# NETWORK ROUTING TABLE USING GRAPHS


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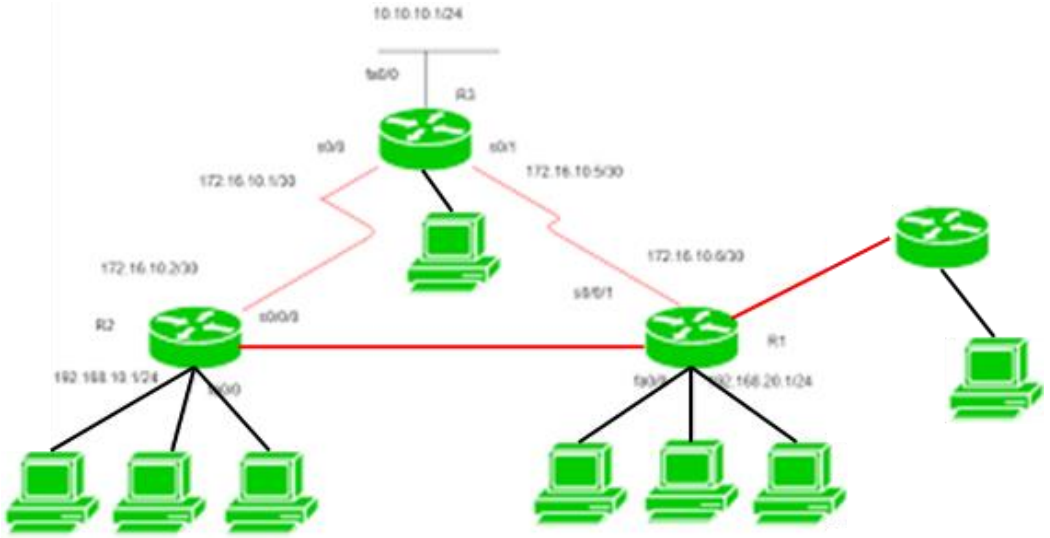
# PROBLEM DEFINITION

Program to handle routing table (network related) using the relevant data structures

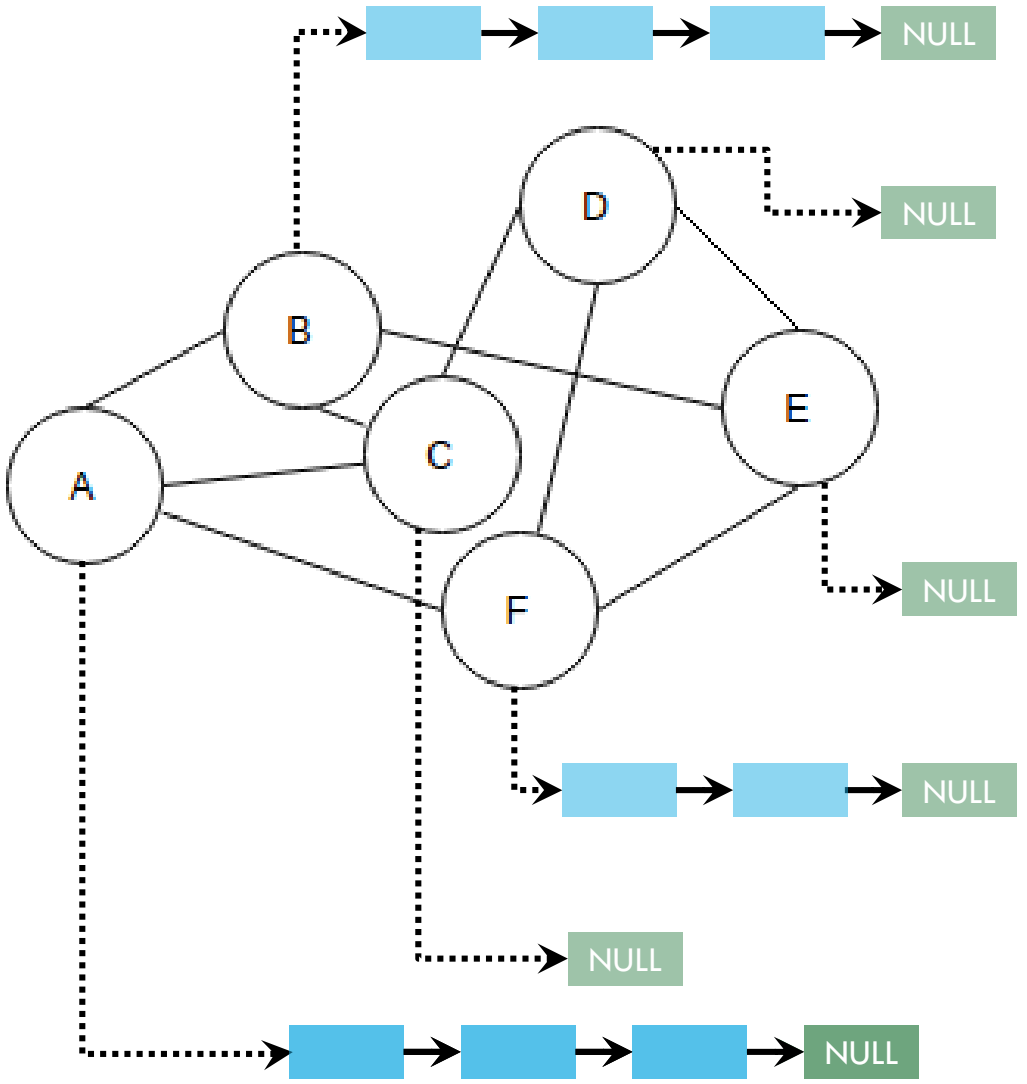
A routing table contains necessary information to forward data packets through a network of routers along the best path from origin to destination.

| Learned | Network Address | Hop | Interface |
|---|---|---|---|
| C | 10.0.10.0 | 0 | Eth0 |
| C | 10.0.11.0 | 0 | Eth1 |
| C | 200.200.4.0 | 0 | S0 |
| R | 10.0.20.0 | 1 | S0 |
| R | 10.0.21.0 | 1 | S0 |



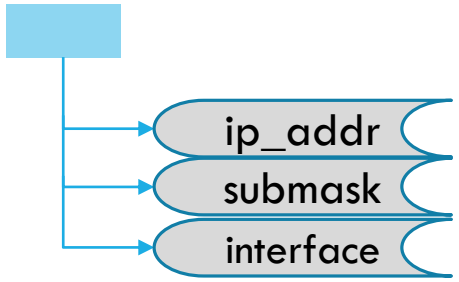
# DATA STRUCTURES USED

- Graphs
  - Router Nodes (A, B, C, D, E & F)
- Linked List
  - Devices (Blue Boxes)

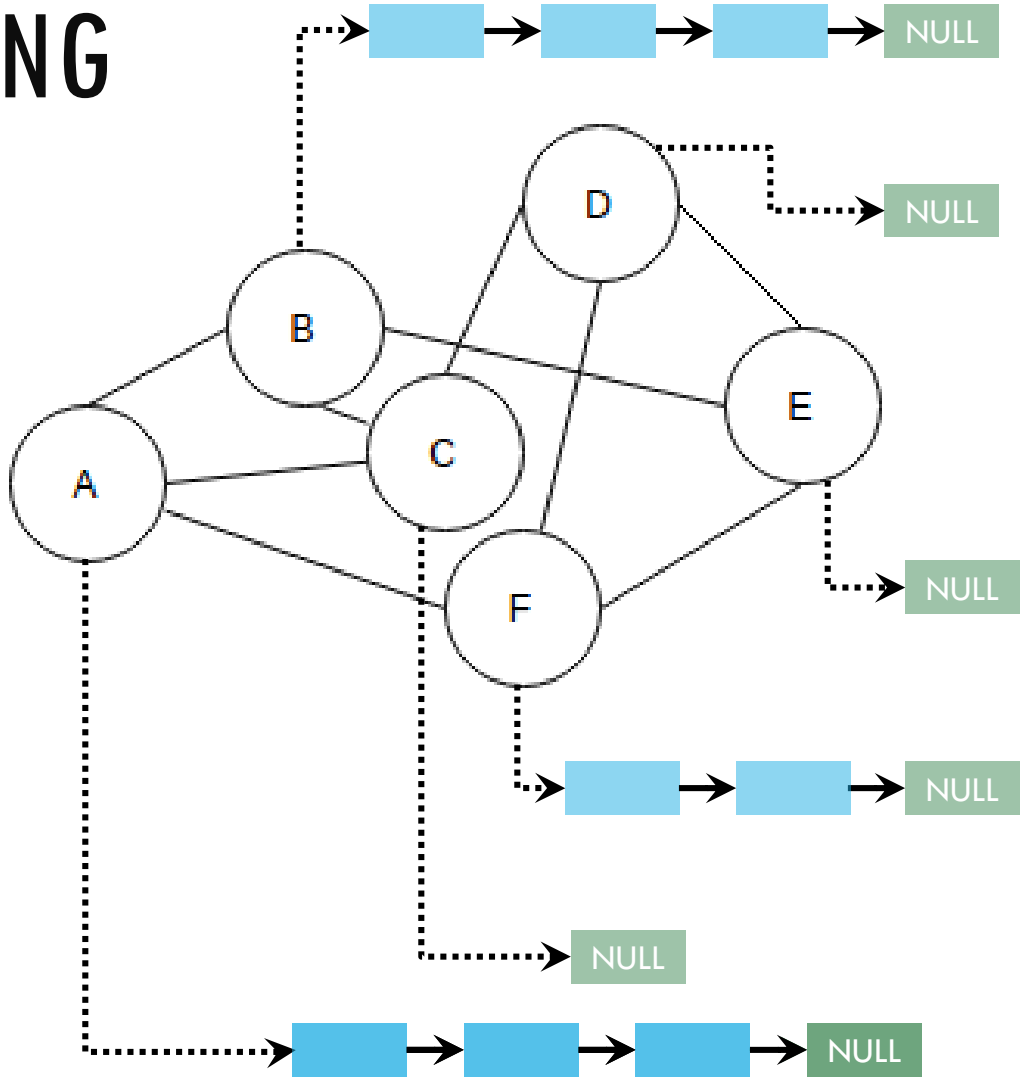


# APPROACH TO PROBLEM SOLVING

- Devices
  - IP address
  - Sub net masks
  - Interface



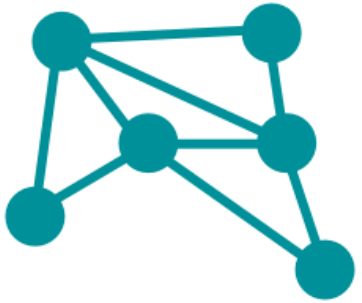

- Usage of **Dijkstra's Algorithm**
  - to find the shortest path between two clients or routers
- Usage of **Depth First Search Algorithm**
  - to find devices



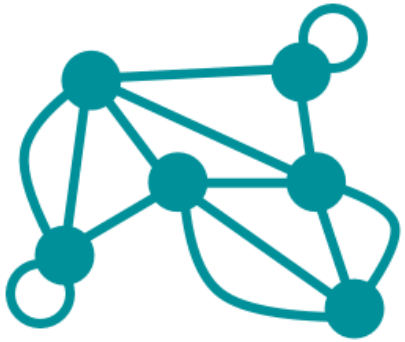
# ASSUMPTIONS MADE

- Weights of all edges are constant
- Graph is undirected and simple
- No self referential edges
- Max of 50 devices per router node
- All routers are connected to Source Node – 0
- Single Connected Component

Simple Graph



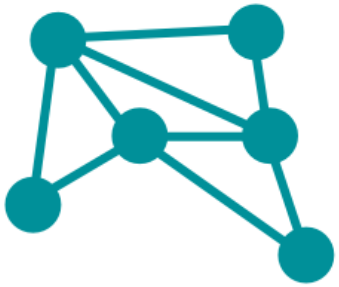
Multigraph



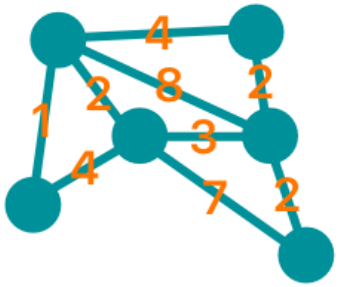
Unweighted Edge

Weighted Edge

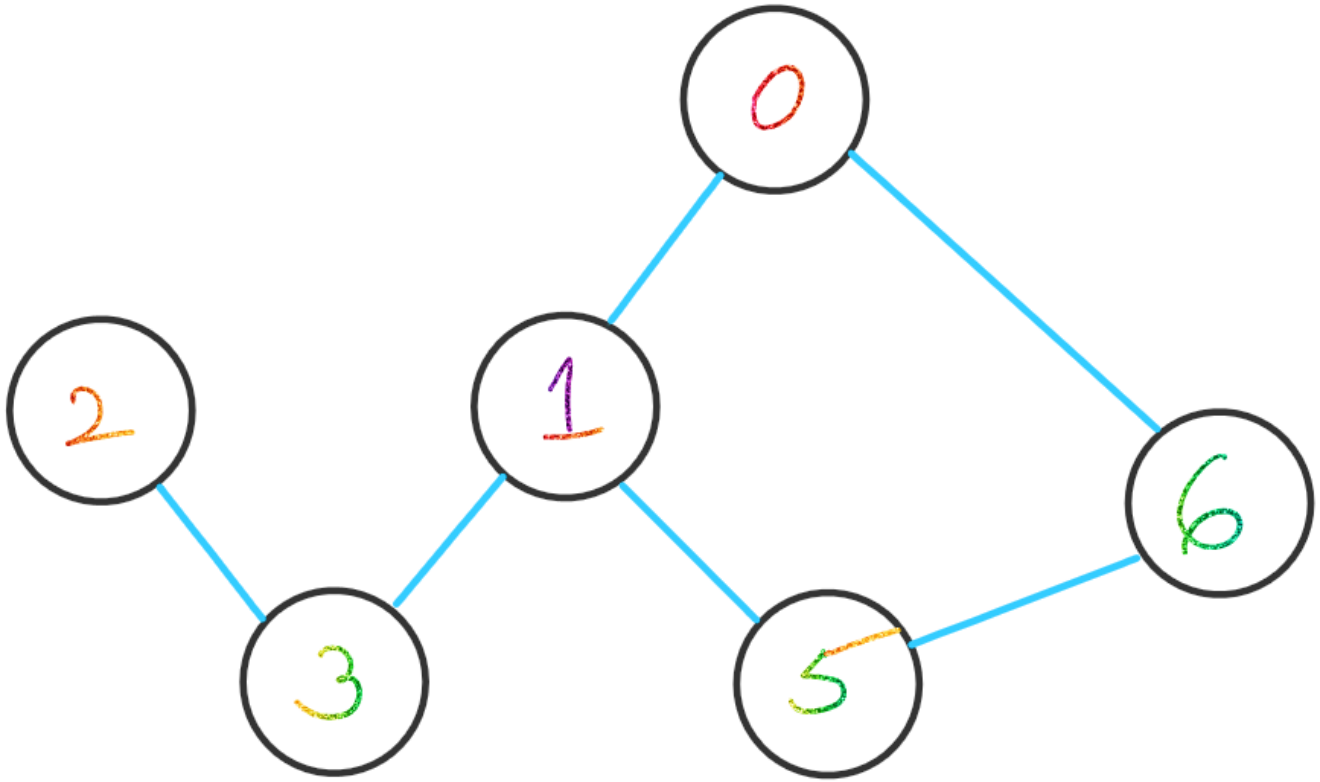

Undirected Graph



Directed Graph



# DEMONSTRATION



```
KMAP & Co. Presents Routing Table Organizer

Enter max number of router:
```

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KMAP & Co. Presents Routing Table Organizer

Enter max number of router:0
No Graph Created! Exit Successful!
C:\Users\Aksha\Documents\DS_Proj>
```

```
KMAP & Co. Presents Routing Table Organizer

Enter max number of router:-1
Routers are marked from 0 to -2
Root Node starts at 0 - Single Connected Component Only!
Memory Allocation Failed!

C:\Users\Aksha\Documents\DS_Proj>
```

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KMAP & Co. Presents Routing Table Organizer

Enter max number of router:7
Routers are marked from 0 to 6
Root Node starts at 0 - Single Connected Component Only!

Available Options:
1.Add Edge
2.Delete Edge
3.Find Quick Path from Root Node 0
4.Print Routing Table Graph
5.Add Device to Router
6.Print Devices
7.Search Device
8.Exit
$>
```
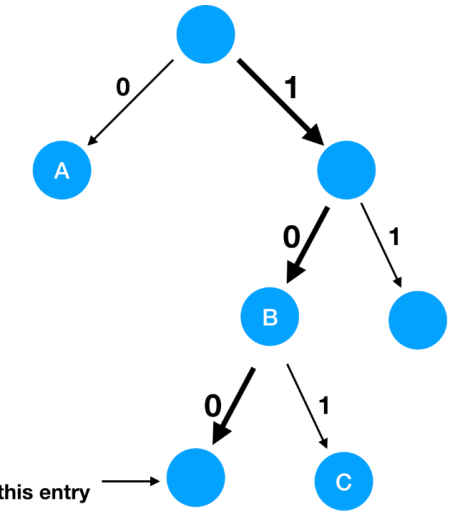

```
KMAP & Co. Presents Routing Table Organizer

Routers are marked from 0 to 6
Root Node starts at 0 - Single Connected Component Only!

/Shortest Path from Root Node 0/
Vertex          HopDistance    Path
0 -> 1          1              0 1
0 -> 2          3              0 1 3 2
0 -> 3          2              0 1 3
0 -> 4          -1             0 No Path!
0 -> 5          2              0 6 5
0 -> 6          1              0 6
```

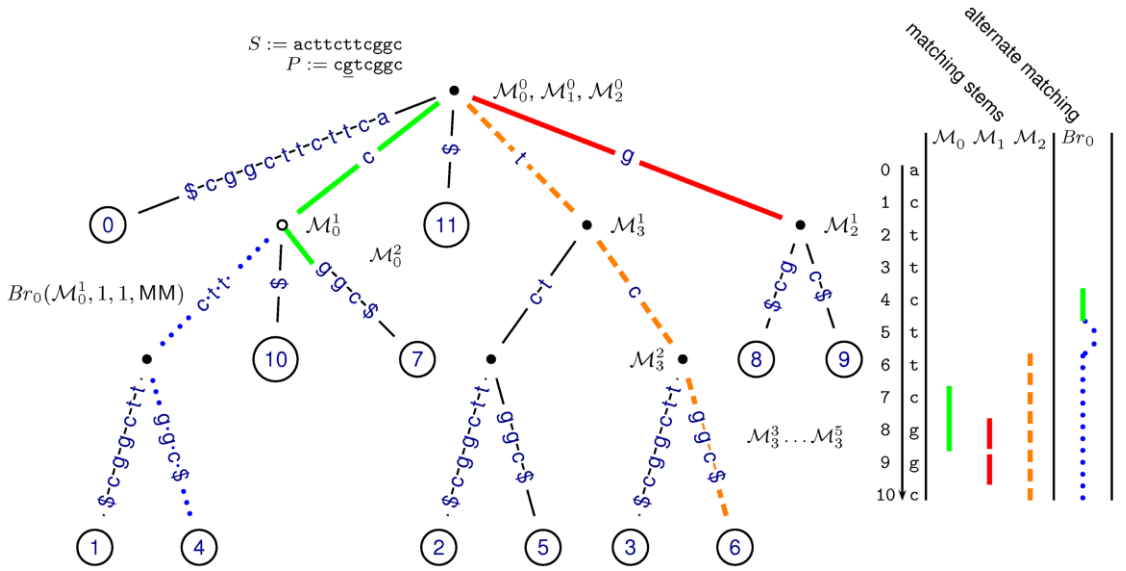
```
KMAP & Co. Presents Routing Table Organizer

Routers are marked from 0 to 6
Root Node starts at 0 - Single Connected Component Only!

/Router Topology/
Adjacency Router list of vertex 0 => 6 -> 1 -> NULL
Adjacency Router list of vertex 1 => 5 -> 3 -> 0 -> NULL
Adjacency Router list of vertex 2 => 3 -> NULL
Adjacency Router list of vertex 3 => 2 -> 1 -> NULL
Adjacency Router list of vertex 4 => NULL
Adjacency Router list of vertex 5 => 6 -> 1 -> NULL
Adjacency Router list of vertex 6 => 0 -> 5 -> NULL

/Routing Table/
Router  IPaddress              Submask                Interface
0       No devices connected!
1       5.5.5.5                255.255.8.7            eth0
1       192.168.0.11           8.8.8.8                wifi
2       No devices connected!
3       No devices connected!
4       No devices connected!
5       No devices connected!
6       10.10.10.25            201.193.95.90          optical
Available Options:
1.Add Edge
2.Delete Edge
3.Find Quick Path from Root Node 0
4.Print Routing Table Graph
5.Add Device to Router
6.Print Devices
7.Search Device
8.Exit
$>
```

# LIMITATIONS/CONSTRAINTS

- Two or more Routers need to be initialised to add an edge
- Routers need be connected to add devices
- Longest prefix match for IP Address is not possible with current data structure
  - Required data structure is Trie

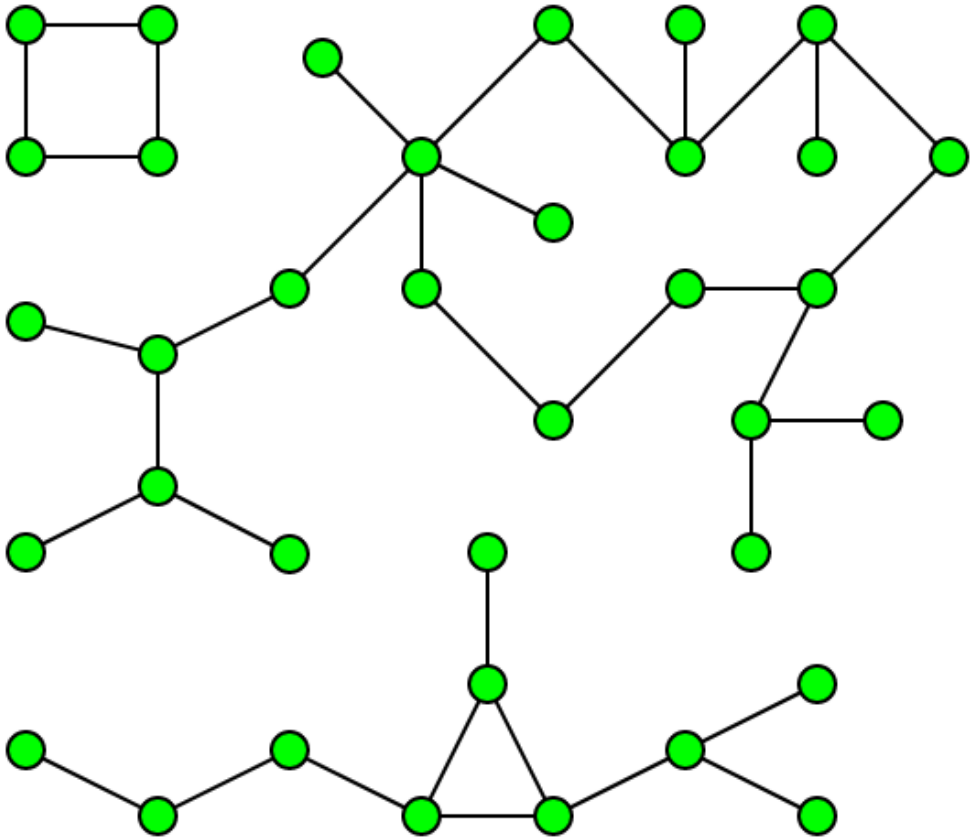
| Prefix | Router |
|---|---|
| 0* | A |
| 10* | B |
| 101* | C |



# KNOWN DEFECTS

- Program does not work with multiple component graphs
  - Error handling is in place to check for the same
- Adding new edges with pre-existing edges causes devices to be reset with node being connected
  - Hence Routers design needs to be added first then devices



# ANY QUESTIONS?

# THANK YOU FOR LISTENING