Data Structures

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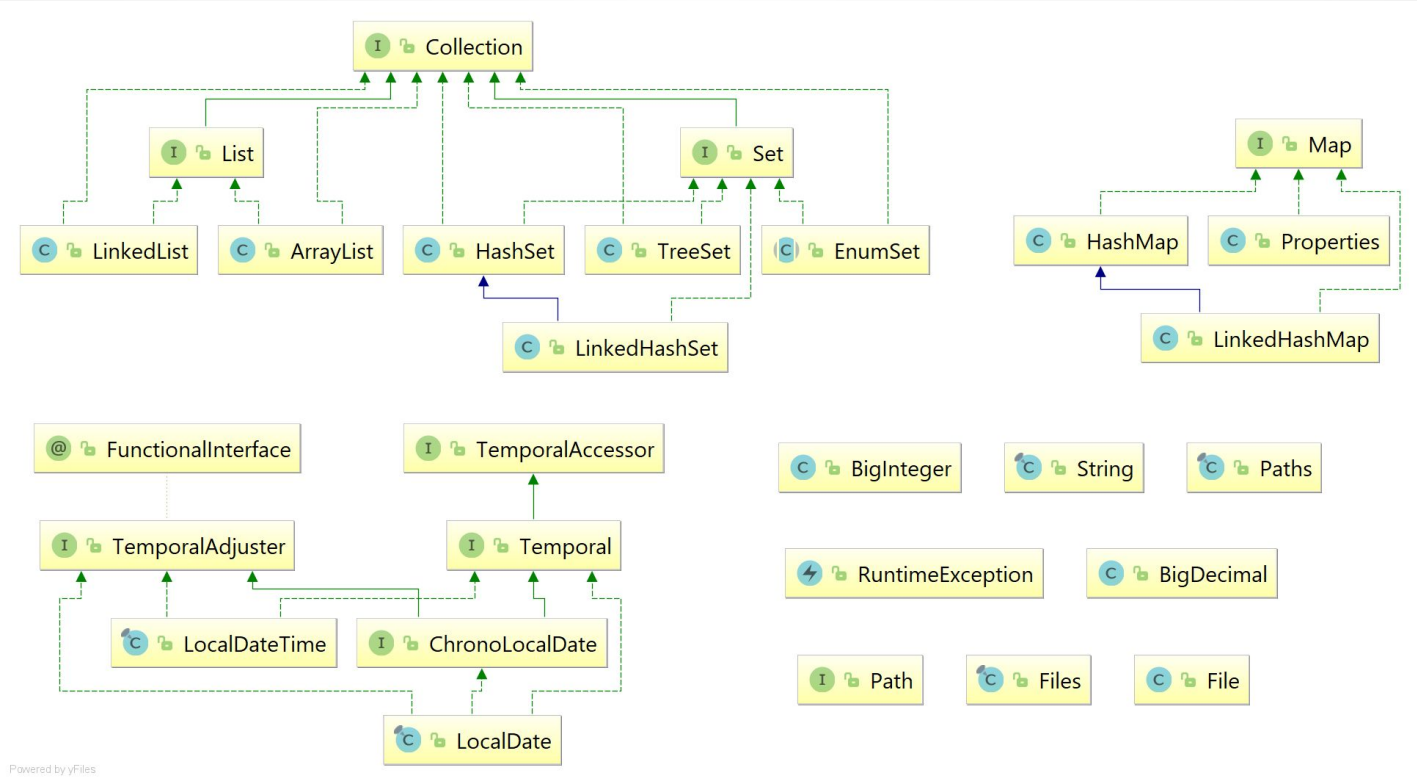
What is data structure?

Data structure is designed to organize data to suit a specific purpose so that it can be accessed and worked with in appropriate ways.

Java data structures



Let’s get started!

ArrayList - summary

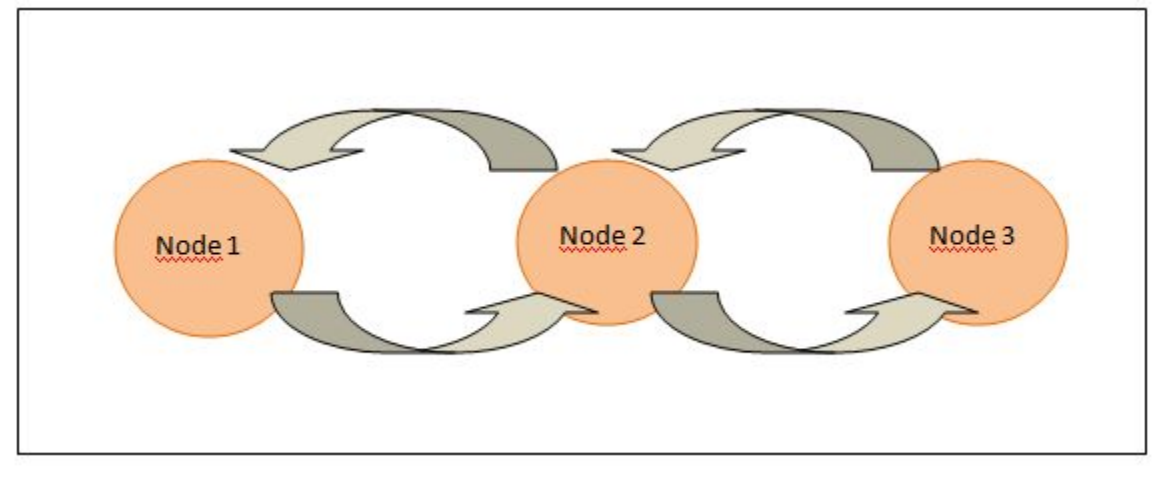
// **List** implementation
// Most often used in everyday situations
// Based on array of objects (**Object[]**)

Iterable and Iterator

// **Iterator** allows to traverse through all collection elements
// Class should implement **Iterable** interface, if we want to use it with **foreach** syntax
// Every **Collection** is Iterable by default

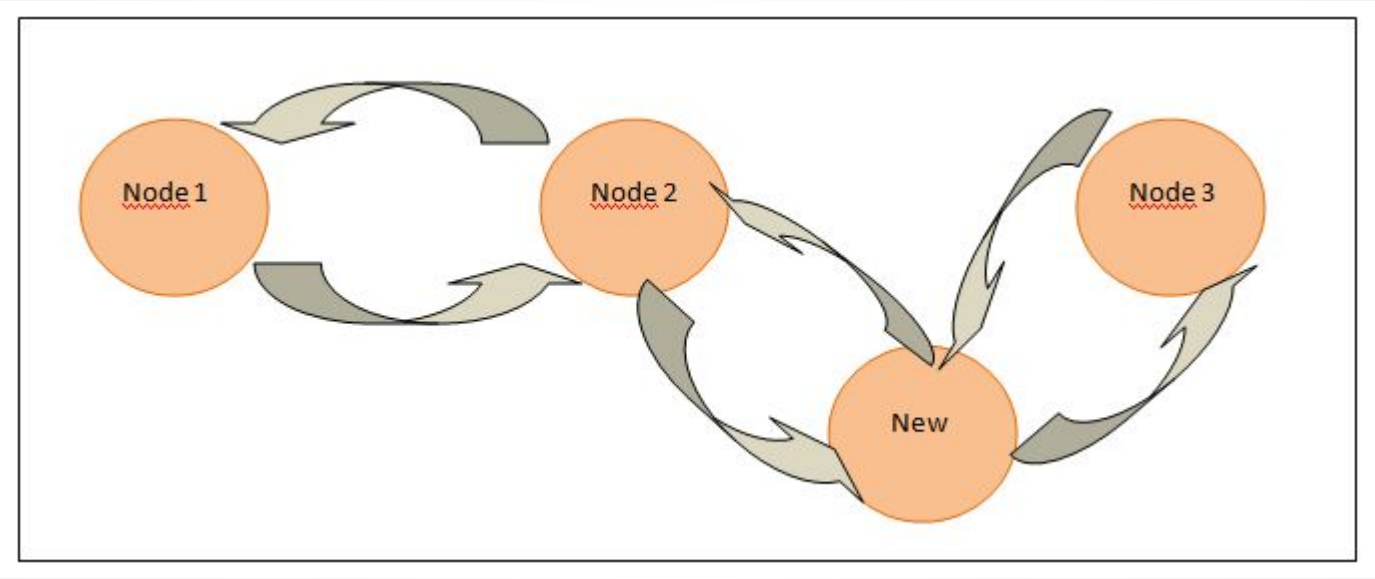
LinkedList - Theory

// Consists of **nodes** connected to each other
// Each **node** knows only about next and previous **node**



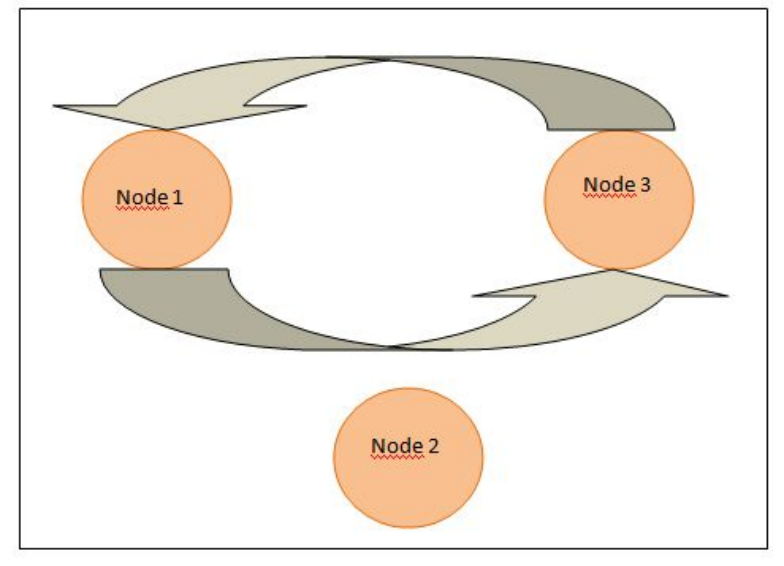
LinkedList - Theory

Add new node:



LinkedList - Theory

Remove node:



List - summary

	ArrayList	LinkedList
get()	Very fast	Needs to traverse whole list to find element
remove()	Slower but still fast	Very fast
add()	Slower but still fast	Very fast
When should I use?	Always	Only in specific cases

Hashing

// Process of converting an object into integer form
// Should always return same result when invoked on same object
// When two objects are equal their hashCodes methods should produce the same result
// Use Objects.hash() method to determine hash value instead of writing it by yourself

Let’s code - again!

Map<K, V> - summary

// Used for creating simple relations between objects or group values together
// One of the uses might be summarizing different kind of data
// **HashMap** - most common implementation. Requires valid *equals()* and *hashCode()* method implementations
// The only **Collection** that does not implement **Collection** interface

Map<K, V> - internals

// Based on entries (key-value pairs) and buckets
// Uses hashCode to decide to which bucket entry should be placed
// If hashCodes of entries are the same uses equals to make sure given Keys are really the same
// Based on entries and buckets

Sorting elements

// **Comparator<T>** - class that implements this interface may be used for sorting values of different class
// **Comparable<T>** - lets us define a natural ordering of a given class
// External **Comparator** should be used when we want to sort values in a different way then natural ordering
// Most Java classes implements **Comparator** interface

Set<T> - summary

// Does not contain duplicates
// Only allows us to iterate over its elements, no positional access

Most common usage scenario is when we want to be sure that values we work with are unique.

Set<T> - implementations

// **HashSet** - do not guarantee any iteration order. Fastest and used in most situation. For proper work required *equals()* and *hashCode()* implementations. Internally based on HashMap.
// **TreeSet** - Slowest implementation. Guarantees natural ordering iteration order. Requires class to implement **Comparator** interface
// **TreeSet** - Speed between **HashSet** and **TreeSet**. Guarantees inserting order while iterating over it.

Queue<T> - summary

// Not used very often
// Order elements in a FIFO (first-in-first-out) manner
// Exception is **PriorityQueue<T>** which orders objects according to their values
// **LinkedList<T>** is also a popular **Queue<T>** implementation