



SMDS Commands

Use the commands in this chapter to configure Switched Multimegabit Data Service (SMDS), a wide-area networking service offered by some regional Bell operating companies (RBOCs) and MCI.

For SMDS configuration information and examples, refer to the “Configuring SMDS” chapter in the *Cisco IOS Wide-Area Networking Configuration Guide*.

arp

To enable Address Resolution Protocol (ARP) entries for static routing over the Switched Multimegabit Data Service (SMDS) network, use the following variation of the **arp** global configuration command. To disable this capability, use the **no** form of this command.

arp *ip-address smds-address smds*

no arp *ip-address smds-address smds*

Syntax Description

<i>ip-address</i>	IP address of the remote router.
<i>smds-address</i>	12-digit SMDS address in the dotted notation <i>nnnn.nnnn.nnnn</i> (48 bits long).
smds	Enables ARP for SMDS.

Defaults

Disabled

Command Modes

Global configuration

Command History

Release	Modification
10.3	This command was introduced.

Usage Guidelines

This command requires a 12-digit (48-bit) dotted-format SMDS address. It does not support 15-digit SMDS addresses.

Examples

The following example creates a static ARP entry that maps the IP address 172.20.173.28 to the SMDS address C141.5797.1313 on interface serial 0:

```
interface serial 0
  arp 172.20.173.28 C141.5797.1313 smds
```

Related Commands

Command	Description
smds enable-arp	Enables dynamic ARP. The multicast address for ARP must be set before this command is issued.
smds static-map	Configures a static map between an individual SMDS address and a higher-level protocol address.

encapsulation smds

To enable Switched Multimegabit Data Service (SMDS) on the desired interface, use the **encapsulation smds** interface configuration command.

encapsulation smds

Syntax Description This command has no arguments or keywords.

Defaults Disabled

Command Modes Interface configuration

Command History	Release	Modification
	10.0	This command was introduced.

Usage Guidelines The interface to which this command applies must be a serial interface. All subsequent SMDS configuration commands apply only to an interface with encapsulation SMDS.



Note

The maximum packet size allowed in the SMDS specifications (TA-772) is 9188. This is larger than the packet size used by servers with most media. The Cisco default maximum transmission unit (MTU) size is 1500 bytes to be consistent with Ethernet. However, on the High Speed Serial Interface (HSSI), the default MTU size is 4470 bytes. If a larger MTU is used, the **mtu** command must be entered before the **encapsulation smds** command.



Caution

The Cisco MCI card has buffer limitations that prevent setting the MTU size higher than 2048, and the HSSI card has buffer limitations that prevent setting the MTU size higher than 4500. Configuring higher settings can cause inconsistencies and performance problems.

Examples The following example shows how to configure the SMDS service on serial interface 0:

```
interface serial 0
 encapsulation smds
```

Related Commands	Command	Description
	mtu	Adjusts the maximum packet size or MTU size.

interface serial multipoint

To define a logical subinterface on a serial interface to support multiple logical IP subnetworks over Switched Multimegabit Data Service (SMDS), use the **interface serial multipoint** interface configuration command.

interface serial { *interface* | *slot/port* }.*subinterface* **multipoint**

Syntax Description		
<i>interface</i>		Interface number.
<i>slot/port</i>		Slot and port number related to specified subinterface (for Cisco 7000 and 7500 series routers).
<i>.subinterface</i>		Number for this subinterface; values in the range 0 to 255.

Defaults This command has no default values.

Command Modes Interface configuration

Command History	Release	Modification
	10.0	This command was introduced.

Usage Guidelines Use this command only for routers that need knowledge of multiple IP networks. Other routers can be configured with information only about their own networks. A period must be used to separate the *interface* or *slot/port* from the *subinterface*.

Examples The following example configures serial interface 2 with multipoint logical subinterface 1:

```
interface serial 2.1 multipoint
```

The following example configures slot 2 port 0 with multipoint logical subinterface 1:

```
interface serial 2/0.1 multipoint
```

Related Commands	Command	Description
	ip address	Sets a primary or secondary IP address for an interface.
	smds address	Specifies the SMDS individual address for a particular interface.
	smds enable-arp	Enables dynamic ARP. The multicast address for ARP must be set before this command is issued.
	smds multicast	Assigns a multicast SMDS E.164 address to a higher-level protocol.

show smds addresses

To display the individual addresses and the interface they are associated with, use the **show smds addresses** privileged EXEC command.

show smds addresses

Syntax Description This command has no arguments or keywords.

Command Modes Privileged EXEC

Command History	Release	Modification
	10.0	This command was introduced.

Examples The following is sample output from the **show smds addresses** command:

```
Router# show smds addresses
SMDS address - Serial0 c141.5555.1212.FFFF
```

Table 33 describes the fields shown in the display.

Table 33 *show smds addresses Field Descriptions*

Field	Description
Serial0	Interface to which this SMDS address has been assigned.
c141.5555.1212	SMDS address that has been assigned to the interface.

show smds map

To display all Switched Multimegabit Data Service (SMDS) addresses that are mapped to higher-level protocol addresses, use the **show smds map** privileged EXEC command.

show smds map

Syntax Description This command has no arguments or keywords.

Command Modes Privileged EXEC

Command History	Release	Modification
	10.0	This command was introduced.

Examples The following is sample output from the **show smds map** command:

```
Router# show smds map

Serial0: ARP maps to e180.0999.9999.FFFF multicast
Serial0: IP maps to e180.0999.9999.FFFF 172.16.42.112 255.255.255.0 multicast
Serial0: XNS 1006.AA00.0400.0C55 maps to c141.5688.1212.FFFF static [broadcast]
Serial0: IPX 1ABC.000.0c00.d8db maps to c111.1111.1111.1111 -- dynamic, TTL: 4 min
```

Table 34 describes the fields shown in the output.

Table 34 *show smds map Field Descriptions*

Field	Description
Serial0	Name of interface on which SMDS has been enabled.
ARP maps to	Higher-level protocol address that maps to this particular SMDS address.
e180.0999.9999.FFFF	SMDS address. Includes all SMDS addresses entered with either the smds static-map command (static) or smds multicast command (multicast).
172.16.42.112	IP address.
255.255.255.0	Subnet mask for the IP address.
static/dynamic	The address was obtained from a static map or dynamic map.
TTL	Time to live.

show smds traffic

To display statistics about Switched Multimegabit Data Service (SMDS) packets the router has received, use the **show smds traffic** privileged EXEC command.

show smds traffic

Syntax Description This command has no arguments or keywords.

Command Modes Privileged EXEC

Command History	Release	Modification
	10.0	This command was introduced.

Examples The following is sample output from the **show smds traffic** command:

```
Router# show smds traffic
624363 Input packets
759695 Output packets
2 DXI heartbeat sent
0 DXI heartbeat received
0 DXI DSU polls received
0 DXI DSU polls sent
0 DXI invalid test frames
0 Bad BA size errors
0 Bad Header extension errors
65 Invalid address errors
1 Bad tag errors
```

Table 35 describes the fields shown in the output.

Table 35 *show smds traffic Field Descriptions*

Field	Description
Input packets	Number of input packets.
Output packets	Number of output packets.
DXI heartbeat sent	Number of Data Exchange Interface (DXI) heartbeat polls transmitted.
DXI heartbeat received	Number of DXI heartbeat polls received.
DXI DSU polls sent	Number of DXI Data Service Unit (DSU) polls sent.
DXI DSU polls received	Number of DXI DSU polls received.
DXI invalid test frames	Number of invalid test frames seen.
Bad BA size errors	Number of packets that have a size less than 32 or greater than 9188 bytes.
DXI Header extension errors	Number of extended SMDS Interface Protocol (SIP) Layer 3 header errors.

Table 35 *show smds traffic Field Descriptions (continued)*

Field	Description
DXI Invalid address errors	Number of address errors.
Bad tag errors	Status indicating the number of errors that occur when there is a mismatch between the Tag value in the header and the BeTag value in the trailer of an SMDS frame. This usually indicates that there is a misconfiguration (that is, a DXI is connected to a non-DXI) or that the SMDS data service unit (SDSU) is scrambling the Layer 2 protocol data units (PDUs).

smds address

To specify the Switched Multimegabit Data Service (SMDS) individual address for a particular interface, use the **smds address** interface configuration command. To remove the address from the configuration file, use the **no** form of this command.

smds address *smds-address*

no smds address *smds-address*

Syntax Description	<i>smds-address</i> Individual address provided by the SMDS service provider. It is protocol independent.
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Defaults	No address is specified.
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Command Modes	Interface configuration
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Command History	Release	Modification
	10.0	This command was introduced.

Usage Guidelines	All addresses for SMDS service are assigned by the service provider, and can be assigned to individuals and groups.
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Addresses are entered in the Cisco SMDS configuration software using an E prefix for *multicast* addresses and a C prefix for *unicast* addresses. Cisco IOS software expects the addresses to be entered in E.164 format, which is 64 bits. The first 4 bits are the address type, and the remaining 60 bits are the address. If the first 4 bits are 1100 (0xC), the address is a unicast SMDS address, which is the address of an individual SMDS host. If the first 4 bits are 1110 (0xE), the address is a multicast SMDS address, which is used to broadcast a packet to multiple end points. The 60 bits of the address are in binary-coded decimal (BCD) format. Each 4 bits of the address field presents a single telephone number digit, allowing for up to 15 digits. At a minimum, you must specify at least 11 digits (44 bits). Unused bits at the end of this field are filled with ones.



Note If bridging is enabled on any interface, the SMDS address is erased and must be reentered.

Examples	The following example specifies an individual address in Ethernet-style notation:
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```
interface serial 0
smds address c141.5797.1313.FFFF
```

smds dxi

To enable the Data Exchange Interface (DXI) version 3.2 support, use the **smds dxi** interface configuration command. To disable the DXI 3.2 support, use the **no** form of this command.

smds dxi

no smds dxi

Syntax Description This command has no arguments or keywords.

Defaults Enabled

Command Modes Interface configuration

Command History	Release	Modification
	10.0	This command was introduced.

Usage Guidelines Adding this command to the configuration enables the DXI version 3.2 mechanism and encapsulates SMDS packets in a DXI frame before they are transmitted. DXI 3.2 adds an additional 4 bytes to the SMDS packet header to communicate with the SMDS data service unit (SDSU). These bytes specify the frame type. The interface expects all packets to arrive with DXI encapsulation.

The DXI 3.2 support also includes the heartbeat process as specified in the SIG-TS-001/1991 standard, revision 3.2. The heartbeat (active process) is enabled when both DXI and keepalives are enabled on the interface. The echo (passive process) is enabled when DXI is enabled on the interface. The heartbeat mechanism automatically generates a heartbeat poll frame every 10 seconds. This default value can be changed with the **keepalive** (LMI) command.

Fast switching of DXI frames is supported, but Interim Local Management Interface (ILMI) is not.



Note If you are running serial lines back-to-back, disable keepalive on SMDS interfaces. Otherwise, DXI declares the link down.



Note Switching in or out of DXI mode causes the IP cache to be cleared. This clearing process is necessary to remove all cached IP entries for the serial line being used. Stale entries must be removed to allow the new MAC header with or without DXI framing to be installed in the cache. This clearing process is not frequently done and is not considered to be a major performance penalty.

Examples

The following example enables DXI 3.2 on interface HSSI 0:

```
interface hssi 0
 encapsulation smds
 smds dxi
 smds address C120.1111.2222.FFFF
 ip address 172.20.1.30 255.255.255.0
 smds multicast ip E180.0999.9999
 smds enable-arp
```

Related Commands

Command	Description
keepalive (LMI)	Enables the LMI mechanism for serial lines using Frame Relay encapsulation.

smds enable-arp

To enable dynamic Address Resolution Protocol (ARP), use the **smds enable-arp** interface configuration command. The multicast address for ARP must be set before this command is issued. Once ARP has been enabled, use the **no** form of this command to disable the interface.

smds enable-arp

no smds enable-arp

Syntax Description This command has no arguments or keywords.

Defaults Disabled

Command Modes Interface configuration

Release	Modification
10.0	This command was introduced.

Usage Guidelines This command first appeared in Cisco IOS Release 10.0.

Examples The following example enables the dynamic ARP routing table:

```
interface serial 0
ip address 172.20.1.30 255.255.255.0
smds multicast IP E180.0999.9999.2222
smds enable-arp
```

Command	Description
arp	Enables ARP entries for static routing over the SMDS network.

smds glean

To enable dynamic address mapping for Internet Packet Exchange (IPX) over Switched Multimegabit Data Service (SMDS), use the **smds glean** interface configuration command. To disable dynamic address mapping for IPX over SMDS, use the **no** form of this command.

smds glean *protocol* [*timeout-value*] [**broadcast**]

no smds glean *protocol*

Syntax Description	<i>protocol</i>	Protocol type. Only IPX is supported.
	<i>timeout-value</i>	(Optional) Time to live (TTL) value. Value can be from 1 to 65535 minutes. The default is 5 minutes. This value indicates how long a gleaned dynamic map is stored in the SMDS map table.
	broadcast	(Optional) Marks the gleaned protocol address as a candidate for broadcast packets. All broadcast requests are sent to the unicast SMDS address.

Defaults Disabled

Command Modes Interface configuration

Command History	Release	Modification
	11.1	This command was introduced.

Usage Guidelines The **smds glean** command uses incoming packets to dynamically map SMDS addresses to higher-level protocol addresses. Therefore the need for static map configuration for the IPX protocol is optional rather than mandatory. However, any static map configuration overrides the dynamic maps.

If a map is gleaned and it already exists as a dynamic map, the timer for the dynamic map is reset to the default value or the user-specified value.

Examples The following example enables dynamic address mapping for IPX on interface serial 0 and sets the time to live (TTL) to 14 minutes:

```
interface serial 0
 encapsulation smds
 smds address c141.5797.1313.FFFF
 smds multicast ipx e1800.0999.9999.FFFF
 smds glean ipx 14
```

smds multicast

To assign a multicast Switched Multimegabit Data Service (SMDS) E.164 address to a higher-level protocol, use the **smds multicast** interface configuration command. To remove an assigned multicast address, use the **no** form of this command with the appropriate address.

smds multicast *protocol smds-address*

no smds multicast *protocol smds-address*

Syntax Description

<i>protocol</i>	Protocol type. See Table 36 for a list of supported protocols and their keywords.
<i>smds-address</i>	SMDS address. Because SMDS does not incorporate broadcast addressing, a group address for a particular protocol must be defined to serve the broadcast function.

Defaults

No mapping is defined.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

When configuring DECnet, you must enter all four DEC keywords (**decnet**, **decnet_router-L1**, **decnet_router-L2**, and **decnet_node**) in the configuration.

Table 36 lists the high-level protocols supported by the **smds multicast** command.

Table 36 *smds multicast Supported Protocols*

Keyword	Protocol
aarp	AppleTalk Address Resolution Protocol
appletalk	AppleTalk
arp	Address Resolution Protocol
bridge	Transparent bridging
clns	International Organization for Standardization (ISO) Connectionless Network Service (CLNS)
clns_es	Multicast address for all CLNS end systems
clns_is	Multicast address for all CLNS intermediate systems
decnet	DECnet
decnet_node	DECnet multicast address for all end systems
decnet_router-L1	DECnet multicast address for all Level 1 (intra-area) routers

Table 36 *smds multicast Supported Protocols (continued)*

Keyword	Protocol
decnet_router-L2	DECnet multicast address for all Level 2 (interarea) routers
ip	Internet Protocol (IP)
ipx	Novell IPX
vines	Banyan VINES
xns	Xerox Network Systems (XNS)

For IP, the IP NETWORK and MASK fields are no longer required. The Cisco IOS software accepts these arguments, but ignores the values. These were required commands for the previous multiple logical IP subnetworks configuration. The software continues to accept the arguments to allow for backward compatibility, but ignores the contents.

Examples

The following example maps the IP broadcast address to the SMDS group address E180.0999.9999:

```
interface serial 0
  smds multicast IP E180.0999.9999.FFFF
```

smds multicast arp

To map the Switched Multimegabit Data Service (SMDS) address to a multicast address, use the **smds multicast arp** interface configuration command. To disable this feature, use the **no** form of this command.

```
smds multicast arp smds-address [ip-address mask]
```

```
no smds multicast arp smds-address [ip-address mask]
```

Syntax Description		
	<i>smds-address</i>	SMDS address in E.164 format.
	<i>ip-address</i>	(Optional) IP address.
	<i>mask</i>	(Optional) Subnet mask for the IP address.

Defaults No mapping is defined.

Command Modes Interface configuration

Command History	Release	Modification
	10.0	This command was introduced.

Usage Guidelines This command is used only when an Address Resolution Protocol (ARP) server is present on a network. When broadcast ARPs are sent, SMDS first attempts to send the packet to all multicast ARP SMDS addresses. If none exist in the configuration, broadcast ARPs are sent to all multicast IP SMDS multicast addresses. If the optional ARP multicast address is missing, each entered IP multicast command is used for broadcasting.

Examples The following example configures broadcast ARP messages:

```
interface serial 0
  smds multicast arp E180.0999.9999.2222
```

Related Commands	Command	Description
	smds multicast ip	Maps an SMDS group address to a secondary IP address.

smds multicast bridge

To enable spanning-tree updates, use the **smds multicast bridge** interface configuration command. To disable this function, use the **no** form of this command.

smds multicast bridge *smds-address*

no smds multicast bridge *smds-address*

Syntax Description	<i>smds-address</i>	SMDS multicast address in E.164 format.
Defaults	No multicast SMDS address is defined. Spanning tree updates are disabled for transparent bridging across SMDS networks.	
Command Modes	Interface configuration	
Command History	Release	Modification
	10.0	This command was introduced.

Usage Guidelines

To allow transparent bridging of packets across serial and HSSI interfaces in an SMDS network, the SMDS interface must be added to an active bridge group. Also, standard bridging commands are necessary to enable bridging on an SMDS interface.

When the **smds multicast bridge** command is added to the configuration, broadcast packets are encapsulated with the specified SMDS multicast address configured for bridging. Two broadcast ARP packets are sent to the multicast address. One is sent with a standard (SMDS) ARP encapsulation, while the other is sent with the ARP packet encapsulated in an 802.3 MAC header. The native ARP is sent as a regular ARP broadcast.

Cisco's implementation of IEEE 802.6i transparent bridging for SMDS supports 802.3, 802.5, and FDDI frame formats. The router can accept frames with or without frame check sequence (FCS). Fast-switched transparent bridging is the default and is not configurable. If a packet cannot be fast switched, it is process switched.

In Cisco IOS Release 10.2 software (or earlier), bridging over multiple logical IP subnetworks is not supported. Bridging of IP packets in a multiple logical IP subnetworks environment is unpredictable.

Examples

In the following example, all broadcast bridge packets are sent to the configured SMDS multicast address:

```
interface hssi 0
 encapsulation smds
 smds address C120.1111.2222.FFFF
 ip address 172.16.0.0 255.255.255.0
 smds multicast bridge E180.0999.9999.FFFF
 bridge-group 5
```

Related Commands

Command	Description
bridge-group	Assigns each network interface to a bridge group.

smds multicast ip

To map an Switched Multimegabit Data Service (SMDS) group address to a secondary IP address, use the **smds multicast ip** interface configuration command. To remove the address map, use the **no** form of this command.

```
smds multicast ip smds-address [ip-address mask]
```

```
no smds multicast ip smds-address [ip-address mask]
```

Syntax Description		
	<i>smds-address</i>	SMDS address in E.164 format.
	<i>ip-address</i>	(Optional) IP address.
	<i>mask</i>	(Optional) Subnet mask for the IP address.

Defaults The IP address and mask default to the primary address of the interface if they are left out of the configuration.

Command Modes Interface configuration

Command History	Release	Modification
	10.0	This command was introduced.

Usage Guidelines This command allows a single SMDS interface to be treated as multiple logical IP subnetworks. If taking advantage of the multiple logical IP subnetworks support in SMDS, you can use more than one multicast address on the SMDS interface (by entering multiple commands). However, each **smds multicast ip** command entry must be associated with a different IP address on the SMDS interface.

Broadcasts can be sent on the SMDS interface by means of the multicast address. By sending broadcasts in this manner, the router is not required to replicate broadcasts messages to every remote host.

In addition, the higher-level protocols such as Open Shortest Path First (OSPF) and Intermediate System-to-Intermediate System (IS-IS) can use the multicast capability by sending one update packet or routing packet to the multicast address.

If the optional IP address and mask arguments are not present, the SMDS address and multicast address are associated with the primary IP address of the interface. This association allows the command to be backward compatible with earlier versions of the software.

If an Address Resolution Protocol (ARP) multicast address is missing, each entered IP multicast command is used for broadcasting. The ARP multicast command has the same format as the IP multicast command and is typically used only when an ARP server is present in the network.

**Note**

All routers at the other end of the SMDS cloud must have the multiple logical IP subnetworks capability enabled. If you allocate a different SMDS subinterface for each logical IP subnetwork on the SMDS interface, you do not have to configure secondary IP addresses.

Examples

The following example configures an interface with two subinterfaces to support two different IP subnets with different multicast addresses to each network:

```
interface serial 2/0
  encapsulation smds
  smds address C120.1111.2222.4444

interface serial 2/0.1 multipoint
  smds addr c111.3333.3333.3333
  ip address 2.2.2.1 255.0.0.0
  smds multicast ip e222.2222.2222.2222
  smds enable-arp

interface serial 2/0.2 multipoint
  smds addr c111.2222.3333.3333.3333
  ip address 2.3.3.3 255.0.0.0
  smds multicast ip E180.0999.9999.FFFF
  smds enable-arp
```

Related Commands

Command	Description
smds multicast arp	Maps the SMDS address to a multicast address.

smds static-map

To configure a static map between an individual Switched Multimegabit Data Service (SMDS) address and a higher-level protocol address, use the **smds static-map** interface configuration command. To remove the map, use the **no** form of this command with the appropriate arguments.

smds static-map *protocol protocol-address smds-address* [**broadcast**]

no smds static-map *protocol protocol-address smds-address* [**broadcast**]

Syntax Description	
<i>protocol</i>	Higher-level protocol. It can be one of the following values: appletalk , clns , decnet , ip , ipx , vines , or xns .
<i>protocol-address</i>	Address of the higher-level protocol.
<i>smds-address</i>	SMDS address, to complete the mapping.
broadcast	(Optional) Marks the specified protocol address as a candidate for broadcast packets. All broadcast requests are sent to the unicast SMDS address.

Defaults No mapping is defined.

Command Modes Interface configuration

Command History	Release	Modification
	10.0	This command was introduced.

Usage Guidelines The **smds static-map** command provides *pseudobroadcasting* by allowing the use of broadcasts on those hosts that cannot support SMDS multicast addresses.

Examples The following example illustrates how to enable pseudobroadcasting. The router at address C120.4444.9999 will receive a copy of the broadcast request because the broadcast keyword is specified with the **smds static-map** command. The host at address 172.16.1.15 is incapable of receiving multicast packets. The multicasting is simulated with this feature.

```
interface hssi 0
 encapsulation smds
 smds address C120.1111.2222.FFFF
 ip address 172.16.1.30 255.255.255.0
 smds static-map ip 172.16.1.15 C120.4444.9999.FFFF broadcast
 smds enable-arp
```

The following example illustrates how to enable multicasting. In addition to IP and ARP requests to E100.0999.9999, the router at address C120.4444.9999 will also receive a copy of the multicast request. The host at address 172.16.1.15 is incapable of receiving broadcast packets.

```
interface hssi 0
 encapsulation smds
 smds address C120.1111.2222.FFFF
 ip address 172.16.1.30 255.255.255.0
 smds multicast ip E100.0999.999.FFFF
 smds static-map ip 172.16.1.15 C120.4444.9999.FFFF
 smds enable-arp
```