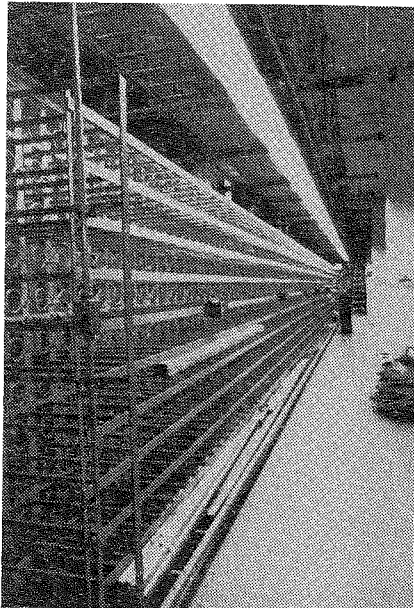


Telecom News

University Telecommunications
The University of Arizona

September 1989
Volume 1, Number 6



A new shoe rack for the UA basketball team? A new wine rack in the Student Union? No, all campus phone lines will pass through this gridwork, the UA's new main distribution frame.

5ESS Switch Takes the Spotlight

There are 10,000 phones on campus. If your voice travels electronically along a continuous line to any of the 9,999 other phones on campus, why isn't there a bundle of 9,999 lines sticking out of the back of your phone?

Because all lines from campus phones are routed to a device known as a switch, and it is the switch that powers the phone system and makes the connection between your line and another.

A switch, then, takes center stage in the drama of any phone system, and it is not surprising that a stir is caused when a switch is replaced.

As part of the modernization of the UA's telecommunications system (the TIPS project), the present

Welcome to the Newsletter!

Communication at a distance—whether phoning an office down the hall, sending a message via a computer network to another building, or accessing information on a computer across the country—is telecommunications.

Helping you to use telecommunications resources at the UA is the purpose of this newsletter.

You may have received *Telecom News* for the first time as part of an extra-large mailing. If you would like to receive it regularly, subscription is easy and free. Please see the back cover (page 8).

Telecom News publishes information about such things as how to use

helpful features of your phone, how the new UA phone system can make you more effective, or how UA computer network connections can benefit your work. For some specific examples of recent topics, see "Summer News Highlights" on page 4 of this issue.

High-Speed Dialup Access

You can now access UA computers connected to the IDX-3000 via a 9600 bps dialup number: 621-9600. University Telecommunications has installed eight 9600 bps modems which are compatible with the new recommended high-speed modem standard for the UA. As announced in the July issue of this newsletter, a campus user group has recommended 9600 bps modems based on CCITT V.32 technology as the UA standard.

For information on vendors who were awarded the bid, their modem models, and prices, call Purchasing and Stores. Or, if you'd like a copy of the July *Telecom News*, call University Telecommunications at 621-TIPS (621-8477).

If you have problems concerning dialup access, call Network Control, 621-7999.

Dimension 2000 switch is being replaced with an AT&T 5ESS switch, truly a telecommunications star.

Consider some of the features of the 5ESS switch:

- basically a powerful digital computer, it has these advantages over previous switches:
 - greater processing speed
 - greater capacity
 - better use of space
 - less power consumption
 - fewer moving parts and less maintenance
 - fewer technicians needed to tend it

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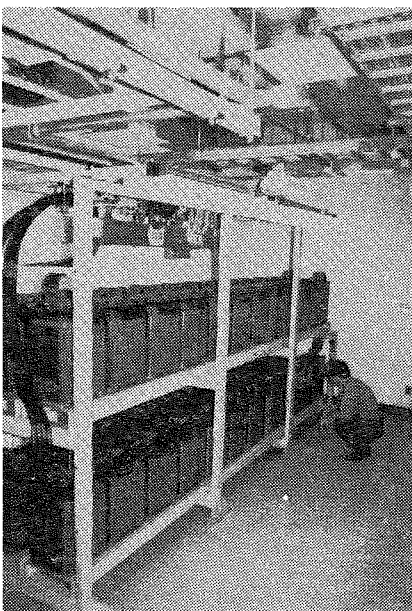
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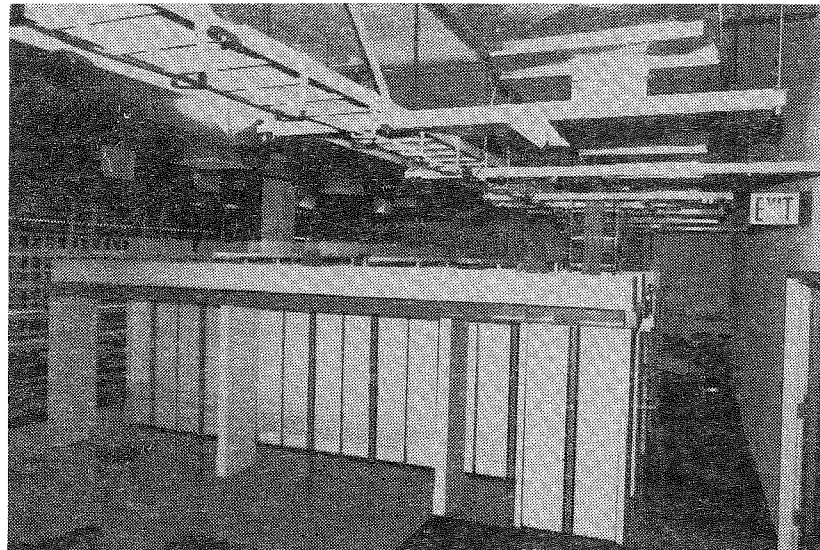
- the 5ESS has a modular design, with these advantages:
 - modules can be easily added as needed, with a maximum capacity of 100,000 lines (phones)
 - modules can be dedicated to specific processing functions, an efficient processing method known as distributed switching
 - modules can be added to accommodate new call processing features and new technologies
- the 5ESS has a wide variety of built-in call processing features (e.g., call pickup and call forwarding), some new to the UA system
- the 5ESS can support the integrated services digital network (ISDN)

These are some of the features that put the 5ESS on the cutting edge of switch technology and put the UA in a select group of universities—including Duke, Harvard, and MIT—who've opted for it.

The 5ESS and its supporting cast of new equipment are located in the "switchroom" in the basement of the



48 batteries will provide emergency backup power for the new switch.



Sleek and compact, the 5ESS switch will be the hub of all UA phone activity.

addition to the Computer Center building. The room looks big enough for a basketball court.

There are 4 main sections of the switchroom:

1) Power Plant – Here, electric power is assured for the switch. Equipment called rectifiers converts the building's power from AC to the DC current that the switch requires.

For power failures—perhaps during a thunderstorm—a set of 48 lead-acid batteries have been installed (see bottom photo). These batteries have power equal to that of 900 standard car batteries, and they will be ready to provide power to the switch until a diesel generator can kick in. The generator will run until building power is restored.

The power plant, then, helps to ensure campus phone service even during general power outages.

2) 5ESS Telephone Switch (see top photo) – Its neatly ordered rows of white-enameled steel cabinets belie the complexity of work done within the switch. The switch is essentially a

computer that performs a multiplicity of tasks, the most essential of which is making that connection between one phone and another.

This connection is a bit of sleight of hand in that it is not a physical, metallic connection. You won't hear the clicking of mechanical relays as you walk by the switch. It makes a digital connection—quickly and reliably.

When's the last time you were aware of dial tone when you picked up your phone receiver? Probably not recently because it is so consistent and constant. It's taken for granted.

Yet dial tone is the indicator of the phone system's readiness for business. Dial tone is provided by a switch, and when you hear dial tone once the 5ESS is in operation, in early 1990, you will know it signals great new things for the UA phone system.

As a computer, the switch will also generate data about its own operation and about phone system use. This data in turn will be analyzed by other computers. The results of this analysis will be used to adjust resources to

phone system needs and to schedule preventive maintenance for the system.

3) Main Distribution Frame (see photo on front page) – Perhaps the most striking feature of the switchroom. A steel gridwork 80-feet long, 9-feet tall, and 3-feet deep, it effectively divides the switchroom, one side devoted to incoming cables from campus, and the other side devoted to the switch and other telecommunications equipment.

Because the many thousands of copper wires from campus phones have great weight, these wires cannot hang off the switch itself. Instead, the main distribution frame holds up these wires and offers a clean, well-organized connection point between the switch and its power plant on the one hand, and the campus cable system on the other.

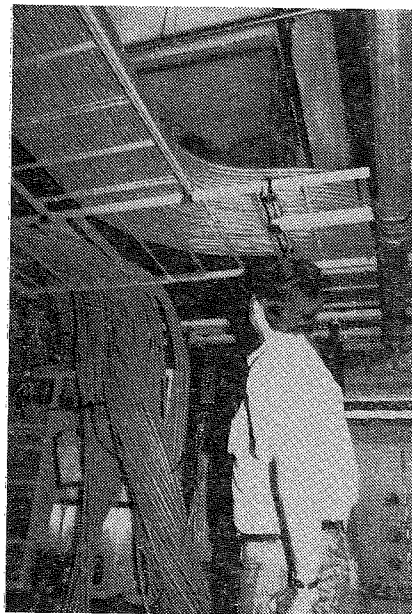
When its skeleton is fully wired, with masses of cables entering and wires exiting, the main distribution frame will have a burly appearance. Nevertheless, the frame will contain a multitude of delicate-appearing, precise wire connections.

4) Cable Vault – All communication paths lead here. The 3-inch black underground communication cables that connect campus buildings end up here below ground level in the vault. The vault is a pit 10-feet deep, 20-feet wide and 110-feet long on the south side of the switchroom.

The cables are directed up out of the vault by steel racks (see photo on right). Thousands of copper wires are released from each cable and spliced to smaller cables leading to the main distribution frame.

Telecommunications experts who've visited the new switchroom have been impressed. Wendell Hughes, manager in Technical Operations for U S WEST, who has helped manage 12 major switchroom installations, says, "This is one fine switchroom."

Hughes points to the poured-concrete construction of the room that allows suspension of cables overhead without stanchions or other floor-to-ceiling supports. Suspending cabling and other hardware makes for efficient installation and maintenance of equipment.



A myriad of cables ascend from the cable vault to be connected to the new switch.

Further, John Carrell, U S WEST project manager for TIPS, says the switchroom equipment, with the SESS as centerpiece, is a superior level of technology among universities. It is a major facility for a major university.

University Telecommunications Department Matches Communications Links with Needs

Imagine providing a service to a business that helps it to compete successfully. Imagine one of the ways of judging the success of your service is how unobtrusive it is and how unnoticeable you are. This is the kind of service the University Telecommunications department strives to provide the UA.

When you speak on the phone, when you send information from your computer, communication links are vital, and University Telecommunications plans and maintains these communication links, within your building, between campus buildings, and between the UA and the world.

These links may include underground cable, building wiring, computerized telephone and data switching devices, computer networks, communications software, and satellite or microwave services.

University Telecommunications consults with members of the UA community to match links with communication needs. University Telecommunications helps UA members to use their phones as powerful tools and to use their computers or terminals to link with important colleagues and powerful computing resources.

A glance at the new dual-jack outlets being installed in offices will tell you the two basic kinds of telecommunications service available on campus: voice and data. Voice is, simply, communications by telephone. Data is communication between computers.

With divestiture of the Bell System in 1984, the UA took over management of its own phone system. This system is now estimated to be one of the hundred largest independent phone systems in the country, and the

(Continued on page 4)

University Telecommunications, continued from page 3

University Telecommunications department is responsible for its operation.

With the proliferation of small, powerful computers around campus, University Telecommunications' role of enabling users of these computers to exchange information, to network, is increasingly important.

University Telecommunications provides networks that allow users to access computers in many campus departments as well as computers around the country and the world.

In addition to day-to-day operation of the UA's voice and data networks, University Telecommunications is also responsible for planning future UA telecommunications capabilities.

Advice from departments across the University is essential to this planning work. For example, an ad hoc Telecommunications Advisory Committee, composed of representatives from 14 UA departments, was formed 3 years ago to provide advice about UA telecommunications needs.

That advice, along with an evaluation made by a telecommunications consulting firm hired by the UA, resulted in a proposal for a complete modernization of campus telecommunications facilities. TIPS (Telecommunications Improvement Project Services), the project to accomplish this upgrade, will be completed early in 1990, and is being implemented by University Telecommunications.

Other services provided by University Telecommunications include user support for computer conferencing, paging, and telex; engineering of telecommunications requirements in campus construction projects; maintenance for microcomputers and associated equipment; and directory information from UA telephone operators.

Some of University Telecommunications' goals for 1989-90 are

- Telecommunications Improvement Project Services (TIPS): Implement the modernization of the UA telecommunications system with as little disruption to present voice and data communications as possible.
- Network Coordination and Management: Plan, develop, and provide a coordinated system to administer the growing campus data communications backbone.
- Information and User Support: Strengthen current service offices, such as the Network Control Center (for user trouble reports).

Develop a Telecommunications Information Center, user guides, training, and policies to promote efficient use of telecommunications services.

- Planning and Organization Development: Solicit University-wide support for long-term telecommunications planning. Adjust telecommunications resources, as needed, to changing campus needs.

Please see the key University Telecommunications service phone numbers in the box below. University Telecommunications welcomes suggestions about the UA's telecommunications facilities and services.

Summer News Highlights

MultiNet TCP/IP and NFS Site License Purchased – University departments can obtain copies of MultiNet TCP/IP software for \$100 annually per computer system. MultiNet software allows VAX/VMS computers to communicate with other computers on the UA extended ethernet and the National Internet. For more information, call Network Operations at 621-4501.

Recommended Modem Standard Announced – A campus user group has recommended 9600 bps modems based on the CCITT V.32 technology as the high-speed modem standard for the UA. For current pricing on recommended modems, contact Purchasing and Stores. University Telecommunications has installed 9600 bps dialup modems that are compatible with the standard (see "dialup access" article on page 1).

NeXT Authorized Service Center Offered on Campus – UA users can obtain authorized warranty and maintenance services for NeXT computer equipment from the Equipment and Maintenance Services

group in the University Telecommunications department. Call 621-5050 for details.

5ESS Switch Arrived – In June, the UA's new AT&T 5ESS telephone switch was delivered to the basement of the Computer Center building addition, where it is currently being installed and connected to the new campus cable system. This new switching system will provide the

(Continued on page 7)

Telecommunications Services Directory

Customer Service Orders (Data/Telephone Lines)	1-5100
Network Control Center (24-Hour Data/Telephone Trouble Reports)	1-7999
Billing Inquiries	1-5100
Telex/Telegrams	1-3030
PC/Terminal Maintenance and Paging Services	1-5050
TIPS Hotline/Help	1-TIPS



UA Network Connections— What Can They Do for You?

Imagine doing any of the following without leaving your office:

- Exchanging proposals, experiment results, or research papers with your colleagues across campus or around the world.
- Doing numeric intensive research on the John von Neumann Center (JvNC) Supercomputers in Princeton, New Jersey.
- Accessing computers in distant places without using a modem.
- Finding out if a book is available in the University Library.
- Printing a proposal or research paper on a laser printer across campus.

Computer networks at the University of Arizona can make all of the above possible. This article provides an overview of these networks and explains what they can do for you. It is divided into two parts; the second will appear in next month's newsletter. In the following article (Part I), we will cover some network basics and then focus on campus networks. In Part II, we will take a look at some networks outside of the UA that can be accessed through campus networks.

What is a Computer Network?

A computer network is a group of computers and related devices that are physically connected together and communicate with each other. If the term computer network is intimidating, think of it as another communications tool just like the telephone—it's a way to exchange information. In addition, computer networks allow you to share computing resources (e.g., printers, computer programs,

storage space) and to do work on computers located in distant places without leaving your office.

When the computers in a network are located close together, such as in a department office, a campus building, or group of buildings, the network is called a local area network (LAN). If the computers are connected over a large geographical area, such as the state of Arizona or across the continent, then the network is called a wide area network (WAN).

A collection of interconnecting wide area networks and local area networks that act as a coordinating whole is called an internet. Internet with a capital I refers to a special internet that comprises wide area networks, such as ARPAnet, NSFNET, and WESTNET, and the various local area networks that are connected to them. A network that interconnects multiple smaller networks is often called a backbone network or spine. ARPAnet and NSFNET are considered backbone networks of the Internet.

Links in computer networks can be cables, telephone lines, microwave relays, satellites, or a mix of these. Computers need more than just a physical link to talk to each other. They must follow a set of rules (called a protocol) in order to communicate. There are many different protocols just as there are many different computers and networks.

Campus Networks

Interdepartmental computer connections at the UA are provided through two different types of networks: the IDX-3000 switching system and the UA extended ethernet network. The

IDX-3000 provides low-speed data communications; the extended ethernet provides high-speed data communications.

IDX-3000 Switching System

The IDX-3000 is a switching system which provides access to central and departmental computing resources at the UA. Using a terminal or microcomputer directly wired to the IDX, or by using a terminal or microcomputer with a modem, you first connect to the IDX, and then you select the computing resource that you wish to use.

You can connect to any computing resources that are available through the IDX provided that you have accounts (if required) on those resources. (Please note that although University Telecommunications manages and maintains the IDX, permission to use a resource connected to the IDX must be obtained from the department which owns the resource.) Examples of computing resources accessible through the IDX include CCIT computers, Biosciences computers, the College of Engineering Sytek network, and the University Library on-line cataloging systems.

Access to CCIT computers can provide you with a wide variety of tools for accomplishing your academic or administrative activities. These systems offer text editors, programming languages, statistics packages, graphics, and electronic communications (mail and conferencing systems). The UA's Student Information System (SIS) and Financial Resource System (FRS) also run on one of CCIT's computers.

(Continued on page 6)

UA Network Connections, *continued from page 5*

Many departments such as Bio-sciences provide access to their computing systems through the IDX. This also provides a department with the capability of accessing other computing resources on the IDX. Some campus networks, such as the College of Engineering Sytek network, are wired so that you can access the IDX-3000 through the Sytek and vice versa.

The IDX-3000 also provides access to the University Library's on-line circulation and catalog systems, GEAC and INNOPAC. GEAC includes more than 2.7 million bibliographic records and allows you to search for information by title, author, or call number. And, without leaving your office, you can use GEAC to quickly see whether or not a book is currently checked out.

Full searching capabilities, including by subject, are provided by INNOPAC, the on-line catalog system installed at the Science-Engineering Library. This system contains only entries for the Science-Engineering Library.

Access to computing resources on the IDX is provided at transmission speeds of 300, 1200, 2400, or 9600 bits per second (eight bits are used to represent one character on your keyboard). While these transmission speeds may meet the needs of many users on campus, high-speed access to UA computers, as well as computer systems worldwide, is provided through the UA extended ethernet network.

UA Extended Ethernet Network

The UA extended ethernet is a high-speed network that provides access to over 300 computer systems on the UA campus and thousands of computers on the Internet via TCP/IP routers. Routers are computer systems that allow you to connect to other networks.

The commonly used protocols on the extended ethernet are DECnet and TCP/IP. DECnet is primarily used for communication between Digital Equipment Corporation (DEC) VAX/VMS computers. Campus DECnet users can access DEC computer systems at the UA and at Pima College.

TCP/IP is normally used for communication between UNIX computers and between dissimilar computers. TCP/IP is also the protocol standard used on the Internet. This means that your networking capabilities via TCP/IP are not limited to the UA—you can communicate with colleagues and access computer systems around the world. Many UA departments are now using TCP/IP on their computers with University Telecommunications' recent purchase of a MultiNet TCP/IP site license (see "summer news" article on page 4).

DECnet and TCP/IP software provide a number of useful applications, such as:

- transmitting interactive messages
- sending electronic mail
- transferring files
- logging into remote computer systems

Transmitting interactive messages can be compared to having a telephone conversation; information is exchanged between two people immediately, but the words are typed instead of spoken. Messages are especially useful when you need to transmit information quickly to another user; however, the recipient must be logged in (currently connected to the system) in order to receive your message.

Sending electronic mail is similar to sending postal service mail; you provide the text of your message and a "to" and "from" address. The address identifies a specific user on a

specific computer system. Mail has a big advantage over interactive messages in that the user at the destination does not have to be logged in; the message is stored until it can be read. Mail messages are also not limited in length, though you may want to keep them short to hold the interest of your reader.

Transferring files means that you can send text or program files that you store on your computer to a user on another computer. This facility allows you to share scholarly articles, proposals, research papers, or computer programs with your colleagues at the UA and around the world.

Logging into remote systems simply means that from your computer here at the UA, you can access computers in distant places provided that you have an account on the remote machine. For example, a visiting professor at the UA could access a numerical analysis program in his/her account on a computer system at the University of North Carolina.

Future Campus Networks

The University Telecommunications department is planning a campus backbone network that can operate at speeds even greater than that of the campus extended ethernet. This backbone network will utilize the fiber optic cabling that is currently being installed as part of TIPS.

If you have any questions about UA campus networks, or if you need information on how to access these networks, please call University Telecommunications at 621-TIPS (621-8477).

Next month: In Part II, we will take a closer look at campus connections to networks outside the UA—the Internet and the inter-university communications network, BITNET.

From:

CAMPUS

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 Computer Center 73A, Rm. 131

Summer News Highlights, *continued from page 4*

capacity, service quality, reliability, and flexibility that the present system can no longer provide.

ISDN Pilot Implemented – The use of the integrated services digital network (ISDN) for data transfer over digital phones and the simultaneous transfer of voice and data was demonstrated in a pilot project with the Optical Sciences and Pathology departments. The UA is exploring applications for ISDN as part of the implementation of the 5ESS switch, which will have a limited number of ISDN data switching circuits.

Underground Conduit System Completed – A major component of TIPS, the digging of trenches and placement of conduit between campus buildings, has been completed. The conduit will house the copper and fiber optic cables used to provide voice and data communications to all campus buildings. Cables

are currently being pulled through the conduit; this phase is 40% complete.

Telephone Equipment Inventoried – Telephone equipment was inventoried in 125 buildings on campus as part of TIPS. This information will be used to determine wiring inside of buildings and to map capabilities for the new 5ESS switch.

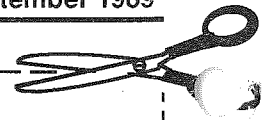
TIPS Inside Wiring Under Way – Wiring inside of buildings is 25% complete. Inside wiring includes pulling new wire between floors, stringing new wire to offices, and the installation of new phone and data jacks. This wiring helps complete the link between your office and the new 5ESS switch.

New UMC Telephone System Installed – In June, UMC cut over to an AT&T System 85 telecommunications system and changed its telephone prefix from “626” to “694”.

(This change did not apply to “626” numbers of UA employees in the College of Medicine.) UMC now provides its own telephone services, medical and paging support, and equipment repair services.

UA Switchboard Hours Changed – The UA switchboard is now staffed 7 a.m. - 11 p.m., Monday - Friday, and 8 a.m. - 4 p.m., weekends and holidays. This change from a 24-hour switchboard was the result of UMC’s decision to assume all hospital switchboard operations and telephone services.




IDX-3000 Data Switch Expanded – The IDX-3000, a port switching system that provides access to UA computer systems, has been expanded by 33%. This expansion will allow an additional 1500 terminal and computer devices to be connected to the IDX switch.



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2.  Phone – Call 621-TIPS (621-8477) between 9 a.m. and 4 p.m.
3.  Electronic Mail – Send a mail message to one of the following addresses.

CoSy Address: tips
 DECnet Address: osprey::tips
 Internet Address: tips@osprey.telcom.arizona.edu

Check one: <input type="checkbox"/> Add my name <input type="checkbox"/> Cancel my subscription <input type="checkbox"/> Change my address	Check one: <input type="checkbox"/> Faculty <input type="checkbox"/> Staff <input type="checkbox"/> Other	Name	Phone
		Department	
		Campus Address	

Telecom News is published monthly by the University Telecommunications department at the University of Arizona. *Telecom News* includes articles about telephone services, data communications services, transmission facilities, and communications applications at the UA. *Telecom News* also provides updates on the Telecommunications Improvement Project Services (TIPS).

Articles may be reprinted without permission as long as credit is given to the newsletter. Suggestions or inquiries are welcome. Please submit all suggestions or inquiries to *Telecom News*, University Telecommunications, Computer Center 73A, Rm. 131, or call 621-TIPS.

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