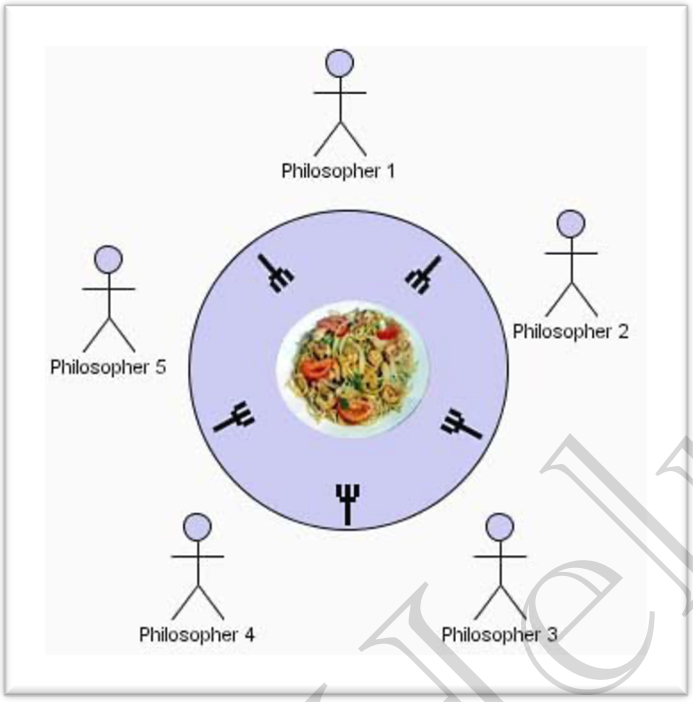
Lec-20: The Dining Philosophers problem



1. We have **5 philosophers.**
2. They spend their life just being in **two states:**
    a. Thinking
    b. Eating
3. They sit on a circular table surrounded by 5 chairs (1 each), in the center of table is a bowl of noodles, and the table is laid with 5 single forks.
4. **Thinking state**: When a ph. Thinks, he doesn't interact with others.
5. **Eating state:** When a ph. Gets hungry, he tries to pick up the 2 forks adjacent to him (Left and Right). He can pick one fork at a time.
6. One can't pick up a fork if it is already taken.
7. When ph. Has both forks at the same time, he eats without releasing forks.
8. Solution can be given using semaphores.
    a. Each fork is a binary semaphore.
    b. A ph. Calls wait() operation to acquire a fork.
    c. Release fork by calling signal().
    d. **Semaphore fork[5]{1};**
9. Although the semaphore solution makes sure that no two neighbors are eating simultaneously but it could still create **Deadlock**.
10. Suppose that all 5 ph. Become hungry at the same time and each picks up their left fork, then All fork semaphores would be 0.
11. When each ph. Tries to grab his right fork, he will be waiting for ever (Deadlock)
12. We must use **some methods to avoid Deadlock and make the solution work**
    a. Allow at most 4 ph. To be sitting simultaneously.
    b. Allow a ph. To pick up his fork only if both forks are available and to do this, he must pick them up in a critical section (atomically).

c. **Odd-even rule.**
an odd ph. Picks up first his left fork and then his right fork, whereas an even ph. Picks up his right fork then his left fork.

13. Hence, only semaphores are not enough to solve this problem.
We must add some enhancement rules to make deadlock free solution.