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Part VI

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Content

Background

For the sixth time the Ministry of Higher Education (MoHE) in Afghanistan in cooperation with the Center for international and intercultural Communication (ZiiK) at the Faculty for Electrical Engineering and Computer Science at the Technische Universität Berlin (TU Berlin) invited to the annual Information Technology (IT) Conference in Kabul.

The focus of this year's conference was on the implementation and realization of application projects done by Master Graduates from TU Berlin.

All projects were done within the graduation theses of the Computer Science Master Graduates, who were enrolled in a two-year program at TU Berlin, financially supported by the World Bank and the German Academic Exchange Service (DAAD) with funds from the German Foreign Office. The projects are directly addressed to the current needs of the Afghan society, and they will now be implemented with further funds from Germany. With that, they will have a noticeable impact to further strengthen the IT structures within the country, as there is an urgent need for reliable IT supply in research, education and management.

Altogether, the Master Graduates are from six different Afghan universities (Kabul University, Kabul Polytechnic University, Herat University, Balkh University, Kandahar University and Nangarhar University). They were educated at TU Berlin to meet the need for IT experts in Afghanistan. Since their graduation, they are working as lecturers at their home universities and serve as multipliers for a Computer Science education on an international level. In the scope of the conference, they presented the status of their projects.

The three-day IT conference in Kabul is financially supported by the German Foreign Office and the DAAD, aiming to further promote the reconstruction of academic structures in the area of IT in Afghanistan. The three days of the conference were organized as follows:

Day 1: Opening and Graduation Ceremony

Day 2: Application Project Presentations

Day 3: Outcome and Discussion

Day 1: Opening and Graduation Ceremony

The first session of the conference was reserved for the welcoming addresses as well as the graduation ceremony of the Master graduates from TU Berlin. The session was moderated by **Mr. Abdul Azim Noorbaksh**, Spokesperson and Director of Public Relations of MoHE, and **Mr. Salim Saay**, Director of the IT department at MoHE.

Opening and Welcome

The conference was opened by **H.E. Sarwar Danish**, Acting Minister of Higher Education, who welcomed all participants. The minister stressed the important role that electronic systems play in today's management and administration. Through higher education the knowledge in this area can be strengthened. Currently there are computer science faculties at the universities of Kabul, Herat, and Nangarhar. The goal is to have computer science faculties in all Afghan universities. The graduates who have just returned from TU Berlin can help us in building up these faculties. On this occasion the minister thanked the TU Berlin for their continuous support, especially Dr. Nazir Peroz. He concluded his talk by stressing the importance of not only the higher education in computer science, but also of IT trainings for administrative staff, as they will be the users of the systems that are developed at the universities.

The second welcoming speech was held by **H.E. Rüdiger König**, German Ambassador. The ambassador welcomed all participants in German language. He said to be proud of speaking German, as the computer was invented by Konrad Zuse, also a German. From the experiences of Konrad Zuse we want to learn one thing: We want to make a connection between science and practical application. This can be achieved in Afghanistan through the collaboration of the MoHE

and the team of the TU Berlin around Dr. Peroz. The ambassador agreed with Minister Danish about the importance of IT in today's world. But the phrase "computers are dumb" is still true. The intelligence is brought in by human beings who form the brain, heart, and hands of these machines. Higher education, science, universities and IT are nothing more than human beings, that are capable to contribute to the project of rebuilding a country after 30 years of war. Germany has been helping in this project since 2001 and everyone in this conference, but especially the 25 graduates, are part of this project. What the MoHE, the DAAD, and the TU Berlin were able to achieve through the continuous strength and effort of Dr. Peroz is an enormous success. To celebrate successes is nice, but it must also be a motivation to continue this in the future. 25 is an impressive number, but everyone here wishes that we will soon have 250 or 2500 Master graduates, because the demand is high, in teaching, application as well as the economy. Why should the development in IT that we have seen in India not be possible in Afghanistan? Mr. König confirmed that he is convinced that this is possible and wishes that for all participants. He is happy that Germany can contribute towards this.

Words of welcome were addressed by **Mr. Lars Gerold**, head of the Afghanistan-Pakistan section of DAAD. Mr. Gerold gave an overview of the structure and the past events of the Afghanistan projects that were financed by DAAD from the fact finding mission after the Petersberg conference in March 2002 until the conference of today. With the new Secretary General, Dr. Dorothea Rüland, the support for the higher education sector in Afghanistan remains high on the agenda in the DAAD. With the team of the TU Berlin the Ministry found an excellent partner to develop a suitable and sustainable structure to implement the plan. The DAAD is proud to be able to facilitate this cooperation.

In March 2010 the freshly graduated Masters in Computer Science were celebrated in the presence of Cornelia Pieper, Minister of State for Cultural Affairs of the German Ministry of Foreign Affairs, at the Technical University in Berlin. All graduates are here today and serve at their home universities. Mr. Gerold said he is looking forward to learn more about the work of thes graduates at their home universities during the course of the conference.

Mr. Gerold thanked Minister Danish and Deputy Minister Professor Babury for the excellent co-operation with the DAAD and the German universities for already so many years.

He continued to thank Ambassador Rüdiger König as the representative of the German Ministry of Foreign Affairs, which secured most of the funding that DAAD can provide for activities in Afghanistan. Already before he came to Kabul this summer Ambassador König was a great source of support for DAAD's work while heading the Afghanistan department of the German Ministry of Foreign Affairs. Further thanks were dedicated to the excellent lobby work of Dr. Peroz in the German capital.

Through the support of the German Foreign Office the DAAD was able to send green lights for several urgent projects here in Afghanistan. Among those is the second round of a Computer Science Master program at the TU Berlin. Mr. Gerold concluded is words by thanking the team of the Technical University Berlin for their efforts in supporting the establishment of academic IT structures and IT knowledge in Afghanistan. He especially thanked Dr. Peroz personally for doing an outstanding job in Afghanistan and acts also as an excellent advocate for Afghanistan in Germany.

Graduation Ceremony

Following the words of the Ambassador, the ceremony of the official handover of the Master certificates started. The graduates received their Master certificates and transcripts from Minister Danish, Ambassador König, Deputy Minister Prof. Babury, Dr. Peroz, Mr. Gerold, head of the Afghanistan-Pakistan section of DAAD, Prof. Amin, president of Kabul University, Prof. Habibullah, president of Balkh University, Prof. Husseini, president of Herat University, Dr. Ezatullah Amed, president of Kabul Polytechnic University, as well as two of the lecturers from TU Berlin, Mr. Herlitz and Mr. Magnus. Additionally to the handover of the certificates, the two students with the highest overall grades were rewarded with laptops, that their lecturers had been using during the program. Minister Danish handed over one laptop to the best student, Mrs. Seema Azimi, and Ambassador König handed over the

second laptop to Mr. Abdul Saeed Ahmadi.

National Strategy for Higher Education in Afghanistan

The first talk of the afternoon session was given by **Prof. Osman Babury**, Deputy Minister to the MoHE. After warm words of thanks to the TU Berlin and DAAD, Prof. Babury presented the National Strategy of the MoHE. The strategy consists of two parts: the development of sophisticated lecturers and the curriculum development. As human resources are one of the most important points in higher education, the first part of the program is addressing the further education of lecturers. The Master graduates in computer science are just one example of actions undertaken within this part of the program. Another group of 25 lecturers will participate in the second round of the program of TU Berlin and will be leaving for Germany in the next weeks. As a representative of the MoHE, Prof. Babury thanked the German Embassy, the DAAD, the TU Berlin, and Dr. Peroz for making this possible.

The second part of the strategy is the curriculum development. With the support of TU Berlin, the MoHE has designed a curriculum for computer science, which is currently implemented at the universities of Herat and Kabul. This curriculum will be further developed and sustained in these faculties and will also be implemented in the other computer science faculties throughout the country.

Philosophy and Objective of the IT Projects of the Master Graduates

Dr. Nazir Peroz, head of the ZiiK, gave an overview of the philosophy and sustainability of projects from TU Berlin. He began his speech by stressing the importance of education: "Education investments are investments in the future". In the area of IT the Afghan education started off from a difficult point in 2002. When Dr. Peroz first visited Afghanistan in that year, no one had heard about IT and there was only a few mobile phones. But since then the situation has evolved rapidly. Today almost everyone has a mobile phone, some even have two or three. This shows that all technology will eventually come to Afghanistan. The problem is, that the knowledge

usually lacks behind and comes afterwards. It is a potential risk if the technology is there, but the education on it has yet to come.

Deputy Minister Babury had talked about a nationwide curriculum for Computer Science. Every university first has to check whether they meet the requirements and resources to implement such a curriculum at their Computer Science faculty. One of these requirements is a modern administration.

Dr. Peroz continued to talk about the role of the ZiiK, which is collaborating with the MoHE in the areas of IT strategy development, establishing a basic IT infrastructure, and demand-driven education.

Within the IT strategy development pillar, action plans are developed. The goal of these action plans is a sustainable and applicable IT environment in Afghanistan. Before applying one of these plans, there needs to be a concept for the plan. These concepts must be embedded in the national IT strategy of Afghanistan, which was started in 2003 when eight university presidents as well as the ministers of communication and higher education came to TU Berlin to discuss the IT strategy of Afghanistan. It continued through the establishment of the IT section at the MoHE, which is coordinating all IT activities in the sector of higher education in Afghanistan. Currently this IT department has a good management, headed by Mr. Saay and supervised by Prof. Babury. To discuss these IT strategies with all universities, IT conferences are being held annually at the MoHE.

For the implementation of the mentioned concepts, a basic IT infrastructure is needed. With the cooperation of TU Berlin, IT centers have been established in Kabul (ITCK) and Herat (ITCH) universities. Furthermore PC pools and workshops have been constructed at several department and universities. Since students are culturally used to study from physical books and not e-books, two computer science libraries have been established at Kabul and Herat universities.

The third pillar in the philosophy of TU Berlin is demand-driven IT education: this has been provided by numerous summer and winter academies for IT administrators, held at TU Berlin. These administrators act as multipliers at their universities and train further generations of administrators at their respective IT centers. Furthermore students and staff members have been trained in these academies. During the first generation of computer science courses at Afghan universities, TU Berlin was helping to compensate the lack of lecturers by sending computer science lecturers to Herat University to teach in the Bachelor

course. From six different Afghan universities, 25 lecturers were then given a scholarship to do a Master's degree in computer science at TU Berlin. These scholarship holders have now graduated and are presenting their application projects within this conference.

The objective of these application projects is the implementation of the acquired knowledge at TU Berlin to independently solve challenging tasks in economy, administration, and science by developing IT solutions for the specific needs and requirements of their respective universities in order to establish IT structures at their respective universities.

Dr. Peroz concluded that in addition to the current Bachelor education in Computer Science in Afghanistan, the country also needs more lecturers that reach Master and Ph.D. level in cooperation with international universities.

Dr. Peroz thanked Minister Danish, Deputy Minister Babury, the MoHE, in particular the IT department, the German embassy, the German Foreign Office, the DAAD, and the World Bank who all made these projects successful through their long-term collaboration and financial support.

Current IT Situation in Higher Education

The head of the IT Department of the MoHE, **Mr. Salim Saay**, gave an overview of the achievements in the area of IT that the MoHE has reached up to the current date. Currently there are 15 departments and faculties in Afghan universities that are offering study courses in the area of Computer Science. To coordinate their activities, the MoHE established the IT department in 2004. Since it's establishment the IT department has reached important steps towards a sustainable IT infrastructure: the automatization of the concours process, an internal telephone system for the MoHE, the Silk project at Kabul university, and an Internet connection to the MoHE. In 2008 the reconstruction of the MoHE network infrastructure took place. Furthermore important administrative steps were taken: an inventory of university IT resources was done, a coordination board for IT was established, a strategic IT plan developed, and a concept for IT departments at the universities proposed. In the current year the IT strategic plan comprises the following activities: implementation of and training on the HEMIS platform and extension of the fiber optic network to seven more universities. The main challenges that the IT department is still facing is the lack of a stable power supply, the unclear situa-

tion regarding the campus and dedicated buildings at some university locations, and the lack of permanent staff for IT related issues or a dedicated IT department.

The future plan of the IT department of the MoHE is tackling these challenges with the following measures: completion of 18 university fibre networks and securing the network, implementation of IT solutions by the Master graduates from TU Berlin as well as implementation of the HEMIS platform, and the completion of the AFREN plan on network infrastructure. Through this plan, it is planned to connect Afghanistan to global research and education.

Creating an IT Research Center

To elevate the scientific environment to an international level, research is needed as much as teaching. **Mr. Abdul Saeed Ahmadi**, Master graduate from TU Berlin and lecturer at Kabul University, presented his ideas on a Center for IT Research and Development. The motivation of this idea lies in the lack of research that is currently done in the area of computer science in Afghanistan. This research should fill the gap between academic studies and the industry. The objectives of the center are:

- Introduction of ICT research culture in Afghanistan,

- Establishing an ICT research community, and

- Involving the ICT industry in higher education.

In order to implement this idea, Mr. Ahmadi suggests to train fourth year computer science students in basics of scientific research and the access and usage of online scientific research journals. The students should then work on a research project themselves. In the first year of the center's functioning these projects could include the analysis of the IT needs of Kabul University. In the long term the center seeks to place the students as interns in the Afghan ICT industry for a final year project. Research should be extended towards national and international projects answering the questions of Afghanistan's role in the international ICT field, a suitable legislative framework in the area of ICT, and the role of ICT in Afghanistan's education system.

For a successful implementation of this idea the support of the MoHE and Kabul University is needed in order to satisfy the demand of human and technical resources of the center.

These resources also include the access to online research journals from Kabul University's network. The idea is to implement this center at the Computer Science Faculty of Kabul University. If the evaluation of the outcomes of the center proves successful, the same idea can be implemented at other computer science faculties in the country.

Day 2: Application Project Presentations

The second day of the conference was reserved for demonstrations of applications that are to be implemented in the next months in the Afghan higher education system. The day was moderated by **Mr. René Herlitz** and **Mr. Ralph B. Magnus**, lecturers from the ZiiK at TU Berlin. The applications were grouped thematically around four areas: IT policies, IT infrastructure, IT administration, and IT education.

IT Policies

The first project presentation was held by **Mr. Obaidullah Rashed** from Kabul University on the topic of a *"National ICT Policy for Higher Education in Afghanistan"*. Such a strategy is considered necessary to reach the goals of establishing, expanding and maintaining a capable IT infrastructure, providing coordination and cooperation between the IT related projects in MoHE and universities, and providing quality control and accountability for results that best serve the higher education community. Further the linkage of universities with foreign universities and research communities needs to be established, which can only by done by ensuring a trusted and reliable technical environment. The strategy should instruct the universities and higher education institutions into an organized, standardized and policy based improvement, which results in a standard outcome of research and study and finally leads to sustainable education development in higher education. By giving the priority for IT in higher education, an increase in productivity, efficiency and effectiveness of the management system can be achieved. In the research stage for the IT strategy, Mr. Rashed conducted interviews with important stakeholders in the MoHE, the Ministry of Education (MoE), the Ministry of Communication and Information Technology (MCIT), and the universities. Based on the interview findings an IT strategy was developed that consists of regulation for IT law, giving priority for IT infrastructure, adoption of IT education within the MoHE, universities and higher education institutions, finding the way of modernizing IT management, improving the cooperation and coordination while highlighting security aspects along all topics. Furthermore an action plan for the years of 2010 to 2020 based on prioritized

aspect was written according to the current situation of IT in universities and higher education institutions in Afghanistan.

Mr. Hamid Rahman Mohmand from Herat University had written his thesis on *"Developing a Nationwide IT Curriculum System for Afghanistan"*. A curriculum consists of everything that promotes learners' intellectual, personal, social and physical development as well as lessons and extracurricular activities which includes approaches to teaching, learning and assessment, the quality of relationships within university, and the values embodied in the way the university operates. It provides the framework for a syllabus and should focus on the people it affects. Changes in the education system towards IT should start in school: the MoE needs to implement principle changes in the education system by integrating computer sciences in schools and providing schools with the right facilities. According to Mr. Mohmand bringing conceptual changes to the curricula of university studies must be of the highest priorities to the MoHE. The only possibility to keep up with IT is to promote Afghan universities with computer science studies that would offer the country a chance to drive along with this fast moving sector. Afghan universities should come to an agreement where they would offer one concrete and well planned curriculum for all faculties where they offer studies in the computer science discipline. This strategy has to be adopted for some period of time before each university could come to a level where they could offer topic-specific studies in computer science. As far as the computer science discipline is changing constantly, this change should not affect the basis of the computer science curriculum in Afghan universities but should bring updates to the related parts of the curriculum. Core and basis of the curriculum for Bachelor studies in Computer Science has to be kept unchanged. That will help Afghan society better digest new changes in IT; because once the core is built concretely, then technological changes will not affect the society anymore.

From Nangarhar University, **Mr. Haji-Gul Wahaj**, presented *"A Strategy to Localize Open Source Software to Pashto in Example of Open Office"*. Localization (L10n) is a process to adopt observance of a specific language locale. L10n is not restricted to the translation of software. It it is closely concerned with culture, attitude and language conventions. There is a need for the localization of software in Afghanistan, because of a lack of professional software developers, not sufficient English language skills by the end user,

and a low level of computer literacy. The goal of Mr. Wahaj's Master's thesis was the analysis of the status of open source software (OSS) localization status in Afghanistan, finding suitable methods for translating software, a comparison and selection of the best translation tools, and developing a standard glossary. These elements make up a standard and sustainable strategy. For this project Mr. Wahaj first analyzed and portrayed the current status of localization in Afghanistan. In his strategy he provides plans on how to motivate community members. It emphasizes on the advantages of OSS localization for Afghanistan, community formation and training. The developed strategy motivates volunteers to build software localization communities, which will help reduce the involvement of current private business driven organizations in the overall localization process. Furthermore, an example is provided of how Open Office could be localized to Pashto, which steps need to be taken and who can contribute to fulfill the task. A strategy is developed to localize OSS to Pashto and as a result it replaces the usage of pirated commercial software by localized Free and Open Source Software (FOSS) in Afghanistan.

"A Concept for Establishing a Computer Science Faculty at Balkh University" was presented by **Mr. Naweed Rahmani**. A computer science faculty is the core of IT services to a university, thus the establishment of a computer science faculty at Balkh University enhances the teaching and research additionally facilitates an efficient administration. The Master's thesis of Mr. Rahmani provides a functional concept for setting up the Computer Science Faculty at the Balkh University by coordinating involved parties and analyzing the current state. Furthermore the concept ensures a long-life functional computer science faculty with suitable recommendations in each and every aspect of establishing a computer science faculty at Balkh University.

Mrs. Seema Azimi from Kabul Polytechnic University presented her project on *"An Online Encyclopedia for Scientific Terms in Dari-Persian and Pashto"*. The idea of developing a web-based system for scientific terms of different fields came from a final year project in Kabul University in 2006. Although the then developed software itself was quite fast, functional and responsive to the technical requirements, the information that

was used as the resource for that software, had been taken from an Iranian-Persian dictionary. Therefore it was not quite comprehensive and understandable for the native speakers of Pashto language and as well as for most of the Dari-Persian speakers who had never been to Iran and therefore, were not familiar with the scientific terms developed and introduced by Iranians. In her project Mrs. Azimi aims to develop a similar system, but this time with a broader vision and concept. The main objectives and goals of this application is to: Enhance and improve the official languages of Afghanistan by introducing new terms into the languages and eliminating the foreign terms. This will provide a more efficient and widespread studying, teaching and researching. Furthermore a platform is provided where users will be able to search through their fields' scientific terms and find the exact meaning and description of a term in their native languages. This facilitates and speeds up the long process of gathering the scientific terms through a forum interface. It will allow the Afghan professionals from anywhere to participate and contribute in writing articles for the encyclopedia. The two most important target areas that were considered during research were: Afghan schools and universities as well as the Academy of Science of Afghanistan (AoS), in which the Encyclopedia Department is currently working on a General Encyclopedia. The proposed solution is the Ariana Encyclopedia for Scientific Terms (AE) which will provide a search interface for 16 different scientific fields. It also has a forum interface which will overcome the manual process of collecting the terms and provide a better and more efficient way of populating the encyclopedia.

Mr. Abdul Sattar Kakar presented *"A Concept for an IT Center at Kandahar University"*. He also used this opportunity to provide to the audience an insight to the current IT situation at Kandahar University. The Master graduate encountered himself in a difficult environment after returning from Berlin: there is still no IT personnel within the university framework, a high computer and IT illiteracy rate among both students and lecturers, the PC labs are closed, and the university website is not updated and administered. The establishment of an IT center could lead to the following goals: supply of an Internet connection to all faculties, provide maximum time for

students and lecturers to surf Internet for research and assignments by controlling band-width and traffic, as well as capacity building for lecturers and staff. In order to actually implement an IT Center, a lot of human resources are needed: IT personnel, an IT manager, network administrators, IT lecturers and web administrators. Furthermore maintenance equipment is needed in order to keep the IT center as well as the other PC labs running. The concept of IT center provided by Mr. Kakar can help to make proposals and convince the donor and funding organizations to fund for the IT center and can be extended to an IT strategy for Kandahar University.

The following presentation was done by an employee of the MoHE, **Mr. Saber Hazratzay**, who has been working on the *"Higher Education Management Information System (HEMIS)"* in the last months. Mr. Hazratzay presented thoroughly the complete funcionality of the HEMIS application. This application is going to be installed within the MoHE and is used to manage all resources of the MoHE and the universities. The presentation provided the basis for the detailed training on the HEMIS for all IT representatives of the universities in the afternoon of the following day.

The final presentation of this session was held by **Mr. Abdul Saeed Ahmadi** who presented his project on *"Improving Maintainability of J2EE Applications by Applying the AOP paradigm"*. The main purpose of the project is to provide concept for improving the maintainability of a chosen J2EE application by applying the aspect oriented programming (AOP) paradigm. AOP is a new programming paradigm that complements the object orientated programming (OOP) paradigm. It increases modularity in object oriented applications by implementing crosscutting concerns of a software in separate modules called aspects. In his Master's thesis Mr. Ahmadi applied concepts of AOP to the university cooperation platform UCOOP, a J2EE web application. The goal is to improve the maintainability of the system. Two different approaches were taken to find crosscutting concerns in the cooperation platform. Top down approach found logging crosscutting concern and bottom up approach found university ranking system and security check crosscutting concerns. Three crosscutting concerns

were implemented with aspects. After implementation of these crosscutting concerns with aspects, the business logic of the application is monitored for readability, reusability, evolvability, modularity, code duplication and lines of code. It is clearly shown that application of AOP concepts is improving maintainability of the system. Crosscutting concerns now have modular implementation and business logic is more readable. Also it is shown how reusability can be increased and code duplication can be avoided. It provides a solution to make the application more evolvable and to reduce lines of code within the application's modules. Further more the thesis solution redesigned and implemented the cooperation platform. Mr. Ahmadi also provided suggestions for proper deployment and sustainable use of the platform at MoHE.

IT Infrastructure

The second presentation session was themed around IT infrastructure. The talks within this session dealt with the efficient use of scarce resources which include electricity, Internet bandwidth, and disk space.

The first presentation within this session was held by **Mr. Abdul Rahman Vakili** from Herat University. He presented his project on a *"Sustainable Power Concept for Servers in IT Centers at Afghan Universities"*. This project introduces a sustainable power concept for IT centers using one of the virtualization techniques called "domain migration" for IT centers in Afghanistan. One of the most problematic obstacles against IT centers in every day work flow in Afghanistan is power instability and in particular power blackout. Considering the weak economical situation, offering a solution which can keep IT center servers and related services running at the time of power blackout is the goal to achieve in this project. When a power blackout happens, physical servers (hosts) will run on power backup of UPS batteries until switching to the power generator electricity. Each physical server runs some virtual servers (domains) which will be migrated to other physical servers at the time of power down in order to run maximum number of servers in fewer number of physical servers. In this case, before turning on the generator, we can power off one or more physical servers and as a result we would use smaller power generators that consume less amount of fuel. The proposed solution is applied in normal hardware used in IT centers and all software used for

implementation is open source so that it does not require a licensing fee or purchasing software.

Mr. Sayed Jahed Hussini from Balkh University presented a *"Sustainable Network and Bandwidth Management for Afghan Universities"*. Since its invention, the Internet has been offering different services. As the number of services is growing, so does their bandwidth consumption volume, which have resulted in a degrading service quality wherever the required bandwidth is not supported by the local Internet connection. Network operators have been trying different methods to utilize the network bandwidth at its ma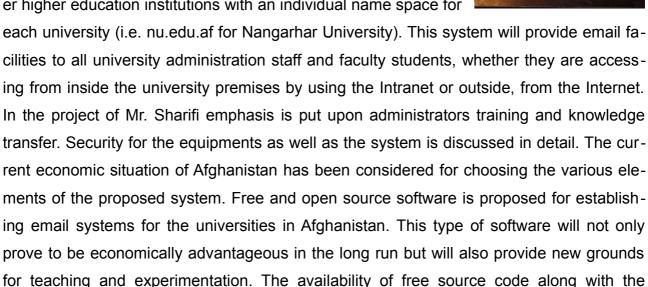ximum. Increasing infrastructure capacity might be a good idea, but it has some problems. First is the cost of increasing the capacity, which will increase the bandwidth price and the second problem is that bandwidth heavy services e.g. file sharing applications, are becoming increasingly popular and can max-out all the bandwidth, as it becomes available. Bandwidth, as a network resource is a valuable asset, which has to be paid for. In countries like Afghanistan which lacks the infrastructure for such networks, its price is much higher than in other countries of the world. Mr. Hussini's Master's thesis looked at ways to increase bandwidth consumption efficiency in academic networks. He presented a concept in which mission critical traffic can always get a fair share of the bandwidth by minimizing non-mission critical traffic. By centralizing all Internet connections of the university, the following goals could be reached: essential services for academic work are running at sufficient speed and each faculty is provided with a fair share of bandwidth. This is achieved by differentiating between important and unimportant traffic through a traffic shaper / proxy.

How the valuable resource of hard disk space can be used more efficiently was shown by **Mrs. Maria Sawaby** from Herat University in the presentation *"Sustainable Backup Solutions for Higher Education in Afghanistan"*. Mrs. Sawaby stressed that it is important for higher education to give the facility to users for their data (projects, researches) to be saved during their studies or works in the universities. The purpose of her Master's thesis study was to provide a cost neutral backup solution for higher education by using the existing resources in Afghan universities.

The ISCSI (Internet Small Computer System Interface) and NBD (Network Block Device) were tested, compared and evaluated according to their performances and reliabilities. Both simulate the remote devices like the local block devices and are used to transmit data over local area networks. RAID (Redundant Array of Independent Disks) levels were studied for the purpose of increasing fault tolerance for the devices. The RAID level 1 and level 5 have been implemented on both iSCSI and NBD accordingly. The backup application called sbackup (Simple Backup) which is also an open source software is chosen to backup on the remote devices. Mrs. Sawaby chose an open source solution which is easy to implement and suitable for the purpose. The main idea is that in each hard disk in a PC pool 20 GB is sufficient for the operating system and the user's home directory. The remaining 60 GB on an average 80 GB hard disk is empty. This makes a total of 25 x 60 GB = 1500 GB in an average PC pool with 25 computers. This space can be used for backup purposes. With the backup technologies described above and with additional encryption to protect the data a sustainable solution was found.

Mr. Ahmad Zia Sharifi from Nangarhar University presented a *"Concept for a Sustainable E-Mail System at Afghan Universities"*. Currently e-mail systems used in Afghanistan are by majority free webmail providers, but they offer limited facilities and cannot offer functionalities as dedicated systems for the universities. Considering the limited infrastructure such as unstable power supply and unstable Internet connection, the proposal is to build a sustainable email system for Afghan Universities and other higher education institutions with an individual name space for each university (i.e. nu.edu.af for Nangarhar University). This system will provide email facilities to all university administration staff and faculty students, whether they are accessing from inside the university premises by using the Intranet or outside, from the Internet. In the project of Mr. Sharifi emphasis is put upon administrators training and knowledge transfer. Security for the equipments as well as the system is discussed in detail. The current economic situation of Afghanistan has been considered for choosing the various elements of the proposed system. Free and open source software is proposed for establishing email systems for the universities in Afghanistan. This type of software will not only prove to be economically advantageous in the long run but will also provide new grounds for teaching and experimentation. The availability of free source code along with the

servers opens up new doors for the modern research and development in Afghanistan with no additional costs.

IT Administration

Following the lunch break a session on projects that use IT to help enhance the administrative systems in Afghan higher education institutions was started.

The first presentation within in this session was held by **Mr. Mohammad Ismail Khattab** from Nangarhar University. He presented his *"Concept for a University Finance Management System"*. The main purpose of this project is to design a systematic, well structured and consistent concept of a system for the University Finance Department. The new concept covers all aspects necessary for this department for a better understandability to computer software and to computer environment. All procedures in this department are currently carried out manually. With the usage of the proposed application the department would become more stable and it would be easier to control its works. The implemented application keeps track of the records and activities and stores them in a database. It will automatically calculate the monthly salaries of all employees and generate annual expenditure reports of the university. The application has been localized into three languages: Pashto, Dari, and English. It is platform independent, secure, reliable, and developed entirely in open source software.

Mr. Mohammad Shafi Tokhi from Herat University presented an application that is used outside the higher education system, a *"Concept for a Patient Emergency and Management System (PEMS)"*. Mr. Tokhi gave a short overview of his Master's thesis, which discusses how to develop a J2EE web application from a very primary step towards requirement elicitation, information gathering, evaluation, and implementation. As an example the thesis applied the above mentioned concepts for developing a Patient Management System for Herat Regional Hospital that is able to computerize the main activities of the hospital. The application is evaluated and tested by the users and its already under customer usage. Mr. Tokhi further discussed inconsistencies and problems of the hospital before software implementation and has clari-

fied what kind of software might be required to overcome the hospital's problems. The presented PEMS application is able to manage the hospital activities and helps the hospital staff to replace the paper works to computer works. It keeps tracks of records and activities and stores them to a central data storage. The data storage is accessible via the network. Doctors and nurses help the patients via this application and can store and view their treatment procedures efficiently. The application has been localized into the three languages English, Dari, and Pashto.

Also from Herat University, **Mr. Abdul Rahman Sherzad** presented his project of *"Transforming a Paper Based Library System to Digital in Example of Herat University"*. A digital library can provide access to many of the information networks around the world, which is a necessary component of almost any research experience today. Considering the facilities associated with a digital library, gradual replacement of traditional libraries by digital ones appears to be inevitable. As an important step in enhancement of education in Afghanistan, the concept of digital libraries must be introduced and integrated into the country's rapidly evolving educational system. Mr. Sherzad's Master's thesis addresses the challenges existing in Afghanistan university libraries. A solution for each challenge is defined by introducing digital and automated systems and finally a scheme is provided for switching from a paper-based library system to a digital library system. The presented system features a library resource management that keeps track of members, books, news, check-ins, and check-outs. A search module and detailed statistics are provided as well.

Mr. Ibrahim Sharistani from Kabul University presented an *"Information Management System for Lecturer Profiles in the Ministry of Higher Education"*. This system is intended to store personal information, processes of promotion and addresses of related files within the Academic Promotion Office in the Ministry of Higher Education. It accelerates the current administration tasks and makes them manageable within the Academic Promotion Office. The reason for these claims are the load of folders and documents that are compiled during the promotion procedure of lecturers from all government universities. In order to develop the system the cur-

rent paper-based process and forms, which hold data related to the process of promotion, were studied and questionnaire based interviews were conducted. The proposed Lecturer Profile System is a web based application that is intended to store the above mentioned information on lecturers and can compile reports on this data.

Mr. Mohammad Mussadiq Jalalzai from Kabul University conducted his research on *"Interoperability Tests with the Quagga Open Source Router"*. Commercial routers are widely implemented in the Internet. Commercial router vendors build proprietary routers while keeping in mind the current and future needs. But these commercial routers are expensive and inflexible. Alternatively, free open source routers are also available. They also provide routing services between networks. But they have limited performance on the top of personal computers. It is also very important to determine if the free open source router is interoperable with other routers in the network. In the thesis of Mr. Jalalzai an open source routing tool named Quagga is considered and different tests have been performed on it to conform its basic interoperability to other commercial routers. Free and open source routing tools are used to perform all tests. BGP Timers implemented in Quagga and Quagga behavior while using these timers and features is also observed. The results show that Quagga implements entirely time driven behavior, but still by tuning BGP timers and enabling certain BGP features can have positive impact on how fast Quagga can detect a change in network and propagate information to other peers, hence making network convergence faster. Mr. Jalalzai further proposed the establishment of a Remote Network Lab. The main focus of the lab will be on providing research facilities for the computer science students and lecturers in the field of computer networks. Furthermore, this lab will be used to develop and test different aspects of free and open source routers by developing and testing network prototypes before the implementation. Such a lab is needed because of the current situation at the Computer Science Faculty of Kabul University: There is only a limited number of working network devices like routers and switches. In each class a large number of students with a limited number of devices is found. The students have to stay in the afternoon in the faculty to perform their experiments or finish their homework, which can be a difficult situation for female students. Due to the large number of users accessing and using the devices physically some of the devices got problems like short circuits, malfunctioning inter-

faces, or malfunctioning power supply. In addition to the research tasks, this lab will offer learning activities through the entire curriculum. All users (students and lecturers) can access the lab from anywhere in the world if they are connected to the Internet. The users have to reserve devices before using them in order to prevent the conflict or loss of data and the same user has to release the devices if he / she is done with his / her work. The reservation time will be controlled so that everybody gets equal opportunity to perform their tasks. In this lab the students will not only work with commercial routing devices, but for the first time in Afghanistan they will be able to work with free and open source routers.

Mrs. Humaira Akhtari from Kabul Polytechnic University presented a *"Concept for an Adapted School Management System"*. The School Management System is a system that is new in Afghanistan; there is no prior investigation existing. Investigations were carried out in examining the process of several schools in Kabul city. The research consisted of four detailed interviews with officials of both governmental and non-governmental schools. During research the present system was examined and short comings of the system were identified. A possible solution for the identified problems were suggested and a new computerized system was introduced in detail. The new system is believed to solve all the problems associated with the current manual system. The school personnel welcomed the project and are ready to adopt to the new system. The system was designed as a web based application using the Java programming language. It is highly recommended that school administrative staff should be well trained on how to use the system. The feasibility of the project was studied and it was found that some major schools in Afghanistan are feasible for applying this system currently, whereas, minor schools with low or no computer resources are not applicable for the time being. Schools residing in farthest provinces of Afghanistan are usually not equipped with computer resources or do not have trained staff for using this system, and therefore in such schools the new system is not applicable and it is considered as the limitation of the project.

The session's final presentation was held by **Mrs. Freshta Popalyar** of Kabul University. She presented the *"Benefits of an Open Source Based School Management System for Afghan schools"*. Most organizations and institutions in Afghanistan need specially designed software for their work. Afghanistan being a country suffering from a weak eco-

nomic situation, can not afford to answer the necessities of the governmental establishments in this regard. In such a situation when offices in Afghan organizations and institutions are mostly equipped with computers, a proper way to get the most benefit from the resources is required. This thesis has presented the open source software development approach as an answer to the specified necessities of Afghan institutions. The purpose of Mrs. Popalyar's Master's thesis was to clarify the benefits of an open source approach for developing software for Afghan institutions. Designing an open source software for Afghan schools was taken as an example for this purpose. The document has analyzed the current situation of school management and open source software in Afghanistan. In addition benefits of open source software in India were explored, as an example of the benefits of open source for developing countries. The thesis evaluated the advantages of open source software and open source software development in the context of Afghanistan. It has also examined the current situation of proprietary software usage and its disadvantages for a country like Afghanistan. The advantages and disadvantages of both open source and closed source software for Afghan institutions were compared and as a result preferred open source software development as the solution of the identified problems. Furthermore an open source school management system software was evaluated and designed for usage in Afghan schools. The feasibility of the implementation of the School Management System in Afghan schools was studied in the document. Additionally guidance on research areas on benefits of open source software for Afghan institutions, development possibilities and further improvements of the project are provided. Mrs. Popalyar encourages and motivates the creation of a center for the Afghan open source community, that gathers all local Afghan experts in the field of software engineering and builds software for Afghan institutions and organizations.

IT Education

The final session of the day was held after the tea break. It combined all projects that tackled urgent issues in Afghanistan's IT education.

The session was opened by the presentation of **Mrs. Mariam Farda** from Kabul University, who presented a *"Concept to Improve the Computerized Post-Examination Processes of the Concours"*. The concours examination is the countrywide university entrance

examination through which tens of thousands of students are selected to universities and other governmental institutions each year. Attempts started to computerize the concours examination process a decade ago. Twice it was done, however the results are not satisfactory. In her Master's thesis Mrs. Farda investigated the current system, identified the factors which negatively impacted the concours system and developed a concept to improve the computerized system used in the concours. The conducted interviews pointed out the factors and issues existing in the current system. To support and measure the feasibility of this concept a proposed system has been developed and discussed in detail. The proposed system has gone through the full system development life cycle model, i.e. the waterfall process. The project was done through requirement engineering using the results of conducted interviews, design by using UML diagrams, implementation using open source technologies and testing using JUnit tests. The result of the Master's thesis indicated the suggested solution to answer the research question and suggestions for further improvement of Concours. The next steps to be taken within this project includes the integration with the question bank and the student registration software, which were presented in the following talks by Mrs. Farda's colleagues from Kabul University.

Mr. Baseer Ahmad Baheer presented the *"Concept to Improve the University Entrance Examination (Concours)"*. Students are admitted to different faculties in different universities on the basis of the university entrance examination. A major part of the ministry's annual budget is spent on this activity. The number of students taking the entrance examination is more than 100,000 per year. So far, two computerized systems are implemented to handle the concours exam processes (pre and post examination processes), but both systems do not fulfill all requirements of the concours committee. The Master's thesis of Mr. Baheer is focusing on pre-examination or students registration and admission processes. The goal of the study was to improve the computerized pre-examination processes of the concours exam and thereby to provide a system which is based on elicited real requirements, to remove existing manual pre-examination processes, free of charge, with high level of secrecy, and free

from any large scale human intervention.

Another presentation on this topic was conducted by **Mrs. Ogai Ahmadi**, who presented *"A Management System for University Entry Examination Questions in Afghanistan"*. In her Master's thesis Mrs. Ahmadi investigated the shortcomings of existing computer packages used for preparing, marking and producing the results of the concours examination. As a result, it has been recommended to the MoHE to develop a system using open source software for this purpose in order to produce an automated system for managing university entry examination questions in Afghanistan. The principles of such a system have been demonstrated. The functionalities provided by the proposed system prototype are storing, retrieving, editing, and deleting question sets; localization of the system interfaces; authentication and authorization; database backup and restore; statistical report generation; as well as the printing of question sheets. Currently the interfaces to the other two systems that are involved in the concours process are being programmed.

Mrs. Zoia Sahab from Kabul University presented *"A System to Support the Transformation to the Credit Point Grading System at Afghan Universities"*. Mrs. Sahab developed an IT system to support the transformation of grading to credit point grading system at Afghan universities. Higher education of Afghanistan applies two grading systems, credit point grading system and semester based grading system. In Mrs. Sahab's Master's thesis, both grading systems are surveyed. Interviews with the responsible people of the Ministry of Higher Education and the respective universities were conducted. Regarding to the main difficulties due to applying credit point grading system in higher education institutions, the requirements for an IT system are defined. According to the system requirements the conceptual and logical designs of the system were developed. The developed system supports the transformation of a semester based grading system to a credit point grading system. It makes the managing of students, students' grades and courses easier. By using the system, the credit point grading system becomes easier to understand, even to those not familiar with the credit point system. The current prototype of the server-client based system has the following

functionality: management of courses, registration of students to courses, management of grades for each course, statistical calculations on the grades, automatic calculation of the achieved credits, as well as generating course and grade lists.

Mr. Noor Mohammad Atapoor from Kabul University presented a *"Concept of a Timetable and Resource Management System for Afghan Universities"*. In his Master's thesis, Mr. Atapoor analyzed how to support the managerial works around the arrangement of timetables, registering official files and documents, registering students and lecturers and handling information about them. Performing these tasks with the current existing methods and approaches are considered to be time consuming, inflexible as well as accompanied with basic searching problems. Required data in the research process was gathered through interviews and questionnaires with lecturers, administrators and the faculty dean. Based on the obtained data and requirements as well as their analysis, the concept was acquired to obviate problems. Through implementing the proposed concept, a web-based software system (TRMS) has been designed and developed to make the above mentioned work flow more manageable, accessible and flexible. The system is designed considered the model-view-controller design pattern and is utilized with open source technologies (J2EE) for its implementation. To make the system's usage more convenient, its interface has been localized into the two official languages of Afghanistan. Through providing appropriate services and functionality the system would be capable to deal with the discussed problems and facilitates the work performance for its users. The services that are provided by the developed software include: arrangement of both teaching and exam timetable, registration of newly admitted students to the university, registration of all lecturers, registration of documents for students and lecturers. Through different search interfaces information and reports can be shown on the teaching and exam timetables, the list of graduated and non-graduated students, lecturers, and registered documents. The system has been developed only for a single faculty, but in the future should be extended to cover all faculties of a university. Two months ago Mr. Atapoor redesigned the software using the technology of Richfaces. Through the AJAX support of Richfaces the usability of the system is strongly enhanced.

The final presentation of the day was made by **Mrs. Fereshteh Forough** from Herat University. She described her strategy of *"Developing a System to Manage Student*

Records at Herat University". The Student Record System (SRS) is a software project which focuses on two main parts, registration and grading. During the Master's project of Mrs. Forough, the SRS software was improved by adding new functionalities which meet the Afghan universities' requirements from a very initial part which is the student registration until making it as a web based application to access it online and make the administration work more easy, reliable, efficient and consistent for the university and faculty administrators. The scope in which the system is going to be applied is the Student Affairs Office at Herat University and its related faculties. To have an appropriate vision of the system data the first step was to gather the needed information which was done at Herat University by gathering several registration forms and grade sheets. For applying a software system many other factors had to be considered like not having a stable electricity and appropriate place to accommodate the tools for running the system. The intention is to gain a system that could offer more facilities and comforts in the administration work and save time.

Day 3: Outcome and Discussion

The aim of the final session of this year's conference on IT in higher education was the discussion of the application projects that were presented on the previous day and to make suggestions towards their implementation. The session was moderated by **Mr. Salim Saay** and **Dr. Nazir Peroz**.

Participants of the discussion were **Dr. Mirza Mohammad Merza**, dean of the Faculty of Computer Science of Kabul Polytechnic University, **Dr. Meer Ghulam Osman Barez Hussaini**, president of Herat University, **Eng. Habibullah**, president of Balkh University, **Prof. Faizullah Habibi**, president of Faryab University, **Prof. Ahmad Sha Nazari**, president of Jawozjan University, **Prof. Kashifi Barmaki**, president of Takhar University, **Prof. Rahim Noorzai**, president of Ghazni University, **Prof. Yosuf Azizi**, president of Kondoz University, **Prof. Mohammad Sabir Sabiri**, president of Parwan University, **Prof. Abdul Rashid**, president of Albironi University, **Prof. Abdul Qadir**, president of Badakhshan University, **Prof. Adina**, president of Bamyan University, **Prof. Obaidullah Paryar**, president of Paktia University, the IT representatives of all Afghan universities, the Master graduates, representatives from international organizations, as well as the team of TU Berlin, **Mr. René Herlitz** and **Mr. Ralph B. Magnus**.

To start off the discussion, Dr. Peroz summarized the contents of the first two conference days. The main topic of the discussion were the 25 projects that were presented on the second day. The question arose how these projects could be implemented in the environment of Afghanistan.

The first discussion covered the first session of the second day, IT policy. All participants confirmed that Afghanistan needs to have a national IT strategy. Regarding the IT curriculum, the future of Afghanistan needs to be focused, and a uniform curriculum for the fields of Computer Science and Computer Engineering need to be established at all respective faculties nationwide. The president of Herat University argued that the curriculum elaborated for Herat University in collaboration with TU Berlin does not match all criteria regarding the maximum number of credit points for each course. Discussion participants suggested that representatives from Herat, Kabul and Kabul Polytechnic universities form a round table with the Academic Affairs Commission of MoHE to discuss these issues and find an

appropriate result.

The two platforms that tackled the local languages of Afghanistan were thoroughly discussed. It was suggested to form a round table together with linguists to discuss how to best integrate the two official languages of Afghanistan, Dari and Pashto, into the higher education in order to use uniform terms in these languages in all universities instead of the different terms from different foreign languages that are currently in use.

The proposal to establish an IT research center found support throughout the whole audience. In the current situation in Afghanistan there is often the need to evaluate and compare different IT systems designed as solutions towards a challenge in society.

The IT infrastructure is an essential part for the development of IT in Afghanistan. The discussion evolved around the power supply, backup and e-mail systems, Internet connection, and the establishment of IT centers at each university. The main point of discussion was around the proposed e-mail system, as the solution presented by Mr. Sharifi tackled the challenge of using an e-mail system that addressed the problems of cuts in both power and Internet connection.

In the discussion part around IT administration, the systems that tackled the need for modernization of the administration were discussed. The MoHE has developed HEMIS in order to computerize the whole administration around the higher education system. The core of the discussion was the concern about the development of duplicated systems. For Afghanistan it is important that the found solutions are cost-efficient and sustainable. In the afternoon a training was given to the IT representatives of all universities on the HEMIS platform.

The last part of the discussion was IT education. At the core of the discussion was the idea of an improvement of the computer-supported concours procedures in the MoHE. The main point of criticism was that the presenters were not deeply enough informed about the whole concours process. Nevertheless the presented system gives a chance to newly think about and discuss the current systems in use. It was suggested that the three presenters sit together with the members of the concours committee in order to discuss their proposed solutions. The systems of online libraries, school management systems, hospital management systems, timetable and grading systems could not be discussed due to the shortage of time.

In the general part of the discussion another suggestion was made for the organization of

the IT conferences in the following years: the date of the conferences should be announced early enough, so that universities are given the chance to contribute to the conference with their own presentations.

The suggestion for the topic of next year's conference is the foundation of a National Computer Science Society for Afghanistan.

Dr. Peroz made a final statement to the conference and confirmed that the projects proposed by the Master graduates will be supported by the German Foreign Office and the DAAD.

At the end of the conference words of thanks were spoken from Dr. Peroz towards the good cooperation with the MoHE, especially to Prof. Babury and Mr. Saay. He further thanked the World Bank for financing the concluded Master program. The presidents and IT responsibles were thanked for taking the time to make the long trip from their respective provinces to Kabul. Further words of thank you were addressed to the Master graduates for presenting their projects. He further thanked the German Foreign Office, especially Minister of State Mrs. Pieper, the German Embassy in Kabul, the Afghan Embassy in Berlin, and the DAAD for their support and warm welcoming words. Special thanks were dedicated towards the two lecturers from TU Berlin, Mr. Herlitz and Mr. Magnus, who helped organizing this year's conference. Without the good collaboration between the team of ZiiK of the TU Berlin and the team of the IT department of the MoHE, which was working as hard as every year, such a conference would not be possible.

Mr. Saay thanked in the name of Minister Danish and Deputy Minister Babury to all participants, Dr. Peroz, Mr. Herlitz, Mr. Magnus, Mrs. Hoffmann, the presidents and IT representatives from the universities. At the end of his speech he handed over presents from the IT department for the team of TU Berlin.

Finally the Master graduates thanked Dr. Peroz, Mr. Herlitz, Mr. Magnus and all other TU Berlin lecturers who continuously supported them throughout their studies. They handed over presents to the TU members present and also send presents for their other lecturers, Mr. Chi-Thanh Christopher Nguyen and Mr. Daniel Tippmann. As a special surprise they invited the TU Berlin team for a closing dinner, at which the university presidents also participated.

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Conference Organization:

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