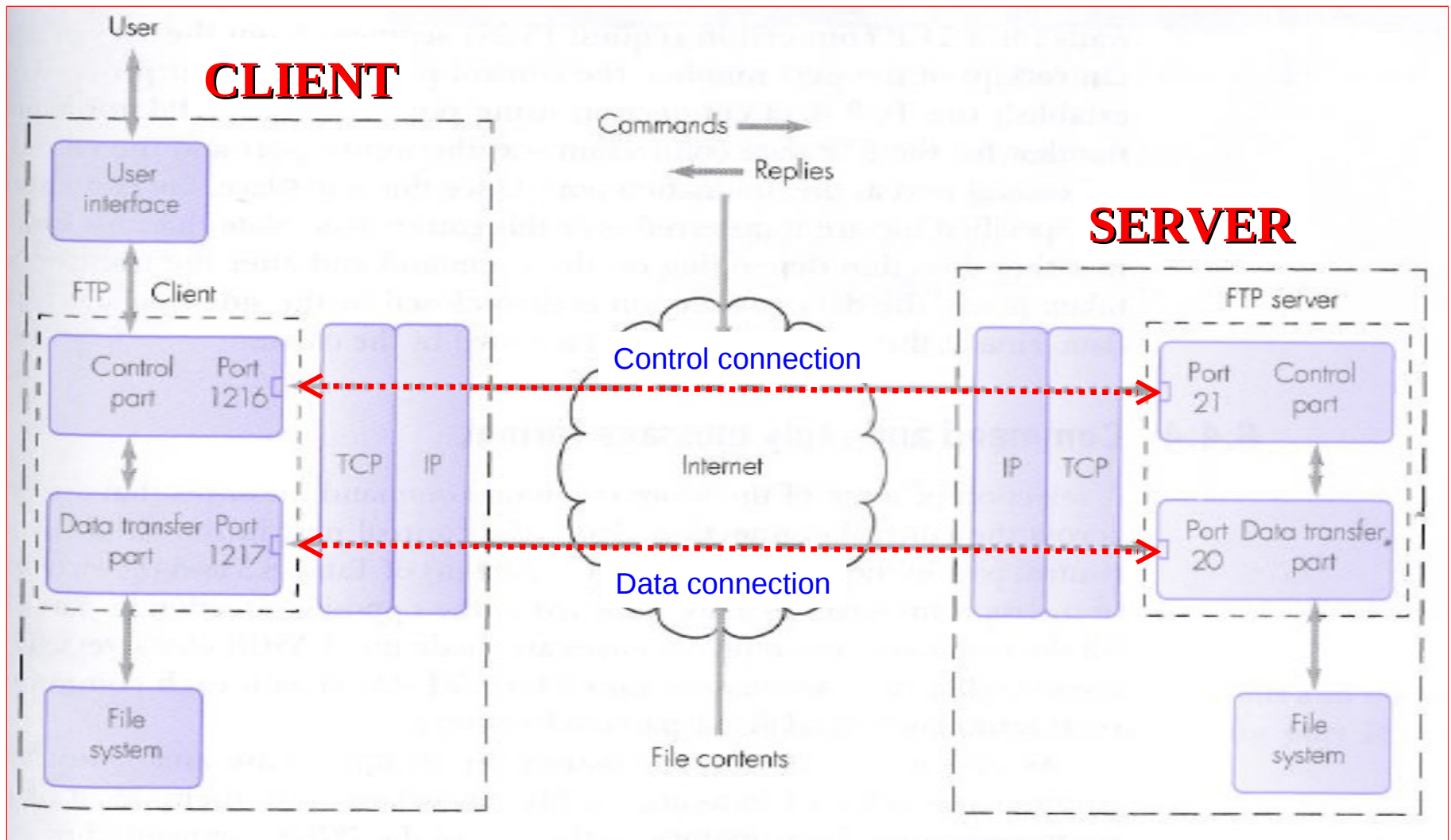


FTP Operation



Note that Ports 1216 & 1217 are ephemeral ports. Any port [1024, 65535] will work.

FTP Commands

COMMAND	DESCRIPTION
USER username	User name on the FTP server
PASS password	User's password on the FTP server
SYST	Type of operating system requested
TYPE type	File type to be transferred: A (ASCII), I (Image/Binary)
PORT n1,n2,n3,n4,n5,n6	Client IP address (n1-n4) and port number (n5, n6)
RETR filename.type	Retrieve (get) a file
STOR filename.type	Store (put) a file
LIST filelist	List files or directories
QUIT	Log off from server

FTP Reply Codes

REPLY	DESCRIPTION
1 yz	Positive reply, wait for another reply before sending a new command
2 yz	Positive reply, a new command can be sent
3 yz	Positive reply, another command is awaited
4 yz	Negative reply, try again
5 yz	Negative reply, do not retry
x 0 z	Syntax
x 1 z	Information
x 2 z	Control or data connection
x 3 z	Authentication
x 4 z	Unspecified
x 5 z	File status

Active FTP

Active (with PORT)

This is the standard FTP mode for Windows.

Operation

The **FTP client**:

Opens a **data port** and listens to it, awaiting for a client to connect to
Sends PORT message, with its own IP address the **data port** number

The **FTP server**:

Must open a new connection (as a client) using **data port**

We can say that the FTP client and server change their roles for the data connection (the client is now a server, the server acts like a client).

All the data should flow through that connection

When the data ends, that connection is disestablished

Very important: synchronization of the data connection

Passive FTP

Passive (with PASV)

This is the standard FTP mode for Unix (and most servers like this better).

Operation

The **FTP client**:

- Sends the message PASV, asking what is the **data port**

- When receives the message 227, it knows the **data port**

The **FTP server**:

- When receives PASV, opens a new **data port**

- Waits until the client connects to it

All the data should flow through that connection

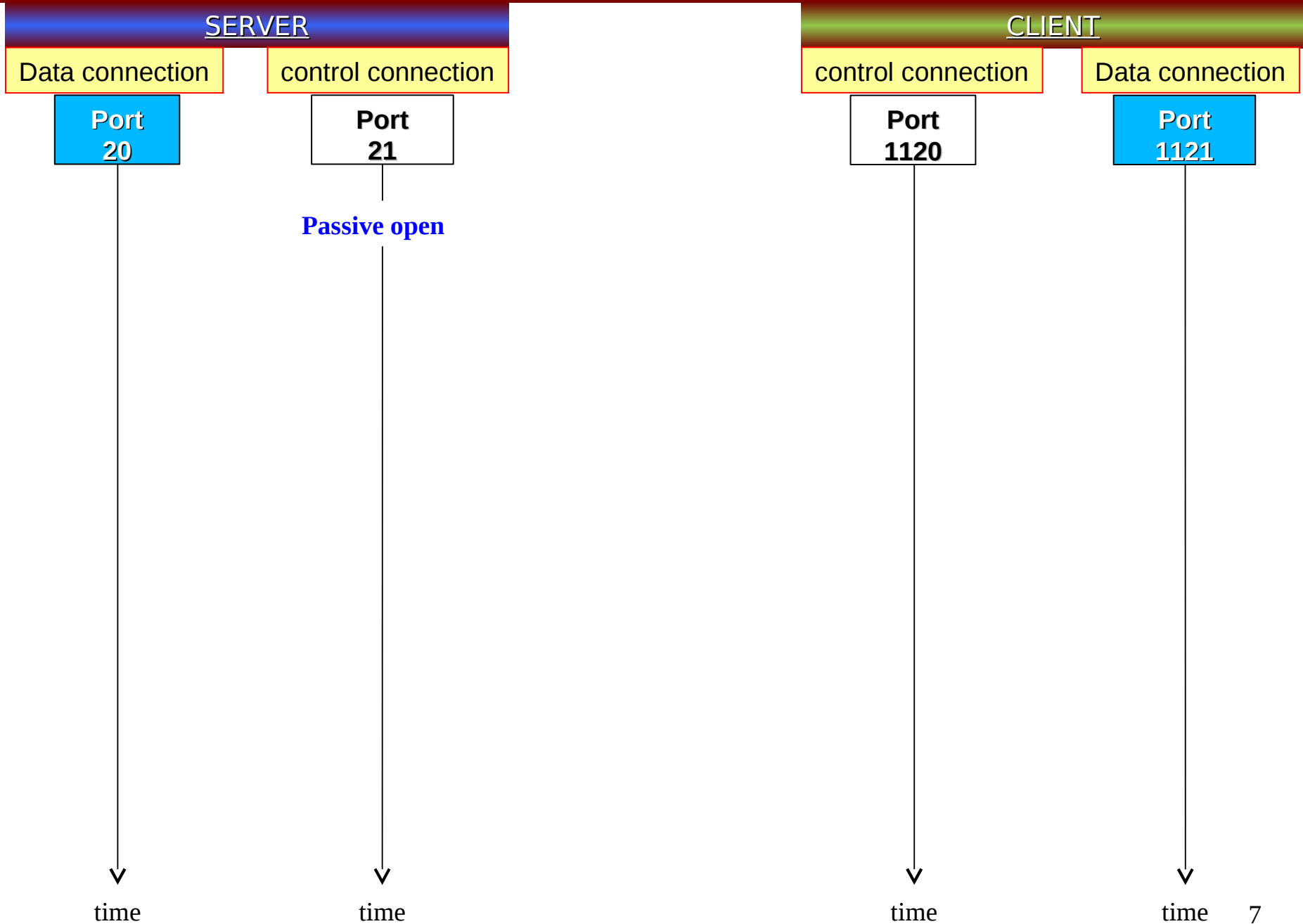
When the data ends, that connection is disestablished

Very important: synchronization of the data connection

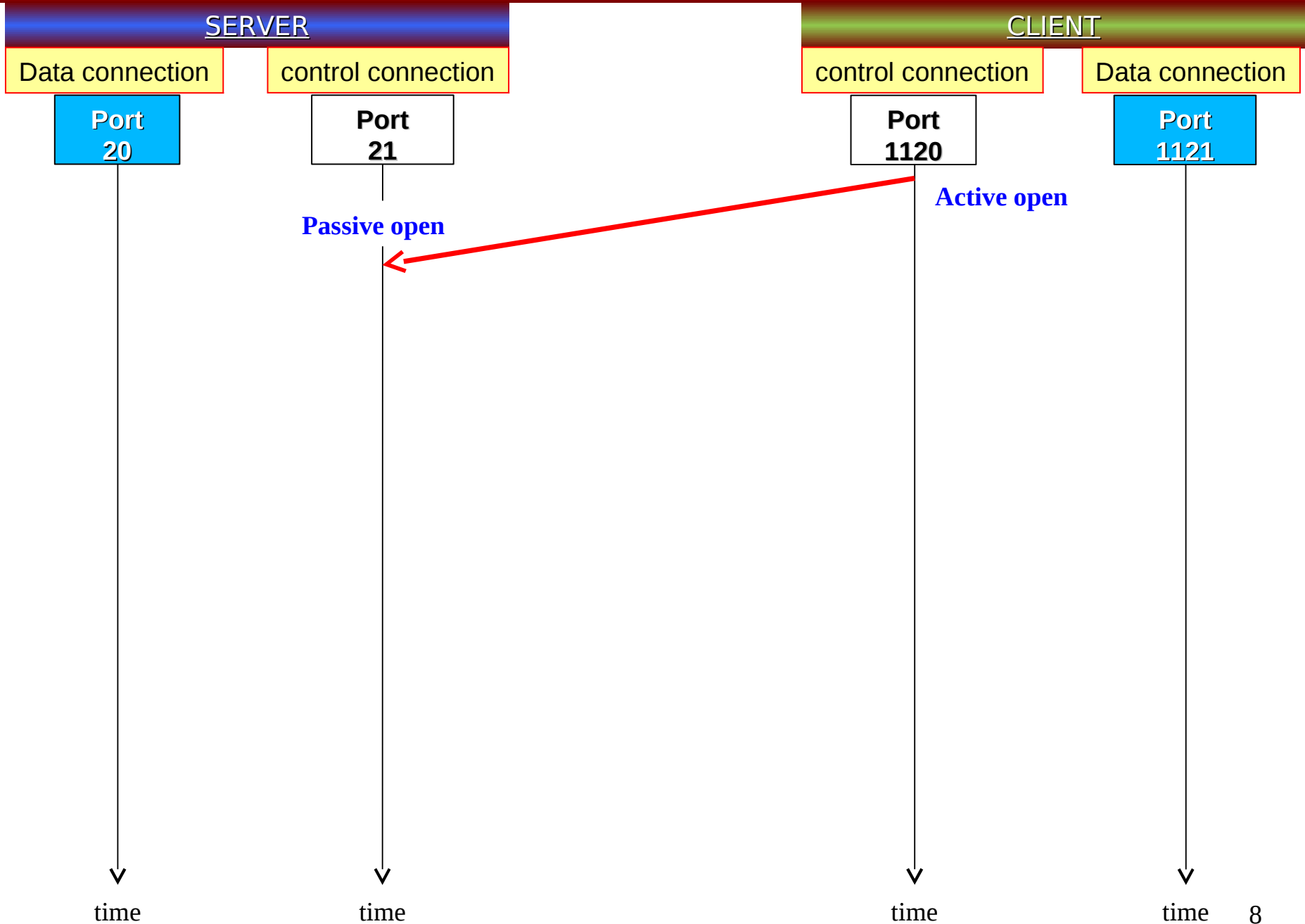
Active FTP mode

p. 50, RFC 959

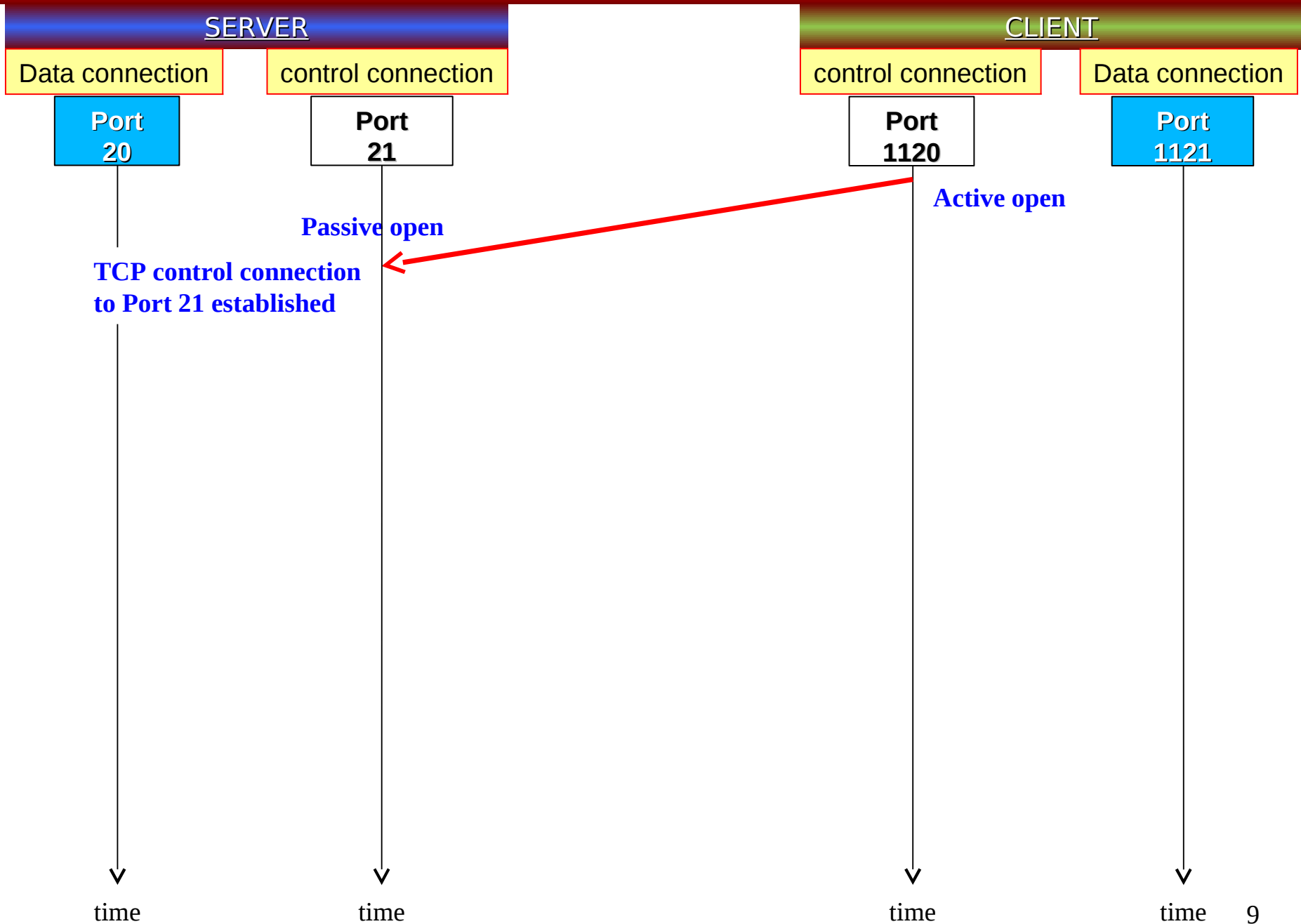
ACTIVE FTP Operation



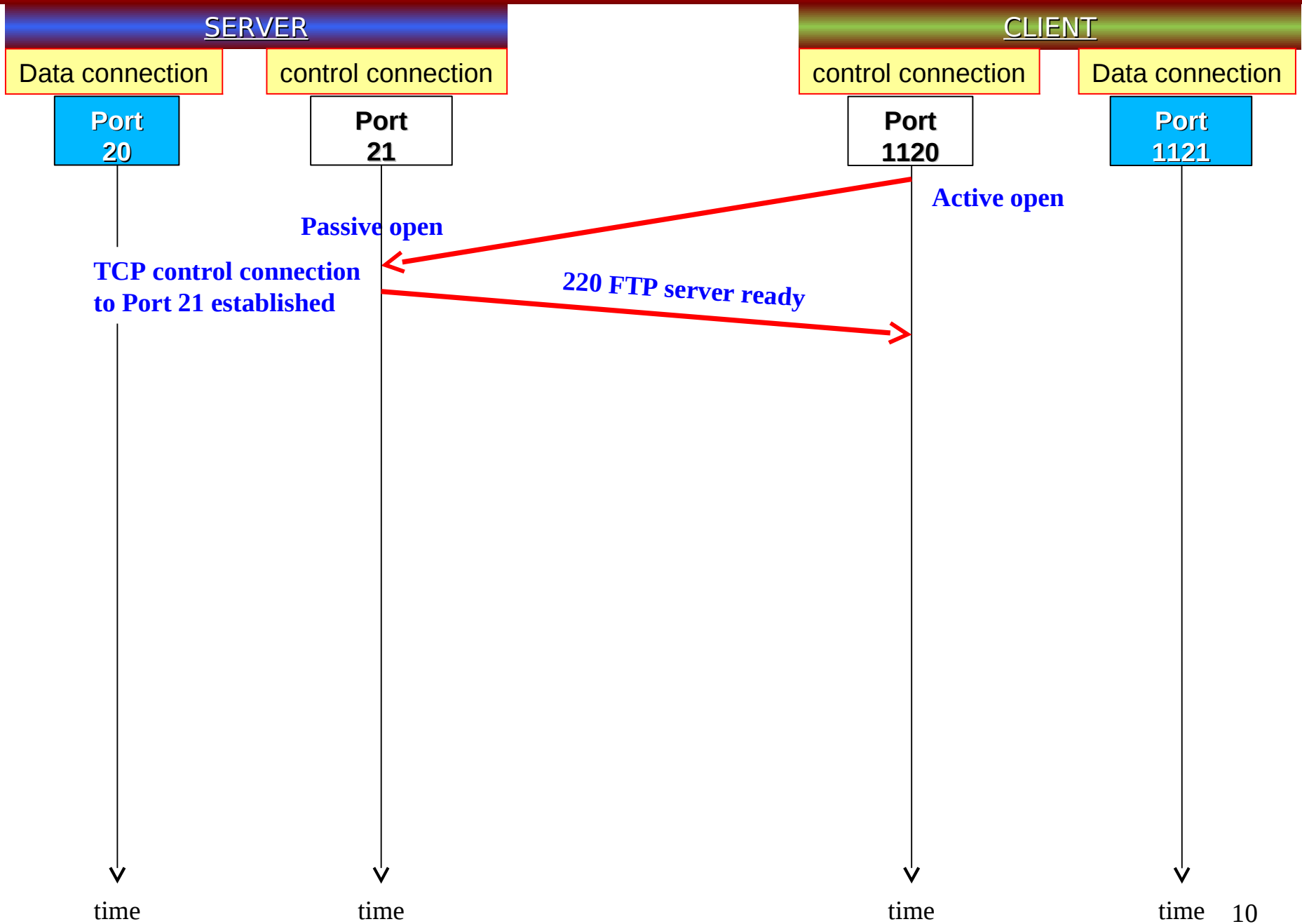
ACTIVE FTP Operation



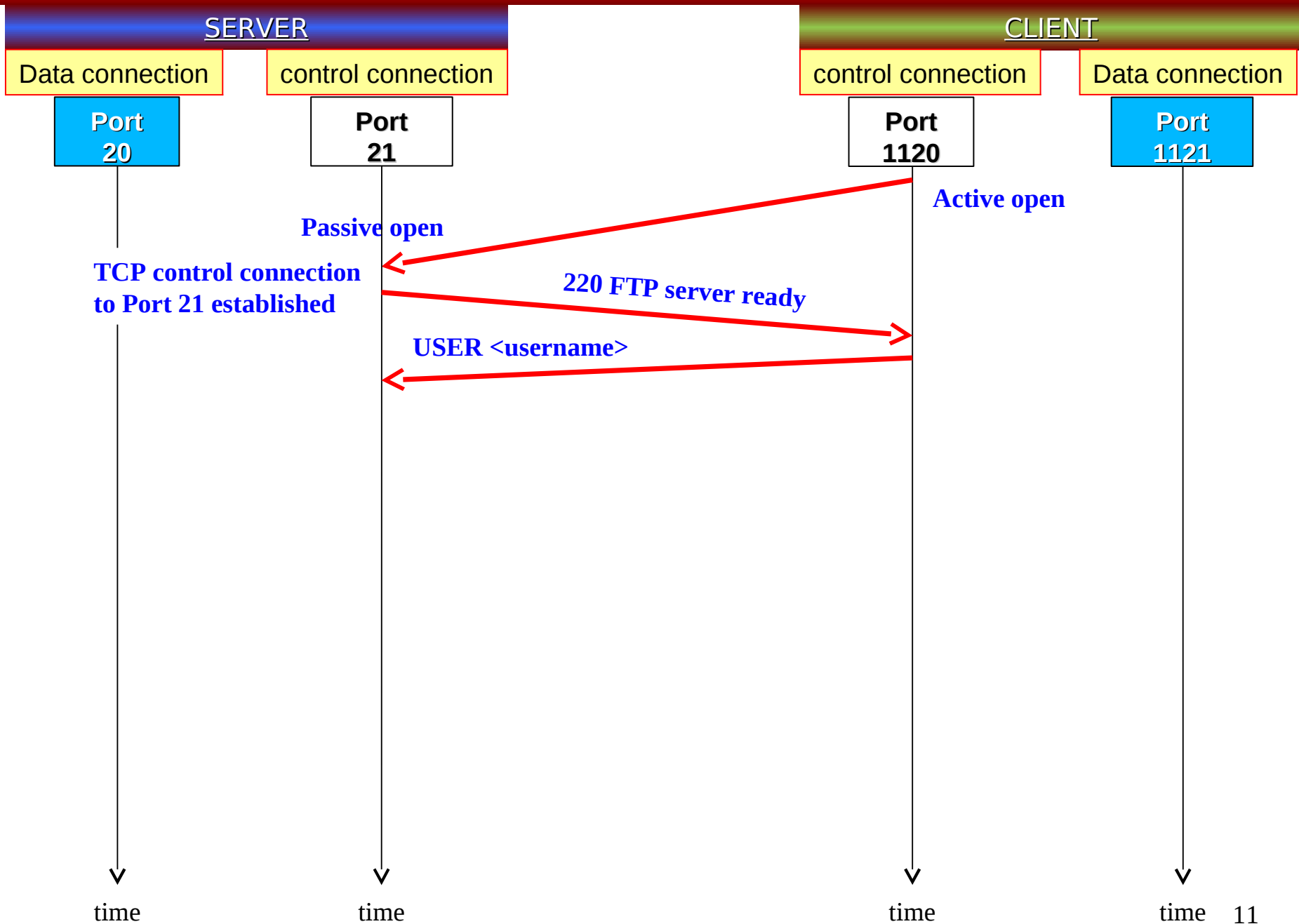
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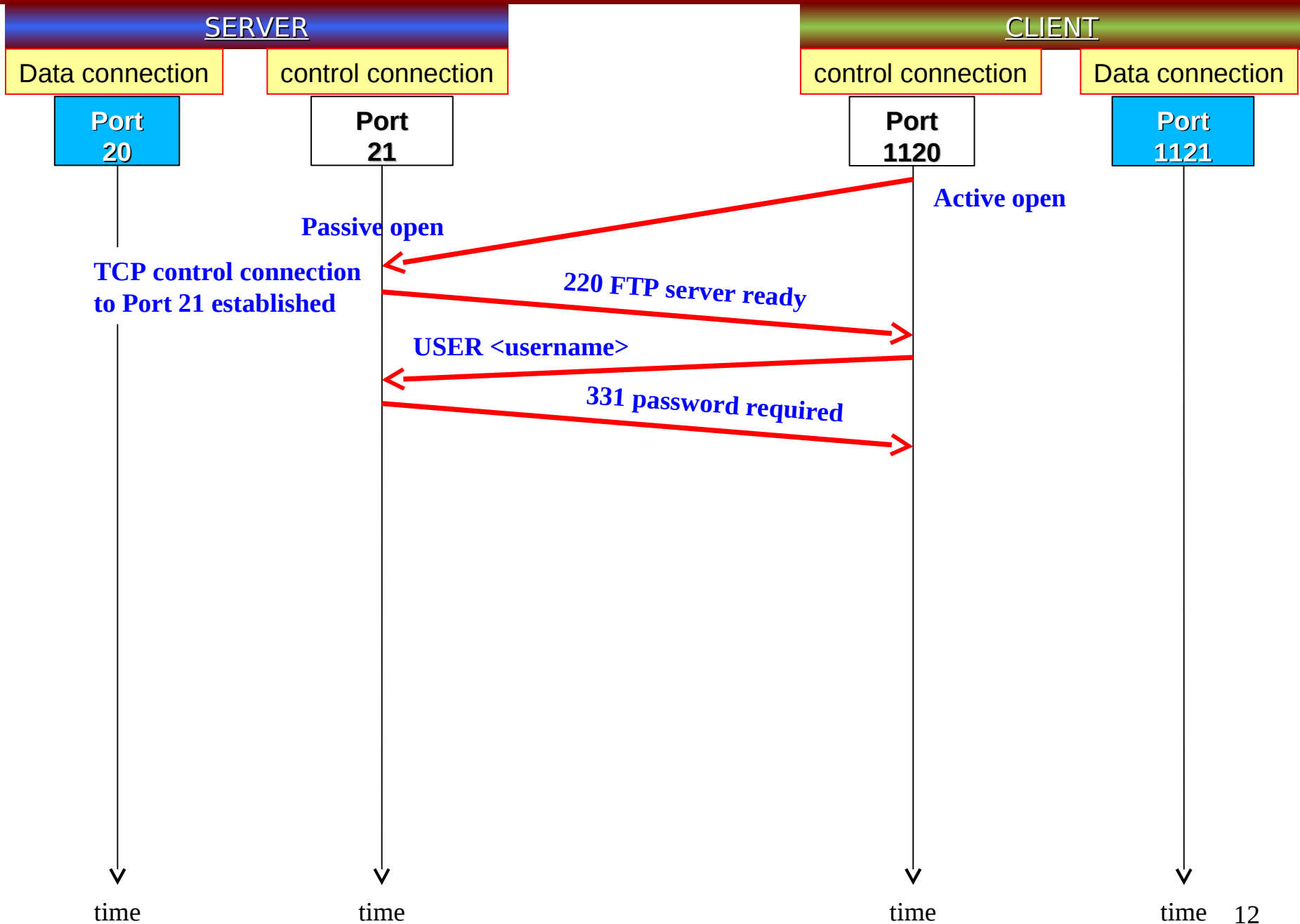
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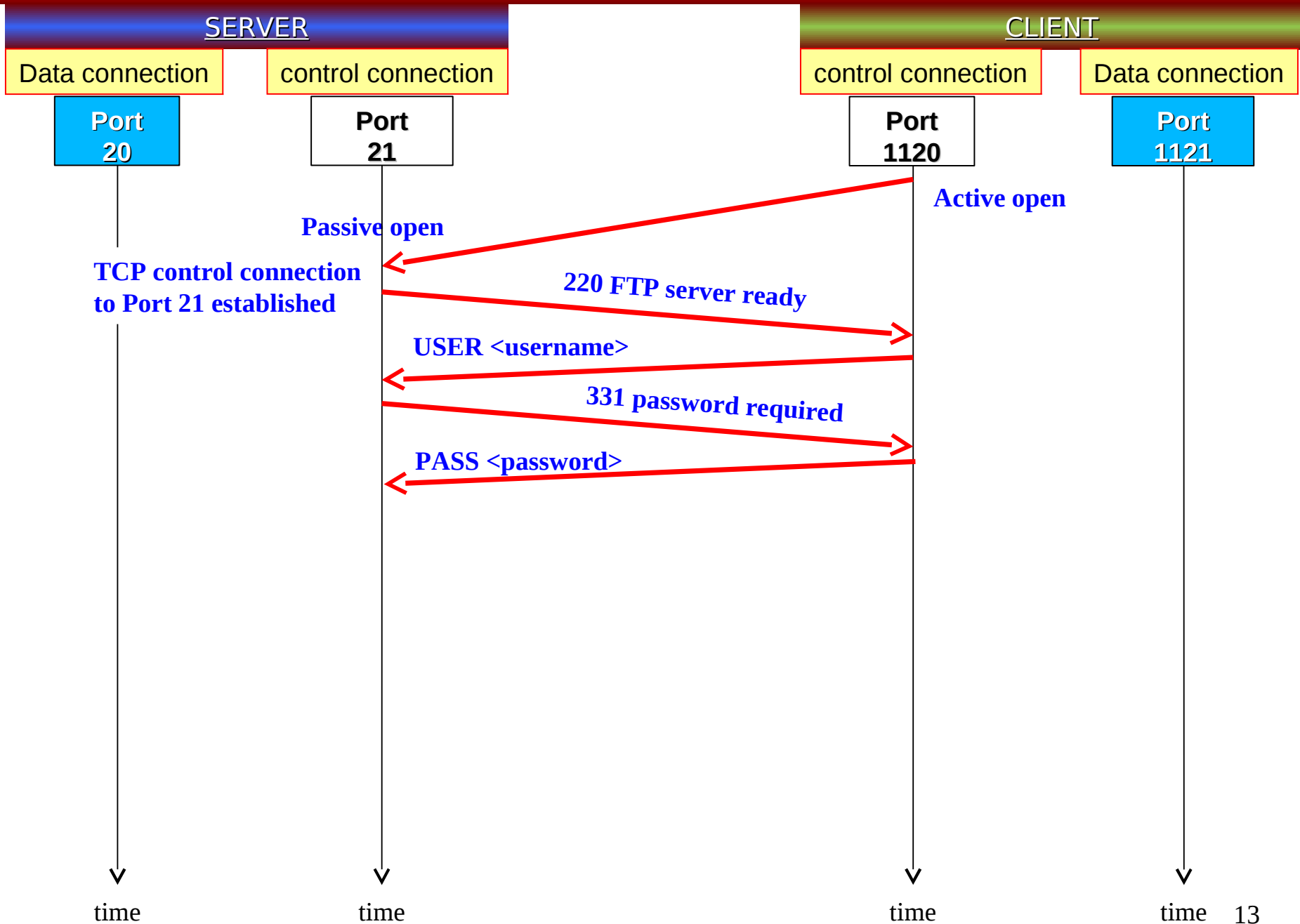
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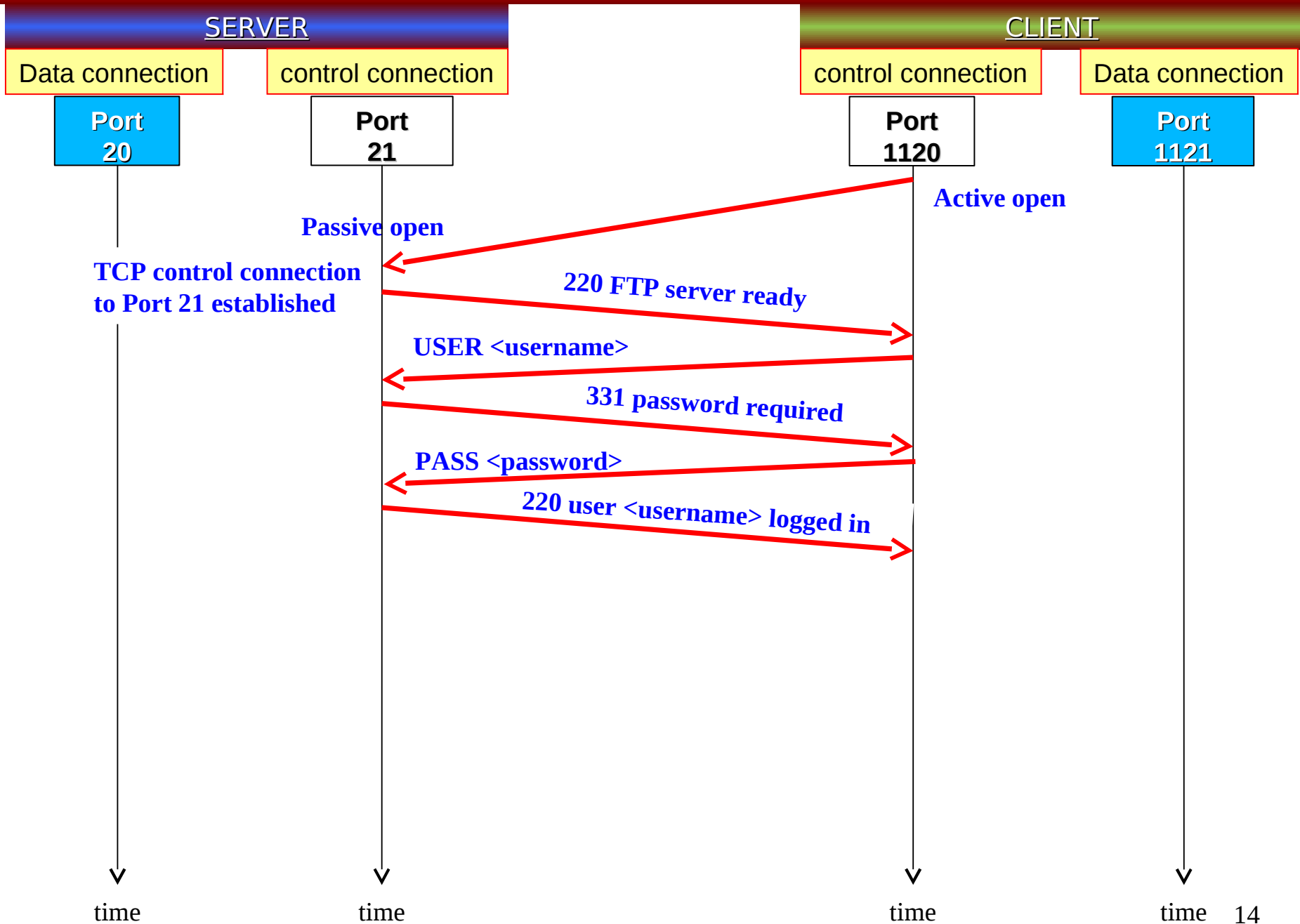
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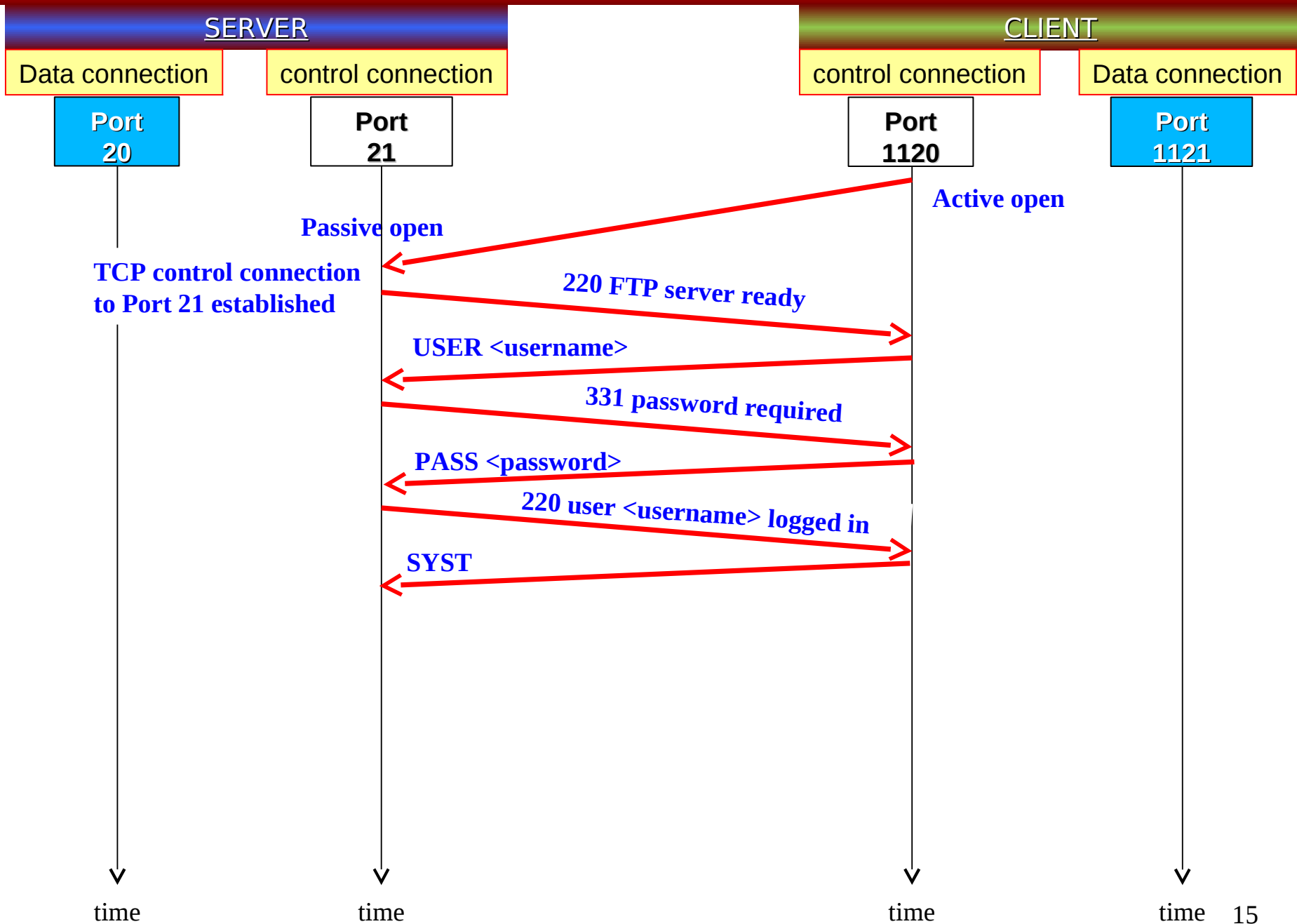
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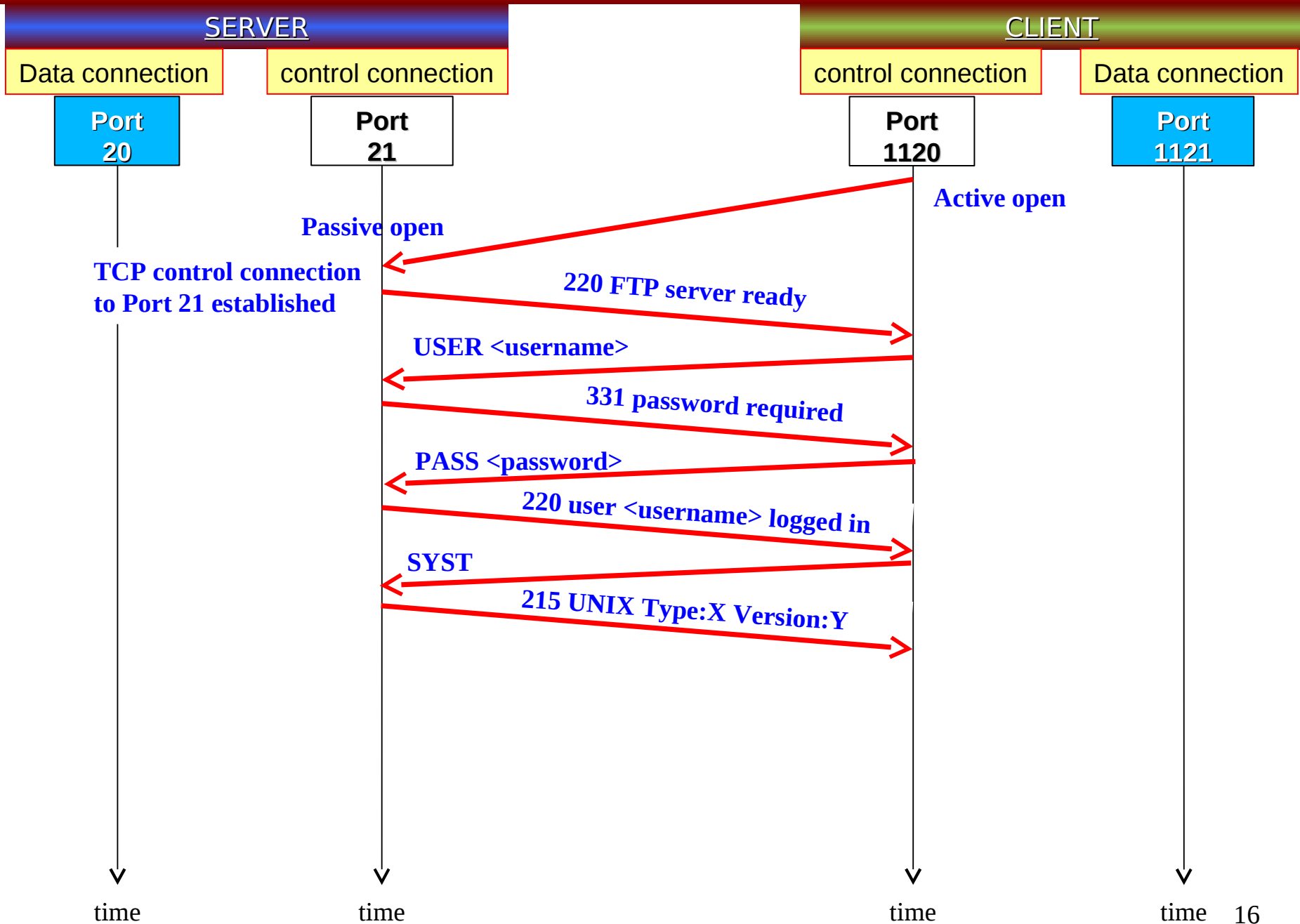
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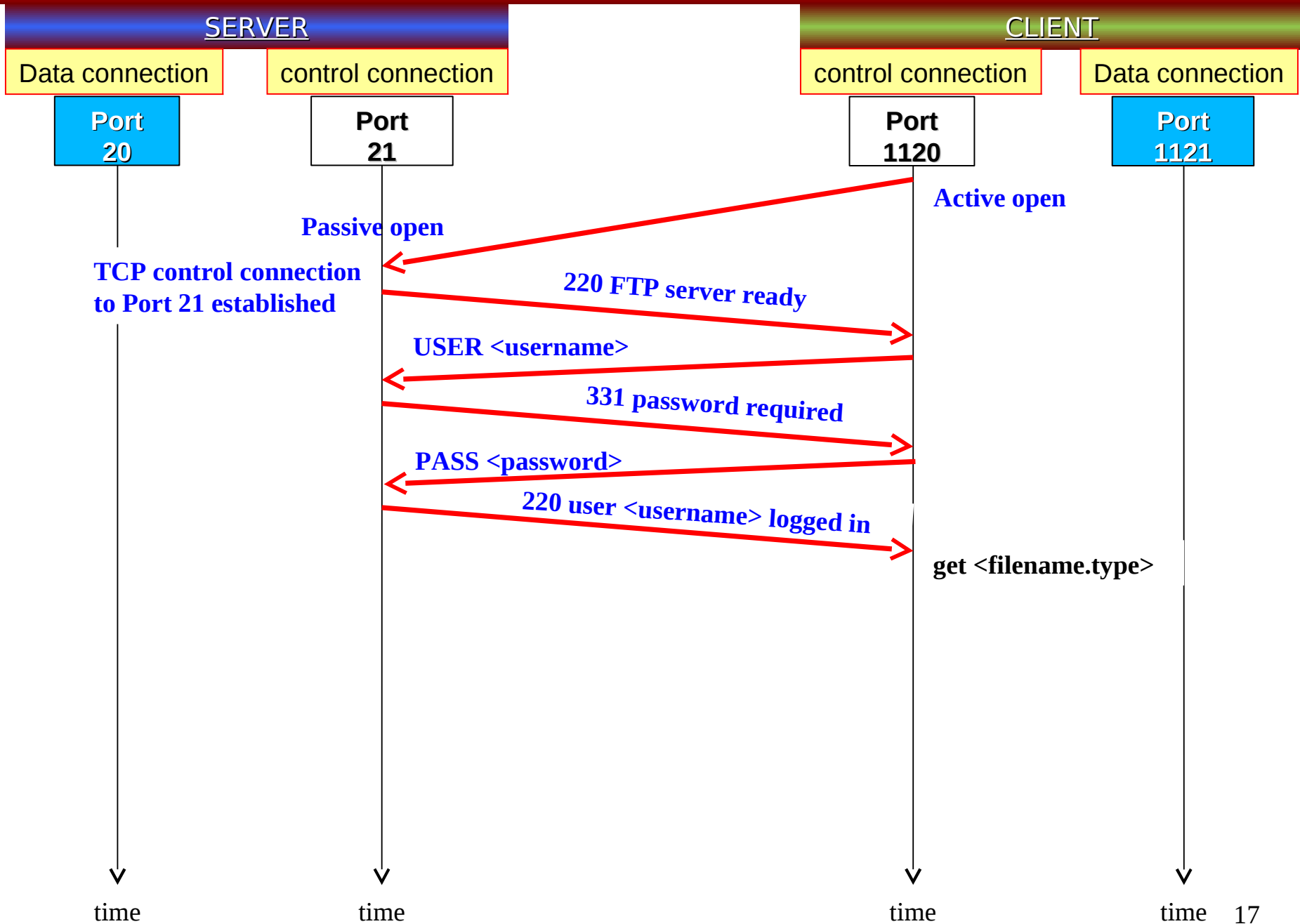
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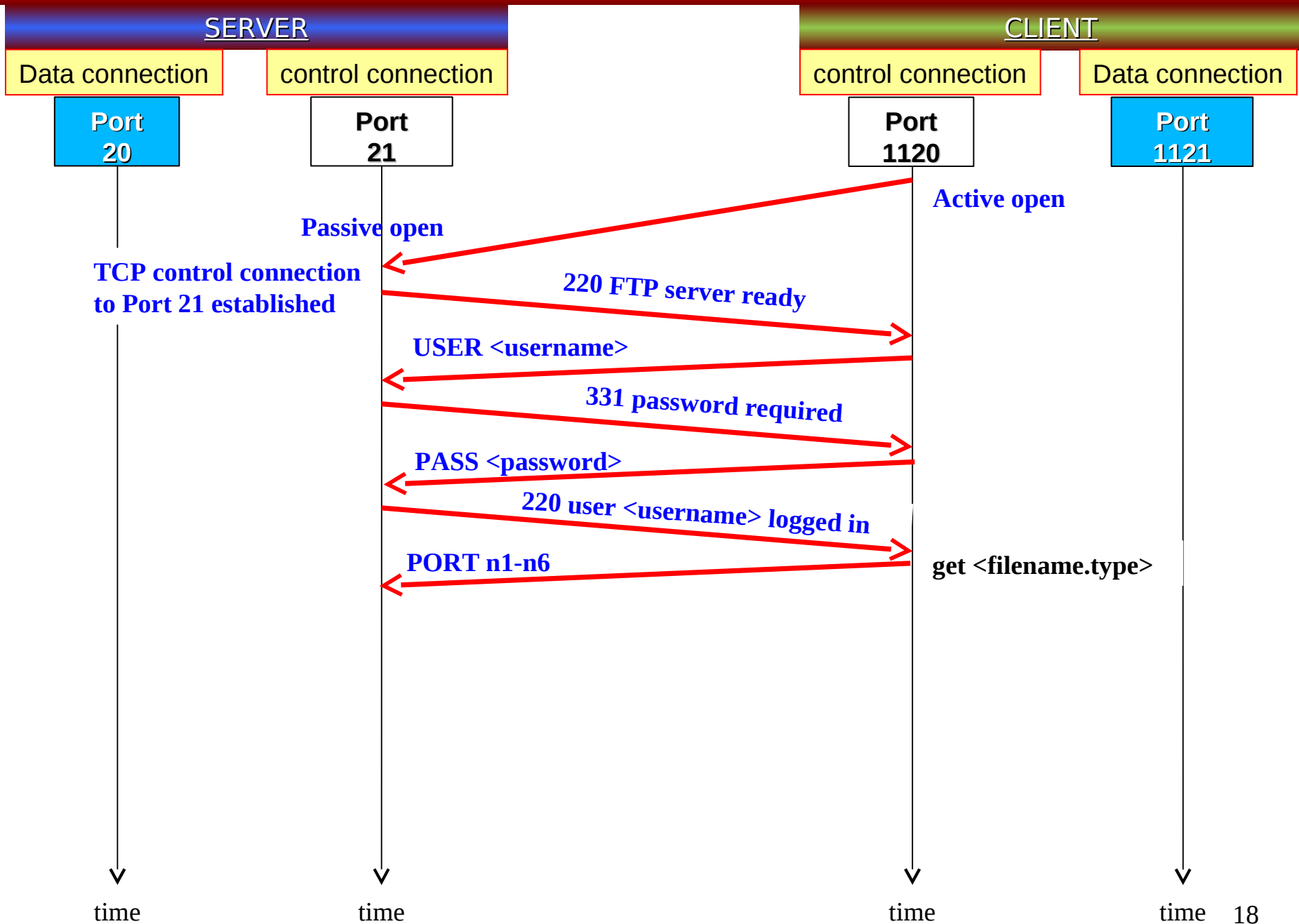
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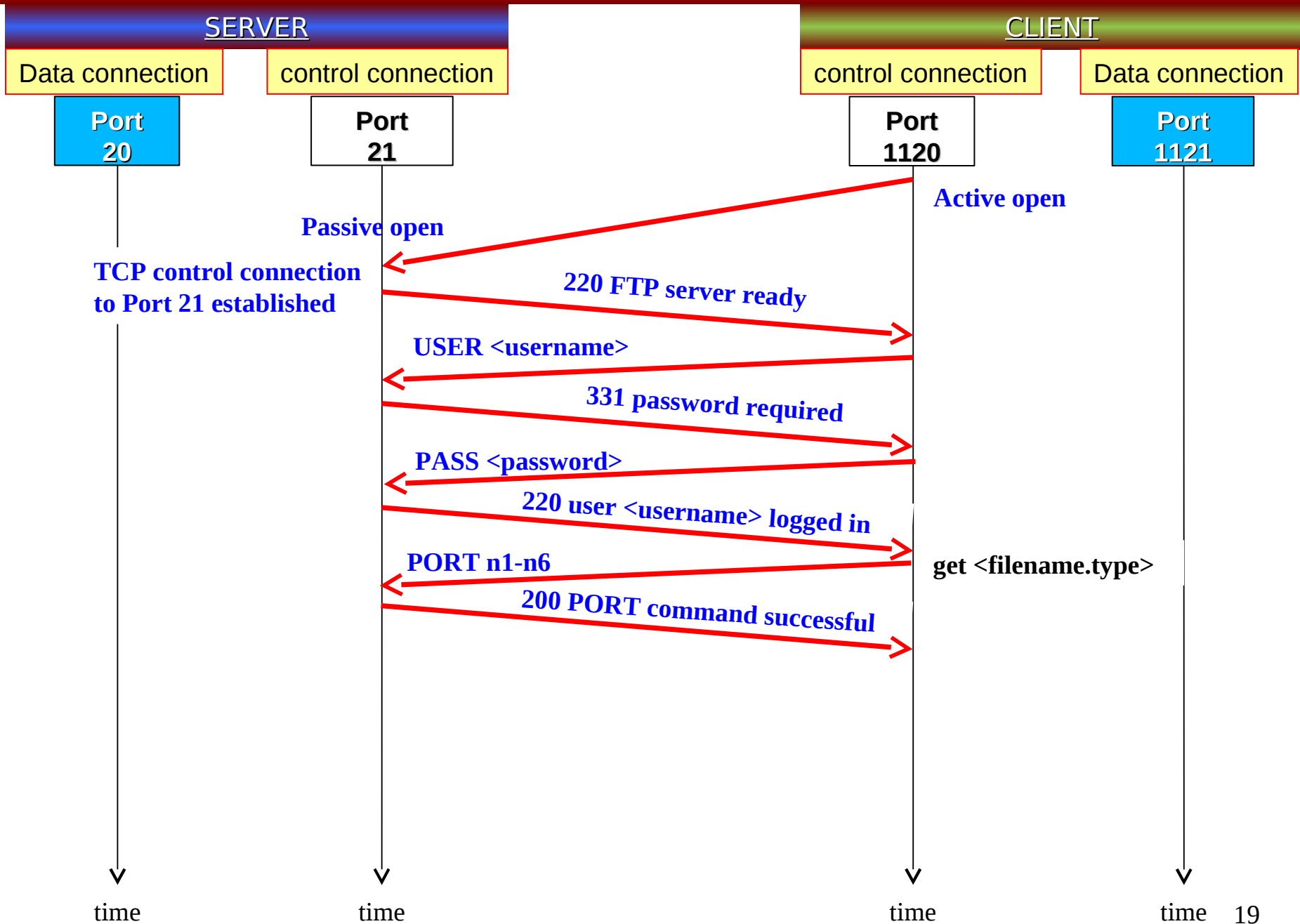
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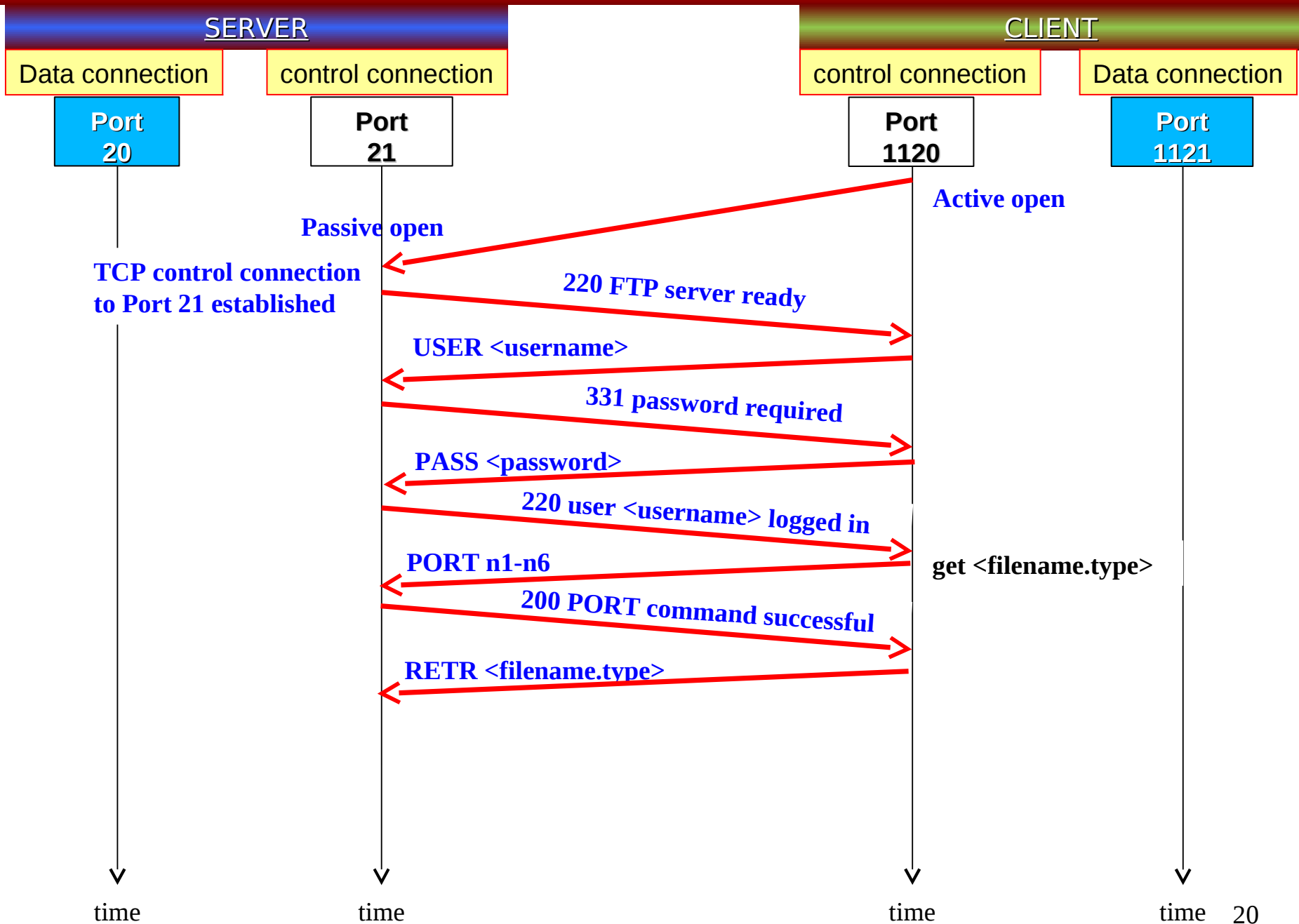
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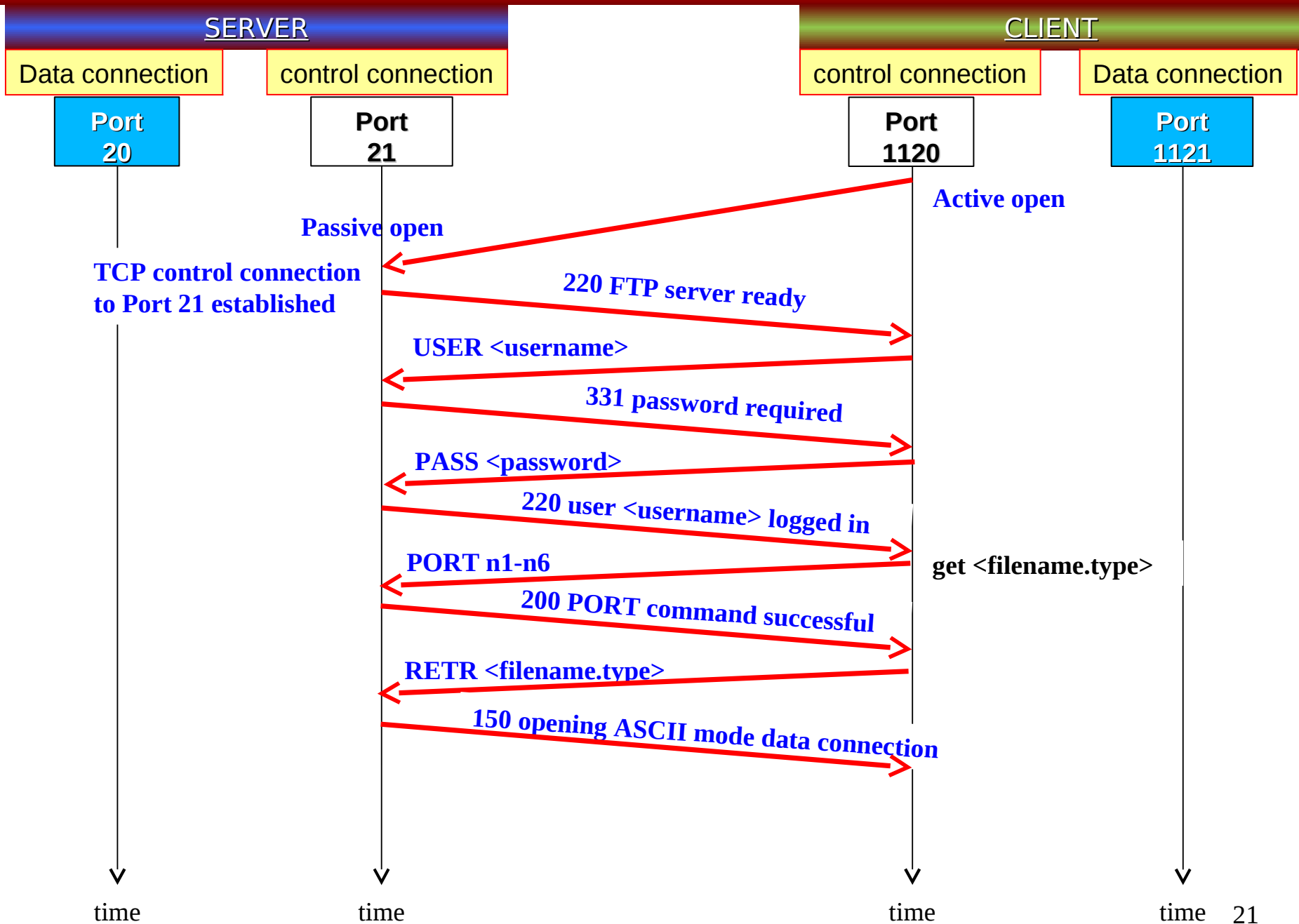
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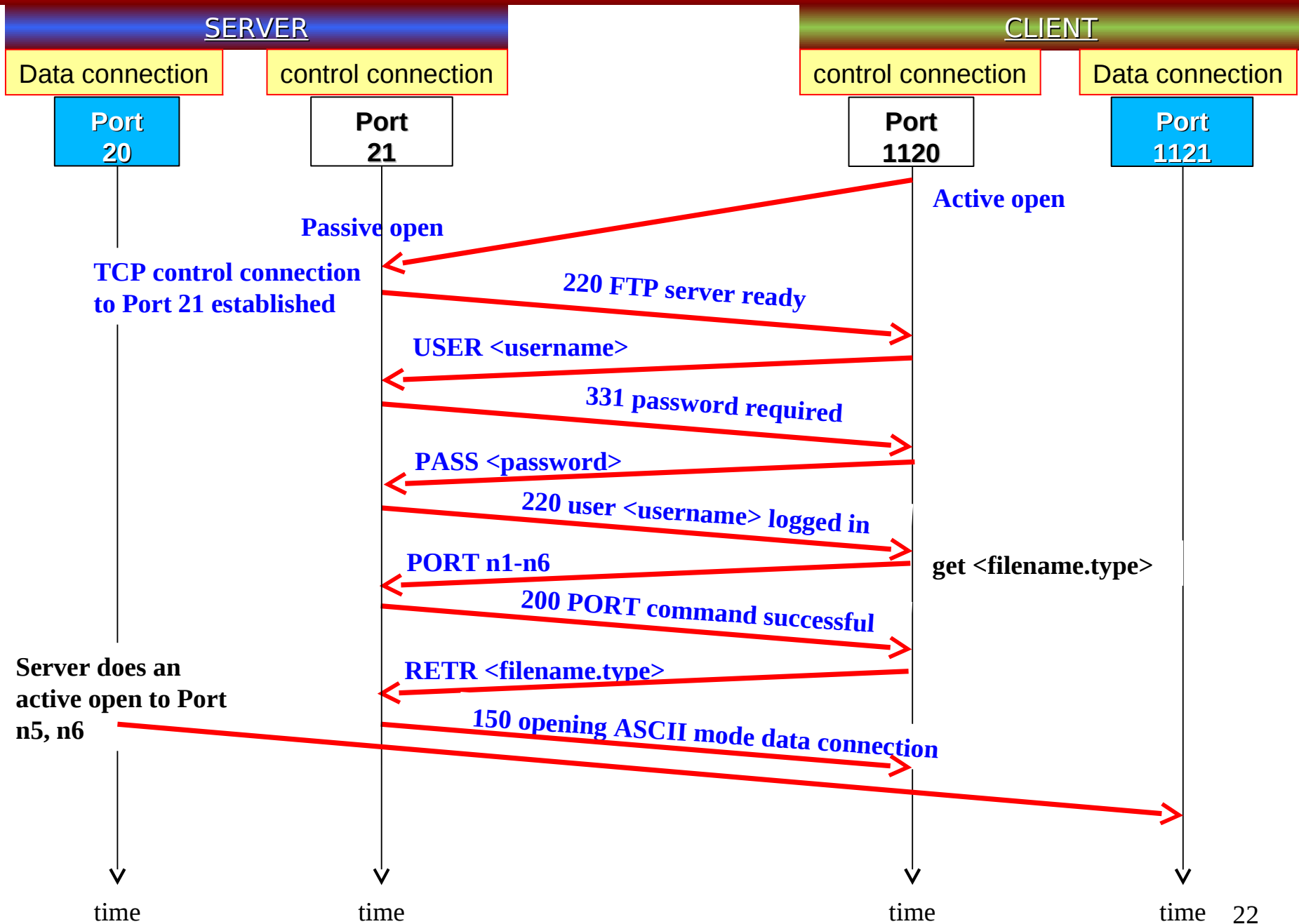
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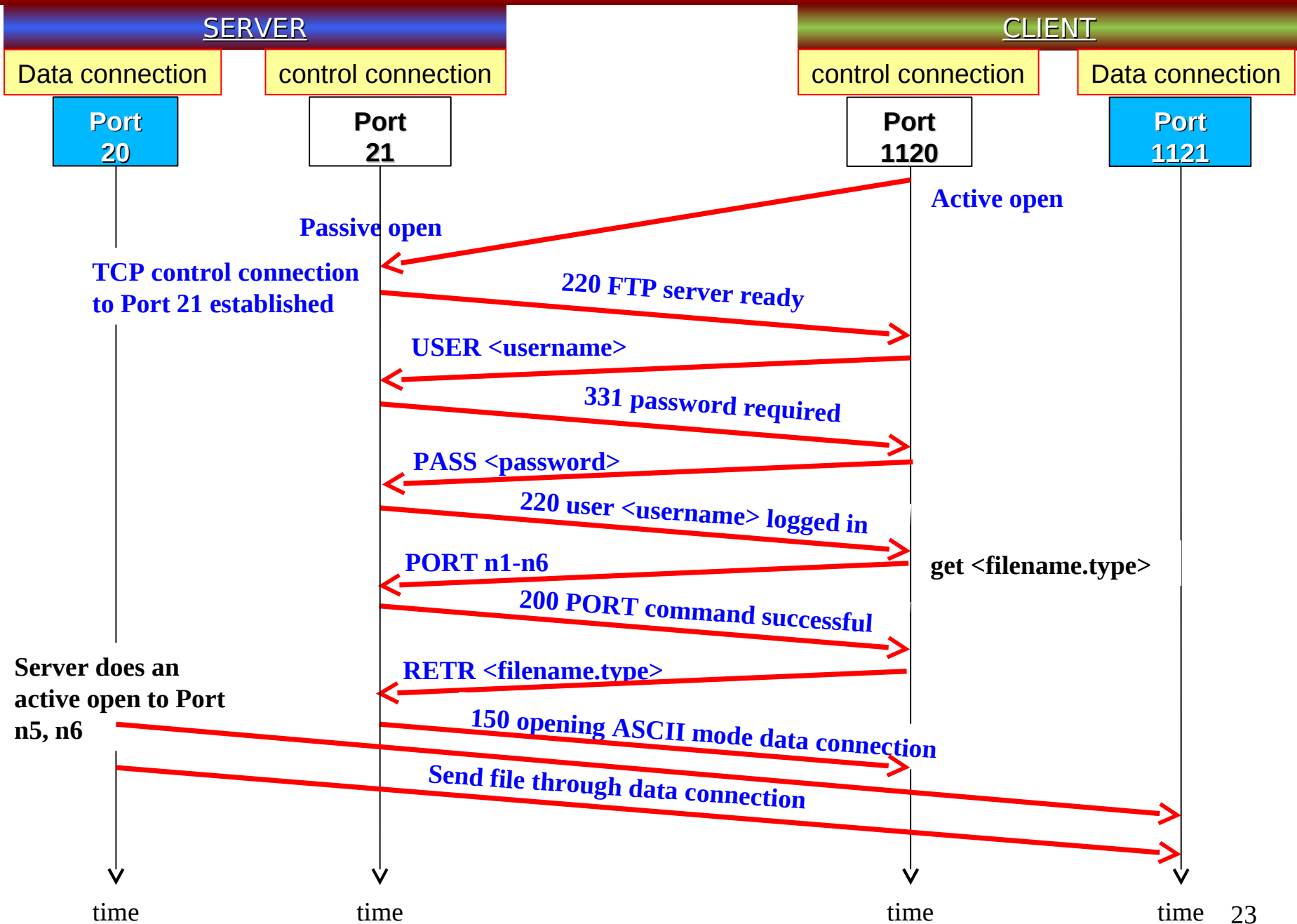
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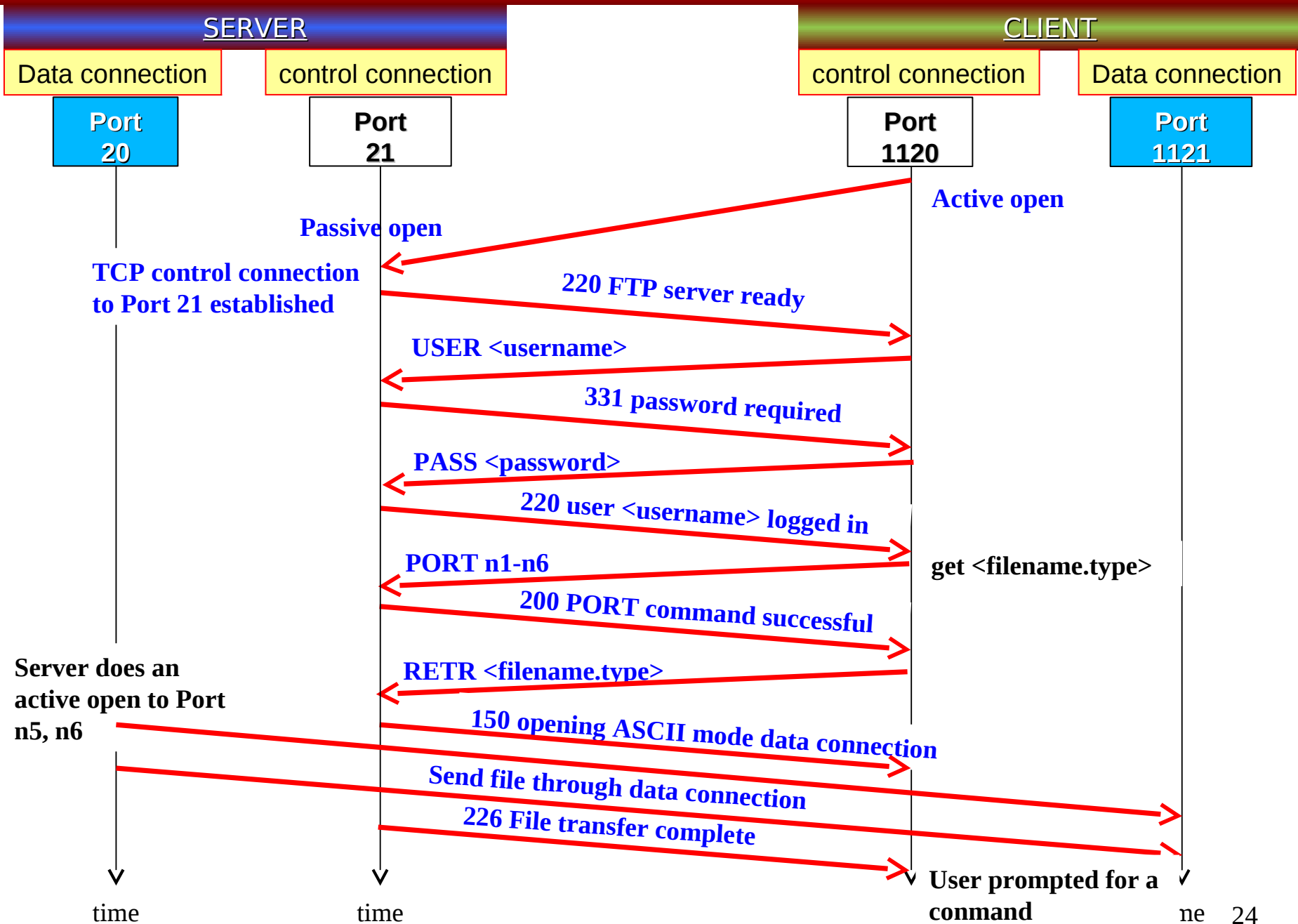
ACTIVE FTP Operation



ACTIVE FTP Operation

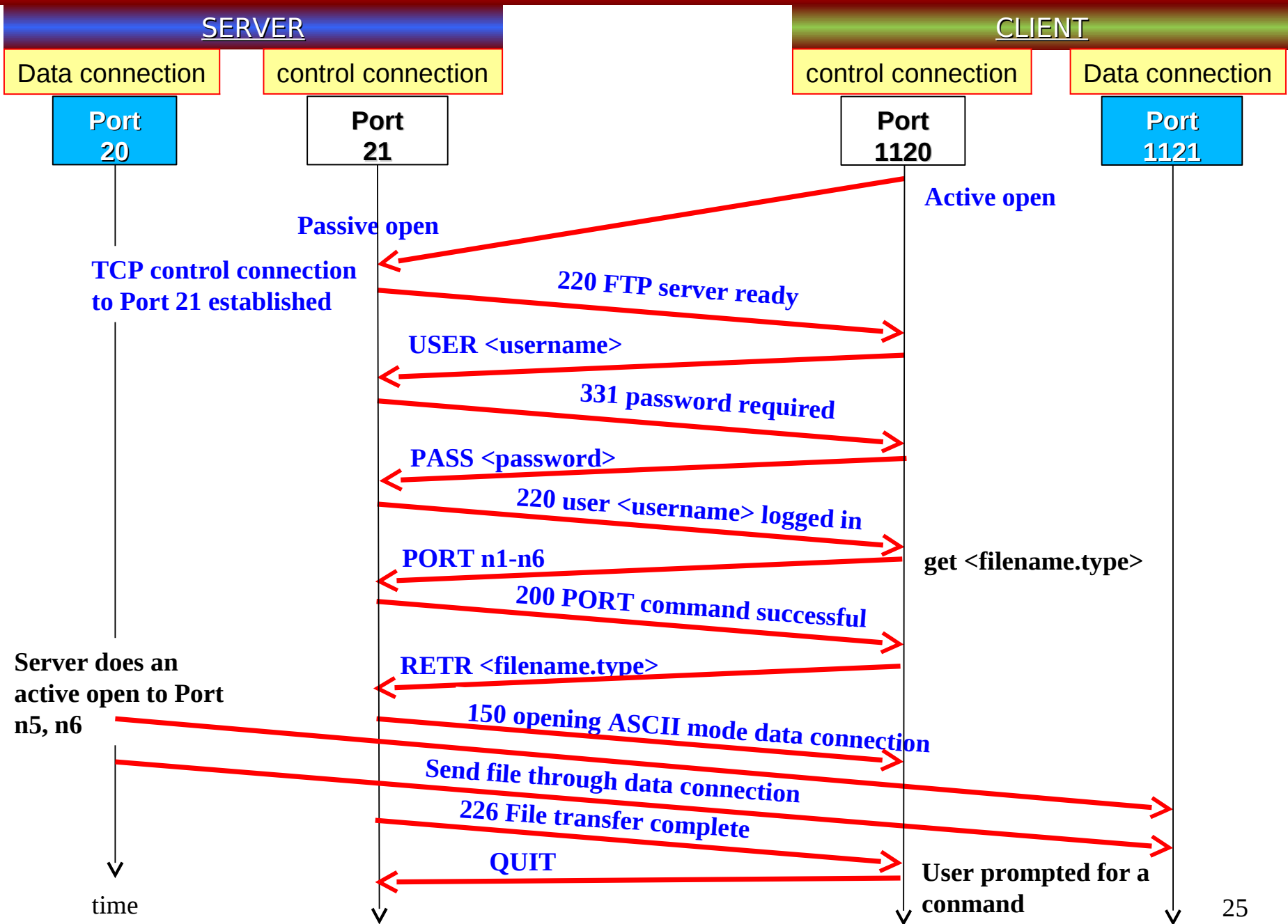


ACTIVE FTP Operation

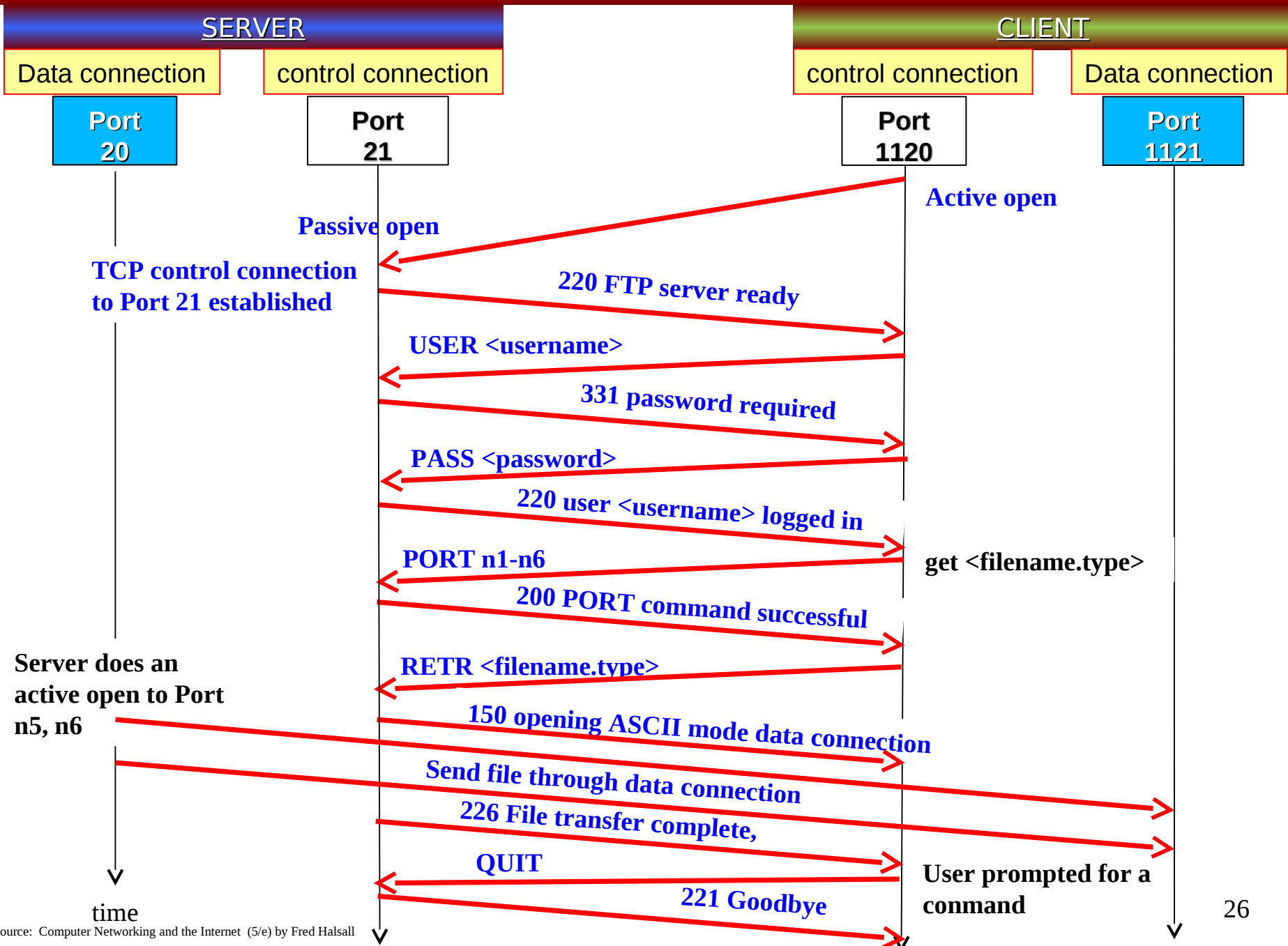


Source: Computer Networking and the Internet (5/e) by Fred Halsall

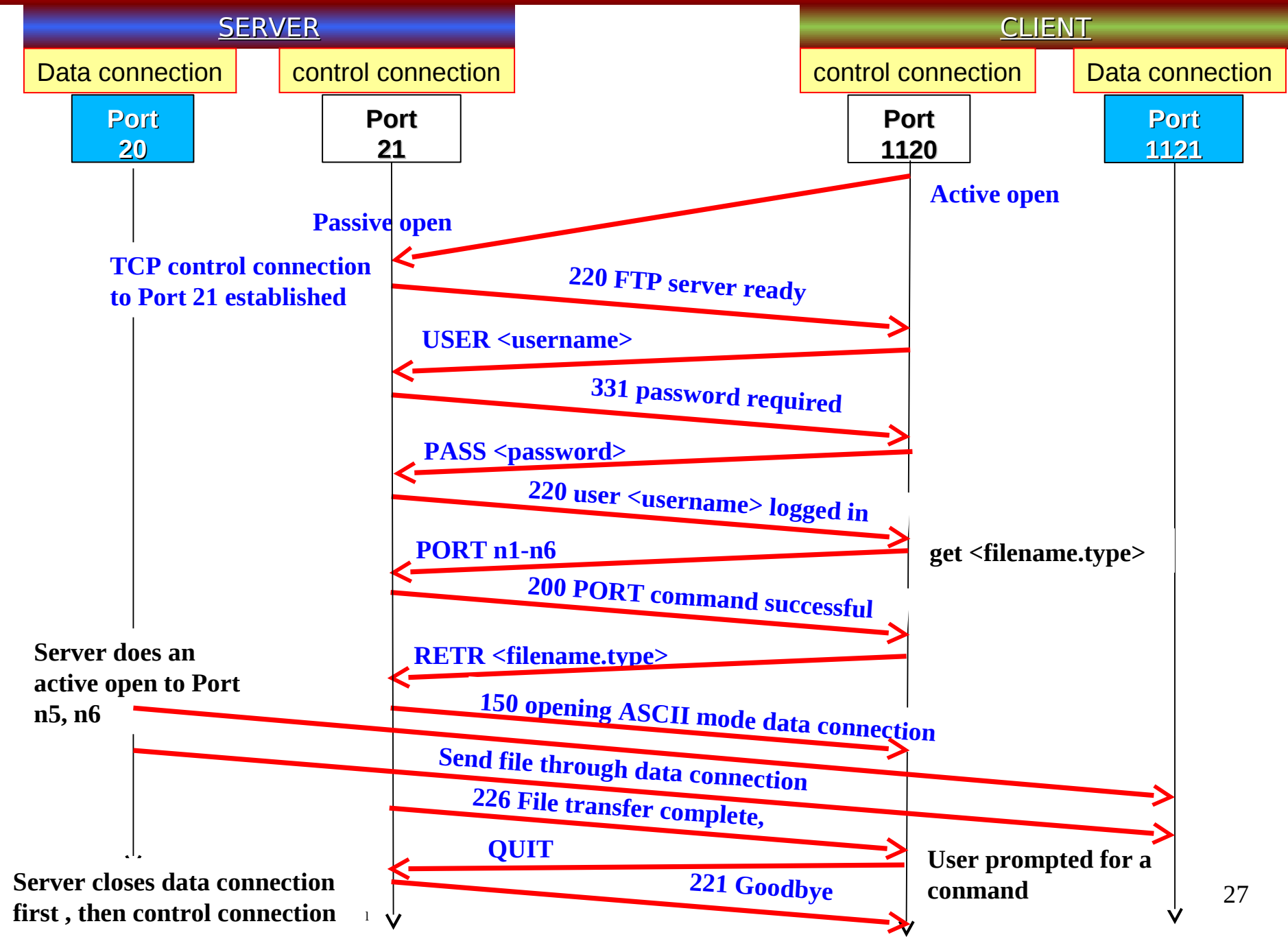
ACTIVE FTP Operation



ACTIVE FTP Operation

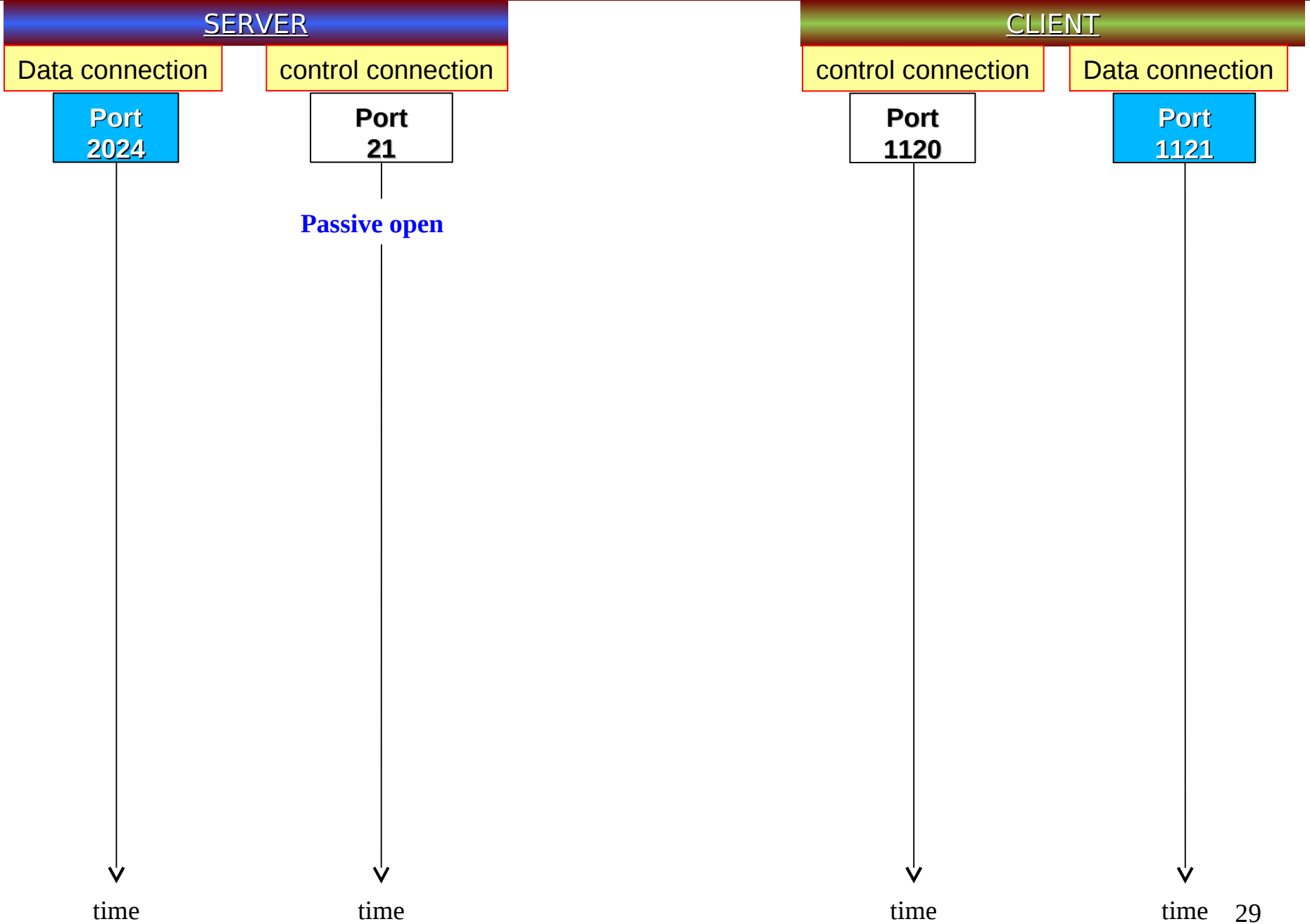


ACTIVE FTP Operation

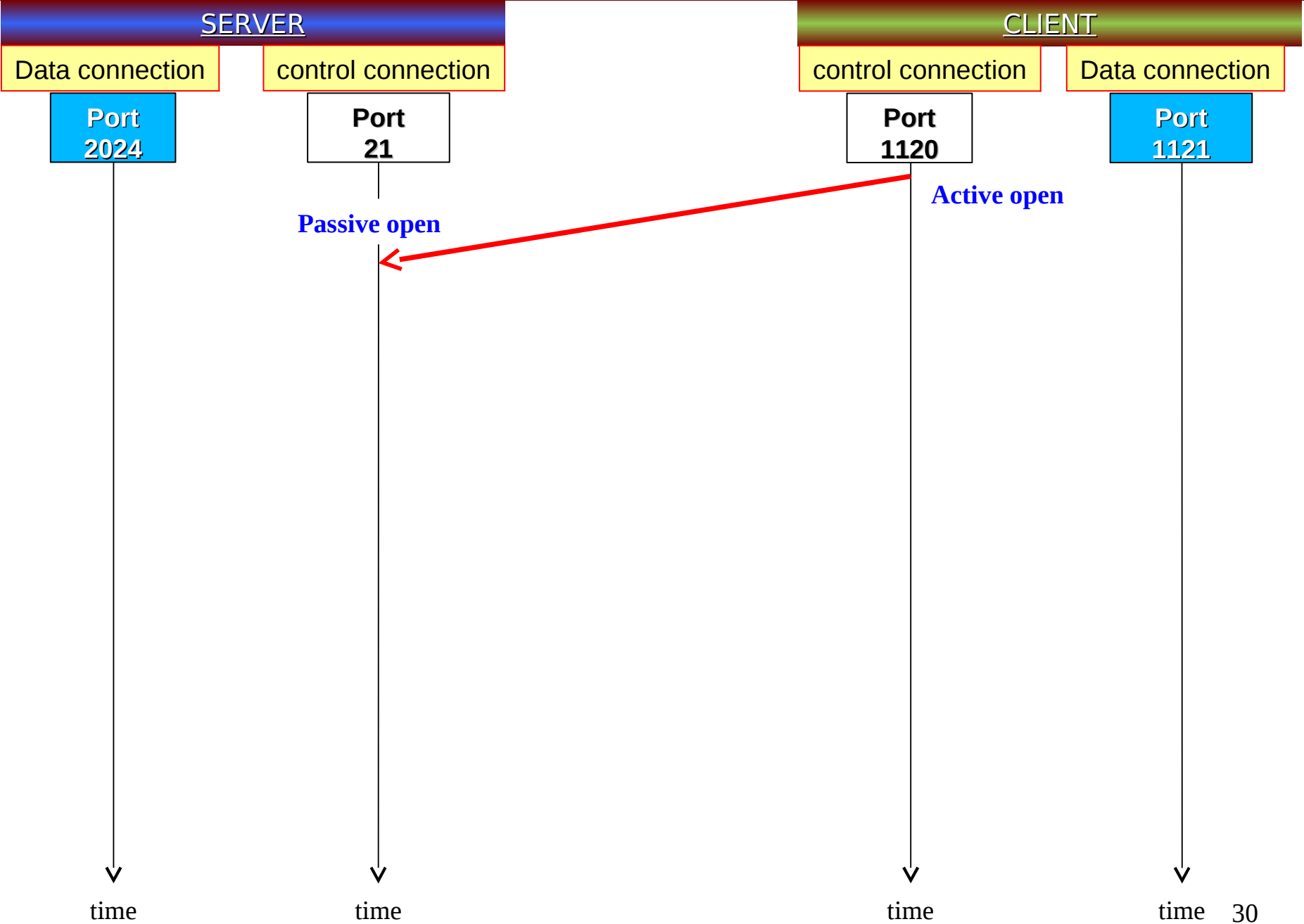


Passive FTP mode

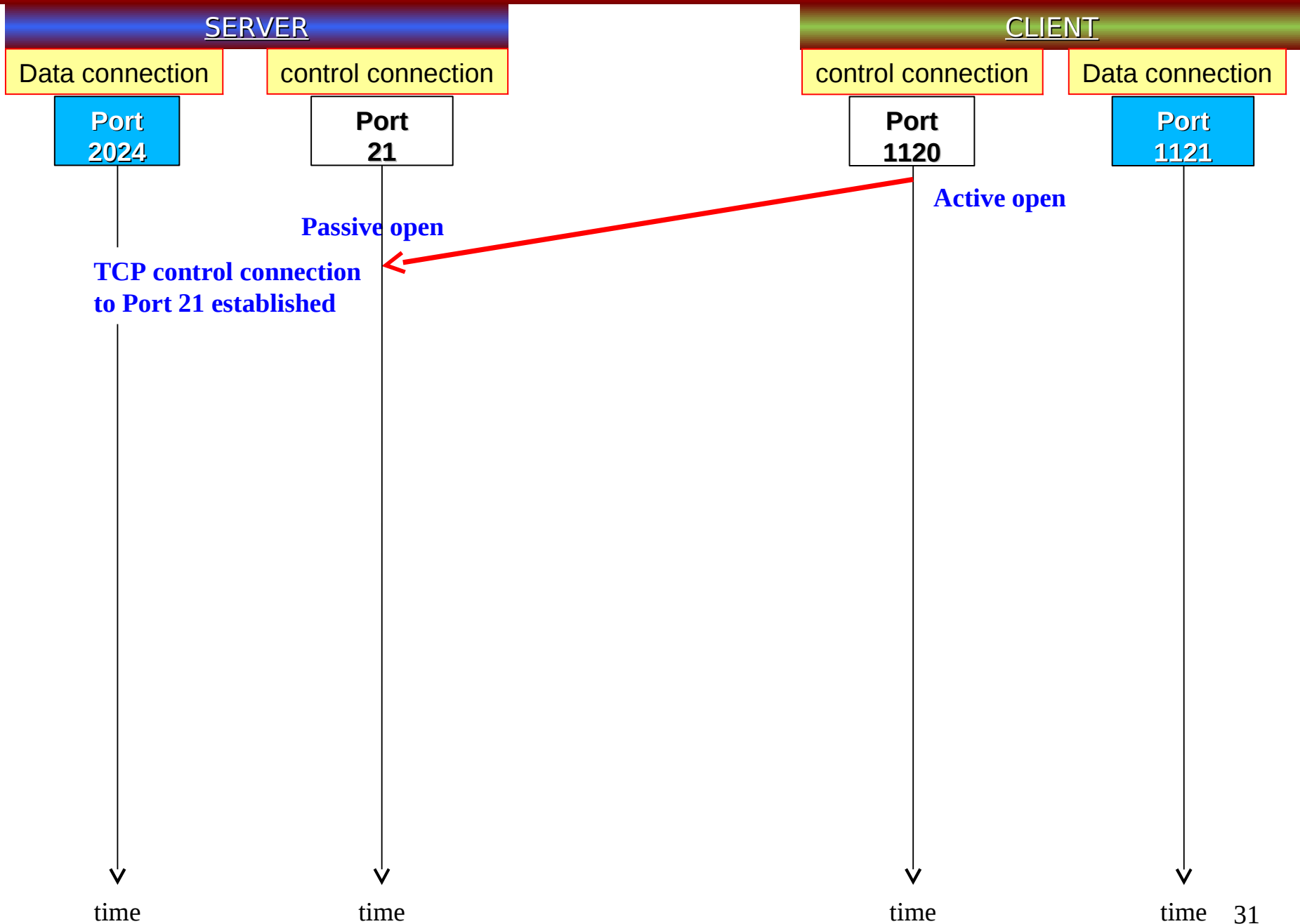
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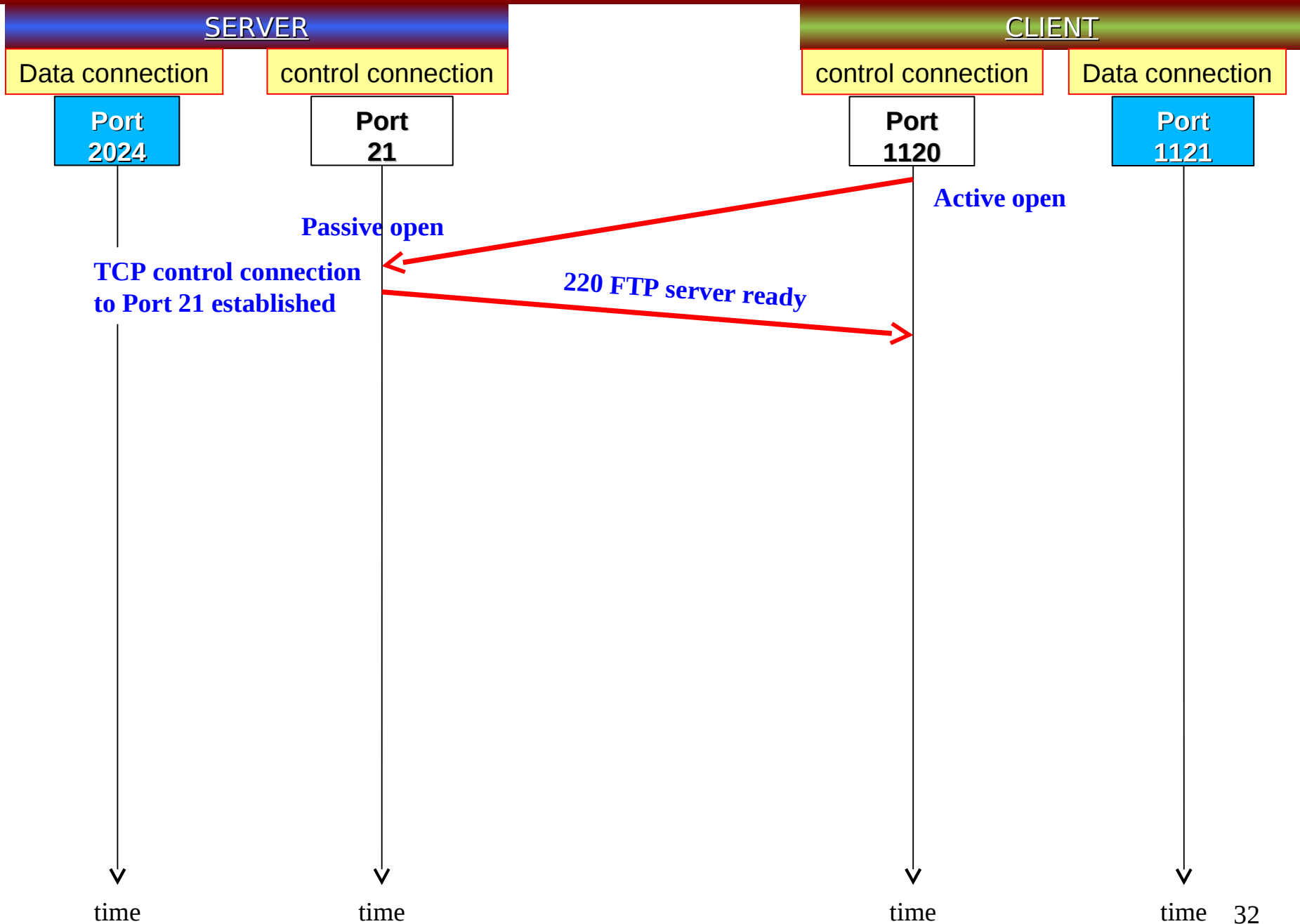
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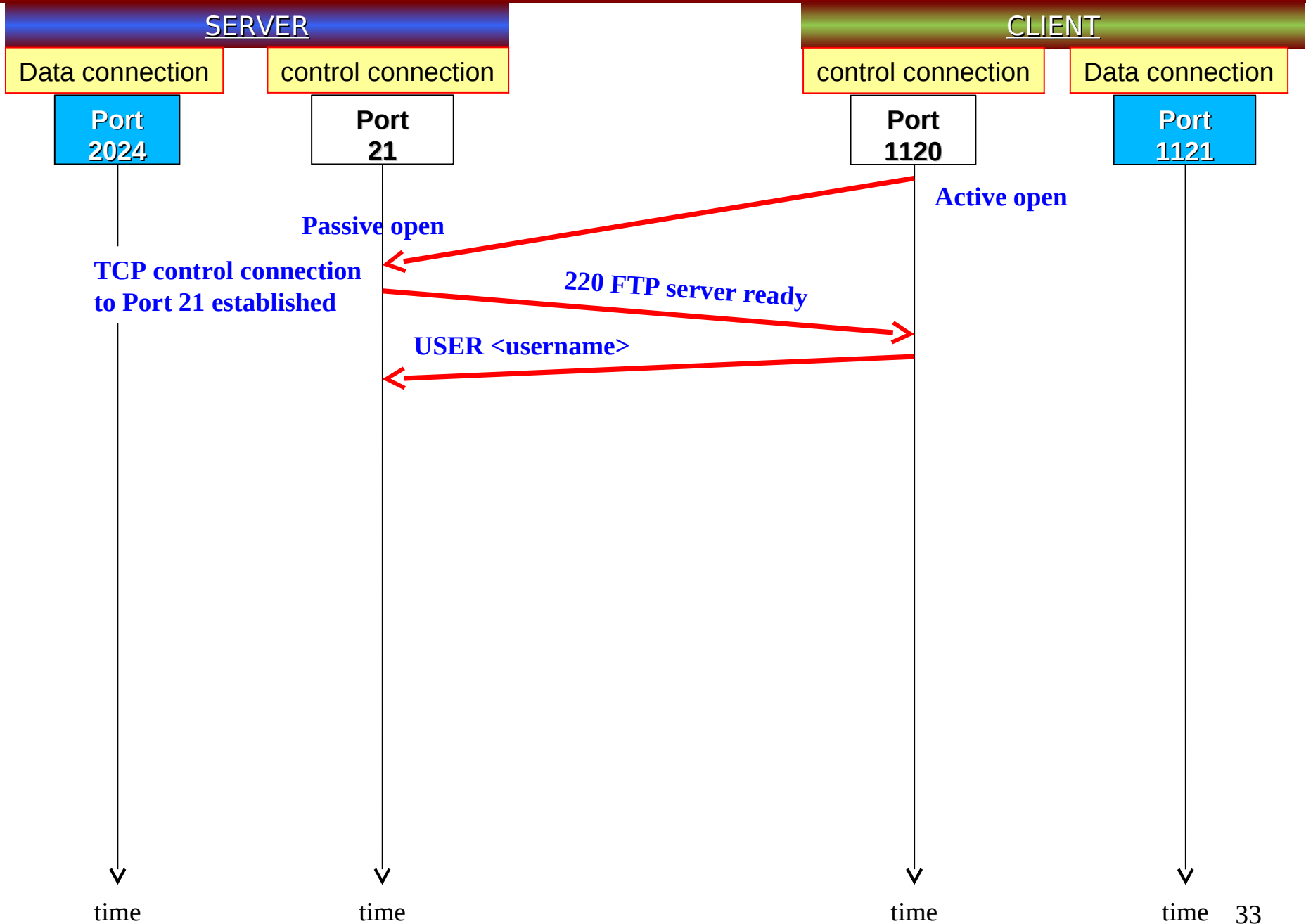
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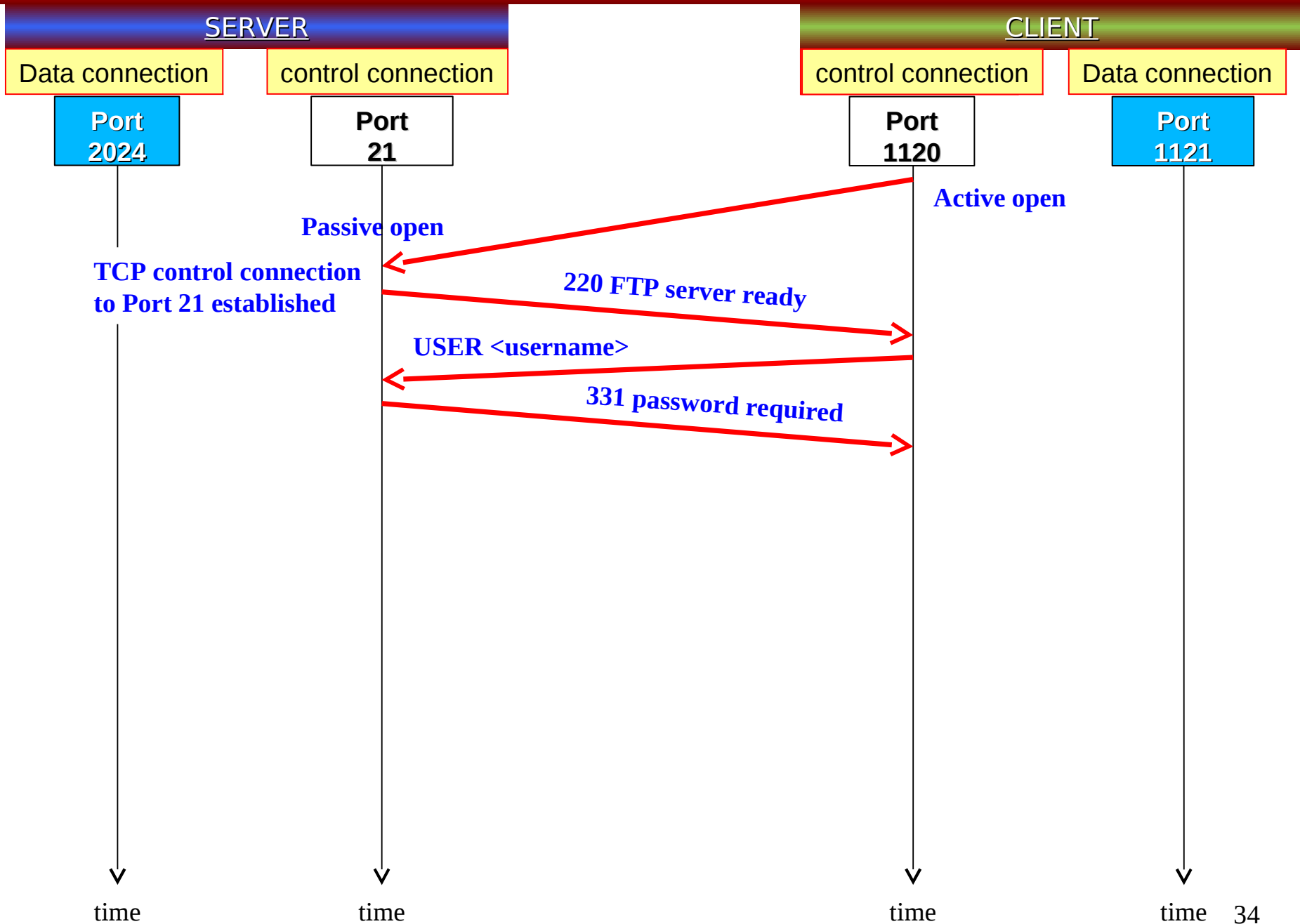
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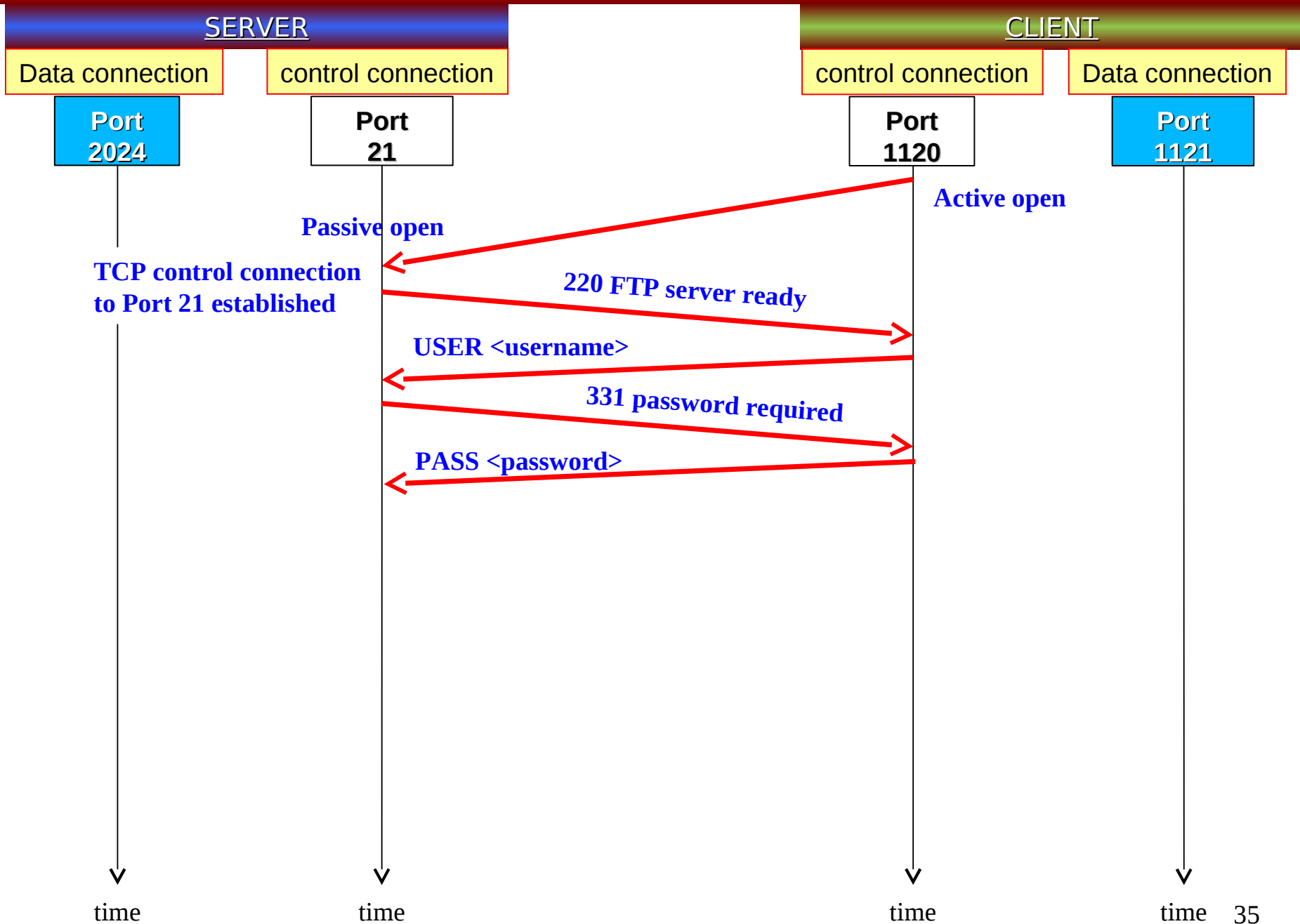
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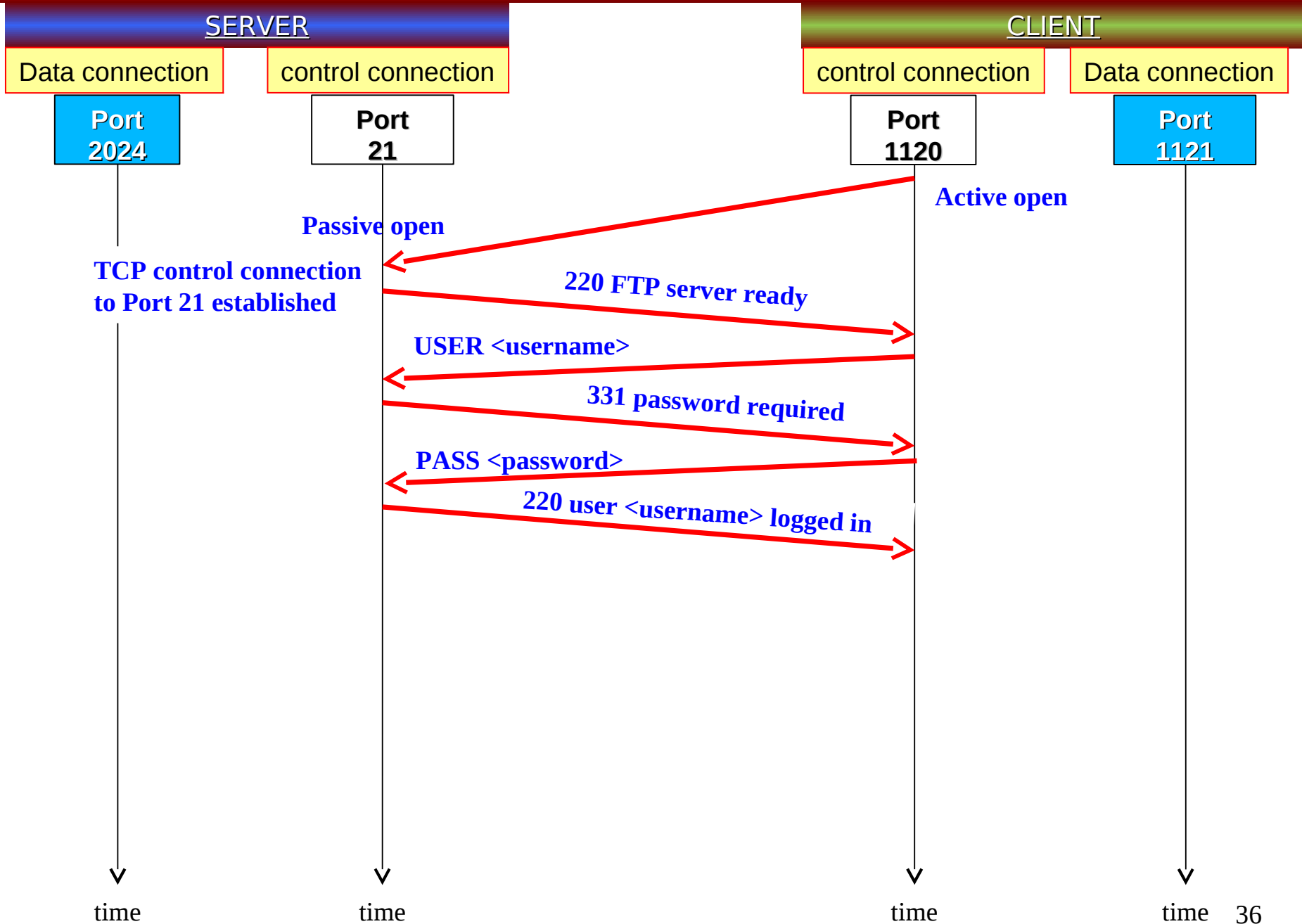
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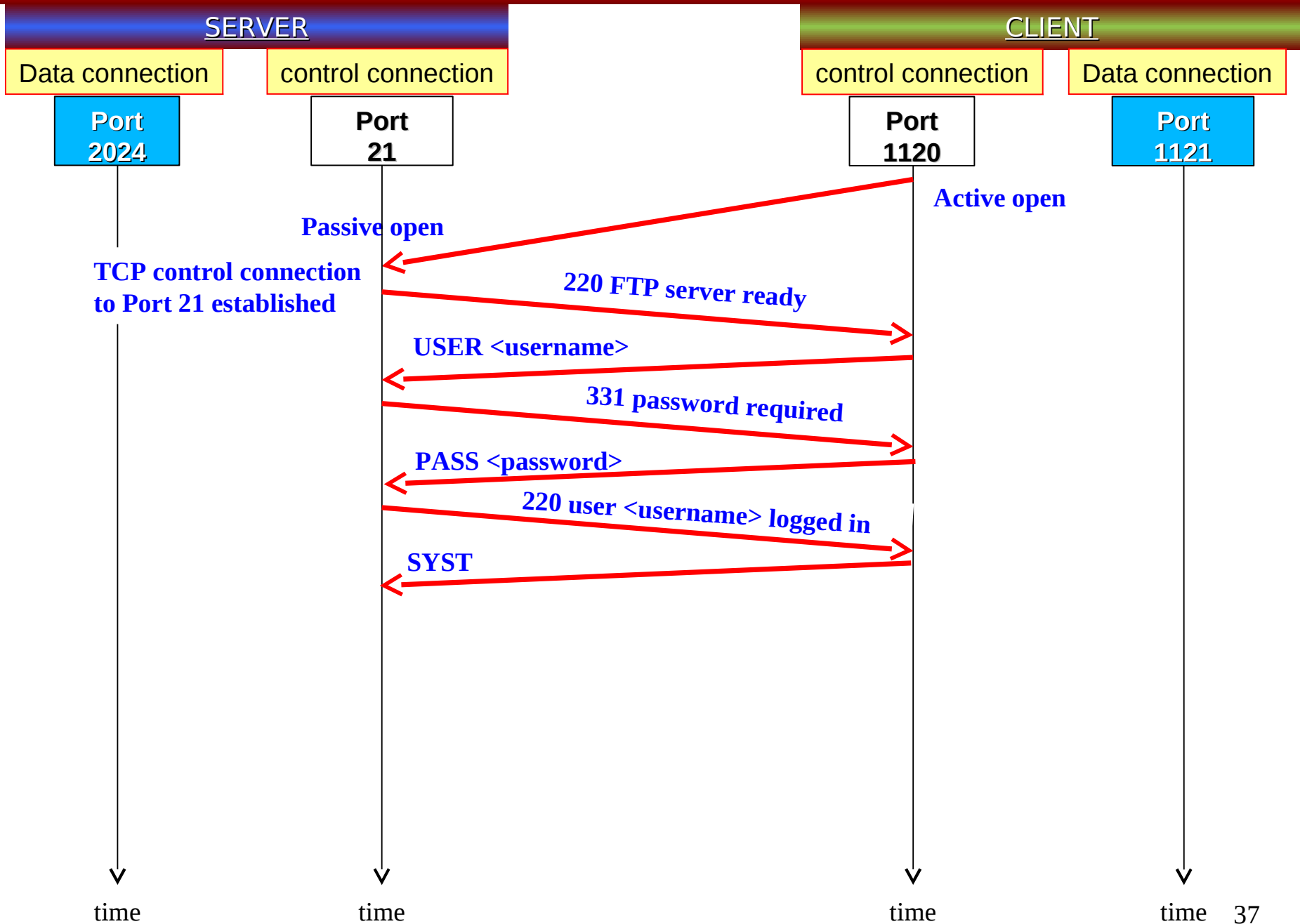
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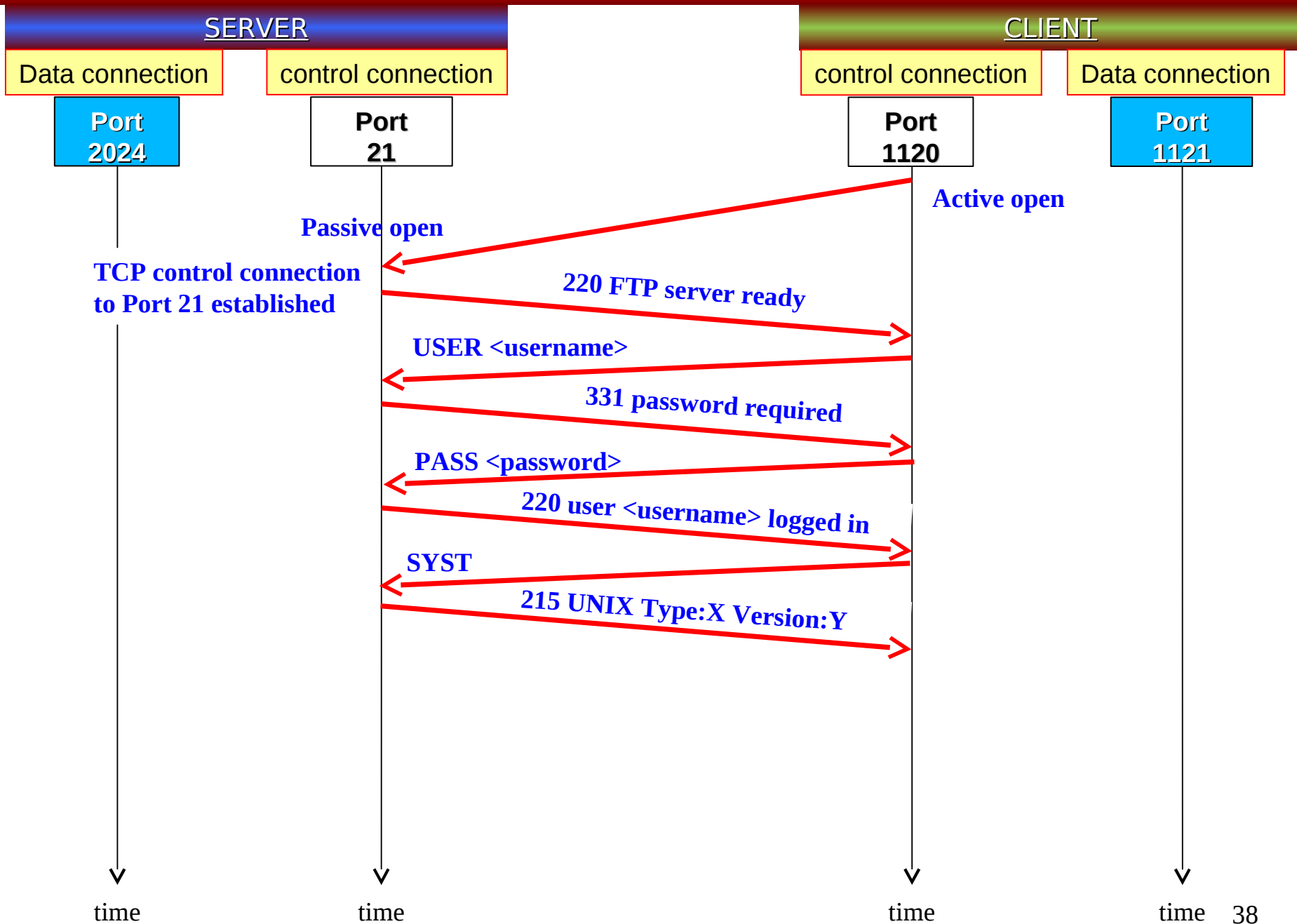
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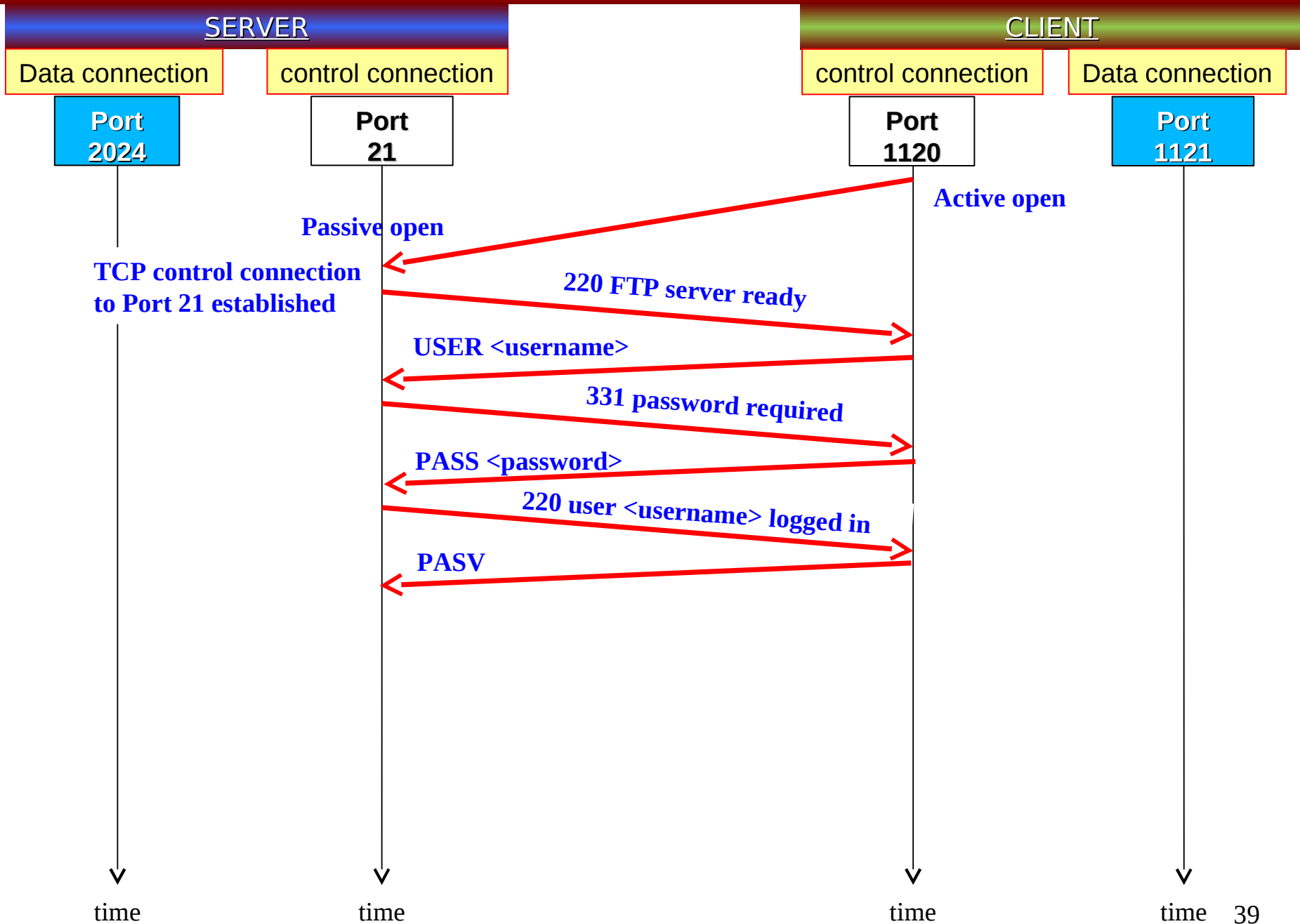
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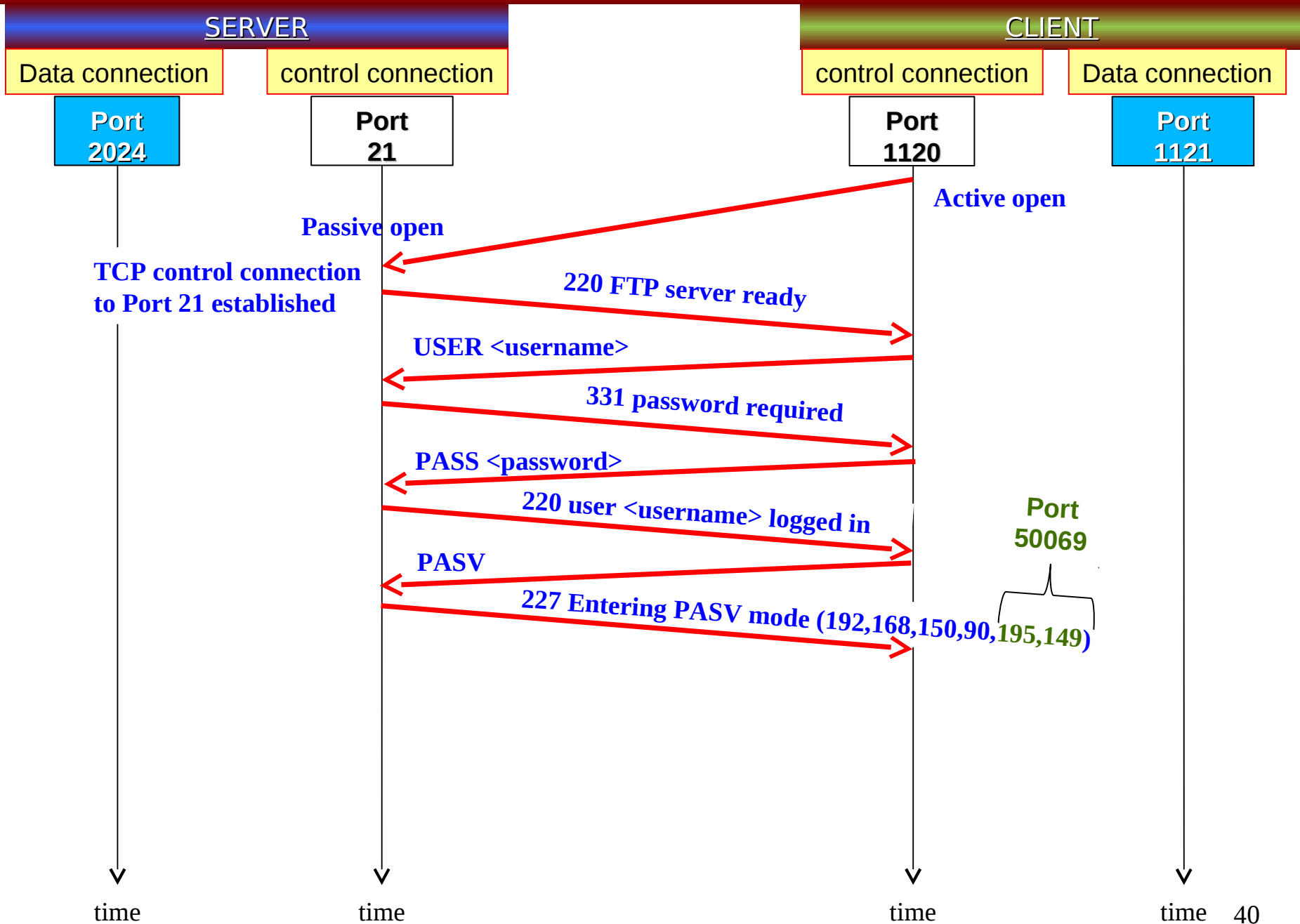
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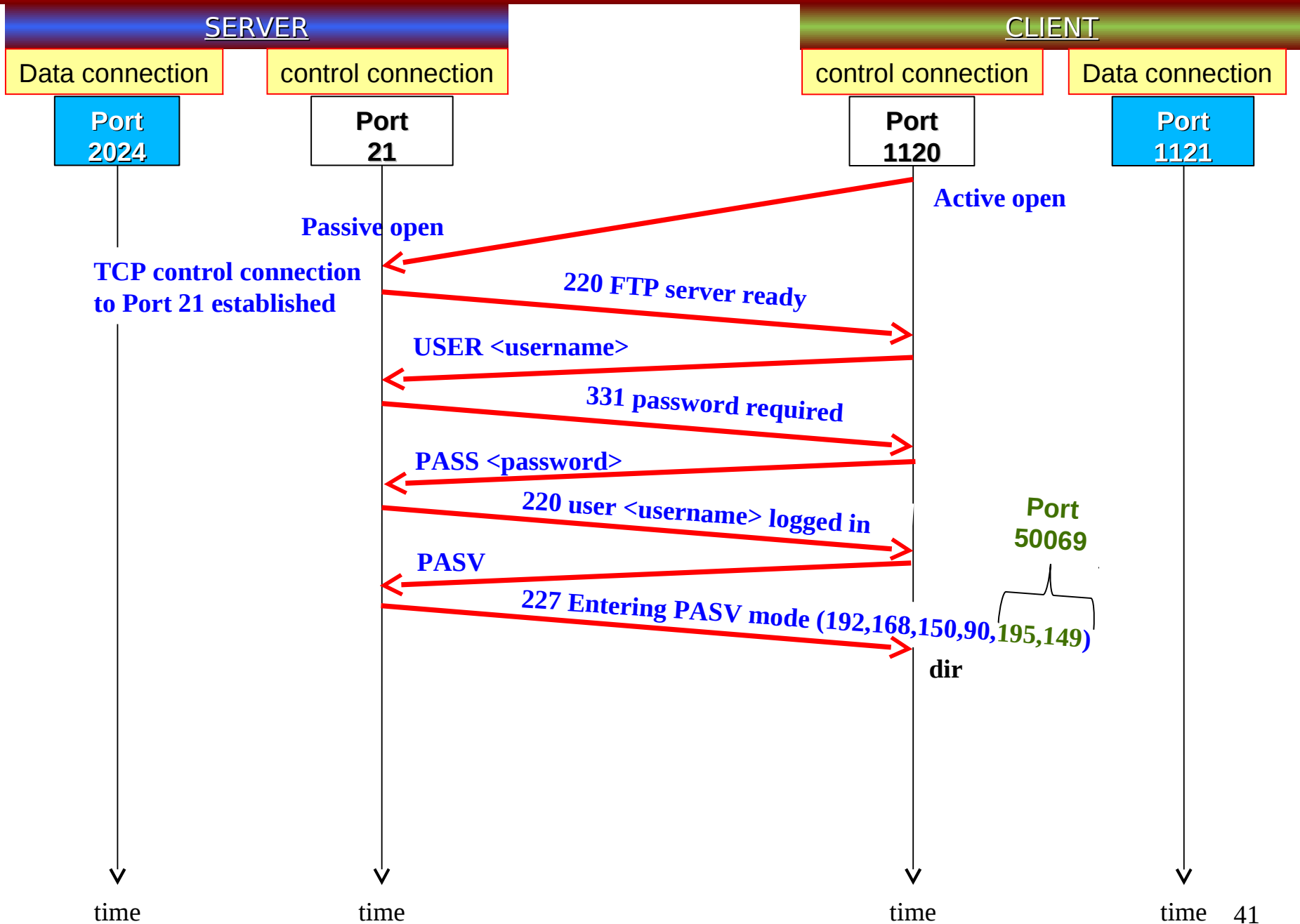
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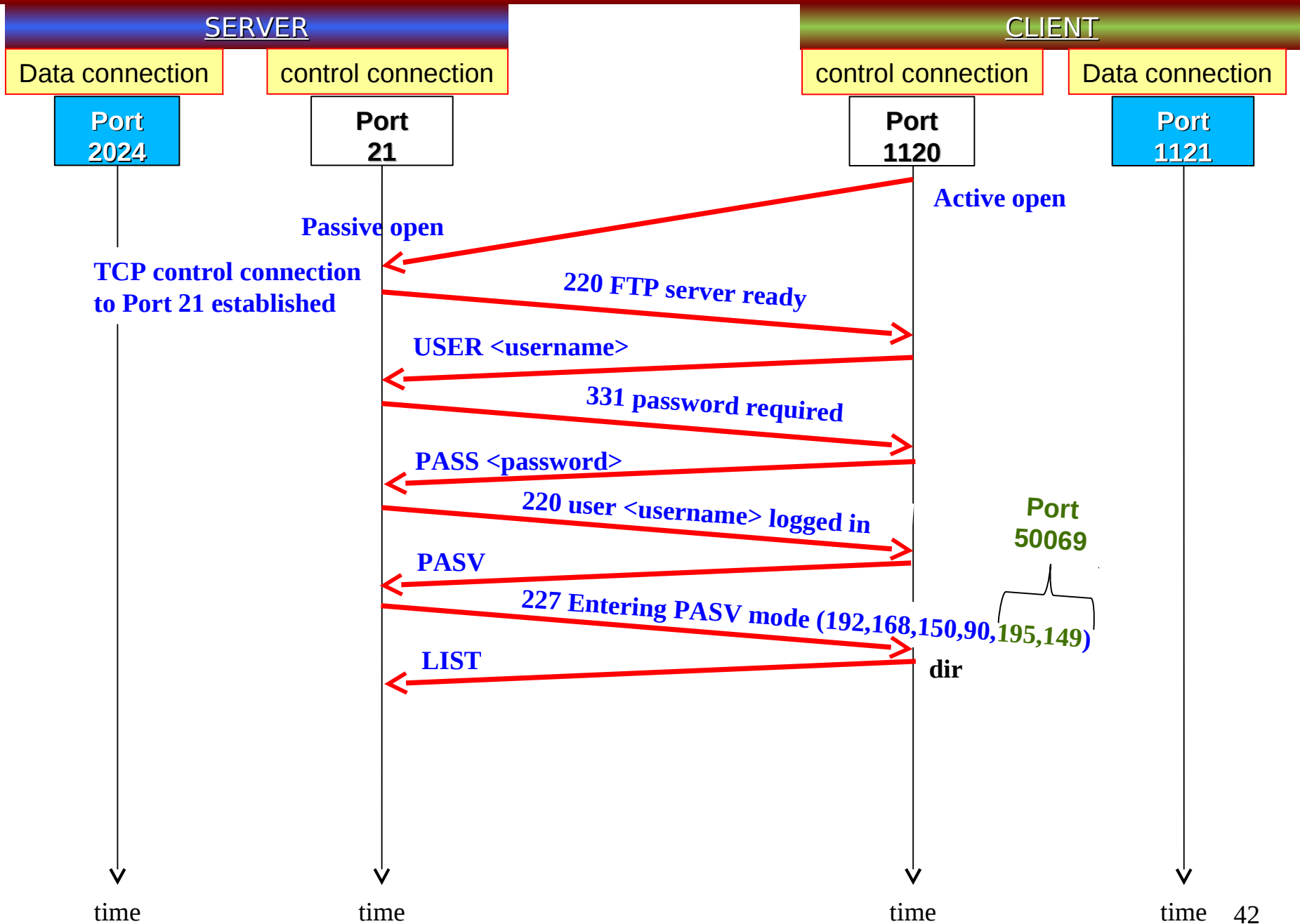
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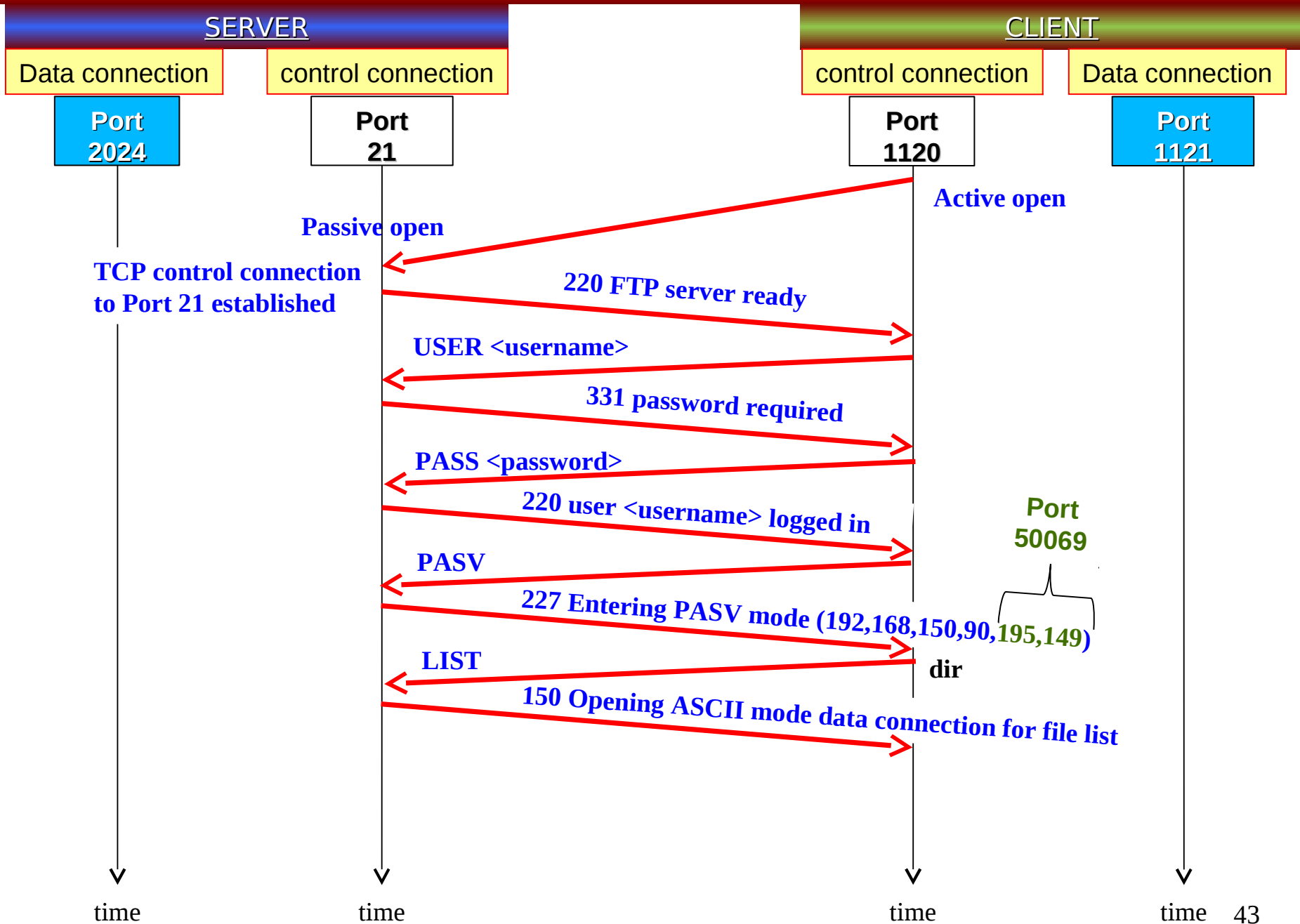
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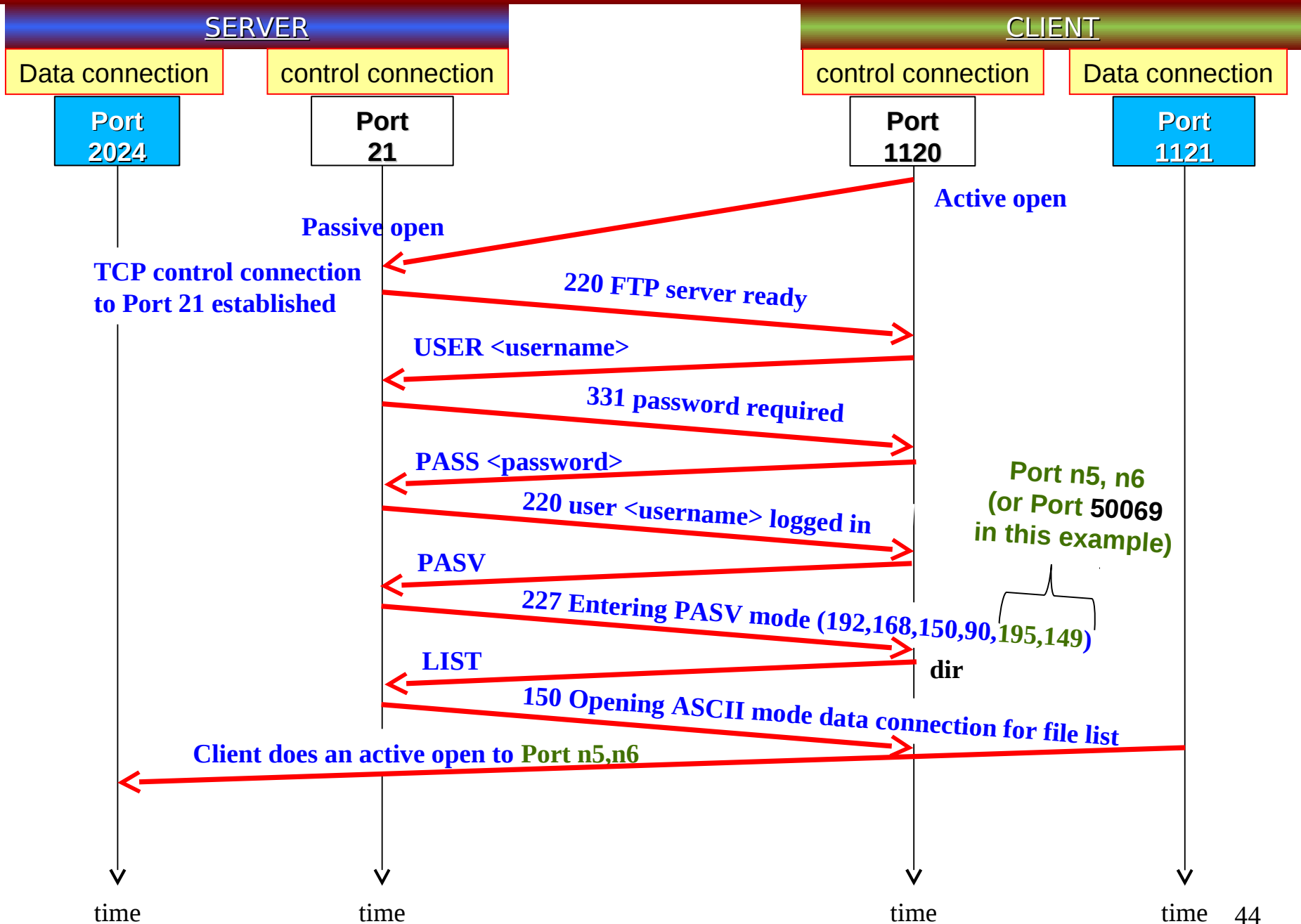
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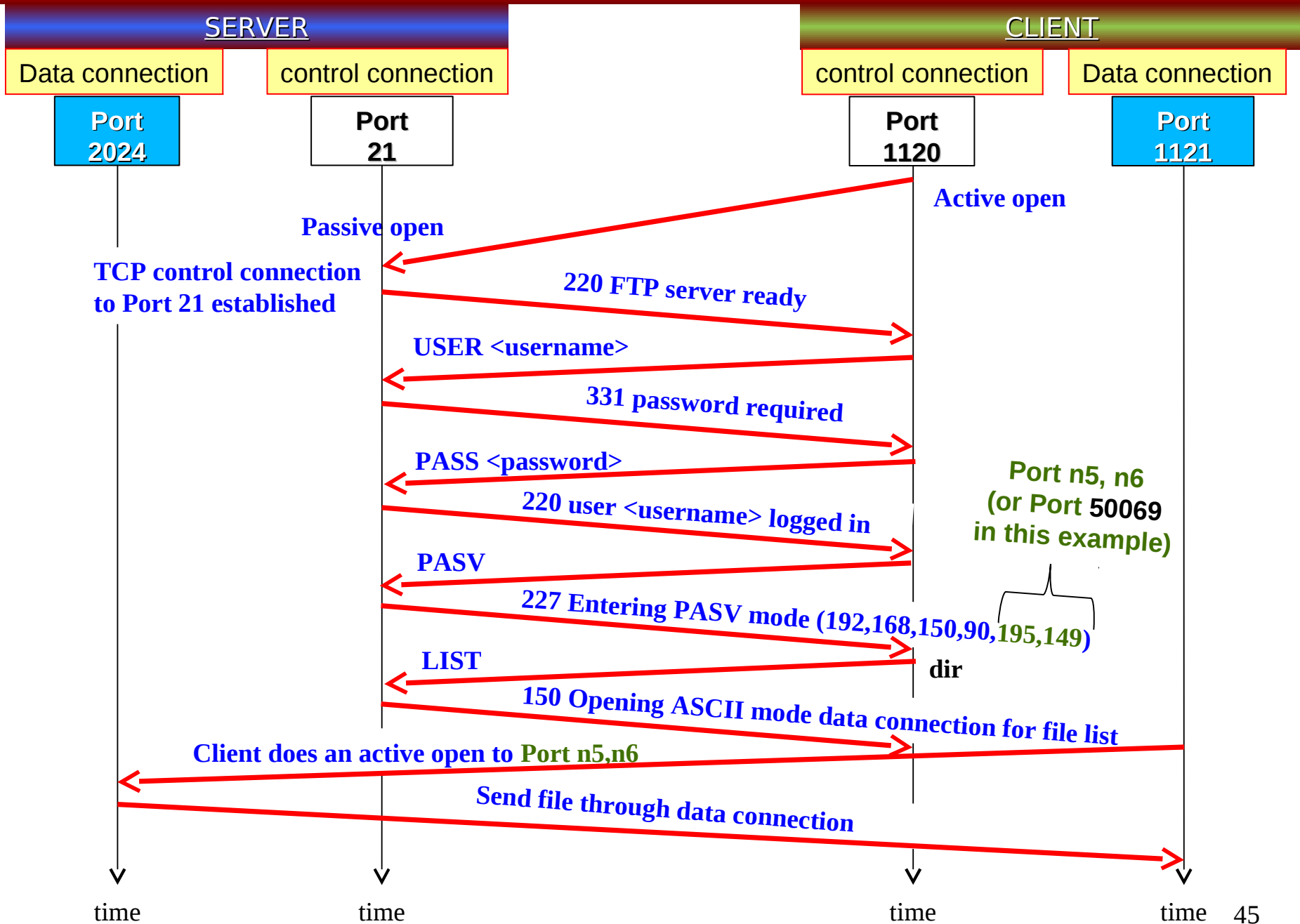
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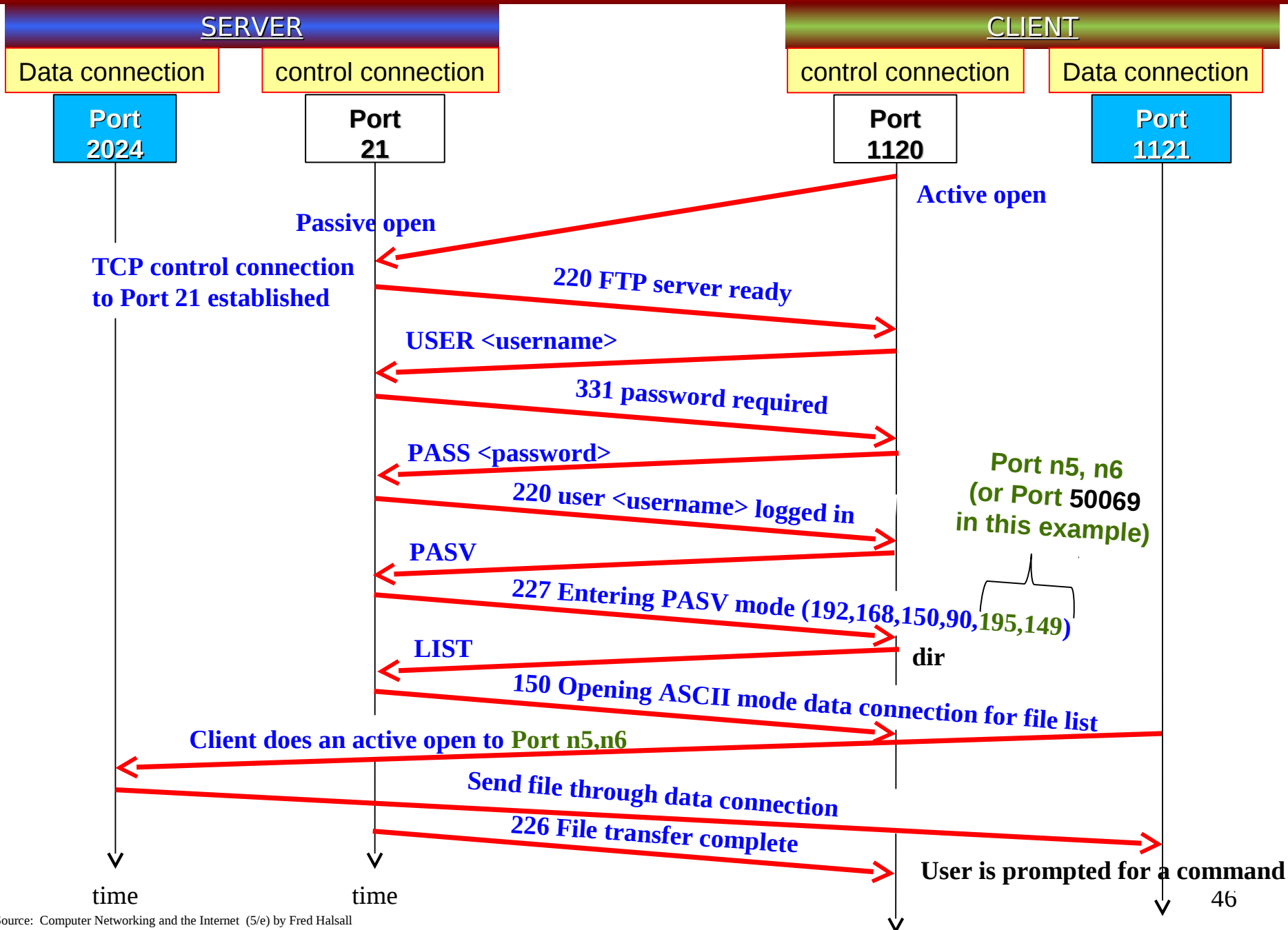
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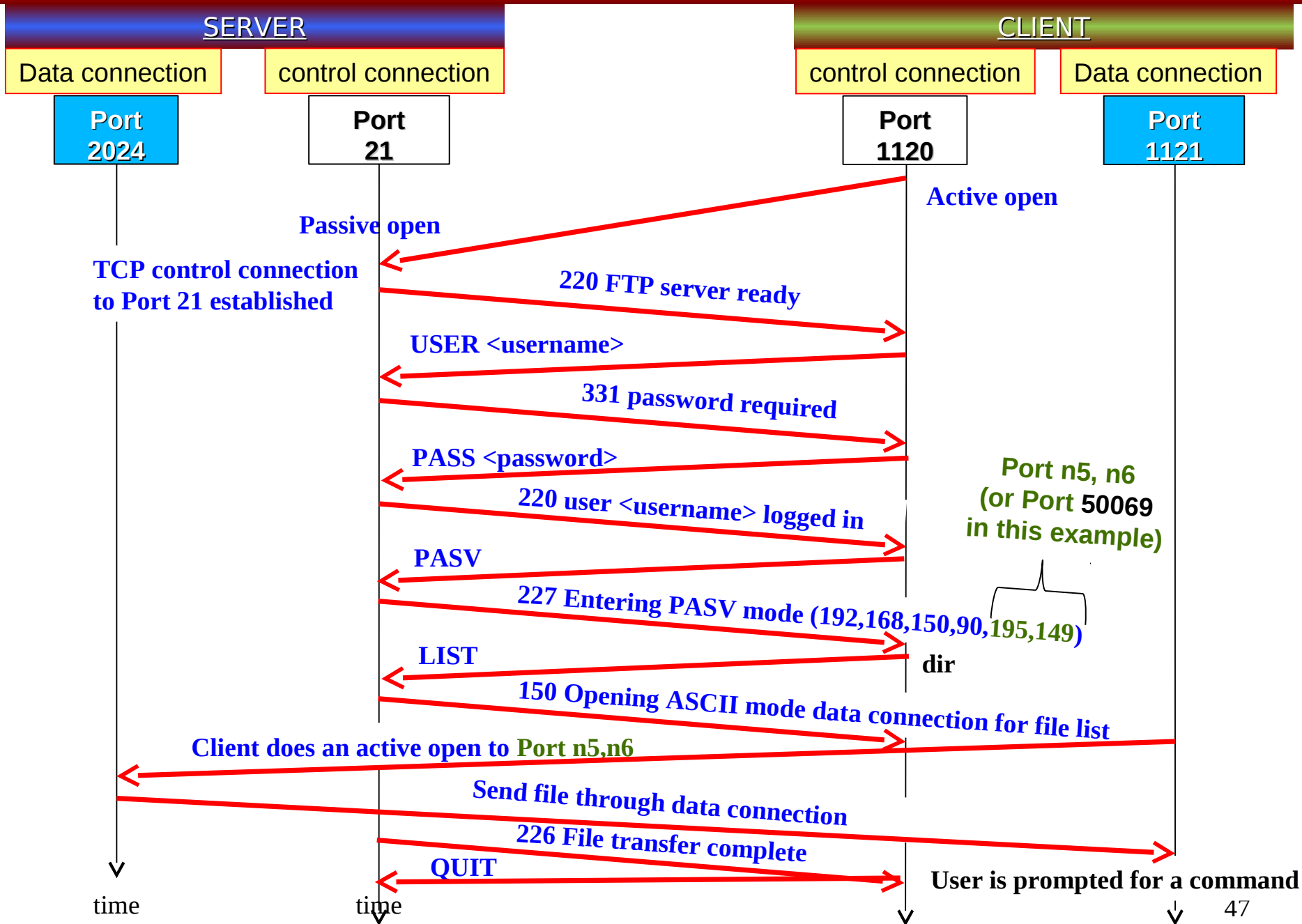
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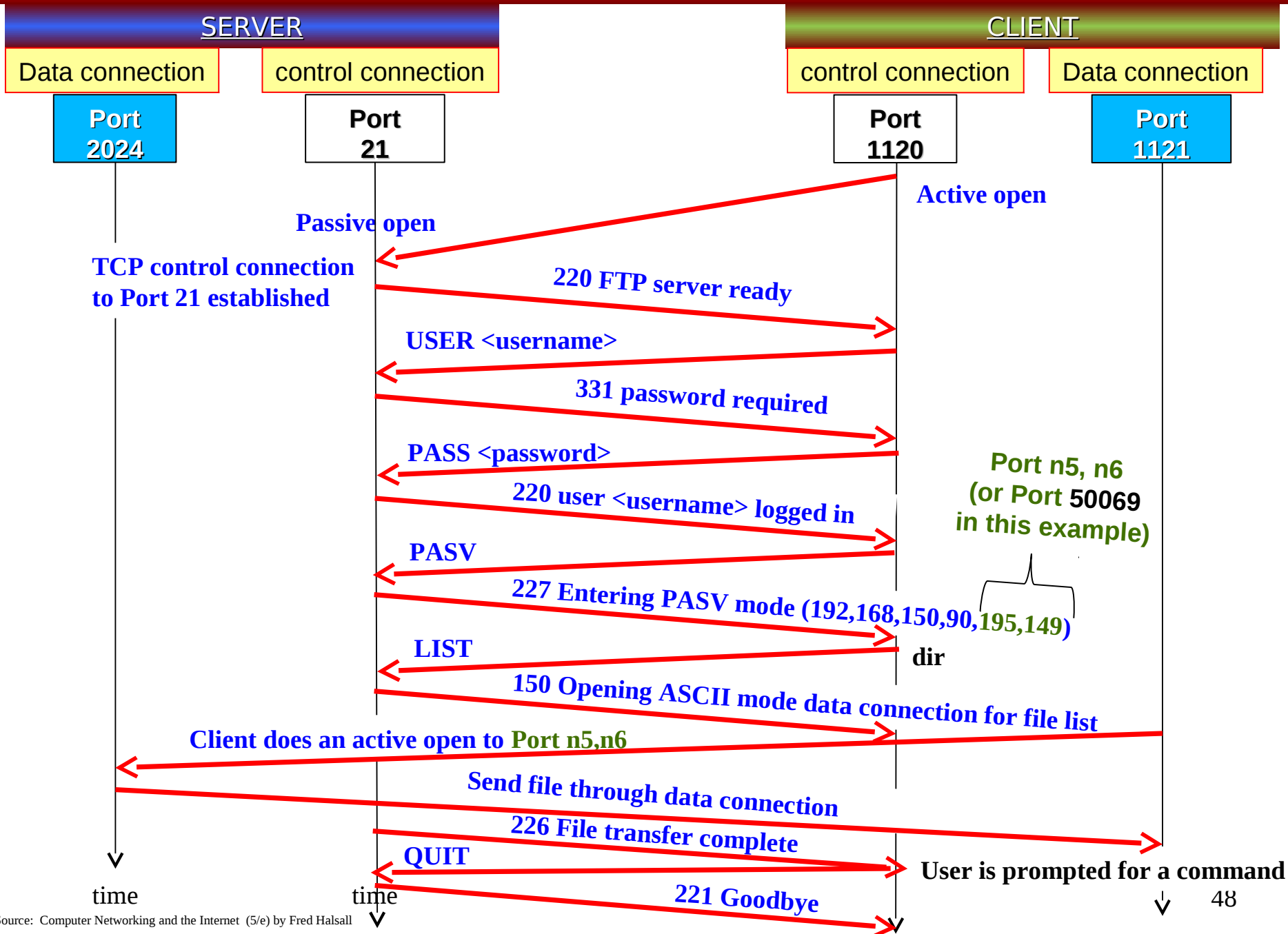
PASSIVE FTP Operation



PASSIVE FTP Operation



PASSIVE FTP Operation



PASSIVE FTP Operation

SERVER

CLIENT

Data connection

control connection

control connection

Data connection

Port
2024

Port
21

Port
1120

Port
1121

TCP control connection
to Port 21 established

Passive open

Active open

220 FTP server ready

USER <username>

331 password required

PASS <password>

220 user <username> logged in

PASV

227 Entering PASV mode (192,168,150,90,195,149)

LIST

dir

150 Opening ASCII mode data connection for file list

Client does an active open to Port n5,n6

Send file through data connection

226 File transfer complete

QUIT

221 Goodbye

User is prompted for a command

Port n5, n6
(or Port 50069
in this example)

Server closes data connection
first, then control connection

time
↓

Security Issues

PASSIVE:

Administrators may not want to use PASSIVE because the FTP server can open any **ephemeral port number**.

Many FTP servers are configured with an *ephemeral port range* of 1024 to 65535.

It means that the Firewall configuration has to allow full access to all ephemeral ports for any connections. This may be considered insecure.

ACTIVE:

On the other hand, the client's local firewall may prevent the data connection FTP to work for the same reason.