

# **Unidirectional Path Switching Ring Over HDLC**

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# **Unidirectional Path Switching Ring Over HDLC Overview**

A Unidirectional Path Switching Ring (UPSR) is a unidirectional network with two rings, one ring used as the working ring and the other as the protection ring. The traffic on a working ring or path is always in one direction (clockwise) and on a protection path is in the opposite direction (counterclockwise). The same signal flows through both working and protection rings using a selector switch.

The UPSR monitoring is performed at the path layer. A node receives two copies of the electrical signals at the path layer, compares them, and chooses the one with the better quality. When a signal fail condition is detected, the hardware initiates an interrupt to software which switches from the working path to the protection path or the opposite way.

In an access network, the UPSR serial traffic is processed with an HDLC encapsulation protocol. The termination CE end may be Ethernet traffic. Between the access routers, the network can be a SONET network, where the data path in the network is protected by UPSR. The data terminating router in the network selects the working or protection path.

UPSR is supported on modes such as VT 1.5, STS 3c, and T3.

# **Limitations for HDLC UPSR**

- HDLC UPSR is supported only on the 1 port OC-48/4 port OC-12/OC-3 + 12 port T1/E1 + 4 port T3/E3 CEM interface module.
- HDLC UPSR is applicable only for the OCx ports of the 1 port OC-48/ 4 port OC-12/OC-3 + 12 port T1/E1 + 4 port T3/E3 CEM interface module.
- Work path and protection path should be in the different interface modules.
- The modes supported for configuring HDLC UPSR are VT 1.5, T3, and STS-3c.
- The HDLC UPSR is supported only on RSP2 module.

• HDLC UPSR switching does not happen when there is any alarm at PDH level, for example T1 or T3. The switching happens at VT or STS path alarm.

## How to Configure UPSR over HDLC

You can configure HDLC UPSR in anyone of the following ways:

- Create protection group first and then add working or protect member under physical controller. The channel group can be configured under protection group controller once the protection group is created.
- Add working or protect member under physical controller which creates the protection group controller. The channel group can be added under the protection group controller once protection group is created.

### **Configuring Protection Group**

You need to create protection group serial interface.

You can create protection group for anyone of the following types: T3, VT 1.5 T1, and STS-3c.

```
enable
configure terminal
controller protection-group 401 type STS3c
channel-group chan-num timeslots 1-24
end
```

## **Configuring Channel Group**

You can configure channel group under protection controller to create a protection group (PG) serial interface.

#### Creating Protection Group Serial Interface for VT 1.5 T1 Mode

Once the protection group is created, you can configure the controller using the protection group name and mode. You need to specify the channel group number with timeslots to create a PG serial interface.

To configure the channel group under the controller for VT 1.5 T1 mode, enter the following commands:

```
enable
configure terminal
controller protection-group pg_grp_num type vt1.5
channel-group chan_num timeslots 1-24
end
```

#### Creating Protection Group Serial Interface for T3 or STS-3c Mode

You can configure protection group for the controller mode types T3 or STS-3c using specific channel group.

To configure channel group under protection controller for mode T3, enter the following commands:

```
enable
configure terminal
protection-group pg_grp_num type sts1
controller sonet x/y/z
sts-1 3
mode t3
```

protection-grouppg\_grp\_numworking
end

To configure channel group under protection controller for mode types STS-3c, enter the following commands:

```
enable
configure terminal
protection-group pg_grp_num type sts1
controller somet x/y/z
sts-3c
mode t3
protection-grouppg_grp_numworking
end
```

The following example details on how to create protection group serial interface for T3 mode:

```
Router(config) #protection-group 6 type stS1
Router(config-ctrlr-sts1) #controller sonet 0/5/17
Router(config-controller) #sts-1 3
Router(config-ctrlr-sts1) #mode t3
Router(config-ctrlr-sts1) #protection-group 6 working
```

#### Creating Protection Group Serial Interface for VT 1.5 T1 Mode

Once the protection group is created, you can configure the controller using the protection group name and mode. You need to specify the channel group number with timeslots to create a PG serial interface.

To configure the channel group under the controller for VT 1.5 T1 mode, enter the following commands:

```
enable
configure terminal
controller protection-group pg_grp_num type vt1.5
channel-group chan_num timeslots 1-24
end
```

#### Creating Protection Group Serial Interface for T3 or STS-3c Mode

You can configure protection group for the controller mode types T3 or STS-3c using specific channel group.

To configure channel group under protection controller for mode T3, enter the following commands:

```
enable
configure terminal
protection-group pg_grp_num type sts1
controller sonet x/y/z
sts-1 3
mode t3
protection-grouppg_grp_numworking
end
```

To configure channel group under protection controller for mode types STS-3c, enter the following commands:

```
enable
configure terminal
protection-group pg_grp_num type sts1
controller somet x/y/z
sts-3c
mode t3
protection-grouppg_grp_numworking
end
```

The following example details on how to create protection group serial interface for T3 mode:

```
Router(config) #protection-group 6 type stS1
Router(config-ctrlr-sts1) #controller sonet 0/5/17
Router(config-controller) #sts-1 3
Router(config-ctrlr-sts1) #mode t3
Router(config-ctrlr-sts1) #protection-group 6 working
```

#### Adding Protection Group to Controller Under VT 1.5 Mode

You can add protection group as working or protect under specific SONET controller mode on the SONET controller interface.

To add protection group to SONET controller under VT 1.5 mode, enter the following commands:

```
enable
configure terminal
controller sonet <x/y/z>
sts-1 1
mode vt-15
vtg 1 t1 1
protection-group pg_grp_num type {working | protect}
end
```

#### Adding Protection Group to Controller Under T3 Mode

You can add protection group for T3 framing type such as M13, c-bit.

To add protection group to SONET controller under T3 mode, enter the following commands:

```
enable
configure terminal
controller sonet <x/y/z>
sts-1 1
mode t3
protection-group pg_grp_num type {working | protect}
end
```

#### Adding Protection Group to Controller Under STS-3c Mode

To add protection group to SONET controller under STS-3c mode, enter the following commands:

```
enable
configure terminal
controller sonet <x/y/z>
sts-1 1 - 3
mode sts-3c
protection-group pg_grp_num type {working | protect}
end
```

### ConfiguringCross-ConnectUnderProtectionGroupSerialInterfacePseudowire

The **xconnect** command binds the attachment circuit to a pseudowire for cross connect service. The identifier creates the binding between a pseudowire that is configured on a PE router and an attachment circuit in a CE device.

To perform cross connection between a pseudowire and attachment circuit, use the following commands:

```
router(config)#interface serial-pg <pg-group-name>.<chan_num>
router(config-if)#xconnect ip-address id encapsulation type pw-class pw-class
```

## **Verifying UPSR Over HDLC Configuration**

Use the following **show** commands to verify the UPSR over HDLC configuration:

Router Serial Serial Router PGN	#show ip : -PG1.0 -PG2.0 #sh protec Type Wo	<pre>int br   sec PG unassigned unassigned ction-group orking I/f</pre>	YES unset YES unset Protect	up up I/f	Active	up up Status
1 2	VT15 S0 VT15 S0	DNET0/5/17.1/1/1 DNET0/5/17.2/2/2			W W	А А
Router DN pri	# <b>show xco</b> ac Se-1	nnect all   sec PG PG1.0(HDLC)	UP mpls	10.10.10.10:2		DN
Router Work Work	#sh contro ing membe: ing membe:	oller sonet 0/5/17   r of protection-group r of protection-group	sec prot : 1 : 2			
Router platfo contro mode s contro rate O no ais alarm- clock ! sts-1 cloc	<pre>#show run rm enable ller Media onet ller SONE C3 -shut report all source in 1 k source 3</pre>	<pre>  sec 0/5/17 controller MediaType aType 0/5/17 r 0/5/17 l ternal internal</pre>	0/5/17 oc3			
mode vtg ! sts-1 cloc mode vtg	vt-15 1 tl 1 pro 2 k source : vt-15 2 tl 2 pro	otection-group 1 work internal otection-group 2 work	ing			

# **Configuration Examples for HDLC UPSR**

This section provides examples to configure HDLC UPSR:

## **Use Case 1**

The following example details on how UPSR is configured over HDLC:

• Protection group of 3 configured under VT 1.5 T1 mode.

- Channel group of zero with timeslot configured under the protection group created.
- SONET controller is configured for mode VT 1.5 T1 on interface 0/5/17.
- Protection group of 3 added as working ring under SONET controller mode VT 1.5 T1.
- · Perform cross connection under attachment circuit

```
Router(config) #protection-group 3 type vt1.5
Router(config) #controller protection-group 3
Router(config-controller) #type vt1.5
Router(config-ctrlr-sts1) #channel-group 0 timeslots 1-24
Router(config-ctrlr-sts1) #controller sonet 0/5/17
Router(config-controller) #sts-1 1
Router(config-ctrlr-sts1) #mode vt-15
Router(config-ctrlr-sts1) #vtg 1 t1 1 protection-group 3 working
```

Verify the configuration using the following **show** commands:

```
Router#show protection-group
PGN Type Working I/f
                                     Protect I/f
                                                            Active Status
_____
1
    VT15
                                                                       Α
2
     VT15
                                                              _
                                                                       Α
                                                              W
3
     VT15
            SONET0/5/17.1/1/1
                                                                       Α
Router#show controller sonet 0/5/17 | sec protection
 Working member of protection-group: 3
Router#show ip int br | sec PG
Serial-PG3.0
                                   YES unset up
                    unassigned
                                                                  up
Router (config) #interface Serial-PG3.0
Router(config-if)#xconnect 10.10.10.10 1 encapsulation mpls pw-
Router(config-if)#$.10.10.10 1 encapsulation mpls pw-class serial_pg
If you want to remove the configuration performed, use the following commands:
Router(config-if-xconn) #int Serial-PG3.0
Router(config-if) #no xconnect
Router(config)#controller sonet 0/5/17
Router(config-controller)#sts-1 1
Router(config-ctrlr-sts1)#no vtg 1 t1 1 protection-group 3 working
```

```
Router(config)#controller protection-group 3
Router(config-controller)#type vt1.5
Router(config-ctrlr-sts1)#no channel-group 0
Router(config-ctrlr-sts1)#no protection-group 3
```

## **Use Case 2**

The following example details on how UPSR is configured over HDLC:

- SONET controller is configured for mode VT 1.5 T1 on interface 0/5/17.
- Protection group of 3 added as working ring under SONET controller mode VT 1.5 T1.

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- Protection group of 3 configured under VT 1.5 T1 mode.
- Channel group of zero with timeslot configured under the protection group created.
- Perform cross connection under attachment circuit

```
Router(config)#controller sonet 0/5/17
Router(config-controller)#sts-1 1
Router(config-ctrlr-sts1)#mode vt-15
Router(config-ctrlr-sts1)#vtg 1 t1 1 protection-group 3 working
Router(config-ctrlr-sts1)#exit
Router(config-controller)#exit
Router(config)#controller protection-group 3
Router(config-controller)#type vt1.5
Router(config-ctrlr-sts1)#channel-group 0 timeslots 1-24
```

Verify the configuration using the following **show** commands:

Route	r# <b>show</b>	protection-group		
PGN	Туре	Working I/f	Protect I/f	Active Status
1	VT15			- A
2	VT15			– A
3	VT15	SONET0/5/17.1/1/1		W A
Route Wor	er# <b>show</b> king me	controller sonet 0/5/1 mber of protection-gro	7   sec protection up: 3	
Route Seria	er# <b>show</b> 11-PG3.0	ip int br   sec PG unassigned	YES unset up	αυ

```
Router(config) #int Serial-PG3.0
```

Router(config-if)#xconnect 10.10.10 1 encapsulation mpls pw-Router(config-if)#\$.10.10.10 1 encapsulation mpls pw-class serial pg