AIX Version 7.2

IBM Hyperconverged Systems

IBM

Note

Before using this information and the product it supports, read the information in "Notices" on page 9.

Contents

About this document

This document provides detailed information about AIX support for IBM Hyperconverged Systems. AIX running on IBM Hyperconverged Systems powered by Nutanix provides simplified management through hyperconverged infrastructure.

Highlighting

The following highlighting conventions are used in this document:

Bold	Identifies commands, subroutines, keywords, files, structures, directories, and other items whose names are predefined by the system. Bold highlighting also identifies graphical objects, such as buttons, labels, and icons that the you select.
Italics	Identifies parameters for actual names or values that you supply.
`Monospace`	Identifies examples of specific data values, examples of text similar to what you might see displayed, examples of portions of program code similar to what you might write as a programmer, messages from the system, or text that you must type.

Case sensitivity in AIX

Everything in the AIX® operating system is case sensitive, which means that it distinguishes between uppercase and lowercase letters. For example, you can use the `ls` command to list files. If you type LS, the system responds that the command `is not found`. Likewise, **FILEA**, **FiLea**, and **filea** are three distinct file names, even if they reside in the same directory. To avoid causing undesirable actions to be performed, always ensure that you use the correct case.

ISO 9000

ISO 9000 registered quality systems were used in the development and manufacturing of this product.

Support for the single UNIX specification

The AIX operating system is designed to support The Open Group's Single UNIX Specification Version 3 (UNIX 03) for portability of operating systems based on the UNIX operating system. Many new interfaces, and some current ones, have been added or enhanced to meet this specification. To determine the correct way to develop a UNIX 03 portable application, see The Open Group's UNIX 03 specification on The UNIX System website (http://www.unix.org).

IBM Hyperconverged Systems

AIX on IBM Hyperconverged Systems that are powered by Nutanix provides simplified management through a hyperconverged infrastructure.

You can run AIX Version 7.2.2 with Service Pack 2, or later, with APAR IJ05283 and APAR IJ06373 on IBM Hyperconverged Systems with POWER8 based CS821 and CS822 nodes.

AIX Version 7.2.2 with Service Pack 2, or later, runs fully virtualized on the Nutanix Acropolis Hypervisor and the corresponding virtual machine (VM) lifecycle is managed by the Nutanix PRISM graphical user interface (GUI). IBM Hyperconverged Systems support is integrated into the same version of the AIX 7.2.2 operating system that runs on IBM PowerVM platforms. IBM Hyperconverged Systems are binary compatible with the AIX operating system running on PowerVM per the AIX binary compatibility guarantee.

For more information about Nutanix documentation, see the Nutanix Portal website.

IBM Hyperconverged System concepts

The AIX operating system uses the Nutanix Kernal-based Virtual Machine (KVM) based (non-PowerVM) Acropolis Hypervisor (AHV) on IBM Hyperconverged Systems powered by Nutanix.

AIX features that rely on PowerVM are not supported in the Nutanix environment because of the differences between the firmware, the Nutanix KVM-based Acropolis Hypervisor, and PowerVM.

The following AIX features are not supported on Hyperconverged Systems powered by Nutanix:

- Virtual Memory Page Sizes of 64 KB
- IBM Hyperconverged Systems use fully virtualized I/O; therefore, workloads that rely on physical I/O are not supported.
- Remote Direct Memory Access (RDMA) based workloads, including DB2 pureScale and Oracle Real Application Clusters (RAC) with Reliable Datagram Sockets (RDS)
- Power NX accelerators, Active Memory Expansion (AME), IPSec hardware accelerated encryption, hardware accelerated encryption supporting JFS2 file encryption
- AIX Live Update
- AIX Dynamic System Optimizer (DSO)
- Transactional Memory

  Note: Transactional Memory is used internally by IBM SDK for Java and will not affect the functionality of applications or middleware.
- Hardware memory protection keys, which are used by AIX on some PowerVM based systems
- Some AIX First Failure Data Capture (FFDC) features, including mini-dumps and crash error logs, are not supported. Including, crash and reboot log entries and the last error log entry before a crash.
- Interrupt binding and CPU interrupt masking, which are used in some customized configurations with high affinity between I/O traffic and applications.

Planning for IBM Hyperconverged Systems

Before you start using the AIX operating system on IBM Hyperconverged Systems powered by Nutanix, you must review the minimum software and hardware requirements.

Software requirements

The minimum level of AIX that supports IBM Hyperconverged Systems is AIX Version 7.2 with the 7200-02 Technology Level, or later, and Service Pack 7200-02-02-1810 with APAR IJ05283 and APAR IJ06373. The minimum memory requirement for AIX 7.2 is 2 GB.

Capacity and software licensing related information

AIX cannot determine the number of physical cores in the system and reports a large default value when running on IBM Hyperconverged Systems powered by Nutanix.

The system administrator must use the Nutanix PRISM graphical user interface (GUI) to obtain information about system capacity for capacity planning and software licensing purposes.

Nutanix does not support micro-partitioning of CPUs or shared processor pools with entitlement controls found on PowerVM based systems. When the AIX operating system is running in this environment, AIX represents all virtual processors as fully entitled and having capped shared CPUs.

Hardware requirements
I/O devices

The AIX operating system supports virtual I/O Ethernet and Small Computer System Interface (SCSI) devices (`virtio-net` and `virtio-scsi` types) by using the KVM VirtIO virtualization standard that is used in IBM Hyperconverged Systems. The AIX operating system also supports the CD device (`spapr` type) used in this environment.

Related information

KVM Virtio

Libvirt

Deploying the AIX operating system on IBM Hyperconverged Systems

You can install the AIX operating system onto IBM Hyperconverged Systems by deploying cloud-ready AIX disk images that are available from IBM Passport Advantage.

AIX on IBM Hyperconverged Systems powered by Nutanix supports installations through AIX cloud images and DVD ISO media. This environment also supports installations through traditional methods for network-based installations by using the Network Installation Management (NIM) that is currently supported on PowerVM systems.

The process for installing the updates is identical to the installation process used on PowerVM:

- Technology Level (TL)
- Service Pack (SP)
- Interim fix (iFix)

The best approach to installing the AIX operating system on IBM Hyperconverged Systems is by deploying cloud-ready AIX disk images that are available from IBM Passport Advantage. You can also use these AIX disk images for virtual machine (VM) deployments. You can also apply customizations and capture a new image for future deployments after deploying an image to a VM.

To deploy, create, and configure a VM by using a cloud-ready AIX disk image, complete the following steps:

1. Download a cloud-ready AIX disk image from IBM Passport Advantage.
2. Upload a cloud-ready AIX disk image to the Nutanix Image Service.

   Note: You must use the Image Configuration interface in the PRISM GUI to upload the image to the Nutanix Image Service. For more information, see the Configure Images topic in the Nutanix Portal.

3. Create and configure the VM to use a disk that is cloned from the AIX image that is available through the Image Service.

You can access the AIX console through the PRISM GUI by using the COM1 console connection after the VM has been started. You must use a VNC console connection to interact with the open firmware.

Installing AIX on IBM Hyperconverged Systems

You can install the AIX operating system on IBM Hyperconverged Systems by using a cloud-ready image, network boot, or the Network Installation Management (NIM).

AIX cloud-ready image deployment

AIX on IBM Hyperconverged Systems supports installations through traditional methods for network-based installations using NIM.

The best approach to installing AIX on IBM Hyperconverged Systems is by deploying cloud-ready AIX disk images that are available from IBM Passport Advantage. For more information about deploying cloud-ready AIX disk images, see "Deploying the AIX operating system on IBM Hyperconverged Systems" on page 2.

You can use these images directly for virtual machine (VM) deployments on IBM Hyperconverged Systems with POWER8 based IBM CS821 system or IBM CS822 system nodes. You can order the AIX cloud-ready image with CS821 or CS822 (PA: D1S5GLL) by using the monthly subscription model that is available in the IBM Passport Advantage website.

Installing the AIX operating system by using ISO media

To install a VM using ISO media, complete the following steps:

1. Download AIX 7.2.2 ISO media from IBM Passport Advantage.
2. Upload the ISO image to the Nutanix Image Service.

   Note: You must use the Image Configuration interface in the PRISM GUI to upload the image to the Nutanix Image Service. For more information, see the Configure Images topic in the Nutanix Portal.

3. Create and configure the VM with a disk to install AIX onto and a CD-ROM type disk that is cloned from the ISO image.

You can access the AIX installer through the PRISM GUI by using the COM1 console after the VM has been started. You must use a VNC console connection to interact with open firmware.

Troubleshooting ISO media AIX operating system installations

Occasionally, when installing the AIX operating system by using ISO media, the AIX ISO images are unable to find a disk. If the AIX ISO images are unable to find a disk, the installer is unable to install the AIX operating system. When a disk cannot be found, the installer does not show anything after the **Disks** field as shown in the following example:

```
Overwrite Installation Summary

Disks:
Cultural Convention:  en_US
Language:  en_US
Keyboard:  en_US
Graphics Software:  Yes
System Management Client Software:  Yes
OpenSSH Client Software:  No
OpenSSH Server Software:  No
Enable System Backups to install any system:  Yes
Selected Edition:  standard

Optional Software being installed:


>>> 1   Continue with Install
                        +-----------------------------------------------------
    88  Help ?          |    WARNING: Base Operating System Installation will
    99  Previous Menu   |    destroy or impair recovery of ALL data on the
                        |    destination disk .
>>> Choice [1]:
```

If you continue with the installation without taking the proper troubleshooting steps, the installer displays the following error message:

```
 Error Warning

Not enough disk space selected to contain the
operating system.



To reboot the system, press reset.

>>> 1   Continue with Install



    88  Help ?


>>> Choice [1]:
```

If the AIX ISO images are unable to find a disk, complete the following steps:

1. Wait until the AIX operating system boots into the installer and enters the **Installation and Maintenance** menu.
2. Once there, select the option to **Enter the Limited Function Maintenance Shell**.
3. Run the **cfgmgr** command in the **Limited Function Maintenance Shell**. You might see errors in the display after running the **cfgmgr** command as many devices are not yet available.
4. After the **cfgmgr** command finishes running, exit the **Limited Function Maintenance Shell**. The installer will now recognize the disk.
5. To verify that the installer recognized the disk, select **Select Storage Adapters** and choose an adapter. Next, select **Change/Show Install Settings** and choose a disk.

Starting from the **Installation and Maintenance** menu, make the following selections as shown in the example below to configure the disk for the installer.

Note: If you accidentally enter a different menu, press **99** until you get back to the **Installation and Maintenance** menu.

```
Welcome to Base Operating System
Installation and Maintenance

Type the number of your choice and press Enter. Choice is indicated by >>>.

3 Start Maintenance Mode for System Recovery
3 Access Advanced Maintenance Functions
>>> 0 Enter the Limited Function Maintenance Shell
$ cfgmgr
Note: Errors are expected from cfgmgr since many devices are not yet available to be configured.
$ exit
99 (Return to previous menu)
5 Select Storage Adapters
1  scsi0      qemu_vhost-user-scsi-pci:0000:00:02.0
0   Continue with choices indicated above
2 Change/Show Installation Settings and Install
1 Disk(s) where you want to install ......
1  hdisk0    qemu_vhost-user-scsi-pci:0000:00:02.0-LW_0
>>>  0   Continue with choices indicated above
```

Installing the AIX operating system by using network installation management (NIM)

To install the base AIX operating system on a NIM client by using installation images, see Using installation images to install the base operating system on a NIM client.

To install the AIX operating system on a Hyper converged System, you can use the NIM Service Handler (NIMSH) Communication Protocol. A NIM client cannot set the boot device as the network adapter that is

defined for the client VM. As a result, the VM must be rebooted manually after the client is setup properly and configured for the installation operation.

To configure the NIMSH communication protocol by using Dynamic Host Configuration Protocol (DHCP), run the following command: `chdev -l inet0 -a <hostname>`.

Note: You must run, `chdev -l inet0 -a <hostname>`, before you run the **smit nim_config_services** or **niminit** commands.

Related information
Installing with NIM

Network boot

Consider the following network boot example and limitations while installing AIX onto IBM Hyperconverged Systems.

Limitations of network boot and installation

If you are using a static IP address for the client virtual machine (VM), the client and server must be on the same subnet when booting a VM across the network. You cannot specify a subnet mask in the **boot** command as shown in the following example.

Network boot example

To boot from the network, the client VM must be started or rebooted and then stopped at the OpenFirmware Prompt.

To stop the client VM at the OpenFirmware prompt, press **'s'** in the virtual network computing (VNC) console connection of the client VM. You must press **'s'** immediately after the client VM is started. The VNC console connection can be opened from the VM view in the PRISM management graphical user interface (GUI).

Note: The client VM will stop automatically at the OpenFirmware Prompt when booting a newly created VM with no operating system (OS).

To boot the client from the network install manager (NIM) master at the OpenFirmware prompt, use the following command template:

```
0> boot <NIC-device>:<nim-server-ip>,<\path\to\client\bootfile>,<clientip>,<gateway-ip>
```

You must replace the following items in the command template:

<NIC-device>
    To obtain the NIC-device details, run the **devalias** command from the OpenFirmware prompt. Identify the Ethernet device alias name. For example, the Ethernet device alias in the following output has an alias of `net`:

```
0 > devalias
net : /pci@800000020000000/ethernet@1
scsi : /pci@800000020000000/scsi@2
disk : /pci@800000020000000/scsi@2/disk@100000000000000
usb0 : /pci@800000020000000/usb@3
nvram : /vdevice/nvram@71000000
hvterm : /vdevice/vty@30000000 ok
```

<nim-server-ip>
    Enter the IP address of the NIM server.

<\path\to\client\bootfile>
    After the installation has started, you can identify the name of the client boot file from the `/etc/bootptab` file on the NIM server.

<clientip>
    Enter the IP address of the client VM.

`<gateway-ip>`
>   Enter the gateway's IP address for the client VM.

The following commands boots the client VM from the network install manager (NIM) master at the OpenFirmware prompt:

```
0> boot net:9.3.94.78,\tftpboot\client-vm.ibm.com,9.3.94.217,9.3.94.1
```

After the AIX operating system has loaded, the COM1 console connection opened by using the PRISM GUI is used to interact with the AIX operating system.

Configuring virtual machines (VM)

You must use the Nutanix PRISM graphical user interface (GUI) to configure a virtual machine (VM) on IBM Hyperconverged Systems.

You can use PRISM to create VMs and specify the number of CPUs. You can also use PRISM to specify the amount of memory, the storage and network devices, and the boot device for the VM.

After the initial creation of the VM, you can change the settings in PRISM.

Note: You must restart the AIX VM when you change the number of CPUs, amount of memory, and after adding or removing a network device or CD-ROM device.

To change the number of simultaneous multithreading (SMT) threads that are used by the VM, complete the following steps:

1. Specify a new SMT mode by running the following commands:

```
smtctl –t <# of SMT threads> -w boot
bosboot -a
```

2. Reboot the VM.

The **smtctl** command shows the current number of SMT threads configured per VCPU.

Notes:

- There is no support for Dynamic Reconfiguration event notification in AIX when running on IBM Hyperconverged Systems.
- Nutanix defaults the maximum SMT mode for VMs to SMT-4.
- You must configure the host to support VMs running in SMT-8 mode to switch into SMT-8 mode.
- The Nutanix PRISM GUI is used to specify the boot device during VM configuration. Commands such as **bootlist** do not support specifying a boot device or viewing the current boot device order from the AIX client VM.

Related information
Nutanix PRISM

Troubleshooting IBM Hyperconverged Systems

You can use the kernel debugger (KDB), AIX console, diagnostics support, initial progress load (IPL) progress codes, and resetting hung virtual machines (VMs) for IBM Hyperconverged Systems to help troubleshoot issues.

Entering the kernel debugger (KDB)

For AIX VMs that are running on IBM Hyperconverged Systems that are powered by Nutanix, you can use the **CTRL+4** key sequence that is entered into the COM1 console connection to enter the kernel debugger (KDB).

Note: You must configure AIX to enter the KDB kernel debugger from the COM1 console connection. For more information about how to load and start the KDB kernel debugger on AIX, see Loading and starting the KDB kernel debugger in the AIX Knowledge Center.

AIX console support

AIX supports serial console connections on IBM Hyperconverged Systems. You must choose the COM1 connection while launching a console from PRISM to interact with the AIX operating system.

The virtual network computing (VNC) console connection must be used to interact with open firmware before the AIX operating system is loaded after starting or rebooting a virtual machine (VM).

Initial progress load (IPL) progress codes

As the VM loads the AIX operating system and software drivers, AIX IPL progress codes are displayed in the COM1 console.

Diagnostics support

AIX does not provide concurrent diagnostics support, including adapter firmware updates, for IBM Hyperconverged Systems powered by Nutanix. The Nutanix product provides support for device diagnostics and firmware updates.

Resetting hung virtual machines (VMs) and initiating memory dumps

A restart interrupt must be sent to the VM from the host system to reset a hung VM or to initiate a memory dump. To inject a restart interrupt into a VM, complete the following steps:

1. Determine the host machine and the name, ID, or UUID for a VM by clicking a VM in PRISM or from the Acropolis Command-line Interface (aCLI) command line. To determine the host machine and the name, ID, or UUID for a VM from the aCLI, enter the following command: `acli vm.list`.

2. Log in to the host machine and enter the following command: `virsh inject-nmi <VS>`.

   Note: <VS> is the name, ID, or UUID of the VM.

The VM's console shows `00c2`, which indicates a memory dump is being performed. The VM console then reboots.

For more information about injecting a restart interrupt, see Can Nutanix infrastructure create memory dumps from snapshots? topic in the Nutanix Next website.

Related information
Loading and starting the KDB kernel debugger

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