Student Name: Ha Trung Tin
Student ID: BI11-261

Network Simulation
Labwork 2: Logging, Attributes and tracing

Consider a C program ../ns 3.34/example/tutorial/first.cc

1. **Logging**

- Enable Logging LEVEL_FUNCTION and list out functions of the class UdpEchoServer and UdpEchoClient that are called during the execution of the script.

- Functions of the class UdpEchoServer:

```
UdpEchoClient(0x55d654beeb40)
SetDataSize(0x55d654beeb40, 1024)
StartApplication(0x55d654beeb40)
ScheduleTransmit(0x55d654beeb40, +0ns)
Send(0x55d654beeb40)
HandleRead(0x55d654beeb40, 0x55d654bf6ba0)
StopApplication(0x55d654beeb40)
DoDispose(0x55d654beeb40)
```

- Functions of the class UdpEchoClient:

```
UdpEchoServer(0x55732ce50800)
StartApplication(0x55732ce50800)
HandleRead(0x55732ce50800, 0x55732cf006b0)
StopApplication(0x55732ce50800)
DoDispose(0x55732ce50800)
```

2. **Editing attributes**

- Edit the code to set up properties of the point-to-point network device and channel.
  `o Data rate = 10Mbps`
  `o Propagation delay = 0.01s`

- Run the updated script and compute the average delay of received packets at the server and client.

```
Delay of received packets at the server is:  0.01084s
Delay of received packets at the client is:  0.02169s - 0.01084s = 0.01085s
The average delay = 0.010845s
```

- Using command line arguments to
  - Set number of sending packets to 100.
  - Edit point-to-point network device and channel attributes to (5Mbps, 1ms) and (10Mbps,0.01s).
  - Compare the average delay of received packets at server and client for two above parameter

sets.

```
The average delay of received packets at server and client for (5Mbps, 1ms) is:
0.002685s.  It is smaller than 0.010845s of the average delay of received packets
at server and client for (10Mbps, 0.01s)
```

3. **Capture packet traces**
   Traces include information of sent and received packets (time, size, other information).

   - ASCII tracing: output the trace to text file

   - PCAP tracing:
     - Capturing sent and received packets: .pcap file format.
     - Read the output: by tcpdump or wiresharkwireshark.

4. **Report results**
   From the traces of two parameter sets in B, compute:

   - Average delay of received packets at client and server

     ```
     Average delay of received packets at the client is:  0.010843s
     Average delay of received packets at server is:  0s
     ```

   - Packet delivery ratio

     ```
     Packet delivery ratio = number of packets sent / number of packets received = 1
     ```