

Hepnet Technical Coordinating Committee

**Meeting Minutes
June 8, 9 - Fermilab**

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9/3/87

Hepnet Technical Coordinating Committee

MEETING MINUTES JUNE 8, 9 - FERMILAB

GREG CHARTRAND

ATTENDANCE

There were 26 participants at our meeting on June 8 and 9. (see appendix A). All HTCC members were in attendance. The two other networking committees (e.g. HEPnet Review Committee (HRC), and ESnet Steering Committee (ESSC) were represented. Additional invited guests from SG-5/CERN, SPAN, MFECC, FSU, and DEC were also present.

NETWORKING ITEMS OF INTEREST (SITE REPORTS)

Most all of the site report information was very specific to local issues at the various institutions. Copies of slides were distributed and are still available from me for those who wish to receive them.

STATUS OF DEC/HTCC AGREEMENT

We were told that the DEC DOE representative (J. Davis) is in the process of hiring a person who's sole purpose will be to handle HTCC needs from DEC. This person will be our interface, and he will (to the best of his ability) arrange meetings, contacts, and testing as we require. Davis hopes to have this person hired soon, and to initiate this arrangement at the next HTCC meeting.

DECNET OVERVIEW

It is an undisputed fact that our DECnet is the largest (non-DEC) DECnet in the world. Being so has forced us into formulating network management agreements between SPAN, HEP-Europe and HEP-Japan. These agreements (which mostly address area filtering) are working. Our DECnet is a viable tool which is being used by an ever increasing community of scientists spread over a very large and spreading geography. These agreements are essential seeing that DECnet phase V may be delayed until 1989. DECnet phase V will probably not be a quick-fix of DECnet on top of TP-4 as we previously understood, but more "ISO like" throughout all of the layers.

Testing of new products can be dangerous! Evidence our most recent experiences. We need to be careful and not necessarily assume that these

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products are tame. Testing however is essential if we ever expect to influence the development of these products to do our bidding. History has shown that DEC does not necessarily understand the needs of the high end users (in either networks or systems). Remember, there are only 63 areas in DECnet!

Finally, we keep hearing about useful enhancements to DEC X.25 products and software. Good things are on the way.

DECNET TRAFFIC STUDY

There has been an on-going effort to accumulate DECnet traffic information for the major nodes within the network over the past three months. This study has given us a considerably better feeling for our utilization in a basically idle period (with the exception of CDF at Fermilab).

```
Network System FNALR6 Line LC-1
From 18-May-1987:00:00:00.00 Current 20-May-19
Prev: Errors Curr: Histogram Next: Status
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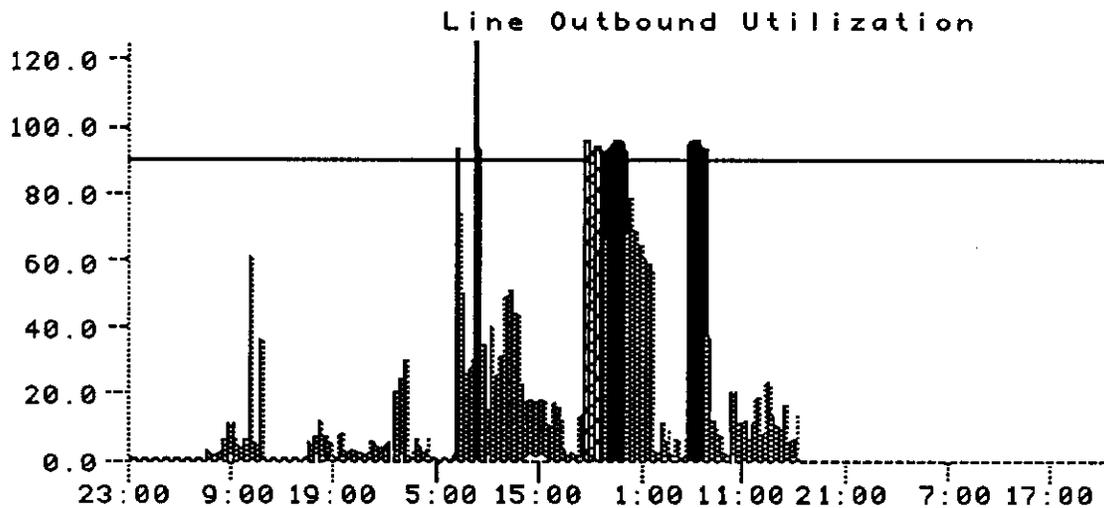


FIGURE 1.0

There have been several things learned from this study. Certainly a better understanding of peak-to-average utilization is one of these. A line that is saturated several hours during the normal working day definitely does impact the potential productivity of those whom might attempt to use it. This is clearly displayed in Figure 1.0 which shows the utilization of the link between Fermilab and Brookhaven for a typical heavily loaded day. A person attempting a "set host" session during the times of peak activity would be hard

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pressed to be very productive. Additional information relating to how links are being used can be extrapolated by examining the average packet sizes. The file traffic appears as larger packet sizes. This information will be useful in tuning performance in our future X.25 switches.

DECNET INFORMATION, CIRCUIT COSTS, DLM CIRCUITS

It was decided after some discussion that it was necessary for the HTCC to take the responsibility for determining the circuit costs, DLM circuits, and level-2 backbone topology throughout the entire USA HEP DECnet. This needs to be done in co-ordination with all other interested parties (e.g. SPAN, EURO/JAPAN DECnet's).

It was also decided that discussing specific circuit costs, DLM issues, and the distribution of DECnet information (which is more of a higher management issue) is not appropriate in the HTCC meeting agenda. It was therefore decided that these discussions should take place outside of the HTCC meeting agenda with reports being presented to the HTCC for future approval.

The following individuals were identified as being appropriate participants in this process.

DeMar	FNAL
Hieman	CERN
McLendon	SPAN
Adelman	LBL/JAPAN
Franks	ESA
Lepera	BNL

The "distribution of DECnet information" issue may be addressed by this same group with appropriate additions or deletions. These issue being less technical may require more expertise in security and over-all management.

There was a feeling of urgency relative to the circuit costing issue. An "after the HTCC" meeting regarding costs took place where those participants had a chance to identify the more important configuration anomalies. This meeting concluded with all understanding that the problem is more complex than assumed, but solvable given that everyone works together. There was also the need for missing information relative to both the SPAN and EURO-DECnet configurations. This information is absolutely necessary for any further discussions can proceed. It has been suggested that the USA end of this sub-committee get the information necessary together and schedule a USA-end meeting as soon as practically possible. Once the USA-end is documented and

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discussed, we can then contemplate scheduling a meeting of the full sub-committee.

WHAT IS HEPNET?

Out of the DECnet issues arose a discussion on creating an identity for HEPnet. The observation was made that within our own community, HEPnet is fairly well known. Outside of our community, we are virtually unknown. The merits of "self identity" were discussed at some length. It was generally agreed that it would be beneficial for us to have an identity which is known outside of HEP. As a first step, it was decided that a document be written which explains what HEPnet is. Volunteers for this project were Kaletka, Cottrell, May, Heiman, and Chartrand. It was mentioned that SPAN has a similar document. B. McLendon had them with him and they were copied and distributed. This group will attempt to put something together via Email.

PLANNING FOR AN ALL DECNET ENVIRONMENT

Information was presented which raised the question "what happens to our network when everything we need to use is on DECnet?" As evidence in support of this occurring, a MAC-DECnet information sheet was distributed along with the observation that DECnet-DOS (IBM-PC), IBM/VM and MVS, SUN and Apollo packages currently are available. Given an all DECnet scenario, we concluded that our DECnet would probably break! We have finite memory in the DECSA Routers that comprise our current network backbone. Although we have never run out of memory on a Router, we do not know where the threshold is at. *(Editor's note: Our up-grading to X.25 Routers may reduce this limitation, but not eliminate the loading problems associated with having several hundreds of nodes in a given area.)*

We then began discussing the problems associated with networking PC's and Workstations in general. Specifically identified were the media and Ethernet loading problems. It appeared that all sites are struggling with the same issues. It was decided that there could be some benefit had by at least forming a network discussion group to address these topics as-well-as other PC/workstation issues. It was decided that suggested participants submit their names and network addresses to HEPNET-L.

NETWORK SECURITY PROCEDURES

As a result from an apparent attempt to break into a Vax at SLAC, the issue of security procedures for DECnet was raised. A lengthy discussion followed with

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no absolute definitive resolution. Basically, good advice would be to contact the area manager (he has the power to do something) and, depending on your preference, contact the system manager of the offending system via phone, or if you trust that the system manager is not personally involved, via Email. You could however opt. to have the area manager make the contact for you.

M. Atchley et.al. has written a document entitled "RECOMMENDATIONS FOR SECURITY POLICY FOR ALL NETWORKED COMPUTERS AT LBL" (LBL publication LBL-23303). (*Which should be read by all of those with computer security and communications responsibility. ed.*)

ESA EURO-HEP DECNET MEETING

The first meeting of an all Europe HEP/ESA (European Space Agency) DECnet meeting took place Feb. 18, 1987. In attendance were representatives from nine countries. This meeting was initiated by ECFA-SG5. There were two major accomplishments as a result of this meeting. Firstly, the USA-HEPNET/SPAN maximum area filter agreement was endorsed by this group. Secondly, a technical sub-committee was formed to study circuit cost issues and to collaborate with the appropriate persons in the USA. The members are;

R. Bilhaut	LAL/Orsay
J. Franks	ESA/Darmstadt
G. Heiman	CERN/Geneva
E. Valente	INFN/Rome

This sub-group met June 2. Resolved at this meeting was;

- 1) Immediate action is required to address mis-use of lines, and a firm policy of fair usage of the network resources is necessary.
- 2) As a general rule, networks (*ESA and HEP ed.*) should be kept as separate as possible. The aim being to have two completely independent backbones.
- 3) These objectives should be pursued even if the ability to share the transatlantic links for backup purposes is lost.
- 4) Use of the MAXIMUM AREA COST parameter should be used to strictly enforce the policy of traffic separation.

(Editor's note: The following was an edited version of a document entitled Euro-HEP-DECnet by Giogio Heiman/CERN. Several other recommendations were included. Complete copies were circulated at the meeting and are available from me on request.)

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NEW ALTERNATIVE HARDWARE

It appears that new network devices which can be used in some wide-area networking scenarios are becoming available and at lower costs. Recently, Tekelec (818 880-5656 ed.) has come out with a low-end Ethernet bridge which has very interesting attributes, not the least of which is the price. It is not realistic at this time to consider this specific device as a solution for our backbone purposes, however, it could provide us some utility in sub-backbone arrangements. The bottom line here is that there seems to be a flood of new network "goodies" which we should track for applicability in our environment.

X.25 SWITCH REQUIREMENTS

We reviewed the requirements document as was written by M. Atchley et.al. at LBL. There were only two known missing items in the the specifications. The first was the lack of "D" bit negotiation, and the second was "selective packet rejection". Selective rejection was classified as a desirable feature in that no known switch vendor currently had this feature.

Next followed a presentation about the progress towards the acquisition of the components. The process is to take the list of vendors and evaluate them in increasing order of expense. To date, two vendors; Camtec and Amnet have been evaluated. It was learned that Camtec would not have extended windowing in any time-frame that would be interesting to us. In fact, their response was that that would do it if we paid them, and that they might complete such a project in January of next year. Amnet hardware was also looked at in detail. It was decided that the Amnet equipment was too fragile (i.e. it crashed if you walked past it) and was not fast enough. Having now eliminated the first two vendors, the next vendor to be evaluated is Telefile. It is expected that Telefile will have a considerably better chance; in that (on paper), it performs considerably better and addresses all of the mandatory requirements. It was noted that Caltech had done an evaluation a few months previous which was not successful. Telefile was unable to install their switch properly. If Telefile should fail to meet our requirements, NCR is the next vendor on the list.

At this point we moved on to discussing implementation issues. We learned that, assuming Telefile qualified, MFECC was prepared to write orders for the equipment and leased-lines. It was stated that there is an immediate need for bandwidth and that the line orders should proceed independently because we could run without the switches in the interim. We were then told that there

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maybe a problem with getting DDS service to BNL. If this is the case, it is not clear what would happen to the configuration of the backbone.

A drawing was then presented which showed the anticipated configuration of the X.25 backbone as it is currently understood by MFECC. (Figure 2.0). The diagram shows CERN as not having a ESnet supplied switch, but it was stated that there clearly needed to be an efficient connection to CERN. At issue here is the fact that CERN uses Camtec switches which (as stated previously) do not have extended windowing which makes them virtually unusable at the speed of the proposed satellite circuit.

It is recognized that CERN connectivity must be provided, therefore, it will be proposed that CERN also be supplied a minimally configured switch within the scope of the proposal. *(This will be an internal MFECC proposal. ed.)*

Next followed a long discussion about the other missing components of the diagram. Notably were the exclusion of SLAC, ANL, and MIT. It was decided that these sites needed to be addressed as well for a variety of reasons. It was pointed out that the current proposal would not address the needs of these sites. It was also noted that there were other important components missing that are necessary to take advantage of the the backbone. Further discussion on this topic was deferred to the following day. *(See DOE REPORT section. ed.)*

We now began discussing some of the management/control issues of the backbone components. We learned that these issues have not yet been directly addressed, but there was an assumption that MFECC was to be the focal point of all of this activity. Strong opposition and concern was expressed with this assumption. The issues here are basically local, where today our network facilities are monitored, maintained, and repaired at the local site. Our sites generally have the expertise to handle these activities. Having a third party be responsible, particularly when the party may be eight time zones away leads one to believe that timely repair and/or resolution would be difficult. The observation was made that today, many (but not all) of our HEP sites can afford days, or even weeks of MFE outages due to our secondary reliance upon the MFE network. In an ESnet scenario, ESnet would now be our primary wide-area common carrier, thus requiring immediate trouble resolution.

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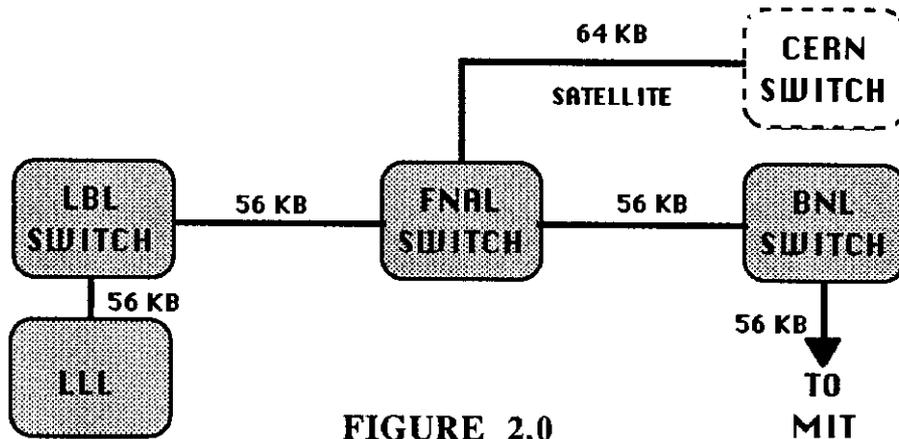


FIGURE 2.0

There are also security issues which can only be addressed by local control of the switches. This discussion terminated with HTCC asking our ESnet steering committee members to specifically receive assurances on the following issues.

- 1) That it is understood that the X.25 backbone is a hands-on operation by HEP personnel.
- 2) That an adequate maintenance contract be let which covers the "continuous operation" nature of our networking needs.
- 3) That appropriate spare modules be made available on-site for the most important nodes in our network.
- 4) That it is understood that the X.25 hardware will in some cases and times be maintained by HEP personnel to expedite repair.
- 5) That switch parameters, settings, and configurations, security/access tables, and general network management will be maintained and determined locally in co-operation with the other nodes and MFECC. (e.g. in the same manner in which HEPnet is maintained today.) It is assumed that MFECC would of course be informed of any configuration changes. *(And could serve as an effective repository for this information. ed.)*
- 6) That information relevant to the sites operation, be available on-site for the day-to-day operation of the network. This would include session record information, statistical information, and monitoring as appropriate.
- 7) That management data on network utilization be made available on-line or by request as is appropriate.

(Editorial comment: The perception from reading the specific items in this section may leave the reader with the impression that the HTCC is a bit

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demanding. Any impression of this nature must be put in the context of the enthusiasm for the successful completion of this project. Several members have been involved with this initiative for over two years now. The HTCC membership consists of talented experienced persons who know what is necessary to make this project succeed for the community they serve, and are attempting to communicate these needs as clearly as possible.)

ESNET STEERING COMMITTEE

The ESnet steering committee members distributed a program plan draft for the "Energy Sciences Network" authored by Bostwick and Cavallini of DOE. The HTCC was asked to read the document and forward comments to our representatives. Because the next ESnet meeting is to be held June 18, urgency was expressed. Apparently missing from the document was mention of several international collaborations associated with HEP, and a funding profile for FY-87. The latter will become an extension of the other outstanding funding issues.

HEPNET REVIEW COMMITTEE

Since the last HTCC meeting, the HEPnet Review committee was formed and had their first meeting. The review committee was formed to;"assess the networking needs of the HEP program."; review the present status; Identify and make recommendations on networking needs or issues; (and) to address these things (to the extent possible) relative to the rest of the HEP activities. *(This is an edited version which contained other points as well. Copies of transparencies were distributed and are available from me. ed.)*

This committee has taken on many of the tough issues which historically have been difficult (or impossible) for the HTCC to address, such as;

Priorities between networking and the rest of HEP.

What is the essential functionality?

Predicting demand; should policies limit use?

Will the new backbone make life better for the typical end-node university?

Will the Labs cooperate (e.g. pass-through, universal access to all systems?)

Will HEPnet provide access to super-computer centers?

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Must HEP insist on DECnet?

The answers to these and other questions will be worked on by three sub-committees which have been formed.

The Review committee also brought questions for the HTCC to address. The HTCC provided immediate responses to some, and deferred others (as well as more detail) to our personal presentation at the next Review committee meeting (June 28 and 29). S. Merola will be present and will respond to the HRC. The following are the questions and a summary of immediate responses.

1) Cost of faster backbone, T-1 for example.

It is estimated that it would cost an additional \$1,000,000/year to upgrade the backbone national links from 56 Kb to T-1. This figure would not include the necessary equipment up-grades at the laboratories.

2) Does the current 5 year plan include hardware for terminal connections at the labs?

No it does not. The costs associated with extending leased lines from the backbone to the universities has been estimated to be an additional \$1,000,000/year.

3) Will the network (X.25 and future ESnet Ed.) provide as good keystroke response as direct lines?

There are inherent differences between direct lines and any packet protocol. At most times the response should be "snappy", however response will be a function of traffic load on the backbone. Additionally, a packet protocol will present the user with a different "feel" because the transit time for a packet (e.g. character echo for example) will vary from second-to-second. This makes using screen editors which are intensive with cursor positioning tricky to use. At times of peak load, the response may not be acceptable by individual standards. (which vary by individual ed.). Strong concern was stated in regard to the proposed ESnet implementation of X.25 where considerable protocol overhead will be added on. An HTCC representative will attend the next HRC meeting to hopefully be more specific.

4) What is the functionality differences between TCP/IP and DECnet?

It was decided that one of the HRC sub-committees will handle this task. (I am sure that the HTCC will work with your sub-committee on request regarding this issue. ed.)

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5) Are there functions the HTCC is performing that would be more appropriate for the HRC while it exists?

Yes there are, and we would like very much to pass them off to you! There are two policy issues which need addressing. First, we need a policy (or at least some sort of statement) regarding commercial interests attaching to our network. Second, we need a policy which addresses connecting to an entity like NCSA (University of Illinois super-computer Center) where the connection provides our users connectivity to NCSA, but NCSA users (who may not be in HEP) would gain connectivity through our network to NCSA, thus using our network for purposes not related to HEP.

In relation to the response time issues, we had a limited discussion on how one can use the network in a way which response time becomes less important. We (HTCC) will encourage the network to be used in this manner in the future so that firstly, the users perception will be that the response time is good, and secondly, because this places considerably less demand on the available network resources.

HEP LAB CONNECTIONS TO TCP/IP NETWORKS

SITE	NETWORK	CONNECTION	SPEED
ANL	NSFNET	U OF ILL.-CHICAGO	56KB
FNAL	NEGOTIATING	U OF ILL -URBANA	
LBL	BARRNET	U.C. BERKELEY	230.4
BNL	NYSERNET	?	?
MIT	JVNCC	JVNCC	?
SLAC	NEGOTIATING	STANFORD	

FIGURE 3.0

We Did discuss which labs were connected to TCP/IP networks. There was an assumption that a lab connect to one of these networks would be able to provide some access to super-computer centers through the INTERNet. Figure 3.0 shows the result of our poll.

We were also asked about how the labs will, in the future, advise universities in connecting to the network backbone. A lengthy discussion followed where

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the complications of such a simple question were enumerated. I believe that a statement to the effect that the options will vary depending upon the geographical relation between the users location, the target location of principal activity, primary applications and computer system(s), and existing hardware and software. *(I said it was complex. ed.)* It was decided that the HTCC representative will make a presentation at the next HRC meeting in this regard.

We stated that the HTCC wishes that the HRC would perpetuate its existence. A statement was made which in effect said that the HTCC can perform considerably better in its "technical" role if it is not over-bounded by policy and/or political issues.

(Editor's note: The HRC slides have been included as an attachment to the minutes.)

BITNET STATUS REPORT

Bitnet continues to grow with 1740 nodes in 25 countries *(Slightly larger than our DECnet. ed.)* Recent additions include Hawaii, Turkey, Singapore and Taiwan. Backlogs have been present, particularly for large files where transit time have extended into weeks or possibly even months.

BITNIC is about to move around July 4, which will kill NETSERVE functions and some international links for a brief period.

A lengthy discussion followed regarding testing of a private RSCS between SLAC and FNAL. Some individuals felt that network usage of this type was not at all appropriate, while others felt it was essential. A reference to the Ballam Report was made where it in effect regards RSCS as an essential protocol.

Reference was made to the classification of LLNL as a class "D" Bitnet member. All agreed that this could prompt a re-classification of the other Labs. There was considerable concern expressed by all. An observation was made that if we become class "D" members, an interesting option would be for all of us to drop out of Bitnet, create our private RSCS links, and gateway into Bitnet at an appropriate University. *(Technically, this is a relatively simple task. ed.)*

INTERNATIONAL OSI MIGRATION ISSUES

There is an international committee formed which will try to address the issues of the differences between the USA TP4 approach, and the European TP0 approach. H. Newman is a member of this committee, and will keep us informed. There is certainly a lot at stake here with the different approaches.

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It certainly would be miserable if we had two incompatible ISO network standards.

RARE/SG-5 MEETINGS

The RARE organization (as described by USA HTCC type) is a highly political body which is concerned with setting the network standards for the Europeans. Notably, a former SG-5 chairman (J. Hutton) has been placed as the Secretary General. RARE functions through its working groups which focus on X.400, FTAM, ISDN and other important network protocols.

The SG-5 has made the observation that they have maintained a close liaison with the HTCC over the last several years by providing representation for EVERY HTCC meeting. In comparison, the USA has sent one representative per year. The SG-5 "is requesting more continuous American Presence at their meetings".

The SG-5 membership was very interested in the ESnet transition as well as the possibility of "increased collaboration among the major U.S. agencies involved in research networking".

The SG-5 expressed considerable interest in the "GOSIP" document.

The SG-5 members expressed concern over the different directions being taken in regard to USA/OSI and EURO/OSI (TP-4 v/s TP0).

The SG-5 does not do site reports as we do, but concentrated on the hosting sites networking, an idea which might suit our purposes as well.

The SG-5 is going to increase its efforts to measure the network traffic throughout the EURO-HEPnet.

The next SG-5 meeting will be held in Rome on September 14 and 15.

There will be another (invitation only) DEC-Euro HEP meeting occurring in Geneva. Members of the HTCC are invited to suggest USA participants for this meeting.

USA TO ITALY CONNECTION

The DECnet connection between Bologna and FNAL has been in operation since March 30. There have been relatively few outages since it has been in operation. Utilization of the link has been high with an average of about 7% (USA to Italy) between April 1 and April 24. (*Local observations have shown a*

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steady increase of this traffic since April 24. We (At FNAL) believe this number to now be about 10%. ed.)

Italy has received the 14.4 Kb modems sent by FNAL. However the modems sent cannot run at 50 Hz., thus creating a new technical problem to overcome.

USA TO JAPAN CONNECTION

While the HTCC was in session, the DECnet connection to Japan (KEK to LBL) became active. Several notes of congratulations were exchanged, and both ends of the link have expressed excitement about future networking initiatives.

STATUS OF L3

The L3 link continues to operate with a very heavy load. Currently the higher performance PAD is being up-graded with new interfaces which should improve performance. For now, MIT is running the old PAD which is severely taxed with the current load. Response time will not be too good until the up-graded PAD is put back into operation.

DOE REPORT

It was reported that due to the recent appointment of Trivelpiece to the AAAS, there have been corresponding organizational changes. The anticipated order from top down will be Decker > Nelson > Austin. No real understanding of apparent changes (from the HTCC's perspective) can be made from these changes at this time.

There is and isn't funds available to augment the initial phase of the X.25 backbone. In spite of the uncertainty of "real dollars" in this fiscal year, those essential items necessary to make the X.25 backbone useable needed to be itemized and costed.

After much discussion, it was decided that it was necessary to have X.25 switches at the other locations of interest if we are to make effective use of the backbone. We also identified the need for X.25 DECnet routers and X.25 PADS. (See Figure 4.0). The only software which would be absolutely necessary would be a PSI. PSI access would be purchased by each site as needed. Funding for these additional items hopefully will be found by HEP-DOE in FY-88. Some funds could be made available in FY-87 if a really important need arose. *(For example, if the leased lines were installed in advance of the*

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switches and we needed PSI at the major backbone nodes to take advantage of the lines. ed.)

It was also decided that it was absolutely necessary for the ESnet proposal to cover the switch to be installed at CERN. Our ESnet Steering Committee members are to make a request to that effect at their next meeting.

We identified the needs at each site, and totaled the anticipated costs as are shown in Figure 5.0.

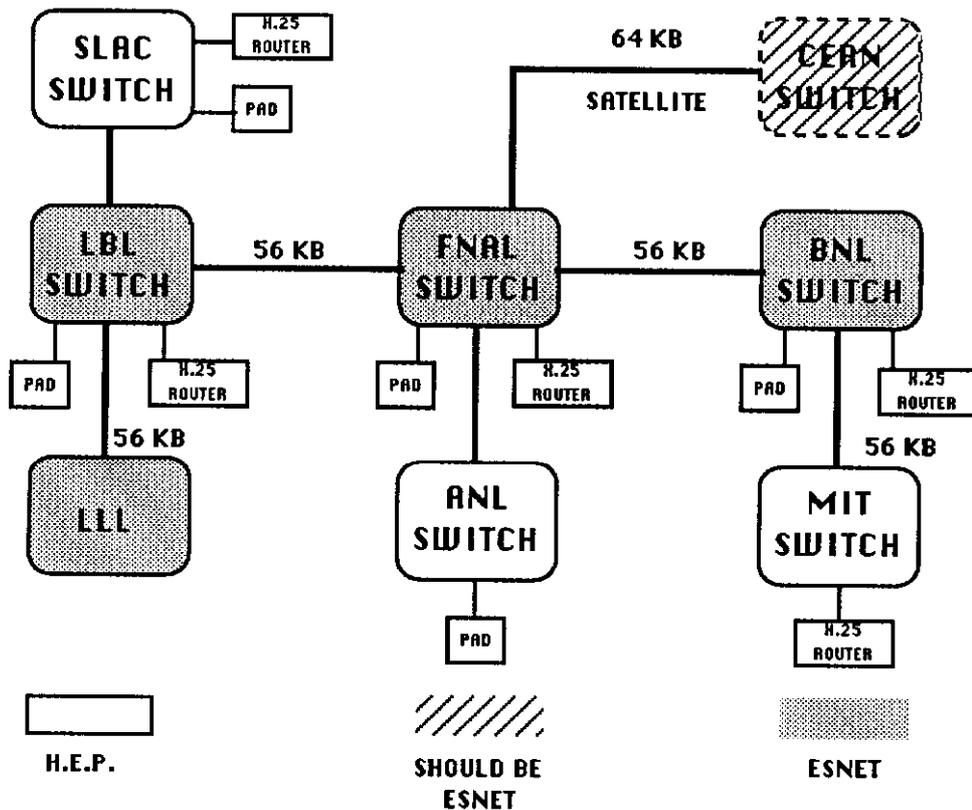


FIGURE 4.0

FULL SCREEN EDITING OPTIONS

We discussed the options that are available for use which provides some level of local editing; which reduces the packet load on the network; and enhances perceived performance. We discussed the merits of working through the

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network in a DECnet environment, where editing for example can be done effectively, even over a very heavily loaded network. We also discussed the various IBM options available for the same purpose. Most of these required an IBM-PC as the terminal device because of the need for some local intelligence. CERN and SLAC are both in the process of testing these various options and associated software.

NEXT MEETING

The next HTCC meeting will be at Brookhaven held on September 17 and 18. If the DECnet sub-committee does not meet before this meeting, we may wish to

FUNDING PROFILE

SWITCHES	COST	MISC.	COST
MIT	35K	X.25 ROUTERS (5)	60K
SLAC	25K	X.25 PADS (6)	30K
ANL	25K	PSI (SOFTW.) (6)	60K
		CONTINGENCY	15K
SUB-TOTAL	85K	SUB-TOTAL	165K

GRAND TOTAL 250K

FIGURE 5.0

have it meet in parallel with the HTCC meeting at Brookhaven. This would allow the sub-committee to report directly to the HTCC as to their progress at the conclusion of the HTCC meeting.

APPENDIX A

HTCC MEETING ATTENDANCE

HTCC MEMBERS

H. Montgomery	(HTCC liaison)/HRC
Edward May	ANL
Harvey B. Newman	L-3/HRC
Les Cottrell	SLAC
Greg Chartrand	FNAL
Sandy Merola	LBL/ESSC
George Rabinowitz	BNL
Mark Kaletka	MIT

INVITED REPRESENTATIVES

Robert Woods	DOE
Larry Price	ANL/HRC
Stewart Loken	ESSC/HRC
Tony Hain	MFECC
Georgio Heiman	INFN/SG5/CERN
Ken Hays	FSU
Bruce McLendon	SPAN
Tim Doody	DEC
George Brandenburg	ESSC/HRC

INVITED GUESTS

Richard Mount	L3
Bob McMahon	ANL
Larry Amiot	ANL
Charlie Granieri	SLAC
Frank Lepera	BNL
Ken Adelman	CALTECH/LBL
Marv Atchley	LBL
Phil DeMar	FNAL
Darryl Wohlt	FNAL