# COMMUNICATIONS
# FORUM

INTRODUCING ISDN :
SOME USERS' EXPERIENCES

November 19, 1987

Seminar Notes

**MASSACHUSETTS INSTITUTE OF TECHNOLOGY**

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Morton Berlan
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Rapporteur
MIT

This seminar focused on the decision-making processes involved in choosing new telecommunications systems at two Cambridge, Massachusetts institutions of higher learning—MIT and Harvard University.  While MIT has recently selected to purchase a 5ESS digital switch from AT&T, Harvard has more recently opted to lease its switch from the local telco (Centrex) and thereby have it located off-campus.  This "buy" versus "lease" decision was the central point of contention at this forum.

Mort Berlan of MIT addressed two main questions in his presentation:  What is it that justifies these new activities, e.g. new switch, plans for ISDN services, etc.?  What is the process by which an organization decides to buy such a switch?

The backbone of MIT's current communications system is a centrex system provided by a 1AESS analog switch and an MIT PBX (Private Branch Exchange) known as "Dorm-Line."  The 5ESS switch which MIT will purchase in August 1988 and locate on campus will provide voice and data communications services to both administration and students at MIT.  (Exhibit A)  The Institute is currently preparing for the system by extending the MIT duct system and readying all the wiring.  (Exhibit B)

Berlan emphasized that MIT's decision to purchase a switch did not happen overnight.  In fact, Berlan first began looking at replacing the Centrex system back in 1980, but due to what he referred to as "institutional lag" he did not get permission to submit an RFP (Request for Proposal) until 1984.  At this time, the local telco (Nynex) was proposing a PBX solution rather than Centrex to MIT.  He noted that today Nynex is more aggressively marketing its Centrex services.  MIT's cost comparisons were calculated over a ten-year period.

In hindsight, Berlan admits that MIT will actually save less money than it originally estimated by purchasing a switch given costs associated with rewiring and cabling MIT, as well as an unanticipated drop in Centrex rates.  However, over the ten year period MIT is confident it will realize savings by owning its own switch.  He estimates the total cost of the project, including the switch and maintenance over time, will be in the range of $21 million.

MIT has studied the role ISDN (Integrated Services Digital Network) will play in its network.  According to Berlan, an ISDN telephone with display will be provided to members of the MIT community at rates competitve to the local telco:  $35.25/month for Class A service and $23.25 for Class E (restricted) service. He does not believe that ISDN will satisfy all the universities communication needs, especially those for wideband communications.  Therefore, MIT has planned for a wiring scheme

(2 4-pair wire into each lab) that will also be used to support local area networks. On a national scope he does not think ISDN will be in use until 1988, citing the current McDonald's ISDN trial in Illinois.

Berlan noted the installation of the new telephone system at MIT will mean added savings and convenience for students who will no longer be charged message units for local calls. Their rotary phones will be replaced with touchtone models giving them access to features like call forwarding, etc. In contrast, business users at MIT will be charged message units. According to Berlan this dichotomy in rate structure is unique to the Commonwealth of Massachusetts.

Peter Heffernan of Harvard provided a chronology of the University's decision-making process relating to its communications system. He noted several factors which prompted Harvard to begin reevaluating its communications systems two years ago: With the divestiture of AT&T and the emergence of competition in the telecommunications business, the University was facing more and more choices. There were also advances being made in technology especially in the area of digital switching. At the same time, the University wanted to address complaints about communications services coming from the user community. Lastly, Harvard was watching MIT's activities in communications.

Integral to Harvard's planning was the formation of its Telecommunications Advisory Group (30-40 people), the University's Telecommunications Services Division, and the consulting firm of Temple, Barker & Sloane. TB&S was contracted by the University to carry-out a "needs assessment." This project used interviews and questionnaires to project the communications needs of administrators, faculty and students over a five year period.

The highlights of the study, especially relevant to the University's administration and faculty, included:

- o  estimated 27% growth in call volume (Exhibit C);
- o  over 40% of voice communications go outside the university;
- o  projected eight-fold growth in data traffic (Exhibit D) with a large increase in traffic going outside the university;
- o  a desire for quality telephone service;
- o  the need for improved call coverage and messaging;
- o  requests for more timely moves and changes and other features;
- o  a growing need for video conferencing.

Student needs were identified as low cost basic service including

provisions for student-owned phones and low cost long distance service.

Mr. Heffernan noted the interesting findings especially in the area of identifying data communications needs. While University administrators ranked as number one their need to access centralized databases, the faculty's primary data communications need was interchange of wordprocessing documents. Harvard estimated that in the next five years two out of three students will own personal computers and half will be enrolled in courses requiring access to a computer center.

In looking for a communications solution to address the aforementioned demands, Harvard felt that ISDN should be an integral part of any plan since it will provide for simultaneous voice, data and video transmission. This would allow the University to take advantage of a single universal wiring plan, allow for the interconnection of multivendor equipment, improve network management, and provide enhanced features/functionality.

After all this analysis, Harvard issued an RFP (Request for Proposal) in February of 1987 for a communications solution. Northern Telecom responded with its SL100 and AT&T with its 5ESS switch. In evaluating the switches, Harvard selected the latter because it felt it represented more advanced technology. At this time, New England Telephone proposed leasing the University a 5ESS and arranging to locate the switch at the telcos central office in Cambridge. After calculating substantial cost savings, Harvard decided on the lease arrangement (Harvard estimates its capital costs will be approximately $20-30 million). The telco even offered Harvard complete control over the maintenance of this off-campus switch.

Heffernan observed that times have changed in the communications business, especially since MIT made its "buy" decision. He believes that the telcos have become more flexible in their pricing given they were losing accounts to the PBX vendors. Also, unlike MIT, Harvard was not interested in becoming its own telco. In making the decision to lease, Heffernan admitted that one potential disadvantage of Harvard's choice of plans is that it will have to reevaluate its whole telecommunications system again in only ten years. Heffernan is however optimistic that the telco will aim to keep costs low to retain its customer base. Although Heffernan is concerned about how regulation could affect his lease agreement, he believes the trend toward deregulation will continue.

Lee Selwyn, the final speaker, focused his attention on putting the recent communications decisions of MIT and Harvard in the larger framework of what is happening in technology and regulation. As a former member of the MIT community and one recently involved with the development of MIT's communications

plan, he traced the development of MIT's communications systems from dorm-line to a separate PBX for computer time-sharing, and the installation of all sorts of specialized dedicated facilities. Lee heralded MIT's decision to purchase the 5ESS, especially since it will allow MIT to have a system "ahead of demand" and to integrate administrative voice, dorm service and data switching.

Selwyn noted that regulatory decisions such as Carterphone and Hush-a-Phone enabled MIT to make significant changes in its telecommunications system, e.g. provide connection between dorm system and the rest of the world, allowed for connection of customer premises equipment. However, he believes that these regulatory changes did not translate into a more competitve market for communications service and equipment until the 1980s.

He also noted the changing attitude of the local telco, New England Telephone (NET), in regard to Centrex versus PBX pricing. At one point, NET (a Nynex Company) filed for a 60-65% rate increase for Centrex with the Massachusetts PUC (Public Utility Commission). As a large Centrex user, MIT intervened in the regulatory proceeding and managed to convince the PUC to only approve a 10-12% rate increase. Lee believes that the telcos, including NET, became less agressive in their Centrex pricing once they realized that this service would be facing competition from PBX vendors. To complicate this situation, "divestiture" gave AT&T the ability to distribute its switch through more than one channel.

Lee Selwyn also noted another instance in which MIT's perserverance payed-off: New England Telephone originally told MIT that the 5E switch would have to be classified as a business system, meaning the Institute's dorms would be provided with the same trunk service as the administration. Since this did not meet MIT's requirement to provide students with a residential-like service, the Institute again filed a complaint with the PUC. After a year of litigation, the PUC ordered NET to provide the residential rates to MIT's dorms.

Mr. Selwyn made comparisions of the future impact of the Harvard and MIT plans, especially their affect on the student population: With MIT's plan, the dorm phones can be left connected all year (might entail restricting toll calls); MIT can turn service to these rooms off and on using a terminal connected to its 5E switch. In contrast, Harvard students will continue to arrange for dorm phones directly with NET and will continue to receive a bill just to have service connected each academic year. He calculated that the fees incurred by Harvard students will likely represent more than $1 million a year for NET.

Selwyn believes the 5E technology is ahead of its time in respect to serving the needs of the MIT campus and in relation to
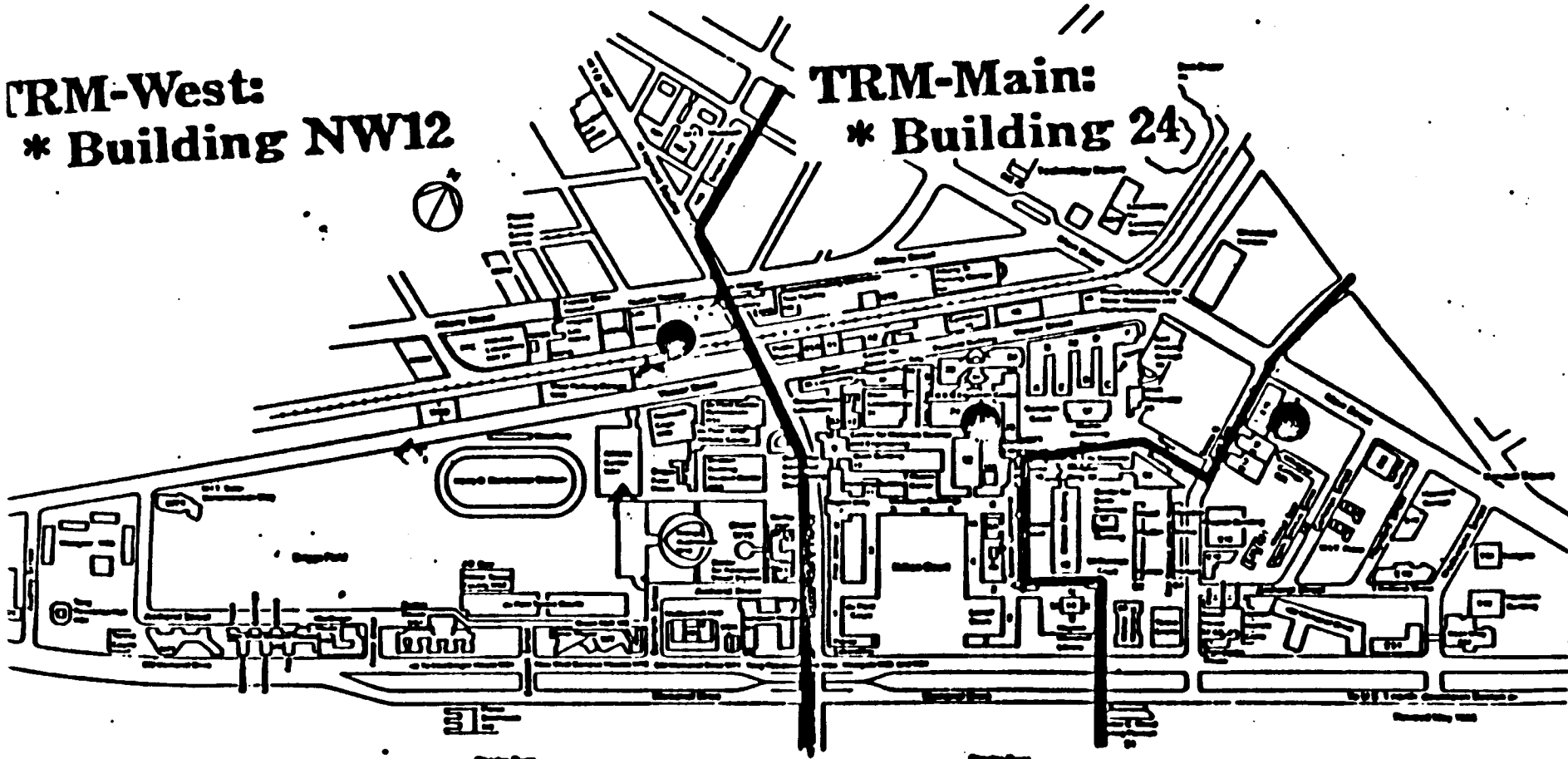
national networks.  He is enthused about the range of services
that ISDN will support, e.g. call-forwarding, ANI (automatic
number identification), message waiting, etc.  Although he
acknowledges that these features will be limited for a time to
the campus since the rest of the world does not yet speak ISDN.
He also noted the potential for enhancing the voice tie-lines
that now run between the Institute and Harvard with ISDN
features.

Mr. Selwyn believes the 5E switch will not be obsolete for
at least twenty years (in contrast to Mort Berlan's more
conservative estimates that the switch will be viable until at
least 1991).  Furthermore, he predicts the system will probably
get cheaper over time.  He questions whether the local telco will
give Harvard the option to continue its lease arrangement with
the same terms after the ten years is up.  Selwyn also noted the
potential vulnerability of Harvard's arrangement given that a
tariff change would take precedence over a lease contract.  In
light of these points, Selyn favors MIT's decision to purchase
its switch, as opposed to Harvard's lease arrangement.

The session ended with questions about tying together the
networks of the two institutions.  This appears to be an area of
potential opportunity that may be pursued once the schools have
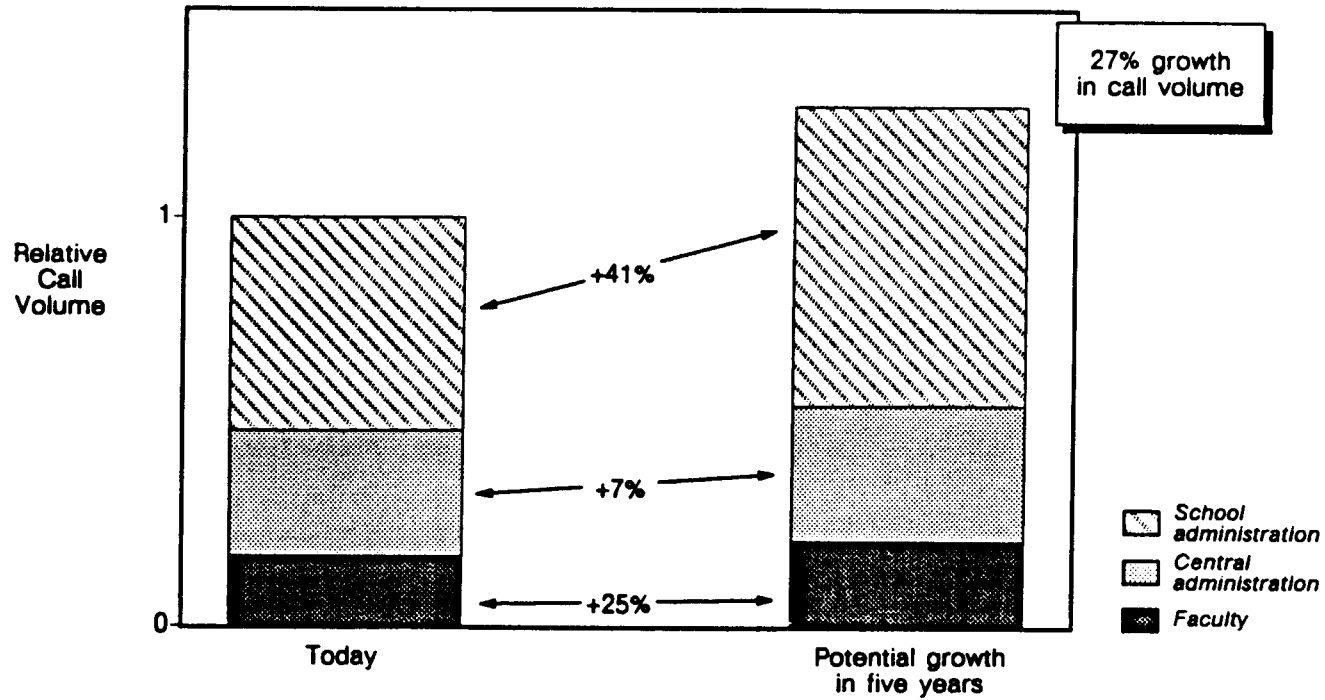their upgraded networks in operation.

# MIT - 5ESS DESIGN OVERVIEW

The MIT 5ESS design incorporates a distributed system design using a **Host and 2 Transmissionless Remote Modules (TRM)** sites to serve the 3 main areas of the campus shown on the associated map. The **Host is in E19 and the TRMs are in 24 and NW12.** The Host has an Administrative module and a Communications module. **Each TRM is connected to the system's Communication module by 62.5/125 micron fiber optic link.** There are 20 Switch modules in the MIT 5ESS.

There are:                    10,865 lines terminated on ISLUs (Integrated
                                         Service Line Units) which are
                                         equipped as follows:
                                              5,355 ISDN (Integrated Service Digital
                                                   Network) T cards
                                              5,510 Analog Z cards
                                     3,590 lines terminated on Analog Line Units

**Total lines: 14,455**

There are:                    600 digital trunks - Direct inward dialing
                              322 digital trunks - Administrative direct
                                         outward dialing
                                90 digital trunks - Student direct outward
                                         dialing
                              133 digital trunks - Long distance
                                55 digital trunks - Misc.
                                55 analog trunks - Tie lines, recordings

**Total trunks: 1,255**

TRM-West:
* Building NW12

TRM-Main:
* Building 24

Host-East:
* Building E19

Exhibit B

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# Call Volume Growth*

27% growth
in call volume

Relative
Call
Volume

1

+41%

+7%

+25%

0

Today

Potential growth
in five years

School
administration

Central
administration

Faculty

*Based on surveyed "Tubs" only.

# Data Traffic Growth