REPORT ON THE REVIEW AND ASSESSMENT OF ECD'S INFORMATION SYSTEM

CB2

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Introduction

The Kiribati Government through Environment Conservation Division (ECD) of Ministry of Environment, Lands and Agricultural Development (MELAD) obtained a UNDP-Global Environment Facility grant to conduct its National Capacity Self-Assessment (NCSA), which started in 2007 and was concluded in 2011 that focussed on the environmental and cross-cutting capacity issues.

With the outcome of NCSA, it was identified that institutional capacity needs was rectified in particular to a lack of environment technical database and information system that mainly focussed on the second prioritizes cross-cutting issue; that is "*Limited availability of data and information related to the three Rio Conventions; climate change, biodiversity and land degradation and their thematic areas*".

In 2015, Capacity Building Phase2 project was implemented under this scheme, and the steering committee was set up to foresee and advice in resolving issues in the cross cutting capacity development. A technical (IT) working group was formulated and comprised of three IT members from the steering committee who are also members of the National ICT Advisory Committee to work according to capacity gaps as identified.

With the scope of services provided by the IT working group, tasks undertaken are carried out to assist the steering committee in providing resolution against the review and assessment of the existing technologies and information system that underpin the followings;

- Assess and review existing environmental databases and environmental management information system in Kiribati particularly at the ECD level using the SWOT analysis.
- Assess and review technologies that are currently in use by ECD, including analysis of specifications needed by the project. Include identifying technologies needs/requirements to support the EMIS such as computer/server equipment, software, networking and communication equipment, backup system, power surge protection, etc.
- Review centralized environment data repository that is currently in place and recommend improvements where seen necessary.
- Assess the internet connectivity at the ECD to determine the level of internet speed that would allow the easy access of the database by the users and make recommendations for improvement.
- Provide the assessment report and submit it to ECD for comments.
- Assist to procure the necessary IT equipment required for the EMIS.

The analytical report will highlight the capacity gaps of the current technologies, and information system including database and data repository/storage currently exist and available within the current network set up at the Environment Conservative Division (ECD), Ministry of Environment, Lands and Agricultural Development in particular to the development of the new Environmental Management Information System (EMIS).

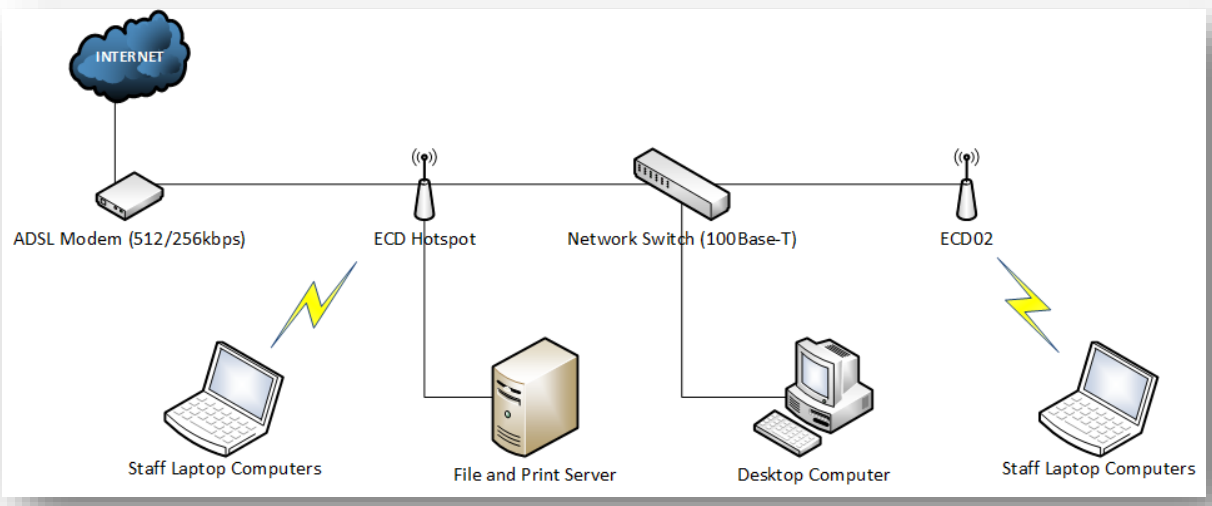
Observation

The on-site visit was organised and carried out on three occasions to observe the structure of the whole network system and existing database systems deployed at the Environment division.

Preliminary findings show that the ECD network employs a very simple design where a wireless router connects to an ATHKL ADSL modem and all computers in the network connect to this wireless router. The server also connects to the wireless router and serves as the printing and file server for the whole network. Internet service is accessible to all employees via the wireless router and access point.

Current Network Setup

The following diagram depicts the network setup that was in place at ECD as at 19th November 2015.



Technical Specifications

File and Print Server

- Asus Server
- 3.4GHz Quad Core Xeon CPU
- 16GB RAM
- 2TB Hard Drive (not RAID)
- Debian Linux Operating System (OS)

ADSL Modem

- 512/256kbps Internet Speed

Wireless Routers/Access Points

- ECD Hotpot (LinkSys Router configured with WPA2 security)
- ECD02 (ZyXEL router configured with WPA security)

Network Switch

- Planet 48Ports 100BASE-T

Analysis and Review of Technologies (Databases, Data Storage, Internet Connection, Network)

SWOT analysis is a tool used to review and assess existing technologies capability. With the strength, weakness, opportunities and threats of applied technologies that are of being observed, the list has been layout out in bulleted form instead of in a table format to allow the authors more room to elaborate more on the findings;

Strengths

- There are some Access Database systems currently in used at ECD including the EIA Register that is used to record the Environment Impact Assessment applications, TREDS Database to record Turtle data and the Assets Database to record Assets.
- Centralised data repository currently stores various data files from staff of ECD.
- The current server is capable of providing a number of services such as printing and file sharing and can also be configured to provide centralised user authentication which may be required when the EMIS is deployed.
- The server hard drives are relatively large and have sufficient space (800GB free space) to accommodate a large number of documents such reports and raw data which will be collected as part of the EMIS Project.
- All staff have access to computers (1 desktop and the rest of the staff use laptop computers).
- Most computers have free antivirus software installed and some have licensed antivirus software.
- There is a 48 port network switch that can be used to connect all laptops and desktop computers if there is a problem with the wireless access point
- All rooms have at least 1 wall mount socket available for connection to the main switch.
- One of wireless access points has been configured to use WPA2 which is the current standard in wireless security
- The ADSL modem has a bandwidth of 512/256kbps which is sufficient for ECD staff access to the Internet
- There is 1TB external hard drive and it is used for backup purposes and was found to contain backups of the network drives from July 2015

- The file server has been configured with multiple shared file directories and these were configured to be accessed only by authorised group of users within the Division.

Weaknesses

- Files in data repository are only searchable from the local network and are not available via the web.
- The current practice of storing raw data in various formats such as Excel and Word makes it hard to find specific information and there is a high risk of having the same files in various locations within the file server.
- The server (data repository) was not powered on when we last visited ECD because of there was an issue with UPS. Currently the server can still be powered on without the UPS but with a higher risk of getting its power supply damaged from power surges.
- The current UPS (Uninterruptible Power Supply) is not working well and does not have sufficient capacity to provide power to more hardware such as the EMIS server, adsl modem, Ethernet switches and wireless equipment located along the current server room.
- The current server cannot be used to host the Environment Management Information System because it does not a have RAIDed hard disks and because the server is currently used for other services i.e file and print server.
- The server hard drives are not configured to use RAID (Redundant Arrays of Inexpensive Disks), which allows for redundancy in case one of the hard disks fails.
- There is no dedicated server room to house the current server as well as the EMIS and air conditioning is not available 24/7 which will be required if the EMIS will be accessible by the general public 24/7.
- There is no currently permanent staff to support the Information Technology infrastructure.
- There is no specialised software or hardware firewall software between the Local Network and the Internet to block intrusions into the network or to prevent data from going out of the network
- Not all of the computers have licensed antivirus software. This may affect staff computers as well as documents that will be uploaded onto data repository and EMIS when completed.
- There is no automated onsite or offsite backup systems in place that can be used to backup all data in the current file server or the planned EMIS.
- The current 48 port Network Switch only supports speeds of up to 100mbps and has been used in ECD since at least 2005 and some of the ports may not be working.
- The current internet link (512/256kbps) is not sufficient to support the access of EMIS from outside the network
- The use of wireless as a primary means of connection between staff laptops to the network resources will limit the speeds of uploading and download large files from the data repository as well as EMIS when deployed.
- The wireless access point named *ECD02* was found to have a weak signal in some areas of ECD

- Both wireless access points (*ECD Hotspot* and *ECD02*) do not support the faster Network Standards such as 802.11n and 802.11ac and therefore the maximum speeds between laptops and these wireless devices is limited to 54mbps (usually it will be a lot less than this).

- The security protocol used on wireless access point *ECD02* is WPA which is a weaker protocol compared to WPA2 which is used on *ECD Hotspot*. Using WPA increases the risk of malicious users piggybacking on the ECD's internet bandwidth.

- Three of the wall mount sockets for network connections found in ECD are working while the rest seemed to be out of order. .

- The network cables currently running around the whole ECD building are quite old and could be easily torn out.

Opportunities

- Donor funding is available and can be utilized to upgrade the network infrastructure to support EMIS

- Technical expertise from the Committee may be available to guide the development of the EMIS as well as the upgrade of the network infrastructure

Threats

- Sustainability of the project with respect to continued support to the operation of EMIS will depend of continuation of funding from the Ministry

- There is a high risk of complete data loss from natural disasters as well as man-made ones such as fire since there is no off-site backup system in place

Recommendations

Based on the assessments above, the following are a number of recommendations that the Team believe will enable ECD to successfully fulfil its vision of having a sustainable Environmental Management Information in place.

1. **New Server for EMIS**

   A new server should be procured specifically for EMIS with the following minimum specification:

   - Server brand (e.g Dell or HP)
   - 2.5Ghz Quad Core Processor
   - 16GB RAM
   - 4 x 600GB 10K hard drives configured in RAID 10

2. **Network Switch and Cabling**

   - A new gigabit network switch should be procured to provide faster speeds (up to 1gbps) to all staff computers.

- New CAT6 network cables should be installed all around the Division office so that staff may be able to use the cable at most locations in the Ministry. This will require installing 2 wall mount sockets per computer in all rooms of the Division to provide redundancy in case of unforeseen problems with some cables.

3. Access Points

- There's a need to procure for more powerful Access Points that will enable to reach all the ECD rooms from one central location. This will replace any wireless extending devices currently in place. Recommended APs are Linksys, Ubiquiti, and TP-Link.

- The access points should support the newest wireless standards such as 802.11n and 802.11ac

4. Antivirus Software

- All computers should have a fully licensed antivirus software to protect the users from security threats that may affect their documents and files especially those stored on a centralised location. It only takes one infected computer to infect or render the data or files useless on the centralised data repository especially with the advent of ransomeware (viruses that encrypt data on a computer and ask for a fee to unlock it)

- Recommended anti virus softwares include Bitdefender, Kaspersky, Avira, Eset Endpoint and Avast.

5. Uninterruptible Power Supply

- An online UPS is needed to support the operation of EMIS. An online UPS is one that provides extra protection from power surges as well as power outages as it runs on battery all the time. The minimum rating of 1000VA is recommended for the server specified above however the bigger the better.

6. On-site/Off—site Backup System

- This can be in the form of a Network Attached Storage (NAS) that will store all data stored on the data repository as well as the EMIS. A NAS system with a minimum capacity of 4TB (2 x 4TB configured in RAID 1) is sufficient for all ECD data and future needs. This will be setup in the MELAD Headquarter office so that the backup can act as an off-site one but at the same time close enough to ECD in case of a need to quickly restore any required data.

7. New Internet Connection

- The current internet connection is sufficient for ECD staff internet use only so if there are plans to have EMIS accessible over the Internet, a new Internet connection will need to be setup so that ECD staff internet traffic will not have any impacts on the accessibility of the EMIS from the Internet and visa versa.

- An ADSL modem (or similar technology) with minimum speed of 512/256kbps should be configured solely for EMIS however speeds in excess of 1gbps/512kbps would make EMIS more responsive from outside the ECD network. Access to EMIS from within ECD, ie from staff is not affected but this as they will be accessing EMIS via the local network.

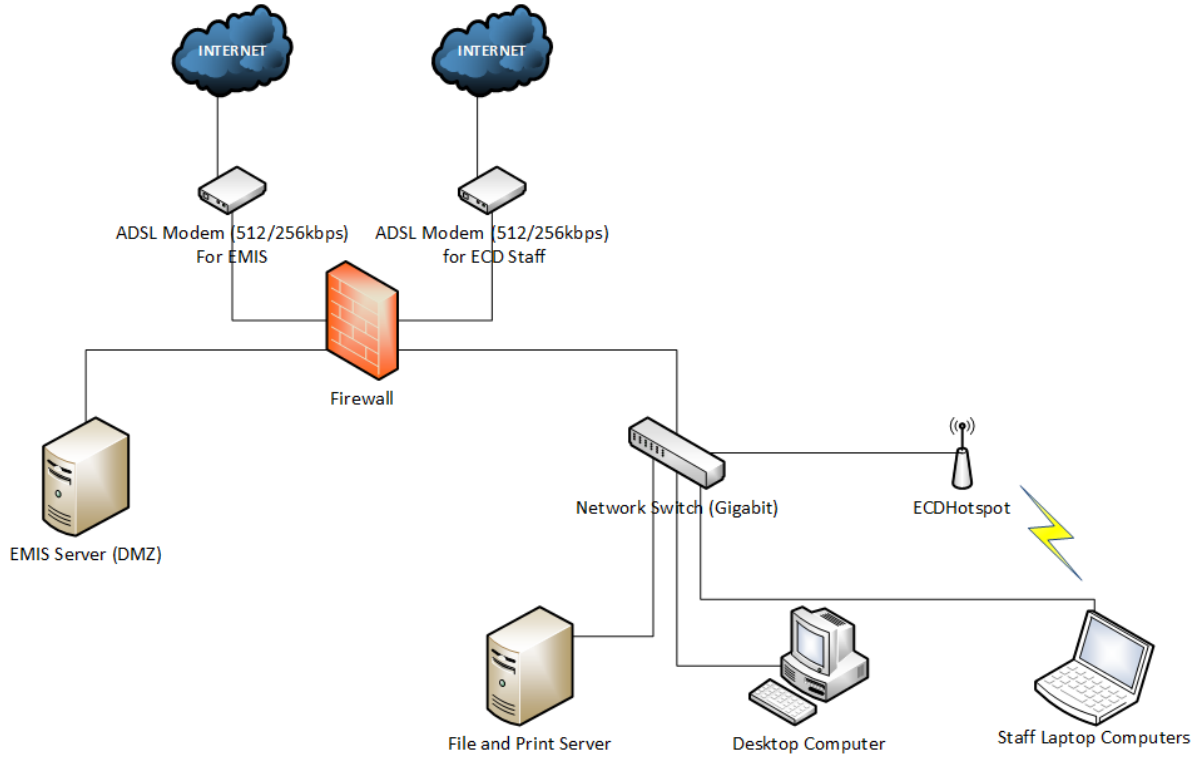
8. Firewall Software

- A dedicated firewall software will be required if EMIS will be accessible from the Internet so that it will be more difficult for malicious users (hackers) to gain access into the ECD network infrastructure and consume or corrupt data

9. Current Infrastructure and Data storage practise

- The current server is more than capable to act as a data repository for the data collected for EMIS
- A new shared drive should be created to store data collected for EMIS
- Backup should be carried on the file server on a more regular basis (i.e weekly) and two copies of these on two different storage media is better than one.
- Current Access databases should be stored on the server and one copy only should be kept
- All data and files on staff computers should be copied to the file server so that data can be securely stored and backups can be made on all ECD data and files.
- A licensed antivirus should be introduced to the File Server just in case infected files happen to exist during files transfers and exchange between server and clients.
- A domain based infrastructure could improve the current level of user and group permissions on File and Printing services and other network resources of EMIS minimizing the security threats posed by unauthorized people happened to bypass Access points authentication security.

10. Proposed new Network Diagram



- The above proposed network setup requires EMIS Server to be configured in a DMZ (Demilitarized Zone) which enables for a more secure public facing service that does not expose the local network to the Internet

With the above findings, there is a need to upgrade the current network of ECD in terms of hardware and software technologies including the increase of internet bandwidth to support the development of EMIS. The estimated costing for the items that will be required for the upgrade have been added as Annex 1.

Acknowledgements

We wish to acknowledge the assistance of staff from ECD including Capacity Building project staffs who have been very helpful in providing information about the ECD IT setup and provided continuous support during the course of writing up this report.

Annex 1. Cost Estimation For Hardware and Software Upgrade

Hardware Name	Hardware Description	Quantity	Unit Price(AUD $)	Total Price (AUD$)
Dell Rack Server	PowerEdge R720, 2.5GHz CPU, Quad Core, 16GB RAM, 4 x 600 10k HDD	1	$ 6,000.00	$ 6,000.00
Server Rack Cabinet	32RU 1000mm Deep Network Server Rack	1	$ 1,140.00	$ 1,140.00
Gigabit Switch	Managed EDGESWITCH, 48-PORT 56W	1	$ 570.00	$ 570.00
Access Point	Ubiquiti UniFi AP AC Long Range 250mW Dual Band 802.11ac 3x3 + 2x2 MIMO 450Mbps(2.4GHz) + 867Mbps(5GHz) UAP-AC-LR	1	$ 275.00	$ 275.00
Hardware Firewall	Untangle u50w Appliance	1	$ 1,230.00	$ 1,230.00
Antivirus	Kaspersky endpoint Security 30 users annually	1	$ 1,100.00	$ 1,100.00
Interactive UPS	APC Smart-UPS 1500 LCD - UPS - 1 kW - 1500 VA	1	$ 1,366.00	$ 1,366.00
NAS Enclosure	Synology Disk Station DS415+ - NAS server - 0 GB	1	$ 812.00	$ 812.00
Cat6 cable (box) & networking accessories and tools.	Cat 6 LAN Cable with Solid Conductors 305m Pull Box – GREY, RJ45 plugs (100pcs), double wall mount sockets (30pcs), crimp tool, chrome	1	$ 1000.00	$ 1,000.00
NAS Hard Drives	WD Black WD4003FZEX - hard drive - 4 TB - SATA 6Gb/s	2	$ 389.00	$ 778.00
TOTAL				**$ 14,271.00**

Except for the Dell Rack Server, all the pricings quoted above are retrieved from overseas based vendors and therefore do not include charges such as Freight, VAT etc.