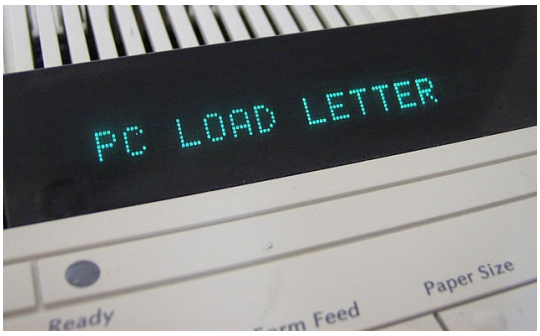
Printer Queues



Source: Wikimedia Commons

Objectives

- To practice writing and using a queue class

Overview

Queues are an abstract data type where items can be added (or “enqueued”) to the rear and removed (or “dequeued”) from the front of a list. In contrast to stacks, which are a last-in first-out (LIFO) data type, queues are a first-in first-out (FIFO) data type. Some examples of queues include waiting in line in a grocery store checkout lane and planes waiting to take off from a runway at an airport. The lab will simulate printers handling queues of documents to print.

You will use the ListNode class developed in the lecture class and attached to the assignment to create a LinkedQueue class. The internal list of the LinkedQueue class will therefore be a linked list.

Your LinkedQueue class will have the following methods:

- **__init__()**: The constructor will initialize attributes representing the front and rear of the queue. It should not take any arguments.
- **enqueue(item)**: This method will insert an item to the queue by adding it to the rear of the queue.
- **dequeue()**: This method will remove the first item at the front of the queue and return it.

- **is_empty()**: Returns True if the queue is empty, otherwise False.
- **is_full()**: Returns True if the queue is full, otherwise False.
- **destroy()**: This method should remove all nodes from the queue, in effect emptying the queue.
- **__str__()**: This method should return a string that consists of all data items stored in the queue and separated by a comma and a space.

Instructions

The assignment has been divided into three parts to help you know where to start. You must finish all parts before turning it in. A driver program that uses your class has been provided. If there is a problem, you must change your class so that it works with the driver.

Part 1

Write the LinkedQueue class. The class should use the ListNode class to handle elements enqueued into and dequeued from the queue. When run with the "tinyPrintJobs.txt" file as input, the driver file will print the average wait time for the printer.

Part 2

Modify the driver file to use the "printerJobs.txt" file. The driver file will then print the average wait time for the printer using print jobs listed in this file.

Part 3

Modify the driver file to keep track of two printers using two LinkedQueue objects. Print jobs originating from rooms beginning with a "2" will be sent to one printer while print jobs originating from rooms beginning with a "3" will be sent to the other printer. When run with the "printerJobs.txt" file as input, the driver file will print the average wait times for each printers.

Requirements

For the code:

- Your program should have the correct comment block at the top (see last assignment).
- Use appropriate comments throughout the code. Be sure to include comments before each function definition explaining the interface (what must be sent, what

is returned) and the purpose of the function. Also, don't forget to make appropriate comments within the method definition.

- Make good use of whitespace. Be sure to include a blank line of space before each comment. Two lines of space between functions is nice, but one will suffice – whichever you choose, be consistent. Follow the Python programming style guide: https://www.python.org/dev/peps/pep-0008/#introduction.

For the lab report, follow the Lab Report Format Guide and complete the following sections:

- Title Page
- Analysis and Conclusions
- Appendix B – code (Be sure that you copy and paste the code into your word document, don't take a screen shot of it and paste that – it ends up being too hard to read).

Deliverables

Electronic submission in myCourses:

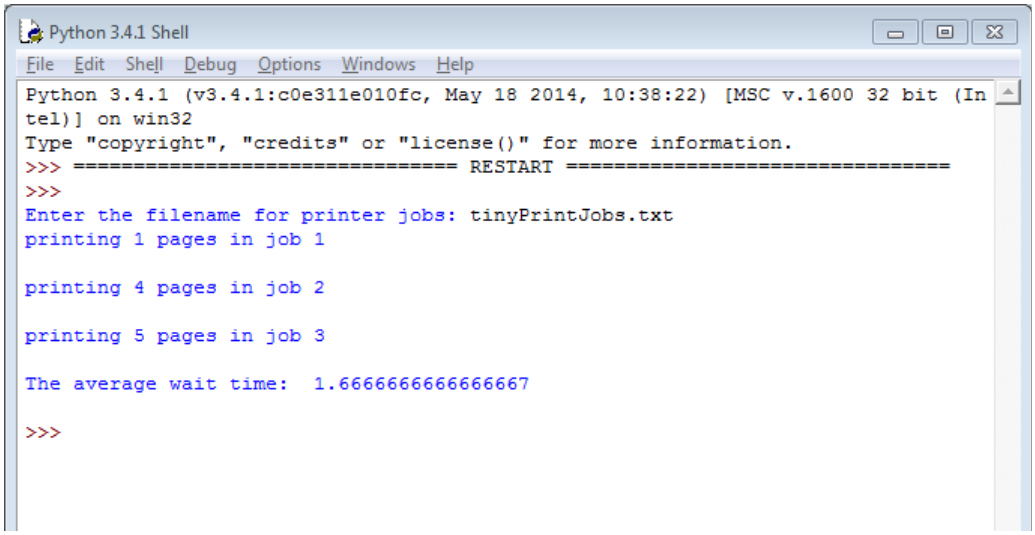
- Code (due by the end of the class period)

Grading

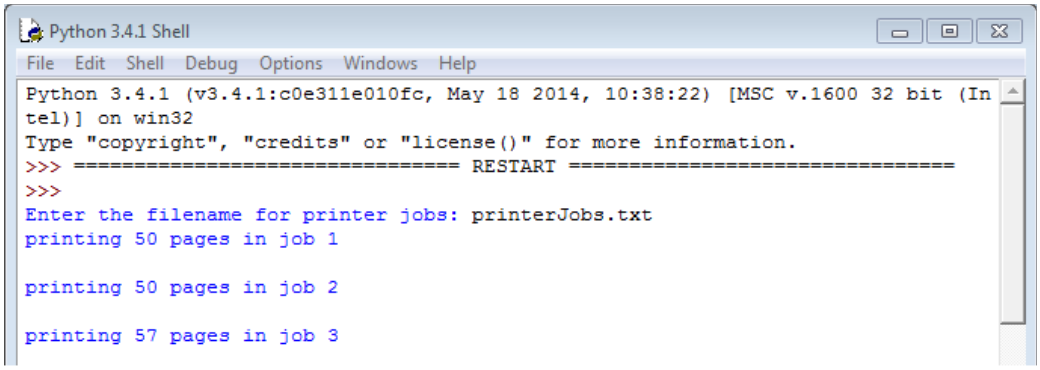
Task	**Points**
Part 1: LinkedQueue class	60 points
Part 2: Works with printerJobs.txt using 1 printer	20 points
Part 3: Works with printerJobs.txt using 2 printers	20 points
Total	*100 points total*

Sample Execution

Using tinyPrintJobs.txt



Using printerJobs.txt (two printers)



Queue for documents originating from rooms 2XX:

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printing 57 pages in job 28

printing 93 pages in job 29

printing 125 pages in job 30

The average wait time:  70.83333333333333
```

Queue for documents originating from rooms 3XX:

```
printing 10 pages in job 46

printing 10 pages in job 47

printing 7 pages in job 48

The average wait time:  6.979166666666667
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