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University of Glasgow

DEGREES OF M.Sc., M.Sci., M.Eng., B.Eng., B.Sc., M.A. and M.A. (Social Sciences)

COMPUTING SCIENCE (M):
GRID COMPUTING

Sample Examination

(Answer all 3 questions.)

1. **(a)** Describe the key differences between a Grid Computing system and a traditional distributed computing system. Discuss why the promise of Grid Computing has proven so difficult to realise in practice.

[10]

(b) A concept with great potential for use in future Grid Computing systems is peer-to-peer computing. Explain what is peer-to-peer computing, discussing the key properties that set it apart from client-server or other models of distributed systems.

[10]

(c) A key challenge in deploying peer-to-peer technologies is the presence of firewalls and Network Address Translation devices in the network. Discuss why such devices can cause problems for peer-to-peer systems.

[5]

(d) A common use of peer-to-peer systems is for file sharing, to provide a distributed index and distributed data store. Explain how such a system works, discussing the benefits and limitations it might have as the basis of a data repository for a large-scale distributed collaboration (for example, if used to index, archive, and make available data from the world's observatories, to help the astronomy community share their results).

[25]

2. **(a)** Earlier versions of Grid were largely driven by technology. Explain this statement with reference to the Globus toolkit and the "bag of services" it offered in supporting the "three pillars" of Globus Grid middleware.

[7]

(b) The Open Grid Service Architecture (OGSA) standardisation activity represents a re-factoring of Grid technologies as Grid/web services. Explain why this re-factoring was necessary.

[7]

(c) Integral to OGSA "was" the Open Grid Service Infrastructure (OGSI). Describe the capabilities of OGSI and explain the differences between an OGSI based Grid service and a pure web service. Describe the benefits and difficulties in web service technologies generally for development, deployment and usage of Grid infrastructures.

[16]

(d) Outline the difficulties in producing generic Grid security standards and implementations within OGSA. Why can no Grid ever be totally secure?

[14]

(e) OGSI has now been superseded by the Web Service Resource Framework (WSRF). Explain the perceived benefits of WSRF and how it is attempting to re-factor OGSI.

[6]

3. **(a)** Describe in detail the entities which require to be created to establish the presentation, confirmation and propagation of identity on the grid by GSI. Your answer should explain the contents and interaction of these entities, along with justifications for the processes that underpin them.

[30]

(b) Explain how authorisation is implemented in GSI. What are the problems associated with this approach?

[5]

(c) Considering the answer to part (b), in what ways can the shortcomings of GSI authorisation be overcome?

[5]

(d) Two authentication processes, Kerberos and Secure Shell, are not recommended for grid activities. Discuss for each method the advantages gained, but eventually the problems encountered in using these mechanisms for grid authentication.

[10]