High Performance Computing in DoD

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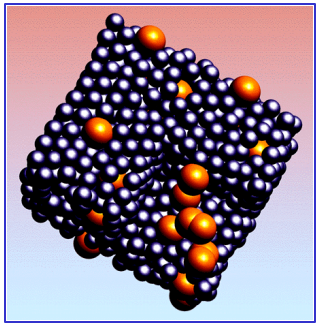
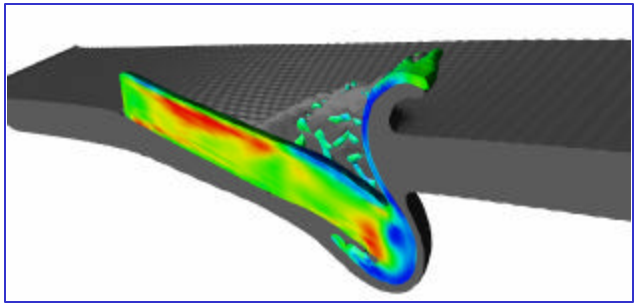
Office of the Deputy Under Secretary of Defense (Science & Technology)

Enabling Capability: Software, HPC and M&S



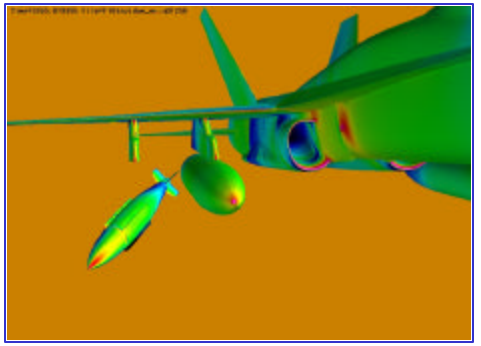
Basic Research

Simulating High-Energy Density Rocket Fuels



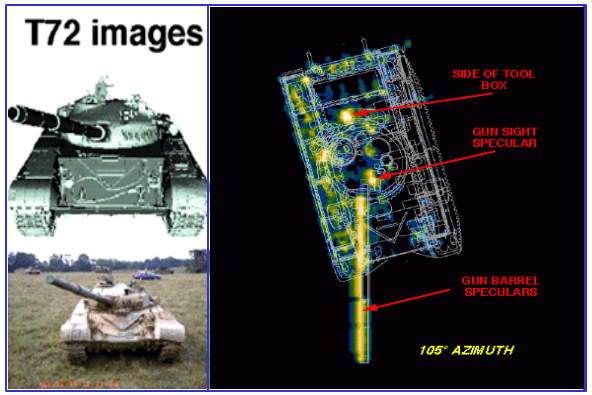
Advanced Technology

Armor and Projectile Design



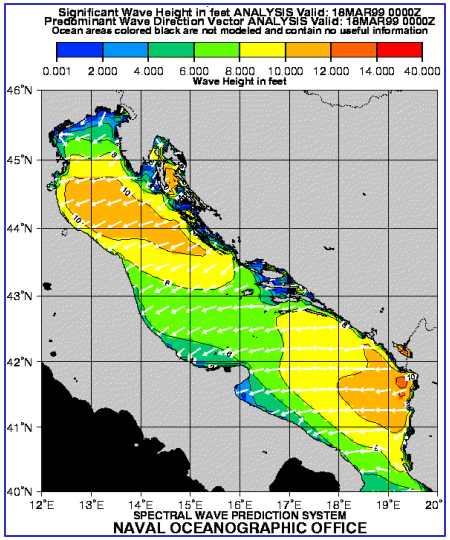
Developmental T&E

Support of Aircraft-Store Compatibility and Weapons Integration



Intelligence

Radar Cross-Sections Predictions



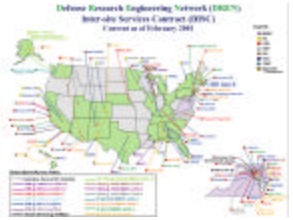
Operations

Ocean/wave forecasting

High Performance Computing (HPC) Modernization Program

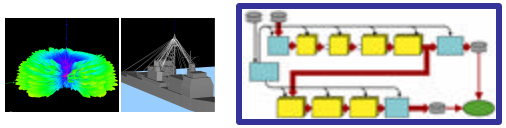
- **Program Initiatives**
  - **HPC Centers**
    - Major Shared Resource Centers
    - Distributed Centers
  - **Networking**
    - Defense Research and Engineering Network
  - **Software Development and Support**
    - Programming Environment and Training
    - Common HPC Software Support

HPC Systems



Networking

Domain Expertise

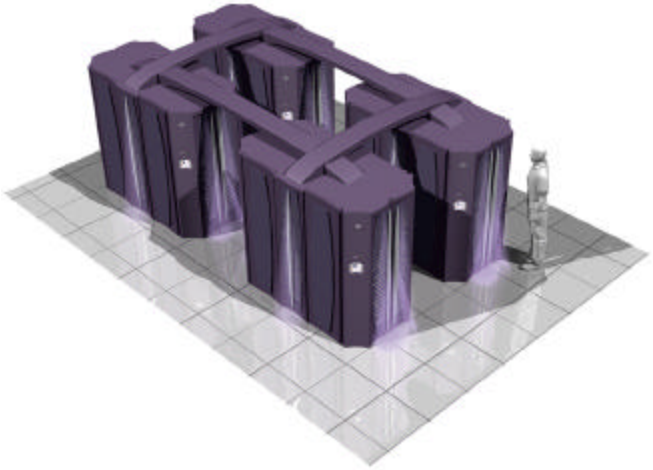


Software Development

Today's DoD HPC Modernization Program provides world class services to DoD

DDR&E/NSA Agreement for Cray SV-2 R&D

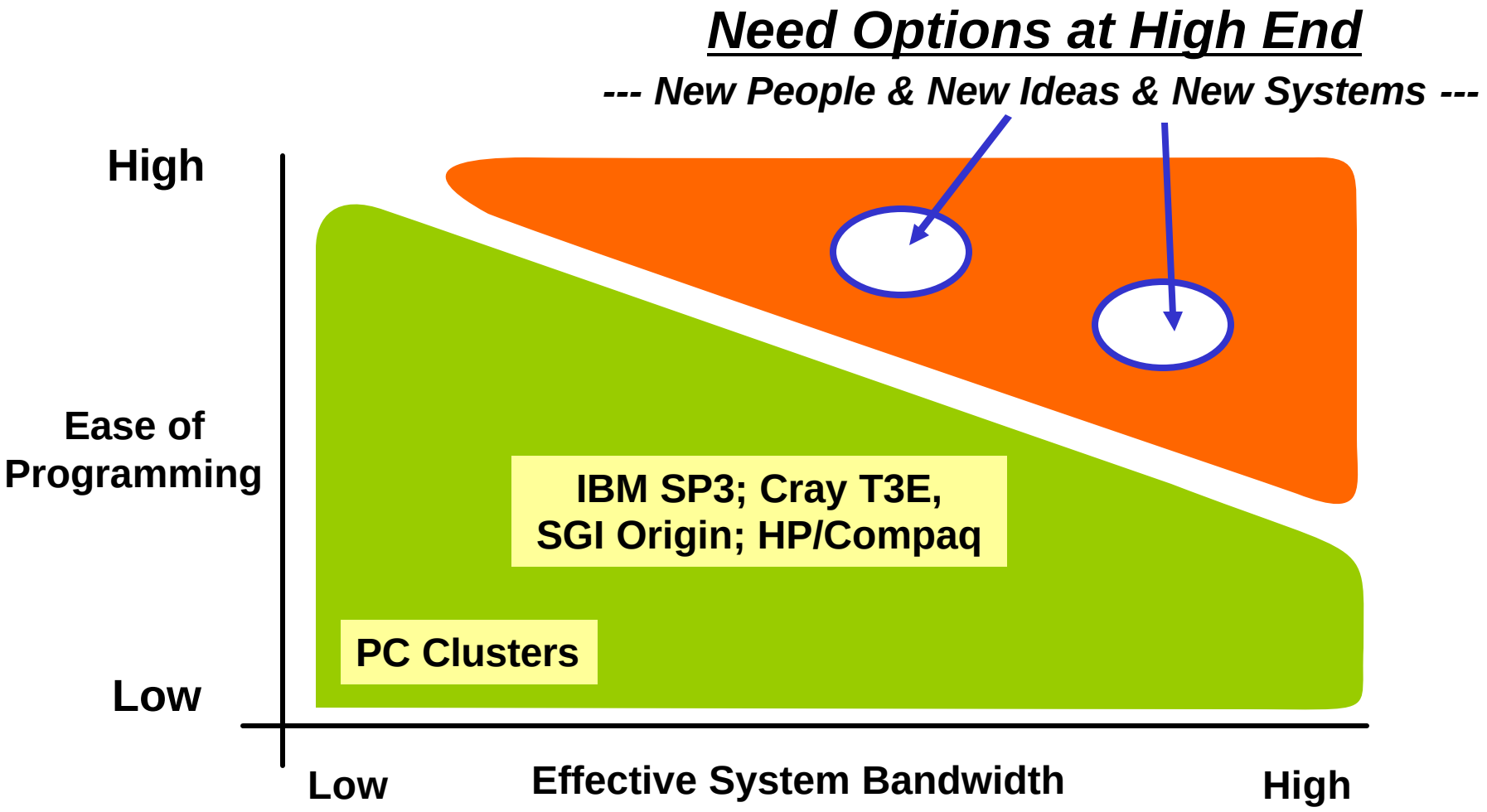
- **3Q/1998 –** DDR&E and NSA co-fund the development of the SV-2
- **3Q/2002 –** Delivery of 5 early-production systems



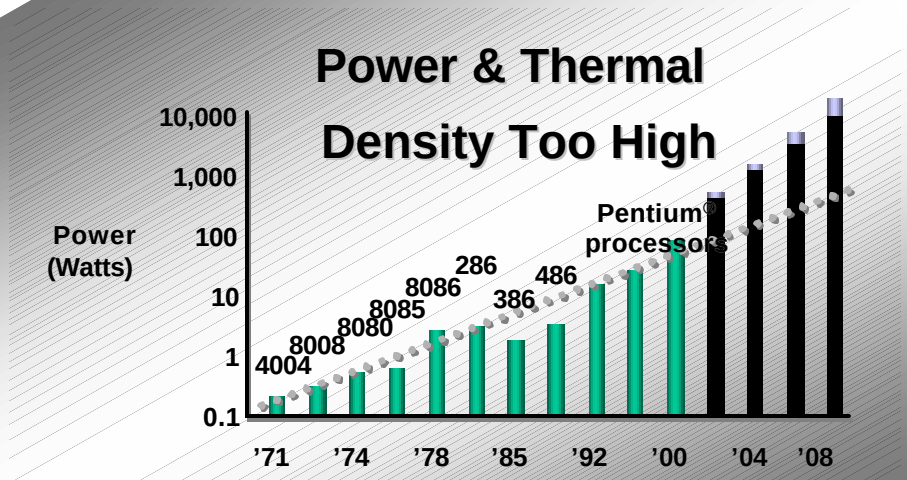
SV-2 256-Node System

SV-2 Component Development
March 2001

Technology Gap: High End Computer Systems

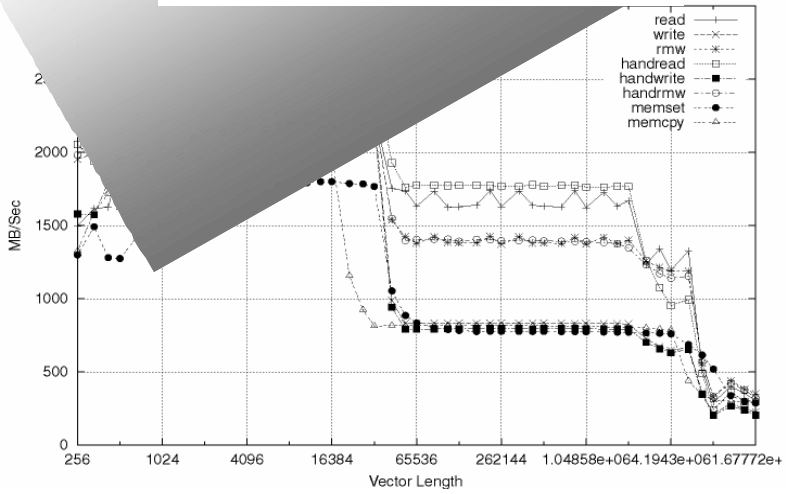


Addi Concerns Impacting nd Systems



Size
(Example - ASCI White)

Memory Performance

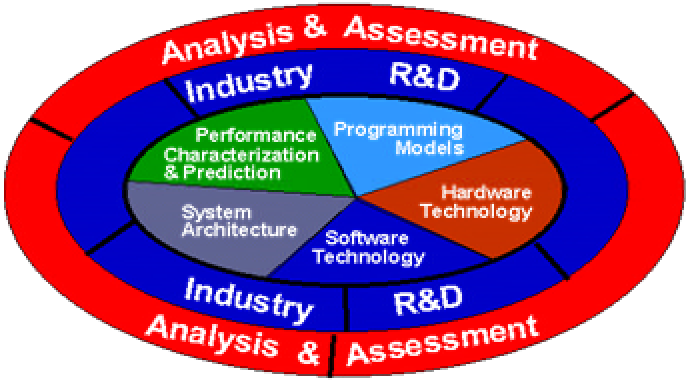


DARPA High Productivity Computing Systems

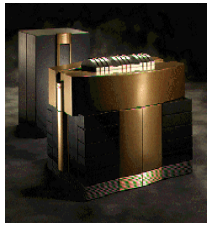
Goal: Provide a new generation of economically viable high productivity computing systems for the national security and industrial user community (2007 – 2010)

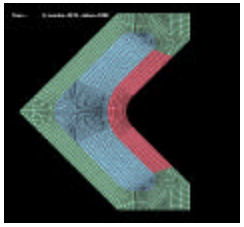
Impact:

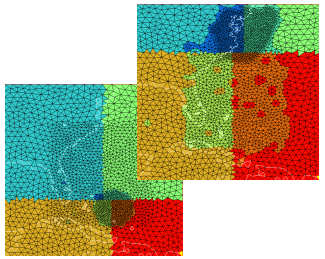
- **Performance** (efficiency): critical national security applications by a factor of 10X to 40X
- **Productivity** (time-to-solution)
- **Portability** (transparency): insulate research and operational application software from system
- **Robustness** (reliability): apply all known techniques to **protect against outside attacks**, hardware faults, & programming errors

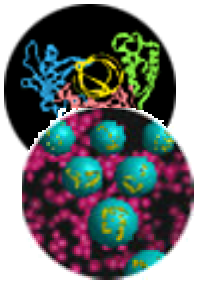


HPCS Program Focus Areas









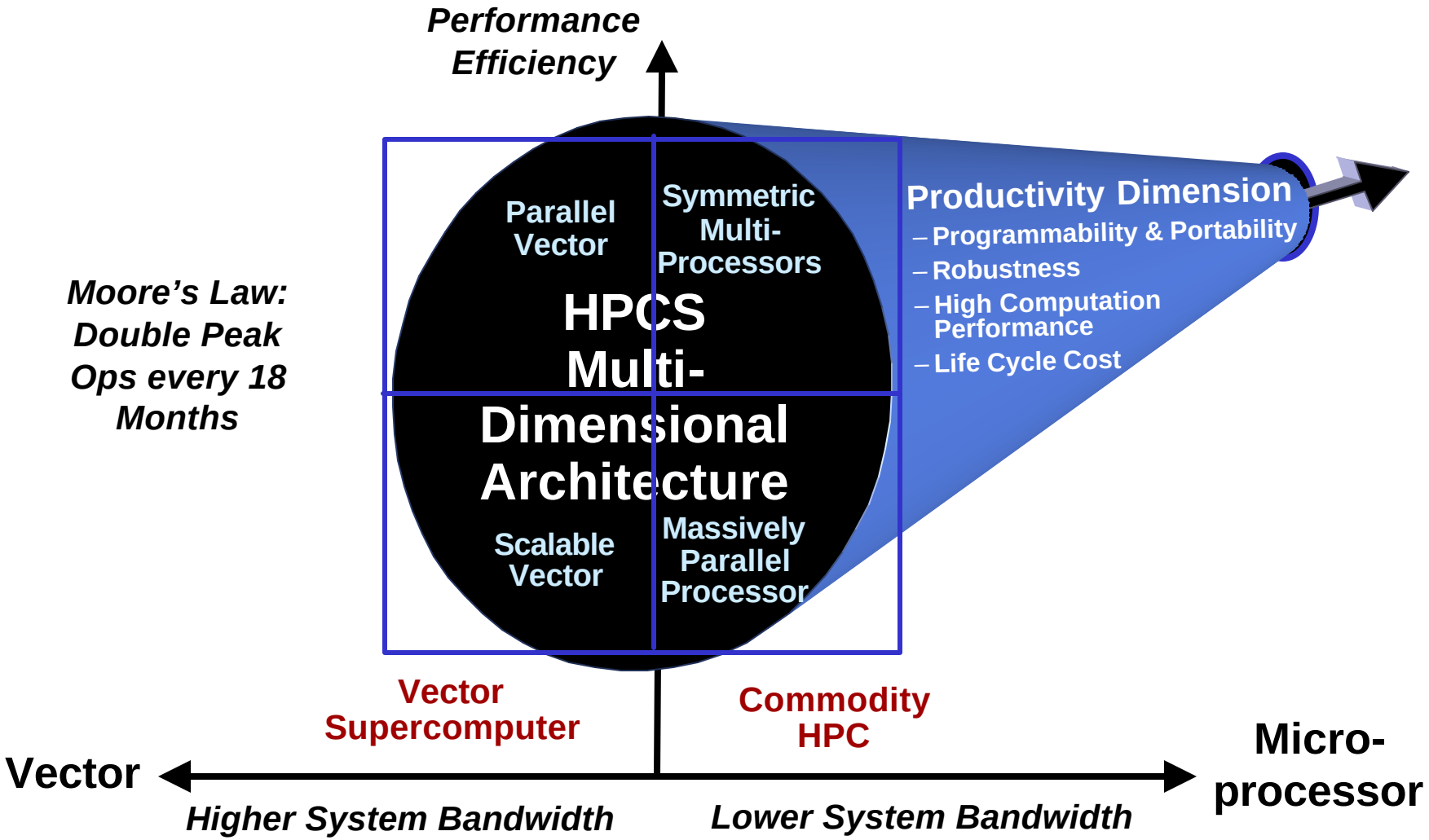
Applications:

- Intelligence/surveillance, reconnaissance, cryptanalysis, weapons analysis, airborne contaminant modeling and biotechnology

Fill the Critical Technology and Capability Gap
Today (late 80's HPC technology).....*to*.....Future (Quantum/Bio Computing)

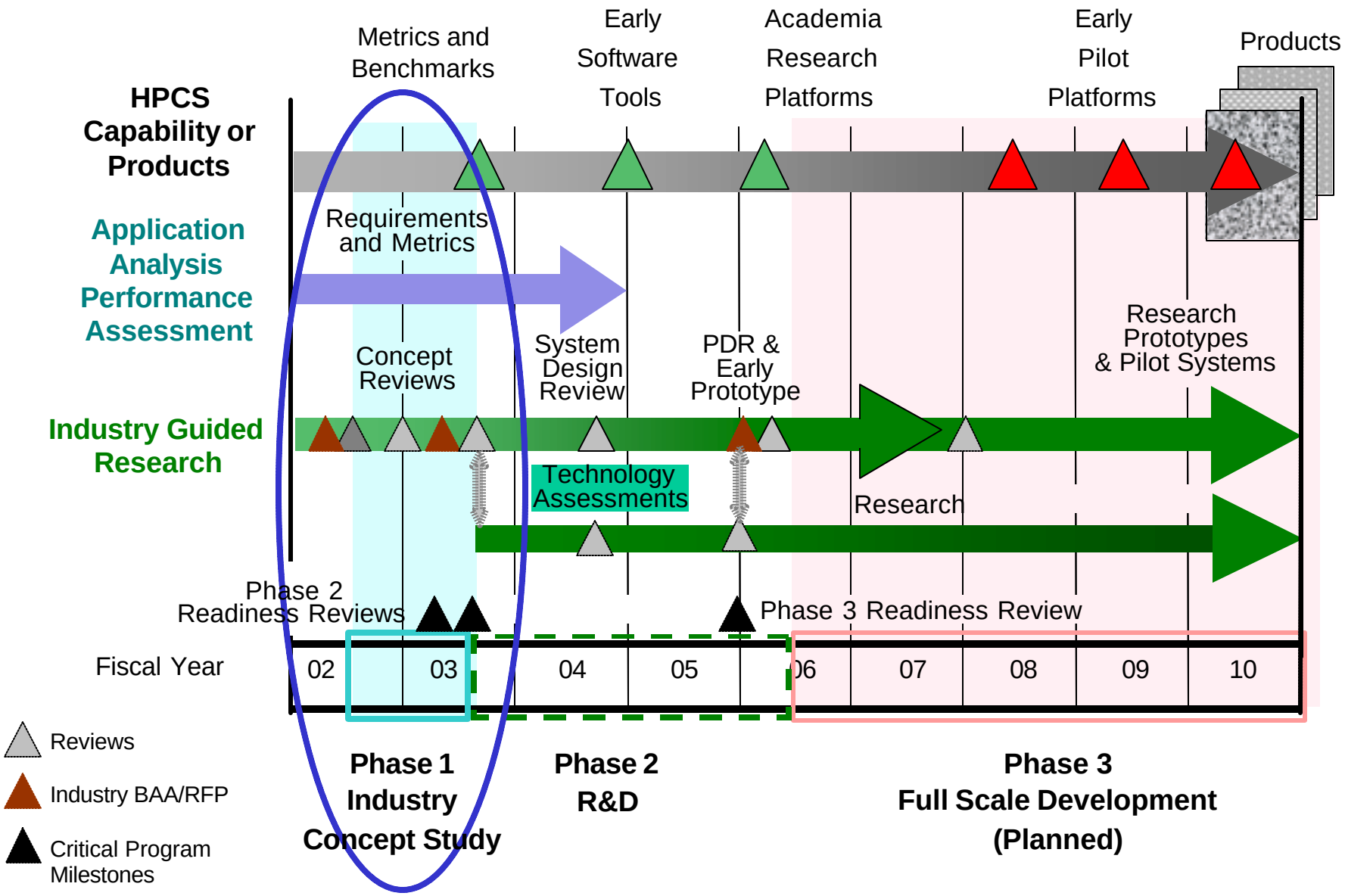
DARPA High Productivity Computing Systems Program

Vision: Focus on the Lost Dimension of HPC –
"User & System Efficiency and Productivity"



New Goal: Double Value Every 18 Months

HPCS Program Phases 1-3



House Committee Report 107-298
DoD Appropriations Bill, 2002

NEXT GENERATION SUPERCOMPUTER CAPABILITY

The Committee is concerned that several critical national security technologies suffer from inadequate Department of Defense (DoD) high-end supercomputing resources. These technologies include cryptanalysis, operational weather forecasting, dispersion of airborne contaminants, armor design, design of large aircraft or ship structures, and studies of weapons effects. Over the last decade, declining markets, inequitable trade practices, and limited DoD support, have severely weakened the United States industrial base for high-end supercomputing. Several reports conducted at the request of the DoD, have clearly identified a number of issues that counsel immediate attention and action to avoid an unacceptable prospect: offshore reliance for critical supercomputing capability vital to our national security.

The **Committee directs the Secretary of Defense** to submit by July 1, 2002, a **development and acquisition plan**, including budgetary requirements, for a **comprehensive, long-range, integrated high-end supercomputing program**. The Secretary shall direct the National Security Agency (NSA) to take the lead in developing this plan in cooperation with DARPA, DoD's HPC Modernization Program, NIMA, NRO, NNSA/ASCI, and NASA.