

## Building a simple network topology and configure it for static routing protocol

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### ➤ Topology

Topology is physical or logical way in which network is laid down. It is arrangement of various elements like node, links, repeaters, hub etc. In which nodes are connected using link between them. In these two or more links are connected for form a topology. It is arrangement of various elements like node, links, repeaters, hub etc.

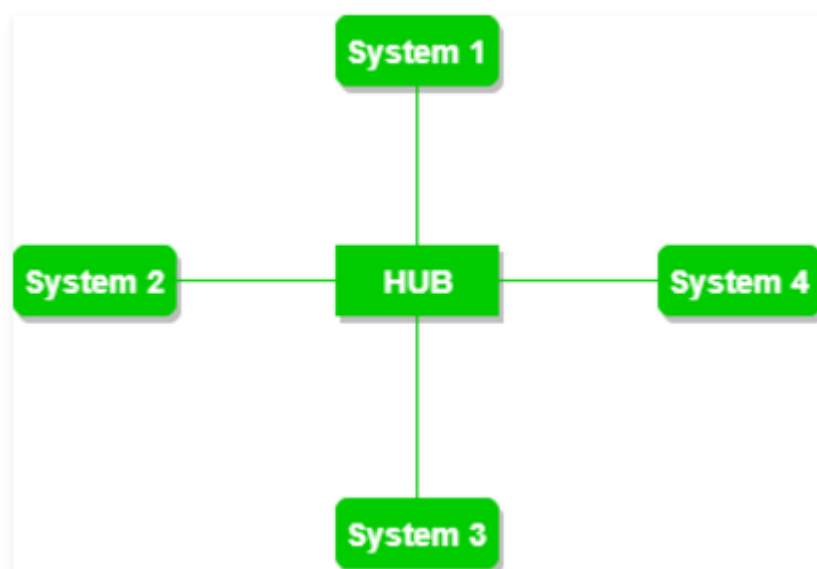
In short, it is the schematic description of the network.

Types of Topology: -

- 1) Mesh Topology
- 2) Star Topology
- 3) Bus Topology
- 4) Ring Topology

- **Example of Star topology**

In star topology, all the devices are connected to a single hub through a cable. This hub is the central node and all others nodes are connected to the central node. The hub can be passive in nature i.e. not intelligent hub such as broadcasting devices, at the same time the hub can be intelligent known as active hubs. Active hubs have repeaters in them



**Advantages of this topology :**

If N devices are connected to each other in star topology, then the number of cables required to connect them is N. So, it is easy to set up.  
Each device require only 1 port i.e. to connect to the hub.

#### **Problems with this topology**

If the concentrator (hub) on which the whole topology relies fails, the whole system will crash down.

Cost of installation is high.

Performance is based on the single concentrator i.e. hub.

*Note: We will implement Star topology through gns-3*

### ➤ **GNS-3**

Graphical Network Simulator-3 (shortened to GNS3) is a network software emulator first released in 2008. It allows the combination of virtual and real devices, used to simulate complex networks. It uses Dynamips emulation software to simulate Cisco IOS.

GNS3 is used by many large companies including Exxon, Walmart, AT&T and NASA, and is also popular for preparation of network professional certification exams. As of 2015, the software has been downloaded 11 million times

### ➤ **Concept of routing**

Routing is the process of moving packets across a network from one host to a another. It is usually performed by dedicated devices called routers.

Packets are the fundamental unit of information transport in all modern computer networks, and increasingly in other communications networks as well. They are transmitted over packet switched networks, which are networks on which each message (i.e., data that is transmitted) is cut up into a set of small segments prior to transmission. Each packet is then transmitted individually and can follow the same path or a different path to the common destination. Once all of the packets have arrived at the destination, they are automatically reassembled to recreate the original message.

Routing is a key feature of the Internet and it, together with a great deal of deliberate redundancy of high capacity transmission lines (e.g., optical fiber cable and microwave), is a key factor in the robustness (i.e., resistance to equipment failure) of the Internet. Each intermediary router performs routing by passing along the message to the next router. Part of this process involves analysing self-configuring routing tables to determine the best (i.e., optimal) path.

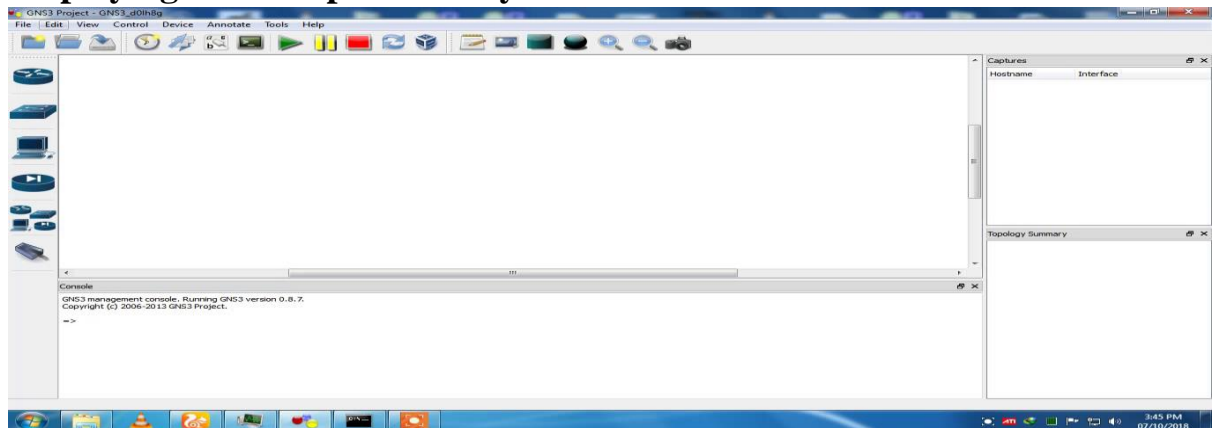
### ➤ **Static Routing**

Static routing is a type of network routing technique. Static routing is not a routing protocol; instead, it is the manual configuration and selection of a network route, usually managed by the network administrator. It is employed in scenarios where the network parameters and environment are expected to remain constant.

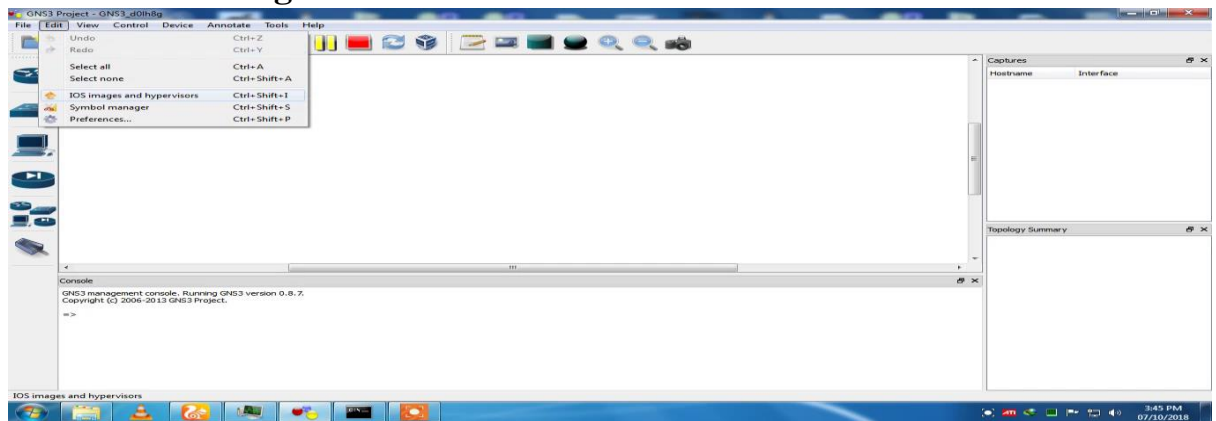
Static routing is only optimal in a few situations. Network degradation, latency and congestion are inevitable consequences of the non-flexible nature of static routing because there is no adjustment when the primary route is unavailable.

## **#Outputs for the process of creation of topology through GNS3**

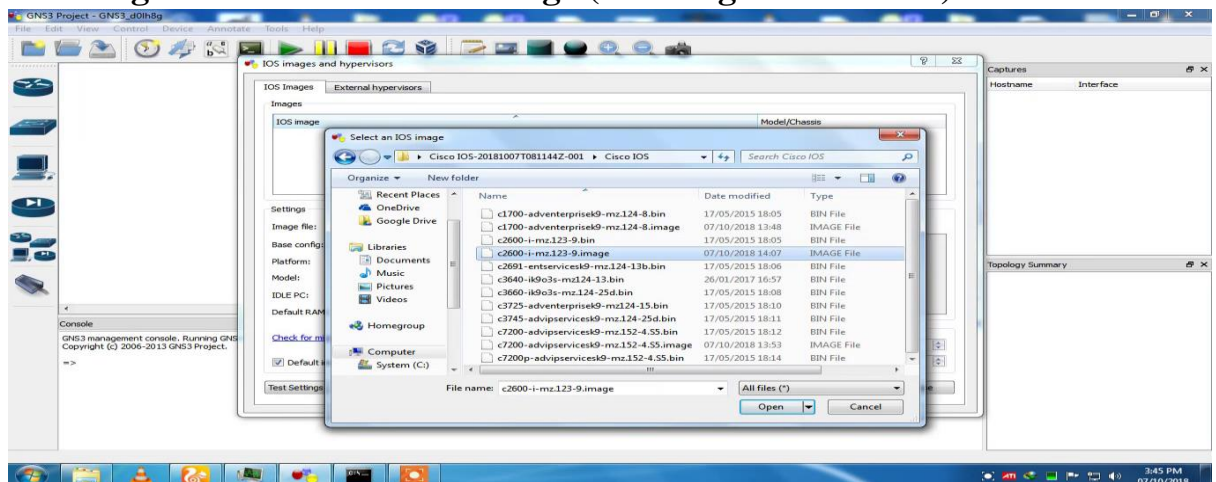
## 1. Displaying the GUI provided by GNS-3



## 2. Select IOS manager

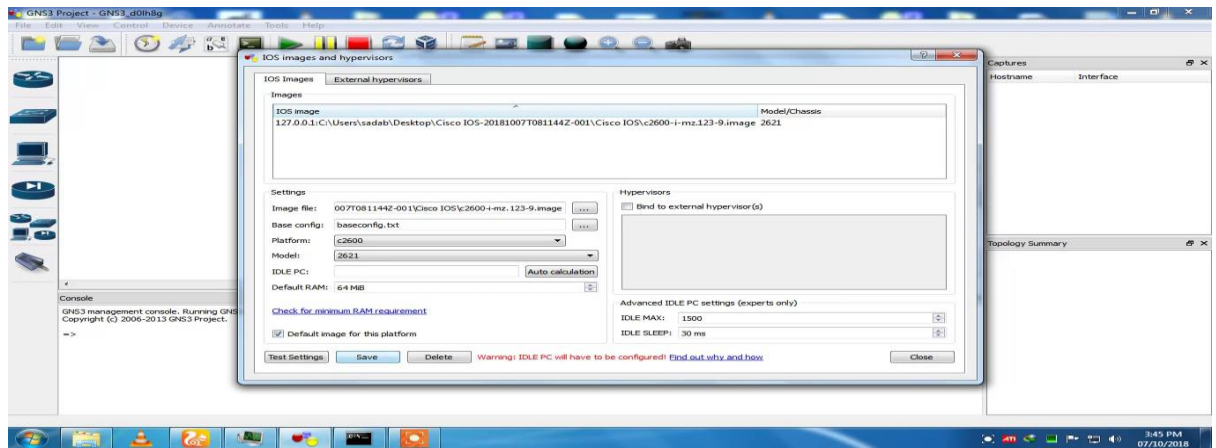


## 3. Locating downloaded Router image (selecting 2600.bin file)

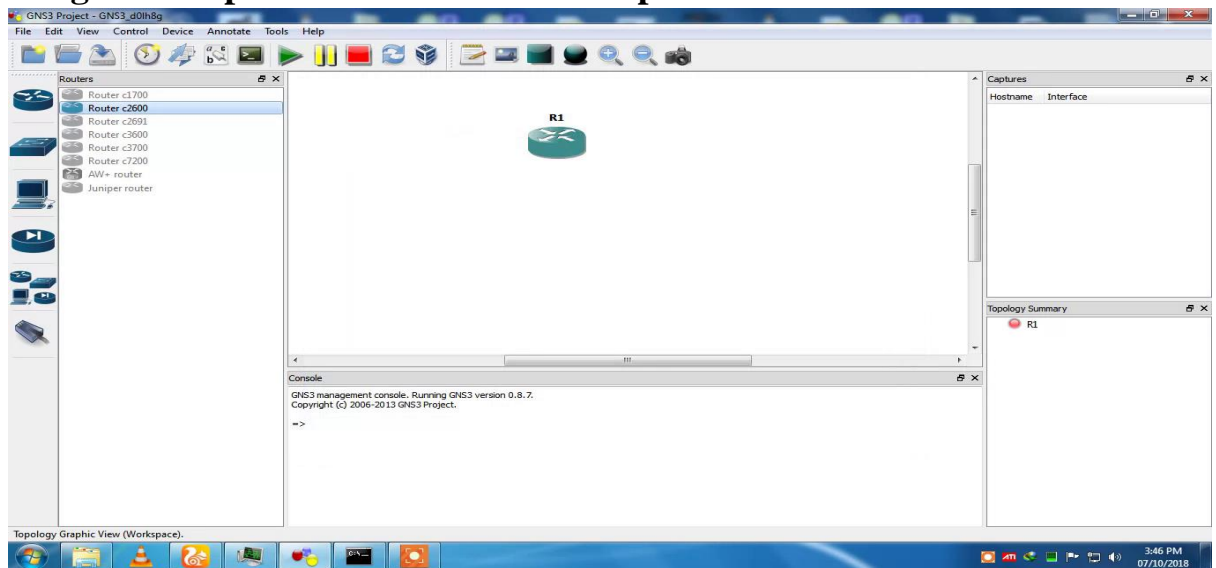


*Note: The router image can be downloaded from [i.sirjit.com](http://i.sirjit.com) for educational purpose only*

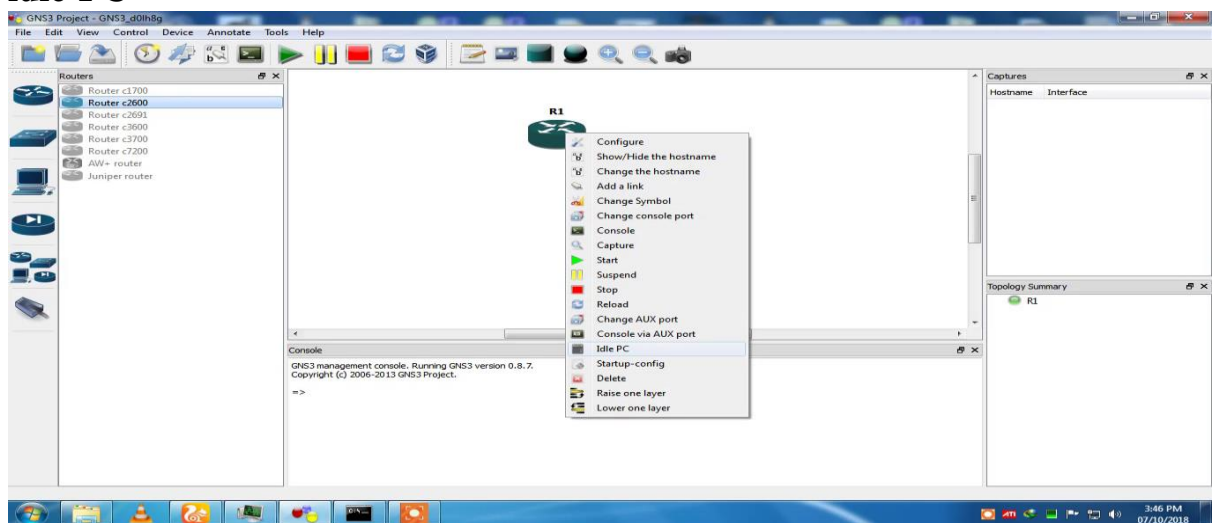
## 4. Saving the setting



## 5. Drag and drop the router into the workplace



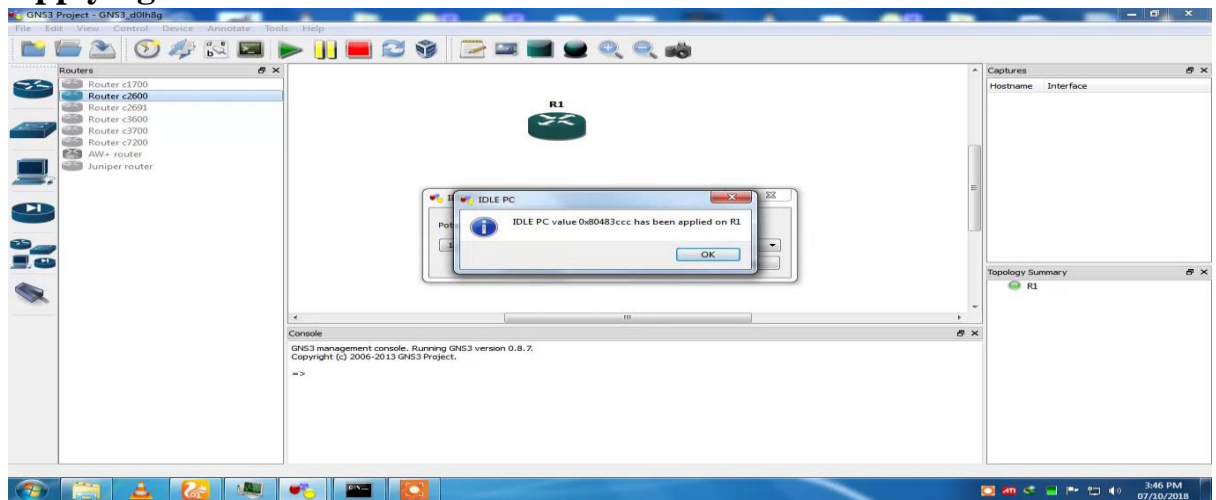
## 6. Clicking on Play simulation button right click on router and selecting idle-PC



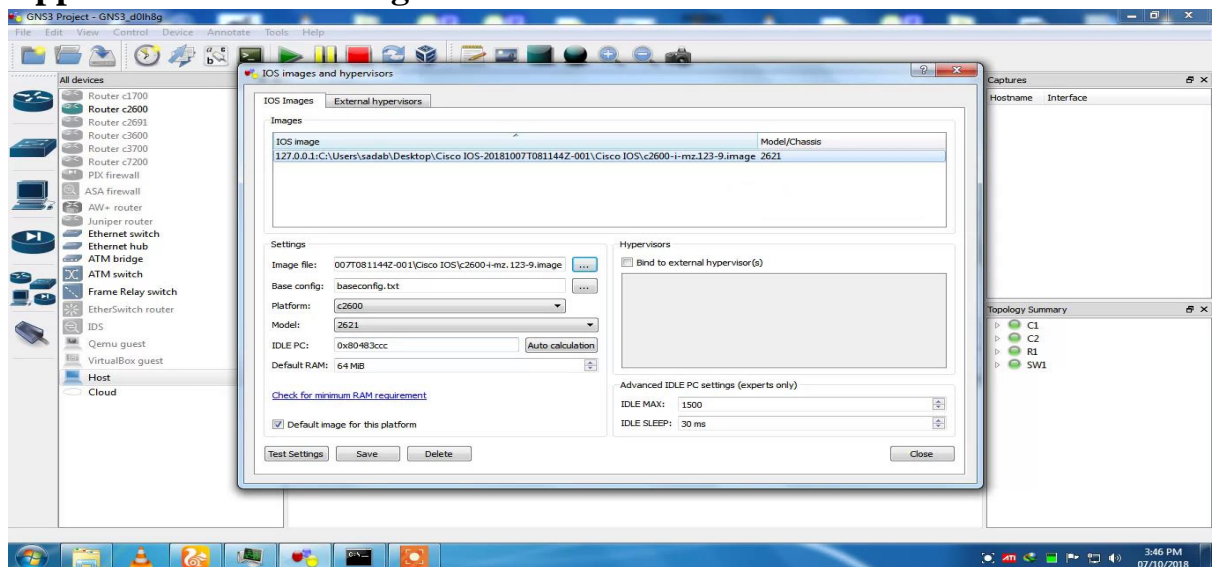
## 7. Auto calculation of idle-PC value by the system itself



## 8. Applying the value

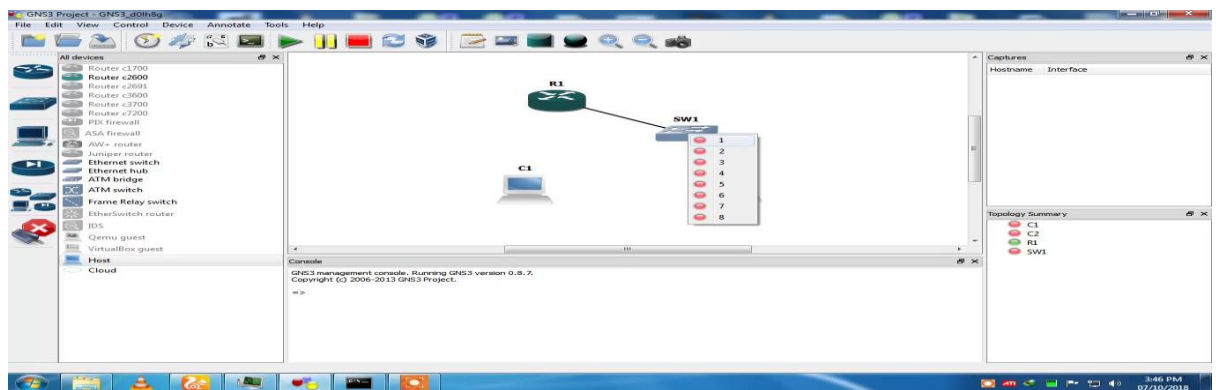
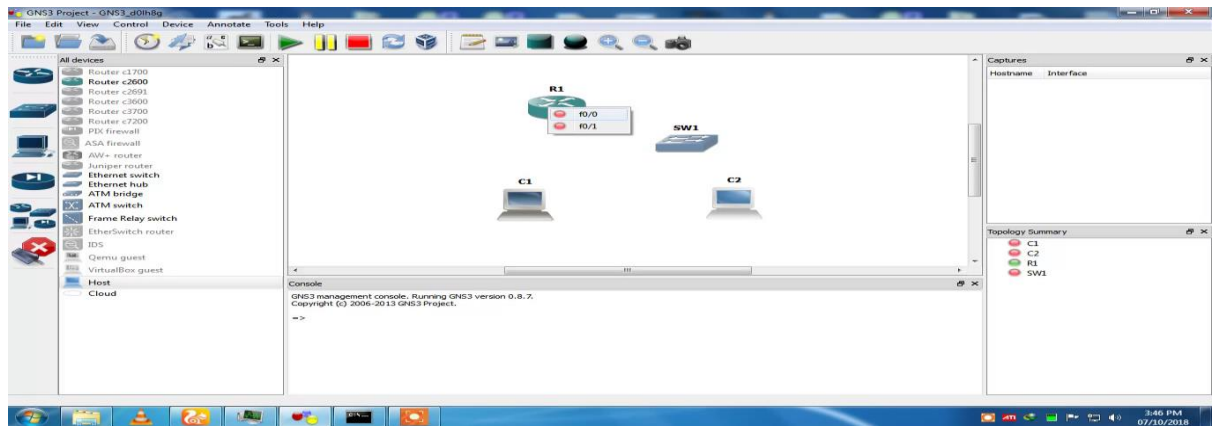


## 9. Applied and saved configuration of router

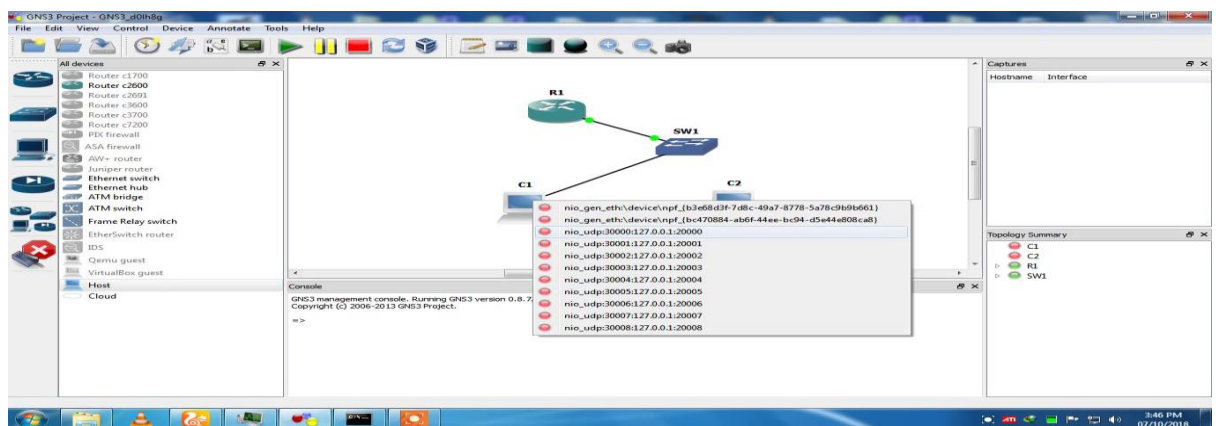
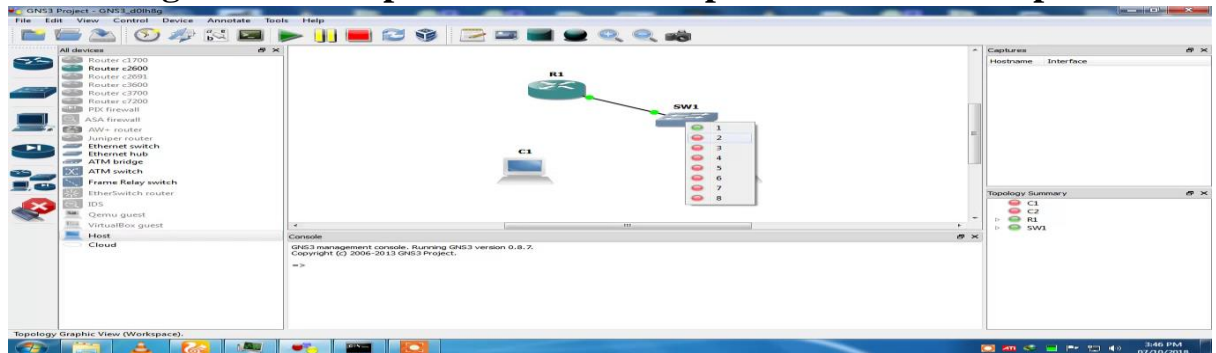


## 10. connecting router from port f0/0 to ethernet switch port 1

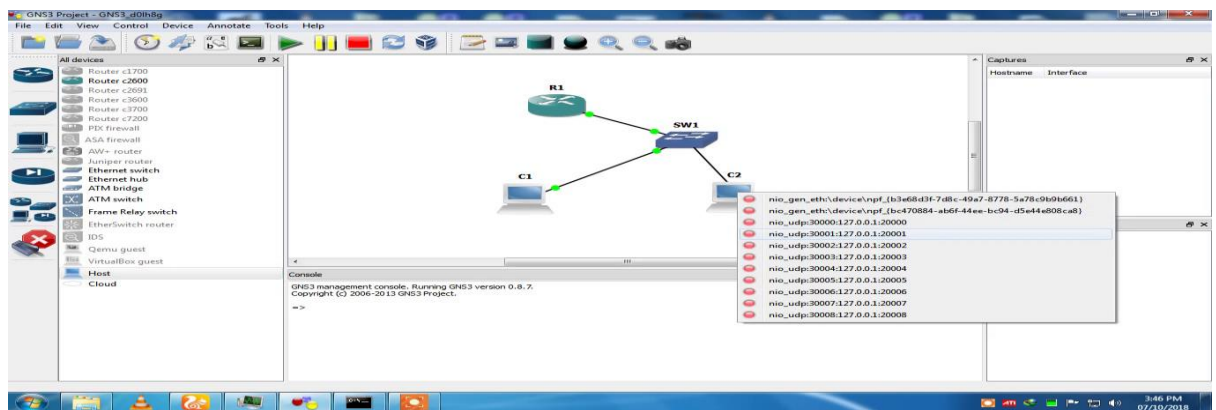
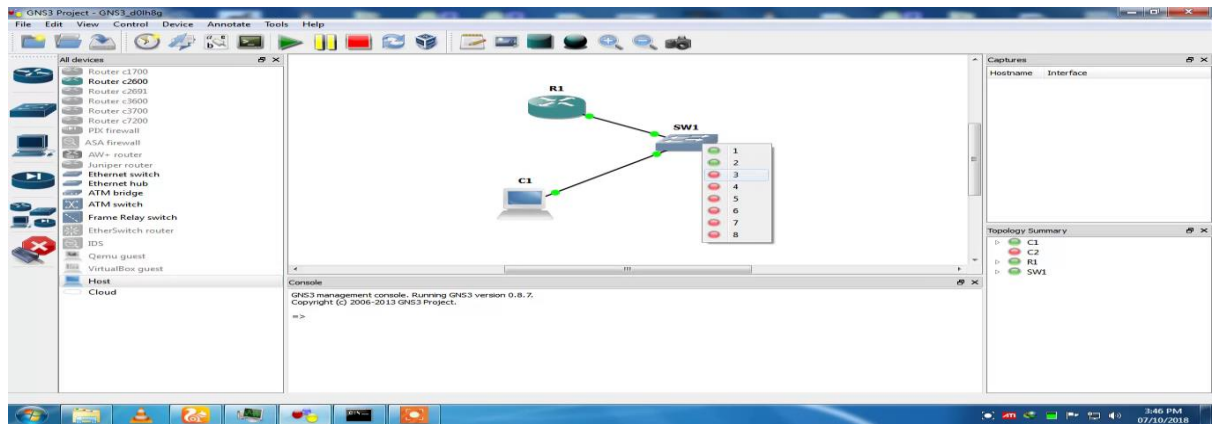




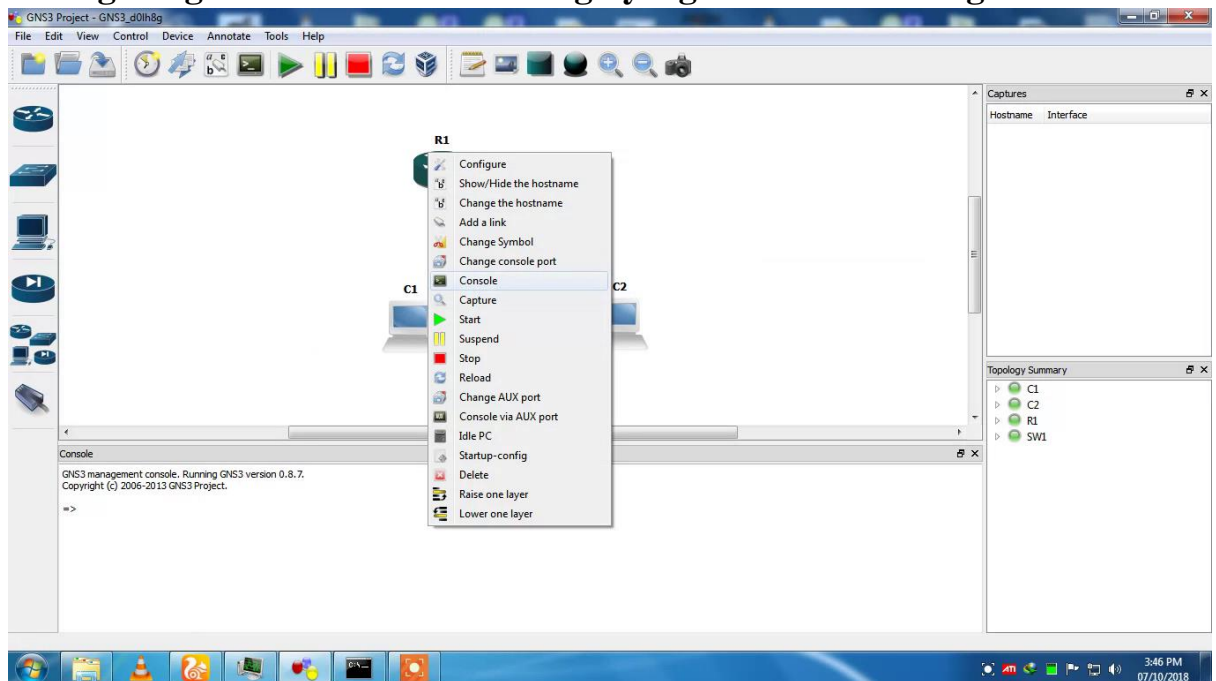
## 11. connecting from switch port 2 to first device port selected at 3rd option



## 12. Connecting switch port 3 to device port 4 option



### 13. Configuring router for static routing by right click->selecting console



### 14. Process of assigning Ip address through terminal commands

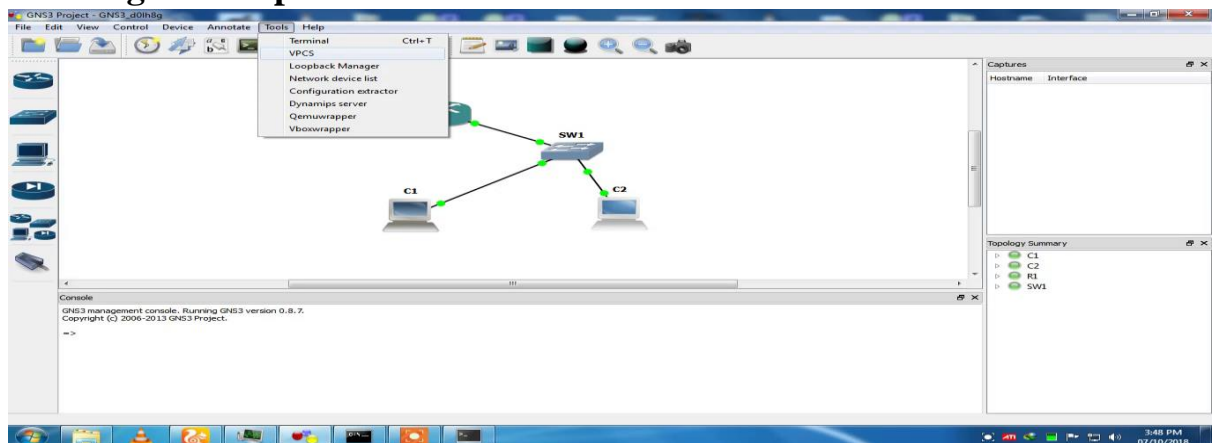
```

R1
Cisco Internetwork Operating System Software
IOS (tm) C2600 Software (C2600-I-M), Version 12.3(9), RELEASE SOFTWARE (fc2)
Copyright (c) 1986-2004 by Cisco Systems, Inc.
Compiled Fri 14-May-04 14:37 by dchih
*Mar 1 00:00:01.643: %SNMP-5-COLDSTART: SNMP agent on host R1 is undergoing a cold start
*Mar 1 00:00:02.197:
*Mar 1 00:00:02.231:
*Mar 1 00:00:03.187:
*Mar 1 00:00:03.231:
R1#
R1#
R1#
R1#sh ip interface brief
Interface              IP-Address      OK? Method Status      Protocol
FastEthernet0/0        unassigned      YES unset    administratively down down
FastEthernet0/1        unassigned      YES unset    administratively down down
R1#
R1#
R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#
R1(config)#
R1(config)#interface FastEthernet0/0
R1(config-if)#
R1(config-if)#ip address 192.168.1.1 255.255.255.0
R1(config-if)#
R1(config-if)#
R1(config-if)#
R1#
R1#
R1#sh
*Mar 1 00:01:27.687: %SYS-5-CONFIG_I: Configured from console by console
R1#sh ip interface brief
Interface              IP-Address      OK? Method Status      Protocol
FastEthernet0/0        192.168.1.1     YES manual  administratively down down
FastEthernet0/1        unassigned      YES unset    administratively down down
R1#
R1#
R1#

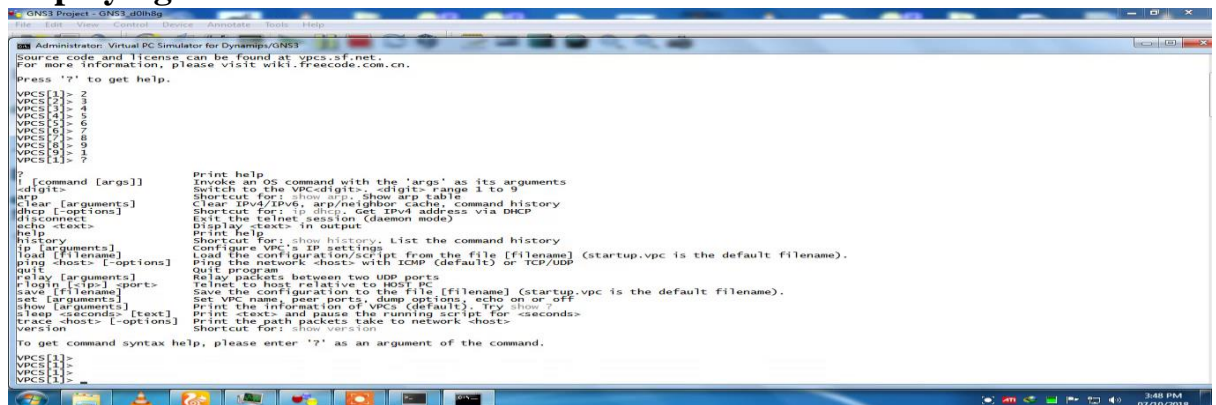
```

- First command -> ip sh interface brief : gives the brief info of assigned ip
- Second command -> configure terminal : means configure through terminal
- Third command -> interface FastEthernet0/0 : we are configuring port f0/0
- Fourth command -> ip address <ip> <subnetmask> : assigns the ip with subnet

## 15.selecting VPCs option



## 16.displaying available VPCS



## 17.assigning ip to vpcs 1 and 2



```
Administrator: Virtual PC Simulator for DynaMips/GNS3

To get command syntax help, please enter '?' as an argument of the command.

VPCS[1]>
VPCS[1]>
VPCS[1]> show ip
NAME      : VPCS[1]
IP/MASK    : 0.0.0.0/0
GATEWAY    : 0.0.0.0
DNS        :
MAC        : 00:50:79:66:68:00
LPORT     : 20000
RHOST:PORT : 127.0.0.1:30000
MTU        : 0

VPCS[1]>
VPCS[1]> ip 192.168.1.2 / 255.255.255.255 192.168.1.1
Checking for duplicate address...
PC1 : 192.168.1.2 255.255.255.0 gateway 192.168.1.1

VPCS[1]>
VPCS[1]> 2
VPCS[2]> ip 192.168.1.3 / 255.255.255.255 192.168.1.1
Checking for duplicate address...
PC2 : 192.168.1.3 255.255.255.0 gateway 192.168.1.1

VPCS[2]>
VPCS[2]> show ip
NAME      : VPCS[2]
IP/MASK    : 192.168.1.3/24
GATEWAY    : 192.168.1.1
DNS        :
MAC        : 00:50:79:66:68:01
LPORT     : 20001
RHOST:PORT : 127.0.0.1:30001
MTU        : 1500

VPCS[2]>
VPCS[2]> 1
VPCS[2]> 1
VPCS[1]>
VPCS[1]>
```

For the above process following is the syntax of command  
**ip <available ip> / <defaultsubnetmask> <static router configures ip>**

## 18. ping from vpcs 1 to vpcs 2 and vice versa

```
Administrator: Virtual PC Simulator for DynaMips/GNS3

VPCS[2]> 1
VPCS[1]>
VPCS[1]> show ip
NAME      : VPCS[1]
IP/MASK    : 192.168.1.2/24
GATEWAY    : 192.168.1.1
DNS        :
MAC        : 00:50:79:66:68:00
LPORT     : 20000
RHOST:PORT : 127.0.0.1:30000
MTU        : 1500

VPCS[1]>
VPCS[1]> ping 192.168.1.3
192.168.1.3 icmp_seq=1 ttl=64 time=0.000 ms
192.168.1.3 icmp_seq=2 ttl=64 time=0.000 ms
192.168.1.3 icmp_seq=3 ttl=64 time=0.000 ms
192.168.1.3 icmp_seq=4 ttl=64 time=0.000 ms
192.168.1.3 icmp_seq=5 ttl=64 time=0.000 ms

VPCS[1]>
VPCS[1]> 2
VPCS[2]>
VPCS[2]> show ip
NAME      : VPCS[2]
IP/MASK    : 192.168.1.3/24
GATEWAY    : 192.168.1.1
DNS        :
MAC        : 00:50:79:66:68:01
LPORT     : 20001
RHOST:PORT : 127.0.0.1:30001
MTU        : 1500

VPCS[2]>
VPCS[2]> ping 192.168.1.2
192.168.1.2 icmp_seq=1 ttl=64 time=0.000 ms
192.168.1.2 icmp_seq=2 ttl=64 time=0.000 ms
192.168.1.2 icmp_seq=3 ttl=64 time=0.000 ms
192.168.1.2 icmp_seq=4 ttl=64 time=0.000 ms
```