1.00 Tutorial 10
Linked List

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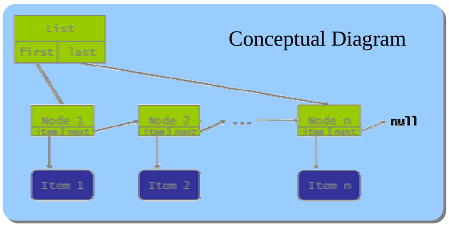
- 1D Linked List Recap
- 2D Linked List Introduction/Pset 9

Linked-list: Recap



Linked-List (basically a list):

- contains a collection of element (object)
- arbitrary length
- cf. ArrayList in Java

Basic operations

- AddFirst/AddLast
- RemoveFirst/RemoveLast
- Traverse/Print

List Interface (from lecture)

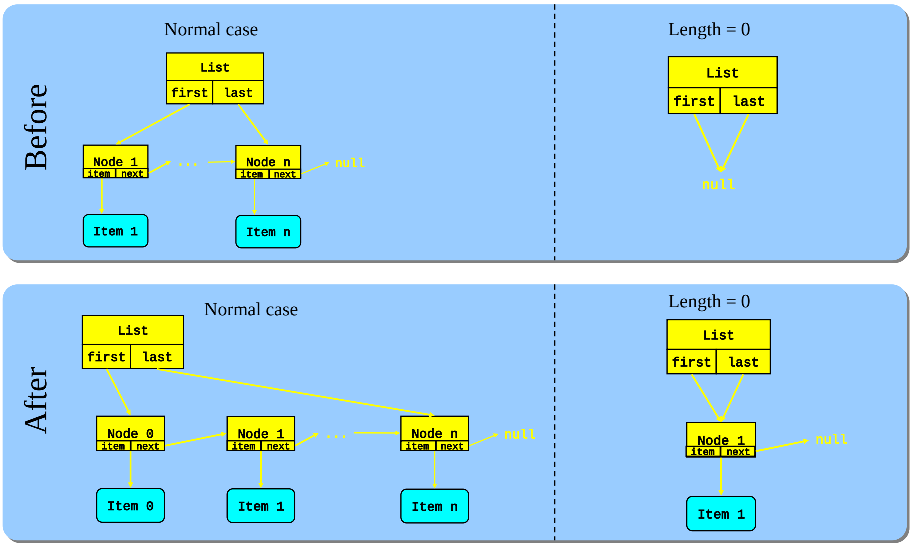
```
public interface List {
  public boolean isEmpty();
  public void addFirst( Object o );
  public void addLast( Object o );
  public boolean contains(Object o);
  public Object removeLast()
          throws NoSuchElementException;
  public Object removeFirst()
          throws NoSuchElementException;
  public boolean remove(Object o);
  public void clear();
  public int size();
  public void print();
}
```

Linked-list: Tips

- Always think of special cases
  - What if your link is empty?
  - What if there is only one element?
- Always draw a diagram
- Warming up!
  - What are special cases for AddFirst method?/Draw a diagram
  - What are special cases for RemoveLast method?/Draw a diagram

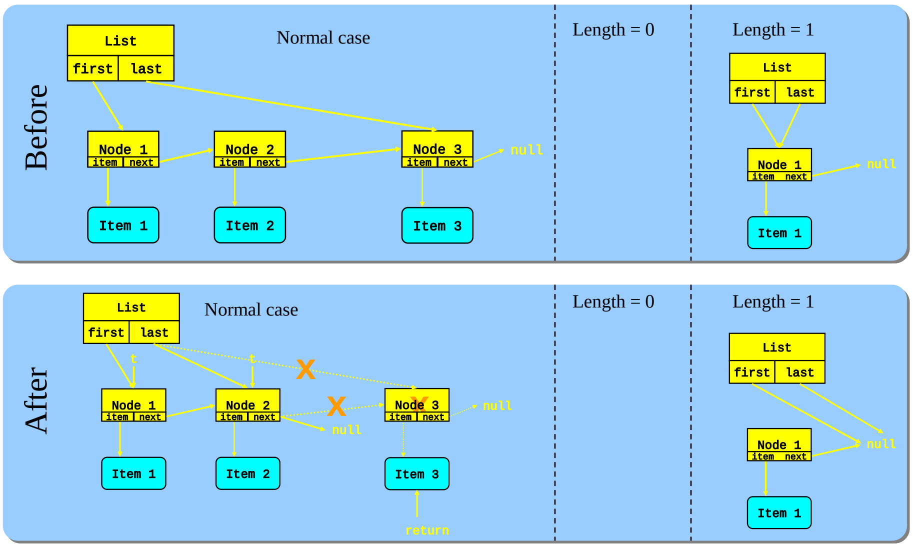
Linked-list: Answers to Warm-up Questions

addFirst Method



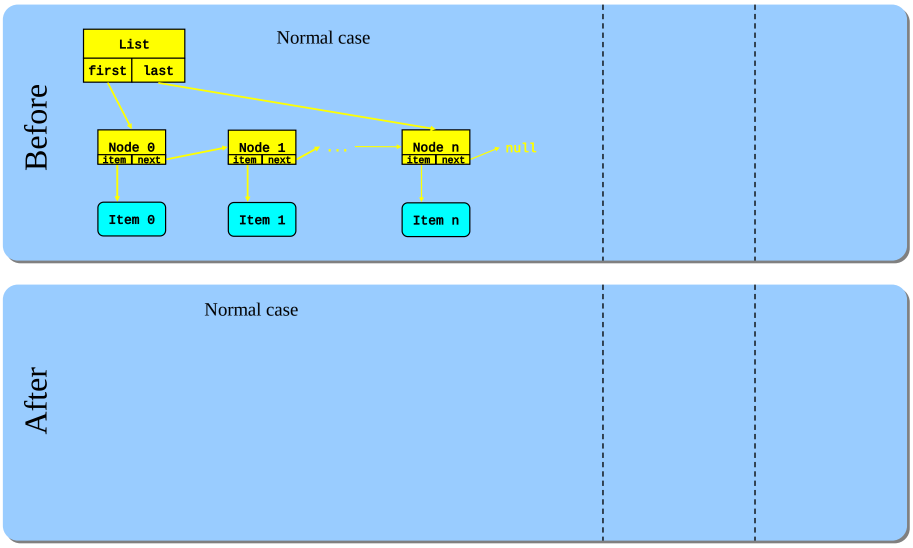
Linked-list: Answers to Warm-up Questions

removeLast Method



Linked-list: insertAt(int i)

insertAt Method



Before

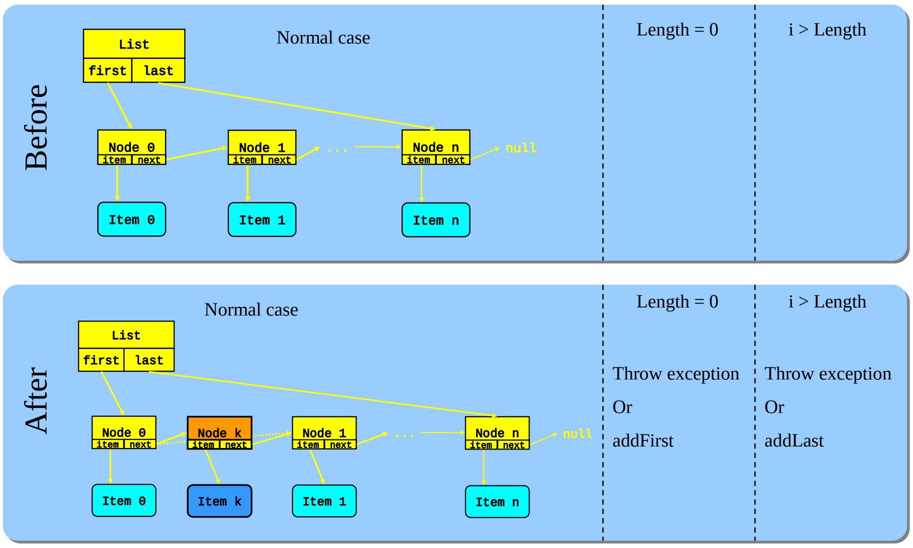
Normal case

After

Normal case

Linked-list: insertAt(int i)

insertAt Method



Before

Normal case

Length = 0

i > Length

After

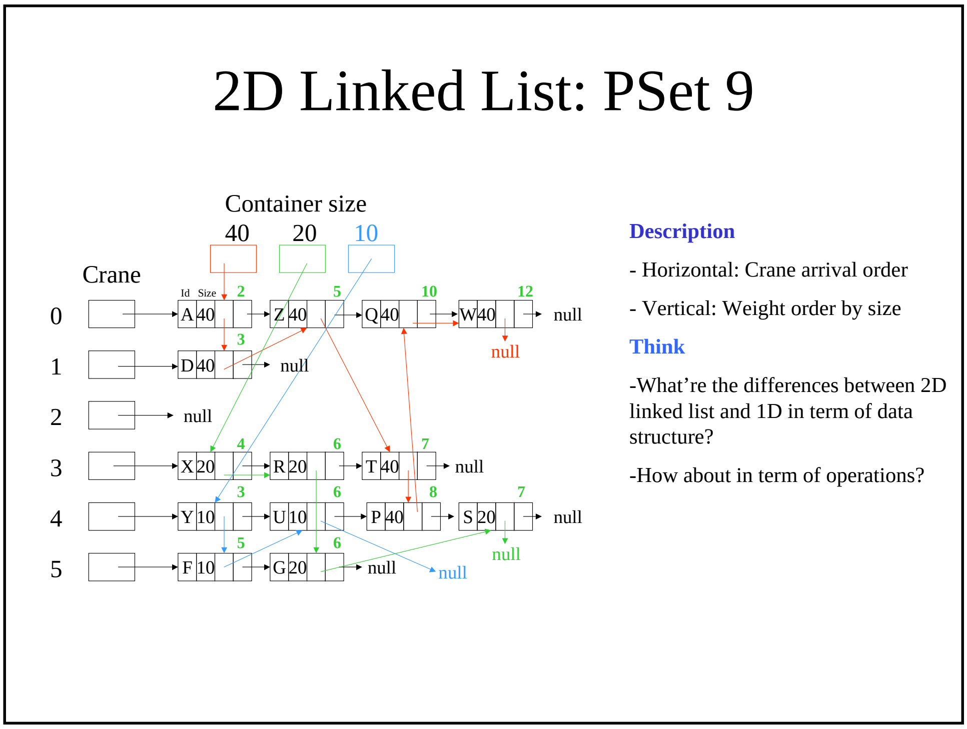
Normal case

Length = 0

Throw exception
Or
addFirst

i > Length

Throw exception
Or
addLast



2D Linked List: PSet 9

Description

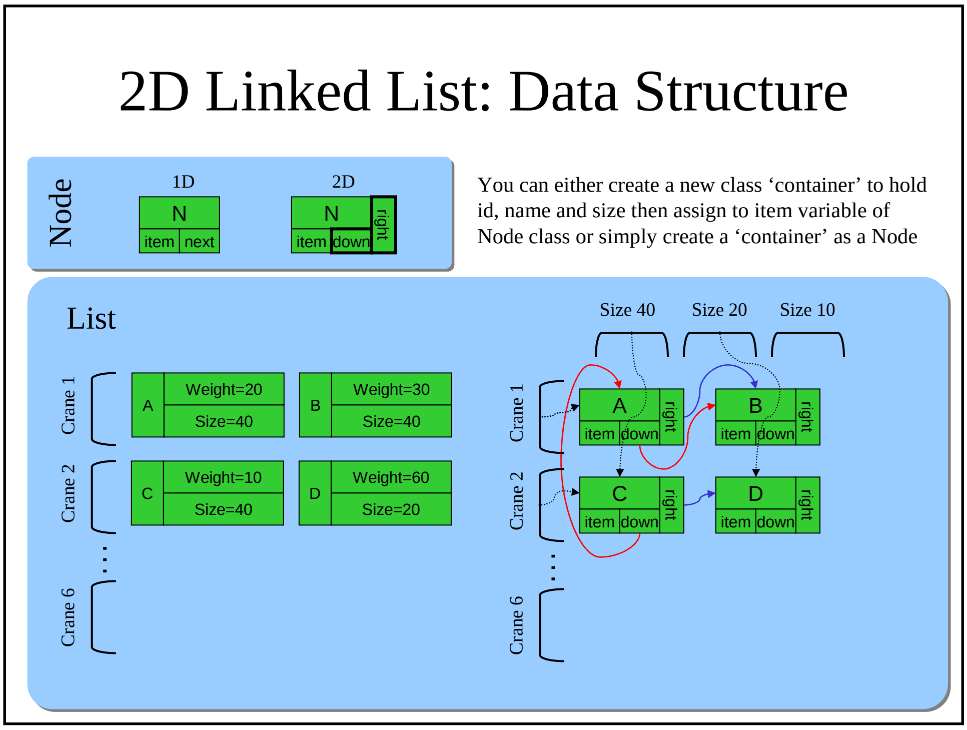
- Horizontal: Crane arrival order

- Vertical: Weight order by size

Think

-What’re the differences between 2D linked list and 1D in term of data structure?

-How about in term of operations?

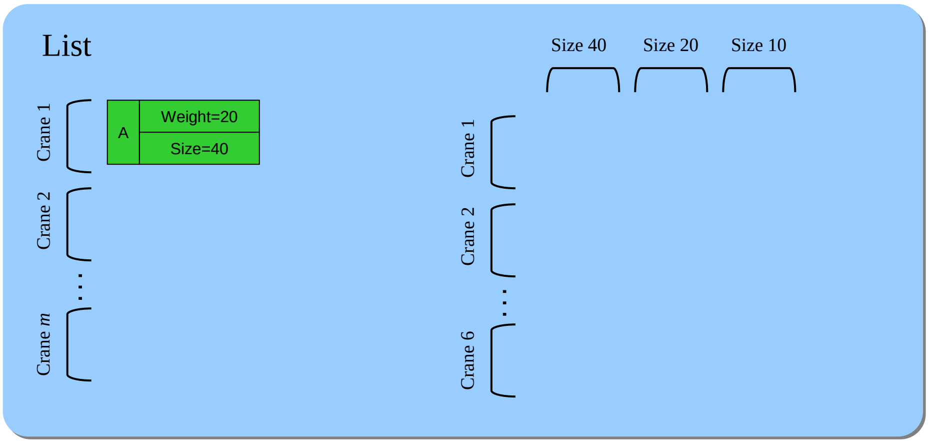


2D Linked List: Data Structure

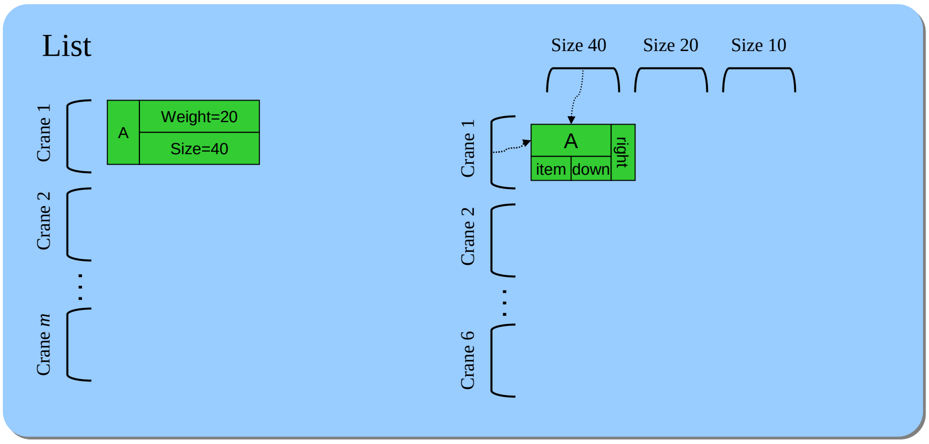
You can either create a new class ‘container’ to hold id, name and size then assign to item variable of Node class or simply create a ‘container’ as a Node

List

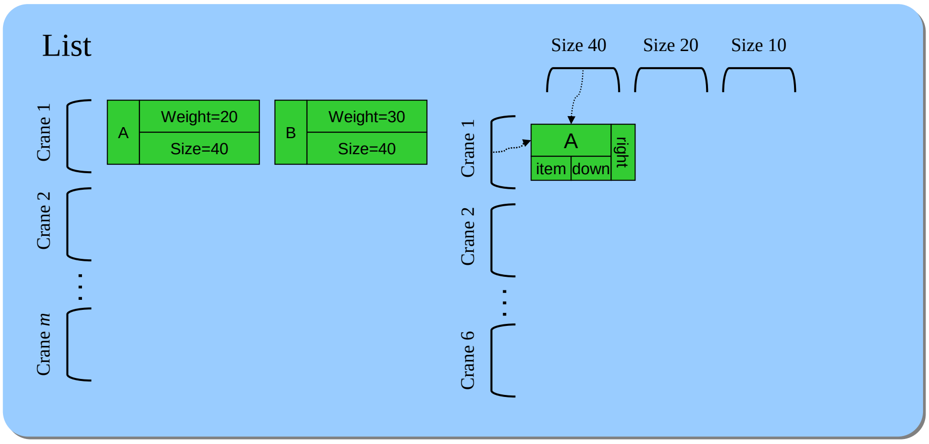
2D Linked List: Adding Containers



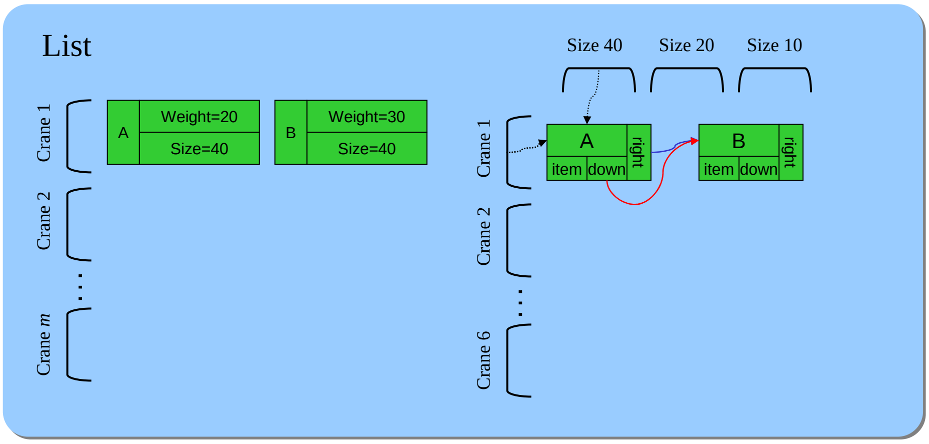
2D Linked List: Adding Containers



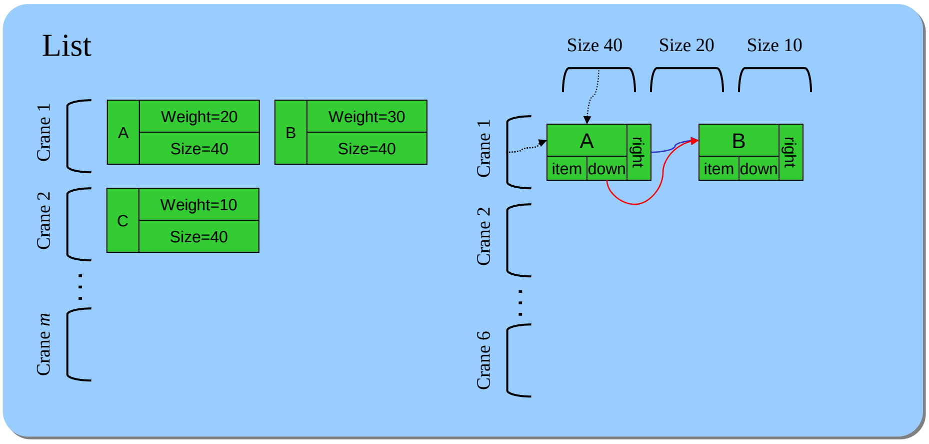
2D Linked List: Adding Containers



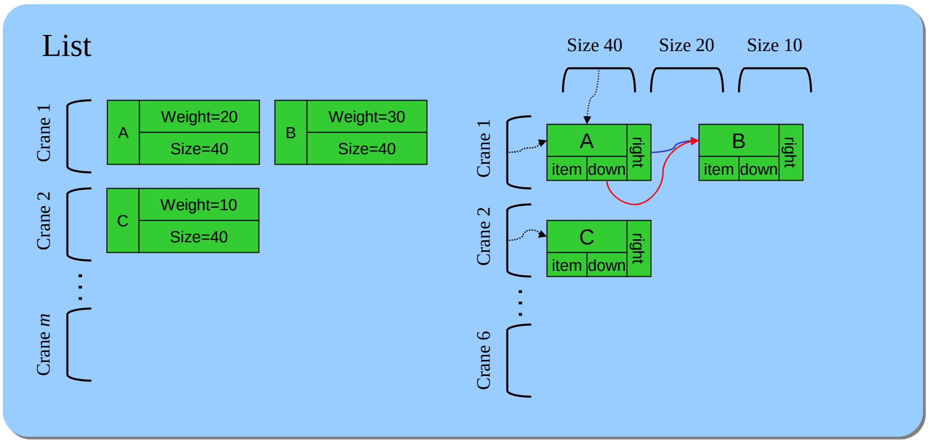
2D Linked List: Data Structures



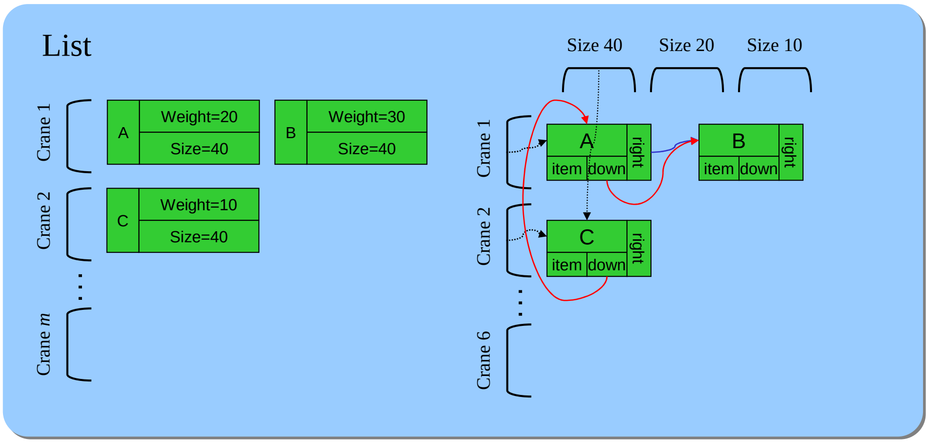
2D Linked List: Data Structures



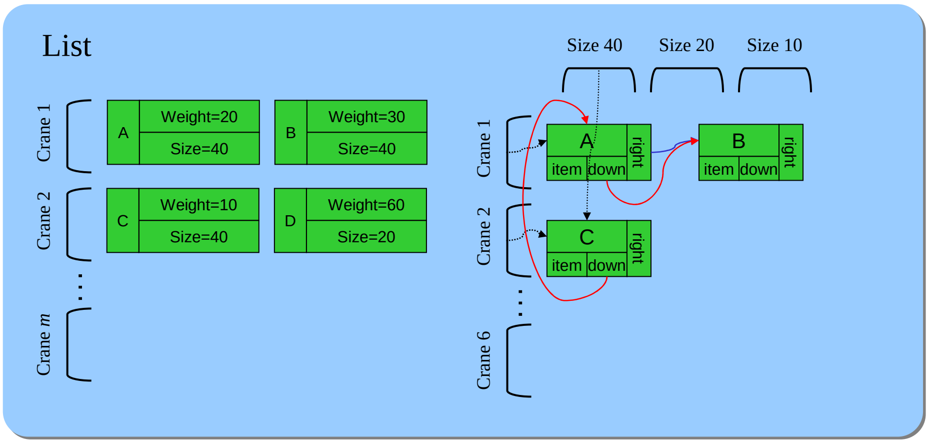
2D Linked List: Data Structures



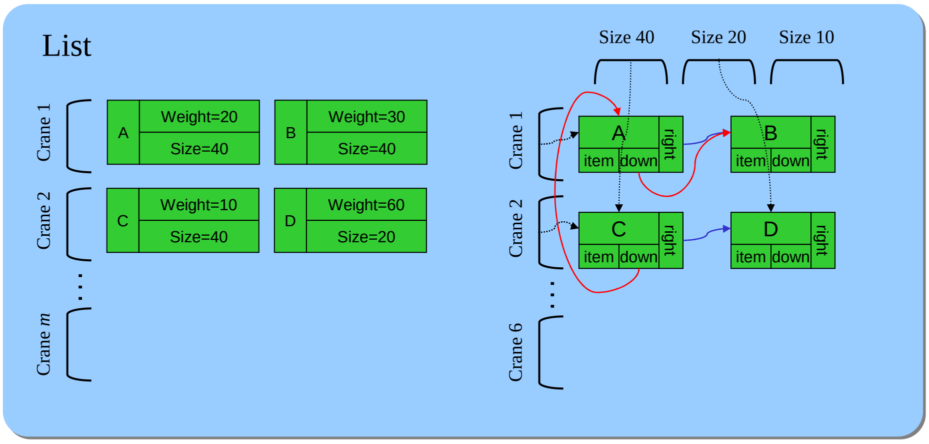
2D Linked List: Data Structures



2D Linked List: Data Structures

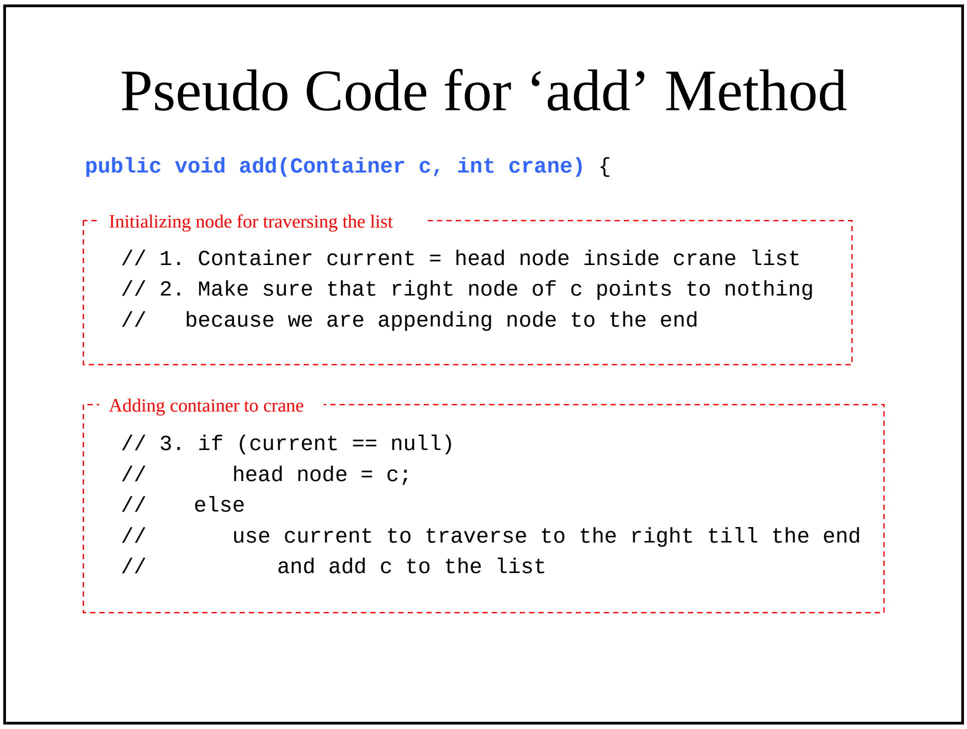


2D Linked List: Adding Containers



2D Linked List: Adding a Container

- We need to add to both crane and size lists
- What are special cases when adding to crane list?
- What are special cases when adding to size list?
- Let us write a pseudo code for a method called “add”, i.e. add(Node c, int crane)



Pseudo Code for ‘add’ Method

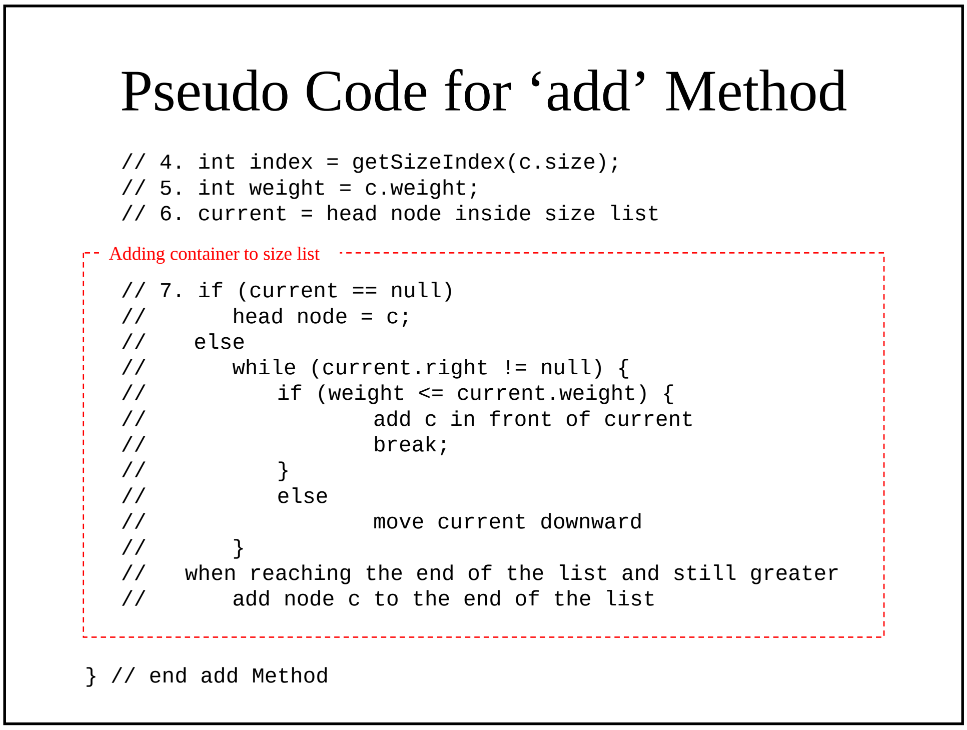
```
public void add(Container c, int crane) {
```

Initializing node for traversing the list

```
   // 1. Container current = head node inside crane list
   // 2. Make sure that right node of c points to nothing
   //   because we are appending node to the end
```

Adding container to crane

```
   // 3. if (current == null)
   //       head node = c;
   //    else
   //       use current to traverse to the right till the end
   //          and add c to the list
```



Pseudo Code for ‘add’ Method

```
   // 4. int index = getSizeIndex(c.size);
   // 5. int weight = c.weight;
   // 6. current = head node inside size list
```

Adding container to size list

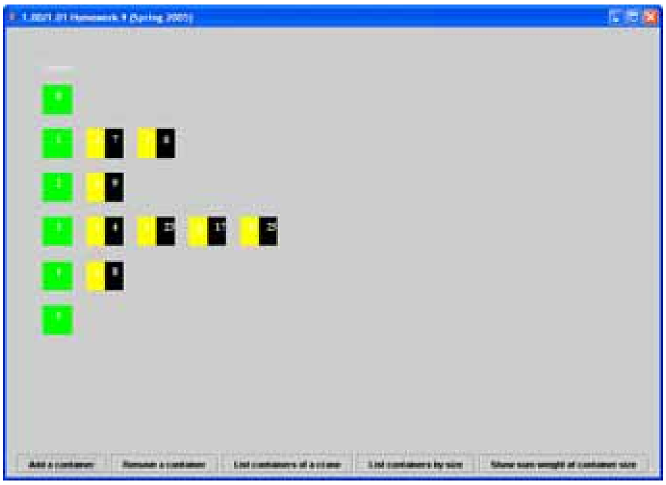
```
   // 7. if (current == null)
   //       head node = c;
   //    else
   //       while (current.right != null) {
   //          if (weight <= current.weight) {
   //                  add c in front of current
   //                  break;
   //          }
   //          else
   //                  move current downward
   //       }
   //   when reaching the end of the list and still greater
   //       add node c to the end of the list
```

```
} // end add Method
```

More (To Think) on PSet 9

- Remove method
- Print method
- Recall example from add Method, you need to pay attention to how to traverse a list

PSet 9 GUI


1.00/1.01 Homework 9 (Spring 2005)
Add a container
Remove a container
List containers of a class
List containers by size
Show sum weight of container size