ROUTING PACKETS

We took a big-picture look at how TCP/IP networking works. As a quick reminder, the most important points were:

- Our computer networks use a stack of protocols known as TCP/IP

- We think of the stack of protocols as being broken into four layers:

  - The Link Layer – lets computers that are on the same network send single packets of data to each other

  - The Internet Layer – Lets computers on different networks send single packets of data to each other

  - The Transport Layer – lets computers send meaningful streams of data between each other

  - The Application Layer – where all the networked apps we use live

- Logically, data travels across the layers – HTTP to HTTP, TCP to TCP, IP to IP, ethernet to ethernet, but physically, data travels up and down the stack, one layer to another, only moving from one device to another when it gets to the Link Layer at the very bottom of the stack.

Unlike ethernet, the IP protocol can send packets across different networks. The act of moving a packet through different networks from source to destination is known as routing. The heavy-lifting in routing, figuring out a route through the

maze of interconnected networks that make up the internet, is done by routers, and is beyond the scope of this series. However, each and every device that speaks IP needs to make some simple routing decisions. Fundamentally our computers have to answer one simple routing question "is the destination IP address for this packet on my local network, or is it on a different network?".

If your computer determines that the destination IP address is on the local network, then it looks up the MAC address for the destination IP using ARP, and sends the packet directly to its destination using ethernet.

On the other hand, if your computer determines that the destination IP is not on your local network, then it must send the packet to your router for processing. To do this your computer must know the IP address of your router, and, it must find your router's MAC address using ARP. Once your computer has that information it sends the packet to your router using ethernet. Your router then sends the packet on to your IPS's router which will send it on it's way across the internet.

At this stage we know that for your computer to work on an IP network it must have an IP address, and it must know the IP address of the router it should use to send remote packets on their way. But how does it know whether or not a packet is destined for the local network? The key to answering that question is IP subnets.