

# Attacks on Router and Switches using Packet Tracer as a Tool with Defense Mechanism

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**Abstract**—In computer networking, attacking has become very common to unauthorized groups. In order to fight against attacking, we have designed a defense mechanism through which information can be prevented from being attacked. In this paper, we demonstrate Layer 2 and 3 attacks on Packet Tracer and also provide their defense mechanism.

**Keywords:** Security; defence; router; packet tracer; networking key words).

## 1. INTRODUCTION

The data link layer is that layer in the OSI reference model on which hacking is easily possible. There are various types of network attacks are created by the attacker. In these attacks, sensitive information of the user is acquired and normal behavior of network is manipulated. In order to fight against attacking, different types of defense mechanisms are provided to restrict the attack. These defense mechanism controls the network access from unauthorized groups.

## 2. ROOT ATTACK

There are more than one root for the destination in the given topology so in this situation STP spanning tree protocol) is used. STP disables other path and enable only single path to form the loop free structure. This path must have root node or root switch which is made either by election among the switches on basis of priority or network administrator assign it. To attack the given network, the hacker connects its switch to the network switches and configures its switch as the root switch.

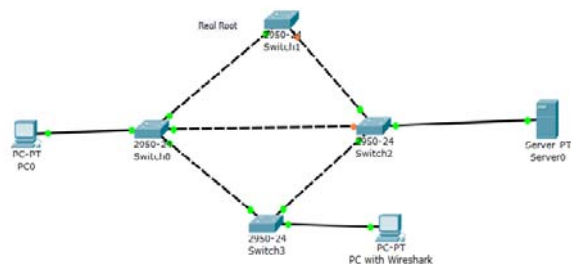


Fig. Root Attack

## 3. DTP ATTACK

In the root attack we attack the network assuming the network top be in VLAN 1 but suppose the network which is to be hacked is not in the VLAN 1. First attacker has to search the VLAN group used by looking whether bridge id and root id are same. After searching the VLAN makes its switch as root switch and block the path using the following command and change the VTP domain name.

### Configuration to Block the Path

```
Switch>enable  
Switch#show vtp status  
Switch#conf t  
Switch(config)#vtp domain ngf  
Changing VTP domain name from NULL to ngf  
Switch(config)#no vlan 10
```

## 4. ROUTING PROTOCOL ATTACK

In routing attack instead of original route a fake root is provided to router whose distance is shorter than the original root. Hence user is connected to the fake server.

## 5. DHCP STARVATION

In this attack, an attacker consumes all the available IP addresses with change of its MAC address. After these IP addresses are issued, the server cannot issue any more addresses, now new clients cannot obtain network access.

## 6. DHCP SPOOFING

In DHCP spoofing fake DHCP server is configured in the network to assign the DHCP address to the clients. Now user machine is under the control of the attacker.

## 7. DEFENSE MECHANISM

The attacks which are created on packet tracer affect the layer 2 and 3 are overcome by using the following defense mechanism.

### 7.1 Root Attack

To overcome this attack we can enable the root guard, in this situation another switch will not be Root Bridge and information will not check out. Secondly by changing the VLAN group of the client machine.

### 7.2 DTP Attack

For preventing DTP attack port security feature is used. If another MAC address device use the port then port of the switch automatically becomes off. We can also prevent the DTP attack by configuring access mode and disable dynamic trunking protocol.

### 7.3 Routing Protocol Attack

If inner port of the router is configured as passive port then no updates will exchanged with the attacker.

### 7.4 DHCP Starvation and Spoofing attack

By using the port security feature and making the unused port shut down the DHCP starvation and spoofing problem can be overcome. A time limit is configured to the DHCP server to assign the IP address to prevent DHCP starvation attack. DHCP spoofing problem can be overcome by using Dot1x authentication and making snooping trust port which means valid MAC address machine can use the port.

## 8. RESULTS

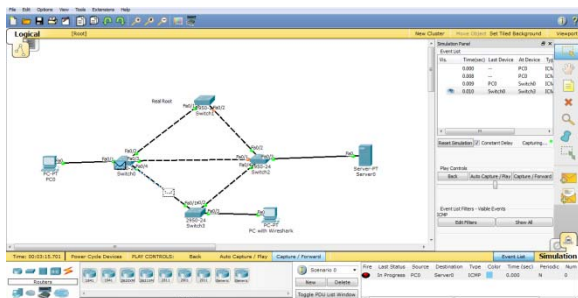


Fig. 1

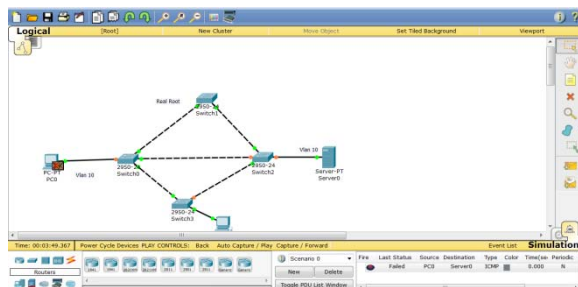


Fig. 2

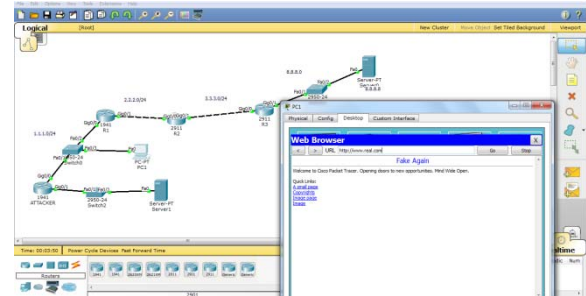


Fig. 3

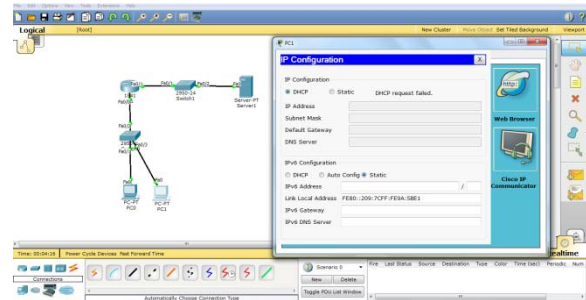


Fig. 4

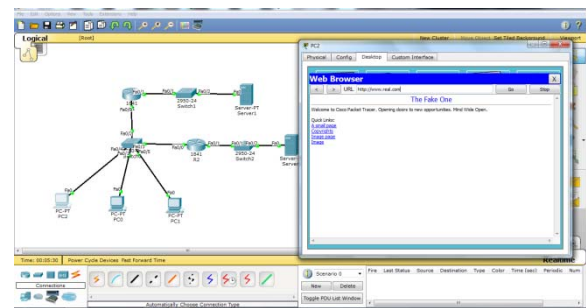


Fig. 5

## 9. CONCLUSIONS

Data link layer and Network layer devices are vulnerable to attacks like Root attack, DTP attack, Routing Protocol attack, DHCP starvation and spoofing attack. These attacks can be prevented by using defense mechanism. DHCP attack can be prevented by configuring port security and snooping security feature. Root attack can be overcome by enabling root guard and BPDU guard. To prevent DTP attack access mode is configured.

This paper has provided solutions to the attacks on router and switches. In this thesis, attacks are shown and demonstrated using a simulator called “PACKET TRACER”.

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