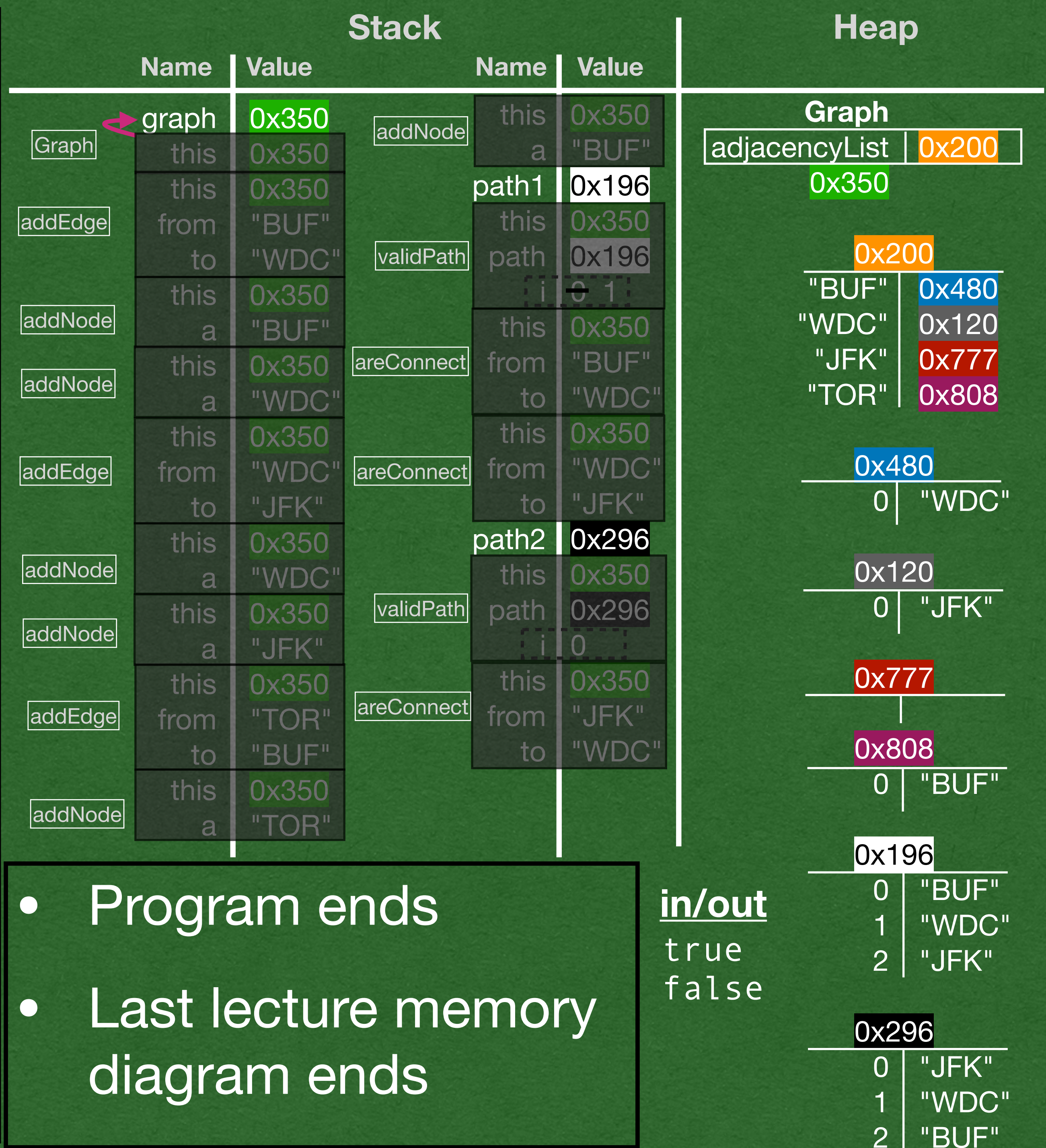# Graphs

Memory Diagram

```java
public class Graph<N> {
    private HashMap<N, ArrayList<N>> adjacencyList;
    public Graph() {
        this.adjacencyList = new HashMap<>();
    }
    public void addEdge(N from, N to) {
        this.addNode(from);
        this.addNode(to);
        this.adjacencyList.get(from).add(to);
    }
    private void addNode(N a) {
        if (!this.adjacencyList.containsKey(a)) {
            this.adjacencyList.put(a, new ArrayList<>());
        }
    }
    public boolean areConnect(N from, N to){
        return this.adjacencyList.containsKey(from) &&
                this.adjacencyList.get(from).contains(to);
    }
    public boolean validPath(ArrayList<N> path) {
        for (int i=0; i < path.size()-1; i++) {
            if(!this.areConnected(path.get(i), path.get(i+1))){
                return false;
            }
        }
        return true;
    }
    public static void main(String[] args) {
        Graph<String> graph = new Graph<>();
        graph.addEdge("BUF", "WDC");
        graph.addEdge("WDC", "JFK");
        graph.addEdge("TOR", "BUF");
        ArrayList<String> path1 = new ArrayList<>(
                Arrays.asList("BUF", "WDC", "JFK"));
        System.out.println(graph.validPath(path1));
        ArrayList<String> path2 = new ArrayList<>(
                Arrays.asList( "JFK", "WDC", "BUF"));
        System.out.println(graph.validPath(path2));
    }
}
```

Stack

Name	Value
graph	0x350
Graph: this	0x350
addEdge: this	0x350
addEdge: from	"BUF"
addEdge: to	"WDC"
addNode: this	0x350
addNode: a	"BUF"
addNode: this	0x350
addNode: a	"WDC"
addEdge: this	0x350
addEdge: from	"WDC"
addEdge: to	"JFK"
addNode: this	0x350
addNode: a	"WDC"
addNode: this	0x350
addNode: a	"JFK"
addEdge: this	0x350
addEdge: from	"TOR"
addEdge: to	"BUF"
addNode: this	0x350
addNode: a	"TOR"

Name	Value
addNode: this	0x350
addNode: a	"BUF"
path1	0x196
validPath: this	0x350
validPath: path	0x196
validPath: i	1
areConnect: this	0x350
areConnect: from	"BUF"
areConnect: to	"WDC"
areConnect: this	0x350
areConnect: from	"WDC"
areConnect: to	"JFK"
path2	0x296
validPath: this	0x350
validPath: path	0x296
validPath: i	0
areConnect: this	0x350
areConnect: from	"JFK"
areConnect: to	"WDC"

Heap

Graph

adjacencyList	0x200

0x350

0x200

"BUF"	0x480
"WDC"	0x120
"JFK"	0x777
"TOR"	0x808

0x480

0	"WDC"

0x120

0	"JFK"

0x777

0x808

0	"BUF"

0x196

0	"BUF"
1	"WDC"
2	"JFK"

0x296

0	"JFK"
1	"WDC"
2	"BUF"

in/out
true
false

- Program ends

- Last lecture memory diagram ends