NIAKWA
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Special Edition

Digital Update

PRODUCT ANNOUNCEMENT

BASIC-2C FOR DIGITAL VAX AND MICRO VAX ANNOUNCED

Niakwa is pleased to announce the availability of Basic-2C for the VAX and Micro VAX families of 32 bit computers from Digital Equipment Corporation.

The VAX implementation of Basic-2C makes it possible for Basic-2C users to operate their programs on machines supporting from one user to hundreds of users.

DIGITAL PERSPECTIVE

A member of the Fortune 100, Digital is one of the largest and best established computer makers in the world. In fact, Digital is the largest company anywhere focused purely on the design and manufacture of computer systems. Digital has over 90,000 employees, had sales of more than 7 billion in fiscal 1986, and an average growth rate of over 20% annually.

Digital has two primary product lines: the PDP 11 and the VAX. The relationship between the VAX and PDP11 is similar to the relationship between the 2200 and VS from Wang Laboratories. The VAX is Digital's "VS".

The PDP11 line was first introduced in 1970 and set the standard for 16 bit computers. Digital has kept the PDP11 line current with repackaging, new disk and back-up devices, and the addition of new operating systems such as Unix. Digital has implemented a bridge strategy that allows programs originally written for the PDP line to operate off the newer, more powerful, VAX systems.

VAX/VMS is the multiuser, multifunction operating system that provides a rich environment for engineering, scientific, commercial, instructional, and systems applications. It includes compatible utilities, languages, programmer tools, data base products, and networking and communication software.

MicroVAX 2000

The MicroVAX 2000 is the newest and lowest cost member of the VAX family. It is a general-purpose 32 bit system that provides up to 6 MB of CPU memory in a configuration so compact that it can sit on a table or shelf. Currently, it supports 71 MB full height Winchester disk drives, and 42 MB half height disk drives. The MicroVAX 2000 supports up to four users. It is primarily distinguished from the MicroVAX II in that it incorporates a business design.

MicroVAX II

Digital's MicroVAX II is a 32 bit system that was one of the first supermicrocomputers to use VLSI technology. The MicroVAX II is available in three CPU/peripheral cabinets. The BA23 pedestal cabinet and BA123 caster mounted enclosure will fit comfortably under a table. The higher capacity H9642 is also caster mounted and will fit comfortably next to a desk or into a corner. All MicroVAX II cabinets use the same CPU. The primary difference being the number and capacity of the supporting devices.

The MicroVAX II has a typical range of 8 to 40 users, with a maximum of 64 users. We predict that the MicroVAX II will be the most commonly used VAX configuration for Basic-2C software.

The VAX line

Digital has one 32-bit architecture -VAX- and one operating system -VMS- for its family of compatible processors. Users can move from one system to another without modifying their software.

No matter what your need, The VAX 8000 series offers an economical solution. The VAX 8200 delivers big-system features in a small package. The VAX 8300 provides versatile performance for compute-intensive applications. The VAX 8500 offers cost-effective midrange performance. The VAX 8650 expands the performance the VAX 8600, Digitals general purpose system, by up to 44 percent. And the VAX 8800 is the highest-performance VAX ever offered.

DIGITAL DISTRIBUTION METHODS

Digital uses numerous channels to distribute their products. The primary channels are:

OEM - Digital OEM's usually have contracts direct with Digital and use DEC equipment to integrate with their own equipment, such as process control systems that control heating and air conditioning in commercial buildings.

DIRECT SALES FORCE - It has been Digital's goal for some time to have its direct sales force concentrate on large user accounts.In 1987 Digital made this their policy. Digitals end-user sales force can only sell to large end-user accounts, usually Fortune 600 and larger.

DISTRIBUTION - With Digital's direct sales force restricted to large accounts, where will the typical small business buy its Digital hardware? ...Distribution. Digital is changing its Distribution channel, which has traditionally sold terminals, printers and upgrades to fill the gap. A handfull of Distributors, who have a national presence, will be allowed to sell Micro VAX II and low-end VAX machines to resellers and end-users. These Distributors will be expected to inventory product, ship product to end-users, and provide pre- and post-sale support to their resellers. This is a new and evolving program for Digital. There will be considerable changes and fallout before it settles into the Digital culture.

VARS Digital still contracts directly with traditional value added resellers. To become a Digital VAR there are requirements that one would expect from a major computer manufacturer, such as: a detailed application form that includes a marketing plan, a line of credit, minimum hardware commitment with the possibility of chargebacks for missed milestones, a well-defined vertical market solution, etc.

Digital does an excellent job of policing these distribution channels and keeps the channel conflict to a minimum. Digital is also very serious about preventing the dumping of its products into the marketplace. Severe penalties are imposed upon companies that violate the rules.

DIGITAL COMPILER AND RUNTIME PACKAGE AVAILABILITY

The Basic-2C Compiler/Interpreter (ReleaseII) for the Digital MicroVAX and VAX is now available.

DIGITAL MULTI-USER RUNTIME PACKAGE INFORMATION

Basic-2C RunTime Packages will be available in different versions designed specifically to meet your users' needs. Each version will support a different number of simultaneous users. They are: single-user, 1-4 users, 1-8 users, 1-16 users, 1-32 users, 1-64 users, and a 64+ user version.

Niakwa will offer a 100% upgrade credit for upgrades from one multi-user RunTime Package to a RunTime Package supporting additional users.

HOW TO LICENSE BASIC-2C FOR THE DIGITAL FAMILY

Basic-2C Development Packages for the Digital MicroVAX and VAX family are licensed in the same manner as any other available version of Basic-2C (i.e., Altos, Wang, IBM, Novell).

DIGITAL EDUCATION AND TRAINING

Digital offers formal systems training to all Digital customers. Their Educational Services group develops convenient self-paced instruction packages and coordinates a worldwide staff of instructors who teach regularly scheduled courses so that you can learn by using your new Digital equipment, at your convenience, at your speed. Digital's curriculum of hardware and software courses spans introductory concepts to technical details. These can be tailored to your requirements, and even presented at your place of business. Contact your local Digital office for details.

CONFIGURATION REQUIREMENTS FOR BASIC-2C

1. CPU requirements:

Basic-2C will operate on the following VAX models under VMS:

Microvax II, VAX 11/730, 11/750, 11/780 VAX 8200, 8250, 8300, 8350, 8500, 8530, 8600, 8650, 8700, 8800

2. Operating System Requirements:

For VAX models, VMS version 4.4 or higher is required. For the Microvax II, MicroVMS 4.4 or higher is required. Note that VMS and MicroVMS are functionally identical.

3. Memory requirements:

VMS utilizes virtual memory. That is, the dynamic allocation and release of physical memory is based on demand. When demand exceeds physical memory, a sufficient amount of the current contents of physical memory are 'paged' to disk to make room for the new contents. Consequently, the question of just how much memory is required to run Basic-2C can not be answered using the same criteria as were used for operating systems which utilize a permanent memory allocation scheme (such as MS-DOS) or a permanent until swapped allocation scheme (such as Xenix).

In essence, there is no minimum memory requirement for Basic-2C on VMS. The RunTime will execute regardless of the amount of physical memory present on the system. Furthermore, the extended partition, if specified, will always be generated.

The real issue in determining memory is system performance. On the most basic level, systems with less physical memory will require more 'paging', thereby reducing overall performance. Systems with more physical memory will reduce 'paging' thereby improving system performance. Furthermore, VMS provides extensive performance management techniques which can be used to maximize the efficiency of the operating system.

Given the nature of the VMS operating system, we can not provide specific 'per user' memory recommendations. However, we can provide some guidelines:

A. The amount of virtual memory required by the RunTime program is relatively small (approximately 340k).

B. Physical memory may be allocated on a per process basis for use as a disk cache. In many cases, this will significantly improve disk performance. Use of physical memory for disk caching should be considered when determining memory requirements. Further details on disk caching are provide in the Basic-2C Supplement for VMS.

C. If performance degrades on a system due to excessive paging, adding more memory may improve performance substantially. However, before investing in additional memory, system performance should be analyzed. It is possible that adjustments to VMS parameters may improve performance without the hardware expenditure.

4. Disk:

There are no special requirements for disk type or capacity for use of Basic-2C on Digital. The Basic-2C Development and RunTime Package software will require approximately 800k of disk space.

5. Diskette:

No diskette drive is required for Basic-2C installation or operation (refer to the section on Media for details on media availability of Basic-2C).

'Raw' access to diskettes is not supported by Basic-2C. Diskimage files on diskettes may be used with restrictions, but the recommended media for backup is tape or tape cartridge. Refer to the Basic-2C Supplement for VMS for details on access to diskettes.

VMS does not support any diskette format which is compatible with other Basic-2C machines or with the Wang 2200. Therefore Basic-2C programs and data must be ported to Digital by other methods. Refer to the Porting section for further details.

6. Terminals:

VT100 and VT200 series terminals are supported by Basic-2C. VT200 series terminals are recommended for applications which make extensive use of special function keys. The

VT200 series includes the VT220, VT240, and VT241. Note that the enhanced graphics capabilities of the VT240 are not supported by Basic-2C - only VT220 features are utilized. The VT241 is a color monitor. Basic-2C attributes (bright, blink, underline, and reverse video) will display as unique background/foreground color combinations on this terminal.

VT100 and VT220 compatible terminals and terminal emulation products may be used. However, it is the responsibility of the licensee to ensure that all features of the terminal required by his application are present. Note that terminal emulation products will likely have keyboard and screen character set differences from the standard terminal.

7. Printers:

Both system printers and terminal printers (attached to VT200 series terminals) may be used with Basic-2C.

MEDIA AVAILABILITY FOR BASIC-2C SOFTWARE:

Both the Basic-2C Development Package and RunTime Package for Digital will be available on the following media:

RX50 5-1/4" Diskettes
TK50 Tape Cartridge
Nine track 1600 B.P.I. Tape

A media fee is applicable for both TK50 cartridges and nine track tapes. Refer to your revised order form for fees. Please be sure to specify media type when placing orders.

PORTING TO DIGITAL:

VMS does not support any diskette format compatible with other machines supported by Basic-2C or with the Wang 2200. Therefore some other form of porting which can transfer 8 bit binary data will be required to port Basic-2C programs and data to Digital. Whatever form of porting is used, there are some standard requirements for diskimage files under VMS. Unlike DOS and Xenix which support only one file organization, VMS supports three file organizations. In addition, VMS requires that record length and type be defined when the file is created. The specific requirements for Basic-2C diskimage files are:

File organization	sequential
Record length	256 byte fixed length records

If the porting method you use can not produce files with these characteristics, it may be necessary to convert the file to conform to the above stated requirements. As a convenience, Niakwa will include with the Development Package a program named CVT.EXE which can be used to convert a file from 512 byte fixed length records (a common format on VMS) to 256 byte fixed length records. Refer to the Basic-2C Supplement for VMS for details.

Porting to Digital can be accomplished by serial communications or nine-track tape.

1. Serial Communications:

From the Wang 2200:

Direct serial file transfer between a Wang 2200 and Digital should be possible. However, we have found no existing software package which will do this.

From PCs:

There are several software packages which will transfer files from IBM or compatible PCs to Digital. To date, we have evaluated one such product. The product is:

Reflection 2 by:
Walker, Richer & Quinn, Inc.
2825 Eastlake Ave. E.
Seattle, WA 98102
(206)324-0350

Cost - $199 (subject to change - contact Walker, Richer & Quinn for current pricing}

The Reflection 2 product worked well in transferring diskimage files from an IBM compatible to VMS. In our testing we used an XT clone with a 25 pin serial port to transfer diskimages to a MicroVax II. We connected the PC to the MicroVax using a standard Digital terminal cable.

The product is capable of transferring diskimage files in the format required by Basic-2C so that no conversion is required after the transfer. To properly transfer diskimage files with Reflection 2, be sure to specify the following parameters on the file transfer screen:

Method -	B (for binary)
Host file name -	follow the file name with the /F switch to generate fixed length records.
Host record size	- 256

The Reflection 2 product also provides a terminal emulation feature which allows an IBM or compatible PC to be used as a VT220 terminal. This also worked well with one exception. Basic-2C uses downloadable fonts to generate the full Basic-2C character set on the VT220. However this does not work with a terminal emulation product such as Reflection 2. Therefore, the full Basic-2C character set is not available in this environment. For the most part, this will affect only those applications which utilize graphics type characters in the range HEX(80) and above.

In addition to the IBM version described above, Walker, Richer and Quinn also offer a Wang PC version of their file transfer software. This product is called Reflection I for the Wang PC and differs from the Reflection 2 product only in price. The cost of this product is $399, but Walker, Richer, and Quinn sales staff have advised us that they will discount the product if you tell them that it is intended for use only on a Wang PC. Apparently the product is bundled with graphics products for use on Hewlett Packard systems.

2. Nine track tape:

VMS does support access to non-VMS nine track tapes. Therefore data and programs can be transferred from the Wang 2200 or from PCs to VMS using tapes. However, Niakwa has not tested this method and can make no specific recommendations regarding implementation of a tape transfer.

NEW FEATURES:

The Digital release of Basic-2C incorporates several significant enhancements to the Basic-2C language. Note that these enhancements will be present on future releases of all other hardware versions of Basic-2C. Please refer to appendix F of the Basic-2C Supplement for VMS for complete technical documentation of these new features. Here is a summary of the new features:

1. Diskimage files larger than 16 MB are now supported. This has been accomplished by use of three byte addresses within the Basic-2C diskimage index (previously unused bytes 7 and 8 of each index entry are used).
2. $PACK/$UNPACK have been extended to allow for storage of signed or unsigned binary numbers using the field format specification.
3. LINPUT and INPUT have been extended to optionally accept characters above HEX(80). This enhancement is primarily intended for non-English users.
4. Printer translation capabilities are now supported via a $PRINTER system variable. The translation capabilities are similar in concept to the screen translation capabilities in prior versions.
5. 132 column mode can now be accessed on terminals which have this capability (VT100 for example).
6. Output from PRINT functions of the HELP and ERROR processor can now be directed to a specified Basic-2C print address.
7. Alternate character fonts supplied on various terminals can now be accessed under Basic-2C by specification of the desired font via a $OPTIONS byte. This allows access to non-English characters on terminals where these are not part of the standard font. For details on this feature, please refer to section 7.4.1 of the Basic-2C Supplement for VMS.

DIGITAL BENCHMARKS

Overview

Niakwa has attempted, for several months, to obtain access to the hardware required to perform our full 16-terminal benchmark series on Digital equipment. Unfortunately, this has proven to be impossible. Therefore, we are restricted to presenting benchmarks going up to 8 terminals only, and only on a MicroVAX II. Higher-end VAX models, from the VAX 8200 to the VAX 8800 will offer increasingly better CPU performance and I/O throughput. However, these benchmarks should still provide a realistic guideline as to the performance that can be expected from Basic-2C applications running on a Digital system.

The systems used for this evaluation were:

Digital MicroVAX II CPU	Wang 2200 LVP CPU
5 MB main memory	512k main memory
71 MB Winchester - model RD53	80 MB Phoenix
configured for 8 terminals	configured for 8 terminals
terminals running at 9600 baud	terminals running at 19200 baud

Four tests were devised for the evaluation, and each was executed on both CPUs with an increasing number of active terminals (from 1,2,4, and 8 on Digital; and from 1,2,4, and 8 on Wang). The tests used were:

1. **CPU INTENSIVE** -- This test involved iterating various constructs of the Basic-2C language to test in-core operations of the CPU only. The following operations were performed:

--FOR/TO LOOP	200,000 iterations
--IF/THEN	100,000 iterations
--Scalar ADD	100,000 iterations
--CONVERT	10,000 iterations
--Alpha LET	50,000 iterations
--MAT COPY	30,000 iterations

2. **SCREEN INTENSIVE** -- This test focused on screen speed and screen I/O system performance. 10,000 iterations of the PRINT AT instruction were performed.

3. **DISK INTENSIVE** -- This test focused on disk and I/O system performance. 500 iterations of random DATALOAD BA's were performed within a 10,000 sector diskimage.

4. **OVERALL MIX** -- This test combined all of the above tests to illustrate overall system performance. A general accounting system was used which read a disk file of customer records, sorted them according to operator supplied parameters, and printed the results to the screen for the entire customer file (TOM SPEED I).

Our general interpretation and opinion of the findings, together with detailed timings of each test, follow.

GENERAL INTERPRETATION

TEST 1 - In the CPU intensive test, the MicroVAX II was determined to be approximately 7 times faster than Wang. As shown, only a limited number of Basic-2C instructions were tested. However, in our view, it would be reasonable to expect a performance improvement for CPU intensive operations of about 3-4 times the Wang 2200 with a typical Basic-2C program instruction mix (note: for CPU intensive instructions only).

TEST 2 - In the screen intensive test, results are slightly slower than the Wang 2200. This is due to the fact that the screens were running at 9600 baud, as opposed to 19200 baud, and the fact that the 2200 supports character compression for repetitive characters sent to the screen.

TEST 3 - In the disk intensive test, the MicroVAX II slightly outperformed the 2200. It should be noted that, for purposes of this test, RMS Blocks was set at 1, and RMS Buffers was set at 2. This optimized performance for random disk reads. Note that disk writes would be somewhat slower, since buffering is not utilized for disk writes. We would expect disk performance to be better on other disk models. The RD53 is one of the slower disks offered by Digital.

TEST 4 - Results of this test are the most important indicator of Digital performance. This test mixes all aspects of system performance, CPU speed, SCREEN speed, and DISK I/O speed (not quite so random) in a typical processing environment.

Specifically, we found that the Digital MicroVAX II performed this test with a 30-50% improvement over the Wang 2200. Note that we set RMS Blocks = 2 and RMS Buffers = 20 for this test. This was found to be optimal for our configuration for a mix of random and sequential disk I/O.

Please refer to the Basic-2C Supplement for Digital for further details on the effect of RMS Buffers and Blocks on disk performance.

COMMENT ON OTHER DIGITAL CPUs AND DISK UNITS

The MicroVAX II and RD53 disk combination is the poorest performer in the Digital VAX line (with the exception of the older 11/700 series machines). Higher-end VAX models from the VAX 8200 to the VAX 8800 will offer increasingly better CPU performance and I/O throughput. The RD53 drive is a relatively slow drive with an average access time of 35 ms. The Digital RA81 offers significantly faster access time as do many third party disk drives.

	Digital			Wang 2200			Factor
	Avg	Low	High	Avg	Low	High	x2200
1. CPU Intensive							
One Terminal							
FOR/TO	8.76	8.76	8.76	59	59	59	6.74
IF/THEN	11.99	11.99	11.99	80	80	80	6.67
ADD	10.25	10.25	10.25	75	75	75	7.32
CONVERT	6.71	6.71	6.71	8	8	8	1.19
ALPHA LET	9.19	9.19	9.19	42	42	42	4.57
MAT COPY	5.96	5.96	5.96	40	40	40	6.71
Two Terminals							
FOR/TO	17.36	17.09	17.70	118	117	119	6.80
IF/THEN	23.9	23.99	24.00	160	160	160	6.67
ADD	20.48	20.45	20.64	150	150	150	7.32
CONVERT	13.48	13.31	13.52	17	17	17	1.26
ALPHA LET	18.38	18.38	18.40	84	84	84	4.57
MAT COPY	12.12	11.76	12.37	80	80	80	6.60

	Digital			Wang 2200			Factor
	Avg	Low	High	Avg	Low	High	x2200
Four Terminals							
FOR/TO	34.39	33.73	35.85	240	239	240	6.98
IF/THEN	47.98	47.98	48.00	320	320	320	6.67
ADD	41.47	40.00	48.00	300	300	300	7.23
CONVERT	26.96	26.52	27.13	32	32	32	1.19
ALPHA LET	36.80	36.79	36.96	169	169	169	4.59
MAT COPY	24.49	23.32	25.71	160	160	160	6.53
Eight Terminals							
FOR/TO	68.43	67.35	70.22	480	480	480	7.01
IF/THEN	95.81	94.59	95.99	640	640	640	6.68
ADD	82.17	79.41	84.78	600	600	600	7.30
CONVERT	53.76	50.54	57.72	64	64	64	1.19
ALPHA LET	73.65	73.18	74.78	340	340	340	4.62
MAT COPY	49.21	46.13	52.18	320	320	320	6.50
2. Screen Intensive							
One terminal	61	61	61	49	49	49	.80
Two terminals	68	61	73	69	69	69	1.01
Four	137	61	229	133.5	133	134	.97
Eight	280	68	486	198	133	260	.71
3. Random Disk I/O							
One terminal	18	18	18	16	16	16	.87
Two terminals	27	27	27	31	31	31	1.13
Four	51	49	52	62	62	63	1.21
Eight	94	91	97	122.5	122	123	1.30
4.Overall Mix							
One terminal	22	22	22	22	22	22	1.00
Two terminals	25	24	26	33.5	33	34	1.33
Four	41	39	43	64	63	65	1.54
Eight	84	74	87	108	105	112	1.29