User Manual

Network Simulator

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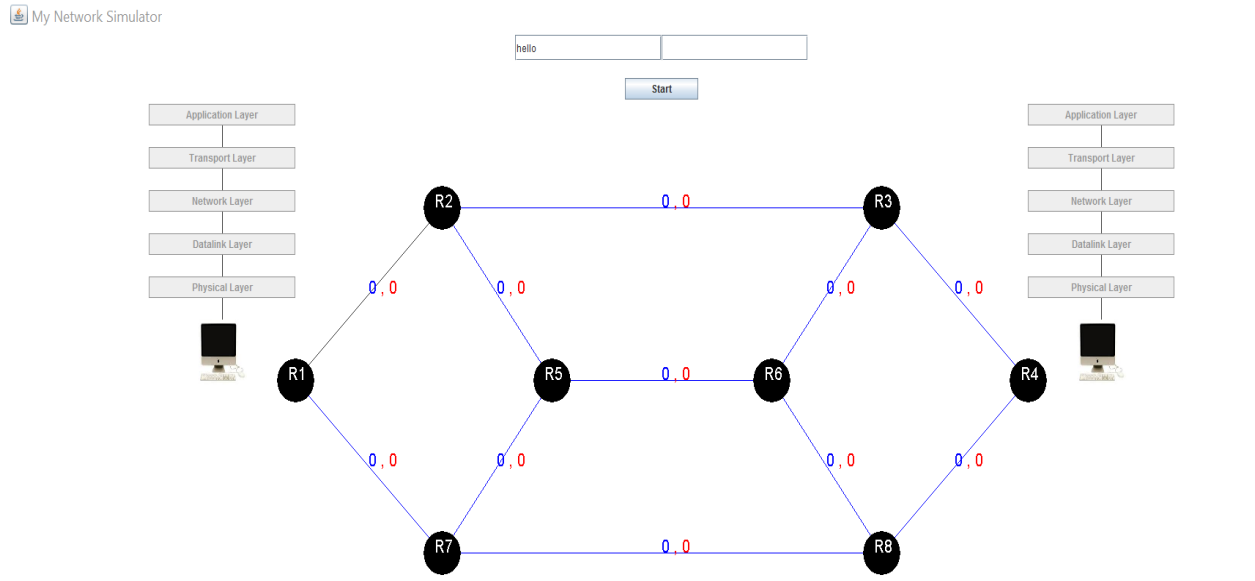
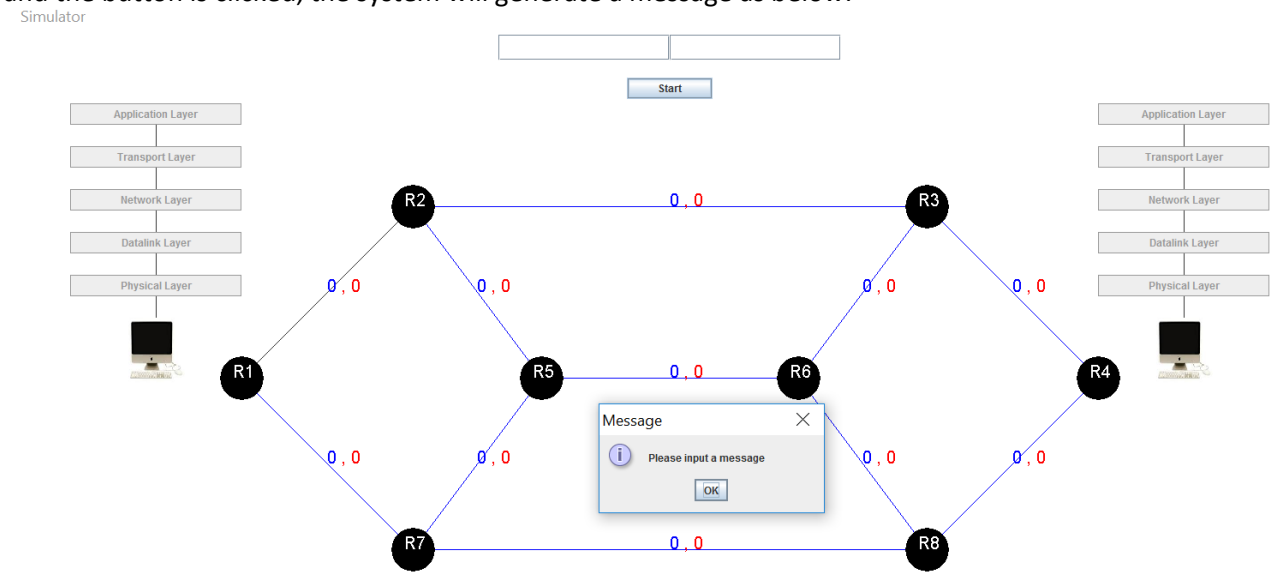
1. Introduction

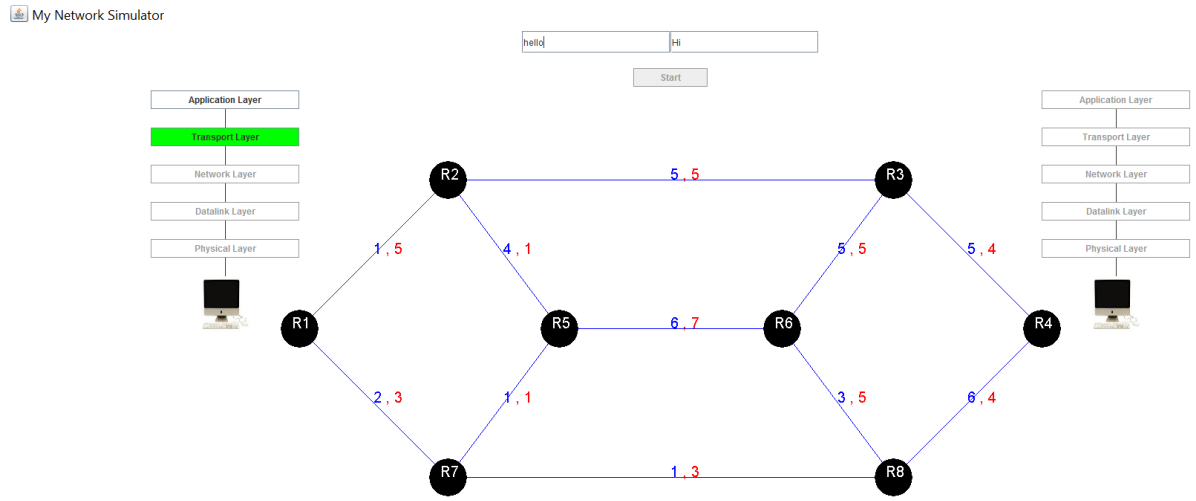
The Network Simulator application is a Java application developed in Swing. This application can be run by NetworkSimulator.jar (runnable jar). Once launched the application looks like this:



This application represents communication between 2 systems and various specifics of data communication. Every system is represented as 5 layered TCP/IP system. Every system is connected to a router.
At startup, all the layers are disabled. A button 'Start' and 2 text boxes are given to the user. User enters at least one message in the text box and the button to start the communication. If the none of the messages are provided and the button is clicked, the system will generate a message as below:

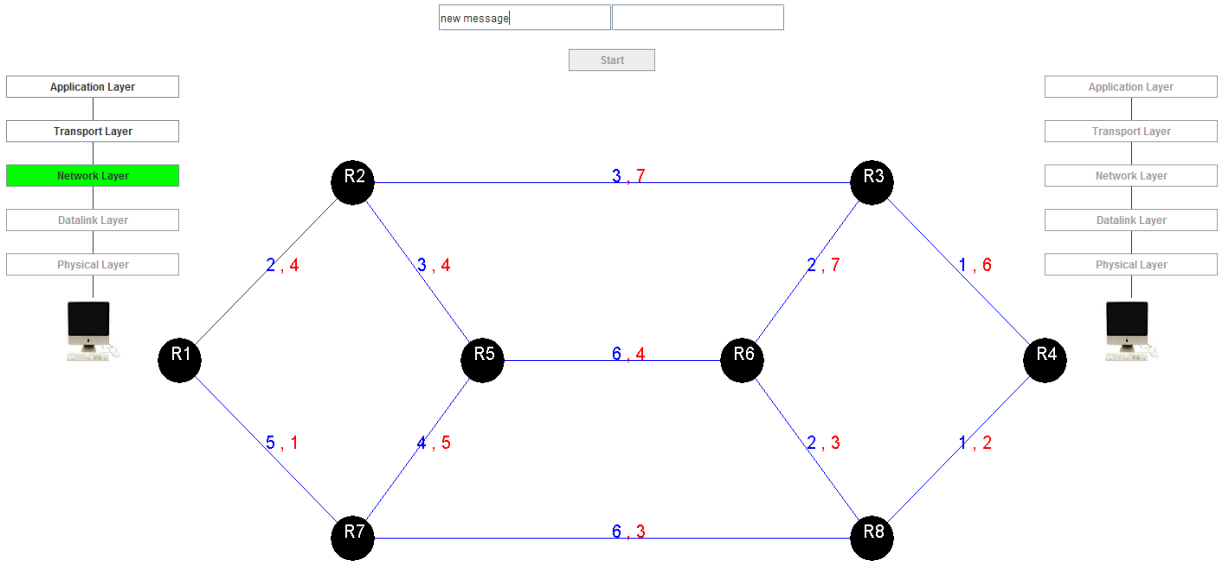


Once a message is entered and button ‘Start’ is clicked, the communication starts with highlighting and enabling the layer button. This represent the flow and data availability in the layers.



Path 1: R1 R7 R8 R4 Path 2: R1 R7 R8 R4

: Simulator

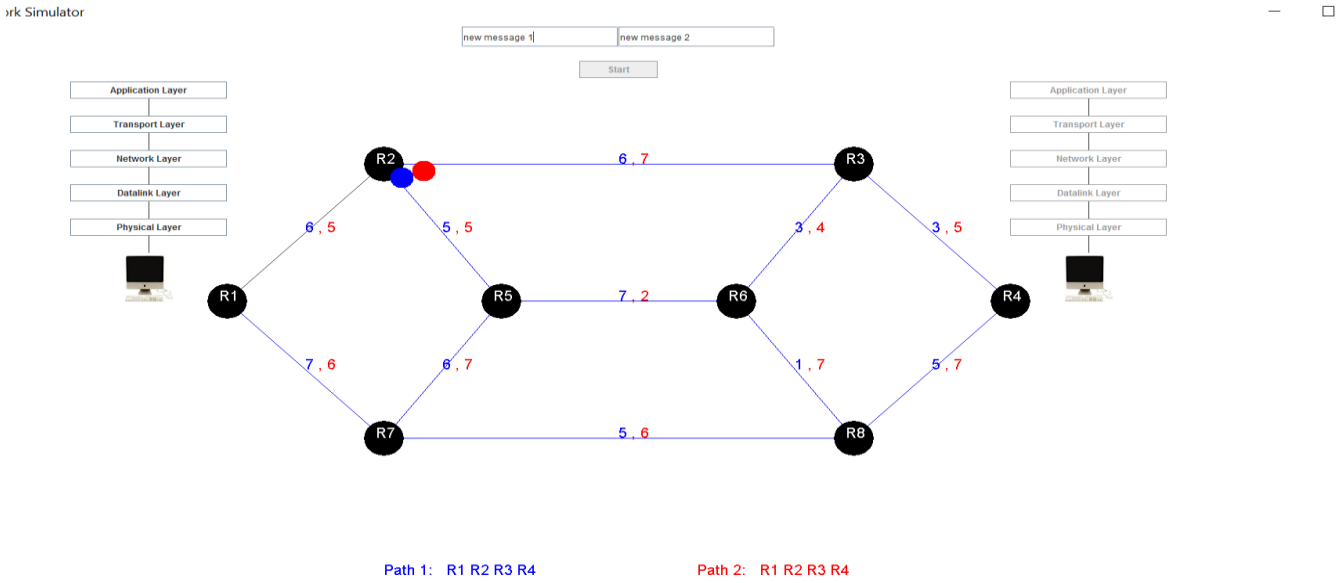


Path 1: R1 R2 R3 R4 Path 2: R1 R7 R8 R4

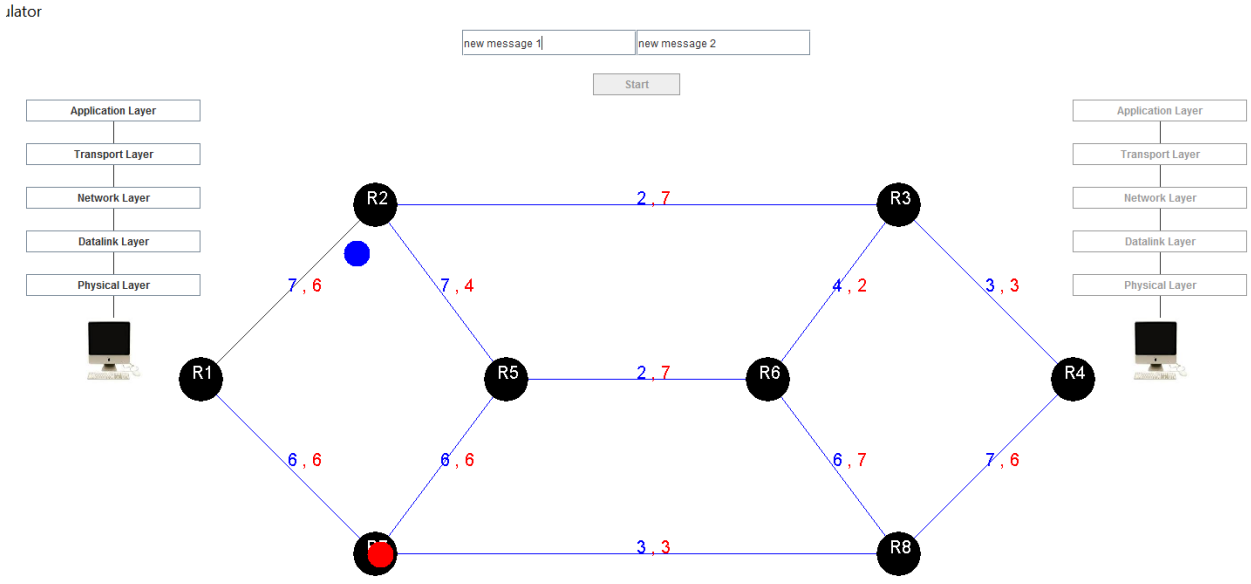
Once message reaches physical layer, it will be routed via router to another system. This is represented by this application in form of the moving ball moving from computer A-router to router- computer B. If 2 messages are provided, one message (black ball) will go to computer B and another message (red ball) will go to computer B.

Dijkstra Algorithm:

The path is computed via **Dijkstra algorithm.** Each message follows the shorted path.



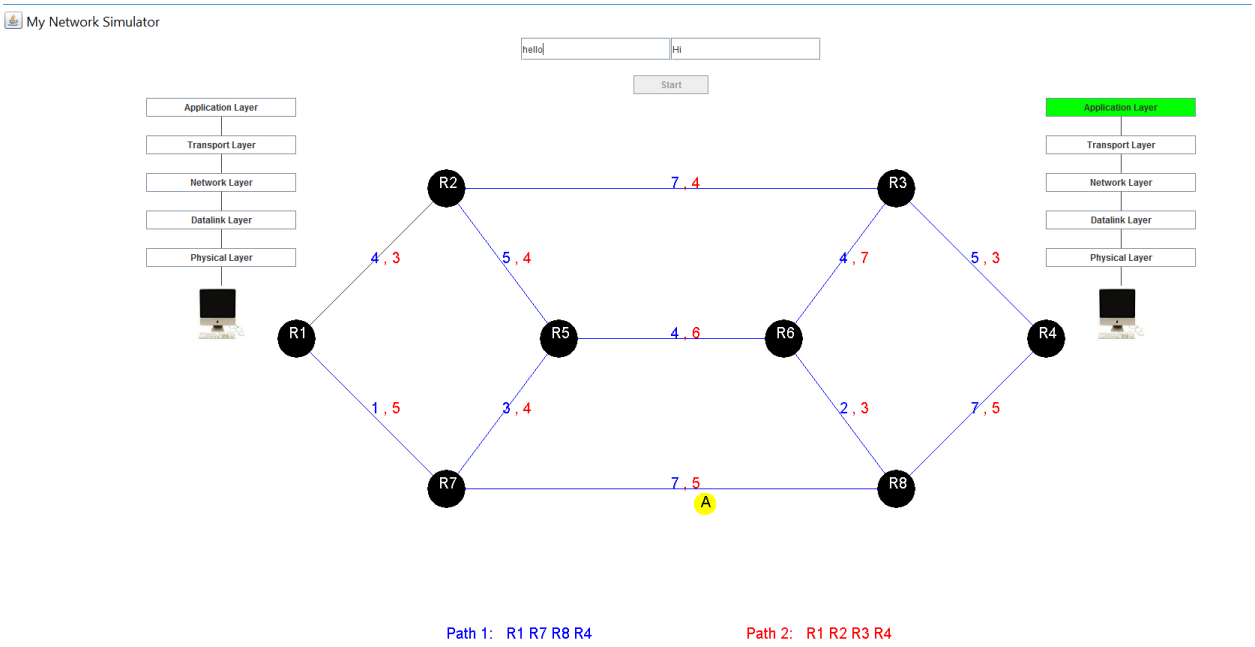
Path 1: R1 R2 R3 R4 Path 2: R1 R2 R3 R4



Path 1: R1 R2 R3 R4 Path 2: R1 R7 R8 R4

Stop and Wait Algorithm:

One of the path shows negative acknowledgement, where the packet follows **Stop and Wait algorithm**. This is represented by yellow ball and once yellow ball reaches sender, the packet is resent.

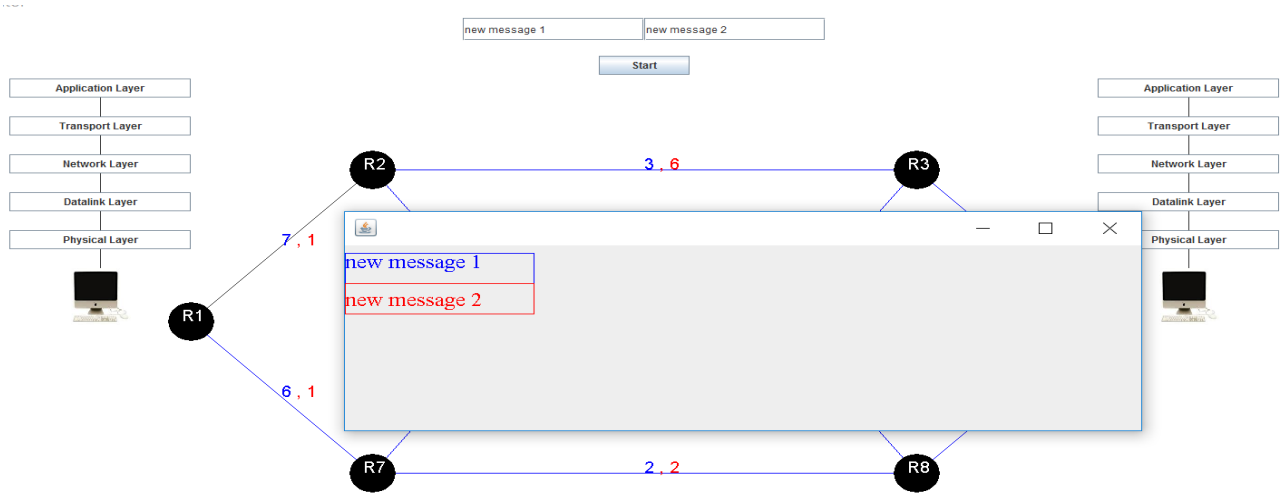


Once messages reach system B, it will follow the same layers in opposite fashion to the application layer.

Meanwhile it can be seen in the application that various layers' buttons are available. When clicked, it shows the different message format in the respective layer.

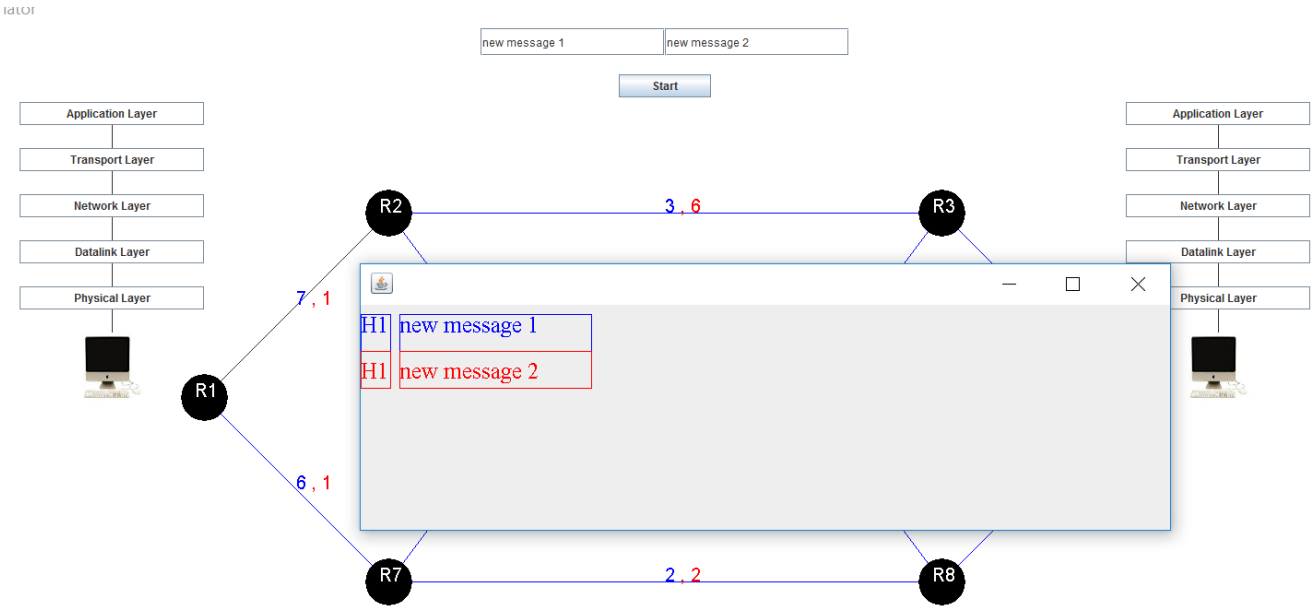
2. Layered Architecture

2.1 Application Layer: On clicking the application layer, the message is shown as the user entered.



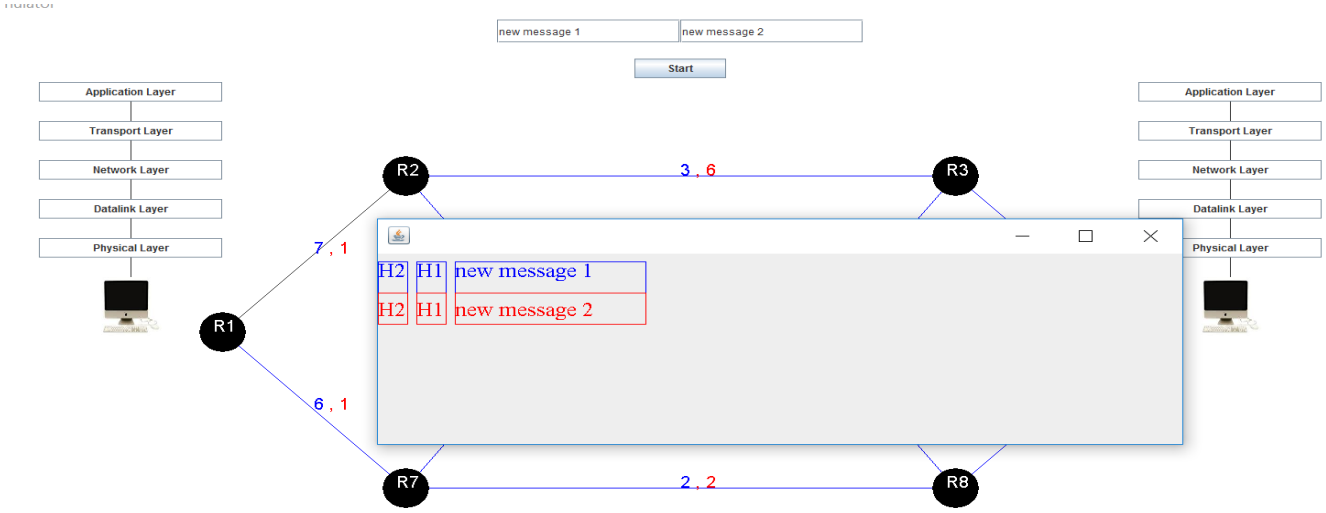
Path 1: R1 R7 R8 R4 Path 2: R1 R7 R8 R4

2.1.2 Transport Layer: At the Transport layer, the Application layer message is appended with a new header H1.



Path 1: R1 R7 R8 R4 Path 2: R1 R7 R8 R4

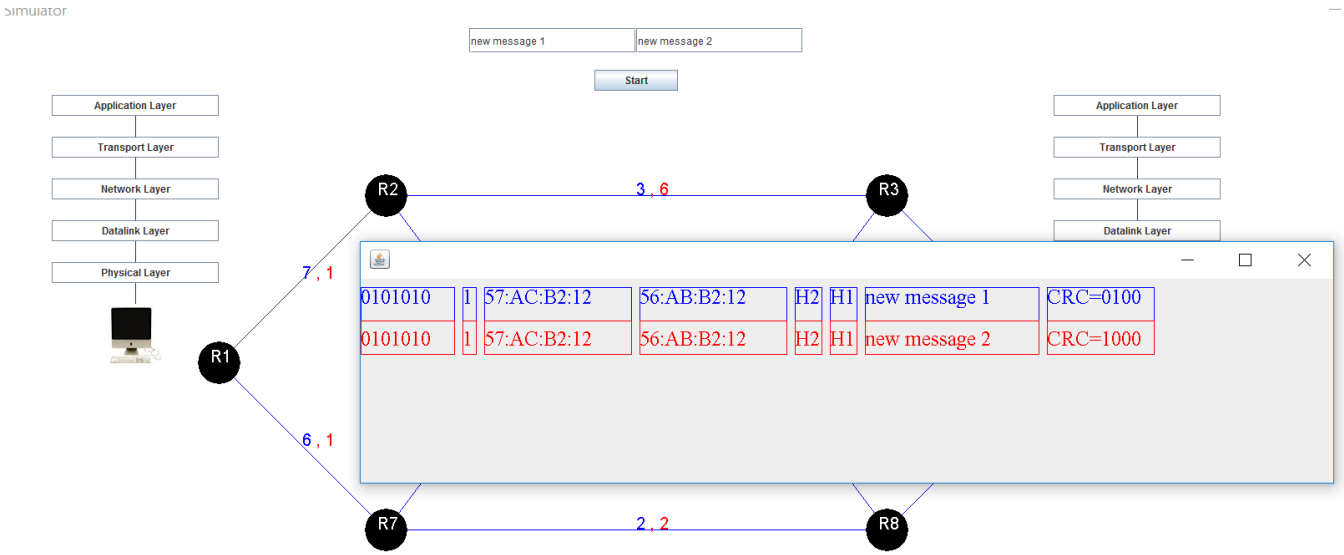
2.1.3 Network Layer: At the Network layer, the Transport layer message is appended with an additional header H2.



Path 1: R1 R7 R8 R4 Path 2: R1 R7 R8 R4

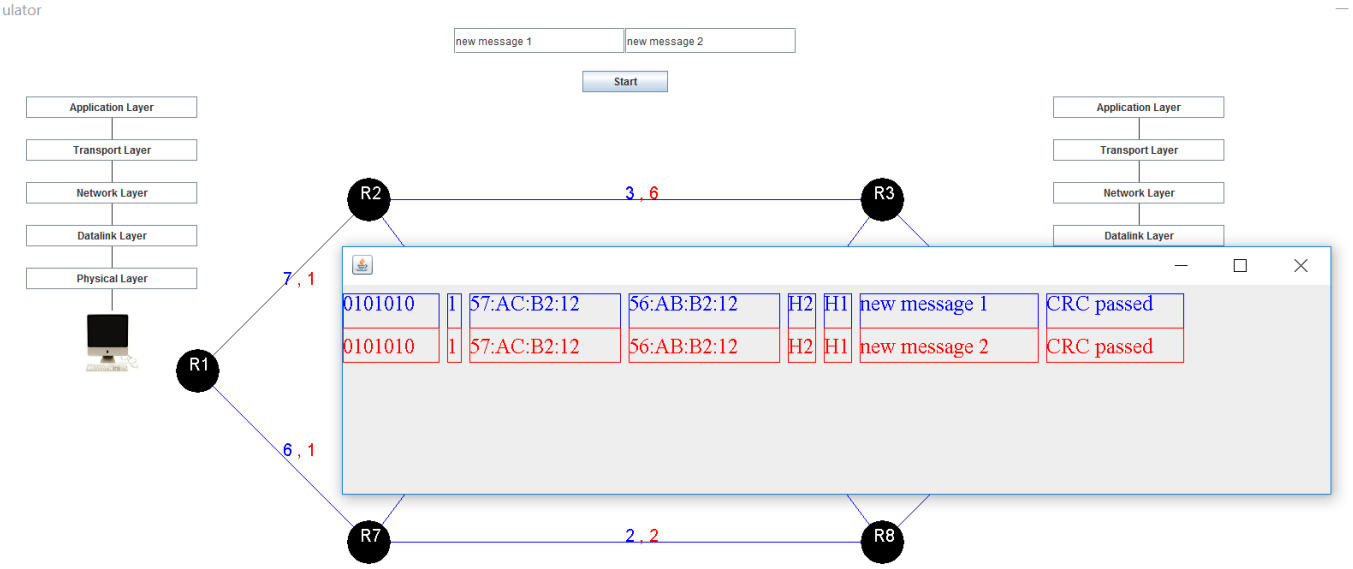
Datalink layer: At the Datalink layer, the Network layer message is appended with Preamble, SFD, destination address and source address and CRC.

- Source System



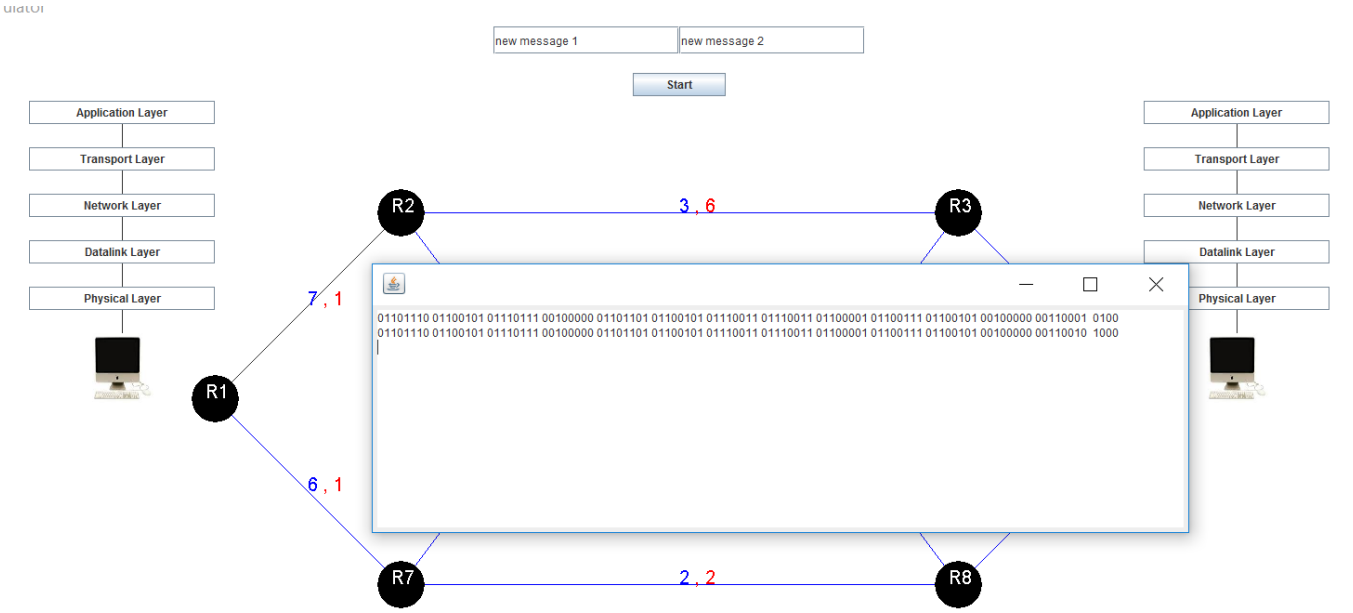
Path 1: R1 R7 R8 R4 Path 2: R1 R7 R8 R4

- **Destination**



Path 1: R1 R7 R8 R4 Path 2: R1 R7 R8 R4

Physical layer: At the physical layer, the message converts into binary format. This application actually converts the message to 8 bit binary.



Path 1: R1 R7 R8 R4 Path 2: R1 R7 R8 R4

Between the systems and routers, the message transmits as analog signals. This can be seen by clicking the passing ball. The actual conversion of bits to signal is done via Frequency Shift Keying conversion.