



COIT20257 Distributed Systems: Principles and Development

Term 3 - 2022

Profile information current as at 27/04/2024 10:20 am

All details in this unit profile for COIT20257 have been officially approved by CQUniversity and represent a learning partnership between the University and you (our student). The information will not be changed unless absolutely necessary and any change will be clearly indicated by an approved correction included in the profile.

General Information

Overview

Distributed Systems: Principles and Development you will learn basic principles of distributed systems including architecture, design, and algorithms and how to use these principles in the development of distributed applications. You will explore the significant distributed system characteristics of scalability, heterogeneity, security, and failure handling in addition to the fundamentals of networking, inter-process communication, remote invocation, and operating system support. You will examine different approaches to supporting distributed applications including distributed objects, web services, and peer-to-peer solutions. You will learn about distributed file systems, naming, and data-related aspects of distributed transactions, and data replication. Algorithms associated to timing, and coordination and agreement will also be studied. You will also analyse the areas of mobile and ubiquitous computing and the social impact arising from the ubiquity of distributed systems. You will consolidate the key theoretical material through the computer lab tutorial sessions and development of software applications.

Details

Career Level: *Postgraduate*

Unit Level: *Level 9*

Credit Points: 6

Student Contribution Band: 8

Fraction of Full-Time Student Load: 0.125

Pre-requisites or Co-requisites

Prerequisite unit: COIT20256 Data structures and AlgorithmsAnti-Requisite unit: COIT23005 Distributed Systems

Important note: Students enrolled in a subsequent unit who failed their pre-requisite unit, should drop the subsequent unit before the census date or within 10 working days of Fail grade notification. Students who do not drop the unit in this timeframe cannot later drop the unit without academic and financial liability. See details in the [Assessment Policy and Procedure \(Higher Education Coursework\)](#).

Offerings For Term 3 - 2022

- Brisbane
- Melbourne
- Online
- Sydney

Attendance Requirements

All on-campus students are expected to attend scheduled classes – in some units, these classes are identified as a mandatory (pass/fail) component and attendance is compulsory. International students, on a student visa, must maintain a full time study load and meet both attendance and academic progress requirements in each study period (satisfactory attendance for International students is defined as maintaining at least an 80% attendance record).

Website

[This unit has a website, within the Moodle system, which is available two weeks before the start of term. It is important that you visit your Moodle site throughout the term. Please visit Moodle for more information.](#)

Class and Assessment Overview

Recommended Student Time Commitment

Each 6-credit Postgraduate unit at CQUniversity requires an overall time commitment of an average of 12.5 hours of study per week, making a total of 150 hours for the unit.

Class Timetable

Regional Campuses

Bundaberg, Cairns, Emerald, Gladstone, Mackay, Rockhampton, Townsville

Metropolitan Campuses

Adelaide, Brisbane, Melbourne, Perth, Sydney

Assessment Overview

1. Practical Assessment

Weighting: 30%

2. Practical Assessment

Weighting: 35%

3. Written Assessment

Weighting: 35%

Assessment Grading

This is a graded unit: your overall grade will be calculated from the marks or grades for each assessment task, based on the relative weightings shown in the table above. You must obtain an overall mark for the unit of at least 50%, or an overall grade of 'pass' in order to pass the unit. If any 'pass/fail' tasks are shown in the table above they must also be completed successfully ('pass' grade). You must also meet any minimum mark requirements specified for a particular assessment task, as detailed in the 'assessment task' section (note that in some instances, the minimum mark for a task may be greater than 50%). Consult the [University's Grades and Results Policy](#) for more details of interim results and final grades.

CQUniversity Policies

All University policies are available on the [CQUniversity Policy site](#).

You may wish to view these policies:

- Grades and Results Policy
- Assessment Policy and Procedure (Higher Education Coursework)
- Review of Grade Procedure
- Student Academic Integrity Policy and Procedure
- Monitoring Academic Progress (MAP) Policy and Procedure – Domestic Students
- Monitoring Academic Progress (MAP) Policy and Procedure – International Students
- Student Refund and Credit Balance Policy and Procedure
- Student Feedback – Compliments and Complaints Policy and Procedure
- Information and Communications Technology Acceptable Use Policy and Procedure

This list is not an exhaustive list of all University policies. The full list of University policies are available on the [CQUniversity Policy site](#).

Previous Student Feedback

Feedback, Recommendations and Responses

Every unit is reviewed for enhancement each year. At the most recent review, the following staff and student feedback items were identified and recommendations were made.

Feedback from Coordinator reflection

Feedback

Students cover the concepts of distributed system security, but do not get sufficient programming practice

Recommendation

Introduce programming components for digital certificate and symmetric and asymmetric encryption; enhance distributed system security by developing a secured distributed system for assessment.

Feedback from Coordinator reflection

Feedback

Not enough depth in concurrency control, so difficult for students to apply

Recommendation

Introduce more programming components e.g. thread safety and synchronisation to apply concurrency control to cope with data inconsistency problems for constructing distributed systems.

Unit Learning Outcomes

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

1. Develop distributed applications using networking, inter-process communication, and remote invocation
2. Design and develop distributed applications using one of the approaches of distributed objects, web services, and peer-to-peer solutions
3. Solve problems in the distributed systems domain by applying the principles of distributed systems to authentic problems
4. Critique the issues involved in developing reliable, secure, and scalable distributed systems
5. Discuss the technology needs and social impact arising from ubiquitous distributed systems
6. Work independently and collaboratively in small teams.

Australian Computer Society (ACS) recognises the Skills Framework for the Information Age (SFIA). SFIA is in use in over 100 countries and provides a widely used and consistent definition of ICT skills. SFIA is increasingly being used when developing job descriptions and role profiles.

ACS members can use the tool MySFIA to build a skills profile at

<https://www.acs.org.au/professionalrecognition/mysfia-b2c.html>

This unit contributes to the following workplace skills as defined by SFIA. The SFIA code is included:

- Systems Design (DESN)
- Systems Integration (SINT)
- Programming/Software Development (PROG),
- Database/Repository Design (DBDS)
- Testing (TEST)
- Network Support (NTAS)
- Release and Deployment (RELM),
- Application Support (ASUP).

Alignment of Learning Outcomes, Assessment and Graduate Attributes

 N/A Level	 Introductory Level	 Intermediate Level	 Graduate Level	 Professional Level	 Advanced Level
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Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes					
	1	2	3	4	5	6
1 - Practical Assessment - 30%	•		•			
2 - Practical Assessment - 35%		•	•	•		•
3 - Written Assessment - 35%				•	•	•

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes					
	1	2	3	4	5	6
1 - Knowledge	o	o	o	o	o	o
2 - Communication	o		o	o	o	o
3 - Cognitive, technical and creative skills	o	o	o	o	o	o
4 - Research	o	o	o	o	o	
5 - Self-management	o	o		o		
6 - Ethical and Professional Responsibility		o		o		o
7 - Leadership		o				o
8 - Aboriginal and Torres Strait Islander Cultures						

Alignment of Assessment Tasks to Graduate Attributes

Textbooks and Resources

Textbooks

COIT20257

Prescribed

Distributed Systems Concepts and Design

Edition: 5 (2012)

Authors: George Coulouris, Jean Dollimore, Tim Kindberg and Gordon Blair

Pearson Education

Gordon Blair, UK

ISBN: 13: 9780137521081

Binding: Paperback

Additional Textbook Information

You can read this book online from the library. If you prefer to study from a paper copy, they are available at the CQUni Bookshop here: <http://bookshop.cqu.edu.au>
(search on the Unit code)

[View textbooks at the CQUniversity Bookshop](#)

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)
- Jakarta EE 8 (available from <https://jakarta.ee/release/8/>)
- JDK 17 (available from <https://www.oracle.com/java/technologies/downloads/#java17>)
- Apache NetBeans IDE 12.5 or higher (<https://netbeans.apache.org/download/index.html>)
- MySQL Community Server 8.06 or higher (<https://dev.mysql.com/downloads/windows/installer/8.0.html>)
- Apache TomEE 8.0 TomEE Plus (available from <https://tomee.apache.org/download.html#tomee-8.0>)

Referencing Style

All submissions for this unit must use the referencing styles below:

- [Harvard \(author-date\)](#)
- [American Psychological Association 7th Edition \(APA 7th edition\)](#)

For further information, see the Assessment Tasks.

Teaching Contacts

Mary Tom Unit Coordinator
m.tom@cqu.edu.au

Schedule

Week 1 - 07 Nov 2022

Module/Topic	Chapter	Events and Submissions/Topic
An Introduction to Distributed Systems	1 and 2	

Week 2 - 14 Nov 2022

Module/Topic	Chapter	Events and Submissions/Topic
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Inter-process Communication	4	
Week 3 - 21 Nov 2022		
Module/Topic	Chapter	Events and Submissions/Topic
Process and Thread Management - Operating System Support	7	
Week 4 - 28 Nov 2022		
Module/Topic	Chapter	Events and Submissions/Topic
Distributed Objects and Introduction to Web Services	5 and Lecture Notes	
Vacation Week - 05 Dec 2022		
Module/Topic	Chapter	Events and Submissions/Topic
Week 5 - 12 Dec 2022		
Module/Topic	Chapter	Events and Submissions/Topic
Web Services	9 and Lecture Notes	
Week 6 - 19 Dec 2022		
Module/Topic	Chapter	Events and Submissions/Topic
Security in Distributed Systems	11	Assignment 1 Due: Week 6 Tuesday (20 Dec 2022) 11:45 pm AEST
Vacation Week - 26 Dec 2022		
Module/Topic	Chapter	Events and Submissions/Topic
Week 7 - 02 Jan 2023		
Module/Topic	Chapter	Events and Submissions/Topic
Distributed File Systems and Name Services	12 and 13	
Week 8 - 09 Jan 2023		
Module/Topic	Chapter	Events and Submissions/Topic
Coordination and Agreement	15	
Week 9 - 16 Jan 2023		
Module/Topic	Chapter	Events and Submissions/Topic
Transactions and Concurrent Control	16	Assignment 2 Due: Week 9 Thursday (19 Jan 2023) 11:45 pm AEST
Week 10 - 23 Jan 2023		
Module/Topic	Chapter	Events and Submissions/Topic
Distributed Transactions	17	
Week 11 - 30 Jan 2023		
Module/Topic	Chapter	Events and Submissions/Topic
Replication and Fault Tolerance	18	
Week 12 - 06 Feb 2023		
Module/Topic	Chapter	Events and Submissions/Topic
Mobile and Ubiquitous Computing	19	
Exam Week - 13 Feb 2023		
Module/Topic	Chapter	Events and Submissions/Topic
		Assignment 3 Due: Exam Week Tuesday (14 Feb 2023) 11:45 pm AEST

Term Specific Information

Unit Coordinator

Dr Mary Tom

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Brisbane

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Assessment Tasks

1 Assignment 1

Assessment Type

Practical Assessment

Task Description

Your task for this assignment is to design, implement, test and document a client/server system which allows concurrent access to multiple clients. The purpose of this assignment is to assess your competency in Java TCP networking, multi-threading, and object serialization. This assignment task is to assess your skills in practicing the theoretical concepts learnt in Weeks 1 - 4. Further details are in the Assignment 1 Specification document available on the Unit website .

Assessment Due Date

Week 6 Tuesday (20 Dec 2022) 11:45 pm AEST

Assignment 1 Due

Return Date to Students

Week 8 Tuesday (10 Jan 2023)

Assignment 1 Results Release

Weighting

30%

Assessment Criteria

The assignment will be assessed by the software implementation and user instruction document.

1. Appropriate Analysis and design of a software application using TCP networking and client-server model for the given problem
2. Correct implementation of the application using TCP streaming, multi-threading, and object serialization
3. Correct incorporation of concurrent multi-user access to the software application
4. Use of good programming techniques/practices
5. Rigorous testing of software application.

Referencing Style

- [Harvard \(author-date\)](#)
- [American Psychological Association 7th Edition \(APA 7th edition\)](#)

Submission

Online

Submission Instructions

You must submit your assignment via the online submission system from the unit Moodle site.

Learning Outcomes Assessed

- Develop distributed applications using networking, inter-process communication, and remote invocation
- Solve problems in the distributed systems domain by applying the principles of distributed systems to authentic problems

Graduate Attributes

- Knowledge

- Communication
- Cognitive, technical and creative skills
- Self-management

2 Assignment 2

Assessment Type

Practical Assessment

Task Description

Your task for this assignment is to design, implement, test and document a secure three tier client/server system which allows concurrent access to multiple clients. Your system will have a graphical user interface, a business logic layer, and a back-end database. This assignment task is to assess your skills in practicing the theoretical concepts learnt in Weeks 1 - 8 and in the prerequisite units. You will be completing the software design and development working in teams consisting of 3 - 5 members. You will develop a test plan and test the software application individually. You will individually write and submit a report documenting the testing details and any other theoretical aspects required. Further details are in the Assignment 2 Specification document available on the Unit website.

Assessment Due Date

Week 9 Thursday (19 Jan 2023) 11:45 pm AEST

Assignment 2 Due

Return Date to Students

Week 11 Thursday (2 Feb 2023)

Assignment 2 Results Release

Weighting

35%

Assessment Criteria

The assignment will be assessed by the completed software implementation, documentation of testing, user instruction, and peer-review report.

1. Analyse the given problem and design a 3 tier client-server software application using distributed system concepts.
2. Correct design and implementation of a software solution to provide a secure multi-user client access using one of the approaches of distributed objects, or web services.
3. Use of good programming techniques/practices
4. User interface design following user interface design guidelines.
5. Rigorous testing of software application
6. Correct and concise documentation as required.
7. Good collaboration working in a small team.

The detailed marking criteria can be accessed from the Assignment 2 Specification available from the Unit Website.

Referencing Style

- [Harvard \(author-date\)](#)
- [American Psychological Association 7th Edition \(APA 7th edition\)](#)

Submission

Online

Submission Instructions

You must submit your assignment via the online submission system from the unit Moodle site.

Learning Outcomes Assessed

- Design and develop distributed applications using one of the approaches of distributed objects, web services, and peer-to-peer solutions
- Solve problems in the distributed systems domain by applying the principles of distributed systems to authentic problems
- Critique the issues involved in developing reliable, secure, and scalable distributed systems
- Work independently and collaboratively in small teams.

Graduate Attributes

- Knowledge
- Communication

- Cognitive, technical and creative skills
- Research
- Self-management
- Ethical and Professional Responsibility
- Leadership

3 Assignment 3

Assessment Type

Written Assessment

Task Description

Your task in this assignment is to demonstrate your understanding of the role distributed systems play in facilitating pervasive computing and critically evaluate the technology needs in terms of reliability and security and the related issues impacting the society. This assessment task is to write a formal academic report demonstrating your knowledge in the topics learnt in Weeks 1 - 12 as well as your understanding of the current developments in distributed systems. Further details including marking criteria are available in the Assignment 3 Specification document available on the Unit website.

Assessment Due Date

Exam Week Tuesday (14 Feb 2023) 11:45 pm AEST

Assignment 3 Due

Return Date to Students

The marked assignment will be returned on the day of Certification of Grades

Weighting

35%

Assessment Criteria

1. Clear demonstration of your understanding of the importance of distributed system principles of security, reliability etc. as per the requirement.
2. Demonstration of good understanding of the topics related to current developments in Distributed Systems as given in the Assignment specification.
3. Demonstration of deep understanding of the theoretical concepts learnt in relation to current applications.
4. Critical review of relevant information and logical construction of arguments.
5. Relevant discussion of the impact of specific aspects of distributed systems to society.
6. Appropriate formatting, clarity of expressions, and relevant and correct use of references.

Referencing Style

- [Harvard \(author-date\)](#)
- [American Psychological Association 7th Edition \(APA 7th edition\)](#)

Submission

Online

Submission Instructions

You must submit your assignment via the online submission system from the unit Moodle site.

Learning Outcomes Assessed

- Critique the issues involved in developing reliable, secure, and scalable distributed systems
- Discuss the technology needs and social impact arising from ubiquitous distributed systems
- Work independently and collaboratively in small teams.

Graduate Attributes

- Knowledge
- Communication
- Cognitive, technical and creative skills
- Research
- Self-management
- Ethical and Professional Responsibility

Academic Integrity Statement

As a CQUniversity student you are expected to act honestly in all aspects of your academic work.

Any assessable work undertaken or submitted for review or assessment must be your own work. Assessable work is any type of work you do to meet the assessment requirements in the unit, including draft work submitted for review and feedback and final work to be assessed.

When you use the ideas, words or data of others in your assessment, you must thoroughly and clearly acknowledge the source of this information by using the correct referencing style for your unit. Using others' work without proper acknowledgement may be considered a form of intellectual dishonesty.

Participating honestly, respectfully, responsibly, and fairly in your university study ensures the CQUniversity qualification you earn will be valued as a true indication of your individual academic achievement and will continue to receive the respect and recognition it deserves.

As a student, you are responsible for reading and following CQUniversity's policies, including the [Student Academic Integrity Policy and Procedure](#). This policy sets out CQUniversity's expectations of you to act with integrity, examples of academic integrity breaches to avoid, the processes used to address alleged breaches of academic integrity, and potential penalties.

What is a breach of academic integrity?

A breach of academic integrity includes but is not limited to plagiarism, self-plagiarism, collusion, cheating, contract cheating, and academic misconduct. The Student Academic Integrity Policy and Procedure defines what these terms mean and gives examples.

Why is academic integrity important?

A breach of academic integrity may result in one or more penalties, including suspension or even expulsion from the University. It can also have negative implications for student visas and future enrolment at CQUniversity or elsewhere. Students who engage in contract cheating also risk being blackmailed by contract cheating services.

Where can I get assistance?

For academic advice and guidance, the [Academic Learning Centre \(ALC\)](#) can support you in becoming confident in completing assessments with integrity and of high standard.

What can you do to act with integrity?



Be Honest

If your assessment task is done by someone else, it would be dishonest of you to claim it as your own



Seek Help

If you are not sure about how to cite or reference in essays, reports etc, then seek help from your lecturer, the library or the Academic Learning Centre (ALC)



Produce Original Work

Originality comes from your ability to read widely, think critically, and apply your gained knowledge to address a question or problem