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NASA

HIGH PERFORMANCE COMPUTING and COMMUNICATIONS PROGRAM

Lee Holcomb

OAST

FEDERAL PROGRAM GOAL AND OBJECTIVES

OAST HPCC

- EXTEND U.S. LEADERSHIP IN HIGH PERFORMANCE COMPUTING AND COMPUTER COMMUNICATIONS
- DISSEMINATE THE TECHNOLOGIES TO SPEED INNOVATION AND TO SERVE NATIONAL GOALS
- SPUR GAINS IN INDUSTRIAL COMPETITIVENESS BY MAKING HIGH PERFORMANCE COMPUTING INTEGRAL TO DESIGN AND PRODUCTION

PRESIDENTIAL COMMITMENT

OAST HPCC

❒ 1991 CALTECH COMMENCEMENT SPEECH

"...we must invest now in a brighter future. That's why our administration fully supports high-performance computing, and math and science education."

❒ HIGH PERFORMANCE COMPUTING ACT OF 1991 (P.L. 102-194)

"The development if high performance computing and communications technology offers the potential to transform radically the way in which all Americans will work, learn and communicate in the future. It holds the promise of changing society as much as the other great inventions of the 20th century, including the telephone, air travel and radio and TV."

FEDERAL HPCC PROGRAM RESPONSIBILITIES*

OAST HPCC

ACTIVITY / AGENCY	HIGH PERFORMANCE COMPUTING SYSTEMS	ADVANCED SOFTWARE TECHNOLOGY AND ALGORITHMS	NATIONAL RESEARCH AND EDUCATION NETWORK	BASIC RESEARCH AND HUMAN RESOURCES
DARPA	• Technology development and coordination for teraops systems	• Technology development for parallel algorithms and software tools	• Technology development and coordination for gigabits networks	• University programs
DOE	• Technology development • Systems evaluation	• Energy applications research centers • Energy grand challenge and computation research • Software tools	• Gigabits applications research • Access to energy research facilities and databases	• Basic research and education programs
NASA	• Aeronautics and space application testbeds	• Software coordination • Computational research in: • Aerosciences • Earth and space sciences	• Access to aeronautic and spaceflight research centers	• Research institutes and university block grants
NSF	• Basic architecture research • Prototyping experimental systems	• Research in: • Software tools, databases • Grand Challenges • Computer access	• Facilities coordination and deployment • Gigabits research	
DOC/NIST	• Research in systems instrumentation and performance measurement • Research in interfaces and standards	• Research in: • software indexing and exchange • scalable parallel algorithms	• Coordinate performance assessment and standards • Programs in protocols and security	• Programs in: • Basic research • Education/training/curricula • Infrastructure
DOC/NOAA		• Ocean and atmospheric computation research • Software tools • Computational techniques	• Ocean and atmospheric mission facilities • Access to environmental data bases	
EPA		• Research in environmental computations, databases, and application testbeds	• Environmental mission assimilation by the states	• Technology transfer to States • University programs
NIH/NLM		• Medical application testbeds for medical computation research	• Development of intelligent gateways • Access for academic medical centers	• Basic Research • Interships for parallel algorithm development • Training and career development

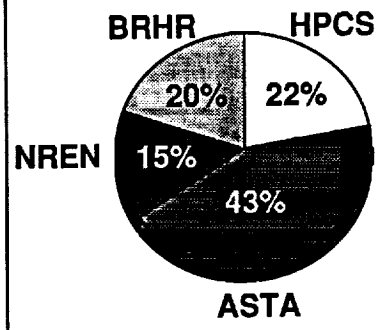
* Department of Education participation expected in FY 1993

FEDERAL HPCC PROGRAM FUNDING FY 92-93

OAST — HPCC

(Dollars in millions)

AGENCY	FY 1992	FY 1993
DARPA	232.2	275.0
NSF	200.9	261.9
DOE	92.3	109.1
NASA	71.2	89.1
HHS/NIH	41.3	44.9
DOC/NOAA	9.8	10.8
EPA	5.0	8.0
DOC/NIST	2.1	4.1
Total	654.8	802.9



APPROACH

OAST — HPCC

- ESTABLISH HIGH PERFORMANCE COMPUTING TESTBEDS
- CONSTITUTE APPLICATION SOFTWARE TEAMS COMPOSED OF DISCIPLINE AND COMPUTATIONAL SCIENTISTS TO UTILIZE AND EVALUATE TESTBEDS
- PROMOTE COLLABORATION, EXCHANGE OF IDEAS AND SHARING OF SOFTWARE AMONG HPCC SOFTWARE DEVELOPERS
- PROMOTE TECHNOLOGY TRANSFER

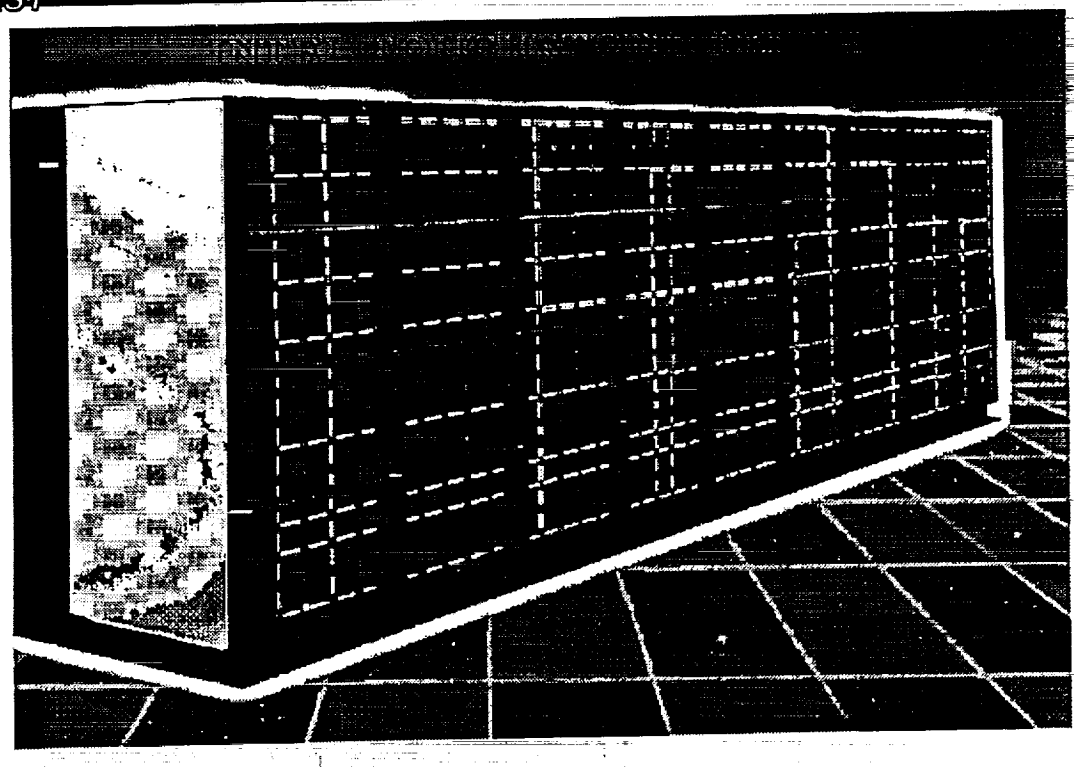
CONCURRENT SUPERCOMPUTER CONSORTIUM

OAST HPCC

PURPOSE ACQUIRE AND UTILIZE THE INTEL TOUCHSTONE DELTA SUPERCOMPUTER

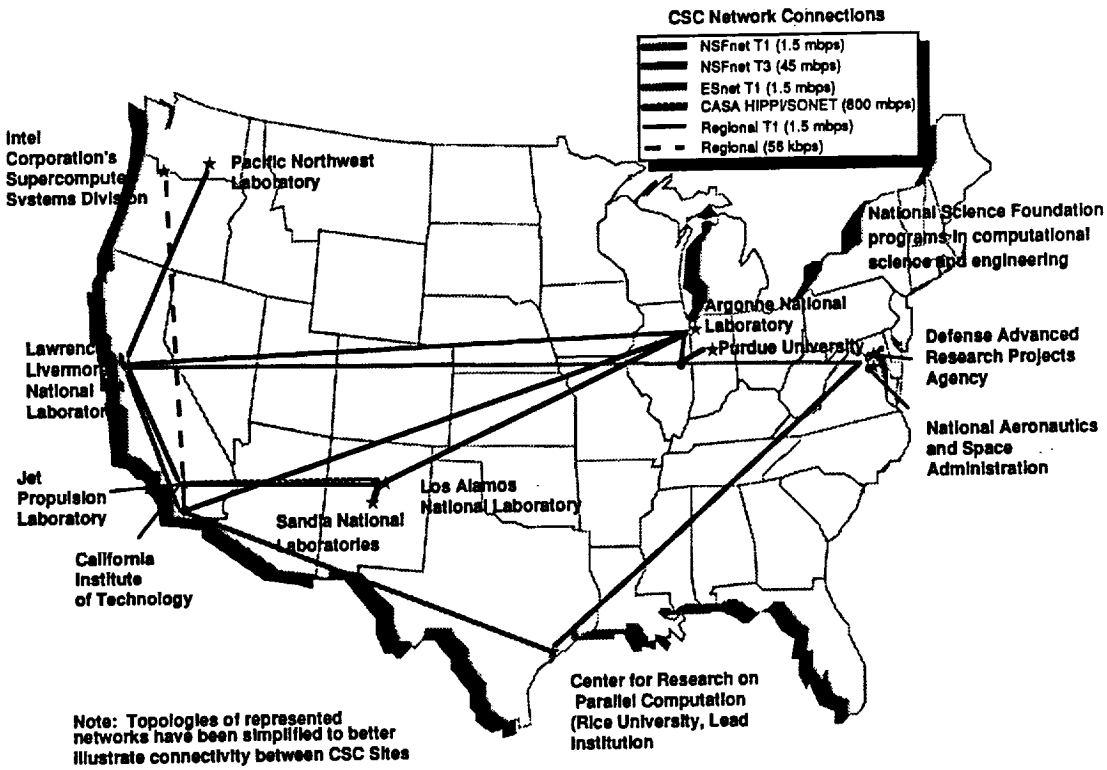
- DELTA IS WORLD'S FASTEST INSTALLED SUPERCOMPUTER
  - — PEAK SPEED OF 32 GFLOPS USING THE 528 NUMERIC PROCESSORS
  - — 13 GFLOPS SPEED OBTAINED ON A LINPAC BENCHMARK CODE OF ORDER 25,000 BY 25,000
- LOCATED AT CALTECH: ACCEPTANCE TESTING COMPLETED
- PEAK SPEED EXPECTED TO BE 32 GIGAFLOPS,
- INTEL TOUCHSTONE DELTA IS ONE OF SERIES OF DARPA DEVELOPED MASSIVELY PARALLEL COMPUTERS
- PARTNERS INCLUDE OVER 14 GOVERNMENT, INDUSTRY AND ACADEMIA ORGANIZATIONS

OAST HPCC



DELTA CONSORTIUM PARTNERS

OAST HPCC



COMPUTATIONAL AEROSCIENCES CONSORTIUM

OAST HPCC

- DEVELOP A MECHANISM TO ALLOW AEROSPACE INDUSTRY TO INFLUENCE THE REQUIREMENTS, STANDARDS, AND DIRECTION OF NASA'S COMPUTATIONAL AEROSCIENCES (CAS) PROJECT
- PROVIDE A MECHANISM TO ALLOW INDUSTRY TO INTELLECTUALLY PARTICIPATE IN THE DEVELOPMENT OF SELECTED "GENERIC" CAS APPLICATIONS SOFTWARE AND SYSTEMS SOFTWARE BASE
- FACILITATE THE TRANSFER OF CAS TECHNOLOGY TO AEROSPACE USERS
- PROVIDE INDUSTRY ACCESS TO HIGH PERFORMANCE COMPUTING RESOURCES
- PROVIDE A MECHANISM TO ALLOW INDUSTRY TO COMMERCIALIZE APPROPRIATE PRODUCTS

PRIVATE SECTOR PARTICIPANTS

OAST HPCC

- INDUSTRY

BOEING, GENERAL ELECTRIC, GRUMMAN, MCDONNELL DOUGLAS, NORTHRUP, LOCKEHHED, UNITED TECHNOLOGIES, TRW, ROCKWELL, GENERAL MOTORS, GENERAL DYNAMICS, MOTOROLA

- ACADEMIA

SYRACUSE, MISSISSIPPI STATE, USRA, UNIVERSITY OF CALIFORNIA-DAVIS

RATIONALE

OAST HPCC

- GENERIC, PRE-COMPETITIVE TECHNOLOGY
  - — RISK AND COST
  - — ULTIMATE COMMERCIAL PRODUCTS ARE DIVERSE AND UNDETERMINED
- INFLUENCE STANDARDS THROUGH DIVERSITY OF APPLICATIONS
- INTELLECTUAL PROPERTY RIGHTS CAN BE VESTED IN CONSORTIUM MEMBERS FOR COMMERCIALIZATION
- PROVIDES MECHANISM FOR COMBINING DIVERSE INTELLECTUAL POINTS-OF-VIEW
- TECHNOLOGY TRANSFER IS THROUGH DIRECT PARTICIPATION