



**Cookbook**  
**for**  
**ZAMREN applicants**

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**Version 1.0**

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## Preface

Education and research institutions are being presented with fabulous new opportunities of conducting their core business through the use of Information and Communication Technologies (ICT's). ICTs in teaching, learning, research, and management is pushing back the traditional boundaries of Teaching Learning and Research Methods. However, deployment of ICTs for effective teaching, learning and research processes comes with challenges at both organizational and operational levels. Institutions among other compelling issues are faced with:-

- i. High demand for ICT resources and services, including Internet services and e-learning resources, by students and staff
- ii. Nonexistence of ICT staff to manage
- iii. Nonexistence of ICT policies
- iv. High cost of bandwidth and ICT equipment especially in developing countries.
- v. The limited or non-existent budgets for ICT in HEI and Research institutions

This cookbook aims at guiding educational and research institutions on fundamentals that need to be addressed in order to maximize the benefit of installed ICT resources.

Before the 'Cooking' can start a general assessment to determine the current status of ICT on an institution will take place. We call this the institution's 'digital proficiency maturity' or short: ICT maturity.

The first chapter highlights organizational issues and resources desired in setting up and building ICT environment. It is very important that top management of the institution is well versed in this so that effective policies and plans are developed to ensure optimum use of ICT.

The second chapter outlines the human resources and competences necessary to drive and support the ICT organization without which optimum return on investment made on ICT cannot be realized.

The third chapter is for techies; it describes in detail on what and how to setup the necessary ICT equipment that will host and support the ICT services. There is a version for Windows based installations (chapter 3a) and Linux based installations (chapter 3b).

Thanks and appreciations go to Nkrumah University College, its principal Mrs. Rachael Kabeta and her team and also to Evelyn Hone College, its principal Mr. Daniel Fwambo and his team. In both institutions we were allowed to run a pilot workshop which helped in improving this version of the Cookbook.

Special acknowledgements go to Drs Wim van Dongen, who led the process of creating this cookbook, Dr Douglas Kunda and Mr Stein Mkandawire for their valuable input.

Bonny Khunga,  
CEO ZAMREN

## Preliminaries

The ZAMREN Cookbook has been made especially for potential new members of ZAMREN who might not have reached yet the entry level for becoming a ZAMREN member. The basic idea is that it only makes sense to have a high-speed ZAMREN Internet connection if the applying organisation will be able to *manage, control* and *use* that connection.

**Manage** refers to the governance and organisational setup of the institutional ICT. It is the domain of management. All important measures are taken, prepared and in place (with regards to finances, human resources, organisational structures) to guarantee a reliable service to the users.

**Control** refers the technical part of having a high-speed fibre connection to the Internet through ZAMREN and all possible technical consequences of that (enough trained technicians, adequate ICT facilities, etc.). It is the domain of the ICT department.

**Use** refers to the present skills and knowledge of all persons that are going to make use of this connection for the core and supporting processes of the institution. Academics, administrators and students are the main groups and their skills and knowledge should be on a proper level. It is the domain of staff and students.

This Cookbook is a guide for applying members to ZAMREN in order to check where they are with their ICT development and how to bridge possible gaps. The recipes for that in this Cookbook should help the organisation to reach the entry level for ZAMREN membership.

### General assessment

In order to have an **indication** on what level an institution might be with regards to ICT, a general ICT Maturity assessment has been made in the form of a questionnaire. The questionnaire does not require in-depth ICT knowledge. It consists of a list of 125 statements that have to be scored **True** or **False** (or **Don't know**). When an institution asks 25 to 30 randomly selected Academic and Administrative staff (of various levels), the result of this questionnaire produces a pretty accurate *indication* (not a final measure) of its ICT Maturity.

This General ICT Maturity assessment is added here as Annex 1 and will become available online very soon.

### Skills assessment

In order to measure the current skill level of staff and students parts of the (slightly adjusted) iTaNGO ICT skills assessment version can be used. The outcome of this assessment will define for each individual his or her overall current ICT skill level (percentage) and will give more precise indications for specific topics (Unable, Basic, Intermediate, Advanced). On the basis of those, a training programme can be designed. The standardized ICDL trainings are suggested and there are also many online training possibilities available that can be done at your own pace at a convenient time.

This ICT Skills assessment is added here as Annex 2 and will become available online very soon.

### Cookbook online

A Cookbook with ICT recipes runs the risk to become outdated overtime. Therefore ZAMREN will make arrangements that a (regularly updated) digital version will become available on their website very soon.

Check: <https://www.zamren.zm/>

## Chapter 1: Governance, Finances and Human Resources

Institutions for Education are deploying ICTs for innovative, efficient and effective teaching and learning processes. In the research arena, ICTs are being deployed to enable collaborative research among researchers in different geographical locations and access to high computing resources and Big Data facilities for research.

Within an institution, ICT's now underpin almost every activity and therefore a large variety of systems which crisscross organizational boundaries may be considered. Consequently, management structures can be complex. Compounded with this, disruption or failure of deployed ICT services can severely cripple an institution. Top management's support for the ICT function is therefore very cardinal.

Institutional investment in ICT both human and technological can be substantial, ranging from 10% upwards of annual budgets.

It is with the above backdrop that institutions put in place a governance structure to manage and monitor and evaluate ICT infrastructure and services so as to ensure extended support of the institutions strategies and objectives.

### Governance

ICT Governance structures vary in terms of size and integration from institution to institution. Governance is not a replacement, but is a facilitator, for good ICT management.

As stated earlier, given the cross-cutting nature of ICT functions in it is advisable that an institutional committee, "ICT Planning Committee" is created that discusses and drives the ICT agenda.

### Financial Resources

Budgeting for ICT function largely depend on the complexity of services demanded and deployed at an institution. The budgeting should be done in consultation with all stake-holders and thoroughly discussed in the ICT Planning Committee to ensure that services projected will be supported and managed.

There are four major budget components

- i. Infrastructure Investment: A provisions of acquisition ICT infrastructure such as PCs and accessories, Servers, Network Switches, Software, and necessary updates.
- ii. Externally Provided Services: A provision for services such as Internet Access, Access to Digital Libraries and Licenses and leased communications infrastructure.
- iii. Staff Training: Targeted training programmes that will ensure that ICT staff is able to support and manage installed equipment and layered products.
- iv. Awareness Programme: In-depth programmes that will ensure that end-users at all levels are aware of ICT services that are generally provided to all users, those that directly relate on their work and related institutional usage policies.

### Human Resources

The benefit accrued to the ICT investment deployed in an institution largely depends on the ICT staff hired to manage and support installed infrastructure. The measure of return on investment is not as easily determined as a production equipment in a manufacturing process, for ICT, it should be derived from effectiveness of the business processes and decision making.

The institution should have a permanent staff establishment for managing and supporting ICT infrastructure and services.

**Chapter: 1**      Governance infrastructure

**Group:**            **Organisation**

**Recipe:**            **Role of Vice Chancellor / Principal**

**Explanation:**

Through extensive experience we have learned that the role of the top-manager of the institution is crucial for the successful implementation of all ICT related activities. This holds not so much on the technical level but definitely on the organisational / managerial level. In short: if the top-manager is the driving force behind all ICT-related ventures, success is eminent. In some cases the deputy vice chancellor or deputy principal could take this role but only in close consultation with the top-manager.

**Ingredients:**

- Inspiration
- Motivation
- Collaboration
- Persuasion
- Pressure

**Instructions:**

- Gather information on the current state of affairs on all ICT related topics and issues on the institution.
- Consult the overall institutional policy if it has paragraphs on ICT development
- Consult the ICT strategy or policy document (if it exist)
- Consult the ICT manager
- Consult the managers of the various stake-holder groups (Registrar, Bursar, Deans, Head of Department, Human Resource manager, student-representation, etc.)
- Make an inventory of important ICT-related challenges
- Make a logical priority list of what needs to be done (since not everything can be accomplished in one go, due to time and resource restrictions, specifically financial and human resource restrictions)
- Take an active role as inspirator and motivator to get things rolling
- Pay special attention to overall ICT mindset, awareness and skills
- In case inspiration, motivation and persuasion don't work, use pressure!
- Discuss all ICT related issues with the ICT committee (if any)

**Side dishes or references:**

ICT committee

**For ZAMREN membership this is:**

A must



**Chapter: 1** Governance infrastructure

Group: Organisation

**Recipe:** Plan for an ICT unit / centre

**Explanation:**

The ICT Unit or ICT Centre is the operational part of the ICT organisation. Whereas in the ICT planning committee general guidelines and strategies are defined for the implementation of ICT for the core and supporting processes of the institution, the ICT Centre executes these guidelines and strategies.

It is important that such an operational unit is established and recognized within the organisation in order to prevent probably well intended but not centrally monitored ICT initiatives.

**Ingredients:**

- Physical office space for ICT manager, technicians and helpdesk officers.
- Physical space for servers (air-conditioned and locked).
- Storage space for equipment, spare parts, etc. (locked).

**Instructions:**

- Analyse the current campus plan for the most optimal space for the various ingredients mentioned above.
- Arrange for the appropriate spaces.
- Communicate to the campus community the existence and mandate of the ICT Centre.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 1** Governance infrastructure

**Group:** Organisation

**Recipe:** Install an ICT committee / focus group

**Explanation:**

The ICT Planning Committee should be chaired by the institutional Head or its Deputy (VC or DVC, Principal or Vice Principal). The ICT Manager could/should be Secretary. The role of the committee will include making decisions, such as how ICT projects are approved and prioritized. The committee should be alive to the holistic view of the institution and all its resource and budget sustainability. The Committee discusses and focuses on strategic issues related to ICT at an institutional level (e.g. emerging needs, support infrastructure, legislation, privacy, security, copyright)

**Ingredients:**

- DVC (chair)
- ICT Manager (secretary)
- Institutional stakeholders
- External experts

**Instructions:**

- Install this ICT committee / focus group at the beginning of ICT deployment process at the institution.
- Discuss strategic issues (which way to go) and operational issues (what are the priorities).
- Meet once every 2 months (prepared agenda, action list, 2-hour meeting max).

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 1** Governance infrastructure

**Group:** Organisation

**Recipe:** **Subscribe to ZAMREN Acceptable Use Policy**

**Explanation:**

There are imposed policies for services provided to the institution by external suppliers. ZAMREN has Acceptable Use Policy (AUP) for all its member institutions that obtain Internet and other Advanced Services from it.

**Ingredients:**

ZAMREN Acceptable Use Policy.

**Instructions:**

- Read through the ZAMREN Acceptable Use Policy.
- Accept the ZAMREN Acceptable Use Policy.
- Communicate the ZAMREN Acceptable Use Policy to all users and stakeholders.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 1** Governance infrastructure

**Group:** Organisation

**Recipe:** Produce a Use Policy for the institution

**Explanation:**

The pervasive nature of ICT affects the confidence and efficient conduct of the institutions business. It is therefore very important that appropriate policies are developed and constantly reviewed to protect and maintain the institution's ICT assets.

There are generally two categories of policies that are enforced, the first specific to the ICT department, who are custodians of institutional ICT infrastructure including data, and the second specific to the end-users, who use the ICT services including data.

**Ingredients:**

Existing institutional Use Policies

**Instructions:**

- Read through some existing Use Policies
- Choose the one that fits most with your institution
- Don't copy but adapt to your institutional situation
- Get the Use Policy accepted
- Communicate the Use Policy to all existing staff and students
- Make it part of the information package of new staff and students

**Side dishes or references:**

There are many Use Policies available on-line

**For ZAMREN membership this is:**

A must

**Chapter: 1**      Governance infrastructure

**Group:**            Organisation

**Recipe:**            **Plan for 2-weekly meetings of Top-Management with the ICT manager**

**Explanation:**

Communication is the most vital part when setting up a professional ICT organisation.

It is extremely important that top management is aware what is happening on the ground with regards to ICT developments. Planned meetings forces both parties (ICT and management) to keep a close eye on opportunities and challenges.

**Ingredients:**

- Scheduler
- Action list
- Minutes

**Instructions:**

- Plan ahead 2-weekly meetings for general reporting on ICT issues.
- Make an agenda and action list.
- Provide minutes of the last meeting in advance for the next meeting.
- Try to hold 1-hour meetings maximum.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 1** Governance infrastructure

**Group:** Organisation

**Recipe:** Organise helpdesk / user support

**Explanation:**

The role of the Help Desk is to provide end-users with information and support related to the institution's ICT services. It provides a single point-of-contact for users to gain assistance in troubleshooting, get answers to questions, and solve known problems about installed operating systems and application software. The Help Desk is manned by ICT Officer(s), who are conversant with the operations of ICT Department and are able to escalate issues that they cannot resolve to respective personnel in the ICT Department.

**Ingredients:**

- Physical space with network access
- Mobile phone connectivity
- (At some point: incident logging software)

**Instructions:**

- Arrange for space and facilities
- Communicate that the helpdesk is the front-office for all ICT related questions and/or problems

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 1** Governance infrastructure

**Group:** Organisation

**Recipe:** Communication ICT developments

**Explanation:**

With the risk to generalise it has been observed that ICT departments on institutions are not the best communicators on what is going on with regards to ICT projects and initiatives. ICT departments are more inward-looking and pay insufficient attention to inform the whole institutional community. Most of the times the communications from such departments are dealing with incidents, on what (for the moment) are the challenges or problems.

It makes total sense to communicate also on on-going projects, successes and planned activities for the future. An informed community is more involved and less prompt to complain.

**Ingredients:**

- Define audience groups (general, administration, academics, students, project-groups, etc.)
- Use a template for the communication (mail-template, info-flyers, etc.)
- Monthly Newsletter

**Instructions:**

- Inform the whole community on topics that are important for everyone (e.g. on viruses or other threats) or on developments that will effect everyone (improved bandwidth, new facilities or services)
- Inform specific groups on topics that only concerns them; nothing is more annoying to get e-mails that are not meant for you
- Use a standardized topic-list in order for follow-up information and to make it easier to keep track of prior communications
- For everybody's convenience put a date or number on the communications
- Create physical flyers or announcements on events or trainings (also put these on the website if present)
- Publish a monthly or bi-monthly (digital) Newsletter and place this on the website

**Side dishes or references:**

None

**For ZAMREN membership this is:**

**Chapter: 1**      Governance infrastructure

**Group:**            **Financial Resources**

**Recipe:**            **Plan for annual ICT budget**

**Explanation:**

Any institution that wants to deploy, maintain and gradually expand ICT facilities for its core and supporting processes will have to budget for this on an annual basis. ICT facilities are nowadays no luxury on a higher education institution; they are a necessary (and not always cheap) part of the overall budget. In order not to waste money or frustrate delivery of ICT services, financial planning is a must.

**Ingredients:**

- Strategic plan
- ICT action plan
- Overview current ICT costs (all categories)

**Instructions:**

Method 1.

- Depending on what has been foreseen in the strategic planning with regards to ICT facilities, calculate as precise as possible what the recurring costs are and what the investments are.
- Take into account that spare parts are needed and that a reservation is present for depreciation costs.
- Plan for an annual ICT budget including hardware, software, licenses, Internet connection, human resources, training, depreciation (etc. etc.) and unforeseen.

Method 2.

- Decide on a yearly amount that the institution can spend on total of ICT.
- Calculate what can be accomplished with such an amount, taking into account the strategic plan and ICT action plan.
- Decide on priorities! (What cannot be financed will have to be postponed).

**Side dishes or references:**

Existing financial models?

**For ZAMREN membership this is:**

A must



**Chapter: 1** Governance infrastructure

**Group:** Financial Resources

**Recipe:** Plan for technical staff training budget

**Explanation:**

Developments in the field of ICT are numerous and go very fast. To stay in touch with reality, technical ICT staff needs training almost on a continuous basis. With the needs for ICT facilities increasing year after year, the skills and knowledge of technical staff have to grow with it in order to accommodate these developments.

Therefore it is of high importance that a specific technical staff training budget is foreseen to keep skills and knowledge of ICT staff updated.

**Ingredients:**

- ICT action plan coming year
- Overview current ICT human resources capacity
- Overview current skills and knowledge level of ICT staff

**Instructions:**

- Analyse which activities of the action plan for the coming year can be accommodated by ICT staff in terms of capacity and skills/knowledge.
- Analyse which activities of the action plan for the coming year cannot be accommodated by ICT staff in terms of capacity and skills/knowledge.
- Determine the gap between needed capacity with specific skills and/or knowledge.
- Calculate the costs of technical training to bridge the determined gap.
- Plan and discuss a technical training plan with ICT technicians and management.
- Invoke the rules from the staff retention plan with regards to trainings.

**Side dishes or references:**

Staff retention policy

**For ZAMREN membership this is:**

A must

**Chapter: 1** Governance infrastructure

**Group:** Financial Resources

**Recipe:** Plan for user awareness raising training budget

**Explanation:**

Next to ICT facilities to support core and supporting processes of the institution you need users that are able to make use of these offered facilities. Without having all users properly aware of opportunities and trained in using ICT facilities, it makes no sense to invest in ICT.

Therefore a budget has to be reserved on a yearly basis to raise ICT proficiency of existing and new staff. Special attention needs to be given to more senior staff that sometimes claims to be BBC (born before computers) and are happy staying ignorant.

**Ingredients:**

Results of user ICT training needs assessment

Open source and/or on-line ICT training modules

**Instructions:**

- Let all staff and students fill in the ICT training needs assessment.
- Make a plan depending on the results of the needs assessment and focus on topics and staff that score as 'Unable' and 'Basic proficiency' in the assessment.
- Calculate the financial consequences for raising the level from 'Unable' to 'Basic proficiency' (and from 'Basic proficiency' to 'Intermediate Proficiency').
- Add these financial consequences as a separate part to the overall training budget.
- Possibly, take into consideration the available open source and on-line ICT training programmes.

**Side dishes or references:**

ICT training needs assessment

**For ZAMREN membership this is:**

A must

**Chapter: 1** Governance infrastructure

**Group:** Human Resources

**Recipe:** Plan for establishment of ICT capacity

**Explanation:**

Planning for the establishment of ICT capacity facilitates the appointment of the initial team of ICT staff and provides for possible future expansion of ICT staff.

**Ingredients:**

- Number of students registered at the institution
- Number of teaching staff working at the institution
- Number of administrative staff working at the institution
- Procedure for establishing ICT capacity at the appropriate level (Ministry of Education)

**Instructions:**

Calculate the total number of registered students, teaching staff and administrative staff.

If the total number is less than 600, establish for 5 ICT staff.

This facilitates for the immediate appointment of:

- 1 ICT coordinator (manager) with a technical background;
- 1 ICT technician (network/systems administrator) with a technical background;
- 1 ICT support staff with a technical background.

In the near future this also facilitates appointing a second ICT technician and second ICT support staff.

When in the future these are appointed, establish again for another 5 ICT staff.

If the total number is between 600 and 1200, establish for 10 ICT staff.

This facilitates for the immediate appointment of:

- 1 ICT coordinator (manager) with a managerial and technical background;
- 2 ICT technicians (network and systems administrator) with a technical background;
- 2 ICT support staff with a technical background.

In the near future this also facilitates expanding the ICT capacity to the emerging needs of the institution.

When in the future these are appointed, establish again for more ICT staff.

Follow the appropriate procedures to establish ICT capacity

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 1** Governance infrastructure

**Group:** Human Resources

**Recipe:** **Appoint 1 ICT Manager**

**Explanation:**

The ICT Manager is responsible for the overall technological direction of the Institution and establishing Institution's technical vision and leading all aspects of technology development, according to its strategic direction and growth objectives.

Coordinate, control and manage the installation, maintenance and support of all servers and communications network equipment and peripherals at the Institution for effective provision of ICT services to the entire institution.

Furthermore, since the ICT Manager will be heading the ICT Centre, he should be a decisive organiser and a people manager with strong communicating skills.

**Ingredients:**

Person with the following qualifications:

- **Education:** BEng/BSc in Computer Science, Telecoms or other related field.
- **Professional Qualification:** Possession of CISCO (CCNA, CCNP, CCSE), or other recognised Networking professional qualifications.

**Instructions:**

Place job advertisement with the following information:

**Main Duties of the Job**

**1. General Duties**

- a) Lead the strategy for technology platforms, partnerships and external relationships as well as building and managing the technology team.
- b) Clearly define long-term, medium-term and short-term technical strategies for the Institution and ensuring that systems, processes and procedures are put in place for implementation
- c) Co-ordinate the planning, design, implementation and management of suitable backup systems and procedures to ensure disaster preparedness and business continuity
- d) Establish technical standards and ensuring adherence, systems security and maintenance for high performance and availability.
- e) Lead the organization in anticipating and reacting to major technology changes.
- f) Provide insight and monitor the provision of ICT services by the ICT Department and ensure that set standards are met in service delivery.
- g) Support end-users at institutions by providing information on utilization of services provided to them and advise them of best practices.
- h) Coach Network Engineers and Systems Administrators and provides guidance in their day to day operations.
- i) Provide input in the preparation of the budget, communicate budget priorities to the technical team and ensure efficient and effective utilization of allocated resource.

**2 Operational Specific**

- a) Maintain a close relationship with, Local Telecommunications Service Providers, Internet Service Providers, computers and communications equipment suppliers and vendors to ensure high level of service is delivered to the Institution.
- b) Maintenance of Contract and Service level Agreements with various vendors
- c) Provide effective project management for project teams which cover Computers, Communications Network installations and upgrades of related equipment to ensure these projects are executed and implemented according to agreed budgets and schedules.

- d) Maintain optimum level of spares for all ICT equipment and devices at the Institution to ensure high and sustainable availabilities.
- e) Ensure all hardware installations are safely executed without compromise to subordinates/clients safety.

Reports to: Executive Director, Vice Chancellor, Principal, Head of Institution

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 1** Governance infrastructure

**Group:** Human Resources

**Recipe:** **Appoint 1 ICT Officer (Network Administrator)**

**Explanation:**

The Network administrator's task is to plan, carryout installations, maintenance and upgrades of Network support equipment (both data and voice), computers and peripherals to ensure high availability of equipment at the Institution.

**Ingredients:**

Person with the following qualifications:

- **Education:** BEng/BSc in Computer Science, Telecoms or other closely related fields.
- **Professional Qualification:** Possession of CISCO (CCNA, CCNP) or other recognised Networking professional qualification.

**Instructions:**

Place job advertisement with the following information:

**Main Duties of the Job**

**1. General Duties**

- a) Planning, Installation, configuration and maintenance of Local Area Networks of Institutions.
- b) Plan and implement network security, including building firewalls, applying cryptography to network applications, managing host security
- c) Analysing performance information for audit and maintenance purposes so that, network services and peripherals are efficiently and cost effectively provided.
- d) Monitoring, optimizing and managing of resources (such as bandwidth) on the institutional LANs.

**2. Operational Specific**

- a) Maintain a close relationship with, Network Administrators at ZAMREN member institutions to ensure high level of performance and availability of network equipment.
- b) Troubleshoot faults on the Network and provide technical solutions to ensure high availability of Network services.
- c) Ensure all hardware installations are safely executed without compromise to subordinates/clients safety.

Reports to: ICT Manager

**Side dishes or references:**

For small institutions the role of Network administrator and Systems administrator can be joined in one person.

**For ZAMREN membership this is:**

A must

**Chapter: 1** Governance infrastructure

**Group:** Human Resources

**Recipe:** **Appoint 1 ICT Officer (Systems Administrator)**

**Explanation:**

The Systems administrator's task is to plan, carry out installations, maintenance and upgrades of Operating Systems and Applications to ensure high quality of ICT services at institutions.

**Ingredients:**

Person with the following qualifications:

- **Education:** BEng/BSc in Computer Science, or other closely related fields.
- **Professional Qualification:** Possession of Linux System Administrator, MSCSE, MSCSA, DBMA, Oracle or other recognised Systems Administration professional qualification.

**Instructions:**

Place job advertisement with the following information:

**Main Duties of the Job**

**1. General Duties**

- a) Planning, Installation, and configuration of Systems on Servers, both UNIX-based and non-UNIX based operating systems.
- b) Setting up, Configuration and maintenance of Server applications and systems which include DNS, DHCP, Mail, File Servers, etc.
- c) Plan and implement system security including, file permissions, backups, business continuity and disaster recovery procedures, file system integrity and user profiles.
- d) Investigate user problems, identify their source, determine possible solutions, test and implement solutions.
- e) Perform and/or oversee software and application installations and upgrades.
- f) Develop and conduct various training and instruction for end-users. on operating systems, and other applications.

**2. Operational Specific**

- a) Troubleshoot system errors and provide technical solutions to ensure high availability of services.
- b) Document system problems and resolutions for future reference.
- c) Ensure that all applications and systems are installed in accordance with set standards and best practices

Reports to: ICT Manager

**Side dishes or references:**

For small institutions the role of Network administrator and Systems administrator can be joined in one person.

**For ZAMREN membership this is:**

A must

**Chapter: 1** Governance infrastructure

**Group:** Human Resources

**Recipe:** **Appoint 1 ICT Support staff (help desk)**

**Explanation:**

The role of the Help Desk is to provide end-users with information and support related to the institution's ICT services. It provides a single point-of-contact for users to gain assistance in troubleshooting, get answers to questions, and solve known problems about installed operating systems and application software. The Help Desk is manned by ICT Officer(s), who are conversant with the operations of ICT Department and are able to escalate issues that they cannot resolve to respective personnel in the ICT Department.

**Ingredients:**

Person with the following qualifications:

- a) **Education:** Diploma IT
- b) **Professional Qualification:** Certification in Industry Standard Products (Microsoft, Database ), International Computer Driving Licence

**Instructions:**

Place job advertisement with the following information:

**Main Duties of the Job**

**1. General Duties**

- a) Provide helpdesk support and resolve problems to the end user's satisfaction
- b) Monitor and respond quickly and effectively to requests received through the IT helpdesk
- c) Monitor Service Desk for assigned tickets
- d) Document Internal Procedures

**2. Operational Specific**

- a) Modify configurations, utilities, software default settings, etc. for the local workstation
- b) Utilize and maintain the helpdesk tracking software
- c) Document internal procedures
- d) Assist with orientation of new users to installed systems.
- e) Install, test and configure new workstations, peripheral equipment and software
- f) Maintain inventory of all equipment, software and software licenses
- g) Log reported incidents and escalate unresolved issues.
- h) Manage PC setup and deployment for new employees using standard hardware, images and software
- i) Assign users and computers to proper groups in Active Directory
- j) Perform timely workstation hardware and software upgrades as required

**Side dishes or references:**

**For ZAMREN membership this is:**

A must



**Chapter: 1** Governance infrastructure

**Group:** Human Resources

**Recipe:** Define staff retention policy

**Explanation:**

Zambia has a critical shortage of qualified ICT personnel. This poses a big challenge as staff turnover is exceptionally high due to competition among institutions to attract the few ICT experts. This is further compounded by the nature of services which must be provided 24/7 and have catastrophic implications to the institution's business when disrupted.

It is advisable for an institution to put in place a retention policy that will mitigate ICT staff turn-over. This should be driven by ICT Planning Committee and recommended to top management of the institution.

**Ingredients:**

- Human Resource policies specific for Zambian Higher Education
- Existing examples of ICT staff retention policies

**Instructions:**

- Define and write down the most practical staff retention policy for Zambian Higher Education ICT staff in accordance with national and institutional rules and regulations.
- Have this staff retention policy approved by the applicable authorities.

**Side dishes or references:**

Internet examples

**For ZAMREN membership this is:**

A must

## Chapter 2: Knowledge, Skills and Capacity

Appropriate knowledge base and skills are necessary if the institution is to get value for money on its ICT investments.

### ICT staff

An establishment for ICT staff is necessary in order to direct and manage ICT resources and ensure that the institution gains operational, organizational and strategic advantages from these resources.

The composition of ICT staff is largely dependent on the complexity, types of services and size of the institution. Generally, ICT staff will comprise a manager, systems administrator, network administrator and support officer(s).

### Academic users

No ICT facilities will generate value for money if the intended users don't have, or acquire, the knowledge and skills on how to use those resources for the specific needs and purposes of the group. For the academic users these resources should facilitate modern teaching and research. On top of having (or acquiring) basic ICT skills, this group should be equipped with the knowledge and skills on how to effectively use ICT in the classroom, for assignments. General ICT awareness should be present as well a general knowledge of social media, Internet searching (and finding) strategies and incorporating this all in teaching.

### Administrative users

The specific needs and purposes of the user group of administrators lies in the supporting processes of the core business of an educational institution. On top of having (or acquiring) basic ICT skills, this group should be equipped with the knowledge and skills on how to effectively use ICT for administering processes with regards to student admission and registration, student results, handling finances and accounting, information management (library processes), etc.

### Student users

The most important user group at any educational institution are the students. By the fact of their younger age they are regarded as being more proficient in ICT knowledge and skills than the aforementioned groups and in most cases that is true, on average. However, in order to efficiently and effectively use ICT in education also this group should have or acquire a basic ICT knowledge and skill level in order to be properly prepared for the society they are facing after studies.

**Chapter: 2**      Knowledge infrastructure

**Group:**            ICT staff

**Recipe:**            ICT manager

**Explanation:**

In a small organisation that is starting with ICT deployment the role of 'ICT manager' is mostly taken by the staff person who knows most about ICT. He is not named 'ICT manager' (yet) but is just the person you turn to for everything involving ICT. When the level of ICT facilities grows higher, this role has to develop to the specific function of a professional, full-time ICT manager.

This means that at the start in a small organisation this person needs to have mainly technical skills and knowledge. As time goes on and the institutional ICT levels up, this person's skills will shift more and more to managerial capacities than technical ones (for the technical issues there will be other ICT staff), good communicating capabilities, strong organiser and negotiator and a people manager.

**Ingredients:**

- The development stage of the institutional ICT (total beginner, slightly aware, basic, intermediate, advanced).
- Characterization of the role of the present person (if any) in charge of ICT matters.

**Instructions:**

- Assess the ICT development stage of your institution.
- Depending on the assessed development level of your institution and the amount of staff involved with ICT services, decide if the role of ICT manager is mainly a technical one or already more a managerial one.
- If the role is on a predominantly technical level, assure that the person has the necessary technical skills and knowledge. If not present, let him/her follow the appropriate technical trainings. If the role is developing more into a management level, assure that the person has the necessary technical skills and knowledge. If not present, let him/her follow the appropriate management trainings.

**Side dishes or references:**

See Recipe: Appoint 1 ICT manager

**For ZAMREN membership this is:**

A must

**Chapter: 2**      Knowledge infrastructure

**Group:**            ICT staff

**Recipe:**           **Network Administrator**

**Explanation:**

When an institution has grown out of the phase where just one person manages all ICT, the presence of more specific ICT technicians is necessary. The typical first necessary ICT roles are those of Network Administrator and System Administrator (and Support Officer: see next recipe).

**Ingredients:**

- Network Administrator

**Instructions:**

The Network Administrator should have the following basic skills or knowledge, and if not present, follow the listed courses:

List of basic skills/knowledge:

- Network Design
- Switch and Router configurations
- Network Management and Monitoring
- Deploying Internet Protocols (IPv4, IPv6)

List of courses:

- Cisco Certifications
- Juniper Certification
- Linux
- Microsoft Certified Network Administrator
- Network Security Certification
- Advanced Switching and Routing

**Side dishes or references:**

**For ZAMREN membership this is:**

A must

**Chapter: 2**      Knowledge infrastructure

**Group:**            ICT staff

**Recipe:**           **System administrator**

**Explanation:**

When an institution has grown out of the phase where just one person manages all ICT, the presence of more specific ICT technicians is necessary. The typical first necessary ICT roles are those of Network Administrator and System Administrator (and Support Officer: see next recipe).

**Ingredients:**

- System Administrator

**Instructions:**

The System Administrator should have the following basic skills or knowledge, and if not present, follow the listed courses:

List of basic skills/knowledge:

- Database Management Systems
- Operating Systems
- Systems Design and Development
- Systems Security
- System backup and recovery

List of courses:

- Web Application Development
- Server Management
- MS Certified Systems Administrator
- Virtualization
- Linux

**Side dishes or references:**

**For ZAMREN membership this is:**

A must

**Chapter: 2**      Knowledge infrastructure

**Group:**            ICT staff

**Recipe:**            **ICT helpdesk / support staff**

**Explanation:**

Deploying ICT (meaning: setting out hardware equipment, installing software) in any organisation will generate questions from users. These could be related to the working of hardware, software, other equipment (printers, scanners, Internet, etc.), or could be related to possible malfunctioning of equipment. Specific ICT staff is needed to answer these questions and resolve those problems. This category of ICT staff (helpdesk/support) should be trained at the appropriate level to be the front office for the posed questions and/or reported problems.

**Ingredients:**

ICT Helpdesk officer(s)

**Instructions:**

The ICT helpdesk officer(s) should have the following basic skills or knowledge, and if not present, follow the listed courses:

List of basic skills/knowledge:

- PC troubleshooting
- Industry Standard Productivity tools (Word Processors, Spreadsheets, Presentation tools..etc)
- Internet Services
- System backup and recovery

List of courses:

- International Computer Driving License
- MS Certified Systems Administrator
- Linux Fundamentals

**Side dishes or references:**

**For ZAMREN membership this is:**

A must

**Chapter: 2**      Knowledge infrastructure

**Group:**            Academic users

**Recipe:**            ICT skills assessment

**Explanation:**

In order to know what ICT skills training for staff and students of your institution is needed, it is necessary to assess the current level of skills of these various groups.

For that process this CookBook uses the ICT Training Needs Assessment as developed by iTaNGO

**Ingredients:**

Digital assessment tool iTaNGO (slightly adjusted)

**Instructions:**

- Let each of academic users fill in the digital ICT skills assessment tool. [Some chapters might be skipped].
- Collect the results according to specific target group and ICT Proficiency.
- Formulate recommendation on the basis of the analysis (ICT skills training by target group or by ICT Proficiency level).

**Side dishes or references:**

iTaNGO ICT Training Needs Assessment

**For ZAMREN membership this is:**

A must

**Chapter: 2** Knowledge infrastructure

**Group:** Academic users

**Recipe:** Basic skills

**Explanation:**

The academic users of the institutions ICT facilities should all have at least basic skill level for all the items that are in the ICT training needs assessment.

Alternatively and preferably, all academic users should apply for the ICDL Base Modules. There are numerous official ICDL test centres in Zambia (many in Lusaka, one in Kitwe).

**Ingredients:**

- Results of the ICT training needs assessment
- Base Modules of the ICDL

**Instructions:**

- Review for each academic user the results on the ICT training needs assessment.
- Mark all items where the score is 'Unable'.
- Follow specific training in order to get to the level 'Basic proficiency'.

Alternatively and preferably, follow the ICDL Base modules, including exam.

**Side dishes or references:**

iTaNGO ICT Training Needs Assessment

<http://www.icdlafrika.org/index.jsp?p=0&n=100>

- [www.microsoft.com/about/corporatecitizenship/citizenship/giving/programs/up/digitalliteracy/default.msp](http://www.microsoft.com/about/corporatecitizenship/citizenship/giving/programs/up/digitalliteracy/default.msp)
- [www.microsoft.com/about/corporatecitizenship/dl/courses/2695DE/onlinelauncher.htm](http://www.microsoft.com/about/corporatecitizenship/dl/courses/2695DE/onlinelauncher.htm)
- [www.microsoft.com/en-us/education/educators/higher-education-resources/default.aspx#fbid=I1NMI6PIWhN](http://www.microsoft.com/en-us/education/educators/higher-education-resources/default.aspx#fbid=I1NMI6PIWhN)
- [www.dreamspark.com/](http://www.dreamspark.com/)
- [www.dreamspark.com/Student/Software-Catalog.aspx#](http://www.dreamspark.com/Student/Software-Catalog.aspx#)

**For ZAMREN membership this is:**

A must



**Chapter: 2**      Knowledge infrastructure

**Group:**            Academic users

**Recipe:**            **Intermediate skills**

**Explanation:**

The academic users of the institutions ICT facilities could all try to acquire intermediate skill level for all the items that are in the ICT training needs assessment.

Alternatively and preferably, all academic users could apply for the ICDL Standard Modules. There are numerous official ICDL test centres in Zambia (many in Lusaka, one in Kitwe).

**Ingredients:**

- Results of the ICT training needs assessment
- Standard Modules of the ICDL (or a subset from these)

**Instructions:**

- Review for each academic user the results on the ICT training needs assessment.
- Mark all items where the score is 'Basic proficiency'.
- Follow specific training in order to get to the level 'Intermediate proficiency'.

Alternatively and preferably, follow the ICDL Standard modules, including exam.

**Side dishes or references:**

iTaNGO ICT Training Needs Assessment

<http://www.icdlafrika.org/index.jsp?p=0&n=100>

- [www.microsoft.com/about/corporatecitizenship/citizenship/giving/programs/up/digitalliteracy/default.msp](http://www.microsoft.com/about/corporatecitizenship/citizenship/giving/programs/up/digitalliteracy/default.msp)
- [www.microsoft.com/about/corporatecitizenship/dl/courses/2695DE/onlinelauncher.htm](http://www.microsoft.com/about/corporatecitizenship/dl/courses/2695DE/onlinelauncher.htm)
- [www.microsoft.com/en-us/education/educators/higher-education-resources/default.aspx#fbid=11NMI6PIWhN](http://www.microsoft.com/en-us/education/educators/higher-education-resources/default.aspx#fbid=11NMI6PIWhN)
- [www.dreamspark.com/](http://www.dreamspark.com/)
- [www.dreamspark.com/Student/Software-Catalog.aspx#](http://www.dreamspark.com/Student/Software-Catalog.aspx#)

**For ZAMREN membership this is:**

**Chapter: 2** Knowledge infrastructure

**Group:** Academic users

**Recipe:** **Advanced skills**

**Explanation:**

The academic users of the institutions ICT facilities could try to acquire advanced skill level for all the items that are in the ICT training needs assessment.

Alternatively and preferably, all academic users could apply for the ICDL Advanced Modules. There are numerous official ICDL test centres in Zambia (many in Lusaka, one in Kitwe).

**Ingredients:**

- Results of the ICT training needs assessment
- Advanced Modules of the ICDL (or a subset from these)

**Instructions:**

- Review for each academic user the results on the ICT training needs assessment.
- Mark all items where the score is 'Intermediate proficiency'.
- Follow specific training in order to get to the level 'Advanced proficiency'.

Alternatively and preferably, follow the ICDL Advanced modules, including exam.

**Side dishes or references:**

iTaNGO ICT Training Needs Assessment

<http://www.icdlafrika.org/index.jsp?p=0&n=100>

- [www.microsoft.com/about/corporatecitizenship/citizenship/giving/programs/up/digitalliteracy/default.msp](http://www.microsoft.com/about/corporatecitizenship/citizenship/giving/programs/up/digitalliteracy/default.msp)
- [www.microsoft.com/about/corporatecitizenship/dl/courses/2695DE/onlinelauncher.htm](http://www.microsoft.com/about/corporatecitizenship/dl/courses/2695DE/onlinelauncher.htm)
- [www.microsoft.com/en-us/education/educators/higher-education-resources/default.aspx#fbid=11NMI6PIWhN](http://www.microsoft.com/en-us/education/educators/higher-education-resources/default.aspx#fbid=11NMI6PIWhN)
- [www.dreamspark.com/](http://www.dreamspark.com/)
- [www.dreamspark.com/Student/Software-Catalog.aspx#](http://www.dreamspark.com/Student/Software-Catalog.aspx#)

**For ZAMREN membership this is:**

**Chapter: 2**      Knowledge infrastructure

**Group:**            **Administrative users**

**Recipe:**           **ICT skills assessment**

**Explanation:**

In order to know what ICT skills training for staff and students of your institution is needed, it is necessary to assess the current level of skills of these various groups.

For that process this CookBook uses the ICT Training Needs Assessment as developed by iTaNGO

**Ingredients:**

Digital assessment tool iTaNGO (slightly adjusted)

**Instructions:**

- Let each of your administrative users fill in the digital ICT skills assessment tool. [Some chapters might be skipped].
- Collect the results according to specific target group and ICT Proficiency.
- Formulate recommendation on the basis of the analysis (ICT skills training by target group or by ICT Proficiency level).

**Side dishes or references:**

iTaNGO ICT Training Needs Assessment

**For ZAMREN membership this is:**

A must

**Chapter: 2**      Knowledge infrastructure

**Group:**            Administrative users

**Recipe:**            **Basic skills**

**Explanation:**

The administrative users of the institutions ICT facilities should all have at least basic skill level for all the items that are in the ICT training needs assessment.

Alternatively and preferably, all administrative users should apply for the ICDL Base Modules. There are numerous official ICDL test centres in Zambia (many in Lusaka, one in Kitwe).

**Ingredients:**

- Results of the ICT training needs assessment
- Base Modules of the ICDL

**Instructions:**

- Review for each administrative user the results on the ICT training needs assessment.
- Mark all items where the score is 'Unable'.
- Follow specific training in order to get to the level 'Basic proficiency'.

Alternatively and preferably, follow the ICDL Base modules, including exam.

**Side dishes or references:**

iTaNGO ICT Training Needs Assessment

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- [www.microsoft.com/about/corporatecitizenship/citizenship/giving/programs/up/digitalliteracy/default.msp](http://www.microsoft.com/about/corporatecitizenship/citizenship/giving/programs/up/digitalliteracy/default.msp)
- [www.microsoft.com/about/corporatecitizenship/dl/courses/2695DE/onlinelauncher.htm](http://www.microsoft.com/about/corporatecitizenship/dl/courses/2695DE/onlinelauncher.htm)
- [www.microsoft.com/en-us/education/educators/higher-education-resources/default.aspx#fbid=11NMI6PIWhN](http://www.microsoft.com/en-us/education/educators/higher-education-resources/default.aspx#fbid=11NMI6PIWhN)
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- [www.dreamspark.com/Student/Software-Catalog.aspx#](http://www.dreamspark.com/Student/Software-Catalog.aspx#)

**For ZAMREN membership this is:**

A must

**Chapter: 2**      Knowledge infrastructure

**Group:**            Administrative users

**Recipe:**           **Intermediate skills**

**Explanation:**

The administrative users of the institutions ICT facilities could all try to acquire intermediate skill level for all the items that are in the ICT training needs assessment.

Alternatively and preferably, all administrative users could apply for the ICDL Standard Modules. There are numerous official ICDL test centres in Zambia (many in Lusaka, one in Kitwe).

**Ingredients:**

- Results of the ICT training needs assessment
- Standard Modules of the ICDL (or a subset from these)

**Instructions:**

- Review for each administrative user the results on the ICT training needs assessment.
- Mark all items where the score is 'Basic proficiency'.
- Follow specific training in order to get to the level 'Intermediate proficiency'.

Alternatively and preferably, follow the ICDL Standard modules, including exam.

**Side dishes or references:**

iTaNGO ICT Training Needs Assessment

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- [www.microsoft.com/about/corporatecitizenship/dl/courses/2695DE/onlinelauncher.htm](http://www.microsoft.com/about/corporatecitizenship/dl/courses/2695DE/onlinelauncher.htm)
- [www.microsoft.com/en-us/education/educators/higher-education-resources/default.aspx#fbid=11NMI6PIWhN](http://www.microsoft.com/en-us/education/educators/higher-education-resources/default.aspx#fbid=11NMI6PIWhN)
- [www.dreamspark.com/](http://www.dreamspark.com/)
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**For ZAMREN membership this is:**

**Chapter: 2**      Knowledge infrastructure

**Group:**            Administrative users

**Recipe:**           **Advanced skills**

**Explanation:**

The administrative users of the institutions ICT facilities could try to acquire advanced skill level for all the items that are in the ICT training needs assessment.

Alternatively and preferably, all administrative users could apply for the ICDL Advanced Modules. There are numerous official ICDL test centres in Zambia (many in Lusaka, one in Kitwe).

**Ingredients:**

- Results of the ICT training needs assessment
- Advanced Modules of the ICDL (or a subset from these)

**Instructions:**

- Review for each administrative user the results on the ICT training needs assessment.
- Mark all items where the score is 'Intermediate proficiency'.
- Follow specific training in order to get to the level 'Advanced proficiency'.

Alternatively and preferably, follow the ICDL Advanced modules, including exam.

**Side dishes or references:**

iTaNGO ICT Training Needs Assessment

<http://www.icdlafrika.org/index.jsp?p=0&n=100>

- [www.microsoft.com/about/corporatecitizenship/citizenship/giving/programs/up/digitalliteracy/default.msp](http://www.microsoft.com/about/corporatecitizenship/citizenship/giving/programs/up/digitalliteracy/default.msp)
- [www.microsoft.com/about/corporatecitizenship/dl/courses/2695DE/onlinelauncher.htm](http://www.microsoft.com/about/corporatecitizenship/dl/courses/2695DE/onlinelauncher.htm)
- [www.microsoft.com/en-us/education/educators/higher-education-resources/default.aspx#fbid=1NMI6PIWhN](http://www.microsoft.com/en-us/education/educators/higher-education-resources/default.aspx#fbid=1NMI6PIWhN)
- [www.dreamspark.com/](http://www.dreamspark.com/)
- [www.dreamspark.com/Student/Software-Catalog.aspx#](http://www.dreamspark.com/Student/Software-Catalog.aspx#)

**For ZAMREN membership this is:**

**Chapter: 2**      Knowledge infrastructure

**Group:**            **Student users**

**Recipe:**           **ICT skills assessment**

**Explanation:**

In order to know what ICT skills training for staff and students of your institution is needed, it is necessary to assess the current level of skills of these various groups.

For that process this CookBook uses the ICT Training Needs Assessment as developed by iTaNGO

**Ingredients:**

Digital assessment tool iTaNGO (slightly adjusted)

**Instructions:**

- Let each of your student users fill in the digital ICT skills assessment tool. [Some chapters might be skipped].
- Collect the results according to specific target group and ICT Proficiency.
- Formulate recommendation on the basis of the analysis (ICT skills training by target group or by ICT Proficiency level).

**Side dishes or references:**

iTaNGO ICT Training Needs Assessment

**For ZAMREN membership this is:**

A must

**Chapter: 2**      Knowledge infrastructure

**Group:**            Student users

**Recipe:**            **Basic skills**

**Explanation:**

The student users of the institutions ICT facilities should all have at least basic skill level for all the items that are in the ICT training needs assessment.

Alternatively and preferably, all student users should apply for the ICDL Base Modules. There are numerous official ICDL test centres in Zambia (many in Lusaka, one in Kitwe).

**Ingredients:**

- Results of the ICT training needs assessment
- Base Modules of the ICDL

**Instructions:**

- Review for each student user the results on the ICT training needs assessment.
- Mark all items where the score is 'Unable'.
- Follow specific training in order to get to the level 'Basic proficiency'.

Alternatively and preferably, follow the ICDL Base modules, including exam.

**Side dishes or references:**

iTaNGO ICT Training Needs Assessment

<http://www.icdlafrika.org/index.jsp?p=0&n=100>

- [www.microsoft.com/about/corporatecitizenship/citizenship/giving/programs/up/digitalliteracy/default.msp](http://www.microsoft.com/about/corporatecitizenship/citizenship/giving/programs/up/digitalliteracy/default.msp)
- [www.microsoft.com/about/corporatecitizenship/dl/courses/2695DE/onlinelauncher.htm](http://www.microsoft.com/about/corporatecitizenship/dl/courses/2695DE/onlinelauncher.htm)
- [www.microsoft.com/en-us/education/educators/higher-education-resources/default.aspx#fbid=11NMI6PIWhN](http://www.microsoft.com/en-us/education/educators/higher-education-resources/default.aspx#fbid=11NMI6PIWhN)
- [www.dreamspark.com/](http://www.dreamspark.com/)
- [www.dreamspark.com/Student/Software-Catalog.aspx#](http://www.dreamspark.com/Student/Software-Catalog.aspx#)

**For ZAMREN membership this is:**

A must



**Chapter: 2**      Knowledge infrastructure

**Group:**            Student users

**Recipe:**            **Intermediate skills**

**Explanation:**

The student users of the institutions ICT facilities could all try to acquire intermediate skill level for all the items that are in the ICT training needs assessment.

Alternatively and preferably, all student users could apply for the ICDL Standard Modules. There are numerous official ICDL test centres in Zambia (many in Lusaka, one in Kitwe).

**Ingredients:**

- Results of the ICT training needs assessment
- Standard Modules of the ICDL (or a subset from these)

**Instructions:**

- Review for each student user the results on the ICT training needs assessment.
- Mark all items where the score is 'Basic proficiency'.
- Follow specific training in order to get to the level 'Intermediate proficiency'.

Alternatively and preferably, follow the ICDL Standard modules, including exam.

**Side dishes or references:**

iTaNGO ICT Training Needs Assessment

<http://www.icdlafrika.org/index.jsp?p=0&n=100>

- [www.microsoft.com/about/corporatecitizenship/citizenship/giving/programs/up/digitalliteracy/default.msp](http://www.microsoft.com/about/corporatecitizenship/citizenship/giving/programs/up/digitalliteracy/default.msp)
- [www.microsoft.com/about/corporatecitizenship/dl/courses/2695DE/online/launcher.htm](http://www.microsoft.com/about/corporatecitizenship/dl/courses/2695DE/online/launcher.htm)
- [www.microsoft.com/en-us/education/educators/higher-education-resources/default.aspx#fbid=11NMI6PIWhN](http://www.microsoft.com/en-us/education/educators/higher-education-resources/default.aspx#fbid=11NMI6PIWhN)
- [www.dreamspark.com/](http://www.dreamspark.com/)
- [www.dreamspark.com/Student/Software-Catalog.aspx#](http://www.dreamspark.com/Student/Software-Catalog.aspx#)

**For ZAMREN membership this is:**

**Chapter: 2** Knowledge infrastructure

**Group:** Student users

**Recipe:** Advanced skills

**Explanation:**

The student users of the institutions ICT facilities could try to acquire advanced skill level for all the items that are in the ICT training needs assessment.

Alternatively and preferably, all student users could apply for the ICDL Advanced Modules. There are numerous official ICDL test centres in Zambia (many in Lusaka, one in Kitwe).

**Ingredients:**

- Results of the ICT training needs assessment
- Advanced Modules of the ICDL (or a subset from these)

**Instructions:**

- Review for each student user the results on the ICT training needs assessment.
- Mark all items where the score is 'Intermediate proficiency'.
- Follow specific training in order to get to the level 'Advanced proficiency'.

Alternatively and preferably, follow the ICDL Advanced modules, including exam.

**Side dishes or references:**

iTaNGO ICT Training Needs Assessment

<http://www.icdlafrika.org/index.jsp?p=0&n=100>

- [www.microsoft.com/about/corporatecitizenship/citizenship/giving/programs/up/digitalliteracy/default.msp](http://www.microsoft.com/about/corporatecitizenship/citizenship/giving/programs/up/digitalliteracy/default.msp)
- [www.microsoft.com/about/corporatecitizenship/dl/courses/2695DE/onlinelauncher.htm](http://www.microsoft.com/about/corporatecitizenship/dl/courses/2695DE/onlinelauncher.htm)
- [www.microsoft.com/en-us/education/educators/higher-education-resources/default.aspx#fbid=11NMI6PIWhN](http://www.microsoft.com/en-us/education/educators/higher-education-resources/default.aspx#fbid=11NMI6PIWhN)
- [www.dreamspark.com/](http://www.dreamspark.com/)
- [www.dreamspark.com/Student/Software-Catalog.aspx#](http://www.dreamspark.com/Student/Software-Catalog.aspx#)

**For ZAMREN membership this is:**

## Chapter 3a: Technology, Network and Servers (Windows)

The technical component of any ICT installation has always been regarded as the most important part. Though this has been true in the past, nowadays since ICT has become a naturally accepted phenomenon in the current society, most of the attention tends to shift to the non-technical components.

Nevertheless, without the technical components and specifically networks (of all kind), nothing can be done. This chapter deals with all technical stuff and is therefore specifically interesting to the technicians and not for the other groups.

Chapter 3a deals with technicalities in case the architecture is based on Windows.

### Setting up the LAN

A LAN, or local area network, is a great way to share files and devices between multiple computers. If you have several computers in your office/s, setting up a network will allow you to share an Internet connection, data, printers, and other devices between your computers.

This section deals with the organisational preparations and the technical setup of a LAN.

### Network administration

Network administration is the field of work in which the hardware and software that comprises the network is maintained. This involves ensuring that network services are available and are working efficiently. Network administration and security plays a very important part in maintaining a robust and secure network. With a large network, it becomes imperative to ensure the security of the data. It is an essential requirement for the network administrator to monitor that the entire network is properly secure from threats, viruses, and other external inputs from different networks and applications.

### Server setup

This section discusses the setting of a number of servers including the Linux operating system. A server is a computer or device on a network that manages network resources or is dedicated for running specific applications or provides a specific service. This section presents the DNS setup, DHCP setup, Web server setup, File server setup, Print server setup and Mail server setup.

### Server administration

This section discusses the monitoring and management of servers. A server is a computer or device on a network that manages network resources or is dedicated for running specific applications or provides a specific service. This section presents the Server upgrades, Server security, Server monitoring and tuning, Backup and restoration automation.

### User administration

This section is dealing with the main aspects of User administration. User account creation is one of many identity management procedures, and it defines the different ways of managing an individual's digital identity, authentication and authorization rights. The task of creating user accounts is performed by either a Network Administrators or Systems Administrator.

**Chapter: 3a**    Technical infrastructure (Windows)

**Group:**            **Setting up the LAN**

**Recipe:**            **Preparations**

**Explanation:**

LAN planning is an iterative process, encompassing topological design, network-synthesis, and network-realization and is aimed at ensuring that a new computer network or service meets the needs of the organization and operator. The process can be tailored according to each new network or service.

**Ingredients:**

- A map of the organization
- Building designs of the organization
- A computer
- Printer/plotter

**Instructions:**

- Identifying the applications that you intend to use, usually diverse environments such as Enterprise Resource Management (ERM), Internet telephony, Instant Messaging (IM), email and others. These in turn are used for estimating the software, hardware, and traffic requirements.
- Traffic Requirements: Computing traffic requirements include several factors. A few points to consider include Identification and documentation of major traffic sources, categorization of traffic as local, distributed, client/server, peer-to-peer, terminal/host or server/server, Estimation of bandwidth requirements for each application.
- Scalability Requirements: Scalability refers to the extent of network growth that should be supported. For corporate network, scalability is a major consideration. Provision must be made to add users, applications, additional sites, and external network connections.
- Availability: The availability of a network needs to be given careful consideration while designing a network. It is the amount of time a network is available to users over a period of time and is often a critical design parameter. Availability has direct relation with the amount of redundancy required. Another important factor that needs to be considered when computing availability requirements is the business loss to the Company due to unavailability of the network for a given amount of time. A right balance needs to be arrived at such that the profitability is maintained.
- Security and Accessibility: Security and accessibility are among the important design phase steps. A security plan needs to be devised that meets the required security specifications. You must specify, a list of network services that will be provided such as FTP, Web, e-mail, etc., who will be administering the security of these services, how the people will be trained on security policies and procedures, recovery plan, in case a security breach does take place.
- Cost considerations: For LANs, the tendency is to minimize the equipment cost. That is minimizing the cable cost, minimizing the per port cost, and the labour cost.
- **Redundancy.** Network uptime becomes more critical every year. Spend time planning a design that provides network redundancy from a physical and logical perspective. For example, utilize dual fiber-optic uplinks from the wiring closets to the core switches. Ensure that chassis-based core switches have dual CPU cards. Be sure to think about items like default gateway redundancy.
- **Standards and maintenance.** When designing a corporate network, try to standardize on a few different types of devices, as opposed to using a different type of switch in every wiring closet, even if all your equipment is from the same manufacturer. Standardizing on a few different types of hardware simplifies configuration and troubleshooting. It also allows the customer to keep cold spares of each device with next-business-day maintenance, allowing for more rapid and cost-effective responses to device failures.
- **Network management tools.** While these always seem to be left off purchase orders, network management tools are invaluable in providing maximum network uptime.

- Get the building plans and identify lighting fixtures and other large electrical appliances. Electromagnetic interference can play havoc with a LAN and cause intermittent problems, which are difficult to track down.
- Determine the placement of servers and networking devices, whether in the data center or in networking closets. The placement of the equipment will directly affect the placement of your wiring runs and wall jacks.
- Decide whether to run wiring through the ceiling or beneath the floor. The floor plans may eliminate one or the other as a possibility. For instance, if the building is on a concrete slab, your only choice is the ceiling, where the fluorescent lights are. Keep security in mind when planning your wiring runs, and avoid exposing your wiring to easy access by an unauthorized person.
- Measure the wiring runs and be sure you have no runs over 110 meters. The maximum run for an Ethernet cable is about 100 meters, plus 10 meters of patch cables from the wall to the actual devices. If you have a run longer than 100 meters, you will have to install a repeater or switch from wire to fiber, which has a much longer maximum run.
- Identify the office walls where you want to install the network jack. Give due consideration to the size and orientation of a given cubicle or office and its equipment. Do not place the jack in a location that will cause the wiring to be a tripping hazard.
- Document your plan by creating drawings of offices and wiring paths. This document will be useful in the event of future building modifications as well as troubleshooting LAN problems.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 3a**    Technical infrastructure (Windows)

Group:            Setting up the LAN

**Recipe:**            **LAN assessment**

**Explanation:**

A LAN assessment gathers information about the network. The information could be for an existing or non-existing network.

**Ingredients:**

- Network diagrams, LAN topology
- Rack layout diagrams
- Server layout diagrams
- LAN infrastructure review
- Labelling
- Cabling
- Collect router utilization reports
- Review router configuration
- Collect technology assessment reports
- Provide Local Area Network Visio diagram depicting the network topology
- Review Local Area Network error report pointing out trouble spots in the LAN
- Provide Recommendations Report for upgrading and performance enhancement steps
- General best practice recommendations
- Simple Network Management Protocol (SNMP)
- IP addressing
- Virtual LANs
- Spanning tree
- Routing protocols
- Computers
- Servers
- Operating System versions
- Applications
- System access and security
- Resilience
- Configurations
- Switches
- Active Directory (AD)
- LDAP

**Instructions:**

**If you do not have a LAN:**

- What would a LAN enable you to do that you can't do now? For example, a LAN might:
  - allow staff members to access each other's' files on the computer;
  - enable you to share Internet access on all of the computers in your organization;
  - allow staff members to use one central database;
  - allow you to set up an automated backup system for all computers on the network
- How many computers do you want on the LAN/network?
- What will be your network topology?
- What routing protocols are going to implement?
- What will be your addressing scheme?
- What type of cabling are you going to use?

- Do you have computers with different operating systems, such as Macintosh OS X or Windows XP?
- What is your budget for setting up a LAN?
- What support staff can you dedicate or hire to maintain and troubleshoot the LAN?
- Do you have access to a consultant who can set up your LAN?

**If you already have a LAN**

- What network software are you using?
- What kind of cabling does your LAN have? (Most LANs typically use blue CAT 5e or Cat6 cables.)
- Are you having any problems with your LAN?
- Is everyone who needs to be on the network connected to it?
- Is there room to put more computers on your network with your current cabling and hub?
- Is the network fast enough? What tasks are too slow to perform, if any?
- Does the network fail often? What seems to cause the breakdowns?
- Do you have a network server? What kind of computer is it (brand, model, hardware specifications, and operating system)? Has it been down more than once in the past few months?
- What kind of backup system does your network have? (For instance, do you use a CD rewriteable drive, tape drive, or external hard drive?) How frequently do you perform these backups? Do you backup all of the hard drives connected to the network, or just the server?
- Do you have a network consultant? If so, what do you estimate you paid them last year?
- Is your LAN connected to the Internet? If so, what kind of connection do you have?
  - Shared modem (56K dial-up or dedicated line)
  - ISDN
  - DSL
  - Cable modem
  - T1
  - T3
- What tasks do you need to perform using your LAN that you can't do now? How is your LAN slowing you down?
- What solutions or next steps can you take?

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 3a**    Technical infrastructure (Windows)

**Group:**            Setting up the LAN

**Recipe:**            **LAN planning**

**Explanation:**

A LAN, or local area network, is a great way to share files and devices between multiple computers. If you have several computers in your office/s, setting up a network will allow you to share an Internet connection, data, printers, and other devices between your computers. Fortunately, the process is simple, and you can learn how to set up a LAN in your home by following a few easy steps.

**Ingredients:**

All LAN set up either Wired or Wireless require the following:

- Router to route traffic
- DHCP if the you will use dynamic IP address location
- Network switches to interconnect devices
- UTP cables to connect devices to switch and devices themselves if it is wired network
- IP addresses
- RJ45 connectors
- Domain Controller

**Instructions:**

- **Assess your needs in a network.** The devices you use to set your network up will determine your network's capabilities. You should address your needs in terms of cost, security, connection speed, expandability (adding more computers or devices later) and distance between computers. In general, you will need to keep all the computers in the network within 91 meters of each other.
- **Install UTP cables:** Ensure that cables are installed if your LAN will be a wired one and if it will be a wireless, ensure that a cable is installed to your wireless router.
- **Ensure that your computers have networking interface cards/NIC installed.** In order to communicate with other computers in the network, each computer must have a NIC. If your computers are only a few years old, you are almost guaranteed to already have one built-in, as this is a standard feature on all computers being produced today. If you have an older computer, you may need to purchase and install a networking card.
- **Install a router and switches:** This will allow your computer to talk to each other and outside computers
- **Install DHCP:** Ensure that your DHCP is working properly to allocate IP addresses.
- **Set up an Internet connection.** To share an Internet connection between computers, you will first need a broadband Internet connection (such as cable or DSL) set up for your primary computer. Contact a local Internet service provider (ISP) to establish a connection if you don't already have one.
- **Connect to any devices in the network.** To connect to devices such as printers and scanners, these devices will also need to be able to communicate. To connect to a device, simply locate the device's icon on the network drive on each computer. Double-clicking on a printer's icon, for example, should install the printer and enable it for future use

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must



**Chapter: 3a**    Technical infrastructure (Windows)

**Group:**            Setting up the LAN

**Recipe:**            **Wired LAN installation**

**Explanation:**

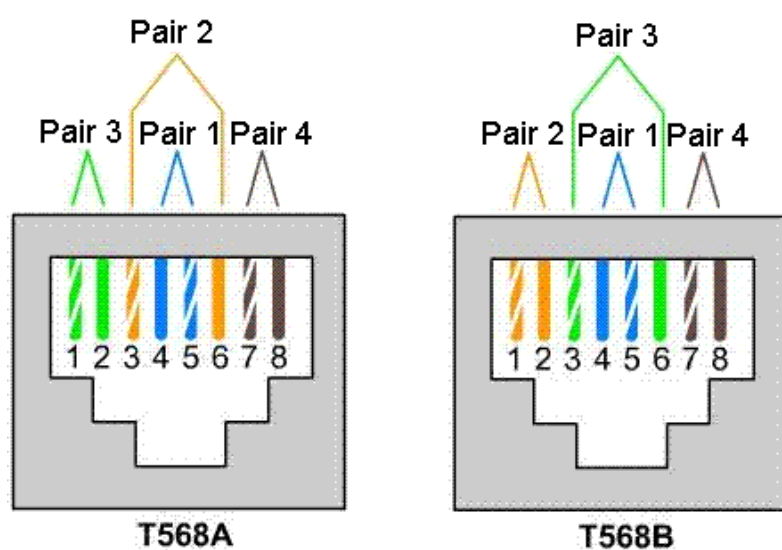
There are several types of networks, but this recipe will focus on local area network (LAN), which is a group of computers that shares a common connection to provide users access to applications, resources, or storage. Another definition is that a local area network (LAN) is a computer network that interconnects computers in a limited area such as a home, school, computer laboratory, or office building using network media.

**Ingredients:**

- UTP Cables preferably Cat6
- RJ45 Connectors
- Wall Jacks
- LAN Testers
- PVC or metal trunking
- Crimping tool
- Manageable network switch
- A swing network cabinet
- Patch panel
- Drilling machine
- Roll bolts
- Cable ties
- Patch cords
- Power cables/Adapters

**Instructions:**

- Cable lengths of 90 metres must be used from switch to wall jacks connections
- Cable lengths of 3 metres must be used for fly leads wall jack to PC connection
- Cable lengths of 30/60cm must be used for patch cords patch panel to switch connection
- For cable termination ensure that you either choose T568A or T568B. See the pictures below:



- Use your LAN tester after each cable termination to ensure correct terminations as well data speed
- Mount your network cabinet correctly in the right place

- Install patch panel and manageable switch inside the network cabinet
- Connect patch cords from patch panel to manageable switch
- Connect the 90 metres cables from patch panel to wall jack
- Connect fly leads from wall jack to computer
- Power up the switch and the computer
- Assign Internet Protocol (IP) address to the switch and computer
- Carry out a test to ascertain that the signal from the computer reaches the switch, a ping test in this case
- If the test is successful then you have successfully set up your LAN
- And if the test is not successful, then check your cable terminations and IP addresses assigned to your switch and computer.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 3a**    Technical infrastructure (Windows)

**Group:**            Setting up the LAN

**Recipe:**           **Wireless LAN setup**

**Explanation:**

A wireless local area network (WLAN) links two or more devices using some wireless distribution method (typically spread-spectrum or OFDM (*Orthogonal Frequency Division Multiplexing*) radio), and usually providing a connection through an access point (AP) to the wider Internet. This gives users the ability to move around within a local coverage area and still be connected to the network. Or it may be explained as a wireless local area network (WLAN or *wireless LAN*) consists of two or more computers that communicate wirelessly via radio waves. This is contrasted to a *wired LAN*, in which each computer in the network is physically tethered with an Ethernet cable to the server's network switch or hub.

**Ingredients:**

The key hardware components of a wireless computer network include:

- Network Interface Cards (NIC/Adapters)
- DHCP Server to allocate IP addresses
- Routers: Wireless routers function comparably to traditional routers for wired Ethernet networks. One generally deploys wireless routers when building an all-wireless network from the ground up.
- Access Points (APs): Access points and routers often utilize a Wi-Fi wireless antenna that significantly increases the communication range of the wireless radio signal. These antennas are optional and removable on most equipment. It's also possible to mount aftermarket add-on antennas on wireless clients to increase the range of wireless adapters. Add-ons antennas are usually not required on typical wireless networks, although it's common practice for wardrivers to use them.
- Antennas: Access points and routers often utilize a Wi-Fi wireless antenna that significantly increases the communication range of the wireless radio signal. These antennas are optional and removable on most equipment. It's also possible to mount aftermarket add-on antennas on wireless clients to increase the range of wireless adapters. Add-ons antennas are usually not required on typical wireless networks, although it's common practice for wardrivers to use them.
- Repeaters: A wireless repeater connects to a router or access point. Often called signal boosters or range expanders, repeaters serve as a two-way relay station for wireless radio signals, helping clients otherwise unable to receive a network's wireless signal to join.

**Instructions:**

This is the procedure for Wireless LAN installation

- Carefully plan the installation.
- Identify Locations for Access Points.
- Install the distribution system (switches).
- Configure and Install Access Points.
- Test the Installation.
- Document the final installation.

This is the procedure for Wireless LAN setup

- Obtain a broadband internet connection and modem.
- Obtain a wireless router.
- Obtain wireless NIC/Adapters for the computer.
- Configure, install and position the wireless router.
- Secure the wireless network.
- Connect computers to wireless network

**Side dishes or references:**

None

**For ZAMREN membership this is:**

**Chapter: 3a**    Technical infrastructure (Windows)

**Group:**            **Network administration**

**Recipe:**            **Switch setup and configuration**

**Explanation:**

A network switch, commonly referred to as a switch, is a network device that is used to connect segments of a LAN (local area network) or multiple LANs and to filter and forward packets among them. Switches have an appearance similar to hubs (because both are box-like devices that contain a number of RJ-45 jacks), but they are actually multi-port. Switches can also include the functionality of routers, which are devices and/or software that connect at least two networks and forward packets among them according to the information in the packet headers and routing tables. However, in general, switches are simpler and faster than routers, which require knowledge about the network and how to determine the route. Switch setup and configuration means arrangement of the parts or elements of a network switch, the totality of a switch and the devices connected to it.

**Ingredients:**

- IP Addresses
- DHCP Server to allocate IP addresses
- Console cable
- UTP cables
- Laptop

**Instructions:**

The list below enumerates the basic switch configuration options in order to get the basic functionality and monitoring.

- Connect the console cable from the computer to the switch
- Ensure correct voltage is supplied to the switch
- Power the switch and computer
- In/On switch configure Hostname and Enable Secret.
- Add an IP address for management.
- Enable Telnet and SSH for remote access.
- Define a default gateway or default route.
- Set the time.
- Enable neighbour discovery.
- Configure logging and traps.
- Add custom SNMP communities.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 3a**    Technical infrastructure (Windows)

**Group:**            Network administration

**Recipe:**            **Router setup and configuration**

**Explanation:**

In order for the traffic to move from one computer/one network to another network there should be a set of commands that direct/guide traffic movement. The process of setting up of commands that direct/guide traffic to move from one network to another is referred to as router configuration.

**Ingredients:**

- Router
- Console cable with serial/USB ends
- IP addresses
- Laptop
- UTP cable preferably CAT5e/6

**Instructions:**

The following lists the basic router configurations that are needed to get the router working.

- Configure Hostname and Enable Secret.
- Configure IP addresses on the various interfaces and un shut the interfaces
- Enable Telnet and SSH for remote access.
- Define a default gateway or default route.
- Set the time.
- Enable neighbour discovery.
- Configure logging and traps.
- Add custom SNMP communities.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 3a**    Technical infrastructure (Windows)

**Group:**            Network administration

**Recipe:**            **IP address allocation**

**Explanation:**

An Internet Protocol address (also known as an IP address) is a numerical label assigned to each device (e.g., computer, printer) participating in a computer network that uses the Internet Protocol for communication. An IP address serves two principal functions: host or network interface identification and location addressing. Its role has been characterized as follows: *A name indicates what we seek. An address indicates where it is. A route indicates how to get there.*

**Ingredients:**

- Hardware/Server
- O/S Windows Server
- Computer/Laptop

**Instructions:**

In order to allocate an IP address on the network, one can do it statically by manually allocation an IP address to a particular device or dynamically using a Dynamic Host Configuration Protocol (DHCP). It is highly recommended that devices that offer a service to its clients like routers, switches and servers should be assigned static IP addresses as follows:

1. Select a unique IP for example 192.168.1.# where # is in the range 2-99 or 150-254 (this avoids any conflict with the default DHCP address range of 100-149). This may be different in your organization if you are using private IP addresses and only use the IP addresses that have been allocated to you by ZAMREN as ZAMREN does not support the issue of NAT to support private IP addresses so your organization will be allocated enough public IP addresses according to your requirements.
2. Obtain 1 or more (typically 2) DNS server addresses you can use.
3. Operating systems vary. Most Windows PCs can use Control Panel to get to network settings (example: "Network and Dialup Connections" then "Local Area Connection" then "Properties"). Navigate to the settings for "TCP/IP" (example: "Internet Protocol (TCP/IP)").
4. Change from "Obtain an IP address automatically" to "Use the following IP address". Enter these values (all are important and exact wording may vary):
  - \* IP address: 192.168.1.# (from step 1.)
  - \* Subnet Mask: 255.255.255.0
  - \* Default Gateway: 192.168.1.1
  - \* DNS servers: (from step 2.)
5. Be sure and click "OK" as needed. You may be asked to reboot.

**Static allocation of IP to devices using Windows**

1. **Open network settings:** On the local computer go to the control panel. Locate the network and sharing center icon (name varies depending on operating system). Select the icon.
2. **Find the network connection that represents your connection to the internet.** Usually it is called Local Area Connection. Click on that and select Properties. Set the IP addresses of the DNS servers to use.
3. **Select Internet protocol version 4(TCP/IPv4).** Next select Use the following Ip address.
4. **Enter a valid IP address for the computer.** Make it the first available IP on the network (not the router address, and not .0, or .255. As these are reserved addresses). If you are unsure of what address to use, find out the network address and make the local pc a host on that network.(if you are unsure do not attempt it until you have researched). Usually 192.168.1.1 or 192.168.10.1 will work.

5. **After entering the IP address check the "subnet mask" has been filled in.** This identifies which part of the address identifies the host (pc) and which part identifies the network.

**OR**

1. Assuming that you're in the *Category* view, you should navigate to the *Control Panel*, choose *Network and Internet*, and then click *Network and Sharing Center*.
2. Then when the Network and Sharing Center opens, click on *Change adapter settings*. This will be the same on Windows 7 or 8.x.
3. Right-click on your local adapter and select Properties.
4. In the Local Area Connection Properties window highlight *Internet Protocol Version 4 (TCP/IPv4)* then click the Properties button.
5. Now select the radio button *Use the following IP address* and enter in the correct IP, Subnet mask, and Default gateway that corresponds with your network setup. Then enter your Preferred and Alternate DNS server addresses. Here we're on a home network and using a simple Class C network configuration and Google DNS.
6. Check *Validate settings upon exit* so Windows can find any problems with the addresses you entered. When you're finished click OK.
7. Now close out of the Local Area Connections Properties window.
8. Windows 7 will run network diagnostics and verify the connection is good. Here we had no problems with it, but if you did, you could run the network troubleshooting wizard.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must



**Chapter: 3a**    Technical infrastructure (Windows)

**Group:**            Network administration

**Recipe:**           **Network monitoring**

**Explanation:**

Network monitoring refers to the practice of overseeing the operation of a computer network using specialized management software tools. Network monitoring describes the use of a system that constantly monitors a computer network for slow or failing components and that notifies the network administrator in case of outages.

Network monitoring systems are used to ensure availability and overall performance of computers (hosts) and network services. These systems are typically employed on larger scale corporate and university IT networks. There are many network monitoring software to deploy both commercial and open source and the choice is purely yours. However, in this recipe, we will use Nagios which is open source running on Windows Server Operating System as a demonstration.

**Key Features in Network Monitoring**

A network monitoring system is capable of detecting and reporting failures of devices or connections. It normally measures the processor (CPU) utilization of hosts, the network bandwidth utilization of links, and other aspects of operation. It will often send messages (sometimes called *watchdog* messages) over the network to each host to verify it is responsive to requests. When failures, unacceptably slow response, or other unexpected behavior is detected, these systems send additional messages called *alerts* to designated locations (such as a management server, an email address, or a phone number) to notify system administrators.

**Network Monitoring Software Tools**

The *ping* program is one example of a basic network monitoring program. Ping is a software tool which is used to test the reachability of a host on an Internet Protocol (IP) network and to measure the round-trip time for messages sent from the originating host to a destination computer. available on most computers that sends Internet Protocol (IP) test messages between two hosts. Anyone on the network can run these basic ping tests to verify the connection between two computers is working and also measure the current connection performance.

While ping is useful in some situations, more sophisticated network monitoring systems exist. These software programs are designed for use by professional administrators of larger computer networks. One specific type of network monitoring system is designed to monitor the availability of Web servers. For larger enterprises that use a pool of Web servers distributed worldwide, these systems help to quickly detect problems at any location.

**Ingredients:**

- A computer/laptop
- Software/application to monitor (Nagios)
- Server
- Windows Server 2008 and above
- Dongle/modem
- Services/devices

**Instructions:**

- Nagios is an open-source program that allows you to monitor the status of a computer network. Using Nagios, you can watch the activities on your network in real time to see how many users are connected, what they are doing and whether the service is having difficulty handling the current

load. Nagios is written for the Unix and Linux operating systems; however, its creators have endorsed a port called Nagwin for the Windows operating system. This is how it goes:

- Navigate in your Web browser to the Nagios Core download page at [nagios.org/download/core/thanks/](http://nagios.org/download/core/thanks/). Scroll down to the "Packaged Nagios Distributions" section and click the "Learn More" link under "Nagwin."
- Click the link next to "Download URL." How to Calibrate an RTD or PT100 Download the Free Calibration Guide on [www.flukecal.com/CalibrateRTD](http://www.flukecal.com/CalibrateRTD)
- Click the "Nagwin" link.
- Click "Nagwin\_1.2.0\_Installer.zip" and save the file to the desktop.
- Right-click the file "Nagwin\_1.2.0\_Installer.zip" on the desktop and select "Extract All" to extract the contents of the archive to a folder on the desktop. Open the folder.
- Double-click the file "Nagwin\_1.2.0\_Installer.exe." After a moment, a window with the title "Nagwin 1.2.0 Setup" appears. Click "Next."
- Examine the Nagwin/Nagios license agreement and click the "I Agree" button to continue the installation process.
- Click the "Browse" button to select a destination folder for Nagios, or click "Next" to use the default location of "C:\Program Files\ICW."
- Write down the account name and password that the installation utility generates for you, or type your own username and password in the "Service Account," "Type Password" and "Confirm Password" fields.
- Click the "Install" button to install Nagwin using the settings you selected. After a moment, the installation utility displays the message "Nagwin 1.2.0 is installed on this machine now."
- Click "OK" and "Close."
- Kindly note that after installation is complete you need to customize this software for you get the full benefits.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 3a**    Technical infrastructure (Windows)

**Group:**            **Server setup**

**Recipe:**            **Server needs assessment**

**Explanation:**

The purpose of the server needs assessment is to help organizations determine their server requirements in terms of what services they require to provide to the user community. It also helps the organization assess its maturity level.

**Ingredients:**

Paper and pen

**Instructions:**

1. How many users are in your organization (no of students, academic and non-academic staff) and growth pattern? Do these users need to share and communicate confidential information? If the numbers of users is over 100 and they need to share and communicate confidential information then you need a mail server
2. How many desktops computers, laptop computers and mobile devices are in your organization? If you have more than 10 devices then you need to install a LAN, a DNS server and DHCP server.
3. Do you need to host your organization website or provide an intranet to your organization or do you need to install open source learning software such as Moodle? If the answer is yes to any of these questions then you need to install the web server.
4. Do you need to share the printers in your organization that is that two or more users sharing one or two printers over the network? If the answer is yes then you need to install the print server
5. Do any of your users in your organization need to save files on the network or do your users need to share files and other resources on the network? If the answer is yes to any of the questions then you need to install a file server.
6. Do you need to install open source software or do you need a mail server or do you need DNS and DHCP server, web server, file and printer server? If the answer is yes to any of these questions then you need to install a server operating system such as Windows Operating System (Server version).

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 3a**    Technical infrastructure (Windows)

**Group:**            Server setup

**Recipe:**            **Windows OS installation and configuration (Server version)**

**Explanation:**

The Operating System (OS) is a set of software that controls the overall operation of a computer system by performing functions such as memory allocation, job scheduling, and input/output control. The Operating System is required before you can install other software applications such as DNS server, XAMPP server, Mail server, PostgreSQL database, print server, file server, Tomcat server.

**Ingredients:**

- 1.4GHz 64-bit processor
- 512 MB RAM (system memory)
- 32 GB of hard-drive space
- Super VGA (800 x 600) or higher resolution
- Either a CD/DVD drive or a USB port for the installer media
- Internet access

**Instructions:**

1. Insert the Windows Server DVD, and press Enter to boot from the setup. Wait for a while till the setup loads all necessary files (Depending on your machine, it will take couple of minutes)
2. Once the setup files are loaded, the setup will start and you can change the default values to meet your needs (the default values should be fine for now) and when you click Next, you can start the installation, click "Install now"
3. When given a number of options. Select Windows Server Data Center (Server With GUI). After you click Next from previous screen, Read the License terms, tick the "I accept the license terms" and click Next
4. Now It will ask you for the drive (or partition) you want to install Windows on. You can install on the one partition and this will remove the content of the partition. Either you create a partition to install windows on, or you can test this on a testing machine
5. Now once we picked our partition, clicking on next from previous screen will start the setup. This process might take a while.
6. Once the setup is done, it will restart and start your Windows Server for the first time. It will ask you then to set up a password for the Administrator user
7. The setup will finalize your settings, might take a couple of minutes
8. Once the setup is done, you can log in for the first time to your Windows Server, as the screen says, press Ctrl+Alt+Delete to log in, and use the password you set in the setup process
9. Once you Log in, Windows Server will show the Server Manager
10. In order to make the windows server domain controller we will install ADDS (Active Directory Domain Services) role from the server manager on Windows Server.
11. First you change the server name let say server2014dc and the IP address 10.10.21.1 (try to avoid using default 192.168.0.1)
12. On Installation Type page, select the first option "Role-based or Feature-based Installation". Scenario-based Installation option applied only to Remote Desktop services.
13. On the "Server Selection" Page, select a server from the server pool and click next.
14. To install AD DS, select Active Directory Domain Services in turn it will pop-up to add other AD DS related tools. Click on Add Features.
15. After clicking "Add Features" above, you will be able to click "Next >"
16. On the "Select Features" Page, Group Policy Management feature automatically installed during the promotion. Click next.
17. On the "Active Directory Domain Services" page, it gives basic information about AD DS. Click Next.

18. On the “Confirmation” Page, You need to confirm this to continue with this configuration. It will provide you an option to export the configuration settings and also if you want the server to be restarted automatically as required.
19. After clicking “Install” the selected role binaries will be installed on the server.
20. After “Active Directory Domain Services” role binaries have been installed and now it is time to promote the server to a Domain Controller.
21. To create a new AD forest called “ZamrenPro.local”, select add a new forest. Type the name ZamrenPro.local. Specify the FFL, DFL, whether or not it should be a DNS Server and also the DSRM administrator password. As you can see, it has selected the GC option by default and you cannot deselect it. The reason for this is that is the very first DC of the AD forest and at least one needs to be a GC.
22. Specify the location of the AD related folders and then click next. A summary Of All Installation Options/Selections is provided. Click View script for single command line PowerShell script for dcpromo. Before the actual install of AD, all prerequisites are checked. If All prerequisite checks are passed successfully then click Install.
23. When you click Install, DNS and the GPMC are installed automatically. After the promotion of the server to a DC finished server restart automatically.
24. Once the server is booted and you logon to it, click on Server Manager | Tools , will notice that following have been installed :
  - Active Directory Administrative Center
  - Active Directory Domains and Trusts
  - Active Directory Module for Windows PowerShell
  - Active Directory Sites and Services
  - Active Directory Users and Computers
  - ADSI Edit
  - DNS
  - Group Policy Management

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 3a**    Technical infrastructure (Windows)

**Group:**            Server setup

**Recipe:**            **DNS setup for Windows**

**Explanation:**

The Domain Name System (DNS) is a hierarchical, distributed database. It stores information for mapping Internet host names to IP addresses and vice versa, mail routing information, and other data used by Internet applications. Domain Name Service (DNS) is an Internet service that maps IP addresses and fully qualified domain names (FQDN) to one another. In this way, DNS alleviates the need to remember IP addresses. Computers that run DNS are called name servers.

**Ingredients:**

Windows operating system (Server version)

**Instructions:**

1. Launch **Server Manager** by clicking **Start > Administrative Tools > Server Manager**. Click **Roles** and then **Add Roles**.
2. Select **DNS Server** from the list and then click Next button.
3. A little introduction to DNS Server and a few useful links for further details will be provided. Click Next button
4. Click Install button to start the installation.
5. DNS Server will be installed successfully. Click Close to finish the **Add Roles Wizard**.
6. Now you need to create Forward Lookup Zone. To do this, launch **DNS Manager** by clicking Start > Administrative Tools > DNS or type dnsmgmt.msc in Run window (Press Windows Key + R) and press Enter.
7. Expand Server (e.g. WIN2008) > Right click **Forward Lookup Zones > New Zone** which will launch New Zone wizard.
8. Click Next on Welcome to the New Zone wizard.
9. To set up the primary DNS Server for the zone select **Primary zone**. Then move on by clicking Next button.
10. Enter the domain name for which you want to create the zone for e.g. example.com. Say you want to build up DNS Server for your own Windows Server 2008 based hosting server then enter your registered domain name here otherwise if it is for intranet only it can be anything (domain naming conventions must be followed). The zone can also be created for subdomain e.g. zm.example.com. Then click next button.

**Zone File Options:**

- **Create a new file with this file name:** Enter the physical zone file name where all zone information will be stored for this domain/subdomain. This file will be created under %systemroot%\system32\dns. Follow standard zone file naming convention e.g. example.com.dns.
  - Use this existing file: If you already have a zone file for this domain/subdomain then select this option and specify zone file name here. You need to put this zone file under %systemroot%\system32\dns folder
11. You then specify the Dynamic Update that is if this DNS zone will accept secure, nonsecure or no dynamic updates from client. Select do not allow dynamic updates (see options below)
    - Allow only secure dynamic updates (recommended for Active Directory): This is available only for Active Directory integrated zones. This setting allows Active Directory client machines to register their name as resource records pointing towards their dynamic/static IP address.

- Allow both nonsecure and secure dynamic updates: This should never be enabled because it allows all clients secure and nonsecure both to update from all clients.
  - **Do not allow dynamic updates:** This should be the preferred setting if you are setting up this zone for your own hosting server. This denies dynamic updates to zone resource records from all client and you will need to change them manually whenever required. We will choose this option and then move on.
12. **Forward lookup zone** has been created successfully for example.com and click Finish to close the New Zone Wizard.
  13. Now configure **Forward Lookup Zone** by right clicking on example.com (forward lookup zone recently created) and then click Properties.
  14. Then configure nameservers for the zone example.com. First remove the default entry from the list and click Add... button to add new nameserver record. Type a fully qualified domain name (FQDN) of the nameserver for your domain e.g. ns1.example.com. Enter the IP addresses to which ns1.example.com will resolve to e.g. 192.168.2.1 (replace it by your Public IP Address allotted by your ISP). You can create another nameserver record e.g. ns2.example.com pointing to 192.168.2.1 (replace it by your Public IP Address allotted by your ISP). Click Apply to save changes.
  15. Configure the **Start of Authority (SOA)**.
    - Serial number: This is the serial number for the zone.
    - Primary server: This is the FQDN of nameserver which you want to set as primary nameserver for this zone e.g. ns1.example.com.
    - Responsible person: Specify the email address of the administrator who is responsible for maintaining this zone.
    - Refresh interval: This value instructs the slave nameserver how often to check that the data for this zone is up to date. Set this to 1 day if zone doesn't change frequently. For the DNS server for hosting purpose 1 day is idle.
    - Retry interval: In case slave nameserver failed to connect to master after Refresh interval (in case master is down or unreachable), slave tries to connect to master every interval specified here. Generally Retry interval is shorter than Refresh interval but it's not compulsory. Enter 2 hours here.
    - Expires after: If the slave fails to connect master for this much time, the slave expires the zone. Expiring the zone means it slave stops responding to queries for this zone because the zone data that slave is having is very old. Enter 7 days here.
    - Minimum (default) TTL: TTL stands for Time To Live. This applies to all negative responses from the authoritative nameservers. Enter 1 day here.
    - TTL for this record: TTL for SOA record.
    - Click Apply to save changes.
  16. Now configure the **Zone Transfers**: Zone transfer is the process of transferring entire zone to the requesting server/client. The best practice is to not allow everyone to connect and transfer the zones. You can allow only specific server for zone transfers i.e. the slave nameserver for the zone. We can setup to notify the servers if any zone updates happen on this zone. Allow zone transfers: Enables/disables zone transfers. Select only to servers listed on the Name Servers tab: Zone transfers will only be allowed to the nameservers specified under Name Servers tab (ns1.example.com, ns2.example.com).
  17. Under Notify select Servers listed on the Name Servers tab: Selecting this will only zone update notification will only be sent to nameservers listed under Name Servers tab.
  18. To configure **DNS Server Properties** open **DNS Manager** by clicking Start > Administrative Tools > DNS. Right Click on the DNS Server for which you want to configure Properties for and click Properties. You can now configure: **Interfaces, Forwarders, Advanced, Root Hints** (this is the list of root name servers), **Debug Logging, Event Logging**.
  19. DNS Server listens on TCP and UDP port 53, so make sure to allow traffic on these ports in Windows Firewall. Also make sure that if you are having any router or firewall device and DNS server is behind any of these device, do necessary configuration to allow connection to DNS Server.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must



**Chapter: 3a**    Technical infrastructure (Windows)

**Group:**            Server setup

**Recipe:**            **DHCP setup**

**Explanation:**

The Dynamic Host Configuration Protocol (DHCP) is a network service that enables host computers to be automatically assigned settings from a server as opposed to manually configuring each network host. Computers configured to be DHCP clients have no control over the settings they receive from the DHCP server, and the configuration is transparent to the computer's user. The most common settings provided by a DHCP server to DHCP clients include: IP address and net mask; IP address of the default-gateway to use and IP addresses of the DNS servers to use. However, a DHCP server can also supply configuration properties such as: Host Name, Domain Name, Time Server and Print Server.

**Ingredients:**

- Windows Operating System (server version)
- A static IP address on the server
- Server must be part of the domain

**Instructions:**

1. Launch the Add Role Wizard from Server Manager.
2. Select DHCP server role and go through the steps needed for installation. The last page of the wizard (which comes up after the role has been installed), provides a link - "Complete DHCP configuration". This provides some tasks that need to be performed to enable the DHCP server role to work properly after role installation.
3. Launch the DHCP post-install wizard and complete the steps required.
4. Create the DHCP security groups (DHCP Administrators and DHCP Users). For these security groups to be effective, the DHCP server service needs to be restarted. This will need to be performed separately by the administrator.
5. Authorize DHCP server in Active Directory (only in case of a domain-joined setup). In a domain joined environment, only after the DHCP server is authorized, it will start serving the DHCP client requests. Authorization of DHCP server can only be performed by a domain user that has permissions to create objects in the Net services container in Active Directory. See how to delegate permissions to do this in active directory.
6. In case completing of the post-install step is missed after role installation, the administrator will continue to see a notification on the action pane and also a link on the DHCP role tile on the main Server Manager page suggesting that some configuration is required. That link would go away only after completion of the post-install task.
7. Configure the DHCP server parameters such as scope, options etc. are no longer available in the new Server Manager by launching the DHCP MMC either via Server manager or via the DHCP MMC application in the Start Menu, or writing dhcpcmgmt.msc on the command prompt. The administrator can now create scopes, set option values so as to be able to lease out IP addresses and provide option values to clients. The scope and options include:
  - Give your scope a name
  - Enter the first address that you want available to clients to use
  - Enter the last address that you want available to clients to use
  - Enter the subnet mask (usually 255.255.255.0)
  - Enter the IP address of your default gateway

**Side dishes or references:**

None

For ZAMREN membership this is:

**Chapter: 3a**    Technical infrastructure (Windows)

**Group:**            Server setup

**Recipe:**            **Webserver setup for Windows**

**Explanation:**

The webserver setup is important if you are going to host the website or implement an intranet for communicating among students and lecturers. The webserver is also used as platform for learning environments such as Moodle.

**Ingredients:**

- Disk space: 20MB free (min) plus as much as you need to store your data. 1GB is probably a realistic minimum.
- Memory: 256MB (min), 1GB or more is strongly recommended.
- Windows operating system.
- Web server software. Primarily [Apache](#) or [IIS](#).
- A database. MySQL and PostgreSQL are the primary development database, the most comprehensively tested and have extensive documentation and support. Oracle and MSSQL are fully supported (note that optional plugins may be untested with these databases) but documentation and online help are not as comprehensive as MySQL/PostgreSQL.
- Client web browser on their PC/tablet/notepad.

**Instructions:**

1. Download Xampp for windows. Go to <http://www.apachefriends.org/en/xampp-windows.html>
2. Scroll to the middle of the page and look for the latest version. You have the option of downloading the ZIP, Installer or 7zip versions. The installer version would be fastest so click on the link and wait for your download to start.
3. Once the application has been successfully downloaded, search for it in your downloads folder and run it. Your **Xampp** file should be moved to local disc (C:).
4. Once you have downloaded the XAMPP file do the following to install it in the windows platform. Double click on the XAMPP file and follow the instructions. The XAMPP file will self-extract and install and create the directory [C:/XAMPP](#).
5. Start the XAMPP control and click on Apache and MySQL services.
6. To test whether it has been successfully installed, go web browser on a client machine and enter the ip address or the name of the machine where you have installed XAMPP. It will show you the XAMPP welcome screen.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

**Chapter: 3a**    Technical infrastructure (Windows)

**Group:**            Server setup

**Recipe:**            **File server setup for Windows**

**Explanation:**

File and Storage Services includes technologies that help you set up and manage one or more file servers, which are servers that provide central locations on your network where you can store files and share them with users. If your users need access to the same files and applications, or if centralized backup and file management are important to your organization, you should set up one or more servers as a file server by installing the File and Storage Services role and the appropriate role services.

The File and Storage Services role and the Storage Services role service are installed by default, but without any additional role services. This basic functionality enables you to use Server Manager or Windows PowerShell to manage the storage functionality of your servers. However, to set up or manage a file server, you should use the Add Roles and Features Wizard in Server Manager or the Install-WindowsFeature Windows PowerShell cmdlet to install additional File and Storage Services role services

**Ingredients:**

- Windows server operating system
- Disk space

**Instructions:**

1. First of all login to your Windows server 2012 as Administrator, when your login is completed the Server Manager will be opened automatically, if it doesn't open then you must open it manually.
2. Now in the Server Manager click on the Manage Button to open the "Add Roles and Features" to add the new feature.
3. Now a new window will be opened in which a few instructions will be given, click on "Next".
4. Now you will be prompted for Installation type, from which you must select the role based or feature based installation type option and then click on "Next".
5. Now you must select the server from the Server Pool. After selecting the server click on "Next".
6. Now a list of Roles will appear, in this list first find the "File and Storage Services" and then expand it, then "Files and iSCSI Services" will open, again expand it to find the "File Server Resource Manager".
7. As you select the File Server Resource Manager a new window will be opened that will ask permission to Add Features. Click on "Add Features" to grant it the permission.
8. As you select the File Server Resource Manager a new window will be opened that will ask permission to Add Features. Click on "Add Features" to grant it the permission. After selecting the Add Features option, you must click on "Next" button.
9. Now a list of Features will be available for selection, you can select any feature if you want to install and then click on "Next" or simply click on "Next" without selecting any Feature.
10. Then a confirmation page will be opened, where you can give permission to the server to restart if required or you can click on "Install" without giving permission to restart. Now your installation will begin.
11. If you had provide permission to restart then your server will first be restart and then in the Server Manager you will see that your installation is successfully completed. You can get this confirmation by clicking on the Flag given on the upper-right hand corner.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

**Chapter: 3a**    Technical infrastructure (Windows)

**Group:**            Server setup

**Recipe:**            **Print server setup for Windows**

**Explanation:**

A print server is a computer that shares printers on a network. Client computers connect to the print server to print to its shared printers. A print queue is a representation of a print device (physical printer) in Microsoft Windows. Opening a print queue displays active print jobs and their status. Each print server has a single print spooler service, which manages all the print jobs and print queues on that server. To print to a physical print device (a printer), each print queue requires a printer driver. Network printer ports are what the printer driver uses to communicate with the physical device across a network. These ports may be standard TCP/IP printer ports, Line Printer Remote (LPR) ports, or other kinds of ports. It is advisable to set a print Server Failover Cluster. A cluster is a group of independent computers that work together to increase the availability of print services or other services. If one of the clustered servers fails, another server begins to provide service, a process known as failover.

**Ingredients:**

- Windows operating system.
- Disk space

**Instructions:**

1. First of all login to your Windows server 2012 as an Administrator. When your log in is completed the Server Manager will be opened automatically, if it doesn't open then you must open it manually.
2. Now in the Server Manager click on the "Manage" button to open the "Add Roles and Features" to add the new feature.
3. Now a new window will be opened in which a few instructions are given; click on "Next".
4. Now it will ask for the "Installation Type" from which you must select the first option Role-based or feature-based installation and then click on "Next".
5. Now you must select the server from the Server Pool. After selecting the server, click on "Next".
6. Now a List of Roles will appear in front of you, from this list you must select the "Print and Document Services". Click on this option.
7. As you select the Print and Document Services a new window will be opened that will ask permission to "Add Features". Click on "Add Features" to grant it the permission.
8. After selecting the Add Features option, you must click on the "Next" button.
9. Now a list of features will be available for selection, you can select any feature you want to install and then click on "Next" or simply click on "Next" without selecting any feature. Now some information will be shown to you about this service, here also you must click on the "Next" button.
10. Now select the "Roll Services" page which will open and select the first option i.e. "Print Server" and then click on "Next".
11. Now a confirmation page will be opened, where you can give permission to the server to restart if required or you can click on "Install" without giving permission to restart. Now your installation will begin.
12. If you had provided permission to restart then your server will first restart and then in the Server Manager you will see that your installation is successfully completed. You can get this confirmation by clicking on the Flag given on the upper right hand corner.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

**Chapter: 3a**    Technical infrastructure (Windows)

**Group:**            Server setup

**Recipe:**            **Mail server setup for Windows**

**Explanation:**

Microsoft Exchange is a server program that heightens communication efficiency, stability, cost-effectiveness, and protection for businesses. It allows users to link their contacts, calendars, and email inboxes from Windows applications on PC, to browsers, and to their phones. Exchange server can be accessed from Outlook and a variety of other standards-based email clients and mobile devices.

**Ingredients:**

- The Edge Transport server role is available starting with Exchange 2013 SP1.
- Make sure that the functional level of your forest is at least Windows Server 2003, and that the schema master is running Windows Server 2003 with Service Pack 2 or later.
- The full installation option of Windows Server 2012 R2, Windows Server 2012 and Windows Server 2008 R2 SP1 must be used for all servers running Exchange 2013 server roles or management tools.
- You must first join the computer to the appropriate internal Active Directory forest and domain.
- Install the latest Windows updates on your computer.
- Some prerequisites require you to reboot the server to complete installation. For more information <http://technet.microsoft.com/en-us/library/bb691354%28EXCHG.150%29.aspx>.

**Instructions:**

1. You can Download the Exchange Setup from the Below Link <http://technet.microsoft.com/en-US/evalcenter/hh973395>
2. To Prepare Active Directory, open Windows PowerShell and type the following command:  
*Install-WindowsFeature RSAT-ADDS*
3. Then within Windows Powershell type the following command:  
*Import-Module ServerManager*  
*Install-WindowsFeature AS-HTTP-Activation, Desktop-Experience, NET-Framework-45-Features, RPC-over-HTTP-proxy, RSAT-Clustering, RSAT-Clustering-CmdInterface, Web-Mgmt-Console, WAS-Process-Model, Web-Asp-Net45, Web-Basic-Auth, Web-Client-Auth, Web-Digest-Auth, Web-Dir-Browsing, Web-Dyn-Compression, Web-Http-Errors, Web-Http-Logging, Web-Http-Redirect, Web-Http-Tracing, Web-ISAPI-Ext, Web-ISAPI-Filter, Web-Lgcy-Mgmt-Console, Web-Metabase, Web-Mgmt-Console, Web-Mgmt-Service, Web-Net-Ext45, Web-Request-Monitor, Web-Server, Web-Stat-Compression, Web-Static-Content, Web-Windows-Auth, Web-WMI, Windows-Identity-Foundation*
4. Run Restart-Computer to Reboot the Server
5. Download and install the following prerequisites:
  - Microsoft Unified Communications Managed API 4.0 Core Runtime 64-bit
  - Microsoft Office 2010 Filter Pack 64 bit
  - Microsoft office 2010 Filter Pack SP1 64 bit
6. Prepare the Active Directory by opening Windows PowerShell. Browse to Setup Location. Run *.\setup /Prepared /IAcceptExchangeServerLicenseTerms /OrganizationName:"Enter Exchange Org Name"*
7. You can remove the Organization name by running *Remove /OrganizationName* Parameter
8. Prepare the Schema by opening Windows PowerShell. Browse to Setup Location. Run *.\setup /PrepareSchema /IAcceptExchangeServerLicenseTerms*
9. Prepare the Domain by opening Windows PowerShell. Browse to Setup Location. Run *.\setup /Preparedomain /IAcceptExchangeServerLicenseTerms*. If you are in a Child domain Scenario Run *.\setup /Preparealldomains /IAcceptExchangeServerLicenseTerms*
10. Once finished an introduction pages will appear on your computer comes, then click Next
11. Choose Use recommended settings and click Next
12. Select the Roles (Mailbox role and Client Access role) and click Next

13. The next window will ask you where you want to save the software; it's recommended that you just choose the default setting. Click Next.
14. It will ask you whether you want to disable malware scanning, Choose No and Click Next
15. The installation now performs checks of your environment (Readiness Checks).
16. You will see warning after completing the readiness checks. Now click **Install** button to start the installation of Exchange 2013.
17. The setup will now start installing the Exchange Server 2013. There are total of 15 steps to complete the setup.
18. Now the setup has completed. Check launch **Exchange administration center** and click **Finish**.
19. Now log in with you domain administrator credentials. You can also open the Exchange Admin Center by browsing the link, <https://localhost/ecp> in the browser of the Exchange Server itself.
20. You can now [configure send and receive connectors](#) to send and receive mails from this console. Exchange Server 2013 has web management console unlike Exchange 2010.
21. In this way you can install Exchange 2013 mail server. You can also verify the Exchange installation. To do so, open Exchange Management Console, and type **Get-ExchangeServer** cmdlet. You can see more detail information by formatted list pipe cmdlet, i.e. **Get-ExchangeServer | fl**.
22. You can also view the setup log located in <system drive> \ExchangeSetupLogs\ExchangeSetup.log path. More on Exchange 2013 installation [here](#). Now [update your Exchange server](#) with latest bug fixes. Then, [configure the server to send and receive outside email](#). You can **download and install Cumulative Update 2** for Exchange Server 2013. To check your current build of Exchange 2013 type following cmdlet in Windows PowerShell.

[PS] C:\Windows\System32>Get-ExchangeServer | fl name,edition,admindisplayversion

#### Side dishes or references:

None

For ZAMREN membership this is:

**Chapter: 3a**    Technical infrastructure (Windows)

**Group:**            **Server administration**

**Recipe:**            **Server upgrades**

**Explanation:**

The purpose of the server upgrades is to update and upgrade the operating system and to address any security vulnerabilities that may exist with older version of the operating system or software installed. A group policy called **Always automatically restart at the scheduled time** enables restarts soon after updates are installed. If you would instead like to force restarts following update installation, you can enable the “Always automatically restart...” policy. When the policy is enabled, a restart timer will always begin immediately after Windows Update installs important updates, instead of multiple days later. The restart timer cannot be postponed once started, but the policy lets you configure the countdown timer to any value between 15 and 180 minutes. When the timer runs out, the restart will proceed even if the machine has signed-in users.

**Ingredients:**

Windows operating system

**Instructions:**

1. To force updates and restarts at a specific time. For example: Install updates on Friday nights at 23:00hrs and force a restart soon after installation. Use the Configure Automatic Updates policy:
  - Enable the policy
  - Use option #4 – Auto download and schedule the install
  - Deselect “Install during automatic maintenance”
  - Set “6 – Every Friday” for the scheduled install day
  - Set “23:00” for the scheduled install time
2. To use the Always automatically restart at the scheduled time policy:
  - Enable the policy
  - Configure the timer to the desired value (default is 15 minutes)
3. To stagger installs and restarts across different hours and days on different machines. Start with the same configuration as the above scenario. Set different scheduled install days and times for different groups which you don’t want rebooting at the same time.
4. To force updates at a specific day and time, but preserve the default Windows 8 restart behaviour, start with the same configuration as the above scenarios, but do not enable the **Always automatically restart** at the scheduled time policy.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must



**Chapter: 3a**    Technical infrastructure (Windows)

**Group:**            Server administration

**Recipe:**           **Server security (anti-virus)**

**Explanation:**

The purpose of the server needs assessment is to help organizations determine their server requirements in terms of what services they require to provide to the user community. It also helps the organization assess its maturity level.

**Ingredients:**

Windows Operating System (server version)

**Instructions:**

1. Use a strong server password. Strong passwords are phrases (or sentences) at least eight characters long—longer is better—that include at least three of the following: uppercase and lowercase letters, numerals, punctuation marks, and symbols
2. Install an antivirus and keep it up to date
3. Ensure that the Windows firewall is turned on
4. Ensure that Windows Update is turned on to automatically get security updates
5. Download and Install the Malicious Software Removal Tool. It checks computers running Windows Operating System for infections by specific, prevalent malicious software and helps remove any infection found.
6. Download and install the Microsoft Security Compliance Manager. The Security Compliance Manager provides centralized security baseline management features, a baseline portfolio, customization capabilities, and security baseline export flexibility to accelerate your organization's ability to efficiently manage the security and compliance process for the most widely used Microsoft technologies.
7. Install security tools from Microsoft <http://technet.microsoft.com/en-us/library/jj730960.aspx>  
Microsoft provides a number of free tools that can be used to diagnose overall system health, plan for improvements and migrations, and security and protect against the risk of infection from malware. More information about security and protection for your server can be found at this website <http://technet.microsoft.com/en-us/library/hh831778.aspx>

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 3a**    Technical infrastructure (Windows)

**Group:**            Server administration

**Recipe:**           **Server monitoring and tuning**

**Explanation:**

The purpose of the server monitoring is know the status of everything about system including CPU load, network traffic statistics, memory consumption, logged in users, availability of disk free space or service. It is important for the system administrator to know that some services on the network are down rather than being told by the user. Server tuning is concerned about improving the performance of the server.

Windows Performance Monitor is a Microsoft Management Console (MMC) snap-in that provides tools for analysing system performance. From a single console, you can monitor application and hardware performance in real time, customize what data you want to collect in logs, define thresholds for alerts and automatic actions, generate reports, and view past performance data in a variety of ways. Windows Performance Monitor combines the functionality of previous stand-alone tools including Performance Logs and Alerts (PLA), Server Performance Advisor (SPA), and System Monitor. It provides a graphical interface for the customization of Data Collector Sets and Event Trace Sessions.

**Ingredients:**

Windows Operating system

**Instructions:**

1. To launch Windows Performance Monitor, click **Start**, click in the **Start Search** box, type **perfmon**, and press ENTER. In the navigation tree, expand **Monitoring Tools** , and then click **Performance Monitor** .
2. To use Performance Monitor to view real-time performance data on a remote computer. Start Performance Monitor. In the navigation tree, right-click **Reliability and Performance** , and then click **Connect to another computer**. In the **Select Computer** dialog box, type the name of the computer you want to monitor, or click **Browse** to select it from a list. Click **OK**. Membership in the target computer's **Performance Log Users** group, or equivalent, is the minimum required to complete this procedure.
3. To improve hardware server performance use the following recommendations:
  - Choose 64-bit processors for servers. Use a processor with higher-frequency cores, or you can increase the number of processor cores. For Hyper-V, make sure that the processor supports SLAT (Second Level Address Translation). It is implemented as Extended Page Tables (EPT) by Intel and Nested Page Tables (NPT) by AMD. You can verify this feature is present by using SystemInfo.exe on your server.
  - Choose large L2 or L3 processor caches. The larger caches generally provide better performance, and they often play a bigger role than raw CPU frequency.
  - Increase Memory (RAM) and paging storage
  - Use PCI Express (PCIe) for the primary storage and network interfaces. To avoid bus speed limitations, use PCIe x8 and higher slots for 10 GB Ethernet adapters.
  - Choose disks with higher rotational speeds to reduce random request service times (~2 ms on average when you compare 7,200- and 15,000-RPM drives) and to increase sequential request bandwidth.
4. The following are the recommended characteristics for network and storage adapters for high-performance servers.
  - A certified adapter
  - 64-bit capability
  - Copper and fibre adapters
  - Dual- or quad-port adapters
  - Interrupt moderation
  - Receive Side Scaling (RSS) support
  - Offload capability and other advanced features such as message-signalled interrupt (MSI)-X

- Dynamic interrupt and deferred procedure call (DPC) redirection
5. Use Microsoft Server Performance Advisor (SPA). Microsoft SPA helps IT administrators collect metrics to identify, compare, and diagnose potential performance issues in a Windows Server. SPA generates comprehensive diagnostic reports and charts, and it provides recommendations to help you quickly analyse issues and develop corrective actions.
  6. Use NTttcp to do Performance Tuning. NTttcp helps measure network driver performance and throughput on different network topologies and hardware setups. It provides the customer with a multithreaded, asynchronous performance workload for measuring an achievable data transfer rate on an existing network setup.
  7. Undertake performance tuning for specific Microsoft server roles, for example for web server, file server, active directory server, Hyper – V server. Server role performance tuning can be found on <http://msdn.microsoft.com/en-us/library/windows/hardware/dn529133.aspx>

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 3a**    Technical infrastructure (Windows)

**Group:**            Server administration

**Recipe:**            **Backup and restoration automation**

**Explanation:**

Backup and recovery is important especially for critical data such as mail or website or learning management system like Moodle. The operating system and most application programs can be re-installed. Therefore it is important that an automated incremental backup is done for the data on the server. An incremental backup backs up all the files that have changed since the last backup. Failure to have verified backup and recovery procedures puts your data at risk of loss.

**Ingredients:**

- Windows Operating system
- Software installed on the server
- Data on the server

**Instructions:**

1. To access backup and recovery tools, you must install the **Windows Server Backup Features** and subordinate items that are available in the Add Features Wizard in Server Manager. To install backup and recovery tools
  - Click **Start**, click **Administrative Tools**, click **Server Manager**, in the left pane click **Features**, and then in the right pane click **Add Features**. This opens the Add Features Wizard.
  - In the **Add Features Wizard**, on the **Select Features** page, expand **Windows Server Backup Features**, and then select the check boxes for **Windows Server Backup** and **Command-line Tools**.
  - On the **Confirm Installation Selections** page, review the choices that you made, and then click **Install**. If there is an error during the installation, it will be noted on the **Installation Results** page.
2. Then, to access these backup and recovery tools, do the following:
  - To access the Windows Server Backup snap-in, click **Start**, click **Administrative Tools**, and then click **Windows Server Backup**.
  - To access and view the syntax for **Wbadmin**, click **Start**, right-click **Command Prompt**, and then click **Run as administrator**. At the prompt, type: **wbadmin /?**
3. You can create a backup by using the Backup Once Wizard, which is available in the Windows Server Backup snap-in—or by using the **Wbadmin start backup** command.
4. You can use the backups you have created with Windows Server Backup to recover your operating system, system state, volumes, applications and application data, backup catalogue, and local files and folders. To do this, use the following tools:
  - Recovery Wizard (in Windows Server Backup) to recover Files, folders, volumes, system state, applications, and application data
  - Windows Setup disc or a separate installation of the Windows Recovery Environment to recover the Operating system (critical volumes) and full server (all volumes)
  - Catalogue Recovery Wizard (in Windows Server Backup) to recover the Backup catalogue.

**Side dishes or references:**

More information on backup and restore <http://technet.microsoft.com/en-us/library/jj713536.aspx>

**For ZAMREN membership this is:**

A must

**Chapter: 3a**    Technical infrastructure (Windows)

**Group:**            **User administration**

**Recipe:**           **Accounts creation**

**Explanation:**

User account creation is a business process for creating and managing access to resources in an information technology (IT) system. User account provisioning is the creation, management and maintenance of an end-user's objects and attributes in relation to accessing resources available in one or more systems. Essentially, user account creation refers to the management of user rights and privileges. User account creation is one of many identity management procedures, and it defines the different ways of managing an individual's digital identity, authentication and authorization rights. The task of creating user accounts is performed by either a Network Administrators or Systems Administrator.

**Ingredients:**

- Active Directory or LDAP
- Hardware/Server
- O/S Windows Server
- Computer/Laptop

**Instructions:**

- To perform this procedure, you must be a member of the Account Operators group, Domain Admins group, or the Enterprise Admins group in Active Directory, or you must have been delegated the appropriate authority. As a security best practice, consider using Run as to perform this procedure.
- To open Active Directory Users and Computers, click **Start**, click **Control Panel**, double-click **Administrative Tools**, and then double-click **Active Directory Users and Computers**.
- Open Active Directory Users and Computers.
- In the console tree, right-click the folder in which you want to add a user account.

**Where?** Active Directory Users and Computers/*domain node/folder*

1. Point to **New**, and then click **User**.
2. In **First name**, type the user's first name.
3. In **Initials**, type the user's initials.
4. In **Last name**, type the user's last name.
5. Modify **Full name** to add initials or reverse order of first and last names.
6. In **User logon name**, type the user logon name, click the UPN suffix in the drop-down list, and then click **Next**.  
If the user will use a different name to log on to computers running Windows 95, Windows 98, or Windows NT, then you can change the user logon name as it appears in **User logon name (pre-Windows 2000)** to the different name.
7. In **Password** and **Confirm password**, type the user's password, and then select the appropriate password options.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 3a**    Technical infrastructure (Windows)

**Group:**            User administration

**Recipe:**           **Space allocation**

**Explanation:**

Disk quota or space allocation track and control disk space usage for NTFS volumes, allowing administrators to control the amount of data that each user can store on a specific NTFS volume. A disk quota limits the amount of information one can store on the server. By using disk quotas, you can configure Microsoft Windows Server to do the following:

- Log an event when a user exceeds a specified disk space warning level. The warning level specifies the point at which a user is nearing the quota limit.
- Prevent further use of disk space or log an event when a user exceeds a specified disk space limit.

If users are sharing file disk space on a server, they can consume considerable disk space when saving documents, graphics, and other files. This can be problematic if some users need to use more disk space than other users, resulting in some users not having enough disk space to store their files on the volume. An administrator can solve this problem by enacting a Group Policy or a computer policy that limits the amount of disk space each user has on the volume. The administrator can also adjust quotas to the user's needs because user's are tracked on a per-user basis, per-volume.

**Ingredients:**

- Active Directory or LDAP
- Hardware/Server
- O/S Windows Server
- Computer/Laptop

**Instructions:**

Windows Server 2008 supports two mutually exclusive methods for setting quotas on the amount of file system resources a user can use—disk quotas or directory quotas. Disk quotas were introduced in Windows 2000, and are applied to specific users and limit the amount of disk space that user can use on a particular volume. Directory quotas are applied to all users and limit the amount of disk space that users can use in a particular folder and its subfolders. Directory quotas were introduced in Windows Server 2003 R2 with the new File Server Resource Manager, and they are covered in detail in Chapter 20.

***Enabling Quotas on a Disk***

By default, disk quotas are disabled in Windows Server 2008. You can enable disk quotas on any volume that has been assigned a drive letter. To enable quotas on a volume, follow these steps:

1. In Windows Explorer, right-click a drive letter and open the properties of that drive.
2. Click the Quota tab, shown in Figure 1, and then click Show Quota Settings.

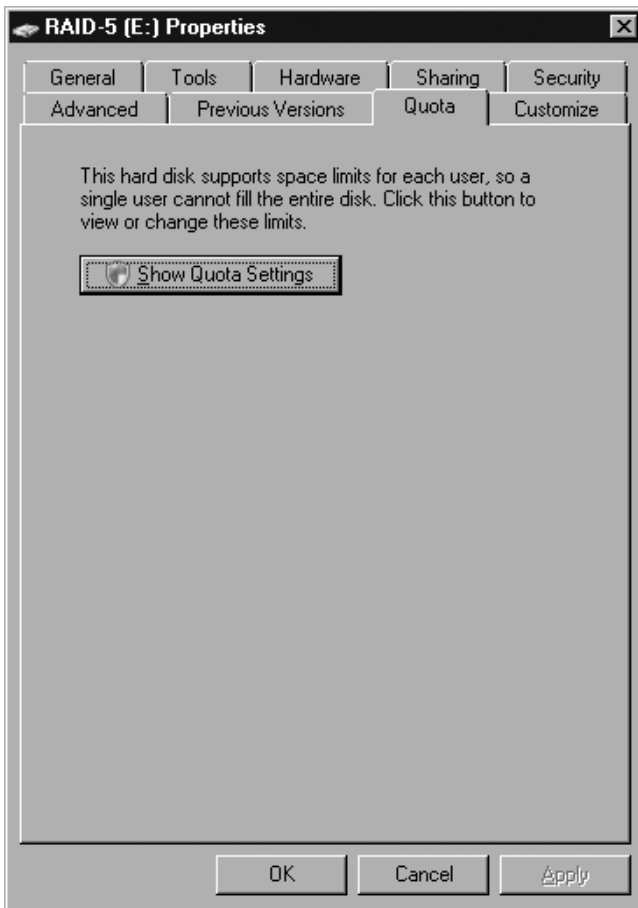


Figure 1. The Quota tab of a drive's properties

3. Select the Enable Quota Management check box to enable quotas for the disk, as shown in figure 2.

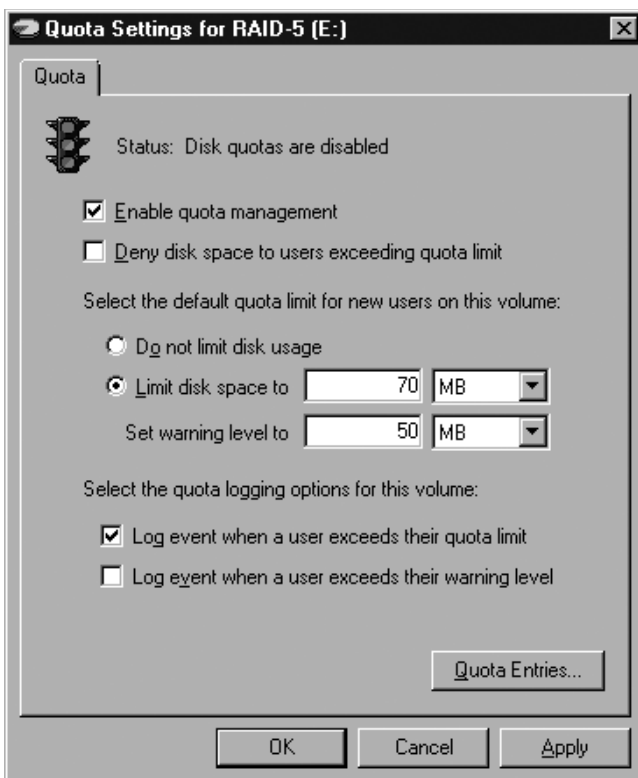


Figure 2. The Quota Settings dialog box for a disk

4. To enable hard quotas that can't be exceeded, select the Deny Disk Space To Users Exceeding Quota Limit check box.
5. Set the limits and warning level, as shown in Figure 2. You can also enable logging on this page.
6. Click OK to enable the quotas. You'll be prompted one last time to confirm, as shown in Figure 3. Click OK and the quotas will be enabled.

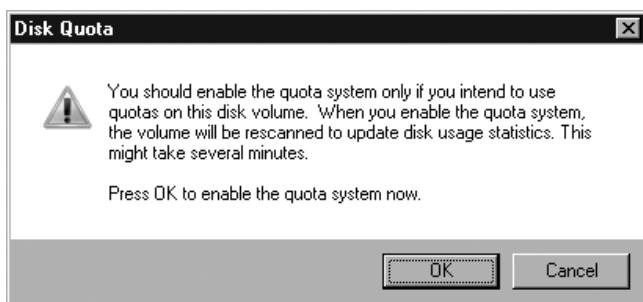


Figure 3. The Disk Quota confirmation message

### Setting Per-User Quotas

You can set quota limits on individual users, or you can have limits apply equally to all non-administrative users. Unfortunately, you can't set limits on groups of users. And any users who already own files on the disk will have their quotas initially disabled. New users will have the default quotas for the disk applied as you would expect when they first save a file on the disk.

To set the quotas for individual users, follow these steps:

1. In Windows Explorer, right-click a drive letter and open the properties of that drive.
2. Click the Quota tab, and then click Show Quota Settings to bring up the Quota Settings dialog box for that disk.
3. Click Quota Entries to open the Quota Entries dialog box for the disk, as shown in Figure 4.

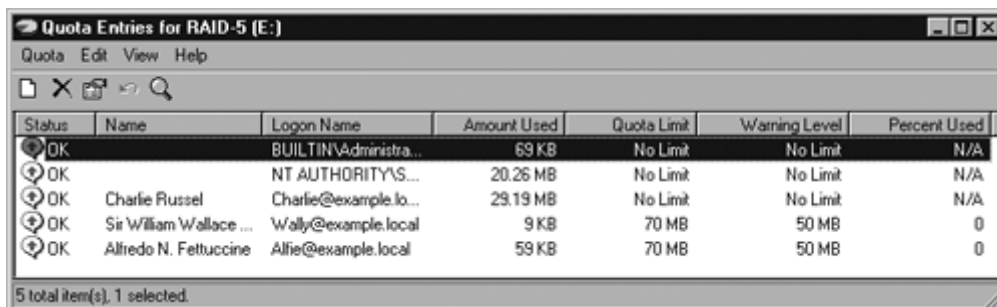


Figure 4. The Quota Entries dialog box for a disk

4. To modify the quota for a user already listed, select the user and then click Properties to open the quota settings for that user, as shown in Figure 5. Set the quota for the user and click OK to return to the Quota Entries dialog box.



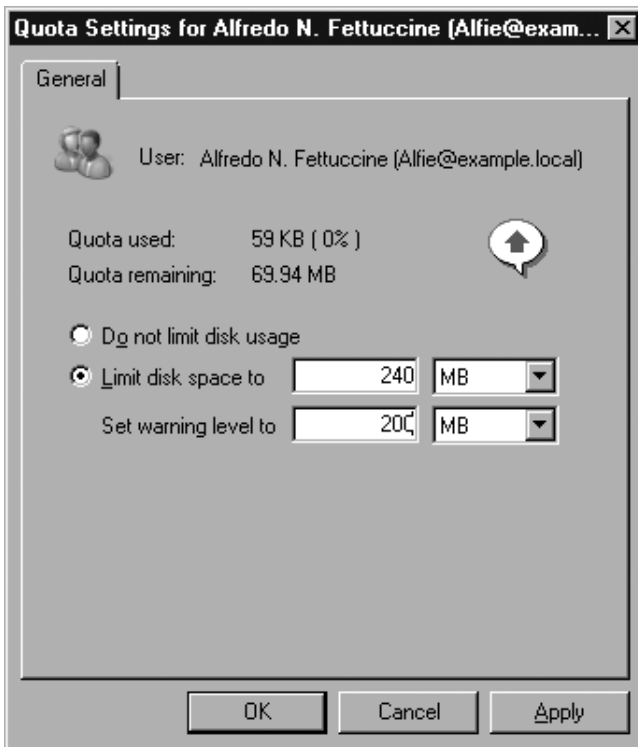


Figure 5. The Quota Settings dialog box for an individual user

5. To create a quota for a user who doesn't have one yet, and who needs a quota different from the default for the disk, click New Quota Entry.
6. Select the user or users to apply the new quota to, and click OK to bring up the Add New Quota Entry dialog box, as shown in Figure 6.

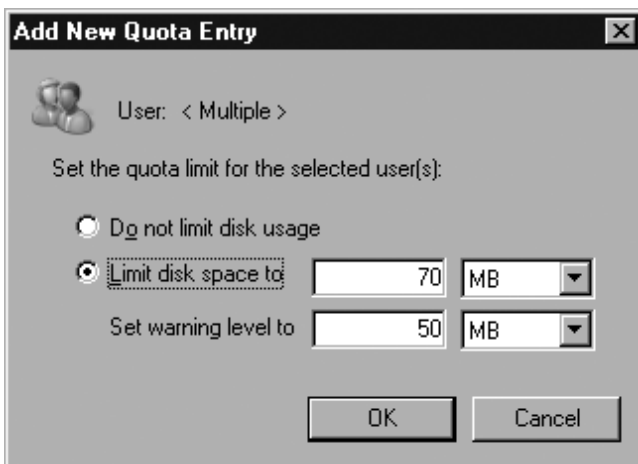


Figure 6. The Add New Quota Entry dialog box

7. Click OK to add the new entry and return to the Quota Entries dialog box. Close the Quota Entries dialog box, click OK in the Quota Settings dialog box, and then click OK in the Properties dialog box for the drive.
8. To manage quotas from the command line, you need to use Fsutil.exe. Even for a determined command-line type, it's pretty lame. Stick to the GUI, and use import and export whenever possible.

### **Importing and Exporting Quotas**

Managing disk quotas is a potentially tedious job if you try to use fine-grained control of individual quotas. The best solution is to use a single, general quota that is correct for almost all users, and then do only limited exceptions to that quota for very specialized cases. If you do have complicated quotas, however,

and you need to transfer them to another server or another volume, you can export a set of quotas and then import them to another volume.

To export the quotas on a volume, follow these steps:

1. Open the Quota Settings page for the volume you want to export the quotas from.
2. Click Quota Entries to open the Quota Entries dialog box.
3. Highlight the quotas you want to export.
4. Choose Export from the Quota menu. Type in a name and location for the export file and click Save.

To import a quota file to a volume, follow these steps:

1. Open the Quota Settings page for the volume you want to import the quotas to.
2. Click Quota Entries to open the Quota Entries dialog box.
3. Choose Import from the Quota menu. Type in a name and location for the import file and click Open.
4. If there are conflicting quotas, you'll be prompted to replace the existing quotas, as shown in the Figure 7.

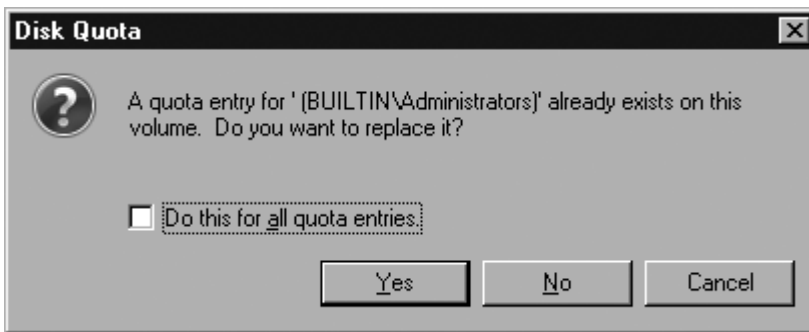


Figure 7. Importing quotas can cause an existing quota to be replaced.

5. Choose to replace a quota by clicking Yes or to not keep the existing one by clicking No. You can have the action repeated for any further conflicts by selecting the Do This For All Quota Entries check box.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 3a**    Technical infrastructure (Windows)

**Group:**            User administration

**Recipe:**            **User account policy setup**

**Explanation:**

A user account policy is a document which outlines the requirements for requesting and maintaining an account on computer systems or networks, typically within an organization. It is very important for large sites where users typically have accounts on many systems. Some sites have users read and sign an account policy as part of the account request process. An example of a user account policy, "Employees shall only request/receive accounts on systems they have a true business need to access. Employees may only have one official account per system and the account ID and login name must follow the established standards. Employees must read and sign the acceptable use policy prior to requesting an account.

**Ingredients:**

- Active Directory or LDAP
- Hardware/Server
- O/S Windows Server
- Computer/Laptop
- Application/Software/Enterprise Resource System

**Instructions:**

To perform this procedure, you must be logged on as a local administrator or provide the credentials of a member of the local **Administrators** group. To change the behavior of user account by using Group Policy

1. Click **Start**, type **secpol.msc** in the **Search programs and files** box, and then press ENTER.
2. If the **User Account Control** dialog box appears, confirm that the action it displays is what you want, and then click **Yes**.
3. In the console tree, expand **Local Policies**, and then click **Security Options**.
4. In the details pane, scroll down and double-click the Group Policy setting that you want to change. User Account Control (UAC) policy settings that a local administrator can modify include:

- User Account Control: Admin Approval Mode for the built-in Administrator account
- User Account Control: Allow UIAccess applications to prompt for elevation without using the secure desktop
- User Account Control: Behavior of the elevation prompt for administrators in Admin Approval Mode
- User Account Control: Behavior of the elevation prompt for standard users
- User Account Control: Detect application installations and prompt for elevation
- User Account Control: Only elevate executables that are signed and validated
- User Account Control: Only elevate UIAccess applications that are installed in secure locations
- User Account Control: Run all administrators in Admin Approval Mode
- User Account Control: Switch to the secure desktop when prompting for elevation
- User Account Control: Virtualize file and registry write failures to per-user locations

5. On the **Properties** page, make your selection, and then click **OK**.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

## Chapter 3b: Technology, Network and Servers (Linux)

The technical component of any ICT installation has always been regarded as the most important part. Though this has been true in the past, nowadays since ICT has become a naturally accepted phenomenon in the current society, most of the attention tends to shift to the non-technical components.

Nevertheless, without the technical components and specifically networks (of all kind), nothing can be done. This chapter deals with all technical stuff and is therefore specifically interesting to the technicians and not for the other groups.

Chapter 3a deals with technicalities in case the architecture is based on Linux.

### Setting up the LAN

A LAN, or local area network, is a great way to share files and devices between multiple computers. If you have several computers in your office/s, setting up a network will allow you to share an Internet connection, data, printers, and other devices between your computers.

This section deals with the organisational preparations and the technical setup of a LAN.

### Network administration

Network administration is the field of work in which the hardware and software that comprises the network is maintained. This involves ensuring that network services are available and are working efficiently. Network administration and security plays a very important part in maintaining a robust and secure network. With a large network, it becomes imperative to ensure the security of the data. It is an essential requirement for the network administrator to monitor that the entire network is properly secure from threats, viruses, and other external inputs from different networks and applications.

### Server setup

This section discusses the setting of a number of servers including the Linux operating system. A server is a computer or device on a network that manages network resources or is dedicated for running specific applications or provides a specific service. This section presents the DNS setup, DHCP setup, Web server setup, File server setup, Print server setup and Mail server setup.

### Server administration

This section discusses the monitoring and management of servers. A server is a computer or device on a network that manages network resources or is dedicated for running specific applications or provides a specific service. This section presents the Server upgrades, Server security, Server monitoring and tuning; Backup and restoration automation.

### User administration

This section is dealing with the main aspects of User administration. User account creation is one of many identity management procedures, and it defines the different ways of managing an individual's digital identity, authentication and authorization rights. The task of creating user accounts is performed by either a Network Administrators or Systems Administrator.

**Chapter: 3b**    Technical infrastructure (Linux)

**Group:**            **Setting up the LAN**

**Recipe:**           **Preparations**

**Explanation:**

LAN planning is an iterative process, encompassing topological design, network-synthesis, and network-realization and is aimed at ensuring that a new computer network or service meets the needs of the organization and operator. The process can be tailored according to each new network or service.

**Ingredients:**

- A map of the organization
- Building designs of the organization
- A computer
- Printer/plotter

**Instructions:**

- Identifying the applications that you intend to use, usually diverse environments such as Enterprise Resource Management (ERM), Internet telephony, Instant Messaging (IM), email and others. These in turn are used for estimating the software, hardware, and traffic requirements.
- Traffic Requirements: Computing traffic requirements include several factors. A few points to consider include Identification and documentation of major traffic sources, categorization of traffic as local, distributed, client/server, peer-to-peer, terminal/host or server/server, Estimation of bandwidth requirements for each application.
- Scalability Requirements: Scalability refers to the extent of network growth that should be supported. For corporate network, scalability is a major consideration. Provision must be made to add users, applications, additional sites, and external network connections.
- Availability: The availability of a network needs to be given careful consideration while designing a network. It is the amount of time a network is available to users over a period of time and is often a critical design parameter. Availability has direct relation with the amount of redundancy required. Another important factor that needs to be considered when computing availability requirements is the business loss to the Company due to unavailability of the network for a given amount of time. A right balance needs to be arrived at such that the profitability is maintained.
- Security and Accessibility: Security and accessibility are among the important design phase steps. A security plan needs to be devised that meets the required security specifications. You must specify, a list of network services that will be provided such as FTP, Web, e-mail, etc., who will be administering the security of these services, how the people will be trained on security policies and procedures, recovery plan, in case a security breach does take place.
- Cost considerations: For LANs, the tendency is to minimize the equipment cost. That is minimizing the cable cost, minimizing the per port cost, and the labour cost.
- **Redundancy.** Network uptime becomes more critical every year. Spend time planning a design that provides network redundancy from a physical and logical perspective. For example, utilize dual fiber-optic uplinks from the wiring closets to the core switches. Ensure that chassis-based core switches have dual CPU cards. Be sure to think about items like default gateway redundancy.
- **Standards and maintenance.** When designing a corporate network, try to standardize on a few different types of devices, as opposed to using a different type of switch in every wiring closet, even if all your equipment is from the same manufacturer. Standardizing on a few different types of hardware simplifies configuration and troubleshooting. It also allows the customer to keep cold spares of each device with next-business-day maintenance, allowing for more rapid and cost-effective responses to device failures.
- **Network management tools.** While these always seem to be left off purchase orders, network management tools are invaluable in providing maximum network uptime.

- Get the building plans and identify lighting fixtures and other large electrical appliances. Electromagnetic interference can play havoc with a LAN and cause intermittent problems, which are difficult to track down.
- Determine the placement of servers and networking devices, whether in the data center or in networking closets. The placement of the equipment will directly affect the placement of your wiring runs and wall jacks.
- Decide whether to run wiring through the ceiling or beneath the floor. The floor plans may eliminate one or the other as a possibility. For instance, if the building is on a concrete slab, your only choice is the ceiling, where the fluorescent lights are. Keep security in mind when planning your wiring runs, and avoid exposing your wiring to easy access by an unauthorized person.
- Measure the wiring runs and be sure you have no runs over 110 meters. The maximum run for an Ethernet cable is about 100 meters, plus 10 meters of patch cables from the wall to the actual devices. If you have a run longer than 100 meters, you will have to install a repeater or switch from wire to fiber, which has a much longer maximum run.
- Identify the office walls where you want to install the network jack. Give due consideration to the size and orientation of a given cubicle or office and its equipment. Do not place the jack in a location that will cause the wiring to be a tripping hazard.
- Document your plan by creating drawings of offices and wiring paths. This document will be useful in the event of future building modifications as well as troubleshooting LAN problems.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 3b**    Technical infrastructure (Linux)

Group:            Setting up the LAN

**Recipe:**            **LAN assessment**

**Explanation:**

A LAN assessment gathers information about the network. The information could be for an existing or non-existing network.

**Ingredients:**

- Network diagrams, LAN topology
- Rack layout diagrams
- Server layout diagrams
- LAN infrastructure review
- Labelling
- Cabling
- Collect router utilization reports
- Review router configuration
- Collect technology assessment reports
- Provide Local Area Network Visio diagram depicting the network topology
- Review Local Area Network error report pointing out trouble spots in the LAN
- Provide Recommendations Report for upgrading and performance enhancement steps
- General best practice recommendations
- Simple Network Management Protocol (SNMP)
- IP addressing
- Virtual LANs
- Spanning tree
- Routing protocols
- Computers
- Servers
- Operating System versions
- Applications
- System access and security
- Resilience
- Configurations
- Switches
- Active Directory (AD)
- LDAP
- Power

**Instructions:**

**If you do not have a LAN:**

- What would a LAN enable you to do that you can't do now? For example, a LAN might:
  - allow staff members to access each other's files on the computer;
  - enable you to share Internet access on all of the computers in your organization;
  - allow staff members to use one central database;
  - allow you to set up an automated backup system for all computers on the network
- How many computers do you want on the LAN/network?
- What will be your network topology?
- What routing protocols are going to implement?
- What will be your addressing scheme?

- What type of cabling are you going to use?
- Do you have computers with different operating systems, such as Macintosh OS X or Windows XP?
- What is your budget for setting up a LAN?
- What support staff can you dedicate or hire to maintain and troubleshoot the LAN?
- Do you have access to a consultant who can set up your LAN?

#### **If you already have a LAN**

- What network software are you using?
- What kind of cabling does your LAN have? (Most LANs typically use blue CAT 5e or Cat6 cables.)
- Are you having any problems with your LAN?
- Is everyone who needs to be on the network connected to it?
- Is there room to put more computers on your network with your current cabling and hub?
- Is the network fast enough? What tasks are too slow to perform, if any?
- Does the network fail often? What seems to cause the breakdowns?
- Do you have a network server? What kind of computer is it (brand, model, hardware specifications, and operating system)? Has it been down more than once in the past few months?
- What kind of backup system does your network have? (For instance, do you use a CD rewriteable drive, tape drive, or external hard drive?) How frequently do you perform these backups? Do you backup all of the hard drives connected to the network, or just the server?
- Do you have a network consultant? If so, what do you estimate you paid them last year?
- Is your LAN connected to the Internet? If so, what kind of connection do you have?
  - Shared modem (56K dial-up or dedicated line)
  - ISDN
  - DSL
  - Cable modem
  - T1
  - T3
- What tasks do you need to perform using your LAN that you can't do now? How is your LAN slowing you down?
- What solutions or next steps can you take?

#### **Side dishes or references:**

None

#### **For ZAMREN membership this is:**

A must



**Chapter: 3b**    Technical infrastructure (Linux)

**Group:**            Setting up the LAN

**Recipe:**            **LAN planning**

**Explanation:**

A LAN, or local area network, is a great way to share files and devices between multiple computers. If you have several computers in your office/s, setting up a network will allow you to share an Internet connection, data, printers, and other devices between your computers. Fortunately, the process is simple, and you can learn how to set up a LAN in your home by following a few easy steps.

**Ingredients:**

All LAN set up either Wired or Wireless require the following:

- Router to route traffic
- DHCP if the you will use dynamic IP address location
- Network switches to interconnect devices
- UTP cables to connect devices to switch and devices themselves if it is wired network
- IP addresses
- RJ45 connectors
- Domain Controller

**Instructions:**

- **Assess your needs in a network.** The devices you use to set your network up will determine your network's capabilities. You should address your needs in terms of cost, security, connection speed, expandability (adding more computers or devices later) and distance between computers. In general, you will need to keep all the computers in the network within 91 meters of each other.
- **Install UTP cables:** Ensure that cables are installed if your LAN will be a wired one and if it will be a wireless, ensure that a cable is installed to your wireless router.
- **Ensure that your computers have networking interface cards/NIC installed.** In order to communicate with other computers in the network, each computer must have a NIC. If your computers are only a few years old, you are almost guaranteed to already have one built-in, as this is a standard feature on all computers being produced today. If you have an older computer, you may need to purchase and install a networking card.
- **Install a router and switches:** This will allow your computer to talk to each other and outside computers
- **Install DHCP:** Ensure that your DHCP is working properly to allocate IP addresses.
- **Set up an Internet connection.** To share an Internet connection between computers, you will first need a broadband Internet connection (such as cable or DSL) set up for your primary computer. Contact a local Internet service provider (ISP) to establish a connection if you don't already have one.
- **Connect to any devices in the network.** To connect to devices such as printers and scanners, these devices will also need to be able to communicate. To connect to a device, simply locate the device's icon on the network drive on each computer. Double-clicking on a printer's icon, for example, should install the printer and enable it for future use.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 3b**    Technical infrastructure (Linux)

**Group:**            Setting up the LAN

**Recipe:**            **Wired LAN installation**

**Explanation:**

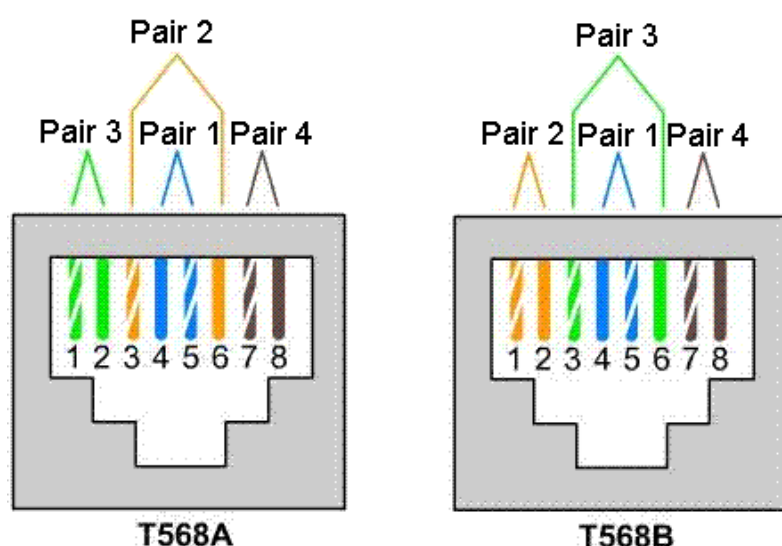
There are several types of networks, but this cook book will focus on local area network (LAN), which is a group of computers that shares a common connection to provide users access to applications, resources, or storage. Another definition is that a local area network (LAN) is a computer network that interconnects computers in a limited area such as a home, school, computer laboratory, or office building using network media.

**Ingredients:**

- UTP Cables preferably Cat6
- RJ45 Connectors
- Wall Jacks
- LAN Testers
- PVC or metal trunking
- Crimping tool
- Manageable network switch
- A swing network cabinet
- Patch panel
- Drilling machine
- Roll bolts
- Cable ties
- Patch cords
- Power cables/Adapters
- UPS
- Generator

**Instructions:**

- Cable lengths of 90 metres must be used from switch to wall jacks connections
- Cable lengths of 3 metres must be used for fly leads wall jack to PC connection
- Cable lengths of 30/60cm must be used for patch cords patch panel to switch connection
- For cable termination ensure that you either choose T568A or T568B. See the pictures below:



- Use your LAN tester after each cable termination to ensure correct terminations as well data speed
- Mount your network cabinet correctly in the right place
- Install patch panel and manageable switch inside the network cabinet
- Connect patch cords from patch panel to manageable switch
- Connect the 90 metres cables from patch panel to wall jack
- Connect fly leads from wall jack to computer
- Power up the switch and the computer
- Assign Internet Protocol (IP) address to the switch and computer
- Carry out a test to ascertain that the signal from the computer reaches the switch, a ping test in this case
- If the test is successful then you have successfully set up your LAN
- And if the test is not successful, then check your cable terminations and IP addresses assigned to your switch and computer.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 3b**    Technical infrastructure (Linux)

**Group:**            Setting up the LAN

**Recipe:**            **Wireless LAN setup**

**Explanation:**

A wireless local area network (WLAN) links two or more devices using some wireless distribution method (typically spread-spectrum or OFDM (*Orthogonal Frequency Division Multiplexing*) radio), and usually providing a connection through an access point (AP) to the wider Internet. This gives users the ability to move around within a local coverage area and still be connected to the network. Or it may be explained as a wireless local area network (WLAN or *wireless LAN*) consists of two or more computers that communicate wirelessly via radio waves. This is contrasted to a *wired LAN*, in which each computer in the network is physically tethered with an Ethernet cable to the server's network switch or hub.

**Ingredients:**

The key hardware components of a wireless computer network include:

- Network Interface Cards (NIC/Adapters)
- DHCP Server to allocate IP addresses
- Routers: Wireless routers function comparably to traditional routers for wired Ethernet networks. One generally deploys wireless routers when building an all-wireless network from the ground up.
- Access Points (APs): Access points and routers often utilize a Wi-Fi wireless antenna that significantly increases the communication range of the wireless radio signal. These antennas are optional and removable on most equipment. It's also possible to mount aftermarket add-on antennas on wireless clients to increase the range of wireless adapters. Add-ons antennas are usually not required on typical wireless networks, although it's common practice for wardrivers to use them.
- Antennas: Access points and routers often utilize a Wi-Fi wireless antenna that significantly increases the communication range of the wireless radio signal. These antennas are optional and removable on most equipment. It's also possible to mount aftermarket add-on antennas on wireless clients to increase the range of wireless adapters. Add-ons antennas are usually not required on typical wireless networks, although it's common practice for wardrivers to use them.
- Repeaters: A wireless repeater connects to a router or access point. Often called signal boosters or range expanders, repeaters serve as a two-way relay station for wireless radio signals, helping clients otherwise unable to receive a network's wireless signal to join.

**Instructions:**

This is the procedure for Wireless LAN installation

- Carefully plan the installation.
- Identify Locations for Access Points.
- Install the distribution system (switches).
- Configure and Install Access Points.
- Test the Installation.
- Document the final installation.

This is the procedure for Wireless LAN setup

- Obtain a broadband internet connection and modem.
- Obtain a wireless router.
- Obtain wireless NIC/Adapters for the computer.
- Configure, install and position the wireless router.
- Secure the wireless network.
- Connect computers to wireless network

**Side dishes or references:**

None

**For ZAMREN membership this is:**

**Chapter: 3b**    Technical infrastructure (Linux)

**Group:**            **Network administration**

**Recipe:**            **Switch setup and configuration**

**Explanation:**

A network switch, commonly referred to as a switch, is a network device that is used to connect segments of a LAN (local area network) or multiple LANs and to filter and forward packets among them. Switches have an appearance similar to hubs (because both are box-like devices that contain a number of RJ-45 jacks), but they are actually multi-port. Switches can also include the functionality of routers, which are devices and/or software that connect at least two networks and forward packets among them according to the information in the packet headers and routing tables. However, in general, switches are simpler and faster than routers, which require knowledge about the network and how to determine the route. Switch setup and configuration means arrangement of the parts or elements of a network switch, the totality of a switch and the devices connected to it.

**Ingredients:**

- IP Addresses
- DHCP Server to allocate IP addresses
- Console cable
- UTP cables
- Laptop

**Instructions:**

The list below enumerates the basic switch configuration options in order to get the basic functionality and monitoring.

- Connect the console cable from the computer to the switch
- Ensure correct voltage is supplied to the switch
- Power the switch and computer
- In/On switch configure Hostname and Enable Secret.
- Add an IP address for management.
- Enable Telnet and SSH for remote access.
- Define a default gateway or default route.
- Set the time.
- Enable neighbour discovery.
- Configure logging and traps.
- Add custom SNMP communities.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 3b**    Technical infrastructure (Linux)

**Group:**            Network administration

**Recipe:**           **Router setup and configuration**

**Explanation:**

In order for the traffic to move from one computer/one network to another network there should be a set of commands that direct/guide traffic movement. The process of setting up of commands that direct/guide traffic to move from one network to another is referred to as router configuration.

**Ingredients:**

- Router
- Console cable with serial/USB ends
- IP addresses
- Laptop
- UTP cable preferably CAT5e/6

**Instructions:**

The following lists the basic router configurations that are needed to get the router working.

- Configure Hostname and Enable Secret.
- Configure IP addresses on the various interfaces and un shut the interfaces
- Enable Telnet and SSH for remote access.
- Define a default gateway or default route.
- Set the time.
- Enable neighbour discovery.
- Configure logging and traps.
- Add custom SNMP communities.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

**Chapter: 3b**    Technical infrastructure (Linux)

**Group:**            Network administration

**Recipe:**            **IP address allocation**

**Explanation:**

In order to allocate an IP address on the network. One can do it statically; by manually allocation an IP address or dynamically using a Dynamic Host Configuration Protocol (DHCP).

**Ingredients:**

- Hardware/Server
- O/S Linux Server
- Computer/Laptop

**Instructions:**

- Set the IP address and net mask
- Set the IP address of the default-gateway to use
- Set the IP addresses of the DNS servers to use

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must



**Chapter: 3b**    Technical infrastructure (Linux)

**Group:**            Network administration

**Recipe:**           **Network monitoring**

**Explanation:**

Network monitoring refers to the practice of overseeing the operation of a computer network using specialized management software tools. Network monitoring describes the use of a system that constantly monitors a computer network for slow or failing components and that notifies the network administrator in case of outages.

Network monitoring systems are used to ensure availability and overall performance of computers (hosts) and network services. These systems are typically employed on larger scale corporate and university IT networks. There are many network monitoring software to deploy both commercial and open source and the choice is purely yours. However, in this recipe, we will use Nagios which is open source running on Windows Server Operating System as a demonstration.

**Key Features in Network Monitoring**

A network monitoring system is capable of detecting and reporting failures of devices or connections. It normally measures the processor (CPU) utilization of hosts, the network bandwidth utilization of links, and other aspects of operation. It will often send messages (sometimes called *watchdog* messages) over the network to each host to verify it is responsive to requests. When failures, unacceptably slow response, or other unexpected behavior is detected, these systems send additional messages called *alerts* to designated locations (such as a management server, an email address, or a phone number) to notify system administrators.

**Network Monitoring Software Tools**

The *ping* program is one example of a basic network monitoring program. Ping is a software tool which is used to test the reachability of a host on an Internet Protocol (IP) network and to measure the round-trip time for messages sent from the originating host to a destination computer. available on most computers that sends Internet Protocol (IP) test messages between two hosts. Anyone on the network can run these basic ping tests to verify the connection between two computers is working and also measure the current connection performance.

While ping is useful in some situations, more sophisticated network monitoring systems exist. These software programs are designed for use by professional administrators of larger computer networks. One specific type of network monitoring system is designed to monitor the availability of Web servers. For larger enterprises that use a pool of Web servers distributed worldwide, these systems help to quickly detect problems at any location.

**Ingredients:**

- A computer/laptop
- Software/application to monitor (Nagios)
- Server
- Linux Server and above
- Dongle/modem (optional: is for getting SMS in case everything is down)
- Services/devices

**Instructions:**

- Nagios is an open-source program that allows you to monitor the status of a computer network. Using Nagios, you can watch the activities on your network in real time to see how many users are connected, what they are doing and whether the service is having difficulty handling the current

load. Nagios is written for the Unix and Linux operating systems; however, its creators have endorsed a port called Nagwin for the Windows operating system. This is how it goes:

- Navigate in your Web browser to the Nagios Core download page at [nagios.org/download/core/thanks/](http://nagios.org/download/core/thanks/). Scroll down to the "Packaged Nagios Distributions" section and click the "Learn More" link under "Nagwin."
- Click the link next to "Download URL." How to Calibrate an RTD or PT100 Download the Free Calibration Guide on [www.flukecal.com/CalibrateRTD](http://www.flukecal.com/CalibrateRTD)
- Click the "Nagwin" link.
- Click "Nagwin\_1.2.0\_Installer.zip" and save the file to the desktop.
- Right-click the file "Nagwin\_1.2.0\_Installer.zip" on the desktop and select "Extract All" to extract the contents of the archive to a folder on the desktop. Open the folder.
- Double-click the file "Nagwin\_1.2.0\_Installer.exe." After a moment, a window with the title "Nagwin 1.2.0 Setup" appears. Click "Next."
- Examine the Nagwin/Nagios license agreement and click the "I Agree" button to continue the installation process.
- Click the "Browse" button to select a destination folder for Nagios, or click "Next" to use the default location of "C:\Program Files\ICW."
- Write down the account name and password that the installation utility generates for you, or type your own username and password in the "Service Account," "Type Password" and "Confirm Password" fields.
- Click the "Install" button to install Nagwin using the settings you selected. After a moment, the installation utility displays the message "Nagwin 1.2.0 is installed on this machine now."
- Click "OK" and "Close."
- Kindly note that after installation is complete you need to customize this software for you get the full benefits.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 3b**    Technical infrastructure (Linux)

**Group:**            **Server setup**

**Recipe:**            **Server needs assessment**

**Explanation:**

The purpose of the server needs assessment is to help organizations determine their server requirements in terms of what services they require to provide to the user community. It also helps the organization assess its maturity level.

**Ingredients:**

Paper and pen

**Instructions:**

1. How many users are in your organization (no of students, academic and non-academic staff) and growth pattern? Do these users need to share and communicate confidential information? If the numbers of users is over 100 and they need to share and communicate confidential information then you need a mail server
2. How many desktops computers, laptop computers and mobile devices are in your organization? If you have more than 10 devices then you need to install a LAN, a DNS server and DHCP server.
3. Do you need to host your organization website or provide an intranet to your organization or do you need to install open source learning software such as Moodle? If the answer is yes to any of these questions then you need to install the web server.
4. Do you need to share the printers in your organization that is that two or more users sharing one or two printers over the network? If the answer is yes then you need to install the print server
5. Do any of your users in your organization need to save files on the network or do your users need to share files and other resources on the network? If the answer is yes to any of the questions then you need to install a file server.
6. Do you need to install open source software or do you need a mail server or do you need DNS and DHCP server, web server, file and printer server? If the answer is yes to any of these questions then you need to install a server operating system such as Linux server.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 3b**    Technical infrastructure (Linux)

**Group:**            Server setup

**Recipe:**            **Linux OS installation and configuration (Ubuntu Server)**

**Explanation:**

The Operating System (OS) is a set of software that controls the overall operation of a computer system by performing functions such as memory allocation, job scheduling, and input/output control. The Operating System is required before you can install other software applications such as OpenSSH server, DNS server, LAMP server, Mail server, PostgreSQL database, print server, Samba file server, Tomcat server.

**Ingredients:**

- 700 MHz processor (about Intel Celeron or better)
- 512 MB RAM (system memory)
- 5 GB of hard-drive space
- VGA capable of 1024x768 screen resolution
- Either a CD/DVD drive or a USB port for the installer media

**Instructions:**

1. First, download the latest version of Ubuntu Server from <http://www.ubuntu.com/download/server> and burn the ISO file to a disk
2. Insert the disk into the CD/DVD drive and boot the system from the CD-ROM drive.
3. At the boot prompt you will be asked to select the language. Select your language and then select 'Install Ubuntu Server' on the next menu
4. Select your keyboard layout. If you already know this select no on the Detect Keyboard Layout prompt and enter it manually, if not select yes.
5. Type your desired hostname (this is how the server will be seen by different computers) for the server and select continue.
6. Select your location and confirm your time zone.
7. Select how you want the disk to be partitioned. There is guided partitioning or you can do it manually, if you are installing alongside another operating system. Select LVM if you think you will need to partition the disk again later.
8. Enter the details for your user account (username and password).
9. Select whether you want to encrypt the hard drive or not. Only do this if you are afraid someone might steal the hard drive, if not select no, as it will slow down your server.
10. If you are using a proxy server, enter the details in the next prompt.
11. Select the software you want to install on your server. You can continue without installing any software and install it later if you wish. You can install all other servers here such as OpenSSH server, DNS server, LAMP server, Mail server, PostgreSQL database, print server, Samba file server, Tomcat server
12. Select yes to install the GRUB Boot loader. Only install this if there are no other operating systems on the machine, as it will overwrite any existing boot loaders.
13. When the installation is complete remove the install disk and finish the installation

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 3b**    Technical infrastructure (Linux)

**Group:**            Server setup

**Recipe:**            **DNS setup for Linux**

**Explanation:**

The Domain Name System (DNS) is a hierarchical, distributed database. It stores information for mapping Internet host names to IP addresses and vice versa, mail routing information, and other data used by Internet applications. Domain Name Service (DNS) is an Internet service that maps IP addresses and fully qualified domain names (FQDN) to one another. In this way, DNS alleviates the need to remember IP addresses. Computers that run DNS are called name servers.

**Ingredients:**

Linux operating system (Ubuntu or Debian or Redhat).

**Instructions:**

1. Start by upgrading the system using the command below  
***sudo apt-get update && apt-get upgrade***
2. Install Bind9 for DNS and dnsutils package for testing and troubleshooting DNS issues using the command below

***sudo apt-get install bind9 dnsutils***

3. Setup caching name server

***nano /etc/bind/named.conf.options***

*add or edit to suit your name servers*

*forwarders {*

*196.12.12.66;*

*196.12.12.65;*

*};*

4. Restart the DNS server, to enable the new configuration

***sudo /etc/init.d/bind9 restart***

5. Setup Bind9 configuration files (create forward and reverse zones)

***nano /etc/bind/named.conf.local***

***add the following***

*zone "example.com" {*

*type master;*

*file "/etc/bind/zones/example.com";*

*};*

*zone "2.168.192.in-addr.arpa" {*

*type master;*

*file "/etc/bind/zones/rev.2.168.192.in-addr.arpa";*

*};*

6. Create your zone files

***mkdir -p /etc/bind/zones***

***nano /etc/bind/zones/example.com***

***add the following***

*@ 14400 IN SOA n1.example.com. domain.n1.example.com. (*

*1315919482*

*28800 ; refresh, seconds*

*7200 ; retry, seconds*

*1209600 ; expire, seconds*

*3600 ) ; minimum, seconds*

```
example.com.      A 196.47.192.41
www.example.com.  A 196.47.192.41
ns1.example.com.  A 192.168.2.10
```

7. Create your reverse zone files by creating the `/etc/bind/db.192` file (see command below). Next edit `/etc/bind/db.192` changing the basically the same options as `/etc/bind/db.example.com`

```
sudo cp /etc/bind/db.127 /etc/bind/db.192
```

8. Restart the DNS server, to enable the new configuration  

```
sudo /etc/init.d/bind9 restart
```

#### **Side dishes or references:**

See Ubuntu Server Guide

#### **For ZAMREN membership this is:**

A must

**Chapter: 3b**    Technical infrastructure (Linux)

**Group:**            Server setup

**Recipe:**            **DHCP setup for Linux**

**Explanation:**

The Dynamic Host Configuration Protocol (DHCP) is a network service that enables host computers to be automatically assigned settings from a server as opposed to manually configuring each network host. Computers configured to be DHCP clients have no control over the settings they receive from the DHCP server, and the configuration is transparent to the computer's user. The most common settings provided by a DHCP server to DHCP clients include: IP address and net mask; IP address of the default-gateway to use and IP addresses of the DNS servers to use. However, a DHCP server can also supply configuration properties such as: Host Name, Domain Name, Time Server and Print Server

**Ingredients:**

Linux operating system (Ubuntu or Debian or Redhat).

**Instructions:**

1.        Install DHCP server on your linux server  
              *sudo apt-get install dhcp3-server*
2.        Configuring DHCP server  
          If you have two network cards in your ubuntu server you need to select which interface you want to use for DHCP server listening. By default it listens to eth0 and you can change this eth1 for example by:  
              *sudo nano /etc/default/dhcp3-server*  
          Find this line  
              INTERFACES="eth0"  
          Replace with the following line  
              INTERFACES="eth1"  
          Save and exit.  
          Next you need to make a backup copy of /etc/dhcp3/dhcpd.conf file  
              *cp /etc/dhcp3/dhcpd.conf /etc/dhcp3/dhcpd.conf.back*  
          Edit /etc/dhcp3/dhcpd.conf file using the following command  
              *sudo nano /etc/dhcp3/dhcpd.conf*

**Using address pool method**

You need to change the following sections in /etc/dhcp3/dhcpd.conf file

```
default-lease-time 600;
max-lease-time 7200;

option subnet-mask 255.255.255.0;
option broadcast-address 192.168.1.255;
option routers 192.168.1.254;
option domain-name-servers 192.168.1.1, 192.168.1.2;
option domain-name "yourdomainname.com";

subnet 192.168.1.0 netmask 255.255.255.0 {
    range 192.168.1.10 192.168.1.200;
}
```

Save and exit the file

This will result in the DHCP server giving a client an IP address from the range 192.168.1.10 to 192.168.1.200. It will lease an IP address for 600 seconds if the client doesn't ask for a specific time frame.

Otherwise the maximum (allowed) lease will be 7200 seconds. The server will also "advise" the client that it should use 255.255.255.0 as its subnet mask, 192.168.1.255 as its broadcast address, 192.168.1.254 as the router/gateway and 192.168.1.1 and 192.168.1.2 as its DNS servers.

If you need to specify a WINS server for your Windows clients, you will need to include the netbios-name-servers option, e.g.

```
nano -w /etc/default/dhcp3-server
option netbios-name-servers 192.168.1.1;
```

### Using MAC address method

This method is you can reserve some of the machines or all the machines with fixed IP address. In the following example I am using fixed IP address for server1, server2, printer1 and printer2

```
default-lease-time 600;
max-lease-time 7200;
option subnet-mask 255.255.255.0;
option broadcast-address 192.168.1.255;
option routers 192.168.1.254;
option domain-name-servers 192.168.1.1, 192.168.1.2;
option domain-name "yourdomainname.com";
subnet 192.168.1.0 netmask 255.255.255.0 {
    range 192.168.1.10 192.168.1.200;
}
host server1 {
    hardware ethernet 00:1b:63:ef:db:54;
    fixed-address 192.168.1.20;
}
host server2 {
    hardware ethernet 00:0a:95:b4:d4:b0;
    fixed-address 192.168.1.21;
}
host printer1 {
    hardware ethernet 00:16:cb:aa:2a:cd;
    fixed-address 192.168.1.22;
}
host printer2 {
    hardware ethernet 00:0a:95:f5:8f:b3;
    fixed-address 192.168.1.23;
}
```

3. Now you need to restart DHCP server using the following command

```
sudo /etc/init.d/dhcp3-server restart
```

4. Configure Ubuntu DHCP Client.

To configure your ubuntu desktop as DHCP client following this procedure

You need to open /etc/network/interfaces file

```
sudo nano /etc/network/interfaces
```

make sure you have the following lines (eth0 is an example)

```
auto lo eth0
iface eth0 inet dhcp
iface lo inet loopback
```

Save and exit the file

You need to restart networking services using the following command

```
sudo /etc/init.d/networking restart
```

5. How to find DHCP server IP address

You need to use the following commands

```
sudo dhclient
```



or

```
tail -n 15 /var/lib/dhcp3/dhclient.*.leases
```

**Side dishes or references:**

None

**For ZAMREN membership this is:**

**Chapter: 3b**    Technical infrastructure (Linux)

**Group:**            Server setup

**Recipe:**            **Web server setup for Linux**

**Explanation:**

A web server is computer hardware/ software that helps to deliver web content that can be accessed through the Internet or Intranet. Every Web server has an IP address and possibly a domain name. The webserver setup is important if you are going to host the website or implement an intranet for communicating among students and lecturers. The webserver is also used as platform for learning environments such as Moodle.

**Ingredients:**

- Disk space: 20MB free (min) plus as much as you need to store your data. 1GB is probably a realistic minimum.
- Memory: 256MB (min), 1GB or more is strongly recommended.
- Linux operating system (Ubuntu or Debian or Redhat). Debian is recommended.
- Web server software. Primarily [Apache](#) or [IIS](#). [PHP](#)
- A database. MySQL and PostgreSQL are the primary development database, the most comprehensively tested and have extensive documentation and support. Oracle and MSSQL are fully supported (note that optional plugins may be untested with these databases) but documentation and online help are not as comprehensive as MySQL/PostgreSQL.
- Client web browser on their PC/tablet/notepad.
- To host the website you will need to register your domain.

**Instructions:**

1. First check that apache web server was not installed at the initial installation. To check open up any web browser and then enter the following into the web address IP address of server or http://localhost/ on the web browser of server and you will see a message saying "It works!" , congrats to you! or something like that!
2. If apache is not installed then install apache using the command below  
`sudo apt-get install apache2`
3. Then install PHP using the command below:  
`sudo apt-get install php5 libapache2-mod-php5`  
`sudo /etc/init.d/apache2 restart`
4. To test whether PHP works, do the following  
`sudo nano /var/www/testphp.php`  
This will open up a file called *testphp.php* and Copy/Paste this line into the phptest file: `<?php  
phpinfo(); ?>`  
Save and close the file and now open your web browser and type the following into the web address http://ip address/testphp.php or http:// localhost/testphp.php
5. Then install MySQL using the command below:  
`sudo apt-get install mysql-server`  
`gksudo nano /etc/mysql/my.cnf`  
Change the line  
`bind-address = 127.0.0.1`  
`mysql -u root`  
`mysql> SET PASSWORD FOR 'root'@'localhost' = PASSWORD('yourpassword');`  
(Make sure to change *yourpassword* to a password of your choice.)
6. To install phpMyAdmin which is an easy tool to edit your databases to the following:  
`sudo apt-get install libapache2-mod-auth-mysql php5-mysql phpmyadmin`

7. Then you need get PHP to work with MySQL and you should open a file entitled *php.ini* as shown below:

```
gksudo nano /etc/php5/apache2/php.ini
```

Change this line by removing the semicolon:

```
;extension=mysql.so
```

To look like this:

```
extension=mysql.so
```

8. Now just restart Apache and you are all set!

```
sudo /etc/init.d/apache2 restart
```

**Side dishes or references:**

None

**For ZAMREN membership this is:**

**Chapter: 3b**    Technical infrastructure (Linux)

**Group:**            Server setup

**Recipe:**           **File server setup for Linux**

**Explanation:**

A file server is a computer and storage device dedicated to storing files. Any user on the network can store files on the server. A file server is used as an efficient way to share files and resources on the network with both Ubuntu and Windows computers.

**Ingredients:**

- Linux operating system (Ubuntu or Debian or Redhat).
- Disk space

**Instructions:**

1.        Install updates:  
              `sudo apt-get update`
2.        Then install the **Samba** package. From a terminal prompt enter:  
              `sudo apt-get install samba`
3.        Edit the following key/value pairs in the *[global]* section of `/etc/samba/smb.conf`:  
              `sudo nano /etc/samba/smb.conf`  
              `workgroup = EXAMPLE`  
              ...  
              `security = user`
4.        Create a new section at the bottom of the file, for the directory to be shared:  
              `[share]`  
                  `comment = Ubuntu File Server Share`  
                  `path = /srv/samba/share`  
                  `browsable = yes`  
                  `guest ok = yes`  
                  `read only = no`  
                  `create mask = 0755`

*comment:* a short description of the share. Adjust to fit your needs.

*path:* the path to the directory to share.

This example uses `/srv/samba/sharename` because, according to the *Filesystem Hierarchy Standard (FHS)*, [/srv](#) is where site-specific data should be served. Technically Samba shares can be placed anywhere on the filesystem as long as the permissions are correct, but adhering to standards is recommended.

*browsable:* enables Windows clients to browse the shared directory using **Windows Explorer**.

*guest ok:* allows clients to connect to the share without supplying a password.

*read only:* determines if the share is read only or if write privileges are granted. Write privileges are allowed only when the value is *no*, as is seen in this example. If the value is *yes*, then access to the share is read only.

*create mask:* determines the permissions new files will have when created.

5.        Now that **Samba** is configured, the directory needs to be created and the permissions changed.

`sudo mkdir -p /srv/samba/share`

`sudo chown nobody.nogroup /srv/samba/share/`

The `-p` switch tells `mkdir` to create the entire directory tree if it doesn't exist. Change the share name to fit your environment.

6. Finally, restart the **Samba** services to enable the new configuration:  

```
sudo restart smbd  
sudo restart nmbd
```
7. Setup the security system  
First, install the **libpam-smbpass** package which will sync the system users to the Samba user database:  

```
sudo apt-get install libpam-smbpass
```

  
Edit `/etc/samba/smb.conf`, and in the `[share]` section change:  

```
guest ok = no
```

  
Finally, restart Samba for the new settings to take effect:  

```
sudo restart smbd  
sudo restart nmbd
```

  
Now when connecting to the shared directories or printers you should be prompted for a username and password.

There are two security levels available to the Common Internet Filesystem (CIFS) network protocol *user-level* and *share-level*. Samba's *security mode* implementation allows more flexibility, providing four ways of implementing user-level security and one way to implement share-level:

- *security = user*: requires clients to supply a username and password to connect to shares. Samba user accounts are separate from system accounts, but the **libpam-smbpass** package will sync system users and passwords with the Samba user database.
- *security = domain*: this mode allows the Samba server to appear to Windows clients as a Primary Domain Controller (PDC), Backup Domain Controller (BDC), or a Domain Member Server (DMS).
- *security = ADS*: allows the Samba server to join an Active Directory domain as a native member.
- *security = server*: this mode is left over from before Samba could become a member server, and due to some security issues should not be used.
- *security = share*: allows clients to connect to shares without supplying a username and password.

The security mode you choose will depend on your environment and what you need the Samba server to accomplish.

#### Side dishes or references:

None

For ZAMREN membership this is:

**Chapter: 3b**    Technical infrastructure (Linux)

**Group:**            Server setup

**Recipe:**            **Print server setup**

**Explanation:**

A print server is a computer that manages one or more printers. Print server is used an efficient way to share printers installed, either locally or over the network, on an Ubuntu server.

**Ingredients:**

- Linux operating system (Ubuntu or Debian or Redhat).
- Disk space

**Instructions:**

1. Install updates:  
`sudo apt-get update`
2. Then install the **samba** package. From a terminal prompt enter:  
`sudo apt-get install samba`
3. Edit the following key/value pairs in the *[global]* section of `/etc/samba/smb.conf`:  
`sudo nano /etc/samba/smb.conf`  
    workgroup = EXAMPLE  
    ...  
    security = user
4. In the *[printers]* section change the *guest ok* option to yes:  
    **browsable = yes**  
    **guest ok = yes**
5. Finally, restart the **samba** services to enable the new configuration:  
    **`sudo restart smbd`**  
    **`sudo restart nmbd`**
6. Setup the security system  
    First, install the **libpam-smbpass** package which will sync the system users to the Samba user database:  
    **`sudo apt-get install libpam-smbpass`**  
    Edit `/etc/samba/smb.conf`, and in the *[share]* section change:  
    **guest ok = no**  
    Finally, restart Samba for the new settings to take effect:  
    **`sudo restart smbd`**  
    **`sudo restart nmbd`**  
    Now when connecting to the shared directories or printers you should be prompted for a username and password.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

**Chapter: 3b**    Technical infrastructure (Linux)

**Group:**            Server setup

**Recipe:**            **Mail server setup for Linux (Zimbra)**

**Explanation:**

VMware Zimbra is an enterprise class email, calendar and collaboration suite designed for the cloud, both private and public. The flexibility, scalability and stability of Zimbra make it as a complete email solution that can be deployed in any environment either small or large. Zimbra email server can be accessed from the Zimbra Web Client, Zimbra Desktop offline client, Outlook and a variety of other standards-based email clients and mobile devices.

**Ingredients:**

- Netcat (nc) is required on all operating systems using ZCS. The nc utility must be installed prior to installation or upgrading.
- For SUSE, Ubuntu, and Debian systems, disable AppArmor and verify that services are not running before installing ZCS.
- SSH client software to transfer and install the Zimbra Collaboration Server software.
- Valid DNS configured with an A record and MX record.
- Servers should be configured to run Network Time Protocol (NTP) on a scheduled basis

**Instructions:**

The configuration is based on the following assumptions:

Ubuntu server IP - 192.168.1.100

Ubuntu Server FQDN - mail.mydomain.com

DNS Server IP - 192.168.1.10 (Internal Windows DNS server) , 8.8.8.8

Gateway IP - 192.168.1.1

Domain name - mydomain.com

**A.) Preparing Ubuntu for Zimbra Installation**

1. Install Ubuntu 12.04 LTS on your server (Include openssh-server during package selection)
2. Login as root user.
3. Update and upgrade Ubuntu

*apt-get update*

*apt-get upgrade*

4. Set a static IP for the server

*nano /etc/network/interfaces*

*auto eth0*

*iface eth0 inet static*

*address 192.168.1.100*

*gateway 192.168.1.1*

*netmask 255.255.255.0*

*network 192.168.1.0*

*broadcast 192.168.1.255*

*dns-nameservers 192.168.1.10 8.8.8.8*

Now restart networking to make the change effective: */etc/init.d/networking restart*

5. Set a hostname for the server. Latter this will become the name of your Zimbra email server.

*nano /etc/hostname*

*mail.mydomain.com*

6. DNS Configuration:

You can either use BIND or your internal DNS server (e.g.: Windows DNS server).

Here you can find the configuration of both. *In this example I used my Internal Windows DNS server to create A record and MX record.*

a.) For BIND configuration follow the below steps:

i. Install BIND9 : `# sudo apt-get install bind9`

ii. Edit the file : `# vi /etc/bind/named.conf` and remove `'//'` from forwarders and add DNS server IP address like below:

```
forwarders {
    8.8.8.8;
};
```

And add the below lines and save the file:

```
zone "mail.mydomain.com" {
    type master;
    file "file.mail.mydomain.com";
};
```

Now create a file **"file.mail.mydomain.com"** in **/var/cache/bind/** directory and add the following inside the file:

```
$ttl 38400
@ IN SOA mail.mydomain.com. mail.mydomain.com. (
                                2011091202
                                10800
                                3600
                                604800
                                38400 )

IN NS ns.mail.mydomain.com
IN A 192.168.1.100
IN MX 10 mail.mydomain.com

@ A 192.168.1.100
ns A 192.168.1.100
mail A 192.168.1.100
```

Then edit **/etc/resolv.conf** and change nameserver to **192.168.1.100**

Now restart BIND9 services: `# /etc/init.d/bind9 restart`

b.) If it is a Windows DNS Server:

`nano /etc/resolv.conf` and provide the IP address of your Windows DNS server.

**nameserver 192.168.1.10**

Create forward lookup zone (mydomain.com) and add the below records:

Forward lookup zone name<-> **mydomain.com**

**A record <-> mail <-> 192.168.1.100**

**MX record <-> mail <-> mail.mydomain.com <-> priority 10**

Now verify the DNS configuration using the code **#dig mail.mydomain.com mx** (in this example I used windows DNS server)

```
; <<>> DiG 9.8.1-P1 <<>> mail.mydomain.com mx
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- 37752="" br="" id="" noerror="" opcode="" query="" status="">; flags: qr aa rd
ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1
```

```
;; QUESTION SECTION:
```

```
;mail.mydomain.com. IN MX
```

```
;; ANSWER SECTION:
```



```
mail.mydomain.com.      3600  IN    MX    10 mail.mydomain.com.
```

```
;; ADDITIONAL SECTION:
```

```
mail.mydomain.com      3600  IN    A     192.168.1.100
```

```
;; Query time: 1 msec
```

```
;; SERVER: 192.168.1.10#53(192.168.1.10)
```

```
;; WHEN: Thu Feb  4 20:57:38 2013
```

```
;; MSG SIZE rcvd: 63
```

7. Firewall Con;; Query time: 1 msec

```
;; SERVER: 192.168.1.10#53(192.168.1.10)
```

```
;; WHEN: Thu Feb  4 20:57:38 2013
```

```
;; MSG SIZE rcvd: 63figuration (Optional)
```

Zimbra recommends us to install ZCS on a system without a firewall. If required you can configure a firewall in your Ubuntu 12.04 LTS.

8. Install updates:

```
sudo apt-get update
```

9. Install Dependencies

These packages will be necessary for Zimbra to be installed on your system.

```
sudo apt-get install netcat libidn11 libpcre3 libgmp3c2 libexpat1 libstdc++6 libperl5.14  
sysstat sqlite3
```

10. Disable & remove Apparmor

```
sudo /etc/init.d/apparmor stop  
sudo /etc/init.d/apparmor teardown  
sudo update-rc.d -f apparmor remove
```

11. Download Zimbra ZCS.

Go to <http://www.zimbra.com/downloads/os-downloads.html> and get the latest link.

```
wget
```

```
http://files2.zimbra.com/downloads/8.0.6_GA/zcs-  
8.0.6_GA_5922.UBUNTU12_64.20131203103702.tgz
```

12. Unpack the downloaded zimbra package:

```
#tar -zxvf zcs-8.0.6_GA_5922.UBUNTU12_64.20131203103702.tgz
```

13. Go the zimbra package and install it.

```
#cd zcs-8.0.6_GA_5922.UBUNTU12_64.20131203103702  
#./install.sh
```

14. Select the packages to install

```
Install zimbra-ldap [Y] Y  
Install zimbra-logger [Y] Y  
Install zimbra-mta [Y] Y  
Install zimbra-snmp [Y] Y  
Install zimbra-store [Y] Y  
Install zimbra-apache [Y] Y  
Install zimbra-spell [Y] Y  
Install zimbra-memcached [N] N  
Install zimbra-proxy [N] N
```

When asked if you want to continue, press Y and hit enter to proceed with the installation.

15. Configuration Menu

Go through all of the items on the configuration and make sure they are what you want.

Then **press "A" and hit enter** to apply your settings and start the server!

Zimbra will ask you to confirm the changes to your system. Type **"Yes" and hit enter**.

16.    Verify Zimbra Server Operation  
When Configuration complete appears, the installation is finished and the server has been started. To verify that the server is running:  
        *su - zimbra*  
        *zmcontrol status*
- 17     Now access the Zimbra admin console  
Use a web browser on <https://192.168.1.100:7071>

**Side dishes or references:**

None

**For ZAMREN membership this is:**

**Chapter: 3b**    Technical infrastructure (Linux)

**Group:**            **Server administration**

**Recipe:**           **Server upgrades**

**Explanation:**

The purpose of the server upgrades is to update and upgrade the operating system and other software installed on the server. The upgrade address any security vulnerabilities that may exist with older version of the operating system or software installed.

[Can be done regularly, or write a script]

**Ingredients:**

Linux Server operating system

**Instructions:**

1. To install updates:  
    *sudo apt-get update*
2. To upgrade the system  
    *sudo apt-get upgrade*
3. To update and upgrade  
    *sudo apt-get update && apt-get upgrade*

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 3b**    Technical infrastructure (Linux)

**Group:**            Server administration

**Recipe:**           **Server security (anti-virus)**

**Explanation:**

The purpose of the server needs assessment is to help organizations determine their server requirements in terms of what services they require to provide to the user community. It also helps the organization assess its maturity level.

**Ingredients:**

- Paper and pen
- IP tables
- VFW firewall
- Expertise

**Instructions:**

1. Turn on the firewall UFW (sudo ufw enable) and then only allow ports that are actually used (see below).  
*ufw allow from {your-ip} to any port 22*  
*ufw allow 80*  
*ufw allow 443*  
*ufw enable*
2. Make sure MySQL only allows connections from localhost.
3. Enable TLS on mail services. Even if it's a self-signed cert. You don't want passwords sent in the clear.
4. Get yourself with a static IP on the system through which you are going to manage the server. Make most of the things IP block and only allow your particular IP to access those configuration places like port 22.
5. You may use a cron job to check when your files were modified without your permission and possibly hacked; using this cron job. I prefer Notepad++ to compare the cron results (directly download the cron email from your web server and open in Notepad++).
6. Install Logwatch to monitor your logs and emails them to you. This is useful for tracking and detecting intrusion.  
*apt-get install logwatch*  
*nano /etc/cron.daily/00logwatch*  
add this line:  
*/usr/sbin/logwatch --output mail --mailto test@gmail.com --detail high*
7. Secure shared memory  
/dev/shm can be used in an attack against a running service, such as httpd. Modify /etc/fstab to make it more secure.  
Open a Terminal Window and enter the following:  
*sudo vi /etc/fstab*  
Add the following line and save. You will need to reboot for this setting to take effect:  
*tmpfs /dev/shm tmpfs defaults,noexec,nosuid 0 0*
8. Prevent IP Spoofing  
*sudo vi /etc/host.conf*  
Add or edit the following lines:  
*order bind,hosts*  
*nospoof on*
9. Harden PHP for security  
Edit the php.ini file:  
*sudo vi /etc/php5/apache2/php.ini*

Add or edit the following lines:

```
disable_functions = exec,system,shell_exec,passthru
register_globals = Off
expose_php = Off
magic_quotes_gpc = On
```

10. Scan open ports – Nmap. Nmap ("Network Mapper") is a free and open source utility for network discovery and security auditing.

```
sudo apt-get install nmap
```

Scan your system for open ports with:

```
nmap -v -sT localhost
```

SYN scanning with the following:

```
sudo nmap -v -sS localhost
```

11. Install Fail2ban. Fail2ban is a daemon that monitors login attempts to a server and blocks suspicious activity as it occurs.

```
apt-get install fail2ban
```

After installation edit the configuration file `/etc/fail2ban/jail.local` and create the filter rules as required.

To edit the settings open a terminal window and enter:

```
sudo vi /etc/fail2ban/jail.conf
```

Activate all the services you would like fail2ban to monitor by changing `enabled = false` to `*enabled = true*` For example if you would like to enable the SSH monitoring and banning jail, find the line below and change `enabled` from `false` to `true`. That's it.

```
[ssh]
```

```
enabled = true
```

```
port    = ssh
```

```
filter  = sshd
```

```
logpath = /var/log/auth.log
```

```
maxretry = 3
```

If you would like to receive emails from Fail2Ban if hosts are banned change the following line to your email address.

```
destemail = root@localhost
```

and change the following line from :

```
action = %(action_)s
```

to:

```
action = %(action_mwl)s
```

You can also create rule filters for the various services that you would like fail2ban to monitor that is not supplied by default.

```
sudo vi /etc/fail2ban/jail.local
```

When done with the configuration of Fail2Ban restart the service with :

```
sudo /etc/init.d/fail2ban restart
```

You can also check the status with.

```
sudo fail2ban-client status
```

12. Install DenyHosts. DenyHosts is a python program that automatically blocks SSH attacks by adding entries to `/etc/hosts.deny`. DenyHosts will also inform Linux administrators about offending hosts, attacked users and suspicious logins.

```
sudo apt-get install denyhosts
```

After installation edit the configuration file `/etc/denyhosts.conf` and change the email, and other settings as required.

To edit the admin email settings open a terminal window and enter:

```
sudo vi /etc/denyhosts.conf
```

Change the following values as required on your server:

```
ADMIN_EMAIL = root@localhost
SMTP_HOST = localhost
SMTP_PORT = 25
#SMTP_USERNAME=foo
#SMTP_PASSWORD=bar
SMTP_FROM = DenyHosts nobody@localhost
#SYSLOG_REPORT=YES
```

13. Use public key authentication. First create the user named deploy

```
useradd deploy
mkdir /home/deploy
mkdir /home/deploy/.ssh
chmod 700 /home/deploy/.ssh
nano /home/deploy/.ssh/authorized_keys
```

Add the contents of the id\_rsa.pub on your local machine and any other public keys that you want to have access to this server to this file.

```
chmod 400 /home/deploy/.ssh/authorized_keys
chown deploy:deploy /home/deploy -R
```

Now test your new account logging into your new server with the deploy user (keep the terminal window with the root login open). If you're successful, switch back to the terminal with the root user active and set a sudo password for your login user:

```
passwd deploy
```

Set a complex password - you can either store it somewhere secure or make it something memorable to the team. This is the password you'll use to sudo.

```
visudo
```

Comment all existing user/group grant lines and add:

```
root  ALL=(ALL) ALL
deploy ALL=(ALL) ALL
```

Configure ssh to prevent password & root logins and lock ssh to particular IPs:

```
nano /etc/ssh/sshd_config
```

Add these lines to the file, inserting the ip address from where you will be connecting:

```
PermitRootLogin no
PasswordAuthentication no
AllowUsers deploy@(your-ip) deploy@(another-ip-if-any)
```

Now restart ssh:

```
service ssh restart
```

[Add RKHunter: for checking of rootkits]

#### **Side dishes or references:**

None

#### **For ZAMREN membership this is:**

A must

**Chapter: 3b**    Technical infrastructure (Linux)

**Group:**            Server administration

**Recipe:**           **Server monitoring and tuning**

**Explanation:**

The purpose of the server monitoring is know the status of everything about system including CPU load, network traffic statistics, memory consumption, logged in users, availability of disk free space or service. It is important for the system administrator to know that some services on the network are down rather than being told by the user. Server tuning is concerned about improving the performance of the server.

**Ingredients:**

Linux Server operating system

**Instructions:**

1. To monitor your servers install a monitoring tool like Nagios, Cacti, Zabbix, MRTG, Nfsen. These tools can be used free of charge and allows to monitor availability and response time of network services, usage of system resources like CPU load, RAM allocation etc., number of logged in users and many-many more.
2. To increase performance of the server by decreasing Swappiness  
*sudo vim /etc/sysctl.conf*  
*Edit: vm.swappiness=10*
3. To increase performance of the server clean up apt cache at /var/cache/apt/archives and unnecessary apt-sources list in /etc/apt/sources.list  
*sudo apt-get autoclean*
4. To increase performance of the server by installing Preload  
*sudo apt-get install preload*
5. To increase performance of the server by using localhost as the host name  
*nano /etc/hosts*  
*127.0.0.1        localhost Ubuntu*  
*127.0.1.1        Ubuntu*  
In the end of the first line, add the host name, which is the name of the second line.
6. To increase performance of the server by tuning TCP/IP setting using sysctl. Tuneable TCP settings can be found on /proc/sys/net/ipv4
7. To increase performance of the server by stopping or disabling un-wanted services. Many services are required to run all the time however many can be safely turned off for both security reasons as running unnecessary services opens more doors into your computer, but also for performance reasons.
8. To increase performance of the server by modifying the File system Access time. Linux records information about when files were last accessed. There is a cost associated with recording the last access time. The ext3/ext4 file system of Linux has an attribute that allows the super-user to mark individual file system to ignore recording of last access time. This may lead to significant performance improvements on often accessed frequently changing files such as the contents of the web server directory.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 3b**    Technical infrastructure (Linux)

**Group:**            Server administration

**Recipe:**            **Backup and restoration automation**

**Explanation:**

Backup and recovery is important especially for critical data such as mail or website or learning management system like Moodle. The operating system and most application programmes can be re-installed. Therefore it is important that an automated incremental backup is done for the data on the server. An incremental backup backs up all the files that have changed since the last backup. Failure to have verified backup and recovery procedures puts your data at risk of loss.

**Ingredients:**

- Linux Server operating system
- Software installed on the server
- Data on the server

**Instructions:**

1. Prepare for backup by unmounting any external drives and remove any optical media such as CDs or DVDs that you do not want to include in the backup.
2. Backup the whole system. To split the archive during creation and to limit each tar to 3.9GB issue the second tar command.

```
cd /
tar cvpzf backup.tgz --exclude=/proc --exclude=/lost+found --exclude=/backup.tgz --exclude=/mnt --
exclude=/sys /
tar cvpzf backup.tgz --exclude=/proc --exclude=/lost+found --exclude=/backup.tgz --exclude=/mnt --
exclude=/sys / | split -d -b 3900m - /name/of/backup.tar.gz.
```

3. Reconstitute the archive. First cd into the directory holding the split archives. Then simply use *cat* to write all the archives into one and send over standard output to tar to extract to the specified directory.

```
cat *tar.gz* | tar -xvpzf - -C /
```

4. Restore on the new machine with same version of Linux operating system. Make sure you copy the */boot/grub/menu.lst* to *menu.lst.bak* just in case there is problem with booting and you can restore this file

```
tar xvpzf backup.tgz -C /
```

5. Make sure the excluded directories exist. If not recreate them.

```
mkdir /proc /sys /mnt /media /lost+found
```

6. Restoring GRUB. For the system to boot, you will need to restore grub. To do this, you will need to reconfigure it in a chroot:

```
sudo -s
for f in dev dev/pts proc ; do mount --bind /$f /media/whatever/$f ; done
chroot /media/whatever
dpkg-reconfigure grub-pc
```

You will get a menu asking you what drive(s) grub should be installed on. Choose whatever drive(s) the computer will be booting from.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must



## Chapter: 3b Technical infrastructure (Linux)

Group: User administration

Recipe: Accounts creation

### Explanation:

User account creation is a business process for creating and managing access to resources in an information technology (IT) system. User account provisioning is the creation, management and maintenance of an end-user's objects and attributes in relation to accessing resources available in one or more systems. Essentially, user account creation refers to the management of user rights and privileges. User account creation is one of many identity management procedures, and it defines the different ways of managing an individual's digital identity, authentication and authorization rights. The task of creating user accounts is performed by either a Network Administrators or Systems Administrator.

### Ingredients:

- Active Directory or LDAP
- Hardware/Server
- O/S Linux
- Computer/Laptop

### Instructions:

When you first started your Red Hat Enterprise Linux system after installation, you were given the opportunity to create one or more user accounts using the **Setup Agent**. If you did not create at least one account (not including the root account) you should do so now. You should avoid working in the root account for daily tasks.

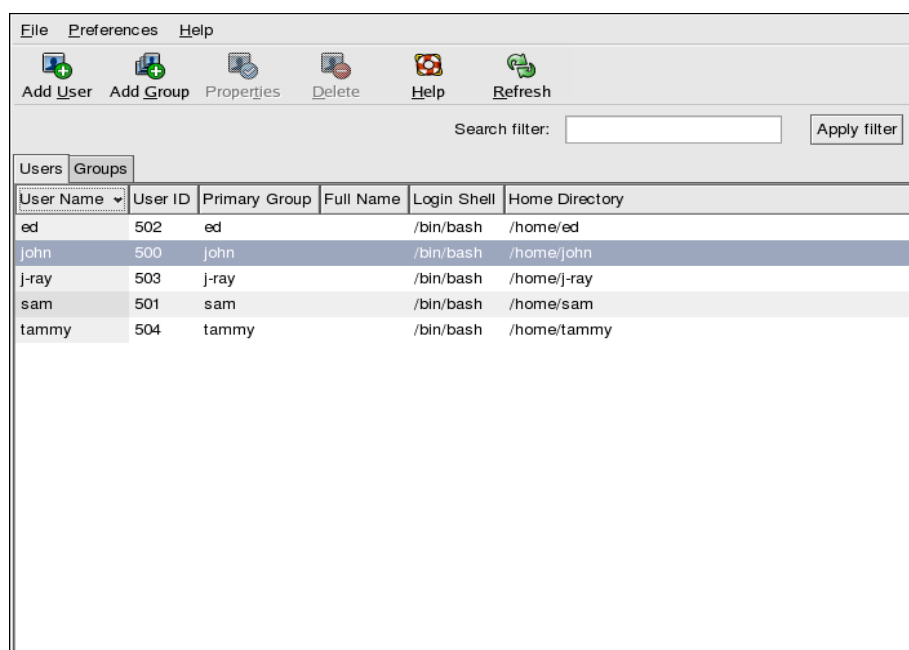
There are two ways to create new and/or additional user accounts: using the graphical **User Manager** application or from a shell prompt.

To create a user account graphically using the **User Manager**:

1. Select **Applications** (the main menu on the panel) => **System Settings** => **Users & Groups** from the panel.

You can also start the **User Manager** by typing `redhat-config-users` at a shell prompt.

2. If you are not logged in as root, you will be prompted for your root password.
3. The window underneath will appear. Click **Add User**.



**Figure 1-16. The Red Hat User Manager**

4. In the **Create New User** dialog box, enter a username (this can be an abbreviation or nickname), the full name of the user for whom this account is being created, and a password (which you will enter a second time for verification). The name of this user's home directory and the name of the login shell should appear by default. For most users, you can accept the defaults for the other configuration options. Refer to the *Red Hat Enterprise Linux System Administration Guide* for details about additional options.
5. Click **OK**. The new user will appear in the user list, signaling that the user account creation is complete.

**To create a user account from a shell prompt:**

1. Open a shell prompt.
2. If you are not logged in as root, type the command `su -` and enter the root password.
3. Type `useradd` followed by a space and the username for the new account you are creating at the command line (for example, `useradd jsmith`). Press [Enter]. Often, usernames are variations on the user's name, such as `jsmith` for John Smith. User account names can be anything from the user's name, initials, or birthplace to something more creative.
4. Type `passwd` followed by a space and the username again (for example, `passwd jsmith`).
5. At the `New password:` prompt enter a password for the new user and press [Enter].
6. At the `Retype new password:` prompt, enter the same password to confirm your selection.



**Important**

You should take precautions when you choose a password. The password is the key to your account, so it should be both unique and easy for you to remember. Your password should be at least six characters. You can use both uppercase and lowercase letters, as well as numbers and characters. Avoid easy selections, such as **qwerty** or **password**. If you want to pick an easy-to-remember but somewhat unique password, consider a variation of a word, such as **a1rPl4nE** for **airplane**.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 3b**    Technical infrastructure (Linux)

**Group:**            User administration

**Recipe:**           **Space allocation**

**Explanation:**

Disk quota or space allocation track and control disk space usage for NTFS volumes, allowing administrators to control the amount of data that each user can store on a specific NTFS volume. A disk quota limits the amount of information one can store on the server. By using disk quotas, you can configure Microsoft Windows Server to do the following:

- Log an event when a user exceeds a specified disk space warning level. The warning level specifies the point at which a user is nearing the quota limit.
- Prevent further use of disk space or log an event when a user exceeds a specified disk space limit.

If users are sharing file disk space on a server, they can consume considerable disk space when saving documents, graphics, and other files. This can be problematic if some users need to use more disk space than other users, resulting in some users not having enough disk space to store their files on the volume. An administrator can solve this problem by enacting a Group Policy or a computer policy that limits the amount of disk space each user has on the volume. The administrator can also adjust quotas to the user's needs because user's are tracked on a per-user basis, per-volume.

**Ingredients:**

- Active Directory or LDAP
- Hardware/Server
- O/S Linux
- Computer/Laptop

**Instructions:**

To implement disk quotas Linux, use the following steps:

1. Enable quotas per file system by modifying the **/etc/fstab** file.
2. Remount the file system(s).
3. Create the quota database files and generate the disk usage table.
4. Assign quota policies.

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must

**Chapter: 3b**    Technical infrastructure (Linux)

**Group:**            User administration

**Recipe:**            **User account policy setup**

**Explanation:**

A user account policy is a document which outlines the requirements for requesting and maintaining an account on computer systems or networks, typically within an organization. It is very important for large sites where users typically have accounts on many systems. Some sites have users read and sign an account policy as part of the account request process. An example of a user account policy, "Employees shall only request/receive accounts on systems they have a true business need to access. Employees may only have one official account per system and the account ID and login name must follow the established standards. Employees must read and sign the acceptable use policy prior to requesting an account.

**Ingredients:**

- Active Directory or LDAP
- Hardware/Server
- O/S Linux
- Computer/Laptop
- Application/Software/Enterprise Resource System

**Instructions:**

To perform this procedure, you must be logged on as a local administrator or provide the credentials of a member of the local **Administrators** group. To change the behavior of user account by using Group Policy

1. Click **Start**, type **secpol.msc** in the **Search programs and files** box, and then press ENTER.
2. If the **User Account Control** dialog box appears, confirm that the action it displays is what you want, and then click **Yes**.
3. In the console tree, expand **Local Policies**, and then click **Security Options**.
4. In the details pane, scroll down and double-click the Group Policy setting that you want to change. User Account Control (UAC) policy settings that a local administrator can modify include:

- User Account Control: Admin Approval Mode for the built-in Administrator account
- User Account Control: Allow UIAccess applications to prompt for elevation without using the secure desktop
- User Account Control: Behavior of the elevation prompt for administrators in Admin Approval Mode
- User Account Control: Behavior of the elevation prompt for standard users
- User Account Control: Detect application installations and prompt for elevation
- User Account Control: Only elevate executables that are signed and validated
- User Account Control: Only elevate UIAccess applications that are installed in secure locations
- User Account Control: Run all administrators in Admin Approval Mode
- User Account Control: Switch to the secure desktop when prompting for elevation
- User Account Control: Virtualize file and registry write failures to per-user locations

5. On the **Properties** page, make your selection, and then click **OK**.

[Text above id for Windows: replace with instructions for Linux]

**Side dishes or references:**

None

**For ZAMREN membership this is:**

A must



## Annex 1 ICT Maturity assessment

### Questionnaire ICT Maturity Higher Education Institution, Zambia

May 2015

This is a questionnaire in order to acquire an **indication** about the ICT Maturity of your institution.  
ICT Maturity is a measure for an institutions' ability to adopt ICT.

For this purpose you are requested to indicate if the statements below are **TRUE**, **FALSE** or you **DON'T KNOW** for the situation **AT THIS VERY MOMENT** for your institution (and not for how it will be in the near or far future).

Please read the statements carefully and indicate your answer with an X.

At the bottom of the page 4, please state your name, department and date.

Your cooperation is highly appreciated.

	Is the statement underneath <b>TRUE</b> or <b>FALSE</b> for YOUR INSTITUTION according to YOU for the situation at this very moment	TRUE	FALSE	DON'T KNOW
1	There is no computer network in the Institution			
2	Management is not well aware of ICT costs			
3	No work processes are supported by ICT			
4	Only some individuals have ICT knowledge			
5	There are no computers in the Institution			
6	Management is not well aware of ICT opportunities			
7	Only some individuals have ICT awareness			
8	There are no ICT applications in use			
9	Existing Internet access is through dial-up (modem) connection			
10	Acquisition of hard- and software is decided by individuals or on departmental level			
11	Work processes are supported by ICT at <i>individual task</i> -level on a voluntary basis			
12	Hard- and software acquisition is funded as part of donor projects			
13	There is no dedicated ICT Centre in the Institution			
14	On campus there are mainly stand-alone computers			
15	Only applications for individual use (word processing, spread sheets, statistics, presentation software, mail, internet) are used by early adopters			
16	It is staff from Computer Science, Mathematics or Engineering department who give all ICT support (full-time)			
17	There is no professional ICT staff (=ICT staff with no other responsibilities)			
18	Existing small local networks are used only for sharing resources (files, printers)			
19	Individuals manage their own hard- and software			
20	Hard- and software acquisition is funded by departmental budgets			
21	The stand-alone computers are managed by their users			
22	It is staff from Computer Science, Mathematics or Engineering department who give some ICT support (part-time)			
23	The use of ICT for supporting tasks and work processes is no longer an individual choice but more and more demanded for			
24	Both staff and students want more and more computers			
25	Internet has become an important source for up-to-date information for staff			
26	ICT skills are needed for supporting system implementation			
27	There are first experiments with online teaching & learning			

	Is the statement underneath <b>TRUE</b> or <b>FALSE</b> for YOUR INSTITUTION according to YOU for the situation at this very moment	TRUE	FALSE	DON'T KNOW
28	Currently ICT staff is recruited from Mathematics, Computer Science or Engineering department and is working part-time			
29	ICT skills are needed for network installation and network configuration			
30	ICT staff takes the lead in ICT development and management is mainly re-active			
31	An Assets & Maintenance System is being implemented			
32	ICT skills are needed for user support			
33	ICT skills are needed for hardware maintenance			
34	ICT illiterate staff starts using computers and networks			
35	Institution management requests the ICT Centre to develop ICT plans or an ICT Policy			
36	There is no institutional ICT budget			
37	Both staff and students want more and more high-bandwidth Internet access			
38	An Accounting or Financial system is being implemented			
39	The ICT Centre (if any) focuses on system installation and software maintenance			
40	Internet has become an important communication channel for students			
41	There is widespread use of ICT for office tasks (word processing, spread sheet, presentation, mail)			
42	A campus-wide network is being installed			
43	Internet has become an important source for up-to-date information for students			
44	An ICT Centre is created			
45	The campus-wide network has considerable technical problems			
46	Internet has become an important communication channel for staff			
47	A Human Resource Management or Personnel System is being implemented			
48	A Library System is being implemented			
49	There is an acute need for ICT support for users on campus			
50	There is Internet access but insufficient bandwidth for efficient use			
51	A Student Information System is being implemented			
52	The Institution has Internet cafés for students installed			
53	The campus-wide network has considerable security/virus problems			
54	The ICT Centre (if any) focuses on network expansion and hardware maintenance			
55	Management becomes aware of the cost of ICT			
56	There are institutional mail accounts for staff and students			
57	ICT staff takes care of mainly technical tasks (network management, database management, application installation)			
58	The core process of research is to a lesser or larger extend supported by ICT			
59	The Accounting or Financial system has no loose ends and is fully operational			
60	The support process of Accounting or Financial Management is to a lesser or larger extend supported by ICT			
61	An ICT Steering Committee is advising senior management on ICT issues			
62	Technical management problems of the network and all security issues (damage through viruses, hackers, etc.) are resolved			
63	ICT user training is offered on a regular basis for new and existing administrative and academic staff			
64	The ICT Services Unit reports directly to top-management			
65	Senior management is well aware of the potential benefits of ICT			
66	The core process of teaching & learning is to a lesser or larger extend supported by ICT			
67	Students can acquire their own personal computer through a special funding scheme			
68	The Institution has an ICT Policy Plan and an ICT Master Plan			

	Is the statement underneath <b>TRUE</b> or <b>FALSE</b> for YOUR INSTITUTION according to YOU for the situation at this very moment	TRUE	FALSE	DON'T KNOW
69	Most research is carried out within the framework of international on-line research communities			
70	The Library System has no loose ends and is fully operational			
71	The installation of a campus-wide network is finalized and the network is operational			
72	There is an institutional ICT budget, revised on a yearly basis			
73	All administrative and academic staff have a computer			
74	The institutional ICT budget includes budget lines for depreciation			
75	The ICT Services Unit delivers services to faculties and administrative departments, on the basis of Service Level Agreements (SLA's)			
76	Mail and electronic agendas are used widely within the institution for communication and planning			
77	There are computer labs for students with enough capacity for the campus population			
78	The support process of Student Information Services is to a lesser or larger extend supported by ICT			
79	The Assets & Maintenance System has no loose ends and is fully operational			
80	The Human Resource Management or Personnel System has no loose ends and is fully operational			
81	New ICT investments are only approved on the basis of a convincing business case (cost-benefit analysis)			
82	The support process of Human Resource Management (including job appraisal) is to a lesser or larger extend supported by ICT			
83	All communication, also within the institution, is largely web-based			
84	High-bandwidth Internet access becomes available for all staff and students			
85	ICT staff takes care of ICT project management			
86	The support process of Information Management (Library) is to a lesser or larger extend supported by ICT			
87	The Student Information System has no loose ends and is fully operational			
88	Staff of the ICT Centre is managing outside ICT contractors (=external suppliers, consultants, advisors)			
89	Senior management is well aware of the costs of ICT			
90	Students have computer access without waiting lists			
91	ICT user training is offered on a regular basis for new and existing students			
92	Some non-vital ICT functions are outsourced			
93	Teachers are trained, motivated and supported to adopt on-line teaching			
94	The support process of Assets Management & Maintenance is to a lesser or larger extend supported by ICT			
95	All ICT staff positions are full-time and dedicated (=no staff from Computer Science, Mathematics or Engineering any more)			
96	The ICT Centre is converted into an ICT Services Unit			
97	A Virtual Learning Environment (VLE) is operational			
98	All applications are accessible by single sign-on			
99	A central ICT budget covers the basic infrastructure requirements			
100	"ICT skills" is part of the recruitment procedure and annual staff assessment (=job appraisal) for administrative staff			
101	Access to the campus network is extended into the outside world: staff can access the Institution intranet from home and anywhere else			
102	Technical support by the ICT Services Unit has become a standardized process and the real effort concentrates now on data and system integration			
103	ICT staff has the professional skills for portal development			
104	Portal technology provides for web-based interface to the integrated systems			



	Is the statement underneath <b>TRUE</b> or <b>FALSE</b> for YOUR INSTITUTION according to YOU for the situation at this very moment	TRUE	FALSE	DON'T KNOW
105	More and more wireless networks are present on campus			
106	Without ICT the institution comes to a stand still			
107	ICT has become a critical tool in all core- and support processes of the institution			
108	The organizational structure of and work processes in the Institution are adjusted (where necessary) due to the realized gain in efficiency and effectiveness by ICT			
109	Authentication and authorization mechanisms are in place to facilitate all web-based services			
110	All applications are accessible through the institutional portal			
111	More and more user applications and data is managed by users themselves on the Internet (Web 2.0)			
112	Strategic priorities are financed by departmental ICT budgets			
113	ICT staff has the professional skills for system architecture development			
114	A special budget for ICT innovations is created			
115	The use of ICT is further optimized to realize real efficiency and effectiveness gain for the institution			
116	Critical Student services like the Virtual Learning Environment, on-line Registration and on-line Results are accessible from anywhere			
117	System integration is supported by middleware (=special software to integrate existing applications with each other)			
118	ICT planning is fully integrated in the institutional strategic planning cycles			
119	All applications are browser oriented (web-based)			
120	ICT staff has the professional skills for system integration (building dedicated interfaces and middleware management)			
121	More and more ICT functions are outsourced or shared between partner institutions			
122	ICT applications are closely integrated to realize further efficiency and effectiveness			
123	ICT staff has the professional skills for developing web-services			
124	Staff that is out of touch with ICT (and not willing to adjust) is replaced			
125	"ICT skills" is part of the recruitment procedure and annual staff assessment (=job appraisal) for academic staff			

Name	Position	Date	Male/Female

## Annex 2 ICT Skills assessment

The ICT Skills assessment is taken from iTaNGo, a project presented by the Victorian Department of Human Services, the Department of Planning and Community Development and designed and delivered by Infoxchange Australia to assist community sector organisations ([www.itango.infoxchange.net.au/](http://www.itango.infoxchange.net.au/)).

The iTaNGO assessment consist of the following topics:

- General skills
- Printers and peripherals
- Word processing
- File management
- Excel (spreadsheet)
- Email
- Internet and online activities
- Databases \*
- Presentations (PowerPoint)
- Library tools
- Advanced Linux skills \*
- Open Source Office applications \*

For the ZAMREN ICT Skills assessment we leave out the topics with the \* (i.e. *databases, advanced Linux skills* and *open source office applications*).

In case of uncertainty, the scoring categories can be translated as follows:

iTaNGO category	Means in other words:	Pts.
<i>Unable</i>	I don't know how to do this	0
<i>Basic Proficiency</i>	I can manage this with some trial and error	1
<i>Intermediate Proficiency</i>	I can manage this without any trial and error	2
<i>Advanced Proficiency</i>	I can easily explain of the top of my head to anyone else how to do this	3

Instructions:

- Put a mark in the applicable category (important: leave out the 3 categories with an \* and put only one mark per line!).
- Score your mark (0, 1, 2 or 3 points)
- Calculate your final score (add up all scores)
- Take your final score; divide by 4 and you have your percentage basic ICT skill proficiency

This ICT Skills assessment will become online in the future.

## ICT Training Needs Assessment

This ICT training assessment needs to be filled in by each of your staff. Please go to the link below to get a copy of the this ICT training assessment in a separate document.  
Please tick only one value per statement - Click to select and deselect

General skills	Unable	Basic Proficiency	Intermediate Proficiency	Advanced Proficiency
I can find, save and print my own documents				
I can recover deleted documents				
I know how to save files in my own directory and in general directories				
I know how to use Windows explorer to manage files				
I can create new directories/folders				
I know how to move and copy files				
I can create a shortcut on the desktop				
I know how to rename files				
I know how to search for a file				
I know how to deal with a "frozen" application				
I know how to run scandisk				
I know how to defragment my C: drive				
I can switch between applications				
I can minimise, maximise and resize windows				
I can cut/copy and paste between applications				
I can use Windows Help				
I can set up a screensaver				
I can back up my work to USB				
I can use the applications menu to launch an application				
I can update my anti-virus				
I can change the look and feel of my desktop environment (desktop wallpaper etc)				
I can minimize, maximize and re-size windows				
I can switch between desktops				
I can locate network resources (files/folders etc)				
I can setup printers				

Training needs assess

## ICT Training Needs Assessment

This ICT training assessment needs to be filled in by each of your staff. Please go to the link below to get a copy of the this ICT training assessment in a separate document.  
Please tick only one value per statement - Click to select and deselect

Score 0	Unable	Basic Proficiency	Intermediate Proficiency	Advanced Proficiency
Printers and peripherals	I can install free software using my computers			
	I can navigate, create, find files and folders using the desktop			
	I know how to shut my PC down properly			
	I can deal with a printer paper jam			
	I can print on labels			
	I can print on non-standard paper			
	I can deal with print queues			
	I can scan an image			
	I can manipulate a scanned image with appropriate software such as Paint Shop Pro etc			
	I can scan a page to the printer			
	I can scan a page to fax			
	I can "burn" files to a CDR (recordable CD)			
Score 0	I can erase and reuse a CDRW (rewritable CD)			
	I can transfer a file from the camera to the PC			
	I am able to email an image file			
	I know how to manage image files on the PC			
	I can set up and use a web cam			
Word Processing	I can format text e.g. size, bold, font			
	I can spell check a document			
	I can cut and paste			
	I know how to use Undo			
	I can customise my toolbar			
	I can set margins and page breaks			
	I can set indents and tab section breaks and partial formats			
	I can create numbers and bullets			

Training needs assess

## ICT Training Needs Assessment

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Please tick only one value per statement - Click to select and deselect

Unable	Basic Proficiency	Intermediate Proficiency	Advanced Proficiency
Score 0	I know about multi level numbering		
	I can set headers and footers		
	I can use tables to present info		
	I can add borders & shading to tables and paragraphs		
	I can use templates for standard docs		
	I can use heading styles		
	I know how to create a table of contents		
	I can mail merge		
	I can create labels		
	I can import images into my document		
File Management	I can view the names and size of files on your desktop or USB		
	I can view how much space is left on a USB or disc		
	I can create and name a new folder		
	I can rename a folder or file		
	I can copy a folder or file		
	I can move a file from one folder to another		
	I can delete a folder or file		
	I can select more than one file (i.e. if I need to copy a group of files)		
Score 0	I can make a back-up copy of my work		
	I can enter text and numeric data in cells		
	I can enter a simple formula (e.g. to add up a column of figures)		
	I am able to save a spreadsheet document		
	I can change the orientation of the print-out from portrait to landscape		
	I can enable gridlines to be shown on prints		
Excel	I can insert and delete rows and columns		

Training needs assess



## ICT Training Needs Assessment

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Please tick only one value per statement - Click to select and deselect

Score 0	Unable	Basic Proficiency	Intermediate Proficiency	Advanced Proficiency
Internet and on-line activities	I can create a new Outlook folder			
	I know how to clear my deleted mail box			
	I know how to set auto archive			
	I know how to create and edit a Task List			
	I know how to find a web page when I know the address			
Score 0	I can move around a web page using links and the back and forward buttons?			
	I can save a web page			
	I can add a web page to 'my favourites'			
	I can save an image from a web page			
	I know how to use a search engine to find a web page			
Databases	I can use an open source or free web browser (Firefox, Google Chrome etc)			
	I know how to view & download Adobe Acrobat (pdf) documents			
	I can change the security settings of my browser			
	I can create a new database			
	I can design a table and add new fields			
	I know what a primary key is			
	I know what an index is			
	I can enter data in a table			
	I can print a table			
	I can add and delete records			
	I can sort data			
	I can sort using a filter			
	I can find data using the Find command			
	I can find data using a query			
	I can select records using more than one criterion			

Training needs assess

## ICT Training Needs Assessment

This ICT training assessment needs to be filled in by each of your staff. Please go to the link below to get a copy of the this ICT training assessment in a separate document.  
Please tick only one value per statement - Click to select and deselect

Score 0	Unable	Basic Proficiency	Intermediate Proficiency	Advanced Proficiency
Presentations (i.e powerpoint)	I can create a report using the report wizard			
	I can adjust a report's layout			
	I can create a form using Autoform			
	I can create a form using the form wizard			
	I can enter and edit data in a form			
	I can modify a form			
	I can create a new presentation			
	I can make a bulleted list			
	I can add an image or graphic			
	I can move parts of the slide around			
	I can add text and images to a blank layout			
	I know how to add colour			
	I can create and use a master slide			
	I can add shapes and lines			
Score 0	I can duplicate slides			
	I can delete slides			
	I can add notes to a slide			
	I can create an organisational chart			
	I can create a bar chart			
	I can import objects from other files			
	I can create transitional effects			
	I can start a slide show			
	I can manually download and install free software			
	I can edit application configuration files using a command line			
Library tools	I can start/stop services provided by on my pc			

Training needs assess



## ICT Training Needs Assessment

This ICT training assessment needs to be filled in by each of your staff. Please go to the link below to get a copy of the this ICT training assessment in a separate document.  
Please tick only one value per statement - Click to select and deselect

Score 0	Unable	Basic Proficiency	Intermediate Proficiency	Advanced Proficiency
Advanced Linux skills				
Score 0				
Open source office applications				
Score 0				
Total out of 495		0		
Digital Proficiency (%)		0%		

[Infoxchange Australia](#)

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**The End**