



# WATERLOO ENGINEERING COMPETITION

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Programming Challenge

# PROGRAM DESIGN

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1. Read in data from CSV files


```
1 import csv
2
3 def indexFunc(e):
4     return e[2]
5
6 # read in all of the server data from the server csv
7 servers = []
8 tot_params = [0, 0] # cores, ram
9 with open('./servers1.csv') as f:
10     data = csv.DictReader(f)
11     for line in data:
12         servers.append([int(line['Sever Number']), int(line['Number of Cores']), int(line['Number of Watts']), int(line['Total RAM']), []])
13         if(int(line['Number of Cores']) > max_params[0]):
14             max_params[0] = int(line['Number of Cores'])
15         if(int(line['Total RAM']) > max_params[1]):
16             max_params[1] = int(line['Total RAM'])
17         tot_params[0] += int(line['Number of Cores'])
18         tot_params[1] += int(line['Total RAM'])
19     servers.sort(key=indexFunc)
20
21 # read in all of the tasks from the task csv
22 all_tasks = []
23 tot_task_params = [0, 0]
24 with open('./tasks1.csv') as f:
25     data = csv.DictReader(f)
26     for line in data:
27         all_tasks.append([int(line['Number of Cores']), int(line['Number of Turns']), int(line['RAM']), int(line['Complete in Turns']), 0, 0, 0, 0])
28         tot_task_params[0] += int(line['Number of Cores'])
29         tot_task_params[1] += int(line['RAM'])
30
```

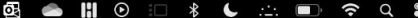
## Ideal server

```
# preprocessing
# start deciding which server will run each task: if there is a task that can only possibly be completed by one server, assign that server to the task
for task in all_tasks:
    for i in range(0, len(servers)):
        if(servers[i][1] >= task[0] and servers[i][3] >= task[2]):
            task[6] = i
            break
    else:
        task[6] = -1
```

```

34 driver.py > ...
55 counter = 0 # counter of finished tasks (both completed or failed)
56 turn = 0 #counter to go through tasks array
57 actualturn = 1 # turn number
58 whoswhere = [len(servers)]
59 print("loop start")
60 curr = [] #array of tasks currently on servers
61 while(counter<len(all_tasks)):
62     if(all_tasks[turn][6]<0): # does not have an ideal server (RAM exceeds max server RAM)
63         remove = [0,0,0,0,0]
64         remove[0] = actualturn
65         remove [1] = i
66         remove[3] = servers[whoswhere[i]][2] * all_tasks[turn][1]
67         with open("output.csv", mode='a', newline='') as file:
68             writer = csv.writer(file)
69             writer.writerow(remove)
70         counter+=1
71     else: # has an ideal server that exists
72         curr.append(all_tasks[turn]) # add to array of tasks currently running
73         for i in range(all_tasks[turn][6], len(servers)):#adding to a server
74             if((servers[i][3]-servers[i][4])>all_tasks[turn][2]): #check which is the most ideal server is that can hold the task based on available RAM
75                 servers[i][4] += all_tasks[turn][2]
76                 #whoswhere[i] = i
77                 break
78             else: # no server available, failed
79                 remove = [0,0,0,0,0]
80                 remove[0] = actualturn
81                 remove [1] = i
82                 #remove[3] = servers[whoswhere[i]][2] * all_tasks[turn][1]
83                 with open("output.csv", mode='a', newline='') as file: # write to output.csv
84                     writer = csv.writer(file)
85                     writer.writerow(remove)
86                 counter+=1 # add one to counter of finished tasks
87 min = curr[0][3]-curr[0][1] #setting minimum difference between Complete in Turns and Number of Turns to first task
88 min_index = 0 # current index 0
89 for i in range(len(curr)): # checking for minimum difference
90     if (len(curr)==1):
91         min_index = i # if only one task currently, min_index is 0
92     elif((curr[i][3] - curr[i][1])<min):
93         min_index = i # replace min index if found a smaller difference
94         min = curr[i][3] - curr[i][1]
95 curr[min_index][4]-=1 # delete from turn of task with the minimum difference
96 numdel = 0 # if a number is deleted (fixes an error)
97 for i in range(len(curr)):
98     if(curr[i-numdel][4]==0):#completed, turn is 0
99         done = [0,0,1,0,0]
100         done[0] = actualturn
  
```


 Code File Edit Selection View Go Run Terminal Window Help




Sun Nov 24 3:26 PM

← →

wec\_curr



 1


# simple program to read from csv Untitled-1


driver.py X


output.csv U

tasks1.csv U


servers1.csv U


 ▾








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



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



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


































driver.py > ...

54

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```

main\*



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