

Management of Network Application - MNA (265300)

Examination

Monday January 19, 2009

13:30 – 17:00

Location: LA A107

Lecturer: dr. ir. B.J.F. van Beijnum

General remarks

This is an open book examination; this means that you are allowed to use:

- the lecture sheets
- the additional (mandatory and optional) readings

The mark for the written examination is 0,4 of the final grade; however a score of at least 5.5 for the written examination is a must to pass for this course! The mark for the JMX Project and the Student Lecture are each 0,3 of the final mark.

--- Examination Questions on following pages ---

Question 1. Functional Areas (max. 10 points: 4+6)

ISO has defined 5 functional areas of management, these are: Fault Management, Configuration Management, Accounting Management, Performance Management and Security Management.

- a. Give a short description of these five functional areas.
- b. Consider the monitoring activity; give, for each functional area, two examples of what managed objects could be controlled in support of the respective functional area.

	Fault	Configuration	Accounting	Performance	Security
Control	1.	1.	1.	1.	1.
	2.	2.	2.	2.	2.

Question 2. Organization Model (max. 10 points; 2 + 2 + 2 + 4)

Consider an ICT infrastructure of an enterprise. For the purpose of management of this infrastructure:

- there are two dedicated management systems for the control of managed resources: one for the communication network(s); and one for the servers and the applications running on these servers. These two management systems are responsible for the configuration management of the network and servers/applications respectively.
- there is one management system for performance management. Based on the collected performance data directly collected from the various elements in the ICT infrastructure, this management system tunes the performance of the various resources via the management systems that control the configuration of these resources. Any change in the configuration in the ICT infrastructure is reported to the monitoring management system so that it can adapt the performance monitoring functionality.
 - a. Explain briefly the concepts comprising a management organization model.
 - b. Explain briefly the difference between a Management Information Base (MIB) and a Management Data Base (MDB).
 - c. Briefly explain the principles of a 2-tier, 3-tier and peer-to-peer management model.
 - d. Explain, for the above case description, the management model (i.e. in terms of 2-tier, 3-tier and/or peer-to-peer).

Question 3. Managed Objects (max. 10 points: 3+3+4)

- a. What is a managed object in SNMP? Hence, you are not expected to describe the properties by which a managed object is defined (i.e. an extensional description), but an intentional definition or description (i.e. a description of what it is or represents in).

- b. Discuss two weak points of the collection of SNMP MIB modules defined for the management of applications.
- c. Briefly discuss three key differences between the modeling principles used to specify managed objects in SNMP and JMX.

Question 4. WSDM - Web Services Distributed Management (max. 10 points: 2+2+2+2+2)

Web Services Distributed Management (WSDM) is a specification for the management of and using Web Services and comprises Management using Web Services (MuWS) and Management of Web Services.

- a. Describe briefly what the MuWS and MoWS is.
- b. Give two advantages of WSDM compared to SNMP.
- c. What is a manageability capability?
- d. Describe the two basic management patterns in the Web Services Management Architecture
- e. The concept "manageability capability" is a key concept to support composability of WSDM based resource management. Explain how this composability is achieved.

Question 5. Autonomic Computing (max. 10 points: 1 + 1 + 2 + 3 + 3)

- a. Briefly describe the goal or purpose of autonomic computing.
- b. Briefly describe the main architectural concepts of autonomic computing.
- c. Briefly discuss what role CIM and SNMP can play in the design and implementation of autonomic elements.
- d. ISO based management distinguishes 5 functional areas, whereas in autonomic computing often the properties self-configuring, self-healing, self-optimizing and self-protecting are used. Briefly discuss if and how these functional areas and properties relate.
- e. Discuss three key differences between the traditional ISO based Management Architecture and Autonomic Computing.

Question 6. Papers on Autonomic Computing (max. 10 points: 3 + 4 + 3)

During the course the following four papers have been presented and studied:

1. N. Kandasamy, S. Abdelwahed, J. P. Hayes, "Self-Optimization in Computer Systems via On-Line Control: Application to Power Management," Proceedings of the 1st International Conference on Autonomic Computing (ICAC'04), 2004.

2. G. Tesauro, D. M. Chess, W. E. Walsh, R. Das, I. Whalley, J. O. Kephart, and S. R. White, "A multiagent systems approach to autonomic computing," *Autonomous Agents and Multi-Agent Systems*, 2004.
3. G. Di Caro, F. Ducatelle, and L. M. Gambardella, "AntHocNet: An adaptive nature-inspired algorithm for routing in mobile ad hoc networks," *European Transactions on Telecommunications, Special Issue on Self-organization in Mobile Networking*, 2005.
4. S.I. J. Kaufman, T. Lehman, G. Deen, J. Thomas, "OptimalGrid – autonomic computing on the Grid" IBM article, 2003.

Select one of these papers and give answers to the following questions.

- a. In your selected paper various functions have been describe or support for various autonomic computing functions have been described. Discuss these (support) functions briefly, and motivate to which of the MAPE functions each related.
- b. An autonomic element also includes and uses "knowledge". What is meant by this term in autonomic computing, and briefly describe what this knowledge is in the paper, or how knowledge representation is supported.
- c. Briefly describe the extent to which the self-CHOP properties are addressed in the paper.

--- End of Examination Questions---