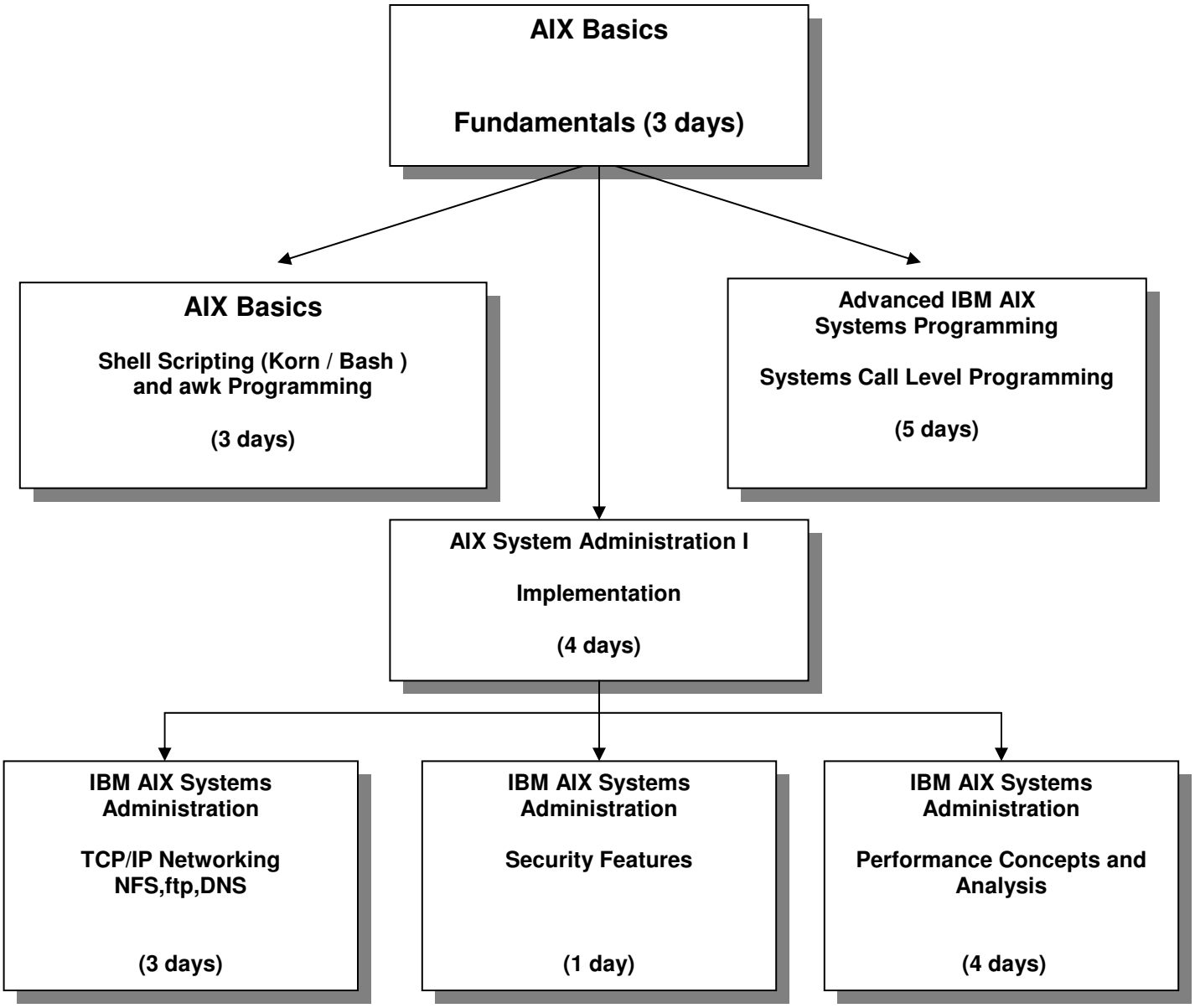
IBM AIX Operating System Courses

(Platforms: POWER4+ based)



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AIX Basics

COURSE DESCRIPTION

This course teaches the basic working environment of an **IBM AIX** system. It introduces commonly required operations that can be performed by entering commands interactively in a command terminal, along with functions available in the Common Desktop Environment (**CDE**). This course is taught for the following **IBM AIX** platforms: **POWER4+** , all **AIX operating system versions**.

COURSE OBJECTIVES

Each student will be able to use **Korn Shell** techniques and commands to maintain collections of files, create files using interactive editor utilities, create and execute basic command procedures, communicate with other users, and tailor the interactive environment to meet their needs. Environment control using the **CDE** graphical utilities will also be shown.

COURSE TOPICS

Understanding the User Environment

- **Unix** / **AIX** Software Overview
- Process Concepts
- The Common Desktop Environment GUI

Getting Started with the Command Language

- Logging Into an **AIX** System
  - Graphically through the **CDE**
  - Non-graphically thru **telnet** or **ssh**
- Shell Syntax Rules
- Command Line Editing
- Obtaining help using **man** and **CDE helpview**
- **Korn** shell history control
- Basic Network Operations

AIX Basics

COURSE TOPICS

Managing Files
- File Specification Syntax
- Device Specifications
- Directory Specifications
- Using the **CDE dtfile** manager
- Regular Expressions and Special Characters
- **AIX** Commands to Manipulate Files
  - **CDE** utilities to manipulate files
- File Protection Mechanisms

Creating and Editing Text Files: Part 1
- Using GUI-based editors (**dtpad**)
- **vi** Editor
- **ex** Editor (commands within **vi**)

Creating and Editing Text Files: Part 2
- Advanced Features of the **vi** Editor
  - abbreviations
  - mapping keys
  - alternative editors: **vim** **nedit**

Improving the User Interface
- Saving History Commands
- Creating Command Aliases
- Redirection of Input and Output
- Using Hard and Symbolic Links
- Process Control Commands

Shell Script Procedures
- Rules for Creating Procedures
- The .profile Procedure
- The .kshrc Procedure

AIX Basics

COURSE TOPICS

Print and Batch Mechanisms
The **lpr** and **lp** Commands and Qualifiers
Using the **CDE** print manager
The **at** Command and Qualifiers

Basic Archiving Techniques
The **tar** Command and Options
Compressing **tar** archives with **gzip**

COURSE DURATION

This course normally requires three (3) days, approximately 50% lecture and 50% lab time.

COURSE PREREQUISITES

This course is considered to be the basic **IBM AIX** course. Experience with any (other) interactive system is helpful.

AIX Basics

Shell Programming and Report Generation

COURSE DESCRIPTION

This course teaches the **IBM AIX** computer professional (user, systems administrator, application/system programmer) the techniques needed to develop advanced shell and reporting type procedures under **AIX**. Techniques in the major shells will be shown. Note that all **Unix** systems support all of the techniques in this course.

COURSE OBJECTIVES

Each student will be able to use **AIX awk**, **nawk**, **Korn** and **Bash** shell features to maintain collections of files, control usage of shell command scripts, and generate reports using the (n)awk facility.

COURSE TOPICS

Writing Korn and Bash Shell Scripts

- Korn Shell environment variables
- User-defined variables
- Substitution of variables
- Command substitution in variables
- Decision statements
- Looping statement constructs
- **typeset**ting variables for output
- **typeset**ting integer variables
- using and defining functions
- accessing files' records using pipes
- accessing files' records directly with **exec**
- special parameter/variable substitutions
- Korn shell parent-child process communications
- defining and using indexed and associative arrays
- processing command line options
- socket level connections

AIX Basics

Shell Programming and Report Generation

COURSE TOPICS

Using the awk Utility to Generate Reports

- **awk** utility calling techniques
- Patterns and actions
- Using the **BEGIN** and **END** patterns
- Using **awk** built-in variables
- Procedure-defined variables in **awk**
- Formatted output using **printf**
- Defining and using associative arrays

COURSE DURATION

This course normally requires three (3) days, approximately 50 % lecture, and 50 % lab time.

COURSE PREREQUISITES

This is an advanced **IBM AIX** course. It is assumed that participants either have attended the **AIX Basics** course, or have equivalent experience with a **Unix** system.

Advanced IBM AIX Systems Programming

Course Description

This course introduces the participants to system level programming in the **C language** in a **IBM AIX** environment. The course focuses on **HP-UX** system calls and library functions, how to use them, and their underlying mechanisms. The course deals with many facets of the **IBM AIX** operating system, including: introduction to UNIX kernel structure, I/O, Signals, Signal handlers, Timers, Processes, Multi-Tasking, Inter-Process Communication (IPC) Pipes, Shared memory, Message Queues, Semaphores, Networking, Sockets, using TCP/IP and UDP/IP**.**Throughout the course the information presented is related to the participant through: the execution of common **IBM AIX** user/administrator commands, and writing, compiling, and executing example **C language** programs which demonstrate the use of system routines and accessing system data structures on a live **IBM AIX** system.

Course Objectives

Upon completion of this course the participant will be able to:

- Explain the various mechanisms available to the programmer in a **IBM AIX** environment
- Write a wide variety of applications using standard **Unix** system calls and library functions

Course Topics

System Programming Environment of the IBM AIX Operating System

- Environment of a **C** language program
- System level programming requirements:
  - **C** compiler issues
  - Header files and libraries
  - Special data types used
  - Useful functions
  - Error handling (basic)
- Documentation
- Security Issues

File Systems

- Types of file I/O
- File I/O structures
- File I/O access types
- Dealing with STDIN, STDOUT, STDERR
- Creating and using temporary files
- Directory file access and manipulation
- Permissions

Process Creation and Control

- Attributes (username, UID, PID, Groups)
- Creation methods
- Multi-tasking
- Shells
- Synchronization
- An introduction to threads

Advanced IBM AIX Systems Programming

Course Topics

Synchronization and System Information

- Time issues:
  - how time is maintained
  - timers
- General synchronization
  - semaphores
  - mutexes
  - signals (generation and handling)
- System information:
  - uname
  - hostname
  - load averages

Interprocess Data Communication Facilities

- Overview of Unix IPC Facilities
- Memory Mapped files
- Pipes and Named Pipes
- Messages Queues
- Creating and Using Shared Memory structures

Sharing Code Between Processes

- Building shared object (libraries)
- Static Linking
- Dynamic Linking

Networking

- Concepts and basic requirements
- Socket creation and usage
- TCP/IP level connections
- UDP/IP level connections

Course Duration

This course normally requires five (5) days, 60% lecture, 40% hands on lab exercises.

Course Prerequisites

It is assumed that the participant has a solid background in basic **IBM AIX** utilities and editors (such as **vi**), and a working knowledge of the **C** (or **C++**) programming language(s).

AIX System Administration I

Implementation

COURSE DESCRIPTION

This course will teach the commands and methods needed to setup and manage **IBM AIX** systems. The course will also use a problem solving approach in the lab exercises to teach system managers advanced topics, for long-term mangement goals.

Systems: **IBM AIX, running on RS/6000 or POWER configurations**.

COURSE OBJECTIVES

On completion of this course, a system manager should be able to install, update, and boot the **IBM AIX** operating system; set up user accounts and directories; prepare queues for use; perform backups for integrity and performance reasons; monitor the system for performance and do basic setup of network software and capabilities.

COURSE TOPICS

Advanced System Concepts for System Administrators

- Process concepts
- Shell command usage and review
- Optimizing system help information
- System administrator functions
- Using the root account
- Using the **smit** graphical and non-graphical interfaces
- Manipulating system default environment files

System Installation and Updating

- Installation types and methods
- Installing the **AIX** operating systems
- Upgrading to a newer version of **AIX**
- Maintaining the system via patches
- Adding additional products to the system (**lpp**)
- Reconfiguring the **AIX** kernels via parameters

AIX System Administration I

Implementation

COURSE TOPICS

Startup and Shutdown

- Default bootstrap
- Boot to single-user mode
- Startup methods and procedures
- Adding procedures to the startup mechanism
- Shutdown methods and control

Managing of System Users

- UID and GID concepts
- Creation of a user account
- Security through password aging
- Login sequence

Managing Printer Queues

- Creation of an execution print queue
- Commands to manipulate queues
- Commands to manipulate jobs in queues

Managing Disk and Tape Volumes

- Commands to manipulate disks/filesystems
  - creating volume groups and logical volumes
  - creating file systems (**crfs** and **mkfs**)
  - manipulating file system structures
  - verifying file system structures with **fsck**
  - making file systems available to software (**mount**)
- Commands to manipulate archival volumes:
  - **tar** utility
  - **cpio** utility
  - **backup** and **restore** utilities

AIX System Administration I

Implementation

COURSE TOPICS

Monitoring System Activity

- Informational Utilities
- The **vmstat** utility
- The **iostat** utility
- The **sar** utility
- The **netstat** utility
- Maintaining swap and paging space(s)
- Building and using the **top** facility

Maintaining System Integrity

- Using cron tables

Network Setup and Configuration

- TCP/IP address selection
- Host names and related files
- Configuring network devices
- Network testing with **ping**
- Network utilities: **telnet, rlogin, rcp, rsh**

COURSE DURATION

This course normally requires **four** (4) days, approximately 60% lecture, and 40% lab time.

COURSE PREREQUISITES

It is assumed that the student has successfully completed the **Fundamentals of IBM AIX:Getting Started** course, or has equivalent system time as a user.

IBM AIX Systems Administration

Networking Features and Setup

COURSE DESCRIPTION

This course will teach the commands and methods needed to setup and manage advanced features in a Unix system. The course will also use a problem solving approach in the lab exercises to teach system managers the proper application of advanced features.

COURSE OBJECTIVES

On completion of this course, a system administrator should be able to implement networking features for the system and it's users; define name service capabilities; and use advanced options and setups for the shell command interpreters.

COURSE TOPICS

Review of System Concepts for Systems Administrators

- Process concepts
- Shell command usage and review

Advanced Network Features

- Review of network basic setup
- Subnet addressing
- Using arp (address resolution protocol)
- Network statistics
- Controlling the inetd process
- Miscellaneous network commands/tools

File Transfer Capabilities

- The ftp utility
  - setup
  - file capabilities
  - additional features
- Using trivial ftp (tftp)

IBM AIX Systems Administration

Networking Features and Setup

COURSE TOPICS

Advanced Network File System (NFS) Features
- Review of basic NFS setup
- Advanced capabilities of server setup
- Advanced capabilities in client setup
- Using the **automount** feature

Using and Configuring Samba
- Reasons for using **samba** features
- Selecting a server host
- Defining client hosts

Name Services
- Capabilities of **DNS**
- **BIND** configurations
- Configuring the resolver
- Configuring the named process
- Cache initialization
- Using n**slookup** to obtain information

Configuring Remote Printers
- Printer setup databases (and control)
- Remote printer usage

Tape Device Access Through TCP/IP
- Using data dump (dd)
- Combining tar with dd
- Remote file system dumping
- Setting up anonymous ftp

IBM AIX Systems Administration

Networking Features and Setup

COURSE TOPICS

Maintaining System Integrity

- Specifying auditing events
- Improving shell performance
- Using the error report facility
- More on performance analysis

COURSE DURATION

This course normally requires three (3) days, approximately 60% lecture, and 40% lab time.

COURSE PREREQUISITES

It is assumed that the student has completed the **Fundamentals of AIX** and the **IBM AIX Systems Administration: Essential Operations** courses, or has equivalent system experience.

IBM AIX Systems Administration Security Issues

COURSE DESCRIPTION

This course will teach the commands and methods needed to setup and enforce a security domain on an IBM AIX system. The course will use a problem solving approach in the lab exercises to give systems administrators hands-on reinforcement of these methods.

COURSE OBJECTIVES

On completion of this course, a system manager should be able to load the IBM AIX operating system with enhanced auditing features; check file systems for security problems; design and enforce a secure password specification and modification mechanism; and review security considerations in other areas of a Unix system.

COURSE TOPICS

Advanced System Concepts for System Administrators

- Process concepts
- Shell command usage and review
- Overview of issues related to Unix security
- System administrator functions related to security

System Security Features Updating

- Security levels in a Unix system
- Rebuilding the Unix kernel with auditing

Managing of System Users

- Using the root account securely
- Password issues
  - changing
  - encryption
  - aging and expirations
  - shadow files
- Groups

IBM AIX Systems Administration Security Issues

COURSE TOPICS

File System Security

- File permissions review
- Special permissions: SUID,SGID,Sticky Bits
- Device files
- Using chown and chgrp
- Backups

Using Unix Log Files

- Users
  - lastlog,utmp,wtmp,pacct,syslog
- System
  - shutdownlog
  - sulog/messages

Network Security

- Proper maintenance of the /etc/hosts file
- Using the "r" commands
- The restricted shell
- NFS security implications
- Known problems with SMTP (sendmail)
- finger utility security issues
- TFTP issues

COURSE DURATION

This course normally requires one (1) day, approximately 60% lecture, and 40% lab time.

COURSE PREREQUISITES

It is assumed that the student has completed the **Fundamentals of AIX** and the **IBM AIX Systems Administration: Essential Operations** courses, or has equivalent system experience.

IBM AIX Systems Administration

PERFORMANCE CONCEPTS AND ANALYSIS

COURSE DESCRIPTION

This course is designed to teach performance concepts relating to Unix systems (**IBM AIX pSeries and RS/6000 hardware platforms**), and to use these concepts to develop a tuning methodology to monitor, interpret, and adjust mechanisms that affect performance. The course will Develop the skills to measure, analyze, and tune **AIX** subsystems for optimum performance. The course will also show how to use standard AIX performance tools (**sar, iostat, vmstat, and trace**), along with advanced **AIX** performance tools (**tprof, svmon,filemon, monitor, and nmon**).

COURSE OBJECTIVES

Upon completion of this course, a system performance analyst will be able to : understand fundamental performance concepts for memory management, CPU management, and I/O management in **AIX** systems; use supplied monitoring tools to interpret performance statistics.

COURSE TOPICS

Performance Basics

- Factors affecting system performance
- Performance metrics
- Virtual system caching
- Effects of Computer Architecture

Memory Management

- Memory usage by the kernel
- Process creation
- Buffer Cache (and allocation control)
- Shared Memory / Page Caching
- Paging and Swapping
- Monitoring Tools

IBM AIX Systems Administration

PERFORMANCE CONCEPTS AND ANALYSIS

COURSE TOPICS

CPU Management

- Software priorities concepts
- Impact of the **nice** parameters
- Priority boosting
- Differences in hardware implementations
- Monitoring tools

I/O Management

- Breakdown of disk I/O
- Measuring Disk and terminal I/O
- File system structure concepts
- File system caching
- Name Lookup Caching
- Tuning the Usage of Non-Computational Memory
- Monitoring tools

Network Management

- TCP/IP Layers
- Socket controls
- Controlling network services
- Setting network buffer values
- Monitoring tools

NFS Performance

- RPC Performance Considerations
- Impact of NFS Blocking and Caching Sizes
- Optimizing NFS Servers and Clients
- Monitoring tools

IBM AIX Systems Administration

PERFORMANCE CONCEPTS AND ANALYSIS

COURSE TOPICS

X-window basics and implementation
- Client-server communications
- Optimizing a system with X
- Reducing xterm memory usage
- Monitoring tools

Modification of Performance Parameters
- using **smit** to change basic parameters
- dynamic changes with **vmtune, schedtune, schedo, iotune**

Summaries
- Memory management
- CPU management
- I/O management
- Network management
- User program management

COURSE DURATION

This course requires four (4) days, approximately 70 % lecture, and 30 % lab time.

COURSE PREREQUISITIES

It is assumed that the student has experience with interactive Unix systems with user-level commands, basic shell or **Perl** scripting techniques, and essential systems administrator functions.