Iterators and Collections

7 April 2008
CMPT166
Dr. Sean Ho
Trinity Western University

TRINITY WESTERN UNIVERSITY

Generic linked lists

- Combine the concepts of generics and linked lists
  - Define node class as inner class
  - Each node has a link to next node as well as
  - Data is of generic type T:

```
public class LinkedList<T> {
    private class Node<T> {
        private T data;
        private Node<T> next;
    }
}
```

  - See Savitch, p.800 LinkedList3

Collections

- A collection is an object that holds other objects
  - Java interface: Collection<T> (java.util)
  - must implement: isEmpty(), size(), contains(), containsAll(), toArray(), iterator(), etc.
- toArray(): convert to a regular array of objects
- containsAll(Collection<?> c): check if subset
  - wildcard: ArrayList<?>: type can be anything
    - ArrayList<? extends String>: type must subclass Str
- Optional (empty bodies): add(), remove()

Sub-interfaces of Collection<T>

- Any class that implements Collection<T> can use a for-each loop: for (item : collection) ...
- The interface Set<T> extends Collection<T>:
  - no duplicates allowed; order not important
- The interface List<T> extends Collection<T>:
  - Duplicates allowed; order preserved
- Abstract classes implement these interfaces:
  - AbstractCollection<T>
  - AbstractSet<T>
  - AbstractList<T>

Concrete Collection classes

- Concrete classes that implement these interfaces:
  - HashSet<T> extends AbstractSet<T>
    - hence implements Set<T>
    - hence implements Collection<T>
  - ArrayList<T> extends AbstractList<T>
    - hence implements List<T>
  - Vector<T> extends AbstractList<T> (similar)
  - LinkedList<T> extends AbstractSequentialList<T>, which extends AbstractList<T>

Iterators

- An iterator is an object that steps through each element in a collection
  - it is not the collection object itself
- Iterator<T> interface (also in java.util):
  - public T next()
    - Get next object in the collection, or throw NoSuchElementException
  - public boolean hasNext()
  - Optional: public void remove()
    - Remove the object last returned by next()