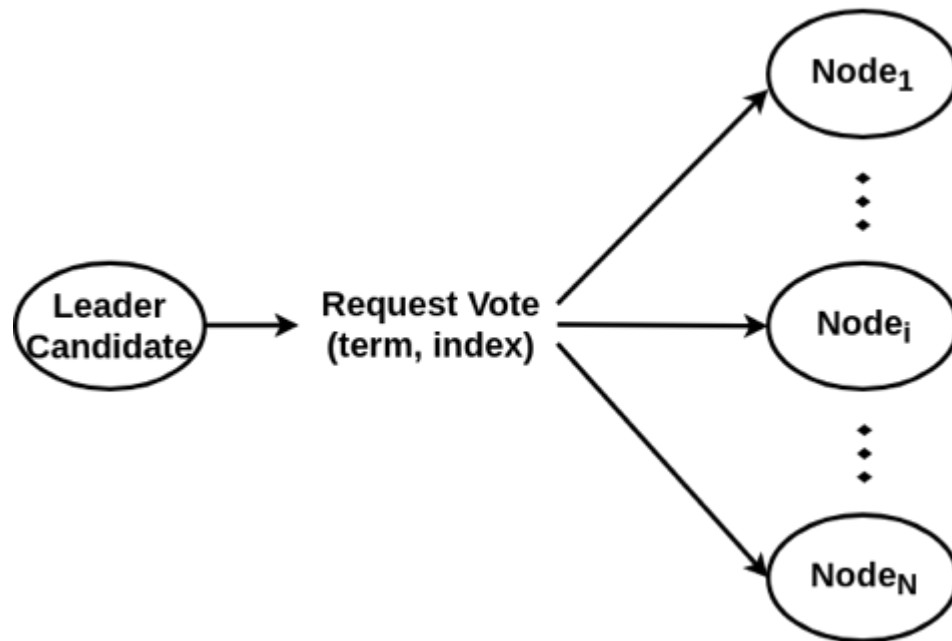# RAFT Consensus

RAFT Consensus

- **Basic idea** -
    - The nodes collectively selects a *leader*; others become *followers*
    - The leader is responsible for state transition log replication across the followers
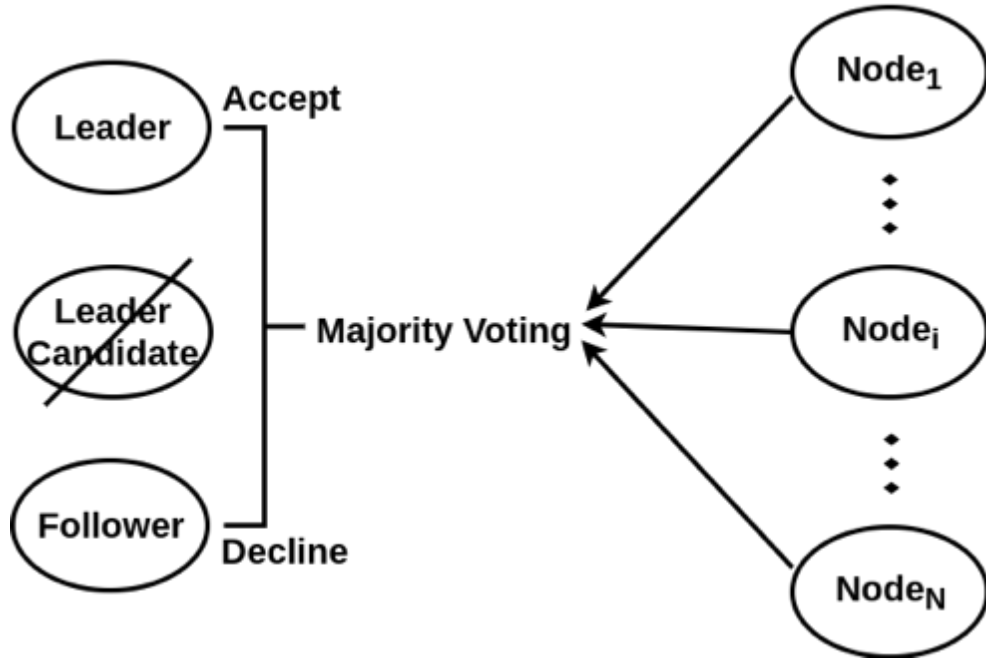
Electing the Leader: Voting Request

- **term:** last calculated # known to candidate + 1
- **index:** committed transaction available to the candidate

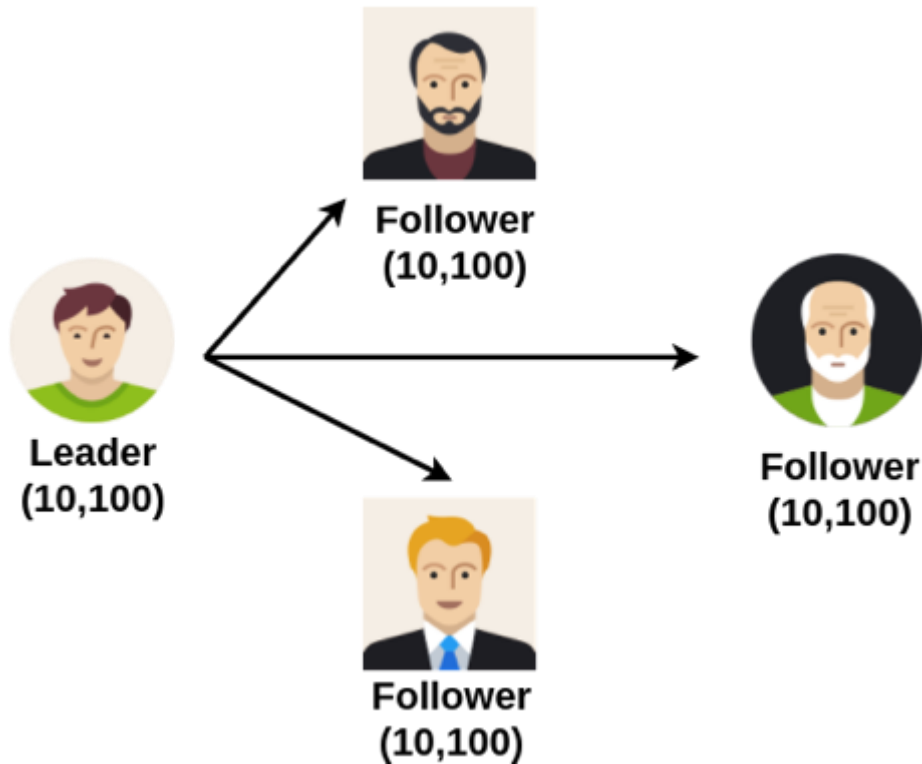# Electing the leader: Follower Node's Decision Making
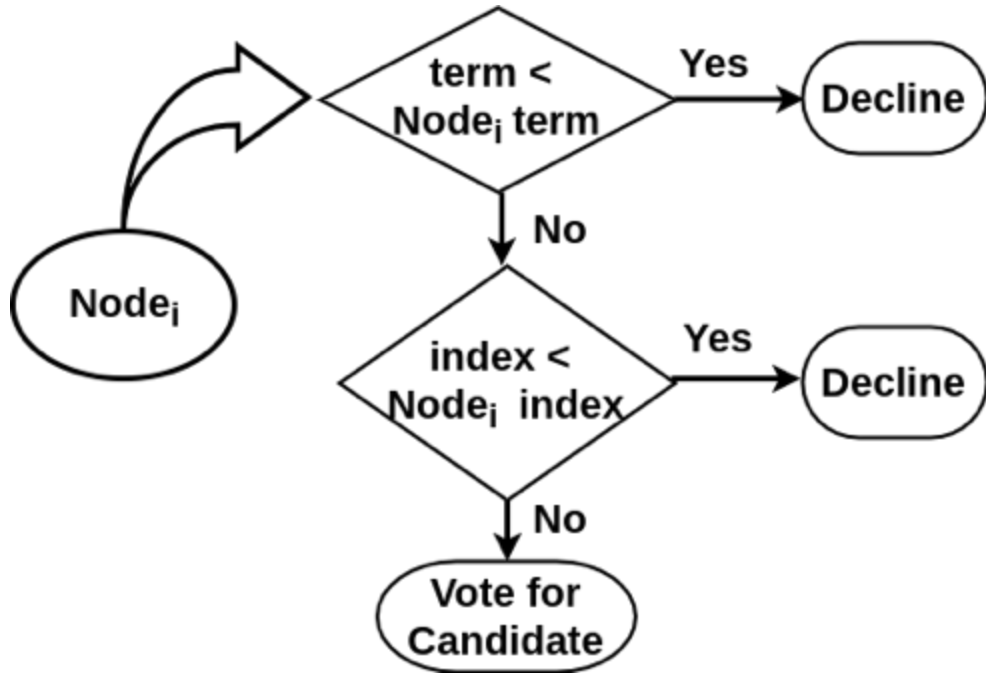
- Each node compares received term and index with corresponding current known values
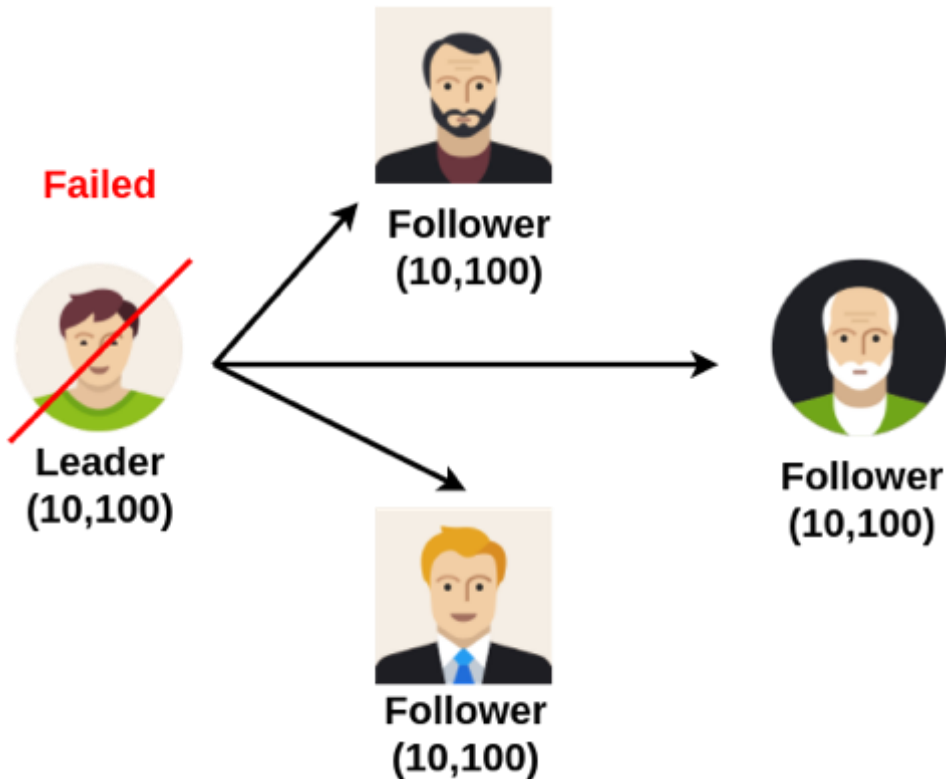
Electing the leader: Majority Voting

- Use of **Majority voting**
  - leader selection
  - commit the log entry

Multiple Leader Candidates: Current Leader Failure
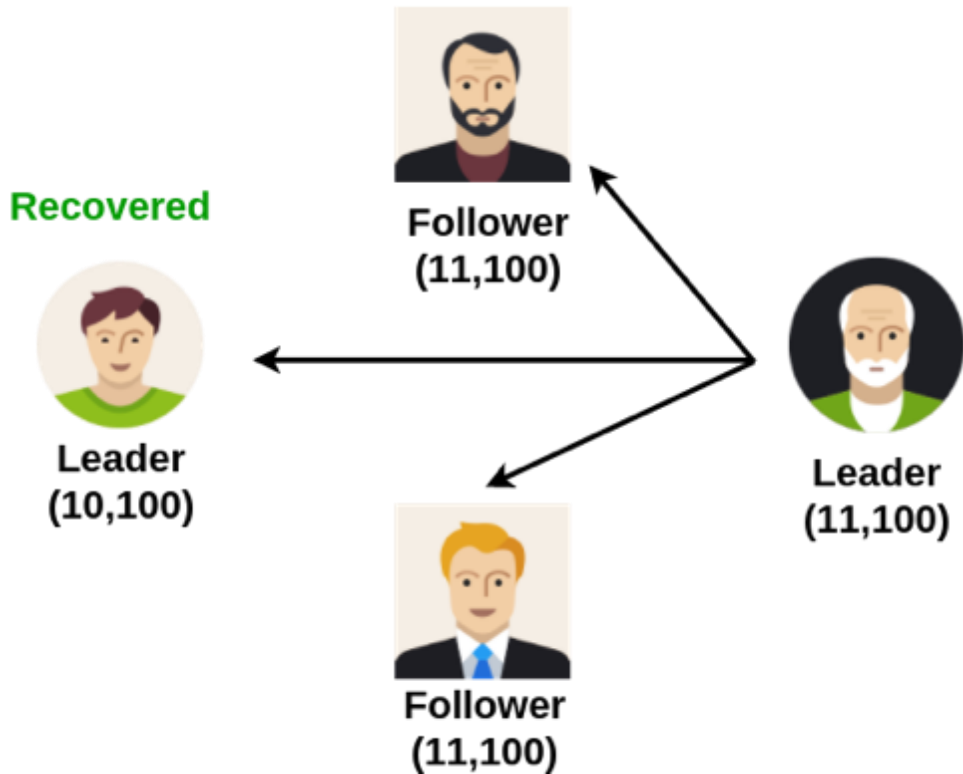

- A leader with three followers
- **term:** 10
- **commit index:** 100

Multiple Leader Candidates: Current Leader Failure

Failed

Leader
(10,100)

Follower
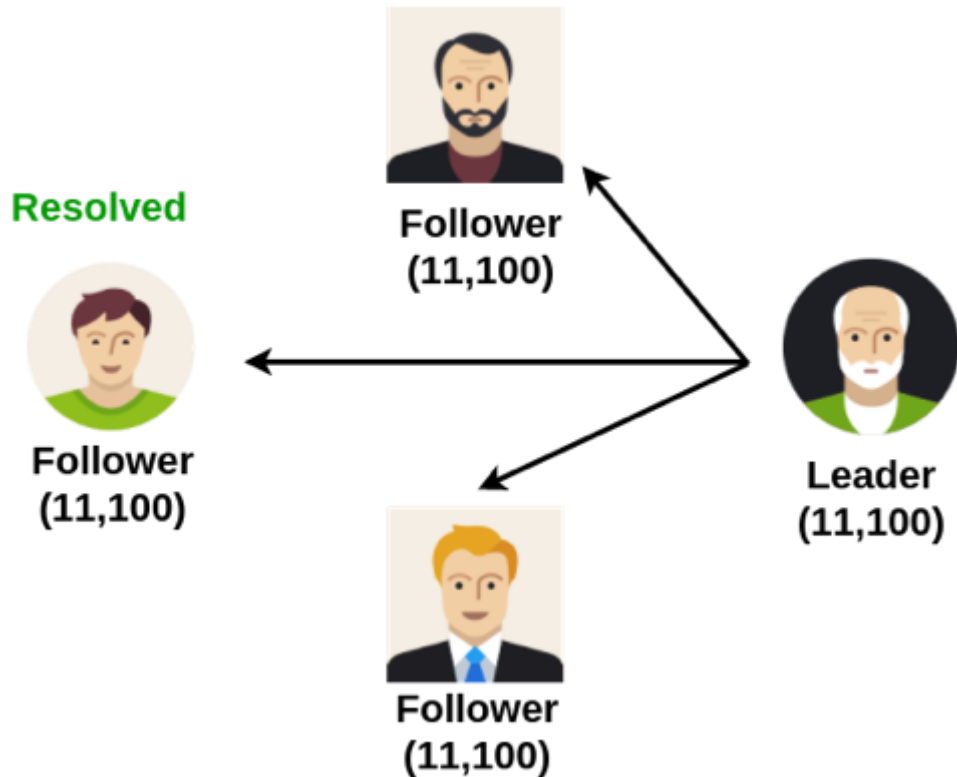(10,100)

Follower
(10,100)

Follower
(10,100)

- The leader node failed

Multiple Leader Candidates: Current Leader Failure

- New leader elected with term 11
- Old leader recovered

Multiple Leader Candidates: Current Leader Failure

Resolved

Follower
(11,100)

Follower
(11,100)

Follower
(11,100)

Leader
(11,100)

- Old leader receive heartbeat message from new leader with greater term
- Old leader drops to follower state

Multiple Leader Candidates: Simultaneous Request Vote
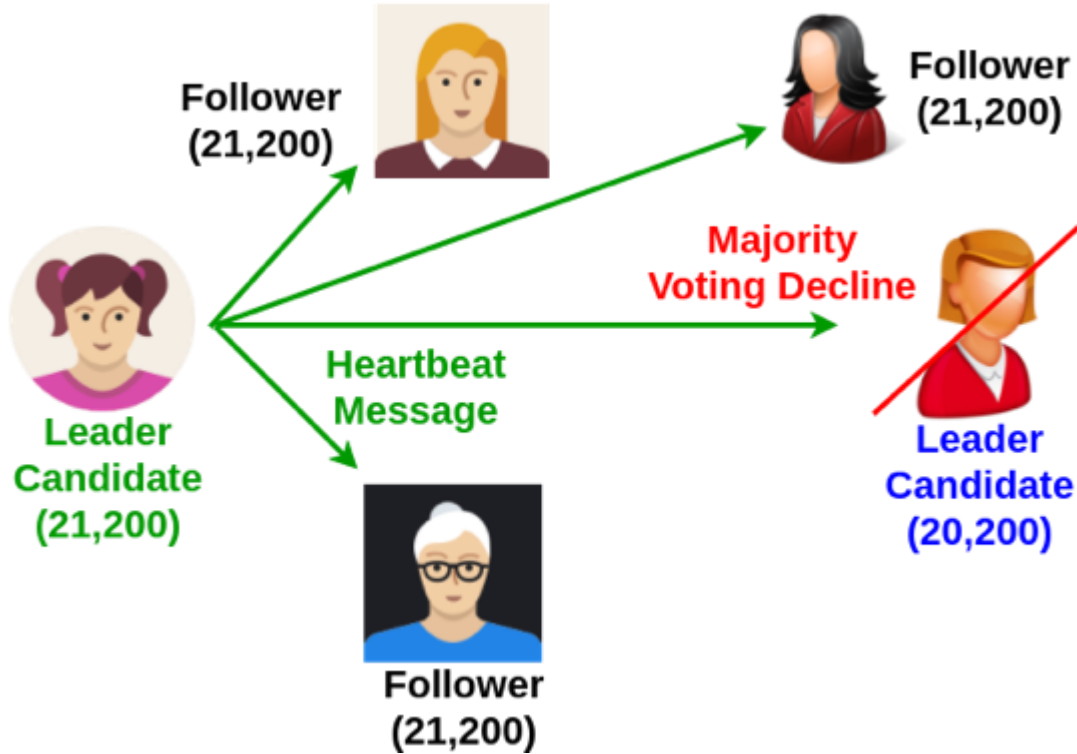

Follower
(20,200)

Follower
(20,200)

Request Vote
(21, 200)

Request Vote
(21, 200)

Leader
Candidate
(20,200)

Leader
Candidate
(20,200)

Follower
(20,200)
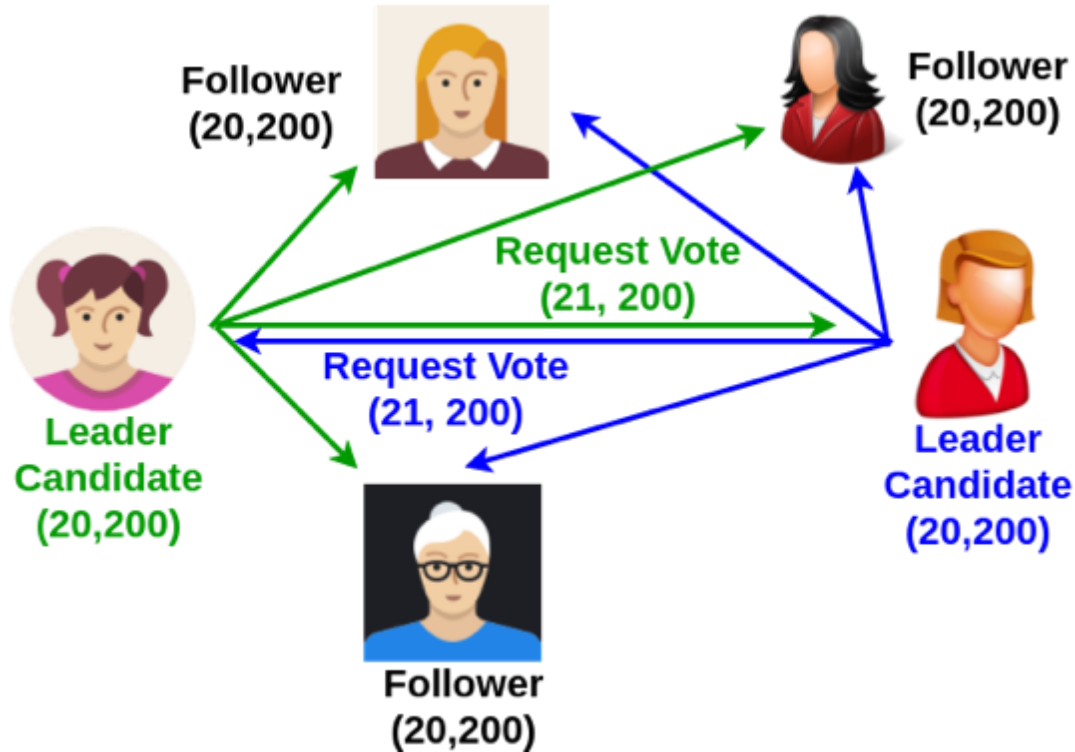
- Two nodes send Request vote message with term 21 at the same time

Multiple Leader Candidates: Simultaneous Request Vote

Follower
(20,200)

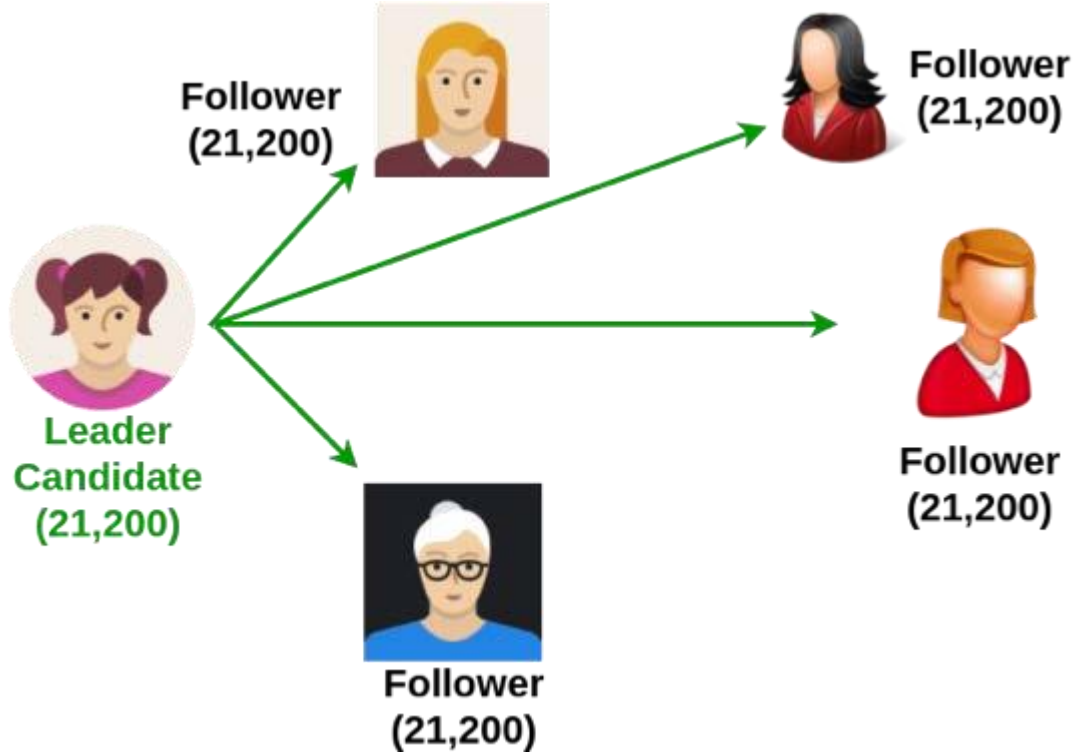Follower
(20,200)

Majority Voting

Leader
Candidate
(20,200)

Leader
Candidate
(20,200)
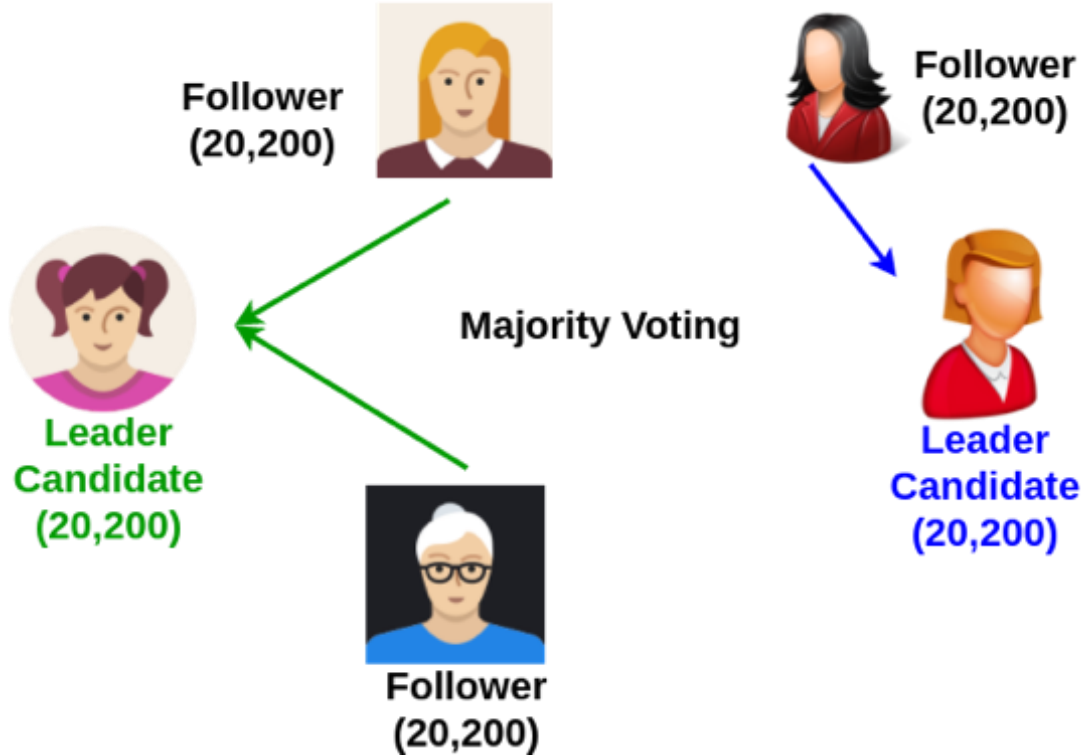
Follower
(20,200)

- One of them gets majority voting

Multiple Leader Candidates: Simultaneous Request Vote

Follower (21,200)

Follower (21,200)

Majority Voting Decline

Heartbeat Message

Leader Candidate (21,200)

Leader Candidate (20,200)

Follower (21,200)

- Winner sends heartbeat message

Multiple Leader Candidates: Simultaneous Request Vote

Follower
(21,200)

Follower
(21,200)

Follower
(21,200)

Leader
Candidate
(21,200)

Follower
(21,200)

- Other leader candidate switches to follower state

Commiting Entry Log

Follower (10,100)

Leader (10,100)
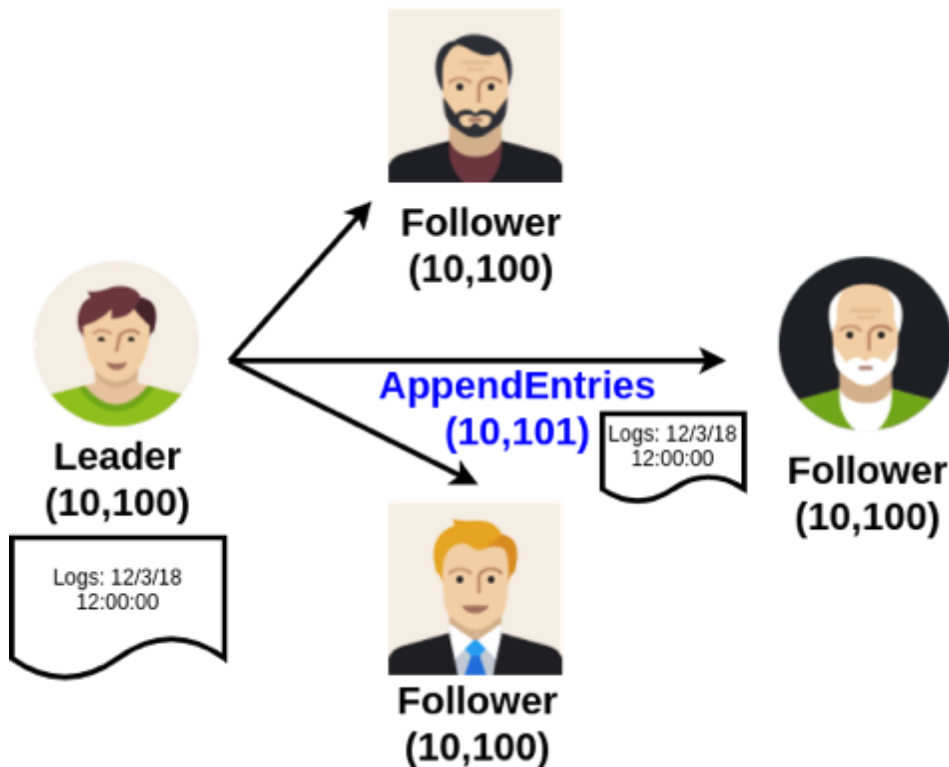
Logs: 12/3/18 12:00:00

Follower (10,100)
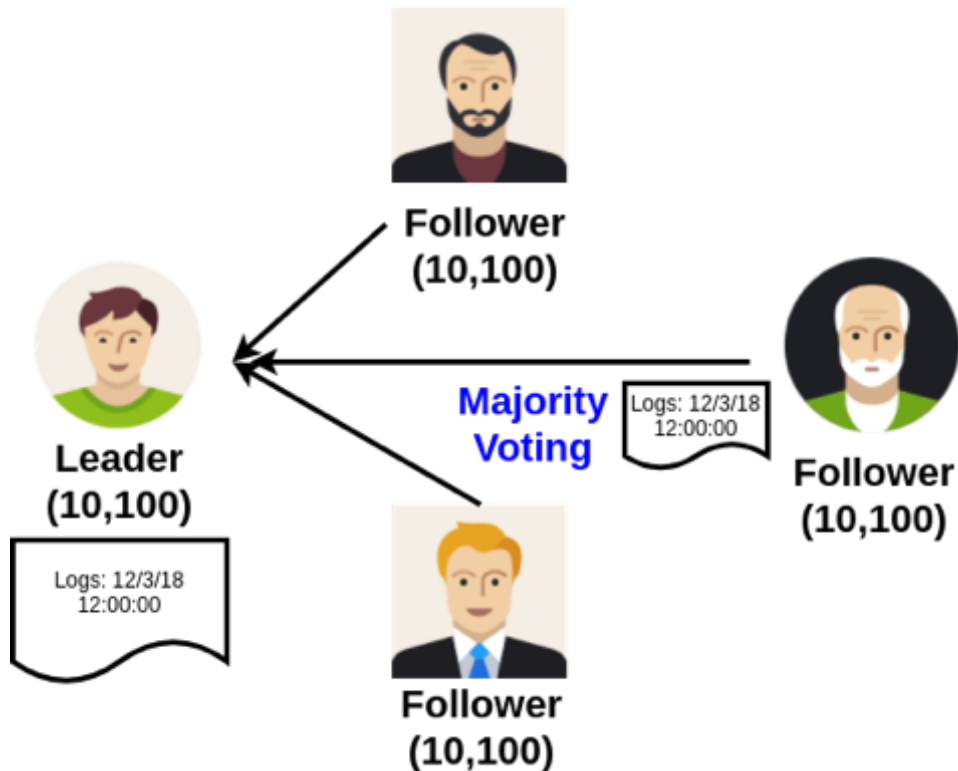
Follower (10,100)

- Leader adds entry to log with term 10 and index 101
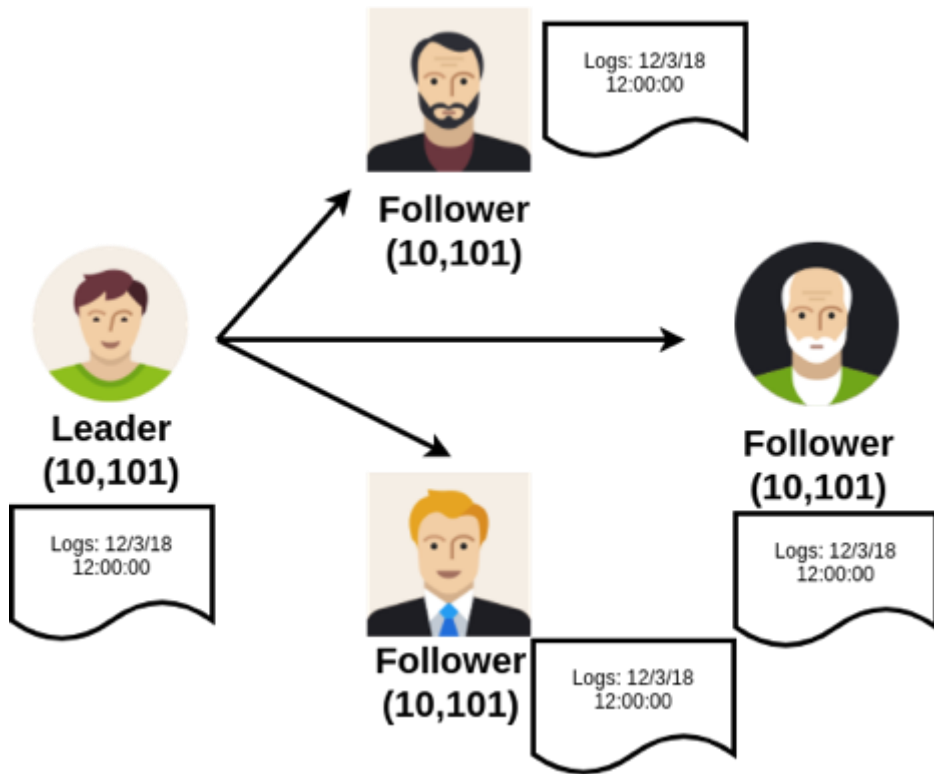
Commiting Entry Log

- Leader sends *AppendEntries* message to followers with index 101

Commiting Entry Log

- Majority voting decides to accept or reject the entry log

Commiting Entry Log

- Successfully accept entry log
  - All leader and followers update committed index to 101