Project 1: Implementing Algorithm

Fall 2023   CPSC 335.01 - Algorithm Engineering
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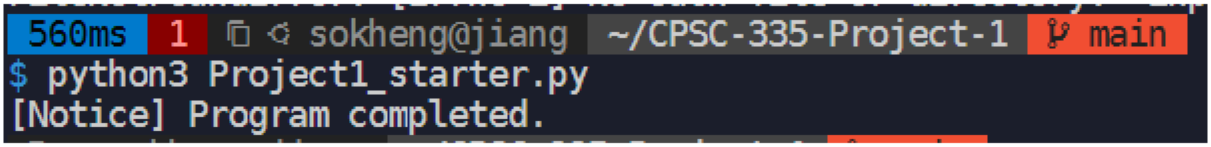
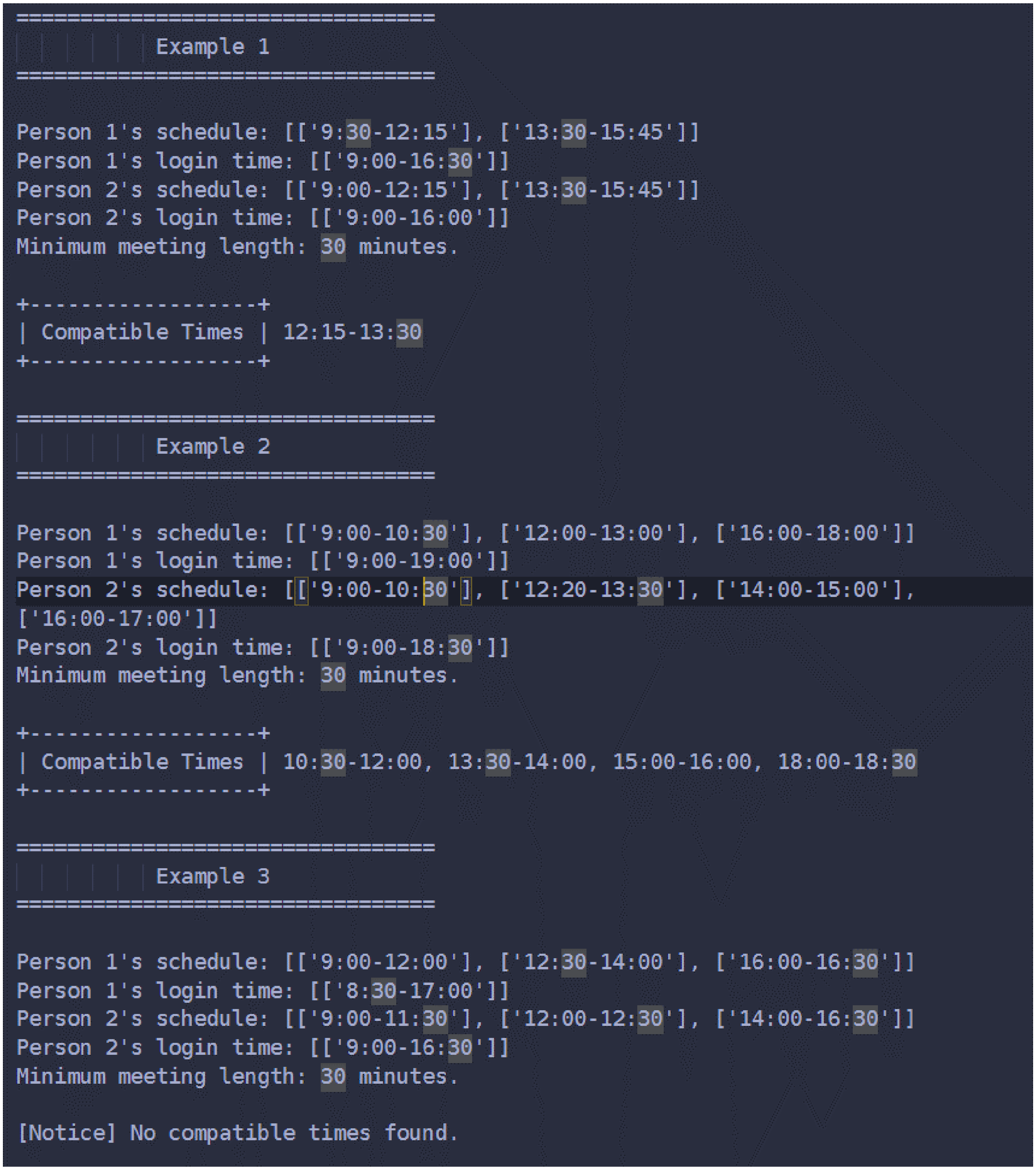
Github repo: https://github.com/Vyadin/CPSC-335-Project-1

Screenshot of outputs showing 10 test cases 2 must be edge cases below**.**



```
560ms  1   sokheng@jiang  ~/CPSC-335-Project-1  main
$ python3 Project1_starter.py
[Notice] Program completed.
```



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          Example 1
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Person 1's schedule: [['9:30-12:15'], ['13:30-15:45']]
Person 1's login time: [['9:00-16:30']]
Person 2's schedule: [['9:00-12:15'], ['13:30-15:45']]
Person 2's login time: [['9:00-16:00']]
Minimum meeting length: 30 minutes.

+-----------------+
| Compatible Times | 12:15-13:30
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          Example 2
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Person 1's schedule: [['9:00-10:30'], ['12:00-13:00'], ['16:00-18:00']]
Person 1's login time: [['9:00-19:00']]
Person 2's schedule: [['9:00-10:30'], ['12:20-13:30'], ['14:00-15:00'],
['16:00-17:00']]
Person 2's login time: [['9:00-18:30']]
Minimum meeting length: 30 minutes.

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| Compatible Times | 10:30-12:00, 13:30-14:00, 15:00-16:00, 18:00-18:30
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          Example 3
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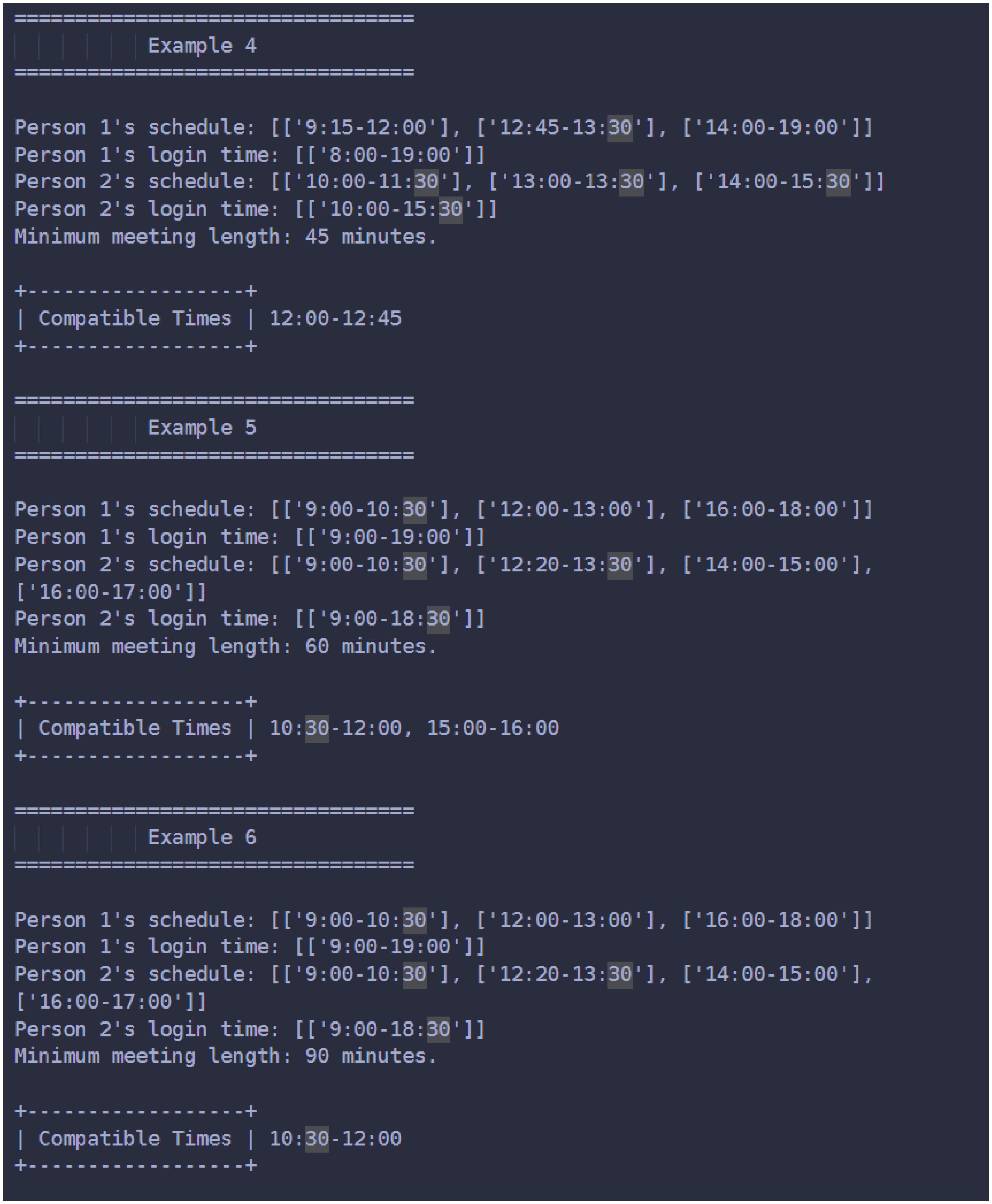
Person 1's schedule: [['9:00-12:00'], ['12:30-14:00'], ['16:00-16:30']]
Person 1's login time: [['8:30-17:00']]
Person 2's schedule: [['9:00-11:30'], ['12:00-12:30'], ['14:00-16:30']]
Person 2's login time: [['9:00-16:30']]
Minimum meeting length: 30 minutes.

[Notice] No compatible times found.
```



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           Example 4
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Person 1's schedule: [['9:15-12:00'], ['12:45-13:30'], ['14:00-19:00']]
Person 1's login time: [['8:00-19:00']]
Person 2's schedule: [['10:00-11:30'], ['13:00-13:30'], ['14:00-15:30']]
Person 2's login time: [['10:00-15:30']]
Minimum meeting length: 45 minutes.

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| Compatible Times | 12:00-12:45
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           Example 5
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Person 1's schedule: [['9:00-10:30'], ['12:00-13:00'], ['16:00-18:00']]
Person 1's login time: [['9:00-19:00']]
Person 2's schedule: [['9:00-10:30'], ['12:20-13:30'], ['14:00-15:00'],
['16:00-17:00']]
Person 2's login time: [['9:00-18:30']]
Minimum meeting length: 60 minutes.

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| Compatible Times | 10:30-12:00, 15:00-16:00
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           Example 6
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Person 1's schedule: [['9:00-10:30'], ['12:00-13:00'], ['16:00-18:00']]
Person 1's login time: [['9:00-19:00']]
Person 2's schedule: [['9:00-10:30'], ['12:20-13:30'], ['14:00-15:00'],
['16:00-17:00']]
Person 2's login time: [['9:00-18:30']]
Minimum meeting length: 90 minutes.

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| Compatible Times | 10:30-12:00
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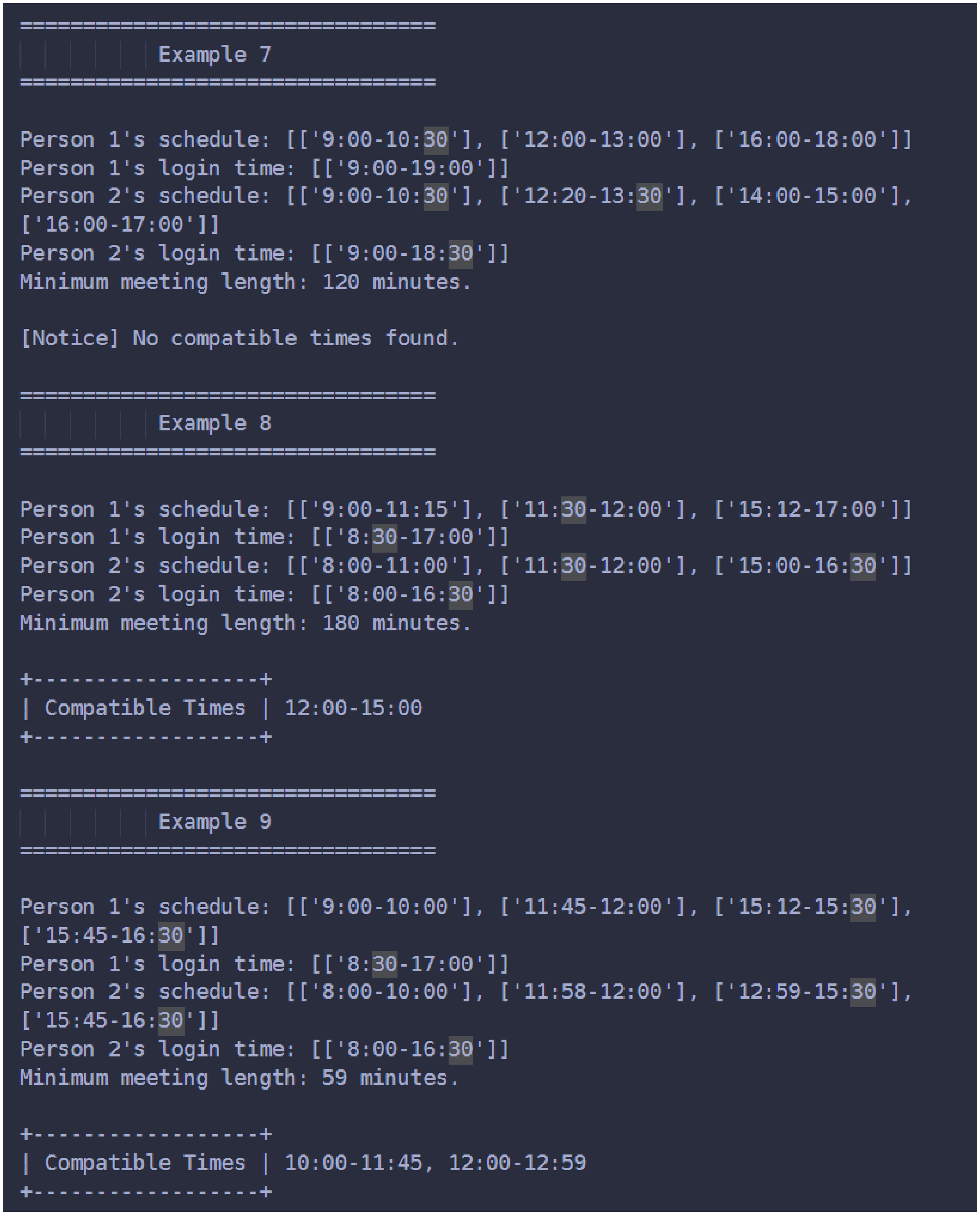

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           Example 7
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Person 1's schedule: [['9:00-10:30'], ['12:00-13:00'], ['16:00-18:00']]
Person 1's login time: [['9:00-19:00']]
Person 2's schedule: [['9:00-10:30'], ['12:20-13:30'], ['14:00-15:00'],
['16:00-17:00']]
Person 2's login time: [['9:00-18:30']]
Minimum meeting length: 120 minutes.

[Notice] No compatible times found.

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           Example 8
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Person 1's schedule: [['9:00-11:15'], ['11:30-12:00'], ['15:12-17:00']]
Person 1's login time: [['8:30-17:00']]
Person 2's schedule: [['8:00-11:00'], ['11:30-12:00'], ['15:00-16:30']]
Person 2's login time: [['8:00-16:30']]
Minimum meeting length: 180 minutes.

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| Compatible Times | 12:00-15:00
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           Example 9
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Person 1's schedule: [['9:00-10:00'], ['11:45-12:00'], ['15:12-15:30'],
['15:45-16:30']]
Person 1's login time: [['8:30-17:00']]
Person 2's schedule: [['8:00-10:00'], ['11:58-12:00'], ['12:59-15:30'],
['15:45-16:30']]
Person 2's login time: [['8:00-16:30']]
Minimum meeting length: 59 minutes.

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| Compatible Times | 10:00-11:45, 12:00-12:59
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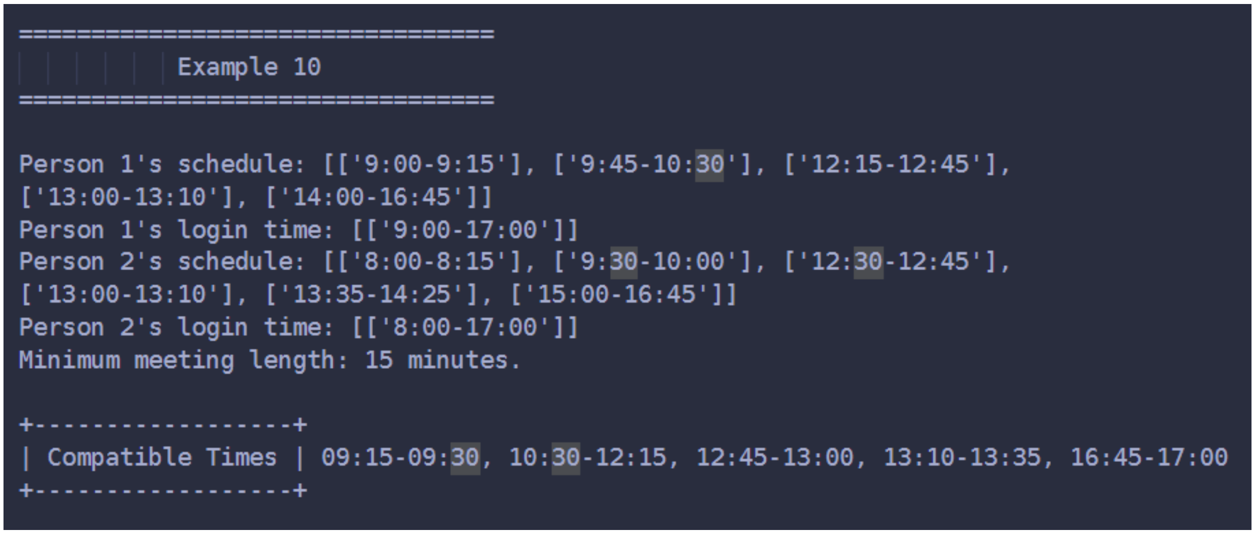

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           Example 10
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Person 1's schedule: [['9:00-9:15'], ['9:45-10:30'], ['12:15-12:45'],
['13:00-13:10'], ['14:00-16:45']]
Person 1's login time: [['9:00-17:00']]
Person 2's schedule: [['8:00-8:15'], ['9:30-10:00'], ['12:30-12:45'],
['13:00-13:10'], ['13:35-14:25'], ['15:00-16:45']]
Person 2's login time: [['8:00-17:00']]
Minimum meeting length: 15 minutes.

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| Compatible Times | 09:15-09:30, 10:30-12:15, 12:45-13:00, 13:10-13:35, 16:45-17:00
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```

brief proof argument for the time complexity of my algorithm, including step-counts

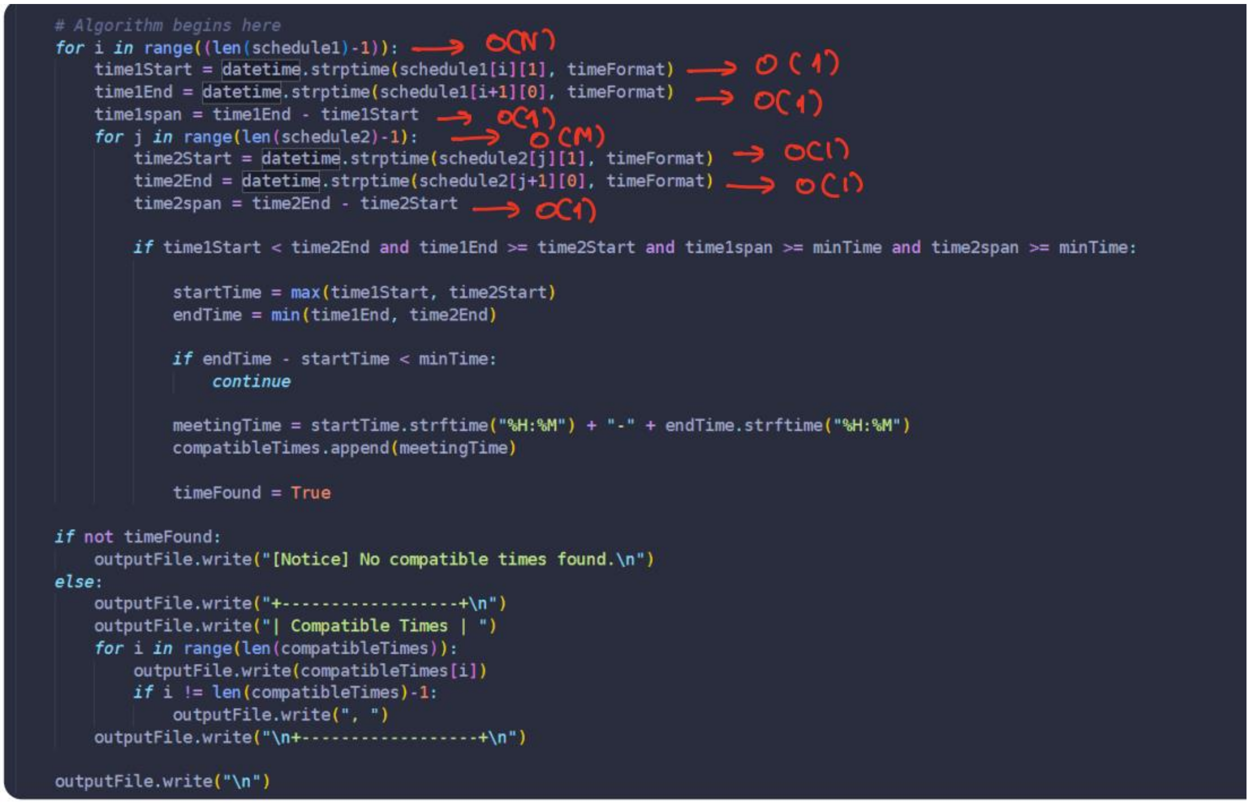
First loop for the schedule1 and nested loop for the schedule2

So the combine time complexity is **O(N*M)**

N: is the length of the schedule1

M: is the length of the schedule2

step-count:



```
# Algorithm begins here
for i in range((len(schedule1)-1)):   → O(N)
    time1Start = datetime.strptime(schedule1[i][1], timeFormat)   → O(1)
    time1End = datetime.strptime(schedule1[i+1][0], timeFormat)   → O(1)
    time1span = time1End - time1Start   → O(1)
    for j in range(len(schedule2)-1):   → O(M)
        time2Start = datetime.strptime(schedule2[j][1], timeFormat)   → O(1)
        time2End = datetime.strptime(schedule2[j+1][0], timeFormat)   → O(1)
        time2span = time2End - time2Start   → O(1)

        if time1Start < time2End and time1End >= time2Start and time1span >= minTime and time2span >= minTime:

            startTime = max(time1Start, time2Start)
            endTime = min(time1End, time2End)

            if endTime - startTime < minTime:
                continue

            meetingTime = startTime.strftime("%H:%M") + "-" + endTime.strftime("%H:%M")
            compatibleTimes.append(meetingTime)

            timeFound = True

if not timeFound:
    outputFile.write("[Notice] No compatible times found.\n")
else:
    outputFile.write("+------------------+\n")
    outputFile.write("| Compatible Times | ")
    for i in range(len(compatibleTimes)):
        outputFile.write(compatibleTimes[i])
        if i != len(compatibleTimes)-1:
            outputFile.write(", ")
    outputFile.write("\n+------------------+\n")

outputFile.write("\n")
```

If we assume the schedule1 and schedule2 is about the same size, we can assume that the time complexity is O(N^2) where N=M

Consider the loop is the dominant operation since other operator like parsing schedules does not affect overall time complexity.

When we are increasing the number of inputs, the algorithm takes longer in practice. But the overall time complexity is still remaining O(n^2)