SMDS Commands

Use the commands in this chapter to configure the 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 *Router Products Configuration Guide*.

arp

Use the following variation of the **arp** interface configuration command to enable ARP entries for static routing over the SMDS network. Use the **no arp** command to disable this capability.

> **arp** *ip-address smds-address* **smds**
> **no arp** *ip-address smds-address* **smds**

Syntax Description

ip-address	IP address.
smds-address	SMDS address.
smds	Enables ARP for SMDS.

Default

Disabled

Command Mode

Interface configuration

Example

The following example sets a static ARP entry for routing from IP network 131.108.173.28 to SMDS address C141.5797.1313 on interface serial 0:

```
interface serial 0
arp 131.108.173.28 C141.5797.1313.FFFF smds
```

Related Command

smds enable-arp

encapsulation smds

Use the **encapsulation smds** interface configuration command to enable SMDS service on the desired interface.

encapsulation smds

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

The interface to which this command applies must be a serial interface. All subsequent SMDS configuration commands only apply 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 MTU size is 1500 bytes to be consistent with Ethernet. However, on HSSI interfaces, the default MTU size is 4470 bytes. If a larger MTU is used, the **mtu** command must be entered before the **encapsulation smds** command.

Keep in mind, however, that 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 has caused router inconsistencies and performance problems.

Example

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

```
interface serial 0
encapsulation smds
```

Related Command

A dagger (†) indicates that the command is documented in another chapter.

mtu[†]

show arp

Use the **show arp** privileged EXEC command to display the entries in the ARP table for the router.

show arp

Syntax Description

This command has no arguments or keywords.

Command Mode

Privileged EXEC

Sample Display

The following is sample output from the **show arp** command:

```
Router# show arp

Protocol   Address          Age (min)   Hardware Addr      Type    Interface

Internet   131.108.42.112   120         0000.a710.4baf     ARPA    Ethernet3
AppleTalk  4028.5           29          0000.0c01.0e56     SNAP    Ethernet2
Internet   131.108.42.114   105         0000.a710.859b     ARPA    Ethernet3
AppleTalk  4028.9           -           0000.0c02.a03c     SNAP    Ethernet2
Internet   131.108.42.121   42          0000.a710.68cd     ARPA    Ethernet3
Internet   131.108.36.9     -           0000.3080.6fd4     SNAP    TokenRing0
AppleTalk  4036.9           -           0000.3080.6fd4     SNAP    TokenRing0
Internet   131.108.33.9     -           c222.2222.2222     SMDS    Serial0
```

Table 10-1 describes significant fields shown in the first line of output in the display.

Table 10-1 Show ARP Field Descriptions

Field	Description
Protocol	Type of network address this entry includes.
Address	Network address that is mapped to the MAC address in this entry.
Age (min)	Interval (in minutes) since this entry was entered in the table, rather than the interval since the entry was last used. (The timeout value is 4 hours.)
Hardware Addr	MAC address mapped to the network address in this entry.
Type	Encapsulation type the router is using for the network address in this entry. Possible values include: • ARPA • SNAP • ETLK (EtherTalk) • SMDS
Interface	Interface associated with this network address.

show smds addresses

Use the **show smds addresses** privileged EXEC command to display the individual addresses and the interface that they are associated with.

show smds addresses

Syntax Description

This command has no arguments or keywords.

Command Mode

Privileged EXEC

Sample Display

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

```
Router# show smds addresses

SMDS address - Serial0   c141.5555.1212.FFFF
```

Table 10-2 describes the fields shown in the display.

Table 10-2 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

Use the **show smds map** privileged EXEC command to display all SMDS addresses that are mapped to higher-level protocol addresses.

show smds map

Syntax Description

This command has no arguments or keywords.

Command Mode

Privileged EXEC

Sample Display

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 150.108.42.112 255.255.255.0 multicast
Serial0:  XNS 1006.AA00.0400.0C55 maps to c141.5688.1212.FFFF static [broadcast]
```

Table 10-3 describes the fields shown in the output.

Table 10-3 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) and **smds multicast** command (multicast).
150.108.21.112	IP address.
255.255.255.0	Subnet mask for the IP address.

show smds traffic

Use the **show smds traffic** privileged EXEC command to display statistics on bad SMDS packets the router has received.

> **show smds traffic**

Syntax Description

This command has no arguments or keywords.

Command Mode

Privileged EXEC

Sample Display

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 10-4 describes the fields shown in the output.

Table 10-4 Show SMDS Traffic Field Descriptions

Field	Description
0 Input packets	Number of input packets.
0 Output packets	Number of output packets.
0 DXI heartbeat sent	Number of DXI heartbeat polls transmitted.
0 DXI heartbeat received	Number of DXI heartbeat polls received.
0 DXI DSU polls sent	Number of DXI DSU polls sent.
0 DXI DSU polls received	Number of DXI DSU polls received.
0 DXI invalid test frames	Number of invalid test frames seen.
0 Bad BA size errors	Number of packets that have a size less than 32 bytes or greater than 9188 bytes.
0 DXI Header extension errors	Number of extended SIP L3 header errors.
0 DXI Invalid address errors	Number of address errors
0 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 SDSU is scrambling the L2 PDUs.

smds address

Use the **smds address** interface configuration command to specify the SMDS individual address for a particular interface. Use the **no smds address** command to remove the address from the configuration file.

    smds address *smds-address*
    no smds address *smds-address*

Syntax Description

smds-address	Individual address provided by the SMDS service provider. This address is protocol independent. For more information, see the "Usage Guidelines" section.

Default

No address is specified.

Command Mode

Interface configuration

Usage Guidelines

All addresses for SMDS service are assigned by the service provider, and can be assigned to individuals and groups.

Addresses are entered in the Cisco SMDS configuration software using an E prefix for Multicast addresses and a C prefix for Unicast addresses. Our 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 when broadcasting 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.

Example

The following example specifies an individual address in Ethernet-style notation:

```
interface serial 0
smds address c141.5797.1313.FFFF
```

smds dxi

Use the **smds dxi** interface configuration command to enable the DXI 3.2 support. Use the **no smds dxi** command to disable the DXI 3.2 support.

> **smds dxi**
> **no smds dxi**

Syntax Description

This command has no arguments or keywords.

Default

Enabled

Command Mode

Interface configuration

Usage Guidelines

Adding this command to the configuration enables the Data Exchange Interface (DXI) version 3.2 mechanism and encapsulates SMDS packets in a DXI frame before they are transmitted. DXI 3.2 adds an additional four bytes to the SMDS packet header to communicate with the SDSU. These bytes specify the frame type. The interface will expect 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** command. The Interim Local Management Interface (ILMI) is not supported.

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

Note   Switching in or out of DXI mode causes the IP cache to be cleared. This 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 is not frequently done and is not considered to be a major performance penalty.

Fast switching of DXI frames is also supported as of this software release.

Example

The following example enables DXI 3.2 on interface HSSI 0:

```
interface hssi 0
encapsulation smds
smds dxi-mode
smds address C120.1111.2222.FFFF
ip address 131.108.1.30 255.255.255.0
smds multicast ip E180.0999.9999
smds enable-arp
```

Related Command

A dagger (†) indicates that the command is documented in another chapter.

keepalive †

smds enable-arp

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

> **smds enable-arp**
> **no smds enable-arp**

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Interface configuration

Example

The following example enables the dynamic ARP routing table:

```
interface serial 0
ip address 131.108.1.30 255.255.255.0
smds multicast IP E180.0999.9999.2222
smds enable-arp
```

Related Command

arp

smds multicast

To assign a multicast 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 smds multicast** command with the appropriate address.

smds multicast *protocol smds-address*
no smds multicast *protocol smds-address*

Syntax Description

protocol	Protocol type. See Table 10-5 in the "Usage Guidelines" section for a list of supported protocols and their keywords.
smds-address	SMDS address. Because SMDS does not incorporate broadcast addressing, a group address for a particular protocol must be defined to serve the broadcast function.

Default

No mapping is defined.

Command Mode

Interface configuration

Usage Guidelines

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

Table 10-5 lists the high-level protocols supported by the **smds multicast** command.

Table 10-5 Supported Protocols

Keyword	Protocol
aarp	AppleTalk ARP address
appletalk	AppleTalk
arp	ARP
bridge	Transparent bridging
clns	ISO 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
decnet_router-L2	DECnet multicast address for all Level 2 (interarea) routers
ip	IP

Keyword	Protocol
ipx	Novell IPX
vines	Banyan VINES
xns	XNS

For IP, the IP NETwork and MASK fields are no longer required. The router will accepts these arguments, but will ignore the values. These were required commands for the previous Multi-LIS configuration. The router continues to accept the arguments to allow for backward compatibility, but ignores the contents.

Example

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

Use the **smds multicast arp** interface configuration command to map the SMDS address to a multicast address. Use the **no smds multicast arp** command to disable this feature.

> **smds multicast arp** *smds-address* [*ip-address mask*]
> **no smds multicast arp** *smds-address* [*ip-address mask*]

Syntax Description

smds-address	SMDS address in E.164 format
ip-address	(Optional) IP address
mask	(Optional) Subnet mask for the IP address

Default

None

Command Mode

Interface configuration

Usage Guidelines

This command is only used when an 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, they are sent to all multicast IP SMDS multicast addresses. If the optional ARP multicast address is missing, each entered IP multicast command will be used for broadcasting.

Example

The following example configures broadcast ARP messages:

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

Related Command

smds multicast ip

smds multicast bridge

Use the **smds multicast bridge** interface configuration command to enable Spanning Tree updates. Use the **no smds multicast bridge** command to disable this function.

> **smds multicast bridge** *smds-address*
> **no smds multicast bridge** *smds-address*

Syntax Description

smds-address	SMDS multicast address in E.164 format

Default

None

Command Mode

Interface configuration

Usage Guidelines

Transparent bridging of packets across an SMDS network must already be enabled to allow this update function. Enable transparent bridging across an SMDS network by adding an SMDS interface to an active bridge group.

When the **smds multicast bridge** command is added to the configuration, broadcast packets will be encapsulated using the specified SMDS multicast address configured for bridging. All bridge packets are first encapsulated in an 802.3 MAC header before encapsulating in an SMDS L3 header with LLC/SNAP. The 802.3 header will specify the particular packet enclosed in the bridge datagram in the EtherType field of the header.

Broadcast ARP packets are treated differently. Two packets are sent to the multicast address. One is sent using a standard (SMDS) ARP encapsulation, 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. Standard bridging commands are necessary to enable bridging on an SMDS interface.

Bridging over multiple logical IP subnets (multiLIS) is not supported in IOS Release 10.2. Bridging of IP packets in a multiLIS environment is unpredictable.

This implementation of 802.6 bridging supports the transmission and reception of only 802.3 encapsulated bridge packets. Other encapsulations will be supported in a future release.

Example

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

```
interface hssi 0
encapsulation smds
smds address C120.1111.2222.FFFF
ip address 131.108.1.30 255.255.255.0
smds multi bridge E180.0999.9999.FFFF
```

smds multicast ip

Use the **smds multicast ip** interface configuration command to map an SMDS group address to a secondary IP address. Use the **no smds multicast ip** command to remove the address map.

> **smds multicast ip** *smds-address* [*ip-address mask*]
> **no smds multicast ip** *smds-address* [*ip-address mask*]

Syntax Description

smds-address	SMDS address in E.164 format
ip-address	(Optional) IP address
mask	(Optional) Subnet mask for the IP address

Default

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

Command Mode

Interface configuration

Usage Guidelines

This command allows a single SMDS interface to be treated as multiple logical IP subnets (MultiLIS). If taking advantage of the MultiLIS support in SMDS, you can use more than one multicast address on the SMDS interface, that is, multiple commands can be entered. 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 using 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 OSPF and 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 allows the command to be backward compatible with earlier versions of the software.

If an ARP multicast address is missing, each entered IP multicast command will be 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 MultiLIS 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.

Example

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 Command

smds multicast arp

smds static-map

Use the **smds static-map** interface configuration command to configure a static map between an individual SMDS address and a higher-level protocol address. Use the **no smds static-map** command with the appropriate arguments to remove the map.

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

Syntax Description

protocol-type	Protocol type. It can be one of the following values: **appletalk**, **ip**, **decnet**, **xns**, **ipx**, **clns**, or **vines**.
protocol-address	Address of the higher-level protocol.
smds-address	SMDS address, to complete the mapping.
broadcast	(Optional) Marks the specified protocol address as a candidate for broadcast packets. All broadcast requests will be sent to the unicast SMDS address.

Default

No mapping is defined.

Command Mode

Interface configuration

Usage Guidelines

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

Examples

The following example illustrates how to enable pseudo-broadcasting. In addition to broadcasting IP and ARP requests to E180.0999.9999, the device at address C120.4444.9999 will also receive a copy of the broadcast request. The host at address 131.108.1.15 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 131.108.1.30 255.255.255.0
smds static-map ip 131.108.1.15 C120.4444.9999.FFFF broadcast
smds enable-arp
```

The following example illustrates how to enable multicasting. In addition to IP and ARP requests to E180.0999.9999, the device at address C120.4444.9999 will also receive a copy of the multicast request. The host at address 131.108.1.15 is incapable of receiving broadcast packets.

```
interface hssi 0
encapsulation smds
smds address C120.1111.2222.FFFF
ip address 131.108.1.30 255.255.255.0
smds multicast ip E100.0999.999.FFFF
smds static-map ip 131.108.1.15 C120.4444.9999.FFFF
smds enable-arp
```