BridgeLabz

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Data Structure Problems using Java Generics

Outcomes

- Data Structures understanding – LinkedList, Stacks, Queues and Hash Tables
- Use Generics to accommodate multiple data types
- Ensure Stack, Queues and Hash Tables are using the LinkedList Data Structure to store

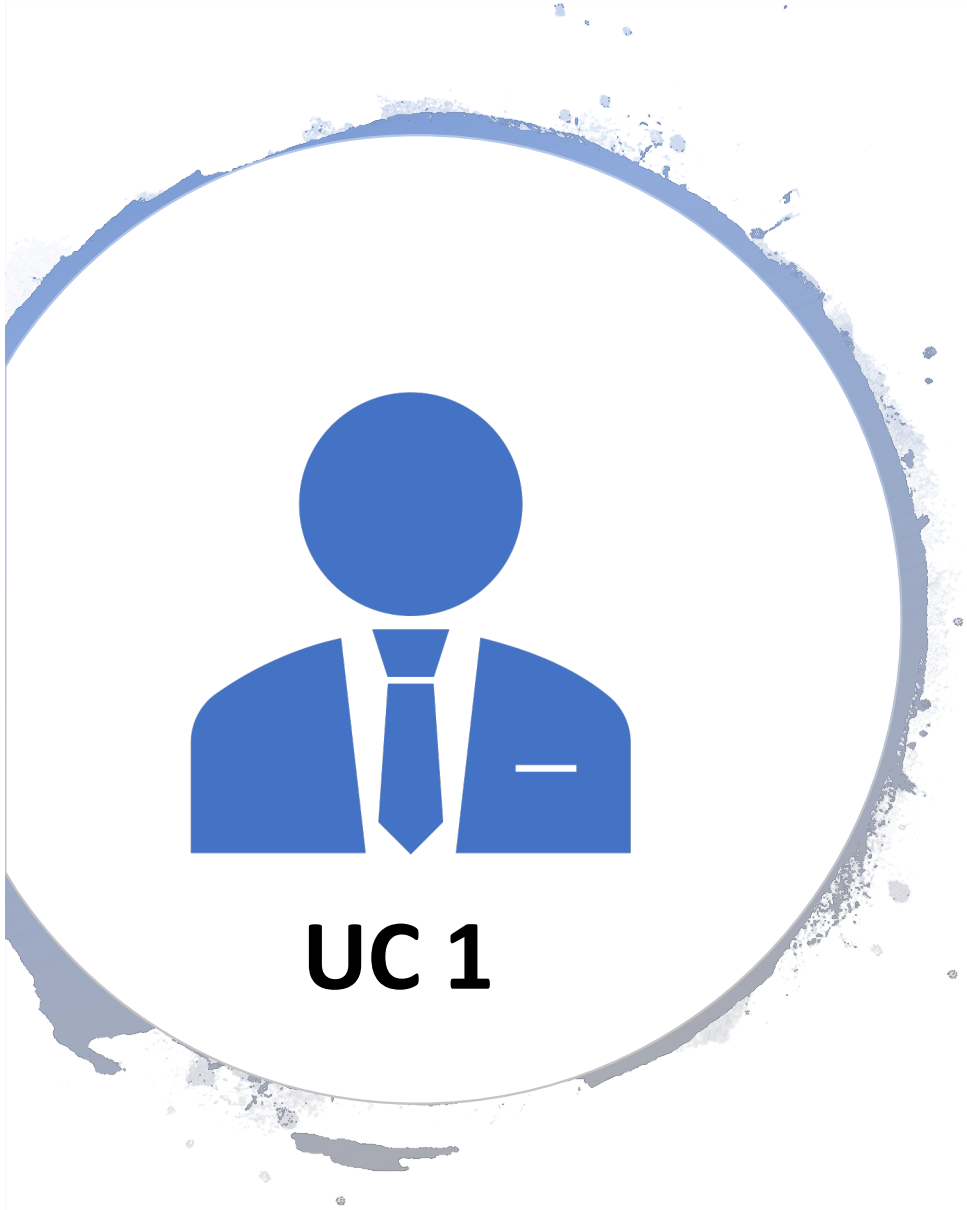
Section 2: Stacks and Queues

The Stack Abstract Data Type

The stack abstract data type is defined by the following structure and operations. A stack is structured, as described above, as an ordered collection of items where items are added to and removed from the end called the "top." Stacks are ordered LIFO. The stack operations are given below.

- `Stack()` creates a new stack that is empty. It needs no parameters and returns an empty stack.
- `push(item)` adds a new item to the top of the stack. It needs the item and returns nothing.
- `pop()` removes the top item from the stack. It needs no parameters and returns the item. The stack is modified.
- `peek()` returns the top item from the stack but does not remove it. It needs no parameters. The stack is not modified.
- `isEmpty()` tests to see whether the stack is empty. It needs no parameters and returns a boolean value.
- `size()` returns the number of items on the stack. It needs no parameters and returns an integer.

Stack API



Ability to create a Stack of 56->30->70

- Use LinkedList to do the Stack Operations
- Here push will internally call add method on LinkedList.
- So 70 will be added first then 30 and then 56 to make 56 on top of the Stack

Ability to peak and pop from the Stack till it is empty

56->30->70

- Use LinkedList to do the Stack Operations

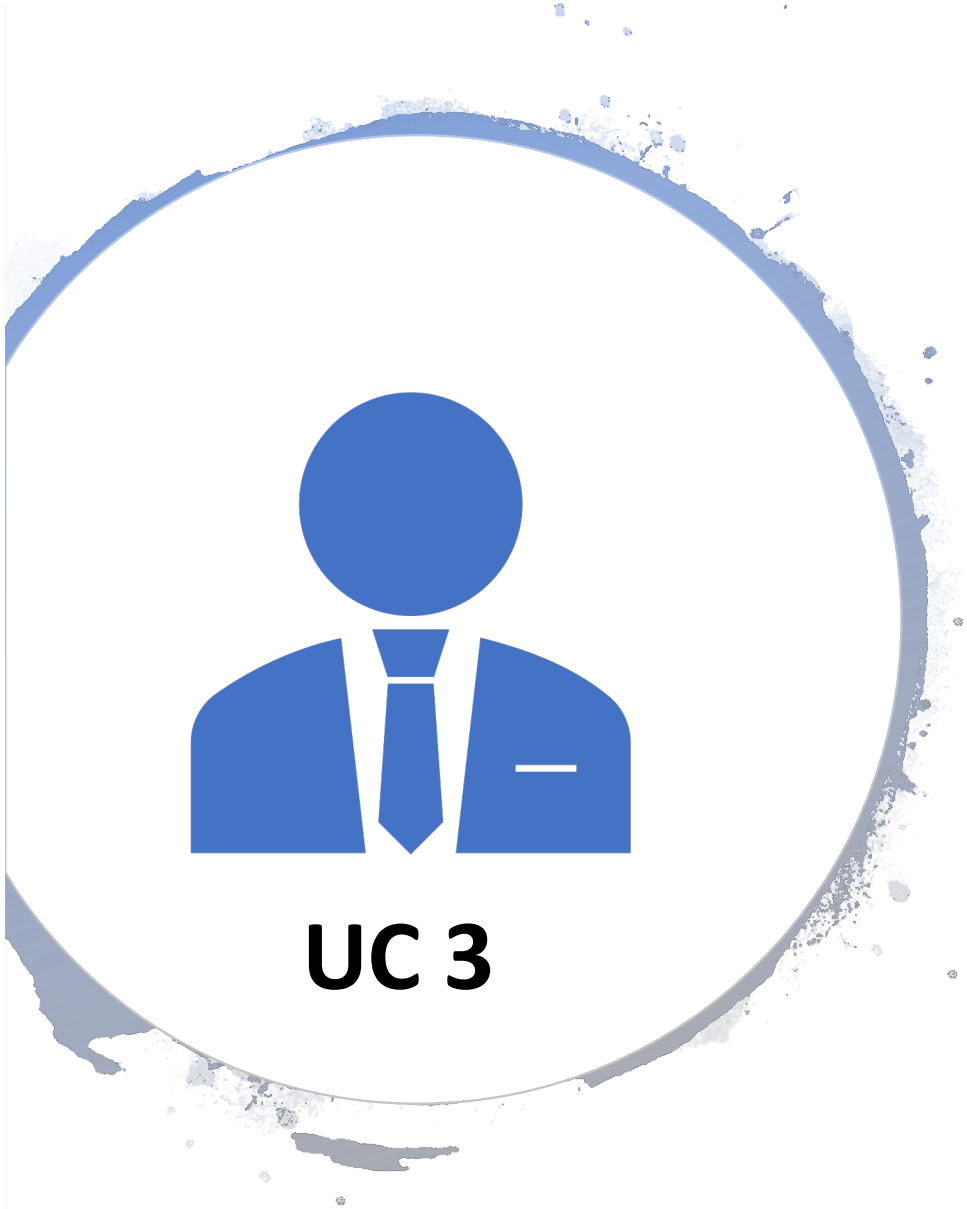
The Queue Abstract Data Type

The queue abstract data type is defined by the following structure and operations. A queue is structured, as described above, as an ordered collection of items which are added at one end, called the "rear," and removed from the other end, called the "front." Queues maintain a FIFO ordering property. The queue operations are given below.

- `Queue()` creates a new queue that is empty. It needs no parameters and returns an empty queue.
- `enqueue(item)` adds a new item to the rear of the queue. It needs the item and returns nothing.
- `dequeue()` removes the front item from the queue. It needs no parameters and returns the item. The queue is modified.
- `isEmpty()` tests to see whether the queue is empty. It needs no parameters and returns a boolean value.
- `size()` returns the number of items in the queue. It needs no parameters and returns an integer.

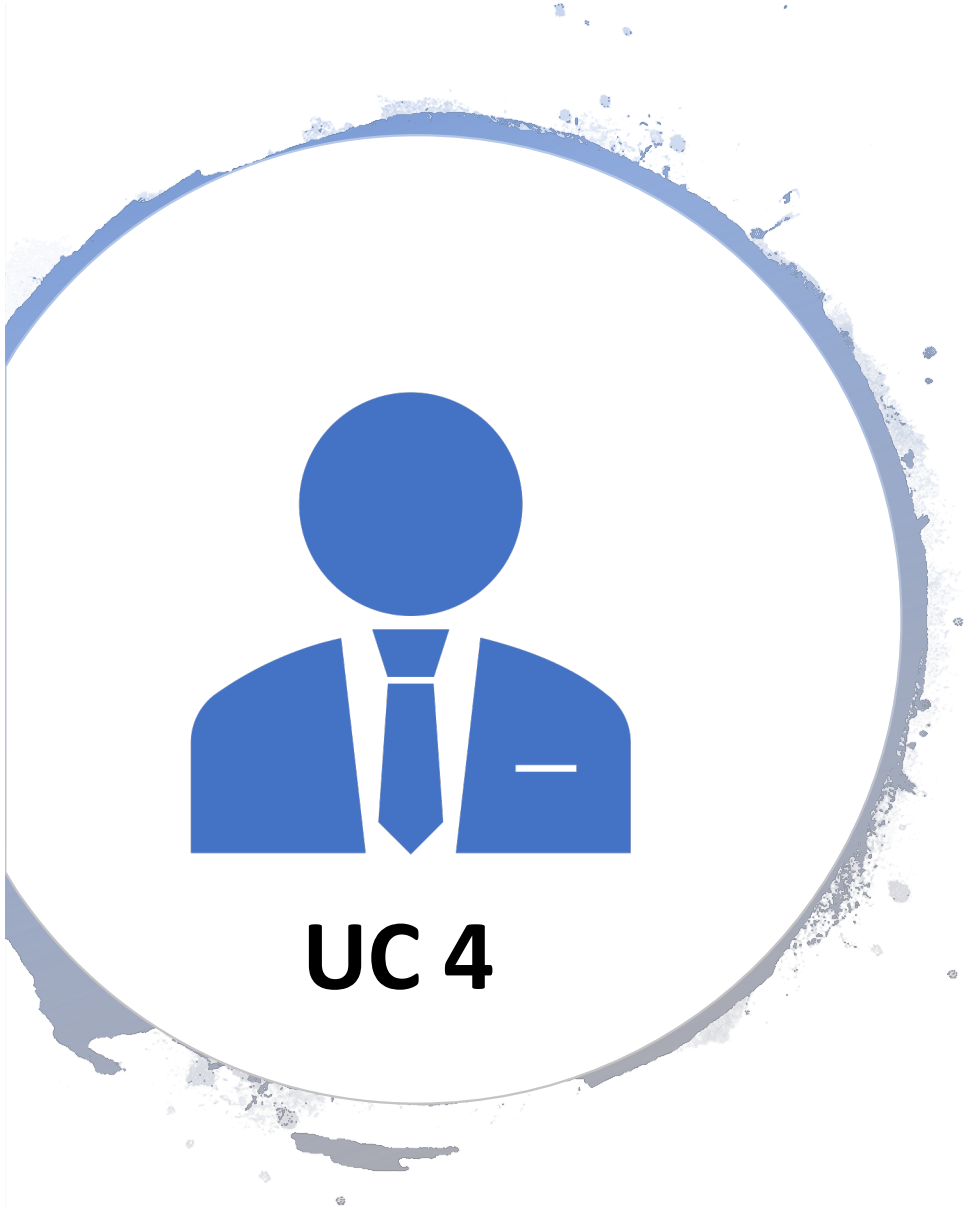
As an example, if we assume that `q` is a queue that has been created and is currently empty, then Table 1 shows the results of a sequence of queue operations. The queue contents are shown such that the front is on the right. 4 was the first item enqueued so it is the first item returned by dequeue.

Queue API



Ability to create a Queue of 56->30->70

- Use LinkedList to do the Queue Operations
- Here enqueu will internally call append method on LinkedList.
- So 56 will be added first then 30 and then 70 to make 56 on top of the Stack



Ability to **dequeue** from the beginning

- Use LinkedList to do the Queue Operations

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Thank You