

BOOTP - Bootstrap Protocol (BOOTP Client and Server in same subnet)							
subnet 1				intranet	subnet 2		EventHelix.com/EventStudio 2.0
client		server 1		router	server 2		
RAM software	ROM software	BOOTP Server 1	TFTP Server 1	BOOTP Relay Agent	BOOTP Server 2	TFTP Server 2	04-Jul-03 15:07 (Page 1)

The Bootstrap Protocol (BOOTP) enables a host to boot from ROM and request it's own IP address, a gateway address and a boot file name. The boot file is used to load the disk image into RAM.

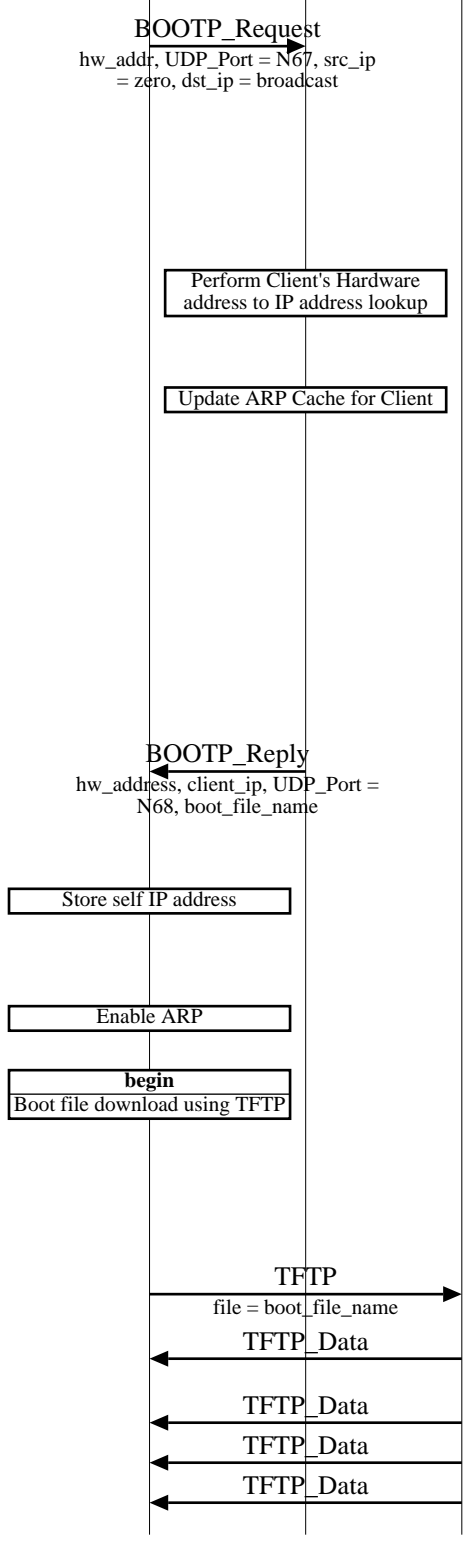
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Determine Hardware Address

Client obtains its own hardware address from the ROM

**LEG: BOOTP within same subnet**

In this scenario we cover the case where the BOOTP Server is directly connected to the BOOTP Client



Client sends a UDP datagram with a BOOTP\_Request. The destination UDP port number is 67. Since the client does not know its own IP address it sets the source IP address to 0.0.0.0. In many cases the client does not know the IP address of the server, so it sets the destination IP address to broadcast (255.255.255.255).

Server looks up the client's hardware address in a configuration file to determine the IP address to be assigned to the client

The server needs to send an IP message to the client. This cannot be done directly as the ARP cache on the server does not contain IP address to hardware address mapping for the client. The default action of using ARP to determine the hardware address will not work as the client does not know its IP address. This issue is resolved by directly updating the ARP cache with an IP address to hardware address mapping for the client

The Server sends out the BOOTP Reply using the client's hardware address. The reply is addressed to UDP Port 68. The boot file name will also be sent out to the client.

Client stores its own IP address. This IP address will be used in all communications with the outside world

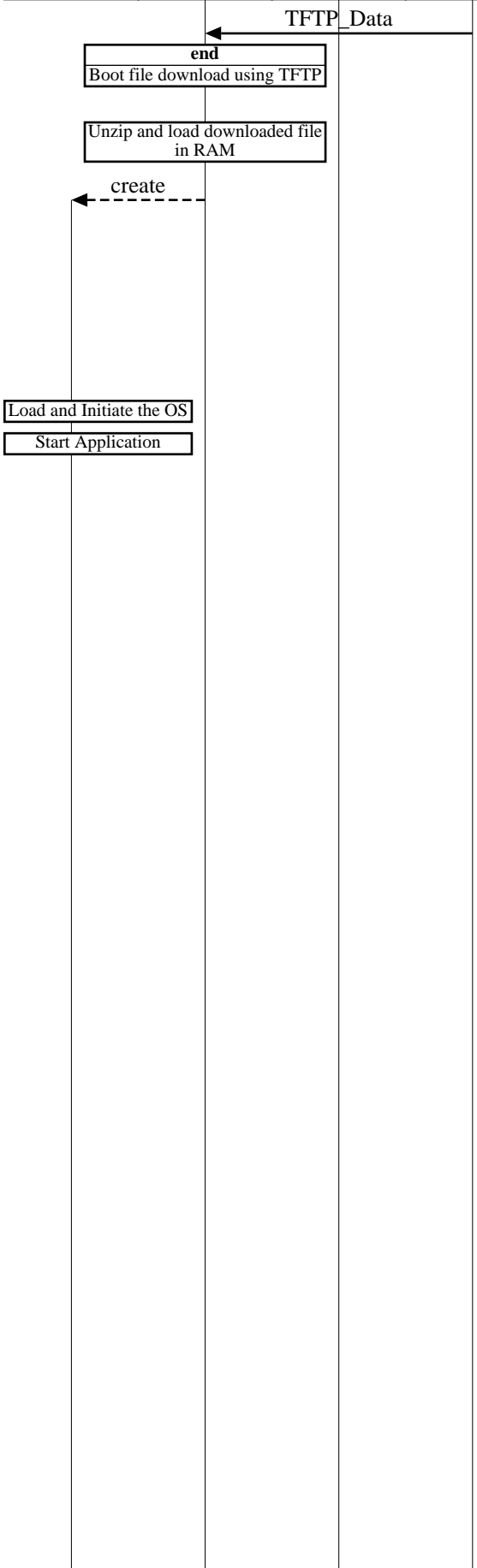
Since the client has received its IP address, it can participate in ARP

Now the client can initiate boot file loading. Typically TFTP is used in downloading the file. TFTP is selected over FTP as it uses UDP. This minimizes the amount of protocol code that needs to be burst into the client ROM.

Boot file name specified in BOOTP Reply is used to initiate TFTP

Complete contents of the file are loaded

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TFTP session has ended. Now control will be transferred to the software that has just been downloaded.

The downloaded file is uncompressed and loaded into RAM

ROM software transfers control to the RAM software. The downloaded software includes the OS as well as the application, so no other downloads are required

Note that the ROM software will include a complete implementation of the TCP/IP stack that would replace the primitive stack in the ROM.

The Downloaded OS is booted  
The Downloaded application is started

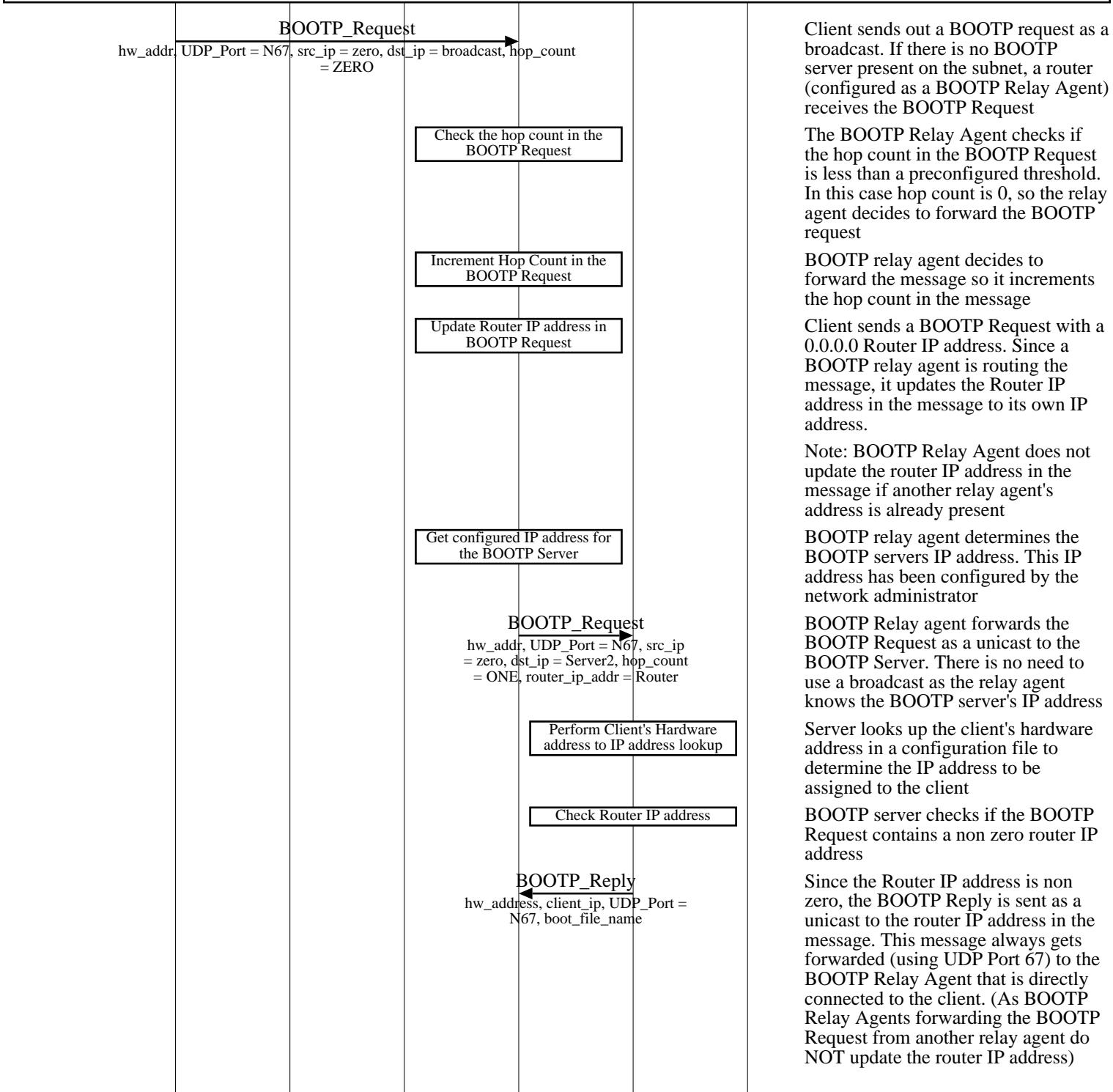
BOOTP - Bootstrap Protocol (BOOTP forwarding via a BOOTP Relay Agent)							
subnet 1				intranet	subnet 2		EventHelix.com/EventStudio 2.0
client		server 1		router	server 2		
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The Bootstrap Protocol (BOOTP) enables a host to boot from ROM and request it's own IP address, a gateway address and a boot file name. The boot file is used to load the disk image into RAM.

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In this scenario we cover the case where the BOOTP Server is not directly connected to the BOOTP Client. Here a BOOTP Relay Agent is used to connect the BOOTP Client to BOOTP Server. (Server1 is assumed to be down in this scenario)



Client sends out a BOOTP request as a broadcast. If there is no BOOTP server present on the subnet, a router (configured as a BOOTP Relay Agent) receives the BOOTP Request

The BOOTP Relay Agent checks if the hop count in the BOOTP Request is less than a preconfigured threshold. In this case hop count is 0, so the relay agent decides to forward the BOOTP request

BOOTP relay agent decides to forward the message so it increments the hop count in the message

Client sends a BOOTP Request with a 0.0.0.0 Router IP address. Since a BOOTP relay agent is routing the message, it updates the Router IP address in the message to its own IP address.

Note: BOOTP Relay Agent does not update the router IP address in the message if another relay agent's address is already present

BOOTP relay agent determines the BOOTP servers IP address. This IP address has been configured by the network administrator

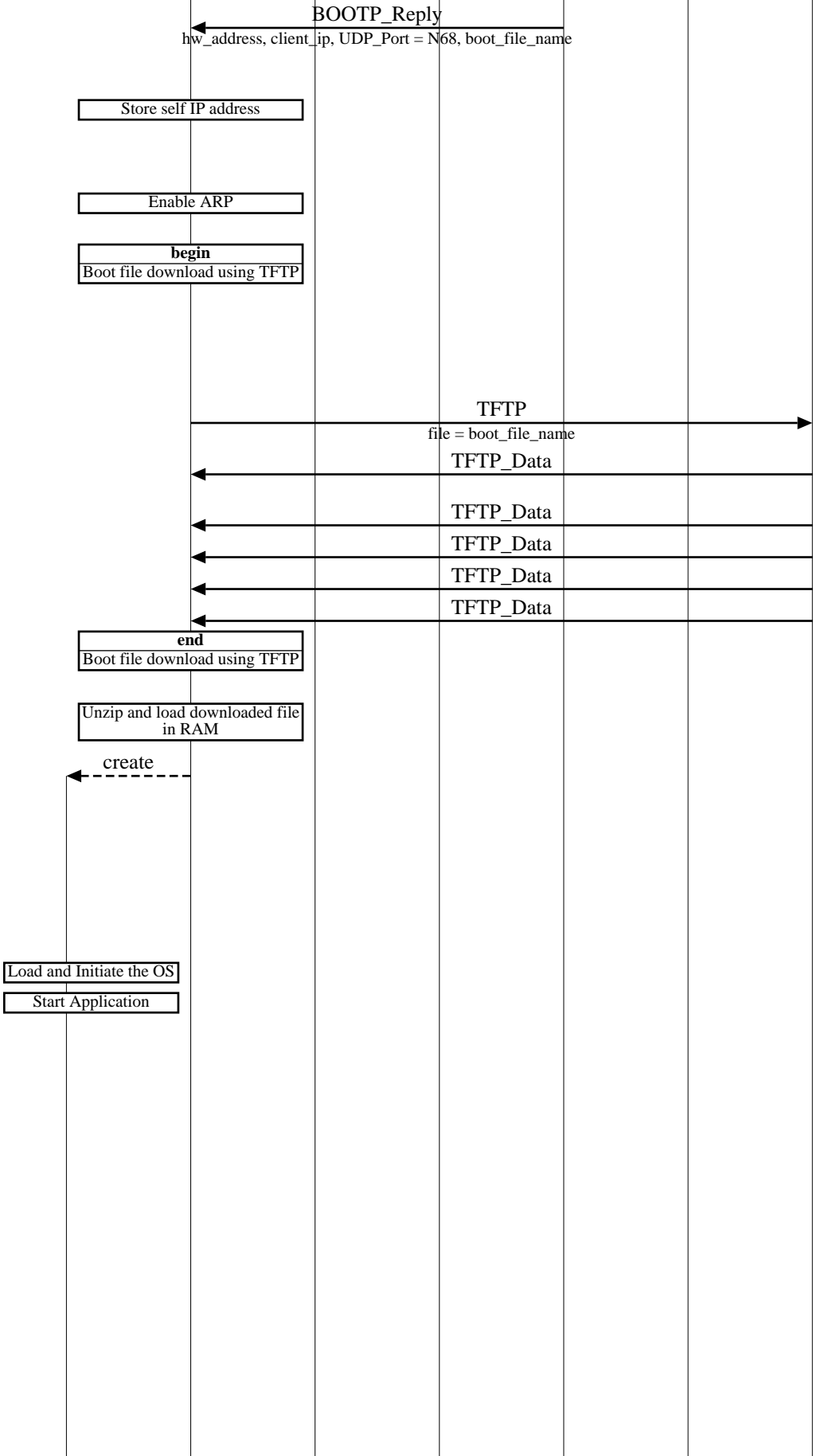
BOOTP Relay agent forwards the BOOTP Request as a unicast to the BOOTP Server. There is no need to use a broadcast as the relay agent knows the BOOTP server's IP address

Server looks up the client's hardware address in a configuration file to determine the IP address to be assigned to the client

BOOTP server checks if the BOOTP Request contains a non zero router IP address

Since the Router IP address is non zero, the BOOTP Reply is sent as a unicast to the router IP address in the message. This message always gets forwarded (using UDP Port 67) to the BOOTP Relay Agent that is directly connected to the client. (As BOOTP Relay Agents forwarding the BOOTP Request from another relay agent do NOT update the router IP address)

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The BOOTP Relay agent then uses the hardware address to directly send the BOOTP reply to the client. This message is sent to UDP port 68

Client stores its own IP address. This IP address will be used in all communications with the outside world

Since the client has received its IP address, it can participate in ARP

Now the client can initiate boot file loading. Typically TFTP is used in downloading the file. TFTP is selected over FTP as it uses UDP. This minimizes the amount of protocol code that needs to be burst into the client ROM.

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