Network Architecture and Security

ECAM STRASBOURG-EUROPE 2018-2019

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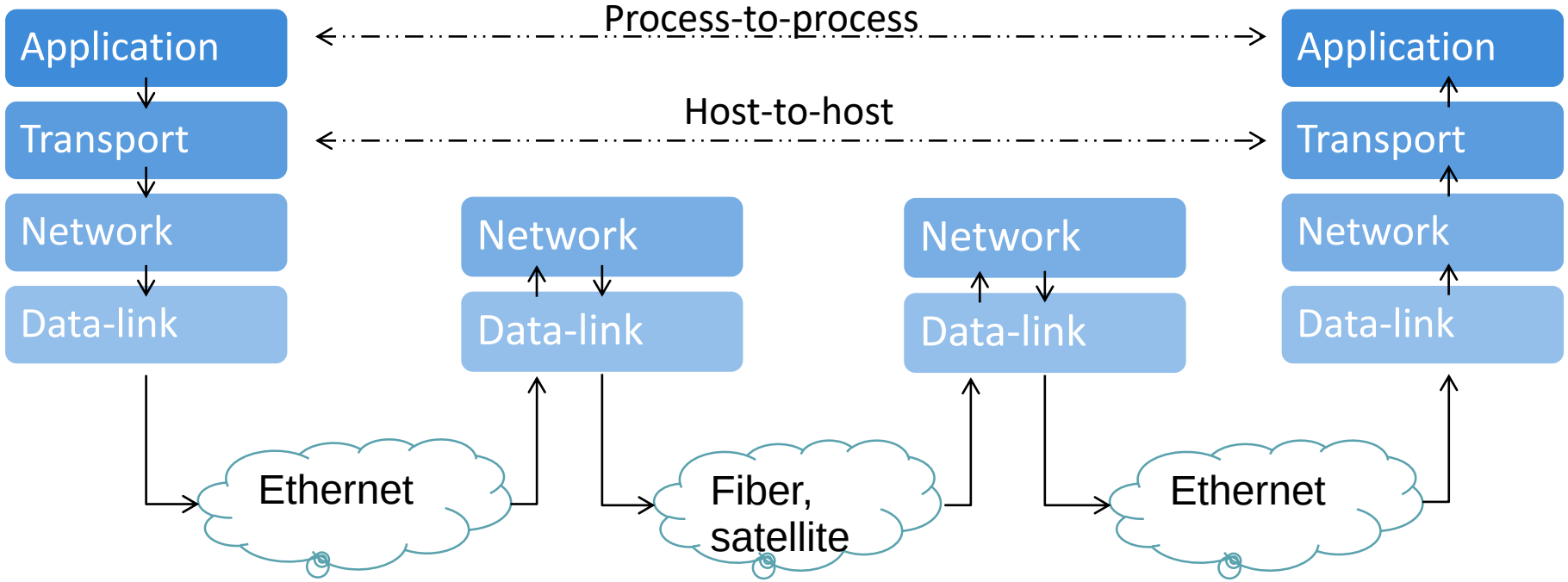
Do you remember ?



Sockets

A socket is an **endpoint** of an inter-process communication flow across a computer network.

Based on **socket address**, it delivers incoming data packets to **an application process.**

Socket address: IP + port

Ex: 192.169.1.23**:**3268

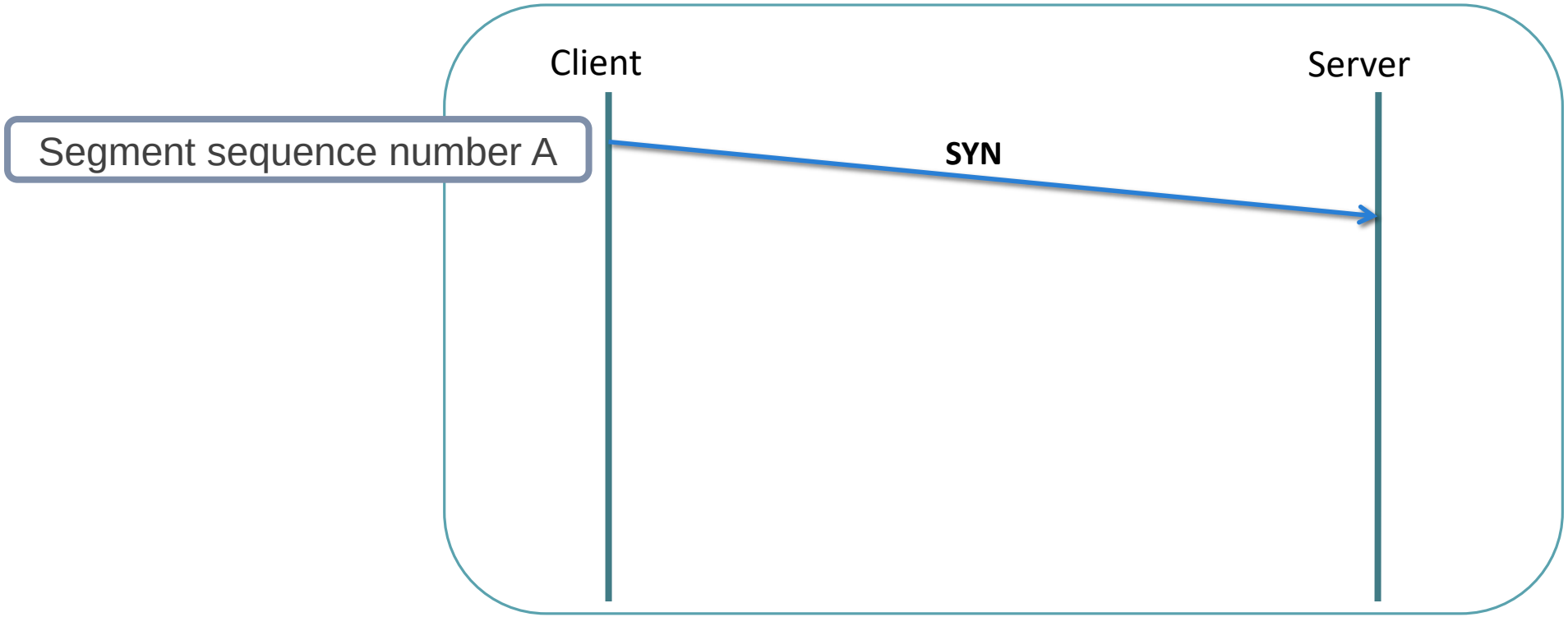
Transmission Control Protocol

A 3-phase process

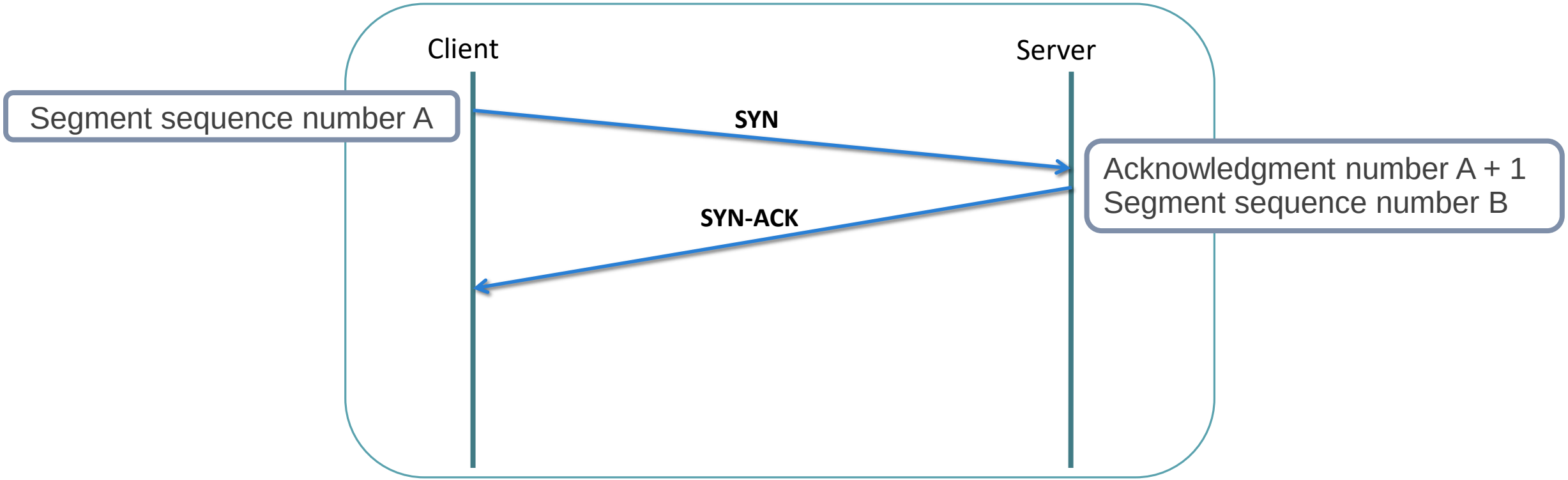
TCP provides **reliable**, **ordered** and **error-checked delivery (connection-oriented)** of data between applications running on hosts communicating via an IP network.

1. Establishment of the connection
2. Data transmission
3. End of the connection

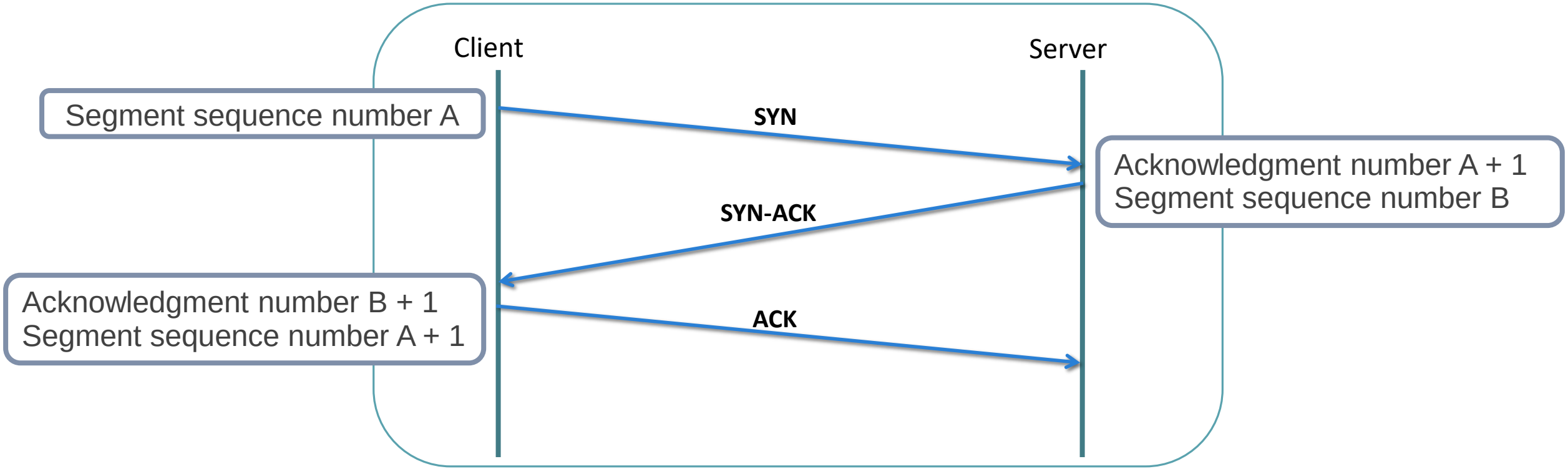
Establishment - Three way handshake



Establishment - Three way handshake

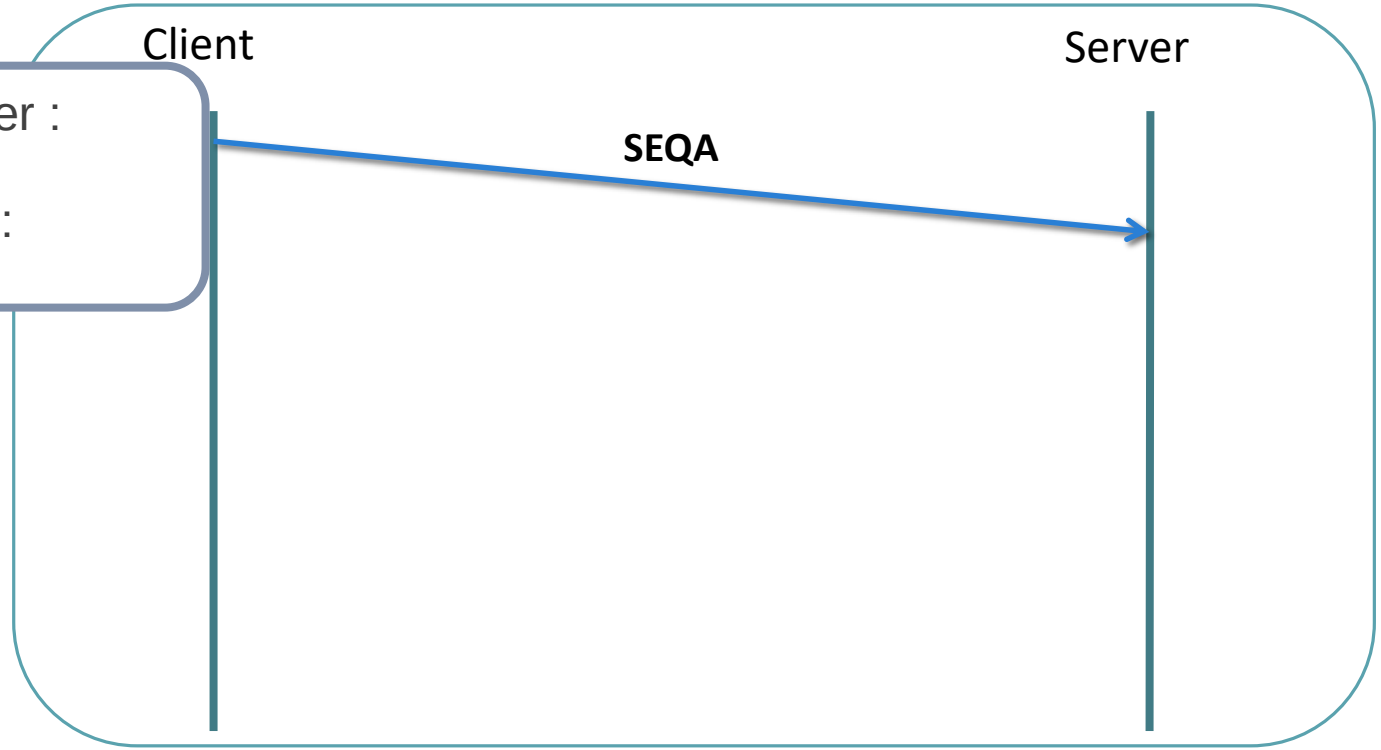


Establishment - Three way handshake

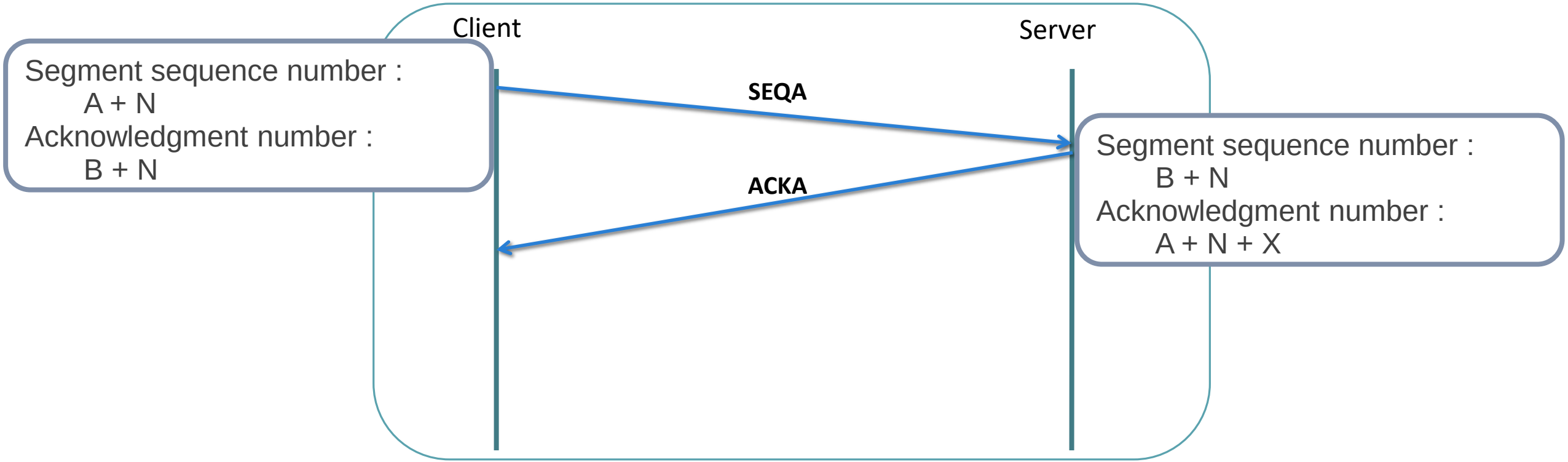


Data Transmission

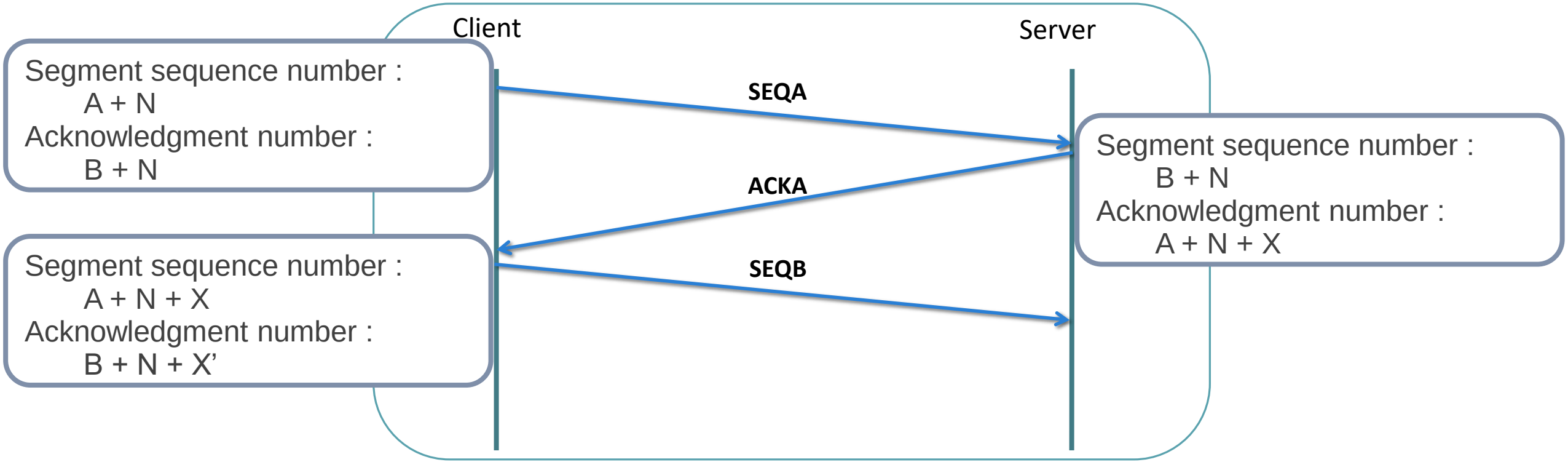
Segment sequence number :
A + N
Acknowledgment number :
B + N



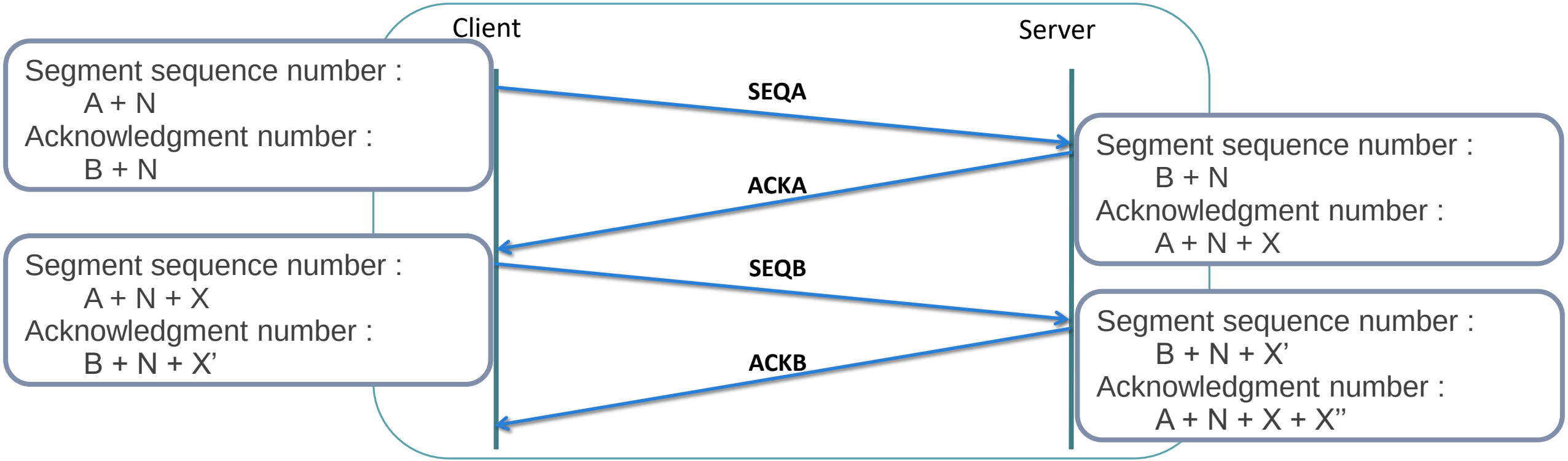
Data Transmission



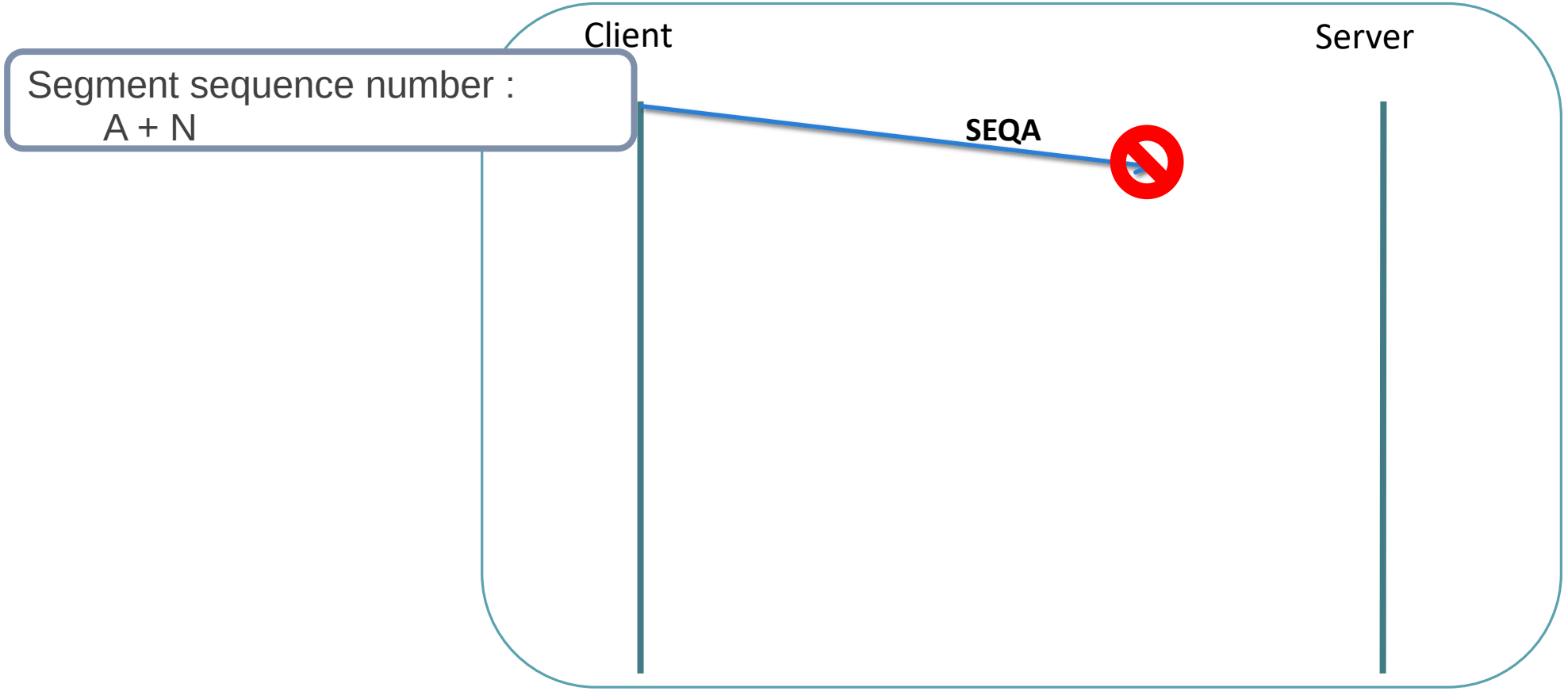
Data Transmission



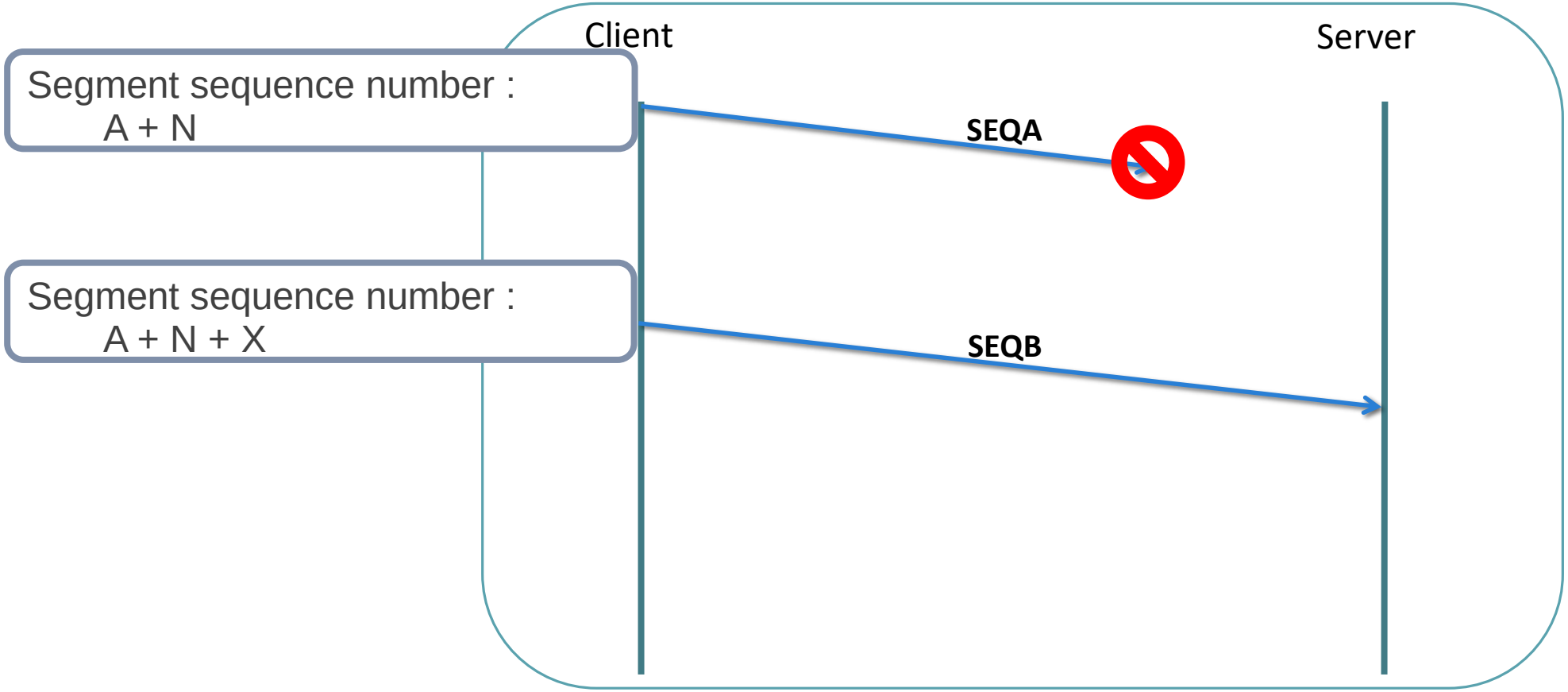
Data Transmission



Data Transmission – Error case



Data Transmission – Error case



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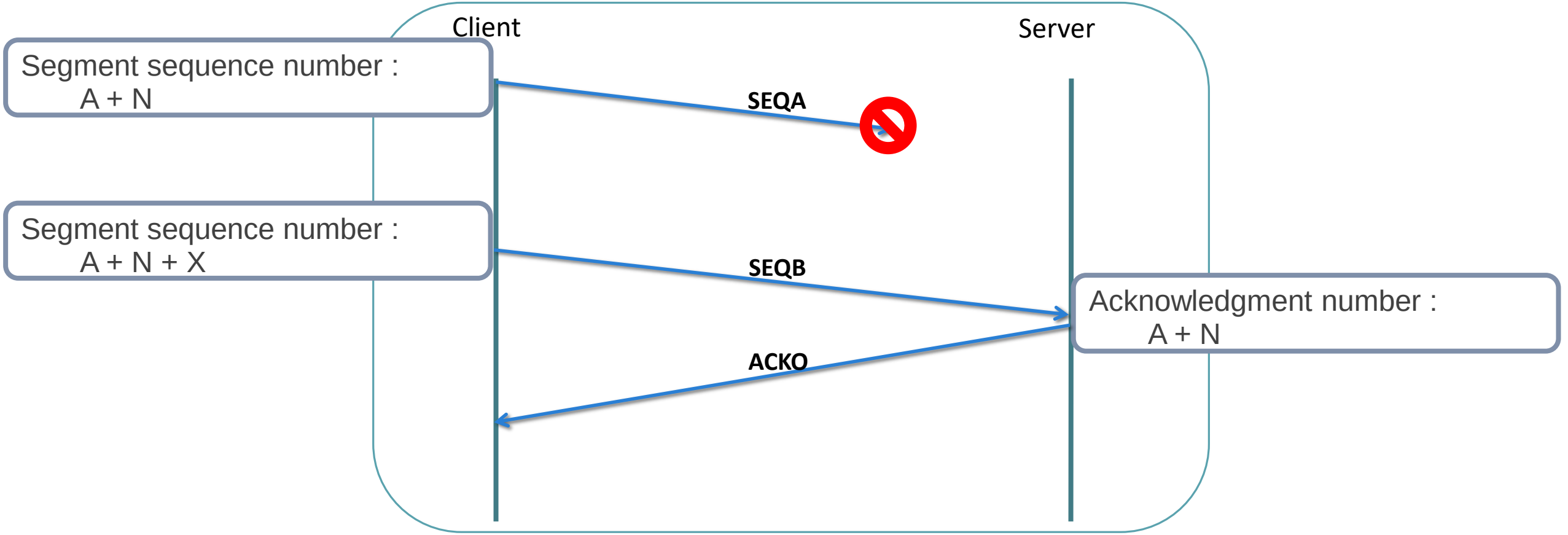
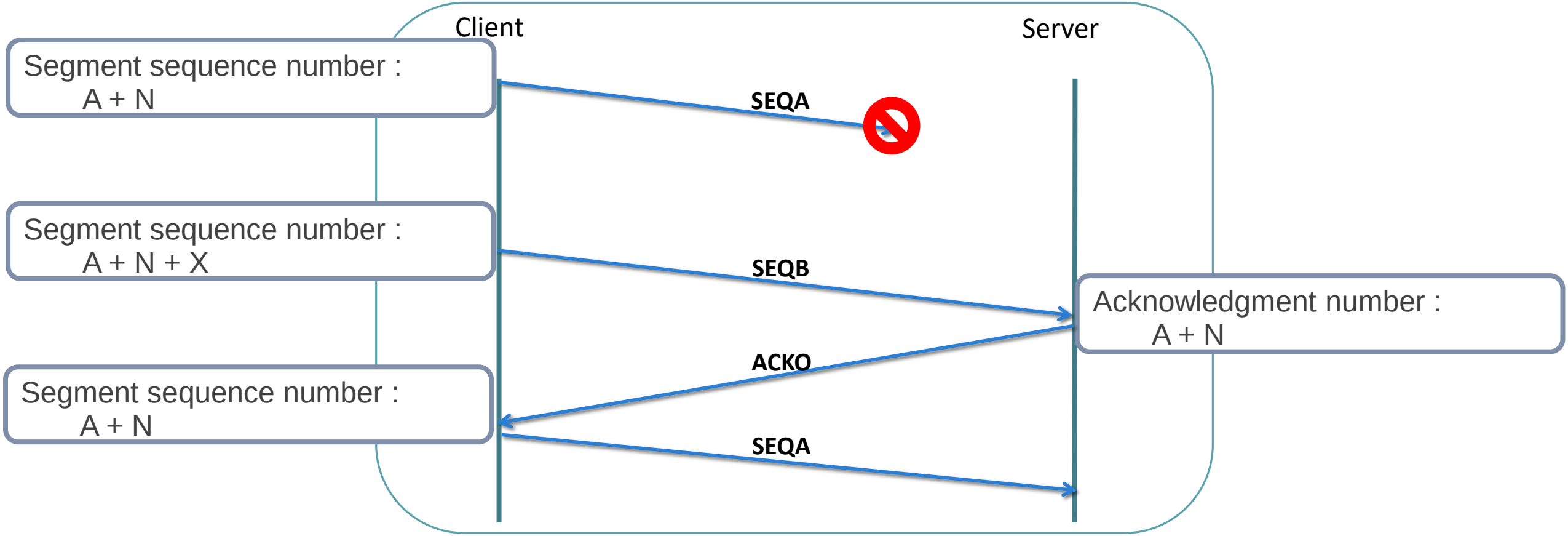
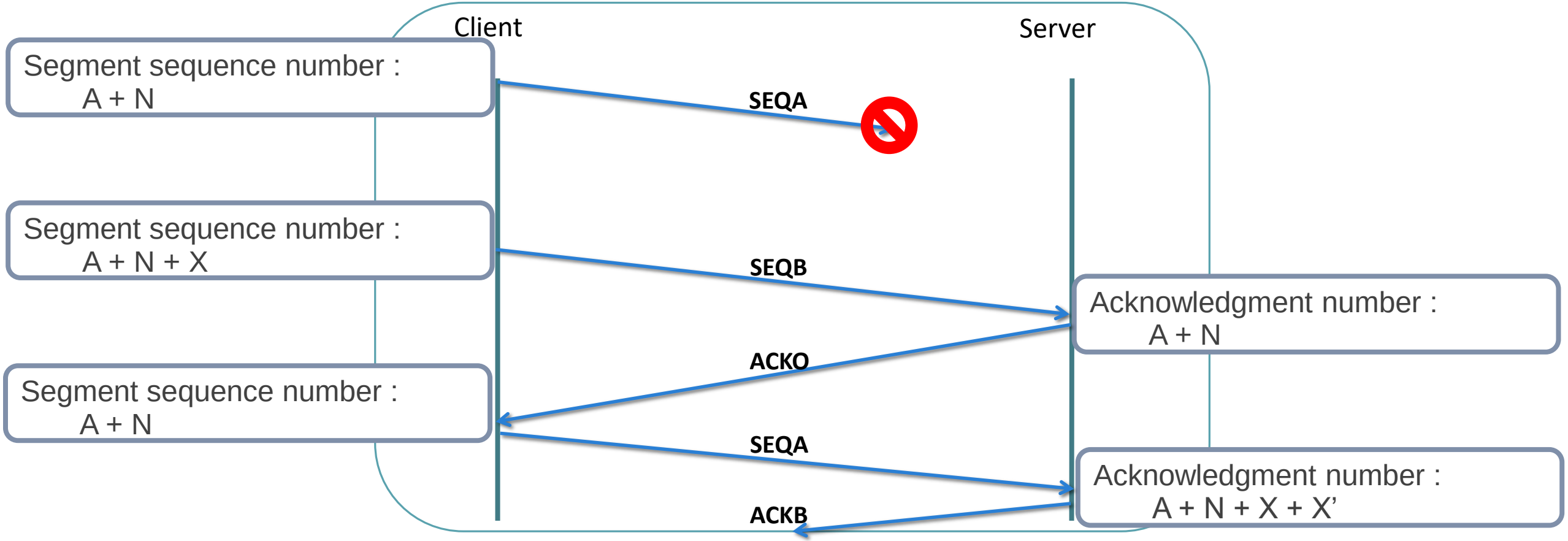


Data Transmission – Error case



Data Transmission – Error case



Data Transmission – Error case

TCP fast retransmit heuristics

ack arrival:

```
if duplicate acknowledgement:
        dupacks++
        if dupacks==3:
                retransmit segment
else:
        dupacks=0
        process acknowledgement
```

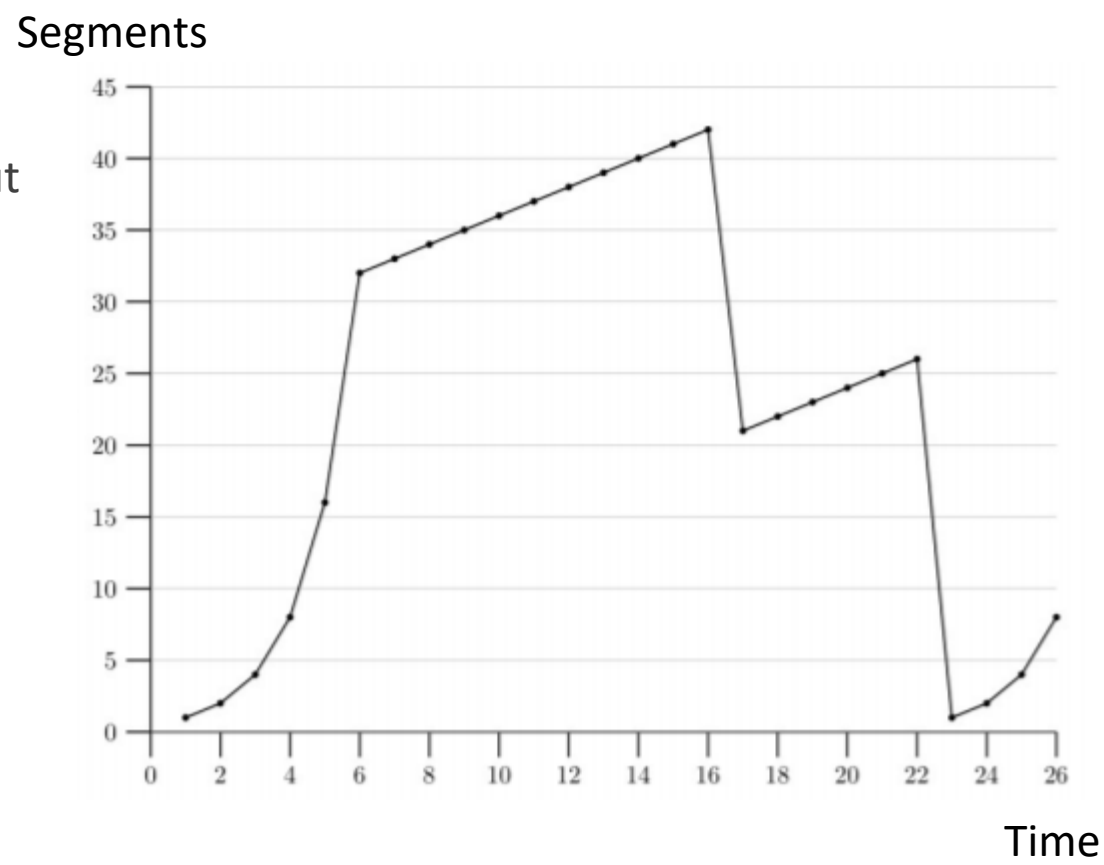
Data Transmission – Congestion Control

Two aims :

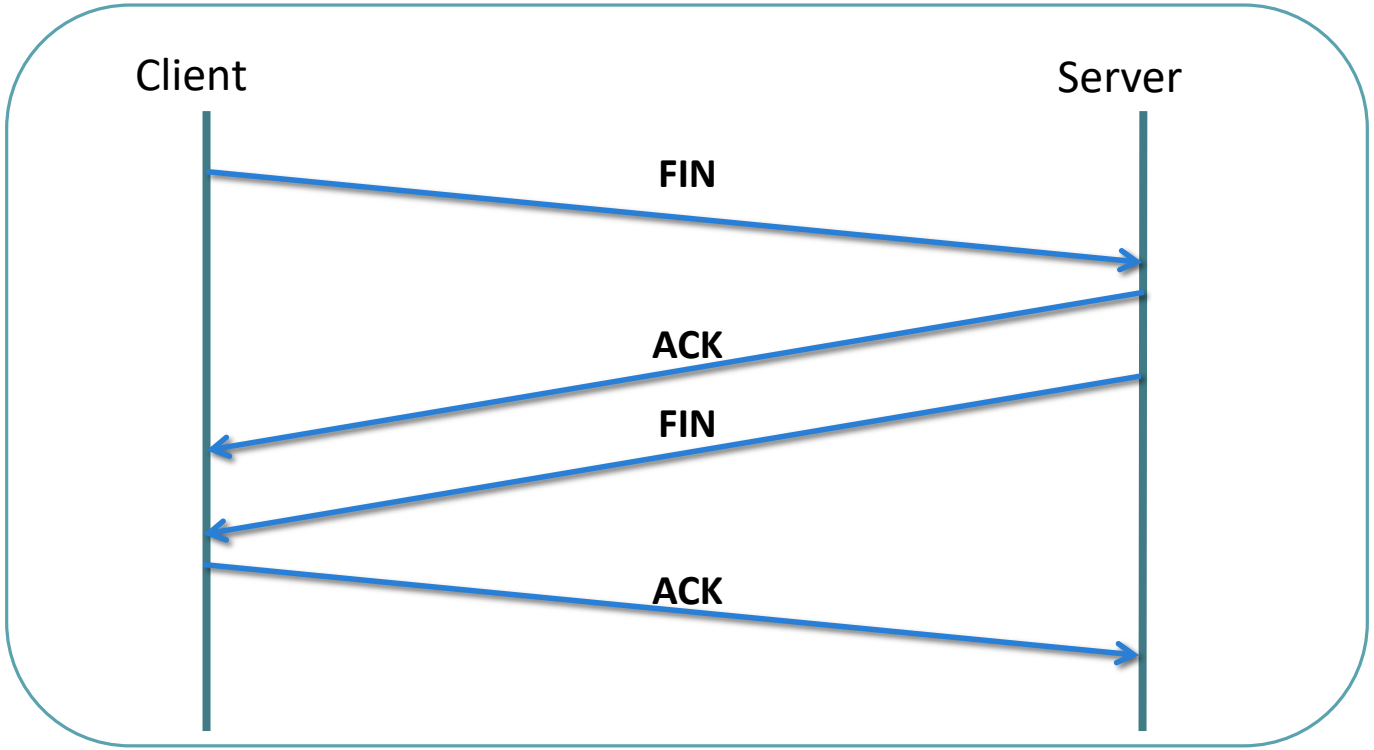
- Adapt packet send rate according to network throughput
- High performance, congestion avoidance

Based on four algorithms :

- Slow Start
- Congestion Avoidance
- Fast Retransmit
- Fast Recovery



End of the connection - Four Way Handshake



Any questions ?

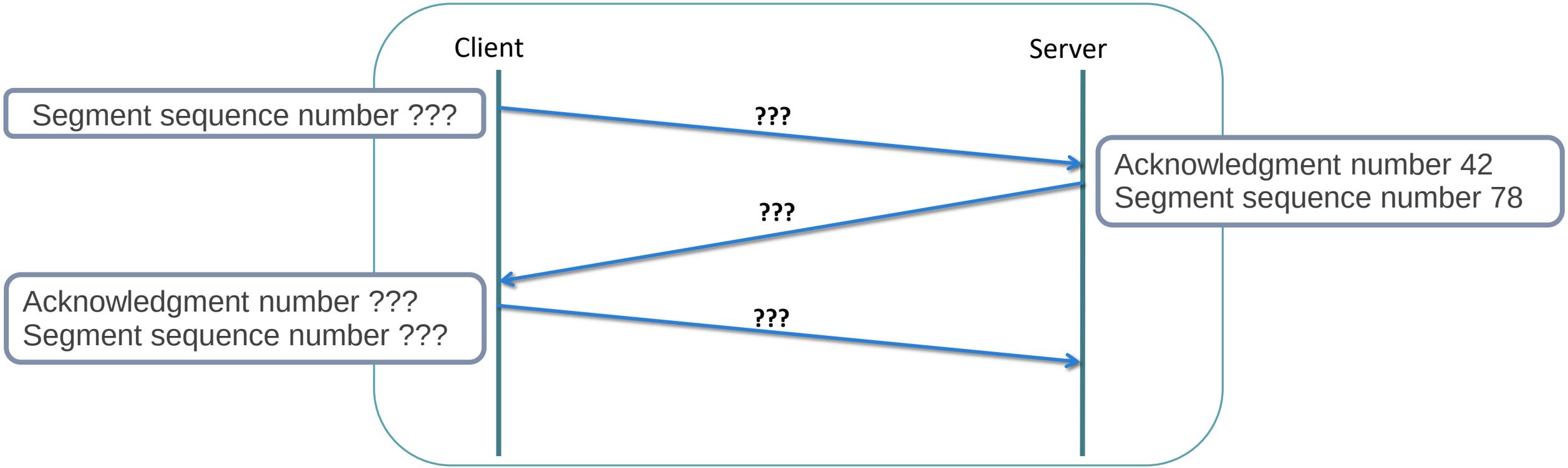
Exercice 1

Explain the difference between an IP address and a port number.

Exercice 2

Complete the following schema.

Exercice 2


Client
Server
Segment sequence number ???
???
Acknowledgment number 42
Segment sequence number 78
???
Acknowledgment number ???
Segment sequence number ???
???

Exercice 3

The TCP exchange of the figure above corresponds to the transfer of a WEB page between a WEB browser and a WEB server. It is assumed that the request to the WEB page makes 100 bytes and the returned WEB page is 1000 bytes. There are no errors of transmission.

Complete the following schema and explain the different segments.