

03. Set interval for sending heartbeats to a very big value

Installation

```
// startLeader switches cm into a leader state and begins process of heartbeats.
// Expects cm.mu to be locked.
func (cm *ConsensusModule) startLeader() {
    cm.state = Leader
    cm.dlog("becomes Leader; term=%d, log=%v", cm.currentTerm, cm.log)

    go func() {
        ticker := time.NewTicker(3000 * time.Millisecond) // <== heartbeat is 3s
        defer ticker.Stop()

        // Send periodic heartbeats, as long as still leader.
        for {
            cm.leaderSendHeartbeats()
            <-ticker.C

            cm.mu.Lock()
            if cm.state != Leader {
                cm.mu.Unlock()
                return
            }
            cm.mu.Unlock()
        }
    }()
}
```

Results

```
[23:24:54] ngankhanh98:/mnt/d/raft/part1 (master) $ go test -v -race -run
TestElectionFollowerComesBack |& tee /tmp/raftlog
=== RUN    TestElectionFollowerComesBack
23:27:52.346243 [0] listening at [::]:42639
23:27:52.346394 [1] listening at [::]:38341
23:27:52.346457 [2] listening at [::]:44987
23:27:52.347667 [1] election timer started (156ms), term=0
23:27:52.347722 [2] election timer started (175ms), term=0
23:27:52.347756 [0] election timer started (208ms), term=0
23:27:52.508346 [1] becomes Candidate (currentTerm=1); log=[]
23:27:52.508449 [1] election timer started (216ms), term=1
23:27:52.508487 [1] sending RequestVote to 2: {Term:1 CandidateId:1 LastLogIndex:0
LastLogTerm:0}
23:27:52.508509 [1] sending RequestVote to 0: {Term:1 CandidateId:1 LastLogIndex:0
LastLogTerm:0}
```

```
23:27:52.510911 [2] RequestVote: {Term:1 CandidateId:1 LastLogIndex:0 LastLogTerm:0}
[currentTerm=0, votedFor=-1]
23:27:52.511002 [2] ... term out of date in RequestVote
23:27:52.511017 [2] becomes Follower with term=1; log=[]
23:27:52.511063 [2] ... RequestVote reply: &{Term:1 VoteGranted:true}
23:27:52.511218 [2] election timer started (250ms), term=1
23:27:52.511679 [1] received RequestVoteReply {Term:1 VoteGranted:true}
23:27:52.511709 [1] wins election with 2 votes
23:27:52.511725 [1] becomes Leader; term=1, log=[]
23:27:52.511812 [1] sending AppendEntries to 2: ni=0, args={Term:1 LeaderId:1
PrevLogIndex:0 PrevLogTerm:0 Entries:[] LeaderCommit:0}
23:27:52.511989 [1] sending AppendEntries to 0: ni=0, args={Term:1 LeaderId:1
PrevLogIndex:0 PrevLogTerm:0 Entries:[] LeaderCommit:0}
23:27:52.512761 [0] RequestVote: {Term:1 CandidateId:1 LastLogIndex:0 LastLogTerm:0}
[currentTerm=0, votedFor=-1]
23:27:52.512847 [0] ... term out of date in RequestVote
23:27:52.512871 [0] becomes Follower with term=1; log=[]
23:27:52.512931 [0] ... RequestVote reply: &{Term:1 VoteGranted:true}
23:27:52.513110 [0] election timer started (232ms), term=1
23:27:52.513708 [1] received RequestVoteReply {Term:1 VoteGranted:true}
23:27:52.513755 [1] while waiting for reply, state = Leader
23:27:52.514455 [2] AppendEntries: {Term:1 LeaderId:1 PrevLogIndex:0 PrevLogTerm:0
Entries:[] LeaderCommit:0}
23:27:52.514534 [2] AppendEntries reply: {Term:1 Success:true}
23:27:52.517552 [0] AppendEntries: {Term:1 LeaderId:1 PrevLogIndex:0 PrevLogTerm:0
Entries:[] LeaderCommit:0}
23:27:52.517687 [0] AppendEntries reply: {Term:1 Success:true}
23:27:52.517945 [0] in election timer term changed from 0 to 1, bailing out
23:27:52.517976 [2] in election timer term changed from 0 to 1, bailing out
23:27:52.519168 [1] in election timer state=Leader, bailing out
23:27:52.648655 [TEST] Disconnect 2
23:27:52.753449 [0] becomes Candidate (currentTerm=2); log=[]
23:27:52.753560 [0] election timer started (291ms), term=2
23:27:52.753604 [0] sending RequestVote to 2: {Term:2 CandidateId:0 LastLogIndex:0
LastLogTerm:0}
23:27:52.753630 [0] sending RequestVote to 1: {Term:2 CandidateId:0 LastLogIndex:0
LastLogTerm:0}
23:27:52.756178 [1] RequestVote: {Term:2 CandidateId:0 LastLogIndex:0 LastLogTerm:0}
[currentTerm=1, votedFor=1]
23:27:52.756295 [1] ... term out of date in RequestVote
23:27:52.756312 [1] becomes Follower with term=2; log=[]
23:27:52.756357 [1] ... RequestVote reply: &{Term:2 VoteGranted:true}
23:27:52.756558 [1] election timer started (272ms), term=2
23:27:52.756904 [0] received RequestVoteReply {Term:2 VoteGranted:true}
23:27:52.756956 [0] wins election with 2 votes
23:27:52.756981 [0] becomes Leader; term=2, log=[]
23:27:52.757102 [0] sending AppendEntries to 1: ni=0, args={Term:2 LeaderId:0
PrevLogIndex:0 PrevLogTerm:0 Entries:[] LeaderCommit:0}
23:27:52.757199 [0] sending AppendEntries to 2: ni=0, args={Term:2 LeaderId:0
PrevLogIndex:0 PrevLogTerm:0 Entries:[] LeaderCommit:0}
23:27:52.763548 [1] AppendEntries: {Term:2 LeaderId:0 PrevLogIndex:0 PrevLogTerm:0
Entries:[] LeaderCommit:0}
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23:27:52.763670 [1] AppendEntries reply: {Term:2 Success:true}
23:27:52.763933 [0] in election timer state=Leader, bailing out
23:27:52.771655 [2] becomes Candidate (currentTerm=2); log=[]
23:27:52.771805 [2] election timer started (226ms), term=2
23:27:52.771865 [2] sending RequestVote to 1: {Term:2 CandidateId:2 LastLogIndex:0
LastLogTerm:0}
23:27:52.771872 [2] sending RequestVote to 0: {Term:2 CandidateId:2 LastLogIndex:0
LastLogTerm:0}
23:27:53.002498 [2] becomes Candidate (currentTerm=3); log=[]
23:27:53.002737 [2] sending RequestVote to 0: {Term:3 CandidateId:2 LastLogIndex:0
LastLogTerm:0}
23:27:53.002850 [2] election timer started (188ms), term=3
23:27:53.002916 [2] sending RequestVote to 1: {Term:3 CandidateId:2 LastLogIndex:0
LastLogTerm:0}
23:27:53.037810 [1] becomes Candidate (currentTerm=3); log=[]
23:27:53.037920 [1] sending RequestVote to 2: {Term:3 CandidateId:1 LastLogIndex:0
LastLogTerm:0}
23:27:53.037993 [1] sending RequestVote to 0: {Term:3 CandidateId:1 LastLogIndex:0
LastLogTerm:0}
23:27:53.038120 [1] election timer started (290ms), term=3
23:27:53.043776 [0] RequestVote: {Term:3 CandidateId:1 LastLogIndex:0 LastLogTerm:0}
[currentTerm=2, votedFor=0]
23:27:53.043889 [0] ... term out of date in RequestVote
23:27:53.043920 [0] becomes Follower with term=3; log=[]
23:27:53.043979 [0] ... RequestVote reply: &{Term:3 VoteGranted:true}
23:27:53.044146 [0] election timer started (226ms), term=3
23:27:53.044219 [1] received RequestVoteReply {Term:3 VoteGranted:true}
23:27:53.044252 [1] wins election with 2 votes
23:27:53.044266 [1] becomes Leader; term=3, log=[]
23:27:53.044435 [1] sending AppendEntries to 0: ni=0, args={Term:3 LeaderId:1
PrevLogIndex:0 PrevLogTerm:0 Entries:[] LeaderCommit:0}
23:27:53.044398 [1] sending AppendEntries to 2: ni=0, args={Term:3 LeaderId:1
PrevLogIndex:0 PrevLogTerm:0 Entries:[] LeaderCommit:0}
23:27:53.048570 [1] in election timer state=Leader, bailing out
23:27:53.048622 [0] AppendEntries: {Term:3 LeaderId:1 PrevLogIndex:0 PrevLogTerm:0
Entries:[] LeaderCommit:0}
23:27:53.048660 [0] AppendEntries reply: {Term:3 Success:true}
23:27:53.193879 [2] becomes Candidate (currentTerm=4); log=[]
23:27:53.194053 [2] sending RequestVote to 0: {Term:4 CandidateId:2 LastLogIndex:0
LastLogTerm:0}
23:27:53.194205 [2] election timer started (253ms), term=4
23:27:53.194169 [2] sending RequestVote to 1: {Term:4 CandidateId:2 LastLogIndex:0
LastLogTerm:0}
23:27:53.274978 [0] becomes Candidate (currentTerm=4); log=[]
23:27:53.275070 [0] sending RequestVote to 1: {Term:4 CandidateId:0 LastLogIndex:0
LastLogTerm:0}
23:27:53.275140 [0] sending RequestVote to 2: {Term:4 CandidateId:0 LastLogIndex:0
LastLogTerm:0}
23:27:53.275257 [0] election timer started (165ms), term=4
23:27:53.279766 [1] RequestVote: {Term:4 CandidateId:0 LastLogIndex:0 LastLogTerm:0}
[currentTerm=3, votedFor=1]
23:27:53.279884 [1] ... term out of date in RequestVote
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23:27:53.279904 [1] becomes Follower with term=4; log=[]
23:27:53.279956 [1] ... RequestVote reply: &{Term:4 VoteGranted:true}
23:27:53.280145 [1] election timer started (161ms), term=4
23:27:53.280274 [0] received RequestVoteReply {Term:4 VoteGranted:true}
23:27:53.280322 [0] wins election with 2 votes
23:27:53.280358 [0] becomes Leader; term=4, log=[]
23:27:53.280603 [0] sending AppendEntries to 2: ni=0, args={Term:4 LeaderId:0
PrevLogIndex:0 PrevLogTerm:0 Entries:[] LeaderCommit:0}
23:27:53.280606 [0] sending AppendEntries to 1: ni=0, args={Term:4 LeaderId:0
PrevLogIndex:0 PrevLogTerm:0 Entries:[] LeaderCommit:0}
23:27:53.282463 [1] AppendEntries: {Term:4 LeaderId:0 PrevLogIndex:0 PrevLogTerm:0
Entries:[] LeaderCommit:0}
23:27:53.282577 [1] AppendEntries reply: {Term:4 Success:true}
23:27:53.285702 [0] in election timer state=Leader, bailing out
23:27:53.299282 [TEST] Reconnect 2
23:27:53.451174 [1] becomes Candidate (currentTerm=5); log=[]
23:27:53.451365 [1] sending RequestVote to 0: {Term:5 CandidateId:1 LastLogIndex:0
LastLogTerm:0}
23:27:53.451477 [1] sending RequestVote to 2: {Term:5 CandidateId:1 LastLogIndex:0
LastLogTerm:0}
23:27:53.451584 [1] election timer started (223ms), term=5
23:27:53.452785 [0] RequestVote: {Term:5 CandidateId:1 LastLogIndex:0 LastLogTerm:0}
[currentTerm=4, votedFor=0]
23:27:53.452969 [0] ... term out of date in RequestVote
23:27:53.453000 [0] becomes Follower with term=5; log=[]
23:27:53.453068 [0] ... RequestVote reply: &{Term:5 VoteGranted:true}
23:27:53.453342 [0] election timer started (203ms), term=5
23:27:53.453382 [0] becomes Dead
23:27:53.453481 [1] becomes Dead
23:27:53.453559 [2] becomes Dead
23:27:53.455491 [2] in election timer state=Dead, bailing out
23:27:53.462891 [1] in election timer state=Dead, bailing out
23:27:53.464180 [0] in election timer state=Dead, bailing out
leaktest.go:132: leaktest: timed out checking goroutines
leaktest.go:150: leaktest: leaked goroutine: goroutine 16 [chan receive]:
github.com/eliben/raft.(*ConsensusModule).startLeader.func1()
/mnt/d/raft/part1/raft.go:343 +0xc5
created by github.com/eliben/raft.(*ConsensusModule).startLeader in
goroutine 13
/mnt/d/raft/part1/raft.go:336 +0x17d
leaktest.go:150: leaktest: leaked goroutine: goroutine 53 [chan receive]:
github.com/eliben/raft.(*ConsensusModule).startLeader.func1()
/mnt/d/raft/part1/raft.go:343 +0xc5
created by github.com/eliben/raft.(*ConsensusModule).startLeader in
goroutine 31
/mnt/d/raft/part1/raft.go:336 +0x17d
leaktest.go:150: leaktest: leaked goroutine: goroutine 71 [chan receive]:
github.com/eliben/raft.(*ConsensusModule).startLeader.func1()
/mnt/d/raft/part1/raft.go:343 +0xc5
created by github.com/eliben/raft.(*ConsensusModule).startLeader in
goroutine 89
/mnt/d/raft/part1/raft.go:336 +0x17d
```

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leaktest.go:150: leaktest: leaked goroutine: goroutine 99 [chan receive]:
    github.com/eliben/raft.(*ConsensusModule).startLeader.func1()
        /mnt/d/raft/part1/raft.go:343 +0xc5
    created by github.com/eliben/raft.(*ConsensusModule).startLeader in
goroutine 68
        /mnt/d/raft/part1/raft.go:336 +0x17d
--- FAIL: TestElectionFollowerComesBack (1.22s)
FAIL
exit status 1
FAIL    github.com/eliben/raft    1.222s
```