Address Resolution Protocol (ARP)

as defined in RFC 826

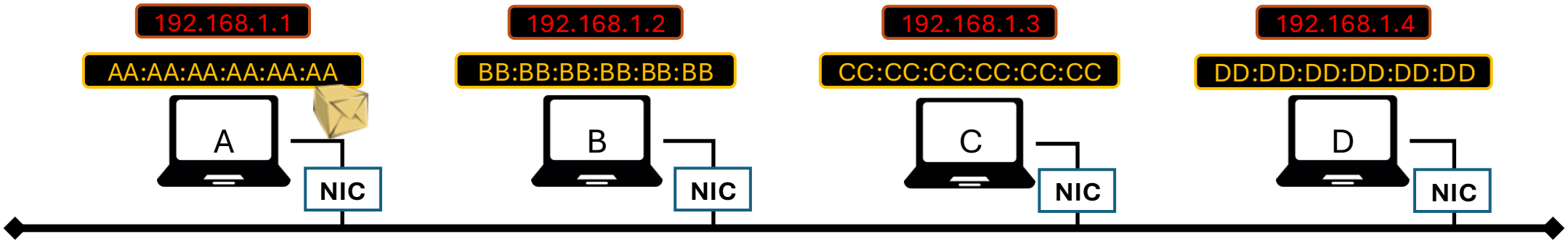
Georgios Z. **PAPADOPOULOS**
Professor at **IMT Atlantique**, campus of Rennes, France
georgios.papadopoulos@imt-atlantique.fr
www.gzpapadopoulos.com

Address Resolution Protocol (ARP)

The ARP is a Data Link layer protocol used in IPv4 networks to map a logical IP address to a physical MAC address on a local network.

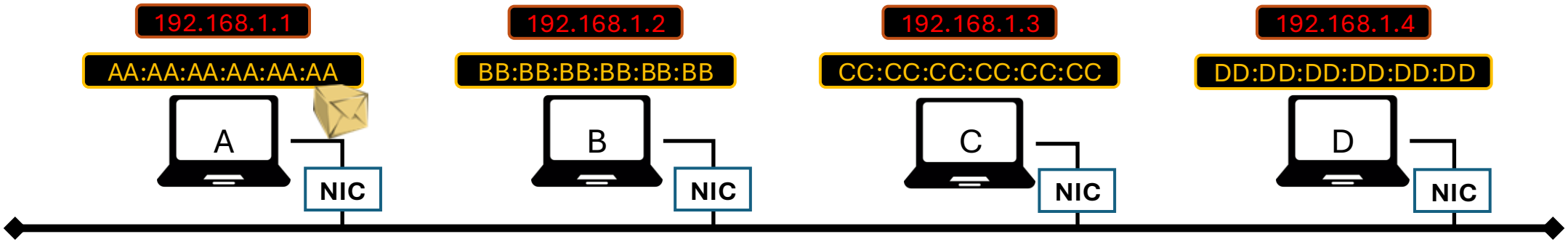
Address Resolution Protocol (ARP)

- A station is aware of the destination IP address.
- However, **Ethernet frames require a MAC address**.
- ARP resolves this mismatch by mapping IP addresses to MAC addresses.



How ARP Works (Step-by-Step)

Suppose that **station A** has a data packet to send to **D**, whose IPv4 address is 192.168.1.4.



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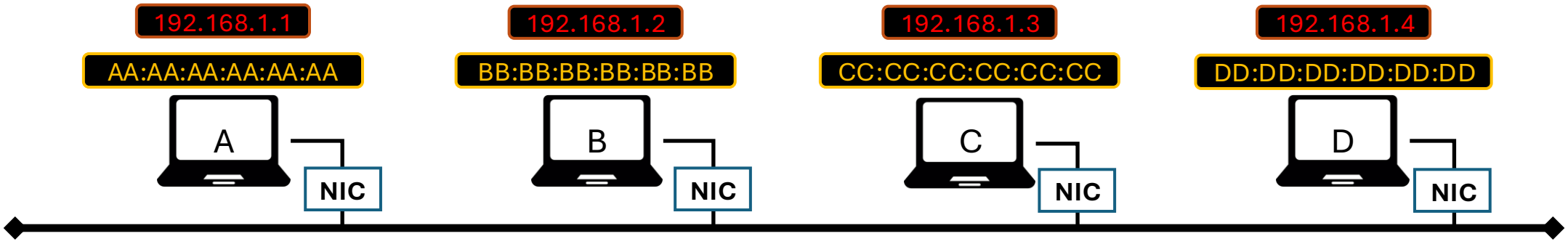
1. **Check ARP Table**:
   - Station A looks in its ARP table to see if it already knows station D's MAC address.



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1. **Check ARP Table**:
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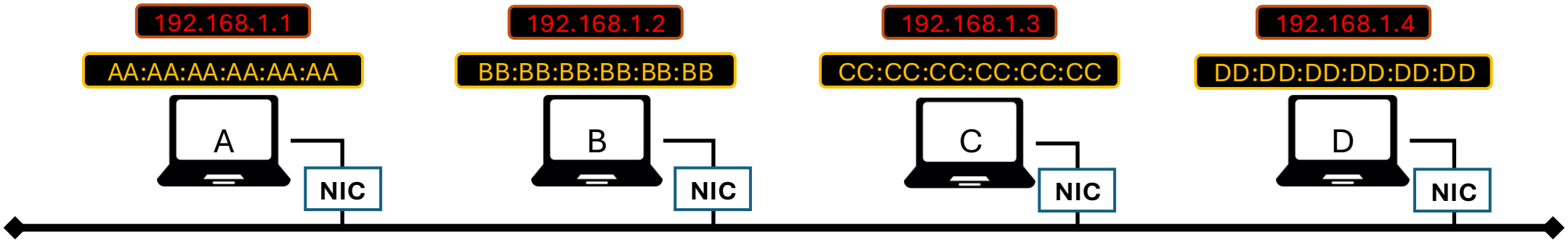
IP Address	MAC Address	Interface
192.168.1.2	BB:BB:BB:BB:BB:BB	eth0



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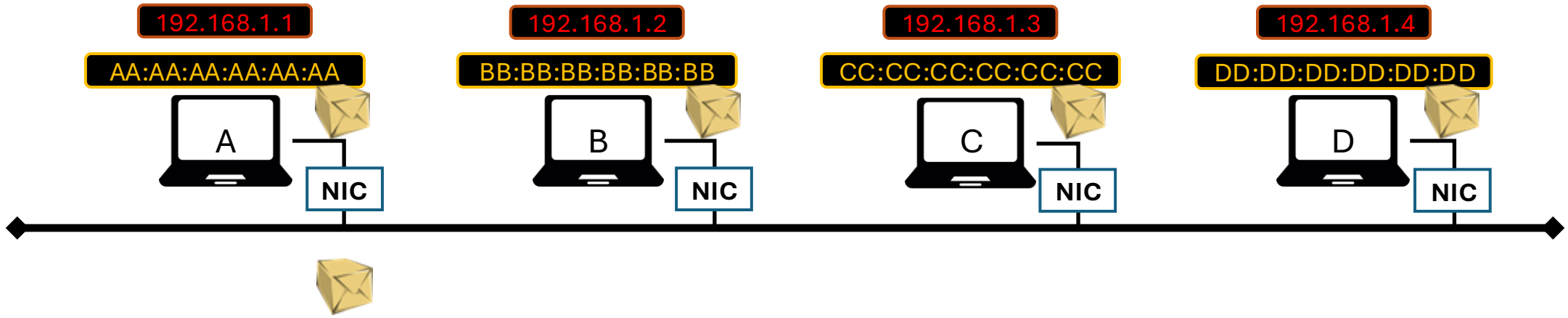
Suppose that **station A** has a data packet to send to **D**, whose IPv4 address is 192.168.1.4.

2. **If** not found, **Broadcast ARP Request**:
   - Station A broadcasts to **FF:FF:FF:FF:FF:FF**: "Who has the IPv4 address 192.168.1.4?"



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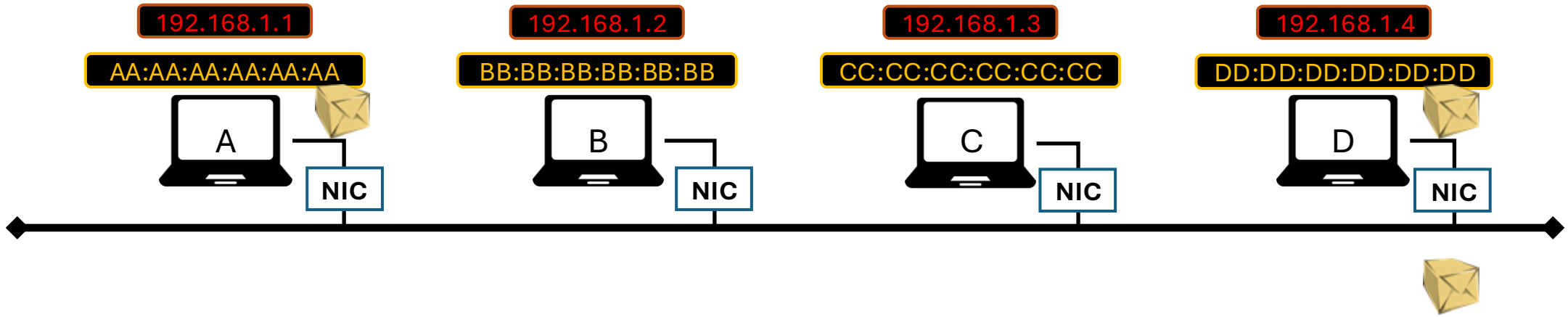
Suppose that **station A** has a data packet to send to **D**, whose IPv4 address is 192.168.1.4.

3. **ARP Reply**:
   - Station D responds **in unicast**: “the MAC address for 192.168.1.4 is DD:DD:DD:DD:DD:DD”.

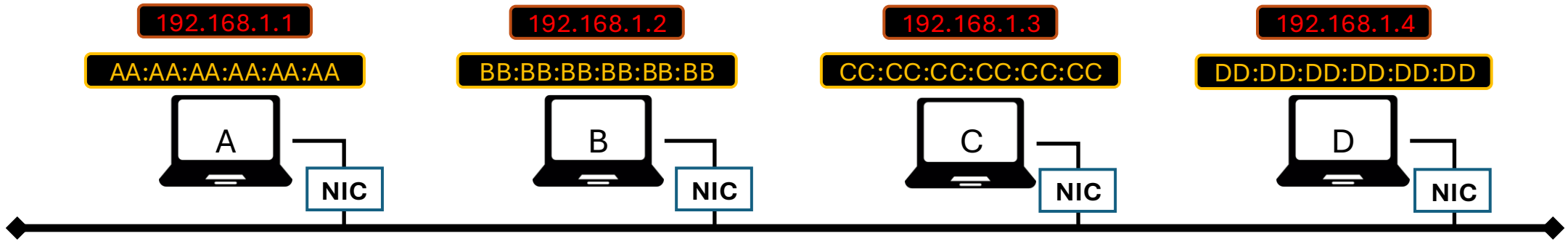


How ARP Works (Step-by-Step)

Suppose that **station A** has a data packet to send to **D**, whose IPv4 address is 192.168.1.4.

4. **ARP Table Update**:
   - Station D caches the lookup in its ARP table for future use.

IP Address	MAC Address	Interface
192.168.1.1	AA:AA:AA:AA:AA:AA	eth0



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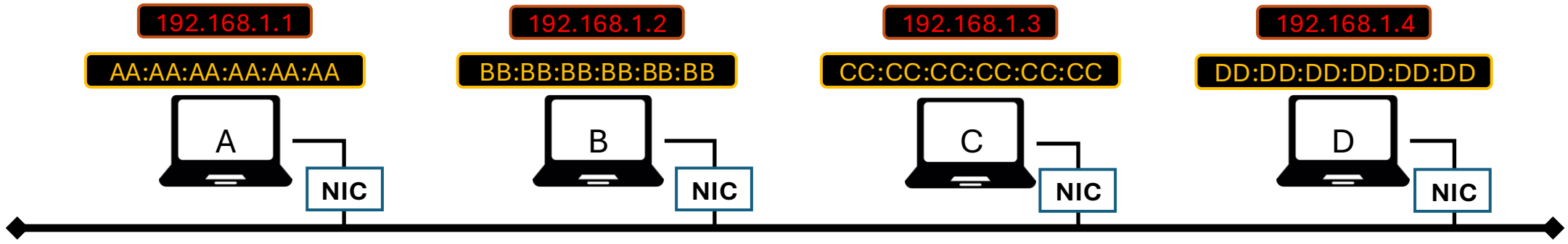
Suppose that **station A** has a data packet to send to **D**, whose IPv4 address is 192.168.1.4.

4. **ARP Table Update**:
   - Station A caches the lookup in its ARP table for future use.

IP Address	MAC Address	Interface
192.168.1.2	BB:BB:BB:BB:BB:BB	eth0
192.168.1.4	DD:DD:DD:DD:DD:DD	eth0



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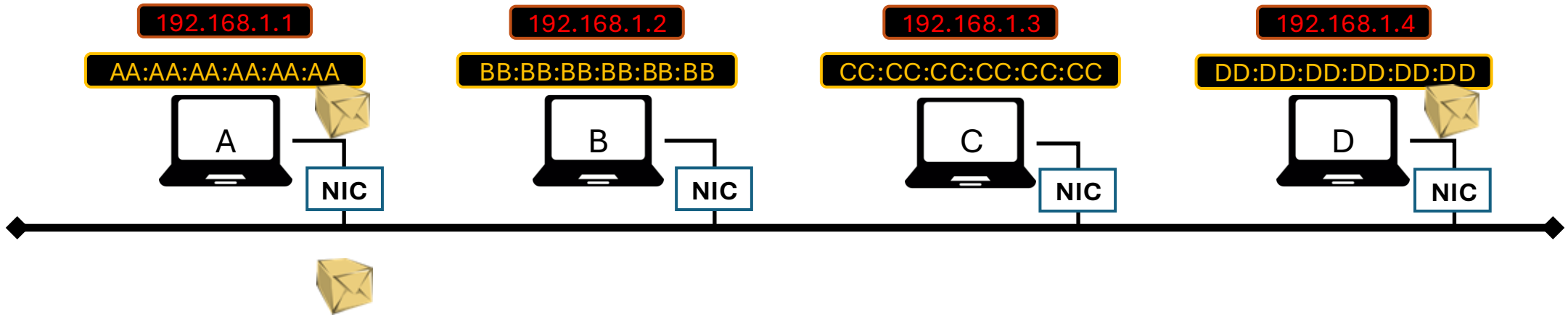
Suppose that **station A** has a data packet to send to **D**, whose IPv4 address is 192.168.1.4.

5. **Data Packet Transmission**:
   - Station A can transmit the data packet(s) directly to the MAC address of station D.

IP Address	MAC Address	Interface
192.168.1.2	BB:BB:BB:BB:BB:BB	eth0
192.168.1.4	DD:DD:DD:DD:DD:DD	eth0



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- ARP operates only within a single subnet and is never routed, i.e., local network.

- **ARP** is not used **in IPv6 networks**, ARP functionality is replaced by the Neighbor Discovery Protocol (**NDP**).

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