

### Conclusion

In our article we wanted to introduce interesting possibilities of improving the reliability of existing systems, or software possibilities in the field of errors or failures detection. These methods can be easily applied e.g. in insuring reliability controlling. Also they can be used when evaluating results in decentralized systems in surrounding with radiated or conducted emissions. (In such case usual resources of EMC are not sufficient for preventing the intersection of emissions into transmission channel or system itself). Two rail logic method can be used in new designed system. However best choice is combining introduced methods interactive.

### References

1. Široký, P., Hartánský, R., Petrálák, J. Possibilities of Increasing the Reliability by Methods of Software And Time Redundancy, International Scientific Journal of Computing, 2003. – Vol. 2, Issue 1 (#3). – P. 35–40. – ISSN 1727-6209.
2. Vintr, Z., Vintr, M. After-sales management of product warranty, Engineering Management Conference, 2004 Proceedings, 2004, IEEE International Publication Date: 18–21 Oct. 2004. – Vol. 1. – P 199–203. – ISBN 0-7803-8519-5, INSPEC Accession Number 8331164.
3. Manna, Z. Mathematical Theory of Computation. – New York, Mc Graw Hill, 1974.
4. Myers, G. J. Software Reliability: Principles and Practices. – New York, John Wiley & Sons, 1976.
5. Sellers, F. F., Hsiao, M. Y., Bearson, L. W. Analyzing Errors with the Boolean difference, IEEE Trans. on Computers.
6. Julényová, A. Computer Models, UNINFOS-2001, medzinárodná konferencia, 2001, Nitra.

УДК 378.147

Dr. Eng. Mhd. Aiman Al-Akkad  
Damascus University, S.A.R.

### ONLINE LEARNING EXPERIENCE IN SYRIA

*In this paper we speak about virtual learning and offer our experience in online learning. We started in talking about targeted students and specialties then we discussed administrative, electronic content requirements, assessment rules and measures, software and infrastructure requirements. Finally we gave our opinion about different types of learning including online learning.*

### Introduction

In the advent of developed network and computer systems, information technologies and communication led to what we call virtual learning or online learning where the student and teacher can interact through the net, lectures are given remotely, a lot of tools are used to make learning powerful and interesting. Mostly targeted to those who don't have chances to attend traditional universities and offers specialties which fulfill this sector of learners needs.

Online learning dislike other learning methods has some different requirements and faces a lot of challenges. It requires certain administrative structure, software packages for virtual classroom achievement, learning and assessment management software which complies with certain standards, network management system, development tools, and an appropriate network equipment infrastructure.

Challenges mostly connected with interconnectivity issues, where some opinions say that voice (may be video also) for giving lectures and for interaction should be used, while other opinions say that this should not be used as a main way but can be used as a complementary means because voice over the net leads to a lot of problems like voice interruption.

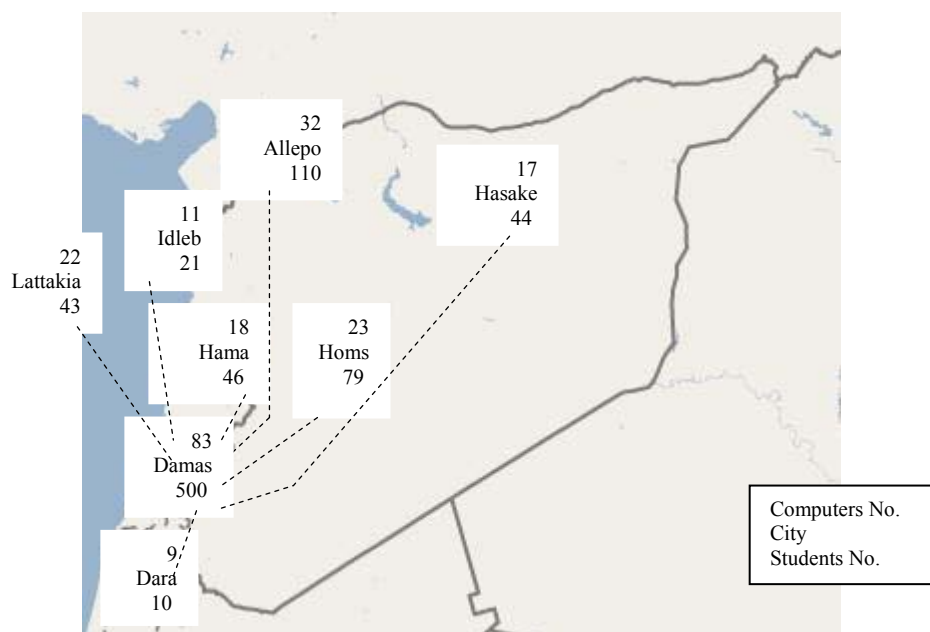
Online learning universities, institutes, or faculties, not only agree with the aim of all modern educational systems which concentrate on education integration, and qualifying individuals to assure employability in the labor markets, but also offer a suitable environment for employing IT people as teachers, IT systems managers and developers.

### Targeted Students

Probably young and talented students go to traditional universities as they their time and effort is dedicated for attending classes, while those who lost their chances in entering universities or those who are working and don't have enough time to attend traditional universities seek other chances, and here virtual learning is the solution for them. So usually virtual learning is targeted to the following:

1. House wives.
2. Individuals who are working.
3. Individuals who lost the chance to enter traditional universities.

In the following figure we see the distribution of students, computers among different Syrian cities, where the student can attend lectures from home or in university tele-centers.



Lattakia (23, Tartus 18, Banias 2)  
 Dara (6, Sweda 4)  
 Hasake (17, Raka 2, Kameshli 21, Dairalzor 3, Albukamal 1)

Fig. 1. Students distribution in Syria

The following figure shows the distribution of students residing outside the country and registered in the university.

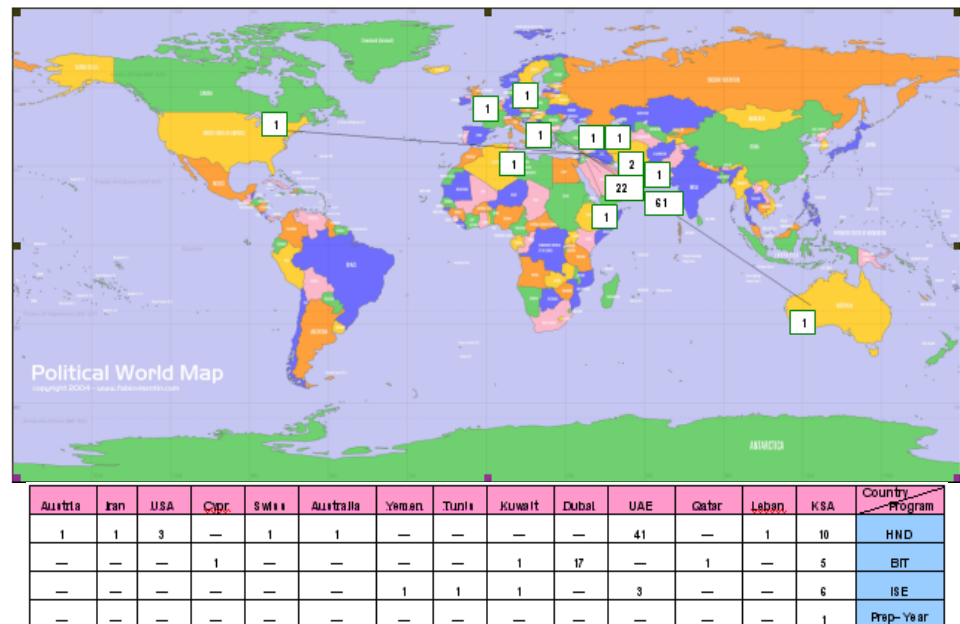


Fig. 2. Students distribution outside the country

### Targeted Specialties

Referring to the targeted students and their interests and needs we can see that the most wanted specialties for those are:

1. Business administration.
2. Accounting.
3. Marketing.
4. Nursing.
5. IT engineering.

The university has three main programs, HND (Higher National Diploma) which enables students after two years of study to make bridging to foreign universities, BIT (Bachelor of Information Technology) which is a four year program where the subjects are a mixture between IT subjects and business subjects, ISE (Information Systems Engineering) a five year program of IT subjects.

Also the university offer specific programs customized for different private and governmental establishments like MoE (Ministry of Education) program for qualifying teachers for IT subjects in order to use their training in teaching using the net later on.

It is possible also to offer Arabic language courses to foreign students through the net online.

### Administrative Requirements

Similar to any traditional university, virtual universities have an administration consists of the rector, vice rectors, learning programs managers, directors of different department and the departments itself.

The most important and different here is the need for the IT department which forms the core of the university and responsible for all the technical needs, problem solving, and clients support.

So according to the functionality the IT department may be divided to different groups with different duties:

1. Infrastructure management group.
2. Teachers and learners support group.
3. Content delivery and exam management group.
4. Programming and development group.
5. Content making group.

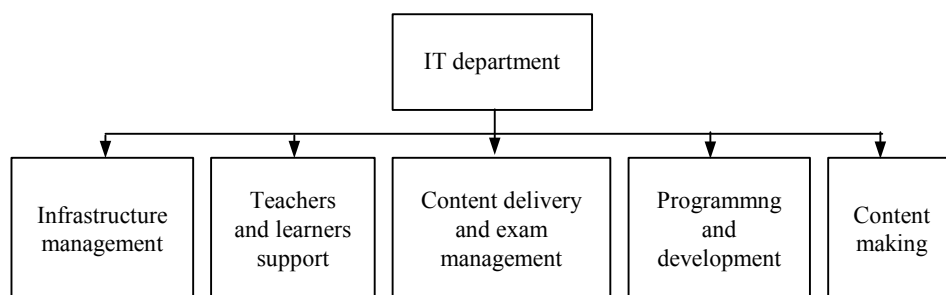


Fig. 3. IT department architecture

### Teaching Materials Measures

Electronic content can be prepared either by a special group in the IT department formed for this purpose or by outsourcing, i.e. by companies specialized in making electronic contents.

The electronic content of the curriculum material should realize the following conditions:

- the curriculum aim should meet the aims of learning, and curriculum should contain rich and sufficient scientific content that guaranties conveying of ideas clearly to students insuring sufficient evaluation feedback that helps in developing and fulfilling learners needs;
- the content should be unique where the mental proprietary and publishing rights are reserved to the owner University;
- curriculums should be accomplished in time to fulfill time scheduler;
- curriculum should be run on learners computers which they have;
- pages and other components should be loaded quickly through learners network links;
- allowing learners to get the curriculum without the need to have additional software to install;
- curriculum should comply to work under the learning management system adopted in the related University;
- curriculum should comply with electronic learning standards like SCORM (Sharable Content Object Reference Model), IMS, AICC, etc;
- the curriculum material should be contemporary and precise;
- curriculum should be free of production errors as cropped links, missing drawings, errors in location;

- allowing students to start with curriculum using online support (defining location, downloading mutual units, recording, reaching start page);
- enabling learners from predicting the general result of pressing every key or link;
- enabling learners from taking curriculum without the fear from software collapsing, server halting, getting wrong format pages more than common while usual web browsing;
- the text should be written in a level fully understandable by learners;
- the text should be readable as it appear using main browser settings according to letters default fonts;
- use drawings in appropriate way (illustrations, photos, graphics, diagrams, etc), as to convey visual and spatial concepts;
- use multimedia content units where words are expressive and photos sufficient;
- drawings and multimedia should help learners to notice and learn the distinguished content instead of only entertain learners or draw away their attention;
- enable learners from browsing curriculum in a way to make them decide which part they want to browse and in which order and speed;
- enable learners from controlling when to download and run multimedia components;
- browsing and access mechanisms (menus, browsing paths, maps, indices) should be sufficient to enable the learner from finding certain content elements;
- units should be sufficiently independent enabling learners from taking it from the context without interference;
- enabling learners always from knowing where are they by checking pages addresses, fixedly displayed menus, or other locating indicators, and enabling them from deducing their current location in curriculum;
- curriculum should make it clear to learners what they will get by following this curriculum.

#### **Examination Rules Measures**

In online exams usually students may cheat using the following methods:

1. Plagiarism.
2. Using cheating reference resources.
3. Using Internet (E-mail and chatting to get the answers).
4. Stealing a copy of the exam before hand.

So we need to implement certain procedures to maintain online exams safety:

1. Adopt an embedded assessment system which insert exams in the learning process.
2. Using an adaptive exam method to raise or lower the level of question according to the students level.
3. To have interaction.
4. Embed exam in the learning method on steps and reduce concentration on the final exam.
5. Use a group of techniques to verify the identity:
  - a) Q-Sum technique: which measures a group of unique habits during interaction like measuring the average length of the sentence and the variance from the standard length then to add the results;

b) behavioral biometrics: to verify the identity like measuring the time distance between keystroke pressing using neural networks and the minimum distance classifier.

Merging both techniques gives higher precision in identification, using neural networks with learning vector quantization LVQ, with radial basis function net RBFN and with fuzzy ARTMAP, where other neural networks and classical algorithms like back propagation gave also good results.

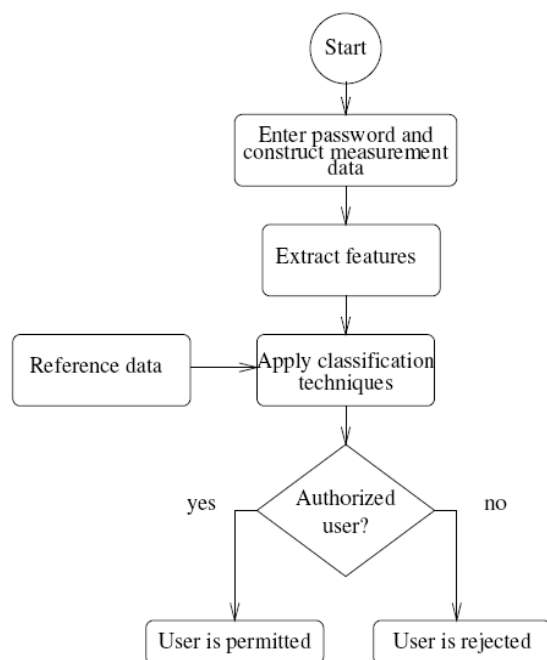


Fig. 4. Keystroke identification algorithm and we may use the pressing duration on keystrokes

1. Assessment should be built in a way that two IDs are needed the students and the observer so the exam wouldn't start without the existence of the observer.
2. Using data banks where the sequence of questions is random.
3. Close or the critical ports [port 21, port 23, port 25, port 443].

#### Software Requirements

Different types of software are needed:

1. Network and communications systems:
  - a) network management system.
2. Learning application systems:
  - a) Learning management system;
  - b) Assessment management system;
  - c) Virtual class room system;
  - d) students information system.
3. Administrative application systems:
  - a) administration management system.
4. Development tools systems.

As an operating system Linux is preferred over Windows 2003 as it is an open source, more secure and flexible. As a web server Apache is recommended.

For network management a group of network monitoring tools may be used:

- PRTG;
- Ethereal;
- Syslog Service;
- Latency grapher (Constant pinging tool).

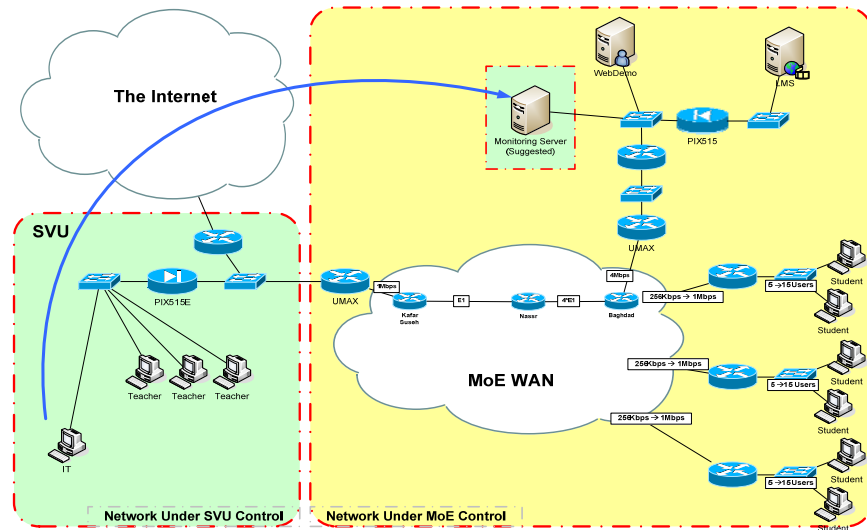


Fig. 5. Network layout for a monitoring server and applications

This procedure is necessary to define voice interruption in the virtual classroom and put the necessary solutions to overcome this problem.

The above diagram shows an example where each user (virtual class room) occupies 20kbps, and if the link capacity 1 Mbps we can have 40 simultaneous class room with out using the view-port feature.

Using view-port and excessively moving the windows increases the band width needed at least 5 times. So there is a need to have a monitoring server.

For LMS and AMS the software systems should be checked to overcome the problem of invoking a certain file on certain software button click many times from the server the thing that prevents the proxy server from providing a cached copy of this file.

As a development software it is possible to develop a students information system SIS using Rational Rose as a development tool and either J2EE or PHP as a programming platform. As a database either MySQL, Oracle, or G4 can be used.

#### Hardware Requirements

The purpose is to design and implement the network that will serve as an interface for the university to the Internet with providing Internet access for students located in the country.

The implementation must achieve the highest quality of the provided service through:

- provide high quality communication infrastructure between students, distributed all-over-the world and those who are inside Syria, the link to a learning application provided by the university;

- gather all the servers responsible for providing university learning resources in one camp, and under the university's technical administration, which will increase flexibility in improving and developing various services and reduce the running costs.

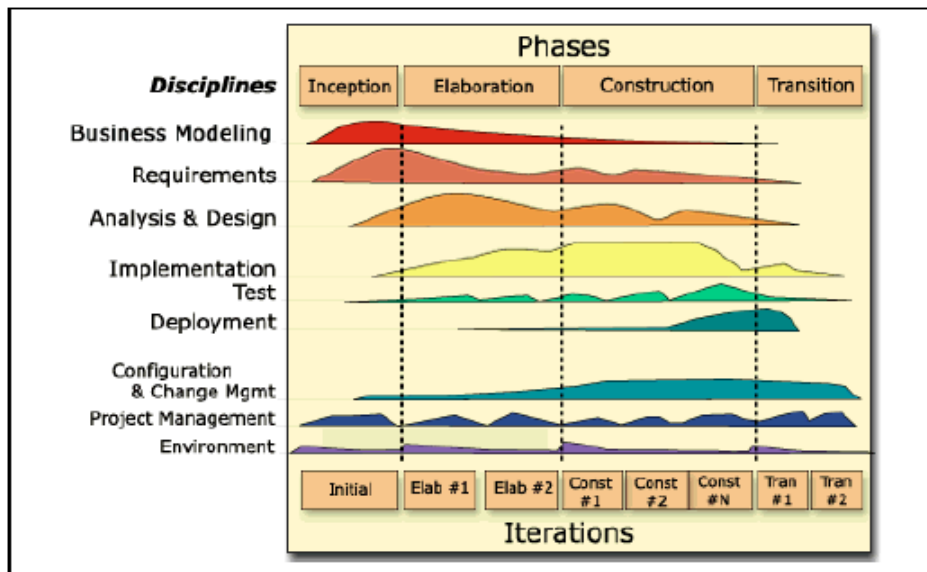


Fig. 6. Development tool task managing diagram

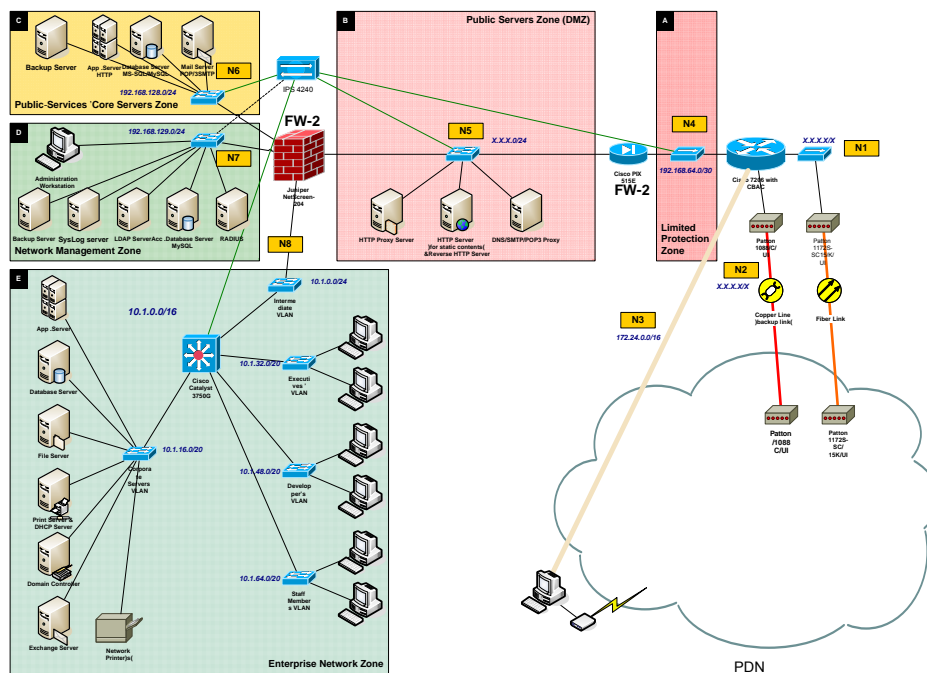


Fig. 7. Network diagram



The purpose of the network is:

1. Provide a dial-up (through PDN) access to the university network and the internet.
2. Provide a web access to study resources and learning applications.
3. Various communication services for students, teachers and university staff members.

The network consists of 5 zones:

1. Zone A (Intermediate) Limited Protection zone:

- virtually this zone includes contains dial-up users also;
- protected by access router;
- uses private address range.

2. Zone B (DMZ) Public Servers zone:

- includes the public servers (front-end servers);
- uses public internet addresses for hosts connected to this zone;
- has limited access to zone C, which includes: HTTP, SMTP and POP3 protocols;
- has limited access to the Internet, which includes: HTTP, SMTP and DNS protocols;
- has limited access to zone D, which includes only LDAP and SysLog service.

This zone includes the following services:

- public DNS server;
- HTTP server for static contents;
- reverse HTTP proxy server for public web applications;
- HTTP proxy server for the enterprise and dial-up users;
- public SMTP server;
- POP3 proxy server for external mail users.

3. Zone C (Core) Public Services zone:

- includes the public services' core servers;
- uses private IP addresses for its hosts;
- has limited access to zone D, which includes only LDAP and SysLog service.

Includes the following services:

- web application servers accessible from zone B (the reverse proxy server) and D (full access);
- required database servers for the web applications, accessible from zone D (full access);
- mail server, accessible from zone B (SMTP server) and D (full access).

4. Zone D (Management) Network Management zone:

- includes basically authentication servers and log servers;
- uses private IP addresses for its hosts;
- includes the following services:
- RADIUS service accessible from zone A (LNS only);
- LDAP service accessible from zone C (The mail server);
- SysLog service accessible from the network equipments distributed in zone A, B, C and E.

4. Zone E (Internal) Enterprise Network zone:

- includes the internal enterprise network.

*Network Addresses Schema*

N1	<ul style="list-style-type: none"> <li>• Subnet used for the fiber link between the university and PDN.</li> <li>• Uses private addresses provided by the service provider.</li> </ul>
N2	<ul style="list-style-type: none"> <li>• Subnet used for the copper link between the university and PDN.</li> <li>• Uses private addresses provided by the service provider.</li> </ul>
N3	<ul style="list-style-type: none"> <li>• Subnet used for the dialup users (terminated L2TP connections)</li> <li>• Uses private addresses assigned by the LNS, class B.</li> <li>• 172.24.0.0/16</li> </ul>
N4	<ul style="list-style-type: none"> <li>• Subnet used for the Ethernet connection between LNS and FW-2.</li> <li>• Uses private addresses.</li> </ul>
N5	<ul style="list-style-type: none"> <li>• Subnet used for the public servers.</li> <li>• Uses public addresses provided by the service provider.</li> <li>• X.X.X.0/24</li> </ul>
N6	<ul style="list-style-type: none"> <li>• Subnet used for the core servers' network.</li> <li>• Uses private addresses, class C.</li> <li>• 192.168.128.0/24</li> </ul>
N7	<ul style="list-style-type: none"> <li>• Subnet used for the network management hosts.</li> <li>• Uses private addresses, class C.</li> <li>• 192.168.129.0/24</li> </ul>
N8	<ul style="list-style-type: none"> <li>• Subnet used for the enterprise's connection with the service providing modules.</li> <li>• Uses private addresses, class A.</li> <li>• 10.1.0.0/24</li> </ul>

*Inter-zones Access Policy*

⇒	External (Internet)	Zone A (Intermediate)	Zone B (DMZ)	Zone C (Core)	Zone D (Management)	Zone E (Enterprise)
External (Internet)	–	(none)	HTTP SMTP DNS	(none)	Syslog	(none)
Zone A (Intermediate)	HTTP (via proxy)	–	HTTP SMTP DNS POP3	(none)	Syslog	(none)
Zone B (DMZ)	HTTP SMTP DNS	(none)	–	(none)	Syslog RADIUS	SMTP
Zone C (Core)	HTTP (via proxy)	(none)	HTTP	–	Syslog LDAP	(none)
Zone D (Management)	HTTP (via proxy)	full access	full access	full access	–	full access
Zone E (Enterprise)	HTTP (via proxy)	(none)	HTTP SMTP DNS	(none)	Syslog	–

*Software Components:*

- SMTP MTA: Sendmail.
- DNS: BIND DNS server.
- HTTP proxy: Squid proxy server
- RADIUS: FreeRADIUS with MySQL as a backend database.
- LDAP: OpenLDAP with MySQL as backend database.
- HTTP Server: Apache and IIS; depending on the application.

*Network Hardware Equipments:***1. LNS:** Cisco Router 7204VXR with:

- a) Total memory: 1GB SDRAM, 128MB FLASH;
- b) IOS v12.4(4)T or newer from the same release train:
- i) Feature set: ADVANCED IP SERVICES;
- ii) Image name: c7200-advipservicesk9-mz.12.4-4.T;
- iii) Enterprise Product Number: S72AISK9-12404T;
- c) Cisco 7200 series Input/Output Controller (C7200-I/O);
- d) NPE-G1 with 1GB SDRAM and 128MB FLASH memory options;
- e) 280W AC-Input Power Supply;
- f) 4-Port Enhanced Serial module (PA-4T+).

**2. IPS:** Cisco IPS4240 (Product number: IPS-4240-K9) with:

- a) Cisco IDS Sensor Software Version 4.1 or newer installed;
- b) Extended service agreement for IPS product code: CON-SU1-IPS4240 (\$2000)

**3. Switches:** 2 \* Cisco Catalyst 3750G Giga Switch (Model: WS-C3750G-24TS-E)

- a) Cisco IOS Software Release 12.2(25)SEB or newer from the same release train:
- i) Feature set: IP SERVICES

**4. Firewall:** Baseline Juniper Networks NetScreen-204 (Part number: NS-204B-005):

- a) ScreenOS 5.3 or newer installed.

**5. Ethernet Extenders:** 2 \* Patton FibreLink Single-Mode Ethernet Extender (1170S Series).**6. Modems:** 2 \* Patton 2.304-Mbps mDSL Modem with Extended Ranges (1088/C/UI).**7. UPS:** APC Symmetra RM 6kVA Scalable to 6kVA N+1 200V w/ 200 to 100V Step-Down Transformer (4) L5-20R (Part number: SYH6K6RMJ-TF3).**Rack enclosure:**

- a) 48U capacity, with depth not less than 42”;
- b) Adjustable mounting depth;
- c) Advanced cooling system;
- d) Power distribution with protective grounding provisions;
- e) Cable management for servers and networking applications;
- f) Rear Cable Management channels;
- g) Quick release lockable doors with split rear doors;
- h) Quick release side panels;
- i) 2 \* fixed rack mount shelves;
- j) 4 \* 1U cable organizer;
- k) 1 \* 2U cable organizer.

**Implementation Plan***Preparation Phase*

1. Purchase the equipments.
2. Determine the required software and purchase non-free ones.
3. Receive the equipments.

**Pilot Phase**

1. Physical installation of the network devices hardware.
2. Network devices testing.
3. Install and test the software to determine the required software configuration.
4. Test the functionality and compliance between the software components and network devices.
5. Deploy the initial configuration for both network devices and related software.
6. Receive the connection from STE and test it.
7. Adjust the various configurations to comply with the connection requirements.
8. Check the functionality of the entire system, and make required tuning for the configuration.
9. Determine the production configuration and prepare the documentation.
10. Deploy the software.

**Migration Phase**

1. Move the Internet connection of the enterprise's local network to the new implementation.
2. Evaluate the network performance and make required optimizations.
3. Move the servers to the new network:
  - a) the servers should be moved to the new network one by one;
  - b) before moving each server, a documentation should be prepared for server's current configurations;
  - c) after moving each server the performance and the functionality should be evaluated and required tunings should be delivered.
4. Move the servers located outside the SVU:
  - a) the servers should be moved to the new network one by one;
  - b) before moving each server, documentation should be prepared for server's current configurations;
  - c) create a data and system backup copy for the moved server;
  - d) after moving each server the performance and the functionality should be evaluated and required tunings should be delivered.

**Conclusion**

In general we have three kinds of learning methods:

1. Traditional universities.
2. Virtual universities.
3. Hybrid universities.

We think that eventually hybrid learning will dominate.

**References**

1. Leggett, J., Williams, G. (1998). Verifying identity via keystroke characteristics. – International Journal of Man-Machine Studies. – 28:67–76.
2. Brown, M., Rogers, J. User Identification Via Keystroke Characteristics of Typed Names Using Neural Networks. – International Journal of Man-Machine Studies. – no. 39. – pp. 999-1014, 1993.
3. Brown, J. Making a Macromedia Flash MX Learning Object SCORM-Conformant. – September 2002.