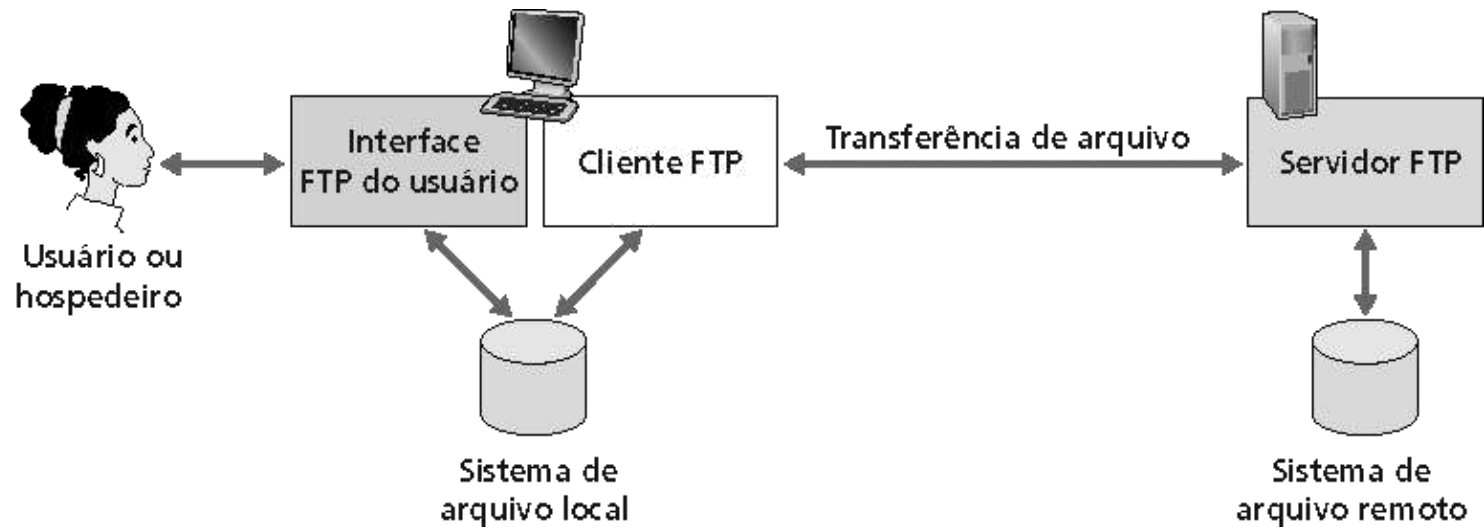


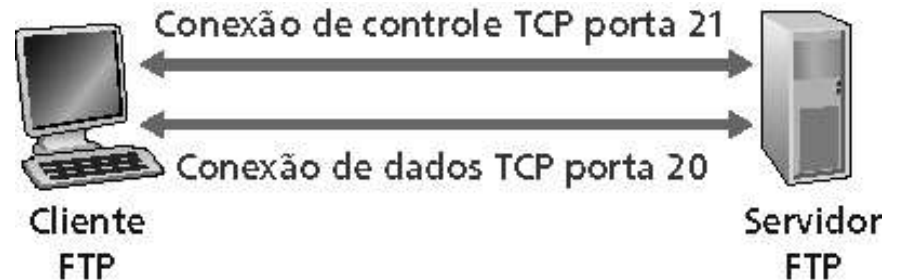
ftp: file transfer protocol



- FTP (RFC 959) permite
 - Transferir, renomear ou remover arquivos remotos
 - Criar, remover e modificar diretórios remotos
- Modelo cliente/servidor
 - Cliente inicia transferência passando o nome (login name) e sua senha
 - Servidor: host remoto
 - Acessível via a porta 21

FTP: conexões separadas p/ controle, dados

- ❑ Cliente FTP cria conexão TCP com a porta 21 no servidor
- ❑ O cliente obtém autorização através da conexão de controle
- ❑ O cliente consulta o diretório remoto enviando comandos através da conexão de controle
- ❑ Quando o servidor recebe um comando para a transferência de um arquivo, ele abre uma conexão de dados TCP para o cliente
- ❑ Após a transmissão de um arquivo o servidor fecha a conexão

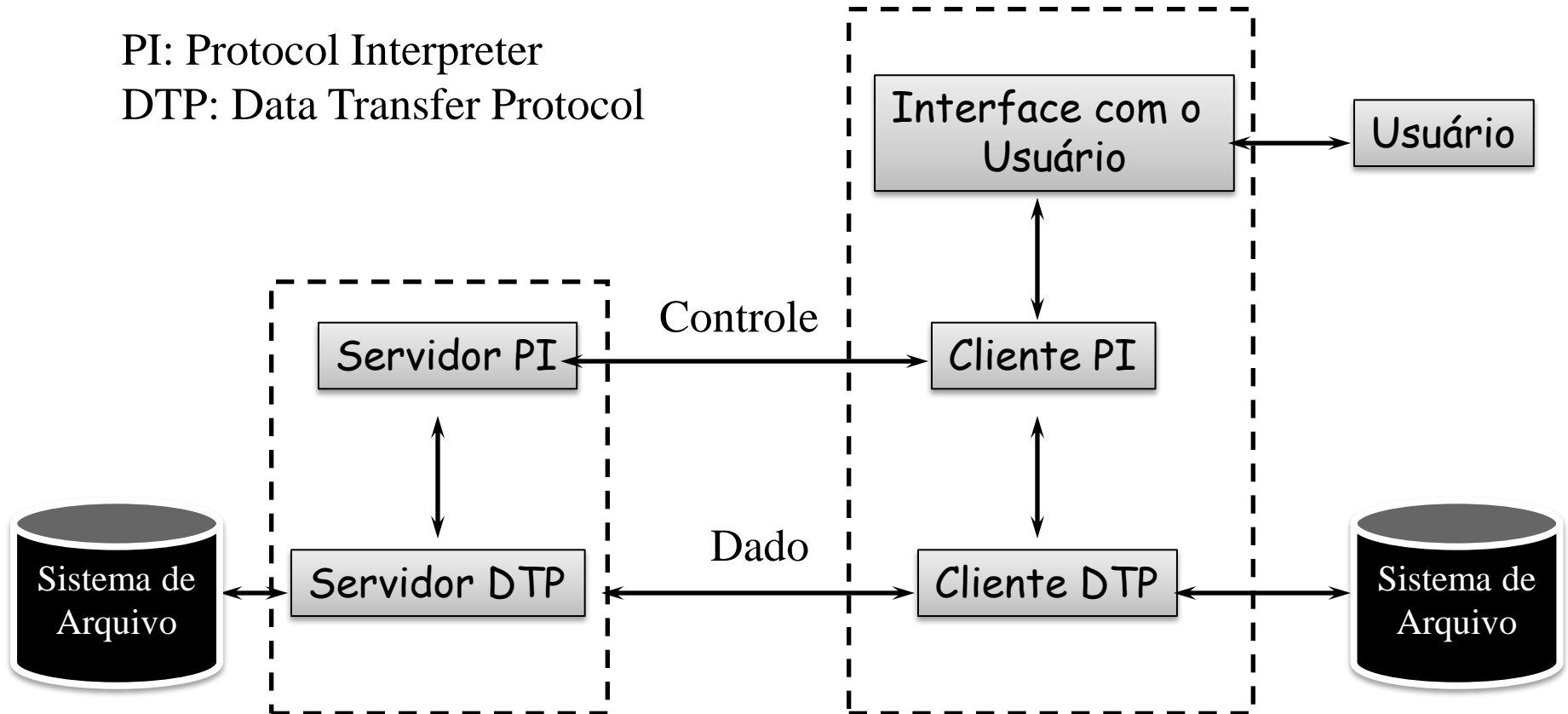


- ❑ O servidor abre uma segunda conexão TCP para transferir outro arquivo
- ❑ Conexão de controle: "fora da faixa"
- ❑ Servidor FTP mantém o "estado": diretório atual, autenticação anterior

O Modelo FTP

PI: Protocol Interpreter

DTP: Data Transfer Protocol



FTP — File Transfer Protocol

- Duas formas de se conectar a um servidor FTP
 - forma autenticada (nome do usuário e password)
 - direitos de acesso do usuário
 - forma anônima
- Na forma anônima
 - Nome de login: anonymous
 - Password: E-mail
 - Têm-se acesso a repositórios públicos de arquivos
 - qualquer pessoa pode acessar
 - não é preciso cadastrar-se
 - Direitos autorais:
 - repositórios públicos contém apenas arquivos em domínio público

FTP — File Transfer Protocol

□ Programa FTP

- Implementa o protocolo FTP
- Existem várias implementações fornecendo interfaces gráficas ou não

□ Forma não gráfica (Unix, DOS)

- Conectando a uma máquina: *ftp nome-da-máquina-remota*

A screenshot of a Windows Command Prompt window titled "Prompt de Comando - ftp ftp.cs.rpi.edu". The window shows the following text:

```
C:\Users\willrich>ftp ftp.cs.rpi.edu
Conectado a womble.cs.rpi.edu.
220 FTP server ready.
Usuário (womble.cs.rpi.edu:(none)): anonymous
331 Guest login ok, send your email address as password.
Senha:
230 Guest login ok, access restrictions apply.
ftp> _
```

FTP — File Transfer Protocol

- Conhecendo o conteúdo das máquinas via ftp

```
ftp> dir [nome-do-diretório][nome-do-arquivo]
ftp> ls [nome-do-diretório][nome-do-arquivo]
ftp> !dir (LOCAL)
```

- Trabalhando com diretórios

```
ftp> lcd [nome-do-diretório] (Local)
ftp> cd [nome-do diretório] (Remoto)
ftp> pwd (Diretório remoto atual)
/home/venus/willrich
```

FTP — File Transfer Protocol

- Transferência de arquivos de texto (ASCII) e binários
 - ftp> binary
 - 200 Type set to I.

 - ftp> ascii
 - 200 Type set to A.

- Exemplos de arquivos e modos de transferência
 - Binários
 - Programas, etc...
 - ASCII
 - texto, mensagens de correio eletrônico, PostScript, etc...

FTP — File Transfer Protocol

- Transferindo arquivos: comandos get e put

ftp> **get** *arquivo-fonte [arquivo-destino]*

ftp> **put** *arquivo-fonte [arquivo-destino]*

- Exemplo de transferência de arquivo:

ftp> **get comentario**

200 PORT command successful.

150 ASCII data connection for comentario
(150.162.60.1,3516) (1588 bytes)

226 ASCII Transfer complete.

1634 bytes received in 0.052 seconds (30 Kbytes/s)

ftp> **quit**

221 Goodbye.

ftp: comandos, respostas

Comandos típicos:

- enviados em texto ASCII pelo canal de controle
- `USER nome`
- `PASS senha`
- `LIST` devolve lista de arquivos no diretório atual
- `RETR arquivo` recupera (lê) arquivo remoto
- `STOR arquivo` armazena (escreve) arquivo no hospedeiro remoto
- `PORT h1, h2, h3, h4, p1, p2` porta informa a porta de dados
 - $H1.h2.h3.h4$ é o endereço IP
 - $P1*256+p2$ é a porta

Códigos de retorno típicos

- código e frase de status (como para http)
- 331 Username OK, password required
- 125 data connection already open; transfer starting
- 425 Can't open data connection
- 452 Error writing file

Respostas FTP

- Enviadas sobre o canal de controle
 - Linhas únicas contendo:
 - 3 dígitos de status
 - Mensagem de texto
 - Primeiro dígito do status indica o tipo de resposta
 - '1': Resposta positiva preliminar (ok, mas espere)
 - '2': Resposta positiva (sucesso)
 - '3': Resposta positiva intermediária (esperando mais informações).
 - '4': Resposta negativa transiente (erro - tente novamente)
 - '5': Resposta negativa permanente (erro - não pode fazer).

Exemplo de FTP

ftp1.pcap - Wireshark

File Edit View Go Capture Analyze Statistics Telephony Tools Help

Filter: tcp Expression... Clear Apply

No.	Time	Source	Destination	Protocol	Info
22	3.438	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [SYN] Seq=0 win=8192 Len=0 MSS=1460 WS=2 SACK_PERM=1
23	3.600	128.113.126.13	192.168.0.197	TCP	ftp > taurus-wh [SYN, ACK] Seq=0 Ack=1 win=65535 Len=0 MSS=1380 WS=2 SACK_PERM=1
24	3.606	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=1 Ack=1 win=8192 Len=0
25	3.770	128.113.126.13	192.168.0.197	FTP	Response: 220 FTP server ready.
26	3.976	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=17 Ack=82 win=8108 Len=0
30	9.322	192.168.0.197	128.113.126.13	FTP	Request: PASS willrich@inf.ufsc.br
31	9.484	128.113.126.13	192.168.0.197	FTP	Response: 331 Guest login ok, send your email address as password.
32	9.686	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=17 Ack=82 win=8108 Len=0
33	13.381	192.168.0.197	128.113.126.13	FTP	Request: PASS willrich@inf.ufsc.br
34	13.611	128.113.126.13	192.168.0.197	FTP	Response: 230 Guest login ok, access restrictions apply.
35	13.821	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=44 Ack=130 win=8060 Len=0
36	14.521	192.168.0.197	128.113.126.13	MSNMS	PNG

Pedido de conexão TCP com a porta 21

Frame 22: 66 bytes on wire (528 bits), 66 bytes captured (528 bits)
Ethernet II, Src: IntelCor_2a:f0:71 (00:1f:3c:2a:f0:71), Dst: D-Link_c0:ce:df (00:1c:f0:c0:ce:df)
Internet Protocol, Src: 192.168.0.197 (192.168.0.197), Dst: 128.113.126.13 (128.113.126.13)
Transmission Control Protocol, Src Port: taurus-wh (1610), Dst Port: ftp (21), Seq: 0, Len: 0

0000 00 1c f0 c0 ce df 00 1f 3c 2a f0 71 08 00 45 00 <*.q..E.
0010 00 34 4c 81 40 00 80 06 ee 56 c0 a8 00 c5 80 71 .4L.@... .V.....q
0020 7e 0d 06 4a 00 15 55 94 00 bd 00 00 00 00 80 02 ~..J..U.
0030 20 00 32 7a 00 00 02 04 05 b4 01 03 03 02 01 01 .Zz.....
0040 04 02 ..

File: "C:\Users\willrich\Documents\My Drop... Packets: 120 Displayed: 110 Marked: 0 Load time: 0:00.000 Profile: Default

Exemplo de FTP

ftp1.pcap - Wireshark

File Edit View Go Capture Analyze Statistics Telephony Tools Help

Filter: tcp Expression... Clear Apply

No.	Time	Source	Destination	Protocol	Info
22	3.438	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [SYN] Seq=0 win=8192 Len=0 MSS=1460 WS=2 SACK_PERM=1
23	3.600	128.113.126.13	192.168.0.197	TCP	ftp > taurus-wh [SYN, ACK] Seq=0 Ack=1 win=65535 Len=0 MSS=1380 WS=0
24	3.600	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=1 Ack=1 win=8192 Len=0
25	3.770	128.113.126.13	192.168.0.197	FTP	Response: 220 FTP server ready.
26	3.976	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=1 Ack=24 win=8168 Len=0
30	9.322	192.168.0.197	128.113.126.13	FTP	Request: USER anonymous
31	9.484	128.113.126.13	192.168.0.197	FTP	Response: 331 Please send the email address as password.
32	9.686	192.168.0.197	128.113.126.13	FTP	Request: PASS wtf@inf.ufsc.br
33	13.381	192.168.0.197	128.113.126.13	FTP	Response: 230 Guest login ok, access restrictions apply.
34	13.611	128.113.126.13	192.168.0.197	FTP	Request: PASS wtf@inf.ufsc.br
35	13.821	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=44 Ack=130 win=8060 Len=0
36	14.521	192.168.0.197	128.113.126.13	MSNMS	PNG

Mensagem de boas vindas do servidor

Frame 25: 77 bytes on wire (616 bits), 77 bytes captured (616 bits)

Ethernet II, Src: D-Link_c0:ce:df (00:1c:f0:c0:ce:df), Dst: IntelCor_2a:f0:71 (00:1f:3c:2a:f0:71)

Internet Protocol, Src: 128.113.126.13 (128.113.126.13), Dst: 192.168.0.197 (192.168.0.197)

Transmission Control Protocol, Src Port: ftp (21), Dst Port: taurus-wh (1610), Seq: 1, Ack: 1, Len: 23

File Transfer Protocol (FTP)

220 FTP server ready.\r\n

0000 00 1f 3c 2a f0 71 00 1c f0 c0 ce df 08 00 45 00 ..<*.q..E.
0010 00 3f 84 45 40 00 2e 06 08 88 80 71 7e 0d c0 a8 .?.E@... ..q~...
0020 00 c5 00 15 06 4a da fa 15 d2 55 94 00 be 50 18J.. ..U...P.
0030 20 58 1b 84 00 00 32 32 30 20 46 54 50 20 73 65 X....22 0 FTP se
0040 72 76 65 72 20 72 65 61 64 79 2e 0d 0a rver rea dy...

File: "C:\Users\willrich\Documents\My Drop... Packets: 120 Displayed: 110 Marked: 0 Load time: 0:00.000 Profile: Default

Exemplo de FTP

ftp1.pcap - Wireshark

File Edit View Go Capture Analyze Statistics Telephony Tools Help

Filter: tcp

No.	Time	Source	Destination	Protocol	Info
22	3.438	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [SYN] Seq=0 win=8192 Len=0 MSS=1460 WS=2 SACK_PERM=1
23	3.600	128.113.126.13	192.168.0.197	TCP	ftp > taurus-wh [SYN, ACK] Seq=0 Ack=1 win=65535 Len=0 MSS=1380 WS=2 SACK_PERM=1
24	3.600	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=1 Ack=1 win=8192 Len=0
25	3.770	128.113.126.13	192.168.0.197	FTP	Response: 220 FTP server ready.
26	3.976	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=1 Ack=24 win=8168 Len=0
30	9.322	192.168.0.197	128.113.126.13	FTP	Request: USER anonymous
31	9.484	128.113.126.13	192.168.0.197	FTP	Response: 331 Guest login ok, email address as password.
32	9.686	192.168.0.197	128.113.126.13	FTP	Request: PASS wllrich@inf.ufsc.br
33	13.381	192.168.0.197	128.113.126.13	FTP	Response: 230 Guest login ok, access restrictions apply.
34	13.611	128.113.126.13	192.168.0.197	FTP	Request: ls
35	13.821	192.168.0.197	128.113.126.13	FTP	Response: 200 PORT command successful.
36	14.571	192.168.0.197	128.113.126.13	FTP	Request: cd pub
37	14.571	192.168.0.197	128.113.126.13	FTP	Response: 250 CWD command successful.

Frame 25: 77 bytes on wire (616 bits) captured on interface eth0 (128.113.126.13) at 3.770 seconds

Ethernet II, Src: D-Link_c0:ce:00:00:00:00, Dst: 192.168.0.197

Internet Protocol, Src: 128.113.126.13, Dst: 192.168.0.197

Transmission Control Protocol, Src Port: 21, Dst Port: 21

File Transfer Protocol (FTP)

220 FTP server ready. \r\n

0000 00 1f 3c 2a f0 71 00 1c f0
0010 00 3f 84 45 40 00 2e 06 08
0020 00 c5 00 15 06 4a da fa 15
0030 20 58 1b 84 00 00 32 32 30
0040 72 76 65 72 20 72 65 61 64

File: "C:\Users\willrich\Documents\My Drop..."

Prompt de Comando

```
C:\Users\willrich>ftp ftp.cs.rpi.edu
Conectado a valvet.cs.rpi.edu.
220 FTP server ready.
Usuário (valvet.cs.rpi.edu:(none)): anonymous
331 Guest login ok, send your email address as password.
Senha:
230 Guest login ok, access restrictions apply.
ftp> ls
200 PORT command successful.
150 Opening ASCII mode data connection for 'file list'.
.login_conf
etc
bin
welcome.msg
.pathmsg
.index.html
.snap
private
.notar
mirrors
pub
226 Transfer complete.
ftp: 97 bytes recebidos em 0.00Segundos 97000.00Kbytes/s.
ftp> cd pub
250 CWD command successful.
```

Exemplo de FTP

ftp1.pcap - Wireshark

File Edit View Go Capture Analyze Statistics Telephony Tools Help

Filter: tcp Expression... Clear Apply

No.	Time	Source	Destination	Protocol	Info
22	3.438	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [SYN] Seq=0 win=8192 Len=0 MSS=1460 WS=2 SACK_PERM=
23	3.600	128.113.126.13	192.168.0.197	TCP	ftp > taurus-wh [SYN, ACK] Seq=0 Ack=1 win=65535 Len=0 MSS=1380 WS=
24	3.600	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=1 Ack=1 win=8192 Len=0
25	3.770	128.113.126.13	192.168.0.197	FTP	Response: 220 FTP server ready.
26	3.976	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=1 Ack=24 win=8168 Len=0
30	9.322	192.168.0.197	128.113.126.13	FTP	Request: USER anonymous
31	9.484	128.113.126.13	192.168.0.197	FTP	Response: 331 Guest login ok, send your email address as password.
32	9.686	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=17 Ack=82 win=8108 Len=0
33	13.381	192.168.0.197	128.113.126.13	FTP	Request: PASS willrich@inf.ufsc.br
34	13.611	128.113.126.13			Restrictions apply.
35	13.821	192.168.0.197			n=8060 Len=0
36	14.521	192.168.0.197			

Comando USER

Frame 30: 70 bytes on wire (560 bits), 70 bytes captured (560 bits)

Ethernet II, Src: IntelCor_2a:f0:71 (00:1f:3c:2a:f0:71), Dst: D-Link_c0:ce:df (00:1c:f0:c0:ce:df)

Internet Protocol, Src: 192.168.0.197 (192.168.0.197), Dst: 128.113.126.13 (128.113.126.13)

Transmission Control Protocol, Src Port: taurus-wh (1610), Dst Port: ftp (21), Seq: 1, Ack: 24, Len: 16

File Transfer Protocol (FTP)

USER anonymous\r\n

```
0000  00 1c f0 c0 ce df 00 1f 3c 2a f0 71 08 00 45 00  ..... <*.q..E.
0010  00 38 4c 84 40 00 80 06 ee 4f c0 a8 00 c5 80 71  .8L.@... .O.....q
0020  7e 0d 06 4a 00 15 55 94 00 be da fa 15 e9 50 18  ~..J..U. ....P.
0030  07 fa 12 65 00 00 55 53 45 52 20 61 6e 6f 6e 79  ...e..US ER anony
0040  6d 6f 75 73 0d 0a  .....mous..
```

Text item (text), 16 bytes Packets: 120 Displayed: 110 Marked: 0 Load time: 0:00.000 Profile: Default

Exemplo de FTP

ftp1.pcap - Wireshark

File Edit View Go Capture Analyze Statistics Telephony Tools Help

Filter: tcp Expression... Clear Apply

No.	Time	Source	Destination	Protocol	Info
22	3.438	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [SYN] Seq=0 win=8192 Len=0 MSS=1460 WS=2 SACK_PERM=
23	3.600	128.113.126.13	192.168.0.197	TCP	ftp > taurus-wh [SYN, ACK] Seq=0 Ack=1 win=65535 Len=0 MSS=1380 WS=
24	3.600	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=1 Ack=1 win=8192 Len=0
25	3.770	128.113.126.13	192.168.0.197	FTP	Response: 220 FTP server ready.
26	3.976	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=1 Ack=24 win=8168 Len=0
30	9.327	192.168.0.197	128.113.126.13	FTP	Request: USER anonymous
31	9.484	128.113.126.13	192.168.0.197	FTP	Response: 331 Guest login ok, send your email address as password.
32	9.686	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=17 Ack=82 win=8108 Len=0
33	13.381	192.168.0.197	128.113.126.13	FTP	Request: PASS willrich@inf.ufsc.br
34	13.611	128.113.126.13			Restrictions apply.
35	13.821	192.168.0.197			n=8060 Len=0
36	14.521	192.168.0.197			

Comando USER

Frame 30: 70 bytes on wire (560 bits) 70 bytes captured (560 bits)

Ethernet II, Src: IntelCor_2a:f0:00, Dst: 08:00:27:00:00:00

Internet Protocol, Src: 192.168.0.197, Dst: 128.113.126.13

Transmission Control Protocol, Src Port: 4144, Dst Port: 21

File Transfer Protocol (FTP)

USER anonymous\r\n

0000 00 1c f0 c0 ce df 00 1f 3c 20 00 00 00 00 00 00
0010 00 38 4c 84 40 00 80 06 ee 40 00 00 00 00 00 00
0020 7e 0d 06 4a 00 15 55 94 00 b0 00 00 00 00 00
0030 07 fa 12 65 00 00 55 53 45 50 00 00 00 00 00 00
0040 6d 6f 75 73 0d 0a 00 00 00 00 00 00 00 00 00 00

Text item (text), 16 bytes

Prompt de Comando

```
C:\Users\willrich>ftp ftp.cs.rpi.edu
Conectado a valvet.cs.rpi.edu.
220 FTP server ready.
Usuário (valvet.cs.rpi.edu:(none)): anonymous
331 Guest login ok, send your email address as password.
Senha:
230 Guest login ok, access restrictions apply.
ftp> ls
200 PORT command successful.
150 Opening ASCII mode data connection for 'file list'.
.login_conf
etc
bin
welcome.msg
.pathmsg
.index.html
.snap
private
.notar
mirrors
pub
```

Exemplo de FTP

ftp1.pcap - Wireshark

File Edit View Go Capture Analyze Statistics Telephony Tools Help

Filter: tcp Expression... Clear Apply

No.	Time	Source	Destination	Protocol	Info
22	3.438	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [SYN] Seq=0 win=8192 Len=0 MSS=1460 WS=2 SACK_PERM
23	3.600	128.113.126.13	192.168.0.197	TCP	ftp > taurus-wh [SYN, ACK] Seq=0 Ack=1 win=65535 Len=0 MSS=1380 WS
24	3.600	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=1 Ack=1 win=8192 Len=0
25	3.770	128.113.126.13	192.168.0.197	FTP	Response: 220 FTP server ready.
26	3.976	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=1 Ack=24 win=8168 Len=0
30	9.322	192.168.0.197	128.113.126.13	FTP	Request: USER anonymous
31	9.484	128.113.126.13	192.168.0.197	FTP	Response: 331 Guest login ok, send your email address as password.
32	9.686	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=17 Ack=82 win=8108 Len=0
33	13.381	192.168.0.197	128.113.126.13	FTP	Request: PASS willrich@inf.ufsc.br
34	13.611	128.113.126.13	192.168.0.197	FTP	Response: 230 Guest login ok, access restrictions apply.
35	13.821	192.168.0.197			
36	14.521	192.168.0.197			

Resposta do comando USER

Frame 31: 112 bytes on wire (896 bits), 112 bytes captured (896 bits)

Ethernet II, Src: D-Link_c0:ce:df (00:1c:f0:c0:ce:df), Dst: IntelCor_2a:f0:71 (00:1f:3c:2a:f0:71)

Internet Protocol, Src: 128.113.126.13 (128.113.126.13), Dst: 192.168.0.197 (192.168.0.197)

Transmission Control Protocol, Src Port: ftp (21), Dst Port: taurus-wh (1610), Seq: 24, Ack: 17, Len: 58

File Transfer Protocol (FTP)

331 Guest login ok, send your email address as password.\r\n

```
0000  00 1f 3c 2a f0 71 00 1c f0 c0 ce df 08 00 45 00  ..<*.q.. .....E.
0010  00 62 84 7b 40 00 2e 06 08 2f 80 71 7e 0d c0 a8  .b.{@... ./..q~...
0020  00 c5 00 15 06 4a da fa 15 e9 55 94 00 ce 50 18  .....J.. ..U...P.
0030  20 58 32 14 00 00 33 33 31 20 47 75 65 73 74 20  x2...33 1 Guest
0040  6c 6f 67 69 6e 20 6f 6b 2c 20 73 65 6e 64 20 79  login ok , send y
0050  6f 75 72 20 65 6d 61 69 6c 20 61 64 64 72 65 73  our emai l adres
0060  73 20 61 73 20 70 61 73 73 77 6f 72 64 2e 0d 0a  s as pas sword...
```

File: "C:\Users\willrich\Documents\My Drop... Packets: 120 Displayed: 110 Marked: 0 Load time: 0:00.000 Profile: Default

Exemplo de FTP

The image displays a Wireshark packet capture of an FTP session and a corresponding command prompt window. The Wireshark interface shows a filter set to 'tcp' and a list of packets. Packet 31 is highlighted with a red circle, showing the response to the 'USER' command. A blue box with the text 'Resposta do comando USER' points to this packet. The command prompt window shows the user 'anonymous' logging in and receiving the same response message, which is also circled in red.

Wireshark Packet List:

No.	Time	Source	Destination	Protocol	Info
22	3.438	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [SYN] Seq=0 win=8192 Len=0 MSS=1460 WS=2 SACK_PERM=1
23	3.600	128.113.126.13	192.168.0.197	TCP	ftp > taurus-wh [SYN, ACK] Seq=0 Ack=1 win=65535 Len=0 MSS=1380 WS=2
24	3.600	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=1 Ack=1 win=8192 Len=0
25	3.770	128.113.126.13	192.168.0.197	FTP	Response: 220 FTP server ready.
26	3.976	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=1 Ack=24 win=8168 Len=0
30	9.322	192.168.0.197	128.113.126.13	FTP	Request: USER anonymous
31	9.484	128.113.126.13	192.168.0.197	FTP	Response: 331 Guest login ok, send your email address as password.
32	9.686	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=17 Ack=82 win=8108 Len=0
33	13.381	192.168.0.197	128.113.126.13	FTP	Request: PASS willrich@inf.ufsc.br
34	13.611	128.113.126.13	192.168.0.197	FTP	Response: 230 Guest login ok, access restrictions apply.
35	13.821	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=18 Ack=86 win=8108 Len=0
36	14.571	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=18 Ack=86 win=8108 Len=0

Command Prompt Output:

```
C:\Users\willrich>ftp ftp.cs.rpi.edu
Conectado a valvet.cs.rpi.edu.
220 FTP server ready.
Usuário (valvet.cs.rpi.edu:(none)): anonymous
331 Guest login ok, send your email address as password.
Senha:
230 Guest login ok, access restrictions apply.
ftp> ls
200 PORT command successful.
150 Opening ASCII mode data connection for 'file list'.
.login_conf
etc
bin
welcome.msg
.pathmsg
.index.html
.snap
private
.notar
mirrors
pub
```

Exemplo de FTP

ftp1.pcap - Wireshark

File Edit View Go Capture Analyze Statistics Telephony Tools Help

Filter: tcp Expression... Clear Apply

No.	Time	Source	Destination	Protocol	Info
22	3.438	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [SYN] Seq=0 win=8192 Len=0 MSS=1460 WS=2 SACK_PERM=1
23	3.600	128.113.126.13	192.168.0.197	TCP	ftp > taurus-wh [SYN, ACK] Seq=0 Ack=1 win=65535 Len=0 MSS=1380 WS=0
24	3.600	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=1 Ack=1 win=8192 Len=0
25	3.770	128.113.126.13	192.168.0.197	TCP	ftp > taurus-wh [ACK] Seq=1 Ack=1 win=8192 Len=0
26	3.976	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=1 Ack=1 win=8192 Len=0
30	9.322	192.168.0.197	128.113.126.13	FTP	Request: USER anonymous
31	9.484	128.113.126.13	192.168.0.197	FTP	Response: 331 Guest login ok, send your email address as password.
32	9.686	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=17 Ack=82 win=8108 Len=0
33	13.381	192.168.0.197	128.113.126.13	FTP	Request: PASS willrich@inf.ufsc.br
34	13.611	128.113.126.13	192.168.0.197	FTP	Response: 230 Guest login ok, access restrictions apply.
35	13.821	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=44 Ack=130 win=8060 Len=0
36	14.571	192.168.0.197	128.113.126.13	MSNMS	PNG

Frame 33: 81 bytes on wire (648 bits), 81 bytes captured (648 bits)

Ethernet II, Src: IntelCor_2a:f0:71 (00:1f:3c:2a:f0:71), Dst: D-Link_c0:ce:df (00:1c:f0:c0:ce:df)

Internet Protocol, Src: 192.168.0.197 (192.168.0.197), Dst: 128.113.126.13 (128.113.126.13)

Transmission Control Protocol, Src Port: taurus-wh (1610), Dst Port: ftp (21), Seq: 17, Ack: 82, Len: 27

File Transfer Protocol (FTP)

PASS willrich@inf.ufsc.br\r\n

```
0000  00 1c f0 c0 ce df 00 1f 3c 2a f0 71 08 00 45 00  ..... <*.q..E.
0010  00 43 4c 86 40 00 80 06 ee 42 c0 a8 00 c5 80 71  .CL.@... .B....q
0020  7e 0d 06 4a 00 15 55 94 00 ce da fa 16 23 50 18  ~..J..U. ....#P.
0030  07 eb cb 96 00 00 50 41 53 53 20 77 69 6c 6c 72  .....PA SS willr
0040  69 63 68 40 69 6e 66 2e 75 66 73 63 2e 62 72 0d  ich@inf. ufsc.br.
0050  0a
```

File: "C:\Users\willrich\Documents\My Drop... Packets: 120 Displayed: 110 Marked: 0 Load time: 0:00.000 Profile: Default

Exemplo de FTP

Wireshark interface showing a packet capture of an FTP session. The filter is set to 'tcp'. The packet list shows the following details:

No.	Time	Source	Destination	Protocol	Info
22	3.438	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [SYN] Seq=0 win=8192 Len=0 MSS=1460 WS=2 SACK_PERM=1
23	3.600	128.113.126.13	192.168.0.197	TCP	ftp > taurus-wh [SYN, ACK] Seq=0 Ack=1 win=65535 Len=0 MSS=1380 WS=2
24	3.600	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=1 Ack=1 win=8192 Len=0
25	3.770	128.113.126.13	192.168.0.197	TCP	ftp > taurus-wh [ACK] Seq=1 Ack=1 win=8192 Len=0
26	3.976	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=1 Ack=1 win=8192 Len=0
30	9.322	192.168.0.197	128.113.126.13	FTP	Request: USER anonymous
31	9.484	128.113.126.13	192.168.0.197	FTP	Response: 331 Guest login ok, send your email address as password.
32	9.686	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=17 Ack=82 win=8192 Len=0
33	13.381	192.168.0.197	128.113.126.13	FTP	Request: PASS willrich@inf.ufsc.br
34	13.611	128.113.126.13	192.168.0.197	FTP	Response: 230 Guest login ok, access restrictions apply.
35	13.821	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=44 Ack=130 win=8060 Len=0
36	14.571	192.168.0.197	128.113.126.13	MSNMS	PNG

The packet details pane for Frame 33 shows the following structure:

- Frame 33: 81 bytes on wire (648 bits) - 81 bytes captured (648 bits) on interface 0
- Ethernet II, Src: IntelCor_2a:f0:71, Dst: 08:00:27:00:00:00
- Internet Protocol, Src: 192.168.0.197, Dst: 128.113.126.13
- Transmission Control Protocol, Src Port: 4444, Dst Port: 21
- File Transfer Protocol (FTP)
 - PASS willrich@inf.ufsc.br\r\n

The packet bytes pane shows the raw data for the selected packet:

```
0000  00 1c f0 c0 ce df 00 1f 3c 2a 00 00 00 00 00 00
0010  00 43 4c 86 40 00 80 06 ee 42 00 00 00 00 00 00
0020  7e 0d 06 4a 00 15 55 94 00 ce 00 00 00 00 00 00
0030  07 eb cb 96 00 00 50 41 53 53 00 00 00 00 00 00
0040  69 63 68 40 69 6e 66 2e 75 66 00 00 00 00 00 00
0050  0a
```

A command prompt window titled 'Prompt de Comando' is overlaid on the bottom right, showing the following output:

```
C:\Users\willrich>ftp ftp.cs.rpi.edu
Conectado a valvet.cs.rpi.edu.
220 FTP server ready.
Usuário (valvet.cs.rpi.edu:(none)): anonymous
331 Guest login ok, send your email address as password.
Senha:
230 Guest login ok, access restrictions apply.
ftp> ls
200 PORT command successful.
150 Opening ASCII mode data connection for 'file list'.
.login_conf
etc
bin
welcome.msg
.pathmsg
.index.html
.snap
private
.notar
mirrors
pub
```

Exemplo de FTP

ftp1.pcap - Wireshark

File Edit View Go Capture Analyze Statistics Telephony Tools Help

Filter: tcp Expression... Clear Apply

No.	Time	Source	Destination	Protocol	Info
22	3.438	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [SYN] Seq=0 win=8192 Len=0 MSS=1460 WS=2 SACK_PERM=1
23	3.600	128.113.126.13	192.168.0.197	TCP	ftp > taurus-wh [SYN, ACK] Seq=0 Ack=1 win=65535 Len=0 MSS=1380 WS=0
24	3.600	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=1 Ack=1 win=8192 Len=0
25	3.770	128.113.126.13	192.168.0.197	FTP	Response: 220 FTP server ready.
26	3.976	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=17 Ack=82 win=8108 Len=0
30	9.322	192.168.0.197	128.113.126.13	FTP	Request: USER willrich@inf.ufsc.br
31	9.484	128.113.126.13	192.168.0.197	FTP	Response: 331 Guest login ok, send your email address as password.
32	9.686	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=17 Ack=82 win=8108 Len=0
33	13.381	192.168.0.197	128.113.126.13	FTP	Request: PASS willrich@inf.ufsc.br
34	13.611	128.113.126.13	192.168.0.197	FTP	Response: 230 Guest login ok, access restrictions apply.
35	13.821	192.168.0.197	128.113.126.13	TCP	taurus-wh > ftp [ACK] Seq=44 Ack=130 win=8060 Len=0
36	14.571	192.168.0.197	128.113.126.13	MSNMS	PNG

Resposta do comando USER

Frame 34: 102 bytes on wire (816 bits), 102 bytes captured (816 bits)

Ethernet II, Src: D-Link_c0:ce:df (00:1c:f0:c0:ce:df), Dst: IntelCor_2a:f0:71 (00:1f:3c:2a:f0:71)

Internet Protocol, Src: 128.113.126.13 (128.113.126.13), Dst: 192.168.0.197 (192.168.0.197)

Transmission Control Protocol, Src Port: ftp (21), Dst Port: taurus-wh (1610), Seq: 82, Ack: 44, Len: 48

File Transfer Protocol (FTP)

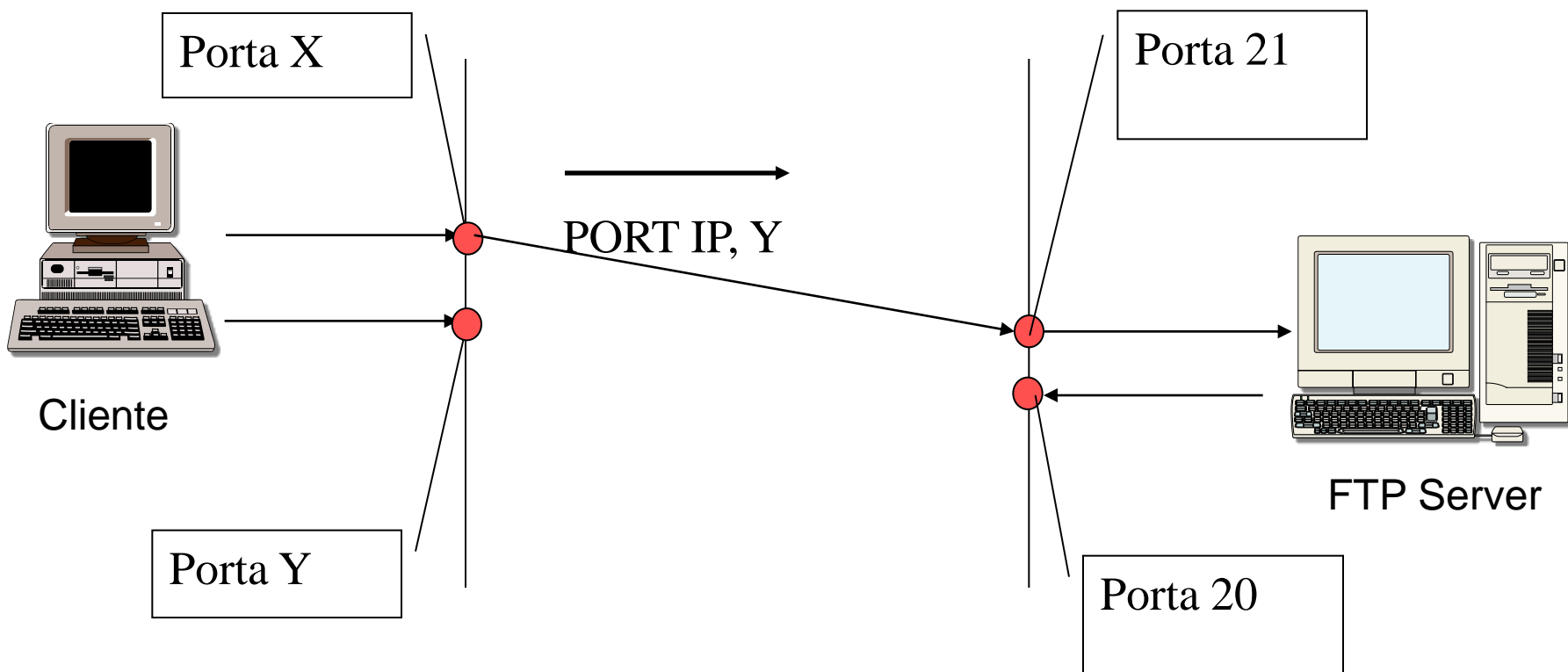
230 Guest login ok, access restrictions apply.\r\n

0000 00 1f 3c 2a f0 71 00 1c f0 c0 ce df 08 00 45 00 ..<*.q..E.
0010 00 58 84 a1 40 00 2e 06 08 13 80 71 7e 0d c0 a8 .X..@... ..q~...
0020 00 c5 00 15 06 4a da fa 16 23 55 94 00 e9 50 18J.. .#U...P.
0030 20 58 d5 77 00 00 32 33 30 20 47 75 65 73 74 20 X.w..23 0 Guest
0040 6c 6f 67 69 6e 20 6f 6b 2c 20 61 63 63 65 73 73 login ok , access
0050 20 72 65 73 74 72 69 63 74 69 6f 6e 73 20 61 70 restric tions ap
0060 70 6c 79 2e 0d 0a ply...

File: "C:\Users\willrich\Documents\My Drop... Packets: 120 Displayed: 110 Marked: 0 Load time: 0:00.000 Profile: Default

FTP – Conexão de Dados

Sempre que houver a transferência de dados, deverá ser enviado antes um comando indicando o PORT, sobre a qual o servidor transferirá as informações.



Exemplo de FTP

ftp1.pcap - Wireshark

File Edit View Go Capture Analyze Statistics Telephony Tools Help

Filter: tcp Expression... Clear Apply

No.	Time	Source	Destination	Protocol	Info
39	15.13	192.168.0.197	128.113.126.13	FTP	Request: PORT 192,168,0,197,6,75
40	15.25	128.113.126.13	192.168.0.197	FTP	Response: 200 PORT command successful.
41	15.25	192.168.0.197	128.113.126.13	FTP	Request: NLST
42	15.45	128.113.126.13	192.168.0.197	TCP	ftp-data > ill [SYN] Seq=0 win=65535 Len=0 MSS=536 WS=3 SACK_PERM=
43	15.55	128.113.126.13	192.168.0.197	TCP	ftp > taurus-wh [ACK] Seq=160 Ack=75 win=66240 Len=0
45	18.45	128.113.126.13	192.168.0.197	TCP	ftp-data > ill [SYN] Seq=0 win=65535 Len=0 MSS=536 WS=3 SACK_PERM=
46	18.45	192.168.0.197	128.113.126.13	TCP	ftp > taurus-wh [ACK] Seq=160 Ack=75 win=66240 Len=0
47	18.62	128.113.126.13	192.168.0.197	TCP	ftp-data > ill [SYN] Seq=0 win=65535 Len=0 MSS=536 WS=3 SACK_PERM=
48	18.62	128.113.126.13	192.168.0.197	TCP	ftp > taurus-wh [ACK] Seq=160 Ack=75 win=66240 Len=0
49	18.62	192.168.0.197	128.113.126.13	TCP	ftp-data > ill [SYN] Seq=0 win=65535 Len=0 MSS=536 WS=3 SACK_PERM=
50	18.62	128.113.126.13	192.168.0.197	TCP	ftp > taurus-wh [ACK] Seq=160 Ack=75 win=66240 Len=0
51	18.62	128.113.126.13	192.168.0.197	TCP	ftp-data > ill [SYN] Seq=0 win=65535 Len=0 MSS=536 WS=3 SACK_PERM=

Comando Port:
IP: 192.168.0.197
Porta Y: $6 \times 256 + 75 = 1611$

Frame 39: 79 bytes on wire (632 bits), 79 bytes captured (632 bits)
Ethernet II, Src: IntelCor_2a:f0:71 (00:1f:3c:2a:f0:71), Dst: D-Link_c0:ce:df (00:1c:f0:c0:ce:df)
Internet Protocol, Src: 192.168.0.197 (192.168.0.197), Dst: 128.113.126.13 (128.113.126.13)
Transmission Control Protocol, Src Port: taurus-wh (1610), Dst Port: ftp (21), Seq: 44, Ack: 130, Len: 25
File Transfer Protocol (FTP)
PORT 192,168,0,197,6,75\r\n

0000 00 1c f0 c0 ce df 00 1f 3c 2a f0 71 08 00 45 00 <*.q..E.
0010 00 41 4c 8a 40 00 80 06 ee 40 c0 a8 00 c5 80 71 .AL.@... .@.....q
0020 7e 0d 06 4a 00 15 55 94 00 e9 da fa 16 53 50 18 ~..J..U.SP.
0030 07 df 12 3b 00 00 50 4f 52 54 20 31 39 32 2c 31 ...;...PO RT 192,1
0040 36 38 2c 30 2c 31 39 37 2c 36 2c 37 35 0d 0a 68,0,197 ,6,75..

File: "C:\Users\willrich\Documents\My Drop... Packets: 120 Displayed: 110 Marked: 0 Load time: 0:00.000 Profile: Default

Exemplo de FTP

ftp1.pcap - Wireshark

File Edit View Go Capture Analyze Statistics Telephony Tools Help

Filter: tcp Expression... Clear Apply

No.	Time	Source	Destination	Protocol	Info
39	15.13	192.168.0.197	128.113.126.13	FTP	Request: PORT 192,168,0,197,6,75
40	15.25	128.113.126.13	192.168.0.197	FTP	Response: 200 PORT command successful.
41	15.25	192.168.0.197	128.113.126.13	FTP	Request: NLST
42	15.45	128.113.126.13	192.168.0.197	TCP	ftp-data > ill [SYN] Seq=0 win=65535 Len=0 MSS=536 WS=3 SACK_PERM=
43	15.55	128.113.126.13	192.168.0.197	TCP	ftp > taurus-wh [ACK] Seq=160 Ack=75 win=66240 Len=0
45	18.45	128.113.126.13	192.168.0.197	TCP	len=0 MSS=536 WS=3 SACK_PERM=
46	18.45	192.168.0.197	128.113.126.13	TCP	win=8192 Len=0 MSS=1460 WS=8
47	18.62	128.113.126.13	192.168.0.197	TCP	ftp-data > ftp [ACK] Seq=1 Ack=1 win=65664 Len=0 TSV=992539352 TSE
48	18.62	128.113.126.13	192.168.0.197	FTP-DATA	FTP Data: 97 bytes
49	18.62	192.168.0.197	128.113.126.13	TCP	ill > ftp-data [ACK] Seq=1 Ack=99 win=16640 Len=0 TSV=269148 TSER=
50	18.62	128.113.126.13	192.168.0.197	FTP	Response: 150 Opening ASCII mode data connection for 'file list'.
51	18.62	128.113.126.13	192.168.0.197	FTP	Response: 226 Transfer complete.

Comando LS

Frame 41: 60 bytes on wire (480 bits), 60 bytes captured (480 bits)

Ethernet II, Src: IntelCor_2a:f0:71 (00:1f:3c:2a:f0:71), Dst: D-Link_c0:ce:df (00:1c:f0:c0:ce:df)

Internet Protocol, Src: 192.168.0.197 (192.168.0.197), Dst: 128.113.126.13 (128.113.126.13)

Transmission Control Protocol, Src Port: taurus-wh (1610), Dst Port: ftp (21), Seq: 69, Ack: 160, Len: 6

File Transfer Protocol (FTP)

NLST\r\n

```
0000  00 1c f0 c0 ce df 00 1f 3c 2a f0 71 08 00 45 00  ..... <*.q..E.
0010  00 2e 4c 8b 40 00 80 06 ee 52 c0 a8 00 c5 80 71  ..L.@... .R.....q
0020  7e 0d 06 4a 00 15 55 94 01 02 da fa 16 71 50 18  ~..J..U. ....qP.
0030  07 d8 ea f6 00 00 4e 4c 53 54 0d 0a                .....NL ST..
```

File: "C:\Users\willrich\Documents\My Drop... Packets: 120 Displayed: 110 Marked: 0 Load time: 0:00.000 Profile: Default

Exemplo de FTP

ftp1.pcap - Wireshark

File Edit View Go Capture Analyze Statistics Telephony Tools Help

Filter: tcp Expression... Clear Apply

No.	Time	Source	Destination	Protocol	Info
39	15.13	192.168.0.197	128.113.126.13	FTP	Request: PORT 192,168,0,197,6,75
40	15.25	128.113.126.13	192.168.0.197	FTP	Response: 200 PORT command successful.
41	15.25	192.168.0.197	128.113.126.13	FTP	Request: NLST
42	15.45	128.113.126.13	192.168.0.197	TCP	ftp-data > ill [SYN] Seq=0 win=65535 Len=0 MSS=536 WS=3 SACK_PERM=
43	15.55	128.113.126.13	192.168.0.197	TCP	ftp > taurus-wh [ACK] Seq=160 Ack=75 win=66240 Len=0
45	18.45	128.113.126.13	192.168.0.197	TCP	ftp-data > ill [SYN] Seq=0 win=65535 Len=0 MSS=536 WS=3 SACK_PERM=
46	18.45	192.168.0.197	128.113.126.13	TCP	ill > ftp-data [SYN, ACK] Seq=0 Ack=1 win=8192 Len=0 MSS=1460 WS=8
47	18.62	128.113.126.13	192.168.0.197	TCP	ftp-data > ill [ACK] Seq=1 Ack=1 win=65604 Len=0 TSV=992539352 TSE
48	18.62	128.113.126.13	192.168.0.197	TCP	ftp-data > ill [ACK] Seq=1 Ack=1 win=65604 Len=0 TSV=992539352 TSE
49	18.62	192.168.0.197	128.113.126.13	TCP	ill > ftp-data [ACK] Seq=0 Ack=1 win=8192 Len=0 MSS=1460 WS=8
50	18.62	128.113.126.13	192.168.0.197	TCP	ftp-data > ill [ACK] Seq=1 Ack=1 win=65604 Len=0 TSV=992539352 TSE
51	18.62	128.113.126.13	192.168.0.197	TCP	ftp-data > ill [ACK] Seq=1 Ack=1 win=65604 Len=0 TSV=992539352 TSE

Estabelece conexão TCP com porta origem 20 (FTP-DATA) e destino 1611

Frame 42: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface 0

Ethernet II, Src: D-Link_c0:ce:df (00:1c:f0:c0:ce:df), Dst: IntelCor_2a:f0:71 (00:1f:3c:2a:f0:71)

Internet Protocol, Src: 128.113.126.13 (128.113.126.13), Dst: 192.168.0.197 (192.168.0.197)

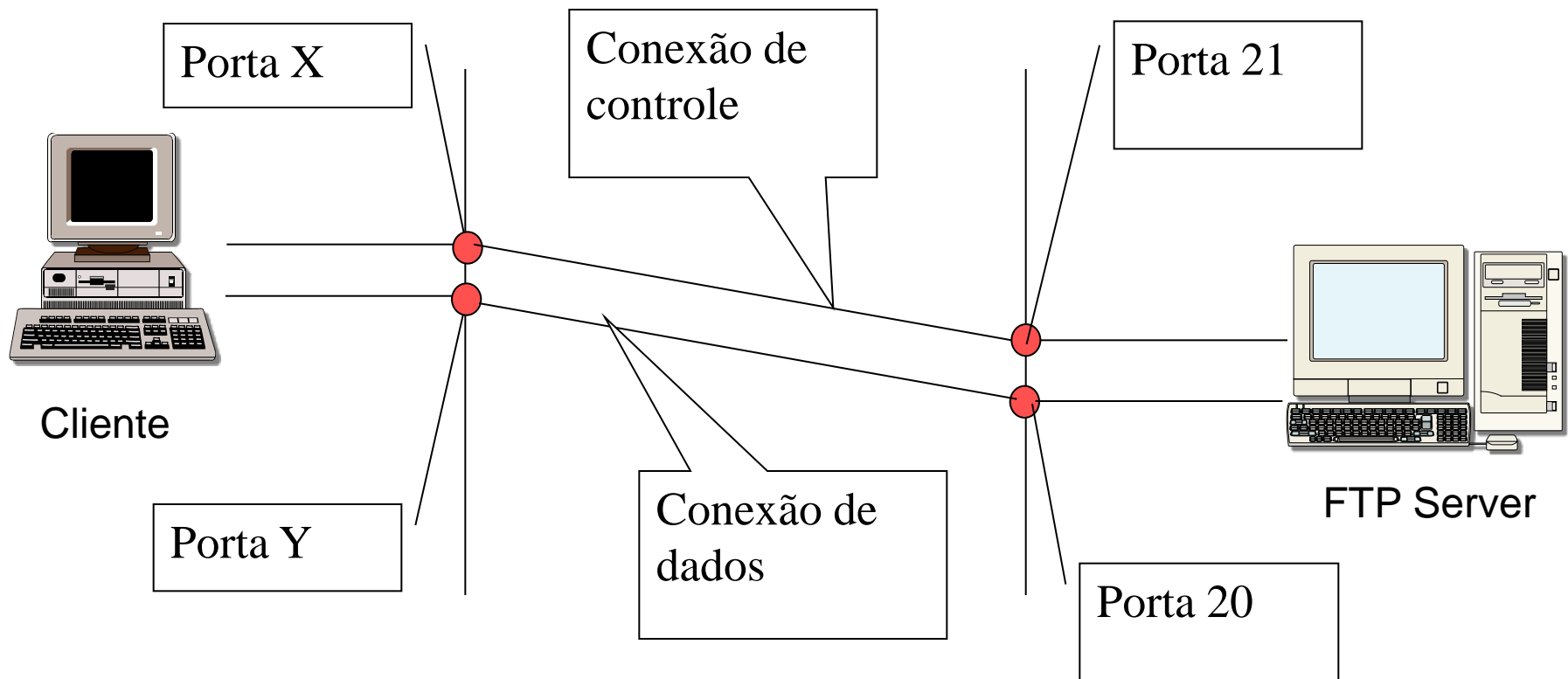
Transmission Control Protocol, Src Port: ftp-data (20), Dst Port: ill (1611), Seq: 0, Len: 0

0000 00 1f 3c 2a f0 71 00 1c f0 c0 ce df 08 00 45 00 ..<*.q..E.
0010 00 3c 84 af 40 00 2e 06 08 21 80 71 7e 0d c0 a8 .<..@... .!.q~...
0020 00 c5 00 14 06 4b 96 b3 47 81 00 00 00 00 a0 02K.. G.....
0030 ff ff 85 7c 00 00 02 04 02 18 01 03 03 03 04 02 ...|.
0040 08 0a 3b 28 e6 7b 00 00 00 00 ..;. {.. ..

File: "C:\Users\willrich\Documents\My Drop... Packets: 120 Displayed: 110 Marked: 0 Load time: 0:00.000 Profile: Default

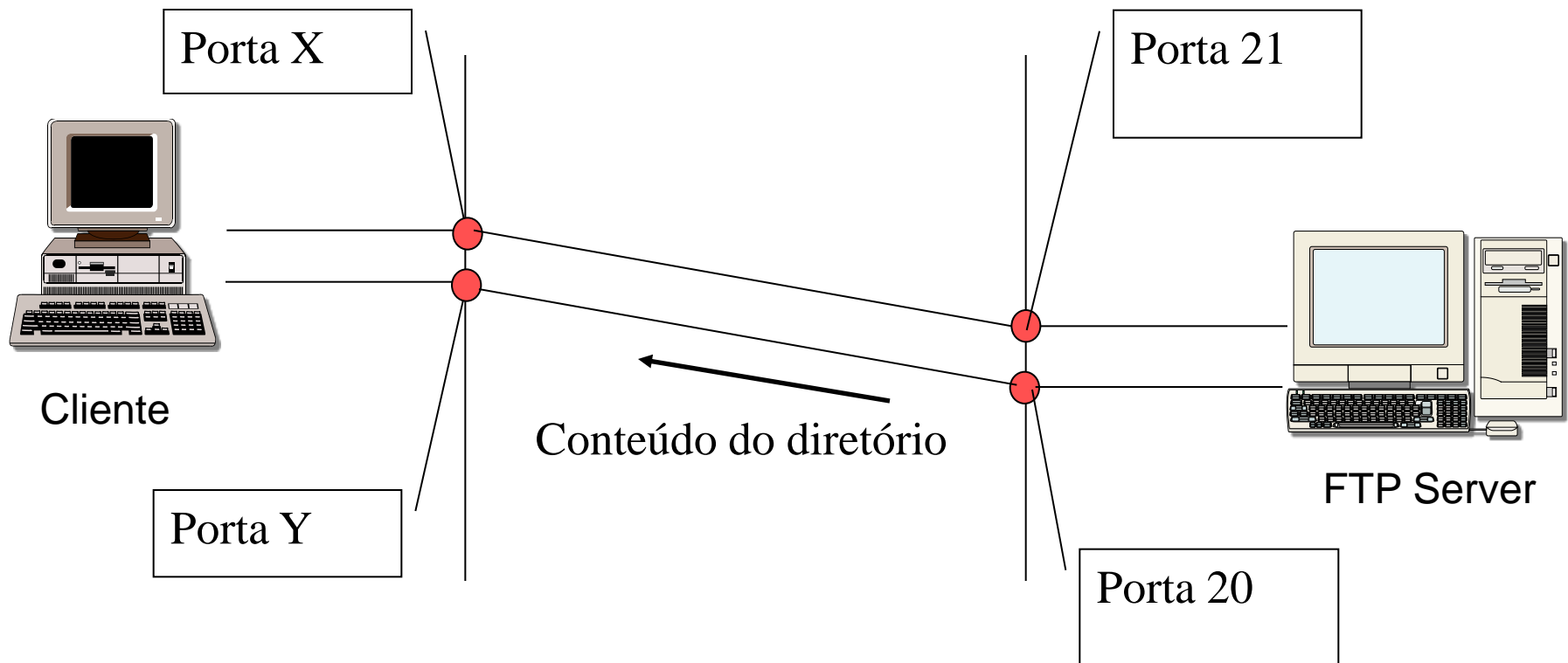
FTP – Conexão de Dados

Cliente aguarda a conexão entre sua porta e a 20 do servidor



FTP – Conexão de Dados

Servidor devolve o resultado do comando



Exemplo de FTP

Wireshark interface showing a packet capture of an FTP session. The filter is set to 'tcp'. The packet list shows several packets, with packet 48 highlighted in blue and circled in red. A red oval highlights packets 48, 49, 50, and 51. A blue box labeled 'Resposta do ls' is overlaid on packet 48.

Filter: tcp

No.	Time	Source	Destination	Protocol	Info
43	15.55	128.113.126.13	192.168.0.197	TCP	ftp > taurus-wh [ACK] Seq=160 Ack=75 win=66240 Len=0
45	18.45	128.113.126.13	192.168.0.197	TCP	ftp-data > ill [SYN] Seq=0 win=65535 Len=0 MSS=536 WS=3 SACK_PER
46	18.45	192.168.0.197	128.113.126.13	TCP	ill > ftp-data [SYN, ACK] Seq=0 Ack=1 win=8192 Len=0 MSS=1460 WS
47	18.62	128.113.126.13	192.168.0.197	TCP	ftp-data > ill [ACK] Seq=1 Ack=1 win=65664 Len=0 TSV=992539352 T
48	18.62	128.113.126.13	192.168.0.197	FTP-DATA	FTP Data: 97 bytes
49	18.62	192.168.0.197	128.113.126.13	TCP	ill > ftp-data [ACK] Seq=1 Ack=99 win=16640 Len=0 TSV=269148 TSE
50	18.62	128.113.126.13	192.168.0.197	FTP	Response: 150 Opening ASCII mode data connection for 'file list'
51	18.62	128.113.126.13	192.168.0.197	FTP	Response: 226 Transfer complete.

Frame 48: 163 bytes
Ethernet II, Src: D...:3c:2a:f0:71)
Internet Protocol, Src: 128.113.126.13 (128.113.126.13), Dst: 192.168.0.197 (192.168.0.197)
Transmission Control Protocol, Src Port: ftp-data (20), Dst Port: ill (1611), Seq: 1, Ack: 1, Len: 97
FTP Data

Resposta do ls

```
0000 00 1f 3c 2a f0 71 00 1c f0 c0 ce df 08 00 45 00 ..<*.q.. .....E.
0010 00 95 84 c0 40 00 2e 06 07 b7 80 71 7e 0d c0 a8 ....@.... .q~...
0020 00 c5 00 14 06 4b 96 b3 47 82 1e 5c f5 db 80 19 ....K.. G.. \....
0030 20 10 14 6f 00 00 01 01 08 0a 3b 28 f2 d8 00 04 ..o.... .;(. ...
0040 1b 4b 2e 6c 6f 67 69 6e 5f 63 6f 6e 66 0d 0a 65 .K.login _conf..e
0050 74 63 0d 0a 62 69 6e 0d 0a 77 65 6c 63 6f 6d 65 tc..bin. .welcome
0060 2e 6d 73 67 0d 0a 2e 70 61 74 68 6d 73 67 0d 0a .msg...p athmsg..
0070 2e 69 6e 64 65 78 2e 68 74 6d 6c 0d 0a 2e 73 6e .index.h tml...sn
0080 61 70 0d 0a 70 72 69 76 61 74 65 0d 0a 2e 6e 6f ap..priv ate...no
0090 74 61 72 0d 0a 6d 69 72 72 6f 72 73 0d 0a 70 75 tar..mir rors..pu
00a0 62 0d 0a b..
```

File: "C:\Users\willrich\Documents\My Drop... Packets: 120 Displayed: 110 Marked: 0 Load time: 0:00.000 Profile: Default

Exemplo de FTP

The image displays a Wireshark packet capture window and a Windows command prompt window. The Wireshark window shows a list of network packets, with packet 48 highlighted. The packet details pane shows the structure of the packet: Ethernet II, Internet Protocol, Transmission Control Protocol, and FTP Data. The packet bytes pane shows the raw data in hexadecimal and ASCII. The command prompt window shows the execution of the 'ftp' command, connecting to 'ftp.cs.rpi.edu', logging in as 'anonymous', and running the 'ls' command to list the directory contents.

Wireshark Packet Capture:

No.	Time	Source	Destination	Protocol	Info
43	15.5	128.113.126.13	192.168.0.197	TCP	ftp > taurus-wh [ACK] Seq=160 Ack=75 win=66240 Len=0
45	18.4	128.113.126.13	192.168.0.197	TCP	ftp-data > ill [SYN] Seq=0 win=65535 Len=0 MSS=536 WS=3 SACK_PER
46	18.4	192.168.0.197	128.113.126.13	TCP	ill > ftp-data [SYN, ACK] Seq=0 Ack=1 win=8192 Len=0 MSS=1460 WS
47	18.62	128.113.126.13	192.168.0.197	TCP	ftp-data > ill [ACK] Seq=1 Ack=1 win=65664 Len=0 TSV=992539352 T
48	18.62	128.113.126.13	192.168.0.197	FTP-DATA	FTP Data: 97 bytes
49	18.62	192.168.0.197	128.113.126.13	TCP	ill > ftp-data [ACK] Seq=1 Ack=99 win=16640 Len=0 TSV=269148 TSE
50	18.62	128.113.126.13	192.168.0.197	FTP	Response: 150 Opening ASCII mode data connection for 'file list'
51	18.62	128.113.126.13	192.168.0.197	FTP	Response: 226 Transfer complete.

Packet Details (Frame 48):

- Frame 48: 163 bytes
- Ethernet II, Src: D... (3c:2a:f0:71)
- Internet Protocol, Src: 128.113.126.13, Dest: 192.168.0.197
- Transmission Control Protocol, Src Port: 19216, Dest Port: 21
- FTP Data

Packet Bytes:

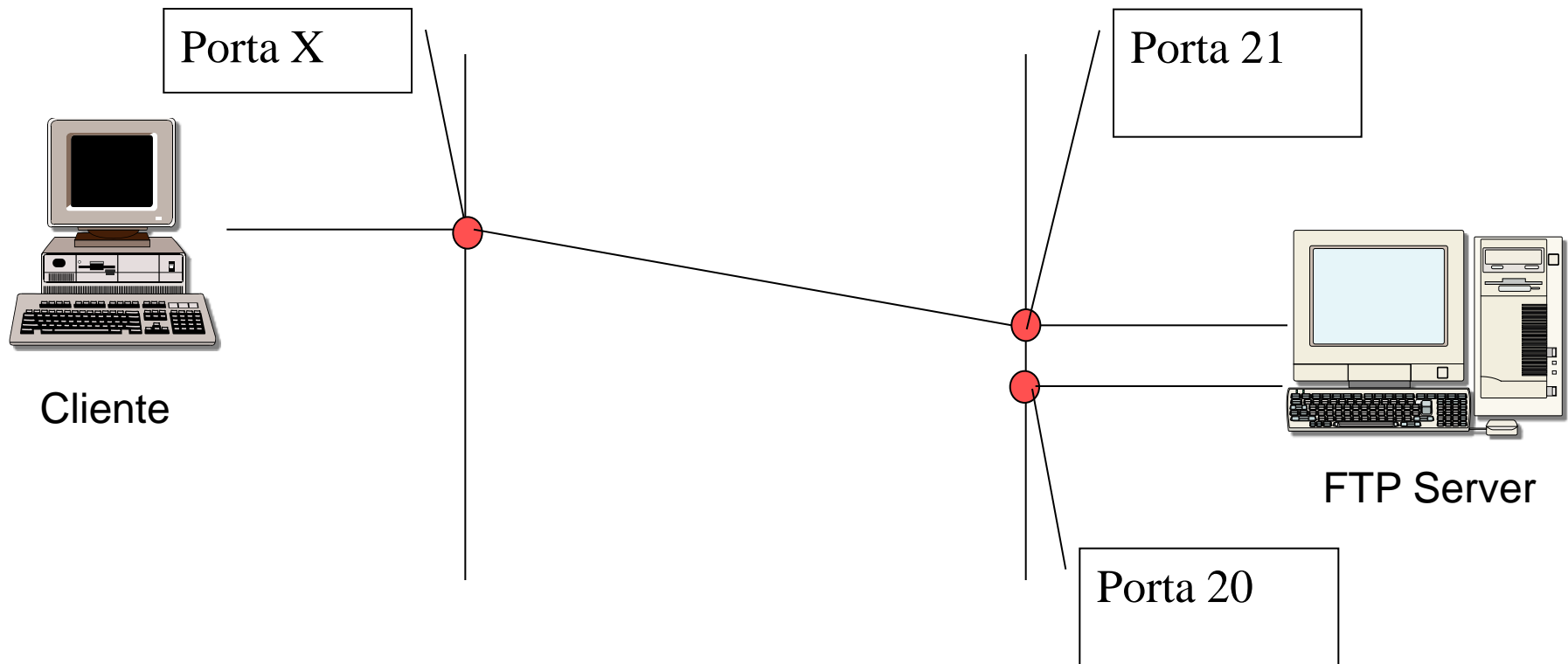
Offset	Hex	ASCII
0000	00 1f 3c 2a f0 71 00 1c f0	
0010	00 95 84 c0 40 00 2e 06 07	
0020	00 c5 00 14 06 4b 96 b3 47	
0030	20 10 14 6f 00 00 01 01 08	
0040	1b 4b 2e 6c 6f 67 69 6e 5f	
0050	74 63 0d 0a 62 69 6e 0d 0a	
0060	2e 6d 73 67 0d 0a 2e 70 61	
0070	2e 69 6e 64 65 78 2e 68 74	
0080	61 70 0d 0a 70 72 69 76 61	
0090	74 61 72 0d 0a 6d 69 72 72	
00a0	62 0d 0a	

Windows Command Prompt:

```
C:\Users\willrich>ftp ftp.cs.rpi.edu
Conectado a valvet.cs.rpi.edu.
220 FTP server ready.
Usuário (valvet.cs.rpi.edu:(none)): anonymous
331 Guest login ok, send your email address as password.
Senha:
230 Guest login ok, access restrictions apply.
ftp> ls
200 PORT command successful.
150 Opening ASCII mode data connection for 'file list'.
.login_conf
etc
bin
welcome.msg
.pathmsg
.index.html
.snap
private
.notar
mirrors
pub
226 Transfer complete.
ftp: 97 bytes recebidos em 0.00 segundos 97000.00Kbytes/s.
```

FTP – Conexão de Dados

A conexão é encerrada e o cliente libera a porta Y



Características do FTP

□ Desvantagens do FTP

- Passwords e conteúdo de arquivos trafegam na rede de forma "plana" (não criptografados)
- Negociação da "porta de dados" entre cliente e servidor
 - dificulta o trabalho de configuração de firewall
- É possível dizer ao servidor para estabelecer a "conexão de dados" com um terceiro host, indicando IP e porta

□ Autenticação FTP

- Para usar o FTP é preciso ter uma conta (login) no host onde o servidor está rodando
- Servidores FTP possuem um usuário padrão chamado "anonymous". Quando habilitado, usuários não precisam ter uma conta naquele host
- Usuário "anonymous" não tem senha: o servidor pede normalmente o e-mail do usuário (mas não checa)

Alternativas ao FTP

- Trivial File Transfer Protocol
 - Versão *muito* básica do FTP
 - Usado para boot remoto
 - Usado para gravar/ler arquivos em/de host remoto
 - Usa UDP (porta 69)
 - Não usa autenticação, nem mecanismos de criptografia
 - TFTP é padronizado pelo IETF pela RFC 1350

FTP Seguro

- Algumas implementações adicionam segurança ao TCP
- Suite OpenSSH inclui (entre outros)
 - ssh (secure shell)
 - Substitui rlogin e telnet (do UNIX)
 - scp (secure copy)
 - Substitui rcp, implementa o comando "cp" entre hosts
 - sftp (secure ftp)
 - Mesmo que FTP mas conexões são criptografadas
 - Usa a porta 22

sftp

- Sua principal função é securizar a transferência de arquivo entre um computador local e remoto
 - Usa o Secure Shell (SSH)
 - É um protocolo de rede que permite que os dados sejam trafegados usando um canal seguro entre dos dispositivos de rede
 - Criptografia oferece confidencialidade e integridade dos dados

