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PARTY LINE

-Ruth Michalecki, Nebraska

This month Party Line is re-printing a short article on the NORTHWESTERN UNIVERSITY Telecommunications System that appeared in the Chicago papers. I have asked Len Tate, Director of Telecom at Northwestern if I could interview him and his staff for a future issue of ACUTA News, and Len said he would cooperate in any way possible—so your editor will be visiting Len for an in-depth look at what has to be one of the more interesting projects I know of.

NORTHWESTERN PHONE SYSTEM

By Christine Winter

With the construction of a state-of-the-art telecommunications system that bypasses the local Bell office, Northwestern University has virtually entered the telephone business for itself.

The controversial move, which has already overrun its anticipated $12 million cost, has not been without serious problems and delays. Yet the system is on the cutting edge of technology, and will probably pay for itself within five to seven years, according to Len Tate, executive director of telecommunications for the university.

"It was engineered to take us past the year 2000," Tate said. "We can enhance and upgrade everything we do as time goes on, primarily through software changes."

According to Steve Vandenpude, group vice president of Centel Business Systems, which supplied Northern Telecom Inc. equipment for the project, the total cost will be close to $14 million, primarily because of expansion.

The system is handling about 13,000 users, but is capable of handling 60,000.

Northwestern has constructed telephone switching stations comparable to Bell offices at its Evanston and Chicago campuses. The two stations are tied together by fiber-optic links, cables made of hair-thin strands of glass fibers. Another link will be added to the Rehabilitation Institute this summer.

All calls made within those sites—that is, from within any part of the Northwestern complex to any other part—including all the special paging needs of Northwestern Memorial Hospital, can be routed through those stations without going through Illinois Bell, and by dialing only five digits.

Calls to and from outside points go through normal Illinois Bell channels. The system also handles all the 911-emergency and special cardiac-assist calls for the hospital.

In addition, both campuses send all their long-distance calls, via another fiber-optic link, directly to GTE Sprint's terminal in the Chicago area. Again, the Bell office is bypassed and access charges are avoided by both Northwestern and Sprint. Two to four seconds are also saved per call through the direct link, Tate estimated.

Such ambitious bypass operations, should they catch on, could be disastrous to local telephone companies. Yet the scope of such an undertaking is so massive from the standpoint of construction, operation and maintenance that few corporations are likely to embark on such a project lightly.

The system is designed not only to handle Northwestern's complex telecommunications needs but also its present and future data needs.

"There are other bypass systems in the country as large or larger than Northwestern's, but nothing anywhere near that size that is so data-intensive," Vandenpude said.

Next to every phone jack is a data jack, and no additional local area network is needed to share data among the computers in the complex. High-speed data can be sent within the complex over the wires at 9600 characters per second without a modem; there are modem pools for outbound data transmission.

All the custom calling features—such as call forwarding—that are offered by Bell companies are available, plus many enhancements. A display screen on each phone will tell users the phone number of any caller from within the complex. Outgoing calls can be restricted, and users can carry their access level with them to any phone they use.

A separate set of computers, designed to handle all maintenance, repairs and billing mechanisms [each department is billed just the way a Bell office would bill them], have been integrated into the main computer. Every stage has all the back-ups and security that normally would be found in a complete Bell office.

"We have taken full responsibility for all our telecommunications needs," said Tate, adding that Northwestern will provide all the upkeep. At present, however, Northern Telecom still has full-time people on campus rechecking the programs for errors.

The reasons for embarking on such an undertaking were primarily economic, he said. Although the system offers high speed and high reliability for data that is not always available through the public network, the rising cost of local telephone service was the motivating factor.
New voice and data features for Centrex

Elizabeth M. Mazur, Mary J. Perhay, Monica Sertoff, and John H. Spencer

ATT Technologies has expanded—and unbundled—Centrex features so telecommunications companies can let their business customers have more control over voice and data transmission.

For telecommunications company managers, Centrex is here to stay.

It is a proven moneymaker, accounting for more than $1.2 billion in telecommunications company revenues last year.

It has penetration in the market, with more than 5.5 million lines serving 12,000 businesses, with most of the systems handling 400 lines or more.

And it has potential for growth in both voice and data capabilities for large and small business markets.

For these reasons, ATT has been working with representatives of telecommunications companies to extend the capabilities of the existing Centrex service with new hardware-and-software-controlled features.

Among the new features developed by ATT Technologies and ATT Bell Laboratories are:

--Advanced data capabilities,
--Increased customer control, and
--An automatic message center for voice services.

As electronic switching systems were first being developed, ATT realized many business customers had special telecommunications needs. They wanted extensive custom-calling features, their own dialling plans, and the ability to tie various locations together in their own communications networks. In addition, many of these companies preferred not to be responsible for the maintenance and associated costs for these services.

To meet these needs, ATT developed Centrex, which provides services based on a central office switch, rather than a PBX-type switch on the customer's premises. Centrex takes advantage of the high reliability of central office switches—including their own power supplies to assure service—to tie together a company's telephones into a private network.

Centrex offers features similar to those provided by private branch exchanges, and is as easy to use. Each telephone is connected to the central office, where the switching and other features are provided. This centralized design eliminates the need for the customer to lease or buy special equipment, and permits centralized maintenance and administration for the customer at the central office.

ATT's newest Centrex services permit telecommunications companies to continue to offer customers services that are competitive with other switching systems and meet their growing voice and data needs at reasonable cost.

The new services include expanded voice and data features, facility management, cost management and electronic station communications sets. These new services will be provided by both the 1AESSM switch and ATT's digital 5ESSM switch.

All of the new features for the 1AESS switch will be generally available in early 1986. Features for the 5ESS switch will be available in 1986.

Voice services

The approach being taken in expanding the voice capabilities of Centrex emphasizes flexibility.

Central office Centrex features have been "unbundled" to form a feature known as Multi-line Variety Package for small businesses. This unbundling permits companies to economically customize Centrex to fit their needs without having to pay for unwanted features.

Unbundling also permits small businesses to use the features most attractive to them at the outset, and add other features as their needs evolve. The Multi-line Variety Package is now available to customers served by a 1AESS switch.

On the 5ESS switch, Centrex will be provided as a group of features, rather than as a single feature set. The individual features can be combined into custom-feature packages, including the Multi-Line Variety Package. This means that traditional Centrex features like Call Transfer and Call Pick-Up will be practical for residential customers and small businesses, as well as large businesses. Each feature can be assigned, extended, or withheld on a line-by-line basis.

Although the 5ESS features will offer the same functionality as those on the 1AESS switch, this new method of allowing more control by the end customer will increase its versatility.

Because the features are being offered individually, the operation of the feature has been decoupled. The customer can forward calls to different numbers, depending on whether the customer's line is busy or not being answered. Also, the type of treatment given to a call can be based on the status of the line that is calling. For example, a catalog store could have local calls forwarded to one directory number, and long distance calls to another; or, inter-Centrex group calls can be given Call Waiting treatment, while intra-group calls can be routed to a busy tone. Calls also can be routed to different numbers, depending on the time of day.

Feature for the 5ESS switch will be developed in terms of a general type of service, like Call Waiting or Call Forwarding, and a set of options that will allow the customer to select exactly how a feature will operate.

One option for Call Forwarding is "When should the incoming call be forwarded?" Another option is "What type of calls should be forwarded?" This design allows features to be data-driven. This means a greater variety of features can be made available and new features can be developed quickly, by providing new values for options, or new options. One extension to Call Forwarding would be to allow the customer to specify a list of directory numbers; calls on that list would be allowed to complete and all other calls would be forwarded.

The general types of services are called modular features. Call processing modular features are defined using Specification and Description Language (SDL), a standard feature-design language of the International Telegraph and Telephone Consultative Committee (CCITT). The requirements for a new feature are described using SDL and refined during the development process. Then, the resulting SDL specification of the feature is compiled into executable code. This allows greater continuity during the development cycle.

The features that the customer sees may be a combination of one or more modular features to provide new types of services. For example, Call Waiting and Call Forwarding can be combined, so that if the
Centrex (CONTINUED):
customer chooses to ignore the Call Waiting tone, the
new incoming call can be redirected to another number.
Call Waiting and Three-Way Calling can be combined so
that the person who received the incoming call can form
a three-way call from the original call and the waiting
call. This can be used to provide a simple form of
"meet-me" conference service.

City-Wide Centrex

City-Wide Centrex is a feature that allows Centrex end
users at multi-locations spread throughout a
metropolitan area to communicate with each other
transparently even though their locations are served by
different switching offices. Users do not have to dial
up tie lines to communicate between the locations.

This networking ability is made possible by using Local
Common Channel Interoffice Signaling (LCCIS), which
permits information on calls to be transmitted between
central offices on separate dedicated channels as the
call is being set up. This ability to transmit
additional information about the incoming call opens up
the door to a variety of new Centrex services.

City-Wide Centrex permits calls to be transferred or
forwarded between Centrex locations within a city just
as easily as within a single Centrex location.

In general, City-Wide Centrex eliminates the need for
the end users to be concerned with the physical design of
the network. Instead, they can use standard intercom dialing to reach all telephones in the
City-Wide Centrex group. Typical Centrex features such as Three-Way Calling and Dial-up Station Conference
Calls can be set up by using only the telephone
extension numbers, making the multiple locations of the
system functionally transparent to the users. This is
a savings for the multi-location Centrex user, since
public switching facilities can be shared and the cost
of dedicated private lines between facilities is
eliminated.

Message desk

Another new Centrex service is the message desk
feature, which can forward intraoffice calls to a
company's local message center, or forward interoffice
calls from different Centrex locations to a city-wide
or regionalized central message center.

The message desk feature forwards the directory number
being called to the message center, where, with the
proper data base, it could be translated into the name
of the person being called for display on an
attendant's console. This allows the message center
attendant to answer with a personalized "Miss Jones'
phone," rather than using a more impersonal "Extension
1234."

There are two versions of this feature. The first,
which is in operation today, allows a Centrex user
served by a single switch to implement a message desk.
The second version uses LCCIS to implement message desk
capabilities in a City-Wide Centrex environment. In
this use, a single message desk center can serve
multiple locations.

In addition, since LCCIS provides the directory number
of the person who is calling, a sophisticated data base
also could display additional information about the
caller, on an attendant's terminal or screen, such as a
customer's record of account payments.

A message light on the telephone or a special dial tone
can signal the person being called that a message is
waiting in the message center.

Centrex users can choose whether their calls should be
forwarded to the message center if their line is busy,
or if the line doesn't answer, or both. If they are
going to be out of the office for an extended period of
time, they can call-forward incoming calls directly to
the message center.

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[Diagram showing Centrex customer and central office connections, with various lines and switches indicating data transmission and connectivity.]
In addition to the added flexibility of new Centrex features, Centrex users also can take advantage of the services provided by Local Area Signaling Services (LASS). LASS features are based on the ability of LCCIS to forward the directory number of the calling party as the call is set up.

That ability of LASS, combined with other new Centrex features, allows Centrex users to automatically recall the last incoming caller—both Centrex and non-Centrex—or the last number called, provide distinctive ringing for selected incoming calls or distinctive tones for selected forwarded calls, trace calls, and even block calls that aren't wanted. No special hardware is required on the Centrex customer's premises.

With a display attached to the telephone, a Centrex user can use LASS to view the telephone number of the incoming, non-Centrex calling party before answering the call. With an associated data base, this information also could be translated into detailed information, such as billing information, that could be displayed on a video screen, just as in the case of the message center. This capability exists for both intercom, intraoffice, and interoffice calls from other offices served by LCCIS.

In addition, LCCIS permits LASS to provide customers with a list of all incoming non-Centrex calls on either a read-only printer or stored in computer memory. The user can then process the data to determine, for example, the percentage of unanswered calls, peak times for calls from different geographic areas, or other pertinent information.

The ACP advantage

The Advanced Communications Package (ACP) is a software program that runs on the ATT 3B computer and provides the Centrex customer with a great variety of new communications features and also greater control of these features.

The ACP provides real-time access to station message detail records data, and a message center operation, which includes alerts to an extension whenever a message is received for it at the center. The ACP also provides support functions for the controller that is used with the new Centrex electronic key system that includes ATT electronic telephones. The key system provides quick and easy access to specific Centrex features, such as Call Transfer and Automatic Recall. The ACP also allows access to multiple lines.

The ACP can be used to store and process call-information data for customized reports for the Centrex customer, and it provides an easy-to-use interface for customer administration. The ACP also permits time-of-day call routing changes that can be made in real time for Centrex customers with private networks. Access is provided to view or modify authorization code assignments, facilities can be restricted to specific people in the corporation's organizational structure and station rearrangements and other changes can be made. In addition, the 3B computer can be used to provide general word processing capabilities using the UNIX operating system, as well as the ACP capabilities.

The ACP uses standard interfaces with the input-output ports and the peripheral control unit of the 1A ESS switch. The ACP can be located at the central office, where it could be used by just one or multiple customers, or at the customer's premises for full customer control. By providing customers increased control over their Centrex system, the ACP saves them time and money.

New data capabilities

In addition to creating communications networks, the need to transmit ever-increasing volumes of data is becoming more commonplace in business today. Now Centrex customers are being offered several features that provide high-speed voice and data transmission at reasonable costs.

One feature is the data facility pool, which provides customers with an inexpensive full-duplex, simultaneous voice and data service at speeds up to 9.6 kilobits per second. This service allows customers to use inexpensive integrated voice-data modems (IVDM) designed for short-distance use to access a pool of modems at the telecommunication company's switching office.

This feature eliminates the need for the customer to have expensive long-distance modems on the premises. Users can use the IVDMs for simultaneous voice and data transmission at rates up to 9.6 kilobits per second, or use the IVDM to access the modem pool for long-distance transmission at 4.8 kilobits per second.

The modem pool can be dedicated to just one Centrex customer, or it can be shared by a number of Centrex customers.

A data-protection capability soon will be available for customers who wish to protect voice lines being used for data transmission from tones that could disrupt the transmission. This feature can be permanently activated for the customer, or activated and deactivated by using an access code.

These features are available over existing Centrex loop circuits. There is no cost for new wiring.

The new Centrex features also are compatible with ATT's Circuit Switched Digital Capability (CSDC), which provides synchronous, 56-kilobits-per-second two-way data transmission and emulates full-duplex, high-speed transmission over voice-grade lines.

CSDC is now being trialed in the Chicago area and soon will be available nationwide. CSDC permits a telephone user to carry on a regular telephone conversation, switch to transmit data over the same line, and alternate between voice and data. Like Centrex, CSDC uses the capabilities of the central office switch, which permits Centrex customers to subscribe to CSDC just as any other telephone subscriber would.

In addition, Centrex can be used with T1 lines at 1.5 megabits per second to multiplex data. This permits business customers to tailor their data networks. For example, an organization or location with low data-transmission needs could economically use Centrex, and still be connected over 56-kilobits-per-second trunk groups by using CSDC.

Centrex potential

During the next few years, exciting new digital services will be introduced into the nations' communications networks, as the country, and indeed the world, move toward the Integrated Services Digital network (ISDN). The ISDN concept is centered on the notion that users should have a uniform view of the many different services that use circuit-switched packet-switched, or other connections. The ISDN standards are now being established by the CCITT. The first use of ISDN on a S55 switch is expected to occur in 1986.

Centrex has been designed to take advantage of ISDN to provide new voice and non-voice services as they are developed. One advantage of ISDN Centrex is that it will integrate a multitude of features by using a
Changes included four new billing options, an option that permits customers to prevent their telephone number from being identified by the persons they are calling, and modifications to the automatic reconnect feature. After service was started, changes to customer-originated trace were made to avoid the inappropriate use of the feature by a few customers.

**Adaptive software**

New approaches to developing these features also were used. A group of systems engineers and developers was selected to write requirements and code, and perform feature and system testing. The group developed a cohesive set of features based on common subcomponents of code. This software structure permitted the quick changes and additions necessary to meet both service dates and telecommunications companies' requests. The new code was inserted into an existing software block to reduce development intervals. As a result, the project took only eighteen months from initial planning to delivery of the generic.

The new features of LASS are based on the existing technologies of the Common Channel Interoffice Signaling (CCIS) system, plus new hardware and software systems developed especially for LASS.

CCIS, which was first introduced by AT&T Communications in 1979, cuts call setup time between switches in the toll network by using a high-speed signaling network that is independent of the voice network. Prior to CCIS, signaling was done over the same channels that carried the voice traffic.

**LOCSIS network**

To provide the call identification information required by LASS, the signaling capabilities of CCIS were extended from the toll to the local network. This extension, called Local Common Channel Interoffice Signaling (LOCSIS), is necessary to a local signaling network that is independent of the voice and data network.

LOCSIS provides telecommunications companies with an opportunity to generate new local revenues by providing their customers new local services such as LASS.

To insure a cost-effective introduction, LASS was designed to be compatible with the existing features of CCIS and IA ESS switches. No existing features had to be modified, but four new software components were added to the IA ESS switch. Two of these use CCIS capabilities for interoffice operation. The new components are:

--- **Retrieval of Calling Line Information.** This capability makes available to LASS the directory number of the most recent incoming telephone call. This is basic information required for all LASS features.

--- **Line History.** This capability was designed especially for LASS and provides a "scratchpad" memory for each line attached to the IA 1ESS switch. The memory is continually updated to store the last directory number that called the line or was called by the line. This capability is necessary for automatic reconnect, customer-originated trace, and identification of individual callers.

--- **Retrieval of Distant Line Status.** This capability automatically retrieves the status of distant lines (valid, on-hook, etc.) for use with automatic reconnect, distinctive ringing and distinctive call waiting tones, and selective call forwarding.

--- **Screen List Memory.** This capability lets customers store selected directory numbers that are to be given special treatment. This memory is used with distinctive ringing and call waiting tones, selective call forwarding, and nuisance call rejection.

**LASS:** Putting the telephone customer in charge

C. Brant Hirschman, Grant E. Swinehart, and Marie L. Todd

A new ATT product, Local Area Signaling Services (LASS) provides new revenues for telecommunications companies and unprecedented control over the basic telephone for their customers.

There is no way around it. Although a basic telephone can put you in touch with the world, in the hierarchy of the highly computerized telecommunications industry, it's still regarded as a "dumb" terminal.

However, recent trials by two telecommunications companies of ATT's new Local Area Signaling Services (LASS) have demonstrated that telephone customers now can have unprecedented control over their telephone calls just by pressing a few buttons on that "dumb" terminal. The telephone hasn't gotten smarter. Instead the "smart" that provide these services have been built into local IA ESSD switches.

LASS lets telecommunications company customers use ordinary rotary or touch-tone telephones to:

--- Automatically reconnect the last number that either called or was called by you.

--- Have only preselected calls forwarded to another location when they will be away from their own phones.

--- Be altered by distinctive ringing that preselected callers are trying to contact them.

--- Be able to initiate a trace on calls in cooperation with local law enforcement officials. And even be able to block certain nuisance callers from even ringing their phones.

Customers don't have to buy or rent additional equipment for most of these services, nor do they pay any monthly service charges; they pay just a nominal fee each time they use a service. In addition, for those customers who want to know who is calling before they answer, a special telephone attachment with an alphanumeric display is available. These incoming numbers also can be printed out on a printer, or stored in the customer's own computer memory.

ATT Bell Laboratories worked with telecommunications companies to conduct market surveys of the proposed features. During the development process, some features were changed—and a new one was added at the companies' requests.

Centrex (CONTINUED):

single access facility—the CCITT standard 2B+D digital subscriber line (DSL). Centrex will offer simultaneous voice and data capabilities, including 64-kilobits-per-second, clear-channel, circuit-switched and packet-switched data on the B channel. Existing voice and non-voice features will have a faster call set-up by using the out-of-band signaling capability of the 16-kilobits-per-second D channel.

The ISDN design is consistent with the overall concept of Centrex, which is based on the switching and computing power of the central office, and offers users a simple, consistent "face" in providing services.

As ISDN services are introduced, and as new services are added to the Centrex Advanced Communications Package and to the 1A ESS and SS5ESS switches—Centrex customers will be able to take advantage of all these new benefits, while leaving the headaches of maintenance and operation for the telecommunications Company.
LASS (CONTINUED):

Although LASS electronics are quite sophisticated, LASS is as easy to use as dialing two or four digits.

Automatic reconnect

Take, for example, the automatic reconnect feature. How many times have you been in the shower, or fumbling with the front door keys, while the telephone rang? Or, how many times have you called a number, only to find it constantly busy? "Automatic reconnect permits LASS customers to automatically recall either the last number the customer called, or the last number that called, by dialing *66 or 1166.

In the central office, the line history capability accesses the LASS temporary memory associated with the customer's line for the last number that either called, or was called by, that line. The number is then passed on to the line status retrieval mechanism, to determine if the number is valid or whether the telephone set is on hook or off.

If the number being checked is from the same office, its status can be determined immediately by the switch. If the number is from another office, then a direct signaling message is sent over the CCS1 network to the far-end switch for the necessary status information. Once this information is returned, LASS determines if the call can be placed.

If the directory number being recalled is not valid, LASS uses a "denial" tone to signal the customer that the automatic reconnect can't be activated. If the number is off hook, a confirmation signal is sent to the customer. This signal tells the customer that LASS is checking the called line. But if the line is on hook, the call is set up just as if the customer dialed the number. All of this interoffice or intraoffice signaling takes less than a second; the customer doesn't experience any perceptible delay.

LASS checks the distant line every 40 seconds until either the recalled number is idle or a half hour passes. When both the customer's number and the recalled number are idle, LASS gives the customer a special ring, and if the customer picks up the telephone, the call is set up. However, if the customer doesn't answer, LASS will then recall the customer every four minutes. This time difference is due to a very practical concern, consideration for neighbors. An unanswered telephone set ringing every 40 seconds could prove to be a nuisance to someone nearby.

Customers can even have a number of reconnect attempts in progress at one time, provided they activate the reconnect on a number before it is overwritten by a second number. For example, a customer could recall an incoming call that was not answered, then call several other numbers and, if there was no answer or they were busy, initiate automatic reconnect on each of them. This is possible because once the retrieval mechanism accesses the directory number in the line history scratchpad memory, that number is then stored in a second memory file associated with automatic reconnect.

Other directory numbers can then overwrite that line history scratchpad memory without affecting a previously activated LASS feature.

Three other LASS features, selective call forwarding, distinctive ringing and distinctive call waiting, and nuisance call rejection, use screen list memory. With this, the customer can store directory numbers that should receive special attention by LASS.

Selective call forwarding

Conventional call forwarding features send all incoming calls to a predetermined number. This new LASS feature lets the customer select which calls are to be forwarded, as identified by calling party attributes, such as the directory number.

Selective call forwarding requires the customer to already have the conventional call forwarding feature now available in many parts of the country. To use selective call forwarding, a customer dials the two-digit *63 or 1163 access code. After hearing a special dial tone, the customer dials the directory numbers that should receive special handling. These numbers are stored in a LASS screen list memory. Telecommunications companies may choose the maximum number of directory numbers that can be stored. As each directory number is dialed in, a confirmation tone tells the customer the number is accepted.

If the number is not accepted by LASS, either because the memory is full, or the directory number is invalid, the customer will hear a special tone or announcement.

Once the customer is done, he or she just hangs up.

As calls come in, LASS compares the incoming number against the numbers stored in LASS' screen list memory. If a match is made, the call is forwarded. If not, the call is directed to its original destination.

Distinctive ringing

The distinctive ringing and distinctive call waiting feature is activated in the same manner as selective call forwarding. The only differences are the activation and deactivation codes.

Incoming calls are processed in the same manner, except that at the point where the ringing or call waiting tones are to be applied, a check will be made to see if the call should receive distinctive ringing or distinctive call waiting tone.

Nuisance call rejection

There are times when avoiding certain calls may be just as important to a customer as receiving certain calls. During the marketing study on what LASS features customers would want, it became apparent they would like to be able to block annoying interruptions from certain people. As a result, the nuisance call rejection feature was developed to make it easy for the customer to stop such calls.

Nuisance call rejection can be activated at the time a nuisance call is received. After the customer hangs up, the feature can be activated by dialing *60 or 1160. LASS obtains the directory number from the line history memory, and stores it in the screen list memory. At the completion of the process, the customer hears a confirmation tone.

Thereafter, every incoming call to the customer is compared to the directory numbers in the nuisance call rejection file, and if a match is made, that call is directed to a special announcement explaining that the call can not be completed at the customer's request. All these features can be activated in the same way by dialing the feature deactivation code.

Customer-originated trace

Local telecommunications companies have always worked with customers and local authorities to curb nuisance calls made by people who abuse the telephone system. Unfortunately, there is little anyone can do to stop people who make nuisance calls at random, since it isn't feasible to put a trace on all the lines that might be affected by these calls.

With the introduction of LASS however, the customer can initiate a trace of a nuisance call—without any special equipment. To recap a point previously made,
LASS (CONTINUED):

only customers with the individual or bulk line identification features can know the directory number of an incoming call. All other LASS features provide services to customers based on that number, but the number itself is known only to the 1A ESS switch.

For customer-originated trace, that's enough. Whenever a customer receives a nuisance call, all she or he has to do is hang up and promptly dial *57 or 157. This signal prompts LASS to retrieve the incoming call's directory number from the line history memory and then relay it over an input/output channel to the local law enforcement agency, where it can be stored in a computer or printed out.

The customer, after dialing the trace code, makes a formal complaint to the police, who then take the appropriate action.

The feature can reduce the number of nuisance complaints by eliminating the shield of anonymity to those who make such calls. Now telecommunications companies can cut the number of nuisance calls and generate both goodwill and extra revenue at the same time.

How LASS makes the connections

Local Area Signaling Service (LASS) gives telephone customers unprecedented control over how they handle incoming calls by using a signaling network that transmits information on calls independent of the voice network. LASS uses the capabilities of AT&T Communications' Common Channel Interoffice Signaling (CCIS) in a cost-effective local version, called Local CCIS (LCCIS), which provides an end-to-end signaling network for local telephone traffic.

For example, if telephone 1 (555-1000) places a call to telephone 2 (555-2000), LASS stores the number of telephone 2 in a temporary memory associated with telephone 1, called line history memory. As switch 1 proceeds to set up the call with switch 2, it uses the out-of-band LCCIS to send to switch 2 the directory number of the calling telephone. In turn, as switch 2 alerts telephone 2, LASS places the calling telephone number in the line history memory associated with telephone 2.

These two updated line history memories can now be used to provide several LASS features. Telephone 1 can activate automatic reconnect, while telephone 2 can activate customer-originated trace, automatic reconnect, or nuisance call rejection. The line history memory also provides the incoming directory numbers for individual line identification and bulk line identification features.

A second type of memory, called the screen list, is required to provide distinctive ringing and call waiting tones, selective call forwarding, and nuisance call rejection. Telephone 1 can select telephone 3 for special treatment by entering its directory number, 555-3000, into the appropriate screen list.

Each directory number calling telephone 1 is compared against the screen list to determine if the calling number should receive special treatment. Numbers not in the screen list are handled as routine calls.

The Retrieval of Calling Line Information is used to provide LASS with the most recent number that called or was called by a customer, while the Retrieval of Distant Line Status queries a distant switch to validate a number before storing it in a screen list memory, or determines if a number is valid, on-hook, or busy, before activating a LASS feature.

Although these four components rely on sophisticated electronics, from the customer's point of view, the LASS features they provide are as easy to use as dialing a few digits.

Call identification

The mechanisms that permit LASS to identify incoming calls for special treatment also can be used to display the incoming directory number for the customer as well. This feature is called individual calling line identification.

Customers who want the line identification feature must first subscribe to the feature from the telecommunications company. In addition, they must separately buy or lease a special station set capable of displaying the incoming directory number while the receiver is still on-hook. The list of special sets built will show just the telephone number, and are expected to be of use to businesses that rely heavily on telephone orders (such as mail order houses or local pizzerias) to reduce caller fraud by verifying the accuracy of the phone number of the calling party.

In addition, individuals could decide—based on the display—whether or not to answer the call.

This display capability could be enhanced to permit customers to direct the incoming telephone number to their own computers, which could, for example, display information about the caller on a video terminal. Such a use could save businesses time and money in dealing with their customers.
Once the display station set is installed and the necessary changes are made in the central office to transmit the directory number over the line, the calling number is automatically sent for every incoming call. The transmission of the calling number does not affect voice transmission, since it is done before the customer answers the phone.

Since the customer may be billed for each telephone number displayed on a desk set, a deactivation code permits the customer to stop the service temporarily when no one will be around to answer the phone.

LASS provides an impressive package of new features that give customers greater control over their telephone without having to buy special equipment in most cases. The per-use charge makes it attractive and convenient for those who normally might not want to invest in such services.

The articles, "New voice and data features for Centrex" and "LASS: Putting the telephone customer in charge," were reprinted from May, 1985 issue of RECORD, AT&T Bell Laboratories.

**PARTY LINE, CONTINUED**

"The high cost of access fees per line was part of it, of course," Tate said. "But the new charging mechanism that requires full recovery of cost from each user, without the traditional subsidies from long distance and other lucrative services, could have totally wiped us out," he said.

"For big business, it is absolutely prohibitive to install, move and add lines, as well as time consuming these days. We have as many as 1,800 moves, adds or changes a month on the Chicago campus; another 800 on the Evanston campus," he said.

"Although we don't have the money to fully utilize every feature now, we have all the hardware in place and we can add users as we go along," he said. "We have the potential to transmit full duplex color video, so that an operation performed at the hospital [in Chicago] could be broadcast live to students on the Evanston campus."

"There have been thousands of problems," Tate said. "Delivery of equipment have been slow, and the new technology, quite frankly, has not been easy for everyone to learn. We have to hold training classes that range from one to four hours to teach employees how to use the phones."

"Like any new computer—which is what the SI-1 switches from Northern Telecom are—there is a certain amount of burn-in time," added Peterson. "In a year, we expect to have no problems at all."

Though extremely frustrating, Tate says, none of the problems is insurmountable.

"It's a mammoth undertaking," Tate added. "Everything is serviceable; it's mostly just a lot of clean-up work right now."

**Party Line, continued:**

ROLM: Contact: Stephen L. Lunson, Manager-Voice Network; First Tennessee Bank, Box 84, Memphis, TN 38102. You could also contact long-time ACUTA member Ted Haynes, ROLM Corporation, 4900 Old Ironsides Drive, Santa Clara, CA., 95054 (408-986-3649), for information.

NORTHERN TELECOM: Len Tate from Northwestern told me about this. Many of our ACUTA members were present at the first National Northern Telecom User Group meeting. The temporary chairman is: Jerry Platt, Senior Director Business Systems Communications, USAA Insurance Company, San Antonio, TX., 78288 (512-690-5460). Some of our fellow ACUTA members involved in the first meeting were: Len Tate, Northwestern; Dino Pezzutti, Ohio State; Ken Johnson, Central Michigan; Tom Morris, Univ of Texas-Austin; John Terrell of UCLA was named Secretary of the association.

INTECOMM: I heard indirectly that ACUTA's Pat Todus, University of Chicago, 1307 East 66th Street, Chicago, IL., 60637 (312-926-7730), heads up the INTECOMM User Group. If interested, give Pat a call, and if my info is incorrect, I am sure Pat could give you the right name and number. Watch for an interesting article from Pat in next month's ACUTA News.

HONEYWELL: Steve Merrill, University of Utah, 1085 Annex, Salt Lake City, UT 84112, (801-581-7300) would be able to give you a contact name for this group.

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Some information from our Region 1 Director, Jeff Kuhns: LEHIGH UNIV has selected an INTECOMM Switch (IBX S80), 5300 stations, due to cutover July, 86. Student resale to start in the Fall, 1986. Student line charges to be built into room charges, rooms will have 1 line with simultaneous voice/data. Total project cost estimated at $20 million (approx 1/3 each switch costs, conduit and plant costs, hardware and support costs). Telecom Director - Janet Smith.

TEMPLE UNIVERSITY will install the INTECOMM IBX S80 (2), 10,000 lines, estimated cost of $11.6 million in a phased cutover: Aug 85 thru Dec, 85. Student Resale will start Fall, 1986. Student rooms will have a duplex jack, one line for voice and one line connected to a mux located in the basement of the halls, which then connects to a data switch. Contract for data switch not yet signed. Three remote locations will be served from the main campus switch. The two IBX S80's will be connected with fiber and the three remotes connected with a 1.544 MBPS circuit on copper. In addition, the NEC NEAX 2400 will be cutover in July 85 for the Temple Conference Center. All new outside and inside plant is being installed. Bell of PA. Includes 13 miles of copper, 16 miles of fiber, 18 miles of conduit and 26 miles of fiber. All fiber is 50 microm multi-node. 95% of all voice sets to be single line and the remaining to be electronic sets. Major problem has been finding the space and equipping the required 12 rooms for node locations. The cost to provide proper environmental conditions for these rooms was estimated at $902 thousand.

UNIVERSITY OF VERMONT selected a ROLM CBX II with Rolbus 295; 7,000 lines for $9 million. $3.25 million of total price is for new conduit and cable. The phase cut started March of 85 and should be completed Nov, 85. Student Resale will start this fall. $66.00 per year will be added to student room charge and the student long distance rates are projected to be 40% below DDD rates. The CBX is distributed among 13 nodes.

**User Groups are forming all over the place. They are certainly of great value and I am going to list a few of them for you. If anyone knows of additional ones, on a national level, please let me know.**

CENTREX: The person involved in the Centrex Users Group, on a national level is Roger Underwood. His address and phone number is: 185 Front Street, Suite 201; Danville, CA. 94526 (415-746-2070). If your state doesn't have an active Centrex User Group, and you are interested in forming one, please contact Roger Underwood for help.