ISP

175.132.12.99 →

R2 / NAT

Conference Building

R1

| Room 1 | Room 2 | Room 3 | Room 4 |

You have been asked to set up the LAN for a conference building. The building has 4 rooms, and each room is equipped with a wireless access point (WAP). Each conference room should be in a different LAN and has a capacity of 1000 people. You can ignore the external interface of R1, the internal interface of R2 and the broadcast IP addresses.

What is the subnet you would assign to each wireless access point? What is the IP address you would assign to each WAP? Write each IP address and subnet in both decimal and binary notation. Explain your decisions.

We need 4000 IP addresses for the wireless hosts and another 4 IP addresses for R1's internal interfaces for a total of 4004 IP addresses. If we use 12 bits for the host part, we will have $2^{12} = 4096$ available IP addresses for our network, which are more than enough. As shown below, we can create a /20 subnet, meaning that 20 bits belong to the subnet part (underlined) and 12 bits belong to the host part.

IP Block from Router R1 (binary)	IP Block from Router R1 (decimal)
00001010.00000000.00000000.00000000 - 00001010.00000000.00001111.11111111	10.0.0.0/20

We need to use 2 bits to assign subnets to 4 rooms, because $2^2 = 4$. We are left with 10 bits to assign host IP addresses in each LAN and router interfaces. So, each conference room will have a LAN with a /22 subnet.
We need 1000 people to be able to connect to Wi-Fi in each room, plus an IP for the internal router interface. Therefore, we need 1001 unique IP addresses in each LAN. We can achieve this by assigning 10 bits to each LAN, because $2^{10} = 1024$. These are the subnets we can assign to each conference room.

Room	Subnet (binary)	Subnet (decimal)
1	00001010.00000000.000000**00**.00000000 - 00001010.00000000.000000**00**11.11111111	10.0.0.0/22
2	00001010.00000000.00000**01**00.00000000 - 00001010.00000000.00000**01**11.11111111	10.0.4.0/22
3	00001010.00000000.00000**10**00.00000000 - 00001010.00000000.00000**10**11.11111111	10.0.8.0/22
4	00001010.00000000.00000**11**00.00000000 - 00001010.00000000.00000**11**11.11111111	10.0.12.0/22

We can assign the first IP of each subnet to the internal interface of the WAP for that specific LAN.

Room	Internal Interface IP (binary)	Internal Interface IP (decimal)
1	00001010.00000000.00000000.00000000	10.0.0.0
2	00001010.00000000.00000100.00000000	10.0.4.0
3	00001010.00000000.00001000.00000000	10.0.8.0
4	00001010.00000000.00001100.00000000	10.0.12.0

Thus, each conference room can support 1023 clients.