



Dramatically simplifying voice and data networking



edgeboxx

HOW-TO GUIDE

Quality of Service (QoS)



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edgeBOX QoS - Traffic Control

Out of the box, with a **default** edgeBOX configuration, **VoIP** traffic is always prioritized as **Gold**.

In this way all the **voice traffic** flowing to the Internet (outbound) is treated with higher priority than all remaining traffic. The **only action needed is to enable the QoS service**. This ensures higher priority than data packets from other traffic to Internet (Best Effort class).

The typical bandwidth weighting of Best Effort, Bronze, Silver and Gold is as follows:

Class of Service	Reserved minimum
Best Effort (BE)	10%
Bronze	20%
Silver	30%
Gold	40%

This means that, in the case of network congestion, BE will have a guaranteed 10% of the non-Premium bandwidth, Bronze will have 20%, etc.



Skype is not treated as Voice traffic, and therefore matches the internal configured "Best Effort" class

The upstream traffic control classification is performed in the following order:

1st - QoS service

2nd - Access profile

3rd - DSCP to CoS

If user authentication is active, the DSCP based classification will never be reached because access profile rules will always match and each profile is mapped into a CoS (Class of Service)



Detailed information about DiffServ (DSCP) can be found here:

http://en.wikipedia.org/wiki/Differentiated_services

Detailed information about Class of Service (CoS) can be found here:

http://en.wikipedia.org/wiki/Class_of_service

Traffic Control Panel

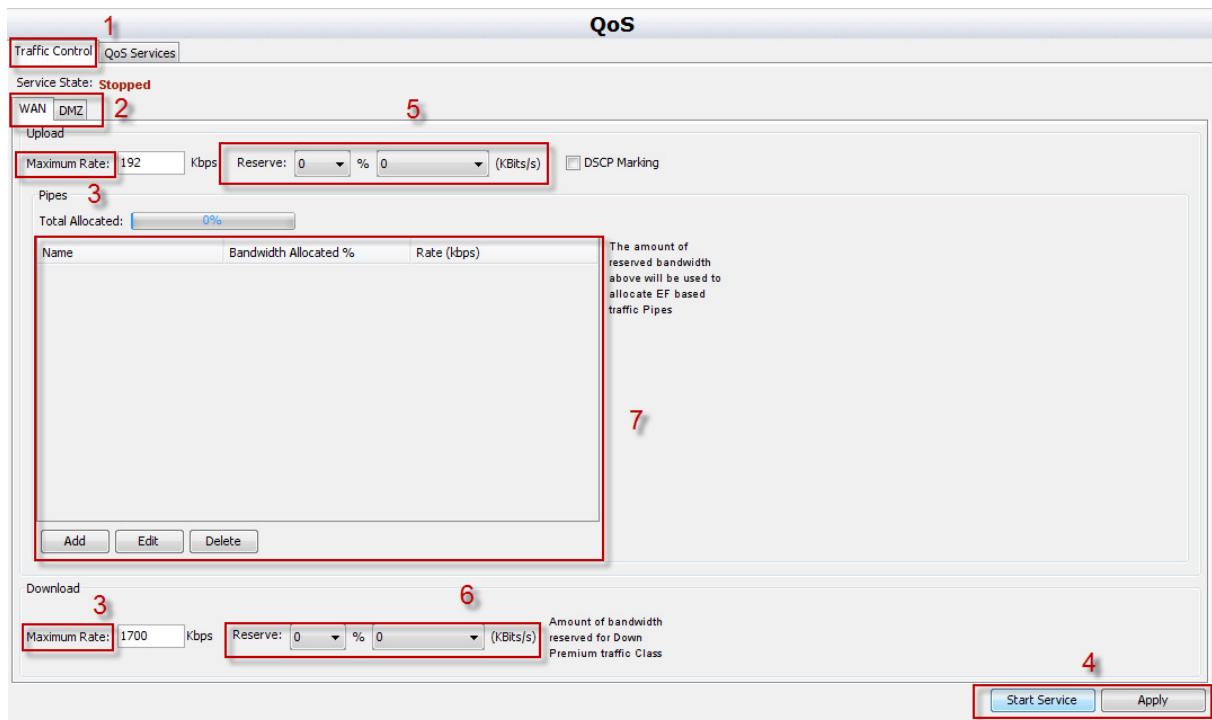


Figure 1

- 1 – Traffic control panel
- 2 – Interface selection
- 3 – Traffic Rates
- 4 – Start Service / Save settings
- 5 – Reserved/premium upload Bandwidth
- 6 – Reserved/premium download Bandwidth.
- 7 – Pipe definition

Activate basic QoS

You have to add WAN and DMZ bandwidth before starting the service:

- 1- Go to edgeBOX QoS -> Traffic Control -> Wan panel (figure 1: 1,2)
- 2- Input your rates (Maximum Rate) in Download and Upload sections. (figure 1: 3)



If you don't know your bandwidth, tools like www.speedtest.net may help

- 3- Do the same for the DMZ
edgeBOX QoS -> Traffic Control -> DMZ panel (figure 1: 2)



Don't reserve any traffic at this stage, leave all at zero and leave DSCP Marking unchecked (off).

- 4- Apply your changes (figure 1: 4)
- 5- Start QoS service by pushing the button "Start Service"(figure 1: 4)



Start Service is a global setting and applies to all interfaces.

Ground rules

- 1 - If you are not differentiating users QoS (by using Access Profiles QoS definition) it is advisable not to use pipes, as edgeBOX will be differentiating VoIP traffic for you.
- 2 - If you need to differentiate (classify) specific traffic in one of the available classes, avoid using Gold class, as this is the one used for Voice Traffic, use Bronze first, and Silver as a last resort.
- 3 - If your scenario requires Gold classification, then it is advisable to create a pipe for all your voice traffic, as it will be treated with higher priority than Gold.
- 4 - QoS pipes allow you to enforce advanced traffic disciplines in your network, but please make sure you do the proper measurements of your network usage before configuring pipes. If you fail to do the proper calculations you may be starving your network or bandwidth.



Traffic which uses Reserved/Premium bandwidth bypasses the Proxy, thus it cannot be blocked via Content Filtering.

QoS in Access Profiles

If you want to give different priorities to traffic generated by different users, the easiest way is to set both an upload and a download Class of Service in the Access Profile you want that user to belong (figure 2)

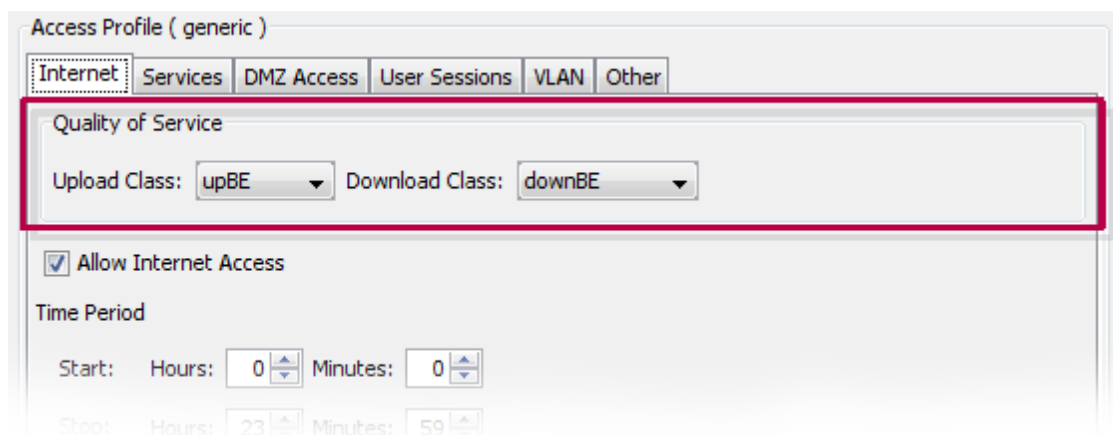


Figure 2

Traffic Control – Pipes

Pipes can be defined to segment the reserved premium Bandwidth for building a more granular upload traffic QoS Policy.

For example, if you want to guarantee bandwidth for a warehouse software application, that might need priority better than “best effort”. Let’s assume you need 13Kbit/s for this on a 256Kbit/s link.


When pipes are created, you specify a percentage of the reserved Premium Bandwidth, if Premium Bandwidth is 50% of your 256Kbit/s link (figure 3: 1) and you set a reserve of this 10%, the pipe will be 10% of 50% of 256Kbit/s , which is approx 13KBits/s. (figure 3: 1)

The screenshot shows the QoS configuration interface. The 'WAN' tab is selected. The 'Service State' is 'Running'. Under 'Upload', the 'Maximum Rate' is 256 Kbps. A red box labeled '1' highlights the 'Reserve' dropdown set to 50% and the resulting rate of 128 (KBits/s). Below this, the 'Pipes' section shows a table with one entry: 'warehouse' with a bandwidth allocated percentage of 10% and a rate of 13 kbps. A red box labeled '2' highlights this table entry. A progress bar shows 'Total Allocated: 10%'. A note on the right states: 'The amount of reserved bandwidth above will be used to allocate EF based traffic Pipes'. At the bottom are 'Add', 'Edit', and 'Delete' buttons.

Name	Bandwidth Allocated %	Rate (kbps)
warehouse	10	13

Figure 3

Be careful, if a pipe has been allocated 25% of the total bandwidth (i.e. for warehouse traffic), but 30% might be needed, it cannot use non allocated bandwidth, even if the pipe is full and there is spare bandwidth outside the pipe.

 Like a “real world pipe” – if it's full, then it's full. Traffic allocated to a pipe cannot share bandwidth with any other pipe or with traffic not allocated to a pipe.

Assign a Pipe

When a pipe is defined it needs to be used in a QoS rule (see “QoS Services”) or assigned to an “Access Profile Policy” (for more details about Access Profiles see the NAC section of the edgeBOX Management Interface). NAC -> Access Profiles -> “select a profile to define policy” -> select “Upload Class”

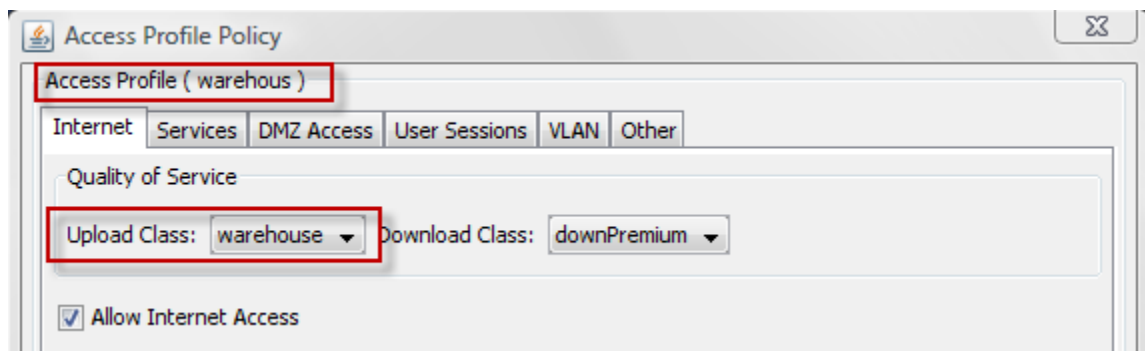


Figure 4

edgeBOX QoS – Services

In most cases it will be OK to use the simple QoS activation as described in the first section of this document. Whenever you don't want to work with NAC Access Profile policies, you can try working with pipes together with the QoS Services panel (figure 5: 1)

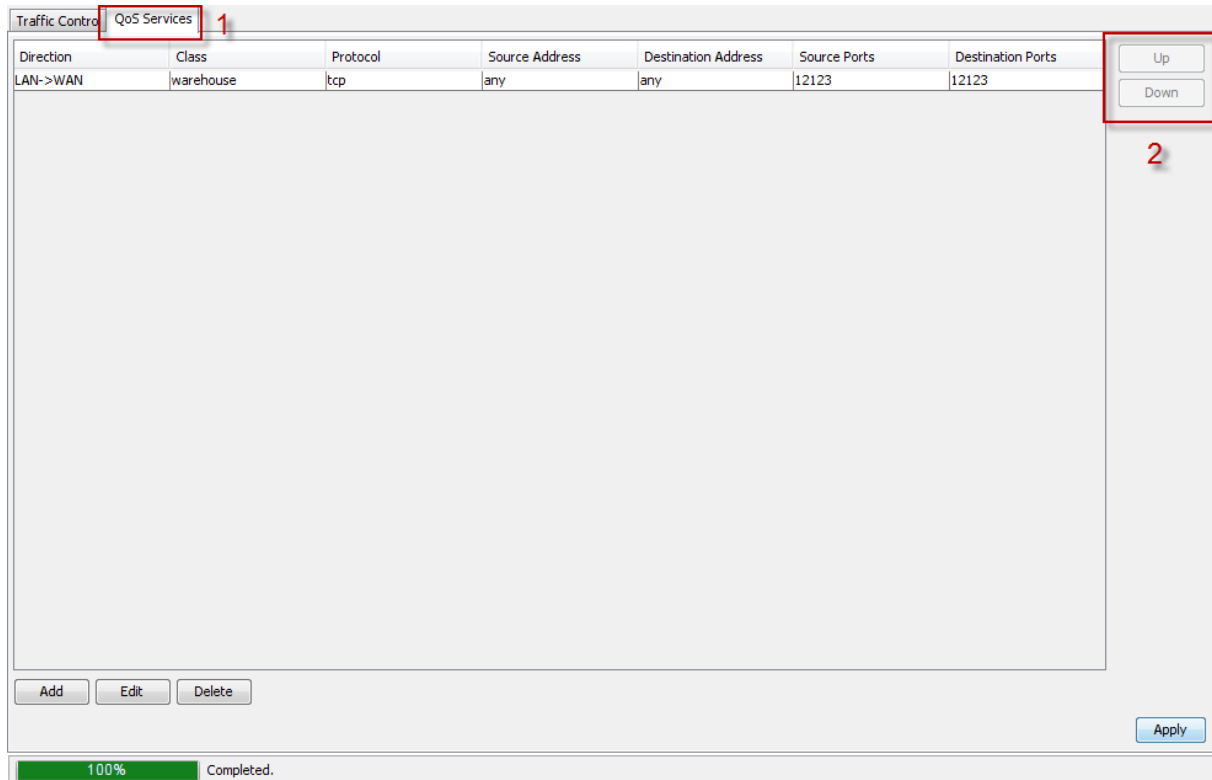



Figure 5

If you are working with port ranges, the rule which includes the port first takes priority. Therefore you have the ability to “order” or “sort” the QoS rules (figure 5: 2)

QoS Services – QoS Rules

You can see in the figure below how to assign your predefined Pipe to a QoS rule. In addition the tcp port of your warehouse application is added. For details about other setup capabilities, like restricting a QoS rule for IP address or a range, please look at the Online Help (QoS -> QoS Service -> Create a new QoS rule)

 You have to press “apply” in the QoS Service rules plane.
Rules not applied will disappear when switching between Traffic Control and QoS Services Tab

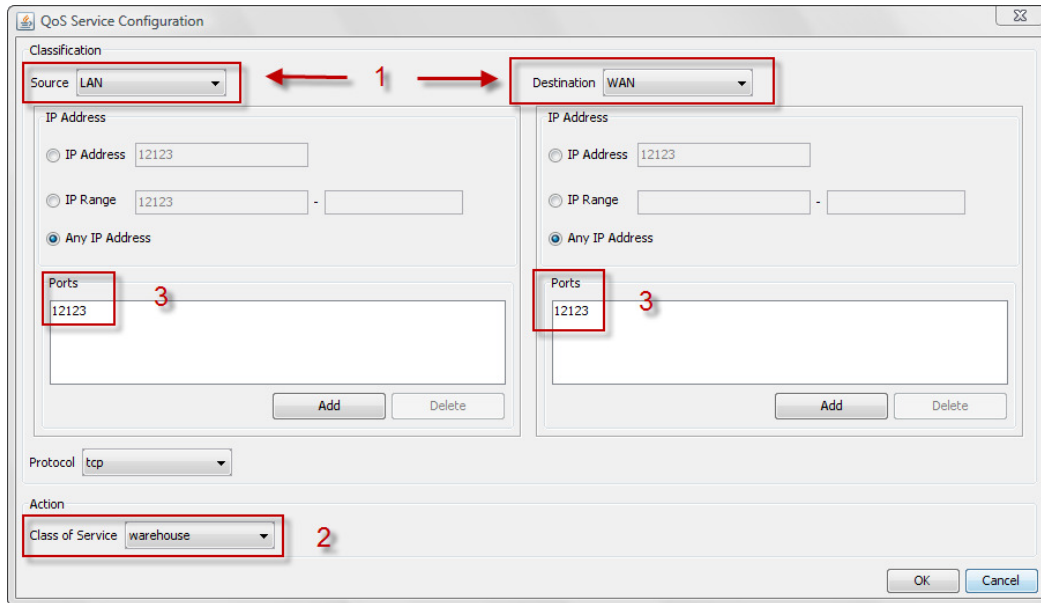



Figure 6


- 1 - define source and destination; 2 - assign Class of service (the “warehouse” CoS defined earlier has been used here) 3 - add the port of your warehouse application

 The LOCAL zone in Source and Destination refers to the edgeBOX itself. It is used when we want to create a rule that applies to traffic originating or terminating at the edgeBOX.

Example Configuration for VoIP

- 1 - Determine the Maximum Rates for Upload and Download that you can achieve through your broadband connection. Add a margin of between 5 and 10% to allow for bandwidth fluctuations.
- 2 - Go to the edgeBOX -> QoS -> WAN panel and add these figures into the Maximum Rate fields for Upload and Download (values of 1400 for our example).
- 3 - Calculate your maximum VoIP upload (outbound) bandwidth requirements. This is calculated by the sum of (maximum calls per proxy X codec rate)
Let assume you have 8 G711 calls and 1 GSM calls through your proxy.
This will be:

$$(8 \times 80k = 640k) + 29.2k = 669.2 \text{ Kbps}$$

 Since Codec payload and overhead vary, you may use the following calculator to get an accurate bandwidth summary: <http://site.asteriskguide.com/bandcalc/bandcalc.php>

- 4 - When you know the minimum bandwidth requirement, go to the edgeBOX -> QoS -> WAN panel and reserve the amount of bandwidth for upload and

download as described in the first section of this document.

- 5 - Create a pipe for voice as described in the “Traffic Control – Pipes” section of this document (in this example we use “allVoIP”) next go to edgeBOX -> QoS -> QoS Services panel and define the traffic that will flow in the previously defined pipes.
- 6 - Add a service for **inbound** traffic:
 - source = "WAN" destination = "LOCAL"port
 - source ports = 10000 to 20000 (VoIP port range), 4569 (for IAX2 trunks), 5060 (for SIP signaling)
 - protocol = "UDP" (protocol used by VoIP)
 - class of service = "downPremium"
- 7 - then add a service for **outbound** traffic :
 - source = "LOCAL" destination = "WAN"
 - protocol = "UDP"
 - source ports = 10000 to 20000 (VoIP port range), 4569 (for IAX2 trunks), 5060 (for SIP signaling)
 - class of service = <your pipe name> (in this example “VoIP”)
- 8 - You should get a configuration like the one shown in figures 7 and 8

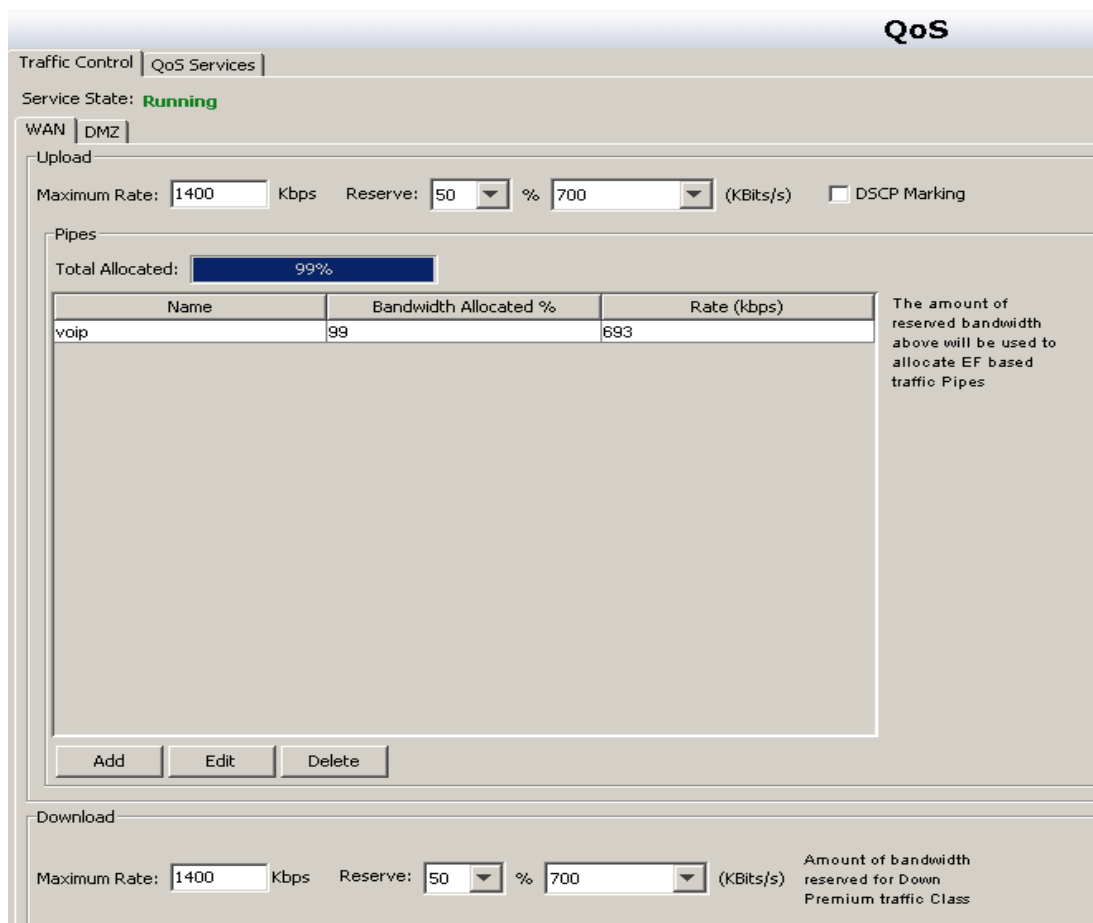


Figure 7

QoS						
Traffic Control		QoS Services				
Direction	Class	Protocol	Source Address	Destination Address	Source Ports	Destination Ports
WAN->LOCAL	downPremium	udp	any	LOCAL	any	10000-20000,4569,5060
LOCAL->WAN	voip	udp	LOCAL	any	10000-20000,4569,5060	any

Figure 8

If you want outbound traffic classified and marked in accordance with the diffserv architecture you can enable **DSCP Marking**. This feature will only be useful if the upstream router is QoS-aware. If the upstream router belongs to your ISP this usually involves establishing a QoS diffserv agreement with them.