Solution to the

Gaming Parlor

Programming Project
The Gaming Parlor - Solution

Scenario:
Front desk with dice (resource units)
Groups request (e.g., 5) dice (They request resources)
Groups must wait, if none available
Dice are returned (resources are released)
A list of waiting groups... A “condition” variable
The condition is signalled
The group checks and finds it needs to wait some more
The group (thread) waits
...and goes to the end of the line

Problem?
The Gaming Parlor - Solution

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**Problem?**
Starvation!
The Gaming Parlor - Solution

**Approach:**
Serve every group “first-come-first-served”.

**Implementation:**
Keep the thread at the front of the line separate
“Leader” - the thread that is at the front of the line
Use 2 condition variables.
   “Leader” will have at most one waiting thread
   “RestOfLine” will have all other waiting threads
The Threads

function Group (numDice: int)
    var i: int
    for i = 1 to 5
        gameParlor.Acquire (numDice)
        currentThread.Yield ()
        gameParlor.Release (numDice)
        currentThread.Yield ()
    endFor
endFunction

thA.Init ("A")
thA.Fork (Group, 4)
...

The Monitor

class GameParlor
  superclass Object
  fields
    monitorLock: Mutex
    leader: Condition
    restOfLine: Condition
    numberDiceAvail: int
    numberOfWaitingGroups: int
  methods
    Init ()
    Acquire (numNeeded: int)
    Release (numReturned: int)
    Print (str: String, count: int)
endClass
The Release Method

```
method Release (numReturned: int)
  monitorLock.Lock ()

  -- Return the dice
  numberDiceAvail = numberDiceAvail + numReturned

  -- Print
  self.Print ("releases and adds back", numReturned)

  -- Wakeup the first group in line (if any)
  leader.Signal (&monitorLock)

  monitorLock.Unlock ()
endMethod
```
The Acquire Method

```plaintext
method Acquire (numNeeded: int)
    monitorLock.Lock ()
    -- Print
    self.Print ("requests", numNeeded)
    -- Indicate that we are waiting for dice.
    numberOfWaitingGroups = numberOfWaitingGroups + 1
    -- If there is a line, then get into it.
    if numberOfWaitingGroups > 1
        restOfLine.Wait (&monitorLock)
    endif
    -- Now we're at the head of the line.  Wait until
    -- there are enough dice.
    while numberDiceAvail < numNeeded
        leader.Wait (&monitorLock)
    endwhile
    ...
```
The Acquire Method

... 

-- Take our dice.
numberDiceAvail = numberDiceAvail - numNeeded

-- Now we are no longer waiting; wakeup some other 
group and leave.
numberOfWaitingGroups = numberOfWaitingGroups - 1
restOfLine.Signal (&monitorLock)

-- Print
self.Print ("proceeds with", numNeeded)

monitorLock.Unlock ()
endMethod