

1996 Paper 9 Question 4

Distributed Systems

Einstein has established that there is no universal time. For earth-based computer systems discuss how events might be assigned a time stamp which is reasonably close to conventional earth-time.

Describe the constraints on system-wide event ordering and discuss alternative approaches to meeting them. [10 marks]

For a system in which data replicas are maintained:

Either Define *total order* and *causal order* applied to the delivery of update messages to the replicas. Outline an approach to maintaining causal order. [10 marks]

or Describe algorithms and protocols which may be used to achieve consistency of replicas at all times. [10 marks]