2006 Paper 9 Question 5

Advanced Systems Topics

(*a*) Distributed storage approaches can be divided into *network attached storage* (NAS) and *storage area networks* (SANs). Explain with the aid of a diagram the basic differences between the two approaches. [4 marks]

(*b*) The network file system (NFS) is often used in local area networks.

    (*i*) Why is NFS not normally considered suitable for wide area networks? [2 marks]

    (*ii*) Briefly discuss how one could modify NFS to better support wide area networks. [2 marks]

(*c*) *Distributed shared virtual memory* can be used within a computing cluster to transparently allow multi-threaded programs to run across multiple machines. Sketch the design of a DSVM system. Be sure to explain what happens both when a memory read and when a memory write occurs. Comment on the expected performance and robustness of your system. [6 marks]

(*d*) EROS is a capability-based operating system.

    (*i*) What is a capability? [1 mark]

    (*ii*) Explain with the aid of a diagram how EROS uses traditional paging hardware to emulate capability hardware. [5 marks]