

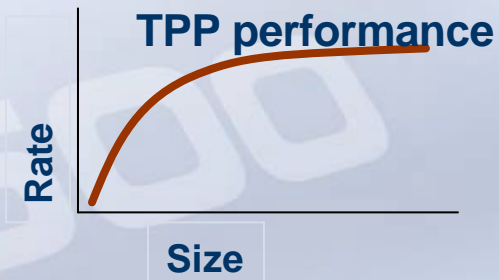


10 Years TOP500

BOF–Session „TOP500 Supercomputers“ at
SC2002 in Baltimore

- **1. Introduction (Hans Meuer, University of Mannheim)**
- 2. Awards (Horst Simon, NERSC/LBNL)
- 3. TOP500 and Architectures (Erich Strohmaier, NERSC/LBNL)
- 4. TOP500 and Linpack (Jack Dongarra, University of Tennessee)
- 5. New and Alternative Benchmarks
 - - IPACS (Franz- Josef Pfreundt, ITWM Kaiserslautern and Karl Solchenbach, Pallas)
 - - STREAM (John D. McCalpin, IBM & University of Virginia)
 - - NERSC Performance Characterization Project (Erich Strohmaier)
- 6. Countries and HPC Centers in the TOP500 (Horst Simon)

- Listing of the 500 most powerful Computers in the World
- Yardstick: Rmax from Linpack
 $Ax=b$, dense problem
- Updated twice a year:
 - ISC'xy in Germany, June xy
 - SC'xy in USA, November xy
- All data available at www.top500.org





TOP 500 SUPERCOMPUTER SITES

Intel® Software Developer Tools **Yes. intel.**

HOME ABOUT CURRENT LIST ARCHIVE DATABASE IN FOCUS NEWS SITEMAP CONTACT

PRESENTED BY
UNIV. OF MANNHEIM
UNIV. OF TENNESSEE
NERSC/LBNL

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SEARCH FOR:

TOP500 SUPERCOMPUTER SITES

The TOP500 project was started in 1993 to provide a reliable basis for tracking and detecting trends in high-performance computing. Twice a year, a list of the sites operating the 500 most powerful computer systems is assembled and released. The best performance on the [Linpack](#) benchmark is used as performance measure for ranking the computer systems. The list contains a variety of information including the system specifications and its major application areas.

TOP500 INFORMATION

NOV 2002
20th TOP500 List now available
The **20th TOP500 List** is now available and will be introduced during the [Supercomputing Conference 2002 \(SC2002\)](#) in Baltimore (November 16-22, 2002).
[< more >](#)

SC2002
BOF - Session: 10 Years TOP500 Lists
The BOF session will be held during SC2002 in Baltimore, Wednesday November 20th, 5:30 - 7:00 pm.
[< more >](#)

SC2002
ISC2002 and TOP500 at SC2002 in Baltimore
The TOP500 Project will have a booth (#1641) at the SC2002 Exhibition in Baltimore, November 17 - 22. You are invited to visit us for in depth information about the latest TOP500 list. All four authors of the TOP500 list may be contacted at our booth.

High-Performance Linpack Benchmark
The Linpack benchmark can now be run using [HPL](#), A Portable Implementation of the High-Performance Linpack

Info Fully-Integrated Clusters

FUJITSU COMPUTERS
SIEMENS

RS/6000 SP

YOU

Aspen Systems
TURNKEY BEOWULF CLUSTERING SOLUTIONS

Turnkey Cluster Solutions

Appro 1U Servers
AMD Athlon™ MP Processor
Powerful & Cost-Effective

Transferring data from rc1.top500.org...

- 1. List in June 1993
- 19. List on June 20, 2002, at ISC2002 in Heidelberg
- 20. List on Nov. 20, 2002 , at ISC2002 in Baltimore
- 21. List on June 26, 2003, at ISC2003 in Heidelberg
- Accepted by users and manufacturers

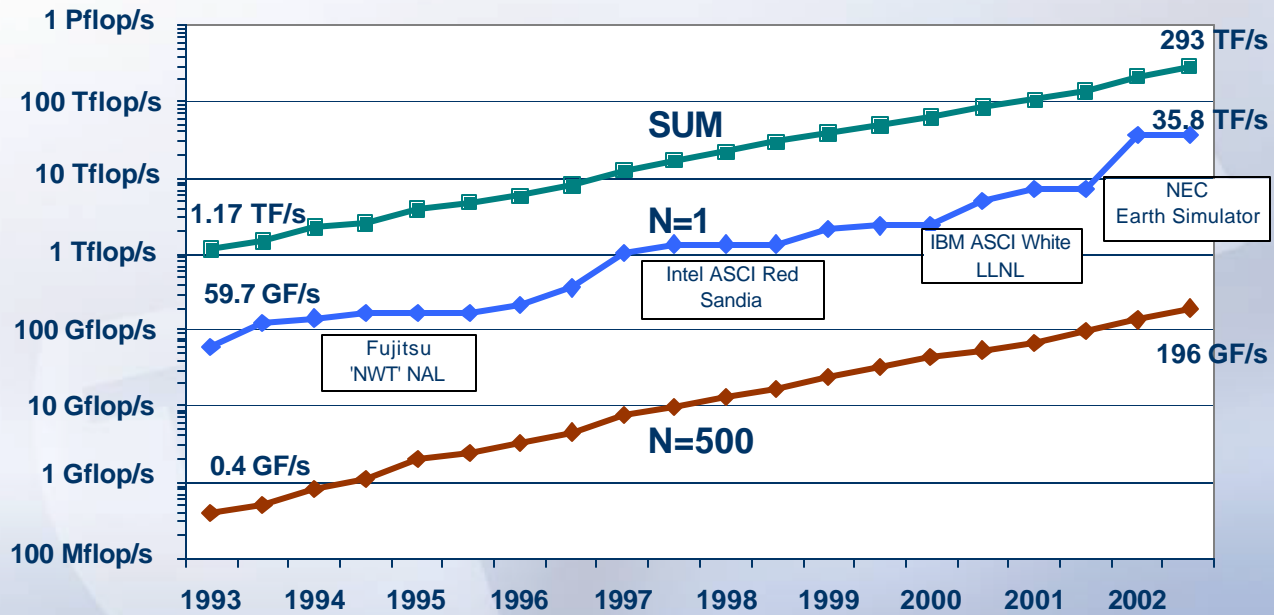


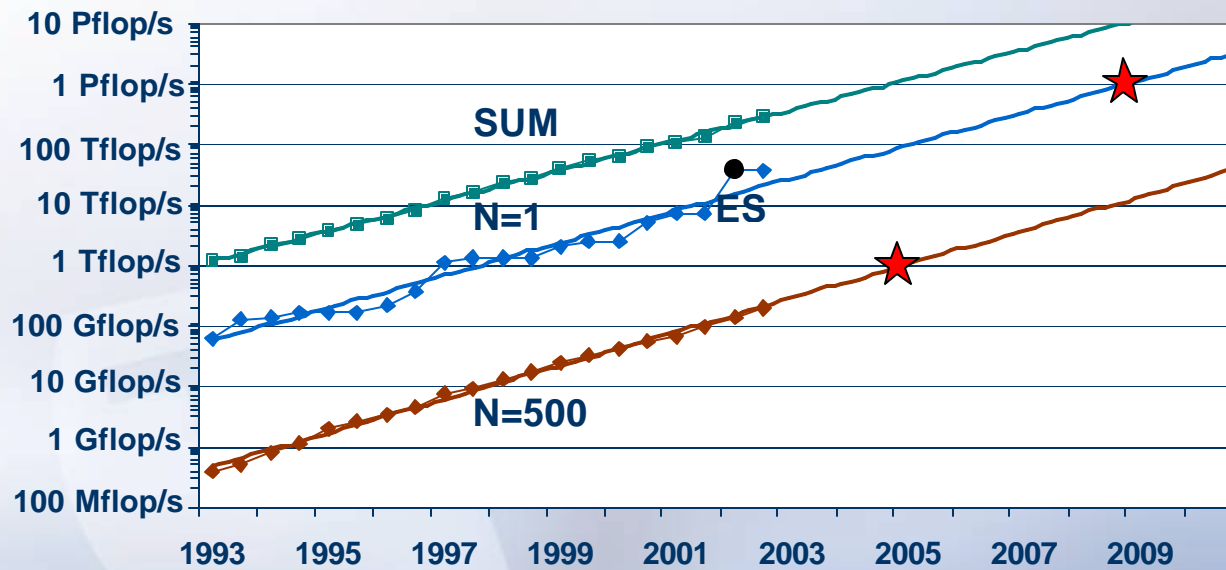
- **Manufacturer** Manufacturer or vendor
- **Computer Type** indicated by manufacturer or vendor
- **Installation Site** Customer
- **Location** Location and country
- **Year** Year of installation/last major update
- **Installation Type** Academic, Research, Industry, Vendor, Class.
- **Installation Area** e.g. Research: Energy / Industry: Finance
- **# Processors** Number of processors
- **R_{\max}** Maxmimal LINPACK performance achieved
- **R_{peak}** Theoretical peak performance
- **N_{\max}** Problemsize for achieving R_{\max}
- **$N_{1/2}$** Problemsize for achieving half of R_{\max}
- **N_{world}** Position within the TOP500 ranking

20th List: The TOP10

Rank	Manufacturer	Computer	R_{max} [TF/s]	Installation Site	Country	Year	Area of Installation	# Proc
1	NEC	Earth-Simulator	35.86	Earth Simulator Center	Japan	2002	Research	5120
2	HP	ASCI Q, AlphaServer SC	7.73	Los Alamos National Laboratory	USA	2002	Research	4096
2	HP	ASCI Q, AlphaServer SC	7.73	Los Alamos National Laboratory	USA	2002	Research	4096
4	IBM	ASCI White SP Power3	7.23	Lawrence Livermore National Laboratory	USA	2000	Research	8192
5	Linux NetworX	MCR Cluster	5.69	Lawrence Livermore National Laboratory	USA	2002	Research	8192
6	HP	AlphaServer SC ES45 1 GHz	4.46	Pittsburgh Supercomputing Center	USA	2001	Academic	3016
7	HP	AlphaServer SC ES45 1 GHz	3.98	Commissariat a l'Energie Atomique (CEA)	France	2001	Research	2560
8	HPTi	Xeon Cluster - Myrinet2000	3.34	Forecast Systems Laboratory - NOAA	USA	2002	Research	1536
9	IBM	pSeries 690 Turbo	3.16	HPCx	UK	2002	Academic	1280
10	IBM	pSeries 690 Turbo	3.16	NCAR (National Center for Atmospheric Research)	USA	2002	Research	1216

Performance Development





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➤ TOP1

Earth Simulator (NEC),
Earth Simulator Center, Japan

➤ TOP2

ASCI Q, AlphaServer SC (HP),
Los Alamos National Laboratory, USA

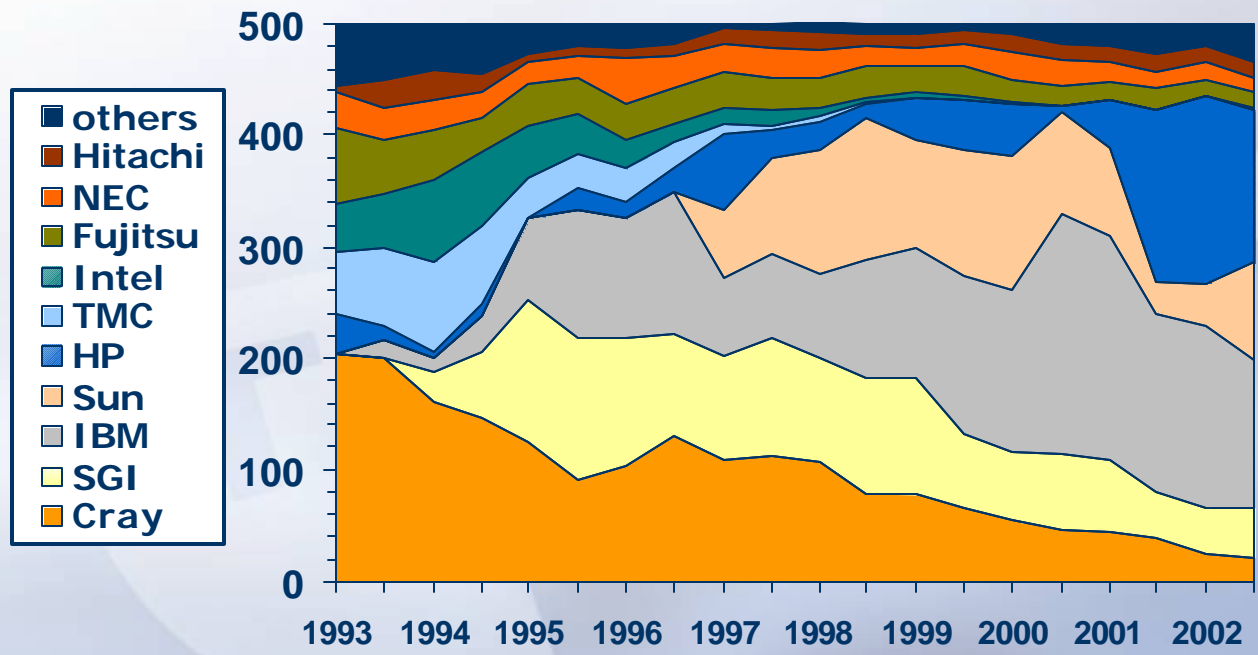
➤ TOP3

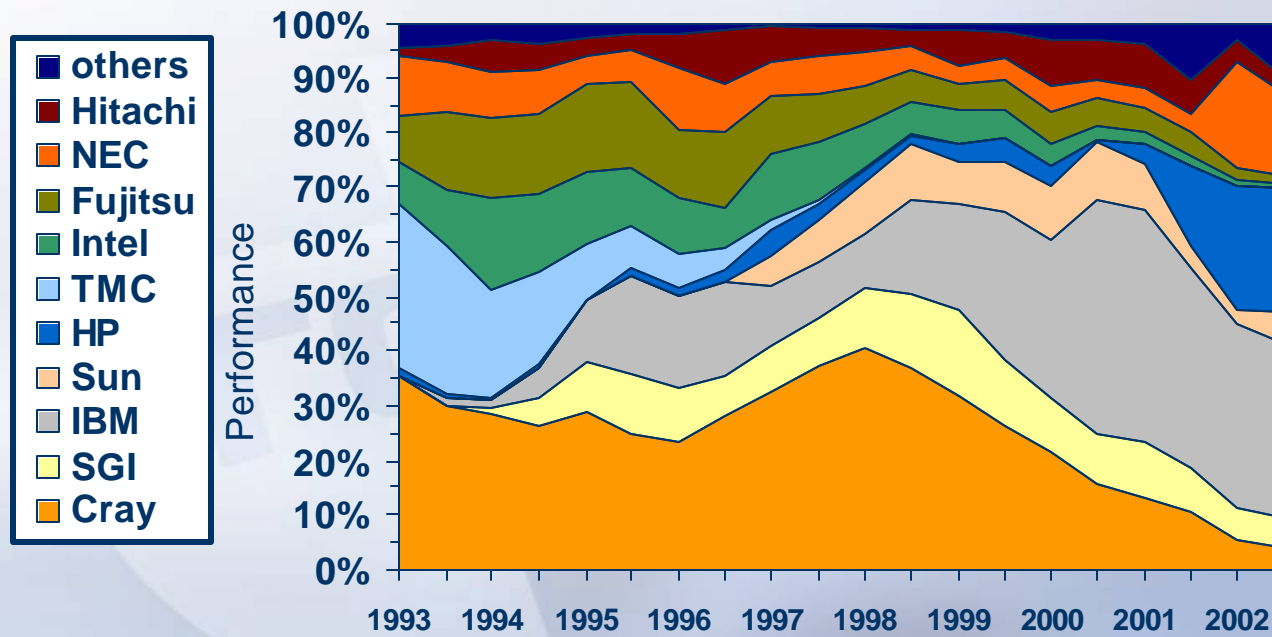
ASCI Q, AlphaServer SC (HP),
Los Alamos National Laboratory, USA



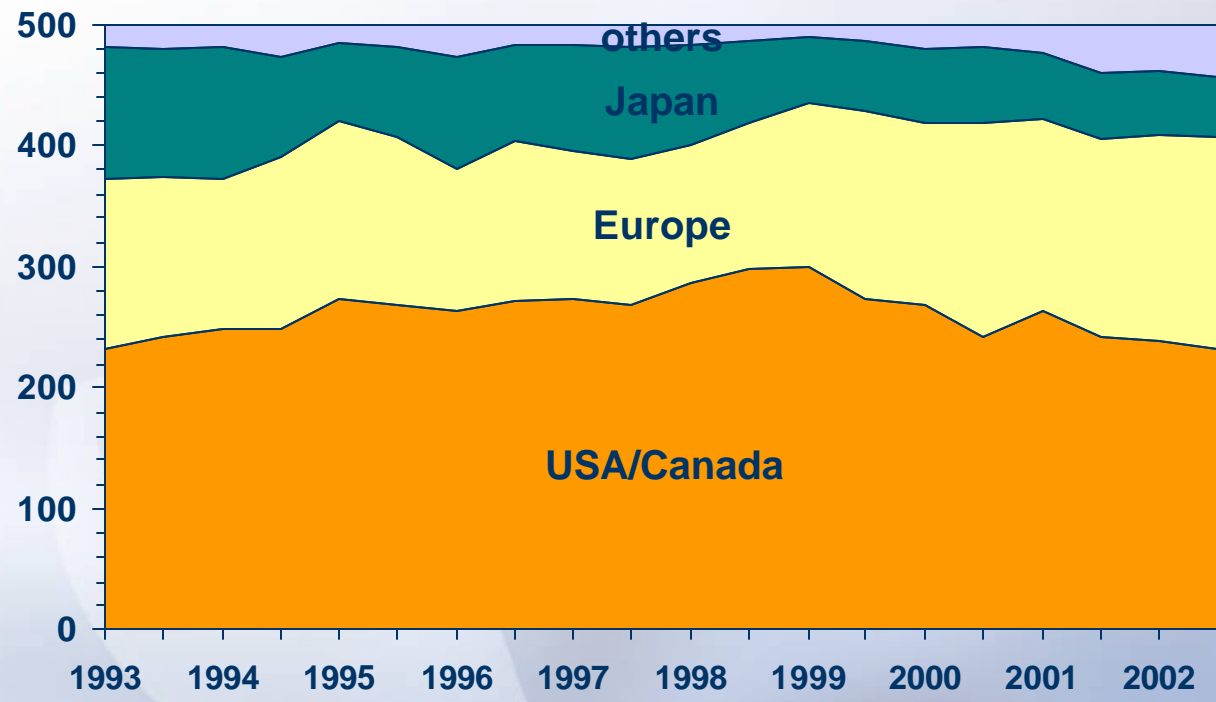
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Manufacturers

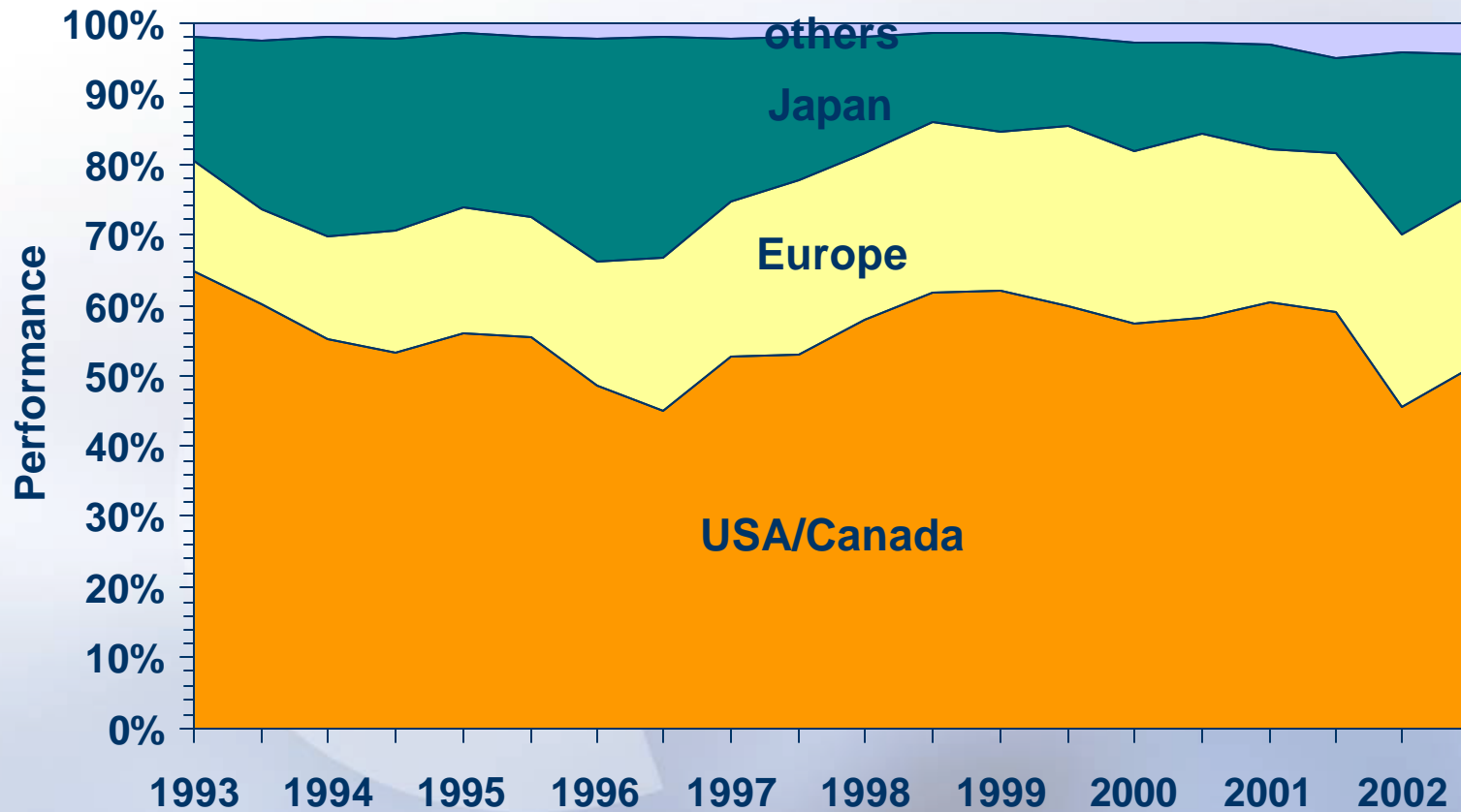




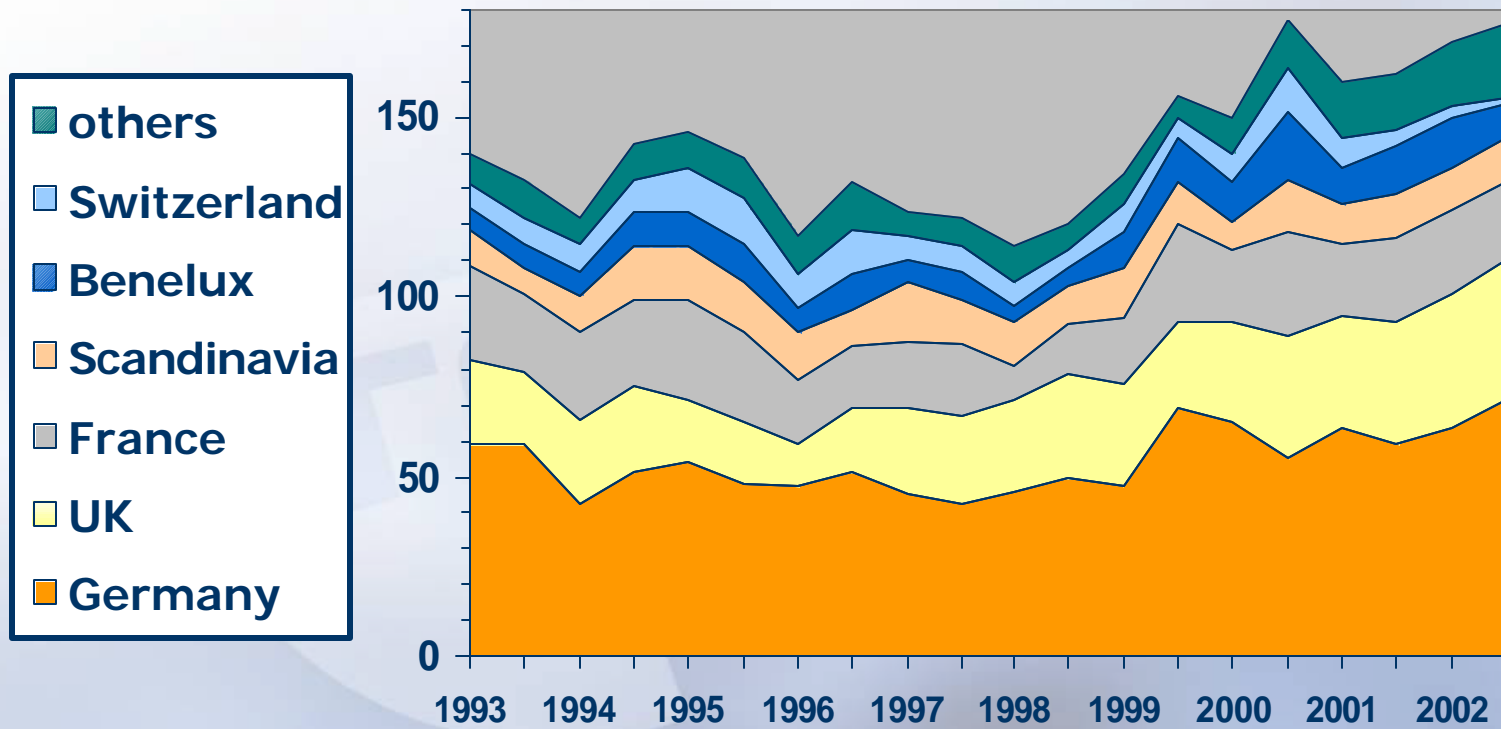
Continents



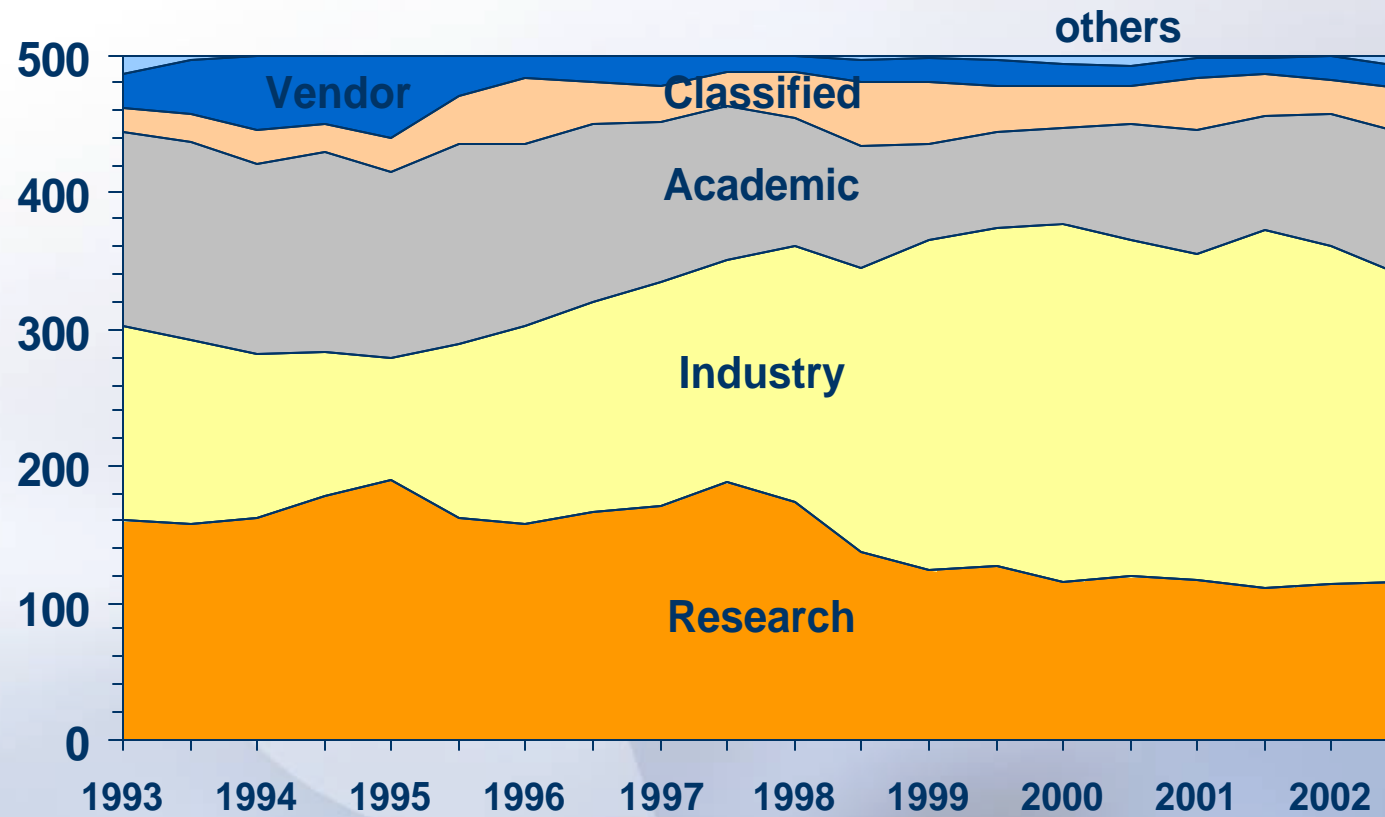
Continents Performance



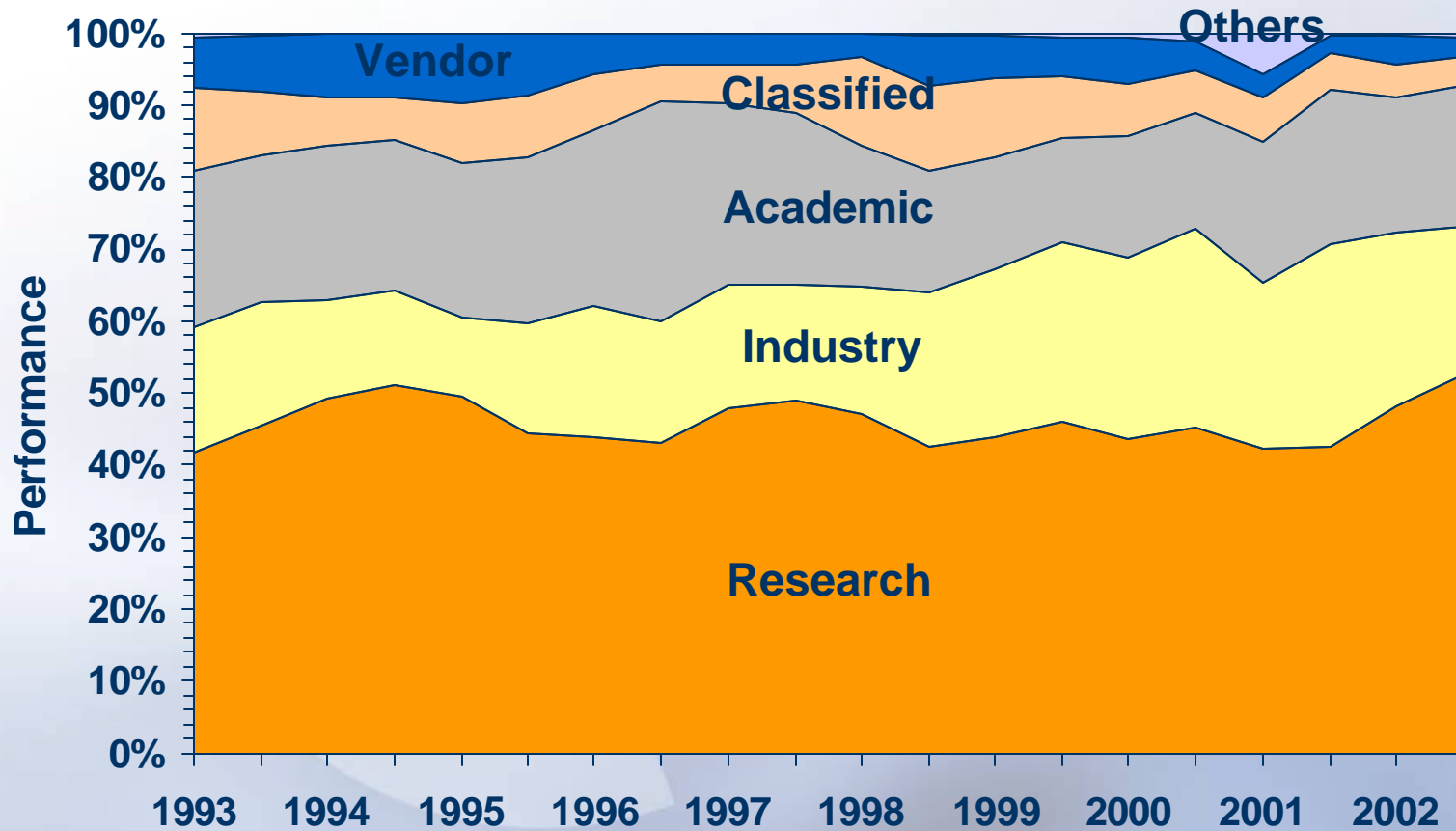
European Countries



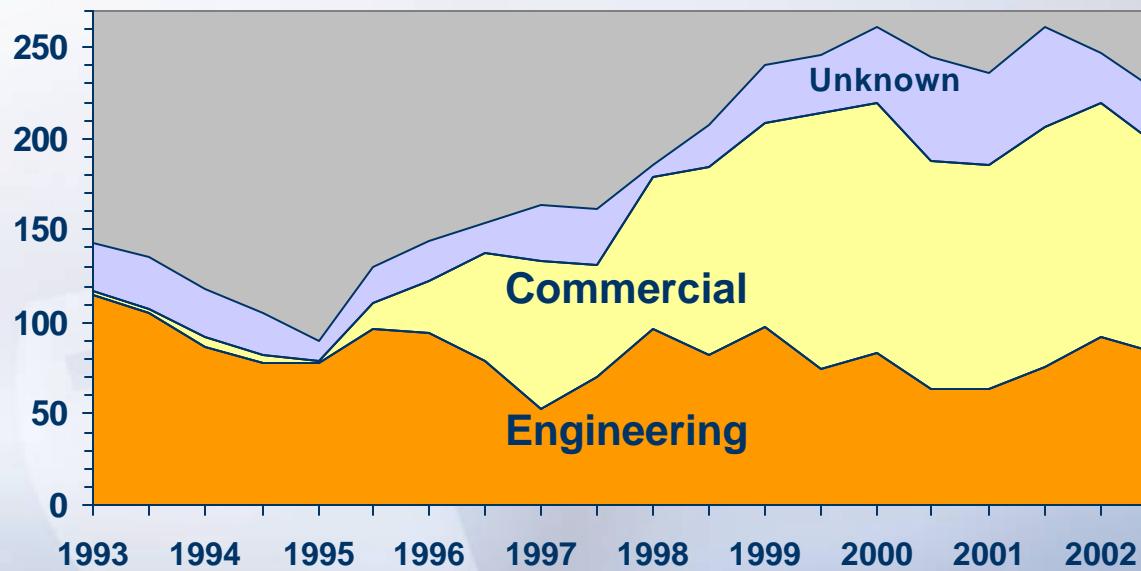
Customer Types



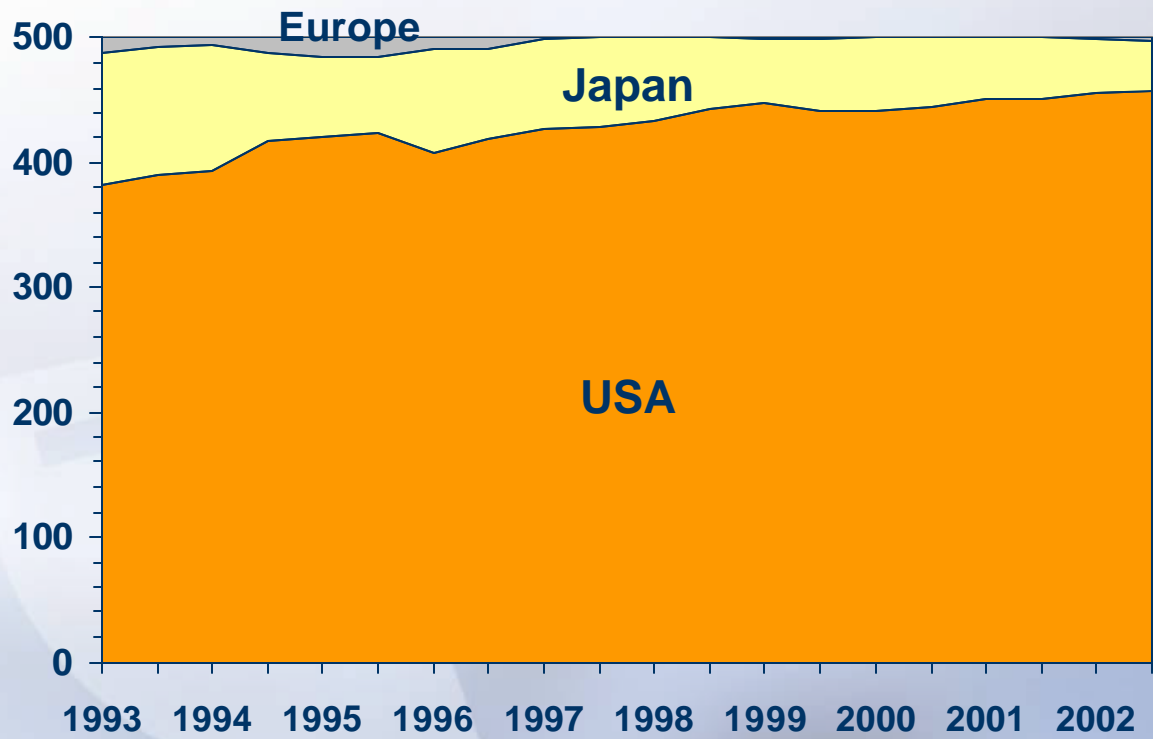
Customer Types Performance



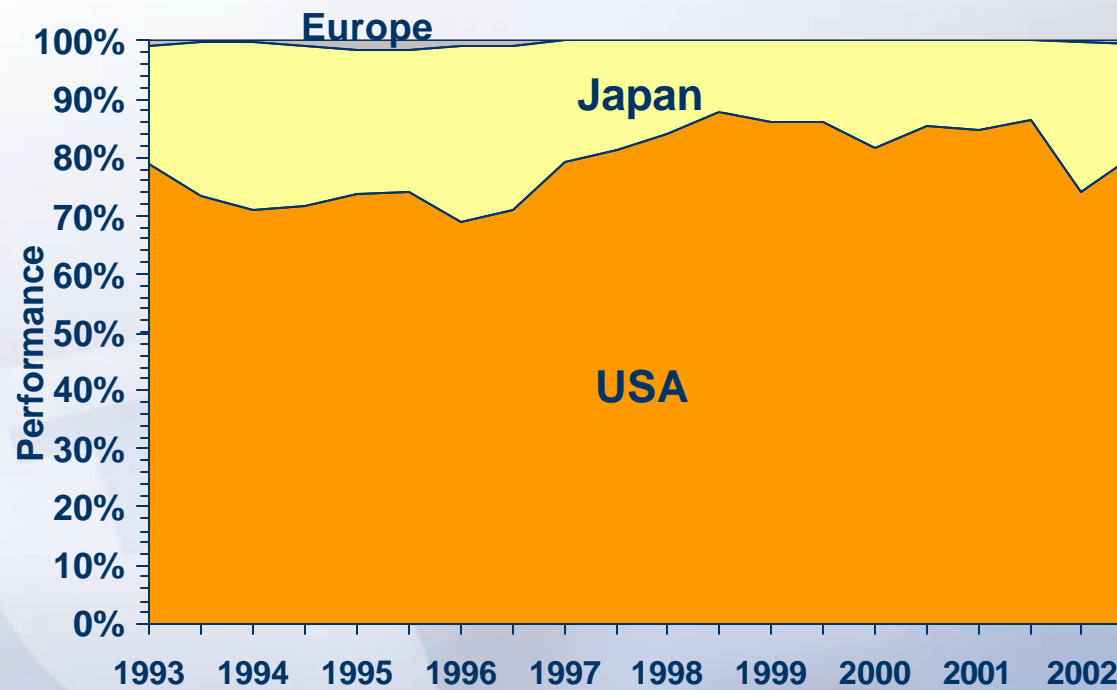
Industrial Customer Segments



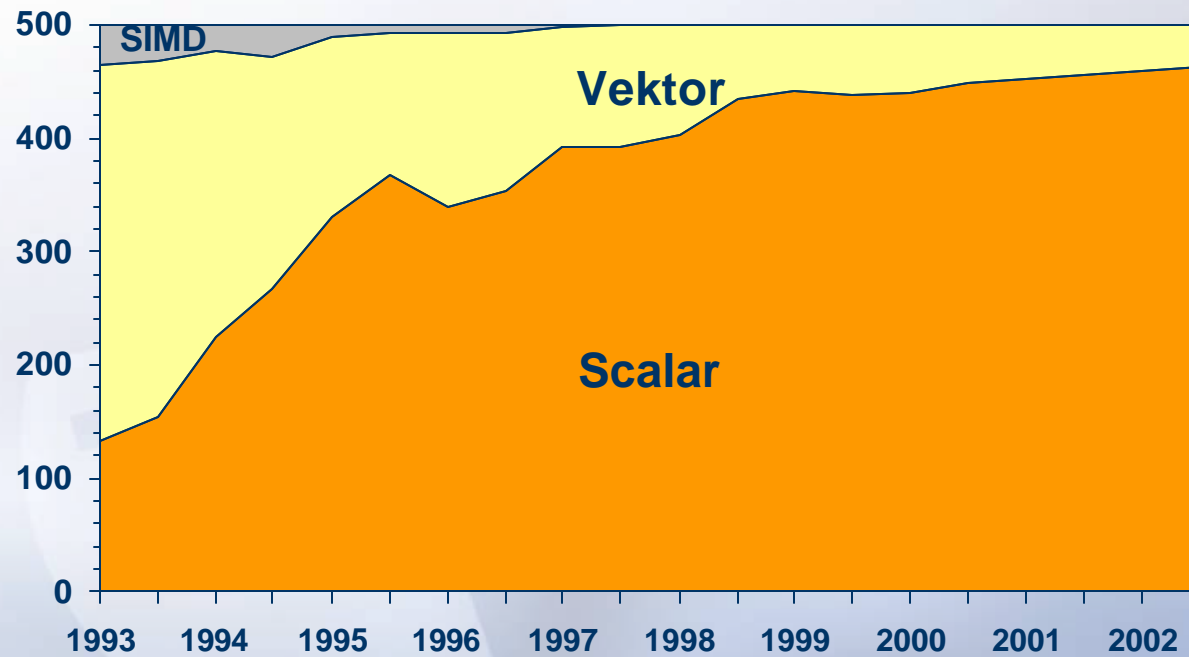
Producers



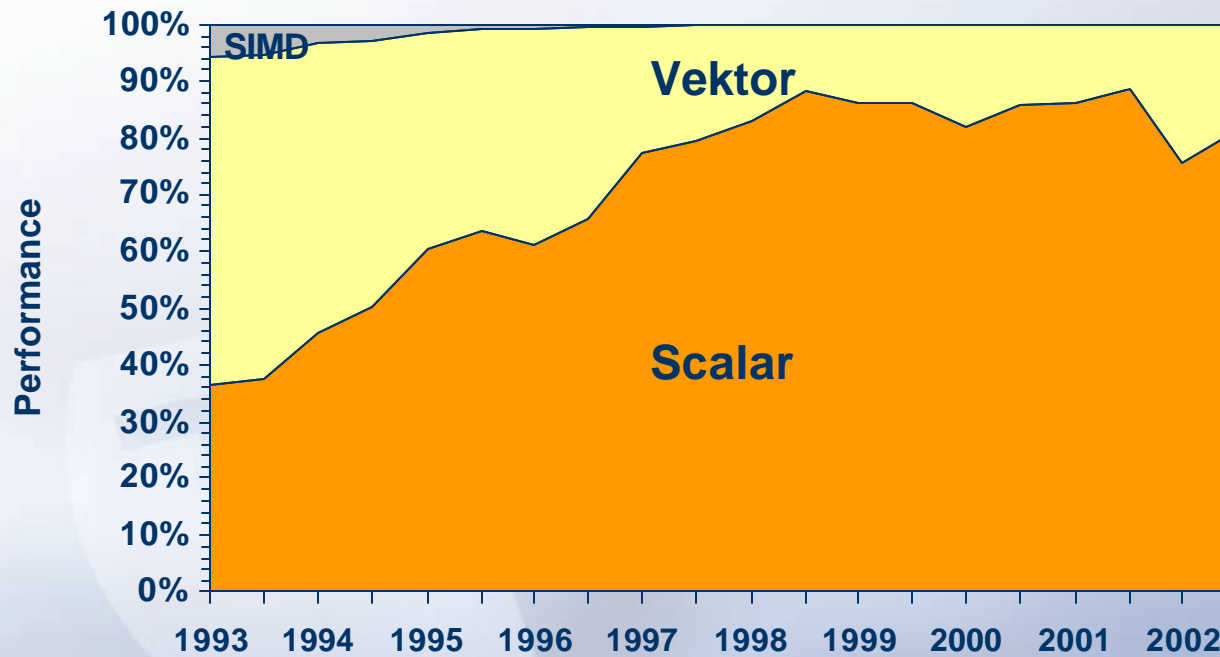
Producers Performance



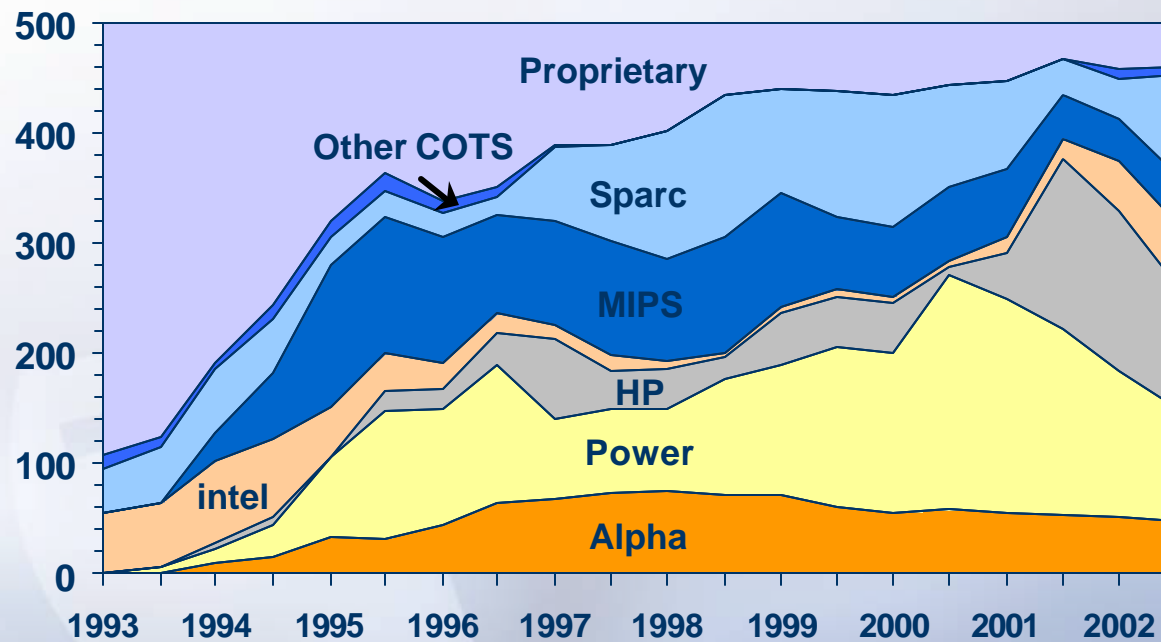
Processor Type

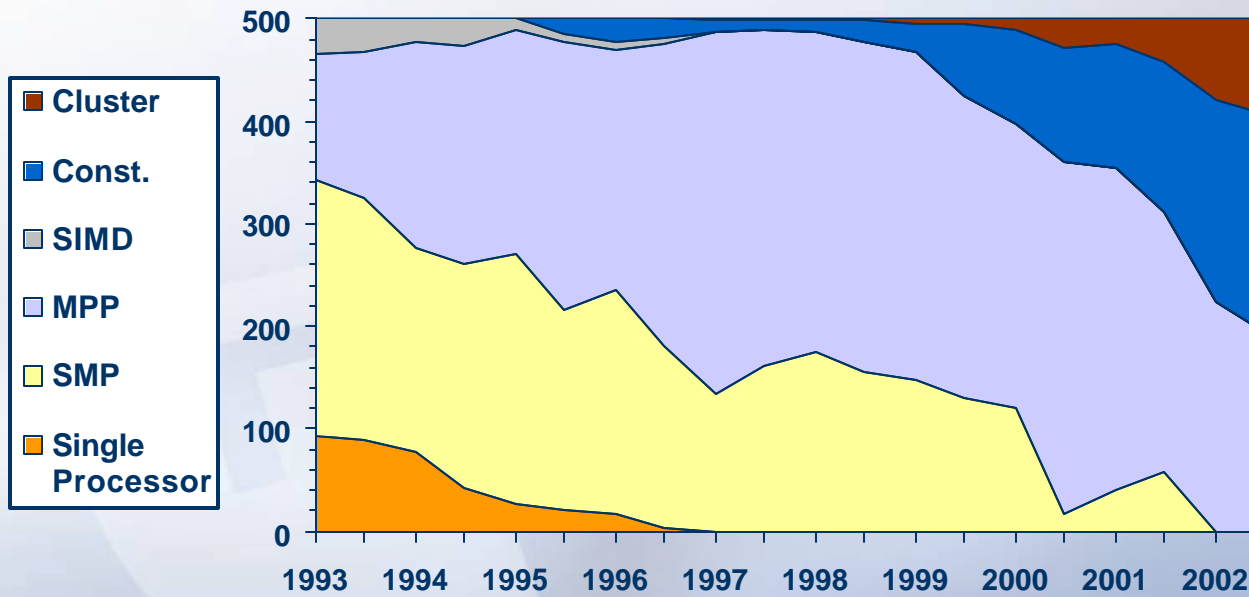


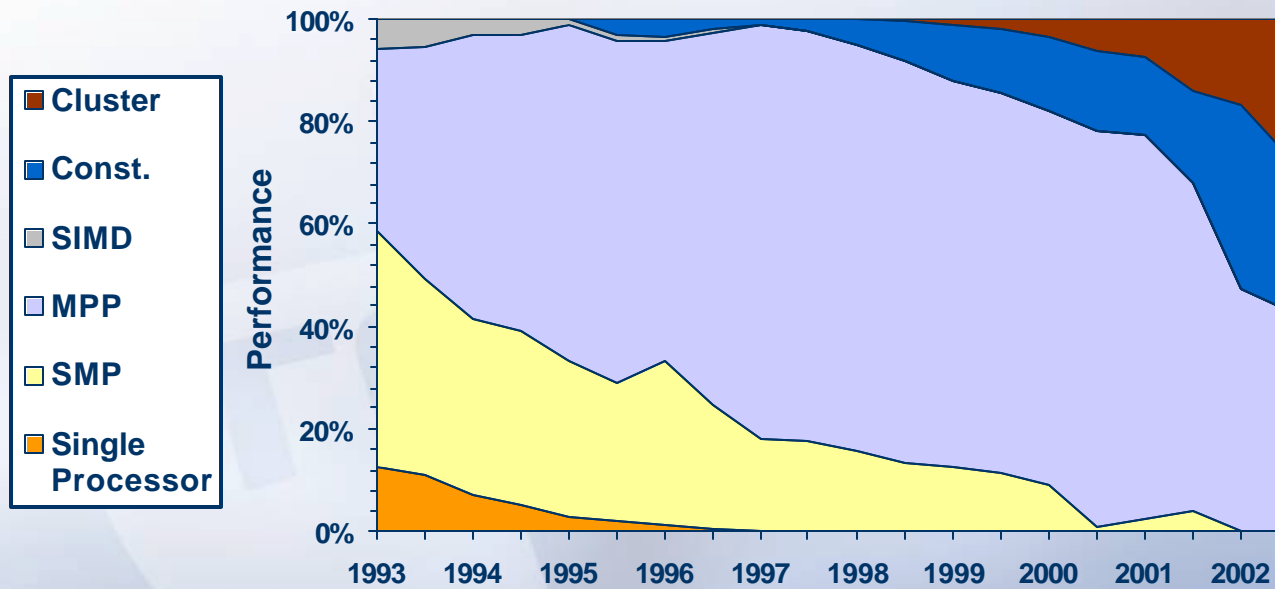
Processor Type



Processor Types



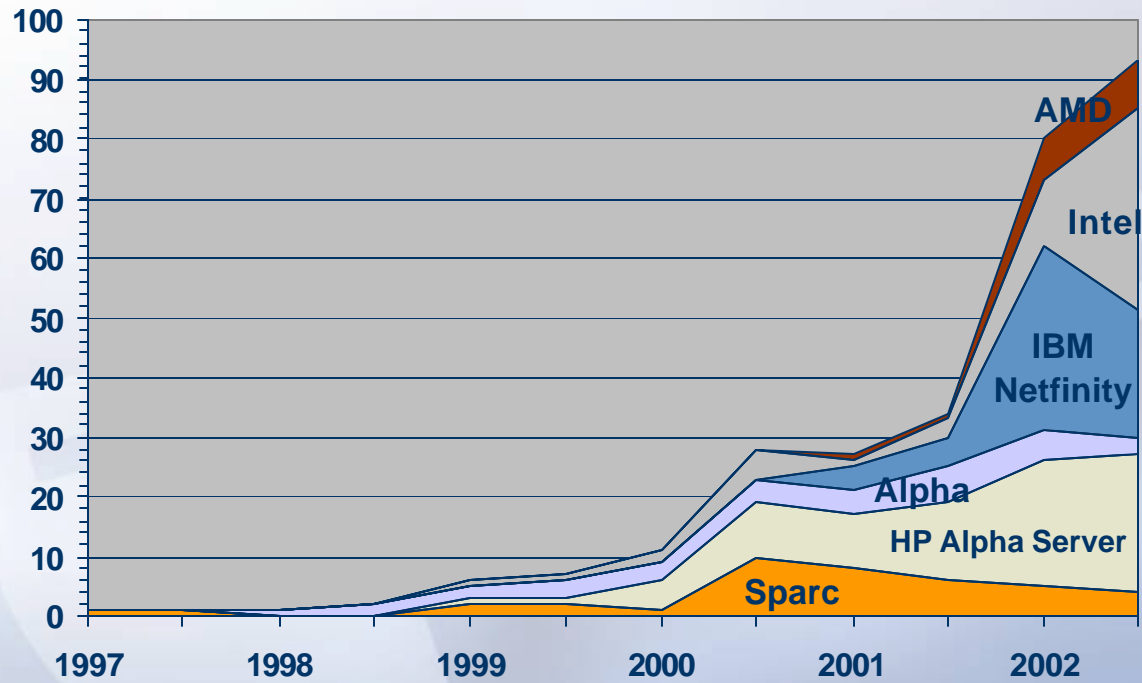


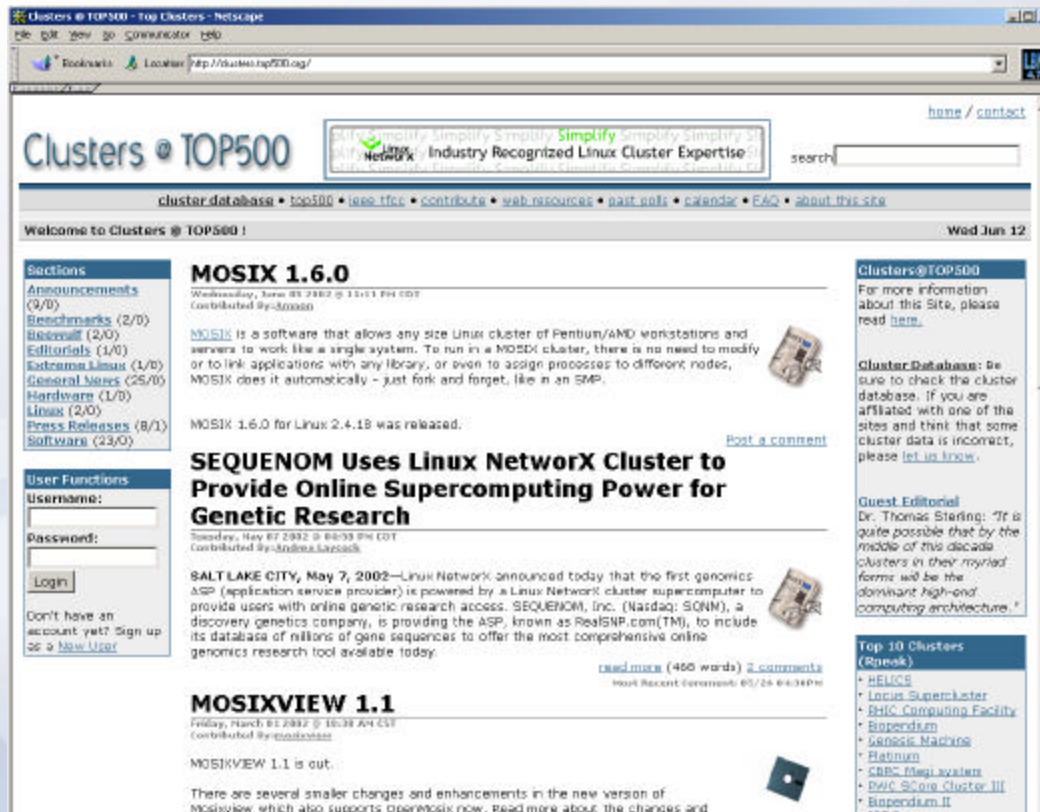


Excerpt from the 20th list

Rank	Manufacturer	Computer	Rmax [TF/s]	Installation Site	Country	# Proc
...
5	Linux NetworX	MCR Linux Cluster Xeon 2.4 GHz - Quadrics/ 2304	5.694	Lawrence Livermore National Laboratory	USA	2304
8	HPTi	Xeon Cluster - Myrinet2000	3.337	Forecast Systems Laboratory - NOAA	USA	2002
17	Atipa Technology	P4 Xeon 1.8 GHz - Myrinet	2.207	Louisiana State University	USA	1024
22	Dell	PowerEdge 2650 Cluster P4 Xeon 2.4 GHz	2.004	University at Buffalo, SUNY, Center for Computational Res.	USA	600
32	Dell	Vplant Cluster P4 XEON 2.4/2.0 GHz - Myrinet	1.272	Sandia National Laboratories	USA	660
42	Hewlett-Packard	rx5670 Itanium2 Cluster - Quadrics	1.090	Oil Company, Houston	USA	545
43	Legend Group	DeepComp 1800 - P4 Xeon 2 GHz - Myrinet	1.046	Academy of Mathematics and System Science Beijing	China	512
46	Linux NetworX	LCRC Xeon 2.4 GHz - Myrinet	1.007	Argonne National Laboratory	USA	361
...

NOW - Clusters



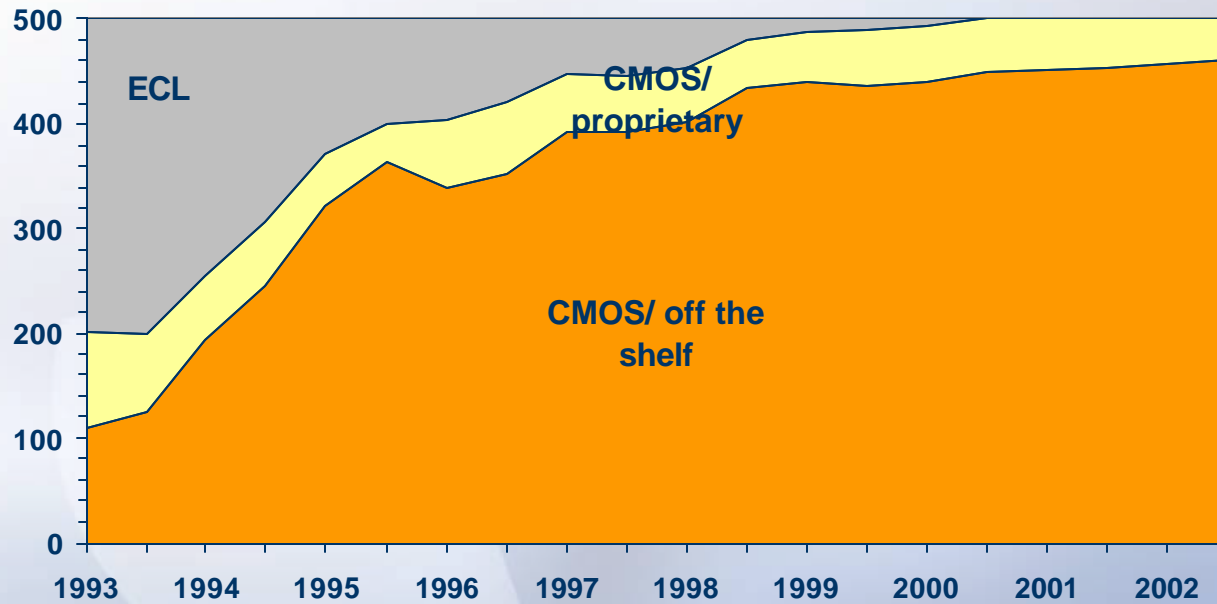


The screenshot shows the Clusters @ TOP500 website in a Netscape browser window. The page features a navigation menu with links for 'cluster database', 'top500', 'faq', 'contribute', 'web resources', 'past posts', 'calendar', 'FAQ', and 'about this site'. A search bar is located in the top right corner. The main content area displays three news items:

- MOSIX 1.6.0**: A software update for Linux clusters, dated Wednesday, June 05 2002. The article describes MOSIX as a software that allows any size Linux cluster of Pentium/AMD workstations and servers to work like a single system.
- SEQUENOM Uses Linux NetworkX Cluster to Provide Online Supercomputing Power for Genetic Research**: A news item dated Tuesday, May 07 2002, reporting that SEQUENOM, Inc. is providing the ASP, known as RealSNP.com(TM), to include its database of millions of gene sequences.
- MOSIXVIEW 1.1**: A software update dated Friday, March 01 2002, indicating that MOSIXVIEW 1.1 is out.

On the right side of the page, there are several sidebar sections: 'Clusters@TOP500' with a link to 'home / contact', 'Cluster Database' with a note to check for incorrect data, 'Guest Editorial' by Dr. Thomas Sterling, and 'Top 10 Clusters (Break)' listing various supercomputing facilities like BEUCS, Lucas Supercluster, and BHC Computing Facility.

Chip Technologies



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The Most Powerful Supercomputers and Sites (10 year retrospective)

Erich Strohmaier and Horst Simon
NERSC/LBNL

November 20, 2002

The Most Powerful Supercomputers 1993 - 2002

- We want to look at systems in the early and mid 1990s in perspective
- In order to account for the rapid performance growth, we need to normalize Rmax performance
- Define **normalized Rmax** for a system the ratio of its Rmax performance and the sum of all Rmax for all the systems on the list
- For each system on all twenty lists we recomputed the normalized Rmax in %
- The we added all the normalized Rmax values together

	Site	Company	System	sum% norm Rmax	Max Rank	Sum Rmax TF/s
1	Sandia	Intel	ASCI Red	49.0%	1	23.86
2	NAL	Fujitsu	Numerical Wind Tunnel	41.2%	1	3.68
3	ES Center	NEC	Earth-Simulator	28.4%	1	71.72
4	Sandia	Intel	XP/S140	26.9%	1	1.45
5	LLNL	IBM	ASCI White	23.6%	1	34.00
6	LANL	TMC	CM-5	19.8%	1	0.66
7	LANL	SGI	ASCI Blue Mountain	17.9%	2	13.55
8	U. Tsukuba	Hitachi	CP-PACS	16.1%	1	4.79
9	LLNL	IBM	ASCI Blue-Pacific	15.2%	2	15.01
10	Minnesota SC	TMC	CM-5	13.7%	2	0.48

Excluding Classified Sites

	Site	Company	System	Edition	% Rmax	Rank
1	ES Center	NEC	Earth-Simulator	Jun-02	16.2%	1
2	NAL	Fujitsu	Numerical Wind Tunnel	Nov-93	8.5%	1
3	Sandia	Intel	ASCI Red	Jun-97	8.3%	1
4	LLNL	IBM	ASCI White	Jun-02	6.7%	1
5	Sandia	Intel	XP/S140	Jun-94	6.4%	1
6	LANL	TMC	CM-5	Jun-93	5.3%	1
7	U. Tsukuba	Hitachi	CP-PACS	Nov-96	4.6%	1
8	LLNL	IBM	ASCI Blue-Pacific	Nov-99	4.2%	2
9	LANL	SGI	ASCI Blue Mountain	Jun-99	4.1%	2
10	Government	Cray	T3E1200	Jun-98	3.9%	2

- In order to determine the most powerful sites we added the normalized Rmax values for all machines and all 20 lists



Sites – Aggregated Performance%

	Site	sum % norm. Rmax	Max Rank	Sum Rmax TF/s	Country
1	Sandia National Laboratories	83.8%	1	32.33	US
2	Los Alamos National Laboratory	74.8%	1	44.08	US
3	Lawrence Livermore National Lab	59.3%	1	67.91	US
4	NAL	46.2%	1	5.12	Japan
5	University of Tokyo	33.9%	1	17.13	Japan
6	Pittsburgh Supercomputing Center	28.5%	2	18.77	US
7	Earth Simulator Center	28.4%	1	71.72	Japan
8	NERSC/LBNL	27.1%	2	17.68	US
9	Oak Ridge National Laboratory	27.0%	3	12.33	US
10	NASA/Ames Research Center	23.7%	17	8.20	US

Excluding Classified Sites

- Hans- Werner Meuer, University of Mannheim
- Erich Strohmaier, NERSC/LBNL
- Jack J. Dongarra, University of Tennessee
- Horst D. Simon, NERSC/LBNL
- Anas Nashif, Prometheus GmbH

More Information at www.top500.org or cluster.top500.org