PAT – changes IP addresses and ports (modifies layer 3 and layer 4 header).

Static – administrator defines PRE and POST mappings.

Static PAT – explicit mapping between an IP:Port to another IP:Port.

Static PAT makes internal resource ports externally accessible. This is different from static NATs because static NATs make internal resources externally accessible by IP address, with static PAT, we do it by port.

A green circular object with white arrows

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Here we are not just concerned about the IP addresses, we are also concerned about the ports. Both servers in the inside network are serving different services on their respective ports. For the 2 external ports to communicate to the servers, they must not use the private IP addresses of the servers as a DST IP address, because then the packet will be dropped. Instead, they should use the public IP address as the DST IP address and the router will do the translations.

So, the private IP address 10.4.4.41:8080 should always be translated to the public IP address 73.8.2.44:80 and the private IP address 10.4.4.42:443 should always be translated to the public IP address 73.8.2.44:443.

So, let’s say the fist external host wants to send a packet to one of the servers. It would stamp the packet with a SRC IP address of 54.4.5.7:7777 and also the DST IP address of 73.8.2.44:80, when the packet crosses the router, the DST IP address 73.8.2.44:80 would get remapped to 10.4.4.41:8080.

Then the second host would stamp the packet with a SRC IP address of 45.5.4.8:9999 and a DST IP address of 73.8.2.44:443. When the packet crosses the router, the DST IP address will be remapped to 10.4.4.42:443.

Now the port has not been changed for the second static PAT mapping, the 443 hasn’t been changed so what difference does this make to a NAT? The reason is because the configuration was matching to a specific port which is what continues to make this a PAT. If this was a NAT, all ports would be matched meaning that if the external host had sent something to port 22 (SSH port), in a NAT it would be allowed through but since this is a PAT, we don’t have an entry for port 22 so the packet would be dropped.

Static PAT’s are very similar to static NAT’s except that static PAT’s include ports and static NAT’s don’t.

NEXT PAGE

* Static PAT’s facilitate using non-standard ports. For example, if 10.4.4.41:8080 was a web server and someone was hosting a website on port 8080, for a user to access the website they would have to type sitre.com:8080 (uses non-standard port). The issue is that users would forget to put :8080 at the end. So, using a static PAT makes it more convenient because any request to port 80 would be translated/redirected to port 8080 on the web server. Since port 80 is used for web traffic, all users have to do is search site.com and it will be directed to port 80 where the router will redirect it to port 8080 by using the static PAT mapping from the router.

Lets take a look at how it would look like if it was a static NAT:

A close-up of a graph

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As we can see it just translates a private IP address to a public IP address, the ports are not involved, meaning that if an incoming packet had the DST IP address of 73.8.2.44 with the port 22 or port 21 or no matter what port it is, it would be mapped to the internal IP address (10.4.4.42) on the same port. Which means that all ports are allowed through. Whereas with a static PAT, only the ports we map out are forwarded through our translation, this is port forwarding, we are saying go ahead and let this port through the translation, it defines which ports are allowed through our translation mapping.

* Static PAT’s are also bidirectional, meaning both hosts can initiate the communication and traffic will flow.

One key point with static PAT’s is that multiple servers are using the one same public IP address:

A close up of a sign

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As we can see we have 2 servers (private IP addresses) that are using the one same public IP address, meaning that static PAT’s can conserve IP addresses.