To: Dr. Thomas,
Vice President of Academic Affairs
CC: Mr. David Blumer,
Technology and Business Division Director
From: Heidie McCauley,
Assistant Professor, CIS/Telecommunications
Subject: The CCBC Internet Project.
An Overview and Update

Dr. Thomas, I am happy to update you on the CCBC Internet Project. For the purpose of this report/memo I have broken the scope of the project into the following outline:

1. INTRODUCTION AND HISTORY
2. CCBC ACADEMIC NETWORK, PHASE I
3. FINANCIAL CONSIDERATIONS
4. CCBC ACADEMIC NETWORK, PHASE II
5. CONCLUSION

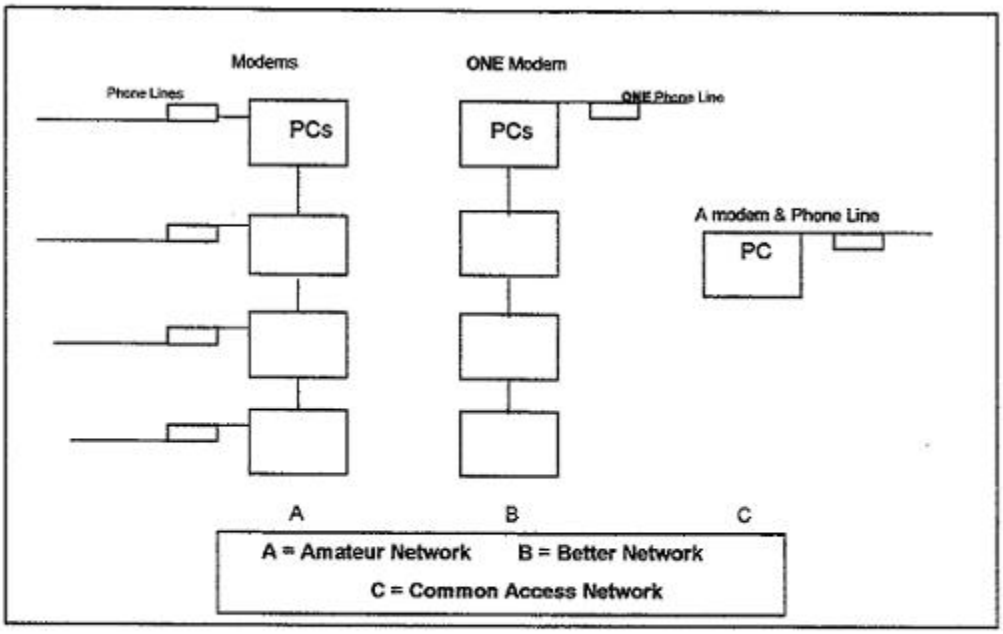
INTRODUCTION AND HISTORY

The CCBC Internet Project began last April at CIS/Telecommunications department, at no cost, using the free experimental and academic software, and our existing equipment available in the CIS/Telecommunications Lab (4-S2).

As their Final Project, six students in the course Network Installation and Management II installed a network using Linux (a shareware copy of Unix) as the server software. The students also prepared a manual and a diskette which they presented at the Beaver County Intermediate Unit's (BCIU) Technology Group. This network provided the members of the BCIU Technology Group with E-Mail addresses at our UNIX server in 4-S2. A copy of the manual and the diskette are provided with this report.

By the end of May, using LINUX as our Internet Server software and workstation software we were able to connect the twelve (12) PCs in Lab 4-G21 to our Internet Server located at 4-S2 and from there to the "Internet" using **only <u>one</u> phone line, <u>one</u> modem, and only one "Real" IP address** given to use by Rochester School District for experimentation.

This part of our experiment helped our students to compare and evaluate three different network models used to connect computers to the "Internet" as illustrated on the next page.



System A is an amateur implementation in that the redundant use of multiple pieces of equipment does not provide a more robust network.

System B is the architecture of common practice in computer network design for business and institutions.

System C is the common access people must use in their homes for Internet access.

The system on the left (A) is a common and expensive mistake in networking. Each modem, telephone, and "Real" IP address is dedicated to a single computer and are wasting of resources.

Common practice in computer networks and design yields the system on the right (B), where resources are shared. System B uses one modem, one phone line, one "Real" IP address and several "Virtual" IP addresses.

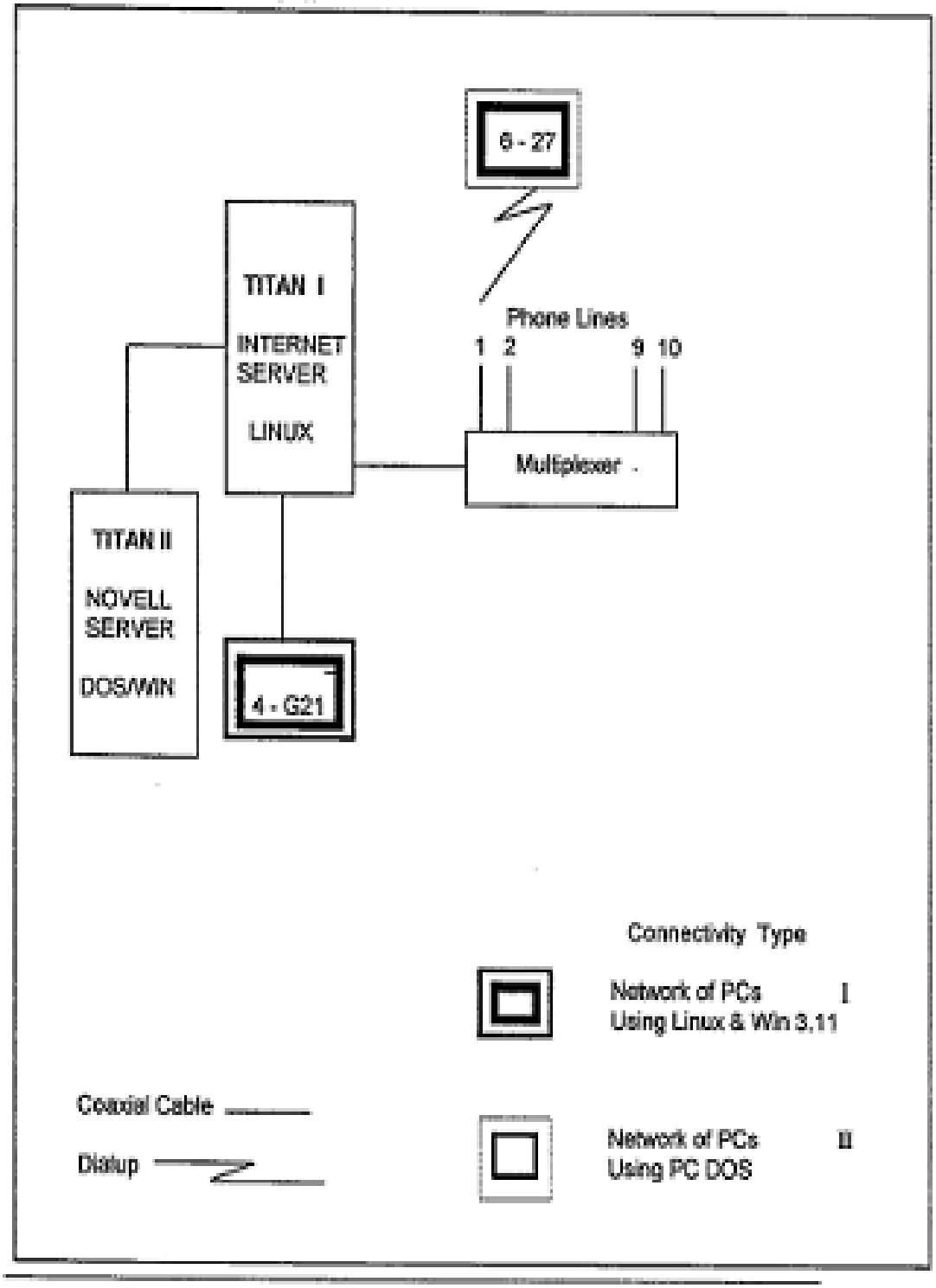
During the month of June and July we tried to implement the system B model in the Nursing lab (6-27) as part of Unix System Administration, the non-credit course that I thought. There again we were able to connect each PC in that lab to our Internet Server in 4-S2 using only one modem and one phone line.

The result of our research and experiment guided our selection of the phase I of CCBC's Academic Network using the system B model in order to maximize our network's performance while minimizing our costs.

The diagram and its description on the following pages provide a good overview of our original network.

CCBC ACADEMIC NETWORK
PHASE I

1. CONFIGURATION:



2. DESCRIPTION:

TITAN I:

This server is a 486, 66 MHz PC using SCSI 2 devices, with 32 MG RAM, 740 MG hard drive, tape backup and UPS. This server uses LINUX as the Internet Server software.

TITAN II:

This server is a 486, 66 MHz PC, with 8 MG RAM, 340 MG hard drive, tape backup and UPS. This server uses Novell 3.12 as the LAN software, Dos 6.0, Windows 3.1, Microsoft Office are among the software installed on this server.

Connectivity Types:

Type I:

This type of connectivity is the most flexible and sophisticated type since it allows the students and the faculty to work in Unix, Window, and DOS environments. It is also the least expensive type since it utilizes shareware copy of Unix, one "Real" IP address and several "Virtual" IP addresses, and provides access to the "Internet" through hard wire connection eliminating any phone connection.

This type of connectivity is recommended for Technology computer labs and Technology faculty offices.

Type II:

This type of connectivity is most expensive when it is used in single user mode since it does not share any resources. However, it can become inexpensive if it utilized in a networked mode due to its resources sharing capability.

This type of connectivity is recommended for computer labs that have hardwire connection between the PCs but are far from the Internet Server.

3. REQUIRED EQUIPMENT:

To implement the Phase I of our network, new pieces of equipment had to be purchased. The following provides a table that shows the hardware, descriptions, function, cost, and funding source, item by time.

Table 1 System Functionality and Cost
Phase I

ITEM	FUNCTION	COST	Paid for?	SOURCE
Computer, 486, 66 MHZ	Internet Server, called TITAN I	$4,000	YES	Carl Perkins, CIS/Telecom 89-90
Computer, 486, 66 MHZ	Novel Server, called TITAN II	$3,500	YES	Carl Perkins, CIS/Telecom 91-92
Novell NOS	To share DOS/Windows application software	$2,000	YES	CIS/Telecom Supplies 94-95
Modems*	Connection to the dialup lines	$850	YES	CON Ed 94-95
Cables and Connectors*	Hardware connection of Tech labs to the Internet server	$120	YES	CIS/Telecom Supplies 94-95
Multiplexor*	To share ports	$200	YES	Con Ed 94-95

After the successful implementation of Phase I a plan was developed to insure the continuation of the Internet Project into its Phase II. Knowing the lack of funds would be our biggest obstacle towards the Phase II of our Project, we started to look for ways which would provide us with the necessary funds to continue our Project. The following pages provide the actions that we took in order to maintain, utilize, and promote our Internet Project.

*** The Items purchased to implement Phase I of this Project. Total Amount=$1,170**

FINANCIAL CONSIDERATIONS

1. GRANTS:

As you know, Alex Gladis, Bob Demarco, and I assisted Rochester School District, during the earlier part of this summer, in preparation of their technology grant proposal. Also, during the earlier part of this summer Bob and I assisted Beaver County Intermediate Unit in preparation of another technology grant proposal.

In both of these grant proposals are stated that CCBC's Technology faculty and students will be providing the necessary technology support, if the grants are accepted. Also, both of these proposals are stated that CCBC Con Ed will be providing the necessary training if the grant are accepted.

The following table provides the amount of money will be coming to our College through these grants.

Table 2 Grants

INSTITUTE	GRANT	SERVICE	AMOUNT
Beaver County Intermediate Unit	Distance Learning	Internet Server Installation	$4,000
Beaver County Intermediate Unit	Distance Learning	Technical Support for a Year Teacher Training	$12,000 $4,790
Rochester Senior High School	Goal 2000	Internet Server Installation and hardware upgrade	$7,000
Rochester Senior High School	Goal 2000	Technical Support for a Year Teacher Training	$12,000 $12,720
Total Amount to be Received by CCBC			$52,510

2. DONATION:

TriState Interlink

The 56K line and the access to the Internet donated by TriState Interlink (TSIL) will provide the needed dial in and dial out and access to the "Internet" through CCBC's Academic Network. In addition, our College will not have to bear the month to month expense for this connection to the Internet service. This donation is worth about $6, 500, a year and it is a valuable contribution to our Academic Network.

CCBC SGA

The students involved in this Project contacted the SGA officers and Invited them to see the CCBC Academic Network which the students have been involved with, on several occasions last spring and summer. To demonstrate SGA's support of this Project a donation for the amount Of $1,000 was given to CIS/Telecom Dept. in order to assist the department in the purchase of additional equipment necessary for this Project.

CCBC Con Ed:

Alex Gladis, Director of Con Ed at CCBC, has demonstrate his commitment to this Project by donating total amount of $2,850 towards the purchase of the necessary equipment for this Project.

3. PARTNERSHIPS:

Titan Technology Club

CIS/Telecom students involved in this Project started this Club in order to demonstrate their support for this Project. The officers and the members of this Club are planning to provide CCBC's Academic Network with technical and financial assistance as long as this network is operated and maintained by students under supervision of the faculty supervisor of the Club.

This Club is also planning to get engaged in fund raising activities such as "Internet Fair". The profits made through these activities as well as the Club's budget surplus will be spent to maintain and upgrade CCBC's Academic Network.

Con Ed

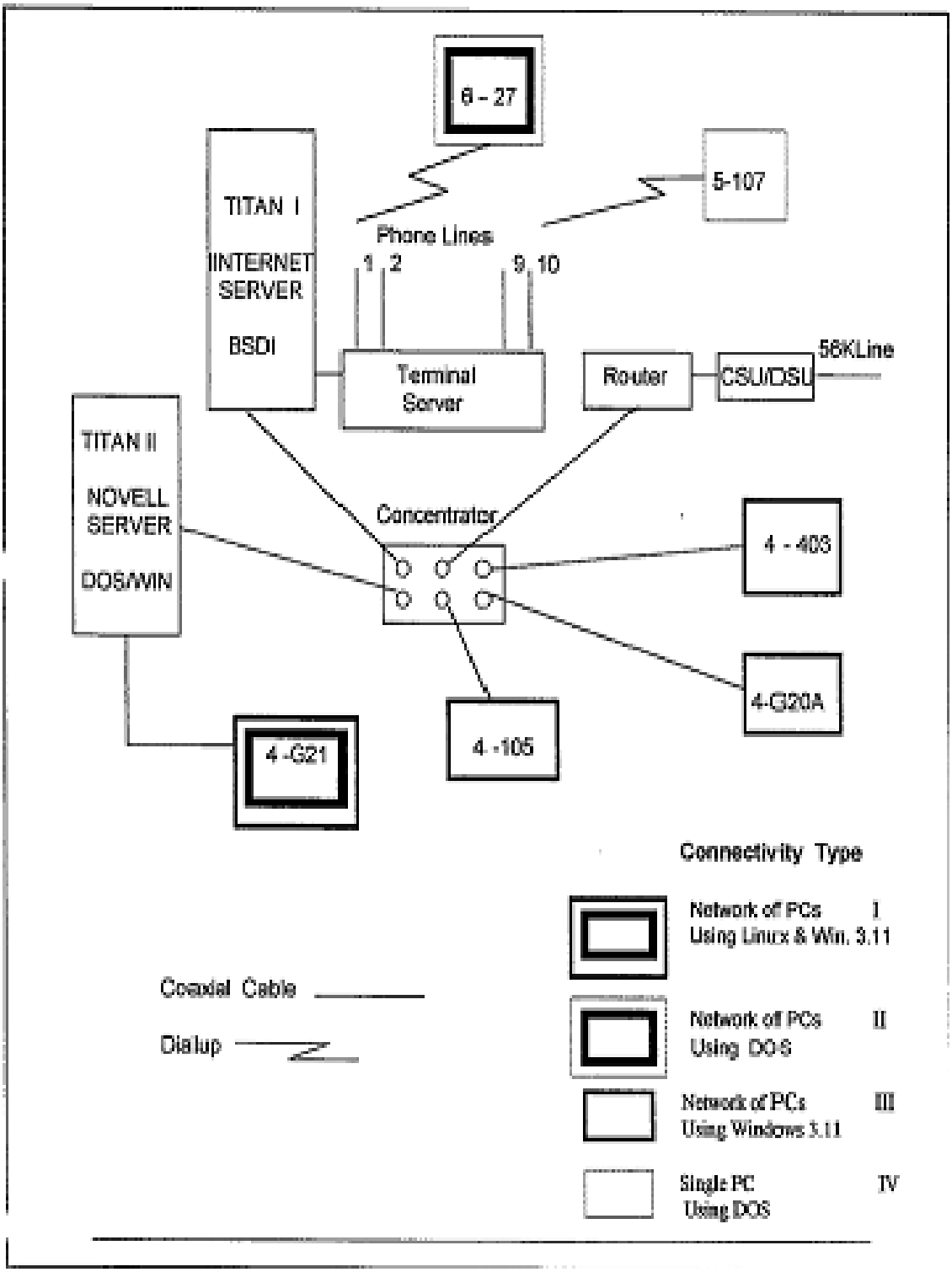
CCBC's Con Ed Dept. has agreed to pay CIS/Telecom Dept. an amount of $10 per student enrolled in anyone of its classes which need access to the Internet and is using CCBC Academic Network.

CIS/Telecom Dept. is planning to use parts of this money to pay students, (as paid internship), who will be assigned to operate and maintain the network. The Dept. is also planning to use parts of this money to keep up with the technology advances required by this network to operate.

The above mentioned fund raising activities provided us with the necessary funds to move our Project into its Phase II. The following pages provide details of Phase II of this Project.

CCBC ACADEMIC NETWORK
Phase II

1. CONFIGURATION:



2. DESCRIPTION:

TITAN I:

This server is a Pantium 133 using SCSI 2 devices, with 32 MG RAM, 2 Gig of hard drive, tape backup and UPS. This server uses BSDI Unix as the Internet Server software.

TITAN II:

This server is a 486, 66 MHz PC, using SCSI2 devices, with 32 MG RAM, 740 MG hard drive, tape backup and UPS. This server uses Novell 3.12 as the LAN software, Windows 3.1, Dos 6.2. Microsoft Office, Pascal and C compilers are among the software installed on this server.

Connectivity Types:

Type I:

Same specifications as the one in Phase I.

Type II:

Same specifications as the one in Phase I.

Type III:

This type of connectivity is less expensive that Type II since it does not require a dedicated phone line for its connection to the Internet server. This type if connectivity is recommended for computer labs that have hardwire connection between the PCs and are close to the Internet server but lack large amount of free disk space.

Type IV:

This type of connectivity is most expensive since it requires a dedicated phone line connection to the Internet server. This type of connectivity is recommended for fast and temporary connection to our Internet server until it is replaced by any of the Types I, or II, or III (which provide more efficient Internet access), as our Academic Network matures.

3. REQUIRED EQUIPMENT:

To implement our network design, using the selected network configuration, new pieces of equipment had to be purchased. The new equipments were selected in or der to work within our financial constraints but keeping with accepted network models and designs. The following provides a table that shows the hardware and the software utilized to implement the Phase II of CCBC's Academic Network. It includes the description, function, the cost, and funding source for each item.

The table includes equipment that CIS/Telecom Dept. owned prior to this Project, the equipment which the Dept. needed regardless of this Project, as well as the equipment that were purchased only for the purpose of this Project.

Table 3: System Functionality and Cost
Phase II

ITEM	FUNCTION	COST	Paid for?	SOURCE
Computer, Pantium 133 MHZ	Internet Server, called TITAN I	$5,000	YES	Computer Grant, CIS/Telecom. 94-95
BSDI	Internet Server Software	$1,000	Available	Carl Perkins, CIS/Telecom, Software 94-95
Tape backup and UPS*	Internet Server reliability/security	$760	YES	SGA 94-95
Router and CSU/DSU	Connection to the 56k line	$2,400	YES	CIS/Telecom and Con Ed 94-95
Terminal Server*	Connection to Internet Server and modems	$3,100	Available	Carl Perkins, Tech Grant 94-95
Modems	Connection to the dialup lines	$850	YES	Con Ed 94-95
Computer, 486, 66	Novell Sever TITAN II	$4,000	YES	Carl Perkins, CIS/Telecom 88-89
Novell	To share Dos/Windows application software	$2,000	YES	CIS/Telecom Supplies 94-95
Concentrator	Connection of Tech Labs to the Internet Server	$600	Available	Car Perkins Tech Grant 94-95
Coaxial cables, Network cards*	Hardware connection of Tech labs to the Internet	$1,500	Available	Car Perkins Tech Grant 94-95
Windows 3.11 and Netscape Navigator*	Connection of Tech labs to the Novell Server and Internet	$3,500	Available	Car Perkins Tech Grant 94-95

*** Items purchased to implement the Phase II of this Project. Total amount: $11,860**

3. IMPLEMENTATION:

Operation and Maintenance

1. The operation and maintenance of CCBC Academic Network will be a joint effort by CIS/Telecom, Drafting, Electronics, and High Technology faculty and students.

2. The servers of the network will be operated and maintained by the faculty and students of CIS/Telecom Dept. This will allow the department to continue to provide its students with network installation and operation skills in accordance with the curriculum requirements of the Network Installation Management I, and II Courses.

3. Electronics, Drafting, and High-Tech Communications faculty and students will assist CIS/Telecom Dept. in connection of their computer labs to the network servers, according to the predetermined network design, using several implementation phases.

4. Technology part-time faculty and alumni will be invited to participate in design, operation and maintenance of the network based on the recommendation and decision of the full-time faculty of the above mentioned departments involved in this Project.

5. The CCBC's Academic Network will be available to the students, faculty, and administration with the understanding that this is an academic network. Interested individuals are to contact CIS/Telecom faculty, who is supervisor of this network in order to initiate the process of becoming a user of this Academic Network.

Expectations:

This is network originally has been designed and implemented by a CIS/Faculty and her students and it will be operated by the student under the supervision of a faculty.

1. An academic network is subject to experiment, and it is maintained by students for educational purposes. The network should not be expected to deliver the same service as it is expected from a commercial ISP (Internet Service Provider), since will operated by faculty and students volunteering their time and expertise to this Project.

2. During the first semester of it operation there will be much testing and debugging. But as this Academic Network matures, more reliable service will be provided.

CONCLUSION

CCBC Internet Project is an important part of our students' academic environment. I would link to mention that had it not been fort the eight students who worked diligently this summer, studying, researching, and experimenting, about Internet, Server operating systems, and starting and ISP in general, our Project would not have progressed to the stage that it has currently. The students involved in this Project were:

1. Jeffrey Bland
2. Jerremy Bussard
3. Douglas King
4. Terry King
5. Ken Kucell
6. Hope Murphy
7. Eric Progar
8. Amber Skiba
9. Daniel Spann

I am sure you will be pleased to hear that four of the above mentioned students have been already employed by businesses, in Beaver County and Allegheny County, due to the experience they have gained through our "Internet Project".

I strongly believe that our Academic Network will be one of the major selling points or our College. I also believe that the number of students requesting access the Internet through this academic network, as well as number of students volunteering to be involved in this Project will grow exponentially.

Finally, since CIS/Telecom Dept. the department that I teach in, has been a sample site for the "Internet" access at our College, my students and I will be happy to provide the expertise and the time necessary for design and implementation of a Campus wide Academic Network at CCBC.