



Figure 149: Event Log tab data, example

26.4.3 Messages that Flag Abnormal Events

The messages listed in [Table 67](#) flag abnormal events and, case by case, may signal the need for corrective action or technical support. See [Troubleshooting](#) on Page 465.

Table 67: Event Log messages for abnormal events

Event Message	Meaning
Expected LUID = 6 Actual LUID = 7	Something is interfering with the control messaging of the module. Also ensure that you are using shielded cables to minimize interference. Consider trying different frequency options to eliminate or reduce interference.
FatalError()	The event recorded on the line immediately beneath this message triggered the Fatal Error().
Loss of GPS Sync Pulse	Module has lost GPS sync signal.
Machine Check Exception	This is a symptom of a possible hardware failure. If this is a recurring message, begin the RMA process for the module.
RcvFrmNum = 0x00066d ExpFrmNum = 0x000799	Something is interfering with the control messaging of the module. Also ensure that you are using shielded cables to minimize interference. Consider trying different frequency options to eliminate or reduce interference.
System Reset Exception -- External Hard Reset	The unit lost power or was power cycled.
System Reset Exception -- External Hard Reset WatchDog	The event recorded on the preceding line triggered this WatchDog message.

26.4.4 Messages that Flag Normal Events

The messages listed in [Table 68](#) record normal events and typically *do not* signal a need for any corrective action or technical support.

Table 68: Event Log messages for normal events

Event Message	Meaning
Acquired GPS Sync Pulse.	Module has acquired GPS sync signal.
FPGA Features	Type of encryption.
FPGA Version	FPGA (JBC) version in the module.
GPS Date/Time Set	Module is now on GPS time.
PowerOn reset from Telnet command line	Reset command was issued from a <code>telnet</code> session.
Reboot from Webpage	Module was rebooted from management interface.
Software Boot Version	Boot version in the module.
Software Version	Canopy release version and authentication method for the unit.
System Log Cleared	Event log was manually cleared.

26.5 VIEWING THE NETWORK INTERFACE TAB (ALL)

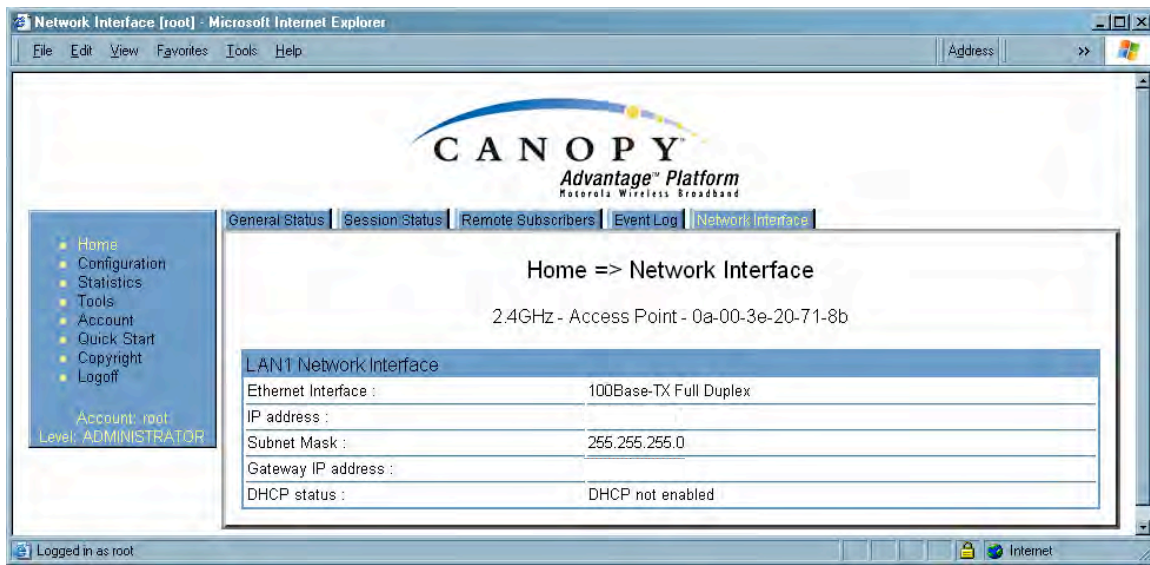


Figure 150: Network Interface tab of AP, example

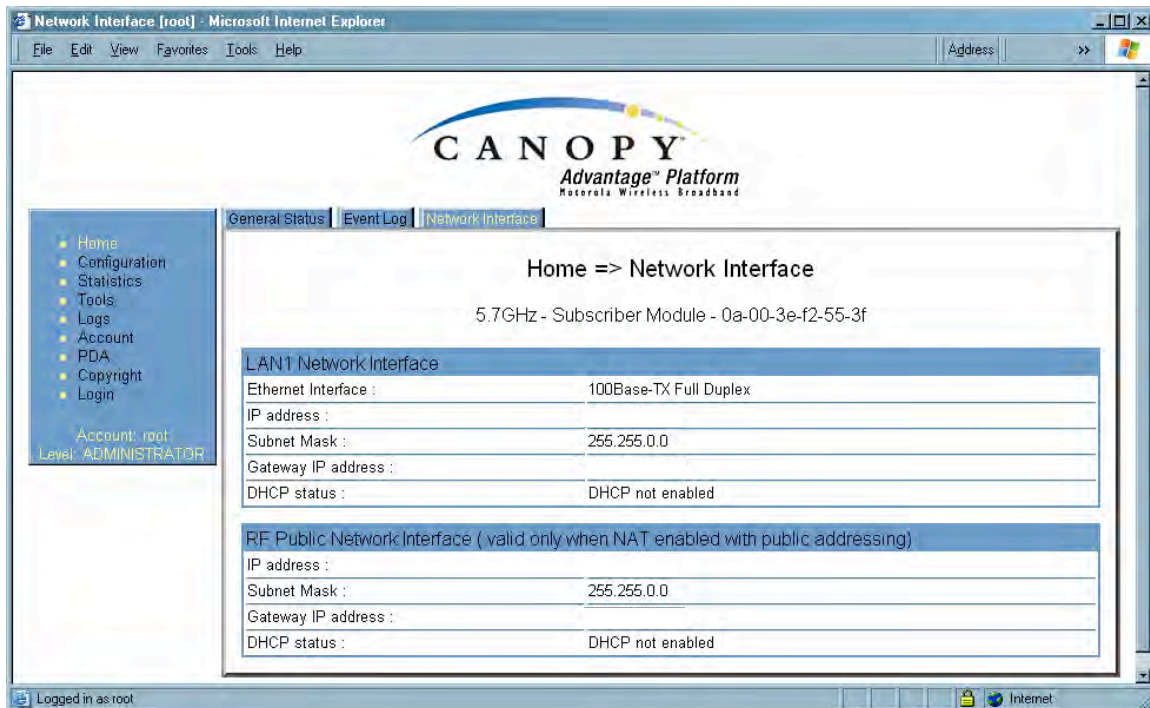


Figure 151: Network Interface tab of SM, example

In any module, the LAN1 Network Interface section of this tab displays the defined Internet Protocol scheme for the Ethernet interface to the module. In slave devices, this tab also provides an RF Public Network Interface section, which displays the Internet Protocol scheme defined for network access through the master device (AP or BHM).

26.6 INTERPRETING RADIO STATISTICS IN THE SCHEDULER TAB (ALL)

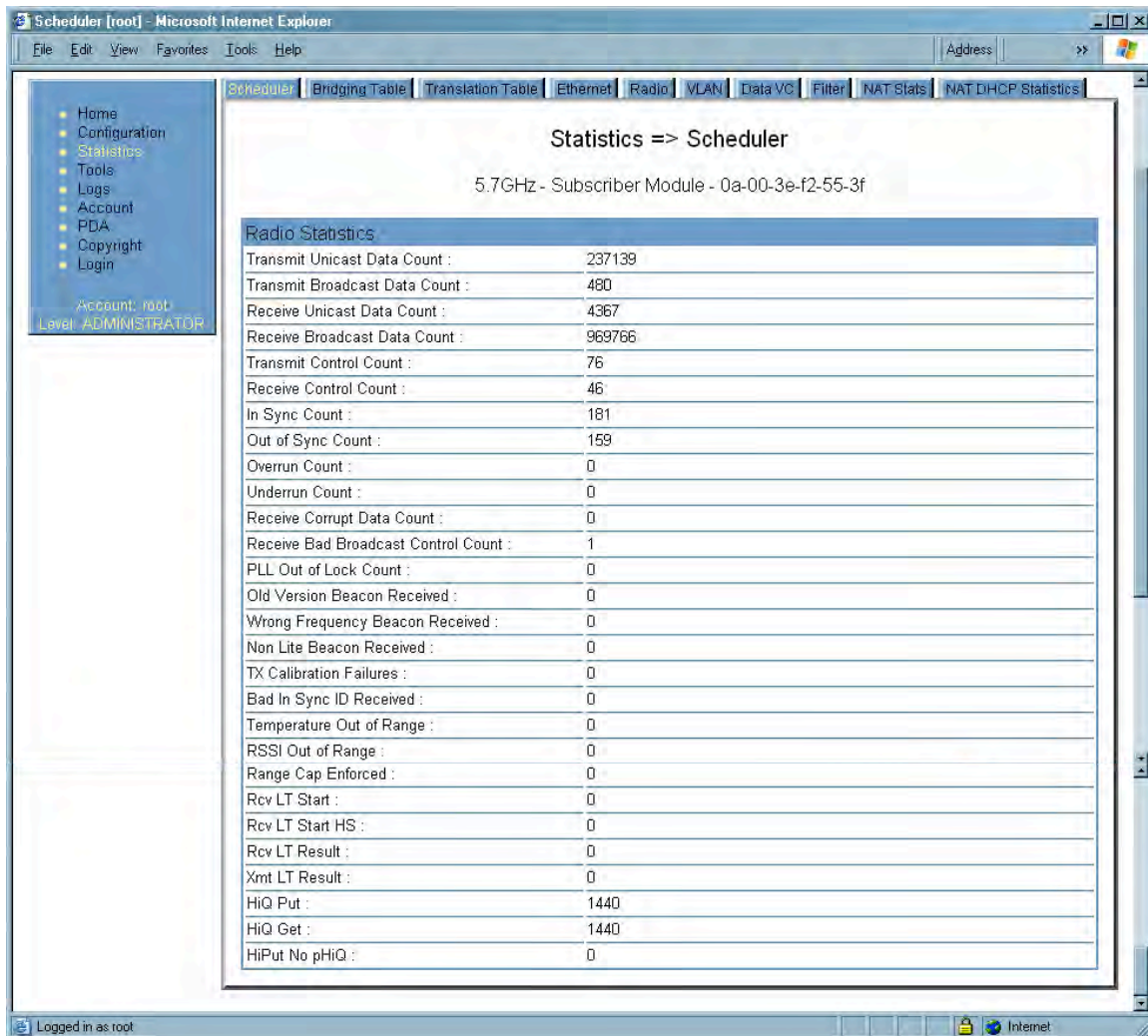


Figure 152: Scheduler tab of SM, example

Statistics for the Scheduler are displayed as shown in [Figure 152](#).

26.7 VIEWING THE LIST OF REGISTRATION FAILURES (AP, BHM)

An example of the SM Registration Failures tab is displayed in [Figure 153](#).

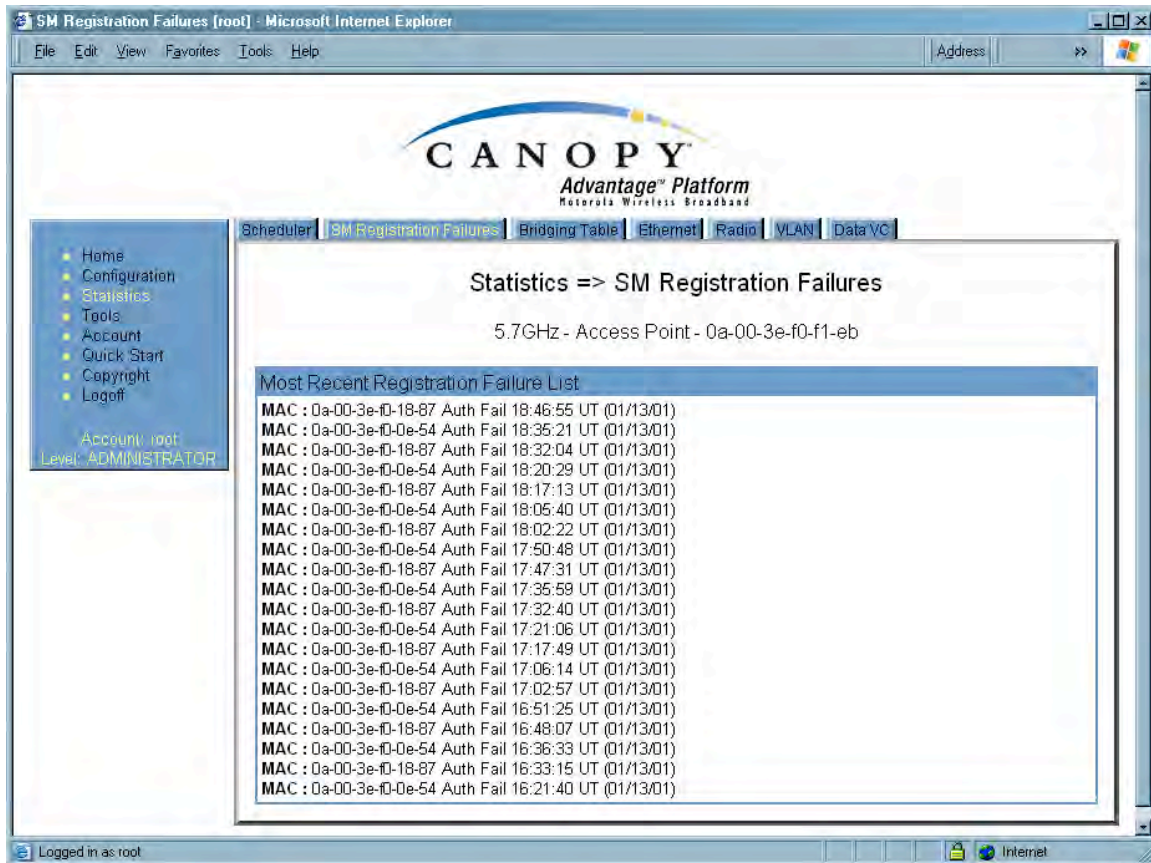


Figure 153: SM Registration Failures tab of AP, example

The SM Registration Failures tab identifies SMs (or BHSs) that have recently attempted and failed to register to this AP (or BHM). With its time stamps, these instances may suggest that a new or transient source of interference exists.

26.8 INTERPRETING DATA IN THE BRIDGING TABLE (ALL)

An example of the Bridging Table tab is displayed in [Figure 154](#).

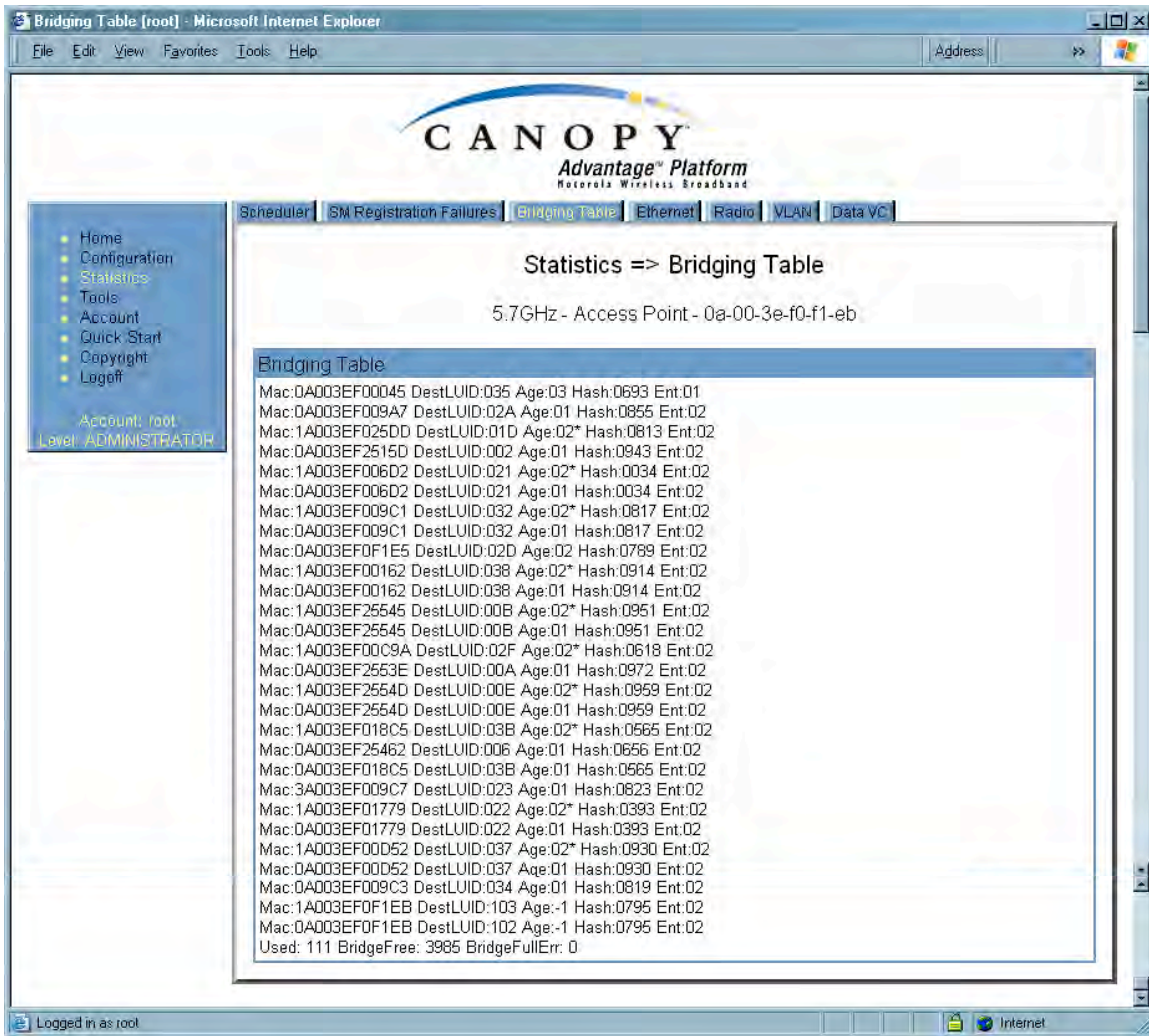


Figure 154: Bridging Table tab of AP, example

If NAT (network address translation) is not active on the SM, then the Bridging Table tab provides the MAC address of all devices that are attached to registered SMs (identified by LUIDs). The bridging table allows data to be sent to the correct module as follows:

- For the AP, the uplink is from RF to Ethernet. Thus, when a packet arrives in the *RF* interface to the AP, the AP reads the MAC address from the inbound packet and creates a bridging table entry of the source MAC address on the other end of the *RF* interface.
- For the SM, BHM, and BHS, the uplink is from Ethernet to RF. Thus, when a packet arrives in the *Ethernet* interface to one of these modules, the module reads the MAC address from the inbound packet and creates a bridging table entry of the source MAC address on the other end of the *Ethernet* interface.

26.9 TRANSLATION TABLE (SM)

When Translation Bridging is enabled in the AP, each SM keeps a table mapping MAC addresses of devices attached to the AP to IP addresses, as otherwise the mapping of end-user MAC addresses to IP addresses is lost. (When Translation Bridging is enabled, an AP modifies all uplink traffic originating from registered SM's such that the source MAC address of every packet will be changed to that of the SM which bridged the packet in the uplink direction.)

An example of the Translation Table is displayed in [Figure 155](#).

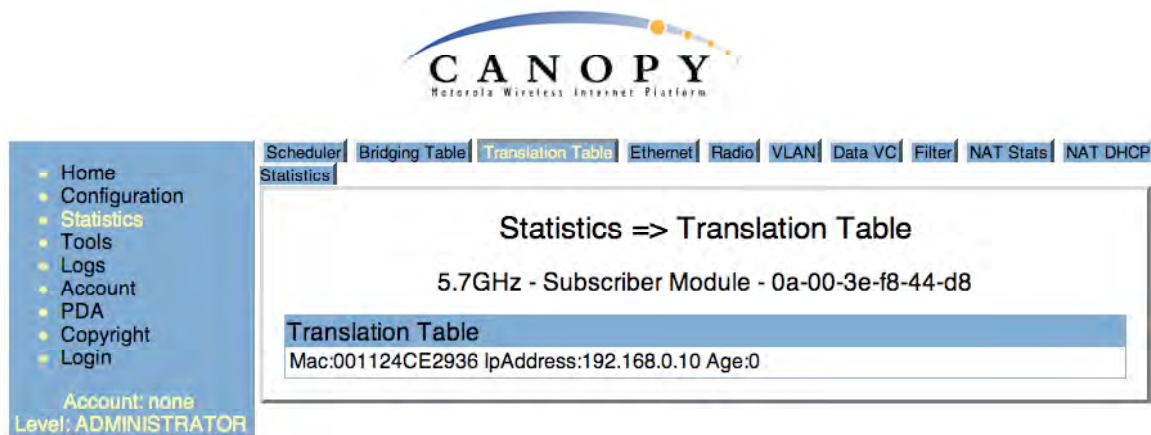


Figure 155: Translation Table tab of SM, example

26.10 INTERPRETING DATA IN THE ETHERNET TAB (ALL)

The Ethernet tab of the Statistics web page reports TCP throughput and error information for the Ethernet connection of the module.

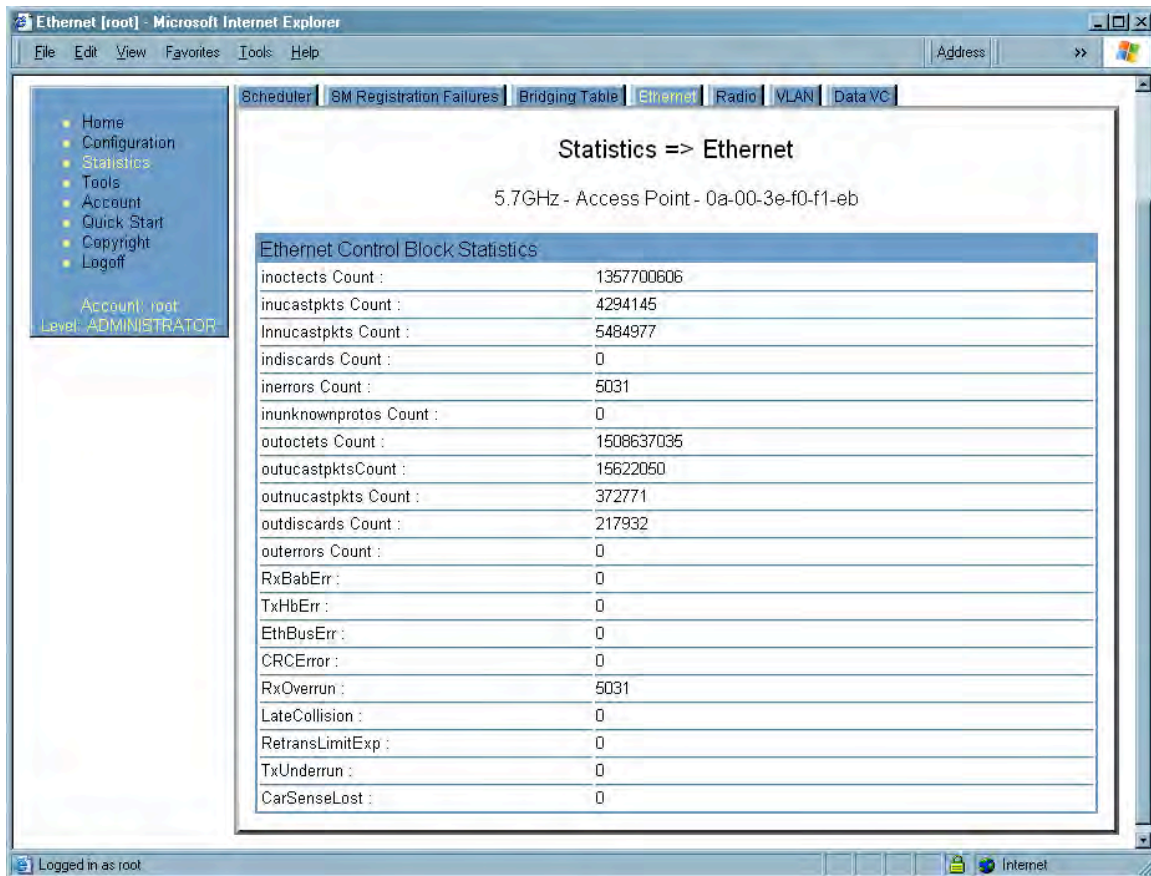


Figure 156: Ethernet tab of AP, example

The Ethernet tab displays the following fields.

inoctets Count

This field displays how many octets were received on the interface, including those that deliver framing information.

inucastpkts Count

This field displays how many inbound subnetwork-unicast packets were delivered to a higher-layer protocol.

Innucastpkts Count

This field displays how many inbound non-unicast (subnetwork-broadcast or subnetwork-multicast) packets were delivered to a higher-layer protocol.

indiscards Count

This field displays how many inbound packets were discarded without errors that would have prevented their delivery to a higher-layer protocol. (Some of these packets may have been discarded to increase buffer space.)

inerrors Count

This field displays how many inbound packets contained errors that prevented their delivery to a higher-layer protocol.

inunknownprotos Count

This field displays how many inbound packets were discarded because of an unknown or unsupported protocol.

outoctets Count

This field displays how many octets were transmitted out of the interface, including those that deliver framing information.

outucastpkts Count

This field displays how many packets for which the higher-level protocols requested transmission to a subnetwork-unicast address. The number includes those that were discarded or not sent.

outnucastpkts Count

This field displays how many packets for which the higher-level protocols requested transmission to a non-unicast (subnetwork-broadcast or subnetwork-multicast) address. The number includes those that were discarded or not sent.

outdiscards Count

This field displays how many outbound packets were discarded without errors that would have prevented their transmission. (Some of these packets may have been discarded to increase buffer space.)

outerrors Count

This field displays how many outbound packets contained errors that prevented their transmission.

RxBabErr

This field displays how many receiver babble errors occurred.

EthBusErr

This field displays how many Ethernet bus errors occurred on the Ethernet controller.

CRCError

This field displays how many CRC errors occurred on the Ethernet controller.

RxOverrun

This field displays how many receiver overrun errors occurred on the Ethernet controller.

Late Collision

This field displays how many late collisions occurred on the Ethernet controller. A normal collision occurs during the first 512 bits of the frame transmission. A collision that occurs after the first 512 bits is considered a late collision.

**IMPORTANT!**

A late collision is a serious network problem because the frame being transmitted is discarded. A late collision is most commonly caused by a mismatch between duplex configurations at the ends of a link segment.

RetransLimitExp

This field displays how many times the retransmit limit has expired.

TxUnderrun

This field displays how many transmission-underrun errors occurred on the Ethernet controller.

CarSenseLost

This field displays how many carrier sense lost errors occurred on the Ethernet controller.

26.11 INTERPRETING RF CONTROL BLOCK STATISTICS IN THE RADIO TAB (ALL)

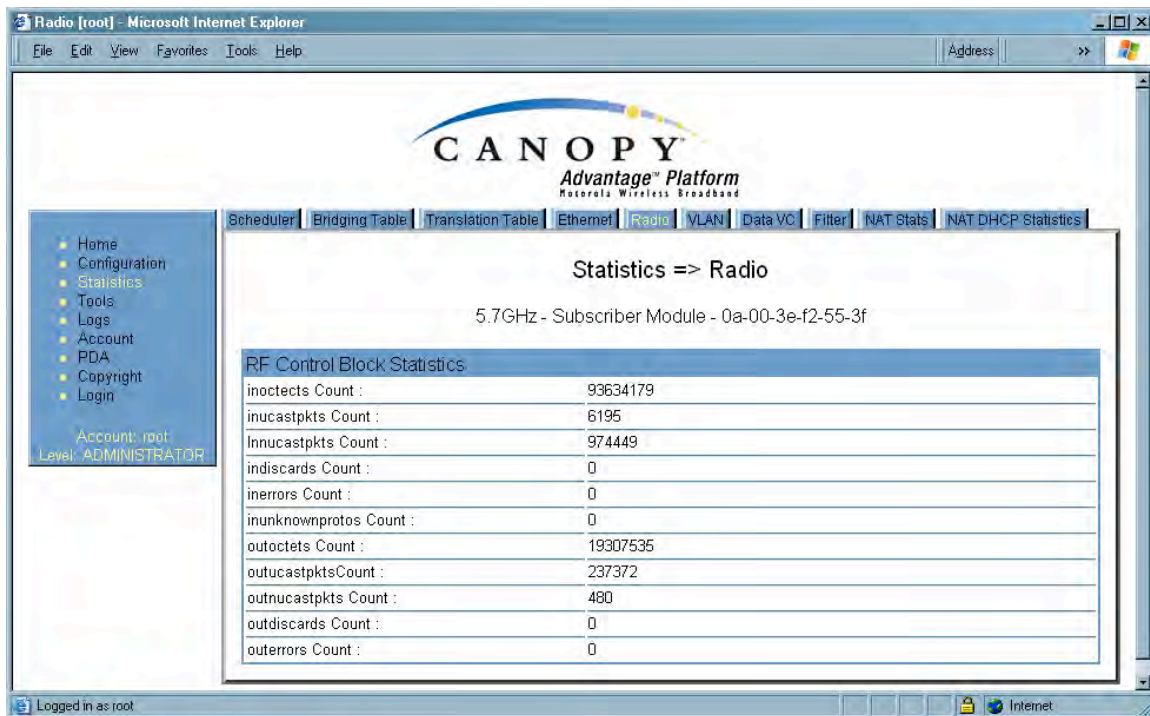


Figure 157: Radio tab of Statistics page in SM, example

The Radio tab of the Statistics page displays the following fields.

inoctets Count

This field displays how many octets were received on the interface, including those that deliver framing information.

inucastpkts Count

This field displays how many inbound subnetwork-unicast packets were delivered to a higher-layer protocol.

Innucastpkts Count

This field displays how many inbound non-unicast (subnetwork-broadcast or subnetwork-multicast) packets were delivered to a higher-layer protocol.

indiscards Count

This field displays how many inbound packets were discarded without errors that would have prevented their delivery to a higher-layer protocol. (Some of these packets may have been discarded to increase buffer space.)

inerrors Count

This field displays how many inbound packets contained errors that prevented their delivery to a higher-layer protocol.

inunknownprotos Count

This field displays how many inbound packets were discarded because of an unknown or unsupported protocol.

outoctets Count

This field displays how many octets were transmitted out of the interface, including those that deliver framing information.

outucastpkts Count

This field displays how many packets for which the higher-level protocols requested transmission to a subnetwork-unicast address. The number includes those that were discarded or not sent.

outnucastpkts Count

This field displays how many packets for which the higher-level protocols requested transmission to a non-unicast (subnetwork-broadcast or subnetwork-multicast) address. The number includes those that were discarded or not sent.

outdiscards Count

This field displays how many outbound packets were discarded without errors that would have prevented their transmission. (Some of these packets may have been discarded to increase buffer space.)

outerrors Count

This field displays how many outbound packets contained errors that prevented their transmission.

26.12 INTERPRETING DATA IN THE VLAN TAB (AP, SM)

The VLAN tab in the Statistics web page provides a list of the most recent packets that were filtered because of VLAN membership violations. An example of the VLAN tab is shown in [Figure 158](#).

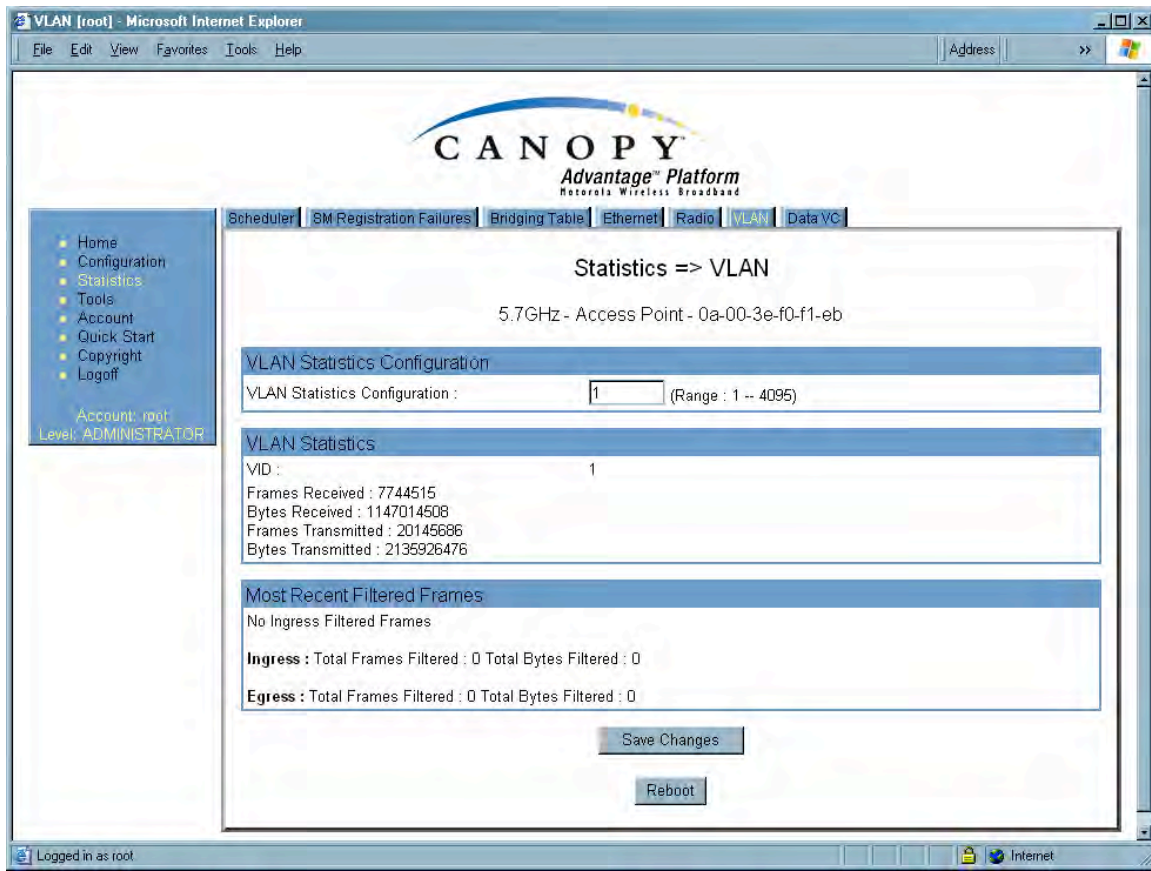


Figure 158: VLAN tab of AP, example

Interpret entries under **Most Recent Filtered Frames** as follows:

- **Unknown**—This should not occur. Contact Canopy Technical Support.
- **Only Tagged**—The packet was filtered because the configuration is set to accept only packets that have an 802.1Q header, and this packet did not.
- **Ingress**—When the packet entered through the wired Ethernet interface, the packet was filtered because it indicated an incorrect VLAN membership.
- **Local Ingress**—When the packet was received from the local TCP/IP stack, the packet was filtered because it indicated an incorrect VLAN membership. This should not occur. Contact Canopy Technical Support.
- **Egress**—When the packet attempted to leave through the wired Ethernet interface, the packet was filtered because it indicated an incorrect VLAN membership.
- **Local Egress**—When the packet attempted to reach the local TCP/IP stack, the packet was filtered because it indicated an incorrect VLAN membership.

26.13 DATA VC (ALL)

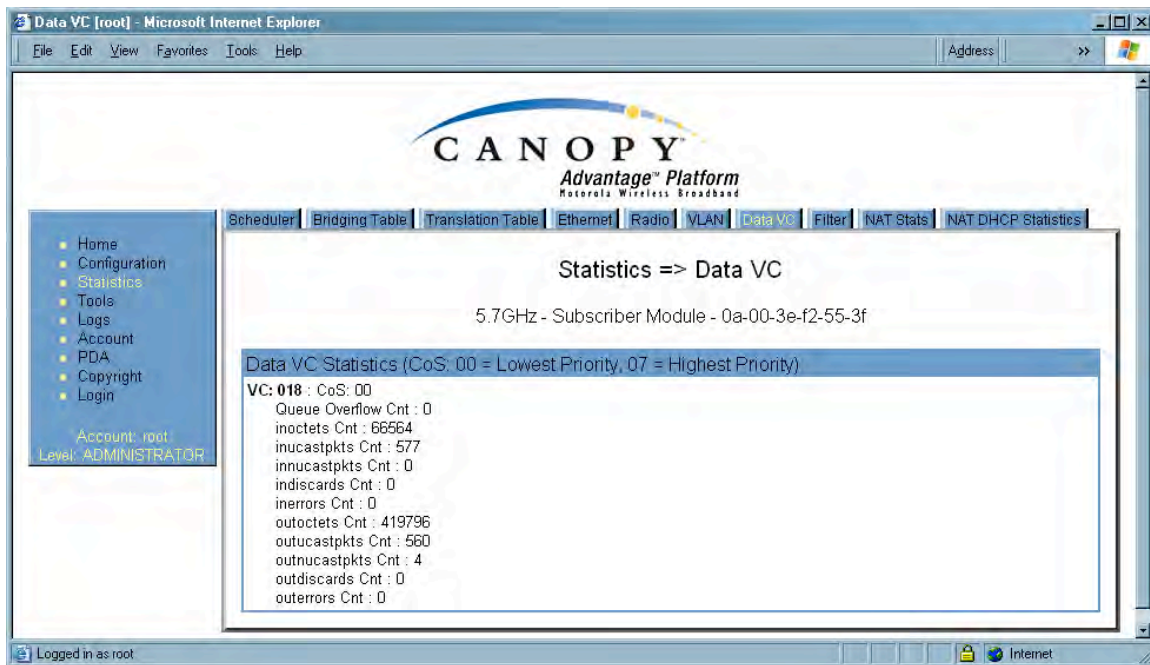


Figure 159: Data VC tab of SM, example

The Data VC tab page displays the following fields.

VC

This field displays the virtual channel number. Low priority channels start at VC18 and count up. High priority channels start at VC255 and count down. If one VC is displayed, the high-priority channel is disabled. If two are displayed, the high-priority channel is enabled.

CoS

This field displays the Class of Service for the virtual channel. The low priority channel is a CoS of 00, and the high priority channel is a CoS of 01. CoS of 02 through 07 are not currently used.

Queue Overflow Cnt

This is a count of packets that were discarded because the queue for the VC was already full.

inoctets Cnt

This field displays how many octets were received on the interface, including those that deliver framing information.

inucastpkts Cnt

This field displays how many inbound subnetwork-unicast packets were delivered to a higher-layer protocol.

Innucastpkts Cnt

This field displays how many inbound non-unicast (subnetwork-broadcast or subnetwork-multicast) packets were delivered to a higher-layer protocol.

indiscards Cnt

This field displays how many inbound packets were discarded without errors that would have prevented their delivery to a higher-layer protocol. (Some of these packets may have been discarded to increase buffer space.)

inerrors Cnt

This field displays how many inbound packets contained errors that prevented their delivery to a higher-layer protocol.

outoctets Cnt

This field displays how many octets were transmitted out of the interface, including those that deliver framing information.

outucastpkts Cnt

This field displays how many packets for which the higher-level protocols requested transmission to a subnetwork-unicast address. The number includes those that were discarded or not sent.

outnucastpkts Cnt

This field displays how many packets for which the higher-level protocols requested transmission to a non-unicast (subnetwork-broadcast or subnetwork-multicast) address. The number includes those that were discarded or not sent.

outdiscards Cnt

This field displays how many outbound packets were discarded without errors that would have prevented their transmission. (Some of these packets may have been discarded to increase buffer space.)

outerrors Cnt

This field displays how many outbound packets contained errors that prevented their transmission.

26.14 FILTER (SM)

The Filter tab displays statistics on packets that have been filtered (dropped) due to the filters set on the SM's Protocol Filtering tab. An example of the Filter tab is shown in [Figure 160](#).

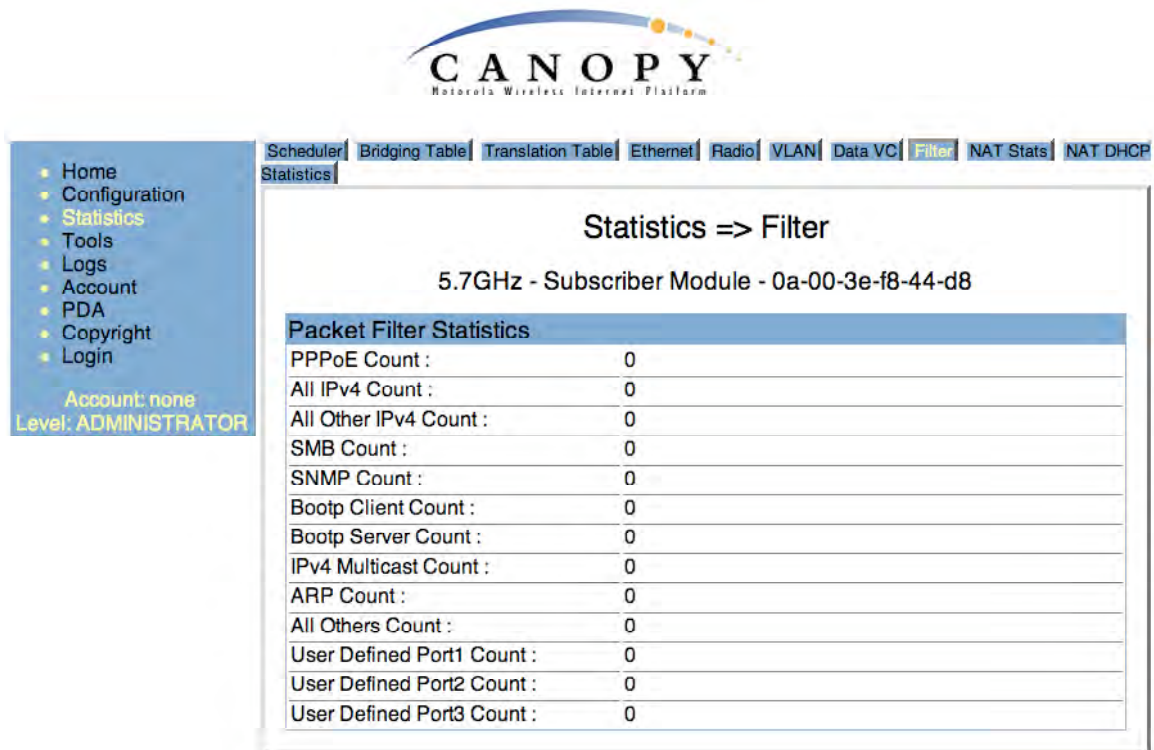


Figure 160: Filter tab on SM, example

26.15 NAT STATS (SM)

When NAT is enabled on an SM, statistics are kept on the Public and Private (WAN and LAN) sides of the NAT, and displayed on the NAT Stats tab. An example of the NAT Stats tab is shown in [Figure 161](#).

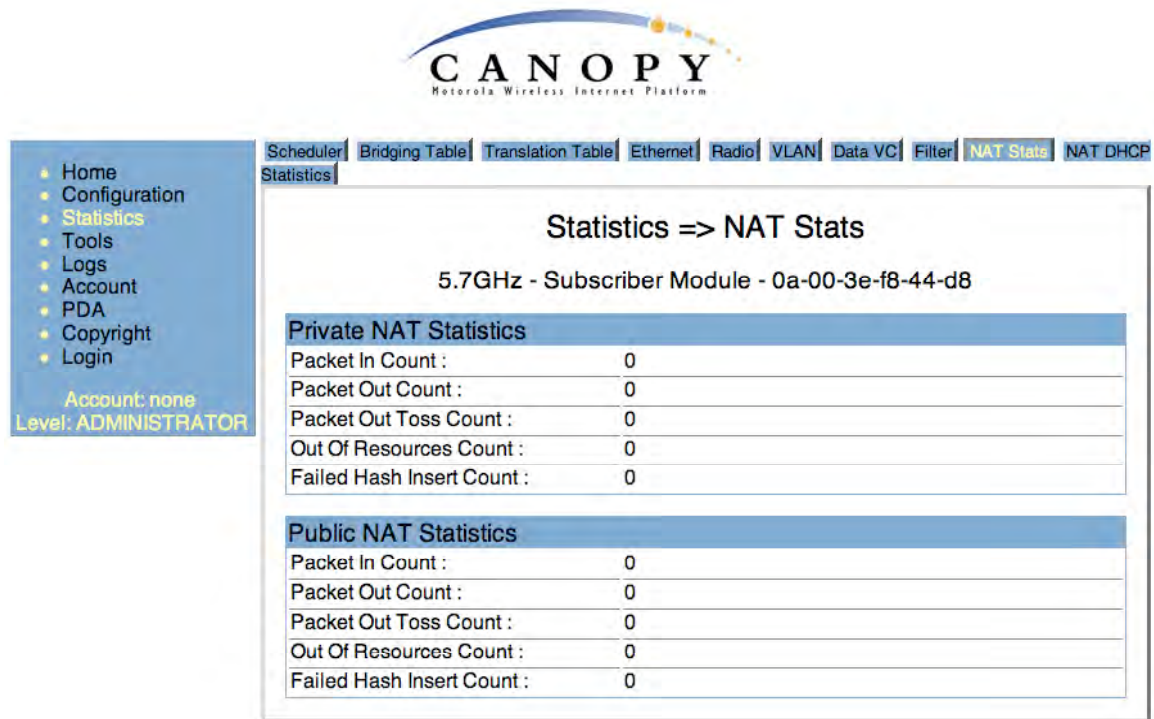


Figure 161: Nat Stats tab on SM, example

26.15.1 NAT DHCP Statistics (SM)

When NAT is enable on an SM with DHCP client and/or Server, statistics are kept for packets transmitted, received, and tossed, as well as a table of lease information for the DHCP server (Assigned IP Address, Hardware Address, and Lease Remained/State). An example of the NAT DHCP Statistics tab is shown in [Figure 162](#).

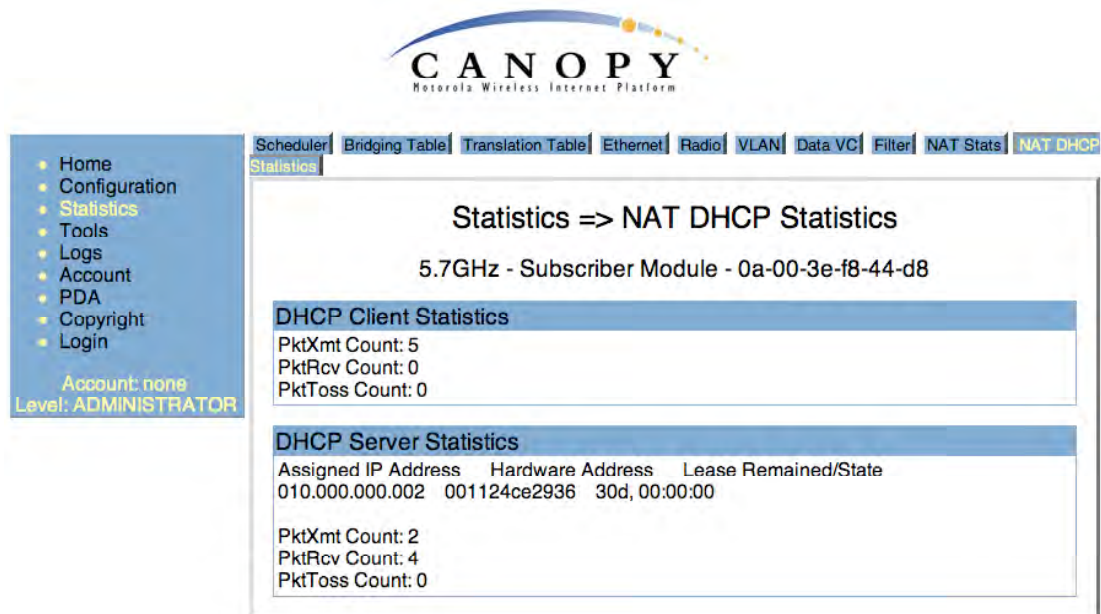


Figure 162: NAT DHCP Statistics tab in SM, example

26.15.2 Interpreting Data in the GPS Status Page (AP, BHM)

The GPS Status tab is only displayed when the Sync Input is set to Sync to Received Signal (Timing Port), which is the configuration desired when connecting an AP or BHM to a CMM2. See [Sync Input](#) on Page 237.

The page displays information similar to that available on the web pages of a CMM3, including Pulse Status, GPS Time and Date, Satellites Tracked, Available Satellites, Height, Latitude and Longitude. This page also displays the state of the antenna in the **Antenna Connection** field as

- [Unknown](#)—Shown for early CMM2s.
- [OK](#)—Shown for later CMM2s where no problem is detected in the signal.
- [Overcurrent](#)—Indicates a coax cable or connector problem.
- [Undercurrent](#)—Indicates a coax cable or connector problem.



IMPORTANT!

If **Unknown** is displayed where a later CMM2 is deployed, then the connection is not working but the reason is unknown.

This information may be helpful in a decision of whether to climb a tower to diagnose a perceived antenna problem.

27 USING TOOLS IN THE GUI

27.1 USING THE SPECTRUM ANALYZER TOOL (SM, BHS)

See [Monitoring the RF Environment](#) on Page 365.

27.2 USING THE ALIGNMENT TOOL (SM, BHS)

An example of the Alignment tab in an SM or BHS is displayed in [Figure 163](#).

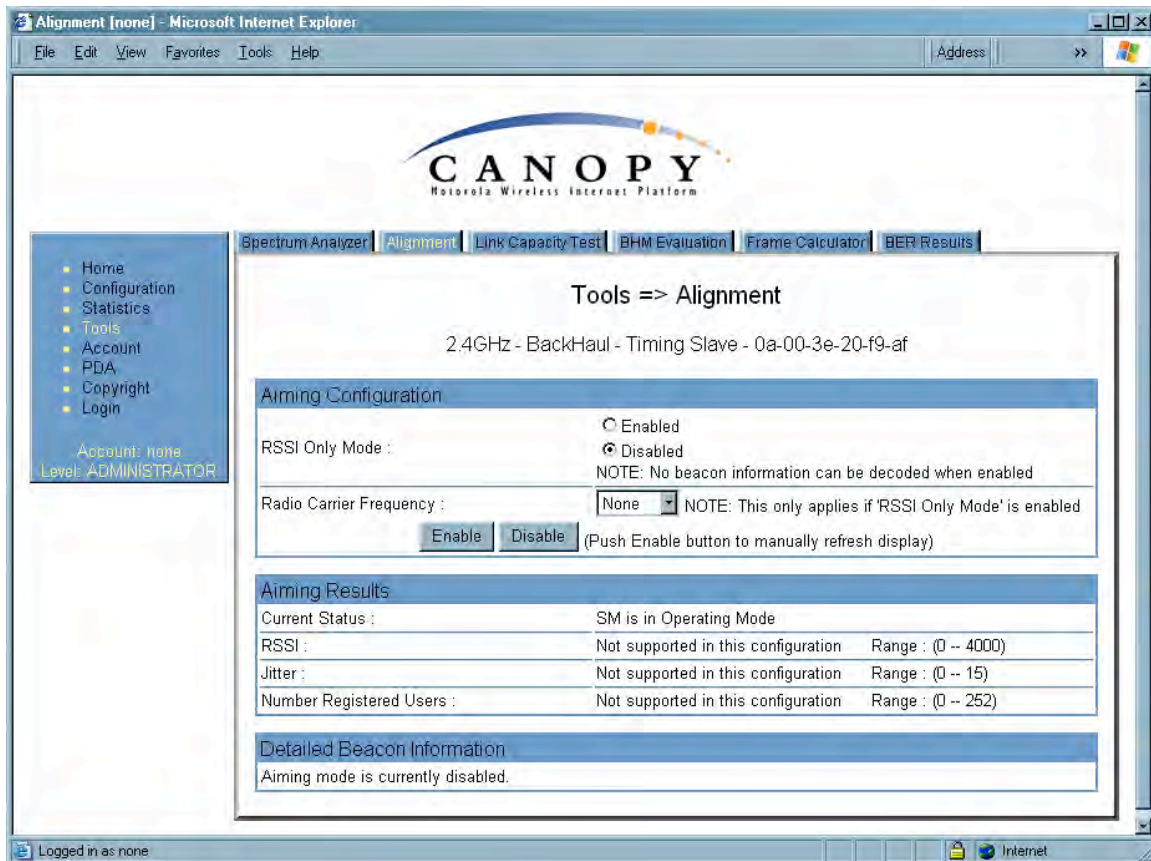


Figure 163: Alignment tab of BHS, example

Proper alignment must achieve all of the following indications for an acceptable link between the modules:

- RSSI typically at least 10 dBm above receiver sensitivity
- jitter value between 0 and 4
- uplink and downlink efficiency greater than 90%, except as described under [Comparing Efficiency in 1X Operation to Efficiency in 2X Operation](#) on Page 134.

**IMPORTANT!**

If any of these values is not achieved, a link can be established but will manifest occasional problems.

In the Alignment tab, you may set the following parameters.

RSSI Only Mode

In the RSSI Only Mode, the screen displays the signal strength based on the amount of energy in the selected frequency, regardless of whether the module has registered. This mode simplifies the aiming process for long links. To invoke the RSSI Only Mode, select **Enabled**.

Radio Carrier Frequency

If you enabled the RSSI Only Mode, select the frequency (in MHz) for the aiming operation.

The Alignment tab also provides the following buttons.

Enable

A click of this button launches the slave device into alignment mode. Each further click refreshes the data in the tab to display the latest measurements collected.

Disable

A click of this button changes the slave device from alignment mode back to operating mode.

The Alignment tab also provides the following read-only fields.

Current Status

This field indicates either `SM is in Alignment Mode` or `SM is in Operating Mode`. This syntax is used in an SM and in a BHS.

RSSI

This field displays the Radio Signal Strength Indicator units and, in parentheses, the current power level, of the signal received from the AP or BHM.

Jitter

This field displays the jitter level of the signal received from the AP or BHM.

Number Registered Users

This field displays how many slave devices are currently registered to the master device whose beacon is being received during the aiming period.

In addition, the Alignment tab includes the following Detailed Beacon Information where it is available.

Average measured RSSI

This field displays the Radio Signal Strength Indicator units and, in parentheses, the power level as an average of the measurements that were collected throughout the aiming period. Try for the highest power level that you can achieve at the least amount of jitter. For example, if you achieve a power level of -75 dBm with a jitter level of 5, and further refine the alignment to achieve a power level of -78 dBm with a jitter level of 2 or 3, the link is better because of the further refinement.

Average measured Jitter

This field displays Jitter as an average of the measurements that were collected throughout the aiming period. In 1X operation, jitter values of 0 to 4 are acceptable. In 2X operation, jitter values 0 to 9 are acceptable. In either mode, 0 to 15 is the range of possible values that the **Jitter** field reports. Within the acceptable range, incremental improvements in the jitter level achieved can significantly improve link quality where power level is not significantly diminished by re-aiming.

Users

This is a count of the number of SMs registered to the AP you are aligning to.

Frequency

This field displays the frequency in MHz of the signal that was being received during the aiming period.

ESN

This field displays the MAC address of the AP or BHM you are aligning to.

Color Code

This field displays the color code of the AP or BHM you are aligning to.

Backhaul

This field displays a 1 if the device you are aligning to is a BHM, and a 0 if the device you are aligning to is an AP.

27.3 USING THE LINK CAPACITY TEST TOOL (ALL)

An example of the Link Capacity Test tab is displayed in [Figure 164](#).

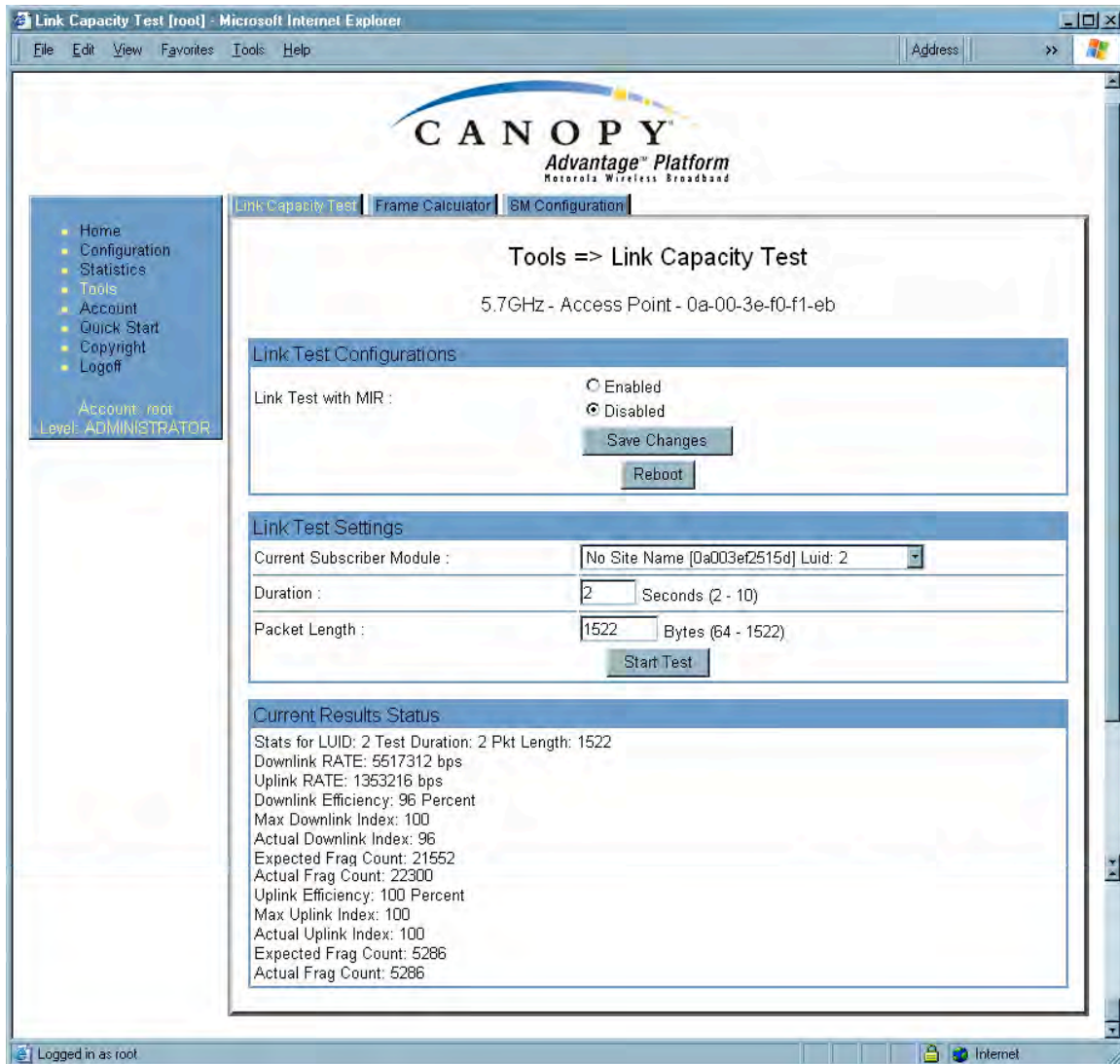


Figure 164: Link Capacity Test tab with 1522-byte packet length, example

The Link Capacity Test page allows you to measure the throughput and efficiency of the RF link between two Canopy modules. Many factors, including packet length, affect throughput. The Link Capacity Test tab contains the settable parameter **Packet Length** with a range of 64 to 1522 bytes. This allows you to compare throughput levels that result from various packet sizes.

For example, the same link was measured in the same time frame at a packet length of 64 bytes. The results are shown in [Figure 165](#).

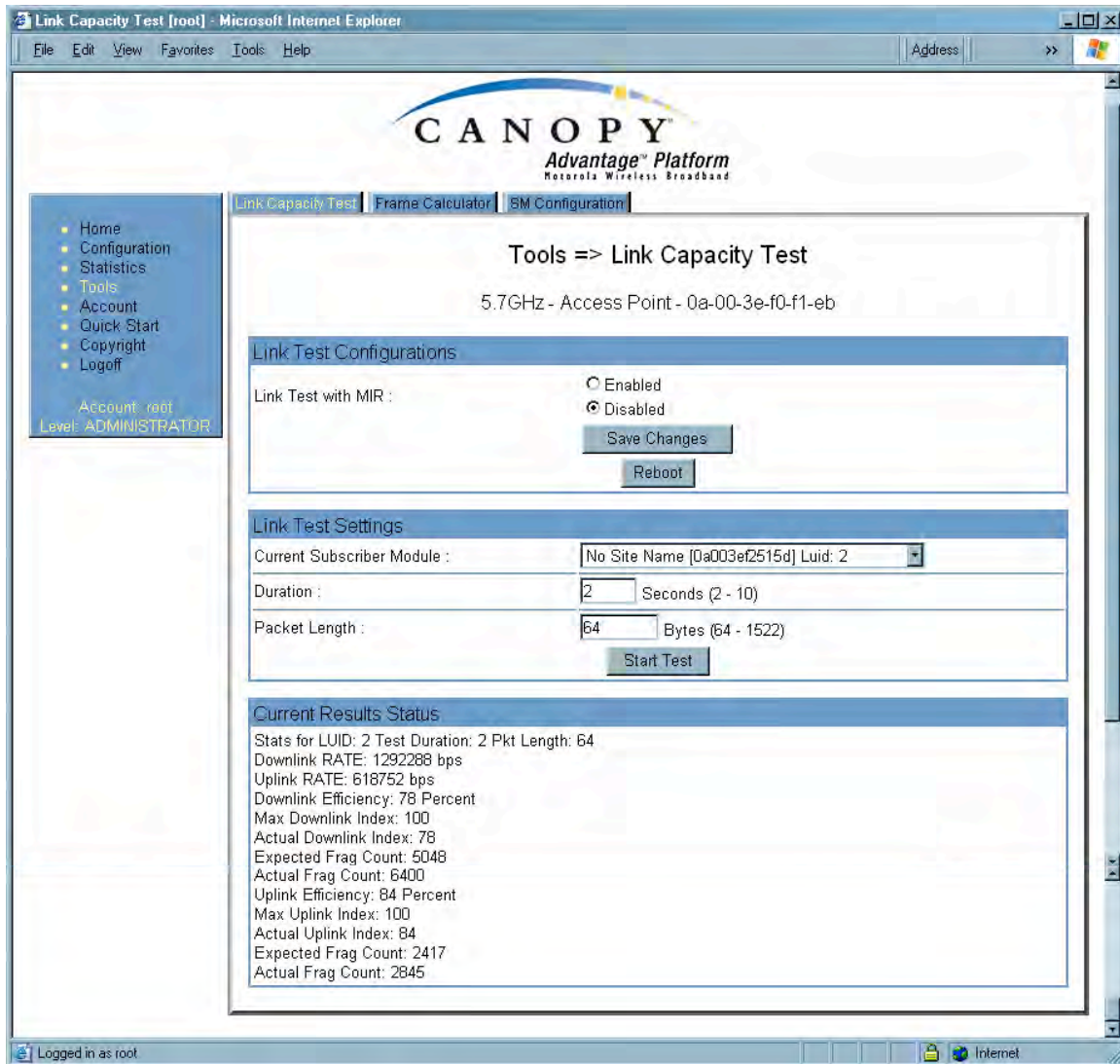


Figure 165: Link Capacity Test tab with 64-byte packet length, example

To test a link, perform the following steps.

Procedure 40: Performing a Link Capacity Test

1. Access the Link Capacity Test tab in the Tools web page of the module.
2. If you are running this test from an AP
 - a. and you want to see Maximum Information Rate (MIR) data for the SM whose link you will be testing, then perform the following steps:
 - (1) For **Link Test with MIR**, select **Enabled**.
 - (2) Click the **Save Changes** button.
 - (3) Click the **Reboot** button.
 - b. use the drop-down list to select the SM whose link you want to test.

3. Type into the **Duration** field how long (in seconds) the RF link should be tested.
4. Type into the **Packet Length** field the packet length at which you want the test conducted.
5. Type into the **Number of Packets** field either
 - the number of packets (1 to 64) for the test.
 - **0** to flood the link for as long as the test is in progress.
6. Click the **Start Test** button.
7. In the Current Results Status block of this tab, view the results of the test.
8. Optionally
 - a. change the packet length.
 - b. repeat Steps 5 and 6.
 - c. compare the results to those of other tests.

===== end of procedure =====

The key fields in the test results are

- **Downlink RATE** and **Uplink RATE**, expressed in bits per second
- **Downlink Efficiency** and **Uplink Efficiency**, expressed as a percentage

A Canopy system link is acceptable only if the efficiencies of the link test are greater than 90% in both the uplink and downlink direction, except during 2X operation. See [Using Link Efficiency to Check Received Signal Quality](#) on Page 134. Whenever you install a new link, execute a link test to ensure that the efficiencies are within recommended guidelines.

The AP downlink data percentage, slot settings, other traffic in the sector, and the quality of the RF environment all affect throughput. However, a Maximum Information Rate (MIR) throttle or cap on the SM does not affect throughput.

27.4 USING THE AP EVALUATION OR BHM EVALUATION TOOL (SM, BHS)

The AP Evaluation tab in the Tools web page of the SM provides information about the AP that the SM sees. Similarly, the BHM Evaluation tab of the BHS provides information about the BHM. An example of the AP Evaluation tab is shown in [Figure 166](#).



NOTE:

The data for this page can be suppressed by the **SM Display of AP Evaluation Data** selection in the Security tab of the Configuration page in the AP.

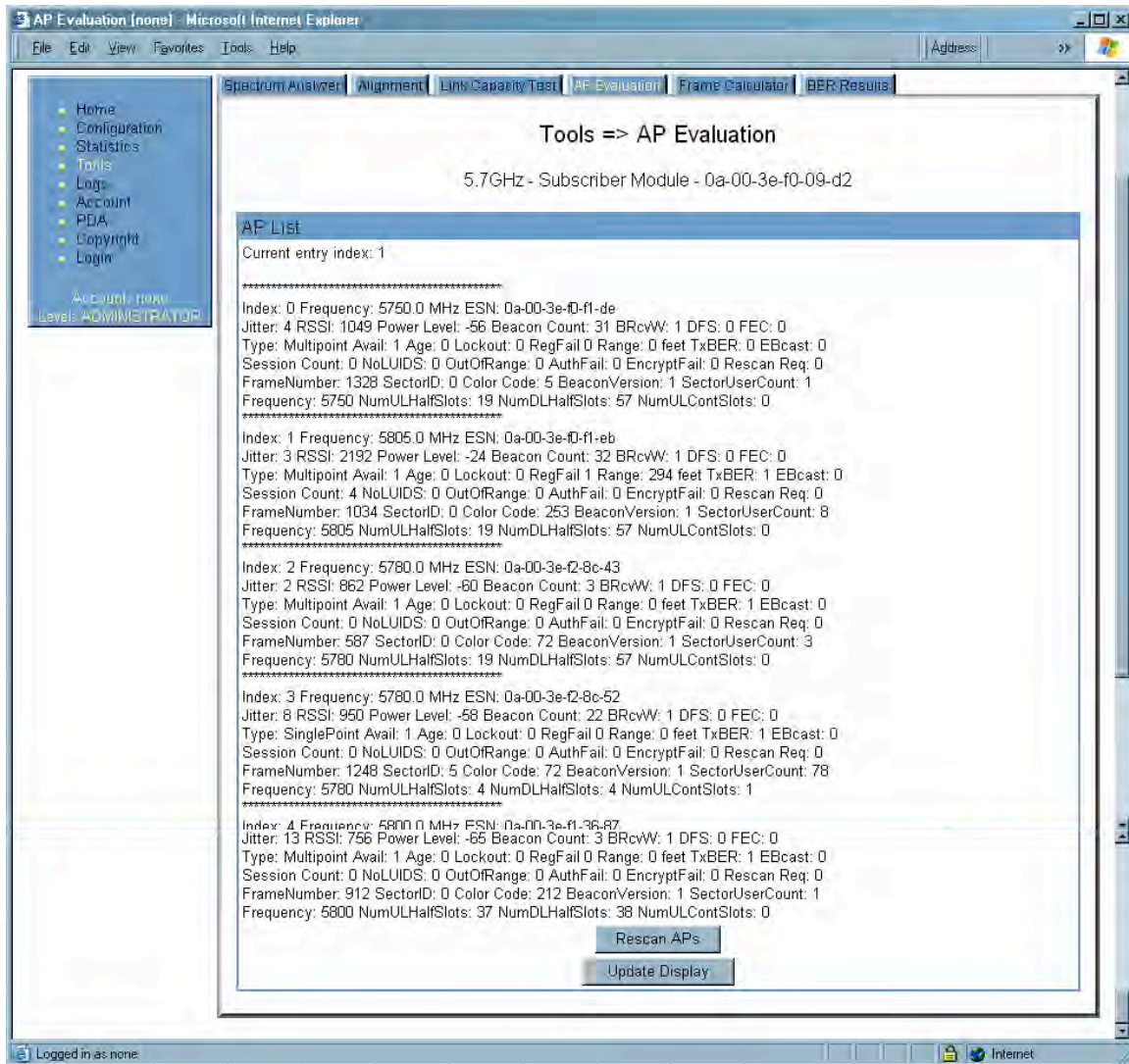


Figure 166: AP Evaluation tab of SM, example

The AP Evaluation tab provides the following fields that can be useful to manage and troubleshoot a Canopy system:

Index

This field displays the index value that the Canopy system assigns (for only this page) to the AP where this SM is registered (or to the BHM to which this BHS is registered).

Frequency

This field displays the frequency that the AP or BHM transmits.

ESN

This field displays the MAC address (electronic serial number) of the AP or BHM.

Jitter, RSSI, and Power Level

The AP Evaluation tab shows the received **Power Level** in dBm and **Jitter**. Proper alignment maximizes **Power Level** and minimizes **Jitter**. As you refine alignment, you should favor lower jitter over higher dBm. For example, if coarse alignment gives an SM a power level of -75 dBm and a jitter measurement of 5, and further refining the alignment drops the power level to -78 dBm and the jitter to 2 or 3, use the refined alignment, with the following caveats:

- When the receiving link is operating at 1X, the **Jitter** scale is 0 to 15 with desired jitter between 0 and 4.
- When the receiving link is operating at 2X, the **Jitter** scale is 0 to 15 with desired jitter between 0 and 9.

For historical relevance, the AP Evaluation tab also shows the **RSSI**, the unitless measure of power. Use **Power Level** and ignore **RSSI**. **RSSI** implies more accuracy and precision than is inherent in its measurement.

**NOTE:**

Unless the page is set to auto-refresh, the values displayed are from the instant the General Status tab was selected. To keep a current view of the values, refresh the browser screen or set to auto-refresh.

Beacon Count

A count of the beacons seen in a given time period.

BRcvW**DFS****FEC****Type**

Multipoint indicates an AP, not a BHM.

Age**Lockout**

This field displays how many times the SM or BHS has been temporarily locked out of making registration attempts.

RegFail

This field displays how many registration attempts by this SM or BHS failed.

Range

This field displays the distance in feet for this link. To derive the distance in meters, multiply the value of this parameter by 0.3048.

TxBER

A 1 in this field indicates the AP or BHM is sending Radio BER.

EBcast

A 1 in this field indicates the AP or BHM is encrypting broadcast packets. A 0 indicates it is not.

Session Count

This field displays how many sessions the SM (or BHS) has had with the AP (or BHM). Typically, this is the sum of Reg Count and Re-Reg Count. However, the result of internal calculation may display here as a value that slightly differs from the sum.

In the case of a multipoint link, if the number of sessions is significantly greater than the number for other SMs, then this may indicate a link problem or an interference problem.

NoLUIDs**OutOfRange****AuthFail**

This field displays how many times authentication attempts from this SM have failed in the AP.

EncryptFail

This field displays how many times an encryption mismatch has occurred between the SM and the AP.

Rescan Req**FrameNumber****Sector ID**

This field displays the value of the **Sector ID** field that is provisioned for the AP or BHM.

Color Code

This field displays the value of the **Color Code** field that is provisioned for the AP or BHM.

BeaconVersion**Sector User Count**

This field displays how many SMs are registered on the AP.

Frequency

This field displays the frequency of the received signal, expressed in MHz.

NumULHalfSlots

This is the number of uplink half slots in this AP or BHM's frame. To get slots, just divide by 2.

NumDLHalfSlots

This is the number of downlink half slots in this AP or BHM's frame. To get slots, just divide by 2.

NumULContSlots

This field displays how many control slots are being used in the uplink portion of the frame.

The AP Evaluation tab also provides the following buttons.

Rescan APs

You can click this button to force the SM or BHS to rescan the frequencies that are selected in the Radio tab of the Configuration page. (See [Custom Radio Frequency Scan Selection List](#) on Page 273.) This module will then register to the AP or BHM that provides the best results for power level, jitter, and—in an SM—the number of registered SMs.

Update Display

You can click this button to gather updated data without causing the SM or BHS to rescan and re-register.

27.5 USING THE FRAME CALCULATOR TOOL (ALL)

Canopy avoids self-interference by syncing collocated APs (so they begin each transmission cycle at the same time) and requiring that collocated APs have the same transmit/receive ratio (so they stop transmitting and start receiving at the same time). This ensures that, at any instant, they are either all receiving or all transmitting.

This avoids, for example, the problem of one AP attempting to receive from a distant SM, while a nearby AP is transmitting and overpowering the signal from the distant SM. Parameters that affect transmit/receive ratio include range, slots, downlink data percentage, and high priority uplink percentage. All collocated APs must have the same transmit/receive ratio. Additional engineering is needed for setting the parameters in a mixed cluster – one with APs on hardware scheduler and APs on software scheduler.

A frame calculator helps to do this. The operator inputs various AP settings into the calculator, and the calculator outputs many details on the frame including the **Uplink Rcv SQ Start**. This calculation should be done for each AP that has different settings. Then the operator varies the **Downlink Data** percentage in each calculation until the calculated **Uplink Rcv SQ Start** for all collocated APs is within 300 time bits. The frame calculator is accessed by clicking on Expanded Stats in the navigation column, then clicking on Frame Calculator (at the bottom of the expanded navigation column).

The calculator does not use data on the module or populate new data. It is merely a convenience application running on the module. For this reason, you can use any module to do the calculations for any AP. Running the calculator on the AP in question is not necessary.

***IMPORTANT!***

APs with slightly mismatched transmit/receive ratios and low levels of data traffic may see little effect on throughput. As the data traffic increases, the impact of mismatched transmit/receive ratios will increase. This means that a system that was not tuned for collocation may work fine at low traffic levels, but encounter problems at higher traffic level. The conservative practice is to tune for collocation from the beginning, and prevent future problems as sectors are built out and traffic increases.

An example of the Frame Calculator tab is shown in [Figure 167](#).

Frame Calculator [root] - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address

Link Capacity Test **Frame Calculator** SM Configuration

Tools => Frame Calculator

5.7GHz - Access Point - 0a-00-3e-f0-f1-eb

Frame Calculator Parameters:

Software Version Transmitter : CANOPY7.2--Current

Software Version Receiver : CANOPY7.2--Current

Transmit Sync Input : Generate Sync Signal

Link Mode :
☐ Point-To-Point Link
☒ Multipoint Link

Max Range : 2 Miles (Range: 1- 30 miles)

Air Delay : 0 bits

Scheduling :
☐ Hardware
☒ Software

Mobility :
☐ On
☒ Off

Wireless/Wired :
☒ Wireless Link
☐ Wired Link

Platform Type Transmitter : P10

Platform Type Receiver : P10

Frequency Band : 5.7GHz

External Bus Frequency Transmitter : 40

External Bus Frequency Receiver : 40

Downlink Data : 75 %

High Priority Uplink Percentage : 0 %

Total Number UACK Slots : 3 (Range: 1--7)

Number High : 0

Number DACK Slots : 3 (Range: 1--7)

Number High : 0

Number Control Slots : 3 (Range: 1-- 16)

Number High : 0

Apply Settings

Calculate

Calculated Frame Results

Invalid Configuration

Logged in as: root

Internet

Figure 167: Frame Calculator tab, example

In the Frame Calculator tab, you may set the following parameters.

Software Version Transmitter

From the drop-down menu, select the Canopy software release that runs on the AP(s).

Software Version Receiver

From the drop-down menu, select the Canopy software release that runs on the SM(s).

Transmit Sync Input

If the APs in the cluster

- receive sync from a CMMmicro, select **Sync to Received Signal (Power Port)**.
- receive sync from a CMM2, select **Sync to Received Signal (Timing Port)**.
- are self timed, select **Generate Sync Signal**.

Link Mode

For AP to SM frame calculations, select **Multipoint Link**.

Max Range

Set to the same value as the **Max Range** parameter is set in the AP(s).

Air Delay

Leave this parameter set to the default value of 0 bits.

Scheduling

Initially select **Software**.

Mobility

Leave the default value of **Off** selected.

Wireless/Wired

Leave the default value of Wireless Link selected.

Platform Type Transmitter

Use the drop-down list to select the hardware series (board type) of the AP.

Platform Type Receiver

Use the drop-down list to select the hardware series (board type) of the SM.

Frequency Band

Use the drop-down list to select the radio frequency band of the AP and SM.

External Bus Frequency Transmitter

Leave this parameter set to the default value of 40.

External Bus Frequency Receiver

Leave this parameter set to the default value of 40.

Downlink Data

Initially set this parameter to the same value that the AP has for its **Downlink Data** parameter (percentage). Then, as you use the Frame Calculator tool in [Procedure 41](#), you will vary the value in this parameter to find the proper value to write into the **Downlink Data** parameter of all APs in the cluster.

High Priority Uplink Percentage

If the AP is running Canopy software earlier than Release 8, set this parameter to the current value of the **High Priority Uplink Percentage** parameter in the AP.

Total Number UACK Slots

If the AP is running Canopy software earlier than Release 8, set this parameter to the current value of the **Total NumUAckSlots** parameter in the AP.

Number High

If the AP is running Canopy software earlier than Release 8, set this parameter to the current value of the **Num High** parameter associated with **Total NumUAckSlots** in the AP.

Number DACK Slots

If the AP is running Canopy software earlier than Release 8, set this parameter to the current value of the **NumDackSlots** parameter in the AP.

Number High

If the AP is running Canopy software earlier than Release 8, set this parameter to the current value of the **Num High** parameter associated with **NumDackSlots** in the AP.

Number Control Slots

Set this parameter to the current value of the **Control Slots** (for Release 8) or **NumCtlSlots** (for earlier releases) parameter in the AP. In Release 8, the **Control Slots** parameter is present in the Radio tab of the Configuration web page.

Number High

If the AP is running Canopy software earlier than Release 8, set this parameter to the current value of the **Num High** parameter associated with **NumCtlSlots** in the AP.

To use the Frame Calculator, perform the following steps.

Procedure 41: Using the Frame Calculator

1. Populate the Frame Calculator parameters with appropriate values as described above.
2. Click the **Apply Settings** button.
3. Click the **Calculate** button.
4. Scroll down the tab to the Calculated Frame Results section.
NOTE: An example of the Calculated Frame Results section is displayed in [Figure 168](#).

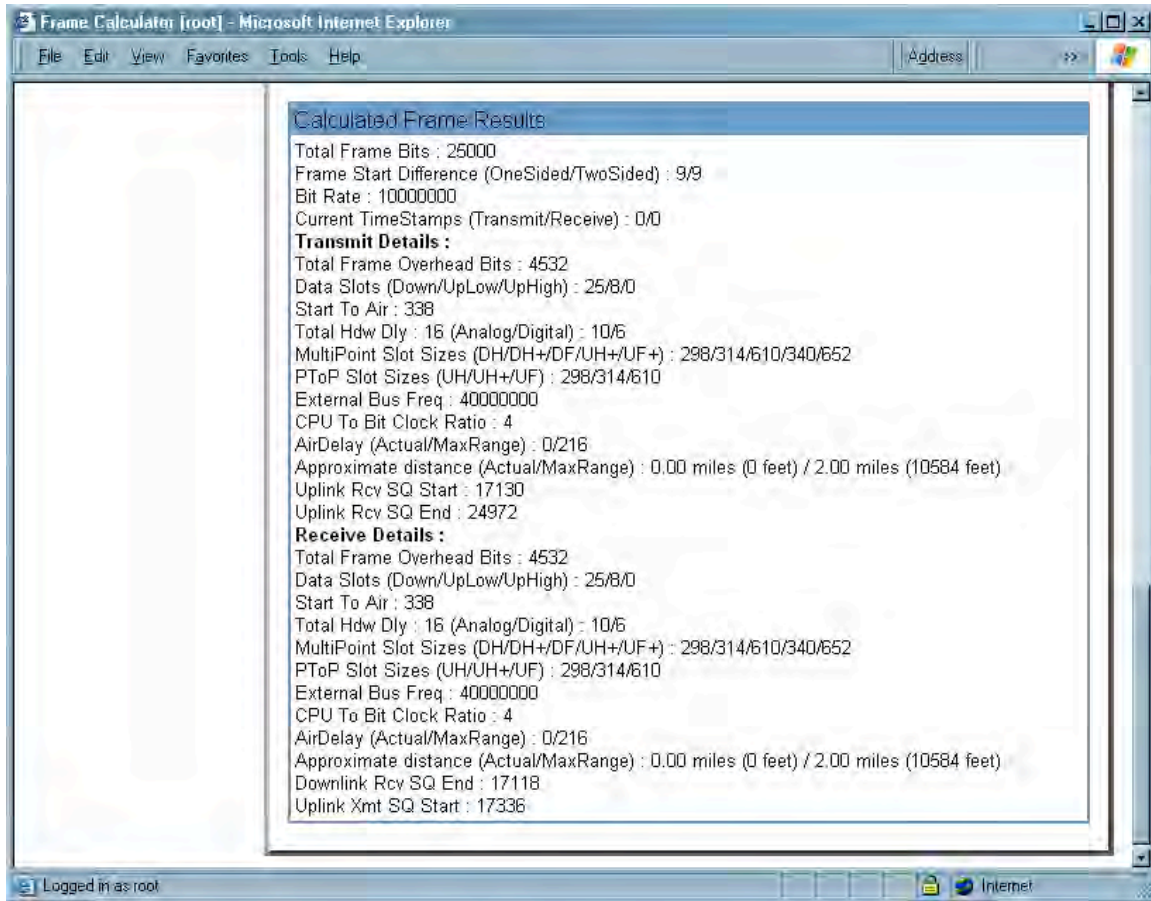


Figure 168: Calculated Frame Results section of Frame Calculator tab, example

5. Record the value of the **Uplink Rcv SQ Start** field.
6. Scroll up to the **Scheduling** parameter.
7. Select **Hardware**.
8. Click the **Apply Settings** button.
RESULT: The values in the Calculated Frame Results section are updated for hardware scheduling.
9. In the **Number Control Slots** parameter, type in the number needed.
10. Click the **Apply Settings** button.
11. Click the **Calculate** button.
12. Scroll down the tab to the Calculated Frame Results section.
13. Record the value of the **Uplink Rcv SQ Start** field.
14. If the recorded values of the **Uplink Rcv SQ Start** field are within 300 time bits of each other, skip the next step.
15. Repeat this procedure, changing the value of the **Downlink Data** parameter until the values that this tool calculates for the **Uplink Rcv SQ Start** field are within 300 time bits of each other regardless of the selection in the **Scheduling** parameter.

16. When they are within 300 time bits, access the Radio tab in the Configuration web page of each AP in the cluster and change its **Downlink Data** parameter (percentage) to the last value that you used in the Frame Calculator.
See [Figure 83: Radio tab of AP \(900 MHz\), example](#) on Page 241.

===== end of procedure =====

27.6 USING THE SM CONFIGURATION TOOL (AP, BHM)

The SM Configuration tab in the Tools page of the AP or BHM displays

- the current values whose control may be subject to the setting in the **Configuration Source** parameter.
- an indicator of the source for each value.

An example of the SM Configuration tab is displayed in [Figure 169](#).

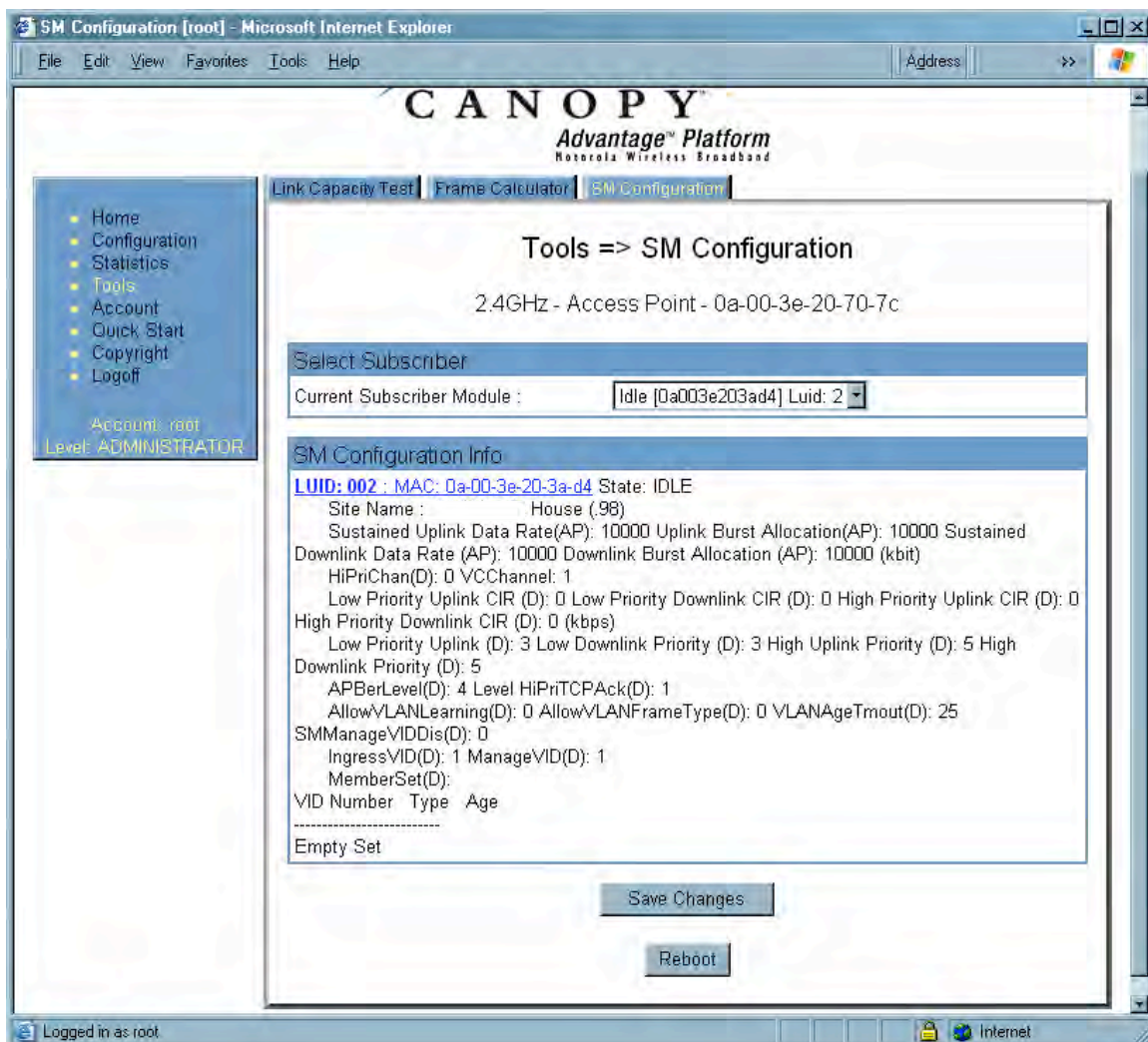


Figure 169: SM Configuration tab of AP, example

Indicators for configuration source are explained under [Session Status Tab of the AP](#) on Page 193.

27.7 USING THE BER RESULTS TOOL (SM, BHS)

Radio BER is now supported on hardware scheduling. When looking at Radio BER data it is important to note that it represents bit errors at the RF link level. Due to CRC checks on fragments and packets and ARQ (Automatic Repeat request), the BER of customer data is essentially zero. Radio BER gives one indication of link quality, along with received power level, jitter, and link tests.

BER is only instrumented on the downlink, and can be read on each SM's Tools>BER Results page. Each time the tab is clicked, the current results are read, and counters are reset to zero. An example of the BER Results tab is displayed in [Figure 170](#).

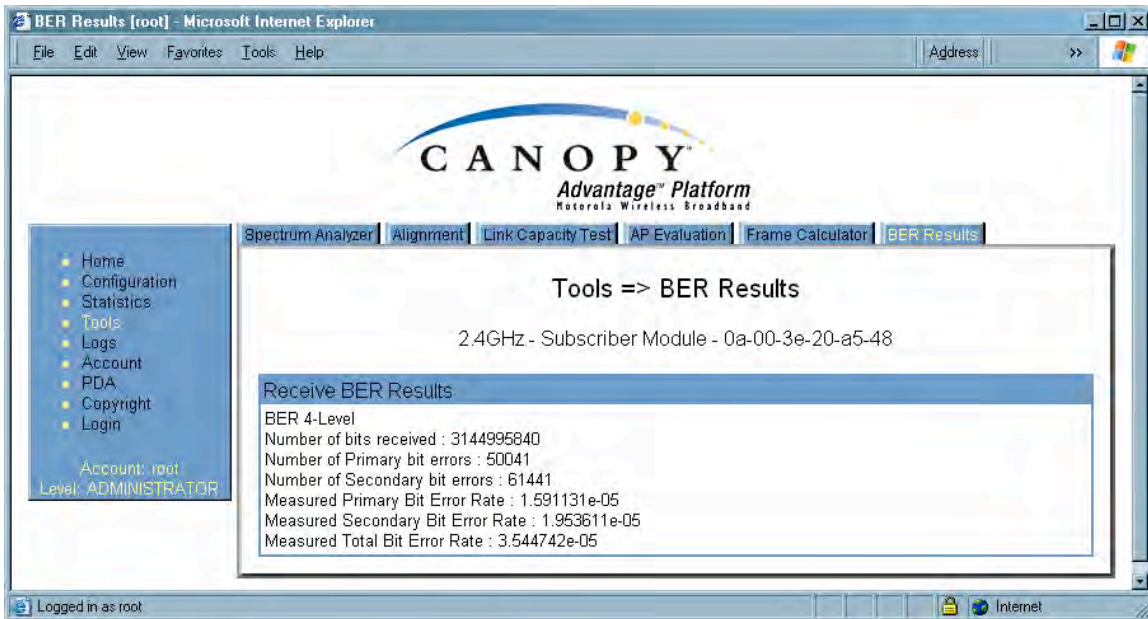


Figure 170: BER Results tab of SM, example

The BER Results tab can be helpful in troubleshooting poor link performance. The value in the **Measured Total Bit Error Rate** field represents the bit error rate (BER) in the RF link since the last time the BER Results tab was clicked.

The link is acceptable if the value of this field is less than 10^{-4} . If the BER is greater than 10^{-4} , re-evaluate the installation of both modules in the link.

The BER test signal is only broadcast by the AP (and compared to the expected test signal by the SM) when capacity in the sector allows it – it is the lowest priority for AP transmissions.

28 MAINTAINING YOUR CANOPY SOFTWARE

Canopy provides release compatibility information and caveats about each release.

28.1 HISTORY OF SYSTEM SOFTWARE UPGRADES

28.1.1 Canopy Release 8 Features

Canopy Release 8 introduces the following new features:

- Scheduling Limited to Hardware Scheduler
- Tiered Permissions and User Accounts
- GUI Customizable via CSS
- Links to SM GUI via Session Status and Remote Subscribers Tabs of AP
- Dynamic Frequency Selection (DFS) v1.2.3 in All 5.4- and 5.7-GHz Modules
- Bit Error Rate (BER) Display with Hardware Scheduler
- AP SNMP Proxy to SMs
- Translation Bridging (MAC Address Mapping)
- SM Isolation
- Management Access Filtering for SM
- Source IP Management Access for AP and SM
- Optional DHCP Configuration of Management Interface

28.1.2 Canopy Release 8 Fixes

Canopy Release 8 includes the following fixes:

- Management Web (http) Access Lockup Fix
- Enforcement of Ethernet Link Speed Setting
- MIBs Support Only Applicable Objects

28.2 HISTORY OF CMMmicro SOFTWARE UPGRADES

- Canopy currently supports CMMmicro Releases up through Release 2.2.

28.3 TYPICAL CONTENTS OF RELEASE NOTES

Canopy supports each release with software release notes, which include

- description of features that are introduced in the new release.
- issues that the new release resolves.
- known issues and special notes for the new release.
- installation procedures for the new release.

28.4 TYPICAL UPGRADE PROCESS

In a typical upgrade process, proceed as follows:

1. Visit the software page of the Canopy web site.
2. Read the compatibility information and any caveats that Canopy associates with the release.

3. Read the software release notes from the web site.
4. On the basis of these, decide whether the release is appropriate for your network.
5. Download the software release and associated files.
6. Use CNUT to manage the upgrade across your network.

28.4.1 Downloading Software and Release Notes

All supported software releases, the associated software release notes document, and updated MIB files are available for download at any time from <http://motorola.motorola.com/canopy/support/software/>. This web site also typically provides a summary of the backward compatibility and any advantages or disadvantages of implementing the release.

When you click on the release that you wish to download, you are prompted for information that identifies yourself and your organization (such as name, address, and e-mail address). When you complete and submit the form that prompts for this information, the download is made available to you.

29 REBRANDING MODULE INTERFACE SCREENS

Distinctive fonts indicate

```
literal user input.  
variable user input.  
literal system responses.  
variable system responses.
```

The interface screens on each module display the Canopy or Canopy Advantage logo. These logos can be replaced with other logos using [Procedure 42](#).

The logo is a hyperlink and clicking on it takes the user to the Canopy web site. A different site (perhaps the operator's support site) can be made the destination using [Procedure 43](#).

To return a module to regular logos and hyperlinks, use [Procedure 44](#).

The logo at the top of each page is a key indicator to the user whether a module is Canopy or Canopy Advantage. If you choose to replace the Canopy logos, use two noticeably different logos so that users can continue to easily distinguish between a Canopy module and a Canopy Advantage module.

To replace logos and hyperlinks efficiently throughout your network, read the following procedures, write a script, and execute your script through the Canopy Network Updater Tool (CNUT).⁸ To replace them individually, use one of the following two procedures.

Procedure 42: Replacing the Canopy logo on the GUI with another logo

1. If the current logo is the Canopy logo, name your custom logo file on your computer `canopy.jpg` and put it in your home directory.
If the current logo is the Canopy Advantage logo, name your custom logo file on your computer `advantaged.jpg` and put it in your home directory.
2. Use an FTP (File Transfer Protocol) session to transfer this file to the module, as in the example session shown in [Figure 171](#).

⁸ See Using the Canopy Network Updater Tool (CNUT) on Page [409](#).

```
> ftp ModuleIPAddress
Connected to ModuleIPAddress
220 FTP server ready
Name (ModuleIPAddress:none): root
331 Guest login ok
Password: <password-if-configured>
230 Guest login ok, access restrictions apply.

ftp> binary
200 Type set to I
ftp> put canopy.jpg
OR
put advantaged.jpg
OR
put top.html
ftp> quit
221 Goodbye
```

Figure 171: Example ftp session to transfer custom logo file

3. Use a telnet session and the **addwebfile** command to add the new file to the file system, as in the example session shown in [Figure 172](#).



NOTE:

Supported telnet commands execute the following results:

- **addwebfile** adds a custom logo file to the file system.
- **clearwebfile** clears the logo file from the file system.
- **lsweb** lists the custom logo file and display the storage space available on the file system.

```

>telnet ModuleIPAddress
/-----\
C A N O P Y

Motorola Broadband Wireless Technology Center
(Copyright 2001, 2002 Motorola Inc.)

Login: root
Password: <password-if-configured>

Telnet +> addwebfile canopy.jpg
OR
addwebfile advantaged.jpg
OR
addwebfile top.html

Telnet +> lsweb

Flash Web files
/canopy.jpg      7867
free directory entries: 31
free file space: 55331

Telnet +> exit

```

Figure 172: Example telnet session to activate custom logo file

===== end of procedure =====

Procedure 43: Changing the URL of the logo hyperlink

1. Browse to `http://ModuleIPAddress/top.html`.
2. Save the page as an html file named `top.html`.
3. In the editor of your choice, open the file `top.html`.
4. Find the expression `http://www.canopywireless.com`.
5. Change `http://www.canopywireless.com` to the URL to which you want the browser directed when the user clicks the logo.
6. Save and close the file as `top.html`.
7. Use an FTP (File Transfer Protocol) session to transfer this file to the module, as in the example session shown in [Figure 171](#) on Page 450.
8. Use a telnet session and the `addwebfile` command to add the new file (`top.html`) to the file system, as in the example session shown in [Figure 172](#).

===== end of procedure =====

If you ever want to restore the original logo and hyperlink in a module, perform the following steps.

Procedure 44: Returning a module to its original logo and hyperlink

1. Use a telnet session and the clearwebfile command to clear all custom files from the file system of the module, as in the example session shown in [Figure 173](#) below.

```
>telnet ModuleIPAddress
/-----\
C A N O P Y

Motorola Broadband Wireless Technology
Center
(Copyright 2001, 2002 Motorola Inc.)

Login: root
Password: <password-if-configured>

Telnet +> lsweb
Flash Web files
canopy.jpg      7867
free directory entries: 31
free file space: 56468

Telnet +> clearwebfile
Telnet +> lsweb

Flash Web files
free directory entries: 32
free file space      64336 bytes

Telnet +> exit
```

Figure 173: Example telnet session to clear custom files

===== end of procedure =====

30 TOGGLING REMOTE ACCESS CAPABILITY

Based on your priorities for additional security and ease of network administration, you can deny or permit remote access individually to any AP, SM, or BH.

30.1 DENYING ALL REMOTE ACCESS

Wherever the No Remote Access feature is enabled by the following procedure, physical access to the module is required for

- any change in the configuration of the module.
- any software upgrade in the module.

Where additional security is more important than ease of network administration, you can disable all remote access to a module as follows.

Procedure 45: Denying all remote access

1. Insert the override plug into the RJ-11 GPS utility port of the module.
2. Power up or power cycle the module.
3. Access the web page <http://169.254.1.1/lockconfig.html>.
4. Click the check box.
5. Save the changes.
6. Reboot the module.
7. Remove the override plug.

RESULT: No access to this module is possible through HTTP, SNMP, FTP, telnet, or over an RF link.

===== end of procedure =====

30.2 REINSTATING REMOTE ACCESS CAPABILITY

Where ease of network administration is more important than the additional security that the No Remote Access feature provides, this feature can be disabled as follows:

Procedure 46: Reinstating remote access capability

1. Insert the override plug into the RJ-11 GPS utility port of the module.
2. Power up or power cycle the module.
3. Access the web page <http://169.254.1.1/lockconfig.html>.
4. Click the check box to uncheck the field.
5. Save the changes.
6. Reboot the module.
7. Remove the override plug.

RESULT: Access to this module is possible through HTTP, SNMP, FTP, telnet, or over an RF link.

===== end of procedure =====

31 SETTING UP A PROTOCOL ANALYZER ON YOUR CANOPY NETWORK

Selection of protocol analyzer software and location for a protocol analyzer depend on both the network topology and the type of traffic to capture. However, the examples in this section are based on free-of-charge Ethereal software, which is available at <http://ethereal.com/>.

The equipment required to set up a protocol analyzer includes:

- 1 hub
- 1 laptop computer with protocol analyzer software installed
- 2 straight-through Ethernet cables
- 1 Canopy power converter (ACPS110)

31.1 ANALYZING TRAFFIC AT AN SM

The IP address of the protocol analyzer laptop computer must match the IP addressing scheme of the SM. If the SM has DHCP enabled, then configure the laptop computer to automatically obtain an address. If DHCP is not enabled, then ensure that the laptop computer is configured with a static IP address in the same subnet as the SM.

The configuration for analyzing traffic at an SM is shown in [Figure 174](#).

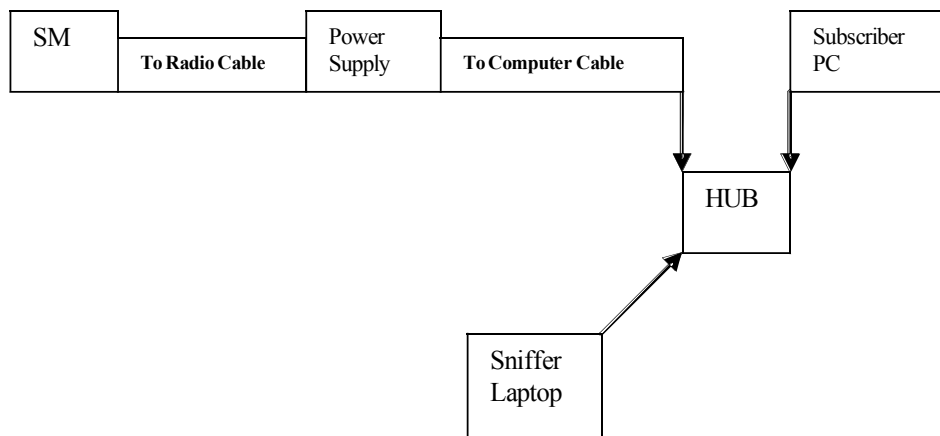


Figure 174: Protocol analysis at SM

31.2 ANALYZING TRAFFIC AT AN AP OR BH WITH NO CMM

The IP address of the protocol analyzer laptop computer must match the IP addressing scheme of the AP/BH. If the router is configured to be a DHCP server, then configure the laptop computer to automatically obtain an address. If DHCP is not enabled, then ensure that the laptop computer is configured with a static IP address in the same subnet as the AP/BH.

The configuration for analyzing traffic at an AP or BH that *is not* connected to a CMM is shown in [Figure 175](#).

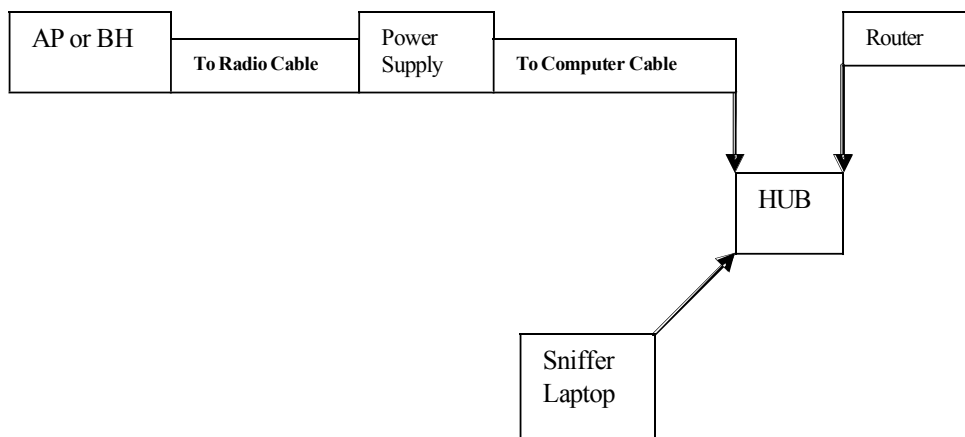


Figure 175: Protocol analysis at AP or BH not connected to a CMM

31.3 ANALYZING TRAFFIC AT AN AP OR BH WITH A CMM

The IP address of the protocol analyzer laptop computer must match the IP addressing scheme of the AP/BH. If the router is configured to be a DHCP server, then configure the laptop computer to automatically obtain an address. If DHCP is not enabled, ensure that the laptop computer is configured with a static IP address in the same subnet as the AP/BH.

Connect the hub to the J2 Ethernet to Switch of the port that is associated with the AP/BH. This example is of capturing traffic from AP/BH 111, which is connected to Port 1. The configuration for analyzing traffic at an AP or BH that is connected to a CMM is shown in [Figure 176](#).

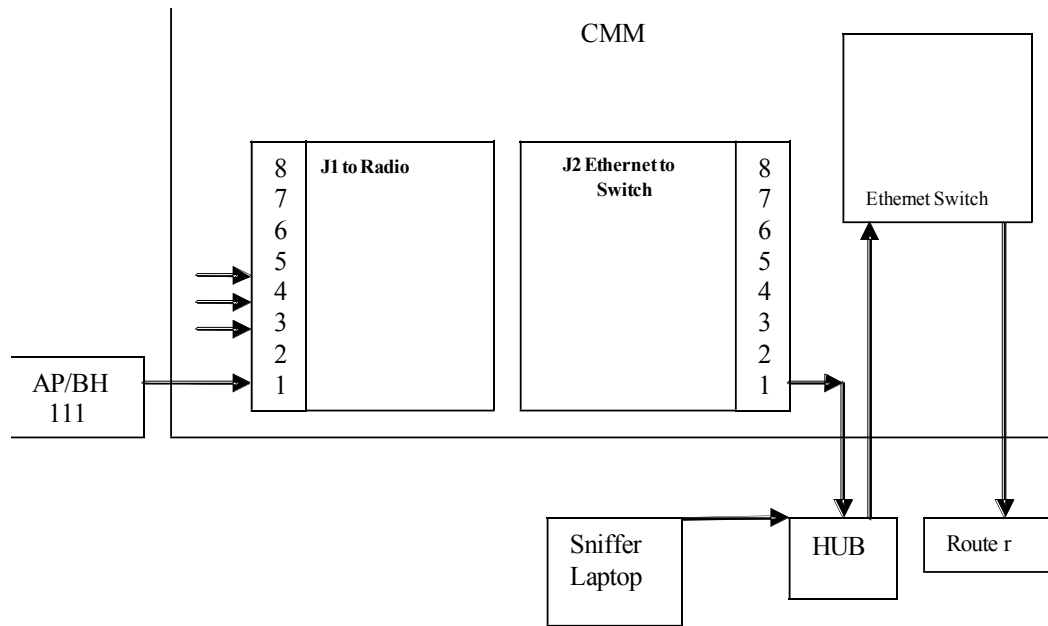


Figure 176: Protocol analysis at AP or BH connected to a CMM

31.4 EXAMPLE OF A PROTOCOL ANALYZER SETUP FOR AN SM

The following is an example of a network protocol analyzer setup using Ethereal[®] software to capture traffic at the SM level. The Ethereal network protocol analyzer has changed its name to Wireshark[™], but functionality and use remains much the same. This example is based on the following assumptions:

- All required physical cabling has been completed.
- The hub, protocol analyzer laptop computer, and subscriber PC are successfully connected.
- The SM is connected
 - as shown in [Figure 175](#) on Page 456.
 - to the subscriber PC and the AP.
- Ethereal software is operational on the laptop computer.

Although these procedures involve the SM, the only difference in the procedure for analyzing traffic on an AP or BH is the hub insertion point.

The IP Configuration screen of the example SM is shown in [Figure 177](#).

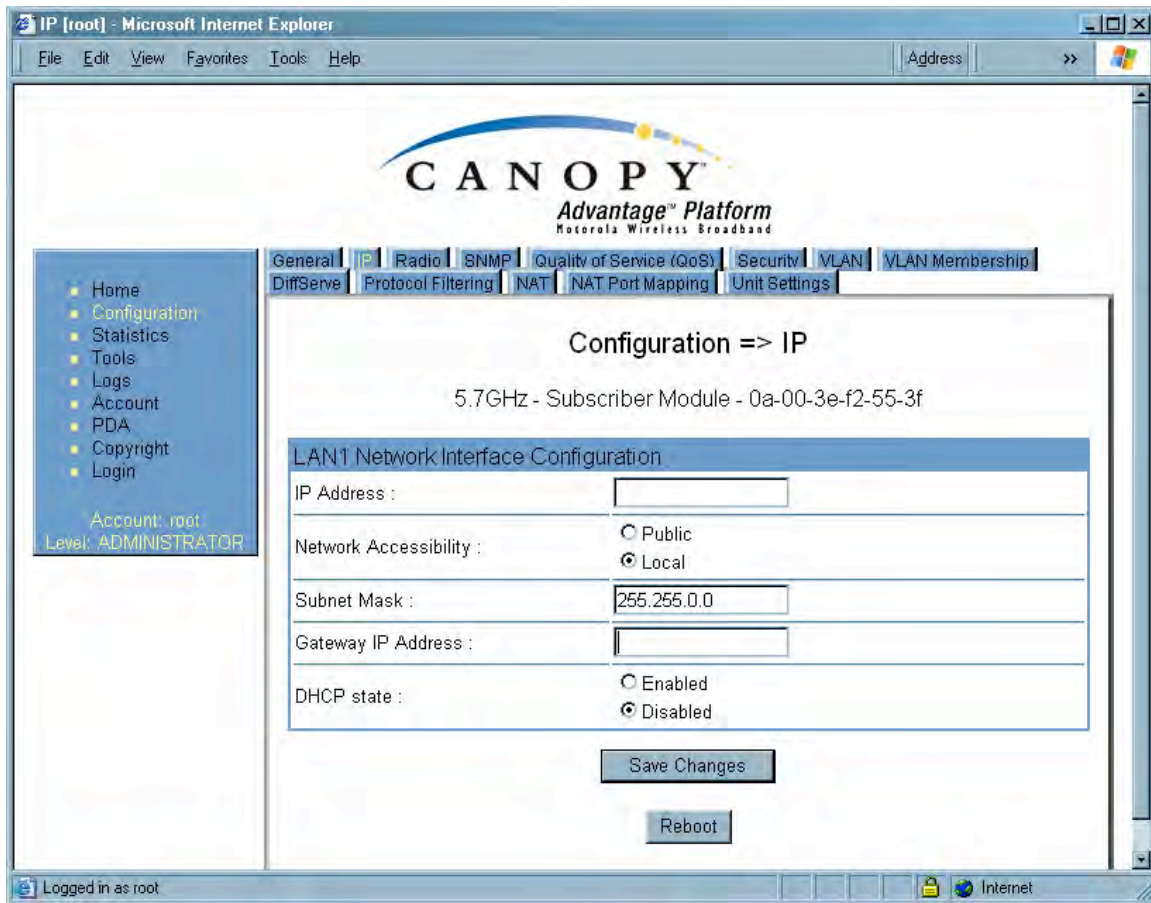


Figure 177: IP tab of SM with NAT disabled and local accessibility

Procedure 47: Setting up a protocol analyzer

1. Note the IP configuration of the SM.
2. Browse to **Start→My Network Places→Network and Dialup Connections**.
3. For **Local Area Connection**, select **Properties**.

RESULT: The Local Area Connections Properties window opens, as shown in [Figure 178](#).

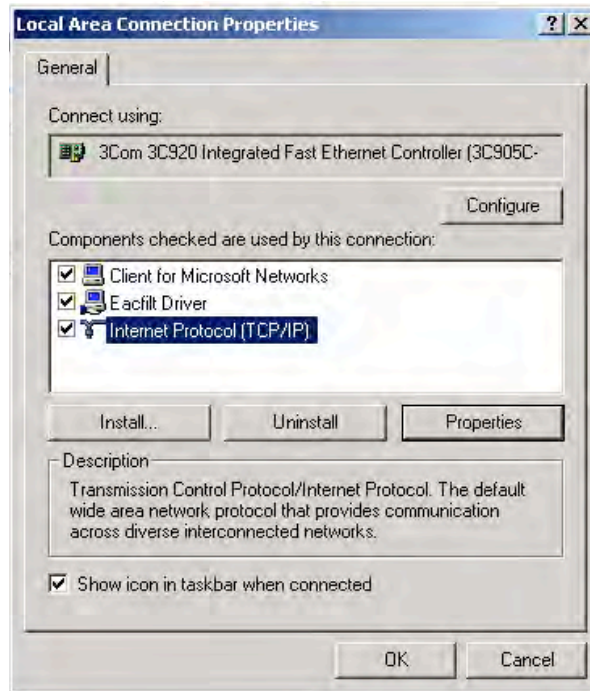


Figure 178: Local Area Connection Properties window

4. Select **Internet Protocol (TCP/IP)**.
5. Click the **Properties** button.

RESULT: The Internet Protocol (TCP/IP) Properties window opens, as shown in Figure 179.

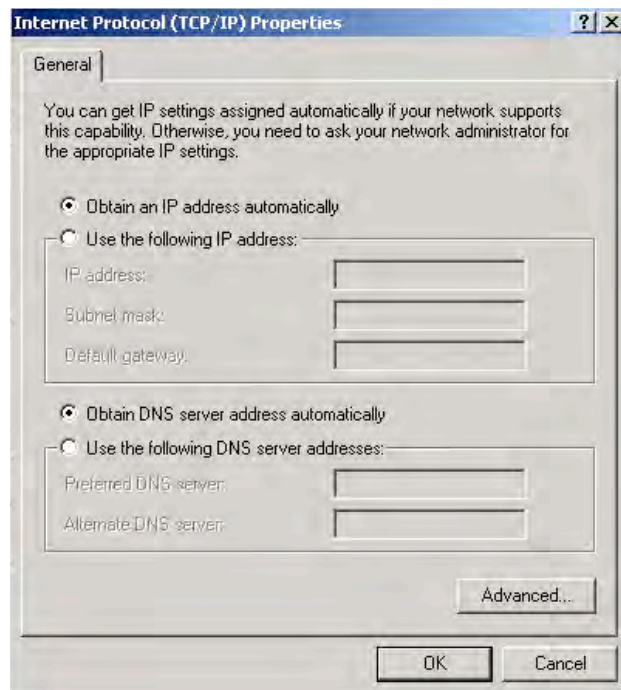


Figure 179: Internet Protocol (TCP/IP) Properties window

6. Unless you have a static IP address configured on the SM, select **Obtain an IP address automatically** for the protocol analyzer laptop computer, as shown in [Figure 179](#).
7. If you have configured a static IP address on the SM, then
 - a. select **Use the following IP address**.
 - b. enter an IP address that is in the same subnet as the SM.
8. Click **OK**.
9. Open your web browser.
10. Enter the IP address of the SM.

RESULT: The General Status tab of the SM opens, as shown in [Figure 66](#) on Page 198.
11. If the General Status tab did not open, reconfigure how the laptop computer obtains an IP address.
12. Verify that you have connectivity from the laptop computer to the SM with the hub inserted.
13. Launch the protocol analyzer software on the laptop computer.
14. In the **Capture** menu, select **Start**.

RESULT: The Ethereal Capture Options window opens, as shown in [Figure 180](#).

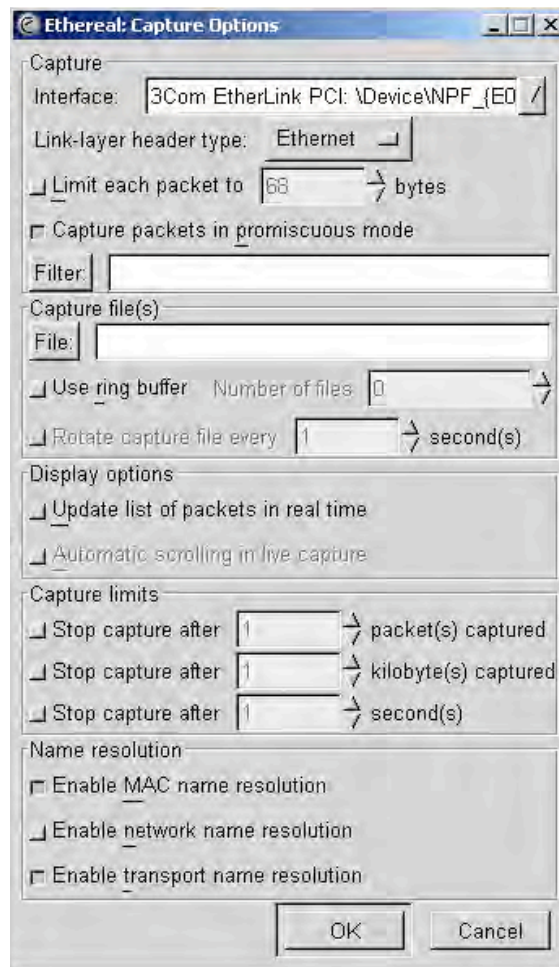


Figure 180: Ethereal Capture Options window

15. Ensure that the **Interface** field reflects the network interface card (NIC) that is used on the protocol analyzer laptop computer.
NOTE: Although you can select filters based on specific types of traffic, all values are defaults in this example.
16. If you wish to select filters, select them now.
17. Click **OK**.

RESULT: The Ethereal Capture window opens, as shown in [Figure 181](#).

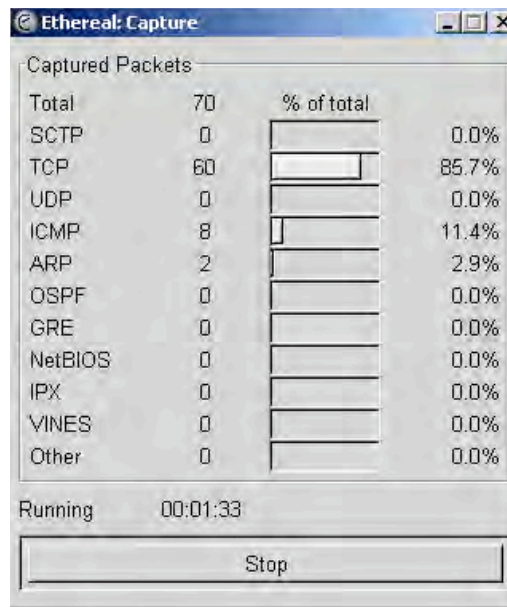


Figure 181: Ethereal Capture window

NOTE: This window graphically displays the types of packets (by percentage) that are being captured.

18. If all packet types are displayed with 0%, either
 - launch your Web browser on the subscriber PC for the IP address of the SM
 - ping the SM from the home PC.
19. If still all packet types are displayed with 0% (meaning that no traffic is being captured), reconfigure IP addressing until you can successfully see traffic captured on the laptop computer.
20. Whenever the desired number of packets have been captured, click **Stop**.
RESULT: When you stop the packet capture, the <capture> - Ethereal window opens, as shown in [Figure 182](#).

===== end of procedure =====

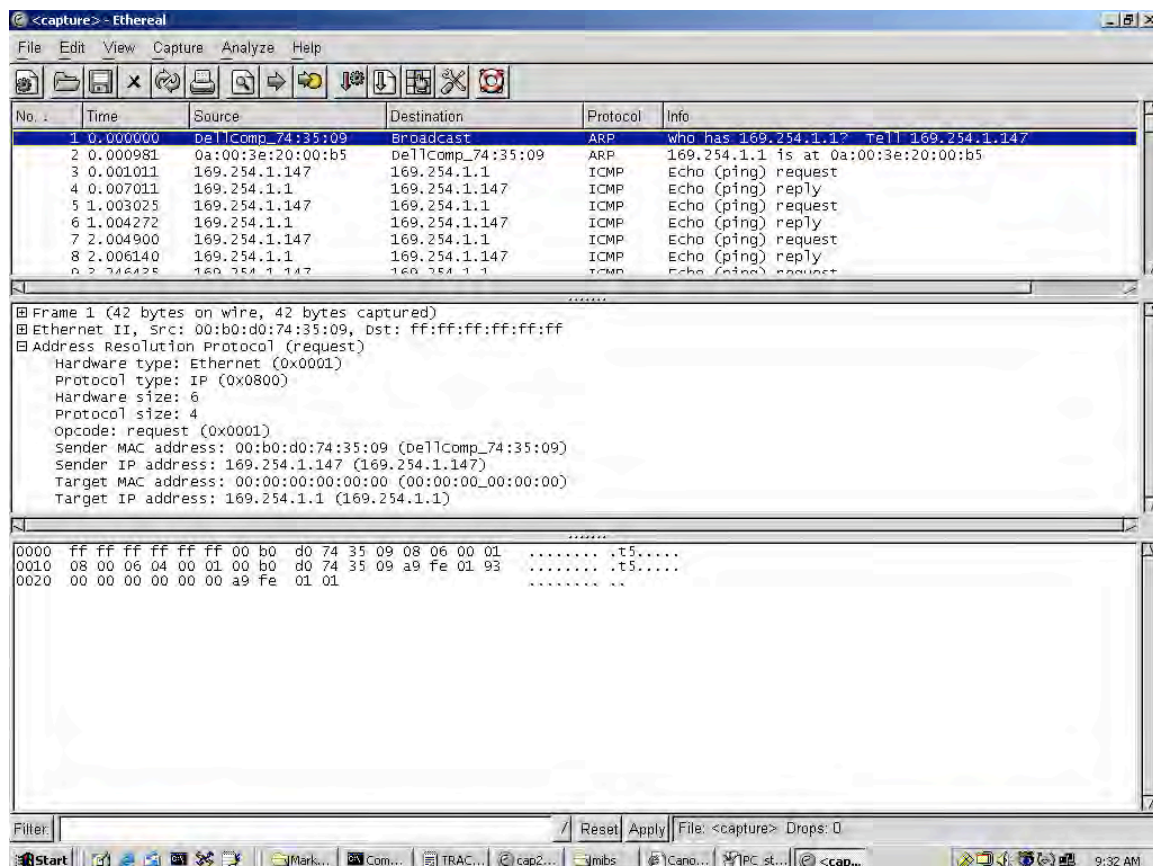


Figure 182: <capture> - Ethereal window, Packet 1 selected

This window has three panes:

- The top pane provides a sequenced summary of the packets captured and includes SRC/DEST address and type of protocol. What you select in this pane determines the additional information that is displayed in the lower two panes.
- The lower two panes facilitate drill-down into the packet that you selected in the top pane.

In this example, Packet 1 (a broadcast ARP request) was selected in the top pane. The lower two panes provide further details about Packet 1.

Another example is shown in [Figure 183](#).