The spectacular netmask

Gilinsky

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At the far end of time, where the <u>vampire taps</u> roam, and the <u>ethernet frames collide</u> as they flow,

There was a great question, so hard for the day; when <u>processors managed just 8 bits</u> to convey.

We divided the networks to keep packets movin', without <u>backing off</u>; though progressively soothin'.

Now divided we pondered, eyes fixed to the foot, how can we know which packets we'll <u>root</u>?

Some packets stay here, some packets go there; across the great router, where treated with care, they're launched on their way, to the great <u>who-knows-where</u>…

The problem, you see, between you and me, is that routers are great, and fast as they be, they can't quite compete with with travelling straight.

So how do we know who stays and who goes, with processors that count with less digits than toes?

The answer's so neat! And fast as can be! It requires no stretch for 8-bangers or me!

We take an <u>address, of the IP persuasion</u>, held in 4 registers, or memory locations.

We treat them as one - a long <u>binary</u> string. Just as in <u>silicon</u> they naturally sing.

We do the same thing with a series of zeros, that tally the hosts we know as close heroes.

Then in one operation, we use a great tool, graciously given to us by <u>George Boole</u>.

The bits that define our destination so grand, combine with the ones that say, 'these are at hand'.

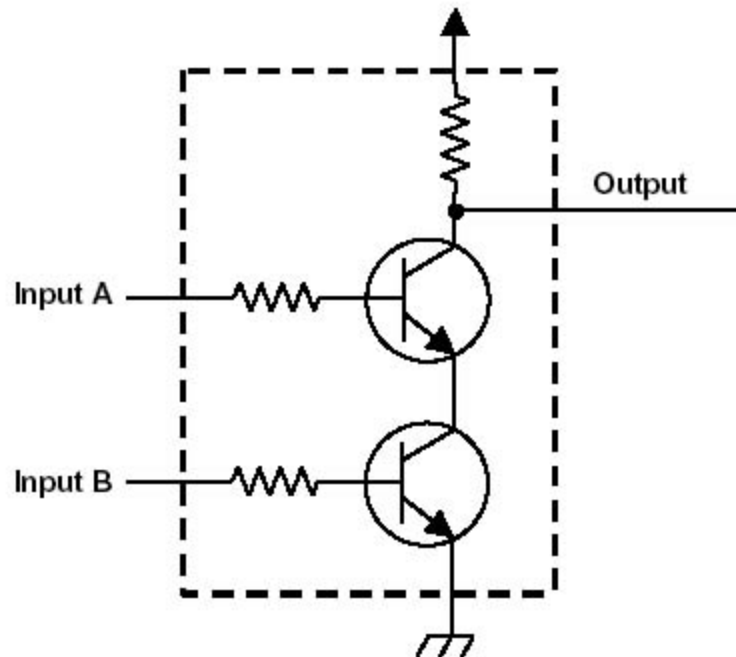Lickety split, and blink-and-you'll-miss-it, all of a sudden you've got the great secrit.

An address you can use to call out with glee, "who owns this one? I know you're near me!"

What tool can this be that brings with such ease the answer we seek from long numbers like these?

You'll laugh when I say it.

You'll clap and you'll stand.

for our helper, of course, is the wonderful AND

AND Gate - With just 64 transistors, we can compute a network address from an IP address and a netmask. Or… Two transistors and two shift registers. How cool is that!?!

Watch this magic….

```
Destination Address: 192.168.010.013    1100 0000 1010 1000 0000 1010 0000 1101
Netmask:             255.255.255.000     1111 1111 1111 1111 1111 1111 0000 0000
                     ******AND******     ***************AND*******************
Network Address:     192.168.010.000     1100 0000 1010 1000 0000 1010 0000 0000
```

How about this one:

```
Destination Address: 192.168.010.013    1100 0000 1010 1000 0000 1010 0000 1101
Netmask:             255.255.255.128     1111 1111 1111 1111 1111 1111 1000 0000
                     ******AND******     ***************AND*******************
Network Address:     192.168.010.000     1100 0000 1010 1000 0000 1010 0000 0000
```

What about this: (Been a long time since I've seen one of these! They used to be common.)

```
Destination Address: 192.168.010.196     1100 0000 1010 1000 0000 1010 1100 0100
Netmask:             255.255.255.128      1111 1111 1111 1111 1111 1111 1000 0000
                     ******AND******      ***************AND*******************
Network Address:     192.168.010.128      1100 0000 1010 1000 0000 1010 1000 0000
```

Or the venerable 9bit netmask:

```
Destination Address: 192.168.029.001     1100 0000 1010 1000 0001 1101 1100 0100
Netmask:             255.255.254.000      1111 1111 1111 1111 1111 1110 0000 0000
                     ******AND******      ***************AND*******************
Network Address:     192.168.028.000      1100 0000 1010 1000 0001 1100 0000 0000
```

Of course, you can go as far left as you want…

How many ways can you divide this old network:

https://who.is/whois-ip/ip-address/12.0.0.0/

Or this little one, just hitting it's 29th birthday tomorrow:

199.165.135.0 whois lookup information - who.is

199.165.135.0 whois lookup information.

https://who.is/whois-ip/ip-address/199.165.135.0