

## TTM 4128 Exam May 19<sup>th</sup> 2009

### Enclosed :

ASN.1 Encoding Scheme  
Shortened version of RFC 1905

### Task 1: SNMPv1 (10%)

Please provide short answers.

1.1 Explain shortly the application area of SNMP.

1.2 List five among the variety of kind of information objects that are identified by use of object identifiers defined by the Management Information Tree.

1.3 We are considering components of the organization, information and communication models of the SNMP management model. Define the main components defined in the various models and give a simple example that explains how components are used in a real executing network management system.

### Task 2: ASN.1 encoding (10%)

2.1 What is the type field BER encoding of the ASN.1 type SEQUENCE? What is the total BER encoding of an instance of INTEGER with value 1?

2.2 What is the BER encoding of an instance of OBJECT IDENTIFIER with value {1 3 6 1}?

2.3 What is the total BER encoding of an instance the following ASN.1 defined type ProtocolMessage, where

ProtocolMessage ::=

SEQUENCE {community INTEGER, id OBJECT IDENTIFIER, ApplicationSyntax}  
with ApplicationSyntax ::= CHOICE { INTEGER , OBJECT IDENTIFIER }

and where:

community INTEGER ::= 1

id OBJECT IDENTIFIER ::= {1 3 6 1}

ApplicationSyntax in this instance is INTEGER with value 1

### Task 3: Tables as managed objects (10%)

Please provide short answers.

3.1 What are Tables used for in SNMP?

3.2 What are the five basic concepts used to define the structure of Tables in SNMPv1?

3.3 Explain shortly the purpose and role of the SNMPv2 Textual Convention RowStatus?

#### **Task 4: SNMP protocol v2 (10%)**

**4.1** Explain what a notification is. A short version of RFC 1905 is given as Attachment. Explain short the encoding of instances of the type Varbind for SNMP PDUs not containing notifications.

**4.2** An example of the use of NOTIFICATION-TYPE MACRO is given as follows:

```
linkUp NOTIFICATION-TYPE
    OBJECTS      {ifIndex}
    STATUS       current
    DESCRIPTION  “ .....”
 ::= {snmpTraps 4}
```

Explain the various elements of this definition.

**4.3** An instance of linkUp is sent from an Agent to a Manager. In this case the Varbind list will carry 4 TLV elements. The first TLV element is TLV for sysUpTime. What are the 3 other elements?

#### **Task 5 CIM and CIM /WBEM. (20%)**

Please provide short answers.

##### **5.1. CIM.**

- What is CIM and what are the CIM components?
- What is UML used for in the CIM standard?
- What are “Named Elements” in a CIM representation? Explain the usage.

##### **5.2. CIM/WBEM.**

- Explain the role of CIM in WBEM.
- What is the difference between cimXML and XML-CIM?

##### **5.3 CIM related to SNMP**

Discuss the relationship between some of the main concepts of SNMP and some of the main concepts of CIM and CIM/WBEM.

#### **Task 6. Web services (10%)**

Please provide short answers.

**6.1.** What is Web service?

**6.2.** How can Web service be used in network management? Sketch and explain one solution.

### Task 7. Design of a network management application system (20%)

A network management application to manage network resources remotely shall be designed. The application will consist of two parts. Part 1 is running on a PC, and Part 2 is running on a Managed Node (storage devices, CPUs, databases, etc.)

The communication between your PC and the node is only possible via HTTP protocol. See the figure. Network management requests/responses are carried as HTTP payload.



Assume also there are a firewall and a proxy between the PC and the Node. The firewall prevents any remote connectivity (ssh, vnc, telnet, etc.), while the proxy does not allow any network management PDUs at the application protocol level. This can for instance be realized by filtering mechanisms at certain port numbers.

To develop your network management application, you can make use of semantic web, web services, and a network management standard such as SNMP or CIM/WBEM.

Based on all these assumptions defined above, the network management application system shall be described.

- 7.1. Describe your proposed solution regarding components, connections, protocols, used development platforms, servers, etc.
- 7.2 Assume the proxy is also applying content-filtering, e.g. not allowing http PDUs that contains any standard object identification for resource management. How can you overcome this obstacle?
- 7.3 What could ontology reasoning be used for in your network management application?
- 7.4 Assume that SOAP traffic is only allowed in one direction from your PC to the Managed Node. How is it possible to obtain regular updates from Managed Node?

### Task 8. Autonomic/Adaptive Systems (10%)

Please provide short answers.

- 8.1 List the main Self-\* properties of autonomic systems.
- 8.2 Explain in more detail two of such Self-\* properties. Give examples of platforms/systems that support autonomic/adaptive systems.