

# PACKET FLOW VISUALIZER : VISUALIZING PACKET FLOW FROM STUDENT HOSTS TO EXTERNAL NETWORKS

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## Abstract

This project, titled "**Packet Flow Visualizer**" focuses on creating a visual representation of the packet flow from students' laptops/desktops to external networks outside the college campus. The existing devices within the college network are identified using tools like traceroute. Based on this information, a network topology is created using Cisco Packet Tracer. The topology showcases the various network devices, network design, and network boundaries, illustrating the path from the host devices to the external network.

The "**Packet Flow Visualizer**" project provides practical experience in network topology creation, packet sniffing, packet header analysis, and the creation of visual representations of packet flow. This hands-on approach fosters a deep understanding of network design principles, OSI model layers, and the distinct roles played by different network devices.

## Introduction

In today's connected world, understanding packet flow on a network is important for network administrators and IT professionals. The "Packet Stream Viewer" project addresses this need by providing a comprehensive view of packet flow from student laptops/desktops to other off-campus networks. This project enables students to gain practical and hands-on experience in network topology design, packet sniffing, packet header analysis, and packet flow visualization.

This study has two main parts: network topology generation and packet flow analysis. In the network topology design phase, students first identify the devices available in the school network. This can be done with tools such as traceroute or in consultation with the campus network administrator. From this information, students can create a network topology using Cisco Packet Tracer, a widely used network simulation tool. The network topology shows the different devices in the network, their connections, and the overall network design. It works as a visual representation of the network infrastructure and provides a clear understanding of how data flows from the host to the outside network.

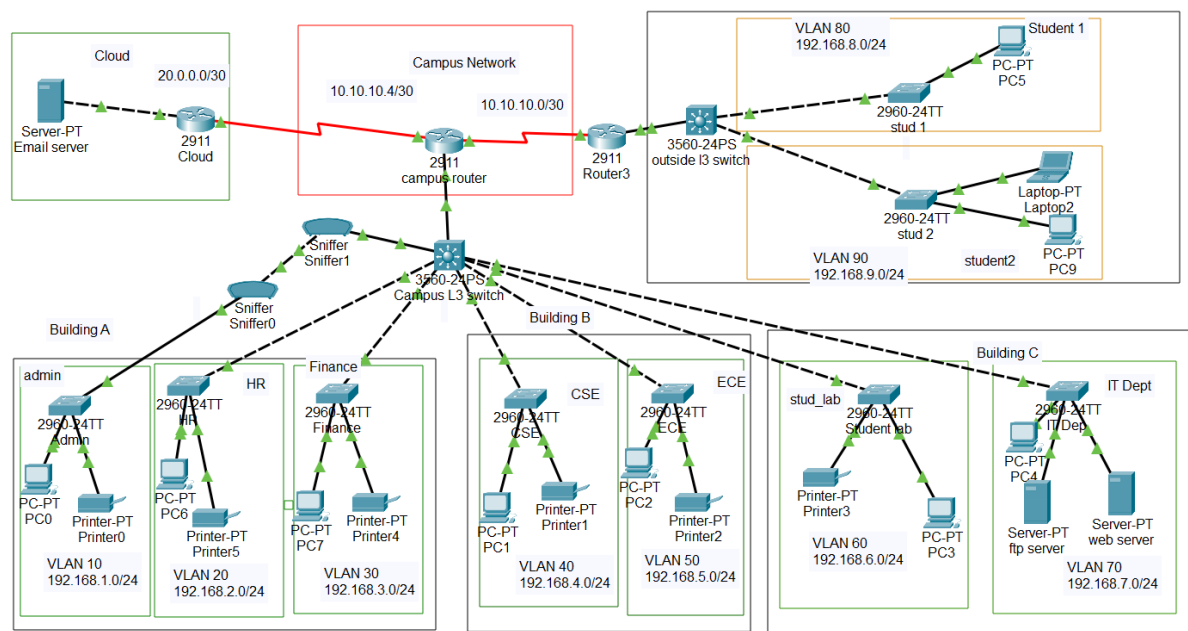
After the network topology is created, the project enters the packet flow analysis phase. Students use Cisco Packet Tracer to configure the IPv4 addresses of all Layer 3 devices in the network topology. They then collect packets from each device using a packet sniffer. They can choose to use the sniffer or other sniffing tools built into Cisco Packet Tracer. By capturing and analyzing packets from different network devices, students gain insight into packet headers, especially looking at changes in Ethernet and IP headers. These observations and analyses allow them to understand how packet-level information is created and modified as it travels through the network. Using data collected from packet analysis, students create a map that shows the path of packets flowing

g from the host to the external network. Diagrams can be created using any flowchart design application. By seeing a visual representation of the packets, students can clearly see the network components and the changes that occur at each step.

The "Packet Flow Visualizer" project has many needs. Students will have a clear understanding of the different models of network design and be familiar with network devices, their role and importance in network development.

They will also develop an understanding of the OSI model and the importance of layers in network communication. In addition, students will acquire the skills to sniff packets, analyze packet headers, and create graphical representations for transmitting complex network flows.

Overall, the "Packet Stream Viewer" project allows students to explore and understand the intricacies of packet flow in a network. The program combines theoretical knowledge with practice, enabling students to master the core skills of network analysis and design, laying a solid foundation for future careers in business networking and IT.



## Steps to Create this Packet flow visualizer:

### 1. Network Topology Creation:

- Identified the devices present within the college network using tools like traceroute or by consulting with the college network administrator.
- Gathered information about the devices, their types, and their interconnections.
- Created a network topology using Cisco Packet Tracer or a similar network simulation tool.
- Designed the network topology to accurately represent the college network and the path from the host devices to the external network.

## **2. Configure IPv4 Addresses:**

- Configured IPv4 addresses on all layer-3 devices (routers) within the network topology.
- Assigned unique IP addresses to each device to enable communication within the network.

## **3. Packet Flow Investigation:**

- Selected a packet sniffing tool, such as the built-in sniffer in Cisco Packet Tracer or an alternative tool.
- Captured packets at each device in the network topology, starting from the host devices and progressing towards the external network.
- Collected a sufficient number of packets for analysis.
- Analysed the captured packets, focusing on the Ethernet and IP headers.
- Noted any changes or modifications occurring in the packet headers as the packets traversed through the network devices.
- Extracted relevant information from the packet headers, such as source and destination addresses, protocols used, and intermediate hops.

## **4. Create Flow Diagram:**

- Used a suitable flowchart creator application to create a flow diagram.
- Represented the path of the packet flow from the host devices to the external network in the flow diagram.
- Included the network devices, their connections, and any transformations occurring at each step.
- Labelled the diagram with relevant information, such as IP addresses, protocols, and changes in the packet headers.

## **5. Analysis and Understanding:**

- Analysed the flow diagram to gain insights into the packet flow within the network.
- Demonstrated a clear understanding of different blocks of network design based on the created topology.
- Showcased familiarity with the OSI model layers and the importance of layering in network communication.
- Comprehended the roles of various devices in the network, distinguishing between routers (L3 devices) and switches (L2 devices).
- Presented findings and insights derived from the packet inspection and header analysis at each node.

By following these steps, I successfully completed the "Packet Flow Visualizer" project, gaining practical knowledge and hands-on experience in network topology creation, packet sniffing, packet header analysis, and visual representation of packet flow.

### **Summary**

The "Packet Flow Visualizer" project aimed to create a visual representation of the packet flow from students' devices to external networks. The project involved creating a network topology using Cisco Packet Tracer, configuring IPv4 addresses on devices, capturing and analyzing packets, and creating a flow diagram to illustrate the packet flow. The project provided practical knowledge in network design, OSI model layers, and the roles of network devices.

Overall, the "Packet Flow Visualizer" project provided valuable hands-on experience in network analysis and design, contributing to a deeper understanding of packet flow within a network and its relationship to network topology and device configurations.