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**Q4. You are given three IP addresses: 192.168.10.5, 172.20.15.1, and 8.8.8.8. Identify the class of each IP address. Determine if it is private or public. Explain how NAT would handle a private IP when accessing the internet.**

**192.168.10.5 belongs to class C. The default subnet mask of class A is 255.0.0.0 and the default IP address format of class A is 0NNNNNNN.HHHHHHHH.HHHHHHHH.HHHHHHHH.**

**172.20.15.1 belongs to class B. The default subnet mask of class B is 255.255.0.0 and the default IP address format of class B is 10NNNNNN.NNNNNNNN.HHHHHHHH.HHHHHHHH.**

**8.8.8.8 belongs to class A. The default subnet mask of class C is 255.255.255.0 and the default IP address format of class B is 110NNNNN.NNNNNNNN.NNNNNNNN.HHHHHHHH.**

**The ranges of IP addresses are as following:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Class** | **IP address format** | **Range** | **Network capacity** | **Host capacity** |
| **A** | **0NNNNNNN.HHHHHHHH.HHHHHHHH.HHHHHHHH** | **1.0.0.0 to 126.255.255.255** | **126** | **16777214** |
| **B** | **10NNNNNN.NNNNNNNN.HHHHHHHH.HHHHHHHH** | **128.0.0.0 to 191.255.255.255** | **16384** | **65534** |
| **C** | **110NNNNN.NNNNNNNN.NNNNNNNN.HHHHHHHH** | **192.0.0.0 to 223.255.255.255** | **2097152** | **254** |

**Note: 127.0.0.0 – 127.255.255.255 IP address range is used for internal testing.**

|  |  |  |
| --- | --- | --- |
| **IP Address** | **Private Range?** | **Private/Public** |
| **192.168.10.5** | **Yes (192.168.x.x)** | **Private** |
| **172.20.15.1** | **Yes (172.16.x.x - 172.31.x.x)** | **Private** |
| **8.8.8.8** | **No** | **Public** |

**Public/Private IP:**

**Note: Private IPs (192.168.x.x, 10.x.x.x, 172.16.x.x – 172.31.x.x) are not routable on the public internet.**

**How NAT Handles a Private IP for Internet Access:**

**Step 1: Outbound Request: A device with a private IP (e.g., 192.168.1.10) sends a request to a web server (e.g., Google).**

**->The packet has:**

**Source IP: 192.168.1.10**

**Destination IP: Google's public IP (e.g., 8.8.8.8)**

**Step 2: NAT Translation (Source NAT - SNAT or Masquerading): The router replaces the private IP (192.168.1.10) with its public IP (e.g., 203.0.113.1). It assigns a unique port number (e.g., 50001) to track the connection.**

**->New packet has:**

**Source IP: 203.0.113.1 (Router’s public IP)**

**Source Port: 50001**

**Destination IP: 8.8.8.8 (Google's IP)**

**Step 3: Internet Response: Google responds, sending data to 203.0.113.1:50001.**

**Step 4: NAT Translation Back (Destination NAT - DNAT): The router checks its NAT table and finds that port 50001 was assigned to 192.168.1.10. It rewrites the destination IP back to 192.168.1.10 and forwards the packet to the original device.**