XMTS T1 Access Concentrator

XMTS

System Configuration Guide

Network Release 3.5.x

Manual Version: 1.0.13

P/N: 9090-090

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Installation and Safety Information

The following information is provided to ensure safe operation of this equipment. Xtend Networks assumes no liability in the event that the customer fails to comply with the following safety precautions and warnings.

System Power-on

AC System

AC System Power

The XMTS power supplies are factory wired for 115 ~ 220 VAC (2 X 200W). A power cords are provided to connect the unit to the power source. To operate the XMTS, turn ON the power switch at the rear panel.

> Warning!
> **Set the fuse selector on the rear panel to the proper position (110V or 220V), before plugging in the power cord, or turning on the XMTS.**

DC System

DC System Power

1. When connecting DC power lines make sure to connect Ground line first.

2. When disconnecting DC power lines – make sure to disconnect ground last.

3.External Circuit Breaker (DuPole) should be used before connection/removal of the power cable to/from the XMTS.

4. FUSE Replacement – Make sure to use same type and value fuse !!

Note that UL requires use of AC ceramic high breaking capacity 10Amp fuse.

Earthing

General	**The minimum cross sectional area of the protective earthing should be 1mm^2 .**

T1 Cable

General	T1 cable to be used with XMTS T1 ports is only 26AWG communication cable (the common cable for this application).

Repairs Safety

General

1. Repairs of XMTS should take place only in Xtend Networks company service laboratories or in other Xtend Networks formally approved distributors service laboratories.
2. In case of field handling - Disconnect the unit from power supply for safest repair.
3. 2. In case of a -48VDC operated XMTS, the External Circuit Breaker (Du Pole) must be used before connection/removal of the power cable to/from the XMTS.

Safety Summary

Warnings:

Carefully connect units to the supply circuit so that wiring is not overloaded. For DC system connect Ground first (or remove Ground last for disconnect).

Read the installation instructions before connecting the system to its power source.

Secure all power cabling when installing this unit.

Do not touch the power supply when power cord is connected. For systems with a power switch, line voltages are present within the power supply, even when the power switch is off and the power cord is connected. For systems without a power switch, line voltages are present within the power supply when the power cord is connected

The device is designed to work with TN power systems

Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects will heat up when connected to the power and ground. This can cause serious burns or weld the metal object to the terminals

Repairs of XMTS should take place only in Xtend Networks company service laboratories or in other Xtend Networks formally approved distributors service laboratories. In case of field handling our general SAFETY warning is to disconnect the unit from power supply for safest repair.

Chapter 1. System Configuration Introduction

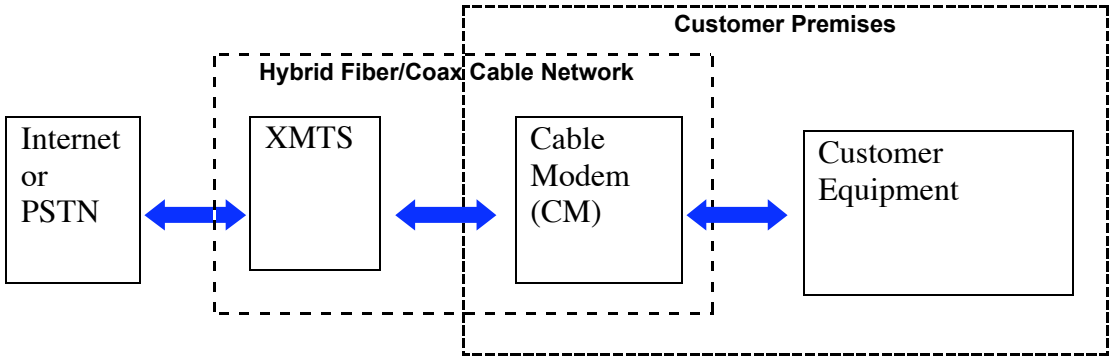
This guide is intended as a practical aid for the Technicians, Operators and Field Service Engineers responsible for quickly configuring Vyyo systems at most common installations. It is not intended as a substitute for a detailed reference manual.

NOTE: Througout this manual the terms modem and WMU are used interchangeably. The term "WMU" refers to "Wired/wireless Modem Unit". In some instances the actual modem model (V280, V301, etc.) may be used if the information is specific to that modem.

The term "XMTS" is used interchangeably with "WMTS". XMTS is an acronymn for "Xtend Modem Termination System" and will replace WMTS , "Wired/wireless Modem Termination System".

1.1 Overview

The system acts as an RF bridge between a network, typically the Internet or the Public Switched Telephone Network (PSTN) (at the head end) and customer equipment at the other end of the RF link.



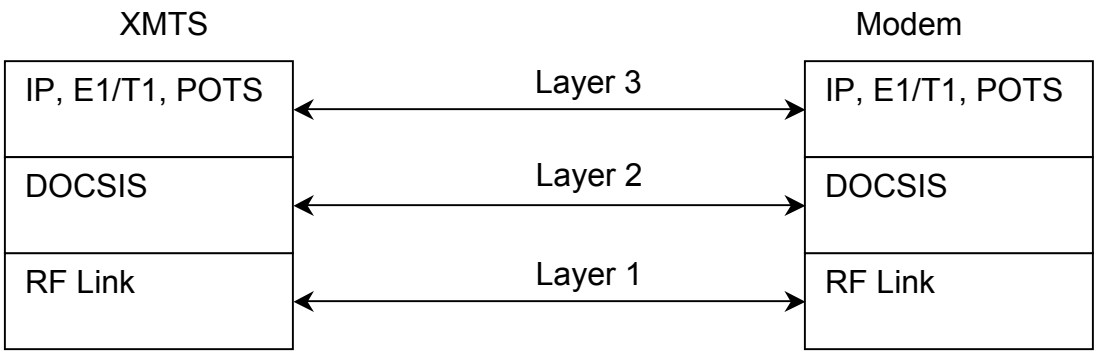
It may be visualized as a three layer protocol stack. The highest layer may be any one of the following: IP, E1/ T1 or PSTN.

All systems include the IP capability, which is required for network management. The E1/T1 capability requires an additional plug-in card at the XMTS (Cable/Wireless Modem Termination System) end and a corresponding cable/wireless modem at the downstream end.

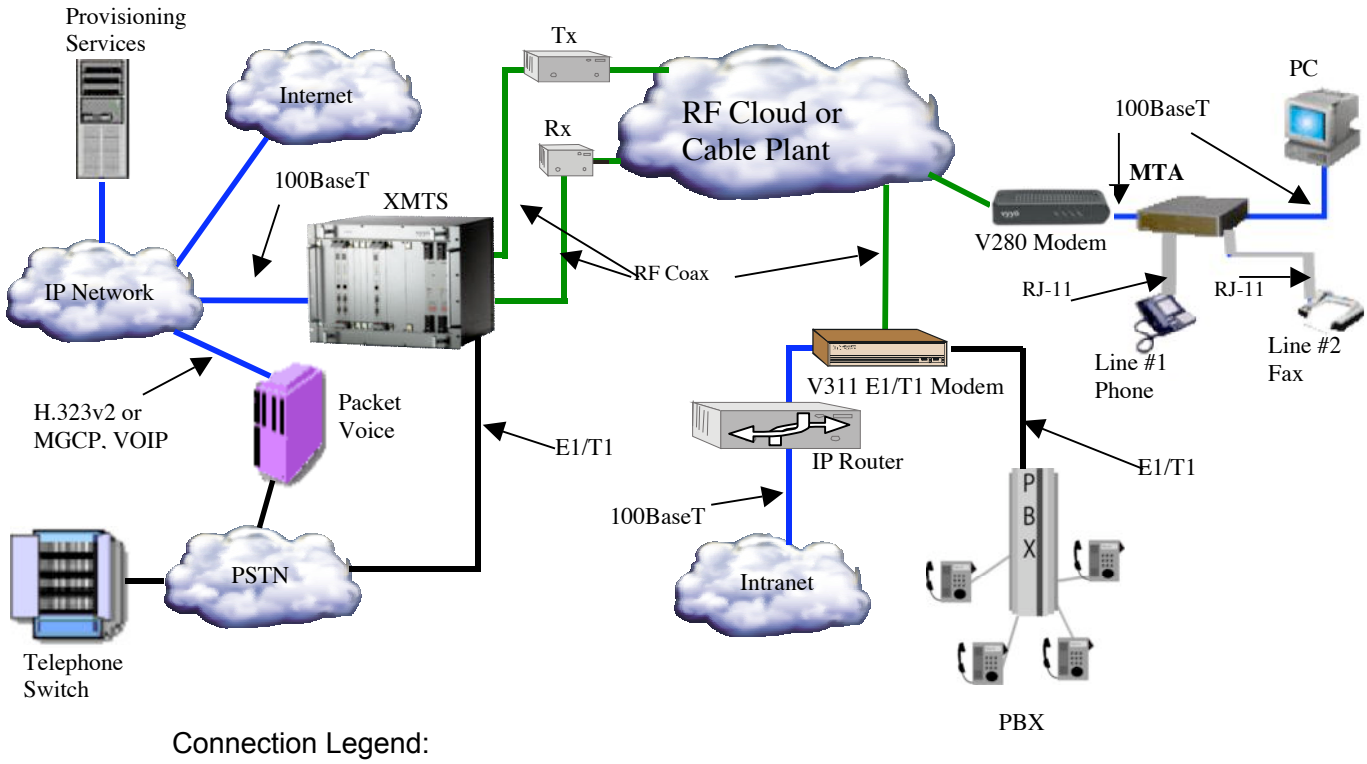
The data from the IP, E1/T1, or PSTN layer are encapsulated as DOCSIS frames which in turn are converted into RF signals and sent over the air or via an HFC (Hybrid Coax Fibre) plant between the XMTS and modem.

> **Important Note***: connectivity MUST be obtained at each layer, beginning with the lowest (RF link) in order to establish full communication.*

The following diagram illustrates this in the form of a three layer protocol stack:



This illustration shows how a complete system is connected:



Connection Legend:

Blue = 100BaseT Ethernet

Green = RF Coaxial cable

Black = T1/E1

Grey = RJ-11

There are different configuration requirements for each layer and different software tools accomplish this task. The configuration of the RF link is typically unique to each installation with the particular downstream and upstream frequencies, modulations and bandwidths being the critical parameters that must be set on the modem and XMTS.

Whereas there is no set standard for implementing an RF link, DOCSIS is a fully specified protocol as are the upper layers (IP, E1/T1 or PSTN). The following sections will describe the currently available system components (equipment) then detail how to configure each of them in turn.

1.2 Equipment Capabilities

There are several different modems available, the simplest being the DOCSIS modems with IP-only capability. All of the other modems use these as their foundation.

The XMTS used at the head end is the other major component. There is only one basic configuration, which is augmented with additional plug-in cards to accommodate E1/T1 and PSTN capabilities.

> *NOTE: The term XMTS was originally conceived as "extended" CMTS for use in a cable plant, hence the "X". This was followed by WMTS in which the "W" indicates a "wireless" CMTS. For practical purposes these terms are interchangeable and in some places the software uses the term "WMTS" when referring to any one of these systems.*

1.3 XMTS

The basic XMTS is a chassis with a power supply and a mid-plane PCI bus that accommodates plug-in cards at the front and rear. Two redundant power supply cards are provided at the right end of the front of the chassis.

The minimum required hardware configuration for an IP-only system consists of one "HOST" card and three "Universal" cards. One Universal card acts as a "Control and Forward" (C&F) card, one as the "Upstream" digital card and one as the "Downstream" digital card. These latter two cards are attached to RF cards in the rear slots. The E1/T1 capability is added by requires the Master4 card (which replaces the older HOST card), and adding one or two E1/T1 interface cards in the rear slots to provide 12 or 24 E1/T1 ports, respectively.

The HOST or Master4 card serves as the PCI bus arbiter and provides the system clock and timing. When the XMTS boots, the Master4 card initializes, then identifies the C&F card. The C&F card then directs the configuration and downloading of relevant application software. The C&F card is connected through a 100 BaseT Full Duplex connection to the switch or router and used to transport data (including management packets) through the system.

All Universal cards are the physically identical: the card attached to them in the rear slots and the application downloaded during initial startup determine the function of the card (Upstream, Downstream or Control & Forward).

In the rear slots, one Downstream and one Upstream RF interface card are required. Each of these corresponds to its companion Universal card. The "Quad" downstream card has four RF connectors and provides four downstream channels. The "Hex" upstream card has six RF connectors and provides six upstream channels.

> **Note:** *All Downstream cards have a fixed output frequency of 44 MHz which must be converted up per the local requirements.*
>
> *Upstream cards may be configured to receive any frequency from 5-65 MHz*

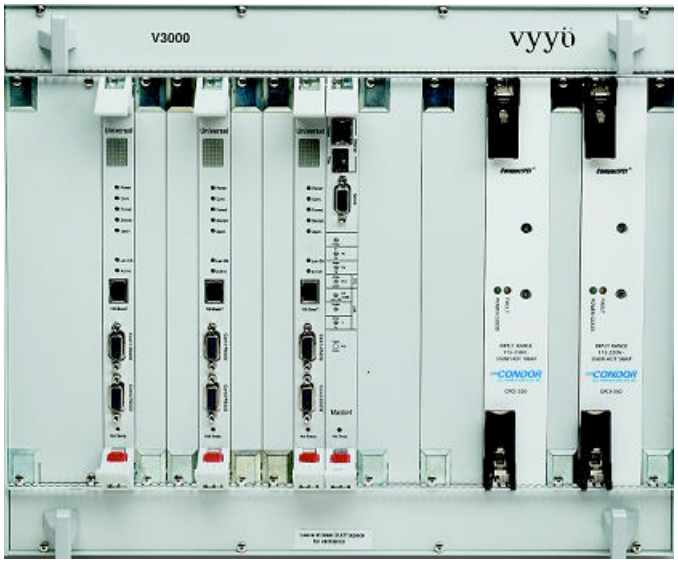


Figure 1-1. The XMTS Chassis with (from left to right) Upstream card, Downstream card, Control and Forward card, MASTER4 card, and Power Supplies shown.

The XMTS is mounted in a standard 19" by 6U high rack-mounted chassis. The chassis has a fan tray above the unit, bringing the total height required in the rack, to 8U. The eight bay chassis contains eight slots in the front, six slots in the rear, and a mid-plane card in between, used to interface the cards. Blank panels cover unused slots.

A standard 33 MHz, 32 bit Compaq PCI bus is used to transfer traffic and data between the system cards. The power supplies, Master4 card and the universal cards are inserted in the front slots of the chassis. The Quad Downstream, Hex Upstream, and E1/T1 cards are inserted in the rear slots of the chassis.

The ON/OFF power switch and the fuse are located in the rear of the power supply.

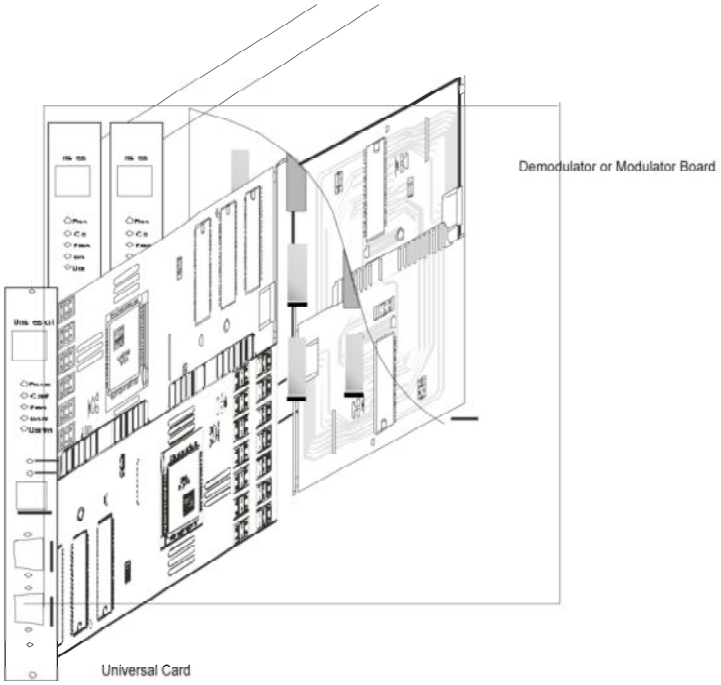


Figure 1-2. Midplane Cutaway View of XMTS; Universal Card Shown in Cutaway attached to an RF card.

1.4 Modems

1.4.1 Modems with DOCSIS and IP only

The V280 is Vyyo's "IP-only" modem. It uses an RJ45 connector (shown below) on the rear panel to provide IP connection to the customer's equipment. The V280 supports up to 63 data users simultaneously and provides privacy, authentication, service classification, prioritization, and traffic shaping.

The USB connector is not supported at this time. Check with Customer Support for updates as they become available if you need this capability.

Figure 1-3. V280 Rear Panel

Figure 1-4: V280 Front panel

Hyperterm (a Windows terminal application which permits either a serial or direct IP connection and is used in the following examples) or Telnet may be used to connect the modem to a computer to configure parameters in the modem, such as the downstream receive frequency. Any equivalent software utilities may be used.

A basic XMTS unit (without E1/T1 capability) is all that is required at the head end to complete an IP connection.

1.4.2 Modems with DOCSIS, IP and E1/T1

The V311 is a V280 modem (to provide the DOCSIS layer) with one E1/T1 interface (via an RJ45 connector on the front panel) added. In addition to IP connectivity, it supports circuit switched E1/T1 applications. It has one 100 BASE-T port for IP data and one E1/T1 port which can support up to 32/24 time slots.

The E1/T1 application supports framed or unframed E1/T1 services. In the case of unframed configuration, all 32/24 time slots (including time slot 0) are delivered over the air.

In the case of framed E1/T1 configuration, a full or fractional E1/T1 (any number up to 31/23 time slots) can be delivered.

The V311 modem is shown in this image:

Figure 1-5: V311 Modem

The V312 is identical to the V311 but has two E1/T1 interfaces instead of one.

The XMTS at the head end requires one or two E1/T1 interface cards (plugged into the rear slots, with the second E1/T1 card attached to the first one as a daughter board) to work with the V311 or V312. The E1/T1 connection will be terminated at one of the ports on this (rear) E1/T1 interface card(s). In addition, a separate software load is required.

All modems have four LED indicators, described below.

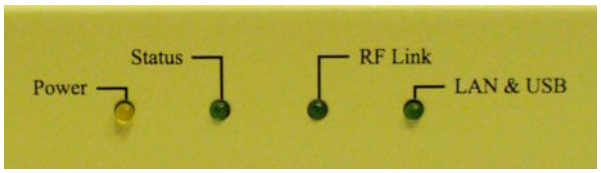


Figure 1-6. LED Indicators

LED Indicator	Function
POWER	• On = Power On • Off = Power Off • Flashing = Fatal Error
STATUS	• On = User has access to the Internet • Off = User has no access to the Internet
RF LINK	When **Status** LED is Off: • **RF** On = The downstream link is operational • **RF** Off = The modem has not yet begun downstream acquisition, or The downstream link is idle, or There is a problem with data reception • **RF** Flashing = Downstream link is being acquired When **Status** LED is On: • **RF** Flashing = Data is transferring in either in the Upstream or Downstream direction
LAN& USB	• On = The LAN link is operational • Off = The LAN link is not operational • Flashing = Data is transferring to or from the LAN

Table 1.1 LED Indicators, Functions, and Conditions

1.4.3 Modems with DOCSIS, IP and PSTN

The V313 is a V280 (for the DOCSIS layer) with a PSTN interface added: this physical interface (provided with the V313) comprises four RJ45 connectors, each of which connects to a special cable terminated in four RJ11 connectors, allowing a total of sixteen PSTN devices to be connected.

The XMTS at the head end requires an E1/T1 card and a V5.2 AN stack (additional software available from Vyyo) to work with this unit. If you plan to deploy the V313 please contact your Vyyo representative.

1.4.4 Modems with DOCSIS and IP Only With Built in UHF Radio

The V284 modem is a basic V280 modem integrated with a built-in UHF radio that provides an upstream RF output in the 710-716 MHz range. Internally the V284 has a factory set intermediate frequency of 44MHz which is converted up to yield an appropriate upstream frequency (This is preset at the factory for 700MHz in the United States).

The downstream frequency ranges from 740-746MHz. Note that the RF setup of this radio requires appropriate preplanning owing to the complexity introduced by the internal UHF radio. Please reference the UHF System Installation Guide and/or your local system engineer.

1.5 Modem Capabilities Matrix

Modem Model	Modem Hardware	Connectivity	Additional XMTS Cards required	Description
V280	V280	IP	none	The basic DOCSIS modem
V311	V280 plus E1/T1 card	IP, E1/T1	E1/T1 interface card and Master4 card	A V280 modem with one E1/T1 interface (one RJ48 connector on the front which can handle one E1 or T1 line)
V312	V280 plus E1/T1 card	IP, E1/T1	E1/T1 interface card and Master4 card	A V280 modem with two E1/T1 interfaces (two RJ48 connectors on the front which can handle one E1 or T1 line each)
V313	V280 plus internal PSTN card	IP, PSTN	E1/T1 interface card and Master4 card with additional V5.2 AN stack	A V280 modem with a built-in PSTN interface (four RJ45 connectors each of which attaches to four RJ11 POTS connectors)
V284	V280 plus internal UHF radio	IP	none	A V280 modem with an internal UHF radio for communication in the 700MHz range – special RF configuration is necessary. Please see the UHF System Installation Guide.

Chapter 2. Configuration Overview

This section of the System Configuration Guide features a short overview of each component/layer of the System including the XMTS and the modems. The last section is a summary presented as a matrix that shows the relationships between the various tools and files. The components and layers are described below.

- Network Servers
  - DHCP Server
  - TFTP Server
  - Time of Day (ToD) Server
- RF Link Layer
- DOCSIS Layer

2.1 Network Servers

The following servers are required for successful completion of modem initialization. They will be accessed by the modem and the XMTS at specific points during the registration and installation process.

2.1.1 DHCP Server

This server binds the modem's MAC address to both its Network IP address and its configuration (or "boot") file, which contains several important system specific parameters required for the modem to communicate with the XMTS. Viewing this information can help in troubleshooting any problems which may occur.

2.1.2 TFTP Server

This server downloads the selected configuration file to the modem during the registration process when the modem requests it. It also downloads files and configuration information to the XMTS. This information is used for initial (first time) startup and for troubleshooting.

2.1.3 Time-of-Day (TOD) Server

This server provides the Time of Day to the modems and the XMTS. It allows the XMTS and the modem to coordinate their timing.

2.2 RF Link Layer

This network layer is unique for each installation and depends on the available frequencies, the frequency plan, the specific hardware used for the installation, and other factors.

Your System Engineer must develop a detailed system plan that accounts for each of these variables. This plan must include the assignments of downstream frequencies, modulations (and other RF parameters) and upstream channel IDs assigned to the various modems deployed in the network. If the modems are to be used with E1/ T1 connections, all related parameters, especially QoS (Quality of Service, also referred to as Class of Service) parameters, also need to be defined (these are discussed later in this document.)

> *NOTE: The methods to define these factors are unique to each customer and are outside the scope of this document. They are part of the site preparation and pre-planning, including any "overbooking" scheme that may be desired. Please consult your Vyyo representative or system integrator for assistance.*

The Downstream and Upstream frequencies, modulations and bandwidths MUST be pre-determined in order to proceed with the configuration of the XMTS and the modems. Each modem must be assigned to a specific XMTS Upstream Channel (the upstream channel is referenced by its Channel ID which identifies the physical port.) The Upstream channel must be configured for a specific frequency, modulation and bandwidth or symbol rate.

> *NOTE: The XMTS must be configured to use the correct Upstream and Downstream parameters. This is done using the Vyyo Configuration tool.*

It also recommended that each modem is assigned to a particular Downstream channel (or set of channels.) The modem can use Downstream channel discovery, however; it is typically not used since it takes much longer to discover the correct frequencies.

Using pre-determined frequencies also allows greater control over the RF frequency assignments and can distribute network bandwidth more efficiently. A range of frequencies can be defined in the modem configuration file to cover all customer assigned bands and to minimize future re-configuration.

> *NOTE: The modem's Downstream ferequency is preset at the factory but may be changed on the modem by using a direct Telnet connection. See Section 5.4 Setting the Modem's Downstream Frequency for details.*

2.3 DOCSIS Layer

The most important items that must match are:

The XMTS Downstream Frequency and the modem Downstream Frequency

The XMTS Upstream Channel ID and the modem Upstream Channel ID (their associated parameters must also match.)

First, the modem searches for a signal at its preprogrammed Downstream Frequency. Once having locked to that downstream channel, the modem receives upstream channel descriptors (UCDs) from the XMTS that describe the available upstream channels.

> *NOTE: The XMTS must be configured to construct the UCDs so that they correspond to the site preplan. Use the **Vyyo Config Tool** to accomplish this if any changes are required.*

The modem then enters a protocol exchange that requires data be transmitted from the modem to the XMTS via an Upstream Channel using its associated Channel ID (designating the physical interface on the RF Interface card), and the correct frequency, modulation and bandwidth or symbol rate.

> *NOTE: A modem configuration file which respecifies these parameters is downloaded to the modem after "ranging" (described below) is complete . This file is also referred to as the modem "boot" file. All further communication done by the modem uses the parameters specified in this file. The modem configuration file is modified using the **WMUconfigFileEditor** tool. (WMU stands for Wireless Modem Unit.)*

This protocol exchange allows the modem to 'range' (adjust its timing and power level so that it can work successfully with all of the other modems on line at this time.). After the ranging is finished, the modem has successfully established physical layer and Link or MAC layer connectivity with the XMTS. The XMTS is now capable of sending MAC layer packets such as DHCP and ARP requests required to complete the registration process.

2.4 IP Layer

Your System Engineer must devise a Network IP Plan. This is required in order to assign IP addresses to the XMTS and all the modems on the network. It must include the IP address of all the servers as well as the network mask and other network parameters.

After connectivity is established at the DOCSIS layer (discussed in Section 2.3 DOCSIS Layer), the modem is assigned to an IP address by using DHCP (Dynamic Host Control Protocol.) If using the ipLease tool as the DHCP Server, this is usually a static IP address defined in the DHCP setup file (CM.SRC.) This file binds the modem's MAC address to a particular fixed IP address. If using Windows 2000 Server Edition this binding is accomplished using its DHCP Administrative Tool, which may be installed at the user's option using the "netsh" command (follow the instructions provided with your server).

The DHCP server grants the "lease" on the IP address to the modem (i.e., tells the modem which IP address to use). The granted IP address is for SNMP connectivity within the Vyyo system; it is not offered as a public IPaddress to Vyyo equipment. However, if desired this can be done using the customer PC or Router as the modem will behave as Layer 2 bridge device.

For the ipLease DHCP Server tool, the CM.SRC file is an ASCII text file that may be edited using any text editor (such as Notepad). This document describes the configuration process using the ipLease tool. The changes are similar for other DHCP servers. Note that if another operating system, such as the Windows 200x Server, is used a DHCP server is often included. Check with your Vyyo representative to make sure the DHCP server is compatible.

> *NOTE: Before the modem can acquire an IP address, the XMTS must be configured with its own IP address This procedure is described later in this document in the section entitled Setting the XMTS IP Address. The XMTS IP address is specified in a different configuration file (regtree.rtr) which may be edited using the* ***wmtsConfigurationFileEditor*** *tool.*

After the modem successfully receives its IP address it contacts the TOD server to establish the time of day. Next, it contacts the TFTP server to download the modem configuration file, which specifies the final DOCSIS parameters for the modem. This file is also referred to as the modem "boot" file. All further communication done by the modem uses the parameters specified in this file. This file may cause the modem to change frequencies or reboot in order to reset some of its configuration parameters. The modem will acquire this file every time it is reset or restarted. Configuration changes to the modem configuration file (profile) will be done from the Operation center with out the need to visit the modem remote location for any setup change; These changes may include encryption, QoS., IP filters, downstream channel parameters. etc….

> *NOTE: the modem configuration file is modified using the* ***WMUconfigFileEditor*** *tool..*

During the final phase of the DOCIS registration process, the modem sends a registration message to the XMTS confirming that the configuration file was received. The XMTS retrieves a copy of the configuration file from the configuration file server TFTP root repository directory. The XMTS then compares the file from the server with the data from the modem to ensure that the modem will only use services for which it was authorized. The modem is then finally allowed to transmit real user data into the network, but only after the modem's configuration file values are crosschecked by the XMTS.

At this point, a data only modem will be successfully connected to the system.

2.5 E1/T1 Layer

After IP connectivity is established, E1 or T1 connectivity may be established. Note that in addition to installing an E1/T1 card into the XMTS chassis, E1 and T1 each require that different firmware be loaded into both the XMTS and the modem.

The E1/T1 configuration will require appropriate changes to the modem configuration file in addition to setting those configuration parameters used for a

standard IP-only modem. The same modem configuration file may be used for several modems provided the Downstream frequencies and the Upstream Channel ID are the same (i.e., same “profiles”).

The XMTS E1/T1 configuration needs to be modifed appropriately for every E1/T1 modem installed on the network. This is done using the Java™-based Vyyo Configuration tool. This tool configures the E1/T1 port on the modem to be connected (“bound’) to the correct E1/T1 port on the E1/T1 card plugged into the XMTS.

After this tool is used to bind the E1/T1 ports together and the standard modem provisioning is done, the installation is complete and the E1/T1 services in the modem are ready to be activated.

2.6 Configuration Tools and Files Matrix

Tool	Configured File or Device	Description
WMUConfigurationFileEditor	Modem Configuration file (e.g., "MIC_xxx.cfg", where xxx is some unique number.)	This file downloads to a modem during the registration process. It contains all the parameters required for the modem's operation in the DOCSIS network: upstream and downstream frequencies, QoS, etc. It is also call the modem "boot" file.
WMTSConfigurationFileEditor (any standard ASCII text file editor may also be used to edit the file)	Regtree.txt	Regtree.txt contains the permanent IP address of the XMTS. This tool is a convenient way to edit the file. However, when changing only a few lines such as the XMTS IP address, any text editor will work.
WMTSConfig	XMTS	Used to assign a temporary IP address to the XMTS and to download files to the XMTS. Specifically it must be used to download the compiled version of the Regtree.txt file to the XMTS. This is primarily used during initial setup.
Vyyo Configuration Tool	XMTS MIB database	This is a standalone JAVA based tool that can be accessed from the NMS. It is used to modify and configure many XMTS parameters. At present it is the preferred tool used to configure the XMTS operating parameters for an E1/T1 link.

Tool	Configured File or Device	Description
NMS (Castlerock)	XMTS or Modem MIB values (Typically for viewing only.)	A general purpose Network Management System for operating the network; also used to launch the Vyyo Configuration tool to configure and change XMTS parameters.
Any ASCII text editor, e.g., Notepad	CM.SRC	Used with ipLease (the DHCP server) to bind a modem's MAC address to its network IP address and its modem configuration file (downloaded during modem initialization) as well as other network parameters needed to configure the modem.
DHCPGen	CM.SRC	Converts the file to a format that ipLease can use
DHCP Server	modem	Sends the modem its network IP address and the name of its modem configuration file as well as other information needed to setup IP connectivity.
TOD Server	modem	Used to set the time of day in the modem and the XMTS
TFTP Server	modem and XMTS	Used to send the modem configuration or "boot" file to the modem during initialization; also used to load the XMTS application and configuration files
Telnet	Modem	Used to set the downstream frequency that the modem will scan to listen to the XMTS. Also used to set the RF offset if required.

Chapter 3. The Modem Initialization Process

To understand the configuration process, it is useful to understand the detailed steps the modem goes through during its initialization.

When the modem is first powered up, it must go through a fixed sequence of steps before it can exchange data with the network. To be successful, this requires the modem and the XMTS to be configured with various parameters.

These parameters should be defined in a Network RF Plan and a Network IP plan set up by your System Engineer. The three Network Servers (TOD, DHCP, and TFTP) must be installed and operational. The XMTS must be configured with the correct software and an IP address.

The modem's RF parameters must also be correctly configured. The modem must be configured with the correct software and its RF parameters must be set correctly. When all of this is done, the modem is ready to initialize itself when placed at the customer's premise.

Finally, after initialization, the modem's E1/T1 port must be "bound" (configured to connect) to the correct E1/T1 port on the XMTS. This step may be done last or pre-configured before the modem is at the customer's premise.

The following sections provide an overview of the modem initialization process.

3.1 Modem Initialization Sequence

All modems proceed through the following sequence of steps, each of which is described in more detail below. The completion of these steps establishes connectivity at the DOCSIS and IP layers. Connectivity for additional layers, e.g., E1/T1, may then be established for the V311 and V312 modems. The steps are:

- Power-On Self Test
- Downstream Synchronization
- Obtain Upstream Parameters
- Ranging
- Establish IP Connectivity
- Establish Time of Day
- Transfer Operational Parameters
- Registration
- Baseline Privacy Initialization

3.1.1 Power-On Self Test

The modem performs a self-check to ensure that its hardware is working properly.

3.1.2 Downstream Synchronization

The modem listens for downstream transmissions from the XMTS (which are broadcast at frequent intervals for exactly this purpose) according to its pre-configured or default frequency plan. This may be a single fixed frequency or a sequence of frequencies, depending on the Network RF Plan and/or the internal programming of the modem.

If the modem is programmed for a single fixed downstream frequency and fails to receive an XMTS downstream transmission after three attempts it switches to its additional backup frequencies. See Setting the Modem's Downstream Frequency for a description of how to set these parameters.

Synchronization is obtained when the modem locks onto the XMTS downstream signal and is able to recognize downstream SYNC messages which are periodically broadcast: these are crucial to calculating the time slots available for upstream transmission.

3.1.3 Obtaining Upstream Parameters

The modem must now wait to collect all the Upstream Channel Descriptors (UCDs) for all upstream channels that are connected to the current downstream channel.

3.1.4 Ranging

The modem then sends a "ranging request" message on one or more of the Upstream frequencies, corresponding to a UCD, at different power levels in an attempt to establish communication with the XMTS. Eventually the XMTS decodes a ranging request from the modem and sends a ranging response.

Ranging is now complete. Whenever the modem needs to send MAC layer data for IP to the XMTS it sends a "request" to the XMTS. The XMTS schedules a time slot for the modem and sends a "grant" message back to the modem that contains all the necessary information telling the modem when it can transmit data. A similar method is used to send E1 or T1 data except that the request sets up periodic time slots that the modem uses to transmit data.

3.1.5 Establish IP Connectivity

The modem uses the "request-grant" ("best effort") mechanism to send a standard DHCP request to the Network DHCP server. The server will recognize the modem via its MAC (Ethernet) address and assign it a temporary IP address. This response also contains the default gateway and the IP subnet mask. The IP addresses of the TFTP and ToD servers, and the name of the modem configuration file are also included. The response also includes the local time offset from Universal Coordinated Time (UTC).

Once the modem receives this response it sets its IP address to the designated value and uses the default gateway to talk to devices using its IP stack.

3.1.6 Establish Time of Day

The modem uses the ToD server address(es) just received to send a Time of Day request to the ToD server(s). This is combined with the time offset received in the DHCP response to calculate the current local time. The Time of Day is used by both the modem and the XMTS to timestamp logged events (accessible via the Network Management System).

3.1.7 Transfer Operational Parameters

The modem then requests the TFTP server to send the configuration (or "boot") file named in step (5) above during the establishment of IP connectivity. If the boot file specifies a different upstream channel and/or downstream frequency, the modem must repeat its initial ranging using this new upstream channel and/or downstream frequency.

3.1.8 Registration

In order to forward traffic into the network the modem must be "registered" with the XMTS. To register, the modem sends the XMTS its class of service (also called QoS for Quality of Service) and any other operational parameters it received in the configuration file as part of a Registration Request. As part of the registration process the modem calculates Message Integrity Check (MIC) values using the parameters specified in its configuration file. This must match the values given for those parameters in the configuration file itself.

3.1.9 Baseline Privacy Initialization (BPI)

If the modem is enabled to run BPI then encryption and decryption keys are established. All further data to or from the modem is now encrypted. The keys have a lifetime and are automatically reset to new values after a specified period which may be set by the operator using the NMS.

NOTE: BPI is required in order to support E1/T1

Chapter 4. Overview of the XMTS and Modem Configuration

This section provides an overview of the steps and tools necessary to configure both sides of the communications link (XMTS and modem) required to add a data modem or the data portion of a new E1/T1 modem to the network. Several different tools and files are used as described below.

1. Make sure that the three required servers are installed and operational: DHCP, ToD and TFTP. For details see Chapter 8, Installing Vyyo Servers for XMTS Operation. The failure of the modem to establish communication with any of these three servers will prevent the modem from completing the registration process.

1. Review the Network IP Plan and use it to assign an IP address to the XMTS, then make it permanent by following the procedure in the section Setting the XMTS IP Address.

2. Verify that the right software version is loaded into the XMTS as described in Appendix B. See the "readme" notes in the distribution software for the version number.

3. Review the RF plan for the network and configure the XMTS upstream and downstream channels accordingly using the procedures in Setting the Upstream Channel. It may not be necessary to configure new upstream and downstream channels when adding a modem; but if required, the Vyyo Configuration tool can be used to modify these parameters.

4. Review the RF Plan to find out which downstream frequency(ies) and upstream channel ID(s) the modem will use to communicate with the XMTS. Use the WMUConfiguration Editor (wmuConfigFileEditor.exe) to edit the modem configuration file that will be downloaded to the modem during the modem initialization sequence to reflect these choices and other needed parameters (e.g., QoS or Class of Service, Max Number of CPE, BPI Enable/Disable – required for E1/T1, etc.). If you know in advance that this modem will be used for an E1/T1 connection then additional edits may be made at this time as described in Chapter 6, Configuring a T1 Connection.

> ***NOTE:*** *One modem configuration file may be used for several modems if the same upstream channel ID and downstream channel are used by all the modems (i.e., same "profile"); thus, this step may not be required every time a new modem is added to the system.*

5. .

> ***NOTE 1****: Five T1s per 3.2MHz upstream channel using 16QAM modulation is the hard limit for the current system. Attempting to configure more T1s on an upstream channel than it can support will cause the modem initialization to fail. Consult your system engineer for advice on the maximum number of modems per upstream channel ID.*

6. Use the appropriate DHCP tool for your system to bind the modem's MAC address to its IP address and modem configuration file. If **ipLease** is used, edit and compile the CM.SRC file as needed. If Windows 200x Server Edition is used then set these values using the graphical user interface. These procedures are described in section 5.2.2, Windows 200x Server Edition: Modifying the DHCP Options

> ***NOTE****: this step is ALWAYS required when adding a modem*

7. Use the modem's Telnet server interface to set the modem to a permanent downstream frequency as described in Setting the Modem's Downstream Frequency. Having a permanent (fixed) downstream frequency (or set of frequencies) expedites the modem initialization process since the modem does not have to scan multiple downstream frequencies to find one being transmitted from the XMTS. This does, however, require some pre-planning of the network to pre-allocate different downstream frequencies to specific modems. Ask your System Engineer for details.

> ***NOTE****: this step is ALWAYS required when adding a modem with a fixed permanent downstream frequency*

8. If a T1 connection is being setup then use the procedures in Configuring a T1 Connection. Configure the XMTS upstream channel ID for E1/T1 operation and bind the XMTS upstream channel ID to the modem E1/T1 interface and to bind the modem's E1/T1 interface to a particular port on the E1/T1 card plugged into the XMTS (use the Vyyo Configuration tool for this procedure.)

> ***NOTE****: the Vyyo Configuration tool binding operation will ALWAYS be required when adding a T1 modem. This step can be done after the modem is installed at the customer's site.*

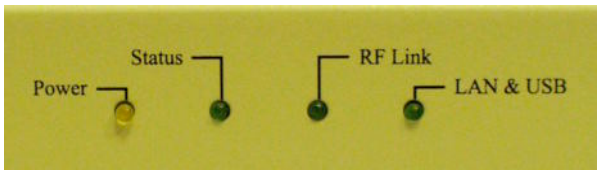
9. Install the modem at the customer site and connect it to the RF equipment, provide power to the modem and turn it on.

> ***NOTE****: This step is ALWAYS required when adding a modem*

10. If the modem is already on and its modem configuration file has been changed (to bind the E1/T1 ports), then the modem must be rebooted; although this happens automatically when the DHCP lease expires, it is more efficient to simply power cycle the modem (unplug and replug the power connector or switch the modem OFF then ON) to restart the modem initialization sequence.

11. If desired, connect the modem's internal Telnet server to a local computer system to observe the process on site and verify that the modem is working correctly.

    The POWER and STATUS LEDs should be lit and the LAN & USB, and RF Link LEDs should be flashing (one at a time) with activity:

12. 

If the Power, Status, RF Link, and LAN/USB LEDs are lit, then the modem has been successfully installed. If one or all of the lights remains unlit, see Chapter 9, Maintenance and Troubleshooting

Chapter 5. Adding a Modem to the XMTS

NOTE: These instructions are required for all modems. If you are adding a T1 modem then you must also perform the step in Chapter 6, Configuring a T1 Connection to finish the installation.

Use the instructions in this chapter to setup a data modem or the data portion of an E1/T1 modem and configure the XMTS to communicate with it over IP.

This chapter covers the following topics:

1. Editing the Modem Configuration File describes the steps necessary to setup the modem configuration file.

2. DHCP Settings for the Modem explains how to set (bind) the modem's IP address and configuration file using either ipLease or the Windows 200x Server Edition DHCP Server.

3. Configuring the XMTS describes how to configure the XMTS upstream, downstream and QoS parameters. At this time instructions are provided for using the Vyyo Configuration tool. Older systems use the Castlerock NMS SNMPc Version 5 Synoptic display interface to change XMTS parameters. Equivalent instructions for performing these changes are shown in Configuring the XMTS

4. Setting the Modem's Downstream FrequencySetting the Modem's Downstream Frequency describes how to set the modem downstream initial receive frequency via the modem's internal Telnet server.

5. Maintenance and Troubleshooting describes how to use the modem's internal Telnet server to view the modem's downstream and upstream status (current values) and verify correct operation.

5.1 Editing the Modem Configuration File

You will need to edit the modem configuration file to set the XMTS downstream frequency, upstream channel ID, concatenation and fragmentation capabilities, and QoS. This file will be downloaded to the modem during its initialization sequence.

> ***NOTE**: A separate modem configuration file is required for each set of upstream and downstream channels. Any modem may use any configuration file and the same file may be used by many modems; typically only five T1 modems are assigned to a single 3.2MHz upstream channel.*

5.1.1 Setting the Upstream Channel

Open the **WMUconfigFileEditor** to edit the modem configuration file to set the Downstream Frequency and Upstream Channel ID.

> ***Note:** If using ipLease, the modem configuration file is bound to the modem's MAC address in the CM.SRC file. If using Windows 200x Server Edition bring up the DHCP Administrative Tool to find the configuration file to the mode:*
>
> *Programs->Administrative Tools->DHCP*
>
> *For more detailed information, see section 5.2.2,*

Windows 200x Server Edition: Modifying the DHCP Options

From the main screen shown below select “General Parameters” and then choose “Upstream Channel ID”.

Right-click on “Upstream Channel ID” and select “MODIFY” to display the popup window in which you may set the value of the Upstream Channel ID.

Note: *The detailed parameters for each upstream channel must be set in accordance (see Setting the Upstream Channel)with the overall Network RF Plan – contact your system engineer for assistance. The Channel ID is the identifier for the physical RF port on the RF cards plugged into the rear of the XMTS. The ports are numbered as follows:*

Channel ID = card slot number + port number

Where the card slot number is zero for the leftmost upstream card (as viewed from the front of the XMTS) and increases by *the ifIndex of the card times eight for each additional card. The if index of the card can be found in the ifTable. Please contact Vyyo for the exact details of this configuration. Typically, the ifIndex increases from left to right by 1 for each card, from 0 to n, where n is the rightmost card. The ports are numbered from bottom to top on each card starting with one. Thus, the first card has ports numbered from 1 to 6 (since the Hex upstream card only has six ports even though a maximum of 8 are allowed) and the second card has its ports numbered from 9 to 14, etc. Contact Vyyo for Details.*

NOTE 2: *See Setting the Upstream Channel to set the receive frequency of an upstream channel.*

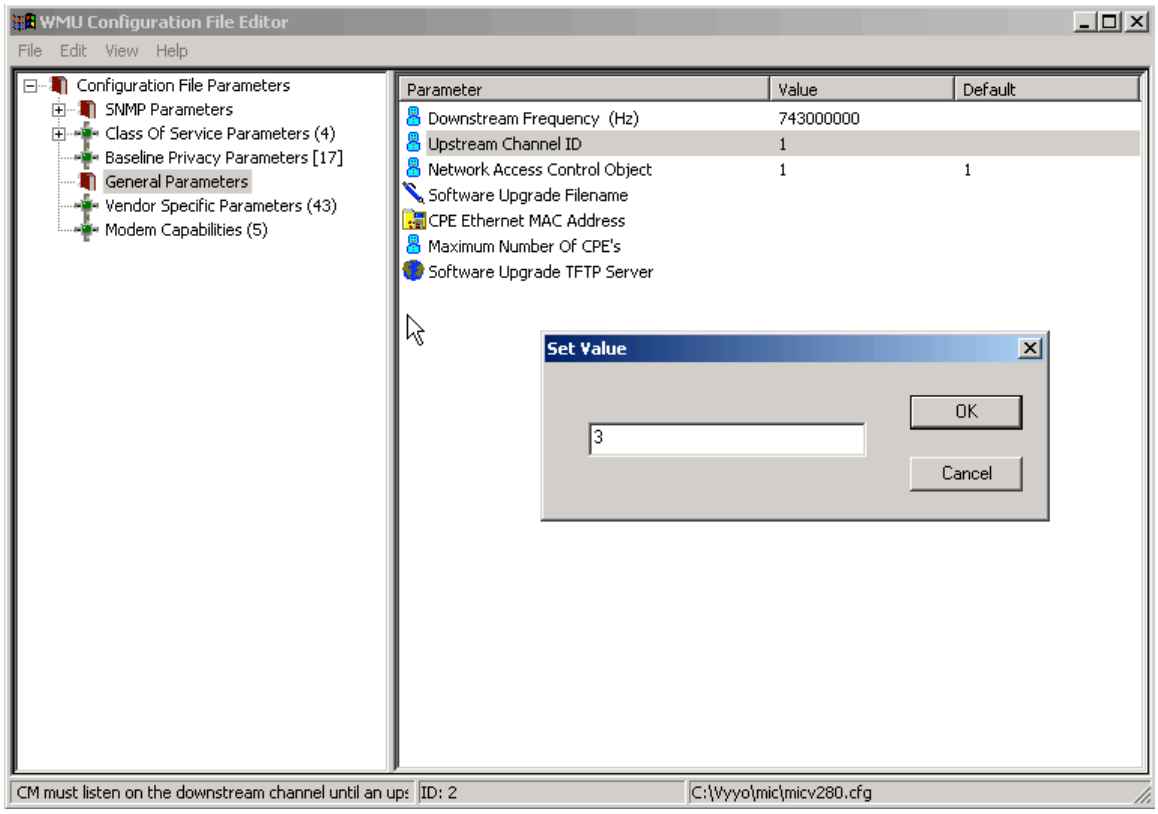


Figure 5-1: Setting Upstream Channel ID

5.1.2 Setting the Downstream Frequency

In the following example, the Downstream Frequency is changed to 743 MHz.

1. From the main screen shown below select “General Parameters” and then choose “Downstream Frequency”.

2. Right-click on “Downstream Frequency” and select “MODIFY” to display the popup window in which you may set the value of the downstream frequency in Hertz (note the six zeroes).

   NOTE: *This value will be specified by your system engineer.*

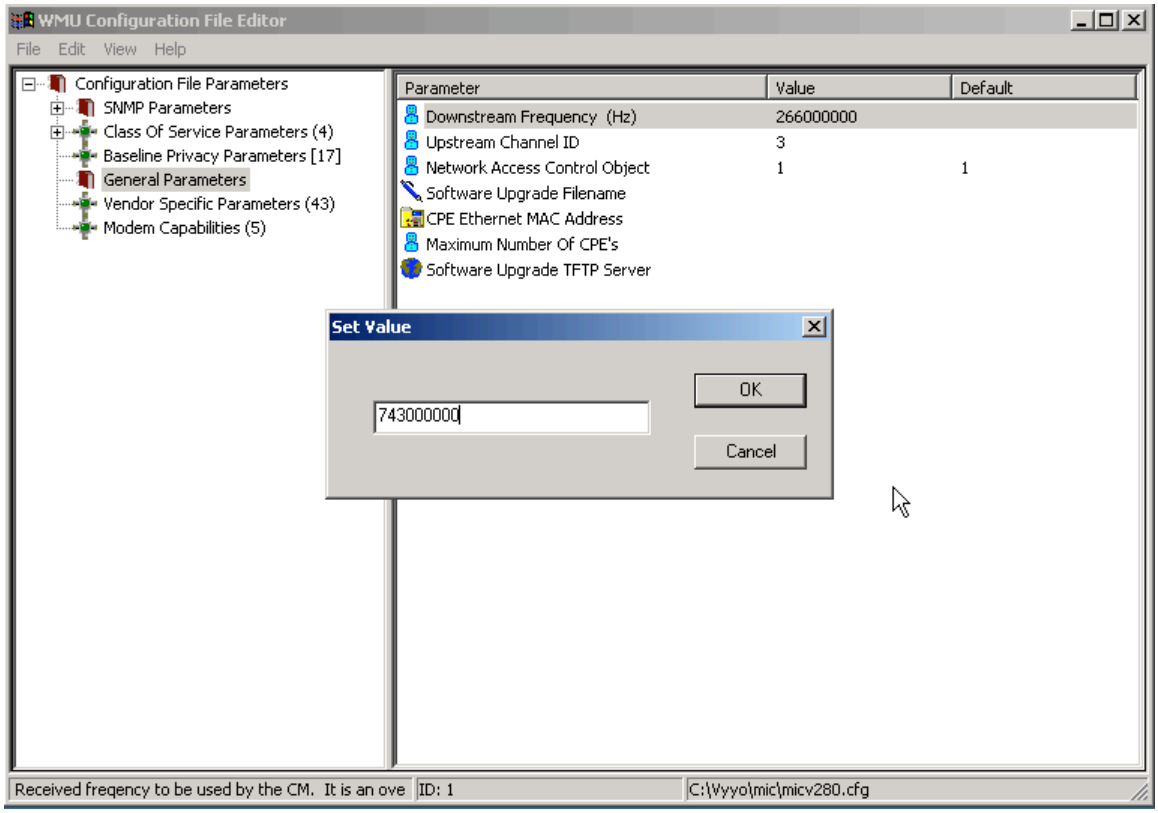


Figure 5-2 Setting Downstream Frequency

5.1.3 Setting Concatenation and Fragmentation Capabilities

1. Select “Modem Capabilities” and enable “Concatenation” and “Fragmentation” by setting them to “1” (select each one then right-click to view the “Set Value” dialog box, enter the value “1” then click “OK”).

NOTE: These should always be used unless specified otherwise by your system engineer.

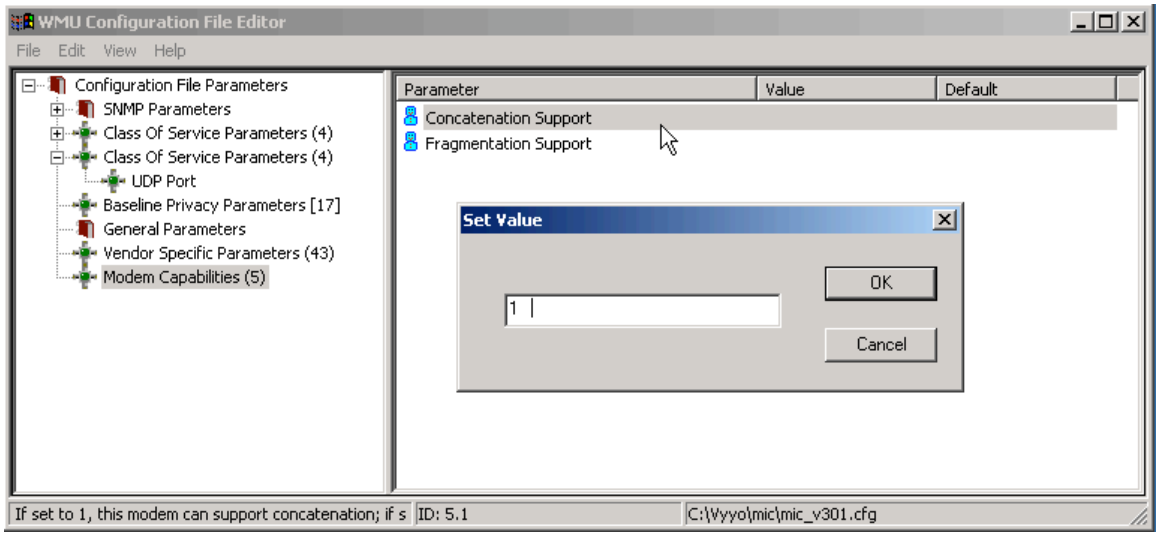


Figure 5-3. Setting the Concatenation Value

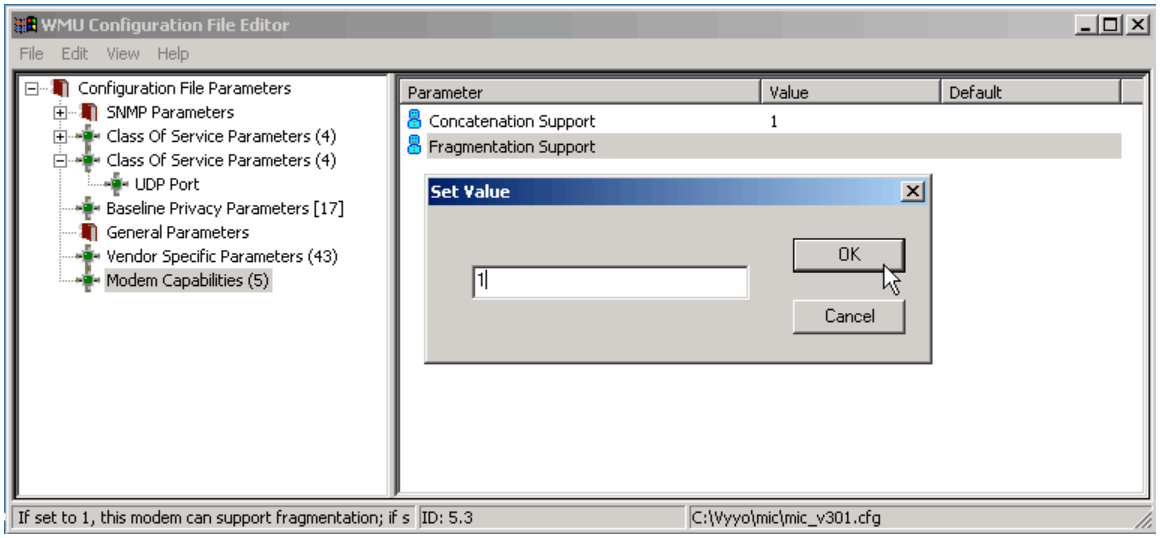


Figure 5-4. Setting the Fragmentation Value

5.1.4 Setting Upstream QoS (Class of Service) for IP Data

1. Select “Class of Service Parameters”

2. Right-click on “Maximum Upstream Rate” to display a selection of QoS profiles.

3. Choose the profile that is appropriate for the installation being done. Your system engineer can provide assistance based on the Network RF & IP Plan.

4. Select a profile in the left side of the popup window to display its corresponding parameters on the right side.

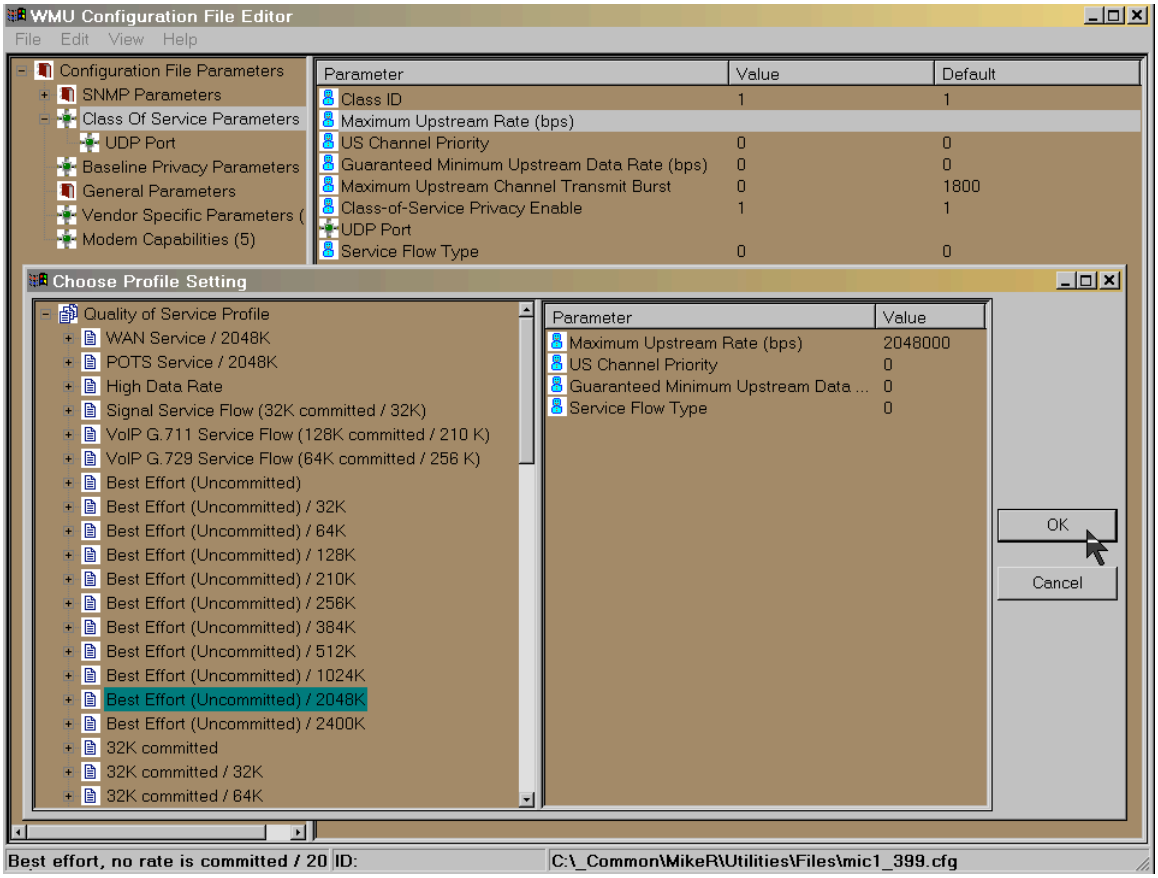


Figure 5-5. Setting Upstream QoS

5.1.5 Setting Additional Downstream and Upstream Channels

Use the “Vendor Specific Parameters” option to set additional downstream frequencies and upstream channels. Your system engineer should tell you if this is necessary. First enter the Frequency of the Additional Downstream Channel in Hertz and then enter the associated upstream channel ID (ID of additional Upstream channels). To add more downstream and upstream frequencies right click on the “Vendor Specific Parameters” option and select “Duplicate” to bring up another screen and enter the desired values.

A Downstream Scan Plan value of ‘9’ indicates that the downstream channel is set to a permanent fixed frequency (the advantage is that the modem initializes faster and doesn’t interfere unnecessarily with other traffic on the network).

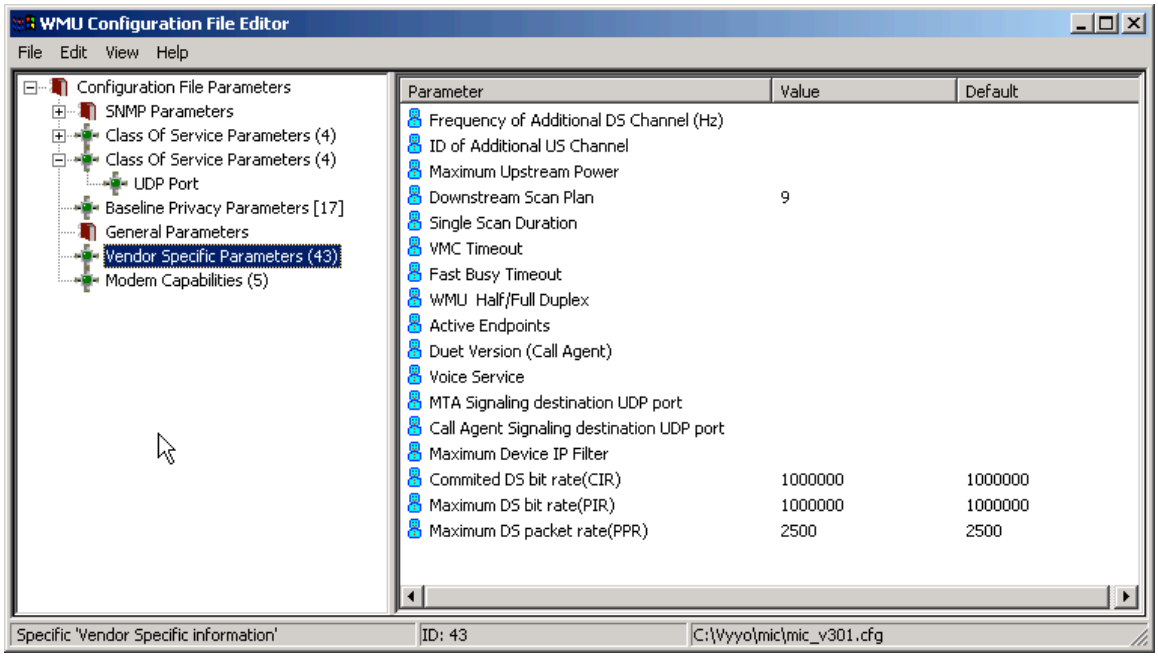


Figure 5-6: Using Vendor Specific Parameters to set additional DS/US pairs

5.1.6 Setting the Maximum Number of CPEs

It is advisable to set the maximum number of CPEs at this time by selecting and entering the desired value on the following screen:

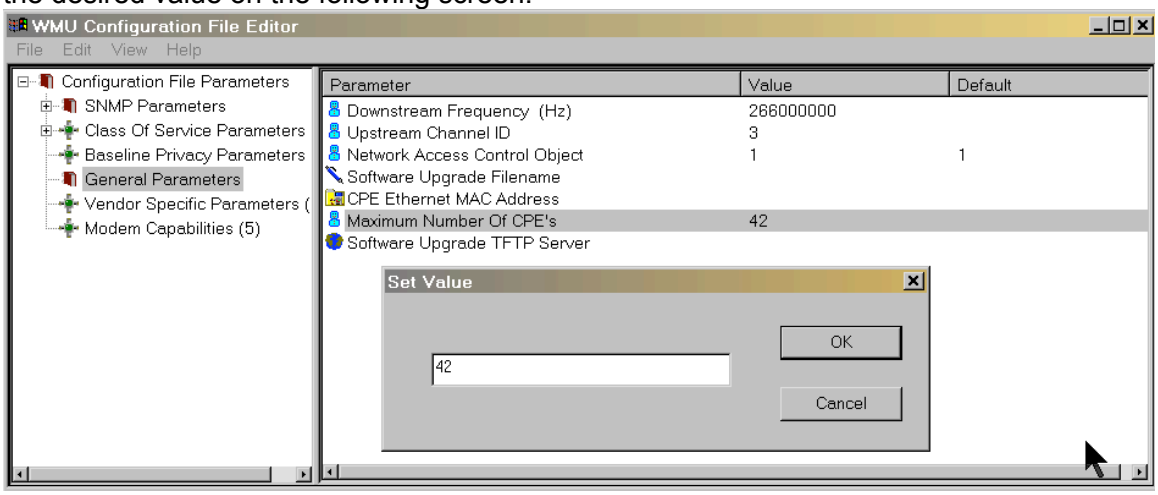


Figure 5-7: Setting the maximum number of CPEs

5.2 DHCP Settings for the Modem

The DHCP Server provides the IP address for the modem and also specifies which modem configuration file will be downloaded to the modem. In the following two sections, instructions are provided for setting up two different DHCP Servers: the ipLease DHCP Server and the Windows 200x Server Edition DHCP Server. Either of these (or any other) DHCP server may be used (but not multiple ones at the same time).

5.2.1 IpLease DHCP Server: Editing and running the CM.SRC File

***Note**: This section applies only if your configuration uses ipLease™ (purchased separately) as the DHCP server.*

Bind the modem MAC Address to its IP Address and modem configuration file by editing the CM.SRC file.

1. Locate the **CM.SRC** file – it is usually in the DHCP tool directory. In this example we are using ipLease as our DHCP server.

2. Open the **CM.SRC** file using any text editor.

***Tip:** Use Windows Notepad to edit this file.*

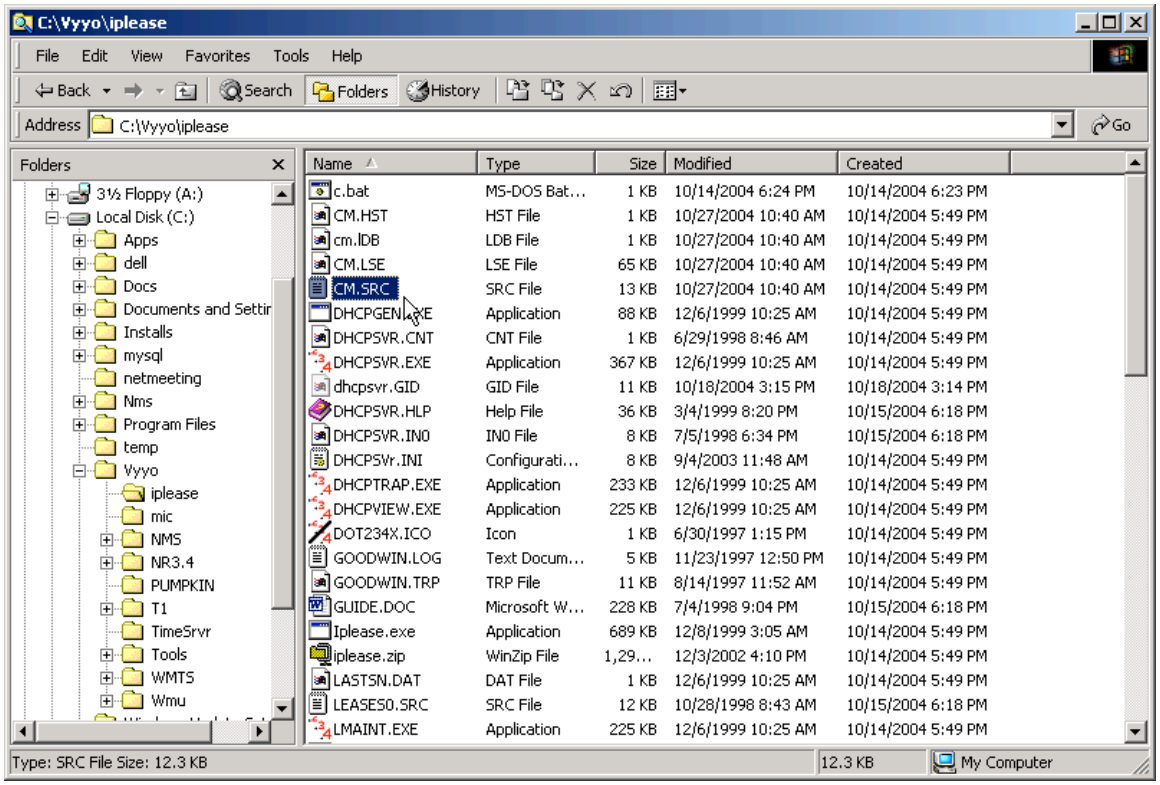


Figure 5-8. Location of CM.SRC file

3. This section of CM.SRC shows IP addresses of all the servers and their associated parameters. See the comments on each line of the file shown for details. Your system engineer can tell you how to configure these addresses.

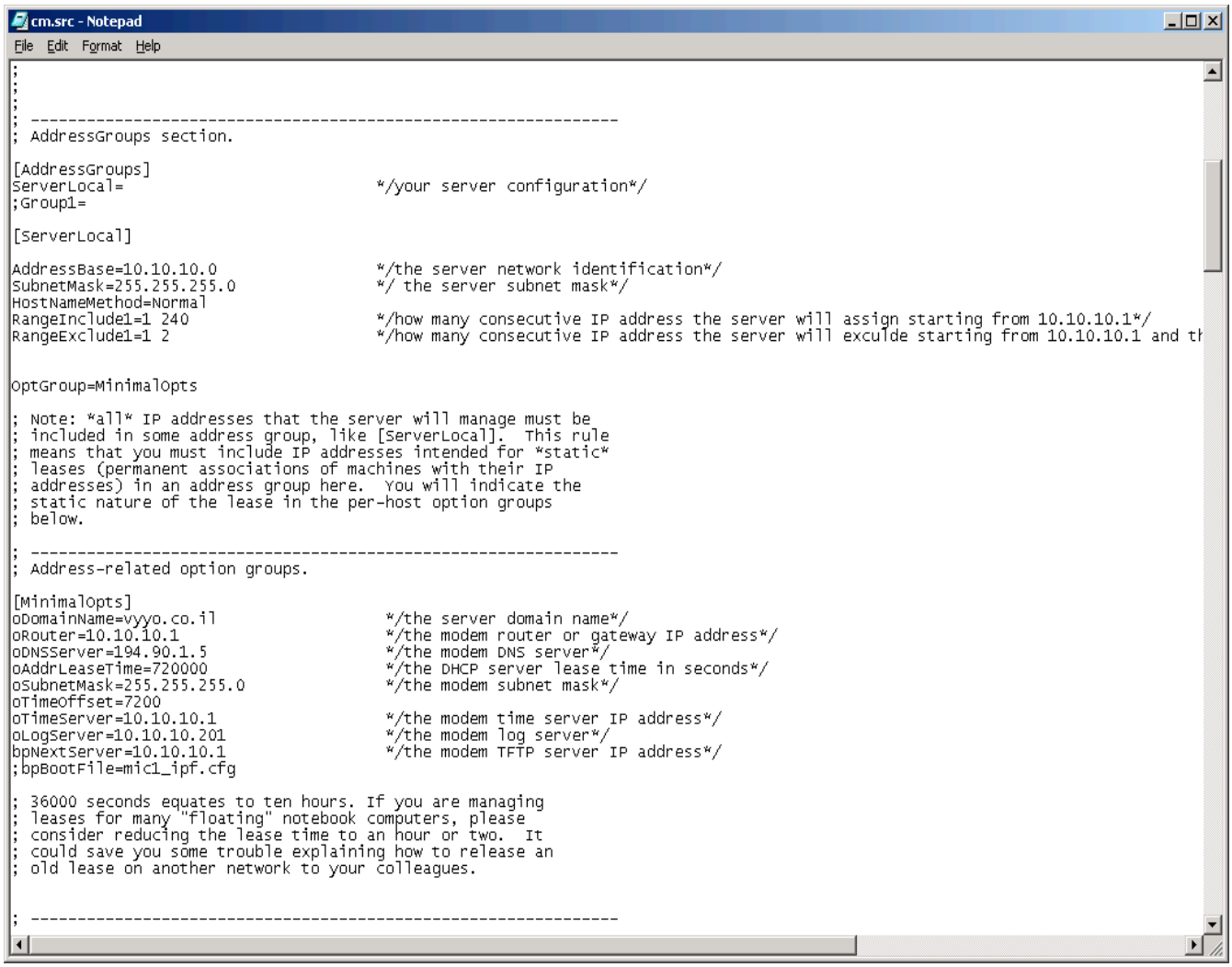


Figure 5-9: Server Configuration Info on CM.SRC file

4. In the [Hosts] section of CM.SRC shown below, four modems are defined. You may add additional modems here. If they are not defined here they will be ignored in the next section.

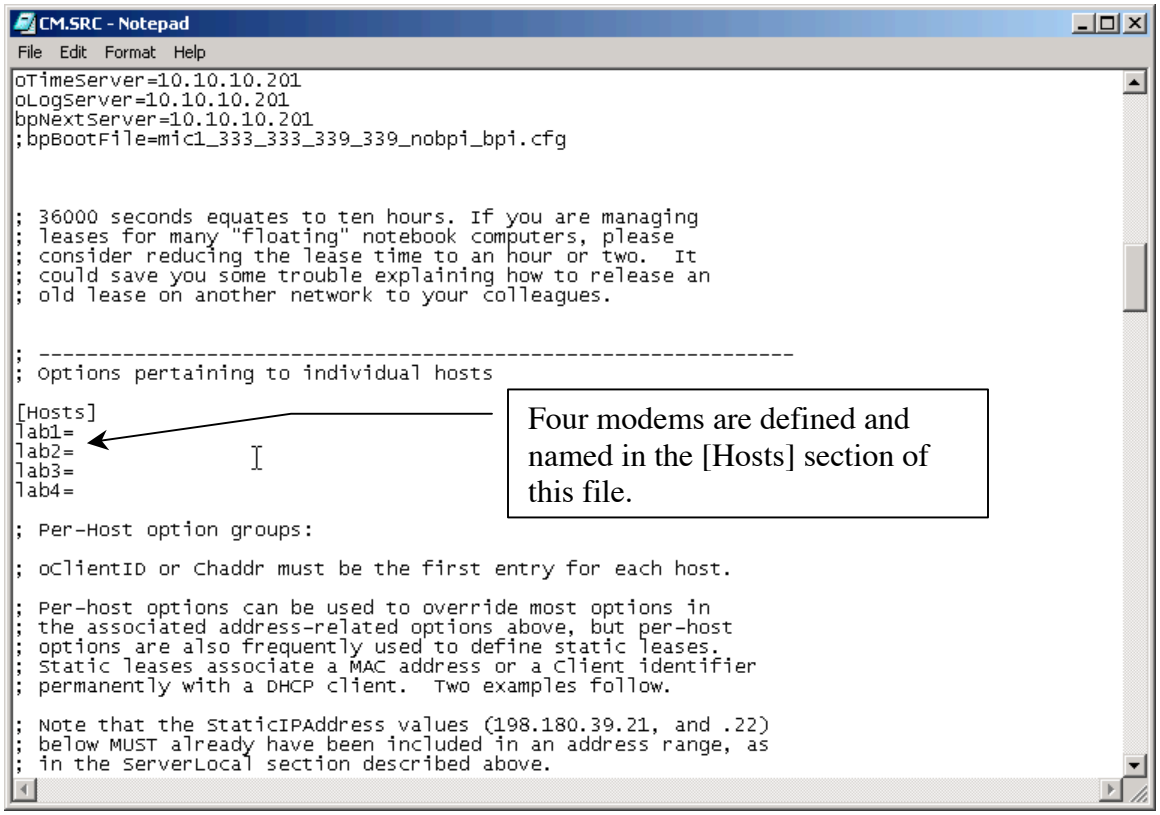


Figure 5-10. CM.SRC File Format

5. Add the configuration parameters for each modem as shown below. Note that even though each modem has a unique bpBootFile filename this is not typical. This file is the modem's configuration file. The same modem configuration file may be used for many modems if they use the same upstream and downstream channels.

NOTE: a line that starts with a semicolon ";" is interpreted as a comment and therefore is ignored by the compiler

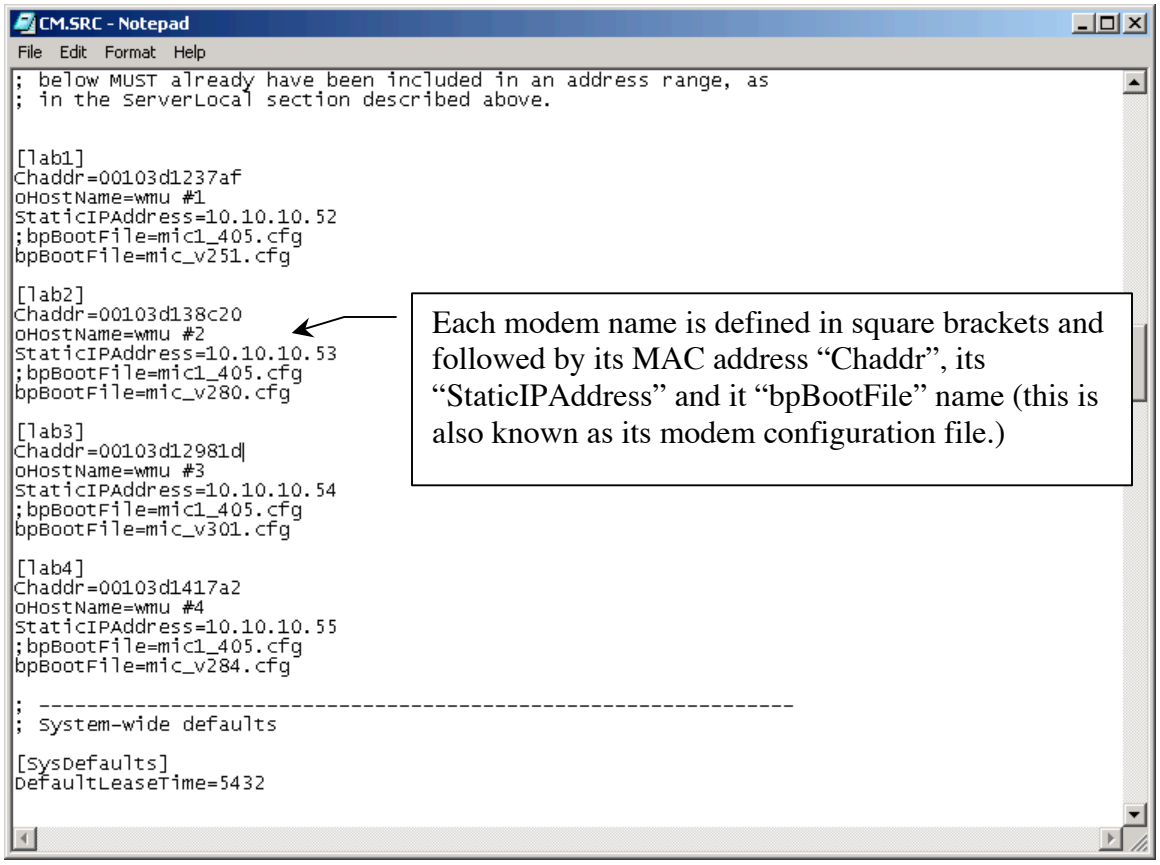


Figure 5-11. Defining and Naming Installed Modems

> ***NOTE**: This file (CM.SRC) must be compiled by executing the command "dhcpgen cm" from the directory in which the file is located. Before compilation, the DHCP Server must be shut down. After compilation the command "dhcpsvr" must be executed from the same directory to read the compiled files and restart the ipLease DHCP server.*

6. If the ipLease DHCP server is running it must be shutdown in order to reconfigure the IP addresses given in the CM.SRC file. Simply click on the "SHUTDOWN" button in the upper right pane of the ipLease application window.

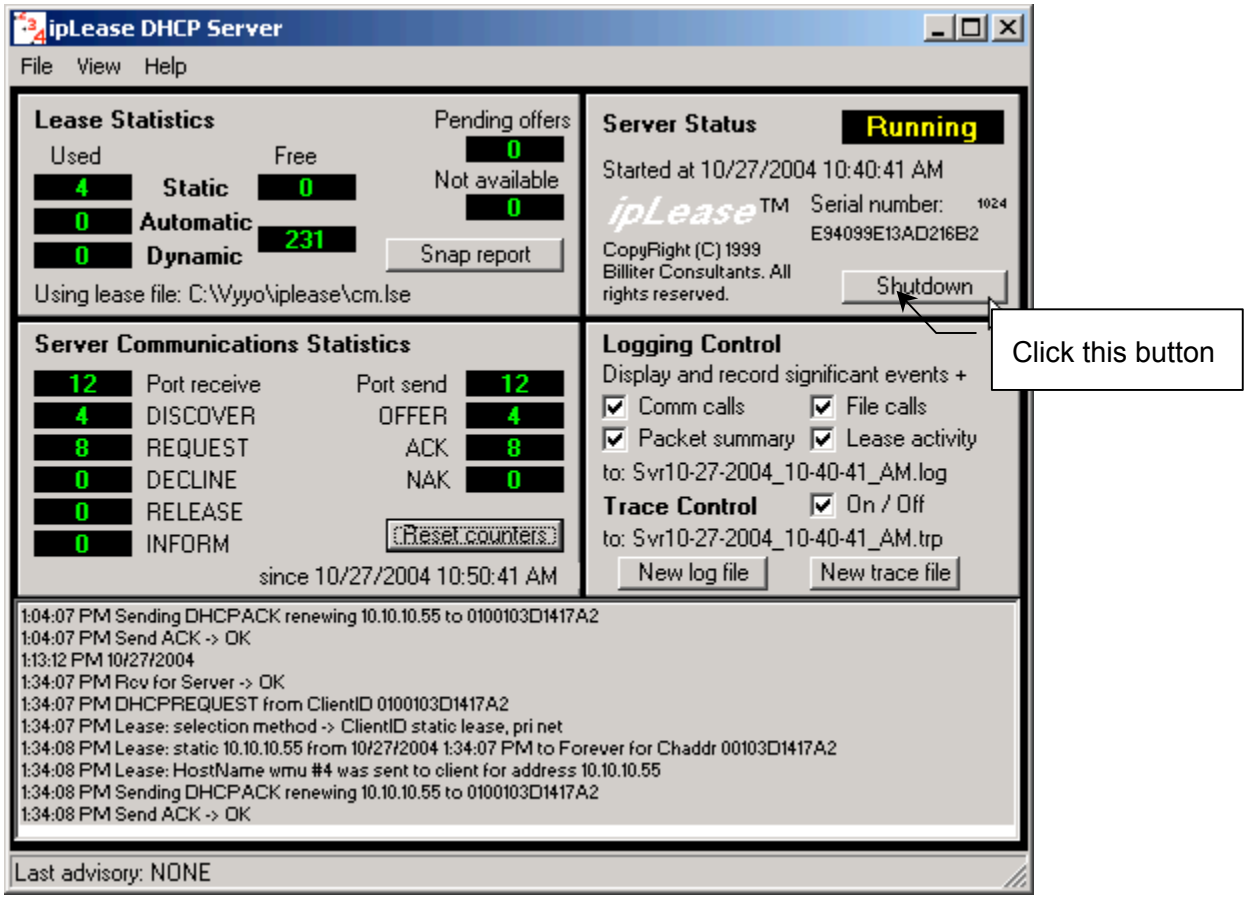
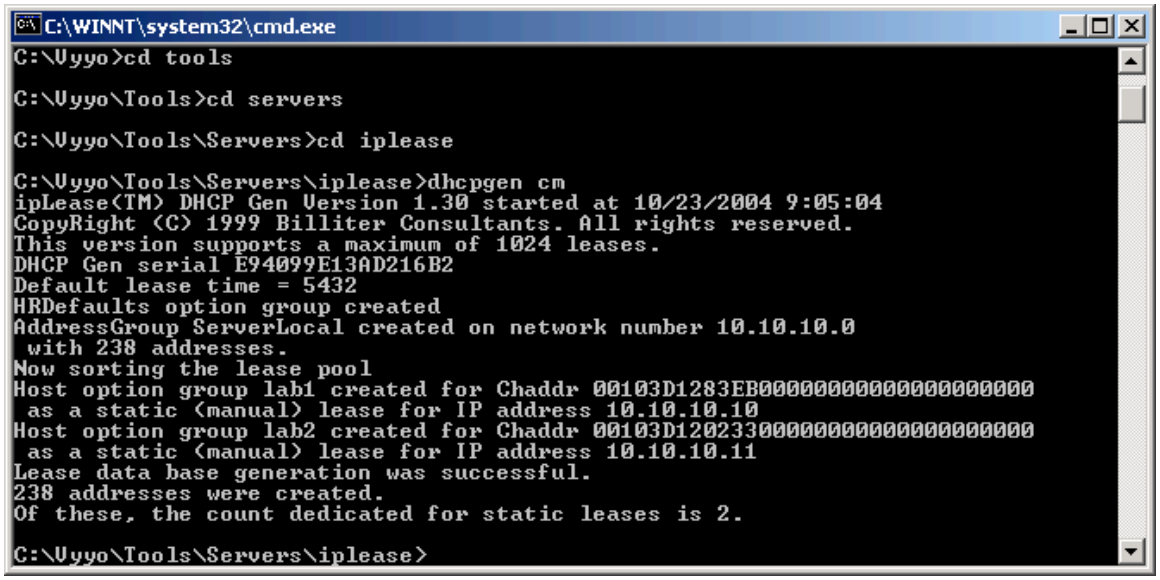


Figure 5-12: DHCP Server Shutdown in ipLease™

7. Now change directories to the ipLease directory (in a DOS window) and type “dhcpgen cm” to generate the machine-readable files for the ipLease DHCP server. The output should indicate “successful” as shown below. If not, check to make sure you have shutdown the iplease server or that you have not mistyped something in the CM.SRC file.



8. Restart the ipLease server. After compilation the command “dhcpsvr” must be executed from the same directory to read the compiled files and restart the ipLease DHCP server.

5.2.2 Windows 200x Server Edition: Modifying the DHCP Options

> ***Note**: This section applies only if your configuration uses Microsoft Windows 200x Server Edition as the DHCP server.*

Bind the modem MAC Address to its IP Address and modem configuration file by entering the appropriate information in popup windows. First bring up the DHCP Administrative Tool by clicking on the “Start” button on the main windows screen then choosing “Administrative Tools” and finally “DHCP”. See the following screen shots:

1. Locate and open the DHCP program by using:
   Start->Programs->Administrative Tools->DHCP

The DHCP window should open on the desktop as shown in Figure 5-14: Expand “Reservations”

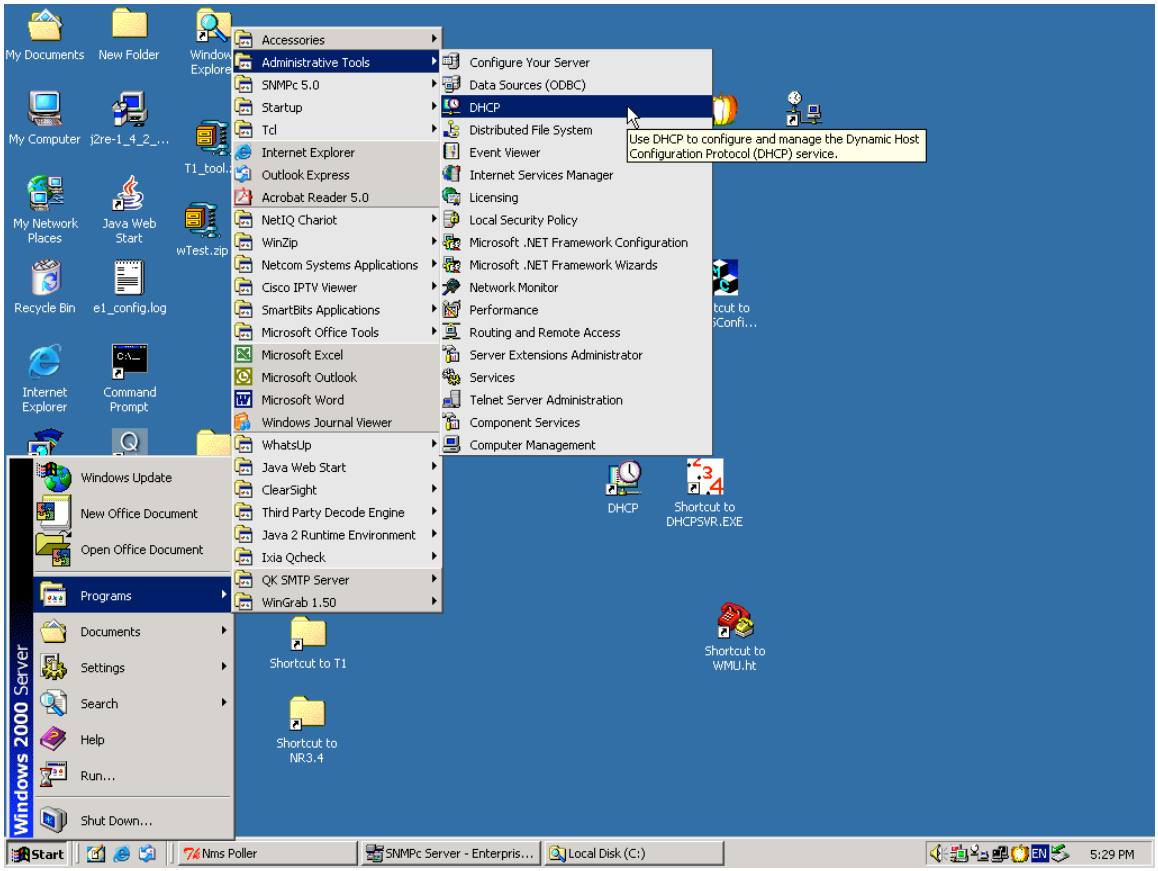


Figure 5-13: Navigate to the DHCP program

2. Expand the tree in the left window pane and expand "Reservations" to view all the modems to which DHCP is leasing IP addresses

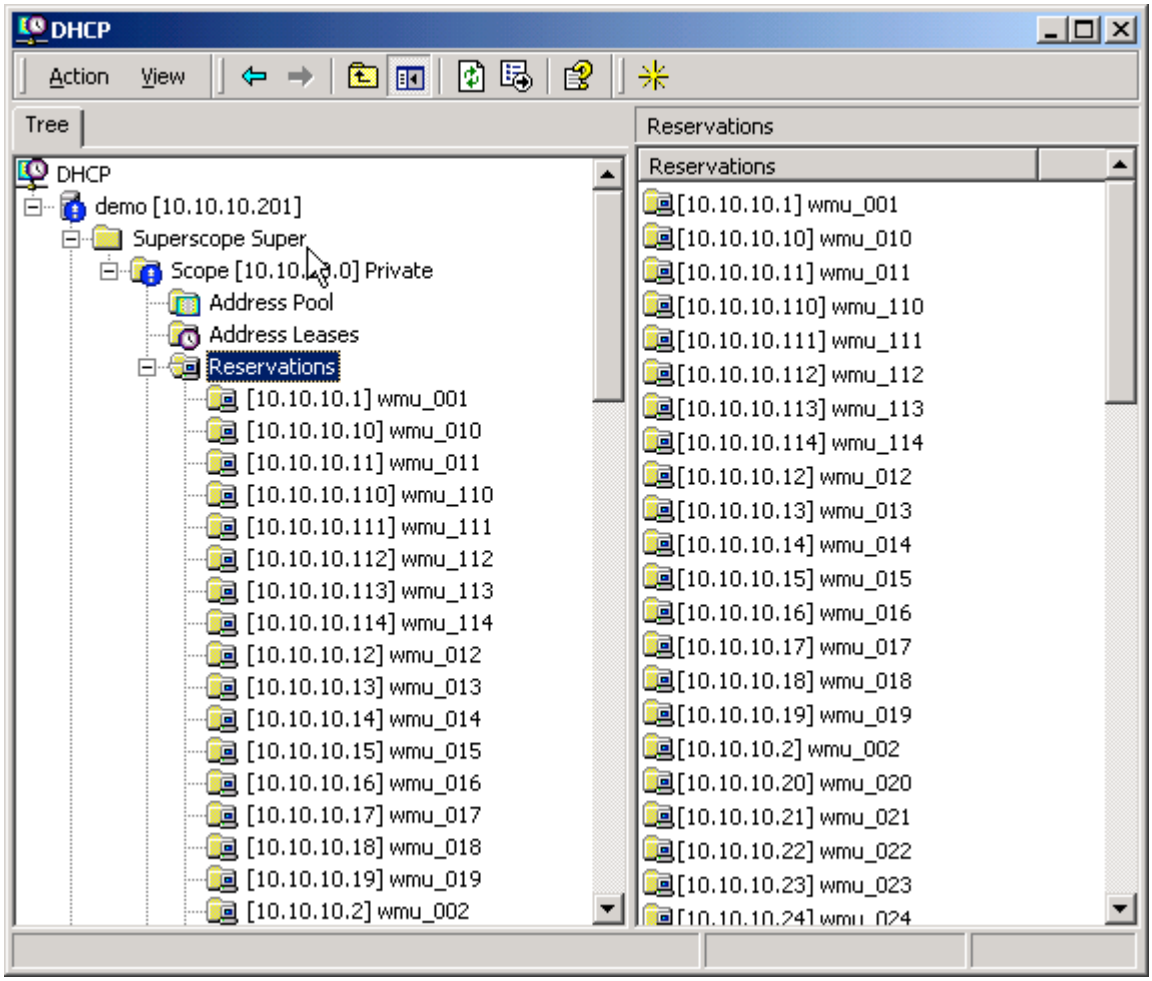


Figure 5-14: Expand "Reservations"

3. Now click "New Reservation" on the "Action" menu (or right-click on "Reservations" and select "New Reservation")

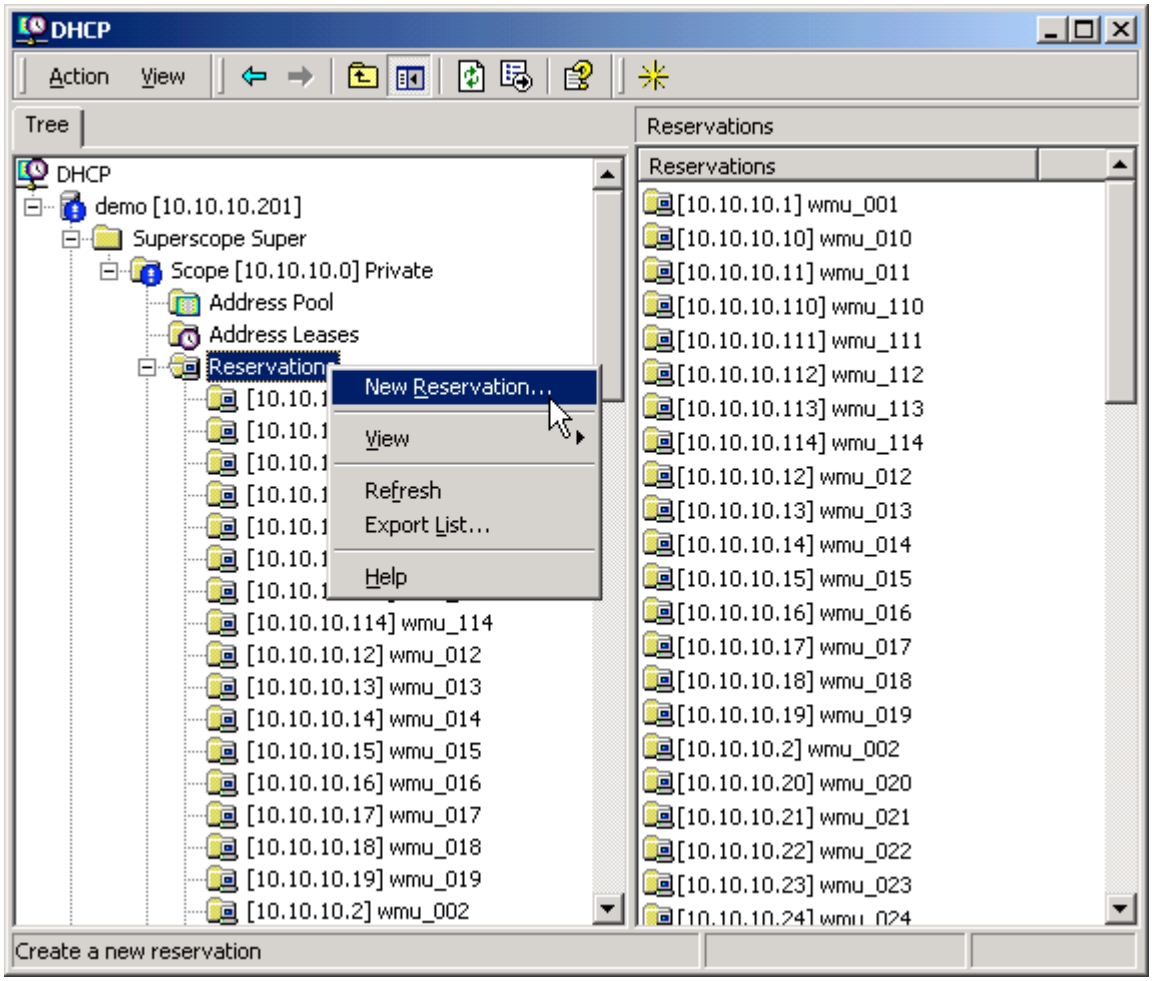


Figure 5-15: Make a "New Reservation" using DHCP

4. Enter the required information (see your system engineer for details) and click the “Add” button.

NOTE: Make sure to select the “DHCP only” radio button under “Supported Types”.

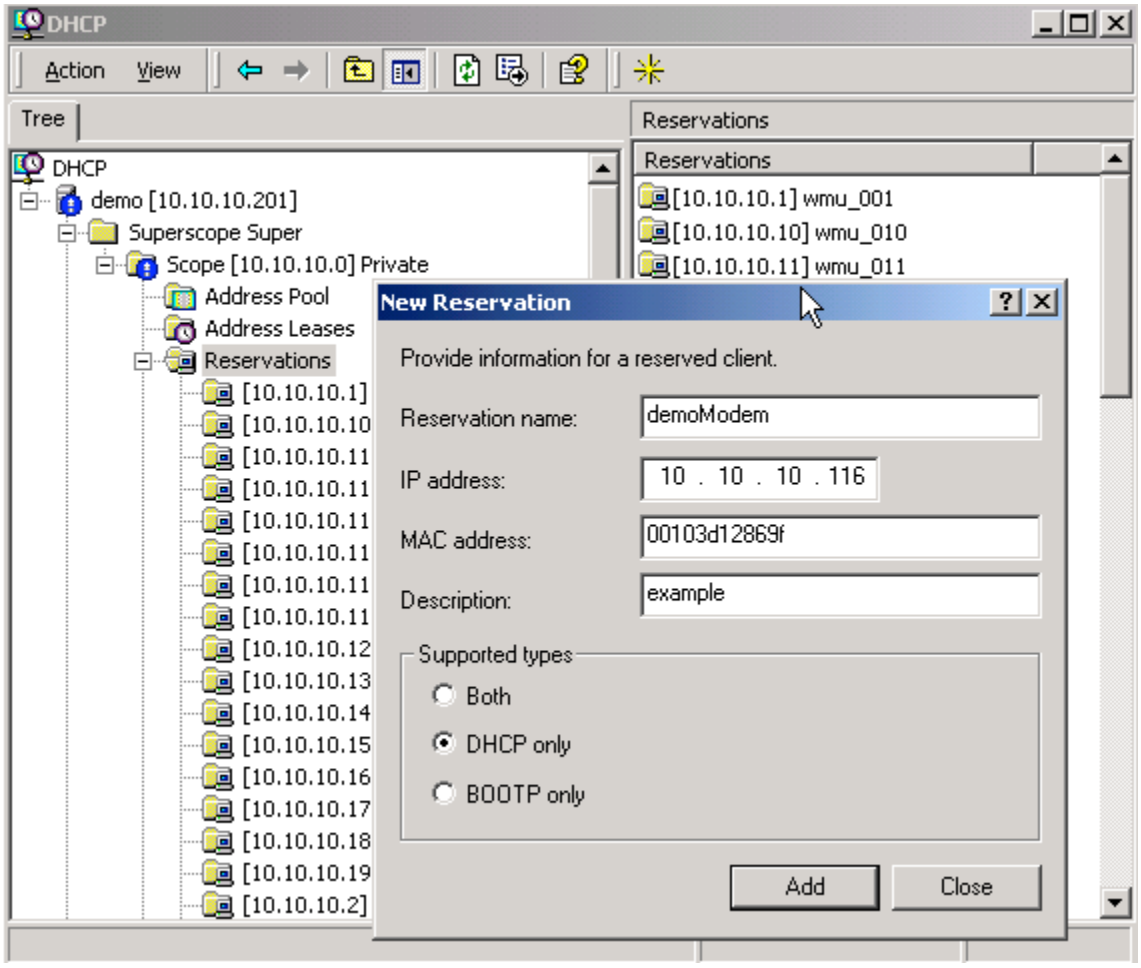


Figure 5-16: Enter the information for the new reservation

5. Now select the new reservation and right-click on the newly added modem then select “Configure Options” to choose the modem configuration file that will be downloaded to this modem. Observe that five Options are shown in the right pane of the main window. These are the default values.:

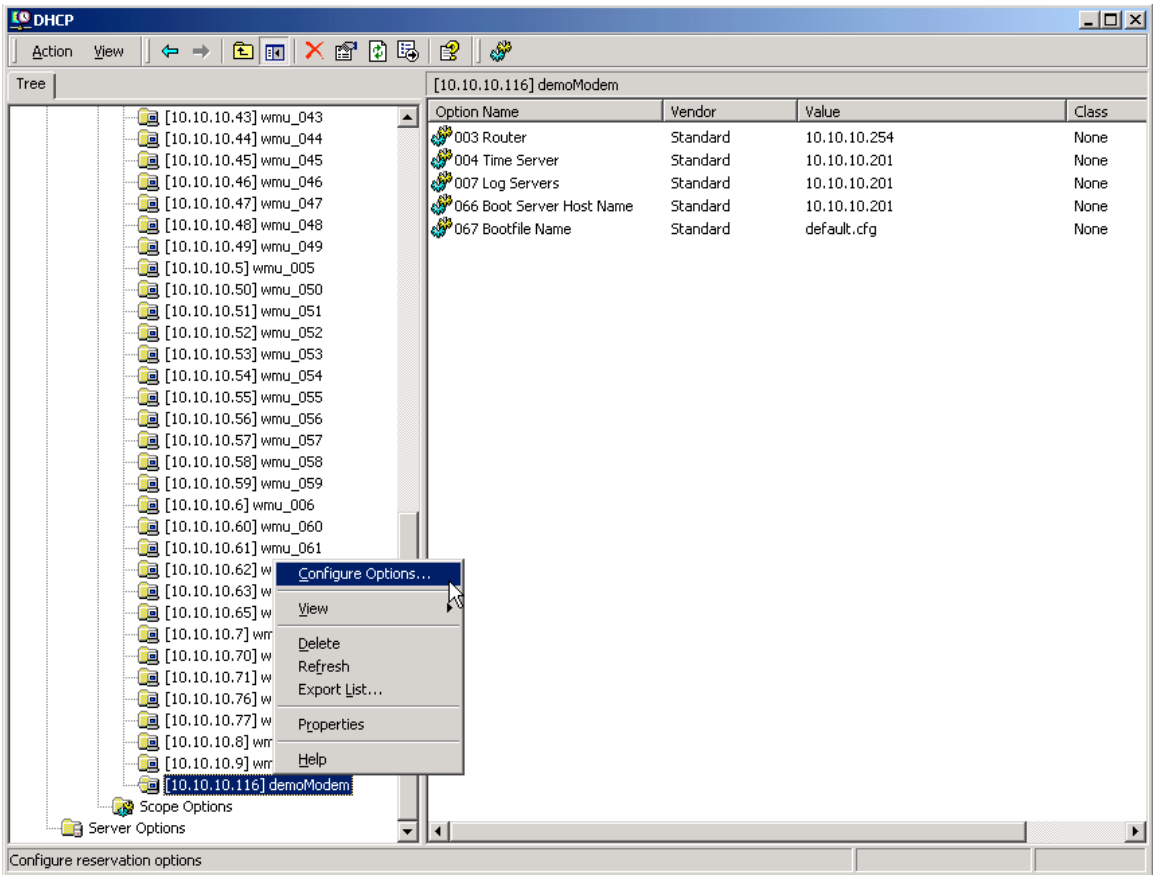


Figure 5-17: Navigate to the “Configure Options” action

6. Select the “General” tab in the popup window, scroll down to item “067” and check (and select) the “Bootfile Name” checkbox to enter or change the “boot” or modem configuration file name.

***NOTE**: Any of the other options may be changed using this same procedure. These values must match the physical setup of the network (as per the Network IP and Network RF plans) to make the system work. If this DHCP server is already in operation the default values should be correct.*

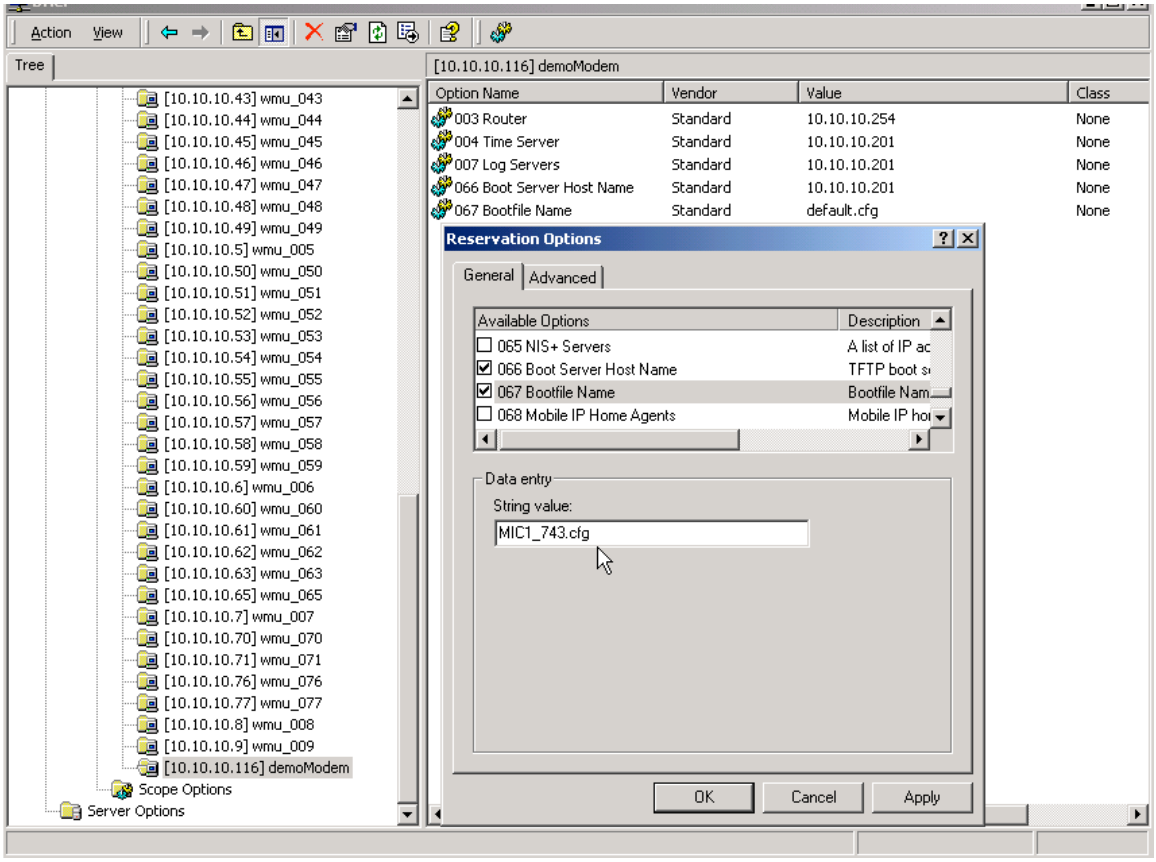


Figure 5-18: Enter the “boot” file name

TIP: *You may verify that the modem properties have been set correctly. Select the modem and right-click to display the action popup window; then select "Properties" to display and allow you to verify the modem information entered previously.*

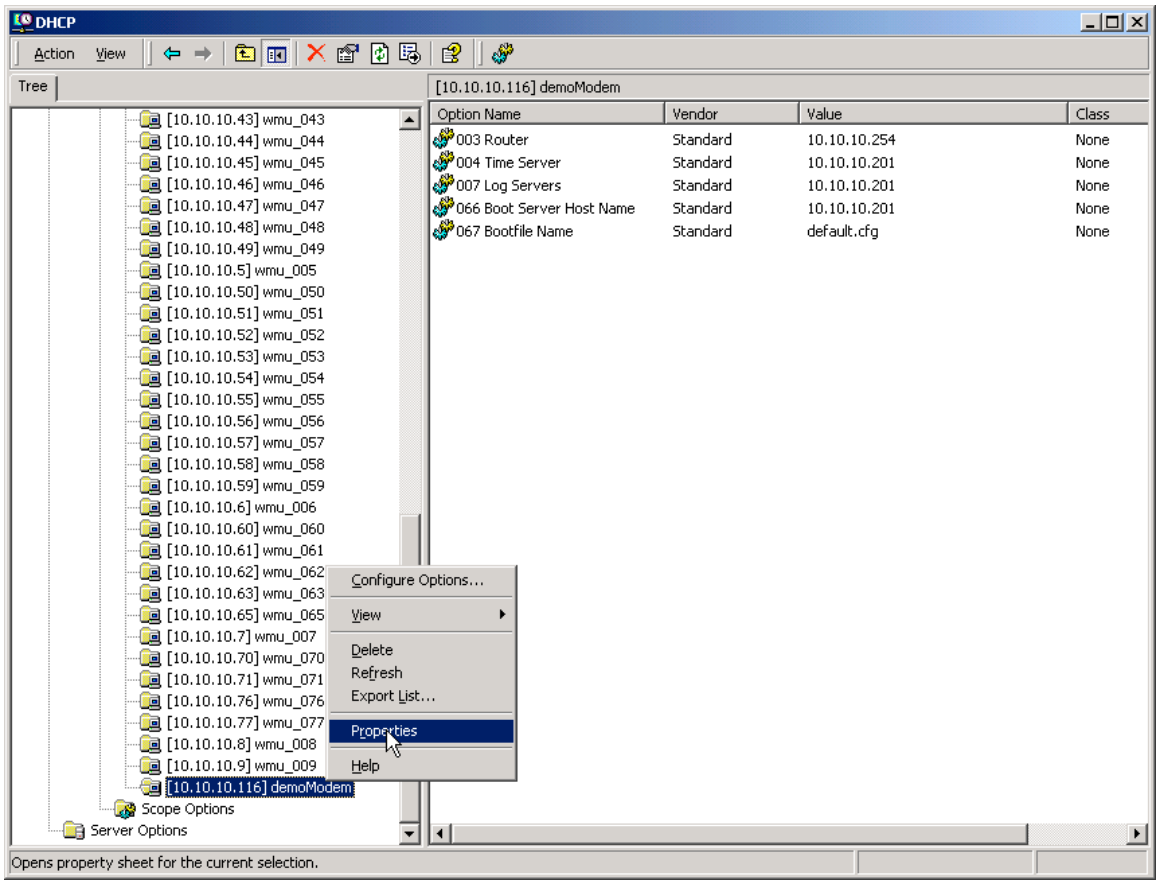


Figure 5-19: Navigate to the Properties display for the selected modem

Tip: *The modem information is displayed in this popup window.*

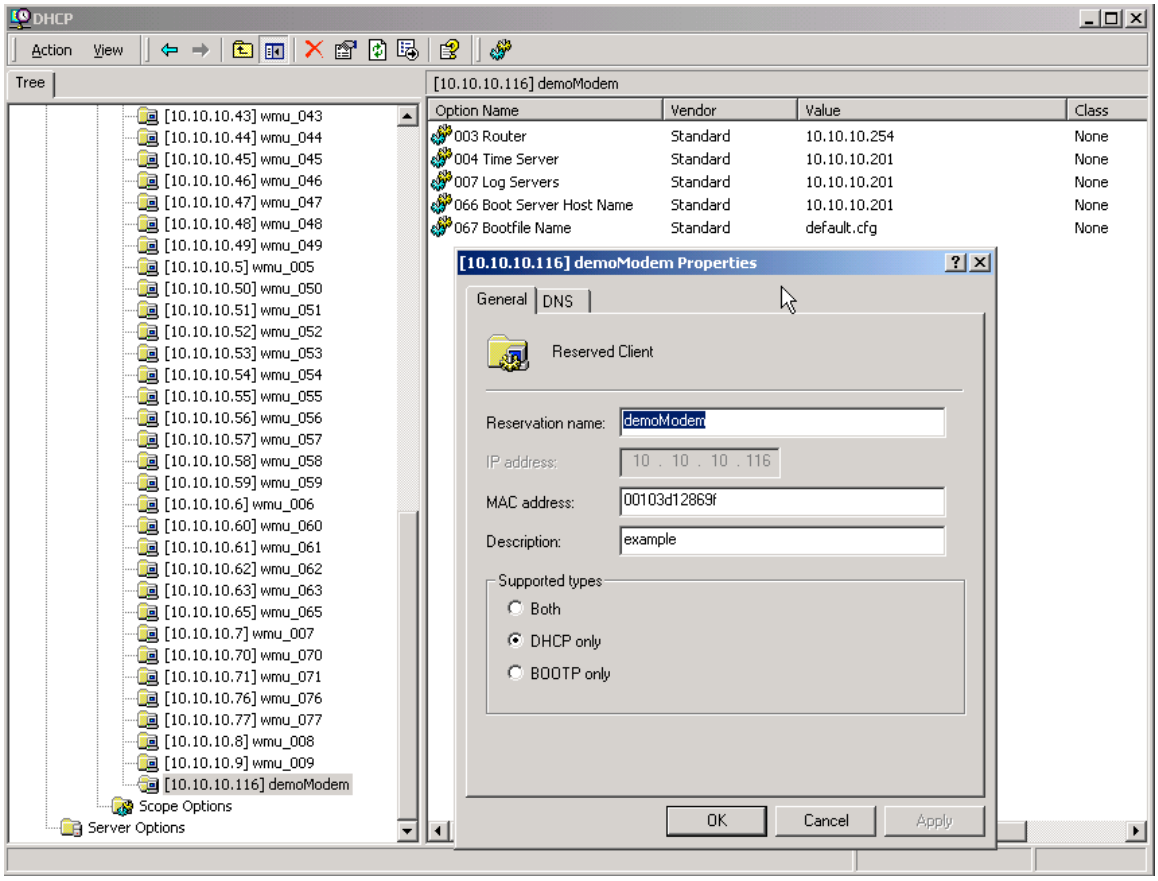


Figure 5-20: View the Properties for the selected modem

5.3 Configuring the XMTS

NOTE: Before you can perform this procedure you must have previously edited the regtree.txt file, compiled it and downloaded it to the XMTS to set its IP address. See Setting the XMTS IP Address.

This section assumes that you have previously installed NMS Version 5.0. See Installing and Uninstalling the NMS for instructions.

The upstream and downstream channels of the XMTS must be configured before a modem can communicate with the XMTS.

5.3.1 Setting the XMTS Upstream Parameters

1. Open the Network Management System and double-click on the XMTS icon to bring up the Network display of the XMTS front panel:

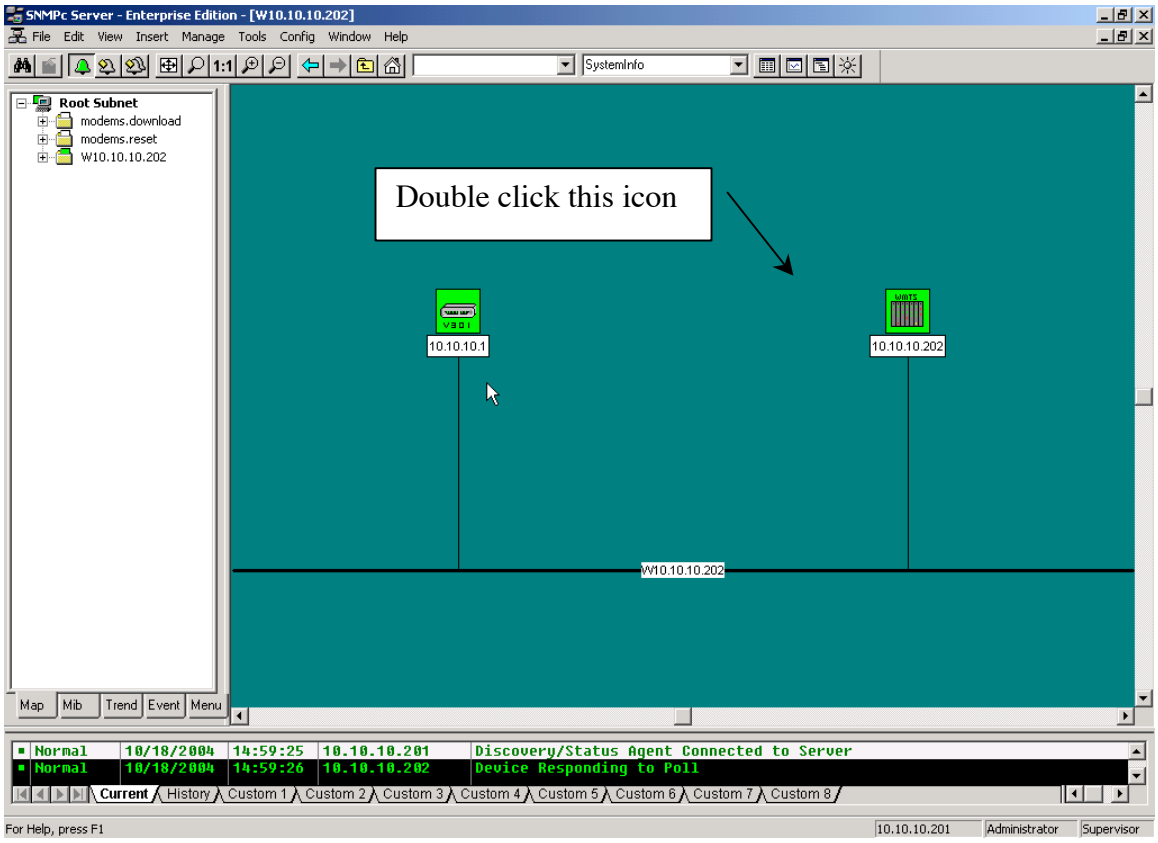


Figure 5-21: Network display of the XMTS

2. Select the Configuration tool item from the Vyyo menu.

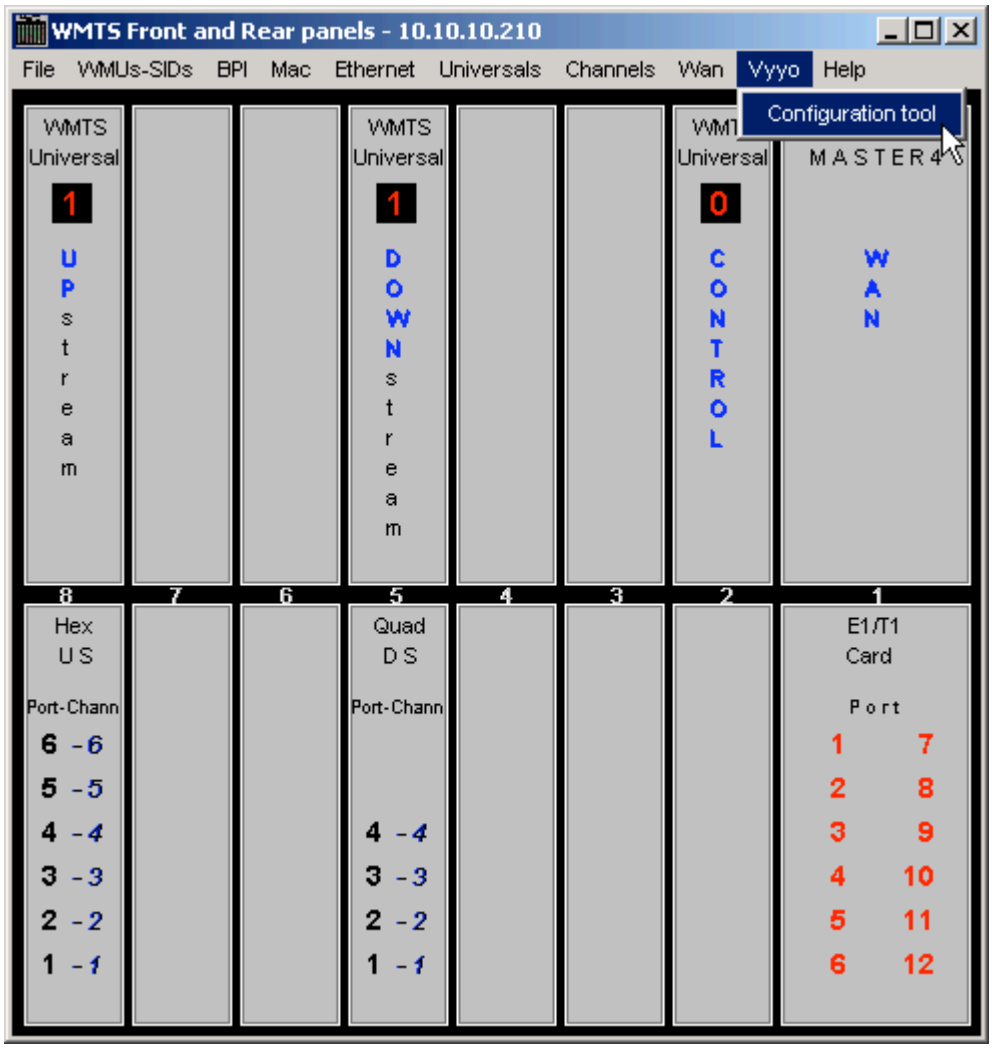


Figure 5-22: **Selecting the Vyyo Configuration Tool from the WMTS Synoptic Display**

3.

4. Now select the Upstream Channel ID you wish to configure and right-click the mouse. The Channel ID refers to the physical port on the upstream RF card that you are configuring. (This connection is described previously in section to be referenced.

In this example upstream channel 1 is selected and all of its parameters are displayed in the right pane of the window.

You may change the frequency the modem is told by the XMTS to transmit on (labeled “Tx Frequency”), the receive frequency that the upstream RF port expects to receive the modem’s signal on (this is labeled “Rx frequency”), its bandwidth, modulation, and the associated downstream channels, antenna diversity and admin status as needed.

These parameters are transmitted by the XMTS as part of the upstream channel descriptor (UCD) sent during the DOCSIS modem initialization process. These parameters should be determined by the system engineer responsible for the RF planning and are outside the scope of this manual.

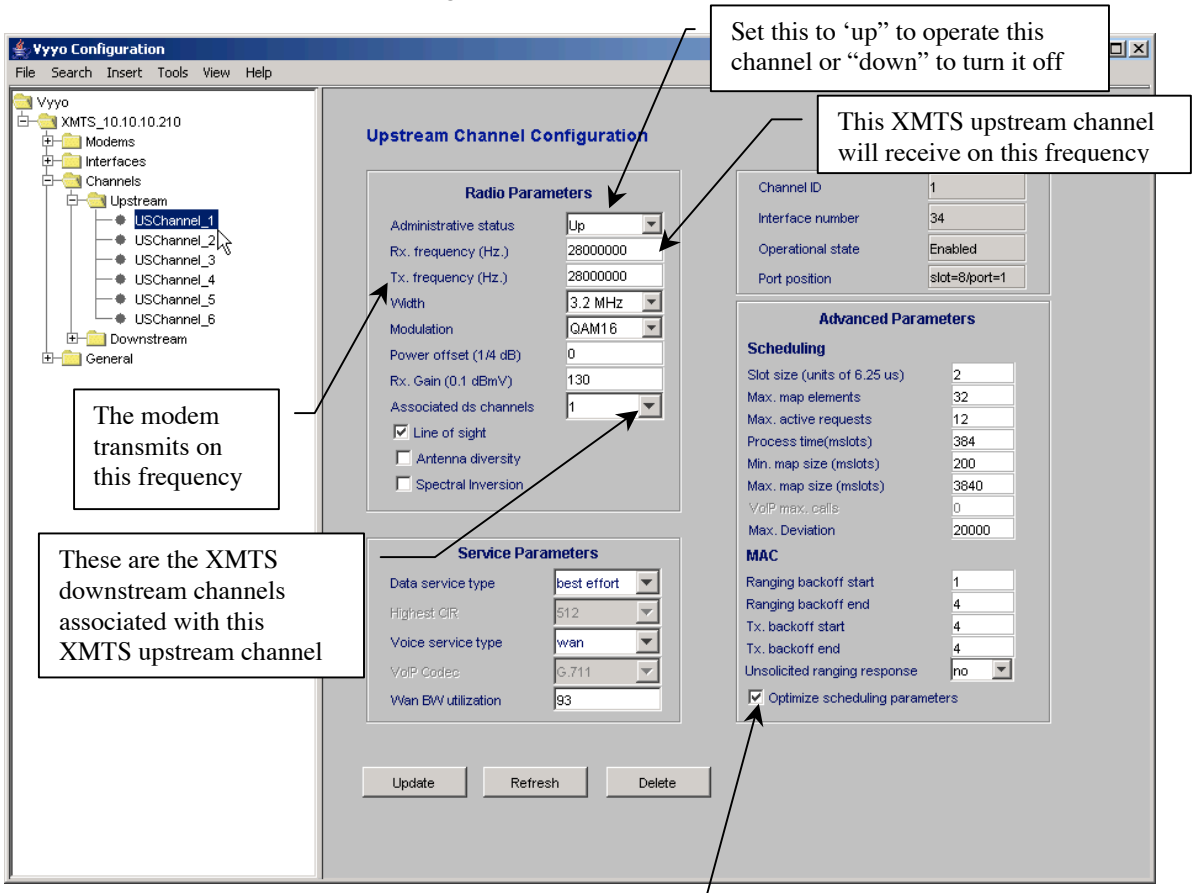


Figure 5-23: Selecting and Setting Upstream Channel 1 Parameters

5. Check this box unless your System Engineer indicates otherwise

6.

NOTE: "Best effort channel" or "CIR channel" are typically used for a data-only modem. An "E1 channel" must be used when the modem supports E1/T1 connections and data. These settings correspond to the desired SLA (Service Level Agreement.)

1. The "Tx backoff" settings control the scheduling algorithms used in the upstream channel. The default values should be used unless your system engineer has indicated otherwise.

2. Ensure that the "Optimize channel parameters" box is checked. This causes the XMTS to maximize the efficiency of the channel usage for the different types of modems assigned to it.

3. Click on the Update button at the bottom of the screen to save the new settings.

7.

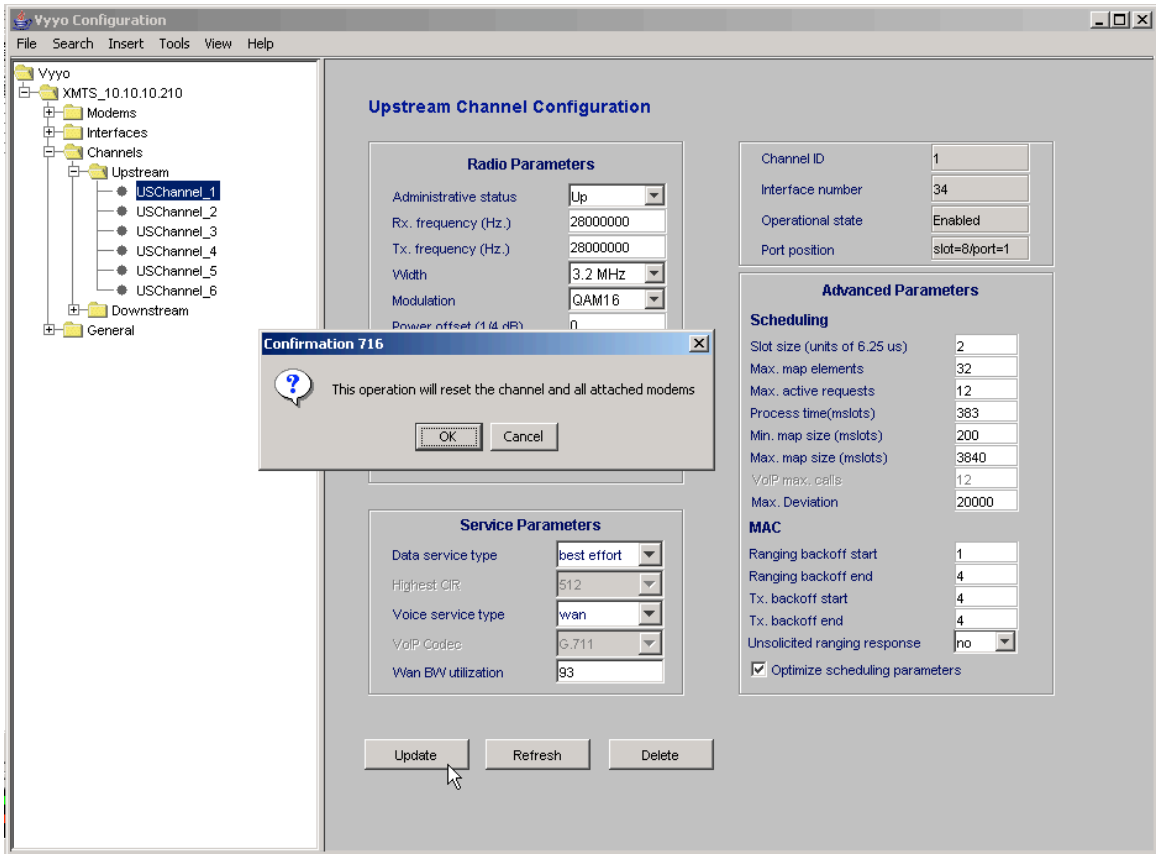
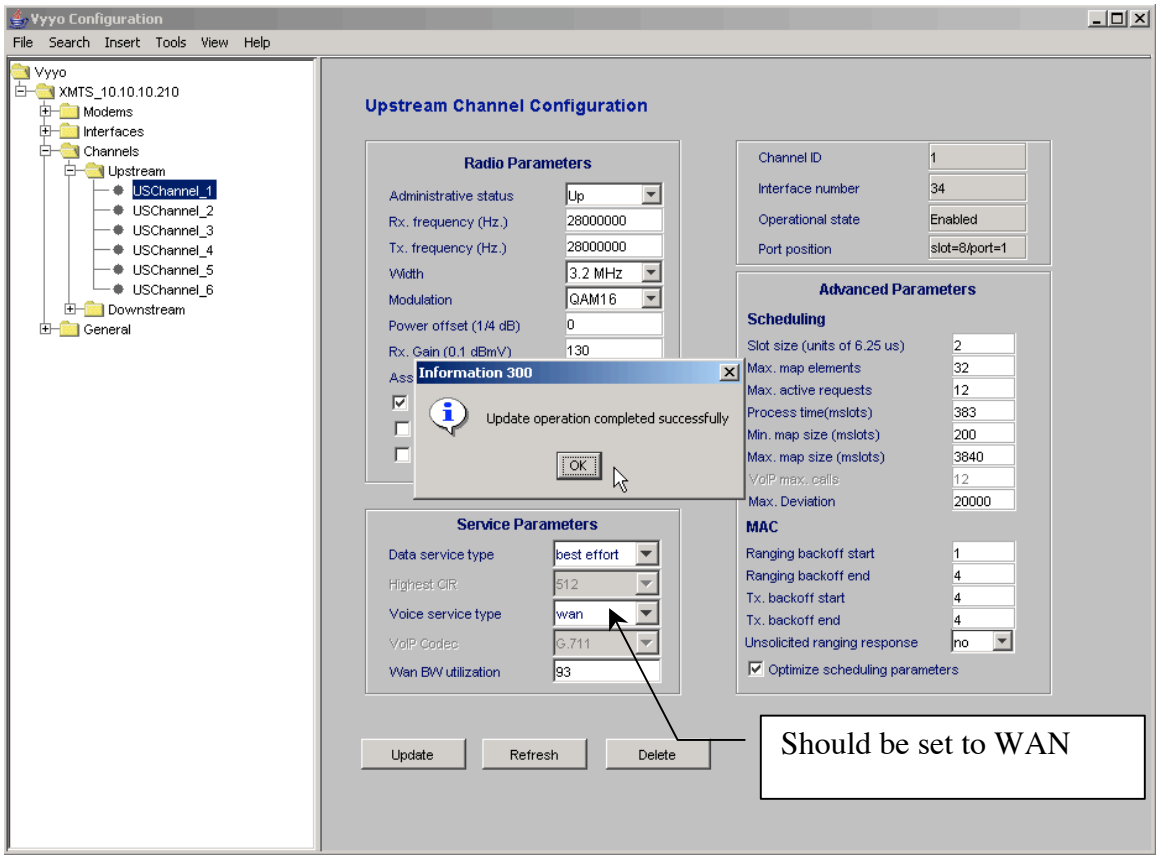


Figure 5-24: Updating the Upstream Channel Settings

8. The following popup window will be displayed if the operation was successful. Click “OK” to proceed.



9. Figure 5-25: Update successful

10. You have now completed configuring the upstream channel. For a summary of all of the upstream channels click on the “Upstream” item in the left pane of the window.

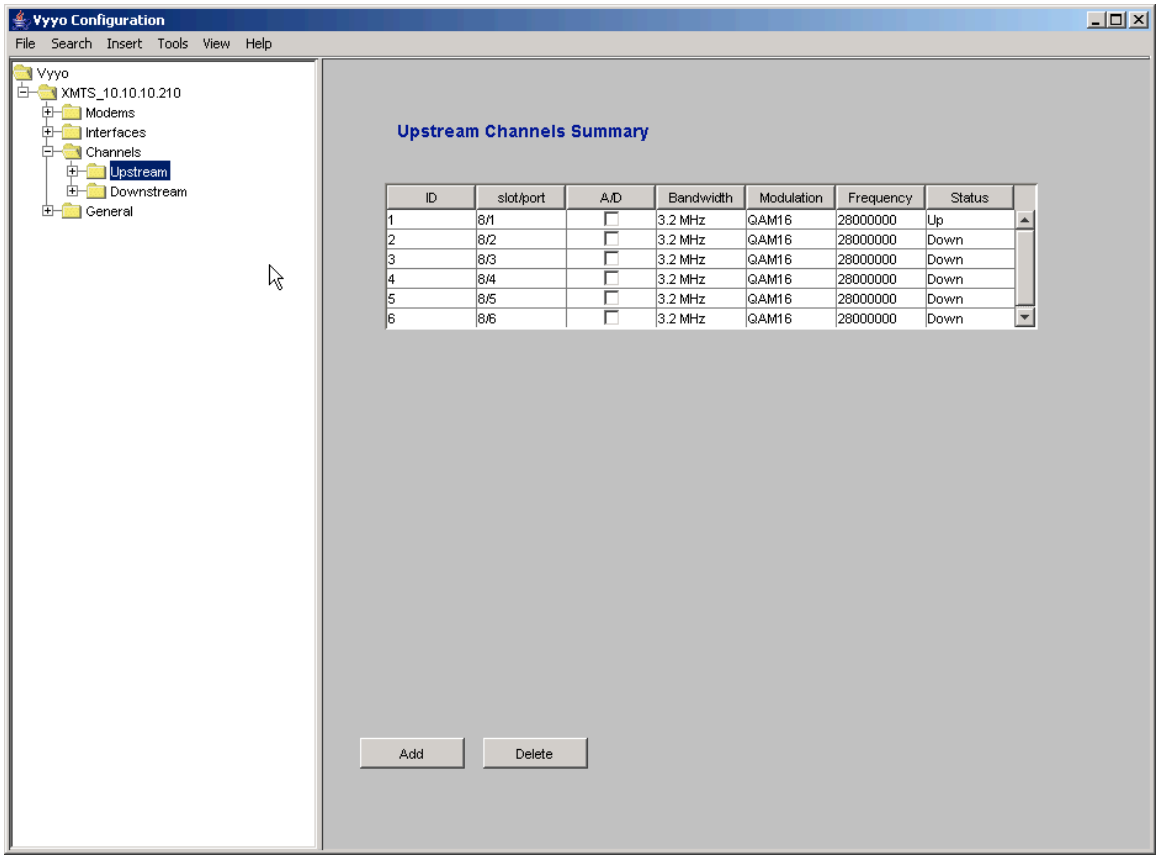


Figure 5-26: Viewing the XMTS Upstream Channels Summary

5.3.2 Setting the XMTS Downstream Parameters

1. If you have already opened the Vyyo Configuration Too then proceed to step 3, otherwise open the Network Management System and double-click on the XMTS icon to bring up the Network display of the XMTS front panel:

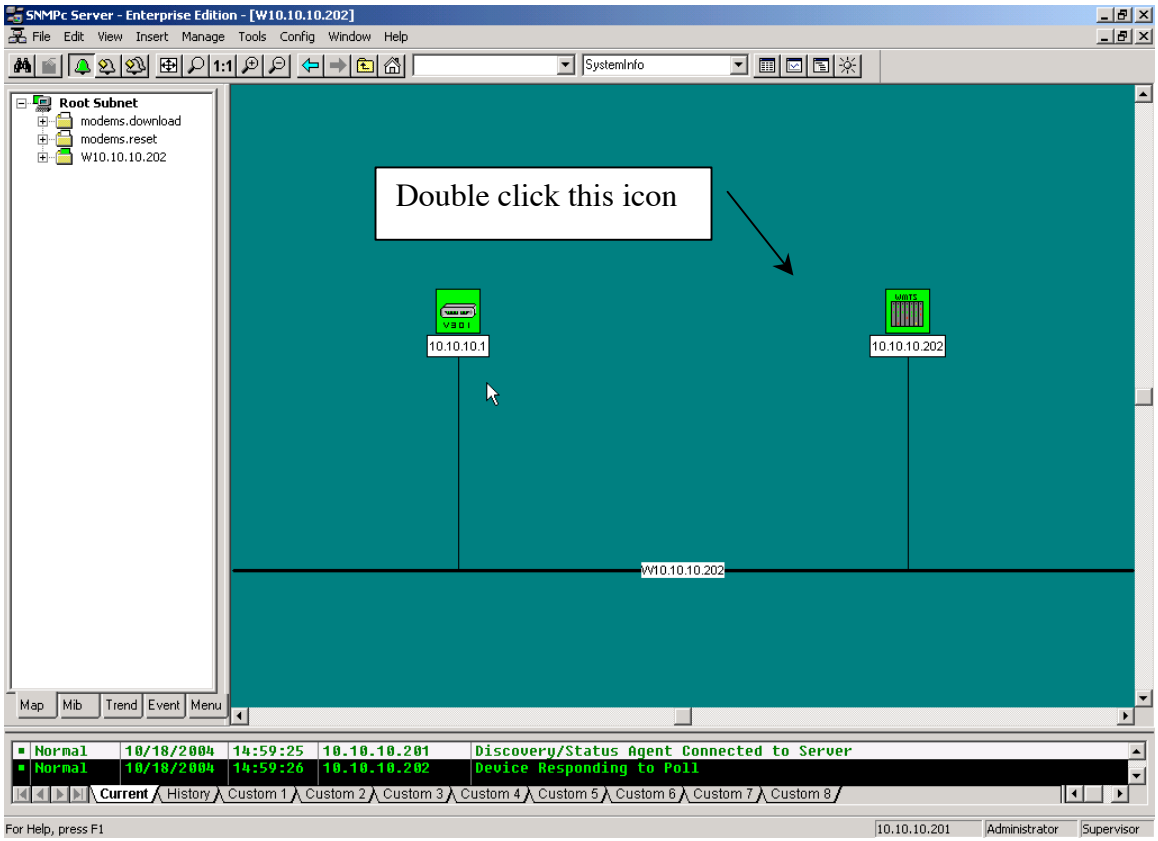


Figure 5-27: Network display of the XMTS

2. Select the Configuration tool item in the Vyyo menu.

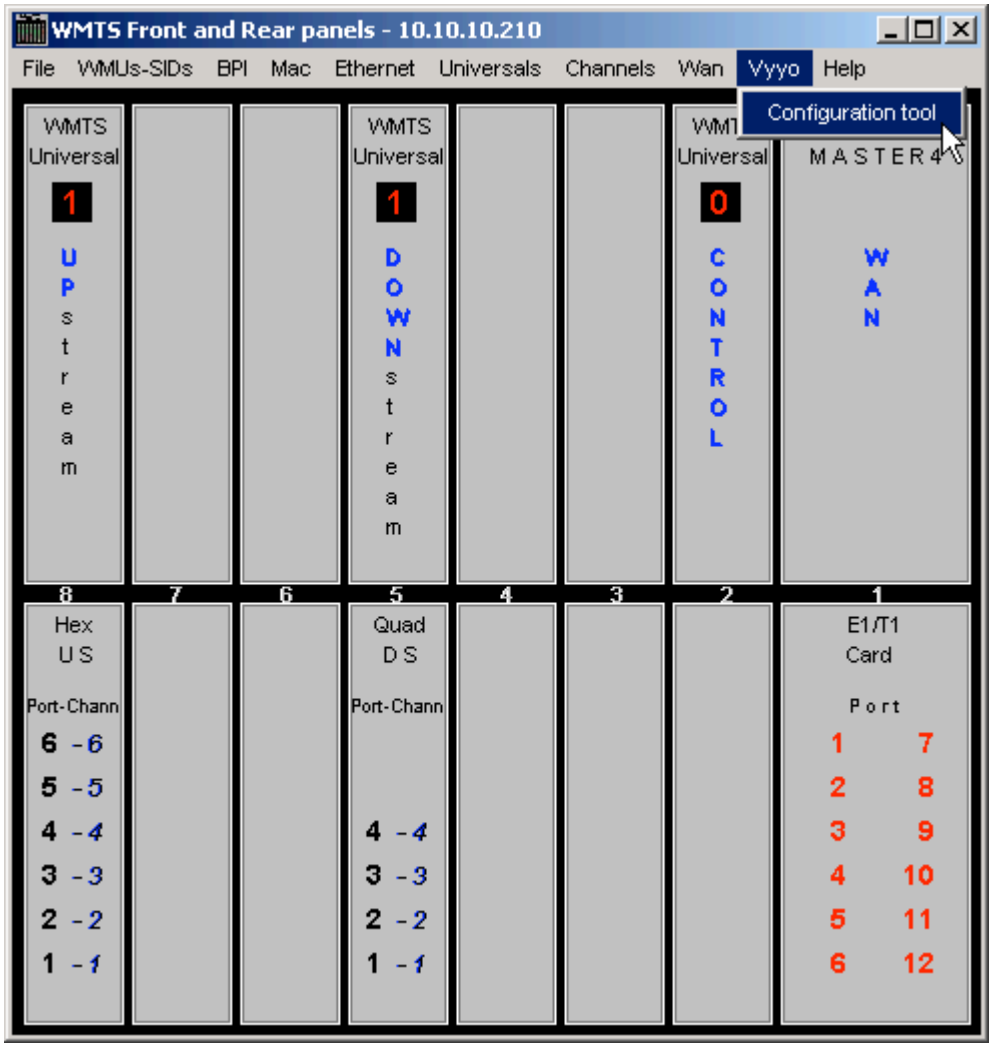


Figure 5-28: Selecting the Vyyo Configuration Tool from the WMTS Synoptic Display

3.

4. Select the XMTS Downstream Channel you wish to configure from the left side of the window. In this example downstream channel 1 is selected and all of its parameters are displayed in the right pane of the window.

Bandwidth, modulation, and other parameters can be changed. Typically the default values should be used with "Optimize channel parameters" unless your system engineer indicates otherwise.

These parameters should be determined by the system engineer responsible for the RF planning and are outside the scope of this manual.

5.

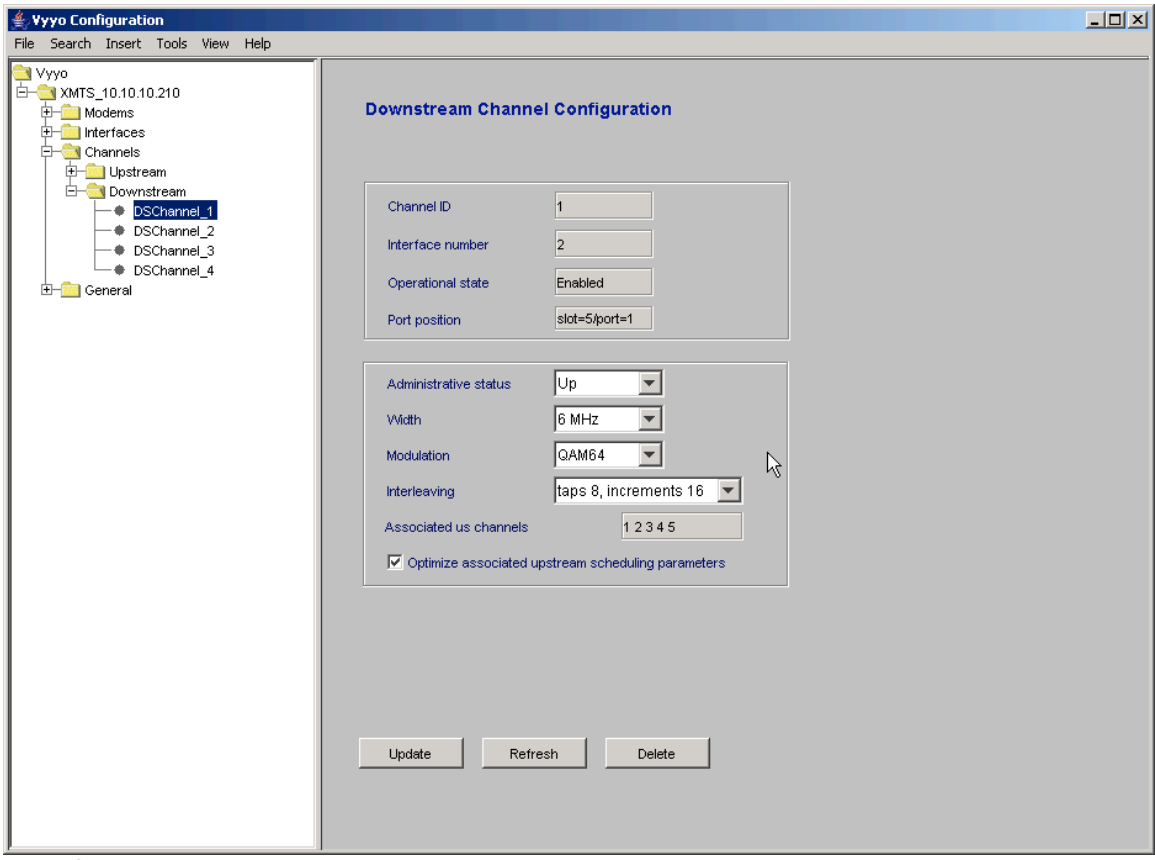


Figure 5-29: Select the downstream channel and change its parameters

6. To permanently save the configuration to the XMTS click on the "Update" button. Press the "OK" button on the popup window to confirm the update.

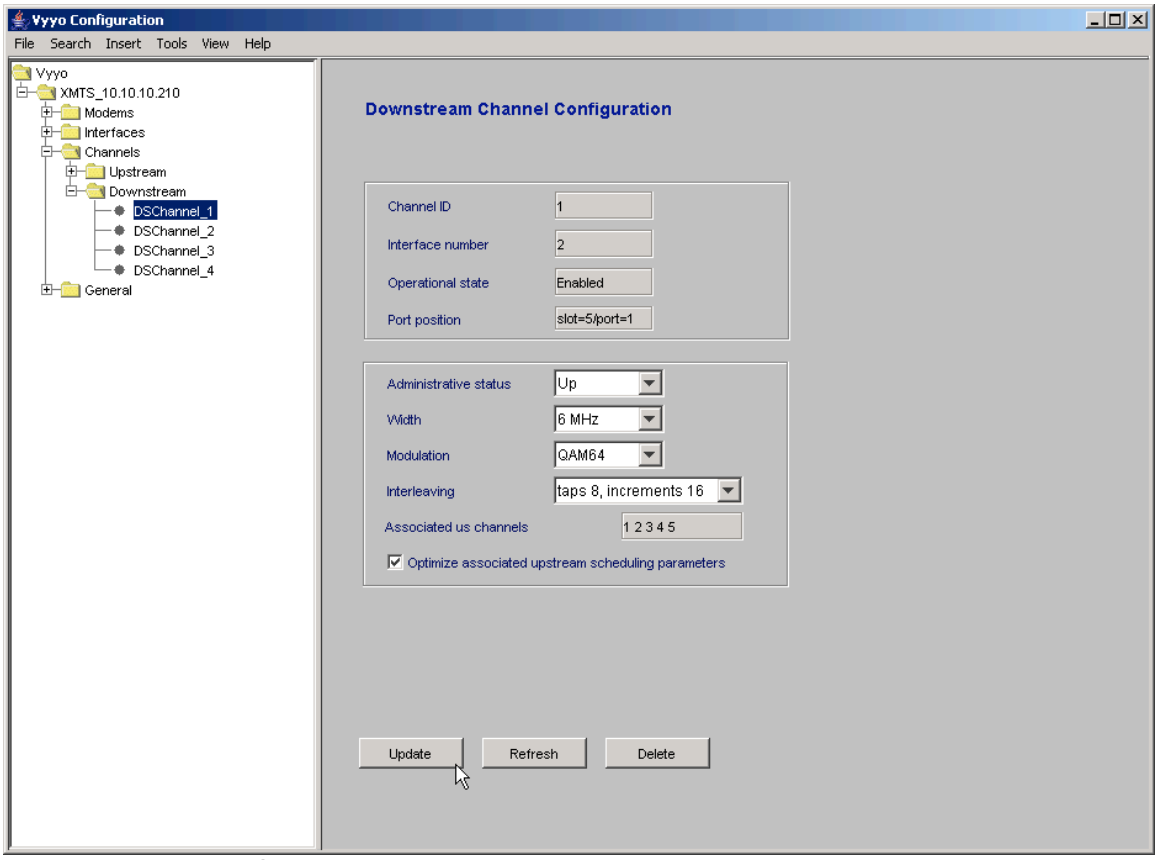
7. 

Figure 5-30: Updating the XMTS downstream parameters

8. If the update was successful this dialog box will appear. Click OK to continue.

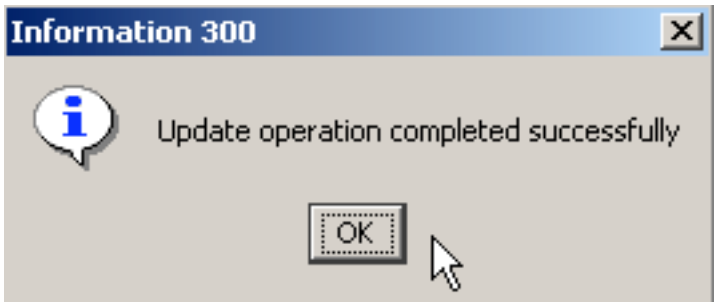


Figure 5-31: Update successful

9. You have now completed configuring the downstream channel. For a summary of all the downstream channels click on the “Downstream” item in the left pane of the window.

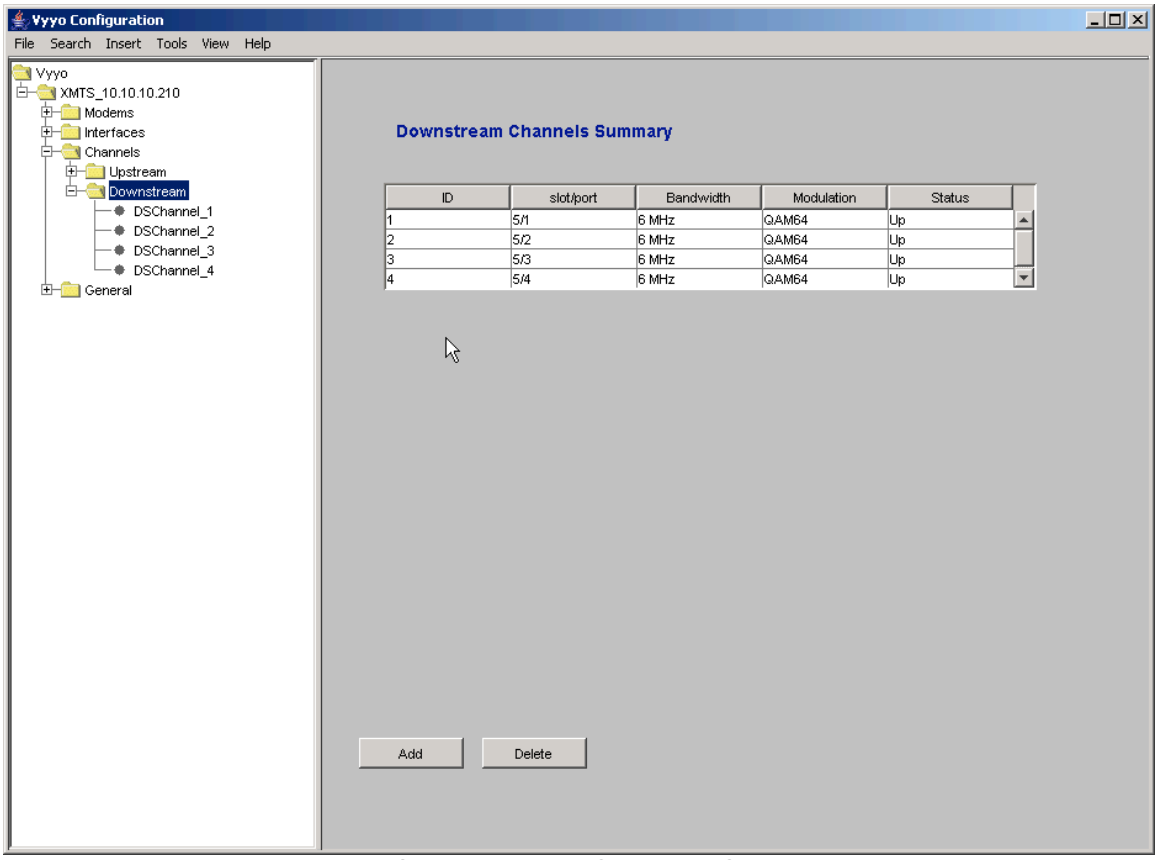


Figure 5-32: Viewing the XMTS Downstream Channels Summary

5.4 Setting the Modem’s Downstream Frequency

This section provides details on how to set the downstream frequency that the modem listens on to begin its initialization sequence. Setting this value greatly reduces the time it takes for a modem to complete its initialization sequence.

NOTE: the downstream frequency that is set using this technique will not be saved in the modem until the modem completes registration.

1. Connect a computer to the RJ45 modem connector using a standard RJ45 patch cable.

2. Make sure your computer's IP address is set to 192.168.100.xxx, where "xxx" is any value from 2 to 254. The subnet mask should be 255.255.255.0. You may use any utility software on your computer that allows you to set these values.

3. All modems include a Telnet server with a fixed IP address of 192.168.100.1. Follow the screens below to set the modem Downstream Frequency and view the Downstream and Upstream settings.

   The modem Telnet server has multiple levels of access privileges:

User – the standard level which permits viewing information

Operator – permits changing the downstream frequency

> ***Note**: The modem will accept typed settings while simultaneously displaying and scrolling though feedback information or messages. This behavior does not affect setup. At present there is no procedure to turn off the streaming messages issued by the modem.*

4. Enter the password (obtained from your system engineer or a Vyyo representative) on this screen.

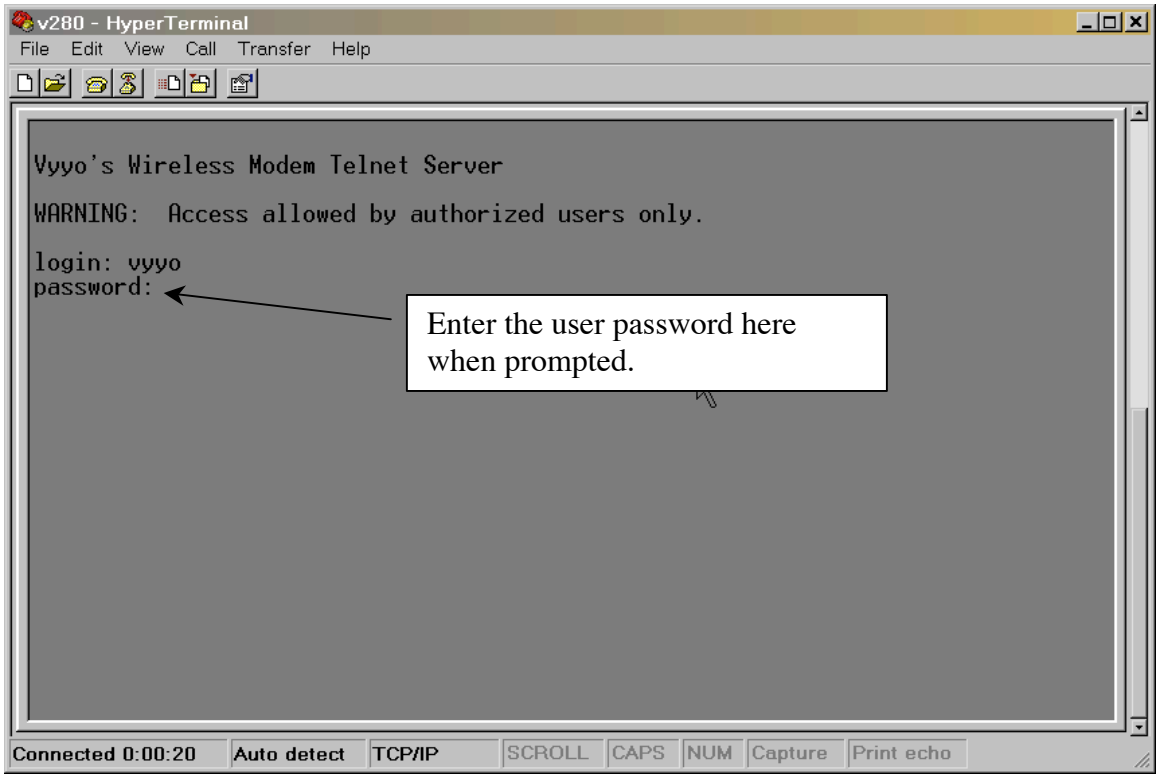


Figure 5-33: Log In to the Vyyo WMU Telnet Server

5. This screen will be displayed after the password is correctly entered:

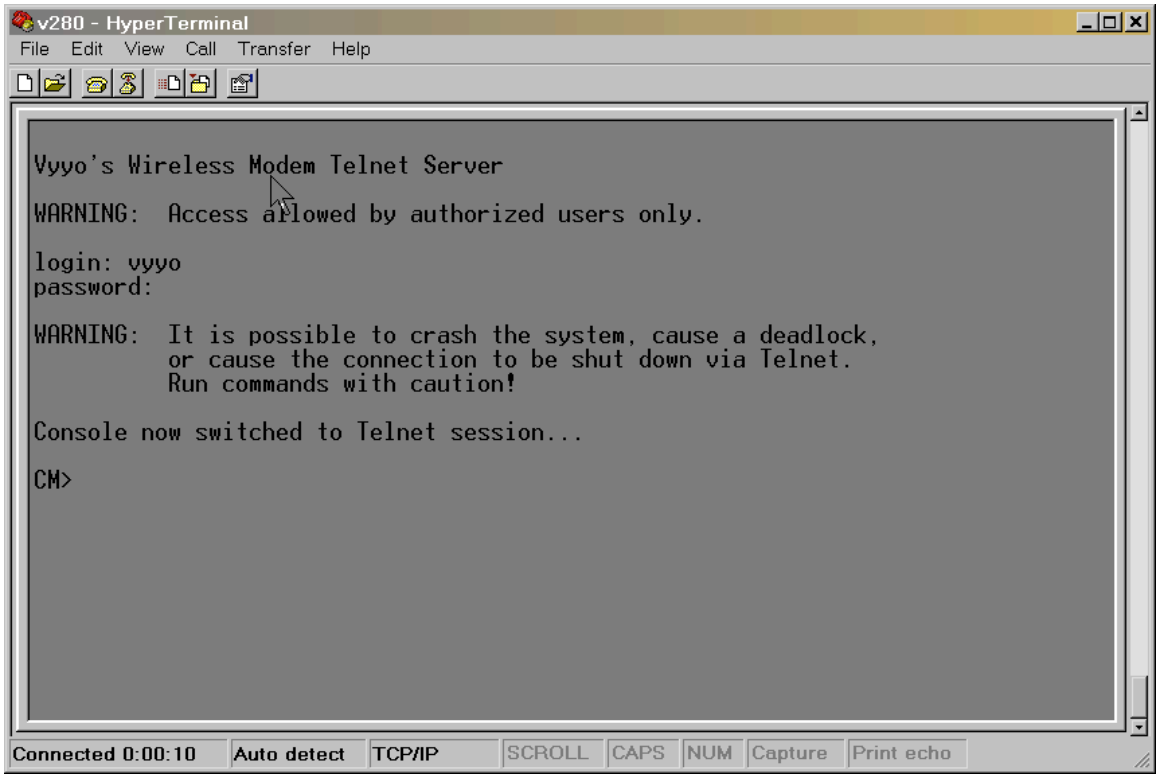


Figure 5-34: Successful Telnet Login

6. Type “su operator”, then press return. Now enter the operator’s password (obtain this from your system engineer or a Vyyo representative) to access the DOCSIS control commands.

> ***Note**: Return to user mode from operator mode at any time by typing “su user” – no password is required to return to user mode.*

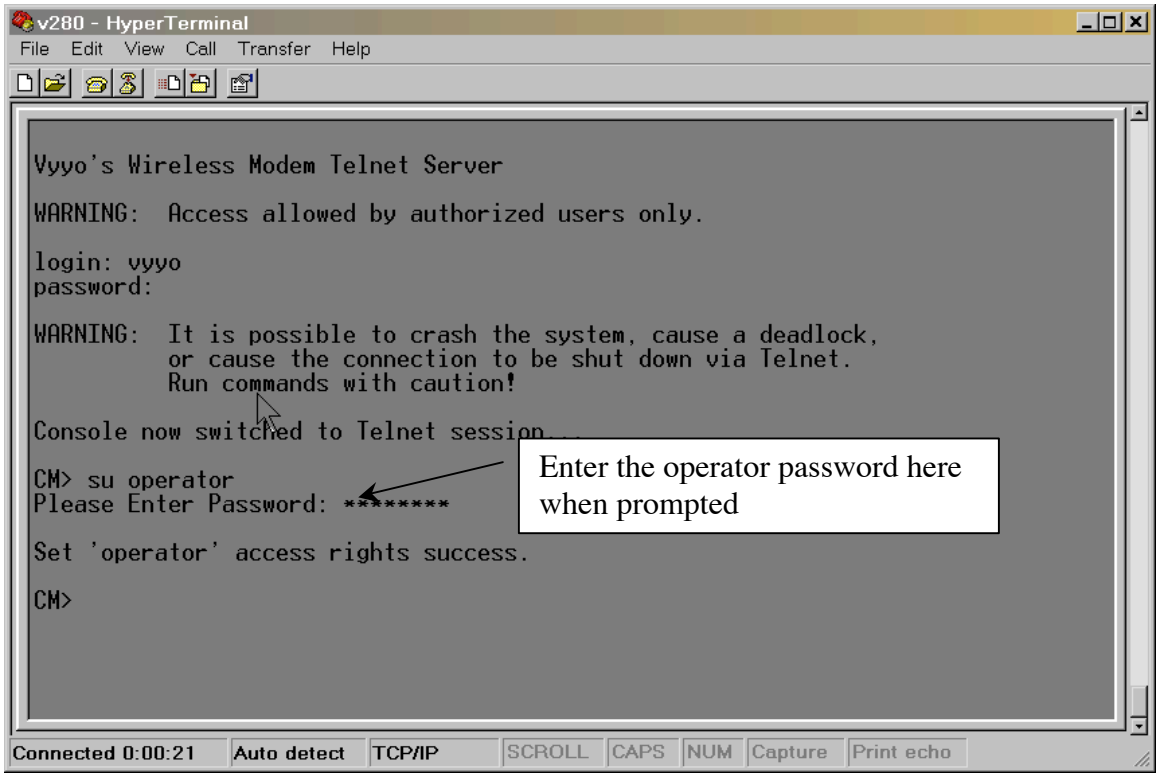


Figure 5-35: Switching to the Operator's Permission Level

7. Change to the DOCSIS Control subdirectory by typing “cd docsis”:

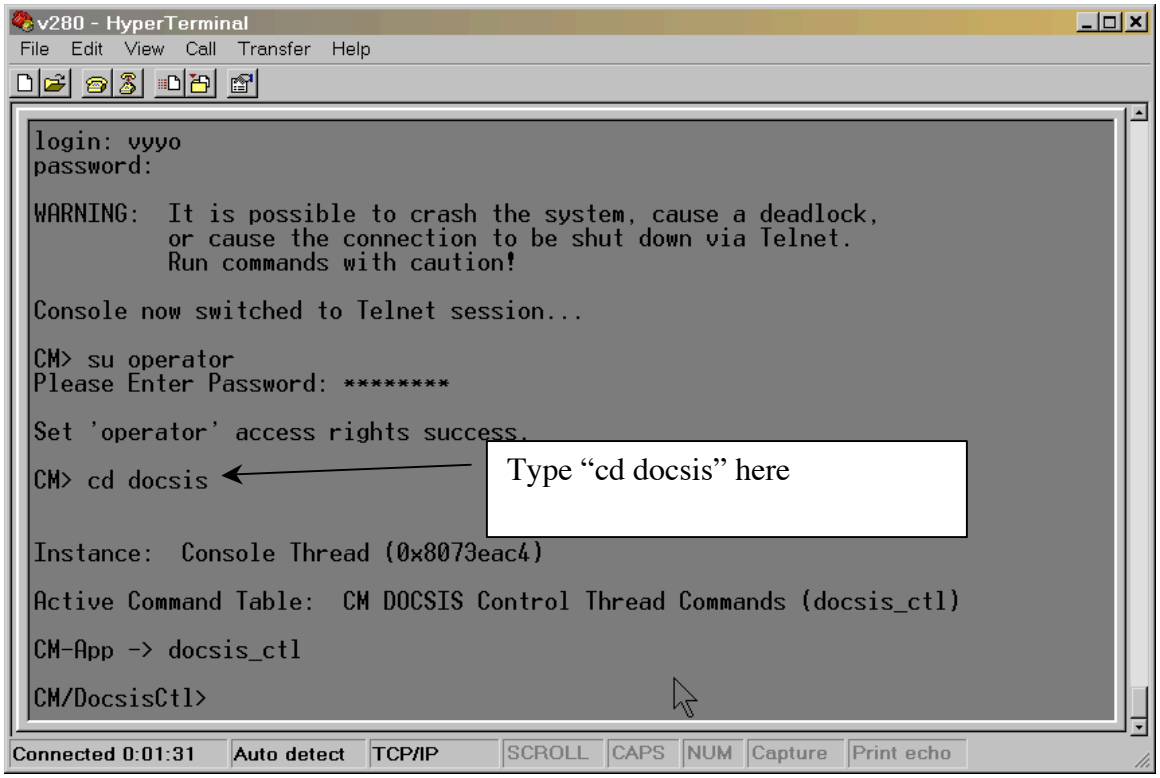


Figure 5-36: The “cd docsis” Command

8. Type “goto_ds xxxxxxxxx” to set the Downstream Frequency, where “xxxxxxxxx” is the frequency in Hertz.

> ***NOTE:*** *Your system engineer should provide you with this value. This will now be the permanent fixed frequency at which the modem will listen for a broadcast from the XMTS. After a maximum of 30 seconds, the modem LEDs should light up and remain lit. This indicates that the modem has locked on to the Downstream channel, is operating on the appropriate Upstream channel, and is authorized for operation on the XMTS.*

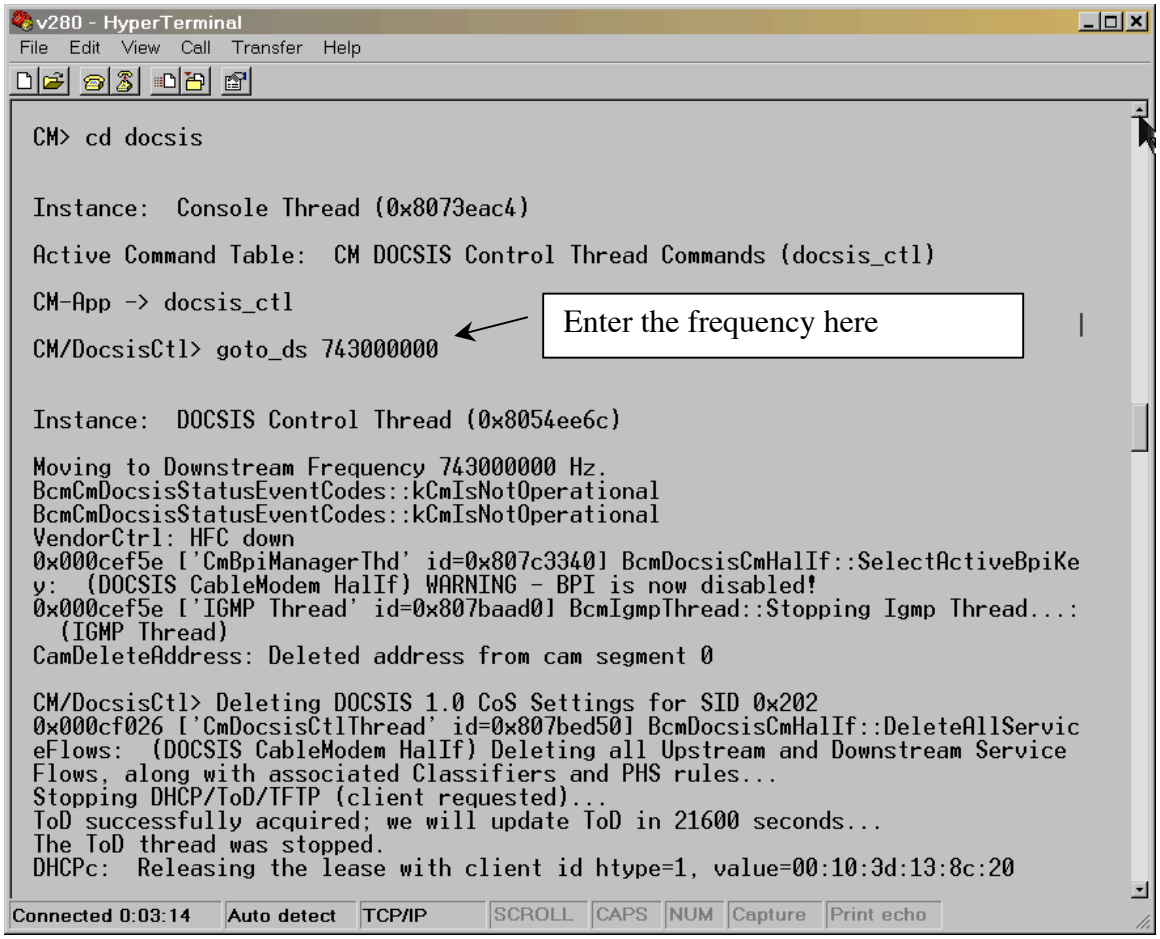


Figure 5-37: Setting the Frequency to 743 Mhz (or 743000000, i.e., six zeroes)

9. To view the “operator” commands type “?”. The following figure shows the “operator” commands.

   NOTE: to get help on a particular command type “help <command>”

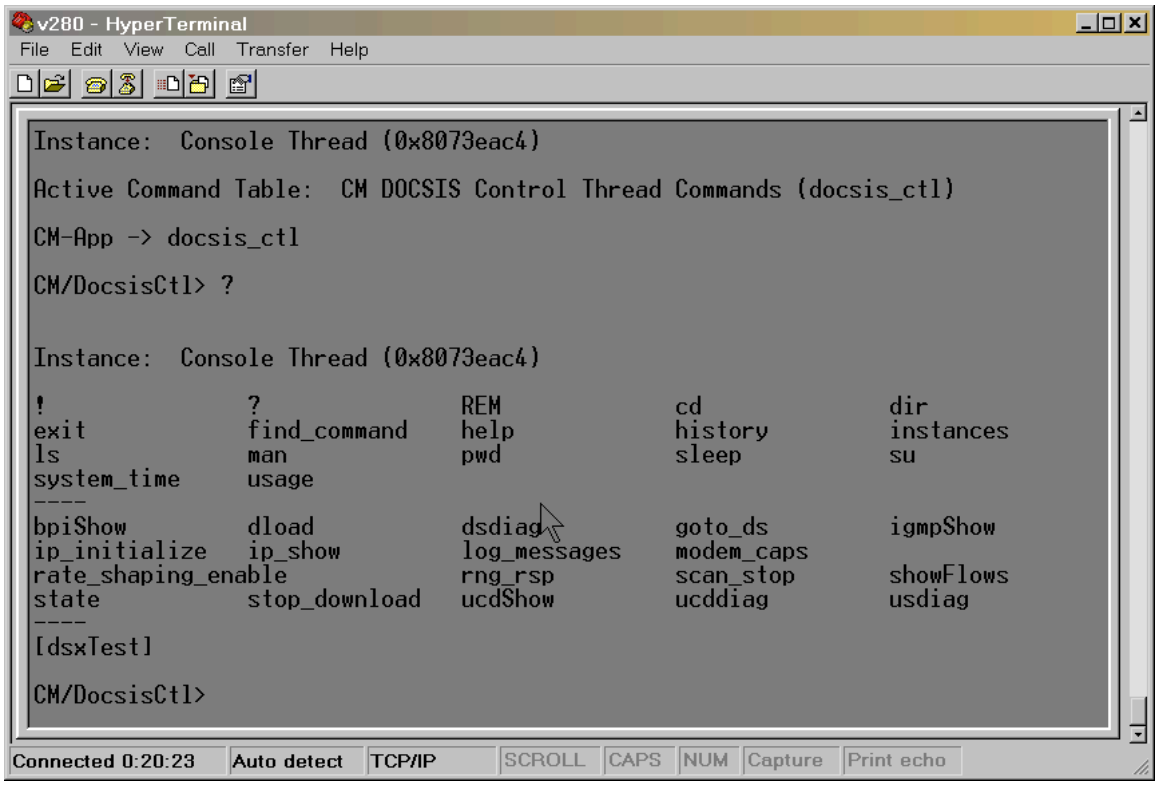


Figure 5-38: Executing the “?” command to view the Operator commands

5.5 Verifying the Modem Downstream and Upstream Status

1. View the downstream status after the modem has successfully completed registration by typing “dsdiag” to verify that the change took effect and the modem is operating correctly: “QAM = LOCKED” and “FEC = LOCKED” should appear as the last two lines. You must have “operator” access rights to do this.

   NOTE: this will only happen if the modem is in a place where it can establish RF connectivity to the XMTS, e.g., hooked up to the cable plant.

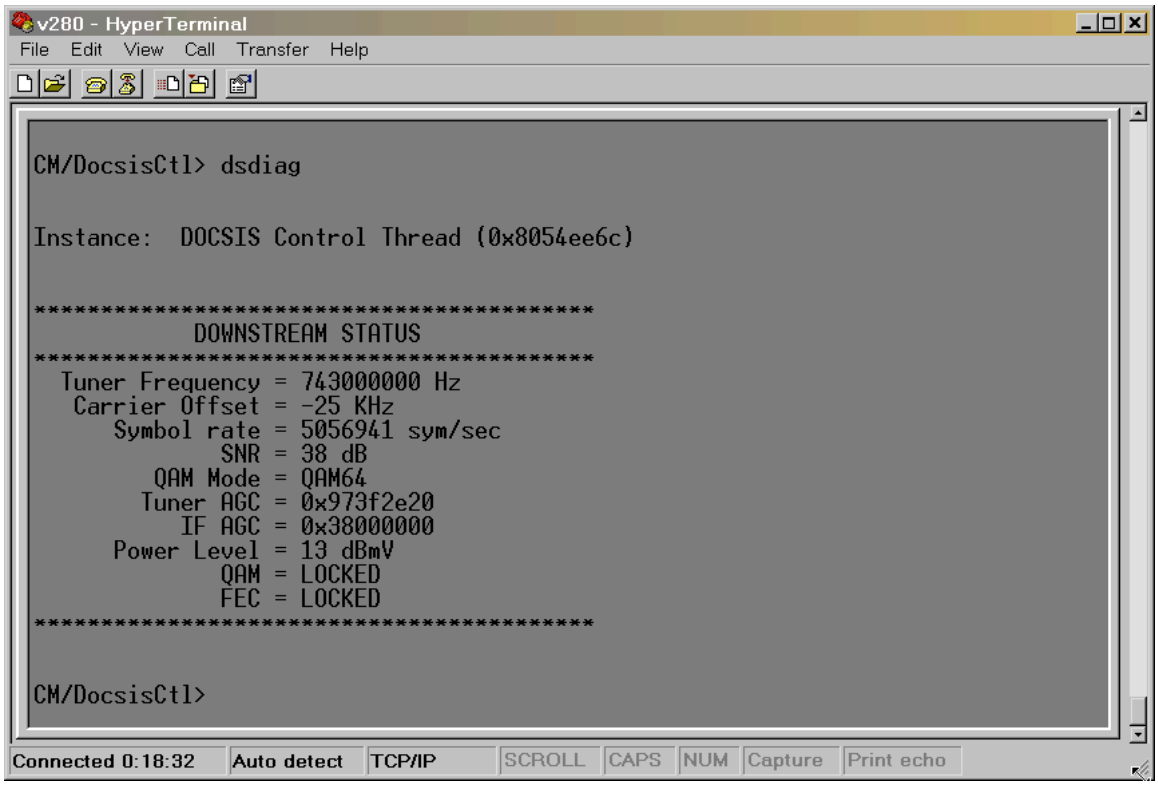


Figure 5-39: Viewing the Modem Downstream Status

2. View the Upstream Status after the modem has successfully completed registration by typing “usdiag” to verify that the modem is operating correctly. The parameters should be stable. You must have “operator” access to do this.

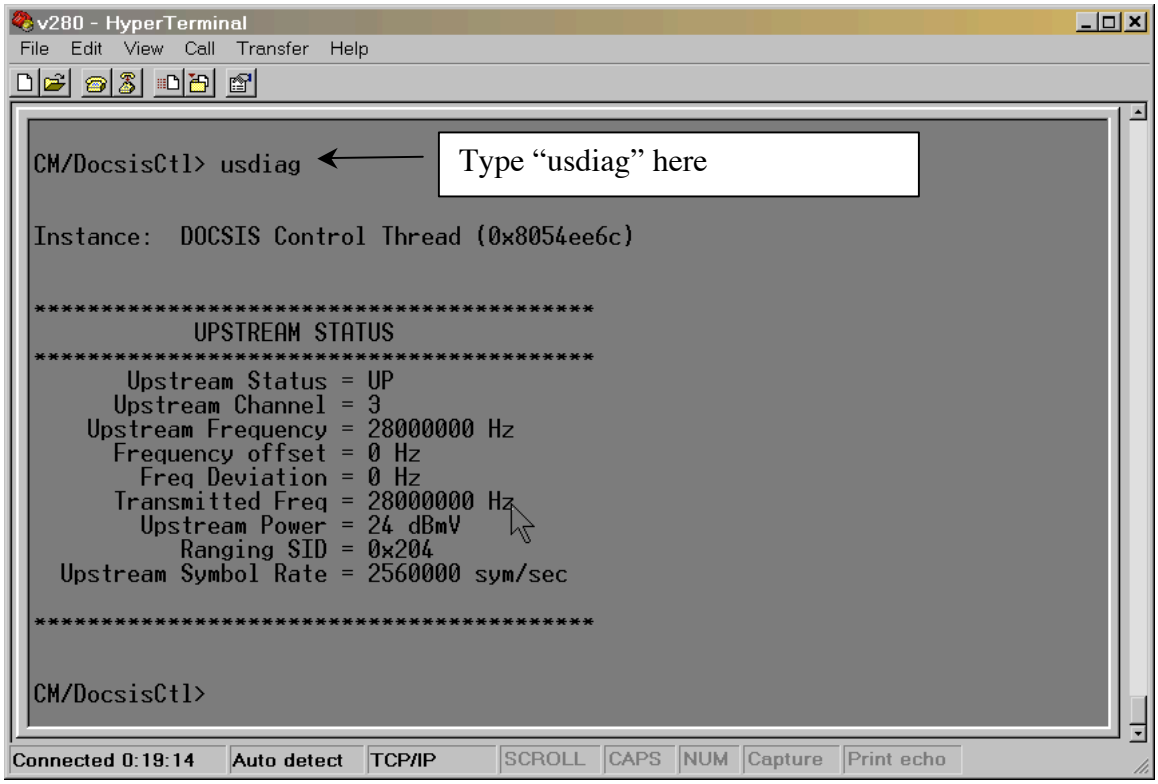


Figure 5-40: Viewing the Modem Upstream Status

The modem has now established IP connectivity with the XMTS.

5.6 Using an HTTP Connection to View Modem Operation

You may also view this information using an HTTP browser such as Internet Explorer. All modems include an HTTP server at the same address as the Telnet server. If the modem does not yet have an IP address assigned and operating (i.e., completed registration), set your browser to browse the URL http://192.168.100.1/ to get the status information.

> ***Note:*** *In order to use this facility, you must be connected to the same LAN to which the modem is connected. This would be 192.168.0.xxx with a subnet mask of 255.255.255.0 in the initial case.*

5.6.1 Viewing the internal modem HTML pages:

1. Open the Web Browser application that is installed on your system.

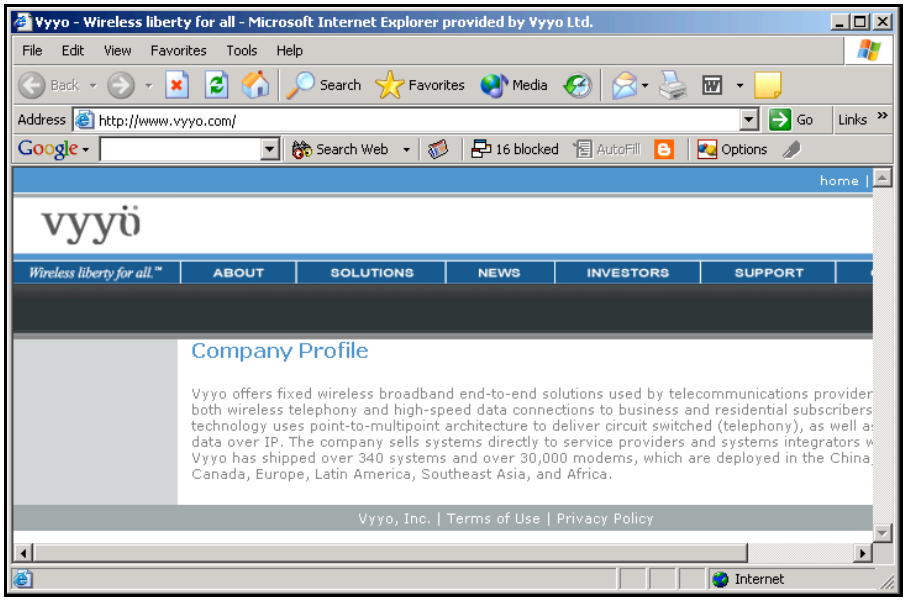


Figure 5-41: Opening a Browser Window to view modem activity

10. Type **http://192.168.100.1/** into the Address field at the top of the Browser window and press **"**Enter**"**.

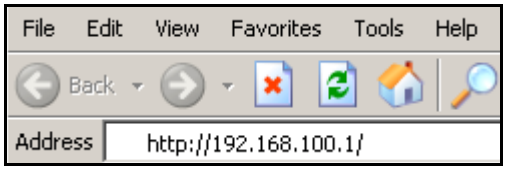


Figure 5-42: Entering the modem IP address into the Browser Window

11. Obtain the Operator user name and password from your System Administrator or an authorized Vyyo representative. Enter the user name and password in the appropriate fields, and click the **OK** button. The **Vyyo Connection** page opens.

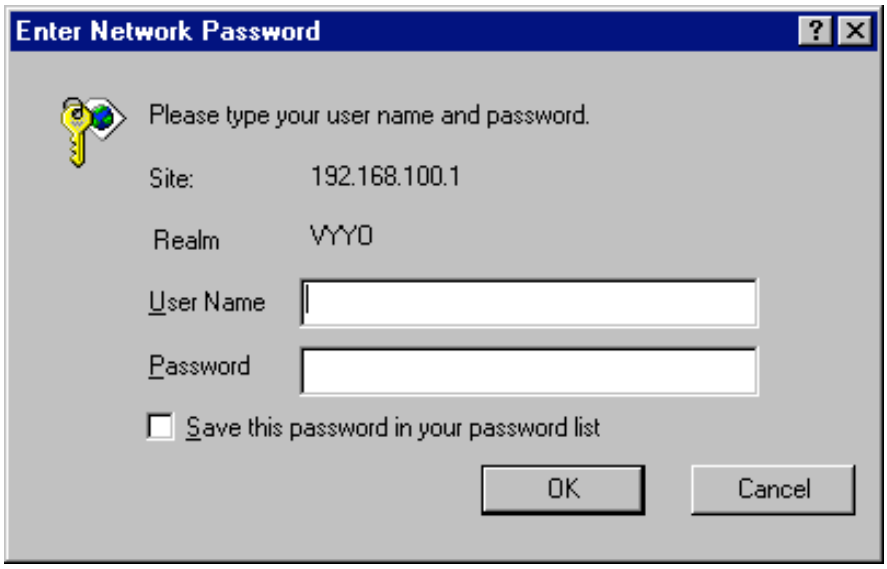
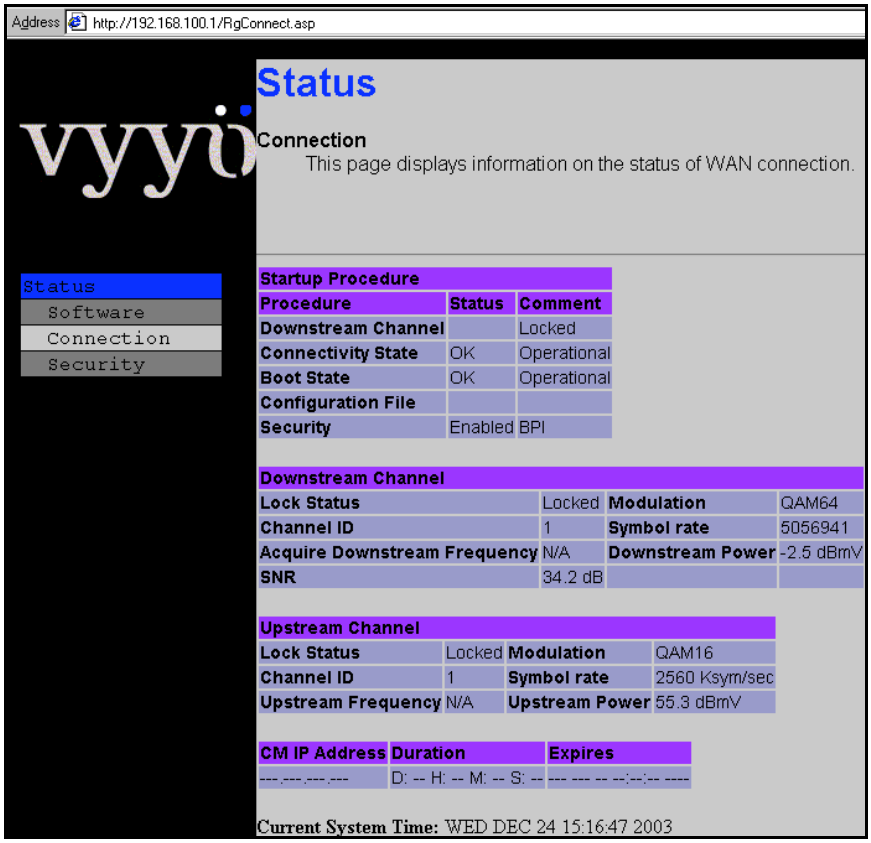


Figure 5-43: Entering the modem user name and password

12. Each informational page consists of two sections: A **Menu** box at the left, which enables you to navigate between pages, and a **Data** area at the right, which shows information specific to the system.



5.6.2 Viewing the Connection Page

To view the Connection page click the "Connection" option on the Menu box.

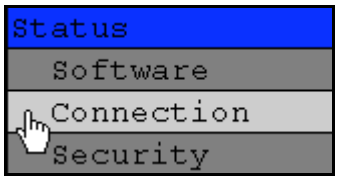
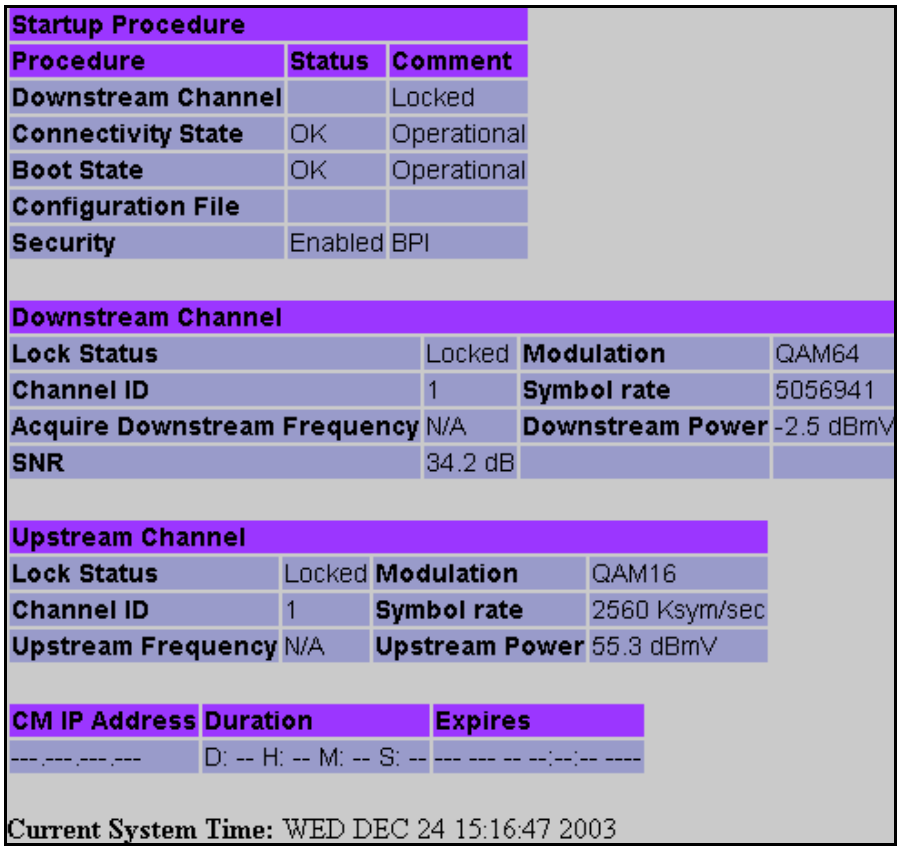


Figure 5-44: Selecting the Browser Connection option

The browser displays the Connection page which has five areas of information:

- Startup Procedure
- Downstream Channel
- Upstream Channel
- Assigned IP Address of the Modem
- Current System Time from the ToD Server.



Startup Procedure		
Procedure	**Status**	**Comment**
Downstream Channel		Locked
Connectivity State	OK	Operational
Boot State	OK	Operational
Configuration File		
Security	Enabled	BPI

Downstream Channel			
Lock Status	Locked	**Modulation**	QAM64
Channel ID	1	**Symbol rate**	5056941
Acquire Downstream Frequency	N/A	**Downstream Power**	-2.5 dBmV
SNR	34.2 dB		

Upstream Channel			
Lock Status	Locked	**Modulation**	QAM16
Channel ID	1	**Symbol rate**	2560 Ksym/sec
Upstream Frequency	N/A	**Upstream Power**	55.3 dBmV

CM IP Address	Duration	Expires
---.---.---.---	D: -- H: -- M: -- S: --	--- --- -- --:--:-- ----

Current System Time: WED DEC 24 15:16:47 2003

Figure 5-45: Viewing the Browser Connection page

5.6.3 Viewing the Software Page

To view the Software page click the **Software** option on the Menu box.

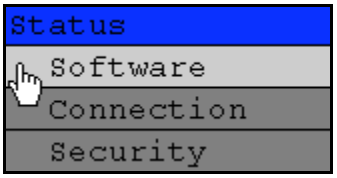


Figure 5-46: Selecting the Browser Software option

The Software page displays modem Information and Status data.

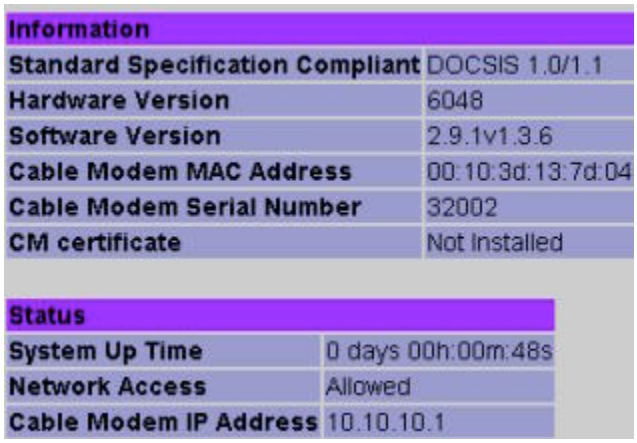


Figure 5-47: Viewing the Browser Software page

5.6.4 Viewing the Security Page

To view the Security page click the **Security** option on the Menu box.

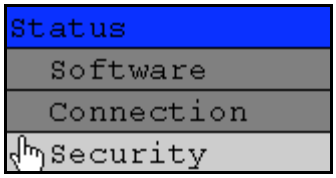
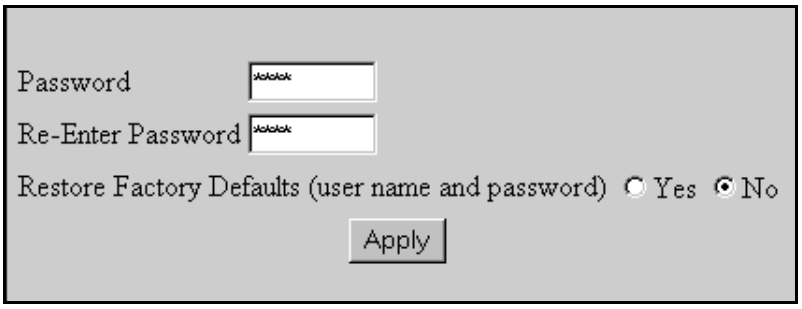


Figure 5-48: Selecting the Browser Status option

The browser displays the **Security** page.



You use the Security page if you wish to change your login password. To change your Password, enter a new Password in the **Password** field, and enter it again for verification in the **Re-Enter Password** field.

If you want to return to the factory default password, select the **Yes** option and click **Apply**.

Chapter 6. Configuring a T1 Connection

***NOTE**: the data connection for the E1/T1 modem must be setup as previously described in Chapter 5, Adding a Modem to the XMTS*

Three separate tools are necessary to configure a T1 connection:

The **WMUconfigFileEditor** is used to set the modem QoS (also referred to as Class of Service) in the modem configuration file downloaded during the modem initialization phase.

The **NMS** (Castlerock SNMPc) tool is the Network Management System used to monitor and reconfigure the network on an ongoing basis. It accesses a MIB database stored in the XMTS as well as a local version residing in the controlling computer. It is used here to set specific XMTS parameters by launching the Vyyo Configuration tool.

The Java™-based **Vyyo Configuration Tool** is necessary to set the E1/T1 parameters of the XMTS when adding a new modem to the network.

These tools may be used as directed in any order. They are described in the following sequence:

1. The **WMUconfigFileEditor** is used to modify the modem configuration file for T1 operation by adding a second Class of Service (the first Class of Service was used for the data only connection). Instructions are also given for setting/checking the upstream and downstream parameters (which may have been previously set when configuring the modem for data only operation).

2. The **NMS** tool is used to launch the Vyyo Configuration Tool to set the XMTS upstream parameters, specifically the QoS (Quality of Service) which is another name for the Class of Service. For older systems, Instructions for using the Synoptics interface are given in Chapter 10, Synoptics Display for XMTS Configuration.

3. The **Vyyo Configuration Tool** is required to bind the T1 ports of the modem to the T1 ports of the XMTS.

6.1 Configure the Modem for T1 Operation

In this section instructions are provided for using the **WMUconfigFile Editor** to edit the modem configuration file which will be downloaded to the modem. When the edits on the following pages are complete, copy or move the modem configuration file to the directory being used by the TFTP Server (usually this will be something like "C:\vyyo\mic"). You may also save it directly to the TFTP directory using the "Save" menu option of the **WMUconfigFile Editor**.

> ***NOTE**: This file name must be bound to this modem's MAC address by using the appropriate DHCP tool for the particular system being used (Edit the CM.SRC file if ipLease is being used. If the Windows 200x Server Edition DHCP Administrative tool is being used then set the "bpBootfile" name to the name of the modem's configuration file).*

1. Set the Downstream Frequency by selecting "General Parameters" then double clicking on the "Downstream Frequency (Hz)" parameter as shown. This is the frequency which the modem will use to receive (downstream) transmissions from the XMTS. This is the same procedure described in Setting the Downstream Frequency and is repeated here for convenience.

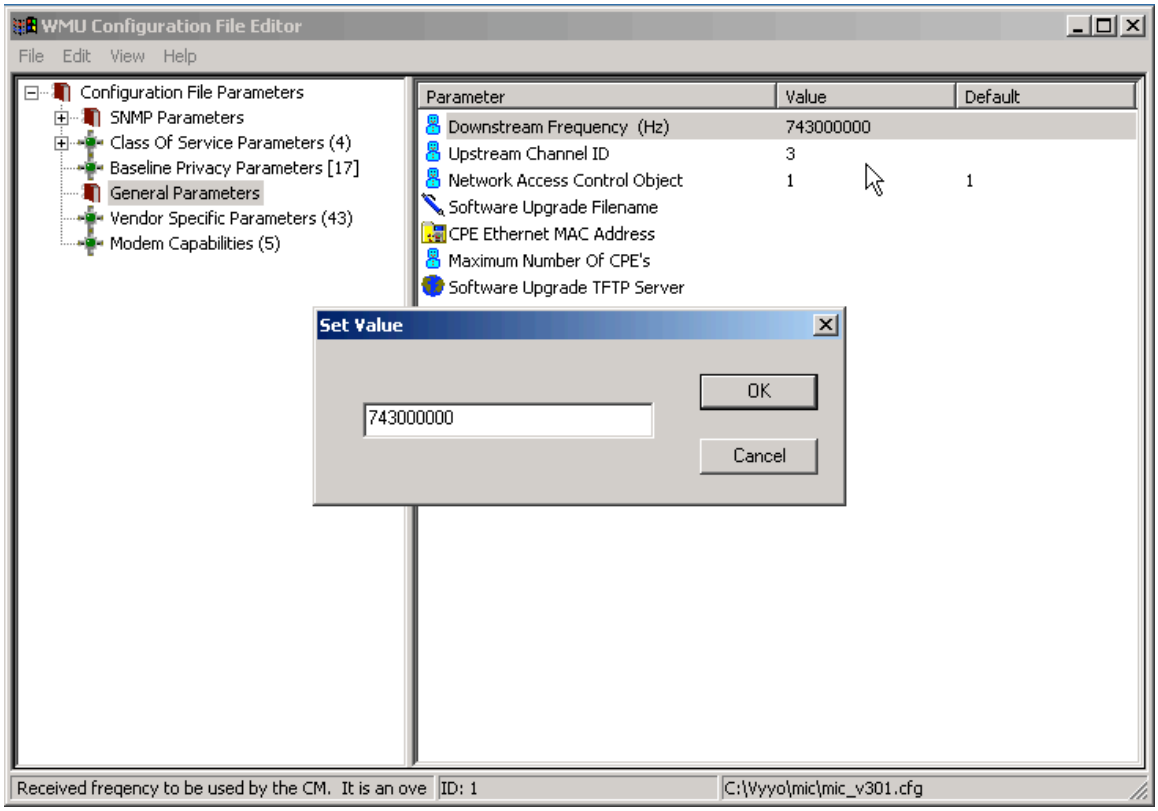


Figure 6-1: Set the Downstream Frequency Value

2. Set the upstream channel ID using the same procedure. This is the channel ID the modem will use to transmit upstream data to the XMTS. The channel ID parameters are sent by the XMTS when it broadcasts UCDs during the Obtaining Upstream Parameters phase (immediately after the Downstream Synchronization phase) of the modem initialization prcocess. This is the same procedure described in Setting the XMTS Upstream Parameters and is repeated here for convenience.

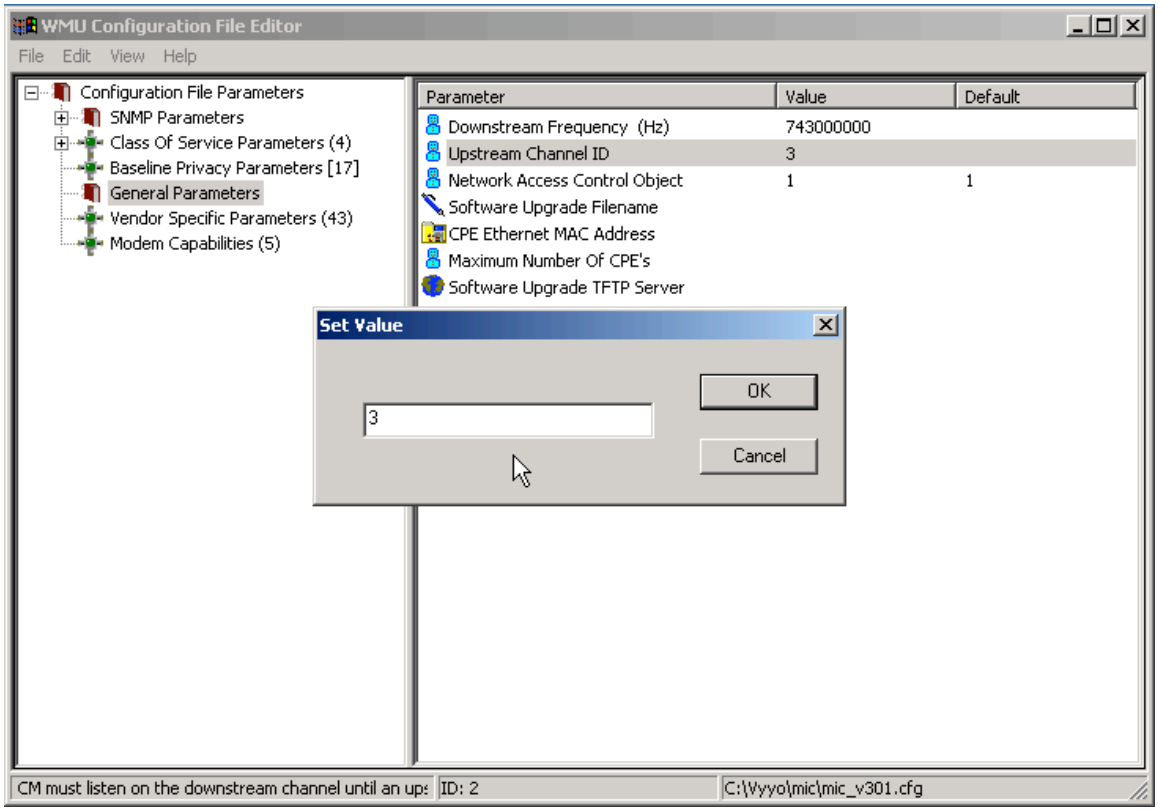


Figure 6-2. Set the Upstream Channel ID

3. Create a second Class of Service (aka. QoS or Service ID). Select and right-click “Class of Service”, then select the “Duplicate” option. This is necessary to add the “Voice” (or “WAN”) service for the T1 connection.

NOTE: the first Class of Service was created previously for the data only connection. This second Class of Service is specifically for the T1 connection so make sure it is setup that way. The same upstream channel is used for both.

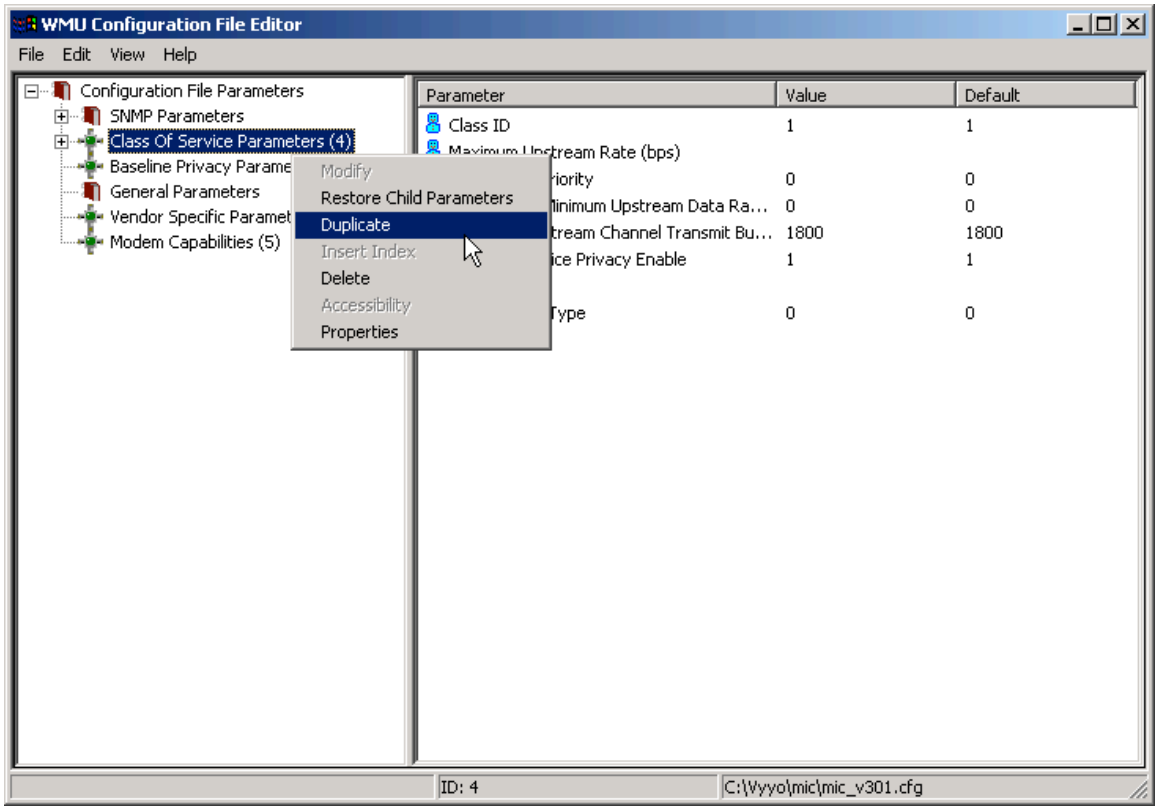


Figure 6-3. Duplicating the QoS Value

4. Observe that a second Class of Service has been added in the left column of the window.

5. Select this second Class of Service, then right-click on the Maximum Upstream Rate parameter and select “Modify” from the popup menu.

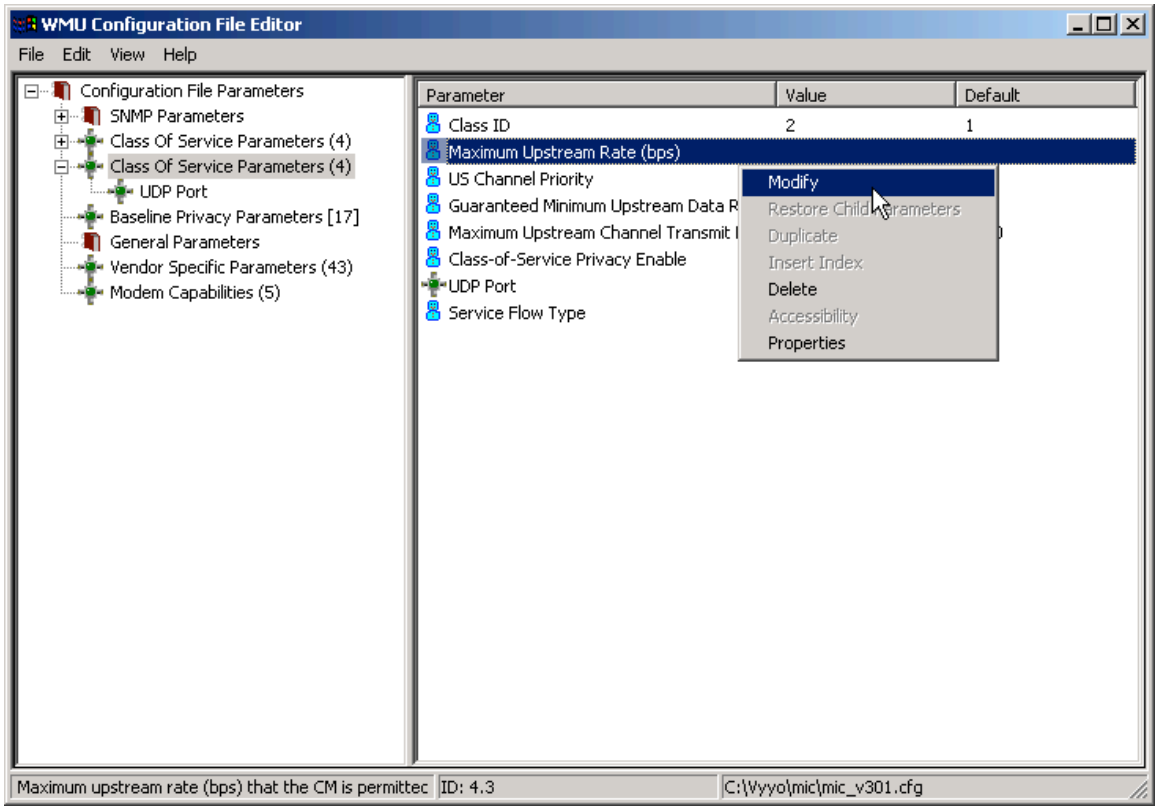


Figure 6-4. Modifying the Upstream Bit Rate Value

6. Now select “WAN Service/2048k” from the “Parameter” pane of the popup window.

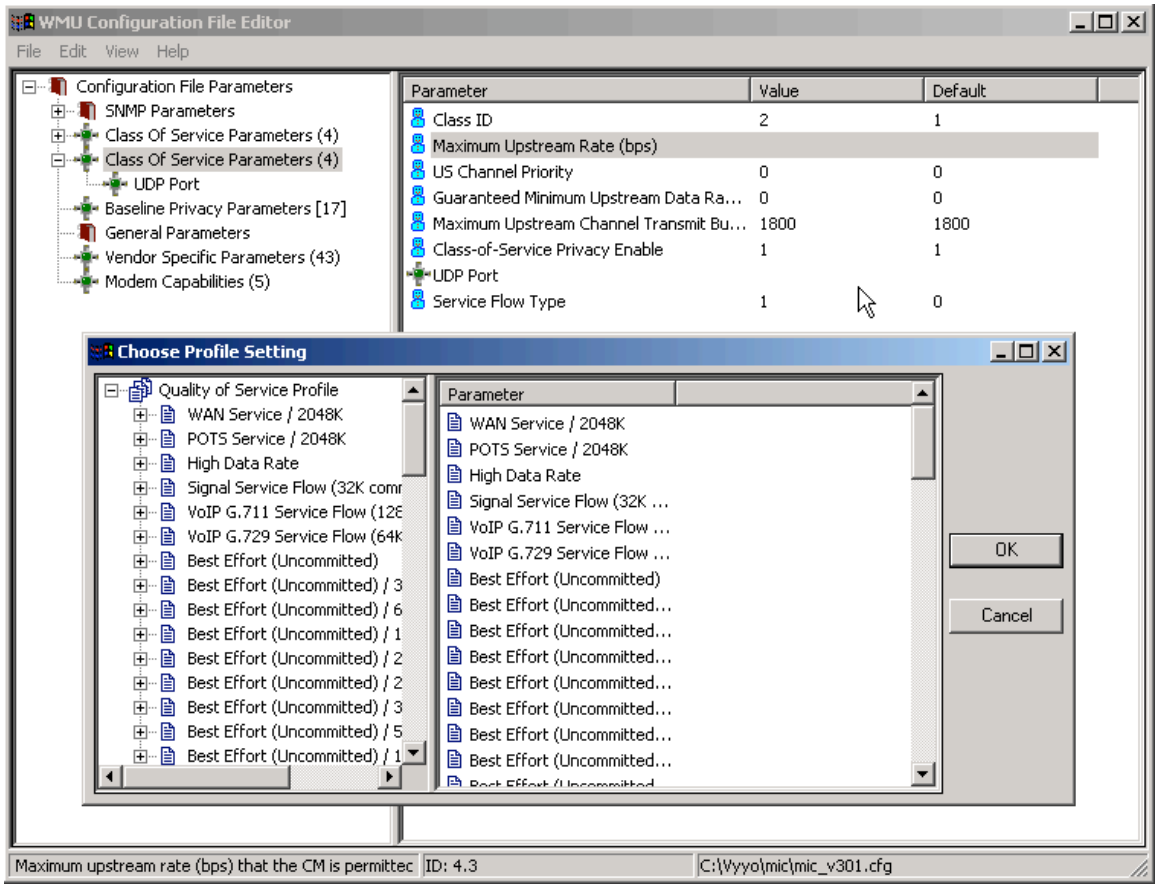


Figure 6-5. Choosing an Upstream Bit Rate Parameter

7. The corresponding parameters will appear on the right side of the popup window.

8. Now select “WAN Service/2048K” in the left pane of the popup window and then Click the “OK” button.

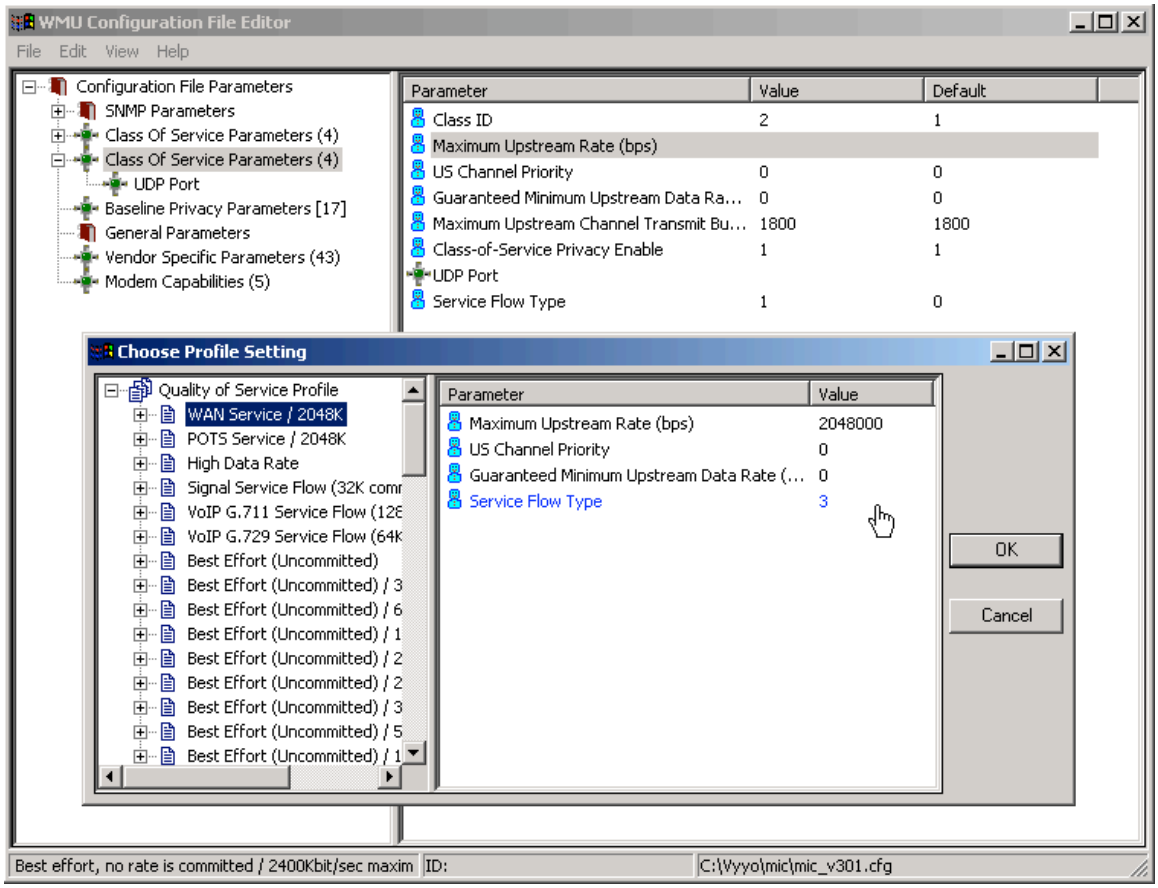


Figure 6-6. Choose Profile Setting

9. The display will return to the main window showing the new values set above, as shown in Figure 6-7.

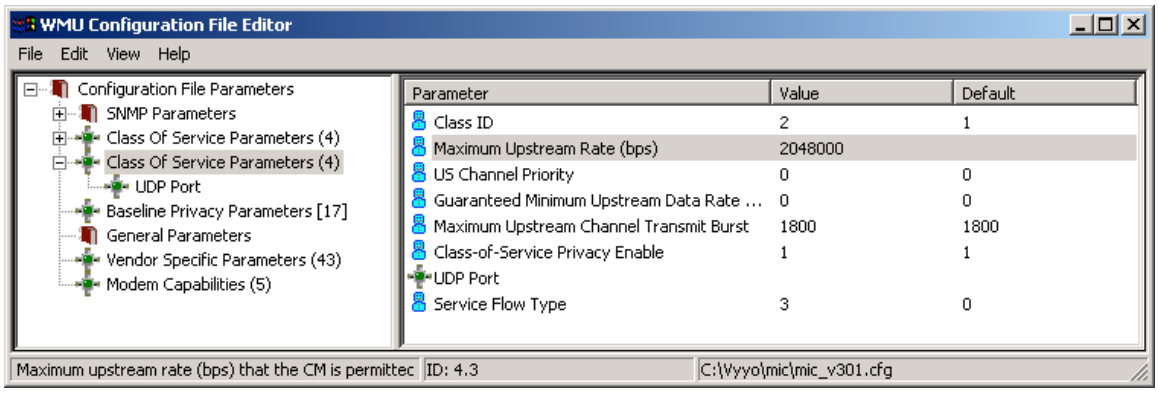


Figure 6-7.

10. Select “Modem Capabilities” and turn on “Concatenation” and “Fragmentation” by setting them to “1” (select each one then right-click to popup the “Set Value” window) and clicking the “OK” button.

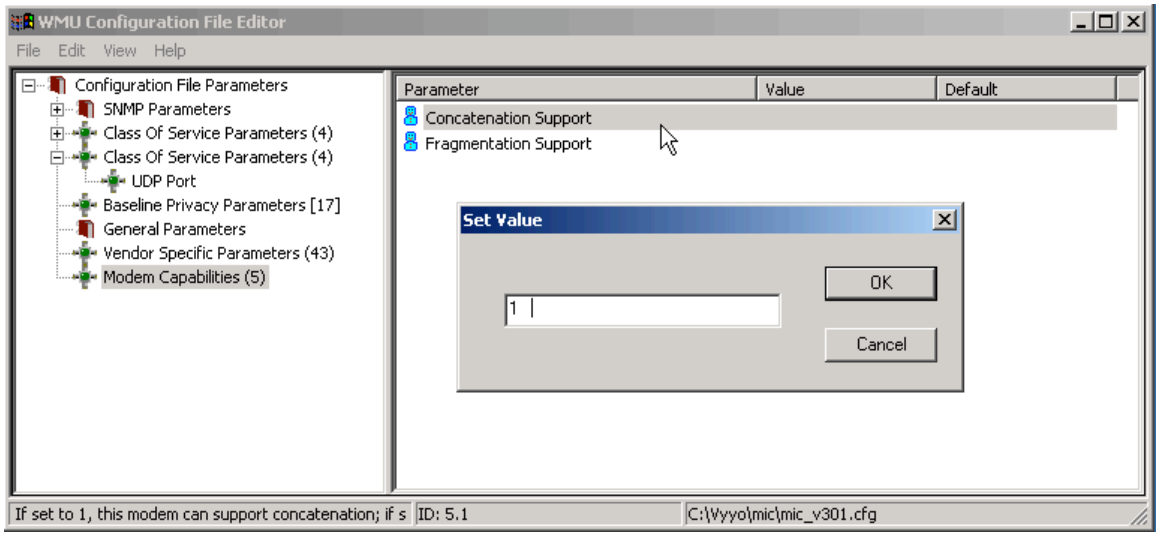


Figure 6-8. Setting Concatenation Value

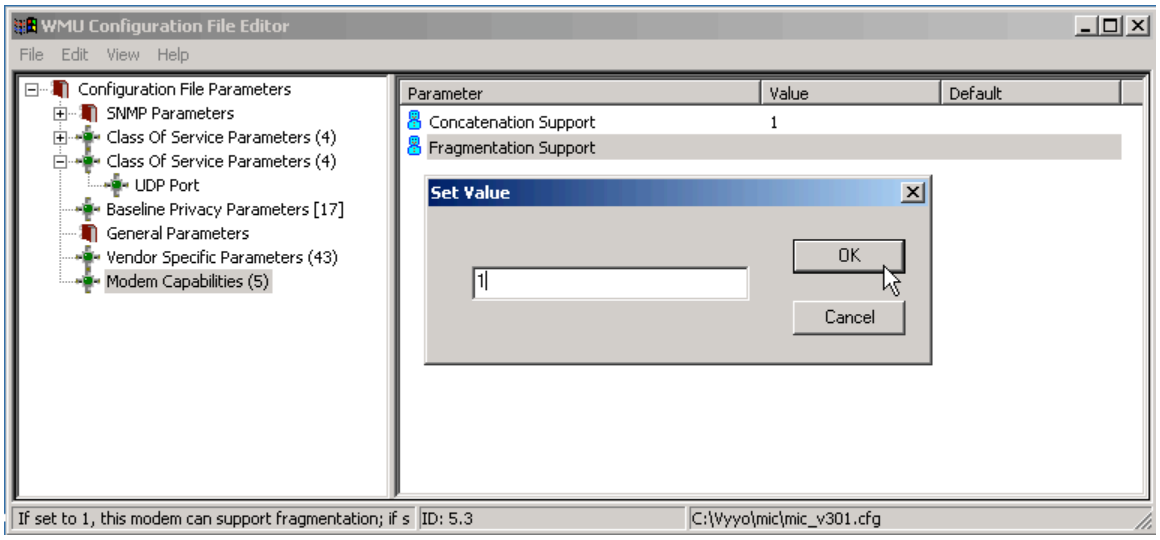


Figure 6-9. Setting Fragmentation Value

11. The display will return to the main window. The modem configuration file is now configured for T1 operation. You should save this file. This filename will be bound to the modem MAC address using the DHCP Server tool as described in IpLease DHCP Server: Editing and running the CM.SRC File. The same modem configuration file may be used for several modems provided the Network RF Plan allows for this; see your system engineer for details.

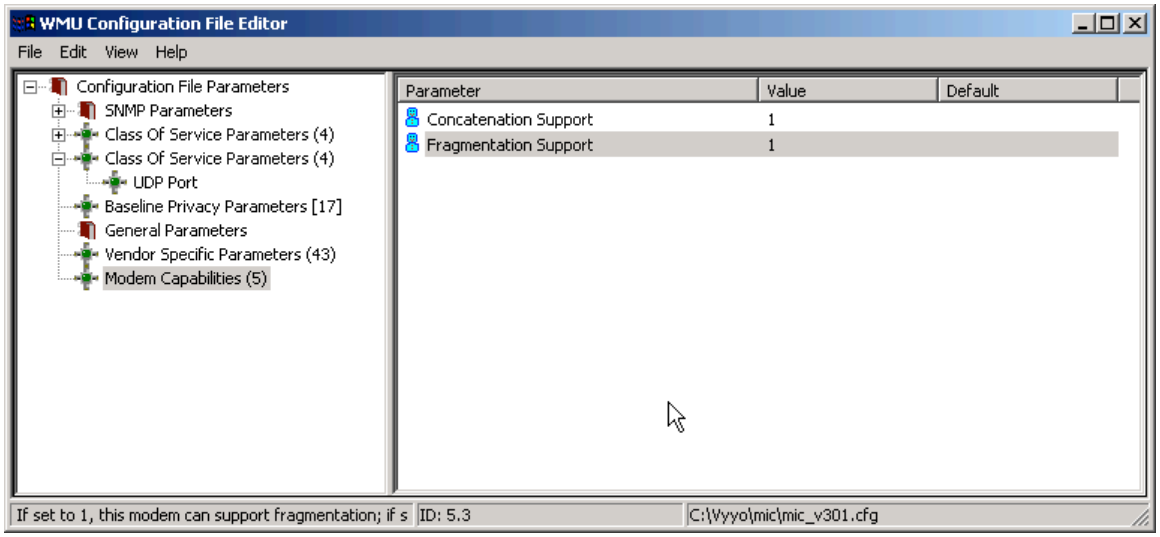


Figure 6-10. Main WMU Configuration File Editor Window

6.2 Adding the T1 modem to the XMTS T1 Interface and Assign Port(s)

NOTE: The XMTS Upstream and Downstream parameters must be configured prior to performing this procedure. In particular the Upstream "Voice Service Type" must be set to "WAN" for an E1/T1 channel. See Configuring a T1 Connection.

1. Open the Network Management System (NMS) tool and double-click on the WMTS icon to bring up the the WMTS front panel.

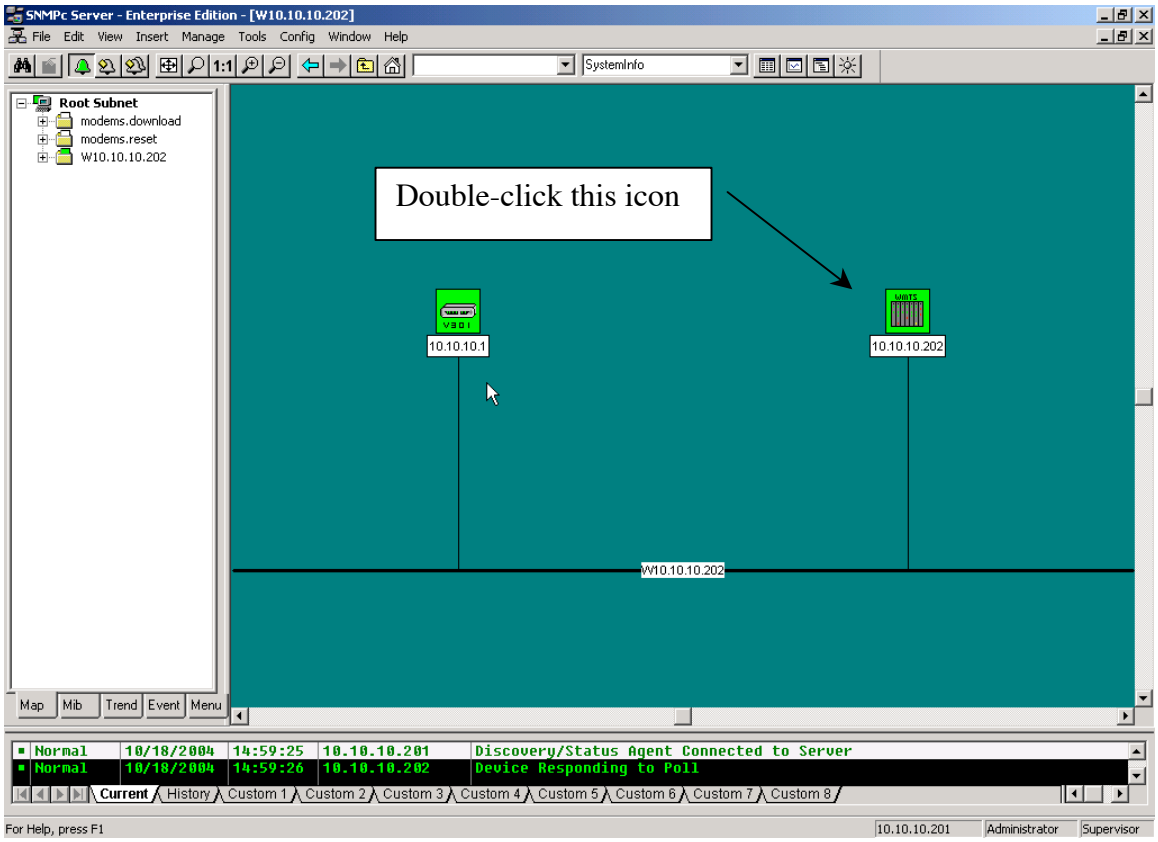


Figure 6-11: NMS View of Network Devices

2. Select the Configuration Tool item from the Vyyo menu to start the Vyyo Configration Tool from the NMS

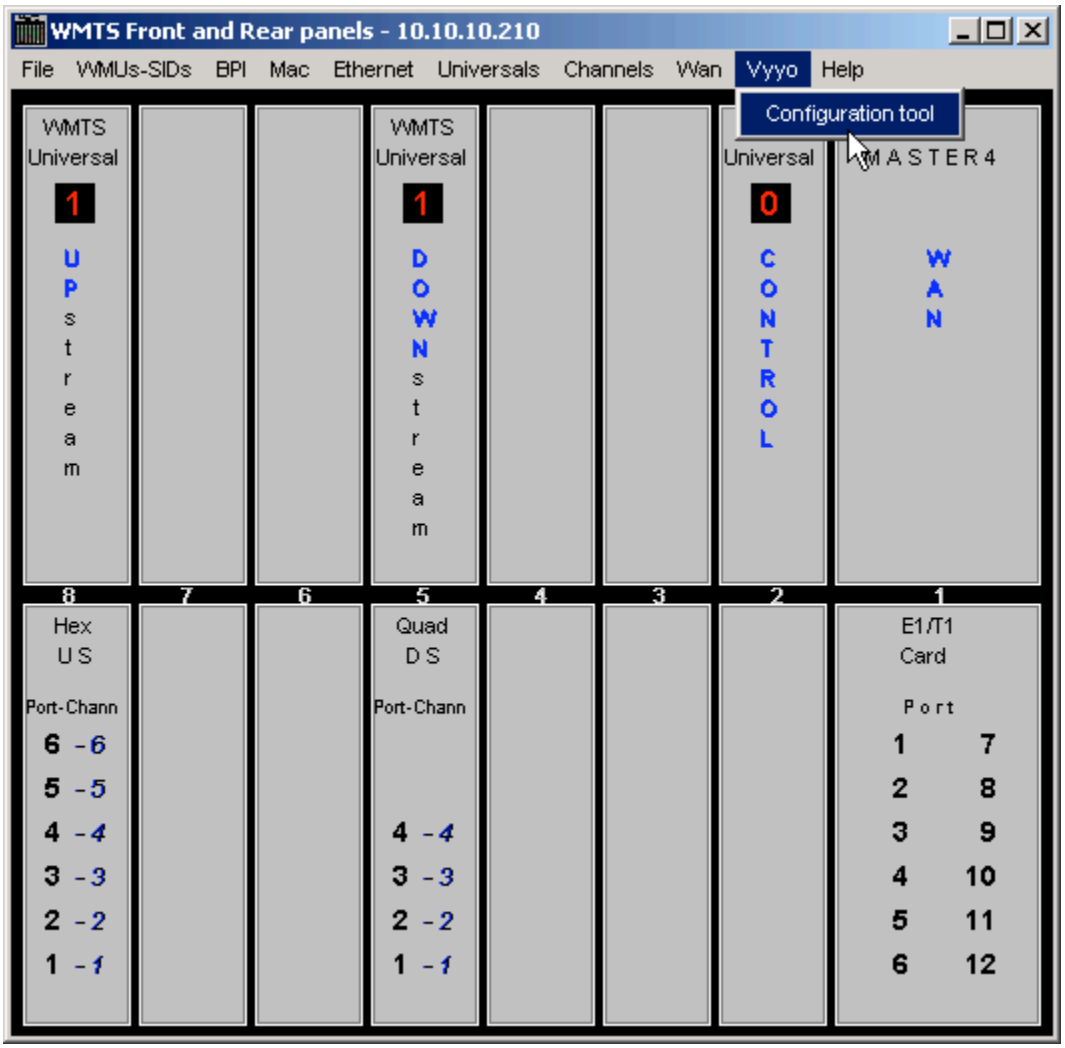


Figure 6-12: Selecting the Vyyo Configuration Tool

3. When the following window appears you will need to expand the "XMTS_xxxx" (where xxxx is the xmts's IP address) and then expand "Modems" to obtain this more informative version of the window If the modem is already connected, the tool will detect it automatically and it will appear in the list under "Modems->E1/T1" or "Modems->Data" by its MAC address; in this case skip to Step 4. Otherwise you must add the modem to the list by continuing this procedure:

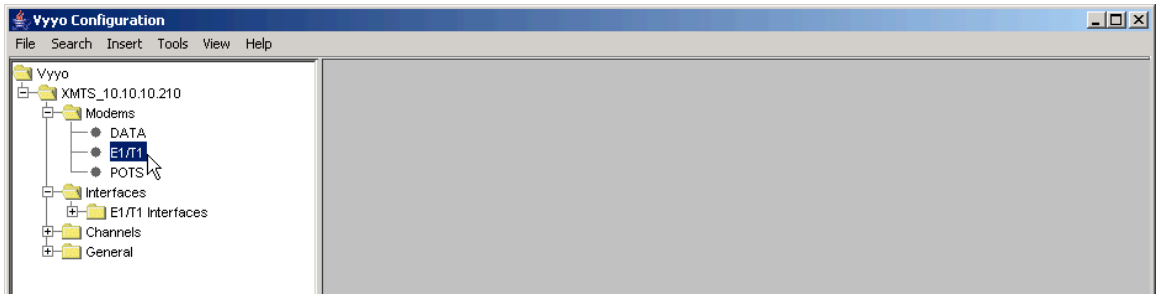


Figure 6-13: Vyyo Configuration Tool main screen

4. Select the "Insert" menu option and choose "Modem"

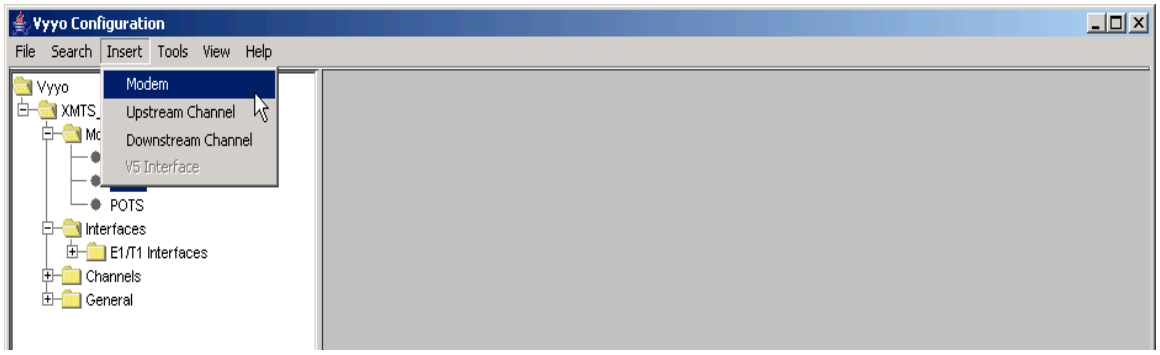


Figure 6-14: Insert Modem

5. A popup window will appear to allow you to enter the modem type. From the pulldown menu select “E1/T1 Modem”.

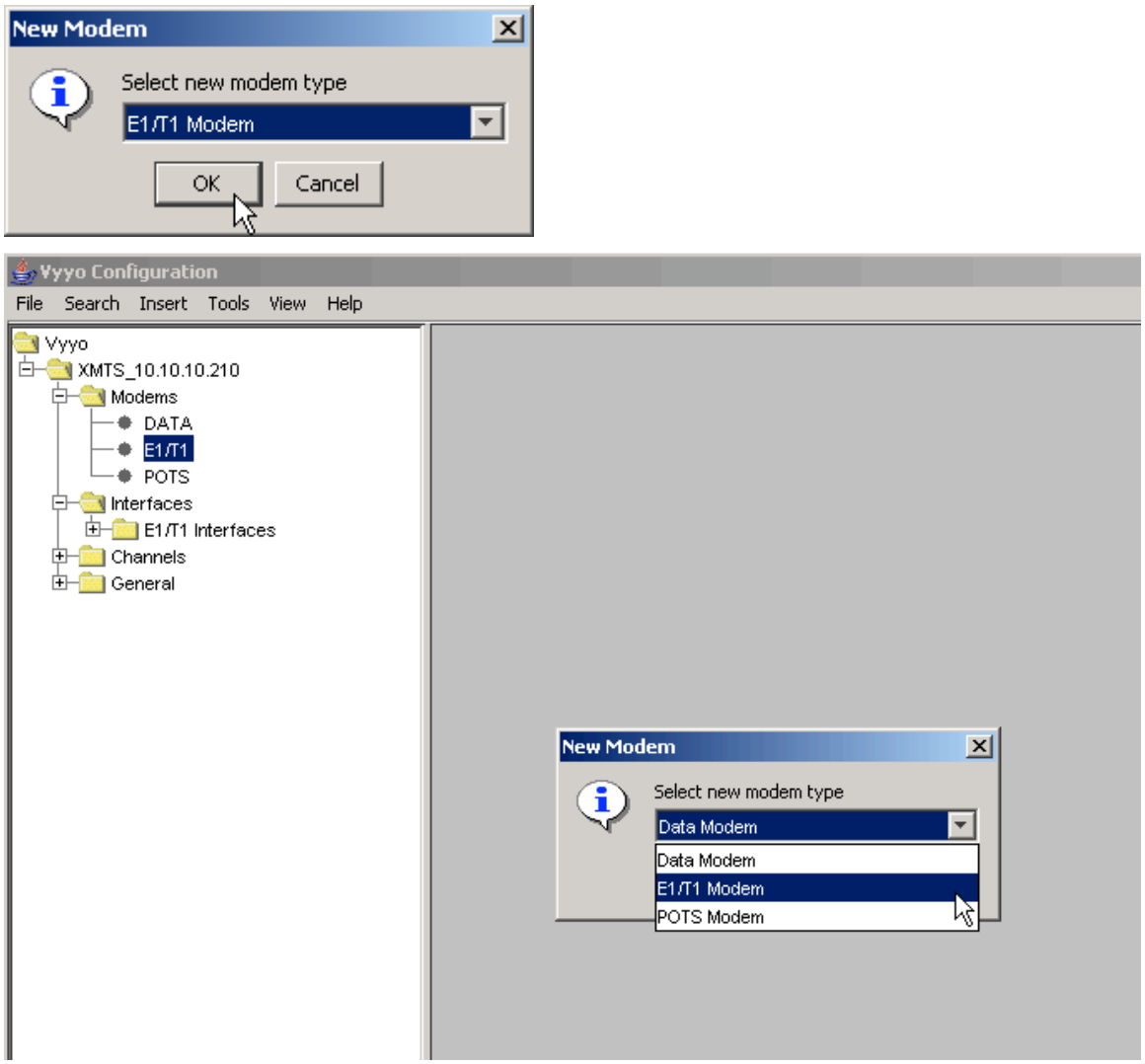


Figure 6-15: Select new modem type

A new modem icon will appear on the navigation tree window pane

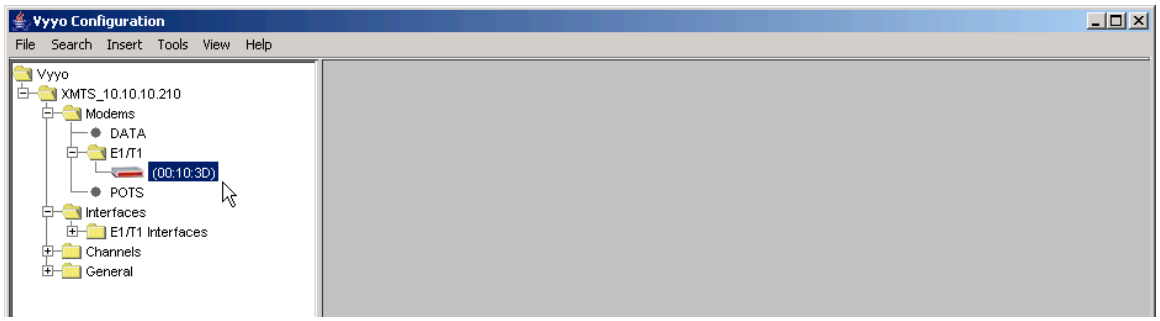


Figure 6-16: New modem icon

6. Enter the last three bytes of the Vyyo modem MAC address and press the “Update” button.

Note: The first six bytes of the Vyyo MAC address (the vendor ID) are displayed both in the navigation tree on the left and in the data entry window on the right.

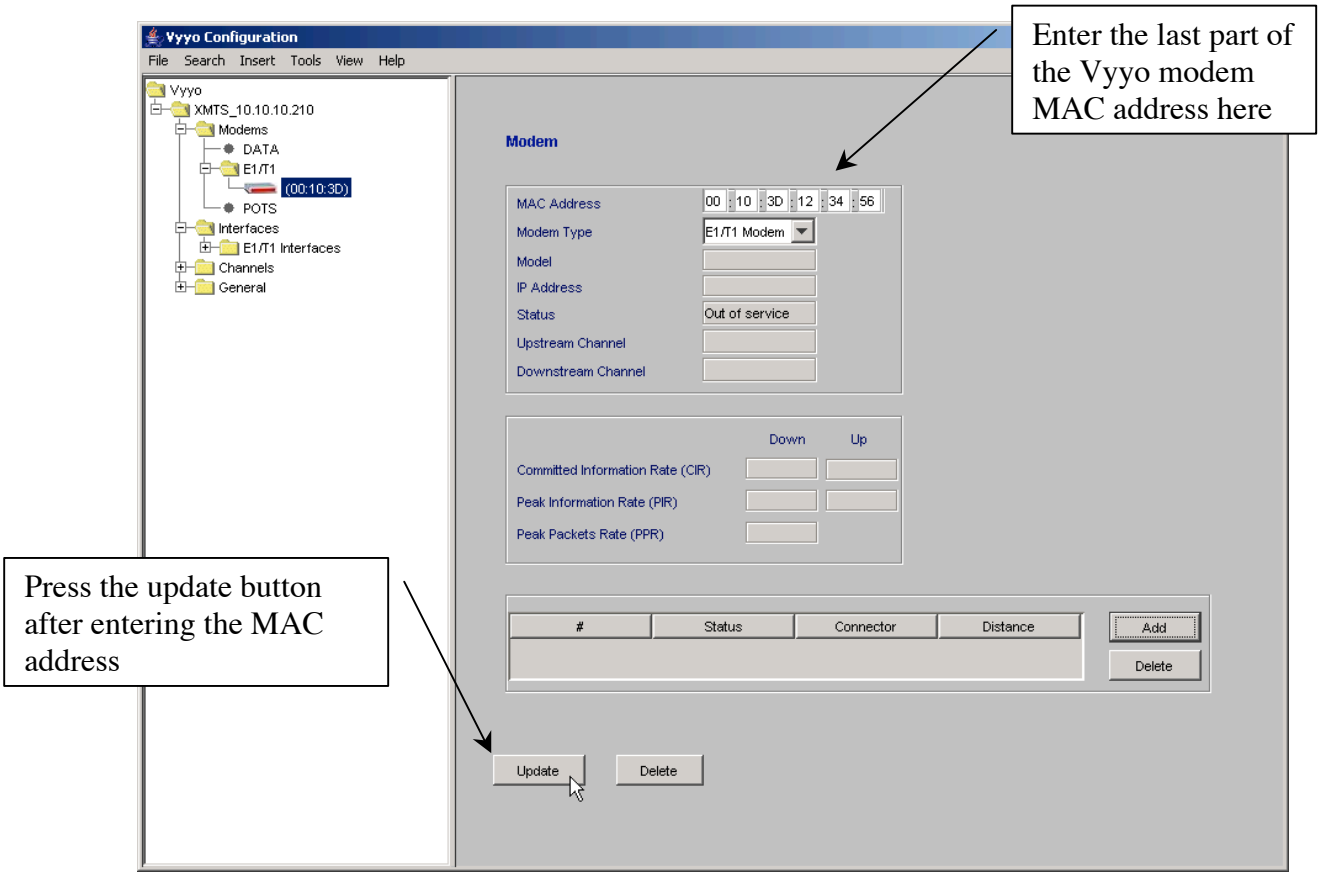


Figure 6-17: Vyyo Modem Configuration Information

7. A popup window will confirm the update. Press “OK”.

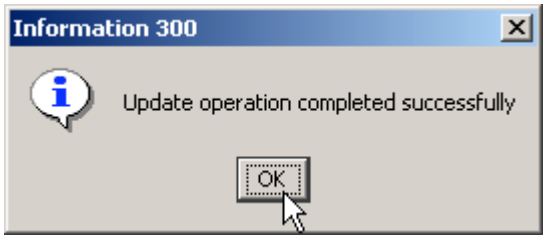


Figure 6-18: Confirm update of new modem

8. Now you must add the E1/T1 configuration for the modem by clicking on the “Add” button.

NOTE: Do this process once for the V311 modems and twice for the V312 modems (the latter have two E1/T1 ports).

NOTE: the modem does not need to be active on the network to perform this procedure as this is strictly a configuration procedure. However, the modem will not appear under its IP address unless it is already on the network as a data modem, i.e., the DOCSIS IP portion of the initialization has been successful.

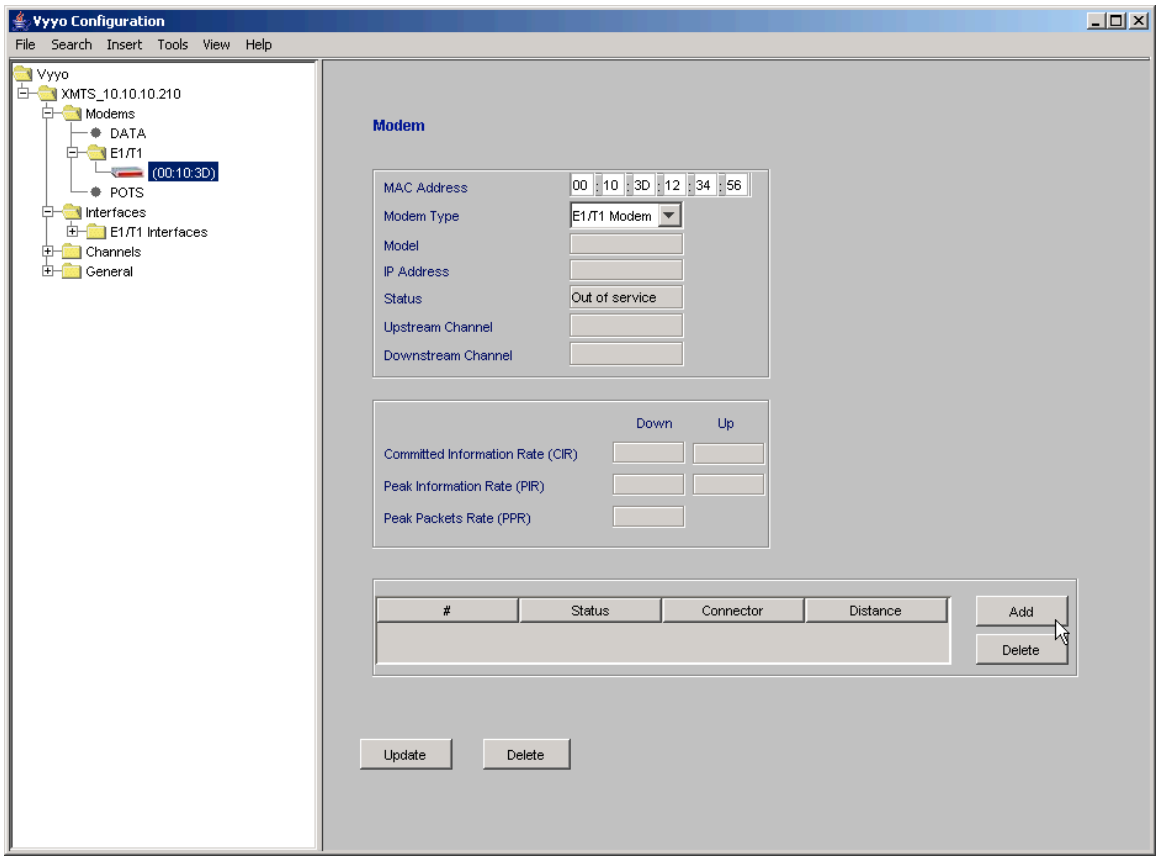


Figure 6-19: Adding a new E1/T1 configuration for a modem

9. When this screen appears, select the desired port on the XMTS E1/T1 interface card using the drop-down menu and press the “Update” button. This binds the T1 port on the modem to its corresponding T1 port on the XMTS E1/T1 interface card (inserted into the rear of the XMTS chassis). Other parameters may be changed fromt the defaults shown in this screenshot to create a “fractional T1” connection.

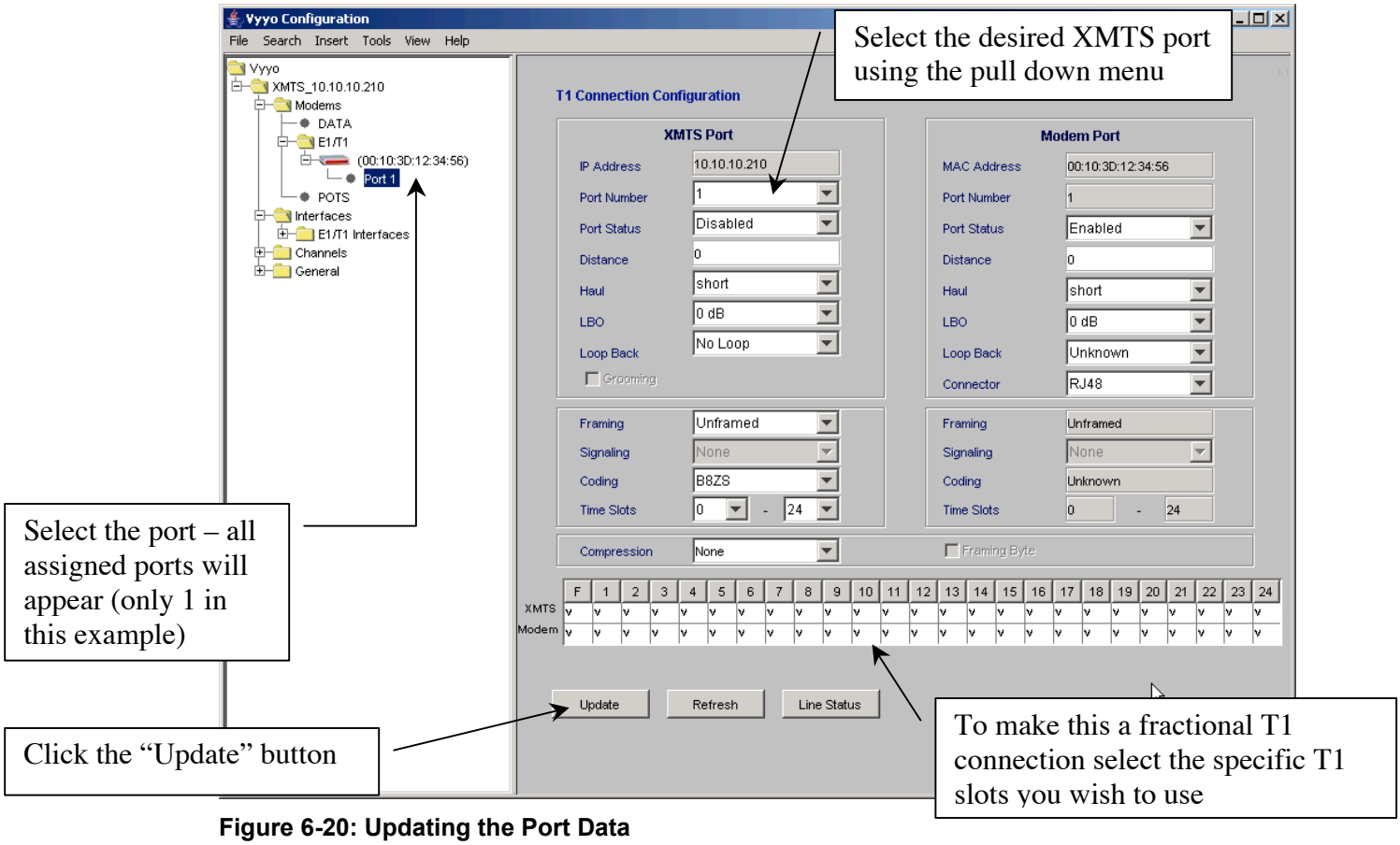


Figure 6-20: Updating the Port Data

10. Enable the newly added modem using the pull down menu

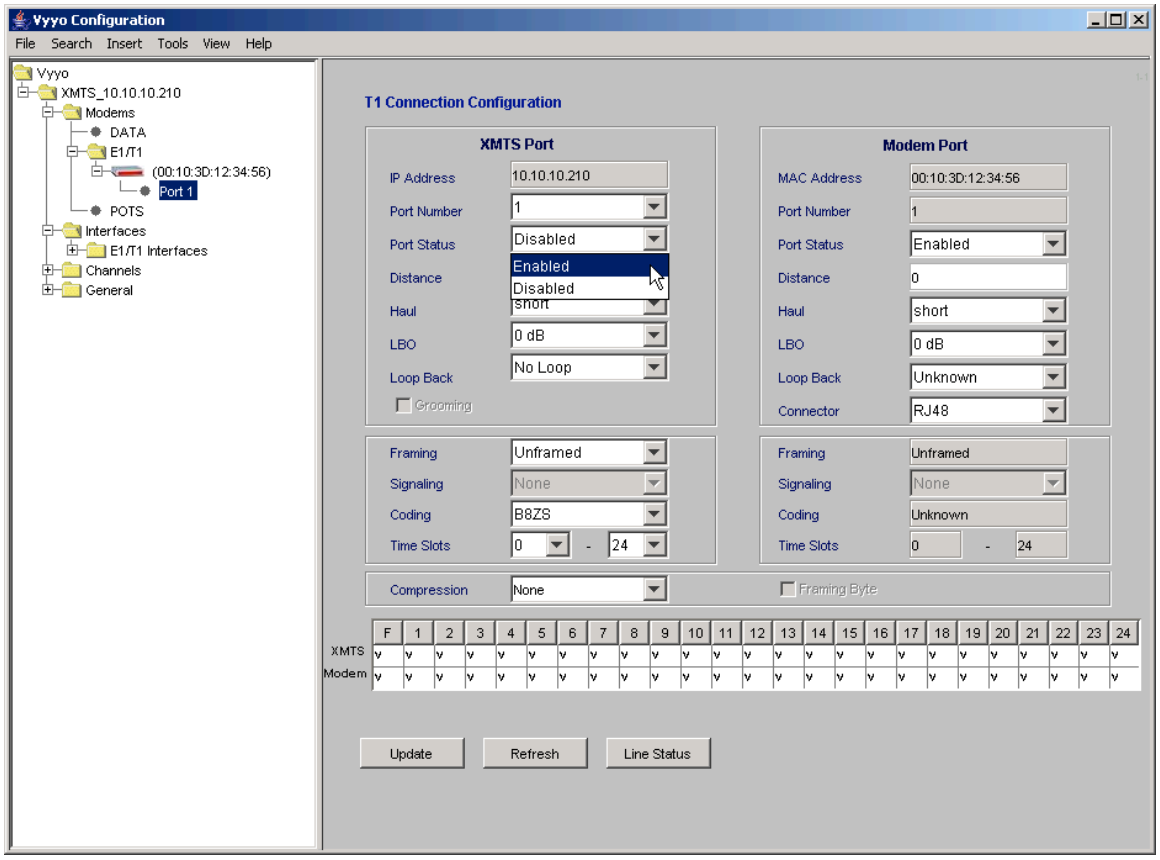


Figure 6-21: Enabling the newly added modem

11. Now click on the “Update” button and press “OK” when the confirmation popup window appears.

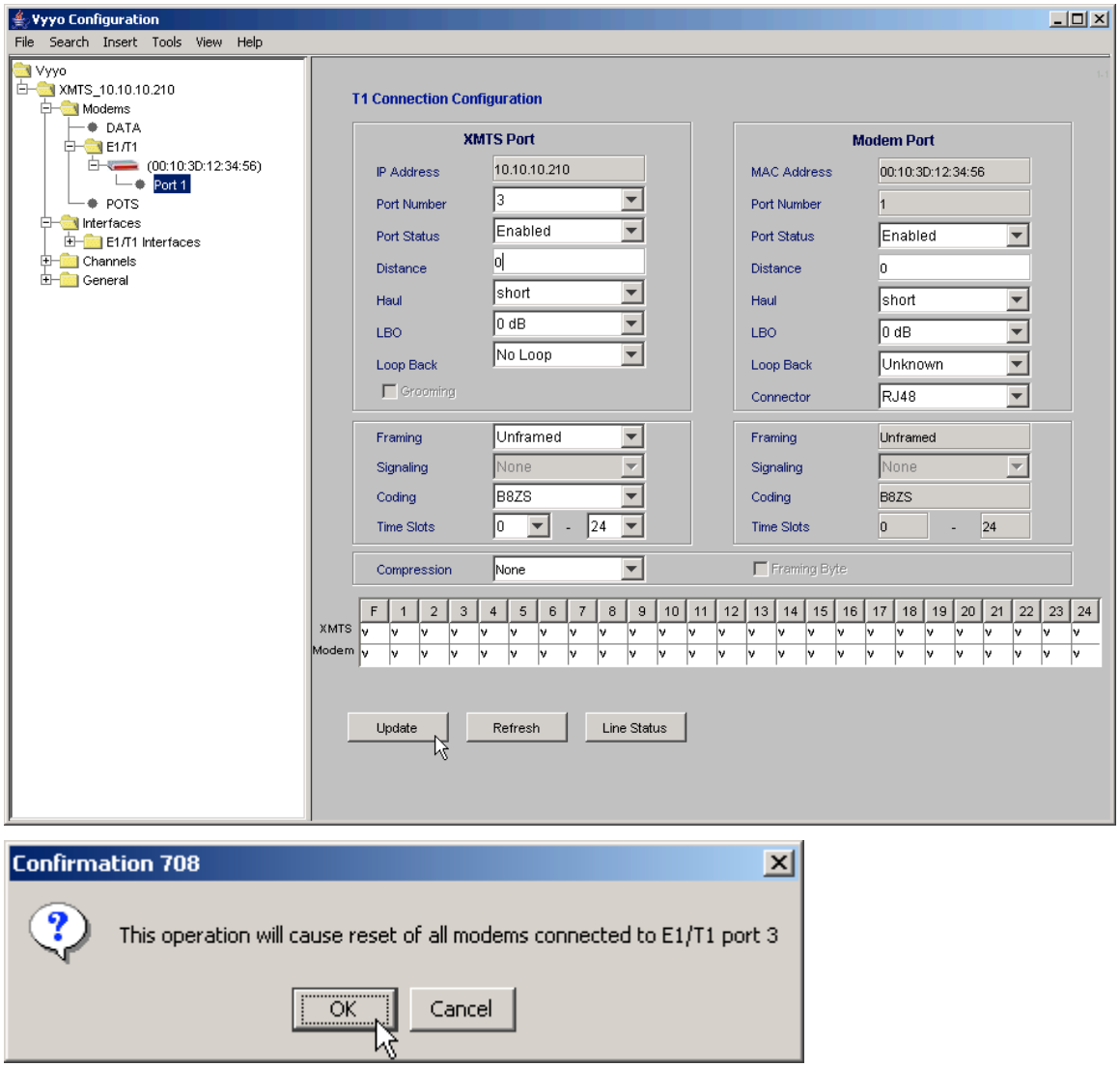


Figure 6-22: Updating the system for the new modem

12. This screen will show the new modem and its corresponding XMTS port. It can also be used to change the assigned modem port if the modem is already connected to an E1/T1 port on the XMTS.

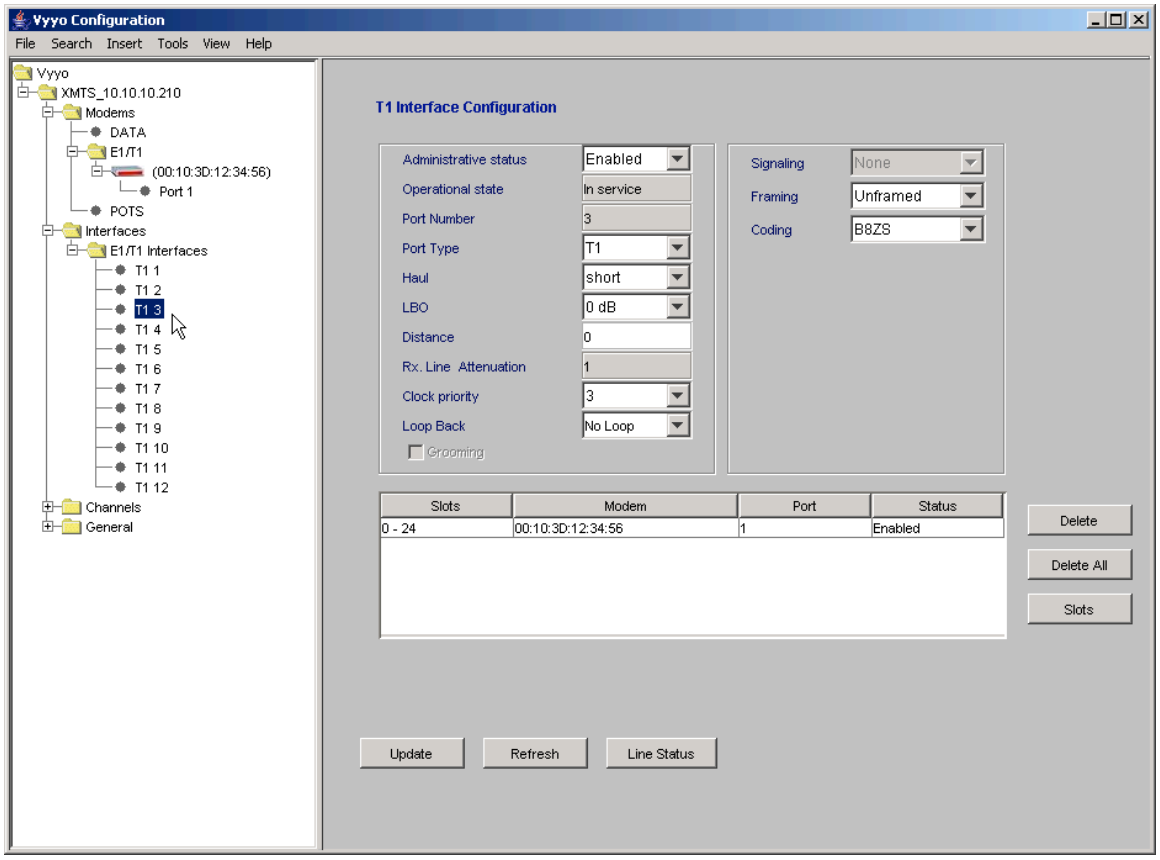


Figure 6-23: Viewing the new modem and its corresponding E1/T1 port

13. For a summary of all modems and E1/T1 ports select the “E1/T1 Interfaces” item on the navigation tree in the left window pane

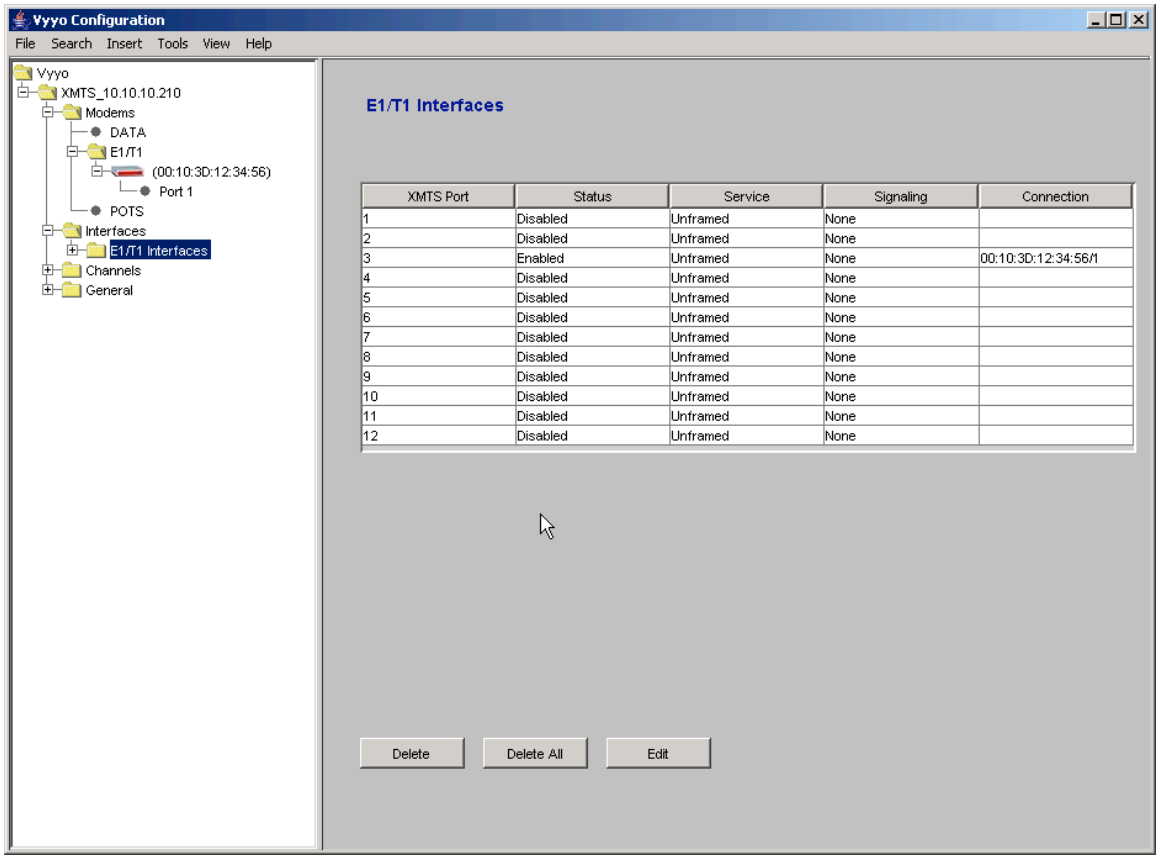


Figure 6-24: Viewing the E1/T1 Interfaces

At this point you have successfully connected the E1/T1 modem to the system and data should be flowing between the modem and the XMTS.

Chapter 7. Setting the XMTS IP Address

***Note**: Prior to performing this procedure the XMTS must be connected to the "download" computer serial port via the lower COM port (COM2) on the XMTS Control and Forward card.*

The XMTS must also be connected to the same LAN subnet as the computer using its RJ45 connector on the same card.

Tip: This procedure may also be used to download other files to the XMTS, such as software downloads.

The **wmtsConfig.exe** tool is used to set a temporary IP address for the XMTS. This IP address allows the XMTS to appear on the LAN subnet and communicate with the servers (which are on the same network).

Next, we will be modifying regtree.txt to contain the permanent XMTS IP address, then compiling regtree.txt into regtree.rtr and downloading it. The download is made by specifying regtree.rtr in the "Version File" field of the **wmtsConfig.exe** tool and making sure that regtree.rtr is copied into the TFTP file transfer folder.

14. Locate the file "regtree.txt" and open it using a standard text editor such as Notepad. Scroll down (or use the "Find" function from the menu) to the entry "**CmtsIPAddress**" which is shown as 10.10.10.210 in this example. The default network address for Vyyo equipment is 10.10.10.xxx. Your system engineer should be able to provide the addresses and other parameters you need to configure the XMTS.

15. Change the "**CmtsIPAddress**" as desired: this is the XMTS's permanent IP address which will be downloaded in the next step.

16. Change the two lines immediately following this line if necessary: the "**GatewayIPAddress**" (the address of the gateway computer or router) and the "**CmtsSubnetMask**".

17. Change **DevNMAccessIP1** and **DevNMAccessCommunity** for remote control as appropriate in Regtree.txt. Up to five IP addresses may be defined here. If you wish to add additional remote computers: duplicate the three lines for **DevNMAccessIP1** and **DevNMAccessCommunity1** and **DevNMAccessControl1** for each additional remote computer, change the numbers so that you have **DevNMAccessIP2, DevNMAccessCommunity2,**

DevNMAccessControl2 for the second computer and so forth up to the fifth remote computer. Then change the corresponding IP addresses for **DevNMAccessIP2** and so forth.

> ***Note:*** *No other edits should be necessary in this file, although the default frequencies for all the upstream and downstream channels are initialized in this file and may be changed if necessary.*

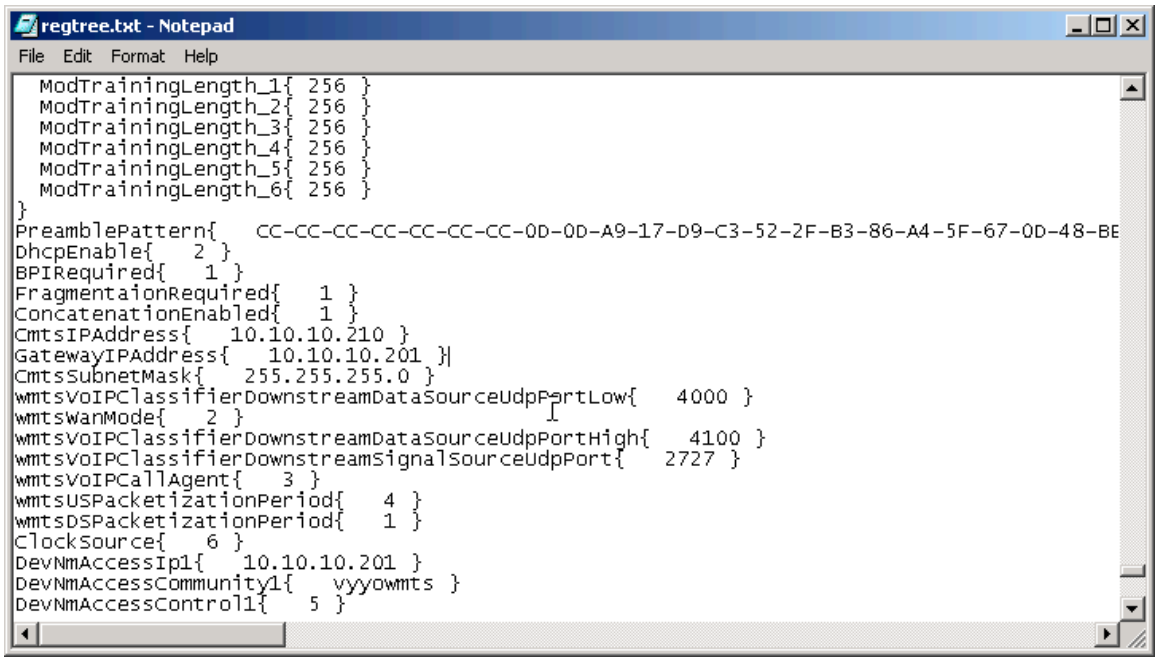


Figure 7-1. Regtree.txt File Contents

18. Now compile **regtree.txt** by executing **SETIP.bat** which should be in the same directory as regtree.txt. **SETIP.bat** is a batch file that converts regtree.txt from text to a special format read by the XMTS. The resulting file will be named **RegTree.rtr**.

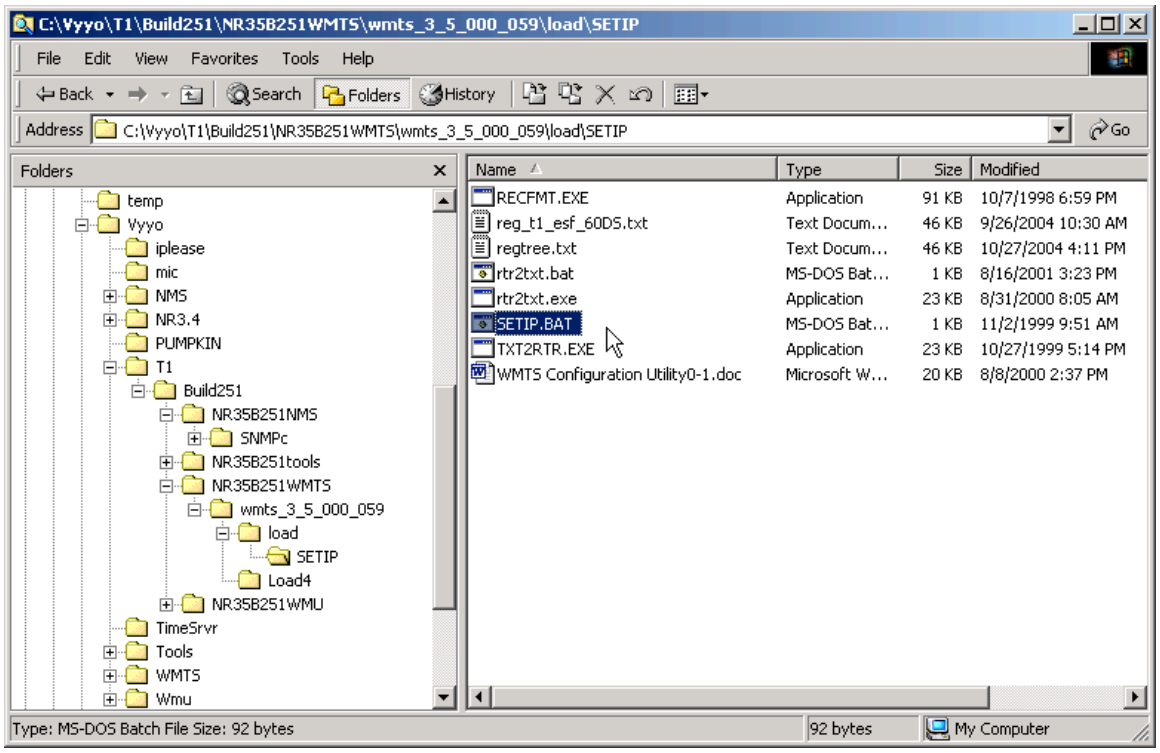


Figure 7-2. Setip.bat

19. Locate the **Regtree.rtr** file and copy it to the directory (download path) that is used by the TFTP server to get the requested download files (the download directory):

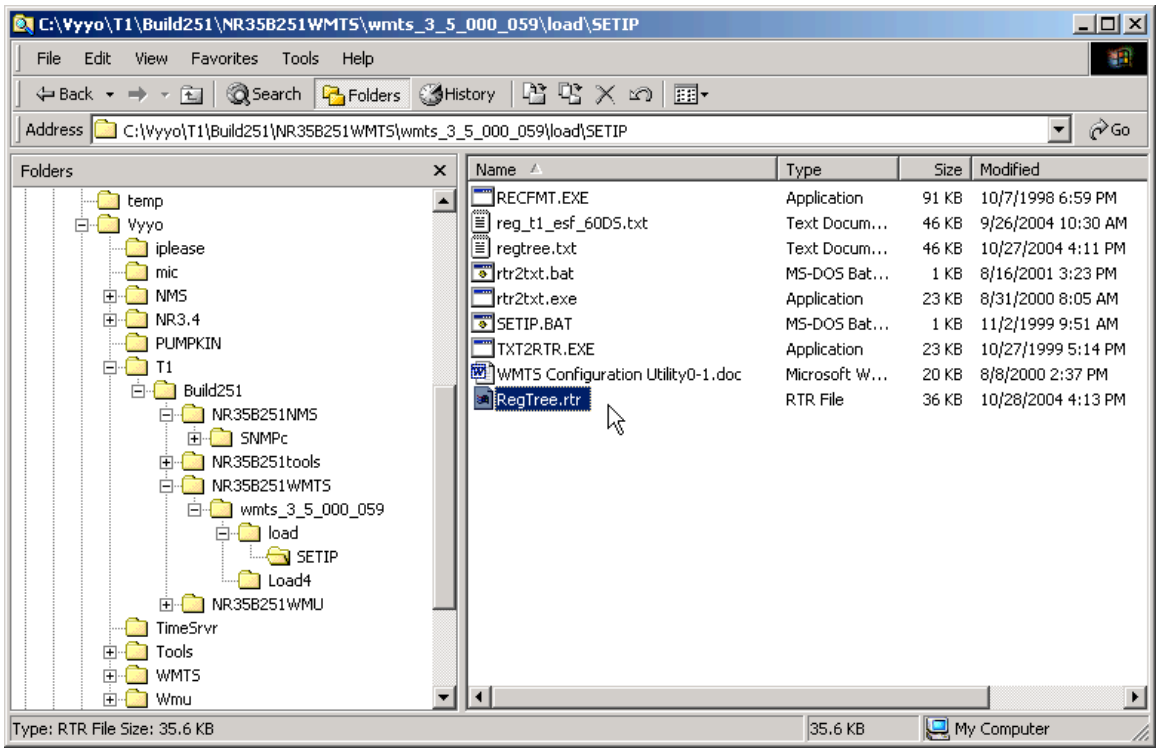


Figure 7-3. Regtree.rtr Location in TFTP Root Directory

20. Open the TFTP server: in this example we use Pumpkin.exe. You may bring up the Options dialog window by clicking on the “Options” button. This will allow you to change the download directory.

Note: *The file* ***RegTree.rtr*** *must be copied to “C:\Vyyo\mic” as shown in this example since this is the directory where the TFTP server finds the requested files to be downloaded. You may change this path to suit your particular directory layout if desired as shown in the next figure.*

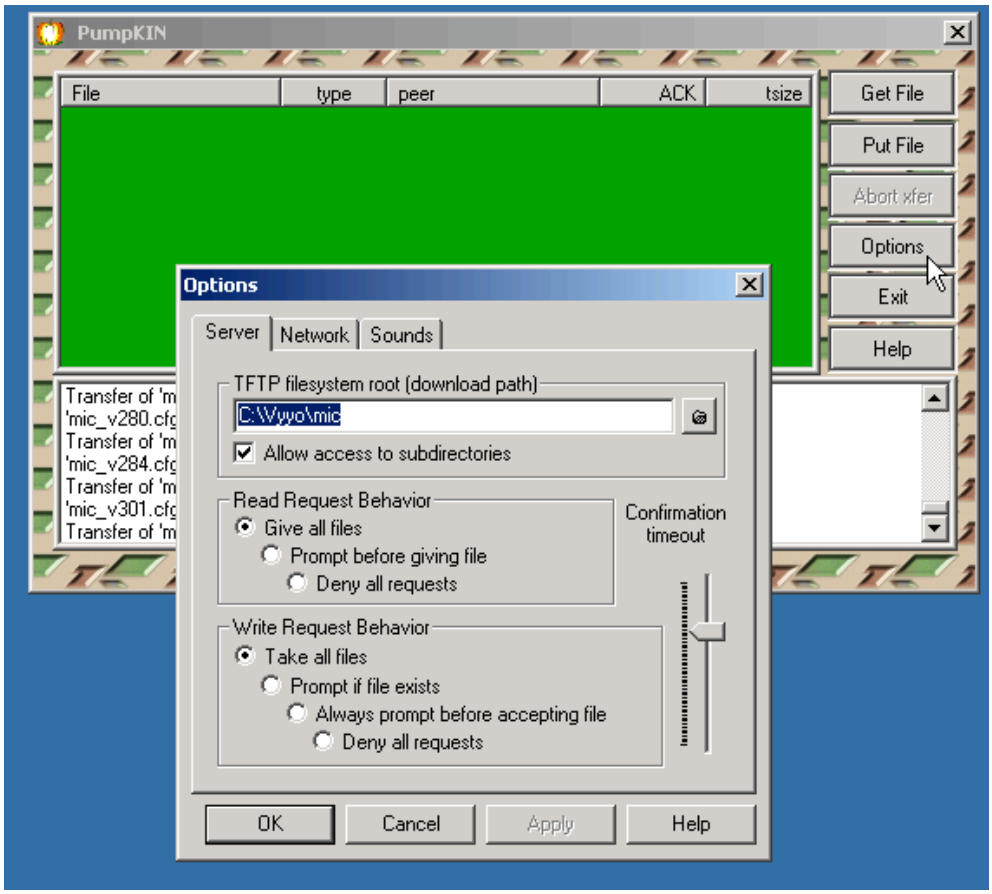


Figure 7-4. PumpKIN TFTP Settings

Note: *Observe that RegTree.rtr now appears in the TFTP download directory (C:\Vyyo\mic):*

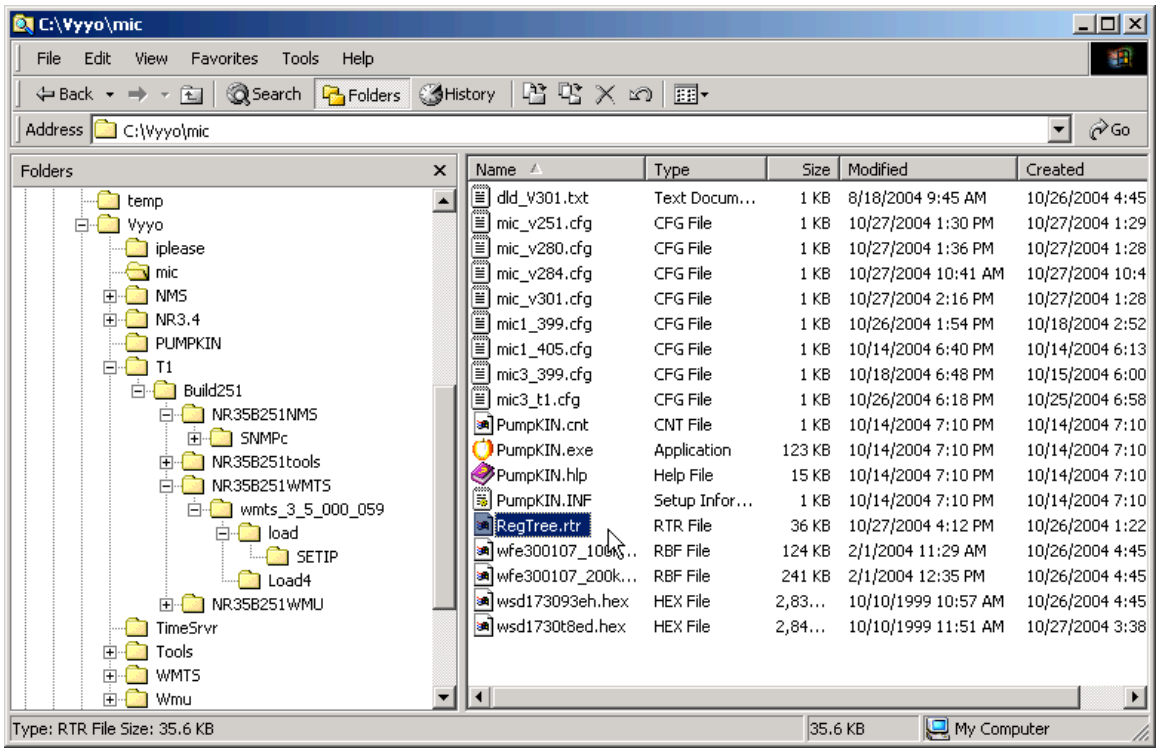


Figure 7-5. Regtree.rtr, Located in TFTP Root or Specified Download Directory

21. Open the **WmtsConfig.exe** tool to prepare to perform the download to the XMTS. This tool is typically located in the "…\Tools\WmtsConfig" directory of the released software.

22. When the initial window appears right-click to expose a popup window from which you must select "Activate".

23. This will enable the screen for one minute, after which you must repeat this procedure to re-activate the screen. The one minute timeout prevents accidental downloads.

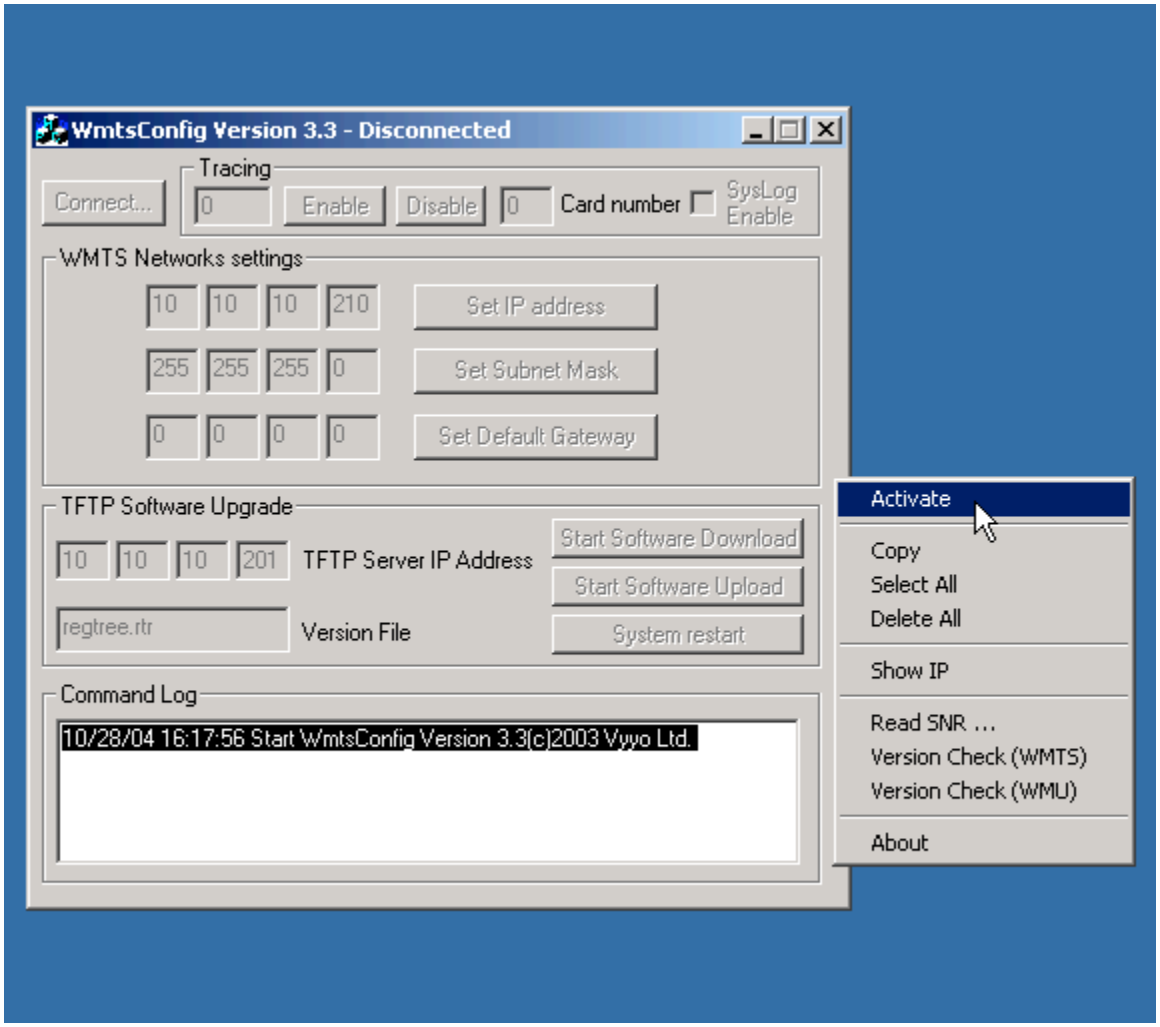


Figure 7-6. WMTS Configuration Tool

24. After activating this application then select 'Connect'. This will open a second small window within which one can choose the type of connection to open (Serial or IP).

25. Select the 'Serial' and the appropriate computer 'Com' port number to which the XMTS is connected. Then select 'close' to close the small window and return to the main application window.

NOTE: If the IP address of the XMTS is working you may connect using it instead of the serial port by choosing "IP" instead of "Serial". The system is shipped with the default IP address of 10.10.10.2.

Although not necessary for this download procedure since it uses the serial connection, you may enter a temporary XMTS IP address, subnet mask and default gateway IP address that is on the same subnet as the PC being used to connect to the WMTS for the XMTS (these can be the same as the permanent ones in the RegTree.rtr file). This is useful if the XMTS has not yet been downloaded with a permanent IP address and you need (or prefer) to communicate with the XMTS via its LAN connection.

Alternatively, if the XMTS IP address is already set then you should verify that it is correct, but you do not need to set it.

26. Enter the TFTP Server IP Address and make sure the filename "**regtree.rtr**" appears in the "Version File" window. Then click the "Start Software Download" button.

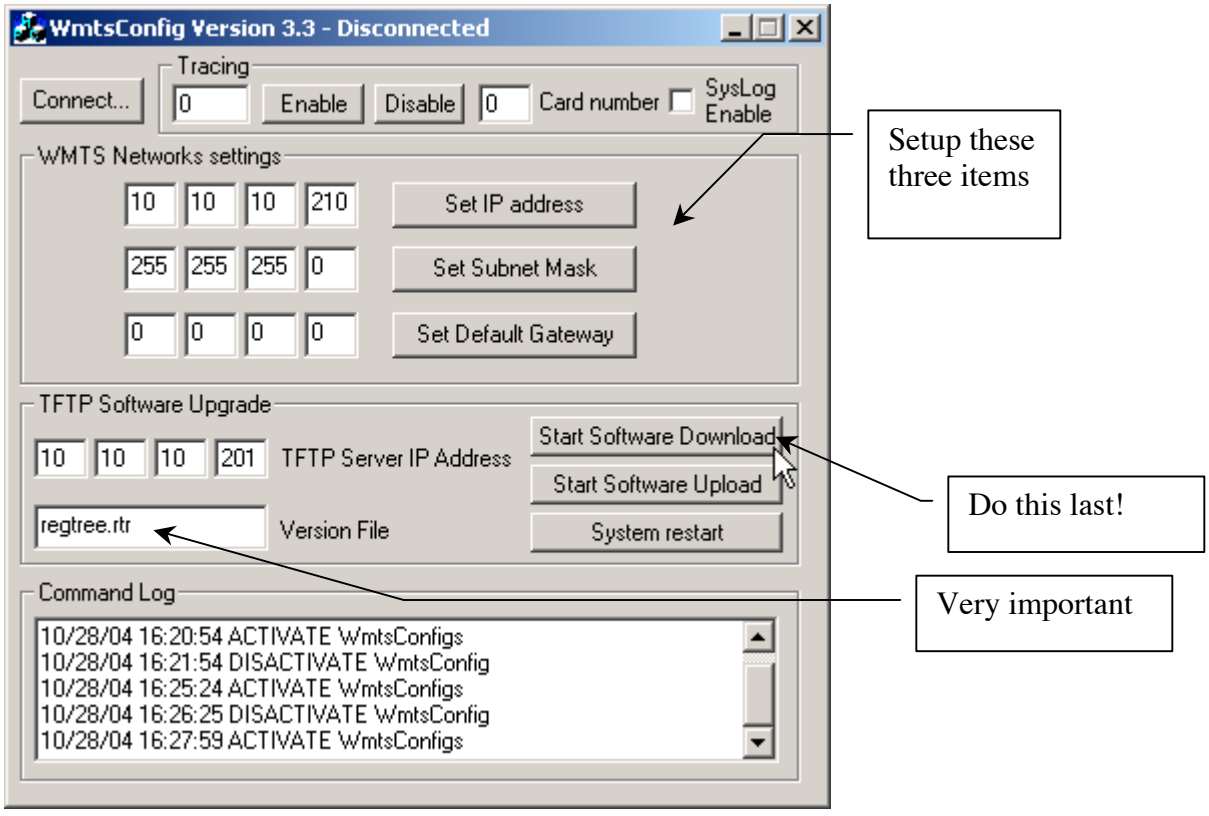


Figure 7-7. WMTS Configuration Progress

27. The message below is displayed after the download command is sent to the XMTS – it does *NOT* indicate that the download has occurred. To confirm the download you must observe the indicator LEDs on the XMTS: they should be flashing with activity. You should also monitor the TFTP application window to verify that the download to the WMTS has occurred.

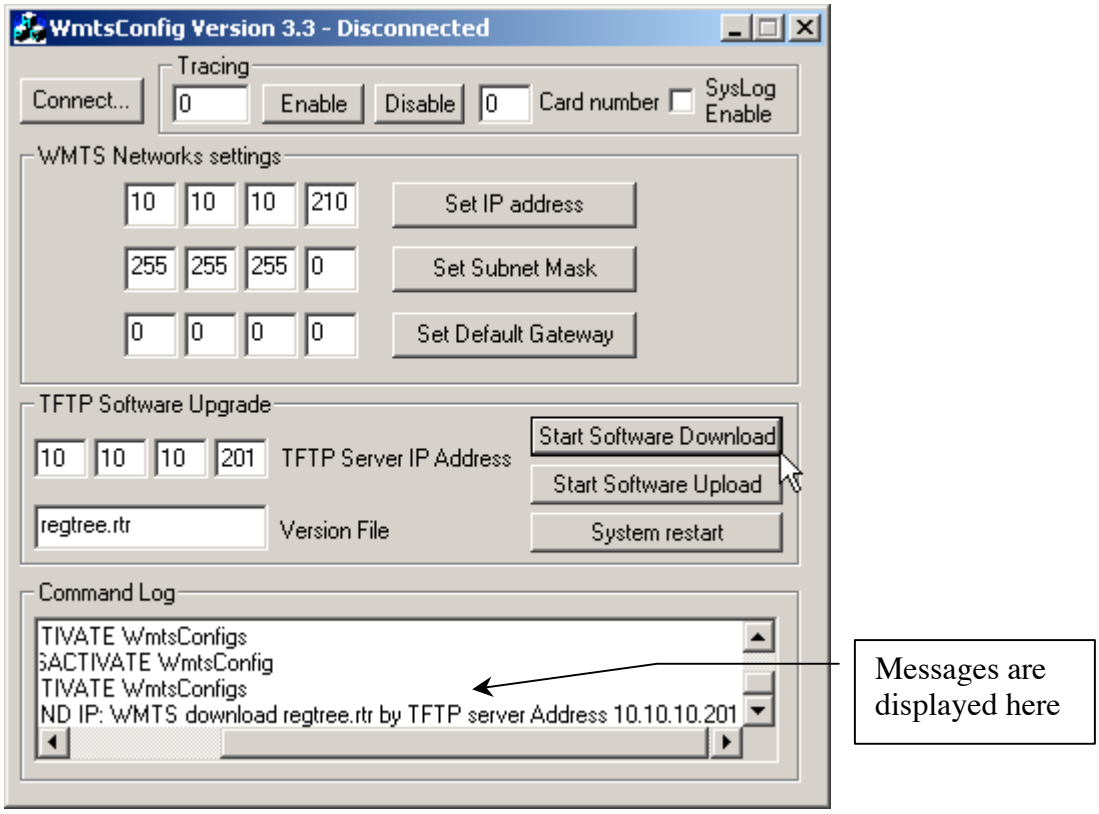


Figure 7-8. WMTS Download Message

28. Click the “System Restart” button. The XMTS will now reboot and read the new **RegTree.rtr** file to configure itself.

29. The message in the following figure should display after the System Restart message is sent.

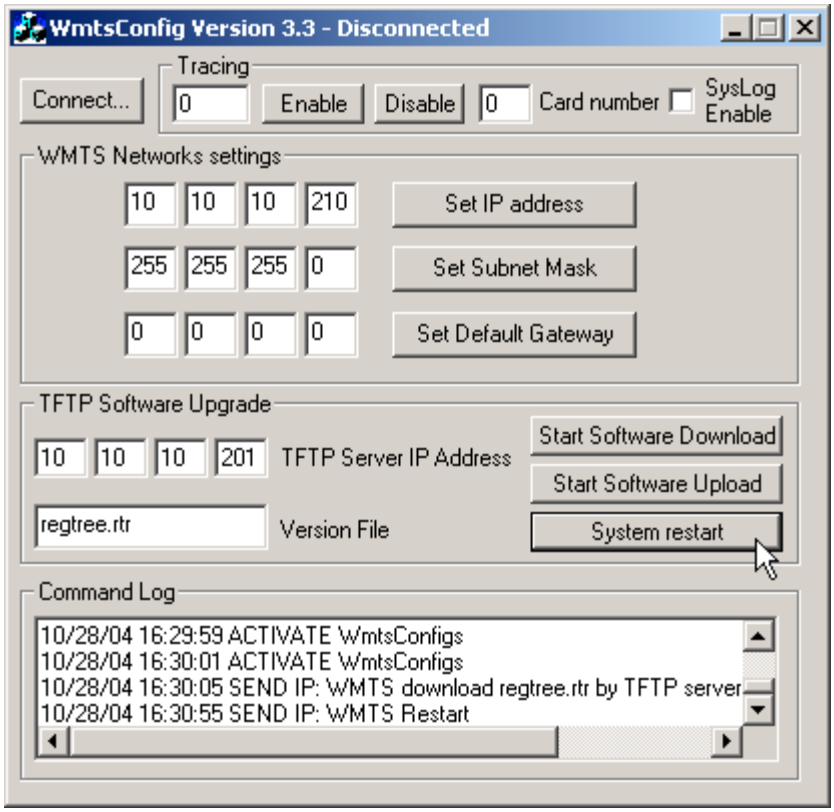


Figure 7-9. System Restart Message

> ***Note:*** *The WMTSconfig application does not report if the action is successful, only that the command has been sent.*

30. To verify that the download has taken effect you must use the procedure described in Appendix B. Checking the XMTS Version.

Chapter 8. Installing Vyyo Servers for XMTS Operation

Three servers must be installed before operating the XMTS system.

These servers are in accordance with the DOCSIS standard.

1. Time of Day server
2. TFTP server
3. DHCP server

On the computer connected to the XMTS there is folder named **c:\vyyo\servers**. This software was part of the original software installed from the installation CD. See your system engineer or Vyyo representative for assistance if necessary.

inside this folder you will find three folders, one each for the TOD, TFTP and DHCP servers.

8.1 Installing The Time Server:

31. Go to the TimeSvr folder under c:\vyyo\servers and double click on the application timeserv.exe. The ToD server should now be running.

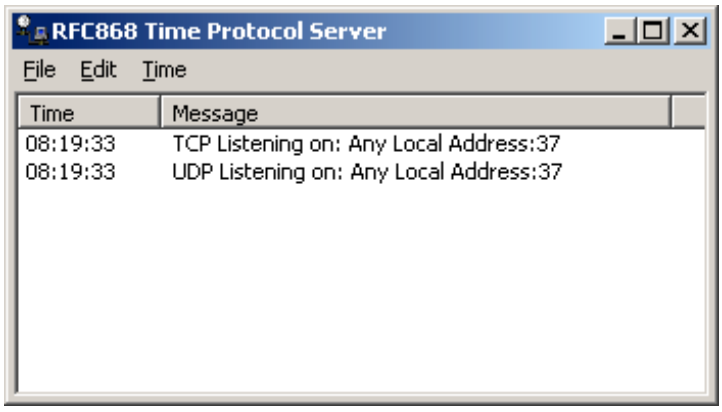


Figure 8-1 Time Server Status Window

8.2 Installing the Pumpkin TFTP Server:

1. Navigate to the Pumpkin folder at c:\vyyo\servers\pumpkin (or the equivalent on your system)

2. Start the application pumpkin.exe

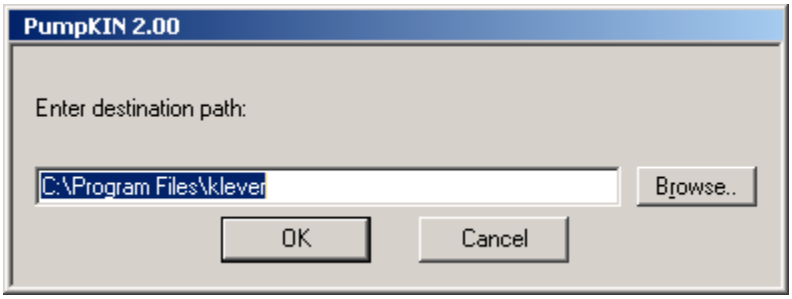


Figure 8-2. Pumpkin Folder Location

32. Click OK and follow the instructions on screen to install the TFTP server.

33. When done, go to Start→Programs→Accessories→Klever Co→PumKin

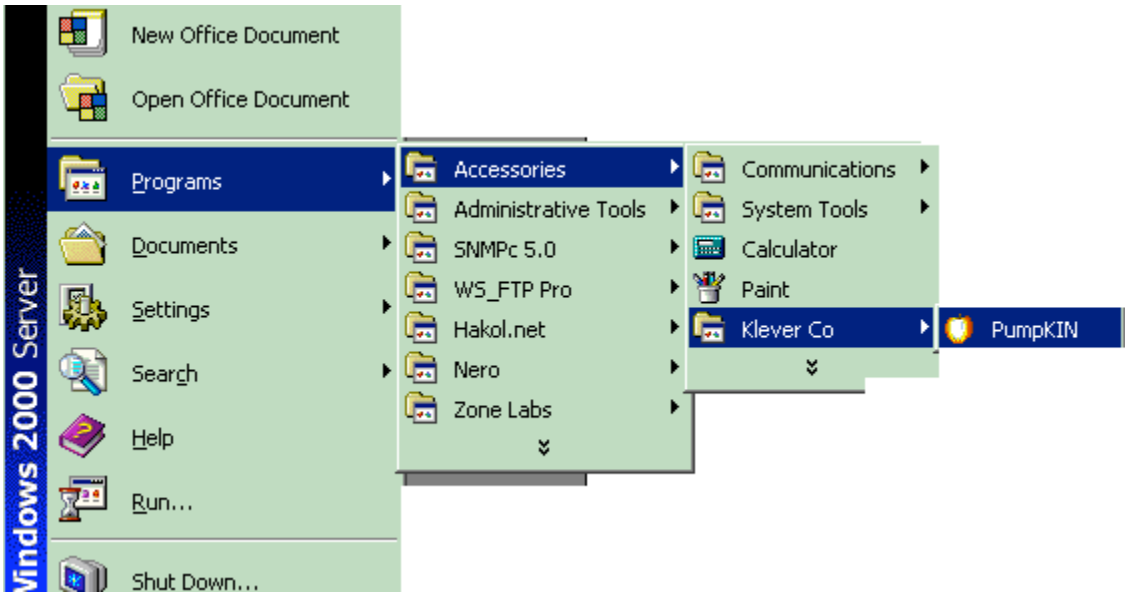


Figure 8-3. Location of PumpKIN After Installation

34. The following window appears after the application has started:

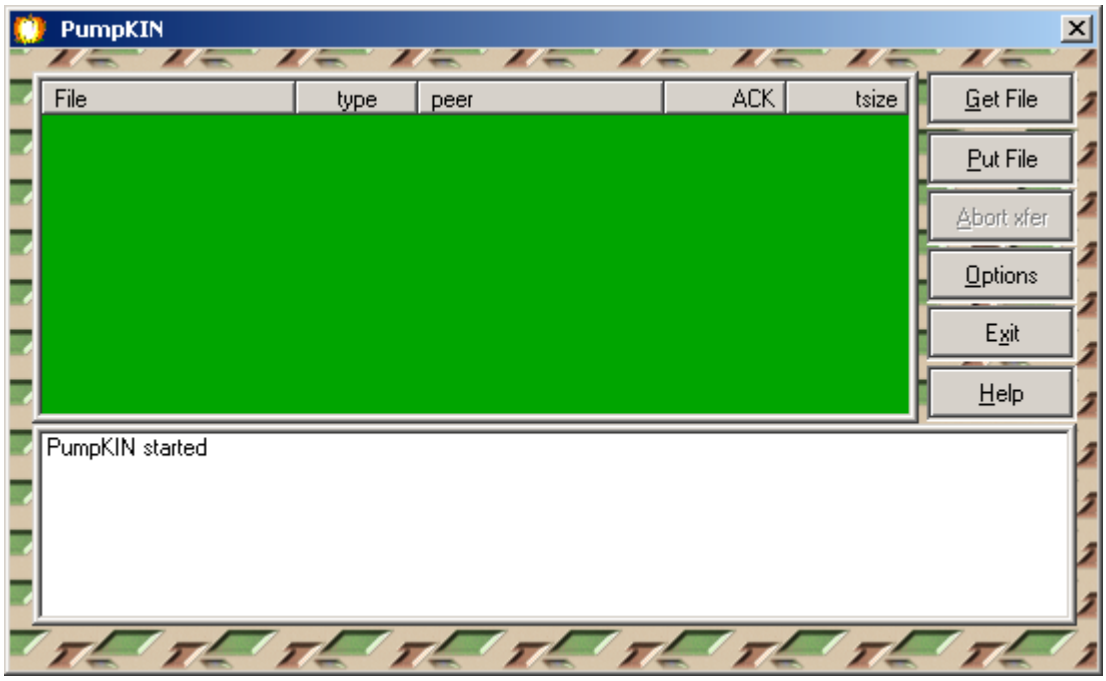


Figure 8-4. PumpKIN Status Window

35. Select Options

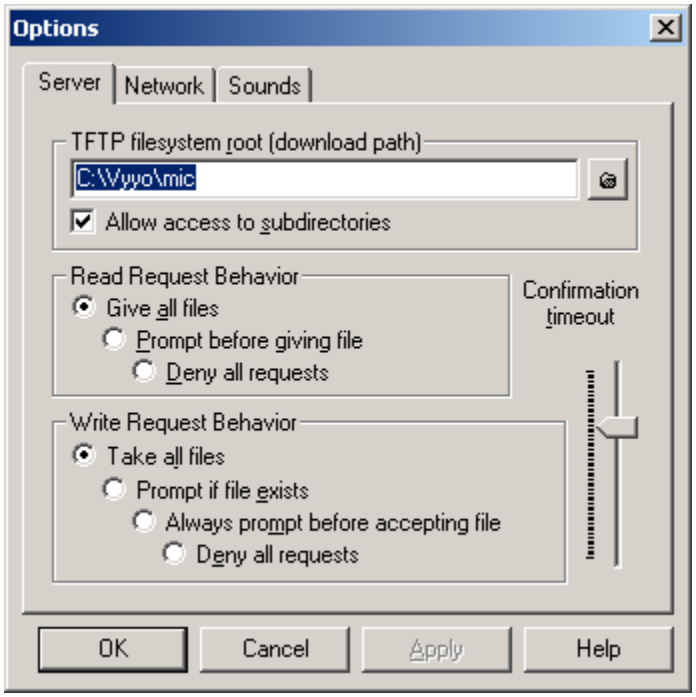


Figure 8-5. Options Dialog Box

36. Change TFTP filesystem root (download path) to where your modem configuration file will be located. In our case it will be under c:\vyyo\mic.

37. Make sure to select “Read Request Behavior and Write Request Behavior” to Give/Take all files.

38. Click OK

8.3 Installing IPLease DHCP Server:

NOTE: if you are using the DHCP Server program from Windows 200x Server Edition please see Section 5.2.2 Windows 200x Server Edition: Modifying the DHCP Options.

1. Before you can execute the DHCP application, you need to make sure that your computer IP address is configured statically to 10.10.10.1, subnet mask of 255.255.255.0. These are the defaults, see your system engineer for the addresses corresponding to your Network IP Plan.

2. Go to the folder iplease that is located under c:\vyyo\servers\iplease. In the folder, there are 4 important files that will configure your iplease DHCP server.

- **dhcpsvr.ini** (the DHCP server configuration file)
- **cm.src** (the file that contains the information sent to the modems)
- **dhcpgen.exe** (the application that processes the CM.SRC file into a format readable by the DHCP server)
- **dhcpsvr.exe** (the DHCP server application)

8.3.1 dhcpsvr.ini

This file sets the computer (DHCP Server) IP address and subnet identification number. These should be set according to your IP address plan set up by your system engineer. You may edit this file using any ASCII text editor, e.g., Notepad.

NOTE: the SubnetNum is actually the network number on which the DHCP server resides – see the comment in the file displayed below.

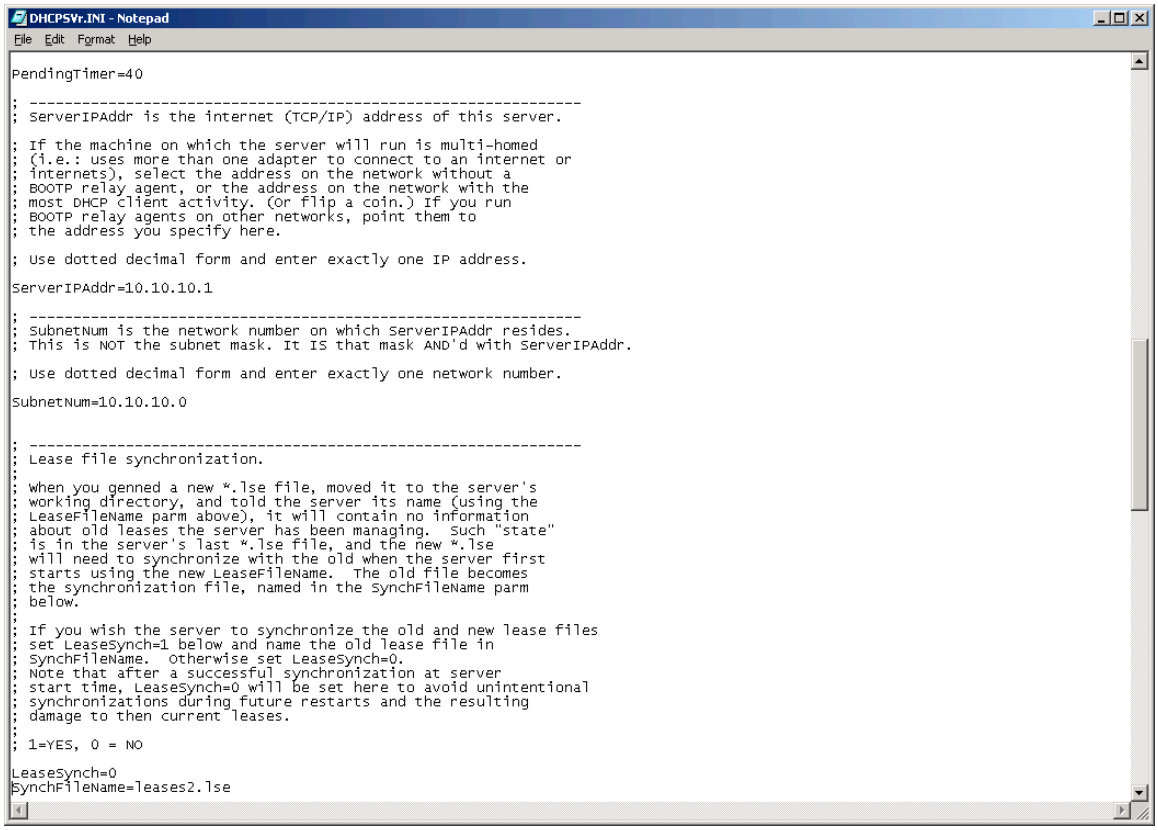


Figure 8-6. DHCPSVR.ini File

1. Set the computer's DHCP server IP address in the **ServerIPAddr=** field.

39. Set your network identification in the **SubnetNum=**xx.xx.xx.xx field.

40. Save this file after completing your changes

8.3.2 cm.src

The **cm.src** file maps the modem MAC address to an IP address and binds the modem MAC address to a specific modem configuration file. It also provide the default addresses for the gateway, TFTP server and ToD server.

NOTE: The lines beginning with a semicolon ";" are comments

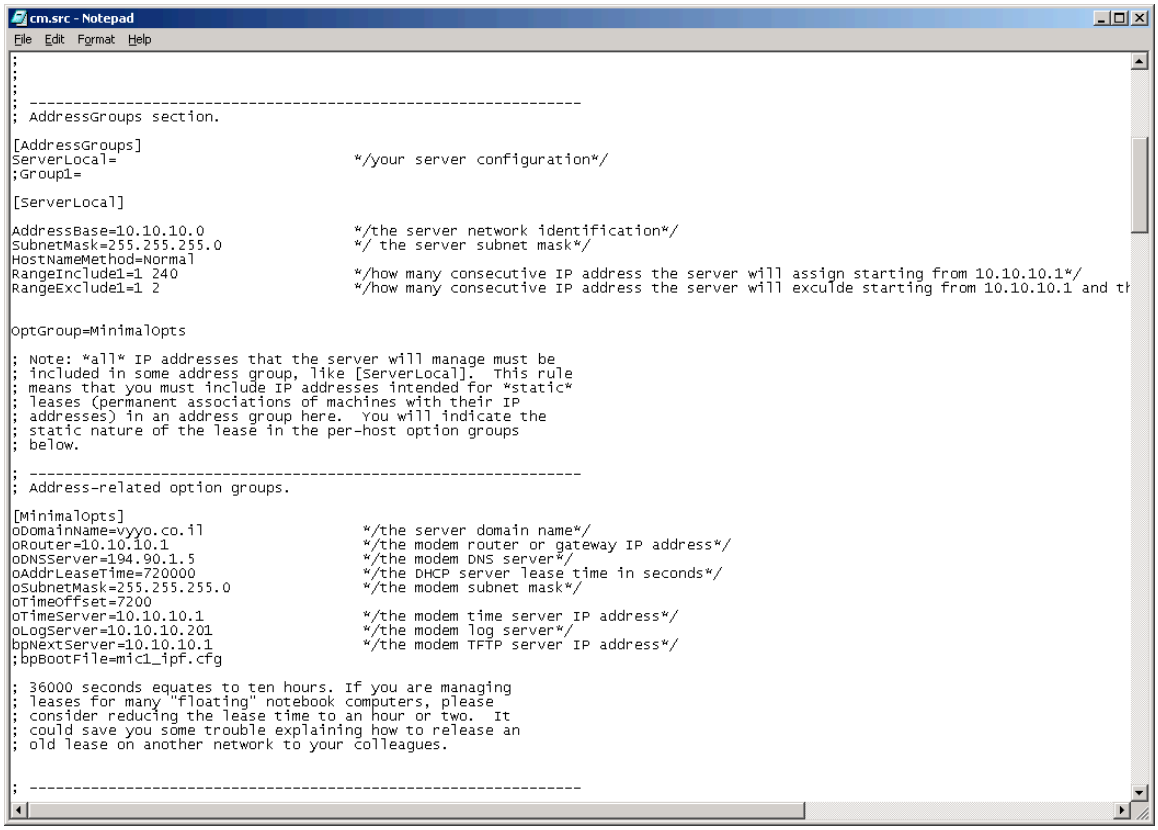


Figure 8-7. CM.SRC File Format

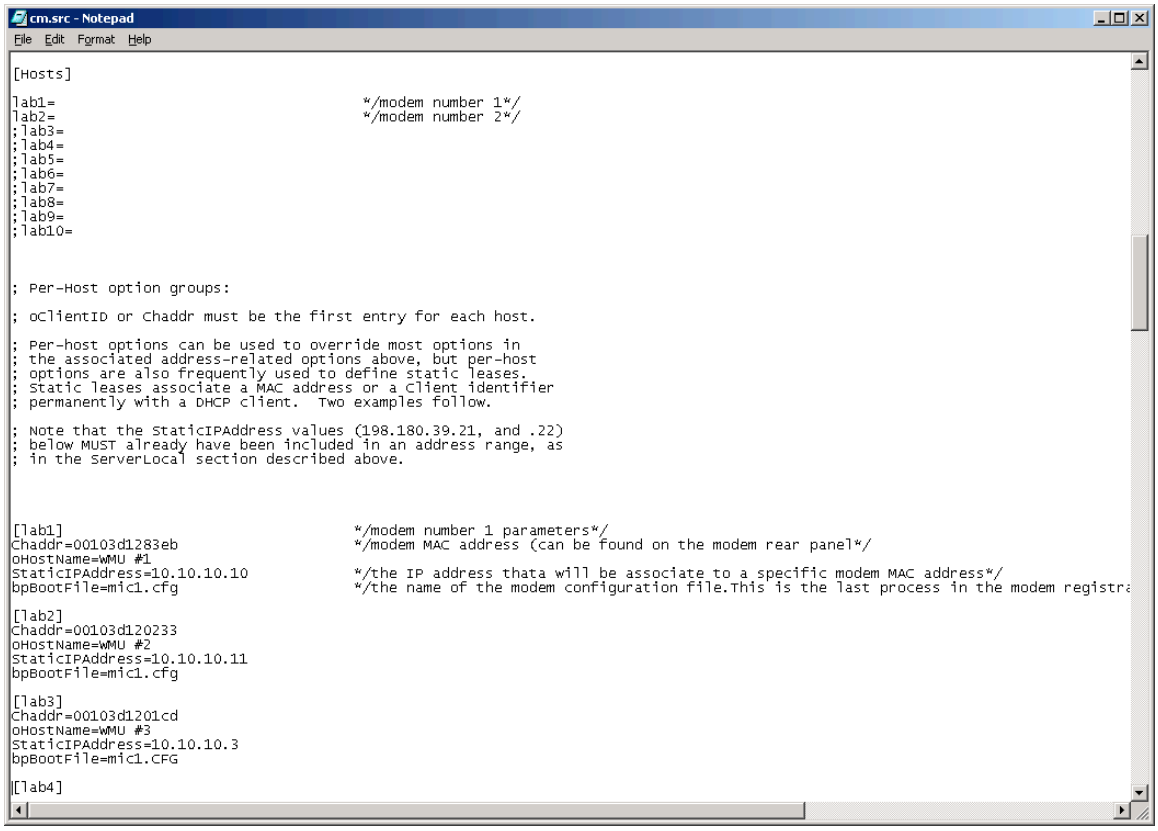


Figure 8-8. CM.SRC File Format (Continued)

1. Comments in the **cm.src** file are annotated with ***/***

2. After editing the cm.src file, save your changes.

8.3.3 Dhcpgen

> ***Note:*** *Your computer must be configured with the correct IP address, i.e., the same one as in the* ***dhcpsvr.ini*** file. *(10.10.10.1in this example) before using dhcpgen*

1. **cm.src** must be compiled with **dhcpgen** for use with the IPLease DHCP server. **Dhcpgen** must be run in a DOS window.

2. On the Start Menu, choose **Run…**

3. Type **cmd** and click the OK button.

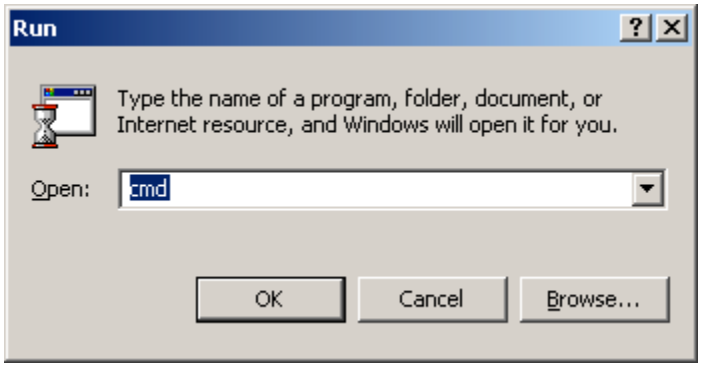


Figure 8-9. The Run... Dialog Box

41. Navigate to the **IPLease** folder by executing the following command:

cd \; cd vyyo; cd servers; cd iplease

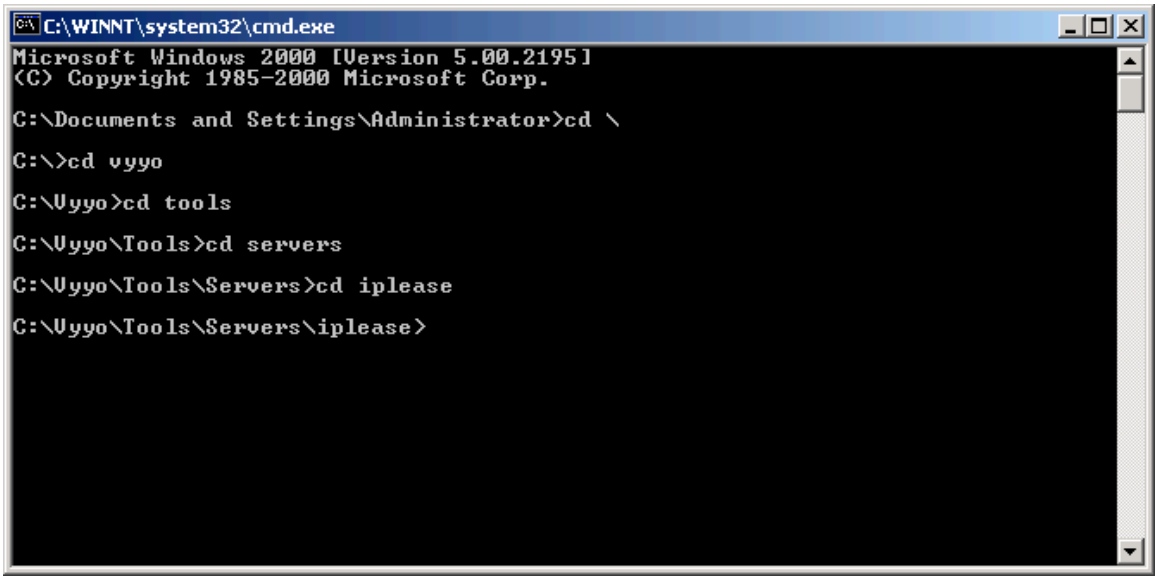


Figure 8-10: Navigating to the iplease directory

42. Type **dhcpgen cm** and press the Return or Enter key. The second parameter is the name of the .src file the **dhcpgen** will convert (compile) into a format usable by the DHCP server (this is called the ipLease format).

The second to last line informs you if the it has completed successfully. If the compilation reports an error you must re-edit the CM.SRC file and recompile it and repeat this process until it executes successfully. Otherwise the DHCP will not be using the correct data.

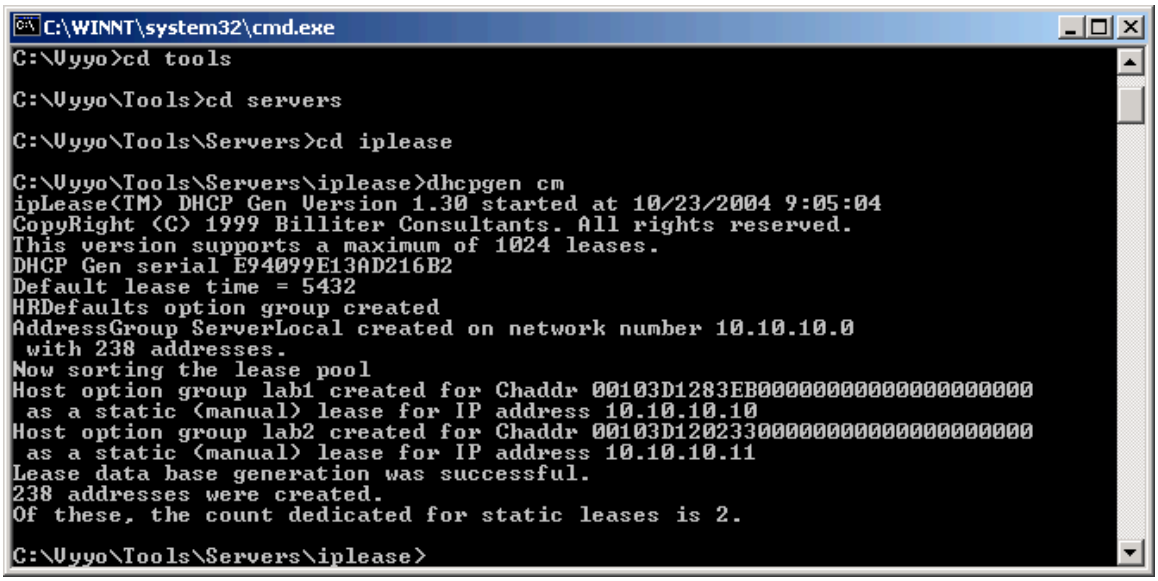
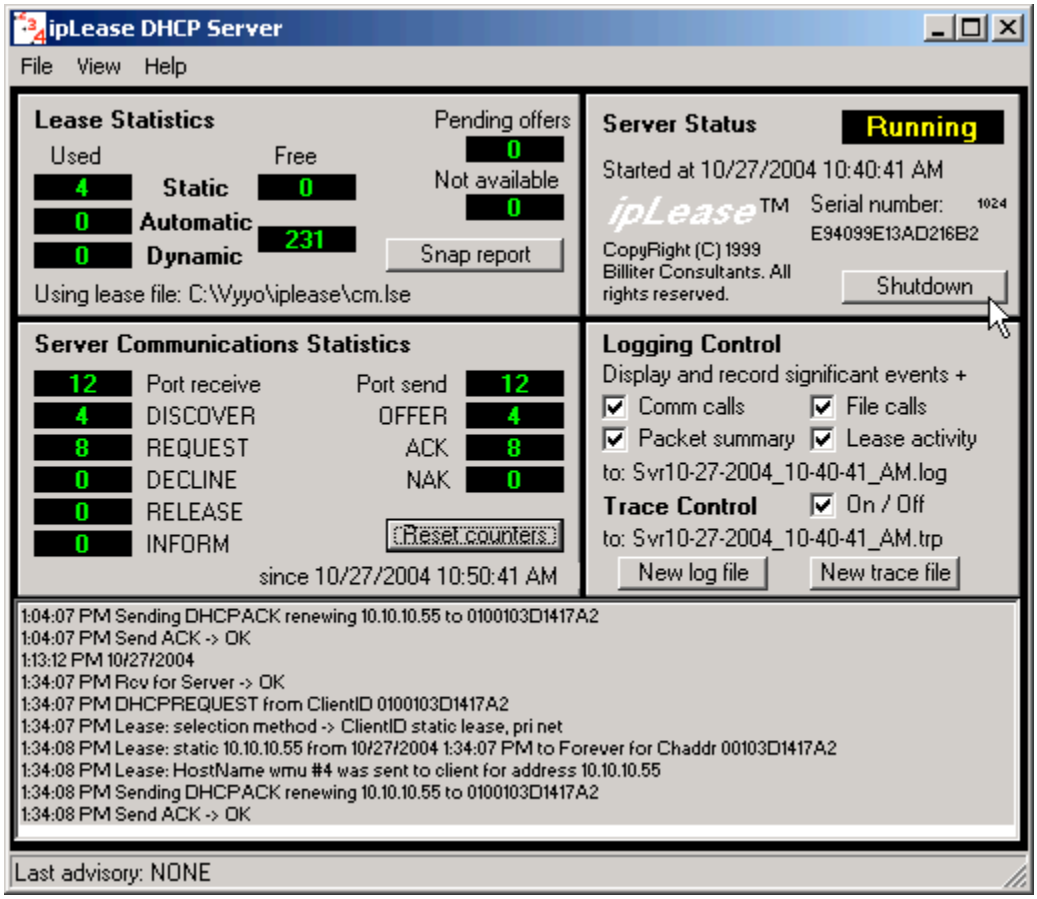


Figure 8-11: Successfully compiled CM.SRC file

NOTE: If this is a new installation then the DHCP server should not be running. For existing installations, the ipLease DHCP server must be shutdown as shown in the instructions below.

43. To shutdown the iplease server click on the Shutdown button in the upper right window pane of the application as shown below:



44.

Figure 8-12: ipLease Server Shutdown

8.3.4 DhcpSvr:

After completing section 6.3.3, open the IPLease folder and start **DhcpSvr.exe**. The ipLease application window will be the same as in Figure 8-12 above.

Chapter 9. Maintenance and Troubleshooting

9.1 Introduction

The XMTS is an IP centric two-way RF system, which incorporates various information technologies and RF devices. When the system is not operating properly, the malfunction must be isolated to localize the problem to a single functional area.

The troubleshooting process consists of three basic steps:

Identifying the problem,

Diagnosing the problem, and

Implementing a solution.

To identify a problem, you have to ask two questions:

1) When does the problem occur?

2) What else is affected?

For example, when none of the modems respond to an SNMP request, it can be assumed that the WMTS or the RF components at the base station are not functioning properly. Try to find out if the problem is on the downstream or upstream path. If only a certain modem does not respond, it can be assumed that the problem relates to the subscriber site, or an NMS software setting for that particular subscriber.

If you have identified the problem, you are ready to diagnose its cause and take the necessary actions to solve the problem.

When implementing solutions, change one thing at a time, if possible. If the first solution does not solve the problem, reverse the change you just made and try another solution. For example, you are experiencing problems in one of the upstream sections. To solve the problem, replace the demodulator card. If the problem still remains, replace the old card and try another solution.

Some of the symptoms can be related to a certain functional area, some not. Use the system block diagram in the next section Troubleshooting the RF Frontend to relate the problem to a certain area.

9.2 Troubleshooting the RF Frontend

9.2.1 General

The RF frontend contains the upstream and downstream channel converters and amplifiers.

Use a spectrum analyzer and RF power meter to perform tests.

A typical basic RF setup is illustrated in Figure 9-1. Please use the specific block diagram for your system when you are troubleshooting problems

9.2.2 Checking the Downstream

Perform the following steps to isolate a problem on the downstream channel of the RF frontend:

a. On the transmitter RF power meter -

- Check the transmit power on the downstream transmitter, to verify the RF output

- Test the reflected power (SWR), to verify that the transmitter is connected to the coaxial system correctly.

b. XMTS

- Measure the output power of the demodulator card. Use a spectrum analyzer tuned to 44 MHz, with a span of 20 MHz. . The power should be 10 dBm ±5 dB.

9.2.3 Checking the Upstream

Perform the following to isolate a problem on the upstream channel of the RF frontend:

Measure the output power of the downconverter. Use a spectrum analyzer tuned to the upstream channel IF (about 44 MHz), with a span of 20 MHz.

The following diagram illustrates a basic RF test setup.

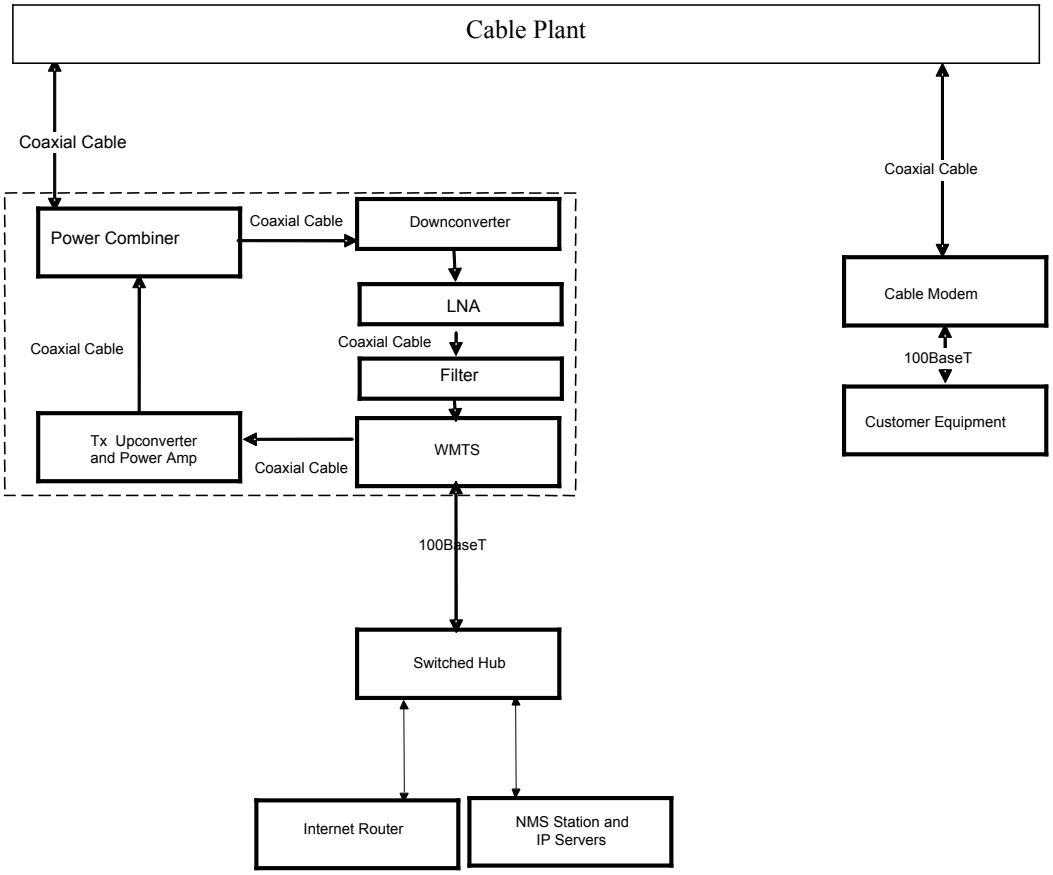


Figure 9-1: Basic RF Setup

Chapter 10. Troubleshooting The Subscriber Site

10.1 Post-Registration Verification

When the modem registration process has reached completion, connect the Laptop or PC to the V280 WMU and verify the following items:

	Verification Item	Task
1	Check the IP address.	From the Windows Command Prompt, **ipconfig** or **winipcfg** to view the configuration. Open the Web Browser and verify that there is proper Internet access.
2	Perform relevant system speed verification tests.	See your System Administrator to install and use a speed verification utility.

Note: *BWA system-specific variables can affect all these troubleshooting steps. Consult your System Administrator or Vyyo representative for further troubleshooting guidance and detail.*

10.2 Physical Layer Troubleshooting

If you experience difficulties operating the modem, there may be problems with the modem's physical layer. Inspect the WMU physical layer by means of the following steps:

	Verification Item	Task
2	Power supply connection	Verify that the WMU power supply is connected to the WMU power input.
3	Radio connection	Verify that the RF cable connector is connected to the WMU RF input.
4	Connection to the testing PC	Verify that the WMU Ethernet port LED is illuminated and that the LAN cable is connected to a working Ethernet port on the testing PC.

10.3 IF Layer Troubleshooting

If the modem powers up, but still is not transmitting or receiving a signal, you may need to check the IF Layer.

Use the following steps to troubleshoot the RF layer:

Verification Item	Task
Signal amplitude	Connect the SLM to the IF input cable. Set the SLM to the appropriate known DS frequency and measure the amplitude in dBmV. Verify that the peak amplitude of the IF signal is compliant with the WMU input signal level specification. If no signal is present, verify that the radio transceiver was installed according to the manufacturer's installation procedures.
Transceiver power supply	Verify that the transceiver power supply is operational and connected correctly.

10.4 Troubleshooting the NMS

If the main SNMPc window does not show the three parts of the panned window (left, right and bottom), try to drag the pan bar. If this fails:

Exit SNMPc 5.0

1) Rename
<SNMPc directory (default: c:\program files\snmpc 5.0)>\SSFAdministrator.ssf
to be <SNMPc directory>\SSFAdministrator.ssf_

2) Run SNMPc 5.0

If SNMPc 5.0 installation is stuck, restart the computer and try again

If SNMPc 5.0 gets corrupted (has been installed but fails to work):

Report error messages and other relevant datails to Vyyo NMS team

3) Uninstall SNMPc, according to instructions (see Apdx C.4, Uninstalling the NMS)

4) Reinstall the NMS according to instructions

5) If a 'low virtual memory' message appears:

Close unneeded applications

6) If the message reoccurs, report to Vyyo NMS team, close the NMS main window and startup the NMS

10.5 Repairs Safety

1. Repairs of WMTS should take place only in VYYO company service laboratories or in other VYYO formally approved distributors service laboratories. In case of field handling our general SAFETY warning is to disconnect the unit from power supply for safest repair.

2. In case of a -48VDC operated WMTS, the External Circuit Breaker (Du Pole) must be used before connection/removal of the power cable to/from the WMTS.

Chapter 11. Synoptics Display for XMTS Configuration

This chapter explains how to use the older Synoptics Display interface to set upstream and downstream parameters for the xTMS.

NOTE: Before you can perform this procedure you must have previously edited the regtree.txt file, compiled it and downloaded it to the XMTS. See Setting the XMTS IP Address.

This procedure is to be used only if you cannot configure the XMTS using the Vyyo Configuration tool as described in 5.3 Configuring the XMTS.

11.1 Setting the XMTS Upstream Parameters

1. Open the Network Management System and double-click on the XMTS icon to bring up the Network display of the XMTS front panel:

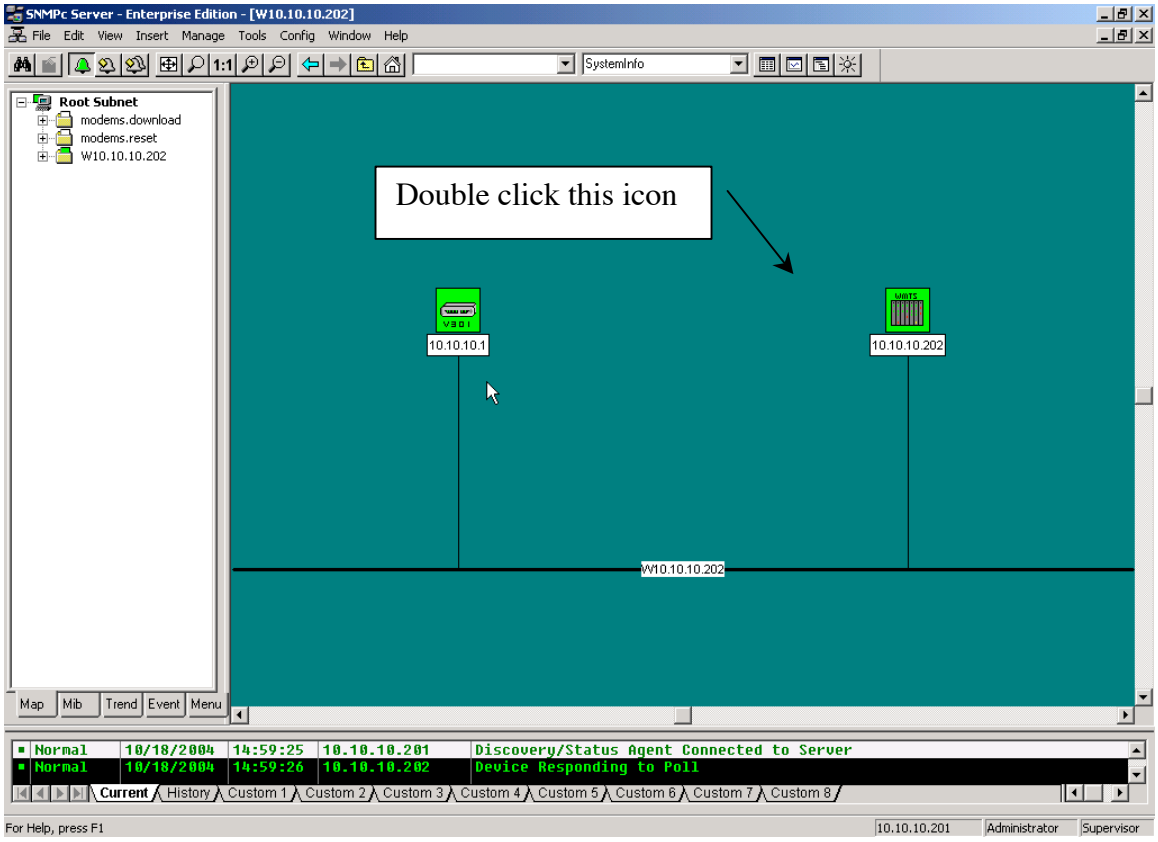


Figure 11-1: Network display of the XMTS

2. Now select the Upstream Channel ID you wish to configure and right-click the mouse. This is a “Synoptics” display of the actual front panel of the XMTS. Observe that there is only one (Hex) upstream card in this example: There are six ports, each one having its own unique upstream channel ID. In this example the channel IDs are the same as the port number. However, if a second Hex card were installed its channel IDs would be numbered from 9 to 14 and they would correspond to ports 1 through 6 on the second card – note that this allows for 8 channel IDs per Hex card even though only 6 are actually used.

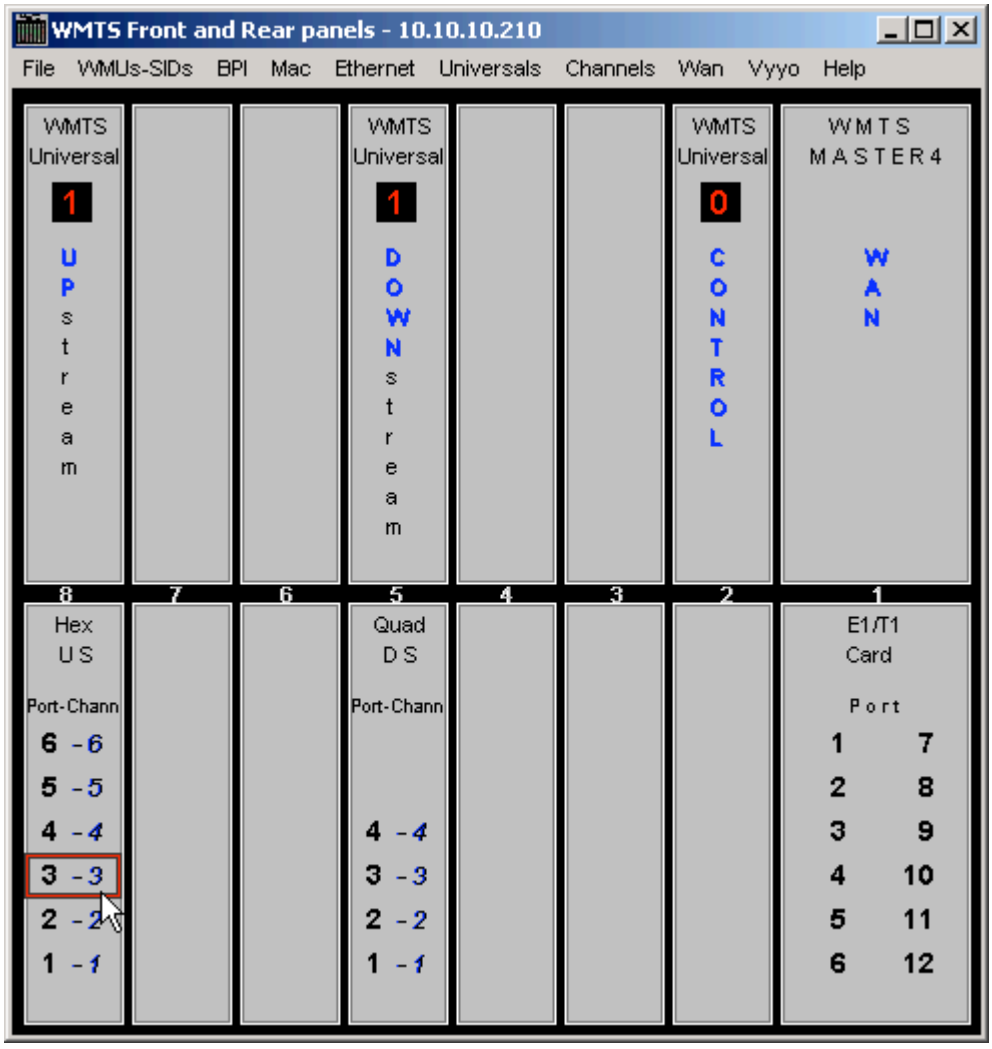


Figure 11-2: Selecting Upstream Channel 3

45.

3. When Options dialog box for the selected channel appears click on “Change channels parameters” to display a popup window for the selected upstream channel ID.

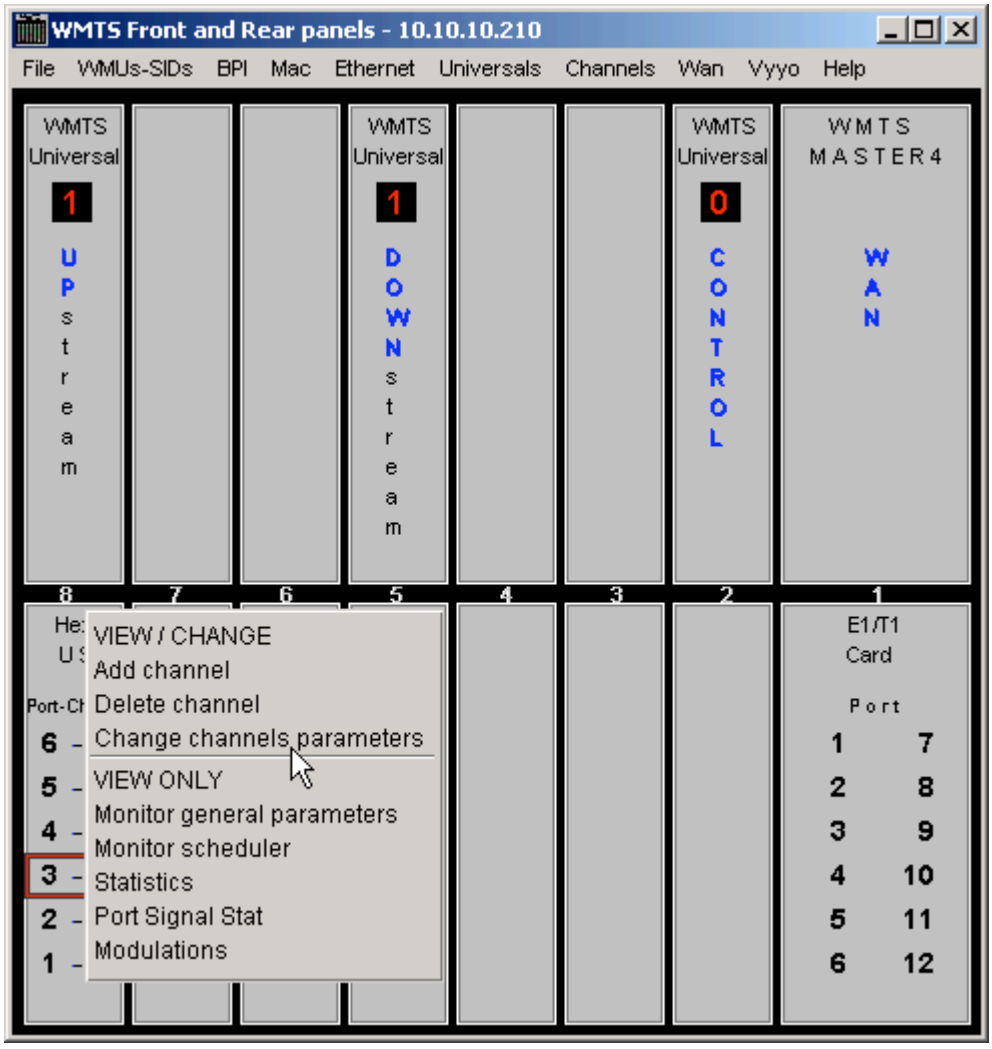


Figure 11-3: Options for Upstream Channel 3

4. Using this popup window, you may change the frequency the modem is expected to transmit on (labelled “Frequency”), the receive frequency that the upstream RF port expects to receive the modem’s signal on (this is labelled “Rx frequency”), its modulation, symbol rate and the associated downstream channel, antenna diversity and admin status as needed. These parameters are transmitted by the XMTS as part of the upstream channel descriptor (UCD) sent during the DOCSIS modem initialization process. These parameters should be determined by the system engineer responsible for the RF planning and are outside the scope of this manual.

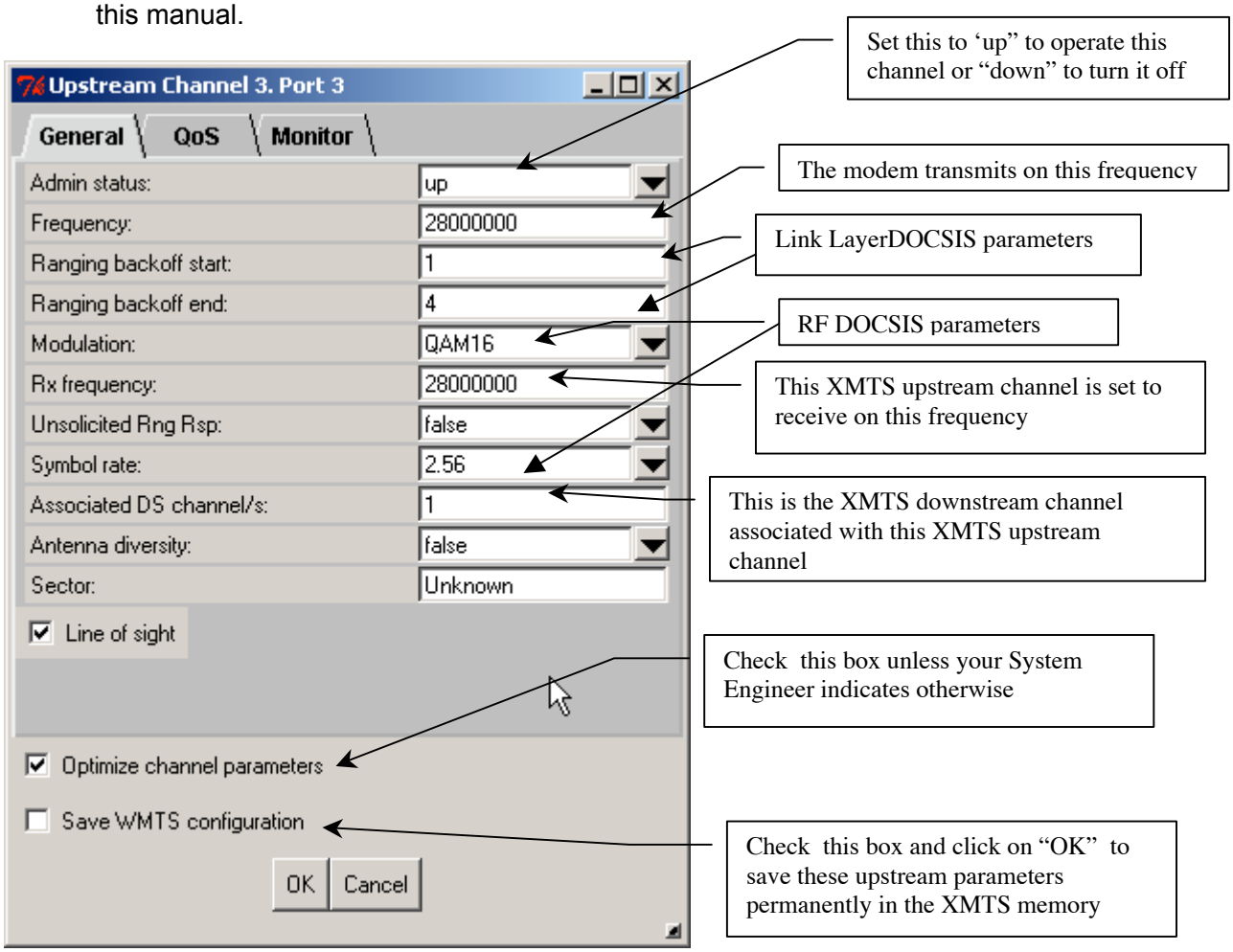


Figure 11-4: Upstream Channel Parameters

5. Click on the “QoS” tab to display the Quality of Service screen and check the appropriate QoS box. “Best effort channel” or “CIR channel” are typically used for a data-only modem. An “E1 channel” must be used when the modem supports E1/T1 connections and data. These settings correspond to the desired SLA (Service Level Agreement).

6. The “Tx backoff” settings control the scheduling algorithms used in the upstream channel. The default values should be used unless your system engineer has indicated otherwise.

7. Ensure that the “Optimize channel parameters” box is checked. This causes the XMTS to maximize the efficiency of the channel usage for the different types of modems assigned to it. Check the “Save WMTS configuration” box and click on the “OK” button to permanently reconfigure the XMTS with these settings.

***Note**: This box is used for both E1 and T1 connections.*

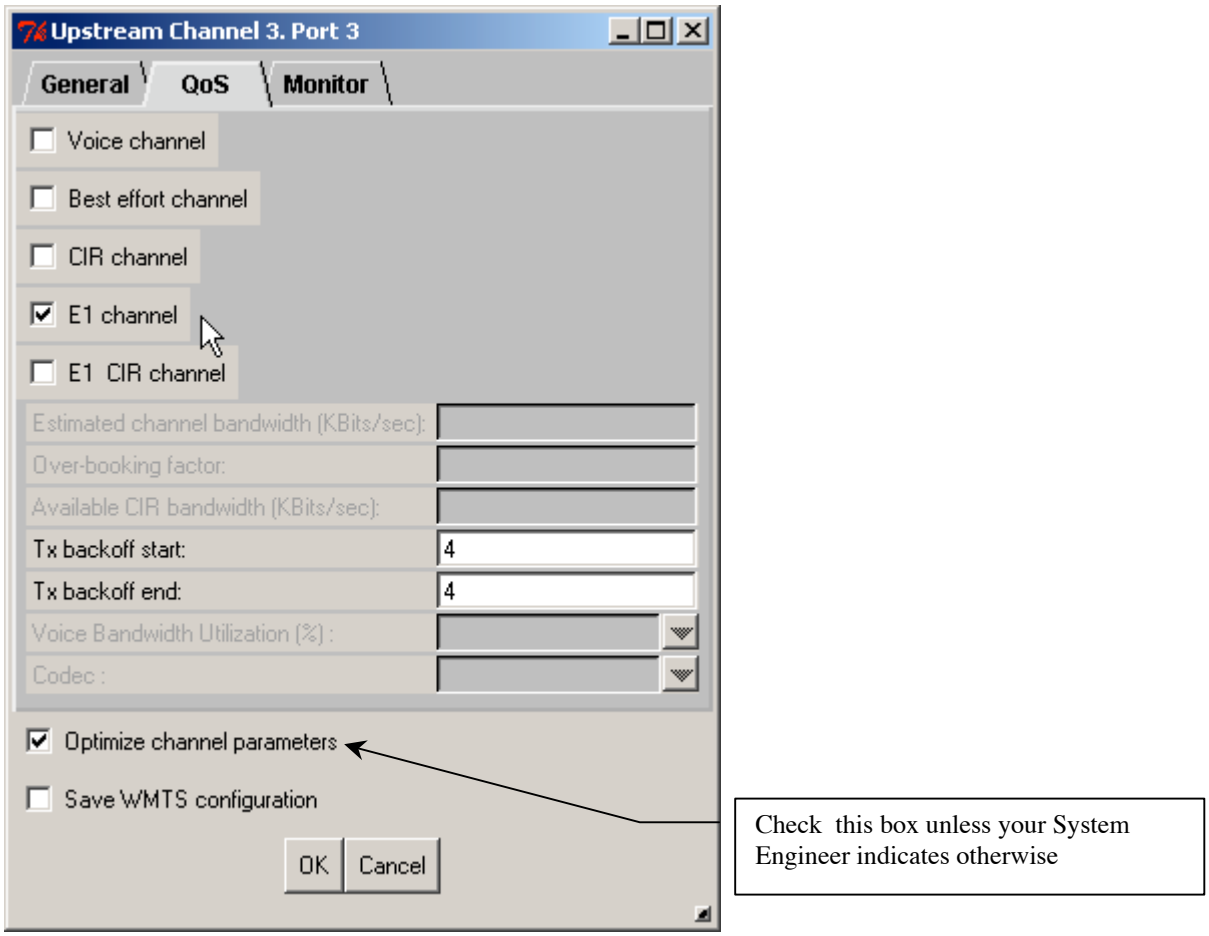


Figure 11-5: Editing QoS for Upstream Channel

11.2 Setting the XMTS Downstream Parameters

1. Open the Network Management System and double-click on the XMTS icon to bring up the Network display of the XMTS front panel:

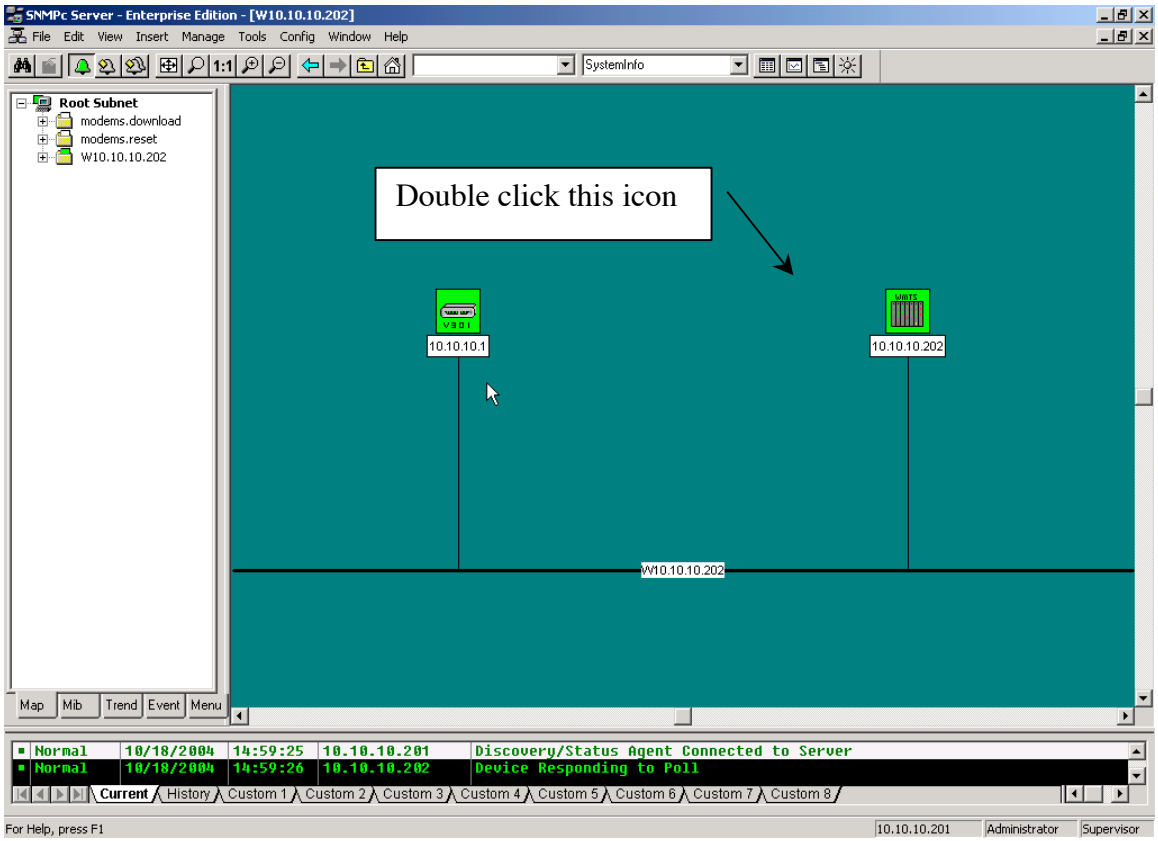


Figure 11-6: Network display of the XMTS

Now select the XMTS downstream channel to be configured by right-clicking the desired channel on the Synoptics display as in previous screens. This image shows that there are four downstream channels on the card (hence the name “Quad” card).

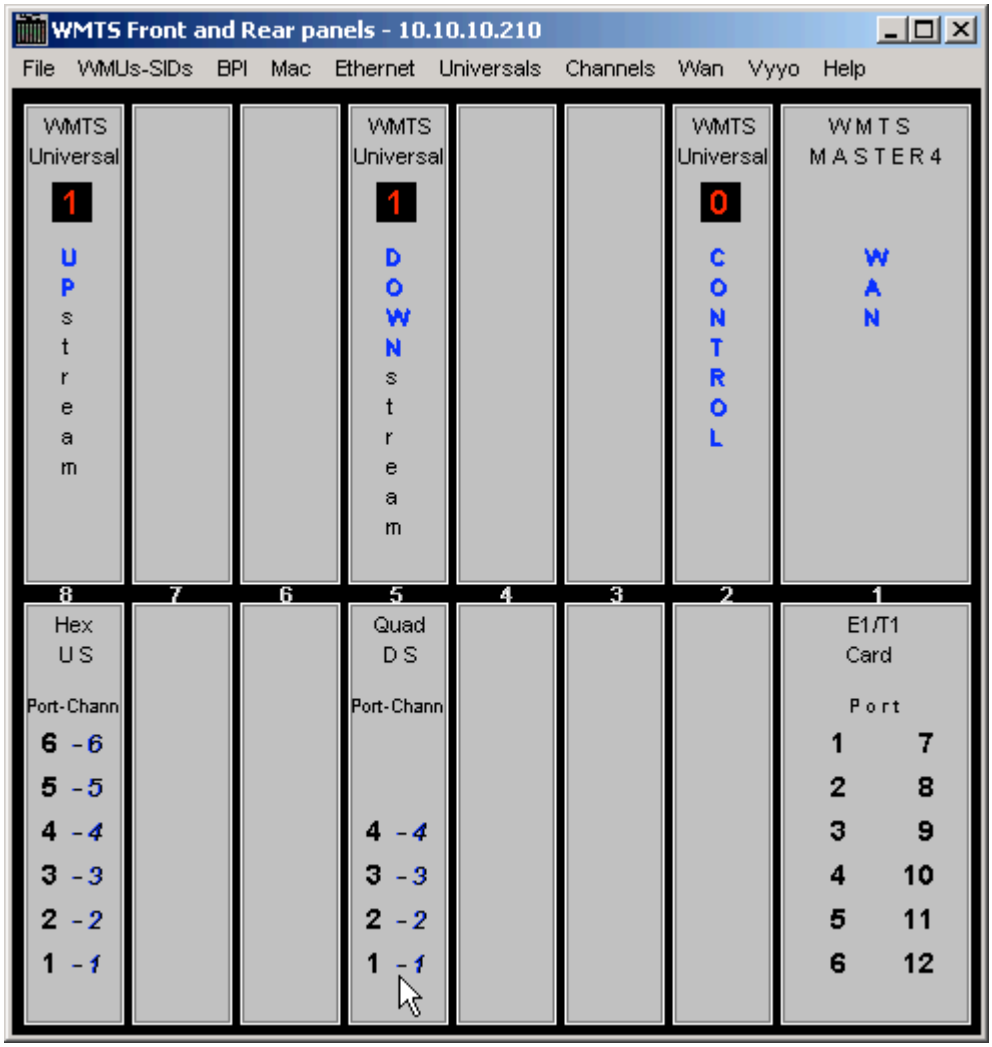


Figure 11-7: Select the downstream channel to be configured

46. Right-click on the selected downstream channel and then select “Change channels parameters”.

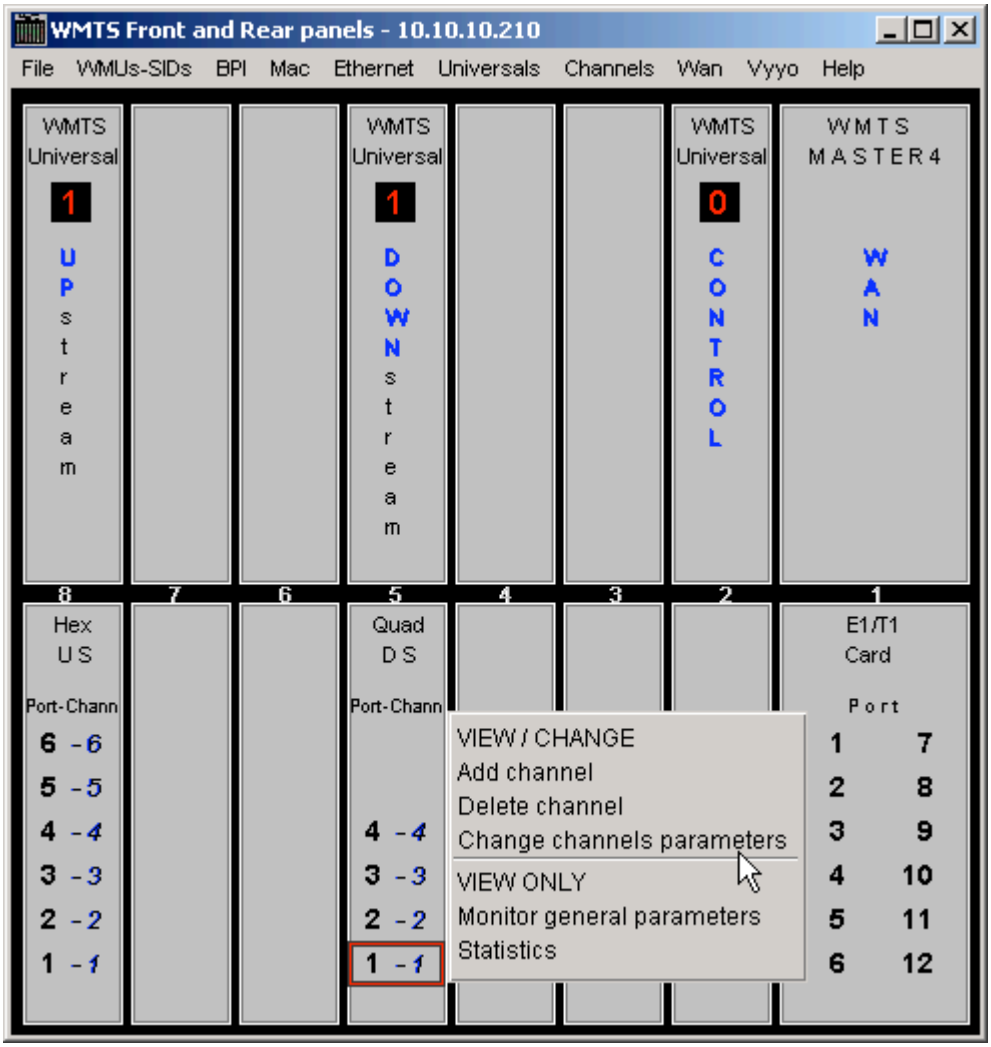


Figure 11-8: The popup menu displayed when right-clicking on the downstream channel

47. Make any necessary changes to the downstream channel parameters here. Typically the default values should be used with “Optimize channel parameters” unless your system engineer indicates otherwise. To permanently save the configuration to the XMTS check the “Save WMTS configuration” box and click “OK”.

48.

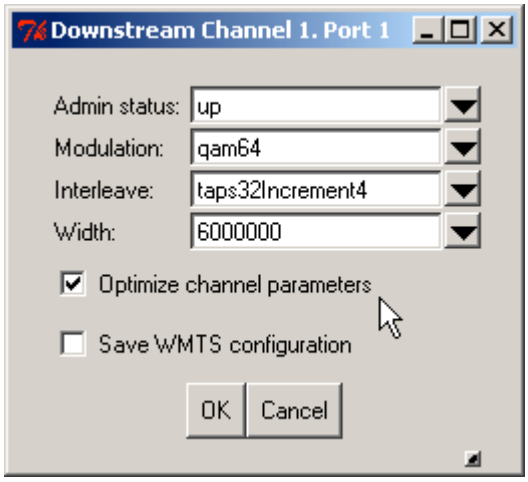
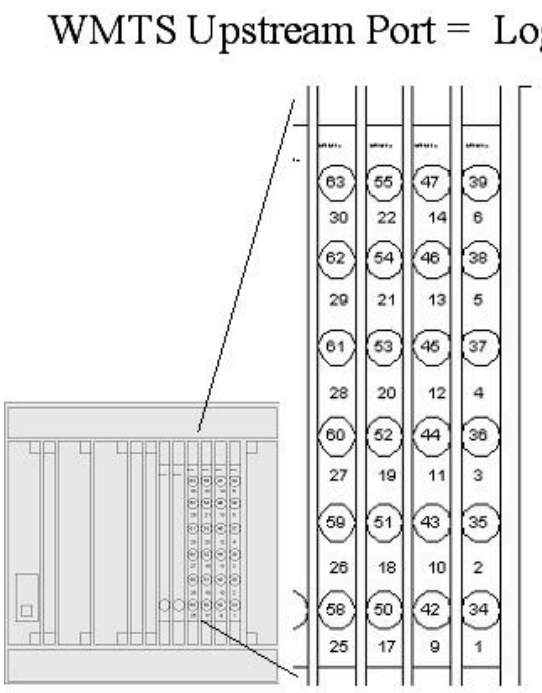


Figure 11-9: View and change downstream parameter

Appendix A. XMTS US Port Mapping

The following figure shows a rear view of the XMTS with several upstream RF cards. The numbering proceeds from right to left and allows for eight channels on each card even if the card does not have eight physical connections. Logical ports are also referred to as “interfaces”.

NOTE: the downstream port mapping is similar except that the first Logical Port is number 2.



WMTS Port	Logical Port
1	34
2	35
3	36
4	37
5	38
6	39
9	42
10	43
11	44
12	45
13	46
14	47
17	50
18	51
19	52
20	53
21	54
22	55
25	58
26	59
27	60
28	61
29	62
30	63

Appendix B. Checking the XMTS Version

The version number may be easily checked by using the **WmtsConfig** tool shown in the figure below: right click on any open area in the main window to display the popup shown, and then click on “Activate” followed by “Connect”. This establishes communication between the WmtsConfig tool and the XMTS. Now click on “Version Check (WMTS)” in the popup window. See Setting the XMTS IP Address for instructions on using the **WmtsConfig** tool.

1. Right click in the main window on any open space and then click in “Activate” on the popup menu.

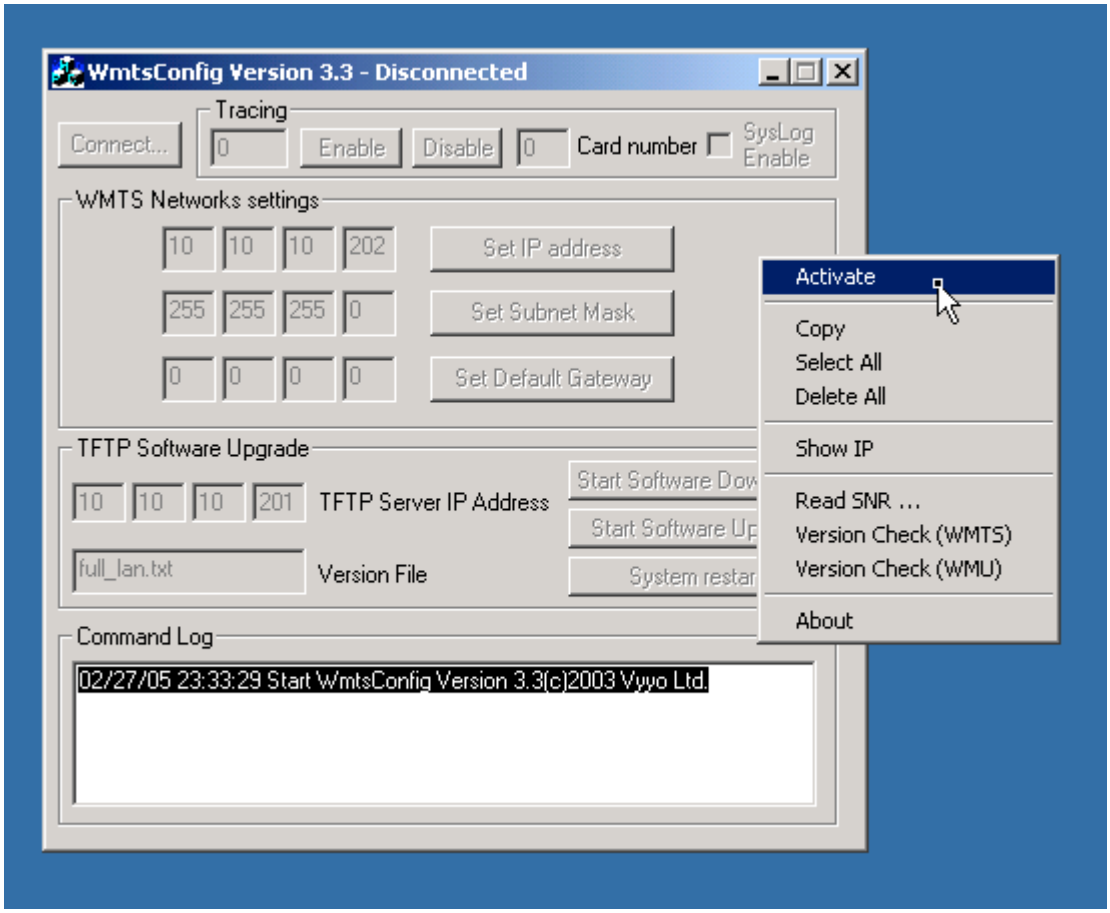


Figure B-1: Viewing the WmtsConfig tool-Activate

2. Now click on “Connect” in the main window and when the popup menu appears, verify or set the IP address as needed, and click on “Connect” then “Close”. A message will appear in the main window indicating if the connect command was sent.

NOTE: the “Activate” command automatically closes the XMTS connection after approximately 60 seconds – this may cause a message like “Inconsistent WMTS Version” to appear in the message window. If this occurs just right click and select “Activate” again then “Connect” then “Version Check (WMTS)”.

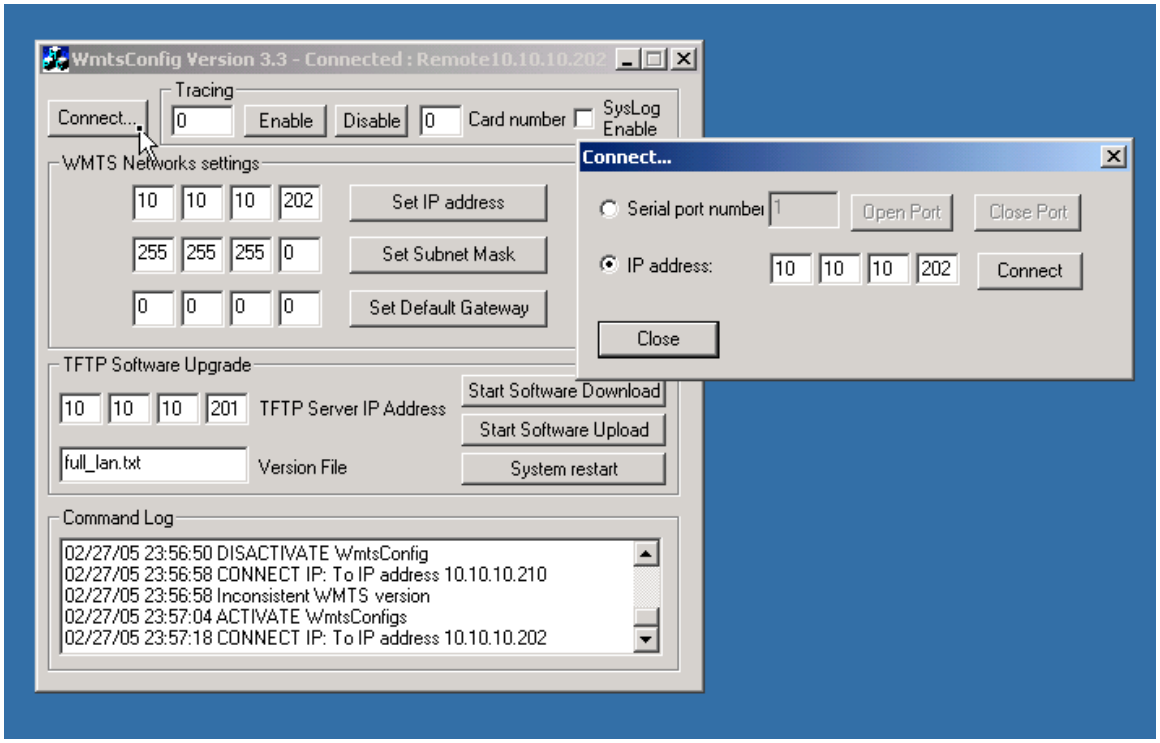


Figure B-2: Connecting to the XMTS

3. Right click in the open space in the main menu to bring up the popup menu and select “Version Check (WMTS)”. The XMTS version will be shown in the message window.

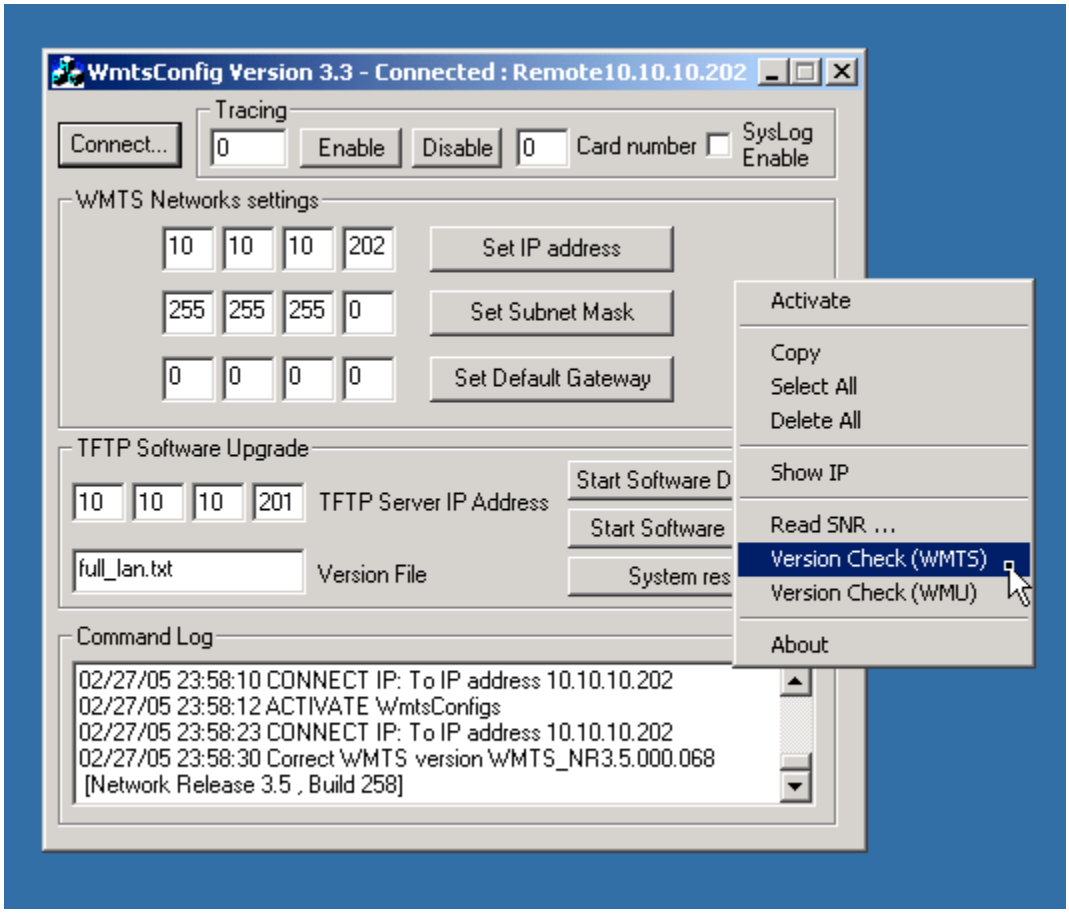


Figure B-3: Viewing the XMTS Version

Appendix C. Installing and Uninstalling the NMS

C.1 First Time Installation

Unzip the installation ZIP file

Invoke INSTALL.CMD

When Java is installed choose "Typical" (use defaults)

On SNMPc-5 installation choose:

- Server
- No Discovery Seed
- Check the "Start with discovery off"

Note:

When using Windows XP, you must extract the installation zip file. Don't run the install from within the zip file.

C.2 Invoking Vyyo NMS

The NMS is launched automatically when you start SNMPc

C.3 Installation Upgrade

Run install.cmd

On the SNMPc installation wizard, choose "Upgrade SNMPc"

C.4 Uninstalling the NMS

1. Un-install all Java versions from the machine.
2. Stop the MySql service
3. Uninstall mySql
4. Verify that mySql is uninstalled: go to the services window and make sure there is no mySql service on it
   If there is, run regedit and remove all entries related to mySql (if you get "can't delete" errors - ignore them)
5. Reboot to continue
6. Un-install SNMPc and delete the SNMPc directory

   Reboot.

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