Distributed Systems

Termination Detection

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Termination detection

Ref: Wiki, VG

- How do we know when a distributed computation has ended?

- We track nodes being in state “idle” Vs “Active”
- Assume: an idle node becomes active only on receiving a message from some other node.
  - (exception : the initiator: leader/server etc..)

- Termination is all nodes being idle

Termination detection (weight throwing)

- We suppose that the computation is started by a process s.
  - This means, other (idle) processes start working (becomes active) after receiving message from s or some other process
  - They have no other way to know that a computation is in progress
- s wants to know when all other processes have concluded working
- S starts with weight = 1.0
- Other processes start with weight = 0

Weight throwing

- When a process sends a message, it puts part (say, half) of its weight in the message.
- When a process receives a message, it adds the message weight to its own weight.
- When a process has finished computing, (becomes idle) it sends its current weight to s
- When s has weight=1.0, it knows no other process is active

Termination detection (weight throwing)

- Works on the assumption that no message is lost
  - Methods like TCP give good guarantee for delivery
  - Many other distributed algorithms have this assumption
  - Useful for their termination detection
- Drawback:
  - What if there are many messages?
  - (Homework!)

Termination detection (Dijkstra-scholten)

- Maintains a tree of which node initiated computation at which other node
- Each node has active children counter (cc)
- When node x sends a message to y
  - x increments cc
  - If y was idle
    - y becomes active
    - y remembers x as the parent
  - If y was already active
    - y sends ack to x
- When x receives an ack
  - x decrements cc
- When y finishes all computation and is idle
  - And has cc = 0
    - y sends ack to parent

Termination detection (Dijkstra-scholten)

- How do you describe its Message complexity ?