Working Implementation Agreements for Open Systems Interconnection Protocols: Part 14 - Virtual Terminal

Output from the June 1991 NIST Workshop for Implementors of OSI

SIG Chair: **Luke Lucas, Control Data Corporation**
SIG Editor: **Luke Lucas, Control Data Corporation**

Foreword

This part of the Working Implementation Agreements was prepared by the Virtual Terminal Special Interest Group (VTSIG) of the National Institute of Standards and Technology (NIST) Workshop for Implementors of Open Systems Interconnection (OSI). See Procedures Manual for Workshop charter.

Text in this part has been approved by the Plenary of the above-mentioned Workshop. This part replaces the previously existing chapter on this subject.

Three normative annexes are given.

Future changes and additions to this version of these Implementor Agreements will be published as a new part. Deleted and replaced text will be shown as strikeout. New and replacement text will be shown as shaded.

Table of Contents

Part 14 ISO Virtual Terminal Protocol

Editor's Note - References to Stable Agreements in this part refer to Version 4.

0 Introduction

See Stable Agreements.

1 Scope

1.1 Phase Ia Agreements

See Stable Agreements.

1.2 Phase Ib Agreements

See Stable Agreements regarding Forms profile.

The Scroll profile is intended to support line-at-a-time applications and has colour and text attribute capabilities.

1.3 Phase II Agreements

See Stable Agreements regarding X.3 profile.

The Page profiles are intended for applications which require page-oriented operation.

2 Normative References

3 Status

These agreements are being done in phases. Below is the current status of each phase.

3.1 Status of Phase Ia

The Phase Ia Agreements, which include the profiles for Telnet and Transparent operation, are complete and were stabilized in May, 1988. See Stable Agreements.

3.2 Status of Phase Ib

The Forms profile of Phase 1b was stabilized in December, 1988. Alignment with EWOS Forms profile was achieved in September, 1989. See Stable Agreements.

3.3 Status of Phase II

The Phase II agreements include profiles for Scroll, X.3 and Page operations and will be completed at an unspecified future date, except for X.3, as mentioned below.

The X.3 profile was stabilized in December, 1989. See Stable Agreements.

It is intended that Phase II agreements be compatible with Phase I agreements.

4 Errata

5 Conformance

See Stable Agreements.

6 Protocol

See Stable Agreements.

7 OIW Registered Control Objects

7.1 Sequenced Application (SA)

See Stable Agreements.

7.2 Unsequenced Application (UA)

See Stable Agreements.

7.3 Sequenced Terminal (ST)

See Stable Agreements.

7.4 Unsequenced Terminal (UT)

See Stable Agreements.

7.5 Termination Conditions CO (TC)

This CO is an instance of the standard type TCCO, as defined in ISO 9040. It is initially designed for use with the OIW Scroll VT profile, though as a registered CO it is available for use by other VT profiles.

In addition to the three standardized data elements, it provides a definition and update syntax for further types of Termination Condition. Each additional type is available for use in additional data elements of the CO. The number and type of such additional data elements is defined in the profile using this CO.

7.5.1 Entry Number

To be supplied by the Registration Authority.

7.5.2 Name of Sponsoring Body

NIST/OSI Workshop for Implementors of OSI, VTSIG.

7.5.3 Date

The date of submission of this proposal is September 15, 1989.

7.5.4 Identifier

```
oiw-vt-co-tcco-tc  OBJECT IDENTIFIER ::= { oiw-vt-co-tcco    tc(0) }
```

7.5.5 Descriptor Value

"OIW VT CO for Termination Conditions"

7.5.6 CO VTE-parameters

```
CO-structure    =  ,     *(not defined in this registration, see note 1 in 14.7.5.8)*
CO-priority     = "normal"
        {
        CO-element-id  = 1,     *(termination length)*
        CO-category    = "integer",
        CO-size        = 65535 },
        {
        CO-element-id  = 2, *(time-out mantissa)*
        CO-category    = "integer",
        CO-size        = 65535 },
        {
        CO-element-id  = 3, *(time-out exponent)*
        CO-category    = "integer",
        CO-size        = 65535 },
*(the following represents possibly multiple invocations of a generic data element type, according to the
value of CO-structure for the instance of this CO. )*
        FOR N=4 to CO-structure
        {
        CO-element-id  = N,     *(acts as integer identifier for the events in this element)*
        CO-category    = "transparent",
        CO-size        =        *(not defined in this registration, see note 2 in 14.7.5.8)* }
```

7.5.7 CO Values, Semantic and Update Syntax

The value fields for data elements 1,2 and 3 are defined in ISO 9040.

The value field for each additional data element is defined by the following ASN.1 construct which also defines the update syntax.

```
TermCondList  ::= SEQUENCE OF CHOICE {
              void               [0] IMPLICIT NULL,
              x3ForwardingCond   [1] IMPLICIT INTEGER,
              stEventList        [2] IMPLICIT Range,
              anySTUpdate        [3] IMPLICIT NULL,
              stEventMasks       [4] IMPLICIT MaskValues,
              dOChars            [5] IMPLICIT DOCharacters }

Range         ::= SEQUENCE OF SEQUENCE {
                                 [1] IMPLICIT LogEvent,
                                 [2] IMPLICIT LogEvent OPTIONAL }
-- each pair represents an interval of values as defined for the value field of
--CO ST, see 14.7.3.7.  The second value in each pair shall not be smaller than
--the first value.  If the second value is omitted, the interval contains only
--the specified first value.

LogEvent      ::= INTEGER
-- values as defined for value field of CO ST, see 14.7.3.7.

MaskValues    ::= SEQUENCE OF SEQUENCE {
              mask               [1] IMPLICIT LogEvent,
              value              [2] IMPLICIT LogEvent }

DOCharacters  ::= SEQUENCE OF SEQUENCE {
                                 [1] IMPLICIT Repref,
                                 [2] IMPLICIT INTEGER,
                                 [3] IMPLICIT INTEGER OPTIONAL }

Repref        ::= INTEGER
-- index to the list of repertoires for the Display Object
```

7.5.8 Additional Information

NOTE - The value of CO-structure is defined in the profile to be the number of types of termination conditions available for use within the profile.

NOTE - The value of CO-size for each additional data element of this CO must be defined within the profile definition which uses those additional termination conditions.

7.5.9 Usage

Defined in profile.

8 OIW Defined VTE-Profiles

8.1 Telnet Profile

See Stable Agreements.

8.2 Transparent Profile

See Stable Agreements.

8.3 Forms Profile

See Stable Agreements.

8.4 X3 Profile

See Stable Agreements.

8.5 Scroll Profile

OIW VTE-Profile Scroll-1989 (r1,r2,...r9)

8.5.1 Introduction

This Scrolling A-mode VTE-profile is designed to support line-at-a-time interactions between a terminal and a host system, the type of operation typified by operating system command entry.

Scrolling is bi-directional, forward and backward.

The profile also provides a facility for switching local echo "on" or "off".

This VTE-Profile supports what is often referred to as "type-ahead", so input from the terminal user is available to the host application as soon as the application is ready for input, thus providing efficiency by minimizing communication delays.

This VTE-profile supports the definition of "input" termination events by the "Application VT-user" so the application can specify what events will cause "input" data to be forwarded to the "Application VT-user".

8.5.2 Association Requirements

8.5.2.1 Functional Units

The Urgent Data Functional Unit is optional, and will be used if available.

8.5.2.2 Mode

This profile operates in A-mode.

8.5.3 Profile Body

```
Display-objects =
{
        {
        display-object-name = DOA,
        DO-access = profile-argument-rl,
        dimension = "two",
                x-dimension =
                {
                        x-bound = profile-argument-r2,
                        x-addressing = "no-constraint",
                        x-absolute = "no",
                        x-window = x-bound
                },
                y-dimension =
                {
                        y-bound = "unbounded",
                        y-addressing = "no-constraint",
                        y-absolute = "no",
                        y-window = profile-argument-r10
                },

        erasure-capability = "yes",

        *( repertoire-capability is implied by the number of occurrences of profile-argument-r4 )*

        repertoire-assignment = profile-argument-r4,

        DO-emphasis = profile-argument-r5,

        foreground-colour-capability = profile-argument-r6,
```

```
        foreground-colour-assignment = profile-argument-r7,
        background-colour-capability = profile-argument-r6,
        background-colour-assignment = profile-argument-r8
        },
        {
        display-object-name = DOB,
        DO-access = opposite of profile-argument-rl,
        dimension = "two",
                x-dimension =
                {
                        x-bound = profile-argument-r2,
                        x-addressing = "no-constraint",
                        x-absolute = "no",
                        x-window = x-bound
                },
                y-dimension =
                {
                        y-bound = "unbounded",
                        y-addressing = "higher only",
                        y-absolute = "no",
                        y-window = 1
                },
        erasure capability = "yes",
        *( repertoire-capability is implied by the number of occurrences of profile-argument-r4 )*

        repertoire-assignment = profile-argument-r4,

        DO-emphasis = profile-argument-r5,

        foreground-colour-capability = profile-argument-r6,
        foreground-colour-assignment = profile-argument-r7,
        background-colour-capability = profile-argument-r6,
        background-colour-assignment = profile-argument-r8
        }
},

Control-objects =
{
        {
        CO-name                 = E,     *(standard Echo CO)*
        CO-type-identifier      = vt-b-sco-echo,
        CO-access               = profile-argument-r1,
        CO-priority             = "normal",
        CO-trigger              = "selected",
        CO-category             = "boolean",
        CO-size                         = 1
        },
        IF r9 = "TE" THEN
        {
```

```
CO-name                 = TE, *(Termination Event CO)*
CO-type-identifier      = vt-b-sco-tco,
CO-access               = opposite of profile-argument-r1,
CO-priority             = "normal",
CO-trigger              = "selected",
CO-category             = "integer"
},
        {
CO-name                 = SA, *(NIST Registered CO)*
CO-type-identifier      = nist-vt-co-misc-sa,
CO-access               = profile-argument-r1,
CO-priority             = "normal",
CO-trigger              = "not selected",
CO-category             = "integer",
CO-size                 = 65535
},
                {
CO-name                 = UA, *(NIST Registered CO)*
CO-type-identifier      = nist-vt-co-misc-ua,
CO-access               = profile-argument-r1,
CO-priority             = "urgent",
CO-category             = "integer",
CO-size                 = 65535
},
                {
CO-name                 = ST, *(NIST Registered CO)*
CO-type-identifier      = nist-vt-co-misc-st,
CO-access               = opposite of profile-argument-r1,
CO-priority             = "normal",
CO-category             = "integer",
CO-size                 = 65535
},

{
CO-name                 = UT, *(NIST Registered CO)*
CO-type-identifier      = nist-vt-co-misc-ut,
CO-access               = opposite of profile-argument-r1,
CO-priority             = "urgent",
CO-category             = "integer",
CO-size                 = 65535
},
{
CO-name                 = TC, *(Termination conditions CO)*
CO-type-identifier      = nist-vt-co-tcco-tc,
CO-structure            = N, *( defined with TCCO)*
CO-access               = profile-argument-r1,
CO-priority             = "normal",
        {
        CO-element-id   = 1, *(termination length)*
```

```
                CO-category     = "integer",
                CO-size         = 65535 },
                {
                CO-element-id  = 2, *(time-out mantissa)*
                CO-category     = "integer",
                CO-size         = 65535 },
                {
                CO-element-id  = 3, *(time-out exponent)*
                CO-category     = "integer",
                CO-size         = 65535 },
                {
                CO-element-id  = 4-N, *(from registered TCCO)*
                CO-category     = ???,
                CO-size         = ??? }
The NIST Workshop VT SIG is defining this registered TCCO.  This
TCCO is a reference to that registered control object.
        }
}

        Device-objects =
        {
                {
                device-name = DVA,     *("output" device object)*
                device-default-CO-access = profile-argument-rl,
                device-default-CO-initial-value = 1."true",
                device-display-object = DOA,
                device-minimum-X-array-length = profile-argument-r2,
                device-minimum-Y-array-length = profile-argument-r3,
                device-control-object = {SA,UA}
                },
                {
                device-name = DVB,     *("input" device object)*
                device-default-CO-access = opposite of profile-argument-r1,
                device-default-CO-initial-value = 1."true",
                device-display-object = DOB,
                device-minimum-X-array-length = profile-argument-r2,
                device-control-object = profile-argument-r9,
                device-control-object = {ST,UT},
                device-control-object = TE
                }
        },

        type-of-delivery-control = "simple-delivery-control".
```

8.5.4 Profile Argument Definitions

r1 - is mandatory and enables negotiation of which VT-user has update access to display object DOA. It takes values "WACI", "WACA". It implies the asymmetric roles of the VT-users as "Application VT-user" and "Terminal VT-user". If the value for DOA is "WACI", then the association initiator is the "Application VT-user"; if the value of DOA is "WACA", then the association initiator is the "Terminal VT-user". This profile argument is also used to determine which VT-user has access to other VT objects as described above. Reference in the profile definition to "opposite of profile-argument-r1" means that the alternative of the two possible values for profile- argument-r1 is to be used. This argument is identified by the identifier for DO-access for display object DOA.

r2 - is optional and enables negotiation of a value for the VTE-parameter x-bound for the display objects DOA and DOB. It takes an integer value greater than zero. This argument is identified by the identifier for x-bound for display object DOA. Default is 80.

r3 - is optional and enables the negotiation of a value for the VTE-parameter device-minimum-Y-array-length for device object DVA. It takes an integer value greater than zero; if absent, a device of any length will be satisfactory.

NOTE - Indicates screen length.

r4 - is optional and provides for the negotiation of value(s) for the VTE-parameter repertoire-assignment. The value of repertoire-capability is implied by the number of occurrences of this argument. Default is specified by 9040.

r5 - is optional and provides for the negotiation of a value for the VTE-parameter DO-emphasis. The default value is that given in ISO 9040, B.17.3. Refer to ISO 9040 B.17.4 for rules governing the selection of non-default values.

r6 - is optional and provides for the negotiation of value(s) for VTE-parameters foreground-colour-capability and background-colour-capability. Default is 8.

r7 - is optional and provides for the negotiation of a value for VTE-parameter foreground-colour-assignment. Default is {"white", "black", "red", "cyan", "blue", "yellow", "green", "magenta"}.

r8 - is optional and provides for the negotiation of a value for VTE-parameter background-colour-assignment. Default is {"black", "white", "cyan", "red", "yellow", "blue", "magenta","green"}.

r9 - is optional and enables negotiation of a termination control object. The value for this argument is the value of CO-name for the termination control object, i.e. "TE"; if absent, no termination control is defined.

r10 - is optional and provides for the negotiation of a value for the VTE-parameter y-window of the DOA Display Object. Default is 24.

8.5.5 Profile Dependent CO Information

This profile makes use of five NIST registered Control Objects, SA, UA, ST, UT and TCCO. The CO-access in each CO is defined within this profile.

8.5.6 Profile Notes

8.5.6.1 Definitive Notes

Only the first boolean of the default control object contained in each device object is defined. This boolean is defined as the "on/off" switch for the device where the value "true" ="on" and "false" = "off". These values were chosen so the initial value of the boolean, "true", means the device is initially "on" and data to/from the display objects is being mapped to the device.

Only one boolean is defined in the standard echo control object, E. The semantics of this boolean is defined such that "false" means "local echo off" and "true" means "local echo on"; these values were chosen so echoing is initially "off" (which would provide security when a password is entered at the start of a terminal session).

8.5.6.2 Informative Notes

This profile models a scrolling device which is capable of scrolling both forwards and backwards. The display pointer may be moved backwards to modify earlier lines. A typical use for this profile is for applications where type-ahead may be advantageous and control over local echo "on"/"off" is required, e.g. the type of application where a conventional teletypewriter device or ‘teletype-compatible’ video device having ‘full duplex’ capability is often used. Display object DOA referred to above is typically mapped to the display or printing device and display object DOB is typically mapped to the keyboard.

Use of A-mode enables "typed-ahead"into display object DOB, and such updates can be delivered immediately to the peer VT-user, potentially reducing transmission delays. Such delivery will be forced, and marked, by a termination condition or a VT-DELIVER. Type-ahead is at the discretion of the terminal user.

Display object DOB has an unbounded y-dimension so as to provide a blank line for each new line entered.

Line-at-a-time forward scrolling is mapped onto an update-window (value zero) which allows NO backward updates to preceding lines (x-arrays). The device-minimum-Y-array-length negotiated by profile-argument-r3 can be used to indicate the number of lines (x-arrays) which should remain visible to the human terminal user although specifically NOT available for update.

The ability to switch local echo "on" or "off" is always present; the ECHO control object is used for this purpose.

8.5.7 Specific Conformance Requirements

None.

8.6 Generalized Telnet Profile

OIW VTE-Profile Generalized Telnet-1991 (r1,r2)

8.6.1 Introduction

This profile provides support for TELNET-like operation for users of the ISO Virtual Terminal Service. It is based on the IS version of ISO 9040 and ISO 9041. This profile references the ARPA Internet TELNET standards documents for the semantics of option negotiation and the values of symbolic constants.

8.6.2 Association Requirements

8.6.2.1 Functional Units

The Structured Control Objects Functional Unit is required. The Urgent Data Functional Unit is optional, but should be used whenever available.

8.6.2.2 Mode

This is an A-mode profile.

8.6.3 Profile Body

```
Display-objects = *(double occurrence)*
{
        {
        display-object-name     = D, *(DISPLAY)*
        do-access               = "WACA",
        dimensions              = "two",
                x-dimension     =
                {
                        x-bound         = "unbounded",
                        x-addressing    = "no constraint",
                        x-absolute      = "no",
                        x-window        = profile-argument-r1
                },
                y-dimension     =
                {
```

```
                    y-bound         = "unbounded",
                    y-addressing    = "higher only",
                    y-absolute      = "no",
                    y-window        = 1
            },
    erasure-capability      = "yes",
    repertoire-capability   = *(implicitly defined by r2)*,
    repertoire-assignment   = profile-argument-r2,
    repertoire-assignment   = <ESC> 2/5 2/15 4/2
    },
    {
    display-object-name     = K, *(KEYBOARD)*
    do-access               = "WACI",
    dimensions              = "two",
            x-dimension     =
            {
                    x-bound         = "unbounded",
                    x-addressing    = "no constraint",
                    x-absolute      = "no",
                    x-window        = profile-argument-r1
            },
            y-dimension     =
            {
                    y-bound         = "unbounded",
                    y-addressing    = "higher only",
                    y-absolute      = "no",
                    y-window        = 1
            },
    erasure-capability      = "yes",
    repertoire-capability   = *(implicitly defined by r2)*,
    repertoire-assignment   = profile-argument-r2,
    repertoire-assignment   = <ESC> 2/5 2/15 4/2
    },
},

Control-objects = *(multiple occurrence)*
{
    { *(SYNCHRONIZE)*
            CO-name         = SY,
            CO-category     = "symbolic",
            CO-access       = "NSAC",
            CO-size         = 1,
            CO-priority     = "urgent"
    },
    { *(DISPLAY-SIGNAL)*
            CO-name         = DI,
            CO-category     = "symbolic",
            CO-size         = 255,
            CO-access       = "WACA",
```

```
        CO-priority     = "normal",
        CO-trigger      = "selected"
},
{ *(KEYBOARD-SIGNAL)*
        CO-name         = KB,
        CO-category     = "symbolic",
        CO-size         = 255,
        CO-access       = "WACI",
        CO-priority     = "normal",
        CO-trigger      = "selected"
},
{ *(NEGOTIATION BY INITIATOR)*
        CO-name         = NI,
        CO-structure    = 2,
                *(DO/DONT)*
                CO-element-id   = 1,
                CO-category     = "boolean",
                CO-size         = 256,
                *(WILL/WONT)*
                CO-element-id   = 2,
                CO-category     = "boolean",
                CO-size         = 256,
        CO-access       = "WACI",
        CO-priority     = "normal",
        CO-trigger      = "selected"
},
{ *(NEGOTIATION BY ACCEPTOR)*
        CO-name         = NA,
        CO-structure    = 2,
                *(DO/DONT)*
                CO-element-id   = 1,
                CO-category     = "boolean",
                CO-size         = 256,
                *(WILL/WONT)*
                CO-element-id   = 2,
                CO-category     = "boolean",
                CO-size         = 256,
        CO-access       = "WACA",
        CO-priority     = "normal",
        CO-trigger      = "selected"
},
{ *(SUBNEGOTIATION BY INITIATOR)*
        CO-name         = SBI,
        CO-structure    = 2,
                *(TELNET OPTION)*
                CO-element-id   = 1,
                CO-category     = "symbolic",
                CO-size         = 256,
                *(SUBNEGOTIATION)*
```

```
                    CO-element-id   = 2,
                    CO-category     = "character",
                    CO-repertoire-assignment = <ESC> 2/5 2/15 4/2,
                    *(Virtual Terminal Service Transparent Set)*
                    CO-size         = 1024,
          CO-access       = "WACI",
          CO-priority     = "normal",
          CO-trigger      = "selected"
     },
     { *(SUBNEGOTIATION BY ACCEPTOR)*
          CO-name         = SBA,
          CO-structure    = 2,
                    *(TELNET OPTION)*
                    CO-element-id   = 1,
                    CO-category     = "symbolic",
                    CO-size         = 256,
                    *(SUBNEGOTIATION)*
                    CO-element-id   = 2,
                    CO-category     = "character",
                    CO-repertoire-assignment = <ESC> 2/5 2/15 4/2,
                    *(Virtual Terminal Service Transparent Set)*
                    CO-size         = 1024,
          CO-access       = "WACA",
          CO-priority     = "normal",
          CO-trigger      = "selected"
     },

Device-objects = *(double occurrence)*
{
     {
     device-name               = DISPLAY-DEVICE,
     device-display-object     = D,
     device-default-CO-initial-value   = 1."true",*(on)*
     device-minimum-X-array-length = 1,*(no constraint)*
     device-minimum-Y-array-length = 1,*(no constraint)*
     device-control-object     = SY,
     device-control-object     = NA,
     device-control-object     = DI,
     device-control-object     = SBA,
          *(SYNC, NEGOTIATE-ACCEPTOR,
          DISPLAY-SIGNAL, SUBNEGOTIATE-ACCEPTOR)*
     device-default-CO-access         = "WACA",
     device-default-CO-priority       = "normal"
     *(other device object parameters assume corresponding
     DO values)*
     },

     {
     device-name               = KEYBOARD-DEVICE,
```

device-display-object = K,
device-default-CO-initial-value = 1."true",*(on)*
device-minimum-X-array-length = 1,*(no constraint)*
device-minimum-Y-array-length = 1,*(no constraint)*
device-control-object = SY,
device-control-object = NI,
device-control-object = KB,
device-control-object = SBI,
*(SYNC, NEGOTIATE-INITIATOR,
KEYBOARD-SIGNAL, SUBNEGOTIATE-INITIATOR)*
device-default-CO-access = "WACI",
device-default-CO-priority = "normal"
*(other device object parameters assume corresponding
DO values)*
}
Type of delivery control = "simple-delivery-control."

8.6.4 Profile Argument Definitions

r1 - is used to represent the line length as the value of VTE parameter x-window for both display objects. This argument is mandatory and takes a nonnegative integer value. This argument is identified by the identifier for x-window for display object D.

r2 - is used to designate the repertoires for both display objects. This argument is optional, and may occur a number of times in an ordered list to provide for negotiation of values for the VTE-parameter repertoire-assignment. The value for the VTE-parameter repertoire-capability is implied by the number of occurrences of this profile argument. The VTE-parameter repertoire-capability equals the number of occurrences of this profile argument plus one. The default is a single occurrence of the value designating the full US ASCII set. This argument is identified by the identifier for repertoire assignment for display object D.

8.6.5 Profile Dependent CO Information

8.6.6 Profile Notes

8.6.6.1 Definitive Notes

1. Sending a KB or DI control object update is the equivalent of sending a TELNET "IAC <command>" sequence. The symbolic value in the KB or DI control object update is equal to the TELNET command code as specified in the TELNET Assigned Numbers.

The following values must be recognized:
SYMBOLIC NAME VALUE

DM	Data Mark	242
BRK	Break	243
IP	Interrupt Process	244
AO	Abort output	245
AYT	Are You There	246
GA	Go ahead	249

The following values, corresponding to TELNET commands, are excluded from KB and DI control object updates:

SYMBOLIC	NAME	VALUE
SE	End Subnegotiation	240
EC	Erase character	247
EL	Erase Line	248
SB	Subnegotiation	250
WILL	Will	251
WONT	Won't	252
DO	Do	253
DONT	Don't	254
IAC	Escaped IAC	255

The NI and NA control objects are used in place of the DO, DONT, WILL, WONT commands.

The SBI and SBA control objects are used in place of the SB <suboptions> SE command sequence.

The EC and EL commands are replaced by display object updates.

The IAC is not needed because commands are not embedded in the text.

The recognition of values corresponding to TELNET commands defined in a TELNET option will be dependent upon the successful negotiation of the TELNET option that defines the additional TELNET command. Unrecognized values shall be ignored.

2. The equivalent of a TELNET SYNCH command is achieved by updating the SY control object with the single symbolic value of "SYNCH" (which is mapped onto the integer value 1), and immediately updating the DI (or KB) control object with symbolic value DM. When an update to the SY control object is received subsequent display object updates are discarded until an update to the DI or KB control is received with symbolic value DM. If a VT-BREAK is received after an SY CO update has been received and prior to the corresponding DI or KB CO update with symbolic value of DM, the discarding of updates is terminated. This is necessary because the VT-BREAK may have caused the DI or KB CO update to be purged.

3. The NI and NA control objects are used to emulate the TELNET option negotiation facility. The facility is symmetric, allowing either party to open negotiation for a change of mode, and every negotiation must be accepted or rejected by the opposite party. The rules for negotiation for each of the option controls are as stated in the TELNET specification and as given below.

    a. Only open negotiation for a change from the current state.

    b. Only acknowledge negotiation for a change from the current state.

    c. Do not send any object updates with a negotiation outstanding except an update to the NI (or NA) control object to acknowledge negotiation.

    NI and NA are structured control objects consisting of two boolean data elements. For full symmetry, both NI and NA have the same value definitions. The first boolean data element stands for DO/DONT and the second boolean data element stands for WILL/WONT. The ordinal position of the boolean value in the data element corresponds to the TELNET option number plus one. This allows the ordinal position of bits 1-256 in the boolean object to represent the TELNET options values of 0-255. DO is represented as a "true" boolean value in CO-element-id 1. DONT is represented as a "false" boolean value in CO-element-id 1. WILL is represented as a "true" boolean value in CO-element-id 2. WONT is represented as a "false" boolean value in CO-element-id 2.

4. The SBI and SBA control objects provide subnegotiation for TELNET options, and correspond to the TELNET command sequence "IAC SB <TELNET option code> <subnegotiation> IAC SE". Element id 1 contains the TELNET option code, and element id 2 contains the octets that comprise the subnegotiation. The specification for the TELNET option defines the semantics of the value in element id 2.

5. The TELNET EC (erase character) command will be mapped to a pointer relative (x:= x-1) update and an erase current update. The TELNET EL (erase line) command will be mapped to an erase-full-x-array update (an erase operation where the extent is defined as <"start-x,"Yc,Xc-1)> and a pointerupdate to set x = 1. These X dimension updates are the only times when backward explicit addressing is permitted.

6. The X address of the pointer can be moved forward only by implicit pointer addressing. Addressing of the Y dimension is limited to the next X-array update operation.

7. The VT next X-array update operation will be sent in place of the TELNET NVT "CR, LF" sequence.

8. Use of the Transparent character set for the D and K display objects is controlled by the negotiation of the TELNET Binary Option. When a party wants to change a repertoire assignment, it must complete a successful TELNET negotiation to change the option control. Then the party with the access rights to the display object in question is required

to perform the corresponding secondary attribute modal update. If a negotiation to change to "binary" repertoire is refused, the current repertoire will remain in effect. When a negotiation to quit using the "binary" repertoire succeeds, the party with the access rights to the display object in question is required to perform the corresponding secondary attribute modal update to switch to the repertoire designated by the first repertoire-assignment parameter.

9. While the "binary" repertoire is being used no mapping to the pointer addressing or erase operations will be done.

10. The repertoire designation "7-bit ASCII (G0+C0)" refers to the repertoire invoked by ISO 2022 defined character set designating escape sequences <ESC> 2/8 4/2, "void," <ESC> 2/1 4/0. The repertoire designation "7-bit ASCII (G0 only)" refers to the repertoire invoked by ISO 2022 defined character set designating escape sequences <ESC> 2/8 4/2. The designation "binary" refers to the "Virtual Terminal Service Transparent Set" registered in the International Register under ISO 2375 register value 125 and invoked by the escape sequence <ESC> 2/5 2/15 4/2.

11. No termination event list is specified so that data buffering and delivery can be controlled according to context. If local echoing is enabled, the local newline or other event shall trigger a VT-DELIVER request. With remote echo a timeout or buffer length may be used to trigger a VT-DELIVER request. This buffer length may be 1.

8.6.6.2 Informative Notes

1. Users of this profile should refer to the TELNET specification (MIL-STD-1782) and RFCs:

   854 Protocol Specification
   855 Options Specification

   or their successors for semantics of the TELNET commands. These documents can be obtained by contacting SRI International, DDN Network Information Center, 333 Ravenswood Ave., Menlo Park, CA 94025, (415) 859-3695.

2. This profile is derived from the Telnet-1988 profile. The negotiation control objects, NA and NI, have been changed to model the DO/DONT WILL/WONT negotiation of TELNET options. The size of the elements of the NA and NI negotiation control objects equals the range of TELNET option numbers, including the numbers presently assigned and those reserved for future options. An implementation can refuse options that it doesn't support. This allows implementations to maintain interoperability while new TELNET options are incorporated. The CO-category of the KB and DI control objects have been changed from "boolean" to "symbolic". A "Go-Ahead" will be signaled by a control object update to the DI or KB control object with symbolic value of GA; therefore, the GA control object has been dropped.

3. If the "go ahead" facility has been negotiated then following a VT-BREAK, only the association acceptor has the right to send data. In the event of VT-BREAK the echo control objects are reinitialized to "false," meaning local echo. If remote echo is desired it must be re-negotiated following VT-BREAK.

8.6.7 Specific Conformance Requirements

The following character sets are required:

- The G0 character set for U.S. ASCII (values 32-126),
- The full U.S. 7-bit ASCII (values 0-127), and
- The transparent character set, see Definitive Note 8 in section 14.8.1.6.1.

Annex A (normative)

Specific ASE Requirements

See Stable Agreements.

Annex B (normative)

Clarifications

See Stable Agreements.

Annex C (normative)

Object Identifiers

See Stable Agreements for Object Identifiers assigned to objects in the Stable Agreements. Object Identifiers below have been assigned to objects for which work is still in progress.

Profiles defined by OIW VT SIG:

```
oiw-vt-pr-scroll-1989  OBJECT IDENTIFIER ::= { oiw-vt-pr scroll-1989(3) }
```

Control Objects defined by OIW VT SIG:

```
oiw-vt-co-tcco-tc  OBJECT IDENTIFIER ::= { oiw-vt-co-tcco  tc(0) }
```