MIT | Academy of Engineering

(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

Problem Statement:

Write a program to implement Distance Vector Routing / Link State Routing.

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Division: A3

Assignment:

1. Network layer functions and services

- The Network Layer is the third layer of the OSI model.
- It responds to service requests coming from the transport layer and passes them on to the data link layer.
- **Routing:**
- The router will transfer packets to the router's output link once they arrive at the router's input link.

  For example, a packet from S1 to R1 must be forwarded to the next router on the path to S2.

- **Logical Addressing:**

  Physical addressing is implemented at the data link layer, while logical addressing is implemented at the network layer. To distinguish between source and destination systems, logical addressing is also used. The logical addresses of the sender and the recipient are added as a header to the packet by the network layer.

- **Internetworking:**

  The network layer's primary function is to establish a logical connection between various types of networks.

- **Fragmentation:**

  The technique of fragmenting packets into the smallest possible individual data units allows them to pass over various networks.

2. Need of routing in the network

The process of choosing a path between two or more networks is known as network routing.

Any network, including those used for public transport and telephone networks, can use the routing principles.

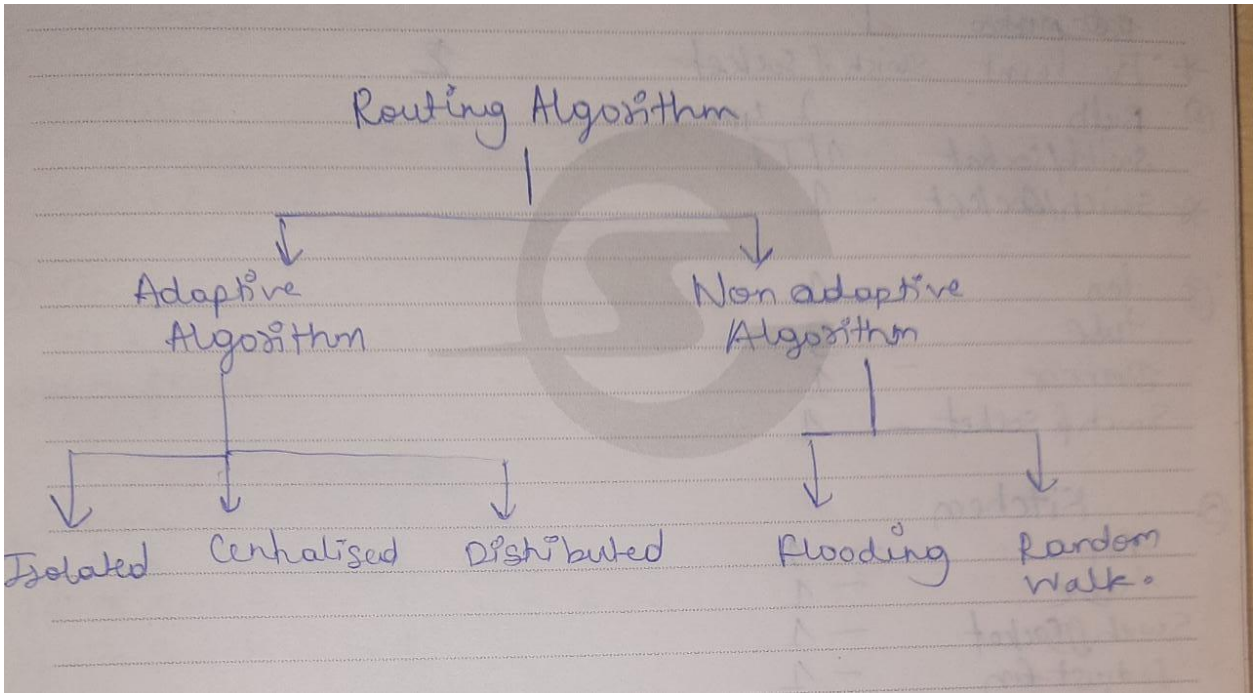
In packet-switching networks, such as the Internet, routing selects the paths for Internet Protocol (IP) packets to travel from their origin to their destination. These Internet routing decisions are made by specialized pieces of network hardware called routers.

3. Difference between intradomain and interdomain routing

S.NO	Intradomain Routing	Interdomain Routing
1	Routing algorithm works only within domains.	Routing algorithm works within and between domains.
2	It need to know only about other routers within their domain.	It need to know only about other routers within and between their domain.
3	Protocols used in intradomain routing are known as Interior-gateway protocols.	Protocols used in interdomain routing are known as Exterior-gateway protocols.
4	In this Routing, routing takes place within an autonomous network.	In this Routing, routing takes place between the autonomous networks.

5	Intradomain routing protocols ignores the internet outside the AS(autonomous system).	Interdomain routing protocol assumes that the internet contains the collection of interconnected AS(autonomous systems).
6	Some Popular Protocols of this routing are RIP(resource information protocol) and OSPF(open shortest path first).	Popular Protocols of this routing is BGP(Border Gateway Protocol) used to connect two or more AS(autonomous system).

4. Types of routing algorithms with their examples



5. Explain any one routing algorithm (Distance Vector Routing / Link State Routing) in detail with example.

Link state routing is **a method in which each router shares its neighbourhood's knowledge with every other router in the internetwork**. In this algorithm, each router in the network understands the network topology then makes a routing table depend on this topology.

The primary problem that caused its demise was

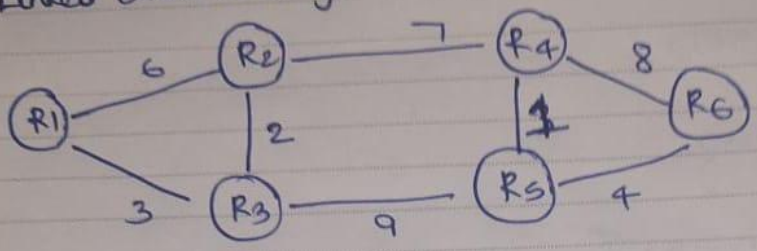
that the algorithm often took too long to converge after the network topology

changed (due to the count-to-infinity problem). Consequently, it was replaced by

an entirely new algorithm, now called link state routing

Date

Linked State Routing:



Link state table

R1	
R2	6
R3	3

R2	
R1	6
R3	2
R4	7

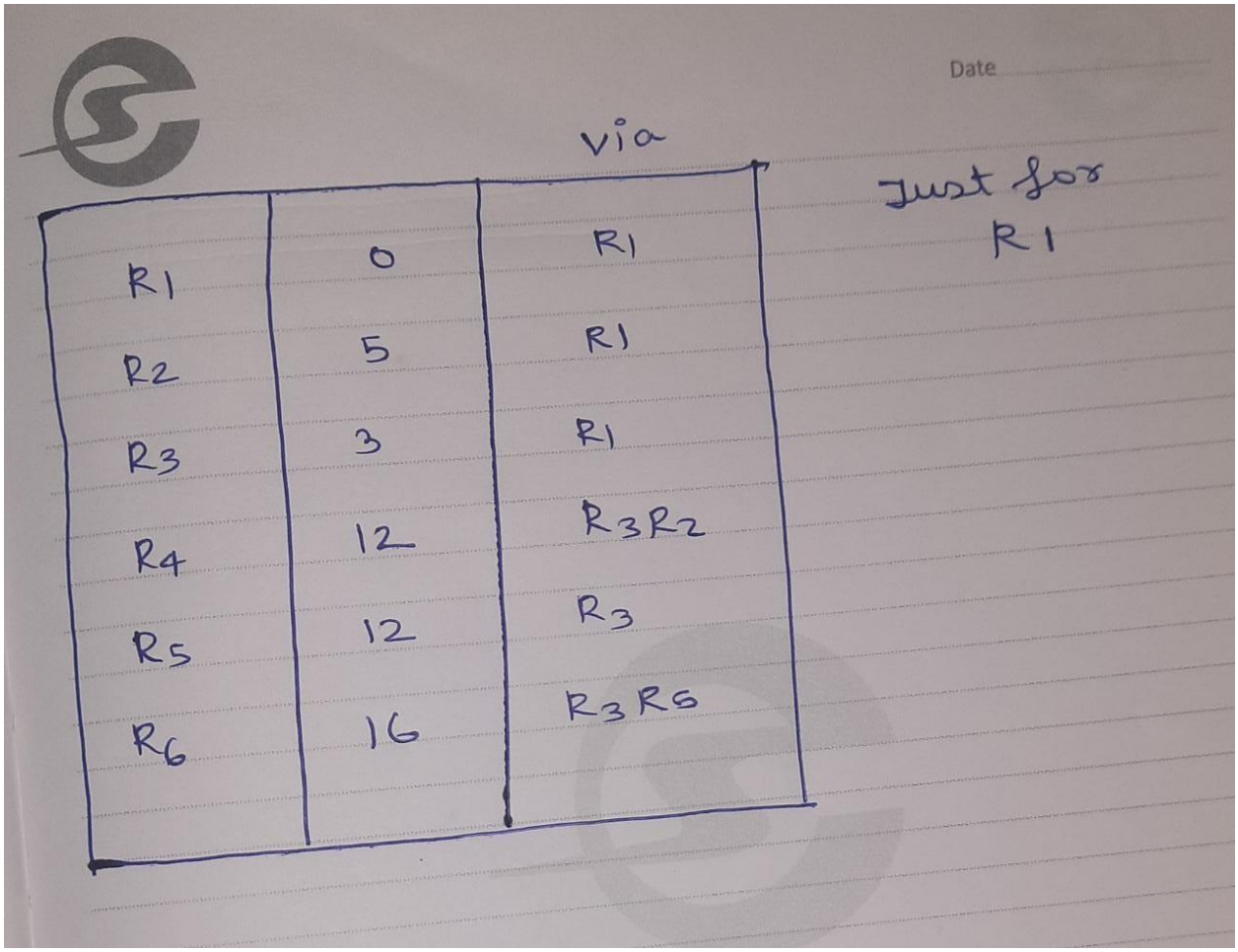
R3	
R1	3
R2	2
R5	9

R6	
R5	4
R4	8

R5	
R3	9
R4	1
R6	4

Using Dijkstra's Algorithm

(R1)	(R2)	(R3)	(R4)	(R5)	(R6)
R1R3	6	3	∞	∞	∞
R1R3R2	5	3	∞	12	∞
R1R3R2			12	12	∞
R4				12	21
R1R3R2R4					16
R5					



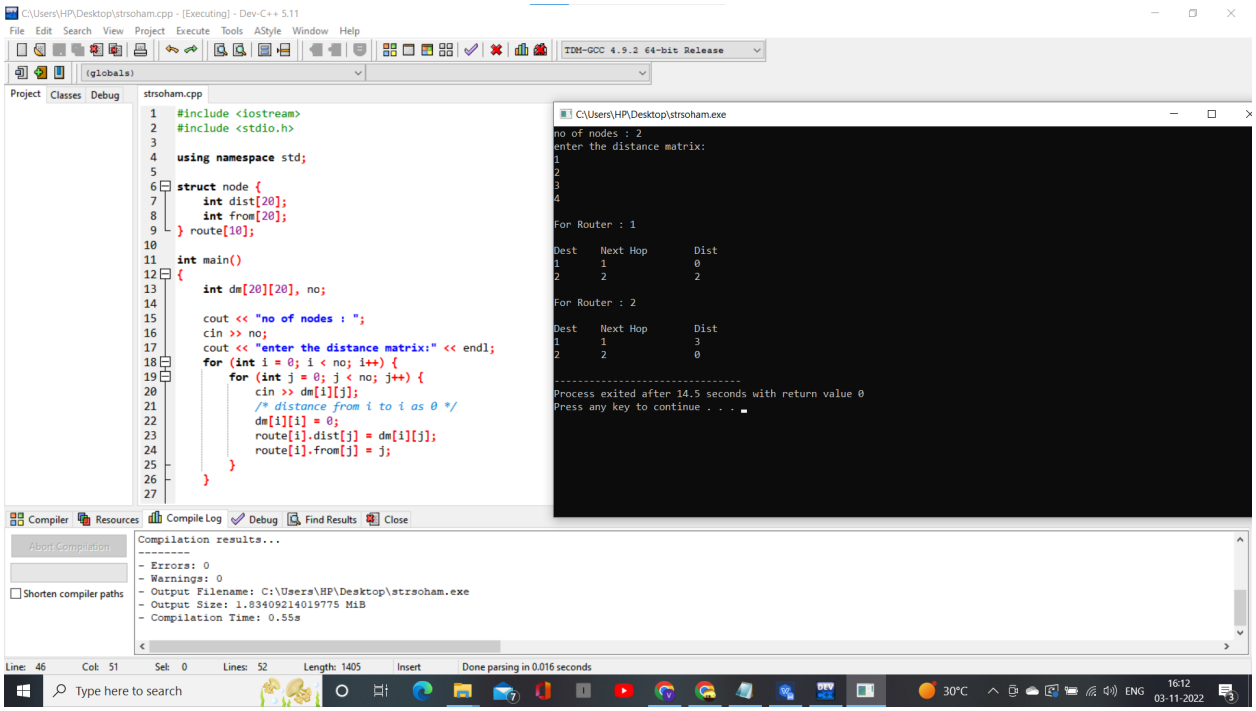
6. Executable code with screenshots of the output window.

```
#include <iostream>

#include <stdio.h>
```

```
using namespace std;

struct node {
    int dist[20];
    int from[20];
} route[10];

int main()
{
    int dm[20][20], no;

    cout << "no of nodes : ";
    cin >> no;
    cout << "enter the distance matrix:" << endl;
    for (int i = 0; i < no; i++) {
        for (int j = 0; j < no; j++) {
            cin >> dm[i][j];
            /* distance from i to i as 0 */
            dm[i][i] = 0;
            route[i].dist[j] = dm[i][j];
            route[i].from[j] = j;
        }
```

```
}

int flag;
do {
    flag = 0;
    for (int i = 0; i < no; i++) {
        for (int j = 0; j < no; j++) {
            for (int k = 0; k < no; k++) {
                if ((route[i].dist[j]) > (route[i].dist[k] + route[k].dist[j])) {
                    route[i].dist[j] = route[i].dist[k] + route[k].dist[j];
                    route[i].from[j] = k;
                    flag = 1;
                }
            }
        }
    }
} while (flag);

for (int i = 0; i < no; i++) {
    cout << "\nFor Router : " << i + 1 << endl;
    cout << "\nDest\tNext Hop\tDist" << endl;
    for (int j = 0; j < no; j++)
        cout<<j+1<<"\t"<<route[i].from[j]+1<<"\t\t"<<route[i].dist[j]<<"\n";
```

```
    }

    return 0;

}
```


C:\Users\HP\Desktop\strsoham.cpp - [Executing] - Dev-C++ 5.11
File Edit Search View Project Execute Tools AStyle Window Help
TDM-GCC 4.9.2 64-bit Release
(globals)
Project Classes Debug
strsoham.cpp
#include <iostream>
#include <stdio.h>
using namespace std;
struct node {
int dist[20];
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} route[10];
int main()
{
int dm[20][20], no;
cout << "no of nodes : ";
cin >> no;
cout << "enter the distance matrix:" << endl;
for (int i = 0; i < no; i++) {
for (int j = 0; j < no; j++) {
cin >> dm[i][j];
/* distance from i to i as 0 */
dm[i][i] = 0;
route[i].dist[j] = dm[i][j];
route[i].from[j] = j;
}
}
C:\Users\HP\Desktop\strsoham.exe
no of nodes : 2
enter the distance matrix:
1
2
3
4
For Router : 1
Dest Next Hop Dist
1 1 0
2 2 2
For Router : 2
Dest Next Hop Dist
1 1 3
2 2 0
Process exited after 14.5 seconds with return value 0
Press any key to continue . . .
Compiler Resources Compile Log Debug Find Results Close
Abort Compilation
Shorten compiler paths
Compilation results...
- Errors: 0
- Warnings: 0
- Output Filename: C:\Users\HP\Desktop\strsoham.exe
- Output Size: 1.83409214019775 MiB
- Compilation Time: 0.55s
Line: 46 Col: 51 Sel: 0 Lines: 52 Length: 1405 Insert Done parsing in 0.016 seconds
Type here to search
30°C
ENG
16:12
03-11-2022