Teldat Router

Backup WAN Reroute (WRR)

Doc. *DM727-I* Rev. *10.00*
December, 2002

INDEX

Chapter 1
Introduction

1. Introduction

This chapter describes the *Backup WAN Reroute* (WRR) process operation.

WRR backup is yet another available instrument to provide fault tolerance. When a link or interface etc., does not function correctly or simply does not function, this mechanism achieves an alternative path to route the data to its destination. Generally, this is carried out by enabling new links in order to find an alternative path (here this indicates the Rerouting), where possible to divert the traffic from the primary link that is currently inactive.

In the following section, the *Backup WRR* operation mode is described.

2. Backup through Rerouting

Backup through rerouting (*Backup WAN Reroute*, WRR) is known as such because the traffic goes through a backup process during the period of time when the primary link is down and is rerouted through an alternative link. This deals with non-transparent backup from the point of view of the layer 3 protocols. This is said to be non-transparent as the link after passing the backup procedures is apparently not the same (as occurs with other types of backup such as WRS WAN Restoral).

The backup by rerouting philosophy implies the following steps:

1. Detection of main link failure.
2. Rerouting of traffic through an alternative link.
3. Detection of main link recovery.
4. Rerouting of traffic through the primary link.

2.1. Primary Link

From a functional point of view, there are two virtual devices integrated in the router:

1. A router carrying out internetworking functions.
2. A packet switch for packets coming from both the router and the X.25 and ISDN ports when these are transporting X.25.
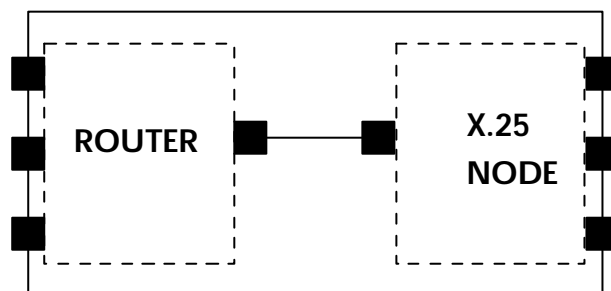
As can be seen in the figure, each virtual device manages its own set of interfaces.

The primary link can be any of the router's interfaces which communicate their active state (if they are *up* or *down*), i.e. they can be established at any given moment whether they are down or not. E.G. a Frame Relay interface, a synchronous or asynchronous PPP interface (not DIAL however as these are always active), LAN interface (Ethernet or Token Ring) etc. Generally a permanent primary link is configured.

In cases where an interface admits various subinterfaces e.g. Frame Relay, you can establish one of the subinterfaces as the primary link (a specific DLCI in Frame Relay, an NRI in X.25).

You **cannot** establish the whole of the X.25 interface as the primary link although you can specify an NRI as a subinterface.

The primary link is the one that the traffic should go through under *normal* operating conditions and only in cases where abnormalities are detected or when it is inactive, is the traffic rerouted through an alternative link prepared for such incidences. In situations where both links (the primary one and the alternative) are active, the primary link has greater priority therefore the traffic is routed through this.

In WRR inverse operations, the alternative link is only maintained active if the main link is active. When abnormalities are detected or the main link is down, the alternative link becomes inactive passing to an available state.

2.2. Secondary Link

The secondary or alternative link is the one the traffic is rerouted through when a failure has been detected in the primary link.

Under normal conditions, this link should not be active but idle waiting for an alternation in the normal function of the primary link being monitored. Should a failure be detected, the secondary link activates and serves as an alternative path for the traffic which cannot go through the primary link.

In these cases, those interfaces controlled by the router which are **NOT** subinterfaces (e.g. a determined DLCI in a Frame Relay link cannot be a secondary link) can be configured as a secondary link.

Usually a 'switch' interface is used as a secondary link, such as a Dial PPP, a PPP link over AT commands, a Frame Relay over ISDN etc., although you can also establish a permanent interface as mentioned in the previous section (except in cases of subinterfaces).

In WRR inverse operations, the alternative link is only maintained active if the main link is active. When abnormalities are detected or the main link is down, the alternative link becomes inactive passing to an available state.

2.3. Function

The way WRR backup is carried out when invese mode is not configured is as follows

An association is established between the primary link and the secondary link (sub) interfaces to specify which interface is going to carry out backup when the primary one is down.

Backup can be established for various primary interfaces or subinterfaces through the same secondary interface. When one of the primary ones falls, the secondary activates and until *ALL* the primary interfaces have recovered, the secondary will not deactivate.

Similarly, you can configure backup for a primary interface or subinterface through various secondary interfaces. In these cases, when the primary interface is down, all the secondary interfaces programmed for this purpose activate.

If the inverse mode is configured:

Through this configuration the secondary link follows the main link state. If the main link is down, the secondary link becomes available. If the main link is active then the secondary link exits the *available* state and tries to activate.

a) Link Status

Any link (be it the primary one or secondary) can be in any of the following states at any given moment:

- *Not present*, interface is not present.
- *Not supported*, interface is not supported.
- *Active*, interface is active.
- *Inactive*, interface is inactive.
- *Carrying out test*, interface is carrying out a test.
- *Disabled*, interface is disabled through configuration.

The **secondary** interface can also be in the following state:

- *Available*, the secondary interface is monitoring the state of the primary interface.

Under normal conditions the primary interface is in an *active* state and the traffic is routed through this (when this corresponds). The secondary interface remains in an *available* state monitoring the primary interface state.

b) Events

Various events can occur provoking changes in the state of the system:

- *Primary Up (**PriUp**)*, one of the primary interfaces associated to a secondary interface has announced the recovery of the link.
- *Primary Down (**PriDwn**)*, one of the primary interfaces associated to this secondary interface has announced link failure.
- *First Stabilization Time expired;* the timer for the first establishment period of time has lapsed. **The First Stabilization Time** is length of time the primary interface must be down before activating the secondary (to carry out backup).
- *Stabilization Time expired,* the timer for the establishment period of time has lapsed. **The Stabilization Time** is the minimum length of time the primary interface must be active for before the secondary deactivates (returns from backup to initial situation).
- *Unknown (**Unk**),* no event has been produced yet, or the event is unknown.

c) State of Backup WRR in the Secondary

The backup WRR procedure can be found in distinct states. The states and their variations depending on the arrival of a determined event are indicated below:

For WRR direct cases:

- **Disabled (---),** when there is no enabled association or where the WRR is globally disabled.
- **Initial (*Pri:INI*),** state of the device on start up. The secondary interface is *available*. If the *Primary Up* event occurs, then it passes to an **Up** state, if the *Primary Down* event occurs it then passes from **Up**⮕**Down.**
- **Up (*Pri:UP*),** the secondary is *available* as all the controlled primary links are *active*.
- **Up**⮕**Down (*Pri:U*⮕*D*),** when the secondary link is *available* but it has received a *Primary Down* event from one of the associated primaries. The *First Stabilization Time* counter starts up.
- **Down (*Pri:DWN*),** when the *First Stabilization Time expired out* event arrives. With this the secondary interface self-test begins so it will activate.
- **Down**⮕**Up (*Pri:D*⮕*U*),** all the main links have indicated *Primary Activation*. The *Stabilization Time* counter starts

For WRR inverse cases:

- **Disabled** (---), when there are no associations enabled or when the WRR is globally disabled.
- **Initial (*Pri:INI*),** state of the device on start up. The secondary interface is executing test, if the *Primary Down* event occurs then this passes to **Up**⮕**Down** state. If the *Primary Activating* event occurs then it passes to **Up** without waiting for *Stabilization Time*.
- **Up (*Pri:UP*),** the secondary begins to *execute selftest and from here to active or down* as all the main links that this controls have indicated that they are *active* and the *Stabilization Time* has timed out.

- **Up⊗ Down (*Pri:U⊗ D*),** when the secondary is *unavailable*, however it has received a *Primary Down* event from one of the associated primaries. The *First Stabilization Time* counter starts up.

- **Down (*Pri:D*),** when the *First Stabilization Time timed out* event occurs therefore the secondary interfaces passes to *available*.

- **Down⊗ Up (*Pri:D⊗ U*),** all the main links indicated *Primary Activating*. The *Stabilization Time* counter starts up.

d) *Backup WRR process*

With the WRR configured in non-inverse mode (direct mode)

The backup process initiates when a *Primary Down* event occurs and the secondary is in an *available* state. The WRR then passes to a *Pri:U ⊗D* state. Once the minimum time required for the primary to be down has expired (*First Stabilization Time*) and secondary effectively begins to operate, the Backup WRR process passes to a *Pri:D* state. In this state, the secondary exits the *available* state and tries to activate.

When the secondary link is *active* (routing traffic normally sent through the primary link) with backup in a *Pri:D* state and the primary (being monitored) recovers (producing a *Primary Up* event), if this primary is the last down link configured in this link as secondary, it passes to *Pri:D ⊗U*. Once the minimum wait time for the primary link to be active (*Stabilization Time*) has expired, the primary link reactivates and the secondary is deactivated (in cases of Dial, secondary links requiring a call to be carried out, the call is released). The backup passes to a *Pri:U* state.

With the WRR configured in inverse mode:

The state monitoring process initiates when the secondary is in a state distinct to *available* and a *Primary down* is produced. In this case, the WRR passes to an *Pri:U ⊗D* and after waiting the minumum time that the primary has to be down (*First Stabilization Time*) and establishing that the WRR is operating, the secondary passes to an *available* state (in cases of Dial secondary links requiring a call in order to establish, this call is released) and the WRR indicates its state as *Pri:D*.

When the secondary link is available with the WRR in *Pri:D* and the primary which it is monitoring recovers (the *Primary Activating* event is produced), if this is the last of the down links that have this link configured as secondary, the primary passes to *Pri:D ⊗U*. Subsequently after waiting the minimum time that the primary link must be active (Stabilization Time) the primary link activates once more and the secondary link exits the *available* state. The WRR pases to an *Pri:U* state.

2.4. Example of backup through rerouting (WRR)

The user environment consists of:

- A device where you configure the WRR feature in a direct mode with an association where the primary link is a dlci (16) and the secondary a Dial-PPP channel.

- A device at the remote end for the FR link.

- A device functioning as a PPP server.
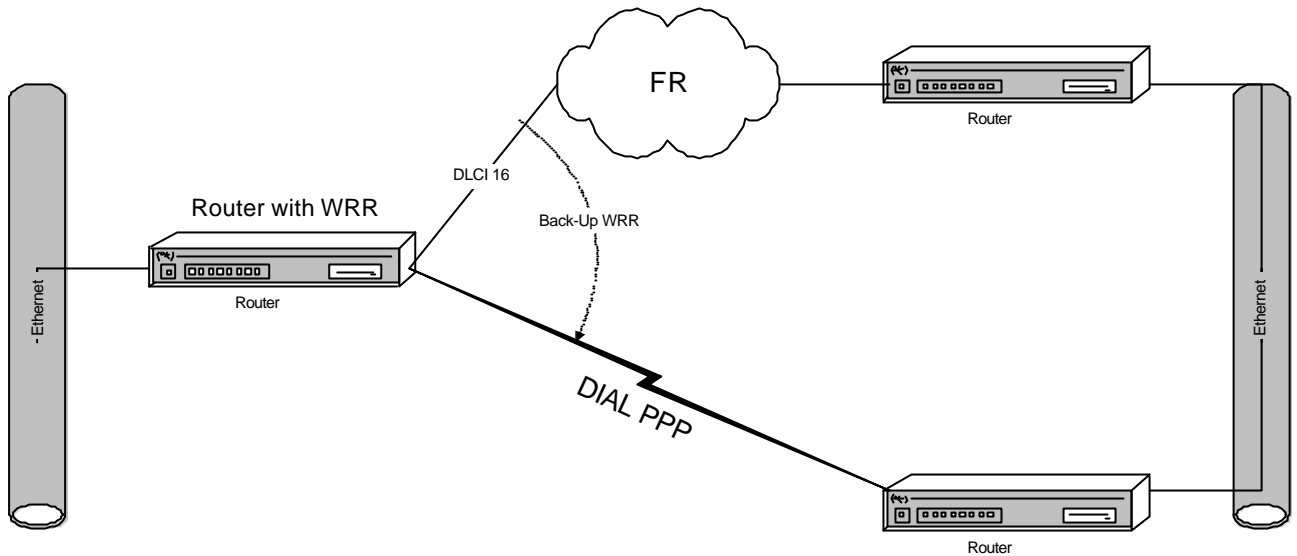
While the primary link is active, the secondary interface is on 'standby' i.e. as if it were down. If the RIP is enabled in the secondary link, calls are not provoked as the link is down. The traffic is routed through the primary link.

When the primary link goes down, the secondary interface activates. If RIP is enabled, it begins to learn the routes through the secondary link. If there are static routes configured through the secondary, these activate. The dynamic routes learned through the primary and the static routes it has as the second hop, fall and the traffic is rerouted through the secondary interface. A larger cost is assigned to all the routes learned by the secondary interface. Through this, if various dlcis backups are configured for the same secondary interface, the IP traffic for dlcis that are still active is not rerouted through the secondary interface.

When the primary link recovers, the static routes activate again. If there is active RIP in the primary this begins to learn the routes through the primary. The dynamic routes learned by the secondary and the configured static routes are deleted. The IP traffic is then routed through the primary.

Chapter 2
Configuration

1. Accessing the Backup WRR Configuration prompt

The WRR configuration commands are available in the associated configuration prompt. To access the WRR configuration prompt, carry out the following steps:

1. Access the general configuration menu, *Config>*.
2. Enter the command related to the WRR, FEATURE WRR-BACKUP-WAN feature.

Example:

```
Teldat                  (c)1996-2002

Router model XXXXX 2 1 CPU M80860      S/N: 0403/00104
1 LAN, 3 WAN Lines, 1 ISDN Line


*P 4
User Configuration
Config> FEATURE WRR-BACKUP-WAN

-- WAN Reroute Backup user configuration --
Backup WRR>
```

Once you have accessed the WRR configuration prompt (*Backup WRR>*), you can configure the feature through the commands described in the following section.

2. Backup WRR Configuration Commands

The following table describes the Backup WRR configuration commands.

Command	Function
?(HELP)	Displays the Backup WRR configuration commands or lists the available options for a specific command.
DISABLE	Permits you to disable the whole Backup WRR function.
ENABLE	Enables the Backup WRR function.
FIRST-STABILIZATION-TIME	Configures the first stabilization time global value.
LIST	Displays the configuration parameters.
NO	Deletes a Backup WRR association or sets the default values for various parameters.
PAIR	Creates a Backup WRR association.
STABILIZATION-TIME	Configures the stabilization time global value.
EXIT	Exits the Backup WRR prompt and returns to the general configuration prompt, *Config>*.

If you do not enter all the necessary parameters in the command line in order to complete a command, the device will request this.

2.1. ? (HELP)

The **?** (HELP) command lists all the valid commands for the level. You can also use this after a specific command to list its options.

Syntax:

```
Backup WRR> ?
```

Example:

```
Backup WRR>?
DISABLE                     Disables the Backup WRR functionality
ENABLE                      Enables the Backup WRR functionality
FIRST-STABILIZATION-TIME    Default first stabilization time value
LIST                        View all the Backup WRR configuration information
NO
PAIR                        Association for the Backup WRR
STABILIZATION-TIME          Default stabilization time value
EXIT
Backup WRR>
```

2.2. DISABLE

Completely disables the Backup WRR function. None of the associations configured will function. However, the associations' configuration is maintained so you can subsequently enable Backup WRR and conserve all the configured parameters.

Syntax:

```
Backup WRR> DISABLE
```

Example:

```
Backup WRR> DISABLE
Backup WRR>
```

2.3. ENABLE

Enables the Backup WRR functionality. If you do not enable the function in general through this command, nothing related to it will be executed.

Syntax:

```
Backup WRR> ENABLE
```

Example:

```
Backup WRR> ENABLE
Backup WRR>
```

2.4. FIRST-STABILIZATION-TIME

Configures the *First Stabilization Time by Default* value.

Syntax:

```
Backup WRR> FIRST-STABILIZATION-TIME < time in sec.>
```

Example:

```
Backup WRR> FIRST-STABILIZATION-TIME
Default First Stabilization Time: [1]? 2
Backup WRR>
```

2.5. LIST

Through the **LIST** command you can view all the Backup WRR configuration information.

This includes both the general parameters and the different associations present.

Syntax:

```
Backup WRR> LIST
```

Example:

```
Backup WRR> LIST
Backup-WRR is enabled.
Default First Stabilization Time: 1 (seconds)
Default Stabilization Time:      1 (seconds)

      Primary              Secondary   Re-route  T.1st T    Inverse
  Interface    Circuit     Interface   Enabled   Stab  Stab Re-route
-------------------------- ----------- --------- ----- ----- --------
serial0/1    16            fr1         Yes       Def   Def   No
serial0/0                  ppp1        Yes       Def   Def   No
Backup WRR>
```

2.6. NO

a) *NO FIRST-STABILIZATION-TIME*

Configures the *Default First Stabilization Time* value to its default value (1 second).

Syntax:

```
Backup WRR> NO FIRST-STABILIZATION-TIME
```

Example:

```
Backup WRR> NO FIRST-STABILIZATION-TIME
Backup WRR>
```

b) NO PAIR

This eliminates one of the Backup WRR associations that have been configured in the router. In this case you only need to indicate the primary link interface and subinterface (if required) and the secondary link interface.

Syntax:

```
Backup WRR> NO PAIR
```

Example:

```
Backup WRR> NO PAIR
Backup pair Id (1 65535): [1]? 1
Backup WRR>
```

c) NO STABILIZATION-TIME

Configures the *Default Stabilization Time* value to its default value (1 second).

Syntax:

```
Backup WRR> NO STABILIZATION-TIME <time in sec.>
```

Example:

```
Backup WRR> NO STABILIZATION-TIME
```

2.7. PAIR

Creates a new association for the Backup WRR. In order to achieve this, you need to indicate the primary interface you wish to monitor, the subinterface (if necessary), the secondary interface and the stabilization times.

If you wish to configure Backup WRR for a primary interface or subinterface over various secondary or various primary interfaces and/or subinterfaces over the same secondary, add as many associations to the same common interface as necessary.

Syntax:

```
Backup WRR> PAIR <id>
active                        activate/deactivate this backup pair

first-stabilization-time      first stabilization time

inverse-wrr                   activate/deactivate inverse wrr mode

no
       active          activate/deactivate this backup pair
       inverse-wrr     activate/deactivate inverse wrr mode

primary                       primary interface/circuit
       interface      primary interface
       circuit        primary circuit

secondary                     secondary interface
       interface      secondary interface

stabilization-time            stabilization time
```

active:	activates this backup pair.
first-stabilization-time:	sets the first stabilization time for this backup pair.
inverse-wrr:	if you configure this mode, the secondary interface passes to an available state if the primary is DOWN. The secondary interface exits this available state when the primary interface passes to UP, (contrary behavior to normal).
primary interface:	configures the primary interface for this backup pair.
primary circuit:	configures the primary subinterface for this backup pair.
secondary interface:	configures the secondary interface for this backup pair.
stabilization-time:	configures the stabilization time for this backup pair.

Example:

```
Backup WRR> PAIR 1 primary interface serial0/0 secondary interface fr1
Backup WRR>
```

NOTE: A "-1" value in the stabilization times indicates that defined values are configured by default.

2.8. STABILIZATION-TIME

Configura el valor del Tiempo de Estabilización por Defecto.

Sintaxis:

```
Backup WRR> STABILIZATION-TIME <tiempo en seg.>
```

Ejemplo:

```
Backup WRR> STABILIZATION-TIME
Default Stabilization Time: [1]? 2
Backup WRR>
```

2.9. EXIT

Exits the Backup WRR configuration prompt and returns to the general configuration prompt, *Config>*.

Syntax:

```
Backup WRR> EXIT
```

Example:

```
Backup WRR> EXIT
Config>
```

3. Interaction with other Protocols

3.1. WRS Backup

You must not configure as either a primary or secondary link an interface having this type of backup enabled (Backup WAN Restoral).

Configuration is independent between backups. It is not possible to enable both types of backup in the same interface.

3.2. Static Routing

Static routing reacts correctly when faced with the rerouting backup process. Its normal functionality is not affected, as the configured static routes are active or not according to the state of the links and not the state of the Backup WRR.

3.3. Dynamic Routing

Dynamic routing maintains its normal functionality when confronted with rerouting backup process. On enabling a secondary link, a route learning process is produced through it when this enters into a backup situation. When the primary link recovers, if you wish all traffic originally routed through it to return, you need to assign a cost for the interface greater than the routes learned through the secondary link (this way the routes dynamically learned through the primary or primary link are always prioritized).

Chapter 3
Monitoring

1. Accessing the WRR Monitoring prompt

The feature monitoring commands are available at the Backup WRR monitoring prompt. To access the WRR monitoring prompt, carry out the following steps:

1. Access the general monitoring menu, (+).
2. Enter the command related to the WRR, FEATURE WRR-BACKUP-WAN feature.

Example :

```
*P 3
Console Operator
+FEATURE WRR-BACKUP-WAN

-- Backup WAN Reroute user console --
WRR>
```

2. Backup WRR Monitoring Commands

The following table describes the Backup WRR monitoring commands.

Command	Function
?(HELP)	Displays the Backup WRR monitoring commands or lists the available options for a specific command.
LIST	Displays the statistics relative to Backup WRR.
EXIT	Exits the Backup WRR monitoring prompt and returns to the general monitoring prompt (+).

2.1. ? (HELP)

The **?** (HELP) command lists all the valid commands for the level. You can also use this after a specific command to list its options.

Syntax:

```
WRR> ?
```

Example:

```
WRR> ?
LIST
EXIT
WRR>
```

2.2. LIST

Through the **LIST** command you can view all the information relative to the Backup WRR, statistics etc.

a) LIST ALL

Displays all the available information in monitoring.

The meaning of the various parts is detailed in the description of the specifically associated commands.

Syntax:

```
WRR> LIST ALL
```

Example:

```
WRR> LIST ALL

Global information:
------------------
Backup-WRR is enabled.
Default First Stabilization Time: 1 (seconds)
Default Stabilization Time:       1 (seconds)
```

```
Per pair information:
---------------------
Primary                     Secondary   Re-route    T.1st T   Last     Num   Num
Network         Subnet      Network     Enabled     Stab  Stab Event    Act   Inact
-------------- ----------- ----------- ----------- ----- ----- -------- ----- -----
serial0/0       16          ppp1        Yes         1     1     PriDwn   0     1
atm3/0                      fr1         Yes         1     1     PriDwn   0     1

Per secondary current status:
-----------------------------
Secondary     Inverse     Re-route    Second. C.1st C     N°Cir Current
 Network      Re-route    State       State   Stab  Stab  InBUp Duration
------------ ----------- ----------- ------- ----- ----- ----- ---------------
ppp1          Off         Pri:Dwn     Act     0     0     1            0:00:34
fr1           Off         Pri:Dwn     Act     0     0     1            0:00:34

Statistics summarized:
----------------------
Total number of times Pri:Dwn state is reached:    2
Total number of times Pri:Dwn->Up state is reached: 0
Total number of times Pri:Up state is reached:      0
Total number of times Pri:Up->Dwn state is reached: 2
Longest completed WRR backup process:         0:00:00
Accumulated amount of time doing WRR backup:   0:00:00

Per secondary ifc statistics:
-----------------------------
Secondary   Num   Num   Num   Num   Current         Accumulated     Longest
 Network    UP    U->D  DWN   D->U  Duration        Duration        Duration
----------- ----- ----- ----- ----- -------------- -------------- --------------
ppp1        0     1     1     0         0:00:35         0:00:00         0:00:00
fr1         0     1     1     0         0:00:35         0:00:00         0:00:00
WRR>
```

b) LIST COUNTERS

Displays the different statistics. The association secondary links or a summary of all the Backup WRR in general.

· LIST COUNTERS SECONDARY-IFCs

Displays the statistics of each interface configured as a secondary link.

Syntax:

```
WRR> LIST COUNTERS SECONDARY-IFCs
```

Example:

```
WRR> LIST COUNTERS SECONDARY-IFCs

Per secondary ifc statistics:
-----------------------------
Secondary   Num   Num   Num   Num   Current         Accumulated     Longest
 Network    UP    U->D  DWN   D->U  Duration        Duration        Duration
----------- ----- ----- ----- ----- -------------- -------------- --------------
ppp1        0     1     1     0         0:01:22         0:00:00         0:00:00
fr1         0     1     1     0         0:01:22         0:00:00         0:00:00
WRR>
```

The meaning of each field is as follows:

Secondary Network   Interface name (ifc) of the secondary link.

Num UP   Number of times the main link has been in an "UP" state.

Num U->D   Number of times the main link has been in an "UP→DOWN" state.

Num DWN   Number of times the main link has been in a "DOWN" state.

Num D->U	Number of times the main link has been in a "DOWN→UP" state.
Current Duration	Current rerouting process time.
Accumulated Duration	Accumulated rerouting process time.
Longest Duration	Maximum rerouting process time.

· *LIST COUNTERS SUMMARY*

Displays the counters relevant to the state changes in the associations and the duration time of the Backup WRR rerouting.

Syntax:

```
WRR> LIST COUNTERS SUMMARY
```

Example:

```
WRR> LIST COUNTERS SUMMARY

Statistics summarized:
----------------------
Total number of times alt state is reached:      2
Total number of times alt->dir state is reached: 1
Total number of times dir state is reached:      2
Total number of times dir->alt state is reached: 2
Longest completed WRR backup process:        0:12:34
Acumulated amount of time doing WRR back-up:  0:12:34
WRR>
```

c) *LIST STATES-SECONDARY-IFCs*

Displays the states of the various secondary link.

Syntax:

```
WRR> LIST STATES-SECONDARY-IFCs
```

Example:

```
WRR> LIST STATES-SECONDARY-IFCs

Per secondary current status:
-----------------------------
Secondary   Inverse    Re-route   Second. C.1st C     NºCir Current
 Network    Re-route   State      State   Stab  Stab  InBUp Duration
----------- ---------- ---------- ------- ----- ----- ----- ----------------
ppp1        Off        Pri:Dwn    Act     0     0     1             0:01:49
fr1         Off        Pri:Dwn    Act     0     0     1             0:01:49
WRR>
```

The meaning of each field is as follows:

Secondary Network	Interface name (ifc) of the secondary link.
Inverse Re-route	Indicates if the inverse operation mode has been configured.
Re-route State	State of WRR (In Chapter **1**, section **2.3.c** the states which they can appear in can be seen).
Second State	State of the secondary interface.
C.1st Stab	Remaining time for switch to backup.
C Stab	Remaining time for backup recovery.
Nº Cir InBUp	Number of primary links associated in backup.
Current Duration	Current time in backup.

d) *LIST PAIRS*

Displays the global information and data relative to the associations.

Syntax:

```
WRR> LIST PAIRS
```

Example:

```
WRR> LIST PAIRS

Global information:
-------------------
Backup-WRR is enabled.
Default First Stabilization Time: 1 (seconds)
Default Stabilization Time:       1 (seconds)

Per pair information:
---------------------
Primary               Secondary  Re-route   T.1st T    Last      Num   Num
Network       Subnet  Network    Enabled    Stab  Stab Event     Act   Inact
--------------------- ---------- ---------- ----- ----- --------- ----- -----
serial0/0     16      ppp1       Yes        1     1     PriDwn    0     1
atm3/0                fr1        Yes        1     1     PriDwn    0     1
WRR>
```

The meaning of the fields is as follows:

Default Stabilization Time	Default Stabilization Time.
Default First Stabilization Time	Default First Stabilization Time.
Primary Net / Subnet	Interface name (ifc) and subinterface of the primary link.
Secondary Net	Interface number (ifc) of the secondary link.
Re-route Enabled	Indicates if the association is enabled (YES) or disabled (NO) in order to carry out backup.
T.1st Stab	First Stabilization Time.
T Stab	Stabilization Time.
Last Event	The last event provoked by the primary interface. (In Chapter **1**, section **2.3.b**, all the distinct events that can be produced appear).
Num Act	Number of times that a primary link has activated.
Num Inact	Number of times that a primary link has gone down, has deactivated.

2.3. <u>EXIT</u>

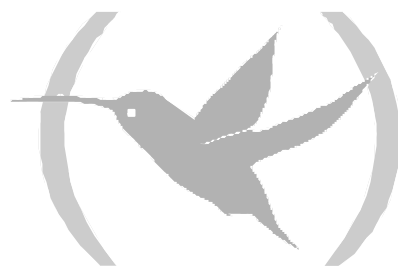Exits the Backup WRR monitoring prompt.

Syntax:

```
WRR> EXIT
```

Example:

```
WRR> EXIT
+
```

Chapter 4
# Practical example of Backup WRR Configuration

1. Backup WRR Configuration Example

The steps to follow in order to configure the case given in chapter **1** are shown below.

The user environment consists of:

- A device where you configure the WRR feature with an association and where the primary link is a dlci (16) and the secondary a PPP interface over an ISDN B channel.

- A device at the remote end of the FR link.

- A device functioning as a PPP server.
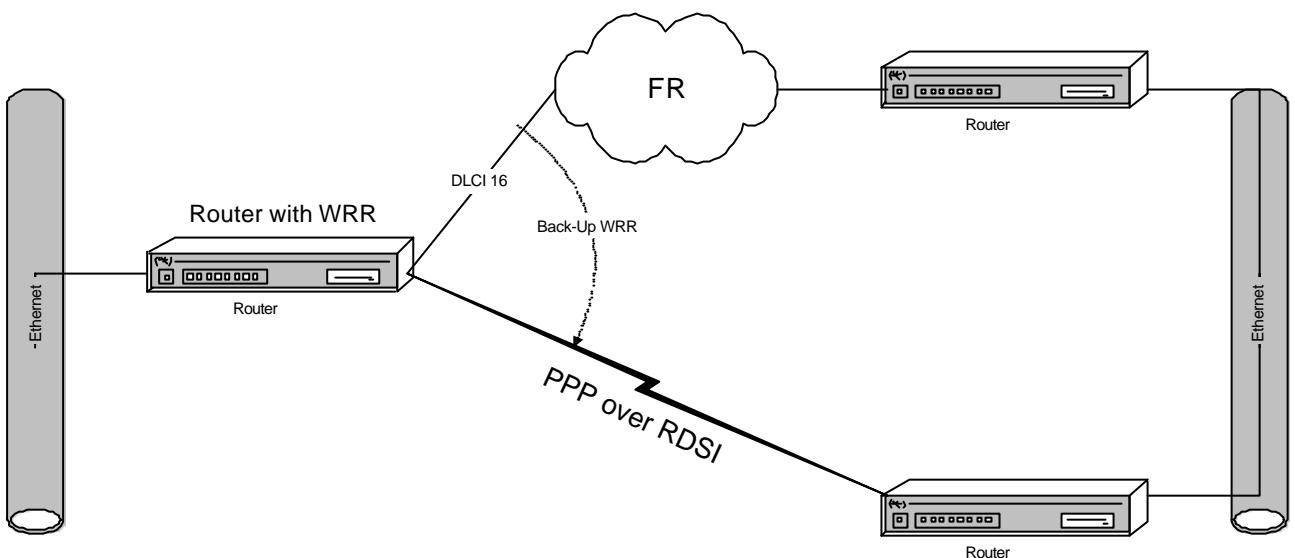
Supposing you wish to establish backup through WRR as indicated in the figure; when the Frame Relay DLCI 16 interface goes down, a PPP link over the ISDN line B channel activates establishing the call etc., until the DLCI recovers, in which case this deactivates releasing the call.

In order to achieve this, you must configure the Frame Relay interface with PVC in the router and the necessary parameters in the DLCI 16 and the PPP over ISDN interface. For further information on configuring these interfaces, please consult manuals *Dm710-I "PPP Interface"*, *Dm703-I "Frame Relay"*.

Supposing you have both interfaces configured in the router. You can check if these are present in the interface list:

```
*PROCESS 4

Config> LIST DEVICES

Interface        Con    Type of interface          CSR       CSR2    int
 ethernet0/0     LAN1   Fast Ethernet interface    fa200e00           27
 serial0/0       WAN1   Frame Relay                fa200a00  fa203c00  5e
 serial0/1       WAN2   X25                        fa200a20  fa203d00  5d
 serial0/2       WAN3   X25                        fa200a60  fa203f00  5b
 bri0/0          ISDN1  ISDN Basic Rate Int        fa200a40  fa203e00  5c
 x25-node        ---    Router->Node                     0            0
 atm3/0          SLOT 3 Generic ATM               f0000000           22
 ppp1            ---    Generic PPP                      0            0
Config>
```

Supposing you wish to establish WRR backup of the Frame Relay interface DLCI 16 configured in the WAN line 1 (interface serial0/0) over the PPP interface that has already been configured over an ISDN line B channel (interface ppp1).

Enter the following to access the Backup WRR configuration menu:

```
Config> FEATURE WRR-BACKUP-WAN

WAN Reroute Backup User Configuration
Backup WRR>
```

Enable the Backup WRR:

```
Backup WRR> ENABLE
Backup WRR>
```

You need to create the association between the required interfaces, establishing the default parameters for the timers:

```
Backup WRR> PAIR 1 primary interface serial0/0 secondary interface ppp1
Backup WRR> PAIR 1 primary circuit 16
Backup WRR>
```

You can now check that the association has been correctly created by viewing the associations' list:

```
Backup WRR> LIST
Backup-WRR is enabled.
Default First Stabilization Time: 1 (seconds)
Default Stabilization Time:       1 (seconds)

        Primary                   Secondary    Re-route   T.1st T      Inverse
  Interface     Circuit           Interface    Enabled    Stab  Stab   Re-route
--------------------------- --------------- ---------- ----- ----- --------
serial0/0       16                ppp1         Yes        Def   Def    No
Backup WRR>
```

In order to obtain the device configuration execute the **SHOW CONFIG** command:

```
Config> SHOW CONFIG
; Showing System Configuration ...
; Router XXXXX 2 8 Version 10.0.0

add device ppp 1
set data-link frame-relay serial0/0
set data-link x25 serial0/1
set data-link x25 serial0/2
network serial0/0
; -- Frame Relay user configuration --
   pvc 16 default
;
exit
;
network ppp1
; -- Generic PPP User Configuration --
   base-interface
; -- Base Interface Configuration --
      base-interface bri0/0 255 link
      base-interface bri0/0 255 profile pepe
;
   exit
;
exit
;
set dial-profile
; -- DIAL PROFILE CONFIGURATION --
   profile pepe default
   profile pepe remote-address 123456
   profile pepe no inbound
;
exit
;
feature wrr-backup-wan
; -- WAN Reroute Backup user configuration --
   pair 1 primary interface serial0/0 secondary interface ppp1
   pair 1 primary circuit 16
;
   enable
exit
;
Config>
```

Now you can save the configuration and restart the router so the changes take affect and the Backup WRR is operating as configured.

You need to return to the general configuration prompt and save the configuration.

```
Backup WRR> EXIT
Config> SAVE
Save configuration [n]? y

Saving configuration...OK
Config>
```

Press *Control-P* in order to access the Console Management (*****), and once there restart the router:

```
Config>                                         (Press Control-P)
*RESTART
Are you sure to restart the system?(Yes/No)? y
Restarting. Please wait ..........................................
APP DATA DUMP..................................................
Running application
Disk configuration read
Initializing




Teldat                  (c)1996-2002

Router model XXXXX 2 1 CPU M80860      S/N: 0403/00104
1 LAN, 3 WAN Lines, 1 ISDN Line

*
```