Quality of Service (QoS) Setup
(3G29Wn)

The following Quality of Service (QoS) settings offer a basic setup example, setting up 3 devices connecting to the 3G29Wn router, the first with the highest priority QoS settings for data traffic with a VoIP ATA, the second with medium priority QoS settings for data traffic flow for a gaming console and the third with low priority QoS settings for data traffic flow to a PC intended for browsing the internet only. All other data packet traffic through the router assumes a default best effort setting.

Quality of Service refers to the reservation of bandwidth resources on the 3G29Wn router to provide different priorities to different applications, users, or data flows, or to guarantee a certain level of performance to a data flow. The guide helps create a series of traffic class rules to classify the upstream traffic and assign queuing priority.

In this implementation Quality of Service employs DSCP – Differentiated Services Code Point – a computer networking architecture that specifies a simple, scalable and coarse-grained mechanism for classifying, managing network traffic.

This example guide sets up QoS with two devices (VoIP ATA, gaming console) connecting via ethernet cable to an 3G29Wn series router. A third device connects via wireless to the 3G29Wn router. One device (VoIP ATA) is assigned the highest priority traffic while the second device (gaming console) is assigned a medium priority while the third device (PC) is assigned a low best effort priority. Before Quality of Service can be implemented the first step involves reserving an IP address for each device linking the MAC address of each device to each IP address as shown in step one. The MAC address is a unique identifier comprised of 12 characters that most network devices possess. To find the MAC address of a network device check underneath the device or for a pc look for the physical address after typing "ipconfig /all" in a command prompt.

Quality of Service (QoS) Setup: Part 1 Reserve IP Addresses

It is necessary to reserve an IP address for a device that is connecting to the 3G29Wn router so that the QoS settings can manage each device and prioritize data packet traffic to each device. Each device connected to the router is identified by MAC and IP address. So that the IP address of a device does not change when the router or device is rebooted it is best practice to reserve the IP address.

1. Navigate to http://192.168.1.1 in a web browser using "**admin**" (no quotes) as both the username and password.
2. Select **Advanced** > **LAN** and select the **Add Entries** button.

3. Enter the **MAC address** of the device you are connecting to the 3G29Wn. Ensure you enter a colon (:) between every 2 characters.

4. Enter the IP address of the device you are connecting to the 3G29Wn. This will be a local address in the range of 192.168.1.x where x can be from 2 to 254.

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DHCP Static IP Lease

Enter the Mac address and Static IP address then click "Apply/Save" .

| MAC Address: | 00:1A:92:11:52:B5 | (xx:xx:xx:xx:xx:xx) |
| IP Address: | 192.168.1.2 | |

Apply/Save

5. Press the **Apply/Save** button.

6. Complete steps 2 -5 until you have reserved an IP address for all devices connected to the 3G29Wn. The Advanced > LAN page should then show the **Static IP Lease List** similar to the screenshot below.

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Local Area Network (LAN) Setup

Configure the Router IP Address and Subnet Mask for LAN interface. GroupName Default ▾

IP Address: 192.168.1.1
Subnet Mask: 255.255.255.0

☐ Enable IGMP Snooping

☐ Enable LAN side firewall

◯ Disable DHCP Server
⦿ Enable DHCP Server
   Start IP Address: 192.168.1.2
   End IP Address: 192.168.1.254
Leased Time (hour): 24

OPTION 42:
OPTION 66:
OPTION 150:
OPTION 160:

Static IP Lease List: (A maximum 32 entries can be configured)

MAC Address	IP Address	Remove
00:1A:92:11:52:B5	192.168.1.2	☐
00:14:A5:7A:63:CC	192.168.1.3	☐
70:F1:A1:53:A4:3D	192.168.1.4	☐

[Add Entries] [Remove Entries]

☐ Configure the second IP Address and Subnet Mask for LAN interface

[Save/Reboot]

Quality of Service (QoS) Setup: Part 2 QoS Queue Management Configuration

1. Select **Advanced** > **Quality of Service** > **Queue Management.**

2. Check the **"Enable QoS"** checkbox.

3. Set the "**Select Default DSCP Mark**" to **default(000000)**.

4. Press the **Apply/Save** button.

1. Select **Advanced** > **Quality of Service** > **Queue Setup**.

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QoS Queue Setup -- A maximum 16 entries can be configured.

If you disable WMM function in the Wireless Page, queues related to wireless will not take effect

Name	Key	Interface	Precedence	DSL Latency	PTM Priority	Enable	Remove
WMM Voice Priority	1	wl0	1			Enabled	
WMM Voice Priority	2	wl0	2			Enabled	
WMM Video Priority	3	wl0	3			Enabled	
WMM Video Priority	4	wl0	4			Enabled	
WMM Best Effort	5	wl0	5			Enabled	
WMM Background	6	wl0	6			Enabled	
WMM Background	7	wl0	7			Enabled	
WMM Best Effort	8	wl0	8			Enabled	

Add | Enable | Remove

2. Press the **Add** button.

3. The first queue we will create is for high priority QoS. Enter a **Name** to reflect this. In the example below the name is simply High_Priority.

QoS Queue Configuration

The screen allows you to configure a QoS queue entry and assign it to a specific network interface. Each of the queues can be configured for a specific precedence. The queue entry configured here will be used by the classifier to place ingress packets appropriately. **Note: Lower integer values for precedence imply higher priority for this queue relative to others** Click 'Apply/Save' to save and activate the queue.

Name:	High_Priority
Enable:	Enable
Interface:	pppoa0(0_0_100)
Precedence:	1
DSL Latency:	Path0

Apply/Save

4. Set the **Enable** option to "**Enable**".

5. Set the **Interface**. For Australian users select pppoe(0_8_35). For New Zealand users select pppoa(0_0_100).

6. Set the **Precedence** to "**1**". (1 being the highest priority, 3 being lowest priority).

7. Set the **DSL Latency** to "**Path0**".

8. Press the **Apply/Save** button.

9. Back on the **Advanced** > **Quality of Service** > **Queue Setup** page press the **Add** button.

10. Enter a **Name** to reflect a QoS queue of **Medium_Priority**.

11. Set the **Enable** option to "**Enable**".

12. Set the **Interface**. For Australian users select pppoe(0_8_35), for New Zealand users select pppoa(0_0_100).

13. Set the **Precedence** to "**2**".

14. Set the **DSL Latency** to "**Path0**".

15. Press the **Apply/Save** button.

16. Back on the **Advanced** > **Quality of Service** > **Queue Setup** page press the **Add** button.

17. Enter a **Name** to reflect a QoS queue of **Low_Priority**.

18. Set the **Enable** option to "**Enable**".

19. Set the **Interface**. For Australian users select pppoe(0_8_35), for New Zealand users select pppoa(0_0_100).

20. Set the **Precedence** to "**3**".

21. Set the **DSL Latency** to "**Path0**".

22. Press the **Apply/Save** button.

23. The **Advanced** > **Quality of Service** > **Queue Setup** page of the 3G29Wn interface should now resemble the screenshot below.

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QoS Queue Setup -- A maximum 16 entries can be configured.

If you disable WMM function in the Wireless Page, queues related to wireless will not take effect

Name	Key	Interface	Precedence	DSL Latency	PTM Priority	Enable	Remove
WMM Voice Priority	1	wl0	1			Enabled	
WMM Voice Priority	2	wl0	2			Enabled	
WMM Video Priority	3	wl0	3			Enabled	
WMM Video Priority	4	wl0	4			Enabled	
WMM Best Effort	5	wl0	5			Enabled	
WMM Background	6	wl0	6			Enabled	
WMM Background	7	wl0	7			Enabled	
WMM Best Effort	8	wl0	8			Enabled	
High_Priority	33	pppoa0	1	Path0		☑	☐
Medium_Priority	34	pppoa0	2	Path0		☑	☐
Low_Priority	35	pppoa0	3	Path0		☑	☐

[Add] [Enable] [Remove]

Quality of Service (QoS) Setup: Part 4 QoS Queue Configuration

The following steps shows how to setup 3 devices with QoS to a 3G29Wn router, one with high priority QoS settings, one with medium priority QoS settings one with low priority QoS settings.

High Priority Device QoS Settings

1. Select **Advanced** > **Quality of Service** > **Queue Configuration**.

2. Set the **Traffic Class Name** for the device you wish to set High Priority QoS for. In the example above the Traffic Class Name is simply called **High_Priority**.
3. Set the **Rule Order** as "**Last**".
4. Set the **Rule Status** to "**Enable**".
5. Set the **Class Interface**. Options include **Local** (traffic between devices connected to the 3G29Wn ie in the range 192.168.1.2-254), **eth0** – ethernet cable connection, **wl0** – wireless connection).
6. Select the Ether type. Options include **IP(0x800)**, **ARP(0x806)**, **IPv6(0x86DD)**, **PPPoE_DISC(0x8863)**,**PPPoE_SES(0x8864)**, **8865(0x8865)**, **8866(0x8866)**, **8021Q(0x8100)**.
7. Enter the **Source MAC Address**, the MAC address of the device you are connecting to the router.
8. Enter the **Source MAC Mask**. Also known as a source MAC Address wild card mask. Wildcards are used to mask all or part of a source IP address. Wild card masks specify which bits are used and which bits are ignored. A MAC mask of ff:ff:ff:ff:ff:ff indicates that no bits are important. A MAC mask of 00:00:00:00:00:00 indicates that all the bits are important. Use 00:00:00:00:00:00 or no mask at all.
9. Enter the **Destination MAC Address** if the destination is to a single server address and you know what the MAC address is. If you require the destination MAC address to be any address on the internet leave this field blank.
10. Enter the **Destination Subnet Mask** of 00:00:00:00:00:00 if you have entered a Destination MAC Address. If you did not enter a Destination MAC Address leave this field blank.
11. Enter the **Source IP Address**, the IP address of the device you have connected to the router.
12. Enter the **Source MAC Mask** of 255.255.255.0 if you have entered a Source IP address.
13. Enter the **Destination IP Address** if the destination IP address is to a single server address. If the destination is required to be any IP address leave this field blank.
14. Enter the Destination Subnet Mask of 255.255.255.0 if you entered a (Class 3) Destination IP Address, otherwise leave this field blank.
15. Set the **Differentiated Service Code Point (DSCP) Check** as **EF(101110).**
16. Select the **Protocol.** The above example is for a VoIP ATA so **UDP** for ports 5060 – 5061 is selected. Other options include **TCP**, **ICMP** and **IGMP**.
17. Enter the **UDP/TCP Source Port** (or port range) and **UDP/TCP Destination Port** (or port range) if required.
18. Set the **Assign Classification Queue** field. For this queue being of high priority select **pppoa0&Prec1&Path0** or **pppoe0&Prec1&Path0** depending on your type of connection.
19. **Set the Differentiated Service Code Point (DSCP) as EF(101110). (**Expedited forwarding – for high priority**).**
20. **Mark 802.1p priority** as **5.** In the scale from 0 -7, 0 is best effort, 6 and 7 are reserved for networking so set the highest priority as 5.
21. Set the **Tag VLAN ID [0-4094]:** to 0.
22. Set the **Rate Control (kbps)** if you wish to have a limit to the bandwdth, or else leave this field blank.

23. Press the **Apply/Save** button.

Medium Priority Device QoS Settings

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Add Network Traffic Class Rule

The screen creates a traffic class rule to classify the upstream traffic, assign queue which defines the precedence and the interface and optionally overwrite the IP header DSCP byte. A rule consists of a class name and at least one condition below. All of the specified conditions in this classification rule must be satisfied for the rule to take effect. Click 'Save/Apply' to save and activate the rule.

Traffic Class Name: Medium_Priority
Rule Order: Last
Rule Status: Enable

Specify Classification Criteria
A blank criterion indicates it is not used for classification.

Class Interface: eth0
Ether Type: IP (0x800)
Source MAC Address: 00:14:A5:7A:63:EE
Ether Type: IP (0x800)
Source MAC Address: 00:14:A5:7A:63:EE
Source MAC Mask:
Destination MAC Address:
Destination MAC Mask:
Source IP Address   192.168.1.3
Source Subnet Mask: 255.255.255.0
Destination IP Address:
Destination Subnet Mask:
Differentiated Service Code Point (DSCP) Check: AF32(011100)
Protocol: TCP
UDP/TCP Source Port (port or port:port):
UDP/TCP Destination Port (port or port:port):

Specify Classification Results
Must select a classification queue. A blank mark or tag value means no change.

Assign Classification Queue: pppoa0&Prec2&Path0
Mark Differentiated Service Code Point (DSCP):   AF32(011100)
Mark 802.1p priority: 3
Tag VLAN ID [0-4094]:   1
Set Rate Control(kbps):

Apply/Save

24. Select **Advanced** > **Quality of Service** > **Queue Configuration**.
25. Set the **Traffic Class Name** for the device you wish to set High Priority QoS for. In the example above the Traffic Class Name is simply called **Medium_Priority**.
26. Set the **Rule Order** as "**Last**".
27. Set the **Rule Status** to "**Enable**".
28. Set the **Class Interface**. Options include **Local** (traffic between devices connected to the 3G29Wn ie in the range 192.168.1.2-254), **eth0** – ethernet cable connection, **wl0** – wireless connection).
29. Select the **Ether Type**. Options include **IP(0x800)**, **ARP(0x806)**, **IPv6(0x86DD)**, **PPPoE_DISC(0x8863)**,**PPPoE_SES(0x8864)**, **8865(0x8865)**, **8866(0x8866)**, **8021Q(0x8100)**.
30. Enter the **Source MAC Address**, the MAC address of the device you are connecting to the router.
31. Enter the **Source MAC Mask**. Also known as a source MAC Address wild card mask. Wildcards are used to mask all or part of a source IP address. Wild card masks specify which bits are used and which bits are ignored. A MAC mask of ff:ff:ff:ff:ff:ff indicates that no bits are important. A MAC mask of 00:00:00:00:00:00 indicates that all the bits are important. Use 00:00:00:00:00:00 or no mask at all.
32. Enter the **Destination MAC Address** if the destination is to a single server address and you know what the MAC address is. If you require the destination MAC address to be any address on the internet leave this field blank.
33. Enter the **Destination Subnet Mask** of 00:00:00:00:00:00 if you have entered a Destination MAC Address. If you did not enter a Destination MAC Address leave this field blank.
34. Enter the **Source IP Address**, the IP address of the device you have connected to the router.
35. Enter the **Source MAC Mask** of 255.255.255.0 if you have entered a Source IP address.
36. Enter the **Destination IP Address** if the destination IP address is to a single server address. If the destination is required to be any IP address leave this field blank.
37. Enter the Destination Subnet Mask of 255.255.255.0 if you entered a (Class 3) Destination IP Address, otherwise leave this field blank.
38. Set the **Differentiated Service Code Point (DSCP) Check** as **AF32(011100).**
39. Select the **Protocol.** Options include **TCP**, **UDP**, **ICMP** and **IGMP**.
40. Enter the **UDP/TCP Source Port** (or port range) and **UDP/TCP Destination Port** (or port range) if required.
41. Set the **Assign Classification Queue** field. For this queue being of high priority select **pppoa0&Prec2&Path0** or **pppoe0&Prec2&Path0** depending on your type of connection.
42. **Set the Differentiated Service Code Point (DSCP) as AF32(011100).** (Assured forwarding – for medium priority**).**
43. **Mark 802.1p priority** to **3.** In the scale from 0 -7, 0 is best effort, 6 and 7 are reserved for networking.
44. Set the **Tag VLAN ID [0-4094]:** to **1**.
45. Set the **Rate Control (kbps)** if you wish to have a limit to the bandwdth, or else leave this field blank.

46. Press the **Apply/Save** button.

Low Priority Device QoS Settings

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Add Network Traffic Class Rule

The screen creates a traffic class rule to classify the upstream traffic, assign queue which defines the precedence and the interface and optionally overwrite the IP header DSCP byte. A rule consists of a class name and at least one condition below. All of the specified conditions in this classification rule must be satisfied for the rule to take effect. Click 'Save/Apply' to save and activate the rule.

Traffic Class Name: Low_Priority
Rule Order: Last
Rule Status: Enable

Specify Classification Criteria
A blank criterion indicates it is not used for classification.

Class Interface: wl0
Ether Type: IP (0x800)
Source MAC Address: 70:F1:A1:53:A4:3D
Source MAC Mask:
Destination MAC Address:
Destination MAC Mask:
Source IP Address 192.168.1.4
Source Subnet Mask: 255.255.255.0
Destination IP Address:
Destination Subnet Mask:
Differentiated Service Code Point (DSCP) Check: AF11(001010)
Protocol: TCP
UDP/TCP Source Port (port or port:port):
UDP/TCP Destination Port (port or port:port):

Specify Classification Results
Must select a classification queue. A blank mark or tag value means no change.

Assign Classification Queue: pppoa0&Prec3&Path0
Mark Differentiated Service Code Point (DSCP): AF11(001010)
Mark 802.1p priority: 0
Tag VLAN ID [0-4094]: 2
Set Rate Control(kbps): 200

Apply/Save

47. Select **Advanced** > **Quality of Service** > **Queue Configuration**.
48. Set the **Traffic Class Name** for the device you wish to set High Priority QoS for. In the example above the Traffic Class Name is simply called **Low_Priority**.
49. Set the **Rule Order** as "**Last**".
50. Set the **Rule Status** to "**Enable**".
51. Set the **Class Interface**. Options include **Local** (traffic between devices connected to the 3G29Wn ie in the range 192.168.1.2-254), **eth0** – ethernet cable connection, **wl0** – wireless connection).
52. Select the **Ether Type**. Options include **IP(0x800)**, **ARP(0x806)**, **IPv6(0x86DD)**, **PPPoE_DISC(0x8863)**,**PPPoE_SES(0x8864)**, **8865(0x8865)**, **8866(0x8866)**, **8021Q(0x8100)**.
53. Enter the **Source MAC Address**, the MAC address of the device you are connecting to the router.
54. Enter the **Source MAC Mask**. Also known as a source MAC Address wild card mask. Wildcards are used to mask all or part of a source IP address. Wild card masks specify which bits are used and which bits are ignored. A MAC mask of ff:ff:ff:ff:ff:ff indicates that no bits are important. A MAC mask of 00:00:00:00:00:00 indicates that all the bits are important. Use 00:00:00:00:00:00 or no mask at all.
55. Enter the **Destination MAC Address** if the destination is to a single server address and you know what the MAC address is. If you require the destination MAC address to be any address on the internet leave this field blank.
56. Enter the **Destination Subnet Mask** of 00:00:00:00:00:00 if you have entered a Destination MAC Address. If you did not enter a Destination MAC Address leave this field blank.
57. Enter the **Source IP Address**, the IP address of the device you have connected to the router.
58. Enter the **Source MAC Mask** of 255.255.255.0 if you have entered a Source IP address.
59. Enter the **Destination IP Address** if the destination IP address is to a single server address. If the destination is required to be any IP address leave this field blank.
60. Enter the Destination Subnet Mask of 255.255.255.0 if you entered a (Class 3) Destination IP Address, otherwise leave this field blank.
61. Set the **Differentiated Service Code Point (DSCP) Check** as **AF11(001010).**
62. Select the **Protocol.** Options include **TCP**, **UDP**, **ICMP** and **IGMP**.
63. Enter the **UDP/TCP Source Port** (or port range) and **UDP/TCP Destination Port** (or port range) if required.
64. Set the **Assign Classification Queue** field. For this queue being of high priority select **pppoa0&Prec3&Path0** or **pppoe0&Prec3&Path0** depending on your type of connection.
65. **Set the Differentiated Service Code Point (DSCP) as AF11(001010)**. (Assured forwarding – for low priority**).**
66. **Mark 802.1p priority** to **0.** In the scale from 0 -7, 0 is best effort, 6 and 7 are reserved for networking.
67. Set the **Tag VLAN ID [0-4094]:** to **2**.
68. Set the **Rate Control (kbps)** if you wish to have a limit to the bandwdth, or else leave this field blank. In the example screenshot above a limit of 200 kbps has been entered.

69. Press the **Apply/Save** button.

70. Select **Advanced** > **Quality of Service** > **Queue Classification**. You should now have QoS entries similar to the screenshot below.

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QoS Classification Setup -- A maximum 32 entries can be configured.

Choose Add or Remove to configure network traffic classes.
If you disable WMM function in the Wireless Page, classification related to wireless will not take effect

														CLASSIFICATION CRITERIA																	CLASSIFICATION
Class Name	Order	Class Intf	Ether Type	SrcMAC/ Mask	DstMAC/ Mask	SrcIP/ Mask	DstIP/ Mask	Proto	Src Port	Dst Port	DSCP Check	802.1P Check	Queue Key	DSCP Mark	802.1P Mark
High_Priority	1	eth0	IP	00:1A:92:11:52:B5		192.168.1.2/24		UDP	5060:5061	5060:5061	EF		33	EF	5
Medium_Priority	2	eth0	IP	00:14:A5:7A:63:EE		192.168.1.3/24		TCP			AF32		34	AF32	3
Low_Priority	3	wl0	IP	70:F1:A1:53:A4:3D		192.168.1.4/24		TCP			AF11		35	AF11	0

Add   Enable   Remove

71. Select **Management** > **Save/Reboot**.

Click the button below to reboot the router.

Reboot

72. Press the **Reboot** button and wait while the 3G29Wn reboots to enable the new QoS settings.