**CHALLENGE Subnets:**

| **Department** | **Needed hosts** | **Next power of 2** | **Subnet Mask** | **Hosts per subnet** |
| --- | --- | --- | --- | --- |
| **Engineering** | 30 | 32 | /27(255.255.255.240) | 30 |
| **Marketing** | 15 | 16 | /28(255.255.255.240) | 14 |
| **Finance** | 10 | 16 | /28(255.255.255.240) | 14 |
| **HR** | 5 | 8 | /29(255.255.255.248) | 6 |

Starting from 172.16.0.0/16, we allocate subnets:

Engineering: 172.16.0.0/27 (32 addresses, 30 usable)

Marketing: 172.16.0.32/28 (16 addresses, 14 usable)

Finance: 172.16.0.48/28 (16 addresses, 14 usable)

HR: 172.16.0.64/29 (8 addresses, 6 usable)

Engineering Subnet:

Network Address: 172.16.0.0

Broadcast Address: 172.16.0.31

Subnet Mask: 255.255.255.224

Usable Hosts: 30

First Host: 172.16.0.1

Last Host: 172.16.0.30

Marketing Subnet:

Network Address: 172.16.0.32

Broadcast Address: 172.16.0.47

Subnet Mask: 255.255.255.240

Usable Hosts: 14

First Host: 172.16.0.33

Last Host: 172.16.0.46

Finance Subnet:

Network Address: 172.16.0.48

Broadcast Address: 172.16.0.63

Subnet Mask: 255.255.255.240

Usable Hosts: 14

First Host: 172.16.0.49

Last Host: 172.16.0.62

HR Subnet:

Network Address: 172.16.0.64

Broadcast Address: 172.16.0.71

Subnet Mask: 255.255.255.248

Usable Hosts: 6

First Host: 172.16.0.65

Last Host: 172.16.0.70

**DHCP:**

### **Trace Summary:**

* The client begins by sending a Discover request.
* The server offers an IP from its pool.
* The client requests the offered IP.
* The server acknowledges the request and records the lease.
* The client receives and applies the assigned IP.

TCP SERVER OUTPUT:

TCP Server is listening...

Connected to ('127.0.0.1', 52148)

Received: DISCOVER

Sending: OFFER 192.168.1.100

Received: REQUEST 192.168.1.100

Sending: ACK 192.168.1.100

TCP CLIENT OUTPUT:

Sending: DISCOVER

Received: OFFER 192.168.1.100

Sending: REQUEST 192.168.1.100

Received: ACK 192.168.1.100

**Explanation of the DHCP Process with TCP:**

Client sends DISCOVER: The client sends a message requesting an IP address from the server.

Server sends OFFER: The server responds with an IP address from its pool.

Client sends REQUEST: The client acknowledges and confirms the IP address it wants.

Server sends ACK: The server confirms the assignment of the IP address to the client.