THE BRITISH COMPUTER SOCIETY

THE BCS PROFESSIONAL EXAMINATION
Professional Graduate Diploma

DISTRIBUTED & PARALLEL SYSTEMS

15th May 2003, 2.30 p.m.-5.30 p.m.
Answer THREE questions out of FIVE. All questions carry equal marks.
Time: THREE hours.

*The marks given in brackets are **indicative** of the weight given to each part of the question.*

1. The developer of a large scale distributed system must take into account a number of important design issues.

    a) Explain briefly what the terms *performance, availability* and *scalability* mean when applied to a distributed system. Why are these issues so important during the design process?

    (13 marks)

    b) Discuss different approaches to load balancing in distributed systems with replicated servers.
    (Where possible, you should illustrate your answers with examples from systems you have used or studied).

    (12 marks)

2. Internetworking allows computers on independent and incompatible networks to communicate reliably and efficiently.

    a) Explain in general terms how internetworks may be implemented. **(7 marks)**

    b) Explain in particular how the Internet emerged. **(7 marks)**

    c) Explain how internetworking protocols enable reliable communication. **(7 marks)**

    d) Why might it be unwise to use bandwidth as the only measure of network performance? **(4 marks)**

3. *a)* Three desirable attributes of parallel algorithms and software are: *concurrency, locality* and *modularity.* What is meant by these terms? **(8 marks)**

    b) Summarise three forms of basic model used to described parallel algorithms and indicate current trends. **(9 marks)**

    c) Describe any parallel algorithm (such as finite differences, pairwise interactions, 2D grid or any other of your choice). Use both text and diagram to aid in your description. **(8 marks)**

4. You have agreed to talk for 30 minutes at the next meeting of your local BCS branch. The title of your talk is "System Security".

    Sketch out approximately eight presentation slides, with associated notes, that you would use for your talk. **(25 marks)**

5. With reference to the architectures and support technologies used to develop modern distributed software systems:

a) What is meant by an n-tier client-server architecture? Discuss how the design of a typical e-commerce web application fits in to this architecture. **(12 marks)**

b) Evaluate the role played in an advanced client-server system by object-base middleware and illustrate your answer with suitable examples. **(13 marks)**