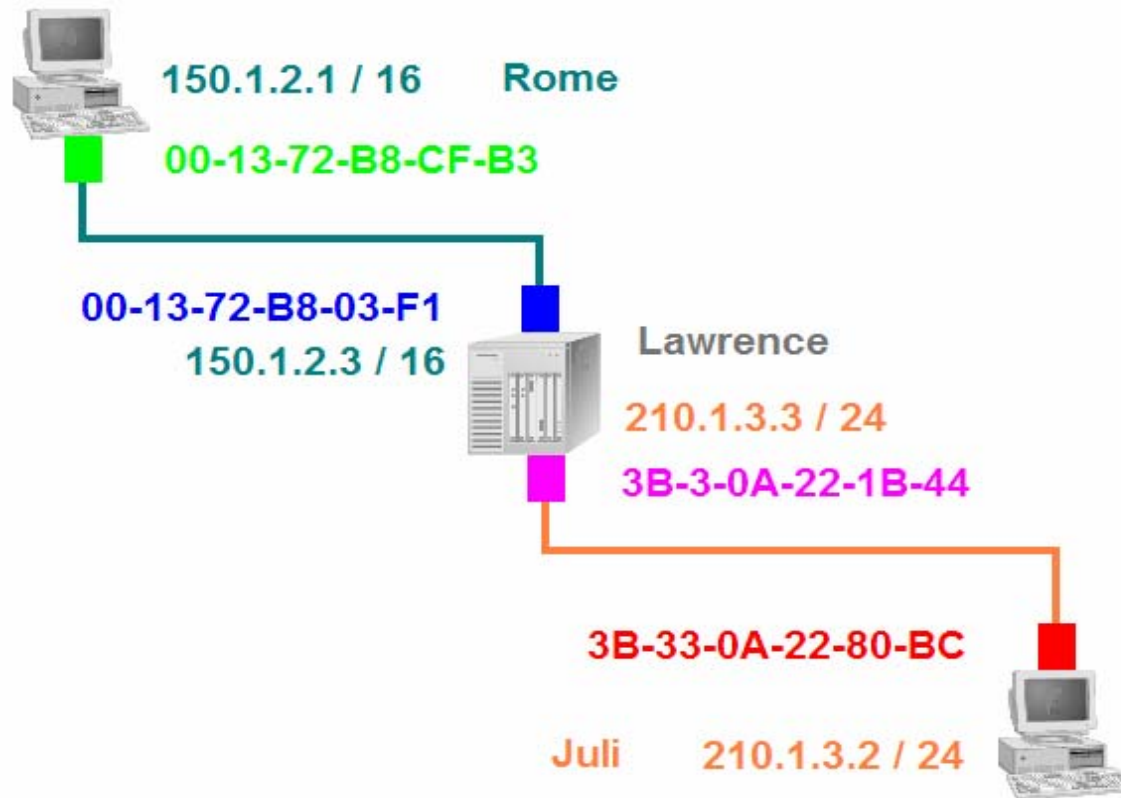


# A Tale of Two Networks

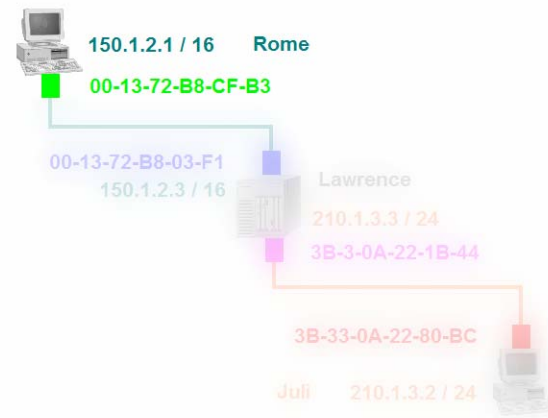
Rome sends a Packet to Juli long,  
long ago, far, far away.

# The Networks of Rome, Lawrence and Juli



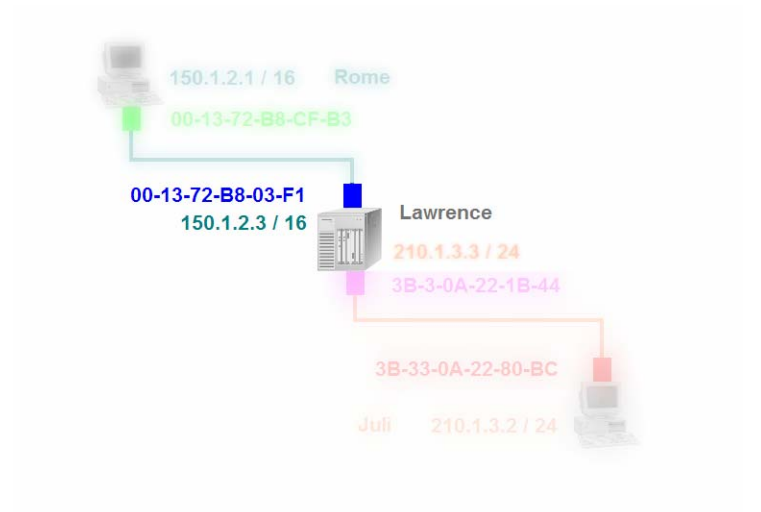
# Rome wants to send a Packet to Juli

- Rome knows Juli's IP address and he knows that Juli is not on his network.
- Rome knows that Lawrence is Rome's default router and he also knows Lawrence's IP address – route print
- But first, Rome also needs to know Lawrence's MAC address.
- Rome must broadcast an ARP request to his entire network in order to learn Lawrence's MAC address.



# Lawrence is on Rome's network

- Lawrence receives Rome's broadcast request.
- Lawrence sends a reply to Rome that includes Lawrence's MAC address.



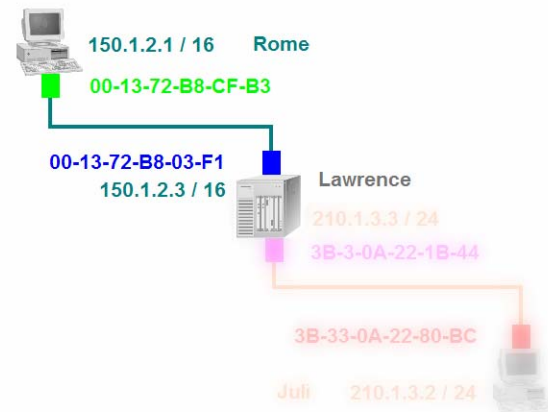
# Rome Builds a Frame around his Packet

- Rome now knows Lawrence's MAC address – arp -a
- Rome can build a Packet that includes:
  - Rome and Juli's IP addresses
  - Data
- Rome can build a Frame around the Packet that includes:
  - Rome and Lawrence's MAC addresses
  - Rome's Packet

Source MAC	00-13-72-B8-CF-B3
Destination MAC	00-13-72-B8-03-F1
Source IP	150.1.2.1
Destination IP	210.1.3.2
Data	Let's get together and recite some poetry!

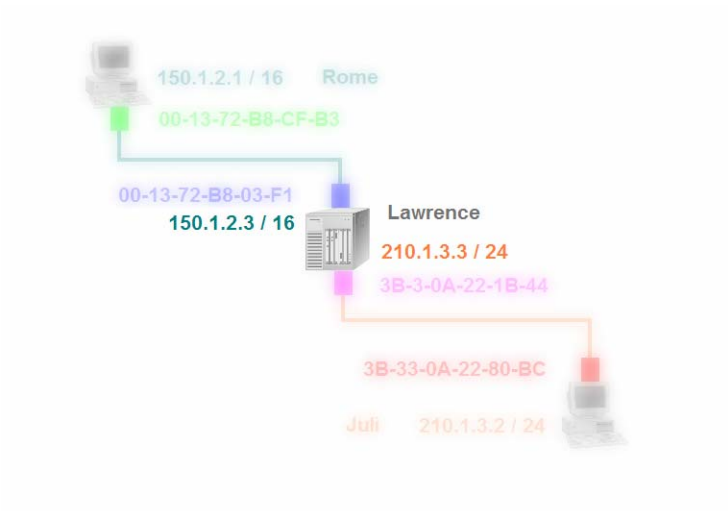
# Rome delivers the Frame

- Rome delivers the Frame directly to Lawrence's MAC address.
- Rome's Packet is inside of the Frame.
- Lawrence is Rome's default router, so Lawrence will accept Rome's Packet for handling.



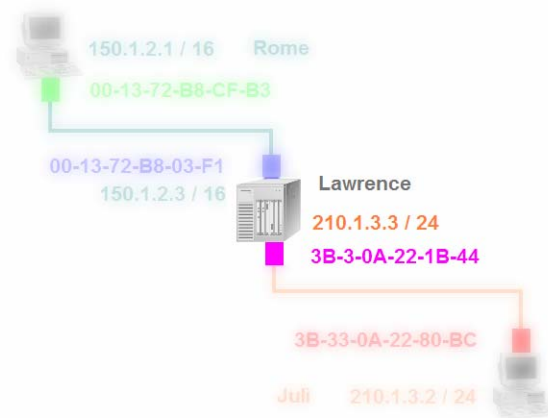
# Lawrence handles the Packet

- Lawrence strips off both the Source MAC address and the Destination MAC address.
- Lawrence reads the Source IP address and the Destination IP address from the Packet.
- Lawrence determines which network to forward the Packet to.



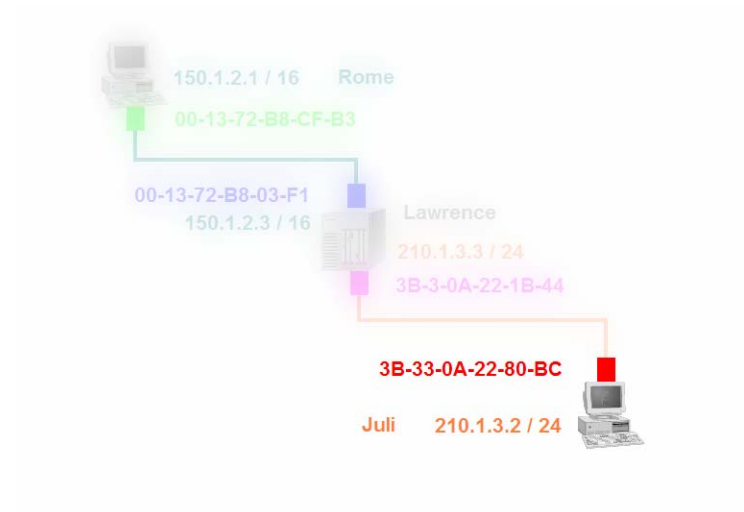
# Lawrence must locate Juli

- Lawrence now knows Juli's Destination IP address.
- Lawrence knows that Juli is on one of his networks.
- But, Lawrence still needs to know **Juli's Destination MAC** address.
- Lawrence must broadcast an ARP request to his entire network in order to learn **Juli's MAC** address.



# Juli is on Lawrence's network

- Juli receives Lawrence's broadcast ARP request.
- Juli sends a reply back to Lawrence that includes **Juli's MAC** address.



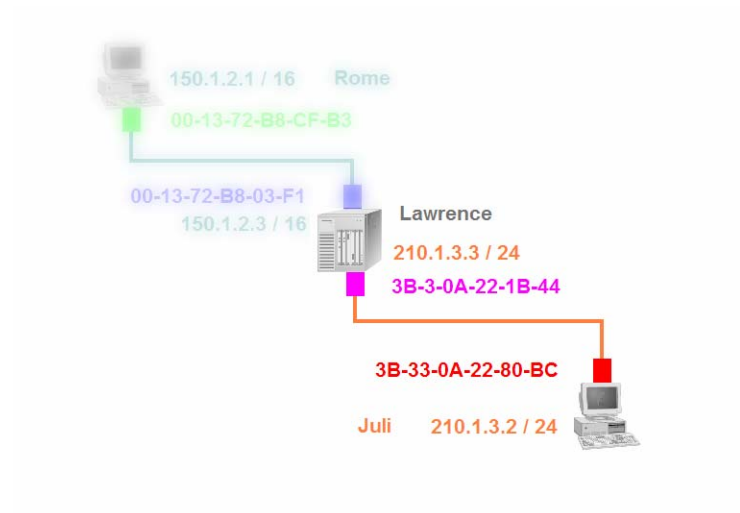
# Lawrence builds a new Frame

- Lawrence now knows **Juli's MAC** address –  
arp -a
- Lawrence can now build a new Frame that includes:
  - Lawrence and Juli's MAC addresses
  - Rome's original Packet.

Source MAC	3B-33-0A-22-1B-44
Destination MAC	3B-33-0A-22-80-BC
Source IP	150.1.2.1
Destination IP	210.1.3.2
Data	Let's get together and recite some poetry!

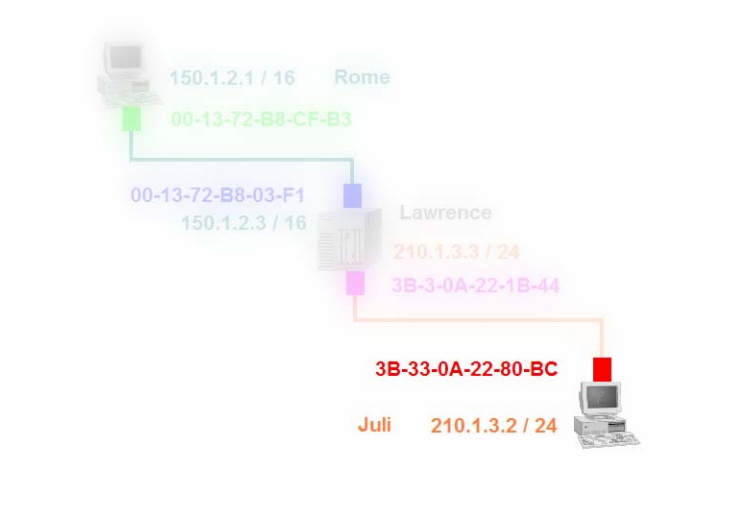
# Lawrence delivers the Frame

- Lawrence delivers the new Frame directly to **Juli's MAC** address.
- Rome's original Packet is inside of Lawrence's new Frame.



# Juli receives the Frame from Lawrence

- Juli will never know Rome's Source MAC address because it has been replaced with Lawrence's Source MAC address.
- Juli strips off Lawrence's and Juli's MAC addresses from the Frame to reveal Rome's Packet.
- When Juli replies to Rome with a new Packet, the entire process will repeat itself, in reverse.



# The Moral of the Tale of Two Networks

- MAC addresses do not hop from network to network.
- Routers reconstruct a new Frame every time they hop a Packet from network to network.
- Routers apply new MAC addresses every time they reconstruct a Frame around a Packet.
- All Frame deliveries are ultimately local deliveries.
- Local deliveries use only MAC addresses.

# The End

They all lived happily ever after.