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U S Agency for International Development


# INTERNET IN MALI:

# USAID STRATEGY FOR

# DEVELOPMENT PARTNER CONNECTIVITY

# FINAL REPORT

**July 23, 1998**

*Study on the Promotion and Extension of Internet Services in the Republic of Mali*

Prepared for USAID/Mali Information & Communications Special Objective Team
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# EXECUTIVE SUMMARY

In recent years a new 'sector' of economic and social development in sub-Saharan Africa has emerged This new sector involves the management of electronic information related to the development experience and the development process A whole new area of focus has evolved around information and communications access and technology The U S Agency for International Development (USAID) has responded on both the regional and the national levels with the Leland Initiative and individual country mission initiatives In Mali, the USAID mission has established the Information and Communications Special Objective Team (InfoComm) to focus specifically on issues and activities related to information access and dissemination

This report has been prepared in the context of a prescribed sequence of events Once the appropriate policy environment has been established and national access to the Global Information Infrastructure (GII) is in place, the subsequent steps involve ensuring access for successively wider circles of users and increasing focus on the specific applications of the available information In Mali, the first two steps are complete A political environment that supports and protects individual access to information has been established Through a combination of Leland Initiative and Mali mission resources, USAID and its partners established the Mali National Internet Gateway operating under the direction of SOTELMA, the Malian national Telephone Company From April 11 to May 2, 1998, InfoComm fielded a team of specialists from Booz Allen & Hamilton Inc to undertake a study focussing on the ensuing step of ensuring wider access to, and effective use of, the newly available information The purpose of the study, and the resulting recommendations, was to provide the InfoComm team with a strategy and an action plan for the extension of Internet services to selected partner institutions

Early discussions with the InfoComm team indicated a specific priority the University of Mali The study team was asked to focus on providing Internet access to the various institutions in the University system As a result, a great deal of effort was spent preparing a detailed approach and plan for 'getting the university connected ' At the same time, InfoComm was also seeking assistance in defining an approach and a strategy for general development partner connectivity Finally, there was a need to examine the current status of the Internet services sector in Mali and potential obstacles to growth and sustainability

These topics are summarized below The body of this report is lengthy due to the differing nature of the topics and the volume of information Each topic can be read independently of the others as necessity dictates The final section of the report is a consolidation and phasing of the actions recommended from all three topics

University Connectivity

The solution recommended for the University is based on the same process with which the Internet has developed in other countries and throughout the world in a modular and incremental fashion The objectives are to

- Build Local Area Networks (LAN) in the individual institutions
- Connect all the University institutions together into a Wide-Area Network(WAN)
- Connect the University WAN to the Internet gateway

In practical and technical terms for the University and InfoComm, this means organizing to accomplish the following specific tasks

- Build institutional LANs with the addition of servers, hubs, and wiring, including wiring together institutions in close proximity
- Overcome infrastructure constraints by using wireless Ethernet bridges to connect remote institutional LANs together
- Establish a single connection to the national Internet backbone through SOTELMA, the national access provider

The approach has a number of benefits 1) It builds high-speed connectivity The Internet (the network of networks) within Mali should not be limited to the speed with which it is connected to the rest of the Internet 2) There are significant savings in recurrent costs for leased line fees 3) The solution can be easily modularized to accommodate resource availability 4) This approach will also serve as a proof-of-concept for the application of new technologies in Mali

Technology application is only part of a solution that would be implemented in the context of existing organizational initiatives and the natural resulting tensions In that light, the study team has recommended a set of steps for both InfoComm and the University (with its parent Ministry) to undertake These steps will ensure the best chance for success and for sustainability of the University's Internet connectivity

The University should, with a commitment to the 'Internet spirit' of collaboration and cooperation, do the following

- Establish a Project Steering Committee comprised of the senior managers of the most appropriate institutions (which are defined in the report)
- Establish the Project Technical Team composed of the best technical resources from within the University system
- Negotiate the agreement for Internet access with SOTELMA
- Establish the required fiscal and administrative mechanisms
- Make physical and logistical arrangements

For its part, InfoComm should

- Provide assistance for the connectivity project(s) planning and management, beginning with a Project Launch Workshop with the management of all the relevant institutions
- Undertake Phase 1 of the project, which involves establishing the wireless backbone and Internet Access, and building the servers and networks at two of the key institutions
- As resources allow, undertake Phase 2 of the project which is the establishment, on a modular basis, of successive institutional LANs until all the University's departments are connected and operational

Phase 1 and each institution in Phase 2 represents a distinct project Each includes elements of hardware and software provision, technical services, and training Training is a key component as the University prepares to modernize and improve information systems infrastructure

This report provides the information required by InfoComm to proceed with the connectivity program Estimated costs have been broken down for each component Sufficient detail is included to solicit proposals from both external technical firms (for the wireless solution) and local firms to undertake the connection work

Development Partner Connectivity

A competitive grant program has been recommended for general development partner connectivity Because of the wide variety and nature of USAID's partners, the best program is one whereby the partners themselves demonstrate each partner's 'readiness' and capabilities InfoComm has limited resources to perform such a wide range of assessments The program is designed so that, after a brief InfoComm-provided orientation and training, the partners prepare a comprehensive proposal for grant funding to establish their connections The approach is based on some key concepts

- It requires the partners to participate actively in the process
- It allows for rapid determination of Internet and information technology "readiness "
- It fosters ownership and entrepreneurship--the foundation for sustainability
- It allows for manageable phasing of support

The grant program process calls for several steps

STEP 1 InfoComm introduces the program to targeted development partners
STEP 2 Meetings with individual partners to confirm participation
STEP 3 The partners attend Internet Orientation Workshops
STEP 4 The partners submit grant proposals
STEP 5 InfoComm evaluates requests
STEP 6 Implementation

The orientation workshops will be critical to providing the basic Internet awareness and assistance with the proposal preparation process for those partners who need it Evaluation criteria will focus on

- 'Fit' of the partner's mission with USAID/Mali's development objectives
- Capability to effectively operate and support the provided equipment and materials
- Plan for sustainability beyond USAID assistance
- Demonstrated initiative

The program's implementation component is also designed for modularity and ease of execution Three levels of 'Connectivity Packages' have been defined The packages include the general amounts of equipment and materials to be provided and the specific terms and duration of InfoComm's assistance

Internet Services Sector

The study team was asked to consider the planned privatization of SOTELMA and to determine its impact on the Internet services sector Although information on the privatization initiative itself was difficult to obtain, a survey of the entire sector was sufficient to draw some conclusions and to develop some recommendations

Analysis of the demand side of the equation indicates that there is no shortage of consumers using and seeking to use Internet services The value of the service is clearly recognized and consumers are actively seeking the best possible arrangements from among the four licensed Internet Service Providers (ISP) For their part, the ISPs are responding to the demand by building their businesses as fast as they can Evidence indicates that the demand is currently outpacing the supply in terms of responsiveness and quality of service Examination of the financial situation for the ISPs indicates that the business is fairly lucrative The potential for revenues is such that the ISPs will continue to invest in their operations and improve their performance The profitability of the business is further demonstrated by the high demand for new ISP licenses, to which SOTELMA is actively responding

The study team found however, that the sector is based on a financial and institutional foundation that requires further analysis Access to the Internet is provided by SOTELMA through the national node All the equipment and materials for the backbone were provided by USAID through the Leland Initiative SOTELMA's tariff structure is based on sound principles, yet contains a great deal of assumptions and uncertainty A large part of that is the fluctuating cost of the satellite connection which is currently heavily subsidized by USAID As correctly anticipated by USAID, the privatization initiative will also have a considerable impact on SOTELMA as an institution and on the telecommunications sector in Mali Finally, USAID's own plans for support to Mali's connectivity will continue to have an impact on SOTELMA and its long-term viability

Information on the progress of the privatization initiative was largely unavailable to the study team Discussions with SOTLEMA management revealed little beyond recognition of the value of Internet services provision and an intention to remain the key player in Mali Although the plans and progress for the sale of capital were kept confidential, evidence suggested that very little analysis has been done within SOTELMA regarding the impact on its Internet operation, on the institution, and on the sector as a whole

Considering the level of uncertainty, SOTELMA's role in the sector, and the levels of planned USAID investment, the study team has recommended a detailed assessment of SOTELMA's long-term financial prospects and institutional capabilities This will by default require USAID to get involved in the privatization dialogue Such involvement would be a new role for USAID, so it would have to be coordinated with SOTELMA and the Ministry of Communications at a high level Considering the stakes, it would be well worth the effort

This report is a detailed record of the findings and recommendations of the study team in the three broad areas discussed above A solution has been recommended for University connectivity along with activity requirements, technical specifications, and estimated costs A program has been defined for InfoComm to support development partners in getting connected, and thereby promote and extend Internet access in Mali A high-level analysis of the Internet services sector has been provided along with recommended actions in that area

# 1.0 INTRODUCTION

## *1 1 Development in the Information Age*

As the 1990's draw to a close, the nature of development in sub-Saharan Africa has taken on a dimension not included in previous decades The exponential growth of electronic information management in the eighties, and it's evolution into a single global information infrastructure in the nineties, has generated the need for an entirely new 'sector' of development activities It is no longer sufficient to address just issues of health, agriculture, education, industry, etc It has now become critical to the development process to specifically address the management of information *about* those sectors Even more specifically, it is critical to address the technology related to the access, manipulation, transmission, and storage of that information

USAID has responded to this new set of requirements with a number of initiatives on regional and national levels The Leland Initiative operates out of USAID/Washington and is working with 20 emphasis countries The project

> "seeks to bring the benefits of the global information revolution to the people of Africa, through connection to the Internet and other Global Information Infrastructure (GII) technologies The Internet is emerging as a low cost pathway that allows information to be more accessible, transferable and manageable, ready access to information is becoming the catalyst that transforms economic and social structures around the world and supports fast-paced sustainable development Even as African countries move toward more open economies and societies, there remain formidable constraints on sustainable development in such areas as the environment, disease prevention, literacy and private sector development Africa needs access to the powerful information and communication tools of the Internet in order to obtain the resources and efficiency essential for sustainable development "

In Mali, the USAID mission has established the Information and Communications Special Objective (InfoComm) to focus specifically on issues and activities related to information access and dissemination Internet access is one of InfoComm's primary application areas Under the objective of "Improved Access to, and Facilitated Use of Information", a key intermediate result is stated as

> "Malians receive pertinent and timely information by using the Internet "

The current study is undertaken in the context of much progress and numerous on-going activities with respect to Internet connectivity in Mali USAID and its partners, through a combination of Leland Initiative and Mali mission resources, have put together an impressive list of accomplishments The Mali National Internet Gateway has been established and is operating under the direction of SOTELMA, the Malian national Telephone Company Four private sector

Internet Service Providers (ISP) are purchasing bandwidth from SOTELMA through leased lines and providing affordable connectivity for roughly 2,000 subscribers By all indications, a solid foundation for healthy, market-based Internet services sector has been established and the facilitative environment required for the next phase is in place

## *1 2 Towards an Appropriate Strategy*

The sequence of events in both the Leland Initiative and the InfoComm strategies is almost identical Once the appropriate policy environment has been established and national access to the GII is in place, the subsequent steps involve ensuring access for successively wider circles of users and increasing focus on the specific applications of the available information

In Mali, these efforts are proceeding on two parallel tracks Leland Initiative resources are focussed primarily on secondary city access VSAT (Very Small Aperture Terminal) connections are being proposed for the main population centers around Mali InfoComm resources are helping to provide access for development and educational institutions operating in the Bamako area This two-pronged approach is in response to the specific objectives stated in the November 20, 1997 amendment to the Memorandum of Understanding (MOU) between the Republic of Mali and the United States of America under which the prior activities have been undertaken (Attachment 2)

The purpose of the current study is to provide the InfoComm team with a strategy and an action plan for the extension of Internet services to selected partner institutions The scope of work (SOW) is expressed as a series of questions related to policy, administrative, managerial, and technical aspects of promoting and extending Internet services (Attachment 3)

Although the SOW refers to 'partner institutions' in the generic sense, early discussions with the InfoComm team indicated a specific priority the University of Mali The University, as Mali's only set of institutions of higher learning, is a logical choice for early Internet access provision and promotion All its institutions are in need of the reference materials, course materials and all types of information resources that are readily available on the Internet and from counterpart institutions in other countries The faculty and students in the University system represent a large part of Mali's intellectual capital and resources They are and will continue to be a key component of Mali's political and social leadership They will derive the maximum value from Internet resources and will serve as champions and promoters of the medium for years to come Because of this logic, the University is mentioned as a specific objective in the above-mentioned MOU In addition, during President Clinton's recent tour of Africa, he made reference to promoting relationships between University-level institutions in Africa and sister institutions in the U S As a result of this increasing emphasis, the study team was asked to focus on providing Internet access to the various institutions in the University of Mali system The scope and depth of this task quickly began to dominate the study team's activities and limited level of effort In spite of this focus, the team was still able to visit a select number of other partner institutions, and to prepare an approach and a strategy for general partner connectivity

This report includes two main components The first component is a proposed design of a national education and research network including access to the national Internet backbone It includes a 'vision' of the network (the desired results) as well as a recommended approach for its implementation The second component is the study team's recommended approach for InfoComm in supporting the connection of a range of development partner institutions

In addition to these two main components, the report also includes consideration of the impact of the SOTELMA's pending privatization efforts and the impact of InfoComm's program on the development of the private sector Internet and information technology service sector

The final section of the report is a consolidation of all the recommended activities in the report They are presented in an activity sequence covering the next three years This sequence can be used by InfoComm to develop a series of specific action plans over that period

# 2.0 UNIVERSITY CONNECTIVITY

## *2 1 Introduction*

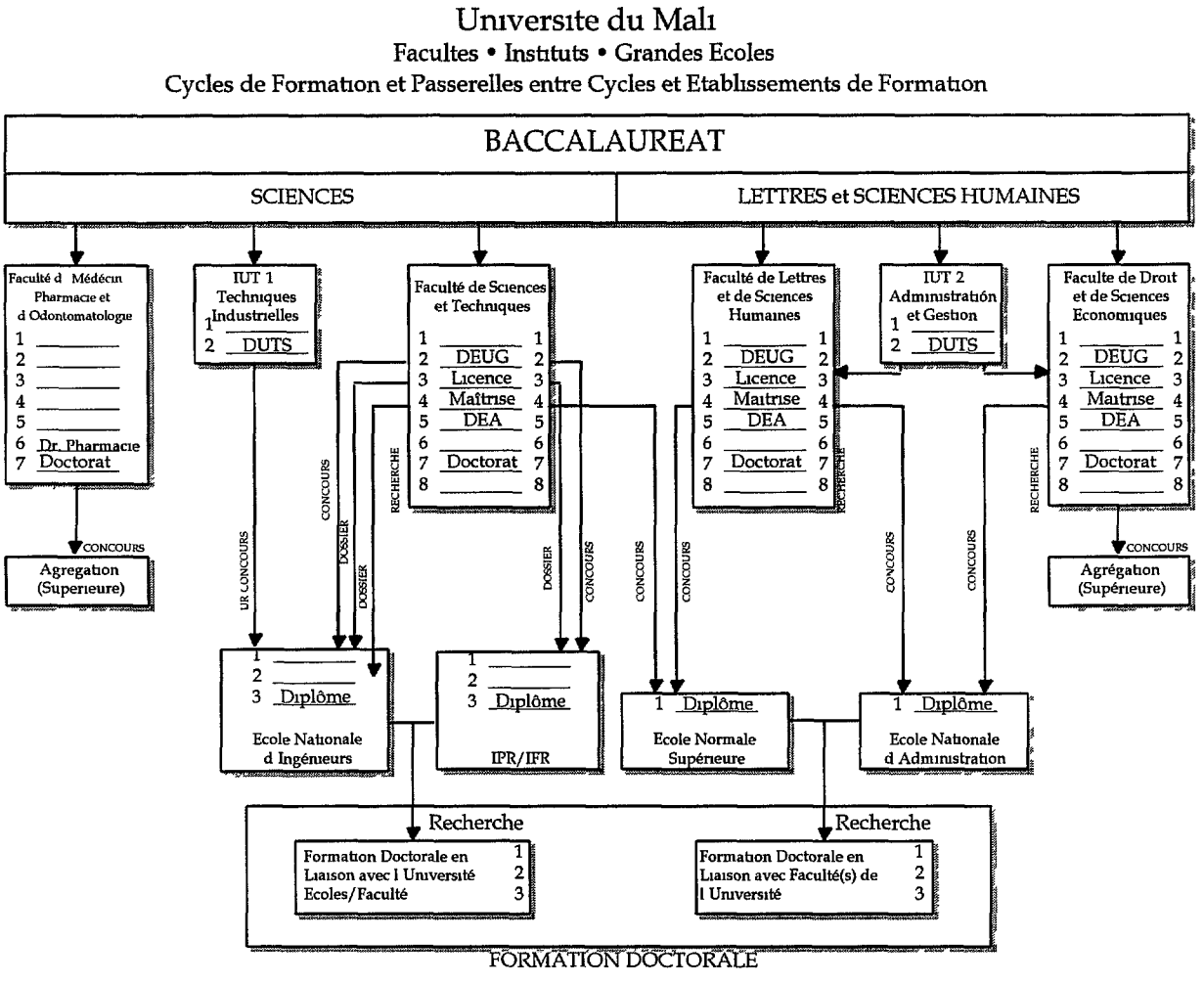
### 2 1 1 Background and History

Two years ago, the University of Mali was created as an administrative consolidation of 10 separate educational units While these units are geographically distributed throughout the greater Bamako area, they function similarly to a traditional university Students follow a path that takes them from general education into specialized, focused programs within the various entities (i e colleges) and on to graduate, research, and doctoral studies Figure 2-1 on the following page illustrates the various educational paths that are available

The professors within the University of Mali also function much the same as in a traditional University model Each professor has a school where he teaches and has his office However, many of the professors also travel to other schools where their area of instruction is part of another curriculum This concept of collegial sharing and cooperation is important to note, as it is a key aspect of the support structure for the recommended networking solution

One area in which the University differs from a more traditional one is the absence of University-wide, coordinated services With the exception of the Rectorat, which oversees University operation, very little centralized management has developed yet There are no university-wide systems of facilities operations, grounds keeping, telecommunications, finance, custodial services, or information technology – just some areas that are typically centralized at a traditional University This is most likely due to the relatively new concept of a unified University and will no doubt develop in time

**Figure 2-1 University of Mali Educational Paths**




## 2 1 2 The Need for Connectivity

In today's modern organizations, both public and private, information flow forms the foundation for collaboration, management and strategic decision making, this is especially true for universities where research and education are the primary focus The University of Mali is no different, with administrators, professors and students constantly contacting and exchanging information with

- Local and international research institutions
- International experts
- Universities around the world
- International non-governmental organizations (NGOs), private voluntary organizations (PVOs), and aid programs

- Colleagues within the University of Mali
- The Rectorat
- Ministere des Enseignements Secondaire, Superieur et de la Recherche Scientifique (the Ministry)
- Other Ministries

Today these flows are often cumbersome, time consuming, and/or expensive The effort of collaboration with international programs by traditional post introduces delay and intra-personal isolation that is frustrating and sometimes detrimental The use of phones, faxes or commercial post (e g DHL) is certainly more direct but can be prohibitively expensive for anything beyond occasional use For example, a 30-minute long distance conversation to the United States could cost as much as $175 61 (10,6525 CFA) or a 10 page fax, $93 66 (56,814 2 CFA) during business hours Additionally, phone and fax communications may ultimately be impossible as many of the University units have only one or two phone lines for an organization with dozens of professors and hundreds, if not thousands, of students

The administrative and management functions of the University are encumbered by inefficient information flows as well The most obvious example of this is student records Currently, students moving from school to school on their educational path (see Figure 2-1) must carry their own paper copies of any previous records and must endure the tedious task of completing re-registration Clearly this is inefficient, inconvenient, duplicative, and creates many more opportunities for the introduction of error

It is for these reasons that the University must move to more modern methods and technologies of electronic communication What is referred to as "connectivity" in this report entails two essential characteristics

- Local connectivity – each unit of the University must be connected to each other
- International connectivity – the University, as a "connected" whole, must be connected to the International network, i e the Internet

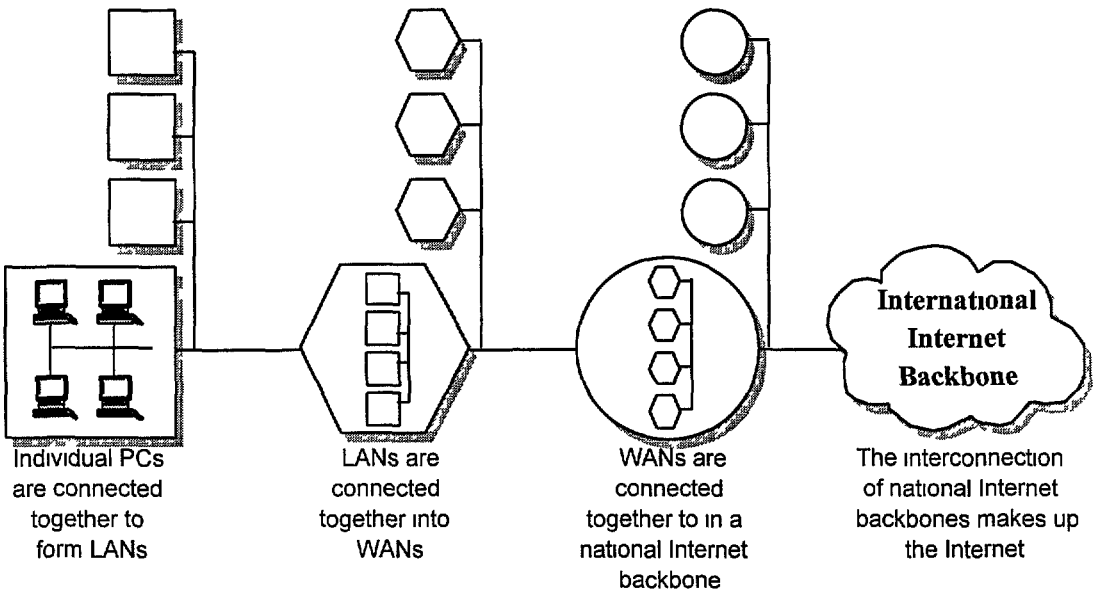
While Internet connectivity is clearly the focus of the Leland Initiative, local connectivity is equally if not more important for a variety of reasons There is no doubt that international communications are very important and essential to research, curriculum development, educational materials, etc There is also a huge amount of intra-University information moving among the schools, the Rectorat and local research facilities This information forms the backbone of day-to-day operations and management From daily status reports during student strikes to annual budget development and student records, this information is rudimentary in the functioning of the University Additionally, local connectivity of the University units actually makes Internet connection easier to implement and manage

The following sections will describe, in more detail, the overall vision and approach for achieving these two essential connectivity goals

## 2.2 Vision/Desired Results

The vision for achieving the connectivity goals discussed above is based upon the time-proven method of modular network construction In essence, build a network of networks, the same way the Internet was constructed Computers in each of the University institutions will be connected into local area networks (LAN) which in turn will be connected together into a University wide area network (WAN) The University's WAN can then be connected to Mali's national Internet backbone which is in turn connected to an international Internet backbone Figure 2-2 illustrates this basic concept

**Figure 2-2**

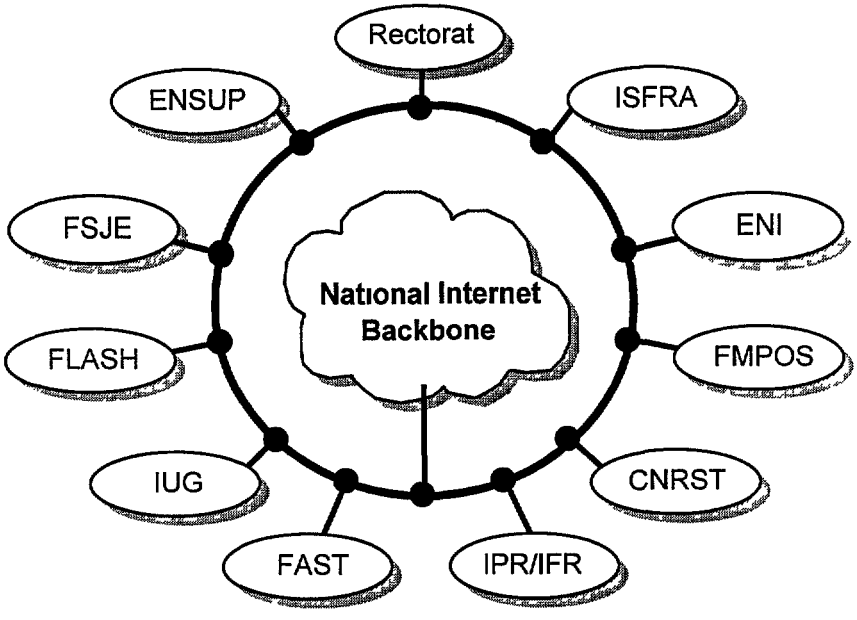



More specifically, this vision entails three main features

- Institutional networks – building LANs in each of the University units
- University backbone – facilitating the connecting of all of the University's LANs into a WAN
- Internet connectivity – connecting the University's WAN to the Malian national Internet backbone (which is already connected to the international Internet backbone)

It should be noted that these features are not necessarily sequential in nature In fact, they are specifically designed to be modular to allow for sequential, parallel or "staggered" implementation as time, resources, and budget allow Each of the three main facets is described in more detail in the following sections Figure 2-3 illustrates a conceptual view of the overall vision

**Figure 2-3**




### 2 2 1 Institutional Networks

At the most basic level, each institution has computers for use by faculty and students These computers are used for a variety of purposes that include word processing, engineering design, computer literacy training, office automation (secretarial) training, etc Some institutions even have small LANs for file/print sharing and dial-up Internet connections for research and e-mail To build the vision of intra-University connectivity, these computers need to be networked together into institutional LANs

In some cases, existing networks may only require some additional cabling and installation of network cards to allow PCs to join networks already in place At other sites, networks must be constructed from scratch with structured wiring, network servers, network interface cards, etc

Each institution was surveyed to assemble the key information needed to characterize each of their connectivity requirements This information included number of computers installed, types of computers, quality and physical security of facilities, existing Internet connections, number of phone lines, and geographic proximity and line-of-sight to other institutions This information was then used to compile the site-by-site recommendations for local area connectivity

In cases where institutions are in close proximity, the study team is recommending that they share wired infrastructure This optimizes the management of networking infrastructure and extends the theme of building the fastest possible connectivity between institutions

The following table summarizes these recommendations Institutions are addressed alphabetically and no significance should be inferred from the order in which they appear

| Institution | Summary of Connectivity Requirements |
|---|---|
| Centre Nationale de la Recherche Scientific et Technologique (CNRST) | 1 Connection to Wide Area Backbone |
| École Nationale d'Ingenieurs (ENI) | 1 Install Cabling<br>2 Build LAN with server, hubs, and NICs<br>3 Connection to Wide Area Backbone |
| École Normale Surerieure (ENSUP) | 1 Install University-wide servers<br>2 Configure current LAN<br>3 Connection to Wide Area Backbone |
| Faculte de la Medecine, de la Pharmacie et d' Odontostomagologie (FMPOS) | 1 Extend current wiring to "Salle Informatique"<br>2 Extend LAN to "Salle Informatique" with hub, and NICs |
| Faculte des Lettres, Arts, et Sciences Humaines (FLASH) | 1 Extend wiring from ENSUP to FLASH<br>2 Extend LAN to FLASH with hub, and NICs |
| Faculte des Sciences et Techniques (FAST) | 1 Extend wiring from IUG to FAST<br>2 Build LANs in offices and computer labs with hubs and NICs<br>3 Connect FAST labs with Ethernet switch for uplink to IUG |
| Faculte des Sciences Juridiques et Economiques/Ecole Nationale d'Administration (FSJE/ENA) | 1 Install Cabling<br>2 Build LANs with server, hubs, and NICs to offices and computer labs<br>3 Connect FSJE/ENA hubs/server with ethernet switch<br>4 Connection to Wide Area Backbone |
| Institut Polytechnique Rural/Institut Formation et de Recherche (IPR/IFR) | 1 Install Server and hub to complete existing wiring<br>2 Establish wide area connectivity via leased line or shared dial-up |
| Institut Superieur de Formation et de Recherche Appliquee (ISFRA) | 1 Extend current wiring from CNRST to ISFRA<br>2 Extend LAN to ISFRA with hub, and NICs<br>3 Installation of Additional PCs |
| Institut Universitaire de Gestion (IUG) | 1 Install Cabling<br>2 Build LANs with server, hubs, and NICs to offices and computer labs<br>3 Connect IUG hubs/server with ethernet switch<br>4 Connection to Wide Area Backbone |
| Rectorat | 1 Install Cabling<br>2 Build LANs with server, hubs, and NICs to offices<br>4 Connection to Wide Area Backbone |

While many of the institutions expressed needs for increased computing resources (e g more personal computers (PCs)), it is not the focus of this study to address these issues The recommendations are focused on the construction of connectivity infrastructure upon which the University can build for years to come Additional computers have been recommended in cases where local area connectivity should not or can not be extended to existing resources

Detailed discussion of the current situation and connectivity requirements can be found in Appendix 1 University Institutional Connectivity Requirements Additionally, detailed project cost spreadsheets, which include wide-area connectivity, are provided in Appendix 2 University Connectivity Project Costing Tables A summary of the cost of the institutional networks and wide-area connectivity is included in Section 2 4

### 2 2 2 Wireless University Backbone

A key theme of this study is promotion of the concept of building the Internet in Mali – that the Internet is not just what lies on the "other side" of the Internet gateway Throughout the world, the Internet is constructed on a national basis, by building networks-of-networks Subsequently, the national infrastructure is connected internationally And Mali is no different The importance is understanding that the University's connectivity (along with the gateway and ISP projects) will be the pioneer in Mali's national Internet infrastructure As such, the University's WAN should be built with the fastest modern connectivity that is technically and fiscally feasible

The primary challenge in finding a solution for wide area connectivity has been the limited traditional telecommunications infrastructure For example, most of the institutions surveyed indicated existence of only one phone line for the entire organization Also in most cases, the addition of more phone lines or installation of leased-lines for networking is simply not technically feasible Further, even when leased lines are feasible, only 64 Kbps throughput is available with upgrades to 128 Kbps available later this year While these speeds are acceptable for low data-rate transactional systems such as credit card verification systems, it is not the best solution for developing modern, high-speed infrastructure for connecting dozens (or hundreds) of computers

It is for all these reasons the University's wide area network should be built with high-bandwidth (1 Mb or higher) wireless connectivity A wireless solution has many advantages over a "wired" approach First, wireless connectivity will be able to reach those institutions where the addition of more telephone lines is simply not possible Also, many wireless solutions can offer higher bandwidth than are available with "wired" connections For example, wireless connectivity can achieve throughput of between 115 Kbps to 10 Mbps Conversely, standard voice lines in Mali have a maximum throughput of 33 6 Kbps and leased lines have a maximum throughput of 64 Kbps (128 Kbps available later in 1998)

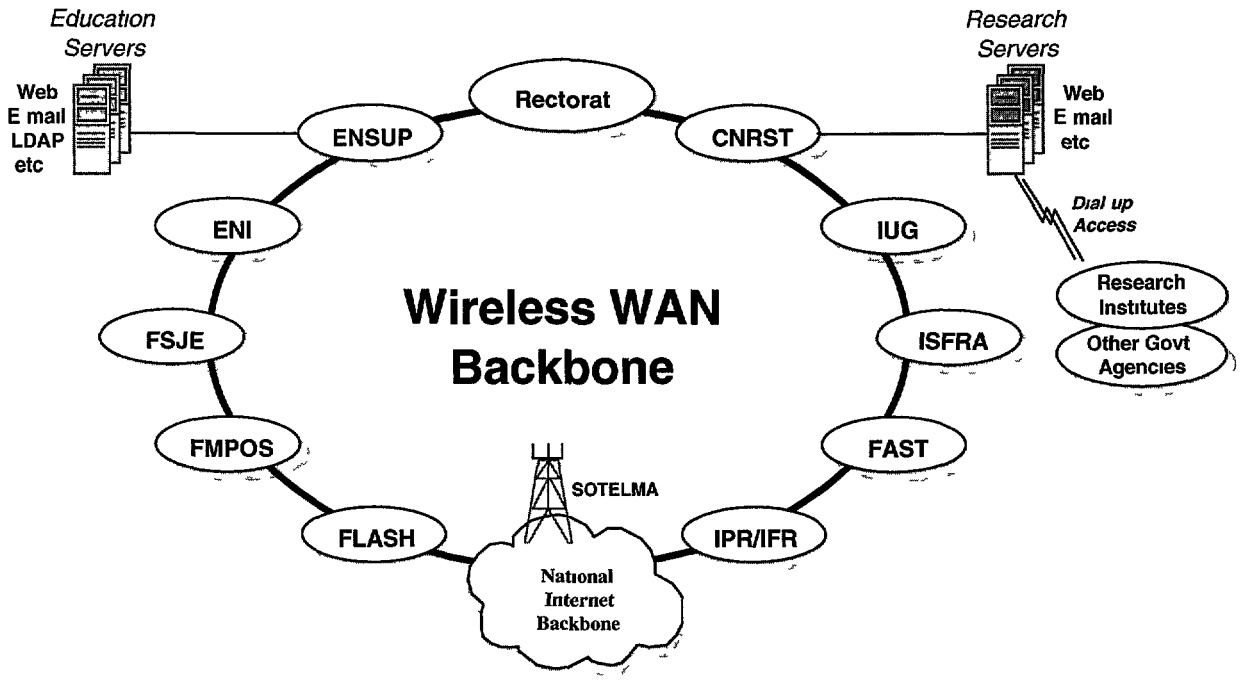



**Figure 2-4 Concept of Wireless WAN Backbone**

Another advantage of a wireless approach is the elimination of recurrent telecommunication costs There are no monthly fees for phone lines or leased circuits In many cases, the purchase cost of wireless equipment is recouped within 6 months when compared to the monthly fees that must be paid for wired connectivity As an example, consider the following case for Mali

| | | |
|---|---|---|
| **IF** | "Retail" cost of a 64 Kbps leased line (connected to the Internet gateway) = | $ 1,713 per month |
| **AND** | Retail price for 10 Mbps connection using two C-Spec RF-10 wireless bridge/routers = | $ 18,990 |
| | The breakeven point at which the cost of the leased line equals the purchase price of the wireless equipment = | 11 months |
| | At the breakeven point, cost per Kbps for 64K leased line = | $ 296 71 per Kbps |
| | At the breakeven point, cost per Kbps for 10M wireless = | $ 1 89 per Kbps |

Clearly, after the breakeven point the initial capital cost of wireless has been completely recouped by cost savings on monthly line charges and the bandwidth is 156 times greater It should be noted that this scenario is overly simplified for illustrative purposes In reality, the situation is much more complex and uncertain but the overall premise is still valid

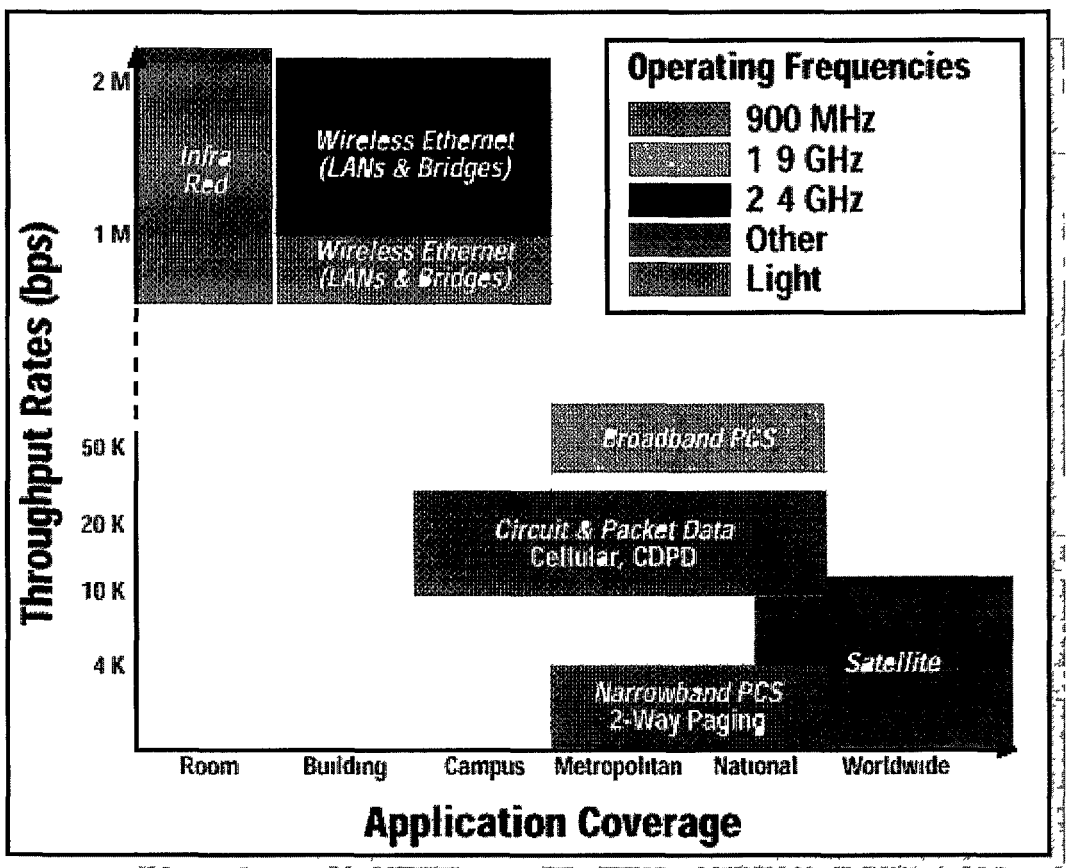
An important secondary benefit of a wireless approach is the introduction of new technologies into Mali The University's wireless WAN project will serve as an important proving ground for the application of innovative technologies to overcome infrastructure limitations This point is endorsed and promoted in the "Memorandum of Understanding to Establish the Mali Global Information Infrastructure" where it clearly states that a primary goal is

> "Introduction of new GII technologies, connecting end users where telephone networks are saturated or where new lines are difficult to obtain "

There are a variety of wireless solutions available, each suitable for a range of applications and bandwidths Figure 2-5 illustrates the various solutions being commercially deployed today and their applicability It is clear that "wireless ethernet" is the appropriate choice for the University's wide-area connectivity Operating predominantly in the 900 MHz and 2 4 GHz radio spectrum, there are two types of "wireless ethernet" available

- spread spectrum, direct sequence
- spread spectrum, frequency hopping

**Figure 2-5 Commercial Application of Wireless**




*Source Black Box Corporation*

Spread spectrum transmitters maintain network privacy and avoid interference by the way they encode their frequency signals In both types of spread spectrum, the transmitters purposely spread their signals across a large band of frequencies, making the signal much less susceptible to jamming, inadvertent interference, or eavesdropping

In frequency hopping systems, the radio transmitter hops from one carrier frequency to another at a specific hopping rate, in a specific sequence that appears to be a random pattern The intended receiver knows the transmitter's hopping pattern so only that receiver can follow the transmission Other transmitters will be using different patterns, which usually will be on non-interfering frequencies In those cases where there is a "collision" (two transmitters using the same frequency), the data is retransmitted on the next hopping frequency

Direct sequence transmitters spread their data over a wide frequency band and scramble their carrier with a digital code sequence Only a receiver with the correct "despreading" code can identify and decode the traffic that is broadcast To any other receiver, the traffic appears to be a short burst of low-level static

There are some characteristic advantages of each of these types of spread spectrum wireless connectivity In general, direct sequence systems offer greater throughput and performance than frequency hopping Additionally, because of the simpler broadcast method, direct sequence systems are quicker to synchronize and recover from outages Frequency hopping systems, however, are much better at operating in an environment of constant interference

The choice of which approach to use must be based on the specific application In areas where a lot of interference (or intentional jamming) is potential, frequency hopping is the clear choice for sustained performance In applications where interference is less prevalent or completely absent, it is possible to employ direct sequence systems to achieve dramatically better throughput

A preliminary survey of the Bamako area reveals that there are no major sources of electro-magnetic interference (EMI), such as electric power plants or other significant radio signal use The Team has consulted with SOTELMA and learned that both the 900 MHz and 2 4 GHz families of frequencies are available for use in Mali SOTEMLA reported, however, that they are deploying GSM cellular phone service in parts of the 900 MHz band Although spread spectrum wireless networking can coexist with cellular traffic, it is recommended that wireless solutions be implemented in the 2 4 GHz band, if possible, for ease of implementation and management

For the purposes of the University's wireless backbone, it is imperative that the highest performance connectivity be implemented as is possible While current wireless solutions on the market have reported data throughputs of 115 Kbps up to 10 Mbps, a faster University backbone offers better performance in the short-term and leaves room for growth in the long-term If it is technically feasible, the higher data rates achieved by a direct sequence system would be highly desirable If possible, InfoComm may wish to conduct tests of both frequency hopping and direct sequence systems to discover which approach offers the best performance for Bamako

Alternately, if testing cannot be performed, it is highly recommended that InfoComm require implementing contractors to guarantee minimum data rates and/or contingency plans for the spread spectrum system which they propose to install

Another important consideration is that spread spectrum technology requires clear line-of-sight in order to make the wireless connections After surveying all of the institutions, the study team concludes that there is no single institution which can be "seen" from all the others that could act as the focal point of the network There is, however, clear line-of-sight to the SOTELMA, 40m communications tower in the center of Bamako Therefore, it is suggested that an additional, single transceiver and omni-directional antenna should be installed at SOTELMA to act as the focus of the multipoint network This has the added advantage of also allowing for easy connectivity to the National Internet Backbone

SOTELMA has already been approached and has agreed to host the equipment and the antenna It would be best, however, if the University retains ownership of the wireless equipment in the near term so as to retain clear delineation of services in anticipation of SOTELMA's privatization As discussed in Section 4 3 2, it is recommended that USAID/University's relationship with SOTELMA remain on a formal commercial basis We strongly recommend against inter-governmental agency agreements that may complicate, or even obstruct, private sector promotion of telecommunication sector and the maturation of the Internet services market This does not mean, however, that SOTELMA should not be involved in the University WAN project Indeed, one of the advantages of the wireless approach is national exposure to modern infrastructure technology The University's WAN project should prove to be an invaluable learning experience for all technical staff and decision makers involved in aspects of telecommunications and networking in Mali

For the most efficient implementation, a multipoint solution of the highest-possible bandwidth is recommended As mentioned earlier, several institutions share the same building or are in close proximity to other institutions As shown in Figure 2-4 above, these institutions will be connected with physical, wired connectivity to each other and will share wireless connectivity to the WAN With this in mind, transceivers and antennas will be required at the following locations

- Campus of Centre Nationale de la Recherche Scientific et Technologique (CNRST) and Institut Superieur de Formation et de Recherche Appliquee (ISFRA)
- Ecole Nationale d'Ingenieurs (ENI)
- Campus of Ecole Normale Surerieure (ENSUP) and Faculte des Lettres, Arts, et Sciences Humaines (FLASH)
- Faculte des Sciences Juridiques et Economiques/Ecole Nationale d'Administration (FSJE/ENA)
- Campus of Institut Universitaire de Gestion (IUG) and Faculte des Sciences et Techniques (FAST)
- Rectorat

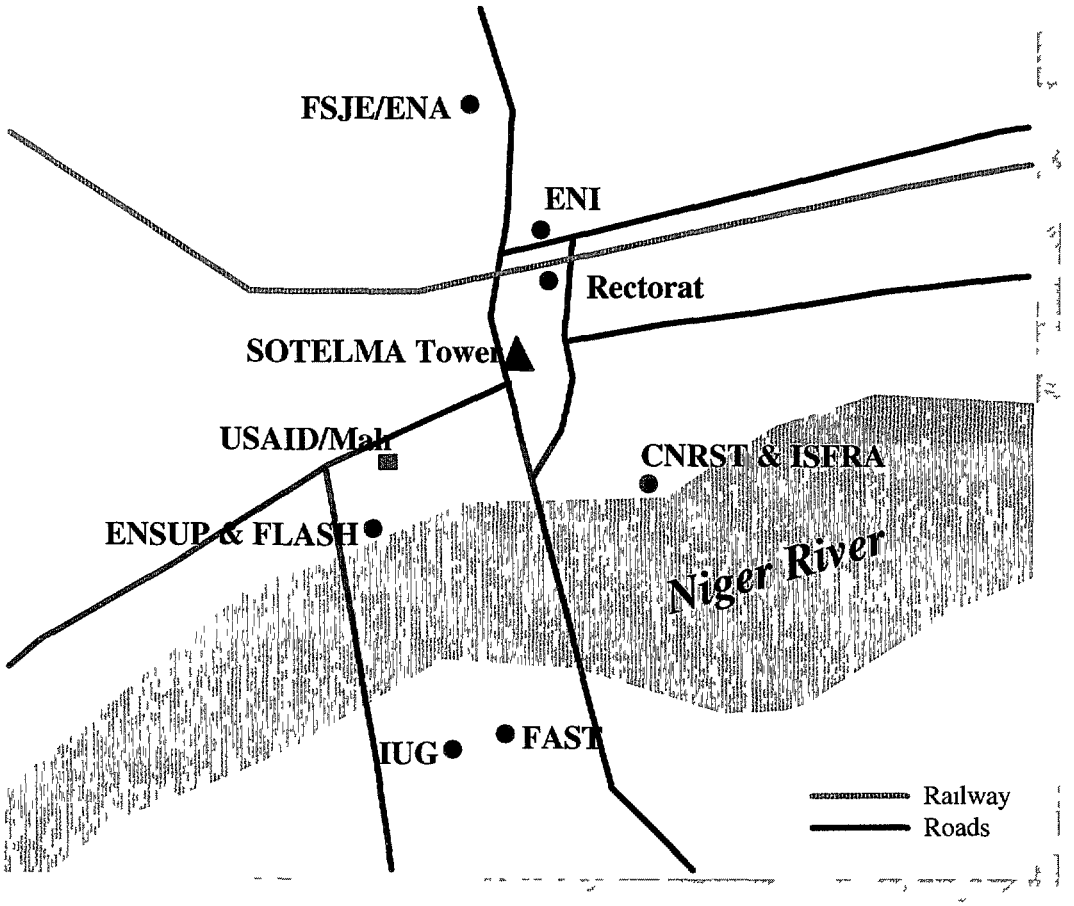



**Figure 2-6 Location of Institutions in Central Bamako**

It is recommended that the Institut Polytechnique Rural/Institut Formation et de Recherche (IPR/IFR) be excluded from the planned wireless network Connectivity to this institution, located 60km from Bamako, is primarily limited by geographic terrain While wireless solutions are feasible, via repeaters on SOTELMA's existing microwave towers, it is not cost effective at this time It is therefor recommended that IPR/IFR be connected via a shared dial-up or leased circuit While phone lines in the Katibougou area are limited now, SOTELMA is in the process of installing a new telecommunications switch and has made assurances that lines will be available in late this year

Furthermore, there will be no need to include the Faculté de la Médecine, de la Parmacie et Odontostomagologie (FMPOS) in the planned wireless network As mentioned in the detailed description of FMPOS institutional network, Internet connectivity is already being implemented as part of the Malaria Research Project

### 2 2 3 WAN Services

As the University's wide-area connectivity is being built, it is recommended that some centralized, University-wide services be deployed as well These should include

- E-mail
- LDAP
- Web services

E-mail is undoubtedly the most revolutionary communications medium of the 90's Its ability to quickly and inexpensively send messages and documents provides communication and collaboration capabilities which are unparalleled In today's modern universities, research institutions, governments and corporations, e-mail is as ubiquitous as the telephone or conference room Establishing University, national, and international e-mail capabilities has been identified by all the institutions as an absolute necessity For ease of management and implementation, it is recommended that e-mail services be centralized This would employ the installation of centralized mail servers and compatible mail client software to each institution It is essential that the e-mail services fulfill the following requirements

- Compatibility with standard operating systems used at the University (Windows 95, Windows 3 X, Unix, etc )
- Compatibility with networks in use (Novell, NT, TCP/IP)
- Compatibility with industry standard SMTP and POP3 or IMAP protocols

To facilitate and simplify e-mail communications between the University, research institutes and the rest of the world, it is recommended that an LDAP (Lightweight Directory Access Protocol) server be implemented LDAP, based on the X 500 directory standard, provides a directory of e-mail addresses and contact information that can be searched from a Web browser or an e-mail client For example, all of the most popular public directory services, WhoWhere, Bigfoot, Four11, and InfoSpace are all LDAP based directories Building these services at the University will greatly simplify communications by providing a searchable "phone book" for all, nationally and internationally, to access

While e-mail is a powerful tool for one-to-one communications, a Web site is better suited for one-to-many or "broadcast" type communications A Web site has the power to convey multi-media information to thousands or millions of people We recommend that the University implement Web services focusing in three key functions

- As an internal communication tool (intranet)
- To disseminate dynamic information which the University generates
- To disseminate information about the University

As an internal communication and resource tool (i e an intranet), a variety of information could be made available including monthly bulletins, important forms, event announcements, grade posting, etc This information would be designed for use by administrators, faculty, and students Secondly, the Web server should be used to broadcast dynamic, key information that the University generates This could include class schedules, research project information, thesis publication, etc This information would be targeted for internal and external use Finally, the Web server should be used to disseminate information about the University This information would be targeted to users such as potential students, foreign lending institutions, and international universities It could include descriptions of the various schools, curriculum detail, tuition scales, photographs, application forms, etc

For the future, it is recommended that the University plan on integrating other features into the Web services as well For example, services could be offered to students for personal Web sites This would encourage skills development and innovation as well as give students an international voice The University could also integrate wide-area access to student records and other administrative systems This would allow faculty and administrators to access key information from any University location, conveniently through their familiar Web browser

With the skills and experience of integrating these functions, both technically and administratively, the University should eventually plan on offering more sophisticated services such as extranet functions These include extending external Web-based access to internal systems The most common examples of these capabilities today are Web-based class registration systems used by hundreds of Universities Other possible capabilities include access to financial systems for automatic tuition payment and access to student transcripts for potential employers

### 2 2 4 Internet Connectivity

The final link in the University WAN will be connectivity to the Malian national Internet backbone Currently, the national backbone (i e the point where all ISP traffic intersects) is housed by SOTELMA, who also maintains the international Internet gateway As mentioned above, SOTELMA has already been proposed as the axis of the University's wireless connectivity because of clear line-of-sight from most institutions Connectivity to the national Internet backbone, then, can be achieved by simply connecting the transceiver that will be operating on SOTELMA's tower to the backbone equipment (routers) located in SOTELMA's facility next to the tower

As of the time of this study, SOTELMA was unable to estimate the possible cost of backbone connectivity in this manner It would seem, however, that the monthly cost for this connectivity should be considerably less than that of wired, lease-line connectivity which is currently offered at CFA1,028,500 or $1,714 It is encouraging to note that SOTELMA understands the importance of this project and is excited about the prospects of deploying new technologies in Mali InfoComm and the University should find SOTELMA to be cooperative on this project

## 2 3 Organizing for Effectiveness and Sustainability

Clearly, the realization of the vision described above is going to require a significant amount of effort It is not just a question of USAID providing the required equipment, materials, and technical assistance Establishing the network will take a great deal of commitment and hard work on the part of all actors involved It will take even more effort to ensure that the network and the information are used in an effective and sustainable manner Only then will the expected benefits be derived

This section of the report provides the study team's recommendations for the required organizational structures and roles It begins with a description of the on-going efforts The recommendations are made in consideration of the existing activities, roles, and relationships It then discusses the need for new management and work processes to match application of new technologies The final part defines the steps required of the Ministry and of USAID in order to establish the appropriate roles and relationships

### 2 3 1 On-Going Plans and Activities

**Reseau Recherche Education (RRE)** The CNRST (Centre Nationale de la Recherche Scientifique et Technologique) is in the process of establishing the RRE, a network connecting the national research institutes, international research institutes in Mali, and the different parts of the University A number of steps have already been taken towards the establishment of the network

- The Director of CNRST had previously been the 'custodian' of the ml domain When the national Internet backbone was established, he turned over that responsibility to SOTELMA In return, SOTELMA agreed to provide CNRST a leased line for RRE Internet access at reduced rates (50% of the CFA1,028,500/month charge for the first year, and 70% for the next two years ) The recurrent costs of the Internet access are expected to be shared among the connected institutions

- A conceptual design of the network has been prepared by one of the Internet service providers See Attachment 6

- The CNRST has purchased, with UNESCO assistance, the 'basic equipment' required for the 'central node' The CNRST server is also intended to host various databases and research web pages

- A number of meetings have been held with interested institutions, which have expressed a willingness to participate

- A request has been made to the Ministere des Enseignements Secondaire, Superieur et de la Recherche Scientifique (the Ministry) for two technicians to be assigned to the CNRST to manage and maintain the system

Although significant progress has been made towards the establishment of the network, there are a number of steps that have yet to be taken There are also some considerable obstacles to effective implementation

- The servers are not yet installed, nor is the leased line connection established

- The interested institutions have not yet committed in writing to contributing to the costs of Internet access The Ministry has stated that it will not support, for the time being, the costs of the connection

- The technicians have not yet been seconded to the CNRST The delay is due to the Ministry's reluctance to replace their teaching stipends with some form of technical stipend

- The network design is based on dial-up access from a single computer in each institution This presents a number of problems A single machine will not provide sufficient access for the users in the participating institutions The institutions do not have the required telephone lines and SOTELMA is unable to provide more Dial-up access for the entire network will not provide sufficient bandwidth for effective inter-connection

- The University, which represents a significant portion of the participation, has expressed that it wishes to have 'a network of its own' (See below) If the University is removed from the equation, the CNRST will be left to finance the operation with only the contributions from the research institutes The Ministry may also be faced with the need to finance a separate University gateway to the national Internet backbone

**Rectorat de l'Universite** The University Administration has begun preparing a conceptual design of a University network The design calls for the 'central server' to be housed in the University Administration (Rectorat) facilities Private ISPs have expressed interest in supporting the University but the plans have not moved beyond the conceptual stage

**ENSUP** Similar to the Rectorat, ENSUP has developed a conceptual design of a university network ENSUP's design calls for it to be the 'Central Network' within the overall Wide Area Network ENSUP's plans have also been supported by technical assistance from an ISP and remain at the conceptual level

### 2 3 2 New Work Processes for New Technologies

The approach adopted thus far to the development and implementation of the University and research network is consistent with the traditional management and organizational patterns a requirement is identified, resources (people, systems, information, etc ) to meet the requirements are defined, and organizational entities begin vying for control of the resources It is organizational behavior that has been long been observed in many environments

A notable exception to this pattern has been the evolution of the Internet It must be pointed out that the Internet itself began as a research network that connected primarily universities and other research centers The intent of the network was to provide an effective means of sharing information among the connected institutions in an open and collaborative manner As it evolved, it retained that personality, and all those who participated maintained a sense of community and attention to the common good The objective was to establish and maintain one's own piece of the network in a manner that ensured compatibility with, and accessibility for, all the other pieces This approach has continued until today and although traditional behavior and ownership issues occasionally emerge, they are fiercely resisted

The spirit illustrated by the evolution of the Internet should be applied to the establishment of Mali's Internet as well, and it is most important for the establishment of the University and research network The objective has to be the open and effective sharing of information across a technically sound, cost-effective, and sustainable platform Universal understanding and support of this point is critical to the success of the development project and the on-going operation of the network

### 2 3 3 Establishing Structures and Mechanisms

There are a number of specific activities required in order to establish the organizational structures and mechanisms necessary for project implementation Listed below is the set of activities for the Ministry and its university and research institutions, and for the InfoComm team at USAID to undertake

**Ministry Tasks**

1 Establish a Project Steering Committee

Top-level management and oversight of the project is essential for effective implementation A management committee should be established that includes the key decision-makers in the relevant institutions, and yet is small enough to remain pro-active and efficient The participants must be aware of the organizational and management issues and they should at least be familiar with the technological environment Most importantly, they must have decision-making authority with respect to the contributions of their institutions to the implementation of the

project and the operation of the network The Steering Committee should include representatives from the following University institutions

- ENI
- CNRST
- ENSUP
- Rectorat

In addition to the members from the University Institutions, there should be two other members from outside institutions USAID and SOTELMA USAID should participate on the basis of its funding role, and SOTELMA will of course play a key role in providing the on-going access to the Internet backbone, as well as hosting the omnipoint wireless antenna

It is expected that the Ministry would issue a written directive that would establish the Steering Committee The committee itself would then be responsible for defining the members' respective roles and operating procedures The role and activities of the USAID and SOTLEMA representatives will be dictated by their respective functions in the process

2 Establish the Project Technical Team

Once the management structure is in place, the next step will be to form the Project Technical Team The team will be drawn from the best technical resources from within the University and research institutes The function of the team will be to support all aspects of the development and operation of the network They will operate and manage the server sites at CNRST and ENSUP, and will support each of the other connections and local area networks

Ideally, the Project Technical Team will consist of four people In general terms, all four technicians should have the same set of basic skills They should be proficient with a variety of operating systems and software packages They should have experience with minor hardware configuration and maintenance Based on the site visits and discussions with the various University institutes, there are numerous professors, staff members, and former students that would be qualified There are even many with far greater formal training than is implied here Many have full university degrees in computer science As mentioned above, the CNRST had already identified two qualified candidates for the management of the RRE Those same individuals can be invited to participate on the Project Technical Team

3 Negotiate Agreement for Internet Access

Prior to the installation of the antennae and the routers in the first set of institutions, the Ministry will need to negotiate and sign an agreement with SOTELMA and the Ministry of Communications for access to national Internet backbone The agreement will define the terms under which the omni-point antennae is hosted by SOTELMA and most importantly, the monthly connection charges

During this study, SOTELMA representatives were asked what would likely be the tariff structure for the wireless access Since this technology has not yet been implemented for any other customers, no structure has been established, so no answer was forthcoming However, current prices for leased line access and policy statements made by the Director of SOTELMA indicate that an affordable structure will be established

- Private sector ISPs currently pay CFA1,028,500/month ($1,714) for a 64kb leased line
- Part of the agreement between CNRST and SOTELMA for the transfer of the ml domain management included a reduced rate scheme for a research network (50% reduction of the commercial rate for the first year and 30% reduction for the next two years)
- The Director of SOTELMA and representatives of the Ministry of Communications have stated that they consider support to the education sector a national development imperative

4 Establish the Required Fiscal and Administrative Mechanisms

Concurrent with the set-up of the management committee and the technical team, the Ministry must establish the fiscal and administrative mechanisms by which on-going support of the network will be managed Key components of this include

- Establishment of budget/expenditure heads to accommodate the payment of access charges and possible leased line fees
- Establishment of revenue heads to accommodate the receipt of possible funding and other revenues, specifically access charges to international research institutes in Mali and government agencies outside of the Ministry's budget responsibility
- Personnel arrangements to ensure the availability of technical team members

5 Make Physical and Logistical Arrangements

The management committee and the technical team will need modest physical accommodations and secretarial support No significant office or workshop accommodations are anticipated The management committee members all have their own offices and secretarial support within their respective institutions The work sites for the technical team will be the installation sites and computer rooms in the various institutions

Actual requirements are expected to be limited to

- Meeting room facilities for hosting Project Steering Committee meetings
- Secure storage facilities for holding equipment and materials prior to installation
- Telephone contact site and communication access for the technical team

The details for these arrangements should be worked out by the Project Steering Committee However, the study team felt that an appropriate source for these services would be the Rectorat, given its University coordination and oversight mandate

**USAID/InfoComm Tasks**

1 Technical Assistance for Project Planning and Management

InfoComm should provide support and technical assistance to the Ministry in the early stages A key component of that support should be a Project Launch Workshop for the senior management of all the participating institutions The objectives of the workshop would be to

- Introduce the project
- Describe the technical approach for the network establishment
- Explain the project management and organizational structure
- Describe the general project timetable
- Obtain agreements and establish a shared vision for project success

Ideally, the Project Steering Committee should be established prior to the workshop That would allow the members to begin to play the leadership and coordinating role for the entire effort After the launch workshop, InfoComm should continue to provide support to the Ministry as it works through the tasks described above

2 Phase 1 - Wireless Backbone and Internet Access

Once the Project Steering Committee and the Technical Team are in place, InfoComm can proceed with the implementation of Phase 1 of the project The study team strongly recommends that the implementation of the project be contingent upon the first four Ministry tasks listed above Completion of those tasks will indicate the Ministry's commitment to the project and acceptance of ownership and responsibility for the outcomes It will also help to ensure institutionalization and sustainability of the project benefits

As described above, implementation of Phase 1 will involve setting up a contract with a technical services provider for

- The provision and installation of the omni-point wireless antenna, cabling, and the router at SOTELMA
- The provision and installation of the antennae, cabling, and routers at CNRST
- The provision and installation of the antennae, cabling, routers, and servers at ENSUP
- Training for the Technical Team on the network configuration, management, and maintenance
- Strategic, management, and conceptual training for senior managers of the University institutions

It is expected that InfoComm will be able to take advantage of existing contract mechanisms for arranging the required site surveys, procurement of the equipment and materials, and technical services

3 Phase 2 and Beyond - University Network and Institutional LANs

After the WAN and Internet access is established, the remaining tasks involve the configuration and installation of the University network, (i e Web and Mail servers) the installation and configuration of the LANs at each of the participating institutions, and the training

The technical tasks involved in each institutional LAN project have already been detailed elsewhere in this document It should be noted that there are a number of organizational issues to be considered as well Questions of security and access will have to be resolved As mentioned in the attached site survey notes, most of the institutions have adequate security procedures with respect to their computer labs The current procedures will not be greatly affected by the network installations, but the demand for access to the computers will increase dramatically Because of the limited number of machines, there will be considerable competition for computer time between the students, faculty, and administration It will be up to each institution to develop an equitable arrangement that best supports institutional objectives The policies and procedures should be developed and approved prior to the actual equipment and LAN installations InfoComm should work with the Project Steering Committee to ensure that the management of each institution assumes responsibility for this task InfoComm may want to provide assistance with one or two of the early installations and use the results to provide a model to the remaining institutions

The timing and sequence of the institutional LAN projects is dependent on the priority defined by the Project Steering Committee, and on the level of available USAID and other financial resources

The study team recommends that InfoComm organize a review of Phase 1 before proceeding with Phase 2 An evaluation of the organizational arrangements and the applied technical solutions will help to avoid issues and improve the implementation process for the remaining institutions

It is expected that InfoComm will establish contracts with technology service firms in Mali in order to accomplish the Phase 2 tasks Local capacity exists for setting up intranet servers and certainly for configuring and cabling LANs There are also numerous resources in Mali for conducting the technical and user training that will be built into each of the institutional LAN installation projects To the extent required, InfoComm may want to extend the services of the local contractors to include specific periods of operation and maintenance of the institutional networks Requirements for these kinds of services can only be determined once the Project Technical Team is in place and after the Phase 1 experience has been evaluated

### 2 3 4 Training

Training is one of the most critical issues as the University prepares to modernize and improve information systems infrastructure Strategic empowerment of users is the key to the success of any technology project In Information Technology (IT) industry surveys, business mangers estimated that users typically use no more than 20%-30% of the functionally of their information systems due to insufficient basic training All too often, when managers consider the sometimes significant costs of hardware and software, they often neglect or minimize budgets for training

For the University connectivity project to succeed, training in several key areas is essential and has been included in the cost estimates for each project Not only must users be trained in how to use their new tools, but also personnel must understand how they work and how to keep them working It is also important for top level administrators and ministry level planners to understand the concepts, functions and capabilities of the University's new infrastructure as a whole

The following table outlines the essential training that must occur and the target audiences for each area It is envisioned that the more operational training may have to be conducted periodically as groups of institutions are brought "on-line " Conversely, conceptual and executive level training can be centralized and conducted only once if key personnel schedules allow

| TRAINING | DESCRIPTION | TARGET |
|---|---|---|
| Conceptual | Over all concept of the University s infrastructure broad Internet concepts, case studies of Internet use in education | Ministers<br>Steering Committee<br>Administrators<br>Faculty |
| Basic User | Basic PC operation Windows 95 Web browser E-mail | Administrators<br>Faculty<br>Students |
| Internet Orientation | Introduction to search engines, specific educational resources, newsgroups etc | Administrators<br>Faculty<br>Students |
| Technical Management LANs | Configuration & management of LANs to include server management user profiles, file sharing back-up, basic wiring | Project Tech Team<br>Technical personnel at each institution |
| Technical Management WANs | Configuration & management of WAN to include LDAP server e mail server Web server and wireless infrastructure | Project Tech Team<br>Technical personnel at institutions with wireless connectivity |
| IT Strategic Management | Concepts of long-term strategic IT management development of 5 year technical plan for University | Steering Committee<br>Administrators |

## *2.4 COSTING*

Probably the most important planning variable in a program such as the one recommended is the cost factor This section of the report, along with Appendix 2, provides detailed cost estimates for the Phase 1 project and for each of the institutional LAN projects

### 2 4 1 Cost Assumptions Made

In estimating costs for the recommended projects, it is useful to understand the methodology for deriving the figures used In review of several existing projects in Mali, and through interviews with technology professionals, it has been concluded that hardware and equipment costs are approximately equivalent to U S retail prices Additionally, all costs used are intended to be conservative to minimize project and budgetary risks in implementation It is probable that lower costs are available for some of this equipment, but the time and effort expended in a more cost-aggressive procurement process is rarely advantageous

**Wireless Communications Equipment**

The costs for wireless equipment are standard retail prices quoted by C-Spec Corporation These include wireless transceivers, antennas, cable connection kits, lightning protectors, and warranties To estimate costs for the wireless transceivers, the C-Spec OverLAN RF-10 was selected as a model This product is competitively priced with other wireless solutions offering similar features This selection should not be considered an endorsement, however The OverLAN RF-10 was chosen solely as a representative of a product *genre* that offers the recommended capabilities

It should be noted that the wireless communications equipment does not need preventative maintenance but we do recommend purchase of extended warranties on transceivers This additional expense is included in the cost projections for this equipment in the cost summaries here and in the cost detail in Appendix 2

**Computing Hardware**

Price projections for PCs and workstations are based upon recent quotes for specifically configured, brand-name equipment procured in from a Value Added Reseller (VAR) This equipment includes PCs, servers, Un-interruptible Power Supply (UPS), digital tape backup, and printers VAR quotes are used to more accurately represent the costs that will be incurred While mail order or discount catalogue costs may be as much as 30% lower than these, they tend to be unrealistic for several reasons First of all, quotes for equipment with exact, recommended specifications are often not available It is also more likely that a reseller model more accurately reflects equipment procurement in Mali than a wholesale model Also, extended warranties and in-country support is often not available for equipment purchased from lower-cost vendors

For the purposes of PC and server estimates, costs for Compaq Prolinea and Proliant equipment has been quoted The specific recommended configurations of the PCs and servers are included at the end of Appendix 2

**Networking Hardware**

Price projections for networking hardware are based upon recent quotes for equipment procured in from a Value Added Reseller (VAR) This equipment includes network hubs, ethernet switches, routers, cable, network interface cards, modems, RJ-45 connectors, wall jacks, and plastic conduit VAR quotes are used to more accurately represent the costs that will be incurred for the reasons indicated above (see computing hardware)

Quotes for equipment are selected from a specific model/manufacturer that is regarded as a good representative and competitive model Unless otherwise specified, equipment descriptions have been left generic to allow for the greatest flexibility in procurement For the purposes of hub, router, and switch costs estimates, products were selected from Addtron, Cisco, and Allied Telesyn respectively

**Software**

Price projections for software are based upon recent quotes from a Value Added Reseller (VAR) VAR quotes are used to more accurately represent the costs that will be incurred for the reasons indicated above (see computing hardware) In the case of software, VAR pricing is very close to direct retail prices

**Services**

In all cases, these cost estimates are based upon average costs for these skill areas as reported by local technical experts, project managers, and service providers The specific rates used are as follows

| SKILL CATEGORY | RATE PER WEEK |
|---|---|
| International Consultants (with travel per-diem) | $ 4,300 00 |
| Local Technical Engineers | $ 1,093 75 |
| Local Technicians | $ 437 50 |

Specific skill categories were then cross-referenced against the required services as follows

| | |
|---|---|
| International Consultants | • Wireless transceiver & antenna installation<br>• Strategic IT Management Training |
| Local Technical Engineers | • Server installation & configuration<br>• WAN management training<br>• Network management training<br>• User Training |
| Local Technicians | • Network cabling and testing<br>• Client PC configuration |

**Recurrent Costs**

All costs except wireless connectivity are actual costs as reported by SOTELMA When interviewed, SOTELMA reported that they were unable to and had no basis for estimating the wireless connectivity to the national router The figure used for cost projection purposes is the cost of a dedicated line connected to the router (1,028,000 CFA) minus the cost of a point-to-point leased line (80,000 CFA)

### 2 4 2 Summary of Costs

The following tables summarize the costs associated with the recommended institutional networks and wide-area connectivity The first table is an overall cost summary of the entire program Subsequent tables provide summaries for each of the institutional LANs Detailed cost tables are included in Appendix 2

| Institution | Estimated Project Costs |
|---|---|
| **PHASE I** | |
| Wide-area, multipoint broadcast hub,<br>Centre Nationale de la Recherche Scientific et Technologique (CNRST)<br>Ecole Normale Surerieure (ENSUP) | $ 112,439 |
| **PHASE II** | |
| École Nationale d'Ingenieurs (ENI) | $ 41,091 |
| Faculte de la Medcine, de la Parmacie et Odontostomagologie (FMPOS) | $ 4,542 |
| Faculte des Lettres, Arts, et Sciences Humaines (FLASH) | $ 9,021 |
| Faculte des Sciences et Techniques (FAST) | $ 19,079 |
| Faculte des Sciences Juridiques et Economiques (FSJE) | $ 49,195 |
| Institut Polytechnique Rural/Institut Formation et de Recherche (IPR/IFR) | $ 23,690 |
| Institut Superieur de Formation et de Recherche Appliquee (ISFRA) | $ 22,905 |
| Institut Universitaire de Gestion (IUG) | $ 45,628 |
| Rectorat | $ 40,580 |
| **Sub-Total for Phase II** | $255,731 |
| **TOTAL** | $368,170 |

**PHASE I Wireless Backbone & Centre Nationale de la Recherche Scientific et Technologique (CNRST) & Ecole Normale Supérieure (ENSUP)**

The following table summarizes the estimated costs for Phase I that includes the following

- Installation of wide-area, wireless backbone hub at SOTELMA
- Installation of University servers at ENSUP
- Connection of CNRST to wireless backbone
- Connection of ENSUP to wireless backbone

| ITEM | SUMMARY OF COST |
|---|---|
| Hardware | $ 62,680 |
| Software | $ 5,519 |
| Services | $ 26,168 |
| Miscellaneous Expenses | $ 8,592 |
| Subsidies of Recurrent Costs | $ 9,480 |
| TOTAL | $ 112,439 |

**PHASE II - Subsequent Institutional LANs**

**École Nationale d'Ingénieurs (ENI)**

The following table summarizes the estimated costs for institutional networking and wide-area connectivity for ENI that includes the following

- Building institutional LAN with wiring, server, hubs, etc
- Connectivity to wireless backbone

| ITEM | SUMMARY OF COST |
|---|---|
| Hardware | $ 30,175 |
| Software | $ 2,822 |
| Services | $ 8,093 |
| TOTAL | $ 41,090 |

**Faculte de la Medecine, de la Parmacie et Odontostomagologie (FMPOS)**

The following table summarizes the estimated costs for institutional networking and wide-area connectivity for FMPOS which includes extending current LAN to "Salle Informatique" with structured cabling and a network hub

| ITEM | SUMMARY OF COST |
|---|---|
| Hardware | $1,272 |
| Software | $ 207 |
| Services | $ 3,062 |
| TOTAL | $ 4,541 |

**Faculté des Lettres, Arts, et Sciences Humaines (FLASH)**

The following table summarizes the estimated costs for institutional networking and wide-area connectivity for FLASH that includes extending the existing LAN at ENSUP with structured wiring and network hubs

| ITEM | SUMMARY OF COST |
|---|---|
| Hardware | $ 2,096 |
| Software | $ 0 |
| Services | $ 6,925 |
| TOTAL | $ 9,021 |

**Faculte des Sciences et Techniques (FAST)**

The following table summarizes the estimated costs for institutional networking and wide-area connectivity for FAST that includes the following

- Building institutional LANs in offices and computer labs with structured wiring, hubs, etc
- Connect FAST to network at IUG with ethernet switch and cabling between facilities

| ITEM | SUMMARY OF COST |
|---|---|
| Hardware | $ 9,103 |
| Software | $ 207 |
| Services | $ 9,768 |
| TOTAL | $ 19,078 |

**Faculté des Sciences Juridiques et Economiques/Ecole Nationale d'Administration (FSJE/ENA)**

The following table summarizes the estimated costs for institutional networking and wide-area connectivity for FSJE that includes the following

- Building institutional LAN with wiring, hubs, etc
- Connect LANs to institutional server via ethernet switch
- Connectivity to wireless backbone

| ITEM | SUMMARY OF COST |
|---|---|
| Hardware | $ 34,682 |
| Software | $ 2,920 |
| Services | $ 11,593 |
| TOTAL | $ 49,195 |

**Institut Polytechnique Rural/Institut Formation et de Recherche (IPR/IFR)**

The following table summarizes the estimated costs for institutional networking and wide-area connectivity for IPR/IFR that includes the following

- Complete institutional LAN with server and hub
- Wide area connectivity established via shared phone line

| ITEM | SUMMARY OF COST |
|---|---|
| Hardware | $ 14,952 |
| Software | $ 1,994 |
| Services | $ 5,031 |
| Subsidies of Recurrent Costs | $ 1,713 |
| TOTAL | $ 23,690 |

**Institut Superieur de Formation et de Recherche Appliquee (ISFRA)**

The following table summarizes the estimated costs for institutional networking and wide-area connectivity for ISFRA that includes the following

- Extension of LAN from CNRST with structured cabling and network hub
- Installation of new PCs to replace resources not capable of connectivity

| ITEM | SUMMARY OF COST |
|---|---|
| Hardware | $ 16,953 |
| Software | $ 3,108 |
| Services | $ 2,843 |
| TOTAL | $ 22,904 |

**Institut Universitaire de Gestion (IUG)**

The following table summarizes the estimated costs for institutional networking and wide-area connectivity for IUG that includes the following

- Building institutional LAN with wiring, hubs, etc
- Connection of LANs to server with ethernet switch
- Connectivity to wireless backbone

| ITEM | SUMMARY OF COST |
|---|---|
| Hardware | $ 32,630 |
| Software | $ 4,467 |
| Services | $ 8,531 |
| TOTAL | $ 45,628 |

**Rectorat**

The following table summarizes the estimated costs for institutional networking and wide-area connectivity for the Rectorat that includes the following

- Building institutional LAN with wiring, server, hubs, etc
- Connectivity to wireless backbone

| ITEM | SUMMARY OF COST |
|---|---|
| Hardware | $ 26,722 |
| Software | $ 2,339 |
| Services | $ 11,518 |
| TOTAL | $ 40,579 |

# 3.0 DEVELOPMENT PARTNER CONNECTIVITY

## *3 1 Introduction*

A main component of the study SOW was to design a strategy for InfoComm to promote and support Internet connection for targeted partners and local institutions Development partners would include Malian non-governmental organizations, private voluntary organizations, and secondary and primary schools Regarding the latter group, other donor initiatives are currently undertaking projects to provide secondary and primary schools with computers InfoComm may be able to coordinate its Internet access assistance with donors providing computers and other assistance

Internet access is viewed as a way for partner institutions to have greater access to, and make better use of information During the study, issues considered were

- the types of Internet promotions and demonstrations that could be used for partner institutions,
- the audiences for such activities,
- available local and USAID resources to undertake promotion activities, and
- InfoComm's role in promoting Internet connection

In addressing these issues, representative partner institutions were surveyed The study team also considered whether or not InfoComm should be involved in further general promotion of the Internet The team interviewed current local Internet Service Providers (ISPs), and companies that have applied to become ISPs to determine if the current market environment warranted additional general promotion

## *3 2 Development Partner Connectivity Program*

### 3 2 1 Approach

The surveys conducted during the study confirmed that USAID/Mali's development partners are a diverse group in terms of mission, the sectors they represent, size, technical equipment and financial resources, management ability and organizational structure, and communication needs and objectives (See Appendix 3) Given this diversity and the large number of development partners (dozens), the question is how InfoComm can assess all the different variables and design in a way that is practical and ensures long-term sustainability The answer is in USAID/Mali's simple slogan "More Mali, less aid "

Sustainable Internet connection for development partners can be achieved through a competitive grant program whereby the partner institutions are responsible for answering the hard business questions themselves Such a grant program serves several purposes

- it embodies the spirit of USAID/Mali's mission by requiring potential partners to work towards their goal in partnership with USAID, instead of simply receiving aid
- it allows InfoComm to rapidly and efficiently determine the institution's "readiness" in terms of vision, planning, management skills, available equipment and knowledge
- it fosters a sense of ownership and entrepreneurship that will be the foundation for sustainability
- it recognizes varying levels of readiness and allows InfoComm to be able to provide support in manageable phases

Through the competitive grant program, targeted partner institutions will submit proposals requesting support for Internet connection The grant program includes a training series to help partners understand the Internet, its impact on management and organization, and to help them prepare for writing the proposal In the proposals, applicants will have to address three main issues organizational capacity, technical capacity, and sustainability Proposals would be evaluated against a set of organizational and technical criteria, and assistance would be provided based on prescribed "connectivity packages" defined below and offered by InfoComm

It is envisioned that the partner institutions would de facto be separated into two groups, which would allow for phasing of any financial assistance The first group would be those that could be considered on a "fast track " These would be partners that have already done some planning and preparing for Internet connection and have computers, but lack resources to finance connection Or, fast track partners might only need additional training in computer and/or Internet operations Fast track partners should be ready to prepare and submit a proposal The second group would include those partners who do not have a vision or plan for using the Internet and require additional computer training and management support before they are ready to prepare a proposal Additional technical and organization training would be provided through the training series It is likely that secondary and primary schools would be included in this second group and would need additional training and support from their SO Team (Strategic Objective Team) counterpart and InfoComm Partner institutions in both groups also should work closely with their SO Team counterparts to develop a vision and plan for using the Internet for their organization, and to strengthen the necessary complementary management and operations skills

### 3 2 2 Process

The grant process is a simple one that recognizes the various levels of sophistication and readiness of the partners, provides training to partners needing additional assistance, and allows for implementation in manageable phases The overall program includes several steps

Step 1 Introduction of the Program

The grant program is not immediately intended for the general public USAID/Mali SO Teams have identified development partners whose work would be enhanced by Internet connection, and these institutions would be the target audience for the grant program InfoComm should invite these selected partners to participate in the program The invitation package would include basic information on the program and an opportunity to meet one-on-one with USAID to discuss the program This introduction could be done through an introductory letter and information sheet, and should be coordinated with the partners' counterpart SO Teams

Step 2 Follow Up Individual Meetings

Following the introduction phase, the InfoComm team should be prepared to have individual meetings with those potential partner institutions that wish to take part in the program, learn more information about it, or begin preparing their proposals The purpose of these meetings is to ensure that the partners truly understand what they are undertaking in terms of the grant process and the Internet The SO Teams should attend these meetings to ensure coordination with their overall development plan During this step, InfoComm will be able to determine and plan for the time, commitment, and financial resources needed for the entire program as well as for individual partners

Step 3 Begin Internet Orientation Workshops

As partners will be at varying levels of readiness, the next step should be the commencement of the Internet Orientation Workshops training series described in further detail in section 3 2 3 below The training series should address technical and organizational issues, as well as proposal preparation For example, training should include hands-on computer applications and operations, and the complementary management and organizational skills and thinking that accompany Internet access The successful training session conducted by the Leland Initiative in December 1997 should be the basis for the Workshops series, as the Leland training covered basic Internet skills as well as management issues that are applicable to the proposal

InfoComm would need to decide whether to contract the operation of all or certain workshops There is local capacity in the ISPs and possibly potential ISPs to conduct many of the application workshops InfoComm's Internet Coordinator is another training resource InfoComm also would need to determine if workshops should be for individual partners or an event that would accommodate several partners at once

The logical sequence of workshops would begin with an introduction to the Internet, followed by a session on the role of information in development, and then workshops on specific Internet functions and resources This sequence allows participants to begin understanding what the Internet really is and how it functions, before trying to fit it into their organizational and management planning The approach also lends toward the phasing of InfoComm assistance in that those organizations that need training in Internet functions but not basic Internet knowledge are automatically delayed

Step 4 Proposal Preparation

After an initial meeting with InfoComm, partners should prepare grant requests based on the proposal content guidelines described in section 3 2 4 below In the case of slow track partners, they would not begin the proposal process until after gaining additional training and coordinating with InfoComm and their SO Team counterparts

Step 5 Evaluation of Proposals

The following are guidelines for evaluating proposals and deciding how best to achieve the proposed Internet connection plans The guidelines are based on the proposal parts organization, sustainability planning, and technical criteria

The organization section of the proposal should indicate a strong mission statement that clearly identifies the general purpose of the organization A vision for integrating the Internet into the organization as a primary resource tool should be clearly articulated and detailed InfoComm should be looking for an expression of understanding the Internet and its resources and how they would be used to achieve the organization's goals The partners should state their information and communication objectives, and InfoComm should be looking for objectives that correspond to its own goals and mission This section is where the applicant should describe an Internet connection plan that is feasible for the applicant to undertake and sustain On the management side, InfoComm should be able to identify easily a management and organizational structure that will support Internet access on a permanent basis For example, an organization might assign the responsibilities associated with Internet connection to a specific person, or create a coordinating position

The key to sustainability is ensuring that once USAID assistance ends, the partners still have the intention and the means to continue using the Internet as a resource tool Therefore, in evaluating the proposals, applicants should outline how they intend to sustain their Internet connection in terms of financing, equipment maintenance and upgrades, and security Included in this section should be realistic options for financing their Internet account For example, a partner institution could provide access to member organizations for a fee for using the organization's computers and account, thus helping the partner institution recover costs but not generate revenue, or applicants could obtain support from a donor agency other than USAID Since development partners obtain their own Internet access from ISPs and would have to purchase additional bandwidth from an ISP in order to be able to provide access to others, it is unlikely that most partners would be able to compete with ISPs Proposals should identify resources for computer maintenance, whether it is in-house or not There are individuals and companies locally that can perform computer repairs and maintenance and applicants should identify these Partners also should be able to point to other donor agencies for financing assistance or other ways to pay for Internet account costs and equipment maintenance and upgrades Finally, plans for securing equipment should be described

The technical criteria allow InfoComm to determine readiness and connection feasibility from a practical standpoint For example, if a partner does not have available adequate facilities such as electricity or telephone lines, further investment and arrangements would have to be made before InfoComm would be able to consider assistance

Step 6 Implementation

Throughout the grant program, there are measures InfoComm should take to ensure its success

- clearly state throughout the process that assistance is not indefinite and that it will end
- work with and monitor progress of the training sessions to ensure that participants are indeed being prepared to complete the proposal process
- coordinate with and encourage SO Teams to work with their development partner counterparts throughout the process
- be flexible in training options of the program, in that some partners may require training other than that suggested

The main activity associated with the implementation of the program is the actual installation of the equipment and connections in the partner institutions To accomplish this in an efficient manner, the study team has defined a range of 'connectivity packages' that can be applied, with possible minor variations, to partner institutions with varying sizes and needs These packages are described in Section 3 2 5

### 3 2 3 Orientation Workshops

As part of the program, USAID should conduct an Internet Orientation Workshop series that would cover technical and organizational issues, as well as proposal preparation sessions The workshops should be open all targeted partners, including fast track institutions that may need additional technical training The purpose of the series would be to provide applicants with a foundation in computer and Internet knowledge and operation, management and organization skills, and other areas required in the proposal

The Leland Initiative training sessions in December 1997 can be used as the core of the proposed workshop series and should be leveraged Sessions should include basic computer operation, Internet basics, Netscape, to Email/surfing/Downloading, etc There should also be sessions dedicated to management, sustainability, and other issues required in the proposal A list of proposed sessions can be found in the following table

InfoComm should contract the work for the training sessions locally or internationally There appears to be sufficient local capacity in ISPs, training schools, and other companies that undertake the training contracts In soliciting proposals for this work, InfoComm should look for

- options for conducting workshops either one-on-one with each institution or larger sessions open to several applicants at once (for example, sessions on what the Internet is could be larger events attended by a number of applicants)
- explanations for the length of each training workshop, i e , whether a full or half day

- details on the intervals between workshops, so that applicants have ample opportunity to practice on their own (at work, an ISP, cybercafe, etc )
- information on where and how applicants could practice outside the training sessions and how they would be encouraged to do so
- how applicants' progress will be measured so that InfoComm can gauge their readiness to move to the proposal preparation stage
- possible venues for the sessions and how choice of venue affects costs

InfoComm also could undertake some of the training itself or host individual sessions at its offices

**Proposed Workshop Orientation Sessions**

| WORKSHOP | CONTENT |
|---|---|
| Basic Computer Operation | • Operations<br>• Windows, Point & Click, Cut & Paste, Highlighting |
| What is the Internet? | • Internet vs Intranet<br>• World Wide Web<br>• Definitions |
| Basic Netscape | • What is Netscape and What Does it Allow You to Do?<br>• How to Move Around in Netscape<br>• My Netscape—How to Personalize Start Pages<br>• Searching and Refining Searches |
| Management Issues/Action Planning | • Organizational Structures<br>• Internet Responsibilities<br>• What to do with Internet<br>• Information Use Strategies |
| Finding Information You Need | • Search Engines<br>• World Wide Web<br>• French Language Sites |
| The Role of Information in Development | • What Information is Useful and Useless<br>• How Information Changes Organization and Management Structures |
| Surfing and Bookmarking | • How to Use Bookmarks<br>• French Bookmarks on Diskette |
| E-mail and Mailing Lists | • How to Send, Check Message<br>• Group Lists<br>• Sending, Receiving, Saving Attachments |
| Sustainability Issues | • ISPs, Account access costs<br>• Maintenance and Upgrades<br>• Financing Options |
| Training of Trainers | • Instructions on training techniques<br>• Development of materials |

### 3 2 4 Proposal Guidelines

The proposal gives development partners the opportunity to present their plans for Internet connection The guidelines are designed to be flexible to accommodate the various sophistication levels of the targeted partners The proposal would be composed of three parts an organization description, a technical component, and a sustainability plan The proposal should be between 3 and 5 pages, exclusive of the objective questionnaire, and would include an Executive Summary

Executive Summary

The Executive Summary should cover the main points of the entire proposal, briefly describing the organization and its information and communication objectives, and introduce a vision for Internet connection Applicants should specifically acknowledge the term limit of USAID support, as defined by InfoComm, and address their intention to sustain their Internet connection and usage The summary should answer the following questions

- What is/are the goal(s) of the project?
- In general, how would your organization use the Internet?
- What Internet resources would be most valuable to your organization?
- How will Internet access help your organization to achieve its results more quickly and efficiently, and how will this affect your corresponding SO Team's assistance objectives?
- What type of analysis did your organization conduct to determine that Internet access would improve your ability to gather useful and relevant information and to disseminate information to a broader audience more effectively?
- What is the general plan for self-sufficiency?

Part I Organization

The Organization part gives partners the opportunity to demonstrate their desire, initiative, ambition, and serious commitment to using the Internet to achieve their goals It should show that the applicant has formulated a vision for using the Internet and has carefully thought through issues such as the potential impact on organizational and management structures

**Organization and Mission Statement** In this section, partners should be able to articulate clearly their mission, and how their goals could be better achieved by using the Internet to obtain and disseminate information Partners should describe their organizational structure, specifically how it is able to support Internet connection

**Internet Knowledge and Usage Plan** This section should demonstrate an understanding of what the Internet is as well as knowledge of specific Internet resources Partners must outline the organization's plan to use these resources (such as promoting the organization and its message through the Internet, obtaining and disseminating useful information, ways of working with organizations with similar goals, etc ) Here is the opportunity to explain their vision of using the

Internet to reach their objectives and how Internet access will help them obtain and disseminate information more quickly and efficiently than they are currently able Partners should be able to support their claim that Internet access will help them For example, partners should explain what type of analysis or pilot they did to determine the utility not only of Internet information, but also of its capacity to reach a large audience The partner should also describe the types of information they would like to find and disseminate via the Internet

**Information and Communication Objectives** Applicants should show how their project corresponds with InfoComm's goal of providing more information and means of communication to as many Malians as possible For example, partners could describe their constituencies and audiences

Part II Technical

The Technical portion of the proposal can be best addressed by using a modified version of the "Partner Survey Questionnaire" (Attachment 5) used during the study, as much of the same information is applicable

1 Internet Capabilities
2 Information Flows
3 Current Technology
4 Facilities

The modified questionnaire should not require mission statements or descriptions of organization structures, as these will be covered in Part I of the proposal

Part III Sustainability Plan

Once the partner's mission and its Internet need have been established, the applicant must demonstrate their commitment to using the Internet as a resource tool beyond the termination of USAID support and assistance Applicants will need to address Internet account costs, equipment maintenance and upgrades, and security of the equipment

**Internet Access Financing** A key part of the overall grant program is the idea of sustaining the Internet as a resource tool for the partner institutions Therefore, this section should describe how the partner intends to take over full responsibility (including account subscription costs, equipment maintenance and upgrade, and management costs) of their Internet connection when the USAID grant has ended

**Security and Maintenance** In this section, the partner institution should describe how they intend to provide for computer maintenance and upgrades when necessary, and what measures they have or will take to ensure the security of the equipment For example, applicants should identify a knowledgeable person at their organization or a private company that can maintain computer equipment

**Evaluation Plan** Applicants should describe how they plan to evaluate the success of their Internet plan, including how they measure the extent to which goals were achieved They should also explain how they plan to identify and report lessons learned throughout the whole experience, including the workshops series, the proposal process, and Internet connection

### 3 2 5 Connectivity Packages

In order to simplify the management of the grant process, it is recommended that a limited number of pre-set "connectivity packages" be developed This minimizes the amount of technical design necessary and simplifies the evaluation process for InfoComm Additionally, the packages can be pre-priced which allows for easy budgeting and fiscal scheduling

Below is a discussion of a three-tiered approach to the connectivity packages It is designed to allow for differing degrees of connectivity and sophistication Each package successively allows for greater Internet capacity but also imposes more burden in terms of long term sustainability This allows InfoComm a manageable spectrum of options to award to grantees

In each case, it is recommended that a limited period of subsidized Internet connectivity be included This will give partners time to learn to use and integrate their new tools into their day-to-day business processes before having to also worry about sustainability It is not recommended, however, that USAID subsidize communication costs that are charged by the phone company, not the ISP This will require the grantees to take a modest level of responsibility promote an early sense of ownership in their new resource It also simplifies the subsidy process by isolating Internet costs from the wide range of communication costs

For ease of management, it is recommended that InfoComm negotiate a flat-rate pricing scale for Internet connectivity with one or more local ISPs Currently, Internet connectivity tariffs are based upon a limited number of "free" hours and hourly pricing based upon time of day For the purpose of managing the grant process, and specifically budgeting, it would be too cumbersome to offer subsidized connectivity under this scheme Even if a negotiated flat rate is slightly higher than the non-peak time connectivity available (the lowest rate), the time and effort saved will more than make up the difference Additionally, it is recommended that these negotiations include consideration for the diminishing subsidies suggested below This would allow InfoComm to "purchase" a single package of full and partial subsidized connectivity For example, if a partner is to receive six months of full and six months of half-subsidized connectivity, InfoComm would pay one fixed fee and the partner would receive no billing for six months and be billed at 50% rates for the second six months

As with the communication costs, it cannot be stressed enough that it is essential to minimize InfoComm's long-term management and/or involvement of each grant The grant process will quickly become unwieldy and will fail if InfoComm becomes involved in month-to-month management and accounting of recurrent costs Ideally, each grant would require only a single expenditure that would cover all equipment, services, and subsidies Then, InfoComm has only

to monitor the project for completion and can focus more on other projects, training, promotion, and usage guidance

**Package 1 Basic Connectivity**

This connectivity option provides only basic, dial-up connectivity to the Internet It would include

- A single PC with internal modem
- Appropriate Internet and connectivity software
- Office automation software
- Ink-jet printer
- Installation and configuration
- One year, flat-rate subsidy for Internet connectivity with a single e-mail address

This option is designed for the development partner with very few existing resources, limited facilities, and/or a small number of personnel It allows for a single computer with full Web access and a single, organizational e-mail account While the PC would have to be shared among users, this connectivity package minimizes the amount of technical knowledge and management necessary at the organization Also, it maximizes the potential for long range sustainability by minimizing the recurrent monthly costs that will have to be assumed by the organization after USAID subsidies end

Approximate costs estimated for these connectivity packages are

| ITEM | COST |
|---|---|
| Pentium PC with internal modem and Windows 95 | $2,900 |
| Netscape Communicator | $0 |
| Microsoft Office Pro suite | $529 |
| HP Ink-jet printer | $349 |
| Installation and Configuration | $250 |
| Subsidized Connectivity (6 x 100%, 6 x 50%)* | $477 |
| **TOTAL** | $4,505 |

* assumed rate of $53 per month (average of all high and low rates for all ISPs)

**Package 2 Shared LAN Connectivity**

This connectivity option provides networking equipment and a shared dial-up connection to the Internet It would include

- LAN wiring
- Network interface cards for existing PCs
- Multi-port LAN hub
- A single PC with internal modem to act as network proxy
- Network (NT), Internet proxy software

- Appropriate Internet access software
- Installation and configuration
- Six months technical network support
- One year, flat-rate subsidy for dial-up Internet connectivity with up to 8 e-mail addresses

This option is designed for the development partner with some computers already in use, good facilities, and some in-house technical competence This option networks existing computers together into a simple LAN and utilizes an Internet proxy server to share connectivity over a single dial-up connection It allows for multiple, simultaneous Web access and a several e-mail accounts This connectivity package requires some in-house technical skills to perform management tasks on the network server with technical assistance provided from the vendor for six months The long-term sustainability burden is slightly higher as well because a single phone line will, in all likelihood, be dedicated to Internet connectivity for the network The organization will also have to decide whether it is more cost effective (or even possible) to maintain in-house technical capabilities for server management or continue to contract out for technical support after the initial six months has expired

In order to minimize the complexity of this package, InfoComm may wish to limit LAN and Internet connectivity to only those PCs currently running Windows 95 or better This eliminates additional technical engineering necessary and dramatically simplifies installation and configuration of servers and PCs This in turn minimizes costs for hardware, software, services, and support

Approximate costs estimated for these connectivity packages are

| ITEM | COST |
|---|---|
| CAT 5 UTP wiring and hardware | $1,355 |
| Network Interface Cards (8) | $1,408 |
| 16 Port 10Base-T Hub | $199 |
| Pentium PC with internal modem | $2,900 |
| Windows NT Server 4 0 | $713 |
| Proxy server | $700 |
| Netscape Communicator | $0 |
| Installation and Configuration | $1,875 |
| Technical support contract (6 months) | $1,500 |
| Subsidized Connectivity (6 x 100%, 6 x 50%)* | $2,250 |
| **TOTAL** | $12,900 |

* assumed rate of $250 per month ( Multi user rate from an ISP)

## Package 3 Advanced LAN Connectivity

This connectivity option provides Internet proxy equipment and dedicated leased line connection to the Internet It would include

- A single PC to act as network proxy
- Router ("edge" or "branch office" router)
- high-speed, synchronous modem
- Network (NT), Internet proxy and e-mail management software
- Appropriate Internet access software
- Installation and configuration
- Six months technical network support
- Installation and one year subsidy for dedicated leased line connection
- One year, flat-rate subsidy for Internet connectivity with up to 20 e-mail addresses

This option is designed for the development partner with networked computers already in use, good facilities, and in-house technical competence This option extends high-speed, dedicated connectivity to the existing network with the proxy predominantly serving a security role It allows for multiple, simultaneous Web access and a several e-mail accounts This connectivity package requires in-house technical skills to perform management tasks on the network server with technical assistance provided from the vendor for six months The long-term sustainability burden is much higher as well because dedicated leased-lines are significantly more expensive The organization will also have to decide whether it is more cost effective (or even possible) to maintain in-house technical capabilities for server management or continue to contract out for technical support after the initial six months has expired

In order to minimize the complexity of this package, InfoComm may wish to limit LAN and Internet connectivity to only those PCs currently running Windows 95 or better This eliminates additional technical engineering necessary and dramatically simplifies installation and configuration of servers and PCs This in turn minimizes costs for hardware, software, services, and support

It should be noted that this option might only be able to be implemented in limited areas where leased lines can be installed

Approximate costs estimated for these connectivity packages are

| ITEM | COST |
|---|---|
| Router (Cisco 1600) | $1,379 |
| High-speed, sych modem (RAD ASM-20) | $878 |
| Pentium PC | $2,900 |
| Windows NT Server 4 0 | $713 |
| Proxy server | $700 |
| Netscape Communicator | $0 |
| Installation and Configuration | $1,875 |
| Technical support contract (6 months) | $1,500 |
| Subsidized Leased Line (6 x 100%, 6 x 50%)* | $16,182 |
| **TOTAL** | $26,127 |

* Assumed rate of $1798 per month This cost estimate is based upon current SOTELMA wholesale rates plus 5% Assuming guaranteed throughput rates from the ISP, this service would have to be comparably priced to wholesale

## *3 3 General Promotion Programs*

There are two schools of thought regarding the further promotion of the Internet in Mali and in particular, in Bamako One group believes it would be best to let the development of the Internet occur naturally as the market and need grow and not to force its growth artificially through promotion This group also points out that it is difficult for Internet Service Providers (ISPs) to handle the demand as it is now, due to unreliable telephone line quality, connection, and service, and electrical power Also, there are simply not enough public access computers for people to use

The other group contends that increased promotion of the Internet would lead to an increased demand for services, and consequently for more and better service and access points This group tends to include smaller service providers needing to, at a minimum, maintain current market share However, they also admit that the inability to provide quality and reliable service due to leased line problems and insufficient technical support has led to client frustrations and increasing loss of business

During the study, it was found that Internet service suffered because of unreliable electricity service, periodic problems with leased lines, inability or inordinate difficulty in obtaining additional telephone lines needed to provide faster service, lack of adequate technical support, and not enough access points for users Because of these problems, ISPs have been losing customers to other ISPs, or clients have terminated personal Internet accounts in favor of using the Internet at work or not all While ISPs and petitioners report increased demand, the former acknowledges their inability to meet those demands and to service current clients and the latter admits not knowing how to deal with utility problems beyond their control

Public promotion would likely lead to user frustration and negativity about the accessibility of the Internet and its positive impact on their life and development Also, it is unclear when infrastructure problems will be resolved or when additional private businesses will be authorized to provide Internet services Thus, if InfoComm were to undertake a general campaign promoting the benefits of using the Internet, there is a good chance that the ultimate result would be increased demand but insufficient resources for people to use the Internet Such an outcome could damage InfoComm's credibility and that of the Internet itself

The following table is a summary of the promotion mechanisms and potential effects

| PROMOTION OPTIONS | PROMOTION CONTENT | EFFECT | ACTION |
|---|---|---|---|
| Targeted Campaign | • Technical and financial assistance for USAID development partners<br>• Demonstrations and training for specific institutions | • Provides training and access for targeted partners in a number of sectors | Yes |
| Community Wide | • Television documentary type programs on Internet<br>• Public demonstrations, seminars, discussion forums<br>• Individual institutional demonstrations<br>• Internet "fair" and/or conference | • Reaches the maximum number of people but creates more demand than can be met<br>• Possibly results in disillusionment | No |
| Limited Public Campaign | • Public demonstrations<br>• Public seminars | • Reaches those that are interested but does not provide for adequate access points | No |

# 4 0 INTERNET SERVICES SECTOR - PRIVATIZATION AND SUSTAINABILITY CONSIDERATIONS

## *4 1 Successful Start-Up and a Foundation for Growth*

The publicity literature emerging from the Leland Initiative and from USAID/Mali makes reference to the establishment of a market-based Internet services sector in Mali A 'cost-based tariff structure', although temporarily subsidized, is often mentioned The fact that Internet services in Mali are among the most affordable in Africa is also well documented In general, an impression of a sustainable (i e affordable for the consumer and profitable for the providers) system is being promoted The study team found that, for the time being, such a foundation has indeed been established At the same time however, there are indications that long term sustainability has received little focus and requires continued analysis and attention

### 4 1 1 Consumer Prices

Comparison of Internet service costs in Mali relative to other African countries, while of general interest, is not especially relevant to the sustainability of the system within Mali itself Comparison of the costs with other means of communication and research, and with other personal or organizational expenditure items is more applicable While heavy usage during 'high rate hours' can result in significant expenditure, basic e-mail access and a fixed number of hours per month for web browsing and other research, is in fact quite affordable The exact number is difficult to determine The published rates for each of the ISPs are slightly different, and as many things in Mali, they are negotiable on a case-by-case basis A reasonable average cost is around CFA25,000/month ($41 67)

The $41 67 buys the capability of sending or receiving infinite amounts of information to or from anywhere in the world It also buys several hours of access to what is rapidly becoming the collective knowledge of all mankind The same $41 67 will pay for just under 15 minutes of telephone time or just over 11 pages of faxed material to the United States It will not cover the cost of a three-pound courier package to Europe Consider also that if information drawn from the Internet can avoid even one trip to Europe or one visit from an U S - or Europe-based partner, it would leave literally thousands of dollars available for other needs At the current prices, there really is no question about the value of Internet access for anyone operating in the formal economy in Mali and interacting with the rest of the world

The best indication of the affordability of the service is the rapid proliferation of user accounts with the ISPs In December of 1997, the number of subscribers was estimated at 800 By April 1998, it was estimated at over 2000 Clearly there are many individuals and organizations in Mali that consider the cost to be well worth the value The growth will eventually level off, but

for the time being the ISPs have all the business they can handle The primary constraint to the growth of the businesses is capacity, not demand The ISPs are currently operating at maximum potential and the level of service is suffering A number of persons interviewed expressed that the ISPs may already be beyond their means in terms of service and responsiveness

### 4 1 2 ISP Profitability

Under the current SOTELMA tariff structure, an ISP operation appears to be fairly lucrative Assuming a very conservative 50% of the estimated subscriber base, and an individual ISP has an even 25% of the market, the ISP would have roughly 250 accounts That number of accounts at the estimated monthly charges would mean monthly revenue of $10,417 The following table is an illustrative annual income and expenditure sheet for an ISP

| ITEM | AMOUNT |
|---|---|
| | |
| Annual Revenue from Subscriptions | $125,000 |
| | |
| Total Revenues | $125,000 |
| | |
| Annual Access Fees | $20,570 |
| Labor (2 Engineers, 3 Technicians) | $25,000 |
| Equipment Maintenance (30% of a $20,000 investment) | $6,000 |
| Facilities (Rent, Power, Telephone Lines) | $36,000 |
| | |
| Total Expenditures | $87,570 |
| | |
| Profit/Discretionary Funds | $37,430 |

The above table is highly simplified There is no mention of the value of the capital investment, depreciation, etc However, the estimates are based on actual fees and costs provided by SOTELMA, the InfoComm Team, and the ISPs Even allowing for a significant margin of error, the table illustrates that a substantial return on investment can be generated in the ISP business in Mali

Another indication of the apparent profitability of the ISPs is the demand for SOTELMA's access services At an "Internet Forum" that occurred during the study in Bamako, a primary theme was the establishment of new ISP operations and the difficulties facing the current ISPs as a result of the high demand SOTELMA is currently responding to thirteen formal applications for ISP licenses True or not, there is definitely the perception in Mali that the ISP business is profitable That may result in some failures, but for the foreseeable future there will remain a number of sources of Internet services for consumers The high demand will keep the industry active, and the competition will likely prevent any highly inflated prices or unreasonable profit margins

## *4 2 SOTELMA - Managing Change for Sustainability*

The market-driven foundation of Mali's Internet service sector is based to a large extent on the prices charged at the Internet access source, SOTELMA If the price for access to the national Internet backbone rises dramatically, it could have a significant impact on the market-driven facilitative environment described above The study team found no indication that a dramatic increase is likely, however there are numerous circumstances that could significantly impact the sector An important one is the financial viability of SOTELMA's Internet operation as it is currently being managed Another is the planned privatization of SOTELMA A third is the nature of SOTELMA's arrangement with USAID, which is currently subsidizing its Internet access

### 4 2 1 Current Situation

The current situation with respect to the profitability and sustainability of SOTELMA's Internet operation is somewhat unstable The price charged to the ISPs for a 64kb leased line, CFA1,028,500 or $1,714 per month, has been determined by SOTELMA A study team fielded by the Leland Initiative provided some assistance in this process in late 1996, but the final result appears to have been primarily based on SOTELMA's own formulae The tariff structure is also based on some key assumptions regarding increasing revenues and the cost of the bandwidth itself

At the time of the current study, an exact rate for the bandwidth was unavailable due to shifting price structures charged by the satellite contractor However, records indicate that the cost to SOTELMA is roughly $6,500 per month, of which the Leland Initiative subsidizes a portion The subsidy is 80% for the first year, 60% for the second year, and 25% for the third year With four ISPs in operation, SOTELMA's revenue is only $6,856 That amount, without the subsidy, is barely enough to cover the estimated cost of the bandwidth alone It is certainly not sufficient to cover all the other costs of running the national Internet node On the other hand, there should be substantial additional revenue generated for SOTELMA's telephone operations by the Internet services Assuming an average use of 10 hours/month of on-line time per account, times 2000 accounts, times 1,122 CFA/hour, times 12 months, SOTELMA will be generating some $449,550 How much of that is actually profit over and above the cost of providing the telephone services, and whether or not this money would be credited or funneled back into the Internet operations are open questions That kind of revenue, however, must be factored in to any analysis and decision-making regarding the sector as a whole

The expectation is that, as the subsidy diminishes and eventually disappears, the number of ISPs purchasing access from SOTELMA will increase at a pace sufficient to cover the related expenses and generate a profit Nothing identified during the current study gives reason to conclude otherwise However, the financial and market analysis was not performed at a level that would allow for definitive conclusions Furthermore, the process by which the Internet

services sector is evolving tends to mask the true market influences In addition to the subsidy for access, SOTELMA has been provided with all of the equipment and materials, and all of the training and capacity building, by USAID through the Leland Initiative There has not been a real need for hard, critical analysis of the real costs of the operation An obvious concern is that as traffic increases through the addition of these new ISPs, the bandwidth that SOTELMA is purchasing will need to be increase as well, thereby increasing its costs What really will be the levels of revenue required to finance the operation and generate a profit over the long term? Will the market generate those levels of revenue? The study team strongly recommends that further focussed attention be paid by USAID to the financial and institutional capacity aspects of SOTELMA's Internet operation, as a key component of its on-going assistance This is especially critical considering the potential impact of the circumstances discussed below

### 4 2 2 SOTELMA's Privatization Initiative

One of the major variables in the discussion of the Internet services sector is the planned privatization of SOTELMA For some time now, SOTELMA has had in place an initiative that will result in the sale of 49% of its capital to a private investor or group of investors Indeed, a component of the current study SOW is to evaluate and predict the impact of that change on the Internet services sector The study team found that the current progress of the privatization initiative is such that predictive conclusions would be mere conjecture The actual sale of capital appears to be a ways off despite the January, 1999 timetable SOTELMA was not forthcoming with any details, nor is it evident that any concrete analysis or planning has been performed on its part with respect to the nature of its Internet operation after the sale Documentation on the process is unavailable from either SOTELMA or the donor community

Conversations with the President Director General indicated only that SOTELMA considers the Internet operation to be a key source of revenue over the long term, especially considering its impact on telecommunications services providers in the U S and Europe SOTELMA intends to retain its control of access to the international infrastructure and its right to provide any and all types of Internet services Currently it is exercising that right only with respect to Government of Mali (GRM) institutions This is further discussed below On the other hand, SOTELMA maintains its commitment not to establish any unfair pricing structures It has also made a strong commitment to supporting the higher education sector in the interest of national development

Internet technology and the Internet services business are considered attractive components of SOTELMA's operation and there is also recognition of the sensitive nature of the market in its infancy These notions are likely to drive SOTELMA's approach to its Internet access provision operation throughout the privatization process As stated above, straightforward analysis of SOTELMA's evolving costs and projected revenues are as critical to sustainability as any potential change resulting from privatization Both components are important aspects of the assessment recommended by the study team

### 4 2 3 USAID Initiatives

Another key variable in the equation is the role played by USAID While the eventual goal is a self-sustaining market-driven Internet services sector in Mali, for the time being there remains a necessary heavy involvement by USAID To the extent that USAID continues to provide funding and technical assistance to the establishment of the sector, most notably thus far to SOTELMA, its actions will have a substantial impact As mentioned in the beginning of this report, USAID is moving forward in two areas One is expanding access and connectivity for institutions in and around Bamako The other is providing secondary city access

The actions recommended in this report would have little impact on SOTELMA's institutional capacity or the financial sustainability of the sector as a whole The secondary city initiative however, could have significant impact because it involves fundamental changes at SOTELMA's level and in its relationship with the access providers Although this issue was not the focus of the current study, events that took place during the study called attention to its impact on the sector as a whole

USAID, through the Leland Initiative, is proposing the establishment of Very Small Aperture Terminal (VSAT) connections in selected secondary cities in Mali This would involve the restructuring of SOTELMA's subsidy arrangements with USAID, the re-distribution of bandwidth among the earth stations, and the establishment of SOTELMA Network Operation Centers (NOC) in the secondary cities While recognizing the value of access to secondary cities, the study team recommends that the initiative proceed in conjunction with the recommended institutional and financial assessment of SOTELMA Although USAID will be providing the capital investment costs, what will be the operation and maintenance costs of multiple VSAT's and NOC's? What will be the additional burden on SOTELMA's already limited and stretched institutional capacity? Will the revenue generated from the secondary city access be sufficient to cover the additional costs? What is the impact of the change in the subsidy arrangements on the profitability of SOTELMA's current operation? These are all questions that need to be answered before proceeding

## *4 3 Private Sector Promotion Considerations*

### 4 3 1 ISP Capacity

As mentioned above, the four current ISPs are at the limits of their capacity The demand for their services far exceeds their ability to deliver As Internet use grows, through market forces and as a result of USAID's Development Partner Connectivity Program, their resources will be stretched even further As part of its program of Internet access promotion and extension, InfoComm should place deliberate emphasis on capacity building within the ISP community By using private sector resources for LAN installation, training, and partner Internet accounts, it will already be doing a great deal to develop business for them and a demand for their services This

approach should continue InfoComm should also closely monitor the ISP response to the increased workload Are they continuing to provide quality services? Are the installed networks fully operational? Are the training programs effective? If they are, then all is well If they are not, then InfoComm should consider applying resources to building ISP capacity The resources would have to be applied and distributed in an equitable manner so as not to favor any ISP or group of ISPs over any other This is difficult to implement, but given the critical link in the chain represented by the ISPs, it may be essential to the achievement of InfoComm's goals

### 4 3 2 SOTELMA Services to GRM Institutions

SOTELMA's provision of direct services to Government of Mali (GRM) institutions also raises some concerns with respect to private sector promotion In countries at Mali's level of development, the national government is a relatively large portion of the overall market Although the notion of reduced rates for GRM agencies in the interest of national development are commendable, the ultimate effect may be counterproductive By effectively cutting off private ISP access to that share of the market, SOTELMA may be limiting the growth potential of the ISP sector, thereby reducing employment potential, savings, and so on This issue does represent something of a dilemma for USAID It places two of USAID objectives, Internet expansion and private sector promotion, in a degree of conflict

In reality, there is little that USAID can do to influence SOTELMA's policy decisions without fully participating in the dialog on the privatization This report has recommended an institutional and financial assessment of SOTELMA that, if undertaken, will most certainly provide USAID with an opportunity to address the issue In the meantime InfoComm should proceed with the program outlined in this report in a manner that ensures successful partner connectivity, while maintaining an approach to SOTELMA that is constant whether it is privatized or not

SOTELMA's relationship with the University and other partners should be formal commercial relationships and fully accountable even if the agreements result in a zero net effect They should not be based on any inter-governmental agency agreements that may establish a precedent that is contrary to private sector promotion USAID does not want to be in the position of subsidizing or even promoting such relationships between SOTELMA and GRM institutions This does not preclude the establishment of temporary concessionaire rates for the University, but does support the transferability of any agreements when SOTELMA is privatized With this in mind, reduced rates may still be the only way to expand connectivity to institutions such as the University of Mali The GRM budget may not be able to support market prices until some savings are realized as a result of the connectivity Only then will decision-makers be compelled to shift funding among budget line items In the meantime, close attention should be paid to SOTELMA's actions and policy directions and an open competitive environment should be encouraged It will also be important to ensure that the access provided to the GRM institutions does not 'leak' out to other institutions or individuals that could otherwise afford to procure access from the ISPs InfoComm should promote, and provide support to, that monitoring process

# 5.0 ACTIVITY SEQUENCING

This section of the report is simply a consolidation of the recommended activities presented in a proposed general time sequence (see chart on following page) It is understood that many of these tasks are dependent upon human and financial resource availability as well as fiscal year calendars and budgeting cycles Its purpose is primarily to offer a consolidated view of the recommended activities and a general sequence It is expected that InfoComm will match its current plans, workloads, and fiscal constraints with what is presented here in order to develop a realistic, feasible workplan for the period in question

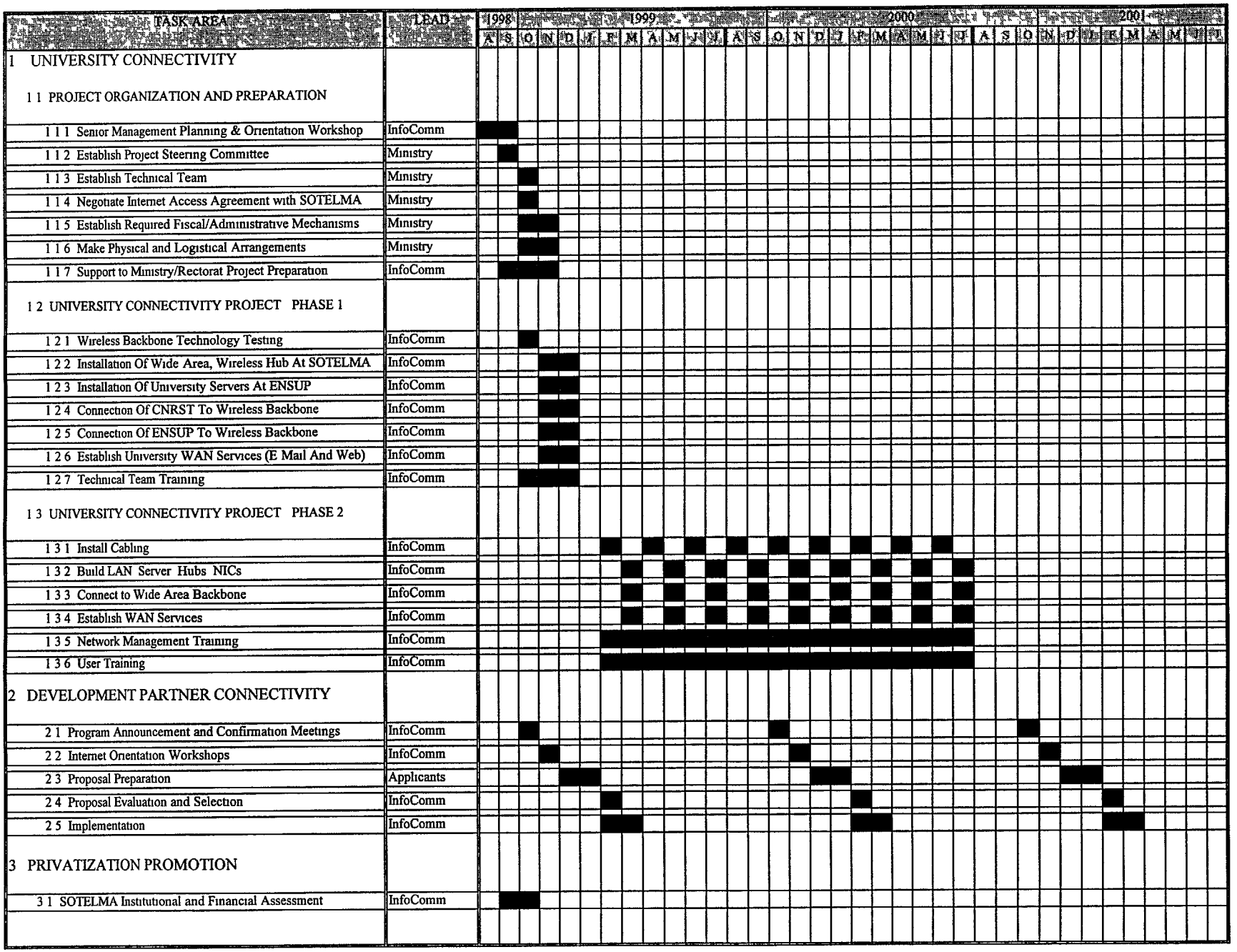
The plan is shown for the next three years The basic unit of duration is a month When an activity is shown to occur in a particular month, it does not necessarily mean that it should take a month, but indicates the month(s) in which the activity should begin and/or end The tasks are specified at a fairly high level It is understood that most tasks involve numerous sub-tasks, such as design, preparation, implementation, etc They also involve a number of administrative, contractual, and legal issues that are not specified here As a result, a technical task that would most probably take only a week or a few days to accomplish is shown to require a month or a portion of two months That period is a reflection of the time required for all of the associated sub-tasks

Phase 2 of the University Connectivity Project is shown as a sequence of nine two-month efforts, one for each of the institutions remaining after Phase 1 is completed The expected duration of the entire University project is approximately two years

The Development Partner Connectivity Program is shown as a six month period for each cycle Understanding that the InfoComm team has other activities, a single cycle is shown for each year The number of applicants invited and subsequently accepted should be consistent with a six month period of implementation Based on the total workload, InfoComm could decide to accept a number of applicants that would require a full year to implement, and stagger the implementation to fill out the year

Although the institutional and financial assessment of SOTELMA is planned for the immediate term, the other recommended activities are unrelated, or at least not dependent on its completion It is shown as an immediate task because of its critical relationship to the overall sector support being planned by both InfoComm and the Leland Initiative

# INFOCOMM DEVELOPMENT PARTNER CONNECTIVITY ACTIVITY SEQUENCE



# Appendix 1 University Institutional Connectivity Requirements

## *Situation and Requirements for Each Institution*

The following pages will discuss in detail the situation and requirements for each of the 11 institutions included in this study Institutions are addressed alphabetically and no significance should be inferred from the order in which they appear

### 2 2 1 1 Centre Nationale de la Recherche Scientific et Technologique (CNRST)

#### *Current Situation*

CNRST is the primary coordinator for the government research organizations throughout Mali CNRST already has a plan underway to build a wide-area research network for use by researchers and educators They have contracted with a local ISP and technical service provider to install cabling, servers (Web and e-mail), dial-in equipment, hubs, and routers The operating design is included in Attachment 6 Additionally, CNRST has begun site construction to build a controlled network-operating center to house the equipment of the research network Overall, CNRST has demonstrated significant thought and planning for sustained technical operation and maintenance of the research network

It is interesting to note that CNRST has also negotiated a significantly reduced Internet-leased-line rate from SOTELMA of 550,000 CFA CNRST has also begun to poll the potential users of the research network to finalize a cost-sharing plan for long-term sustainability

#### *Requirements for local connectivity*

Because of the current project underway at CNRST, there are no local area connectivity issues that need to be addressed It is strongly recommended, however, that CNRST be included in the wide-area connectivity that will be discussed later in this section If this course of action were taken, it would preclude CNRST's planned installation of leased-line connectivity to the Internet This has two significant advantages for CNRST First, the connectivity would be provided as part of the wide-area connectivity at (presumably) lower rates with cost sharing among University built in Secondly, the provided connectivity would have a bandwidth of (potentially) many times that available via the leased-lines solution

### 2 2 1 2 École Nationale d'Ingenieurs (ENI)

#### *Current Situation*

ENI, the University's engineering school, is focused in the areas of geology, topography, industrial engineering, and civil engineering ENI has a faculty of around 100 serving a student body of approximately 960

ENI has approximately 19 computers in use throughout the institution The types and operating systems used vary and are as follows

| Qty | Type | OS | General Location |
|---|---|---|---|
| 1 | 386 | Win 3 x | Secretary |
| 12 | 486 DX | Win 3 x | Computer Lab |
| 6 | Pentium | Win 95 | Offices of administrators and department heads |

None of the PCs have network interface cards

In all cases, PCs are protected with Un-interruptible Power Supply (UPS), adequate physical security, and an air conditioned environment The computers are maintained using technical expertise available locally at ENI While they are not formally trained in PC maintenance they seem to be performing the task well

ENI currently has Internet access via a single dial-up account It is problematic to use it, though, because they only have one phone line and one fax line for the entire school

***Requirements for local connectivity***

Structured CAT 5 UTP cabling
NT Server with DHCP, Proxy Server
2 16 Port Hubs (1 for administration area, 1 for lab)
18 Network interface cards

Connectivity equipment for wide area connectivity (to be discussed later)

For implementation, it should be noted that the 12 486 DX PCs may require older network interface cards (i e ISA or EISA) Additionally, an after-market Winsock will have to be installed and it may not support dynamic IP addressing In this case, static IP addresses can be assigned to these computers and be marked as "reserved" on the Dynamic Host Control Protocol (DHCP) server

**2 2 1 3 Ecole Normale Surerieure (ENSUP)**

***Current Situation***

ENSUP is the University's secondary teachers training college ENSUP is currently serving a student body of approximately 1300, although this number will be declining as ENSUP transitions from a 4-year to a 2-year college

ENSUP has over 20 computers in use throughout the institution, many of which are linked together in a Novell LAN The types and operating systems used vary and are as follows

| Qty | Type | OS | General Location |
|---|---|---|---|
| 1 | Pentium | Novell | Server room |
| 1 | Pentium | NT 4 0 | Server room |
| 10 | 286/386 | Win 3 x | Continuing Education computer lab |
| 4 | 286/386 | Win 3 x | Student lab |
| 1 | 486 | Win 3 x | Library |
| 4+ | 486/Pent | Win 95 | Offices of administrators and department heads |

ENSUP is housed in two adjacent buildings All of the administrative and departmental offices as well as the server room are in the primary building The second building includes the Continuing Education lab, the Student lab and the Library All of the PCs in the primary facility are wired to the LAN with CAT 5 UTP and a 16 port hubs There is also CAT 5 UTP wiring and a hub in the student lab The continuing education lab and library are not wired for connectivity nor do the PCs have network interface cards There is an unshielded coaxial cable installed as the backbone to the secondary building but it was not operational

In all cases, PCs are protected with UPS and adequate physical security In most cases, there is adequate air conditioning available, although not always in use The Student Lab, however, does not appear to have air conditioning or ventilation available Personnel with technical expertise available locally at ENSUP do some software maintenance Hardware and network maintenance is covered under a maintenance contract with an ISP

ENSUP is in the process of installing Internet access to their network It will be connected via a 28 8 Kbps modem and shared on the network using the proxy service called Wingate

***Requirements for local connectivity***

Configure existing NT Server with DHCP, Proxy Server
NT Server to act as University SMTP mail server
NT Server to function as University Web server
Equipment of wide area connectivity
All to be located in the "server room"

The existing network is Novell Netware

Strongly recommend that ENSUP contract to fix or rewire connectivity with second building and extend cabling to Continuing Education Lab and Library

For implementation, it should be noted that the 486/386 PCs might require older network interface cards (i e , ISA or EISA) Additionally, an after-market Winsock will have to be installed and it may not support dynamic IP addressing In this case, static IP addresses can be assigned to these computers and be marked as "reserved" on the DHCP server

### 2 2 1 4 Faculté de la Medecine, de la Parmacie et Odontostomagologie (FMPOS)

***Current Situation***

FMPOS has a faculty of around 150 serving a student body of approximately 2300 FMPOS also hosts the Malaria research project which as been in operation for many years

FMPOS has approximately 30 computers in use throughout the institution The types and operating systems used vary and are as follows

| Qty | Type | OS | General Location |
|---|---|---|---|
| 1 | 486 | Win 3 x | Malaria department office |
| 1 | Pentium | Win 95 | Malaria department office |
| 1 | 386 | Win 3 x | Registrar's office |
| 12 | Pentium | Win 95 | Malaria Lab |
| 6 | Pentium | Win 95 | Library |
| 3 | 486 | Win 3 x | Informatique building |
| 1 | Pentium | Win 95 | Informatique building |
| 5 | 286/386 | DOS/Win 3 x | Informatique building |

All of the computers are housed in three primary buildings The first building hosts several administrative and project offices and the Malaria research program All of the PCs in this building, with the exception of the Registrar's office, are connected together in a LAN Connectivity is achieved via an NT server, structured CAT 5 UTP cabling and a 16 port hub All of these PCs are protected by UPS, adequate physical security, and an air conditioned environment

The Library is the home of 6 PCs dedicated to general research and access to Healthnet CD-ROMs One of the PCs is connected to the Malaria research project LAN The other PCs are not connected nor do they have network interface cards All of these PCs are protected by UPS, adequate physical security, and an air conditioned environment

The third building houses the "Salle Infomatique" which servers as the centralized data processing resource for faculty and students None of these PCs are connected to the Malaria research network nor do they contain network interface cards The building has adequate physical security but none of the 5 286/386 PCs have UPS nor does the room have air conditioning

In addition to many PCs and the LAN, the Malaria research program is sponsoring a dedicated connection to the Internet The link will be a wireless 64K connection to an ISP using Cylink

wireless modems operating in the 900 MHz band The connection will be shared on the network by using a Wingate proxy server

***Requirements for local connectivity***

As mentioned above, the Malaria research program is sponsoring a dedicated connection to the Internet for FMPOS The link will be a wireless 64K connection to an ISP using Cylink wireless modems operating in the 900 MHz band The connection will be shared on the network by using a Wingate proxy server

As such, equipment for wide area connectivity will not be necessary at this site

Extend network wiring to the Salle Informatique with CAT 5 UTP or coaxial cable
Cable with CAT 5 UTP
16 port unmanaged hub
Install 4 NICs in Pentium and 486s

For implementation, it should be noted that the 486/386 PCs might require older network interface cards (i e ISA or EISA) Additionally, an after-market Winsock will have to be installed and it may not support dynamic IP addressing In this case, static IP addresses can be assigned to these computers and be marked as "reserved" on the DHCP server

**2 2 1 5 Faculté des Lettres, Arts, et Sciences Humaines (FLASH)**

***Current Situation***

FLASH is the University's teachers collage for arts, languages and humanities FLASH is co-located with ENSUP and shares a majority of the faculty with them as well

FLASH has approximately 7 computers operating in the institution Apparently 5 of the PCs were installed as part of a Norwegian project Additionally, 2 others have been provided by CNRST and must be returned to them when the associated project is complete The types and operating systems used vary and are as follows

| Qty | Type | OS | General Location |
|---|---|---|---|
| 7 | Pentium | Win 95 | Offices of administrators/faculty |

As mentioned above, all of the PCs are located in the offices of administrators/faculty Even though there are computer science classes as part of the college's curriculum, there are no PCs available for student instruction or use

Despite the fact that FLASH is only a dozen meters from the ENSUP server room, none of these computers are connected to a LAN nor do they have network interface cards

In all cases, PCs are protected with UPS, adequate physical security, and an air conditioned environment The local provider maintains the computers under warranty

As part of the Norwegian project, FLASH currently has Internet access via a single dial-up account that utilizes a cellular phone FLASH has no phone or fax lines themselves and must walk down the hall to ENSUP in order to place a call

***Requirements for local connectivity***

Extend ENSUP network down the hall to FLASH with addition of coaxial or CAT 5 UTP
Structured cabling using CAT 5 UTP to connect all 7 PCs
Unmanaged 16 port hub
7 network interface cards

Strongly suggest close coordination with ENSUP to upgrade and expand student accessible PCs for both schools

**2 2 1 6 Faculté des Sciences et Techniques (FAST)**

***Current Situation***

FAST is the University's undergraduate collage for students wishing to follow science or technical tracks ENI has a faculty of around 140 serving a student body of approximately 1400 FAST is co-located with IUG, across the river, at Badalabuogou

FAST has approximately 33 computers in use throughout the institution The types and operating systems used vary and are as follows

| Qty | Type | OS | General Location |
|---|---|---|---|
| 5 | Pentium | Win 95 | Administrative offices |
| 5 | Pentium | Win 95 | Faculty Lab |
| 20 | Pentium | Win 95 | Student Lab |
| 3 | 486 | Win 3 x | Student Lab |

None of the PCs have network interface cards

In all cases, PCs are protected adequate physical security and an air conditioned environment None of the computers in either the Student or Faculty Labs are protected by surge suppressors

or UPS units The computers are fairly new and are still covered under warranty Some minor maintenance is done by local expertise from nearby IUG

FAST does not currently have Internet access FAST has only one phone line and has been waiting over a year for installation of a fax line

***Requirements for local connectivity***

Extend IUG network approximately 300 yards to FAST (building which houses admin and Faculty Lab) with CAT 5 UTP, coaxial or fiber optic and use of repeater if necessary

DHCP and wide area connectivity will be served via IUG network

Structured cabling of admin offices, and Faculty Lab with CAT 5 UTP and unmanaged 16 port hub & printer
Extend FAST network to Student Lab with CAT 5 UTP or coaxial cable
Structured cabling of Student Lab with stackable, unmanaged 16 port hubs & printer
33 network interface cards

For implementation, it should be noted that the 486/386 PCs might require older network interface cards (i e ISA or EISA) Additionally, an after-market Winsock will have to be installed and it may not support dynamic IP addressing In this case, static IP addresses can be assigned to these computers and be marked as "reserved" on the DHCP server

## 2 2 1 7 Faculté des Sciences Juridiques et Economiques Ecole Nationale d'Administration (FSJE/ENA)

***Current Situation***

FSJE/ENA is the University's graduate collage for students wishing to pursue law or economics FSJE/ENA has a faculty of 123 serving a student body of approximately 4700

FSJE/ENA has approximately 41 computers in use throughout the institution The types and operating systems used vary and are as follows

| Qty | Type | OS | General Location |
|---|---|---|---|
| 17 | Pentium | Win 95 | Student Lab |
| 12 | Pentium | Win 95 | Continuing Education Lab |
| 5 | 386/486 | Win 3 x | Administrative offices |
| 1 | Pentium | Win 95 | Administrative offices |
| 1 | Pentium | Win 95 | Library |
| 5 | Pentium | Win 95 | Economic & Social Research Lab |

Additionally, FSJE/ENA indicated that they currently have 20 additional Pentium PCs on order

None of the PCs have network interface cards

In all cases, PCs are protected adequate physical security and an air conditioned environment None of the computers in the Continuing Education Lab are protected by surge suppressors or UPS units while all other PCs are Computer maintenance is handled by in-house staff when possible and by a contractor (who is also a professor) for more difficult work

FSJE/ENA currently has Internet access via a single dial-up line but it is dedicated to a Dutch sponsored program FSJE/ENA has two phone lines but one of them is dedicated to the Dutch project as well

***Requirements for local connectivity***

Structured CAT 5 UTP cabling of admin offices building and library with unmanaged 16 port hub
Structured CAT 5 UTP cabling of Student Lab with 2 stackable, unmanaged 16 port hubs and a printer
Structured CAT 5 UTP cabling of Continuing Education Lab with 2 stackable, unmanaged 16 port hubs and a printer
Structured CAT 5 UTP cabling of Economic & Social Research Lab with an unmanaged 16 port hub and printer

Connect 4 clusters and server with daisy chained coaxial cable or CAT 5 UTP and a 5 port ethernet switch

NT Server with DHCP, Proxy Server
41 Network interface cards
Connectivity equipment for wide area connectivity (to be discussed later)

FSJE/ENA has indicated that an additional 20 Pentium PCs have been ordered Special care should be taken when planning structured cabling to consider the probable location(s) of these PCs Additionally, FSJE/ENA may need 20 additional network interface cards for the new computers

For implementation, it should be noted that the 486s PCs might require older network interface cards (i e ISA or EISA) Additionally, an after-market Winsock will have to be installed and it may not support dynamic IP addressing In this case, static IP addresses can be assigned to these computers and be marked as "reserved" on the DHCP server

### 2 2 1 8 Institut Polytechnique Rural/Institut Formation et de Recherche (IPR/IFR)

***Current Situation***

IPR/IFR, located 60 km outside of Bamako in Katibougou, is the University's agriculture college IPR/IFR has a student body of approximately 2000

IPR/IFR has approximately 13 computers in use throughout the institution The types and operating systems used vary and are as follows

| Qty | Type | OS | General Location |
|---|---|---|---|
| 8 | Pentium | Win 95 | Student Lab |
| 1 | 286 | DOS | Student Lab |
| 1 | Unknown | Unknown | Student Lab |
| 3 | 286 | DOS | Anterior Student Lab |
| 3+ | Pentium | Win 95 | Faculty/Administrative offices |

The 8 Pentium computers in the Student Lab had been connected with a Novell server, CAT 5 UTP cabling, and a 16 port hub Because of some logistics difficulties, IPR/IFR received equipment that was supposed to be installed at a different UNESCO project location Subsequently, the server and hub have removed and the network is not currently operational None of the other PCs are connected to the network nor do they have network interface cards The lab has good security and air conditioning Additionally, all the PCs are protected with UPS and dust covers Routine PC maintenance is carried out by a local faculty member with more serious work contracted for from the firm that installed the PCs and network

IPR/IFR does not currently have any type of Internet access IPR/IFR has only one phone line

***Requirements for local connectivity***

Assuming that the server and hub issues mentioned above are not resolved, the connectivity project should install
NT server running DHCP and proxy server
Unmanaged 16 port hub
Equipment for wide area connectivity (to be discussed later)

## 2 2 1 9 Institut Supérieur de Formation et de Recherche Appliquée (ISFRA)

### *Current Situation*

ISFRA, is a top level, doctoral college for teacher training ISFRA has a faculty of 13 professors and a student body of approximately 50 post-grad students ISFRA is co-located in the same building with CNRST

ISFRA has approximately 10 computers in use throughout the institution The types and operating systems used vary and are as follows

| Qty | Type | OS | General Location |
|---|---|---|---|
| 1 | 486 DX | Win 3 x | Administrative offices |
| 2 | 386 | Win 3 x | Administrative offices |
| 1 | 386 | Win 3 x | Computer Lab |
| 1 | Mac Performa | OS 7 x | Computer Lab |
| 1 | Mac LC | OS 7 x | Computer Lab |
| 1 | Mac Plus | OS 6 x | Computer Lab |
| 3 | Mac SE | OS 6 x | Computer Lab |

None of these computers have network interface cards

In all cases, PCs are being operated in an air-conditioned environment None of the computers, though, were protected by surge suppressors or UPS units Also, only those computers located in the administrators' offices have adequate physical security

ISFRA does not currently have any type of Internet access They used to be connected to RioNet but operating costs were too high to maintain ISFRA has only one phone line and it does not allow international dialing

### *Requirements for local connectivity*

ISFRA is located in the same building as CNRST and should utilize the wide area connectivity that will (tentatively) be installed there

Extend CNRST network across the building to FLASH with addition of coaxial or CAT 5 UTP
Four new PCs w/UPS for installation into the "lab" because Macintoshes will not be networked
Structured cabling using CAT 5 UTP to connect PCs in "lab" and 2 offices
Additionally, it would be advantageous to wire the "lab" for several extra network connections in preparation for additional computers
Unmanaged 16 port hub
4 network interface cards

It is not recommended that the Macintosh computers be included in network connectivity The Mac Plus and three Mac SE s are not expandable to include an ethernet interface and drivers for external interfaces are not compatible with the older architecture Ethernet cards can be added to the Mac Performa and LC but enough other significant modifications would be needed (i e RAM & hard disk) as to make it not cost effective

For implementation, it should be noted that the 386/486s PCs might require older network interface cards (i e ISA or EISA) Additionally, an after-market Winsock will have to be installed and it may not support dynamic IP addressing In this case, static IP addresses can be assigned to these computers and be marked as "reserved" on the DHCP server

### 2 2 1 10 Institut Universitaire de Gestion (IUG)

***Current Situation***

IUG, is an under-graduate college for business, management, and secretarial skills training IUG has a faculty of 50 professors and a student body of 800 IUG is co-located with FAST, across the river, at Badalabuogou

IUG has approximately 32 computers in use throughout the institution The types and operating systems used vary and are as follows

| Qty | Type | OS | General Location |
|---|---|---|---|
| 3 | Pentium | Win 95 | Administrative offices |
| 9 | 486 DX | Win 3 x | Computer Lab #1 |
| 10 | 486 DX | Win 3 x | Computer Lab #2 |
| 10 | 286/386 | DOS/Win 3 X | Computer Lab #3 |

None of these computers have network interface cards

In all cases, PCs are protected by UPS and good physical security Additionally, all the computers are in rooms with air conditioning available, but it is not used unless classes are in session As a result, some of the labs become quite hot The PCs in Computer Lab #1 are relatively new and are still under warranty All of the other computers are maintained by a faculty member with superior technical expertise

IUG currently has Internet access via a single dial-up connection in the dean's office Use of the dial-up is problematic, though, because IUG has only one phone line

***Requirements for local connectivity***

Structured CAT 5 UTP cabling of admin offices and Computer Lab #1 and library with unmanaged 16 port hub and a printer
Structured CAT 5 UTP cabling of Computer Lab #2 unmanaged 16 port hubs and a printer

Connect 2 clusters and server with daisy chained coaxial cable or CAT 5 UTP and a 5 port ethernet switch

NT Server with DHCP, Proxy Server
22 Network interface cards
Connectivity equipment for wide area connectivity (to be discussed later)

It is not recommended that the 286s and 386s be modified or upgraded for the purpose of local area connectivity because of limited cost-effectiveness and an connectivity already available in adjacent labs It may be advantageous, though, to wire Computer Lab #3 at the same time in preparation for installation of new computers at a latter date

For implementation, it should be noted that the 486s PCs might require older network interface cards (i e ISA or EISA) Additionally, an after-market Winsock will have to be installed and it may not support dynamic IP addressing In this case, static IP addresses can be assigned to these computers and be marked as "reserved" on the DHCP server

### 2 2 1 11 Rectorat

***Current Situation***

The Rectorat is the supervising authority responsible for management and operation of the University of Mali The Rectorat has a 60 personnel working at their facility, many of them professors who also teach classes It is important to note that The Rectorat will be moving from their current facility to a new building across the river in Badalabuogou The new building is still being designed and the completion date is unknown

The Rectorat has approximately 14 computers in use throughout the institution The types and operating systems used vary and are as follows

| Qty | Type | OS | General Location |
|---|---|---|---|
| 9 | Pentium | Win 95 | Administrative offices |
| 5 | 486 | Win 3 x | Administrative offices |

None of these computers have network interface cards

In all cases, PCs are protected by UPS, adequate physical security, and an air conditioned environment Four of the PCs are relatively new and are still under warranty All of the other computers are maintained by a faculty members within the University or by a local contractor

The Rectorat does not currently have any access to the Internet The Rectorat has three phone lines and one fax line

***Requirements for local connectivity***

Structured CAT 5 UTP cabling to offices of 14 PCs
NT Server with DHCP, Proxy Server
Unmanaged 16 Port Hubs
14 Network interface cards
Connectivity equipment for wide area connectivity (to be discussed later)

Network cabling does not have to be permanent nor does planning for network expansion need to be considered as the Rectorat will be moving to Badalabuogou when their new facility has been built

For implementation, it should be noted that the 12 486 DX PCs may require older network interface cards (i e ISA or EISA) Additionally, an after-market Winsock will have to be installed and it may not support dynamic IP addressing In this case, static IP addresses can be assigned to these computers and be marked as "reserved" on the DHCP server

**PHASE I - Wireless Local Loop, CNRST, & ENSUP**

**HARDWARE**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Bridge Transceiver | 3 | $ 8,595 00 | $ 25,785 00 |
| Omni Directional Antenna | 1 | $ 775 00 | $ 775 00 |
| Directional Antenna | 2 | $ 415 00 | $ 830 00 |
| Cable connection kit + 150 ft cable | 3 | $ 979 00 | $ 2,937 00 |
| Lightning Protector | 3 | $ 199 00 | $ 597 00 |
| 3 year warranty (2 year extension) oh wireless equipment | 3 | $ 795 00 | $ 2,385 00 |
| Servers | 2 | $ 12,249 00 | $ 24,498 00 |
| Workstations | 0 | $ 3,102 00 | $ - |
| HP LaserJet 6 MP Printer w/ parallel and Jet Direct ethernet interfaces | 0 | $ 949 00 | $ - |
| Toner Cartridges for HP LaserJet Printer | 0 | $ 85 00 | $ - |
| HP DeskJet Printer w/ parallel interface | 0 | $ 349 00 | $ - |
| DeskJet Printer Cartridges (black) | 0 | $ 29 00 | $ - |
| NIC (Network Interface Cards) | 0 | $ 176 00 | $ - |
| Hub, 16 port 10Base-T, unmanaged | 1 | $ 199 00 | $ 199 00 |
| 8 Port Ethernet Switch with 10/100 uplink | 0 | $ 599 00 | $ - |
| APC smart UPS power supply with APC Power Chute | 3 | $ 654 00 | $ 1,962 00 |
| Digital tape Backup unit w/ Arkserver Backup Software | 2 | $ 1,174 00 | $ 2,348 00 |
| Digital tapes for backup unit | 14 | $ 26 00 | $ 364 00 |
| 28 8 Modem | 0 | $ 163 00 | $ - |
| CAT 5 UTP Cable (in meters) | 0 | $ 0 88 | $ - |
| Patch cables 5ft w/RJ45 connectors | 0 | $ 9 50 | $ - |
| Patch cables 10ft w/RJ45 connectors | 0 | $ 10 50 | $ - |
| Patch cables 25ft w/RJ45 connectors | 0 | $ 14 50 | $ - |
| High density module connector CAT 5 | 0 | $ 5 99 | $ - |
| 2 position flush wall plates | 0 | $ 1 95 | $ - |
| Plastic Conduit for Cables (in meters) | 0 | $ 3 20 | $ - |
| | | | $ 62,680 00 |

**SOFTWARE**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Windows NT Server 4 0 - 5 user license | 1 | $ 713 00 | $ 713 00 |
| Windows NT Server 4 0 20 Quantity Client Access License | 1 | $ 581 00 | $ 581 00 |
| Microsoft Services for Netware - for Windows NT Server 4 0 | 1 | $ 131 00 | $ 131 00 |
| Microsoft Windows 95 | 0 | $ 179 00 | $ - |
| MS Office Pro | 0 | $ 529 00 | $ - |
| SMTP Mail Server | 1 | $ 1,295 00 | $ 1,295 00 |

| | | | |
|---|---|---|---|
| Proxy Server | 1 | $ 700 00 | $ 700 00 |
| LDAP Server | 1 | $ 995 00 | $ 995 00 |
| IP Stack for 16 bit computers | 16 | $ 69 00 | $ 1,104 00 |
| | | | $ 5,519 00 |

**SERVICES (In Man Weeks)**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Transceiver & Antenna Installation (includes per diem) | 3 | $ 4,300 00 | $ 12,900 00 |
| Network Cabling and Testing | 4 | $ 437 50 | $ 1,750 00 |
| Server Installation & Configuration | 1 | $ 1,093 75 | $ 1,093 75 |
| Client Configuration | 4 | $ 437 50 | $ 1,750 00 |
| Strategic Management Training | 1 | $ 4,300 00 | $ 4,300 00 |
| WAN Management Training | 1 | $ 1,093 75 | $ 1,093 75 |
| Network Management Training | 2 | $ 1,093 75 | $ 2,187 50 |
| User Training | 1 | $ 1,093 75 | $ 1,093 75 |
| | | | $ 26,168 75 |

**Miscellaneous Expenses**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Air Travel for International Experts | 3 | $ 2,864 00 | $ 8,592 00 |
| | | | |
| | | | $ 8,592 00 |

| | |
|---|---|
| **Sub-Total of Fixed Costs** | $ 102,959 75 |

**SUBSIDY OF RECURRENT COSTS (In Months)**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Connection to national router - 2 | 6 | $ 1,580 00 | $ 9,480 00 |
| Leased Line Internet Connection | 0 | $ 1,713 33 | $ - |
| Dedicated Phone Line | 0 | $ 133 33 | $ - |
| | | | $ 9,480 00 |

| | |
|---|---|
| **Total Costs** | $ 112,439 75 |

NOTES

1 - based on C-SPEC OverLAN Wireless Bridge RF-10 which includes internal routing of IP If this feature is not included in selected technology, a router must also be included

2 - SOTELMA is currently unable to provide the cost of this service This estimate is based on the reasonable assumption of a direct internet connection costs minus leased line costs

**ENI - Implementation Costs**

**HARDWARE**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Bridge Transceiver | 1 | $ 8,595 00 | $ 8,595 00 |
| Omni Directional Antenna | 0 | $ 775 00 | $ - |
| Directional Antenna | 1 | $ 415 00 | $ 415 00 |
| Cable connection kit + 150 ft cable | 1 | $ 979 00 | $ 979 00 |
| Lightning Protector | 1 | $ 199 00 | $ 199 00 |
| 3 year warranty (2 year extension) oh wireless equipment | 1 | $ 795 00 | $ 795 00 |
| Servers | 1 | $ 12,249 00 | $ 12,249 00 |
| Workstations | 0 | $ 3,102 00 | $ - |
| HP LaserJet 6 MP Printer w/ parallel and Jet Direct ethernet interfaces | 0 | $ 949 00 | $ - |
| Toner Cartridges for HP LaserJet Printer | 0 | $ 85 00 | $ - |
| HP DeskJet Printer w/ parallel interface | 0 | $ 349 00 | $ - |
| DeskJet Printer Cartridges (black) | 0 | $ 29 00 | $ - |
| NIC (Network Interface Cards) | 18 | $ 176 00 | $ 3,168 00 |
| Hub, 16 port 10Base-T, unmanaged | 2 | $ 199 00 | $ 398 00 |
| 8 Port Ethernet Switch with 10/100 uplink | 0 | $ 599 00 | $ - |
| APC smart UPS power supply with APC Power Chute | 1 | $ 654 00 | $ 654 00 |
| Digital tape Backup unit w/ Arkserver Backup Software | 1 | $ 1,174 00 | $ 1,174 00 |
| Digital tapes for backup unit | 7 | $ 26 00 | $ 182 00 |
| 28 8 Modem | 0 | $ 163 00 | $ - |
| CAT 5 UTP Cable (in meters) | 680 | $ 0 88 | $ 598 40 |
| Patch cables 5ft w/RJ45 connectors | 18 | $ 9 50 | $ 171 00 |
| Patch cables 10ft w/RJ45 connectors | 9 | $ 10 50 | $ 94 50 |
| Patch cables 25ft w/RJ45 connectors | 9 | $ 14 50 | $ 130 50 |
| High density module connector CAT 5 | 18 | $ 5 99 | $ 107 82 |
| 2 position flush wall plates | 18 | $ 1 95 | $ 35 10 |
| Plastic Conduit for Cables (in meters) | 72 | $ 3 20 | $ 230 40 |
| | | | $ 30,175 72 |

**SOFTWARE**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Windows NT Server 4 0 - 5 user license | 1 | $ 713 00 | $ 713 00 |
| Windows NT Server 4 0 20 Quantity Client Access License | 1 | $ 581 00 | $ 581 00 |
| Microsoft Services for Netware - for Windows NT Server 4 0 | 0 | $ 131 00 | $ - |
| Microsoft Windows 95 | 0 | $ 179 00 | $ - |
| MS Office Pro | 0 | $ 529 00 | $ - |
| SMTP Mail Server | 0 | $ 1,295 00 | $ - |

| | | | |
|---|---|---|---|
| Proxy Server | 1 | $ 700 00 | $ 700 00 |
| LDAP Server | 0 | $ 995 00 | $ - |
| IP Stack for 16 bit computers | 12 | $ 69 00 | $ 828 00 |
| | | | $ 2,822 00 |

**SERVICES (In Man Weeks)**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Transceiver & Antenna Installation (includes per diem) | 0 | $ 4,300 00 | $ - |
| Network Cabling and Testing | 3 | $ 437 50 | $ 1,312 50 |
| Server Installation & Configuration | 1 | $ 1,093 75 | $ 1,093 75 |
| Client Configuration | 3 | $ 437 50 | $ 1,312 50 |
| Strategic Management Training | 0 | $ 4,300 00 | $ - |
| WAN Management Training | 1 | $ 1,093 75 | $ 1,093 75 |
| Network Management Training | 2 | $ 1,093 75 | $ 2,187 50 |
| User Training | 1 | $ 1,093 75 | $ 1,093 75 |
| | | | $ 8,093 75 |

**Miscellaneous Expenses**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Air Travel for International Experts | 0 | $ 2,864 00 | $ - |
| | | | |
| | | | $ - |

**Sub-Total of Fixed Costs** $ 41,091 47

**SUBSIDY OF RECURRENT COSTS (In Months)**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Connection to national router - 2 | 0 | $ 1,580 00 | $ - |
| Leased Line Internet Connection | 0 | $ 1,713 33 | $ - |
| Dedicated Phone Line | 0 | $ 133 33 | $ - |
| | | | $ - |

**Total Costs** $ 41,091 47

NOTES

1 - based on C-SPEC OverLAN Wireless Bridge RF-10 which includes internal routing of IP If this feature is not included in selected technology, a router should be included

2 - SOTELMA is currently unable to provide the cost of this service This estimate is based on the reasonable assumption of a direct internet connection costs minus leased line costs

**FMPOS - Implementation Costs**

**HARDWARE**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Bridge Transceiver | 0 | $ 8,595 00 | $ - |
| Omni Directional Antenna | 0 | $ 775 00 | $ - |
| Directional Antenna | 0 | $ 415 00 | $ - |
| Cable connection kit + 150 ft cable | 0 | $ 979 00 | $ - |
| Lightning Protector | 0 | $ 199 00 | $ - |
| 3 year warranty (2 year extension) oh wireless equipment | 0 | $ 795 00 | $ - |
| Servers | 0 | $ 12,249 00 | $ - |
| Workstations | 0 | $ 3,102 00 | $ - |
| HP LaserJet 6 MP Printer w/ parallel and Jet Direct ethernet interfaces | 0 | $ 949 00 | $ - |
| Toner Cartridges for HP LaserJet Printer | 0 | $ 85 00 | $ - |
| HP DeskJet Printer w/ parallel interface | 0 | $ 349 00 | $ - |
| DeskJet Printer Cartridges (black) | 0 | $ 29 00 | $ - |
| NIC (Network Interface Cards) | 4 | $ 176 00 | $ 704 00 |
| Hub, 16 port 10Base-T, unmanaged | 1 | $ 199 00 | $ 199 00 |
| 8 Port Ethernet Switch with 10/100 uplink | 0 | $ 599 00 | $ - |
| APC smart UPS power supply with APC Power Chute | 0 | $ 654 00 | $ - |
| Digital tape Backup unit w/ Arkserver Backup Software | 0 | $ 1,174 00 | $ - |
| Digital tapes for backup unit | 0 | $ 26 00 | $ - |
| 28 8 Modem | 0 | $ 163 00 | $ - |
| CAT 5 UTP Cable (in meters) | 140 | $ 0 88 | $ 123 20 |
| Patch cables 5ft w/RJ45 connectors | 4 | $ 9 50 | $ 38 00 |
| Patch cables 10ft w/RJ45 connectors | 4 | $ 10 50 | $ 42 00 |
| Patch cables 25ft w/RJ45 connectors | 4 | $ 14 50 | $ 58 00 |
| High density module connector CAT 5 | 4 | $ 5 99 | $ 23 96 |
| 2 position flush wall plates | 4 | $ 1 95 | $ 7 80 |
| Plastic Conduit for Cables (in meters) | 24 | $ 3 20 | $ 76 80 |
| | | | $ 1,272 76 |

**SOFTWARE**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Windows NT Server 4 0 5 user license | 0 | $ 713 00 | $ - |
| Windows NT Server 4 0 20 Quantity Client Access License | 0 | $ 581 00 | $ - |
| Microsoft Services for Netware - for Windows NT Server 4 0 | 0 | $ 131 00 | $ - |
| Microsoft Windows 95 | 0 | $ 179 00 | $ - |
| MS Office Pro | 0 | $ 529 00 | $ - |
| SMTP Mail Server | 0 | $ 1,295 00 | $ - |

| | | | |
|---|---|---|---|
| Proxy Server | 0 | $ 700 00 | $ - |
| LDAP Server | 0 | $ 995 00 | $ - |
| IP Stack for 16 bit computers | 3 | $ 69 00 | $ 207 00 |
| | | | $ 207 00 |

**SERVICES (In Man Weeks)**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Transceiver & Antenna Installation (includes per diem) | 0 | $ 4,300 00 | $ - |
| Network Cabling and Testing | 1 | $ 437 50 | $ 437 50 |
| Server Installation & Configuration | 0 | $ 1,093 75 | $ - |
| Client Configuration | 1 | $ 437 50 | $ 437 50 |
| Strategic Management Training | 0 | $ 4,300 00 | $ - |
| WAN Management Training | 0 | $ 1,093 75 | $ - |
| Network Management Training | 1 | $ 1,093 75 | $ 1,093 75 |
| User Training | 1 | $ 1,093 75 | $ 1,093 75 |
| | | | $ 3 062 50 |

**Miscellaneous Expenses**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Air Travel for International Experts | 0 | $ 2,864 00 | $ - |
| | | | |
| | | | $ - |

**Sub-Total of Fixed Costs** $ 4,542 26

**SUBSIDY OF RECURRENT COSTS (In Months)**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Connection to national router - 2 | 0 | $ 1,580 00 | $ - |
| Leased Line Internet Connection | 0 | $ 1,713 33 | $ - |
| Dedicated Phone Line | 0 | $ 133 33 | $ - |
| | | | $ - |

**Total Costs** $ 4,542 26

NOTES

1 - based on C-SPEC OverLAN Wireless Bridge RF-10 which includes internal routing of IP If this feature is not included in selected technology, a router should be included

2 - SOTELMA is currently unable to provide the cost of this service This estimate is based on the reasonable assumption of a direct internet connection costs minus leased line costs

**FLASH - Implementation Costs**

**HARDWARE**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Bridge Transceiver | 0 | $ 8,595 00 | $ - |
| Omni Directional Antenna | 0 | $ 775 00 | $ - |
| Directional Antenna | 0 | $ 415 00 | $ - |
| Cable connection kit + 150 ft cable | 0 | $ 979 00 | $ - |
| Lightning Protector | 0 | $ 199 00 | $ - |
| 3 year warranty (2 year extension) oh wireless equipment | 0 | $ 795 00 | $ - |
| Servers | 0 | $ 12,249 00 | $ - |
| Workstations | 0 | $ 3,102 00 | $ - |
| HP LaserJet 6 MP Printer w/ parallel and Jet Direct ethernet interfaces | 0 | $ 949 00 | $ - |
| Toner Cartridges for HP LaserJet Printer | 0 | $ 85 00 | $ - |
| HP DeskJet Printer w/ parallel interface | 0 | $ 349 00 | $ - |
| DeskJet Printer Cartridges (black) | 0 | $ 29 00 | $ - |
| NIC (Network Interface Cards) | 7 | $ 176 00 | $ 1,232 00 |
| Hub, 16 port 10Base-T, unmanaged | 1 | $ 199 00 | $ 199 00 |
| 8 Port Ethernet Switch with 10/100 uplink | 0 | $ 599 00 | $ - |
| APC smart UPS power supply with APC Power Chute | 0 | $ 654 00 | $ - |
| Digital tape Backup unit w/ Arkserver Backup Software | 0 | $ 1,174 00 | $ - |
| Digital tapes for backup unit | 0 | $ 26 00 | $ - |
| 28 8 Modem | 0 | $ 163 00 | $ - |
| CAT 5 UTP Cable (in meters) | 310 | $ 0 88 | $ 272 80 |
| Patch cables 5ft w/RJ45 connectors | 7 | $ 9 50 | $ 66 50 |
| Patch cables 10ft w/RJ45 connectors | 7 | $ 10 50 | $ 73 50 |
| Patch cables 25ft w/RJ45 connectors | 7 | $ 14 50 | $ 101 50 |
| High density module connector CAT 5 | 7 | $ 5 99 | $ 41 93 |
| 2 position flush wall plates | 7 | $ 1 95 | $ 13 65 |
| Plastic Conduit for Cables (in meters) | 30 | $ 3 20 | $ 96 00 |
| | | | $ 2,096 88 |

**SOFTWARE**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Windows NT Server 4 0 - 5 user license | 0 | $ 713 00 | $ - |
| Windows NT Server 4 0 20 Quantity Client Access License | 0 | $ 581 00 | $ - |
| Microsoft Services for Netware - for Windows NT Server 4 0 | 0 | $ 131 00 | $ - |
| Microsoft Windows 95 | 0 | $ 179 00 | $ - |
| MS Office Pro | 0 | $ 529 00 | $ - |
| SMTP Mail Server | 0 | $ 1,295 00 | $ - |

| | | | |
|---|---|---|---|
| Proxy Server | 0 | $ 700 00 | $ - |
| LDAP Server | 0 | $ 995 00 | $ - |
| IP Stack for 16 bit computers | 0 | $ 69 00 | $ - |
| | | | $ - |

**SERVICES (In Man Weeks)**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Transceiver & Antenna Installation (includes per diem) | 0 | $ 4,300 00 | $ - |
| Network Cabling and Testing | 2 | $ 437 50 | $ 875 00 |
| Server Installation & Configuration | 0 | $ 1,093 75 | $ - |
| Client Configuration | 1 5 | $ 437 50 | $ 656 25 |
| Strategic Management Training | 1 | $ 4,300 00 | $ 4,300 00 |
| WAN Management Training | 0 | $ 1,093 75 | $ - |
| Network Management Training | 0 | $ 1,093 75 | $ - |
| User Training | 1 | $ 1,093 75 | $ 1,093 75 |
| | | | $ 6,925 00 |

**Miscellaneous Expenses**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Air Travel for International Experts | 0 | $ 2,864 00 | $ - |
| | | | |
| | | | $ - |

| | |
|---|---|
| **Sub-Total of Fixed Costs** | $ 9,021 88 |

**SUBSIDY OF RECURRENT COSTS (In Months)**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Connection to national router - 2 | 0 | $ 1,580 00 | $ - |
| Leased Line Internet Connection | 0 | $ 1,713 33 | $ - |
| Dedicated Phone Line | 0 | $ 133 33 | $ - |
| | | | $ - |

| | |
|---|---|
| **Total Costs** | $ 9,021 88 |

NOTES

1 - based on C-SPEC OverLAN Wireless Bridge RF-10 which includes internal routing of IP If this feature is not included in selected technology, a router should be included

2 - SOTELMA is currently unable to provide the cost of this service This estimate is based on the reasonable assumption of a direct internet connection costs minus leased line costs

**FAST - Implementation Costs**

**HARDWARE**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Bridge Transceiver | 0 | $ 8,595 00 | $ - |
| Omni Directional Antenna | 0 | $ 775 00 | $ |
| Directional Antenna | 0 | $ 415 00 | $ - |
| Cable connection kit + 150 ft cable | 0 | $ 979 00 | $ - |
| Lightning Protector | 0 | $ 199 00 | $ - |
| 3 year warranty (2 year extension) oh wireless equipment | 0 | $ 795 00 | $ - |
| Servers | 0 | $ 12,249 00 | $ - |
| Workstations | 0 | $ 3,102 00 | $ - |
| HP LaserJet 6 MP Printer w/ parallel and Jet Direct ethernet interfaces | 0 | $ 949 00 | $ - |
| Toner Cartridges for HP LaserJet Printer | 0 | $ 85 00 | $ - |
| HP DeskJet Printer w/ parallel interface | 2 | $ 349 00 | $ 698 00 |
| DeskJet Printer Cartridges (black) | 10 | $ 29 00 | $ 290 00 |
| NIC (Network Interface Cards) | 33 | $ 176 00 | $ 5,808 00 |
| Hub, 16 port 10Base T, unmanaged | 2 | $ 199 00 | $ 398 00 |
| 8 Port Ethernet Switch with 10/100 uplink | 0 | $ 599 00 | $ - |
| APC smart UPS power supply with APC Power Chute | 0 | $ 654 00 | $ - |
| Digital tape Backup unit w/ Arkserver Backup Software | 0 | $ 1,174 00 | $ - |
| Digital tapes for backup unit | 0 | $ 26 00 | $ - |
| 28 8 Modem | 0 | $ 163 00 | $ - |
| CAT 5 UTP Cable (in meters) | 730 | $ 0 88 | $ 642 40 |
| Patch cables 5ft w/RJ45 connectors | 33 | $ 9 50 | $ 313 50 |
| Patch cables 10ft w/RJ45 connectors | 20 | $ 10 50 | $ 210 00 |
| Patch cables 25ft w/RJ45 connectors | 20 | $ 14 50 | $ 290 00 |
| High density module connector CAT 5 | 33 | $ 5 99 | $ 197 67 |
| 2 position flush wall plates | 33 | $ 1 95 | $ 64 35 |
| Plastic Conduit for Cables (in meters) | 60 | $ 3 20 | $ 192 00 |
| | | | $ 9,103 92 |

**SOFTWARE**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Windows NT Server 4 0 5 user license | 0 | $ 713 00 | $ - |
| Windows NT Server 4 0 20 Quantity Client Access License | 0 | $ 581 00 | $ - |
| Microsoft Services for Netware - for Windows NT Server 4 0 | 0 | $ 131 00 | $ - |
| Microsoft Windows 95 | 0 | $ 179 00 | $ - |
| MS Office Pro | 0 | $ 529 00 | $ |
| SMTP Mail Server | 0 | $ 1 295 00 | $ - |
| Proxy Server | 0 | $ 700 00 | $ - |

| | | | |
|---|---|---|---|
| LDAP Server | 0 | $ 995 00 | $ - |
| IP Stack for 16 bit computers | 3 | $ 69 00 | $ 207 00 |
| | | | $ 207 00 |

**SERVICES (In Man Weeks)**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Transceiver & Antenna Installation (includes per diem) | 0 | $ 4,300 00 | $ - |
| Network Cabling and Testing | 5 | $ 437 50 | $ 2,187 50 |
| Server Installation & Configuration | 0 | $ 1,093 75 | $ - |
| Client Configuration | 5 | $ 437 50 | $ 2,187 50 |
| Strategic Management Training | 1 | $ 4,300 00 | $ 4,300 00 |
| WAN Management Training | 0 | $ 1,093 75 | $ - |
| Network Management Training | 0 | $ 1,093 75 | $ - |
| User Training | 1 | $ 1,093 75 | $ 1,093 75 |
| | | | $ 9,768 75 |

**Miscellaneous Expenses**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Air Travel for International Experts | 0 | $ 2,864 00 | $ - |
| | | | |
| | | | $ - |

**Sub-Total of Fixed Costs** $ 19,079 67

**SUBSIDY OF RECURRENT COSTS (In Months)**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Connection to national router - 2 | 0 | $ 1,580 00 | $ - |
| Leased Line Internet Connection | 0 | $ 1,713 33 | $ - |
| Dedicated Phone Line | 0 | $ 133 33 | $ - |
| | | | $ - |

**Total Costs** $ 19,079 67

NOTES

1 based on C SPEC OverLAN Wireless Bridge RF-10 which includes internal routing of IP If this feature is not included in selected technology, a router should be included

2 SOTELMA is currently unable to provide the cost of this service This estimate is based on the reasonable assumption of a direct internet connection costs minus leased line costs

**FSJE - Implementation Costs**

**HARDWARE**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Bridge Transceiver | 1 | $ 8,595 00 | $ 8,595 00 |
| Omni Directional Antenna | 0 | $ 775 00 | $ |
| Directional Antenna | 1 | $ 415 00 | $ 415 00 |
| Cable connection kit + 150 ft cable | 1 | $ 979 00 | $ 979 00 |
| Lightning Protector | 1 | $ 199 00 | $ 199 00 |
| 3 year warranty (2 year extension) oh wireless equipment | 1 | $ 795 00 | $ 795 00 |
| Servers | 1 | $ 12,249 00 | $ 12,249 00 |
| Workstations | 0 | $ 3,102 00 | $ - |
| HP LaserJet 6 MP Printer w/ parallel and Jet Direct ethernet interfaces | 0 | $ 949 00 | $ - |
| Toner Cartridges for HP LaserJet Printer | 0 | $ 85 00 | $ - |
| HP DeskJet Printer w/ parallel interface | 0 | $ 349 00 | $ - |
| DeskJet Printer Cartridges (black) | 3 | $ 29 00 | $ 87 00 |
| NIC (Network Interface Cards) | 30 | $ 176 00 | $ 5,280 00 |
| Hub, 16 port 10Base T, unmanaged | 5 | $ 199 00 | $ 995 00 |
| 8 Port Ethernet Switch with 10/100 uplink | 1 | $ 599 00 | $ 599 00 |
| APC smart UPS power supply with APC Power Chute | 1 | $ 654 00 | $ 654 00 |
| Digital tape Backup unit w/ Arkserver Backup Software | 1 | $ 1,174 00 | $ 1,174 00 |
| Digital tapes for backup unit | 7 | $ 26 00 | $ 182 00 |
| 28 8 Modem | 0 | $ 163 00 | $ |
| CAT 5 UTP Cable (in meters) | 1000 | $ 0 88 | $ 880 00 |
| Patch cables 5ft w/RJ45 connectors | 41 | $ 9 50 | $ 389 50 |
| Patch cables 10ft w/RJ45 connectors | 20 | $ 10 50 | $ 210 00 |
| Patch cables 25ft w/RJ45 connectors | 20 | $ 14 50 | $ 290 00 |
| High density module connector CAT 5 | 41 | $ 5 99 | $ 245 59 |
| 2 position flush wall plates | 41 | $ 1 95 | $ 79 95 |
| Plastic Conduit for Cables (in meters) | 120 | $ 3 20 | $ 384 00 |
| | | | $ 34,682 04 |

**SOFTWARE**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Windows NT Server 4 0 5 user license | 1 | $ 713 00 | $ 713 00 |
| Windows NT Server 4 0 20 Quantity Client Access License | 2 | $ 581 00 | $ 1,162 00 |
| Microsoft Services for Netware - for Windows NT Server 4 0 | 0 | $ 131 00 | $ - |
| Microsoft Windows 95 | 0 | $ 179 00 | $ - |
| MS Office Pro | 0 | $ 529 00 | $ |
| SMTP Mail Server | 0 | $ 1 295 00 | $ |
| Proxy Server | 1 | $ 700 00 | $ 700 00 |

| | | | |
|---|---|---|---|
| LDAP Server | 0 | $ 995 00 | $ - |
| IP Stack for 16 bit computers | 5 | $ 69 00 | $ 345 00 |
| | | | $ 2,920 00 |

**SERVICES (In Man Weeks)**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Transceiver & Antenna Installation (includes per diem) | 0 | $ 4,300 00 | $ - |
| Network Cabling and Testing | 8 | $ 437 50 | $ 3,500 00 |
| Server Installation & Configuration | 1 | $ 1,093 75 | $ 1,093 75 |
| Client Configuration | 6 | $ 437 50 | $ 2,625 00 |
| Strategic Management Training | 0 | $ 4,300 00 | $ - |
| WAN Management Training | 1 | $ 1,093 75 | $ 1,093 75 |
| Network Management Training | 2 | $ 1,093 75 | $ 2,187 50 |
| User Training | 1 | $ 1,093 75 | $ 1,093 75 |
| | | | $ 11,593 75 |

**Miscellaneous Expenses**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Air Travel for International Experts | 0 | $ 2,864 00 | $ - |
| | | | |
| | | | $ - |

**Sub-Total of Fixed Costs** $ 49,195 79

**SUBSIDY OF RECURRENT COSTS (In Months)**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Connection to national router - 2 | 0 | $ 1,580 00 | $ - |
| Leased Line Internet Connection | 0 | $ 1,713 33 | $ - |
| Dedicated Phone Line | 0 | $ 133 33 | $ - |
| | | | $ - |

**Total Costs** $ 49,195 79

NOTES

1 - based on C SPEC OverLAN Wireless Bridge RF-10 which includes internal routing of IP If this feature is not included in selected technology, a router should be included

2 SOTELMA is currently unable to provide the cost of this service This estimate is based on the reasonable assumption of a direct internet connection costs minus leased line costs

**IPR/IFR - Implementation Costs**

**HARDWARE**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Bridge Transceiver | 0 | $ 8,595 00 | $ - |
| Omni Directional Antenna | 0 | $ 775 00 | $ - |
| Directional Antenna | 0 | $ 415 00 | $ - |
| Cable connection kit + 150 ft cable | 0 | $ 979 00 | $ - |
| Lightning Protector | 0 | $ 199 00 | $ |
| 3 year warranty (2 year extension) oh wireless equipment | 0 | $ 795 00 | $ |
| Servers | 1 | $ 12 249 00 | $ 12,249 00 |
| Workstations | 0 | $ 3 102 00 | $ - |
| HP LaserJet 6 MP Printer w/ parallel and Jet Direct ethernet interfaces | 0 | $ 949 00 | $ - |
| Toner Cartridges for HP LaserJet Printer | 0 | $ 85 00 | $ - |
| HP DeskJet Printer w/ parallel interface | 1 | $ 349 00 | $ 349 00 |
| DeskJet Printer Cartridges (black) | 5 | $ 29 00 | $ 145 00 |
| NIC (Network Interface Cards) | 0 | $ 176 00 | $ - |
| Hub 16 port 10Base T, unmanaged | 1 | $ 199 00 | $ 199 00 |
| 8 Port Ethernet Switch with 10/100 uplink | 0 | $ 599 00 | $ - |
| APC smart UPS power supply with APC Power Chute | 1 | $ 654 00 | $ 654 00 |
| Digital tape Backup unit w/ Arkserver Backup Software | 1 | $ 1,174 00 | $ 1,174 00 |
| Digital tapes for backup unit | 7 | $ 26 00 | $ 182 00 |
| 28 8 Modem | 0 | $ 163 00 | $ |
| CAT 5 UTP Cable (in meters) | 0 | $ 0 88 | $ - |
| Patch cables 5ft w/RJ45 connectors | 0 | $ 9 50 | $ - |
| Patch cables 10ft w/RJ45 connectors | 0 | $ 10 50 | $ - |
| Patch cables 25ft w/RJ45 connectors | 0 | $ 14 50 | $ - |
| High density module connector CAT 5 | 0 | $ 5 99 | $ - |
| 2 position flush wall plates | 0 | $ 1 95 | $ - |
| Plastic Conduit for Cables (in meters) | 0 | $ 3 20 | $ - |
| | | | $ 14,952 00 |

**SOFTWARE**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Windows NT Server 4 0 5 user license | 1 | $ 713 00 | $ 713 00 |
| Windows NT Server 4 0 20 Quantity Client Access License | 1 | $ 581 00 | $ 581 00 |
| Microsoft Services for Netware for Windows NT Server 4 0 | 0 | $ 131 00 | $ - |
| Microsoft Windows 95 | 0 | $ 179 00 | $ - |
| MS Office Pro | 0 | $ 529 00 | $ |
| SMTP Mail Server | 0 | $ 1,295 00 | $ |
| Proxy Server | 1 | $ 700 00 | $ 700 00 |

| | | | |
|---|---|---|---|
| LDAP Server | 0 | $ 995 00 | $ - |
| IP Stack for 16 bit computers | 0 | $ 69 00 | $ - |
| | | | $ 1,994 00 |

**SERVICES (In Man Weeks)**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Transceiver & Antenna Installation (includes per diem) | 0 | $ 4,300 00 | $ - |
| Network Cabling and Testing | 0 | $ 437 50 | $ - |
| Server Installation & Configuration | 1 | $ 1,093 75 | $ 1,093 75 |
| Client Configuration | 1 5 | $ 437 50 | $ 656 25 |
| Strategic Management Training | 0 | $ 4,300 00 | $ - |
| WAN Management Training | 0 | $ 1,093 75 | $ - |
| Network Management Training | 2 | $ 1,093 75 | $ 2,187 50 |
| User Training | 1 | $ 1,093 75 | $ 1,093 75 |
| | | | $ 5,031 25 |

**Miscellaneous Expenses**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Air Travel for International Experts | 0 | $ 2,864 00 | $ - |
| | | | |
| | | | $ - |

**Sub-Total of Fixed Costs** $ 21,977 25

**SUBSIDY OF RECURRENT COSTS (In Months)**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Connection to national router - 2 | 0 | $ 1,580 00 | $ - |
| Leased Line Internet Connection | 1 | $ 1,713 33 | $ 1,713 33 |
| Dedicated Phone Line | 0 | $ 133 33 | $ - |
| | | | $ 1,713 33 |

**Total Costs** $ 23,690 58

NOTES

1 - based on C SPEC OverLAN Wireless Bridge RF-10 which includes internal routing of IP If this feature is not included in selected technology, a router should be included

2 - SOTELMA is currently unable to provide the cost of this service This estimate is based on the reasonable assumption of a direct internet connection costs minus leased line costs

**ISFRA - Implementation Costs**

**HARDWARE**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Bridge Transceiver | 0 | $ 8,595 00 | $ - |
| Omni Directional Antenna | 0 | $ 775 00 | $ - |
| Directional Antenna | 0 | $ 415 00 | $ - |
| Cable connection kit + 150 ft cable | 0 | $ 979 00 | $ - |
| Lightning Protector | 0 | $ 199 00 | $ |
| 3 year warranty (2 year extension) oh wireless equipment | 0 | $ 795 00 | $ |
| Servers | 0 | $ 12,249 00 | $ |
| Workstations | 4 | $ 3,102 00 | $ 12,408 00 |
| HP LaserJet 6 MP Printer w/ parallel and Jet Direct ethernet interfaces | 0 | $ 949 00 | $ |
| Toner Cartridges for HP LaserJet Printer | 0 | $ 85 00 | $ - |
| HP DeskJet Printer w/ parallel interface | 1 | $ 349 00 | $ 349 00 |
| DeskJet Printer Cartridges (black) | 5 | $ 29 00 | $ 145 00 |
| NIC (Network Interface Cards) | 4 | $ 176 00 | $ 704 00 |
| Hub 16 port 10Base T unmanaged | 1 | $ 199 00 | $ 199 00 |
| 8 Port Ethernet Switch with 10/100 uplink | 0 | $ 599 00 | $ |
| APC smart UPS power supply with APC Power Chute | 4 | $ 654 00 | $ 2,616 00 |
| Digital tape Backup unit w/ Arkserver Backup Software | 0 | $ 1,174 00 | $ |
| Digital tapes for backup unit | 0 | $ 26 00 | $ - |
| 28 8 Modem | 0 | $ 163 00 | $ - |
| CAT 5 UTP Cable (in meters) | 190 | $ 0 88 | $ 167 20 |
| Patch cables 5ft w/RJ45 connectors | 8 | $ 9 50 | $ 76 00 |
| Patch cables 10ft w/RJ45 connectors | 8 | $ 10 50 | $ 84 00 |
| Patch cables 25ft w/RJ45 connectors | 8 | $ 14 50 | $ 116 00 |
| High density module connector CAT 5 | 8 | $ 5 99 | $ 47 92 |
| 2 position flush wall plates | 8 | $ 1 95 | $ 15 60 |
| Plastic Conduit for Cables (in meters) | 8 | $ 3 20 | $ 25 60 |
| | | | $ 16,953 32 |

**SOFTWARE**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Windows NT Server 4 0 5 user license | 0 | $ 713 00 | $ |
| Windows NT Server 4 0 20 Quantity Client Access License | 0 | $ 581 00 | $ |
| Microsoft Services for Netware for Windows NT Server 4 0 | 0 | $ 131 00 | $ |
| Microsoft Windows 95 | 4 | $ 179 00 | $ 716 00 |
| MS Office Pro | 4 | $ 529 00 | $ 2,116 00 |
| SMTP Mail Server | 0 | $ 1,295 00 | $ |
| Proxy Server | 0 | $ 700 00 | $ - |

| | | | |
|---|---|---|---|
| LDAP Server | 0 | $ 995 00 | $ - |
| IP Stack for 16 bit computers | 4 | $ 69 00 | $ 276 00 |
| | | | $ 3,108 00 |

**SERVICES (In Man Weeks)**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Transceiver & Antenna Installation (includes per diem) | 0 | $ 4,300 00 | $ - |
| Network Cabling and Testing | 2 | $ 437 50 | $ 875 00 |
| Server Installation & Configuration | 0 | $ 1,093 75 | $ - |
| Client Configuration | 2 | $ 437 50 | $ 875 00 |
| Strategic Management Training | 0 | $ 4,300 00 | $ |
| WAN Management Training | 0 | $ 1,093 75 | $ |
| Network Management Training | 0 | $ 1,093 75 | $ - |
| User Training | 1 | $ 1,093 75 | $ 1,093 75 |
| | | | $ 2,843 75 |

**Miscellaneous Expenses**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Air Travel for International Experts | 0 | $ 2,864 00 | $ - |
| | | | |
| | | | $ - |

| | |
|---|---|
| **Sub-Total of Fixed Costs** | $ 22,905 07 |

**SUBSIDY OF RECURRENT COSTS (In Months)**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Connection to national router - 2 | 0 | $ 1,580 00 | $ |
| Leased Line Internet Connection | 0 | $ 1,713 33 | $ - |
| Dedicated Phone Line | 0 | $ 133 33 | $ |
| | | | $ |

| | |
|---|---|
| **Total Costs** | $ 22,905 07 |

NOTES

1 - based on C SPEC OverLAN Wireless Bridge RF-10 which includes internal routing of IP If this feature is not included in selected technology, a router should be included

2 - SOTELMA is currently unable to provide the cost of this service This estimate is based on the reasonable assumption of a direct internet connection costs minus leased line costs

**IUG - Implementation Costs**

**HARDWARE**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Bridge Transceiver | 1 | $ 8,595 00 | $ 8,595 00 |
| Omni Directional Antenna | 1 | $ 775 00 | $ 775 00 |
| Directional Antenna | 0 | $ 415 00 | $ - |
| Cable connection kit + 150 ft cable | 1 | $ 979 00 | $ 979 00 |
| Lightning Protector | 1 | $ 199 00 | $ 199 00 |
| 3 year warranty (2 year extension) oh wireless equipment | 1 | $ 795 00 | $ 795 00 |
| Servers | 1 | $ 12,249 00 | $ 12,249 00 |
| Workstations | 0 | $ 3,102 00 | $ |
| HP LaserJet 6 MP Printer w/ parallel and Jet Direct ethernet interfaces | 0 | $ 949 00 | $ |
| Toner Cartridges for HP LaserJet Printer | 0 | $ 85 00 | $ |
| HP DeskJet Printer w/ parallel interface | 2 | $ 349 00 | $ 698 00 |
| DeskJet Printer Cartridges (black) | 10 | $ 29 00 | $ 290 00 |
| NIC (Network Interface Cards) | 22 | $ 176 00 | $ 3,872 00 |
| Hub 16 port 10Base T, unmanaged | 2 | $ 199 00 | $ 398 00 |
| 8 Port Ethernet Switch with 10/100 uplink | 1 | $ 599 00 | $ 599 00 |
| APC smart UPS power supply with APC Power Chute | 1 | $ 654 00 | $ 654 00 |
| Digital tape Backup unit w/ Arkserver Backup Software | 1 | $ 1,174 00 | $ 1,174 00 |
| Digital tapes for backup unit | 7 | $ 26 00 | $ 182 00 |
| 28 8 Modem | 0 | $ 163 00 | $ - |
| CAT 5 UTP Cable (in meters) | 320 | $ 0 88 | $ 281 60 |
| Patch cables 5ft w/RJ45 connectors | 22 | $ 9 50 | $ 209 00 |
| Patch cables 10ft w/RJ45 connectors | 10 | $ 10 50 | $ 105 00 |
| Patch cables 25ft w/RJ45 connectors | 10 | $ 14 50 | $ 145 00 |
| High density module connector CAT 5 | 22 | $ 5 99 | $ 131 78 |
| 2 position flush wall plates | 22 | $ 1 95 | $ 42 90 |
| Plastic Conduit for Cables (in meters) | 80 | $ 3 20 | $ 256 00 |
| | | | $ 32,630 28 |

**SOFTWARE**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Windows NT Server 4 0 5 user license | 1 | $ 713 00 | $ 713 00 |
| Windows NT Server 4 0 20 Quantity Client Access License | 3 | $ 581 00 | $ 1,743 00 |
| Microsoft Services for Netware - for Windows NT Server 4 0 | 0 | $ 131 00 | $ |
| Microsoft Windows 95 | 0 | $ 179 00 | $ |
| MS Office Pro | 0 | $ 529 00 | $ |
| SMTP Mail Server | 0 | $ 1,295 00 | $ - |
| Proxy Server | 1 | $ 700 00 | $ 700 00 |

| | | | |
|---|---|---|---|
| LDAP Server | 0 | $ 995 00 | $ - |
| IP Stack for 16 bit computers | 19 | $ 69 00 | $ 1,311 00 |
| | | | $ 4,467 00 |

**SERVICES (In Man Weeks)**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Transceiver & Antenna Installation (includes per diem) | 0 | $ 4,300 00 | $ - |
| Network Cabling and Testing | 3 | $ 437 50 | $ 1,312 50 |
| Server Installation & Configuration | 1 | $ 1,093 75 | $ 1,093 75 |
| Client Configuration | 4 | $ 437 50 | $ 1,750 00 |
| Strategic Management Training | 0 | $ 4,300 00 | $ - |
| WAN Management Training | 1 | $ 1,093 75 | $ 1,093 75 |
| Network Management Training | 2 | $ 1,093 75 | $ 2,187 50 |
| User Training | 1 | $ 1,093 75 | $ 1,093 75 |
| | | | $ 8,531 25 |

**Miscellaneous Expenses**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Air Travel for International Experts | 0 | $ 2,864 00 | $ - |
| | | | |
| | | | $ - |

**Sub-Total of Fixed Costs** $ 45,628 53

**SUBSIDY OF RECURRENT COSTS (In Months)**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Connection to national router 2 | 0 | $ 1,580 00 | $ - |
| Leased Line Internet Connection | 0 | $ 1,713 33 | $ - |
| Dedicated Phone Line | 0 | $ 133 33 | $ - |
| | | | $ - |

**Total Costs** $ 45,628 53

NOTES

1 based on C SPEC OverLAN Wireless Bridge RF-10 which includes internal routing of IP If this feature is not included in selected technology, a router should be included

2 SOTELMA is currently unable to provide the cost of this service This estimate is based on the reasonable assumption of a direct internet connection costs minus leased line costs

**RECTORAT - Implementation Costs**

**HARDWARE**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Bridge Transceiver | 1 | $ 8,595 00 | $ 8,595 00 |
| Omni Directional Antenna | 1 | $ 775 00 | $ 775 00 |
| Directional Antenna | 0 | $ 415 00 | $ - |
| Cable connection kit + 150 ft cable | 1 | $ 979 00 | $ 979 00 |
| Lightning Protector | 1 | $ 199 00 | $ 199 00 |
| 3 year warranty (2 year extension) oh wireless equipment | 1 | $ 795 00 | $ 795 00 |
| Servers | 1 | $ 12,249 00 | $ 12,249 00 |
| Workstations | 0 | $ 3,102 00 | $ - |
| HP LaserJet 6 MP Printer w/ parallel and Jet Direct ethernet interfaces | 0 | $ 949 00 | $ - |
| Toner Cartridges for HP LaserJet Printer | 0 | $ 85 00 | $ - |
| HP DeskJet Printer w/ parallel interface | 0 | $ 349 00 | $ - |
| DeskJet Printer Cartridges (black) | 0 | $ 29 00 | $ - |
| NIC (Network Interface Cards) | 0 | $ 176 00 | $ - |
| Hub, 16 port 10Base-T, unmanaged | 1 | $ 199 00 | $ 199 00 |
| 8 Port Ethernet Switch with 10/100 uplink | 0 | $ 599 00 | $ - |
| APC smart UPS power supply with APC Power Chute | 1 | $ 654 00 | $ 654 00 |
| Digital tape Backup unit w/ Arkserver Backup Software | 1 | $ 1,174 00 | $ 1,174 00 |
| Digital tapes for backup unit | 7 | $ 26 00 | $ 182 00 |
| 28 8 Modem | 0 | $ 163 00 | $ - |
| CAT 5 UTP Cable (in meters) | 340 | $ 0 88 | $ 299 20 |
| Patch cables 5ft w/RJ45 connectors | 14 | $ 9 50 | $ 133 00 |
| Patch cables 10ft w/RJ45 connectors | 10 | $ 10 50 | $ 105 00 |
| Patch cables 25ft w/RJ45 connectors | 10 | $ 14 50 | $ 145 00 |
| High density module connector CAT 5 | 14 | $ 5 99 | $ 83 86 |
| 2 position flush wall plates | 14 | $ 1 95 | $ 27 30 |
| Plastic Conduit for Cables (in meters) | 40 | $ 3 20 | $ 128 00 |
| | | | $ 26,722 36 |

**SOFTWARE**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Windows NT Server 4 0 5 user license | 1 | $ 713 00 | $ 713 00 |
| Windows NT Server 4 0 20 Quantity Client Access License | 1 | $ 581 00 | $ 581 00 |
| Microsoft Services for Netware - for Windows NT Server 4 0 | 0 | $ 131 00 | $ - |
| Microsoft Windows 95 | 0 | $ 179 00 | $ - |
| MS Office Pro | 0 | $ 529 00 | $ - |
| SMTP Mail Server | 0 | $ 1,295 00 | $ - |

| | | | |
|---|---|---|---|
| Proxy Server | 1 | $ 700 00 | $ 700 00 |
| LDAP Server | 0 | $ 995 00 | $ - |
| IP Stack for 16 bit computers | 5 | $ 69 00 | $ 345 00 |
| | | | $ 2,339 00 |

**SERVICES (In Man Weeks)**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Transceiver & Antenna Installation (includes per diem) | 0 | $ 4,300 00 | $ - |
| Network Cabling and Testing | 3 | $ 437 50 | $ 1,312 50 |
| Server Installation & Configuration | 1 | $ 1,093 75 | $ 1,093 75 |
| Client Configuration | 1 | $ 437 50 | $ 437 50 |
| Strategic Management Training | 1 | $ 4,300 00 | $ 4,300 00 |
| WAN Management Training | 1 | $ 1,093 75 | $ 1,093 75 |
| Network Management Training | 2 | $ 1,093 75 | $ 2,187 50 |
| User Training | 1 | $ 1,093 75 | $ 1,093 75 |
| | | | $ 11,518 75 |

**Miscellaneous Expenses**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Air Travel for International Experts | 0 | $ 2,864 00 | $ - |
| | | | |
| | | | $ - |

| | |
|---|---|
| **Sub-Total of Fixed Costs** | $ 40,580 11 |

**SUBSIDY OF RECURRENT COSTS (In Months)**

| Item | Quantity | Unit Price | Total |
|---|---|---|---|
| Wireless Connection to national router - 2 | 0 | $ 1,580 00 | $ - |
| Leased Line Internet Connection | 0 | $ 1,713 33 | $ - |
| Dedicated Phone Line | 0 | $ 133 33 | $ - |
| | | | $ - |

| | |
|---|---|
| **Total Costs** | $ 40,580 11 |

NOTES

1 based on C-SPEC OverLAN Wireless Bridge RF-10 which includes internal routing of IP If this feature is not included in selected technology, a router should be included

2 - SOTELMA is currently unable to provide the cost of this service This estimate is based on the reasonable assumption of a direct internet connection costs minus leased line costs

## PERSONAL COMPUTER CONFIGURATION

| # | DESCRIPTION | Cost US$ |
|---|---|---|
| 1 | Pentium processor operating at least at 166 MHz | $ 2,200 |
| | 2 Gb size hard drive with an access time of less than 15 ms | * |
| | Cache memory 256 Kb external | |
| | 32 Mb of memory installed, expandable to at least 32 Mb (70 ns SIMMS minimum speed) | $ 158 |
| | Floppy disk drives (3 5 & 5 25) | $ 87 |
| | 4X CD ROM Drive | $ 188 |
| | Mouse compatible Microsoft | * |
| | 2 Serial ports/2 parallel | $ 40 |
| | 220 volts power supply using French power plug and at least 250 Watts capacity | $ 16 |
| | Minimum of 6 - 16 bit expansion slots and at least two 32 bit expansion slots | * |
| | PCI Local Bus | * |
| | 3COM Etherlink III Ethernet Network Adapter Card with at least RJ45 connectors - Auto configuring | $ 176 |
| 2 | SVGA monitor operating at 220 volts and card with a minimum of 1 Mb of memory - monitor to connect directly to the PC and turn on and off with the PC | $ 237 |
| 3 | Enhanced minimum of a 101-key "Tactile" type click keyboard - US keyboard | * |
| 4 | Desktop case | * |
| | **SINGLE UNIT TOTAL** | $ 3,102 |

* = included in base configuration price

## REVISED FILE SERVER CONFIGURATION

| # | DESCRIPTION | Cost US$ |
|---|---|---|
| 1 | Pentium processor operating at least at 266 MHz | $ 6,410 |
| | (2) 1 2 Gb minimum SCSI hard disks with an access time of less than 13 ms | $ 1,894 |
| | 400 Mb minimum SCSI hard drive with an access time of less than 13 ms | * |
| | 32 bit VESA SCSI-2 controller cards to operate the three hard drives | $ 360 |
| | Cache memory 256 Kb external | * |
| | 128 Mb of memory installed, expandable to at least 256 Mb (60 ns SIMMS minimum speed) | $ 948 |
| | Internal CD-ROM, 8X speed minimum | $ 239 |
| | Floppy disk drive - 3 5 inch 1 4 Mb (on the top as "A" drive) | * |
| | Mouse compatible Microsoft | * |
| | Serial Ports | * |
| | (2) Parallel port | * |
| | 220 volts power supply using a French power plug and at least 300 watts capacity | $ 1,985 |
| | Minimum of 8 -32 bit expansion slots | * |
| | PCI Local Bus | * |
| | 3COM Etherlink III Ethernet Network Adapter Cards with at least RJ45 connectors - Auto configuring | $ 176 |
| 2 | VGA monitor operating at 220 volts | $ 237 |
| 3 | Enhanced minimum of a 101 key "Tactile" type click keyboard, US keyboard | * |
| 4 | Tower case | * |
| | **Sub-Total** | **$12,249** |

* = included in base configuration price

**Results of Development Partner Surveys**

The study team visited one priority partner institution identified by each of the SO Teams to determine their readiness for connection to the Internet During the interviews, it was found that the partners were at disparate levels of development, knowledge of the Internet, and capacity to support and sustain Internet connectivity Given the large number of partners, their varying capacities, and limited resources, it was determined that the grant/proposal program was appropriate and a more manageable approach for InfoComm

The following is a brief description of the potential partner institutions interviewed during the study

**Groupe Pivot Sante (GPS)** is an association of 100 health-related organizations located throughout Mali GPS itself has Internet access on one computer through an ISP, but none of its members currently have access in their own organization or through an accessible computer lab GPS is fairly sophisticated in its knowledge of the Internet and the potential uses of Internet resources to further its mission and those of its members For example, GPS could use the Internet to reduce communication costs to and between its members, to promote the missions and information of the different groups through Web pages, and to have access to information databases

What GPS lacks is a dedicated line for Internet connection, resources to extend the Internet to its members, and some of its members lack knowledge of computers and/or the Internet GPS itself would be on a fast track for assistance in that it may need assistance in installing a dedicated dial-up line for its Internet access GPS members, however, would need training in computer and Internet skills and operation and assistance in developing visions for Internet usage and in proposal preparation As the association's organization structure is such that GPS is the central coordinating body of the network, any assistance to members should be coordinated through GPS Specifically, GPS would attend any information sessions about the grant program and the Internet Orientation Workshops and relay the information and training to its members GPS also could assist InfoComm in identifying needs and priority members

One potential option for providing Internet access to GPS members is connecting the Bamako offices of the members Another option is establishing a regional computer facility with access to the Internet that members in that particular region could use Difficulties associated with a regional facility include adequate available facilities, availability of telephone lines for a dial up account, proximity of members to the proposed facility and ability to travel to the facility frequently enough to make having the facility worthwhile

**Lycee Ibrahima Ly (Lycee)**, the largest Malian secondary school, lacks even basic knowledge of the Internet, and has only one computer used exclusively by the Secretaire Generale to compose letters The school needs considerable assistance in developing a knowledge base about computers, the Internet, and management and maintenance of computer networks In terms of available technical expertise, there is a professor at the Lycee who has limited familiarity with

computers, and the school has access to a technician who works on an international project Facilities in the school are poor for supporting a computer lab The library seems to be the only available large space, however, it lacks air conditioning and adequate security

The Lycee would be on the slowest track of the grant program and would need significant assistance in developing a computer and Internet knowledge base, as well as a vision and management plan, before even beginning the proposal process First, the school would need assistance in determining which administration officials and faculty should be involved in the process

**Mission de Décentralisation (Mission)** provides information about and seeks to change the politics of decentralization, and to assist regions in their preparations to accept increasing power and responsibilities The Mission is fairly sophisticated in its knowledge of the Internet and how it could facilitate contacts and the distribution of information It also has a vision of connecting its partners to a Mission network, however, many of their partners lack even basic facilities and knowledge of computers, let alone the Internet

Mission employees use laptop computers for their work, and there is only one laptop with a modem The Mission currently has plans to obtain Internet access and have requested a dedicated line from SOTELMA The Research Triangle Institute (RTI) is providing assistance to the Mission The Mission does not need immediate USAID assistance to connect to the Internet, however, its employees could make use of the Internet Orientation Workshops

**Systeme d'Information du Marché (SIM)** is an organization that collects and distributes information, analyses, and interpretation of the agriculture market in Mali The information is gathered from the different regions of Mali, and is accessible to producers, exporters, international organizations, decision-makers, researchers, etc SIM also represents Mali in the network of SIMs in the region (Côte d'Ivoire, Benin, and Senegal)

The administration of SIM had a very good understanding of the Internet and were able to describe how they could/would use it in furthering their mission They understood the usefulness of maintaining a Web page on which statistical and other information could be posted, to obtain information from similar foreign private and government organizations, and to disseminate faster more information to a wider audience For example, its *Rapport Hebdomadaire* could be posted on a SIM Web page, thus reaching more people in a more cost-effective way than by mail or fax SIM also understood how the Internet could be used in improving the communication and development of the regional SIMs network (however, many of their counterparts in other countries do not have Internet access either)

SIM currently does not have any Internet access and relies on traditional methods to communicate and share information with its constituents, regional partners in Mali, and SIMs in other countries in the region The organization does have four computers that could support Internet access and an appropriate facility with air conditioning and security SIM needs equipment and training for its immediate Internet needs It could also use additional training in

computer and network maintenance As SIM receives assistance from other donor agencies (World Bank, the French, the Canadians, USAID/Mali/SEG etc ), some of the less immediate needs can be met through support from these other partners

**Potential Partner Institutions Survey**

| PARTNER | INTERNET READINESS | APPROPRIATE SPEED | CONNECTIVITY PACKAGE OPTIONS |
|---|---|---|---|
| Groupe Pivot Sante (GPS) | • GPS has Internet access but no dedicated line<br>• 100 members do not have access<br>• Does have a "vision" | • GPS fast track<br>• Members on Workshops track | • Package 1 Basic Connectivity<br>• Training |
| Lycee Ibrahima Ly (Lycee) | • Lacks basic knowledge of Internet<br>• One computer but no access<br>• Needs significant technical and management assistance | • Begin with Workshops<br>• Vision development<br>• Proposal preparation | • Package 1 Basic Connectivity |
| Mission de Decentralisation | • Has plan for Internet access financed by another donor agency<br>• Has vision and other necessary components | • Workshops as necessary for employees | • Package 2 Shared LAN connectivity |
| Systeme d'Information du Marche | • Has computers, facility, some security<br>• Has a vision for immediate Internet and usage, and progressive evolution<br>• Needs modem, dedicated line, access and some training | • Fast track for access and training<br>• Phased approach for larger plan | • Package 2 Shared LAN connectivity |

# LIST OF ACRONYMS

| | |
|---|---|
| CAT 5 UTP | Category 5 Unshielded Twisted Pair cable |
| CNSRT | Centre Nationale de la Recherche Scientific et Technologique |
| DHCP | Dynamic Host Control Protocol |
| EISA | Extended Industry Standard Architecture |
| EMI | Electromagnetic interference |
| ENA | Ecole Nationale d'Administration |
| ENI | Ecole Nationale d'Ingenieurs |
| ENSUP | Ecole Normale Superieure |
| FAST | Faculte des Sciences et Techniques |
| FLASH | Faculte des Lettres, Arts, et Sciences Humaines |
| FMPOS | Faculte de la Medecine, de la Pharmacie et Odontostomagologie |
| FSJE | Faculte des Sciences Juridiques et Economiques |
| GHz | Giga hertz |
| GII | Global Information Infrastructure |
| GRM | Government of Mali |
| GSM | Global System for Mobile |
| IFR | Institut Formation et de Recherche |
| IMAP | Internet Message Access Protocol |
| InfoComm | Information and Communications Special Objective Team, USAID |
| IP | Internet Protocol |
| IPR | Institut Polytechnique Rural |
| ISA | Industry Standard Architecture |
| ISFRA | Institut Superieur de Formation et de Recherche Appliquee |
| ISP | Internet Service Provider |
| IT | Information Technology |
| IUG | Institut Universitaire de Gestion (IUG) |
| Kbps | Kilo bytes per second |
| LAN | Local Area Network |
| LDAP | Lightweight Directory Access Protocol |
| Mbps | Mega bits per second |
| MHz | Mega hertz |
| MOU | Memorandum of Understanding |
| NGO | Non-governmental organization |
| NIC | Network Interface Card |
| NOC | Network Operation Centers |
| NT | Network |
| OS | Operating System |
| PC | Personal computer |
| POP3 | Post Office Protocol 3 |
| PVO | private voluntary organization |
| Rectorat | Rectorat de l'Universite |

| | |
|---|---|
| RRE | Reseau Recherche Education |
| SMTP | Simple Mail Transfer Protocol |
| SO Teams | Strategic Objective Teams, USAID |
| SOW | Scope of Work |
| TCP | Transport Control Protocol |
| The Ministry | Ministere des Enseignements Secondaire, Superieur et de la Recherche Scientifique |
| UPS | Un-interruptible Power Supply |
| USAID | U S Agency for International Development |
| VAR | Value Added Reseller |
| VSAT | Very Small Aperture Terminal |
| WAN | Wide Area Network |

**MALI INTERNET CONNECTIVITY STUDY**
**LIST OF PERSONS INTERVIEWED**
(Organization name follows interviewee)

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# Memorandum of Understanding

# *Protocole d'Accord*

between / *entre*

## The Republic of Mali / *la République du Mali*

and / *et*

## The United States of America / *les Etats-Unis d'Amérique*

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ARTICLE 1 PURPOSE

e United States of America, acting through the Agency for International Development ("USAID"), and the Republic of Mali ("GRM"), acting through the Ministry of Culture and Communications and the Societe des Telecommunications du Mali ("SOTELMA"), hereinafter referred to as the Parties, wish to cooperate in a mutual effort to establish a national Internet gateway USAID wishes to furnish and the GRM wishes to receive in-kind assistance for this purpose Accordingly, the Parties have concluded the present Memorandum of Understanding, hereinafter referred to as the 'MOU," to set forth their understanding with respect to their

ARTICLE 1 OBJET

Le Gouvernement des Etats-Unis, agissant a travers l'Agence des Etats-Unis pour le Developpement International (USAID), et le Gouvernement de la Republique du Mali (GRM), agissant a travers le Ministere de la Culture et de la Communication et la Societe des Telecommunications du Mali (SOTELMA), ci-apres denommes les Parties, se proposent de cooperer en vue de l'etablissement d'un noeud national Internet au Mali L'USAID se propose de fournir et le GRM consent a recevoir une assistance materielle en vue d atteindre cet objectif En consequence, les Parties ont conclu le present Protocole d' Accord afin de formaliser leurs rôles respectifs dans le cadre de cette

undertakings in support of the stated purpose This MOU is not intended to effect an obligation of funds by USAID

The Internet gateway shall assist in the creation of an enabling environment to facilitate electronic networking and access to Global Information Infrastructure technologies such as the Internet, ensure the availability of reliable, competitive, and cost-effective services for accessing the Internet, and increasing broad-based utilization of the Internet to enhance GRM and USAID sustainable development objectives

ARTICLE 2 UNDERTAKINGS OF THE PARTIES

Section 2 1 The U S Government, through USAID, wishes to grant to the GRM in-kind assistance in the form of technical assistance training, commodities and telecommunications services for the establishment of a national Internet gateway or node, over a period of three years from the date of this MOU, or such date as the Parties may agree upon in writing The nature of the assistance and coordination between the Parties is more fully described in the Annexes attached to this MOU

Section 2 2 In the event USAID furnishes assistance described above the GRM shall

2 2 1 Allow access to the national Internet gateway node by public or private entities for all connections managed and/or owned by SOTELMA

activite Ce Protocole d'Accord n'est pas destine a autoriser une reservation de fonds par l'USAID

La passerelle Internet contribuera a creer un environnement propice a l'acces aux reseaux electroniques et aux technologies lies a l'Infrastructure Globale d'Information, tels que l'Internet, a assurer la disponibilite de services fiables d'acces a Internet, et permettra une utilisation plus importante d'Internet en vue de renforcer les objectifs de developpement durable du Gouvernement de la Republique du Mali et de l'USAID

ARTICLE 2 ROLES DES PARTIES

Section 2 1 Le Gouvernement des Etats-Unis, a travers l'USAID, accorde un don au Gouvernement de la Republique du Mali sous forme d'assistance materielle et technique, de formation, d'equipement et materiel et de services de telecommunications pour l'etablissement d'une passerelle ou noeud national Internet au Mali sur une periode de trois ans a compter de la date de signature de ce Protocole d'Accord, ou toute autre date dont auront convenu les Parties par ecrit La nature de l'assistance et de la coordination entre les Parties est plus specifiquement decrite dans les Annexes de ce Protocole

Section 2 2 Si l'USAID fournit l'assistance decrite ci-dessus le Gouvernement de la Republique du Mali

2 2 1 Permettra l'acces au noeud national a des institutions publiques ou privees, sur les mêmes bases d'acces aux lignes de la SOTELMA



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2 2 2 Ensure equal and open access to information on the Internet by the public in Mali, consistent with the laws currently in effect in Mali

2 2 3 Provide appropriate staffing for national Internet gateway operations and management

2 2 4 Make available or cause to make available adequate and appropriate space for the installation of the equipment described in this MOU, including appropriate climate control and security

2 2 5 Will make every effort to provide continuous international Internet gateway telecommunications operations

2 2 6 Will make every effort to provide connectivity to other cities in Mali as telecommunications circuits allow

2 2 7 Ensure that Internet Service Provider(s) will obtain the number of lines required to operate their service, given the physical availability of those lines in the network

2 2 8 SOTELMA may provide Internet services directly to the public, on the same basis as private commercial providers SOTELMA commits itself not to limit access to potential clients by commercial providers in any way, nor to limit in any way the services which may be offered by providers to those clients, such as leased lines or Web site construction, nor to operate its services in any way which may be considered deliberately unprofitable (unfair competition) SOTELMA will, however, attempt to promote the widest diffusion of Internet in Mali by offering 64 KB leased line access to private providers at a lower price than that charged to the general public for a similar capacity line

2 2 2 Assurera un acces equitable et libre du public malien aux informations disponibles sur Internet, sous reserve du respect des lois maliennes

2 2 3 Fournira le personnel adequat pour le fonctionnement et la gestion du noeud national

2 2 4 Fournira ou permettra la fourniture de locaux appropries, en termes d'espace, de climatisation et de securite, pour l'installation de l'equipement decrit dans le present Protocole d'Accord

2 2 5 Mettra tout en oeuvre pour assurer la fiabilite permanente du reseau de telecommunications utilise par le noeud national

2 2 6 Mettra tout en oeuvre pour fournir la connectivite Internet aux autres villes du Mali, au fur et a mesure que les conditions necessaires seront reunies

2 2 7 Assurera aux prestataires de services Internet le nombre de lignes necessaires a leurs operations dans la mesure de la disponiblite des lignes du reseau

2 2 8 La SOTELMA pourra fournir des prestations de services Internet directement au public sur les mêmes bases que les societes privees commerciales La SOTELMA s'engage a ne limiter l'acces a aucune clientele potentielle pour les societes privees, ni les services commercialises, tels que les lignes specialisees ou les sites WEB, et a ne pas commercialiser les services de maniere non rentable (concurrence deloyale) Par contre, dans le but d'encourager une large diffusion de l'Internet au Mali, la SOTELMA offrira les lignes specialisees aux societes prestataires de services a un prix inferieur a celui offert aux autres clients de la SOTELMA pour des lignes de même capacite

2 2 9 A Malian Internet Society will be formed to promote the Internet The role, membership, and responsibilities of the Society will be established and agreed upon by all interested and concerned parties

2 2 10 SOTELMA will provide USAID with an annual report indicating overall development of the Internet sector in Mali, including, inter alia, information on the number of subscribers, volume of Internet traffic, the number of private providers, a breakdown showing types of subscribers (individual vs organizational, Malian vs non-Malian, for example), pricing established for Internet services, SOTELMA costs of operating the Internet gateway and related services, administrative policies, and any Government of Mali policies related to the diffusion of Internet in the country

Section 2 3 The GRM and USAID will jointly undertake to establish a Plan of Action within three months of signing this agreement to accomplish the goals as set forth in the Purpose Statement the creation of an enabling environment to facilitate electronic networking and access to Global Information Infrastructure technologies such as the Internet, ensure the availability of reliable, competitive, and cost-effective services for accessing the Internet, and increasing broad-based utilization of the Internet to enhance GRM and USAID sustainable development objectives The Malian Internet Society will assist in the oversight of the stated objectives

2 2 9 Il sera cree une association nationale pour la promotion de l'Internet dont le rôle, la composition, le fonctionnement et les attributions seront arrêtes de commun accord entre toutes les parties concernees et interessees

2 2 10 La SOTELMA fournira a l'USAID un rapport annuel sur l'evolution globale de l'Internet au Mali Il comprendra, entre autres, des elements tels que le nombre d'utilisateurs, le volume du trafic, le nombre de prestataires prives, la repartition des utilisateurs (entre particuliers et entreprises, Maliens et expatries, par exemple), les tarifs pratiques, les frais de fonctionnement du noeud Internet SOTELMA et les services s'y rattachant, les procedures etablies, et toute politique du gouvernement du Mali liee a la diffusion de l'Internet dans le pays

Section 2 3 Le Gouvernement de la Republique du Mali et l'USAID developperont conjointement un Plan d'Action dans les trois mois suivant la signature du present Protocole, en vue de realiser les objectifs enonces dans la presentation de son objet la creation d un environnement propice a l'acces aux r seaux electroniques et aux technologies lies a l'Infrastructure Globale d'Information, tels que l'Internet, a assurer la disponibilite de services fiables et rentables d'acces a Internet, sur la base d'une saine concurrence et l'accroissement de l'utilisation d'Internet en vue de renforcer les objectifs de developpement durable du Gouvernement de la Republique du Mali et de l'USAID L'association nationale Internet prêtera son assistance pour assurer l'atteinte de ces objectifs



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## ARTICLE 3 STANDARD PROVISIONS

Section 3 1 Relation to Framework Bilateral Agreement In-kind assistance furnished by USAID pursuant to this MOU is considered United States assistance within the scope of the Agreement between the United States of America and the Government of the Republic of Mali relating to Economic and Technical Assistance, signed January 4, 1961, and is subject to the terms and conditions of that Agreement, including provisions relating to exemptions from taxes and customs duties

Section 3 2 Third Party Instruments and Availability of Funds In order to provide the in-kind assistance described above and in the attached Annexes, USAID may enter into such contracts and other instruments with public and private parties as USAID deems appropriate All undertakings of the U S Government pursuant to this MOU are subject to the availability of funds and to further agreement between USAID and such public and private parties, regarding the provision of in-kind assistance This MOU is not intended to effect an obligation of funds by USAID

Section 3 3 Compliance with U S Law and Regulations USAID shall obligate, commit and expend funds and carry out operations pursuant to this MOU only in accordance with the applicable laws and regulations of the United States

Section 3 4 Title to and Use of Property Unless otherwise directed by USAID, title to all property furnished by USAID shall be in the GRM Any property furnished by USAID and titled to the GRM shall be used effectively for the assistance purpose described above and,

## ARTICLE 3 CLAUSES STANDARDS

Section 3 1 Relation avec l'Accord Cadre bilateral L'assistance materielle fournie par l'USAID au terme de cet Accord entre dans le cadre de l'Accord de cooperation entre les Etats-Unis d'Amerique et le Gouvernement de la Republique du Mali, relatif a l'Assistance Economique et Technique et date du 4 janvier 1961, et est conforme aux termes et conditions de cet Accord, y compris les clauses relatives aux exemptions de taxes et de droits de douanes

Section 3 2 Tierce partie et disponibilite des fonds En vue de fournir l'assistance prevue dans le cadre de cet Accord et ses Annexes, l'USAID peut conclure des marches ou toute autre forme de collaboration avec des institutions publiques ou privees, comme elle le jugera necessaire La contribution du Gouvernement des Etats-Unis dans le cadre de cet Accord, se fera sous reserve de la disponibilite des fonds et dans le cadre d'autres accords, en cas de collaboration avec d'autres institutions publiques ou privees Cet Accord n'est pas destine a autoriser une reservation de fonds par l'USAID

Section 3 3 Conformite avec les lois et reglementations des Etats-Unis L'USAID ne pourra reserver, engager et decaisser les fonds relatifs a ce Protocole d'Accord qu'en conformite avec les lois et reglementations de Etats-Unis s'y appliquant

Section 3 4 Droit de propriete et usage Sauf si contrairement indique par l'USAID, tous les equipements et materiels fournis par l'USAID seront la propriete du GRM Ils seront utilises en vue d'atteindre les objectifs fixes par ce Protocole d'Accord et, au terme de l'assistance

upon completion of the assistance, shall be used so as to further the objectives of the assistance If property furnished by USAID and titled to the GRM is used for purposes other than those agreed upon by the Parties, under circumstances which could reasonably have been prevented by appropriate action of the GRM, the GRM shall, upon USAID's request and election, return such property or refund the amount disbursed for such property in U S dollars

les renforcer Si ce n'est pas le cas et si le Gouvernement de la Republique du Mali pouvait raisonnablement en prevoir les circonstances, il devra, sur demande de l'USAID, retourner les equipements ou materiels ou en rembourser le montant en dollars U S

Section 3 5 Records, Audit and Inspection The GRM shall maintain or cause to be maintained, as appropriate, records relating to the assistance adequate to show use and receipt of assistance furnished pursuant to this MOU Records shall be maintained for a period of three years after assistance has been furnished The GRM shall afford authorized representatives of USAID, or their designees, the opportunity at all reasonable times to inspect the site of the assistance and records relating to the assistance

Section 3 5 Archives officielles, audit et inspection Le Gouvernement de la Republique du Mali devra tenir, ou faire tenir, les archives officielles relatives a cette assistance, de maniere appropriee, en vue de permettre l'examen de l'utilisation et la reception de l'assistance fournie dans le cadre de ce Protocole Le Gouvernement de la Republique du Mali devra conserver, ou faire conserver, les archives officielles au moins trois ans apres la fin de l'assistance Pour permettre l'examen des archives a des moments consideres comme raisonnables et inspecter les locaux assignés aux activites de ce Protocole, le Gouvernement de la Republique du Mali en autorisera l'acces aux representants dûment designes de l'USAID

Section 3 6 Publicity The Grantee will give appropriate publicity to the assistance as a program to which the U S Government has contributed

Section 3 6 Couverture publicitaire Le beneficiaire assurera une large publicite a cette activite, en tant que programme auquel a contribue le gouvernement des Etats-Unis

Section 3 7 Information and Implementation Letters USAID and the GRM shall provide each other with such information as may be needed to facilitate provision of the assistance and to evaluate the effectiveness of this assistance In addition, USAID may from time to time issue implementation letters to provide additional information on matters discussed in this MOU The Parties may also use jointly

Section 3 7 Information et Lettres d'Execution L USAID et le GRM echangeront mutuellement les informations requises en vue de faciliter la fourniture de l'assistance et en evaluer l'impact Par ailleurs, l'USAID emettra ponctuellement des Lettres d'Execution pour transmettre des informations supplementaires concernant des questions relatives a ce Protocole Les Parties pourront egalement



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agreed letters to confirm their mutual understandings with respect to implementation of this MOU, including changes in elements of the attached Annexes

Section 3 8 Authorized Representatives The GRM will be represented by the person holding or acting in the office of President and Director General, SOTELMA, and the United States will be represented by the person holding or acting in the office of Director, USAID/Mali Each Party may by written notice, to the other, identify additional representatives authorized to represent that Party for all purposes other than executing formal amendments to this MOU

Section 3 9 Amendment and Modification This MOU may be amended or modified by written agreement of the Parties Elements of the attached Annexes may be changed by written agreement of the Parties without formal amendment of this MOU One year after signature, his MOU will be reviewed to assess accomplishments and progress towards meeting USAID and GRM strategic goals, and prior to defining second year follow-on activities

Section 3 10 Suspension and Termination

(A) Suspension In the event

(i) the GRM fails to comply with any provision of this MOU,

emettre en accord conjoint des correspondances destinees a confirmer leur comprehension mutuelle de certains aspects de l'execution de ce Protocole, y compris les modifications de certains elements des Annexes

Section 3 8 Representants autorises Le Gouvernement de la Republique du Mali sera represente par le President Directeur General de la SOTELMA ou son interimaire et le gouvernement des Etats-Unis par le Directeur de l'USAID Mali ou son interimaire Chaque Partie peut designer d'autres representants autorises a agir au nom de cette Partie dans le cadre de ce Protocole, a l'exception des amendements a celui-ci Chaque Partie doit en aviser l'autre par ecrit

Section 3 9 Amendements et modifications Ce Protocole d'Accord peut être amende par accord ecrit entre les Parties Les elements des annexes jointes peuvent être modifies par accord ecrit entre les Parties, sans amendement officiel de ce Protocole Un an a compter de la date de signature de ce Protocole d'Accord, il fera l'objet d'une revue conjointe qui permettra de mesurer les realisations et les progres accomplis en direction des objectifs strategiques de l'USAID et du Gouvernement de la Republique du Mali, avant la definition des activites qui seront poursuivies la seconde annee

Section 3 10 Suspension et resiliation

(A) Suspension Dans le cas ou

i) le Gouvernement de la Republique du Mali manque a se conformer a l une des clauses de ce Protocole d'Accord



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(ii) USAID determines that an extraordinary situation has occurred which makes it improbable either that the purpose of the MOU will be attained or that the GRM will be able to comply with provisions of the MOU, or

(iii) USAID determines that continuation of assistance would result in a violation of U S law or regulations,

USAID may, at its option, take steps to suspend, in whole or in part, provision of assistance under this MOU and provide written notice of its actions to the GRM In the event of partial suspension, such notice shall specify affected activities If, after sixty (60) days from the date of such notice, USAID determines that the cause or causes for suspension have not been corrected, USAID may terminate assistance and provide written notice of its action to the GRM

(B) Termination Either Party may terminate this MOU, in whole or in part, by giving the other Party thirty (30) days written notice In the event of partial termination, such notice shall specify affected activities Termination of this MOU will terminate any responsibilities of Parties to provide financial or other resources for this activity, except for payments which they are committed to make pursuant to noncancellable commitments entered into with third parties prior to the termination of this MOU Obligations of the GRM set forth in Section 3 4 above relating to use of property furnished under this MOU shall remain in force after termination In addition upon such termination, USAID may, at USAID's expense direct that title to goods

ii) des circonstances exceptionnelles se presentent pouvant compromettre de maniere tres probable l'atteinte des objectifs fixes par ce Protocole d'Accord ou la capacite du Gouvernement de la Republique du Mali a se conformer a ses clauses,

iii) l'USAID determine que la poursuite de l'assistance dans le cadre de ce Protocole resulterait en une violation des lois ou reglementations des Etats-Unis,

l'USAID peut, a sa discretion, prendre des mesures de suspension totale ou partielle de ce Protocole d'Accord et en aviser par ecrit le Gouvernement de la Republique du Mali En cas de suspension partielle, la notification ecrite devra indiquer specifiquement les activites concernees Si, dans les soixante (60) jours qui suivent une telle notification, l'USAID determine que la ou les causes de suspension n'ont pas fait l'objet de rectification, elle pourra mettre un terme a son assistance et en aviser par ecrit le Gouvernement de la Republique du Mali

(B) Resiliation Chaque Partie peut resilier ce Protocole d'Accord, en totalite ou partiellement, en notifiant l'autre Partie par ecrit trente (30) jours a l'avance En cas de resiliation partielle, elle devra indiquer specifiquement les activites affectees La resiliation de ce Protocole d'Accord mettra fin a toute responsabilite des Parties relative a la fourniture d assistance sous forme financiere ou autre a l'exception des engagements pris et non resiliables vis-a-vis de tierces parties, avant la resiliation de celui-ci Les obligations du Gouvernement de la Republique du Mali enoncees dans la Section 3 4 ci-dessus et relatives a l'utilisation des equipements dans le cadre de ce Protocole d'Accord demeurent valides apres une resiliation Par ailleurs en cas



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furnished hereunder be transferred to USAID if the goods are from a source outside Mali, are in a deliverable state, and have not been off loaded in ports of entry of Mali

Section 3 11 Language This MOU is prepared in both English and French In the event of ambiguity or conflict between the two versions, the English language version will control

IN WITNESS WHEREOF, the Parties, each acting through their duly authorized representatives, have caused this MOU to be signed in their names and delivered as of this _____ day of _____, 1996

AUG 0 6 1996

For the United States of America

David P Rawson
U S Ambassador to Mali

Cheryl Jennings
Acting Mali Mission Director
U S Agency for International Development

United States Agency for International Development
USAID
AU MALI

de resiliation, l'USAID peut, a ses propres frais transferer le titre de propriete des biens fournis dans le cadre de ce Protocole d'Accord a l'USAID s'ils proviennent d'une autre source que le Mali, sont livrables et n'ont pas ete decharges dans un port d'acces au Mali

Section 3 11 Langue Ce Protocole d'Accord a ete prepare en Anglais et en Français En cas d'ambiguite ou de contradiction entre les deux versions, la version anglaise prevaudra

EN FOI DE QUOI, les Parties, chacune agissant a travers ses representants dûment habilites, ont signe le present Protocole d'Accord en leur nom et l'ont fait entrer en vigueur ce jour, le _____ 1996

Pour la République du Mali

Bakary Konuba Traore
Ministre de la Culture et de la Communication
Porte-Parole du Gouvernement

Tiemoko Mahamane Maiga
Président Directeur General
Societé des Telecommunications
du Mali



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# ANNEX 1

## PROGRAM DESCRIPTION

### A BACKGROUND

The Government of the Republic of Mali has indicated an interest in bringing access to the full range of Internet services to Mali, to be implemented by the national telecommunications company, *Societe des Telecommunications du Mali* ("SOTELMA") In this regard, a small workshop on the Internet was held in Bamako in January 1996 It was organized by SOTELMA and the Ministry of Industry, Cottage Industries, and Tourism It was sponsored by UNESCO and facilitated by ORSTOM, and it resulted in some key recommendations One of them was that SOTELMA establish a means of access to the Internet and that the following activities be undertaken

- The establishment of a national Internet access server (domain "ML") that would allow for the connection of multiple nodes and for commercial provision of services
- Determination, amongst the various entities, of a structure for usage and for provision of services
- Familiarization of decision-makers to the value of the Internet
  Training of the different groups of users
- Dissemination of information on the Internet to the general public

The United States Government has established a mechanism for providing financial, technical training and policy support for African countries interested in creating a national Internet

# ANNEXE 1

## DESCRIPTION DU PROGRAMME

### A CONTEXTE GENERAL

Le Gouvernement de la Republique du Mali a manifeste son interêt pour l'acces du Mali a toute la gamme de services Internet au Mali, et des actions sont a entreprendre a cet effet par la Societe des Telecommunications du Mali (SOTELMA) A cet egard, un atelier sur l'Internet s'etait tenu en janvier 1996 a Bamako Il avait ete organise par la SOTELMA et le Ministere de l'Industrie, de l'Artisanat et du Tourisme Il avait ete sponsorise par l'UNESCO, avait beneficie de la participation de l'ORSTOM et a abouti a quelques recommandations importantes L'une d'entre elles etait que la SOTELMA etablisse les moyens d'acces a Internet et que les activites suivantes soient entreprises

- Etablissement d'un serveur national d'acces a Internet (domaine "ML") qui permettrait la connection de plusieurs noeuds et la fourniture commerciale de services
- Determination, entre les differentes entites, d'une structure adequate pour l'utilisation et la fourniture des services
  Familiarisation des hauts responsables avec Internet
- Formation des differents groupes d'utilisateurs
- Campagne d'Information du public sur Internet

Le Gouvernement des Etats-Unis a elabore un mecanisme en vue de fournir un appui financier et technique et une assistance dans les domaines de la formation et de la politique sectorielle aux

gateway This mechanism called the Leland Initiative Africa GII (Global Information Infrastructure) Gateway Project, is being implemented by the U S Agency for International Development ("USAID") Also, USAID Mali has as one of its program objectives "improved access to and facilitated use of information in Mali " The establishment of a national Internet gateway is consistent with this objective and will enable information to be exchanged and shared internationally

Therefore, USAID and the Ministry of Culture and Communications have agreed to collaborate in a telecommunications project that will increase access to and facilitate the use of information by citizens of Mali, specifically acce s to the global information infrastructure via a national Internet gateway in Mali This project meets USAID objectives (under the Leland Initiative) to improve connectivity within Africa, increase access by Africans to information worldwide for sustainable development, and enhance Africans' ability to find solutions to African problems by promoting low-cost access to Internet by the maximum number of Malian citizens It also seeks to promote private sector enterprise and partnerships between public and private sector entities and encourage training in state-of-the-art technologies

The project also meets SOTELMA objectives to provide a national gateway for international Internet access to extend Internet access to as many cities and citizens in Mali as possible, to recruit and train the highest possible level of

pays africains manifestant un interet pour l'etablissement d'une passerelle nationale sur Internet Ce mecanisme connu sous le nom de l'Initiative Leland Projet de Passerelle pour l'Afrique sur l'Infrastructure Globale d'Information (*Leland Initiative Africa GII [Global Information Infrastructure] Gateway Project*), est mis en oeuvre par l'Agence des Etats-Unis pour le Developpement International (USAID) Par ailleurs, l'un des objectifs du programme de l'USAID Mali vise a "ameliorer l'acces a l'information au Mali et a en faciliter l'utilisation' L'etablissement d'une passerelle nationale sur Internet est conforme a cet objectif et permettra un echange et un partage de l'information a l'echelle internationale

En consequence, l'USAID et le Ministere de la Culture et de la Communication ont convenu de collaborer dans le cadre d'un projet de telecommunications qui accroitra l'acces du public malien aux informations et en ameliorera l'utilisation, en liaison en particulier avec l'infrastructure globale d'information, a travers une passerelle nationale Internet au Mali Ce projet est conforme aux objectifs de l'USAID (dans le cadre de l'Initiative Leland) qui visent a ameliorer la connectivite de l'Afrique, a accroître l'acces des Africains a l'information sur le plan international, en vue d'un developpement durable, et a renforcer les capacites permettant de trouver des solutions aux problemes de l'Afrique en favorisant l'acces a Internet a un prix accessible pour le plus grand nombre de Maliens possible Il vise aussi a promouvoir le developpement du secteur prive et le partenariat entre les institutions des secteurs public et prive et a encourager la formation dans les technologies de pointe

Le projet est egalement conforme aux objectifs de la SOTELMA qui visent a fournir une passerelle nationale pour l'acces a Internet, a etendre l'acces a Internet a autant de villes et de citoyens que possible au Mali, a selectionner et

engineering talent, and to increase public access to modern telecommunications systems and services

## B PLAN OF ACTION

USAID wishes to capitalize on the opportunities described above to provide funding through the Leland Initiative project for SOTELMA's establishment of a national Internet access server In doing so, it would be able to address the key issues and potential barriers to the establishment of an appropriate environment

USAID has an opportunity to be a catalyst for collaboration and cooperation by providing venues and a medium for enhanced communication, and a vehicle for human resources interventions Additionally, the establishment of a Malian Internet Society will assist in the overall development of the Internet in Mali

The next set of activities would be to determine institutional strengthening requirements of SOTELMA, prepare a detailed design of the computer and telecommunications infrastructure, and determine an appropriate structure for collaboration between SOTELMA and Internet Service Providers Specific tasks which USAID will assist with include

Organizational Strengthening

- Conduct interviews with SOTELMA managers and technical personnel to articulate organizational objectives and the related network management requirements

former ses cadres au plus haut niveau possible et a accroître l'acces du public aux systemes et services de telecommunications modernes

## B PLAN D'ACTION

L'USAID souhaite capitaliser sur les opportunes decrites ci-dessus en fournissant, a travers le Projet Initiative Leland, le financement requis pour l'etablissement d'un serveur national d'acces a Internet De cette maniere, l'USAID pourrait s'adresser aux problemes fondamentaux et aux barrieres potentielles a l'etablissement d'un environnement incitatif

L'USAID a l'opportunite de jouer un rôle de catalyseur en suscitant la collaboration et la cooperation et en fournissant un mecanisme et des moyens de renforcer la communication et un outil pour les interventions dans les domaines des ressources humaines Par ailleurs, l'etablissement d'une association nationale pour la promotion d'Internet a pour objectif de contribuer au developpement global d'Internet au Mali

L'etape suivante consistera a determiner les besoins pour la gestion du noeud national, preparer les specifications techniques detaillees du systeme informatique et de telecommunications et definir une structure appropriee de collaboration entre la SOTELMA et tous les utilisateurs d'Internet Les actions specifiques sont

Renforcement Organisationnel

- Organiser des sessions de travail avec la direction de la SOTELMA et les responsables techniques en vue d'articuler les objectifs en termes d'organisation et de besoins relatifs a la gestion du noeud national

- Recommend organizational improvements for SOTELMA, with respect to its new responsibilities as manager of the Internet national node

- Prepare recommended national Internet node and access provider management and organizational structure including staffing and skill level requirements

- Prepare and implement a detailed training program for personnel from SOTELMA and related organizations (including both private providers and users) to ensure adequate skill levels

Organizational Relationships

- Identify appropriate organizations (both private providers and clients) which will require access to an Internet node and recommend optimal structure of the relationship to those organizations

- Recommend the most appropriate approach for the collaboration and relationship between SOTELMA and private and/or non-profit Internet Service Providers, and end-users

- Provide recommendations for marketing Internet services

Analysis of Existing Systems and Technological Environment

- Conduct an inventory and analysis of current digital data communications hardware, software and architecture

- Fournir a la SOTELMA des recommandations organisationnelles dans le cadre des ses nouvelles responsabilites dans la mise en place de l'Internet

- Proposer des recommandations pour la gestion du noeud national et des fournisseurs de services et la structure organisationnelle en termes de besoins en personnel et en competences

- Elaborer et mettre en oeuvre un programme detaille de formation pour le personnel de la SOTELMA et les institutions concernees (fournisseurs de services et utilisateurs), en vue d'assurer un niveau de competences adequat

Relations organisationnelles

- Identifier les institutions (fournisseurs de services et utilisateurs) appropriees qui pourront se brancher sur le noeud national et recommander une structure optimale de collaboration

- Faire des recommandations sur la meilleure approche a adopter dans la collaboration et les relations entre la SOTELMA et les fournisseurs de services Internet prives (commerciaux ou non) et les utilisateurs

- Faire des recommandations pour la promotion des services Internet

Analyse des systemes existants et de l'environnement technologique

- Faire l'inventaire et l'analyse de l'equipement et du materiel de communication numerique existants, ainsi que des logiciels et de l'architecture des systemes

- Identify and describe existing digital data communications linkages to external networks including technological and organizational relationships

Detailed System Design

- Prepare the design of an appropriate national Internet node and network for SOTELMA as the national Internet access provider including i) linkages to the foreign Internet node, ii) linkages to the existing digital data communications systems, and iii) means of access for individuals and institutions

- Prepare detailed system design specifications including i) system functions and features, and ii) hardware, software, and networking configuration and iii) operating environment, showing linkages with existing equipment

- Prepare a network development and implementation program

- Prepare a plan of operation and management for the on-going use and maintenance of the system

Financial Analysis

- Prepare detailed cost estimates for the network development and implementation

  Prepare an estimate of recurrent costs for system operation and maintenance

- Identifier et decrire les liaisons de communication numerique actuellement etablies avec les reseaux exterieurs, y compris les liaisons technologiques et organisationnelles

Conception detaillee du systeme

- Faire la conception d'un noeud Internet national approprie et du reseau de la SOTELMA, en tant que fournisseur national d'acces a Internet, y compris I) liens avec le noeud Internet exterieur, ii) liens avec les systemes de communication numerique existants, et iii) moyens d'acces pour les particuliers ou institutions

- Preparer les specifications detaillees du systeme, y compris i) ses fonctions et caracteristiques, ii) l'equipement, les logiciels et la configuration du reseau, iii) l'environnement et les interfaces avec les equipements existants

- Preparer un programme de developpement et de mise en oeuvre du reseau

- Preparer un plan de fonctionnement et de gestion pour l'utilisation et l'entretien du systeme

Analyse financiere

- Preparer des estimations de coûts pour l'installation et le fonctionnement du reseau

- Preparer une estimation des coûts d'exploitation pour le fonctionnement et l'entretien du systeme

- Recommend a fee and pricing structure for access to SOTELMA's Internet gateway by Internet service providers and other potential SOTELMA clients

- Prepare a profitability analysis of the system for the first two years of operation

## C IMPLEMENTATION PLAN

Based on the results of the analyses described above, USAID wishes to provide SOTELMA with the following

- basic equipment for a national Internet hub, as described in Annex 2,

  technical assistance in equipment installation and configuration, a design of the establishment of an Intranet for the SOTELMA

- training in UNIX and internet fundamentals,

- support for obtaining an international circuit to the US

- ongoing assistance and technical support,

- a commitment to provide spare parts, as needed, for a period of three years

- provision of French-language operating manuals

- assistance to SOTELMA in obtaining, via the Malian Internet Society, (registration of the ML domain and associated IP addresses),

- Proposer une structure des prix pour la fourniture de l'acces a Internet par la SOTELMA aux fournisseurs de services Internet et aux autres clients potentiels de la SOTELMA

- Faire une etude de rentabilite du systeme sur deux (2) ans

## C PLAN D'EXECUTION

Sur la base des analyses decrites ci-dessus, l'USAID se propose de fournir a la SOTELMA

- L'equipement de base pour l'etablissement d'un noeud national Internet, tel que decrit dans l'Annexe 2

- L'assistance technique pour l'installation et la configuration de l'equipement, et l'elaboration d'un plan de mise en place de l'Intranet au niveau de la SOTELMA,

- Une formation sur le syteme UNIX et sur les bases de l'Internet,

- Un appui pour la liaison avec le circuit international,

- Une assistance continue et un appui technique,

- Une garantie de fourniture de pieces de rechange pendant trois ans,

- Des manuels d'exploitation en français

- L appui a la SOTELMA pour l enregistrement au niveau d'*Internet Society* (obtention d'un numero IP et configuration du domaine ML),



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- technical and material assistance in establishing three points of presence in secondary cities outside of Bamako to the extent that funds are available

With the prior agreement of both Parties, this implementation plan may be modified as a result of the availability of funds or other resources from donors which would like to support the establishment of Internet in Mali

- L'assistance technique et materielle pour la connexion de trois villes secondaires au noeud national dans la mesure de la disponibilite de fonds

Avec l'accord prealable des deux Parties, ce plan d'execution peut être modifie en fonction de la disponibilite de fonds et des contributions d'autres bailleurs de fonds qui se joindront a la mise en place de l'Internet au Mali

# ANNEX 2 / *ANNEXE 2*

## ILLUSTRATIVE EQUIPMENT AND SERVICES TO BE SUPPLIED BY USAID

## *EQUIPEMENT ET SERVICES FOURNIS PAR L'USAID (A TITRE INDICATIF)*

Note The US Dollar amounts shown in the following table, as well as the quantity, brand and model of equipment proposed, are illustrative and do not constitute a commitment on the part of USAID

*Note les montants en dollars U S presentes dans le tableau ci-dessous, ainsi que les quantites, les marques et les modeles de l'equipement propose ne sont qu'indicatifs et ne constituent pas un engagement de la part de l'USAID*

| EQUIPMENT FOR NATIONAL INTERNET GATEWAY<br>*EQUIPEMENT POUR LA PASSERELLE NATIONALE INTERNET* | |
|---|---|
| Router (2 Cisco 4000s) / *routeurs* | US$20,000 |
| Concentrator (Synoptics) and Routers to/from ISPs (5 Cisco 2511s)<br>*Concentrateur (Synoptics) et Routeurs pour ISPs (5 Ciscos 2511)* | 15,000 |
| PC for national public WWW server (Pentium)<br>*PC pour serveur public WWW (Pentium)* | 7,000 |
| PC for development of WWW (Pentium)<br>*PC pour le developpement de WWW (Pentium)* | 7,000 |
| PC for network control and accounting<br>*PC pour le contrôle du reseau et la comptabilite* | 7,000 |
| Workstation for security management (Sun SPARC 5, 64 MB RAM, 5 GB HDD) *Poste de travail pour la gestion du systeme de securite* | 20,000 |
| Tape backup system / *Systeme de backup* | 3,000 |
| Software / *Logiciels* | 11 000 |
| Shipping / *Fret* | 10 000 |
| Sub-total / *Sous-total* | 100 000 |

| SYSTEM DEVELOPMENT, RESEARCH, AND TRAINING EQUIPMENT<br>*DEVELOPPEMENT DU SYSTEME ET EQUIPEMENT POUR LA FORMATION* | |
|---|---|
| Router / *Routeur* (Cisco 2516) | 5,000 |
| PC for WWW server (Pentium) / *PC pour serveur WWW* | 7,000 |
| PC for control and accounting / *PC pour le contrôle et la comptabilite* | 7,000 |
| Terminal server (with 16 modems) / *Serveur terminal(avec 16 modems)* | 10,000 |
| Software / *Logiciels* | 4,000 |
| Shipping / *Fret* | 7,000 |
| **Sub-total / *Sous-total*** | **40,000** |
| ENGINEERING, TRAINING, AND TECHNICAL SUPPORT<br>*CONCEPTION FORMATION ET APPUI TECHNIQUE* | |
| UNIX fundamentals / *Bases pour UNIX* | 15,000 |
| Internet configuration and setup / *Configuration et installation d'Internet* | 15,000 |
| (to be determined) / *(a determiner)* | 50,000 |
| **Sub-total / *Sous-total*** | **80,000** |
| INTERNATIONAL SATELLITE LINK<br>*LIAISON AVEC LE SATELLITE INTERNATIONAL* | |
| Year 1 (80% of cost) / *Annee 1 (80% des coûts)* | 30,000 |
| Year 2 (60% of cost) / *Annee 2 (60% des coûts)* | 25,000 |
| Year 3 (25% of cost) / *Annee 3 (25% des coûts)* | 10,000 |
| **Sub-total / *Sous-total*** | **65,000** |
| MISCELLANEOUS / *IMPREVUS* | |
| Miscellaneous / *Imprevus* | 15 000 |
| TOTAL COST / *MONTANT TOTAL* | **$300 000** |

# AGREEMENT

# BETWEEN

# THE REPUBLIC OF MALI

# AND

# THE UNITED STATES OF AMERICA

# TO ESTABLISH

# THE MALI GLOBAL INFORMATION INFRASTRUCTURE

Dated November 20, 1997

THIS AGREEMENT is entered into by and between the Government of the Republic of Mali ("GRM"), represented by President Alpha Oumar Konare, and the Government of the United States of America, acting through the United States Agency for International Development ("USAID", the GRM and USAID are hereinafter referred to a the "Parties")

WHEREAS, USAID, pursuant to the Leland Initiative, a White House Initiative to introduce the Internet to the people of Africa, entered into a Memorandum of Understanding ("MOU") with the GRM on August 6, 1996 to establish a national Internet gateway in Mali ,

WHEREAS, the Parties have successfully implemented the MOU to date in that, among other accomplishments in Mali a high-speed Internet gateway has been designed, installed and tested and has become the first operational Leland Initiative gateway, cost-based tariffs and first-year incentive discounts have been established, being among the lowest in Africa, a transparent process has been put into place to bring the private sector into the Internet access business and four firms have already established new businesses as Internet Service Providers, some 800 subscribers have purchased Internet access Malian businesses have begun to participate in the global economy via the Internet, the Mission de Decentralization has begun sharing the lessons learned from Mali's ambitious decentralization program with its sister democracies, and the Mali Malaria Research and Training Center has embarked on a joint venture with the U S National Institutes of Health on a pioneering malaria research effort, and

WHEREAS, based upon this success, the Parties wish to undertake a broader partnership to establish a global information infrastructure ("GII") in Mali with a particular emphasis on providing high-speed Internet access to the University and selected secondary schools, and to amend the MOU to provide for this undertaking

NOW THEREFORE, the Parties hereby agree to amend the MOU as follows

1 A new Section 2 4 is added to the MOU stating as follows

Section 2 4 The GRM and USAID will jointly undertake to establish a second Plan of Action within three months of signing this Agreement to Establish the Mali Global Information Infrastructure to accomplish the following goals

a) Policy Outcomes

i) a Mali GII Policy, reflecting A) the five principles of encouraging private sector involvement, promoting competition, providing open access to the GII for all information providers and users, creating a flexible regulatory environment, and ensuring universal service, B) defining the values of an Information Society, C) acknowledging the contribution of a national information infrastructure to sustainable economic development in the coming century, and D) articulating the resources required to put such an infrastructure in place, and

ii) GII "Friendly" Tariffs, identifying telecommunications rate structures that promote increased usage of a broad range of digital GII services while maintaining the overall sustainability of the program

b) Sustainable Infrastructure Results

i) Nation-wide access, establishing point-to-point, high-bandwidth, Internet connections in one or more secondary cities, and

ii) Introduction of new GII technologies, connecting end users where telephone networks are saturated or where new lines are difficult to obtain

c) Sustainable Development Applications through GII Technologies

i) Providing high-speed Internet access to the University and selected secondary schools and teaching them how to use these tools to build "information partnerships" with their sister institutions in Africa and the United States, and

ii) Enhancing democratic governance through Internet links between the citizens and local and national decision-makers

2 No funds are obligated by this Agreement USAID and GRM funding to implement this Agreement will be subject to subsequent determination of the Parties and the availability of funds for this purpose

3 All other provisions of the MOU shall remain in force and effect, except as expressly amended by this Agreement or where the meaning of the MOU is contrary to the provisions of this Agreement, and are incorporated herein by reference

IN WITNESS WHEREOF, the Parties, each acting through their duly authorized representatives, have caused this Agreement to be signed in their names and delivered as of the date given below

For the Government of the Republic of Mali

Alpha Oumar Konare
President

11/20/97
Date

For the United States of America

J Brian Atwood
Administrator
United States Agency for International Development

11/20/97
Date

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# DELIVERY ORDER STATEMENT OF WORK

# for a

# STUDY ON THE EXTENSION AND PROMOTION OF INTERNET SERVICES IN MALI

*PCE-I-00-97-00013-00*

**Background**

In 1996, Mali developed and received Africa Bureau approval of a new Strategic Plan Included in that plan is a "Special Objective" on Information and Communications, which aims to provide Internet access to as many Malians as possible, and provides support for community-managed FM radio stations The vision behind the objective is to provide Malians with "improved access, and better use of, information"

In 1997, a national Internet gateway was established through the Leland Initiative and is now officially operational It provides a direct linkage between Mali (through the national telephone company, Sotelma) and the international Internet backbone Sotelma currently plays the role of wholesaler, selling Internet services to four private-sector Internet Service Provider firms who then offer the services to clients

Mali is preparing to privatize its telecommunications sector in 1998, which should have a significant positive impact on the growth of Internet access Already, Mali enjoys a very liberal policy environment in the telecommunications field there are currently 77 private radio stations operating in Mali, and up to 30 more are expected to be on the air within a few months, the government has invited the private sector to play a crucial role in the provision of Internet services, and a thorough analysis of the telcom policy environment conducted in 1996 identified no significant constraints to the access to information by Malian citizens

Now that the Internet national gateway is fully operational, the Information & Communications (Info/Comm) Special Objective team is ready to move ahead with its planned activities in the promotion of Internet services demonstrations of the technology, and direct Internet connection for selected partner institutions

Currently, Internet services in Mali are being provided by four private sector firms (Internet Service Providers, ISPs) However, with the privatization of the Malian telecommunications company, the playing field will change The privatized telcom will be in a position to offer services directly to clients, without having to "wholesale" the services to ISPs On the other



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hand (and assuming deregulated international telecommunications access), private firms will be able to obtain Internet services directly from the international backbone, without passing through the national gateway The selection of the most appropriate vendor of services is important to USAID we do not want to privilege a former parastatal at the risk of discouraging competition while on the other hand, the privatized parastatal may in fact be the best source of services

Before making any decisions on the appropriate approach, USAID is commissioning the study described herein on the various policy, administrative, managerial and technical aspects of promoting and developing Internet services in Mali, and to provide the Info/Comm team with a program for the promotional aspects of Internet resources in Mali, as well as a strategy for the connection of the selected partners

Prior to the start up of the study, the Info/Comm team will provide the consultant with a list of potential partners identified by the Mission's Strategic Objective teams

## ARTICLE I - TITLE

Project Name Program Development & Support
Project Number 688-0510

## ARTICLE II - OBJECTIVE

To provide the services of a Communications Specialist, a Telecommunications Industry Specialist and a Marketing Specialist for developing a strategy for the USAID Mali Information & Communications Special Objective team on Internet connections and promotion for targeted partners and local institutions

## ARTICLE III - STATEMENT OF WORK

The consultants will provide the Information & Communications Special Objective team with a comprehensive report that contains answers to the following questions

### Part A - Internet Promotion and Demonstrations

1 What types of Internet promotion and demonstrations programs should be undertaken for immediate and future partner institutions?



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2 What are the audiences for these promotional programs?

3 What are the best available resources for conducting these programs?

4 What is the specific role of the Info/Comm team in this effort?

## Part B - Internet Connections and Access

*Policy Issues*

5 What is the role of the privatized telcom in the Internet arena? The private sector ISPs?

6 What are the various privatization scenarios, and what are the advantages and disadvantages of each in regards to providing national-level Internet services? What role should USAID play in the privatization process?

7 What type of a long-term relationship—if any—should USAID Mali enter into with the selected partners? What monitoring role should USAID play, and how should that monitoring take place?

8 What should be the level of financial support for recurring costs (e g monthly service charges for Internet services)? Should we be providing subsidies for the telephone charges associated with Internet usage? For how long a period should any subsidies last? What exit strategy should be built into the agreements with the selected partners?

9 What is the minimum level of commitment we should be accepting with a partner institution before we engage in the installation (e g memorandum of understanding, including a financial pledge, a contract, etc )?

*Administrative and Management Issues*

10 How will the Internet networks be managed? (For example, each partner institution should have a "champion" or leader to ensure that the project succeeds )

11 What staff will be required to manage the system?

12 What management or administrative training will be required?

13 Should the partner institutions charge for Internet use? If so what is a "reasonable" rate?

*Technical Issues*

14 An assessment of existing equipment will be conducted for each of the proposed partner institutions by the consultant Is any additional equipment needed (e g network cards, modems, multi-media upgrade equipment, etc )? If so, who should pay for this equipment?

15 What is the best system for connecting computers into a network and connecting the network to an ISP?

16 How many computers can reasonably be connected using a 64 kbps link? What other technologies are available for increasing that bandwidth?

17 What security measures need to be built into the network (e g firewall)?

18 Who is responsible for maintenance and repairs?

*Training and Internet Promotion Issues*

19 What kind of training will be required, at the senior management, network administrator, and user levels?

20 Who should be trained?

## ARTICLE IV - DELIVERABLES

Prior to departing Mali, the Contractor shall prepare a draft report in English that addresses each of the issues listed above The report should include a section on an overall strategy for Info/Comm for the promotion and demonstration of Internet resources, not only for the institutions identified for this study, but for other institutions and partners as well This section should include types of promotional activities to be carried out, which organization is best placed to do these promotions, what should be included in the demonstrations, what are the target audiences, etc The report shall contain annexes listing persons contacted and interviewed, along with their organizational, institutional and professional affiliations

Within 30 days following receipt of written comments, the Contractor shall provide the Mission with ten copies of a final report in English on the findings of the analysis The final report shall include a 1-3 page Executive Summary in both English and French The reports shall be submitted to the Information & Communications Special Objective Team Leader

In addition, within 15 days following USAID Mali approval of the final report, the Contractor shall submit a model business plan for the eventual takeover of responsibility for the maintenance and operation of the Internet network installed at a partner institution This plan

should include an estimate of fixed and recurring costs over a five-year period, an analysis of how Internet services might reduce other cost categories (visiting professors, purchase of periodicals and textbooks, fax charges, etc ), a plan for periodic upgrading of equipment, management of the network, staff requirements, etc

Finally, also within 15 days following USAID Mali approval of the final report, the Contractor will prepare an Action Plan for the next three years, detailing Info/Comm's activities in the Internet sector

## ARTICLE V - RELATIONSHIPS AND RESPONSIBILITIES

The team will work under the technical directions of the USAID Mali Team Leader of the Information & Communications Special Objective Team All coordination with the Government of the Republic of Mali will be done through the AID Special Objective Team

## ARTICLE VI - PERFORMANCE PERIOD

The work described herein shall be started within 15 days following signing of the Delivery Order by the USAID Contracting Officer

## ARTICLE VII - WORK DAYS ORDERED

The contractor will field a Communications Specialist (who will also serve as Chief of Party), an Industry Specialist (telecommunications), and a Marketing Specialist Following is the level of effort required for this work

| Functional Labor Catenory | Work Days |
|---|---|
| Communications Specialist | 29 |
| Industry Specialist - Telecommunications | 32 |
| Marketing Specialist | 22 |
| TOTAL LEVEL OF EFFORT | 83 |



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## ARTICLE VIII - SPECIAL PROVISIONS

### 1 DUTY POST

All work will take place in Mali, with the exception of a few days in Washington, DC (or other U S cities as appropriate) to discuss the study with officials of the Leland Initiative and to gather technical materials and discuss telecommunications policy issues with appropriate technical staff A 1-day stopover is Paris is also authorized when traveling to and from Mali

### 2 LANGUAGE REQUIREMENTS

The Communications Specialist and the Marketing Specialist shall have a minimum French level of FS R/3 S/3, all three consultants shall have a minimum English level of FS R/4 Sl4

### 3 ACCESS TO CLASSIFIED INFORMATION

Contractor shall not have access to any Government classified material

### 4 LOGISTIC SUPPORT

Contractor staff will be provided with office space within the USAID Mali building Contractor shall be responsible for paying for and arranging all travel and transportation, including intown and in-country travel (Rental vehicles are available in Bamako ) Contractor staff should bring any computer equipment (e g laptops) that will be needed to undertake the work Contractor staff will not have Mission Cashier check cashing privileges, and should come prepared to meet any local currency requirements (Note many local hotels and car rental agencies do not accept credit cards Local banks do accept US$ and French Franc travelers' checks )

### 5 WORK WEEK

A six-day work week (Monday through Saturday) is authorized

UNIVERSITY OF MALI INTERNET CONNECTIVITY

GEOGRAPHIC COORDINATES OF KEY SITES

| SITE | LATITUDE (NORTH) | LONGITUDE (WEST) | DISTANCE FROM SOTELMA TOWER(KM) |
|---|---|---|---|
| ENI | 12°39 045' | 7°59 844' | 98 |
| ENSUP/FLASH | 12°37 902' | 8°00 080' | 1 22 |
| FAST | 12°37 055' | 7°59 159' | 3 22 |
| FMPOS | 12°40 245' | 7°59 732' | 3 16 |
| CNRST/ISFRA | 12°38 349' | 7°59 382' | 1 28 |
| IUG | 12°36 923' | 7°59 291' | 3 33 |
| RECTORAT | 12°38 893' | 7°59 713' | 86 |
| IPR/IFRA | 12°54 951' | 7°32 000' | 58 72 |
| ENA/FSJE | 12°39 415' | 8°00 031' | 1 57 |
| SOTELMA | 12°38 563' | 8°00 058' | |
| USAID | 12°38 248' | 8°00 181' | 62 |

# MALI INTERNET SURVEY GUIDELINES

## I Interviewee

| | |
|---|---|
| **Organization** | |
| **Name** | |
| **Title** | |
| **Telephone #** | **Fax #** |
| **Email** | |

## II Organization

| | |
|---|---|
| **Full Name of Organization** | |
| **Parent Organization (if applicable)** | |
| **Address** | |
| **Number of Staff/Faculty** | **Number of Students** |
| **Brief Description of Organizational Mission** | |

## III. Internet Capabilities

| |
|---|
| **Do you currently have any type of Internet access** ☐ Yes ☐ No |
| **If Yes, please indicate what type**<br>Dial-up (landline) ☐ Dial-up (cellular) ☐ Leased-line ☐ |
| **If Yes, who are the primary users?**<br>Administrators ☐ Faculty ☐ Students ☐ |
| **What ways is it used (email, web browsing, etc)** |
| **What resources on the Internet are you aware of that are (or could be) useful to your organization (i e Web sites, databases, e-mail lists)** |
| |
| |
| |
| |
| |
| |
| **What are some of your ideas for how Internet access can be useful to your organization** |
| |
| |
| |

## IV. Information Flows

**Could you please indicate which organizations you currently need to exchange information with and how often**

| | Information To | Information From | Weekly | Monthly |
|---|---|---|---|---|
| Colleagues within your own organization | | | | |
| Colleagues elsewhere in the University | | | | |
| Government Agencies | | | | |
| Colleagues Abroad | | | | |
| Information Resources Abroad | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

## V. Current Technology

**Do you have computers** ☐ Yes ☐ No **If Yes, how many**

**Are your computers connected to a network** ☐ Yes ☐ No

**What types of computers do you have**
☐ 286/386 ☐ 486
☐ Pentium ☐ Mini/Mainframe
☐ Other _____

**What types of Operating Systems**
☐ Windows 3 x ☐ Windows 95/NT
☐ Unix (Xenix, Linux, AIX, etc )
☐ Other _____

**Please Estimate Overall Level of Computer Use for Each of Type of User**

| | High | Medium | Low | None |
|---|---|---|---|---|
| Administrators | ☐ | ☐ | ☐ | ☐ |
| Faculty | ☐ | ☐ | ☐ | ☐ |
| Graduate Students | ☐ | ☐ | ☐ | ☐ |
| Students | ☐ | ☐ | ☐ | ☐ |
| _____ | ☐ | ☐ | ☐ | ☐ |
| _____ | ☐ | ☐ | ☐ | ☐ |
| _____ | ☐ | ☐ | ☐ | ☐ |

**Do you have staff able to support the following**

| | YES | YES (need training) | NO |
|---|---|---|---|
| Hardware Maintenance | ☐ | ☐ | ☐ |
| Software Configuration | ☐ | ☐ | ☐ |
| Network Administration | ☐ | ☐ | ☐ |
| User Support | ☐ | ☐ | ☐ |
| Training | ☐ | ☐ | ☐ |

## VI. Facility

**Does your facility have climate control** ☐ Yes ☐ Partial ☐ No

**Do you have phone lines** ☐ Yes ☐ No | **If Yes, how many?**

**How difficult is it to have additional phone lines installed?**

**In your experience, how long is the waiting period (if any) for installing additional phone lines?**

**How reliable is electric power supply?**



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# ATTACHMENT 6

# CNRST DESIGN

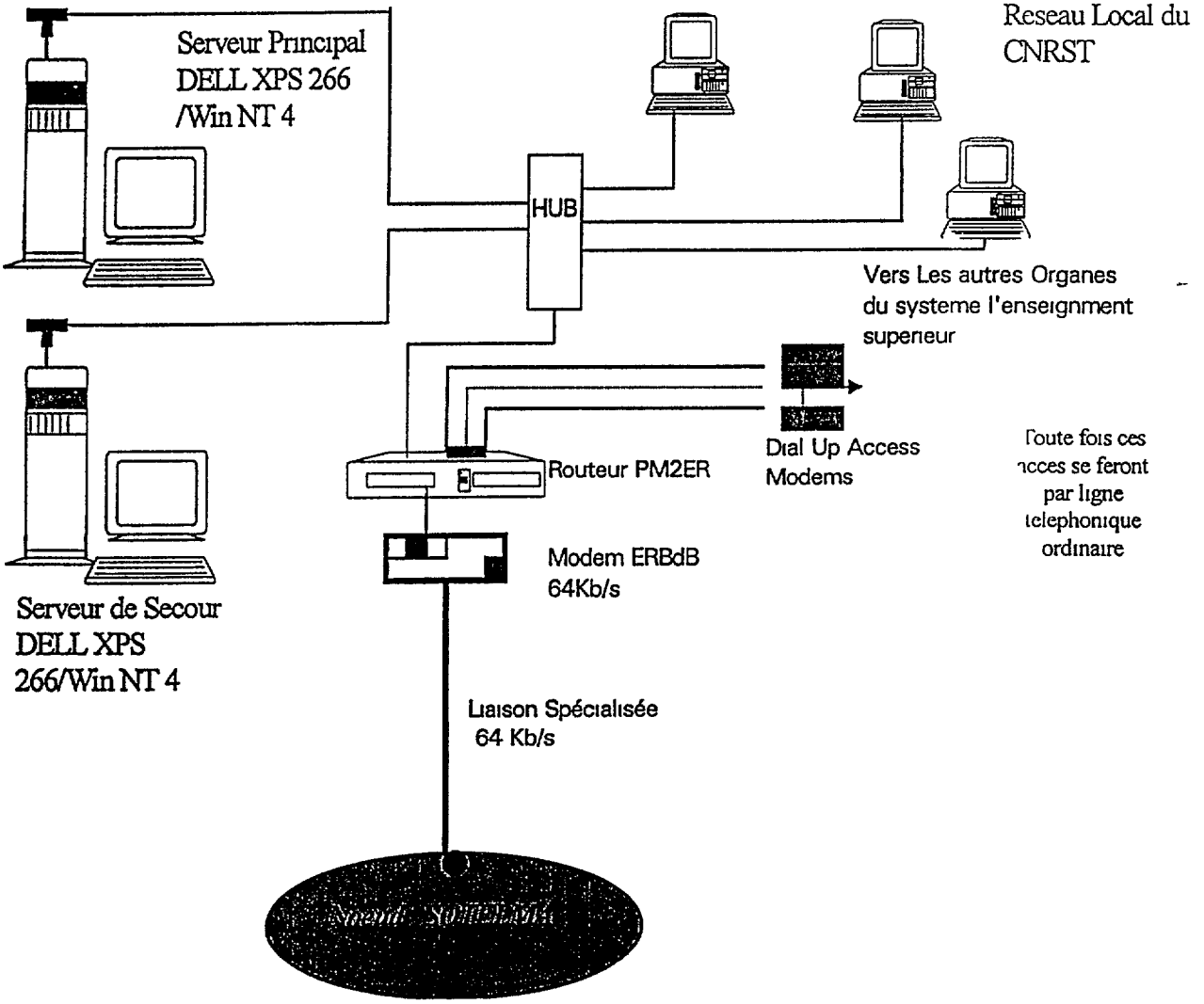
# SPIDER Sarl

RC 7297 - N° DNSI 6851009142 - N° INPS 17996/1
Capital 1 500 000 - Compte BOA 02711501185
BP E1693 - Tel 22 23 02 Hippodrome Rue 224 Porte N° 1238 Bamako


Réseau - Recherche - Education

# RESEAU INTERNET / INTRANET DU CNRST
## Etude Technique

### I-) Architecture générale ( Schéma technique )




Toute fois ces acces se feront par ligne telephonique ordinaire