

TELNET

**OVERVIEW OF THE TELNET PROTOCOL
FOR REMOTE LOGIN SESSIONS**

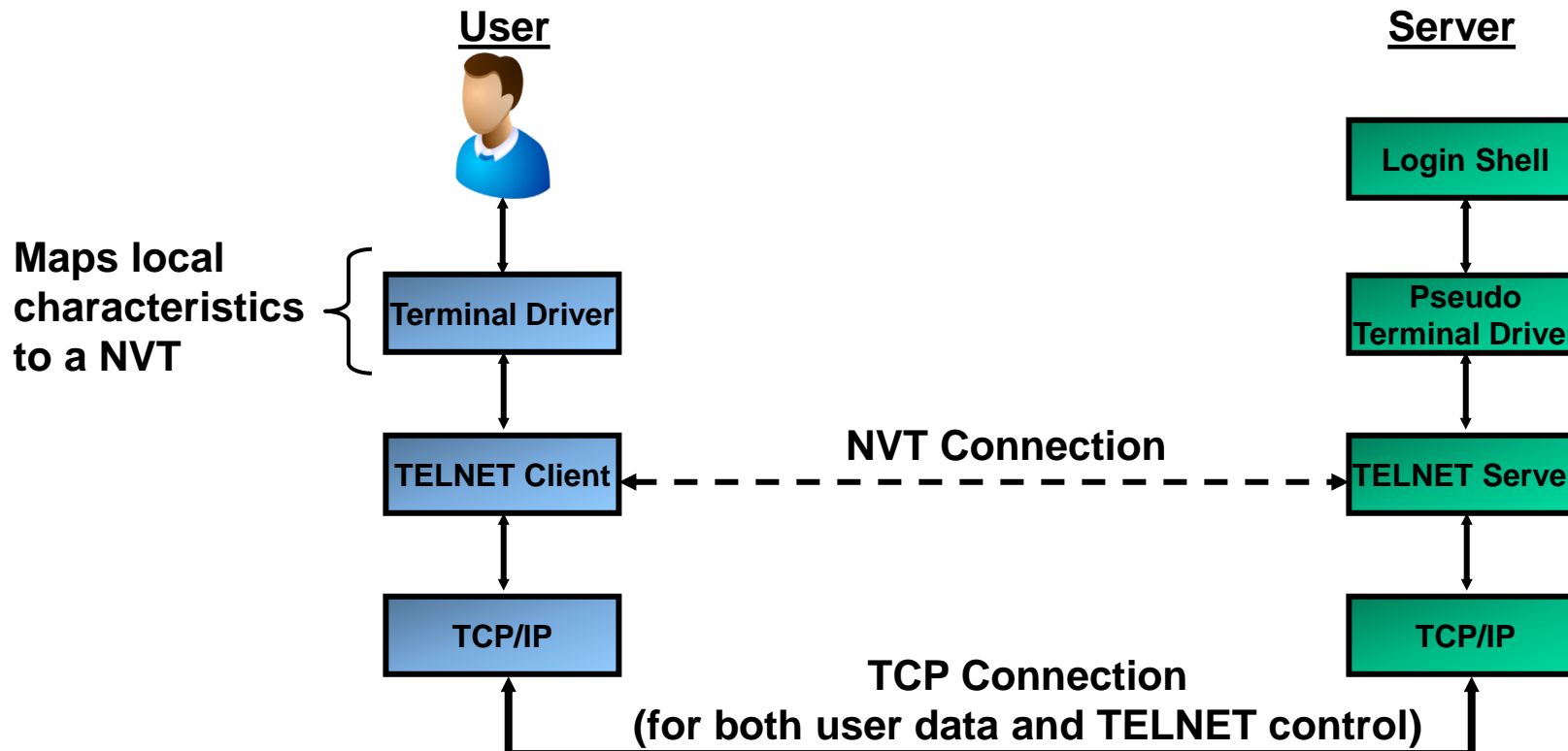
**Peter R. Egli
INDIGOO.COM**

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1. What is TELNET?

- TELNET (RFC854) is a protocol providing platform independent, bi-directional byte-oriented communication between hosts (unlike rlogin which is Unix based).
- Most often TELNET is used for remote login to hosts on the Internet.
- TELNET is basically a TCP connection with interspersed TELNET control information.
- TELNET may use option negotiation for providing additional services.



2. TELNET commands (1/2)

- TELNET commands are used to cause an action at the remote terminal such as erasure of a character (control interaction between client and server).
- TELNET commands (and options) are incorporated into the data stream (in-band signaling).
- Commands are distinguished from user data by setting the MSB (Most Significant Bit) to 1 (non-ASCII characters).
- Commands have the form (IAC=Interpret As Command, hex 0xFF):

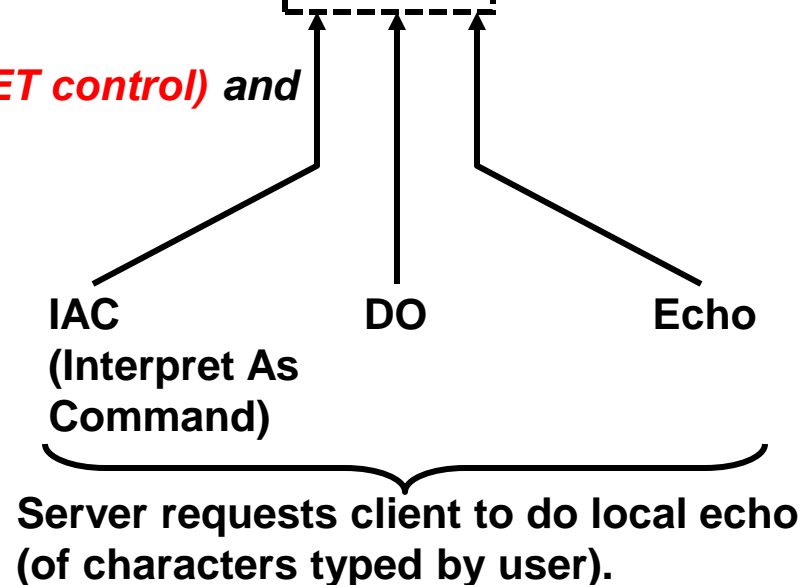
IAC <command> [option]

Example (TELNET session data stream in TCP connection):

... *ff fc 27 ff fc 24 ff fa 18 00 76 74 31 30 30 ff f0* 0d 0a 0d 0a 53 75 6e
 4f 53 20 35 2e 39 0d 0a 0d 00 0d 0a 0d 00 ***ff fd 01*** 6c 6f 67 69 6e 3a 20 ...

where

... ff fc 27 ... are commands (TELNET control) and
... 4f 53 20 ... is user data.



2. TELNET commands (2/2)

TELNET command codes:

Name	Dec/Hex Code	Description
SE	240/0xF0	End of subnegotiation parameters.
NOP	241/0xF1	No operation.
DM	242/0xF2	Data mark: Indicates the position of a Synch event within the data stream. This should always be accompanied by a TCP urgent notification.
BRK	243/0xF3	Break Indicates that the "break" or "attention" key was hit.
IP	244/0xF4	Suspend Interrupt or abort the process to which the NVT is connected.
AO	245/0xF5	Abort output: Allows the current process to run to completion but does not send its output to the user.
AYT	246/0xF6	Are you there: Send back to the NVT some visible evidence that the AYT was received.
EC	247/0xF7	Erase character: The receiver should delete the last preceding undeleted character from the data stream.
EL	248/0xF8	Erase line: Delete characters from the data stream back to but not including the previous CRLF.
GA	249/0xF9	Go ahead Under certain circumstances used to tell the other end that it can transmit.
SB	250/0xFA	Subnegotiation of the indicated option follows.
WILL	251/0xFB	The sender wants to enable the option itself.
WONT	252/0xFC	The sender wants to disable the option itself.
DO	253/0xFD	The sender wants the receiver to enable the option.
DONT	254/0xFE	The sender wants the receiver to disable the option.
IAC	255/0xFF	Interpret as a command

WILL / WONT / DO / DONT
are used for
option negotiation.

3. TELNET options (1/2)

TELNET option negotiation allows the client and server to provide more services than is possible with pure NVT.

TELNET option codes are of the form enable/disable (no parameter for options).

Either side (client and server) can initiate option negotiation at any time (also during data transfer).

There are 6 cases for option negotiation (between sender and receiver):

	<u>Sender</u>	<u>Direction</u>	<u>Receiver</u>	<u>Description</u>	<u>Means</u>
1.	WILL	→ ←	DO	Sender wants to enable option. Receiver says OK.	Option is in effect.
2.	WILL	→ ←	DONT	Sender wants to enable option. Receiver says no.	Option is not in effect.
3.	DO	→ ←	WILL	Sender wants receiver to enable option. Receiver says OK.	Option is in effect.
4.	DO	→ ←	WONT	Sender wants receiver to enable option. Receiver says no.	Option is not in effect.
5.	WONT	→ ←	DONT	Sender wants to disable option. Receiver must say OK.	DONT is only valid response.
6.	DONT	→ ←	WONT	Sender wants receiver to disable option. Receiver must say OK.	WONT is only valid response.

3. TELNET options (2/2)

Options have the form (IAC=Interpret As Command, hex 0xFF):

```
IAC      <command>      <option>
```

TELNET option codes:

Dec/Hex code	Name	RFC
3/0x03	suppress go ahead	858
5/0x05	status	859
1/0x01	echo	857
6/0x06	timing mark	860
24/0x18	terminal type	1091
31/0x1F	window size	1073
32/0x20	terminal speed	1079
33/0x21	remote flow control	1372
34/0x22	linemode	1184
36/0x24	environment variables	1408

4. TELNET sub-options

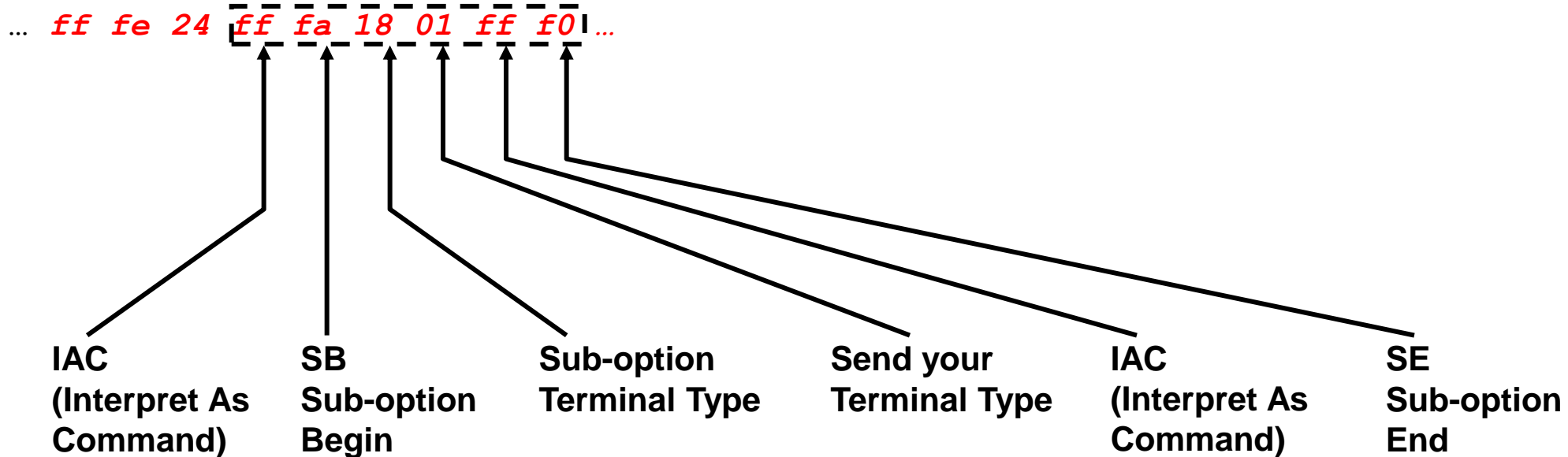
Some options require more information than just enable/disable.

Sub-options have the form:

(IAC=Interpret As Command, hex 0xFF):



Example Sub-option (TELNET session data stream in TCP connection):



5. NVT Network Virtual Terminal (1/2)

Each end of the communication implements an NVT (Network Virtual Terminal).

An NVT is an imaginary device that provides a standard, network-wide intermediate representation of a canonical terminal.

All hosts (user and server) map their local characteristics to the NVT.

NVT is the definition of some standard formatting control codes that must be supported by an NVT-compliant terminal.

NVT uses 7-bit ASCII characters. End-of-line is represented as CRLF (“\r\n”).

NVT mandatory control codes:

Name	Code	Dec/Hex Code	Description
NULL	NUL	0/0x00	No operation.
Line Feed	LF	10/0x0A	Moves the printer (cursor) to the next print line, keeping the same horizontal position.
Carriage Return	CR	13/0x0D	Moves the printer (cursor) to the left margin of the current line.

5. NVT Network Virtual Terminal (2/2)

NVT optional control codes:

Name	Code	Dec/Hex Code	Description
BELL	BEL	7/0x07	Produces an audible or visible signal (which does NOT move the print head (cursor)).
Back Space	BS	8/0x08	Moves the print head one character position towards the left margin. [On a printing devices this mechanism was commonly used to form composite characters by printing two basic characters on top of each other.]
Horizontal Tab	HT	9/0x09	Moves the printer to the next horizontal tab stop. It remains unspecified how either party determines or establishes where such tab stops are located.
Vertical Tab	VT	11/0x0B	Moves the printer to the next vertical tab stop. It remains unspecified how either party determines or establishes where such tab stops are located.
Form Feed	FF	12/0x0C	Moves the printer to the top of the next page, keeping the same horizontal position. [On visual displays this commonly clears the screen and moves the cursor to the top left corner.]