COMP335

Distributed Systems

S1 Day 2018

Dept of Computing

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General Information

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Credit points
3

Prerequisites
(39cp at 100 level or above) including (COMP202 and COMP247)

Corequisites

Co-badged status

Unit description
A distributed system traditionally refers to a group of networked computers; however, it should be today understood in a much wider sense including applications consisting of multiple processes. This unit studies the fundamentals of distributed systems from both hardware perspective and software perspective. The unit also gives some hands-on experience. Topics include distributed systems principles (concurrecy and scheduling), paradigms (cloud computing, mobile computing and Internet of Things), architectures (client-server model, peer-to-peer model and distributed file systems) and techniques (shared memory and message-passing).

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:

Gain an understanding of theoretical background of distributed systems.

Apply theoretical principles and models to design distributed systems.

Be able to identify and select appropriate technologies for building practical distributed systems.

Identify challenges and issues in modern distributed systems.

General Assessment Information

If you receive special consideration for the final exam, a supplementary exam will be scheduled in the interval between the regular exam period and the start of the next session. By making a special consideration application for the final exam you are declaring yourself available for a resit during the supplementary examination period and will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure you are familiar with the policy prior to submitting an application. You can check the supplementary exam information page on FSE101 in iLearn (bit.ly/FSESupp) for dates, and approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.

Assessment Tasks

Name	Weighting	Hurdle	Due
In-class Exercises	10%	No	Weeks 2-12
Group Project	45%	No	Weeks 2-13
Mid-term Exam	15%	No	Week 7
Final Exam	30%	No	Exam weeks

In-class Exercises

Due: **Weeks 2-12**
Weighting: **10%**

There will be a total of eleven in-class assessments during your allocated tutorial classes. You will be asked to submit your solutions to the week's tutorial exercises. You will be graded on your answer by the tutor. The mark allocated to each week's tutorial exercises is 1%; the maximum

marks cannot exceed 10%.

This Assessment Task relates to the following Learning Outcomes:

- Gain an understanding of theoretical background of distributed systems.
- Apply theoretical principles and models to design distributed systems.
- Identify challenges and issues in modern distributed systems.

On successful completion you will be able to:

- Gain an understanding of theoretical background of distributed systems.
- Apply theoretical principles and models to design distributed systems.
- Identify challenges and issues in modern distributed systems.

Group Project

Due: **Weeks 2-13**
Weighting: **45%**

Group Project is a distributed system development task that requires collaborative efforts to design and implement a real distributed system. There are five milestone tasks to be assessed including project presentations and reports, with varying mark allocations. All presentations will be held in lecture classes.

This Assessment Task relates to the following Learning Outcomes:

- Apply theoretical principles and models to design distributed systems.
- Be able to identify and select appropriate technologies for building practical distributed systems.
- Identify challenges and issues in modern distributed systems.

On successful completion you will be able to:

- Apply theoretical principles and models to design distributed systems.
- Be able to identify and select appropriate technologies for building practical distributed systems.
- Identify challenges and issues in modern distributed systems.

Mid-term Exam

Due: **Week 7**
Weighting: **15%**

The Mid-term exam assesses students' knowledge and understanding on distributed systems fundamentals including architectures, paradigms, principles and models of distributed systems. The Mid-term exam will be held in week 7's lecture.

This Assessment Task relates to the following Learning Outcomes:

- Gain an understanding of theoretical background of distributed systems.
- Apply theoretical principles and models to design distributed systems.
- Identify challenges and issues in modern distributed systems.

On successful completion you will be able to:

- Gain an understanding of theoretical background of distributed systems.
- Apply theoretical principles and models to design distributed systems.
- Be able to identify and select appropriate technologies for building practical distributed systems.
- Identify challenges and issues in modern distributed systems.

Final Exam

Due: **Exam weeks**
Weighting: **30%**

The final examination will assess your understanding of the unit content and your ability to integrate concepts learned throughout the unit to solve problems.

This Assessment Task relates to the following Learning Outcomes:

- Gain an understanding of theoretical background of distributed systems.
- Apply theoretical principles and models to design distributed systems.
- Identify challenges and issues in modern distributed systems.

On successful completion you will be able to:

- Gain an understanding of theoretical background of distributed systems.
- Apply theoretical principles and models to design distributed systems.
- Be able to identify and select appropriate technologies for building practical distributed systems.
- Identify challenges and issues in modern distributed systems.

Delivery and Resources

Text Books

1. “Distributed Systems: Principles and Paradigms” by Maarten van Steen and Andrew Tanenbaum, 3rd (3.01) edition.
2. “Distributed Systems: Concepts and Design” by George Coulouris, Jean Dollimore, and Tim Kindberg, Addison Wesley, 5th edition.
3. “Distributed and Cloud Computing: From Parallel Processing to the Internet of Things” by Geoffrey C. Fox, Jack Dongarra, and Kai Hwang, 1st edition.

Soft copy of the first two books is “freely” available online.

iLearn Unit Home Page

COMP335 will make extensive use of the iLearn course management system, including for delivery of class materials, discussion boards, submission of work and access to marks and feedback. Students should check the iLearn site (https://ilearn.mq.edu.au) regularly for unit updates.

Questions and general queries regarding the content of this unit, its lectures or practical classes, or its assessments should be posted to the discussion boards on the COMP335 iLearn site. In particular, any questions which are of interest to all students in this unit should be posted to one of these discussion boards, so that everyone can benefit from the answers. Questions of a private nature should be directed to the unit teaching staff.

Lectures

Each week of COMP335 has two hours of lecture. There are several weeks in which lectures will be delivered in the form of pre-recorded videos. In these weeks, students will present the progress on their group project during lecture time.

Tutorials

Tutorial classes commence in Week 2. Each week has two hours of tutorial class. Each week you should prepare your solutions to the set tutorial questions and attend your enrolled tutorial class. Tutorial classes also provide an opportunity to (collaboratively) work on group project.

Technology Used and Required

Group Project in this unit involves heavy use of cloud computing technologies and solutions including virtual machines and Amazon Web Services (AWS) cloud services. You will be required to **create an account for AWS clouds** to use free academic credits for Group Project.

Unit Schedule

The unit consists of three modules.

- Distributed systems fundamentals
- Internet-scale distributed systems
- Mobile and edge computing

Week	Topic	Textbook	Lecture
1	Introduction to Distributed Systems	M&A Ch 1, Coulouris Ch 1	
2	System models, Architectures and Networks	M&A Ch 2, Coulouris Chs 2 and 3	Project group formation
3	Communications	M&A Ch 4, Coulouris Ch 4	Online; workshop on technologies and solutions for projects
4	Naming and Distributed file systems	Coulouris Ch 13 and M&A Ch 5, and Coulouris Ch 12	Online; Project proposal presentation
5	Synchronisation and concurrency	M&A Ch 6, Coulouris Chs 14 and 16	
6	Fault tolerance and Security	M&A Chs 8&9, Coulouris Ch 15	
7	Cluster, Grids and Volunteer computing projects	Geoffrey Chs 2 and 7	Online; **mid-term exam**

Mid-semester break 1			
Mid-semester break 2			
8	Virtualisation: VMs and Containers	Coulouris Chs 19 and 7, and Geoffrey Ch 3	Online; system design presentation
9	Data centres and Clouds	Geoffrey Ch 4	
10	Mobile computing: including mobile clouds and vehicular clouds	Coulouris Ch 19 and Geoffrey Ch 9	
11	Ubiquotous computing and IoT: edge/fog computing	Coulouris Ch 19 and Geoffrey Ch 9	
12	Real-world distributed systems		Online; Project demo
13	Review		

* Note that the schedule is indicative only and subject to change.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Grade Appeal Policy
- Complaint Management Procedure for Students and Members of the Public
- Special Consideration Policy *(**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)*

Undergraduate students seeking more policy resources can visit the Student Policy Gateway (https://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/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/study/getting-started/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

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- Gain an understanding of theoretical background of distributed systems.
- Apply theoretical principles and models to design distributed systems.
- Be able to identify and select appropriate technologies for building practical distributed systems.
- Identify challenges and issues in modern distributed systems.

Assessment tasks

- In-class Exercises
- Group Project
- Mid-term Exam
- Final Exam

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- Gain an understanding of theoretical background of distributed systems.
- Apply theoretical principles and models to design distributed systems.
- Be able to identify and select appropriate technologies for building practical distributed systems.
- Identify challenges and issues in modern distributed systems.

Assessment tasks

- In-class Exercises
- Group Project
- Mid-term Exam
- Final Exam

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate

and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- Gain an understanding of theoretical background of distributed systems.
- Apply theoretical principles and models to design distributed systems.
- Be able to identify and select appropriate technologies for building practical distributed systems.
- Identify challenges and issues in modern distributed systems.

Assessment tasks

- In-class Exercises
- Group Project
- Mid-term Exam
- Final Exam

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

- Gain an understanding of theoretical background of distributed systems.
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- Be able to identify and select appropriate technologies for building practical distributed systems.
- Identify challenges and issues in modern distributed systems.

Assessment tasks

- In-class Exercises
- Group Project
- Mid-term Exam
- Final Exam

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcomes

- Gain an understanding of theoretical background of distributed systems.
- Apply theoretical principles and models to design distributed systems.
- Be able to identify and select appropriate technologies for building practical distributed systems.
- Identify challenges and issues in modern distributed systems.

Assessment tasks

- In-class Exercises
- Group Project
- Mid-term Exam
- Final Exam

Changes since First Published

Date	Description
19/02/2018	There have been a few changes to Unit Schedule.