7-1987

ACUTA eNews July 1987, Vol. 16, No. 1987

Association of College & University Telecommunication Administrators

VOLUME 16, NUMBER 7 JULY, 1987 RUTH A. MICHALECKI, EDITOR

211 Nebraska Hall, University of Nebraska, Lincoln, NE 68588 • Telephone (402) 472-2000

Stanford University switches to the Meridian SL-100.

When asked to rate U. S. universities by the quality of their undergraduate programs, national university president --- in two separate surveys --- most often assigned top ranking to one institution: Stanford University.

In a recent survey of deans of business schools, Stanford again received the highest honors. So, too, did its education school in a separate study. And, as a research institution, Stanford is considered one of the top five in the world. Its preeminence in research is based not merely on opinion but on fact, as the university counts among its faculty nine Nobel laureates.

In quality of life, Stanford would surely rate an A-plus as well. Located in Palo Alto, California, 30 miles south of San Francisco, the 8,200-acre campus is a palette of palm trees and Romanesque architecture --- an environment as stimulating to the eye as it is to the intellect.

To be associated with such an illustrious institution, "Stanford demands excellence, both from its faculty and its student body," says Ed Shaw, a stanford alumnus who now serves as the university's director of Information Technology Services (ITS). His department is responsible for managing the university's voice and data communications systems.

At Stanford, Shaw is quick to point out, striving for excellence is not limited to research and instruction; it is a value that carries over to the management of the university.

"Stanford has been able to attract a group of people to its academic management, student-service management and business and finance management that is as good as any," he says. "And that makes it a challenging institution. The people on the management side place a premium on excellence as they look for better ways to serve the faculty and students --- better in the sense of improving productivity and efficiency."

Recently the ITS group found a better way for the university to communicate. It replaced its outmoded analog telephone system and cable, graduating to the largest, most advanced Private Branch Exchange (PBX) available: Northern Telecom's Meridian SL-100 integrated services network.

Utilizing digital switching components and fiber optic transmission facilities, this new electronic telecommunications network is an integral part of a system that also includes separate lines for data communications and cable television technology.

Stanford's telecommunications needs are sizable, calling for a switch with the capacity to serve 1,300 faculty members and a support staff of 10,600 people working in 240 buildings and a medical center. Eventually the system may be expanded to handle residential telecommunications for 13,000 students.

The Main Quad, Stanford University, which was completed in 1903, covers 17 acres in the heart of the campus.

After reviewing the products of 12 vendors, then narrowing the field to three, Stanford chose the meridan SL-100 system because "we felt that it was, and still is, without peer in the marketplace for the size switch we needed," says Shaw.

But the selection wasn't based solely on technological capability, he adds. "We also felt that marketing support was crucial." Northern Telecom, the ITS team determined, was the leader in that regard as well. "They did their homework," Shaw says.

"They found out what our needs were, and then cast their technology to meet our needs. We saw more of the Northern Telecom people --- salespeople and marketing people --- in the six months leading up to the decision than any of the other vendors. Northern Telecom was the one that took the bear by the tail."

The selection of the system was confirmed when Northern Telecom agreed to work with Stanford and BNR, Northern Telecom's research subsidiary, in developing communications technology. This technology would measure and increase the productivity of engineers, systems analysts and other knowledge specialists working at the university.

The installation of the Meridan SL-100 began early in 1985, with portions of the system coming on line in December of that year. The work was completed in April 1986. "From a technical viewpoint, it was a very smooth installation," Shaw reports, "We had no downtime."

The sprawling university system presented some special requirements. The switch had to be laid out according to a complex plan developed by the ITS staff. The system was configured in a series of distributed nodes --- eight in all. Connecting the nodes to the host site is a giant highway of fiber that rings the campus.

Mike Glenn, director of SL-100 distributor support to PacTel Information Systems for Northern Telecom, explains the significance of this architecture: "Because the distributed intelligence is so close to the end user, a solid copper wire loop can be run from each workstation to the switch with full digital capabilities." That's a unique design, he adds, that results in very clear communications with virtually no decibel loss.

In the future, when Stanford decides to increase the speed of its data communications system, it will be able to provide 2.5 megabits to each workstation through this design.

More than 10 miles of fiber optic transmission cable link current and future Electronic Communication Hub (ECH) sites. Wiring within the buildings is composed of two three-pair copper cables terminating in a dual modular jack outlet for each 100 square feet of office space. Covering Stanford's existing four million square feet of building space, the Meridan SL-100 system now serves more than 14,000 lines; 2,000 lines will be added in the next few months. Ultimately, the network may be expanded to accommodate more than 22,000 voice lines.

Now that the network is fully operational, what benefits has it brought to the university1?

One important advantage, says Shaw, is that the Meridan SL-100 system gives the university control over its telecommunications costs. With the system, he explains, "we have a kind of insurance policy against rate increases." To further control expenditures, the system provides least-cost routing for toll calls in the local area and for long-distance calls.

Access to the outside world --- simply receiving calls --- certainly is a primary benefit as well. The old telephone system was so overburdened, calls often couldn't get through to the university, he says. Compare that to the Meridan SL-100, which processes more than 30,000 calls a day, and there is a vastly improved communications picture.

The phones themselves make communication easier too. Call Forward, Multiparty Conferencing, Group Pickup, Speed Dial and Speed Redial are among the features offered by the new system.

Approximately 20 percent of the SL-100 telephone sets are electronic, with push-button access to features and support for/multiple telephone numbers. The remainder are single-line instruments with four function buttons, a Link key, a Message Waiting light and a code access to system features.

Stanford University Medical Center includes the School of Medicine and the Stanford University Hospital.

At Stanford University Medical Center, a complex of nine buildings that includes a 660-bed hospital and a medical school, the Meridan SL-100 provides the interface for doctors to dictate medical records over the phones. Initially this analog feature didn't work well with the SL-100 digital system, reports John Jacobsen, manager of telecommunications at the medical center.

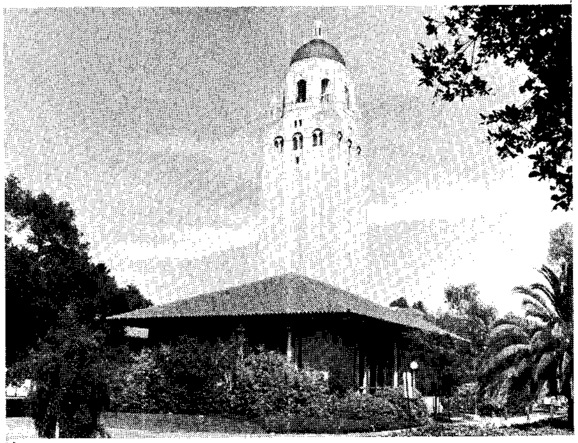
He adds, however, that Northern Telecom helped his department develop a set of channel banks to make the technologies compatible.

Like the rest of the Stanford campus, the medical center is processing calls "so much faster," Jacobsen notes. "The SL-100 gives us far more capacity over the previous system. It was all peaked out; it couldn't grow at all." The largest node in Stanford's telecommunications network, the medical center's Remove Line Concentrating Modules (RLCMs) handle between 4,000 to 5,000 lines, including telecommunications to patient rooms, medical personnel stations and paging equipment.

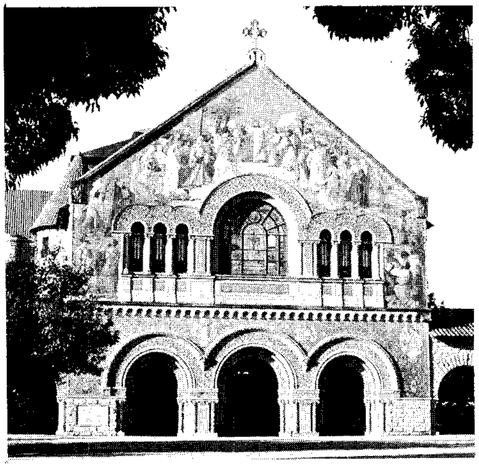
As a medical center and an academic environment, Stanford is one of the world's premier institutions. "We're very excited to be working with a university like Stanford," Glenn says. "Together, Northern Telecom, BNR, PacTel Information Systems and Stanford have unlimited opportunities to develop new applications to test new equipment --- and to effect the merger of voice, data, text and images in a fully integrated operating system.

"It is clearly within our reach."

The above article appeared in NORTHERN TELECOM, Spring 1987 issue.



Hoover Tower, a landmark at Stanford University, houses the Documentary collections of the Hoover Institute on War, Revolution, and Peace.



Stanford Memorial Church is noted for its Italian mosaics and American stained glass windows. It is nondenominational and was built by Jane Stanford as her memorial to her husband, Senator Leland Stanford.

THE BROADBAND CABLE NETWORK

University of North Carolina
at
Chapel Hill

--- **Steve Harward**

GENERAL

This guide has been prepared to provide University departments and agencies general information regarding the Campus Broadband Network. The reader should gain an understanding of the following:

- Physical characteristics of the broadband system
- Differences between LANs and the broadband system
- Current network services
- Future utilization of the broadband system
- Guidelines for using the system

Questions regarding this information should be directed to the Telecommunications Office by calling 962-8353. Additional guidelines for the implementation of microcomputer networks may be obtained from the Microcomputer Support Center.

WHAT IS BROADBAND?

The Campus Broadband System is a communications medium designed to facilitate the transmission of various forms of communications between University buildings, departments, or networks and to provide access to off-campus networks. The term "broadband" is actually a generic term describing a form of communications that utilizes a wide bandwidth to transmit communications signals. Broadband communications may be accomplished over copper, coaxial cable, fiber optics, or microwave facilities. In addition to supporting a variety of computer and terminal networking services, the broadband system also supports point-to-point data links, video services, and voice communications.

A LAN (Local Area Network) is a network of computers or terminals that is generally found within a department or building. Like the broadband system, LANs may also use copper wiring, coaxial cable, or fiber optics as a distribution medium. However, most LANs have significant limitations in terms of their geographical coverage and the number of attached devices. The Campus Broadband System may be used as a LAN or to connect LANs located in different buildings on the campus.

The Campus Broadband System uses a 75 ohm coaxial cable as its distribution medium and frequency division multiplexing as its channel allocation scheme. Data, voice, and video signals may be converted to radio frequencies and transmitted over the frequency spectrum supported by the broadband system. Two way communication is accomplished by splitting the frequency spectrum into forward and reverse paths. The reverse path is used for communications from network interface devices to a central retransmission facility, or headend. The headend broadcasts signals on the broadband system in a forward path to all points on the network. Signals may be received on the network by using appropriate broadband network interfaces provided by the Telecommunications Office. Two way communications may only be accomplished by pairing frequencies in the forward and reverse paths.

WHY BROADBAND?

The major advantages of the current broadband system include the use of proven cable television (CATV) technology, its bidirectional characteristics, its wide bandwidth, and its ability to serve a wide geographical area. One of the most appealing aspects of the broadband system is that it provides the basis for an integrated approach to solving a number of communications needs. In addition, all devices attached to the network are geographically independent.

DATA COMMUNICATIONS SERVICES

In the current environment at UNC, there exists a number of requirements for independent data communications networks. By properly allocating channels on the broadband system and by selecting appropriate network interface devices, a diverse set of data communications services can be supported over a single broadband cable. In some cases, bridging between networks can be accommodated. The following paragraphs describe broadband services that are currently being supported:

<u>SYTEK SYSTEM 2000:</u> This service provides for a connection of a user's asynchronous terminal, microcomputer, or host computer port to the System 2000 for communications at rates of up to 9.6 Kbps to other devices connected to the network. Each Sytek port has a unique address and the system handles the routing of calls to the correct destination. Users of the Sytek network can access the Gandalf PACX, IBM 7171, and LINCNET via connections to Academic Computing Services. In addition, other computer services such as TRLN, electronic mail, TSO, and WYLBUR can be subsequently accessed from Academic Computing Services.

The Sytek network utilizes techniques such as packet communications with collision detection to allow access to a single channel shared by hundreds of Sytek network users. Other data communications services may operate independently of the Sytek network on discrete broadband channels.

<u>POINT-TO-POINT CIRCUITS:</u> Non-switched, medium speed, synchronous or bisynchronous channels can be supported on the broadband system instead of four wire data channels leased from the telephone company. Each channel connects one device at one location to one device at another location. These channels are typically used to connect 3270 cluster controllers and remote job entry stations to Administrative Data Processing or to the Academic Computing Center or to interconnect pairs of statistical multiplexors.

<u>WIDEBAND SERVICES (bidirectional):</u> Wideband services generally occupy a significant portion of a 6 Mhz channel or multiple 6 Mhz Channels on the broadband system. Wideband services are generally allocated in regions of the frequency spectrum not reserved for other network services. Frequency assignments may be subject to change, thus the use of frequency agile modems is encouraged. Wideband services include high speed (56 Kbps up to 1.54 Mbps) point to point circuits and shared network services such as the campus Ethernet. Channel allocations for wideband services must also include guardbands to provide separation between services allocated in close proximity within the broadband frequency spectrum.

<u>ETHERNET:</u> The Ethernet is a form of wideband service utilizing a 6 Mhz broadband channel to pass data between standard Ethernets connected to the broadband system at a 5 Mbps data rate. The broadband Ethernet utilizes a Bridge Communications, Inc. High performance broadband to baseband bridge that provides protocol transparent routing and routes packets based on Ethernet addresses only. The existing Ethernet channel is used primarily by departments affiliated with the Microelectronics Center of North Carolina (MCNC) for internetworking and access to the MCNC microwave network. This channel may be used by all University departments and agencies. Other channels are expected to be allocated to meet departmental and institutional networking needs.

VIDEO COMMUNICATIONS SERVICES

Each video channel can be used to send a video signal from one point on the cable to any number of other points on the cable or to external networks. Users can coordinate the use of a channel and share a channel by originating video signals from different points at different times. The MCNC teleclassroom in 08 Peabody uses video channels on the broadband system to send and receive video signals from the MCNC microwave network. Each video channel required a pair of 6 Mhz Channels on the broadband system.

(Continued on Page 5)

PARTY LINE

—Ruth Michalecki, Nebraska

In last month's Party Line I quoted several articles from various telecom publications concerning the fraudulent use of credit cards/authorization codes as reported by the long distance carriers. The articles all stated that a major source of fraud was a campus environment and went on to cite specific cases where the persons were charged with theft or fraud. Several ACUTA members told me they have also experienced some problems in this area.

Norm Sefton from DUKE University responded to the stories and his letter is the Party Line column this month. Norm makes a lot of good points about providing telephone services to students. I would not argue or disagree with any of them.

The student telecom services at the University of Nebraska has been highly successful, and we do operate almost exactly like DUKE. In fact, when we first started planning to provide full student telephone services, I asked Norm's advice, and we have pretty well followed it. Contrary to DUKE's operation, we bill the Housing Office for the local service, so regardless of the status of long distance accounts, the residence hall students always have local dial tone. This was an administrative decision at UNL, prompted by security or safety concerns.

We do not request a deposit from the students. We do insist on a contract card. We use ANI (automatic number identification) instead of authorization codes and the students have to decide which calls are theirs. With our upgraded Centrex system (DMS-100), we will be able to provide station-specific or discrete authorization codes and individual billing to the students. We believe this will be an improvement.

Very much like DUKE, our bad debt experience is less than 1% over the four years we have been providing toll services to the students. It is interesting to note, that prior to our involvement with student toll services, the local operating company provided student toll. They did not require a deposit; they used ANI for billing rather than auth codes; students were billed at DDD rates; they did insist on a contract from the students, and their bad dept experience averaged slightly more than 2%; a lower percentage than the rest of their customers.

Norm is right on target with his comments. I followed his advice early on and I am glad. However, the national concern for toll fraud is real, whether it involves students or anyone else. I doubt we have heard the last of this issue.

Thanks Norm!

"Response from Norm Sefton"

I just finished reading the ACUTA news dated June 1987 and you have awakened the sleeping "mouth of the south". Your article under the byline A Party Line That Dealt With Student Toll Fraud nudged me to the point of coming out of semi-retirement to respond to your challenge. That is "it would be interesting to hear from our members of what they've experienced in this area and what steps they're taking to control the problem".

Let me first state that this so called problem is a problem of our own making. It's a problem you do not have to face. It is a problem that can be overcome with a change in philosophy. The answers that I have for you and members of ACUTA have come from over 25 years experience that I have had in higher education dealing with telecommunications plus some 55 years of telephone service provided by Duke University to its student body. The adjectives that you used such as, schemes to use stolen long distance codes, third number billing, toll forward, hackers, code abuse and theft, accounting reports, publicizing, notifying, nonpublishing, changing authorization codes, limiting the number of codes, lock on assigning codes, monitoring, etc. are all after the fact bureaucratic administrative procedures that deals with a problem after the fact. It immediately sets up a challenge to the students that they will readily accept. They're young, they're eager, they are bright, they like to pit their brainpower against the establishment. So long as you adopt this philosophy, you will spend many hours going one on one with a new student body each year, trying to handle this tiger by its tail.

My solution is a radical change in philosophy. It begins with the concept, or question, that asks "what business are we in?" In answering this question, I think you might agree that the business we're in is "education." We, as telecommunications professionals, are part of the educational process that teaches students within our great universities. I also contend that one of the greatest lessons to be learned by any young person is how to manage and handle his or her money and to accept sole responsibility for their lives. "Why should a student on campus be treated any differently than a student who is off campus?" With these two fundamental philosophies, my logic then follows. If we are to provide telephone service to the students in the dorms, we should not force them to take the service. That is to say, we can put telephones in the dormitory rooms and we should make it an elective option. Do not force them to take the service by hiding the cost in the room rent or some other scheme that makes it mandatory that they must have telephone service. We should make the service available and establish the ground rules under which the service will be provided. These ground rules begin with the fact that one student in each room must step forward and put his or her name on a binding contract that states that they will be responsible for the telephone bill for that particular room. This is not unlike the student who is off campus who is sharing an apartment with others and is dealing with the local teleco. Upon signing such a contract, the student agrees to a few fundamental rules. One, the university will turn on the telephone for both local and long distance service on a given date and the monthly recurring charges will be set forth and published so that he or she knows the charges and that any additional expenses are attributable to that telephone, i.e. long distance services, telegrams, third number bills, etc., will be the responsibility of that individual. The next premise is that the bills will be rendered on a given date each month and the student will be allowed X number of days to pay this bill. If they fail to do so, the phone will be immediately disconnected and the line will revert to a very polite recording that indictes that the phone is temporarily out of service (it is read by all those "in the know" on the campus that the deadbeat didn't pay his phone bill). This immediately gives the individual peer pressure from their roommates and colleagues and if we should receive a phone call from a parent inquiring as to why this particular phone has been disconnected, we refer the parent to the nearest hall phone adjacent to that room so that the student can explain the situation. In no case do we deal with the parent or explain to the parent what has happened. This is the obligation of the individual to do the explaining to his colleagues as well as to his parents.

PARTY LINE, Continued:

The next step is that if the student then elects to finally pay his bill in full he is charged a nuisance or reconnect fee for the return of their service. If the same condition repeats itself during the semester, the process is repeated and the nuisance fee is doubled. This will continue so long as the individual elects to follow their accounting system rather than that of the university and their contract.

If the student elects not to pay his bill, we notify the registrar that an outstanding debt is owed to the university telephone system (just like the library or other academic departments do if a student owes the University). The student that has their name on the contract is prohibited or blocked from registering for next semester. This debt is not transferred to the registrar or bursar but the student must obtain a release from Tel-Com to proceed with the next semester's registration. All in all, this service at Duke University has been in effect for many, many years and our collection rate and nuisance rate is one of the lowest in the country. We have had to write off only a few thousand dollars worth of bad debt over the past eleven years and our student billing appreaches $100,000 per month. As they say, the proof of the pudding is in the eating.

I might add that if a student doesn't pay us and leaves school, we then make a business decision on whether or not to use a collection agency, depending on the size of the bill. All in all, we are completely satisified with the process as many of our students who return as alumnus will sometimes drop by the Tel-Com building and express their appreciation for teaching them for the first time how to handle finances without the involvement of authorization codes, their mom and dad, deposits, or all the other schemes that have been devised to outwit the student body. I guess my message is "treat them like young adults, be firm, be fair, be open and be compassionate occasionally when a student gets involved in a situation such as an incompatible roommate and needs your assistance." I think the lives of the telecommunications professionals will be a little bit easier and more meaningful if you adopt this philosophy. I know it will allow you a lot more time to do the planning for telecommunications on your campuses that will enchance the educational opportunities. Thank you very much for letting me express my opinions on this subject.

Norman H. Sefton
Assistant University Business Manager
Duke University, Durham, North Carolina

MURPHY'S LAWS
RELATED TO TELEPHONE PROJECTS

WETHERN'S LAW OF SUSPENDED JUDGMENT:
Assumption is the mother of all screw-ups.

THE EINSTEIN EXTENSION OF PARKINSON'S LAW:
A telephone project expands to fill more than the space available.

FOUR WORKSHOP PRINCIPLES:
Most projects require three hands.
The more carefully you plan a project, the more confusion there is when something goes wrong.

SMITH'S LAW OF TELEPHONE REPAIR:
Access holes will be 1/2" too small.
Corollary: Holes that are the right size will be in the wrong place.

LAWS OF OFFICE MURPHOLOGY:
Vital papers will demonstrate their vitality by spontaneously moving from where you left them to where you can't find them.
The last person who quit or was fired will be held responsible for everything that goes wrong - until the next person quits or is fired.

From Murphy's Law Book Two, by Arthur Block, published by Price/Stern/Stern publishers, Inc., 1980.

BROADBAND CABLE NETWORK, Continued:

Forward transmission of video signals provides the distribution of video signals from the headend location in the Bennett Building to other points on the cable. This method could be used for distribution of video signals received off the air or from other external network connections.

FUTURE SERVICES

The Campus Broadband System provides the flexibility to offer a wide variety of communications services. The services which will be offered on the broadband system depend on future voice, data and video communications requirements of the University. Computer networking strategies and the implementation of an improved campus telephone system will also have a significant impact on future uses of the broadband system. Currently, less than 22% of the capacity of the broadband system has been allocated for use. It is estimated that less than 53% of the available bandwidth will be required to meet current projections of future broadband communications requirements. The Telecommunications Office has responsibility for ensuring the efficient use of available bandwidth on the broadband system and developing a frequency plan that will accommodate projected voice, data, and video uses of the system.

HOW CAN I GET ON THE BROADBAND SYSTEM?

Construction of the broadband trunk and the connection of campus buildings is continuing at a steady pace. Currently, over forty campus buildings, including the Academic and Administrative Computing Centers, have been connected to the broadband trunk. Completion of all on campus trunk facilities and the connection of over sixty major academic and administrative buildings is anticipated by the end of 1987.

In addition to providing bandwidth resource allocation for broadband service, the Telecommunications Office provides, installs, and maintains broadband network interfaces used on the broadband system. A variety of standard interfaces is offered and stocked. The provision of interfaces for other specialized uses of the broadband system will require close coordination with the Telecommunications Office.

Departments interested in learning more about the services offered on the broadband system or in establishing specific service connections should contact the Telecommunications Office by calling 962-8353. Estimates for wiring, equipment procurement and installation, and recurring charges can be provided. Formal estimates should be requested using a standard University purchase requisition form (P-101).

The above article was written by Steve Harward, University of North Carolina, and may be used as an example of a guide to provide university departments with general information on The Broadband Cable Network.

"Then she began picking on the long-distance phone company I chose."

Microcomputers Found More Available –and More Often Required –at Selected Colleges

By JUDITH AXLER TURNER

Microcomputers are more available---and more often required---at the nation's most selective colleges and universities than on other campuses, a survey has found.

The survey, which covered 211 institutions, found that the most selective were most likely to require or recommend that students own microcomputers, to specify the brand of microcomputer that students buy, to offer discounts on microcomputer purchases, and to have a low ratio of students, faculty members, and staff members to each microcomputer. The survey was conducted by EDUCOM and Peat Marwick Main and Co., in conjunction with The Chronicle.

The survey included questions about microcomputer ownership, access to microcomputers, software availability, assistance in using software, illegal access, and illegal copying.

The 12-page questionnaire was sent to the nearly 450 colleges and universities that are members of EDUCOM, a computer-technology consortium.

The survey results will be published next month.

'In Forefront of Concern'

"This sample, though not intended to be representative of all institutions of higher education, probably closely represents those institutions in the forefront of concern about computing and resources for computer," a survey report said.

Steven W. Gilbert, managing director of EDUCOM, who worked on the project, said the information would be "invaluable to our member institutions."

"It will help them understand more realistically what their peers are actually doing so they can make decisions for their own computer projects," he said.

Susan S. Lukesh, senior consultant at Peat Marwick, did the analysis and wrote the report.

13 Pct. of Students Are Owners

One figure that surprised some administrators was the respondents' estimates of student-owned computers. On average, 13 per cent of the students in the 211 institutions were said to own microcomputers.

"I was amazed at how many microcomputers are already out there at every level," said Peter Lyman, assistant director of academic computing at Michigan State University.

Mr. Lyman is working with EDUCOOM to find ways to get more information from the survey results and to plan future surveys that will give longitudinal data, he said.

For instance, he would like to compare figures from institutions where computers are required with those from institutions where students are not encouraged to purchase them. "My intent is to make the survey, and future surveys, useful as policy tools, to allow people to get a sense of norms and variations," Mr. Lyman said.

EDUCOM's Mr. Gilbert said that, because the questionnaire was sent out last August, it probably reflected the situation in academic 1985-86. Although both the totals and the percentage distributions may have changed, he said, the survey represents the "first comprehensive study of microcomputer ownership and use."

The data in the survey showed the most interesting results when broken down according to Barron's Index of Competitiveness, said Peat Marwick's Ms. Lukesh. For instance, she noted, the most selective institutions had the highest estimated percentage of student ownership of microcomputers, and students in professional and graduate schools were more likely than undergraduates to own computers. The breakdown follows:

Student ownership of computers, by type of Institution

Most selective	24%
Highly selective	12%
Very selective	16%
Competitive	10%
Less selective	9%
Non-selective	10%
Professional and graduate schools	34%
Private colleges	14%
Universities	14%
Public colleges	11%
Four-year colleges	11%
Two-year colleges	7%
All institutions	13%

Respondents were also asked to estimate the numbers of microcomputers purchased by their colleges and universities, both centrally and through departments, and to estimate the percentage breakdown by brand.

Almost half of the 109,847 microcomputers estimated to have been purchased by institutions were made by International Business Machines Corporation. Except for the Apple II and the Apple Macintosh, all seven of the most popular microcomputers were from I.B.M. or were compatible with I.B.M.:

Institutional purchases, by brand

I.B.M. PC	28,143
Apple Macintosh	19,233
I.B.M. PC/XT	13,771
Zenith	9,894
Apple II	9,463
I.B.M. PC/AT of RT-PC	7,257
Other I.B.M. compatible	5,519

At 117 of the 211 institutions in the survey, students who were contemplating microcomputer purchases were encourages to buy one of a limited number of brands---usually because they were sold and serviced on the campuses and offered at a discount, or because they were brands for which instructional software was available. Following are the computer brands, and the number of institutions that considered them acceptable:

Institutions accepting major brands

I.B.M.	98
Zenith	61
Apple Macintosh	56
Apple II	31
A.T.&T.	31
DEC	16
Tandy	15
Hewlett-Packard	9
Commodore	4
I.T.T.	4
All computers	3
Texas Instruments	3
Atari	1
Other	30

All 44 of the public institutions said they recommended I.B.M. computers.

Many institutions purchase microcomputers for use by faculty members and students, the survey found. Computers for faculty members may be in departmental offices, classrooms, or computer laboratories; most institution-owned computers for student use are in computer laboratories or computer centers. According to the survey, each student or faculty member had access to these machines an average of 3.3 hours a week.

By comparing the number of available computers to the number of faculty members and students, Ms. Lukesh figured that there was, on average, one institutionally owned microcomputer for every 16.7 students and faculty members. However, when estimates of student-owned and faculty-owned microcomputers were added to the number of machines available, the ratio dropped to 5.3 students and faculty members for each microcomputer---"demonstrating the significance of personal ownership in any assessment of the demand for machine access," Ms. Lukesh said.

The major use for microcomputers by students, faculty members, and staff members is word processing, respondents reported. The survey did not look at instructional use of computers, but EDUCOM's Mr. Gilbert said that future surveys would include questions about that.

Uses of microcomputers
by students and faculty members

	Students	Faculty	Staff
Word processing	40%	42%	40%
Spread sheets	13%	15%	16%
Public-domain software	15%	15%	8%
On-campus communications	11%	13%	12%
Statistical packages	13%	15%	5%
"Freeware" or "Shareware"	13%	13%	7%
Data base manager	9%	10%	14%
Graphics	11%	10%	6%
Inter-campus communications	7%	10%	9%

More than half of the 211 institutions surveyed---57 per cent ---required some or all students to taken a introductory computer course in order to graduate.

The less competitive institutions were most likely to require such a course, especially for students majoring in business, computer science, and engineering, the survey found. Other fields that had computer-course requirements included general sciences, nursing and health, architecture, education, management, motel administration, and secretarial technology.

Institutions where computer
courses are required

How selective	All students	Some schools	Some depart-ments
Most	20%	7%	7%
Highly	9%	4%	17%
Very	15%	28%	15%
Competitive	13%	30%	23%
Less	23%	23%	18%
Non-selective	40%	40%	20%

More than 60 percent of the colleges and universities surveyed indicated that they had negotiated or were negotiating for site licenses---which permit the reproduction and distribution of software on their campuses---and 56 per cent of the institutions sold software. Of those, half sold the software at a discount.

A total of 154 institutions had adopted written policies about illegal access to software, and 142 had written policies about illegal copying of software. But most indicated that the policies were not very effective.

Effectiveness of policies
against illegal access and copying

	Access	Copying
Very effective	33%	11%
Fairly effective	49%	51%
Not effective	1%	9%
Unclear	15%	26%

While many colleges and universities offered faculty members help in selecting and using instructional microcomputer software, few institutions had formal plans or programs for integrating microcomputers into the curriculum.

Most institutions that offered assistance in software use offered instruction, often in scheduled classes or seminars, or consultants who could answer specific questions.

Institutions providing
software assistance

Instruction	83%
Consultants	83%
Hot-line	40%
On-line consultants	13%

Copies of the executive summary of Survey of Microcomputer Use in Higher Education, to be released next month, are $7.50 from Susan S. Lukesh, Peat Marwick Main and Co., 345 Park Avenue, New York 10154. The full report will be priced at $45 for EDUCOM members, $125 for other institutions of higher education and not-for-profit organizations, $495 for EDUCOM corporate associates, and $1,195 for others.

The above article appeared in THE CHRONICLE OF HIGHER EDUCATION, April 29, 1987 edition.

"I forgot why we came to New Orleans. Something about LANs, I guess."

Telecommunication's New Terminology

--- A. M. Rutkowski

An exciting new world of virtual functionalities is being born; some of telecommunications new terminology is listed below.

One of the most interesting and remarkable revolutions now occurring is the phenomenal rate at which information systems concepts are being applied to telecommunication. Telecommunication networks are literally being transformed into integrated information systems. All the old dilapidated concepts and boundaries are falling overnight, sending the lawyers and regulators scrambling.

An exciting new world of virtual functionalities is being born, and in keeping with this change, new terms have been developed. This is telecommunication's new terminology.

Block: The block is the group of user information bits together with appended bits.

Block payload: The block payload is the user information bits within a cell.

Block overhead: The overhead is identified as the bits remaining in a cell after discarding the block payload.

Cell: A cell is a block of fixed length.

Channel: A channel is a portion of the payload used for a service access. A channel exists only during a call, set up by a signaling or administrative procedure. The throughput supported by the channel may be deterministic or statistical.

Channel capacity: The channel capacity is the bit rate of a deterministic channel.

Connectionless service: Transport of a single quantum of information not set-up by a signaling or administrative procedure (i.e., a packetgram).

Frames (physical): Frames are a serial logical synchronous bit stream at an interface, partitioned into successive segments.

Frame: One frame is a block of variable length.

Frame interface: An interface whose serial bit stream is segmented into periodic physical frames. Each frame is divided by a fixed partition into an overhead portion and a payload portion.

Hybrid interface structure: An interface which has a mixture of labeled and positioned channels.

Information payload capacity: The information payload capacity is the bit rate of the interface payload.

Interface overhead: The interface overhead is the remaining portion of the bit stream after deducting the information payload. The interface overhead may be essential (e.g., framing for an interface shared by users) or ancillary (e.g., performance monitoring).

Interface payload: The portion of the bit stream which can be used for telecommunication services. Any signaling is included in the interface payload.

Labeled channel: A labeled channel is a channel that occupies bit positions which do not necessarily form a periodic pattern and whose bit locations are grouped together and continuously identified during the call with an appended label. Other bits may also be appended to provide an error check on the label value.

A labeled channel is also the temporally ordered collection of all block payloads having a common label value. The label value is assigned at call setup and released at the end of the call.

Label multiplexing: Label multiplexing is the multiplexing of labeled channels by concatenating the blocks of the different channels.

Labeled deterministic channel: A labeled deterministic channel is designed so that each successive interval of specified constant duration T seconds contains an integer number of blocks whose aggregate payload is a constant b bits.

Labeled interface structure: This structure is one in which all services and signaling are provided by labeled channels. A labeled interface structure can be accommodated within a framed interface or a self-delineating labeled interface.

Labeled statistical channel: A labeled channel is one in which the payload of the successive blocks of the channel is random and/or the block epochs are random.

Optical carrier level-1 signal (OC-1): It is the optical counterpart of the basic modular electrical signal, STS-1.

Payload module: The payload module is the portion of the information payload within which a channel entirely exists.

Payload mapping: Payload mapping is the mapping of network services into synchronous payload envelopes.

Periodic frames: Periodic frames have segments of equal duration (e.g., 125 us); they are delineated by incorporating fixed periodic patterns into the bit stream.

Positioned channel: A positioned channel is a deterministic channel that occupies bit positions which form a fixed periodic pattern (e.g., B, H, and D channels in existing ISDN-user interfaces).

Positioned interface structure: In this type of structure, all services and signaling are provided by positioned channels. A structure such as this can exist only within a framed interface.

Self-delineating blocks: Self-delineating blocks are a defined pattern or flag at the beginning and end of each block of a label multiplex which serves to demarcate the block.

Self-delineating labeled interface: It is an interface whose entire serial bit stream consists of a self-delineating label multiplex.

Synchronous payload: A synchronous payload is derivable from a network transmission signal by removing integral numbers of bits in every frame, i.e., there are no variable bit-stuffing rate adjustments required to fit the payload in the transmission signal.

Synchronous transport signal level-1 (STS-1): It is the basic logical building block signal in its electrical form with a rate of 49.920 Mbps.

STS-1 payload pointer: The pointer enables flexible and dynamic alignment of the STS-1 synchronous payload envelope within the STS-1 frame, independent of the actual contents of the envelope.

Transport overhead: The transport overhead is the overhead that is added to the STS-1 synchronous payload envelope to form a STS-N signal. In the case of STS-1, 1.664 Mbps is added for transport purposes.

User proprietary channel: This channel is allocated to the user for input of information for use in maintenance activities and remote alarms external to the span equipment.

Virtual tributary (VT): The VT is an information grouping within a STS-1 which consists of 26 bytes in a 125-us period. The VT is one of the building blocks in the STS -1 synchronous payload envelope, devised to carry sub-STS-1 services.

Virtual tributary payload pointer: The VT payload pointer enables flexible and dynamic alignment of the VT synchronous payload envelope within the virtual tributary superframe.

This article was reproduced with permission from TELECOMMUNICATIONS, appearing in July, 1987 issue.