CISCO ONE AND TWO PORT
T1/E1 MULTIFLEX VOICE/WAN INTERFACE CARDS

Flexible multiservice solution supports multiple voice, data and integrated voice/data applications, facilitating the migration from data only or channelized voice and data to packet voice solutions and simplifying deployment, management and sparing.

INTRODUCTION

The Cisco 1 and 2-port T1/E1 Multiflex Voice/WAN Interface Cards ("Multiflex VWICs") support voice, and data applications in Cisco 2600, 2800, 3600, 3700, and 3800 multiservice routers. The Multiflex VWIC combines WAN Interface Card (WIC) and Voice Interface Card (VIC) functionality to provide unparalleled flexibility, versatility and investment protection through its many uses. Customers who choose to integrate voice and data in multiple steps preserve their investment in a T1/E1 WAN interface since the Multiflex VWIC can be reused in packet voice applications.

The T1/E1 Multiflex Voice/WAN Interface Cards are offered in single and dual port versions which can be used and then re-deployed as network requirements change, thereby addressing several applications:

- *Data*—As a WIC for T1/fractional T1, and E1/fractional E1 applications. The 1- and 2- port E1 versions include models that support unframed G.703. To simplify remote management issues the T1 version integrates a fully managed data service unit/channel service unit (DSU/CSU) and the E1 version includes a fully managed DSU.
- *Packet Voice*—As a VIC for the Digital T1/E1 Packet Voice Trunk Network Module (NM-HDV), IP Communication Voice Network Module (NM-HD-2VE), and IP Communication High-Density Voice Network Module (NM-HDV2) to provide T1 or E1 connections to Private Branch Exchanges (PBXs) and central offices (COs) enabling new services and reducing voice/fax toll charges.
- *Multiplexed Voice/Data*—As a dual port T1 or E1 Drop and Insert Multiplexer with integrated DSU/CSUs, reducing the complexity and number of network components and facilitating a graceful migration to bandwidth efficient packet voice.

Figure 1.   Cisco Dual Port T1/E1 Multiflex Voice/WAN Interface Card

VWIC-1MFT-T1, VWIC-2MFT-T1, VWIC-2MFT-T1-D1, VWIC-1MFT-E1, VWIC-2MFT-E1, VWIC-2MFT-E1-DI, VWIC-1MFT-G703, VWIC-2MFT-G703

KEY BENEFITS

Reduces networking lifecycle costs

- Enables graceful migration from data-only to multiplexed voice and data to packetized voice applications
- Reduces training, deployment, management and sparing inventory over single purpose interfaces Maximizes investment protection
- Multifunction support for LAN to LAN routing, multiplexed voice and data, and packetized voice
- Modules shared between Cisco 2600, 2800, 3600, 3700 and Cisco 3800 series
- E1 versions support both balanced and unbalanced modes
- Specific models to support E1 G.703 unframed for utilizing the full 2.048 Mbps (Note: The G.703 models can also be configured for framed mode where they support all the features of the other VWIC models). Improves branch-office network manageability and reliability
- Eliminates costly external third party CSU/DSUs and drop and insert multiplexers
- Simplifies remote network management by allowing a single management tool such as CiscoView or CiscoWorks to support router, CSU/DSU, drop and insert multiplexer

Maximizes system resources
- Increases T1/E1 port density supported on Cisco 2600, 2800, 3600, 3700 and 3800 multiservice access routers - up to 4 T1/E1 with integrated CSU/DSU in a single Network Module slot or up to two T1/E1 connections in a single WIC slot
- Easy Migration to bandwidth efficient packet voice, enabling new services

Customers who choose to integrate voice and data in stages preserve their investment in WAN interfaces. For example, the Multiflex VWIC can support data only applications as a WAN interface, then be re-used to integrate voice and data with the Drop and Insert multiplexer functionality and/or configured to support packetized voice (Voice over IP [VoIP] or Voice over Frame Relay [VoFR]) when in the NM-HDV, NM-HD-2VE, or NM-HDV2.

APPLICATIONS

Packet Voice Solutions: PBX and CO Connectivity

The Multiflex VWICs supply private branch exchange (PBX) and public switched telephone network (PSTN) connectivity for the NM-HDV, NM-HDV-2VE, or NM-HDV2 via digital T1/E1 ports. The NM-HDV, NM-HDV-2VE, and NM-HDV2 support industry standard H.323 based VoIP, industry standards FRF.11 and FRF.12 based VoFR, and AAL5 based VoATM.

Please note that for each of these packet voice applications (VoIP, VoFR, or VoATM), an appropriate WAN interface card is also required.

Data Solutions: 1 and 2-port T1/E1 WIC with Integrated DSU/CSU

The Multiflex VWICs simplify branch office connectivity by integrating the functionality of a router, T1/E1, fractional T1/E1 serial interface with a fully managed DSU/CSU.

When used for "data-only" WAN connectivity, the Multiflex VWICs support numerous functions, including Cisco IOS® command line interface initiated loopback control, similar to the popular WIC-1DSU-T1. Additionally the Multiflex VWIC is also offered in a dual port versions, including dual E1 configurations, enabling increased WAN port density in Cisco 26/28/36/37/3800 series multiservice access routers. The E1 VWIC versions include integrated DSUs, while the T1 VWIC versions integrate CSU and DSU functionality, simplifying remote network management.

The 2-port Multiflex VWICs increase configuration flexibility on Cisco multiservice access routers eliminating the need for 2 single-port T1/E1 WAN interface cards. Increasing the T1/E1 port density in a single WIC slot enables applications such as local serial aggregation with the WIC-2T or WIC-2A/S, or ISDN backup with the WIC-1B-S/T or WIC-1B-U.

The VWICs also support a channelized capability where the T1 or E1 service can be flexibly split into two or more fractional channel groups. Thus a single physical port can provide connection to multiple sites. (Note: when choosing this mode only a single port can be supported in each WIC slot.)

The VWIC-1MFT-G703 and VWIC-2MFT-G703 not only support unframed G.703 but also support all the features of the other VWICs including Drop and Insert on the VWIC-2MFT-G703. Additional flexibility is provided on the VWIC-2MFT-G703 with the capability to configure one port for unframed G.703 while configuring the other for standard framed E1.

Multiplexed Voice/Data Solutions: 2-port T1/E1 Drop and Insert Multiplexer with Integrated DSU/CSU

These 2-port Multiflex VWICs simplify branch office connectivity by enabling a Cisco 2600, 2800, 3600, 3700 or 3800 to consolidate the functions of a router, a fully managed Drop and Insert Multiplexer, and a fully managed DSU/CSU into a single box. Typically a Drop and Insert multiplexer is used for channelized (i.e. Time Division Multiplexing [TDM]) integration of voice and data onto a single T1/fractional T1 or E1/fractional E1 connection to the CO. Sharing a line can significantly reduce costs over that of two separate physical lines to the CO. While the normal use is for voice and data sharing of a T1 or E1 service, the Drop and Insert capability can also be used for video and data, or data and data sharing of the service (e.g. two routers).

Moreover, the Enhanced Availability Drop and Insert (EADI) feature enhances system availability by allowing the Cisco IOS software to be reloaded while maintaining time division multiplexing (TDM) switching.

Figure 2. Drop and Insert to Share a T1/FT1 or E1/FE1 Service
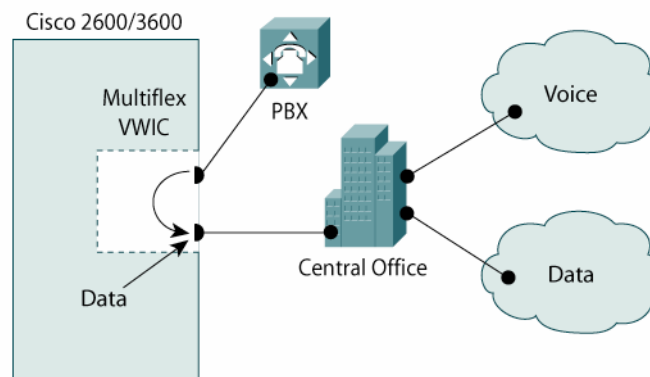
To illustrate, consider the example of a PBX with a T1 interface that needs to support a maximum of 10 simultaneous calls. With 24 DS0s in a T1 Service (1.544 Mbps) this leaves 14 DS0s or 896 Kbps of bandwidth for data from the router (14 x 64 Kbps). The number of DS0s assigned for PBX calls and the remainder that are available for use with router data are fully configurable (statically, not dynamically). In the case of an E1 service 30 DS0s are available for division between voice and router data.

In this example one port of the 2-port Drop and Insert Multiflex VWIC is connected to the PBX and the other port is connected to the CO. The 10 DS0s from the PBX are TDM switched to the "CO port" and this switching is done on the VWIC itself. The configuration of this TDM switching is flexible so that DS0s on the "PBX port" do not have to be mapped to DS0s with the same timeslots on the "CO port". The remaining 14 DS0s on the VWIC "CO port" terminate through the VWIC's backplane connector on the router as a single aggregate channel group. The 14 DS0s are not individually addressable by the router as a channelized service, but can be split into two or more channel groups. (See Table 2 for specifics.)

The 2-port Drop and Insert Multiflex VWIC is the model included in the 2-port versions of the Digital T1/E1 Packet Voice Trunk Network Module. The term "drop and insert" is normally used when router data (or data from another data device) is multiplexed with voice calls. A more generic term for "drop and insert" is "digital cross connect". Digital cross connecting of voice channels only is supported by the 2-port Drop and Insert Multiflex VWIC when in the NM_HDV, NM-HD-2VE, or NM-HDV2. For example, a single T1 connection from a PBX to the "PBX port" on the VWIC can

be divided up between DS0s that go to the NM-HDV for packetized voice (e.g. VoIP), and DS0s that are TDM switched to the "CO port" of the VWIC for standard circuit switched voice connectivity.

In addition to support for Drop and Insert, the 2-port Drop and Insert VWICs have all the fuctionality of the 1- and 2-port Multiflex VWICs. Thus, for example, in a Cisco 2600 they can serve as 2-port T1/E1 interfaces with integrated DSU/CSU when drop and insert is not configured.

Table 1. Multiflex VWIC Platform Support and Minimum Cisco IOS Release Requirements

	VWIC-1MFT-T1	VWIC-2MFT-T1	VWIC-2MFT-T1-D1	VWIC-1MFT-E1	VWIC-2MFT-E1	VWIC-2MFT-E1-D1	VWIC-1MFT-G703	VWIC-2MFT-G703
C2600 Chassis WIC Slots	12.0(5)XK	12.0(5)XK	12.0(5)XK	12.0(5)XK	12.0(5)XK	12.0(5)XK	12.1(1)T	12.1(1)T
C2600 NM-2W	12.0(7)XK	12.0(7)XK	12.0(7)XK	12.0(7)XK	12.0(7)XK	12.0(7)XK	12.1(1)T	12.1(1)T
C2600XM Chassis WIC Slots	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T
C2600XM NM-2W	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T
C2691 Chassis WIC Slots	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T
C2691 Ethernet NMs* C2691 Fast Ethernet NMs**	No	No	No	No	No	No	No	No
C2691 Fast Ethernet NMs**	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T
C3620 and C3640 Ethernet NMs*	12.0(5)XK	No	12.0(5)XK	12.0(5)XK	No	12.0(5)XK	12.1(1)T	No
C3620 and C3640 Fast Ethernet NMs**	12.0(7)XK	12.0(7)XK	12.0(7)XK	12.0(7)XK	12.0(7)XK	12.0(7)XK	12.1(1)T	12.1(1)T
C3631 Chassis WIC Slots	12.2(2)XT1	12.2(2)XT1	12.2(2)XT1	12.2(2)XT1	12.2(2)XT1	12.2(2)XT1	12.2(2)XT1	12.2(2)XT1
C3631 Ethernet NMs*	No	No	No	No	No	No	No	No
C3631 Fast Ethernet NMs**	No	No	No	No	No	No	No	No
C3660 Ethernet NMs*	No	No	No	No	No	No	No	No
C3660 Fast Ethernet NMs**	12.0(7)XK	12.0(7)XK	12.0(7)XK	12.0(7)XK	12.0(7)XK	12.0(7)XK	12.1(1)T	12.1(1)T
C3700 Chassis WIC Slots	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T
C3700 Ethernet NMs*	No	No	No	No	No	No	No	No
C3700 Fast Ethernet NMs**	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T	12.2(8)T
C2800 Chassis HWIC Slots	12.3(8)T4	12.3(8)T4	12.3(8)T4	12.3(8)T4	12.3(8)T4	12.3(8)T4	12.3(8)T4	12.3(8)T4

	VWIC-1MFT-T1	VWIC-2MFT-T1	VWIC-2MFT-T1-D1	VWIC-1MFT-E1	VWIC-2MFT-E1	VWIC-2MFT-E1-D1	VWIC-1MFT-G703	VWIC-2MFT-G703
C3800 Chassis HWIC Slots	12.3(11)T	12.3(11)T	12.3(11)T	12.3(11)T	12.3(11)T	12.3(11)T	12.3(11)T	12.3(11)T

*Ethernet NMs: NM-1E2W, NM-2E2W, NM-1E1R2W

** Fast Ethernet NMs: NM-1FE2W, NM-2FE2W, NM-1FE1R2W, NM-2W

Table 2. Multiflex VWIC Feature Comparison and Cisco IOS Release Requirements

	Data Support WIC mode	Voice Support VIC Mode	Add/Drop Multiplexing	Unframed E1 G.703	Channel Groups on One Port	Management and Diagnostics
WIC-1DSU-T1	Yes	No	No	No	No	Yes
VWIC-1MFT-T1	Yes	Yes	No	No	Yes[3]	Yes[4,5,6]
VWIC-2MFT-T1	Yes	Yes	No	No	Yes[3]	Yes[4,5,6]
VWIC-2MFT-T1-DI	Yes	Yes	Yes[7]	No	Yes[3]	Yes[4,5,6]
VWIC-1MFT-E1	Yes	Yes	No	No	Yes[3]	Yes[4,5,6]
VWIC-2MFT-E1	Yes	Yes	No	No	Yes[3]	Yes[4,5,6]
VWIC-2MFT-E1-DI	Yes	Yes	Yes[7]	No	Yes[3]	Yes[4,5,6]
VWIC-1MFT-G703[8]	Yes	Yes	No	Yes	Yes[3]	Yes[4,5,6]
VWIC-2MFT-G703[9]	Yes	Yes	Yes[7]	Yes	Yes[3]	Yes[4,5,6]

[3] When the channel groups mode is enabled only one physical port is supported by the WIC slot. Add/Drop multiplexing is still supported in this mode since only one port terminates on the router.

[4] BERT support requires Cisco IOS 12.1(1)T or later releases.

[5] V.54 loopback requires Cisco IOS 12.1(1)T or later releases.

[6] T1 ESF and SF remote loopback initiation and detection requires Cisco IOS 12.1(2)X, 12.1(3)T (Summer 2000) or later releases.

[7] Enhanced Availability Drop and Insert (EADI) requires Cisco IOS 12.1(2)X, 12.1(3)T (Summer 2000) or later releases.

[8] The 1-port G703 VWIC can be configured as a standard E1 interface and therefore has all the features of the VWIC-1MFT-E1 when not in unframed G.703 mode.

[9] The 2-port G703 VWIC can be configured as a standard E1 interface and therefore has all the features of the VWIC-2MFT-E1-DI when not in unframed G.703 mode.

SPECIFICATIONS

Product Number	Description
VWIC-1MFT-T1	1-Port RJ-48 Multiflex Trunk-T1
VWIC-2MFT-T1	2-Port RJ-48 Multiflex Trunk-T1
VWIC-2MFT-T1-DI	2-Port RJ-48 Multiflex Trunk-T1 With Drop and Insert

Product Number	Description
VWIC-1MFT-E1	1-Port RJ-48 Multiflex Trunk-E1
VWIC-2MFT-E1	2-Port RJ-48 Multiflex Trunk-E1
VWIC-2MFT-E1-DI	2-Port RJ-48 Multiflex Trunk-E1 With Drop and Insert
VWIC-1MFT-G703	1-Port RJ-48 Multiflex Trunk-E1 G.703
VWIC-2MFT-G703	2-Port RJ-48 Multiflex Trunk-E1 G.703
CAB-E1-RJ45BNC	E1 Cable RJ-45 to Dual BNC (Unbalanced)
CAB-E1-RJ45TWIN	E1 Cable RJ-45 to Twinax (Balanced)

Cisco IOS Software Release

See Table 1 and 2. Feature and platform support vary by release. First supported in Cisco IOS 12.0(5) XK.

Data Features

- T1/E1 or fractional T1/E1 network interface
- N X 64 Kbps or N X 56 Kbps, nonchannelized data rates (T1:N=1 to 24, E1:n=1 to 31)
- Standards based, including ANSI T1.403 and AT&T Publication 62411

T1 Network Interface	
Transmit Bit Rate	1.544 Mbps +/– 50 bps/32 PPM
Receive Bit Rate	1.544 Mbps +/– 50 bps/32 PPM
Line Code	AMI, B8ZS
AMI Ones Density	Enforced for N x 56 Kbps channels
Framing Format	D4 (SF) and ESF
Output level (LBO)	0, –7.5, or –15 dB
Input Level	+1dB0 down to –24 dB0
DTE Interface (WIC mode)	Fractional Service
DTE Interface (VIC mode)	G.704/structured
DCE Interface	G.704/structured

E1 Network Interface	
Transmit Bit Rate	2.048 Mbps +/– 100 bps/50 PPM
Receive Bit Rate	2.048 Mbps +/– 100 bps/50 PPM
Data Rate	1.984 Mbps (framed mode) Per E1 Port

E1 Network Interface	
Clocking	Internal and Loop (recovered from network)
E1 National Bits	Fixed (non-configurable)
Encoding	HDB3
DTE Interface (WIC mode)	Fractional Service
DTE Interface (VIC mode)	G.704/structured
DCE Interface	G.704/structured

Dimensions and Weight (H x W x D)

- 0.8 in. x 3.1 in. x 4.8 in.
- (2.1 x 7.9 x 12.2 cm)

Weight

- .12 lb (56 g) (minimum)
- .18 lb (81 g) (maximum)

Diagnostics

- ANSI T1.403 Annex B/V.54 loopup/down code recognition, network loopback, and user initiated loopbacks, network payload loopback, local data terminal equipment (DTE) loopback, remote line (codes: V.54, loop up, and loop down)
- BERT patterns all 0's, all 1's, 1:2, 1:8, 3:24, QRW, QRSS, 63, 511, 2047 and V.54/T1.403 annex B bit patterns, two user-programmable 24-bit patterns
- Alarm detection: alarm indication signal (AIS), time slot 16 AIS, remote alarm, far-end block error (FEBE), out of frame (OOF), cyclic redundancy check (CRC) multiframe OOF, signaling multiframe OOF, frame errors, cycle redundancy checks (CRC) errors, Loss of network signal (red alarm), loss of network frame, receive (blue alarm) (AIS) from network, receive (yellow) from network Performance Reports / Error Counters CRC, errored seconds, burst errored seconds, severely errored seconds, Ft and Fs framing errors for SF framing, FPS framing errors for ESF framing, 24-hour history stored in 15-minute increments
- Onboard processor for real-time facility data link (FDL) messaging, in-band code detection and insertion, alarm integration, and performance monitoring
- Full FDL support and FDL performance monitoring, according to configurable standard: ANSI T1.403 or AT&T TR 54016

DSU/CSU

- Selectable DSX-1 cable length in increments from 0 to 655 feet in DSU mode)
- Selectable DS1 CSU line build-out: 0, –7.5, –15, and –22.5 dB
- Selectable DS1 CSU receiver gain: 26 or 36 dB

Packet Voice Support

On the voice network modules, the basic voice connectivity is as follows:

- The 1-port T1 Multiflex VWIC connects 1 to 24 DS0 channels (voice calls) to the network module
- The 2-port T1 Multiflex VWIC or 2-port Drop and Insert T1 Multiflex VWIC connect 1 to 48 DS0 channels (voice calls) to the network module
- The 1-port E1 Multiflex VWIC connects 1 to 30 DS0 channels (voice calls) to the network module
- The 2-port E1 Multiflex VWIC or 2-port Drop and Insert E1 Multiflex VWIC connect 1 to 60 DS0 channels (voice calls) to the network module

See the data sheet of each network module (NM-HDV, NM-HD-2VE, and NM-HDV2) for further details.

LEDs

- CD (Data Carrier Detect)
- LP (loopback)
- AL (Alarm)

Management	
Telnet/Console	Remote and local configuration, monitoring, and troubleshooting from Cisco IOS Command Line Interface
SNMP	Router and DSU/CSU managed by single SNMP agent; router/DSU/CSU appear as single network entity to user
	Standard MIB (MIB II)
	Cisco integrated DSU/CSU MIB
	RFC 1406 T1 MIB, including alarm detection and reporting
SNMP Traps	Generated in response to alarms

Environmental

- Operating Temperature: 0 to 40º C (32 to 104° F)
- Storage Temperature: –25 to +70º C (–13 to 158° F)
- Relative Humidity
    - 5 to 85% noncondensing operating

    - 5 to 95% noncondensing, nonoperating

T1 Compliance (Partial List)

- ANSI T1.403
- US (UL 1950, T1)
- FCC Part 68
- CS-03
- Canada (CSA 950, T1)
- US (FCC Part 15 Class B, T1)
- U.K. (BS6301, EN60950, EN41003)
- Canada (CSA C108.8 Class A, T1)
- Bellcore—AT&T Accunet (62411)
- ATT 54016
- Japan (VCCI Class 2, VCCI:V-3/97.04, T1, JATE Green Book, IEC950)

E1 Compliance (Partial List)

- Australia (TS 016, AS/NZS 3548:1995)
- Germany (TUV GS, EN60950)
- Germany (VDE 0878 part 3 and 30)
- France (NFC98020, EN60950, EN41003)
- Sweden (SS447-2-22, SS636334, EN60950)
- UK (NTR4)
- Europe (EN55022 Class B, EN55102-1, EN55102-2, CTR12, EN60950, EN50082-1:1992, EN55022:1994)
- CCITT/ITU G.704, I.431
- ETSI NET5, ETS300156
- TBR4
- CTR-13
- ETS 300011
- ITU I.431

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