

PRODUCTS

AViiON Server Family

Revision 1.0

March 1991

AViiON Family

Overview

In April 1988, Data General publicly announced its intention to build a product line based on the newly announced Motorola 88000 RISC processor. Nine months later in January 1989, Data General demonstrated the first members of this new product family at the Uniforum show in San Francisco. The AViiON™ products announced that day set new standards for price/performance and introduced symmetric multi-processing to RISC-based systems. Today the AViiON line spans a price and performance range that is unmatched in the industry. Starting with 19 MIPS workstations at \$3995 and extending to 117 MIPS quad-processor servers, the AViiON family offers the broadest range of binary-compatible systems and supports over 1,000 applications.

Four key factors allowed Data General to quickly build such a broad competitive product line and amass such a volume and variety of applications.

1. Standards

A cornerstone of the AViiON strategy, adherence to standards has resulted in a system implementation that is not just open but wide open. AViiON was built on an industry-standard CPU and I/O bus architecture. Software standards for UNIX O/S, communications, and binary application portability enhance the hardware implementation and provide a system designed for portability and multi-vendor interoperability. Support for these standards has allowed software developers to port over 1,000 applications in a relatively short time. These standards also allow end users and VARs to integrate AViiON systems with existing systems or desktop devices.

2. Motorola 88000 RISC family

The Motorola 88000 provides the performance and multi-processing capability to be the standard engine for the complete line of AViiON products. This single architecture throughout the product line simplifies compatibility and upgrade issues. Future development from Motorola will provide the technology needed to expand capabilities in the future.

3. Multiple processor technology

Software and hardware support for tightly coupled multiple processors allows the AViiON line to scale the performance of current chip technology with no impact on application software. Users can expand their systems by adding additional processors and Data General can offer more powerful systems than competitors who rely on single-processor implementations. With 1-4 processors available on our server line today and 16, 20, and 25 MHz chips from Motorola, we can support a performance range from 19 to 117 MIPS.

4. Experience

With over 20 years selling and supporting a full range of systems, Data General has the experience to add significant value to standards-based hardware and software platforms. AViiON continues the Data General tradition of supplying leading technology, reliable systems, excellent value and worldwide service and support.

The AViiON product line is made up of a family of workstations and a family of low- and high-end servers. The low-end servers in compact deskside packaging are targeted at small workgroups while the high-end servers are aimed at large user groups where high performance, capacity and availability are key requirements. All server systems support a variety of desktop devices. PC or Macintosh® users can be connected to provide access to UNIX® applications on the server. Standard terminals or X-terminals can provide a text or graphics-based interface to UNIX applications. Applications can also be distributed to UNIX workstations or PCs to balance system loading and provide local processing capability on the desktop. The workstation family is binary compatible with the servers so that distribution of application processing is simplified. Deskside workstation packaging allows multi-processing performance for compute-intensive applications such as Geographic Information Systems or Imaging.

High Availability

Availability of computing resources is important to all customers. All AViiON systems have been designed to the highest quality standards and have built-in features to assure reliable operation. We also provide additional products and capabilities for those customers who require an absolute minimum of downtime. Our High Availability products enables the user to configure increasingly redundant and reliable components such that he need only purchase the level of availability he needs. Starting with simple disk mirroring and extending to multiple host, dual-ported fault tolerant disk subsystems and uninterruptible power supplies, the user can configure exactly the level of redundancy that meets his availability objectives.

Summary

The AViiON family is a truly open, scalable, and complete product family that offers users access to more than a thousand applications, interoperability with a wide range of systems and desktop devices, and the power today and in the future to meet their application processing requirements. Backed by Data General with a worldwide network of service and support, AViiON is the clear leader in UNIX business systems.

AViiON Family Low-end Systems

Overview

The AV 3200 and 4000 Series server families provide cost-effective, deskside-package systems based on the Motorola 88000 RISC architecture. These two series provide a small footprint and a tower package with a range of models providing similar functionality. The differences are in the capacity ranges defined for individual models which permit the cost and scale of the system to suit the customer's requirements (see chart on page 2-2).

Both series use an integrated motherboard which includes CPU-parity memory, a SCSI bus controller, an ETHERNET® controller and a VME interface. Additionally, the AV 4000 can support outboard SCSI expansion chassis and dual CPU capability. In a timeshared environment, the AV 3200 can support up to 18 asynchronous devices. The AV 4000 series can support up to 257 asynchronous connections.

An ETHERNET controller is built into the motherboard on both AViiON servers and the bus architecture used is the popular VMEbus. The VMEbus provides an industry-standard interface between AViiON systems and controllers. Because the VMEbus technical specifications are so well defined, they allow AViiON systems to easily support a wide range of compliant controllers and subsystems from Data General and third-party suppliers.

The full AViiON product family has been carefully designed and implemented to provide a wide range of scalable choices for customers choosing Data General as their UNIX supplier. Additionally, interoperability between our ECLIPSE®-based proprietary product line and our Open Systems products allows integration of applications running on MV and AViiON systems. Customers choosing Data General can have the desktop environment of their choice—UNIX, X-Windows, DOS, OS/2 or Apple—and can enjoy easy access to the server platform best suited to their applications. This means that traditional Data General customers can integrate AViiON servers into their workplace using industry standards such as Novell or TCP/IP while preserving the investment they have made in proprietary systems.

Low-end System Features

Features	Benefits
Entry-level server family	Cost-effective entry into a binary compatible family with easy growth path
Balanced system design	Maximizes application throughput as processing power is increased
DG/UX™ commercial grade operating system support	Compatible with UNIX standards. Offers symmetric multi-processing for enhanced performance, and other extensions for increased data integrity
Wide software range	Enables customers to select from leading languages, development tools, utilities, communications, databases and applications software
Motorola 88000 RISC-based	Provides high performance at a low cost. 88open Binary Compatibility Standard insures software compatibility among Data General and many other systems

Low-end Server Characteristics

	AV 3200	AV 4000/4020	AV 4100/4120
Packaging	Deskside	Deskside	Deskside
MIPS	19	19-38	23-46
Main Memory (MB)	16	128	128
Maximum Disk (GB)	1.3	6	6
VME Slots	1	2	2
Async Connects	18	257	257

Product Positioning

AV 3200 versus the AV 4000 Series

The main difference between the AV 3200 and the AV 4000 series is capacity. Additionally, the AViiON 4000 series offers a dual-processor capability.

The AV 3200 has been designed as a low-cost, entry-level server. As such, it has less disk capacity, fewer expansion slots in the chassis, and supports a smaller number of asynch users. Please refer to the chart on the previous page for details.

The second major difference between the AV 3200 and the AV 4000 series is that the AV 4000 series can support a dual processor while the AV 3200 can not. Additionally, a second processor can be added to an existing AV 4000 without having to swap the CPU, allowing a customer to easily upgrade and dramatically increase the horsepower of a system.

All AViiON systems support DG/UX as their operating system which means that software developed or ported to an AV 3200 or 4000 series system can be used on any AViiON platform. This will make upgrading systems and protecting a customer's investment in AViiON hardware much easier than with many of our competitors (such as DEC or IBM).

Selling to Target Markets

New Customers

The entry-level AViiON systems are powerful and cost-effective making them good choices for departmental solutions.

The flexibility and ease of upgrade lends itself well to "trying out," for instance, an office automation or database solution within a workgroup. These pilot projects can then be easily expanded to include other groups or join the corporate information system if needed.

The over 1,000 applications supported on the AViiON platform and the fact that it is truly an open system make a pilot with Data General much less of a risk. Distributed applications such as ORACLE® or the new Open Systems Office/pc.DAA are attractive to many customers on this cost-effective platform.

The support of Novell and LAN Manager/X will open the door to many commercial LAN customers who are interested in open systems and the more powerful applications provided on a UNIX platform. These customers do not want to change the desktop environment that they have chosen but they are very interested in adding to the applications which they can access on the AViiON server. Also a plus is the fact that both LAN Manager and Novell can be supported simultaneously from a single AViiON server meaning that a customer would not be locked-in to his LAN vendor choice.

VAR Channels

Many Data General VARs are very interested in moving into the UNIX world and in creating distributed versions of their applications to gain an advantage over their competitors. The AV 3200 and AV 4000 series give them an inexpensive AViiON platform with which to enter this world.

The AViiON product family's complete compatibility and upward mobility is also attractive to a VAR. He can sell an entry-level system and upgrade at a later date with no modification of application software or customer data.

Terminal emulation on PCs or workstations allows a VAR to sell AViiON systems today with his current terminal-based application. As he converts to distributed applications, he can fully utilize the local processing power of the workstation or PC.

The Software Developers' Kit (SDK) and other AViiON software tools can help a developer more easily create distributed applications on our platform. The SDK will automatically create the communications code and the user interface code needed. The developer simply chooses from entries in a library. This allows the developer to be concerned only with writing and maintaining the server-based code with which he is the most familiar.

NetWare for the AViiON has made these entry level AViiON servers a very attractive platform for the VAR who would like to sell his application to the over 6 million Novell PC LAN users presently installed. An AViiON server can simply plug into an existing Novell LAN and allow the PCs on the LAN to access the UNIX application with terminal emulation. The PC server continues to provide file and print services to the PCs and the AViiON becomes an application server. Because the AViiON is a multi-function server it can provide application support, network management and communications capabilities from a single server and not interrupt the functionality of the original LAN. This true "value added" approach plus the scalability of the AViiON product family can make AViiON a very cost-effective and strategic product for VARs.

Configuration flexibility is very important to a VAR when choosing a platform for an application. Not only is AViiON a scalable hardware family supporting the same operating system on all models, but a single AViiON can support multiple environments simultaneously. This means that a VAR can sell a single server to manage a mix of UNIX or X-Windows terminals; DOS, OS/2 or Apple PCs over Novell, LAN Manager, TCP/IP or traditional asynch connections. Flexibility like this is important because it means that a VAR can propose his application into almost any existing environment, offer added value, and still protect the customer's investment.

Installed Base

Existing customers can introduce AViiON servers into their environments with little disruption. Server-to-server interoperability is possible between the MV and the AViiON but the simplest approach is through the use of a LAN. Both the AViiON and the MV can support both TCP/IP and Novell LANs, allowing the user to have the desktop environment of his choice and use the LAN to select the application desired. AViiON can provide a whole suite of UNIX-based applications to the non-UNIX end user without having to exchange the DOS, OS/2 or Apple PC on the desktop for UNIX. AViiON and MV servers can both be present on the LAN, each supporting the appropriate applications. The user can access UNIX, proprietary or PC-based applications easily.

Selling Points

When promoting the AViiON 3200 and 4000 series products to customers, some key points to emphasize are:

- 88K, RISC-based architecture
- True BCS compliance ensures application availability and portability
- Over 1,000 available applications
- Powerful development tools (CASE, compilers, SDK)
- Very cost competitive
- Upward compatibility in the family
- Low entry cost but powerful system
- DG/UX (highly optimized with symmetric multi-processing)

AViiON High-end Systems

Overview

The high-end consists of the office and rackmount AV 5200 and AV 6200 series systems as well as the specially packaged highly-available AV 7000 and AV 8000 systems. These systems offer high performance, high capacity configurations to support large user communities, high transaction processing rates and large data storage requirements. The combination of DG/UX, ECC memory, disk mirroring, RAID 5 disk arrays, and redundant configuration capability provide a high degree of reliability and availability for mission-critical application environments.

The HADA (High Availability Disk Array) subsystem provides a critical system component to the high-end product line. Configured for high performance and fault tolerance, this subsystem can meet the reliability requirements of a key component of a commercial processing environment, the customer's data base. Using RAID 5 technology, the subsystem achieves 100% redundancy of data storage with only a 25% increase in physical storage cost. (See HADA product section for details).

High End System Features

Features	Benefits
Motorola RISC processor	Standard architecture for applications availability
1-4 processor systems	Scalable growth through processor upgrades
Repair under power HADA	Uninterrupted availability of data during disk failure
20-slot VME chassis	Configuration flexibility and capacity for large disk, memory or special I/O requirements
UPS	Continued operation during power failure
Up to 768 MB ECC memory	Fast reliable performance in large user or high-transaction environments

High-end System Characteristics

	AV 5200/AV 7000	AV 6200/AV 8000
MIPS	29-117 MIPS	29-117 MIPS
AIM Users	121-450 USERS	121-450 USERS
Max Memory	512 MB	768 MB
Max Disk	15 GB	113 GB
Asynch Connects	1020	1275
LAN ports	2	8
Synch ports	24	48

Product Positioning

AV 6200 versus AV 5200

Configuration issues and packaging will determine which system to choose.

- Support for fault tolerant HADA subsystem
- More memory, disk, I/O, and VME expansion
- Rackmount packaging for other peripherals

AV 8000 versus AV 6240

- Customer requirement for high-availability
- Packaged fault tolerant HADA subsystem
- Packaged UPS (US only)

AV 7000 versus AV 5240

- Customer requirement for high-availability
- Packaged RAID 5 or mirrored CSS2/CSS2DC
- Packaged UPS (US only)

Target Market

New Accounts

AViiON high-end systems offer a compelling alternative to fault tolerant systems where non-stop processing is not a requirement. The cost of configuring CPU, disk, I/O, and terminal connect redundancy with recovery time measured in minutes can be significantly less expensive than dedicated fault-tolerant solutions from other vendors. The use of RAID 5 technology also means on-site spares for disk replacement are much less expensive as well. The scalability of 1-4 processor systems also means users don't have to overbuy to cover future growth plans. They can buy the right size system today and add capability to that system as their needs grow. Key prospects would be large corporations where a compatible family of systems allows optimal sizing within a binary-compatible architecture. Also VARs selling into multiple size user accounts will benefit from the broad family and upgradability. Applications, where disruption of access is costly but not fatal (as in fault tolerant requirements), are good prospects for the AV 7000 and AV 8000.

Installed Base

Current AViiON customers may be attracted to the AV 7000 or AV 8000 if increased reliability and availability of data is a requirement. Customers may also look at the 5240 and 6240 upgrades for existing systems where CPU utilization is close to capacity due to increased user counts or application loads. The modularity of the high availability features provide an excellent opportunity to sell additional capability at reasonable cost to the installed base. Features like mirroring or the addition of a CSS2 RAID 5 subsystem can add significant redundancy for a relatively small cost.

Selling Strategy

AV 5200/AV 7000

- Sell the benefits of ECC memory and 10-slot VME compared to limited configuration of AV 4000 series
- Bid for today's requirement and sell 1-4 processor expansion to cover future growth requirements
- Promote the features of RAID 5 or mirrored disks for high availability
- Promote the high performance of 117 MIPS quad-processor in office packaging for OA or office applications

AV 6200/AV 8000

- Promote the maximum configurability with 20 slots and quad-processor performance
- Use the fault tolerant HADA subsystem to meet critical data availability requirements
- Promote repair under power HADA and RAID 5 plus mirroring capability to demonstrate most flexible solution

Competitive Overview

The announcement of the new high-end AViiON systems positions Data General as the premier supplier of high-performance, high availability, open systems and servers. The high-end quad-processor, disk array subsystems, high availability features in DG/UX, VDA/255 and B1/C2 security, place Data General in a leadership position with respect to the competition. AViiON systems offer significant advantages when compared to both our traditional competition like IBM, DEC, SUN, HP, and NCR, as well as new competitors like Pyramid and Sequent. AViiON offers clear competitive advantages in the areas of:

- Price/performance
- High-availability systems
- 'Commercial strength' operating system
- High-end disk array subsystems
- Breadth of family from binary-compatible single-user workstations to 117 MIPS quad-processor systems.
- B1/C2 security

As can be seen from the chart below, no other vendor can offer today as complete an open systems story as Data General.

Table 1.

	AViiON COMPETITIVE COMPARISON							
	DG	IBM	DEC	HP	NCR	SUN	PYR	SEQ
BINARY FAMILY	X	X	X			X		
BROAD PERFORMANCE	X						X	X
SMP	X		X			X	X	
OPEN PLATFORM	X	X			X			X
COMMERCIAL UNIX	X	X		X	X		X	X
HIGH AVAILABILITY	X							
W/W RESOURCES	X	X	X	X	X			

The remainder of the competitive section will provide detail on how Data General AViiON systems beat the competition everyday in every way when it comes to the high-performance, high-availability, commercial open systems.

IBM High-end Position and Strategy

The IBM RS/6000 was positioned by IBM as the price/performance leader in the open systems arena, targeted in particular for the technical market. Data General's high-end announcements put us in front of IBM in both price/performance and raw performance at the high end, and give us a significant window of opportunity in competing against them. The RS/6000 has impressive uniprocessor performance, but is currently limited by a single-processor architecture, and lack of high-availability features. Our new high end enables us to significantly strengthen our strategy to target large multiuser environments; competing against IBM in this space will be easier, especially in light of recent stories of poor multiuser performance on the RS/6000.

The Model 550 is the high end of the RS/6000 product line, which at 56 MIPS, is not a significant threat to Data General's new high-end systems. At present, there is no discussion of disk array technology, high availability, or fault tolerance coming from IBM as statements of direction for the RS/6000 line. It is expected, however, that IBM will continue to increase clock speeds and therefore MIPS, and that by 1993, the RS/6000 chip set will be rearchitected to include SMP. As an interim step, there is also talk of a parallel multiprocessing high end, yielding 100 MIPS performance by the Third Quarter 1991. In 1993, high availability subsystems, including CPU failover, quad-processors, and redundant controllers are expected to be announced.

Competitive Position by High-end Issue

SYSTEMS

The three high-end systems in the RS/6000 family are shown in Table 2. Systems-related issues that can be used to show Data General's competitive advantage include:

- AViiON offers the expandability and performance advantages of SMP
- At 117 MIPS, CPU performance of the new AViiON systems is more than twice as high as the 56 MIPS of the RS/6000 Model 550
- Capacity, as measured by maximum disk and memory, is much higher for AViiON than for the RS/6000, despite IBM's new implementation of 4 Mbit memory chips
- IBM's highest performing systems support only 256-512 connections, compared to the 1020 and 1275 connections available on AViiON. The use of terminal servers also gives Data General a more flexible multiuser solution
- AViiON's high availability features, such as disk arrays and disk mirroring, enable Data General to position itself more aggressively against IBM in many environments.

Table 2.

	AViiON Versus IBM				
	AV 52X0	AV 62X0	PS 930	PS540	PS550
CPU	88100	88100	POWER	POWER	POWER
CLOCK	25MHz	25Mhz	25Mhz	30Mhz	41.6Mhz
MIPS	29-117	29-117	37	44	56
AIM III	121-450	121-450	195	227	307
SMP	Yes	Yes	No	No	No
# CPUs	1-4	1-4	1	1	1
MEMORY	16-512MB	16-768MB	512MB	256MB	512MB
DISK MAX	15GB	113GB	12GB	25GB	25GB
SLOTS					
Number	10	10/20	16	8	8
Type	VME	VME	MCA	MCA	MCA
MAX ASYNCHS	1020	1275	512	256	256
BC FAMILY	* Yes	Yes	Yes	Yes	Yes
DISK ARRAY	Yes	Yes	No	No	No
RAID Type	1-5	1-5	NA	NA	NA
Dual Porting	Yes	Yes	NA	NA	NA
ENTRY PRICE	\$35-106K	\$52-113K	\$62K	\$93K	\$135K
NOTE:					
* = Binary Compatible Family					

UNIX

IBM's AIX can be compared with DG/UX in terms of standards compliance, commercial enhancements, and high availability features.

- IBM supports only TCB Level C2 today, with B1 a "statement of direction." DG/UX supports both C2 and B1 levels.
- XPG3 compliance is an IBM "statement of direction," whereas DG/UX has it today.
- IBM supports SRV3 compliance with no commitment to SRV4. DG/UX will be compliant with SRV4 with migration support.
- IBM supports logical volume file mirroring, which creates a backup of data, but does not yield the level of high availability that DG/UX offers with both software and hardware disk mirroring.
- AIX offers DOS emulation; DG/UX supports native DOS file systems in addition to DOS emulation.
- DG/UX offers selective file recovery options which help lead to 15 minute recovery after outage. IBM does not support this backup option.

High Availability

IBM has no high availability features, other than those built into the operating system, such as logical file management.

Data General's new AViiON systems, on the other hand, offer the following high-availability features:

- Disk Arrays
- Disk mirroring (both software and hardware)
- Symmetrical multiprocessing
- C2 and B1 security

Data General Competitive Strategy

The following issues and strategies can be used in competing against the RS/6000 family:

- IBM is architecturally limited by lack of SMP
- IBM's strategy includes a technical vs commercial orientation
- There is a growing number of stories of weak commercial performance on the RS/6000
- Data General offers a broader, higher performing, binary-compatible product family, which includes high-end servers with high-availability features and superior price/performance
- Data General high-end systems can compete in different target markets
- Higher commercial performance of AViiON systems
- High-availability features without fear of legitimate IBM response
- Take advantage of the window of opportunity—at least until the end of 1991—until IBM has a competitive high-end product

DEC High-end Position and Strategy

The announcement of the new high-end AViiON systems plays particularly well against DEC's open systems product line. Unlike most of our competitors, DEC has had, at least on paper, some significant capability at the high end, predicated by its ability to deliver symmetric multiprocessing in Ultrix.

The good news is that DEC's high-end product line has not done well. DEC has focused its open systems product line ON THE DESKTOP and is focused more on its competitive position in technical markets against competitors like Sun. DEC would much rather sell VAXs at the high end and, as we will see, one of the knock-offs on the open systems product line is that it is not "open" at all, being essentially a VAX architecture with a RISC CPU.

The high-end open system from DEC includes DECsystem 5800s, which are all based on the same architecture and chipset, and are differentiated by the number of CPUs. The 5810 supports 1 CPU, the 5820 supports 2, the 5830 has 3 and the 5840 supports 4. See Table 3 for a view of the system expansion and performance capabilities.

One notable feature of the 5800 family is that it provides THE ONLY SYSTEMS in DEC's open systems product line which today implement Ultrix's Symmetric Multiprocessing capability. Reports are that the implementation is poor and, despite the 5800's high CPU performance capability on paper, the 2, 3 and 4 CPU versions of the 5800 scale poorly. A recent article in *Digital Review* suggests that DEC has backed away from selling multiprocessor 5800s because of the inability of Ultrix to scale. Additional processors in the 5800 can provide as little as 10% greater performance per CPU.

Competitive Position by High-end Issue

SYSTEMS

The introduction of the AV 5240/6240/7000/8000 gives Data General dramatic advantages over DEC for high-end system/server business. Table 3 highlights some of the differentiators:

- AViiON systems span a dramatically wider performance range than DECsystems. Today, Data General provides system/server solutions which range from 19 to 117 MIPS. The DECsystems product line ranges from 19.4 to 62 MIPS (even accepting Ultrix SMP scalability claims at the high end).
- AViiON systems offer more memory, and support for more disk, more expansion slots, and a larger number of direct asynch connects.
- AViiON systems are based on industry standards such as VME. DECsystems are essentially VAXs with RISC CPUs. The I/O bus is the proprietary VAXBI bus, for example.
- AViiON systems simply blow away DECsystems 5800s from the price/performance perspective.

Table 3.

	Data General Versus DEC					
	AV 52X0	AV 62X0	DS 5810	DS 5820	DS 5830	DS 5840
CPU	88100	88100	R3000	R3000x2	R3000x3	R3000x4
CLOCK	25MHz	25MHz	25MHz	25MHz	25MHz	25MHz
MIPS	29-117	29-117	18.7	to 35	to 48	to 62
AIM III	121-450	121-450	NA	NA	NA	NA
SMP	Yes	Yes	Yes	Yes	Yes	Yes
#CPUs	1-4	1-4	1	2	3	4
MEMORY	16-512MB	16-768MB	256MB	256MB	198MB	128MB
DISK MAX	15GB	113GB	58GB	58GB	58GB	58GB
SLOTS						
Number	10	10/20	5	5	5	5
Type	VME	VME	VAXBI	VAXBI	VAXBI	VAXBI
MAX ASYNCHS	1020	1275	< unlim/terserver >			
BC FAMILY*	Yes	Yes	Yes	Yes	Yes	Yes
DISK ARRAY	Yes	Yes	No	No	No	No
RAID Type	1-5	1-5	NA	NA	NA	NA
Dual Porting	Yes	Yes	NA	NA	NA	NA
ENTRY PRICE	\$35-106K	\$52-113K	\$75K	\$115K	\$140K	\$160K
NOTE:						
* = Binary Compatible Family						

UNIX

DEC has taken some significant knocks in the press with regard to its UNIX implementation. The good news is that Ultrix is being faulted in precisely the areas that are Data General strengths: commercial robustness, production capabilities, high availability: in short, "industrial strength" UNIX.

In particular, a recent article in *Digital Review* suggested that Ultrix is today farther away from full production robustness than other UNIX systems. The knocks on Ultrix were:

- No dynamic memory management
- Poor file management
- Poor scalability in the symmetric multiprocessing implementation in the DECsystem 5800s
- Inability to support large disk farms.

High Availability

DEC has for several years touted high-availability features in the VAX/VMS world. DEC's high-availability strategy has centered around the VAXcluster: an architecture which allows multi-porting of disks, disk mirroring, and other high-availability features. To date, there is no parallel high-availability strategy for DEC's open systems products.

The DECsystem 5800s do support some of the hardware that provides high-availability for VAX systems. The disk units and intelligent disk controllers configurable on DECsystem 5800 systems do support disk mirroring and dual porting. Note that disk shadowing is not supported by Ultrix, however, and so many of the high-availability features of DEC's proprietary disk and controller families available on the DECsystem 5800s are not fully functional due to the weakness of Ultrix.

Data General Competitive Strategy

When competing against the DECsystem 5800s, the following issues should be considered:

- Data General has a dramatic advantage in breadth of product line
- Data General has a dramatic advantage in performance, in price, and in price/performance.
- Data General's open systems product line is fully open, DEC's is largely proprietary.
- Data General's high-availability strategy at the high-end is a clear differentiator from DEC.
- DEC is focused on competing on the desktop against competitors like Sun, where high availability is not a major issue.
- Ultrix weakness means that high availability is not something DEC can pull off on this product line anytime soon.

Hewlett-Packard High-end Position and Strategy

Hewlett-Packard High-End Position And Strategy

AViiON systems have always enjoyed a significant price/performance advantage over the HP Series 800 systems. Even with HP's recent announcement of the high-performance Series 842S, 852S and 865S systems, the AV 5200/6200 systems still maintain a significant price/performance advantage. Now, with the new quad-processor AV 5200/6200 systems, we have an advantage in overall performance as well as price. When you put this together with our superior open systems architecture, binary-compatible family, and high-availability features, you have an unbeatable combination.

Competitive Position by High-end Issue

SYSTEMS

AViiON systems enjoy many advantages over the HP Series 800 systems. Some of the more significant advantages are:

- AViiON offers a broader range and higher performance, 19-117 MIPS, than HP Series 800 systems
- AV 52X0/62X0 systems offer significantly better MIPS, AIM and TPC performance than the HP Series 800 systems
- AViiON systems support high performance disk arrays
- AViiON offers significantly better price/performance across the board as compared to HP Series 800 systems
- AViiON offers a wider range of disk, memory and asynchronous port expansion
- AViiON supports an industry-standard RISC architecture and industry-standard bus; Motorola 88K and VME

Table 4.

	AViiON Versus Hewlett-Packard					
	AV 52X0	AV 62X0	HP842	HP852	HP865	HP870
CPU	88100	88100	HPPA	HPPA	HPPA	HPPA
CLOCK	25MHz	25Mhz	28MHz	50Mhz	50Mhz	48Mhz
MIPS	29-117	29-117	29	52	52	50-90
AIM III	121-450	121-450	NA	NA	NA	NA
SMP	Yes	Yes	No	No	No	No**
# CPUs	1-4	1-4	NA	NA	NA	1-2
MEMORY	512MB	768MB	256MB	256MB	512MB	768MB
DISK MAX	15GB	113GB	8GB	8GB	85GB	85GB
SLOTS						
Number	10	20	10	10	20	20
Type	VME	VME	HPPB	HPPB	HPIB	HPIB
MAX ASYNCH	1020	1275	400	600	600	800
BC FAMILY *	Yes	Yes	No	No	No	No
DISK ARRAY	Yes	Yes	No	No	No	No
RAID type	1-5	1-5	NA	NA	NA	NA
Dual Porting	Yes	Yes	No	No	No	No
ENTRY PRICE	\$35-106K	\$52-113K	\$85K	\$143K	\$275K	\$350K/\$645K
NOTE:						
*	= Binary-compatible workstations and servers					
**	= SMP announced but not delivered.					

UNIX

While HP's implementation of UNIX is perceived to have good commercial functionality, there are several areas where DG/UX is better.

- DG/UX supports disk mirroring as a standard feature.
- DG/UX offers many high-availability features such as fast file system, fast system reboot, communications controller on-line restart, and auto dump to tape after system failure.
- DG/UX supports symmetric multiprocessing. HP/UX currently cannot support any form of SMP.
- Data General offers a single version of UNIX for all its AViiON systems, HP supports at least four different versions of UNIX.

High Availability

HP's current high-availability products are limited to optional disk mirroring and battery back-up. An automatic CPU switchover capability has been announced. However, SwitchOver/UX capability will not be available until the release of HP/UX 8.0 late in 1991. While HP is expected to further enhance its high-availability offering with additional features, it currently does not offer any products that can compete with Data General's:

- Disk arrays
- Disk mirroring as standard feature
- Packaged high-end, high-availability systems
- Symmetrical multiprocessing
- C2 and B1 security

Data General Competitive Strategy

When competing against the Series 800 systems from Hewlett-Packard, the following issues should be emphasized:

- AViiON offers better price/performance
- AViiON offer a wider range of binary-compatible systems and workstations
- AViiON systems are more open than HP Systems offering support for VME, SCSI, and 88K
- AViiON supports wider range of memory, disk and asynchronous ports than HP
- Data General supports more high-availability features in DG/UX than HP/UX
- Data General offers UPS and disk arrays to support high availability
- DG/UX supports C2 and B1 security levels

NCR High-end Position Strategy

NCR's high-end systems have traditionally not been uncompetitive against the AV 5200 and AV 6200 systems. The Tower products do not offer performance above 20 MIPS and their high-availability functionality is limited to disk mirroring, auto restart and battery back-up. The recently announced System 3450/3550 products are not available and will not be before June 1991. Furthermore, they are likely to be delayed due to their dependence upon the unreleased 50 MHz 80486 and AT&T SVR4 with SMP technology. NCR talks about high-availability features such as disk arrays and UPS support, but the disk arrays are not currently available and they do not seem to have a real strategy mapped out for high availability.

Competitive Position by High-end Issue

SYSTEMS

In most cases the AViiON product should have very little problem competing with the NCR Tower products. AViiON is a superior architecture that offers significantly better price/performance at the high end. When competing against the NCR Tower systems, AViiON offers the following advantages:

- Better price/performance
- Greater performance range across the entire family
- Larger disk, memory and asynchronous connection expandability
- High-performance VME bus vs Multibus II for NCR
- Symmetrical multiprocessing
- Binary-compatible family of workstations and servers

While, on paper, the NCR System 3450/3550 seems to offer competitive price and performance, NCR has yet to deliver real products. When the NCR System 3450 and 3550 products are available, AViiON will offer the following advantages:

- A wide range of binary-compatible systems and workstation, all available today. None of the NCR 3450/3550 products are available today and they do not offer true UNIX workstations.
- Industry-standard benchmark information to support Data General's performance claims. NCR Systems 3000 performance claims are based upon the 80486 MIPS rating.
- Larger disk, memory, and asynchronous expandability than the NCR 3450/3550 systems.

Table 5.

	AViiON Versus NCR					
	AV 52X0	AV 62X0	3450	3550	32/825	32/850
CPU	88100	88100	80486	80486	68020	68020
CLOCK	25MHz	25MHz	50MHz	50MHz	30MHz	30MHz
MIPS	29-117	29-117	40-160	80-320	3-18	3-18
AIM III	121-450	121-450	NA	NA	210 (6)	210 (6)
SMP	Yes	Yes	Yes**	Yes**	Yes***	Yes***
# CPUs	1-4	1-4	1-4	1-8	1-6	1-6
MEMORY	512MB	768MB	256MB	256MB	128MB	384MB
DISK MAX	15GB	113GB	50GB	50GB	19GB	19GB
SLOTS						
Number	10	20	8	16	10	20
Type	VME	VME	MCA	MCA	MBUSII	MBUSII
MAX USERS	1020	1275	256	1000+	256	512
BC FAMILY *	Yes	Yes	Yes	Yes	No	No
DISK ARRAY	Yes	Yes	Yes**	Yes**	No	No
RAID type	1-5	1-5	1-5	1-5	NA	NA
Dual Porting	Yes	Yes	Yes	Yes	NO	NO
ENTRY PRICE	\$35-106K	\$52-113K	\$43K	\$104K	\$98K	\$99 k
NOTE:						
* = Binary-compatible workstations and servers						
** = Announced but not delivered						
*** = Asymmetrical multiprocessing						

UNIX

Data General supports a more commercially oriented version of UNIX than NCR currently supports. NCR's Tower systems use SVR3 and will not be upgraded to SVR4. The as yet unavailable NCR 3000 systems depend upon AT&T's unreleased SVR4 with SMP. When competing with NCR, remember that DG/UX:

- Supports symmetric multiprocessing now.
- Supports many commercial enhancements such as large file systems, system administrations tools, logical disk across physical disk, etc.
- Provides a clear set of migration tools UNIX SVR3 to SVR4.
- Is available today. NCR SRV4 with SMP will not be available before second quarter, 1991.

High Availability

While NCR supports some basic high-availability features on the Tower systems, they do not match up to what Data General offers with AViiON. System 3000 products may offer more robust high-availability support in the future, but these products are not yet available. AViiON currently offers the following advantages over NCR in the area of high availability.

- Support for disk arrays across entire product line
- Features in DG/UX such as fast recovery file system, fast system reboot, communication controller on-line restart, auto dump to tape after system failure, resizeable unmounted file system, etc.
- High-end, high availability packages including disk array, quad-processors, and UPS.

Data General Competitive Strategy

When competing against NCR systems the following AViiON strengths should be emphasized:

- Offers better price/performance vs the NCR Tower systems.
- Offers greater expandability than either the Tower or the System 3450/3550.
- Supports SMP today.
- Provides industry-standard benchmarks to support its industry-leading performance.
- Offers a more robust commercial version of UNIX.
- Supports disk arrays across entire product family.
- Offers significant high-availability features in DG/UX today.

Sun Microsystems High-end Position and Strategy

When Sun defines its "corporate mission," it states that its goal is to make SPARC the recognized leading architecture for network-based computing systems, servers and high-performance workstations in the UNIX marketplace. It goes on to state that it envisions itself as a top-ranking supplier of both commercial and technical computing solutions.

However, today Sun can only deem itself a market leader in technical UNIX markets. The company's infrastructure and purchasing base reflect deep roots in technical markets such as design automation and manufacturing, technical publishing, CASE, and scientific research. As a result, it gets caught in wanting to branch out into new territory, but falls victim to needing to protect its installed base. Sun knows if it does not, it will run the risk of repeating DEC's mistakes made back in the early 1980s when it abandoned its technical base.

The net of all this is that Sun's migration into the commercial, high-availability marketplace has been slow in getting off the ground. It is currently running an "all talk no action HA strategy." Only a handful of commercial software features have been announced over the past six months. These products are not integrated with Sun/OS and must be purchased separately.

As for Sun's direction in multiprocessing (code name "Galaxy," expected late this summer), no matter what it may be disclosing to its customer base regarding its future multiprocessing story, the products are not likely to ship for three to six months following the announcement. This, in and of itself, is a *critical* dynamic to work into your Data General Open System's solution theme. Data General's high-availability solutions are real and available now! Additionally, since Sun has never supported a multiprocessing architecture, it is unclear how much time it will need or take to get the architecture running "bug free."

SYSTEMS

Data General's mid- to high-end server family has historically offered a stronger and more compelling price/performance story over Sun's SPARC server family. Now, with the announcements of quad support, disk array technology and high availability features, *Data General's AViiON system family is clearly in a different league than Sun!* Sun's mid- to high-end systems, although capable of expanding out in memory and disk, have significantly lower performance not only when compared to Data General but to the overall marketplace. Sun's lack of commitment to the high-end system space can be best appreciated when reviewing its system family line. Its low-end system, the SPARCserver 2, outperforms the 470 or Rackmount 490 in MIPS, MFLOPS, AIM and SPEC. This is a clear indication that, although Sun claims it is committed to being a broad-based supplier of comprehensive systems, it is most attentive to the low-end space where its greatest marketshare is based.

Stress to your customers:

- AViiON offers 500% more integer performance than Sun with its symmetric multiprocessing support. At the high end, AViiON spans 29-117 MIPS where Sun can only reach 22 MIPS.
- AViiON offers greater price/performance in AIM, TP, and MIPS.
- Data General offers greater asynch capabilities due to a richer selection of terminal servers. Sun only supports 16 asynch line muxes!
- AViiON systems offer superior price/performance

Table 6.

	Data General Versus Sun Microsystems			
	AV 52X0	AV 62X0	SUN 470	SUN 490
CPU	88100	88100	SPARC	SPARC
CLOCK	25MHz	25Mhz	33MHz	33MHz
MIPS	29-117	29-117	22	22
AIM III	121-450	121-450	124	124
SMP	Yes	Yes	No	NO
# CPUs	1-4	1-4	1	1
MEMORY	16-512MB	16-768MB	32-672MB	32-672MB
DISK MAX	15GB	113GB	10GB	32GB IPI
SLOTS Number Type	10 VME	10/20 VME	12 VME	16 VME
MAX ASYNCHS +	1020	1275	125 +	200 +
BC FAMILY *	Yes	Yes	Yes	Yes
DISK ARRAY RAID Type Dual Porting	Yes 1-5 Yes	Yes 1-5 Yes	No NA NA	No NA NA
ENTRY PRICE	\$52-106K	\$52-113K	\$60K	\$100
NOTE: * = Binary-compatible Family + = This reflects networked clients and asynchs				

UNIX

One can not argue that Sun is perceived as one of the leading UNIX suppliers. However, it is important to keep in perspective that the majority (over 80%) of its achieved market penetration is in workstations. Additionally, Sun/OS is mostly targeted at the technical marketplace. Although Sun's marketing thrust is to expand into the commercial marketplace and achieve supremacy in both commercial and technical markets, it is slow in actually implementing commercial features in Sun/OS. To date, its strategy has not been to enhance the actual kernel but rather to add optional software components that sit on top of Sun/OS. Point out to your customers:

- DG/UX has always supported symmetric multiprocessing. Sun/OS is still bound to uniprocessing.
- DG/UX is delivered as a complete, robust commercial-grade UNIX operating system with all enhancements made to the kernel. Sun/OS is an unbundled operating system meaning customers pick and choose features, paying for all optional enhancements.

High Availability

Sun has made the case over the past six months that it intends to move into the high-availability commercial marketplace. Although it has a long way to go, it references its action with the following software enhancements: **Sun SPARCserver Manager Server Software** (data mirroring, on-line back-up, disk spanning, and window-based administration tools); **Sun DataBase Excelerator Server software** (increases DBMS performance, transaction throughput and concurrent users); and **Sun QuickCheck** (speeds up filechecking and down-time). However, none of these come close to the level of functionality inherent to DG/UX and the AViiON systems family. Point out to your customers:

- DG/UX supports RAID 5 disk arrays; Sun/OS does not support disk array technology.
- DG/UX, unlike Sun, supports many high-availability features such as resizable filesystem, fast system reboot, communication controller on-line restart, and auto dump to tape after system failure.
- Data General offers superior I/O performance with the support of disk array technology provided by 9U VMEbus IOPs.
- Data General offers an easy upgrade strategy by providing AV 5200 and AV 6200 system growth via board swap.

Data General Competitive Strategy

In sum, the AViiON architecture offers a superior platform for a broad customer base. Emphasize the following to your customers:

- AViiON's rackmount high-end server offers the greatest degree of performance and functionality unlike Sun that puts its horsepower in the low end.
- AViiON supports four CPUs reaching 117 MIPS via symmetric multiprocessing. Sun's SPARCserver 4x0 only supports 22 MIPS.
- Data General offers a more comprehensive solution set for enterprise-wide, multivendor distributed computing in business and office environments.
- AViiON systems provide more robust and flexible terminal servers. Sun only supports 16-channel asynch line muxes.
- Data General's systems offer greater flexibility and a broader growth path for customers. In particular, AViiON offers five times the processing capability, three times the asynch capability and nearly three times more disk over Sun's SPARCserver family.
- AViiON supports dual-ported disk array technology (RAID level 5).
- Data General offers far greater high-availability features in DG/UX than Sun/OS.
- Data General offers greater I/O performance than Sun.
- DG/UX supports automatic recovery; Sun/OS does not.

Sequent High-end Strategy and Position

Since its inception in 1981, Sequent's strategy has been focused on the high-end commercial UNIX marketplace. At the heart of the Sequent high-availability strategy lies parallel multiprocessing support combined with a robust commercial-grade UNIX operating system. As a result of this focused strategy, it has been successful in penetrating the OLTP and DBMS marketplace. However, Sequent's strategy has not centered around an aggressive pricing strategy as we in open systems know it. Some of this is a result of timing. When Sequent entered the market (1985), the competition was minimal. Proprietary systems (high-end minis and mainframes) were expensive. However, in the company's eyes it was competitive and offered a strong price/performance story. Open systems was in its infancy and posed no real threat to Sequent.

This scenario is no longer the case and has not been so for quite some time. The AViiON architecture, with 88K, symmetric multiprocessing and DG/UX, has been able to take Sequent on quite effectively. Even prior to our announcement of quad support, disk arrays and high availability features *the bottom line to AViiON's success has been superior price/performance and greater value in absolute performance!* Sequent, on average, costs twice as much as a comparable AViiON system with less flexibility and less capability of interoperating in multivendor environments.

Sequent has certainly carved out a niche for itself in the high-end commercial space. However, Sequent has been accustomed to having relatively little competition and has been slow in adjusting to the new rules set by the open systems marketplace. As a result, the AViiON family is in an excellent position to put an enormous amount of pressure on Sequent. Sequent is small, young and already feeling financial pressures as gross margins are on the decline as a result of poor price positioning!

Competitive Position by High-end Issues

SYSTEMS

Sequent recently announced its next generation system family, the S/2000. Based on the Intel 486 architecture, the family is quoted as being able to support up to 450 MIPS. However, the S/2000 700 currently can only support 20 CPUs (or roughly 300 MIPS), not the full 30 CPUs. Packaging has not been changed, although some enhancements have been made to disk and memory. Yet even with these enhancements, the systems fall short of many of the rich features found in the AViiON family. The bottom line is the AViiON family remains to be a much broader family with greater flexibility in system packaging for almost half the price!

When competing against Sequent's S/2000 family, point out to your customers the following benefits:

- Data General's 25MHz 88100 offers nearly double the performance over the Intel 25MHz 486 (29 MIPS versus 15 MIPS).
- AViiON offers substantially greater value for its TP performance (AViiON @ \$5,000/TPS versus Sequent's \$8,000/TPS).
- Data General supports substantially greater scalability via memory, peripherals and user connections.
- Data General supports both low-cost SCSI drives as well as leading-edge disk array technology, unlike Sequent which emphasizes high-cost SMD drives.

Since the S2000 family has just been announced and, for the time being, Sequent claims it will continue to support its older 386 Symmetry line, you may find yourself running up against the older Symmetry line. This will be particularly true in price-sensitive situations. When you find yourself up against the Symmetry line, point out to your customers:

- Even with Sequent's recent 40% price cut on Symmetry, AViiON systems continue to offer substantially better price/performance.
- On average, Sequent needs approximately 4-5 CPUs for every AViiON CPU.
- AViiON 4-CPU systems compares to a 30 CPU Symmetry.
- AViiON offers wider range of memory, disk and asynch connections.

Table 7.

	Data General Versus Sequent			
	DG 52X0	DG 62X0	S/2000 200/400	S2000/700
CPU	88100	88100	Intel 486	Intel 486
CLOCK	25MHz	25Mhz	25MHz	25MHz
MIPS	29-117	29-117	30-90,30-150	30-450+
AIM III	121-450	121-450	NA	NA
SMP	Yes	Yes	Yes	Yes
# CPUs	1-4	1-4	2-6,2-10	1-30
MEMORY	16-512MB	16-768MB	16-128	16-384MB
DISK MAX	15GB	113GB	12GB	87GB
SLOTS				
Number	10	10/20	5/7-25	12-48
Type	VME	VME	VME/Multibus	Multibus
MAX Asynchs	1020	1275	80/144	256+
BC Family*	Yes	Yes	Yes	Yes
DISK ARRAY	Yes	Yes	No	No
RAID Type	1-5	1-5	NA	NA
Dual Porting	Yes	Yes	NA	NA
ENTRY PRICE	\$35-106K	\$52-113K	\$63K/\$102K	\$205K
NOTE:				
+ = Sequent currently is only able to support 20 CPUs on the S/2000 700.				
* = Binary-compatible servers and workstations				

UNIX

Although Sequent has built its reputation as one of the leading suppliers of high-end, commercial-grade UNIX systems, Data General's new high-availability features now make for a compelling high-availability UNIX platform. Point out to your customers:

- DG/UX offers rich UNIX features such as fast file system, fast system reboot, communications controller on-line restart and auto dump to tape after system failure. Sequent does not support such features.
- DG/UX offers rich commercial UNIX features such as logical disk over physical disk, bad block remapping, critical data structure duplication on disks and large filesystems. Sequent's Dynix/ptx does not.
- DG/UX supports both C2 and B1 security levels. Sequent supports neither.

High Availability

Sequent cannot go unrecognized for the time and energy it has put to establish itself as one of the top suppliers of high-availability systems. However, in today's marketplace, many of the features that were once deemed as compelling differentiators, are no longer. More importantly, Sequent has not kept pace with the marketplace and can not claim any rights to supporting any leading-edge technology. Point out to your customers:

- DG/UX support disk mirroring as a standard feature and offers dual ported RAID level 5 disk arrays. Sequent does not support any disk array technology.
- High-availability features in DG/UX such as fast recovery file system, fast system reboot, communication controllers on-line restart, auto dump to tape after system failure and a resizeable unmounted file system.

Data General Competitive Strategy

- Data General offers a far more comprehensive set of solutions for enterprise-wide, multivendor distributed computing in business and office environments.
- AViiON systems provide support for more robust and flexible terminal servers. Sequent only supports 16-channel asynch line muxes.
- AViiON and DG/UX offers superior fault tolerant disk subsystems via disk array technology.
- AViiON systems offer practically double the asynch connection capability over Sequent.
- Data General provides a scalable open systems platform in both workstations and systems. Sequent has not gone beyond addressing anything but large DBMS engines. Sequent is a niche player.
- Data General's AViiON family offers leading edge technology in DG/UX and its disk arrays as well as excellent performance at practically half the cost of a Sequent system.
- Sequent is only a \$250 million dollar company and can not be all things to all people. It has limited resources particularly in service and support.

Pyramid High-end Strategy and Position

Pyramid has built its reputation around high-availability in the general-purpose commercial UNIX marketplace. The majority of its success has been with OLTP in markets such as RBOCs, financial services and the Federal government. Pyramid leverages its success around the following:

- Symmetric multiprocessing
- Robust commercial-grade UNIX features
- High-throughput and high-availability features
- Multivendor interoperability and networking

Although Pyramid has addressed some of the high-end, high-availability issues, it has not stabilized its hardware platform, causing migration problems for both installed and new customers. Pyramid is currently based on its own proprietary RISC implementation, however will be moving onto the MIPS architecture in the next three months. It has a number of pending issues in binary compatibility as well as with OSx, its UNIX-derivative operating system. This combined with supporting premium pricing, makes its high-end strategy less than effective. The high-end AViiON announcements magnify this point in a big way!

Competitive Position by High-end Issues

SYSTEMS

The introductions of the new high-end AViiON systems give Data General a substantial boost in performance and functionality when compared to Pyramid. The most exciting result is not only can AViiON compete with Pyramid's MIS family technically, but AViiON can go much further by offering customers far greater functionality, flexibility and growth paths at half the cost!

Point out to your customers:

- Data General's 25MHz 88100 offers nearly double the performance over the Intel 25MHz 486 (29 MIPS versus 15 MIPS).
- AViiON offers substantially greater value for its TP performance (AViiON @ \$5,000/TPS versus Pyramid's \$10,000/TPS)
- Data General supports substantially greater scalability via memory, peripherals and user connections.
- Data General offers a consistent binary standard, while Pyramid does not. Pyramid currently supports its own RISC implementations well as OEM'd MIPS systems.

Table 8.

	Data General Versus Pyramid			
	AV 52X0	AV 62X0	MIS-4(T)	MIS-12(T)
CPU	88100	88100	VLSI RISC	VLSI RISC
CLOCK	25MHz	25Mhz	N/A	N/A
MIPS	29-117	29-117	14-56	12-140*
AIM III	121-450	121-450	NA	84-550 +
SMP	Yes	Yes	Yes	Yes
# CPUs	1-4	1-4	1-4	1-12#
MEMORY	16-512MB	16-768MB	16-128(512MB)	16-256(512MB)
DISK MAX	15GB	113GB	12GB	70GB(40GB)
SLOTS				
Number	10	10/20	10-64	18-54
Type	VME	VME	VME/Multibus	VME/Multibus
MAX USERS	1020	1275	500	1000
BC Family**	Yes	Yes	No	No
DISK ARRAY	Yes	Yes	No	No
RAID Type	1-5	1-5	NA	NA
Dual Porting	Yes	Yes	NA	NA
ENTRY PRICE	\$35-106K	\$52-113K	\$200K/\$400K	\$300K/\$625K +
NOTE:				
* = This AIM number is representative of an 8-CPU configuration				
** = Binary-compatible Family				
# = Pyramid has yet to make 12 CPU systems available to the general market				

UNIX

Although Pyramid has built its reputation as one of the leading suppliers of high-end commercial-grade UNIX systems, Data General's new high availability features now make for a compelling high availability UNIX platform. Point out to your customers that DG/UX:

- Offers rich UNIX features such as fast file system, fast system reboot, communications controller on-line restart and auto dump to tape after system failure.
- Offers rich commercial UNIX features such as logical disk over physical disk, bad block remapping, critical data structure duplication on disks and large filesystems.
- Supports both C2 and B1 security levels. Pyramid supports neither.

High Availability

Pyramid, like Sequent, can not go unrecognized for the time and energy it has put into establishing itself as one of the top suppliers of high-availability systems. Although Pyramid has extended its hardware platforms with very high-level software, it still does not offer a stable hardware platform. The company's move to the MIPS architecture will likely cause some disruption to its ability to focus on extending its level of high availability features.

- DG/UX support disk mirroring as a standard feature and offers dual-ported RAID level 5 disk arrays. Pyramid does not support any disk array technology.
- Data General supports high-availability features in DG/UX such as fast recovery file system, fast system reboot, communication controllers on-line restart, auto dump to tape after system failure and a resizeable unmounted file system.

Data General Competitive Strategy

- Data General offers a far more comprehensive set of solutions for enterprise-wide, multivendor distributing computing in business and office environments.
- Data General offers consistent binary compatibility and scalability with the 88K architecture. Pyramid does not as it currently supports its own proprietary RISC architecture as well as OEM'd MIPS systems. Although Pyramid has announced it will be moving exclusively to the MIPS chip (R4000), its installed base is still faced with no single binary standard.
- AViiON systems provide support for more robust and flexible terminal servers.
- AViiON and DG/UX offers superior fault-tolerant disk subsystems via disk array technology. Pyramid only offers disk mirroring.
- Data General offers a higher degree of sophisticated commercial features in DG/UX. Pyramid does not offer a fast file system nor a fast system reboot.
- Data General supports leading edge disk array technology with fault-tolerant features such as hot repair, dual-port support, disk mirroring, and auto reboot.
- Data General's AViiON family offers leading-edge technology and performance for half the cost of a Pyramid system.

APPENDIX B

AViiON Family Product Highlights

Revision 1.0

March 1991

AViiON 3200

Introduction

An entry level single processor server and/or multi-user system based on the Motorola 88000 RISC Family Architecture, the AViiON 3200 provides a cost-effective entry point to a multiprocessing UNIX environment. Packaged in an attractive desktide tower cabinet, it provides large system capability that operates in an office environment.

Product Highlights

- Lowest cost entry point into the broad family of AViiON systems which provides an easy growth path as needs grow
- Customers considering high-end PC solutions have a cost-effective entry point into the multi-programming UNIX arena
- Balanced hardware/software system design maximizes application throughput, allowing more computing capability per amount spent
- Supported by DG/UX a commercial grade implementation of the UNIX standards, providing a highly reliable operating system environment
- Offers a wide range of application software and systems tools allowing the system to be used for many additional applications in the future
- VME I/O bus allows access to a wide range of industry standard devices to be used with the 3200
- Motorola 88000 RISC architecture provides a low-cost/high performance platform used by multiple vendors and provides for binary compatible interchange of applications among platforms

Logical Upgrade Paths

- In Chassis expansion via board swap to AViiON 4000 system to provide more I/O connectivity and memory capacity
- In Chassis expansion via board swap to AViiON 4020 system to provide dual processing, more I/O connectivity and memory capacity
- In Chassis expansion via board swap to AViiON 4100/4120 systems providing additional computer performance, dual processing, I/O connectivity and memory capacity
- Trade in program to AViiON 5200, AViiON 6200, AViiON 7000, and AViiON 8000 systems

AViiON 4000/4020

Introduction

The AViiON 4000/4020 is an economical server and/or multi-user UNIX system based on the Motorola 88000 RISC Family Architecture. Available in single- or dual-processor configurations and packaged in an attractive deskside tower cabinet, it provides large system capability that operates in an office environment.

Product Highlights

- Entry-level member of a broad family of AViiON systems provides easy growth path as needs grow
- Balanced hardware/software system design maximizes application throughput, allowing more computing capability per amount spent
- Supported by DG/UX, a commercial grade implementation of the UNIX standards, providing a highly reliable operating system environment
- Offers a wide range of application software and systems tools allowing the system to be used for many additional applications in the future
- 2 VME slots allow access to a wide range of industry standard devices used with the AV 4000
- Motorola 88000 RISC architecture provides a low cost/high performance platform and cross-vendor-compatible architecture
- VME-based asynch adapter allows up to 255 asynch connections

Logical Upgrade Paths

- In Chassis expansion to dual processor with the addition of a CPU daughter board
- In Chassis expansion to higher performance Motorola processors by board level exchange
- Trade-in program to AViiON 5200, AViiON 6200, AViiON 7000, and AViiON 8000 systems
- Users of the AViiON 3200 low-cost server can expand to the 4000/4020 by board-level exchange

APPENDIX C

AViiON Family Technical Specifications

**Revision 1.0
March 1991**

AViiON 3200

Central Processor

The Data General AViiON family of computer systems is based on the powerful Motorola 88000 Reduced Instruction Set Computing (RISC) processors. AViiON 3200 is a low-cost entry-level system using the 16MHz Motorola 88100 RISC Processor. This entry-level system is supported by DG/UX, Data General's powerful implementation of industry standard UNIX.

Performance

AIM Users: 73
MIPS: 19

Maximum Configurations

Main Memory: 16MB
Disk Storage: 1.36GB
I/O Controllers: 1 VME Slot
Communication Ports
 Synchronous: 3
 Asynchronous: 16
 ETHERNET: 2
Tape Drives
 150MB Cartridge: 2
 525MB Cartridge: 2
 Reel to reel: Not Available

Note: Other than memory, not all maximums can be obtained simultaneously.

Architecture

CPU: Motorola 16MHz 88100 with integral FPU and dual 88200 Cache Memory Management Units per processor

I/O system: SCSI Bus for disk and tape systems
VME for external interface
ETHERNET for LAN connection

Operating Environment

Temperature:	Operating: 10°C - 38°C 40°F - 100°F	Non-Operating/Storage: -40°C - 70°C -40°F - 158°F
Humidity:	Non-Condensing 20% - 80% RH	Non-Condensing 10% - 90% RH

Physical

Packaging: Deskside
Size: 24.75" high x 5.75" wide x 22" deep
Weight: System 60 lbs

Power

All AViiON power systems are designed for worldwide installation, see MAPS/PLUS white pages for details on power options.

AViiON 4000/4020

Central Processor

The Data General AViiON family of computer systems is based on the powerful Motorola 88000 Reduced Instruction Set Computing (RISC) processors. AViiON 4000 and 4020 Servers are implemented with the 16MHz Motorola 88100 RISC Processor. These entry-level servers are available in single- and dual-processor configurations and are supported by DG/UX, Data General's powerful implementation of industry-standard UNIX.

Performance

	4000	4020
AIM Users:	73	105
MIPS:	19	38

Maximum Configurations

Main Memory:	128MB
Disk Storage:	6 GB
I/O Controllers:	2 VME Slots

Communication Ports

Synchronous:	3
Asynchronous:	257
ETHERNET:	2

Tape Drives

150MB Cartridge:	2
525MB Cartridge:	2
Reel to reel:	1

Note: Other than memory, not all maximums can be obtained simultaneously.

Architecture

CPU:	Motorola 16MHz 88100 with integral FPU and dual 88200 Cache Memory Management Unit per processor
I/O system:	SCSI Bus for disk and tape systems VME for external interface ETHERNET for LAN connection

Operating Environment

Temperature:	Operating:	Non-Operating/Storage:
	10°C - 38°C 40°F - 100°F	-40°C - 70°C -40°F - 158°F
Humidity:	Non-Condensing	Non-Condensing
	20% - 80% RH	10% - 90% RH

Physical

Packaging:	Deskside
Size:	24.75" high x 5.75" wide x 22" deep
Weight:	System 60 lbs

Power

All AViiON power systems are designed for worldwide installation, see MAPS/PLUS white pages for details on power options.

AViiON 4100/4200

Central Processor

The Data General AViiON family of computer systems is based on the powerful Motorola 88000 Reduced Instruction Set Computing (RISC) processors. AViiON 4100 and 4120 Systems are implemented with the 20MHz Motorola 88100 RISC Processor. These entry-level systems are available in single- and dual-processor configurations and are supported by DG/UX, Data General's powerful implementation of industry-standard UNIX. These computers may be used in multi-user timesharing applications or as network servers, or a combination of these computing models.

Performance

	4100	4120
AIM Users:	84	115
MIPS:	23	46

Maximum Configurations

Main Memory:	128MB
Disk Storage:	6 GB
I/O Controllers:	2 VME Slots

Communication Ports

Synchronous:	3
Asynchronous:	257
ETHERNET:	2

Tape Drives

150MB Cartridge:	2
525MB Cartridge:	2
Reel to reel:	1

Note: Other than memory, not all maximums can be obtained simultaneously.

Architecture

CPU:	Motorola 20MHz 88100 with integral FPU and dual 88200 Cache Memory Management Unit per processor.
I/O system:	SCSI Bus for disk and tape systems VME for external interface ETHERNET for LAN connection

Operating Environment

Temperature:	Operating:	Non-Operating/Storage:
	10°C - 38°C 40°F - 100°F	-40°C - 70°C -40°F - 158°F
Humidity:	Non-Condensing	Non-Condensing
	20% - 80% RH	10% - 90% RH

Physical

Packaging:	Deskside
Size:	24.75" high x 5.75" wide x 22" deep
Weight:	System 60 lbs

Power

All AViiON power systems are designed for worldwide installation. These systems operate on very low power and utilize standard office outlets. See MAPS/PLUS white pages for details on power options.

AViiON 5200/5220/5240

Central Processor

The Data General AViiON family of computer systems is based on the powerful Motorola 88000 Reduced Instruction Set Computing (RISC) processors. AViiON 5200, 5220 and 5240 Systems are implemented with the 25MHz Motorola 88100 RISC Processor. These mid-range systems are available in single-, dual- and quad-processor configurations and are supported by DG/UX, Data General's powerful implementation of industry-standard UNIX. These computers may be used in multi-user timesharing applications or as network servers, or a combination of these computing models. The systems are packaged in an integrated free-standing cabinet and are designed for use in the office.

Performance

	Single	Dual	Quad
	5200	5220	5240
AIM Users:	121	218	450
MIPS:	29	59	117

Maximum Configurations

	Single	Dual	Quad
	5200	5220	5240
Main Memory:	528B	528MB	512MB
Disk Storage:	< ----- 15GB ----- >		
I/O Controllers:	9 VME Slots		
Communication Ports			
Synchronous:	< ----- 24 ----- >		
Asynchronous:	1020		
ETHERNET:	2		
Tape Drives			
150MB Cartridge:	4		
525MB Cartridge:	4		
Reel to reel:	4		

Note: Other than memory, not all maximums can be obtained simultaneously.

Architecture

CPU:	Motorola 25MHz 88100 RISC CPU with integral FPU and dual 88200 Cache/Memory Management Units per processor.
I/O system:	VME for external interface ETHERNET for LAN connection

Operating Environment

Temperature:	Operating:	Non-Operating/Storage:
	10°C - 38°C 50°F - 100°F	-40°C - 65°C -40°F - 149°F
Humidity:	Non-Condensing	Non-Condensing
	20% - 80% RH	10% - 90% RH

Physical

Packaging:	Integrated free-standing cabinet Size 24.75" High x 17.25" wide x 25.5" deep
Weight:	System 160 lbs

Power

All AViiON power systems are designed for worldwide installation. These systems operate on very low power and utilize standard office outlets. See MAPS/PLUS white pages for details on power options.

AViiON 6200/6220/6240

Central Processor

The Data General AViiON family of computer systems is based on the powerful Motorola 88000 Reduced Instruction Set Computing (RISC) processors. AViiON 6200, 6220 and 6240 Systems are implemented with the 25MHz Motorola 88100 RISC Processor. These high-end systems are available in single-, dual- and quad-processor configurations and are supported by DG/UX, Data General's powerful implementation of industry-standard UNIX. These computers may be used in multi-user timesharing applications or as network servers, or a combination of these computing models. The systems are packaged in a flexible racking system suitable for use in office or traditional computer room setting.

Performance

	Single 6200	Dual 6220	Quad 6240
AIM Users:	121	218	450
MIPS:	29	59	117

Maximum Configurations

	10 VME slots	20 VME slots	20 VME slots
Main Memory:	784MB	784MB	768MB
Disk Storage:	39GB	81GB	81GB
Communication Ports			
Synchronous:	24	48	48
Asynchronous:	1275	1275	1275
ETHERNET:	2	8	8
Tape Drives			
150MB Cartridge:	4	4	4
525MB Cartridge:	4	4	4
Reel to reel:	4		4

Note: Not all maximums can be obtained simultaneously.

Architecture

CPU:	Motorola 25MHz 88100 RISC CPU with integral FPU and dual 88200 Cache/Memory Management Units per processor.
I/O system:	VME for external interface ETHERNET for LAN connection

Operating Environment

Temperature:	Operating: 10°C - 38°C 50°F - 100°F	Non-Operating/Storage: -40°C - 65°C -40°F - 149°F
Humidity:	Non-Condensing 20% - 80% RH	Non-Condensing 10% - 90% RH

Physical

Packaging: Size:	Flexible rack mount system CPU system cabinet requires WxD, and is available in three heights x," y," z." System expansion cabinets with a footprint of WxD can be utilized to house additional disk and tape systems.
Weight:	Typical CPU System cabinet with disk - 450 lb.

Power

All AViiON power systems are designed for worldwide installation. See MAPS/PLUS white pages for details on power options.

AViiON 7000

Central Processor

The Data General AViiON family of computer systems is based on the powerful Motorola 88000 Reduced Instruction Set Computing (RISC) processors. The AViiON 7000 system incorporates four Motorola 25MHz 88100 RISC Processor system in office packaging in conjunction with the high-performance, high-reliability CSS2 stand-alone disk array subsystem. This configuration is complemented by DG/UX, Data General's powerful implementation of industry-standard UNIX which features high availability functionality. These computers may be used in multi-user timesharing applications, as network servers, or a combination of these computing models.

Performance

AIM Users: 450
MIPS: 117

Maximum Configurations

Main Memory: 512MB
Disk Storage: 11GB
I/O Controllers: 8 VME Slots
Communication Ports
 Synchronous: 24
 Asynchronous: 1020
 ETHERNET: 2
Tape Drives
 150MB Cartridge: 4
 525MB Cartridge: 4
 Reel to reel: 4

Note: Not all maximums can be obtained simultaneously.

Architecture

CPU: Motorola 25MHz 88100 RISC CPU with integral FPU and dual 88200 Cache/Memory Management Units per processor.
I/O system: VME for external interface
ETHERNET for LAN connection

Operating Environment

Temperature:	Operating: 10°C - 38°C 50°F - 100°F	Non-Operating/Storage: -40°C - 65°C -40°F - 149°F
Humidity:	Non-Condensing 20% - 80% RH	Non-Condensing 10% - 90% RH

Physical

Processor Packaging: Integrated free-standing cabinet
Size: 24.75" high x 17.25" wide x 25.5" deep
Weight: System 160 lbs
Disk Array Packaging: Free standing cabinet
Size: 8.75"x19"x24" inches
Weight: 34 lbs.

Power

All AViiON power systems are designed for worldwide installation. These systems operate on very low power and utilize standard office power. See MAPS/PLUS white pages for details on power options.

AViiON 8000

Central Processor

The Data General AViiON family of computer systems is based on the powerful Motorola 88000 Reduced Instruction Set Computing (RISC) processors. The AViiON 8000 System is implemented in a quad-CPU configuration using the 25MHz Motorola 88100 RISC Processor. The 8000 is packaged with the high-performance, high-reliability disk array subsystem. A UPS system is available for use in North America. The configuration is supported by DG/UX, Data General's powerful implementation of industry-standard UNIX. These computers may be used in multi-user timesharing applications or as network servers, or a combination of these computing models. The systems are packaged in a flexible racking system suitable for creation of large disk system configurations.

Performance

AIM Users: 450
MIPS: 117

Maximum Configurations

Main Memory: 768MB
Disk Storage: 60GB
Communication Ports
Synchronous: 48
Asynchronous: 1275
ETHERNET: 8
Tape Drives
150MB Cartridge: 4
525MB Cartridge: 4
Reel to reel: 4

Note: Not all maximums can be obtained simultaneously.

Architecture

CPU: Motorola 25MHz 88100 RISC CPU with integral FPU and dual 88200 Cache/Memory Management Units per processor.
I/O system: VME for external interface
ETHERNET for LAN connection

Operating Environment

Temperature:	Operating: 10°C - 38°C 50°F - 100°F	Non-Operating/Storage: -40°C - 65°C -40°F - 149°F
Humidity:	Non-Condensing 20% - 80% RH	Non-Condensing 10% - 90% RH

Physical

Packaging: Flexible rack mount system
Size: Dependant on cabinet used
The disk array is provided in a cabinet system that measures 60x32.9x31.8 inches

Power

All AViiON power systems are designed for worldwide installation. See MAPS/PLUS white pages for details on power options. However UPS installations must be developed on a country by country basis and are not supplied directly by Data General.

AViiON 4100/4120

Introduction

The AViiON 4100/4120 is a high performance version of the AViiON 4000/4020 systems, featuring a higher performance version of the Motorola 88000 central processor. Targeted for use as a system server and/or multi-user system, the AV 4100/4120 is available in single- or dual-processor configurations. Packed in a convenient desk-side tower cabinet, it provides large system capability that works in an office environment.

Product Highlights

- Part of the entry-level systems of the broad family of AViiON systems which provides an easy growth path as customer needs grow
- Balanced hardware/software system design maximizes application throughput, allowing more computing capability per amount spent
- Supported by DG/UX, a commercial grade implementation of the UNIX standards, providing a highly reliable operating system environment
- A wide range of application software and systems tools allows the system to be used for many additional applications in the future
- VME I/O bus allows access to a wide range of industry-standard devices used with the 4000
- Motorola 88000 RISC architecture provides a low-cost high-performance platform and a cross-vendor-compatible architecture

Logical Upgrade Paths

- In Chassis expansion to dual processor
- AViiON 3200 and 4000/4020 owners can expand via board swap to the 4100/4120 and preserve system footprint and external peripheral systems
- Trade-in program to AViiON 5200, AViiON 6200, AViiON 7000, and AViiON 8000 systems

AViiON 5200/5220

Introduction

The AViiON 5200 systems offer single-, dual-, and quad-processor configurations of the 25MHz Motorola 88100 RISC Processor. 5200s are packaged in attractive and compact office packaging. Highly configurable, and supporting up to 1020 asynchronous users, these systems can fulfill the computing needs of a wide range of organizations.

Product Highlights

- Large-scale processing capability in an office package that does not require special facilities or a computer room
- Balanced hardware/software design maximizes application throughput, allowing more computing capability per amount spent
- Supported by DG/UX, a commercial grade implementation of the UNIX standards, providing a highly reliable operating system environment
- Wide range of application software and systems tools allows the system to be used for many additional applications in the future
- 10 slot VME I/O chassis allows access to a wide range of industry-standard devices to be used with the 5200
- Motorola 88000 RISC architecture provides a low-cost/high-performance platform

Logical Upgrade Paths

- Trade-in program available for users of AViiON 3200, 4000/4010, and 4100/4120 systems
- In chassis expansion via board swap from single to dual or quad processor
- Trade-in program available for 5200 users desiring to expand to 6200 and 8000 series

AViiON 6200/6220/6240

Introduction

The AViiON 6200 systems offer single-, dual-, and quad-processor configurations of the 25MHz Motorola 88100 RISC Processor. 6200s are packaged in flexible rackmount packaging that allows for creation of large disk system configurations. Highly configurable, supporting up to 1275 asynchronous users, these systems can fulfill the computing needs of a wide range of organizations.

Product Highlights

- Large-scale processing capability in flexible rackmount package that allows for creation of very large system configurations
- Balanced hardware/software design maximizes application throughput, allowing more computing capability per amount spent
- Supported by DG/UX, a commercial grade implementation of the UNIX standards, providing a highly reliable operating system environment
- Wide range of application software and systems tools allows the system to be used for many additional applications in the future
- 10 or 20 slot VME I/O bus allows access to a wide range of industry-standard devices to be used with the 6200
- Motorola 88000 RISC architecture provides a low-cost/high-performance platform

Logical Upgrade Paths

- Trade-in program available for users of AViiON 3200, 4000/4010, 4100/4120 and 5200 systems
- In chassis expansion via board swap from single to dual or quad processor
- 6240 system can be field expanded to an AViiON 8000 system by addition of the Disk Array Subsystem

AViiON 7000

Introduction

The AViiON 7000 system offers a quad-processor configuration of the 25MHz Motorola 88100 RISC Processor in combination with the highly available CSS2 Disk Array Subsystem. The 7000 and the disk array are packaged in attractive and compact office packaging. Highly configurable, supporting up to 1020 asynchronous users, these systems can fulfill the computing needs of a wide range of organizations.

Product Highlights

- Large-scale processing capability in an office package that does not require special facilities or a computer room
- Disk array offers high-reliability and high-availability functionality for large or critical data base applications
- Balanced hardware/software design maximizes application throughput, allowing more computing capability per amount spent
- Supported by DG/UX, a commercial-grade implementation of the UNIX standards, providing a highly reliable operating system environment
- A wide range of application software and systems tools allows the system to be used for many additional applications in the future
- 10 slot VME I/O bus allows access to a wide range of industry-standard devices to be used with the 5200
- Motorola 88000 RISC architecture provides a low-cost/high-performance platform

Logical Upgrade Paths

- Trade-in program available for users of AViiON 3200, 4000/4010, and 4100/4120 systems
- Trade-in program available for 7000 users desiring to expand to the 8000 series

AViiON 8000

Introduction

The AViiON 8000 system offers a quad-processor configuration of the 25MHz Motorola 88100 RISC Processor in combination with the high-performance HADA subsystem. The 8000 and the disk array are packaged in a flexible rackmount system that permits the creation of large-system configurations. Highly configurable, supporting up to 1275 asynchronous users, these systems can fulfill the server and/or multi-programming computing needs of a wide range of organizations.

Product Highlights

- Large-scale processing capability in a flexible rackmount package that allows the creation of large system configurations
- Disk array offers high-reliability and high-availability functionality for large or critical data base applications
- Balanced hardware/software design maximizes application throughput, allowing more computing capability per dollar spent
- Supported by DG/UX, a commercial grade implementation of the V.4 standard UNIX, providing a highly reliable operating system environment
- A wide range of application software and systems tools allows the system to be used for many additional applications in the future
- 10 or 20 slot VME I/O bus allows access to a wide range of industry-standard devices to be used with the 5200
- Motorola 88000 RISC architecture provides a low-cost/high-performance platform

Logical Upgrade Paths

- Trade-in program available for users of AViiON 3200, 4000/4010, 4100/4120, 5200 and 7000 systems
- AViiON 6200 users can expand to the 8000 series by adding additional processor and the disk array