

# Computer Networks Assignment 1

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## 1 Introduction

This report presents a detailed analysis of the concepts covered in Assignment 1, with a focus on IP addressing, subnetting, network configuration, and the practical application of tools like `ifconfig` and Packet Tracer.

## 2 Questions and Answers

### Question 1

The command `ifconfig` is used to display the network configuration of the machine. In this case, the output reveals the following relevant information:

- **IP Address:** 192.168.1.2
- **Subnet Mask:** 255.255.255.0 (0xfffff00 in hexadecimal)

To determine the number of usable IP addresses in this network, we need to understand subnetting. The subnet mask 255.255.255.0, in binary form, is 11111111.11111111.11111111.00000000. The '1' bits represent the network portion, while the '0' bits represent the host portion of the address.

With 8 bits allocated for hosts (the eight '0' bits), we have a maximum of  $2^8 = 256$  possible addresses. However, two of these addresses are reserved:

- **Network Address:** The address with all host bits set to 0 (e.g., 192.168.1.0) is the identifier for the entire network.
- **Broadcast Address:** The address with all host bits set to 1 (e.g., 192.168.1.255) is used to send messages to all devices on the network.

Therefore, the number of usable IP addresses in this network is  $2^8 - 2 = \boxed{254}$ .

### Packet Tracer Simulation:

A network simulation was created in Packet Tracer using the obtained IP address (192.168.1.2) and subnet mask (255.255.255.0). Multiple devices were connected, each assigned a unique IP address within the 192.168.1.0/24 range, demonstrating the subnet's capacity.



Figure 1: Packet Tracer simulation depicting the network configuration.

## Question 2

The Packet Tracer simulation (refer to the figure above) visually confirms the network configuration derived from the `ifconfig` output. It demonstrates how the subnet mask restricts the range of usable IP addresses within the 192.168.1.0 network.

## 3 `ifconfig` Output

```
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 16384
    options=1203<RXCSUM,TXCSUM,TXSTATUS,SW_TIMESTAMP>
    inet 127.0.0.1 netmask 0xff000000
    inet6 ::1 prefixlen 128
    inet6 fe80::1%lo0 prefixlen 64 scopeid 0x1
    nd6 options=201<PERFORMNUD,DAD>
gif0: flags=8010<POINTOPOINT,MULTICAST> mtu 1280
```

```
stf0: flags=0<> mtu 1280
anpi0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=400<CHANNEL_IO>
        ether c2:d7:93:94:e3:a5
        media: none
        status: inactive
anpi1: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=400<CHANNEL_IO>
        ether c2:d7:93:94:e3:a6
        media: none
        status: inactive
en3: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=400<CHANNEL_IO>
        ether c2:d7:93:94:e3:85
        nd6 options=201<PERFORMNUD,DAD>
        media: none
        status: inactive
en4: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=400<CHANNEL_IO>
        ether c2:d7:93:94:e3:86
        nd6 options=201<PERFORMNUD,DAD>
        media: none
        status: inactive
en1: flags=8963<UP,BROADCAST,SMART,RUNNING,PROMISC,SIMPLEX,MULTICAST> mtu 1500
        options=460<TSO4,TSO6,CHANNEL_IO>
        ether 36:8f:81:c7:df:80
        media: autoselect <full-duplex>
        status: inactive
en2: flags=8963<UP,BROADCAST,SMART,RUNNING,PROMISC,SIMPLEX,MULTICAST> mtu 1500
        options=460<TSO4,TSO6,CHANNEL_IO>
        ether 36:8f:81:c7:df:84
        media: autoselect <full-duplex>
        status: inactive
bridge0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=63<RXCSUM,TXCSUM,TSO4,TSO6>
        ether 36:8f:81:c7:df:80
        Configuration:
            id 0:0:0:0:0:0 priority 0 hellotime 0 fwddelay 0
            maxage 0 holdcnt 0 proto stp maxaddr 100 timeout 1200
            root id 0:0:0:0:0:0 priority 0 ifcost 0 port 0
            ipfilter disabled flags 0x0
        member: en1 flags=3<LEARNING,DISCOVER>
            ifmaxaddr 0 port 8 priority 0 path cost 0
        member: en2 flags=3<LEARNING,DISCOVER>
            ifmaxaddr 0 port 9 priority 0 path cost 0
```

```

nd6 options=201<PERFORMNUD,DAD>
media: <unknown type>
status: inactive
ap1: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
options=6460<TSO4,TSO6,CHANNELIO,PARTIALCSUM,ZEROINVERTCSUM>
ether 32:bd:3a:77:80:65
inet6 fe80::30bd:3aff:fe77:8065%ap1 prefixlen 64 scopeid 0xb
nd6 options=201<PERFORMNUD,DAD>
media: autoselect (<unknown type>)
status: inactive
en0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
options=6460<TSO4,TSO6,CHANNELIO,PARTIALCSUM,ZEROINVERTCSUM>
ether 10:bd:3a:77:80:65
inet6 fe80::c98:25ae:5d9f:7220%en0 prefixlen 64 secured scopeid 0xc
inet 192.168.1.2 netmask 0xffffffff broadcast 192.168.1.255
nd6 options=201<PERFORMNUD,DAD>
media: autoselect
status: active
awdl0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
options=6460<TSO4,TSO6,CHANNELIO,PARTIALCSUM,ZEROINVERTCSUM>
ether fe:85:8d:0f:7e:48
inet6 fe80::fc85:8dff:fe0f:7e48%awdl0 prefixlen 64 scopeid 0xd
nd6 options=201<PERFORMNUD,DAD>
media: autoselect
status: active
llw0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
options=400<CHANNELIO>
ether fe:85:8d:0f:7e:48
inet6 fe80::fc85:8dff:fe0f:7e48%llw0 prefixlen 64 scopeid 0xe
nd6 options=201<PERFORMNUD,DAD>
media: autoselect
status: inactive
utun0: flags=8051<UP,POINTOPOINT,RUNNING,MULTICAST> mtu 1500
inet6 fe80::4617:753a:d532:88c0%utun0 prefixlen 64 scopeid 0xf
nd6 options=201<PERFORMNUD,DAD>
utun1: flags=8051<UP,POINTOPOINT,RUNNING,MULTICAST> mtu 1380
inet6 fe80::10c0:16a:dabb:5c67%utun1 prefixlen 64 scopeid 0x10
nd6 options=201<PERFORMNUD,DAD>
utun2: flags=8051<UP,POINTOPOINT,RUNNING,MULTICAST> mtu 2000
inet6 fe80::cc15:49cc:e725:6903%utun2 prefixlen 64 scopeid 0x11
nd6 options=201<PERFORMNUD,DAD>
utun3: flags=8051<UP,POINTOPOINT,RUNNING,MULTICAST> mtu 1000
inet6 fe80::ce81:b1c:bd2c:69e%utun3 prefixlen 64 scopeid 0x12
nd6 options=201<PERFORMNUD,DAD>

```

## 4 Conclusion

This assignment provided valuable insights into the core concepts of IP addressing, subnetting, and network configuration. The use of tools like `ifconfig` and Packet Tracer facilitated a hands-on understanding of these principles, solidifying the theoretical knowledge gained in the course.