

# Cisco Multipath Channel+

## Feature Summary

CMPC+ is Cisco's implementation of IBM's MPC+ feature. The Cisco Multipath Channel+ (CMPC+) feature in Cisco IOS Release 12.0(3)T supports the MPC+ features and protocols necessary to support IP. CMPC+ enables High Performance Data Transfer (HPDT). It allows TCP/IP connections to the host through Cisco Mainframe Channel Connection (CMCC) adapters, using either the TCP/IP stack or the High Speed Access Services (HSAS) IP stack.

CMPC+ offers the following support:

- Support for TCP/IP and HSAS Transmission Group (TG)
- Support for one IP stack per MPC+ group
- Support for one read subchannel and one write subchannel per CMPC+ group. The read subchannel and write subchannel in an MPC+ group can be on different physical channels.
- Support for up to 64 KB per I/O block.
- Runs on the Channel Interface Processor (CIP) and the the Channel Port Adapter (CPA)

Up to 64 MPC+ groups can be configured on a CMCC, depending on memory configuration. CMPC+ can coexist with CMPC, TCP/IP Offload, CLAW, TN3270, and CSNA features.

Figure 1 shows an MVS host with a TCP/IP stack and a Cisco router configured with CMPC+ and IP.

**Figure 1** MVS Host with TCP/IP Stack and Cisco Router with CMPC+

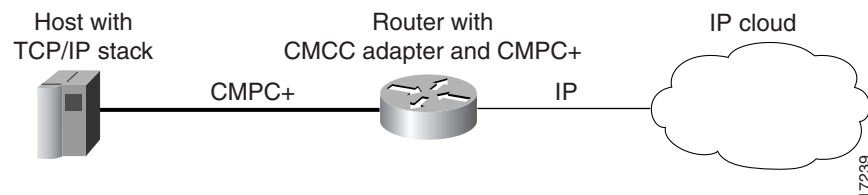
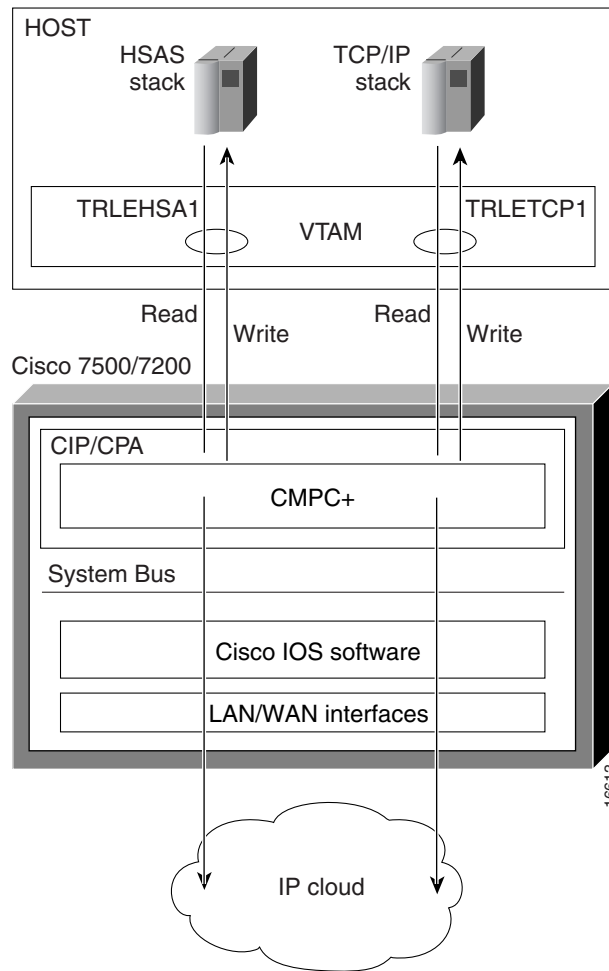


Figure 2 shows a scenario where a VTAM host is configured with both HSAS and TCP/IP stacks. Each stack on the host has a TG with a read and write subchannel. The CMCC adapter can be a CIP or CPA. On the outbound flow coming from the host, the Cisco router receives the MPC+ packets from the channel, removes the MPC+ headers, and transfers the packets as IP packets to the IP cloud. The router sends the packets to the appropriate interface, depending on the destination IP address in the packet.

On the inbound flow coming from the IP cloud via LAN or WAN interfaces, the IP packets are switched from the Cisco IOS software to the CMCC adapter and MPC+ headers are added to the packets. The MPC+ block of packets is then sent to the host.

**Figure 2 CMPC+ IP Structure**



IP communication from one IBM host to another can also be accomplished through the same CMCC adapter. Figure 3 illustrates IP packets going from Host 1 to Host 2 and from Host 2 to Host 1. These packets are routed through the same Route Switch Processor (RSP) in the Cisco router.

**Figure 3 IP Communication Between IBM Hosts Through the Same CMCC**

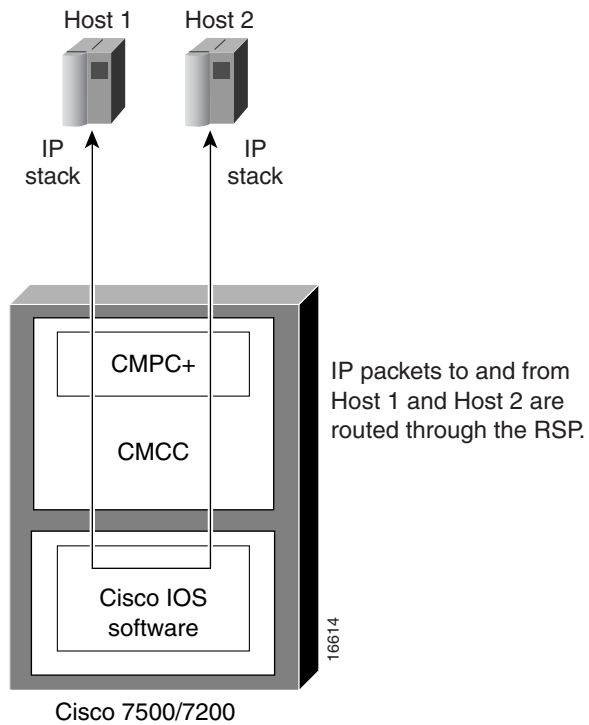


Figure 4 illustrates IP packets flowing between host 1 and host 2. IP packets can also be sent from one host to another host using different CMCC adapters.

**Figure 4 IP Communication Between IBM Hosts Using Different CMCC Adapters**

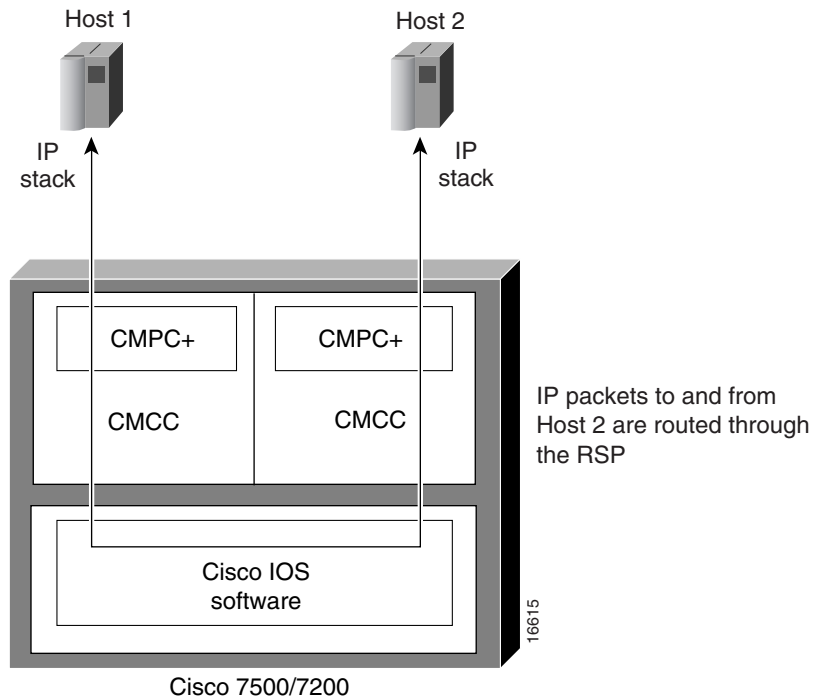


Figure 5 illustrates IP communication flowing between host 1 and host 2. IP communication can occur between two different hosts connected through two different routers.

**Figure 5** IP Communication Between Hosts Through Different Routers

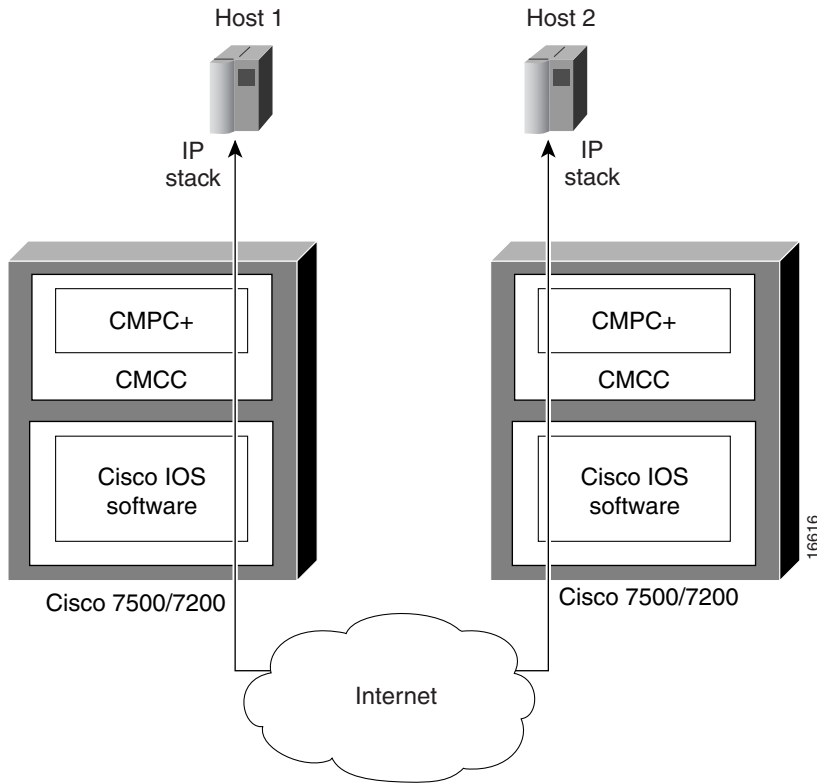
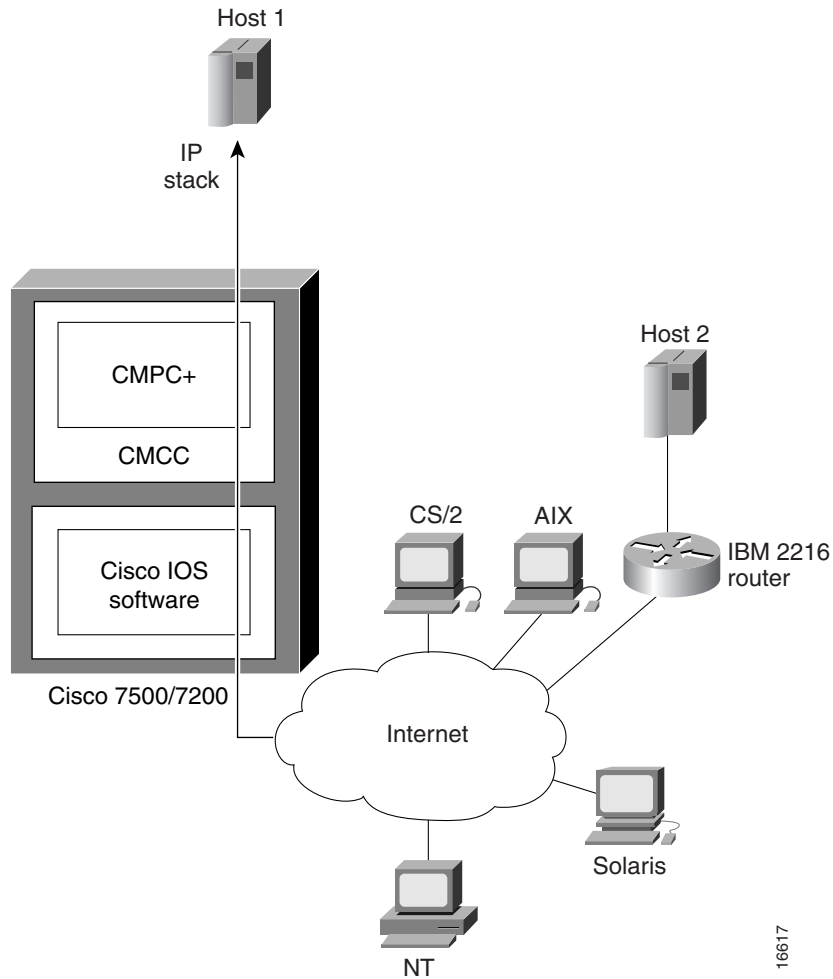


Figure 6 illustrates IP communication between a host and different IP nodes.

**Figure 6 IP Communication from a Host to IP Nodes**



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## Benefits

The following benefits are available in CMPC+:

- Support for HPDT
- IP connections to hosts using MPC+
- Coexists with CMPC, CSNA, TN3270, TCP/IP Offload, and CLAW features on a CMCC
- ESCON and Parallel Channel support
- ESCON Director support
- EMIF support

## List of Terms

- **Cisco Mainframe Channel Connection (CMCC)**—Adapter cards (CIP or CPA) used in the Cisco 7000, 7200, and 7500 series routers for mainframe channel connections.
- **Cisco Multipath Channel (CMPC)**—Cisco’s implementation of IBM’s MPC feature.
- **Cisco Multipath Channel+ (CMPC+)**—Cisco’s implementation of IBM’s MPC+ feature.
- **High Performance Data Transfer (HPDT)**—In VTAM, a family of functions that enhance the efficiency of large message transfers for VTAM application programs.
- **High Speed Access Services (HSAS)**—IBM’s high-speed TCP/IP stack that exclusively uses the efficient and strategic MPC point-to-point interface to communicate with both enterprise system connection (ESCON) network devices, and Open Systems Adapter (OSA) features.
- **Multipath Channel (MPC)**—IBM channel protocol that allows a channel connection consisting of multiple read-direction and write-direction subchannels.
- **Multipath Channel+ (MPC+)**—IBM channel protocol that allows channel connection consisting of multiple read-direction and write-direction subchannels that enables HPDT.
- **Transmission group (TG)**—A connection between adjacent nodes.

## Platforms

This feature is supported on these following platforms:

- Router Platform Requirements
  - Cisco 7200, Cisco 7000 with RSP, and Cisco 7500 routers. These routers must have Cisco IOS Release 12.0(3)T or later, CMCC (either CIP or CPA) with a minimum of 32 MB DRAM and appropriate CMCC microcode.
- Host Platform Requirements
  - The S/390 mainframe host is supported and the following networking software must be on the host:
    - OS/390 1.3 or later
    - ACF/VTAM 4.4 or later

The following IP stacks on the mainframe are supported:

- TCP/IP 3.3 or later
- HSAS

## Related Publications

Mainframe-related publications include the following:

- *OS/390 TCP/IP OpenEdition Configuration Guide*, SC31-8304-00
- *OS/390 TCP/IP OpenEdition Planning and Release Guide*, SC31-8303-00
- *OS/390 TCP/IP OpenEdition User’s Guide*, GC31-8305-00
- *IP Planning and Migration Guide*, SC31-8512
- *IP User’s Guide*, C31-8514-00

- *High Speed Access Services User's Guide*, GC31-8676
- *ES/390 Principles of Operation*, SA22-7201
- *VTAM Network Implementation Guide*, SC31-8370-00
- *VTAM Resource Definition Reference*, SC31-8377-00
- *VTAM V4R4 Resource Definition Samples*, SC31-8378-00

## Supported MIBs and RFCs

The following Management Information Bases (MIBs) are supported for CMPC+:

- CISCO-CIPCMPC-MIB
- CISCO-CIPTG-MIB

For descriptions of supported MIBs and how to use MIBs, see Cisco's MIB website on CCO at <http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>

No RFCs are supported.

## Configuration Tasks

This section describes the following configuration tasks for CMPC+:

- Configuration Tasks for the Host
- Configuration Tasks for the Router

### Configuration Tasks for the Host

This section contains the following host configuration tasks:

- Configure the VTAM Transport Resource List Major Node
- Configure the Stacks

### Configure the VTAM Transport Resource List Major Node

The CMPC+ feature supports standard Transport Resource List (TRL) major node configurations, standard TCP Profiles and OE configuration statements. The host configuration must be coordinated with the CMPC+ configuration for IP connectivity to be successful.

Following is a sample TRL configuration:

```

MPCPRTL  VBUILD  TYPE=TRL
MPCPTRLE  TRLE   LNCTL=MPC,MAXBFRU=16,                X
                                     READ= (246) ,        X
                                     WRITE= (247)

```

CMPC+ requires a unique TRLE for each CMPC+ TG.

## Configure the Stacks

This section provides samples for the following tasks:

- Configure the IBM TCP/IP Stack
- Configure the HSAS Stack

### Configure the IBM TCP/IP Stack

Following is an excerpt of a sample TCP/IP profile. The most important configuration commands are in bold:

```

DEVICE mpcptrle MPCPTP
LINK MPCPIP1 MPCPTP mpcptrle
;
telnetparms
    TIMEMARK 600
    PORT 23
    DBCSTRANSFORM
endtelnetparms
;
ASSORTEDPARMS NOFWD ENDASSORTEDPARMS
;
PORT
    20 TCP OMVS          NOAUTOLOG ; FTP Server
    21 TCP OMVS          ; FTP Server
    23 TCP INTCLIEN      ; TELNET Server
    25 TCP SMTP          ; SMTP Server
    53 TCP NAMESRV       ; Domain Name Server
    53 UDP NAMESRV       ; Domain Name Server
    111 TCP OMVS         ; OE Portmap Server
    111 UDP OMVS         ; OE PORTmap Server
    135 UDP NCSLLBD      ; NCS Location Broker
    161 UDP SNMPD        ; SNMP Agent
    162 UDP SNMPQE       ; OE SNMPQE Agent
    515 TCP LPSERVE      ; LPD Server
    520 UDP OROUTED      ; OE Routed Server
    750 TCP MVSKERB      ; Kerberos
    750 UDP MVSKERB      ; Kerberos
    751 TCP ADM@SRV      ; Kerberos Admin Server
    2049 UDP MVS NFS     ; NFS Server
    3000 TCP CICSTCP     ; CICS Socket
HOME
    172.18.5.3 MPCPIP1
GATEWAY
    172.18.5.1 = MPCPIP1 4468 HOST
    DEFAULTNET 172.18.5.1 MPCPIP1 4468 0
;
; TRANSLATE
BEGINVTAM
3278-2-E NSX32702 ; 24 line screen
3279-2-E NSX32702 ; 24 line screen
3278-3-E NSX32703 ; 32 line screen - default of NSX32702 is 24 lines
3279-3-E NSX32703 ; 32 line screen - default of NSX32702 is 24 lines
3278-4-E NSX32704 ; 48 line screen - default of NSX32702 is 24 lines
3279-4-E NSX32704 ; 48 line screen - default of NSX32702 is 24 lines
3278-5-E NSX32705 ; 132 column screen - default of NSX32702 is 80
3279-5-E NSX32705 ; 132 column screen - default of NSX32702 is 80
DEFAULTPLUS
    TCP20000..TCP20999 ; allow 1000 LU-LU SESSIONS on this TCPIP
ENDDEFAULTPLUS
ALLOWAPPL * ; Allow access to all applications
USSTCP USSTCPMF MPCPIP1

```

```
ENDVTAM
DATASETPREFIX TCPMVS2.TCPIP1
START MPCPTRLE
```

For the CMCC adapter, the MTU size on the DEFAULTNET statement must be 4468 or less to ensure that the CMCC adapter does not receive packets larger than the CMCC adapter's MTU.

## Configure the HSAS Stack

Following are the sample OE configuration commands for configuring and activating the HSAS stack:

```
oeifconfig trle host-ip-addr router-ip-addr [mtu size] [netmask netmask]
oeifconfig trle [up|down|detach]
oeroute [flags] [add|delete] [default|dest-ip-addr gateway-ip-addr [metric]]
oenetopts [+a [config-file-name]]
```

For HSAS, the MTU size must be set to 4468.

## Configuration Tasks for the Router

This section describes the configuration tasks associated with the CMPC+ feature.

- Assign IP Address to Network Interface
- Configure the CMPC+ Subchannels
- Configure the CMPC+ Transmission Groups

## Assign IP Address to Network Interface

To assign an IP address to the network interface, use the following command in interface configuration mode:

<b>ip address</b> <i>ip-address mask secondary</i>	Assign IP address to network interface.
--	---

## Configure the CMPC+ Subchannels

To define a CMPC+ read subchannel and CMPC+ write subchannel, use the following commands in interface configuration mode on a CMCC adapter physical interface:

Step	Command	Purpose
1	<b>cmprc path device</b> <i>tg-name read</i>	Configure the CMPC+ read subchannel.
2	<b>cmprc path device</b> <i>tg-name write</i>	Configure the CMPC+ write subchannel.

These statements define the subchannel addresses that CMPC+ uses to connect to the host and to correspond to the definitions in the TRL major network node on the host.

Use the **no cmprc path device** command to remove the definition of a subchannel.

## Configure the CMPC+ Transmission Groups

To define a CMPC+ TG by name, use the following command in interface configuration mode on a CIP virtual interface or a CPA physical interface:

Command	Purpose
<b>tg</b> <i>tg-name</i> [ <b>ip</b>   <b>hsas-ip</b> ] <i>host-ip-addr local-ip-addr</i>	Define IP addresses for CMPC+ connection.

The **tg** command defines the name of the TG. The *tg-name* must match the name given in the **cmpe** command issued in the physical interfaces on the same CMCC adapter.

Use the **no tg** command to delete a CMPC+ TG from the configuration and deactivate the TG.

To change any parameter of the **tg** statement, the statement must be removed by using the **no tg** *tg-name* command and reentered first with new parameters.

## Configuration Examples

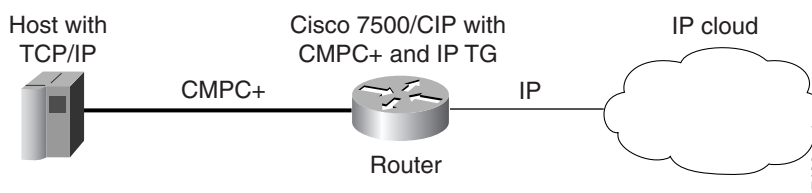
Following are the CMPC+ configuration examples shown in this section:

- CMPC+ with TCP/IP Stack Example
- CMPC+ with HSAS Stack Example
- CMPC+ with TCP/IP and HSAS Stacks
- CMPC+ TG Using Two Interfaces Example

### CMPC+ with TCP/IP Stack Example

Figure 7 illustrates TCP/IP link for CMPC+ between a Host and a Cisco router with a CMCC adapter. The configurations for this example follow.

**Figure 7 CMPC+ IP with TCP/IP**



### Router

The following configuration is for the CIP in the Cisco 7500 router:

```
hostname ipclust1
!
microcode CIP flash slot0:cip27-0
microcode reload
!
interface Channel0/1
no ip address
no keepalive
```

```

cmpc 0170 00 TG00 READ
cmpc 0170 01 TG00 WRITE
!
interface Channel0/2
ip address 80.12.165.1 255.255.255.0
no ip redirects
no ip directed-broadcast
ip route-cache same-interface
no ip mroute-cache
load-interval 30
no keepalive

tg TG00      ip 80.12.165.2 80.12.165.1

```

In this configuration, the CMPC+ configuration is for the TCP/IP stack on the host. The host IP address of 80.12.165.2 in the TG statement corresponds to the IP address for the TCP/IP stack in the TCP/IP profile on the host. The IP address for the CIP is 80.12.165.2.

## TCP/IP Profile

The following sample shows the TCP/IP Profile on the Host:

```

ARPAGE 5
telnetparms timemark 600 port 23 dbcstransform endtelnetparms
ASSORTEDPARMS NOFWD ENDASSORTEDPARMS
;
DEVICE mpc4b00 MPCPTP
LINK MPCPLNK2 MPCPTP mpc4b00
;
AUTOLOG
OEF TPE3
ENDAUTOLOG
INCLUDE TODD.MPCP.TCPIP.PROFILES(PORTS)
HOME
80.12.165.2 MPCPLNK2
GATEWAY
; NETWORK FIRST DRIVER PACKET SUBNet mask subnet value
; HOP SIZE
80.12.165.1 = mpcplnk2 4468 host
DEFAULTNET 80.12.165.1 mpcplnk2 4468 0
BEGINVTAM
; Define logon mode tables to be the defaults shipped with the latest
; level of VTAM
3278-3-E NSX32703 ; 32 line screen - default of NSX32702 is 24 line screen
3279-3-E NSX32703 ; 32 line screen - default of NSX32702 is 24 line screen
3278-4-E NSX32704 ; 48 line screen - default of NSX32702 is 24 line screen
3279-4-E NSX32704 ; 48 line screen - default of NSX32702 is 24 line screen
3278-5-E NSX32705 ; 132 column screen - default of NSX32702 is 80 columns
3279-5-E NSX32705 ; 132 column screen - default of NSX32702 is 80 columns
; Define the LUs to be used for general users
DEFAULTAPPL ECHOMVSE
; DEFAULTAPPL ECHOMVSE 10.10.1.188
; DEFAULTAPPL NETTMVSE
DEFAULTLUS
TCPE0000..TCPE9999
ENDDEFAULTLUS
ALLOWAPPL * ; Allow all applications that have not been previously
; specified to be accessed

ENDVTAM
DATASETPREFIX TODD.MPCP
start mpc4b00

```

In this TCP/IP profile, the DEVICE specifies the VTAM TRLE mpc4b00 and LINK specifies the link name (MPCPLNK2) associated with the IP address (80.12.165.2) for that link. The host IP address 80.12.165.2 that is specified for the TG in the router configuration must be identical to the IP address specified for the TG in the router configuration.

## TRL Major Node Example

The following sample shows the TRL major node example:

```

TRL4B00 VBUILD TYPE=TRL
MPC4B00 TRLE LNCTL=MPC,MAXBFRU=16,
READ=(4B00),
WRITE=(4B01)

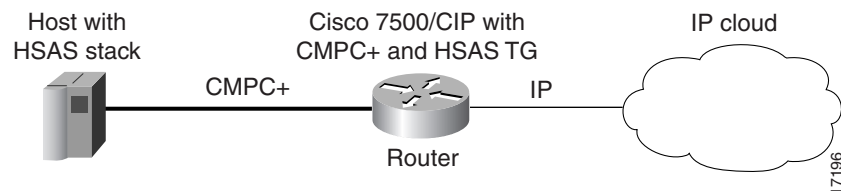
```

In this TRL major node example, the parameter *MPC4B00* must be identical to the LINK parameter in the TCP/IP profile.

## CMPC+ with HSAS Stack Example

Figure 8 illustrates HSAS for CMPC+ between a host and a Cisco router with a CMCC adapter. The configurations for this example follow.

**Figure 8 CMPC+ IP with HSAS**



## Router

The following sample shows the configuration for the CIP in the Cisco 7500 router:

```

hostname ipclust1
!
microcode CIP flash slot0:cip27-0
microcode reload
!
interface Channel0/1
no ip address
no keepalive
cmpc 0170 00 TG00 READ
cmpc 0170 01 TG00 WRITE
!
interface Channel0/2
ip address 80.12.165.1 255.255.255.0
no ip redirects
no ip directed-broadcast
ip route-cache same-interface
no ip mroute-cache
load-interval 30
no keepalive
tg TG00 hsas-ip 80.12.165.2 80.12.165.1

```

In this configuration, the CMPC + configuration is for the HSAS stack on the host. The IP address of 80.12.165.2 on the CIP corresponds to the HSAS IP address for the HSAS stack on the host.

## Stack Definition in the OE Parmlib Member for HSAS

The following example shows the HSAS communications stack defined through the BPXPRMxy member in SYS1.PARMLIB. The most important configuration statement is shown in bold.

```

SYS1.PARMLIB(BPXPRMxy)
.
.
FILESYSTYPE      ENTRYPOINT(BPXTTCINT)  TYPE(CINET)
NETWORK DOMAINNAME(AF_INET) DOMAINNUMBER(2) MAXSOCKETS(11000)
                  TYPE(CINET) INADDRANYPORT(5000) INADDRANYCOUNT(4000)
SUBFILESYSTYPE   NAME(TCPMVSE1) ENTRYPOINT(EZBPFINI) TYPE(CINET)
                  DEFAULT
SUBFILESYSTYPE   NAME(TCPMVSE2) ENTRYPOINT(EZBPFINI) TYPE(CINET)
SUBFILESYSTYPE   NAME(TCPMVSE3) ENTRYPOINT(EZBPFINI) TYPE(CINET)
SUBFILESYSTYPE   NAME(TCPMVSE4) ENTRYPOINT(EZBPFINI) TYPE(CINET)
SUBFILESYSTYPE   NAME(TCPMVSE5) ENTRYPOINT(EZBPFINI) TYPE(CINET)
SUBFILESYSTYPE   NAME(TCPMVSE6) ENTRYPOINT(EZBPFINI) TYPE(CINET)
SUBFILESYSTYPE   NAME(TCPMVSE7) ENTRYPOINT(EZBPFINI) TYPE(CINET)
SUBFILESYSTYPE   NAME(TCPMVSE8) ENTRYPOINT(EZBPFINI) TYPE(CINET)
SUBFILESYSTYPE NAME(OESTACK) ENTRYPOINT(BPXUIINT) TYPE(CINET)

```

The OpenEdition Common INET physical file system must be defined to include the HSAS communications stack (OESTACK). Whereas other IP communications stacks require a separate address space, the HSAS communications stack resides within the OpenEdition kernel.

The SUBFILESYSTYPE NAME(OESTACK) statement defines the HSAS stack. This statement must be coded exactly as shown in the example and only one such statement must be coded.

## HSAS Configuration Example

The following sample is the HSAS configuration on the MVS host:

```

oeifconfig mpc4b02 80.80.165.2 80.12.165.1 mtu 4468
oeroute add default 80.12.165.1

```

## TRL Major Node Example

The following sample is the TRL major node configuration:

```

TRL4B02 VBUILD TYPE=TRL
MPC4B02 TRLE LNCTL=MPC,MAXBFPU=16, X
          READ=(4B02), X
          WRITE=(4B03)

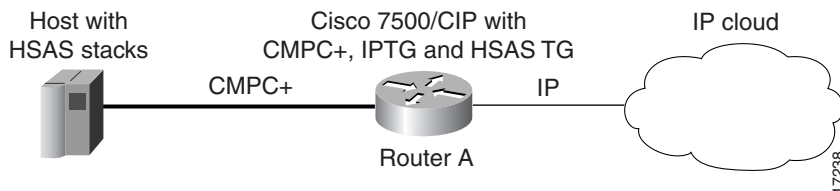
```

In this TRL major node configuration, the parameter *MPC4B02* must be identical to the *trle* parameter in the *oeifconfig* configuration.

## CMPC+ with TCP/IP and HSAS Stacks

Figure 9 illustrates CMPC+ used between a Cisco router with a CMCC adapter and a Host with both TCP/IP and HSAS stacks.

**Figure 9 CMPC+ with TCP/IP and HSAS Stacks**



### Router

The following is the CMPC+ configuration for TCP/IP and HSAS in the CPA:

```
hostname ipclust2
!
enable secret 5 $1$2Py5$GmguUvRGwLdOj2UCi6cv71
enable password lab
!
microcode ecpa slot0:xcpa216-0.plus110698
microcode reload
ip subnet-zero
ip host bizarre 171.69.160.37
ip domain-name cisco.com
ip name-server 171.69.161.21
!
interface Channel5/0
 ip address 80.80.2.1 255.255.255.0
 no ip directed-broadcast
 ip route-cache same-interface
 no ip mroute-cache
 load-interval 30
 no keepalive
 cmpc 0180 00 TG00 READ
 cmpc 0180 01 TG00 WRITE
 cmpc 0180 02 TG02 READ
 cmpc 0180 03 TG02 WRITE
 tg TG00      ip 80.80.2.2 80.80.2.1
 tg TG02      hsas-ip 80.80.2.3 80.80.2.1
```

In this configuration, the `cmpc` configuration is for the TCP/IP and HSAS stacks on the host. The IP address of 80.80.2.2 corresponds to the IP address for the TCP/IP stack in the TCP/IP profile on the host. The IP address of 80.80.2.3 corresponds to the IP address in the HSAS stack on the host.

### TRL Major Node for TCP/IP Stack Example

The following sample shows the TRL major node configuration for the TCP/IP stack:

```
TRL4900 VBUILD TYPE=TRL
MPC4900 TRLE LNCTL=MPC,MAXBFRU=6,REPLYTO=3,
READ=(4900),WRITE=(4901) x
```

In this TRL major node example, the parameter `MPC4900` must be identical to the `TRLE` parameter in the `LINK` statement in the TCP/IP profile.

## TRL Major Node for HSAS Stack Example

The following sample shows the TRL major node configuration for the HSAS stack:

```

TRL4902  VBUILD  TYPE=TRL
MPC4902  TRLE   LNCTL=MPC,MAXBFRU=9,REPLYTO=3,           X
          READ=(4902),                                   X
          WRITE=(4903)

```

In this TRL major node example, the parameter *MPC4B02* must be identical to the *oeifconfig* statement in the TCP/IP profile.

## TCP/IP Profile

The following example shows the TCP/IP Profile on the Host:

```

ARPAGE 5
telnetparms timemark 600 port 23 dbcstransform endtelnetparms
ASSORTEDPARMS NOFWD ENDASSORTEDPARMS
;
DEVICE mpc4900 MPCPTP
LINK MPCPLNK2 MPCPTP mpc4900
;
INCLUDE TODD.MPCP.TCPIP.PROFILES(PORTS)
HOME
  80.80.2.2      MPCPLNK2
GATEWAY
; NETWORK      FIRST      DRIVER      PACKET      SUBNet mask      subnet value
;              HOP              SIZE
  80.80.2.1    =      mpcplnk2    4468      host
DEFAULTNET 80.80.2.1 mpcplnk2 4468      0
BEGINVTAM
  ; Define logon mode tables to be the defaults shipped with the latest
  ; level of VTAM
  3278-3-E NSX32703 ; 32 line screen - default of NSX32702 is 24 line screen
  3279-3-E NSX32703 ; 32 line screen - default of NSX32702 is 24 line screen
  3278-4-E NSX32704 ; 48 line screen - default of NSX32702 is 24 line screen
  3279-4-E NSX32704 ; 48 line screen - default of NSX32702 is 24 line screen
  3278-5-E NSX32705 ; 132 column screen - default of NSX32702 is 80 columns
  3279-5-E NSX32705 ; 132 column screen - default of NSX32702 is 80 columns
  ; Define the LUs to be used for general users
DEFAULTAPPL ECHOMVSF
; DEFAULTAPPL NETTMVSE
DEFAULTLUS
  TCPF0000..TCPF9999
  ENDDEFAULTLUS
  ALLOWAPPL * ; Allow all applications that have not been previously
              ; specified to be accessed
ENDVTAM
DATASETPREFIX TODD.MPCP

START mpc4900

```

In this TCP/IP profile, the *DEVICE* specifies the VTAM *TRLE* *mpc4900* and *LINK* specifies the link name (*MPCPLNK2*) associated with the IP address (80.8.2.2) for that link. The IP address 80.80.2.1 must be identical to the IP address specified for the *TG* in the router configuration.

## HSAS Stack Configuration

The following example shows the OE commands for the HSAS stack configuration:

```
oeifconfig mpc4902 80.80.2.3 80.80.2.1 mtu 4468
oeroute add default 80.80.2.1
```

In this configuration, *mpc4902* must be identical to the TRLE parameter in the *oeifconfig* configuration.

## CMPC+ TG Using Two Interfaces Example

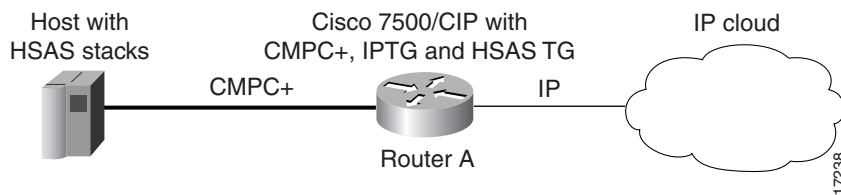
Figure 10 illustrates CMPC+ used between a Cisco router with a CIP and a Host with split TGs.

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**Note** The split TG configuration is only supported on a CIP with two physical interfaces.

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**Figure 10** CMPC+ with Split TG



## Router

The following example shows the CMPC+ router configuration for a split transmission group:

```
interface Channel0/0
no ip address
no ip directed-broadcast
no keepalive
cmpc 0170 00 TG00 READ
!
interface Channel0/1
no ip address
no ip directed-broadcast
no keepalive
cmpc 0170 00 TG00 WRITE
!
interface Channel0/2
ip address 80.12.165.1 255.255.255.0
no ip redirects
no ip directed-broadcast
ip route-cache same-interface
no ip mroute-cache
load-interval 30
no keepalive
tg TG00      hsas-ip 80.12.165.2 80.12.165.1
!
```

## HSAS Configuration Example

The following example shows the HSAS configuration on the Host:

```
oeifconfig mpcsplit 80.12.165.2 80.12.165.1 mtu 4468
oeroute add default 80.12.165.1
```

## TRL Major Node for HSAS Stack Example

The following example shows the TRL major node configuration for the HSAS stack:

```
TRLSPLIT VBUILD TYPE=TRL
MPCSPLIT TRLE LNCTL=MPC,MAXBFRU=16,REPLYTO=3, X
          READ=(5200), X
          WRITE=(4B00)
```

In this TRL major node example, the parameter *mpcsplit* must be identical to the TRLE parameter in the LINK statement within the *oeifconfig* statement.

## Command Reference

This section documents new or modified commands. All other commands used with this feature are documented in the Cisco IOS Release 12.0 command references.

- **cmpe**
- **show extended channel cmgr**
- **show extended channel cmgr**
- **show extended channel cmpe**
- **show extended channel statistics**
- **show extended channel subchannel**
- **show extended channel tg**
- **tg**

## cmPC

Use the **cmPC** interface configuration command to configure a CMPC+ read subchannel and a CMPC+ write subchannel. Use the **no** form of this command to remove a subchannel definition and to deactivate the transmission group.

```
cmPC path device tg-name {read | write}
no cmPC path device
```

### Syntax Description

<i>path</i>	Hexadecimal value in the range 0000 to FFFF. This value specifies the logical channel path and consists of two digits for the physical connection (either on the host or on the ESCON director), one digit for the channel logical address, and one digit for the control unit logical address. For the bus and tag, use the value 0x0100.
<i>device</i>	Two-digit hexadecimal value that specifies the device address of the CMPC+ subchannel.
<i>tg-name</i>	Name of the CMPC+ transmission group. The maximum length of the name is eight characters.
<b>read</b>	Read value is identical to the read value specified in the TRL major node. Specifies the subchannel used for reads. This must match the configuration of the device TRL.
<b>write</b>	Write value is identical to the write value specified in the TRL major node. It specifies the subchannel used for writes.

### Command Mode

Interface configuration

### Usage Guidelines

This command first appeared in Cisco IOS Release 11.3. This command supports CMPC+ in Cisco IOS Release 12.0(3)T.

Each **cmPC** configuration command in a CMPC+ transmission group specifies the same transmission group name. The corresponding **tg** command specifies the same transmission group name. Together, the **cmPC** and **tg** commands make up the transmission group specification.

The **cmPC** command defines the read and write subchannel addresses that CMPC+ uses to connect to the host. The command corresponds to the definitions in the TRL major node on the host. Configure the **cmPC** command on a CMCC adapter physical interface. Configure one read subchannel and one write subchannel. If CMPC+ is configured on a CMCC adapter with two physical interfaces, the read and write CMPC+ subchannels can be configured on separate physical interfaces.

The **no cmPC** command deactivates the CMPC+ subchannel and all sessions using the TG are immediately terminated.

### Example

The following example configures read and write subchannels on path C020 for the CMPC+ transmission group named CONFIGE:

```
cmpc C020 F8 CONFIGE READ  
cmpc C020 F9 CONFIGE WRITE
```

### Related Commands

- show extended channel cmpc**
- show extended channel tg**
- show extended channel subchannel**
- show extended channel statistics**

## show extended channel cmgr

Use the **show extended channel cmgr** privileged EXEC command to display information about the MPC+ TG connection manager.

```
show extended channel slot/port cmgr [tg-name]
```

### Syntax Description

<i>slot</i>	Slot number.
<i>port</i>	Physical channel interface port number.
<b>cmgr</b>	connection manager.
<i>tg-name</i>	(Optional) Name of the transmission group.

### Command Mode

Privileged EXEC

### Usage Guidelines

This command first appeared in Cisco IOS Release 12.0(3)T.

This command is valid on the CIP's virtual channel interface or the CPA's physical channel interface.

### Sample Display

The following is sample output from the **show extended channel cmgr** command:

```
Router# show extended channel 3/2 cmgr
CMGR:MPCPTG2  Type=PTP
  Local Group Token:0500128933          Remote Group Token :0500993355
  Local VC Token   :0500109002          Local Conn. Token  :0500109003
  Remote VC Token  :0500201002          Remote Conn. Token :0500201002
  VC Status        :Active               Connection Status  :Active

CMGR:MPCPTG3  Type=PTP
  Local Group Token:050014573           Remote Group Token :05008984300
  Local VC Token   :0500109044          Local Conn. Token  :0500109066
  Remote VC Token  :0500201095          Remote Conn. Token :0500201088
  VC Status        :Active               Connection Status  :Active
```

Table 2 describes the fields shown in the display.

**Table 1 Show Extended Channel CMPC+ Field Descriptions**

Field	Description
Local Group Token	CMCC's MPC+ group token for this TG.
Remote Group Token	Host's MPC+ group token for this TG.
Type	Connection manager type supported is point-to-point (PTP).
Local VC Token	CMCC adapter's token for the connection manager's virtual circuit.
Remote VC Token	host's token for the connection manager's virtual circuit.
VC Status	Valid states for a VC are: <ul style="list-style-type: none"> <li>• <b>Reset</b>—Awaiting a connection manager virtual circuit activate indication from the host.</li> <li>• <b>Active</b>—Connection manager virtual circuit active indication was received from the host and CMCC adapter has sent a virtual circuit active indication to the host. The virtual circuit is now ready to send and/or receive connection requests.</li> </ul>
Local Conn Token	CMCC's token for the connection manager's connection.
Remote Conn Token	Host's token for the connection manager's connection.
Connection Status	Valid states for a connection manager's connection are: <ul style="list-style-type: none"> <li>• <b>Reset</b>—Awaiting a connection manager connection request from the host.</li> <li>• <b>Active</b>—Connection is active. The host has sent a connection request and the CMCC adapter has responded with a confirmation of the connection.</li> </ul>

Related Commands

- cmpr**
- show extended channel cmgr**

## show extended channel cmpc

Use the **show extended channel cmpc** privileged EXEC command to display information about each CMPC+ subchannel configured on the specified channel interface.

```
show extended channel slot/port cmpc [path [device]]
```

### Syntax Description

<i>slot</i>	Slot number.
<i>port</i>	Physical channel interface port number.
<i>path</i>	(Optional) Logical channel path.
<i>device</i>	(Optional) A two-digit hexadecimal value that specifies a device address of the CPMC subchannel. If specified, only status for that CMPC+ device is displayed. If not specified, status for all CMPC+ devices for the specified path are displayed.

### Command Mode

Privileged EXEC

### Usage Guidelines

This command first appeared in Cisco IOS Release 11.3. This command was modified in Cisco IOS Release 12.0(3)T to include CMPC+ support.

This command is valid only on the CMCC adapter physical interfaces.

### Sample Display

The following sample shows output from the **show extended channel cmpc** command on a Cisco 7500 router:

```
Router# show extended channel 3/0 cmpc c020

      Path Dv  TGName   Dir   Bfrs  Status
CMPC C020 46  MVS2ISRA READ   10  Active+
CMPC C020 47  MVS2ISRA WRITE  16  Active+
CMPC C020 4A  MVS2ISR1 READ    7  Active
CMPC C020 4B  MVS2ISR1 WRITE  16  Active
CMPC C020 4C  MVS2ISR2 READ    7  Active
CMPC C020 4D  MVS2ISR2 WRITE  16  Active
CMPC C020 4E  MVS2TN   READ    0  Inactive
CMPC C020 4F  MVS2TN   WRITE   0  Inactive
```

Table 2 describes the fields shown in the display.

**Table 2 Show Extended Channel CMPC+ Field Descriptions**

<b>Field</b>	<b>Description</b>
Path	CMPC+ channel path configured.
Dv	CMPC+ subchannel device configured.
TGName	Transmission group name configured for the CMPC+ subchannel.
Dir	Identifies this CMPC+ subchannel as READ or WRITE.
Bfrs	On the read subchannel, this is the number of 4 KB-size pages that VTAM has allocated for each read. This number matches the MAXBFRU value configured in the VTAM TRL major node. On the write subchannel, this is the maximum number of 4 KB pages VTAM can write to the CMCC adapter for a single channel I/O. The value is always 16 for the write subchannel because the CIP always allows VTAM to write up to 64 KB per channel I/O.
Status	<p>State of the CMPC+ subchannel. Valid values are:</p> <ul style="list-style-type: none"> <li>• Shutdown—CMCC adapter interface for this CMPC+ subchannel is shut down. In this state, the Bfrs value is not available and will be displayed as zeros.</li> <li>• Inactive—CMPC+ subchannel is not active.</li> <li>• XID2_Pending—XID2 handshaking is in progress.</li> <li>• Active—XID2 exchange is complete; subchannel is active in non-HPDT mode. This value is invalid for IP.</li> <li>• Active+—XID2 exchange is complete; subchannel is active in HPDT mode.</li> </ul>

Related Commands

- cmpr**
- show extended channel cmgr**

## show extended channel statistics

Use the **show extended channel statistics** EXEC command to display statistics about subchannels on the physical interface of a CMCC. This command displays information that is specific to the interface channel devices. The information is generally useful only for diagnostic tasks performed by technical support personnel.

**show extended channel** *slot/port* **statistics** [*path* [*device-address*]] [**connected**]

### Syntax Description

<i>slot</i>	Slot number.
<i>port</i>	Port number.
<i>path</i>	(Optional) Hexadecimal value in the range 0x0000 to 0xFFFF. This specifies the data path and consists of two digits for the physical connection (either on the host or on the ESCON Director switch): one digit for the control unit address, and one digit for the channel logical address.
<i>device-address</i>	(Optional) Hexadecimal value in the range 0x00 to 0xFE. This value is the unit address associated with the control unit number and path as specified in the host IOCP file. For CLAW and offload support, the device address must have an even value.
<b>connected</b>	(Optional) For each backup group, only display information about the active subchannel or the first subchannel defined in the group if none are active.

### Command Mode

EXEC

### Usage Guidelines

This command first appeared in Cisco IOS Release 10.2.

Sample Displays

The following is sample output for the **show extended channel statistics** command from a CMCC adapter configured with CLAW, Offload, CSNA, and CMPC+:

```
tanzania#show extended channel 0/1 statistics

Path:C020 -- ESTABLISHED
      Command           Selective      System      Device      CU
Dev   Connects  Retries  Cancels      Reset      Reset      Errors      Busy
 30         5         0         0         0         3         0         0
 31         5         0         0         0         3         0         0
 36        27        15         1         0         3         0         0
 37        29         6         1         0         3         0         0

      Blocks           Bytes           Dropped Blk      Memd
Dev-Lnk  Read    Write    Read    Write    Read    Write    wait Con
 30-00         0         0         0         0         0         0         0  N
 31-00         0         0         0         0         0         0         0  N
 36-00        19         6      54236      789         0         0         0  Y
 37-00         9        17       801     63302         0         0         0  Y

Path C020
Total:         28         23     55037     64091         0         0         0

Path:C190 -- ESTABLISHED
      Command           Selective      System      Device      CU
Dev   Connects  Retries  Cancels      Reset      Reset      Errors      Busy
 34         12         0         0         0         5         0         0
 35         12         0         0         0         5         0         0
 36        251        226         6         0         5         0         0
 37        258        14         8         0         5         0         0
 3E         12         0         0         0         5         0         0
 3F         12         0         0         0         5         0         0

      Blocks           Bytes           Dropped Blk      Memd
Dev-Lnk  Read    Write    Read    Write    Read    Write    wait Con
 34-00         0         0         0         0         0         0         0  N
 35-00         0         0         0         0         0         0         0  N
 36-00       236         12     3604441     1578         0         0         0  Y
 37-00         18        236       1602     4217913         0         0         0  Y
 3E-00         0         0         0         0         0         0         0  N
 3F-00         0         0         0         0         0         0         0  N

Path C190
Total:       254        248     3606043     4219491         0         0         0

Adapter Card
Total:       282        271     3661080     4283582         0         0         0

      Last statistics 8 seconds old, next in 2 seconds
tanzania#
```

Table 3 describes the fields shown in the display.

**Table 3 Show Extended Channel Statistics Field Descriptions**

Field	Description
Path	Path from the CLAW, offload, CMPC+, or CSNA configuration.
Dev	Address for each device. For CLAW and offload, there are two device addresses. In the configuration statement, you specify only the even address. Both CSNA and CMPC+ have one device.

**Table 3 Show Extended Channel Statistics Field Descriptions (Continued)**

<b>Field</b>	<b>Description</b>
Connects	Number of times the channel started a channel program on the device.
Command Retries	Number of times the CMCC adapter either had no data to send to the channel (for the read subchannel) or the number of times the CMCC adapter had no buffers to hold data from the channel (for the write subchannel). Every command retry that is resumed results in a connect. A command retry can be ended via a cancel.
Cancels	Host requested any outstanding operation to be terminated. It is a measure of the number of times the host program was started.
Selective Reset	Selective reset resets only one device. On VM, selective reset occurs when a device is attached and a CP Initial Program Load (IPL) command is issued.
System Reset	Number of times the system IPL command was issued. A system reset affects all devices on the given channel. The command is always issued when the ECA is initialized, and when the channel is taken off line.
Device Errors	Errors detected by the ESCON or Parallel interface because of problems on the link. This value should always be 0.
CU Busy	Number of times the adapter returned a control unit busy indication to the host. This indication occurs after a cancel or reset if the host requests an operation before the CMCC adapter has finished processing the cancel or reset.
Dev-Lnk	First number is the device address. The second number is the logical link. Link 0 is always used for CLAW control messages. For IP datagram mode, link 1 is for actual datagram traffic.  For offload, link 2 is for API traffic. For CSNA and CMPC+, the Dev-Lnk is not relevant.
Blocks Read/Write	Count of channel blocks that are read and written from the mainframe.
Bytes Read/Bytes Write	Sum of the bytes in the blocks.
Dropped Blk Read/Write	If the route processor sends data to the CMCC adapter faster than it can send it to the channel, then the block is dropped. High values mean the host is not running fast enough. A write drop occurs if the CMCC adapter fails to get a router processor buffer <i>n</i> times for a given block. See the Memd wait counter.
Memd wait	Number of times the CMCC adapter could not obtain a buffer.
Con	For link 0, a connection of Y means the system validation is complete. For all other links, Con means the connection request sequence is completed. For CSNA devices, a value of Y is displayed when the CSNA device status is complete. For all other states, the Con shows a value of N.

The following is sample output using the **show extended channel statistics** command for the CSNA path:

```

Router# show extended channel 0/1 statistics E200

Path: E200 -- ESTABLISHED

      Command          Selective      System      Device      CU
Dev  Connects    Retries    Cancels      Reset      Reset      Errors      Busy
D0   217440     108293         1          0          0          0          0
D1   59530      19800          1          0          0          0          0
D2   1065        252            2          0          0          0          0
D3   1329        16             2          0          0          0          0
D4   1066        251            2          0          0          0          0
D5   887         29             2          0          0          0          0
DA   1073         17             2          0          0          0         373
DB   410         174            2          0          0          0          0
DC   1154         14             2          0          0          0         459
DD   254         17             2          0          0          0          0

      Blocks          Bytes          Dropped Blk      Memd
Dev-Lnk  Read    Write    Read    Write    Read    Write    wait Con
D0-00   109096  109095  237799616  880468    0        0        0    Y
D1-00   19877   19875   160688    237876362  0        0        0    Y
D2-00     9     12842     801    52554701  0        0        0    Y
D3-00   1315     8    30378114    1052    0        0        0    Y
D4-00     9     12842     801    52554701  0        0        0    Y
D5-00    860     8    17003956    1052    0        0        0    Y
DA-00    687     8    14617852    1052    0        0        0    Y
DB-00     9     3578     801    14613989  0        0        0    Y
DC-00    682     8    14513604    1052    0        0        0    Y
DD-00     9     3594     801    14679517  0        0        0    Y
Path E200
Total:   132553  161858  314477034  373163946    0        0        0
      Last statistics 3 seconds old, next in 7 seconds
    
```

Related Commands

- claw**
- empc**
- csna**
- offload**

## show extended channel subchannel

Use the **show extended channel subchannel** EXEC command to display information about the CMCC adapter physical interfaces. This command displays information that is specific to the interface channel connection. The information displayed is generally useful only for diagnostic tasks performed by technical support personnel.

**show extended channel** *slot/port* **subchannel** [**connected**]

### Syntax Description

<i>slot</i>	Slot number.
<i>port</i>	Port number.
<b>connected</b>	(Optional) For each backup group, displays information about the active subchannel or the first subchannel defined in the group if none are active.

### Command Mode

EXEC

### Usage Guidelines

This command first appeared in Cisco IOS Release 10.2. In the Cisco IOS Release 12.0(3)T, additional fields were added to the display for this command.

Sample Display

The following is sample output from the **show extended channel subchannel connected** command used on a CMCC adapter configured for CLAW, offload, CSNA, and CMPC:

```

Router#show extended channel 0/1 subchannel

Channel0/1: state up
Flags: VALID ESCON LOADED ENABLED SIGNAL
Link: DD, Buffers 0, CRC errors 0, Load count 4
Link Incident Reports
  implicit 0, bit-error 0, link failed 0,
  NOS 0, sequence timeout 0, invalid sequence 0
Neighbor Node - VALID
  Class: Switch           Type Number : 009032           Tag: DD
  Model: 002              Manufacturer: 000
  Plant: 02               Sequence      : 000000011123
Local Node - VALID
  Class: CTCA-standalone Type Number : C7500           Tag: 1
  Model: 2                Manufacturer: CSC
  Plant: A                Sequence      : 76027714

Mode      Path Device      Last
CLAW      E010  D0   10.50.1.11   CISCOMVS DUBLIN   TCPIP   TCPIP   0080
CLAW      E010  D1   10.50.1.11   CISCOMVS DUBLIN   TCPIP   TCPIP   0080
OFFLOAD   E010  D2   10.50.1.2    CISCOMVS MPC1OF TCPIP   TCPIP   0080
          TCPIP   API
OFFLOAD   E010  D3   10.50.1.2    CISCOMVS MPC1OF TCPIP   TCPIP   0080
          TCPIP   API
CMPC      E010  D9   PC1-789 WRITE 0080
CMPC      E010  DA   PC1-789 READ  0080
CSNA      E200  D0   maxpiu 20470 time-delay 10 length-delay 20470 0000
CSNA      E200  D1   maxpiu 20470 time-delay 10 length-delay 20470 0000
CMPC      E200  D2   PC1-7F2 WRITE 0000
CMPC      E200  D3   PC1-7F2 READ  0000
CMPC      E200  D4   PC1-7F4 WRITE 0000
CMPC      E200  D5   PC1-7F4 READ  0000
CMPC      E200  DA   PC1-7FA READ  0000
CMPC      E200  DB   PC1-7FA WRITE 0000
CMPC      E200  DC   PC1-7FB READ  0000
CMPC      E200  DD   PC1-7FB WRITE 0000
Last statistics 0 seconds old, next in 10 seconds
    
```

Table 4 describes the fields shown in the display.

**Table 4 Show Extended Channel Subchannel Field Descriptions**

Field	Description
Channelx/y: state	State can be up, down, or administratively down.

**Table 4 Show Extended Channel Subchannel Field Descriptions (Continued)**

Field	Description
Flags	<ul style="list-style-type: none"> <li>• <b>BUF_WAIT</b>—Mainframe attempts to write data to the CMCC adapter and the CMCC adapter has no buffers for all of the write operation.</li> <li>• <b>BUSY</b>—Processing resets.</li> <li>• <b>CMD_RETRY</b>—Mainframe attempts to write data to the CMCC adapter when the CMCC adapter has no buffers for it, or the mainframe performs a read operation and the CMCC adapter has no data to send.</li> <li>• <b>ENABLED</b>—Interface is allowed to send and receive datagrams.</li> <li>• <b>ESCON</b>—Channel interface is an ESCON interface.</li> <li>• <b>FBL_WAIT</b>—Mainframe attempts to write data to the CMCC adapter and the CMCC adapter has no buffers for all of the write operation.</li> <li>• <b>GO-OFF</b>—CMCC adapter is trying to shut down the channel interface. This state should not persist for more than a few seconds. This flag is not applicable to the virtual channel interface.</li> <li>• <b>INVALID</b>—All displays for virtual channel interfaces should contain this flag. On physical channel interfaces, it indicates a problem with the CMCC adapter microcode.</li> <li>• <b>LOADED</b>—Channel firmware for the physical channel interface is loaded. The channel firmware is loaded only if the interface configuration contains at least one device configuration statement and is not shut down. This flag matches the state of the “loaded” LED. This flag is not applicable to the virtual channel interface.</li> <li>• <b>LOVE</b>—Note indicating an interface state change (up-down or down-up) is pending on this interface. This state should not persist for more than a few seconds.</li> <li>• <b>OFFLINE</b>—For an ESCON channel interface, this flag indicates that no mainframe has established an ESCON logical path corresponding to the paths specified in any device configuration statement (CLAW, offload, CSNA, CMPC, or CMPC+). For a Parallel channel interface, this flag indicates that the x'0100' path is not defined in any device configuration statement or SIGNAL is not present.</li> <li>• <b>ONLINE</b>—For an ESCON Channel interface, this flag indicates that at least one mainframe has established an ESCON logical path corresponding to the paths specified in one of the device configuration statements (CLAW, offload, CSNA, CMPC, or CMPC+). For a Parallel Channel interface, this flag indicates that the x'0100' path is defined in at least one device configuration statement and SIGNAL is present.</li> <li>• <b>RQC_PEND</b>—CMCC adapter is attempting to send status to the channel on this interface. This state should not persist for more than a few seconds. This flag is not applicable to the virtual channel interface.</li> <li>• <b>SIGNAL</b>—For an ESCON channel interface, this flag indicates that light is detected. For a Parallel channel interface, this flag indicates that the “operational out” signal is detected. This flag matches the state of the “signal” LED. It will only be set if the LOADED flag is set as well. This flag is not applicable to the virtual channel interface.</li> <li>• <b>STAT_PEND</b>—CMCC adapter has status to present for this device. The indication is cleared when the mainframe accepts the status.</li> </ul>

**Table 4 Show Extended Channel Subchannel Field Descriptions (Continued)**

Field	Description
Flags (continued)	<ul style="list-style-type: none"> <li>• SUSPEND—CMCC device task has decided to suspend data transfer for a particular device.</li> <li>• VALID—Physical interface is installed. All displays for physical channel interfaces should contain this flag. This flag matches the state of the “present” LED.</li> </ul>
Link: xx	Director Port number to which the physical channel is connected. If the physical channel is directly connected, then this value is host dependent.
Buffers	Number of times the CMCC adapter has dropped a packet bound for the route processor because no packet switching buffer was available on the route processor.
CRC errors	Number of CRC errors detected on the channel for ESCON. Number of parity errors detected on the channel for Parallel.
Load count	For a CMCC physical channel interface, the number of times the channel adapter microcode has been loaded.
Link Incident Reports	<p>Link incidents are errors on an ESCON channel. These errors are reported to the host operating system and are recorded here for additional information.</p> <ul style="list-style-type: none"> <li>• Implicit incidents—Recoverable error occurred in the ECA.</li> <li>• Bit errors—Bit error rate threshold was reached. The bit error rate threshold is 15 error bursts within 5 minutes. An error burst is defined as a time period of 1.5 +/- .5 seconds during which one or more code violations occurred. A code violation error is caused by an incorrect sequence of 10 bit characters.</li> <li>• Link failed—Loss of synchronization or light has occurred.</li> <li>• NOS—Channel or switch transmitted the Not Operational Sequence.</li> <li>• Sequence timeout—Connection recovery timeout has occurred or the router is waiting for the appropriate response while in the transmit off-line sequence (OLS) state.</li> <li>• Invalid Sequence—Unconditional disconnect (UD) or unconditional disconnect response (UDR) is recognized in the wait for offline sequence state.</li> </ul>
Neighbor node	<p>Describes the channel or switch. Valid values are:</p> <ul style="list-style-type: none"> <li>• VALID—Information has been exchanged between the router and channel or switch.</li> <li>• Class—Switch or channel depending on whether the connection is a switched point-to-point connection or a point-to-point connection.</li> <li>• Type number—Model of switch or processor.</li> <li>• TAG—Physical location of the connector.</li> <li>• Model—A further classification of type.</li> <li>• Manufacturer—Identifies who made switch or processor.</li> <li>• Plant and sequence—Manufacturer-specific information to uniquely define this one device.</li> </ul>

**Table 4 Show Extended Channel Subchannel Field Descriptions (Continued)**

<b>Field</b>	<b>Description</b>
Local node	Describes the router. Valid values are: <ul style="list-style-type: none"> <li>• VALID—Information has been exchanged between the router and channel or switch.</li> <li>• Class—Always CTCA.</li> <li>• Type number and model—Defines the router.</li> <li>• Tag—Slot and port where the channel interface processor resides.</li> <li>• Manufacturer—Always CSC (for Cisco Systems).</li> <li>• Plant—Location where the CMCC adapter was manufactured.</li> <li>• Sequence—Base Ethernet address assigned to the route processor (RP).</li> </ul>
Mode	Operation mode: CLAW, offload, CSNA, or CMPC+.
Last sense	Two bytes of sense data transmitted to the host at the time of the last unit exception. Normally the value will be 0000 if no unit exception has occurred, or 0080 to indicate that a resetting event has occurred. Resetting events occurs when an ESCON device starts unless the first command is a 0x02 read command. The CLAW read subchannel always starts with a 0x02 read command so a resetting event will not occur.

#### Related Commands

**claw**  
**cmpc**  
**csna**  
**offload**

## show extended channel tg

Use the **show extended channel tg** EXEC command to display configuration, operation information, and statistics for CMPC+ transmission groups configured on the specified CMCC adapter's virtual interface.

**show extended channel** *slot/port* **tg** [**oper** | **stats**] [**detailed**] [*mpc-tg-name*]

### Syntax Description

<i>slot</i>	Slot number.
<i>port</i>	Port number.
<b>oper</b>	(Optional) Operational parameters for the CMPC+ transmission group values.
<b>stats</b>	(Optional) Statistical values for the CMPC+ transmission group.
<b>detailed</b>	(Optional) Additional LLC information about the CMPC+ transmission group.
<i>mpc-tg-name</i>	(Optional) Name of the transmission group.

### Command Mode

EXEC

### Usage Guidelines

This command first appeared in Cisco IOS Release 11.3. In the Cisco IOS Release 12.0(3)T, the display outputs for this command were updated to include new fields for CMPC+.

The **show extended channel tg** command is valid only on the virtual channel interface on the Cisco 7500. On a Cisco 7200 router, this command is valid on the physical interface. If the *mpc-tg-name* argument is not specified, information about all transmission groups configured on the specified interface is displayed.

If the **oper** or **stats** arguments are not specified, operational values are displayed.

## Sample Displays

The following is sample output from the **show extended channel tg** command:

```

CMPC-TG:MPCPTG2  Status:Active
  Local IP address:201.44.4.1                Remote IP Address :201.44.4.2

  Connection Info: Type=TCP/IP
  Local VC Token  :0500109002                Local Conn. Token :0500109003
  Remote VC Token :0500201002                Remote Conn. Token:0500201002
  VC Status      :Active                      Connection Status :Active

CMPC-TG:MPCPTG3  Status:Active
  Local IP address:172.18.3.1                Remote IP Address :172.18.3.2

  MPC+ Connection Info: Type=HSAS IP
  Local VC Token  :0500109002                Local Conn. Token :0500109003
  Remote VC Token :0500201002                Remote Conn. Token:0500201002
  VC Status      :Active                      Connection Status :PendingActive

```

Table 5 describes the fields shown in the display.

**Table 5 Show Extended Channel Tg Field Descriptions**

Field	Description
Status	<p>Connection status of the CMPC+ transmission group. Valid values are:</p> <ul style="list-style-type: none"> <li>Shutdown—CMCC virtual interface is shut down. In this state, all nonconfigurable values will not be displayed and the connection operational values displayed when the detailed argument is specified also are not displayed.</li> <li>Ready—CMCC virtual interface is operational.</li> <li>Unknown—Unknown status.</li> <li>Inactive—CMPC+ transmission group is reset ready to activate.</li> <li>Active—CMPC+ transmission group connection active.</li> </ul>
Local IP Address	IP address of the CMCC interface for this TG. This address matches the router's IP address configured on the corresponding TG statement.
Remote IP Address	IP address of the host for this TG. This address matches the host IP address configured on the corresponding TG statement.
Type	<p>Valid IP connection types are:</p> <ul style="list-style-type: none"> <li>TCP/IP—Indicates that the connection is via the TCP/IP stack.</li> <li>HSAS IP—Indicates that the connection is via the HSAS stack.</li> </ul>
Local VC Token	CMCC adapter's token for the virtual circuit.
Remote VC Token	Host's token for the virtual circuit.
VC Status	<p>Valid states for the virtual circuit are:</p> <ul style="list-style-type: none"> <li>Reset—Awaiting a connection request from the host or CMCC adapter.</li> <li>Active—Virtual circuit active indication was received from the host and the CMCC adapter sent a virtual circuit active indication to the host. The virtual circuit is now ready to send and receive connection requests.</li> </ul>
Local Conn Token	CMCC adapter's token for the MPC+ connection.
Remote Conn Token	Host's token for the MPC+ connection.

**Table 5 Show Extended Channel Tg Field Descriptions (Continued)**

Field	Description
Connection Status	<p>The valid states for a connection are:</p> <ul style="list-style-type: none"> <li>• Reset—Awaiting a connection request from the host or CMCC adapter.</li> <li>• ConnectionRequestSent—CMCC adapter sent a Connection Request to the host and is waiting a Connection Confirm from the host.</li> <li>• PendingActive—CMCC adapter is waiting for the host to enable traffic flow on the connection.</li> <li>• Active—Connection is active and both the CMCC adapter and the host have enabled traffic flow on the connection. At this point, the CMCC adapter has added a static route on the router for the host’s IP address. Verify with the <b>show ip route static</b> command.</li> </ul>

The following sample shows output on a CMCC adapter from the **show extended channel tg stat** command:

```
Router# show extended channel 3/2 tg stat MVS2-TG1

CMPC-TG:MPCPTG2
PacketsIn      :      81361  PacketsOut     :      71369
BytesIn        : 3874888438  BytesOut       : 377499994
ConnNr         :           0  ConnNs         :           0
SweepReqsIn   :           0  SweepReqsOut  :           0
SweepRspIn    :           0  SweepRspOut   :           0
Wraps          :           0
LastSeqNoIn   : 56047093    LastSeqNoOut   : 6751136
LastSeqNoFailureCause : None
TimeSinceLastSeqNoFailure : never

CMPC-TG:MPCPTG3
PacketsIn      :      44361  PacketsOut     :      63369
BytesIn        : 6834888438  BytesOut       : 954539994
ConnNr         :           0  ConnNs         :           0
SweepReqsIn   :           0  SweepReqsOut  :           0
SweepRspIn    :           0  SweepRspOut   :           0
Wraps          :           0
LastSeqNoIn   : 6274700    LastSeqNoOut   : 1829808
LastSeqNoFailureCause : None
TimeSinceLastSeqNoFailure : never
```

The following is sample output from the **show extended channel tg stats** command.

**Table 6 Show Extended Channel Tg Stats Field Descriptions**

Field	Description
PacketsIn	Number of packets sent to the host on this TG.
PacketsOut	Number of packets sent by the host on this TG.
BytesIn	Total byte count for all packets sent to the host on this TG.
BytesOut	Total byte count for all packets sent by the host on this TG.
ConnNr	Sequence number of the last MPC+ frame on this connection from the host. Because IP traffic is all connectionless, the value will always be zero.
ConnNs	Sequence number of the last MPC+ frame on this connection sent to the host. Because IP traffic is always connectionless, the value will always be zero.

**Table 6 Show Extended Channel Tg Stats Field Descriptions (Continued)**

<b>Field</b>	<b>Description</b>
SweepsReqsIn	Number of CMPC+ sweep requests received from the host on this CMPC+ TG.
SweepsReqsOut	Number of CMPC+ sweep requests sent to the host on the CMPC+ TG.
SweepsRspsIn	Number of CMPC+ sweep responses received from the host on the CMPC+ TG.
SweepsRspsOut	Number of CMPC+ responses sent to the host on this CMPC+ TG.
Wraps	Number of times the CMPC+ sequence number for this TG has wrapped on the write subchannel.
LastSeqNoIn	Last block sequence number sent on the read subchannel.
LastSeqNoOut	Last block sequence number received on the write subchannel.
Last SeqNoFailureCause	Valid values are: <ul style="list-style-type: none"> <li>• None—No sequence number failures detected since the program started.</li> <li>• Block—Sequence number received in a data block on the write subchannel was not the expected sequence number.</li> <li>• Sweep—Sequence number received in a sweep message on the write subchannel was not the expected sequence number</li> </ul>
TimeSinceLastSeqNoFailure	Number of seconds since the last sequence number failure.

#### Related Commands

**cmPC**  
**show extended channel cmgr**

## tg

Use the **tg** interface configuration command to define connection parameters for the CMPC+ transmission group. Use the **no** form of this command to remove the specified transmission group from the configuration and deactivate the transmission group.

```
tg tg-name {ip | hsas-ip} host-ip-addr local-ip-addr broadcast
no tg name
```

### Syntax Description

<i>tg-name</i>	Name of the CMPC+ transmission group. The maximum length of the name is eight characters. This name must match the name specified on the <b>cmpe</b> statements.
<b>ip</b>	Specifies that this transmission group is connected to the TCP/IP stack.
<b>hsas-ip</b>	Specifies that this transmission group is connected to the HSAS IP stack.
<i>host-ip-addr</i>	Specifies the IP address of the channel-attached host using this transmission group. A host may have more than one IP stack, therefore this is the IP address of the host IP stack as indicated by the HOME statement in the host TCP/IP profile. For HSAS, this address is the host address as indicated by the <i>source-IP-address</i> parameter of the <b>oeifconfig</b> command.
<i>local-ip-addr</i>	This address must match an IP address configured on the virtual interface. Specifies the IP address of the router to be used for this transmission group. This is the IP address of the router as indicated by the DEFAULTNET statement in the host TCP/IP profile. For HSAS, this address is the router IP address as indicated by the <i>destination-IP-address</i> parameter of the <b>oeifconfig</b> command.
<b>broadcast</b>	Enables the sending of routing updates to the host.

### Command Mode

Interface configuration

### Usage Guidelines

This command first appeared in Cisco IOS Release 11.3. This command was modified in Cisco IOS Release 12.0(3)T to include CMPC+ support.

The **tg** command is valid only on the CIP's virtual channel interface and the CPA's physical channel interface. This command defines either an IP connection or an HSAS IP connection.

To change any parameter of the **tg** command, the existing transmission group must be removed first by using **no tg name** command. At a minimum, **tg-name** must be specified to avoid ambiguity.

The **no tg** command removes the CMPC+ transmission group from the configuration. All sessions using the transmission group are terminated immediately.

## Example

The following example configures a transmission group name for an HSAS stack configured with CMPC+:

```
interface Channel0/2
 ip address 80.12.165.1 255.255.255.0
 no ip redirects
 no ip directed-broadcast
 ip route-cache same-interface
 no ip mroute-cache
 no keepalive
 tg TG00 hsas-ip 80.12.165.2 80.12.165.1
```

The following example configures a transmission group name for an IP stack configured with CMPC+:

```
interface Channel0/2
 ip address 80.12.165.1 255.255.255.0
 no ip redirects
 no ip directed-broadcast
 ip route-cache same-interface
 no ip mroute-cache
 no keepalive
 tg TG00 ip 80.12.165.2 80.12.165.1
```

## Related Commands

**cmpc**

## Debug Commands

This section documents new or modified debug commands. All other commands used with this feature are documented in the Cisco IOS Release 12.0 debug command references.

- debug channel events

## debug channel events

The **debug channel events** EXEC command displays processing events that occur on the channel adapter interfaces of all installed adapters. This command is valid for the Cisco 7000 series routers only. Use the **no** form of this command to disable debugging output.

**debug channel events**  
**no debug channel events**

### Command Mode

EXEC

### Usage Guidelines

The display output for the **debug channel events** command was updated in the Cisco IOS Release 12.0(3)T.

This command displays CMCC adapter events that occur on the CIP or CPA and is useful for diagnosing problems in an IBM channel attach network. It provides an overall picture of the stability of the network. In a stable network, the **debug channel events** command does not return any information. If the command generates numerous messages, they can indicate the possible source of the problems. To observe the statistic message (cip\_love\_letter) transmitted every 10 seconds, use the **debug channel love** command.

When configuring or making changes to a router or interface that supports IBM channel attach, enable **debug channel events**. Doing so alerts you to the progress of the changes or to any errors that might result. Also use this command periodically when you suspect network problems.

### Sample Display

The following sample output is from the **debug channel events** command:

```
Router# debug channel events
Channel3/0: cip_reset(), state administratively down
Channel3/0: cip_reset(), state up
Channel3/0: sending nodeid
Channel3/0: sending command for vc 0, CLAW path C700, device C0
```

The following line indicates that the CIP is being reset to an administrative down state:

```
Channel3/0: cip_reset(), state administratively down
```

The following line indicates that the CIP is being reset to an administrative up state:

```
Channel3/0: cip_reset(), state up
```

The following line indicates that the node id is being sent to the CIP. This information is the same as the "Local Node" information under the **show extended channel slot/port subchannels** command. The CIP needs to send this information to the host mainframe.

```
Channel3/0: sending nodeid
```

The following line indicates that a CLAW subchannel command is being sent from the RP to the CIP. The value vc 0 indicates that the CIP will use virtual circuit number 0 with this device. The virtual circuit number also shows up when you use the **debug channel packets** command.

```
Channel3/0: sending command for vc 0, CLAW path C700, device C0
```

The following is a sample output that is generated by the **debug channel events** command when a CMPC+ IP TG connection is activated with the host:

```
1d05h:Channel14/2:Received route UP for tg (768)
1d05h:Adding STATIC ROUTE for vc:768
```

The following is a sample output from the **debug channel events** command when a CMPC+ IP TG connection is deactivated:

```
1d05h:Channel14/2:Received route DOWN for tg (768)
1d05h:Deleting STATIC ROUTE for vc:768
```

### Related Commands

- debug channel love**
- debug channel packets**