**Test**

# Wrong starting arguments:

$ java lsnode 1111 2222 1 3333 3

$ java lsnode 2222 1111 1 3333 1

$ java lsnode 3333 1111 3 2222 2 last


## Node 3333 output:

```
Node (Port 3333) started with Neighbors: 1111 2222

Link status verification started.
Message sent from Node (Port 3333) to Node (Port 2222)
Message sent from Node (Port 3333) to Node (Port 1111)
Link cost from Node (Port 3333) to Node (Port 2222) is 2
Link cost from Node (Port 2222) to Node (Port 3333) is 1
Link cost does not match. Program terminated.
```

## Node 2222 output:

```
Node (Port 2222) started with Neighbors: 1111 3333

Message sent from Node (Port 2222) to Node (Port 3333)
Link cost from Node (Port 2222) to Node (Port 3333) is 1
Link cost from Node (Port 3333) to Node (Port 2222) is 2
Link cost does not match. Program terminated.
```

## Node 1111 output:

```
Node (Port 1111) started with Neighbors: 2222 3333

Message sent from Node (Port 1111) to Node (Port 3333)

Link status verification started.
Message sent from Node (Port 1111) to Node (Port 3333)
Message received at Node (Port 1111) from Node (Port 3333)
Message sent from Node (Port 1111) to Node (Port 2222)
Message sent from Node (Port 1111) to Node (Port 3333)
Node (Port 1111) cannot reach Node (Port 2222)
Link failure occurred. Program terminated.
```

## Node offline before last node was added (With correct input):

$ java lsnode 1111 2222 1 3333 3

$ java lsnode 2222 1111 1 3333 2

//Node 2222 terminates unexpectedly

$ java lsnode 3333 1111 3 2222 2 last


**Node 3333 output:**

```
Node (Port 3333) started with Neighbors: 1111 2222

Link status verification started.
Message sent from Node (Port 3333) to Node (Port 2222)
Message sent from Node (Port 3333) to Node (Port 1111)
Message received at Node (Port 3333) from Node (Port 1111)
Message sent from Node (Port 3333) to Node (Port 1111)
Message sent from Node (Port 3333) to Node (Port 1111)
Message received at Node (Port 3333) from Node (Port 1111)
Node (Port 3333) cannot reach Node (Port 2222)            //No response from 2222 within 500 msec
Link failure occurred. Program terminated.
```


**Node 1111 output:**

```
Node (Port 1111) started with Neighbors: 2222 3333

Message sent from Node (Port 1111) to Node (Port 3333)

Link status verification started.
Message sent from Node (Port 1111) to Node (Port 3333)
Message received at Node (Port 1111) from Node (Port 3333)
Message sent from Node (Port 1111) to Node (Port 2222)
Message sent from Node (Port 1111) to Node (Port 3333)
Message received at Node (Port 1111) from Node (Port 3333)
Node (Port 1111) cannot reach Node (Port 2222)            //No response from 2222 within 500 msec
Link failure occurred. Program terminated.
```

# Nodes remain online (correct input):

$ java lsnode 1111 2222 2 3333 1 4444 5

$ java lsnode 2222 1111 2 3333 2 4444 3

$ java lsnode 3333 1111 1 2222 2 3333 3 5555 1

$ java lsnode 4444 1111 5 2222 3 3333 3 5555 1 6666 5

$ java lsnode 5555 3333 1 4444 1 6666 2

$ java lsnode 6666 4444 5 5555 2 last

## Node 6666 output:

```
Node (Port 6666) started with Neighbors: 4444 5555

Link status verification started.                                    //Link verification
Message sent from Node (Port 6666) to Node (Port 5555)
Message sent from Node (Port 6666) to Node (Port 4444)
Message received at Node (Port 6666) from Node (Port 5555)
Message received at Node (Port 6666) from Node (Port 4444)
Message sent from Node (Port 6666) to Node (Port 5555)
Message sent from Node (Port 6666) to Node (Port 5555)
Message received at Node (Port 6666) from Node (Port 5555)
Message sent from Node (Port 6666) to Node (Port 4444)
Message sent from Node (Port 6666) to Node (Port 4444)
Message received at Node (Port 6666) from Node (Port 4444)
Link status verification finished.                                   //Link verification terminates…waits 1 second.


Message flooding started.                                            //Inititates message flooding
Message sent from Node (Port 6666) to Node (Port 5555)
Message sent from Node (Port 6666) to Node (Port 4444)
Message received at Node (Port 6666) from Node (Port 5555)
Message received at Node (Port 6666) from Node (Port 4444)
Message sent from Node (Port 6666) to Node (Port 5555)
Message sent from Node (Port 6666) to Node (Port 5555)
Message sent from Node (Port 6666) to Node (Port 4444)
Message sent from Node (Port 6666) to Node (Port 4444)
Message received at Node (Port 6666) from Node (Port 5555)
Message received at Node (Port 6666) from Node (Port 5555)
Message sent from Node (Port 6666) to Node (Port 5555)
Message sent from Node (Port 6666) to Node (Port 5555)
Message sent from Node (Port 6666) to Node (Port 5555)
Message sent from Node (Port 6666) to Node (Port 4444)
Message sent from Node (Port 6666) to Node (Port 4444)
Message sent from Node (Port 6666) to Node (Port 4444)
Message received at Node (Port 6666) from Node (Port 4444)
Message received at Node (Port 6666) from Node (Port 5555)
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Message received at Node (Port 6666) from Node (Port 5555)
Message received at Node (Port 6666) from Node (Port 5555)
Message received at Node (Port 6666) from Node (Port 4444)
Message received at Node (Port 6666) from Node (Port 4444)
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Message received at Node (Port 6666) from Node (Port 5555)
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Message sent from Node (Port 6666) to Node (Port 5555)
Message sent from Node (Port 6666) to Node (Port 5555)
Message sent from Node (Port 6666) to Node (Port 4444)
Message sent from Node (Port 6666) to Node (Port 4444)
```

```
Message sent from Node (Port 6666) to Node (Port 4444)
Message sent from Node (Port 6666) to Node (Port 4444)
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Message received at Node (Port 6666) from Node (Port 5555)
Message received at Node (Port 6666) from Node (Port 5555)
Message received at Node (Port 6666) from Node (Port 5555)
Message received at Node (Port 6666) from Node (Port 5555)
Message received at Node (Port 6666) from Node (Port 5555)
Message received at Node (Port 6666) from Node (Port 5555)
Message flooding finished.                                                          //Message flooding finishes. Each node waits 5 seconds.

Node (Port 6666) received the following link-state information:                      //Displays the link-state information of the network
source Node (Port 5555): Neighbors Node (Port 4444) (Cost 1), Neighbors Node (Port 6666) (Cost 2), Neighbors Node (Port 3333) (Cost 1)
source Node (Port 2222): Neighbors Node (Port 1111) (Cost 2), Neighbors Node (Port 4444) (Cost 3), Neighbors Node (Port 3333) (Cost 2)
source Node (Port 1111): Neighbors Node (Port 2222) (Cost 2), Neighbors Node (Port 4444) (Cost 5), Neighbors Node (Port 3333) (Cost 1)
source Node (Port 4444): Neighbors Node (Port 5555) (Cost 1), Neighbors Node (Port 2222) (Cost 3), Neighbors Node (Port 1111) (Cost 5), Neighbors Node (Port 6666) (Cost 5), Neighbors Node (Port 3333) (Cost 3)
source Node (Port 3333): Neighbors Node (Port 5555) (Cost 1), Neighbors Node (Port 2222) (Cost 2), Neighbors Node (Port 1111) (Cost 1), Neighbors Node (Port 4444) (Cost 3), Neighbors Node (Port 3333) (Cost 3)


Node (Port 6666) starts routing table construction.
```

| Step | N' | 1111 | 2222 | 3333 | 4444 | 5555 |
|------|------|------|------|------|------|------|
| 0 | [6666] | N/A | N/A | N/A | 5, 4444 | 2, 5555 |
| 1 | [6666, 5555] | 10, 4444 | 8, 4444 | 3, 5555 | 3, 5555 | |
| 2 | [6666, 5555, 3333] | 4, 5555 | 5, 5555 | | 3, 5555 | |
| 3 | [6666, 5555, 3333, 4444] | 4, 5555 | 5, 5555 | | | |
| 4 | [6666, 5555, 3333, 4444, 1111] | | 5, 5555 | | | |
| 5 | [6666, 5555, 3333, 4444, 1111, 2222] | | | | | |

```
Node (Port 6666) finished routing table construction.                               //Each node waits 1.5 seconds per node.

Tracing route to 2222                                                               //Last node sends a trace message to the farthest (most costly) node according to the routing table.
1          6666 to 5555 (Cost: 2)
2          5555 to 3333 (Cost: 3)
3          3333 to 2222 (Cost: 5)
Trace complete.

>>> table : Displays the routing table                                              //On screen instructions
>>> tracert <port_number>
>>> exit : Exits the program

>>>
```

## Node 2222 output:

```
Node (Port 2222) started with Neighbors: 1111 3333 4444

Message sent from Node (Port 2222) to Node (Port 4444)                              // receives a verify message from node 4444 which starts 2222's verification process

Link status verification started.
Message sent from Node (Port 2222) to Node (Port 4444)
Message received at Node (Port 2222) from Node (Port 4444)
Message sent from Node (Port 2222) to Node (Port 1111)
Message sent from Node (Port 2222) to Node (Port 1111)
Message received at Node (Port 2222) from Node (Port 1111)
Message sent from Node (Port 2222) to Node (Port 3333)
Message sent from Node (Port 2222) to Node (Port 3333)
Message received at Node (Port 2222) from Node (Port 3333)
Message sent from Node (Port 2222) to Node (Port 4444)
Message received at Node (Port 2222) from Node (Port 4444)
Message received at Node (Port 2222) from Node (Port 1111)
Message sent from Node (Port 2222) to Node (Port 1111)
Message sent from Node (Port 2222) to Node (Port 3333)
Message received at Node (Port 2222) from Node (Port 3333)
Link status verification finished.                                                  // Link verification ends, waits 1 second

Message sent from Node (Port 2222) to Node (Port 4444)                              // Other nodes have started flooding. ACKs any received.
Message sent from Node (Port 2222) to Node (Port 4444)
Message sent from Node (Port 2222) to Node (Port 1111)
Message sent from Node (Port 2222) to Node (Port 1111)
Message sent from Node (Port 2222) to Node (Port 3333)
Message sent from Node (Port 2222) to Node (Port 3333)
Message received at Node (Port 2222) from Node (Port 4444)
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Message sent from Node (Port 2222) to Node (Port 1111)
Message sent from Node (Port 2222) to Node (Port 3333)
Message sent from Node (Port 2222) to Node (Port 3333)
Message received at Node (Port 2222) from Node (Port 4444)
Message sent from Node (Port 2222) to Node (Port 4444)
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```
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Message received at Node (Port 2222) from Node (Port 1111)
Message received at Node (Port 2222) from Node (Port 1111)
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Message received at Node (Port 2222) from Node (Port 1111)
Message received at Node (Port 2222) from Node (Port 1111)
Message received at Node (Port 2222) from Node (Port 1111)
Message received at Node (Port 2222) from Node (Port 1111)
Message received at Node (Port 2222) from Node (Port 1111)

Message flooding started.                                        // Upon receipt of a flood message, initiate 2222's own flooding
Message sent from Node (Port 2222) to Node (Port 4444)
Message sent from Node (Port 2222) to Node (Port 4444)
Message sent from Node (Port 2222) to Node (Port 4444)
Message sent from Node (Port 2222) to Node (Port 4444)
Message sent from Node (Port 2222) to Node (Port 4444)
Message sent from Node (Port 2222) to Node (Port 4444)
Message sent from Node (Port 2222) to Node (Port 1111)
Message sent from Node (Port 2222) to Node (Port 1111)
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Message sent from Node (Port 2222) to Node (Port 1111)
Message sent from Node (Port 2222) to Node (Port 1111)
Message sent from Node (Port 2222) to Node (Port 1111)
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Message sent from Node (Port 2222) to Node (Port 3333)
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Message flooding finished.                                                          //flooding finishes, waits 5 seconds.

Node (Port 2222) received the following link-state information:                      //Displays the link-state information of the network
source Node (Port 5555): Neighbors Node (Port 4444) (Cost 1), Neighbors Node (Port 6666) (Cost 2), Neighbors Node (Port 3333) (Cost 1)
source Node (Port 1111): Neighbors Node (Port 2222) (Cost 2), Neighbors Node (Port 4444) (Cost 5), Neighbors Node (Port 3333) (Cost 1)
source Node (Port 4444): Neighbors Node (Port 5555) (Cost 1), Neighbors Node (Port 2222) (Cost 3), Neighbors Node (Port 1111) (Cost 5), Neighbors Node (Port 6666) (Cost 5), Neighbors Node (Port 3333) (Cost 3)
source Node (Port 3333): Neighbors Node (Port 5555) (Cost 1), Neighbors Node (Port 2222) (Cost 2), Neighbors Node (Port 1111) (Cost 1), Neighbors Node (Port 4444) (Cost 3), Neighbors Node (Port 3333) (Cost 3)
source Node (Port 6666): Neighbors Node (Port 5555) (Cost 2), Neighbors Node (Port 4444) (Cost 5)


Node (Port 2222) starts routing table construction.
```

| Step | N' | 1111 | 3333 | 4444 | 5555 | 6666 |
|------|------|------|------|------|------|------|
| 0 | [2222] | 2, 1111 | 2, 3333 | 3, 4444 | N/A | N/A |
| 1 | [2222, 1111] | | 2, 3333 | 3, 4444 | 3, 3333 | 8, 4444 |
| 2 | [2222, 1111, 3333] | | | 3, 4444 | 3, 3333 | 5, 3333 |
| 3 | [2222, 1111, 3333, 4444] | | | | 3, 3333 | 5, 3333 |
| 4 | [2222, 1111, 3333, 4444, 5555] | | | | | 5, 3333 |
| 5 | [2222, 1111, 3333, 4444, 5555, 6666] | | | | | |

```
Node (Port 2222) finished routing table construction.

>>> table : Displays the routing table
>>> tracert <port_number>
>>> exit : Exits the program

>>> Message received at Node (Port 2222) from Node (Port 6666)                       // Receives trace message from node 6666
>>>
```

# tracert simulation:

## Node 6666 (continued):

```
>>> table : Displays the routing table
>>> tracert <port_number>
>>> exit : Exits the program

>>> table
```

| Step | N' | 1111 | 2222 | 3333 | 4444 | 5555 |
|---|---|---|---|---|---|---|
| 0 | [6666] | N/A | N/A | N/A | 5, 4444 | 2, 5555 |
| 1 | [6666, 5555] | 10, 4444 | 8, 4444 | 3, 5555 | 3, 5555 | |
| 2 | [6666, 5555, 3333] | 4, 5555 | 5, 5555 | | 3, 5555 | |
| 3 | [6666, 5555, 3333, 4444] | 4, 5555 | 5, 5555 | | | |
| 4 | [6666, 5555, 3333, 4444, 1111] | | 5, 5555 | | | |
| 5 | [6666, 5555, 3333, 4444, 1111, 2222] | | | | | |

```
>>> tracert 1111                                          // traces a message to any node in the network

Tracing route to 1111
1           6666 to 5555 (Cost: 2)                         // displays the hop count, two nodes along the current path, and the total running count of the cost
2           5555 to 3333 (Cost: 3)
3           3333 to 1111 (Cost: 4)
Trace complete.                                            // node reached, trace complete.

>>> tracert 1                                              // tracing to node not in network
Node (Port 1) not found.

>>> tracert hello                                          // bad input
Input invalid.

>>> tracert 6666                                           // cannot trace a route to self
Cannot trace a route to self.

>>> tracrt 3333                                            // bad command
Command not recognized.

>>> exit                                                   // terminates the program
Program Terminating...
```

## Node 2222 (continued):

```
Node (Port 2222) finished routing table construction.

>>> table : Displays the routing table
>>> tracert <port_number>
>>> exit : Exits the program

>>> Message received at Node (Port 2222) from Node (Port 6666)     // receives a trace from previously
>>> tracert 6666

Tracing route to 6666
1           2222 to 3333 (Cost: 2)
2           3333 to 5555 (Cost: 3)                         // waits 5 seconds for the next message
Node (Port 6666) unreachable.                              // node unreachable

>>>
```