

RG50xQ&RM5xxQ Series

QMAP Multiple Data Call

Application Note

5G Module Series

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About the Document

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1 Introduction

Quectel 5G RG50xQ series and RM5xxQ series modules support mapping between Multi-PDN and VLAN to achieve multiple data call, meeting the demands of data service isolation.

This document illustrates the detailed configuration steps and matters warranting your attention related to QMAP multiple data call based on the specific application scenario.

1.1. Applicable Modules

Table 1: Applicable Modules

Module Series	Module
RG50xQ	RG500Q Series
	RG501Q-EU
	RG502Q Series
RM5xxQ	RM500Q Series
	RM502Q-AE
	RM505Q-AE
	RM510Q-GL

2 Multiple Data Call Configurations

2.1. Application Scenario

Quectel QMAP Multi-PDN data call feature can be used to perform multiple data calls by connecting, mapping and binding several VLANs and several different PDNs, thus, implementing data service isolation. The application scenario is shown below:

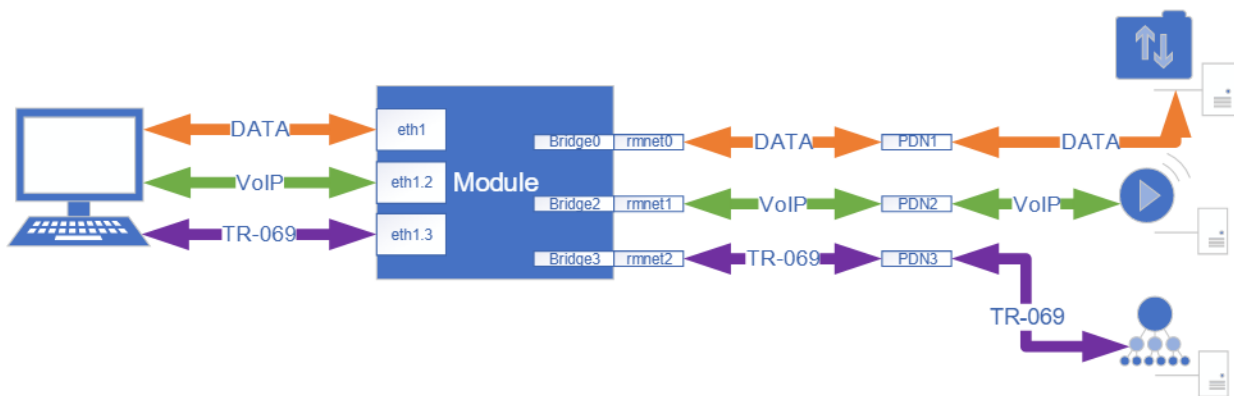


Figure 1: QMAP Multi-PDN Application Scenario

2.2. Configuration Steps

This chapter takes the application scenario mentioned in **Chapter 2.1** as an example to list the configuration steps both on the module and the host.

2.2.1. Module Configurations

1. Configure APN

Configure the required APN with **AT+CGDCONT**. For details of the AT command, see **document [1]**. The application scenario in **Chapter 2.1** has three profiles. This section takes configuring APNs to ctnet, apn5 and apn6 as an example:


```
AT+CGDCONT=1,"IPV4V6","ctnet"
AT+CGDCONT=5,"IPV4V6","apn5"
AT+CGDCONT=6,"IPV4V6","apn6"
```

NOTE

Special APNs, such as IMS and SOS, cannot be used for data call.

2. Check APN Configurations

Check APN configurations with **AT+CGDCONT?**. For details of the AT command, see [document \[1\]](#).
Example:

```
AT+CGDCONT?
+CGDCONT: 1,"IPV4V6","data","0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0",0,0,0,0,,,,,,,,,"",,0
...
+CGDCONT: 5,"IPV4V6","apn5","0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0",0,0,0,0,,,,,,,,,"",,0
+CGDCONT: 6,"IPV4V6","apn6","0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0",0,0,0,0,,,,,,,,,"",,0

OK
```

3. Enable Ethernet NIC (PCIe or RGMII NIC)

- 1) If RGMII NIC is used, execute **AT+QETH="rgmii","ENABLE",0** without specifying data call parameters.
- 2) If PCIe NIC is used, first set PCIe to RC mode with **AT+QCFG="pcie/mode",1** and then set Ethernet driver to be loaded when the module is booting with **AT+QETH="eth_driver","r8125",1** (take PCIe RTL8125 driver as an example).

For details of the AT commands, see [document \[1\]](#).

NOTE

RGMII NIC is only supported on RG50xQ series module.

4. Configure Ethernet VLAN

The module reboots automatically when you enable the first Ethernet VLAN. After the module is rebooted, you can enable other VLANs and the module will not reboot. Up to 4 VLANs can be enabled at the same time. VLAN0 of the module indicates the physical default LAN interface that cannot be disabled rather than a VLAN. Then you can enable and configure 2 more VLANs as presented below.

For details of the AT command, see *document [2]*.

Enable Ethernet VLAN2:

AT+QMAP="vlan",2,"enable",1

Enable Ethernet VLAN3:

AT+QMAP="vlan",3,"enable",1

5. Configure QMAP Multiple Data Call Rules

The module supports querying or configuring QMAP multiple data call rules with **AT+QMAP="MPDN_rule"**. For details of the AT command, see *document [2]*.

- 1) Map the first data call rule (<rule_num>=0) to the physical LAN interface (<VLAN_ID>=0), enable IPPT mode and automatic connection, and then allocate the public IP address to the device whose MAC address is "00:0e:c6:67:78:02":

AT+QMAP="MPDN_rule",0,1,0,1,1,"00:0e:c6:67:78:02"

- 2) Map the second data call rule (<rule_num>=1) to VLAN2 (<VLAN_ID>=2), enable IPPT mode and automatic connection, and then allocate the public IP address to the device whose MAC address is "00:0e:c6:67:78:02":

AT+QMAP="MPDN_rule",1,5,2,1,1,"00:0e:c6:67:78:02"

- 3) Map the third data call rule (<rule_num>=2) to VLAN3 (<VLAN_ID>=3), enable IPPT mode and automatic connection, and then allocate the public IP address to the device whose MAC address is "00:0e:c6:67:78:02":

AT+QMAP="MPDN_rule",2,6,3,1,1,"00:0e:c6:67:78:02"

- 4) Query the configured multiple data call rules.

```
AT+QMAP="MPDN_rule"
+QMAP: "MPDN_rule",0,1,0,1,1
+QMAP: "MPDN_rule",1,5,2,1,1
+QMAP: "MPDN_rule",2,6,3,1,1
+QMAP: "MPDN_rule",3,0,0,0,0
OK
```

NOTE

If automatic connection in a QMAP data call rule is disabled, you can start a data call manually with **AT+QMAP="connect"** after all configuration items have been configured.

6. Query Multiple Data Call Status and Whether IPPT Mode is Enabled

The module supports querying QMAP multiple data call status and whether IPPT mode is enabled with `AT+QMAP="MPDN_status"`.

```
AT+QMAP="MPDN_status"
+QMAP: "MPDN_status",0,1,1,1
+QMAP: "MPDN_status",1,5,1,1
+QMAP: "MPDN_status",2,6,1,1
+QMAP: "MPDN_status",3,0,0,0
OK
```

2.2.2. Host Configurations

Add 3 VLANs and check MAC address. Then obtain the corresponding IP address and other configurations of each VLAN interface through dhcp client.

1. Load VLAN module by executing the following command:

```
modprobe 8021q
```

2. Reboot NIC and configure MAC address by executing the following command:

```
sudo ifconfig eth1 down
sudo ifconfig eth1 hw ether 00:0e:c6:67:78:02 up
```

3. Add 2 VLANs (<VLAN_ID>=2 and 3) for eth1 by executing the following command:

```
sudo vconfig add eth1 2
sudo vconfig add eth1 3
```

4. Obtain dynamic IP address of each VLAN interface through dhcp client by executing the following command:

```
sudo udhcpc -i eth1
sudo udhcpc -i eth1.2
sudo udhcpc -i eth1.3
```

2.3. Matters Warranting Attention

1. Check whether APN is configured correctly with **AT+CGDCONT?**. Special APN cannot be used for data call.
2. If the module fails to access the wide area network, check data call status first. If the data call failed, check network connection.
3. Check whether VLAN interface has obtained IP address (IP address can be obtained automatically with udhcpc or another dhcp client. You can also configure the IP address manually).
4. View routing table with **route -n**.
 - 1) Executing **udhcpc** obtains IP address of each NIC, and also adds the obtained IP address to default router. So, multiple default routers are added after you execute **udhcpc** on several NICs for several times. Example:

Table 2: Linux IP Routing Table

Destination	Gateway	Genmask	Flags	Metric	Ref	Use	Interface
default	10.47.2.16	0.0.0.0	UG	0	0	0	eth1.3
default	10.46.11.45	0.0.0.0	UG	0	0	0	eth1.2
default	10.46.214.249	0.0.0.0	UG	0	0	0	eth1
10.46.214.0	-	255.255.255.0	U	0	0	0	eth0

- 2) Only one default router is effective. If there are several default routers, you can delete the default routers and add a new default router. After the default router is configured, all data without specified static router will be sent from the default router.

You can delete default routers with the following commands. Example:

```
route del default //Delete the first default router
route del default //Delete the second default router
route del default //Delete the third default router
```

You can add a default router by applying the following two methods:

- A. Add a default router with **route add default gw <gateway_address> dev <interface>**. Take adding eth1.3 to default router as an example (gateway address can be obtained from dhcp client):

```
route add default gw 10.47.2.16 dev eth1.3
```

B. Automatically add a default router. For example, when executing **udhcpc -i eth1.3** to obtain IP address, eth1.3 will be automatically added to default router.

3) To switch a data call connection, you should manually re-configure default router.

5. If multiple data calls are all successfully established, but only one data call connection can access the wide area network, check whether reverse path filtering is enabled and disable it if it is enabled. You can query whether reverse path filtering is enabled with the following command:

```
cat /proc/sys/net/ipv4/conf/eth0.x/rp_filter
cat /proc/sys/net/ipv4/conf/all/rp_filter
```

6. The module reboots automatically when

- 1) you enable the first VLAN with IPA feature or disable the last VLAN.
- 2) you change the LAN/VLAN interface bound with the default QMAP data call or delete the bound VLAN interface from the default QMAP data call.

NOTE

1. By default, the default QMAP data call is the first data call (<rule_num>=0).
2. The default QMAP data call is bound to the physical LAN interface (VLAN0) by default. If you want to change the LAN interface bound to a VLAN interface, the configuration takes effect after the module is rebooted.
3. If you remove the VLAN interface bound to the default QMAP data call rule, the default QMAP data call rule automatically re-binds to the physical LAN interface, and the configuration takes effect after the module is rebooted.

3 Appendix References

Table 3: Related Documents

Document Name
[1] Quectel_RG50xQ&RM5xxQ_Series_AT_Commands_Manual
[2] Quectel_RG50xQ&RM5xxQ_Series_AT+QMAP_Command_Manual

Table 4: Terms and Abbreviations

Abbreviation	Description
APN	Access Point Name
DHCP	Dynamic Host Configuration Protocol
IP	Internet Protocol
IPA	IP Accelerator
IPPT	IP Passthrough
IMS	IP Multimedia Subsystem
MAC	Medium Access Control
NIC	Network Interface Card
PCIe RC	PCI Express Root Complex
PDN	Packet Data Network
RGMII	Reduced Gigabit Media Independent Interface
VLAN	Virtual Local Area Network
VoIP	Voice over Internet Protocol