Operating System

Design Doc for Project 1

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Solution

TASK I: KThread.join()

```
    Current Thread wait this thread to finish

    wait until the this thread stop
    while(not this thread finish)
    yield();
    (Do we need to destroy the finished thread object and TCB?)
```

TASK II: Condition Variables

Implement directly without semaphore.

```
sleep:
    add this thread to queue
    release conditional lock
    this thread sleep (removed from ready queue?)
    acquire conditional lock (sleep should only received when wake or wakeAll is calle
    (enable machine interrupt)
wake:
    (disable machine interrupt, make sure the next thread get the lock)
    if queue not empty
        queue.removeFirst().ready
wakeAll:
    while queue not empty
        queue.removeFirst().ready
```

TASK III: Alarm Class

Make the waitUntil call no busy waiting

```
    Create a list of pairs (thread, time)
    waitUtil:
        put (thread, waitTime) in the list (Do we need to sort the list?)
    timerInerrupt:
        check all thread in the queue
        if waitTime > currentTime
            thread.ready()
        currentThread.yield()
```

TASK IV: Synchronous Send/Receive

one-word messages.

```
    Using 1 lock with two conditional variable,
    Similar to producer consumer code in textbook
```

TASK V: PriorityScheduler Class

Implement priority scheduling in Nachos.

```
PriorityQueue:
  IDEA:
    Using insertion sort to maintain the sorted property
    (highest priority with longest waiting time at head)
  constructor:
    create a linked list to store threads
  nextThread:
    pop the thread on head
    return the popped thread
  pickNextThread:
    return the thread on head
ThreadState:
  getEffectivePriority:
    ?
  wait for access:
    insert to the linked list, check from the bottom
    (if nextItem's priority >= my priority, insert behind it, as nextItem have longer
  acquire:
```

```
    ?
```

TASK VI: Boat Problem

Test Case

References

1. Example design doc