



**MONASH** University  
Information Technology

**FIT3142**  
**Distributed computing**

**Unit Guide**

**Semester 2, 2014**

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# **FIT3142 Distributed computing - Semester 2, 2014**

Modern computer systems rely increasingly on distributed computing mechanisms, implemented often as clusters, web services, grids and clouds. Distributed computing systems can provide seamless (or web-like) access to a variety of networked resources, e.g. processing cores, large data stores and information repositories, expensive instruments, high-speed links, sensor networks, and multimedia services for a wide range of applications. This unit provides foundation knowledge and understanding of the basic mechanisms required to implement distributed computing systems, especially clouds, grids, web services and clusters. Topics covered include: Introduction to parallel and distributed computing mechanisms, concurrency and synchronisation, monitors, deadlocks, concurrent program analysis - Deadlock, Safety & Liveness properties, computational and service-oriented grids. LVS and Beowulf Clusters. Gridservices, Webservices, WSDL, HPC Portals, Home Grids, Clouds and Peer-to-Peer (P2P) networks. Distributed applications, and their performance and reliability in relation to processor and network performance constraints.

## **Mode of Delivery**

Clayton (Day)

## **Workload Requirements**

Minimum total expected workload equals 12 hours per week comprising:

(a.) Contact hours for on-campus students:

- Two hours of lectures
- One 2-hour laboratory
- One 1-hour tutorial

(b.) Additional requirements (all students):

- A minimum of 7 hours independent study per week for completing lab and assignment work, private study and revision.

## **Unit Relationships**

### **Prohibitions**

FIT3010

### **Prerequisites**

([FIT2069](#), [FIT2070](#) and one of [FIT3141](#) or [ECE2041](#)) or ([FIT1005](#)/FIT2008 and FIT2022)

## **Chief Examiner**

**Dr Carlo Kopp**

## **Campus Lecturer**

### **Clayton**

**Asad I. Khan, Room 221/63, Clayton**

Consultation hours: By appointment

## **Tutors**

### **Clayton**

**Tennyson YUAN**

Consultation hours: By appointment

**Chandana Watagodakumbura**

Consultation hours: By appointment

## **Your feedback to Us**

Monash is committed to excellence in education and regularly seeks feedback from students, employers and staff. One of the key formal ways students have to provide feedback is through the Student Evaluation of Teaching and Units (SETU) survey. The University's student evaluation policy requires that every unit is evaluated each year. Students are strongly encouraged to complete the surveys. The feedback is anonymous and provides the Faculty with evidence of aspects that students are satisfied and areas for improvement.

For more information on Monash's educational strategy, see:

[www.monash.edu.au/about/monash-directions/](http://www.monash.edu.au/about/monash-directions/) and on student evaluations, see:  
[www.policy.monash.edu/policy-bank/academic/education/quality/student-evaluation-policy.html](http://www.policy.monash.edu/policy-bank/academic/education/quality/student-evaluation-policy.html)

## **Previous Student Evaluations of this Unit**

Students in previous offerings have found this unit to be intellectually stimulating.

If you wish to view how previous students rated this unit, please go to  
<https://emuapps.monash.edu.au/unitevaluations/index.jsp>

# Academic Overview

## Learning Outcomes

At the completion of this unit students will be able to:

- understand basic problems in distributed computing, especially in relation to concurrency, parallelism, synchronisation, deadlocks, safety and liveness properties;
- understand differences between various distributed computing models and widely used distributed computing schemes;
- understand basic functional and performance concepts in grids and clouds and identify frequent causes of performance problems in grid applications;
- understand basic software and hardware reliability concepts in grids and identify frequent causes of reliability problems in grid applications;
- discuss some of the enabling technologies e.g. high-speed links, emulators and storage area networks for building computer grids and clouds;
- explain the use of some of the cloud computing, grid computing and clustering middleware used to implement virtual super computers, including security mechanisms;
- explain programming toolkits such as Parallel Virtual Machine (PVM) for writing parallel computer applications;
- explain HPC Portals, peer-to-peer (P2P) networking and semantic grids;
- elaborate some of the significant grid and cloud computing areas of application e.g. Bio-Technology, eHealth and eMedicine, Finance, and Computer Networks;
- install and configure a small computer grid using Globus toolkit middleware;
- gain basic familiarity with commonly used grid application tools and middleware interfaces;
- extend the grid and test these applications.

## Unit Schedule

Week	Activities	Assessment
0		No formal assessment or activities are undertaken in week 0
1	Introduction: Sockets, RPC, Objects, Clusters, Grids, Clouds; Administrative: Lab Registration; Check MURPA Schedule	Tutorial 1
2	Distributing Computing Schemes	Tutorial 2; Lab 1
3	Concurrency, Parallelism, Synchronisation, Deadlocks, Safety	Tutorial 3; Lab 2
4	Grid / Cloud Middleware	Tutorial 4; Lab 3
5	Grid / Cloud Security	Tutorial 5; Lab 4
6	Advanced Distributed Networking Technologies	Tutorial 6; Lab 5
7	Clusters and Distributed Programming Environments	Tutorial 7; Lab 6; Assignment 1 due Friday Week 7
8	High Performance Computing and Grids	Tutorial 8; Lab 7
9	Distributed Application Performance Modelling	Tutorial 9; Lab 8
10	Reliability of Distributed Applications	Tutorial 10; Lab 9
11	The Design of Distributed Applications	Tutorial 11; Lab 10; Assignment 2 due Friday Week 11; Tutorial report due Fri Week 11 (to be included within the Assignment 2 submission)
12	Limits to Distributed Application Performance	Lab 11
	SWOT VAC	No formal assessment is undertaken in SWOT VAC
	Examination period	LINK to Assessment Policy: <a href="http://policy.monash.edu.au/policy-bank/academic/education/assessment/assessment-in-coursework-policy.html">http://policy.monash.edu.au/policy-bank/academic/education/assessment/assessment-in-coursework-policy.html</a>

\*Unit Schedule details will be maintained and communicated to you via your learning system.

## Teaching Approach

### Lecture and tutorials or problem classes

This teaching and learning approach provides facilitated learning, practical exploration and peer learning.

### Assessment Summary

Examination (3 hours): 60%; In-semester assessment: 40%

Assessment Task	Value	Due Date
Assignment 1	10%	Friday Week 7 (12/Sep), 12PM
Assignment 2	15%	Friday Week 11 (17/Oct), 12PM

## Unit Schedule

Laboratory Work	10%	Weekly (starting Week 2)
Tutorial Work	5%	Friday Week 11 (17/Oct), 12PM
Examination 1	60%	To be advised

# Assessment Requirements

## Assessment Policy

Faculty Policy - Unit Assessment Hurdles

(<http://intranet.monash.edu.au/infotech/resources/staff/edgov/policies/assessment-examinations/assessment-hurdles>)

Academic Integrity - Please see resources and tutorials at

<http://www.monash.edu/library/skills/resources/tutorials/academic-integrity/>

## Assessment Tasks

### Participation

To meet the learning objectives for this unit students are expected to attend 80% of Tutorials (MURPA) and 80% of Labs. Failure to meet these expectations may cause difficulties in passing the unit.

#### • Assessment task 1

**Title:**

Assignment 1

**Description:**

This assignment will be a written report requiring some independent reading.

Further details will be provided during the semester.

**Weighting:**

10%

**Criteria for assessment:**

Individual assessment of independent work by student:

1. How well underlying principles and theories are demonstrated in the student's answers
2. The appropriateness of the formatted report style
3. The quality of the student's arguments

**Due date:**

Friday Week 7 (12/Sep), 12PM

#### • Assessment task 2

**Title:**

Assignment 2

**Description:**

This assignment will be a written report requiring some independent reading.

Further details will be provided during the semester.

**Weighting:**

15%

**Criteria for assessment:**

Individual assessment of independent work by student:

1. How well underlying principles and theories are demonstrated in the student's answers



## Assessment Requirements

2. The appropriateness of the formatted report style
3. The quality of the student's arguments

**Due date:**

Friday Week 11 (17/Oct), 12PM

### • Assessment task 3

**Title:**

Laboratory Work

**Description:**

Weekly laboratory exercises and tasks. Students will organise themselves in groups of 4 to 5 and elect a group leader. Each group leader will email the completed lab work of the group to the tutor as follows.

1. Email *subject*: FIT3142 Group No. ?? Week ??
2. *Cc*: to every group member.
3. Email *attachment*. (i) Group's source code (if applicable), (ii) lab results as a single PDF file, and (iii) each group member's percentage contribution as assessed by the group (expressed as a percentage).

**Weighting:**

10%

**Criteria for assessment:**

The laboratory work is group-based and it is assessed on correctness and on the quality of the solutions and on the quality of presentation/documentation. Individual marks for each group member will be derived from (i) the peer assessments made by the group under the supervision of the tutor and (ii) the overall marks achieved by the group.

**Due date:**

Weekly (starting Week 2)

### • Assessment task 4

**Title:**

Tutorial Work

**Description:**

Weekly attendance of MURPA tutorials or FIT Seminars/Colloquia (in G12A/26, Clayton) and reporting by students. The students who are unable to attend a scheduled session owing to timetabling conflicts may have the option to review the MULO recordings available at <https://messagelab.monash.edu.au/MURPA> and [www.infotech.monash.edu.au/seminars](http://www.infotech.monash.edu.au/seminars)

This is an individual assessment, with submission required in Week 11.

**Weighting:**

5%

**Criteria for assessment:**

Individual assessment of independent work by student:

1. How well underlying principles and theories are demonstrated in the student's answers
2. The appropriateness of the formatted report style
3. The quality of the student's arguments

**Due date:**

Friday Week 11 (17/Oct), 12PM

## Examinations

### • Examination 1

**Weighting:**

60%

**Length:**

3 hours

**Type (open/closed book):**

Closed book

**Electronic devices allowed in the exam:**

Non programmable scientific calculator

## Learning resources

### Reading list

**George Coulouris, Jean Dollimore, Tim Kindberg and Gordon Blair**, Distributed Systems: Concepts and Design, Fifth Edition, published by Addison Wesley, May 2011, ISBN 0-13-214301-1 (not prescribed)

Monash Library Unit Reading List (if applicable to the unit)

<http://readinglists.lib.monash.edu/index.html>

Faculty of Information Technology [Style Guide](#)

### Feedback to you

Examination/other end-of-semester assessment feedback may take the form of feedback classes, provision of sample answers or other group feedback after official results have been published. Please check with your lecturer on the feedback provided and take advantage of this prior to requesting individual consultations with staff. If your unit has an examination, you may request to view your examination script booklet, see

<http://intranet.monash.edu.au/infotech/resources/students/procedures/request-to-view-exam-scripts.html>

Types of feedback you can expect to receive in this unit are:

- Informal feedback on progress in labs/tutes
- Graded assignments with comments

### Extensions and penalties

Submission must be made by the due date otherwise penalties will be enforced.

You must negotiate any extensions formally with your campus unit leader via the in-semester special consideration process: <http://www.monash.edu.au/exams/special-consideration.html>

## **Returning assignments**

Students can expect assignments to be returned within two weeks of the submission date or after receipt, whichever is later.

## **Resubmission of assignments**

Resubmission is not permitted.

## **Referencing requirements**

External materials must be properly cited and referenced.

## **Assignment submission**

It is a University requirement

(<http://www.policy.monash.edu/policy-bank/academic/education/conduct/student-academic-integrity-managing-pla>) for students to submit an assignment coversheet for each assessment item. Faculty Assignment coversheets can be found at <http://www.infotech.monash.edu.au/resources/student/forms/>. Please check with your Lecturer on the submission method for your assignment coversheet (e.g. attach a file to the online assignment submission, hand-in a hard copy, or use an online quiz). Please note that it is your responsibility to retain copies of your assessments.

## **Online submission**

If Electronic Submission has been approved for your unit, please submit your work via the learning system for this unit, which you can access via links in the my.monash portal.

## Other Information

### Policies

Monash has educational policies, procedures and guidelines, which are designed to ensure that staff and students are aware of the University's academic standards, and to provide advice on how they might uphold them. You can find Monash's Education Policies at:

[www.policy.monash.edu.au/policy-bank/academic/education/index.html](http://www.policy.monash.edu.au/policy-bank/academic/education/index.html)

Key educational policies include:

- Student Academic Integrity Policy and Student Academic Integrity: Managing Plagiarism and Collusion Procedures ;  
<http://www.policy.monash.edu/policy-bank/academic/education/conduct/student-academic-integrity-policy.h>
- Assessment in Coursework Programs;  
<http://www.policy.monash.edu/policy-bank/academic/education/assessment/assessment-in-coursework-po>
- Special Consideration;  
<http://www.policy.monash.edu/policy-bank/academic/education/assessment/special-consideration-policy.ht>
- Grading Scale;  
<http://www.policy.monash.edu/policy-bank/academic/education/assessment/grading-scale-policy.html>
- Discipline: Student Policy;  
<http://www.policy.monash.edu/policy-bank/academic/education/conduct/student-discipline-policy.html>
- Academic Calendar and Semesters; <http://www.monash.edu.au/students/dates/>
- Orientation and Transition; <http://intranet.monash.edu.au/infotech/resources/students/orientation/>
- Academic and Administrative Complaints and Grievances Policy;  
<http://www.policy.monash.edu/policy-bank/academic/education/management/complaints-grievance-policy.h>

### Faculty resources and policies

Important student resources including Faculty policies are located at

<http://intranet.monash.edu.au/infotech/resources/students/>

### Graduate Attributes Policy

<http://www.policy.monash.edu/policy-bank/academic/education/management/monash-graduate-attributes-policy.h>

### Student Charter

[www.opq.monash.edu.au/ep/student-charter/monash-university-student-charter.html](http://www.opq.monash.edu.au/ep/student-charter/monash-university-student-charter.html)

### Student services

The University provides many different kinds of support services for you. Contact your tutor if you need advice and see the range of services available at <http://www.monash.edu.au/students>. For Malaysia see <http://www.monash.edu.my/Student-services>, and for South Africa see <http://www.monash.ac.za/current/>.

## Monash University Library

The Monash University Library provides a range of services, resources and programs that enable you to save time and be more effective in your learning and research. Go to [www.lib.monash.edu.au](http://www.lib.monash.edu.au) or the library tab in [my.monash](http://my.monash) portal for more information. At Malaysia, visit the Library and Learning Commons at <http://www.lib.monash.edu.my/>. At South Africa visit <http://www.lib.monash.ac.za/>.

## Disability Liaison Unit

Students who have a disability or medical condition are welcome to contact the Disability Liaison Unit to discuss academic support services. Disability Liaison Officers (DLOs) visit all Victorian campuses on a regular basis.

- Website: <http://www.monash.edu/equity-diversity/disability/index.html>
- Telephone: 03 9905 5704 to book an appointment with a DLO; or contact the Student Advisor, Student Community Services at 03 55146018 at Malaysia
- Email: [dlu@monash.edu](mailto:dlu@monash.edu)
- Drop In: Equity and Diversity Centre, Level 1, Building 55, Clayton Campus, or Student Community Services Department, Level 2, Building 2, Monash University, Malaysia Campus