



ITEC850

Network System Design

S1 Evening 2016

Dept of Computing

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General Information

Unit convenor and teaching staff

Lecturer

Rajan Shankaran

rajan.shankaran@mq.edu.au

Contact via 98509537

E6A337

Lecturer

Damian Jurd

damian.jurd@mq.edu.au

Damian Jurd

damian.jurd@mq.edu.au

Credit points

4

Prerequisites

ITEC647

Corequisites

Co-badged status

Unit description

This unit will focus on the design of network systems such as routers, switches, and virtual machines for building and managing large scale communication networks. Students will learn the applied theoretical and technological principles in network systems design such as packet processing and classification, lookup algorithms, and switching fabrics. The unit will systematise and further develop this knowledge of network systems in the area of cloud computing and virtualization. Students will gain a thorough understanding of cloud computing concepts such as datacentre design, network virtualization for systems and network devices. Students will also learn about the security issues that cloud deployments experience, and how these are addressed.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

Learning Outcomes

On successful completion of this unit, you will be able to:

Analyse different designs of network systems such as routers, switches, and virtual machines for design and managing large-scale networks.

Analyse different strategies for packet processing, classification, lookup algorithms, and switching fabrics.

Apply theoretical and technological principles in network system design.

Demonstrate competence at analysis, synthesis, design, and evaluation of proposed network technologies.

Apply detailed knowledge of the design of cloud computing and virtualization of compute, storage and network nodes to data centre design with an emphasis on network function virtualisation, overlay networks and software defined networks.

Classify potential vulnerabilities in cloud computing applications and apply appropriate modifications to address these vulnerabilities.

General Assessment Information

The two Quizzes constitute 10% of the total mark and serve as a feedback mechanism to monitor your progress in the unit.

Assignment must be submitted on time. Late submission of the assignment will be accepted, but penalized at the rate of 10% per working day late.

Assignment work must be written clearly, with good grammar, correct word usage, correct punctuation, and lack of spelling errors. Poor or bad expression will be penalized. Wherever required, all written work must be properly referenced and conform to standard stylistic conventions.

General notes on assignment

For all submittable assignment work you are encouraged to:

- set your personal deadline earlier than the actual one;
- keep backup of all important files;
- make sure that no one else picks up your printouts.

Assessment Tasks

Name	Weighting	Due
<u>Assignment 1</u>	15%	Week 7
<u>Assignment 2</u>	25%	Week 12

Name	Weighting	Due
Quiz 1	5%	Week 6
Quiz 2	5%	Week 12
Examination	50%	After last lecture

Assignment 1

Due: **Week 7**

Weighting: **15%**

Assignment 1 will apply to material taught in first five weeks of the course.

Students will analyse implementations of routers and switches in order to maximize throughput and minimize latency with different queuing, switching fabrics, and discard strategies in a number of different scenarios.

On successful completion you will be able to:

- Analyse different designs of network systems such as routers, switches, and virtual machines for design and managing large-scale networks.
- Analyse different strategies for packet processing, classification, lookup algorithms, and switching fabrics.

Assignment 2

Due: **Week 12**

Weighting: **25%**

Assignment 2 will apply to material taught from week 5 onwards.

Students will leverage their knowledge of data center design and cloud computing to design a cloud based application with an emphasis on network design and security.

On successful completion you will be able to:

- Apply theoretical and technological principles in network system design.
- Demonstrate competence at analysis, synthesis, design, and evaluation of proposed network technologies.
- Apply detailed knowledge of the design of cloud computing and virtualization of compute, storage and network nodes to data centre design with an emphasis on network function virtualisation, overlay networks and software defined networks.
- Classify potential vulnerabilities in cloud computing applications and apply appropriate modifications to address these vulnerabilities.

Quiz 1

Due: **Week 6**

Weighting: **5%**

Quiz 1 is a short test (close book) that will be based on your previously covered lecture material for weeks 1-5. The quiz questions will be handed over to you at the beginning of your Lecture class. Quiz 1 contributes 5% of the total mark.

On successful completion you will be able to:

- Analyse different designs of network systems such as routers, switches, and virtual machines for design and managing large-scale networks.
- Analyse different strategies for packet processing, classification, lookup algorithms, and switching fabrics.
- Apply theoretical and technological principles in network system design.
- Apply detailed knowledge of the design of cloud computing and virtualization of compute, storage and network nodes to data centre design with an emphasis on network function virtualisation, overlay networks and software defined networks.

Quiz 2

Due: **Week 12**

Weighting: **5%**

Quiz 2 is a short test (close book) that will be based on your previously covered lecture material for weeks 6-11. The quiz questions will be handed over to you at the beginning of your Lecture class. Quiz 2 contributes 5% of the total mark.

On successful completion you will be able to:

- Demonstrate competence at analysis, synthesis, design, and evaluation of proposed network technologies.
- Apply detailed knowledge of the design of cloud computing and virtualization of compute, storage and network nodes to data centre design with an emphasis on network function virtualisation, overlay networks and software defined networks.
- Classify potential vulnerabilities in cloud computing applications and apply appropriate modifications to address these vulnerabilities.

Examination

Due: **After last lecture**

Weighting: **50%**

An examination allows us to individually and securely assess student's mastery of the

coursework material. The examination will be closed book and three (3) hours in length

Regarding the examination process, note that

§ you must attend all required classes and submit all required assessment, otherwise the Executive Dean of the Faculty or delegated authority has the power to refuse permission to attend the final examination

§ the University Examination period for first Half Year 2016 is from Monday 14th June to Thursday 30th June 2016.

§ you are expected to present yourself for examination at the time and place designated in the [University Examination Timetable](#)

§ the timetable will be available in Draft form approximately eight weeks before the commencement of the examinations and in Final form approximately four weeks before the commencement of examinations

§ no early examinations for individuals or groups of students will be set. All students are expected to ensure that they are available until the end of the teaching semester, that is the final day of the official examination period

§ the only exception to not sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these circumstances you may wish to consider applying for [Special Consideration](#).

On successful completion you will be able to:

- Analyse different designs of network systems such as routers, switches, and virtual machines for design and managing large-scale networks.
- Analyse different strategies for packet processing, classification, lookup algorithms, and switching fabrics.
- Apply theoretical and technological principles in network system design.
- Demonstrate competence at analysis, synthesis, design, and evaluation of proposed network technologies.
- Apply detailed knowledge of the design of cloud computing and virtualization of compute, storage and network nodes to data centre design with an emphasis on network function virtualisation, overlay networks and software defined networks.
- Classify potential vulnerabilities in cloud computing applications and apply appropriate modifications to address these vulnerabilities.

Delivery and Resources

Each week you should attend the class which is three to four hours. For details of days, times and rooms consult the timetables webpage.

The first four weeks will be mainly foundational material covered in lectures and readings and

discussion. The second part of the course will have two hours of lecture and two hours of practical depending on the content for the week.

Please note it is to your benefit to attend most of the classes, prepared to participate in discussions, ask and answer questions, and provide perspectives from your own background and workplaces.

Resources to assist your learning

Digital recordings of lectures are available as Echo360 through iLearn login. These are provided for review material and in case of missing lectures. Recordings should not be relied upon and copyrighted material may be omitted.

iLearn is used for out-of-class communication as well as forums where active discussion of issues is encouraged. iLearn can be found at <http://learn.mq.edu.au>. You are encouraged to review iLearn weekly and to do background reading before each class.

Textbook

The textbook for ITEC850 is:

Dan C. Marinescu Cloud Computing, 1st Edition Theory and Practice
ISBN: 9780124046276 eBook ISBN: 9780124046412

These books are also useful:

Paul Göransson, Chuck Black, Software Defined Networks: A Comprehensive Approach.
Morgan Kaufmann, ISBN: 9780124166844

Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, Mastering Cloud Computing,
Morgan Kaufmann, ISBN: 978-0-12-411454-8, Burlington, Massachusetts, USA, May 2013.

References.

Tannenbaum, A. S and Wetherall, J., Computer Networks, Fifth Edition. Pearson (Prentice Hall)

Stallings, W., Data and Computer Communications, Ninth Edition. Pearson (Prentice Hall)

Comer, D.E., Internetworking with TCP/IP, Sixth Edition. Pearson

Comer, D.E., Network Systems Design using Network Processors. Pearson (Prentice Hall)

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](#). Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

New Assessment Policy in effect from Session 2 2016 http://mq.edu.au/policy/docs/assessment/policy_2016.html. For more information visit http://students.mq.edu.au/events/2016/07/19/new_assessment_policy_in_place_from_session_2/

Assessment Policy prior to Session 2 2016 <http://mq.edu.au/policy/docs/assessment/policy.html>

Grading Policy prior to Session 2 2016 <http://mq.edu.au/policy/docs/grading/policy.html>

Grade Appeal Policy <http://mq.edu.au/policy/docs/gradeappeal/policy.html>

Complaint Management Procedure for Students and Members of the Public http://www.mq.edu.au/policy/docs/complaint_management/procedure.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the [Learning and Teaching Category](#) of Policy Central.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/support/student_conduct/

Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit ask.mq.edu.au.

Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module for Students](#)
- [Ask a Learning Adviser](#)

Student Services and Support

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/

[offices_and_units/information_technology/help/](#).

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

PG - Discipline Knowledge and Skills

Our postgraduates will be able to demonstrate a significantly enhanced depth and breadth of knowledge, scholarly understanding, and specific subject content knowledge in their chosen fields.

This graduate capability is supported by:

Learning outcomes

- Analyse different designs of network systems such as routers, switches, and virtual machines for design and managing large-scale networks.
- Analyse different strategies for packet processing, classification, lookup algorithms, and switching fabrics.
- Apply theoretical and technological principles in network system design.
- Apply detailed knowledge of the design of cloud computing and virtualization of compute, storage and network nodes to data centre design with an emphasis on network function virtualisation, overlay networks and software defined networks.
- Classify potential vulnerabilities in cloud computing applications and apply appropriate modifications to address these vulnerabilities.

Assessment tasks

- Assignment 1
- Assignment 2
- Quiz 1
- Quiz 2
- Examination

PG - Critical, Analytical and Integrative Thinking

Our postgraduates will be capable of utilising and reflecting on prior knowledge and experience, of applying higher level critical thinking skills, and of integrating and synthesising learning and knowledge from a range of sources and environments. A characteristic of this form of thinking is the generation of new, professionally oriented knowledge through personal or group-based critique of practice and theory.

This graduate capability is supported by:

Learning outcomes

- Apply theoretical and technological principles in network system design.
- Demonstrate competence at analysis, synthesis, design, and evaluation of proposed network technologies.
- Apply detailed knowledge of the design of cloud computing and virtualization of compute, storage and network nodes to data centre design with an emphasis on network function virtualisation, overlay networks and software defined networks.
- Classify potential vulnerabilities in cloud computing applications and apply appropriate modifications to address these vulnerabilities.

Assessment tasks

- Assignment 2
- Examination

PG - Research and Problem Solving Capability

Our postgraduates will be capable of systematic enquiry; able to use research skills to create new knowledge that can be applied to real world issues, or contribute to a field of study or practice to enhance society. They will be capable of creative questioning, problem finding and problem solving.

This graduate capability is supported by:

Learning outcomes

- Demonstrate competence at analysis, synthesis, design, and evaluation of proposed network technologies.
- Classify potential vulnerabilities in cloud computing applications and apply appropriate modifications to address these vulnerabilities.

Assessment tasks

- Assignment 2
- Quiz 1
- Quiz 2

PG - Effective Communication

Our postgraduates will be able to communicate effectively and convey their views to different social, cultural, and professional audiences. They will be able to use a variety of technologically supported media to communicate with empathy using a range of written, spoken or visual formats.

This graduate capability is supported by:

Learning outcome

- Demonstrate competence at analysis, synthesis, design, and evaluation of proposed network technologies.

Assessment tasks

- Assignment 1
- Assignment 2
- Examination

Changes from Previous Offering

ITEC850 2015 is substantially different from previous years. Previously ITEC850 looked extensively at Network Management architectures and protocols. ITEC850 now examines the design and implementation of computer networks at a detailed level as described in the new learning outcomes.

Standards and Grading

At the end of the semester, you will receive a grade that reflects your achievement in the unit

- **Fail (F):** does not provide evidence of attainment of all learning outcomes. There is missing or partial or superficial or faulty understanding and application of the fundamental concepts in the field of study; and incomplete, confusing or lacking communication of ideas in ways that give little attention to the conventions of the discipline.
- **Pass (P):** provides sufficient evidence of the achievement of learning outcomes. There is demonstration of understanding and application of fundamental concepts of the field of study; and communication of information and ideas adequately in terms of the conventions of the discipline. The learning attainment is considered satisfactory or adequate or competent or capable in relation to the specified outcomes.
- **Credit (Cr):** provides evidence of learning that goes beyond replication of content knowledge or skills relevant to the learning outcomes. There is demonstration of substantial understanding of fundamental concepts in the field of study and the ability to apply these concepts in a variety of contexts; plus communication of ideas fluently and clearly in terms of the conventions of the discipline.
- **Distinction (D):** provides evidence of integration and evaluation of critical ideas, principles and theories, distinctive insight and ability in applying relevant skills and concepts in relation to learning outcomes. There is demonstration of frequent originality in defining and analysing issues or problems and providing solutions; and the use of means

of communication appropriate to the discipline and the audience.

- **HighDistinction (HD):** provides consistent evidence of deep and critical understanding in relation to the learning outcomes. There is substantial originality and insight in identifying, generating and communicating competing arguments, perspectives or problem solving approaches; critical evaluation of problems, their solutions and their implications; creativity in application.

In this unit, your final grade depends on your performance in each part of the assessment. For each task, you receive a mark that combines your standard of performance regarding each learning outcome assessed by this task. Then the different component marks are added up to determine your total mark out of 100. Your grade then depends on this total mark and your overall standards of performance.

Concretely, in order to pass the unit, you must

- obtain a total mark of 50% or higher and a mark of 40% or higher in the final examination;
- make a reasonable attempt at the exercises in the assessment tasks;
- demonstrate that you can perform at a Functional level or higher for each criterion assessed in the two assignments;
- reach a Functional level or higher for each criterion assessed in the final examination.

Students obtaining a higher grade than a pass in this unit will (in addition to the above)

- - have a total mark of 85% or higher and perform at distinction level or higher in the final examination to obtain High Distinction;
 - have a total mark of 75% or higher and perform at credit level or higher in the final examination to obtain Distinction;
 - have a total mark of 65% or higher and perform at pass level but with 50% or higher in the final examination to obtain Credit.

You are encouraged to:

- set your personal deadline earlier than the actual one;
- keep backups of all important assessed tasks;
- make sure no one else picks up your printouts.

All work submitted should be readable and well presented.

You should **never commit plagiarism** in any of your submitted work, including tutorial and practical answers.