

DAY 7 - IPv4 Identifying Trick

IPv4 Identifying Tips & Tricks:

[Playlist on Subnetting from Practical Networking](#)

Question:

Finding important IP Addresses given an IPv4 address:

1. **Network Address:** Make all Host portion = 0
2. **Broadcast Address:** Make all Host portion = 1
3. **First Usable Host:** The address after network address.
4. **Last Usable Host:** The address before broadcast address.
5. **No. of Usable Host:** *big math?*

We know how to, but would we really convert decimal to binary and back to decimal again?

- eg. 10.0.0.4/9 :

Octet	1 st	2 nd	3 rd	4 th
IP Address	00001010	00000000	00000000	00000100
Mask	11111111	10000000	00000000	00000000

- Network Address:

Octet	1 st	2 nd	3 rd	4 th
Binary	00001010	00000000	00000000	00000000
Decimal	10	0	0	0

- Broadcast Address

Octet	1 st	2 nd	3 rd	4 th
Binary	00001010	01111111	11111111	11111111
Decimal	10	127	255	255

We would run out of time in any exam before we can do anything.

The Answer (Table):

1. Create a table of the "powers of 2" from 1 to 128, call this row the **Group Size**:

Group Size	128	64	32	16	8	4	2	1
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2. Subtract from **256** on each column, this row is called the **Mask**:

Group Size	128	64	32	16	8	4	2	1
Mask	128	192	224	240	248	252	254	255

3. Now write the Netmask /x notation (**CIDR**) from /32 from **Right to left** and **Top to Bottom**, each row will correspond to the **4th, 3rd, 2nd, 1st Octet** respectively.

Group Size	128	64	32	16	8	4	2	1
Mask	128	192	224	240	248	252	254	255
4 th	/25	/26	/27	/28	/29	/30	/31	/32
3 rd	/17	/18	/19	/20	/21	/22	/23	/24
2 nd	/9	/10	/11	/12	/13	/14	/15	/16
1 st	/1	/2	/3	/4	/5	/6	/7	/8

4. Number of **Usable Host** is $\text{pow}(2, 32 - \text{netmask}) - 2$ (+2 when including network and broadcast address)

The Answer (How to use Table):

eg: From the same question: 10.0.0.4/9

1. Seeing the /9 we look for the specific cell in the Table.

Group Size	128	64	32	16	8	4	2	1
Mask	128	192	224	240	248	252	254	255
4 th	/25	/26	/27	/28	/29	/30	/31	/32
3 rd	/17	/18	/19	/20	/21	/22	/23	/24
2 nd	<u>/9</u>	/10	/11	/12	/13	/14	/15	/16
1 st	/1	/2	/3	/4	/5	/6	/7	/8

* `/9` is associated with the 2nd octet.

* Looking at the 2nd octet, we set that octet (and the 3rd & 4th octet) to `0` then **increment** the original 2nd octet by the **Group Size** until the value of the 2nd octet is **Greater than or equal** the **Original**'s 2nd octet.

* (Increment must happen at least once even if the set-0 of that octet is already `0`)

Octet	1 st	2 nd	3 rd	4 th	Contain 0?
Original	10	0	0	4	-
2nd Octet = 0	10	0	0	0	-
+ Group Size	-	128	-	-	YES

- We see that 128 has surpassed the original 2nd octet's value of 0 :
 - 10.128.0.0 is the result **but** we need to back down by 1 address to 10.127.255.255 as the broadcast address.
 - 10.0.0.0 is the result *before* the 128 increment, and thus that is the network address.
- We can also convert between /9 format and the mask's dotted decimal notation:
 - Mask value of the /9 column is 128, and so the mask is 255.128.0.0
- Usable IP = $\text{pow}(2, 32-9) - 2 = 8388606$ IP Addresses.

Eg: 172.16.26.5/22

Group Size	128	64	32	16	8	4	2	1
Mask	128	192	224	240	248	252	254	255
4 th	/25	/26	/27	/28	/29	/30	/31	/32
3 rd	/17	/18	/19	/20	/21	/22	/23	/24
2 nd	/9	/10	/11	/12	/13	/14	/15	/16
1 st	/1	/2	/3	/4	/5	/6	/7	/8

- /22 deals with the 3rd octet.

	1st	2nd	3rd	4th	Contains 26?
Original IP	172	16	26	5	-
Set 3rd = 0	172	16	0	0	-
+ Group Size	-	-	4	-	No
+ Group Size	-	-	8	-	No
+ Group Size	-	-	12	-	No
+ Group Size	-	-	16	-	No
+ Group Size	-	-	20	-	No
+ Group Size	-	-	24	-	No
+ Group Size	-	-	28	-	YES

- Original value of the 3rd octet is 26 and from the table, we can see that it lies between 24 and 28 .
 - 28 in the 3rd octet gives: 172.16.28.0 back down by 1 gives the **Broadcast Address** of 172.16.27.255 .
 - 24 in the 3rd octet gives: 172.16.24.0 gives us the **Network Address**.
- Mask in dotted-decimal notation: 255.255.252.0
- Number of usable hosts: $\text{pow}(2, 32-22) - 2 = 1022$ IP

Eg: 192.168.1.186/26

Group Size	128	64	32	16	8	4	2	1
Mask	128	192	224	240	248	252	254	255

Group Size	128	64	32	16	8	4	2	1
4 th	/25	/26	/27	/28	/29	/30	/31	/32
3 rd	/17	/18	/19	/20	/21	/22	/23	/24
2 nd	/9	/10	/11	/12	/13	/14	/15	/16
1 st	/1	/2	/3	/4	/5	/6	/7	/8

/26 is 4th octet.

	1st	2nd	3rd	4th	Contains 186?
Original IP	192	168	1	186	-
Set 4th = 0	192	168	1	0	-
+ Group Size	-	-	-	64	No
+ Group Size	-	-	-	128	No
+ Group Size	-	-	-	192	Yes

- **Broadcast Address:** 192.168.1.192 back down by 1 equals 192.168.1.191
 - **Network Address:** 192.168.1.128
 - **First Host:** 192.168.1.129
 - **Last Host:** 192.168.1.190
 - **Mask:** /26 equals 255.255.255.192
 - **No. of Hosts:** $\text{pow}(2, 32-26) - 2 = 62$ IP.
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