

When the CRAY-1 was designed in 1976 by Seymore Cray, it was the fastest computer in the world. It was used for a larger scale scientific calculation requiring many floating-point operations, such as aircraft or weapons design. When operating at maximum speed, it could produce two floating points results every 12..5 nanoseconds.

The system had 1662 modules, each with 5-layer circuit boards mounted on a heavy copper heat transfer plates. Only 3 chip type were used: an ECL 16-pin 5/4 NAND gate, a 16 X 1 register chip, and a 1024 X 1 memory chip. The average power consumption of each board was 49 watts, to a maximum of 65 watts.

#### CPU

|                          |   |
|--------------------------|---|
| Instruction size         | 16 or 32 bits   |
| Repertoire size          | 128 instruction codes   |
| Clock period             | 12.5 nanosecond   |
| Instruction stack/buffer | 64 work (4096 bits)   |
| Functional units         | twelve:<br>3 integer add<br>1 integer multiply<br>2 shift<br>2 logical<br>1 floating add<br>1 floating multiply<br>1 reciprocal approx.<br>1 population count |
| Programmable registers   | 8 X 64-bits<br>73 64-bits<br>72 24-bits<br>1 7-bit  |
| Max. vector result rates | 12.5 nanoseconds / unit   |

#### FLOATING POINT COMPUTATION RATES (results per second)

|                |                               |
|----------------|-------------------------------|
| Addition       | 80 X 10 <sup>6</sup> / second |
| Multiplication | 80 X 10 <sup>6</sup> / second |
| Division       | 25 X 10 <sup>6</sup> / second |

#### MEMORY

|            |                       |
|------------|-----------------------|
| Technology | bipolar semiconductor |
|------------|-----------------------|

|                           |  |
|---------------------------|--|
| Word length               | 72 bits (64 data, 8 SECDED)  |
| Address space             | 4M words   |
| Data path width (bits)    | 64 (1 word)  |
| Cycle time                | 50 nanosecond  |
| Size                      | 262,144 words or<br>524,288 words or<br>1,048,576 words                      |
| Organization / interleave | 16 banks (8 banks optional)  |
| Maximum band width        | 80 X 10 <sup>6</sup> words / second<br>(5.1 X 10 <sup>9</sup> bits / second) |
| Error checking            | SECDED   |

#### PHYSICAL CHARACTERISTICS / ELECTRONIC TECHNOLOGY

|   |   |
|---|---|
| Size of CPU cabinets                      | 9 feet diameter base<br>4.5 feet diameter center<br>6.5 feet height |
| Weight of mainframe                       | 5.25 tons   |
| Cooling                                   | Freon   |
| Plug-in modules                           | 1662  |
| Module type                               | 113   |
| PC boards                                 | 5 layer   |
| Circuitry (equivalent no. of transistors) | 2.5 Million   |
| Logic                                     | ECL, 1 nanosecond   |
| High-density logic                        | SSI   |

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San Francisco Examiner, Business Thursday April 15th 1993

This Cray had had its day

What was once the world's fastest computer is sold by Livermore Lab for its scrap value

By Tom Abate  
EXAMINER TECHNOLOGY WRITER

Call it a symbol of technology obsolescence, or a museum piece, perhaps.

But a Cray1 supercomputer, once the world's fastest computational device, is now sitting in a South San Francisco warehouse, where it will either be sold to a collector or get melted down to recover the five tons of copper and gold inside.

Hayward businessman Tony Cole bought the supercomputer for \$10,000 at a surplus equipment auction at Lawrence Livermore National Laboratory. When purchased new in the late 1970s, the Cray 1 cost \$19,000,000, lab officials said.

"We got our money's worth out of it," said Derrol Hammer, a purchasing agent at the lab. "We ran that machine for over 10 years at 24 hours a day."

But Hammer said it cost more than \$35,000 a month to run the Cray 1, a cylindrical machine that is 7 feet tall and 9 feet in diameter, and requires its own electrical substation to provide it with power.

"A desktop workstation of the Sun type, or a Silicon Graphics workstation that we can put on a desk, is a Cray 1 equivalent," Hammer said. "You can buy a workstation for the monthly cost of maintenance" on the Cray 1.

So in 1990 Livermore pulled the plug on the aging supercomputer, and began asking other government and university labs if they wanted the 10,000 pound digital dinosaur. When no takers surfaced, the lab auctioned off the machine in February.

Enter Tony Cole, 29 founder of VIPC Computers, a 10-year-old Hayward firm that salvages useful components or scrap metals from surplus machines. Cole offered the highest of seven bids, and drove away on a flat-bed truck with several tons of supercomputer and associated peripherals.

"We're sure to make our money back on the scrap value of the metal alone," Cole said. "There's at least \$15,000 worth of gold in that thing."

Because it is an excellent conductor, gold was used to coat the edge connectors on the more than 1,600 circuit cards that made up the Cray's innards. Cole said each circuit card also contains about 2 pounds of valuable copper.

But rather than crush the machine for its metals, Cole would like to sell it intact as a relic of the early supercomputer age.

"The Cray system is the granddaddy of all of them," Cole said. "I would like to sell it to somebody like Bill Gates or Ross Perot."

"It would make a great centerpiece."

But so far the Hayward entrepreneur has had trouble even giving the Cray away. Gloria Chun Hoo of the Tech Museum of Innovation in San Jose said Cole had offered to loan the machine to her institution, but the museum thinks it is too heavy.

"We thought we could put it in our lobby," she said. "But occasionally people have evening receptions here, and we couldn't keep moving it out of the way."

Courtesy of the Oakland Tribune by Editor Kathy?

The Oakland Tribune, Wednesday April 14th. 1993

Lab sells its supercomputer at a bargain-for \$10,000

After 10 years or use, the one-time \$19 million machine was just too outdated and costly to keep

By David Berkowitz  
STAFFWRITER

Was it colossal government waste or just the price of staying in the research game?

About 10 years ago, Lawrence Livermore Laboratory paid \$19 million for a Cray-1 supercomputer, then the fastest, most complex computer available in the world.

In late February, the lab sold that same computer at auction-less a few key propriety components-for \$10,000 to Hayward computer reseller.

Tony Cole, 29, said he bought the machine figuring that at the very least he could break it down and sell its gold and other metal parts for \$16,000 to \$20,000.

At best, Cole hopes to deal the 30-ton machine to a technology museum or some domestic company able to foot the \$100,000 to \$500,000 tab of restarting the now-obsolete machine.

Seven parties submitted sealed bids to buy the supercomputer at the auction, a lab spokeswoman said.

"Normally you can't get ahold of one of these, regardless of the age, because of the nature of it." Said Cole, only the second private citizen to buy a Cray-1.

Cray Research Inc. installed about 40 Cray-1s between 1976 and 1982, after which it released the more Cray X-MP and the Cray-2, said Ron Rayome, an analyst with Cray in San Ramon.

The computer was used to simulate physical events, such as airflow over an airplane's wing or a missile's casing.

"The thing that made the Cray-1 unique was that it was products that exhibited a clear superiority to any other previous technology," said Alan Geller, a sales representative for Cray.

Lawrence Livermore Laboratory, deeply entrenched in weapons research during the Cold War era, considered the supercomputer crucial to its design efforts.

For the lab, it wasn't a matter of paying \$19 million for a machine that would lose nearly all of its value in 10 years: it was a matter of getting the most possible use from a top computer for \$1.9 million a year, plus maintenance cost, said Mike May, a former lab director.

"You don't really buy it with the idea of reselling it," said Gary Dvorchak, an industry analyst with Hambrecht & Quist in San Francisco.

"Presumably, they got the full value they were looking for in terms of the projects they were working on. There are things you can't do without a supercomputer. That's why they're buying them."

"There's not much choice," agreed Bruce Kelly, a computer scientist at the lab. "That's the price tag they put on those types of machines. And we need the machine. They do large scientific calculations, real number-floating point calculations. They do them very fast, and they can do a lot of them."

Today, the lab uses newer versions of Cray supercomputer, including the latest \$30 million YMP-C-90, which is 100 times more powerful than the Cray-1.

The Cray-1 that Cole bought was actually one or two the lab retired to a warehouse in 1990 because they were outdated and too costly to maintain. The other was sold three years ago.

Darrol Hammer, a technician who works with supercomputers, said the lab was paying more than \$30,000 a month to keep the Cray-1s running.

Meanwhile, he said many modern desktop computers were able to perform the same functions as quickly and accurately as the Cray, he said.

"It just does not pay to keep something like that going," Hammer said. "The power requirements on one of those is incredible."

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NEWS & INDUSTRY  
SILICON VALLEY NEWS

"Look Honey, I Bought A Cray 1 Supercomputer!"

Tony Cole of Hayward, California says he is the first individual on record to own a Cray Model 1 supercomputer. Though the

supercomputer doesn't work, Cole says the gold in it alone could be worth as much as \$60,000.

Cole bought the Cray at a government auction held by Lawrence Livermore National Laboratory (Livermore, Calif.) in February of this year. Cole says the Cray can be fixed, and he plans to sell it to the highest bidder. It stands about seven feet high, weighs in at 20,000 pounds, and cost the government an estimated \$19 million new in 1976. Cole said he bid a binary amount, \$10,101.01, for the Cray in sealed bids accepted by Lawrence Livermore, figuring the binary number would be lucky. He won the bid, but it took a week for Livermore Labs to requisition a forklift big enough to move the supercomputer the 100 feet to the dock where Cole could load it.

The Cray 1 was billed as the first "designer" computer with its cylindrical shape and custom genuine leather upholstery. It took four years for Seymours Cray to build the first Cray 1 when he started Cray Research in 1972.

When the first Crays were delivered, they were the world's fastest supercomputers, but only three were known to be still operational in 1991, while others have become museum pieces.

The Cray 1 is cooled by liquid nitrogen, and offers 29 14-inch removable media disk drives systems weighing in at 600 pounds each. The main computer housing holds 20 panels with 2,800 printed circuit boards with gold connectors. As for processing speed, Digital Equipment Corporation's new 64-bits Alpha chip, 21064, offers the same processing speed as the Cray 1.

Cole says while he could get his money back by selling the Cray for scrap metal, he is hoping to get more. "Selling a Cray just to get gold out of it would be like selling a Model-T Ford for the scrap iron," Cole said. He's hoping Ross Perot or Bill Gates might be interested in having the Cray for their offices. An old Cray employee has even contacted him to offer to get the Cray working again. "I'm waiting to see what happens," Cole added.

-Linda Rohrbough, Newsbytes