



Queues

Queues

- First in First Out (FIFO)
 - Processing Data in Order
 - Time
 - “Waiting in a Line”
- Queue Operations
 - Enqueue: Add new element to the end of the queue
 - Dequeue: Remove the first element from the queue
 - Peek: Observe but not remove the first element in a queue
 - Print: Print all elements in a Queue

Queue

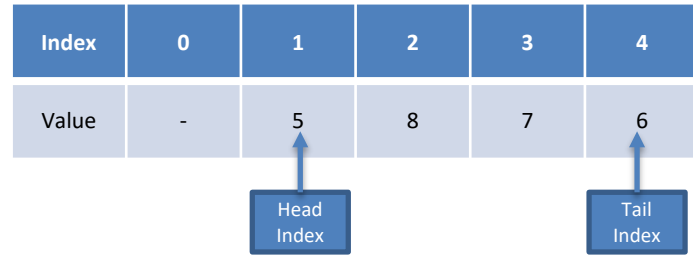


Queues

- Queue Implementations
 - Array
 - Linked List
- Two Major References
 - Head
 - Tail

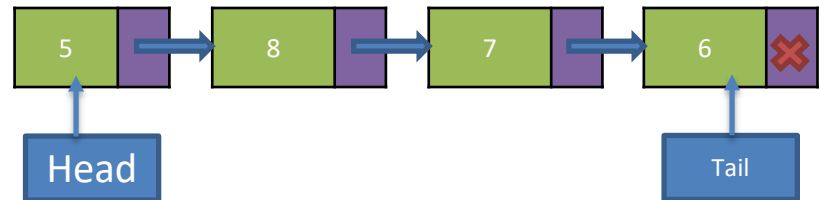
Array Queue

Index	0	1	2	3	4
Value	-	5	8	7	6

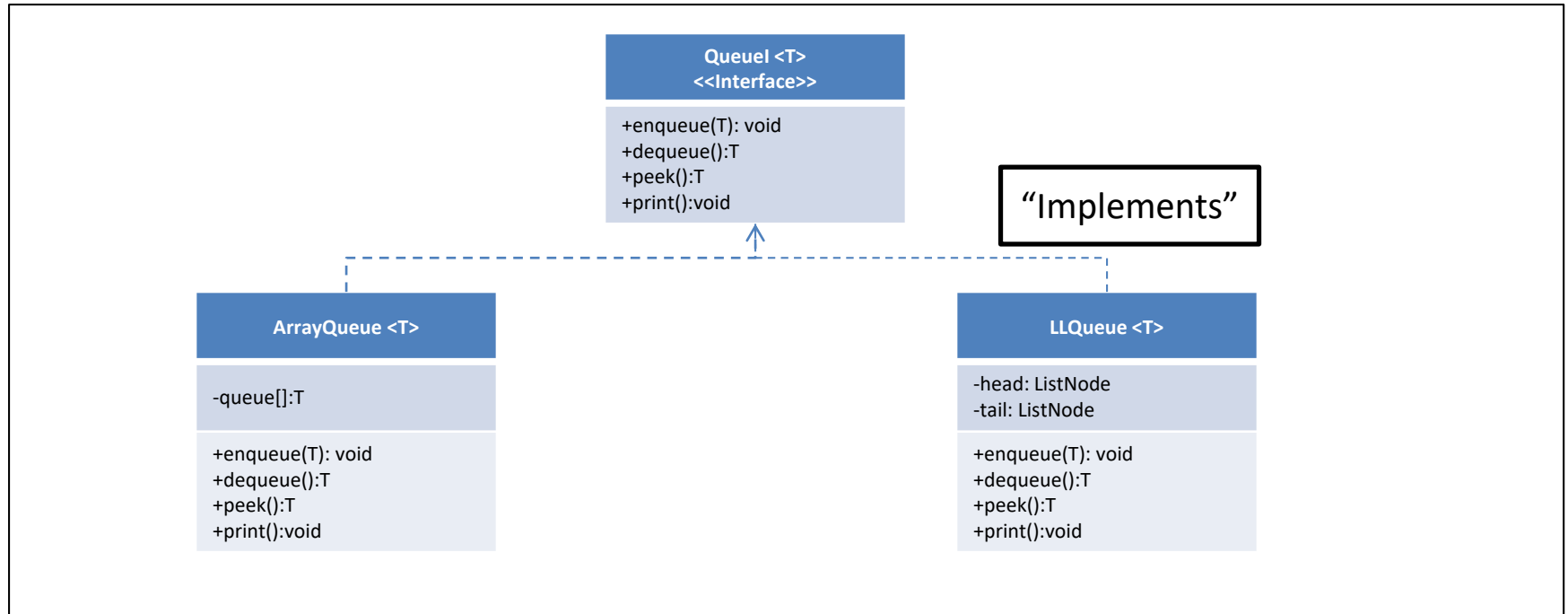


The diagram illustrates an array-based queue. The array has five slots, indexed 0 to 4. The values are -, 5, 8, 7, and 6. The 'Head Index' is 1, pointing to the value 5. The 'Tail Index' is 4, pointing to the value 6. The slot at index 0 is empty, representing the front of the queue.

Linked List Queue



Queues



Array Queue

- References
 - Head Index (First Element)
 - Tail Index (First NULL Element)
 - Items in the Queue start from the Head Index and end Tail Index - 1
- Moves forward in a Circular Way
 - “Next Index = (Index + 1)%Array.Length”
 - Avoids “Shifting”

Array Queue

Index	0	1	2	3	4	5
Value	-	5	8	7	6	-

Diagram illustrating an Array Queue. The array has indices 0 to 5. The values are: Index 0: -, Index 1: 5, Index 2: 8, Index 3: 7, Index 4: 6, Index 5: -. The Head Index is 1 (pointing to the value 5) and the Tail Index is 5 (pointing to the value -).

Array Queue

- References
 - Head Index (First Element)
 - Tail Index (First NULL Element)
 - Items in the Queue start from the Head Index and end Tail Index - 1
- Moves forward in a Circular Way
 - “Next Index = (Index + 1)%Array.Length”
 - Avoids “Shifting”

Array Queue

Index	0	1	2	3	4	5
Value	6	-	-	5	8	7

↑ Tail Index ↑ Head Index

Array Queue

- Enqueue
 - Add new element at the Tail Index
 - Advance Tail Index Circularly

Array Queue

Index	0	1	2	3	4	5
Value	-	5	8	7	6	-

The diagram illustrates an Array Queue. It consists of a table with two rows: 'Index' and 'Value'. The 'Index' row has columns for indices 0 through 5. The 'Value' row has corresponding values: '-' for index 0, '5' for index 1, '8' for index 2, '7' for index 3, '6' for index 4, and '-' for index 5. Below the table, there are two blue boxes. The first box, labeled 'Head Index', has an arrow pointing up to the value '5' at index 1. The second box, labeled 'Tail Index', has an arrow pointing up to the '-' at index 5.

Array Queue

- Enqueue
 - Add new element at the Tail Index
 - Advance Tail Index Circularly

Array Queue

Index	0	1	2	3	4	5
Value	-	5	8	7	6	4

The diagram illustrates an array queue. A table shows the state of the array with indices 0 to 5. The values are: index 0 is empty (-), index 1 is 5, index 2 is 8, index 3 is 7, index 4 is 6, and index 5 is 4. A blue box labeled 'Head Index' has an arrow pointing to the value 5 at index 1. Another blue box labeled 'Tail Index' has an arrow pointing to the value 4 at index 5.

Array Queue

- Enqueue
 - Add new element at the Tail Index
 - Advance Tail Index Circularly

Array Queue

Index	0	1	2	3	4	5
Value	-	5	8	7	6	4

Tail Index	Head Index
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The diagram illustrates the state of an array queue. A table shows indices 0 through 5 with corresponding values: -, 5, 8, 7, 6, 4. Below the table, two boxes labeled 'Tail Index' and 'Head Index' have arrows pointing to the cells at index 0 and index 1, respectively.

Array Queue

- Dequeue
 - Save Reference to item at the Head Index
 - Advance Head Index Circularly
 - Return Saved Reference

Array Queue

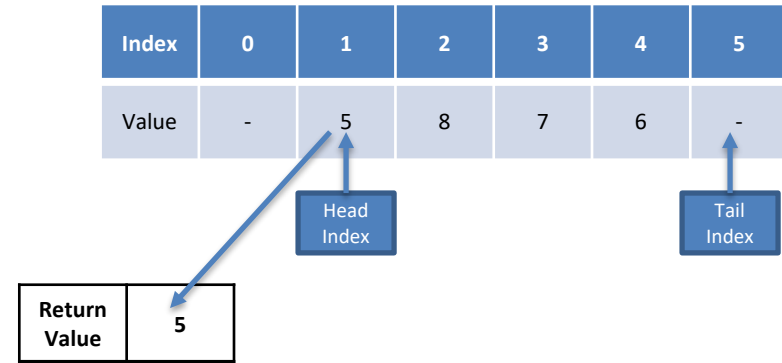
Index	0	1	2	3	4	5
Value	-	5	8	7	6	-

Diagram illustrating the Array Queue structure. The array has indices 0 to 5. The values are: Index 0: -, Index 1: 5, Index 2: 8, Index 3: 7, Index 4: 6, Index 5: -. The Head Index is 1 (pointing to value 5) and the Tail Index is 5 (pointing to value -).

Array Queue

- Dequeue
 - Save Reference to item at the Head Index
 - Advance Head Index Circularly
 - Return Saved Reference

Array Queue



Array Queue

- Dequeue
 - Save Reference to item at the Head Index
 - Advance Head Index Circularly
 - Return Saved Reference

Array Queue

Index	0	1	2	3	4	5
Value	-	5	8	7	6	-

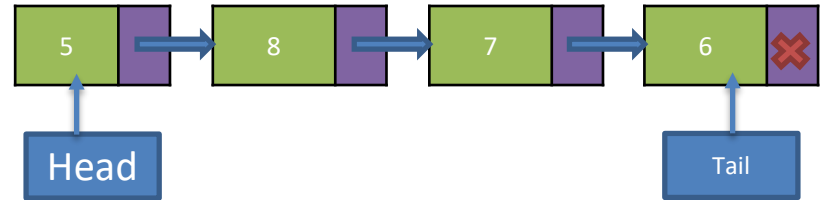
Diagram illustrating the Array Queue structure. The array has indices 0 to 5. The values are: Index 0: -, Index 1: 5, Index 2: 8, Index 3: 7, Index 4: 6, Index 5: -. The Head Index is 2 (pointing to value 8) and the Tail Index is 5 (pointing to -).

Return Value	5
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Linked List Queue

- Enqueue
 - Create a new List Node with the Data
 - Add new element after the Tail Reference

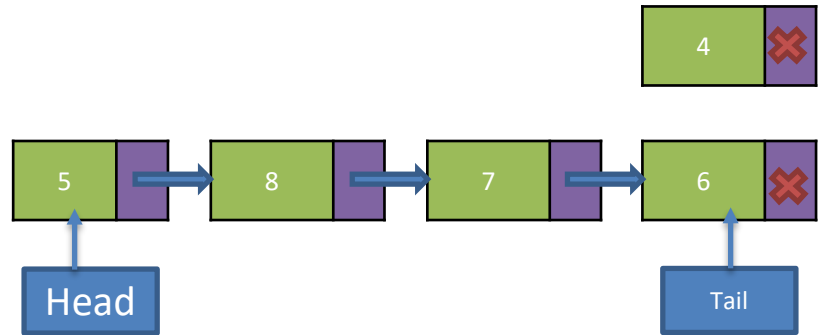
Linked List Queue



Linked List Queue

- Enqueue
 - Create a new List Node with the Data
 - Add new element after the Tail Reference

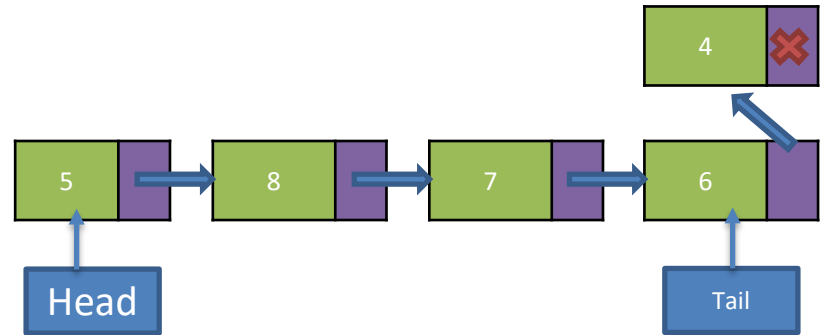
Linked List Queue



Linked List Queue

- Enqueue
 - Create a new List Node with the Data
 - Add new element after the Tail Reference

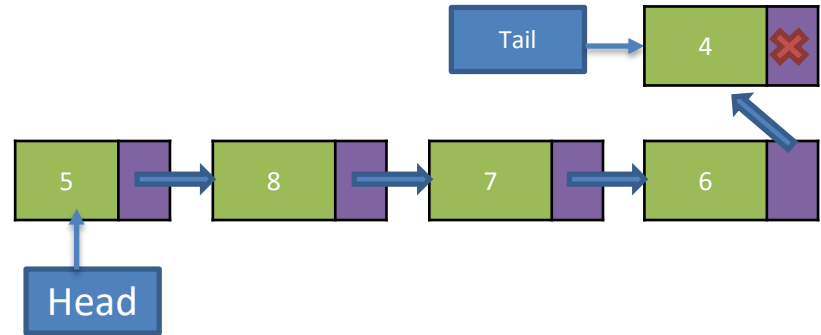
Linked List Queue



Linked List Queue

- Enqueue
 - Create a new List Node with the Data
 - Add new element after the Tail Reference

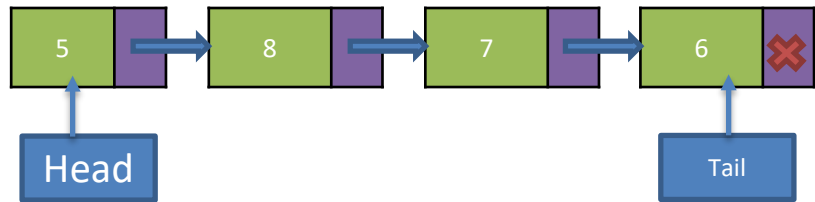
Linked List Queue



Linked List Queue

- Dequeue
 - Save Reference to the Data in the Head
 - Move the Head forward
 - Return Saved Reference

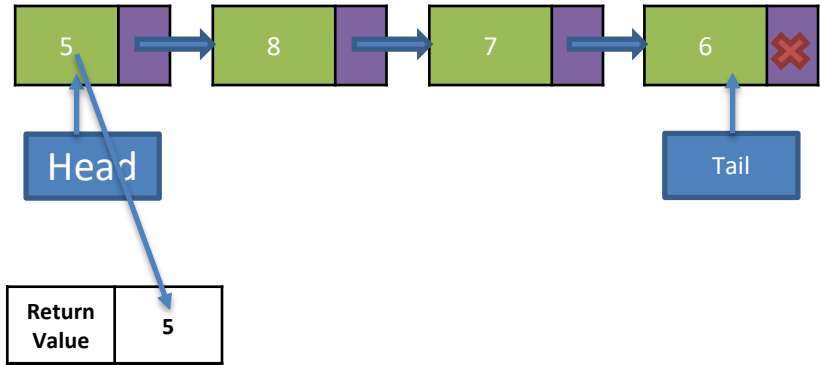
Linked List Queue



Linked List Queue

- Dequeue
 - Save Reference to the Data in the Head
 - Move the Head forward
 - Return Saved Reference

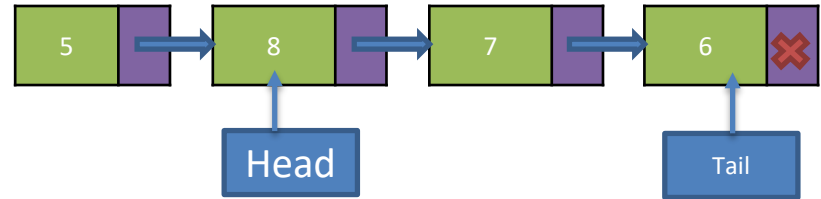
Linked List Queue



Linked List Queue

- Dequeue
 - Save Reference to the Data in the Head
 - Move the Head forward
 - Return Saved Reference

Linked List Queue

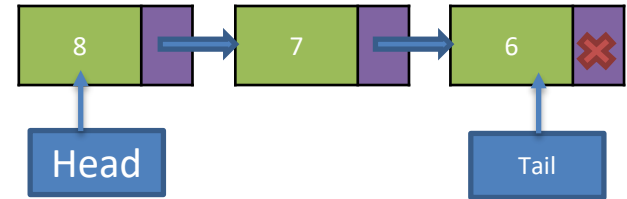


Return Value	5
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Linked List Queue

- Dequeue
 - Save Reference to the Data in the Head
 - Move the Head forward
 - Return Saved Reference

Linked List Queue



Return Value	5
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