AIX Benefits for System Administrators

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Introduction

This paper discusses some of the benefits that AIX offers system administrators. All of the function discussed in this paper is native to the base operating system and is shipped and installed as a part of the base operating system.

The following topics are covered in this paper:

- Flexible Installation Options
- System Resource Controller (SRC)
- Logical Volume Manager (LVM)
- File System Management
- Device Configuration
- Commands for System Administrators

For detailed information about the AIX operating system, refer to the following Web address: http://www.ibm.com/servers/aix/library/.

AIX library information is listed under *Technical Publications*.

Flexible Installation Options

AIX has such a variety of customers, each with unique installation requirements, that the AIX installation procedure emphasizes flexible solutions to help you manage your environment. Among the features available to you during an AIX installation are:

You have a choice when you update the operating system.

When you have an existing AIX version on your system, you have several options when deciding how, when, and what to update.

- You can choose which fixes to apply for your maintenance level. This feature, called *selective fix,* can be done through the System Management Interface Tool (SMIT) by typing the following fast path:

  ```
  smitty instfix
  ```

  and selecting the fix in the **FIXES to install** field.
- You can preview a fix to see what filesets are going to change and the space requirements by using the same SMIT fast path and selecting **yes** in the **PREVIEW** field. When you apply a fix, you can list what files are affected.
- You can test a fix by applying it only. Then, if the fix does not help in your environment, you can back out of it. Rejecting a fix is a simple process when done through SMIT. Type the following fast path:

  ```
  smitty reject
  ```
- You can update to the next maintenance level while your current AIX version is still running. Only a reboot is required at the end of the upgrade. Either product media or update media can be used with this feature. Type the following fast path:

  ```
  smitty update_all
  ```

- AIX offers *migration* as a method of moving to a new release or version of the operating system while maintaining your system configuration and user configuration data. Migration installations preserve the root volume group and user volume groups. New user configuration files are either merged or saved when updated. Saved files can then be replaced by either the new or existing files to a separate directory for the user to merge with existing files and continue using existing files, or save existing files to a separate directory while new configuration files are introduced and tested.

Convenient Backup

Maintaining a backup of your system for recovery is recommended. AIX simplifies the backup procedure in the following ways:

- Traditionally, backups have stored data on hard disks. If you have a CD writer and associated software, AIX gives you the option of backing up your system to CD. Compared to other backup media, CDs are portable, cheap, and highly reliable.
- You can create a bootable root-volume group backup or user-volume group backup.
- In addition to system recovery, backups can be used to install additional systems with the same image as the system that was originally backed up (called *cloning*) or to create a customized installation CD for other machines.
- You can use generic AIX backups confidently on other RS/6000 machines without regard to hardware options.
- You don't have to restore an entire backup. You can list the contents of a system backup and choose to restore only selected files on a running system.

Centralized Installation Administration

The Network Installation Manager (NIM) lets you centralize installation administration for multiple machines and schedule those installations to minimize disruptions and inconvenience.

- You can choose to install all networked machines at the same time or stagger those installations.
- Within NIM, you can remain at your console while installing AIX on remote machines. You can even run typical installations unattended.
- You can install each machine with unique options or install all machines with consistent options.
- You can make a system backup to a NIM server using the **mksysb** command and use that backup to install another machine (*cloning*).

Benefits of Alternate Disk Installation

If you already have an AIX version installed, you can choose an alternate disk installation to transition your site through the upgrade process more smoothly.

- Alternate Disk Installation lets you install a new version of the operating system while your current version is still running.
- You can retain the flexibility of reverting to the earlier version of AIX if the new installation isn't compatible with your existing applications or customizations.
- Using an alternate destination disk, you can install the new version to different machines over time, then, when it is convenient, reboot to implement the new installations.

- You can test your applications against the new version on an alternate disk. With this option, you can stabilize your environment before implementing the installation on other machines.

System Resource Controller

The System Resource Controller (SRC) is useful if you want a common way to start, stop, and collect status information on processes. It was designed to minimize the need for operator intervention. The SRC provides a set of commands and subroutines to make it easier for the system manager and programmer to create and control subsystems. A *subsystem* is any program or process or set of programs or processes that is usually capable of operating independently or with a controlling system. A subsystem is designed as a unit to provide a designated function.

Some of the benefits of the SRC include:

- Consistent user interface for start, stop, and status inquiries
- Logging of the abnormal termination of subsystems
- Notification program called at the abnormal system termination of related processes
- Tracing of a subsystem, a group of subsystems, or a subserver
- Support for control of operations on a remote system
- Refreshing of a subsystem (such as after a configuration data change)

The SRC provides a mechanism to control subsystem processes using a common command line and the C interface.

Logical Volume Manager

The Logical Volume Manager (LVM) allows logical volumes to span multiple physical volumes. Data on logical volumes appears to be contiguous to the user, but might not be contiguous on the physical volume. This allows file systems, paging space, and other logical volumes to be resized or relocated, span multiple physical volumes, and have their contents replicated for greater flexibility and availability.

The Logical Volume Manager (LVM) consists of the logical volume device driver (LVDD) and the LVM subroutine interface library. The LVDD is a pseudo-device driver that manages and processes all I/O. It translates logical addresses into physical addresses and sends I/O requests to specific device drivers. The LVM subroutine interface library contains routines that are used by the system management commands to perform system management tasks for the logical and physical volumes of a system. The programming interface for the library is available to anyone who wishes to expand the function of the system management commands for logical volumes.

Benefits that the LVM offers are:

- Continuous data usage in the event of a drive failure: *Mirroring* is the process of writing data to two or more drives simultaneously. This allows for continuous data usage should one drive fail. LVM allows you to mirror the root volume group.

- Spread I/O over multiple disks: *Disk Striping* allows you to spread I/O for large reads and writes over multiple disks and allows for simultaneous read operations.
- Dynamically grow file systems: Management tools allow you to add and remove mirrors online without data interruption.
- Access a volume group from more than one location using a concurrent access volume group.

File System Management

A file system is a complete directory structure, including a root directory and any subdirectories and files beneath the directory. File systems are confined to a single logical volume. Some of the most important system management tasks have to do with file systems, specifically:

- Allocating space for file systems on logical volumes
- Creating file systems
- Making file system space available to system users
- Monitoring file system space usage
- Backing up file systems to guard against data loss in the event of system failures
- Maintaining file systems in a consistent state.

Journaled File System

The native file system type is called the *journaled file system* (JFS). This file system uses database journaling techniques to maintain its structural consistency, preventing damage to the file system when the system is halted abnormally. It supports the entire set of file system semantics.

Some of the benefits of a journaled file system include:

- Isolate part of the file tree to work on: Each journaled file system resides on a separate logical volume. The operating system mounts journaled file systems during initialization. This multiple file system configuration is useful for system management functions such as backup, restore, and repair, because it isolates a part of the file tree so that you can work on it.
- Minimize wasted space: The block size for an enhanced journaled file system (JFS2) is specified during its creation. Smaller block sizes minimize wasted disk space by more efficiently storing the data in a file or directory's partial logical blocks.
- Contiguous storage: JFS is an *extent*—based file system, allowing data to be stored in a more contiguous manner.
- Ordered storage: Directory entries are stored in alphabetic order.
- I-node directory storage: Small directory entries are stored directly on the i-node, not on disk.

  Note: Journaled file system (JFS) is native to the PowerPC platform and is not available on the IA-64 platform.

  Note: Enhanced journaled file system (JFS2) is native to IA-64 platform. Although JFS2 is not native to the PowerPC platform, it is available.

Device Configuration

The Configuration Manager is automatically invoked at boot time to configure all devices detected. Some of the benefits of using the Configuration Manager include:

- Install new device support at run time: You can install device support at run time without knowing the name of the fileset or package you need to install.
- Complete control: You have complete control over device configuration by using the following commands:
  - **mkdev**: Add a device
  - **rmdev**: Remove a device
  - **lsdev**: List devices
  - **chdev**: Change a device's characteristics
  - **lsattr**: List a devices attributes

Commands for AIX System Administrators

The following is a list of commands that are used specifically for administering AIX:

bosboot	Initializes a boot device.
bootlist	Alters the list of boot devices (or the ordering of these devices in the list) available to the system.
cfgmgr	Configures devices by running the programs in **/etc/methods** directory.
chcons	Redirects the system console to device or file, effective next startup
chdev	Changes a device's characteristics.
chdisp	Changes the display used by the low-function terminal (LFT) subsystem.
checkcw	Prepares constant-width text for the **troff** command.
checkeq or **checkmm**	Checks documents formatted with memorandum macros.
checknr	Checks **nroff** and **troff** files.
chfont	Changes the default font selected at boot time.
chfs	Changes attributes of a file system.
chgroup	Changes attributes for groups.
chgrpmem	Changes the administrators or members of a group.
chhwkbd	Changes the low-function terminal (LFT) keyboard attributes stored in the Object Data Manager (ODM) database.
chitab	Changes records in the **/etc/inittab** file.
chkbd	Changes the default keyboard map used by the low-function terminal (LFT) at system startup.
chkey	Changes your encryption key.
chlang	Sets **LANG** environment variable in **/etc/environment** file for next login.

chlicense	There are two types of user licensing, fixed and floating. Fixed licensing is always enabled, and the number of licenses can be changed through the **-u** option. Floating licensing can be enabled or disabled (on or off) through the **-f** option.
chlv	Changes the characteristics of a logical volume.
chnamsv	Changes TCP/IP-based name service configuration on a host.
chprtsv	Changes a print service configuration on a client or server machine.
chps	Changes attributes of a paging space.
chpv	Changes the characteristics of a physical volume in a volume group.
chque	Changes the queue name.
chquedev	Changes the printer or plotter queue device names.
chssys	Changes a subsystem definition in the subsystem object class.
chtcb	Changes or queries the trusted computing base attribute of a file.
chtz	Changes the system time zone information.
chuser	Changes attributes for the specified user.
chvfs	Changes entries in the **/etc/vfs** file.
chvg	Sets the characteristics of a volume group.
chvirprt	Changes the attribute values of a virtual printer.
crfs	Adds a file system.
crvfs	Creates entries in the **/etc/vfs** file.
exportvg	Exports the definition of a volume group from a set of physical volumes.
extendvg	Adds physical volumes to a volume group.
grpck	Verifies the correctness of a group definition.
importvg	Imports a new volume group definition from a set of physical volumes.
lsallq	Lists the names of all configured queues.
lsallqdev	Lists all configured printer and plotter queue device names within a specified queue.
lsattr	Displays attribute characteristics and possible values of attributes for devices in the system.
lsdev	Displays devices in the system and their characteristics.
lsdisp	Lists the displays currently available on the system.
lsfont	Lists the fonts available for use by the display.
lsfs	Displays the characteristics of file systems.
lsgroup	Displays the attributes of groups.
lsitab	Lists the records in the **/etc/inittab** file.
lskbd	Lists the keyboard maps currently available to the low-function terminal (LFT) subsystem.

lslicense	Displays the number of fixed licenses and the status of floating licensing.
lslpp	Lists optional program products.
lsnamsv	Shows name service information stored in the database.
lsprtsv	Shows print service information stored in the database.
lsps	Lists paging space and attributes.
lsque	Displays the queue stanza name.
lsquedev	Displays the device stanza name.
lssrc	Gets the status of a subsystem, a group of subsystems, or a subserver.
lsuser	Displays attributes of user accounts.
lsvfs	Lists entries in the **/etc/vfs** file.
mkcatdefs	Preprocesses a message source file.
runcat	Pipes the output data from the **mkcatdefs** command to the **gencat** command.
mkdev	Adds a device to the system.
mkfont	Adds the font code associated with a display to the system.
mkfontdir	Creates a **fonts.dir** file from a directory of font files.
mkgroup	Creates a new group.
mkitab	Makes records in the **/etc/inittab** file.
mklv	Creates a logical volume.
mklvcopy	Adds copies to a logical volume.
mknamsv	Configures TCP/IP-based name service on a host for a client.
mknotify	Adds a notify-method definition to the notify-object class.
mkprtsv	Configures TCP/IP-based print service on a host.
mkps	Adds an additional paging space to the system.
mkque	Adds a printer queue to the system.
mkquedev	Adds a printer queue device to the system.
mkserver	Adds a subserver definition to the subserver object class.
mkssys	Adds a subsystem definition to the subsystem object class.
mksysb	Backs up mounted file systems in the **rootvg** volume group for subsequent reinstallation.
mkszfile	Records size of mounted file systems in the **rootvg** volume group for reinstallation.
mktcpip	Sets the required values for starting TCP/IP on a host.
mkuser	Creates a new user account.
mkuser.sys	Customizes a new user account.
mkvg	Creates a volume group.
mkvirprt	Makes a virtual printer.
odmadd	Adds objects to created object classes.

odmchange	Changes the contents of a selected object in the specified object class.
odmcreate	Produces the **.c** (source) and **.h** (include) files necessary for ODM application development and creates empty object classes.
odmdelete	Deletes selected objects from a specified object class.
odmdrop	Removes an object class.
odmget	Retrieves objects from the specified object classes and places them into an **odmadd** input file.
odmshow	Displays an object class definition on the screen.
pwdck	Verifies the correctness of local authentication information.
redefinevg	Redefines the set of physical volumes of the given volume group in the device configuration database.
reducevg	Removes physical volumes from a volume group. When all physical volumes are removed from the volume group, the volume group is deleted.
reorgvg	Reorganizes the physical partition allocation for a volume group.
restbase	Restores customized information from the boot image.
rmdel	Removes a delta from a Source Code Control System (SCCS) file.
rmdev	Removes a device from the system.
rmf	Removes folders and the messages they contain.
rmfs	Removes a file system.
rmgroup	Removes a group.
rmitab	Removes records in the **/etc/inittab** file.
rmlv	Removes logical volumes from a volume group.
rmlvcopy	Removes copies from a logical volume.
rmm	Removes messages.
rmnamsv	Unconfigures TCP/IP-based name service on a host.
rmnotify	Removes a notify-method definition from the notify-object class.
rmprtsv	Unconfigures a print service on a client or server machine.
rmps	Removes a paging space from the system.
rmque	Removes a printer queue from the system.
rmquedev	Removes a printer or plotter queue device from the system.
rmserver	Removes a subserver definition from the subserver object class.
rmssys	Removes a subsystem definition from the subsystem object class.
rmuser	Removes a user account.
rmvfs	Removes entries in the **/etc/vfs**file.
rmvirprt	Removes a virtual printer.

savebase	Saves base customized device data in the ODM onto the boot device.
swapoff	Deactivates one or more paging space.
swapon	Specifies additional devices for paging and swapping.
syncvg	Synchronizes logical volume copies that are not current.
usrck	Verifies the correctness of a user definition.
varyoffvg	Deactivates a volume group.
varyonvg	Activates a volume group.

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