

Constructing CA-OPS/MVS Applications

Course Summary

Objectives

At the end of this course, students will be able to:

- Explain the OPS/MVS Architecture and feature set
- Use and program the Multi-System Facility (MSF)
- Know the differences between REXX and OPS/REXX
- Code and debug Automated Operator Facility (AOF) Rules
- How to build secure automation applications
- When and how to use the Programmer Operations Interface (POI) commands
- How to combine OPS/MVS and ISPF
- How to design and code common routines
- How to use the External Product Interface (EPI)
- Explain Address SQL and Understand the System State Manager
- Setup and use the UNIX System Services interface
- Setup and use the CICS Operations Facility
- Setup and use the IMS Operations Facility
- Roll out automation code and data to remote systems
- Understand OPS/MVS and Automation Point Web Services

Topics

- CA-OPS/MVS Introduction
- Multi-System Facility (MSF)
- OPS/REXX Review
- Advanced OPS/REXX
- AOF Rules Review
- Advanced AOF Rules
- OPS/MVS TSO Commands
- OPSLOG WebView
- Switch Operations Facility
- Managing OPS/MVS Automation
- System State Manager
- Using OPS/MVS with UNIX System Services
- Installing and Configuring USS Support
- CICS Operations Facility
- CICS Operations Facility Install
- IMS Operations Facility
- External Program Interface
- Automating CA-7 with OPS/REXX
- OPS/MVS New Features
- Automation Web Services
- z/OS Client Web Enablement Toolkit
- Coding AutoMate format rules (optional)

Audience

Automation Analysts, z/OS Systems Programmers working with Automation, Lead console operators

Prerequisites

Essential:

- Prior attendance at PT1189 Understanding and Using CA-OPS/MVS, or equivalent knowledge.
- REXX Programming skills as provided by PT1201 Introduction to REXX Programming

Recommended:

- PT1200 Understanding CA-OPS/MVS RDF and SSM

Duration

Four days

Constructing CA-OPS/MVS Applications

Course Outline

1. CA-OPS/MVS Introduction

- a. Why Automation?
- b. Standards
- c. Base Product Components
- d. Optional Features
- e. OPS/REXX (ORX)
- f. Automated Operations Facility (AOF)
- g. AOF Rule Types
- h. Sample CMD rule
- i. CA-OPS/MVS Architecture
- j. OPS/MVS Emergency Shutdown
- k. OPS/MVS Excessive WTO Detection
- l. OPSVIEW
- m. OPSLOG WebView
- n. OPS/MVS Server Facility (OSF)
- o. Unix System Services (USS)
- p. External Product Interface (EPI)
- q. Programmable Operations Interface (POI)
- r. Relational Data Framework (RDF)
- s. System State Manager (SSM)
- t. VM Guest Support (VMGS)
- u. Multi-System Facility (MSF)
- v. CICS Operations Facility (COF)
- w. IMS/DC Operation Facility (IOF)
- x. SYSPLEX Variables
- y. ADDRESS HWS Environment
- z. MTC-A Mainframe Team Center - Automation
- aa. MTC-A Rule Visualization and Management
- bb. MTC-A System State Manager Interface
- cc. MTC-A Mainframe Team Center - Architecture
- dd. CA-OPS/MVS Web Services Web API
- ee. What are RESTful Interfaces?
- ff. REST: REpresentational State Transfer
- gg. Web Services Example: Run REXX
- hh. OPS/MVS Documentation

2. Multi-System Facility (MSF)

- a. MSF Overview
- b. OPS/MVS MSF Display
- c. OPSCTL Environment
- d. MSF Example
- e. Optional Lab: Sending Global Variables
- f. Recap of OPS/MVS MSF Display
- g. Dynamically Defining new MSF Session
- h. OPSLOG MSF Command

3. OPS/REXX Review

- a. Review: What's a REXX Procedure?
- b. Portability: REXX Environments
- c. REXX vs. TSO CLIST
- d. Review: The REXX Data Stack
- e. Differences: OPS/REXX Data Stack
- f. OPS/REXX Limitations
- g. Differences: OPS/REXX Trace
- h. OPS/REXX Extensions
- i. OPS/REXX History
- j. OPS/REXX POI (TSO) Cmds
- k. OPS/REXX Variable Syntax
- l. OPS/REXX Global Variables
- m. Nonvolatile Global Variables
- n. Volatile Global Variables
- o. How to Create a Global Variable
- p. Lab: Creating Global Variables
- q. How to Delete a Global Variable
- r. Optional Lab: Deleting Global Variables
- s. Lab: Creating Global Variables
- t. How to Delete a Global Variable
- u. Optional Lab: Deleting Global Variables
- v. Working With Sysplex Variables
- w. OPSVASRV Sysplex Variable Function
- x. OPSVASR1 Sample Program
- y. Lab: Creating Sysplex Variables
- z. OPS/REXX Address Environments
- aa. Address OPER
- bb. Lab: Issuing MVS Commands
- cc. Address WTO
- dd. Multi-line Address WTO
- ee. OPS/REXX Functions
- ff. OPS/MVS MVS Info Functions
- gg. OPSDEV() Example
- hh. OPSINFO() Function
- ii. OPSIPL() Example
- jj. OPSENQ() Function
- kk. OPSJES2() Function
- ll. OPSPRMLB() Example
- mm. OPSTATUS() Example
- nn. OPSYSPLX() Example
- oo. OPSYSSYM() Example
- pp. OPSLOG() Example
- qq. OPS/MVS MVS Service Functions
- rr. OPS/MVS Params affecting OPS/REXX
- ss. OPTIONS REXX Keyword Instruction

4. *Advanced OPS/REXX*

- a. *OPS/REXX Address Environments*
- b. *CA-GSS Address Environments*
- c. *ADDRESS NETMASTR*
- d. *OPSDYNAM Example - ALLOC, FREE*
- e. *OPSDYNAM Example - CONCAT, DECONCAT*
- f. *OPS/MVS Built-in Functions*
- g. *OPS/MVS MVS Service Functions*
- h. *OPSARM() Return Code Variables*
- i. *OPSARM() Example*
- j. *Opsarmst() – Global ARM Status Vars*
- k. *EXECIO - OPS/MVS I/O Handling*
- l. *OPS/MVS Management Functions*
- m. *OPSPRM() Example*
- n. *OPS/MVS Management Functions*
- o. *OPS/MVS Variable Functions*
- p. *OPSHFI Function – Optional Keywords*
- q. *OPSHFI Example*
- r. *OPS/MVS Misc Functions*
- s. *Keyword Instruction - Interpret*

5. *AOF Rules Review*

- a. *What is a RULE?*
- b. *AOF Event Definition Types*
- c. *AOF Rule Sections*
- d. *Rule Section Example*
- e. *CMD Rule Example*
- f. *OPS/REXX Variable Types*
- g. *Event-Related Variables*
- h. *Nonvolatile Global Variables*
- i. *Volatile Global Variables*
- j. *GLVEVENT Global Variables*
- k. *Address Space Global Variables*
- l. *GLVJOBID Variable Example*
- m. *How to Create a Global Variable*
- n. *How to Delete a Global Variable*
- o. *Manipulating Global Variables*
- p. *OPSVLUE() Example*
- q. *Message Event*
- r. *Message Event Scope*
- s. *Sample MSG rule*
- t. *Multi-line WTO Processing*
- u. *MSG Rule w/ MLWTO handling*
- v. *MLWTO MSG Rule Example*
- w. *OPS/MVS Built-in Function: OPSTHRSH*
- x. *MVS Route code (ROUTCDE) Info*
- y. *MVS Descriptor code Info*
- z. *AOF Test Editor*
- aa. *Specifying AOF Test Rules DSN*
- bb. *AOF Test Rules Member List*
- cc. *Testing a Message Rule*
- dd. *Listing Global variables*
- ee. *MSG Rule Exercise*
- ff. *Command Event*
- gg. *Command Event Scope*
- hh. *Example CMD rule*
- ii. *Testing a Command Rule*
- jj. *CMD Rule Exercise*
- kk. *Time of Day Event*

ll. *TOD Event Scope*

- mm. *TOD Examples*
- nn. *Multi TODspec Example*
- oo. *Testing a Time of Day Rule*
- pp. *Manual Catchup of TOD Rules*
- qq. *Relative Time Rule*
- rr. *Dynamic Rules*
- ss. *TOD Rule Exercise*
- tt. *OPS/MVS Params affecting AOF Rules*
- uu. *EasyRule*

6. *Advanced AOF Rules*

- a. *AOF Event Definition Types*
- b. *Advanced MSG Rule Example*
- c. *Setting OPS Message Suffix Params*
- d. *OPS/MVS Message Severity Levels*
- e. *Example OPS/MVS Msg Rule*
- f. *Threshold checking with opsThresh()*
- g. *TOD -> REXX Example*
- h. *End of Memory Event*
- i. *EOM Event Scope*
- j. *EOM Example*
- k. *Testing an End of Memory Rule*
- l. *End of Job, End of Step Events*
- m. *EOJ, EOS Event Scope*
- n. *EOJ Example*
- o. *Time Limit Exceeded Event*
- p. *TLM Event Scope*
- q. *Example: TLMDEMO*
- r. *Example: TLM2TBL*
- s. *Delete Operator Message Event*
- t. *DOM Event Scope*
- u. *DOM Rule Example*
- v. *OPS Built-in Functions: OPSEND*
- w. *Global Variable Event*
- x. *GLV Event Scope*
- y. *Example GLV Rule*
- z. *Test Global Variables*
- aa. *Omegamon Event*
- bb. *Omegamon Setup*
- cc. *Omegamon JCL*
- dd. *OMG Event Scope*
- ee. *Example Omegamon Rule*
- ff. *Request Event*
- gg. *REQ Event Scope*
- hh. *Sample REQ Rule*
- ii. *Security Event*
- jj. *OPS Built-in Functions: OPSECURE()*
- kk. *SEC (Security) Event Scope*
- ll. *Security Rule Example - Audit Trail*
- mm. *Dynamic Rules*
- nn. *API Event*
- oo. *API Event Scope*
- pp. *API Rule Example*
- qq. *Example: API2TBL*
- rr. *Automatic Restart Manager Event*
- ss. *ARM Event Scope*
- tt. *ARM Rule Example*

7. OPS/MVS TSO Commands

- a. TSO Commands - Reasons to Avoid
- b. TSO Commands - Reasons to Use
- c. The OPSWAIT Command
- d. The OPSCMD Command
- e. The OPSREPLY Command
- f. The OPSPARM Command
- g. The OPSRMT Command
- h. The OPSWTO Command
- i. The OPSVIEW and OB Commands

8. OPSLOG WebView

- a. WebView Overview
- b. Launching WebView
- c. Using WebView
- d. WebView Features
- e. WebView Components
- f. WebView Components: Client
- g. WebView Components: Server
- h. WebView Server Proc
- i. WebView Operator Commands
- j. WebView: How it Works
- k. Client Installation & Setup
- l. OPSLOGSV Installation & Setup
- m. OpsLog WebView Lab

9. Switch Operations Facility

- a. What is SOF?
- b. SOF Architecture
- c. SOF Discovery
- d. SOF User Interface and API
- e. SOF Operator Commands
- f. SOF Actions
- g. SOF Control Menu
- h. SOF Device View
- i. SOF Notes
- j. SOF Documentation

10. Managing OPS/MVS Automation

- a. OPS/MVS Element Mgmt Issues
- b. Requirements
- c. Environments
- d. A Concatenation Scheme for Environments
- e. AOF Rules Rollout Issues
- f. RULEMGR Tool written by ProTech
- g. Global Variable Rollout Issues
- h. RDF Table Rollout Issues
- i. WRITTBLS Tool written by ProTech

11. System State Manager

- a. System State Manager
- b. Relational Data Framework
- c. Where Can SQL Code Run?
- d. Returned Data
- e. WHERE Clause
- f. SSM Overview
- g. StateMan Components

- h. Monitoring StateMan From Console
- i. Monitoring StateMan From ISPF
- j. StateMan Filter command
- k. Core STCTBL Resource Columns
- l. Newer STCTBL Resource Columns
- m. Resource Table Structure
- n. STCTBL Table View
- o. System State Manager
- p. Phases in the SSM Cycle
- q. Basic PREREQ Checking
- r. StateMan Modes & States
- s. StateMan Action Table
- t. SSM V2 STCTBL Action Table
- u. SSM V2 Action Table Columns
- v. ACTION_TEXT Clauses
- w. SSM V2 ACTION_TEXT Clauses
- x. Action Substitution Variables
- y. Additional Action Substitution Variables
- z. Example CA-supplied Action execs
- aa. SSM Rules Must be Enabled
- bb. Review SSM Rules
- cc. Setting the Desired State
- dd. SSMBegin REXX Exec
- ee. IPL Time
- ff. System Shutdown
- gg. StateMan IPL Walk-thru
- hh. StateMan Parameter Review
- ii. Directory Table
- jj. StateMan Administration
- kk. SNAPSHOT
- ll. Understanding SSM V2
- mm. SSMV2 Required Resource Table Columns 1
- nn. ACTMODE Column Notes
- oo. Process Exit example
- pp. EVNTINFO REQ RULE
- qq. Process Exit Example
- rr. SSM v2 PREREQ Syntax
- ss. SSMGA System Affinity PREREQ
- tt. Minimum Number of Prerequisites
- uu. Positive & Negative (+/-) PREREQs
- vv. Positive & Negative (>/<) SUBREQs
- ww. WLM Scheduling Environments
- xx. SSM v2 Global Events
- yy. Global Event Action Table
- zz. SSM v2 Global Event Audit Trail
- aaa. Auxiliary Tables
- bbb. Sysplex Resource Monitor
- ccc. Other SSM Features
- ddd. SSM v2 Migration Considerations
- eee. Introduction to SSMGA
- fff. SSMGA Capabilities
- ggg. SSMGA Architecture
- hhh. SSMGA Columns in STCTBL
- iii. Understanding SSM V3
- jjj. StateMan Policy Manager
- kkk. StateMan Policy Manager Discovery
- lll. StateMan Policy Resources
- mmm. StateMan Policy Editor Line Commands

12. OPS/MVS with UNIX System Services

- a. OPS/MVS UNIX Architecture
- b. USS Server Class
- c. ADDRESS USS Environment
- d. USS Process Start and Stop Events
- e. USS Process Events in OPSLOG
- f. USS AOF Rules
- g. UNIX System Service Msg Event
- h. USS Event Variables
- i. USS Event Scope
- j. Example USS Rule
- k. USS Log Monitoring
- l. Calling the LOG Monitor Script
- m. OPSINFO() UNIX Information
- n. OPSUSS('Process') Function
- o. Selected OPSUSS() Return variables
- p. OPSUSS('User') & OPSUSS('Group')
- q. OPSUSS('Set') Function
- r. OPSUSS Function: Examples
- s. Running OPS/REXX in USS
- t. OPS/REXX and USS: HFS Files
- u. OPS/REXX Execution from USS Shell
- v. OPS/REXX Execution from ssh
- w. OPS/REXX Execution from OMVS
- x. OPS/REXX Execution in UNIX REXX
- y. OPS/REXX Commands in USS
- z. ADDRESS USS Environment
- aa. Address USS USSCMD
- bb. Address USS USSCMD Example
- cc. Address USS Return Codes
- dd. Address USS CMD
- ee. Address USS API Keywords
- ff. Address USS DOM
- gg. Address USS PING
- hh. Address USS REPLY
- ii. Address USS WTO
- jj. Address USS WTO Example
- kk. Address USS WTOR
- ll. Address USS WTOR Example
- mm. Terminating OPSUSS Servers

13. Installing and Configuring USS Support

- a. Reasons to Install OPS USS Interface
- b. Recent Updates and Changes
- c. USS Installation Checklist
- d. Parameters and Customization
- e. Customizing the OPSUSS Proc
- f. Customizing the OPSUSS ENVFILE
- g. OPS/MVS USS Parameters
- h. Activating OPS/MVS USS
- i. Monitoring OPS/MVS USS w/ OpsView
- j. Sending work to OPS/MVS USS
- k. ADDRESS USS Example

14. CICS Operations Facility

- a. CICS Operations Facility Overview
- b. CICS WTO and COF Messages in OPSLOG
- c. Defining CICS Region to COF
- d. Monitoring COF from OpsView
- e. CICS Operations Facility Install
- f. Other CICS Management Tools

15. CICS Operations Facility Install

- a. Copying OPS/MVS OPCITDCN to DFHRPL
- b. Determining CICS GRPLIST value & CSD
- c. Defining OPS/MVS XTDOU Global Exit
- d. Installing OPS/MVS OPXTDOU Group
- e. Adding OPXTDOU Group to dfhLIST
- f. Running the OPS/MVS OPTD Transaction
- g. Dynamically Enabling OPS/MVS COF Parns
- h. Defining CICS Regions and TDQ Names
- i. CICS WTO and COF Messages in OPSLOG

16. IMS Operations Facility

- a. IOF Overview
- b. IOF Variables
- c. Using OPSINFO() with IOF
- d. IOF Message Processing
- e. IMS Command Response
- f. IOF Install & Configuration Overview
- g. Issuing IMS Commands
- h. IMS Operations Facility Install
- i. ProTech IOF Add-ons

17. External Program Interface

- a. EPI Overview
- b. Understanding the EPI Logmode
- c. EPI Programming Overview
- d. EPI Setup
- e. Defining terminals w/ OPEPDFAL exec:
- f. EPI in OpsView
- g. EPI Define Command
- h. EPI LIST Command
- i. EPI Enable/Disable Commands
- j. EPI Logon / Logoff Commands
- k. EPI Change Command
- l. EPI ENQ / DEQ Commands
- m. EPI Bind / UnBind Commands
- n. EPI Msgld Command
- o. EPI RdCursor & MvCursor Commands
- p. EPI RdScreen / RdScrRow Commands
- q. EPI SubAttr / SubUnpt Commands
- r. EPI SetTerm / SetUname Command
- s. EPI TimeOut / Trim Commands
- t. EPI InqInput Command
- u. EPI Type / TypeSec Commands
- v. EPI TypeTest Command
- w. EPI Special Key Names for Type

- x. EPI GetScr Command
- y. EPI SessCmd Command
- z. GETSCRN & SESSCMD Variables
- aa. SESSCMD HLLAPI Keystrokes
- bb. EPI Wait / WaitTOD Commands
- cc. EPI Debug / Trace Commands
- dd. EPI PEEK / POKE Commands
- ee. EPI SubSys Command
- ff. EPI Hints and Tips
- gg. EPI Demo via OpsView 4.10
- hh. EPI Demo via EPITRY Sample
- ii. Screen Event
- jj. SCR Event Scope

18. Automating CA-7 with OPS/REXX

- a. Using REXX with CA-7
- b. What CA-7 and REXX can do
- c. CA-7 Interface Options
- d. CA-7 REXX Interface Architecture
- e. Overview of REXX and CA-7
- f. Configuring the CA-7 GSS Interface
- g. Configuring OPS/MVS CA-7 Interface
- h. CA7DEMO Exec
- i. CA7DEMO Exec Output
- j. JES2 Ready Queue
- k. Demand a job on hold
- l. Why is a Job Late? (1 of 2)
- m. Critical Path Monitoring
- n. CPM Flow Status
- o. Defining a CPM Flow in CA-7
- p. What to define in CA-7

19. OPS/MVS New Features

- a. New Features of OPS/MVS 14.0 +
- b. New Features of OPS/MVS 14.0.01
- c. New Features of OPS/MVS 14.0
- d. Features Removed from OPS/MVS 14.0
- e. New Features of OPS/MVS 13.5
- f. New Features of OPS/MVS 13.0
- g. Updated Features of OPS/MVS 13.0
- h. New Features of OPS/MVS 12.3
- i. New Features of OPS/MVS 12.3 - ESP
- j. Updated OPS/MVS 12.3 Features - OPSLOG
- k. Updated OPS/MVS 12.3 Features - PPRC
- l. OPS/MVS 12.3 Migration Issues
- m. New Features of OPS/MVS 12.2

20. Automation Web Services

- a. Intro to Web Services
- b. HTTP Architecture
- c. eXtensible Markup Language
- d. XML Terminology
- e. XML Basics
- f. White Space
- g. Some Example XML...
- h. XML "Elements" (or Nodes)
- i. XML as a Tree
- j. XML Text and Attributes
- k. XML as Paths

- l. XML Schema
- m. XML Validation
- n. Many XML Schema Languages
- o. JSON: JavaScript Object Notation
- p. Service Oriented Approach
- q. Web Service Technologies
- r. What are RESTful Interfaces?
- s. REST: Representational State Transfer
- t. API Security and Rate Limiting
- u. Google Geocoding API Limits
- v. OPS/MVS Web Services
- w. Example: OSFRexx GET XML Response
- x. Automation Point Web Services
- y. Web Services in Broadcom Schedulers
- z. CA-7 Web Services
- aa. CA-ESP Application Endpoint Web Services
- bb. CA-ESP Job Endpoint Web Services
- cc. CA-ESP Command Endpoint Web Services
- dd. CA-View RESTful API
- ee. Mainframe Team Center RESTful API

21. z/OS Client Web Enablement Toolkit

- a. HTTP Request Overview
- b. JSON: JavaScript Object Notation
- c. JSON Parser Services
- d. Programming Toolkit Environment
- e. z/OS Client Web Toolkit: REXX Support
- f. Response Headers
- g. Request Body
- h. Problem: Large Request or Response Bodies
- i. Sending Request Body Prior To Streaming
- j. Receiving Request Body Prior To Streaming
- k. New Streaming Send (Request Body)
- l. New Streaming Receive (Request Body)

22. Coding AutoMate format rules (optional)

- a. What Are AutoMate Format Rules?
- b. Syntax For Rules
- c. Rules Keywords By Category
- d. Rules: Event Filtering Keywords
- e. Rules: Message Management Keywords
- f. Rules: Automation Action Keywords
- g. Types of Variables
- h. Environment Variables
- i. Environment Variables: Date & Time Information
- j. Environment Variables: Msg & Event Information
- k. Environment Variables: Event-Specific Information
- l. Status Variables
- m. Dynamic Status Variables
- n. Using Dynamic Status Variables
- o. Event Filtering Keywords: Every
- p. Event Filtering Keywords: Limit, Matchlim
- q. Event Filtering Keywords: When
- r. Message Display Keywords: Suppress, Display

- s. *Message Display Keywords: Highlight, Lowlight*
- t. *Message Display Keywords: WTO, Rework*
- u. *Automation Action Keywords: DOM*
- v. *Automation Action Keywords: OSCMD*
- w. *Automation Action Keywords: Reply*
- x. *Automation Action Keywords: REXX*
- y. *Automation Action Keywords: Set*
- z. *Automation Action Keywords: SQL*
- aa. *Automation Action Keywords: TSOCMD*
- bb. *Specifying Text Strings*
- cc. *Managing AutoMate Format Rules*
- dd. *AutoMate Rule Setup*
- ee. *AutoMate Rule Setup - Parns*
- ff. *Creating an AutoMate Rule*
- gg. *Managing AutoMate rules from Console*
- hh. *Inside the ATMRULES Ruleset:*
- ii. *Converting an AutoMate Rule*