

Assignment 6 (20 pts)

Implement the echo algorithm with extinction for leader election. Use the topology you used in the previous assignment (saves work!).

The idea is that each initiator starts a run of the echo algorithm, tagged with its ID (so messages need to carry the wave ID of the wave they are part of). Only the wave started by the initiator with the largest ID completes, after which this initiator becomes the leader.

Non-initiators join the first wave that hits them. When hit with waves with a higher ID, they abandon their old wave, and start afresh in the new wave.

Specifically at any time, each node takes part in at most one wave – so the node must remember which wave it is part of, initiators are initially part of their own wave, and non-initiators are part of no wave.

Suppose a node **p** that is participating in a wave tagged with **q** is hit by a wave tagged with **r** (so receives a message with wave ID **r**) Then:

- If $q < r$, then **p** makes the sender of the message its parent, changes to the wave tagged with **r** (it abandons all the wave messages it received earlier), and treats the incoming message accordingly.
- If $q > r$, then **p** continues with the wave tagged with **q** (it throws the incoming message away).
- If $q = r$, then **p** treats the incoming message according to the echo algorithm of the wave tagged with **q**.

When the wave tagged with **p** completes, by **p** receiving a reply **tagged with p** from all its neighbors, then **p** becomes the leader.

Note that waves of initiators that do not have the largest ID among all initiators are guaranteed not to complete (that is, are extinguished), because the initiator with the largest ID will refuse to take part in these waves. Conversely, the wave of the initiator with the largest ID is guaranteed to complete, because each node will eventually switch to this wave.

Put in print statements to show the progress of your algorithm – specifically make sure to show when a node decides it is or is not the leader.