Software Requirements Specification

SNMP Agent & Network Simulator

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Table of Contents

1. Introduction

1.1. Problem Definition

SNMP Agent & Network Simulation project is based on the simulation of the network devices which will be used in a huge area or with a huge number, and it is a very costly operation. We know indeed that it can be managed by using simulation of those many computers and giving the whole control of this system to just one or two computers, even simple laptop PCs. With this project, it will be possible to create big networks like environments without investment on hardware. Our sponsor company, Siemens, has an application named HiPath Fault Management; nevertheless, it can only be used on separate machines with long testing time and insufficient results.

1.2. Purpose

The purpose of this document is to give detailed information about the overall description of SNMP Agent & Network Simulation project, the requirements, data model and behavioral model of the project, which are described in detail in the following chapters. Moreover, the team structure of our group, the estimated schedule and process model are provided at the end of the document.

1.3. Scope

The scope of this document includes the requirements of SNMP Agent & Network Simulation project, definitions of product functionalities, constraints, assumptions, dependencies, behavioral and data models. The audience of this document comprises the engineers who develop SNMP Agent & Network Simulators and the users of the product.

1.4. User and Literature Survey

There are a variety of products in the market which allows users to develop, train and test SNMP management applications without purchasing expensive hardware. Here is the list of available products in the market:

1.   SimpleAgentEnterprise, released by SimplySoft [1]

2.   MIMIC® SNMP Agent Simulator, released by Gambit Communications [2]

3.   WebNMS Simulation Toolkit 7, released by WebNMS [3]

4.   DynamicSNMP® Java SNMP Agent Simulator, released by Monfox [4]

5.   SNMP Agent Simulator Version 3.3, released by Ireasoning Networks [5]

6.   Multi Server Simulator, released by Paessler [6]

Although these products were developed for the same purposes, they differ from each other according to the environments they run on, the limits and constraints and additional functionalities.

1.5. Definitions and Abbreviations

SNMP: Set of operations which give the administrators the ability to change the properties and state of some SNMP-based devices.
SNMP Agent: A piece of software that runs on the network devices being managed by SNMP Simulator.
MIB (Management Information Base): Database of the objects that the agent tracks.

1.6. References

[1] SimplySoft Home Page, "SimpleAgentEnterprise",
    http://www.snmptester.com/SimpleAgentEnterprise.html
[2] Gambit Communications Home Page, "MIMIC® SNMP Agent Simulator",
    http://www.snmpsimulation.com/site/products/snmp_simulator.shtml
[3] WebNMS Home Page, "WebNMS Simulation Toolkit 7",
    http://www.webnms.com/simulator/index.html
[4] Monfox Home Page, "DynamicSNMP® Java SNMP Agent Simulator",
    http://www.monfox.com/dsnmp_sim.html
[5] Ireasoning Networks Home Page , "SNMP Agent Simulator Version 3.3",
    http://ireasoning.com/snmpsimulator.shtml
[6] Paessler Home Page, "Multi Server Simulator",
    http://www.paessler.com/serversimulator
[7] Cisco Home Page, "Simple Network Management Protocol (SNMP)",
    http://www.cisco.com/en/US/docs/internetworking/technology/handbook/SNMP.html
[8] IEEE Std 830-1998: IEEE Recommended Practice for Software Requirements Specifications

1.7. Overview

This document includes software requirements for SNMP Agent & Network Simulation project. It explains functionalities, dependencies, constraints of the software. It contains use cases, flow-charts and diagrams. In the part 2 overall descriptions is explained. Overview is shown in the figure 2.1. After general overview, product functions are listed. In the last title of part 2, constraints, assumptions and dependencies are shown. Most critical part is the part 3. Requirements are listed in order in this part. Part 4 and 5 describes which data type will be used. Our schedule is shown in part 6 and part 7 is the conclusion.

2. Overall Description

2.1. Product Perspective

SNMP Agent & Network Simulation project is web-based software which can be accessed by the owner company. In order to use the system, users must login to system by using their username and password which are supplied by their company. Most probably this username and password will be default. If someone wants to change the login information, it will be arranged by changing some line of code of the database. The structure of the software is shown in figure below. This simple diagram shows the major components of the overall system. Each device's data are sent to the server by Internet. Since the system will be web-based, it has 2 interfaces. The configuration of the simulation environment is shown on the left part of the figure below. CRUD (create, read or retrieve, update, delete or destroy) functions are available and also there will be some scenarios, some network topologies. While using the simulation, user will be able to stop and pause the simulation.

Figure 1

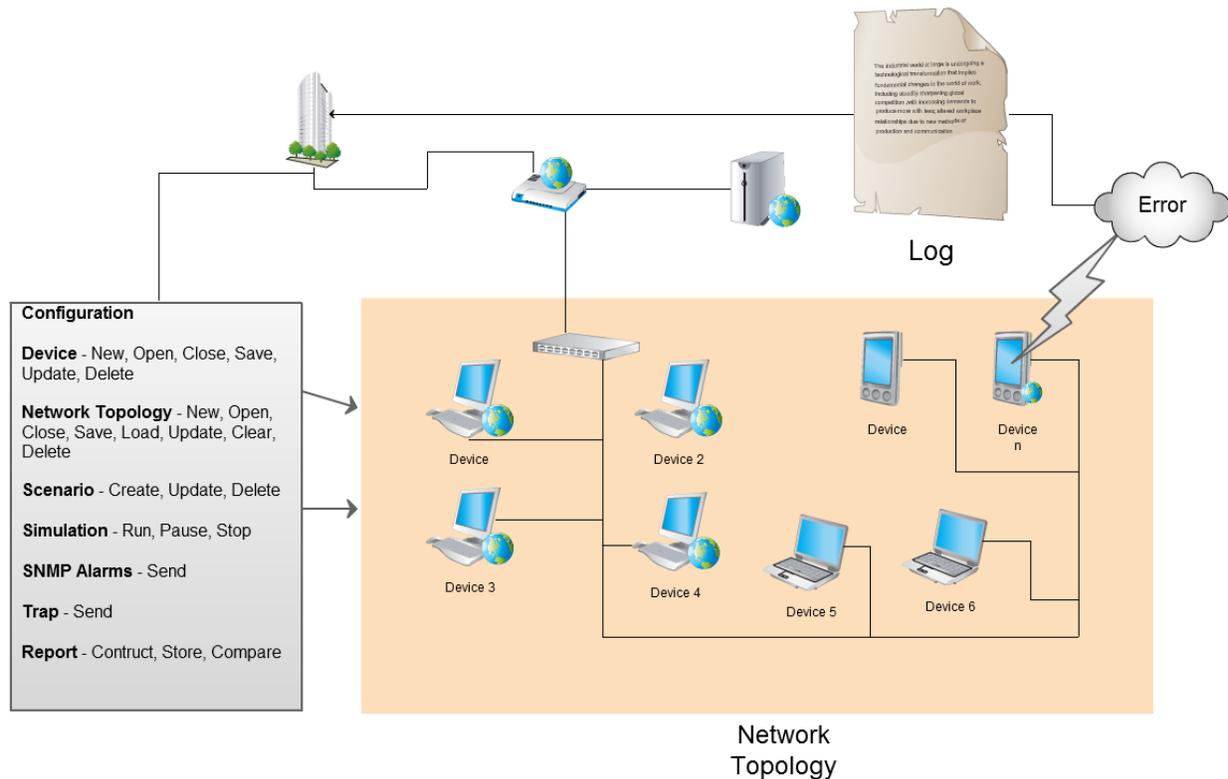### 2.2. Product Functions

SNMP Agent & Network Simulator provides the following functions to the users:

- **Device - New, Open, Close, Save, Update, Delete**

Users can create new devices in a required number, and save them to the system. All saved devices can be used whenever user needs them in the simulation. Moreover, a device which is

already created and stored in the system can be updated according to the scenarios or other factors, while user can delete a device, if there is no need for the device. When a device is used on a simulation, it is opened, and it is closed after the simulation terminates.

- **Network Topology - New, Open, Close, Save, Load, Update, Clear, Delete**

    Users can create new network topologies and add devices to the network topologies. Users can save the network topologies, and use a saved topology by loading it whenever users need it. In order to project a topology, user must open it. After projection is done, user closes the topology. Users can update the topologies, or delete them if they are not necessary anymore.

- **Scenario - Create, Update, Use, Save, Load, Delete**

    There are two types of scenarios in the system: default scenarios and user-defined scenarios. Users can both use default scenarios and create their own scenarios and use them. Moreover, users can save the scenarios they defined for later possible uses. If necessary, users can update the scenarios for their specific purposes. When there is no need for a scenario, users can delete it.

- **Simulation - Run, Pause, Continue, Stop, Real Time, Shortened**

    Users can simulate a network topology with devices by selecting run function. In any time, users can pause the simulation and continue to the simulation. In any phase, user can terminate the simulation by selecting stop function. There are two types of simulation, first of all is real time simulation and the other one is shortened simulation. In the first type of simulation, user can observe the network and the devices in real time; however, in the second option, user can reduce the time to a specified value in order to get results within a shorter time.

- **SNMP Alarms - Send**
    In case of any errors or crashes in one or more devices, the devices which have errors send notices of facility problems instantly to the simulation system in the form of SNMP TRAPs.

- **Report - Construct, Store, Compare**
    All events, Traps and errors are kept in logs after each simulation to give detailed information about the process. Users can monitor these logs, save them and compare two or more reports.

2.3. Constraints, Assumptions and Dependencies

2.3.1 Hardware Requirements

    The system will be used by one common user who will be the employee of the owner company of the software.
So there will be hardware requirement for users, developers and server.

Hardware Requirements for Developer:
- Intel Core 2 Duo 2 GHz processor
- 4 GB Ram
- Graphics Card

- 50 GB HDD Space
- Internet connection

Hardware Requirements for Server:
- Intel Pentium Core 2 Duo 2.24 GHz processor
- 2 GB Ram
- Graphics Card
- 40 GB HDD Space
- Fast Internet connection

Hardware Requirements for User (non mobile):
- Celeron 1.6GHz processor
- 256 MB Ram
- Graphics Card
- Internet connection

2.3.2 Software Requirements

Software requirements are in 3 groups: developer, server and the user.

Software Requirements for Developer:
- Windows XP / Vista / 7
- Windows server
- Eclipse
- Google Chrome or Mozilla Firefox

Software Requirements for Server:
- Windows Server 2005/2008

Software Requirements for the user:
- Google Chrome or Mozilla Firefox

The system will be built in using these protocols: SNMP v1 (version 1) and SNMP v2 (version 2). All system will be built on this limitation. For the safety, system will check the scenario whether there is a mismatch or not. In other words the result of simulation is checked that given values is appropriate for the run scenario. For the security, there will be a login screen to enter the system, since the system will be only used by the owner company. Other accesses are not allowed to use the system.

3. Specific Requirements

Aggregated explanation about interface requirements are given in 3.1. Detailed explanation about the functions are given in 3.2.

3.1. Interface Requirements

User interface is provided from a web-browser. All the actions and simulation can be managed and viewed remotely using a web-browser. After running the simulation configuration panel will be disabled and the states of devices can be seen.

This software product generates outputs for other software that supports SNMP and communicates with them. However this software generates its own input creating a scenario and network-topologies and process through them.

3.2. Functional Requirements

3.2.1. Display the List of Devices

Use-case name: Display the list of devices	**ID:** 1	**Priority:** High
Primary Actor: User	**Use-case Type:** Detail/Essential	
Stakeholders and Interests: User – wants to display list of devices		
Brief Description: This describes how a user displays list of devices		
Precondition: User logs in successfully. **Trigger:** User selects "display the list of devices" option.		

Normal Flow of Event:
A- The system directs user to a "device list" page.
    i. All devices in the system are listed on the screen.
    ii. Device options are displayed on the screen.		

Exceptions: Device list can't be displayed		

3.2.2. Create a New Device

Use-case name: Create a new device	**ID:** 2	**Priority:** High
Primary Actor: User	**Use-case Type:** Detail/Essential	
Stakeholders and Interests: User – wants to create a new device in the system		
Brief Description: This describes how a user creates new devices in the system.		

| **Precondition:** |
| User logs in successfully. |
| **Trigger:** |
| User selects "create new device" option. |
| **Normal Flow of Event:** |
| A- The system directs user to a "create device" page. |
| i. All required fields displayed on the screen as text fields. |
| B- The user enters the required information |
| i. If the user clicks save, new device is created; user is forwarded to a page in which all properties of the new device are displayed. |
| ii. If the user clicks cancel, the user is returned to the menu without saving changes. |
| **Exceptions:** Device can't be created exception |

3.2.3. Open a Device

Use-case name: Open a device	**ID:** 3	**Priority:** High
Primary Actor: User	**Use-case Type:** Detail/Essential	
Stakeholders and Interests:		
User – wants to open a device which is already created		
Brief Description:		
This describes how a user opens devices which the user previously saved into the system.		
Precondition:		
User logs in successfully and lists all devices.		
Trigger:		
User selects a device by clicking on it.		
Normal Flow of Event:		
A. User clicks on a device from the list of devices on the screen.		
i. If a problem occurs, a message box which states that the device selected can't be opened at the moment with a possible reason is displayed.		
ii. If no error occurs, all properties of the device are displayed on the screen.		
Exceptions: Device can't be opened exception		

3.2.4. Close a Device

Use-case name: Close a device	**ID:** 4	**Priority:** High
Primary Actor: User	**Use-case Type:** Detail/Essential	
Stakeholders and Interests:		
User – wants to close a device which already opened		
Brief Description:		
This describes how a user close a device after series of operations		
Precondition:		
User logs in successfully and opens a device previously.		
Trigger:		
User selects "close the device" option.		
Normal Flow of Event:		
A. User clicks "close" button on the device screen.		
i. User is directed to the list of devices.		

Exceptions: -

3.2.5. Save a Device

Use-case name: Save a device	**ID:** 5	**Priority:** High
Primary Actor: User	**Use-case Type:** Detail/Essential	
Stakeholders and Interests: User – wants to save a device which is not saved to the database yet		
Brief Description: This describes how a user saves a device into the system		
Precondition: User logs in successfully and creates a new device. **Trigger:** User selects "save device" option.		

Normal Flow of Event:
 1- User fills the required fields
 2- If user clicks on the save button
     i. System checks whether all required fields are filled
     ii. If there are some required fields which is empty system displays a warning
     iii. If all required fields are filled, system creates a new device and save to the database
 3- If user clicks on cancel button, user is returned to the device page without any change.		

Exceptions: Device can't be saved exception		

3.2.6. Update a Device

Use-case name: Update a device	**ID:** 6	**Priority:** High
Primary Actor: User	**Use-case Type:** Detail/Essential	
Stakeholders and Interests: User – wants to update the properties of a device which is already saved to the database		
Brief Description: This describes how a user updates the properties of a device which is stored in the system		
Precondition: User logs in successfully and opens a device. **Trigger:** User selects "update the device" option.		

Normal Flow of Event:
 A- A page is opened where all current options are listed in the text fields which can be changed.
 B- User changes the required values from the text fields
     i. If user selects save button, new information is replaced with the old information on the database
     ii. If user clicks on cancel button, user is returned to the device page without any changes.		

Exceptions: Device can't be updated exception		

3.2.7. Delete a Device

Use-case name: Delete a device	**ID:** 7	**Priority:** High
Primary Actor: User	**Use-case Type:** Detail/Essential	
Stakeholders and Interests:		

User – wants to delete a device from the database which is not required any more
Brief Description:
This describes how a user removes a device from the system, which is not required by the user any more
Precondition:
User logs in successfully and opens a device
Trigger:
User selects "delete device" option.
Normal Flow of Event:
A-System directs to a confirmation page which asks whether user is sure to delete the device
i. If the user selects yes, device is removed from the database, user is forwarded to device page.
ii. If the user selects no, device is not deleted, user is forwarded to the previous page.
B. If the user clicks cancel, the user is returned to the menu without saving changes.
Exceptions: Device can't be deleted exception

3.2.8. Display the List of Network Topologies

Use-case name: Display the list of NTs	**ID:** 8		**Priority:** High
Primary Actor: User	**Use-case Type:** Detail/Essential		
Stakeholders and Interests:			
User – wants to display list of network topologies			
Brief Description:			
This describes how a user displays list of network topologies			
Precondition:			
User logs in successfully.			
Trigger:			
User selects "display the list of network topologies" option.			
Normal Flow of Event:			
A- The system directs user to a "network topologies list" page.			
i. All network topologies in the system are listed on the screen.			
ii. Network topology options are displayed on the screen.			
Exceptions: Network topologies list can't be displayed			

3.2.9. Create a New Network Topology

Use-case name: Create a new network topology	**ID:** 9		**Priority:** High
Primary Actor: User	**Use-case Type:** Detail/Essential		
Stakeholders and Interests:			
User – wants to create a new network topology			
Brief Description:			
This describes how a user creates a new network topology			
Precondition:			
User logs in successfully.			
Trigger:			
User selects "create new network topology" option.			
Normal Flow of Event:			
A- The system directs user to a "create network topology" page.			

i. All required fields displayed on the screen as text fields.
B- The user enters the required information
i. If the user clicks save, new network topology is created; user is forwarded to a page in which all properties of the new network topology are displayed.
ii. If the user clicks cancel, the user is returned to the menu without saving changes.
Exceptions: Network topology can't be created exception

3.2.10. Open a Network Topology

Use-case name: Open a network topology	**ID:** 10	**Priority:** High
Primary Actor: User	**Use-case Type:** Detail/Essential	
Stakeholders and Interests: User – wants to open a network topology which is saved into the database before		
Brief Description: This describes how a user opens a network topology previously saved into the system		
Precondition: User logs in successfully.		
Trigger: User selects "open network topology" option and selects a network topology to be opened.		

Normal Flow of Event:
A. User clicks on a device from the list of network topologies on the screen.
    i. If a problem occurs, a message box, which states that the network topology selected can't be opened at the moment with a possible reason, is displayed.
    ii. If no error occurs, all properties of the network topology are displayed on the screen.		

Exceptions: Network topology can't be opened exception		

3.2.11. Close a Network Topology

Use-case name: Close a network topology	**ID:** 11	**Priority:** High
Primary Actor: User	**Use-case Type:** Detail/Essential	
Stakeholders and Interests: User – wants to close a network topology which is already opened		
Brief Description: This describes how a user closes a network topology which is already opened		
Precondition: User opens a network topology.		
Trigger: User selects "close network topology" option.		
Normal Flow of Event: A. User clicks "close" button on the network topology screen. i. User is directed to the list of network topologies.		
Exceptions: Network topology can't be closed exception		

3.2.12. Save a Network Topology

Use-case name: Save a network topology	**ID:** 12	**Priority:** High
Primary Actor: User	**Use-case Type:** Detail/Essential	

| **Stakeholders and Interests:** |
| User – wants to save a network into the database |

| **Brief Description:** |
| This describes how a user saves a network topology into the system for the first time |

| **Precondition:** |
| User opens a network topology. |
| **Trigger:** |
| User selects "save network topology" option. |

| **Normal Flow of Event:** |
| 1- User fills the required fields |
| 2- If user clicks on the save button |
| i. System checks whether all required fields are filled |
| ii. If there are some required fields which is empty system displays a warning |
| iii. If all required fields are filled, system creates a new network topology and save to the database |
| 3- If user clicks on cancel button, user is returned to the network topology page without any change. |

| **Exceptions:** Network topology can't be saved exception |

3.2.13. Load a Network Topology

Use-case name: Use-case name	**ID:** 13	**Priority:** High
Primary Actor: User	**Use-case Type:** Detail/Essential	

| **Stakeholders and Interests:** |
| User – wants to load a network topology previously saved into the database |

| **Brief Description:** |
| This describes how a user loads a network topology which is previously saved into the system |

| **Precondition:** |
| User logs in successfully. |
| **Trigger:** |
| User selects "load network topology" option and selects a network topology to be loaded. |

| **Normal Flow of Event:** |
| 1- A box which contains a directory selection panel and shows files in the selected directory appears on the screen. |
| 2- If user changes the directory, files are refreshed so that files in the new directory are displayed. |
| 3- If user select a file and click on the upload button, |
| i. File begins to be uploaded and a progress bar appears on the screen. |
| ii. After process finished, system asks whether user wants to upload another file or not. |

| **Exceptions:** Network topology can't be loaded exception |

3.2.14. Update a Network Topology

Use-case name: Update a network topology	I**D:** 14	**Priority:** High
Primary Actor: User	**Use-case Type:** Detail/Essential	

| **Stakeholders and Interests:** |
| User – wants to update a network topology previously saved into the database |

| **Brief Description:** |
| This describes how a user updates a network topology which is previously saved into the system |

| **Precondition:** |

User opens a network topology.
Trigger: User selects "update network topology" option.

Normal Flow of Event:
A- A page is opened where all current options are listed in the text fields which can be changed.
B- User changes the required values from the text fields
    i. If user selects save button, new information is replaced with the old information on the database
    ii. If user clicks on cancel button, user is returned to the network topology page without any changes.

Exceptions: Network topology can't be updated exception

3.2.15. Clear a Network Topology

Use-case name: Clear a network topology	**ID:** 15	**Priority:** High
Primary Actor: User	**Use-case Type:** Detail/Essential	
Stakeholders and Interests: User – wants to clear all fields of a network topology which is opened previously		
Brief Description: This describes how a user clears all fields of a network topology		
Precondition: User opens a network topology. **Trigger:** User selects "clear network topology" option.		
Normal Flow of Event: 1. All properties of the network topology are changed to be null.		
Exceptions: Network topology can't be cleared exception		

3.2.16. Delete a Network Topology

Use-case name: Delete a network topology	**ID:** 16	**Priority:** High
Primary Actor: User	**Use-case Type:** Detail/Essential	
Stakeholders and Interests: User – wants to delete a network topology which is not required any more		
Brief Description: This describes how a user removes a network topology from the system which is not required any more		
Precondition: User opens a network topology. **Trigger:** User selects "delete network topology" option.		

Normal Flow of Event:
A-System directs to a confirmation page which asks whether user is sure to delete the network topology
    i. If the user selects yes, network topology is removed from the database, user is forwarded to network topology page.
    ii. If the user selects no, network topology is not deleted, user is forwarded to the previous page.
B. If the user clicks cancel, the user is returned to the menu without saving changes.		

Exceptions: Network topology can't be deleted exception		

3.2.17. Display the List of Scenarios

Use-case name: Display the list of scenarios	ID: 17	Priority: High
Primary Actor: User	Use-case Type: Detail/Essential	
Stakeholders and Interests: User – wants to display list of scenarios		
Brief Description: This describes how a user displays list of scenarios		
Precondition: User logs in successfully. Trigger: User selects "display the list of scenarios" option.		
Normal Flow of Event: A- The system directs user to a "scenarios list" page. i. All scenarios in the system are listed on the screen. ii. Scenario options are displayed on the screen.		
Exceptions: Scenarios list can't be displayed		

3.2.18. Create a New Scenario

Use-case name: Create a new scenario	ID: 18	Priority: High
Primary Actor: User	Use-case Type: Detail/Essential	
Stakeholders and Interests: User – wants to create a new scenario		
Brief Description: This describes how a user creates a new scenario		
Precondition: User logs in successfully. Trigger: User selects "create new scenario" option.		
Normal Flow of Event: A- The system directs user to a "create scenario" page. i. All required fields displayed on the screen as text fields. B- The user enters the required information i. If the user clicks save, new scenario is created; user is forwarded to a page in which all properties of the new scenario are displayed. ii. If the user clicks cancel, the user is returned to the menu without saving changes.		
Exceptions: Scenario can't be created exception		

3.2.19. Update a Scenario

Use-case name: Update a scenario	ID: 19	Priority: High
Primary Actor: User	Use-case Type: Detail/Essential	
Stakeholders and Interests: User – wants to update a scenario which is previously saved into the database		
Brief Description: This describes how a user updates a scenario which is previously saved into the database		

Precondition:		
User opens a scenario.		
Trigger:		
User selects "update scenario" option.		
Normal Flow of Event:		

A- A page is opened where all current options are listed in the text fields which can be changed.
B- User changes the required values from the text fields
    i. If user selects save button, new information is replaced with the old information on the database
    ii. If user clicks on cancel button, user is returned to the scenario page without any changes.		

Exceptions: Scenario can't be updated exception		

3.2.20. Use a Scenario

Use-case name: Use a scenario	**ID:** 20	**Priority:** High
Primary Actor: User	**Use-case Type:** Detail/Essential	
Stakeholders and Interests:		
User – wants to use a scenario which is previously saved into the database		
Brief Description:		
This describes how a user uses a scenario which is previously saved into the database		
Precondition:		
User logs in successfully.		
Trigger:		
User selects a scenario to use.		
Normal Flow of Event:		
1. The selected scenario is marked as the scenario to be used in the simulation.		
Exceptions: Scenario can't be opened exception		

3.2.21. Delete a Scenario

Use-case name: Delete a scenario	**ID:** 21	**Priority:** High
Primary Actor: User	**Use-case Type:** Detail/Essential	
Stakeholders and Interests:		
User – wants to delete a scenario which is not required anymore		
Brief Description:		
This describes how a user removes a scenario from the system which is not required anymore		
Precondition:		
User opens a scenario.		
Trigger:		
User selects "delete scenario" option.		
Normal Flow of Event:		

A-System directs to a confirmation page which asks whether user is sure to delete the scenario
    i. If the user selects yes, scenario is removed from the database, user is forwarded to scenario page.
    ii. If the user selects no, scenario is not deleted, user is forwarded to the previous page.
B. If the user clicks cancel, the user is returned to the menu without saving changes.		

Exceptions: Scenario can't be deleted exception		

3.2.22. Run the Simulation

Use-case name: Run the simulation	ID: 22	Priority: High
Primary Actor: User	Use-case Type: Detail/Essential	
Stakeholders and Interests:		
User – wants to run a simulation		
Brief Description:		
This describes how a user run a simulation		
Precondition:		
User logs in successfully, specifies scenario, devices and network topology.		
Trigger:		
User selects "run" option.		
Normal Flow of Event:		
1. A page for simulation options is displayed on the screen.		
i. User selects a network topology.		
ii. User selects a scenario.		
2. User clicks on "run" button.		
3. If an error occurs, a message box is displayed on the screen.		
Exceptions: Simulation can't run		

3.2.23. Pause the Simulation

Use-case name: Pause the simulation	ID: 23	Priority: High
Primary Actor: User	Use-case Type: Detail/Essential	
Stakeholders and Interests:		
User – wants to pause a running simulation		
Brief Description:		
This describes how a user pauses a running simulation		
Precondition:		
User runs a simulation.		
Trigger:		
User selects "pause" option.		
Normal Flow of Event:		
1. Run procedure pauses.		
2. System indicates the pause state with a symbol on the screen.		
Exceptions: Simulation can't be paused		

3.2.24. Resume the Simulation

Use-case name: Resume the simulation	ID: 24	Priority: High
Primary Actor: User	Use-case Type: Detail/Essential	
Stakeholders and Interests:		
User – wants to resume a paused simulation		
Brief Description:		
This describes how a user resumes a paused simulation		
Precondition:		
User pauses a simulation.		

Trigger:		
User selects "resume" option.		
Normal Flow of Event:		
1. Paused simulation starts to run again.		
2. The symbol which indicates the paused state is not displayed on the screen.		
Exceptions: Simulation can't be resumed		

3.2.25. Stop the Simulation

Use-case name: Stop the simulation	**ID:** 25	**Priority:** High
Primary Actor: User	**Use-case Type:** Detail/Essential	
Stakeholders and Interests:		
User – wants to terminate a running simulation		
Brief Description:		
This describes how a user terminates a simulation when it is running		
Precondition:		
User runs a simulation.		
Trigger:		
User selects "stop" option.		
Normal Flow of Event:		
1. Running simulation ends.		
2. A message box which asks whether user wants to construct a report of the simulation appears on the screen.		
i. If user selects construct option, report is constructed; user is directed to the report.		
ii. If user selects don't construct option, report is not constructed and user is directed to the simulation page.		
Exceptions: Simulation can't stop		

3.2.26. Send SNMP Alarms

Use-case name: Send SNMP alarms	**ID:** 26	**Priority:** High
Primary Actor: Device	**Use-case Type:** Detail/Essential	
Stakeholders and Interests:		
Device – wants to alert the user after an error occurs		
Brief Description:		
This describes how a device sends Traps to the user when an error occurs		
Precondition:		
User runs a simulation.		
Trigger:		
An error occurs on the device.		
Normal Flow of Event:		
1. The green color of the device turns into red which indicates the error		
2. If user clicks on the device error message is displayed on the screen		
Exceptions: Alarm can't be sent		

3.2.27. Construct a Report

Use-case name: Construct a report	ID: 27	Priority: High
Primary Actor: User	Use-case Type: Detail/Essential	
Stakeholders and Interests: User – wants to constitute a report of all events after a simulation		
Brief Description: This describes how a user constitutes the reports of all events after the simulations		
Precondition: User runs a simulation and simulation ends whether naturally or the abort by the user.		
Trigger: User selects "construct" option.		
Normal Flow of Event: 1. A report is displayed on the screen.		
Exceptions: Report can't be constructed		

3.2.28. Store a Report

Use-case name: Store a report	ID: 28	Priority: High
Primary Actor: User	Use-case Type: Detail/Essential	
Stakeholders and Interests: User – wants to store a report for later comparisons		
Brief Description: This describes how a user stores the reports of simulations		
Precondition: User runs a simulation and simulation ends whether naturally or the abort by the user. User constructs a report.		
Trigger: User selects "store" option.		
Normal Flow of Event: 1. Report is stored in the database. 2. User is directed to the home page.		
Exceptions: Report can't be stored		

3.2.29. Compare Reports

Use-case name: Compare reports	ID: 29	Priority: High
Primary Actor: User	Use-case Type: Detail/Essential	
Stakeholders and Interests: User – wants to compare two or more reports		
Brief Description: This describes how a user compares the reports of two or more simulations		
P Precondition: User selects two or more reports.		
Trigger:		

User selects "compare" option
Normal Flow of Event:
1. The reports of reports to be compared are displayed on the screen.
Exceptions: Reports can't be opened

3.2.30. Log in

Use-case name: Log in	**ID:** 26	**Priority:** High
Primary Actor: User	**Use-case Type:** Detail/Essential	
Stakeholders and Interests: User – wants to log in the system		
Brief Description: This describes how a user logs in the system		
Precondition: User enters username and password to the specified text areas in the login screen **Trigger:** User clicks on the log in button.		
Normal Flow of Event: 1. The user enters their login id and password 　　　A. If the login and password is valid, a session is opened. 　　　　　i. The security is verified. 　　　　　ii. The menu is loaded. 　　　B. If the login or password is not valid, an error message is displayed. 　　　　　i. The user is returned to login screen.		
Exceptions: Invalid username or password		

3.2.31. Log out

Use-case name: Log out	**ID:** 27	**Priority:** High
Primary Actor: User	**Use-case Type:** Detail/Essential	
Stakeholders and Interests: User – wants to log out the system		
Brief Description: This describes how a user logs out the system		
Precondition: User logs in successfully. **Trigger:** User selects "log out" option.		
Normal Flow of Event: 2. The user clicks the logout button 　　　i. The session is terminated.		
Exceptions: -		

3.3. Non-functional Requirements

3.3.1. Performance requirements

The performance is important for us because of these three reasons. It is a web application so it should not disconnect with the users' PC. Testing a 10000.deviced network will be done using functional buttons manually, so it should not consume so many time. Finally, its cost is greater than most of the part of a system in all software project.

There is no user role and only one user can run the program at a time but many of them can view it. The number of the user who can view the system depends on server capacity. The number of devices can be changed in this interval [1, 20000] and it can be increased by supporting the hardware. Because of the physical capacity of the network infrastructure, adding a device to the system after 1000 devices will have more effect on performance than adding it at the beginning. So performance will change dynamically.

3.3.2. Design constraints

Software system attributes are one of the important parts of all software projects. Actually system attributes show the quality of the software project. Some attributes, that we mainly considered, are reliability, portability, security, usability and safety.

I.   *Reliability*
        Reliability is important as much as performance. If the system does not require its task under constraints, this software will be useless.
        We should consider 3 parts:
        Hardware Reliability: It should satisfy the requirements in 2.3.1(user and server part). Under those constraints it will perform its task.
        Software Reliability: After completing the project, it will perform its task under the constraints indicated in   2.3.2
        Operator Reliability: It depends on the server reliability
II.   *Portability*
        It can be accessed from any platform, because software will be implemented in java and it will be web-based.
III.   *Security*
        Since SNMP Agent & Network Simulation software is commercial software, it must not allow to be used the system by outside users. It can lead to abuse the simulation. We will keep a default username and password. If changing the password is required, it will be managed by changing the some line of source code in database part.
IV.   *Usability*
        SNMP Agent & Network Simulation software will be an easy to use online application and it will have user friendly interface. It will not be complicated program because we will supply simple buttons like ADD, DELETE, RUN, etc.   It allows editing of instance information to suit your needs.
V.   *Safety*
        SNMP Agent & Network Simulation software will not keep users private information because software is not a public application. It is prepared for companies.

4. Data Model and Description

4.1 Data Description

This section describes data objects that will be used and managed in SMNP simulator. Some of the data objects that will be managed in this software are used to store information of its components and some of them are outputs for other software and used for analyzing the results. In others words data objects has different functionalities and purposes.

4.1.1 Data objects

Data objects and their major attributes are described below.

User Data: This system has no user role and different users. There is only a login mechanism to use this software and single id and password will be sufficient for this purposes and can embedded to log-in screen so that we don't need actually a user data object and database table.

Device Data: This data object is used for hold the information of the IP devices in the system. New object can be added or existing ones can be edited or deleted. In the configuration behavior of the system this data can be loaded and some changes can be made. However in the run or simulation behavior this data are disabled. This data object can be stored in the XML format or a database table but the exact storage format will be decided in the design document.

Scenario Data: Scenario data is depends of the futures of devices in the system. Devices affect the test cases and scenario of simulation. In the configuration of system default and saved scenarios can be loaded and some changes can be made and stored through this data object. When the system is running the simulation uses this data and cannot be changed during this period. Scenarios can be stored in the XML format. This data will contain devices that will be used in the system and its alarm and error messages.

Network-Topology Data: It holds the graph structure or the simulated network environment of the session that are going to implemented. It contains devices and its connection to each other. When programs starts to run this data cannot be changed, it is only creatable and editable in the configuration phase. Created network-topology can be stored in the XML format.

SNMP Data: This data is produced during the running phase of simulation and used for other software that supports SNMP. Using this data session of that simulation also can be analyzed. In addition to these sessions result can be stored with its scenario to analyze it future. Produced data are depends on both scenario and devices. This data will contain devices that will be used in the system and its alarm and error messages with their time.

4.1.2 Relationships

In this section states the relationships among the data objects.

Scenario data consist of devices information in other words device's action, alarm and errors and scenario jobs assigned according to these values.

Figure 2

Network-topology data is hold the information of connected devices in the simulation. Therefore it components are devices that are in the system.

Figure 3

SNMP data is uses information's of the both scenario data and network-topology data.

Figure 4

Figure 5

4.1.3 Complete data model

Below there is a diagram that shows the relationships among the objects, but some of the attributes will be determined later in the initial design report.
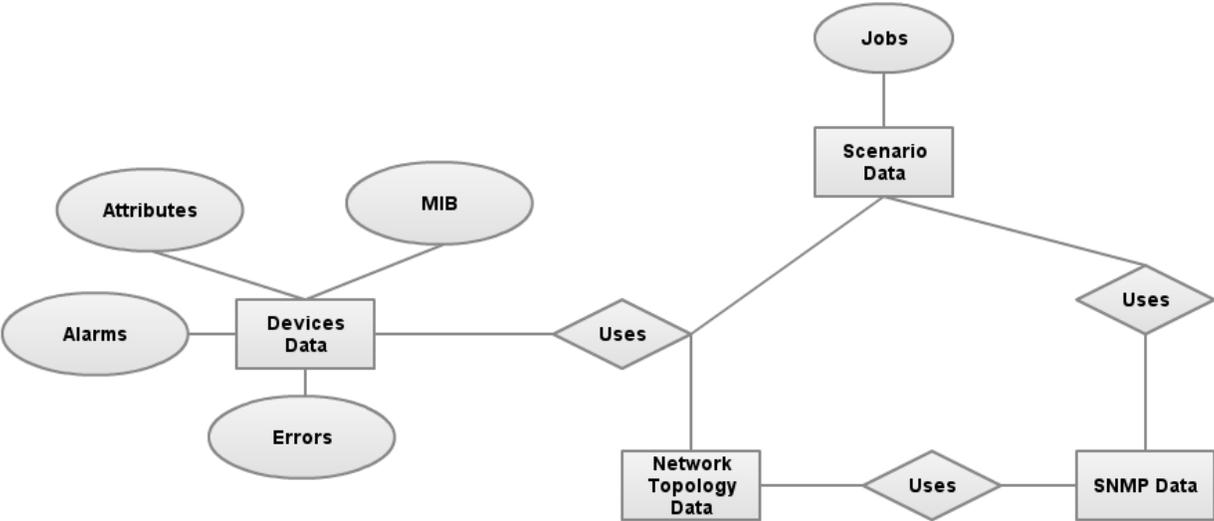
Figure 6

4.1.4 Data dictionary

Data objects are described in the section of 4.1.1 and its attributes are described later after sponsored company determine and give some detailed information about the objects.

5. Behavioral Model and Description

This software is mainly a SNMP simulator which creates a virtual environment and tests this environment. This software product has three behavior, first one is the configuration and the other one is the simulation or run and the last one is the analyzing the results.

5.1. Description for software behavior

To use the system one should connect the system via a web-browser and the system has some states that user can be face of them.

Login: User must enter user-id and password to use this system. If the entered values are correct, then system accepts user. If not system asks to user reenter the user-id and password.

Configuration: In this window user can add, delete, edit IP devices and create scenarios and network-topologies. These windows are used for making changes on the system and preparing it for simulation.

Run: After creating or selecting existing a scenario and network-topology user can run the simulation but it is mandatory to give scenario and network topology to start it. After simulation is started system doesn't allow to make any changes, two option is available one is pause the other one is stop. In addition to these simulation has two modes, one is that real-time simulation which you specify it to run 5 hour, then it exactly runs 5 hour and the other one is shorten time simulation which finish it earlier according to the specified time.

Device event and states: Devices that are inserted to the network-topology will be in states like alarm, error, unreachable. These states are determined in details later documents. These states and changes of the devices can be seen in the simulation program via the user browser.

Analyze: After simulation ends the result will be shown in this window.

5.2. State Transition Diagrams

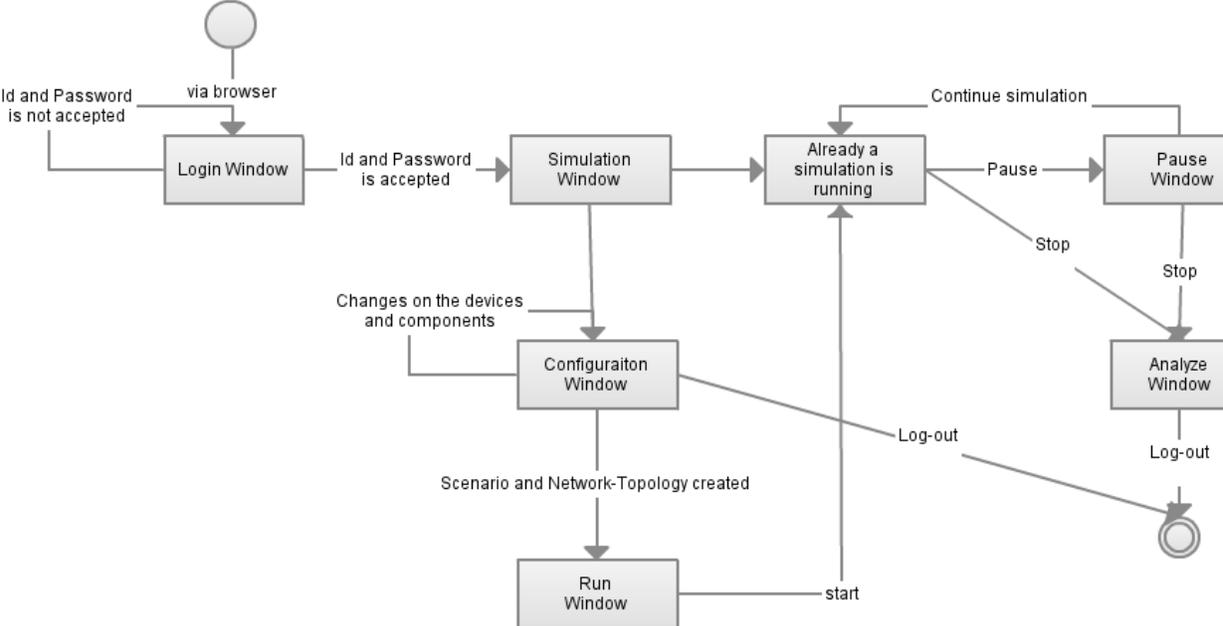Below there is a diagram which depicts the overall behavior of the system.

Figure 7

6. Planning

6.1. Team Structure

While producing this software we have a sponsored company which is Siemens EC located at METU Teknopolis and advisor from there. In addition to these we have also one more advisor who is teaching assistant from our department. Lastly our group has three members which are mainly assigned writing documents and developing the software.

Alper Teke - Advisor from Siemens EC
Selcan Artan - Advisor from Siemens EC
Burçak Oltu Sarıtaş - Teaching Assistant from Department

Mehmet Elgin Akpınar - Developer Group member
Mustafa İlhan - Developer Group member
Osman Tahsin Berktaş - Developer Group member

6.2. Estimation (Basic Schedule)

ID	Task Name	Start	Finish	Duration
1	Weekly Meeting with Assist.	15.10.2010	20.01.2011	15m
2	Weekly Meeting with Siemens	23.10.2010	18.01.2011	1.5h
3	Literature Survey	15.10. 2010	25.11. 2010	45d
4	General design of Simulation	15.10. 2010	30.10. 2010	15d
5	Preparing Proposal	29.10. 2010	05.11. 2010	7d
6	Preparing SRS	20.11. 2010	05.12. 2010	15d
7	Interface Design	25.11. 2010	10.12. 2010	15d
8	Design of Devices	06.12. 2010	18.12. 2010	12d
9	Design of Network Topology	10.12. 2010	20.12. 2010	10d
10	Design of Scenario	13.12. 2010	18.12. 2010	5d
11	Initial Design Report	13.12. 2010	20.12. 2010	7d
12	Team Presentation	19.12. 2010	26.12. 2010	7d
13	Detailed Design Report	27.12. 2010	04.01. 2011	7d
14	Prototype Demo	05.01. 2011	20.01. 2011	15d

6.3. Process Model

For development of this software waterfall model can be appropriate choice. Waterfall model has phases that followed by the other ones and process these sequentially. However combining waterfall model

with prototyping model may be more suitable. In the development of this software there are some stages must be tried and passed so that creating prototypes and getting feed-backs is very essential for the progress of software.

7. Conclusion

After making so many literature searches we could collect the data about SNMP Agent & Network Simulator. And then we formed our requirements which are functional, non-functional requirements, dependencies, constraints and data descriptions. We prepared our project plan and we agreed in this conclusion: After completing this project, using this tool, management application vendors and system integrators can quickly develop, test and demonstrate management applications without requiring thousands of expensive and bulky hardware boxes and testing departments can test management applications without requiring large inventories of testing devices in the lab. Even large networks with thousands of devices can be quickly simulated without requiring large budgets. Full control over the values returned by the agent for SNMP requests and the ability to generate SNMP traps on demand enable thorough testing of applications.