Assignment # 1

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Course: Parallel and Distributed Computing

BroadCast Protocals And Trends In Distributed Systems

Telephone and Cellular networks are also examples of distributed networks Telephone networks have been around for over a ~~country~~ century and it started as an early example of peer to peer network. Cellular networks are distributed networks with base stations.

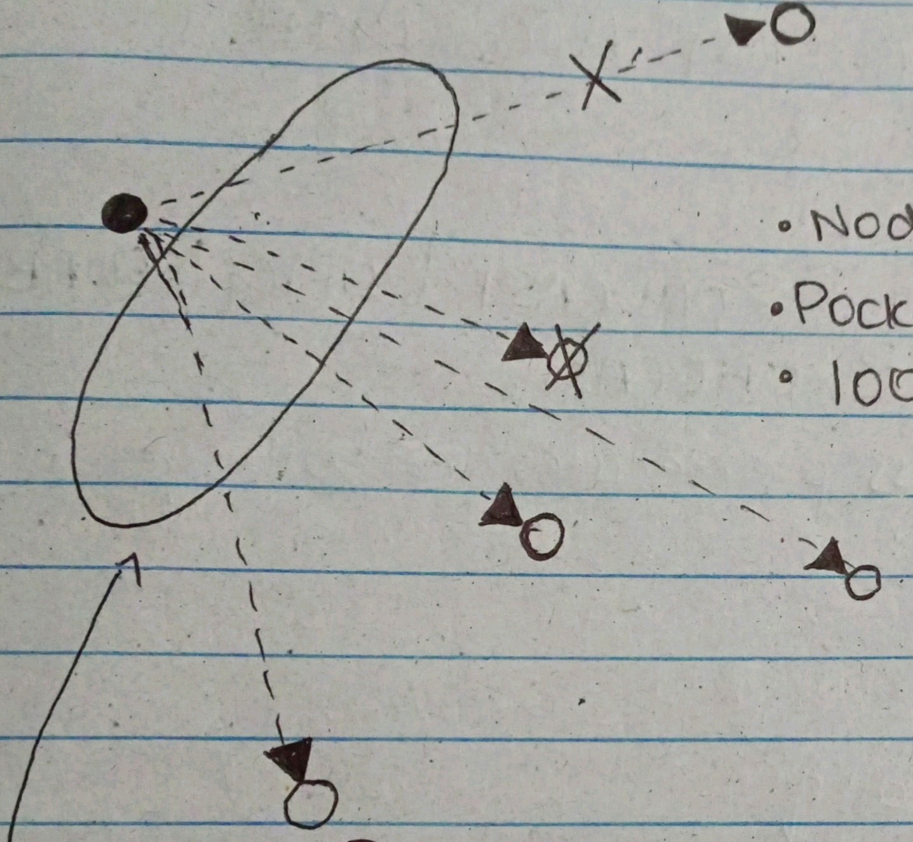
Key Characteristics Of Distributed Systems:

- Resource Sharing
- Openess
- Concurrency
- Scalability
- Fault Tolerance
- Transparency

1) GOSSIP BROADCAST PROTOCOL:

Many distributed system benefits from the availability of a reliable broadcast service. Informally, reliable broadcast ensures that all correct participants receive all broadcast messages, even in the presence of network omissions or node failures. Gossip protocols have emerged as a highly scalable and resilient approach to implement reliable broadcast. [1, 2, 3, 4]. In a typical gossip protocol, when a nod wants to broadcast a message, it selects t nodes from the system at random (t is a configuration parameter called fan-out) and sends the message to them; upon recieving a message for the first-time, each node repeats this procedure.

MULTICAST SENDER



- Nodes may crash
- Pockets may be dropped
- 1000's ob nodes

MULTICAST PROTOCOL

2) FIFO BROADCAST ALGORITHM :

BUILD FIFO BROADCAST USING RELIABLE BROADCAST

Every Process p encecutes the following:

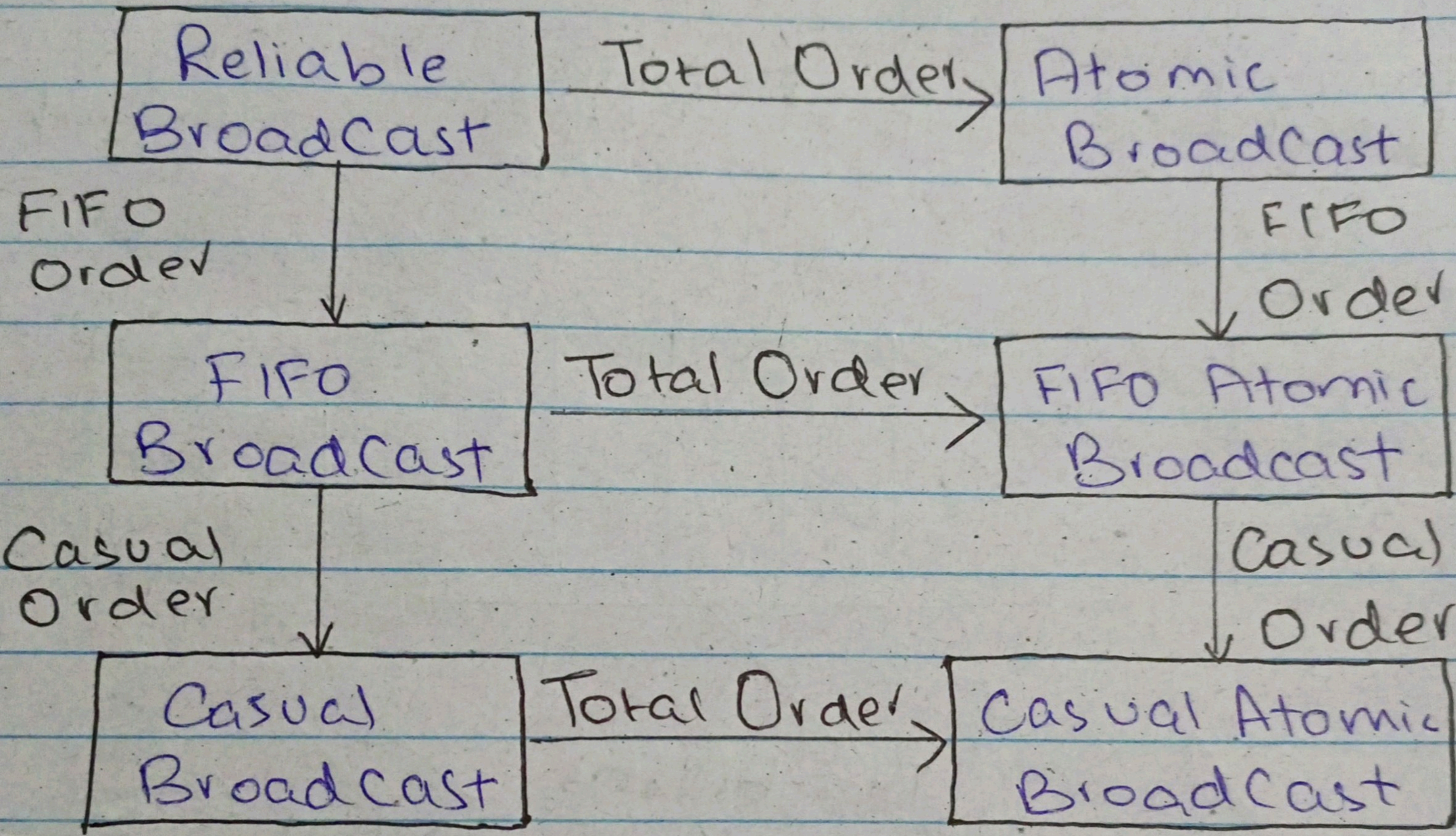
Initialization:

msgBag: = ∅

next[q]: =1 for all q

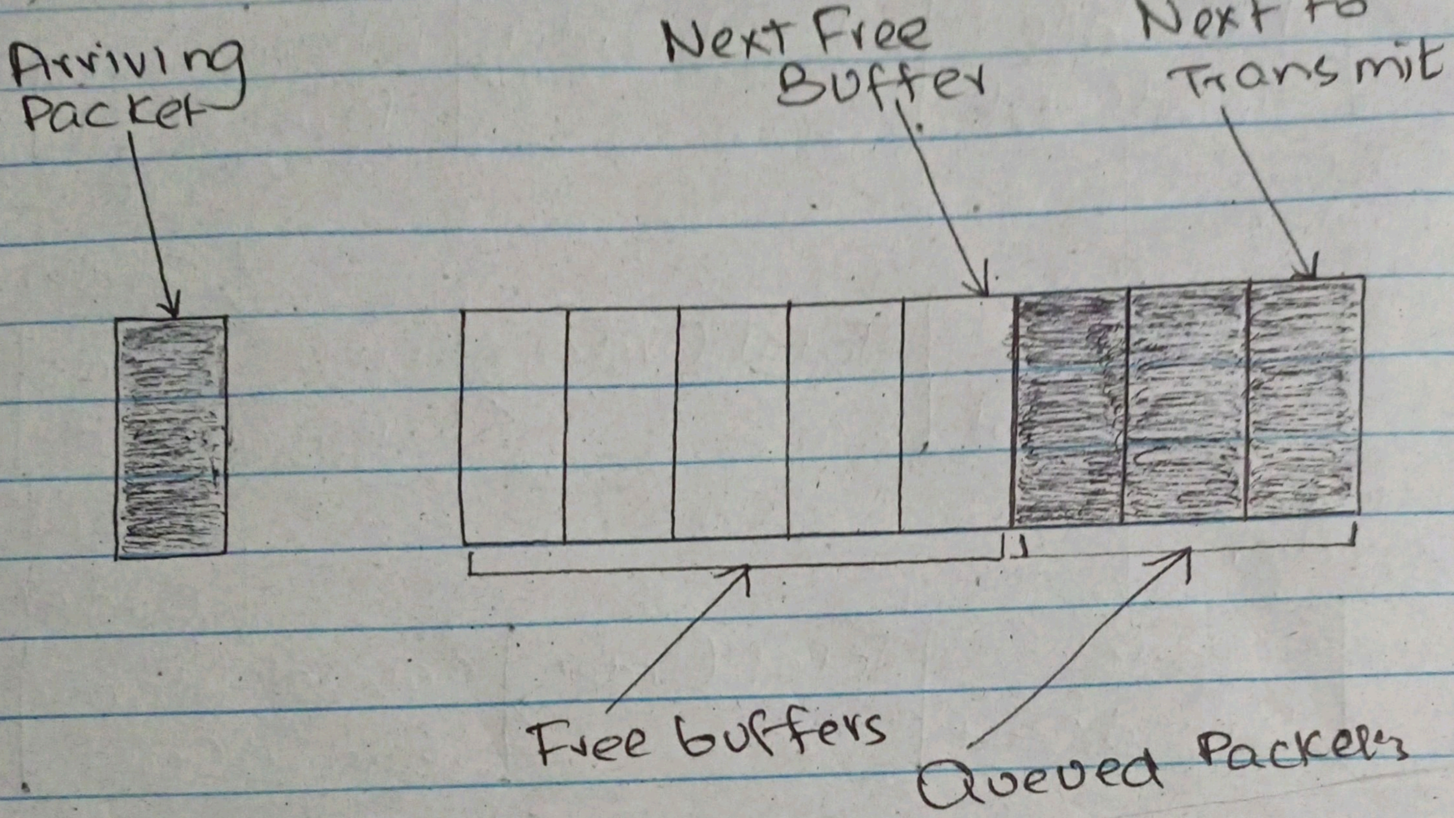
To encecute broadcast (F,m)
    broadcast (R,m)

deliver (F,m) occurs as follows:
upon deliver (R,m) do
q : = sender(m)
msgBag: = msgBag ∪ {m}
while (∃ m' ∈ msgBag: sender(m') == q, and seq#(m') == next[q]) do
    deliver (F, m')
next [q] : = next [q] + 1
msgBag : = msgBag - {m'}

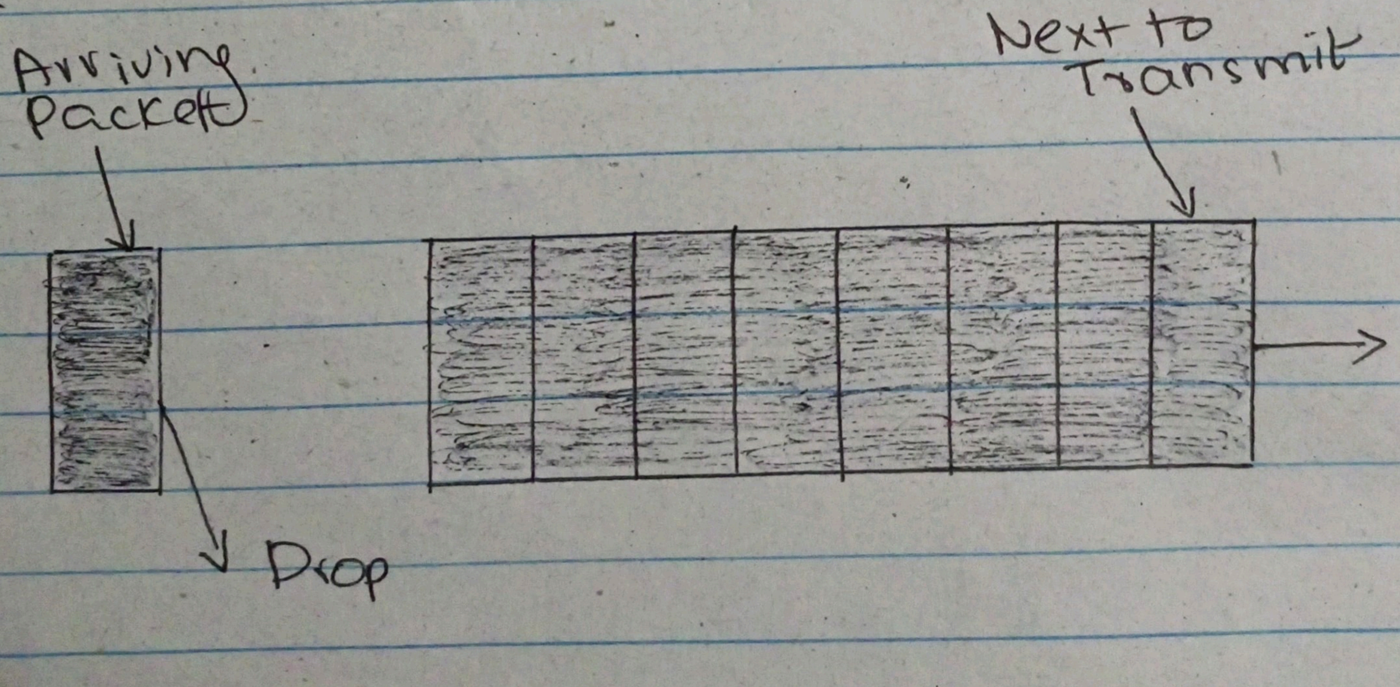


Reliable Broadcast
Total Order
Atomic Broadcast
FIFO Order
FIFO Order
FIFO Broadcast
Total Order
FIFO Atomic Broadcast
Casual Order
Casual Order
Casual Broadcast
Total Order
Casual Atomic Broadcast

(a)


Arriving
Packet
Next Free
Buffer
Next to
Transmit
Free buffers
Queued Packets

(b)

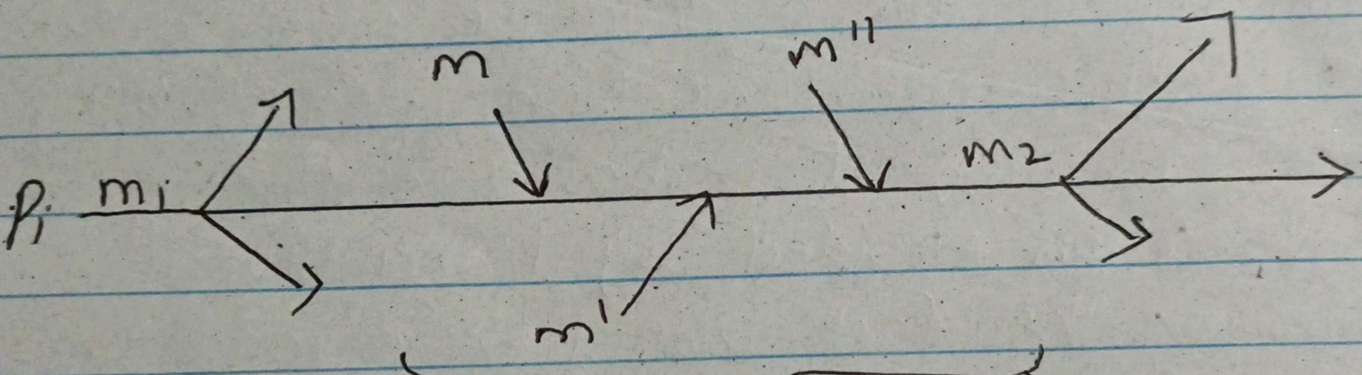

Arriving
Packet
Next to
Transmit
Drop

3) CASUAL BROADCAST ALGORITHM:

The order in which messages are delivered is unimportant in atomic broadcast. Consider a case of a distributed data base system in which a node I sends a message to another node j after broadcasting a request. Note j sends its own request for a database action after getting this communication. It's possible that j's request is based on the information provided by I and that it relies on the fact that I has already performed some database operations. In this case, whenever the node wishes, a received message is transmitted. As a result, a node has complete control over the delivery order. Casual broadcast Protocols must make sure that the messages are delivered in the same sequence as the casual ordering.

For example, if two messages m and m' are such that $m \to m'$ at all nodes, m is delivered before m'. If there is no

2) casual relationship between m and m'.
i.e; m fr m' and m' fr m, then m and m' can be supplied in sequence, which may or may not be the same at various notes.



$copr_i = (m, m', m'')$

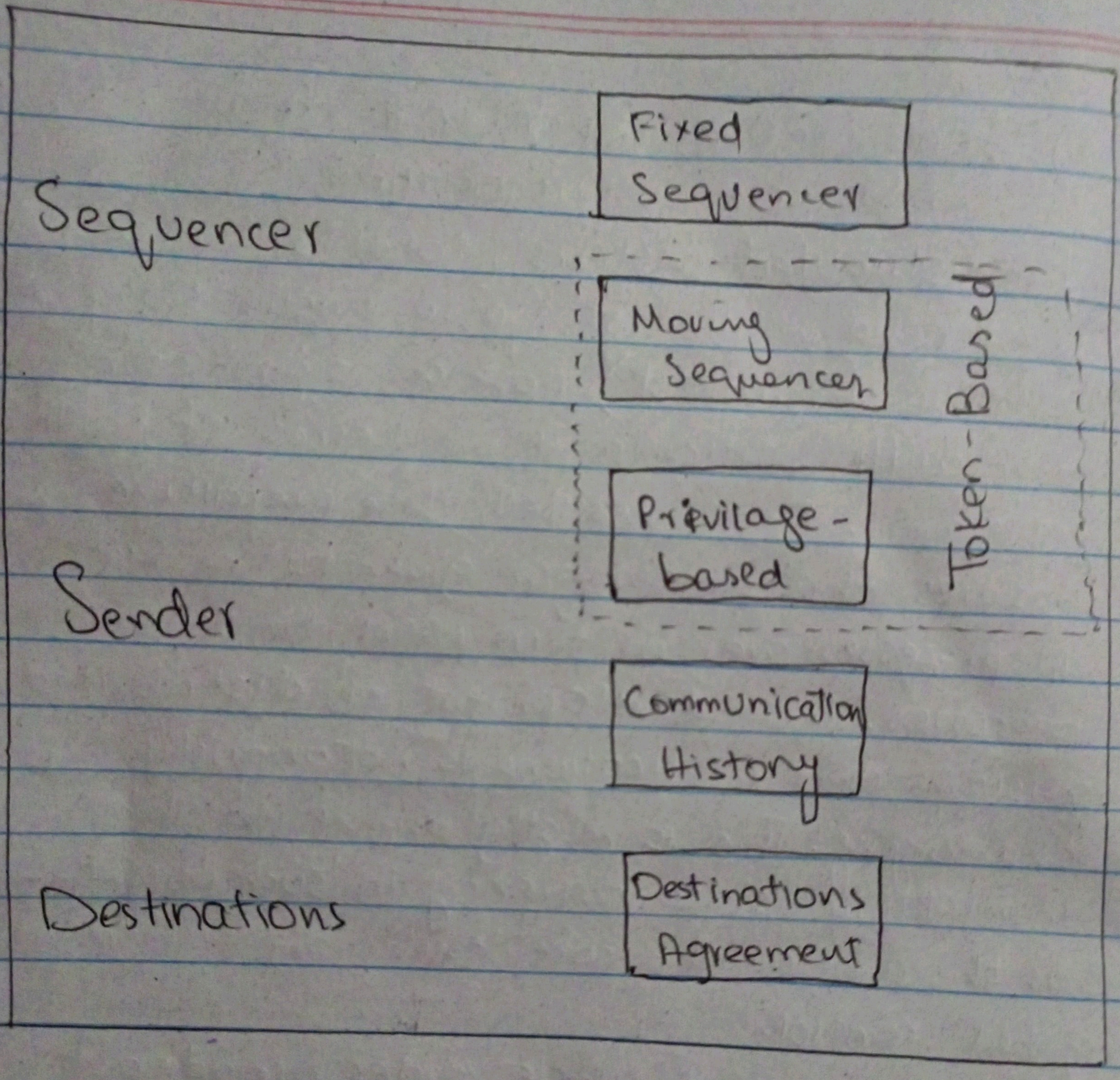
4) TOTAL ORDER BROADCAST AND MULTICAST ALGORITHMS.

In distributed systems, total order broad-cast and multicast (also known as atomic broadcast) pose a significant difficulty, particularly in terms of fault tolerance. In a nutshell, the premitive ensures that messages given to a set of processes are, in turn, sent to set a processes. The development of distributed systems and applications is notoriously challenging. This is mostly owing to the inevitability of co currency in such systems as th well as the complexity of implementing global control.

Proper usage of whole order broadcast can enhance the performance of replicated databases dramatically.

Indeed, the term atomicity implies a feature connected to agreement rather than entire order, and the ambiguity has already caused confusion.

"Total Order BroadCast" on the real attributes, assumptions and other key features


Sequencer
Fixed Sequencer
Moving Sequencer
Token-Based
Privilage-based
Sender
Communication History
Destinations
Destinations Agreement

TOTAL ORDER BROADCAST (I)