Cisco NetAcademy: Introduction to Packet Tracer

Lyndon Renaud

104 566 776

Computer Networks

60-367-01

November 25, 2018

I. Introduction

Packet tracer is a network design, simulation, and modelling program which allows the user to experiment with network behaviour and hardware interactions. The program allows you to model complex systems without the need for dedicated equipment, allowing users to "create a network with an almost unlimited number of devices" [1]. Users can practice network configuration and troubleshooting skills through numerous features provided in the tool. The Cisco NetAcademy: Introduction to Packet Tracer course is designed to teach new users how to use Packet Tracer and provide familiarization with the tool. The course has eight chapters which will run the user through the usage and features of Packet Tracer. One can gain access to this course and many other courses by creating an account on the Cisco NetAcademy website, www.netacad.com.

II. In Depth

Packet Tracer is created and maintained by Cisco Systems, Inc. "Cisco developed the Packet Tracer software to help Networking Academy students gain practical networking technology skills in a rapidly changing environment" [1]. The program allows users to "design, build, and configure networks with drag-and-drop devices" [1]. Packet Tracer provides "visualizations for internal processes in real-time, such as dynamic data transfers and packet content expansion" [1]. This program is mainly focused on educating users on network technology. Cisco NetAcad teaches the usage of this program through their online Introduction to Packet Tracer course, along with customized learning scenarios available for usage through the Activity Wizard. While the program can be used for individual learning, it also features "multiuser and peer-to-peer real-time collaboration and competition for dynamic learning" [1]. Packet Tracer also supports "feature expansion through external application using an API" [1].

Obtaining the Packet Tracer Software

The Packet Tracer tool is available for download on the Cisco Networking Academy website. Although the download is free, enrollment in the *Intro to Packet Tracer Course* is a requirement to gain access to the file. The current version of Packet Tracer is 7.2. It is available for Windows and Linux (Ubuntu or Fedora) systems. The steps taken to download and launch Packet Tracer are:

1. Login to Cisco Network Academy "I'm Learning" page.
2. Select Resources from the menu in the upper right portion of your screen.
3. Select Download Packet Tracer.
4. Select the version of Packet Tracer
5. Save the file to disk
6. Launch the Packet Tracer install program
7. After installation, close and restart the web browser
8. Launch Cisco Packet Tracer
9. Login using NetAcad login information
10. Packet Tracer will launch and is ready to be used

Packet Tracer provides three main menus that allow users to:

- Add devices and connect the via cables or wireless
- Select, delete, inspect, label, and group components within the network
- Manage the network

Packet Tracer Logical View

The logical view is selected by clicking the "Logical" button in the top left of the Packet Tracer workspace. This view shows the arrangement of devices on the network and how they communicate with each other. This is the default view for Packet Tracer.

Realtime and Simulation Modes

Packet Tracer can run in two modes: realtime and simulation mode. The default mode is realtime mode. In this mode, time is continuously running as indicated by the clock in the lower right hand corner of the workspace. Packet Tracer responds to actions "immediately as they would in a real device. All network activity, particularly the flow of PDUs across the network, happens in the Packet Tracer model of real time" [2].

In simulation mode, one can pause or move forward and backward in time. This mode provides "direct control over time related to the flow of PDUs" [2]. The network can be seen running step by step or event by event in the Simulation Panel. Custom network scenarios can be setup, such as sending a ping from one device to another. This is useful to check several functions within the network, such as basic connectivity, security, and services such as DNS, HTTP, and FTP. Contents of PDUs can be viewed as OSI model layers, providing a "summary of the addresses and contents of the headers at each layer" [3].

These modes can be selected by using the "Realtime" and "Simulation" buttons in the bottom right of the Packet Tracer workspace.

Packet Tracer Physical View

The physical view in Packet Tracer "applies building and distance factors" [3] in the network design. This view has four containers representing the intercity, city, buildings, and wiring closets. Each container has a child and/or parent container. The intercity container is the parent of city container, the city container is the parent of the building container, and the building container is the parent of the wiring closet container. Child containers work backwards. The wiring closet container is the child of the building container, the building container is a child of the city container, and so on. The physical view shows the "actual layout of the network within a room or building" [3]. One can add "backgrounds, buildings, and wiring closets" [3] to the physical diagram. This provides valuable information on the "flow of network traffic and suitability and placement of equipment" [3]. This view also shows the "wireless coverage areas based on equipment placement within buildings" [3].

Internet of Things Components

The internet of things (IoT) is a "connection of actuators, smart devices, and networked sensors that collect and share data" [3]. IoT devices can be configured to perform an action based on their surrounding environment values. Packet Tracer comes with many of the devices needed for "smart homes, smart cities, and smart factories" [3]. It also allows for the creation of custom IoT devices. These devices can be controlled in two ways:

- Hold down Alt key and click an IoT device to turn it on or off
- Connect remotely to a home gateway or registration server

IoT devices are configured by simply clicking on them. A window will pop up with multiple tabs to select:

- "Specifications: describes the features, usage, local, and remote control of device" [3]
- I/O Config: specify the I/O hardware configuration of device
- "Physical: available modules for power connections" [3]
- "Config: shows display name, serial number, network configuration, and IoT server" [3]
- "Attributes: device attributes such as MTBF, power consumption, and cost" [3]

These devices can be connected to an IoT server in the Config: IoT Server section. Here, one can choose between a home gateway or a remote server. The remote server option requires a server address, username, and password.

Home gateway devices are found in wireless devices section. It can be configured by placing one on the workspace, then clicking on it. A window will pop up with multiple tabs to select:

- "Physical: available modules and power" [3]
- "Config: shows display name and network interfaces to be configured" [3]
- "GUI: shows services to be turned on/off" [3]
- Attributes: device attributes such as "MTBF, power sources, cost, and wattage" [3]

To use a dedicated registration server, one can select the Server device from the End Devices section and place it on the workspace, then click on it. A window will pop up with multiple tabs to select. In the "Services" tab under the "IoT" section, the registration server can be turned on by simply clicking the "On" radial button. To access the remote server via web browser, the IP address of the server can be entered in the URL box. A login will have to be created if it is the first time accessing the registration server. By configuring IoT devices with the registration server and a certain user login, the devices can be controlled through the registration server web page after logging in.

Environment Controls

Each container in the physical workspace has their own set of environment values. "There are twenty four default environment elements such as rain, wind speed, temperature, and sunlight" [3]. Many devices can "affect or respond to the environment in some way" [3]. If no devices are configured to affect the environment, then environment values will be "looped on a 24-hour cycle" [3]. Different containers may have "different levels of insulation" [3] and "different values of transference" [3]. "The transference values determine the rate that the child container converges with the parent container and works the same way for all environment types" [3].

Time inside a container is represented in thirty minute increments. For every one second in real time, thirty minutes passes in container time. Container timers go from "0 (midnight) to 11:59" [3]. Each container has its own keyframe graph. This graph "shows the value of environmental elements at any given point in time throughout the day" [3]. Environmental elements within a container can be modified by clicking the "Environmental" button in the top right of the physical view workspace. This will bring up an Environments window. The container which will have its environmental values changed can be selected by using the "Location" drop down menu. After selecting a container, clicking the "Edit" button beside the container name will show a keyframe graph for the environment elements in the container. By selecting the advanced tab and modifying the required environmental conditions, "the modified values will be reflected immediately in the keyframe graph" [3]. Environmental values can also be modified by dragging the keyframes in the keyframe graph.

III. My Experience with Cisco NetAcademy and Packet Tracer

The Cisco NetAcademy: Introduction to Packet Tracer course was very thorough in explaining the features and usage of Packet Tracer. The chapters of the course are ordered in a way that teaches users basic Packet Tracer usage and incrementally grows in complexity by chapter. It is very helpful and fun to design networks by incorporating knowledge learned in previous chapters along with information learned in later chapters. Multiple Packet Tracer video tutorials are provided with each chapter. These videos were a great reference for me when I could not figure out how to use Packet Tracer properly. My only gripe with these videos is that they are made in an older version of Packet Tracer using a different UI. This made it hard to find buttons the lecturer was using since the buttons in Packet Tracer 7.2 have been redesigned. The chapter that interested me the most was chapter 3, the "Simulation Mode" chapter. It was great being able to connect information that I learned in the Computer Networks course with features in Packet Tracer such as inspecting PDU contents. A few months ago the PDU content would mean nothing to me, but with the new knowledge I've learned in Computer Networks, I can interpret PDU contents into something meaningful and useful for troubleshooting networks.

Along with the videos provided in the course, there are also labs and sample packet tracer files to go with the lab assignments. These labs provided step by step instructions on designing the type of network that is discussed in the lab's chapter. The labs helped me learn a lot about the usage of Packet Tracer functions and features since they are the most hands on part of the course. In addition to the chapters, labs, and videos, the Introduction to Packet Tracer course contains two quizzes which must be completed. These quizzes are fairly easy as long as one has studied the course content well.

Overall, the Introduction to Packet Tracer course was very useful for applying concepts that I learned in Computer Networks and teaching me new things such as IoT and the physical network view. I would recommend this course to other students in Computer Networks as it helps to gain a deeper understanding of concepts taught in Computer Networks. In addition to that, it also teaches new concepts that are built upon networking concepts.

IV. REFERENCES

[1] Netacad.com. (2018). *Download Packet Tracer | Cisco NetAcad*. [online] Available at: https://www.netacad.com/courses/packet-tracer-download/?p_auth=h6jOI2lZ&p_p_auth=iJXrHgDA&p_p_id=resendscreenname_WAR [Accessed 17 Nov. 2018].

[2] Dill.zjtcm.net. (2018). *Operating Modes*. [online] Available at: http://dill.zjtcm.net/pthelp/operatingModes.htm [Accessed 25 Nov. 2018].

[3] 373583482.netacad.com. (2018). *Introduction to Packet Tracer*. [online] Available at: https://373583482.netacad.com/courses/709875 [Accessed 25 Nov. 2018].