



## Supercomputer The extreme machine of the age

EDWARD APURBA SINGHA

I am sure you are familiar with the term 'godfather'. Except its literal meaning, whenever we come across this term, we immediately anticipate something powerful or a very influential position. Like this, supercomputers are the godfathers of general-purpose computers as they encompass ultra high processing power and massive storage capacity.

Today from weather analysis to complex gene mapping all require the assistance of supercomputers. Supercomputers keep alive modern science and engineering activities. In this article I highlighted four most powerful supercomputers that presently dominate the computing world. Before that I need to disclose some basic information regarding supercomputers.

**History**

Seymour Cray is considered as a father of supercomputer. This legendary scientist founded his own company, Cray Research in 1960. He then continued to unveil his new



designs and stayed at the top position in supercomputing arena for five years (1985-1990).

Today, supercomputers are typically one-of-a-kind custom designs produced by 'traditional' companies such as IBM and HP, who had purchased many of the 1980s companies to gain their experience, although Cray Inc. still specializes in building supercomputers.

**Inside story**

Supercomputers are used primarily for scientific and engineering work. Unlike conventional computers, they usually have more than one CPU, often functioning in parallel (simultaneously); even higher-performance supercomputers are now being developed through use of massively parallel processing, incorporating thousands of individual processors. Supercomputers have huge storage capacity and very fast input/output capability, and can operate in parallel on corresponding elements of arrays of numbers rather than on one pair of elements at a time.

There are two approaches to the design of supercomputers. One, called massively parallel processing (MPP), is to chain together thousands of commercially available microprocessors utilizing parallel processing techniques. A variant of this, called a Beowulf Cluster, or cluster computing, employs large

numbers of personal computers interconnected by a local area network and running programs written for parallel processing. The other approach, called vector processing, is to develop specialized hardware to solve complex calculations.

The speed of a supercomputer is generally measured in "Flops" (Floating Point Operations Per Second) or TFLOPS ( $10^{12}$  Flops); this measurement is based on a particular benchmark, which does LU decomposition of a large matrix. This mimics a class of real-world problems, but is significantly easier to compute than a majority of actual real-world problems.

**Operating System**

Several operating systems are available today in order to coordinate operations of supercomputer. But Linux gained immense popularity and currently it runs more of the world's top supercomputers than any other operating system. Linux powers 60 percent of those machines, displacing Unix, which used to be most popular operating system for high-performance computing.

Linux powers 301 of the 500 top supercomputers, compared to 189 on Unix, 2 on FreeBSD, a Unix variant and one on Microsoft's Windows. Linux outgrows popular Unix operating systems like AIX and Solaris from Sun Microsystems because those

systems contain features that make them great for commercial users but add a lot of system overhead that ends up limiting overall performance. For instance, a "virtualization" feature in AIX lets many applications share the same processor but just degrades performance.

Now information regarding four powerful supercomputers such as Earth Simulator, Columbia, Blue Gene and MDGrape-3 are presented sequentially:

**Earth Simulator**

The Earth Simulator (ES) was the fastest supercomputer in the world from 2002 to 2004. The system was developed for NASDA, JAERI, and JAMSTEC in 1997 for running global climate models to evaluate the effects of global warming. It has been able to run holistic simulations of global climate in both the atmosphere and the oceans down to a resolution of 10 km.

Located at the Earth Simulator Center (ESC) in Kanazawa-ku (ward), Yokohama-shi, Japan, the computer is capable of 35.86 trillion (35,860,000,000,000) floating-point calculations per second, or 35.86 TFLOPS.

According to NEC, the ES is based on their SX-6 architecture. It consists of 640 nodes with eight vector processors and 16 gigabytes of computer memory at each node, for a

total of 5120 processors and 10 terabytes of memory. Construction started in October 1999, was completed by February 2002, and the site officially opened on March 11, 2002. The project cost 7.2 billion yen.

**Columbia** is a supercomputer built by Silicon Graphics for NASA. The supercomputer was installed at the NASA Advanced Supercomputing facility in 2004. According to the TOP 500 list, it is currently the eighth fastest computer in the world running at 51.87 teraflops, or 51.87 trillion floating point calculations per second.

It is composed of twenty SGI Altix 3000 nodes each of which have 512 Intel Itanium 2 processors bringing the total number of processors to 10,240. It was named in honour of the crew of the space shuttle Columbia. The SGI Altix platform was selected due to a positive experience with Kalpana, a single Altix 512-CPU system operated by NASA Ames which was integrated into the Columbia supercomputer system.

The computers are connected together with a Voltaire InfiniBand ISR 9288 288 port switch with transfer speeds of up to 10 gigabits (or 1250 megabits) per second, 10 gigabit Ethernet and multiple 1 gigabit Ethernet nodes.

**Blue Gene**

MDGrape-3 is a parallel computing system consisting of two main sections: a primary server unit and a specialized engines unit. The latter component is a cluster of 201 engines running proprietary chips developed by Riken specifically for MDGrape-3. It's this huge set of engines; running 24 MDGrape-3 chips each that does the heavy protein-analysis lifting. Each chip has a maximum processing speed of 230 gigaflops (one billion operations per second). The primary server unit manages the engine cluster. This parallel server setup runs two different types of processors: 65 servers run dual-core Intel 5000-series Xeon processors, 256 per server; and 37 servers run 3.3-GHz Intel Xeon processors, each with 2 MB of level 1 cache, at 74 processors per server. This hardware structure enables the 1-teraflop speed, which is the machine's theoretical maximum for certain processes.

As the power of supercomputers increasing day by day in near future they will acquire incredible strength to solve critical problems that is not possible to fix at this moment.

References: ibm.com, wikipedia.org, howstuffworks.com

**RHYTHM-BITS**

Japanese toy giant Tomy employee displays tiny toy robots shaped as little turtle 'Rhythm-bits', which reacts to music and dance with wagging its rear at the Tokyo International Gift Show on February 13. Tomy is expecting to put it on the market in July with a price of 1,800 yen (15 USD). Tomy sold over 500,000 units of Walkie-bits turtle robots in 2005.

PHOTO: AFP

**Amiga 500**

The Amiga 500, also known as the A500, was the first "low-end" Commodore Amiga 16/32-bit multimedia home/personal computer. It was announced at the winter Consumer Electronics Show in January 1987, at the same time as the high-end A2000, and competed directly against the Atari 520ST. The A500 was released in mid 1987 at the price of US \$595.95 without monitor.



startech@thelystar.net

## 'Madame Wikipedia' runs web giant from village HQ

AFP, France

**F**AR from the power-broking of Silicon Valley, the new boss of the Internet giant Wikipedia is a soft-spoken French mother of three, who runs the global success story from a home office in a village in central France.

Florence Devouard, 38, an agronomist by training who took on the top job at Wikipedia last October, first came across the user-written online encyclopaedia in 2001, when it was still a fledgling.

"What got me hooked was the idea of being able to write articles that left nothing out," she explained from her home in Malintrat, a village of 900 souls outside the city of Clermont-Ferrand -- a region better known for its extinct volcanoes and pure spring water than its Internet start-ups.

She started editing entries on genetically-modified organisms -- her field of expertise -- and was gradually drawn into Wikipedia's community of volunteer editors, who complete and correct each other's entries.

"At that point there were just a handful of us. We had to create the whole site architecture. Pretty soon I started focusing on internal organisation rather than writing articles," Devouard said.

Three years on -- having made a name as a bridge-builder between the project's French- and English-speaking communities -- she was elected to the board of the Wikimedia Foundation, the non-profit body that operates Wikipedia.

Last summer it was agreed she would step into the shoes of Wikipedia's founder, the US Internet entrepreneur Jimmy Wales, as chair of the board.

"What Jimmy Wales does best is public relations -- he just didn't have the time to look after the executive side of things as well," she explained.

Or extended maternity leave from a job developing tools for sustainable agriculture, she took on the volunteer role -- which she says demands the energy of a full-time job -- until July 2008.

"My job is to help 'professionalise' the project, and at the same time act as custodian of the Wikipedia community's founding principles."

With six million articles and counting, in 249 languages from English and Arabic to Tagalog or Wolof, Wikipedia is used each month by more than 100 million people and was last month voted one of the world's five most influential brands.

Since its launch in 2001, it has become a powerful symbol of a new generation of Internet service based on collaboration and information sharing -- referred to collectively by the tag Web 2.0.

"We're part of Web 2.0 -- we're an example of it -- but most Web 2.0 projects are commercial. We don't operate in the same sphere at all," Devouard said.

Internet giant or no Internet giant, in many respects Wikipedia -- which neither charges its users nor takes advertising -- is run on a shoestring.

The Wikimedia Foundation's task is to work out ground rules and editorial policy as Wikipedia expands and -- crucially -- raise funds to pay for IT investments and development projects.

"On January 15 we raised a million dollars, but ideally we need three times that" to cover the cost of new servers, Devouard said.

"As far as possible, we operate on a bottom-up principle. If an editor tells us we need to add a new software function, we go away and look at what's possible. But we also impose some things,

and nappy-changing with high-level web strategy: 'It's quite simple, I spend all my time running around."

"But that's just life: there are millions of women who have children and who work. It's wonderful when you have young children to be able to watch them grow up -- and a whole lot more interesting than a 12-hour day in a city office."

"France has the highest birth rate in Europe -- we have to find some kind of solution!"

Once the children are in bed, she flips open her laptop and links up via Internet chat with the other board members -- three in the United States, two in the Netherlands and one in Germany.

"I work mainly in the evening



Florence Devouard, chair of the Wikimedia foundation, pictured January 2007. From her small village in central France, the 38-year-old, is in charge of improving the quality of the articles and facilitate an easier access to the readers.

like regular calls for donations."

Beyond pure IT costs, the foundation would also like to send out copies of the encyclopaedia on CD for people without web access, or make it accessible to the visually-impaired -- all impossible without extra funds.

So Devouard is experimenting with new economic models -- such as matching user donations with corporate funds -- but must tread carefully to avoid upsetting editors fiercely attached to their independence.

She admits laughingly to the challenge of juggling school runs

and part of the night. Fortunately I don't need a lot of sleep, and that's when most of the Wikipedia community is online." Every six to eight weeks the board gathers in a European or American city for a face-to-face meeting.

She admits Malintrat is a far cry from Microsoft's leafy corporate campus in Redmond, Washington, but then, she says, Wikipedia is also "another world" from its big business.

## Oracle – 'Vendor of the Year for HR Technology'

StarTech Desk

**O**RACLE has been named "HRIS (Human Resources Information System) Vendor of the Year 2006" by *Human Resources* in their latest annual 'HR Vendors of the Year' awards, in recognition of Oracle's market-leading Human Capital Management software solutions, says a press release. *Human Resources* is a leading HR publication in Singapore, with regional readership amongst the wider HR community.

Oracle also won top spots in eight other categories to emerge as the vendor with the highest number of awards received, including:

- Best HRIS Vendor - Distribution & Logistics Services sector (Winner)
- Best HRIS Vendor - Financial Services sector (Winner)
- Best HRIS Vendor - IT & Telecommunications (Winner)
- Best Payroll Software Vendor
- Financial Services sector (Winner)
- Best Payroll Software Vendor
- IT & Telecommunications (Winner)
- Best Payroll Software Vendor
- Distribution & Logistics Services sector (Second)
- Best HRIS Vendor - Manufacturing (Second)
- Payroll Software Vendor of

the Year (Third)

The annual "HR Vendors of the Year" awards by *Human Resources* are well regarded in the HR industry in Singapore. The results of this year's awards are based on extensive research conducted by BDM Intelligence and user survey responses from 466 HR professionals, representing 462 organisations across various industries.

Oracle's strong performance in these awards reinforces its position as the number one Human Capital Management (HCM) solutions provider worldwide and preferred choice for customers across Asia Pacific.

Organisations that are users of Oracle Human Capital Management solutions include: Alibaba (China), Amway Company Limited (China), Bangkok Dusit Medical Services Pcl (Thailand), Bank of India (India), Cheongju National University of Education (Korea), Daum Communications (Korea), Delhi Call Centers Pvt Ltd (India), Employees Provident Fund (Malaysia), First Commercial Bank (Taiwan), GRD Minproc (Australia), Huawei (China), Hutchison International (Hong Kong), Infocomm Development Authority (Singapore), Jeonju National University of Education (Korea), LG Electronics (Korea), Maruti Udyog Ltd (India), Ottogi (Korea), PT Lippo Karawaci Tbk (Indonesia), Panasonic Electric Works (China), Pune Customer Operations Pvt Ltd (India), Shanti Communication Company (China), Shenzhen Development Bank (China), Sindorico (Korea), Sinosteel (China), Synergis Holdings Ltd (Hong Kong), SVA-NEC (China) and Universiti Islam Antarabangsa (Malaysia).

"We are honoured to receive recognition from the HR community and *Human Resources* magazine," said Sean Loiselle, senior director for Human Capital Management, Oracle Asia Pacific. "Progressive organisations across Asia Pacific recognize the strategic value of human capital and are leveraging technology to give them a competitive edge in improving workforce performance. These awards reflect Oracle's commitment and proven track record in driving ongoing innovation and technology best practices for all aspects of human capital management. Our focus continues to be on ensuring that we deliver industry-leading human capital management solutions, enabling a superior ownership experience to HR professionals worldwide."