# Using HCD/HCM to manage your I/O configuration in z/VM

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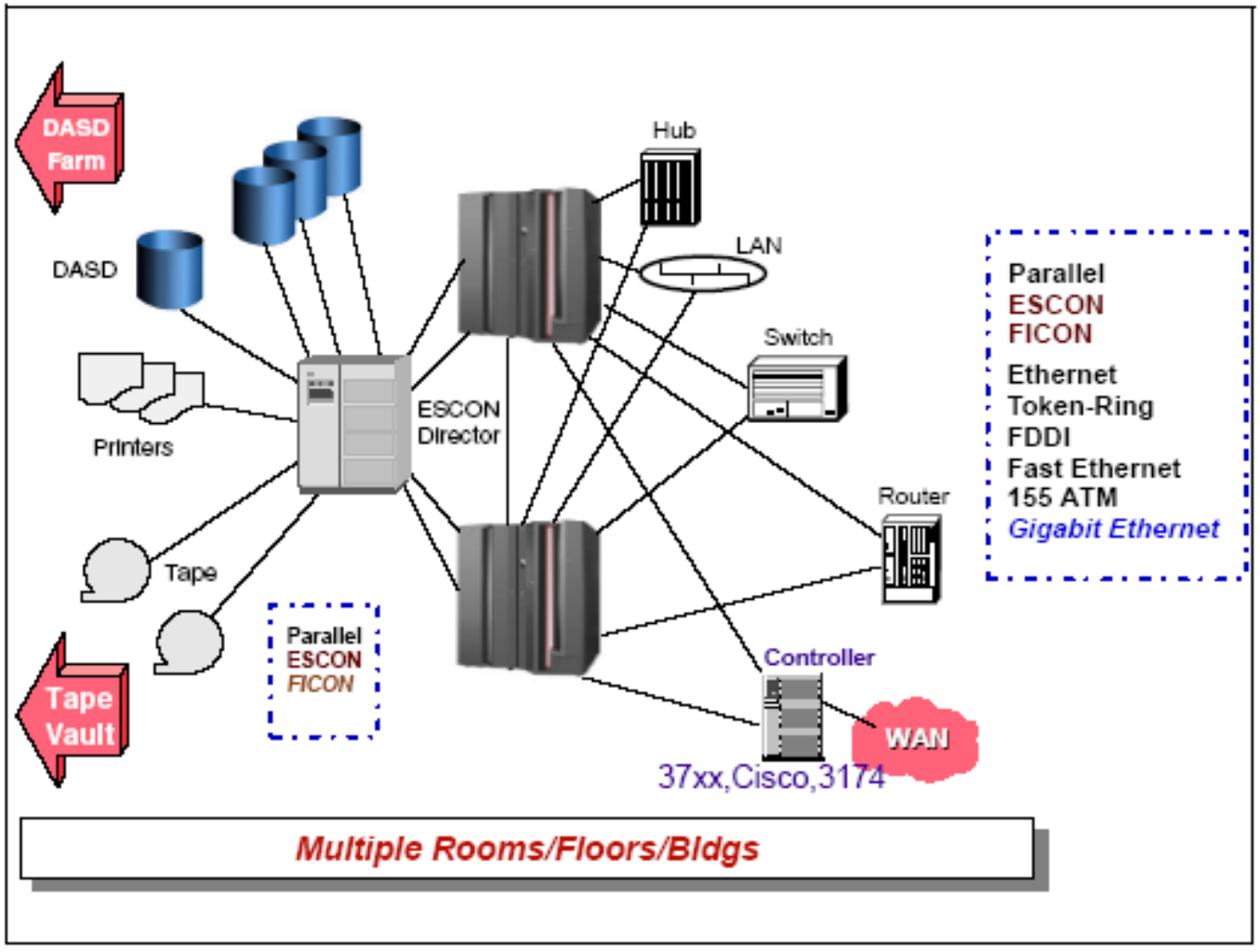
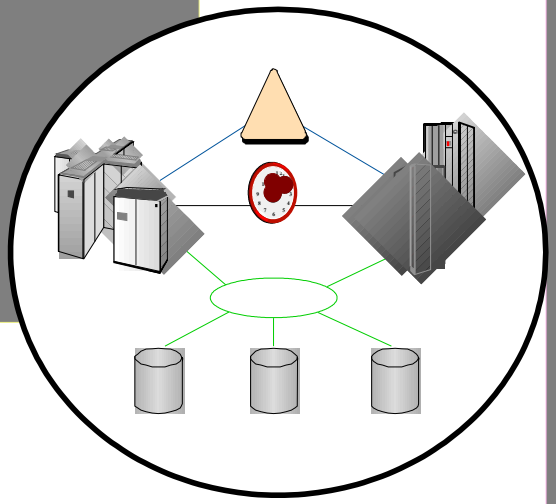
# Scope of I/O Configuration



# I/O Configuration Management

Configuration Management

- Plan
- Define
- Activate
- Operate

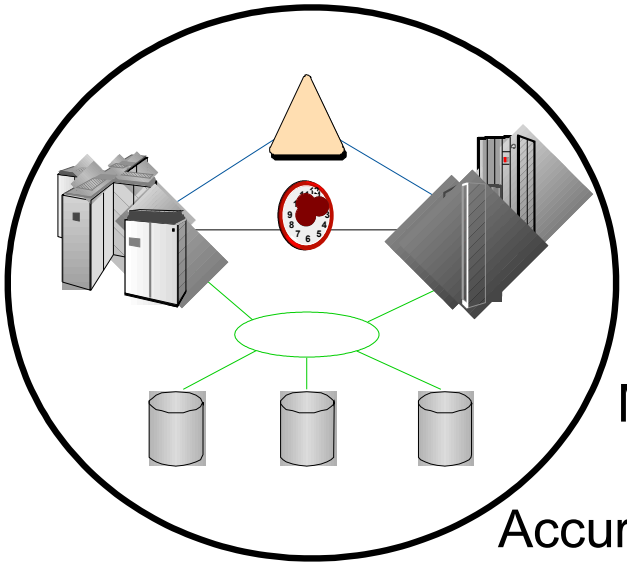


Configuration Aspects

Hardware Management

- assets
- CSS and OS
- physical
- cabling
- network
- floorspace
- power, cooling, etc.
- change
- performance
- problem

# The problem



Different tools

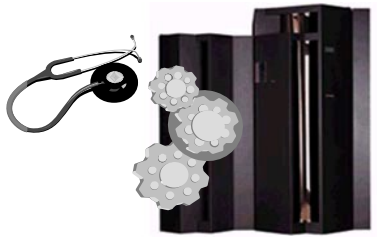
Redundant data

Manual mapping between various aspects

Accuracy of documentation by human discipline only

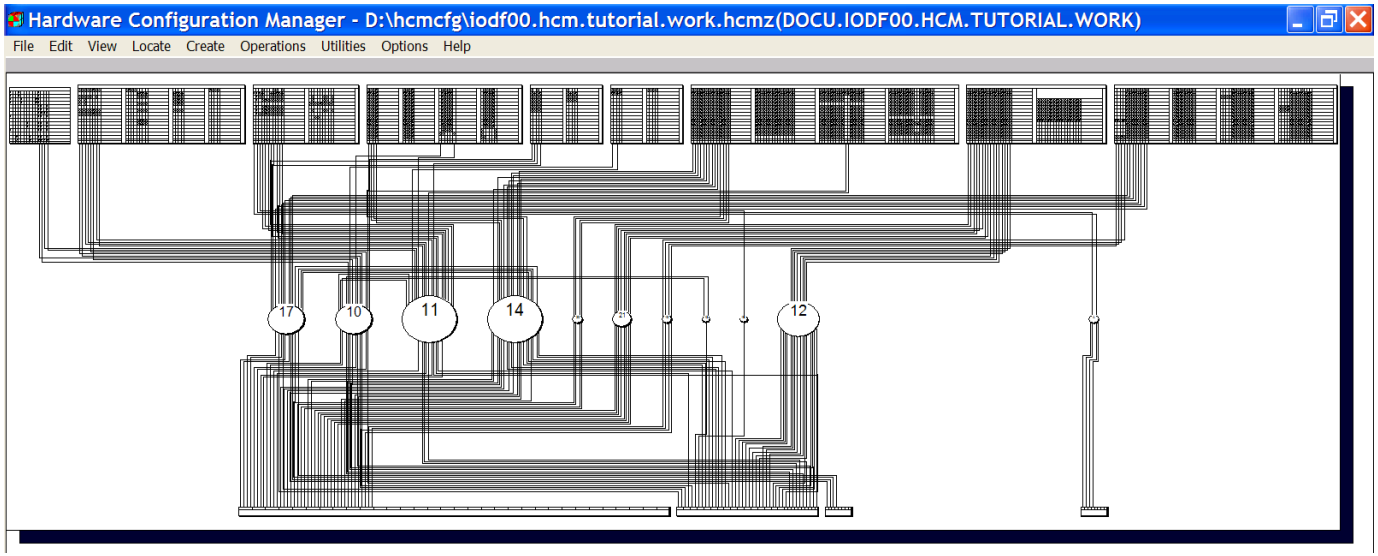
Increasing complexity with System z

# Value of HCD



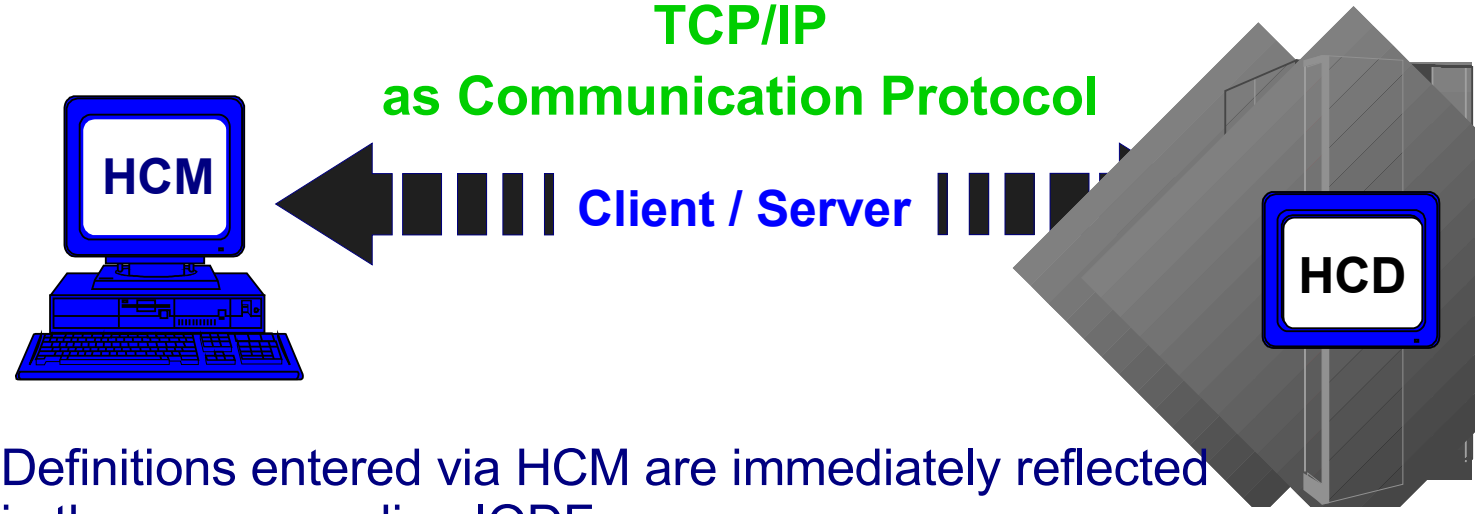
- Integrates **I/O definitions** for the CSS and the OS
- Configuration data stored in a **single repository** (IODF)
- **Rigorous validation** of hardware configuration data
- Helps to **avoid system outages** due to definition inconsistencies
- **Dynamic activate** of configuration changes **non-disruptively**
- Extensive **reporting facility** for configuration data
- HCD Customers (base element in both z/OS and z/VM)
  - **all z/OS customers** (mandatory)
  - **all z/VM customers** (optional)
- **Provides configuration migration**
  - z10 migration
  - configuration migration of IOCP .

# Value of HCM



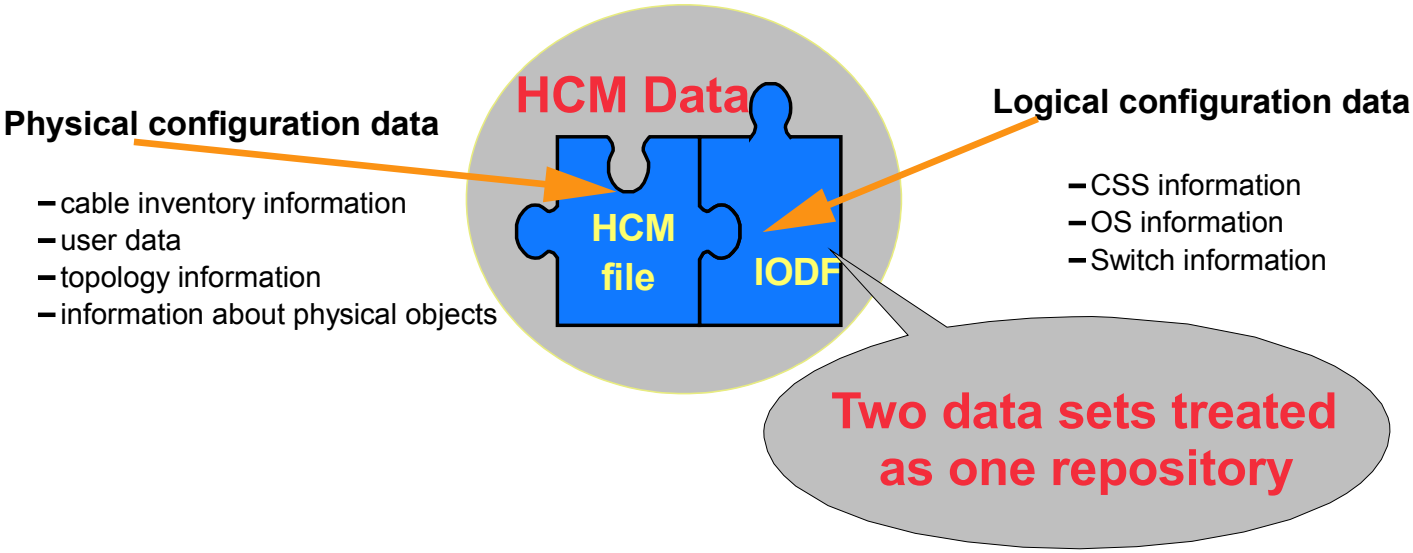

- provides intuitive graphical user interface to HCD
- manages physical and logical data in one place
- includes powerful definition wizards
- provides accurate configuration documentation
- uses HCD as a server for data validation

# HCD – HCM relationship




- ★ Definitions entered via HCM are immediately reflected in the corresponding IODF.
- ★ The access to the IODF as well as the validation of data is done by HCD.
- ★ The use of HCD's rigorous validation algorithm ensures that all data are correct and complete.

# Data repository

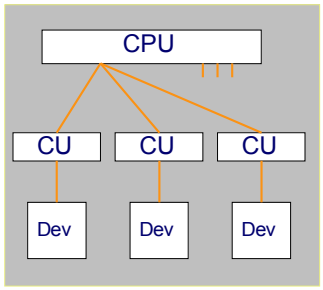


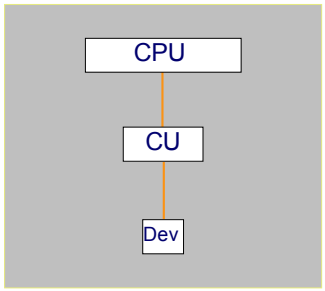

No duplication of data entry for physical and logical definitions

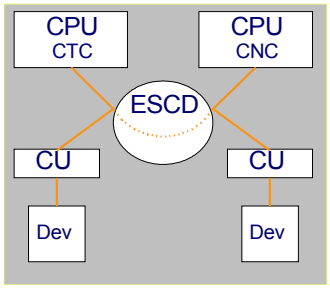
Multiple configuration versions supported
- name of IODF stored in HCM file

Data integrity ensured by time stamp / token
- token updated by HCD whenever IODF is modified
- in case of token mismatch a resynchronization takes place

# General concept

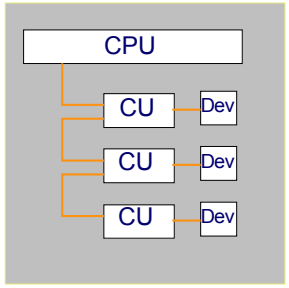


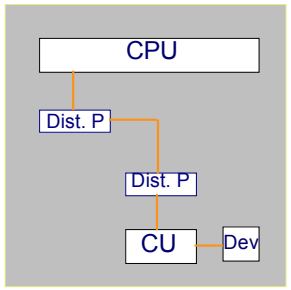



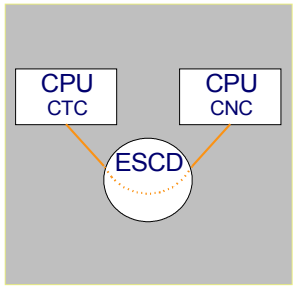




Logical vs. Physical

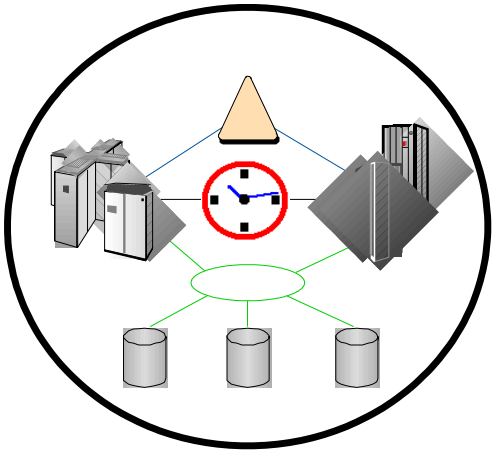
View



# Supported I/O equipment



## Support for I/O Equipment is determined by:

- HCD's Unit Information Modules **(UIMs)**

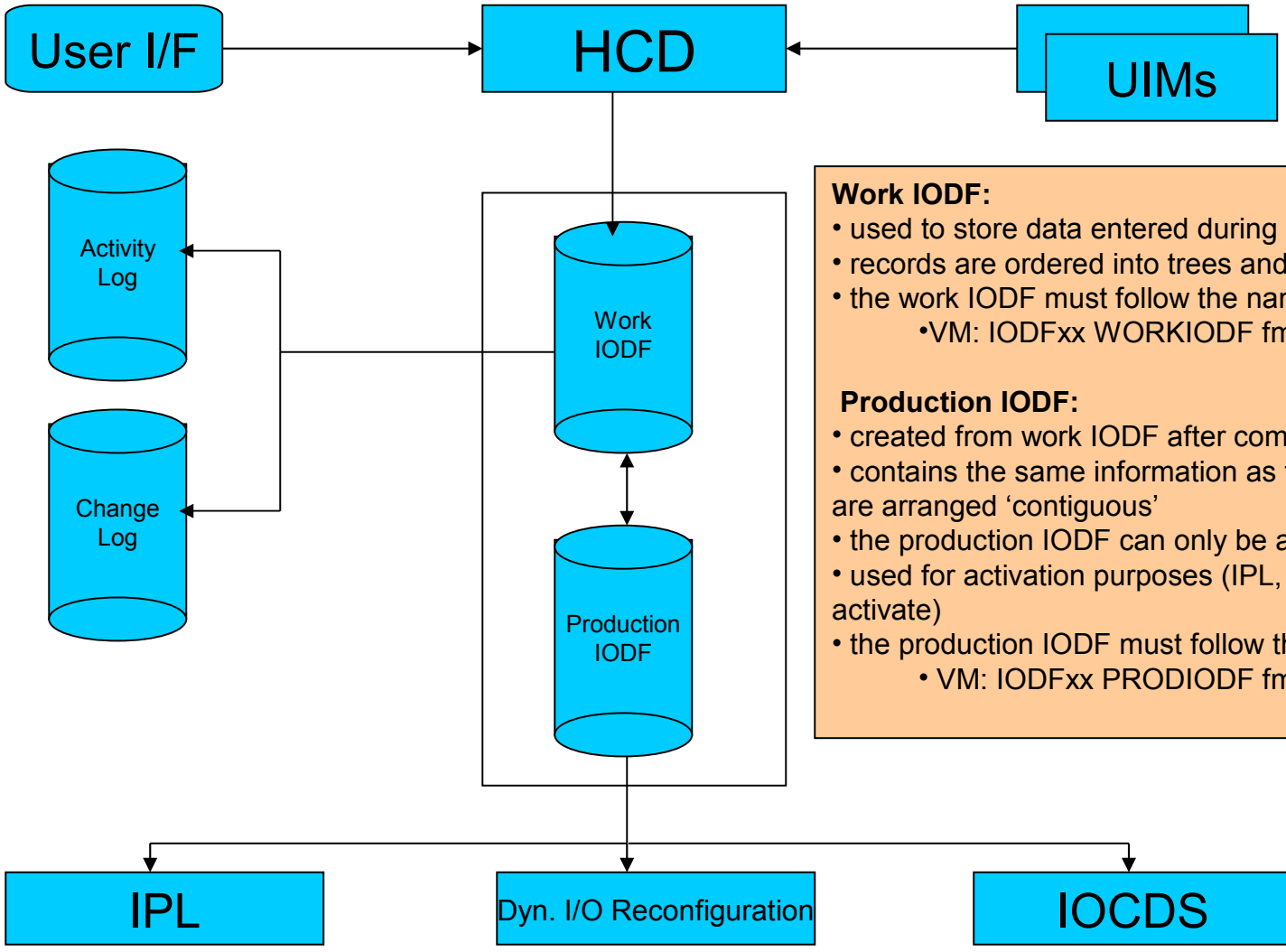
  the logical characteristics and connectivity rules for each device or device group

- HCM's Physical Description Files **(PDFs)**

  the physical appearance of the object on the diagram (e.g. number and name of channel interfaces)

**Same technique for OEM equipment**

# Concept of work and production IODF




**Work IODF:**
- used to store data entered during definition
- records are ordered into trees and connected together
- the work IODF must follow the naming conventions:
  - VM: IODFxx WORKIODF fm

**Production IODF:**
- created from work IODF after completeness validation
- contains the same information as the work IODF but the records are arranged 'contiguous'
- 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

# HCD Functions

Controlled by user configuration file, CBDCONF NAMES

- Create and initialize an empty IODF
  - `cbdsiodf iodf01 workiodf a 2096`
- Migrate (import) I/O configuration statements / IOCP deck into an IODF
  - `cbdsmigr iodf01 workiodf a iocp deck a i proc1 2097-e12 lpar`
- Export I/O configuration statements from an IODF
  - `cbdsconf iodf01 workiodf a config deck a i proc1`
- Extract software configuration file from RDEV control blocks
  - `cbdsrdev cbdmconf rdevlist a`
- Import RDEV configuration into the IODF
  - `cbdsmigr iodf01 workiodf a cbdmconf rdevlist a r vm1`
- Build a production IODF
  - `cbdsprod iodf01 workiodf a iodf01 prodiodf a`
- Build a work IODF from a production IODF
  - `cbdswork iodf01 prodiodf a iodf01 workiodf a`

# HCD Functions (cont.)

- Copy IODF
  - `cbdscopy iodf01 workiodf a iodf11 workiodf c (repl`
- Print configuration reports
  - `cbdsrep iodf01 workiodf a iodf01 report a cpuds`
- Create a graphical configuration report
  - `cbdsdraw iodf01 workiodf a iodf01 script a lcu proc1`
- Compare configurations in IODFs
  - `cbdscomp iodf01 prodiodf a iodf11 prodiodf c iodf01 compare a`
- Export an IODF
  - `cbdsexp iodf01 prodiodf a jack boevm3`
- Import an IODF
  - `cbdsimp 0018 iodf88 workiodf a`

# HCD Functions (cont.)

- Build an IOCP deck
  - `cbdsiocp iodf01 prodiodf a proc1 d proc1 iocp a`
- Write an IOCDS
  - `cbdsiocp iodf01 prodiodf a proc1 i a1`
- Dynamically activate a configuration
  - `cbdsact iodf01 proc1 vm1 a1`

- Start the z/VM HCD TCP/IP dispatcher for HCM
  - `cbdsdisp`
- Stop the z/VM HCD TCP/IP dispatcher for HCM
  - `server stop`

# Additional CMS files

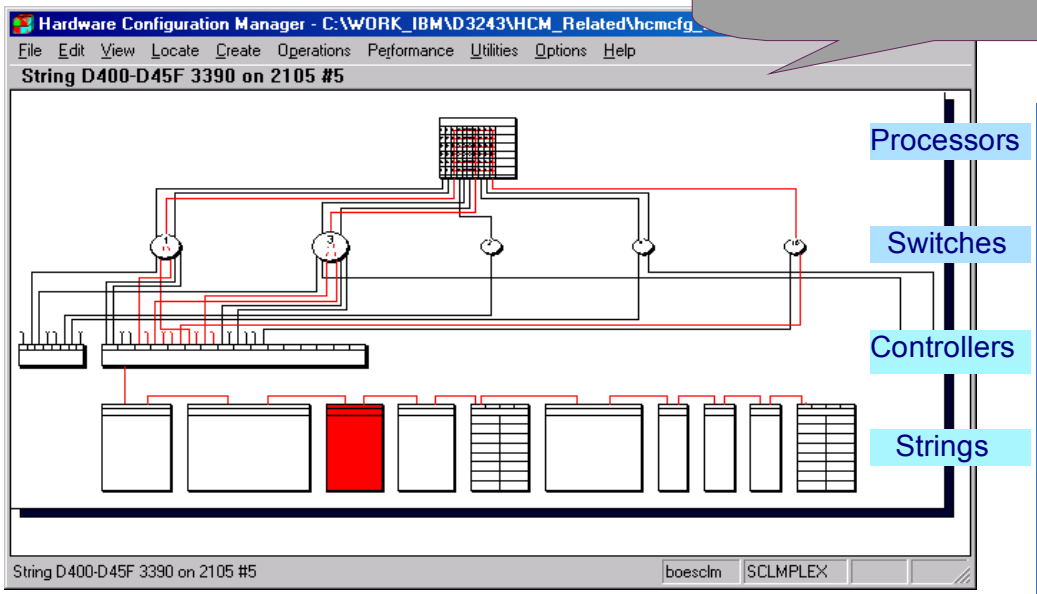
- HCD message log `<rexx-utlility_name> msglog a`
- HCD profile `hcd profile a`
- HCD trace file `hcd trace a`
- HCD activity log file `<iodf_name> workactl a`
- HCD change log file `<iodf_name> workclog a`
- HCM master configuration file

  `<iodf_name> workmcf a`

  `<iodf_name> prodmcf a`

# Layout of the HCM screen

The logical definitions in the IODF are represented as
- **connections between objects in the diagram** , and
- **attribute information in appropriate dialogs**

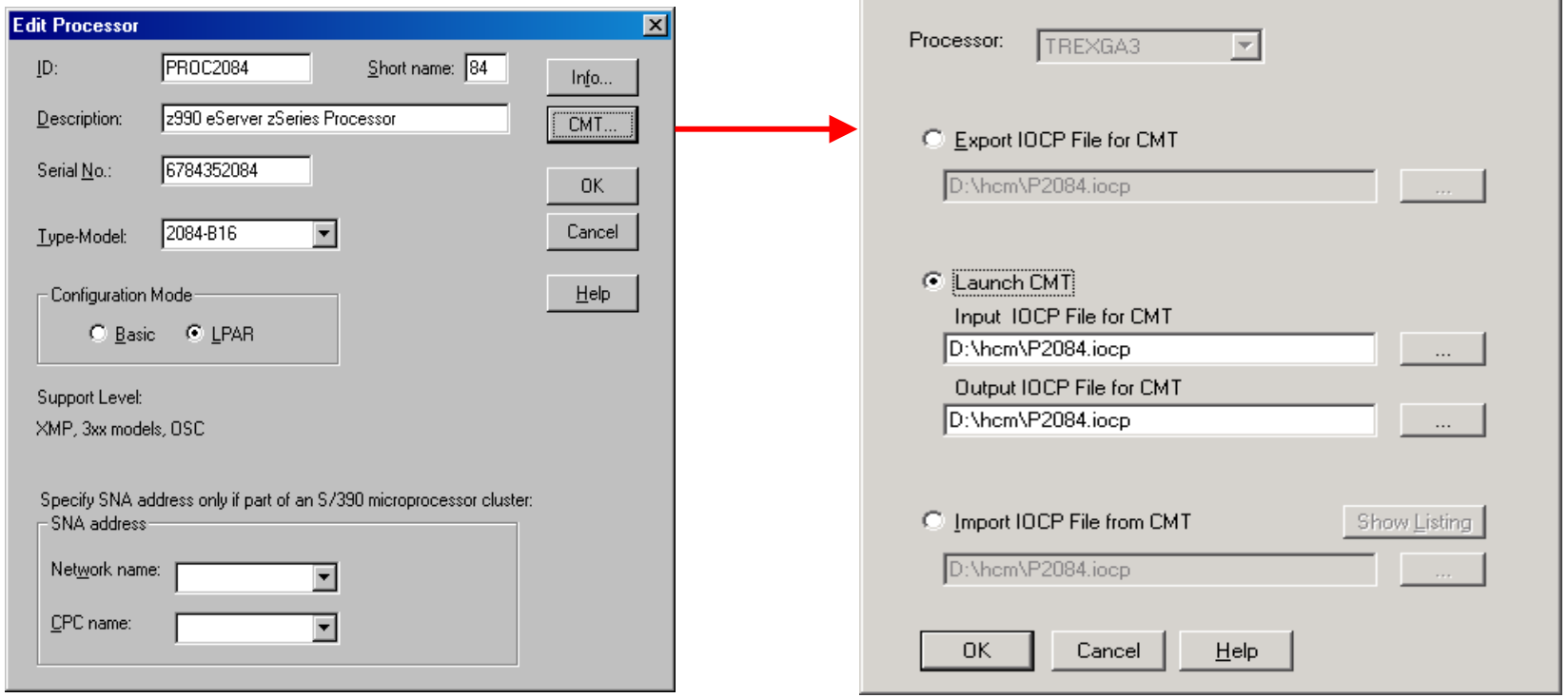



Use HCM to add, delete, or modify physical connections and associated logical definitions.

## Configuration Diagram

- **starting point** for any configuration task (like create/edit, or connect/disconnect objects)
- presents the **physical view** of the elements and their relation
- layouted in a **hierarchical structured** form (Processors, Switches, Controllers (CU), and Strings)
- allows **zooming and filtering** techniques to work with the elements of interest

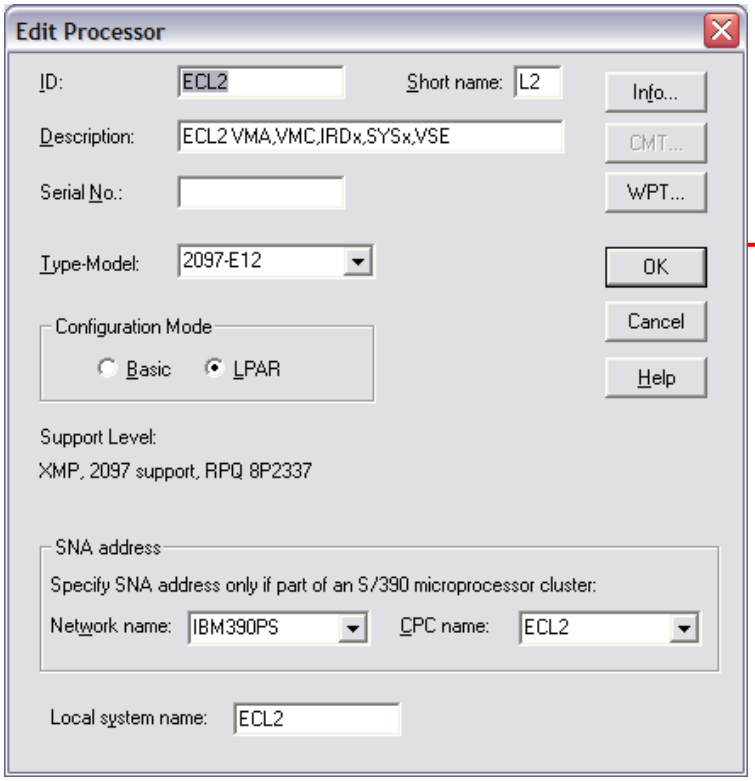
# Support of CHPID Mapping Tool

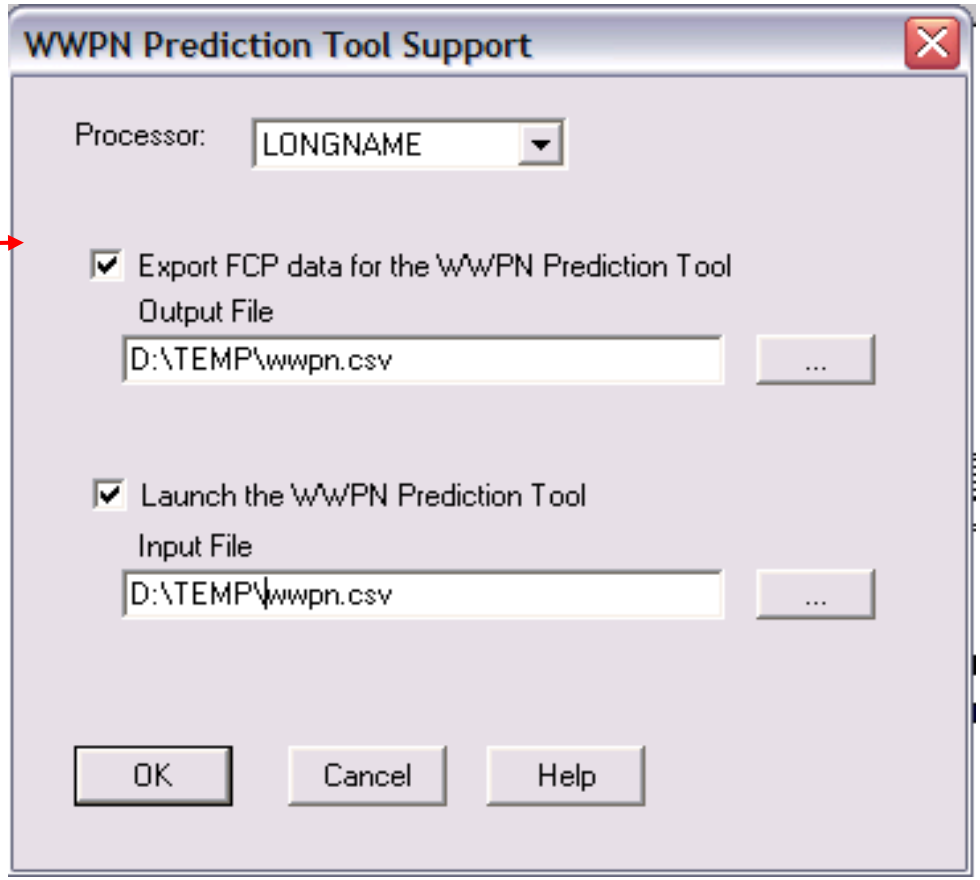



CHPID Mapping Tool (CMT): Assigns PCHIDs to CHPIDs 'automatically'
'CHPID Mapping Tool Support' dialog in HCM assists you in

1. Exporting an IOCP file for the CMT for a selected processor,
2. Launching the CMT with IOCP input and output specfications
3. Importing an updated IOCP file from the CMT to the IODF.

# Support of WWPN Prediction Tool




HCD offers a new option for exporting the FCP specific part of the I/O configuration. This file can be used together with the I/O Serial Number (from Resource Link) as input for the WWPN Prediction Tool to generate the WWPNs for the system.

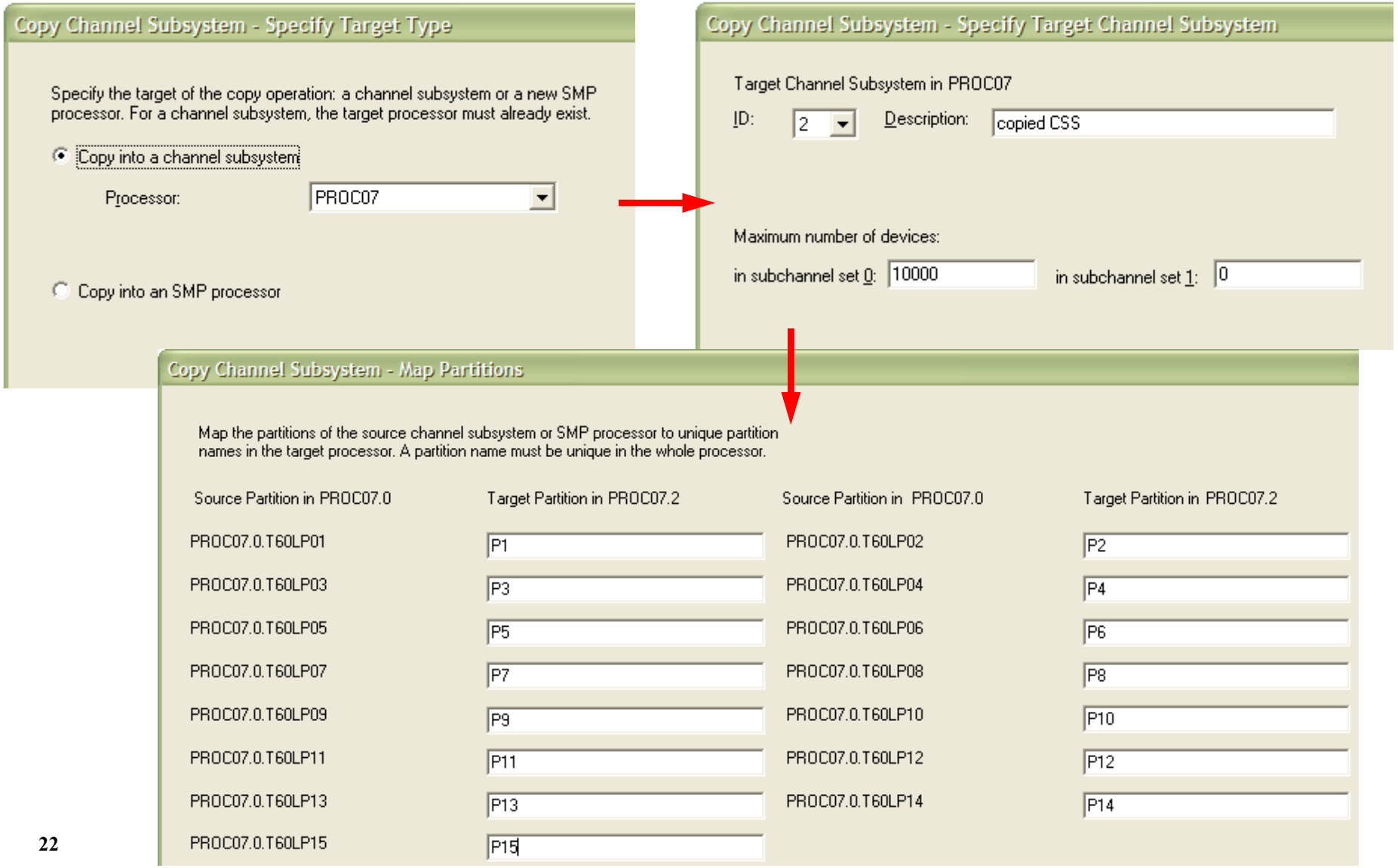
# HCM Wizards

To support you in performing complex processor configuration tasks, HCM offers several wizards or utilities:

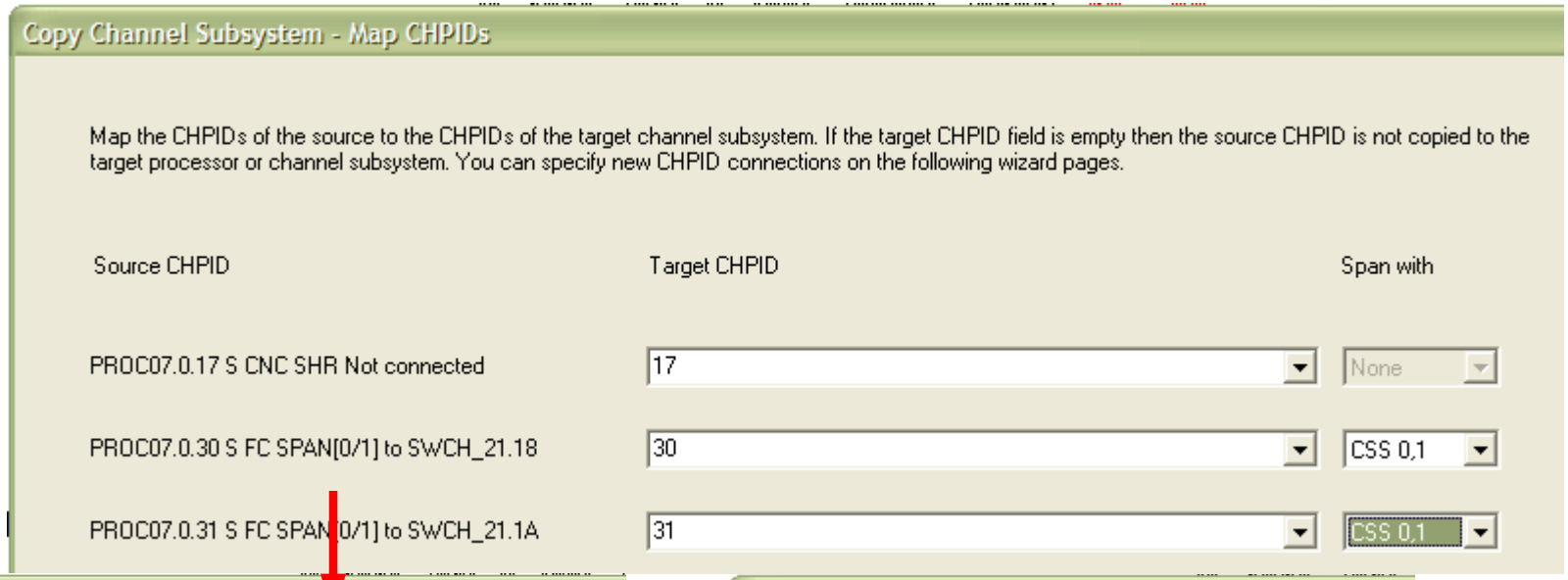
- Copy Processor
- Copy Channel Subsystem (*)
- Copy Partition
- Aggregate CHPID
- Move Port Connections
- Import/Export PPRC Connections
- Converting CNC Channels to FICON Channels
- Change Link Address Format
- Creating/Copying/Editing an I/O subsystem (*)
- Define CTC / CF / STP connections

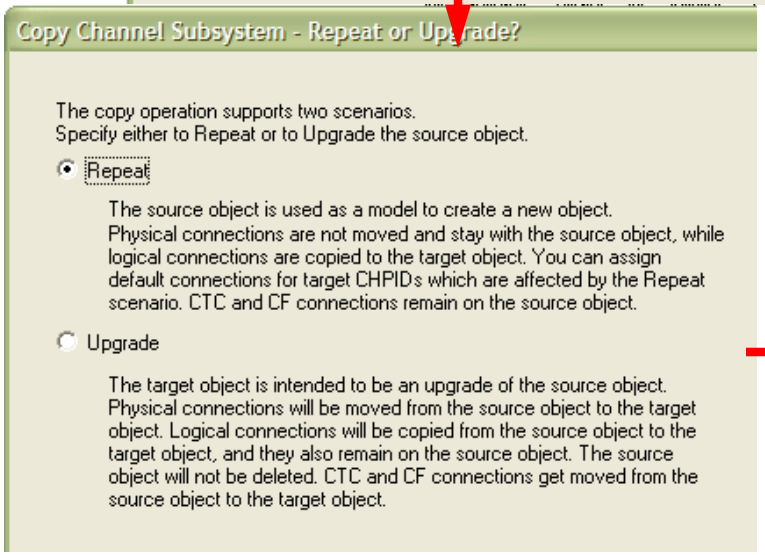
(*) Example dialogs are shown on the following pages

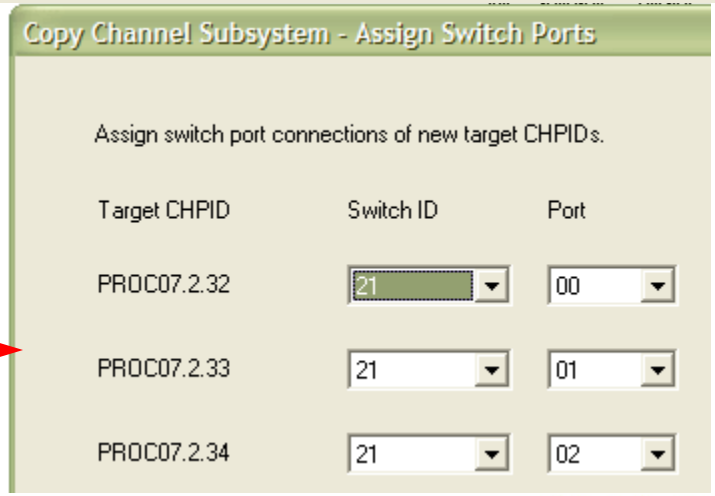
# Copy channel subsystem (1)



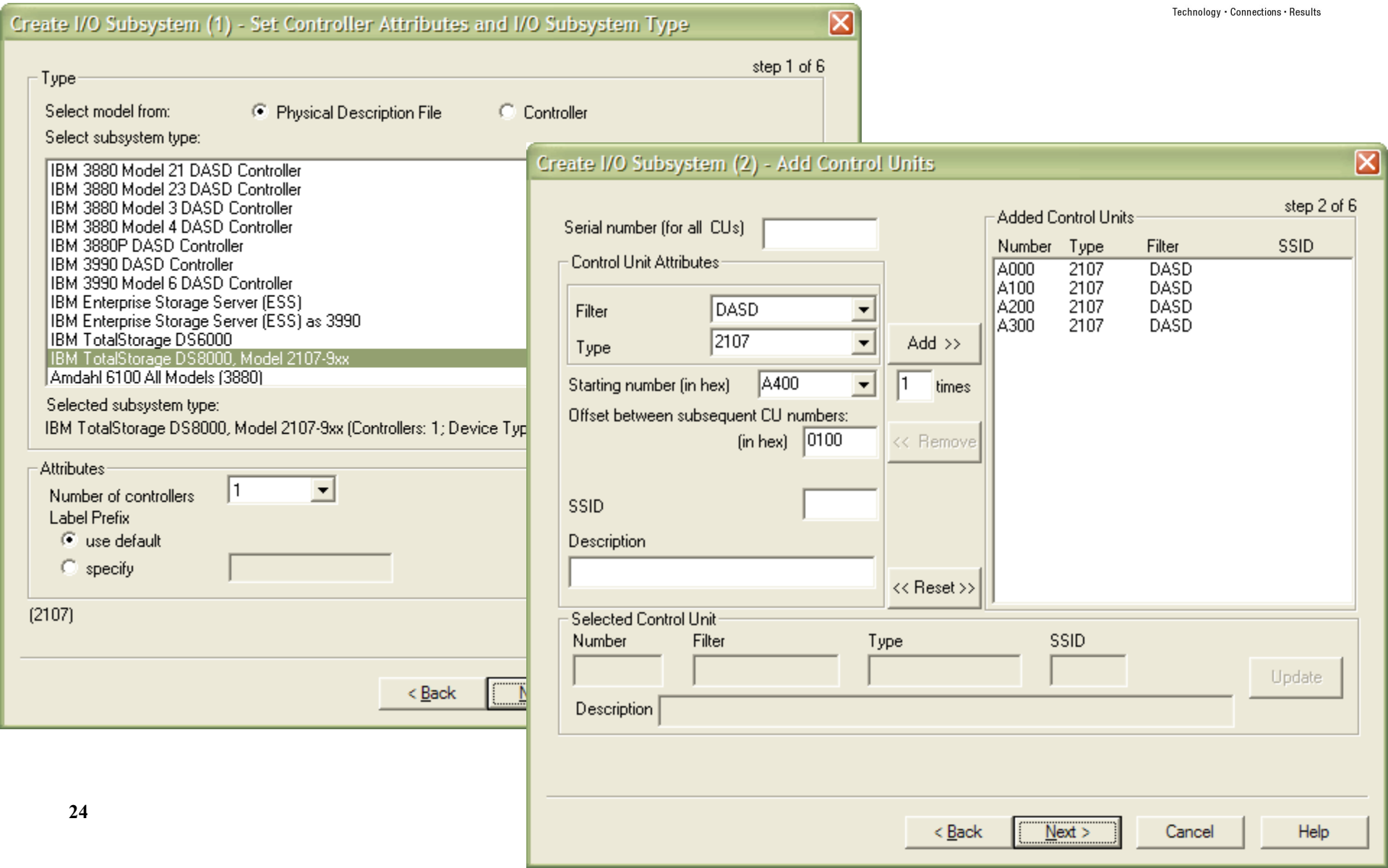
# Copy channel subsystem (2)



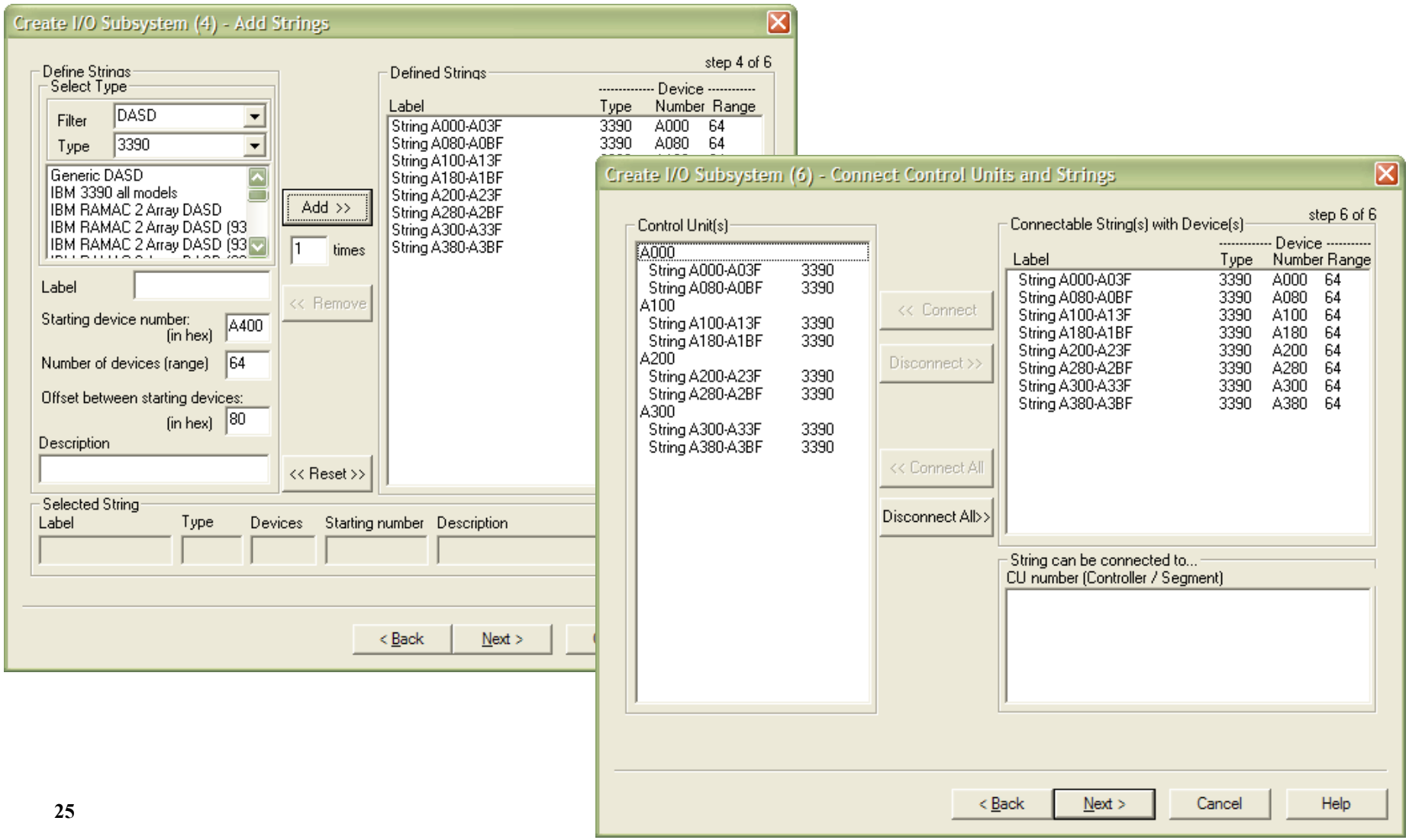



# Create I/O subsystem (1)



# Create I/O subsystem (2)



# Reports

- HCD Reports
  - Textual Reports: CSS configuration (like IOCP reports), OS configuration, switch configuration, CTC connections, CF connections, supported hardware, compare reports
  - Graphical Reports (logical view): bookmaster, DCF, GML, GDF
- HCM Reports
  - HCD textual reports
  - Textual: processor, switches, controllers, strings, cables and links, cabinets and general boxes, crossbar switches
  - Format: print, XML, csv
  - Graphical reports (physical view): diagrams

# Migration to z/VM HCD

- Change the dynamic I/O configuration method from CP commands to lock-step mechanism of HCD.

- Two scenarios:

1. Installation has no z/OS system:
   > IODF definition for z/VM has to be done by z/VM HCD

2. Installation has a z/OS system
   > IODF definition for z/VM can be done by z/OS HCD

# Scenario 1: z/VM is used to define the IODF

- Step 1: Prepare your IOCP deck for migration to the IODF
- Step 2: Migrate the IOCP deck
- Step 3 (optional): Migrate your RDEV information
- Step 4: Verify the IODF configuration
- Step 5: Prepare for POR and IPL with the production IODF
- Step 6: POR with HCD generated IOCDS
- Step 7: IPL with IODF
- Step 8: Load IODF into HCM

- Recurring step: Perform dynamic I/O reconfiguration

# Step 1: Prepare your IOCP for migration

- Use comment tags ***$HCDC$** and ***$HCD$**
- RESOURCE statement:
  - Include partition usage types

```
   RESOURCE PART=((LP1,1),(LP2,2),(LP3,3),(CF1,4))
*$HCDC$       USAGE=(OS,OS,OS,CF)
```

- CHPID statements:
  - Provide switch connection data
  - Provide coupling facility connection data

```
   CHPID  PATH-(CSS(0),14),SHARED,PCHID=100,TYPE=FC
*$HCDC$                   SWPORT=(A0,18)
```

- CNTLUNIT statements:
  - Change UNIT operand to control unit type that is supported by HCD
  - Provide switch connection data
  - Provide serial numbers for DASD/TAPE control units

```
   CNTLUNIT CUNUMBR=8000,PATH=(14,16,19,1B),LINK=(E0,E4,E8,EC),     *
            CUADD=0,UNITADD=(00,64)),UNIT=2107
*$HCDC$                   SWPORT=((A0,E0),(A0,E8),(B0,E4),(B0,EC)),SERIAL='23425'
```

- IODEVICE statements:
  - Change UNIT/MODEL operands to device types that are supported by HCD
- Include SWITCH statements for the used directors

```
   *$HCD$   SWITCH  SWID=A0,ADDRESS=60,PORT=((04,43),(FE,FE)),UNIT=2032
```

# Step 2: Migrate the IOCP deck to IODF

- Create and initialize an empty work IODF
  - `cbdsiodf iodf71 workiodf h 4096`
- Migrate the prepared work IOCP deck into the work IODF
  - `cbdsmigr iodf71 workiodf h proc1 iocp a proc1 2097-e12`
- Verify successful migration
  - Inspect the output files:

| | |
|---|---|
| CBDSMIGR MSGLOG | HCD message log file informs about the success of the migration function |
| CBDSMIGR LISTING | Assembler listing file informs about syntax errors |
| CBDSMIGR MESSAGES | Migration messages, inform about validation errors |

- Repeat the migrate task until the IOCP has been successfully imported in the IODF
- Produce an HCD report and check the configuration for correct data
  - `cbdsrep iodf71 workiodf h iodf71 report a`

# Step 3 (optional): Migrate RDEV data

- Create an RDEVLIST from your active z/VM system
  - `cbdsrdev vmconf rdevlist a`
- Migrate the RDEVLIST into your work IODF
  - `cbdsmigr iodf71 workiodf h vmconf rdevlist a r realvm`
- Complete the OS configuration
  - Export OS configuration as I/O configuration statements

    `cbdsconf iodf71 workiodf h realvm deck a o realvm`

  - Update OS configuration with additional devices

    `RDEVICE DEVNO=(1100,1),DEVTYPE=3215,OFFLINE=NO`

  - Re-migrate the updated OS configuration deck

    `cbdsmigr iodf71 workiodf h realvm deck a op realvm`
- Verify the OS configuration
  - Generate an OS configuration report

    `cbdsrep iodf71 workiodf h realvm report a mn`

# Step 4: Verify I/O configuration

- Check whether CSS definitions match the OS definitions
  - Use the HCD compare report to check partition configuration with OS configuration

```
cbdscomp iodf71 workiodf h * * * iodf71 compare a d
                                    proc1 lp1 realvm
```

- Build the production IODF
  - `cbdsprod iodf71 workiodf h iodf71 prodiodf h`
- Inspect the messages given in the HCD message log file
  - `CBDSPROD MSGLOG A`
  - Error messages does not allow the production IODF to be built
  - Warning messages/information messages may indicate configuration problems
- Correct the IODF definitions if necessary

# Step 5: Prepare for POR and IPL with production IODF

- Perform an IOCDS download
  - `cbdsiocp iodf71 prodiodf h proc1 i a1`
- Copy the production IODF to the SYSPARM disk
- Set up the SYSTEM CONFIG file
  - Insert IODF statement

    `IODF IODF71 REALVM`

    or

    `IODF * REALVM`

# Step 6: POR with HCD generated IOCDS

- Adapt the Reset Profile to allow dynamic changes.
- Select the IOCDS slot to which the IODF processor configuration has been written.
- Perform a POR.

# Step 7: Perform IPL

- IPL your system
- After IPL, check if HCD controls the I/O configuration
  - `q 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
Ready;
```

  - `q token`

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

- If IODF to be loaded is not on the SYSPARM disk, a disabled WAIT occurs.

# Step 8: Load IODF into HCM

- Download HCM from host and run installation EXE file.
- On z/VM host, start HCD dispatcher
  - `cbdsdisp`
- Launch HCM from your workstation
- Logon to the z/VM user, using TCP/IP host name and port number
- In **`File`** menu, select item **`IODFs`**…
- On the **`IODFs`** list, select the work IODF and press the LOAD button
- Provide the name of the HCM configuration file
- You now see the default configuration diagram of the IODF and are now ready to work with HCM.
- For new logins, select **`File – Open`** to open the HCM configuration file

# Recurring step: Perform dynamic I/O


- Using HCD, build a new production IODF with the changes:
  - Make a work IODF from your active production IODF
    ```
    cbdswork iodf71 prodiodf h iodf72 workiodf h
    ```
  - Export processor and OS configurations to CMS files
    ```
    cbdsconf iodf72 workiodf h proc1 deck a i proc1 (repl
    cbdsconf iodf72 workiodf h realvm deck a o realvm (repl
    ```
  - Edit the I/O configuration statements with the changes
  - Remigrate the changed configuration files (partial migrate)
    ```
    cbdsmigr iodf72 workiodf h proc1 deck a ip proc1
    Cbdsmigr iodf72 workiodf h realvm deck a op realvm
    ```
  - Build production IODF
    ```
    cbdsprod iodf72 workiodf h iodf72 prodiodf h
    ```
- Or, use HCM to perform the changes to the IODF directly

- Activate the changes
  - `cbdsact iodf72 proc1 realvm a1`
- Use `q hcd` and `q token` to check that the new configuration is active.

# Scenario 2: z/OS is used to define the IODF

Almost same steps as with scenarios 2, however, they may be done differently.

- Step 1: Prepare your z/VM IOCP deck for migration to the IODF
- Step 2: Migrate the IOCP deck
- Step 3 (optional): Migrate your RDEV information
- Step 4: Verify the IODF configuration
- Step 5: Prepare for POR and IPL with the production IODF
- Step 6: POR with HCD generated IOCDS
- Step 7: IPL with IODF
- Step 8: Load IODF into HCM

- Recurring step: Perform dynamic I/O reconfiguration

## Step 1: Prepare your IOCP for migration

- identical to scenario 1

## Step 2: Migrate the IOCP deck to the IODF

- Transmit the IOCP deck from your z/VM to your z/OS system
  - `Sendfile proc1 iocp to ossys at boetrx2`
- Migrate the VM IOCP deck using z/OS HCD into the existing work IODF

# Step 3 (optional): Migrate your RDEV data


- Export your work IODF to z/VM using z/OS HCD
- Import the work IODF under your z/VM system
  - `cbdsimp 0018 iodf71 workiodf h`
- Create an RDEVLIST from your active z/VM system
  - `cbdsrdev vmconf rdevlist a`
- Migrate the RDEVLIST into your work IODF
  - `cbdsmigr iodf71 workiodf h vmconf rdevlist a r realvm`
- Complete the OS configuration
  - Export OS configuration as I/O configuration statements

    `cbdsconf iodf71 workiodf h realvm deck a o realvm`
  - Update OS configuration with additional devices

    `RDEVICE DEVNO=(1100,1),DEVTYPE=3215,OFFLINE=NO`
  - Re-migrate the updated OS configuration deck

    `cbdsmigr iodf71 workiodf h realvm deck a op realvm`
- Verify the OS configuration
  - Generate an OS configuration report

    `cbdsrep iodf71 workiodf h realvm report a mn`
- Export the work IODF back to z/OS
  - `cbdsexp iodf71 workiodf h ossys boetrx2`

# Step 4: Verify I/O configuration

- If you are using HCM with z/OS HCD, open your HCM configuration file connected to your work IODF. A resync will take place.
- Other tasks are same as with scenario 1 but tasks are done in z/OS HCD or z/OS HCM.

# Step 5: Prepare for POR and IPL with production IODF

- Perform remote IOCDS download under z/OS HCD for the CEC running your z/VM system
- Export the production IODF to your z/VM system and receive it there
- Copy the production IODF to the SYSPARM disk
- Set up the SYSTEM CONFIG file as with scenario 1

## Step 6: POR with HCD generated IOCDS

- Same as with scenario 1

## Step 7: Perform IPL

- Same as with scenario 1

## Step 8: Load the IODF into HCM

- If you are using HCM with z/OS HCD, open your HCM configuration file connected to your work IODF. A resync will take place to include the new processor configuration into the HCM configuration and diagram.

# Recurring step: Perform dynamic I/O

- Using the z/OS HCD or z/OS HCM dialogs, build a new production IODF with the changes for your z/VM CPC or VM operating system.
- Distribute the production IODF to your z/VM CPC.
- Activate the changes
  - `cbdsact iodf72 proc1 realvm a1`
- Use `q hcd` and `q token` to check that the new configuration is active.

# Exchange an IODF between z/VM and z/OS

- Export an IODF from z/OS to z/VM
  - z/OS HCD function ***Export IODF*** (dialog option 6.5). Use **`CMS RECEIVE`** or the ***CBDSIMP*** REXX utility to obtain the CMS file.
  - Use FTP to the exported VSAM data format
  - Use z/OS HCM function ***Export IODF*** to download the exported format to the HCM workstation. Send the file as mail attachment or connect HCM to z/VM. Use HCM function ***Import IODF*** to establish the IODF as CMS file.
- Export an IODF from z/VM to z/OS
  - Use **`CMS SENDFILE`** or the ***CBDSEXP*** REXX utility. On z/OS, use HCD dialog option 6.6. (***Import IODF***).
  - Use FTP to the CMS file. On z/OS, use HCD dialog option 6.6.
  - Use HCM function ***Export IODF*** to download the IODF to the workstation. Connect to z/OS HCD. Use HCM function ***Import IODF*** to establish the IODF as VSAM file.
- Sharing volume between z/OS and z/VM

1. Bring up z/OS guest on z/VM.
2. Invoke z/OS HCD and use option 6.5 ***Export IODF*** to shared DASD xxxx.

```
1.VARY xxxx,OFFLINE
```

1. Detach device xxxx from z/OS.

On z/VM:

```
5.ATTACH xxxx * R/O or link to the appropriate full-disk minidisk
6.ACCESS xxxx T
7.LISTDS T
8.FILEDEF IODFIN T DSN userid.exported.iodf01 (DSORG PS
9.FILEDEF IODFOUT DISK IODF01 PRODIODF H
10.MOVEFILE IODFIN IODFOUT
```

# Session Summary

- This session showed
  - What benefits the use of HCD and HCM for I/O configuration management has.
  - How HCD and HCM can be used to manage the I/O configuration for z/VM.
  - Which are the migration steps to use HCD and HCM
- Q & A

# Appendix

**References**:

- z/VM I/O Configuration, SC24-6100
- 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/