

CN8861 Network and Service Management

Course Objectives

- Introduce Network Management concepts, tools, and technologies.
- Prepare students to specify, design, and implement management systems to monitor and manage networks, devices, and/or services.
- Prepare for jobs at network equipment vendors, carriers, and service providers.
- Help in obtaining vendor certifications.
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Course Description

This document proposes an outline for the graduate level course on Network Management offered as an elective for the Master of Engineering students in the Department of Electrical and Computer Engineering at Ryerson University.

The subject is introduced with an overview of Network Management models such as the OSI, TMN, and IETF. The course then focuses on the TCP/IP-based Internet Management including SNMP protocol, Structure of Management Information (SMI), Management Information Base (MIB), and Agent Architectures. The course will introduce and discuss advanced topics such as Distributed Network Management and Policy-Based Network Management.

The course requires students to engage in detailed study of the SNMP protocol, IETF proposed standard MIBs such as the MIB-II, SNMPv3 MIBs including VACM, USM, Target, and Notification MIBs, Distributed Management MIBs, and RMON2. Students will be introduced to SNMP Agent/MIB implementation using an open source extensible agent toolkit such as the Net-SNMP as part of their individual/group course project. Students are expected to apply the knowledge gained from this course to specify, design, and implement management models and agent architectures to monitor and manage networks, devices, and/or applications. Students will be exposed to a commercial Network Management Systems such as the HP Openview Network Node Manager.

Evaluation

Assignments (30%)

Mid-term (20%)

Class Participation (10%)

Final Exam or Project Presentation (40%)

Course Outline

1. Introduction and Overview

- Goals of Network Management
- The Telecommunication Management Network Model
- The OSI Network Management Model
- The TMN Network Model
- The TCP/IP Internet Management
- Element, Network, and Service Management

2. TCP/IP Management: SNMP Overview

- Evolution of SNMP Management standards
- SNMP Message Processing, Security, and Access Control
- Abstract Syntax Notation One (ASN.1) and Basic Encoding Rules (BER)
- SNMP Protocol Messages (SNMP PDUs, GET, SET, and TRAP PDU Structures)
- Structure of Management Information (SMI)
- Management Information Base (MIB) Modules: MIB-II, RMON, and Host MIB

5. TCP/IP Management: SNMPv3

- The SNMPv3 Message Format, Security Models and Parameters
- View Based Access Control Model
- Groups, Security Level, Contexts, MIB Views, Access Policy
- SNMPv3 Applications
- The Management Target MIB Module
- The Notification MIB Module

6. Distributed Network Management

- Distributed Network Management Architectures
- Agent Extensibility (AgentX) Protocol
- Definitions of Managed Objects for the Delegation of Management Scripts
- Definitions of Managed Objects for Scheduling Management Operations
- Distributed Management Expression MIB

7. Network Management Systems

- FCAPS Management
- HP Openview Network Node Manager
- SNMPc Network Management System

References

- 1 David Zeltserman, "A Practical Guide to SNMPv3 and Network Management", Prentice Hall
- 2 Douglas R. Mauro, Kevin J. Schmidt, "Essential SNMP", O'Reilly
- 3 David T. Perkins, Evan McGinnis, "Understanding SNMP MIBs", Prentice-Hall
- 4 RFC 1213, "Management Information Base for Network Management of TCP/IP internets: MIB-II".
- 5 RFC 2578, "Structure of Management Information Version 2 (SMIV2)".
- 6 RFC 3416, "Version 2 of the Protocol Operations of the Simple Network Management Protocol".
- 7 RFC 3411, "An Architecture for Describing Simple Network Management Protocol Management Frameworks".
- 8 RFC 3412, "Message Processing and Dispatching for the Simple Network Management Protocol".
- 9 RFC 3413, "Simple Network Management Protocol (SNMP) Applications".
- 10 RFC 3414, "User-based Security Model for Version 3 of SNMP".
- 11 RFC 3415, "View-based Access Control Model (VACM) for the Simple Network Management Protocol".
- 12 RFC 3231, "Definitions of Managed Objects for Scheduling Management Operations".
- 13 RFC 3165, "Definitions of Managed Objects for the Delegation of Management Scripts".