

THE BRITISH COMPUTER SOCIETY

THE BCS PROFESSIONAL EXAMINATION Professional Graduate Diploma

NETWORK INFORMATION SYSTEMS

30th April 2004, 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. You have been tasked to provide a review of user requirements for a new distributed system which is being planned for your organization. Discuss the issues you would consider under the following three headings and provide suitable explanations of the factors associated with each.
 - a) Functionality. Among the factors you need to consider are operating systems. Discuss the following three options:
 - i) Adapt the existing operating system.
 - ii) Move to an entirely new operating system designed specifically for distributed systems.
 - iii) Emulation. **(9 marks)**
 - b) Reconfigurability.
In your discussion ensure you consider the following:
 - i) Short term changes.
 - ii) Medium to long term evolution. **(8 marks)**
 - c) Quality of Service.
Include the following three factors in your discussion:
 - i) Performance.
 - ii) Reliability and availability.
 - iii) Security. **(8 marks)**
2. Within the context of Local Area Networks describe the functionality of ethernet, token ring and token bus, giving the major advantages and disadvantages of each. **(25 marks)**

Turn over]

3. Distributed processes often need to co-ordinate their activities. For example, if a collection of processes share a single or a collection of resources managed by a server, then often mutual exclusion is required to prevent interference and ensure consistency when accessing resources.

a) Explain the requirements for mutual exclusion in terms of safety, liveness and ordering. (9 marks)

b) The simplest way to achieve distributed mutual exclusion is to employ a server that grants permission to enter a critical section, commonly referred to as 'the central server algorithm'. Figure 1 below depicts such a server managing a mutual exclusion token for a set of processes.

Explain the structure and operation of this algorithm. (16 marks)

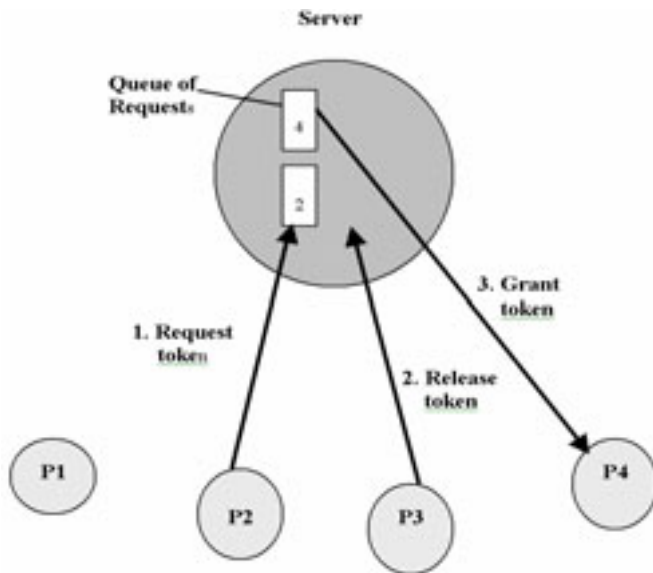


Figure 1

4. a) Describe the technologies which are required to implement an E-commerce Web site which supports on-line ordering and payment. (15 marks)

b) Describe two mechanisms which can be used to allow end users to update Web content on a commercial Web site. (10 marks)

5. A process group is a collection of processes that co-operate towards a common goal or that consume one or more common streams of information. Group structures are defined according to the pattern of communication in which the members of a group are involved.

a) **Figure 2** below shows one such group structure, referred to as client-server group. Explain how requests from clients are handled and the subsequent actions of the servers. **(9 marks)**

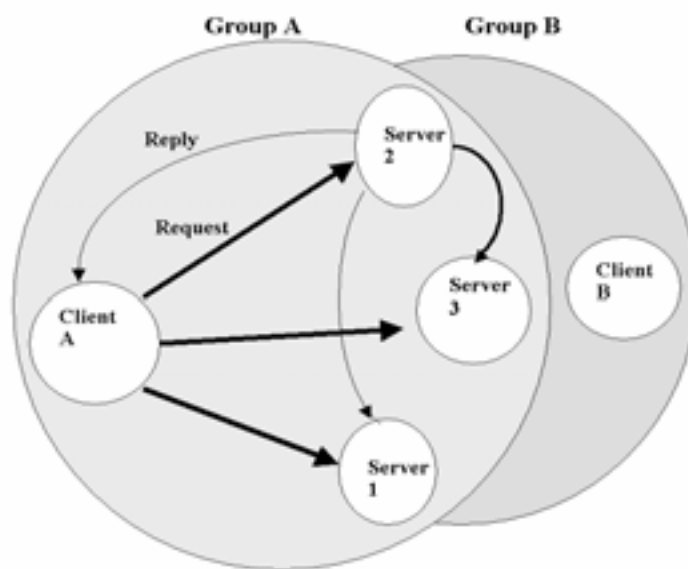


Figure 2

b) Other examples of group structures are:

- Peer group
- Server group
- Subscription group
- Hierarchical group

Using diagrams where appropriate, explain the principles of operation of such groups. **(16 marks)**