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RESEARCH STATEMENT

Background

After my bachelors, I joined full-time MS program with an aim to pursue a career in computer science research. In the MS, I was selected as a Research Officer / Teaching Assistant. I have assisted teachers in various courses. During this time, I have developed an automated assignment testing system which helped me and other faculty members to grade assignments quickly and easily. I have also introduced the use of various available plagiarism detection tools to keep a check on increasing plagiarism by the students.

As part of my research activities, I worked under the supervision of Dr. Misbah Uddin Mirza in setting up a distributed computing environment in FAST-NU. We used Parallel Virtual Machine to execute task in the distributed environment. Several test applications were developed and we published some results in a paper titled: "*A Parallel Distributed Environment for Pakistan"* presented in IEEE INMIC 2003. We also established a Linux based laboratory mainly aimed at distributed computing and software agent research. The lab mainly consisted of discarded IBM PCs and existing infrastructure was used.

Later on, I worked under the supervision of Dr. Qurban Ali Memon and Dr. Misbah Uddi Mirza, in the area of grid computing. I worked towards setting up a grid computing environment within the campus and developing some simple grid applications. My MS thesis was also in the same area whose title was "PAREGIN - Pakistan Research and Education Grid Initiative". The thesis was the result of an extensive study towards the need for such an environment in a developing country such as Pakistan. Network and bandwidth related issues were also explored with an aim to re-use existing network infrastructure.

Current Interests

My current research interests are in the fields of distributed computing, middleware design and development, network protocols, and ad-hoc networks. I am also interested in working on a combination on some of the above technologies. I have worked in these fields for some years now and have good background information on these. Below are my views and some specific problems I am interested in. Due to shortage of space, I am only presenting the basic ideas here. For details, see the details on my website: http://ovais.khan.tripod.com/.

Grid Computing

Grid Computing is the core area of my thesis and thus many of my future research plans involve Grids. Grid Computing is an active research area with research going on in the area of performance, security, scalability and protocols. I am interested in working in one or more of the following problems facing Grids.

- **Grid Implementations**

  I would like to continue my thesis work in the area of grid computing implementation for collaboration, scientific and educational purposes in developing countries. The work in the thesis stopped short of any real implementation. If funding is approved, it would be extended to deploy a educational campus grid with some useful grid applications and sharing expensive equipment.

- **Grid middleware development**

  When I started to look for Dot Net based, Grid Middleware, I was only able to found some middleware being developed for specific grids especially computational

grid. I am thus interested to work towards a complete dot net based grid middleware with extensible design so that third party components could easily be plugged. The middleware should ideally have some commonly used scheduling techniques.

This work could be further extended to include support for an extensible grid portal which could be used in order to easily develop Grid Portals and Portlets.

There is also a need to further develop Grid Middleware for handheld devices. This will greatly impact the

- **Grid based applications**

  Either the implementation or the middleware development would require new and useful Grid Applications in order to be successful. I am interested in developing grid services to be used in industrial and scientific purposes, specifically to develop collaboration and resource utilization services (grid services).

- **Semantic Grids**

  Semantic Grid is the intersection of Grid, Semantic Web and Web Services. There has been a lot of work already done in this field and I am still doing some investigation on the work that I can do. I, for instance, intend to do work in the area of multimedia information storage along with semantics and its subsequent searching and retrieval.

- **Business policies**

  Business Policies play an important role in commercial success of any new technology. We need to start with proper business requirements, concerns and future strategy and based on these formulate proper business policies for grids. Such policies will play an important role in global and inter-organization grids.

- **Network protocols for Grids**

  Most grid applications have their own network and bandwidth requirements. I am interested to work in this area with two goals, for the development of transport layer protocols suitable for high-throughput applications, and to tweak the available protocols for such requirements.

- **Grid security infrastructure**

  Security is still secondary to many grid implementations. Grid Security is an active research area which is highly dependant on the new web service security standards and I am interested in doing work in its development, implementation and deployment.

Other Work

- **Mobile agents**

  Mobile agents have the capability to make Grid based solutions smarter, flexible, and adaptable. Agents can be used for purposes such as scheduling, resource management, and monitoring. I am interested to work on protocols, middleware and applications for agent-based grid environment.

- **Network protocol design & analysis**

  I would like to work on the design and analysis of transport and application layer protocols for grids and www as discussed above. I am specifically interested in multimedia networks.

- **Distributed document search and management**

  Most of the companies are faced with data explosion, with lots of unorganized data

which is not easily searchable. Recently, we saw many enterprise search solutions getting little better, but they still lack the ease and power that enterprise users have for managing the explosion of data. I am interested to work on such a system especially in the context of peer to peer networks.

I am interested to do research work towards highly available and redundant distributed data management systems over extensible networks (even ad-hoc network). These systems are able to replicate data and place data during run-time for easy collaboration and data availability for mobile teams. Such a system could be used for teams on the move like exploration and investigation teams. I would like to study these systems in the context of grids, ad-hoc and extensible networks.

- **Distributed data mining**

  Data mining is a computationally expensive operation. By making is distributed, it will not only save time, but will also enable deployment of complex data mining tasks in mobile network that is used by mobile forces. Such a solution would let them quickly find the required results, by using the computational and storage powers of Mobile devices.

- **Ad-hoc network**

  I am also interested to work on routing and data protection techniques in Ad-hoc networks and work towards secure networking, systems, and applications. I am still reading about this area and fascinated by the amount of work that has already been done. Lack of trust, privacy, security, and reliability hinder the basic purpose of information sharing. The potential for theft, fraud, harassment, and destruction of critical private data thus increases even more in such a setup.