



SnIP Application Guide

Redundancy with the M500 Modem and SnIP

Revision History

Rev 0.1	7-24-2010	Initial Release.
Rev 0.2	8-23-2010	Add info on editing red-config.
Rev 0.3	8-28-2010	Add info on SNMP controls.

1.0 SnIP and Modem Redundancy Overview

The Satellite network Interface Processor or “SnIP” is a fairly complete Linux computer on a small card which can be installed into a PSM-500 series modem. It can serve as both a selectable data interface and an IP based monitor and control element for the modem independently.

There has recently been interest expressed in using the SnIP in conjunction with redundant modems in varied applications. This document describes some possible configurations and methods of implementing them.

Why Redundancy?

The purpose of redundancy is to insure reliable communications paths in the event of equipment failures. Redundancy can be either manual or automatic. The ideal is a self-healing systems that switches automatically to continue data service and allows easy isolation and replacement of failed equipment

What does it look like?

Typically redundancy involved two possible paths for data. The “On-Line” path is the current set of equipment that data is traveling through and the “Off-Line” path is the backup set of equipment that is available should some problem develop with the on-line equipment. For communications equipment the normal redundancy configuration is to switch the outputs of devices only. The inputs are fed to both devices as this may be required to determine proper functionality and status. A single Modem with SnIP is shown below and then the equivalent as a redundant Modem/SnIP setup for use with the SnIP as the main data interface or as a monitor control interface only.

A similar configuration is usable when the SnIP is used for Monitor and Control (M&C) and one of the synchronous serial interfaces is used as the main data interface. That configuration is presented in Section 2 below and the configuration when the SnIP is the main data interface is shown in Section 3.

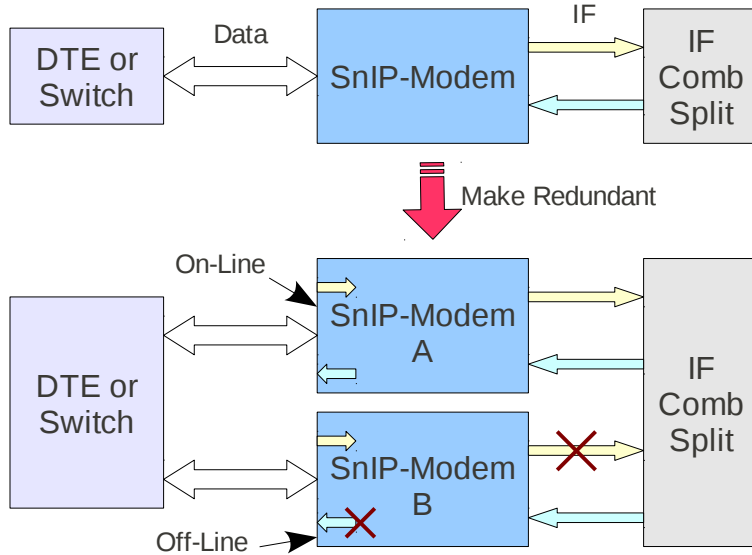


Figure 1: Converting a Modem with SnIP to 1:1 Redundancy

In the diagram above when making a redundant modem and SnIP setup note that only the outputs of the off-line modem are switched off, while the inputs remain active. In the case of a modem and SnIP being made redundant there are no physical switches used to break the outputs. The modem IF transmit is muted while retaining proper terminating impedances while the Ethernet side is switched off in software.

There are many ways to arrange redundant paths in an equipment chain. For example an entire transmit or receive path consisting of a router, modem and RF equipment could be switched as a group with no inter-device switches, but this usually involves more complex logic and switches.

Switching Methods?

Switching control can be done by a wide variety of methods as shown below. For equipment with extremely long life a manual method may be sufficient, but usually an automated method is desired. Most automatic methods also include the possibility of forcing a switch to either path and locking in a manually forced path. This is at least advisable for equipment maintenance.

Manual Methods:

- Equipment replacement or “swap-out” of failed gear with working gear.
- Manual switches that substitutes one set of gear for another.

Automated Methods:

- Automatic switching equipment that detects status between the two sets of equipment or paths and choses the good one by setting it to on-line. Most automated switching is based on either 1:1 redundancy where two pieces of equipment form a redundant pair that can be switched or “M:N” systems where one or more backup pieces of equipment can substitute for one of several on-line pieces.
- Software determination of good paths using functions such as alternate routing.

More information on M500 series modem 1:1 redundancy is included in the main modem document titled “PSM-500 Main” and is available on our web site at www.datumsystems.com.

The possible implementations of these methods for specific individual equipment items and chains of equipment is a huge subject by itself. We are only looking at a few, and those center around 1:1 redundancy for a SnIP equipped M500 series modem. This can be broken down into two specific cases: 1) using the SnIP as the data interface or 2) using one of the standard synchronous serial interfaces as the data interface and the SnIP for monitor and control.

2.0 Setup for Modem/SnIP Redundancy When Using Sync Data Interface.

In this configuration the SnIP is used for monitor and control functions using either Telnet/SSH, m500ctl, SNMP or the web gui. It does not carry customer traffic, which is all routed via the selected synchronous data interface.

2.1 Equipment Required

The following items are needed:

1. Two M500 series modems with SnIPs installed.
2. Modem software Version 1.19 or above.
3. SnIP kernel # 410 and Filesystem Version 0.6.12 or above (0.6.17 for SNMP control).
4. One Datum Systems Alternate Redundancy Communications Cable DRF08-084
5. One Datum Systems Modified “Y” redundancy cable DRF00-081-S
6. IF/RF Combiners/Splitters for the transmit and receive connections.

The “Y” data cable that is normally used for synchronous serial based redundancy contains the inter-modem communications link. It must be modified because the SnIPs require this same link for communications with the modem. The inter-modem link is moved to the alternate redundancy cable. The modification is removal of pins 32 and 34 in one male cable connection, thus breaking the inter-modem redundancy status link.

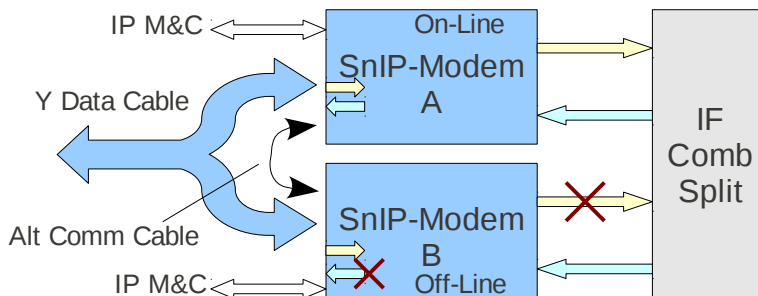


Figure 2-1 Sync Serial Redundancy with SnIP for M&C

2.2 Setup and Configuration

Setup of redundancy in this configuration with a standard data interface, but with a SnIP installed is almost identical to normal redundancy setup without the SnIP. The main difference is the two special cables used which allow both SnIP to modem communications and modem to modem inter-communications for redundancy. These are the special “Y” data cable and the Alternate Redundancy Communications cable.

2.2.1 Modem Setup

One of the two modems in the redundant pair is set up with all of the appropriate parameters. Later we can simply transfer this configuration to the backup modem with a simple command.

Several particular items should be set up to allow proper redundancy alarm detection for switching

1. Install the Modified “Y” Data Cable between the two modem's Data Interfaces at J3 in the redundant pair. This now presents a single DB37 connection as if a single modem was present. Install other adapters and cables as required.
2. Install the Alternate Redundancy Communications Cable between connectors J6 of the redundant pair.
3. Install the IF/RF cables as normal for redundancy. That is each should go to the station's splitter and combiner facilities.
4. Set the modem Unit Redundancy to “Enable”.
5. Set the modem Unit Redundancy Switch On to “Alarm A&B”. This allows selection of those alarms that will cause switching.
6. Set the Modulator and Demodulator Alarm Data Alarm to “None”. Otherwise if no data is present for approximately 5 seconds the unit will report an alarm.
7. Set the Interface Alarm Option to “None”. We are doing this to prevent a SnIP reboot from causing a redundancy switch, since it is not in the data path.
8. Set the Interface Mode to the desired interface type such as V.35 or RS-449

The DRF08-084 Alternate Redundancy Cable simply swaps pins 2 and 3 between the two modem's J6 Remote Control connectors and also includes the common on pin 5. Minimal wiring to accomplish this is shown below.

Minimal Redundancy Cable Wiring	
Male DB9 A	Male DB9 B
2	3
3	2
5	5

Once the other parameters such as IF frequencies, modulation, data rate, FEC parameters, etc are set the configuration can be transferred by going to the front panel Unit Redundancy display and pressing the “1” key which will transfer the full configuration except for the SnIP's IP address and Mask to the backup unit.

When fully configured transfer the parameters to the backup unit. Go to the Unit Redundancy

2.2.2 SnIP Setup

In this configuration the Data Interface is set to one of the available synchronous serial interfaces such as V.35 or RS-449, etc. The SnIP uses the modem polling routines to periodically tell the modem that it is alive (keep-alive) and gathers information on the modem status at the same time. That information includes the redundancy settings and status, therefore modem polling must be enabled via configwiz even though it is not the active data interface.

Operate the redundant pair as normal now. You will also have access to modem status and control via Telnet or SSH or SNMP or the web gui on the individual SnIP IP address. Forced switching from one modem to another is only possible from the on-line unit.

3.0 Setup for Modem/SnIP Redundancy With SnIP as Data Interface

When the SnIP is used as the data interface multiple additional factors come into play. For example in most cases it is desirable for the SnIP to present a common single IP address for data communications no matter which unit is currently on-line, but separate IP addresses must be maintained for individual monitor and control functions. Therefore we are currently recommending assignment of 3 IP addresses to a redundant modem/SnIP pair:

1. SnIP A IP Address – as set on the modem front panel or via configwiz for one of the redundant pair. This address is used for unique access to this SnIP/modem for monitor and control including SNMP and web gui.
2. SnIP B IP Address – as set on the modem front panel or via configwiz for the other of the redundant pair. This address is used for unique access to this SnIP/modem for monitor and control including SNMP and web gui.
3. Common Data IP Address – as set in the “/etc/config/red-config” file under “COMMON_DATA_IP”. This address is used by equipment connected to both SnIPs for data configuration. For example a router connected to the redundant pair would use this address as the gateway for networks located on the other side of the link. The SnIP will send an ARP message to this type equipment upon going on-line telling it to update its ARP table.

The number of possible configurations and requirements in this type of redundancy depend on other network factors out of control via either the modem or the SnIP. Consequently we have attempted to create a flexible set of controls that allow for customizing as necessary for any specific case. These consist of the standard modem polling routine running as a background daemon. Its purpose in redundancy is to signal a change in the redundancy status to an accessible Bash script named “/etc/red-switch” which controls the actions to be taken for each case. The red-switch script in turn gets configuration information from a configuration file named “/etc/config/red-config”. The script and red-config files are currently set up for the standard redundancy case as described here, but may require changes in the future to accommodate other network configurations.

3.1 Equipment Required

The following items are needed:

1. Two M500 series modems with SnIPs installed.
2. Modem software Version 1.19 or above.
3. SnIP kernel # 410 and Filesystem Version 0.6.12 or above (0.6.17 for SNMP control).
4. One Datum Systems Alternate Redundancy Communications Cable DRF08-084
5. IF/RF Combiners/Splitters for the transmit and receive connections.

The modem will automatically recognize that redundancy is enabled with a SnIP installed and move inter-modem status information to the alternate redundancy cable.

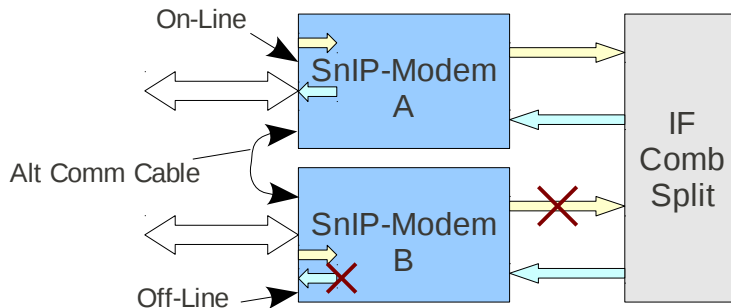


Figure 3-1 Redundant SnIP as Data Interface

3.2 Setup and Configuration

Setup of redundancy in this configuration with a SnIP installed and used as the Data Interface is very close to normal redundancy. The main difference is that no “Y” data cable is required, but

the Alternate Redundancy Communications cable is still needed for inter-modem redundancy status communications.

3.2.1 Modem Setup

One of the two modems in the redundant pair is set up with all of the appropriate parameters. Later we can simply transfer this configuration to the backup modem with a simple command. Several particular items should be set up to allow proper redundancy alarm detection for switching

1. Install the Alternate Redundancy Communications Cable between connectors J6 of the redundant pair.
2. Install the IF/RF cables as normal for redundancy. That is each should go to the station's splitter and combiner facilities.
3. Set the modem Unit Redundancy to "Enable".
4. Set the modem Unit Redundancy Switch On to "Alarm A&B". This allows selection of those alarms that will cause switching.
5. Set the Modulator and Demodulator Alarm Data Alarm to "None". Otherwise if no data is present for approximately 5 seconds the unit will report an alarm.
6. Set the Interface Alarm Option to "Alarm A&B". The modem is then aware of SnIP problems and can cause a redundancy switch if necessary.
7. Set the Interface Mode to Option 8, the Ethernet (SnIP) interface.

The DRF08-084 Alternate Redundancy Cable simply swaps pins 2 and 3 between the two modem's J6 Remote Control connectors and also includes the common on pin 5. Minimal wiring to accomplish this is shown below.

Minimal Redundancy Cable Wiring	
Male DB9 A	Male DB9 B
2	3
3	2
5	5

Once the other parameters such as IF frequencies, modulation, data rate, FEC parameters, etc are set the configuration can be transferred by going to the front panel Unit Redundancy display and pressing the "1" key which will transfer the full configuration except for the SnIP's IP address and Mask to the backup unit.

When fully configured transfer the modem parameters to the backup unit. Go to the Unit Redundancy setting and press "1".

3.2.2 SnIP Setup

The two SnIPs should be set up identically for the desired type of operation. In many cases this can be any available setting for bridge or router type service using static or dynamic routing as appropriate. Not however that the off-line unit is not able to communicate its common IP address to other units and therefore will not be able to build a dynamic routing table until it is actually on-line.

The SnIP uses its modem polling routines to periodically tell the modem that it is alive (keep-alive) and gathers information on the modem status at the same time. That information includes the redundancy settings and status, therefore modem polling must be enabled via configwiz for redundancy switching to occur.

When SnIP redundancy is used the red-config file must be edited to contain the proper information needed for switching. A sample configuration might contain the following values:

```
INT="eth0:1"
COMMON_IP="10.11.1.20"
NETMASK="255.255.255.0"
BROADCAST="10.11.1.255"
ROUTER_IP="10.11.1.1"
```

The values contained here must be the same in both SnIPs that are part of a redundant pair. The variables have the following meanings.

- **INT** is the virtual interface name and shares all values with the eth0 interface except the IP address and Mask. This should probably not be changed.
- **COMMON_IP** is the virtual IP address used for data communications. If a router ahead of the SnIP, this is the value that would be entered as a gateway or via for the networks on the other end of the link.
- **NETMASK** is for the COMMON_IP.
- **BROADCAST** is also related to the COMMON_IP.
- **ROUTER_IP** is the IP address of a device that the SnIP will send an ARP update message to upon being switched "on-line".

Editing the "red-config" file -

The red-config file is read by a script used in redundancy control. It is easily edited using the SnIP's built in **nano** editor, or **vi** if you are more familiar with its use. Make certain in editing the file that you only edit values between quotation marks and use no spaces on either side of the "=" signs. Comments are allowed as lines beginning with "#".

Use "**nano /etc/config/red-config**" to start editing the file. When you are finished making changes use "**ctrl o**" to write the file to memory and then "**ctrl x**" to exit the nano editor.

Operate the redundant pair as normal now. You will also have access to modem status and control via Telnet or SSH or SNMP or the web gui on the individual SnIP IP address. Forced switching from one modem to another is only possible from the on-line unit.

4.0 Redundancy Control from a SnIP

Both the command line m500ctl, SNMP and web GUI user interfaces provide information on redundancy status and the currently on-line units of a redundant pair. They are also capable of controlling the individual redundancy parameters used to enable redundancy and set the switch hold time plus the alarm set that will cause switching.

From the web Modem>>Unit Config SnIP web page it will show status in the "Redundancy Status" and control elements in the "Redundancy Control" block. This page can be accessed from all 3 of the available IP addresses, one for the on-line, off-line and common_ip addresses.

From a Telnet or SSH session logged into from any of these 3 addresses you can use the m500ctl command to get the same type information. Some examples are

- The "**m500ctl 0 ur ?**" command will return the status of redundancy parameters and if the unit is on or off-line.
- The "**m500ctl 0 ure 0, 1 or 2**" command can be used to disable modem redundancy (0), set it to 1:1 internal redundancy mode (1), or external redundancy switch mode (2).
- The "**m500ctl 0 urs 1**" command can be used to send this modems configuration (if on-line) to the off-line backup unit.
- The "**m500ctl 0 urh 7**" command can be used to control the "hold" time that the modem will wait before switching to the off-line backup unit.
- The "**m500ctl 0 urc 0 or 1 or 2 or 3**" command is used to set which alarm conditions will result in switching. 0 = Any alarm, 1 = alarm A, 2 = alarm B and 3 = alarm A or B.
- The "**m500ctl -v 0 uss ?**" command will return the status of redundancy and if the unit is on or off-line.

SnIP Redundancy Guide

- The “**m500ctl 0 uss 1**” command can be used to force this unit to switch off-line (if currently on-line) and place the backup unit to on-line.

From SNMP the available commands are:

- unitRdnEnable.0 = INTEGER: enableInt(1)
- unitRdnOnLine.0 = INTEGER: OnLine(1)
- unitRdnSwitchOn.0 = INTEGER: AnyAlarm(0)
- unitRdnHoldDelay.0 = INTEGER: 6 tenths of seconds
- unitRdnSendConfig.0 = INTEGER: idle(0)
- unitRdnSwitchToBackup.0 = INTEGER: idle(0)

MAB

End of Document.