DAY 7 - IPv4 Identifying Trick

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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	1st	2nd	3rd	4th
IP Address	**00001010**	**0**0000000	00000000	00000100
Mask	**11111111**	**1**0000000	00000000	00000000

- Network Address:

Octet	1st	2nd	3rd	4th
Binary	00001010	**0**0000000	**00000000**	**00000000**
Decimal	10	0	0	0

- Broadcast Address

Octet	1st	2nd	3rd	4th
Binary	00001010	**0**1111111	**11111111**	**11111111**

Octet	1st	2nd	3rd	4th
Decimal	10	127	255	255

We would ran 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

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

4. Number of **Usable Host** is `pow(2, 32-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
4th	/25	/26	/27	/28	/29	/30	/31	/32
3rd	/17	/18	/19	/20	/21	/22	/23	/24
2nd	**/9**	/10	/11	/12	/13	/14	/15	/16
1st	/1	/2	/3	/4	/5	/6	/7	/8

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* `/9` is associated with the 2nd octet.
* Looking at the 2nd octet, we set that octet (and the 3rd & 4th octet) to `0` the
    * (Increment must happened at least once even if the set-0 of that octet is al
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Octet	1st	2nd	3rd	4th	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 = `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
4th	/25	/26	/27	/28	/29	/30	/31	/32
3rd	/17	/18	/19	/20	/21	***/22***	/23	/24
2nd	/9	/10	/11	/12	/13	/14	/15	/16
1st	/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: `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
4th	/25	**/26**	/27	/28	/29	/30	/31	/32
3rd	/17	/18	/19	/20	/21	/22	/23	/24
2nd	/9	/10	/11	/12	/13	/14	/15	/16
1st	/1	/2	/3	/4	/5	/6	/7	/8

`/26` is 4th octet.

	1st	2nd	3rd	4th	Contains 26?
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**: `pow(2, 32-26) - 2` = 62 IP.
