

# SMDS Commands

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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** global configuration command to enable ARP entries for static routing over the SMDS network. Use the **no** form of this command to disable this capability.

```
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).
<b>smds</b>	Enables ARP for SMDS.

### Default

Disabled

### Command Mode

Global configuration

### Usage Guidelines

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

### Example

The following example creates a static ARP entry that maps the IP address 131.108.173.28 to the SMDS address C141.5797.1313 on interface serial 0:

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

### Related Command

```
smds enable-arp  
smds static-map
```

## 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.

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**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.

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#### 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**<sup>†</sup>

## 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 11-1 describes significant fields shown in the first line of output in the display.

**Table 11-1 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: <ul style="list-style-type: none"> <li>• ARPA</li> <li>• SNAP</li> <li>• ETLK (EtherTalk)</li> <li>• SMDS</li> </ul>
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 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 11-2 describes the fields shown in the display.

**Table 11-2 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

To display all 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 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 11-3 describes the fields shown in the output.

**Table 11-3 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 <b>smds static-map</b> command (static) and <b>smds multicast</b> command (multicast).
150.108.21.112	IP address.
255.255.255.0	Subnet mask for the IP address.

## show smds traffic

To display statistics about bad 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 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 11-4 describes the fields shown in the output.

**Table 11-4 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

**show smds traffic**

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<b>Field</b>	<b>Description</b>
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

To specify the 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

*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.

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

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### Example

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

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

## smds dxi

To enable the DXI 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.

### 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.

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

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**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.

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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

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.

### 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** 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 the “SMDS Multicast Supported Protocols” table in the “Usage Guidelines” section 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.

### 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 11-5 lists the high-level protocols supported by the **smds multicast** command.

**Table 11-5 SMDS Multicast Supported Protocols**

<b>Keyword</b>	<b>Protocol</b>
<b>aarp</b>	AppleTalk ARP address
<b>appletalk</b>	AppleTalk
<b>arp</b>	ARP
<b>bridge</b>	Transparent bridging
<b>clns</b>	ISO CLNS
<b>clns_es</b>	Multicast address for all CLNS End Systems
<b>clns_is</b>	Multicast address for all CLNS Intermediate Systems
<b>decnet</b>	DECnet
<b>decnet_node</b>	DECnet multicast address for all end systems
<b>decnet_router-L1</b>	DECnet multicast address for all Level 1 (intra-area) routers
<b>decnet_router-L2</b>	DECnet multicast address for all Level 2 (interarea) routers
<b>ip</b>	IP

<b>Keyword</b>	<b>Protocol</b>
<b>ipx</b>	Novell IPX
<b>vines</b>	Banyan VINES
<b>xns</b>	XNS

For IP, the IP NETWORK and MASK fields are no longer required. The router will accept 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

To map the SMDS address to a multicast address, use the **smds multicast arp** interface configuration command. Use the **no** form of this command to disable this feature.

```
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.

### Default

No mapping is defined.

### 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

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

No multicast SMDS address is defined. Spanning tree updates are disabled for transparent bridging across SMDS networks.

### 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 EtherType field of the 802.3 header will specify the particular packet enclosed in the bridge datagram.

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

To map an SMDS group address to a secondary IP address, use the **smds multicast ip** interface configuration command. Use the **no** form of this 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

<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.

### 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 broadcast 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.

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**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.

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### 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

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

```
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: <b>appletalk</b> , <b>clns</b> , <b>decnet</b> , <b>ip</b> , <b>ipx</b> , <b>vines</b> , or <b>xns</b> .
<i>protocol-address</i>	Address of the higher-level protocol.
<i>smds-address</i>	SMDS address, to complete the mapping.
<b>broadcast</b>	(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
```

## smds static-map

---

```
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
```