Checksum

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Abstract

A Checksum is a small piece of information derived from a digital block of data for the sole reason of detecting anomalies in the data that may occur during the transmission of the data.An end user sending data across a network sends a checksum along with the data which is matched on the receiving end to determine any form of data corruption or packet loss.

Keywords

Checksum; Client; Server; Files; Tcp Connection; Packet Loss;

I. Implementation

The interface consists of a client and a server.The client sends a file to the server attached with a checksum which is in turn received by the server which recomputes the checksum and compares for a match. If the checksum on both the client as well as server side match then there is no packet loss.

The Checksum is calculated in the following manner - :

- Pad the ascii value of every character in the data to be transferred to 7 bits.(Can be chosen arbitrarily - For our case Ascii values range between 0 to 127)
- These binary numbers are the binary values of the ascii values of each character padded with 0's upto 7 digits.
- Add all the binary numbers.
- In case there is an overflow we wrap around by adding binary 1 to the computed sum.
- This value gives us the equivalent checksum of the given data.

The Computed checksum is complemented and sent along with the original data is to the server side.At the server side the encoded data is decoded and the checksum is separated from the data.

The computed checksum from the client is matched at the server side by recomputing the checksum from scratch.At this point there are 2 checksums - :

- Client Side complemented value of checksum.
- Server Side actual checksum.

Both of the aforementioned checksums are added.This result is compared with binary '111111' which upon validation returns a true or false result.Two cases occur when the checksum is validated - :

- TRUE : Checksums computed match therefore there is no packet loss.Data gets transmitted and the server responds to the client side by sending an acknowledgment message.
- FALSE : Checksums computed don't match.The server responds to the client with a NAK response (Not Acknowledged).We can compute the packet loss percentage by the formula

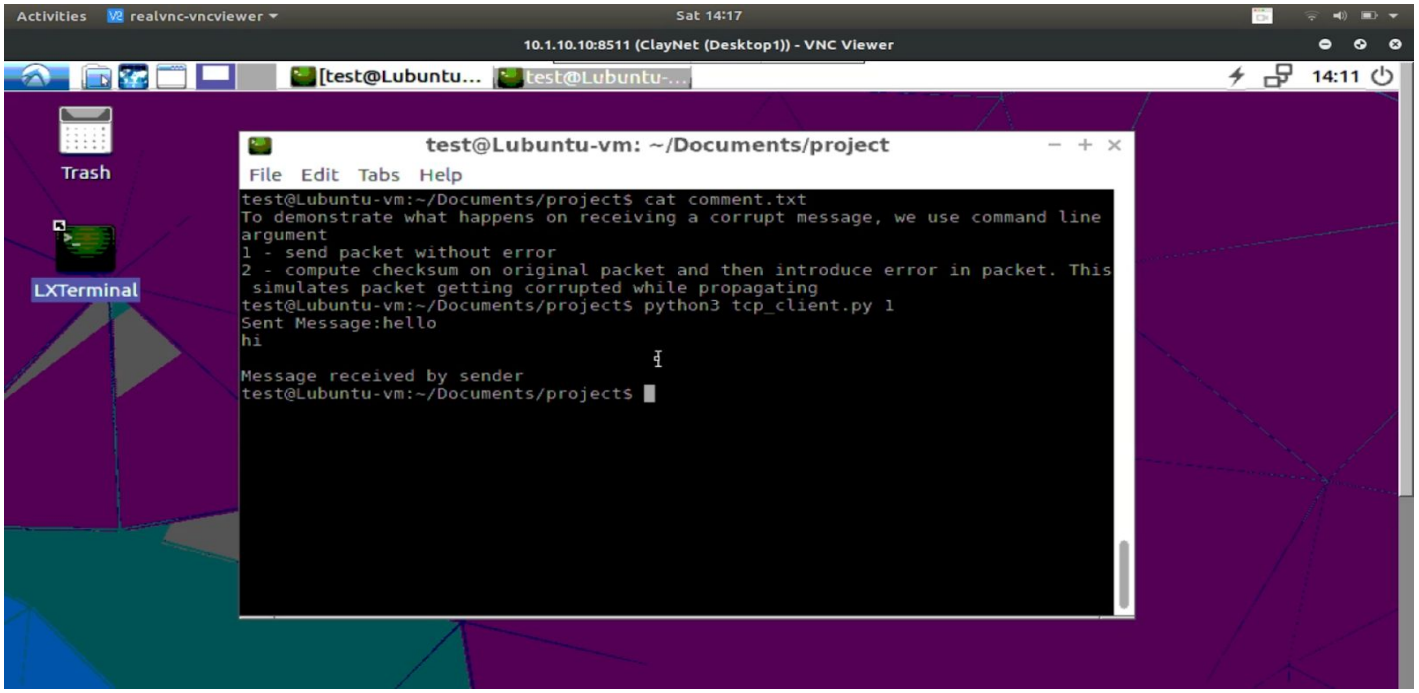
II. Implementation on Claynet

Claynet is a network visualization tool which we have used for the demonstration of our project.Claynet is a software developed by nivetti Systems which allows the user to create complex network topologies consisting of routers,firewalls and also simulate end systems and servers to simulate a real world IT infrastructure.

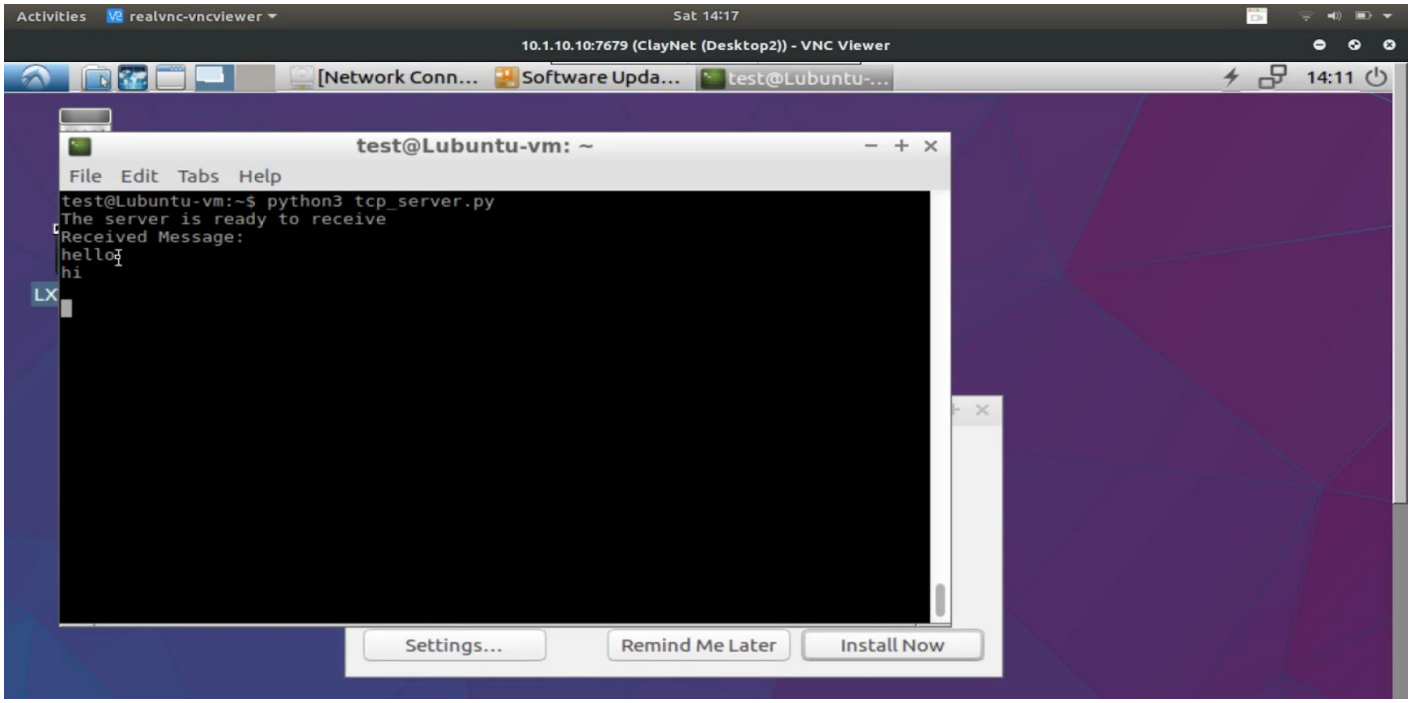
- Designing Topology
  - Our topology consists of one client and one server.
  - Server is connected to the router by means of 2 routers to simulate the flow of data from one network to another.
  - The client as well as server have the same specs they both have 512mb ram each and run ubuntu Lite.
  - Next we set the IP address of both the client as well as the server machine.
  - We further set the routing table entries for both the routers.

Claynet Implementation

Claynet Client Side



Claynet Server Side



III. Results

Checksum is calculated on client side complemented and further transmitted to the server side.At the server side the complemented checksum (from the client side) as well as the freshly computed checksum from the server side are added and if the sum is 1111111 then there are no bit errors. Otherwise a packet loss has occurred.

IV. Links and References

- Git : https://github.com/sivagirish81/Checksum
- Video Link : https://drive.google.com/drive/folders/1sdhbiAwpIDyMnTTvK3CRGAU3wdQRFKPY