FIT3142
Distributed computing

Unit Guide

Semester 2, 2011

Last updated: 22 Aug 2011

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FIT3142 Distributed computing - Semester 2, 2011

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)

Contact Hours

2 hrs lectures/wk, 2 hr laboratory/wk, 1 hr tutorial/wk

Workload

Students will be expected to spend a total of 12 hours per week during semester on this unit as follows:

- Lectures: 2 hours
- Lab Sessions: 2 hours
- Tutorials: 1 hour (MURPA - Monash University Research Projects Abroad)
- and up to an additional 7 hours for completing lab and assignment work, private study and revision.

Unit Relationships

Prohibitions

FIT3010

Prerequisites

(FIT2069, FIT2070 and FIT3141) or (FIT1005/FIT2008 and FIT2022)

Chief Examiner

Dr Carlo Kopp

Campus Lecturer

Clayton

Carlo Kopp

Contact hours: By appointment / email (part time staff)

Ronald Pose

Contact hours: By appointment (part time staff)

Tutors

Clayton

Ronald Pose

Contact hours: By appointment (part time staff)

Academic Overview

Learning Objectives

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.

Graduate Attributes

Monash prepares its graduates to be:

1. responsible and effective global citizens who:

a. engage in an internationalised world
b. exhibit cross-cultural competence
c. demonstrate ethical values

critical and creative scholars who:

a. produce innovative solutions to problems
b. apply research skills to a range of challenges
c. communicate perceptively and effectively

Assessment Summary

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

Assessment Task	Value	Due Date

Assignment 1	10%	Friday Week 7
Assignment 2	10%	Friday Week 12
Laboratory Work	10%	Weekly (starting Week 2)
Tutorial Work	10%	Weekly
Examination 1	60%	To be advised

Teaching Approach

Lecture and tutorials or problem classes

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

Feedback

Our feedback to You

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

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

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 SETU, Student Evaluation of Teacher and Unit. 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, and on student evaluations, see:
http://www.monash.edu.au/about/monash-directions/directions.html
http://www.policy.monash.edu/policy-bank/academic/education/quality/student-evaluation-policy.html

Previous Student Evaluations of this unit

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

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 and Liveness	Tutorial 3; Lab 2
4	Grid Middleware	Tutorial 4; Lab 3
5	Grid 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
12	Limits to Distributed Application Performance	Tutorial 12; Lab 11; Assignment 2 due Friday Week 12
	SWOT VAC	No formal assessment is undertaken SWOT VAC
	Examination period	LINK to Assessment Policy: http://policy.monash.edu.au/policy-bank/academic/education/assessment/assessment-in-coursework-policy.html

*Unit Schedule details will be maintained and communicated to you via your MUSO (Blackboard or Moodle) learning system.

Assessment Requirements

Assessment Policy

To pass a unit which includes an examination as part of the assessment a student must obtain:

- 40% or more in the unit's examination, and
- 40% or more in the unit's total non-examination assessment, and
- an overall unit mark of 50% or more.

If a student does not achieve 40% or more in the unit examination or the unit non-examination total assessment, and the total mark for the unit is greater than 50% then a mark of no greater than 49-N will be recorded for the unit

Assessment Tasks

Participation

To meet the learning objectives for this unit there is an 80% attendance hurdle for Tutorials (MURPA) and an 80% attendance hurdle for Labs.

A student who does not meet all these hurdles can get a maximum of 49-N for the unit.

For applying for special consideration refer to the link provided under 'Extensions and penalties' at the end of this section.

- **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

- **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:
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 12

• Assessment task 3

Title:
Laboratory Work

Description:
Weekly laboratory exercises and tasks.

Weighting:
10%

Criteria for assessment:
Individual assessment of independent work by student:

1. Quality of solutions/answers to problems/questions (demonstrates understanding of learning materials)

Due date:
Weekly (starting Week 2)

• Assessment task 4

Title:
Tutorial Work

Description:
Weekly attendance of MURPA tutorials and reporting by students.

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:
Weekly

Examinations

- **Examination 1**

  Weighting:
  60%
  Length:
  3 hours
  Type (open/closed book):
  Closed book
  Electronic devices allowed in the exam:
  Non programmable scientific calculator.

Assignment submission

It is a University requirement
(http://www.policy.monash.edu/policy-bank/academic/education/conduct/plagiarism-procedures.html) 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).

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.infotech.monash.edu.au/resources/student/equity/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.

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:
http://policy.monash.edu.au/policy-bank/academic/education/index.html

Key educational policies include:

- Plagiarism
  (http://www.policy.monash.edu/policy-bank/academic/education/conduct/plagiarism-policy.html)
- Assessment
  (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.h
- 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/key-dates/);
- Orientation and Transition (http://www.infotech.monash.edu.au/resources/student/orientation/);
  and
- Academic and Administrative Complaints and Grievances Policy
  (http://www.policy.monash.edu/policy-bank/academic/education/management/complaints-grievance-policy.
- Codes of Practice for Teaching and Learning
  (http://www.policy.monash.edu.au/policy-bank/academic/education/conduct/suppdocs/code-of-practice-tea

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 www.monash.edu.au/students The Monash University Library provides a range of services and resources that enable you to save time and be more effective in your learning and research. Go to http://www.lib.monash.edu.au or the library tab in my.monash portal for more information. 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://adm.monash.edu/sss/equity-diversity/disability-liaison/index.html;
- Telephone: 03 9905 5704 to book an appointment with a DLO;
- Email: dlu@monash.edu
- Drop In: Equity and Diversity Centre, Level 1 Gallery Building (Building 55), Monash University, Clayton Campus.