NATIONAL UNIVERSITY OF COMPUTER & EMERGING SCIENCE

Computer Networks Lab (CL307)

Lab Session 05

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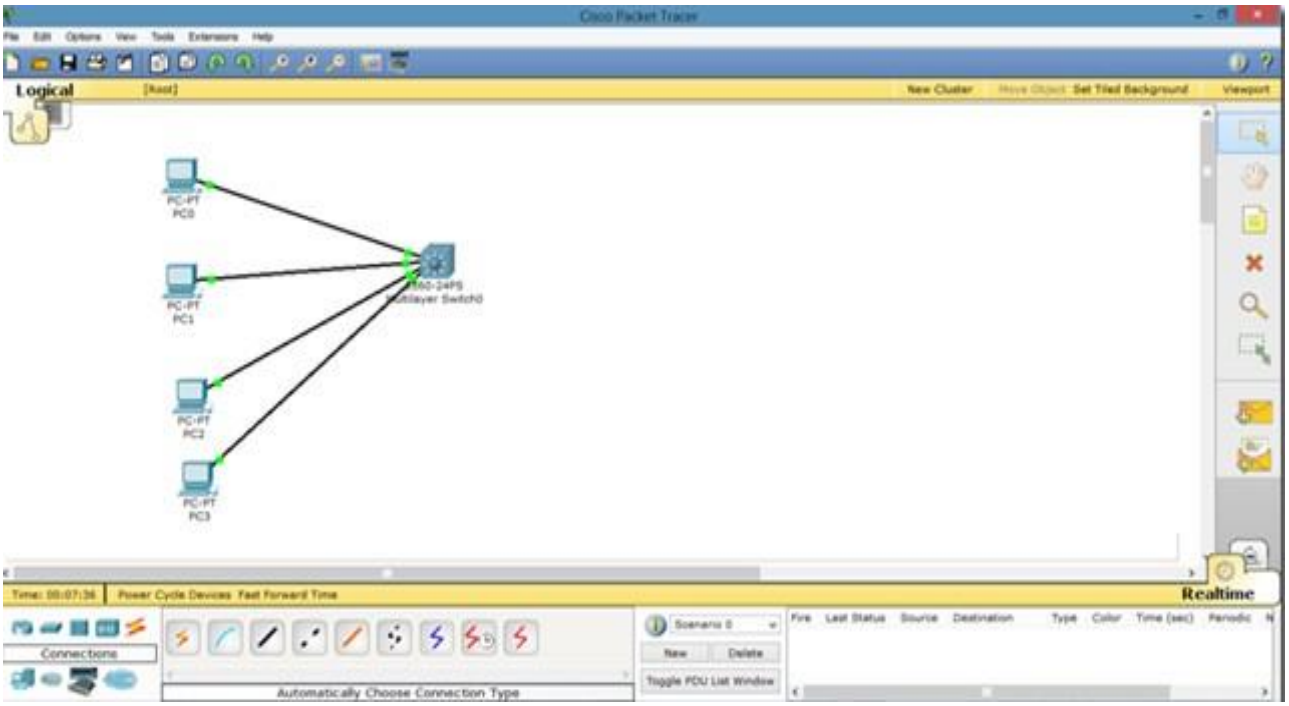
Application Layer Protocol

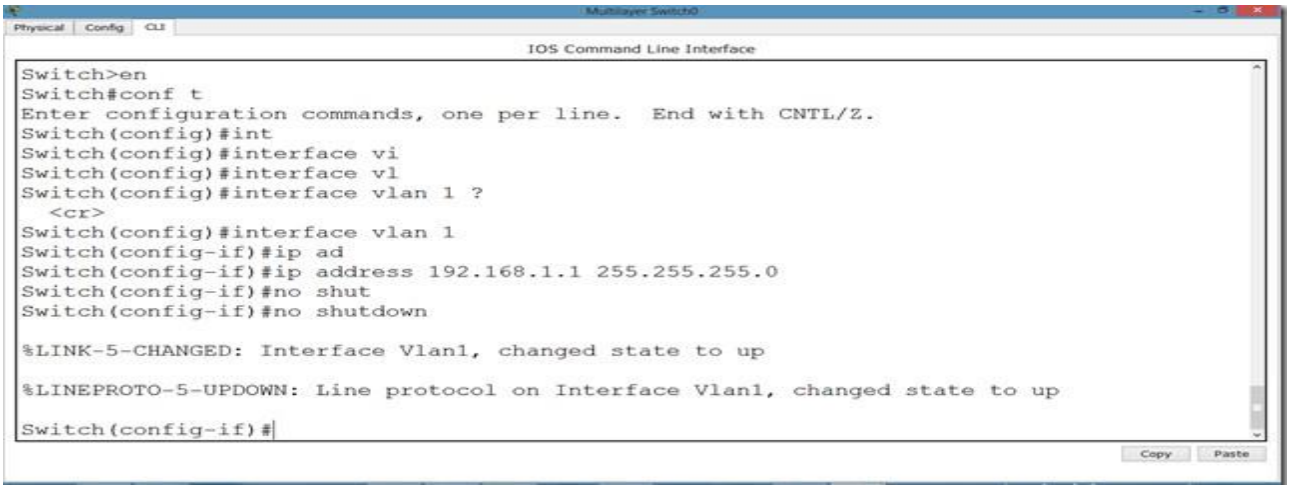
TELNET

A terminal emulation program for TCP/IP networks such as the Internet. The Telnet program runs on your computer and connects your PC to a server on the network. You can then enter commands through the Telnet program and they will be executed as if you were entering them directly on the server console. This enables you to control the server and communicate with other servers on the network. To start a Telnet session, you must log in to a server by entering a valid username and password. Telnet is a common way to remotely control Web servers. To telnet means to establish a connection with the Telnet protocol, either with command line client or with a programmatic interface.

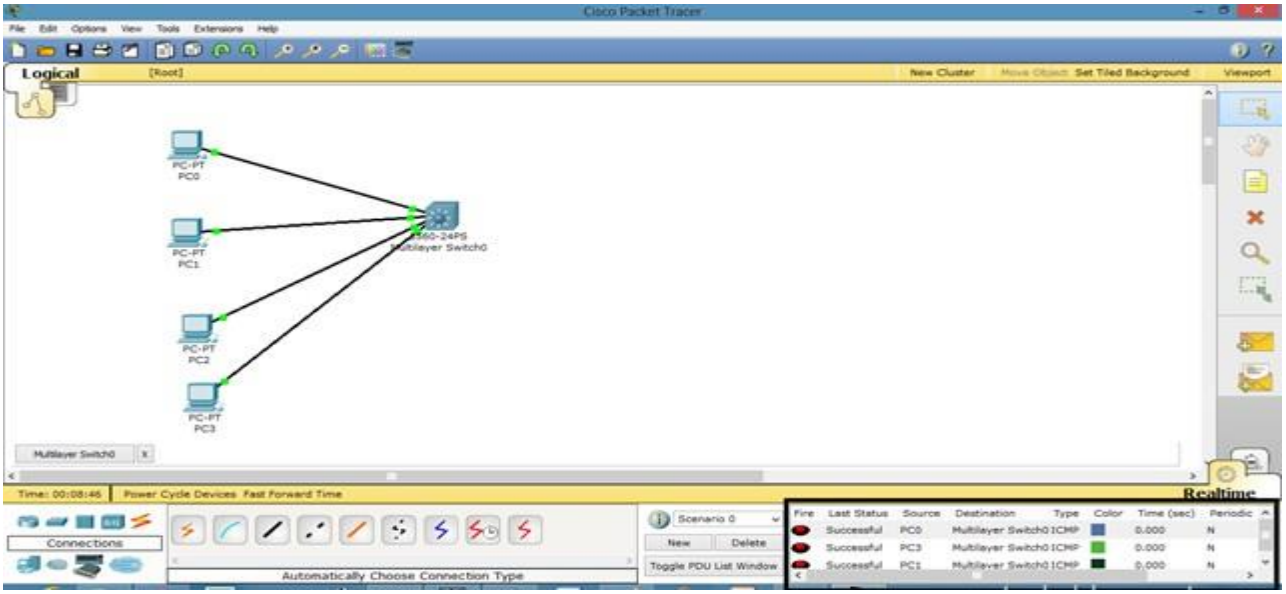
Let us apply Telnet on packet tracer.



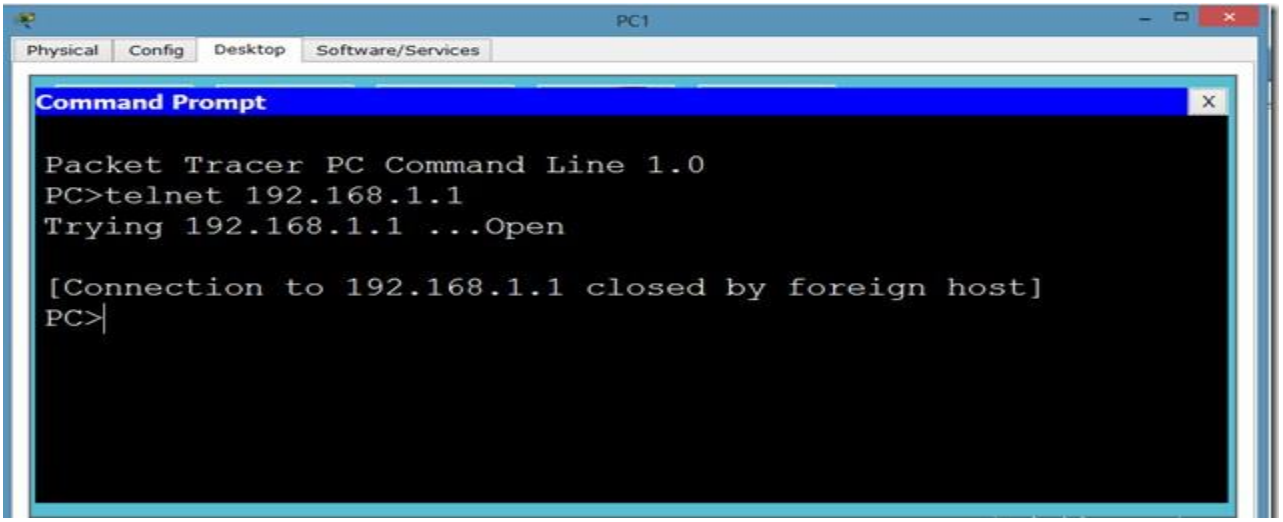
Take the topology as in the above diagram. Set IPs on the PCs. As, by default, all PCs are in vlan 1. We will create a virtual interface on switch with vlan 1 as follows.



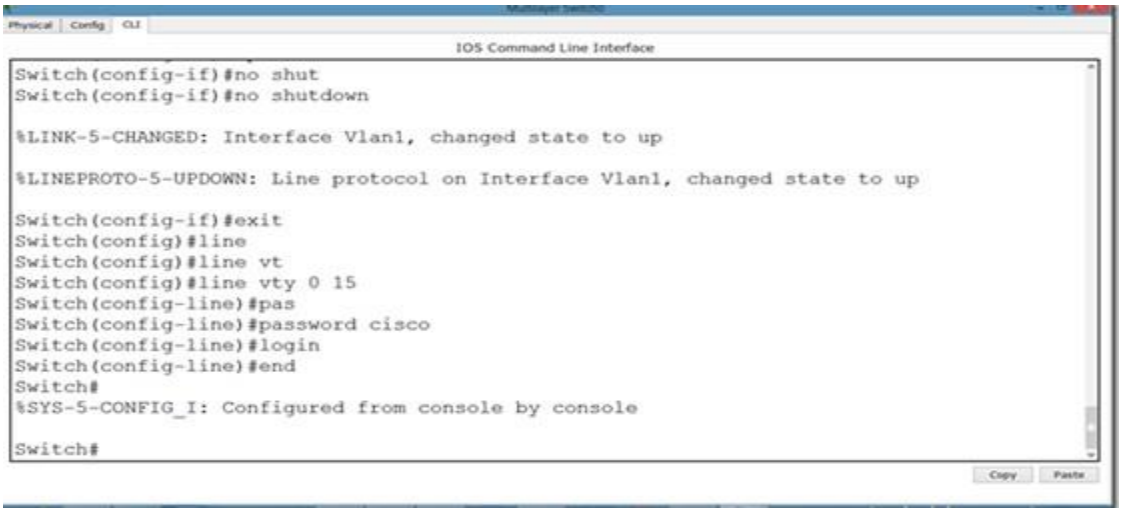
Now, we can ping to switch by our hosts because hosts are in vlan 1 and switch also has a vlan 1 interface.



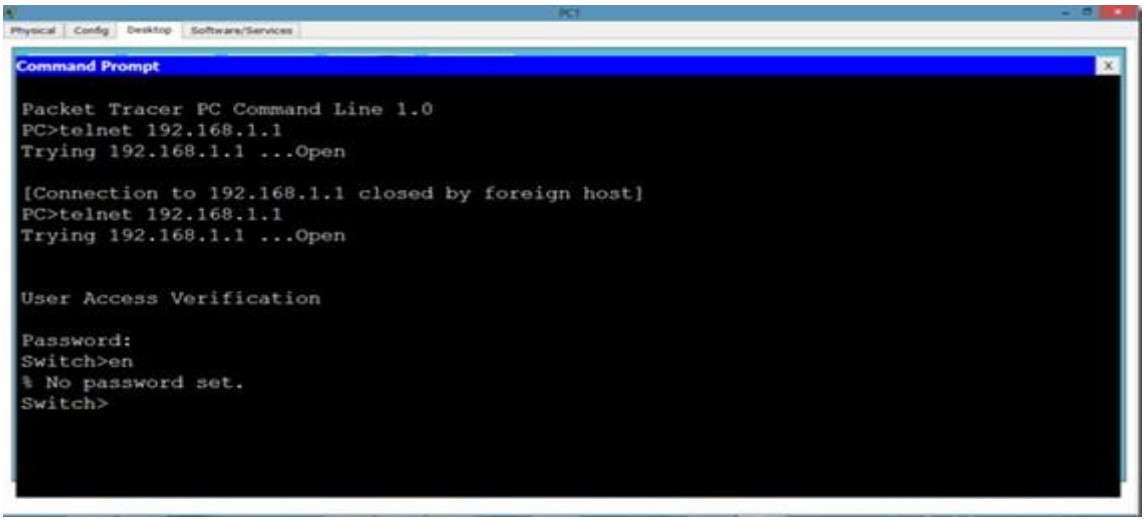
Now, try to telnet the switch from our PC, it refuses because we have not applied authentication on the switch yet.



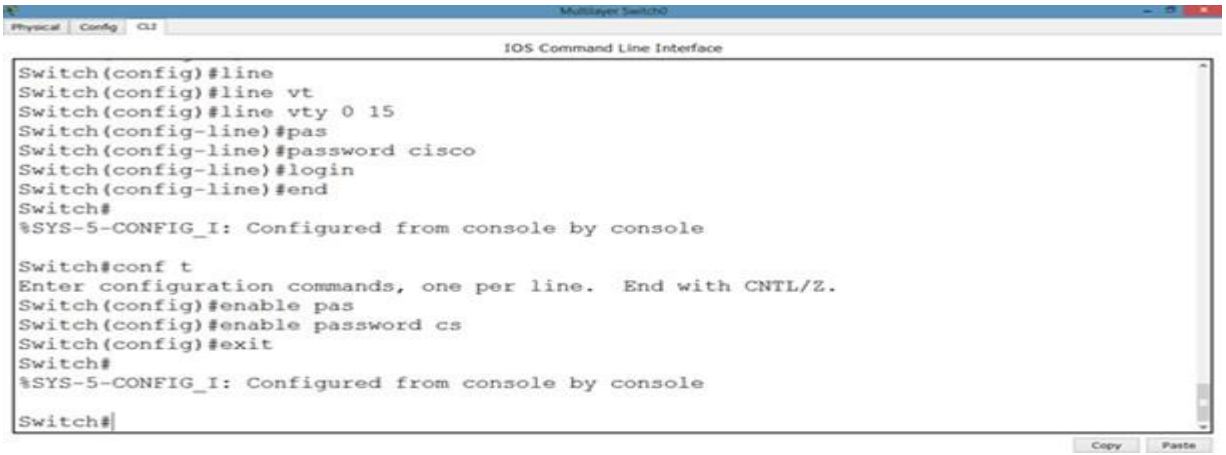
So, let's apply line authentication on the switch. The system supports 20 virtual tty (vty) lines for Telnet, Secure Shell Server (SSH) and FTP services. Each Telnet, SSH, or FTP session requires one vty line. You can add security to your system by configuring the software to validate login requests.



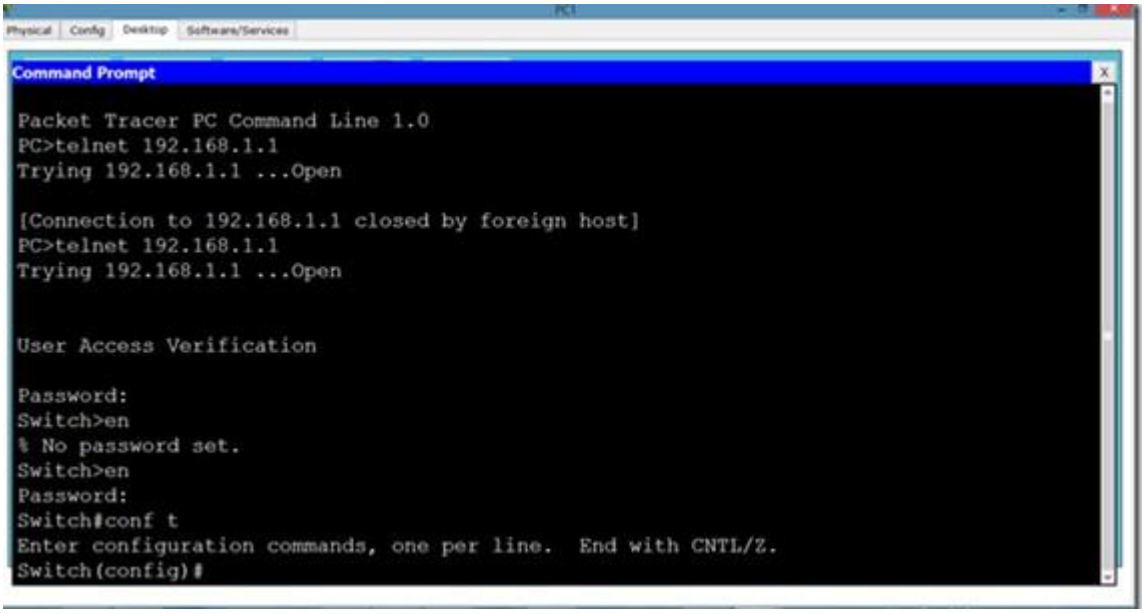
Now, we can easily telnet. But it does not let us go in the switch enabled mode because we have not set the password on the switch yet.



Let's apply password on the switch enabled mode.

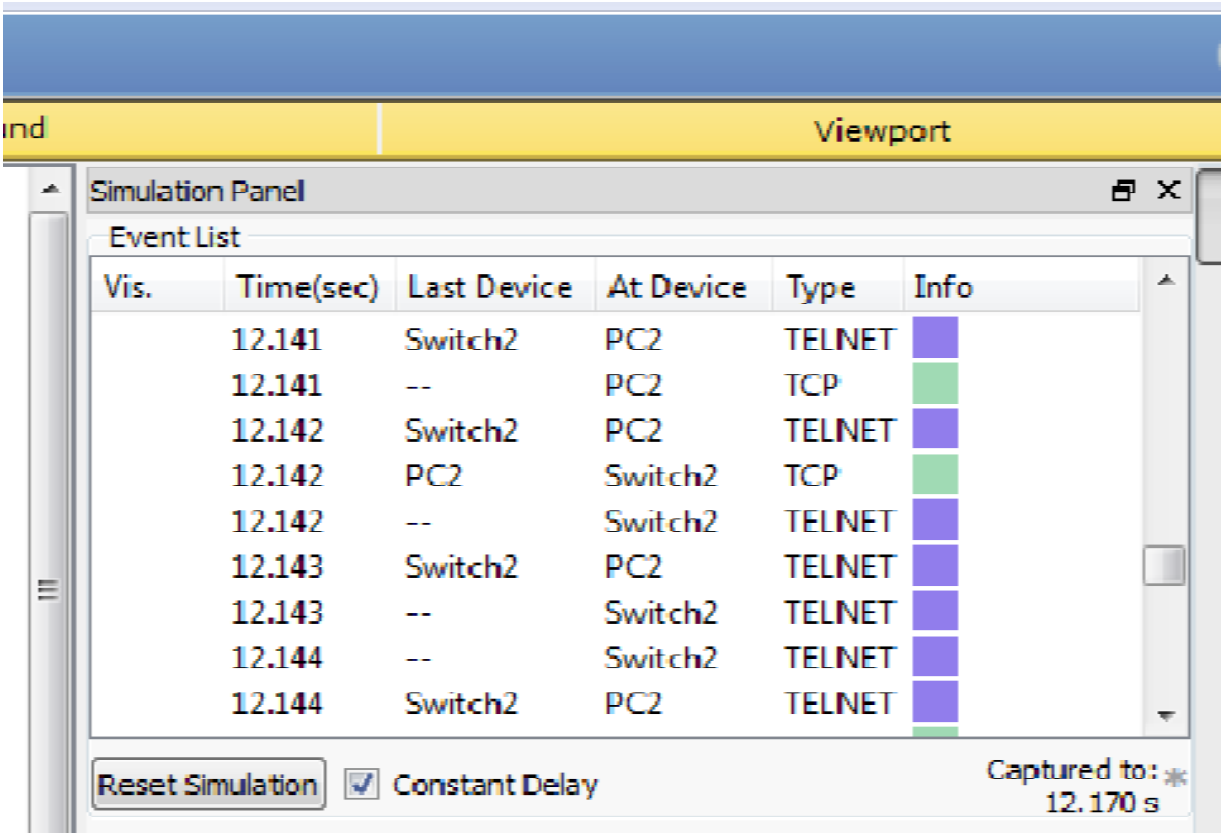


Now, we can go inside Switch configuration mode from our pc.



SIMULATION

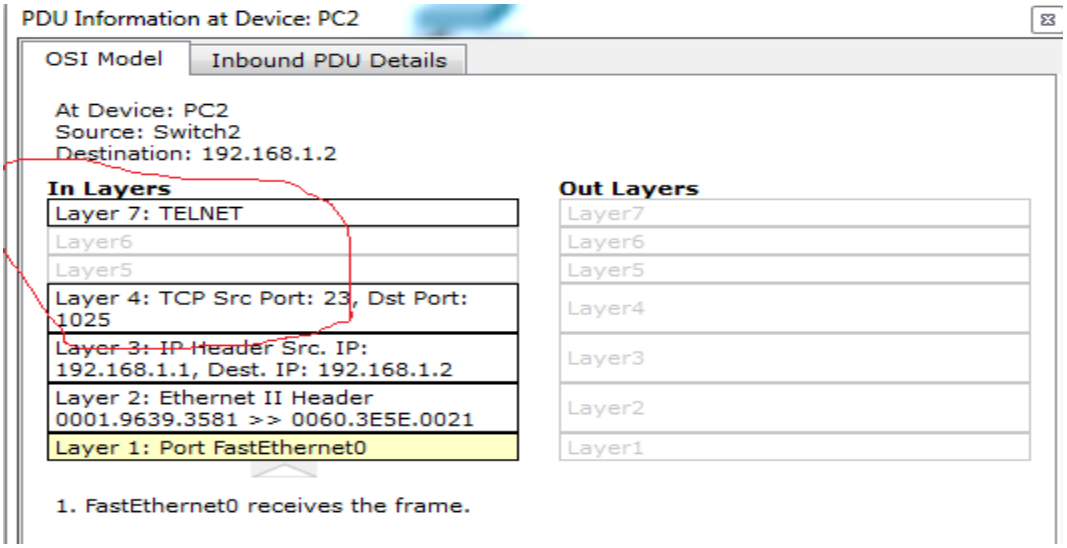
a) **Now click on simulation icon in the right bottom of packet Tracer.**
b) **Now click on auto capture /play icon for packet capturing.**
c) **Click on the PC and go to Desktop →Command Prompt then Telnet 192.168.1.1**



Now click on the TELNET packet show its header.

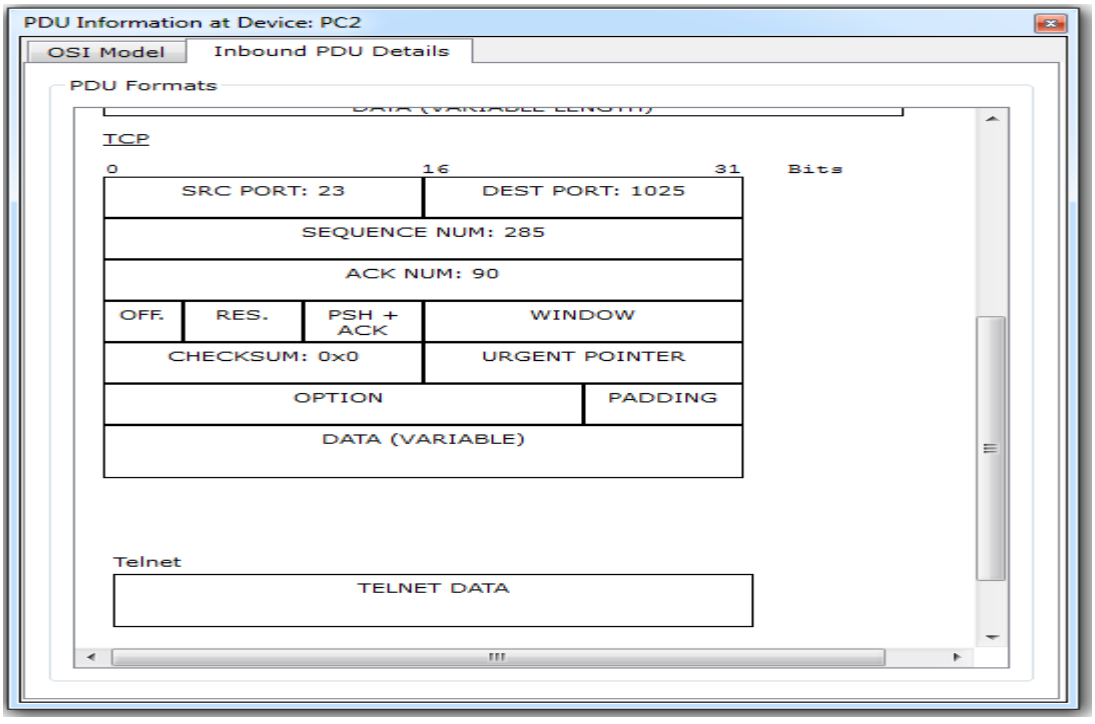
a) Shows OSI layers involved in transmission.

The popped up window (below) will enable you to trace the content of the message through the OSI layer and what changes will occur at each layer (use next and previous buttons to trace each layer content).



b) Show Inbound PDU Details.

The inbound tab shows the content of the message (header format) during the receiving process.

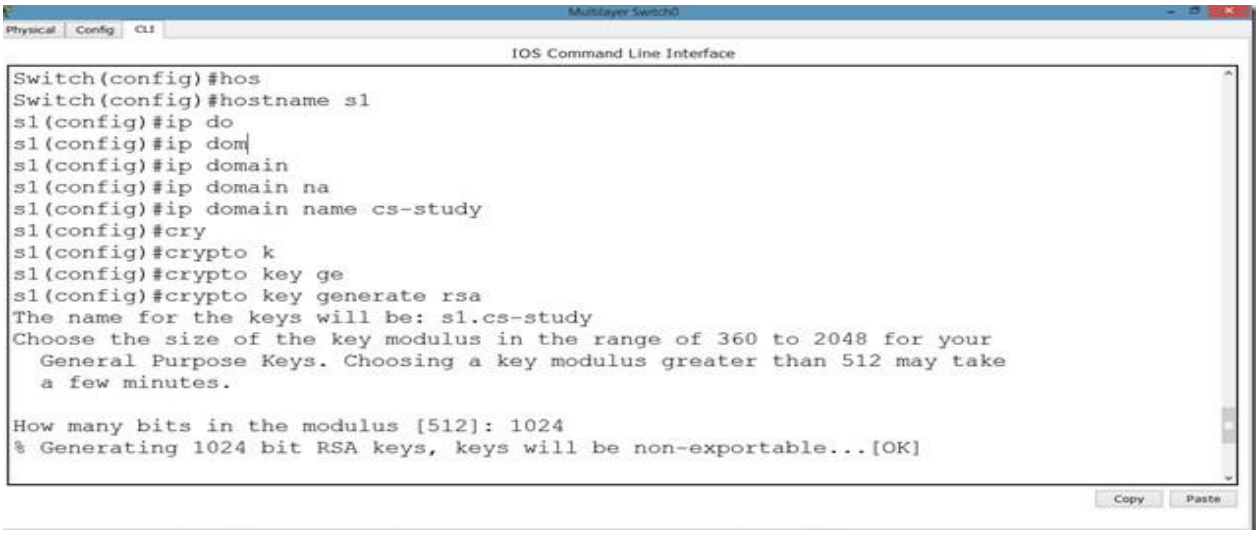


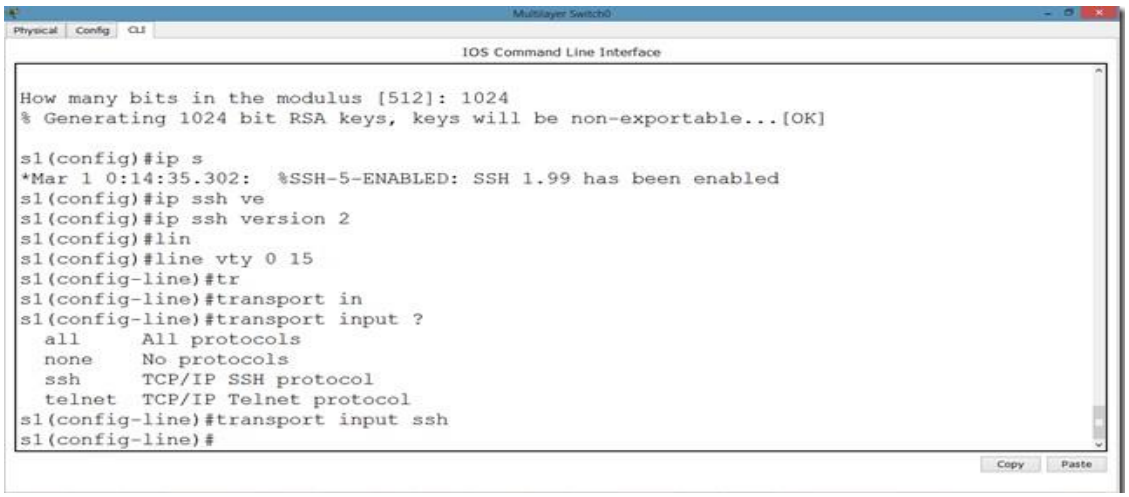
SSH

Secure Shell (SSH) is a cryptographic network protocol for secure data communication, remote shell services or command execution and other secure network services between two networked computers that connects, via a secure channel over an insecure network, a server and a client (running SSH server and SSH client programs, respectively). It was designed as a replacement for Telnet and other insecure remote shell protocols such as the Berkeley rsh and rexec protocols, which send information, notably passwords, in plaintext, rendering them susceptible to interception and disclosure using packet analysis. The encryption used by SSH is intended to provide confidentiality and integrity of data over an unsecured network, such as the Internet.

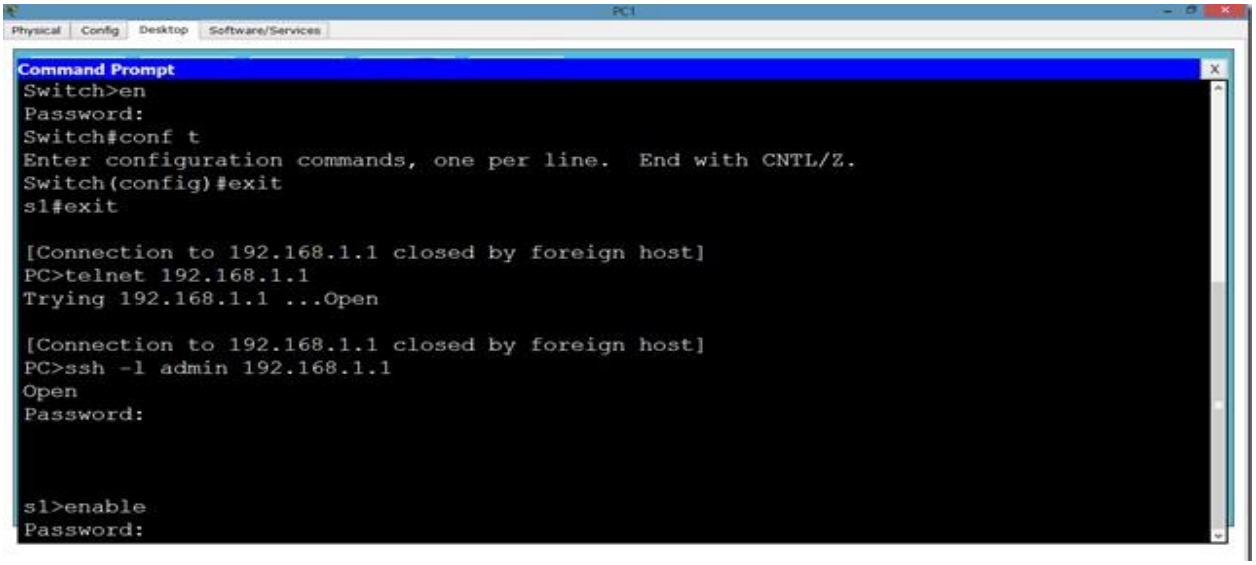
A network protocol that ensures a high-level encryption, allowing for the data transmitted over insecure networks, such as the Internet, to be kept intact and integrate. SSH and SSH Telnet, in particular, work for establishing a secure communication between two network-connected computers as an alternative to remote shells, such as TELNET, that send sensitive information in an insecure environment. In contrast to other remote access protocols, such as FTP, SSH Telnet ensures higher level of connection security between distant machines but at the same time represents a potential threat to the server stability. Thus, SSH access is considered a special privilege by hosting providers and is often assigned to users only per request.

So, now let us apply SSH on the switch.



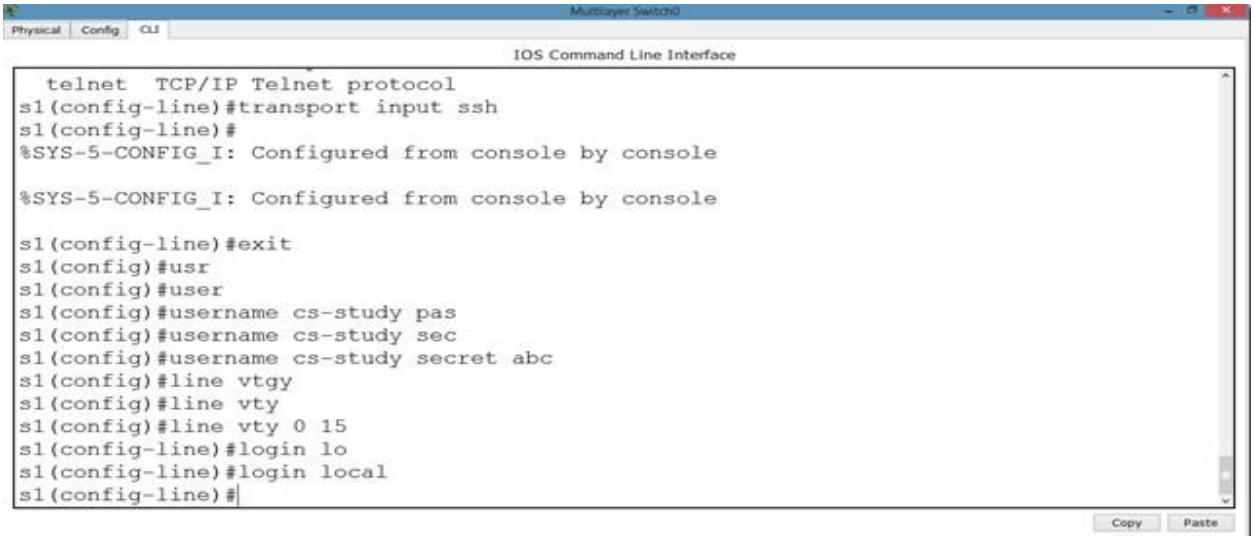


Now, we try to telnet it but it is refused because ssh has over ruled telnet. So, we will use SSH protocol on it. By default, username is admin.

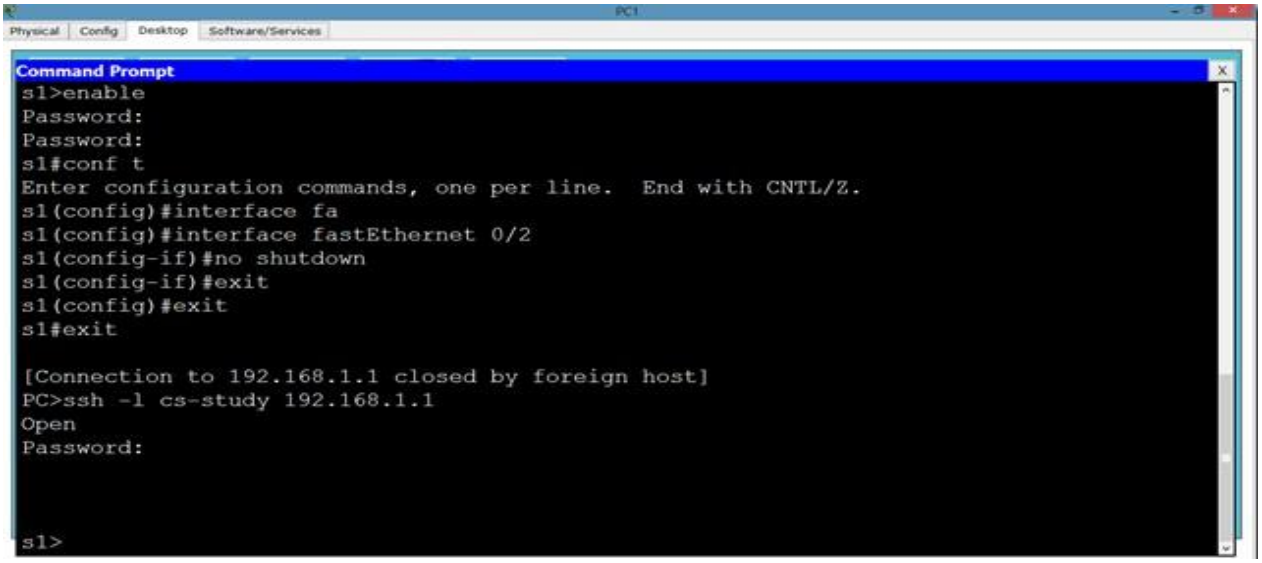


And we can apply any sort of configuration on our switch from out pc.

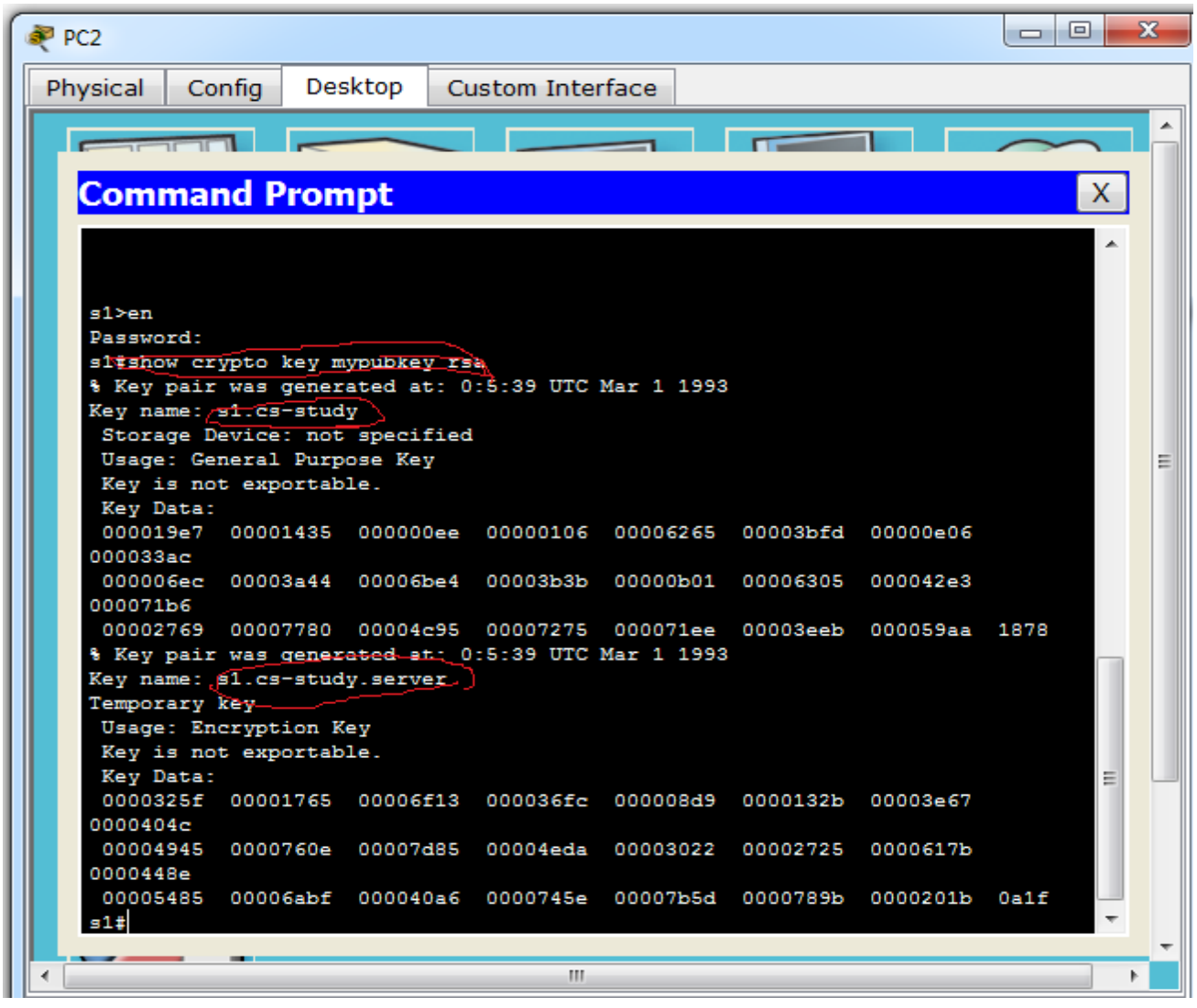
Now, if we want to change the username from admin to something else, we will do it as follows.



And from our pc as follows.



You can also see the generated keys in SSH as shown below.

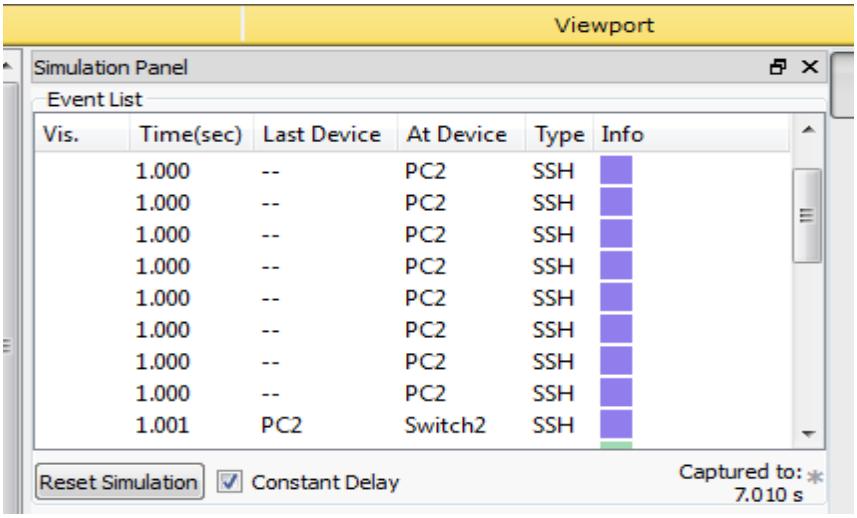


SIMULATION:

a) Now click on simulation icon in the right bottom of packet Tracer.

b) Now click on auto capture /play icon for packet capturing.

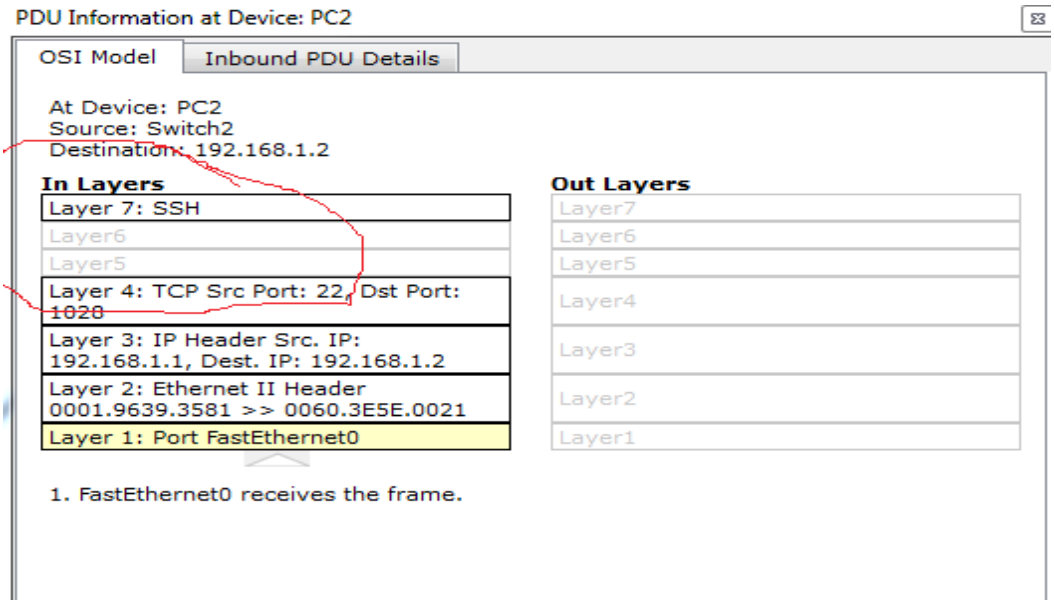
c) Click on the PC and go to Desktop →Command Prompt then ssh -l admin 192.168.1.1



Now click on the SSH packet show its header.

b) Shows OSI layers involved in transmission.

The popped up window (below) will enable you to trace the content of the message through the OSI layer and what changes will occur at each layer (use next and previous buttons to trace each layer content).



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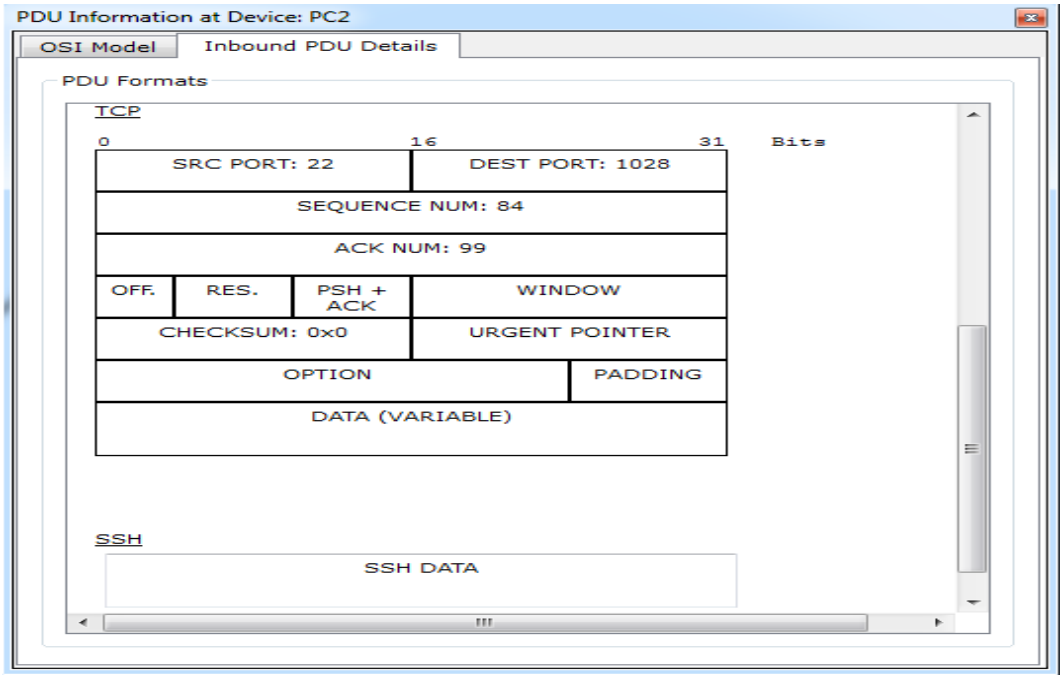


Domain Name System

The Domain Name System (DNS) is a hierarchical distributed naming system for computers, services, or any resource connected to the Internet or a private network. It associates various information with domain names assigned to each of the participating entities. Most prominently, it translates easily memorized domain names to the numerical IP addresses needed for the purpose of locating computer services and devices worldwide. The Domain Name System is an essential component of the functionality of the Internet.

An often-used analogy to explain the Domain Name System is that it serves as the phone book for the Internet by translating human-friendly computer hostnames into IP addresses. For example, the domain name www.example.com translates to the addresses 93.184.216.119 (IPv4) and 2606:2800:220:6d: 26bf:1447:1097:aa7 (IPv6). Unlike a phone book, the DNS can be quickly updated, allowing a service's location on the network to change without affecting the end users, who continue to use the same host name. Users take advantage of this when they use meaningful Uniform Resource Locators (URLs), and e-mail addresses without having to know how the computer actually locates the services.

The Domain Name System distributes the responsibility of assigning domain names and mapping those names to IP addresses by designating authoritative name servers for each domain. Authoritative name servers are assigned to be responsible for their supported domains, and may delegate authority over sub domains to other name servers. This mechanism provides distributed and fault tolerant service and was designed to avoid the need for a single central database. Some common DNS record types are:

A record:

The A record is one of the most commonly used record types in any DNS system. An A record is actually an address record, which means it maps a fully qualified domain name (FQDN) to an IP address. For example, an A record is used to point a domain name, such as "google.com", to the IP address of Google's hosting server, "74.125.224.147". This allows the end user to type in a human- readable domain, while the computer can continue working with numbers. The name in the A record is the host for your domain, and the domain name is automatically attached to your name.

CNAME record:

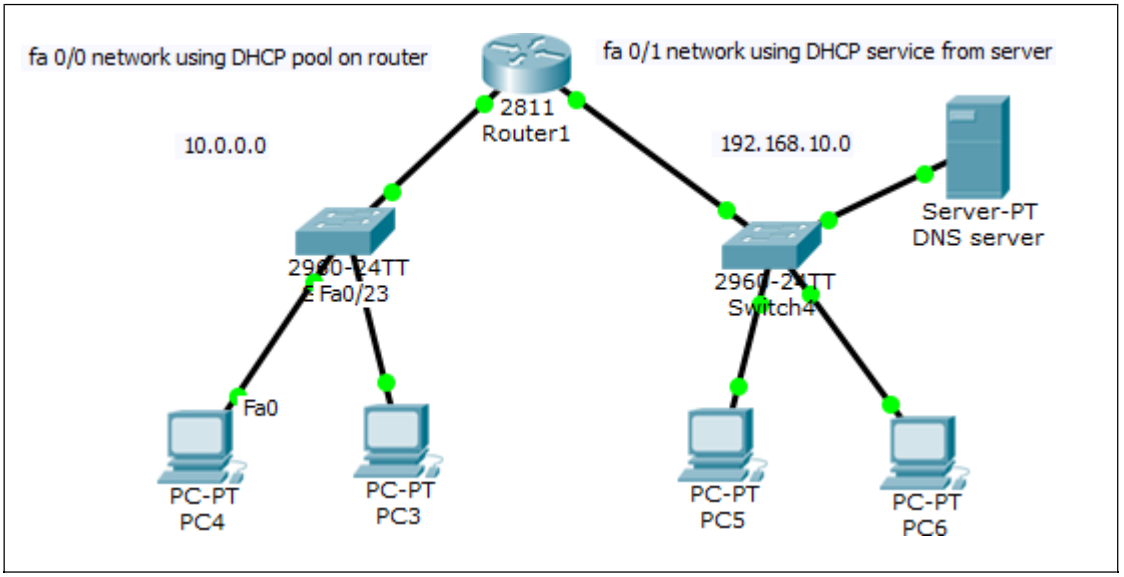
Canonical name records, or CNAME records, are often called alias records because they map an alias to the canonical name. When a name server finds a CNAME record, it replaces the name with the canonical name and looks up the new name. This allows pointing multiple systems to one IP without assigning an A record to each host name. It means that if you decide to change your IP address, you will only have to change one A record.

NS record:

An NS record identifies which DNS server is authoritative for a particular zone. The "NS" stands for "name server". NS records that do not exist on the apex of a domain are primarily used for splitting up the management of records on sub-domains.

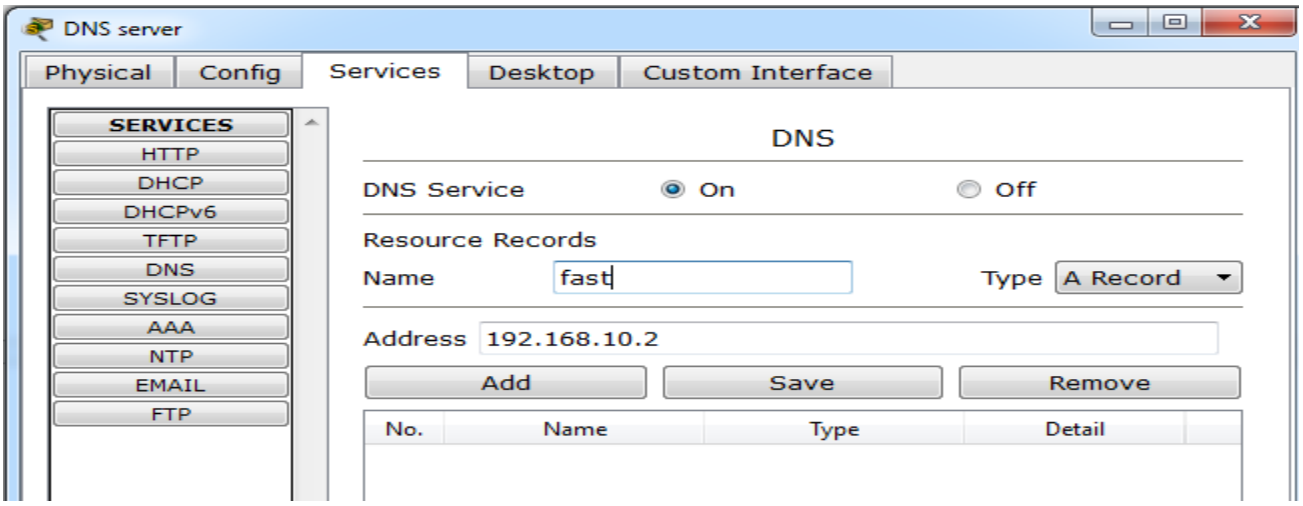
SOA record:

The SOA or Start of Authority record for a domain stores information about the name of the server that supplies the data for the zone, the administrator of the zone and the current version of the data. It also provides information about the number of seconds a secondary name server should wait before checking for updates or before retrying a failed zone transfer.

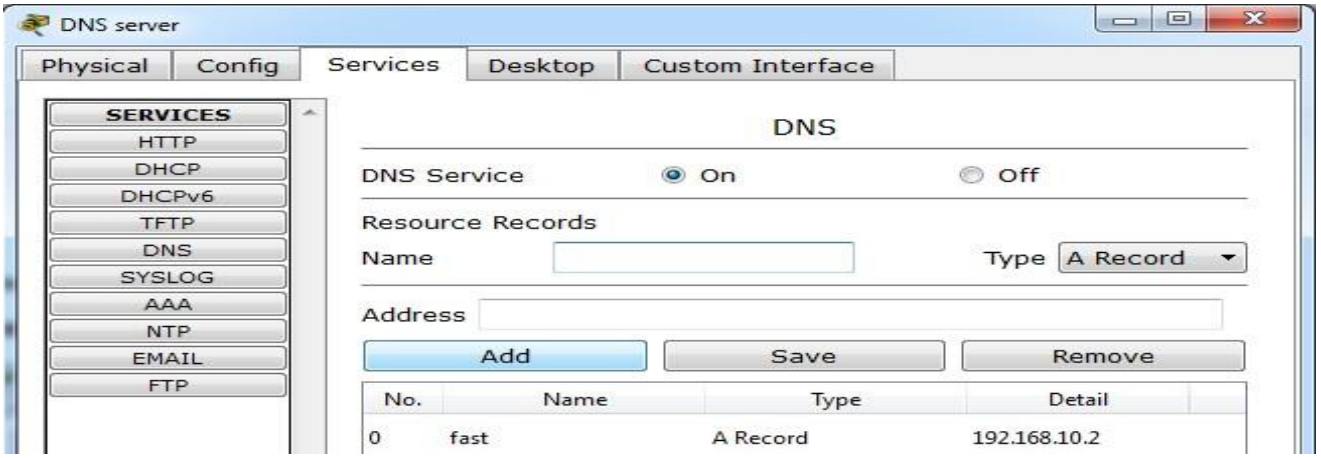


Now using the DNS service on Server0.Go to server

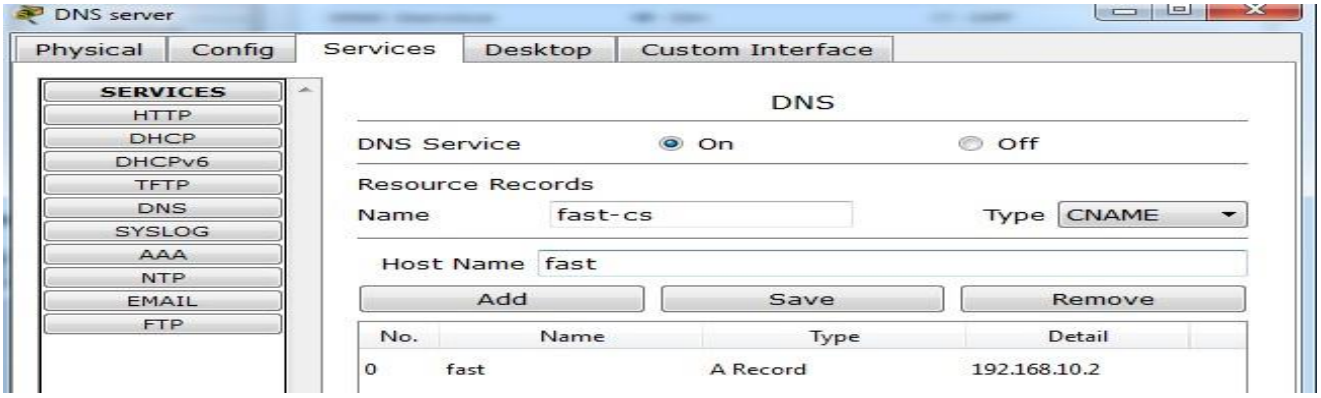
→services →DNS First we add A record.



Now click on Add.

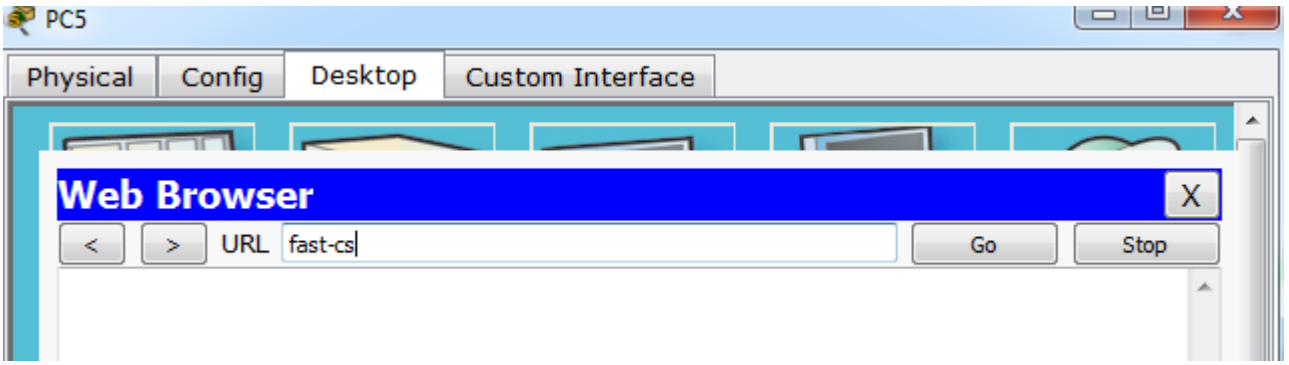


Now add Cname record.

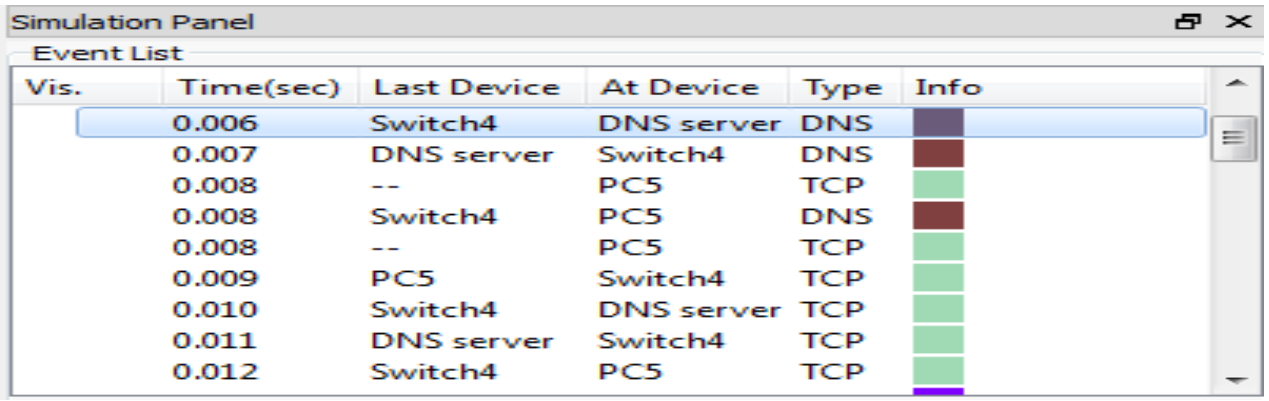


Now click on Add.

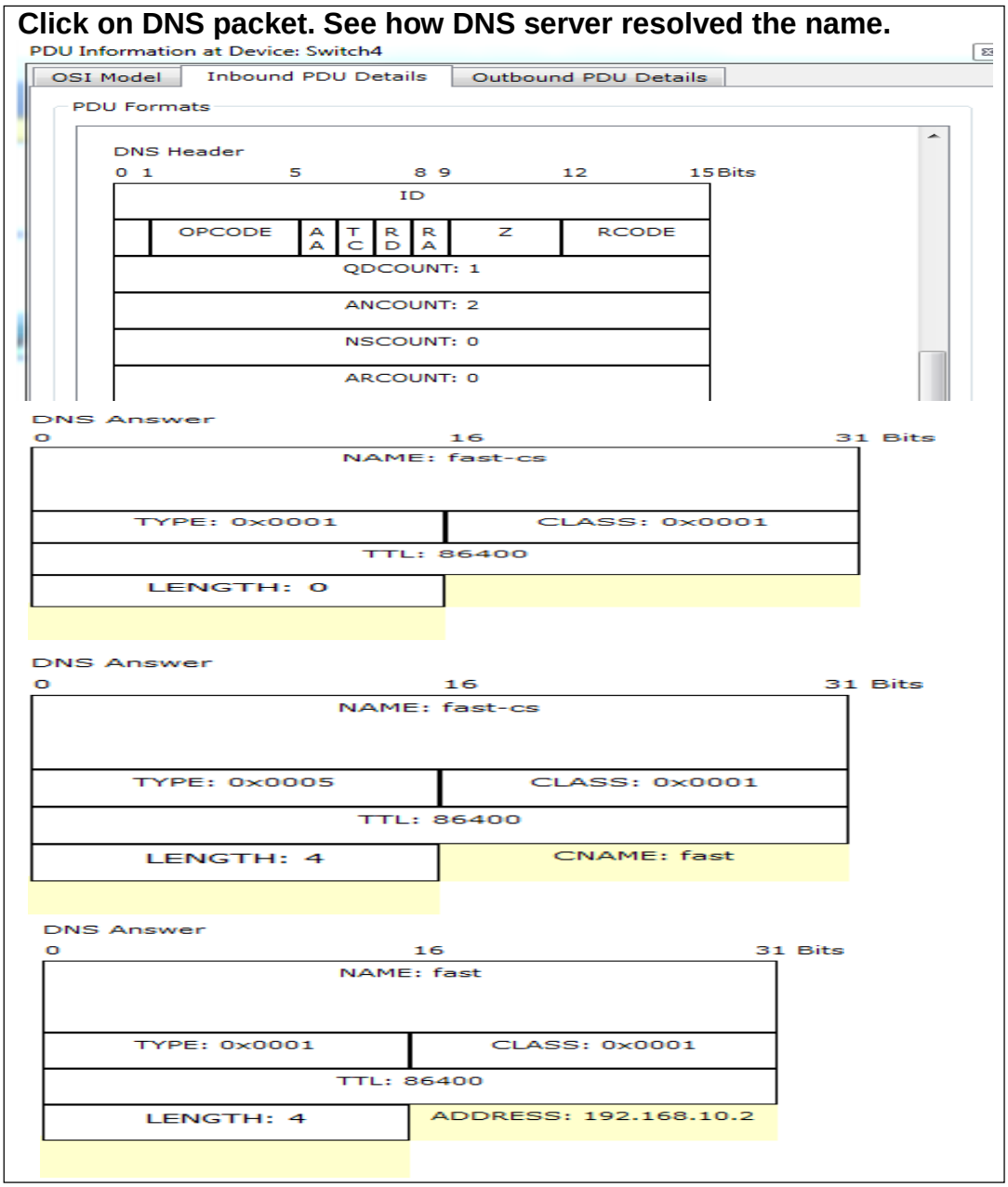
Now go to pc5 →Desktop →web browser → type fast-cs and see how DNS works.



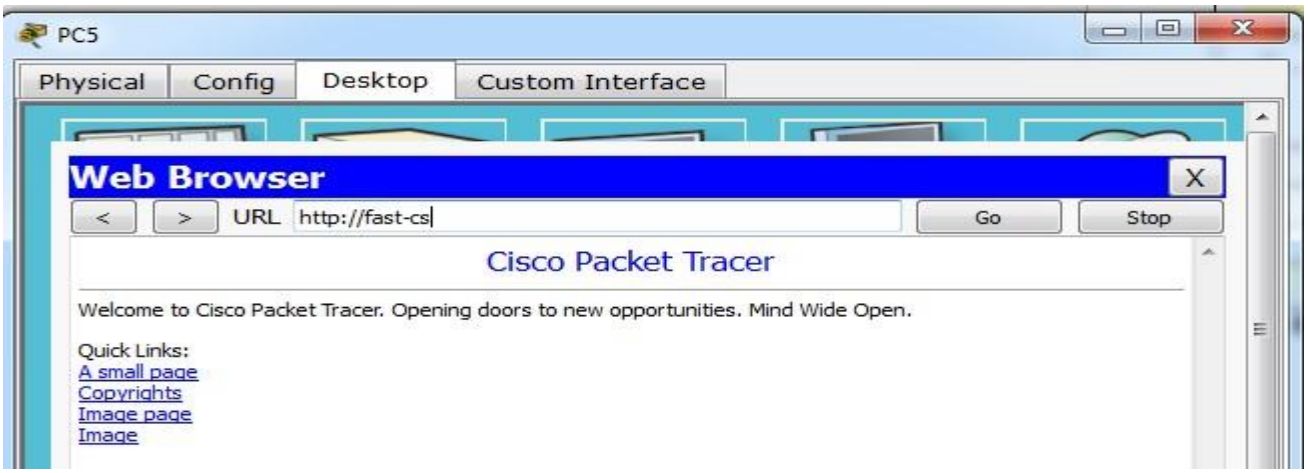
Start simulation.



Click on DNS packet. See how DNS server resolved the name.



Now finally, required web page.



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