Lab3 Protocol

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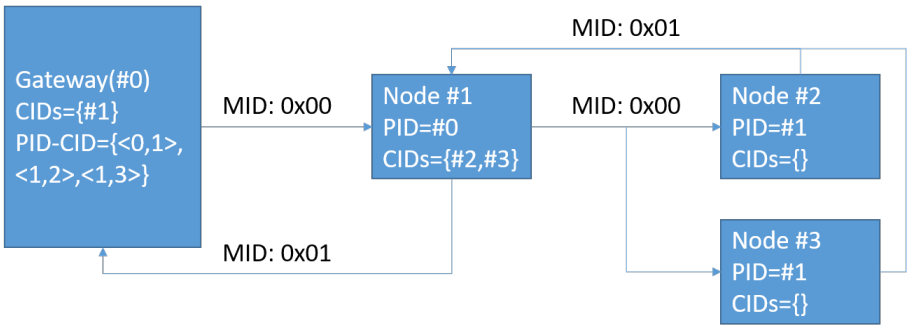
Contents

1 Self-Organization



1.1 Gateway

1.1.1 TX (G-Thread-1): Message ID 0x00

1. Start (re-)organization at time t (default reorganization interval: 5s configurable)
2. Mutex lock
   (a) Clear parent-child list $\{< PID, CID >_i\}$
   (b) Increase round count $\rho \leftarrow (\rho + 1)\%256$
3. Mutex unlock
4. Broadcast an organization message with ρ, and node ID NID:

Message ID 0x00 [1B], ρ [1B], NID [1B]: e.g. 0x00 0x04 0x00

5. goto 1

1.1.2 RX (G-Thread-2): Message ID 0x01

1. Get and parse the replied organization message (Message ID 0x01)
   - received round count ρ_R
   - received parent ID PID_R
   - received parent-child pair $< PID, CID >_R$
2. Mutex lock
   (a) If $\rho_R \neq \rho$ or $PID_R \neq NID$, then mutex unlock and goto 1
   (b) Add $< PID, CID >_R$ to $\{< PID, CID >_i\}$ and refresh the neighbor list of $< PID, CID >_R$:: PID node.
3. Mutex unlock
4. goto 1

1.2 Communication Node

1.2.1 RX (N-Thread-1): Message ID 0x00

1. Get and parse the organization message (Message ID 0x00):
   - received round count ρ_R
   - received note ID NID_R
   - RSSI level Φ
2. If $\Phi < \Phi^*$ (Φ^* is the minimum required RSSI to build a reliable wireless connection), then goto 1

3. If its own round count $\rho = \rho_R$, then goto 1

4. Mutex lock

   (a) Set round count: $\rho = \rho_R$

   (b) Set parent ID: $PID = NID_R$

   (c) Reply an acknowledge message with ρ, PID, and NID:
Message ID 0x01 [1B], ρ [1B], PID [1B], $< PID, NID >$ [2B]: e.g. 0x01 0x04 0x01 0x01 0x02

5. Mutex unlock

6. Broadcast an organization message with ρ, and NID:
Message ID 0x00 [1B], ρ [1B], NID [1B]: e.g. 0x00 0x04 0x01

7. goto 1

1.2.2 RX (N-Thread-1): Message ID 0x01

1. Get and parse the replied organization message (Message ID 0x01)

   - received round count ρ_R
   - received parent ID PID_R
   - received parent-child pair $< PID, CID >_R$

2. Mutex lock

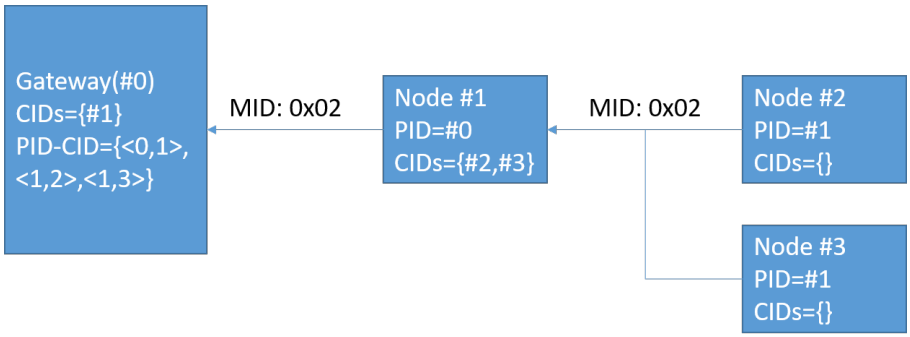
   (a) If $\rho_R \neq \rho$ or $PID_R \neq NID$, then mutex unlock and goto 1

   (b) Relay an acknowledge message with ρ, PID, and $< PID, CID >_R$:
Message ID 0x01 [1B], ρ [1B], PID [1B], $< PID, CID >_R$ [2B]: e.g. 0x01 0x04 0x00 0x01 0x02

3. Mutex unlock

4. goto 1

2 Upload Light Values



2.1 Gateway

2.1.1 RX (G-Thread-2): Message ID 0x02

1. Get and parse the light value message (Message ID 0x02)
   - received round count ρ_R
   - received parent ID PID_R
   - received node ID NID_R
   - received light value L_R
2. Mutex lock
   (a) If $\rho_R \neq \rho$ or $PID_R \neq NID$, then Mutex unlock and goto 1
   (b) Display light value "NID_R's light value is L_R"
3. Mutex unlock
4. goto 1

2.2 Communication Node

2.2.1 RX (N-Thread-1): Message ID 0x02

1. Get and parse the light value message (Message ID 0x02)
   - received round count ρ_R
   - received parent ID PID_R
   - received node ID NID_R
   - received light value L_R
2. Mutex lock
   (a) If $\rho_R \neq \rho$ or $PID_R \neq NID$, then Mutex unlock and goto 1
   (b) Relay light value message with ρ, PID, NID_R, and L_R to parent:
Message ID 0x02 [1B], ρ[1B], PID [1B], NID_R [1B], L_R [2B]: e.g. 0x02 0x04 0x00 0x02 0x11 0x23
3. Mutex unlock
4. goto 1

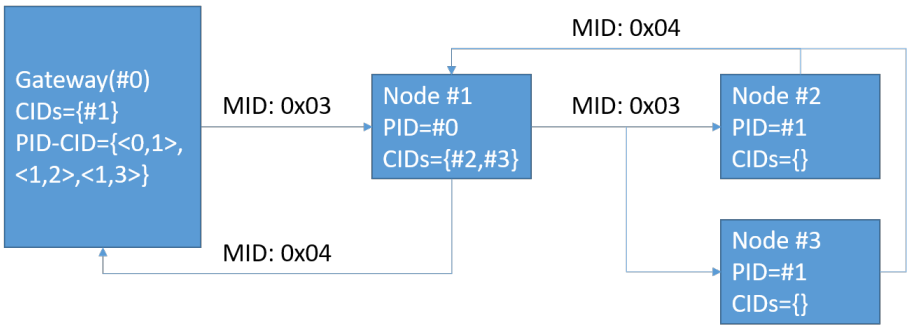
2.2.2 TX (N-Thread-2): Message ID 0x02

1. Sample start at time t (sample rate is controlled by dt ms and is configurable via gateway)
2. Get light value L_t
3. Mutex lock
   (a) Send light value message with ρ, PID, NID, and L_t to parent:

Message ID 0x02 [1B], ρ[1B], PID [1B], NID [1B], L_t [2B]: e.g. 0x02 0x04 0x01 0x02 0x11 0x23

4. Mutex unlock
5. goto 1

3 Configure Sample Rate



3.1 Gateway

3.1.1 TX2 (G-Thread-3): Message ID 0x03

1. Give a new sample rate dt
2. Mutex lock
   (a) Broadcast a sample rate message with ρ, NID, and dt (ms):
   Message ID 0x03 [1B], ρ[1B], NID [1B], dt [4B]: e.g. 0x03 0x04 0x00 0x19 0x90 0x11 0x23
3. Mutex unlock

3.1.2 RX (G-Thread-2): Message ID 0x04

1. Get and parse the sample rate update message (Message ID 0x04)
   - received round count ρ_R
   - received parent ID PID_R
   - received node ID NID_R
   - received sample rate dt_R
2. Mutex lock
   (a) If $\rho_R \neq \rho$ or $PID_R \neq NID$, then Mutex unlock and goto 1
   (b) Display sample rate update info "NID_R's sample rate changes to dt_R"
3. Mutex unlock
4. goto 1

3.2 Communication Node

3.2.1 RX (N-Thread-1): Message ID 0x03

1. Get and parse the sample rate message (Message ID 0x03)
   - received round count ρ_R
   - received parent ID PID_R
   - received sample rate dt_R
2. Mutex lock
   (a) If $\rho_R \neq \rho$ or $PID_R \neq PID$, then Mutex unlock and goto 1
   (b) Set $dt = dt_R$

(c) Reply a sample rate update message with ρ, PID, NID, and dt (ms):

Message ID 0x04 [1B], ρ[1B], PID [1B], NID [1B], dt [4B]: e.g. 0x03 0x04 0x01 0x02 0x19 0x90 0x11 0x23

(d) Relay a sample rate message with ρ, NID, and dt (ms):

Message ID 0x03 [1B], ρ[1B], NID [1B], dt [4B]: e.g. 0x03 0x04 0x01 0x19 0x90 0x11 0x23

3. Mutex unlock
4. goto 1

3.2.2 RX (N-Thread-1): Message ID 0x04

1. Get and parse the sample rate update message (Message ID 0x04)
   - received round count ρ_R
   - received parent ID PID_R
   - received node ID NID_R
   - received light value dt_R
2. Mutex lock
   (a) If $\rho_R \neq \rho$ or $PID_R \neq NID$, then Mutex unlock and goto 1
   (b) Relay sample rate update message with ρ, PID, NID_R, and dt_R to parent:

Message ID 0x04 [1B], ρ[1B], PID [1B], NID_R [1B], dt_R [4B]: e.g. 0x03 0x04 0x00 0x02 0x19 0x90 0x11 0x23

3. Mutex unlock
4. goto 1