Distributed Computing Systems
Assignment 1

1. For each of the factors that contribute to the time taken to transmit a message between two processes over a communication channel, state what measures would be needed to set a bound on its contribution to the total time. Why are these measures not provided in current general-purpose distributed systems?

2. Consider two communication services for use in asynchronous distributed systems. In service A, messages may be lost, duplicated or delayed and checksums apply only to headers. In service B, messages may be lost, delayed or delivered too fast for the recipient to handle them, but those that are delivered arrive in order and with the correct contents.
Describe the classes of failure exhibited by each service. Classify their failures according to their effect on the properties of validity and integrity. Can service B be described as a reliable communication service?

3. Outline the design of a scheme that uses message retransmissions with IP multicast to overcome the problem of dropped messages. Your scheme should take the following points into account:
i) there may be multiple senders;
ii) generally only a small proportion of messages are dropped;
iii) unlike the request-reply protocol, recipients may not necessarily send a message within any particular time limit.
Assume that messages that are not dropped arrive in sender ordering.

4. Assume the RRA protocol is in use. How long should servers retain unacknowledged reply data? Should servers repeatedly send the reply in an attempt to receive an acknowledgement?

5. Explain the different RMI Invocation semantics.