Computer Networks Project Report

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Abstract

In this project,we have demonstrated a simple computer network consisting of 1 Router which has DHCP enabled and is connected to 2 Switches, 1 DNS Server,1 HTTP server.Each of the switch is connected to 5 hosts which can avail to these services- 1.They can ping to any other computer in the same network or in the other network
2.They can make HTTP request.
3.They can make DNS request to access HTTP server.

For implementation,we have used **Java 8** and **Eclipse** IDE.
Each of the network component is implemented by a seperate Java Class and all these classes are used within a driver class where we have instantiated all these classes.

Chapter 1

Structure of Classes

1. Router Class- It is most important class for this project.This class has variables name,interfaceNo,ip,subnetMask,type where name is used to store name given to router(**Router1** in this case) ,interfaceNo stores name of the interfaces,ip stores IP addresses of all the interfaces,subnetMask stores the Subnet Masks of all the interfaces and type which stores the type of device being connected to router(Switch,DNS or HTTP server).

Constructor of this class-In this class we have made a default constructor which is used to give name **Router1** to this router and we have given ip's, subnet masks,type and interfaceNo of all the 4 interfaces of this router.

DHCP () method-This method takes object of host class and switch as arguements and assigns IP's dynamically to the host requesting DHCP service from a pool of IP addresses it has and displays message of successful request.

sendPacketRouter() method-This method takes objects of router,switchs,dns and http class and destination addresses and interface and mode as arguements.
Here, mode bit is used to discriminate between the type of request made by user which can take values out of 0,1,2.
0 for ping
1 for HTTP request
2 for DNS request

If mode bit is 0 i.e. request made by user is ping then packet is send to switch connected to the host,switch then searches for destination address in it's network,if destination is found then it forwards packet to destination and if not then it forwards this packet to router then router checks for destination IP addresses into other switch's network and forwards packet to destination and if IP address is not found then it checks for destination in it's interface and if not found then it checks in other types as HTTP or DNS server which we have initially provided to all the devices directly connected to the router and if address is found then it forwards packet to that element and displays message on screen and if destination not found then it shows **"Destination Unreachable"** message.

If mode bit is 1 i.e. request made by user is HTTP then router checks for type 'HTTP Server' in it's network and matches the ip address of HTTP Server with the destination address passed as destination address in function call.

If mode bit is 2 i.e. request made by user is DNS then method dnsRequest() of DNS class is called then it checks whether Domain Name of DNS server is equal to destination address or not ,if it is equal then it recursively calls sendPacketRouter() method with IP address of HTTP Server as destination address and with mode bit 1.

Note-In case of HTTP or DNS request,we have to pass IP of HTTP Server or Domain Name of DNS Server as destination address .

2. Switch Class-This class has variables name,Rinterface,Rip,portNo,count where name stores name of the switch,Rinterface stores interface name of router through which this switch is connected to router,Rip stores IP address of interface of the router to which this is connected ,portNo initially stores MAC addresses of Hosts connected to the switch which are replaced by IP addresses of hosts after they make DHCP request, varaible count stores the count of hosts connected to the switch.

Constructor of this class-This constructor of switch class is parameterized constructor and takes name of switch,interface name and ip of interface of router to which this switch is connected , as arguements and assigns these values to class level variables of the same.

getCount() method-This method is used to know the no.of the hosts connected to the switch.

incCount() method- This method is used to increment the count of host connected to the switch by 1 ,every time a new host is connected to switch.

sendPacketSwitch() method-This method takes objects of router,switchs,dns and http class and destination address and mode as arguements.
If mode bit is 0 i.e. ping then It then checks for destination address in it's network if destination is found then it forwards packet to the destination otherwise forwards packet to the router by calling sendPacketRouter() method with the required arguments.
If mode bit is 1 i.e. HTTP request then it calls sendPacketRouter() method of Router Class i.e. forwards packet to router.
If mode bit is 2 i.e. DNS request then it calls sendPacketRouter() method of Router Class i.e. forwards packet to router.

getDetails() method-This function takes no arguements and simply prints values stored portNo array i.e. IP addresses of all the connected hosts or MAC address of hosts(Before hosts have made request for DHCP).

3.Host Class-This class has variables name,ip,mac,dg,port where name is used for storing name of host, ip for storing IP address of host(Dynamically assigned by DHCP),mac for storing MAC address of host,dg for storing IP of default gateway,port stores port no. of switch to which this host is connected to switch.

Constructor of this class-This is parameterized constructor and name, mac,dg,port and object of switch class as parameters and assigns these values to class variables made for same purpose.

getDetails() method-This function displayes all the details of host like Name,Mac Address,Default Gateway,IP address.

ping() method-This is most useful method of this class.This method takes objects of router,switchs,dns and http class and destination address and mode as arguements.
This method forwards packet to switch for furthur options i.e. calls sendPacketSwitch() method of Switch class without checking for mode bit because it will be checked by Switch.

4.HTTP Class-This class has a single variable ip which stores IP address of HTTP Server.

Constructor of this class-It initializes ip address of HTTP server as '6.6.6.2'.

getIp() method-Returns ip address of HTTP server.

httpRequest() method-It is called by host when user makes HTTP request to display message on screen.

5.DNS Class-This class has variables ip,ipAddress,domainName where ip stores IP Address of DNS Server,ipAddress stores stores IP of HTTP Server,domainName stores name of DNS Server which we have defined as 'www.google.com'.

Constructor of this class-It initializes ip address of DNS server as '5.5.5.2'.

getIp() method-Returns ip address of DNS server.

dnsRequest() method-It is called by host when user makes DNS request to display message on screen and it takes domain name as arguement.

6. NetworksProject Class-This is driver class for this project and has main() method .
In main() method-
We have first created object R of Router class and then created object sw of Switch class which is named 'Switch1' and connected to interface '0/0' of Router R.
Then, created 5 objects of Host class from h1 to h5 all connected to switch sw and having name 'PC1' to 'PC5' and MAC's 'A.B.C.D','E.F.G.H' and so on and all having default gateway as '1.2.3.1' and port no. from 0 to 4.
All hosts are then requesting for DHCP by calling DHCP() method of Router class.

Then created object sw2 of Switch class which is named 'Switch2' and connected to interface '1/0' of Router R.
Then, created 5 objects of Host class from h6 to h10 all connected to switch sw2 and having name 'PC6' to 'PC10' and MAC's 'AA.BB.CC.DD','EE.FF.GG.HH'

and so on and all having default gateway as '7.7.7.1' and port no. from 0 to 4.
All hosts are then requesting for DHCP by calling DHCP() method of Router class.

Then we checked for details of both the switches by calling getDetails() method by sw and sw2.
Now we created objects h and d for HTTP and DNS classes respectively.

After that we have called ping() method by differnt host object having differnt destinations and different mode bits.

Below is the representation of network made using Cisco Packet Tracer-