FTP
File Transfer Protocol

Reference:

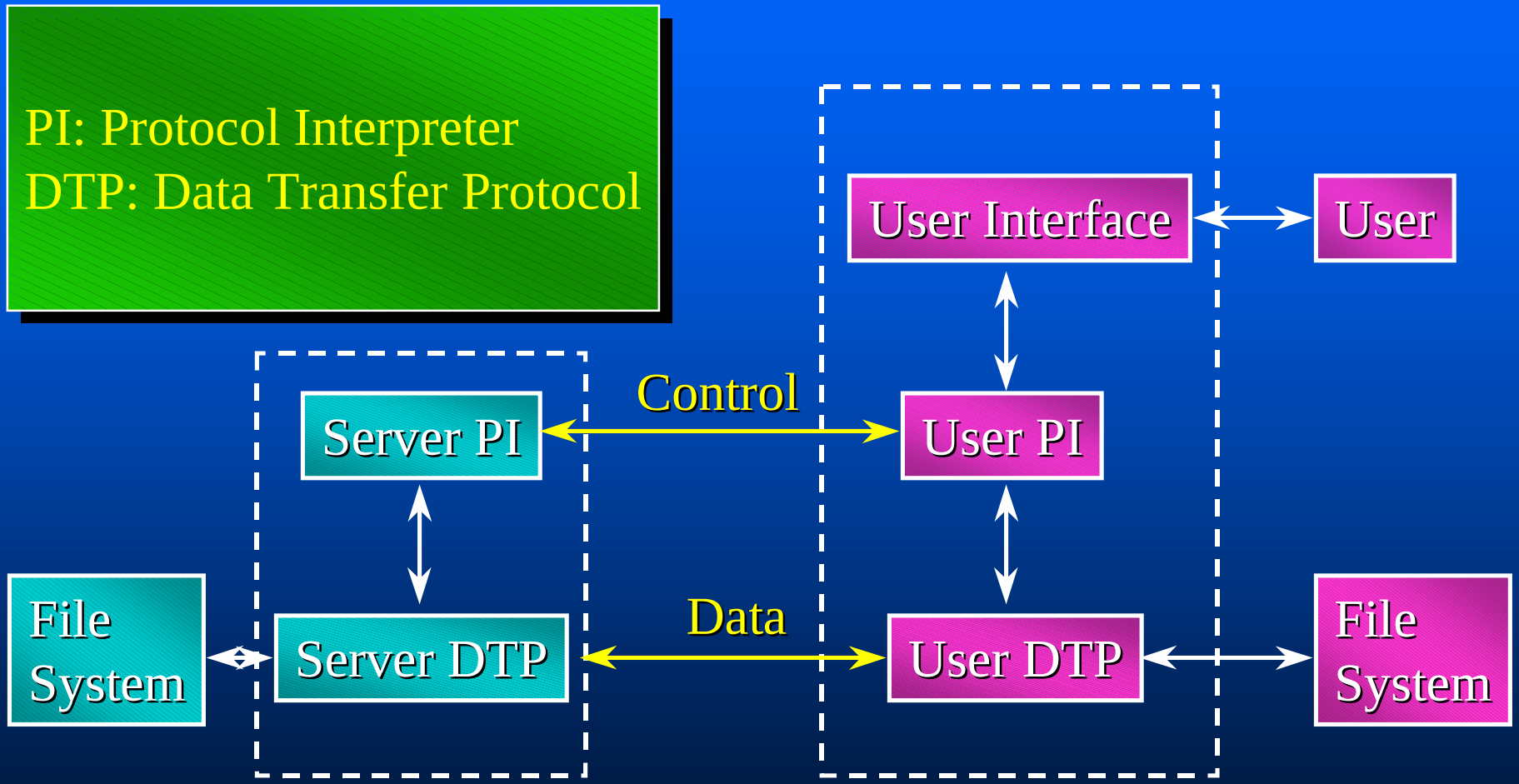
RFC 959

FTP Objectives (from RFC 959)

- promote sharing of files
- encourage indirect use of remote computers
- shield user from variations in file storage
- transfer data reliably and efficiently
- “FTP, although usable directly by a user at a terminal, is designed mainly for use by programs”

The FTP Model

PI: Protocol Interpreter
DTP: Data Transfer Protocol



Control and Data Connections

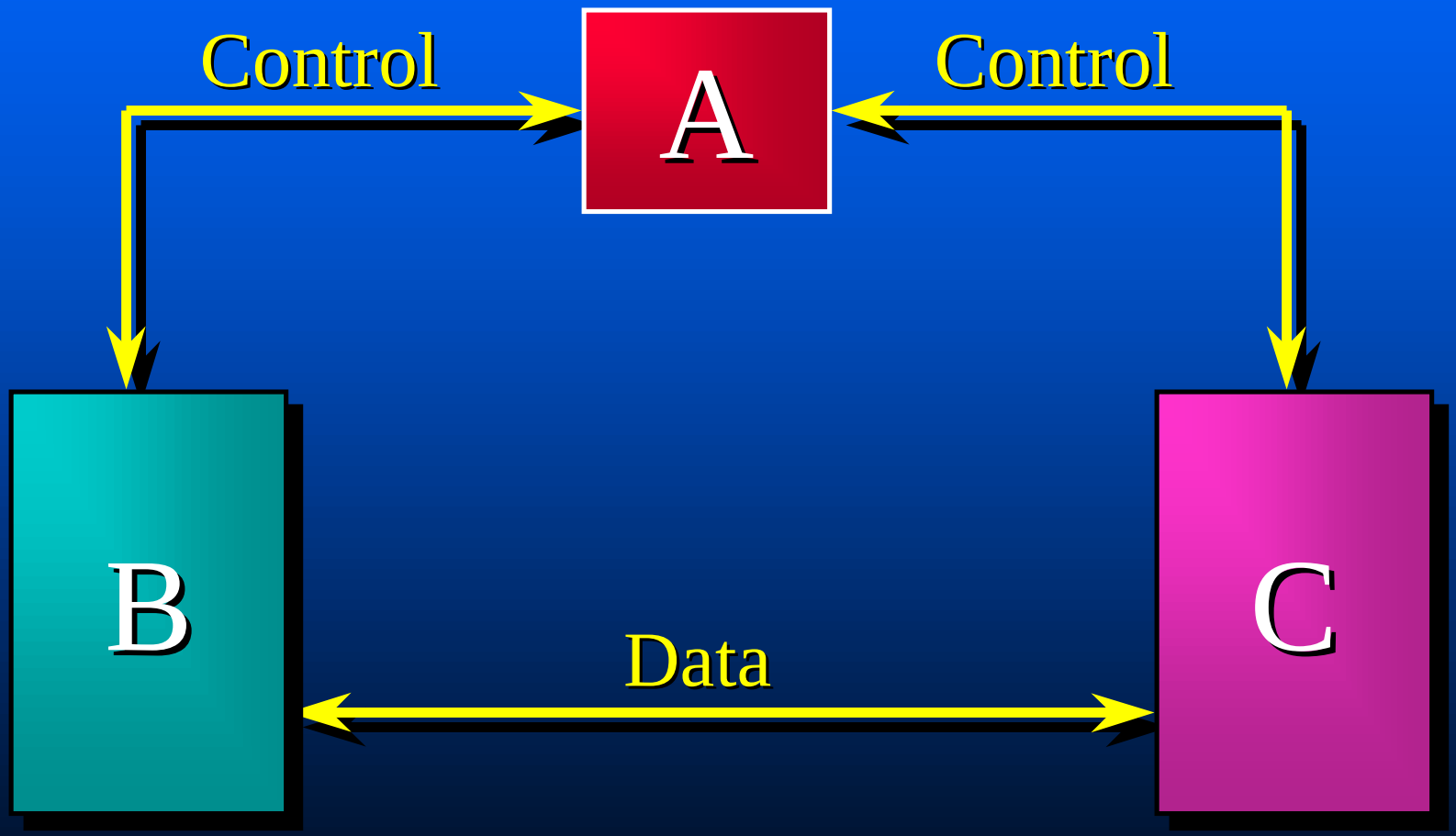
- Control functions (commands) and reply codes are transferred over the control connection.
- All data transfer takes place over the data connection.
- The control connection must be “up” while data transfer takes place.

Control Connection

- The control connection is the “well known” service.
- The control connection uses the TELNET protocol.
- Commands and replies are all line oriented text (default is ASCII).

Standard Connection Model

Alternative Connection Model



Access ControlCommands

USER	*specify user*
PASS	*specify password*
CWD	*change directory*
CDUP	*change directory to parent*
QUIT	*logout*

Transfer Parameter Commands

PORT	*publish local data port*
PASV	*server should listen*
TYPE	*establish data representation*
MODE	*establish transfer mode*
STRU	*establish file structure*

Service Commands

RETR	*retrieve file*
STOR	*send file*
STOU	*send file and save as unique*
APPE	*send file and append*
ABOR	*abort previous service command*
PWD	*print working directory*
LIST	*transfer list of files over data link*

FTP Replies

- All replies are sent over control connection.
- Replies are a single line containing
  - 3 digit status code (sent as 3 numeric chars).
  - text message.
- The FTP spec. includes support for multiline text replies.
- status code is used by programs, text is for humans.

FTP Reply Status Code

First digit of status code indicates type of reply:

- ‘1’: Positive Preliminary Reply (got it, but wait).
- ‘2’: Positive Completion Reply (success).
- ‘3’: Positive Intermediate Reply (waiting for more information).
- ‘4’: Transient Negative Completion (error - try again).
- ‘5’: Permanent Negative Reply (error - can’t do).

FTP Reply Status Code

- 2nd digit indicates function groupings.
  - ‘0’: Syntax (problem with command syntax).
  - ‘1’: Information (reply to help or status cmds).
  - ‘2’: Connections (problem with a connection).
  - ‘3’: Authentication (problem with login).
  - ‘4’: Unspecified.
  - ‘5’: File system (related to file system).
- 3rd digit indicates specific problem within function group.

Data Transfer Modes

- STREAM: file is transmitted as a stream of bytes.
- BLOCK: file is transmitted as a series of blocks preceded by headers containing count and descriptor code (EOF, EOR, restart marker).
- COMPRESSED: uses a simple compression scheme - compressed blocks are transmitted.

RFC 959

- The RFC includes lots more information and many details including:
  - parameters for commands
  - lists of reply status codes
  - protocol state diagrams
  - support for a variety of file structures
  - sample sessions