VITA's "TECHNOLOGY ON VME" Series

Technology on VME: Processor Cards

Ray Alderman, Executive Director, VITA

Now that we're getting good VME market research on the demand side from VDC (Venture Development Corp.) and ETP (Electronic Trends Publications), it's time for VITA to concentrate on the supply-side information. In 1997, we will focus on "Technology on VME" as our theme, and this is the first in a series of articles we will write concerning product and technology trends.

While there are many segments of the VME market where leading-edge technology is being applied, none garners more attention than the processor segment. The following graphs and tables come from a distillation of data in the *VMEbus Products Directory* which we have now put into database format here at VITA. This information does not include DSP boards. They will be analyzed separately in a later issue.

Today, there are 370 different VME processor cards available from 61 different companies (see figure 1). Thirty-nine percent of those CPU cards support 64-bit data transfers, and 61% support only 16- or 32-bit data.

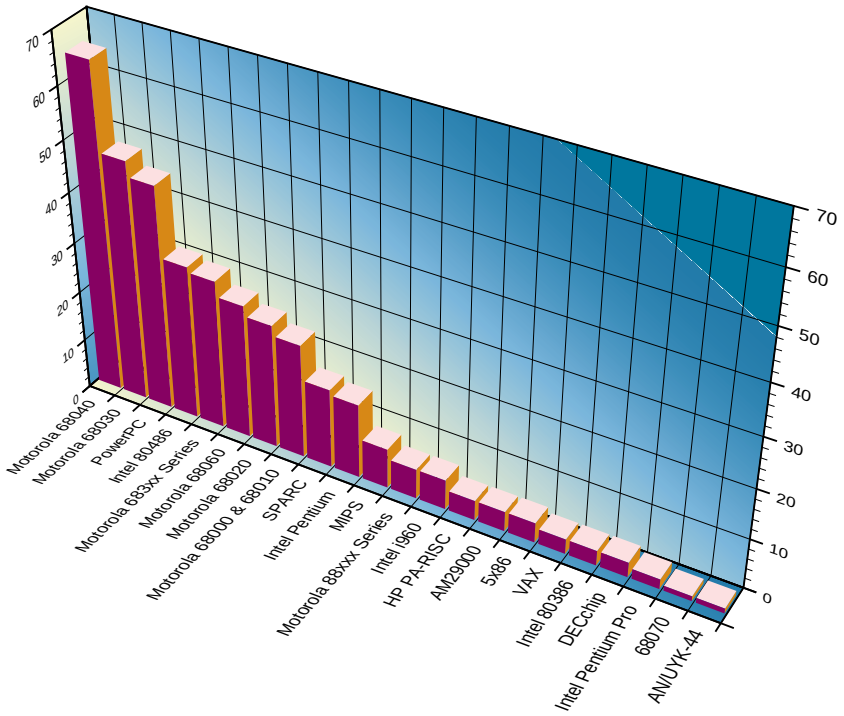
Motorola Processors

Motorola processors account for 269 or 73% of the total CPU cards. The flagship processor technology is the 68040 CPU, showing a total of 65 boards, or 18% of the total, available from 34 different companies. The 68030 is the second most-available CPU technology with 48 cards (13%) from 28 companies. Coming in third, in a very short period of time, is the Power PC CPU technology with 45 cards (12%) available from 17 companies. It's interesting to note that PPC processor and the 80486 have surpassed the availability of sixth-place 68060 CPU cards with 27 boards (7%) available from 18 different companies.

In the Motorola CPU catagory, 219 processor cards (59%) are based on the 68XXX CPU architecture. As the 68K has increased in performance and capability since its original release in 1979, each new-generation chip has remained code-

Microprocessor Models found on CPU Boards

(distribution among 370 'models' of VMEbus CPU boards)

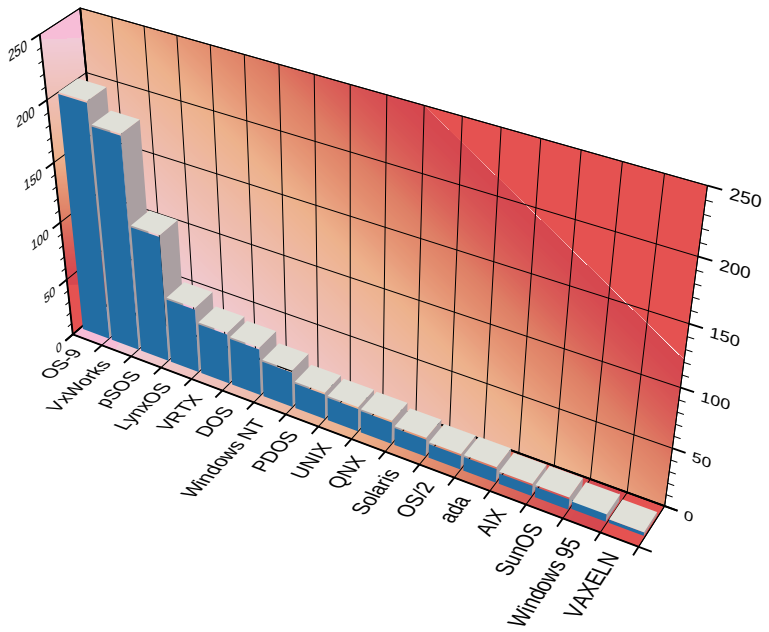


CPU Make	# of models	percent of models
Motorola 68040	65	18%
Motorola 68030	48	13%
PowerPC	45	12%
Intel 80486	31	8%
Motorola 683xx Series	30	8%
Motorola 68060	27	7%
Motorola 68020	25	7%
Motorola 68000 & 68010	23	6%
SPARC	16	4%
Intel Pentium	15	4%
MIPS	8	2%
Motorola 88xxx Series	6	2%
Intel i960	6	2%
HP PA-RISC	4	1%
AM29000	4	1%
5x86	4	1%
VAX	3	1%
Intel 80386	3	1%
DECchip	3	1%
Intel Pentium Pro	2	1%
68070	1	less than 1%
AN/UYK-44	1	less than 1%

Figure 1.

Operating Software on CPU Boards

(distribution among 370 'models' of VMEbus CPU boards)



Operating Software	# of models supported	percent of models supported
OS-9	201	54%
VxWorks	183	49%
pSOS	109	29%
LynxOS	56	15%
VRTX	44	12%
DOS	41	11%
Windows NT	31	8%
PDOS	22	6%
UNIX	20	5%
QNX	19	5%
Solaris	15	4%
OS/2	12	3%
Ada	12	3%
AIX	9	2%
SunOS	9	2%
Windows 95	8	2%
VAXELN	3	1%

Figure 2.

compatible with the previous generation devices. Users have been able to re-use much of their application software, their development tools, and the drivers over the past 15 years. Secondly, any next-generation 68K-based CPU card could use all the legacy VME I/O cards without hardware or software modification. Of all the reasons for the success and longevity of the 68K and VME in the embedded markets, these are the most significant.

The 683XX series of integrated microcontrollers ranks fifth in overall availability due to the popularity of the 68302 and 68360 devices. These processor chips integrate serial ports, counter-timers, and other functions inside the 68K core, but still remain code-compatible with the original 68K. Thirty CPU cards are available from 16 different companies, making up 8% of the total processor cards. Finally, the 88000 CPU comes in last in the Motorola catagory with six cards available from two suppliers.

Intel Processors

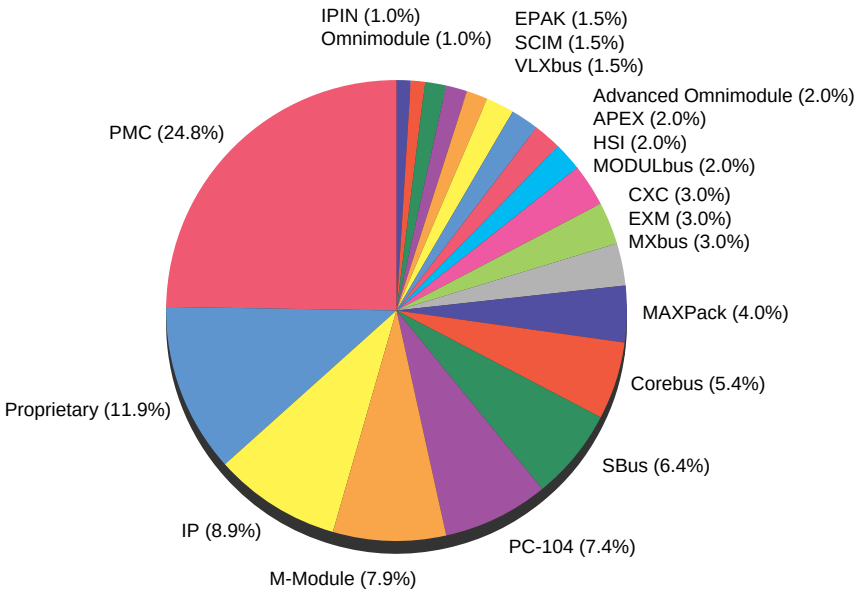
The Intel processor family is the second most-popular CPU architecture on VME today. There are 51 Intel-based CPU cards, and they constitute 14% of the total. This CPU group is lead by the 80486 with 31 cards (8%) from 13 companies, the Pentium with 15 cards (5%) from 12 companies, and the i960 with 6 cards (2%) from 4 companies. It's interesting to see that there are more 5X86 boards available (4) than Pentium Pro boards (2) at this point. And, there are only three 80386 boards from two companies available today. The 68030 and the 80386 were released about the same time in the mid 1980s, yet there are 48 CPU cards available for the '030 compared to three remaining for the '386.

SPARC Processors

The third most-popular CPU family on VME is the SPARC architecture. There are 16 SPARC CPU cards available today (4%) from four different manufacturers. While the bulk of the 68K-based boards are used as embedded controllers in most

Mezzanine Cards on CPU Boards

(distribution among 210 'models' of VMEbus CPU boards having mezzanine support)



Mezzanine Type	# of CPU boards	% of boards
PMC	50	24.8%
Proprietary	24	11.9%
IP	18	8.9%
M-Module	16	7.9%
PC-104	15	7.4%
SBus	13	6.4%
Corebus	11	5.4%
MAXPack	8	4%
CXC	6	3%
EXM	6	3%
MXbus	6	3%
Advanced Omnimodule	4	2%
APEX	4	2%
HSI	4	2%
MODULbus	4	2%
EPAK	3	1.5%
SCIM	3	1.5%
VLXbus	3	1.5%
IPIN	2	1%
Omnimodule	2	1%

Figure 3.

applications, virtually all SPARC boards are used in Unix systems.

The Remaining Technologies

MIPS comes in next with eight CPU cards (2%) built by three different manufacturers. HP-PA and AMD29000 tie for the next most-available CPU families with four cards each. HP-PA has one manufacturer and the AMD29K has one. DEC Vax and DEC Alpha cards finish the VME CPU catagory with three cards each.

Operating Systems

Of the 17 total operating systems running on VME processor cards, OS-9 is the most available (see figure 2). There are 201 VME CPU cards (54%) that run this OS. The popularity of OS-9 is probably based on it being a 68K-only operating system, and it was one of the first kernels available for this processor family in the early 1980's.

Second in availability is VxWorks, ported to 183 different CPU cards, or 49% of the total. VxWorks leveraged the Unix software development environment, the defacto operating system for software engineering. Third is pSOS, available on 109 different CPU cards or 29% of the total. Lynx OS (56 ports or 15%) and VRTX (44 ports or 12%) finish out the top real-time kernels available on VME processor cards.

DOS is available on 41 different processor cards, Windows NT runs on 31, Windows 95 runs on 8 different CPU cards, and OS2 is available on 12 different processor cards. Unix ports are available for 20 different VME boards, Solaris on 15, AIX on 9 , and SunOS on 9 different cards.

The remainder of the available operating systems were PDOS (22 ports), QNX (19 ports), Ada (12 ports), and VAXeln (3 ports). The average number of operating systems supported per board is 2.15, but this is skewed by the fact that some cards only support one OS while others support three or four different operating systems.

There are about as many full operating systems (like DOS, Windows, Unix, etc) supported on VME CPU cards now as there are real-time kernels (OS-9, VxWorks, pSOS, etc). This indicates that the VME processor board market might be equally divided between system sales and board sales, according to the software numbers in figure 3. It might be interest-

ing to compare this software availability to the demand-side data from VDC as it relates to system sales versus board sales.

Mezzanines

Today, 57% of all VME processor cards support some type of mezzanine bus (see figure 3). According to the *VMEbus Product Directory* information, 21 different mezzanine buses are available on VME CPU cards. The number-one supported mezzanine bus is PMC (PCI Mezzanine Cards), available on 50 different boards, or 22% of the total processor cards. Second are proprietary mezzanine interfaces with 24 CPU cards (10%) sporting these interfaces. Third is IndustryPacks, supported by 18 different CPU cards or 8% of the total. Fourth is M-Modules with 16 CPUs or 7%, followed by PC-104 which is available on 15 different CPU cards (6%).

Sbus on 13 cards (6%) and Corebus on 11 cards (5%) round out the top seven available mezzanine architectures. It's obvious from looking at mezzanine availability on VME processor cards that many manufacturers use them for differentiation.

From the data shown in the graph, however, it looks like the VMEbus industry is consolidating around PMC for high-end processors and IPs for the low end of the performance spectrum. The remaining entries are just monuments to the mezzanine wars that took place four years ago. The top seven mezzanine buses account for 72% of the mezzanines available on VME processor cards. But, the youngest in the pack, the PMC cards are three times larger in support than any of the previous market entries, except proprietary mezzanines. This is also an indication that companies are abandoning older mezzanine buses when they move to Power PC, Pentium, MIPS, and Alpha on their next processor card designs.

Conclusions

The information in this article will be published on the VITA www pages and updated periodically. Then, we can all see the trends in CPU technology, software availability, and mezzanine usage by manufacturers. While this information is illuminating, keep in mind that it only looks at the *supply* side of the equation. To be truly useful, it must be compared to the *demand* side data supplied to the market by VDC and ETP. VITA will provide this information to both companies and work with them to supply VITA members with an integrated perspective in the near future.