VAX-11/780 vs. Fairchild 9440

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| Architektūra | VAX-11 | Fairchild 9440 |
| Elementary base | CPU cabinet and power supplies  2 MB of ECC MOS memory  RX01 floppy disk console subsystem  PDP-11/03 console microprocessor  H9652 UNIBUS expansion cabinet  VAX/VMS license and warranty or ULTRIX-32 user license for up to 32 users  Magnetic tape units |  |
| Physical characteristics | The processor is contained in a cabinet of 153.0 x 181.1(118.1) cm size.  Weight: 782.1 kg  Height: 15.7 cm  Width: 186 cm  Depth: 76.2 cm  AC power consumption: 6500W /10 kVA |  |
| Type of architecture | CISC, register-based, memory-addressed |  |
| zero-address, ... ? | Multi-address |  |
| Registers, types | 16 32-bit registers that can be used for temporary storage, as accumulators, index registers, and base registers.  General registers: R0-R11  Index registers:  R12 – Argument Pointer (AP)  R13 – Frame Pointer (FP)  R14 – Stack Pointer (SP)  Program Counter:  R15 – PC | 8 16-bit on-chip registers  General registers:  Accumulators (AC0-AC3)  Special registers:  Scratch register  Bus register  Instruction register  Program counter  Internal data flows between the various registers via 4-bit-wide data paths.  AC2 and AC3 are used as index registers.  AC3 serves as the subroutine linkage register as well. |
| Flags | I  V  N  Z  C |  |
| Data width | 32 bits | 16 bits |
| Memory layout | “The right side of the unit contains the memory controller and memory modules, two option panel spaces for mounting adapters, the memory power supply, and the RX01 subsystem.”  “The memory management hardware translates a virtual address to a physical address under OS control.”  “Dynamic MOS RAM modules |  |
| Address space | Virtual address space of 4 billion bytes |  |
| Amount of memory | Main memory: 16 MB (32 MB)  Virtual address capacity: 4 GB  Capacity: 32 MB max. (256-KB chip) | 32 768 16-bit words |
| Virtual memory support |  |  |
| ISA | VAX native instruction set is an extension of the PDP-11 instruction set. It can be grouped into classes based on their functions and uses. |  |
| Number of instructions | 304 | 50 basic instructions for a total of 2192 different instructions |
| Classes of instructions | * Arithmetic and Logical Data Types * Special kinds of data * Basic program flow * Special operating system functions * High-level language constructs * Addressing modes |  |
| Instruction format | “integral decimal, character string, floating-point instructions  integer, logical and bit field instructions” |  |
| Instruction examples | Add  Compare  Branch | JMP  JSR  ISZ  DSZ  LDA  STA  ALU:  COM  NEG  MOV  INC  ADC  SUB  ADD  AND |
| Instructions similar/different? |  |  |
| Addressing modes | 9 modes:   * Register, * Register deferred, Autoincrement, * Autoincrement deferred, * Autodecrement, * Byte, word, and longword displacement, * Byte, word, and longword displacement deferred, * Indexed, * Literal | 8 modes |
| Mode similarity/difference? |  |  |
| I/O capabilities | UNIBUS adapter, MASSBUS, CI Bus, DDI Bus, console terminal  LSI-11 mmicrocomputer  RX01 floppy-disk drive | 64 directly addressable devices, each with 3 bidirectional I/O ports |
| Interrupt support | Priority interrupt levels: 32 | Priority interrupt handling: up to 16 levels |
| Interrupt support similar/different? |  |  |
| Data types | integer,  floating point,  Character strings |  |
| Fixed point/floating point support | Floating point |  |
| Integer form (sign-magn., 2’s compl., 1’s compl.) |  |  |
| Other exotic data types | Packed decimal |  |
| System speed | Data transfers up to 13.3 MB per second |  |
| Clock frequency |  |  |
| Clock cycles per instruction | Cycle time: 500 ns per 128-bit read | 4 machine cycles to complete a 16-bit instruction |
| Instruction rates |  |  |
| Which is faster? |  |  |
| Cache memory usage | Used for reducing processor’s effective memory access time |  |
| How much cache memory? | 8 KB bipolar cache memory with parity |  |
| Application areas | Various |  |
| Written software | VMS operating system, ULTRIX-32 operating system |  |
| Software availability | VAX/VMS is a legacy OS and no longer used today. Successor is OpenVMS. |  |
| Compilers/programming tools | Native assembly language VAX MACRO |  |
| Software libraries | VMS system libraries:  VMS Run-Time Library (RTL)  VMS I/O Libraries  VMS System Services (SSS) |  |
| Emulators |  |  |

**VAX-11 additional notes**:

It is a multi-address machine

Supports virtual memory and segmentation

**Fairchild 9440**

16-bit microprocessor

Transistor-transistor logic (TTL) system