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6.191 M.Eng. Project Pre-Proposal

1. Introduction

The following paper describes my current M.Eng. project status and serves as a loose pre-proposal. Unfortunately, I do not have a well-defined project or advisor commitment as of yet. Therefore, this paper focuses more on the group and group research I hope to become apart of than a well-defined project. This is followed by a brief discussion of my proposed schedule and the risks involved at this stage.

2. Advanced Network Architecture Group Overview

The Advanced Network Architecture (ANA) Group at the Laboratory for Computer Science (LCS) focuses on the design principles and technology for large and decentralized, open-access networks such as the Internet. This involves the analysis and development of network architectures, systems, and protocols for such networks in a broad context, ranging from performance to economic significance.

Within the group, I have identified and am talking with two possible advisors: Professors John Wroclawski and Karen Sollins. Their areas of research are similar and the specific projects I am interested in are Prof. Wroclawski's "Personal Router" project and a Prof. Sollins' modular check-pointing and migration project. These are discussed below.

3. Specific Research Technology within the ANA Group

As noted, two research projects are of particular interest to me. The first is Prof. Wroclawski's "Personal Router" project. "The personal router," as it is dubbed, seeks to enable the users of portable communications devices to seamlessly and effortlessly swap between

wireless service providers, depending on price, performance, and availability. This is not possible at present, because of the plethora of incompatible standards among portable communications devices. For example, a laptop equipped with a wireless network card cannot talk on a cell phone network; the same is true for the interoperability of a host of other portable devices and differing international standards only complicates things further. These protocol incompatibilities have, no doubt, largely restricted the wireless service offerings available to consumers. One must purchase a separate service for a cell phone, wireless Internet access, etc.

The personal router seeks to solve this problem by providing a common interface and communications standard for portable wireless devices. All of one's wireless devices—cellphones, laptops, pagers, PDAs, etc.—would ideally talk to the personal router which would transparently select the cheapest wireless service (among differing standards) based on the needs of the user. This would potentially give the wireless consumer much more market flexibility than is currently available to day, leading to cost savings. Analogously, it would make it feasible for businesses to actually offer such short-term, open wireless service to consumers.

The second ANA project of particular interest (under Prof. Sollins) is in the beginning stages. The idea is fairly simple, but the problem is very complicated in nature: modular software applications that are aware of changing resources and able to react and *migrate* appropriately. For example, someone might be using a wireless PDA for videoconferencing or a video stream and might arrive at his or her office that happens to be equipped with a dedicated video monitor. If the software were resource aware and migratable, the video stream should migrate to the dedicated video monitor with little or no work from the user. This area of research is particularly appropriate for the ANA group because it is largely dependent on realizing changing network resources and topology. The chief obstacles include effective ways of detecting available

resources, determining the relative network bandwidth and processing power of the resource, and modularizing software in such a way that it is migratable between systems without loosing state. As an analogy, one might think of migratable software resources in the way that operating systems can checkpoint, or"hibernate," and later restart in the same state.

4. Specific M.Eng. Project/Demonstration

As noted, I do not have a specific project as of yet. Further, I have only been able to meet with my prospective advisors once each, briefly, so no detailed discussion of projects occurred. Thus, I will briefly mention possible projects related to the research above.

Within the personal router project, there are seemingly quite a few areas that yet to be tackled. For example, the agent software for controlling the personal router and expressing preferences has not been implemented, nor have many of the needed protocols for pricing negotiation, passing service requirements, etc. There are many more areas of the personal router that need research and work. As for Prof. Sollins' migratable software project, it is currently in the beginning stages, so the "technology" per se is not there. Thus there are many opportunities for design, development, or perhaps simulation models once the overall project gets underway.

5. Schedule, Resources, and Milestones

An overview of my anticipated schedule can be seen in Table 1. At the close of this term, fall 2001, I had anticipated having a committed project and advisor. Unfortunately, that is not the case, at present, and my revised schedule reflects this. At the end of this term, I do anticipate having completed all of my undergraduate requirements, (with the exception of the Advanced Undergraduate Project and Phase II of the Writing Requirement). Thus I will begin taking

graduate level classes next term to offset some of the load during my fifth year. During upcoming IAP, I plan to find and clearly define a specific project within the Advanced Network Architecture group and hopefully receive a commitment for some level of M.Eng. funding. In the following spring term, I plan to begin doing research, reading, and any learning required for completion of my M.Eng. project, possibly in the form of a UROP. The summer following graduation, I intend to remain on campus and complete as much work on my project as possible.

	2001-02		2002-03
Fall	• Complete Undergraduate Degree Requirements • Search For M.Eng Advisor & Project		• Finish Up Work on M.Eng. Project • Finish Taking H-Level Classes • Begin Job Search • Possibly TA
IAP	• Finalize M.Eng. Project & Secure Advisor		• Finish Any Last Remaining Details on M.Eng. Project • Begin M.Eng. Thesis
Spring	• Begin M.Eng. Project Research, Possibly UROP • Begin Taking H-Level Classes • Graduate		• Complete M.Eng. Thesis • Finish Job Search • Possibly TA • Graduate
Summer	• Complete Large Portion of M.Eng. Project		• Begin Career

Table 1 – Proposed/Anticipated M.Eng. Schedule

Depending on the level of funding I am able to obtain, I anticipate that I may have to TA a class at least one term. Preferably this would be in the fall of my fifth year, if necessary, when I also plan to complete my graduate level class requirements. Completing my graduate coursework in combination with being a TA would certainly limit the amount of time available to spend on my project, but hopefully I will have completed enough work in the previous summer to allow

completion of the research and work phase during the fall—or IAP at the latest. Aside from job searching, this would allow the bulk of the spring to be devoted to writing my thesis.

6. Risks

The primary risk at the moment is certainly that I am not able to find a project within the Advanced Network Architecture group. This is certainly possible as I have no commitments. However, the very limited time I have been able to meet with Professors Wroclawski and Sollins has been encouraging—though I have not yet had the chance to discuss specific details, nor really delve into project ideas. I have appointments scheduled to do so before Christmas and the first week of IAP. In the event that I am unable to secure a project in the ANA group, the next step would be to pursue another group or groups—with the same goal of absolutely securing a project during IAP. The very next group would be the Mobile Networks and Systems Group at LCS; I have had some contact with the group regarding M.Eng. projects (though funding was somewhat of an issue).

Secondary risks include securing a project but a lack of funding and also the possibility of project difficulties once I begin my M.Eng. project. If funding becomes an issue, being a TA two terms would be an option. It would certainly lessen the overall time available for my project and thesis, but I believe it could still be done, with the possibility of scaling back the scope of my project. It is too early to speculate the course of action in the event of project difficulties.

7. Conclusion

Given setbacks and difficulties in my search for a project and advisor, I feel I have made decent—albeit not great—progress toward finding and securing a project. Certainly I have a sense of what I must do now and a game plan of sorts formulated.