

# EPA Data Center Efficiency Workshop

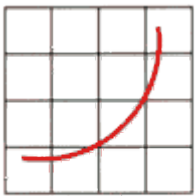
# **SPEC Benchmarks**

March 27, 2006

Walter Bays, President, SPEC



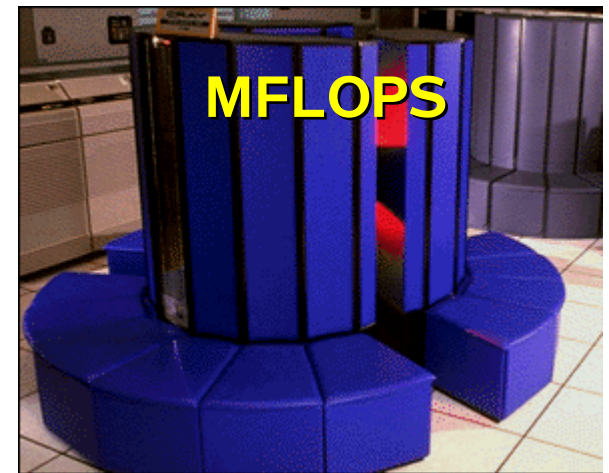
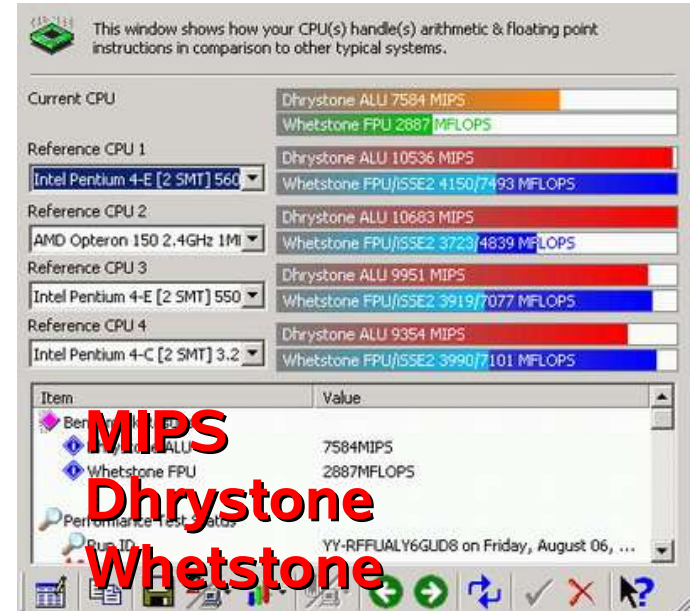


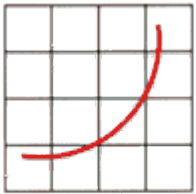


spec

# SPEC Background

- “*Benchmark wars*” of the 80's
  - RISC vs. CISC
- Vendors & *EE Times* created SPEC for better benchmarks
  - Fair, representative, repeatable
- Non-profit consortium
  - Open membership
  - Many benchmark projects



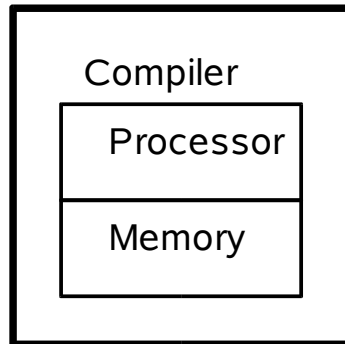


# Benchmarks

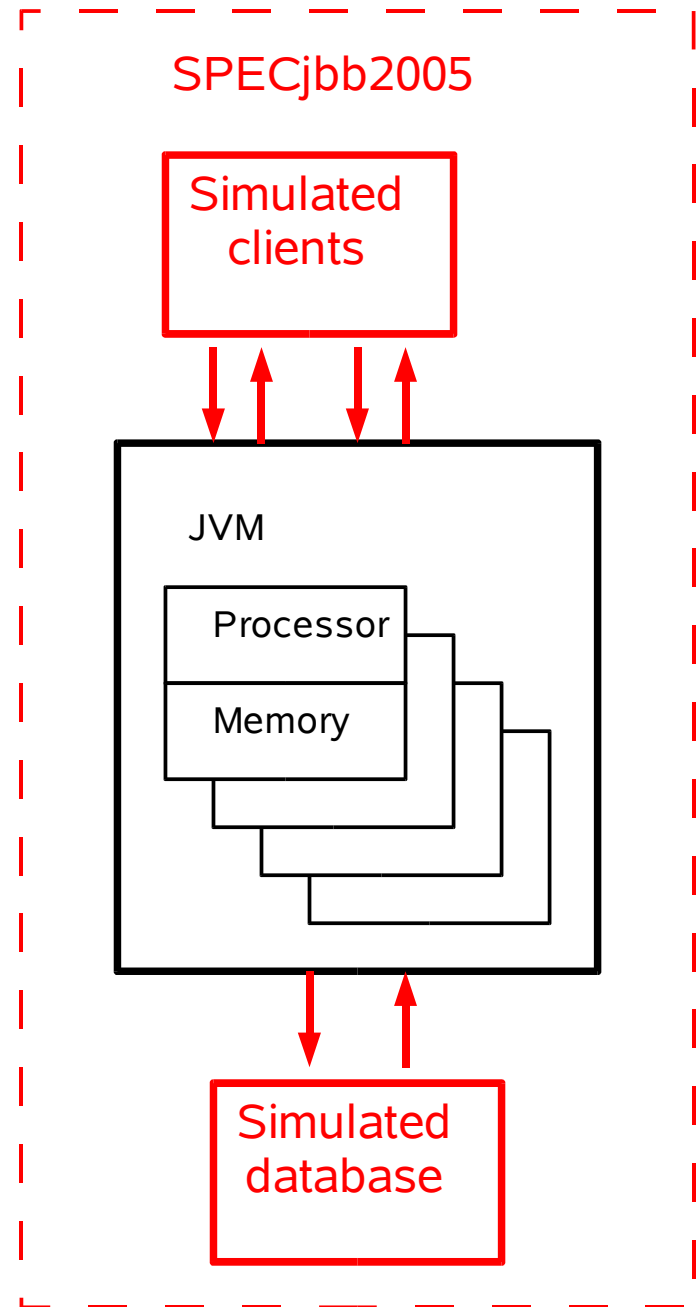
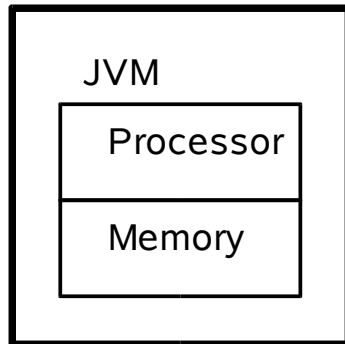
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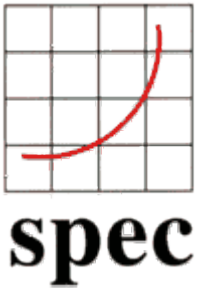
- Speed / throughput
- System Under Test
- Benchmark driver
- Workload

SPECint2000  
SPECfp2000  
(also *base*)  
(also *rate*)

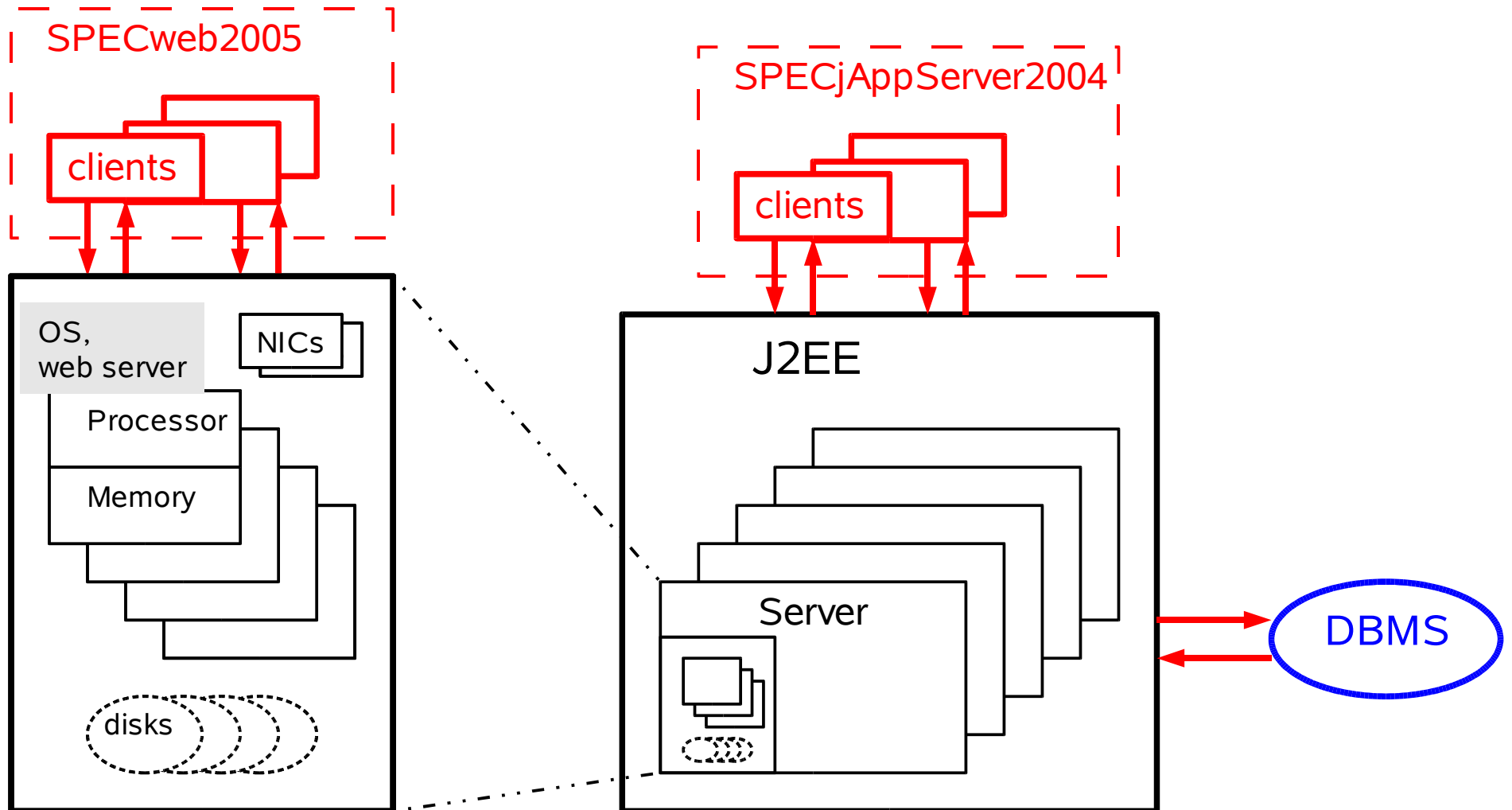


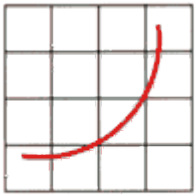
SPECjvm98





# Scope and Complexity

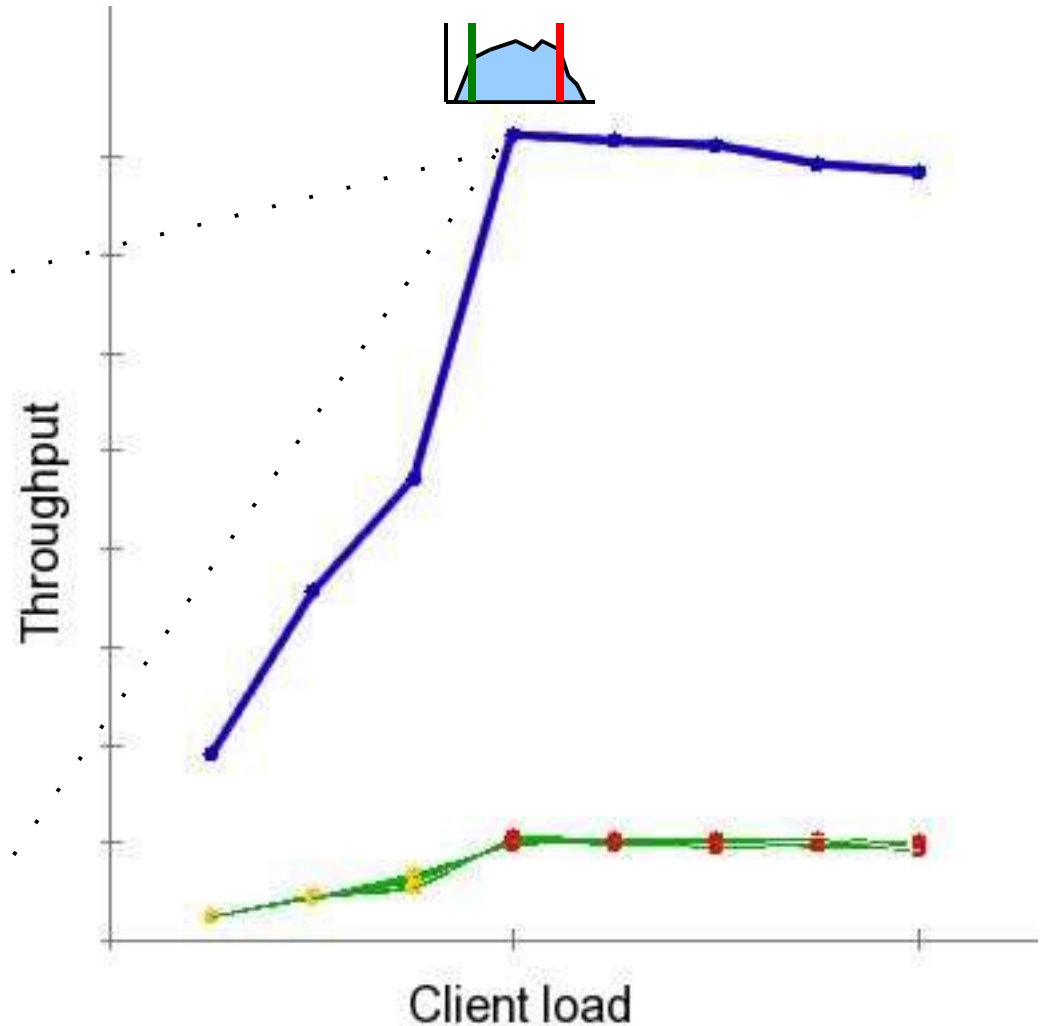
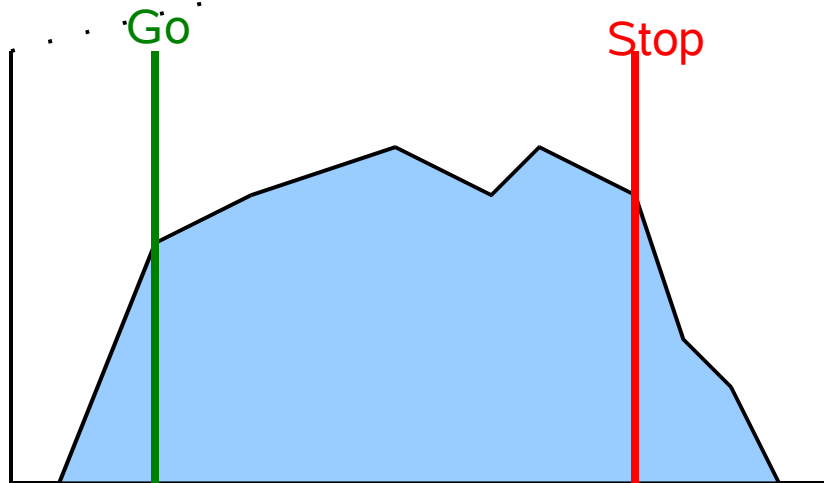


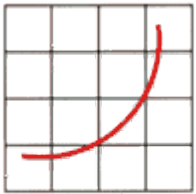


# Benchmark Execution

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- Initialization, ramp up
- Measurement
- Ramp down
- Throughput vs. load

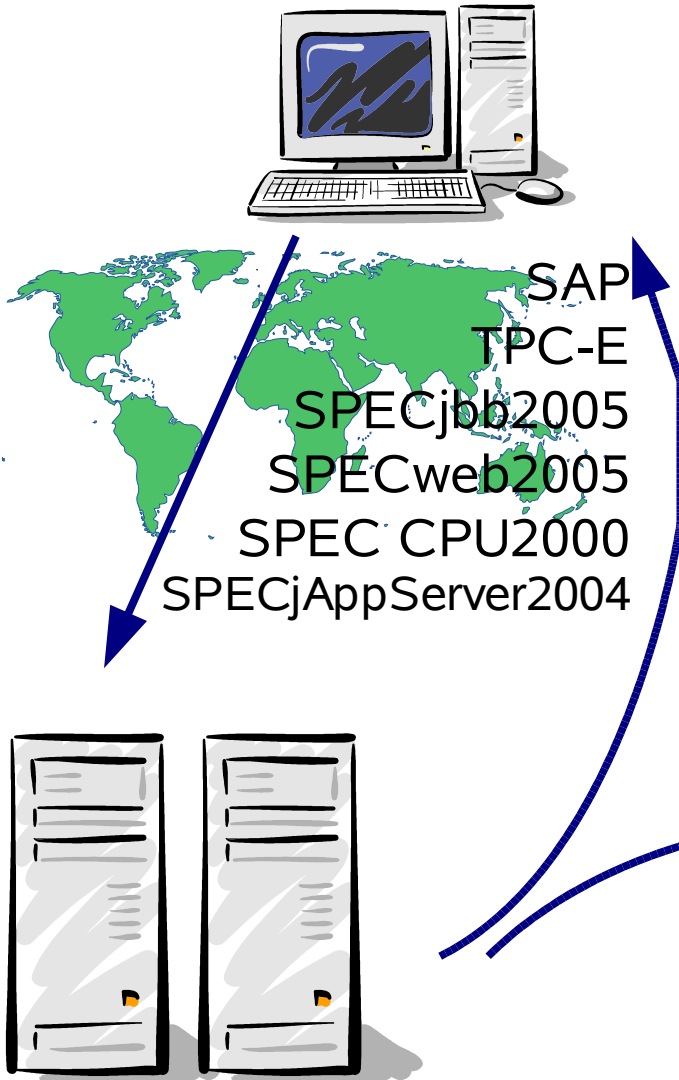




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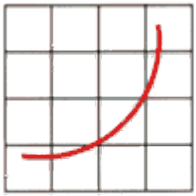
# Benchmark Test Lab

- Each physical configuration
  - Sequence of benchmarks
- Remote execution
  - Down the hall
  - Around the world
- Testing & tuning runs
- **Cost of benchmarking \$\$\$**



*World Record!*

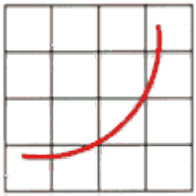




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# SPEC Benchmark Suites

- Commercial graphics applications
- OpenGL tests
- High Performance Computing:
  - OMP, MPI, Seismic, Weather, Chemistry
- CPU: integer, floating point, speed, throughput
- Web: banking, e-commerce, support
- Java: JVM, transaction processing, J2EE
- NFS file server. Mail server



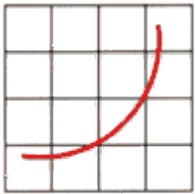
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# SPEC Membership

Acer, Advanced Micro Devices, Apple Computer, ATI Research, Azul Systems, BEA Systems, Borland, Bull S.A., California Institute of Technology, Center for Scientific Computing, CommuniGate Systems, Defence Science and Technology Organisation - Stirling, Dell, Dresden University of Technology, Duke University, EMC, EP Network Storage Performance Lab, Exanet, Fabric7 Systems, Freescale Semiconductor, Fujitsu Limited, Fujitsu Siemens, Hewlett-Packard, Hitachi Data Systems, Hitachi Ltd., IBM, Intel, ION Computer Systems, JAIST, JBoss, Johns Hopkins University, Kyushu University, Leibniz Rechenzentrum - Germany, Microsoft, Mirapoint, National University of Singapore, NEC - Japan, Network Appliance, New Mexico State University, New South Wales Department of Education and Training, Novell, NVIDIA, Openwave Systems, Oracle, Panasas, P.A. Semi, PathScale, Penn State, Purdue University, Queen's University, Rightmark, S3 Graphics, SAP AG, SGI, Stanford University, Sun Microsystems, Super Micro Computer, SuSE Linux AG, Sybase, Symantec Corporation, Technical University of Darmstadt, Texas A&M University, The Portland Group, Tsinghua University, Unisys, University of Aizu - Japan, University of California - Berkeley, University of Central Florida, University of Illinois - NCSA, University of Maryland, University of Modena, University of Nebraska, Lincoln, University of New Mexico, University of Pavia, University of Stuttgart, University of Texas at Austin, University of Texas at El Paso, University of Tsukuba, University of Waterloo, VA Austin Automation Center, Verisign, Zeus Technology

***And you?***





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# SPEC Membership

*Here today...*

**Brent Kelley – AMD**

**Klaus Lange – HP**

**Matt Accapadi – IBM**

**Walter Bays – Sun**

**Questions?**

Acer, Advanced Micro Devices, Apple Computer, ATI Research, Azul Systems, BEA Systems, Borland, Bull S.A., California Institute of Technology, Center for Scientific Computing, CommuniGate Systems, Defence Science and Technology Organisation - Stirling, Dell, Dresden University of Technology, Duke University, EMC, EP Network Storage Performance Lab, Exanet, Fabric7 Systems, Freescale Semiconductor, Fujitsu Limited, Fujitsu Siemens, Hewlett-Packard, Hitachi Data Systems, Hitachi Ltd., IBM, Intel, ION Computer Systems, JAST, JBoss, Johns Hopkins University, Kyushu University, Leibniz Rechenzentrum - Germany, Microsoft, Mirapoint, National University of Singapore, NEC - Japan, Network Appliance, New Mexico State University, New South Wales Department of Education and Training, Novell, NVIDI, Openwave Systems, Oracle, Panasas, P.A. Semi, PathScale, Penn State, Purdue University, Queen's University, Rightmark, S3 Graphics, SGI, Stanford University, Sun Microsystems, Super Micro Computer, SuSE Linux AG, Sybase, Symantec Corporation, Technical University of Darmstadt, Texas A&M University, The Portland Group, Tsinghua University, Unisys, University of Aizu - Japan, University of California - Berkeley, University of Central Florida, University of Illinois - NCSA, University of Maryland, University of Modena, University of Nebraska, Lincoln, University of New Mexico, University of Pavia, University of Stuttgart, University of Texas at Austin, University of Texas at El Paso, University of Tsukuba, University of Waterloo, VA Austin Automation Center, Verisign, Zeus Technology