**FICON & Channel Architecture**

Längd: 3 Days Kurskod: ESG0G

**Sammanfattning:**

This course provides an overview of current IBM System z family of servers. It gives detailed information on the System z channel architecture, System z High Performance FICON, (zHPF), Fiber connection (FICON) and Enterprise Systems Connection (ESCON) channels. It lists operational and protocol characteristics and use of available tools for problem determination (PD) purposes. It discusses operator commands, directors, and Hardware Management Console (HMC)/Support Element (SE) usage for channel problem determination and resolution. Also discussed is the I/O operations component of System Automation (SA) for z/OS (SA z/OS), its purpose and how it is used to manage and assist in PD for large enterprises with FICON and ESCON configurations. Hands on lab exercises are included to reinforce lecture topics.

The course describes how the OS initiates an I/O request, passes it to the channel subsystem (CSS) and identifies the flow through the CSS, control blocks used, and the associated FICON or ESCON channel path components to the target I/O device. It compares the operation of zHPF capable channels using command mode and transport mode, describing the differences in the channel program command structure and operation. Operational and protocol differences are identified between zHPF, FICON, and ESCON architecture used by the System z servers. System z channel subsystem enhancements such as: System z high performance FICON (zHPF) architecture, persistent information unit (IU) pacing for extended distances, FICON channel-to-channel (CTC) capabilities and FICON cascaded director support are discussed in detail. Channel operation and performance between ESCON and FICON are compared and discussed.

The course describes FCS FC-SB missing information unit detection, retry and recovery sequences, channel path problems and what type of indications surface potential trouble areas and corrective action. Operator messages and indications on the z/OS console, Hardware Management Console, (HMC) and SE will be shown. HMC and z/OS command usage will be identified to display current FICON channel and path status.

**Målgrupp:**

This intermediate class should consist of hardware planners, technical support personnel, and system programmers and anyone that needs a complete understanding of the System z channel architecture and how it applies to FICON I/O configurations.

**Målsättning:**

- Describe System z servers in relationship to
- The operating system and the channel subsystem on the mainframe
- Processor unit types and usage
- Servers supporting multiple logical channel subsystems
- Major new functions and features for recent server families
- Models within the server family
- Frame layout and cage usage
- MSU ratings
- Describe recent new technology used for processors and the channel subsystem
- Identify the various server components and how they are involved in a channel operation
- Processors, memory, memory buses, and channels
- Describe the System z channel connectivity provided at the CEC cage
- STI connectivity to I/O cage
- STI connectivity to I/O cage
- Identify an alternative to using an FCV configuration
- Describe FICON director connections
- Identify unique IOCPII coding requirements for the director
- Describe how channels can exploit the multiple image facility
- Describe channel usage when the HCD/IOCP coding defines a CHPID as dedicated, reconfigurable, shared, or spanned
- Describe the ESCON protocols and what they are used for within the I/O architecture
- Describe ESCON initialization process
- Identify the maximum number of logical images (Logical partitions and control unit) that the ESCON architecture supports
- Describe the FICON initialization process
- Describe how FICON exploits the Fibre Channel standard
- Identify source link and destination link addressing information contained in the FICON frame
- Compare FICON and ESCON frame transmission in a switched point to point topology
- Describe the persistent IU pacing enhancement
Describe zHPF architecture in relationship to
Initialization process to determine zHPF support
Compare zHPF, FICON, and ESCON frame transmission in a
Switched point to point topology
Describe the process of an I/O request (from an SSCH to frame
Transmission) for a transport mode or command mode operation
List the high-level hierarchical steps (link-level and device-level)
used in the error recovery process
Describe how the channel and control unit detects missing IUs and
the recovery action
Identify basic architectural rules and how they apply to ESCON and
FICON configurations
Describe I/O concurrency between ESCON and FICON and how
they apply when designing a configuration
Describe requirements for FICON CTC and cascaded switch
Configurations
Define what is a high-integrity fabric and why it is necessary for
cascaded switch configurations
Identify new keyword or entries added to IOPC/HCD to support new
FICON channels and FICON configurations
Use IOPC/HCD to define a FICON cascaded switch configuration
Describe the Initial Program Load (IPL) sequence
Identify where and how the load address, load parameters are
defined and used for IPL
Identify three major phases of the IPL
Describe z/OS message format
Identify z/OS display commands that can be used to determine
device and channel path status
Interpret the results of various I/O-related commands
Describe the use of VARY and CONFIG z/OS operator commands
Use z/OS commands for I/O problem determination
Describe the purpose of I/O operations in an enterprise
Identify the I/O operations commands and what they do
Identify the different operator interfaces where these commands can
be used
Use the various commands from all of the available operators
Identify typical HMC operational errors
Use proper navigation techniques to identify error conditions
reported on the HMC
Identify CPC/Image operational status, profile assignments and
usage
Log on and navigate the SE workplace
Use the channel problem determination panels
Identify console messages and indicators of FICON path problems
Identify and use operator commands and HMC/SE and FICON

- zEnterprise EC12 HCA and PCIe connectivity
- System z server connectivity for various types of CF links
- Describe server initialization process and the difference between
  Basic mode and LPAR mode
- Describe the difference between the term channel and CHPID
- Identify System z channel and CHPID usage
- Describe the hardware configuration definition process
- Hardware definitions
- Software definitions
- How definitions are loaded and activated
- Describe the evolution of the Fibre Channel standard and the FC
  Single-Byte Command Set protocol used by FICON
- List the Fibre Channel layers FC-0 through FC-4, how they are
  used and the associated FC terminology
- Define non-cascaded and cascaded switch configurations and
  how they relate to ESCON
- Describe data framing, buffer credits and classes of service for
data delivery
- Identify characteristics unique to the Fibre Channel point-to-point
  and switched fabric topologies
- Define the purpose of high performance FICON (zHPF) on
  System z servers
- Describe the command structure of a channel program using
  ESCON or FICON (CCW) command operation
- Describe the command structure of a channel program using
  zHPF
- Describe the various phases and control blocks used in an I/O
  operation:
  - How it is started from the application level and z/OS builds the
    channel program
  - How z/OS turns it over to the CSS and identifies if a command
    mode or transport mode I/O operation is to be performed
  - How various control blocks and command words are used to
    perform the actual I/O operation
  - How the CCS notifies z/OS that channel operation is complete
- Identify the components that make up the I/O device path
- Identify all available ESCON feature cards for System z servers
- Identify all available FICON Express feature cards for all System
  z servers
- List maximum unrepeated and repeated distances for ESCON
  before performance droop
- Describe the purpose of ESCON directors and director port
  connection types
- Identify how port connection types and status can be determined
  from the director
- Identify unique IOPC coding requirements for the director
- List maximum unrepeated and repeated distances for FICON and FICON before performance droop
- Identify FICON feature System z server and connectivity support

**Förkunskaper:**
You should have an understanding of basic data processing and input/output concepts

**Innehåll:**

**Day 1**
- Welcome
- Unit 1 - System z hardware overview and CSS components
- Unit 2 - System z LPAR, Channels, CHPIDs, and HCD concepts
- Unit 3 - Fibre Channel overview

**Day 2**
- Review
- Unit 4 - Channel operations and connectivity
- Unit 5 - ESCON, FICON and zHPF architecture, protocols and frame addressing
- Unit 6 - FICON configuration definition, Topic: Coding rules and concepts: Channels, CTCs and cascaded switch support

**Day 3**
- Review
- Unit 6 - FICON configuration definition, Topic: FICON definition (IOCP/HCD) support
- Exercise 1 - Remote access setup (eLab)
- Exercise 2 - Configuring FICON directors and cascaded directors with HCD
- Unit 7 - System IPL and z/OS commands
- Unit 8 - System automation for z/OS: I/O operations concepts and usage

**Day 4**
- Review
- Exercise 3 - HMC web browser and UI setup
- Exercise 4 - HMC setup and system activation
- Exercise 5 - Determining IPL information on running and non-running systems
- Unit 10 - FICON error recovery and problem determination
- Exercise 6 - Using system tools to identify and resolve device/path or channel problems
- Wrapup

**Övrig information:**
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