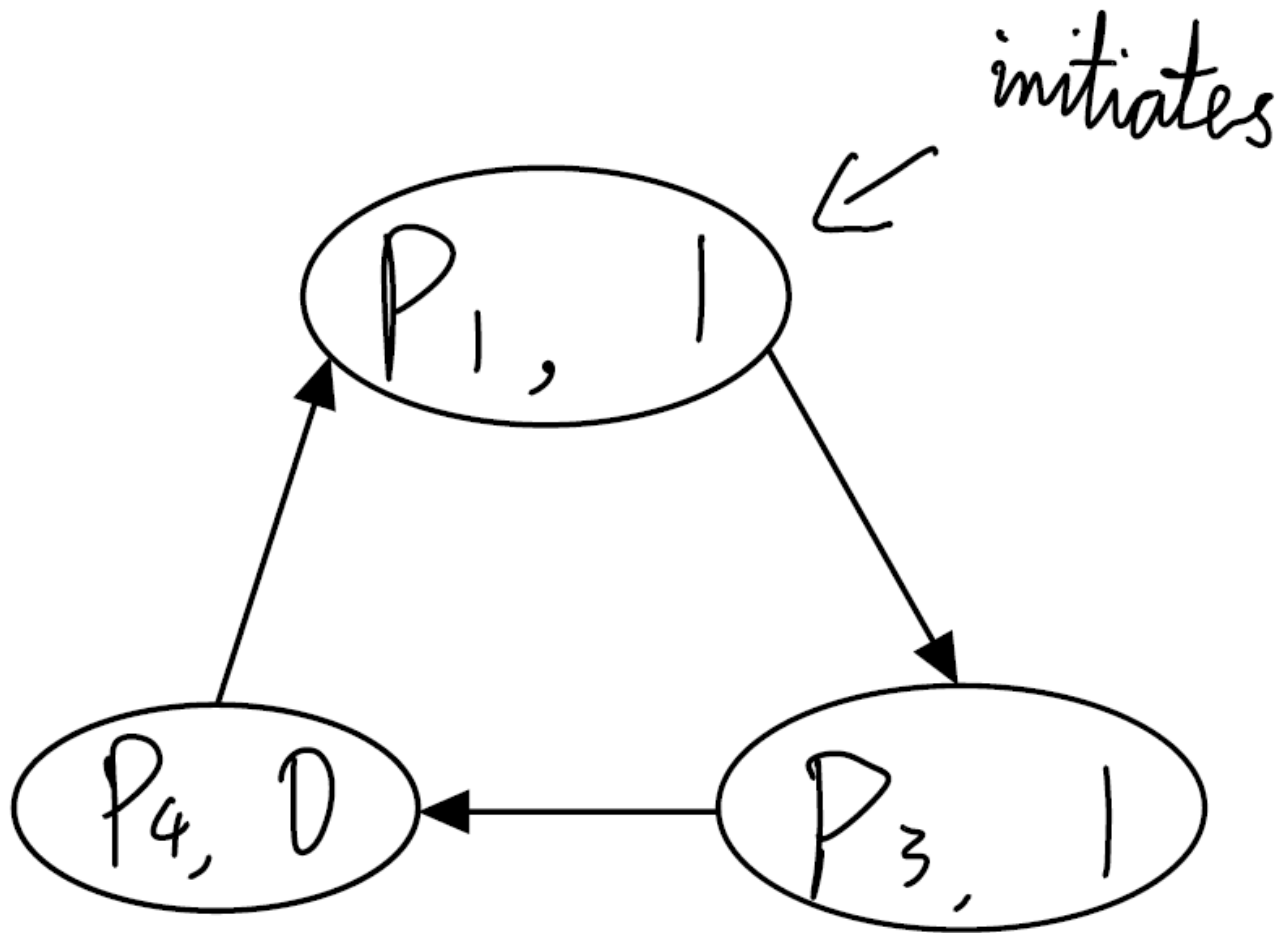# CS 425 Homework 3

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Monday, March 7, 2022

1. (a) State: neither (free)
   Action: immediately send back a reply
   Reason: P1 hasn't sent any requests

   (b) State: Wanted
   Action: immediately send back a reply
   Reason: P3 has sent a request, but P2 has a smaller request message (timestamp is the same but P2 has smaller process number, pseudo-fairness)

   (c) State: Held
   Action: queue the request
   Reason: P2 is in CS

   (d) State: Wanted
   Action: queue the request
   Reason: P3 has sent a request, and P1 has a bigger request message (P1's timestamp is bigger)

   (e) State: neither (free)
   Action: immediately send back a reply
   Reason: P2 has finished its CS by then and return to free state.

2. (a) Send Coordinate message to all processes with lower ID

   (b) 7 in total:
   1 from P3 to P7, 6 from P7 to P1   P6

   (c) 2T

   (d) 7 in total:
   1 from P3 to P7, 1 from P3 to P6, 5 from P6 to P1   P5
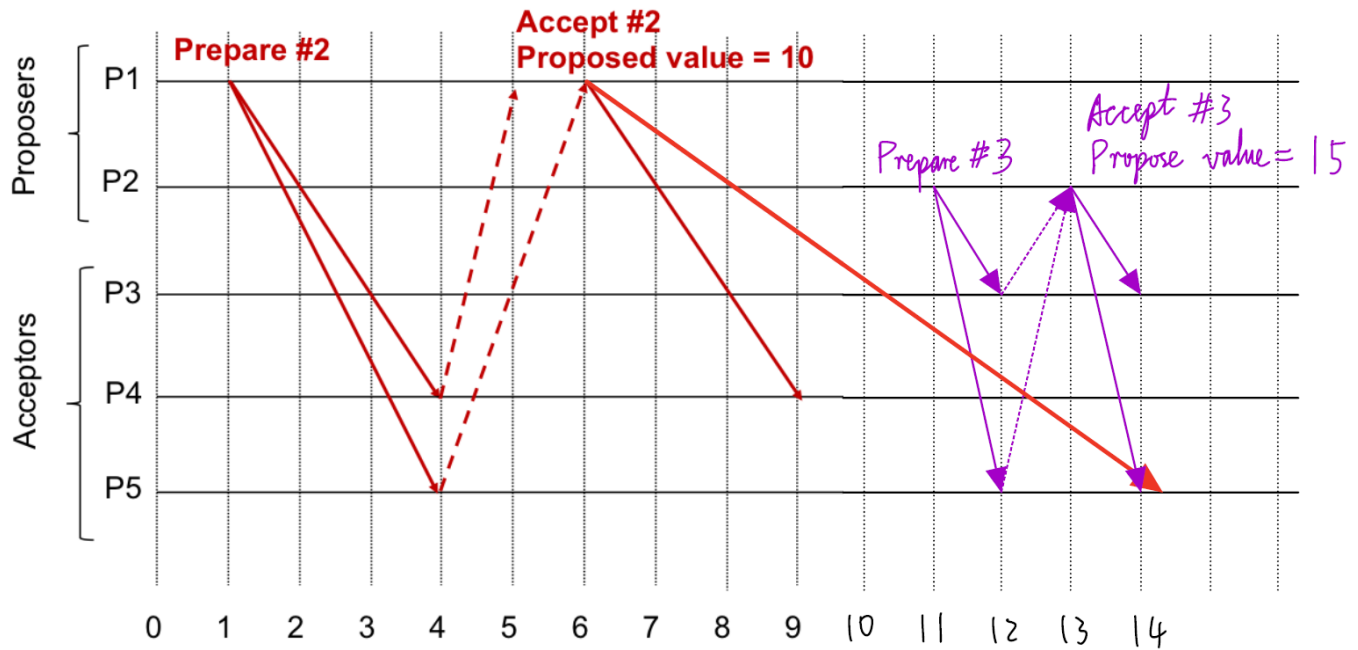
   (e) 4T

3. No!

i) Scenario:

initiates

(a) P1 initiates propose

ii) Modification: include unique id i in the propose message and decide only when (propose, i, x_i) is exactly the same to the current process.

4. (a) All processes will decide on $y_i = 2$ at 10 ms.

   (b) All processes will decide on $y_i = 2$
       P1 and P2 will decide at 20 ms, P3 and P5 will decide at 20 ms.

   (c) P1 and P2 will decide on $y_1 = y_2 = 5$ at 25 ms
       P5 will decide on $y_5 = 2$ at 20 ms.

   (d) P1 will decide on $y_1 = 6$ at 25 ms
       P5 will decide on $y_5 = 2$ at 25 ms.

   (e) The smallest timeout should be set to at least $\mathbf{(N - 1)\ T = 40\ ms}$.

   (f) P1 and P2 will decide on $y_1 = y_2 = 2$ at 30 ms
       P5 will decide on $y_5 = 2$ at 20 ms.

   (g) P1 and P5 will decide on $y_1 = y_5 = 2$ at 40 ms.

5. (a) P4

   (b) P4 will reply back **OK** with accepted proposed value $= 10$
       P5 will reply back **OK** with just a promise.

   (c) Yes, the proposed value will be **10**

   (d) No, it has not been implicitly decided. The scenario:

(a) P1 gets pre-empted by someone who doesn't listen to P4

   (e) Yes, it has been implicitly decided.

   (f) Yes, P2 will send out an *accept* message with proposed value $= \mathbf{15}$.