

Join my social circle! (Instructor Version)

Instructor Note: Red font color or Gray highlights indicate text that appears in the instructor copy only.

Objectives

Describe the impact of ARP requests on network and host performance.

Students will discuss the ways that local addressing (source and destination) is critical to data communication identification when using messaging, conferencing, emailing, and even gaming.

Background /Scenario

Note: This activity can be completed individually in class or outside of class.

Much of our network communication takes the form of email, messaging (text or instant), video contact, social media postings.

For this activity, choose one of the following types of network communications that you use:

- Text or instant messaging
- Audio/video conferencing
- Emailing
- Online gaming

Now that you have selected a network communication type, record your answers to the following questions:

- Is there a procedure you must follow to register others and yourself so that you form a communications account? Why do you think that a procedure is needed?
- How do you initiate contact with the person or people with whom you wish to communicate?
- How do you ensure that your conversations are received only by those with whom you wish to communicate? Be prepared to discuss your answers in class.

Instructor notes: This Modeling Activity is not intended to be a graded assignment. Its purpose is to encourage students to reflect on their perceptions of source and destination host identification as compared to social media. Students' answers should generate discussion about how we are identified as we communicate through these types of networks.

Required Resources

- Recording capabilities (paper, tablet, etc.) for reflective comments to be shared with the class.

Reflection

1. Is there a procedure you must follow to register others and yourself so that you form a communications account? Why do you think that a procedure is needed?

In each of these services, you are bringing the person you want to communicate with “directly into your network”. You are doing this in order to have a direct contact with your correspondents and be able to communicate together directly, without requiring any intermediary person to relay messages between you and your friends in your network. In essence, by registering yourself and your correspondents into your contact list, you are building your own (social) communication network.

During the registration process, you as a person with a civil name are assigned a service-specific user identifier that identifies you in the particular communication service. In the same way, when you add your friends into your contact list, you are looking for their service-specific user identifiers and adding them to your contact list. This service-specific user identifier may bear different formats – for e-mail service, it is an e-mail address; for ICQ accounts, it is a number; for Skype, LinkedIn or Facebook accounts, the identifier would be a username. Whenever you contact the person, you select it in your contact list by his/her civil name and the system contacts the user using the associated user identifier. A single person may have different user identifiers depending on how many social networks he or she subscribed into.

In communication networks, there is a similar process. Although a network node, say, a PC, is a single entity, it may have several network interface cards (NICs). Each NIC is using a different unique identifier depending on the technology – Ethernet and WiFi NICs use MAC addresses, ATM cards use Virtual Path and Circuit Identifiers, ISDN interfaces use Terminal Endpoint Identifiers, Frame Relay interfaces use Data Link Circuit Identifiers, and there are many other examples. In these technologies, when you access a network, you may be assigned this identifier for your own NIC (this would be true especially for ATM, Frame Relay or ISDN where the identifier was assigned dynamically rather than built into the NIC's hardware). Also, these network technologies may require you to register before you can start communicating (in WiFi, you have to authenticate and associate to a particular access point; in Ethernet, you may be required to authenticate). And last but not least, a network node has to build its own contact list for each network it is connected to – in order to communicate with a different peer in the same network, knowing its logical identity, it needs to know what kind of NIC identifier the peer is reachable under.

In IP networks, this would be a process of associating the peer's IP address in the same network with its Layer2 data-link layer address. On Ethernet and WiFi, the two most widely used network technologies, IP uses a supporting protocol called Address Resolution Protocol, or ARP, to perform this translation.

2. How do you initiate contact with the person or people with whom you wish to communicate?

The exact sequence of steps would depend on the service you are using to communicate with your peer. However, there will always be common steps: First, you decide what network is your peer reachable in. Second, you look up the person's contact in your contact list, and then use this contact to send your peer a message. Depending on the service, the message will be received only by this person (like in e-mail or instant messaging services), or it may actually be visible by other people in the recipient's network (like in LinkedIn or Facebook message boards). There is never doubt, though, who is the intended recipient.

In IP networks, a node sending a message to another node decides on which directly network is the peer located, and then performs destination IP or next-hop IP into Layer2 address translation to know how to address that node's NIC. The message may then be delivered only to the recipient NIC (if there are, say, switches on the path between the sender and receiver), or it may actually be seen by other stations (like in WiFi where stations can hear each other).

3. How do you ensure that your conversations are received only by those with whom you wish to communicate?

The primary prerequisite is that the message is unambiguously addressed to a single intended recipient only. This is exactly the purpose of using a contact list that associates individual persons with their unique user identifiers. Otherwise, if we did not know the user identifier of the recipient, we would either have to send the message to everyone, effectively broadcasting it, or we would not be able to send the message at all. In IP networks, this goal is performed by the resolution of the recipient (or next-hop) IP address into

its unique Layer2 address, using ARP or a similar mechanism. It is then up to the network technology to make sure that the message arrives to, and only to, the intended recipient.

Some technologies do not allow sending messages in a way that prevents third parties from seeing the message. For example, in Ethernet deployments using hubs or WiFi, the transmission is always visible to all nodes in the network. While only the intended recipient will actually process the message, others can nonetheless see it. This is similar to message boards on LinkedIn or Facebook where, although intended for a single recipient only, many or all other users can see the messages.

Identify elements of the model that map to IT-related content:

- Different social network technologies correspond to different network technologies.
- Different user IDs for one particular person, depending on the social network the person is subscribed to correspond to different Layer2 addressing used by different network technologies.
- Contact lists correspond to tables where Layer3-to-Layer2 mappings are stored, e.g.. ARP tables in Ethernet or IP/DLCI tables in Frame Relay.
- Subscribing to a social network corresponds to the process of obtaining an access to a particular network and the related network technology.
- Looking up a person in one's contact list corresponds to lookups in the L3/L2 mapping tables.