Auto-Provisioning Manual

Version 190904.1

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Auto-Provisioning of ReadyNet Router ATAs

Introduction

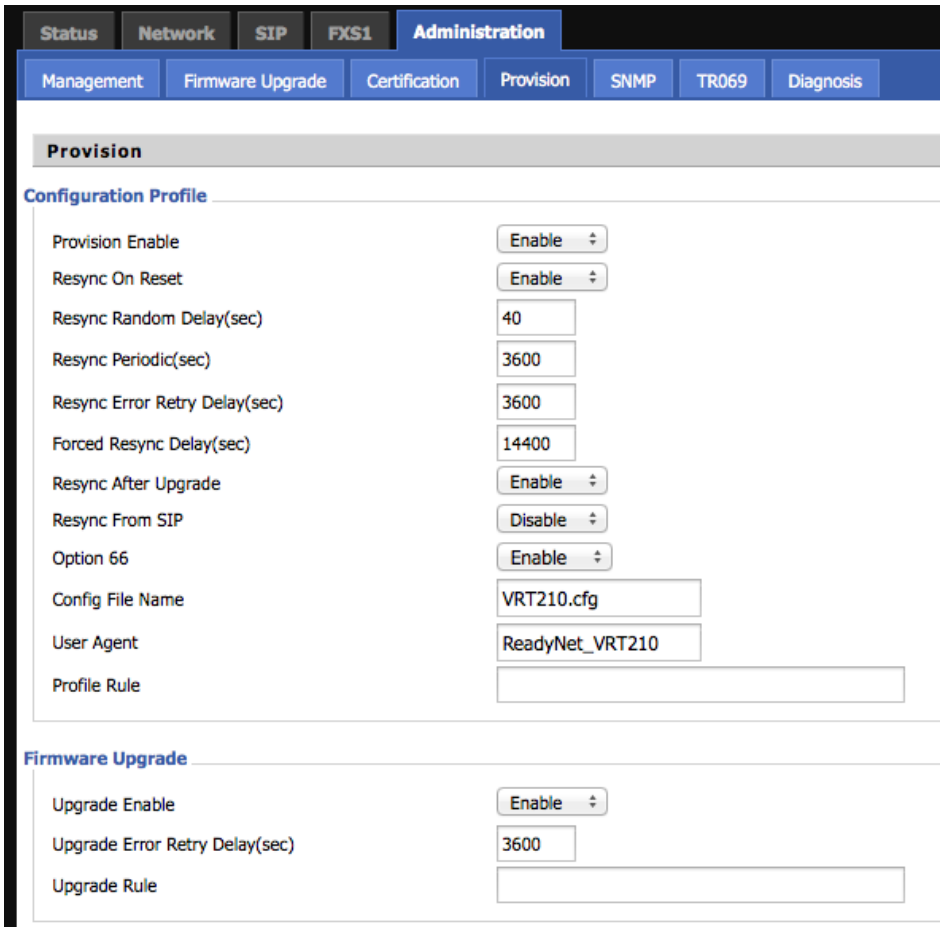
This document is targeted to developers and system integrators who intend to include support for the ReadyNet ATAs in their VoIP provisioning systems. It provides details for auto-provisioning ReadyNet routers with one or more ATA ports. Auto-provisioning is supported via TFTP, HTTP and HTTPS as well as DHCP Option 66, allowing for true zero-touch remote provisioning.

Configure Provisioning Parameters

This section first describes how to enable provisioning via the web interface and then describes the various parameters that can be set to control provisioning.

Enable Provisioning

To enable provisioning, log into the ReadyNet router and navigate to Administration -> Provision. The image below shows the default values for the QX202.
With the default settings, provisioning is enabled but the parameter 'Profile Rule', which is the



provisioning URL, is blank. Similarly, firmware upgrade is enabled but 'Upgrade Rule' has no value.

The table below describes the various provisioning parameters and provides their default values.

Parameter Name	Description	Default Value
Provision Enable	Enable or disable the Provision functions.	Yes
Resync on Reset	Triggers a resync after every reboot except for reboot caused by parameter updates and firmware upgrades.	Yes
Resync Random Delay	The maximum value for a random time interval that the device waits before making its initial contact with the provisioning server. This delay is effective only on the initial configuration attempt following device power-on or reset. The delay is a pseudo-random number between zero and this value. This parameter is in units of 1 second; the default value of 40 represents 40 seconds. This feature is disabled when this parameter is set to zero. It can be used to prevent an overload of the provisioning server when a large number of devices power on simultaneously.	40 seconds
Resync Periodic	The number of seconds between periodic resyncs with the provisioning server. Set this parameter to zero to disable periodic resyncing.	3600 seconds
Resync Error Retry Delay	If the last resync failed, the device will retry resync after the “Resync Error Retry Delay” seconds.	3600 seconds
Forced Resync Delay	Maximum delay in seconds the device waits before performing a resync. The device will not resync while any of its phone lines are active. Because a resync can take several seconds, wait until the device has been idle for an extended period before resyncing. This allows a user to make calls in succession without interruption. The device has a timer that begins counting down when all of its lines become idle. This parameter is the initial value of the counter. Resync events are delayed until this counter decrements to zero.	14400 seconds
Resync After Upgrade	Triggers a resync after every firmware upgrade attempt.	Yes
Option 66	If enabled, the device will also request DHCP Option 66 with its DHCP request. When enabled, the parameter ‘Profile Rule’ is ignored.	Yes
Config File Name	This parameter is appended to the DHCP Option 66 value returned by the DHCP server to create the TFTP provisioning URL. e.g. if the DHCP Option 66 return value is 123.45.67.89 and the ‘Config File Name’ parameter is a.conf , then the device will request a provisioning file from the TFTP server located at123.45.67.89 for a file named, a.conf. This parameter is ignored when the parameter ‘Option 66’ is set to ‘No’.	Changes for different models. For the QX202, it will be QX202.conf. For engineering samples, .cnf
Profile Rule	This parameter is a URI that evaluates to the provisioning resync command. The protocol can be TFTP and HTTP. The file name component of this parameter can make use of macros allowing the device to make requests for unique provisioning files. This parameter is ignored if the parameter ‘Option 66’ is enabled.	Empty

The table below describes the various firmware upgrade parameters and provides their default values.

Parameter	Description	Default Value
Enable Upgrading	Enables firmware upgrade operations independently of resync actions	Enable
Upgrade Error Retry Delay	The upgrade retry interval (in seconds) applied in case of upgrade failure. The device has a firmware upgrade error timer that activates after a failed firmware upgrade attempt. The timer is initialized with the value in this parameter. The next firmware upgrade attempt occurs when this timer counts down to zero.	3600 seconds
Upgrade Rule	This parameter sets the URL for the new firmware file. It follows the same syntax as the 'Profile Rule' parameter. e.g. http://192.168.100.1/QX202_v3.1.bin	Empty

Syntax of Profile Rule and Upgrade Rule

The two parameters 'Profile Rule' and 'Upgrade Rule' must follow the following syntax.

[scheme://][server IP or domain[:port]]/file_path

The scheme can be one of the following;

http
https
tftp

The 'file_path' component follows macro expansion rules as described in the section 'Macro Expansion' below.

Examples:

tftp://prov.mydomain.com/cpe/$MAU.conf
http://dev.easyvoip.com:8080/prov/$PN/$MA.conf

Macro Expansion

Macro expansion can be used with the parameters ‘Profile Rule’ and ‘Upgrade Rule’. The table below list the macros variables and to what they expand.

Macro Name	Expansion
$	The form $$ expands to a single $ character. The form $$MAU expands to $00019F16B1B2. The form $MAU expands to 00019F16B1B2.
MA	MAC address with lower case hex digits, e.g. 00019F16b1b2.
MAU	MAC address with upper case hex digits, e.g. 00019F16B1B2.
MAC	MAC address with lower case hex digits, and colons to separate hex digit pairs, e.g. 00:01:9F:16:B1:B2.
PN	Product Name, e.g. QX202
SN	Serial Number, e.g. QX2123456
IP	WAN IP address , e.g. 123.45.67.89
SWVER	Software version, e.g. v3.0.1
HWVER	Hardware version, e.g. v1.0.1

Macro variables are invoked by prefixing the macro name with the ‘$’ character (e.g. $MAC). Macro substitution works even within a quoted sting, without requiring additional escapes. If the macro is immediately followed by an alphanumeric character, enclose the variable name in parentheses (e.g.‘$(MAC)config.conf’).

Please note the following additional points with regards to macro expansion;

1) During macro expansion, expressions of the form $NAME and $(NAME) are replaced by the contents of the named variables. For example, a router with a MAC address of 00:01:9F:16:B1:B2, the macro $(MAU)config.cfg expands to 00019F16B1B2config.cfg.
2) If the macro name is not recognized, it will remain unexpanded. For example, if you try to use STRANGE as a macro name it will remain unexpanded. Thus the expression $STRANGE$MAC.cfg expands to $STRANGE00:01:9F:16:B1:B2.cfg.
3) Macro expansion is not applied recursively. This means that the macro expression $$MAU expands to $MAU and not 00019F16B1B2.
4) Macro expressions can have optional qualifiers that allow you specify a substring of the macro variable. The syntax for macro substring expansion is $(NAME:p) and $(NAME:p:q) where p and q are non-negative integers. The resulting expansion results in the macro variable substring starting at the character offset p, and of length q (or till end-of-string if q is not specified). So, for our example device with a MAC address of 00019F16B1B2, the expression $(MAU:4) expands to the string 9F13B1B2, and the expression $(MAU:8:2) expands to the string B1.

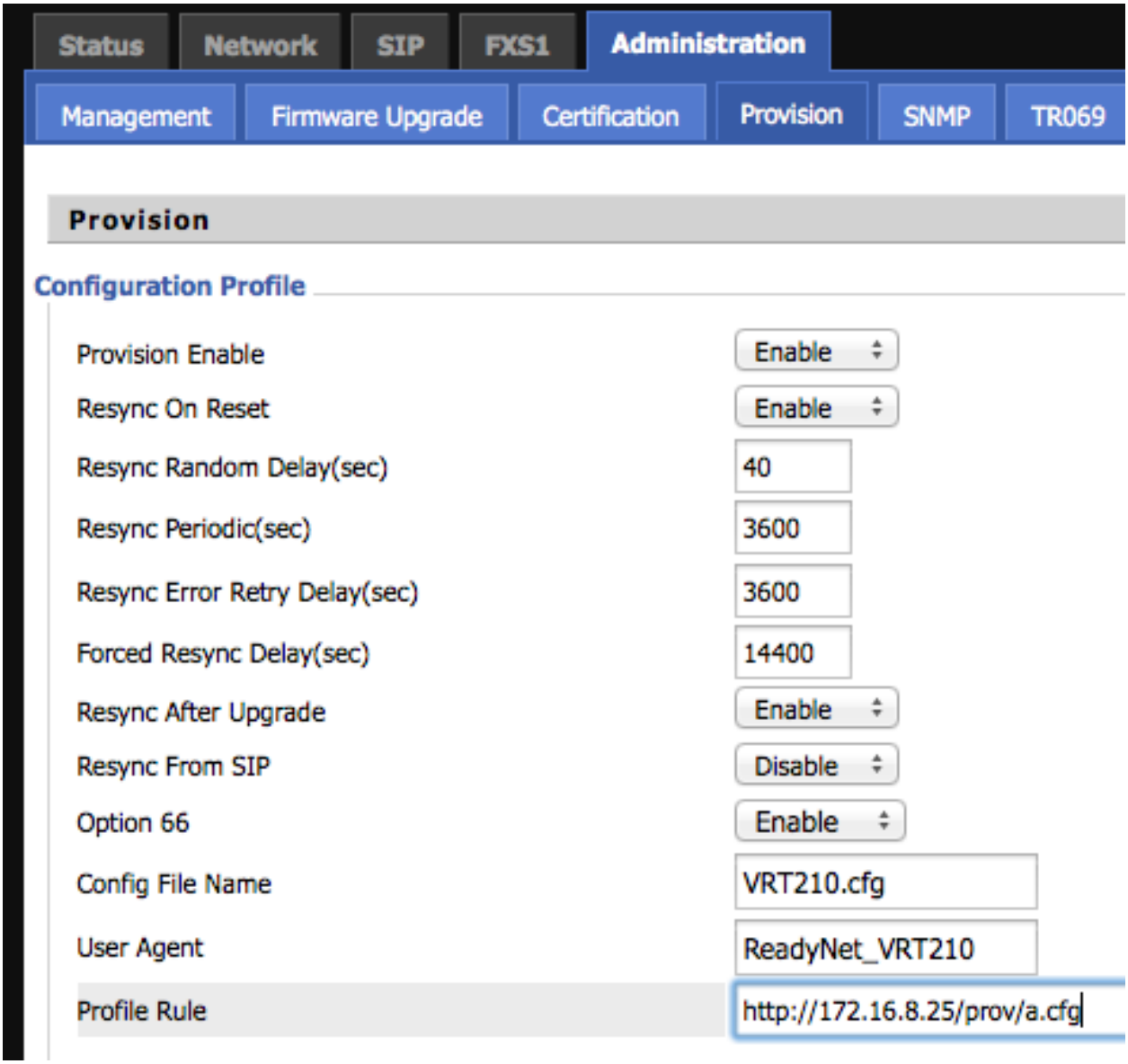
Provisioning

Provision with HTTP

Begin by resetting a ReadyNet router to factory defaults.
1) Install an HTTP server on the WAN side of the router.
2) In the DocumentRoot of the HTTP server, create a directory named ‘prov’ for provisioning files. So if the path to the DocumentRoot is /var/www/html, the path to the directory for the provisioning files will be /var/www/html/prov .
In the prov directory, create a file named a.cfg with the following contents and save it.

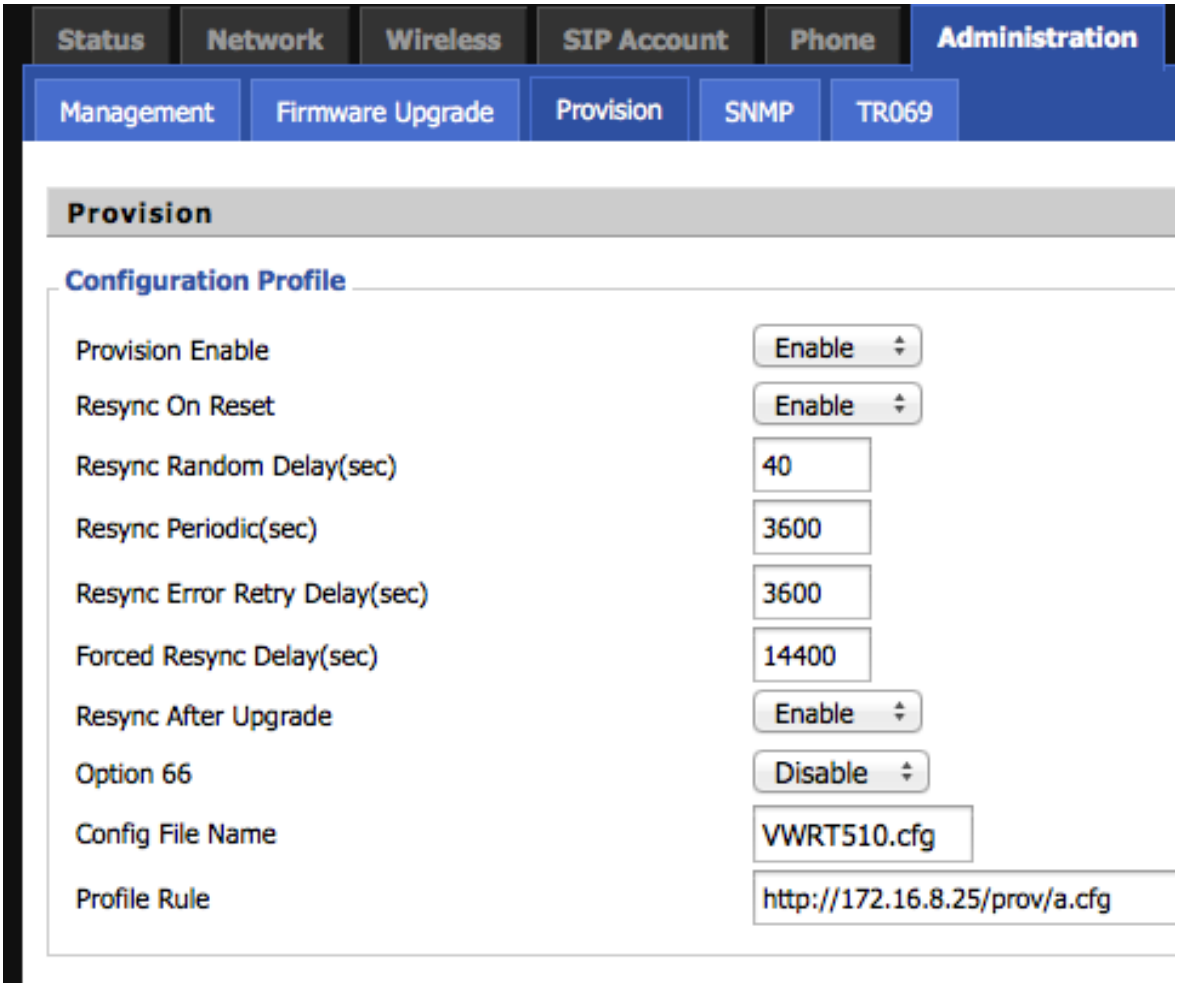
DBID_SUPER_WEB_PASSWORD=newpass1

3) From a PC connected to a LAN port of the device, you should be able to view the file



contents of a.cfg by browsing to; http://HTTP_SERVER/prov/a.cfg.

4) Log into the ReadyNet router, navigate to Administration -> Provision and set the ‘Option 66’ field to Disable and in the Profile Rule field enter: http://HTTP_SERVER/prov/a.cfg .



5) Click save and then do a reboot.
6) When the device boots and its WAN interface is up, it will retrieve the file located at Profile Rule. The ATA will reboot to apply the new parameters.
7) When you now login to the web interface with the user ‘admin’ you will need to enter the password: newpass1.

Provision with DHCP and TFTP

In the example above, we had to manually configure the Profile Rule of the router by logging into the web interface of the device as the admin user and entering a valid location for the provisioning URI. Using DHCP Option 66 together with a TFTP server, the Profile Rule parameter can be automatically set. The ReadyNet router with its default, out-of-the-box configuration is set for 1) DHCP on the WAN interface and 2) Option 66 enabled. A correctly configured DHCP server will provide the IP address of a TFTP server when the router includes a request for Option 66 together with its DHCP request. e.g. if the DHCP server sends back ‘172.16.8.25’ as the Option 66 response and **DBID_PRV_CONFIGFILE** is ‘QX202.cfg’, the device will make a TFTP request to the server at IP address 172.16.8.25, for a file named ‘QX202.cfg’.

8) Configure DHCP server to include Option 66 response.

9) Configure TFTP server. Create the initial provisioning file named '.cfg' with the following contents.

```
DBID_RESYNC_PERIODIC=60
DBID_PRV_OPTION66_ENABLED=0
DBID_PROFILE_RULE=http://172.16.8.25/prov/$MAU.conf
```

Note: We change DBID_RESYNC_PERIODIC to 60 seconds only during testing and development.

10) In the prov directory of the HTTP server create a file named 00019F16XXXX.conf, replacing XX:XX in the file name to match the WAN MAC address of the router.

```
DBID_SUPER_WEB_PASSWORD=newpass2
```

So if the WAN MAC address is 00:01:9F:16:00:01, the file would be named, '00019F160001.conf'.

11) Reset the router to factory defaults. On boot-up, we should expect the following events to occur;
    a. The ReadyNet router includes Option 66 in its DHCP request on the WAN port.
    b. The DHCP server includes the Option 66 response with the other DHCP parameters.
    c. The router makes a TFTP connection to the IP address that it received as the Option 66 value and requests a file named .cfg.
    d. On receiving the file named '.cfg', the device will set the Option 66 parameter to 'Disable' and set the Profile Rule to '`http://172.16.8.25/prov/$MAU.conf`' and do a reboot.
    e. This time when the devices boots up, it will not include Option 66 with its DHCP request. Once the WAN interface is up, the router will expand the macro $MAU to its WAN MAC address in uppercase. So if the WAN MAC address of the router is 00:01:9F:16:00:01, then the device will request a provisioning file from the URI; http://172.16.8.25/prov/00019F160001.conf.
    f. The request URI uniquely identifies the device allowing the provisioning server to customize the provisioning file returned. In this example we set the password for the user admin to 'newpass2'.
    g. The device will reboot again.
12) When you now log in to the web interface with the user 'admin', you will need to enter the password 'newpass2'.

Provisioning Examples

This section provides example provisioning files for the ReadyNet router. Refer to the Appendix for a listing of the provisioning parameters and their descriptions.

Note 1: The provisioning file only contains the parameters that need changing.

Note 2: The ATA calculates a checksum of the provisioning file. It compares this checksum with the checksum of each new provisioning file it receives. If the checksums are different, the ATA will apply the changes in the new provisioning file and reboot.

Provisioning WAN Parameters

In this example provisioning file, the WAN connection mode is changed from DHCP to STATIC. Further we change, `mdns_mode` from 0 (Auto) to 1 ('Manual') and define a primary and secondary DNS server that the router itself will use.

```
mwanConnectionMode=STATIC
mwan_ipaddr=172.16.8.60
mwan_netmask=255.255.255.0
mwan_gateway=172.16.8.1
mdns_mode=1
mwan_primary_dns=8.8.8.8
```

Provisioning LAN Parameters

This remote provisioning example file changes the network parameters on the LAN side of the router. In addition, this file changes the username and passwords of the two administrative access levels of the web interface of the router.

```
lan_ipaddr=192.168.88.1
lan_netmask=255.255.255.0
dhcpGateway=192.168.88.1
dhcpStart=192.168.88.200
dhcpEnd=192.168.88.220
dhcpLease=3600
NormalUser=Alice
DBID_NORMAL_WEB_PASSWORD=Alice123Pass
AdminUser=Jack
DBID_SUPER_WEB_PASSWORD=Jack123pass
```

Provisioning SIP Parameters

This example provisioning file configures the SIP port of the router. You will need to change the actual parameters in the file to match your SIP server.

```
DBID_DNSSRV_DOMAIN=12.34.56.78
DBID_SIP_SERVER_HOST_NAME=12.34.56.79
DBID_SIP_DIS_NAME=Customer Name
DBID_SIP_PHONE_NUM=1234
DBID_SIP_ACCOUNT=1234
DBID_SIP_PASSWORD=SIPpass
```

Appendix

WAN *Network Parameters*

Parameter	Valid Values	Description
mwanConnectionMode	**DHCP** STATIC PPPOE	This parameter defines the WAN connection method. It can be one of the following; Static, DHCP or PPPOE.
mdns_mode	**0** 1	With the default setting of 0, the device will use the DNS server provided by the DHCP server. Setting this parameter to 1 allows you to define m**wan_primary_dns** and m**wan_secondary_dns** manually.
mwan_primary_dns	*IP Address*	When mdns_mode is set to 1 or m**wanConnectionMode** is set to Static, this parameter can be defined to set the primary DNS server used by the router.
mwan_secondary_dns	*IP Address*	When mdns_mode is set to 1 or **mwanConnectionMode** is set to Static, this parameter can be defined to set the secondary DNS server used by the router.
mwan_ipaddr	*IP Address*	This parameter sets the WAN IP address and must be set when **mwanConnectionMode** is set to Static.
mwan_netmask	*Netmask*	This parameter sets the WAN Netmask and must be set when **mwanConnectionMode** is set to Static.
mwan_gateway	*IP Address*	This parameter sets the WAN Netmask and must be set when **mwanConnectionMode** is set to Static.
mwan_pppoe_user	Empty	This parameter is the PPPoE username and must be defined when **mwanConnectionMode** is set to PPPoE.
mwan_pppoe_pass	Empty	This parameter is the PPPoE password and must be defined when **mwanConnectionMode** is set to PPPoE.
mwan_pppoe_opmode	**KeepAlive** On Demand Manual	This parameter is the PPPoE Operation mode and defaults to KeepAlive.
mwan_pppoe_optime	**60**	This parameter defines the PPPoE Keep Alive Redial period in seconds when PPPoE is the **wanConnectionMode**. Range is between 0 - 3600.

LAN Network Parameters

Parameter	Valid Values	Description
natEnabled	**NAT** Bridge	When in natEnabled is set to NAT, the router operates as a router and when set to Bridge, all network interfaces are bridged.
lan_ipaddr	IP Address	This parameter sets the IP address of the LAN interface when **natEnabled** is set to NAT. This IP address is also the gateway address for the devices connected to the LAN side of the router.
lan_netmask	*Subnet Mask*	This parameter sets the subnet mask of the LAN subnet when **natEnabled** is set to NAT.
dhcpEnabled	**Enable** Disable	Use this parameter to enable or disable running a DHCP server on the router.
dhcpStart	*IP Address*	If **dhcpEnabled** is set to Enable, this parameter sets the starting IP address of the DHCP pool.
dhcpGateway	*IP Address*	**dhcpGateway** defines the gateway address for DHCP requests from the LAN network.
dhcpEnd	*IP Address*	If **dhcpEnabled** is set to Enable, this parameter sets the ending IP address of the DHCP pool.
dhcpDnsMode	**Auto** Manual	When this parameter is set to Auto, DHCP clients are assigned the
dhcpPriDns		When **dhcpDnsMode** is set to Manual, this parameter defines the IP address of DNS server that will be provided as the primary DNS server with DHCP requests.
dhcpSecDns		When **dhcpDnsMode** is set to Manual, this parameter defines the IP address of DNS server that will be provided as the secondary DNS server with DHCP requests.
dhcpLease	**86400**	This parameter defines the DHCP lease time.
lan_vid	1	This parameter defines the VLAN ID of the LAN port. VLAN IDs are defined under Network -> VLAN in the web interface.

SIP Parameters

These parameters configure the SIP settings and correspond to the settings seen on the 'SIP Account' menu of the web interface.

Parameter	Description
DBID_DNSSRV_DOMAIN	This parameter defines the 'Proxy Server' for the SIP account.
DBID_SIP_OUTBOUND_PORT	This parameter defines the 'Proxy Port'. The default port is 5060.
DBID_SIP_SERVER_HOST_NAME	This parameter defines the 'Outbound Server' for the SIP account.
DBID_SIP_SERVER_PORT	This parameter defines the 'Outbound Port'. Default value is 5060.
DBID_ALTER_SIP_SERVER_HOSTNAME	This parameter defines the 'Backup Outbound Server' for the SIP account.
DBID_ALTER_SIP_SERVER_PORT	This parameter defines the 'Backup Outbound Port'. The default port is 5060.
DBID_SIP_DIS_NAME	This parameter defines the 'Display name' for the SIP account.
DBID_SIP_PHONE_NUM	This parameter defines the 'Phone Number' for the SIP account.
DBID_SIP_ACCOUNT	This parameter defines the 'Account' attribute associated with the SIP account.
DBID_SIP_PASSWORD	This parameter defines the 'Password' assigned to the particular SIP account.
DBID_SIP_TOS	This parameter sets the DHCP mark for Layer 3 QoS for SIP packets. Range is 0 through 63.
DBID_RTP_TOS	This parameter sets the DHCP mark for Layer 3 QoS for RTP packets. Range is 0 through 63.
DBID_DATA_TOS	This parameter sets the DHCP mark for Layer 3 QoS for Data packets. Range is 0 through 63.
sip_vid	This parameter defines the VLAN ID over which SIP packets will be sent. VLAN IDs are defined under Network -> VLAN in the web interface. The default is 2.
rtp_vid	This parameter defines the VLAN ID over which RTP packets will be sent. VLAN IDs are defined under Network -> VLAN in the web interface. The default is 2.

Administration Parameters

Parameter		Description
BasicUser	**useradmin**	This parameter defines a web login username of type ‘Basic’.
BasicPass	**admin**	This parameter defines the password for **BasicUser**.
NormalUser	**user**	This parameter defines a web login username of type ‘Normal’.
DBID_NORMAL_WEB_PASSWORD	**user**	This parameter defines the password for NormalUser.
AdminUser	**admin**	This parameter defines a web login username of type ‘Admin’.
DBID_SUPER_WEB_PASSWORD	**admin**	This parameter defines the password for AdminUser.
DBID_LAN_LOGIN_ONLY	**0**	The default for this parameter is 0 which allows access to the web interface of the device from the WAN interface. To only allow access to the web interface set this parameter to 1.
DBID_WEB_PORT	**80**	This parameter set the port that web server on the device listens to requests on both the LAN side and WAN (if DBI_LAN_LOGIN_ONLY =0) side.
DBID_WEB_IDLE_TIMEOUT	**5**	Whilst logged into the web interface of the device this parameter sets the value in minutes of inactivity that results in getting logged out.

Provisioning Parameters

Parameter	Default	Description
DBID_PROVISION_ENABLED	**1** 0	The default value for this parameter is 1 which enables provisioning for the device.
DBID_RESYNC_ON_RESET	**1** 0	The default value for this parameter is 1 which triggers a resync after every reboot except for reboot caused by parameter updates and firmware upgrade.
DBID_RANDOM_DELAY	**40**	This parameter defines the maximum number of seconds the device waits before making its initial contact with the provisioning server. This delay is effective only on the initial configuration attempt following device power-on or reset. The delay is a pseudo-random number between zero and this value. The default value is 40 and setting this parameter to 0, disables this feature.
DBID_RESYNC_PERIODIC	**3600**	This parameter is used to define the number of seconds between periodic resyncs with the provisioning server. Set this parameter to zero to disable periodic resyncing.
DBID_RESYNC_RETRY_DELAY	**3600**	This parameter defines the number of seconds the device will wait to retry a resync after the last attempt to resync failed.
DBID_RESYNC_DELAY	**14400**	This is the starting value of a counter in seconds that is decremented when all its line become idle. Resync events are delayed until this counter decrements to zero.
DBID_RESYNC_AFTER_UPGRADE	**1** 0	When set to 1, the device will trigger a resync after every firmware upgrade attempt. Set this parameter to disable.
DBID_PRV_OPTION66_ENABLED	**1** 0	When this parameter is set to 1 (default), the device will include DHCP Option 66 with its DHCP request. When enabled, the parameter DBID_PROFILE_RULE is ignored.
DBID_PRV_CONFIGFILE	**.cfg**	This is the name of the provisioning file retrieved from the TFTP server when DHCP Option 66 is enabled.
DBID_PROFILE_RULE		This parameter sets the URI that the device will reterive its provisioning file from. This parameter is ignored when DBID_PRV_OPTION66_ENABLED is set to 0.
DBID_UPGRADE_ENABLED	**1** 0	The default value for this parameter is 1, which enables firmware upgrades. Set to 0 to disable this function.
DBID_UPGRADE_RETRY_DELAY	**3600**	On a firmware upgarde failure this parameter is set to the value defined in seconds and a countdown begins. Once the timer reaches zero, the next attempt at firmware upgrade will occur.
DBID_UPGRADE_RULE		This parameter sets the URI from which the new firmware file is requested from.

Default Provisioning Template File

```
mwanConnectionMode=DHCP
dhcpDnsMode=Auto
mwan_primary_dns=
mwan_secondary_dns=
mwan_ipaddr=
mwan_netmask=
wan_gateway=
wan_pppoe_user=
wan_pppoe_pass=
wan_pppoe_opmode=KeepAlive
wan_pppoeoptime=5
wan_vid=2
natEnabled=1
lan_ipaddr=192.168.11.1
lan_netmask=255.255.255.0
dhcpEnabled=1
dhcpStart=192.168.11.2
dhcpEnd=192.168.11.24
dhcpGateway=192.168.11.1
dhcpDnsMode=Auto
dhcpPriDns=192.168.11.1
dhcpSecDns=8.8.8.8
dhcpLease=86400
lan_vid=1
DBID_DNSSRV_DOMAIN=
DBID_SIP_OUTBOUND_PORT=5060
DBID_SIP_SERVER_HOST_NAME=
DBID_SIP_SERVER_PORT=5060
DBID_ALTER_SIP_SERVER_HOSTNAME=
DBID_ALTER_SIP_SERVER_PORT=5060
DBID_SIP_DIS_NAME=
DBID_SIP_PHONE_NUM=
DBID_SIP_ACCOUNT=
DBID_SIP_PASSWORD=
DBID_SIP_TOS=0
DBID_RTP_TOS=0
DBID_DATA_TOS=0
sip_vid=2
rtp_vid=2
DBID_PROVISION_ENABLED=1
DBID_RESYNC_ON_RESET=1
DBID_RANDOM_DELAY=40
```

```
DBID_RESYNC_PERIODIC=3600
DBID_RESYNC_RETRY_DELAY=3600
DBID_RESYNC_DELAY=14400
DBID_RESYNC_AFTER_UPGRADE=1
DBID_PRV_OPTION66_ENABLED=1
DBID_PRV_CONFIGFILE=QX202.cfg
DBID_PROFILE_RULE=
DBID_UPGRADE_ENABLED=0
DBID_UPGRADE_RETRY_DELAY=3600
DBID_UPGRADE_RULE=
```