PKF

Accountants &
business advisers

Government of Sierra Leone

Audit Service

DFID Support to the Auditor General's Department

Proposals for ICT Network and Capacity Building

July 2007

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TABLE OF CONTENTS

TABLE OF EXHIBITS

LIST OF ABBREVIATIONS

AfDB	African Development Bank
AGD	Auditor General's Department (now Audit Service)
DFID	Department for International Development - UK
GoSL	Government of Sierra Leone
HRM	Human Resource Management
ICT	Information, Communications and Technology
IDEA	Proprietary name of software for audit sampling and investigation
IFMIS	Integrated Financial Information System
ISP	Internet Service Provider
IT	Information Technology
LAN	Local Area Network
NAO	National Audit Office (of the UK)
PC	Personal Computer
PFMRU	Public Financial Management Reform Unit
SAI	Supreme Audit Institution
UK	United Kingdom
WAN	Wide Area Network

1   EXECUTIVE SUMMARY

The objective is to improve the operation of the Audit Service (previously known as the Department of the Auditor General) by establishing a platform and infrastructure for the use of ICT in the Audit Service, for enhancing communications, developing the existing IT facilities to enable the sharing of documents, and providing audit access to IFMIS.

The detailed benefits include:-

- Improve communication and links

- Facilitate e-mail, data transfer and collaboration by e-mail

- Enable internet access

- Enable shared file storage and access

- Facilitate use of audit standards, manuals, audit forms

- Facilitate provision of internal training

- Provide audit access to IFMIS

- Establish a web-site to improve information and accountability.

The proposals provide for operationalising the network server (provided by an earlier project but not usable) and linking the key offices of the Audit Service. The solution provides for a robust networked office for the Audit Service comprising the following key components:-

- Network server at the Youyi Building

- Local area networks for the Youyi and Lotto Buildings

- Wide area network to link the Youyi and Lotto local networks

- Internet access link for the network

- IFMIS link via the existing PFMRU network

- Connection of the New England building *via* the existing PFMRU network links

- (possible) Connection of the MoF Audit office *via* existing PFMRU network links.

2 INTRODUCTION

2.1 Background

This study was carried as an integral part of PKF's DFID-funded Support to the Sierra Leone Audit Services technical assistance project. The purpose of the study is to review the progress upon enabling the Audit Service with modern information technology facilities, and make recommendations to fully operationalise these facilities.

The primary purpose of these proposals is to provide a network to service the IT activities within the Audit Service and a secondary benefit will be to enable wider use such as access to IFMIS and deployment of future Audit Service based applications such as HRM, IDEA, etc.

Funding has been provided previously by the African Development Bank (AfDB) for the procurement of computers and IT and network equipment. Due to the exhaustion of funds the installation of the server and network was not completed.

The current DFID-funded Support Project to the Audit Service has provided IT training and, with DFID funding, recently procured additional computers for use by the Audit Service.

It should be noted that the Audit Service is also a potential operational user of IFMIS for the administrative operation of its function e.g. payment of accounts, payroll.

2.2 Objectives and Benefits

The objective is to improve the operation of the Department of the Auditor General by establishing a platform and infrastructure for the developing use of ICT in the Audit Service, developing the existing IT facilities to enable the sharing of documents, and providing audit access to IFMIS.

The supportive objectives and benefits are detailed below:-

- Improve communication and links (both internal and external)
- Facilitate e-mail, data transfer and collaboration by e-mail
- Enable internet access
- Enable shared file storage and access
- Facilitate use of audit standards, manuals, audit forms
- Facilitate provision of internal training
- Provide audit access to IFMIS
- Improved access and transparency
- Web-site to provide information and improve accountability and transparency
- Improved IT security
- Develop IT support and standards within the Audit Service.

3 SITUATIONAL ANALYSIS

3.1 Donor Activities

3.1.1 AfDB Project

An AfDB project provided funds in 2004 for the procurement of personal computers in the Audit Service (together with other ministries/agencies) and the planned installation of a limited Audit Service network. Equipment procured under these proposals was acquired around two years ago (approx. July 2005) and extensive use has been made of the personal computers upon a stand-alone basis.

The personal computers were initially utilised in the Audit Service training room and have now been distributed to the many Audit Service offices. This is a useful process as it enables Audit Service staff to gain experience of IT use and benefit from the IT training provided.

Unfortunately the network server and inter-office network were never finalised and the equipment has remained unused for around two years. Some of this investment, despite its non use, is probably redundant and will need to be re-visited in the light of technological development.

We were unable to find any of the substantive documentation and detailed plans for the AfDB work undertaken. Requests for this information have yielded no details to date.

3.1.2 DFID Support Project

The current DFID Support project to the Office of the Auditor General has the primary objective of improving audit standards, audit performance, and encouraging accountability and good governance. Within this project a number of capacity building initiatives have been undertaken such as in HRM and IT.

The DFID support project has invested substantially in IT training and capacity building which has been widely carried out. Details of the training undertaken are indicated later.

The current project has also applied DFID funding to the purchase of personal computers that have been used to reequip the Audit Service training room.

These proposals build upon the earlier investment by providing Internet and IFMIS access from the training facility.

With DFID funding, a stand-by generator was acquired by the Project for Audit Service use at the Youyi Building in order to address regular power supply problems.

3.2 IT Training

Previous IT training has built Audit Service knowledge and capacity in a progressive manner:-

3.2.1 Basic IT Literacy

Basic IT training has been conducted widely and covered IT literacy and the use of IT equipment.

3.2.2 Microsoft Windows and Office

All staff of the Audit Service have participated in this training and it has been well-received and successful in promoting the use of IT within the Department. The training was conducted in a laboratory style setting where all staff had hands-on access to the computers. The training covered:-

- Microsoft Windows (including file handling, Internet browsing and e-mail)
- MS Office (Word, Excel and PowerPoint).

The distribution of PCs to audit offices referred to previously has enabled some audit staff to consolidate their expertise following the training.

3.2.3 IFMIS Audit Training

Additionally many Audit Service staff have attended the IFMIS auditing course and some were subsequently involved in an IFMIS joint audit that was conducted in May 2006. A seminar was conducted for a wider group of audit staff to provide feedback and information of the outcomes of this audit.

It should be noted that as the Audit Service commences audit of the accounts prepared upon IFMIS (financial year 2006 onwards), all audit staff will benefit from access to IFMIS data in the conduct of audits.

3.2.4 IDEA Audit Workshop

IDEA is a software tool that provides auditors with the ability to access, sample and download data from financial databases such as used in IFMIS. It provides interrogation facilities to assist auditors by identifying similar transactions, exceptions, patterns etc.

The suppliers of IDEA conducted a workshop for a number of audit staff. Presently the Audit Service has not acquired this software and it is not part of the current proposals. However establishing the ICT network will provide the requisite infrastructure to access and support this approach, and it is envisaged that the Audit Service will seek to acquire this facility in a subsequent phase.

3.3 Internet Access

Although the earlier AfDB project was not able to complete the network, the Audit Service has subsequently implemented from Government funds a basic connection to the Internet at the Lotto Building to provide e-mail and Internet browsing for the top management of the Audit Service. These facilities are not currently available to other audit staff due to the absence of the network.

3.4 IT Support to Audit Service

As the Audit Service makes increasing use of IT, and becomes reliant upon it, there is a requirement for a supporting infrastructure, standards and security appropriate to maintaining a reliable, resilient and secure IT service.

To address the above requirements the Audit Service has recently approved the establishment of two posts to provide the requisite IT skills and support to the Audit Service. It is anticipated that these will be posts for:-

- Senior IT and Network Support Officer, assisted by
- IT and Network Support Officer.

These staff will provide cover for each other to maintain a continuous support presence.

The expected duties of these posts will include:-

- Servers and network support
- Network administration
- Security (access, anti-virus)
- Establishing IT standards and policies
- Web maintenance and updating
- Hardware support
- Support and help-desk
- Systems and data back-up
- Advanced report writing
- Assisting with IT training.

The key task will be to ensure that the Audit Service network and attached equipment provides a reliable, resilient and secure service to the offices and staff of the Audit Service. They will need to manage within the parameters of local issues, such as power supply availability.

A requirement will be to provide the requisite training for these support staff in Windows servers, e-mail servers, networking, security, web development, etc. This can be achieved by a mixture of formal training courses, technical books, Internet-based courses and adviser input.

3.5 Office Locations

The Department of the Auditor General operates out of several buildings namely:-

- Lotto Building (Tower Hill, Freetown)
- Youyi Building (Freetown)
- New England building (Freetown)

- Eastern Freetown office

- Ministry of Finance – Audit Service office

- Bo Provincial office

- Kenema Provincial office

- Makeni Provincial office (presently operated from Freetown).

The Auditor General and most central management functions are located at the Lotto Building in Freetown. The other Audit Service offices are located to facilitate audit services across both Freetown (where the Ministries are located) and Sierra Leone generally.

An IT training facility and resource office equipped with fourteen computers is located at the Youyi Building in Freetown.

3.6 IT Server Location

The existing server and network hub, funded under the earlier AfDB support are located in an office at the Youyi Building in Freetown currently occupied by a senior officer of the Audit Service. This arrangement will not be satisfactory for the future planned development of the IT server and support facility. The server and network (which is incomplete) are currently not in operational use.

The continued location of the server at the Youyi Building has been proposed by the Audit Service management as it is a more permanent office for the Audit Service than the Lotto Building which is a rented building. Also a DFID-funded generator has been installed for the Audit Service offices at the Youyi Building which will be beneficial to locating the equipment where stable power supplies can be provided.

The Youyi Building is also the existing server location and adjacent is the IT equipped training laboratory which will use the proposed facilities.

3.7 Network Server and Software

As previously indicated, the Dell network server has not been used since its installation due to the absence of network links. It will need to be checked out to ensure that it is still working properly as an initial examination indicated faulty operation. The existence of a Dell guarantee is also being explored as this equipment normally has a three year guarantee which might cover any remedial works. A specification of the existing Dell server is in Annex 2.

The inability to locate any significant documentation, software issue disks, etc makes the task of sorting out the existing situation more difficult.

As nothing has been configured on the server and the existing server software has now been superseded by a later release, the option to start again with the updated software and a known situation is recommended. Software was not procured as part of the earlier AfDB project for handling e-mail and it is therefore proposed to purchase Windows Exchange Server software for this task.

Pirated software is both illegal and creates potential security vulnerabilities because users may be prevented from downloading updates that keep the software up to date with the latest changes and that repair vulnerabilities. It should be a requirement that all supplied software will be authenticated as "genuine windows software" and is not counterfeit or pirated.

The uninterruptible power supply unit, APC Smart-UPS 1500 model, that was purchased with the server has not been utilised and as a result of its non-use we are unsure if it is still fit for purpose.

3.8 Links Between Existing Buildings

There are presently no IT links between Audit Service buildings or to any other buildings except the single Internet connection in the Lotto Building previously referred to.

3.9 Provincial Offices

The DFID Support project to the Audit Service has sought to be inclusive of Audit Service staff located at the provincial offices in Bo and Kenema. At present the work of the northern provincial office of Makeni is undertaken from Freetown.

Some IT equipment has been located at the Bo and Kenema provincial offices and the staff have participated in the IT training courses at Freetown. Additionally, some IT training courses were delivered in Bo for staff of the Bo and Kenema offices.

The country communications and IT infrastructure in the provincial areas are still lacking and we are advised that services can be unreliable. However, some suppliers and service providers are turning their attention to these areas and services are expected to improve over the next few years. There is little likelihood of high-speed broadband facilities being generally available at the present time but if these higher speed facilities become available, as has happened in Freetown, the proposed network can be enhanced to take advantage. (Note – the situation appears to be changing whilst this report was being prepared).

The use of V-sat (satellite-based) communication technology has been the only reliable high-speed option at the present time but this involves both significant initial installation costs and on-going usage charges. These costs are presently not justified for the limited usage required by these provincial offices.

An alternative more cost-effective approach of providing Internet access and e-mail services at each provincial office if necessary by using slow-speed dial-up access may be available. This would provide adequate communication for the provincial offices in the short term to enable reports and data to be sent as e-mail attachments. This inter-office communication would work in a seamless manner compatible with the operation between other Audit Service offices, although operating remotely they would not have direct access to the Audit Service network.

3.10 IT Security

There are many risks to the stable operation of IT services and systems and it is important to address these issues. The main risks to IT security arise from virus, mal-ware, spy-ware, hacking, and network attacks.

Many developing countries suffer from a lack of internet security due to the following reasons:-

- Lack of user awareness

- Cost of anti-virus and internet security (including annual licence renewal)

- Failure to appreciate need for security and implications of security failure

- Inability to keep internet security updated due to connectivity and bandwidth issues

- Failure to take firm action in dealing with and managing IT security issues

- Lack of dedicated or knowledgeable IT support staff.

Whilst the facilities for the Audit Service envisage the creation of a "local" network to service the office activities and requirements of the Audit Service, the connection of this network to the Internet and access to external applications such as IFMIS post risks to the Audit Service network and *vice versa*.

The connection of other networks to the Government-wide IFMIS has security implications and requires measures to prevent vulnerability to the IFMIS network. We have discussed these issues with the PFMRU and requested details of their security requirements. These have not yet been received but their requirements will be fully addressed in the technical configuration and implementation of the Audit Service network.

3.11 Power Supply Issues

The power supply situation in Sierra Leone was described to us as "challenging". This is a real problem as computer and network equipment demands stable and continuous power supplies for their proper operation. Reference has been made elsewhere to the existence of the DFID-funded generator at the Youyi Building. Account will be taken of the requirement for uninterruptible power supplies to bridge short transient losses of power or to enable the generator to be started. The "at worst" situation is that back-up power supplies allow computers to be closed down, preferably automatically, in an orderly manner without the risk of loss or corruption of data.

Equipment that can also ensure power smoothing to avoid peaks and troughs in the supply is also necessary to avoid potential damage to this delicate electrical equipment.

3.12 Future Requirements

There is a requirement to take account of future areas that may be pursued by the Audit Service to ensure that proposals are flexible enough to support such developments. Examples are:-

- IDEA audit software

- Applications – human resource management, etc

- Connection to Makeni office (if established).

4 PROPOSALS

4.1 Overview

The proposed solution provides for a networked office for the Audit Service and comprises the following key network components:-

- A network server at the Youyi Building

- A local area networks for the Youyi and Lotto Buildings linked by a wide area network, including the training room

- An internet link to the Youyi Building

- An IFMIS link

- Connection of the New England building

- Potential connection of the MoF Audit Office

- Separate connections for the provincial offices at Bo and Kenema.

- These arrangements are detailed in the following sections.

4.2 Network Server and Software

The existing server (currently unused) would be retained and configured with a later release of the server software Windows Server 2003 R2 which is compatible (but more current) than the servers presently utilised by the IFMIS system. The server will need to be checked to ensure that it is still working properly. No software was procured for handling e-mail and it is proposed to purchase Windows Exchange Server software for this task. The Windows Server operating system and Exchange Server software would be configured for the required number of users and the appropriate software licenses procured.

It is proposed to upgrade the server memory (ram) from 1mb to 4mb as this is more appropriate to handling the proposed tasks and network users. A specification of the existing Dell server is in Annex 2.

The uninterruptible power supply unit, APC Smart-UPS 1500 model, purchased with the server will need to be checked and if necessary replaced.

An enterprise level security solution will also be implemented on the server to enforce security on computers connected to the network and provide for the continuous updating of security protection.

It will be a requirement that all supplied software will be authenticated as genuine licensed software, and is not therefore counterfeit or pirated.

> **Recommendation 1:**   Required changes to server hardware, server software and server security be procured.

4.3 Establishing the Networks

A star-bus topology is proposed for the central network that will link the Audit Service-staffed buildings in Freetown to create a single logical network that will provide the shared storage, filing, e-mail, internet access and IFMIS access for all these offices.

This will be achieved by establishing the following network components

- A network server at the Youyi Building

- A local area network (LAN) segment for the Youyi Building

- A local area network (LAN) segment for the Lotto Building

- An internet link to the Youyi Building

- A WAN link between the Youyi LAN and Lotto Building LAN

- An IFMIS link via the existing PFMRU network connection at the Youyi Building

- Connection of the New England building *via* the existing PFMRU network links

- Potential connection of the MoF Audit Office via existing PFMRU network links.

- Network firewall

- Network security filters

- Network back-up on server

- UPS power back-up for server and network

- Facilities to support networked printers

Local Area networks (LAN) will be installed in each of the Youyi and Lotto Buildings and inter-connected by a wide Area network (WAN) link from the Lotto Building to the Youyi Building using wireless radio modems.

This LAN and WAN arrangement will enable the server and network to operate as a single logical network giving access to both the server and to the internet for all users. It also facilitates the use of security facilities to safeguard the gateway to the Internet and the receipt of e-mail. A building survey has been carried out to confirm the viability of both the Youyi-Lotto network link and the upgraded ISP Internet link.

> **Recommendation 2:** **Implement the local networks at the Youyi and Lotto Buildings and interconnect them with a wide area network.**

4.4 Provincial Offices

An approach of providing Internet access and e-mail services at each provincial office by using slow-speed dial-up access is proposed. This would provide communication for and to these provincial offices that would enable files, reports and data to be sent as e-mail attachments. The inter-office communication would work in a seamless manner compatible with the operation between other Audit Service offices.

A PC operating as a "mini-server" at each location could be utilised as an Internet gateway and facilitate shared storage that replicates a similar approach to the Audit Service network. Thus reports, manuals, documents, training materials could be replicated from the centre to each provincial office. Larges files and the initial set-up could be done by CD couriered by Audit Service staff on their occasional visits. Updates could be supplied by e-mail or from the Internet.

These proposals therefore include the provision for connecting the provincial offices of the Audit Service in Bo and Kenema to provide Internet access and E-mail communications. The availability of other more robust and high-speed options at a similar cost is currently being investigated. A fall-back solution of a more costly wireless network between Kenema and Bo might be considered if the connection at Kenema proves difficult to implement.

There will be recurring annual charges incurred for this broadband Internet access.

The power supply issues will need to be evaluated at these locations as part of the solution but would not be as onerous as in Freetown where the solution is server-based.

> **Recommendation 3:** **Implement Internet connectivity to enable Internet access and improve communication using e-mail to the provincial offices at Bo and Kenema.**

4.5 Internet Access

The Audit Service presently has Internet access but this is limited to a few computers located in the Lotto Building. The speed of the link (128kb) is adequate for existing use but will not be sufficient to support the wider Audit Service access and number of users that is proposed.

Further, the current link is to the Lotto Building and the future link will need to be connected to the server which is located at the Youyi Building and where it can be supported and monitored by the IT support staff. The existing ISP link supplied by Multinet will be disconnected.

The proposed ISP and Internet link will be provided by IPTel using an always-on broadband link operating at 512kb or 1024kb. There will be recurring annual charges incurred for this broadband Internet access.

All offices directly connected to the Audit Service network will be enabled to use this shared Internet link using the planned local and wide area network.

Recommendation 4:	**A broadband connection be established to provide Internet and e-mail connectivity for the Audit Service network users.**

4.6 Network and Internet Security

In planning the IT network for the Audit Service, significant attention has been paid to ensure adequate levels of IT network security are implemented and maintained. The planned measures include:-

- Network firewall – to prevent internet or external network intrusion

- Spam, virus and mal-ware firewall – prevent e-mail infection and vulnerability

- Regular server and PC updating – minimise operating system vulnerabilities

- Regular (automatic) anti-virus and internet security updating – to ensure that individual PCs are protected

- Developing IT security awareness and compliance – to encourage security awareness and action

- Optional Web access and spam filters – to control web-site access to maintain bandwidth and restrict sites that exploit vulnerabilities (see below).

As indicated, an enterprise level security solution will also be implemented on the server to enforce security on computers connected to the network and provide for the continuous updating of protection. Laptops and computers at provincial offices not connected to the server will be protected by stand-alone security solutions.

Recommendation 5:	**Deploy basic network filters, anti-virus and security on the Audit Service server and network.**

4.6.1 Optional Spam and Web Filters

IT networks are vulnerable to attack from viruses, mal-ware and accessing malicious web-sites. The disruption to office operations and additional work for IT support staff resulting from penetration of the IT network can be both annoying and time consuming. Many security facilities are available to protect against these intrusions and problems. Additionally the problems have potential implications for other networks to which the Audit Service network is linked i.e. IFMIS. Therefore a robust network security deploying spam, anti-virus and web access filters is proposed that will offer the maximum safeguards against intrusion.

Such filters are the Spam filters and web-access filters, which can be software or hardware/software based. In order to increase the protection it is proposed that these facilities should be installed on the gateway to the Audit Service network.

We have examined several security products marketed by Barracuda, Ironport, CheckPoint and WebSense and recommend that such products be deployed to ensure a robust and easy to control network.

A multi-layered approach to provide strong security minimises both the risks of vulnerability and the potential effort of diagnosing and cleansing security attacks. It should be noted that many of these processes have been designed to be automatic and function with the minimal of support involvement.

These products do require the commitment to annual renewal of licences to maintain regular updates of the security protection.

> **Recommendation 6:   Optionally implement robust spam and web access filters to improve network security.**

4.7 Enterprise E-mail

E-mail is an important means of communication and particularly relevant in Sierra Leone where other forms of communication are subject to problems. The use of an enterprise e-mail solution will provide the staff of the Auditor General's Department with a reliable means of communication including the transfer of documents which can be sent as attachments.

This will enable the communication between various buildings used by the Audit Service, with Government ministries and agencies, with the international donor community, and with the wider business world. The solution will provide individual e-mail accounts for (substantially all) Audit Service staff and for the delivery or collection of e-mail on a near continuous basis.

The Microsoft Exchange Server software, previously referred to, is both an established solution and compatible with the Microsoft Office suite (word processing, spreadsheet and presentational applications) that is widely deployed in the Audit Service. The software is sophisticated, flexible and scalable as an enterprise mail solution.

Facilities exist for establishing a common contact directory that can be used by all Audit Service staff and the system can also support collaborative working and sharing of diaries for organising meetings and making appointments.

4.7.1 Remote E-mail Access

The proposed network server and e-mail solution would provide secure e-mail services that would support remote e-mail access for staff working anywhere in the world, for example when carrying out audits in the High Commission in London or when on training courses. This can be achieved wherever there is Internet access or *via* a dial-up connection to a local provider.

> **Recommendation 7:   Enterprise level e-mail server software be procured.**

4.8 IFMIS link

The IFMIS system was installed during 2005 and the first full year of operation was in financial year 2006. As the Audit Service commences to audit the accounts for 2006 there will be a requirement and benefit for the Audit Service to have electronic access to the IFMIS accounting data and transactions.

The Audit Service has already provided training and awareness to staff on the facilities of the IFMIS system as part of the current DFID support project. Additionally a joint systems audit was conducted on the IFMIS system in May 2006 to assess the implementation and the operation of accounting controls. A further IFMIS audit and follow-up is scheduled for July 2007.

As the Audit Service will be working on the audit of the financial year 2006 and subsequent years accounts, it is an opportune time to provide electronic access to IFMIS for the Audit Service. This facility will benefit both the Audit Service staff working upon the audit of annual accounts and the many ministry and agency audits conducted by the Audit Service.

The main benefits of IFMIS access will be the ability to:

- Access transaction detail
- Run investigative reports
- Carry-out selective searches and sampling.

Connection of the proposed Audit Service network to IFMIS can now be simply and cheaply achieved following the recently installed IFMIS link to other parts of the Youyi Building. An interlink between the two networks can now be made the costs of which will only be the cabling and installation of a network router and security unit. Therefore the provision of the IFMIS link is included in these proposals.

Arrangements will need to be agreed with the MoF for the provision of server/IFMIS licences to facilitate access by audit staff.

Resulting from the IFMIS link it is also now feasible to cost-effectively extend the Audit Service network to include Audit Service staff located at the New England building.

Recommendation 8:   Implement links to the IFMIS system to facilitate audit use by the Audit Service.

4.9 Website

Provision has been made for establishing a website for the Audit Service. The purpose of the website is to provide a presence for the Audit Service and a vehicle for the publication of information about the work of the Department, and in due course the audit reports that are prepared. The website supports the development of accountability, transparency and good governance that is an important aspect of improving the delivery of accountable services within Sierra Leone.

4.9.1 Preparing the Site Content

The technical issues of developing and hosting a website are not difficult - the key issue is preparing and maintaining the site content. Content is the key word in delivering a website that will be meaningful to the citizens, donors and world community.

It is proposed that input from the Audit Service management together with a workshop of representatives from different divisions of the Audit Service will generate participation and ownership of the website content. There will be a need for regular updating to ensure that the content is current, relevant and accurate. It may be useful to observe the websites of other SAIs such as the UK NAO to appreciate the scale and options that can be pursued.

The working group should meet periodically to review and update the Audit Service website. The members would represent the sections of the Audit Service. As part of the implementation it is proposed that the outcome of the workshop would be the initial site planning, its content, and achieving an operational website.

Provision has been made in the work programme for the advisor to facilitate at the workshop the initial preparation of the website and then establishing the hosting of the website. The outcome would be an operational website.

4.9.2 Website Hosting

It is proposed that the Audit Service website will be externally hosted due to the power problems and limited internet bandwidth, which would result in the inability to maintain the 24/7 availability required of a credible website. It is not practical to host the website internally if the server(s) cannot provide this required continuous service.

External hosting is not unusual as it is beneficial to use the services of specialist hosting companies. The Asian Development Bank (ADB) hosted its extensive website for many years on hosting servers located in the USA. Hosting in developed countries can have benefits by providing fast access throughout the world and is achieved in a cost-effective manner.

4.9.3 Maintaining the Website

It is proposed that the IT Network and support staff would be responsible for the technical aspects of maintaining the website but driven by the content from the various divisions of the Department.

The procurement of software for developing and maintaining the site has been included in the cost schedule as also has the cost of website hosting and establishing an Audit Service domain name.

4.9.4 Domain Names

To facilitate the establishment of a website and for the operation of the enterprise e-mail solution a domain name(s) would be purchased. It has been recommended that a non .sl domain be utilised due to reliability issues with the local web domain controller (SierraTel). However, the auditservice.gov.sl domain and sub-domain could be reserved for future use and could be mirrored to the chosen domain auditservice-sl.org.

4.9.5 IntraNet

A similar technique to the website can be used to develop and maintain an interface to the data held on the Audit Service server for internal users i.e. an IntraNet.

Recommendation 9:   Establish an Audit Service website, provide hosting facilities and purchase web development software.

4.10 Tape Back-up

Back-up facilities on the server provide for easy security of e-mail messages and other stored documents to enable the data to be stored in a compact form that can be kept in a safe off-site location. No back-up solution was provided with the original server procurement. The purchase of a tape drive for regular back-up of the server is therefore proposed.

A back-up routine would be implemented in the Audit Serrvice to ensure the regular back-up, i.e. daily, of the data held upon the server. Users would be encouraged to transfer files from their individual personal computers to the server so that they are protected against potential loss.

Recommendation 10: Purchase a tape-based server back-up facility for the secure storage of data.

4.11 Power Supply Issues

The operation of IT systems creates "a challenge" in Sierra Leone as the operation of IT systems, especially those involving networks, require a stable and reliable power supply.

DFID has funded the procurement of a generator at the Youyi Building for use by the Audit Service on the occasions when mains power (i.e. city power) is not available.

It is proposed that all the server and network equipment will be serviced *via* uninterruptible power supplies to allow continued operation across transient power loss and to allow the switch-over from mains to generator power without loss of service. This requires that the uninterruptible power supply equipment has sufficient capacity to bridge these power breaks whilst retaining a reserve sufficient to allow a controlled shut-down of the server if restoration of power is not imminent.

Provision has been made for inclusion of a basic UPS as the capacity of the existing unit is uncertain and this old unit can be deployed to other less critical areas.

Recommendation 11: Replacement of existing UPS power supply and procure power stabiliser equipment.

4.11.1 Enhanced Power Supply Solution

A further more costly solution if sufficient funds are available is for a high capacity UPS capable of operation for several hours. This would have the benefit of maintaining the maximum uptime of the network server, support operation of devices like the tape backup unit and ensure that back-up and update processes are not interrupted.

Establishing servers and networks that service multiple buildings requires a more robust solution that enables operation to continue for many hours. A network that is failing regularly or frequently closing down will not provide the desired level of service expected by users.

Given the present difficult power supply issues, this additional proposal is strongly recommended if available funding permits.

> **Recommendation 12: Optional installation of high capacity UPS power supply and battery equipment to provide extended operation to overcome power supply problems.**

4.12 Network Cabling

In the absence of existing cable plans and in order to provide adequate network points for a flexible deployment it is proposed to substantially re-cable the Youyi and Lotto Buildings using "Cat-5" standard cabling.

All cable terminations would terminate in modern RJ45 type network sockets (the existing network cabling in the Youyi Building does not use this standard) and sufficient network points would allow flexibility in the deployment of attached computer equipment. The computers in the training room located at the Youyi Building would also be connected.

Provision has been made for limited cabling at the provincial offices in Bo and Kenema. This is based upon a maximum of four computer connections *per* site as the expected service would be incapable of supporting a greater number.

> **Recommendation 13: Installation of network cabling, sockets, switches at the Youyi and Lotto Buildings, and at the Bo and Kenema provincial offices.**

4.13 Server and Support Room Requirements

The existing room in the Youyi Building that houses the server needs to be established as a server room that can also serve as the hub for network and Internet connections.

4.13.1 Server Room

The server room requires changes to make it a secure environment and suitable environmentally for housing this critical equipment:-

- Door locks on access to the server room
- Restriction of staff to authorised staff
- Install reliable air conditioning to maintain stable environmental conditions
- Window treatment to minimise solar gain from the sun
- Power backup facilities to adequately support the server and network equipment (as previously referred to).

Provision has been made for the purchase of server racks to house the equipment in a secure manner and facilitate all-round physical access to the equipment by the IT support staff.

Provision will be made for the installation of the tape back-up system to provide proper data back-up for the server data, as previously indicated. Arrangements will be made for a back-up procedure and for the tapes to be stored off-site in another building.

4.13.2 Support Room

The outer room currently housing secretarial staff should be utilised for the location of the IT Support staff that are being recruited by the Audit Service. The Audit Service will need to make arrangements for the relocation of the existing staff in the proposed server and support offices.

4.13.3 Other Office Changes

The layout of most offices in the Audit Service is not ideal for the use of IT. In particular, many offices have power cables laid across the floors which are:-

- Safety hazard for the staff
- Potential fire hazard and
- Likely to result in operational problems.

The cabling of offices for the IT network provides an opportunity to correct this situation by placing the desks either against the walls or abutted to the walls, to eradicate trailing wires. The installation of adjacent power and network connection points should be carried out where possible.

> **Recommendation 14: Provide for the establishment of server and support rooms, relocate existing staff and make equipment safety changes.**

4.14 Adviser Input

It is proposed that a local firm would be selected to provide the equipment and carry out the technical installation processes. Contact has been made with several local firms including the SBTS Group who are IT and networking specialists.

The SBTS Group has carried out similar work for PFMRU project and IFMIS, and is therefore experienced in the environment. They were able to carry out site surveys and provide cost estimates that have been utilised in developing these proposals.

Contact has also been made with local firms to establish the availability of suitable services for the provincial office locations.

The implementation would be supervised and supported by adviser input to oversee implementation of the proposals. It is estimated that six weeks will be necessary for these tasks, namely:-

- Monitor installation of networks and server software
- Provinces implementation and training
- Web-site development, working group, and workshop
- Oversee training on network server
- Mange e-mail implementation and conduct e-mail training
- Introduce backup arrangements
- Develop support activities, and IT standards and policies

4.15 Summary of Proposals

The proposals will operationalise the ICT facilities to support the Auditor General and the Audit Service to provide the following benefits:-

- Improved communication
- Assist operational activities
- Provide means of additional training
- Allow access to information resources
- Promote accountability
- Enable and involve provincial office locations
- Basis for deploying applications e.g. IFMIS, HRM, IDEA.

5 SUMMARY OF RECOMMENDATIONS

Exhibit 1: Summary of Recommendations

No	Recommendation	Option
1	Required changes to server hardware, server software and server security be procured.	1
2	Implement the local networks at the Youyi and Lotto buildings and interconnect them with a wide area network.	1
3	Implement Internet connectivity to enable Internet access and improve communication using e-mail to the provincial offices at Bo and Kenema.	1
4	A broadband connection be established to provide Internet and e-mail connectivity for the Audit Service network users.	1
5	Deploy basic network filters, anti-virus and security on the Audit Service server and network.	1
7	Enterprise level E-mail server software be procured.	1
8	Implement links to the IFMIS system to facilitate audit use by the Audit Service.	1
9	Establish an Audit Service web-site, provide hosting facilities and purchase web development software.	1
10	Purchase a tape-based server back-up facility for the secure storage of data.	1
11	Replacement of existing UPS power supply and procure power stabiliser equipment.	1
13	Installation of network cabling, sockets, switches at the Youyi and Lotto buildings, and at the Bo and Kenema provincial offices.	1
14	Provide for the establishment of server and support rooms, relocate existing staff and make equipment safety changes.	1
	Additional Options	
6	Optionally implement robust spam and web access filters to improve network security	2
11	Optional installation of high capacity UPS power supply and battery equipment to provide extended operation to overcome power supply problems.	2

Annex 1 - Schedule of Costs

Exhibit 2: Schedule of Costs

The estimated cost schedule is not included in this version.

Annex 2 – Existing Dell Server

The specification of the existing Dell server is as follows:-

Dell Power Edge 1800

2.8ghz Xeon dual-processor

1gb ram memory

1mb L2 cache memory

RAID disk configuration

Disk   C: 12gb   D:124gb

Dell 3 year warranty ?

Windows Server 2003   - 5 client license?

Symantec Client security   - now out of date