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The Naval Postgraduate School Celebrates 50 Years in Computing

By Dr. Christine Cermak - January-March 2005

Information technology pioneers from around the world gathered at the Naval Postgraduate School to celebrate 50 years of academic computing leadership and share their visions for the future. This watershed event, held Aug. 27, 2004, featured Mark Pullen, Director of George Mason University's Networking and Simulation Laboratory C3I Center; Dr. Robert Kahn, the "Father of the Internet"; Professor Peter Denning, chairman of the NPS Department of Computer Science and director of the university's Institute for Information Innovation and Superiority; and Dr. Christine Cermak, NPS Executive Director of Information Resources and chief information officer.

CHIPS celebrates with NPS by featuring three articles that highlight the NPS leadership role in pursuing advanced technologies. We will begin with an article by Dr. Christine Cermak, which traces some of the school's proud "firsts" in U.S. Naval computing.

The Naval Postgraduate School has a rich history in computing and information technology. Established in 1909 in Annapolis, Md., we will soon be celebrating our centennial year.

In 1951, NPS moved to its present location in Monterey, Calif. Almost immediately after the move to Monterey, NPS began to assume its leadership role in computing. The graduate and research programs at NPS used computing and information technology as a scientific tool, and as the subject of inquiry and experimentation. Not surprisingly, NPS was one of the first ARPANET nodes in California because the NPS faculty and students quickly recognized the value of networks and demanded connectivity.

To put NPS progress in context, I thought it might be helpful to give you a quick snapshot of NPS today. We have about 450 full-time tenured and tenure-track faculty members and approximately 1,500 students. Our student body is comprised of officers from all military services and Department of Defense employees. About 33 percent of the students are foreign officers representing over 50 countries around the world.

Last year, our faculty brought in more than $95 million in research funding. As a result, NPS is considered a research-intensive university and ranks among the top 100 U.S. universities in research funding — particularly impressive when you consider our comparatively small size.

Our information technology environment is complex. We support both .edu and .mil domains; we have classified and unclassified networks, and support wireless and VoIP (Voice over Internet Protocol). Our faculty and students access supercomputers all over the United States and participate in Internet2 initiatives. Our faculty are members of National Academy committees forging recommendations about technology research, and they serve on international organizations crafting Web policies.

NPS supports about 55 gigabytes of Internet traffic daily, 110 terabytes of mainframe data and 924 gigabytes of e-mail data. Every NPS curriculum and research program uses information technology. In many cases, the technology itself is the subject of the course or the research program. The technology world has also changed, as you can see below.

• IPv6 will increase the number of Internet addresses from 4 billion to 340 trillion.

• A National Center for Education Statistics 2003 report noted that 75 percent of 5-year-olds use computers and about 25 percent use the Internet.

The world's first Cray Supercomputer, Control Data Corp.'s Model 1, No. 1, being installed at the Naval Postgraduate School in 1960.

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• The number of Internet hosts grew from four in 1969 to just under 200 million today.

• According to an Internet Domain Survey, the Internet is growing at a rate of about 40-50 percent per year. Americans, who dominated Internet use for so long, are now dropping in the percentage of total users — illustrating the true global nature of this technology.

• A recent report to Congress compared the diffusion of technologies in the United States. From invention, it took 38 years for phones to be used in 30 percent of households. Television took 17 years. Personal computers took 13 years. Commercial Internet took less than 7 years to be used by 30 percent of U.S. households.

• The Corporation for Education Network Initiatives in California, or CENIC, is calling for gigabit connectivity to every California educational institution, business and home by 2010. This level of connectivity is seen as integrally linked with economic development and the vitality of the state. In fact, Gartner's 2003 report on this subject estimated a $376 billion increase in gross state product and 2 million additional jobs as a result of implementing the CENIC "Gigabit or Bust" initiative.

As a result of the changes in the larger environment, we at NPS realized that we could only participate in these exciting changes through a network of strategic partnerships. Our partnership with the city of Monterey and California State University, Monterey Bay is possible by connectivity with CENIC. That, in turn, made Internet2 membership possible.

Through the vision of the City of Monterey's chief information officer, we were able to construct a local-area, high-speed network with regional Defense Department and federal partners at the Defense Language Institute, Fleet Numerical Meteorology and Oceanography Center, Naval Research Laboratory, National Weather Service and the Defense Manpower Data Center. This creative joint effort permits us even more efficient vehicles for collaborative work.

With our colleagues at CENIC, we are exploring the possibility of higher level access to California's higher education network — moving from the current Defense Research and Engineering Network (DREN) DS3 speed to gigabit and then to 10 gigabit. Technology planning at NPS today involves forging alliances with the Department of the Navy CIO, other Navy higher education institutions, the Naval Education and Training Command, our local DoD and federal agency colleagues, state agencies, national network organizations, higher education partners, and municipal and county governments.

In addition, our matrix of partnerships includes corporate as-sociates. For example, in order to assist in our faculty's research on 10 gigabit networks, Foundry Networks donated a laboratory to the NPS Foundation that was awarded to faculty in our Informa-tion Sciences department. Sun Microsystems has provided NPS with future technology briefings and access to its senior scientists. In addition, Sun has donated equipment to the NPS Foundation that was awarded to the NPS Center for Information Security Research. Sun is an especially interesting company for those of us in universities because its roots are in higher education — its corporate name stands for Stanford University Network.

Partnerships are an intrinsic part of our technology present and future. Just as multidisciplinary work is the hallmark of 21st century higher education — collaboration is an imperative for technology planning. Sharing resources not only gives NPS a better return value in terms of technology investment dollars, but more importantly, in intellectual collaboration.

The last 50 years showed us the way to a rich future with impressive accomplishments and innovative — and sometimes risky initiatives. This history left a legacy that urges raising the bar each year.

50 Years of NPS Computing Highlights

• 1953 - Lt. Cmdr. Warren Randolph Church, the "Father of NPS Computing" and chairman of the Department of Mathematics, purchased the first electronic automatic digital computer, a National Cash Register 102A for the department.

• 1960s - Church replaced the NCR 102A with the world's first all-solid-state computer, Control Data Corp.'s CDC 1604 Model 1, No. 1. It was designed, built, tested and certified by the legendary Seymour Cray. Cray's first-born supercomputer was the first of 10 ordered by the Navy's Bureau of Ships for Operational Control Centers worldwide. • The Naval Numerical Weather Project (NANWEP) was given time on NPS' newly-minted CDC1604 for a feasibility study. NANWEP soon got its own super-computers. Renamed the Fleet Numerical Meteorological and Oceanographic Center, it is still collocated with NPS just a mile away. • NPS was among the first to move beyond single-user machines to multi-access timesharing.

• 1970s - NPS Professor of Computer Science, Gary Kildall, wrote the world's first high-level programming language for Intel's microprocessor, and then the first microprocessor operating system, soon to be run on nine out of 10 PCs. He soon founded Intergalatic Digital Research, later shortened to Digital Research. About the same time, IBM approached a young Bill Gates to design an operating system for its PC, and he referred them to Kildall. IBM went back to Gates when Kildall's approach didn't work out ... and the rest is history. • NPS established its first Computer Science Group, and two years later it was the third California node to connect to the ARPANET. • By the end of the decade, NPS had a dedicated Department of Computer Science.

• 1980s - NPS purchased an IBM 3033AP mainframe, marking a major shift from punched cards to online terminals. • Learn-ing Centers were set up across campus, making workstations widely available.

• 1990s – NPS implements a five-year computer infrastructure master plan, "Support of Graduate Education in the 1990s." The program purchased an AMDAHL 5995-700A and a Cray X/MP (E98) supercomputer; Sun servers to support the campus network; 150 Sun Sparc10 workstations in faculty offices and clusters throughout campus; StorageTek mass-storage silos accessible via the network; Learning Resource Centers; a Scientific Visualization Laboratory; a War Laboratory for secure classified thesis production; the first Web browser; and a robust, high-speed, flexible, centrally-managed campus network. • By the end of the decade, the speed of the NPS network had increased from 10 to 100 megabits per second. • In 1997, the AMDAHL was replaced by an IBM 9672 mainframe, followed in 1998 by a move to PC standardization implementing the Navy's Information Technology for the 21st Century (IT-21) Strategic Plan.

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Introduction and sidebar by Barbara Honegger, Senior Military Affairs Journalist, NPS Public Affairs.

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