCP/IP dispatcher for HCM
 successfully started.
...
```

- Command to stop HCD TCPIP dispatcher for HCM
  - **server stop**

```
SERVER   BKWSRV0300I Shutdown initiated.
CBDD210I z/VM 5.4.0 HCD TCP/IP dispatcher for HCM
  stopped.
```

- Default configuration of HCD TCP/IP dispatcher should be sufficient to start with

Useful information - cont

- How to install HCM on Windows® workstation ?
  - FTP host
    user/password
    cd 5VMHCD40.400
    bin
    get EEQINSTM MSIBIN hcd.msi
    quit
  - Double click hcd.msi to install it
- How to connect to connect to HCD for z/VM from HCM?
  - Log-on to CBDIODSP, start HCD TCPIP dispatcher
  - Invoke HCM and specify,
    - Host connection details,
      - *IP/DNS of z/VM host*
      - *HCD TCPIP dispatcher for HCM port number (default port : 51107)*
    - User ID/password : *CBDIODSP is the user id and type its password*

IOCP & z/VM Dynamic I/O Configuration Commands

IOCP

- A CP utility
- Can be used to define I/O configuration to hardware
- I/O configuration is defined in a CMS file, using the following macro statements,
  - ID : Defines the identification information
  - RESOURCE : Defines logical partitions, logical channel subsystem etc
  - CHPID : Defines channel paths
  - CNTLUNIT : Defines control units attached to the channel paths
  - IODEVICE : Defines I/O devices assigned to the control unit

IOCP - cont

- A sample IOCP file, PROC1 IOCP A

```
ID    MSG2='IODF05 PRODIODF A - 2011-08-22 17:19',                  *
            SYSTEM=(2097,1),                                        *
                  ...
      RESOURCE PARTITION=((CSS(0),(CFC,1),
                  ...
      CHPID PATH=(CSS(0,1,2,3),01),SHARED,                          *
                  ...
            PCHID=100,TYPE=FC
                  ...
      CNTLUNIT CUNUMBR=D200,                                        *
      PATH=((CSS(0),01,02),(CSS(1),01,02),                          *
                  ...
      UNITADD=((00,255)),CUADD=2,UNIT=2107
                  ...
       IODEVICE DDRESS=(D200,255),CUNUMBR=(D200),STADET=Y,UNIT=3390
```

- Using IOCP utility write to IOCDS
  - **iocp proc1 (wrta1 dyn**

Software I/O Configuration

- Statements in SYSTEM CONFIG define I/O configurations for z/VM OS

```
Rdevice  1910  Type  3800 Model 3
Devices ,
  Offline_at_IPL  dddd-ffff,
  Online_at_IPL   0000-cccc,
  Sensed          0000-ffff
```

z/VM Dynamic I/O Configuration Commands

- Using dynamic I/O commands resources can be added/modified/deleted to both software & hardware
- The commands should be entered in a predefined order, else could result in errors that are difficult to recover
- Dynamic resource definitions/modifications are always lost between PORs
- The resource definitions/modifications have to be backed up with definitions in IOCP file & written to an IOCDS for post POR retention/use
- Apart from LPARs & processor enabled for dynamic I/O changes, SYSTEM CONFIG must have dynamic I/O commands enabled

```
Features ,
  Enable Dynamic_I/O
```

z/VM Dynamic I/O Configuration Commands - examples

- Add LPAR dynamically
  - `define lpar lpar2 css 0 mif 4`
- Add control unit dynamically
  - `define cu 22 type * unitadd 00-ff cuadd 1a chpid 10 14 20 css 0`
- Add devices dynamically
  - `define device 1a00-1aff unitadd 00 cu 22 css 0 dasd par lpar1 lpar2`
- More such commands exist for adding, modifying & deletion different resources

Few useful commands

- How to find out whether dynamic I/O configuration changes are allowed in a system?

```
QUERY DYNAMIC_I/O STATUS
Dynamic I/O changes are allowed on this system
```

- How do you know who is controlling I/O configuration?
  - **query config**
    - When HCD is controlling the I/O, the output looks like below

```
query config
HCPCCO6816E Dynamic I/O changes are being controlled by HCD
```

    - When HCD is not controlling the I/O, the output looks like below

```
query config
System is not in configuration mode
```

Note : It indicates that turn on the configuration mode before issuing dynamic I/O commands. To turn on the configuration mode, issue the command

```
SET CONFIGMODE ON
System is now in configuration mode
```

I/O Configuration Definition from z/VM - Considerations

- Only one of the mentioned methods can be used for managing I/O configuration definition from z/VM
- To move from one method of I/O definition to another, a POR is required
- Recovery from z/VM dynamic I/O definition command failures can be difficult
- HCD for z/VM & HCM is the most efficient method of managing I/O configuration from z/VM
- HCD offers facilities to migrate IOCP macro definitions to IODF

Key Learning Points

- I/O Configuration
- HCD for z/VM & HCM
- IOCP & z/VM Dynamic I/O configuration commands

Appendix

References:

- z/VM I/O Configuration, SC24-6198
- z/OS and z/VM Hardware Configuration Manager User's Guide, SC33-7989
- z/OS and z/VM Hardware Configuration Definition Messages, SC33-7986

HCD/HCM Homepage:

- http://www.ibm.com/servers/eserver/zseries/zos/hcm/