

## What does NBN Quality of Service (QOS) mean?

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Broadband services are mostly “best effort”. This means two things, no guarantees for bandwidth (i.e. download/upload rates), and no preference for individual subscribers. The NBN changes this. Data traffic from (or to) individual subscribers will be divided into “traffic classes”, each class assigned a different Quality of Service or QOS.

This means voice calls or Pay TV traffic can receive preference over other traffic types, e.g. Internet browsing or email. The result: better performance for voice, Pay TV and other premium services

Quality of Service has long been an enterprise network feature. The NBN will now provide Quality of Service to individual subscribers (e.g. households) as well. This report shows how.

### **Background**

The Internet has mostly been a best effort network, treating all traffic equally. The best effort model works well for email, Internet browsing, less so for voice and video conferencing. Broadband access is usually best effort as well.

Over the last two decades, data network Quality of Service (QOS) mechanisms have improved greatly. QOS is widely applied, e.g. to provide guaranteed bandwidth for enterprise networks.

Enterprise customers need QOS capabilities, e.g. to ensure corporate voice service quality, and will pay extra to get them. To date there has been little need for QOS for household broadband subscribers.

However, as well as replacing existing broadband access networks, the NBN also replaces the fixed line voice network. Hence this is a clear need for NBN QOS to individual subscribers, to at least ensure adequate voice services.

### **How does QOS work?**

QOS essentially means giving preference to one traffic type over another. For example, sending voice traffic before email traffic. When a broadband network becomes busy (e.g. during evening “peak” hours), voice traffic QOS ensures call quality, even though download/upload speeds for other traffic types (e.g. email) may decrease.

To provide QOS two things are needed. The first is a means to identify traffic types, e.g. a marker for voice traffic, another for email, another for video and so on. Then a method is needed to give priority to one traffic type over another.

Traffic identification may be done by inserting a “priority” field at the front of each data “packet”. The NBN is based on Ethernet technology, where a 3 bit “Priority Code Point” field at the start of each Ethernet packet allows the QOS “class” to be identified.

For example, a Priority Code Point value of 5 (the three bits set to “101”) might be assigned to all Ethernet voice call packets. This identifies the voice packets as highest priority. A lower priority value (e.g. 4) might be assigned to all video conferencing packets. Best effort packets may then be assigned a Priority Code Point value of 0.

Once the various traffic types have been identified, using the Priority Code Point field, then preferential treatment can be applied. Essentially this means a separate “queue” for each traffic class at the various network nodes. Traffic (e.g. Ethernet packets) in the highest priority queues are sent first, the lowest priority queue goes last, the others in between.

There are many other details, but this is essentially how QOS is applied.

### **How does the NBN provide QOS?**

The NBN identifies 4 QOS categories, or classes. These are

Traffic Class 1 (TC\_1): meant for voice or other services with strict delay requirements

Traffic Class 2 (TC\_2): meant for interactive video services

Traffic Class 3 (TC\_3): enterprise data services, e.g. with guaranteed bandwidth

Traffic Class 4 (TC\_4): best effort

Traffic Class 1 has the highest priority, Traffic Class 4 (the default class) has the lowest priority.

The standard NBNC0 “Access VC”, which will underpin most subscriber broadband services, provides 150 kbps of TC\_1 capacity. This is for the NBN supported voice service, which replaces the previous fixed line voice service. For the default Access VC, all additional subscriber traffic is designated Traffic Class 4 (TC\_4), i.e. best effort with no guarantees.

Several methods may be used to indicate or mark traffic belonging to the four NBN Traffic Classes. A key method will be the Ethernet Priority Code Point (PCP) field outlined above. Here Ethernet frames (or packets) are assigned PCP values as follows

TC\_1 gets a PCP value of 5

TC\_2 gets a PCP value of 4

TC\_3 gets a PCP value of either 3 or 2

TC\_4 gets a PCP value of 1

Ethernet packets with higher PCP values are assigned higher priorities within the respective NBN nodes. Hence Traffic Class 1 (TC\_1), with a PCP value of 5, gets the highest priority.

In particular, the various NBN traffic classes apply within the “Network Terminal Unit” or NTU installed within subscriber premises (the box replacing the current broadband gateway). This NTU recognises the 4 NBN traffic classes described above, and essentially sorts incoming traffic (from the subscriber) into 4 queues, one for each traffic class.

These queues determine the order in which traffic from the 4 respective classes is sent into the NBN, hence providing the required QOS capability. Similar mechanisms are used within the NBN to enforce the four traffic classes for incoming traffic to the subscriber.

### **What does NBN QOS actually provide?**

The technical details aside, NBN QOS allows different services to operate without interfering with each other. For example, NBN based Pay TV or voice services can operate normally, even if all the teenagers within a neighbourhood download games/music at once. In contrast, current broadband services generally deteriorate when overall traffic levels increase.

Within a given home, NBN QOS ensures the performance of voice/video services remain similarly unaffected by the online activities of the various house members.

### **Summary**

The NBN will provide Quality of Service (QOS) to individual subscribers. This guarantees the performance of critical services, e.g. voice calls, regardless of other data traffic levels. To enable QOS, traffic “classes” are identified. The NBN uses industry standard mechanisms to do this. The result is four NBN Traffic Classes, designed to maintain performance of premium services such as voice, interactive video and Pay TV, while allowing normal Internet browsing activities.