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UNIVERSITY OF APPLIED SCIENCES
Prime Mover

Developing networking studies to match the requirements of the workplace

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Abstract

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Computer networks are one of the biggest investments that businesses can make, and managing them requires well-trained professionals. The purpose of this thesis project was to investigate the size of the role data network related education has on the working life of Bachelor of Business Administration graduates. The method used to gather data was a questionnaire which was distributed to the IT support staff at Laurea University of Applied Sciences. The outcome of the study was not conclusive due to the small number of replies to the questionnaire, but the thesis results provide a basis for further study into this subject.

Key words data networks, working life, IT support

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1 Introduction

The data networking industry is one of the fastest growing markets right now. With the availability of very sophisticated equipment, companies are searching for people who are able to manage them. Schools such as Laurea University of Applied Sciences (Laurea) offer courses on this subject to educate their students so that they can possibly start a career in this field. A partnership with Metropolia University of Applied Sciences (Metropolia) has opened up new opportunities for the students of Laurea to take their education of data networks to a higher level by offering a more focused path.

But these new opportunities pose a few questions about the relevance of such knowledge specifically for Bachelor of Business Administration (BBA) students. And the necessity of such knowledge in the jobs that are fit for graduates with a BBA degree.

Firstly, this thesis aims to answer the question of relevance by analysing the networking course offerings of Laurea as well as the offerings of Metropolia and comparing them to the job requirements and the responsibilities of a job that will be defined later on in the thesis. Another aim is to distinguishing the differences between studies as an IT Engineering student and Bachelor as a Business Administration student.

1.1 Bachelor of Business Administration

Bachelor of Business Administration is a degree title earned by Laurea students who graduate in the following degrees; Business Information Technology (BIT), Business Management (BM) and Security Management (SM). This thesis is aimed mainly at students who are studying BIT, as computer networking is naturally an information technology related field. The BIT degree is offered in both English and Finnish and its extent is 210 study credits and takes approximately 3.5 years to complete. (Laurea, 2013)

	STUDIES	OP	210	60	60	60	30		
	INITIATION OF PROFESSIONAL GROWTH	A029	60.0					Compulsory	
	Integration in the Global ICT Field	A0181	5.0	5				Compulsory	Basic Studies
	Becoming an ICT Professional	A0182	5.0	5				Compulsory	Basic Studies
	Basic Finnish 1	A0203	5.0	5				Optional	Basic Studies
	Swedish in the ICT field	01137	5.0	5				Optional	Basic Studies
	Designing ICT Systems	A0105	5.0	5				Compulsory	Basic Studies
	Data Networks	01117	10.0	10				Compulsory	Professional Studies
	Principles of Accounting	A9011	5.0	5				Compulsory	Basic Studies
	Business Communication Skills	A0147	5.0	5				Compulsory	Basic Studies
	Basic Finnish 2	A0204	5.0	5				Optional	Basic Studies
	Developing ICT Systems	A0107	10.0	10				Compulsory	Professional Studies
	ICT Network Infrastructure	A9064	5.0	5				Compulsory	Professional Studies
	DEVELOPMENT OF CORE COMPETENCES IN THE FIELD	A030	60.0					Compulsory	
	Managing Information Security	A0111	5.0		5			Compulsory	Professional Studies
	Corporate Social Responsibility	A0153	5.0		5			Compulsory	Professional Studies
	Implementing ICT Systems	A0109	5.0		5			Compulsory	Professional Studies
	Innovative Web Development	A9063	5.0		5			Compulsory	Professional Studies
	SOA: Principles of Service Design	A9062	5.0		5			Compulsory	Professional Studies
	ICT Network Infrastructure Project	A9065	5.0		5			Compulsory	Professional Studies
	Information Security Technologies	A0112	5.0		5			Compulsory	Professional Studies
	Managing Business Performance	A9013	5.0		5			Compulsory	Professional Studies
	Planning and implementing SOA solutions using Oracle	A0115	10.0		10			Compulsory	Professional Studies
	Information Security Development Project I	A0113	5.0			5		Compulsory	Professional Studies
	ICT Project Management	A0110	5.0			5		Compulsory	Professional Studies
	Creating Innovation through Service Design	A0132	10.0			10		Compulsory	Professional Studies
	Applied Innovative ICT Service Systems	A0164	10.0			10		Compulsory	Professional Studies
	Information Security Development Project II	A0119	5.0			5		Compulsory	Professional Studies
	Job placement in Information and Communication Technologies - I	A0169	15.0		15	15		Compulsory	Practical Studies
	WORKPLACE DEVELOPMENT AND RENEWAL	0335	30.0					Compulsory	
	Job placement in Information and Communication Technologies - II	A0170	15.0			15		Compulsory	Practical Studies
	Thesis	A0159	15.0			15		Compulsory	Thesis
	LAUREA'S COMMON STUDIES	127	0.0					Compulsory	
	Initial Test in Finnish	00521	0.0	0				Compulsory	Basic Studies
	Written skills in Finnish	00636	0.0	0				Compulsory	Basic Studies
	Oral skills in Finnish	00637	0.0	0				Compulsory	Basic Studies
	Initial Test in Swedish	00506	0.0	0				Compulsory	Basic Studies
	Written skills in Swedish	00635	0.0	0				Compulsory	Basic Studies
	Oral skills in Swedish	00634	0.0	0				Compulsory	Basic Studies
	Maturity test (in English)	00488	0.0				0	Optional	Thesis
	Maturity test (in Finnish)	00489	0.0				0	Optional	Thesis
	Maturity test (in Swedish)	00490	0.0				0	Optional	Thesis
	ELECTIVE STUDIES	154	0.0					Compulsory	
	Preparatory Studies in English	01261	5.0		5			Elective	Elective Studies
	Intermediate Finnish	A0205	5.0		5			Elective	Elective Studies
	Research Methods	00471	5.0		5			Elective	Elective Studies
	Organisational Management and Leadership	A0141	10.0			10		Elective	Elective Studies
	International Leadership	A9010	10.0					Elective	Elective Studies
	Organisational Communication	A0198	5.0					Elective	Elective Studies
	Interconnecting Networks	00103	10.0					Elective	Elective Studies
	Developing Data Network Services	00104	10.0					Elective	Elective Studies
	Service Innovations in Business Development	00019	10.0					Elective	Elective Studies
	Innovation-Based Entrepreneurship	00020	10.0					Elective	Elective Studies
	Developing and Managing Customer Relationships	00005	10.0					Elective	Elective Studies
	Laajuudet yhteensä vuosittain			60	60	60	30		
	Opintojaksojen laajuus yhteensä		210.0	210					

Figure 1: BIT Curriculum (Curriculum 2013)

1.2 Cisco Certified Network Associate

Cisco's official academy offers a wide range of different educational courses for people who are pursuing a career in the field of computer networking. The courses available prepare individuals for entry-level jobs as well as further educate readily established professionals by providing the competency in using current technologies in the rapidly developing IT industry. Cisco offers CCNA certification in a variety of areas in networking, for example Security, Data Center, Voice and Video, but the main focus of this thesis will be the Routing and Switching module. After completing a course and passing the test in an official Cisco Academy, the student receives a certification that is highly regarded in working life. The certifications last for 3 years, after which it is required to re-certify by passing an up to date exam.

1.3 Metropolia Partnership

In the beginning of 2013 Metropolia opened up a few seats in their courses for Laurea students. Unlike Laurea which uses its own material to teach networking to the students, Metropolia uses material provided by Cisco because they are an official Cisco Academy.

The courses offered by Metropolia are from Cisco CCNA Exploration curriculum. There are 4 parts and each part is 3 study credits. A more thorough breakdown of each course will follow later in this thesis. The following figure shows the flow of those courses.

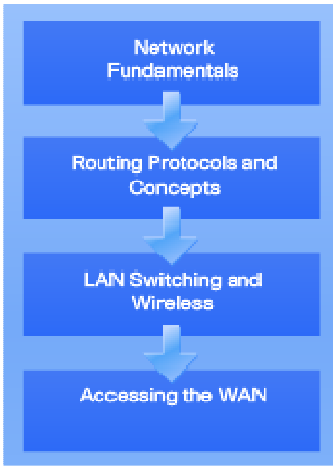

Figure 2: CCNA Exploration course flow (CCNA Curricula Guide 2013)

Metropolia offers its courses once a week and each lesson lasts about 3 hours. The lessons consist of two parts. The first part is a theoretical lecture conducted by a certified lecturer. The second part is a practical exercise where the students implement their newly acquired knowledge in a lab environment.

1.4 Differences between BBA and IT Engineers

This thesis investigates the studies of two different Universities which offer their education at different levels. It must be kept in mind that courses offered by Metropolia are for IT engineering students whilst the courses offered by Laurea are for BBA students. As this is an important factor, this section will try to clarify the differences between the two degrees and list some of the most common jobs that are done by the graduates of each degree.

As the following descriptions on page 10 will demonstrate, engineering jobs can be very technical. This is important when considering the main difference in the educational focus of the two degrees. An examination of the curriculums of both degrees reveals that in addition to the studies related to information technology, engineering studies include a substantial amount of courses focused on Mathematics and Physics, which is not offered to BBA students. Such studies may open up more opportunities for jobs that require knowledge of these subjects, for example Game Designers and Programmers.

Finally the last point that should also be kept in mind is that Cisco offers access to the CCNA exam certification to anyone who is interested without any pre-requisites, so essentially the educational background of the person trying to obtain the certificate does not play a significant role. But nonetheless, the CCNA courses offered by Metropolia are on a higher level than the networking studies in Laurea. The higher level of studies mainly comes from the in-depth and detailed theoretical lectures that cover every aspect of the topics, unlike the Interconnecting Networks course in Laurea which is based around online self-study by the students. Also in the practical sense Metropolia offers a more advanced lab environment for the students with newer hardware and more devices for each person to use.

1.4.1 BBA Statistics and Jobs

According to the statistics found on the tral.fi website which is the Finnish Union for BBA graduates, the following pie chart displays the distribution of graduated BBA students in the different sectors.

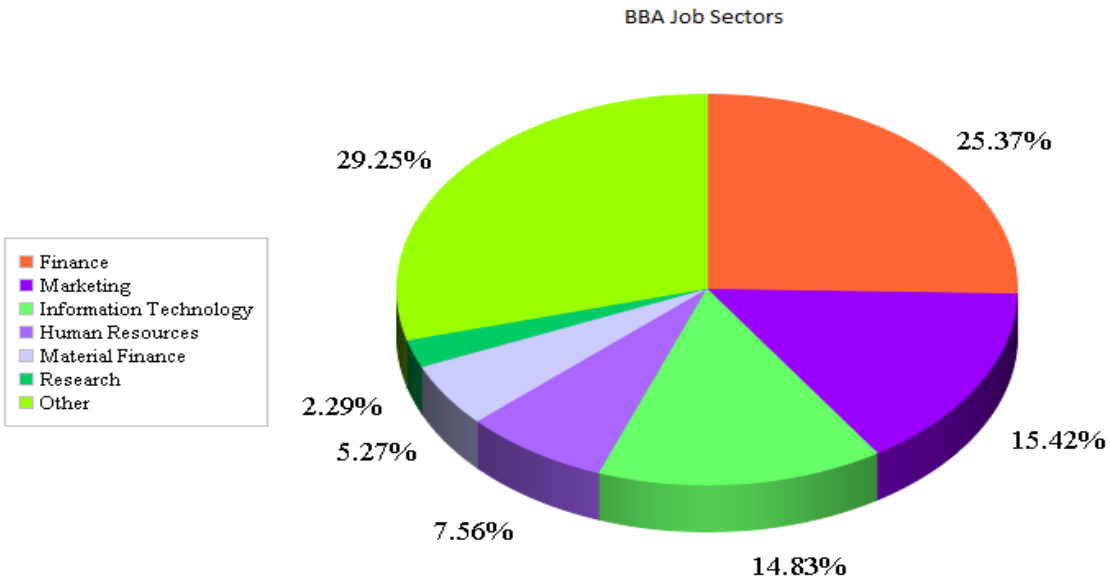

Figure 3: BBA Job Sectors (TRAL 2011)

An additional statistic found on the same website states that 3.8% of the BBA graduates get a job in Telecommunications and Data Networks. The statistics provided by TRAL are only collected from members of the union which means that not all graduates are recorded and that there are possibly many more BBA graduates working in positions related to data networks.

The description of the Business Information Technology degree on Laurea's website provides some possible career opportunities for graduates of the degree. The following jobs are listed, system experts and designers, software architects, web application developers, network developer and finally IT support.

As IT Support jobs are among the most common job offers available, this position was chosen to be the one studied in this thesis. Also because Laurea has its own IT support helpdesk where the workers are mainly students, the answers from the questionnaire will be of more value when answered by people who are just starting out with their careers that are study related.

1.4.2 Engineer Statistics and Jobs

Finding precise statistics for engineering students is difficult, mainly because there are a large number of different branches of engineering. But the Engineer Union offers some information which states that 14% of engineering graduates work in the IT sector. The website also states that currently the number of IT Engineer students is rapidly increasing and now account for 20% of all engineering students. (Engineer Union 2012)

Some possible career opportunities for IT Engineer graduates are ones such as system, software and hardware designers, consulting, product support as well as some management positions.

1.5 Objectives

This thesis has two main objectives that need to be addressed. At first, the networking education offerings of both Laurea and Metropolia need to be understood and compared. This comparison will give an insight of the level difference of each universities offering and the details of what is being taught to the students. These details will then be used to see how the requirements of job in question are matched with the education, and if this education is even necessary for this kind of job.

As well as understanding the education, it is equally important to understand the requirements and the responsibilities of the target job position. This information will be gathered with the use of a questionnaire to find out more from the employees perspective. With the possession of the aforementioned information, a conclusion needs to be made based on the observations.

And finally, because the topic at hand is manly oriented around Cisco technology a few questions might arise in the mind of the reader, such as the reason for selecting Cisco when there are a large number of other network solutions to choose from. This question will be answered with a profile of Cisco and an explanation as to why they are so popular in the networking world.

1.6 Research Methods

To gather the necessary information about the work place, a questionnaire was distributed to the employees of Laurea IT support. This questionnaire focused on finding out the amount of network related problems they encounter, what kind of skills are required to fix these problems as well as some background information about the employees knowledge in networking. By knowing this information and knowing the contents of the courses, it is possible to directly link the relevant available courses to the workplace.

The information about the courses was gathered from 2 main sources. One of the sources was the available course descriptions on the universities websites. And the other source was by personal participation in some of the courses that will be described. As of the point of writing this thesis, the author has participated and completed 3 of Laureas networking courses and CCNA 3 in Metropolia.

In addition to participation in the courses, the author was employed by Laurea SID Networks lab as an assistant. The main tasks as an assistant, was to help the students who were enrolled to Interconnecting Networks course. The course is an online implementation focused on self-study. Once a week students would come in to the lab to complete lab exercises according to the things they learned that week.

2 Theoretical Background

2.1 Cisco World

Cisco was founded in 1984 by two computer scientists by the name of Leonard Bosack and Sandra Lerner with a vision to enable detached networks to communicate and share information with each other. The company grew at a high rate and in 1989 the company reported revenue of 27 million dollars. Cisco success allowed them to launch the Networking Academy program in October of 1997, which included 64 locations at launch. The program was designed for high school and college students to learn networking based on the use of Cisco technology. Over the years Cisco is responsible for a number of innovations that changed the course of the internet. (Cisco 2013)

According to information found on Cisco's official website, as of 3rd quarter of 2012 Cisco is the market leader in at least 7 markets for networking solutions and other IT technologies. Cisco's customer base is over 100,000 customers and has reported revenue of 11.9B in Q1 of 2013 alone.

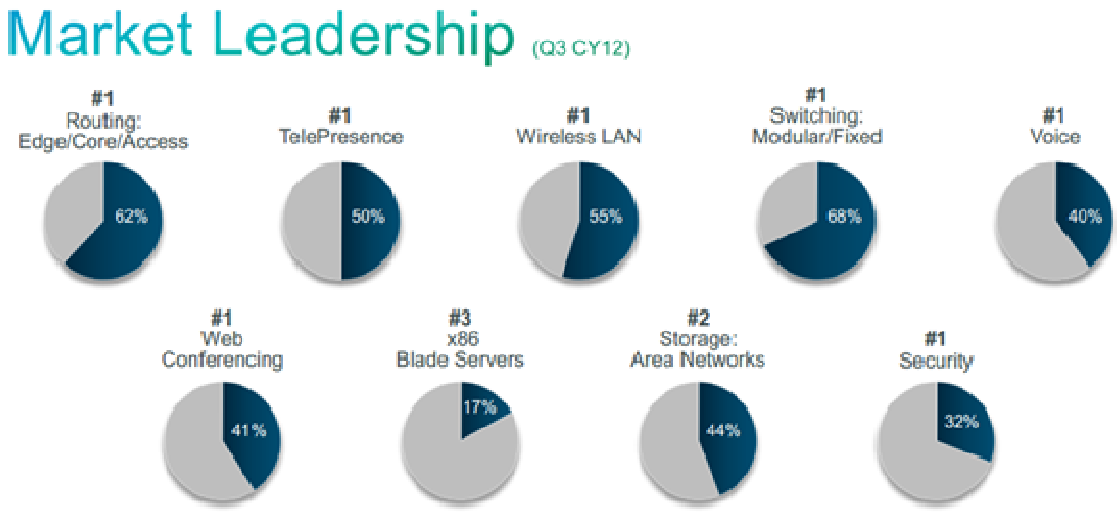

Figure 4: Cisco Market Share (Cisco Market 2012)

These numbers show that Cisco is doing well in the market, but the success does not only come from good presence in the market. Ciscos involvement in education with their aforementioned Cisco Academy programme has helped them increase their popularity and has increased the rate at which companies implement the use of Cisco solutions. The Cisco Academy has trained up to 4 million students to date in their 10,000 academies which span over 165 countries. Naturally with high availability certified professionals, companies will get a better return from investing in the implementation of Cisco technology.

Some of Ciscos larger competitors that offer networking solutions for businesses are HP and Juniper. A common perception is that Cisco solutions are generally a bit more expensive, but offer more reliability.

2.2 CCNA Exploration Breakdown

In this section each courses of the CCNA Exploration curriculum will be introduced and a summary will be given about what the students should be able to perform after completing the module.

As mentioned in the introduction, after completing a CCNA exam you receive a certification. But this is not the case with CCNA Exploration. This course is offered by universities that are partnered with Cisco. Cisco provides the materials and gives students access to the official Network Academy webpage where they complete assessments and final exams. This website tracks all the performance, which teachers use to give final grades. CCNA Exploration is a preparatory course that gives students all the required knowledge if they wish to pursue the certification. The certification can be gained by passing a separate test for an additional fee.

2.2.1 CCNA1

The first course of Ciscos CCNA Exploration is called Network Fundamentals. The most focused topics in this module are Subnetting, which is a way to divide the network into smaller logical networks to increase the performance of the network and it also provides some level of security. As well as understanding the OSI and TCP/IP protocol models. This course also includes a lot of other basics such as planning and building a network with the use of routers and switches, and learning how to properly connect all the devices using the correct cables according to the planned designs. Some commands such as traceroute and netstat are covered. And finally students learn the basic commands of the Cisco IOS (Internetwork Operating System). This includes navigating through the different privilege levels, making basic configurations and erasing and rebooting the hardware.

The following are the topics covered in each lab and what students should be able to do.

Lab 1: Topology Orientation and Building a Small Network

- Identify the correct cables to use
- Physically cable the network
- Verify that the networks are communicating

Lab 2: Basic Cisco Device Configuration

- Configure global configuration settings
- Configure password access
- Configure individual interfaces
- Save or erase the configurations

Lab 3: Ipv4 Subnetting

- Understand how to divide networks using Subnetting
- Determine network information from given IP and network mask
- Determine subnet information from give IP and network mask

Lab 4: Examining A Device's Gateway and Examine a Route

- Understand the purpose of gateway address
- Understand Windows OS network configurations
- Use route command modify windows routing table
- Connect to routers using telnet

Lab 5: Frame Examination

- Understand what's in Ethernet frames
- Use Wireshark to analyse Ethernet frames

2.2.2 CCNA2

The second course of Ciscos CCNA Exploration is called Routing Protocols and Concepts. In this course students learn the fundamentals of routing and the available routing protocols. In the labs the students will learn how to configure and troubleshoot Cisco router and routing protocol configurations such as RIPv1, RIPv2, EIGRP and OSPF. The following is detailed description of what students learn after each lab.

The following are the topics covered in each lab and what students should be able to do.

Lab 1: Basic Static Route Configuration

- Configure Serial and Ethernet interfaces and test connectivity
- Troubleshoot causes for lack of connectivity
- Configure static routes
- Check the current static route settings

Lab 2-3-4: Basic RIP, RIPv2 and EIRP Configuration

- Configure routing with any of the 3 protocols
- Verify that the protocol is functional
- Propagate default routes to neighbours
- Gather information about the protocol

Lab 5: Basic OSPF Configuration Lab

- Configure OSPF routing and router IDs
- Configure OSP Hello and Dead timers
- Configure OSPF priority
- Configure OSPF on multi-access network
- Understand the OSPF election process

2.2.3 CCNA3

The third course of Ciscos CCNA Exploration is called LAN Switching and Wireless. This course focuses on teaching the students all the different functions of a switch as well as some best practices about setting up and securing wireless connections. After completing the course students should be comfortable with creating, configuring and troubleshooting VLANs (Virtual LAN). With the created VLANs they should be able to set up inter-VLAN routing. Coverage of other switch functions such as VTP (VLAN Trunking Protocol) and RSTP (Rapid Spanning Tree Protocol) are also included in this course.

The following are the topics covered in each lab and what students should be able to do.

Lab 1: Basic Switch Configurations

- Cable a network according to topology diagram
- Clear configurations and reboot device
- Create and examine configurations
- Manage MAC address tables
- Configure port security

Lab 2: Basic VLAN Configurations

- Create and verify VLAN configurations
- Manage VLANS on switch ports
- Enable trunking for inter-switch connections
- Verify trunking configurations

Lab 3: Basic VTP configurations

- Change the VTP modes
- Know the difference between the 3 modes (Client, Server, Transparent)
- Distribute VLANS created on a switch in VTP server mode
- Enable VTP pruning and describe its function

Lab 4: Basic Spanning Tree Protocol

- Know the behaviour of default RSTP settings
- Make configurations of RSTP and observe the changes

Lab 5: Basic Inter-VLAN Routing

- Explain how inter-VLAN routing works
- Configure 802.1q trunking on router interfaces
- Configure router sub-interfaces with correct settings according to VLANs

Lab 6: Basic Wireless Configurations

- Connect to web based WLAN management tool
- Configure basic WLAN settings
- Configure WLAN security
- Test connectivity

2.2.4 CCNA4

The fourth course of Ciscos CCNA Exploration is called Accessing the WAN. In this course students learn how to interconnect networks in different geographical areas with the use of protocols and technologies such as PPP (Point-to-Point Protocol), Frame Relay and Serial WAN connection. Other topics covered in this course include how to configure Access Control List to implement security features in the network, as well as configuring DHCP and DNS. Finally the students learn how to troubleshoot the problems that can occur in the network by setting up the lab environment and purposely creating errors so that they can isolate the problems and solve them.

The following are the topics covered in each lab and what students should be able to do.

Lab 1: Basic PPP Configuration Lab

- Configure PPP encapsulation on Serial Interfaces
- Know how to change encapsulation on serial interfaces from PPP to HDLC
- Configure PPP authentication

- Troubleshoot encapsulation and authentication by creating errors and restoring them

Lab 2: Basic Frame Relay

- Configure Frame Relay encapsulation on serial interfaces
- Configure Frame Relay sub-interface
- Configure router as a Frame Relay Switch
- Know the difference and how to implement both Cisco and Open standards related to Frame Relay

Lab 3: Basic Security Configuration

- Configure basic router security
- Disable unused services
- Protect network from external and internal attacks
- Know how to manage configuration files (backing up, restoring)
- Know how to use Cisco Security Device Manager to configure basic security

Lab 4: Basic Access Control List

- Design standard and extended ACL rules
- Apply the rules to interfaces
- Test the ACL rules
- Troubleshoot ACL problems

Lab 5: Basic DHCP and NAT Configurations

- Configure a DHCP server in Cisco IOS
- Configure static NAT
- Configure dynamic NAT with a set pool of addresses
- Configure NAT overload

Lab 6: Troubleshooting Network Problems

- In this lab students learn and revise how to troubleshoot problems related to subjects completed in previous labs

2.3 Laurea Network offerings

This section will describe the networking related course offered by Laurea. There are four courses in total which amount to 30 study credits. Three of the courses are compulsory to all students who are completing the Business Information Technology degree. The three compulsory courses are Data Networks, ICT Network Infrastructure and ICT Network Infrastructure Project. Data Networks teaches the students all the necessary basics of networking, and is the pre-requisite for the other courses which offer a more in-depth understanding. The available optional course is called Interconnecting Networks and is heavily Cisco oriented. In the following sections the courses will be described and broken down.

2.3.1 Data Networks

Data Networks is the first networking course every BIT students has to take when starting to learn networking. The course offers basic theoretical knowledge about computer networks. Some of the topics covered in this course are covered more in depth during the next course ICT Network Infrastructure.

During the course the students will get introduced to the 7 layers of the OSI model and will learn to understand all the different services and technologies that are used on each of the layers. Students will also learn to distinguish between the different types of networks such as LAN, WAN, MAN and PAN. The course also covers very thoroughly about IP, things such as the different classes of IP addresses, network masks as well as the two protocols TCP and UDP that are used in IP. And finally the basics of subnetting and binary calculations are covered.

2.3.2 ICT Network Infrastructure

ICT Network Infrastructure is a continuation course for Data Networks. In this course the students continue to learn the world of networking, but this time with a little more hands on approach. The students get introduced to Cisco IOS and learn the basic commands as well as complete a few exercises with Cisco equipment.

Five practical exercises are offered in this course, two of which are Cisco oriented and are identical to the ones completed during Interconnecting Networks. The other three exercises focus on teaching the students how to properly cable a network, how to set up a VoIP telephone system in the network and how to configure a Linux firewall.

In theoretical lectures there is a heavy focus on teaching the students how to make subnet calculations, which is important knowledge if students want to take advantage of the partnership with Metropolia. Other topics covered in the theoretical lectures are mainly about the different network technologies available such as WLAN, Cellular Networks (3G, 4G, GMS, Tetra).

2.3.3 ICT Network Infrastructure Project

In this course students use their acquired knowledge from the previously described courses, to conduct a project work. The purpose of the project is for the students to demonstrate their ability to work on and manage projects related to building, managing and maintaining networks. As well as being able to formulate and justify project objectives. At the end the students should present their documentation and final results of the project and go through with implementation if applicable.

2.3.4 Interconnecting Networks

The Interconnecting Networks course offered by Laurea is a course based on self-learning and practical exercises. Students study the topics with the use of an online learning tool and once a week come into the SID Networks lab in Laurea to complete practical exercises. The course is more advanced than the other networking offerings in Laurea thus making completion of Data Networks a pre-requisite. Interconnecting Networks comes closest to Metropolias CCNA offerings of covering topics related to the practical use of Cisco routers and switches.

The course consists of 8 lab exercises in total which are completed on a weekly basis. Each week when the students come to the lab, they are required to complete a small exam before the lab which will in the end have an impact on their final grade. If the students don't do well in the small exams, or want to increase their grade they have the chance to do a final exam in the end of the course.

During the first two weeks the students familiarize themselves with the basic commands and configuration of the Cisco IOS operating system. After the first two weeks the students should be comfortable with creating configurations, setting passwords, removing configurations and reloading the devices. Students also learn how to cable their network according to the topology diagram that comes with the exercise.

Weeks 3 and 4 are router oriented and during these weeks students learn how to use CDP (Cisco Discovery Protocol) to collect the information of other devices in the network. Other

topics covered during these weeks include configuring RIPv2 routing protocol as well as configuring a router as a DHCP server.

During the weeks 5 students learn how to configure VLANS and also lean how VTP works in its different modes. In addition to this, inter-VLAN routing and Spanning Tree Protocol are also covered during this week. The things learned during the 5th week are very similar to many of the labs that are done in CCNA 3.

The final 3 weeks of this course are again router oriented. Students learn how to create different Extended Access Lists to allow and to block network traffic. After creating the rules they learn how to apply the rules to interfaces and test if they work. During these weeks students also learn to configure other routing protocols in addition to RIPv2 from the previous week, such as EIGRP and OSPF. Finally students learn to configure routing with Ipv6, which is not covered in any of the CCNA courses, but can prove to be a very important in the future when more networks make the change from Ipv4.

As this course is based on self-learning, the amount of knowledge the students gain is purely up to them. The students may do all the labs without understanding the bigger concepts, unlike the courses at Metropolia where everything is explained by the lecturer.

2.4 Comparison Table

The following is a comparison table of all the topics that are covered in the courses described above. This table should make it easier for the reader to see everything covered in the previous sections in a simplified way.

Topic	Metropolia	Laurea
OSI Model	CCNA 1	Data Networks
Subnetting	CCNA 1	Data Networks ICT Network Infrastructure
Cisco IOS Basics	CCNA 1	Interconnecting Networks ICT Network Infrastructure
Cabling	CCNA 1	ICT Network Infrastructure
Frame Examination	CCNA 1	X
Routing Protocols	CCNA 2	Interconnecting Networks
VLAN	CCNA 3	Interconnecting Networks
Inter-VLAN Routing	CCNA 3	
VTP	CCNA 3	Interconnecting Networks
RSTP	CCNA 3	Interconnecting Networks
Wireless	CCNA 3	Data Networks ICT Network Infrastructure
PPP	CCNA 4	X
Frame Relay	CCNA 4	X
ACL	CCNA 4	Interconnecting Networks
DHCP	CCNA 4	Interconnecting Networks
NAT	CCNA 4	X
Troubleshooting	CCNA 4	X
Cellular Networks	X	Data Networks ICT Network Infrastructure
IPv6 Configuration	X	Interconnecting Networks

Table 1: Topic Comparison

2.5 Laurea IT support description

Laurea IT Support is responsible for installing and maintaining the hardware in all of the Laurea Units as well as giving support to anyone who encounters a problem. The systems they are responsible for are used by 8000 students as well as 500 staff members, they also maintain about 2500 computers. The work is done locally in the units of the University as well as over

the phone. The personnel of IT support consist mainly of Laurea students who are doing their job placement, as well as some other full time employed staff.

3 Questionnaire of Laurea IT support

The questionnaire is aimed at finding out the experiences of the staff working in Laurea's IT support. The main goal of the questions is to understand the amount of network related problems they have to deal with and to find out if their current education is sufficient enough to independently be able to solve the issues. The answers can be directly linked to the courses that need to be developed. As well as show which areas the staff are having difficulties in, which can also link to the relevant CCNA course they could attend. This section will explain the choice of questions and what kind of information they are aiming to obtain.

Since there is a mix of full-time and intern employees working at Laurea IT support it is important to be able to distinguish them. The first two questions are there to distinguish and to find out how long they have been working in this position.

Question three tries to get some insight into the respondent's educational history. Main point of this question was to find out if they have completed any networking courses at Laurea, or somewhere else. This information can be used when seeing the answer of question six, if the respondent marks that their knowledge is not sufficient, it must mean that the courses they completed did not give them the required understanding of the topics.

The purpose of questions four to six is to understand the amount of networking problems that they have to deal with as IT support and to find out the areas of the most common problems. As well as finding out if the respondents have sufficient educational background to solve the problems independently. This information can help when planning courses in the future, to be more focused around the problems that occur more often in the working life.

The last two questions are focused on finding out the further educational needs for workers of IT support. This will give some insight into the perspective of the workers, if they themselves think that CCNA would benefit them.

4 Findings

Unfortunately the questionnaire did not get enough responses to make any decisive conclusions. There were only 2 respondents both of whom were full-time workers. The following table shows the collected responses. For the questions see the appendix.

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Respondent 1	Full-time	1-3 years	N/A	Daily	Switch, WLAN, Cabling, Printers and Phones	Yes	N/A	3
Respondent 2	Full-time	<1 year	N/A	Weekly	WLAN, DHCP and Firewall	No	Routing, WLAN, Network Troubleshooting	2

Table 2: Answers of the questionnaire

As we can see from the results collected, network related problems occur frequently in the job of IT support. The problems range from WLAN and switches to other network connected devices such as printers and phones. Both of the respondents did not give a high mark for question number eight, which means that in their opinion CCNA would not be very beneficial in their current position, but only to some extent.

Because there were no interns who replied to the questionnaire it is hard to understand the sufficiency of Laureas offerings in relation to the working life. But as it is seen from the responses that most of the areas in which problems do occur are covered in Laureas courses.

5 Conclusion

The study was not completely successful due to time restrictions as well as just having just one target job to be studied. But this opens up opportunities for further study into the subject. By selecting a larger range of positions and collecting information from more people, mainly recent graduates or students who are doing their job placement would give a better insight into how sufficient their education is.

As a soon to be graduate, personally I believe that CCNA would be beneficial for anyone who is interested in the networking field. IT support is mostly a stepping stone position which people use to gain experience in their field, so that they can move on in their careers to more demanding jobs. Having that CCNA certification alongside couple years of work experience in IT support would make it easier to find a better position.

During my work at the networks lab, I observed that a very small number of students are very interested in the subject and are doing well. This is mainly because the students are not supervised and do not have any assignment deadlines. I would advise to change the format of the course so that instead of doing small multiple choice exams before the exercises, the students would have to return written assignments related to the subject on a weekly basis. That way the students make their own research and learn better the different technologies.

In my opinion, Laurea should ask for 2 or 3 seats in Metropolias CCNA, mainly for those students who are performing well in Interconnecting Networks, as well as for interns working as Lab Assistants in the networks lab or IT Support.

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Figures

Tables

Appendices

Questionnaire

1) You position is?
   a. Full-time
   b. Part-time
   c. Intern

2) How long have you been working in your position?
   a. < 1 year
   b. 1-3 years
   c. > 3 years

3) What kind of educational background do you have in Networking?

4) How often do you have to deal with Network related problems?
   a. Daily
   b. Weekly
   c. Monthly
   d. Never

5) Out of the occurring problems, which ones are the most common?
   a. Switch
   b. Router
   c. WLAN
   d. Cabling
   e. Other

6) Do you find your knowledge sufficient enough for solving these problems independently?
   a. Yes
   b. No

7) If previous answers is No, further studies in which following subjects would make you more comfortable with problem solving?
   a. Switching

b. Routing
c. WLAN
d. Network Troubleshooting
e. Other

8) How beneficial would a more in-depth education of networks be in your current position?
On a scale of 1-5