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Continuity in Computing

Avanti™, Avanti*Flex*™ & FreeAXP™ SPD
Software Product Description: V4.0.0.670 and higher
30-MAY-2022

Avanti, Avanti*Flex*, and FreeAXP are all iterations of a virtual AlphaServer 400 designed to be hosted on **Windows x64** systems. Avanti is the full-blown product, Avanti*Flex* is a customized iteration of the product, and FreeAXP is a free version of the product. Hence forth, Avanti will refer to all three products unless otherwise indicated. Avanti offers the following key features:

- OpenVMS, Digital UNIX, and Tru64 UNIX support
- Simple configuration
- Flexible pricing
- Commercial licensing and support
- Multiple instances on a single host
- VM host support
- *Free version* (FreeAXP)

Avanti is designed to virtualize legacy Digital Equipment Corporation (DEC), Compaq, and HP Alpha hardware. The product is *binary compatible* with real Alpha hardware, allowing the resident operating system and software to be ported to Avanti without modification or the need for source code. Avanti offers a simple way to upgrade existing Alpha systems to new, commodity hardware.

Avanti is designed for critical system use. It is capable of providing on par performance with first generation personal and work group class Alpha systems when hosted on appropriate hardware. It can serve as a replacement for any Alpha system where performance is not a key criterion.

Each Avanti instance supports 32MB to 3.0GB[1] of virtual memory, up to 45 disk, tape, or CD-ROM storage devices, including physical CD/DVD-ROMs, up to three 100Mb NICs, one virtual or physical serial console, and up to 26 virtual or physical serial ports.

FreeAXP supports 32 to 128MB of virtual memory, up to fifteen storage devices, including one physical CD/DVD-ROM, up to two 100Mb NICs, one virtual serial console, and one virtual serial port. It is designed for hobbyist and non-critical system use. Clients requiring additional performance and capabilities should consider Avanti commercial Alpha replacement solutions. FreeAXP is provided free of charge without warranty or official support.

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[1] Tru64 Unix systems are limited to 1.0GB of memory.

Contents

GUEST O/S

Avanti supports the OpenVMS, Digital UNIX (OSF/1), and Tru64 UNIX operating systems.

OpenVMS

OpenVMS 6.2 thru 8.4-2L2 with up to 3GB of memory is support.

Digital and Tru64 UNIX

Digital and Tru64 UNIX V3.2C thru V5.1B-6/Pk8 with up to 1GB of memory is supported.

HOST SERVER REQUIREMENTS

Single Avanti Instance

These are *minimum* recommended host system requirements. Faster hardware will provide better performance. Use quality hardware to ensure long term reliability. When running multiple instances of Avanti on a single host system, an additional CPU is required for each Avanti instance.

- Windows 64-bit O/S: 10, 11, 2012, 2016, 2019, 2021
- Dual core processor, 3GHz or faster recommended
- Memory: 8GB
- 2 NICs
- Sufficient disk space to support virtual disk image files.

Multiple Virtual Alpha Instances

Multiple Avanti instances can be run on a single host server simultaneously. An additional host server CPU core is required for each additional virtual Alpha. When running Avanti with features beyond the base set provided in FreeAXP, sufficient license units are required to support each Alpha instance.

Note: When running multiple instances of Avanti, each instance after the first one incurs additional license charges. See the *Licensing Multiple Avanti Instances on a Single Host* section for details. FreeAXP instances do not incur additional license charges.

Running multiple virtual Alpha systems requires robust host hardware. Sufficient CPUs, additional memory, and a fast I/O bus will be required to achieve adequate performance. The following table provides *minimum* host system configuration guidelines.

CPUs	3/2: 3 host CPU per 2 Alpha instances
Memory	8GB for Windows + 2GB for JIT + 2 * Alpha Memory
Disks	• One disk dedicated to Host O/S. • At least one disk per Alpha instance. RAID arrays provide performance and redundancy advantages and are recommended.

AVANTI SOFTWARE PACKAGE

The Avanti software package, User Guide, and Release Notes can be downloaded from the FreeAXP home page (http://www.migrationspecialties.com/FreeAXP.html). The kit includes the Avanti emulator, configuration utility, NDIS network driver, and PuTTY terminal emulator[2]. Avanti license units can be ordered from Migration Specialties via the web site or by contacting the company (+1 719-784-9196, sales@migrationspecialties.com).

AVANTI VIRTUAL HARDWARE SUMMARY

CPU	1 CPU supporting EV4, EV5, and EV6 instruction sets
Memory	32MB – 3.0GB[3]
Disk Controllers	1 - 3*
Disks per Controller	7 (KZPAA) or 15 (KZPCA)
Maximum Disk Size	2TB (limit determined by guest operating system)
Tape	DEC DLT2000
NICs	1 - 3*
Serial Ports	2 virtual and/or physical
5-Port Serial Card[4]	Up to 5 cards supporting virtual and/or physical serial connections
CD-ROM	45**
PCI slots	4*

*Avanti allows up to four virtual PCI devices. Each PCI slot can contain either a NIC or a disk controller. As a system without at least one NIC and one disk controller is not very useful, a maximum of three NICs or three disk controllers is allowed. An Avanti system can be configured with 1 to 3 NICs and 1 to 3 disk controllers, with a combined maximum of 4 PCI devices.

** In theory, each disk on each controller could be a virtual or physical CD/DVD-ROM drive. There is a maximum of 45 SCSI drives.

BASE AVANTI*FLEX* VIRTUAL HARDWARE SUMMARY

The following table outlines the base components provided with an Avanti*Flex* license. AvantiFlex can be upgraded through the purchase of additional license units to the full capabilities of Avanti. The Avanti*Flex* base package includes 10 license units.

CPU	1 CPU supporting EV4, EV5, and EV6 instruction sets
Memory	128MB - 512MB
Disk Controllers	1 KZPAA or KZPCA
Disks per Controller	7 - 15
Maximum Disk Size	2TB (limit determined by guest operating system)
NICs	2
Serial Ports	2 virtual and/or physical
CD-ROM	1
PCI slots	4

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[2] Avanti includes software developed by the Computer Systems Engineering Group at Lawrence Berkeley Laboratory and Simon Tatham. See the Avanti license agreement for additional details.

[3] Tru64 Unix systems current limited to 1.0GB of memory.

[4] OpenVMS only

FREEAXP VIRTUAL HARDWARE SUMMARY

CPU	1 CPU supporting the EV4, EV5, and EV6 instruction sets
Memory	32MB – 128MB
Disk Controllers	1 KZPAA or KZPCA
Disks per Controller	7 - 15
Maximum Disk Size	2TB (limit determined by guest operating system)
NICs	1 - 2*
Serial Ports	2 virtual
CD-ROM Support	1
PCI slots	3*

*FreeAXP allows up to three virtual PCI devices. Each PCI slot can contain either a NIC or a disk controller. A FreeAXP system can be configured with 1 to 2 NICs and 1 disk controller.

LICENSE UNITS

Avanti features are controlled by license units. A full Avanti license provides 175 license units. An Avanti*Flex* base license provides 10 license units. Avanti*Flex* allows the user to select desired Avanti features without purchasing a full Avanti license.

The following table outlines the units required for individual Avanti components.

Avanti Component	Required License Units
1 CPU supporting EV4, EV5, and EV6 instruction sets[5]	20
512MB Memory	10
Narrow SCSI Disk Controller (7 disks)	10
Wide SCSI Disk Controller (15 disks)	10
Virtual Tape Device	10
NIC	5
2 x Physical Serial Ports	10
5-port Serial Card	10
Enhanced Performance (JIT)	60

License unit pricing is covered in the Migration Specialties *Virtual Alpha Pricing Guide*, available on the Migration Specialties web site.

Licensing Multiple Avanti Instances on a Single Host

The first instance of Avanti includes the CPU (20 units), a disk controller (10 units), and two NICs (10 units) at no license charge. This equates to 40 license units. The second Avanti instance *on the same host* requires enough additional license units to support the configuration, including the CPU. Hence, the second Avanti configuration on a single host system will require at least 40 additional license units. FreeAXP configurations do not require additional license units.

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[5] The first instance of Avanti/Avanti*Flex* includes the CPU, a disk narrow controller, and two NICs. Each additional instance is charged for these components. See the *Licensing Multiple Avanti Instances on a Single Host* section for details.

License Unit Utilization

An Avanti*Flex* base package includes 10 license units. Thus, a customer could immediately create one of the following configurations using the base package:

- Virtual Alpha configured with 512MB of memory.
- Virtual Alpha configured with two SCSI controllers.
- Virtual Alpha configured with a virtual tape device.
- Virtual Alpha configured with 3 NICs.
- Virtual Alpha configured with 2 physical serial ports.

To add additional Avanti features, additional license units are required. Here are two sample Avanti*Flex* configurations and the *additional* license units required to create them. Remember, Avanti*Flex* already includes 10 license units in the base package.

Configuration	License Units			
	Additional	Total 1st Instance	Total 2nd Instance	Total for 2 Instances
Virtual Alpha configured with 1GB of memory	10	20	60	80
Virtual Alpha configured with: - 512MB of memory (10 units) - JIT (60 units) - Physical Serial Ports (10 units)	70	80	120	200

CPU

Avanti provides a single virtual Alpha CPU. The Avanti CPU includes support for the EV4, EV5 and EV6 Alpha processor instruction sets. Symmetric Multiprocessing (SMP) is not supported.

MEMORY: AVANTI/AVANTI*FLEX*

Avanti supports 32MB to 3.0GB of memory for OpenVMS systems and 32MB to 1.0GB of memory for Digital and Tru64 UNIX of memory. A real AlphaServer 400/166 supported a maximum of 384MB of memory.

The base version of Avanti*Flex* supports 128MB of memory. Additional memory can be licensed in 512MB increments to the maximum supported by Avanti. The base 128MB of memory included with Avanti*Flex* does not accumulate with 512MB units. I.E. you cannot have an Avanti*Flex* system with 10 license units and 640MB of memory. It would be allowed a maximum of 512MB of memory. An Avanti*Flex* system with 20 license units would be allowed a maximum of 1GB of memory, and so on.

Memory is mapped to match the three memory banks available in a real AlphaServer 400. The user need only specify the total memory desired in the Memory field. The following table describes how legal memory values are calculated.

Table 1: Legal Memory Values

Total Memory	Bank 1	Bank 2	Bank3
32MB	16MB	16MB	-
48MB	16MB	16MB	16MB
64MB	32MB	32MB	-
96MB	32MB	32MB	32MB
128MB	64MB	64MB	-
192MB	64MB	64MB	64MB
256MB	128MB	128MB	-

Total Memory	Bank 1	Bank 2	Bank3
384MB	128MB	128MB	128MB
512MB	256MB	256MB	-
768MB	256MB	256MB	256MB
1024MB (1.0G)	512MB	512MB	-
1536MB (1.5G)	512MB	512MB	512MB
2048MB (2.0G)	1024MB	1024MB	-
3072MB (3.0G)	1024MB	1024MB	1024MB

MEMORY: FREEAXP

FreeAXP supports 32 to 128MB of memory in 32MB increments. Memory is mapped to match the three memory banks available in a real AlphaServer 400. The user need only specify the total memory desired in the Memory field. The following table describes how legal memory values are calculated.

Table 2: Legal Memory Values

Total Memory	Bank 1	Bank 2	Bank3
32MB	16MB	16MB	-
48MB	16MB	16MB	16MB
64MB	32MB	32MB	-
96MB	32MB	32MB	32MB
128MB	64MB	64MB	-

STORAGE

Controllers

Avanti supports up to three KZPAA narrow and/or KZPCA wide SCSI controllers. Which controller is available for use is dependent upon the O/S version installed. For example, VMS 7.1 and earlier and Tru64 UNIX V4.0D and earlier do not support the KZPCA wide SCSI controller.

The base version of Avanti*Flex* and FreeAXP support a single KZPAA or KZPCA SCSI controller. Additional controllers can be licensed to the maximum supported by Avanti.

KZPAA SCSI Controller

The virtual KZPAA supports up to 7 virtual disks, CD/DVD-ROMs, or virtual tapes.

KZPCA SCSI Controller

The virtual KZPCA supports up to 15 virtual disks, CD/DVD-ROMs, or virtual tapes.

Internal Storage

Virtual disk, CD-ROM, DVD-ROM, and tape drives are supported as image files under the host operating system. File location is limited only by the host system.

Disks

Maximum supported disk size is limited by the guest operating system running on Avanti. For example, Avanti running OpenVMS version 6.2 would be limited to virtual disk sizes of 9GB. Check the Software Product Description (SPD) for the guest O/S version in use to determine actual limits.

Removable Media Devices

CD and DVD-ROM

Avanti supports physical CD and DVD-ROM device. FreeAXP supports a single physical CD/DVD-ROM device. CDs and DVDs can also be copied as ISO files and accessed as virtual media. Avanti does not support CD/DVD-ROM burning.

External Expansion

Virtual disk, CD-ROM, DVD-ROM, and tape drives can be created on external storage devices accessible to the host system.

CONSOLE

Avanti provides SRM console access via a serial port (OPA0/tty00). The serial port can be virtual or physical. FreeAXP provides SRM console access via a virtual serial port.

COMMUNICATIONS

- Avanti allows up to three virtual 10/100Mb DE435 or DE500 NICs. FreeAXP allows up to two virtual 10/100Mb DE435 or 10/100Mb DE500 NICs. External performance is driven by the host system and may exceed 100Mb.
- Avanti allows one virtual or physical serial console (OPA0/tty00). FreeAXP is limited to a virtual console port.
- Avanti allows one virtual or physical serial port (TTA0 or /dev/tty01). FreeAXP is limited to a virtual serial port.
- Avanti allows up to five virtual 5-port ISA serial cards[6]. FreeAXP does not provide ISA card support.

Virtual serial port access is by telnet via a user defined telnet port. Physical serial port access is supported via a physical serial (COM) port on the host system.

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[6] OpenVMS only.

PRINTERS

- Network printer support is dependent upon the O/S running on Avanti.
- Serial printer support is available via TTA0/tty01 or the virtual 5-port ISA serial cards[6] and host system serial ports. FreeAXP does not provide serial printer support.

CONFIGURATION

Avanti is configured via a simple Windows GUI interface.
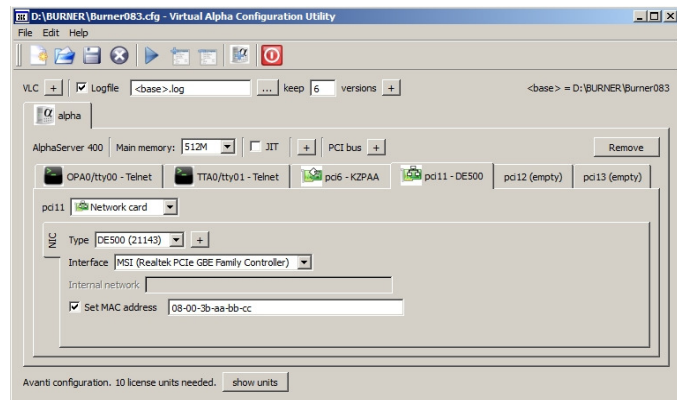
SOFTWARE

Operating Systems

- OpenVMS V6.1-1H1 and higher.
- Digital OSF/1 V3.2C and higher.
- Tru64 UNIX V3.2C and higher.

Avanti Configuration Utility

Avanti implements the Alpha SRM firmware, limiting O/S support to those O/S's that can boot from SRM. Thus, Avanti does not support WindowsNT. Avanti implements a virtual serial console, but does not implement a graphics card, so O/S's requiring a graphical interface are not supported. Avanti has not been tested against O/S's such as Red Hat Linux, NetBSD, FreeBSD, and OpenBSD, which utilize the Alpha SRM firmware.

Terminal Emulator

PuTTY: Free implementation of Telnet and SSH for Windows and UNIX platforms. A copy of PuTTY is provided with Avanti. The software is also available from this link:

http://www.chiark.greenend.org.uk/~sgtatham/putty/

TESTED O/S

Avanti has been tested under the following 64-bit operating systems:

Windows 10	Windows 11	Windows Server 2012
Windows Server 2016	Windows Server 2019	Windows Server 2022

VIRTUAL MACHINES

Avanti has been hosted on Windows O/S running under VMware®, Microsoft Hyper-V, Oracle VM VirtualBox, Apple Parallels, and others. Avanti supports VMware vMotion.

WARRANTY

Avanti is provided with a 30-day factory warranty. Annual software support contracts are available for purchase.

FreeAXP is freeware. It is provided as is without warranty or official support. Use it at your own risk. FreeAXP questions and problem reports can be posted to the FreeAXP forum at http://vmshobbyist.org/forum. Migration Specialties will respond as time permits

UNSUPPORTED OPTIONS

Avanti has not implemented the EV4 CPU on-chip performance counters. Code profiling applications such as kprofile and uprofile will not work correctly on Avanti.

SUPPORT

Avanti customers under warranty or holding a valid support contract may contact their Avanti supplier with questions and problem reports.

FreeAXP questions and problem reports can be posted to the FreeAXP forum at http://vmshobbyist.org/forum. Migration Specialties will respond as time permits.

UPDATES

Migration Specialties may post updates to Avanti at any time. Notices of updates will be posted to Avanti customers, Avanti suppliers, and on the Migration Specialties web site.

COUNTRY OF ORIGIN

Avanti was developed by an international team with members from the USA, Canada, The Netherlands, and the UK. Avanti is owned and controlled by Migration Specialties International, Inc., a US corporation.