

# Local Area Network Proposal

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**Prepared by ...**

*ABC Labs, Inc.*

*“Building the computers of tomorrow today.”®*

**Sample LAN Design  
November 1999  
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# Local Area Network Proposal

## I. Executive Summary

Personnel of the CIS Department Personnel of ABC Labs, Inc. believe that this LAN proposal offers the following features:

- innovation
- up-to-date technology
- flexibility
- upgradability
- functionality
- in-house capabilities

Throughout the planning and design process of this proposal, stringent efforts were made to assist ABC's new enterprise in remaining competitive in the multimedia PC chip market. At the same time, the drafters considered cost effectiveness for the company whenever productivity would not suffer as a result of purchasing slower computers or less software licenses.

The Topology, Design and Cost Estimates Sections of this proposal are technical, while the Section on Software is more practical and would appeal even to the layman. The proposed System and Network Administration functions and personnel, which comprise the CIS Department, are outlined, including yearly salaries as well as LAN installation personnel costs. The Cost Estimates portion of this proposal is continued in detail in Appendix 2.

The Logical and Physical LAN Designs are contained in the PowerPoint presentation accompanying this proposal.

## II. Task

ABC Labs, Inc. (ABC) has been manufacturing personal computers (PCs) on a small-scale basis for around five years. Recently, the company has decided to expand greatly in order to manufacture and market a revolutionary multimedia CPU. In order to accommodate these new demands on personnel and resources, ABC will have to move their company to a new facility and purchase software and hardware necessary to manufacture and market the new PCs.

The CIS Department of ABC has been given the task of developing a LAN Proposal outlining support requirements for company operations in their newly leased facilities. The Department has also been given the job of costing out the new enterprise. Several assumptions have been made regarding this LAN Proposal; they are listed in Section IV.

## III. Environmental Factors

### **Physical Environment**

The new site consists of two buildings with two floors in Building 1 and one large floor in Building 2. The distance between the two buildings is 500 meters with public roads existing between the buildings. These roads are maintained by the city and are subject to

regular maintenance, including excavation. Reliable, fast, consistent wireless communication must be considered for transfer of data between the two buildings.

### **Operating Schedules**

The Manufacturing Division will maintain working crews seven days a week, twenty-four hours a day. Normal operating hours for other divisions and departments will be from 8:00 a.m. to 5:00 p.m.

### **Special Considerations**

The robotics devices in Manufacturing require 100% time predictability of data flow between stations. This will generally be in milliseconds.

The multimedia testing area will require transfer of large amounts of multimedia data between workstations on a routine basis.

In the testing and robotics areas, ElectroMagnetic Interference (EMI), the electromagnetic waves that emanate from an electrical device, must be considered. The low-frequency or high-frequency waves from electromechanical devices or LAN cables could interfere with workstation communication. FCI allowable limits must be considered in these areas.

## **IV. Topology**

### **Assumptions**

The CIS Department used the following assumptions in the Network design:

- Based mainly on the given department area sizes, we assume that Building 1 is a two-story building with Administration, Sales, and Accounting on the 1st Floor and Engineering/CAD and Testing on the 2nd Floor.
- We assume that the entire Building 1 and the office area of Building 2 are pre-wired with Category 3 UTP, which is common in commercial buildings. Because the building is leased, we made use of the assumption for budgetary reasons where it suited our needs.
- The total number of nodes outlined in the LAN Requirements Table (Appendix 1) must have included all devices that require a node, therefore, we assumed that the total number of nodes does not reflect the total number of workstations.
- We assume that there will be numerous EMF sources in Building 2 due to the machinery and furnaces required in the manufacture of CPU chips.
- We assume that the acquisition of robotics stations and software will be handled between Administration and an outside firm, Robotics, Inc. Therefore, the cost of this part of the new operation is not covered in our proposal. However, the CIS Department will handle all network media going to and from these workstations.
- We assume that a certified microwave technician will handle the installation of the microwave transceivers and that he will calibrate and aim the microwave dishes. Regular maintenance of this equipment will become the duty of the CIS Department.

### **Architecture**

The design of network for ABC was driven by requirements that we received from Manufacturing, mentioned in Special Considerations in Section III above.

In our design, we considered the hard requirements for network performance in certain areas of the plant against the expense that would be required to run Ethernet grade cable through the plant. Based on the amount of network traffic estimated by judging the type of client-server applications that were used in the various departments on the First Floor of Building 1, we decided that the 10Base protocol would suffice for this building. The 10Base-T specification defines a star-shaped topology. In this specification, each node is connected to a central point, which repeats the node signals on all other lines connected to the central point. So while this is physically a star, it is logically a bus topology.

In our design, we used 10/100 Base-TX switches, which allow for automatic switching between 10Mbps and 100Mbps on the same network. We feel that these will leverage ABC's investment in network components by allowing increased performance using the same network components. This will allow the backbone to use the 100Base-TX protocol. The intelligent hub is actually an ATM LAN Hub configuration. This type of configuration is becoming popular (Stallings, pp. 333-338). In this configuration, the Hub maintains the role of router by allowing multiple protocols to be joined together.

For the Second Floor of Building 1, there were requirements that the network must be able to support the Multimedia Testing area, which routinely transfers large amounts of data between workstations. To meet these requirements, we will use the 100Base-T4 protocol. This allows ABC to step up to a high-performance LAN, while using only a limited amount of additional wiring in the leased buildings. This network will also use the same 10/100 Base-TX switches that are used on the First Floor.

The two buildings are linked by microwave transceivers that are also part of the same Ethernet network. These transceivers can be expected to provide about 10Mbps performance over the link.

In Building 2, several factors were used in the design. As previously stated, there were hard deadline requirements for the data. This means that the data must have a guaranteed arrival time. In CIS, we assumed that because we were dealing with robotic devices, the interaction required of the devices requires the guaranteed delivery time. For example, if a robot arm starts an operation, and encounters an obstacle blocking its path, it would need detailed instructions on how to handle this anomaly in near real time. ATM LANs provides this level of service. They support multiple, guaranteed classes of service such as is required for this application. For example, in *Local and Metropolitan Area Networks*, Stallings states that an ATM is useful for "a live video application which may require a guaranteed 2-Mbps connection for acceptable performance, while a file transfer program can utilize 'background' class of service" (Stallings, p. 334).

## **Servers**

We recommend using the Dell PowerEdge servers. They offer many superior amenities including hot-swapping of hard disks. The servers will contain two or three separate hard disks that will act as separate servers, some for use by specific departments and some for use by everyone in the company. The tape-back up drives and accompanying software will be included in all servers purchased by Dell as part of the package.

Building 1, Floor 1 will house five servers, three in Administration and two in Accounting. These servers will house the following: Mail, Client Database, Vendor Database,

Correspondence and Publications, and Internet Server (Domino) all in Lotus Notes. One server will be used solely by Accounting and Personnel for employee and tax records. Servers will also house Network Monitor and Systems Management Server in conjunction with WindowsNT Server.

All servers are connected to the 100Mbps high-speed backbone cable. This will allow all server-to-server applications to operate at the maximum LAN performance rate.

## **Media**

The following are the media specifications for ABC's LAN. Based on the existing wiring of Building 1, we opted for the 10Base-T protocol on the First Floor. This medium specification allows use of 2 pairs of Category 3 Unshielded Twisted Pair (UTP). This will allow us to use the existing wiring. From the network we used 100Base-TX backbone, which connects the switches to the intelligent hub. This backbone will actually consist of very short pieces of Category 5 STP.

On the Second Floor of Building 1, we will use 100-T4 as the primary protocol. This will provide 100Mbps over 4 pairs of Category 3 UTP.

The ATM LAN in Building 2 uses Stranded Loose Tube Indoor/Outdoor Fiber Cable. This cable will be run in the space above the false ceiling. We have confirmed with the Building Supervisor that this is NOT a plenum space. In this building, the HVAC is contained in ducts that are run in the space above the false ceiling.

## **Connections**

Intelligent Hub, Bay Network's System 5000, features highly flexible backplane architecture. The System 5000 Hub simultaneously supports:

- 10 and 100 megabit-per-second (Mbps) shared and switched Ethernet
- 4 and 16 Mbps Token Ring
- 100 Mbps Fiber Distributed Data Interface (FDDI)
- 155 Mbps asynchronous transfer mode (ATM)
- Full routing and remote access capabilities.

This enables us to use the Intelligent Hub to perform routing functions, like between the Ethernet and the ATM, and also to perform switching functions, as with the 10Mbps in the Data Collection and Office in the Manufacturing Area. In order to configure the system, the user buys the chassis and the modules they need for their application. We have specified the modules needed for ABC in the accompanying Network Cost spreadsheet found in Appendix 2.

- 10/100Base-TX Switches

These switches support industry-standard 10BASE-T, with each port delivering a switched 10 megabit-per-second (Mbps) link to individual desktops or network segments, allowing multiple data transfers to take place simultaneously. These switches provide the capability to relieve the congestion found on traditional shared media Ethernet networks where all

users share a single 10 Mbps segment. The switches also support 100 Mbps 100BASE-TX and 100BASE-FX Fast Ethernet switched ports, enabling high-speed connections.

### **Network Management**

Microsoft includes a limited-function version of its Network Monitor protocol analyzer with Windows NT Server 4.0. The free version provided with WinNT Server lacks a few features found in the full version, but it is still useful for monitoring traffic to and from a specific Windows NT Server machine.

Network Monitor uses the server's existing LAN card to collect data. During capture, Network Monitor uses a multiple-window display to show detailed network utilization statistics, a list of the stations seen, and running counts of LAN traffic by station.

The full-blown version of Network Monitor is available only as part of Microsoft's Systems Management Server (\$1,198 for the server and 10 clients). The CIS Department recommends purchasing five of these packages for the extended LAN analyzer and control features offered.

## **V. Designs**

### **Logical**

A table detailing the total number of node devices used in each company department is listed in Appendix 1.

A drawing of the Logical LAN Design is shown in the accompanying PowerPoint presentation.

### **Physical**

The physical connection of this network is relatively easy because of the extensive use of existing wiring in Building 1. This wiring terminates in the wiring closets on each floor. CIS Department technicians are left with the task of mounting the switches in racks in the wiring closet, then connecting the UTP to the switch. Next, the 100Mbps backbone cable should be run from the wiring closet to the equipment room, where it will be connected with the LAN servers via modules in the Intelligent Hub.

The installation process for the fiber optics cable in Building 2 is slightly more complicated by the use of the fiber. We will create a drop-out from the ceiling for each node. Once the Fiber is cut, technicians will polish the ends. The technicians can test the cable and termination before connecting to the network. Because the Manufacturing Division building does not use plenum space, we can run the cable directly over the false ceiling supports. The fiber cables are connected directly to the ATM modules in the System 5000 Hub.

The Physical LAN Design is shown in the accompanying PowerPoint presentation.

## **VI. Software**

### **Network OS**

The CIS Department selected **Windows NT 4.0 Server** as the Network Operating System. Windows NT (NT) is a true 32-bit preemptive, multitasking OS. Our choice of this NOS was based upon cost, security, stability, wide user base and its ability to satisfy the functionality requirements of each of our 10 servers, 200 nodes and 164 PCs.

NT supports the same popular application development tools as Windows 95. If the server is Windows NT, any part of the application can run on either the server or the client, which opens the door to three-tier client/server architectures.

The key strengths of the NT OS are its high level of integration across diverse IT strategies, its comprehensive capabilities to support server environments, and the ease of use it provides end users and system and network administrators. Data storage functions are also strong. NT supports a number of file systems including its native NT file system (NTFS). Recent releases of NT provide efficient multi-threading synchronization, which allows applications with concurrent clients to access server resources. NT allows centralized control of user passwords and privileges. NT has built some of its essential internal communication channels on an OSF standard. Out of the box, NT supports all the major communication standards (TCP/IP, NETBIOS, IPX, sockets, X.25, ISDN), and NT includes the Internet browser, Internet Explorer.

### **Workstation OS**

The CIS Department selected **Windows 95** as the Workstation Operating System. Windows 95 OS (Win95) has become the most widely used OS next to DOS. It is nominally a 32-bit operating system, but has retained some code from its 16-bit ancestors, MS-DOS and Windows 3.1. That code makes it compatible with the vast majority of hardware and with most DOS and Windows programs.

Win95 has Plug and Play and peer-to-peer networking features and is also an excellent OS choice for remote computing. Win95 is the easiest way to a 32-bit desktop with a reduced set of requirements, comprehensive compatibility and advanced mobile computing tools. The software, hardware and functional requirements of each workstation in ABC vary significantly. Win95 provides the flexibility needed to pick and choose software and hardware components for each area and workstation. Win95's near-universal hardware and software compatibility and advanced support for portable PCs made it the perfect choice for our Workstation Operating System.

### **Applications**

Because our LAN supports numerous departments with varying requirements and functions, we have made our software selections by department. Software requirements for each workstation within a department will also vary depending upon the functional requirements of each user. We have prepared a spreadsheet indicating our software selections by department, number of licenses required and total cost. This spreadsheet is shown in Appendix 2.

Our software selections include the following:

- **Windows NT Server**

Windows NT will be installed on each of the 10 servers on our LAN. The function of each server is defined in Section IV.

- **Network Management System**

As discussed above in Section IV, Microsoft includes a limited-function version of its Network Monitor protocol analyzer with Windows NT Server 4.0. This will be used to monitor traffic. In addition, we will purchase five licenses of MS Systems Management Server Application for the added features and controls.

- **McAfee Netshield Security**

McAfee Netshield Security is a firewall to be installed on all servers with a link to the Internet or other off-sight Intranets. This program will protect against unauthorized access by hackers or other unauthorized outsiders.

- **Norton Utilities f/Win95**

Norton Utilities automatically tunes up and stabilizes a PC, providing a faster, safer environment with features like System Doctor, Speed Disk and Disk Doctor, which looks for system problems, prescribes and delivers the cure. Copies are recommended for each server (10), all CIS Department personnel (8), and some Testing (10) and certain Administrative personnel (6).

- **Lotus Notes Server**

Lotus Notes Server will be installed on all servers. We plan to use Lotus Notes extensively for interoffice correspondence as well as numerous database functions including time & expense reporting, vendor databases, client databases, personnel databases, etc.

- **Windows 95**

All individual workstations will run off of the Windows 95 OS. This software is pre-installed on the PCs before purchase.

- **McAfee Virus Scan**

This Virus Scanner is one of the best virus detection and repair tools on the market. It will be installed on each of the 164 workstations and will remain active at all times. The CIS Department will upgrade it on a quarterly basis to guard against new viruses.

- **Lotus Notes**

Each workstation and user will have access to Lotus Notes Mail. It will be the primary source of written internal communication and will also allow for offsite access for remote users. It will also serve as the source for maintaining and sharing databases. Database access will be controlled by Access Control settings as determined by management and managed by the Lotus Notes Administrator. For each database, access levels and levels of authority, functions and the need to read, edit, create or delete documents or fields will define roles.

- **MS Office 97 Standard Edition (Word, Excel, Outlook, PowerPoint)**

Microsoft Office '97 will be installed on all workstations except the robotics workstations in Manufacturing. This suite of programs will serve as the primary tools for creating word processing, spreadsheet and presentation documents.

- **Delrina WinFax Pro**

This software allows for the receipt and sending of Faxes directly to and from individual workstations. We will provide licenses to personnel in Corporate Management (6), Desktop Publishing (6), Sales (6), Accounting (1), Engineering (5), Testing (4), and Manufacturing (7) for a total number of 35 licenses for facsimile correspondence.

- **Platinum for Windows: Accounting & Financial Reporting**

Platinum for Windows is a top-rated accounting system known for its reliability, ease of use, customizing, report writing and multinational capabilities. The program can handle all of ABC's accounting requirements including sales, accounts receivable, purchases, accounts payable, cash disbursements, inventory control, assets, payroll, budgeting and financial reporting. The following modules should be acquired to satisfy all of our accounting needs: System Manager, General Ledger, Accounts Payable, Accounts Receivable, Sales Order, Inventory, Bank Book, Payroll Manager, Budget Manager, Multi-Currency Manager, Financial Report Writer, and Customization Workbench.

We recommend purchasing 16 licenses for each module with 4 to be allocated to Accounting and 12 to Corporate Management, with 8 additional sales order module licenses for the Sales Department. All sales will be entered into this system for processing and calculation

- **Act! 3**

This is a customer and activity management application that assists sales members in tracking current and prospective customers. This application combines the contact manager capabilities with the workgroup features of Lotus Notes. It can also link mobile salespeople to the office via the Lotus Notes mail server. A total of 20 licenses will be required, 8 in Sales and 12 in Corporate Management.

- **Paint Shop Pro, Clipart, Corel Draw, Adobe PageMaker**

Our Desktop Publishing and Web page design personnel will use these applications to develop brochures and advertisements for publication on the World Wide Web and in magazines, newspapers, etc. All design work will be done in-house. Paint Shop Pro and Clipart will also be used by our Clerical, Sales, and Engineering Design personnel. We will require a total of 45 Paint Shop Pro & Clipart licenses, 19 Adobe Page Maker licenses, and 30 Corel Draw licenses.

- **Microsoft Project**

The tools in this program will be used by Corporate Management and various departments to plan and manage projects. A total of 25 licenses will be required, 11 in Administration, 4 in Sales, 1 in Accounting, 1 in Engineering, 2 in Testing and 6 in Manufacturing.

- **Corel CAD**

Corel CAD is a highly respected 3-D computer-aided drawing program. Our Engineers will use this software in the design of new products. A total of 12 copies will be required for Engineering Department.

## **VII. System Administration**

Our system includes 10 servers, 200 nodes, 164 PCs, 12 laser printers, 5 color printers, 5 tape back-up drives, 2 plotters, 1 CD burner station and 1 Fed Ex station. We recommend the following CIS staff to support these systems:

### **Personnel**

- 1 Certified Windows NT Administrator to support all servers.
- 3 Network staff to support the Network Administrator in management and maintenance of the network. These three individuals will man a help desk on a rotating basis, which will be open during office hours. A rotating system will also be established for the four network staff, including the Network Administrator. One of the four staff members will be on call at all times in the event of a problem or emergency outside normal office hours.
- 1 Dedicated Lotus Notes Administrator.
- 2 Software specialists knowledgeable in MS Office and all other software used in the organization. See Software Requirements attached.
- 1 Administrative Assistant to support the entire CIS Department.

### **Annual Support and Maintenance**

<u>Qty</u>	<u>Position</u>	<u>Est. Annual Salary @</u>
1	Network Administrator	\$65,000
3	Network Staff	\$30,000
1	Lotus Notes Administrator	\$40,000
3	Software Specialists	\$29,000
1	Administrative Assistant	\$25,000

Staffing requirements equal seven professional staff and one administrative assistant with a combined annual salary of \$307,000. After incorporating employee benefits, office and equipment space, furniture and operating expenses, the total estimated budget for this department is \$600,000.

## **VIII. Security**

System security should be one of the primary responsibilities of the CIS Department and the Network Administrator. Security must be addressed from the Physical and Logical perspective.

### **Physical Security**

This includes consideration of the physical location and environment in which the computer system and its components are installed. Potential threats include theft, vandalism, accidental damage, water or other liquid, fire, dust, Electro-magnetic interference, humidity and exposure to high or low temperatures. In addition, weather conditions such as lightning can damage a system if not properly protected.

All servers, hubs, routers and other LAN equipment at ABC Labs will be located in separate equipment rooms, safeguarded against unauthorized access. Housing the backbone cables and cable connections, the wiring closet will be adjacent to the equipment room. The temperature in these areas will be controlled with vents and an air conditioning system. Only authorized CIS personnel will have access to these areas, and the network administrator will be responsible for checking the room for other potential problems such as water seepage, temperature, faulty locks, etc.

Workstations, printers and other computer equipment located throughout the two buildings are susceptible to physical security in the form of theft. Thus, the best security option is to maintain controlled access for both buildings, during and after working hours. This can be achieved with security guards and an alarm system. Unknown persons entering the building should be stopped and questioned by the security guard and access should not be allowed without the approval of a supervising company employee.

### **Logical Security**

Logical Security includes the policies, procedures and mechanisms that control accesses to the system. The greatest threats are unauthorized access, loss or corruption of data through accidental or deliberate means. Viruses are a major threat that must also be carefully considered. Unauthorized access from sources internal and external to the organization must be addressed.

Logical security encompasses the use of passwords, user IDs, encryption, system monitors, virus scanners, access privilege controls and similar measures. Network security features, such as access privilege settings, are critical in ensuring access is limited to authorized parties within the organization.

Passwords and ID names can be installed at different levels of access including power on, logon, network access, application access, and database or file access. We plan to have power on and network access ID and password controls installed. In addition, access privileges will be defined and monitored by the CIS Department. For highly confidential files and databases, personnel will be required to set separate passwords as an added level of security. Periodic changing will be required every three months.

We have selected the McAfee Virus Scanner, which is one of the best virus detection and repair applications available today. It will be installed on every workstation and will remain active at all times. The software should be updated on a frequent basis, perhaps quarterly, to add protection against new viruses.

A firewall, McAfee Netshield Security Suite, will be installed on all servers with a link to the Internet or other off-sight Intranets. This program will protect against unauthorized access by hackers or other outsiders.

## **IX. Disaster Recovery Plan**

A Disaster Recovery Plan deals with the organization's ability to survive and recover from unexpected destruction or other crisis. It is an established, documented plan that will allow the company to recover its software and data files in the event of system failure.

## **Tape Back-Up Drives**

The primary component of the plan is a tape back-up procedure. On a daily basis, the data on each server will be backed up, two copies of each tape will be made, and the tapes will be taken to different off-site locations. The tapes can be rotated but there should be a separate tape for each day of the week. Once established, the system should be tested to ensure that execution is consistent with the stated procedure.

## **Documentation**

Documentation of the above policies, procedures and control mechanisms will be a primary responsibility of the Network Administrator and the CIS department. This should cover the physical layout and security of the systems and well as logical issues discussed above. The functions of the network administrator and other key CIS personnel should also be documented. Copies of this documentation should be kept in a safe and secure place.

A Disaster Recovery Plan also includes alternative arrangements for the use of computer systems in the event the existing system is destroyed or severally damaged in an earthquake, hurricane or other natural disaster. Although not easy to establish, such arrangements can be made and insurance policies secured to cover the costs of those unpredictable events.

## **X. Cost Estimates**

The CIS Department has suggested purchasing materials that will offer the greatest power, flexibility, reliability and upgradability for the lowest price. We have suggested purchasing various configurations according to company department needs and intended use. We have suggested purchasing from manufacturers known for their good warranties and outstanding customer service.

### **Hardware**

The Hardware Component spreadsheet is included in Appendix 2. The total for suggested Hardware is \$439,955, excluding Robotics workstations, which are handled by Robotics, Inc. and are separate from this LAN Proposal.

### **Software**

The Software Licenses spreadsheet is included in Appendix 2. The total for suggested Software is \$125,575, excluding software used by the Robotics workstations, which is supplied by and maintained by Robotics, Inc.

### **Network**

The Network Components spreadsheet is included in Appendix 2. The total for this equipment is \$283,556.

### **Robotics & Microwave**

Set-up and maintenance of the robotics workstations within the Manufacturing Division is not within the realm of this report. Those stations have their own robotics hardware and software, which will be installed by a subcontractor, Robotics, Inc.

Installation and calibration of the microwave transceivers to be placed on top of Building 1 and Building 2 also represent a separate fee schedule not included in this report. Consultants from WireLess LAN, INC will perform this set-up.

However, CIS Department personnel will install and maintain all LAN cables and connections in the Robotics Department; they will also handle regular maintenance of the microwave transceivers after installation.

### **Installation**

Before installation at the new site begins, the CIS Department of ABC Labs will expand its workforce to include those individuals listed in Section VIII of this paper under System Administration. We anticipate hiring temporary employees for two weeks to assist in setting up equipment and laying cable in the new site. These employees need only have minimal PC and network experience, as members of the CIS Department will closely supervise them.

4	Temporary employees	\$10 an hr.	80 hrs @	\$3,200
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According to the table in Section VII under Annual Support and Maintenance, the CIS Department employee payroll for one week equals \$5,904, which for three weeks would total \$17,712. Assuming 2/3 of the employees' time would be devoted to start-up duties at the new site (for three weeks), that would equal \$11,796 for the CIS Department payroll contribution. Adding in the cost of temporary employees totals \$14,996 for payroll costs for Installation.

Total for Start-up Costs for new LAN including all hardware, software, personnel and network costs (but excluding robotics) equals **\$864,082.**

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## **APPENDIX 1**

**Table 1 - LAN Requirements**

<b>Department</b>	<b>Building</b>	<b># Area (meters)</b>	<b>Nodes</b>	<b>Work Type</b>
Admin.	1	20 x 60	50	Office
Sales	1	10 x 30	10	Office
Accounting	1	20 x 60	5	Office
Engineering/ CAD	1	30 x 90	25	Design and Database (20) Office (5)
Testing	1	20 x 60	35	Data Acquisitions, Multimedia Testing, Database, Testing Stations (30) Office (5)
Manufacturing	2	100 x 250	75	Robotics (60) Data Collection (10) Office (5)

**Table 2 - LAN Design Specifications**

<b>Depart.</b>	<b>Location</b>	<b># of PCs</b>	<b>Type of PCs</b>	<b>Other Node Devices</b>	<b>Network Servers</b>	<b>Total # Nodes in Area</b>	<b>Cabling</b>
Admin.	Bldg. 1 Floor 1	42	27 Pentium PCs, 5 Laptop PCs, 10 slower PCs	4 printers, 1 FedEx station	3 WinNT servers	50	10Base-T over 2 pairs of existing UTP - Category 3
Sales	Bldg. 1 Floor 1	8	5 Pentium PCs, 3 Laptop PCs	2 printers	Use Admin and Acctng servers	10	10Base-T over 2 pairs of existing UTP - Category 3
Acctng.	Bldg. 1 Floor 1	3	3 Pentium PCs	1 printer	1 WinNT server	5	10Base-T over 2 pairs of existing UTP - Category 3
Eng./ CAD	Bldg. 1 Floor 2	17	12 Pentium PCs 5 slower PCs	2 Plotters, 2 printers, 1 CD burner	3 WinNT servers, also used by Testing	25	100Mbps over 4 pairs of existing UTP, and Existing UTP 2 pair - Category 3
Testing	Bldg. 1 Floor 2	23	10 Multimedia PCs 8 Pentium PCs, 5 slower PCs	2 printers, 10 Empty Testing nodes		35	100Mbps over 4 pairs of existing UTP, and Existing UTP 2 pair - Category 3
Mfg.	Bldg. 2	67	55 Robotics PCs, 7 Pentium PCs, 5 slower PCs	5 printers	3 WinNT servers	75	Stranded Loose Tube Indoor/Outdoor Fiber Cable, and Existing UTP - Category 3