



Frame Relay Backup - ISDN Configuration

Teldat-Dm 711

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I Related Documents

Teldat-Dm703-I Frame Relay

Teldat-Dm729-I ISDN BRI Interface

Teldat-Dm732-I Dial Profiles

Teldat-Dm772-I Common Configurations for Interfaces

Chapter 1 Frame Relay Backup

1.1 Introduction

This chapter describes how Frame Relay backup operates using the ISDN basic access B channels (ISDN BRI interfaces).

The backed up link (i.e. the one normally in operation) is known as **primary link** and the link which provides backup is the **secondary link**. The backup process implicates the following:

- (1) Detects the main link failure.
- (2) Switches to secondary link.
- (3) Detects main link recovery.
- (4) Switches back to main link.

The backup process is transparent to superior level protocols except for possible delays or changes in the speed (speed changes occur for example when the secondary link has less capacity than the primary link). All the routing information, protocol connections etc. remain the same.

Teldat routers can provide backup for both the Frame Relay links over a serial WAN line as well as FR links over ISDN. The secondary link, depending on the ISDN base interface configuration, operates over the switched or semi-permanent B channels. It's also possible, by grouping the channels, to provide backup over both B channels at the same time, therefore achieving an information transfer rate of 128 Kbps (only over semi-permanent channels and provided the ISDN access supports this).

Therefore, the primary link can be either an FR interface over a WAN line or a FR interface over ISDN BRI. The following table displays the two possible combinations for the primary and secondary interfaces:

Primary Interface	Secondary Interface
Frame Relay (WAN)	Frame Relay (over ISDN BRI)
Frame Relay (over ISDN BRI)	Frame Relay (over ISDN BRI)

1.2 WAN network Backup

The WAN backup facility permits alternative routing of serial link data in cases of link failure. Backup protects against errors produced in the network nodes or in the access network itself. A Generic FR interface is used as the secondary link backup which runs over ISDN.

When the device detects the need to switch to backup, it makes an ISDN call (ISDN with switched B channels) and begins to transmit over the B channel assigned by the Network during the call set up process. If the ISDN has semi-permanent channels available, the data is directly transmitted through the configured B channel.

WAN network backup example

In the following figure you can see that Router **A** is connected to Router **B** through a Frame Relay network. If the Frame Relay network fails, then the secondary link (the ISDN link on demand) links the two routers. When the Frame Relay connection has recovered then the secondary link automatically disconnects. The time delay for disconnection is configurable.

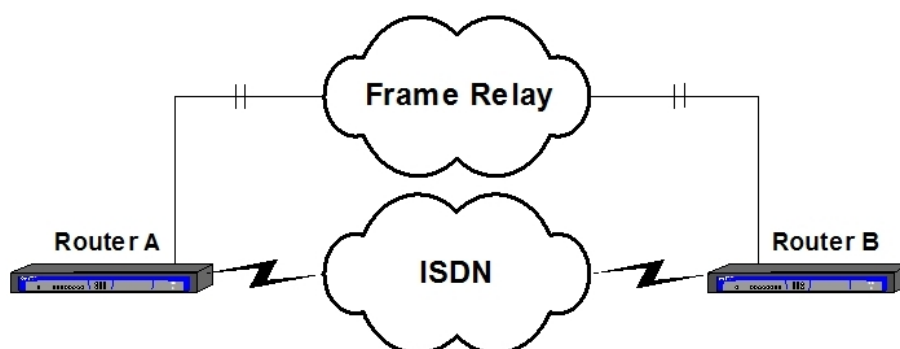


Fig. 1: WAN network backup example

1.3 Generic FR interface Backup

Generic FR interfaces over ISDN BRI can also be backed up through ISDN. These interfaces are true Frame Relay interfaces, equivalent to Frame Relay over serial line and in the same way also support LMI.

Normally a Generic FR interface over ISDN BRI transmits data through an ISDN B channel. However it is also possible to additionally associate this to a secondary backup link (also over ISDN) so that there is an alternative data route should the primary link fail.

Generally switch to backup occurs due to; the LMI being down, a circuit (configured with the *Back-ISDN always* option) becomes inactive or is eliminated, or when the ISDN call needed for the Generic FR interface over ISDN BRI operation could not be established. In any of the above cases, the data is routed through the secondary link, establishing the call if the ISDN basic interface (ISDN BRI) is not configured as semi-permanent.

The backup configuration within the Generic FR interface is carried out in exactly the same way as the Frame Relay interfaces over a serial line. Similarly, you must have associated the primary link with the secondary link (**FEATURE WRS-BACKUP-WAN** command). This is described in the following sections.

1.4 ISDN basic Interface

An ISDN basic interface (known as *ISDN Basic Rate Int –ISDN BRI–* in the Teldat routers) is a basic access consisting of two 64 Kbps B channels for transparent data transmission, and a 16 Kbps D channel. The router's B channels are used to transport HDLC frames at 64 Kbps. The router's D channel is only used to request calls.

The ISDN basic interface allows you to interconnect routers using the ISDN. The ISDN interface can be configured as a dedicated link with a permanent connection established; or as an on demand circuit for those connections that are automatically established when data transmission is requested or due to a drop in the primary link which it backs up.

The ISDN basic interface establishes connections with the remote router through ISDN. This initiates or accepts connections if the on demand connection interfaces indicate they should. In this particular case these are Frame Relay backup interfaces.

1.5 Frame Relay Backup Interface

The Frame Relay backup interface (Generic FR) is one of the types of connection interfaces on demand which act as ISDN basic interface users (*ISDN Basic Rate Int –ISDN BRI–*). This deals with a logical interface without a physical connection. Various Frame Relay backup interfaces can be configured over a single ISDN BRI base interface.

Addressing

To make a call you need to know the destination address. The destination address is configured in a dial profile. For further information on Dial Profiles, please see manual Teldat-Dm732-I "Dial Profiles." In order to accept calls from different routers you need to know the possible callers who are authorized to request calls. Each on-demand connection interface can have several different remote caller addresses which, like the destination addresses, are configured within the dial profile.

Circuit Content

Each ISDN BRI base interface admits a maximum of two simultaneously activated calls. If both calls are in process in an ISDN BRI interface and another on demand connection interface requests a new connection, this will not be established. Packets that should be routed via this third on-demand interface are discarded by the router.

Example

In the below example figure you can see that Router **A** is connected via both links to the two remote routers **B** and **C** through a Frame Relay network. Over the ISDN base interface two Frame Relay backup interfaces are configured. Each of these has a distinct destination address corresponding to each of the remote routers.

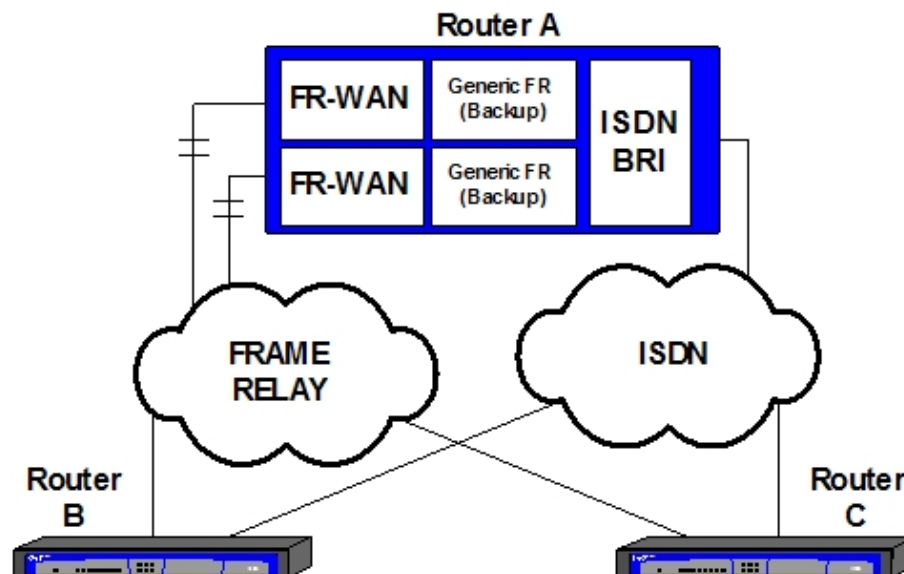


Fig. 2: Circuit content

Association to the primary Frame Relay interface

Logically, in order to carry out backup of a Frame Relay interface, the primary interface must be associated to a Frame Relay backup interface.

Regarding to the previous example. Each Frame Relay interface has its own Frame Relay backup interface associated. In this way, when the primary Frame Relay interface fails, the ISDN calls are carried out through Router *B*'s address, associated to the primary Frame Relay backup interface. The calls are managed in the same way when provoked by errors in the second Frame Relay interface, only this time they are sent towards Router *C*.

If the remote routers initiate the calls, the ISDN base interface distributes them to one or other of the Frame Relay backup interfaces depending on the calling number which appears in the call request. This calling number is compared with that configured in each dial profile so that the call is assigned to the correct interface.

Chapter 2 Configuring Frame Relay Backup

2.1 Introduction

This chapter describes the Frame Relay backup configuration process. This process is required in order to achieve backup for Frame Relay interfaces using the ISDN basic access B channels.

The information in this unit is divided into the following sections:

- Creating the backup interface.
- Configuring the Frame Relay Backup Interface.
- Configuring the dial profile.
- Configuring the ISDN base Interface.
- Association commands with the primary Frame Relay interface.
- Configuring backup in the primary Frame Relay interface.

For further information on the operation of Frame Relay backup, please consult chapter 1.

2.2 Creating the backup interface

Frame Relay backup is available both for the interfaces over a serial line as well as for interfaces FR over ISDN (Generic FR). In either of the two cases, the backup interface will be a Generic FR over ISDN. However, the configuration screens that will appear assume that this is providing backup service to a previously configured FR interface over a serial line. I.e. only one of the two cases will be explained as really the configuration of the backup is the same for both. The FR interface over a serial line, as shown in the following examples, has been created by using the **SET DATA-LINK FR serialX/X** command; another possible option would be to add a Generic FR and assign to it a synchronous interface, previously configured in one of the device WAN lines, as a base interface.

The configuration process is accessed by introducing the following:

```
*process 4
```

```
Config>
```

Or

```
*config
```

```
Config>
```

Through the configuration process **LIST DEVICES** command you can obtain the list of interfaces available in the device. Subsequently, the output of the said command is displayed in a device where line 1 is a Frame Relay interface over a serial line:

```
Config>list devices
```

Interface	Connector	Type of interface
ethernet0/0	LAN1	Fast Ethernet interface
serial0/0	SERIAL0/WAN1	Frame Relay
serial0/1	SERIAL1/WAN2	X25
serial0/2	SERIAL2/WAN3	X25
bri0/0	BRI/ISDN1	ISDN Basic Rate Int
x25-node	---	Router->Node

```
Config>
```

Firstly we are going to create the backup interface:

```
Config>add device fr 1
```

```
Config>list devices
```

Interface	Connector	Type of interface
ethernet0/0	LAN1	Fast Ethernet interface
serial0/0	SERIAL0/WAN1	Frame Relay

```

serial0/1      SERIAL1/WAN2  X25
serial0/2      SERIAL2/WAN3  X25
bri0/0         BRI/ISDN1     ISDN Basic Rate Int
x25-node       ---          Router->Node
fr1            ---          Generic FR
Config>

```

As you can see, a new Generic FR interface (fr1) has been created. This interface acts as an ISDN BRI interface user and handles the ISDN basic access. You can configure as many Generic FRs as you wish over an ISDN BRI. The defined Generic FRs share the available resources. E.g. if the ISDN BRI has two switched B channels, only a maximum of two Generic FRs can have simultaneous calls established.

In the next section, we will be showing how to associate a Generic RF interface to its ISDN BRI base interface.

2.3 Configuring the FR backup interface

In order to configure the parameters associated to an ISDN Frame Relay backup interface, you have to introduce the **NETWORK** command at the configuration *Config>* prompt followed by the Frame Relay backup interface to be configured.

In the previous example:

```

Config>network fr1

-- Generic FR User Configuration --
fr1 config>

```

The following commands are available once you have entered the interface configuration:

```

frX config>?
  base-interface  Access the base interface configuration menu
  fr              Takes you to the Frame Relay configuration prompt
  exit
frX config>

```

The **BASE-INTERFACE** command permits you to access the menu relating to the base interface (ISDN BRI) and the **FR** command to the parameters pertaining to Frame Relay. When the Generic FR provides backup services to another interface, you do not have to configure any parameter in the Frame Relay menu as the configuration of the DLCIs, IP-DLCI address mapping and IP address is taken from the primary interface being backed up. In reality, the backup interface substitutes the primary interface when this requires backup and the change is imperceptible at the IP level.



Note

If you configure the Frame Relay's own parameters in a Generic FR interface that provides backup, these will be ignored as the values of the primary Frame Relay interface are always used.

In addition to the above commands, there are other commands which are common for all the device's interfaces. These commands are described in the manual on configuring common interfaces (**Teldat- Dm772-I Common Configurations for Interfaces**).

2.3.1 BASE-INTERFACE

You need to relate the Generic FR interface with its corresponding ISDN BRI base interface. Firstly you need to access the base interface configuration menu:

```

frX config>base-interface

-- Base Interface Configuration --
frX Base IFC config>

```

The available options are as follows:

```

frX Base IFC config>?
  base-interface  Specify a base interface
  list           List current configuration
  no             Negate a command or set its defaults
  exit
frX Base IFC config>

```

2.3.1.1 BASE-INTERFACE

The **BASE-INTERFACE** permits you to specify the associated ISDN BRI interface, the number of the B channel through which you wish to establish the FR link (only used in cases of semi-permanent) and the name of the dial profile you wish to associate (in cases of switched links). Once this command has been executed, the Generic FR interface providing backup is associated to the base interface.

Syntax:

```
frX Base IFC config>base-interface <interface> <circuit_id> {link | profile <profile_name>}
```

The *link* option simply establishes the BRI ISDN interface and the B channel number indicated as the FR Generic interface base. The *profile* option also permits you to associate the call profile which is used in the backup connection.



Note

The channel number (*circuit_id*) is only significant in cases of FR connections over SEMIPERMANENT channels as in the case of switched channels, the channel is assigned when the call is carried out (this value must be configured to 255). Value 255 indicates that no channel is associated therefore if you are dealing with semi-permanent connections, the link will be inoperative.

In situations where the two B channels have been grouped in the ISDN BRI base interface, in order to configure the link over the said grouping, you can indicate either of the two channels pertaining to the group. However, as a general rule we recommend that you assign the lowest numbered channel in the group i.e. number 1.

The *Dial Profile* permits you to associate the link with the profile indicated (this contains data such as the type of permitted calls, outbound calls destinations, idle time etc.). The link cannot be established if there is no dial profile associated (when the ISDN connection is switched).

For further information on Dial Profiles, please consult manual Teldat-Dm732-I "Dial Profiles".

Example:

```
fr1 Base IFC config>base-interface ?
<interface>      Base interface
fr1 Base IFC config>base-interface bri0/0 ?
<1..255>        Base circuit id
fr1 Base IFC config>base-interface bri0/0 255 ?
link            Add this interface to the dial group
profile        Dial profile to use with this interface
fr1 Base IFC config>base-interface bri0/0 255 profile ?
<word>         Text
fr1 Base IFC config>base-interface bri0/0 255 profile prueba ?
<cr>
fr1 Base IFC config>base-interface bri0/0 255 profile prueba
fr1 Base IFC config>
```

2.3.1.2 LIST

Permits you view the options configured in the base interface.

```
fr1 Base IFC config>list
```

Base Interface	Profile Name	Base Circuit Id	Number of circuits
bri0/0	bri/0 prueba	255	1

```
fr1 Base IFC config>
```

"Base Interface" this refers to the name of the base interface used in the FR interface (in this case this must be the associated ISDN BRI interface name). The text appearing after the interface name (bri/0) specifies the type of interface. In this case no additional information is provided, however this can be useful when dealing with a serial line, as you can check if this involves a synchronous or asynchronous line.

"Profile Name" name of the call profile associated with the FR line. This identifier links to the circuit with the call characteristics this is going to have (source address, destination address, types of permitted calls, etc.).

"Base Circuit Id" number of the B channel connection is established over. Value 255 indicates that the channels are

switched and consequently the channel number is assigned when the call is established.

“**Number of circuits**” the number of base interface circuits that are going to be used. FR interfaces always use a single circuit.

2.3.1.3 NO

The **NO** command is used to carry out delete operations or to disable options or establish default values. In this particular menu, the **NO** command is only used to delete associations with the base interfaces.

```
frX Base IFC config>no ?
  base-interface    Specify a base interface
frX Base IFC config>
```

NO BASE-INTERFACE

The **NO BASE-INTERFACE** command permits you to delete the existing association with a base interface. The name of the associated ISDN BRI interface and (optionally) the assigned channel number must be specified as parameters.

```
fr1 Base IFC config>no base-interface ?
  <interface>      Base interface
fr1 Base IFC config>no base-interface bri0/0 ?
  <1..255>         Base circuit id
  <cr>
fr1 Base IFC config>no base-interface bri0/0 255
fr1 Base IFC config>
```

2.3.1.4 EXIT

Use the **EXIT** command to return to the main prompt for the Generic FR interface configuration.

```
frX Base IFC config>exit
frX config>
```

Enter the **EXIT** command as many times as necessary in order to return to the Config> prompt.

2.3.2 FR

The **FR** command permits you to access the configuration menu for parameters pertaining to Frame Relay.

```
frX config>fr
-- Frame Relay user configuration --
frX FR config>
```

When the Generic FR interface provides backup service to another interface, you do not need to configure any parameter in the Frame Relay menu, as these values are taken from the main interface the Generic FR interface is backing up. In cases where any of the said parameters are configured, these values will be ignored.

2.3.3 EXIT

Use the **EXIT** command to return to the general configuration prompt, *Config*>.

Example:

```
frX config>exit
Config>
```

2.4 Configuring the dial profile

Once the Generic FR backup interface has been created and configured, you need to create a dial profile for it (if the backup link is switched). In the dial profile you need to configure the following; the destination number to call in order to establish the backup connection through ISDN, the permitted connection interval, the idle time that must lapse in order to release the call and other parameters that, depending on the type of configuration, may be significant or not.

In cases of backup interfaces, the most common configurations only permit outbound calls to a remote number. Additionally, it makes sense for example to set a connection interval so backup is only carried out during specific hours.

For a more detailed explanation on dial profile configuration, please see manual Teldat-Dm732-I “Dial Profiles”

2.5 Configuring the ISDN base interface

Teldat routers provide the possibility of configuring the ISDN BRI base interface. Generally, the parameters configured in this interface permit the router to adapt to the peculiarities of the distinct ISDN standards that exist. However, in the vast majority of cases, the default configuration is valid and you do not need to configure any parameters within the ISDN BRI interface.

However, so that a backup FR link over an ISDN BRI interface with semi-permanent B channels operates correctly, you need to correctly configure certain ISDN BRI interface parameters. The possibilities presented are as follows:

2.5.1 Backup Generic FR over an ISDN BRI semi-permanent channel

You need to configure the channel over which you wish to establish the FR connection as semi-permanent (*PERM*).

2.5.2 Backup Generic FR over an ISDN BRI Switched channel

You need to configure one of the ISDN BRI base interface channels as switched (*SW*). Both the B channels are configured as switched in the default configuration.

The type of B channel is configured through the **SET CIRCUIT TYPE** command. Firstly you need to enter the ISDN BRI interface configuration menu:

```
Config>network bri0/0
-- BRI ISDN Configuration --
bri0/0 BRI config>
```

The options given in the ISDN BRI interface configuration menu are as follows:

```
bri0/0 BRI config>?
  description      Enter interface description
  join-b1+b2       Associates B channels in a single pipeline at 128 Kbps
  leave-b1+b2      Separates B channels that were previously associated
  list             Displays the interface configuration information
  no               Negate a command or set its defaults
  set              Configures interface parameters
  shutdown         Change state to administratively down
  update           Update a level indicator
  exit
bri0/0 BRI config>
```

You can now configure the B channels. The two options are semi-permanent (PERMANENT) or switched (SWITCHED).

```
bri0/0 BRI config>set circuit type ?
  permanent       Permanent connection type (Not Q.931 signalling)
  switched        Switched connection type
bri0/0 BRI config>
```

Example:

```
bri0/0 BRI config>set circuit type permanent ?
 <1..2>          Enter circuit
bri0/0 BRI config>set circuit type permanent 1
bri0/0 BRI config>
```

or

```
bri0/0 BRI config>set circuit type switched ?
 <1..2>          Enter circuit
bri0/0 BRI config>set circuit type switched 1
bri0/0 BRI config>
```

In addition to the type of B channel, there is also the possibility of configuring the maximum frame size (MTU) to be used in the interface, the maximum frame size for each channel and the grouping of the two B channels so that the total binary rate passes to 128 Kbps (only where the Network supports this). Other parameters related to the ISDN are also configurable such as for example the numeration plan, standard used etc. Further information on how to configure these parameters can be found in manual Teldat-Dm729-I "ISDN BRI Interface".

2.6 Association with the primary FR interface

In order to associate a primary Frame Relay interface (be it over a serial line or ISDN) to a backup Frame Relay link through ISDN, you need to enter the WRS backup facility configuration menu:

```
Config>feature wrs-backup-wan

-- WAN Back-up user configuration --
Back-up WAN>
```

The available options are as follows:

```
Back-up WAN>?
  pair      Add a back-up pair
  no        Add a back-up pair
  list      List back-up configuration
  exit
Back-up WAN>
```

2.6.1 PAIR

The **PAIR** command permits you to add a new association between a primary Frame Relay interface (*Primary Interface*) and its corresponding backup Generic FR (*Secondary Interface*).

```
Back-up WAN>pair ?
  <interface>  Primary Interface
Back-up WAN>pair serial0/0 ?
  <interface>  Secondary Interface
Back-up WAN>pair serial0/0 fr1 ?
  recovery-time  Configure time to return from backup to principal
                  connection
  <cr>
Back-up WAN>pair serial0/0 fr1
Back-up WAN>
```

It is possible to configure the return from backup time: this is the period of time waited from the moment the primary link is detected as available until the secondary connection is no longer used and data is once more being transmitted over the primary link. In the above example, as the value of the said parameter has not been expressly indicated, the default value has been configured which is 1 second. If, when creating an association or a pair, you wish configure a different value for this parameter, you need to use the *recovery-time* configuration option.

Example:

```
Back-up WAN>pair serial0/0 fr1 recovery-time ?
  <0..65535>  Value in the specified range
Back-up WAN>pair serial0/0 fr1 recovery-time 2
Back-up WAN>
```

2.6.2 NO

The **NO** command is used to carry out delete operations or to disable options or establish default values. In this particular menu, the **NO** command is only used to delete backup associations (pairs).

```
Back-up WAN>no ?
  pair      Add a back-up pair
Back-up WAN>
```

NO PAIR

The **NO PAIR** command permits you to delete an association previously set up between a primary Frame Relay interface and its corresponding backup Generic FR interface (*Secondary Interface*).

```
Back-up WAN>no pair ?
  <interface>  Primary Interface
Back-up WAN>no pair serial0/0 ?
  <interface>  Secondary Interface
Back-up WAN>no pair serial0/0 fr1 ?
  recovery-time  Configure time to return from backup to principal
```

```

connection
<cr>
Back-up WAN>no pair serial0/0 fr1
Back-up WAN>

```

2.6.3 LIST

The **LIST** command presents all the associations configured in the device on the screen.

```

Back-up WAN>list

Primary Interface  Secondary Interface  Recovery Time
-----
serial0/0         fr1                  2

Back-up WAN>

```

2.6.4 EXIT

The **EXIT** command permits you to exit the configuration menu.

```

Back-up WAN>exit
Config>

```

2.7 Configuring backup in the primary Frame Relay interface

Once the backup interface has been created and configured, and you have assigned a dial profile and associated the primary interface with the backup interface through the WRS-BACKUP-WAN facility, you need to configure some parameters found within the primary interface. This can, for example, be DLCI to be used in the backup connection and also the possibility of switching to backup when a circuit becomes inactive or only when the whole interface is down. These parameters are configured in the same way as in FR interfaces over a serial WAN line and FR over ISDN (Generic FR interfaces). Please see manual Teldat-Dm703-I “Frame Relay” for a more in-depth description.

To configure the backup in the primary interface, first enter its configuration menu. In the screens that appear below, the primary interface is FR over serial WAN line and only PVC 16 is configured.

```

Config>list devices

Interface          Connector      Type of interface
-----
ethernet0/0       LAN1          Fast Ethernet interface
serial0/0         SERIAL0/WAN1  Frame Relay
serial0/1         SERIAL1/WAN2  X25
serial0/2         SERIAL2/WAN3  X25
bri0/0            BRI/ISDN1     ISDN Basic Rate Int
x25-node          ---          Router->Node
fr1               ---          Generic FR

Config>

```

Enter the primary Frame Relay interface configuration menu:

```

Config>network serial0/0

-- Frame Relay user configuration --
serial0/0 FR config>

```

2.7.1 PVC circuit_number BACKUP

In order to configure backup, use the *backup* option found in the PVC command. The **PVC** command permits you to configure diverse Frame Relay Permanent Virtual Circuit parameters (or create one with the default values). Specifically, the *backup* option is used to associate the backup circuits to the main circuit you are configuring and whose number is indicated. Within the said *backup* option you can also see two other options: the *dldci* option, to configure the backup PVC for PVC to PVC in cases where you want the backup to be within the primary interface itself and not through ISDN, and the *isdn-dldci* option, to configure the PVC to be used when the device switches to backup through ISDN.

Syntax:

```
{serialX/X | frX} FR config>pvc <circuit_number> backup dldci <FR_backup_circuit_num>
```

Or

```
{serialX/X | frX} FR config>pvc <circuit_number> backup isdn-dlci <ISDN_backup_circuit_num>
```

<i>circuit_number</i>	Number corresponding to a configured primary PVC.
<i>FR_backup_circuit_num</i>	Number corresponding to the backup PVC for the configured PVC to PVC. If this value is set to zero, then the primary circuit does not have a PVC-to-PVC backup circuit associated. This backup is in the primary interface itself, not over ISDN.
<i>ISDN_backup_circuit_num</i>	Number corresponding to the PVC used when the device switches to backup through ISDN. This can be the same DLCI used in the primary interface or a different one. If the value is set to zero then the primary circuit does not have an associated ISDN backup circuit.

Example:

```
serial0/0 FR config>pvc 16 ?
  backup          Configure several backup parameters
  Bc              Outgoing Committed Burst Size
  Be              Outgoing Excess Burst Size
  CIR             Outgoing Committed Information Rate
  compression     Enable/disable compression for this circuit
  default         Create the virtual circuit
  encapsulation   Encapsulation type
  encrypt         Enable/disable encryption
  fragmentation-size Forced fragmentation size
  inverse-arp     Inverse ARP configuration for this dlci
  name           Set the virtual circuit name
  no
  route          Set static route for PVC switching
serial0/0 FR config>pvc 16 backup ?
  dlci           Set a frame-relay dlci to backup
  isdn-dlci     Set an isdn frame-relay dlci to backup
serial0/0 FR config>pvc 16 backup isdn-dlci ?
  <16..1007>    Value in the specified range
serial0/0 FR config>pvc 16 backup isdn-dlci 17 ?
  <cr>
serial0/0 FR config>pvc 16 backup isdn-dlci 17
serial0/0 FR config>
```

In cases where you have configured a DLCI to carry out backup though ISDN, you can configure a series of options applicable to the backup circuit.

```
serial0/0 FR config>pvc 16 backup ?
  dlci           Set a frame-relay dlci to backup
  isdn-dlci     Set an isdn frame-relay dlci to backup
  always        Always backup to the isdn dlci
  encrypt       Encrypt data through the isdn backup
serial0/0 FR config>pvc 16 backup always
serial0/0 FR config>
```

always Configure this option then provided both the Frame Relay circuits (primary and secondary) are inactive, transmission is carried out through the backup circuit via ISDN. If this option is not selected then backup is only carried out through the ISDN circuit if the interface is down.

encrypt On selecting this option, data transmitted through the ISDN backup circuit is encrypted.

By default, these latter two options (*always* and *encrypt*) are disabled. If they have been enabled and you wish to disable them once more, this is carried out through the *no* option found in the *PVC* command:

```
serial0/0 FR config>pvc 16 no ?
  backup          Configure several backup parameters
  Bc              Outgoing Committed Burst Size
  Be              Outgoing Excess Burst Size
```



```

CIR                Outgoing Committed Information Rate
compression        Enable/disable compression for this circuit
encapsulation      Encapsulation type
encrypt            Enable/disable encryption
fragmentation-size Forced fragmentation size
name               Set the virtual circuit name
route              Set static route for PVC switching
serial0/0 FR config>pvc 16 no backup ?
dlci               Set a frame-relay dlci to backup
isdn-dlci         Set an isdn frame-relay dlci to backup
always            Always backup to the isdn dlci
encrypt           Encrypt data through the isdn backup
serial0/0 FR config>pvc 16 no backup always
serial0/0 FR config>

```

2.7.2 LIST BACK-UP

Displays information on all the PVCs configured in the Frame Relay interface and their associated backup circuits.

```

serial0/0 FR config>list back-up

Maximum PVCs allowed = 64
Total PVCs configured = 1

      Name          Circuit  Circ.  Circ.  Back-ISDN  Encrypt
      Circuit      Main    Back-FR Back-ISDN  always    Back-ISDN
      -----
Unassigned          16      0      17      No        No
serial0/0 FR config>

```

Chapter 3 Example

3.1 Practical configuration example

Let's take a normal working environment where the remote center needs to communicate with the data processing center through a Frame Relay network, using ISDN as the backup network. We are going to configure PVCs 16, 17 and 18 on the primary FR line. The DLCIs used for backup through ISDN are 20 and 25.

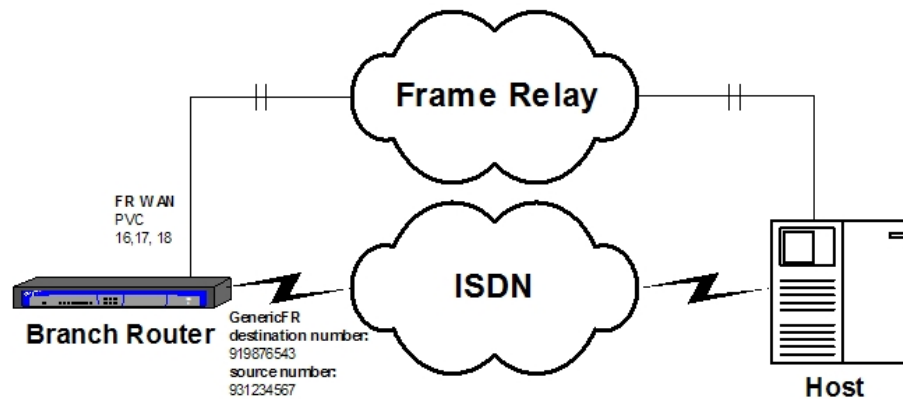


Fig. 3: Configuration example

3.1.1 Configuring the interfaces

You can execute the **NO CONFIGURATION** command to delete any previous configuration. The first thing is to add two FR interfaces (Generic FR) and configure at least one of the WAN lines as a synchronous interface so this serves as the FR interface base interface, which acts as the main interface. The ISDN BRI (bri0/0) is assigned as base interface to the other FR interface.

```
Router model ATLAS2 CPU MPC860      S/N: 403/00567
1 LAN, 3 WAN Lines, 1 ISDN Line
CIT software version: 10.7.1 Nov 23 2006 11:19:19

*config

Config>no config
Config>set data-link sync serial0/0
Config>add device fr 1
Config>add device fr 2
Config>list devices

Interface      Connector      Type of interface
ethernet0/0    LAN1           Fast Ethernet interface
serial0/0      SERIAL0/WAN1   Synchronous Serial Line
serial0/1      SERIAL1/WAN2   X25
serial0/2      SERIAL2/WAN3   X25
bri0/0        BRI/ISDN1      ISDN Basic Rate Int
x25-node       ---           Router->Node
fr1           ---           Generic FR
fr2           ---           Generic FR
Config>
```

3.1.2 Configuring the FR WAN Interface

First configure the main Frame Relay interface. To do this enter the configuration menu for the corresponding Generic FR, associate the synchronous interface, established in one of the WAN lines, as the base interface and additionally configure the necessary FR parameters.

```
Config>network fr1
```

```
-- Generic FR User Configuration --
fr1 config>base-interface

-- Base Interface Configuration --
fr1 Base IFC config>base-interface serial0/0 link
fr1 Base IFC config>exit
fr1 config>fr

-- Frame Relay user configuration --
fr1 FR config>
```

Create the permanent virtual circuits (PVCs) you wish to have available:

```
fr1 FR config>pvc 16 encrypt
fr1 FR config>pvc 16 name C16
fr1 FR config>
```

You can now see the configuration for the created circuit:

```
fr1 FR config>list circuits

Maximum PVCs allowed = 64
Total PVCs configured = 1

      Circuit      Circuit  Circuit  CIR    Burst  Excess
      Name         Number   Type    in bps  Size   Burst  Encrypt
-----
C16                16  Permanent  16000  16000    0   Yes
Inverse ARP: default          Encapsulation: IETF

No SVCs configured
fr1 FR config>
```

In order to see all the backup possibilities available in the Teldat router, three circuits are used. These are added as previously shown resulting in the following configuration:

```
fr1 FR config>list circuits

Maximum PVCs allowed = 64
Total PVCs configured = 3

      Circuit      Circuit  Circuit  CIR    Burst  Excess
      Name         Number   Type    in bps  Size   Burst  Encrypt
-----
C16                16  Permanent  16000  16000    0   Yes
Inverse ARP: default          Encapsulation: IETF
C17                17  Permanent  16000  16000    0   Yes
Inverse ARP: default          Encapsulation: IETF
C18                18  Permanent  16000  16000    0   No
Inverse ARP: default          Encapsulation: IETF

No SVCs configured
fr1 FR config>
```

The need to create the previous three circuits is due the fact that two types of traffic over Frame Relay are supported in this example: IP and SNA. Circuits 16 and 17 are used to transport SNA traffic while 18 transports IP. The circuits assigned to SNA are configured with the *encrypt* option. This means that providing the device has a corresponding encryption card available, the content of the Frame Relay frame data field will be encrypted. The password is configured in the following way:

```
fr1 FR config>set encryption
Circuit number: [16]?
Encrypt mode (DES, Triple DES, Clear): [DES]? Tr
Enable CBC encrypt mode [No]: (Yes/No)? y
New Encrypt Key (8 characters): *****
Rewrite:
New Encrypt Key (8 characters): *****
New Second Key of TRIPLE DES (8 characters): *****
Rewrite:
New Second Key of TRIPLE DES (8 characters): *****
```

```

New Third Key of TRIPLE DES (8 characters): *****
Rewrite:
New Third Key of TRIPLE DES (8 characters): *****

    Updating encrypt configuration...
fr1 FR config>

```

And the same applies to DLCI 17:

```

fr1 FR config>set encryption
Circuit number: [16]? 17
Encrypt mode (DES, Triple DES, Clear): [DES]? Triple
Enable CBC encrypt mode [No]: (Yes/No)? y
New Encrypt Key (8 characters): *****
Rewrite:
New Encrypt Key (8 characters): *****
New Second Key of TRIPLE DES (8 characters): *****
Rewrite:
New Second Key of TRIPLE DES (8 characters): *****
New Third Key of TRIPLE DES (8 characters): *****
Rewrite:
New Third Key of TRIPLE DES (8 characters): *****

    Updating encrypt configuration...
fr1 FR config>

```

At this point there is nothing configured in relation to the two possible types of backup: PVC to PVC (in the same Frame Relay interface), and Frame Relay to ISDN. This can be verified by listing the current state of the backup configuration:

```

fr1 FR config>list back-up

Maximum PVCs allowed = 64
Total PVCs configured = 3

      Name          Circuit  Circ.  Circ.  Back-ISDN  Encrypt
      Circuit      Main    Back-FR  Back-ISDN  always    Back-ISDN
-----
C16          16         0         0         No         No
C17          17         0         0         No         No
C18          18         0         0         No         No
fr1 FR config>exit
Config>

```

With the above you have the necessary elements configured in the Frame Relay interface to subsequently configure the backup.

3.1.3 Configuring the Frame Relay backup interface

You need to configure the profile you wish to use for this interface and also the associated ISDN BRI base interface. The channel is set to 255 as the ISDN interface in the example is switched i.e. the channel is assigned by the Network during the call set up process.

```

Config>network fr2

-- Generic FR User Configuration --
fr2 config>base-interface

-- Base Interface Configuration --
fr2 Base IFC config>base-interface bri0/0 255 profile fr_prueba
fr2 Base IFC config>list

      Base Interface      Profile Name      Base Circuit Id      Number of circuits
-----
      bri0/0      bri/0      fr_prueba      255      1

fr2 Base IFC config>exit
fr2 config>exit

```

```
Config>
```

3.1.4 Configuring the Dial Profile

This is where you configure the parameters to be used to make and receive calls. Introduce a name chosen for the profile, the local number (only necessary in cases where you wish to receive calls) and the remote number, and the release time due to absence of data.

```
Config>global-profiles dial

-- Dial Profiles Configuration --
Dial Profiles config>profile fr_prueba ?
  alternative-address      Alternative remote address
  callback                Callback
  caller                  Authorized caller (incoming calls)
  call-list               Access list to allow calls
  call-retry              Call retry options
  code                    Proprietary code
  default                 Set dial profile default configuration
  dialin                  Allow incoming calls only
  dialout                 Allow outgoing calls only
  3gpp-accessibility-control Set 3G connection accessibility control
  3gpp-apn                GPRS/UMTS/HSDPA access point name
  3gpp-bearer-service     Set circuit bearer service parameters
                        according to 3GPP TS 27.007 for CSD calls
  3gpp-pdp-type           GPRS/UMTS/HSDPA packet data protocol type
  hold-queue              Maximum packets queued when calling
  idle-time               Idle time before disconnecting
  inout                   Allow both incoming and outgoing calls
  isdn-class              ISDN class (64kbps or 56kbps)
  isdn-type               ISDN call type
  local-address           Local number
  no                      Negate a command or set its defaults
  priority                Priority of this dial profile
  remote-address          Remote number
  shutdown                Shutdown calls when leaving allowed intervals

Dial Profiles config>profile fr_prueba local-address 931234567
Dial Profiles config>profile fr_prueba remote-address 919876543
Dial Profiles config>profile fr_prueba idle-time 60
Dial Profiles config>profile fr_prueba no dialin
Dial Profiles config>list

DIAL PROFILE..: fr_prueba
Local Address.: 931234567
Remote Address: 919876543      Alternative Remote:
Permissions...: Outbound
Idle Time.....: 60
Shutdown Calls: Yes
Priority.....: Normal
Callback.....: None
ISDN Call type: Digital unrestricted data
ISDN Class....: 64 Kbps
Hold queue....: 0
3GPP Acc Ctrl.: None
3GPP APN.....: None
3GPP PDPTType .: IP
3GPP CBST.....: 0,0,1
Call Retry....: Disabled
Call List.....: None

Dial Profiles config>exit
Config>
```

3.1.5 Configuring the ISDN base interface

You do not need to configure any parameters as we are going to use the switched circuits with MTU 2048 without channel grouping, i.e. the default configuration. It is also unnecessary to configure a local address, as this is not mandatory.

```
Config>network bri0/0

-- BRI ISDN Configuration --
bri0/0 BRI config>list

ISDN Standard      : EURO-ISDN
Emulation          : User
Type of number     : Unknown
Numbering Plan Identific : Unknown
Sending Complete   : Enabled
Alerting incoming calls : Disabled
Calling number presentat : Allowed
TEI Negotiation option : First Call
Supervision interval : 0
Supervision fails to down: 3
Local address      :
SPID Value for B1  :
SPID Value for B2  :
Maximum frame length : 2048

          B1  B2
-----  ---  ---
MTU      2048 2048
Type     SW   SW
B1+B2

bri0/0 BRI config>exit
Config>
```

3.1.6 Associating the primary FR with the backup interface

You need to associate the primary FR interface with the backup interface via ISDN. The backup facilities are used for this:

```
Config>feature wrs-backup-wan

-- WAN Back-up user configuration --
Back-up WAN>
```

Networks interconnection is then added:

```
Back-up WAN>pair fr1 fr2 recovery-time 2
Back-up WAN>
```

Check that the configuration is as expected:

```
Back-up WAN>list

Primary Interface Secondary Interface Recovery Time
-----  ---  ---
fr1      fr2      2

Back-up WAN>exit
Config>
```

3.1.7 Configuring backup in the primary FR interface

Once the primary interface is associated to the backup one, you can configure the parameters related to backup within the primary Frame Relay interface. This is carried out in the following way:

```
Config>network fr1
```

```
-- Generic FR User Configuration --
fr1 config>fr

-- Frame Relay user configuration --
fr1 FR config>
```

Firstly you configure the main circuit.

```
fr1 FR config>pvc 16 backup dlci 17
fr1 FR config>pvc 16 backup isdn-dlci 20
fr1 FR config>pvc 16 backup always
fr1 FR config>pvc 16 backup encrypt
fr1 FR config>
```

Then configure the second one.

```
fr1 FR config>pvc 18 backup isdn-dlci 25
fr1 FR config>pvc 18 no backup always
fr1 FR config>
```

The configuration should look like this:

```
fr1 FR config>list back-up

Maximum PVCs allowed = 64
Total PVCs configured = 3

      Name          Circuit  Circ.  Circ.  Back-ISDN  Encrypt
      Circuit       Main    Back-FR Back-ISDN  always    Back-ISDN
-----
C16             16      17      20      Yes       Yes
C17             17       0       0       No        No
C18             18       0      25       No        No
fr1 FR config>
```

For the primary circuit 16, a backup circuit PVC to PVC (within the FR over WAN line interface itself) is assigned with a value of 17. If for any reason the network informs you (through LMI messages) that circuit 16 has been eliminated or become inactive, traffic destined to this circuit will be transferred to circuit 17.

If both circuits 16 and 17 are inaccessible (due to elimination or inactivity) then the interface will switch to backup over ISDN. The DLCI used in the backup is 20. This circuit does not have to be previously configured. As the *Back-ISDN always* option is enabled the switch to backup occurs when the interface is down or when the two circuits are unavailable. If the *Back-ISDN always* option is not enabled, switch to backup only occurs when the interface fails completely.

Finally, circuit 18 does not have PVC-to-PVC backup configured but it does have backup through ISDN. Additionally in this case, the *Back-ISDN always* option is not enabled as this circuit only switches to backup when faced with a complete drop in the primary interface. The DLCI used in backup over ISDN is 25.

If a situation arises where circuits 16 and 17 are inactive but circuit 18 is active, traffic from circuits 16 and 17 will exit through backup over ISDN. Traffic from circuit 18 will exit through the primary interface as it is perfectly possible that some circuits leave through ISDN and others, those that are still active, continue through the main interface.

Once everything indicated has been configured, you need to save the configuration and restart the device.

```
Config>save
Save configuration (Yes/No)? y

Building configuration as text... OK
Writing configuration... OK on Flash
Config> <CONTROL+P>

*restart
Are you sure to restart the system(Yes/No)? y
  Done

Restarting. Please wait .....
```

3.1.8 Configuring the example in text mode

If you execute the **SHOW CONFIG** command at the **Config>** prompt once the previous steps have been executed, the following is obtained:

```
Config>show config
; Showing System Configuration for access-level 15 ...
; Router model ATLAS2 Version 10.7.1

log-command-errors
no configuration
add device fr 1
add device fr 2
set data-link sync serial0/0
set data-link x25 serial0/1
set data-link x25 serial0/2
global-profiles dial
; -- Dial Profiles Configuration --
  profile fr_prueba default
  profile fr_prueba dialout
  profile fr_prueba remote-address 919876543
  profile fr_prueba local-address 931234567
  profile fr_prueba idle-time 60
;
exit
;
;
;
network ethernet0/0
; -- Ethernet Interface User Configuration --
  no ip address
;
exit
;
;
;
;
network x25-node
; -- X25-node interface configuration --
  no ip address
;
exit
;
;
;
;
network fr1
; -- Generic FR User Configuration --
  no ip address
;
  base-interface
; -- Base Interface Configuration --
  base-interface serial0/0 link
;
  exit
;
  fr
; -- Frame Relay user configuration --
  pvc 16 default
  pvc 16 backup dlci 17
  pvc 16 backup isdn-dlci 20
  pvc 16 backup always
  pvc 16 encrypt
  pvc 16 name C16
;
  pvc 17 default
  pvc 17 encrypt
  pvc 17 name C17
```



```
;
    pvc 18 default
    pvc 18 backup isdn-dlci 25
    pvc 18 name C18
;
    exit
;
exit
;
;
;
network fr2
; -- Generic FR User Configuration --
    no ip address
;
    base-interface
; -- Base Interface Configuration --
    base-interface bri0/0 255 link
    base-interface bri0/0 255 profile fr_prueba
;
    exit
;
exit
;
;
;
feature wrs-backup-wan
; -- WAN Back-up user configuration --
    pair fr1 fr2 recovery-time 2
;
exit
;
dump-command-errors
end
; --- end ---
Config>
```