$LogicalTimeME_i$ automaton (formal):

Signature:

Input:
- try_i
- $exit_i$
- $receive(m)_{j,i}$, $m \in \{$ *"try"*, *"exit"*, *"ack"*$\}$ $\times \mathbb{N}$, $1 \leq j \leq n$,

Output:
- $crit_i$
- rem_i
- $send(m)_{i,j}$, $m \in \{$ *"ack"*$\} \times \mathbb{N}$, $j \neq i$
- $bcast(m)_i$, $m \in \{$ *"try"*, *"exit"*$\} \times \mathbb{N}$

States:

$region \in \{R, T, C, E\}$, initially R
$clock \in \mathbb{N}$, initially 0
bcast-buffer, a FIFO queue of $\{$ *"try"*, *"exit"*$\}$, initially empty
for every $j, 1 \leq j \leq n$:
- *history*(j), a subset of $\{$ *"try"*, *"exit"*, *"ack"*$\} \times \mathbb{N}$, initially $\emptyset$

for every $j \neq i$:
- *send-buffer*(j), a FIFO queue of $\{$ *"ack"*$\} \times \mathbb{N}$, initially empty

Transitions:

try_i
- Effect:
  - $clock := clock + 1$
  - $region := T$
  - add *"try"* to *bcast-buffer*

$bcast(m, c)_i$
- Precondition:
  - m is first on *bcast-buffer*
  - $c = clock + 1$
- Effect:
  - $clock := c$
  - remove first element of *bcast-buffer*

$receive(m, c)_{j,i}$
- Effect:
  - $clock := \max(clock, c) + 1$
  - $history(j) := history(j) \cup \{(m, c)\}$
  - if $m =$ *"try"* and $j \neq i$ then
    - add *"ack"* to *send-buffer*(j)

$exit_i$
- Effect:
  - $clock := clock + 1$
  - $region := E$
  - add *"exit"* to *bcast-buffer*

$send(m, c)_{i,j}$
- Precondition:
  - m is first on *send-buffer*(j)
  - $c = clock + 1$
- Effect:
  - $clock := c$
  - remove first element of *send-buffer*(j)

$crit_i$
- Precondition:
  - $region = T$
  - $($*"try"*$, c) \in history(i)$
  - $\nexists($*"exit"*$, c') \in history(i)$ with $c' > c$
  - for all $j \neq i$
    - if $($*"try"*$, c') \in history(j)$, $(c', j) < (c, i)$
    - then
      - $\exists($*"exit"*$, c'') \in history(j)$ with $c'' > c'$
    - $\exists(m, c') \in history(j)$ with $(c, i) < (c', j)$
- Effect:
  - $clock := clock + 1$
  - $region := C$

rem_i
- Precondition:
  - $region = E$
  - $($*"exit"*$, c) \in history(i)$
  - $\nexists($*"try"*$, c') \in history(i)$ with $c' > c$
- Effect:
  - $clock := clock + 1$
  - $region := R$

Tasks:

$\{crit_i\}$
$\{rem_i\}$
$\{bcast(m)_i : m \in \{$ *"try"*, *"exit"*$\} \times \mathbb{N}\}$
for every $j \neq i$:
- $\{send(m)_{i,j} : m \in \{$ *"ack"*$\} \times \mathbb{N}\}$