

Configuring OMPROUTE to Run on the Mainframe

Document ID: 12257

Introduction

Prerequisites

- Requirements
- Components Used
- Conventions

Configurations

- Mainframe Configuration – OMPROUTE Files
- Mainframe Configuration – TCP/IP Stack
- Mainframe Configuration – VTAM Definitions and Starting TCP/IP
- Router Configuration

Displays on the Router

Displays on Mainframe

- VTAM Displays on System Console
- Routing Information Displays Under TSO from the netstat Command

NetPro Discussion Forums – Featured Conversations

Related Information

Introduction

This document outlines sample host and router configurations to run the OMPROUTE procedure on the mainframe to exchange routing updates with the rest of the TCP/IP network. OMPROUTE is often used, as in this example, in conjunction with a Virtual IP Address (VIPA), which allows the IP address of the mainframe configured in the clients to be independent of any one channel interface. This provides redundancy for the channel. Originally, IBM's mainframe TCP/IP implementation only supported Routing Information Protocol (RIP) as a routing protocol, with the use of the OROUTED procedure. The newer OMPROUTE supports either RIP V1 or V2 and Open Shortest Path First (OSPF). IBM recommends that OMPROUTE be used rather than OROUTED, and IBM will eventually remove support for OROUTED.

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

The Cisco IOS® Software Release that was used for this configuration was 12.1(3a)T2 with xCPA microcode 27–9, which was the latest at the time this was tested. If you are using CLAW, however, this should work with any version of Cisco IOS Software. The use of CMPC+ requires a minimum of Cisco IOS Software Release 12.1T.

The router was a Cisco 7206 with an xCPA port adapter. Alternatively, a Cisco 7500 router with a CIP card could be used with minor changes in the configuration, as noted later in this document.

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Conventions

For more information on document conventions, refer to the Cisco Technical Tips Conventions.

Configurations

Mainframe Configuration – OMPROUTE Files

The configuration of OMPROUTE on the mainframe is very similar to the configuration of OROUTED. OMPROUTE also uses a minimum of two configuration files. You must point to the location of these configuration files, in the OMVS address space, with these two environment variables:

- `export resolver_conf=/etc/resolv.conf`
- `export omproute_file=/etc/omproute.conf`

This is an example of the contents of `resolver_conf`:

```
TCPJobName TCPIP
DomainOrigin cisco.com
domain cisco.com
Datasetprefix TCPIP
HostName P390
Messagecase mixed
```

The `omproute_file` will depend on whether RIP or OSPF is being used. This is an example configuration for RIP:

```
;
Originate_RIP_Default Condition=Always Cost=1
;
RIP_Interface IP_Address=10.64.3.34
Name=LDIPTG
Subnet_Mask=255.255.255.240
Receive_Dynamic_Nets=YES
Receive_Dynamic_Subnets=YES
MTU=1470
Destination_Addr=10.64.3.33
;
RIP_Interface IP_Address=10.64.3.17
Name=VIPALINK
Subnet_Mask=255.255.255.240
MTU=1470
;
```

For OSPF, there are more configuration options available, which include the ability to make the mainframe act as a stub area. This can significantly reduce the load routing updates that are placed on the channel when many logical partitions (LPARs) are connecting over the same channel. This is an example:

```
Area Area_Number=0.0.0.0 Authentication_Type=None Stub_Area=NO
;
Comparison=Type2
;
AS_Boundary_Routing Import_Subnet_Routes=YES
Import_Direct_Routes=YES
;
OSPF_Interface IP_Address=10.64.3.34
Name=LDIPTG
Subnet_Mask=255.255.255.240
Attaches_To_Area=0.0.0.0
```

```

MTU=1470
Destination_Addr=10.64.3.33
Hello_Interval=30
Dead_Router_Interval=120
;
OSPF_Interface IP_Address=10.64.3.17
Name=VIPALINK
Subnet_Mask=255.255.255.240

```

Mainframe Configuration – TCP/IP Stack

The TCP/IP profile dataset does not require any special configuration for OMPROUTE, other than the fact that you must comment out all of the static and default route configuration and the BSDROUTINGPARMS section (which is only used by OROUTED). This extract shows only what must be commented out and the parameters to which the OMPROUTE configuration files refer:

```

TCPIP Profile dataset
-----
; Hardware definitions:
-----
; NOTE: To use these device and link statements, update the statements
; to reflect your installation configuration and remove the semicolon
;
DEVICE DIPTG MPCPTP
LINK LDIPTG MPCPTP DIPTG
DEVICE VIPADEV VIRTUAL 0
LINK VIPALINK VIRTUAL 0 VIPADEV
;
;
; -----
;
; HOME Internet (IP) addresses of each link in the host.
;
; NOTE: To use this home statement, update the ipaddress and linknames
; to reflect your installation configuration and remove the semicolon
;
HOME
10.64.3.17    VIPALINK
10.64.3.34    LDIPTG
; -----
;
; IP routing information for the host. All static IP routes should
; be added here.
;
; NOTE: To use this GATEWAY statement, update the addresses and links
; to reflect your installation configuration and remove the semicolon
;
; GATEWAY
;
; Direct Routes - Routes that are directly connected to my interfaces.
;
; Network  First Hop  Link Name Packet Size  Subnet Mask  Subnet Value
; 10        =         CIS1    1500        0.255.255.0  0.101.1
; 10        =         LDIPTG   1500        0.255.255.240 0.64.3.32
; 9         =         LIS1    1500        0.255.255.0   0.117.56.0
; 130.50    =         TR1    2000        0.0.255.0     0.0.10.0
; 193.5.2   =         ETH1    1500        0              0
; 9         =         FDDI1   4000        0.255.255.0  0.67.43.0
; 193.7.2.2 =         SNA1    2000        HOST
;
; Indirect Routes - Routes that are reachable through routers on my
; network.
;
;

```

```

; Network      First Hop   Link Name Packet Size Subnet Mask Subnet Value
; DEFAULTNET  10.64.3.33  LDIPTG   DEFAULTSIZE 0
; 193.12.2    130.50.10.1 TR1      2000        0
; 10.5.6.4    193.5.2.10  ETH1     1500        HOST
;
; Default Route - All packets to an unknown destination are routed
;                  through this route.
;
; Network      First Hop   Link Name Packet Size Subnet Mask Subnet Value
; DEFAULTNET  9.67.43.1   FDDI1    DEFAULTSIZE 0
;
; -----
;
; orouted Routing Information
;
; if you are using orouted, comment out the GATEWAY statement and
; update the BSDROUTINGPARMS statement to reflect your installation
; configuration and remove the semicolon
;
; Link      Maxmtu   Metric   Subnet Mask   Dest Addr
; BSDROUTINGPARMS false
; LDIPTG    1500     0        255.255.255.240 10.64.3.33
; VIPALINK  1500     0        255.255.255.240 0
; TR1      2000     0        255.255.255.0   0
; ETH1     1500     0        255.255.255.0   0
; FDDI1    DEFAULTSIZE 0        255.255.255.0   0
; ENDBSDROUTINGPARMS

```

!--- Note that all of the last two sections have been commented out.

Mainframe Configuration – VTAM Definitions and Starting TCP/IP

Routing updates can be exchanged over either CLAW or CMPC+ connections. If you are using CLAW, no additional configuration is required on the mainframe. This example uses CMPC, which requires a VTAM transport resource list (TRL) entry. This is the VTAM member:

```

DIPTGTRL VBUILD TYPE=TRL
*
*
DIPTG    TRLE  LNCTL=MPC,MAXBFRU=16,READ=(E24),WRITE=(E25)
*

```

The TRL must be activated before the TCPIP started task is started. For example:

```

V NET,ACT,ID=DIPTRL1,UPDATE=ALL
IST097I VARY ACCEPTED
ISTTRL ACTIVE

```

Then, activate the TCP/IP started task with the **S TCPIP MVS** console command. Once the TCP/IP started task is running, the OMROUTE procedure can be started, either with the use of job control language (JCL) as a started task or from within the OMVS address space. To start within OMVS, issue these commands:

```

cd /usr/lpp/tcpip/sbin

omproute &

```

To check that OMROUTE is running, issue this console command, where **p390** is the user ID under which the OMROUTE demon was started:

```

d omvs,u=p390

```

Router Configuration

Both CLAW and CMPC must be specifically configured to send broadcasts over the channel, with the **broadcast** keyword. For example, for CLAW:

```
claw 0100 20 10.101.1.10 P390D C7000D TCPIP TCPIP broadcast
```

In this example, CMPC+ is in use, so these are the relevant parts of the router configuration:

```
!  
interface Channel2/0  
 ip address 10.64.3.33 255.255.255.240  
 ip ospf network point-to-multipoint  
 no keepalive  
 cmpc 0100 24 DIPTG READ  
 cmpc 0100 25 DIPTG WRITE  
 tg DIPTG ip 10.64.3.34 10.64.3.33 broadcast  
 router ospf 1  
   network 10.0.0.0 0.255.255.255 area 0  
!
```

If this had been a Cisco 7500 router with a CIP card rather than a 7200 with an xCPA port adapter the `tg` statement would have been configured under the `virtual /2` interface. Note the **ip ospf network point-to-multipoint** command, which is required for OSPF to function correctly. The channel interface is considered a multipoint interface much like Frame Relay. If you do not wish to run OSPF throughout your network, you can run it only on the channel interface itself and use redistribution between other routing protocols. For example:

```
!  
router eigrp 1  
 redistribute ospf 1  
 passive-interface Channel2/0  
 network 10.0.0.0  
 no eigrp log-neighbor-changes  
!  
router ospf 1  
 log-adjacency-changes  
 redistribute eigrp 1  
 network 10.64.3.33 0.0.0.0 area 0  
!
```

Displays on the Router

```
diplodocus# show extended channel 2/0 status
```

```
Path: 0100 -- ESTABLISHED  
      Command      Selective   System      Device      CU  
Dev   Connects      Retries    Cancels     Reset       Reset       Errors      Busy  
24    30             21         1           0           0           0           0  
25    29             0          1           0           0           0           0  
Blocks      Bytes      Dropped Blk      Memd  
Dev-Lnk     Read      Write    Read   Write    Read   Write    wait    Con  
24-00       29        6      3484   789     0      0       0       Y  
25-00        9       29      801   3920    0      0       0       Y  
Path 0100  
Total:      38       35     4285  4709    0      0       0  
Last statistics 0 seconds old, next in 10 seconds
```

```
diplodocus# show extended channel 2/0 cmpc
```

```
Path   Dv   TGName   Dir   Bfrs   Status
```

```
CMPC 0100 24 DIPTG READ 16 Active+
CMPC 0100 25 DIPTG WRITE 16 Active+
```

```
diplodocus# show ip ospf i
```

```
Channel2/0 is up, line protocol is up
Internet Address 10.64.3.33/28, Area 0
Process ID 1, Router ID 200.100.100.9, Network Type POINT_TO_MULTIPOINT,
Cost: 4
Transmit Delay is 1 sec, State POINT_TO_MULTIPOINT,
Timer intervals configured, Hello 30, Dead 120, Wait 120, Retransmit 5
Hello due in 00:00:10
Index 1/1, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1, Adjacent neighbor count is 1
Adjacent with neighbor 10.64.3.17
Suppress hello for 0 neighbor(s)
```

```
diplodocus# show ip ospf neighbor
```

Neighbor ID	Pri	State	Dead Time	Address	Interface
10.64.3.17	1	FULL/ -	00:01:35		
Neighbor is up for 00:04:01			10.64.3.34	Channel2/0	

```
diplodocus# show ip route
```

```
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route
Gateway of last resort is 10.64.3.1 to network 0.0.0.0
1.0.0.0/27 is subnetted, 1 subnets
C 1.1.1.0 is directly connected, Loopback1
200.100.100.0/29 is subnetted, 1 subnets
C 200.100.100.8 is directly connected, Loopback0
10.0.0.0/8 is variably subnetted, 9 subnets, 3 masks
D 10.0.0.0/8 is a summary, 00:06:40, Null0
C 10.64.3.0/28 is directly connected, Ethernet6/0
O E2 10.64.3.17/32 [110/1] via 10.64.3.34, 00:03:57, Channel2/0
O 10.64.3.16/28 [110/5] via 10.64.3.34, 00:03:57, Channel2/0
C 10.64.3.32/28 is directly connected, Channel2/0
S 10.64.3.34/32 [1/0] via 10.64.3.34, Channel2/0
S 10.64.3.37/32 [1/0] via 10.64.3.37, Channel2/0
C 10.64.3.48/28 is directly connected, Serial11/3.1
C 10.64.3.128/28 is directly connected, Serial11/3.2
S* 0.0.0.0/0 [1/0] via 10.64.3.1
```

Displays on Mainframe

VTAM Displays on System Console

```
D NET,TRL
```

```
IST097I DISPLAY ACCEPTED
ST350I DISPLAY TYPE = TRL 042
IST1314I TRLE = DIPTG STATUS = ACTIV CONTROL = MPC
IST1454I 1 TRLE(S) DISPLAYED
IST314I END
```

D NET,TRL,TRLE=DIPTG

```
IST097I DISPLAY ACCEPTED
IST075I NAME = DIPTG, TYPE = TRLE 045
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST087I TYPE = LEASED , CONTROL = MPC , HPDT = YES
IST1715I MPCLEVEL = HPDT MPCUSAGE = SHARE
IST1577I HEADER SIZE = 4092 DATA SIZE = 60 STORAGE = ***NA***
IST1221I WRITE DEV = 0E25 STATUS = ACTIVE STATE = ONLINE
IST1577I HEADER SIZE = 4092 DATA SIZE = 60 STORAGE = DATASPACE
IST1221I READ DEV = 0E24 STATUS = ACTIVE STATE = ONLINE
IST314I END
```

Routing Information Displays Under TSO from the netstat Command

netstat route displays the routing table. For example:

====> **netstat route**

```
EZZ2350I MVS TCP/IP NETSTAT CS V2R7          TCPIP NAME: TCPIP          15:56:33
EZZ2755I Destination          Gateway          Flags  Refcnt  Interface
EZZ2756I -----
EZZ2757I 10.0.0.0              10.64.3.33     UG     000000  LDIPTG
EZZ2757I 10.64.3.32          0.0.0.0        U      000000  LDIPTG
EZZ2757I 10.64.3.33          0.0.0.0        UH     000000  LDIPTG
```

netstat device displays the status and so forth of all of the connected devices or links. For example:

====> **netstat device**

```
EZZ2350I MVS TCP/IP NETSTAT CS V2R7          TCPIP NAME: TCPIP          15:58:04
EZZ2760I DevName: LOOPBACK          DevType: LOOPBACK  DevNum: 0000
EZZ2761I LnkName: LOOPBACK          LnkType: LOOPBACK  Status: Ready
EZZ2762I NetNum: 0  QueSize: 0  ByteIn: 0000004278  ByteOut: 0000004278
EZZ2768I BSD Routing Parameters:
EZZ2769I MTU Size: 00000          Metric: 00
EZZ2770I DestAddr: 0.0.0.0          SubnetMask: 0.0.0.0
EZZ2810I Multicast Specific:
EZZ2811I Multicast Capability: No
EZZ2760I DevName: DIPTG            DevType: MPC        DevNum: 0000
EZZ2761I LnkName: LDIPTG            LnkType: MPC        Status: Ready
EZZ2762I NetNum: 0  QueSize: 0  ByteIn: 0000001848  ByteOut: 0000001936
EZZ2768I BSD Routing Parameters:
EZZ2769I MTU Size: 01470          Metric: 01
EZZ2770I DestAddr: 0.0.0.0          SubnetMask: 255.255.255.240
EZZ2810I Multicast Specific:
EZZ2811I Multicast Capability: Yes
EZZ2812I Group                    RefCnt
EZZ2813I -----
EZZ2814I 224.0.0.5                    0000000001
EZZ2814I 224.0.0.1                    0000000001
EZZ2760I DevName: VIPADEV          DevType: VIPA       DevNum: 0000
EZZ2761I LnkName: VIPALINK          LnkType: VIPA       Status: Ready
EZZ2762I NetNum: 0  QueSize: 0  ByteIn: 0000000000  ByteOut: 0000000000
EZZ2768I BSD Routing Parameters:
EZZ2769I MTU Size: 01470          Metric: 01
EZZ2770I DestAddr: 0.0.0.0          SubnetMask: 255.255.255.240
EZZ2810I Multicast Specific:
EZZ2811I Multicast Capability: No
```

There are many more options available with **netstat**. You can issue the **netstat ?** command to display them all.

NetPro Discussion Forums – Featured Conversations

Networking Professionals Connection is a forum for networking professionals to share questions, suggestions, and information about networking solutions, products, and technologies. The featured links are some of the most recent conversations available in this technology.

NetPro Discussion Forums – Featured Conversations for IBM

Network Infrastructure: Enterprise Data Centers

Related Information

- [Technology Support](#)
- [Product Support](#)
- [Technical Support – Cisco Systems](#)

[Contacts & Feedback](#) | [Help](#) | [Site Map](#)

© 2008 – 2009 Cisco Systems, Inc. All rights reserved. [Terms & Conditions](#) | [Privacy Statement](#) | [Cookie Policy](#) | [Trademarks of Cisco Systems, Inc.](#)

Updated: Sep 09, 2005

Document ID: 12257
