

National College of Ireland

MSc Cloud Computing – Full-time – Year 1 – MSCLOUDJAN17

Semester Two Examinations – 2016/17

**Friday 5th May 2017
10.00am – 12.00pm**

Cloud Architecture

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Answer All Questions

Duration of exam: 2 hours

Attachments: None

1. (i) List 5 key advances in technologies or architectural approaches that have enabled the growth of cloud computing systems. (10 Marks)
(ii) Show how each technology advance has contributed to addressing a problem in Cloud systems, giving examples of each technology to support the points made. (10 marks)
[Total: 20 marks]
2. (i) Describe Amdahl's Law and its importance. (6 marks)
(ii) A given program has 99.9% of its code parallelisable. If this program is executed on a parallel machine, what is the parallel speedup on (9 marks)
 - 8 cores
 - 16,000 cores
 - 1,600,000 cores
(iii) Briefly comment on the trends in technology used in the Top500 list, using an example system to explain your answer. (5 marks)
[Total: 20 marks]
3. (i) Define Hardware Abstraction, Operating System and User level application levels of virtualization. (12 marks)
(ii) Compare and discuss the differences in these 3 approaches to virtualization, with examples showing the interaction with the hardware and Operating system as appropriate. (8 marks)
[Total: 20 marks]
4. (i) Define Computational Clusters. (6 marks)
(ii) Explain the concept of Single System Image (SSI), showing the features it must provide. (6 marks)
(iii) Describe the characteristics of Cloud describing the types of Cloud services available (8 marks)
[Total: 20 marks]
5. (i) Describe Brewer's CAP Theorem. (5 marks)
(ii) Describe the roles of the Name Node and Data Nodes in the HDFS Architecture and how they are used to provide fault tolerance. (10 marks)
(iii) A Cloud Provider has a maximum time to repair (MTTR) a failed component in its cloud infrastructure of 10 minutes. Assuming a maximum of one failure per year, calculate the annual availability without planned downtime. (5 marks)
[Total: 20 marks]