

The OSI Encapsulation Explorer is a tool designed for educational purposes to visualize how data moves through the OSI model and TCP/IP stack. It is designed to show an offline demonstration of encapsulation and decapsulation, compare OSI and TCP/IP layering, as well as generate synthetic PCAP files for analysis. This is a system strictly designed for educational purposes and not to be used to manipulate live traffic.

The key features are the encapsulation simulation which is a step by step visualizations of how layer 7 (application) down to layer 1 (physical). Next is the decapsulation simulation which is the reverse process of the encapsulation simulation that shows layer 1 to layer 7. Next is the PCAP Generation which has two modes, the basic mode which is the synthetic ethernet/IP/UDP packets with placeholder headers. The other mode is the advanced mode which is the realistic ethernet that uses scapy. There will also be a comparison mode which has an ASCII table comparing OSI and TCP/IP models.

The parts of this project that works best is the encapsulation and decapsulation visualization which is the main part of the project. The PCAP generation in both the basic and advanced modes work properly. There is a clear OSI and TCP/IP comparison as well as a robust CLI argument validation.

The next things we want to add would be support for IPV6, TLS headers, and VLAN tags. The ability to export metrics in JSON/CSV for more automated analysis. Extend the visualization with more charts and or web UI as well as integrate it with Docker/CI pipeline for reproducible demo.