61A Lecture 35

Announcements

Distributed Computing

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Distributed computing for large-scale data processing:

- Databases respond to queries over a network
- Data sets can be partitioned across multiple machines (next lecture)

Network Messages

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Computers communicate via messages: sequences of bytes transmitted over a network

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- Protocols are designed to be implemented by many different programming languages on many different types of machines

Internet Protocol

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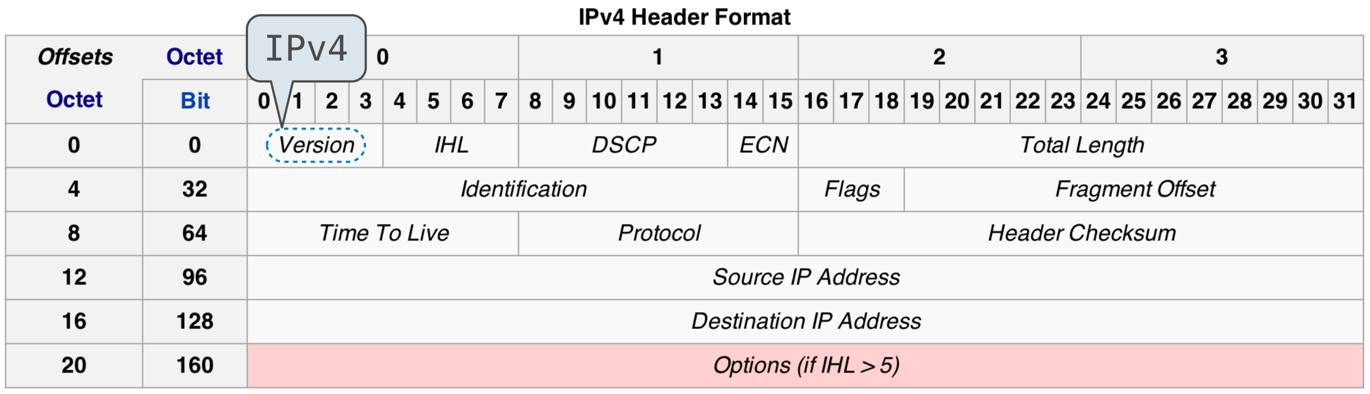

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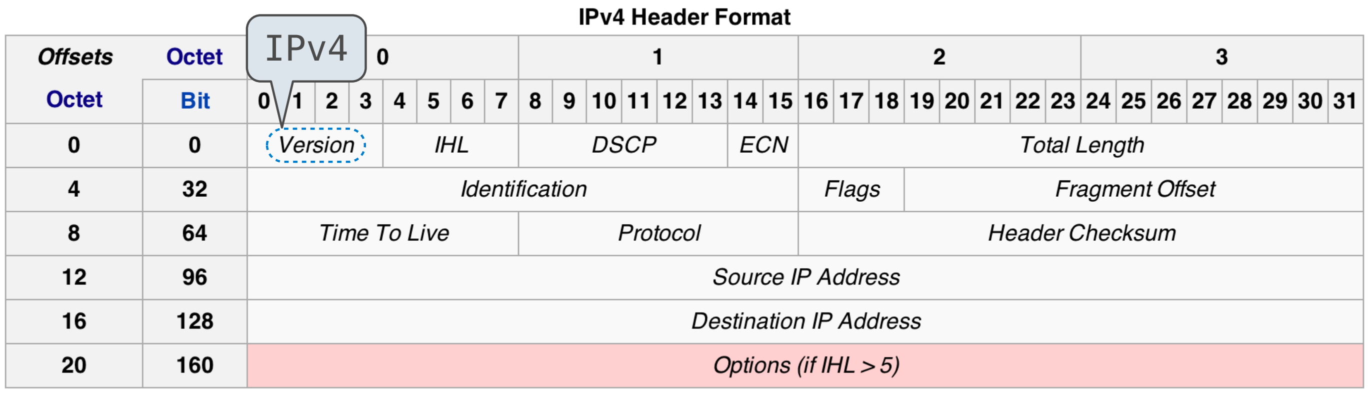

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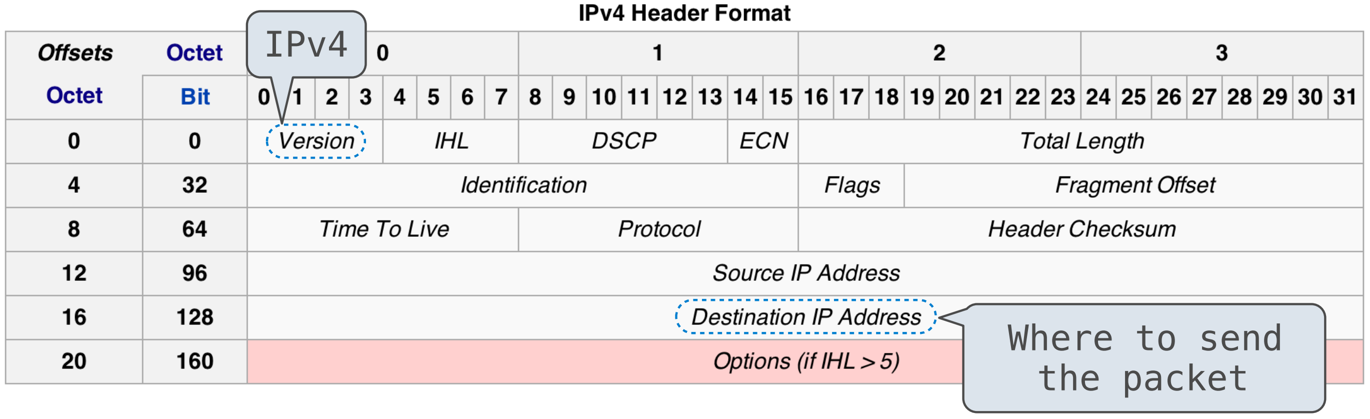
IPv4
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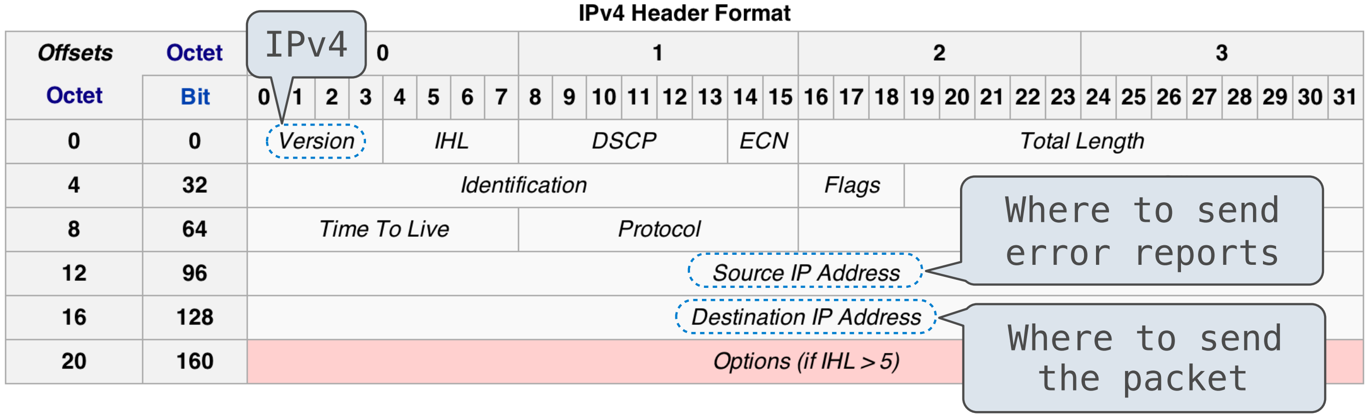
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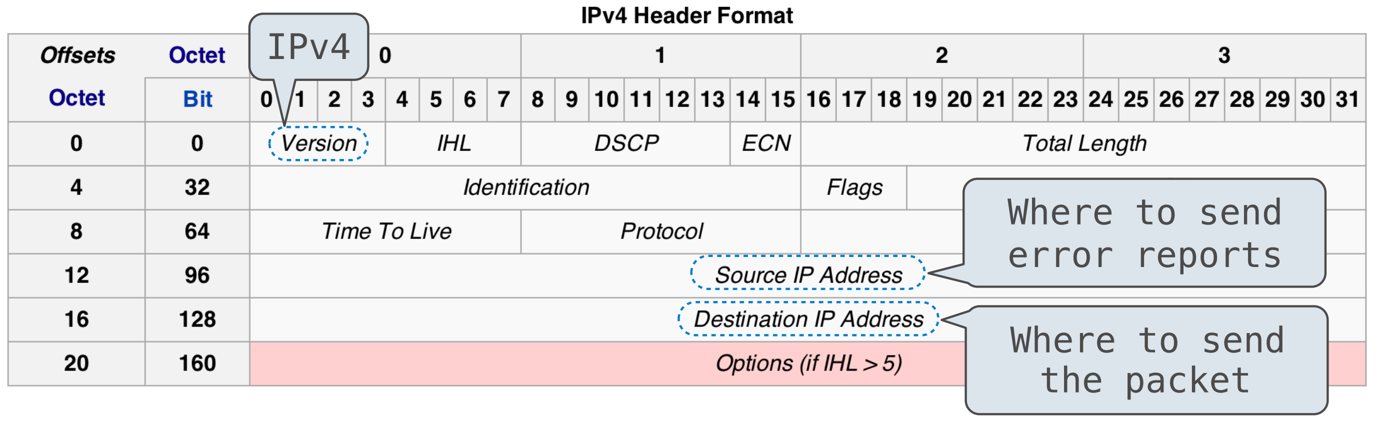
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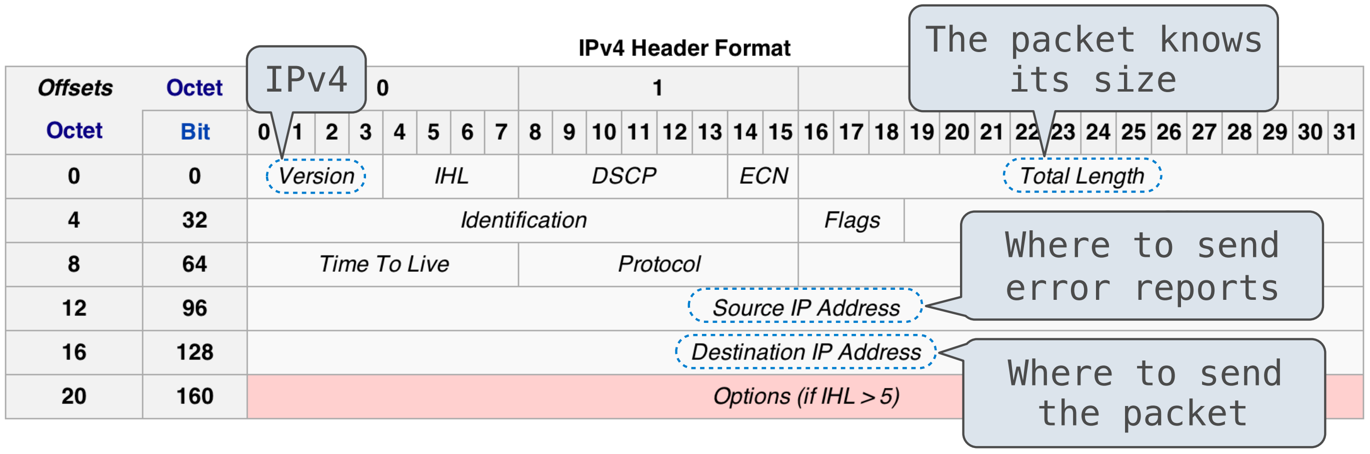

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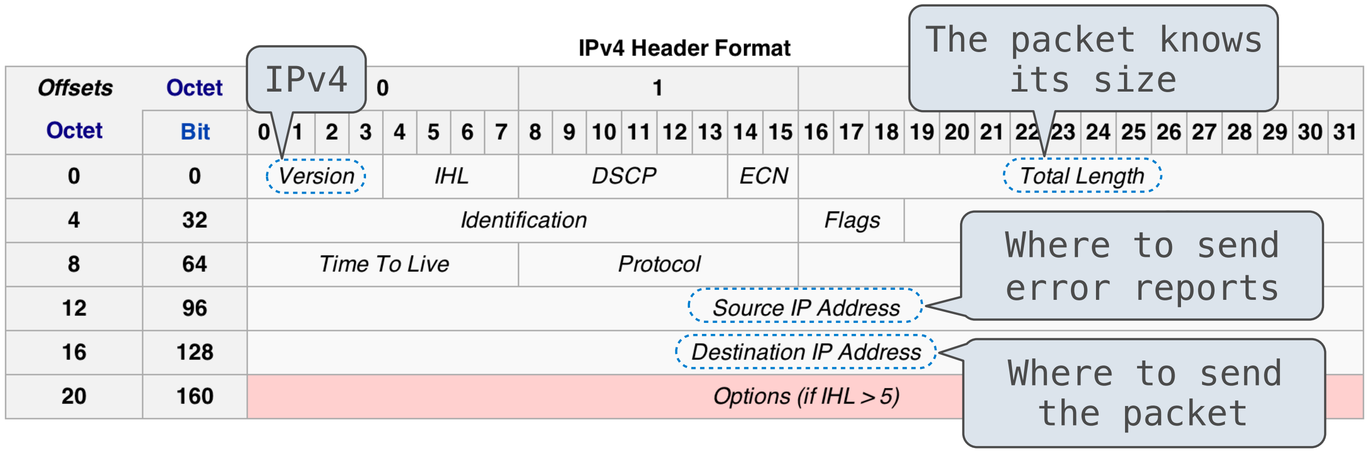
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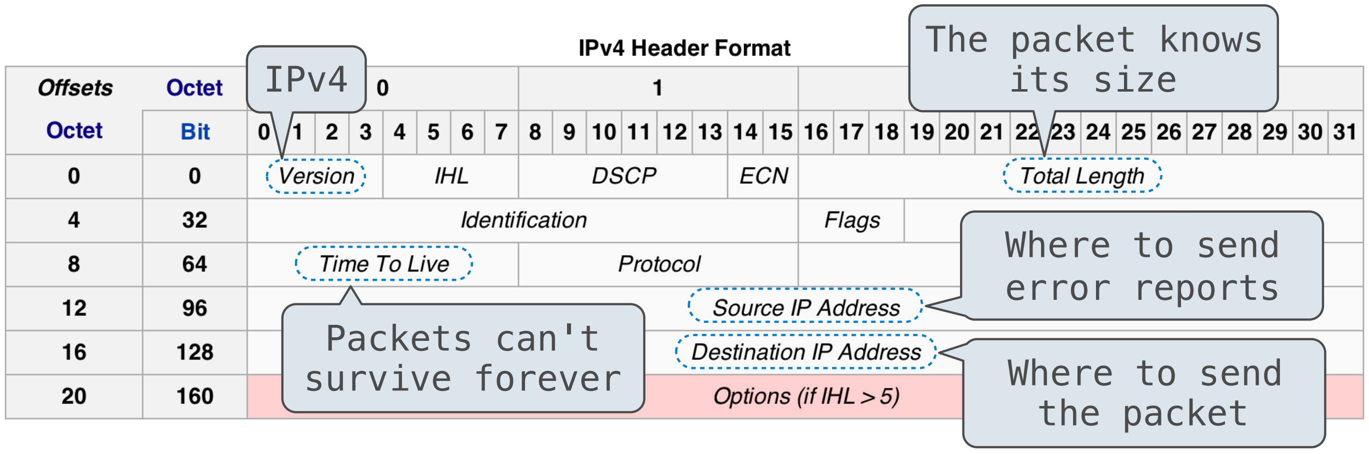

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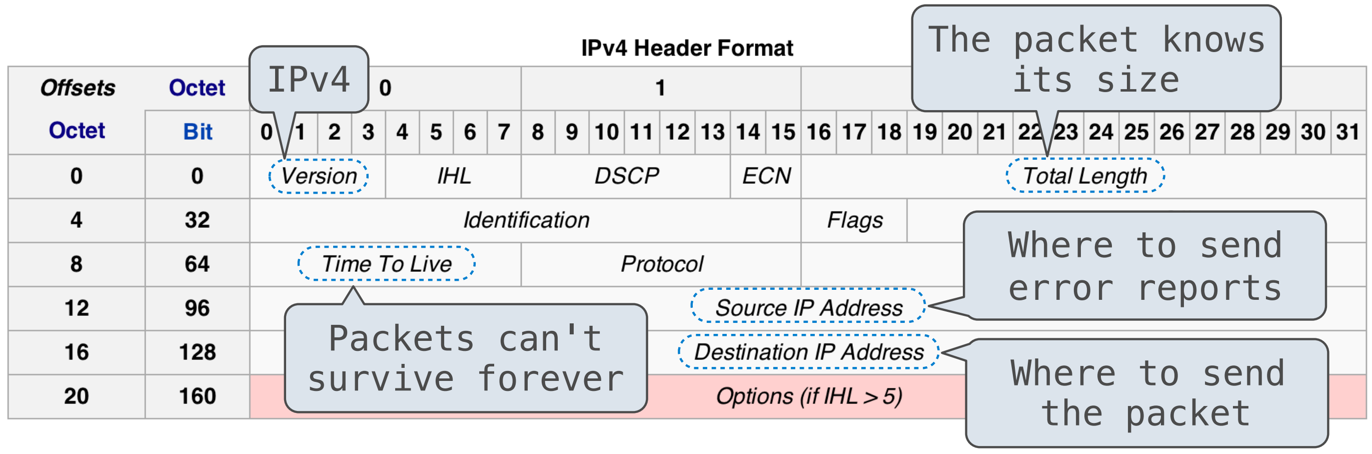
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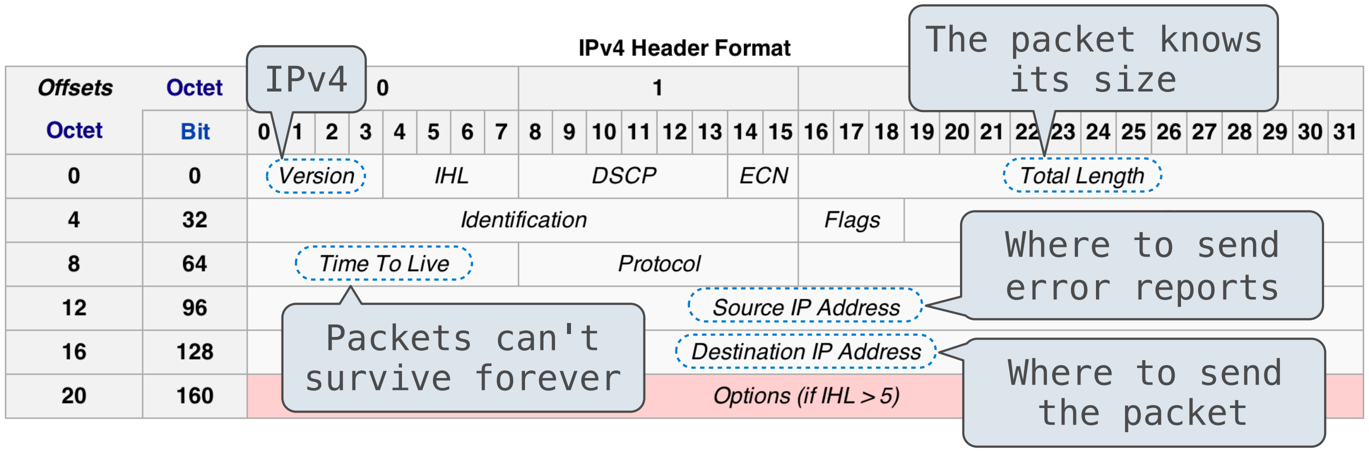
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Packets are forwarded toward their destination on a best effort basis

Programs that use IP typically need a policy for handling lost packets

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The socket module in Python implements the TCP

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All TCP connections begin with a sequence of messages called a "handshake" which verifies that communication is possible

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- Computer A knows that it can send data to and receive data from Computer B
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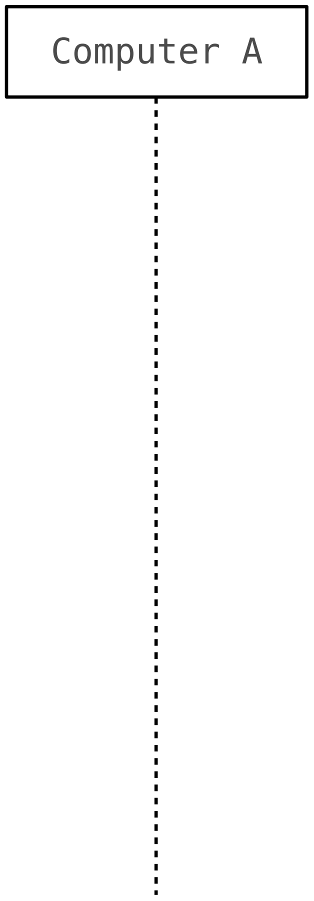

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Computer A
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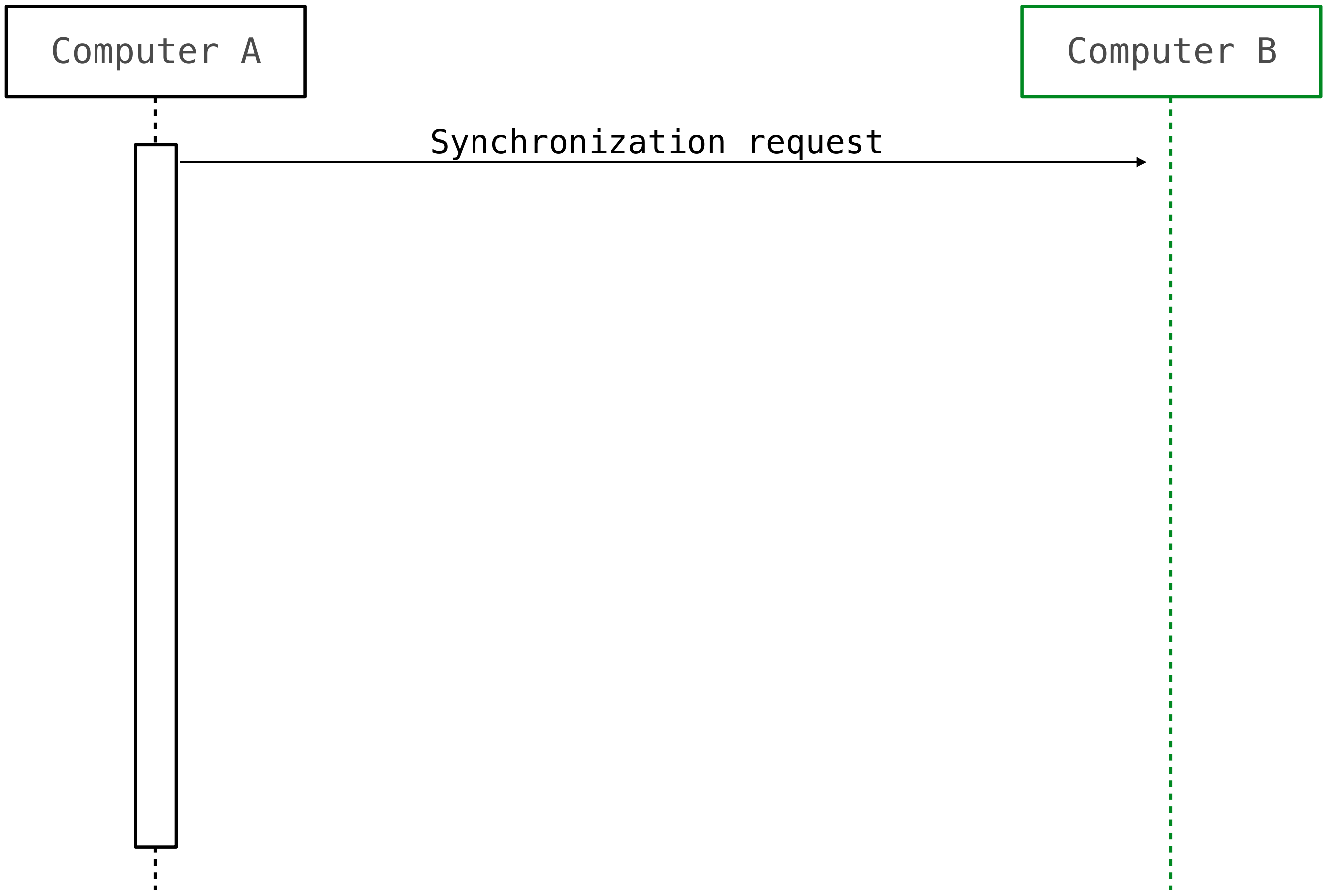

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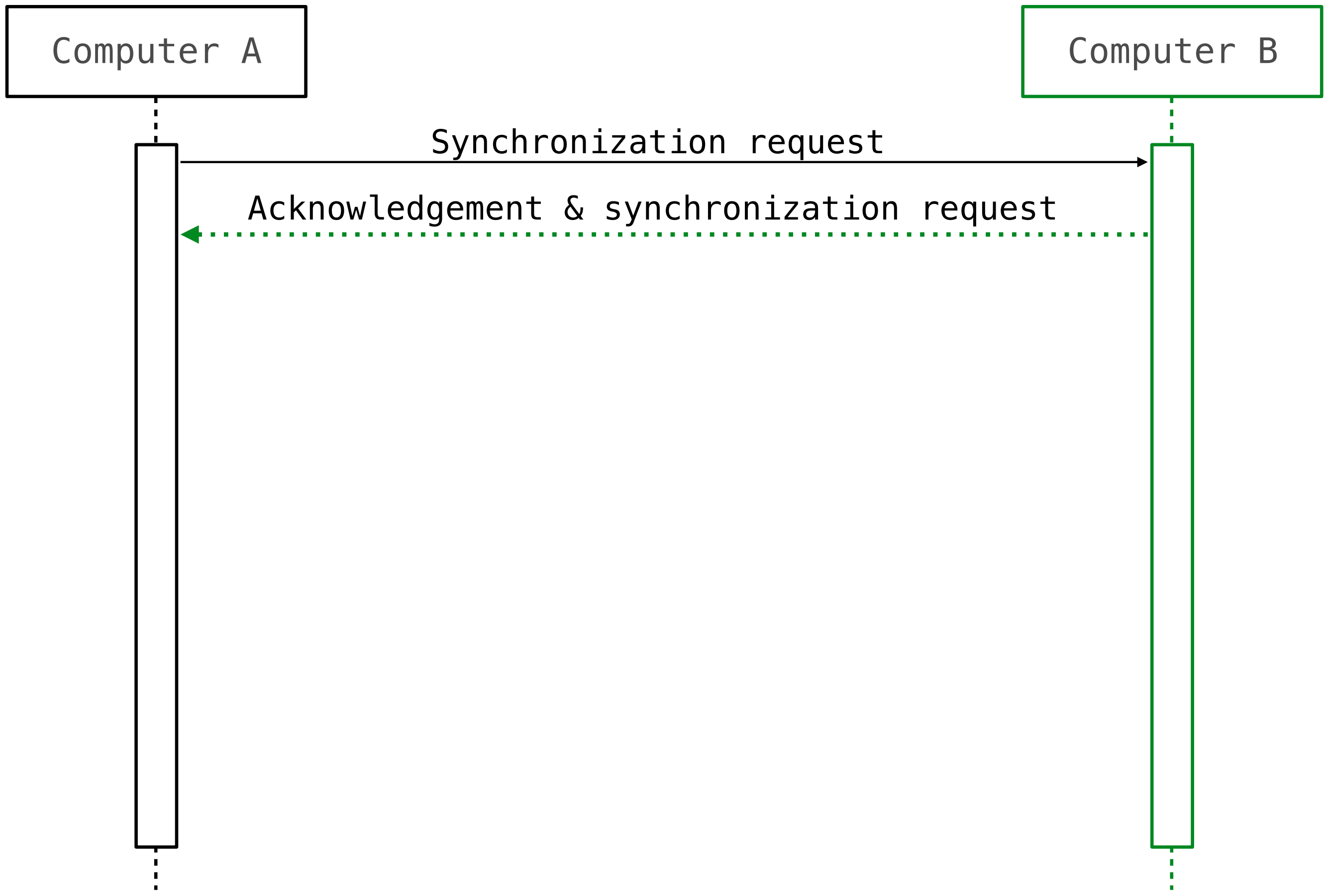

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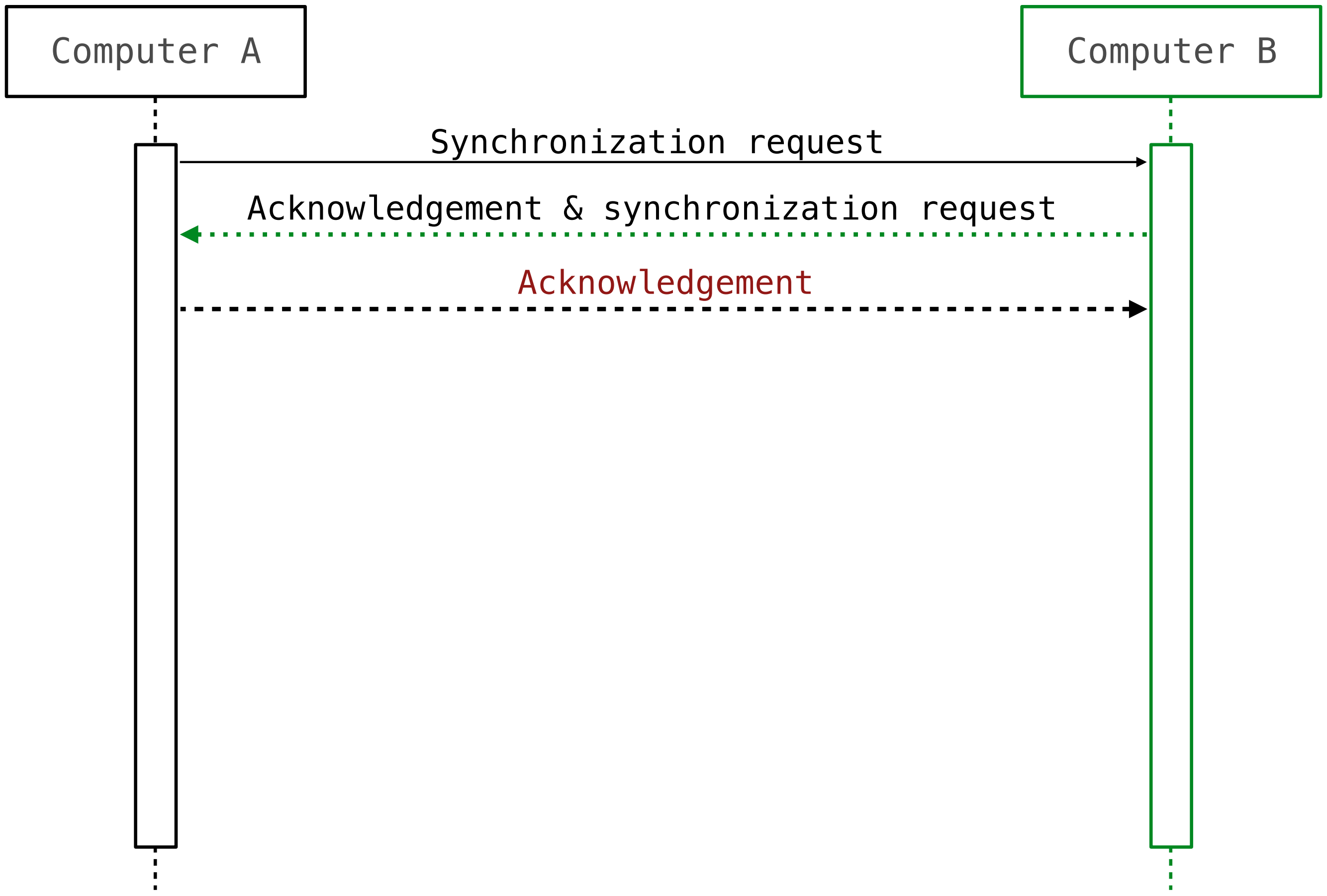

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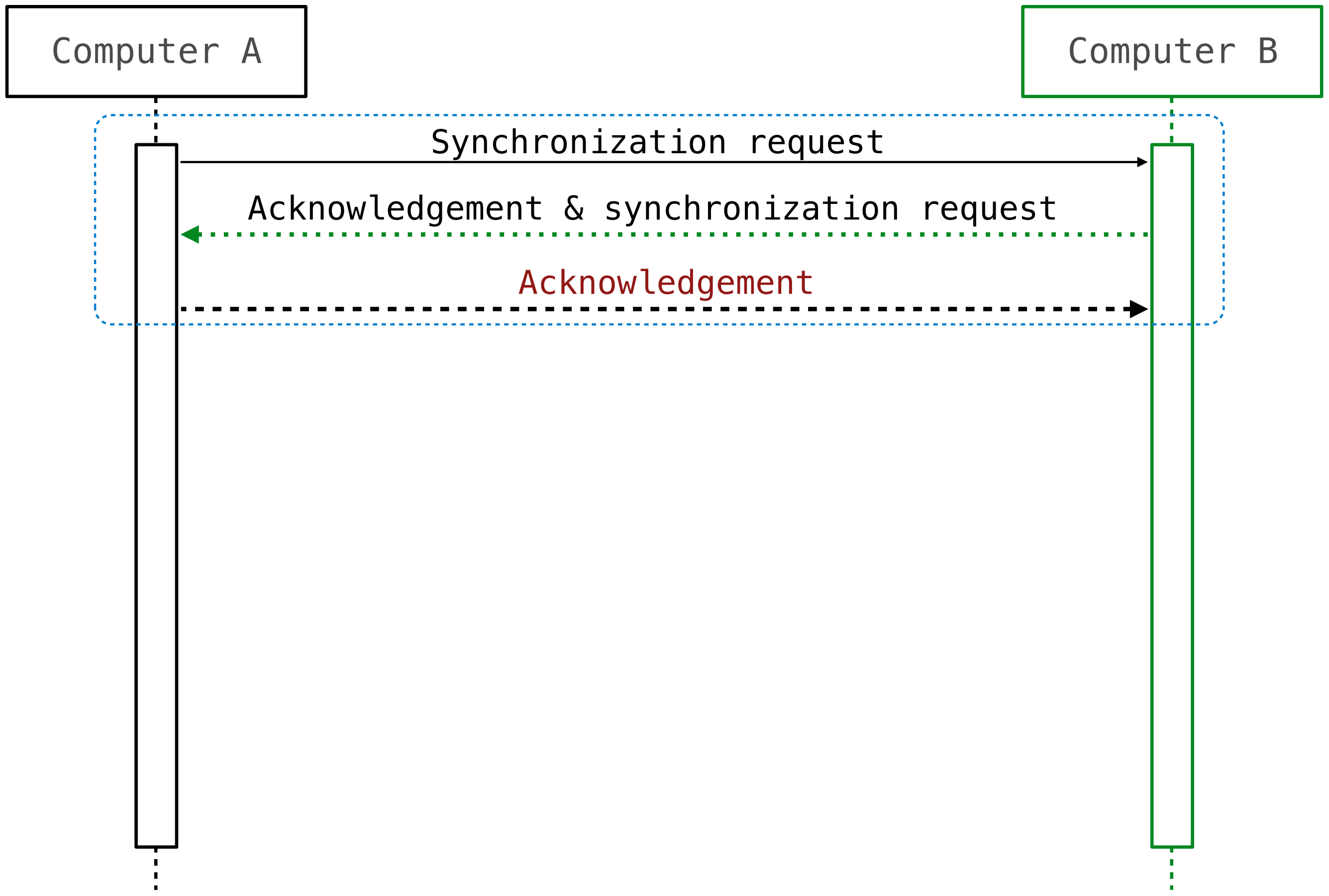

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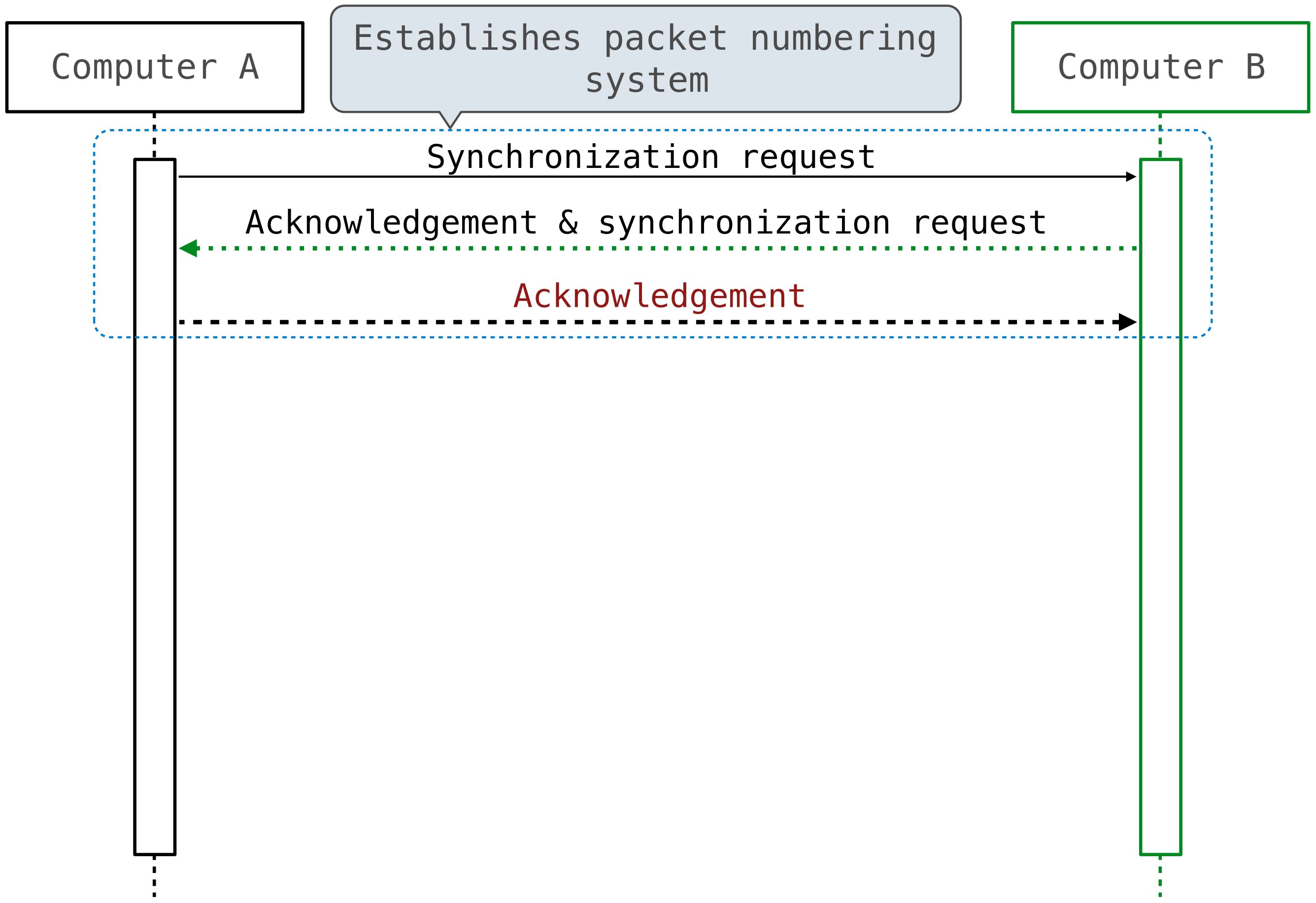
Computer A
Establishes packet numbering system
Computer B
Synchronization request
Acknowledgement & synchronization request
Acknowledgement

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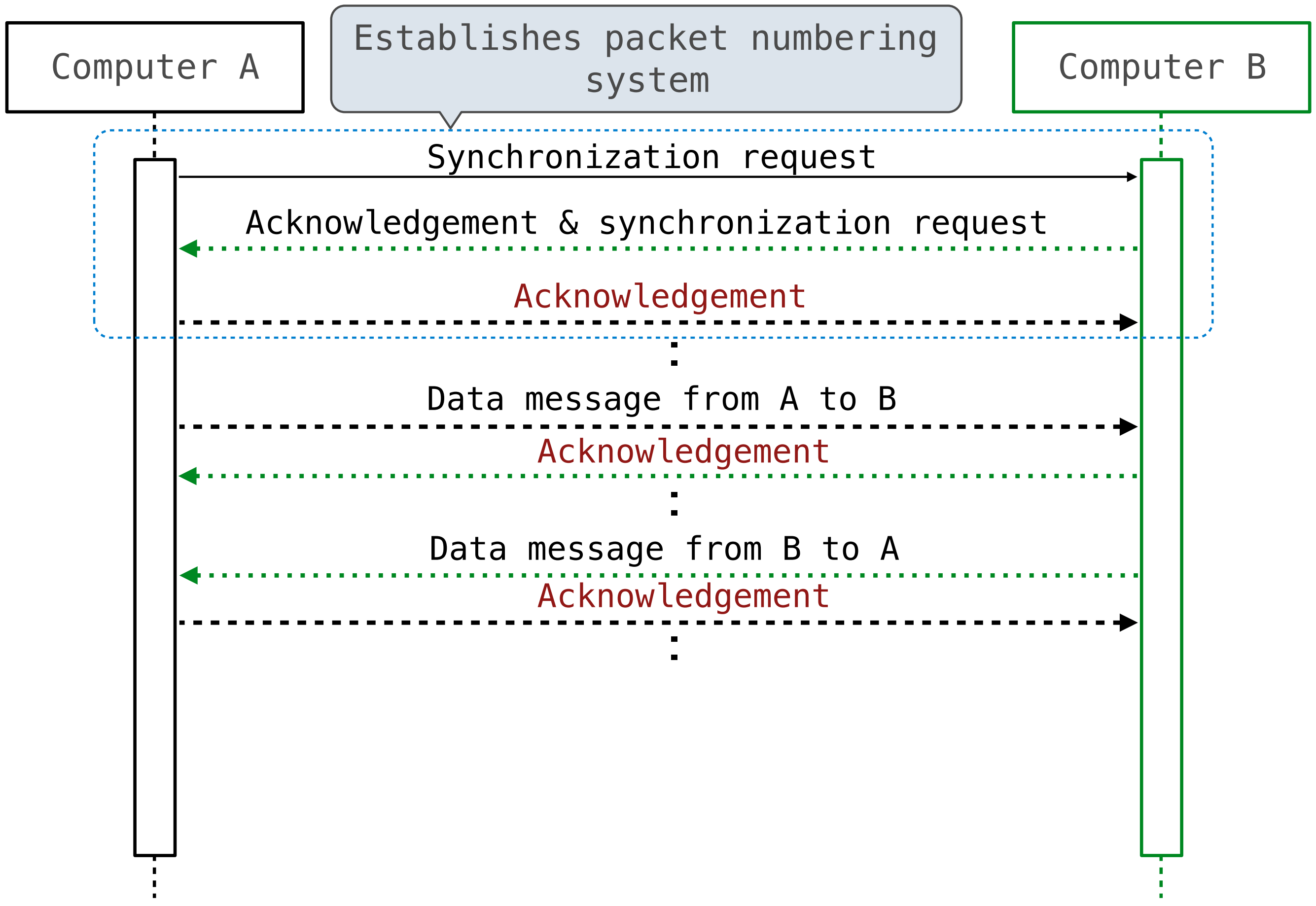

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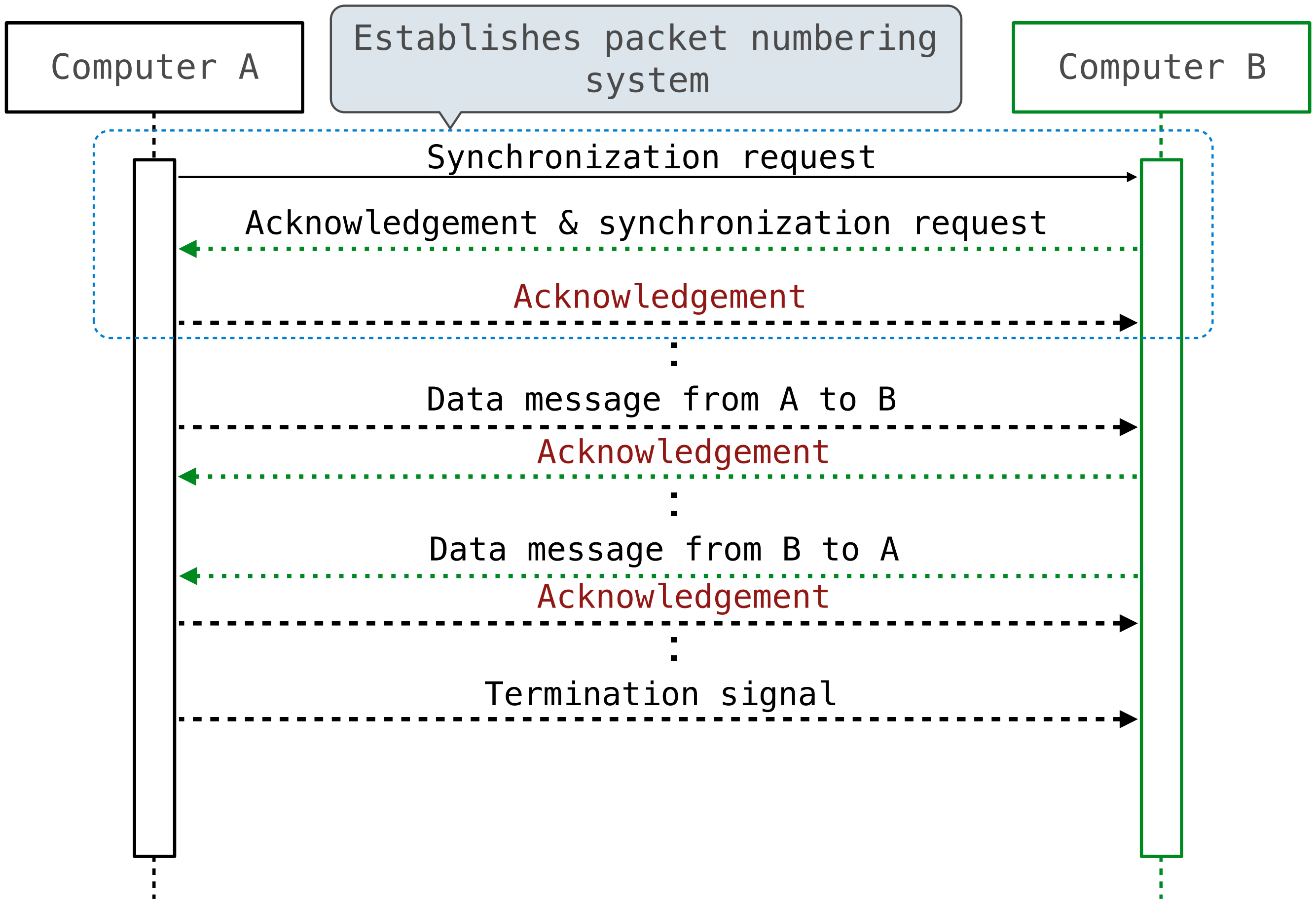

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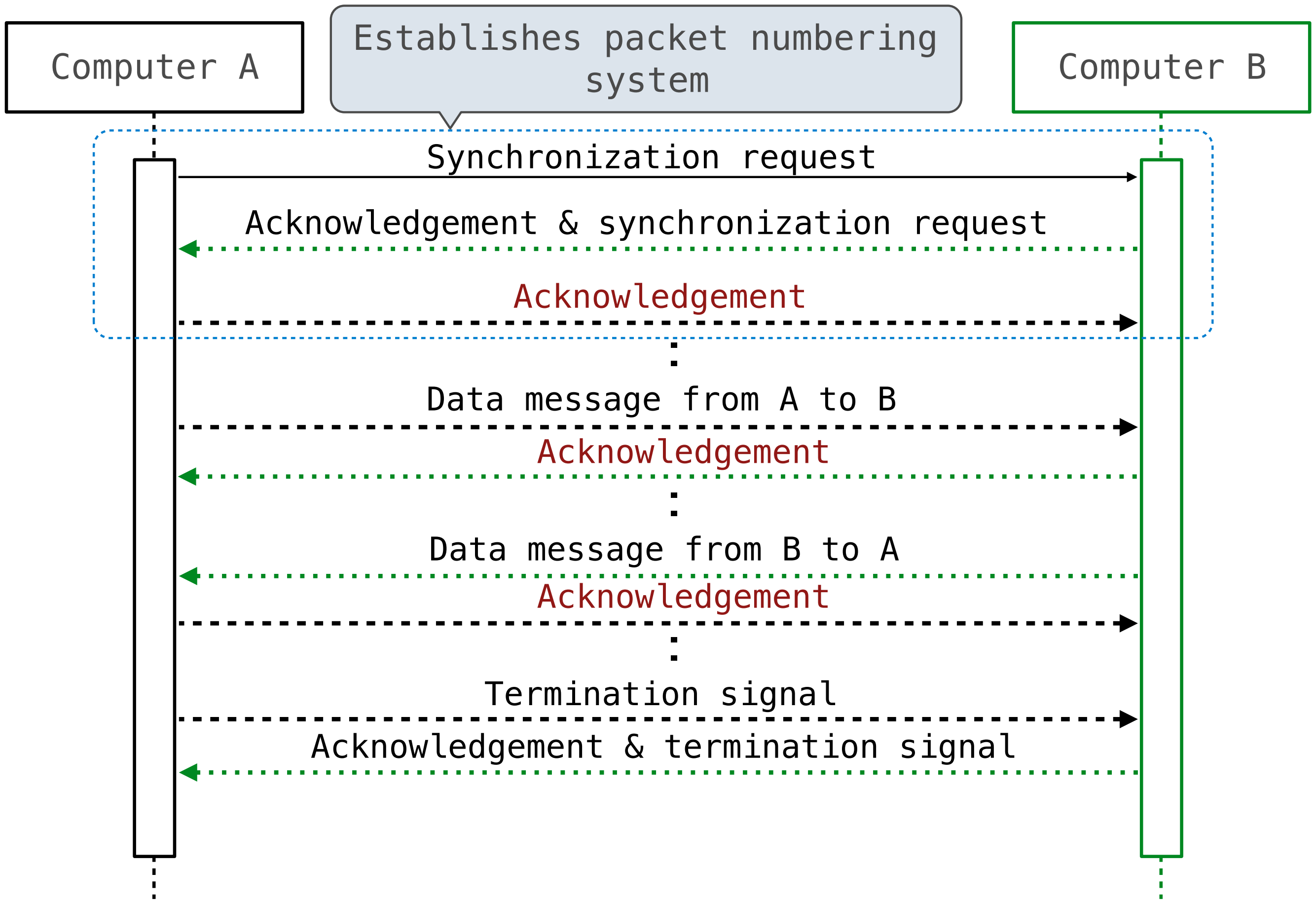

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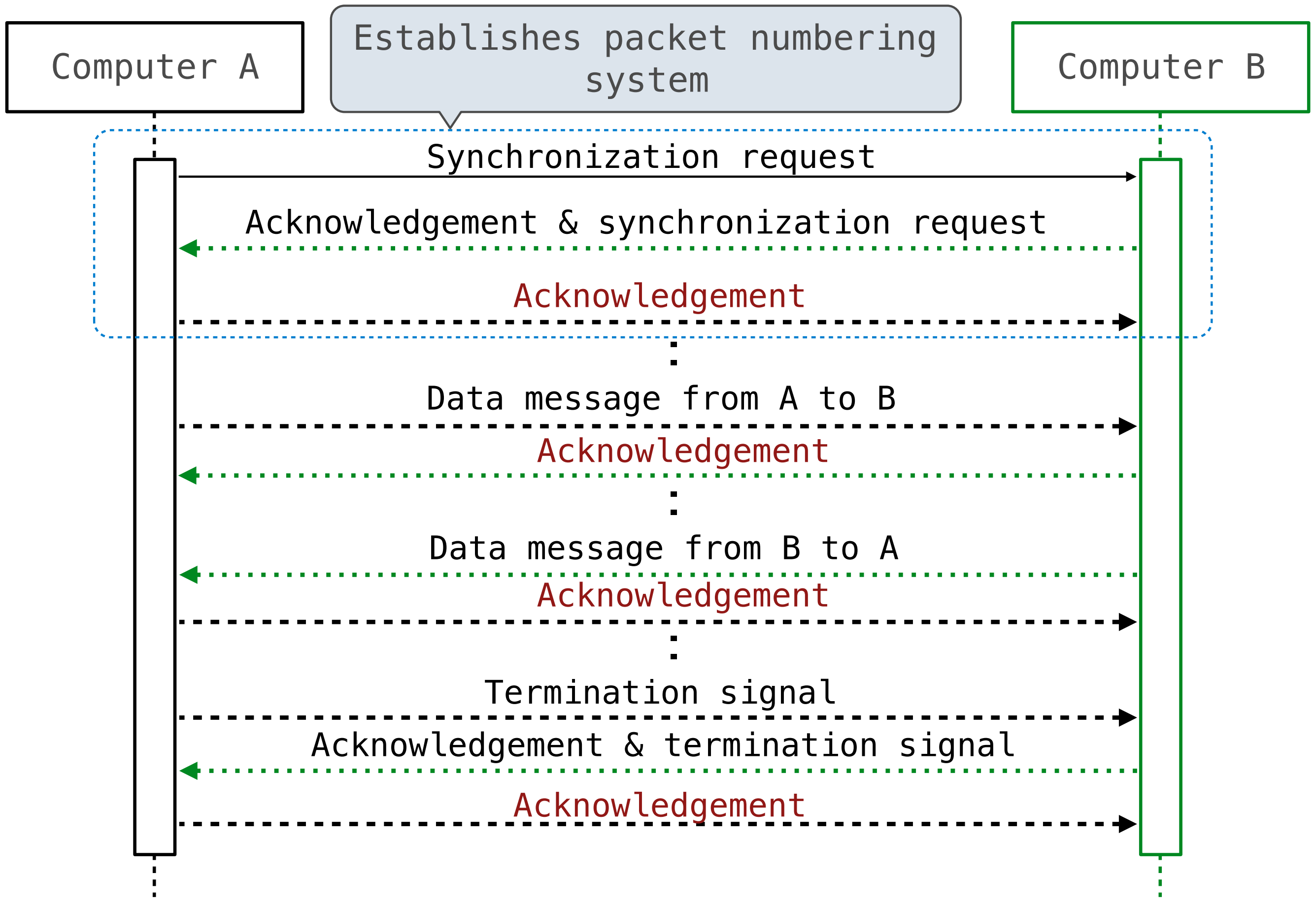

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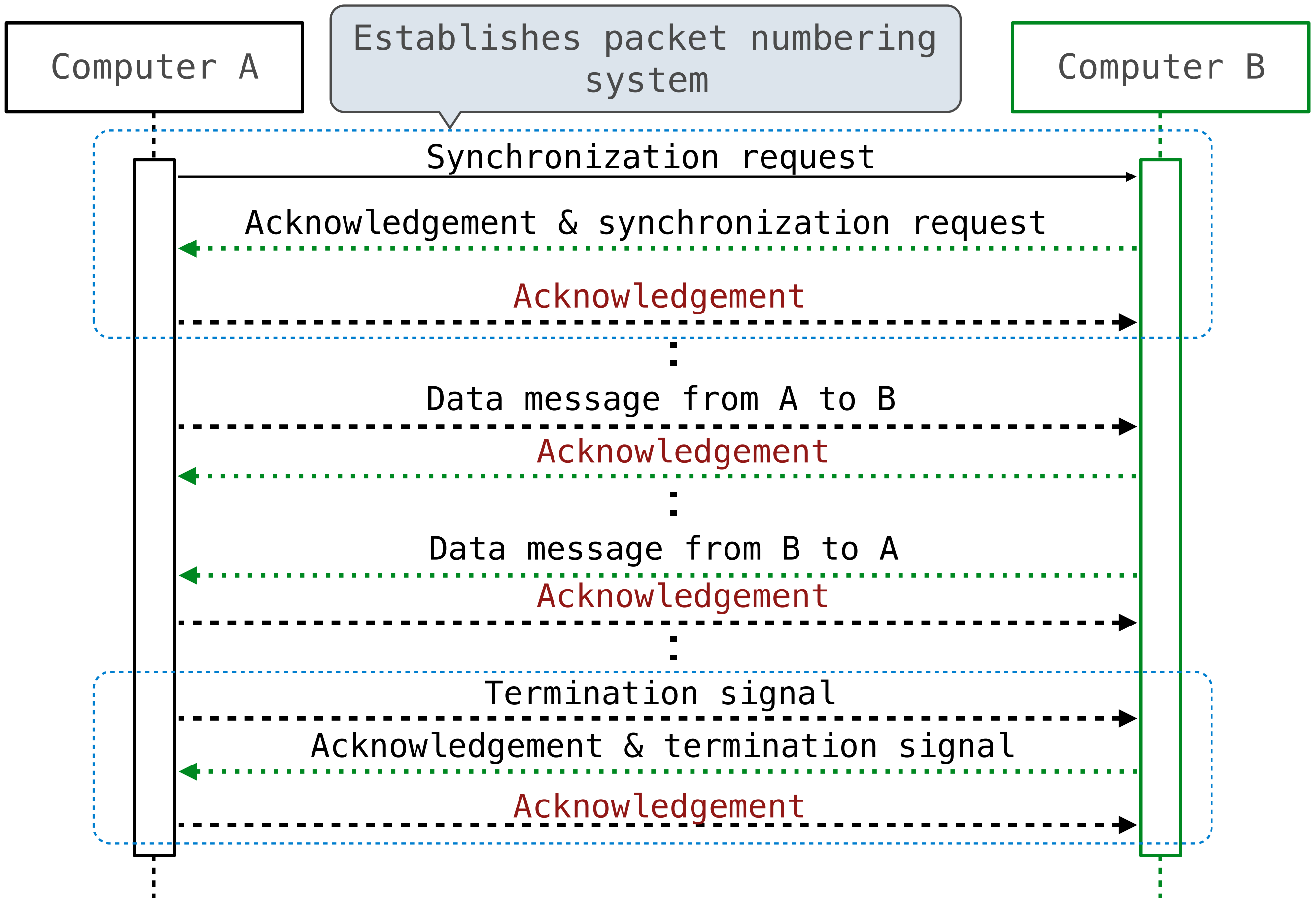

Client/Server Architecture

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One server provides information to multiple clients through request and response messages

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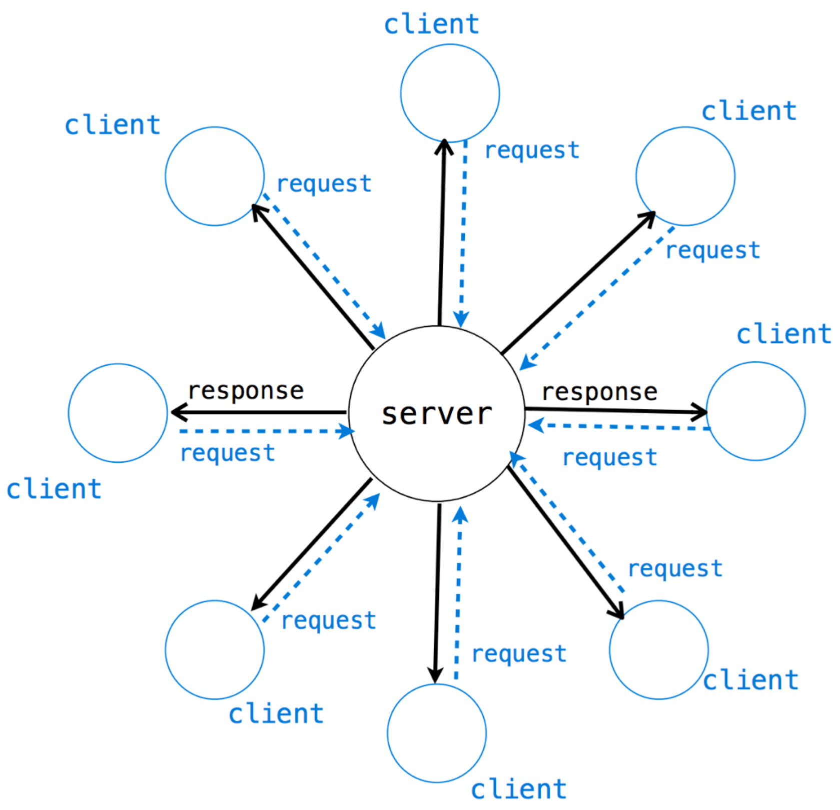

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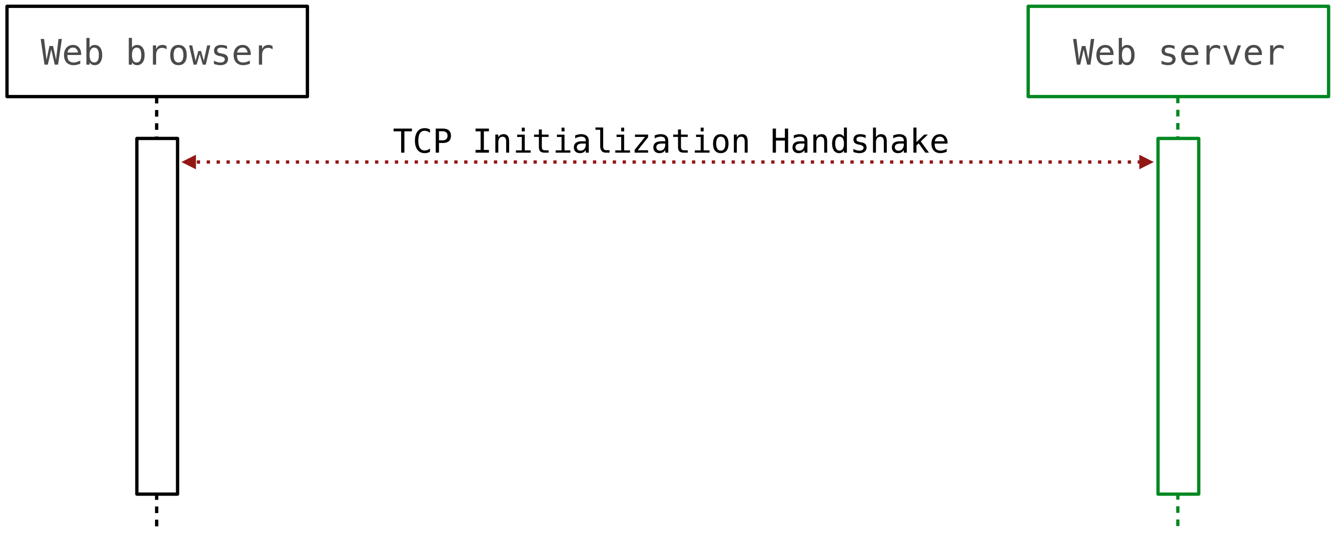

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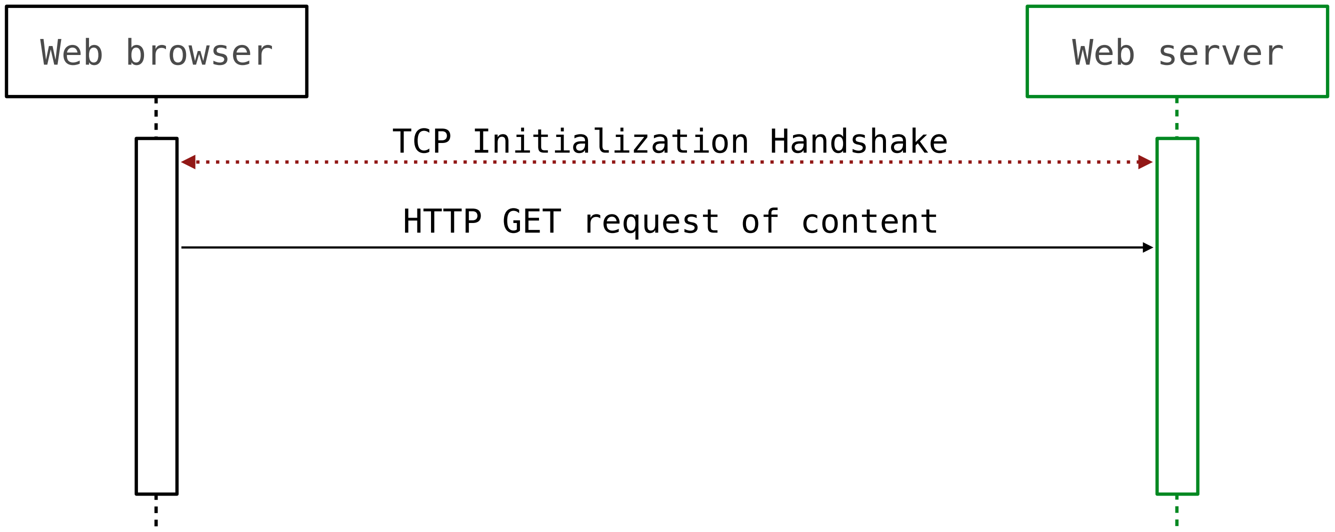

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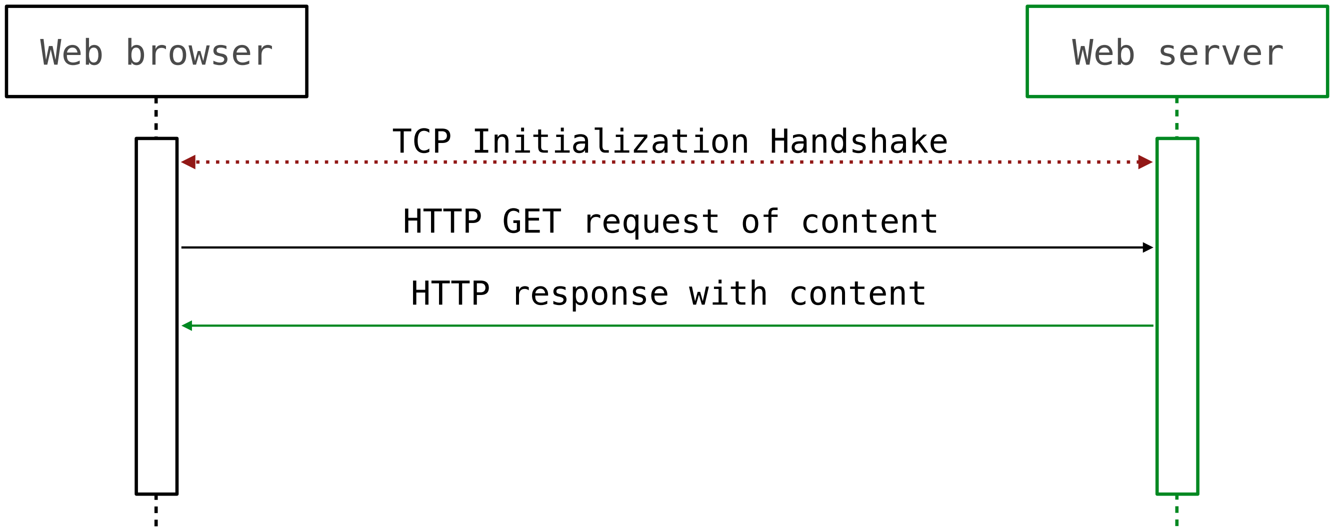
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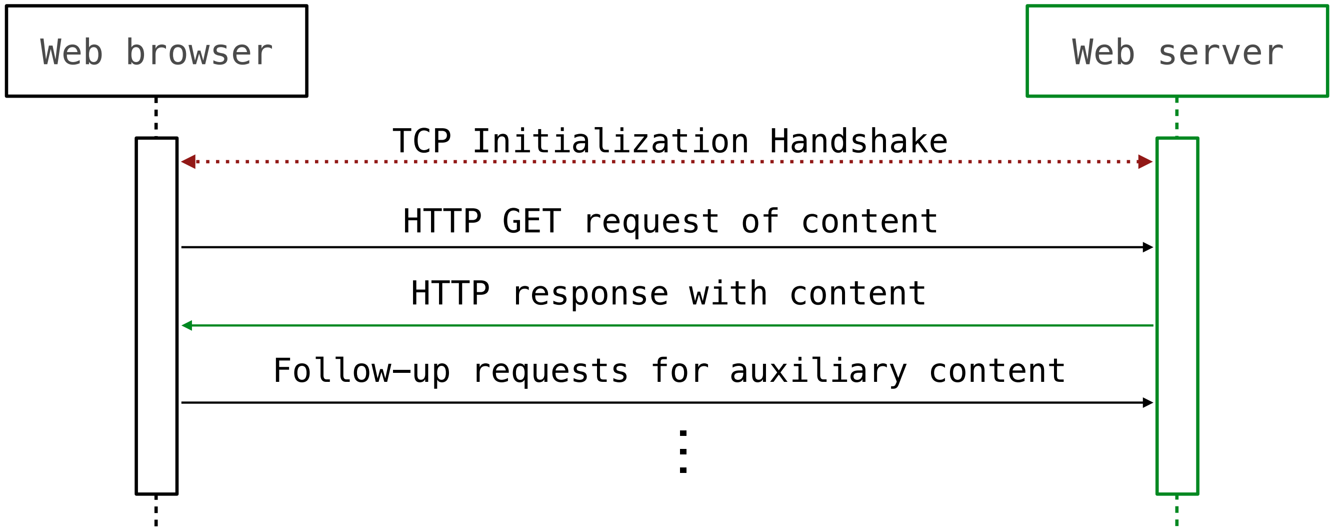
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Follow-up requests for auxiliary content

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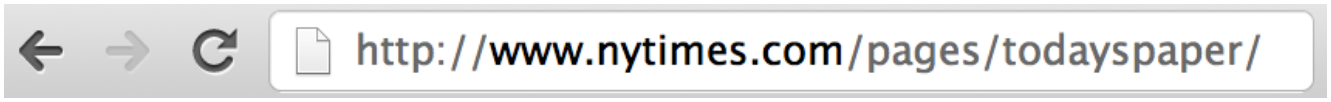

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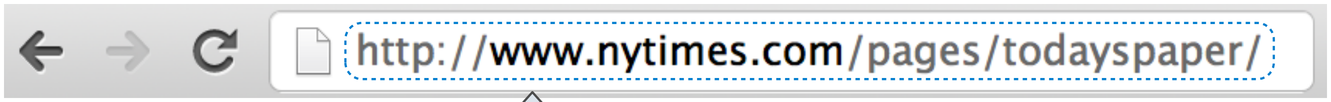

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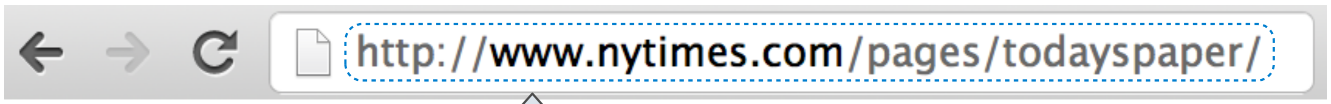

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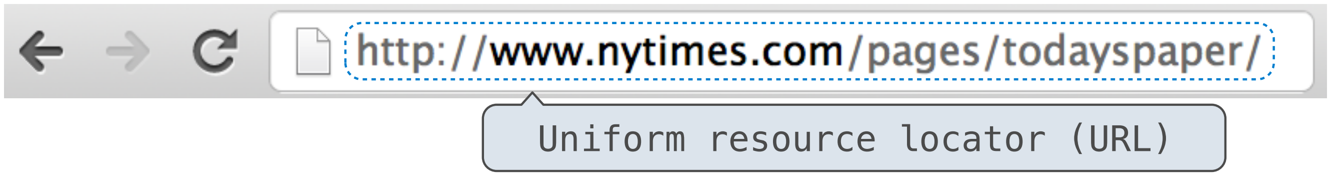
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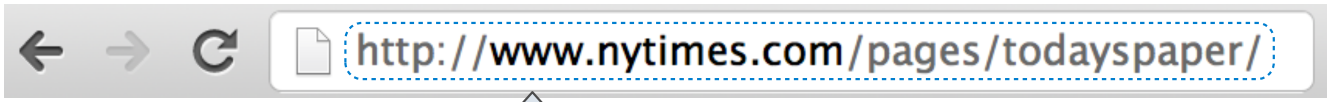

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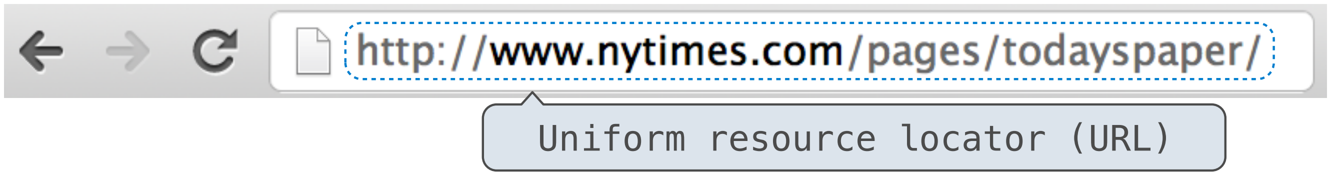
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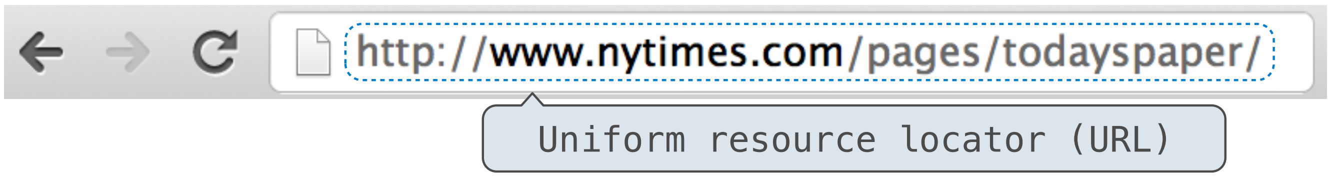
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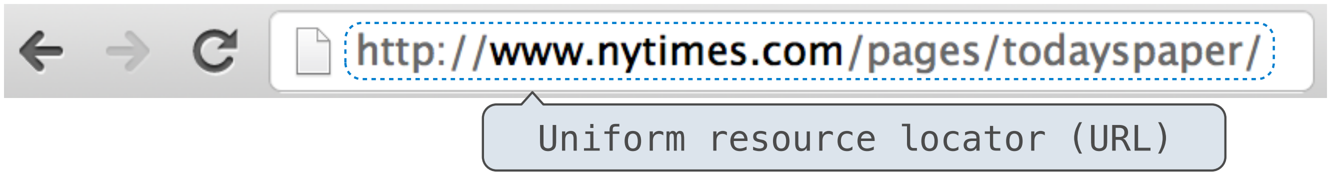
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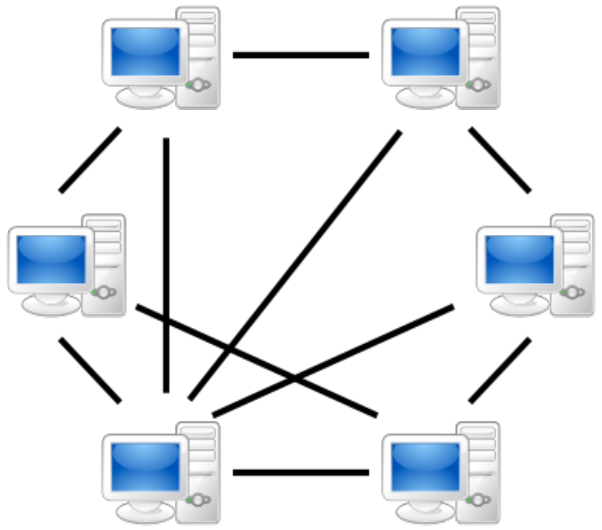

http://en.wikipedia.org/wiki/File:P2P-network.svg

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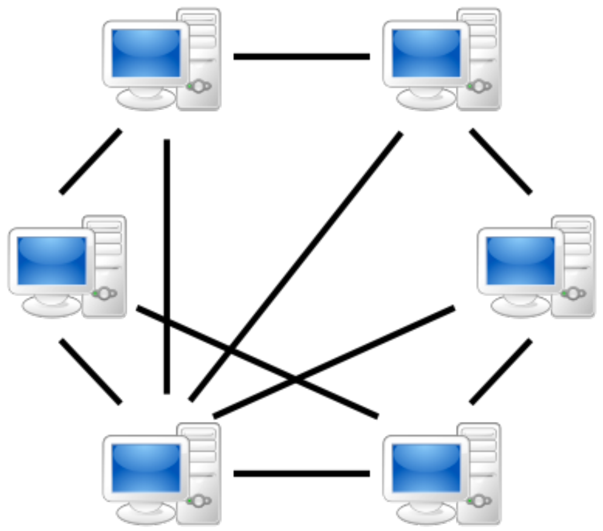

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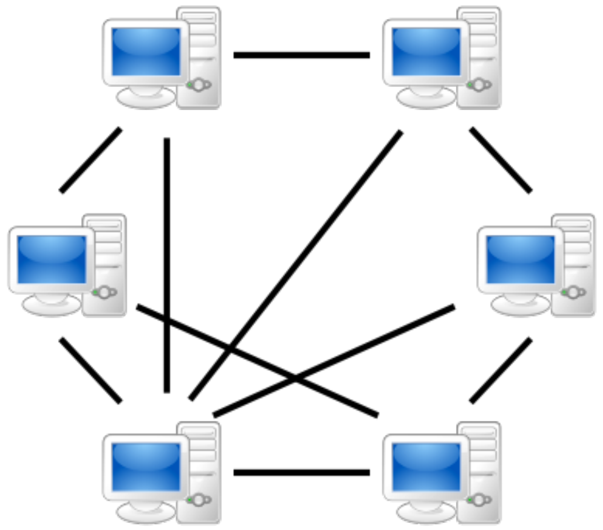

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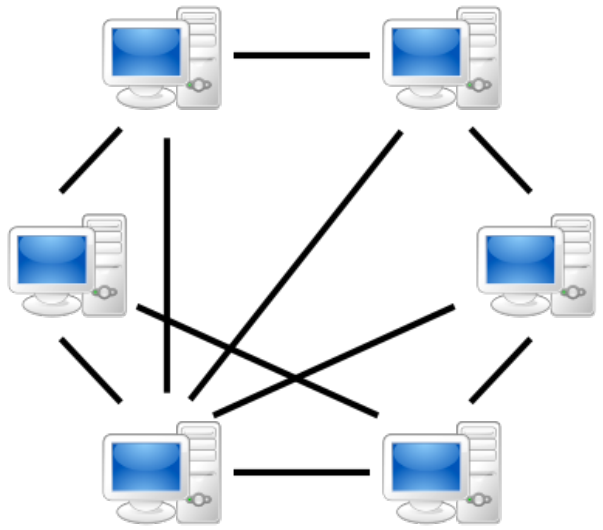

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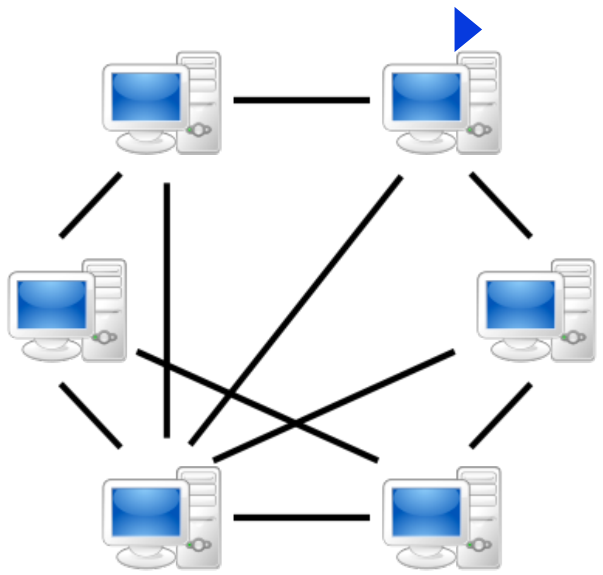

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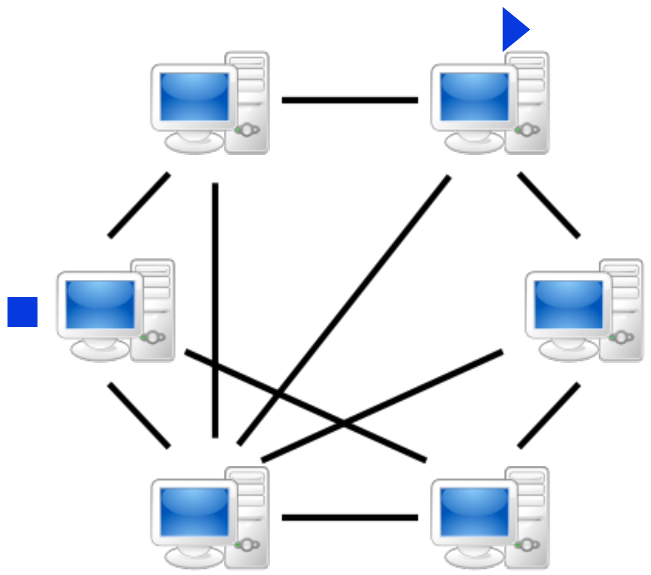

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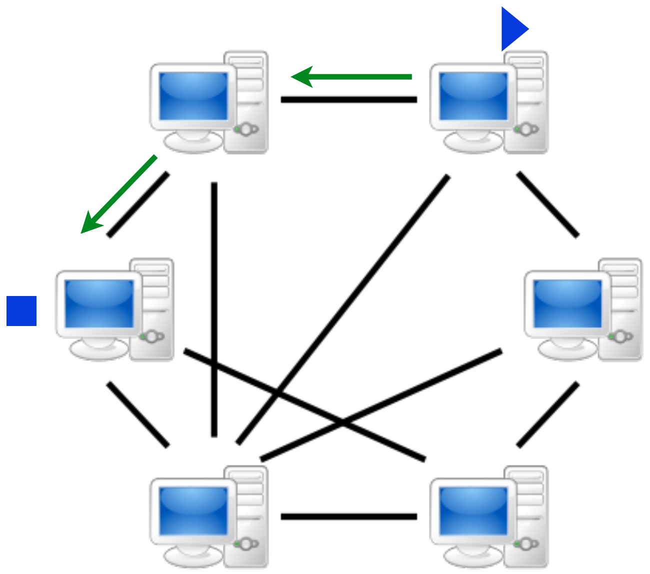

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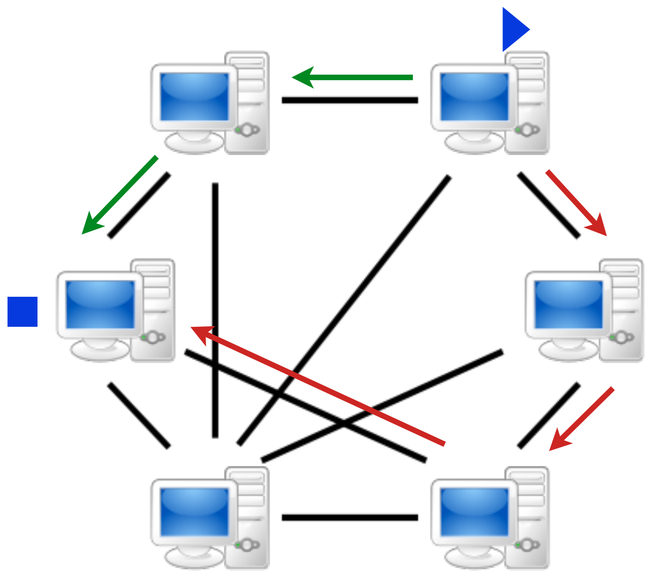

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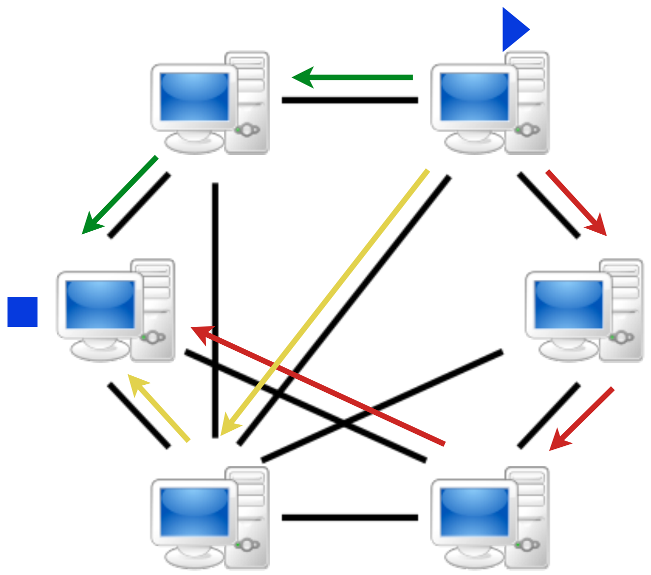

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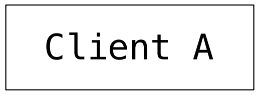

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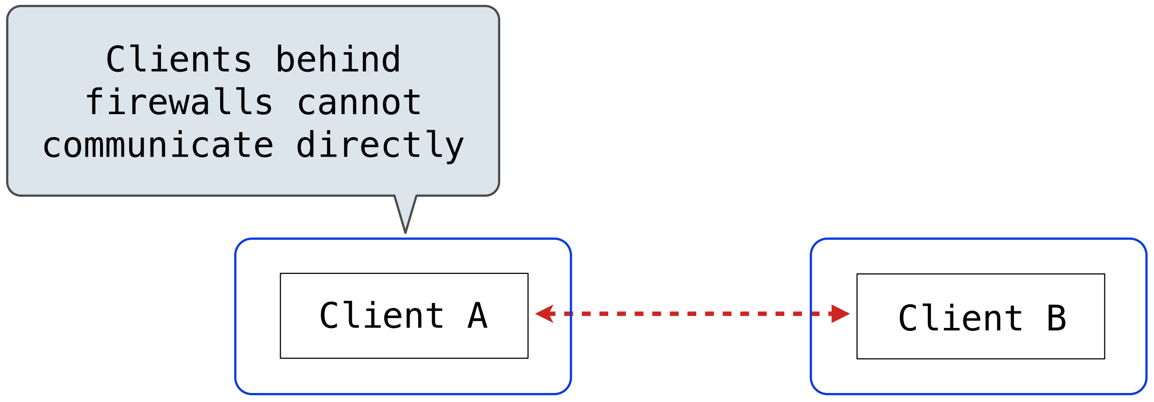

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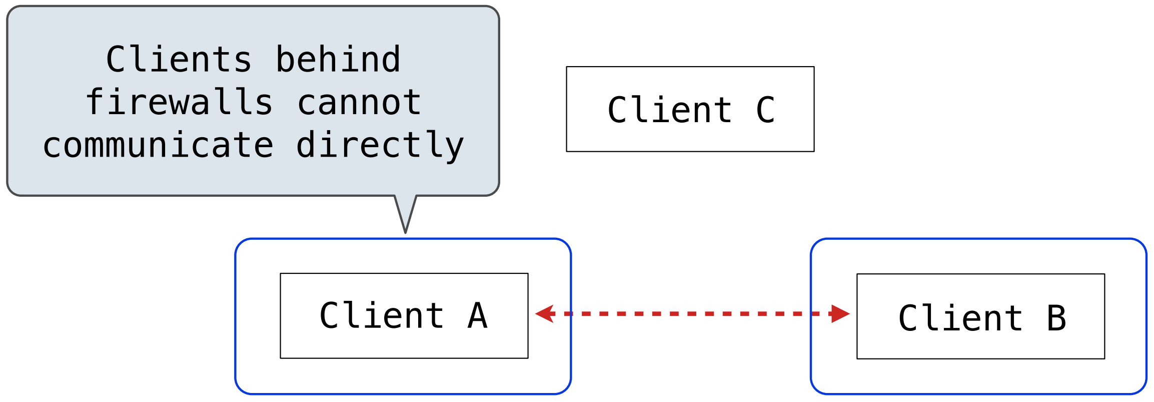

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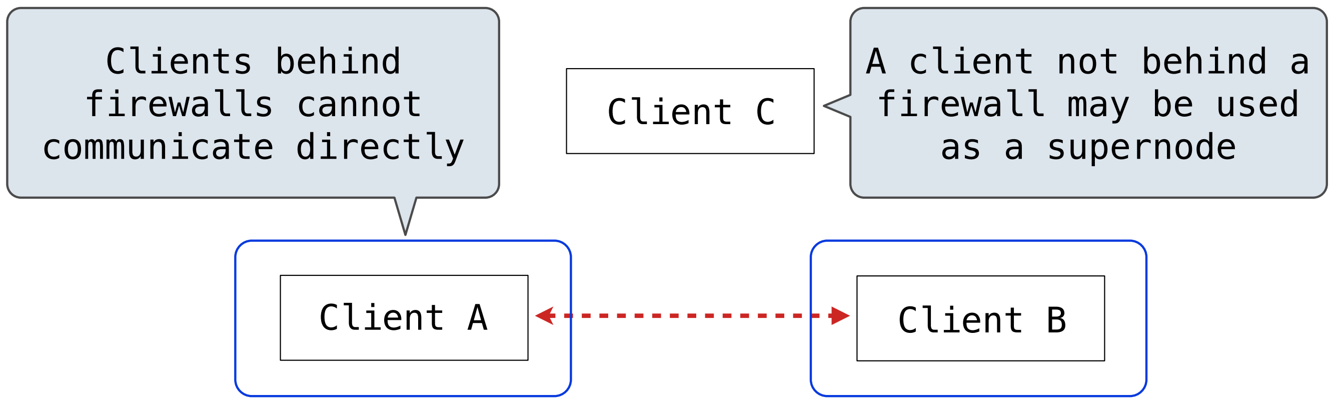
Clients behind firewalls cannot communicate directly
Client C
A client not behind a firewall may be used as a supernode
Client A
Client B

Example: Skype

Skype is a Voice Over IP (VOIP) system that uses a hybrid peer-to-peer architecture

Login & contacts are handled via a centralized server

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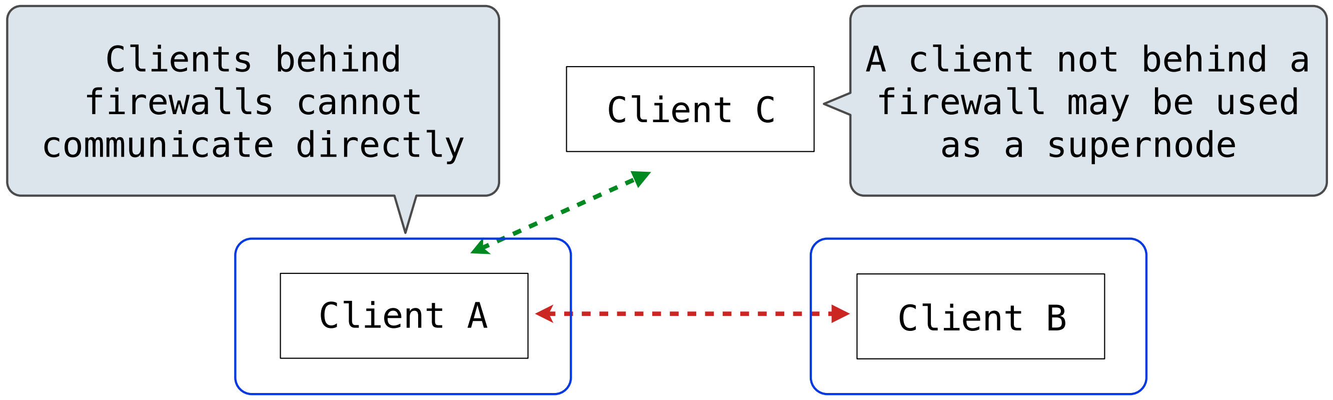
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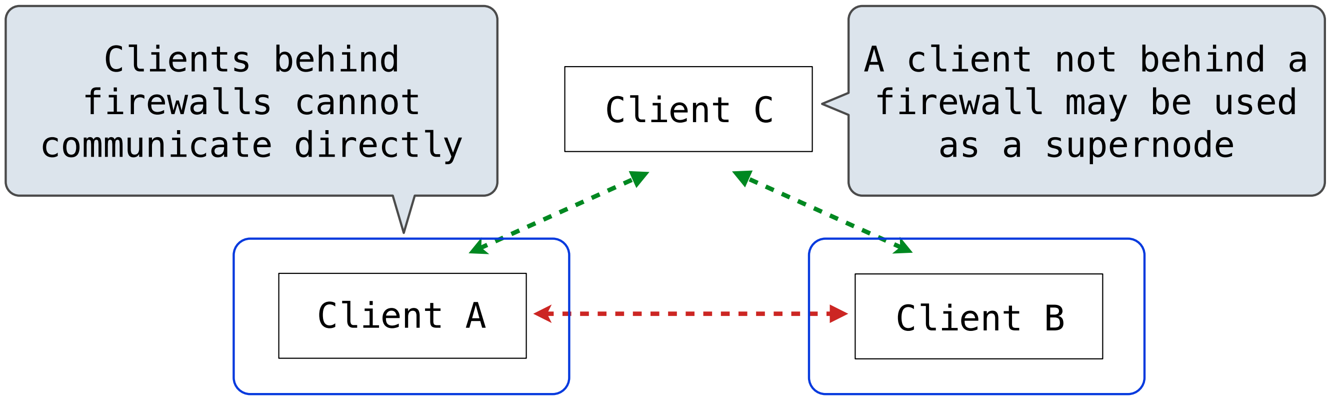
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