

ICT535 Advanced Business Data Communications

Unit Information and Learning Guide

Semester 2 - 2021

This information should be read in conjunction with the online learning materials which can be found on your MyUnits page.

Unit coordinator

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Discipline of IT, Media & Communications



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Information about the unit

Welcome to:

ICT535

Advanced Business Data Communications

Unit description

ICT535 is an intermediate unit that extends the study of LAN architecture previously covered in ICT546. The unit aims to develop a students existing ability to build a functional network and apply design methodologies that allow a small network to scale to a larger regional, national or global network that is manageable, reliable and secure.

A consistent theme throughout the unit is "scalability". Templates and design methodologies are used as techniques to create large networks that minimise complexity and promote structure. With increasing size and complexity, networks become more vulnerable to failure. Many of the technologies explored within the unit support the redundancy and resiliency that are necessary for large enterprises whose business practices rely on robust and reliable access to information and online services.

The unit also explores local area network Ethernet switching at a more advanced level and introduces access control lists as a basis for network security.

ICT535 makes use of two modules of the Cisco Systems Networking Academy CCNA curriculum. Namely, CCNAv7: Enterprise Networking, Security, and Automation (ENSA) & CCNAv7: Switching, Routing, and Wireless Essentials (SRWE). The expectation is that students that apply themselves to the activities within this unit will, with some self study, be adequately prepared to sit the externally administered Cisco Certified Network Associate (CCNA) exam if they choose to do so.

Prerequisites

You will need to have completed:

- ICT546, LAN Design and Implementation.
- Cisco Networking Academy modules "Introduction to Networks" and "Routing and Switching Essentials" or equivalent.

Aims of the unit

- Extend the student's knowledge of data communications networks to include scalable network design; Allowing the development of larger networks.
- Expand the student's repertoire of network technologies to include the Spanning Tree Protocol and the Hot Standby Routing Protocol.
- Extend the student's understanding of the Open Shortest Path First (OSPF) routing protocol.
- Introduce Access Control Lists as framework for traffic selection and a mechanism for security policy implementation.
- Develop skills in the use of EVE-NG network emulation software.

Learning outcomes for the unit

On successful completion of the unit you should be able to:

- Create a network design that is functional, stable and scalable.
- Apply established industry design methodologies and best practices to design and implement a highly available network that delivers the needs of the stakeholders.
- Manage network traffic according to organisational policy using ACLs (Access Control Lists) and demonstrate an understanding of sound security practices.
- Detect, troubleshoot and correct common enterprise network implementation issues using common tools and established troubleshooting methodologies.
- Design, configure and manage simulated enterprise networks using using EVE network emulation software.

Graduate attributes developed in the unit

This unit will contribute to the development of the following Graduate Attributes.

- Critical and creative thinking
- In-depth knowledge of a field of study

Cisco Certified Network Associate (CCNA) Exam Preparation.

This section contains information relating to the externally administered CCNA exam. None of this information relates to the requirements of this unit but it does explain which parts of the Cisco Curriculum are considered less important by the unit coordinator, as the requirements and emphasis of a University course on data communications and a vendor based certification exam are not always in perfect alignment.

This unit makes use of two modules of the Cisco Systems Network Academy curriculum which in itself aims to provide a broad coverage of IP based data communications, prepare students to sit the CCNA exam and provide background information on the networking industry and work life and roles within the industry. This unit emphasises and assesses the IP networking theory and application and tends to ignore the extraneous topics.

For students wishing to sit the CCNA exam after taking this unit, and I do encourage you to do so, here are some points to take into account in your preparation.

The unit coordinator will place little emphasis on the Cisco proprietary elements of the curriculum. Fortunately the communications industry is based on standards and the vast majority of the Cisco content applies to the industry as whole and to other vendor's equipment. Content that relates to the following areas is likely to be covered in little depth and you should revisit these sections prior to sitting for your CCNA exam:

- Cisco product hardware and features.
- Marketing concepts and terminology. Often this includes methodologies and models that emphasise integration and a single vendor environment.
- Navigation of the GUI configuration environments.

For the most part these are items that candidates memorise prior to a certification exam rather than something that is learned. There are a number of Cisco authored labs available that emphasise the use of the GUI interface. These are not used in this unit but for those planning to take the CCNA exam, you are encouraged to complete at least some of these as part of your Certification examination preparation.

<https://www.cisco.com/c/en/us/training-events/training-certifications/certifications/associate/ccna.html>

Contact details

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How to study this unit

(1) Using the schedule as a guide, listen to the recorded lecture and complete the weekly readings prior to attending the workshop.

(2) At the end of each chapter there is online assessment item that is accessible via your Cisco Network Academy login. You are encouraged to make use of these as a form of regular feedback on your comprehension and understanding of the weeks topic. You are strongly encouraged to make use of this feedback after you have read the relevant chapters of the Curriculum.

(3) Check your answers and the provided solutions for the end-of-chapter exams. Make sure you understand where you've gone wrong and seek assistance from your tutor if necessary. Check the unit forum in Moodle to see if there are any discussions surrounding problem areas. Often if you are having difficulty with a topic, so are others. Any questions that are put to the teaching staff in an email will be copied to the forum if we feel it's likely to assist others.

(4) Attend the workshop and feel free to ask questions. Work through the provided exercises. Depending on your skill level, organisation and the lab requirements you may find that you are unable to complete all of the lab material within the allotted 3 hours. If this is the case, you are strongly advised to complete the exercises in your own time. All labs are completed using the EVE-NG software and can be completed on your own computer.

(5) Check the schedule to see what assessment is due or will become due in the following weeks. There is something to submit almost every week, even if it is minor.

(6) Apply the skills you developed in the workshop, to the Case Study. The case study is built up over the course of the semester to include almost all of the technologies and concepts covered in the unit. Resolve any difficulties you are having with the case study, as you go. Don't leave completion of the case study till the end of the semester.

Although the case study itself is not assessable, it is the mechanism by which all of the individual technologies come together. There is a lot of interaction between the technologies that can't be captured in the very targeted workshop sessions. Overcoming and understanding technical issues encountered while completing the case study is the only way to deepen your technical understanding and build your troubleshooting skills. A student's performance on both the practical exam and the final exam often closely matches their level of engagement with the case study.

Expectations

ICT535 has a prerequisite of ICT546 and assumes the learning objectives of that unit have been achieved. If your performance in ICT546 was marginal, then you will find ICT535 a challenging unit. It is crucial that you work on the areas you struggled with in ICT546 and build on a solid foundation. Looking at the background of students that don't pass ICT535, all too often, I see that they repeated ICT546 or scraped through with grades in the low 50s. If you struggled with the introductory ICT546, you should ask yourself honestly whether a networking specialisation is right for you.

ICT535 is a prerequisite for the advanced units ICT611 and ICT613 and the learning objectives in ICT535 are crucial for your ultimate success in the advanced units. The assessments are rigorous, as should be expected in an intermediate Masters level unit and aim to test your understanding rather than merely your memory.

The Skills Framework for the Information Age (SFIA) Foundation provides widely used tools for defining the skill sets and levels required for various roles in IT-related industries. <https://www.sfia-online.org>

In terms of levels, SFIA identify seven levels of responsibility. For network professionals SFIA specifies level 5 “Ensure, advise” and Level 6 “Initiate, Influence”. For level 6 SFIA define the expected complexity and knowledge as follows:

SFIA level 6 - Complexity

Performs an extensive range and variety of complex technical and/or professional work activities. Undertakes work which requires the application of fundamental principles in a wide and often unpredictable range of contexts. Understands the relationship between own specialism and wider customer/organisational requirements.

SFIA level 6 - Knowledge

Is fully familiar with recognised industry bodies of knowledge both generic and specific. Actively seeks out new knowledge for own personal development and the mentoring or coaching of others. Develops a wider breadth of knowledge across the industry or business. Applies knowledge to help to define the standards which others will apply.

<https://www.sfia-online.org/en/framework/sfia-7/documentation/sfia-7-summary-chart>

I would like to draw your attention to the underlined text. Although we will cover the theory and provide examples, we will not cover every possible scenario. You will need to use your understanding of various technologies and protocols to create solutions to problems that occur in environments (contexts) that you are not familiar with. Rote learning facts is not effective in developing understanding and you should not expect that the assessment items will contain many questions that you have already seen.

Contact time

There is a 3 hour workshop associated with this unit.

Time commitment

As this is a 3 credit point unit, we expect a student of average ability to spend 9 hours per week for the total weeks of this teaching period (or 150 hours overall) working on this unit. This is a challenging unit and if you did not do well in ICT546 it will take more time to meet the learning objectives of ICT535.

The most valuable learning occurs when students engage with the lab exercises, test, troubleshoot and experiment to reinforce or clarify their understanding of the material. Please ensure we can maximise our time in the lab actually working on the labs. It is very important that you listen to the recorded lecture, read and prepare prior to the workshop so that the workshop can be used to apply your skills and work through specific issues with your instructor. At the workshop the instructor will only summarise the technology described in the recorded lecture and relate this to the laboratory task at hand. This will not be sufficient to learn the underlying theory and without a sufficient background the lab exercise will become merely a typing exercise.

Attendance requirements

Attendance at workshops is not compulsory and does not form part of the assessment, however there is a strong link between attendance and success in this unit. The weekly troubleshooting or design problem, which is assessed, will often assume completion of the lab. So while the workshop is not assessable, non-attendance is likely to impact your grade.

All workshop sessions form part of the content of the unit, consequently, if you miss a class you should take steps to minimise the impact on your studies. Prerecorded lectures are available online via the Learning Management System (Moodle) and wherever possible Lab materials will also be available.

Your student card should provide access to the lab and providing you have your card with you, you can access the lab 24x7.

Resources for this unit

To undertake study in this unit, you will need:

Optional textbooks:

Everything is available online but if you prefer a paper based book, the following titles will have chapters and topics that will broadly align with the online readings.

Scaling Networks Companion Guide

Published by Cisco Press.
Series: Companion Guide.
ISBN-10: 1-58713-328-8
ISBN-13: 978-1-58713-328-2

Connecting Networks Companion Guide

Published by Cisco Press.
Series: Companion Guide.
ISBN-10: 1-58713-332-6
ISBN-13: 978-1-58713-332-9

Keep in mind that the online Curriculum was released in 2021, by comparison the paper based books above are a few years old.

Online resources

Cisco Networking Academy Curriculum:

(Readings, Feedback Quizzes, Multiple Choice Exams).

<http://cisco.netacad.com>

You will need the unit coordinator or your tutor to add you to the Cisco Networking Academy class. This is important and you need to follow up on this if you having trouble getting access.

It is expected that Cisco Netacad classes will be created towards the end of week 1 when student enrolments begin to stabilise.

If you enrol late (after the commencement of week 1), the onus is on you to contact your tutor/lecturer/unit coordinator and request that you be added to the online class.

Wiki is no longer used

In the past, this unit has hosted labs and the case study on a Wiki page. I am progressively rewriting the content and labs and hosting them on Github. Links to the current labs and case study will be provided in LMS. If you are repeating ICT535 and used to accessing the Wiki, please don't. The labs there will be out of date and may no longer match those pointed to by LMS.

LMS

Access learning materials via the Unit Materials portlet on the MyUnits page of MyMurdoch.

The following will be provided during the teaching period:

- Pre-recorded lectures
- Lecture slides
- Workshop handouts
- Laboratory instructions/workbooks
- Virtual Machine containing the EVE server environment that it used in the labs and for the practical exam.

All assessments are submitted using LMS.

EVE-NG

In ICT546 you will have used Cisco's Packet Tracer simulation software. In ICT535 we use a network emulator called EVE-NG. The unit coordinator will endeavour to provide a virtual machine, hosted in our data-center, that will act as your EVE server. You can access this server using a University provided VPN and a browser on your computer.

An email will be sent to students early in the semester explaining the process and providing login details.

The EVE server can also be run on a student's own computer if it has sufficient RAM (8GB) and a fairly current processor (older AMD processors may not work).

Study schedule

The next page outlines a tentative schedule, some topics are longer than others and thus the tail end of one topic may be completed in a following week. Over the semester shorter and longer topics tend to balance out.

Study schedule

Topic #	Readings	Topic	Laboratories	Assessment Due
1.	SRWE 2 & 14	Introduction Layer 2/3 revision	Introduction to EVE	Feedback question. Best completed during workshop.
2.	ENSA 11	Scalable Network Design	See LMS	Feedback question. Best completed during workshop.
3.	SRWE 5	LAN Redundancy and STP 802.1d	See LMS	Weekly lab problem. Midnight Sunday.
4.	ENSA 13.4 – 13.5	Rapid STP and alternatives to STP and Spine-Leaf model	See LMS	Weekly lab problem. Midnight Sunday.
Independent Study Week 5				Midterm Exam Friday 1:00PM
5.	SRWE 3 (revision) 6 & 4	Link Aggregation InterVLAN routing Routing principles and protocols	See LMS	Weekly lab problem. Midnight Sunday.
6.	SRWE 14 (revision) ENSA 1 & 2	Introduction to OSPF	See LMS	Weekly lab problem. Midnight Sunday.
7.	TBA	OSPF multi-area and Summarisation	See LMS	Weekly lab problem. Midnight Sunday.
8.	ENSA 4 & 5	Access Control Lists (ACL)	See LMS	Weekly lab problem. Midnight Sunday.
Independent Study Week 10				
9.	ENSA 6	ACL continued Implementing NAT	See LMS	Weekly lab problem. Midnight Sunday.
10.	SRWE 9	First hop redundancy HSRP / VRRP	See LMS	Weekly lab problem. Midnight Sunday.
11.	ENSA 12	Troubleshooting Practical Exam - Briefing	See LMS	Weekly lab problem. Midnight Sunday.
12.	N/A	Prac Exam	Mock Prac Exam	Practical Exam Friday 1:00PM

- CCNAv7: Enterprise Networking, Security, and Automation (ENSA)
- CCNAv7: Switching, Routing, and Wireless Essentials (SRWE) www.netacad.com

Assessment

Assessment for this unit is conducted in accordance with the Assessment Policy.

Schedule of assessment items

You will be assessed on the basis of:

Assessment item	Description	Value	Due
Weekly troubleshooting or design problem.	A small assessment item, relating to the current weeks topic.	15%	As per study schedule.
Midsemester exam	Supervised exam taken on campus. Closed book, LMS online delivery	20%	1 st Independent Study Week. Friday 27 th August 1:00 PM
Practical Exam	Supervised exam taken on campus. Individual network design problem. Implemented in EVE.	30%	Week 14 Workshop Friday 29 th October 1:00 PM
Final Examination	Exam taken from home. LMS online delivery.	35%	University Examination Period.

Assessment details

Weekly troubleshooting or design problem

- A small assessment item, relating to the current weeks topic, delivered via LMS, that a student completes in their own time.
- 15% of unit grade.
- Generally activated on the day of the workshop.
- Due on midnight on the Sunday following the workshop.
- There are a total of 8 during the semester.
- Each weekly assessment is equally weighted.
- Your grade for this assessment will be based on the average of your score in each completed assessment item, as long as you complete at least 6 of the 8 that are available.
 - If you complete less than 6 assessments, then you will be deemed to have completed 6 with any any missing attempts being scored as zero.
 - In practice, this means you can miss up to two of the weekly assessments without it impacting your grade.
 - If you can't submit one of the minor weekly assessments there is no need for a doctors certificate or the permission of the unit coordinator. You will merely use up one of the two "free passes"
 - There are no extensions, or "resits". If circumstances are preventing you from submitting 3 or more then perhaps you should consider withdrawing from the unit as it will be difficult to show that you are meeting the learning objectives.

Midterm exam

- An exam covering the first four weeks of the unit.
- 20% of unit grade.
- 120 minutes duration.
- Covers the lecture and lab content of the first four weeks of teaching.
 - Narrow focus
 - STP (theory behind, different types, limitations, determination of port roles)
 - Scalable network design (three layer hierarchy, principles)
- Closed book, supervised exam, held in the lab.
 - No electronic aids
 - No use of computer tools such as "Windows Calculator"
 - No access to sites other than the LMS testing engine page is permitted.
 - No notes are permitted.
- The examination may include multiple choice, short answer and written answer questions.
- Students should bring identification to the exam
- Students have a right to see their marked exam after the final results have been released. Generally this opportunity is limited to a two week period immediately following the release of results.
- Being LMS based, there are no relevant past exam papers held by the library.
- Sample questions will be made available.

Practical exam

- 30% of unit grade.
- 120 minutes for configuration .
- Students are given an EVE topology file which contains a preconfigured network. The configuration and topology will be similar to a provided case-study that students will have been working with over the semester so the scenario will not be unfamiliar.
- The assessment will require students to fix errors in the network configuration, make changes to the configuration to reflect business requirements and extract information from the network. Details of the changes made to the configuration are pasted into an LMS based exam.
- Closed book, supervised exam, held in the lab.
 - No electronic aids
 - No use of computer tools such as “Windows Calculator”
 - No access to sites other than the LMS testing engine page is permitted.
 - No notes are permitted.
- During the semester, a mock exam will be made available so students can practice.

Final Examination

- 120 minutes duration.
- 35% of unit grade.
- A comprehensive exam covering the breadth of the topics covered in the unit.
- Conducted online, during the examination period, using LMS.
See the University web site for details and times.
- This exam is not scheduled to be taken on campus. It is uninvigilated and students may take it “at home”.
- While the exam is “open book”, the expectation is that the answers provided are the words of the student and they complete the assessment on their own and without assistance.
 - Serious penalties apply for academic misconduct.
- The exam uses a “sequential” format. Once a question is viewed it must be answered before moving to the next question and you may not return the question once answered. This is the same format used in most industry certification exams.
- The examination may include multiple choice, short answer and written answer questions.
- Students have a right to see their marked exam after the final results have been released. Generally this opportunity is limited to a two week period immediately following the release of results.
- Being LMS based, there are no relevant past exam papers held by the library.
- A practice exam and sample questions will be made available.

Assessment submission

Students have a responsibility to keep a copy of all assignments handed in for assessment. Late submissions will attract a penalty of a 10% reduction in the overall mark for every day or part day the assessment is late.

IE an assignment graded at 70% that is one day late will receive a mark of:
 $70 - (10\% * 70) = 63\%$

Late submissions will not be accepted once any graded assessments or answers are released. This is University policy. Once the due date has past answers or model solutions could be released at any time and without warning.

Students may change their submission up to the due date. After that time, the current submission will be the one that is graded.

There is no option to resubmit assessments on which a student receives a low grade. The graded attempt is final.

Students need to plan their workloads and other commitments to ensure that assessments are completed on time. The expectation is that you will work on assignments continuously rather than commencing in the week they are due.

Any requests for extensions less than a week before the due date should be submitted with an electronic copy of your assignment work to date.

Should significant unforeseen events prevent you from completing an assessment, it may be possible to seek a deferred assessment. Further information on the requirements and process can be found here: <http://about.murdoch.edu.au/handbook/study/assessment.html>

Determination of the final grade

In order to pass this unit you must:

- Achieve an overall score of 50% or above.
- Achieve a satisfactory (> 50%) score on the supervised assessment components (combined mid-semester and practical exam).

In the event that a student achieves an overall result of 50% or more but the weighted combined score of the supervised assessments is below 50%, under University policy they will receive a mandatory supplementary exam.

The pass mark for the supplementary exam in this case is 50%.

Other supplementary assessments are at the discretion of the unit coordinator.

Scaling of marks

To ensure equity of marking by different tutors the unit coordinator reserves the right to moderate grades between tutorial groups and assignments.

However, shared marking, where one tutor grades one component for all students, is the unit coordinators preferred approach and to date has been the approach taken.

See Section 11 in the current Assessment Policy regarding grades.

Learning Guide

All learning guide information will be provided using the the University's Learning Management System (LMS). Please check the unit LMS page for information on each weeks requirements.

As this unit is subject to continual change and adapts to make use of available facilities and variations in scheduling, not all topics will be available for viewing in the first week. If you are trying to work ahead and the information you require is not yet available, please liaise with the unit coordinator.