



DIRECT-IP Interface

bintec-Dm 811-I

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I Related Documents

bintec-Dm 732-I Dial Profile

bintec-Dm 772-I Common Configuration Interfaces

Chapter 1 Direct-IP Interface

1.1 Description

Until now, to establish a connection through a cellular interface, we used a PPP interface over a serial interface (cellularX/1), inside which the data were encapsulated. This method is also known as Dial-Up networking (DUN).

This mechanism allows you to obtain the address assigned to the connection and also provides a way to encapsulate data. Using this mechanism implies very high data processing requirements since, depending on the negotiated values (ACCM), you have to apply a certain transparency to each piece of data sent or received.

As technology has evolved, connection speeds in these interfaces have increased (from the initial 64 Kbps in GPRS interfaces to current values of 21 Mbps in HSPA+ interfaces, 42 Mbps in HSPA-DC and even 100 Mbps in LTE interfaces). As a result, and given the amount of processing that has to be done, this encapsulation method is no longer adequate.

Manufacturers of 3G/4G modules offer the possibility of using an alternative mechanism called “Network Driver Interface Specification” (NDIS). Through this mechanism, connection to the interface is directly established using an Ethernet network interface. All data transmission and reception is then carried out through the direct encapsulation of IP datagrams in level 2 frames (Ethernet encapsulation). This method, known as **DIRECT-IP**, saves the user from having to execute a process for each character sent.

This mechanism offers a method of transmission that downloads to the CPU, both for the cellular module as well as the router, and increases the effective transmission and reception speeds of a PPP interface.

Routers equipped with 3G (HSPA+) and 4G (LTE) modules support this alternative mechanism for greater speed.

Chapter 2 Configuring the DIRECT-IP Interface

2.1 Creating the DIRECT-IP interface

To create DIRECT-IP interfaces, enter the following command from the general configuration menu:

add device direct-ip <direct-ip interface identifier>

```
Config>add device direct-ip 1
Config>
```

You also need to configure the cellular interface's data interface as a network interface rather than a serial interface.

```
Config>set data-link nic cellular1/1
Config>
```

You can check that the interface has been correctly created and added by listing the interfaces available on the device:

```
Config>list dev
Interface      Connector      Type of interface
ethernet0/0    EXP/SWITCH    Marvell Fast Ethernet Switch
x25-node       ---           Router->Node
cellular1/0    SLOT1         AT COM
cellular1/1    SLOT1         USBNIC Interface
cellular1/2    SLOT1         USBNIC Interface
wlan2/0        SLOT2         Wireless LAN Interface
direct-ip1     ---           Generic DirectIP encapsulation
Config>
```

2.2 Clearing the DIRECT-IP interface

To remove an existing DIRECT-IP interface, use the following command from the general configuration menu:

no device <direct-ip interface>

Syntax:

```
Config>no device <interface_name>
```

- *<interface_name>* is the name of the interface to delete (direct-ip X, X=Interface identifier).

Example:

```
*config
Config>no device direct-ip1
Config>
```

You can return to serial mode through the cellular module's data interface.

```
Config>set data-link at cellular1/1
Config>
```

You can check that the newly created interface has been properly deleted by listing the interfaces available on the device:

```
Config>list devices
Interface      Connector      Type of interface
ethernet0/0    EXP/SWITCH    Marvell Fast Ethernet Switch
x25-node       ---           Router->Node
cellular1/0    SLOT1         AT COM
cellular1/1    SLOT1         USBNIC Interface
cellular1/2    SLOT1         USBNIC Interface
wlan2/0        SLOT2         Wireless LAN Interface
direct-ip1     ---           Generic DirectIP encapsulation
Config>no device direct-ip1
Config>set data-link at cellular1/1
Config>list devices
```

```

Interface      Connector      Type of interface
ethernet0/0    EXP/SWITCH     Marvell Fast Ethernet Switch
x25-node       ---            Router->Node
cellular1/0    SLOT1          AT COM
cellular1/1    SLOT1          AT COM
cellular1/2    SLOT1          USBNIC Interface
wlan2/0        SLOT2          Wireless LAN Interface
Config>

```

2.3 Configuring the DIRECT-IP interface

To access the DIRECT-IP interface configuration menu, you need to enter **<DIRECT_IP interface>** in the general configuration menu. For example, if you want to access the **direct-ip1** interface, enter:

```

Config>network direct-ip1
-- Generic Direct IP Encapsulation User Configuration --
direct-ip1 config>

```

All interfaces available on the device share some common commands. These are detailed in manual *bintec-Dm 772-I "Common Configuration Interfaces"*.

The specific commands for the DIRECT-IP interface configuration menu are as follows:

```

direct-ipX config>?
  base-interface  Enter the Base Interface configuration menu
  direct-ip       Takes you to the direct ip encapsulation configuration
                  prompt
  exit
pppX config>

```

Command	Function
? (HELP)	Displays the available commands or their options.
BASE-INTERFACE	Accesses the configuration menu for the base interfaces associated with the DIRECT-IP interface.
DIRECT-IP	Accesses the menu where you can configure the DIRECT-IP parameters.
EXIT	Exits the DIRECT-IP interface configuration.

The configuration for the DIRECT-IP interface mainly consists of the following tasks:

- Specifying the base interfaces where you will establish the DIRECT-IP.
- Configuring the DIRECT-IP's *own* parameters (address, authentication, etc.)

2.3.1 Configuring the base interfaces for the DIRECT-IP interface

To access the configuration for the base interfaces, enter the **base-interface** command from the DIRECT-IP interface configuration menu.

```

Config>network direct-ipX
-- Generic Direct IP Encapsulation User Configuration -
direct-ipX config>base-interface
-- Base Interface Configuration --
direct-ipX Base IFC config>

```

The following commands are available in this configuration menu:

```

direct-ipX Base IFC config>?
  base-interface  Specify a base interface
  list            List current configuration
  no              Negates a command or sets its defaults
  exit
pppX Base IFC config>

```

Command	Function
BASE-INTERFACE	Allows you to specify the base interfaces over which the DIRECT-IP link is established.
LIST	Displays the base interfaces that are linked to the DIRECT-IP interface.

2.3.1.1 BASE-INTERFACE

This command allows you to associate a given base interface and some DIAL profile (call) parameters with the DIRECT-IP interface.

For further information on how to configure the Call Profile, please see manual *bintec-Dm 732-I "Dial Profile"*.

The **base-interface** command syntax for the most general case is as follows:

```
direct-ipX Base IFC config>base-interface <interface> <options>
  link          Add this interface to the dial group
  profile       Dial profile to use with this interface
```

<interface> Name of the base interface.
link Adds the base interface to the DIRECT-IP
profile Call profile that the base interface uses.



Important

The only type of base interface currently supported is the NIC (cellular1/1 interface configured in NIC mode or cellular1/2 configured in NIC mode).

Example:

Assuming that the cellular1/1 interface is configured as a NIC interface:

```
direct-ip1 Base IFC config>base-interface cellular1/1 link
direct-ip1 Base IFC config>base-interface cellular1/1 profile HSPA
direct-ip1 Base IFC config>list
  Base Interface      Profile Name      Base Circuit Id  Number of circuits
  -----
  cellular1/1        nic/0            HSPA              1                  1
direct-ip1 Base IFC config>
```

To delete a base interface of this type:

```
direct-ipX Base IFC config>no base-interface <interface>
```



Important

You must enter a valid DIAL profile or the base interface cannot establish the link as it doesn't have the call parameters.

Command history:

Release	Modification
11.01.00	As of version 11.01.00, it is not possible to associate a DIAL profile that doesn't exist. The profile must be created first.

2.3.1.2 LIST

This command displays the base interfaces that are linked to the DIRECT-IP interface.

Example:

```
direct-ip1 Base IFC config>list
  Base Interface      Profile Name      Base Circuit Id  Number of circuits
  -----
  cellular1/1        nic/0            HSPA              1                  1
direct-ip1 Base IFC config>
```

Base Interface Base interface associated to the DIRECT-IP interface.
Profile Name **Name** (identifier) for the DIAL profile the base interface is going to use (this only applies to switch interfaces).
Base Circuit Id Circuit identifier.
Number of circuits This is the number of base interface circuits to be used.

2.3.2 Configuring the DIRECT-IP parameters for the DIRECT-IP interface

To establish the specific DIRECT-IP parameters, you need to access the DIRECT-IP parameter menu through the **direct-ip** command found in the DIRECT-IP interface configuration menu.

```
Config>network direct-ipX
-- Generic Direct IP Encapsulation User Configuration --
direct-ipX config>dir
direct-ipX config>direct-ip
-- Direct IP encapsulator user configuration --
direct-ipX DIP config>
```

The PPP parameter configuration menu offers the following commands:

```
direct-ipX DIP config>?
  address      Address negotiation options
  authentication Set authentication parameters
  dns          Set DNS options
  list         Display Interface Configuration
  modem-mode   Behave like a modem assigning host
               subnet mask and 0.0.0.0 gateway
  no          Negate a command or set its defaults
  router       Set default router options
  exit
pppX PPP config>
```

Command	Function
? (HELP)	Displays the available commands or their options.
ADDRESS	Configures the parameters to handle the DIP link address.
AUTHENTICATION	Configures the DIP link authentication parameters.
DNS	Configures options relating to DNS.
MODEM-MODE	Configures the router to behave as a modem, assigning host subnet mask and 0.0.0.0 as default gateway address, via DHCP.
NO	Configures the default value for a given option, disables parameters or deletes previously added configuration elements.
ROUTER	Configures options to manage the default route.
EXIT	Exits the DIP parameter configuration.

2.3.2.1 ADDRESS

Configures the IP address to be used on the local end.

Syntax:

```
direct-ip1 DIP config>address ?
  fixed      Fixed local IP
  assigned   Assigned local IP
  dhcp       Dhcp local IP
```

- *fixed*, if the IP address to be used on the local end should be the one the user configured for the DIRECT-IP interface.
- *assigned*, if you want the remote end to assign the IP address for the local end.
- *dhcp*, if you obtain the IP address for the local end through DHCP consulting. The default is *assigned*.

Example:

```
direct-ip1 DIP config>address dhcp
```

2.3.2.2 AUTHENTICATION

This command allows you to configure the authentication options for the DIP link.

The options available in this command are as follows:

```
direct-ipX DIP config>authentication ?
  chap      CHAP authentication
```

```

none          Disable authentication
pap          PAP authentication
sent-user    Set outbound user to authenticate itself to a remote peer
direct-ipX DIP config>

```

- *chap*, the protocol that needs to be used in order to authenticate the CHAP link (*Challenge Authentication Protocol*).
- *pap*, the protocol that needs to be used in order to authenticate the PAP link (*Password Authentication Protocol*).
- *none*, when a protocol is not used to authenticate the link.
- *sent-user*, to define the user/password that the router uses to identify itself when the remote end requests authentication.

Example:

```

direct-ip1 DIP config>authentication pap
direct-ip1 DIP config>authentication sent-user USER password PASSWORD

```

2.3.2.3 DNS

This command allows you to configure the options in the primary and secondary DNS servers' negotiation.

- *learn*, the addresses for the DNS servers gathered in the interface are communicated to the DNS process in order to be used. This is the default option.
- *ignore*, the addresses for the DNS servers gathered in the interface are ignored and not used.

Example:

```

direct-ip1 DIP config>dns ignore

```

2.3.2.4 LIST

Use this command to display the configured options.

Example:

```

direct-ip1 DIP config>list
AUTHENTICATION:
  Authentication pap required
  Sent user (local): USER
ADDRESSING:
  Local IP address dhcp learned
DNS:
  DNS ignore
MTU:
  Size 1500
direct-ip1 DIP config>

```

2.3.2.5 MODEM-MODE

This command helps you configure the router to behave like a modem. If you want to use the router as a modem, configure a bridge between the Direct-ip and Ethernet interfaces and use this command to enable *modem-mode*. The IP address assigned by DHCP will then have a host subnet mask (255.255.255.255) and the IP address 0.0.0.0 as the default gateway.

Example:

```

direct-ip1 DIP config>modem-mode

```

Command history:

Release	Modification
10.09.25	This command was introduced as of version 10.09.25.
11.00.04	This command was introduced as of version 11.00.04.
11.00.00.02.08	This command was introduced as of version 11.00.00.02.08.

2.3.2.6 ROUTER

This command allows you to configure the options in the default route negotiation obtained through DHCP.

- *learn*, the default address obtained through DHCP in the interface is communicated to the IP protocol for installation purposes. Since the interface is point-to-point, the route installed is the DIRECT-IP interface itself. This is the default.
- *ignore*, the default router address obtained via DHCP in the interface is ignored and not used.

Example:

```
direct-ip1 DIP config>router ignore
```

2.4 Configuring the CELLULAR (NIC) interface

The cellular data interface configured in NIC mode is different from the one configured in AT mode.

```
*config
Config>network cellular1/1
-- Direct IP. Configuration --
cellular1/1 NIC config>
```

The options in this menu are as follows:

```
cellular1/1 NIC config>?
  input-buffers    Number of rx buffers
  no               Negate a command or set its defaults
  exit
cellular1/1 config>
```

Command	Function
? (HELP)	Lists the commands or their options.
INPUT-BUFFERS	Configures the number of receive buffers.
NO	Establishes the default values.
EXIT	Returns to the configuration menu.

2.4.1 INPUT-BUFFERS

Sets the number of receive buffers used by the interface. The default is 128.

Syntax:

```
cellular1/1 NIC config>input-buffers ?
<128..512>    Value in the specified range
```

Example:

```
cellular1/1 NIC config>input-buffers 256
```

Chapter 3 Monitoring the DIRECT-IP Interface

3.1 Monitoring the DIRECT-IP interface

This section summarizes and explains the DIRECT-IP interface monitoring commands.

To access the DIRECT_IP interface monitoring menu, enter the **NETWORK <DIRECT-IP Interface>** command from the general monitoring menu:

```
*monitor
Console Operator
+network direct-ipX
Generic Direct IP Console
direct-ipX+
```

Command	Function
? (HELP)	Lists the commands or their options.
BASE-INTERFACE	Accesses the monitoring menu for the base interfaces associated with the DIRECT-IP interface.
DIRECT-IP	Accesses the monitoring menu for the DIRECT-IP parameters.
EXIT	Exits the DIRECT-IP interface monitoring.

3.2 Monitoring the DIRECT-IP interface base interfaces

To access the menu where you can monitor the DIRECT-IP interface base interfaces, enter the **BASE-INTERFACE** command from the DIRECT-IP interface's monitoring menu.

```
direct-ipX+base-interface
-- Base Interface Console --
direct-ipX Base IFC+
```

The options available in this menu are as follows:

```
direct-ipX Base IFC+?
  list    Display base interface parameters
  exit
```

3.2.1 LIST

Displays the base interface parameters associated with a given DIRECT-IP interface. If more than one base interface has been associated with the DIRECT-IP interface, the value of these parameters is shown for each link.

Syntax:

```
direct-ipX Base IFC+list
```

Example:

```
direct-ip1 Base IFC+list
Destination address  :
Local address       :
Base interface      : cellular1/1
Circuit id request  : 1
Dial circuit status : CLOSED
Circuit id assigned : 1
direct-ip1 Base IFC+
```

<i>Destination address</i>	Remote address used.
<i>Local address</i>	Displays the local address used.
<i>Base interface</i>	Base interface.
<i>Circuit id request</i>	Identifier of the circuit requested in the configuration.
<i>Dial circuit status</i>	Current DIAL circuit status (base interface status).
<i>Circuit id assigned</i>	Identifier for the assigned circuit.

3.2.2 EXIT

This command allows you to exit DIRECT-IP base interface monitoring and return to the DIRECT-IP general monitoring menu.

Syntax:

```
direct-ipX Base IFC+exit
```

Example:

```
direct-ipX Base IFC+exit
direct-ipX +
```

3.3 DIRECT-IP monitoring for the DIRECT-IP interface

To access the monitoring menu for the DIRECT-IP parameters, enter the **direct-ip** command from the DIRECT-IP interface monitoring menu:

```
direct-ipX+direct-ip
-- Direct IP Encapsulator Console --
direct-ipX DIP+
```

The following commands are found in the DIRECT-IP monitoring menu:

```
direct-ip1 DIP+?
  bitrate      Bit rate monitor
  list         List interface parameters
  exit
direct-ip1 DIP+
```

3.3.1 BITRATE

Displays the instant speed in the interface.

Each line change indicates a maximum in the direction detected with respect to the values already displayed .

Syntax:

```
direct-ipX DIP+bitrate
```

Example:

```
direct-ip1 DIP+bitrate
          Interface direct-ip1
Trx rate (bps/pps)  Rcv rate (bps/pps)
-----
   7376/   13      8032/    6
  29272/   16     61552/   11
  48216/   17     29816/   11
  60128/   33     373968/   46
  38936/   32     404984/   43
  16544/   37     446816/   46
  79104/   36     484680/   56
 108952/   20      75672/   18
 130416/   31      78600/   24
 152472/  199    2461416/  292
 125024/  220    5552288/  576
 128656/  269    6520656/  672
 161704/  314    6049456/  629
 290944/  532    6224672/  680
 339152/  589    5429552/  591
 340952/  355    3639448/  402
 378864/   42      22192/   26
1210216/  134    108096/   66
1698856/  176      83744/   92
1994824/  205      84872/  122
2009024/  210    102264/  116
2196245/  227      81495/  114
```

2425736/ 250 87384/ 126

3.3.2 LIST

Displays monitoring information relative to the DIRECT_IP interface.

Syntax:

```
direct-ipX DIP+list
```

Example:

```
direct-ip1 DIP+list
base interface state is up
protocol state is up
out frames: 6893
      IP: 6893
      TCP: 6754
out reject: 0
in frames: 7599
in reject: 0
direct-ip1 DIP+
```

<i>Base interface state</i>	Base interface state (up/down).
<i>Protocol state</i>	Direct-ip interface state (up/down).
<i>Out Frames</i>	Number of frames sent.
<i>IP</i>	Frames sent from the IP protocol.
<i>TCP</i>	Frames sent from the TCP protocol.
<i>Out Reject</i>	Frames rejected in transmission.
<i>In Frames</i>	Number of frames received.
<i>In Reject</i>	Frames rejected at reception.

3.3.3 EXIT

This command allows you to stop monitoring DIRECT-IP parameters and return to the DIRECT-IP general monitoring menu.

Syntax:

```
direct-ipX DIP+exit
```

Example:

```
direct-ip1 DIP+exit
direct-ip1+
```

3.4 Monitoring the CELLULAR (NIC) interface

The cellular data interface configured in NIC mode has a different monitoring menu to the one configured in AT mode.

```
*monitor
Console Operator
+network cellular1/1
-- Direct IP Monitor --
cellular1/1 NIC+
```

The options in this menu are as follows:

```
cellular1/1 NIC+?
 bdescs      List descriptors
 bitrate     Bit rate monitor
 clear       Clear interface parameters
 dump        Dump internal stats
 list        List interface parameters
 statistics  Interface statistics
 exit
```

```
cellular1/1 NIC+
```

Command	Function
? (HELP)	Lists the commands or their options.
BDESC	Information on the buffers and the descriptions used.
BITRATE	Information on the interface's instant throughput.
CLEAR	Clears the interface statistics.
LIST	Lists the interface parameters.
STATISTICS	Information on the interface statistics.
EXIT	Exits DIRECT-IP interface monitoring.

3.4.1 BDESC

Displays information on the buffers and the descriptions used by the interface.

Syntax:

```
cellular1/1 NIC+bdesc
```

Example:

```
cellular1/1 NIC+bdesc
Mnemonic          = cellular1/1
Intf ID           = 1
Memory            = 0x0158f000
Max Tx completions per poll = 1
Max Rx processed per poll  = 2
TX QUEUE
  Head            = 0x0158f000
  Tail            = 0x0158f7f0
  To check        = 0x0158f320
  To use          = 0x0158f320
  TXBD location  iob          data          length  status
  000 0158f000   00000000    00000000    0000    0x00000000
  001 0158f010   00000000    00000000    0000    0x00000000
  002 0158f020   00000000    00000000    0000    0x00000000
  003 0158f030   00000000    00000000    0000    0x00000000
  004 0158f040   00000000    00000000    0000    0x00000000
  005 0158f050   00000000    00000000    0000    0x00000000
  006 0158f060   00000000    00000000    0000    0x00000000
  007 0158f070   00000000    00000000    0000    0x00000000

  121 0158f790   00000000    00000000    0000    0x00000000
  122 0158f7a0   00000000    00000000    0000    0x00000000
  123 0158f7b0   00000000    00000000    0000    0x00000000
  124 0158f7c0   00000000    00000000    0000    0x00000000
  125 0158f7d0   00000000    00000000    0000    0x00000000
  126 0158f7e0   00000000    00000000    0000    0x00000000
  127 0158f7f0   00000000    00000000    0000    0x00000000
RX QUEUE
  Head            = 0x0158f800
  Tail            = 0x0158fff0
  To check        = 0x0158fb50
  To use          = 0x0158fb50
  RXBD location  iob          data          length  status
  000 0158f800   013ff000    03df11da     0000    0x00000100
  001 0158f810   013ff2b0    03df07ea     0000    0x00000100
  002 0158f820   013ff560    03defdfa     0000    0x00000100
  003 0158f830   013ff810    03def40a     0000    0x00000100
  004 0158f840   013ffac0    03deea1a     0000    0x00000100
  005 0158f850   013ffd70    03dee02a     0000    0x00000100
  006 0158f860   01400020    03ded63a     0000    0x00000100
  007 0158f870   014002d0    03decc4a     0000    0x00000100
  121 0158ff90   01413530    03da5f6a     0000    0x00000100
  122 0158ffa0   014137e0    03da557a     0000    0x00000100
  123 0158ffb0   01413a90    03da4b8a     0000    0x00000100
```



```

124 0158ffc0      01413d40      03da419a      0000      0x00000100
125 0158ffd0      01413ff0      03da37aa      0000      0x00000100
126 0158ffe0      014142a0      03da2dba      0000      0x00000100
127 0158fff0      01414550      03da23ca      0000      0x00000500
cellular1/1 NIC+

```

3.4.2 BITRATE

Displays the instant speed in the interface.

Each line change indicates a maximum in the direction detected with respect to the values displayed.

Syntax:

```
cellular1/1 NIC+bitrate
```

Example:

```

cellular1/1 NIC+bitrate
          Interface cellular1/1
Trx rate (bps/pps)  Rcv rate (bps/pps)
-----
      624/      1      624/      1
    23944/     19    11952/     9
    16632/     11    58368/     7
    24880/     12     7880/     8
    54976/     21    90368/    17
   113056/     81   1103944/   114
   132992/     76   583536/    75
    36016/      7    49368/    11
cellular1/1 NIC+

```

3.4.3 CLEAR

Clears interface statistics information.

Syntax:

```

cellular1/1 NIC+clear ?
  interface-stats      Interface statistics
  layer3-stats         Layer 3 interface statistics

```

3.4.4 LIST

Displays information associated with the interface.

Syntax:

```
cellular1/1 NIC+list
```

Example:

```

cellular1/1 NIC+list
  Drop by ping failed      = 0
  Drop by tracert failed   = 0
  Drop by traffic failed   = 0
  Dialers registered       = H1
  Current dialer registered = H1
  State                    = (8) CONNECT
  Call request              = 1
  Access Point Name        = ac.vodafone.es
  Total connection time    = 8 minutes 6 seconds
  Current connection time  = 8 minutes 6 seconds
  Time to establish connection = 16 sec
  Hardware Interface address = 0215E0EC0100
  Low layer link state      = Up
  IP Interface address      = 77.209.5.136
  DNS primary server address = 212.166.210.82
  DNS secondary server address = 212.73.32.67

```

```
cellular1/1 NIC+
```

<i>Drop by ping failed</i>	Disconnections detected in the interface due to loss of ping in the access control.
<i>Drop by tracer failed</i>	Disconnections detected in the interface due to loss of trace route in the access control.
<i>Drop by traffic failed</i>	Disconnections detected in the interface due to loss of data (traffic) in the access control.
<i>Dialers registered</i>	Dialers registered in the interface.
<i>Current dialer registered</i>	Dialers registered in the interface at a given time.
<i>State</i>	State of the interface states machine.
<i>Call request</i>	Connections that have established in the interface.
<i>Access Point Name</i>	Access point used in the connection.
<i>Total connection time</i>	Total time for all the connections executed by the interface.
<i>Current connection time</i>	The time the current connection has been established for.
<i>Hardware Interface address</i>	Address used to encapsulate the frames towards the cellular module.
<i>Low layer link state</i>	State of the data connection in the cellular module. Internal information.
<i>IP interface address</i>	IP address assigned to the connection.
<i>DNS primary server address</i>	Primary DNS server assigned DNS address.
<i>DNS secondary server address</i>	Secondary DNS server assigned DNS address.

3.4.5 STATISTICS

Displays different interface statistics.

Syntax:

```
cellular1/0 AT+statistics ?
layer3-stats Layer 3 interface statistics
```

3.4.5.1 STATISTICS LAYER3-STATS

Displays the layer 3 interface statistics regarding the packets and bytes exchanged by the radio interface. Please note that the interface statistics displayed through the **STATISTICS** command in process 3 (*monitor*) refer to all the packets and bytes exchanged with the module, and they include, in addition to the layer 3 statistics, the statistics linked to the AT commands used to control the module and those linked to DIRECT-IP encapsulation.

The throughput values measured during the last second, the last minute and the last 5 minutes are also displayed.

Syntax:

```
cellular1/0 AT+statistics layer3-stats
```

Example:

```
cellular1/1 NIC+statistics layer3-stats
Total
Rx pkts:          443   Tx pkts:          422
Rx bytes:        312577 Tx bytes:        127216
Throughput (bps)
Last sec  Rx:         0   Tx:         0
Last 1 min Rx:       41192 Tx:       16435
Last 5 min Rx:       8260  Tx:       3314
cellular1/0 AT+
```

Total:

Rx/Tx pkts: Packets transmitted / received by the interface.

Rx/Tx bytes: Bytes transmitted / received by the interface.

Throughput:

Last sec Rx/Tx: Performance measured during the last second.

Last 1 min Rx/Tx: Performance measured during the last minute.

Last 5 min Rx/Tx: Performance measured during the last five minutes.

Chapter 4 DIRECT-IP Interface Configuration Examples

4.1 DIRECT-IP interface over the cellular interface

4.1.1 Description

In this example, we are going to configure a DIRECT-IP interface over the cellular interface network interface. The DIRECT-IP interface is configured so that it obtains its assigned IP address through DHCP.

4.1.2 Configuration

```
*config
Config>set data-link nic cellular1/1
Config>add device direct-ip 1
Config>
```

The next step is to indicate how to obtain the address. To do this, you need to access the configuration menu and execute the **ip address** command indicating the “*dhcp-negotiated*” option.

```
Config>network direct-ip1
-- Generic Direct IP Console --
pppl config>ip address dhcp-negotiated
pppl config>exit
Config>
```

The following step is to create the connection profile.

```
Config>global dial
-- Dial Profiles Configuration --
Dial Profiles config> profile HSPA default
Dial Profiles config> profile HSPA dialout
Dial Profiles config> profile HSPA 3gpp-apn internet
Dial Profiles config> exit
-- Generic PPP User Configuration --
direct-ip1 config>base-interface
Config>
```

Next, you have to specify that the DIRECT-IP interface you've created is going to be mounted over the “cellular1/1” cellular interface network interface. To do this, you first need to access the configuration menu for the base interfaces associated with the direct-ip1 interface. Once there, execute the **base-interface** command indicating the base interface and the option to associate said interface with the DIRECT-IP. Likewise, you need to indicate the connection profile that must be used.

```
Config>network direct-ip1
-- Generic PPP User Configuration --
direct-ip1 config>base-interface
-- Base Interface Configuration --
direct-ip1 Base IFC config>base-interface cellular1/1 link
direct-ip1 Base IFC config>base-interface cellular1/1 profile HSPA
direct-ip1 Base IFC config>exit
direct-ip1 config>exit
Config>
```

Subsequently, carry out the configuration for the aforementioned DIRECT-IP parameters, address mode, authentication used and the user/password for this.

```
Config>net direct-ip1
-- Generic Direct IP Encapsulation User Configuration --
direct-ip1 config>direct-ip
-- Direct IP encapsulator user configuration --
direct-ip1 DIP config>address dhcp
direct-ip1 DIP config>authentication pap
direct-ip1 DIP config>authentication user-sent USER password PASSWORD
direct-ip1 DIP config>exit
direct-ip1 config>exit
Config>
```

Once you have executed all of the configuration steps, simply save the configuration and restart the device.

```
Config>save
Save configuration (Yes/No)? yes
Building configuration as text... OK
Writing configuration... OK on Flash
Config>
                                     pulsar <ctrl-p>
*restart
Are you sure to restart the system(Yes/No)? yes
  Done
Restarting. Please wait .....
```

The complete configuration for this example is as follows:

```
; Showing Menu and Submenus Configuration for access-level 15 ...
; H1 Auto. IPSec SNA VoIP T+ Router 20 12 Version 10.9.3-MR
log-command-errors
no configuration
set inactivity-timer disabled
add device direct-ip 1
set data-link at cellular1/0
set data-link nic cellular1/1
set data-link nic cellular1/2
feature afs
  alg ftp port 21
;
  enable
exit
;
feature access-lists
; -- Access Lists user configuration --
  access-list 10
    entry 1 default
    entry 1 permit
    entry 1 source address 192.168.212.0 255.255.254.0
;
  exit
;
exit
;
global-profiles dial
; -- Dial Profiles Configuration --
  profile HSPA default
  profile HSPA dialout
  profile HSPA 3gpp-apn internet
;
exit
;
network ethernet0/0
; -- Ethernet Interface User Configuration --
  ip address 192.168.213.150 255.255.254.0
;
exit
;
network cellular1/0
; -- Interface AT. Configuration --
  coverage-timer 10
;
  no register-denied-reset
;
  sim-select internal-socket-2
  record-changes cell enable
  record-changes cell samples 200
  record-changes enable
  record-changes registration enable
  record-changes plmn enable
  record-changes technology enable
```

```

record-changes technology samples 200
record-changes coverage enable
record-changes coverage samples 200
record-changes call-state enable
record-changes sim enable
network mode automatic
network domain cs+ps
exit
;
;
network direct-ip1
; -- Generic Direct IP Encapsulation User Configuration --
ip address dhcp-negotiated
;
ip mtu 1300
ip tcp adjust-mss 1200
base-interface
; -- Base Interface Configuration --
base-interface cellular1/1 link
base-interface cellular1/1 profile HSPA
;
exit
;
direct-ip
; -- Direct IP encapsulator user configuration --
address dhcp
authentication sent-user USER password PASSWORD
exit
;
exit
;
event
; -- ELS Config --
enable trace subsystem AT ALL
;
enable filter
filter 1 default
filter 1 text "UMTS"
filter 1 action green
filter 2 default
filter 2 text "HS"
filter 2 action magenta
filter 3 default
filter 3 text "GPRS"
filter 3 action red
filter 4 default
filter 4 text "RX level (dBm):"
filter 4 action yellow
exit
;
;
protocol ip
; -- Internet protocol user configuration --
route 0.0.0.0 0.0.0.0 direct-ip1
;
classless
no icmp-redirects
nat
rule 1 out direct-ip1 list 10 dynamic overload
rule 1 translation source interface direct-ip1
;
exit
;
exit
;
;

```

```
feature dns
; -- DNS resolver user configuration --
    server 8.8.8.8
    exit
;
    dump-command-errors
    end
; --- end ---
```