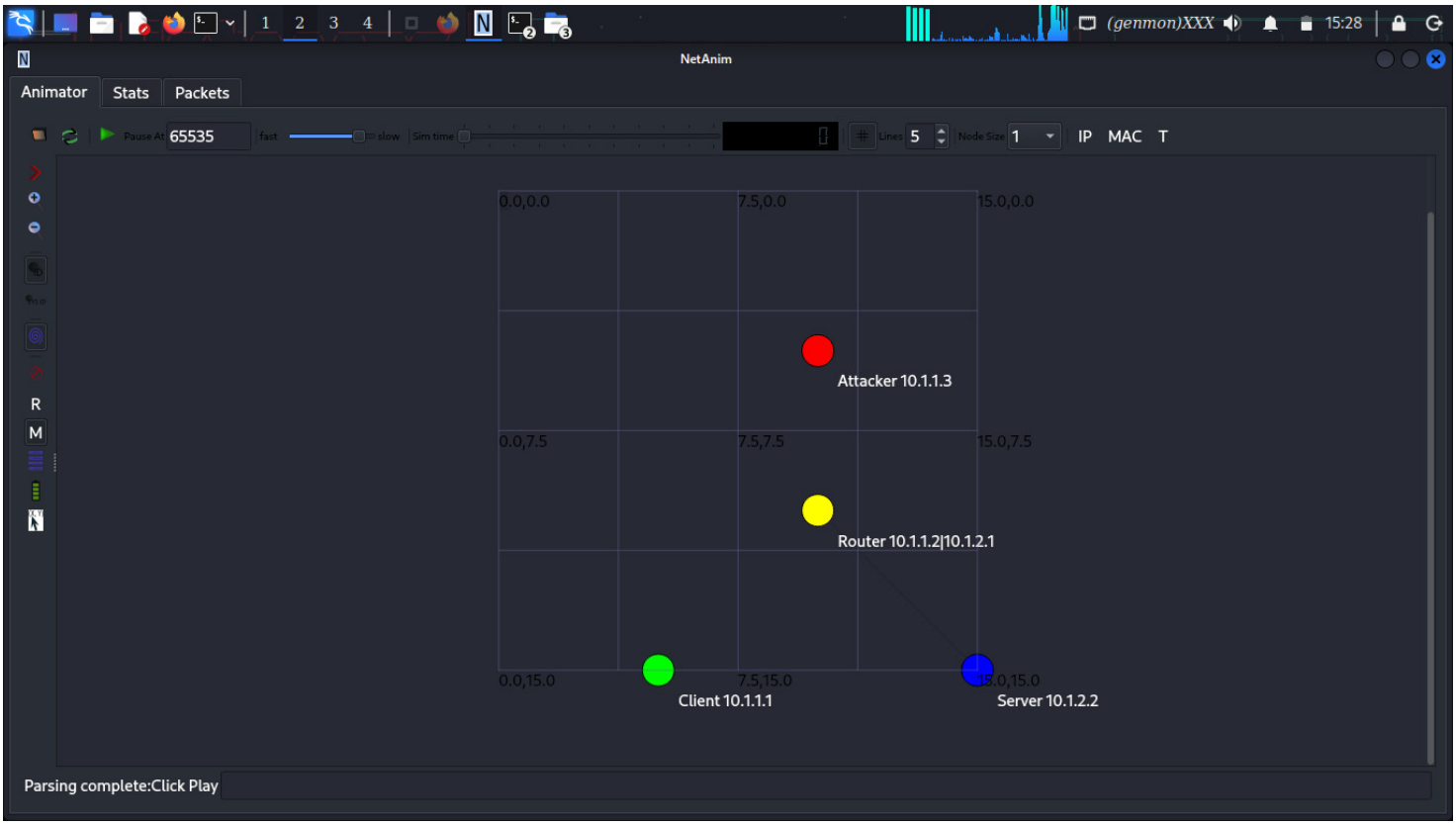
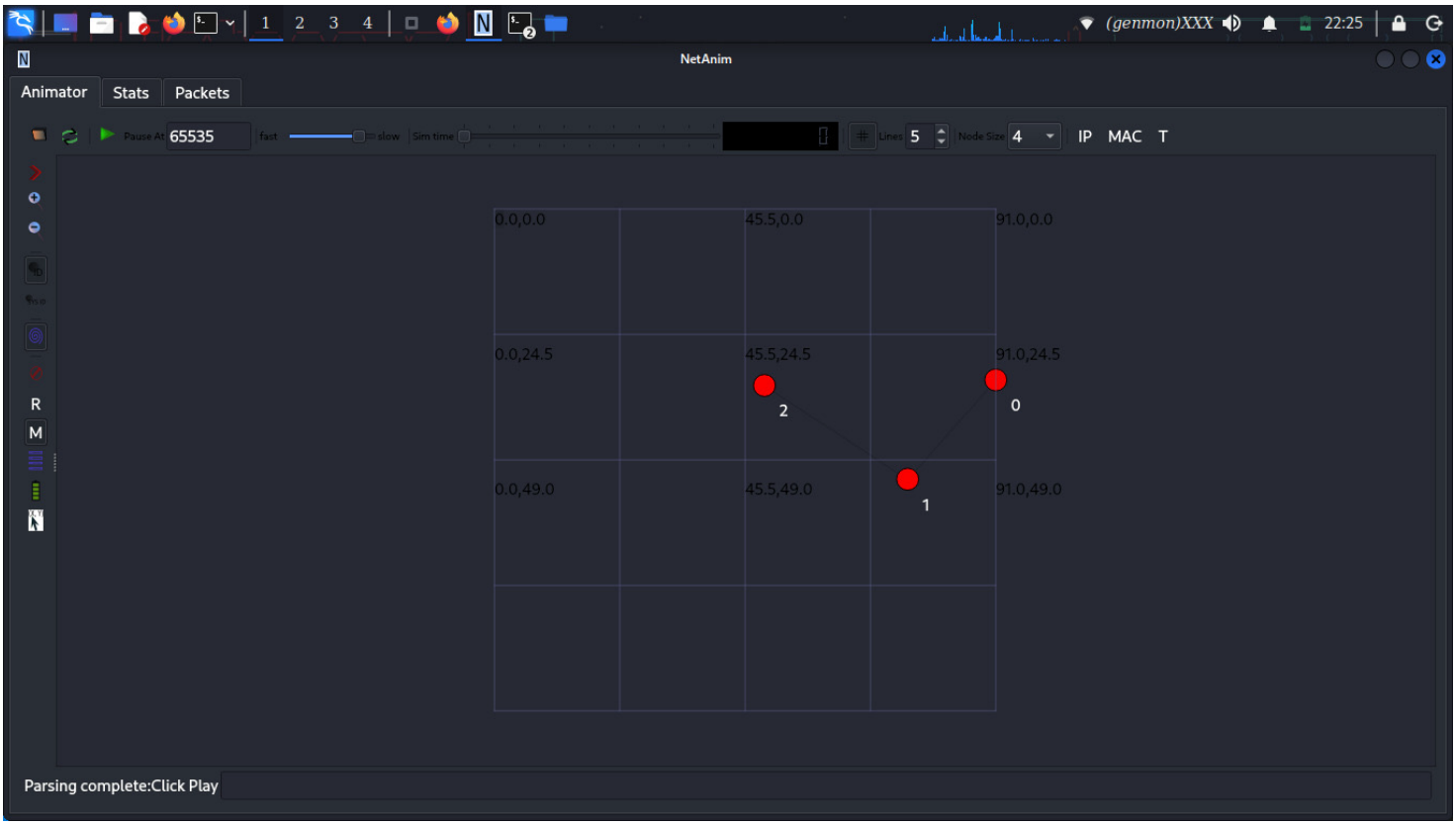
## Exercise 1




The image shows a network simulation visualized using NetAnim, a graphical tool for the NS-3 network simulator. It represents a small network topology designed to study communication and security behavior. The network consists of four main nodes: a client, a router, a server, and an attacker. The client generates legitimate traffic that is forwarded by the router to the server across two different IP subnets. The router acts as a gateway, managing packet forwarding between these networks. In contrast, the attacker node represents a malicious system that sends harmful or abnormal traffic, such as flooding or probing, toward the server. By including both normal and malicious nodes, the simulation allows researchers to observe packet flow, congestion, and potential performance degradation. The visual layout helps in understanding how traffic moves through the network over time and how attacks can affect server availability, routing efficiency, and overall network performance.

## Exercise 2

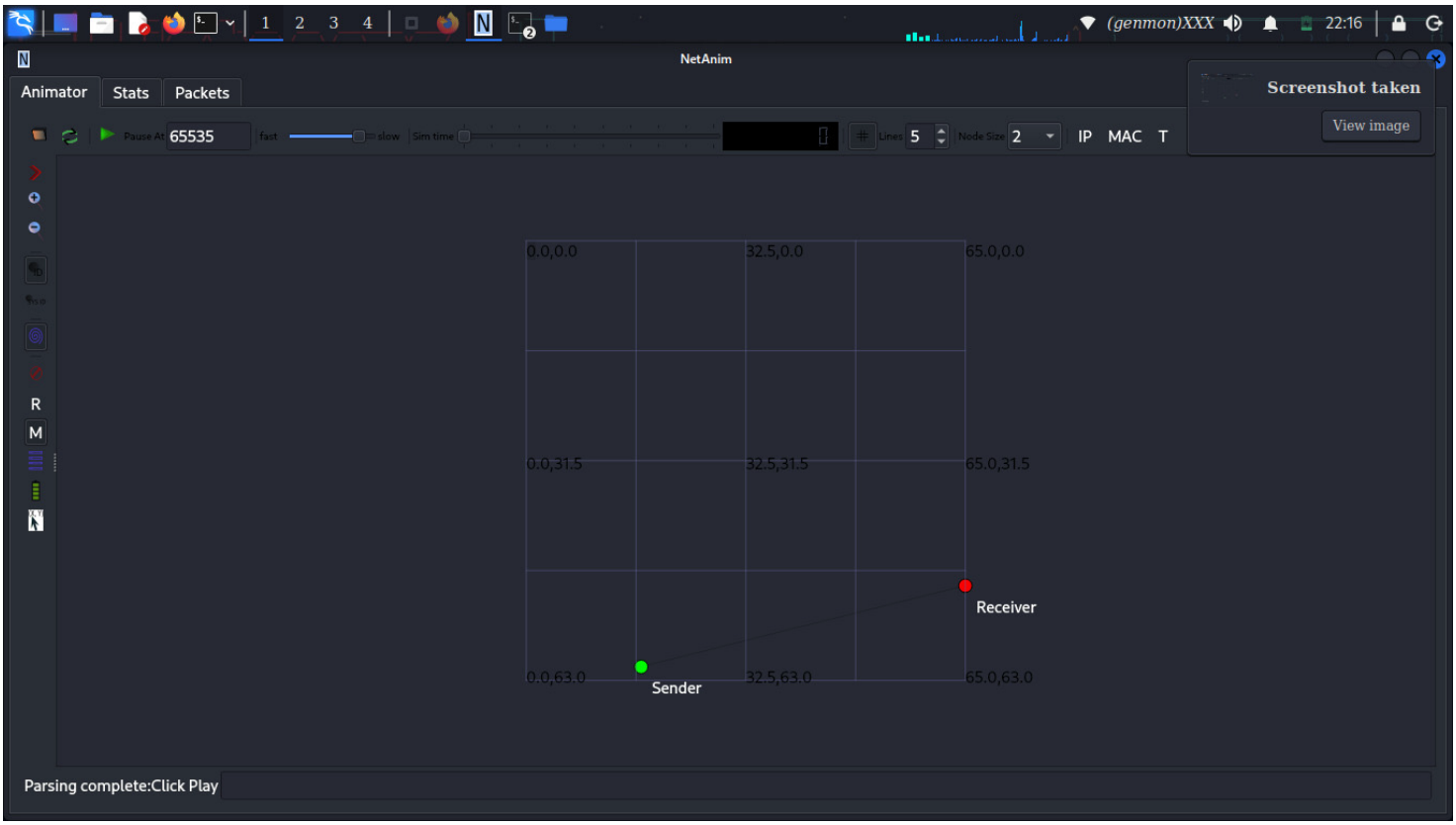



The image shows a NetAnim visualization, a graphical tool used with the NS-3 network simulator to display and analyze network simulations. The grid represents a two-dimensional simulation area where nodes are placed using coordinate values. The red circles labeled 0, 1, and 2 are network nodes, such as computers or routers, positioned at different locations. The faint lines between nodes indicate communication links or packet transmissions occurring during the simulation.

At the top of the interface, playback controls allow the user to start, pause, speed up, or slow down the simulation, making it easier to observe network behavior over time. Tabs like Animator, Stats, and Packets provide different views, enabling analysis of node movement, performance statistics, and packet flow. The coordinate markings help visualize distance and topology structure.

Overall, this visualization helps students and researchers understand how nodes interact, how data travels across a network, and how topology affects performance in a simulated networking environment.

## Exercise 3

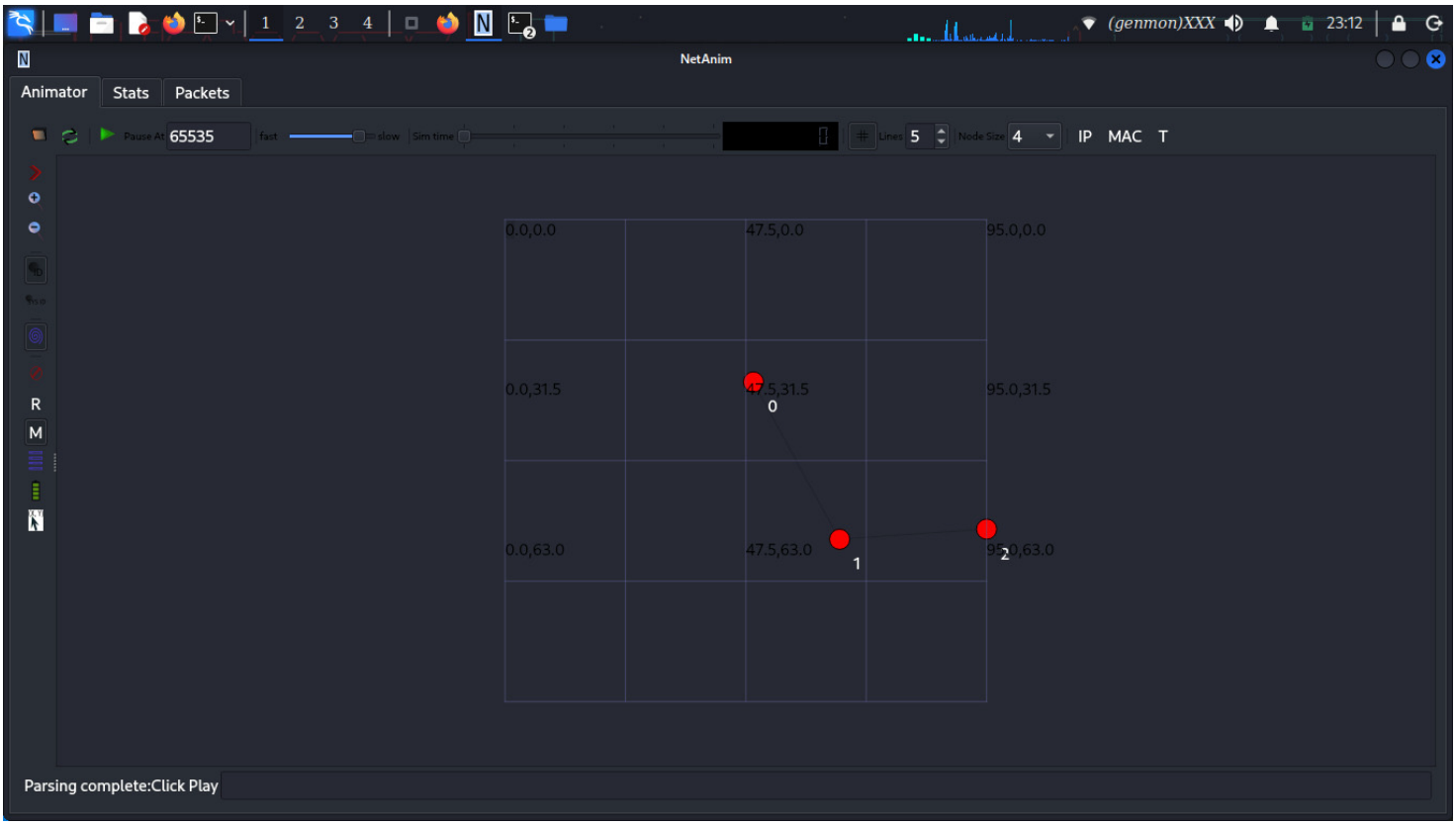



The image presents a NetAnim visualization from the NS-3 network simulator, illustrating a simple point-to-point communication scenario. This simulation area is represented by a grid with coordinate values, defining the spatial layout of the network. Two nodes are shown: a Sender, marked in green, and a Receiver, marked in red. Their positions indicate physical separation, which can influence transmission delay, signal strength, or routing behavior depending on the simulation model.

A thin line between the two nodes represents the communication link, showing the path through which packets are transmitted from the sender to the receiver. The interface at the top includes controls for playing, pausing, and adjusting the simulation speed, allowing detailed observation of packet flow over time. Tabs such as Animator, Stats, and Packets enable deeper analysis of performance metrics and data transmission.

Overall, this visualization helps demonstrate basic network communication concepts, including data flow, topology design, and node interaction in a controlled simulation environment.

## Exercise 4




The image illustrates a NetAnim simulation from the NS-3 network simulator, showing a small multi-node network topology within a defined two-dimensional grid. Three red nodes, labeled 0, 1, and 2, are positioned at different coordinates, representing network devices such as hosts or routers. The grid and coordinate values indicate the physical placement of each node, which is important for analyzing distance-based effects like delay, signal range, or routing efficiency.

Thin lines connecting the nodes represent active communication links or packet exchanges during the simulation. These links demonstrate how data may travel through intermediate nodes rather than directly, highlighting concepts such as multi-hop communication and routing paths. The interface controls at the top allow the user to play, pause, and adjust the simulation speed to observe network behavior over time.

Overall, this visualization helps explain how node placement and topology influence connectivity, packet flow, and performance in a simulated networking environment, making abstract networking concepts easier to understand.

## Exercise 5

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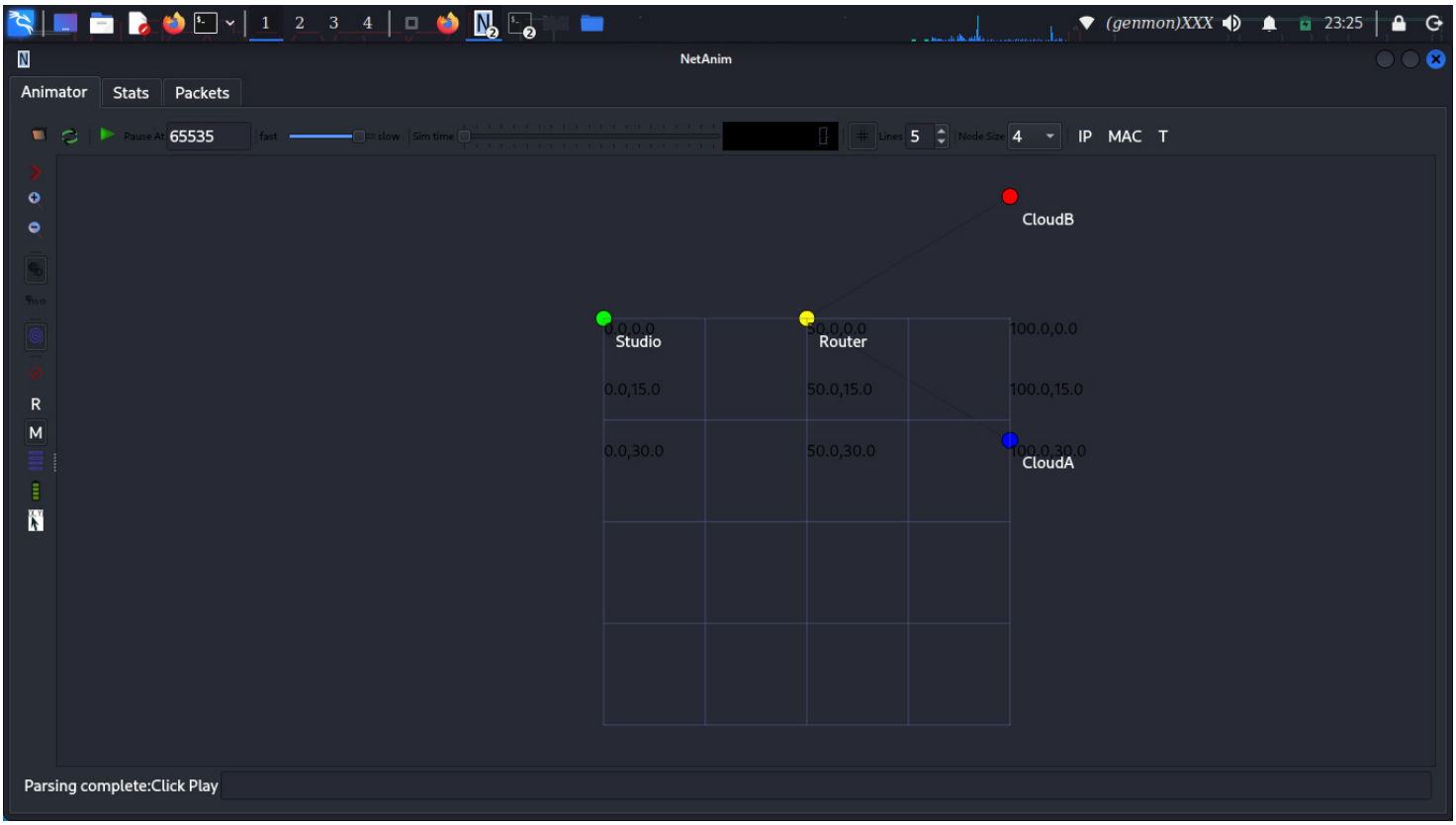


The simulation area is displayed as a grid with coordinate values that define the spatial placement of each node. Four main nodes are visible: Studio, Router, CloudA, and CloudB, each represented with different colors to distinguish their roles.

The Studio node, shown in green, represents a local source such as a media studio, office network, or client system that generates data. This node is directly connected to the Router, displayed in yellow, which acts as the central routing device responsible for forwarding packets to external networks. The router forms the core of the topology, demonstrating how traffic is managed and directed.

On the right side, CloudA (blue) and CloudB (red) represent remote cloud servers or external networks. These nodes are connected to the router through separate links, illustrating how a single local network can communicate with multiple cloud services. The connecting lines indicate active communication paths or logical links used for packet transmission.

Overall, this simulation demonstrates a basic client–router–cloud architecture. It helps visualize routing behavior, network segmentation, and how data flows from a local source through a router to multiple cloud destinations in a simulated environment.

## Exercise 6

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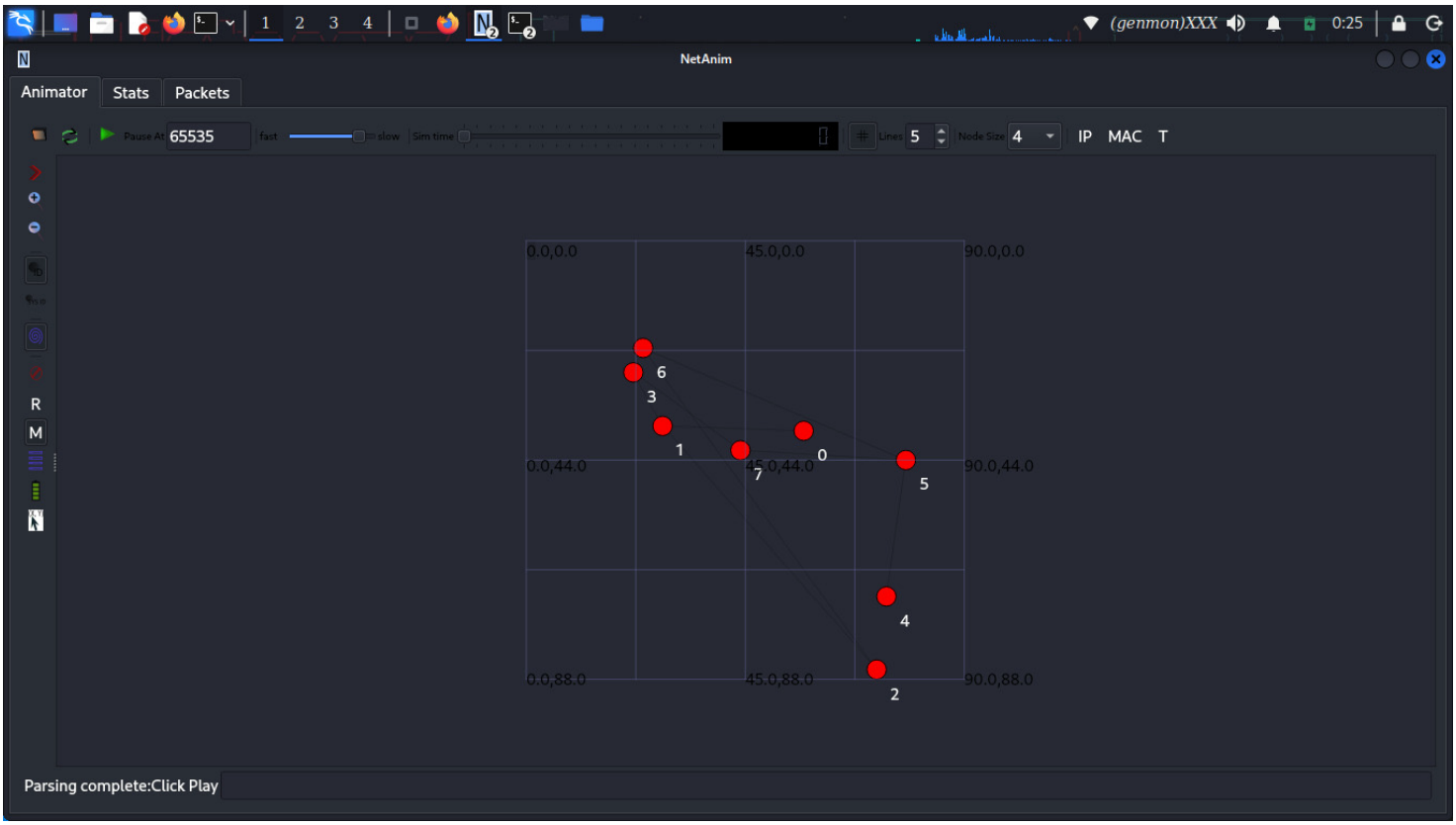


NetAnim visualization produced from an NS-3 network simulation, showing a relatively dense network topology composed of multiple interconnected nodes. The simulation space is organized as a two-dimensional grid with coordinate labels, which define the physical positions of each node. These spatial placements are important because distance can influence delay, transmission range, and routing behavior in network simulations.

Several red nodes are visible, each labeled with a unique identifier such as 0, 1, 2, 3, 4, 5, 6, and 7. These labels represent individual network devices, which may act as hosts, routers, or intermediate relay nodes depending on the simulation configuration. The clustering of some nodes on the left side suggests a local group or subnet, while nodes on the right and bottom are more dispersed, representing a wider or distributed network.

Thin connecting lines between the nodes indicate active communication links or packet transmissions. These links reveal that data does not always travel directly between distant nodes but may pass through multiple intermediate nodes, demonstrating multi-hop routing. This is especially important for studying ad hoc networks, mesh networks, or wireless sensor networks, where routing efficiency and path selection are critical.

The interface at the top provides controls for playing, pausing, and adjusting simulation speed, allowing the user to observe how packets move through the network over time. Overall, this visualization helps users analyze network topology, routing paths, node density, and connectivity. It makes complex networking concepts such as packet forwarding, routing decisions, and topology design easier to understand in a visual and interactive manner.