

INSTITUTE OF TECHNOLOGY BLANCHARDSTOWN

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| Year | Year 3 |
| Semester | 2 |
| Date of Examination | May 2013 |
| Time of Examination | Tuesday 28 th May 2013 |

12.30pm – 2.30pm

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| Programme Title | Bachelor of Science in Computing in Information Technology |
| Programme Code | BN302 |
| Module Title | Network Distributed Computing |
| Banner Module Code | COMP H3031 |

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| Programme Title | Bachelor of Science in Computing in Information Technology |
| Programme Code | BN013 |
| Module Title | Network Distributed Computing |
| Banner Module Code | COMP H3031 |

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| Programme Title | Bachelor of Science (honors) in Computing |
| Programme Code | BN104 |
| Module Title | Network Distributed Computing |
| Banner Module Code | COMP H3031 |

Internal Examiner(s): *Dr. Anthony Keane*

External Examiner(s): *Dr Tom Lunney*
Mr. Michael Barrett

Instructions to candidates:

- 1) To ensure that you take the correct examination, please check that the module and programme which you are following is listed in the tables above.
- 2) Answer question 1 and any two of the other questions.
- 3) Question 1 is worth 40 marks and all other questions are worth 30 marks each.

**DO NOT TURN OVER THIS PAGE UNTIL YOU ARE
TOLD TO DO SO**

Question 1:**Total 40 marks**

- (a) Give a definition of ***Distributed Systems*** and explain how it is different to ***Network Distributed Computing***.

(8 marks)

- (b) Briefly describe ***each*** the following characteristics of distributed systems:

- Openness
- Scalability

(8 marks)

- (c) Describe how mobile computing is regarded as ***ubiquitous*** and identify some of the ***challenges*** of having ubiquitous systems in the corporate enterprise.

(8 marks)

- (d) What is the role of ***Security*** in Network Distributed Computing and why has it become so important in the recent times?

(8 marks)

- (e) Assuming two computer clocks on a network have the same max drift rate ρ where $1-\rho \leq dC/dt \leq 1+\rho$. To keep them synchronized to within a time of one second, how often must they be re-synchronize, if $\rho=0.5$ seconds? *Show all calculations clearly.*

(8 marks)

Question 2:**Worth 30 marks**

- (a) Explain why **scalability** is more difficult to achieve in **Client-Server** systems than **P2P** systems. Illustrate your answer with an example. (8 marks)
- (b) Describe and illustrate the **client-server architecture** of one major Internet applications (for example the WWW, Email or Search Engine). In your answer, explain how the servers would co-operate in providing a service. (12 marks)
- (c) Consider a simple server that carries out client requests without accessing other servers.
- (i) Explain why it is generally not possible to set a limit on the time taken by such a server to respond to a client request. (4 marks)
 - (ii) What would need to be done to make the server able to execute requests within a bounded time? (4 marks)
 - (iii) Is your solution to part (ii) a practical option? (2 marks)

Question 3:**Worth 30 marks**

- (a) What are the main challenges to developing **distributed applications for mobile wireless devices** compared to traditional wired networked computer systems. (8 marks)
- (b) What are the main concerns in organizations with **BYOD** and give some examples of how this is a **security risk** to the integrity and availability of data. (10 marks)
- (c) Many sensor nodes are scattered throughout a region. The nodes are to communicate securely. Describe the problems of **key distribution** and outline any possible strategy to overcome such problems. (12 marks)

Question 4:**Worth 30 marks**

- (a) Identify any issues for distributed applications when using **time clocks** on a computer to tell time?
(6 marks)
- (b) Describe how the synchronizing of clocks on an internal and external synchronous system and how is this different to an asynchronous system.
(12 marks)
- (c) A client attempts to **synchronise with a time server**. It records the round-trip times and timestamps returned by the server in the table below.
- (i) Which of these times should it use to set the clock?
 - (ii) To what time should the clock be set?
 - (iii) Estimate the accuracy of the setting with respect to the server's clock.
 - (iv) If the min time between sending and receiving a message is 2 ms, will your answer change?
 - (v) If the system is required to synchronise a file server's clock to within 0.1 ms, what is the required roundtrip time?
 - (vi) If the time server was unavailable, what time should I set my clock to?

| Round-trip(ms) | Time (hr:min:sec) |
|----------------|-------------------|
| 5 | 04:07:04.678 |
| 8 | 04:05:06.123 |
| 11 | 04:06:07.245 |
| 12 | 04:05:09.321 |

(12 marks)