Cisco 1, 2 and 4 Port T1/E1 Multiflex Trunk Voice/WAN Interface Cards

This document answers common questions about the Cisco® 1-, 2- and 4-Port T1/E1 Multiflex Trunk Voice/WAN Interface Cards (VWIC2s and VWIC3s).

General

Q. **What specific Cisco VWIC cards exist?**

A. The cards are described in Table 1.

Table 1.   Cisco VWIC2 and VWIC3 Interface Cards

Part Number	Description
VWIC3-1MFT-T1/E1	1-Port 3rd Gen Multiflex Trunk Voice/WAN Int. Card—T1/E1
VWIC3-2MFT-T1/E1	2-Port 3rd Gen Multiflex Trunk Voice/WAN Int. Card—T1/E1
VWIC3-1MFT-G703	1-Port 3rd Gen Multiflex Trunk Voice/WAN Int. Card—G.703
VWIC3-2MFT-G703	2-Port 3rd Gen Multiflex Trunk Voice/WAN Int. Card—G.703
VWIC3-4MFT-T1/E1	4-Port 3rd Gen Multiflex Trunk Voice/WAN Int. Card—T1/E1
VWIC2-1MFT-T1/E1	1-Port 2nd Gen Multiflex Trunk Voice/WAN Int. Card—T1/E1
VWIC2-2MFT-T1/E1	2-Port 2nd Gen Multiflex Trunk Voice/WAN Int. Card—T1/E1
VWIC2-1MFT-G703	1-Port 2nd Gen Multiflex Trunk Voice/WAN Int. Card—G.703
VWIC2-2MFT-G703	2-Port 2nd Gen Multiflex Trunk Voice/WAN Int. Card—G.703

Q. **How do the Cisco VWIC3 cards differ from the VWIC2 cards?**

A. The Cisco VWIC3 cards are supported only on the Cisco Integrated Services Router (ISR) 1900, 2900, 3900 and 3900E series platforms. The VWIC3 cards add enhancements to the previous generation VWIC2 cards, including:

Enhanced clocking capabilities: The Cisco VWIC3 cards can enable each port to be clocked from an independent clock source for data applications. Data ports can also be clocked independent of voice ports. All voice ports on the card much use the same clock source.

Multiple data channel-groups supported per T1/E1 port

Q. **How do the Cisco VWIC2 cards differ from the previous generation VWIC cards?**

A. The Cisco VWIC2 cards add numerous enhancements to the previous generation Cisco VWIC cards. These improvements include:

Dedicated echo-cancellation option: The Cisco VWIC2 cards have an onboard slot for an optional Cisco Dedicated Echo Cancellation Module (part number EC-MFT-32 or EC-MFT-64), offering an enhanced echo-cancellation capability for demanding network conditions requiring up to 128 ms of echo tails.

Support for both T1 and E1: The Cisco T1/E1 VWIC2 cards support both T1 and E1, providing additional flexibility in configuring the VWIC2 cards for supporting T1, fractional T1, E1, and fractional E1 for both voice and WAN applications.

Drop-and-insert capability on all versions: All Cisco VWIC2 modules now include the drop-and-insert multiplexing capability, eliminating costly external third-party channel service units/data service units (CSUs/DSUs) and drop-and-insert multiplexers.

Enhanced clocking capabilities: The Cisco 2-port VWIC2 cards can enable each port to be clocked from independent clock sources for data applications. This independent clocking capability is not supported for voice applications or with the Cisco ATM/Voice Advanced Integration Modules (part numbers AIM-ATM, AIM-VOICE-30, and AIM-ATM-VOICE-30).

Q. **On which access routers and service modules are the Cisco VWIC3 cards supported?**

A. The Cisco VWIC3 1- and 2-port cards can be inserted into the EHWIC slots on the following routers:

- Cisco 1905, 1921, 1941, 1941W Integrated Services Routers

- Cisco 2901, 2911, 2921, or 2951 Integrated Services Routers

- Cisco 3925, 3945, 3925E and 3945E Integrated Services Routers

The Cisco VWIC3 4-port cards can be inserted into the EHWIC slots on the following routers:

- Cisco 2911, 2921, or 2951 Integrated Services Routers

- Cisco 3925, 3945, 3925E and 3945E Integrated Services Routers

The Cisco VWIC3 cards are not supported in any network module or service module slots.

Q. **On which access routers and network modules are the Cisco VWIC2 cards supported?**

A. The Cisco VWIC2 cards can be inserted into the WIC or high-density WIC (HWIC) slots on the following routers:

- Cisco 1721 Modular Access Router (data only)

- Cisco 1751-V or 1760 Modular Access Routers

- Cisco 1841 Integrated Services Router (data only)

- Cisco 3662 Telco Versatile DCN Access Platform (data only)

- Cisco 2600XM and 2691 Multiservice Router

- Cisco 3725 or 3745 Multiservice Access Routers

- Cisco 2801, 2811, 2821, or 2851 Integrated Services Routers

- Cisco 3825 or 3845 Integrated Services Routers

- Cisco 1905, 1921, 1941 and 1941W Integrated Services Routers

- Cisco 2901, 2911, 2921, or 2951 Integrated Services Routers

- Cisco 3925, 3945, 3925E and 3945E Integrated Services Routers

The VWIC2 cards can also be used in the VWIC slot(s) of any of the following network modules on the router platforms where these network modules are supported:

- Cisco Digital T1/E1 Packet Voice Trunk Network Modules (NM-HDV)

- Cisco IP Communications Enhanced Voice/Fax Network Modules (NM-HD-2VE)

- Cisco IP Communications High-Density Digital Voice/Fax Network Modules (NM-HDV2, NM-HDV2-1T1/E1, and NM-HDV2-2T1/E1)

- Cisco Ethernet/Token Ring Mixed Media Network Modules (NM-1FE2W, NM-2FE2W, NM-2W, NM-1FE1R2W, NM-1FE2W-V2 and NM-2FE2W-V2)

Refer to the corresponding data sheet for the router or network module for more specific information.

Q. **What combinations of data and voice do the Cisco VWIC2 and VWIC3 cards support?**

A. The Cisco VWIC2 and VWIC3 cards combine WIC and voice-interface-card (VIC) functions to provide unparalleled flexibility, versatility, and investment protection through its many uses. Customers who choose to integrate data and voice in multiple steps preserve their investment in a T1/E1 WAN interface because the VWIC2 and VWIC3 cards can be reused in packet voice applications. The following combinations of data and voice are supported:

T1/E1 data: The Cisco 1-, 2- and 4-port T1/E1 cards act as a WIC, supporting T1, fractional T1, E1 (including structured G.703 with G.704 framing), and fractional E1 applications. To simplify remote management, these VWIC2 cards integrate a fully managed DSU/CSU for T1 deployments and a fully managed DSU for E1 deployments.

E1/G.703 data: The Cisco 1- and 2- port G.703 cards act as a WIC, supporting unstructured E1 (G.703) applications. To simplify remote management, the G.703 version includes a fully managed DSU. The G.703 versions also support all the capabilities on the T1/E1 versions.

T1/E1 voice: The Cisco 1-, 2- and 4-port T1/E1cards (voice and WAN) act as a VIC, supporting voice applications by providing T1, fractional T1, E1, and fractional E1 connections to private branch exchanges (PBXs) and central offices, thereby enabling new services and reducing voice and fax toll charges.

Mixed data and voice: The Cisco VWIC2 and VWIC3 interface cards can simultaneously support both data and voice, reducing the complexity and number of network components, and facilitating a graceful migration to bandwidth-efficient packet voice.

Mixed data and packet voice with drop and insert: The Cisco VWIC2 and VWIC3 cards can be deployed as a T1/E1 drop-and-insert multiplexer with integrated DSUs/CSUs, reducing the complexity of the network and the cost of the central-office ports by efficiently combining time-division multiplexing (TDM) voice (PBX), IP voice, and data on the same trunks. Note that the Cisco 1721, 1751, and 1760 routers support drop and insert between two ports over a single VWIC2 card, whereas the Cisco 2800, 3800, 1900, 2900, 3900 and 3900E Series Integrated Services Routers support drop and insert between two ports over a single VWIC2 or VWIC3 card and two ports over two different VWICs.

Q. **What features do the Cisco VWIC2 and VWIC3 interface cards support?**

A. Table 2 outlines the high-level features supported on the cards.

Table 2. Features Supported on the Cisco VWIC2 and VWIC3 Cards

Part Number	Number of Ports	T1 Support	E1 Support	Unstructured E1/G.703 Support	Data Support WIC Mode	Voice Support VIC Mode	Drop-and-Insert Multiplexing
VWIC3-1MFT-T1/E1	1	Yes	Yes	No	Yes	Yes	Yes*
VWIC3-2MFT-T1/E1	2	Yes	Yes	No	Yes	Yes	Yes
VWIC3-1MFT-G703	1	Yes	Yes	Yes	Yes	Yes	Yes*
VWIC3-2MFT-G703	2	Yes	Yes	Yes	Yes	Yes	Yes
VWIC3-4MFT-T1/E1	4	Yes	Yes	No	Yes	Yes	Yes
VWIC2-1MFT-T1/E1	1	Yes	Yes	No	Yes	Yes	Yes*
VWIC2-2MFT-T1/E1	2	Yes	Yes	No	Yes	Yes	Yes
VWIC2-1MFT-G703	1	Yes	Yes	Yes	Yes	Yes	Yes*
VWIC2-2MFT-G703	2	Yes	Yes	Yes	Yes	Yes	Yes

* For supported platforms with more than 1 HWIC slot, at least 2 VWICs are required to support drop and insert. The 1-port VWIC2 card does not support drop and insert on the Cisco 1721, 1751, and 1760 Routers.

Q. **Can Cisco VWIC2 and VWIC3 interface cards support T1 and E1 ports on the same 2- or 4-port card?**

A. No. All ports can support T1, E1, or G.703—but all ports must be of the same type on the same card.

Q. **What version of Cisco IOS® Software is required for supporting the Cisco VWIC3 cards, and what are the Cisco IOS Software license requirements?**

A. The Cisco 1- and 2-port VWIC3 cards are first supported in Cisco IOS Software Releases 15.0(1)M3, 15.1(1)T1, 15.1(2)T. The Cisco 4-port VWIC3 card is first supported in Cisco IOS Software Release 15.1(3)T. Data applications require a minimum of the IP Base Technology Package, and voice applications require a minimum of the UC Technology Package.

Q. **What version of Cisco IOS® Software is required for supporting the Cisco VWIC2 cards, and what are the Cisco IOS Software license requirements?**

A. The Cisco VWIC2 cards are first supported in Cisco IOS Software Release 12.3(14)T and is first available in the Cisco IOS Software Release 12.4(1) Mainline. Data applications require at a minimum the IP Base feature set license, and voice applications require at a minimum the IP Voice feature set license. On the Cisco 1900, 2900, 3900 and 3900E series ISR platforms, data applications require a minimum of the IP Base Technology Package, and voice applications require a minimum of the UC Technology Package.

Q. **What Cisco VWIC2 and VWIC3 cards support drop and insert, and how can this feature be used to reduce telecom costs?**

A. All Cisco 1- and 2-port VWIC2 cards and 1-, 2- and 4-port VWIC3 cards support the drop-and-insert capability. This capability simplifies branch-office connectivity by enabling a Cisco 2800, 3700, 3800, 1900, 2900, 3900 or 3900E Series Integrated Services Router and select Cisco 2600 and 3600 Series Multiservice Access Routers 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 (that is, TDM) integration of data and voice onto a single T1, fractional T1, E1, or fractional E1 connection to the central office. Sharing a line can significantly reduce costs over those of two separate physical lines to the central office. Although the normal use is for data and voice sharing of a T1 or E1 service, the drop-and-insert capability also can be used for video and data, or data and data sharing of the service (for example, two routers).

Q. **Can the 2- and 4-port VWIC3 cards support different clocking domains?**

A. When the 2- or 4-port VWIC3 is used in data only, non-ATM applications, each port can connect to a different clocking domain, for example, when two different T1/E1 carriers are used. When the VWIC3 is used for voice applications, all voice T1/E1s have to be synchronized to a single clock source and any difference in clocks risk clock slips or interface flaps. When the VWIC3 is used for mixed data and voice applications, each data port can use an independent clock, and the voice ports can use a clock source independent from the data ports.

Q. **Can the 2-port VWIC2 support different clocking domains?**

A. When the 2-port VWIC2 is used in data only, non-ATM applications, each port can connect to a different clocking domain, for example, when two different T1/E1 carriers are used. When the VWIC2 is used for voice applications or together with the Voice and ATM Advanced Integration Modules (AIM-ATM or AIM-ATM-VOICE-30) cards, all T1/E1s have to be synchronized and any difference in clocks risk clock slips or interface flaps.

Q. **How many channel groups can the VWIC2 and VWIC3 interface cards support?**

A. The number of channel groups supported depends on the capabilities of the router chassis in which the VWIC2 or VWIC3 card is used. Table 3 provides details. Channel groups apply to serial data (HDLC, MLPPP, or FR) applications.

Table 3.   Channel-Group Support on Cisco VWIC2 and VWIC3 Cards

Router or Module	Maximum Number of Channel Groups per Router or Network Module
Cisco 1900 Series Integrated Services Routers	Maximum of 2 channel groups per VWIC2 card. Maximum of 1 channel group per port Maximum of 2 channel groups per 1- or 2-port VWIC3 card
Cisco 2900 Series Integrated Services Routers	Maximum of 2 channel groups per VWIC2 card. Maximum of 1 channel group per port Maximum of 2 channel groups per 1- or 2-port VWIC3 card Maximum of 4 channel groups per 4--port VWIC3 card
Cisco 3900 and 3900E Series Integrated Services Routers	Maximum of 2 channel groups per VWIC2 card. Maximum of 1 channel group per port Maximum of 2 channel groups per 1- or 2-port VWIC3 card Maximum of 4 channel groups per 4--port VWIC3 card
Cisco 2800 Series Integrated Services Routers	Maximum of 2 channel groups per VWIC2 card
Cisco 3800 Series Integrated Services Routers	Maximum of 128 channel groups across all 4 router HWIC slots (for example, a maximum of 8 ports over 4 VWIC2 cards)

Router or Module	Maximum Number of Channel Groups per Router or Network Module
Cisco 2600, 3600, and 3700 Multiservice Access Routers	Maximum of 2 channel groups per VWIC2 card
Cisco 1721, 1751, 1760, and 1841 Routers	Maximum of 2 channel groups per VWIC2 card
Cisco IP Communications High-Density Digital Voice/Fax Network Modules (NM-HDV2) and Associated Models	Maximum of 32 channel groups per VWIC2 card with a total bandwidth of up to 2 Mbps (assuming no Primary Rate Interface [PRI] groups); if PRI groups are supported, one less channel group is supported for each PRI group
Cisco IP Communications Voice/Fax Network Module (NM-HD-2VE)	Maximum of 32 channel groups per VWIC2 card with a total bandwidth of up to 2 Mbps (assuming no PRI groups); if PRI groups are supported, one less channel group is supported for each PRI group
Cisco Digital T1, E1 and J1 Packet Voice Trunk Network Modules (NM-HDV) and Associated Models	Maximum of 2 channel groups per VWIC2 card with a total bandwidth of up to 2 Mbps (assuming no Primary Rate Interface [PRI] groups); if PRI groups are supported, one less channel group is supported for each PRI group
Cisco Ethernet/Token Ring Mixed Media Network Modules (NM-2W, NM-1FE2W, NM-2FE2W, NM-1FE2W-V2, NM-2FE2W-V2, and NM-1FE1R2W)	Maximum of 2 channel groups per VWIC2 card
Cisco E1/T1 ISDN PRI Network Module (NM-1CE1T1-PRI and NM-2CE1T1-PRI)	Maximum of 30 channel groups per E1/T1 port; note there is no HWIC slot on these network modules, thus the VWIC card is not used on these modules; this entry is added here only for reference

Q. **Can you give an example of how a Cisco 2821 Integrated Services Router can be configured to support a large number of channel groups using both the HWIC and network module slots?**

A. Following is a Cisco 2821 Integrated Services Router configuration example:

- **Four HWIC/VIC/WIC/VWIC slots**: Each slot can contain a 2-port VWIC2 card. Each HWIC slot on the Cisco 2800 Integrated Services Router can support 2 channel groups, so a total of 8 channel groups are supported across the 4 HWIC slots on the chassis.

- **One network module slot**—Cisco IP Communications High-Density Digital Voice/Fax Network Modules (NM-HDV2) option: The network module slot can contain an NM-HDV2-2T1/E1, which has 2 onboard (E1/T1) ports and a potential of 2 additional ports through a 2-port VWIC2 in the onboard slot. Thus the network module can have a total of 4 T1/E1 ports. The NM-HDV2 network module can support up to 32 channel groups (minus D channels for any PRI interfaces). For data, the NM-HDV2 network module is limited to a total aggregate bandwidth of 2 Mbps for the network module (that is, all 4 ports).

Q. **Can you give an example of how a Cisco 3845 Integrated Services Router can be configured to support a large number of channel groups using both the HWIC and network module slots?**

A. A Cisco 3845 Integrated Services Router configuration example follows:

- **Four HWIC/VIC/WIC/VWIC slots**: Each slot can contain a 2-port VWIC2 card. The Cisco 3800 Integrated Services Routers can support up to 128 channel groups across the 4 HWIC slots on the chassis. Therefore, a 2-port VWIC2 in a HWIC slot could have up to 64 channel groups as long as the total number of channel groups configured on all the VWIC2s in the 4 HWIC slots does not exceed 128.

- **Four network module slots**—Cisco IP Communications High-Density Digital Voice/Fax Network Modules (NM-HDV2) option: Each network module slot can contain an NM-HDV2-2T1/E1, which has 2 onboard (E1/T1) ports and a potential of 2 additional ports through a 2-port VWIC2 in the onboard slot. Thus the network module can have a total of 4 T1/E1 ports. The NM-HDV2 network module can support up to 32 channel groups (minus D channels for any PRI interfaces). For data, the NM-HDV2 network modules are limited to a total aggregate bandwidth of 2 Mbps per network module (that is, all 4 ports).

Q. **How many ds0-groups (voice) are supported on the VWIC2 and VWIC3 cards?**

A. One ds0-group per timeslot (24 for T1 and 31 for E1) is supported on all VWIC2s and VWIC3s. One ds0-group per timeslot is supported on all DS-0 interfaces independent of whether they are on an interface card attached directly to a router chassis, an interface card attached to a network module, or a built-in interface mounted directly on the network module. The ds0-groups apply only to voice.

Q. How many pri-groups (voice) are supported on the VWIC2 and VWIC3 cards?

A. One pri-group per port (T1/E1 port) is supported on all VWIC2s and VWIC3s. One pri-group per port is supported on all T1/E1 interfaces independent of whether they are on an interface card attached directly to a router chassis, an interface card attached to a network module, or a built-in interface mounted directly on the network module. The pri-groups apply to voice and data.

Q. What impedance options are supported by the VWIC2s and VWIC3s for E1 and G.703 environments?

A. The VWIC2s and VWIC3s support both 120 ohms balanced mode, and 75 ohms unbalanced modem (using the BNC 750-ohm interface). This support is controlled in Cisco IOS Software with the **line-termination** command.

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