PRISM Systems Overview

DECwest Engineering, November 1986

Agenda

- **Why PRISM?**
- **PRISM Architecture**
- **Competition**
- **Hardware Overview (Jewel, Crystal, Emerald)**
- **Software Overview (VMS Compatibility, User Interfaces, P.ULTRIX)**
- **Product Positioning**
- **Applications Computing Environment**
- **SDT Status and Products**
- **2nd Wave Products**
- **Software Status**
- **Schedule**

Quote from InformationWEEK 11/10

"Olsen sees no limitation for some time to come in the VAX architecture, but cautioned that 'we don't care if it's RISC, or parallel processing or whatever—if it plays VMS software, it's a VAX, and we have the freedom to make sweeping changes behind that.' "

Why PRISM?—Competitive Threat

- 12% of of the sales that were lost in FY85 went to RISC/Vector vendors (e.g., Ridge, Pyramid, Elxsi, Convex, Alliant). This percentage is expected to be worse in FY86. (Source: Joel Berman—Long Range Sales Planning)

- "It is clear that a new class of machines has come into it's own and has at least a chance to become the next new opportunity in the computer industry" (Dataquest, Introduction to Minisupercomputers)

Why PRISM?

- **Competitive threat**

- **Emergence of the minisupercomputer market**

- **Performance**

- **Price/Performance**

- **Evolving software and hardware technologies**

New Architecture

- **Architecture Team**

- **Corporate Wide Effort**

- **New Architecture gives opportunity for:**

  - **Improved performance and price/performance**
  - **New capabilities/functionality**
  - **Contemporary software technology**

- **VAX compatibility major goal**

PRISM Architecture Overview

- **Simplified Instruction Set**

- **Parallel Architecture**

- **Scalar and Vector processing**

- **Symmetric Multiprocessing**

- **32-bit Architecture (future: 64-bit)**

- **32-bit virtual address space (future: 64-bit)**

- **45-bit physical address space**

- **VAX compatible memory addressing**

- **VAX compatible data types**

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Major Competitors

- **IBM—Summit, 43xx and 9370 follow-ons**
- **Convex follow-ons**
- **Alliant follow-ons**
- **SCS**
- **Others (HP, Prime, Amdahl, DG, Vitesse,...)**

Why PRISM Wins

- **Over IBM:**
  - **Better absolute performance, price/performance**
  - **VAX compatibility and networking**
- **Over "hot-box" vendors:**
  - **Better absolute performance and equal or better price/performance**
  - **VAX compatibility, networking, service, sales and support**

Jewel Overview

- **General**

    PRISM Architecture

    Air-cooled (impingement) ECL Logic

    Single-processor

    Optional Vector Unit

    14 ns Cycle Time

    Up to 256 Mbytes of Memory

    Standard BI Peripherals

    Kernel System Cost $59K (With Vector Unit - $70K)

    FRS Date March 1989

- **Performance**

    30 x 780 Scalar Single Precision (LINPACK)

    115 x 780 Vector Double Precision (LINPACK)

    570 Mbytes Memory Bandwidth

    32 Mbytes Usable I/O Bandwidth (54.4 Mbytes Theoretical)

Crystal Overview

- **General**

  PRISM Architecture

  Air-cooled (impingement) ECL Logic

  Symmetric Multiprocessor

  – 1-4 Scalar Units

  – 0-4 Vector Units

  14 ns Cycle Time

  Up to 1 GByte of Memory

  Standard BI Peripherals

  Kernel System Cost $82K (With Vector Unit - $94K)

  FRS Date ~~██~~ *Sept* 1989

- **Performance**

  30-100 x 780 Scalar Single Precision (LINPACK)

  115-350 x 780 Vector Double Precision (LINPACK)

  2 Gbytes Memory Bandwidth

  64 Mbytes Usable I/O Bandwidth (108.8 Mbytes

  Theoretical)

10/24/86

PRISM System Software

- **High Performance, contemporary general purpose operating system**

- **Multi-threading and Parallelism for decomposition**

- **Supports vector operations**

- **Symmetric Multiprocessing (1-32 processors)**

- **P.VMS and P.ULTRIX user interfaces**

- **VAX and ULTRIX compatibility**

- **Portable to future architectures**

- **Support state-of-the-art compilers (across both interfaces)**

- **Pillar is the new system implementation language (portability, maintainability)**

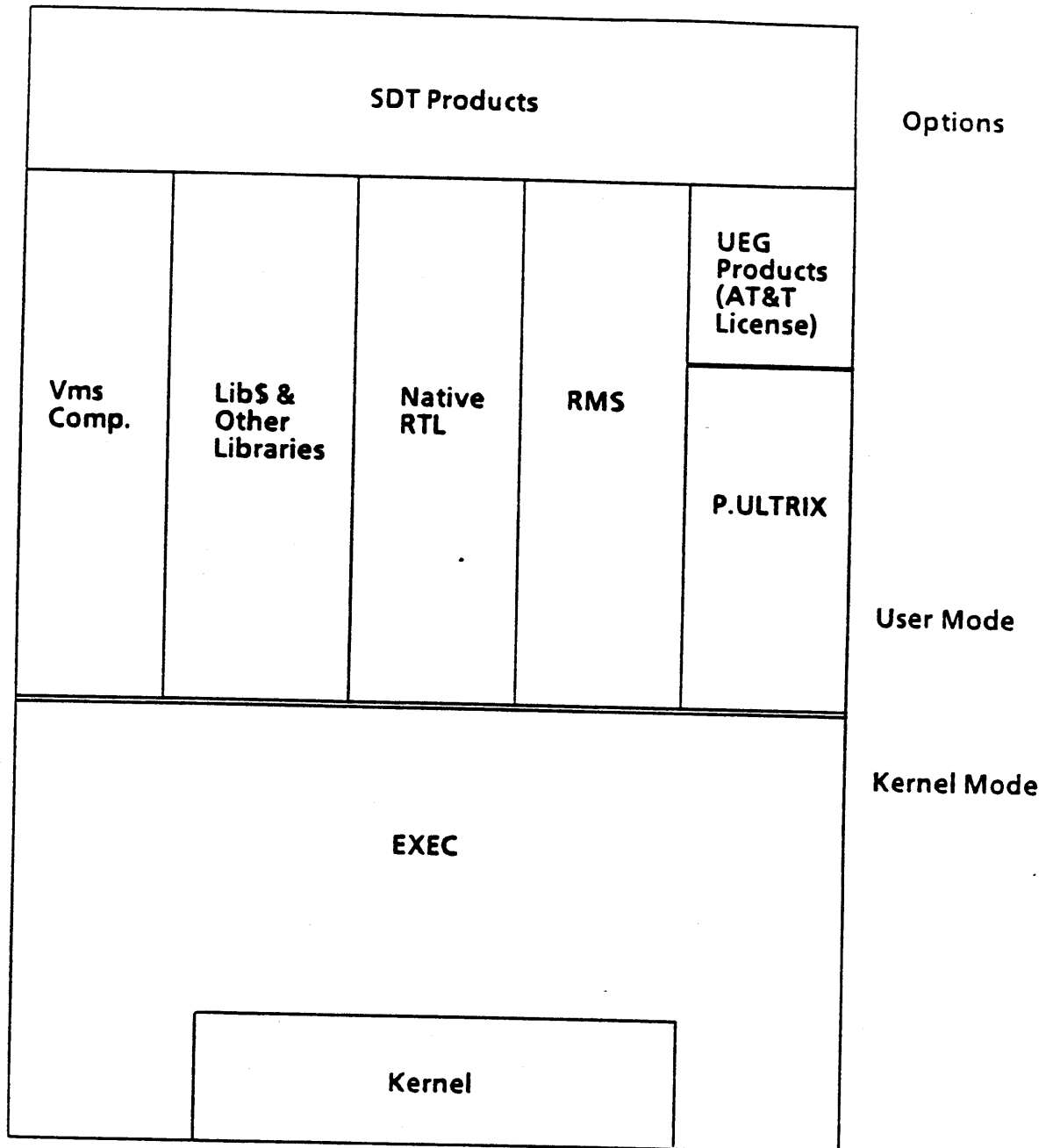- **Disk caching and striping**

VMS Compatibility

- **System Services via compatibility layer**

- **File system (ODS-extended)**

- **Command Language (DCL)**

- **DECnet and TCP/IP**

- **"Clustering" via Workgroups**

- **Languages, RTL, Math Library, debugger and layered products**

Caveats

- **VMS data structure dependent command procedures will need editing, e.g., Lexical Functions that return job information**

- **Level of compatibility for cluster support is being defined— at the very least it will contain shared file access. Workgroups is the current concept for the "next generation of clusters".**

- **Not all VMS System Services can be perfectly emulated—different memory management and process structure**

- **P.VMS Device Drivers are not compatible with VMS Device Drivers**

User Interfaces

P.VMS and P.ULTRIX

SDT Products					Options

| Vms Comp. | Lib$ & Other Libraries | Native RTL | RMS | UEG Products (AT&T License) | User Mode |
| | | | | P.ULTRIX | |

| EXEC | Kernel Mode |
| Kernel | |

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UNIX Strategy

(Application Environment)

- Executive support (EXEC, Fork, Byte Stream I/O)
- IEEE 1003 (POSIX)
- Unencumbered programming interface
- Full functionality target is ULTRIX
- Encumbered set of standard ULTRIX utilities
- C compiler and RTL
- TCP/IP networks
- Compilers and layered products
- Market goal: Ability to run 3rd party applications and user programs

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High End Task Force

- **Representatives from MSB and HPS**

- **Joint non-overlapping product positioning/forecast for:**
    - **Argonaut**
    - **Aquarius/Aridus**
    - **Crystal/Jewel**

- **Goals**
    - **Market opportunity (commercial and technical)**
    - **Digital's market share**
    - **Product positioning and market share**
    - **VAX—PRISM migration**
    - **Forecast for each product**

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Crystal/Jewel's % of Digital's Market Share

Year	Price Band	Commercial %	Tech (Price/Perf) %	Tech GP (Broad Range SW) %
1989	$500K-$1M	—	80%*	—
	$1M-$2M	—	80%	—
1993	$500K-$1M	8%	82%	8%
	$1M-$2M	9%	82%	9%
1995	$500K-$1M	16%	84%	16%
	$1M-$2M	17%	84%	17%

* i.e., For systems in the $500K to $1M price band and in the 1989 Technical (Price/Performance, MFLOP) Market, Crystal and Jewel will capture 80% of Digital's market share. Aquarius and Argonaut will capture 10% each.

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PRISM Systems Market Focus

- 1990—100% Scientific/Technical

- 1995—75% Scientific/Technical
- —25% Commercial

PRISM Systems's % of New System Sales ($)

Year	Percent
1989	16%
1991	20%
1993	30%
1995	42%
1996	50%

Availability of application software, layered software products and tools for the various markets is critical to this forecast

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Unit Forecast

Processor	Nov 86 Units
JEWEL	5,080
CRYSTAL	
. Uniprocessor	100
. Dual	960
. Three	30
. Quad	240
Emerald	13,385
TOTAL	19,795

The forecast for Crystal and Jewel is a preliminary Phase 1 cut based on the High End Task Force study. The Emerald Phase 0 forecast is based on their November Business Plan.

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PRISM Applications Computing Environment

- **Vector**

- **Scalar**

- **Mixed: Vector and Scalar**

Vector Applications

- **Signal Processing Analysis**

  - **Seismic Analysis**

  - **Weapons Research**

  - **Related Applications**

    . **Solids Modeling**

    . **Magnetic Resonance**

    . **Computer Aided Tomography**

    . **Animation**

    . **Remote Sensing**

Vector Applications (Cont.)

● **Computational Fluid Dynamics**

    — **Related Applications**

       . **Reservoir Simulation**

       . **Meteorology**

       . **Oceanography**

● **Finite Element Analysis**

Scalar and Multiprocessing Applications

- **Computational Chemistry and Monte Carlo Simulation**

  - **Related Applications**
    - **Material Design**

- **Electrical Simulation**

  - **Related Applications**
    - **IC/PCB Layout**
    - **Design Rule Checking**

Vector/Scalar Applications

- **Software Development**

- **Education**

- **Government**

    - **NASA**
    - **Energy**
    - **Defense**

- **Econometrics**

SDT PRISM Strategy*

- **Provide all the Language, Tool, Graphic, Display and Database products for the PRISM operating systems**

- **Provide most robust set of layered products for the technical market at FRS**

- **Grow the layered product offering so that the market for prism can expand**

- **Provide layered products which help PRISM systems achieve market goals by supporting vectorization and parallelism**

- **Provide an integrated tool environment on PRISM systems**

*From Susan Azibert's slides

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FRS Products

- **Vectorizing Fortran**
- **Pascal**
- **C**
- **Bliss (will not be sold)**
- **Pillar (bundled)**
- **RTL, Math Library**
- **LSE, ▓▓▓, ▓▓▓, PCA, TPU, Multi-threaded Debugger**
- **Under evaluation for FRS: Ada, GKS, CMS, MMS**

Goal: All other layered products that make sense will be available two years after FRS

PRISM Products

First Wave Products PRISM products are aimed at the Technical/Scientific Price/Performance Market.

However, 40% of Digital's technical sites use commercial products.

PRISM will play an increasingly important role in Commercial and Technical General Purpose Markets.

But we need the correct products to get there.

We also need your help in defining what these products are.

Preliminary Cut At 2nd Wave PRISM Products

- **ADA** *
- **Graphic Products** *
- **Database Products** *
- **Commercial Products which are used in the technical market**
- **Other Compilers**
- **Tools Products**
- **Real-Time Products**
- **AI Products**
- **Communication Products**
- **Office Products**
- **4GL Products**
- **OLTP**
- **Next generation of products—What new products will be coming out in the future?**

* **Needed at FRS, but not committed by Engineering**

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Software Status

- **Phase 0 closed May 1986**

- **Phase 1 June 1987**

- **P.TBD Working Design Document published (2nd Revision due February)**

- **Specs, project plans currently being written**

- **SDT Phase 0 Sept. 1986 (still open)**

- **Emulators and software support packages shipped last summer**

- **Workgroup definition in progress with VMS**

- **DECwest/SDT Review Committee**

PRISM SYSTEMS SCHEDULE