TTM 4128 Network and Service Management: Plan for spring term 2012.

(http://www.item.ntnu.no/academics/courses/ttm4128/)

(Version 8, 2401.2012 by Finn Arve)

Contents

1. Overall learning objectives

- Knowledge
  - To get a *basic understanding* of principles and architectures for management of networks and networked services
  - To get a *profound understanding* of SNMP as an architecture and platform for network management
  - To get a *profound understanding* of Web-based management
  - To get a *basic overview* of the area Adaptive and Autonomic Systems
- Skills
  - To be able to communicate, reason and creatively think about management of networks and networked services
  - To be able to design, implement and use web-based platforms for network management
  - To be able to configure and use Net-SNMP for network management

2. Lectures, assignments and exercises

Lectures: Mondays 11.15-14.00 in EL4
Exercises/Assignments: Tuesdays 17.15-19.00 in EL4 or SAHARA.

2.1. Lecture Structure

A) General: (Finn Arve)	1 week
A.1. Introduction and Course Overview	
A.2. Standards and Model Foundations	
B) SNMP based management (Finn Arve)	4 weeks
B.1. ASN.1	1 week
B.2. SNMPv1	2 weeks
B.3. SNMP v2-3	1 week
C) WEB-based Management	5 weeks
C.1. WEB-based platform technologies (Thanh)	2 week
C.2. WEB management standards (Mazen)	3 weeks
D) Adaptive and Autonomic Systems (Mazen)	1 week

2.2. Semester assignment:
There will be **two** Semester assignment deliveries in the spring 2012.

Part 1: Network management based on SNMP.
Part 2: Network management based on Web-services and Semantic web.

The semester assignments will be graded with weight 33%. The grading is both based on the written submission as well as presentation and demonstration. The assignment will be graded by a %-score (0-100%). The grading of the assignments will not be published before the final grade is published.
Responsible: Mazen/Jonas

2.3. Exercises:
Exercise 1 General (Lab)
Exercise 2 SNMPv1 (Theoretical)
Exercise 3 SNMP v1/v2 , Net-snmp (LAB)
Exercise 4 SNMP v2/v3 (Theoretical)

The exercises will still be voluntary. The understanding of the exercises as well as semester assignment will be tested during the final exam.
Responsible: Finn Arve/Mazen/Peach/

2.4. Schedule

Week no/date	**Lecture**	**Lecturer**	**Exercises/ Assignment**
2	9/1: 11.15-14.00, EL4 A: General A.1. Introduction and Course Overview A.2.Standards and Model Foundations	FAA	
3	16/1: 11.15-14.00, EL4 B1: SNMP based management ASN.1 (3 hours)	FAA	17/1: 17.15-19.00, Sahara Tuition Exercise 1: General, Lab
4	23/1: 11.15-14.00, EL4 B2: SNMPv1 (3hours)	FAA	24/1: 17.15-19.00, EL4 Tuition Exercise 2: SNMP v1, Theoretical
5	30/1: 11.15-14.00, EL4 B2: SNMPv1 (2 hours) B3: SNMPv2-v3 (1 hour)	FAA	31/1: 17.15-19.00, Sahara Tuition Exercise 3: SNMP v1/v2, Net-snmp, Lab
6	6/2: 11.15-14.00, EL4 B3: SNMPv2-v3 (2hours) Guest lecture UNINETT (1 hour)	FAA	7/2: 17.15-19.00, EL4 Publication Semester Assignment Part 1, Net-snmp information
7	13/2: 11.15-14.00, EL4 C1: Web-based platform technologies - 1 (3 hours)	Thanh	14/2: 17.15-19.00, Sahara Tuition Semester Assignment Part 1

8	**No lectures**		21/2: 17.15-19.00, Sahara Tuition Exercise 4, SNMP v2/v3 Tuition Semester Assignment Part 1
9	27/2: 11.15-14.00, EL4 C1: Web-based platform technologies - 2 (2 hours) Web Service and Semantic Web tools (30 min)	Thanh/ Peach	2/3 before16:00 Delivery Semester Assignment Part 1
10	5/3: 11.15-14.00, EL4 C2: WEB management standards	Mazen	6/3: 17.15-19.00, EL4 Publication Semester Assignment Part 2
11	12/3: 11.15-14.00, EL4 C2: WEB management standards	Mazen	13/3: 17.15-19.00, Sahara Tuition Semester Assignment Part 2
12	19/3: 11.15-14.00, EL4 C2 WEB management standards	Mazen	20/3: 17.15-19.00, Sahara Tuition Semester Assignment Part 2
13	26/3: 11.15-14.00, EL4 D: Adaptive and Autonomic Systems	Mazen	
14	Easter		
15	**No Lectures**		10/4: 17.15-19.00, Sahara Tuition Semester Assignment Part 2
16	**No Lectures**		20/04 at latest 16:00 Delivery Semester Assignment Part 2

2.5. WEB-page
Responsible: Peach.

2.5. Final Exam
May 19th, 0900-1200, Support type D

3. Learning objectives for the various parts

Part A.2. Standards and Model Foundations.

- Knowledge
  - To get a *basic overview* and understanding of OSI Network management, SNMP and TMN
  - To provide a basis for a *profound understanding* of fundamental concepts such as Manager, Agent, Managed Objects, MIB type, MIB instance, MDB (Management database), MOIV (Management Object Instance Values)
  - To provide a basis for a *profound understanding* of naming and identification of MIB object types

Part B. SNMP (Simple Network Management Protocol)

Part B.1. Abstract Syntax Notation 1 (ASN.1)

- Knowledge
  - To get a *basic understanding* of the general use of ASN.1 and BER (Basic Encoding Rules) and the ASN.1 object identification system
  - To provide *a basis* for the later use of ASN.1/BER in the SNMP framework. ASN.1/BER will later be used for
    - *object definitions*
    - *SNMP protocol definitions*
    - *SNMP PDU (Protocol Data Unit) instance encoding and decoding*
- Skills
  - To be able to *understand* ASN.1 module definitions
  - To be able to use BER to *encode* instances of ASN.1 types and also to use BER to *decode* encoded instances of ASN.1 types

Part B.2 SNMPv1 **(Textbook Chapter 4 and 5)**

- Knowledge
  - To get a profound understanding of SNMPv1 *SMI* and *MIB* and the differences between SMI and MIB
  - To get a profound understanding of the *use of* SNMP protocol to access instances of managed objects
  - To get a basic understanding of SNMP Administrative model
  - To get a profound understanding of SNMP protocol PDU structure
- Skills
  - To be able to communicate, reason and creatively think about management based on SNMPv1
  - To be able to configure and use Net-SNMP for network management

Part B.3 SNMPv2. (Textbook Chapter 6)

- Knowledge
  - To get a basic understanding of the changes to the SNMPv1 framework introduced by SNMPv2
    - *Extended framework with Compliance and Capability definitions*
    - *Extended and revised SMI with extended set of MIB-tree nodes and MACROES*
    - *New Managed object types in the MIB-tree: snmpTrapOID and snmpTrapEnterprise*
    - *Revised protocol with*
      - Common PDU structure for all PDU types
      - Unified use of Varbind elements
      - GetBulk for more efficient Table handling
      - InformRequest for Manager-to-Manager communication

Part B.4 SNMPv3 (Textbook Chapter 7)

- Knowledge
  - To get a basic understanding of the changed architecture as well as the added functionality introduced by SNMPv3
    - Modularization of the functionality architecture of the SNMP entities (= the physical nodes containing manager, agents, proxies)
      - *Engines, Applications and Names*
      - *Abstract Service Interfaces and Service Primitives*
    - Added Security functionality
      - *Threats,*
      - *User-based Security Model*
      - *Access Control*
      - *Revised protocol*

Part C. Web-based Management

Part C.1 Web-based platforms technologies: Web services and Semantic web

- Knowledge
  - To get a *basic understanding* of the Semantic Web and its usage
    - RDF (Resource Description Framework) and RDF Schema
    - OWL (Web Ontology Language)
  - To get a *basic understanding* of the Web service concept and architecture
    - WSDL (Web Services Description Language)
    - SOAP (Simple Object Access Protocol)
  - To get a basic overview of the tools to be used in the semester assignment second delivery.
- Skills
  - To be able to communicate, reason and creatively think about the use of web technologies and to make a basis for the use web-technologies in the semester assignment

Part C.2: Web-based management standards: WBEM, WS-management and NETCONF

- Knowledge
  - To get a *basic understanding* of the usage of Web technologies in Network management
  - T*o* get a basic overview and understanding of WBEM (WEB-Based Enterprise Management) and CIM (Common Information Model)
  - T*o* get a *basic overview* and understanding of the WS-Management (WEB Services for Management)
  - To get a basic overview and understanding *of NETCONF* (Network Configuration Protocol)

Part D: Adaptive and Autonomic Systems

- Knowledge
  - To get a basic overview of the principles of Autonomic communication
  - To understand the Self-* features
  - To get a basic overview and understanding of the TAPAS architecture

4. Learning objectives for exercises and assignment

Exercise 1: General (LAB)

Knowledge

- to obtain a profound understanding of the following common operating system commands:
  - nslookup/dig,
  - traceroute/tracepath/tracert,
  - ping,
  - ipconfig/ifconfig/winipcfg.

Skills:

- to be able to use above listed common operating commands/ tools to get information from network components
- to be able to select the appropriate commands/tools to get specified information from network components

Exercise 2: SNMPv1 (Theoretical)

Skills

- to be able to understand information acquired by an SNMP NMS
- to be able to apply the knowledge of ASN.1/BER
  - to write some ASN.1 expressions
  - to encode management information
- to be able to determine the MIB objects needed to find some network information
- to be able to apply the knowledge of ASN.1 and SMI to write a MIB module
- to be able to apply the knowledge of tabular aggregate objects for a table-form MIB object

Exercise 3: SNMP v1/v2 , Net-snmp (LAB)

Skills

- to be able to use the following commands in *net-snmp* tools:
  - `snmptranslate`
  - `snmpget`
  - `snmpgetnext`
  - `snmpwalk`
  - `snmptable`
- to be able to determine the MIB objects needed to find management information and use the suitable command(s) to get their instance values.

Exercise 4: SNMPv2/v3 (Theoretical)

Skills

- to be able to write SNMP engine ID in SNMPv1 and SNMPv3 formats
- to be able to draw time sequence operation for get-request and get-response messages using the knowledge of the command generator and command responder applications
- to be able to define configuration parameters for a notification generator using the knowledge of SNMPv3 MIB

Assignment: Network management based on web-services and semantic web (Practical)

Part 1 Network management based on SNMP.

Skills

- to be able to configure and run an SNMP agent in a host using *net-snmp* tool suite (`snmpd`)
- to be able to determine the MIB objects needed to find management information and use the suitable command(s) to get their values
- to be able to write an SNMP module that specificies SNMP notifications
- to be able to configure and run a trap receiver using *net-snmp* tool suite (`snmptrapd`)
- to be able to use a *net-snmp* command to send notifications (`snmptrap`)

Part 2: Network management based on web-services and semantic web.

Skills

- to be able to create an ontology (OWL) for network management
- to be able to create a semantic web application using ***Jena***, a Java Framework for building Semantic Web application
- to be able to deploy a web service application using:
    - ***Apache*** Axis
    - A***pache*** Ant