ICT situation after move to new site

Report from a mission to the National Statistical Institute of Mozambique, Maputo Mozambique

2 – 11 December, 2011

within the frame work of the

**AGREEMENT ON CONSULTING ON
INSTITUTIONAL CAPACITY BUILDING,
ECONOMIC STATISTICS AND RELATED AREAS**

between

INE and Scanstat

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List of abbreviations

DBA   Database Administrator

DST   Statistics Denmark

INE   Instituto Nacional de Estatística, Mozambique

IIS   Internet Information Server (A Microsoft product)

PX   Family of Software produced by Statistics Sweden

Scanstat   Consortium between Statistics Denmark, Statistics Norway and Statistics Sweden

SCB   Statistics Sweden

SDMX   Statistical Data and Meta data exchange

SSB   Statistics Norway

SQL   Structured Query Language

XML   Extendable Mark-up Language

1   EXECUTIVE SUMMARY / SUMÁRIO EXECUTIVO

1.1   English

Scope of the mission

The main focus of the mission was to ensure stable operation after moving servers etc. to the new location. The move took place on 7 December 2011 where all the servers were transported to the new address. All services were back online, 9 December 2011. Fortunately there was no damage to the equipment while moving.

A number of activities were carried out, and a number of changes primary to the network and firewall were implemented. There was implemented a DMZ zone on the firewall, where external services can be made available to external users on the internet.

1.2   Português

Alcance da missão

O foco principal da missão era a de garantir um funcionamento estável depois de se mudar servidores etc. para o novo local. A mudança ocorreu em 07 de Dezembro de 2011, onde todos os servidores foram transportados para o novo endereço. Todos os serviços estavam de volta online, 09 de Dezembro de 2011. Felizmente não houve danos ao equipamento durante o movimento.

Uma série de actividades foram realizadas e uma série de mudanças, primária com a rede e o firewall, foram implementadas. Foi implementado uma zona DMZ no firewall, onde os serviços externos podem ser disponibilizados aos usuários   externos   na   Internet.

2   INTRODUTION

The mission was carried out 2 – 11 December 2011.

During the mission the servers were transported to INES new location at Av. 24 de Julho. The transport took place at the back of a car and the trunk of another car. The equipment was treated as gently as it was practically possible during the transport.

Unfortunately there was great difficulty in transporting the rack cabinet to the server room at 4th floor, and this resulted in a longer downtime of a wide range of internal services including the Nadabas server. The problem with the rack cabinet delayed the process by almost 2 days.

None of the servers took damage during transportation, and all services were running again on Friday 9 December in the afternoon. First impressions are that the network is running significantly better than it was on old INE. The same goes for the Internet connection out of the building.

Only a few workstations were connected when I left INE on Saturday 10 December because the constructor company did not finish the marking of cables in time. Without marks on cabling, it is very difficult to connect workstations to the network switches.

Infrastructure at the new site The constructor company of the new the building, was responsible of the power and network infrastructure. INE had no influence on the choice of network devices from Dell and Cisco. Generally it is said to be a sensible choice from the perspective of functionality and economy. From the beginning, the Cisco router switch will not be used, but in a near future when a new network design is going to be implemented, it will be a central device. A proposal for a new network design is attached in a separate document.

The server room is not designed with raised floors for cooling. The normal way of cooling in a server room, is to raise the floor and let the cold air coming throughout grates in the floor. The selected solution for cooling is OK, when you do not expect the large increase in the number of servers.

The building is equipped with UPS and power generator that can supply servers and workstations in the event of a power outage. There needs to be delivered some units to the UPS solution. The installed solution can handle 40 KW, but when the remaining units will be connected, the solution is able to handle up to 120 KW

The implementation of UPS and power generator was not completed during the mission, and no test has been performed.

Training needs for network staff Through the years there has been a need for training of employees. The network staff is still in need of getting training and knowledge in the areas of Microsoft products and general network infrastructure.

There must be a common level of knowledge among network staff, to operate and support a stable operation of servers and network. There is a strong

desire among employees about learning new knowledge in the areas of network and servers. This willingness to learn can be used to raise the level of knowledge essential.

Employees must be able to exploit each other's knowledge and thereby help to raise the common level of knowledge. A method for efficient sharing of knowledge is to document how to do the daily procedures. Examples include managing users, assigning rights, implementation of the PC and backup / restore

Relevant courses are listed in the recommendations.

Virtual server environment   Part of INE's servers is getting old and a replacement is needed in a near future. When it comes to new servers it is recommended to take a closer look at server virtualization. The following description of virtual machines is copied from Wikipedia.

A virtual machine (VM) is a software implementation of a machine (i.e. a computer) that executes programs like a physical machine. Virtual machines are separated into two major categories, based on their use and degree of correspondence to any real machine. A system virtual machine provides a complete system platform which supports the execution of a complete operating system (OS). In contrast, a process virtual machine is designed to run a single program, which means that it supports a single process. An essential characteristic of a virtual machine is that the software running inside is limited to the resources and abstractions provided by the virtual machine— it cannot break out of its virtual world.

Multiple VMs each running their own operating system (called guest operating system) are frequently used in server consolidation, where different services that used to run on individual machines to avoid interference are instead run in separate VMs on the same physical machine.

The desire to run multiple operating systems was the original motivation for virtual machines, as it allowed time-sharing a single computer between several single-tasking Operation Systems. The guest OS's do not have to be compliant with the hardware making it possible to run different OS's on the same computer (e.g., Microsoft Windows and Linux, or older versions of an OS to support software that has not yet been ported to the latest version). The use of virtual machines to support different guest OSes is becoming popular in embedded systems; a typical use is to support a real-time operating system at the same time as a high-level OS such as Linux or Windows.

Another use is to sandbox an OS that is not trusted, possibly because it is a system under development. Virtual machines have other advantages for OS development, including better debugging access and faster reboots.

INE can achieve great benefits of virtualizing server environment on a few physical servers.

- Disaster recovery. Services can run on multiple devices. In a virtual environment, it will be possible to move virtual servers to another physical server in the case of a physical server crashes.
- Server consolidation. A number of older servers can be phased out.

- Better utilization of hardware, both technically and economically

It is estimated that all servers can be virtualized on 2 powerful servers with a shared disk system.

Internal mail system E-mail correspondence is an important part of the daily work. It is important to have stable operation of the mail system and ensure that managers and staff are able to communicate with internal and external partners.

INE's internal mail system is based on Microsoft Exchange 2003 service pack 2, where the latest version is Microsoft Exchange 2010. Upgrade of both hardware and software is to be needed to ensure stable operation in the future

It is estimated that 2 consultants can implement a virtual environment and upgrade Exchange 2003 to 2010 in 2 weeks.

Firewall and DMZ Implementation of Cyberoam firewall has a number of new opportunities. INE has already benefited greatly from the built-in antispam and antivirus solution, which has minimized the spam in users' mailboxes.

Configuring a DMZ zone on the firewall was implemented during the mission. There is now external access to the Prognoz server from the internet. All future external services should be available through the DMZ zone.

3   RECOMMENDATIONS

3.1   Concluding remarks

Thanks to all at INE Finally I would like to express our thanks to all officials and individuals meet during the mission. They all provided us with the necessary information in a kind and open atmosphere which greatly facilitated our work in Mozambique. But specially, we would like to thank Mr. Lars Carlsson for being an excellent host and for a very constructive sharing of his thoughts on the project.

My best personal professional opinion It should be noted that this report contains my best personal professional opinions as consultants, and that they therefore do not necessarily correspond to the views of Statistics Denmark, Danida or INE.

3.2   Follow up on recommendations

The list contains only the outstanding recommendations. Implemented recommendations are removed from the list.

3.2.1   Follow up on recommendations from January 2004

ID:	Description	Comments	Status

JAN-REC-03	Only store INE relevant data at INE equipment	The content of the fileservers are unknown. When Windows Server 2003 R2 is implemented, it will be possibility to control content by file extensions. The technique allows to ban etc. music and video files, and the users will not be able to store this kind of files. *Use of file screening in Windows Server 2003 R2 is recommended on the file servers to avoid storing specified file types. Not all file servers are running Windows Server 2003 R2.*	Not Implemented
JAN-REC-06	Centralize software installation	The user still have local administrator on their workstations. Only network administration staff should install software. It is also a security risk when the users have administrative rights on the workstations. Virus, worms and spyware have better conditions. When Windows Server 2003 is implemented, the use of group policy can install software on workstations. *The recommendation can be implemented without any economic costs.*	Not Implemented
JAN-REC-09	Add procedures for managing the user accounts.	Procedures for managing the user accounts when employees are hired, move from one part to another inside INI, or leave INE are not implemented. There should be procedures for these tasks. Human resources must provide the network administration with this information. The technical procedures for managing user accounts should be automated by use of scripts or templates. A yearly check for consistency between the user account database and lists of employees from human resources is recommended. *This recommendation can be implemented without any economic costs.*	Not Implemented
JAN-REC-10	Use personal normal and administrative accounts for daily work	The network administrators should have two accounts. One for daily work, and one for when administrative rights is needed. *This recommendation can be implemented without any economic costs.*	Not Implemented
JAN-REC-16	Update operation manual and prepare maintenance documentation for all systems.	Fill out information in the documentation template will give a good basis in a disaster recovery situation. The information should be updates regularly, printed and places in a safe place. This can be the same place as the backup tapes. *As the infrastructure gets more and more complex, the need of documentation increases. INE will be less depending on knowledge by individuals. There are existing plans on having a logbook where changes are documented.*	Not Implemented
JAN-	Store important data	The network administration presumes that most	(Implemented)

ID:		Comments	
REC-17	centrally	data is stored on the file servers. As long as the users have administrative rights on the workstations, they can store data locally.	

3.2.2   Follow up on recommendations from December 2005

ID:	Description	Comments	Status
DEC09	FSMO roles	Place all Flexible Single Master Operation (FSMO) roles on a domain controller with a tape device. Windows Server 2003 has 5 FSMO roles: Schema master, Domain naming master, PDC emulator, RID master and Infrastructure master. As a general rule, the infrastructure master should be located on a non global catalog server, but in a single domain forest it is not an issue. Both domain controllers should be global catalog servers.	*Not Implemented*
DEC12	Assign permissions using group nesting	It is recommended to assign file permissions using group nesting. Domain local group are assigned rights on objects. Every user should have a global user group account. This group can be added to the domain local group when permissions are needed.

The recommendation can be implemented without any economic costs. | *Not Implemented* |
| DEC17 | Knowledge of Linux and open source | It is recommended to get basic knowledge of Linux for testing purpose. It is possible that part of the environment in the future can run on Linux. It will be advisable to get experience on this platform already now. Also look at open source software. There are many open source application that runs on the Windows platform. For example the Open Office maybe an alternative to Microsoft Office for some users.

At the current situation with new members of the network staff, this recommendation is not relevant. | *Wating* |

3.2.3   Follow up on recommendations from October 2007

ID:	Description	Comments	
OCT03	Govnet network	As soon as the Govnet can offer a faster connection it is recommended to move the traffic from the TV Cabo to Govnet. By now the Govnet connection is for free, but the bandwidth is too small. Govnet will also cover the provinces and can be used to connect offices in the provinces to INE.

There are plans for using the the Govnet network in 2012. | *Not implemented* |
| OCT05 | Mail quota | The Exchange has limited resources for storing mails in the database. This has cost INE a lot of problems in the past. The total size of the Exchange 2003 database can be 30 GB, it is recommended to | *Not implemented* |

| | | implement mailbox limitations. It is possible to have different limits on different mailboxes.

This recommendation can be implemented without economic costs. | |

3.2.4 Follow up on recommendations from January 2010

ID:	Description	Comments	Status
JAN01	Replacement of server hardware	The server farm at INE is keep getting older, and the wish to split up services from running on one server to run on more servers, can be helped by buying 2 new servers running VMWare. The 2 servers have to be configured with a lot of RAM and CPU cores, with Microsoft Windows Server 2008 R2. The 2 servers running VMware Server can host domain controllers, DNS- and DHCP-servers, Exchange server, file server, print server, MS Forefront server and BlackBerry server. One domain controller should still be physical as it can become difficult to start everything without having a domain controller running. After a power breakdown a domain controller should be started as the first one. The backup server should be physical as well and should be used for backup only. The server hardware should smoothly be replaced to keep the server hardware more up to date.	*Not implemented*
JAN02	Administrator password	Both local administrator and domain administrator should have a strong password. The administrator passwords should be changed twice or at least once a year. If one who knows one of the administrator passwords is no longer at the IT staff, the administrator passwords should be changed. It is not a good idea to have people outside the IT staff knowing the administrator passwords. It has been noticed that some local administrators have no password. *This recommendation can be implemented without economic costs.*	*Not implemented*
JAN03	Change log	To share knowledge and to keep track of what changes have been made and why, a change log should be implemented especially for central systems like ISA firewall, DC's and Exchange. The change log should include date for change,	*Not implemented*

		who did the change, the change and why the change was made. It is of no cost to implement a change log but it is necessarily that everyone making changes put the change in the log. Otherwise the change log is of no use. *This recommendation can be implemented without economic costs.*	
JAN07	Requirements to new members of the IT staff at INE	To avoid any language barriers between members of the IT staff at INE and foreign consultants, using forums on the internet and reading manuals, it is important that members of the IT staff at INE talks and reads English.	*Unknown*
JAN11	VLAN	The network should be segmented into VLANs for security reasons. Now the net 172.16 and 192.168.3 are running on the same physical net and have different rules at the firewall. *A plan for a new logical network infrastructure was developed during the mission and is described in a separate document.* *It becomes necessary to change the internal IP address when implementing a new logical network setup. It is important that the new IP address ranges are different from those used by GOVNET.*	*Not implemented*
JAN12	Certificate	To avoid users of OWA to have the browser giving a certificate error, INE should buy a certificate from a trusted Certificate Authority like Verisign (expensive) or Thawte (less expensive). INE can also consider to buy a wild card certificate (*.ine.gov.mz) to be used on every SSL website from INE. A wild card certificate is more expensive than an ordinary certificate but is very flexible. *The president asked for a solution during the mission.*	*Not implemented*
JAN13	Workgroup	Members of the IT staff at INE should try to make some connections with members from IT staffs from other institutions in Mozambique to exchange knowledge and ideas. It is a cheap way to learn about new things and to share knowledge across institutions which can be very helpful.	*Not implemented*
JAN14	IT policy	INE should create an IT policy. The IT policy should include rule about what is allowed browsing and downloading from the Internet, how often do users and administrators need to change password, what happens with a user account when an employee stops at INE and so on.	*Not implemented*

		Long term advisor Mr. Mogens Grossen wrote an IT Security Policy, but it has never been approved by the INE presidency.	

3.2.5 Follow up on recommendations concerning the infrastructure at INE's new building January 2010

ID:	Description	Comments	Status
JAN17	Storage	Storage can be considered but the amount of data at INE is not that big and combined to the price it is not necessarily for now. Internal disks, direct attached storage like HP MSA 60 or iSCSI like HP MSA 2020 should do the job. *A Disk Systems that connect to servers with iSCSI is a cost effective method to handle larger data volumes. Shared storage is a pre requirement if virtualization is implemented.*	*Not implemented*
JAN18	Backup	A separate physical server with tape drive and/or attached storage running a well-known and tested backup product like Backup Exec or EMC Networker. Backup needs to be taken often and automatically and can be both backup to tape and disk, and it is important to decide which systems and data need to backed up. Daily check for success and take action on errors.	*Not implemented*

3.2.6 New recommendations December 2011

Dec11-01	Training of employees	All of the network staff should have the following training:
		  • Configuring, Managing and Maintaining Windows Server 2008-based Servers (Course 6419)
		    • http://www.microsoft.com/learning/en/us/Course.aspx?ID=6419B&Locale=en-us
		  • General network understanding.
		One among the network staff should participate in a SQL Server 2008 R2 course.
		  • Maintaining a Microsoft SQL Server 2008 R2 Database
		    • http://www.microsoft.com/learning/en/us/Course.aspx?ID=6231B&Locale=en-us
		One among the network staff should participate in an Exchange 2010 course.
		  • Configuring, Managing and Troubleshooting Microsoft Exchange Server 2010
		    • http://www.microsoft.com/learning/en/us/course.aspx?ID=10135a
		If HyperV I chosen to be the software used for virtualization on among the network staff shoud participate in Microsoft HyperV course.
		  • Implementing and Managing Microsoft Server

		Virtualization ○ http://www.microsoft.com/learning/en/us/Course.aspx?ID=10215A The Internet contains much documentation concerning almost anything. As we say in Denmark: *google is your friend*. Those who are good to search and understand information on the Internet is a good employee.
Dec11-02	Upgrade internal mailsystem to Exchange 2010	The internal mail system is based on Microsoft Exchange 2003 SP2. The latest version is Exchange 2010 has a significantly better performance than the previous version. The maximum recommended mailbox database size has increased to 2 TB in Exchange 2010. It is many times larger than the current database at INE Exchange 2003 server.
Dec11-03	Virtualization of hardware.	Virtualization is an effective method of running the server infrastructure. In at virtual environment there will be a farm of physical servers from 2 to almost unlimited. The virtual servers can run on any server in the farm. If one of the physical servers breaks down, the virtual server can be moved to another server in the farm in no time. All of INE's present physical servers can be virtualized on two medium sized servers. VMWare, Microsoft and Citrix are three of the marked leaders when it comes to virtualization of hardware. INE should choose the vendor with the best support in Maputo. Microsoft Hyper-V is an integral part of Windows Server 2008 R2 Enterprise edition. It has been reported that INE already have licenses for Microsoft Hyper-V. When this occurs it will be obvious to use virtualization technology from Microsoft.
Dec11-04	Centralized storage system	A central disk system is needed to implement virtualization as the physical hosts must run on a shared file system. This is necessary to move virtual servers from one physical host to another. The connection between the common disk system and physical servers can be done efficiently and cheaply by using iSCSI technology where standard switches are used to create the connection.
Dec11-05	Testing of emergency power	At the new site UPS and power generator are implemented that can supply servers and workstations in the event of a power failure. The constructor company must prove that the system works by interrupting the injection of power to the building. The functionality should be tested by INE on a regular basis ex. once a month. The test will be to disconnect power to the building and then check that there still are power on the servers, network, storage and workstations. As part of the test, check that there is sufficient fuel in the tank. If it is not the case there must be a refill of the tank.
Dec11-	Block window to the server	In the server room is a window where the sun shines on much of

06	room	the day, and generates some heat. The window should be covered to avoid the extra warming.
Dec11-07	Fire protection of the server room.	The door to the server room is an ordinary door like the other doors in the building. It is recommended to install a fireproof door that can resist a fire in the neighboring offices. There should be a pump on the door so that it automatically closes. A door to a server room must be closed by default. There are smoke detectors in the server room but no equipment for automatic fire fighting in case of fire. A facility for automatic fire fighting will be able to protect equipment in the server room efficiently in the event of a fire.
Dec11-08	Keep order in the server room from the start.	Daily cleaning is more effective if all equipment is mounted in rack cabinets or at lease placed on a table. Dust and dirt can damage equipment in the server room
Dec11-09	External Security test	An external Danish security company has conducted a security tests up against www.ine.gov.mz. The result is attached to the report. INE must quickly follow up on the recommendations listed in the safety report.
Dec11-10	Management software to monitor the infrastructure	Monitoring the server and network infrastructure is an important to task. If a services or server break down a message can be sent automatically to the network administrators, who can take action to solve the problem.

4   APPENDIX 1. List of persons met

INE
Mr. Tomas Bernardo
Mr. Salomão Muianga

Scanstat Consortium, LTA:
Mr. Lars Carlsson, Team Leader
Mr. Jan Redeby

5   APPENDIX 2. List of Literature

All mission reports from the Scandinavian programme are available online on: *www.dst.dk/mozambique*

For this mission I would also like to refer to the report:

Mission Report from a short-term mission on Stabilizing and extending the IT-Infrastructure 25 January – 5 February 2010 by Niels Poulin. MZ:2010:01a

Mission Report from a short-term mission on Windows 2003 Migration follow up and maintenance 15 – 26 October 2007 by Bo Guldager and Niels Poulin. MZ: 2007:11

Mission report from a short-term mission on Win03 and Migration 28 November – 9 December 2005 by Bo Guldager. MZ:2005:20

6 APPENDIX 3. Terms of Reference

TERMS OF REFERENCE

For a Short-term Mission on the ICT situation after move to new site

3 – 11 December, 2011

within the

AGREEMENT ON CONSULTING IN INSTITUTIONAL CAPACITY BUILDING, ECONOMIC STATISTICS AND RELATED AREAS BETWEEN INE AND SCANSTAT.

Consultant*:*   Bo Guldager Clausen
Counterparts*:* Tomás Bernardo, Salomão Muianga and other staff at DICRE/DISI

1. Background

The INE internal network has been used for several years without a thorough revision that makes it up to date with current necessities. Apart from in-house and local technical assistance TA from Scanstat has been here on several occasions. See for example: MZ:2010:01 Manutenção da rede interna e do servidor Exchange, do Niels Poulin, MZ:2007:11; Windows 2003 Migration follow up and maintenance By Bo Guldager and Niels Poulin, MZ:2006:10: IT Management and Strategic IT use by Lars Thygesen, MZ:2006:09: Final report from a long term consultancy on IT and Statistical Production by Karsten Bormann, MZ:2005:20: Win2003 and Migration by Bo Guldager Clausen, MZ:2005:03 Final observations and recommendations from a Long-Term Advisor on IT by Mogens Grosen Nielsen, MZ-2004-04: Consolidation of Network Administration by Bo Guldager Clausen and Niels Jespersen, MZ-2003-10: Strategic IT Development issues by Lars Thygesen

Now INE is moving to a new site some kilometers away and several changes to the ICT environment will occur. The old and patched network will be substituted by a new one with routers on every floor and the server room will be completely new and built for its purpose.

2. Main Reasons for the Mission

This short-term mission is to verify that the changes have been done in a good manner and assist when problems arise.

3. Beneficiaries of the Mission

The mission will primarily benefit the staff at the IT-Department by providing knowledge of the software and hardware to be used. The beneficiaries in the long run will be the users of the INE network through improved functioning of network dependent processes.

4. Objectives of the Mission

Secure, adjust and modify the network in co-operation with the DICRE/DISI staff.

5. Expected Results
A network that gives a secure and stable environment for INE activities.

6. Work to be carried out by the Consultants
Related to the move to the new building:
1. Verify the work done by the installation firm.
2. Secure good operation of the file servers in the new environment.
3. Secure the operation of the Exchange server, its connection to the Internet and internal network.
4. Secure the operation of the Cyberroam system.
5. Secure the operation Nadabas server.
6. Check the operation of the systems for power and cooling.

Related to the general work regarding the development of ICT at INE:
7. Review the recommendations of the last visit.
8. Assess the actual general situation.
9. Give new relevant recommendations.

7. Agenda for the Mission
Working sessions with the staff

8. Tasks to be done by INE to facilitate the Mission
- Elaborate the Terms of Reference for the mission
- Prepare and supply the consultant with necessary documents and information
- Supply good working conditions for the consultant

Timing of the mission
Se above.

9. Source of Funding
Project: MPD-2008-0011 – Coordenação e Integração Estatística
PAAO11 – 3.1.1 Construção de Bases de Dados Integrados

10. Report
The consultant will prepare a draft Technical Report to be discussed with INE before leaving Maputo. A final draft will be submitted to INE for final comments within one week of the end of the mission.

Approved by Cirilo Tembe INE/DICRE

Day / / ....

Approved by Tomás Bernardo INE/DICRE/DISI

Day / / ....

Confirmed by Luis Mungamba, Contract Manager for the INE – Scanstat Contract

Day   /   /   ....

7 APPENDIX 4 ACTIVITIES DURING THE MISSION

The following activities where conduct during the mission:

Friday 2 December Visit to the new site at Av. 24 de Julho to get an overview of the infrastructure.

Kick off meeting with Mr. Tomas Bernardo, Mr. Salomão Muianga and Mr. Lars Carlsson.

Saturday 3 December Mr. Salomão Muianga gave a detailed introduction to the current technical situation at INE.

Backup procedures for the NADABAS server was reviewed

Sunday 4 December Cyberoam Firewall upgraded to version 9.6.0 build 078

Monday 5 December Cyberoam Firewall upgraded to version 10.01.02 build 059

Rulebase in Cyberoam firewall changed to a more secure state.

Tuesday 6 December ISA firewall installed on new site.

Inspection of edge DELL PowerConnect 2848 switches supplied by the constructor company.

Preparation of manual for upgrading firmware and configuration of edge switches.

Plan prepared for the relocation of servers to new location.

Wednesday 7 December Disassembly and transport of servers to new location.

Setup of a minimal IT environment on new local production with internet access.

The President of INE was the first using the new network.

Thursday 8 December Upgrading of switches to latest firmware.

Hands on training of employees

Solved problems with DNS and a new IP address from TV-Cabo

Friday 9 December Mounting rack and servers.

Startup and test of all systems.

Final meeting with Mr. Tomas Bernardo, Mr. Salomão Muianga and Mr. Lars Carlsson.

Saturday 10 December   Setup DMZ with new a new INE website.