The first ping sometimes fails to resolve due to the multiple networks between the source and destination device. For instance, if the sender S(IP: 192.168.0.2) attempts to ping the receiver R(IP: 10.0.0.2), the sender must send the ping message via its default gateway. To do this, S needs the MAC address of the default gateway. If the sender's ARP table doesn't contain the address, the sender must send an ARP request to the default gateway *(fig 1)*. After S has received the gateway MAC address (*fig 2)*, it will forward the ping and start the wait timer for the reply message. The default gateway finds the correct next-hop IP address for the ping based on its routing table. Once it has the IP, it must determine the appropriate MAC Address by checking its ARP table, assuming the ARP table contains the appropriate address. If not, it must send an ARP request to the next hop to find the MAC address (*fig 3)*. When the first ping message is forwarded, the ARP tables aren't yet populated, so ARP requests are sent at each hop (*fig 3 – 6)*. This process takes time, which can cause the first few ping messages to time out. Timeouts are more likely to occur as the network grows because the number of ARP tables to populate increases. Note that the ARP requests made by S are not part of the PING timeout, whereas requests made by other devices along the route are. Therefore, the timeout doesn't happen when pinging a local machine - it must be a computer on a different network.

A close-up of a message

Description automatically generated

|  |  |
| --- | --- |
|  |  |
| A diagram of a diagram  Description automatically generated | A diagram of a network  Description automatically generated |
|  |  |