Ordering OSA Adapters with Multiple Ports per CHPID? Don't Make these Mistakes!!

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Abstract

• So you think you know all about the OSA-E3 or OSA-E4S multi-port design? Did you know that you may not be able to seamlessly transfer a network design of a pair of two-port adapter cards to the four ports of a single OSA-E3 adapter or even the two ports of an OSA-E4S?
• Did you know that the IOCDS or HCD definitions must correlate with the OSA firmware table known as the “OAT” in order for the channel path to come online during a migration?
• This document is a brief introduction to problems you want to avoid when ordering and planning for new OSA configurations. An appendix contains a list of valuable reference documents and presentations that you may use when working on a new OSA order or implementation.
The “Tricky” Part about Ordering/Implementing New OSA Ports (1)

• You must know the obvious:
  • Whether Copper or Fiber Connection Type
  • If Fiber, then whether long or short reach
  • Whether 1 Gigabit or 10 Gigabit

• The Biggest Problem:
  – Thinking that a customer requirement for “x” number of OSA ports can immediately be mapped into available OSA ports on an Adapter card
  • You must also know the less obvious to make a proper assessment of what to order:
    – Number of OSA Ports per CHPID Types
    – Whether or not Customer wants port consolidation onto multi-port cards despite
      » additional administrative steps and
      » possible impact on adapter redundancy
The “Tricky” Part about Ordering/Implementing New OSA Ports (2)

- Confusion over:
  - “Adapter,” “Port,” “Feature Code”
  - Adapter with one Port per CHPID vs.
  - Adapter with two Ports per CHPID
    - Also known as “multi-port per CHPID” cards or “multi-port” cards
  - Multi-port CHPID Types and the IOCDS
  - Multi-port CHPID Types and Operating System Definitions

- Correlation between ...
  - CHPID Type “OSE” and
  - OSA Address Table
  - TCP/IP and SNA Configuration in Operating System
## Open Systems Adapter features on System z (Enterprise Class – IBM 2817)

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</table>

X = Available for ordering  
C = Carry forward on an upgrade
* CHPID type OSN is supported on z196, z114, z10, and z9 servers
** L2/L3 = Layer 2/Layer 3 which is applicable to z990 and later servers
*** OSM and OSX are exclusive to z196 and z114

SOD - z196 and z114 are last System z servers to support OSA-Express 2

CHPID Type OSN not offered on OSA-Express4S GbE

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### Open Systems Adapter features on System z (Business Class – IBM 2818)

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**SOD - z196 and z114 are last System z servers to support OSA-Express 2**

**CHPID Type OSN not offered on OSA-Express4S GbE**

---

X = Available for ordering  
C = Carry forward on an upgrade  
* L2/L3 = Layer 2/Layer3 which is applicable to z900 and later servers  
** L2/L3 = Layer 2/Layer3 which is applicable to z900 and later servers  
*** OSM and OSX are exclusive to z196 and z114
Comparison: Layout of Single-Port vs. Multi-Port CHPID

OSA-E2: 2-Port Adapter
- CHPID x
  - CHPID Type “A”
  - Port 0
- CHPID y
  - CHPID Type “?”
  - Port 0

OSA-E3: 2-Port Adapter
- CHPID x
  - CHPID Type “A”
  - Port 0
  - Port 1
- CHPID y
  - CHPID Type “?”
  - Port 0
  - Port 1

FC 3362, 3363, 3367

OSA-E3: 4-Port Adapter
- CHPID x
  - CHPID Type “A”
  - Port 0
  - Port 1
- CHPID y
  - CHPID Type “?”
  - Port 0
  - Port 1

FC 3369

OSA-E4S: 2-Port Adapter
- CHPID y
  - CHPID Type “?”
  - Port 0
  - Port 1

FC 0404, 0405

OSA-E4S: 2-Port Adapter
- CHPID y
  - CHPID Type “?”
  - Port 0
  - Port 1

FC 0405

OSA-E4S: 2-Port Adapter
- CHPID y
  - CHPID Type “?”
  - Port 0
  - Port 1

NOTE #1: Visuals depict fiber ports although some models have copper (RJ45) connections.
NOTE #2: Visuals depict vertical layout; horizontal layout is available with some System z configurations.
NOTE #3: All ports on a single CHPID must be of the same CHPID Type in the IOCDS.
NOTE #4: Multiple CHPIDs on a single Adapter or Feature Code may be of the same or different CHPID Type in the IOCDS.
Portnames: A Pitfall (Must Be Unique Names for z/OS!)

- On an OSA CHPID, the Portname value must be unique to the CHPID.
- This example depicts a single port per CHPID, as in the design of an OSA-E2.
- The Portnames are not only unique to the CHPID but also different from each other (GIGx and GIGy).
- However, certain configurations would permit the Portnames to be the same as in "GIG0."
- Example: If different VTAMs control the OSA TRLE definitions, the Portnames could be the same (e.g., GIG0) across the two CHPIDs.

- On an OSA CHPID, the Portname value must be unique to the CHPID.
- This example depicts multiple ports per CHPID, as in the design of an OSA-E3 or OSA-E4S.
- The Portnames in the top left of the visual are not only unique to the CHPID but also different from each other: "GIG0x" and "GIG1x."
- No configuration can allow two OSA ports on the same CHPID to be assigned the same Portname.
- Example: The Portnames in the bottom half of the visual must bear unique portnames. Otherwise, one port will fail to activate.
Notes on "Port Name Relief" for z/VM and Linux on z

Port Name on z/VM and Linux on z no longer verified at OSA Port activation. (See specifics below.)

**Port name relief**
- For OSA-Express features running in QDIO mode, the port name identifies the OSA port for sharing by other operating system instances.
- **OLD RULE:** When the port name is defined, all operating system instances that share the port must use the same port name.
- **NEW RULE:** Beginning with a particular level of OSA-Express Licensed Internal Code (LIC) and some operating systems, this restriction has been lifted. A port name is not required at the following OSA-Express LIC levels and operating system levels:
  - z800 and z900 with OSA-Express (LIC) level September 2003 or higher
  - z890 and z990 with all levels of OSA-Express LIC levels
  - z9 EC
  - z10
  - z/VM 4.3 with APAR PQ73878 and z/VM 4.4
  - Linux – V2.4 kernel June 2003 stream and above – V2.6 kernel April 2004 stream and above
- z/OS, VSE/ESA, and TPF require a port name, which must be the same when the OSA port is shared with the same operating system in different images or in a mixed OS environment. In addition, the port name must match the device name in the z/OS TCP/IP profile [or must match the PORTNAME parameter of the INTERFACE statement].

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The IOCDS Recognizes CHPIDs, Device Numbers . . But
not the OSA Port Numbers!

- No!
- Port Numbers are not assigned in the IOCDS of System z.

Port numbers are assigned in:
- VTAM of z/OS
  - QDIO
  - non-QDIO (LSA)
- TCP/IP of z/OS
  - non-QDIO (LCS)
- Device Configurations for Linux and z/VM
  TCP/IP Stack
The IOCDS for Multi-Port OSA Adapters
A full presentation on these issues is available as Migrating to a Multi-port CHPID OSA-E3 or OSA-E4S: Avoiding Common Problems (CHPID Types OSD and OSE) at

http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/PRS3950

The topic is only briefly illustrated in this section to give you an appreciation of how a customer might choose to pick the simplest migration solution even though it would mean ordering more OSA Port capacity than is needed so as to avoid the administrative overhead of making IOCDS, HCD, Operating system changes, and so on.
Assigning Device Addresses (QDIO): Alternative 2 (cuadd)

To simplify migration, you might retain existing device address ranges used on the OSA-E2:

- Port 0 uses IODEVICES from 3000 to 301F on CHPID x
- Port 1 uses IODEVICES from 3500 to 351F on CHPID x

Alternative:

Retain CHPID number (CHPID y) and IOCDS:

- Move OSA-E2 CHPID y (Port 0) to OSA-E3 CHPID y (Port 0)

A full presentation on these issues is available as Migrating to a Multi-port CHPID OSA-E3 or OSA-E4S: Avoiding Common Problems (CHPID Types OSD and OSE) at

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Assigning Device Addresses (QDIO): Alternative 3 (2 device ranges)

CHPID x
OSA-E2:  2-Port Adapter
Port 0
Port 1
IODEVICE 1000 - 101F

CHPID y
OSA-E3:  2-Port Adapter
Port 0
Port 1
IODEVICE 2000 - 201F

CHPID x
OSA-E3:  4-Port Adapter
Port 0
Port 1
Port 1
Port 0
IODEVICE 1000 - 101F
IODEVICE 2000 - 201F

CHPID y
OSA-E4S:  2-Port Adapter
Port 0
Port 1
IODEVICE 1000 - 101F
IODEVICE 2000 - 201F

To simplify migration, you might retain existing device address ranges used on the OSA-E2
OSA-E3:  Port 0 uses IODEVICES from 1000 to 101F on CHPID x
OSA-E3:  Port 1 uses IODEVICES from 2000 to 201F on CHPID x

Alternative:
- Retain CHPID number (CHPID y) and IOCDS:
  - Move OSA-E2 CHPID y (Port 0) to OSA-E3 CHPID y (Port 0)

A full presentation on these issues is available as Migrating to a Multi-port CHPID OSA-E3 or OSA-E4S: Avoiding Common Problems (CHPID Types OSD and OSE) at
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The topic is only briefly illustrated in this section to give you an appreciation of how a customer might choose to pick the simplest migration solution even though it would mean ordering more OSA Port capacity than is needed so as to avoid the administrative overhead of making IOCDS, HCD, Operating system changes, and so on.
Other Definitions for Implementation of Multi-Port OSA Adapters
These examples are for zOS only. Nevertheless, the other operating systems on z also have to deal with definitions that assign certain device numbers that were coded in the IOCDS to different OSA port numbers. Again, remember that the IOCDS knows nothing about the separate ports on a multi-port card. The other definitions must deal with these changes.

A full presentation on these issues is available as Migrating to a Multi-port CHPID OSA-E3 or OSA-E4S: Avoiding Common Problems (CHPID Types OSD and OSE) at http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/PRS3950

The topic is only briefly illustrated in this section to give you an appreciation of how a customer might choose to pick the simplest migration solution even though it would mean ordering more OSA Port capacity than is needed so as to avoid the administrative overhead of making IOCDS, HCD, Operating system changes, and so on.
Even OSA Firmware for CHPID Type OSE must know about the Port Numbers on a Multi-Port Adapter:

Configuration File

```c
/* Fast Ethernet parameters */
fenet.0.1 = MYCHP1P0           /* Configuration name (32-char max) */
fenet.0.2 = user data          /* User data (32-char max) */
fenet.0.3 = ETHD0              /* Port name (8-char max) */
fenet.0.4 = 0200345681234      /* Local MAC address (12 hex digits) */
fenet.0.5 = auto               /* Speed/mode */
fenet.1.1 = MYCHP1P1           /* Configuration name (32-char max) */
fenet.1.2 = user data          /* User data (32-char max) */
fenet.1.3 = ETHD1              /* Port name (8-char max) */
fenet.1.4 = 0200345684321      /* Local MAC address (12 hex digits) */
fenet.1.5 = auto               /* Speed/mode */
```

• This is an OSA Configuration file for a CHPID Type of OSE.

• Note how the 1000Base-T Fast Ethernet column contains either a 0 or a 1 in the middle of the field name to indicate whether
  • Port 0 or Port 1 is being referenced.
Even OSA Firmware for CHPID Type OSE must know about the Port Numbers on a Multi-Port Adapter

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*This is an OSA Address Table (OAT) for a CHPID type of OSE which has been customized using OSA/SF to indicate which Port Number of the OSA adapter contains which IOCDS device addresses.*

- Again, the IOCDS does not know anything about OSA Port Numbers.
Even OSA Firmware for CHPID Type OSE must know about the UNITADDs Coded in the IOCDS/HCD

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<th>Port (Dev) Mode</th>
<th>Port</th>
<th>Entry specific information</th>
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</tbody>
</table>

- This is an OSA Address Table (OAT) for a CHPID type of OSE which has been customized using OSA/SF to indicate which Port Number of the OSA adapter contains which IOCDS device addresses.
- Again, the IOCDS does not know anything about OSA Port Numbers.
- The UNITADDs of the IOCDS must match the UNITADDs coded in the first column in order for the Channel Path to be varied online.
- IMPORTANT: The Default OSA Address Table that is installed by the factory contains only Port 0 and UNITADD 00-01 for passthru.
Worksheets for Planning a Migration to Multi-Port OSA Adapters
Multi-Port OSA Adapter Card Considerations

1. Current 1 Gigabit OSA Port Requirements:
   A. Number of OSA Ports on each CHPID Type (OSD, OSE, OSN, OSC, OSM) and current Feature Code (Fiber LX or SX or Copper)
      - Verify with HCD Channel Path Detail Report (see this page and next)

2. Future OSA 1 Gigabit Port Requirements:
   A. Number of future OSA Ports on each CHPID Type (OSD, OSE, OSN, OSC, OSM) and future Feature Codes (Fiber or Copper)

3. System Programming and Cabling/switch Considerations:
   A. Significance of the "multi-port per CHPID" adapter types:
      - IOCDS, OAT, and VTAM, TCP/IP configurations when converting from one port per CHPID to two ports per CHPID.
   B. Significance of OAT firmware that must match the IOCDS definitions
   C. Considerations for conversions from copper to fiber or vice versa – OSA Feature Codes and Switch Connections

• Migrating one type of 10 Gigabit Adapter to another does not require as much thought, because there is always only one port per CHPID.
Determine together with the customer the current OSA port usage and the future OSA port usage requirements. For example, ....

Current Requirements:

Ask customer for a listing of each OSA CHPID Type, number of ports in use on each CHPID, and Feature Code Type. Much of this information can also be verified against the HCD Channel Path Detail Report that you see on these two pages.

Future Requirements:

Confirm with customer the number of future ports and CHPIDs of each type are required on new System z platform.

System Programming and Cabling/Switch Considerations:

Review with customer the significance of the “multi-port per CHPID” adapter types:

Possible changes to IOCDS when converting from one port per CHPID to two ports per CHPID.

Possible conversions from fiber to copper or changes to the external switch types.
### Channel Path Detail Report from HCD (Part 2)

#### PROCESSOR ID B35

- **Type:** 2097
- **Model:** E26
- **Configuration Mode:** LPAR
- **Token:** B35
- **Time:** 15:06
- **Date:** 2011-03-01

#### CSS ID 0

- **Control Unit:** 

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<th><strong>PNID</strong></th>
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<th><strong>Protocol</strong></th>
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<th><strong>To</strong></th>
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#### OPERATING SYSTEM SUMMARY REPORT

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<th><strong>Operating System ID</strong></th>
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<td>SYS2</td>
<td>MVS Sysprog TEST Lpar</td>
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---

The CHPID Type and the DEVICE TYPE-MODEL are highlighted in this report and will help your customer verify the number and type of CHPID ports in use.
Worksheet for OSA Adapter Orders: 1 Gigabit Adapters

The 1 Gigabit Adapters can house multiple ports per CHPID.

<table>
<thead>
<tr>
<th>Type of CHPID &amp; Connector</th>
<th>Previous # of such CHPIDs</th>
<th>Previous # of Ports</th>
<th>Future # Ports</th>
<th>Minimum # of Adapters or Feature Codes to Order</th>
<th>Maximum # of Adapters or Feature Codes to Order</th>
<th>Comments: Effect of Minimum Order</th>
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<td>5</td>
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<td>2 x FT2367, FC3367</td>
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<tr>
<td>OSM, LX (Fibre)</td>
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<td>4</td>
<td>5</td>
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<td></td>
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<tr>
<td>OSM, SX (Fibre)</td>
<td>2</td>
<td>4</td>
<td>5</td>
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<tr>
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<tr>
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<td>5</td>
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<tr>
<td>OSM, SX (Fibre)</td>
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Worksheet for OSA Adapter Orders: 10 Gigabit Adapters

**The 10 Gigabit Adapters house a single port per CHPID.**

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<th>Type of CHPID &amp; Connector</th>
<th>Previous # of each CHPID(s)</th>
<th>Previous # of Ports</th>
<th>Future # of Ports</th>
<th>Minimum # of Future CHPID(s)</th>
<th>Minimum # of Adapters or FCs to Order</th>
<th>Comments</th>
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<td>OSX (10 Gig)</td>
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Quiz #1 on Ordering Sufficient OSA Feature Codes

- Customer’s current implementation:
  - 4 1 Gigabit OSD CHPIDs (fiber connections)
  - 4 OSD Ports (all Port 0)
  - 2 1 Gigabit OSC (ICC) CHPIDs (copper connections)
  - 2 OSC Ports (all Port 0)

- Future Requirement: Same number of ports with minimal administrative (IOCDS/HCD, OAT, Operating System) or cabling changes
  - New Configuration must include:
    - __________ OSD CHPIDs
      - __________ OSA Ports (but using only Port 0)
      - __________ Adapter(s) of Feature Code _________ or
      - __________ Adapter(s) of Feature Code _________
    - __________ OSC CHPIDs
      - __________ OSA Ports (but using only Port 0)
      - __________ Adapter(s) of Feature Code _________ or
      - __________ Adapter(s) of Feature Code _________
Answers: Quiz #1 on Ordering Sufficient OSA Feature Codes

- Customer’s current implementation:
  - 4 1 Gigabit OSD CHPIDs (fiber connections)
  - 4 OSD Ports (all Port 0)
  - 2 1 Gigabit OSC (ICC) CHPIDs (copper connections)
  - 2 OSC Ports (all Port 0)

- Future Requirement: Same number of ports with minimal administrative (IOCDS/HCD, OAT, Operating System) or cabling changes
  - New Configuration must include:
    - 4 OSD CHPIDs
      - 8 OSA Ports (but using only Port 0)
      - 2 Adapter(s) of Feature Code 3362/3 or
      - 4 Adapter(s) of Feature Code 404/5/3373
    - 2 OSC CHPIDs
      - 4 OSA Ports (but using only Port 0)
      - 2 Adapter(s) of Feature Code 3367 or
      - 2 Adapter(s) of Feature Code 3369
Quiz #2 on Ordering Sufficient OSA Feature Codes

- **Customer’s current implementation:**
  - 4 1 Gigabit OSD CHPIDs (fiber connections)
  - 4 OSD Ports (all Port 0)
  - 2 1 Gigabit OSC (ICC) CHPIDs (copper connections)
  - 2 OSC Ports (all Port 0)

- **Future Requirement:** Same number of ports but with OSA Port consolidation regardless of administrative changes
  - New Configuration must include:
    - __________ OSD CHPIDs
      - __________ OSA Ports (but using Port 0 and Port 1)
      - __________ Adapter(s) of Feature Code _________ or
      - __________ Adapter(s) of Feature Code _________
    - __________ OSC CHPIDs
      - __________ OSA Ports (but using Port 0 and Port 1)
      - __________ Adapter(s) of Feature Code _________ or
      - __________ Adapter(s) of Feature Code _________
Answers: Quiz #2 on Ordering Sufficient OSA Feature Codes

- **Customer’s current implementation:**
  - 4 1 Gigabit OSD CHPIDs (fiber connections)
  - 4 OSD Ports (all Port 0)
  - 2 1 Gigabit OSC (ICC) CHPIDs (copper connections)
  - 2 OSC Ports (all Port 0)

- **Future Requirement:** Same number of ports but with OSA Port consolidation regardless of administrative changes
  - New Configuration must include:
    - 2 OSD CHPIDs
      - 4 OSA Ports (but using Port 0 and Port 1)
      - 1 Adapter(s) of Feature Code ___3362/3___ or
      - 2 Adapter(s) of Feature Code ___404/5/3373___
    - 1 OSC CHPIDs
      - 2 OSA Ports (but using Port 0 and Port 1)
      - 1 Adapter(s) of Feature Code ___3367___ or
      - 1 Adapter(s) of Feature Code ___3369___

- Adapter Redundancy is compromised with only one FC; better solution is to order two cards and use the other port or the other CHPID for a different purpose.
1. Moving from OSA-E2 to OSA-E3 or OSA-E4S (1 Gigabit)
   1. Make a copy of this worksheet page for each adapter you are moving from.
   2. Fill in the CHPID numbers of the Ports you want to move from and move to.
   3. Provide the CHPID Type of each CHPID and identify fiber vs. copper.
   4. Also fill in the Device Ranges on each port.
   5. Fill in the Portnames that z/OS Requires.
Identify the Ordering and Implementation Mistake #1

- **Customer's current implementation:**
  - 7 1-Gigabit OSD CHPIDs (fiber connections)
  - 7 OSD Ports
  - 1 1-Gigabit OSN CHPID (fiber connections)
    - 1 OSN Port
  - 3 1-Gigabit OSE CHPIDs (copper connections)
    - 3 OSE Ports
  - 2 1-Gigabit OSC (ICC) CHPIDs (copper connections)
    - 2 OSC Ports

- **Future Requirement:** Same number of ports but consolidate them on the fewest number of Feature Codes (Adapters) that you can.
  - On the configuration that was ordered, identify the problems with an "X" and provide an explanation of the error:
    - 2 Feature Codes 3362 to be configured with
      - 7 OSD Ports
      - 1 OSN Port
    - 2 Feature Codes 3367 to be configured with
      - 3 OSE Ports on one FC 3367
      - 2 OSC ports on second FC 3367
Solution: Identify the Ordering and Implementation Mistake

#1

- **Customer’s current implementation:**
  - 7 1-Gigabit OSD CHPIDs (fiber connections)
  - 7 OSD Ports
  - 1 1-Gigabit OSN CHPID (fiber connections)
  - 1 OSN Port
  - 3 1-Gigabit OSE CHPIDs (copper connections)
  - 3 OSE Ports
  - 2 1-Gigabit OSC (ICC) CHPIDs (copper connections)
  - 2 OSC Ports

- **Future Requirement:** Same number of ports but consolidate them on the fewest number of Feature Codes (Adapters) that you can.
  - On the configuration that was ordered, identify the problems with an “X” and provide an explanation of the error:
    - **X** 2 Feature Codes 3362 to be configured with
      - 7 OSD Ports
      - 1 OSN Port
      - **Problem:** Although 8 ports will fit on the four available CHPIDs, the first 7 ports consume the 4 available CHPID Type of OSD. The 8th port of type OSN requires a different CHPID Type.
      - **Solution:** Order 2 FCs 3362 and place 6 OSD Ports on three CHPIDs; make the last CHPIDs of Type OSN. Then order a FC 404 and place the 7th OSD Port on it.
    - Alternative 1: 2 Feature Codes 3367 to be configured with
      - 2 OSE Ports on first FC 3367 and 1 OSE port on the second FC 3367
      - 1 OSC ports on first FC 3367 and second OSC port on second FC 3367
    - Alternative 2: 2 Feature Codes 3367 to be configured with
      - 3 OSE Ports on one FC 3367
      - 2 OSC ports on second FC 3367

❖ Alternative 2 works but does not provide the same high availability that Alternative #1 does. With either alternative you are ordering enough Feature Codes; the planning effort that follows can address the desirable placement of the OSA ports of the varying CHPID Types.
These references will help you with understanding how to deal with other CHPID types that we have not covered in this brief presentation – like OSC or OSX or OSM, etc.
End of Presentation

• For more detail on these topics, reference the full presentation named
  • Migrating to a Multi-port CHPID OSA-E3 or OSA-E4S: Avoiding Common Problems (CHPID Types OSD and OSE) at
  • http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/PRS3950