

UNIVERSITÉ CATHOLIQUE DE LOUVAIN

LOUVAIN SCHOOL OF ENGINEERING

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MASTER THESIS

Analysis and performance monitoring of a large WiFi network

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A thesis submitted to obtain the degree
of *Master 120* in computer science with
option in *networking and security*.

Louvain-la-Neuve

February 2014

“Thanks to my solid academic training, today I can write hundreds of words on virtually any topic without possessing a shred of information, which is how I got a good job in journalism.”

Dave Barry

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Chapter 1

Introduction

1.1 Presentation

This project constitute our master thesis. The goal is to implement a set of tools to help the network administrators monitoring the wireless infrastructure. To achieve that, we have to proceed in two steps. First, we will have to collect all the information available. The sources of information are completely heterogeneous. They range from simple logs to active monitoring through customized routers. The main difficulty here will be to aggregate all the information in a coherent and efficient way. The amount of data will force us to choose which ones are pertinent and which ones are not. Once the gathering steps is done, the raw data will be available but they will be useless if the user can't understand and use them. So, the second step will be to analyse and present them to the users. We will have to define the profile of the end-user and understand what are his needs. The success of our work will be directly link to the fact if our implementation is helpful or not. If the data collected are correct but we are unable to present them in the right way, our work would be meaningless.

1.1.1 Data Gathering

As said before, the sources of data are quite heterogeneous. To handle that, we'll have to implement a system that can hold and represent all the information in a coherent way.

1.1.2 Data Analysis

The core will be responsible to centralized, analyse and take the action accordingly the information received from the probes. Its actions will mainly depend on the access that it will have the network. Typical action would be to adapt the controller or inform precisely the administrator of the problems detected. Most of the time, there most difficult is not to be aware of the problem but to understand the causes of it.

1.2 Motivation

1.3 Objectives

Chapter 2

Working Environment Overview

2.1 UCL Internet Infrastructure

The Catholic University of Louvain (UCL) is one of the biggest universities in Belgium. It gathers almost 30.000 students and about 10.000 other members from staff to teachers and researchers.

The university also owns several student campus. The headquarters of the UCL is located in the city of Louvain-la-Neuve. The campus gathering the health sciences is located in Woluwe-Saint-Lambert and more recently the cities of Tournai and Mons as well as Charleroi were added to the list.

Faced with such a scale, it is vital for the Catholic University of Louvain to develop a reliable and efficient Internet connection and wireless network able to deliver a connectivity throughout its campus and all users at all time.

The purpose the University enrolled in is to provide an Internet access and a connectivity according to the "status" of the user who wants to connect. To do this, there are 3 main networks at the Catholic University of Louvain, each with a different SSID. Those available networks are:

- **student.UCLouvain**: Only for the students enrolled for the current year at UCL.
- **UCLouvain-prive**: Only for university staff as well as for the researchers.
- **UCLouvain**: Accessible for guests invited by the university.

The university also participates in the projet **eduroam** (which stands for education roaming). Eduroam is the secure, world-wide roaming access service developed for the international research and education community[4].

The eduroam system is a RADIUS-based infrastructure that uses the 802.1X security

technology to allow for inter-institutional roaming. It allows the users visiting another institution connected to eduroam to log on to the WLAN using the same credentials the user would use if he were at his home institution[5].

The Catholic University of Louvain thus has a fourth network available with the SSID `eduroam` allowing the foreign students to be able to get an Internet connection at any time on the university locations.

2.2 Hardware infrastructure

2.3 Understanding the passive and active logs

Chapter 3

Network Components and Protocols

3.1 802.1X

3.2 RADIUS

3.3 WiSM

3.4 DHCP

3.5 SNMP

3.6 Problems encountered

Chapter 4

Monitoring tool implementation

4.1 Monitoring tool modeling

Chapter 5

Monitoring Tool Deployment

5.1 Equipment used

5.2 Testbed conditions

Chapter 6

Results and Analyzis

6.1 Results

6.2 Feedback

6.3 Modification proposed by the test users

Chapter 7

Conclusion and Future Talks

7.1 Conclusion

Appendix A

Source Code

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