COMPUTER NETWORKS

Scenario 3

TEAM MEMBERS

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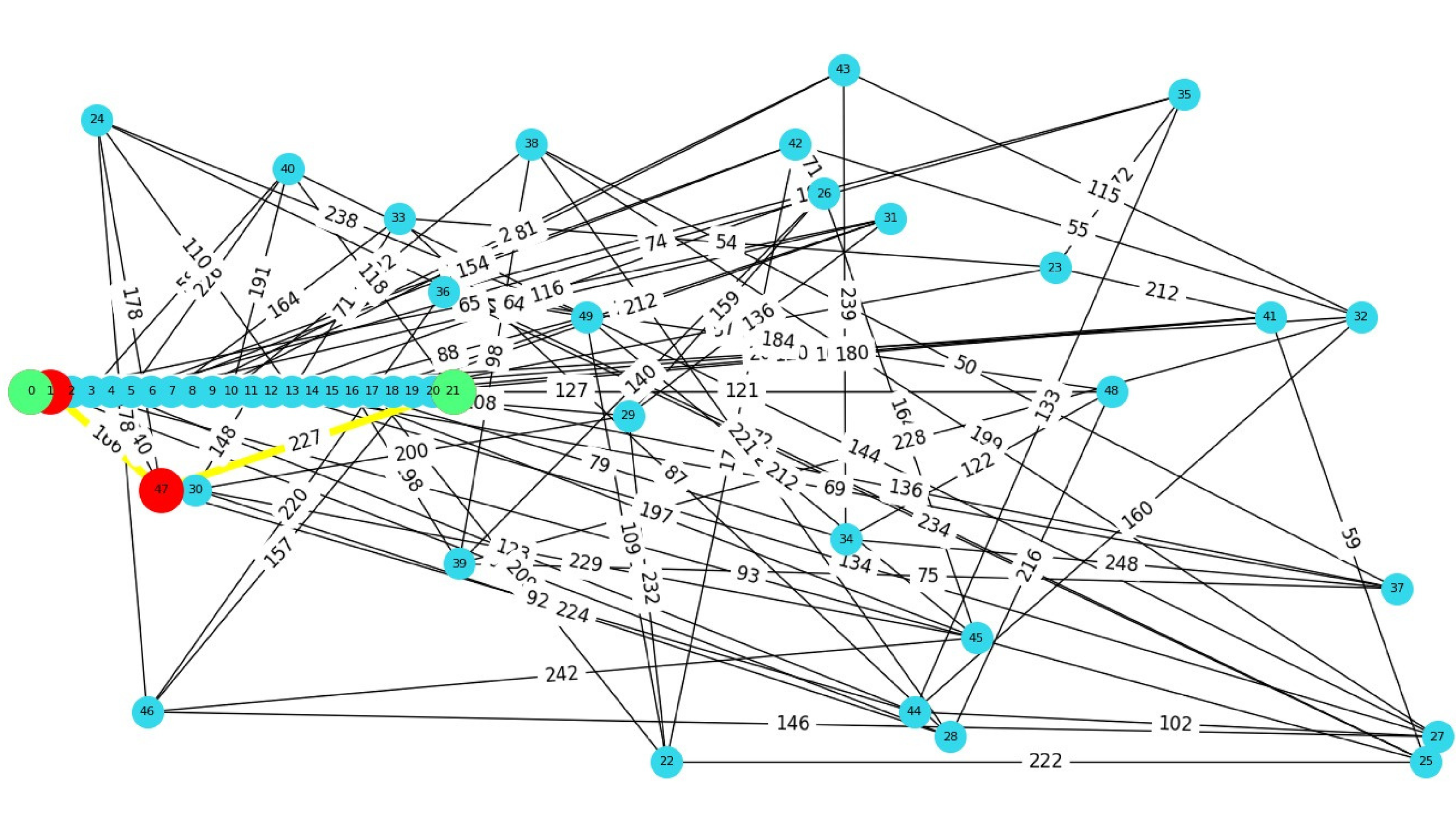
PROBLEM STATEMENT

- Network Topology Setup
- Link Bandwidth Assignment
- Optimal Path Selection
- Metrics Calculation
- Experiment Iterations

Solution


0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49

Pseudocode

Create a graph G

Add 50 nodes to the graph:
- 22 nodes with x-coordinates (0 to 21) and y-coordinate 0
- 28 nodes added to the list for subsequent addition to the graph

Create a list of interfaces for each node:
- Each node (except source and destination) with 5 interfaces
- Source and destination nodes with 3 interfaces each

Remove any self loops in the interfaces

Store positions of nodes in a dictionary dic:
- Random positions for nodes 22 to 49 ,
  nodes 0 to 21 spaced 10 units apart on x-axis

Pseudocode

```
Iterate 20 times:
    Initialize packets_dropped counter
    Assign random bandwidths to edges and nodes
    Simulate link breakage with 20% probability up to 4 edges broke
    Visualize the graph
    Find the shortest path using Dijkstra's algorithm
    Calculate edges involved in the shortest path
    Simulate packet transmission:
        - Calculate total cost and payload
        - Append hop count, cost, and payload to arrays
```

Pseudocode

Calculate packets dropped and Packet Delivery Ratio (PDR)
Display relevant information:
- Path, average cost, total hops, PDR
Visualize the graph highlighting the path
Save plotted figures with iteration number
Calculate and display average hop count, cost, overhead, and payload across 20 iterations

NETWORK

Random Bandwidth

Optimal Path Selection

Random Edge Selection

Edge Breakage

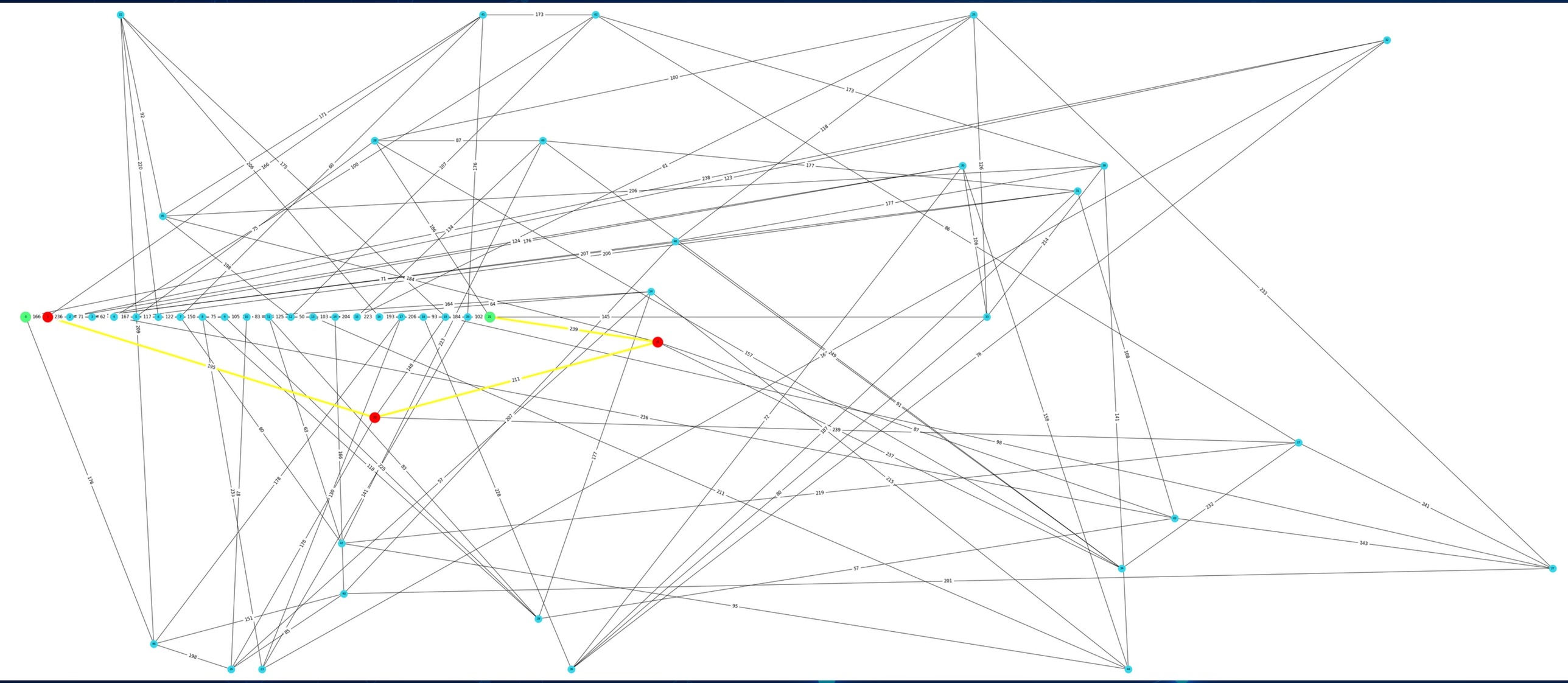
PDR CALCULATION

Metric used in Networking to measure the successful delivery of data packets

High PDR values indicate a reliable and efficient network, while lower values suggest potential issues affecting packet transmission and delivery

FORMULA

PDR = (TOTAL_PACKETS - PACKETS_LOST)/TOTAL PACKETS



```
Packets Dropped: 1
The optimal path is:
[0, 32, 23, 20, 21]
The average cost is: 12.0
Total number of hops are: 4
Total overhead of the network is: 4 hello packets.
That is for each connection established bw source and dest. we have to transmit 4 hello packets of 50 bytes in our case.
Packet Delivery Ratio (PDR): 0.8
Packets Dropped: 0
The optimal path is:
[0, 1, 29, 35, 21]
The average cost is: 16.0
Total number of hops are: 4
Total overhead of the network is: 4 hello packets.
That is for each connection established bw source and dest. we have to transmit 4 hello packets of 50 bytes in our case.
Packet Delivery Ratio (PDR): 1.0
Packets Dropped: 2
The optimal path is:
[0, 1, 29, 35, 21]
The average cost is: 12.0
Total number of hops are: 4
Total overhead of the network is: 4 hello packets.
That is for each connection established bw source and dest. we have to transmit 4 hello packets of 50 bytes in our case.
Packet Delivery Ratio (PDR): 0.6
```


Thank You