

SMG-1100/6100 User's Manual

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SMG-1100/6100 User's Manual

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Introduction

Thank you for using Moxa's SMG-6100 IPSec Gateway and SMG-1100 MODBUS Gateway. These products help you easily establish the secured network communication with the IPSec protection and the protocol conversion between MODBUS/Serial and MODBUS/TCP. In this manual, you will learn how to configure and monitor the SMG-6100 and the SMG-1100 for your network communication.

The following topics are covered in this chapter:

□ **Overview**

□ **Introduction to IPSec VPN Connectivity**

- IPSec VPN Requirements
- Typical IPSec VPN Scheme
- Planning IPSec VPNs
- Configuring IPSec Tunnels

□ **Introduction to MODBUS Gateway**

- MODBUS Gateway Applications
- MODBUS TCP Master
- MODBUS RTU/ASCII Master
- Managing MODBUS Gateway

Overview

The SMG-6100 can be used as a smart gateway with sophisticated Machine-to-Machine solutions to help construct a tunnel server (IPSec) and bi-directional IP communications. When used with Moxa's SMG-1100, the SMG-6100 can serve as a secure networking host over IPSec to back-end host computers and MODBUS TCP Master/Slave devices.

In addition, the SMG-1100 features 2 software selectable RS-232/422/485 ports, 1 Ethernet port, and quad-band GPRS/EDGE 900/1800/850/1900 MHz for cellular communication.

The SMG-1100 series provides a sophisticated wireless M2M solution for distributed MODBUS devices. Implemented with protocol conversion functionality, the SMG-1100 can serve both serial masters and slaves and the built-in IPSec function guarantees that data transmission is encrypted in a wireless connectivity environment.

Introduction to IPSec VPN Connectivity

This section describes how to use and manage IPSec VPN on the SMG-6100.

IPSec VPN Requirements

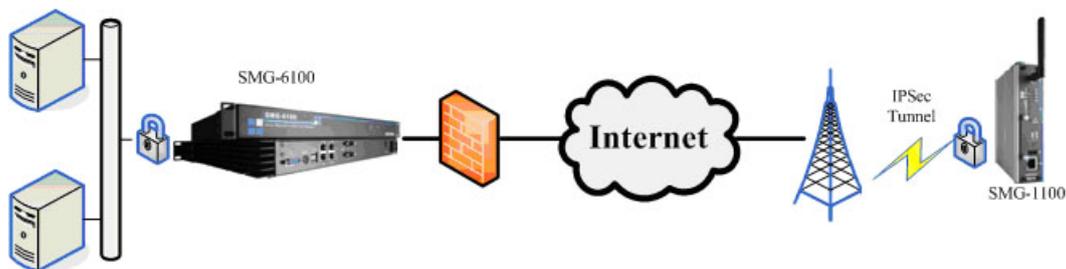
The following requirements must be met to use IPSec VPN on the SMG-6100:

You must have a fixed public IP address accessible to the Internet.

You must have a computer running Device Configuration Gateway (DCG) and SMG Manager to set up and monitor IPSec VPN for the SMG-6100.

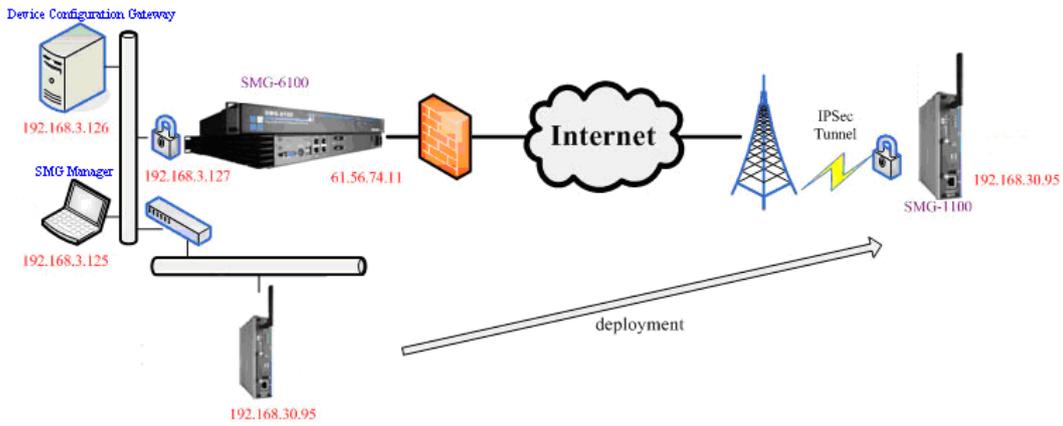
Typical IPSec VPN Scheme

An SMG-6100 acting as an IPSec VPN gateway can create multiple IPSec VPN tunnels between its VPN subnet interface and remote mobile SMGs via the Internet. An IPSec VPN tunnel is created between the remote SMG-1100s and the SMG-6100. Computers on the same VPN subnet as the SMG-6100 can securely and mutually communicate with remote mobile SMGs via IPSec VPN tunnels.



Planning IPSec VPNs

The IPSec tunnel provides mobile operators with an independent solution that considers remote mobile SMGs part of the internal intranet, allowing several remote mobile SMGs to be implemented on the same subnet. In the example illustrated below, the SMG-1100 is assigned the IP address of 192.168.30.95 during LAN 1 port network configuration. After it is deployed to the remote site, its IP address does not need to be changed. This is convenient as it allows administrators to configure programs such as SCADA and remote device monitoring at the local field site with a fixed IP address.

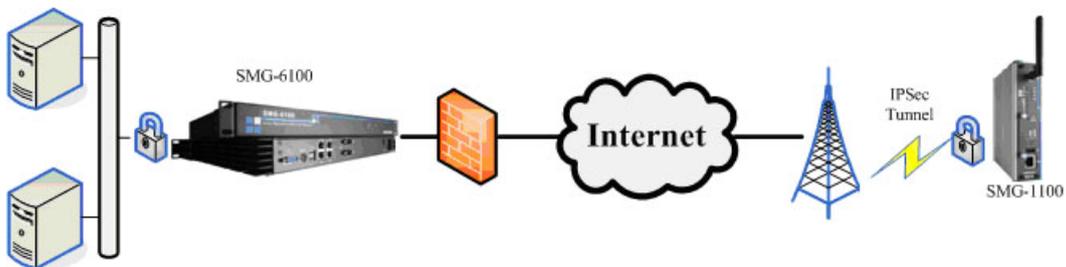


Configuring IPsec Tunnels

To set up IPsec tunnels between the SMG-6100 and the remote mobile SMG (the SMG-1100), refer to the **VPN(IPsec)** section in the **SMG Manager** chapter of this manual. We strongly recommend that IPsec tunnels be configured from the SMG-6100 and deployed to the SMG-1100 at the same time via SMG Manager at the local site. When finished, the SMG-1100 can be moved to the remote field site.

Introduction to MODBUS Gateway

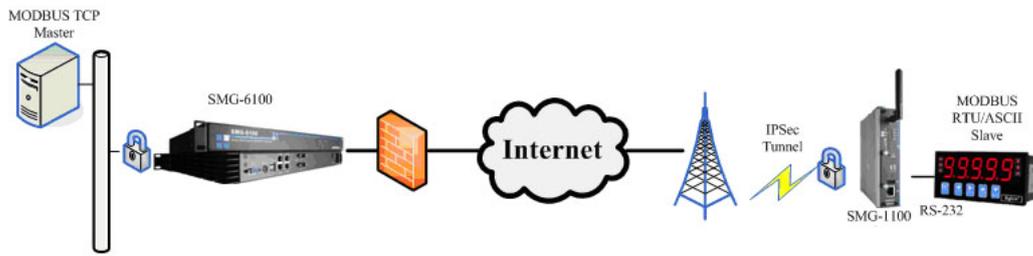
The Moxa SMG-1100 is a secure mobile MODBUS gateway that provides IPsec tunnels between itself and the peer IPsec Gateway SMG-6100 via the Internet while transferring MODBUS messages. It features two RS-232/422/485 serial ports, one 10/100 Mbps Ethernet port, and a GPRS/EDGE wireless module for mobile connections.



MODBUS Gateway Applications

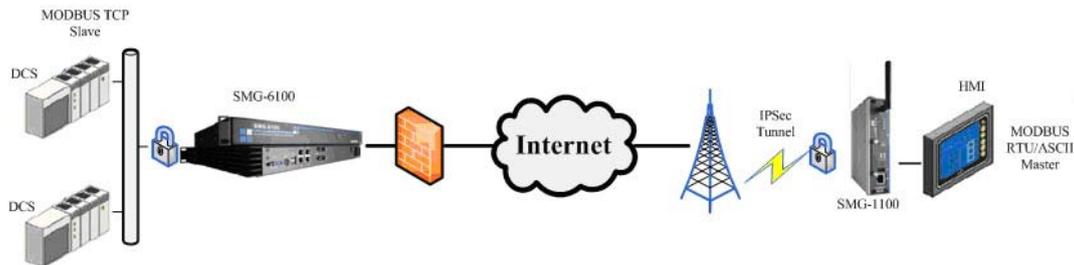
MODBUS TCP Master

In the MODBUS Gateway configuration for a MODBUS TCP master and MODBUS RTU/ASCII slave, programs running on the MODBUS TCP master can securely send MODBUS TCP request messages via the Internet to the MODBUS TCP slave. The MODBUS Gateway then sequentially converts MODBUS TCP request messages to MODBUS RTU/ASCII messages and sends the request messages to connected MODBUS RTU/ASCII slave devices through the serial port, based on specified slave ID values in the MODBUS request messages and settings in the MODBUS Gateway. When the slave devices receive MODBUS RTU/ASCII request messages, they reply with MODBUS RTU/ASCII response messages to the MODBUS Gateway. Once the MODBUS Gateway receives MODBUS RTU/ASCII response messages, they are converted to MODBUS TCP response messages and sent to the corresponding programs of the MODBUS TCP master.



MODBUS RTU/ASCII Master

In the MODBUS Gateway configuration for a MODBUS RTU/ASCII master and MODBUS TCP slave, the software running on each MODBUS RTU/ASCII master device sends MODBUS RTU/ASCII request messages to the MODBUS Gateway via its connected serial port. The MODBUS Gateway then converts the messages to MODBUS TCP request messages and securely sends them to MODBUS TCP slaves in MODBUS TCP slave devices via the Internet, based on slave ID values in the MODBUS request messages and settings in the MODBUS Gateway. After the slave devices receive MODBUS TCP request messages, they reply with MODBUS TCP response messages to the MODBUS Gateway. Once the MODBUS Gateway receives MODBUS TCP response messages, they are converted to MODBUS RTU/ASCII response messages and sent to the corresponding MODBUS RTU/ASCII master device.



Managing MODBUS Gateway

After the MODBUS Gateway application for each serial port is determined, the configuration of MODBUS Gateway can be set up via SMG Manager. Refer to **MODBUS** section for detailed MODBUS Gateway configuration instructions.

2

Installation

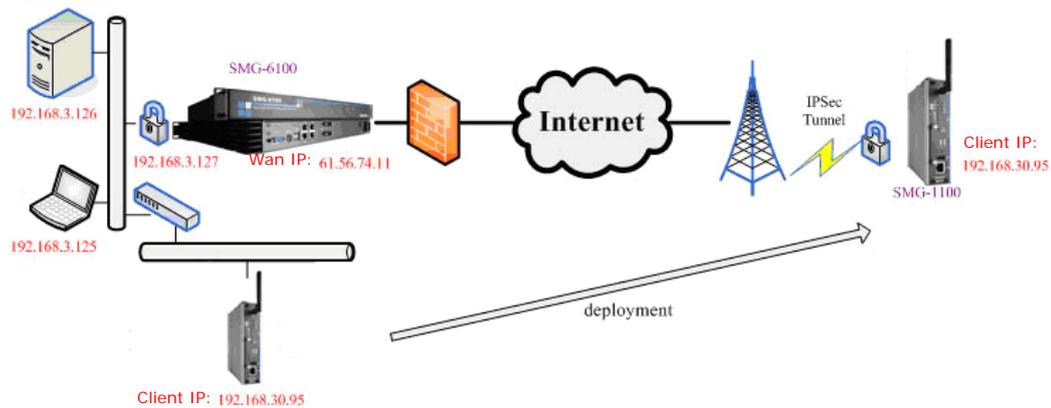
The following topics are covered in this chapter:

- ❑ **Installation**
 - Deploying the SMG-1100
- ❑ **Installing Device Configuration Gateway**
- ❑ **Installing SMG Manager**
- ❑ **Uninstalling Device Configuration Gateway and SMG Manager**

Installation

Deploying the SMG-1100

You must use SMG Manager to configure the SMG-1100. In the example shown below, SMG Manager, Device Configuration Gateway, and the SMG-6100 are all on subnet 192.168.3.xxx. Each SMG-1100 also has an *intranet* IP address in subnet 192.168.30.xxx, and this IP address is used when the SMG-1100 is deployed at the remote site. The next step in the implementation process is to insert the SIM card, Ethernet cable and power cable. After the SMG-1100 is accessible via the LAN, SMG-1100 should connect to Device Configuration Gateway automatically. Finally, use SMG Manager to configure the SMG-1100. A step-by-step procedure is outlined below.



1. Refer to the **MODBUS** section in the **SMG Manager** chapter of this manual to set up the MODBUS Gateway. In addition, see Step 4 below to manage MODBUS Gateways on an SMG-1100.
2. Refer to the **VPN(IPSec)** section in the **SMG Manager** chapter to create an IPsec tunnel between an SMG-6100 and **SMG-1100**.
3. When **deploying** the SMG-1100, change the IP address of the LAN port to a static private IP address, without default gateway. In the example shown above, 192.168.30.95 is used for the SMG-1100.
4. Reboot the SMG-1100 to test the configuration.
5. Power off the SMG-1100 and deploy it to the remote site.

To use SMG Manager to remotely monitor and manage Moxa's SMGs, you need to install two software programs:

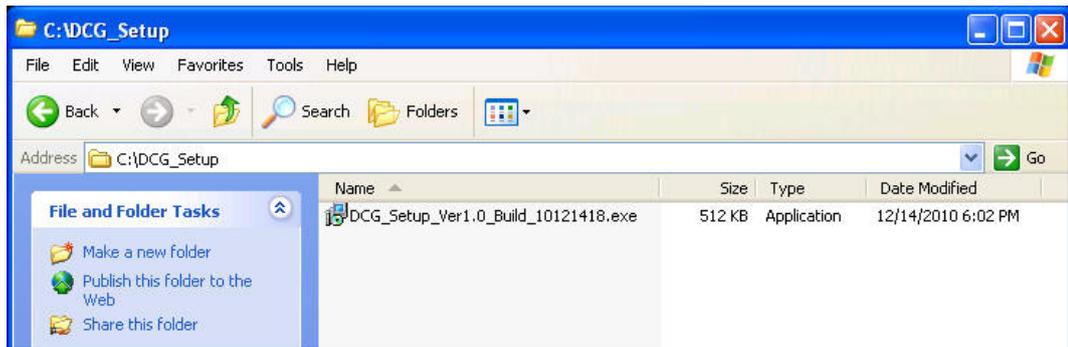
1. **Device Configuration Gateway:** This program must be installed on the computer(s) used as the Device Configuration Gateway. It serves as a portal between two programs, allowing them to share information by communicating between protocols on the same computer or between computers. Device Configuration Gateway can be used to connect to many SMGs at remote sites, so that a centralized management architecture can be established.
2. **SMG Manager:** This program is installed on the computer, usually a PC or a laptop, in the control center. It allows users to connect to the Device Configuration Gateway to monitor and manage the remote SMGs.

Installing Device Configuration Gateway

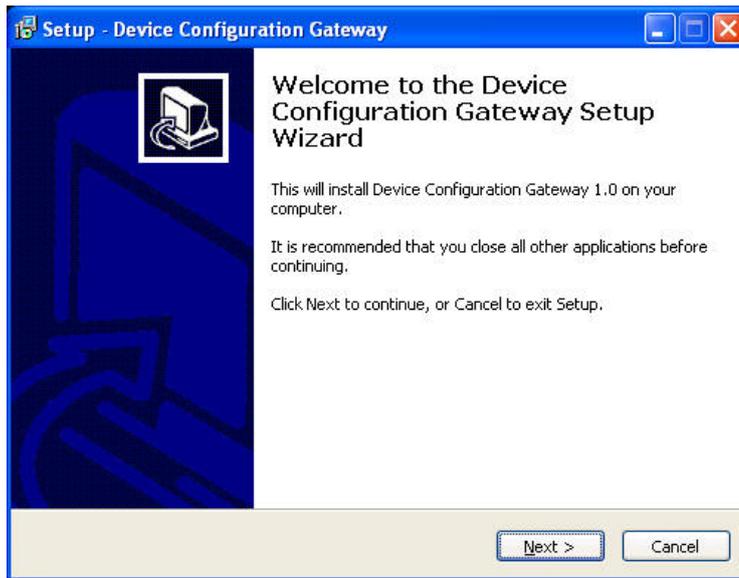
Device Configuration Gateway should be installed on the computers that you will use as the Device Configuration Gateway that the remote SMGs connect to. Device Configuration Gateway can be downloaded from Moxa's website. The files will be packaged as zip files.

Follow these steps to install Device Configuration Gateway.

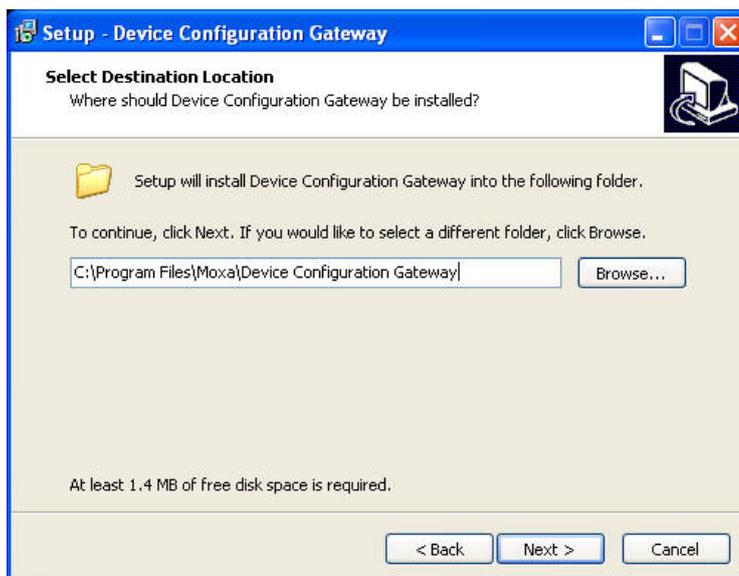
1. Unzip the file and double click **DCG_Setup_Ver1.0_Build_xxx.exe** to start the installation procedure.



2. Click **Next** to continue.



3. Next, select **Browse** if you would like DCG to be installed in a different folder. Click **Next** to continue.



4. Click **Finish** to complete the installation procedure.

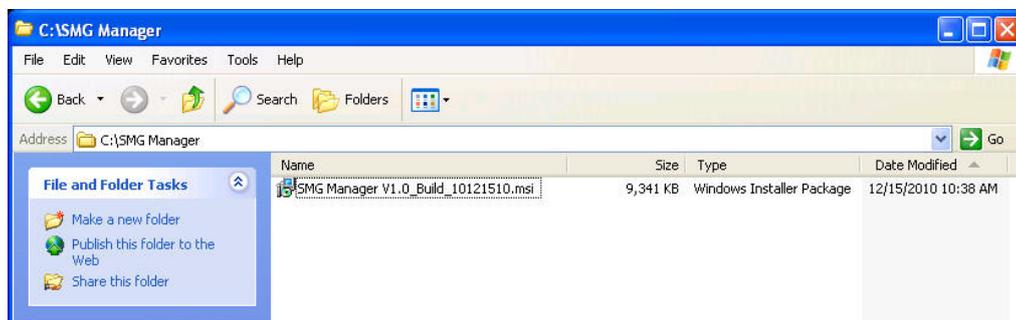


Installing SMG Manager

SMG Manager should be installed on the computers at the control center. Once installed, the computers at the local site can connect to the Device Configuration Gateway and connect over the internet to the SMGs at the remote site. SMG Manager can be downloaded from Moxa's website.

The files will be packaged in zip format. Follow these steps to install SMG Manager.

1. Unzip the files and then double click **SMG Manager V1.0_Build_xxx.msi** to start the installation.



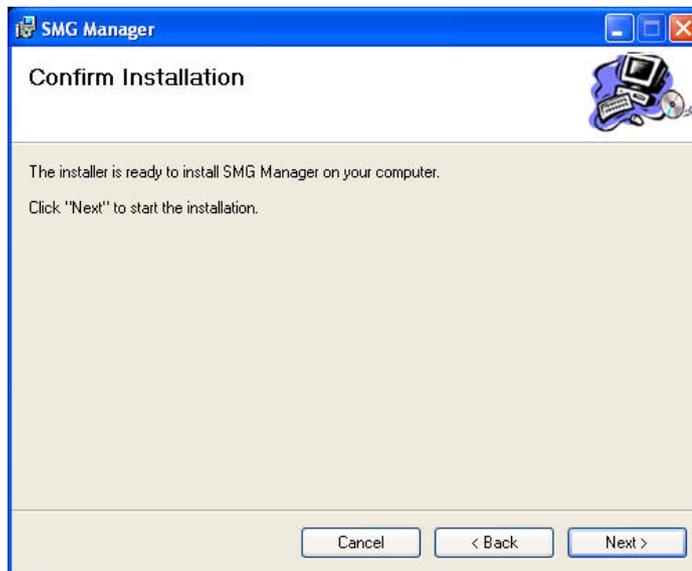
2. Click **Next** to continue.



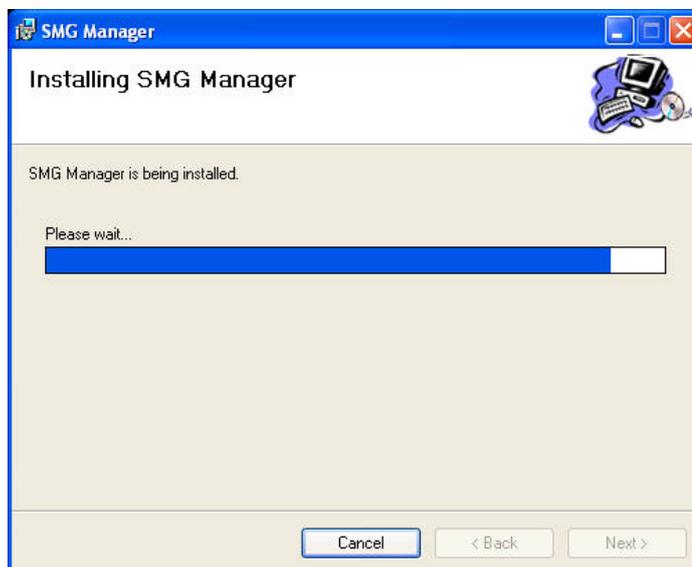
- Next, select **Browse** if you would like SMG Manager to be installed in a different folder. Click **Next** to continue.



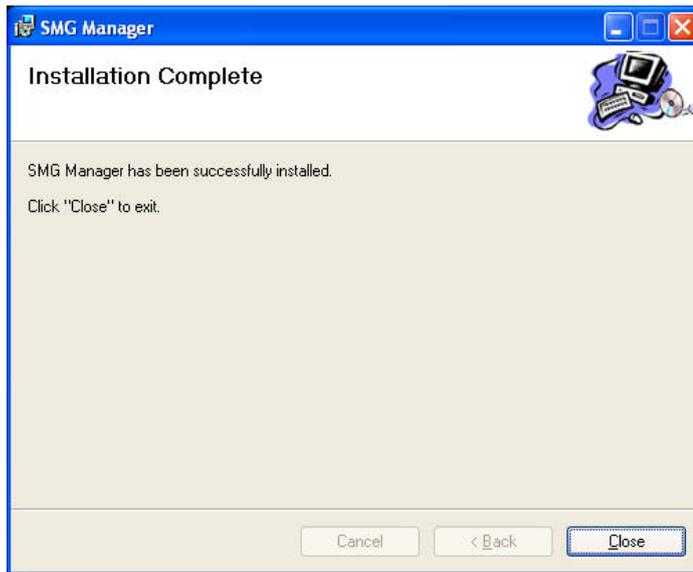
- Click **Next** to confirm the installation.



- Wait until the installation has finished.



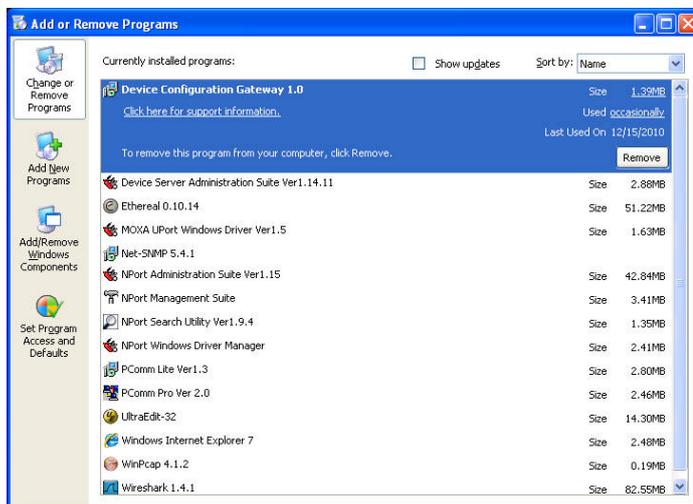
- Click **Close** to complete the installation procedure.

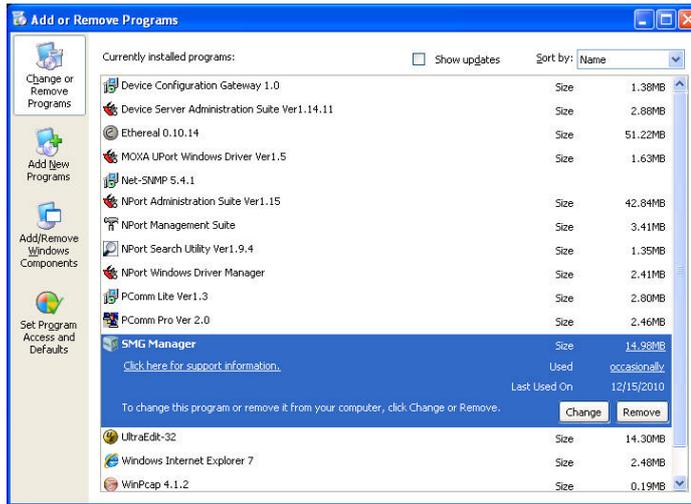


Uninstalling Device Configuration Gateway and SMG Manager

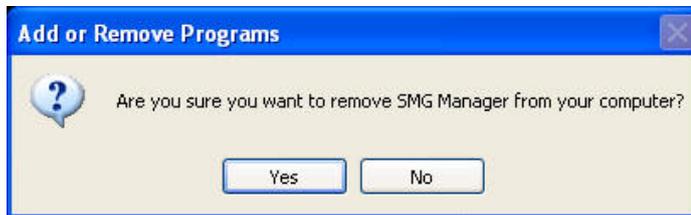
Follow these instructions to uninstall Device Configuration Gateway and SMG Manager.

- Select **Add or Remove Programs** from **Start** → **Settings** → **Control Panel**.
- Select **Device Configuration Gateway** and **SMG Manager** from the program list, and click **Remove** to continue.





3. Click **Yes** to start **removing** Device Configuration Gateway or SMG Manager from your computer.



This chapter describes how to use SMG Manager to monitor and configure SMG-6100 and SMG-1100 devices at remote sites over the Internet.

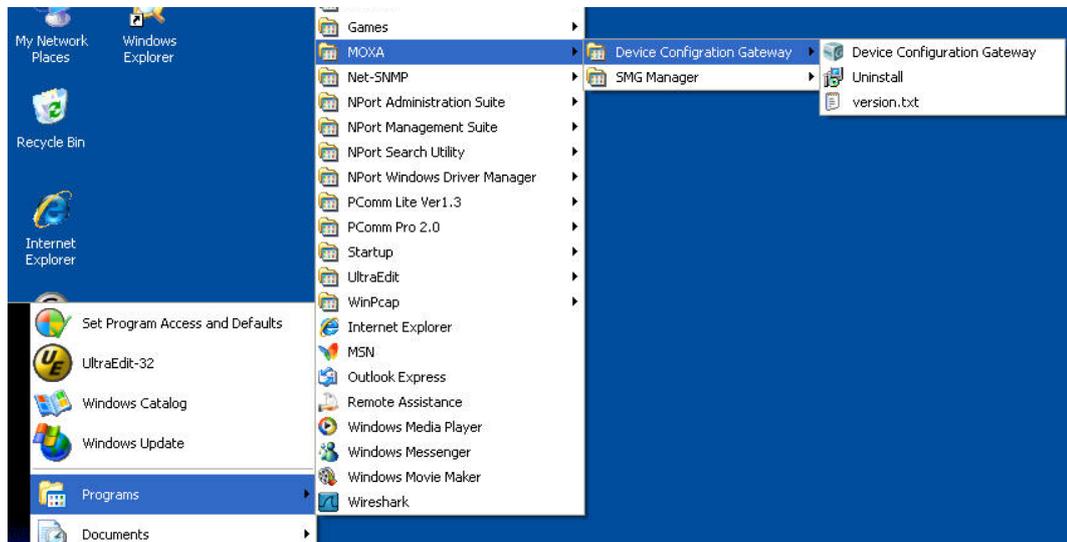
The following topics are covered in this chapter:

- ❑ **Launching Device Configuration Gateway**
- ❑ **Launching SMG Manager**
- ❑ **Connecting to Device Configuration Gateway**
- ❑ **Introduction to the SMG Manager Interface**
 - Menu Bar Introduction
- ❑ **Toolbar Functions**
 - Login/Change Password
 - Locate
 - Set Device Name
 - Network Setup
 - GPRS
 - VPN(IPSec)
 - Modbus
 - Import/Export Configuration
 - Apply
 - Monitor Connections
 - Upgrading the Firmware
 - Reboot
 - Disconnecting Device Configuration Gateway

Launching Device Configuration Gateway

Before using SMG Manager on your PC to manage SMGs, you must first run Device Configuration Gateway.

1. Select Device Configuration Gateway from the Start menu under **All Programs**→**MOXA**.

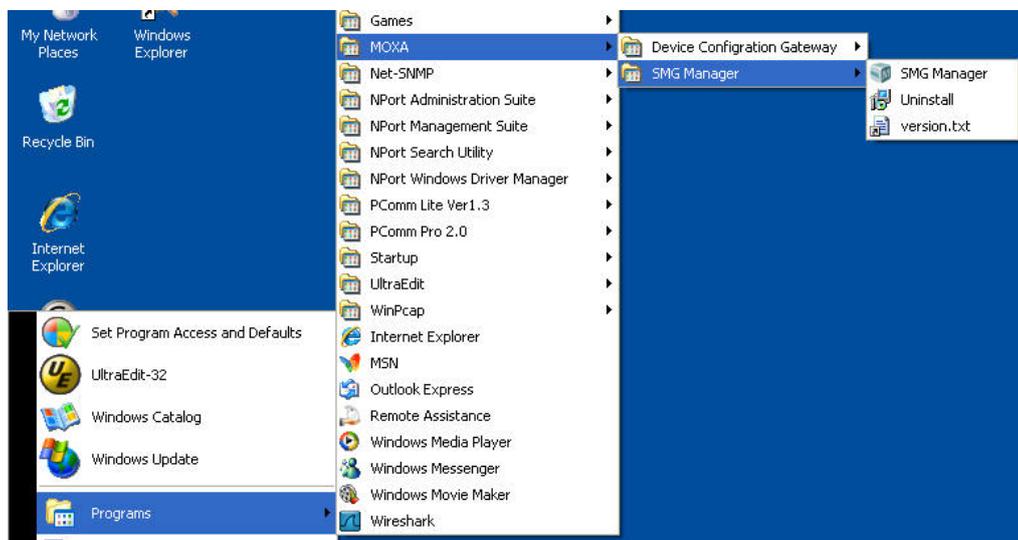


2. The Device Configuration Gateway will run in the background; an icon will be displayed in the system tray.



Launching SMG Manager

1. Click SMG Manager from **Start** → **All Programs** → **MOXA**.



2. Once launched, the SMG Manager interface will appear.



Connecting to Device Configuration Gateway

1. Choose **Gateway Manager** from **Tools**.



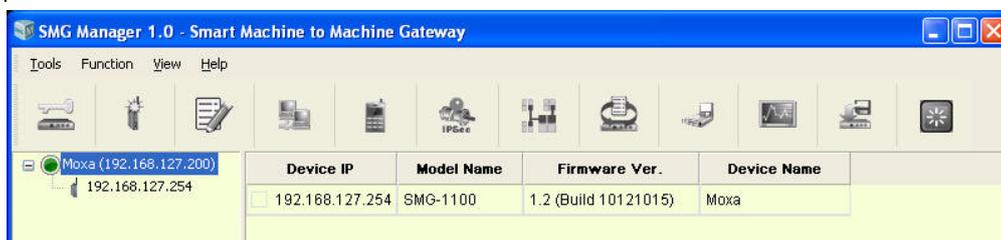
2. Type in the IP address and the name of the Gateway Server. Click **Add** to continue.



3. The Gateway **information** will be displayed as follows. Click **Connect** to continue.



4. If the information is correct, you will be able to connect to the Gateway Server and the main screen of the SMG Manager will appear. You can check the Gateway Server that has just been connected to in the left panel.



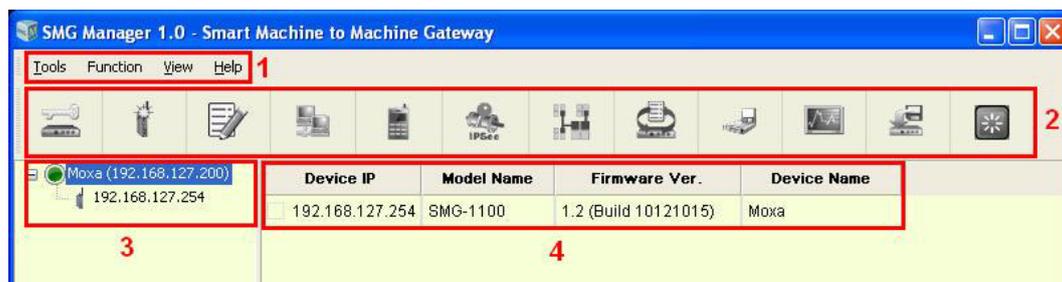
- If you have left Gateway Server and would like to connect to the existing server again, right-click the name of the Gateway, and then select **Connect**.



- Please note that only one Gateway Server is allowed to connect. If you would like to connect to another server, disconnect the first server and then connect the second one.

Introduction to the SMG Manager Interface

When you connect to a Gateway Server, the following screen will appear.



- Menu Bar:** Includes the Tools, Function, View, and Help menus.
- Toolbar:** The icons shown, listed from left to right, are Login/Change Password, Locate, Set Device Name, Network Setup, GPRS, VPN(IPSec), Modbus, Import/Export Configuration, Apply, Monitor Connections, Firmware Upgrade and Reboot. Note that if right-click a device, a list of function options will appear. Each function will be introduced in the following sections.
- Gateway & Device Tree:** In this area, you can view the Gateway Server and the currently active SMGs under this Gateway. Both gateway and IP address can be shown here. Double-click the Gateway icon, you can view the all device information on the right frame.
- Device List:** This area contains all of the information on the SMGs attached under the Gateway Service that you have connected to. This includes device IP, model name, firmware version, and device name. Double-click a device icon to view information about a single SMG in the right frame.

Menu Bar Introduction

This section briefly introduces the options under the Tools, View, and Help menus.

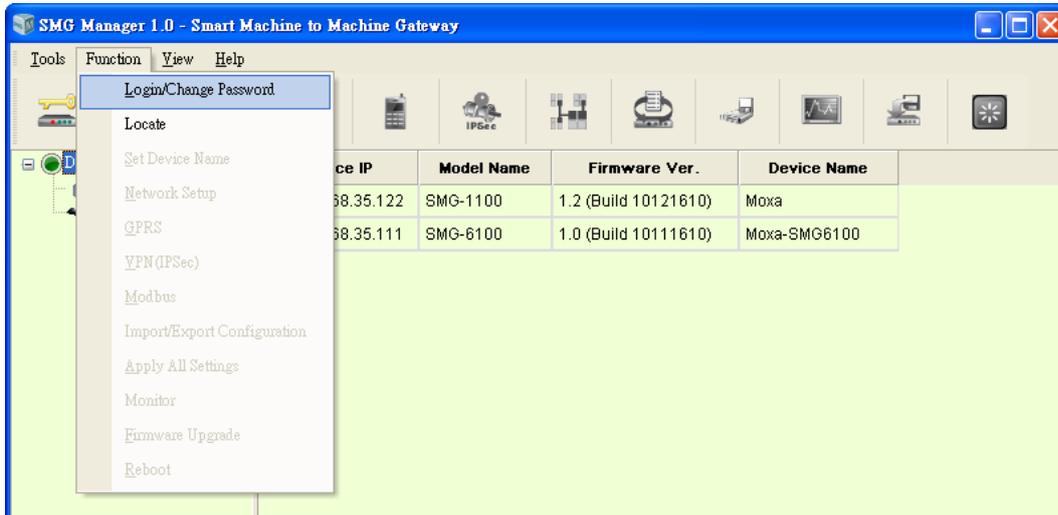
Tools

Gateway Manager: Enables users to manage the gateway information and connect to the Device Configuration Gateway Server.



Exit: Click this to quit SMG Manager.

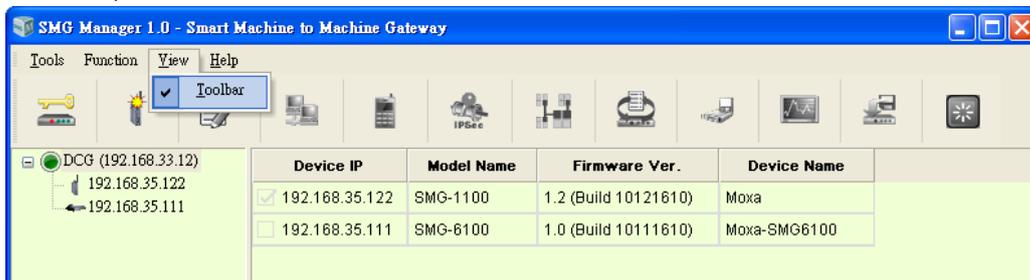
Function



Each function will be introduced in the **Toolbar Functions** section.

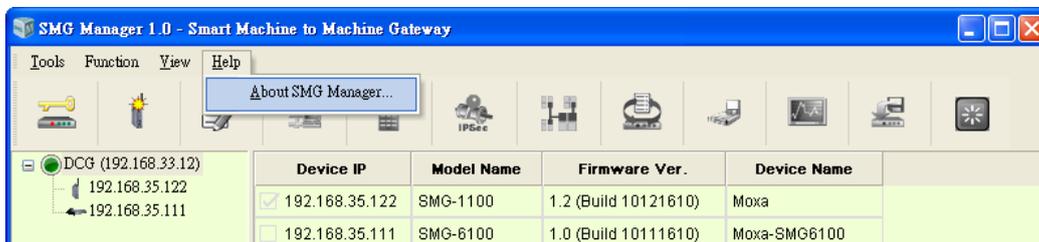
View

Allows you to decide if the toolbar will be displayed. Check the **Toolbar** option to show the toolbar; uncheck the **Toolbar** option to remove the toolbar.



Help

Allows users to view the **About SMG Manager** information.



About SMG Manager: The SMG Manager version number will appear in the SMG Manager window.



Toolbar Functions

The icons that appear on the toolbar, listed from left to right, are Login/Change Password, Locate, Set Device Name, Network Setup, GPRS, VPN(IPSec), Modbus, Import/Export Configuration, Apply, Monitor Connections, Firmware Upgrade and Reboot. See the following sections for detailed descriptions.

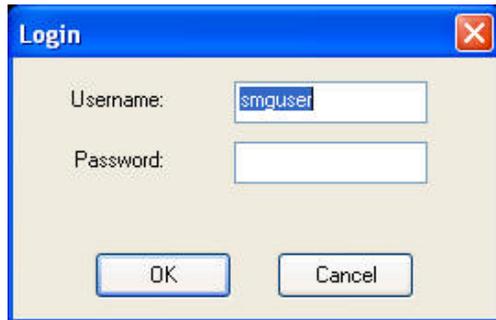
Login/Change Password

You can set a password to prevent unauthorized users from configuring the unit. The password will be required when anyone attempts to configure the unit over the network.

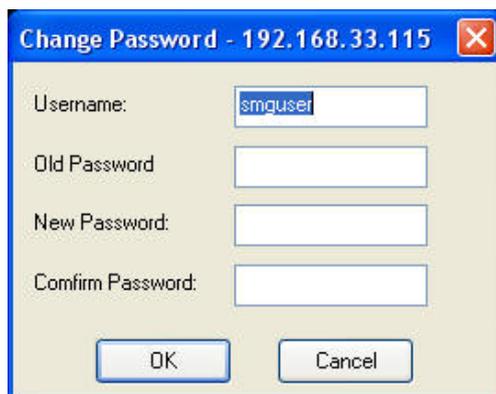
Select the SMG unit on which you would like to set a password and click **Login/Change Password**.



The default **Username** and **Password** is **smguser**.



If you want to change password, click **Login/Change Password** again, and fill in old, new passwords and confirm the new password.



Locate

If you are managing multiple SMG units, it can be confusing to keep track of which physical SMG unit you are currently configuring in SMG Manager. To check which SMG unit is currently being configured, select the unit in SMG Manager and click **Locate**. The corresponding SMG's "Ready" LED will blink for a few seconds so you can identify which physical unit corresponds to the unit on the screen.

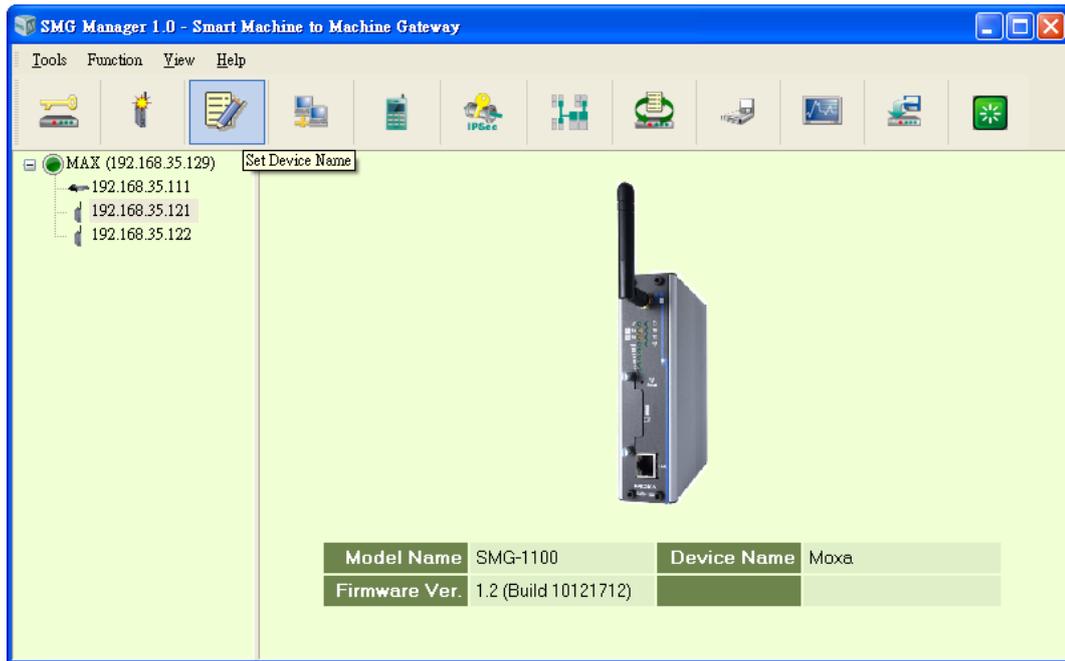


Click **OK** once you have found the correct unit.



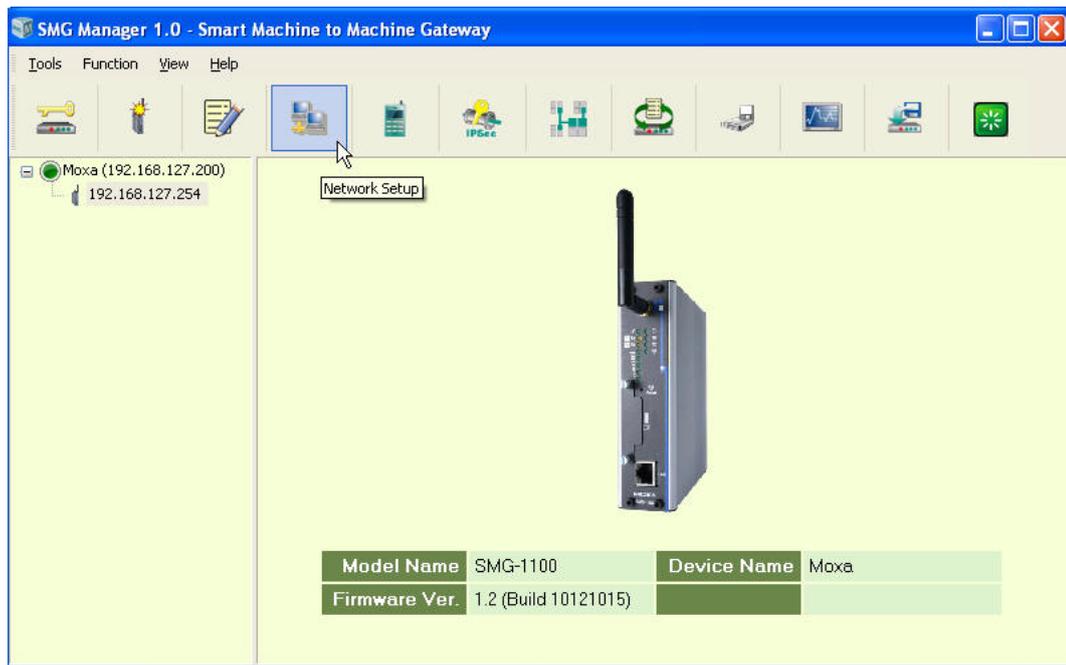
Set Device Name

You can enter a name to help you identify the unit, such as the location, function, etc.

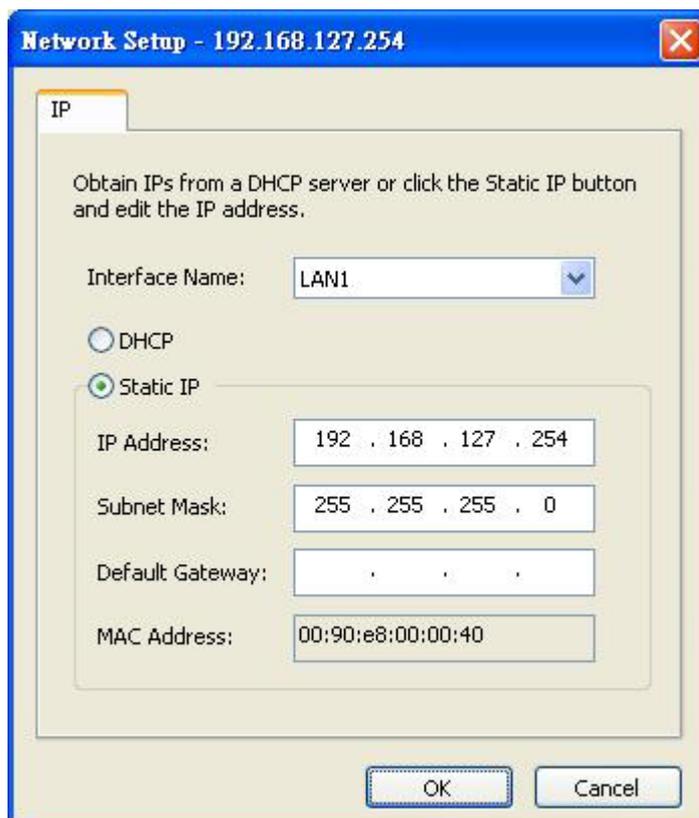


Network Setup

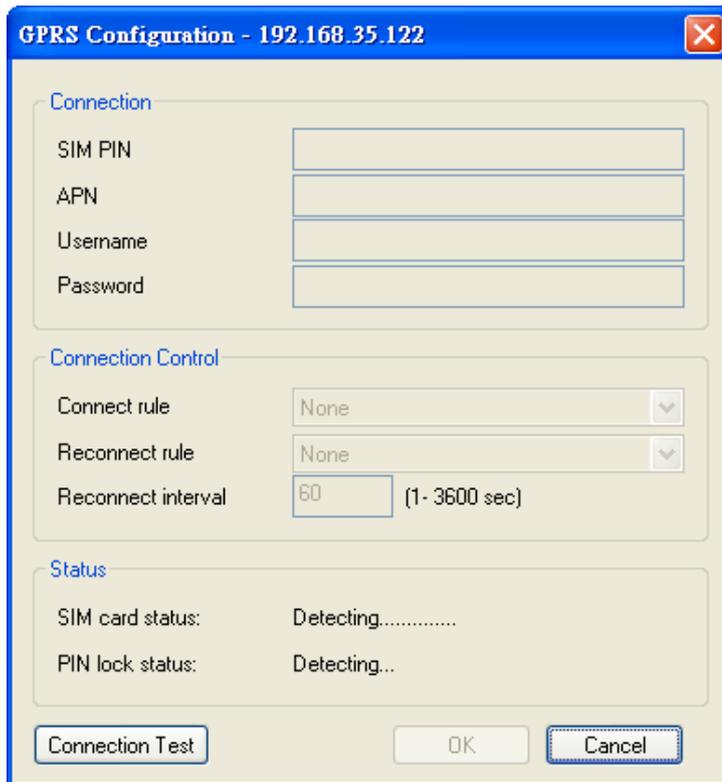
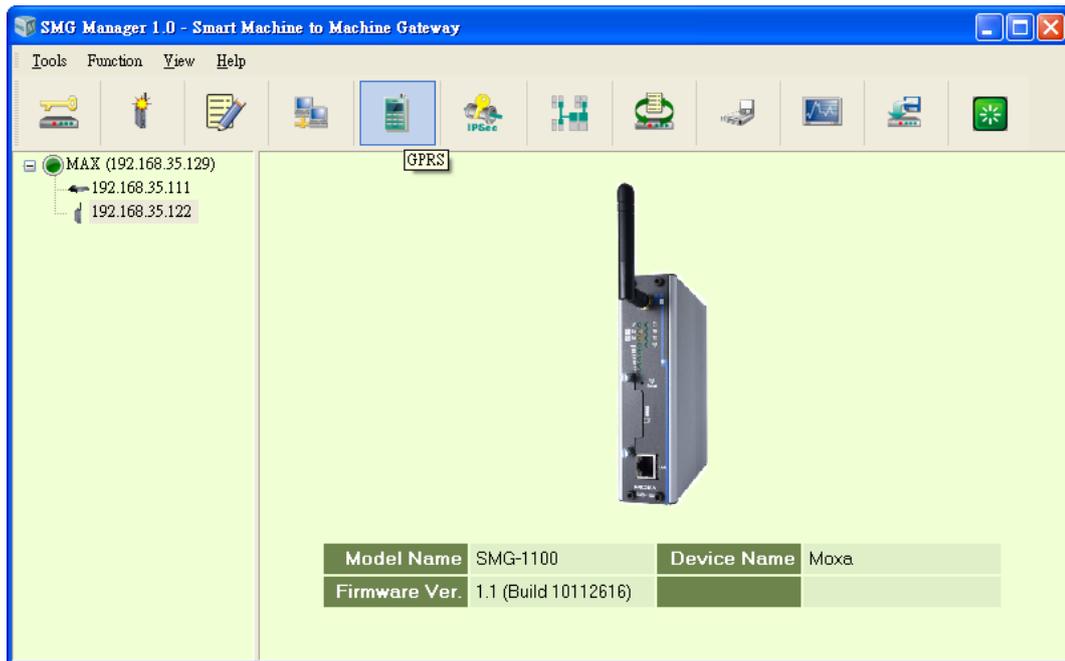
SMG Manager provides a **Network Setup** function that allows users to configure network settings. Select and right-click on the SMG, and then select **Network Setup** to continue. You may also use the **Network Setup** icon from the toolbar to complete the task. You can only perform Network Setup on one device at a time. Before you perform this task, make sure that your network cable is connected and Internet service is available.

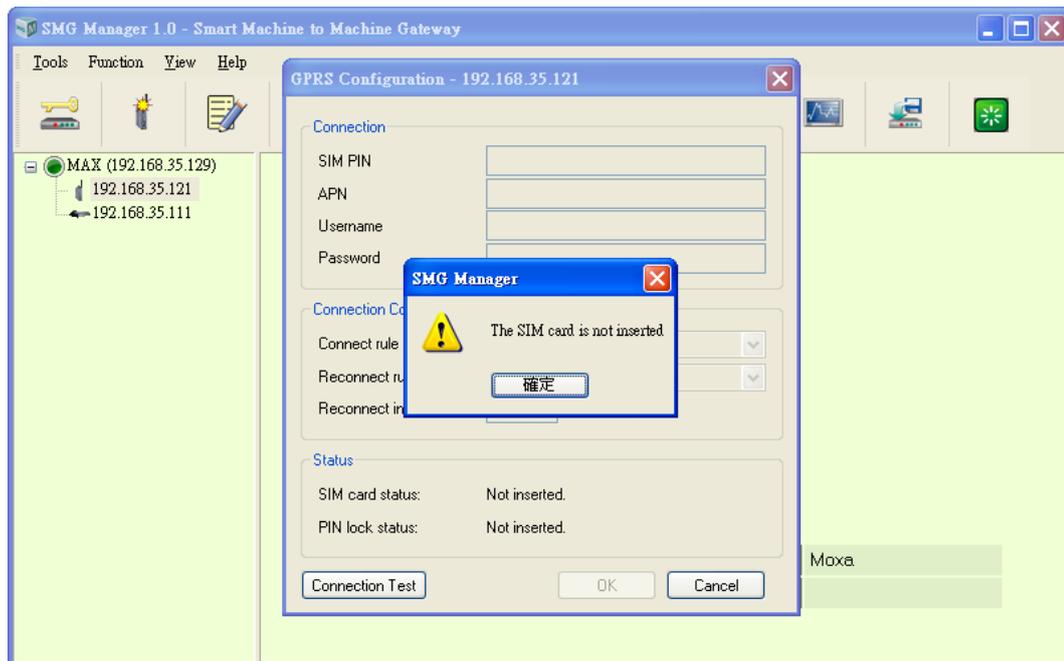


This function configures the IP address and DNS settings. Click the **IP** tab to select the interface, and enter the related IP information, including the interface name, DHCP or Fixed IP, IP address, subnet mask, and default gateway. If there is more than one network interface, select one from the **Interface Name** option menu to continue.



GPRS





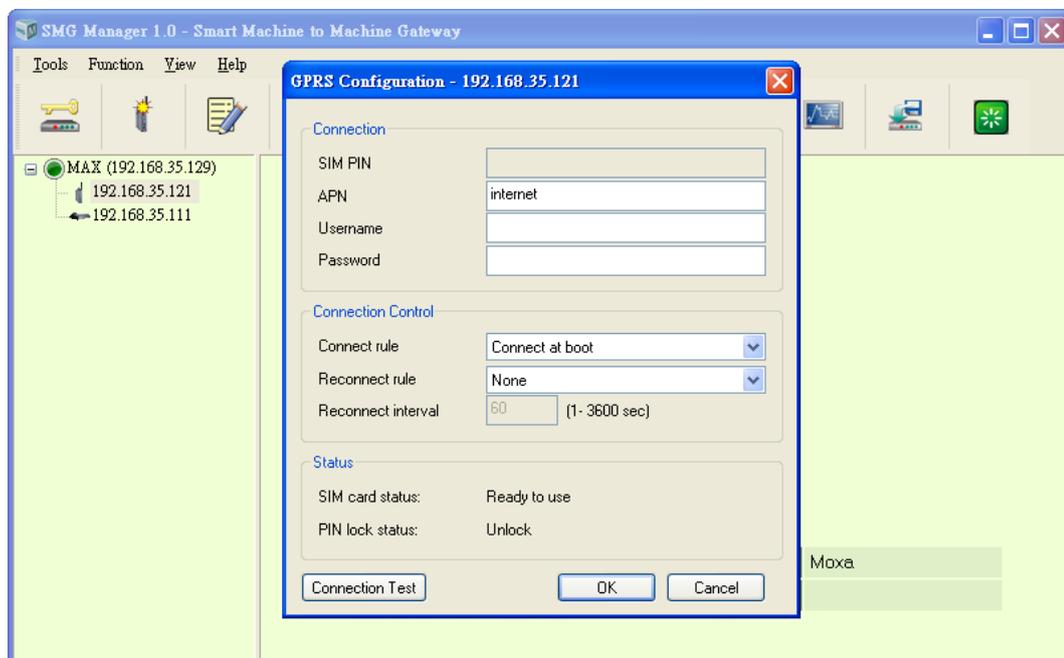
Before using the GPRS, the APN (Access Point Name), Username (user ID account) and Password (user password) must be filled in for the modem initialization command.

Connect rule: Select **Connect at boot** to configure the SMG-1100 to automatically connect to GPRS upon boot up, or select **none** if not using a GPRS connection.

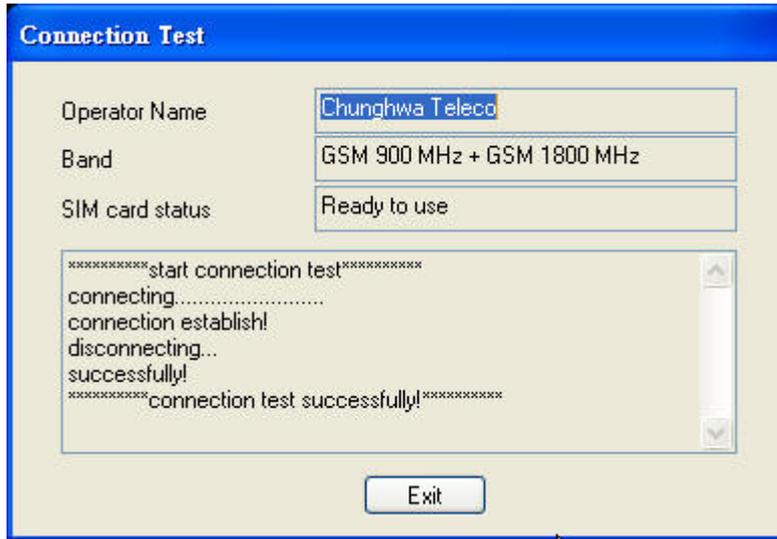
Reconnect rule: Select **Periodically Reconnect** to configure the SMG-1100 to automatically reconnect to GPRS if disconnected.

Reconnect interval: If the reconnect rule is set as Periodically Reconnect, you can designate the reconnect interval time (1 to 3600 seconds).

Status: Shows the current SIM card and PIN lock status.

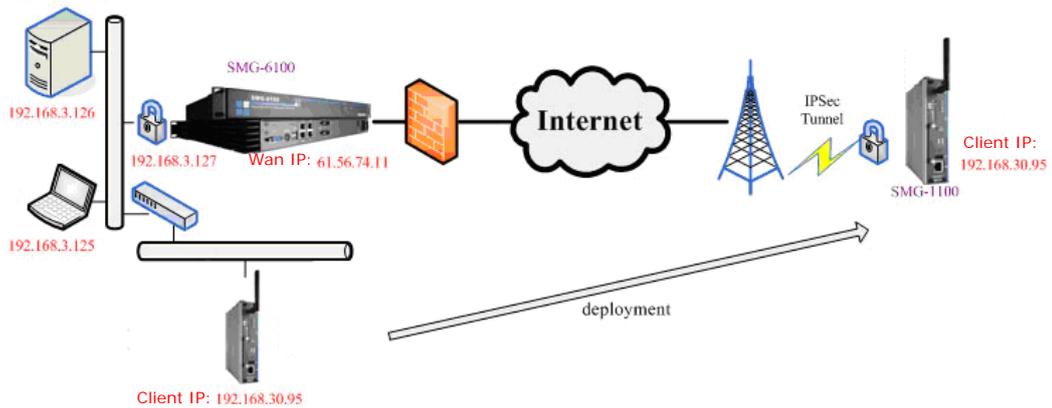


Connection Test: Click this to check your settings. The SMG-1100 will try to establish a GPRS connection and then disconnect.



VPN(IPSec)

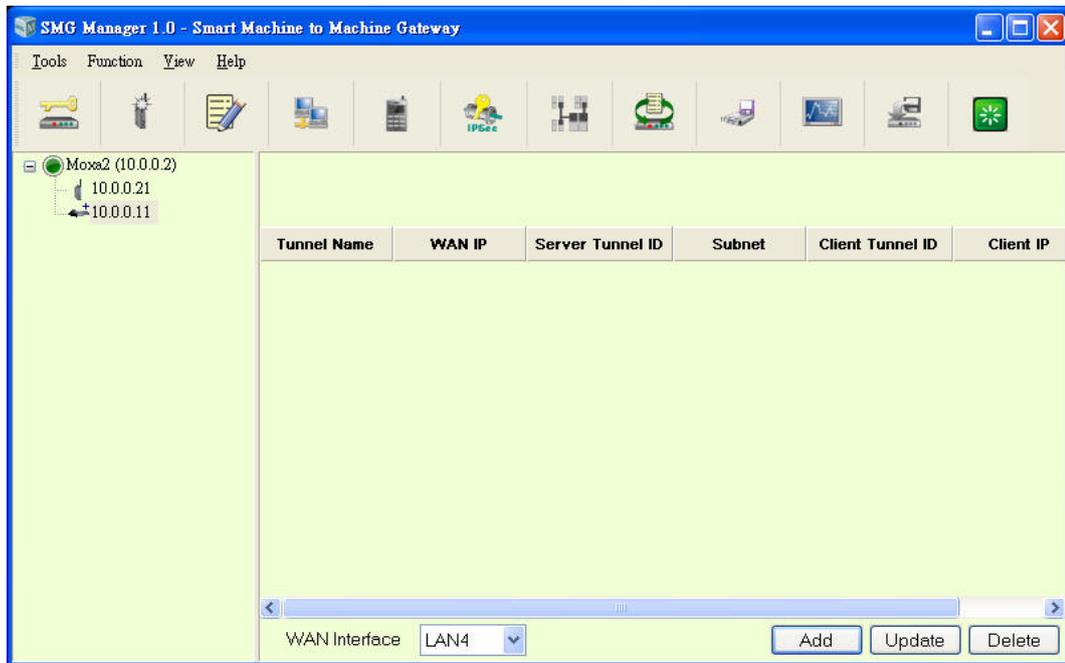
This section introduces how to configure the SMG-6100 as the IPSec Gateway. It also illustrates how to configure the SMG-1100 to work with the SMG-6100 via IPSec security on the Internet for secure data transmission and remote device monitoring.



Select the SMG-6100 on the device list to check the information of the device and click the **VPN(IPSec)** icon.



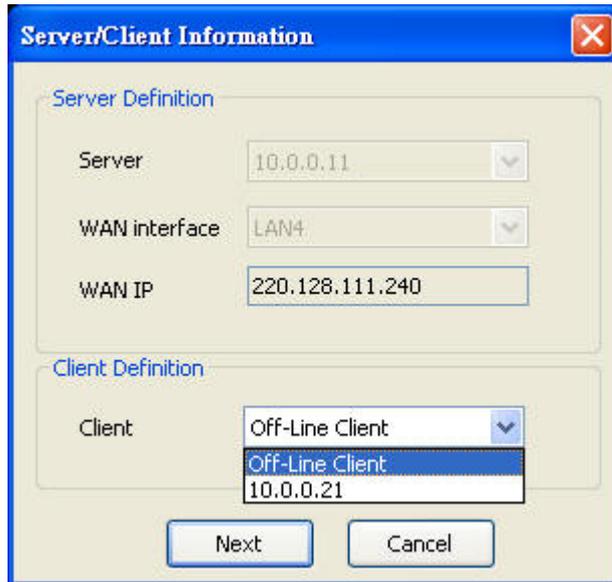
You can see the IPSec tunnel list. Select which WAN interface you wish to use and click Add to continue.



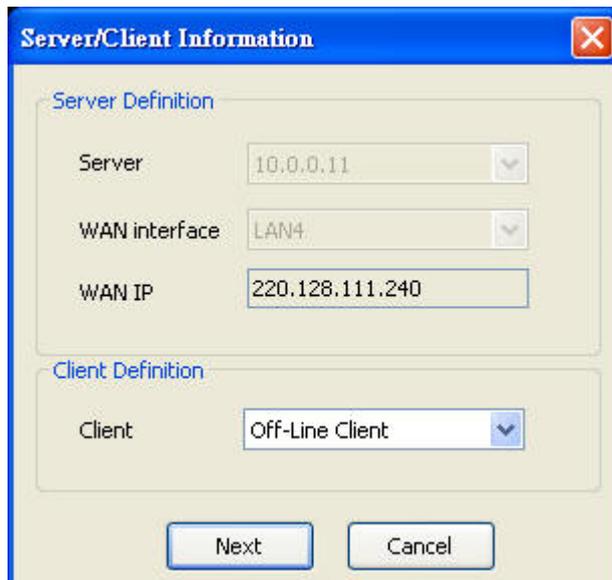
The following section describes how to make a offline configuration file for future/remote use, and how to directly import IPSec configuration into the client over the network.

Off-Line Import IPSec Configuration

Tunnel Name: Select the Off-Line Client and click Next to continue.



The screenshot shows the 'Server/Client Information' dialog box. It is divided into two sections: 'Server Definition' and 'Client Definition'. In the 'Server Definition' section, the 'Server' field is set to '10.0.0.11', the 'WAN interface' is 'LAN4', and the 'WAN IP' is '220.128.111.240'. In the 'Client Definition' section, the 'Client' dropdown menu is open, showing 'Off-Line Client' (selected) and '10.0.0.21'. At the bottom, there are 'Next' and 'Cancel' buttons.



This screenshot is identical to the one above, but the 'Client' dropdown menu is now closed, and 'Off-Line Client' is the selected option. The 'Next' and 'Cancel' buttons remain at the bottom.

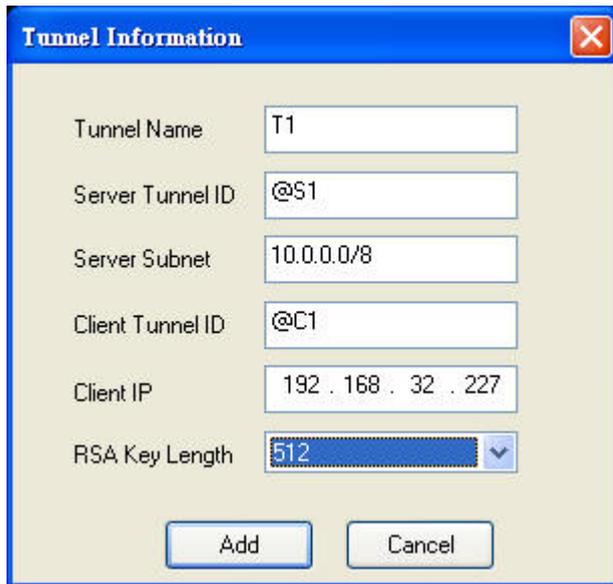
Tunnel Name: Provide a name for this IPSec tunnel. In the screenshot below the tunnel is named T1.

Server/Client Tunnel ID: Provide the ID that will be used in authentication. This ID must be in the form of a domain name preceded by @ or an IP address. For example, you may use @S1 to indicate this is the server of the IPSec tunnel and use @C1 to indicate this is the client of the IPSec tunnel.

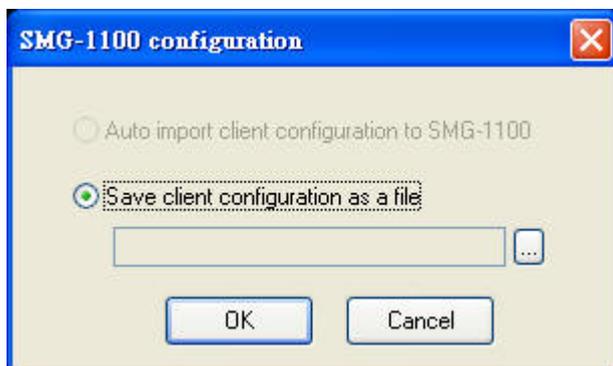
Server Subnet: Identify the private subnet behind the SMG-6100. Use the format subnet network/subnet mask.

Client IP: This option is used to make the IPSec gateway itself use its internal IP. This IP is the local LAN IP of the SMG-1100.

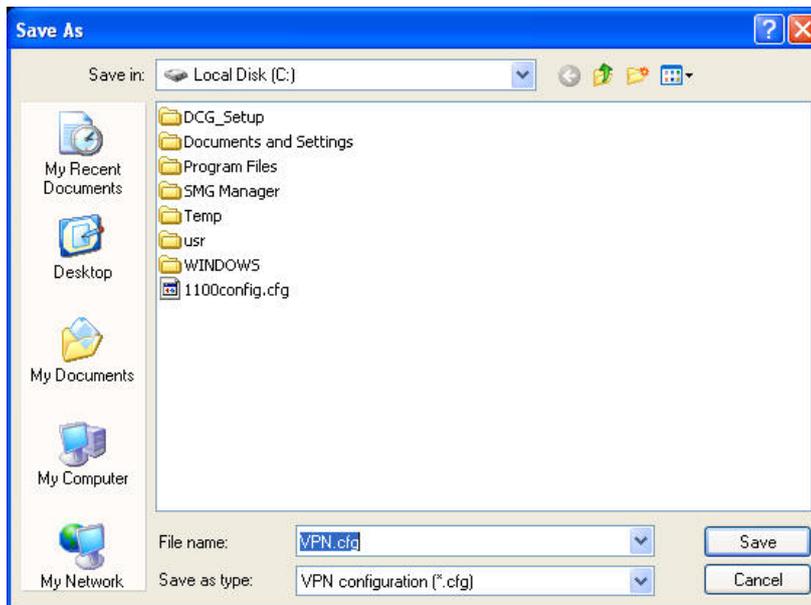
RSA Key Length: Select a RSA key length from the drop-down list.



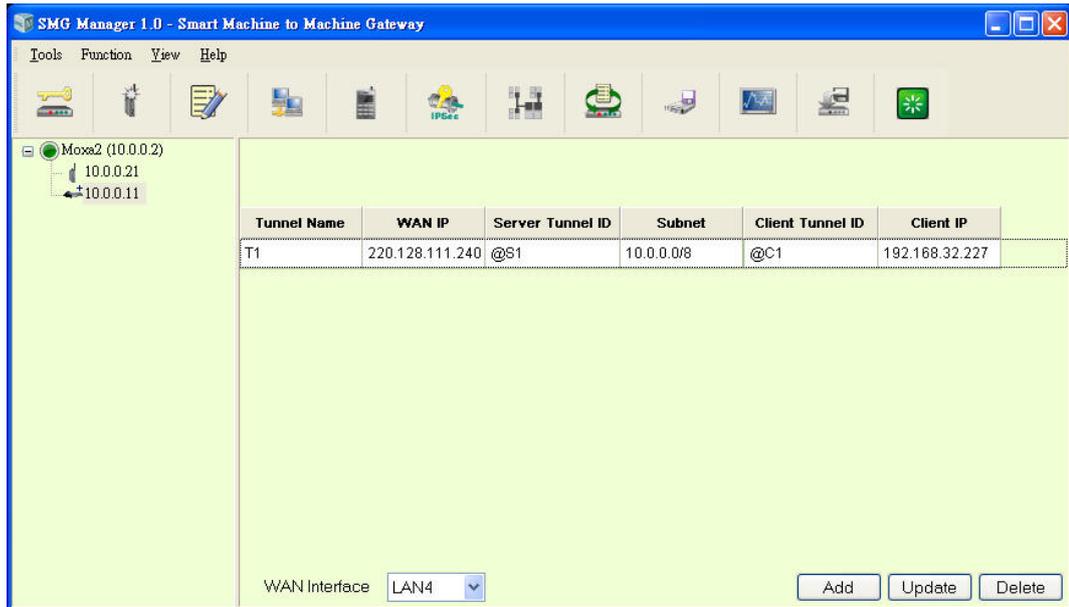
Click **OK** to save the IPsec configuration.



Select a local file to save.

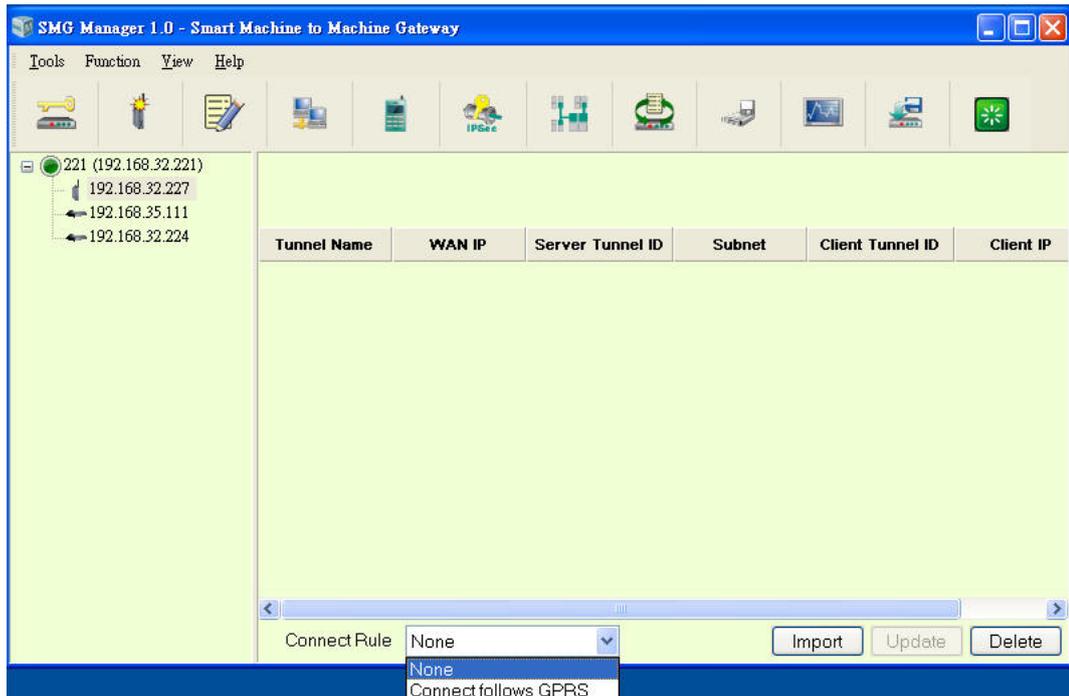


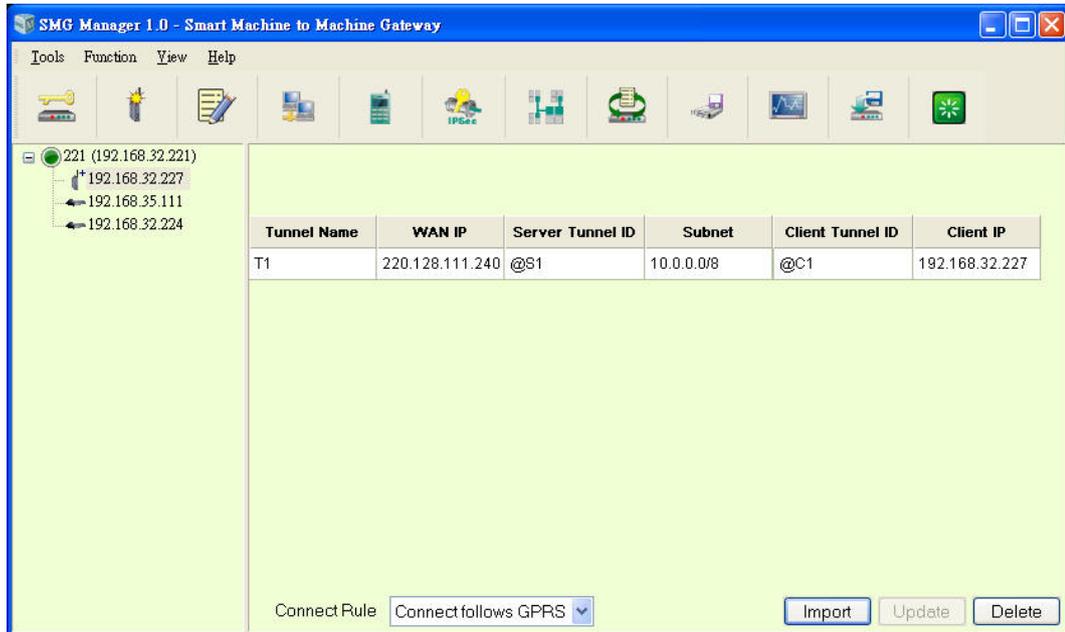
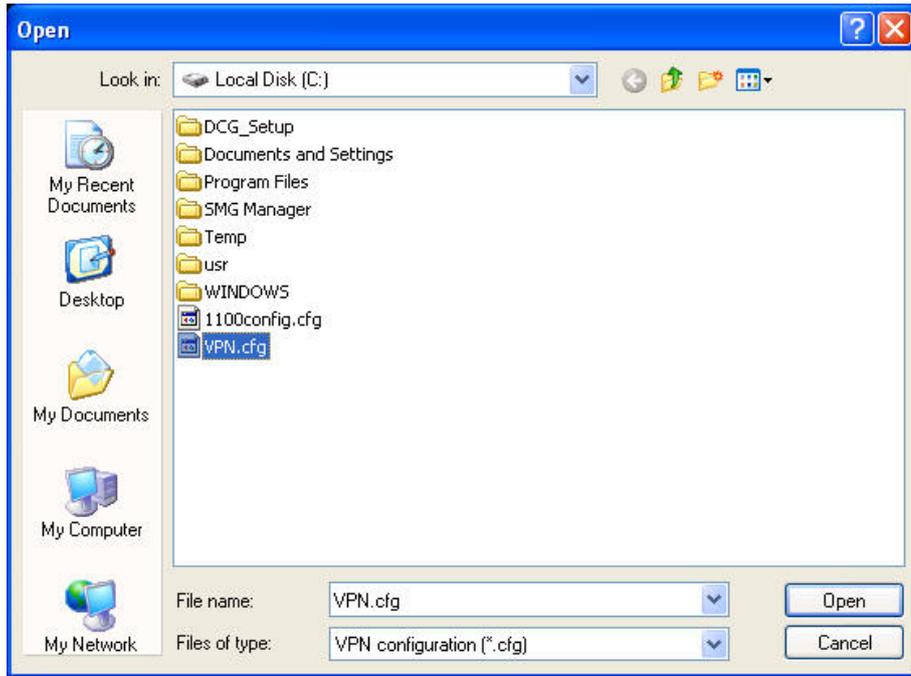
In SMG-6100 page, you can see all IPsec configuration that you have set.



Take this IPsec configuration file to corresponding SMG-1100s, and click **Import** to load the IPsec tunnel info.

Connect Rule: whenever the SMG-1100 have IPsec tunnel info, you can select its activity mode. Select **None** to manually connect to the IPsec tunnel by yourself; select **Connect follows GPRS** to automatically connect to the IPsec tunnel once a GPRS connection is established.





On-Line Import IPsec Configuration

If the SMG-1100 is online for configuration, you will see the IP in the drop-down list. Select the IP of the client you wish to configure and directly import the IPsec configuration.

Server/Client Information

Server Definition

Server: 10.0.0.11

WAN interface: LAN4

WAN IP: 220.128.111.240

Client Definition

Client: 10.0.0.21

Next Cancel

Refer to off-line configuration directions for information on IPsec settings. Click **Add** to continue.

Tunnel Information

Tunnel Name: T2

Server Tunnel ID: @S2

Server Subnet: 10.0.0.0/8

Client Tunnel ID: @C2

Client IP: 192.168.32.228

RSA Key Length: 512

Add Cancel

Select **Auto import client configuration to SMG-1100** and click **OK**.

SMG-1100 configuration

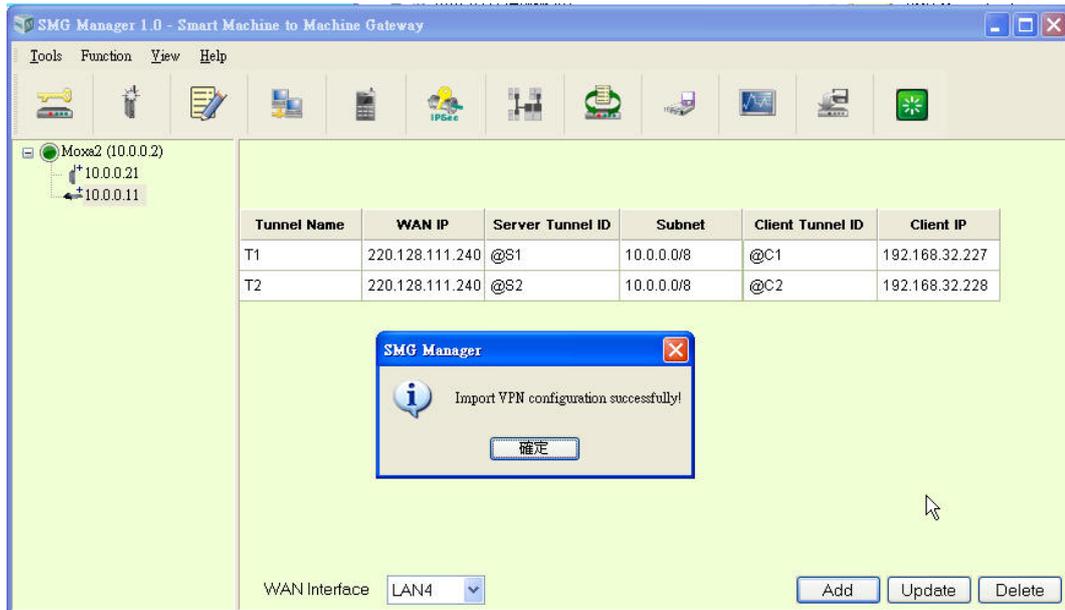
Auto import client configuration to SMG-1100

Save client configuration as a file

...

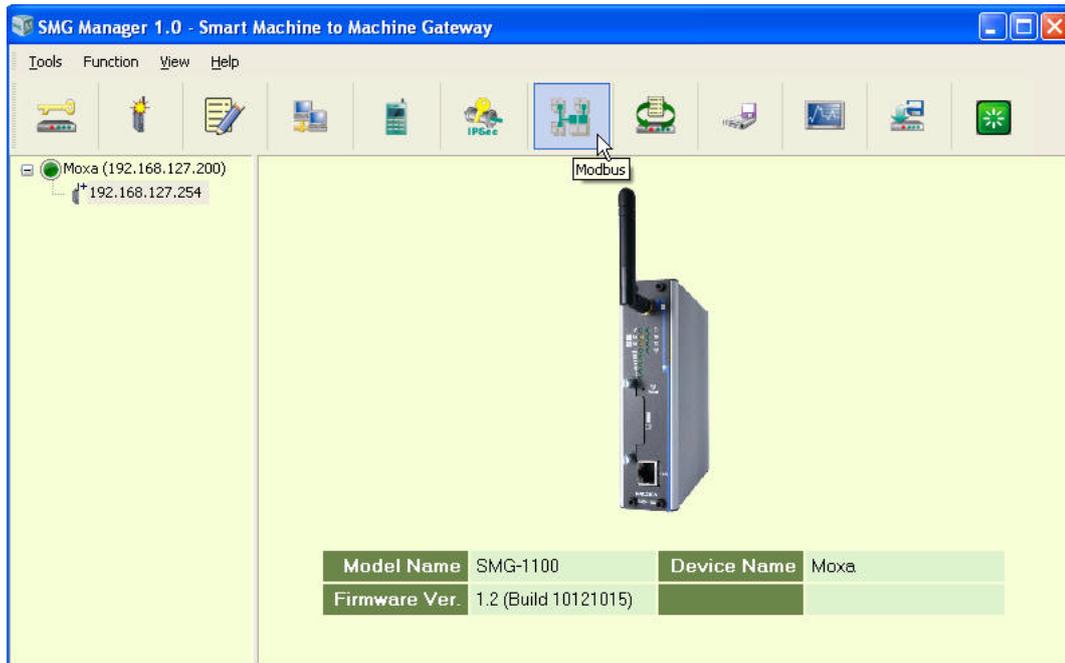
OK Cancel

Once you see the **Import VPN configuration successfully** popup message, the IPSec tunnel info has been configured in both the SMG-6100 and SMG-1100.

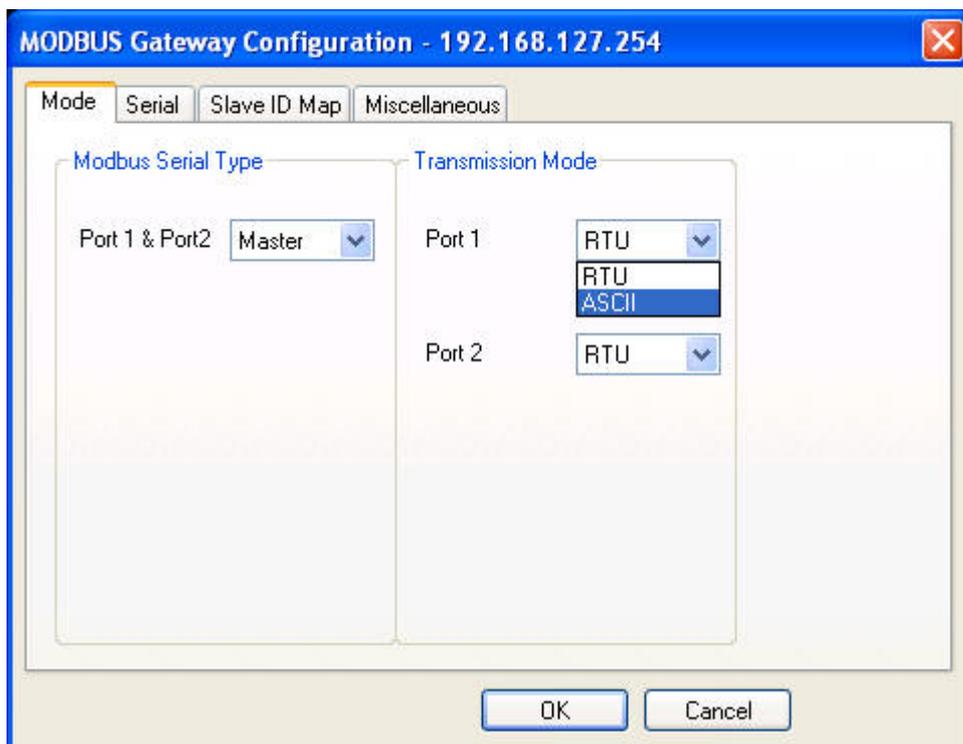
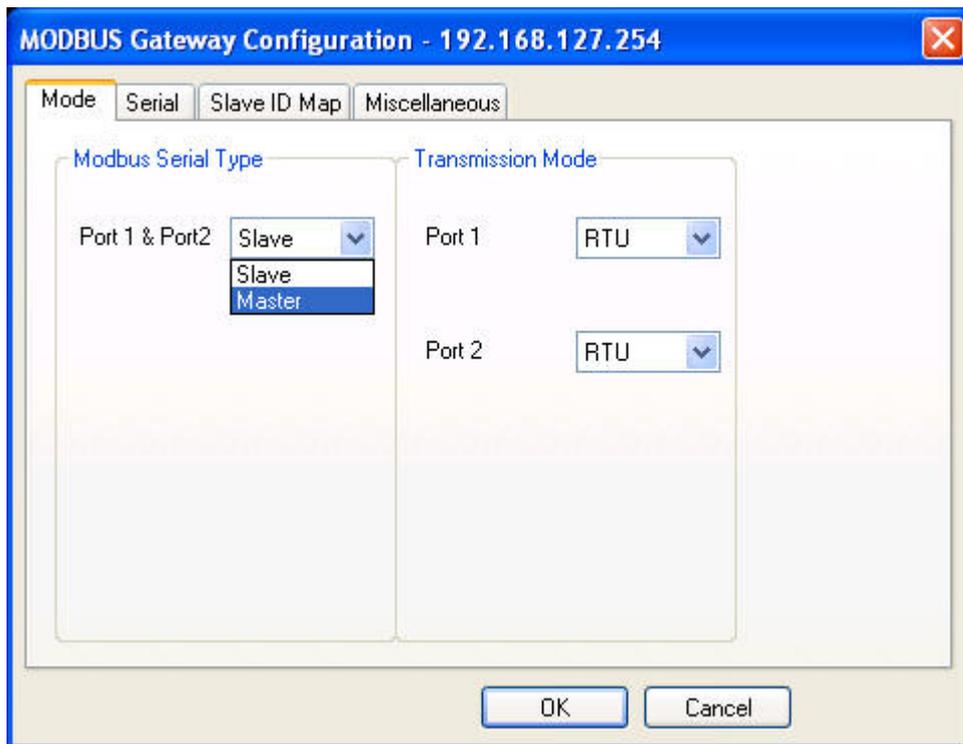


Modbus

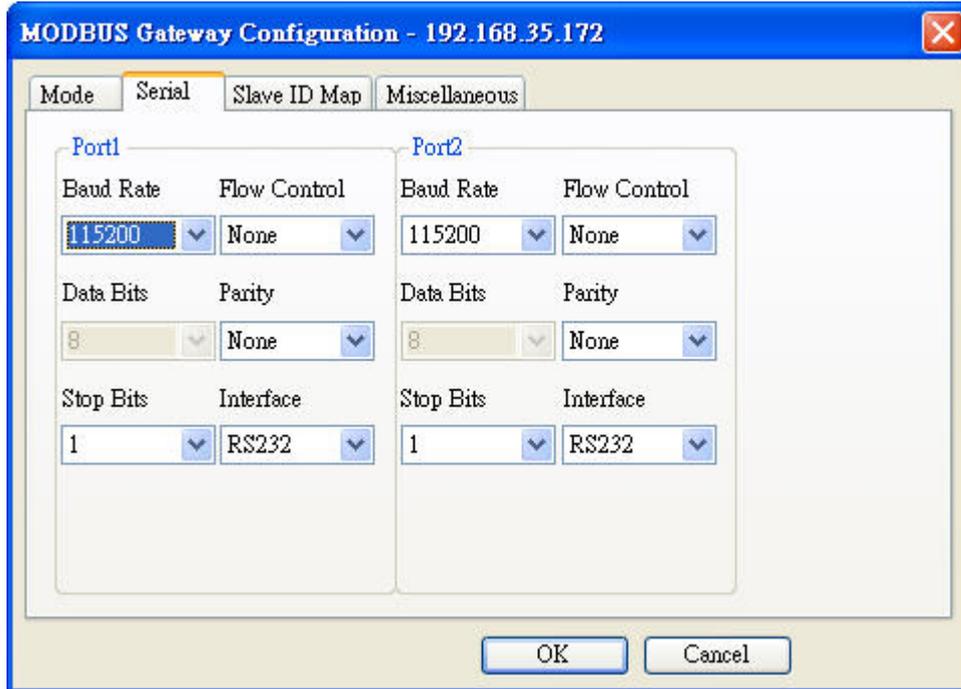
In the device list, select the SMG-1100, then click the Modbus icon.



You will be guided to the Modbus Gateway Configuration dialog. Select either Slave or Master type for Port 1 and Port 2. Note that both Modbus serial ports use the same type, but can have different Transmission Modes: RTU or ASCII.

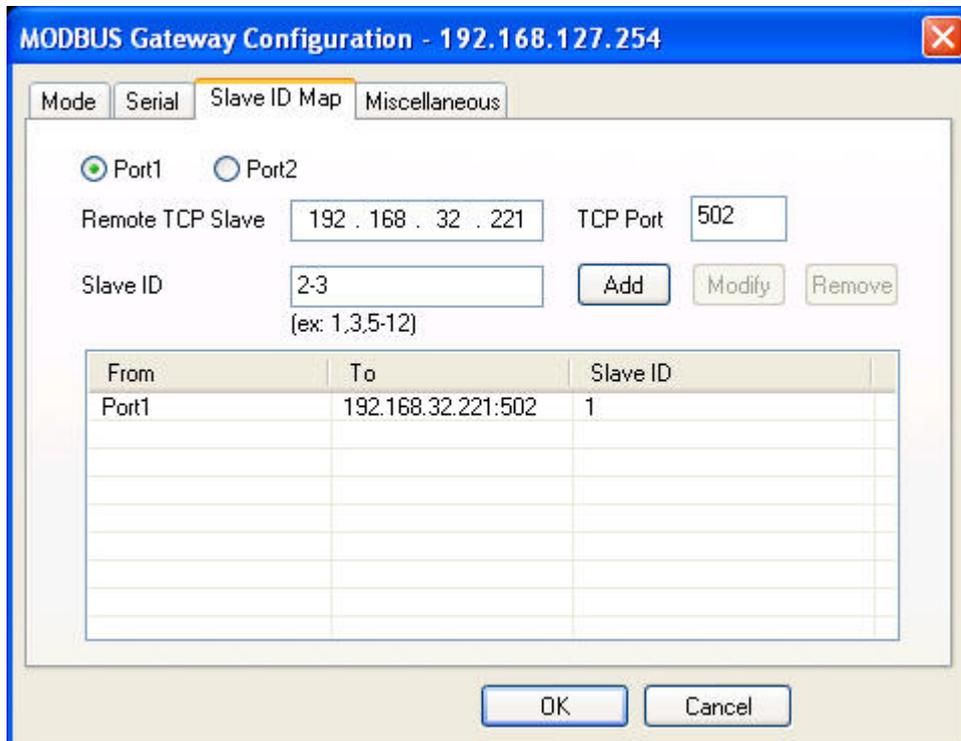


The Serial tab is where each serial port's communication parameters are configured. You can configure Baud Rate, Parity, Stop Bit, Flow Control, FIFO, and Interface Mode. Data bits is not configurable.

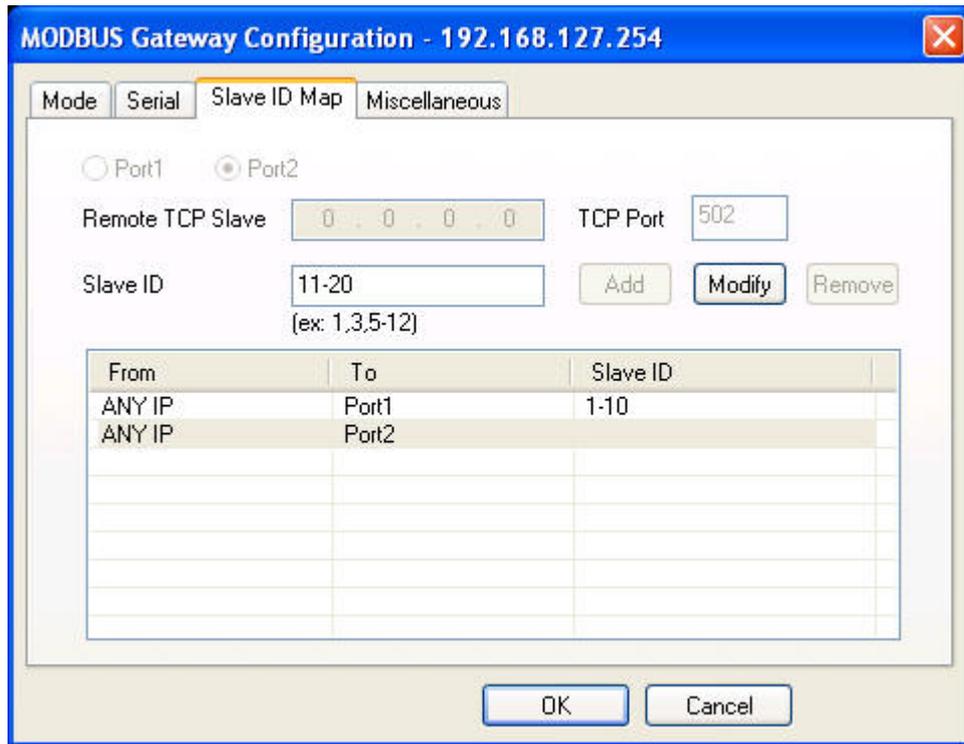


The Slave ID Map tab is where slave IDs are managed. The definitions on this tab determine how requests will be routed by the unit.

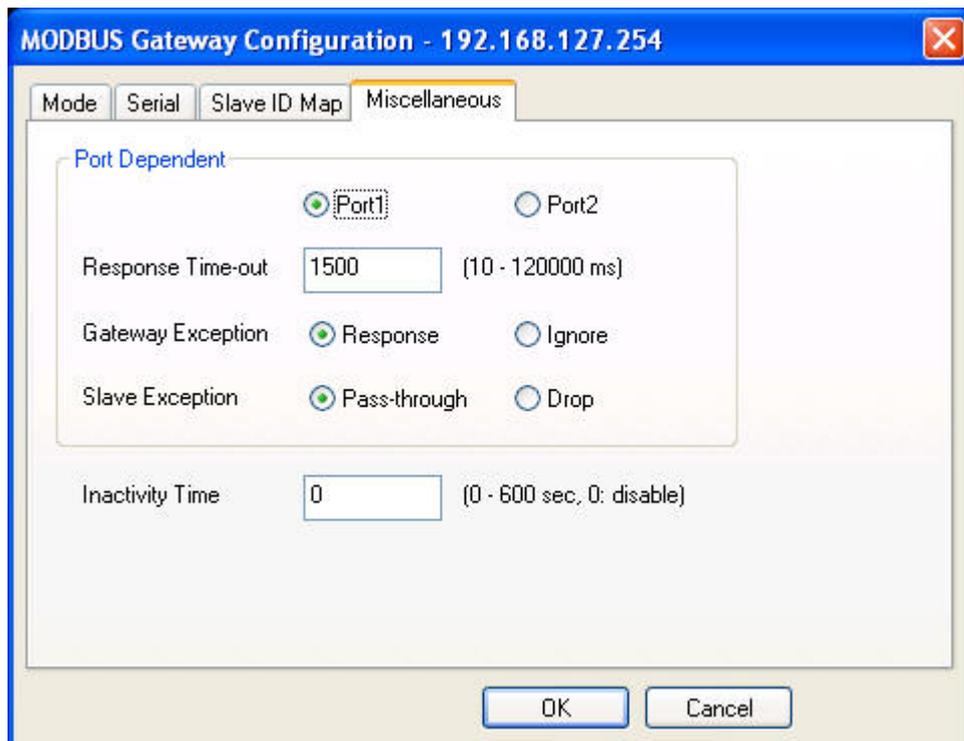
When the serial port is set to RTU Master or ASCII Master mode, simply select the Slave ID entry in the table and modify the range. For TCP slaves, you can add an entry that assigns a range of IDs to a specific IP address, using the **Remote TCP Slave** settings including TCP Port.



When the serial port is set to RTU Slave or ASCII Slave mode, simple select the Slave ID entry in the table and modify the range. For TCP slaves, you can add an entry that assigns a range of Slave IDs from any IP address access.

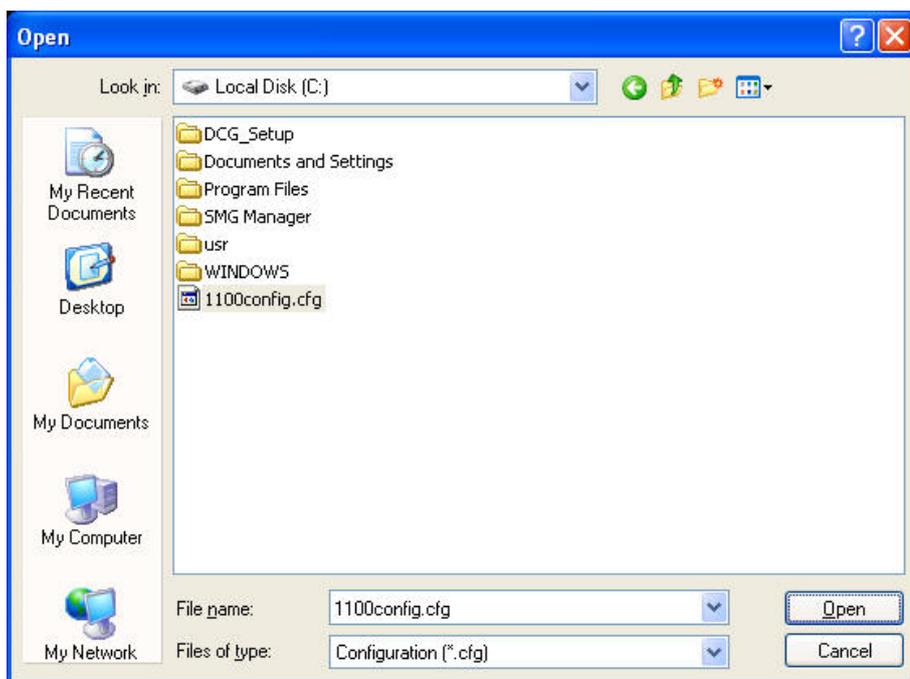
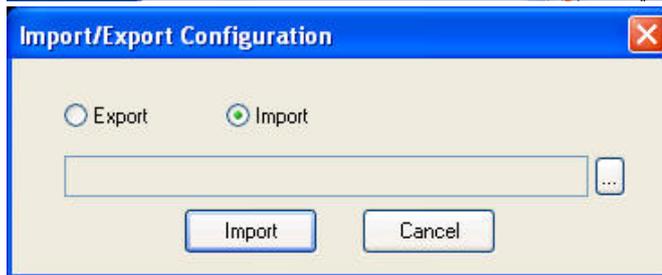
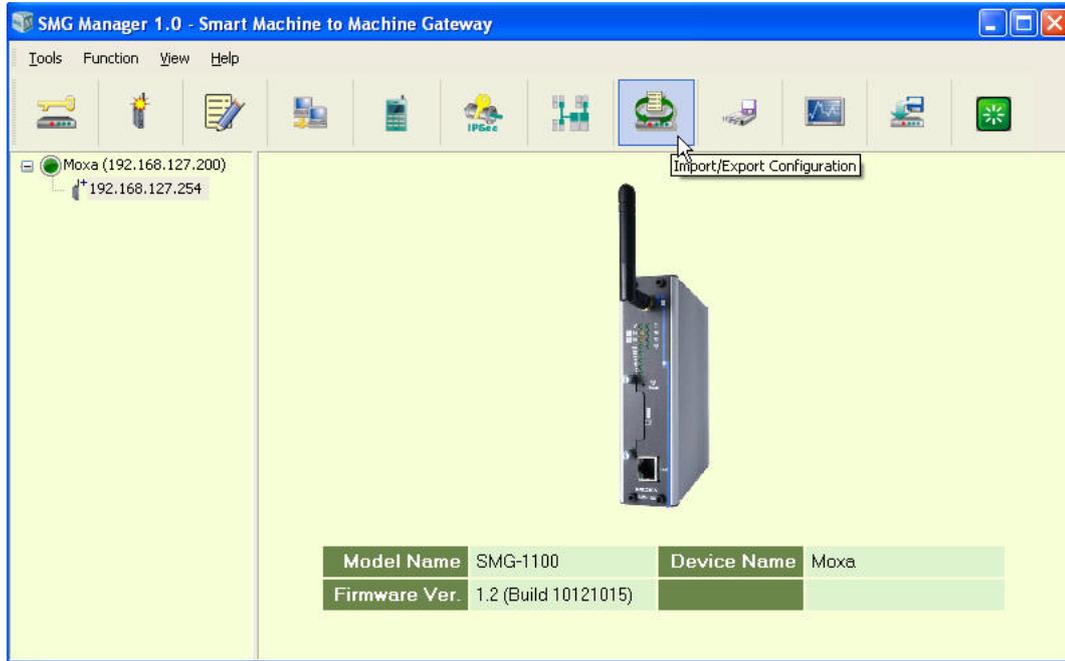


On the Miscellaneous page, all fields are set independently for each serial port. The Response **Time-out** field is used to configure how long the gateway will wait for a response from a Modbus ASCII or RTU slave. Please refer to your device manufacturer's documentation to manually set the response time-out. The **Gateway Exception** is used to determine whether the SMG-1100 should create an exception and send to Master or just ignore it when a response timeout occurs. The **Slave Exception** is used to determine whether the SMG-1100 should pass through or drop any exceptions that come from serial ports.



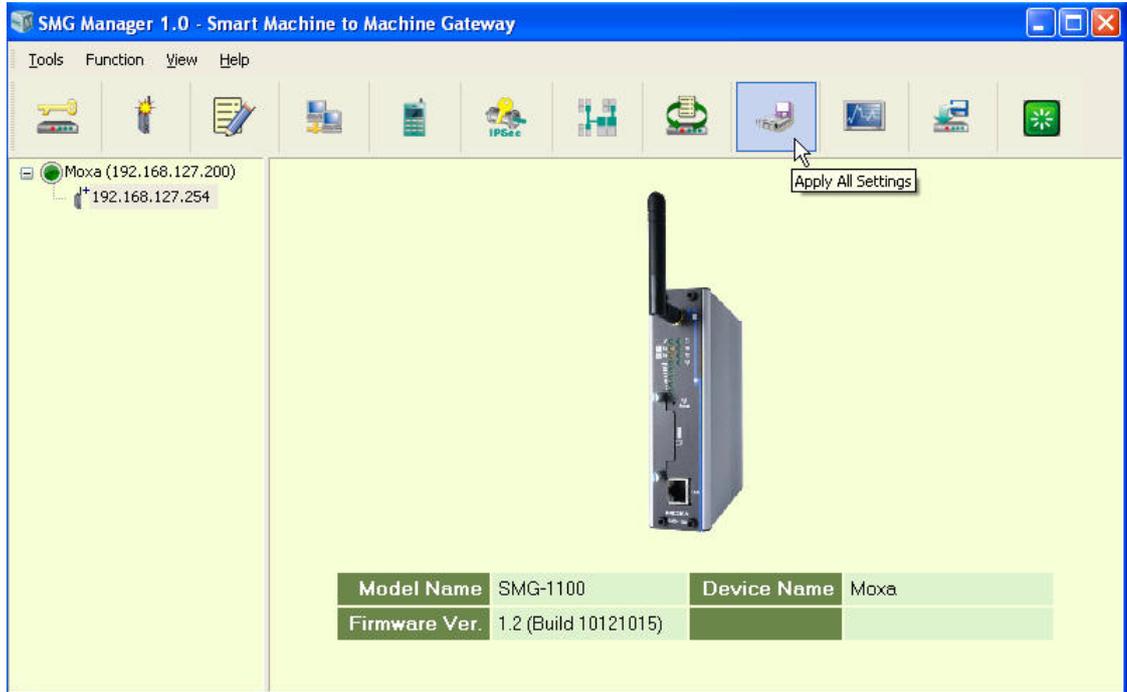
Import/Export Configuration

To import or export the configuration of an SMG-6100/1100, click **Import/Export Configuration**, and then follow the onscreen instructions to upload/download the configuration file.



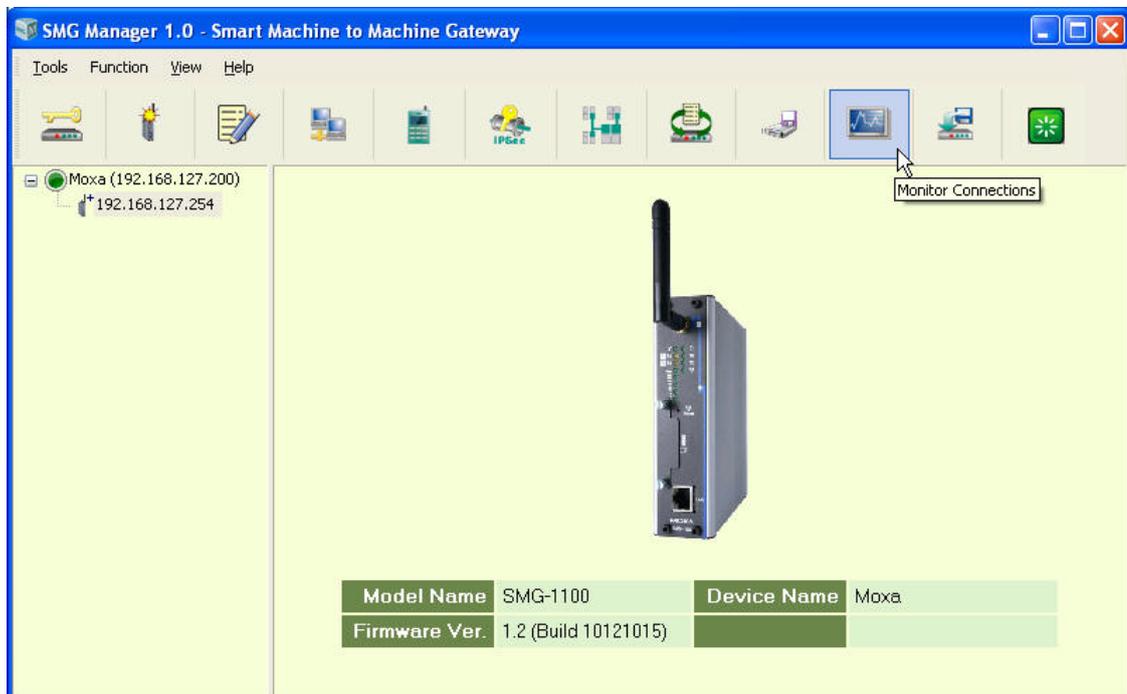
Apply

After configuring the SMG-6100/1100, remember to click **Apply** to save the information to the host system registry. Settings or changes to the SMG-6100/1100 will not become effective until they are applied.



Monitor Connections

Click Monitor Connections to check the status of GPRS, VPN and Modbus connections.



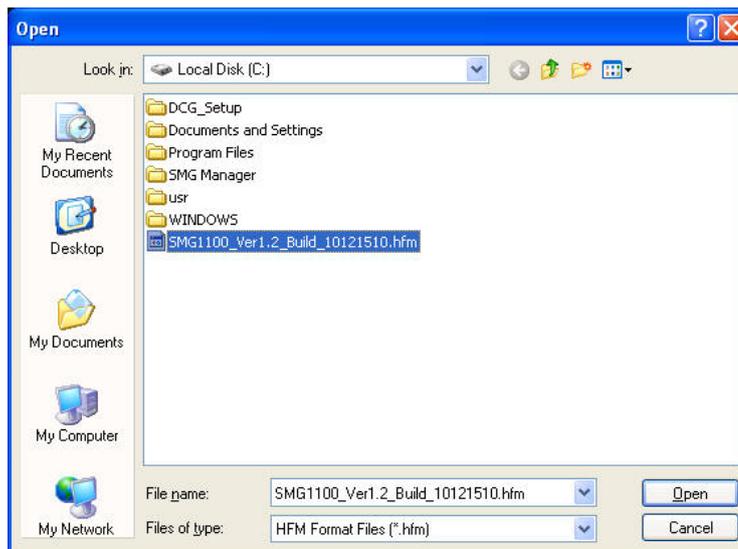


Upgrading the Firmware

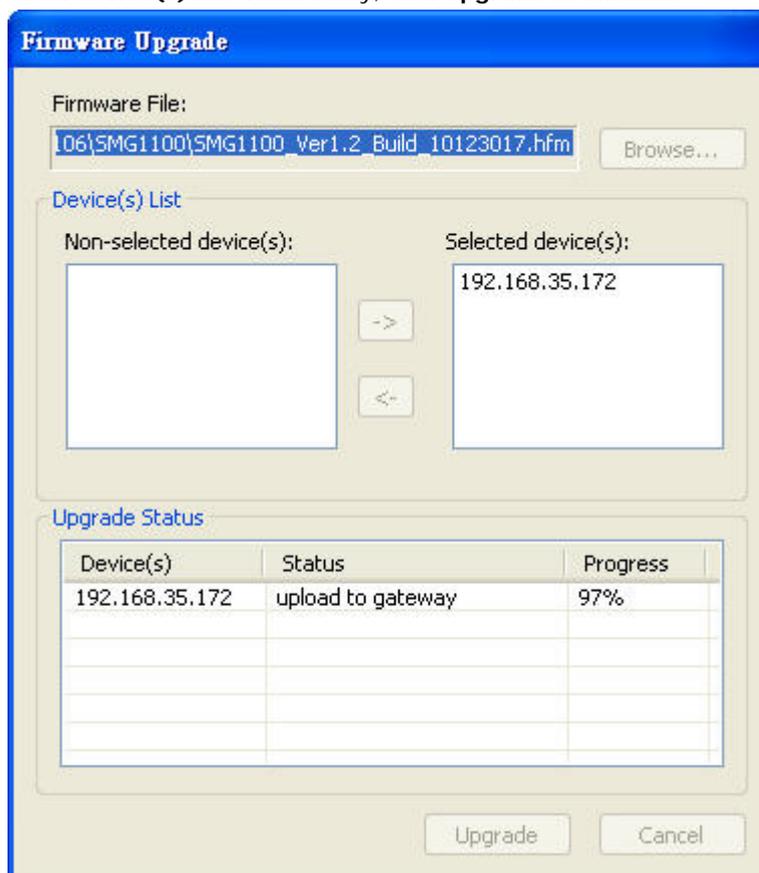
If you would like to upgrade the firmware on one device, first click the check box next to the SMG, and then right-click it and select **Firmware Upgrade**. You may also use the **Firmware Upgrade** icon in the toolbar. If you would like to upgrade the firmware on two or more devices, make sure that the devices have been selected, and then click the **Firmware Upgrade** icon to continue.



In the **Open** window, choose the firmware file, and then click Open to continue.



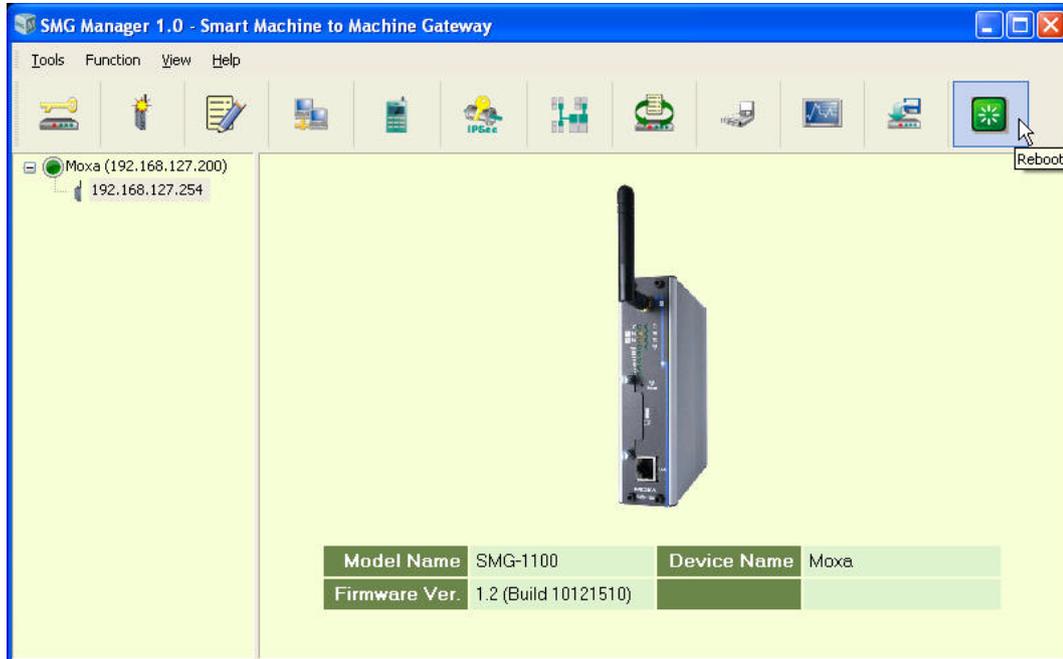
If you would like to upgrade the firmware on multiple SMGs, make sure that they are of the same model type and that you have the correct firmware file. Using the incorrect firmware may cause the system to crash. Select additional devices from the **Non-selected device(s)** list and use the arrow buttons to move them to the **Selected device(s)** list. When ready, click **Upgrade** to continue.



Please note that when firmware upload is complete, it will still take several minutes for the SMG to update the new information. All the functions may not work during this period.

Reboot

SMG Manager provides a **Reboot** function that allows users to reboot the device. Select and right-click the SMG and then select **Reboot** to continue. Note that you can only use the Reboot function on one SMG at a time.



Make sure you want to reboot the SMG and then click **OK** to finish.



Disconnecting Device Configuration Gateway

To disconnect Device Configuration Gateway, right-click **Gateway** and select **Disconnect**.

