# Tunneling and Firewall Evasion



N9.1. Host H is on an internal network `10.7.2.0/24`, which is protected by a firewall (only the ssh connection to H is allowed). Alice tries to access the other hosts on the internal network. She has an account on host H, so she uses SSH to create a VPN between her outside machine and the host H. After the VPN is established, she needs to configure both outside machine and Host H. Please describe in plain English what exact configuration she needs to do to make this work.

N9.2. Why can VPN be used to bypass geo-restriction enforced by some firewalls?

N9.3. A TCP server is running on a remote machine called `sirius` using "`nc -lv 9090`". This machine is on a planet outside the Solar system. An alien named Alice living on the Earth wants to communicate with the TCP server on `sirius`, but unfortunately, the Earth has a firewall that prevents all computers on the Earth from accessing any machine outside the Solar system. Alice does have a computer on Mars, which does not have such a restrict firewall rule. Alice's computer on Mars is called `mars`, and her account name is called `alien`. (1) Please describe how Alice can use an SSH tunnel to bypass Earth's firewall, so she can talk to `sirius`. (2) Without the firewall, if Alice wants to communicate with the TCP server on `sirius`, she can use the "`nc sirius 9090`" command. Now, with the SSH tunnel and the firewall, what command should Alice run to access the server?

N9.4. This problem is based on Problem N9.3. After Alice has established an SSH tunnel between her local computer `earth` and `mars`, she can use the `nc` command to communicate with the `netcat` server on `sirius`. Please describe how the TCP packets flow, from the `netcat` client program to the destination `netcat` server.

N9.5. This problem is based on Problem N9.3. The alien Alice has many friends outside the Solar system, and she wants to connect with them by visiting various social network sites hosted on the planets where her friends live. Establishing one SSH tunnel for each social network site is tedious. Can you help Alice set up one single SSH tunnel, which she can use to stay connected with her friends?

N9.6. This problem is based on Problem N9.3. Alice also runs a web server on her machine `earth` on the Earth, and she would like her friends from her home planet to visit this web server. Unfortunately, the Earth has a firewall the prevents computers outside the Solar system from accessing any computer on the Earth. Alice would like to use her computer on Mars to set up a port forwarding using SSH, so instead of visiting Alice's machine on Earth, her friends can point their browsers to `mars`, which automatically forward the traffic to Alice's machine on the Earth. This kind of port forwarding is called *remote port forwarding*, which is not covered in the book. Please read about this kind of port forwarding from the Internet, and then describe how to use it to help Alice.

N9.7. VPN tunnel and SOCKS5-based dynamic port forwarding can both be used to create tunnels. What are their main differences?