NetCommWireless

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Vodafone MachineLink

TR-069 Configuration Guide

Document history

This guide covers the following products:

- Vodafone MachineLink 3G (NWL-10)

- Vodafone MachineLink 3G Plus (NWL-12)

- Vodafone MachineLink 4G (NWL-22)

Ver.	Document description	Date
v. 1.0	Initial document release.	March 2013
v. 2.0	Revised content based on current firmware	September 2016

Table i - Document revision history

Note – Before performing the instructions in this guide, please ensure that you have the latest firmware version installed on your router.

Visit http://vodafone.netcommwireless.com to download the latest firmware.

Note – The functions described in this document require that the router is assigned with a publicly routable IP address.

Please ensure that your mobile carrier has provided you with a publicly routable IP address before performing the instructions in this document.

Copyright

Note – This document is subject to change without notice.

Contents

Notation

The following symbols are used in this user guide:

    ⚠️   The following note requires attention.

    ⚡   The following note provides a warning.

    ℹ️   The following note provides useful information.

Introduction

Overview

The Vodafone MachineLink router supports the Technical Report 069 (TR-069) standard published by the Broadband Forum for remote Customer-Premises Equipment (CPE) administration and management.

The TR-069 standard allows Auto Configuration Servers (ACS) to automatically conduct remote configurations of CPE devices such as modems, routers, gateways, set-top boxes, and VoIP-phones. Increasing numbers of network carriers and ISPs use TR-069 ACSs to remotely mass-deploy, administer and manage their TR-069-ready CPEs.

Purpose of this document

The purpose of this configuration guide is to demonstrate how to:

1 Connect a Vodafone MachineLink router (a CPE) with a typical ACS server, and

2 Remotely upgrade firmware on Vodafone MachineLink routers using TR-069.

There are many different Auto Configuration Server (ACS) options available including commercial and open source offerings.

For this configuration guide we have chosen the Overture® (*powered by netmania*) Auto Configuration Server to demonstrate how to upgrade device firmware using TR-069. The exact procedures and steps may vary depending on your chosen ACS and FTP/HTTP server.

Preliminary matters

When configuring your MachineLink for TR-069, you should ensure that the following environmental considerations are addressed:

● The device must have IP address access to the ACS server [this may pose a problem on some private networks], and

● The device must have a publicly routable IP address for connection requests to work.

Before establishing the connection between the Vodafone MachineLink router and the ACS server, please check the following:

● Ensure the relevant version of firmware is loaded in the MachineLink router that supports TR-069.

● Ensure the MachineLink router is loaded with a test SIM that supports an accessible WAN IP address. In this configuration guide, the SIM used in the MachineLink router has a public IP address.

● Note the ACS management URL, administrator user name and password for remote management.

● Note the MachineLink router ACS CPE connection URL, ACS user name and password.

● Note the MachineLink router CPE TR-069 Connection Request user name and password .

● Read the device manual and know how to connect and make device configuration via its web management interface.

Other ACS capabilities

In addition to firmware upgrades, other TR-069 ACS operations include:

- **GetParameterNames** – Retrieve list of supported parameter names from the device.

- **GetParameterValues** – Retrieve one or multiple the current monitoring parameters values.

- **SetParameterValues** – Sets the value of one or multiple parameters.

- **GetParameterAttributes** – Retrieves the current monitoring (Active/Passive/None) set on a parameter or multiple parameters.

- **SetParameterAttributes** – Sets attributes of one or multiple parameters

- **Retrieve Device System Log** – Retrieves from ACS Server

- **Reboot** – Reboot CPE remotely from ACS Server

- **Factory Reset** – Restore CPE to factory default settings from ACS Server

These operations are described in separate documents.

TR-069 firmware upgrade setup overview

Broadly speaking, the following steps are required to set up a TR-069 automatic firmware upgrade process:

1   Set up **Vodafone MachineLink CPE** to enable TR-069 client settings

   In order to get the CPE (Customer-Premises Equipment) enabled and ready for upgrade by ACS service:

   a   Login to Vodafone MachineLink user interface and enable the TR-069

   b   Configure the CPE device to be a client of the ACS

   c   Set the inform (interval between 'ready messages' to CPE) period

2   Set up **Overture ACS** to reference CPE types and devices

   Next the Overture ACS must be set up to recognise and reference the CPE devices by type and individual serial number:

   a   Login to Overture ACS management URL

   b   Create (or import) Device Type definitions for CPEs

   c   Add specific CPE devices to be managed by ACS

3   Create and place firmware files in external **FTP/HTTP server**

   The following files must be prepared and placed in an external FTP/HTTP server ready for retrieval and upload by the ACS:

   a   Uboot file

   b   recovery system firmware image file

   c   main system firmware image file

   The ID and location of these files will be required for step 4.b

4   Set up **Overture ACS** to reference download files, then add the files to the task queue

   Finally, the Overture ACS needs to be given location detail of the upgrade files and the upgrade has to be scheduled:

   a   Login to Overture ACS management URL

   b   Enter details of the FTE/HTTP server and download files into the ACS

   c   Go to each device and queue the firmware download tasks and send a connection request.

If Vodafone MachineLink CPE continues to be enabled for TR-069 (refer step 1), the connection will be made upon receipt of the next inform message from the CPE and the upgrade will proceed as scheduled.

1. Enable TR-069 client settings on CPE

By default, the Vodafone MachineLink router is not pre-configured with active TR-069 client settings and the TR-069 feature is disabled.

To set up the TR-069 functionality, you need to manually log in via the router's Ethernet interface and enable the TR-069 feature and then configure it with the relevant TR-069 client settings of the Auto Configuration Server (ACS) that you are using.

1.a. Configure and enable a TR-069 CPE

Click the **Services** toolbar item and select **TR-069** from the menu on the left.

In the **TR-069 configuration** section, toggle **Enable TR-069** on (as shown below) to display the ACS configuration parameters fields:
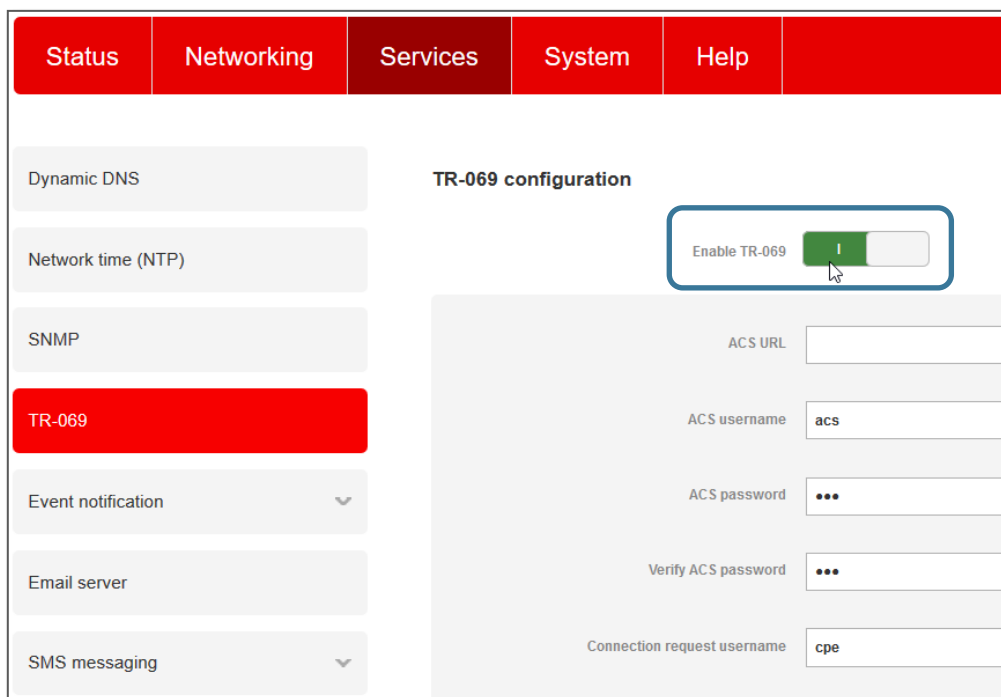
Figure 1: Enable MachineLink3G Router TR-069 client configuration

An example of the MachineLink router TR-069 client configuration is as follows:

Figure 2: An example MachineLink3G Router TR-069 client configuration

Field	Description
Enable TR-069	By default the TR-069 functionality is not enabled.
	Set the toggle key to the ON position to display the setting fields for the TR-069 functionality and the Auto Configuration Server (ACS).
ACS URL	Enter the URL of the Auto Configuration Server (ACS) that will be providing the TR-069 service.
	Note that each ACS has its own requirements for the URL and file extension. Check your ACS documentation to confirm the correct URL and file extension to use.
ACS user name	Enter: acs (do not use the user name to log in to the web application)
ACS password	Enter: acs (do not use the user name to log in to the web application)
Verify ACS password	Re-enter acs to confirm that it was correctly entered.
Connection request username	Enter: cpe (do not use the user name to log in to the web application)
Connection request password	Enter: cpe (do not use the user name to log in to the web application)
Verify connection request password	Re-enter cpe to confirm that it was correctly entered.
Enable periodic ACS informs	Set the toggle key to the ON position to enable TR-069 functionality.
	This will enable Inform signals to be sent to the Auto Configuration Server (ACS) to periodically check for any changes to configuration.
	When a change has been registered with the ACS for the device, the ACS will automatically update the device the next time an inform signal is received.
Inform periods	Set the time interval between inform signals which are sent to the Auto Configuration Server (ACS) to periodically check for any changes to configuration.
	The default is 600 seconds (ten minutes).
	Possible range = 30 to 2,592,000 seconds (½ minute to 30 days)
Last inform status	
Starts at	Timestamp of first inform message received from CPE/router.
Ends at	Timestamp of last inform message received from CPE/router.

Table 1: Details of MachineLink3G Router TR-069 client configuration fields

2. Set up ACS to interact with CPE device

TR-069 is the standard that is run in any of the available Auto Configuration Servers (ACS).

Prior to use the ACS must be configured to recognise anyTR-069 compliant CPEs that it will be scheduled to interact with.

2.a. Login to the ACS management user interface

Log in to the ACS management URL (or other user interface) using the appropriate username and password.

Note – In this demonstration configuration guide, we are using Overture™ ACS and for privacy reasons, the login credentials to the CPE connection URLs were replaced with http://xxx.xxx.xxx/cpe.php. The ACS user name, password and CPE TR-069 Connection Request user name and password used in this configuration guide are for test purposes only.

2.b. Create the Device Type on the ACS server

If it has not already been added, details of each Customer Premises Equipment (CPE) device type must be registered with the ACS.
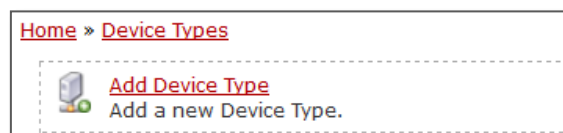
1   Navigate to **Home > Manage Device Types**
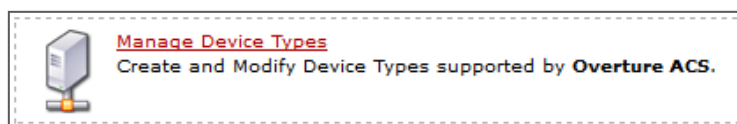
Note – At this point all Device Types that have previously been added to the ACS server will be listed in a table.

If the device type that you are managing is already in the list, skip this section and proceed to section *2.c Add CPE device details on the ACS server*.

2   Navigate to **Home > Device Types > Add Device Type**

3   Complete the fields on the **Add Device Type** page:

Home » Device Types » **Add Device Type**

Select the appropriate Data Model and enter the information requested below.
Fields marked with * are REQUIRED.

Manufacturer	NetComm Wireless
OUI *	006064
ProductClass	NWL 10 Series
Description	NetComm Wireless - 006064 MachineLink 3G
Data Model	Blank InternetGatewayDevice Data Model
HTTP Authentication Method	Use System Default
HTTPS Authentication Method	Use System Default

Warning: If authentication is disabled for a device type and if it has Device Registration configured, its registration credentials will be ignored and ALL devices of this type that Bootstrap to the platform will be allowed to register!

Enable Data Model Discovery ☐

Create Device Type

Figure 3: Vodafone MachineLink product class name

2.b.i. Finding the CPE device information

The Customer-Premises Equipment (CPE) device details for that are required to configure the TR-069 connection can all be found on your Vodafone MachineLink router web user interface in the **TR-069 DeviceInfo** section at the bottom of the **Services -> TR-069** page (scroll down):
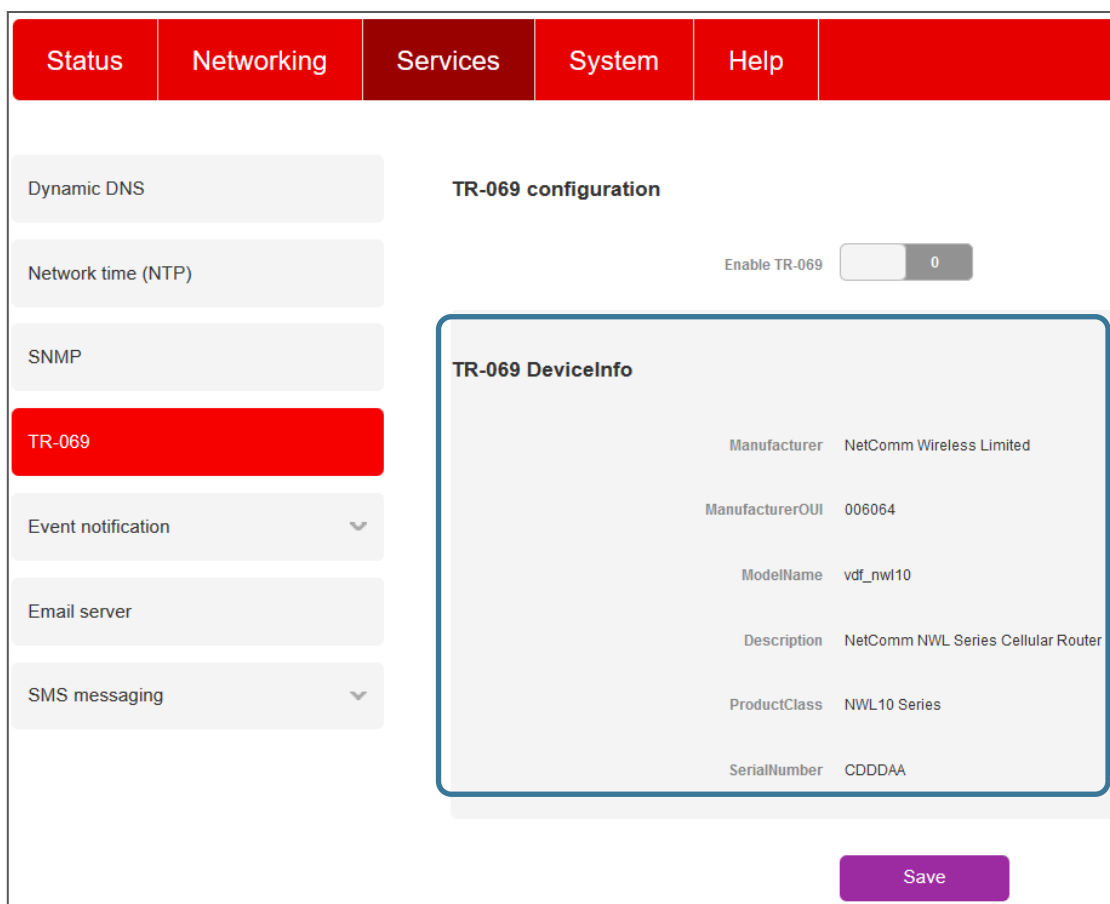

| Status | Networking | Services | System | Help |

TR-069 configuration

Enable TR-069 [0]

TR-069 DeviceInfo

Manufacturer	NetComm Wireless Limited
ManufacturerOUI	006064
ModelName	vdf_nwl10
Description	NetComm NWL Series Cellular Router
ProductClass	NWL10 Series
SerialNumber	CDDDAA

Save

Figure 4: Device information details

Copy the fields from the device information page into the corresponding fields on the ACS's Add Device Type page.

Field	Description
Manufacturer	Enter the full name: NetComm Wireless Limited Copy this from the CPE's device information page.
OUI * * required field	The OUI (Organizationally Unique Identifier) is the manufacturer's code included in the last six characters/digits of the MAC address. Copy this from the CPE's device information page.
ProductClass	Copy this from the CPE's device information page
Description	Copy this from the CPE's device information page

Table 2: Field details for Add Device Type to ACS page

The fields listed in the table below exist on the Overture **Add Device Type** page.

Generally speaking, the default setting of these options on the Overture server do not need adjustment.

Field	Description
Data Model	Select from the following: • Blank InternetGatewayDevice Data Model – Select this Model, NWL-10 supports it. Also check the **Enable Data Model Discovery** checkbox, see below. • Blank Device Data Model – do not select • Data Model for: DEF – do not select
HTTP Authentication Method	Select from the following: • Use System Default – Use this setting, NWL-10 accepts default authentication settings. • HTTP Digest Auth – do not select • HTTP Basic Auth – do not select • Authentication Disabled – do not select
HTTPS Authentication Method	Select from the following: • Use System Default – Use this setting, NWL-10 accepts default authentication settings. • HTTP Digest Auth – do not select • HTTP Basic Auth – do not select • Authentication Disabled – do not select
Enable Data Model Discovery	☑ When checked the ACS will query the CPE and create a Data Model during its initiation process. This is the recommended setting. ☐ Do not leave unchecked.
Create Device Type button	Click to save the device type details.

*Table 3: Field details required for the Overture Add Device Type page*

2.c. Add CPE device details on the ACS server

After the Device Type definitions have been added, enter the details of each device that is to be managed by the ACS. Use the **Import Devices** function, see below, to import batches of devices using .CSV files.

1   From **Home,** click **Manage Devices.**
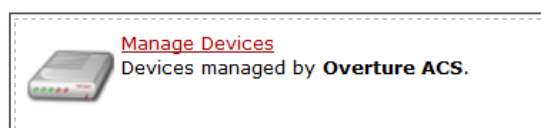
2   Click the **Add Device** link.
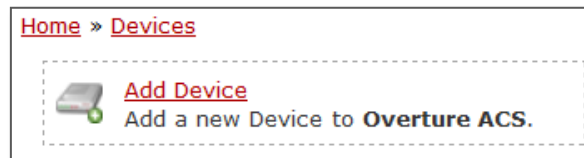
3   For each device, enter its details (note that **All Fields are REQUIRED**) in the **Add Device** page:

Figure 5: Add Device to the ACS Server

Field	Description
Device	Select the Device type from a drop down list. The Device type name is a combination of the OUI and the Product Class. If the Device Type is not in the list, you must add it via **Home > Device Types > Add Device Type.**
Serial Number	The serial number is the last 6 digits of the MAC address of the device. Copy this from the CPE's device information page, see Figure 4: Device information details. **Note** – This is not the Manufacturer OUI.

Field	Description
Description	Enter a short, meaningful description of the device so that you know where it is located and its purpose.
connectionrequestusername	This is the Username required to log in to the Vodafone MachineLink router's management website, i.e. to log in to the CPE.
connectionrequestpassword	This is the Password required to log in to the Vodafone MachineLink router's management website, i.e. to log in to the CPE.
username	This is the Username required to log in to the Auto Configuration Server (ACS).
password	This is the Password required to log in to the Auto Configuration Server (ACS).
Add Device button	Click to save the details of this device in the ACS.

Table 4: Field details for Add Device to ACS page

The Auto Configuration Server (ACS) relies on the router's first device boot up or initial inform to learn the router's WAN IP address. This can be triggered by manually disabling and enabling the CPE TR-069 configuration or waiting for the periodic inform message from the CPE to the ACS server.

After the inform period has elapsed (600 seconds by default), the Last Contacted field shows the time of the last inform message indicating that the MachineLink router is now part of the group and communicating with the ACS server.

Note – The ACS uses the last 6 characters of the device MAC address as the serial number.

Figure 6: Access Device details from Device

The device inform message will contain the device's current WAN IP address. This is viewable by clicking on the **Device Data** tab.


Figure 7: Viewing the device data tab

ManagementServer

ConnectionRequestURL   http://123.209.27.244:7547/33DC5219951CAE6F
                                                                         2013-02-15 03:08

ParameterKey
                                                                         2013-02-15 03:08

Figure 8: ACS learns CPE WAN IP address

The TR-069 ACS Server and TR-069 M2M Router CPE connection has now been established. You may now start to perform a device firmware upgrade remotely via TR-069.

> **Note** – If the Device Data tabbed page shows this message: "No Device Data to Display":
>
> This means that the connection from your router to your ACS server was not established.
>
> Check the URL and other connection rsettings on the router's TR-069 configuration page (see section 1.a.) or the connection settings on the Add Device page of the ACS (see section 2.b.)
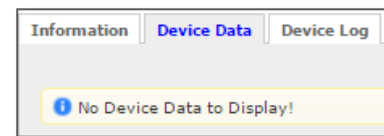

## 2.d. Add multiple CPE device details to the ACS server

You can add multiple devices without the need to individually enter each devices details using the Add Devoce screen by creating a comma separated value (.CSV) file containing all the required information in a specified order.

To add multiple devices at once:

1   Using a spreadsheet such as Excel create the comma separated value (.CSV) file containing all the required information in rows under headings the specified order. See *.CSV file format* below.

2   In the ACS server from **Home,** click **Manage Devices.**
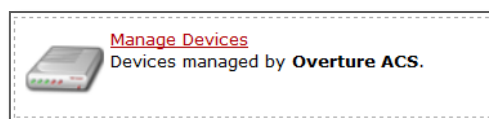
3   Click **Import Device(s).**
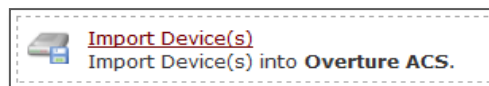
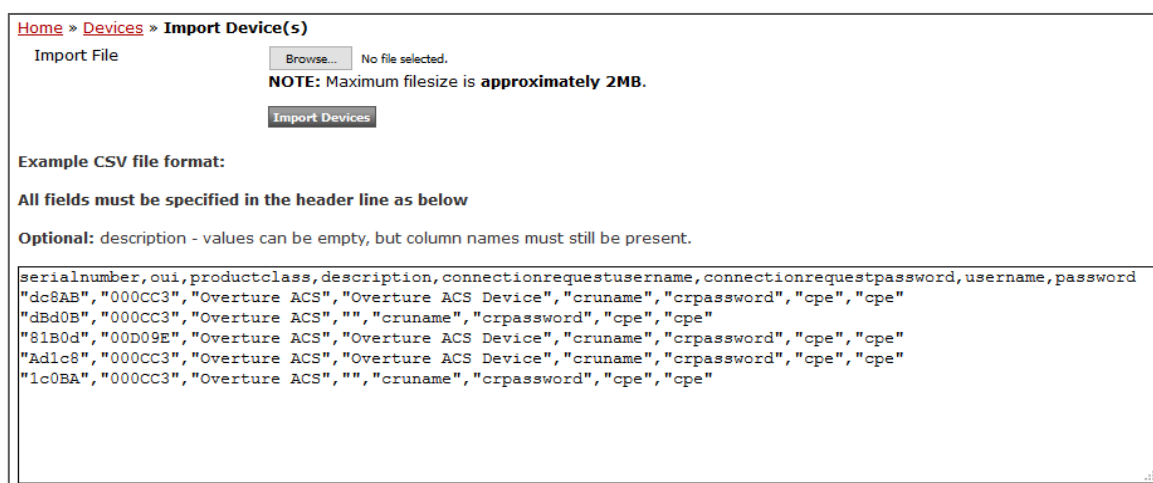4   Click the **Browse** button and open a CSV file which is formatted as illustrated below:

```
Home » Devices » Import Device(s)
   Import File          Browse...   No file selected.
                        NOTE: Maximum filesize is approximately 2MB.

                        Import Devices

Example CSV file format:

All fields must be specified in the header line as below

Optional: description - values can be empty, but column names must still be present.

serialnumber,oui,productclass,description,connectionrequestusername,connectionrequestpassword,username,password
"dc8AB","000CC3","Overture ACS","Overture ACS Device","cruname","crpassword","cpe","cpe"
"dBd0B","000CC3","Overture ACS","","cruname","crpassword","cpe","cpe"
"81B0d","00D09E","Overture ACS","Overture ACS Device","cruname","crpassword","cpe","cpe"
"Ad1c8","000CC3","Overture ACS","Overture ACS Device","cruname","crpassword","cpe","cpe"
"1c0BA","000CC3","Overture ACS","","cruname","crpassword","cpe","cpe"
```

Figure 9: Example Import Devices page

.CSV file format

The **Import Devices** function can import any number of files provided the file size does not exceed 2MB.

The .csv file (comma separated values file) must have the following column headers that correspond to the fields in the **Add Device** page:

Serial number	oui	productclass	description	connectionrequestusername	connectionrequestpassword	username	password

Column headings must be on the first line and be separated by commas.

Values (but not column headings) must be enclosed by quotation marks ("") and be separated by commas (,).

Values can be empty, but column heading names must always be present.

3. Firmware files in external FTP/HTTP server

The upgrade files must be accessible via the internet by the Auto Configuration Server (ACS) at all times. Hence the firmware files are placed into an external FTP/HTTP server whose details are referenced by the ACS.

You can use any FTP/HTTP server.

Note – Instructions on how to transfer device firmware files to an FTP/HTTP server are not covered in this configuration guide.

3.a. Upload Firmware image files to FTP/HTTP server

The following files must be prepared and placed in an external FTP/HTTP server ready for retrieval and upload by the ACS:

- U-Boot file

- Recovery system firmware image file

- Main system firmware image file

3.b. Record FTP/HTTP server details

The following FTP/HTTP server information will be required to be entered into the ACS:

- URL of the active FTP/HTTP server link

- Login for the FTP/HTTP server

- Password for the FTP/HTTP server

- Exact path and file names of the three firmware image files

4. Run TR-069 remote firmware upgrade

Once you become aware that a new upgrade is available, you must add the FTP/HTTP server details of the upgrade files into the ACS and then schedule the upgrade to the ACS's job queue.

4.a Add download file details from FTP/HTTP Server to ACS

1 From **Home,** click **Manage Downloads**:
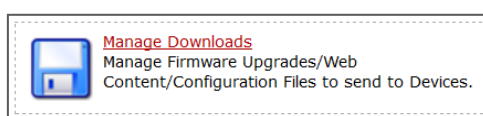
2 Then select **Add Download** to add details for each new download file.
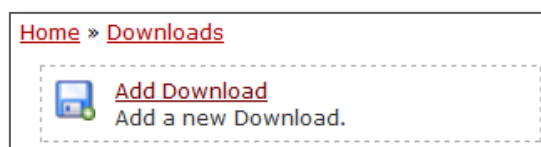
3 The **Add Download** dialog must be completed for each new download file on the FTTP/HTTP server.

The following example is for the UBoot system image file:

Figure 10: Add FTP link for ACS to reference UBoot system image file

Field	Description
Device * * required field	Select the Device type from a drop down list. The Device type name is a combination of the OUI and the Product Class. If the Device Type is not in the list, you must add it via **Home > Device Types > Add Device Type.**
Filetype * * required field	Select from: 1 Firmware Upgrade Image – The NWL-10 CPE supports the "1 Firmware Upgrade Image" File Type value. Always select this for download files. 2 Web Content – Select only for files that contain only web content for a CPE's web-based user interface. 3 Vendor Configuration File – used for downloading a single vendor configuration file.
Name * * required field	Create a meaningful name that includes the model number, versions number and indicates whether the file is UBoot, Recovery or Main, for example: NWL-10FW1.1.28.UBoot

Field	Description
Description	Enter a short, meaningful description so that you can remember what the download file is supposed to do.
url ***** ** required field*	The FTP/HTTP path to the file and filename expressed as a URL in the following format: `ftp(http)://<host>:<port>/<path>/<filename>`
username	If your FTP/HTTP server is password secured, you must put in the appropriate username for the FTP/HTTP server.
password	If your FTP/HTTP server is password secured, you must put in the appropriate password for the FTP/HTTP server.
filesize ***** ** required field*	Enter "0". It is a required field, but it will accept any number.
targetfilename	Leave blank – this feature is not supported by NWL-10.
delaysecs	Normally set at 0 for no delay. Use when upgrading multiple devices. Set a time interval that will allow the upgrade process to complete for each device before proceeding to the next device.
successurl	Leave blank – this feature is not supported by NWL-10.
failureurl	Leave blank – this feature is not supported by NWL-10.
Add Download button	Click to add the details of this file to the ACS's **Queued Requests** list.

Table 5: Field details for the UBoot system image file's Add Download page

4   Repeat for Recovery download file. Click **Home > Manage Downloads > Add Download** and complete the **Add Download** page for the Recovery download file on the FTTP/HTTP server.

The fields are that same as the previous step, the following table contains notes on how the entries vary:

Field	Description
Device ***** ** required field*	Same as above.
Filetype ***** ** required field*	Same as above.
Name ***** ** required field*	Create a meaningful name, for example: `NWL-10FW1.1.28.rRecovery`
Description	Same as above.
url ***** ** required field*	Same as above.
username	Same as above.
password	Same as above.

Field	Description
filesize ***** *** required field**	Same as above.
targetfilename	Same as above.
delaysecs	Same as above.
successurl	Same as above.
failureurl	Same as above.
Add Download button	Same as above.

Table 6: Field details for the Recovery system image file's Add Download page

5 Repeat for Main download file: Click **Home** > **Manage Downloads** > **Add Download** and complete the **Add Download** page for the Main download file on the FTTP/HTTP server.

The fields are that same as the previous step, the following table contains notes on how the entries vary:

Field	Description
Device ***** *** required field**	Same as above.
Filetype ***** *** required field**	Same as above.
Name ***** *** required field**	Create a meaningful name, for example: `NWL-10FW1.1.28.Main`
Description	Same as above.
url ***** *** required field**	Same as above.
username	Same as above.
password	Same as above.
filesize ***** *** required field**	Same as above.
targetfilename	Same as above.
delaysecs	Same as above.
successurl	Same as above.
failureurl	Same as above.
Add Download button	Same as above.

Table 7: Field details for the Main system image file's Add Download page

6 Once the three firmware file links are created, they will be displayed in the **Home > Manage Download** summary page on the ACS server.

006064	NWL10 Series	NWL-10FW1.1.32.4.UBoot	ftp://repository.netcommwireless.com/NWL-10/uboot.sb	0	0	1 Firmware Upgrade Image	
006064	NWL10 Series	NWL-10FW1.1.32.4.Main	ftp://repository.netcommwireless.com/NWL-10/vdf_nwl10_2.0.18.21.cdi	0	0	1 Firmware Upgrade Image	
006064	NWL10 Series	NWL-10FW1.1.32.4.Recovery	ftp://repository.netcommwireless.com/NWL-10/vdf_nwl10_2.0.18.21_r.cdi	0	0	1 Firmware Upgrade Image	

Figure 11: Three ACS references to downloadable system image files

4.b. Queue firmware download task

Once the file locations have been entered into the ACS, each device can be scheduled to be updated.

To perform firmware upgrades or downgrades on the router via TR-069, open the ACS server's management URL and click **Home > Manage Devices**, and select from the list the serial number of the device on which to perform the firmware upgrade or downgrade.

Figure 12: Select a device to queue for update

Queue the firmware download task by selecting **Download** from the **Queue a new Request** drop down list, then click the **GO** button to submit a new request.
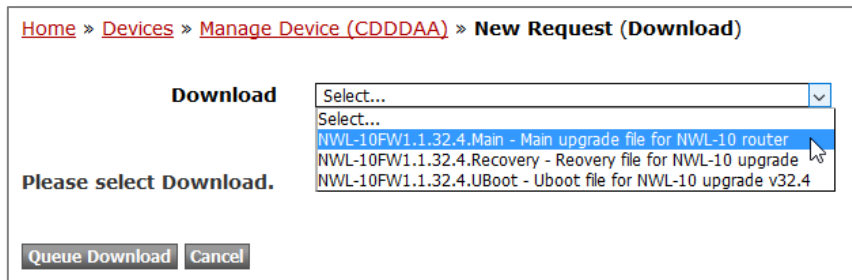

Figure 13: Select New Request type as Download and click GO button

Note – Both device firmware upgrade and firmware downgrade tasks make use of the 'Download' action button on the ACS Server.

The **New Request (Download)** page is displayed.

Select one of the files associated with the device from the drop down list and click **Queue Download**:
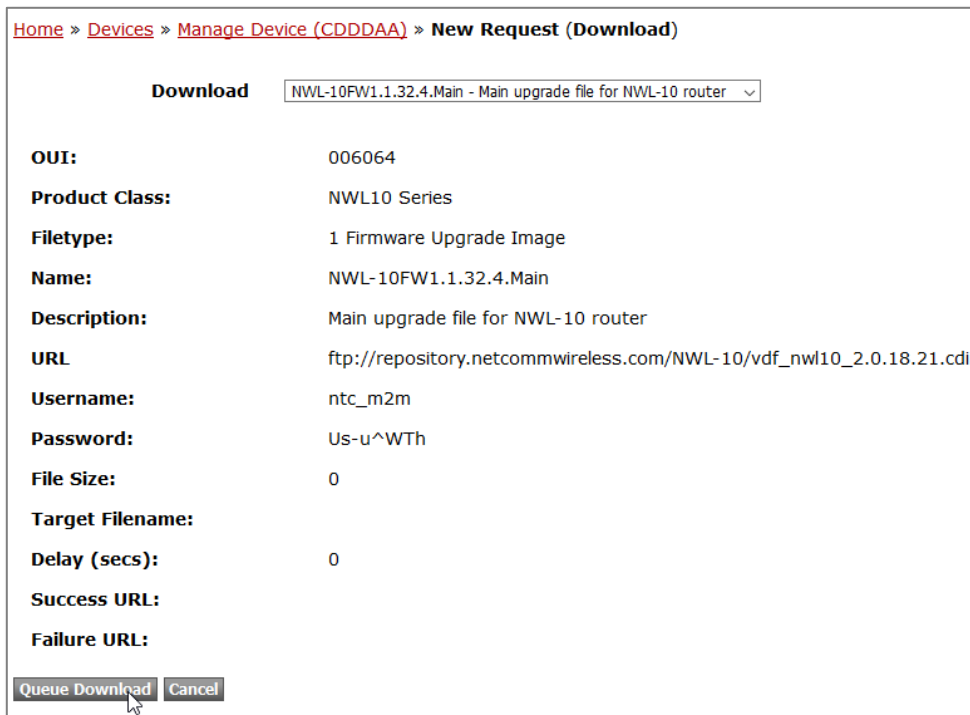
Figure 14: Add files to be included in the queue for update

The page will display details for the selected file and device:

Figure 15: Confirm each file for inclusion in the queue for update

Confirm that this is the download that you want to queue and click Queue Download.

The download file's details will be added to the **Requests** list.

Repeat the process for the other two files.

4.c. Execute the firmware 'Download' tasks
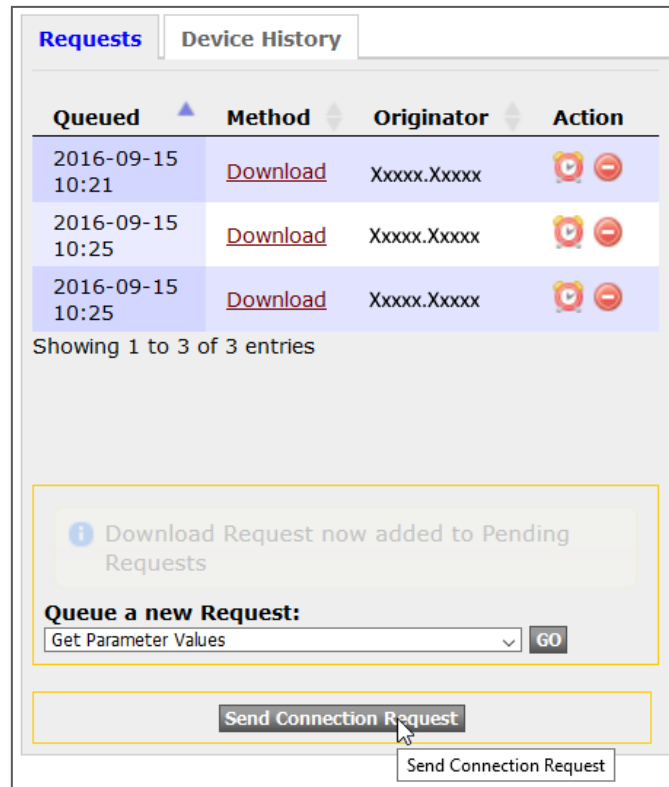
1   When all three **Requests** appear in the list:

Figure 16: Manually Send Connection Request from ACS

2   Click the **Send Connection Request** button to execute the queued tasks when the next "inform" message is received from the CPE/router.

> **Note** – If you get the message "Connection Request Failed" it usually means that the connection from your ACS server to the FTP server was not established.
>
> Check the URL and other connection settings for the FTP server in the ACS's Add Download page (see section 4.a.).
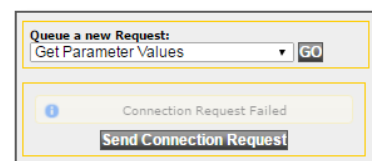
4.d. Confirmation of firmware update

It may take up to 10 minutes to complete the device firmware upgrade task remotely, depending on the 3G connection speed and the distance between the TR-069 CPEs and the TR-069 Server.

When the upgrade is complete, navigate to the **Device Data** tab to confirm the firmware version has changed.

Figure 17: Confirm the firmware version has changed

Remote CPE firmware upgrade via TR-069 is complete.

Appendix A – Trigger connection request via SMS

If the MachineLink does not have a publicly routable IP address, a connection request may be triggered by sending an SMS to the router.

The SMS command to trigger a connection request is:

```
set tr069.request.trigger=1
```