VDSL and GSHDSL

VDSL and GSHDSL

Very High-Speed Digital Subscriber Line (VDSL) is a digital subscriber line (DSL) technology that provides high-speed data transmission over existing copper telephone wires. It is an advanced version of earlier DSL standards like ADSL, offering significantly faster speeds by utilizing higher frequency ranges

Symmetric High-Speed Digital Subscriber Line (G.SHDSL) is a data communications technology designed for symmetric high-speed data transmission over copper twisted pairs. While the query mentioned G.HDSL, G.SHDSL (standardized as ITU-T G.991.2) is the more modern and widely adopted international standard for symmetric DSL. G.HDSL (G.991.1) is an older standard.

Key characteristics of VDSL

- Speed: VDSL can offer speeds up to 52 Mbit/s downstream and 16 Mbit/s upstream. Its successor, VDSL2 (ITU-T G.993.2), can provide data rates exceeding 100 Mbit/s simultaneously in both upstream and downstream directions, and VDSL2+ can reach 300+ Mbit/s.
- Technology: It uses frequencies up to 12 MHz (VDSL) or up to 30 MHz (VDSL2) to achieve these higher speeds.
- Applications: VDSL is capable of supporting applications such as high-definition television (HDTV), voice over IP (VoIP), and general high-speed internet access over a single connection.
- Distance Sensitivity: The performance of VDSL degrades as the distance from the service provider's equipment increases.

For related information, see VDSL Commands.

Key characteristics of G.SHDSL

G.SHDSL is an international standard that allows devices to send and receive high-speed symmetrical data streams over a single pair of copper wires. This section provides information about the Cisco G.SHDSL EFM/ATM NIM and provides guidelines for configuring G.SHDSL in SD-WAN mode.

- Symmetry: Unlike asymmetric DSL (ADSL), G.SHDSL provides symmetrical transmit and receive data rates, meaning the upload and download speeds are equal.
- Speed: It offers symmetric rates typically ranging from 192 kbit/s to 15296 kbit/s on a single twisted pair.
- Applications: G.SHDSL is often used for high-speed commercial broadband services, enabling applications that require significant data transfer in both directions, such as LAN remote access, web hosting, and combining multiple voice and data channels.
- Compatibility: It is compatible with other DSL technologies and can extend transmission distances while maintaining high data rates.

For related information, see Configuring Cisco G.SHDSL HWICs in Cisco Access Routers and VDSL Commands.

VDSL configuration guidelines

This table provides usage information and guidelines for configuring asymmetric DSL (ADSL2/2+) and VDSL for supported Integrated Services Router Network Interface Modules (ISR NIMs) in SD-WAN mode. VDSL2 and ADSL2/2+ provide highly reliable WAN connections for remote sites.

Function	Command	Guidelines
Configure operating mode	Device# **configure terminal** Device(config)# **controller VDSL** *slot/subslot/port* Device(config)# **operating mode auto**	To switch from operating mode auto adsl1 (adsl2+/ or vdsl2) to operating mode auto ads2+ (adsl1 or vdsl2), switch to operating mode auto first. Before you change the operating mode, ensure that line-mode is changed to line-mode single-wire line 0.
Enable DSL on a line	Device(config)# **line-mode single-wire line** *line-number*	This command is supported only on DSL NIM-VAB-A.
Enable bonding	Device(config)# **line-mode bonding**	This command is supported only on DSL NIM-VAB-A.

Function	Command	Guidelines
Load firmware on a device	Device# **configure terminal** Device(config)# **controller VDSL** *slot* / *subslot* / *port* Device(config-controller)# **firmware phy filename** *filename*	The Cisco Catalyst SD-WAN CLI template does not support specifying the file location. Prepend the file name with flash: or with bootflash:, depending on its location.
Enable or disable SRA	Device(config-controller)# **sra**	The Cisco Catalyst SD-WAN CLI template does not support the sra *line number* command. In line-mode bonding, sra enables sra on both lines and no sra disables sra on both lines.
Enable or disable bitswap	Device(config-controller)# **bitswap**	The Cisco Catalyst SD-WAN CLI template does not support the bitswap *line number* command. In line-mode bonding, bitswap enables bitswap on both lines and no bitswap disables bitswap on both lines.
Enable modem features	Device(config-controller)# **modem** *keyword*	–
Display a description of a controller	Device(config-controller)# **description** *string*	–
Enable dual ended line testing	Device(config-controller)# **diagnostics DELT**	–
Modify the file in which the training log is stored	Device(config-controller)# **training log filename flash:** *filename*	The Cisco Catalyst SD-WAN CLI template does not support specifying the file location. Prepend the file name with flash: or with bootflash:, depending where the file should be stored.
Enable sync mode	Device(config-controller)# **sync mode** *mode*	To switch from one sync mode to another, delete the existing sync mode, then configure the new one.
Enable sync interval	Device(config-controller)# **sync interval** *seconds*	–

Cisco VDSL examples

Configuration example for VDSL:

```
Device# config-transaction
Device(config)# controller VDSL 0/0/0
Device(config)# operating mode auto


Device# config-transaction
Device(config)# line-mode single-wire line 1


Device# config-transaction
Device(config)# line-mode bonding


Device# config-transaction
Device(config)# controller VDSL 0/0/0
Device(config-controller)# firmware phy filename flash:IDC_1.7.2.6_DFE_FW_BETA_120111A.pkg


Device# config-transaction
Device(config-controller)# sra


Device# config-transaction
Device(config-controller)# bitswap


Device# config-transaction
Device(config)# controller VDSL 0/0/0
Device(config-controller)# modem customUKAnnexM


Device# config-transaction
Device(config)# controller VDSL 0/0/0
Device(config-controller)# description to ISP 1


Device# config-transaction
Device(config)# controller VDSL 0/0/0
Device(config-controller)# diagnostics DELT


Device# config-transaction
Device(config)# controller VDSL 0/0/0
Device(config-controller)# training log filename bootflash:VDSLLOG.log



Device# config-transaction
Device(config)# controller VDSL 0/0/0
Device(config-controller)# sync mode ansi previous



Device# configure terminal
Device(config)# ptp clock ordinary domain 0
Device(config-ptp-clk)# clock-port slave slaveport
Device(config-ptp-port)# sync interval -4
Device(config-ptp-port)# end
```

The following example show the VDSL configuration:

```
Device(config)# show controllers vdSL 0/2/0
Controller VDSL 0/2/0 is UP

Daemon Status:          UP

                        XTU-R (DS)              XTU-C (US)
```

```
Chip Vendor ID:          'BDCM'                   'BDCM'
Chip Vendor Specific:    0x0000                   0xA39A
Chip Vendor Country:     0xB500                   0xB500
Modem Vendor ID:         'CSCO'                   'BDCM'
Modem Vendor Specific:   0x4602                   0x0000
Modem Vendor Country:    0xB500                   0xB500
Serial Number Near:      FGL2149956Y C1117-4P 16.7.20180
Serial Number Far:
Modem Version Near:      16.7.20180709:09395
Modem Version Far:       0xa39a

Modem Status:            TC Sync (Showtime!)
DSL Config Mode:         AUTO
Trained Mode:            G.993.2 (VDSL2) Profile 17a

TC Mode:                 PTM
Selftest Result:         0x00
DELT configuration:      disabled
DELT state:              not running

Failed full inits:       0
Short inits:             0
Failed short inits:      0

Modem FW  Version:       4.14L.04
Modem PHY Version:       A2pv6F039t.d26d

Line 0:

                         XTU-R (DS)               XTU-C (US)
Trellis:                  ON                       ON
SRA:                      enabled                  enabled
SRA count:                0                        0
Bit swap:                 enabled                  enabled
Bit swap count:           1                        3
Line Attenuation:         18.4 dB                   0.0 dB
Signal Attenuation:        0.0 dB                   0.0 dB
Noise Margin:              5.2 dB                  6.0 dB
Attainable Rate:         46022 kbits/s            18866 kbits/s
Actual Power:            14.5 dBm                 10.4 dBm
Per Band Status:         D1      D2      D3      U0      U1      U2      U3
Line Attenuation(dB):    13.9    32.7    50.1    N/A     25.6    37.7    42.3
Signal Attenuation(dB):  13.5    32.4    N/A     N/A     25.0    36.9    41.9
Noise Margin(dB):        5.3     5.1     N/A     N/A     6.0     6.0     5.9
Total FECC:              446                      0
Total ES:                3                        0
Total SES:               0                        0
Total LOSS:              0                        0
Total UAS:               50                       50
Total LPRS:              0                        0
Total LOFS:              0                        0
Total LOLS:              0                        0


                  DS Channel1     DS Channel0   US Channel1       US Channel0
Speed (kbps):              NA           47610            NA             18859
SRA Previous Speed:        NA               0            NA                 0
Previous Speed:            NA               0            NA                 0
Reed-Solomon EC:           NA             446            NA                 0
CRC Errors:                NA              51            NA                 0
Header Errors:             NA            3935            NA                 0
Interleave (ms):           NA            1.00            NA              1.00
Actual INP:                NA            0.00            NA              0.00
```

```
Training Log :  Stopped
Training Log Filename : flash:vdsllog.bin
```

GSHDSL configuration guidelines

This table provides usage information and guidelines that apply when you configure the Cisco G.SHDSL EFM/ATM in CPE or CO mode.

Function	Command	Guidelines
Configure a device with the dsl-group auto command	Device(config-controller)# **dsl-group auto**	Use customer premises equipment (CPE) mode when configuring a device with the dsl-group auto command. If you use this command in Central Office (CO) mode, the configuration does not take effect.
Add or delete a link	—	The efm-grp command is not supported. To add or delete a link to a dsl-group, delete the dsl-group, then create a new dsl-group.
Load firmware on a device	Device(config-controller)# **firmware phy filename** *location*	File name location options are not supported when using the firmware phy command. Prepend the file name with flash: or with bootflash:, depending on the location.
Create or delete an annex	Device(config-controller-dsl-group)# **no shdsl annex** Device(config-controller-dsl-group)# **no shdsl rate** *rate*	To avoid Cisco IOS and Cisco Catalyst SD-WAN configuration from going out of sync when you create or delete an annex, create or delete the rate in the same transaction.
Enable SHDSL to use enhanced mode	(config-controller-dsl-group)# **shdsl 4-wire mode enhanced**	To enable SHDSL to use the enhanced mode in a 2-pair digital subscriber line (DSL) group, use the shdsl 4-wire mode enhanced command in configuration controller DSL group mode.
Ignore CRC errors	(config-controller-dsl-group)# **ignore** *seconds*	To configure a device to ignore CRC errors, use the ignore command. Replace *timeout* with a value from 0 through 60, which indicates the number of seconds that the device ignores CRC errors that do not resolve before the device terminates an action.

Function	Command	Guidelines
Shutdown a DSL group	(config-controller-dsl-group)# **shutdown**	To shut down a DSL group, use the shutdown command.

GSHDSL EFM-ATM NIM

G.SHDSL EFM/ATM NIM

The Cisco G.SHDSL EFM/ATM NIM connects Cisco 4000 Series Integrated Services Routers with central office Digital Subscriber Line Access Multiplexers (DSLAMs) and supports up to four DSL pairs. The DSL pairs are bundled in groups and configured in the Cisco IOS CLI by using the dsl-group command. Use the mode command to choose the mode (ATM or EFM).

The NIM supports the following configuration:

- You can configure up to four DSL groups.
- You can configure auto mode on only one DSL group. For example, DSL group 0.
- In ATM Mode, you can configure the lines to use 2-wire, 4-wire (standard or enhanced), or m-pair.
- In EFM mode, you can configure a DSL group with any one of the lines in 2-wire non-bonding mode or with multiple lines in bonding mode.
- Depending on the mode (ATM or EFM), the corresponding interface (ATM or EFM) is automatically created.

Cisco GSHDSL examples

Configuration example for GSHDSL:

```
Device# config-transaction
Device(config)# controller SHDSL 0/0/0
Device(config-controller)# dsl-group auto


Device# config-transaction
Device(config)# controller VDSL 0/0/0
Device(config-controller)# firmware phy filename bootflash:IDC_1.1.1.0_DFE_1.1-1.8.1__001.pkg



Device# config-transaction
Device(config)# controller SHDSL 0/0/0
Device(config-controller)# dsl-group 0 pairs 0
Device(config-controller-dsl-group)# no shdsl annex
Device(config-controller-dsl-group)# no shdsl rate 5696


Device# config-transaction
Device(config)# controller SHDSL 0/0/0
Device(config-controller)# termination cpe
Device(config-controller)# dsl-group 0 pairs 0
```

```
(config-controller-dsl-group)# shdsl 4-wire mode enhanced


Device# config-transaction
Device(config)# controller SHDSL 0/0/0
Device(config-controller)# termination cpe
Device(config-controller)# dsl-group 0 pairs 0
config-controller-dsl-group)# ignore 30


Device# config-transaction
Device(config)# controller SHDSL 0/0/0
Device(config-controller)# termination cpe
Device(config-controller)# dsl-group 0 pairs 0
config-controller-dsl-group)# shutdown
```

The following example show the GSHDSL configuration:

```
Device# show controllers shDSL 0/1/0
Controller SHDSL 0/1/0 is UP
  Hardware is NIM-SHDSL-EA, on slot 0,bay 0
  Capabilities: EFM: 2-wire, EFM-Bond, Annex A, B, F & G
                ATM: 2-wire, Mpair, Annex A, B, F & G
  CPE termination
  cdb=0x7F7EB723D8A8
  Vendor: Intel, Chipset: SOCRATES-4e
  PHY Source: System
  IDC Firmware version: 0.0.0.0
  DFE Firmware version:
  Group 0 info:
        Type: EFM Auto status: Down
         Ethernet Interface: Ethernet0/1/0, hwidb: 0x7F7EB723B648
         ATM Interface: ATM0/1/0, hwidb: 0x7F7EB724CE08
        Configured/active num links: 4/0, bit map: 0xF/0x0
        Line termination: CPE, Annex: auto
        PMMS disabled,Line coding: AUTO-TCPAM
        Configured/actual rate: AUTO/0 kbps
        Dying Gasp: Present
        SHDSL wire-pair (0) is in DSL DOWN state
                LOSWS Defect alarm: none
                SNR Margin alarm: none
                Loop Attenuation alarm: none
                Termination: CPE, Line mode: EFM Auto, Annex: auto
                Line coding: AUTO-TCPAM
                Configured/actual rate: AUTO/0 kbps
                Modem status: DOWN_NOT_READY,Condition: NO_COND_
        DSL Stats:
                Power Back Off: 0dB
                LoopAttn: 0dB, SnrMargin: 0dB
                Current 15 minute statistics (Time elapased 1 seconds)
                        ES:0, SES:0, CRC:0, LOSWS:0, UAS:0
                Previous 15 minute statistics
                        ES:0, SES:0, CRC:0, LOSWS:0, UAS:0
                Current 24 hr statistics
                        ES:0, SES:0, CRC:0, LOSWS:0, UAS:0
                Previous 24 hr statistics
                        ES:0, SES:0, CRC:0, LOSWS:0, UAS:0
        EFM Stats:
                EFM-TC Tx: data frames: 0
                EFM-TC Rx: data frames: 0
        SHDSL wire-pair (1) is in DSL DOWN state
                LOSWS Defect alarm: none
                SNR Margin alarm: none
                Loop Attenuation alarm: none
                Termination: CPE, Line mode: EFM Auto, Annex: auto
```

```
                Line coding: AUTO-TCPAM
                Configured/actual rate: AUTO/0 kbps
                Modem status: DOWN_NOT_READY,Condition: NO_COND_
        DSL Stats:
                Power Back Off: 0dB
                LoopAttn: 0dB, SnrMargin: 0dB
                Current 15 minute statistics (Time elapased 1 seconds)
                        ES:0, SES:0, CRC:0, LOSWS:0, UAS:0
                Previous 15 minute statistics
                        ES:0, SES:0, CRC:0, LOSWS:0, UAS:0
                Current 24 hr statistics
                        ES:0, SES:0, CRC:0, LOSWS:0, UAS:0
                Previous 24 hr statistics
                        ES:0, SES:0, CRC:0, LOSWS:0, UAS:0
        EFM Stats:
                EFM-TC Tx: data frames: 0
                EFM-TC Rx: data frames: 0
        SHDSL wire-pair (2) is in DSL DOWN state
                LOSWS Defect alarm: none
                SNR Margin alarm: none
                Loop Attenuation alarm: none
                Termination: CPE, Line mode: EFM Auto, Annex: auto
                Line coding: AUTO-TCPAM
                Configured/actual rate: AUTO/0 kbps
                Modem status: DOWN_NOT_READY,Condition: NO_COND_
        DSL Stats:
                Power Back Off: 0dB
                LoopAttn: 0dB, SnrMargin: 0dB
                Current 15 minute statistics (Time elapased 1 seconds)
                        ES:0, SES:0, CRC:0, LOSWS:0, UAS:0
                Previous 15 minute statistics
                        ES:0, SES:0, CRC:0, LOSWS:0, UAS:0
                Current 24 hr statistics
                        ES:0, SES:0, CRC:0, LOSWS:0, UAS:0
                Previous 24 hr statistics
                        ES:0, SES:0, CRC:0, LOSWS:0, UAS:0
        EFM Stats:
                EFM-TC Tx: data frames: 0
                EFM-TC Rx: data frames: 0
        SHDSL wire-pair (3) is in DSL DOWN state
                LOSWS Defect alarm: none
                SNR Margin alarm: none
                Loop Attenuation alarm: none
                Termination: CPE, Line mode: EFM Auto, Annex: auto
                Line coding: AUTO-TCPAM
                Configured/actual rate: AUTO/0 kbps
                Modem status: DOWN_NOT_READY,Condition: NO_COND_
        DSL Stats:
                Power Back Off: 0dB
                LoopAttn: 0dB, SnrMargin: 0dB
                Current 15 minute statistics (Time elapased 1 seconds)
                        ES:0, SES:0, CRC:0, LOSWS:0, UAS:0
                Previous 15 minute statistics
                        ES:0, SES:0, CRC:0, LOSWS:0, UAS:0
                Current 24 hr statistics
                        ES:0, SES:0, CRC:0, LOSWS:0, UAS:0
                Previous 24 hr statistics
                        ES:0, SES:0, CRC:0, LOSWS:0, UAS:0
        EFM Stats:
                EFM-TC Tx: data frames: 0
                EFM-TC Rx: data frames: 0
Group 1 is not configured
Group 2 is not configured
Group 3 is not configured
```