King Fahd University of Petroleum & Minerals
College of Computer Sciences and Engineering

CSE 552 - Network Management (3-0-3)
Fall 2004 (Term 041)

Course Projects

Tuesday, September 21, 2004

1   Introduction

Students will work in groups of 2 on a practical project throughout the semester and will be expected to design and implement a network management system. They will have to deliver a report, a presentation and a demo at the end of the semester of their implementation. Students should decide on one project and discuss it with the instructor before they start. The project must be defined by the end of the second week.

2   Project Description

The students will define the project they are going to work on. The following are some guidelines to help you choose a project:

➢ The project must implement components of a network management system.

➢ The outcome of the project must be a working prototype that you can demonstrate at the end of the semester. For example, if you implement an SNMP manager, it should communicate with existing SNMP agents.

➢ You can choose your own project, but you must talk to the instructor about your plan before you start working.

➢ The project could be one of these three choices:

    o   A real world project defined by a company that you implement and evaluate

    o   An network management tool that you define, implement and evaluate

    o   A system found in a research paper that you implement, evaluate, and compare results

3   Project Options

One example of projects you can work on is to design and implement an SNMP manager. You can use any tool that you can get for this. You need to implement at least the basic SNMP messages to be able to communicate with agents. In this case, you can test your application with already existing agents. This should include the implementation of a partial MIB (Management Information Base).

3.1 Some of the options you can choose from

The manager can have an MDB (Management Database) where it stores values gathered from the different agents.

The manager can also talk to multiple agents. You may want to use multithreading to make the implementation more efficient.

Implement some configuration management functions such as configuration of parameters of a managed object, a MIB browser, network discovery, etc.

Implement some fault management functions such as alarms reporting, trouble ticket systems.

Implement some performance management functions such as collecting statistics and plotting the results.

Implement some security management functions such as an intrusion detection/prevention system.

Implement other functions of network management that were discussed in the class, and presented by some students.

You can choose to have a GUI for ease-of-use of your application.

You may want to implement a web-based manager with some of the above functions.

You can use any platform (e.g., UNIX, Windows, or Linux), any language (e.g., Java, C/C++, TCL/TK), any tools (e.g., net-snmp, JDMK based on JMX).

3.2 What is expected?

Your grade will be based on the amount of work accomplished and the number and efficiency of the components implemented. The demonstration represents 50% of the overall project grade.

A working prototype is expected at the end of this project, in addition to a report and a user manual.

3.3 You need to follow these steps in your project

- ➢ Survey of different options in developing an NMS, and choice of one
- ➢ Plan of implementation of the option chosen
- ➢ First prototype of the NMS
- ➢ Report and user manual
- ➢ Demo of the final implementation
- ➢ Presentation

4   Project Examples

4.1   Web-based Network Topology Discovery

The project involves designing and implementing a web-based discovery of all the agents in the network. The students will survey the different options for designing a web-based network topology discovery. Then, they will choose one design and devise a plan for implementation. A working prototype is expected at the end of this project, in addition to documentation and a user manual. Optionally, the prototype could allow for browsing MIB (Management Information Base) objects of the agents discovered.

- One version of this could discover layer-3 devices only.
- Another version could discover the spanning tree of a layer-2 network. This could also include the dynamic update of the status of links on the map as it changes in the real network.

4.2   Web-based SNMP statistics collector

The project involves designing and implementing a web-based SNMP statistics collector. The students will survey the different options for designing the web-based statistics collector. Then, they will choose one design and devise a plan for implementation. A working prototype is expected at the end of this project, in addition to documentation and a user manual. The prototype should allow the configuration of parameters such as time of collecting statistics, agents to communicate with, and type of statistics to collect. It may also implement a basic discovery of all the agents in the local segment of the network.

4.3   Performance Grapher

Uses statistics collected to compute performance metrics such as link utilization, etc. This can also be web-based.

4.4   Trouble Ticket System

Uses the alarms sent by agents on the network to generate trouble tickets, and manage them until they are resolved and the ticket is closed. This can also be web-based.

5   Project Deliverables

The following are the deliverables expected from each group and the due date for each.

	Deliverables	Due date	Grade's weight
1	Project proposal and action plan	Saturday October 2nd, 2004	5%
2	Progress report	October 23rd	5%
3	Demo of first prototype of the NMS	October 24th-27th, 2004	10%
4	Final demo of the NMS	December 18th-22nd, 2004	40%
5	Report and user manual	Monday December 27th, 2004	20%
6	Presentations	January 1st-3rd, 2005	20%

5.1 Project proposal and action plan
The project proposal and action plan is a document of 2-3 pages that includes a section on the project description and another on the project plan of implementation.

Project proposal
In this section you should define the project goal and scope. You should also include a detailed description of the project you plan to work on. This should include the expected final product to be delivered, the main components to be implemented, the tools to be used, and the overall work to be accomplished.

Project plan
In this section you should include a detailed plan of the project:
- A detailed tasks description
- Duration and due dates
- Clear deliverables
- Responsibility assignment
- Overall organization

5.2 Project Progress Report
The progress report (2-3 pages) should include:

- Introduction
- Updated plan
- Description of accomplished work
- Description of unaccomplished work
- Any issues or problems encountered
- Conclusion

A meeting with the instructor will be scheduled during the same week to discuss your progress, and to demo the first prototype of your NMS.

6 Late submission policy

All assignments (e.g., project report) submitted after the due date will have 10% of the assignment maximum grade subtracted for every late day. If the submission is one week late, the grade for the assignment will be 0. (e.g.; if you get a grade of 80% in one assignment submitted 2 days later than the due date, you'll only receive a grade of 60%)

7   References

The following is a list of web site to help you make the decision of what you want to work on:

- http://www.simpleweb.org/: provides links and information on network management, including software, RFCs and tutorials.

- http://net-snmp.sourceforge.net/ (Previously known as "ucd-snmp"): Various tools relating to the Simple Network Management Protocol

- http://joe.lindsay.net/webbased.html: The Web Based Management Page

- http://linas.org/linux/NMS.html: Linux SNMP Network Management Tools

- http://www.gaertner.de/snmp/welcome-3.7last.html: Linux CMU SNMP Project

References for similar projects done at other Universities:

- http://www.cc.gatech.edu/classes/AY2002/cs6255_fall/: Check the end of this web page for projects presentations.

Additional references on network management:

- http://www.caida.org/tools/: The CAIDA Tools site contains CAIDA tools and software as well as a taxonomy of available research and visualization tools.

- http://www.slac.stanford.edu/xorg/nmtf/nmtf-tools.html: Network Monitoring Tools

- http://www.topology.org/comms/netmon.html: Network monitoring

- http://www.lrg.ufsc.br/cnom/: Committee on Network Operation and Management

- http://www.geocities.com/iadhicandra/links3.htm: Resource Links Collection

- http://www.ibr.cs.tu-bs.de/projects/nmrg/: Network Management Research Group

- http://www.sce.carleton.ca/netmanage/resources.htm#links: NM Research Web resources

- http://www.simple-times.org/: The **Simple Times** is an openly-available publication devoted to the promotion of the Simple Network Management Protocol (SNMP).

- http://www.mibexplorer.com/

- Google ☺

- Chapters 12, 13, & 14 of the textbook