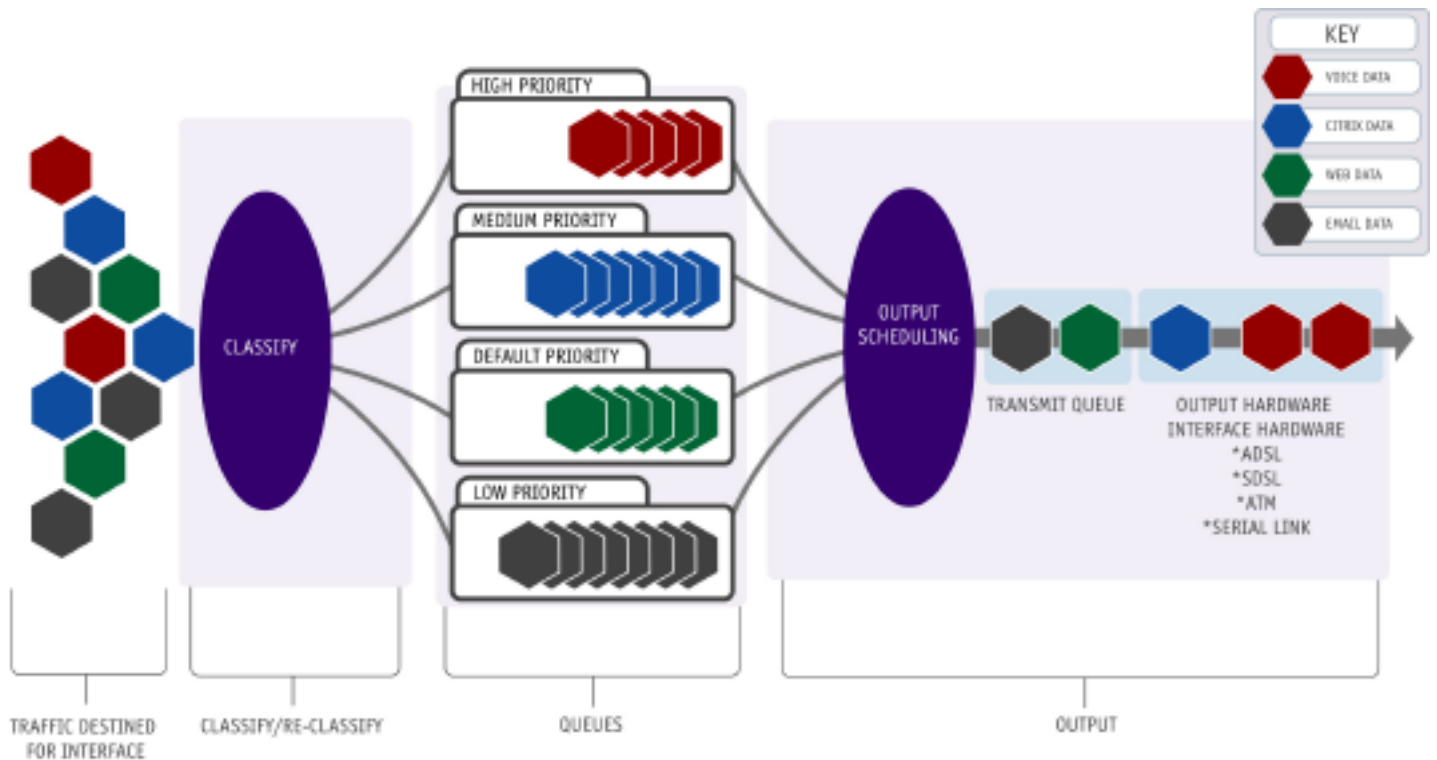


QoS Enabled Broadband

- Is your ISP shouting fact or fiction?

What is QoS, why is it required and who is really delivering it?



Contents

What is QoS?	3
Why is QoS needed?	3
What applications/services require QoS?	3
What's important for real-time traffic?	3
Delay, Jitter and Packet Loss	3
What is contention and why is it important to QoS?	4
What type of broadband services support QoS?	4
Is QoS available on contended broadband services?	4
I have an uncontended broadband service, doesn't that provide QoS?	5
Where should QoS be implemented in a broadband network?	5
How is queuing implemented in a broadband network?	5
What questions should I ask my ISP about their QoS enabled broadband?	6
What should you consider when looking for QoS enabled broadband?	6
Node4's QoS enabled broadband	7
About the author	7
About Node4	7

What is QoS?

In short Quality of Service (QoS) is the ability to guarantee that an IP packet be sent from source to destination within a given time. QoS enables the network to deliver a differentiated service to certain traffic classes.

Why is QoS needed?

Without QoS IP traffic can be delayed or even lost.

Why is this important? Well with general internet traffic, such as web browsing or file transfers, it isn't but with real-time traffic delay or packet loss can have a significant impact.

Traditionally QoS has not been available within broadband networks and therefore customers have been unable to migrate from leased lines, or MPLS based VPN's both of which can support QoS, to cost-effective broadband for their real-time business-critical data.

Companies who have tried to deliver VoIP between their sites using standard broadband and IPsec VPN's have quickly come to understand the reasons for requiring a QoS enabled network, as the voice quality they experienced is not acceptable for today's business user no matter what the cost savings maybe.

What applications/services require QoS?

Real-time applications such as Voice over IP (VoIP) and Video over IP are dependant on a QoS enabled network in order to perform well. Without QoS voice quality will be poor - speech may be broken, echo may be experienced or a call maybe dropped. It's a similar story with video.

For interactive data applications such as Citrix a delay causes aggravation to the end user as they wait for the application to 'catch up', and packet loss will result in a session closing.

What's important for real-time traffic?

Delay, Jitter and Packet Loss...

Delay - delay is the time it takes a packet to travel from source to destination. For VoIP one way delay should be less than 150ms.

Jitter - Jitter is inter-packet delay, jitter can be positive or negative. If jitter is too great, generally over 20ms, it can severely affect voice quality.

Packet loss - VoIP is very intolerant to packet loss.

What is contention and why is it important to QoS?

Contention is the number of other customers who share the bandwidth from your local exchange to your ISP. If you have a 1Mbps 50:1 contended service you share that 1Mbps with 50 other customers. If no one else is using their broadband service then that 1Mbps can be used by you, if 30 customers download data at the same time then you only receive 1/30th of the 1Mbps. Depending on your ISP contention ratio's can vary, you will pay more to receive a service with a lower contention. In general 50:1 (residential) and 20:1 (business) are the most common.

Contention is directional - it can be upstream, customer-to-ISP and downstream, ISP-to-customer. Generally an ISP states only the downstream contention and not the upstream.

Today contention is only just beginning to become an issue, and as the take up of broadband rapidly increases as more people perform more tasks on-line, contention will become more and more of a problem to business user.

Contention is important as means that there are no guarantees, because you share the bandwidth you don't know when you will access to the bandwidth. A contended service can not provide QoS1.

1 With two exceptions - where 4:1 contention is used on ADSL with Hierarchical Shaping with Back Pressure (not supported by many ISP's) and where two PVC's are delivered to the CPE one which is contended and used for non-real-time traffic and the other which is not contended and used for real-time data (again this is not supported by many ISP's).

What type of broadband services support QoS?

QoS is only supported on broadband provided over BT Datastream and Local Loop Unbundled (LLU) networks. LLU is where the ISP installs their own broadband equipment in the BT exchanges.

To ensure that delay, jitter and packet loss are controlled within an ATM based broadband network, the ATM virtual paths must be provisioned using Variable Bit Rate (VBR) or Constant Bit Rate (CBR). Unspecified Bit Rate (UBR) paths are not capable of providing QoS as they provide no traffic guarantees.

BT's IP Stream service - used by the vast majority of ISP's to deliver broadband - is not currently capable of supporting QoS.

Is QoS available on contended broadband services?

In general no, however some ISP's may offer an ADSL service with 4:1 contention. In this instance they may provide 4:1 downstream and 1:1 (uncontended) upstream. This service, if delivered with Hierarchical Shaping with Back Pressure, is capable of providing QoS but availability is limited as it must be supported within the ISP's equipment.

I have an uncontended broadband service, doesn't that provide QoS?

An uncontended broadband service alone does not provide QoS. Over-subscription and congestion can occur, either downstream or upstream, which can result in delay and packet drops.

By default a router and the ISP's Broadband Remote Access Server (BRAS) will implement tail-drop - once congestion occurs, output buffers fill and any further traffic entering the buffer is dropped.

To provide QoS queuing must be applied on the ISP's Broadband Remote Access Server (BRAS) and the Customer Premises Equipment (CPE) device (router). Queuing ensures that, when congestion occurs, the most important traffic is sent and the least important is either delayed or dropped.

Where should QoS be implemented in a broadband network?

QoS must be implemented end-to-end, from the source device to the destination device. Within the broadband network QoS must be configured on the CPE, a QoS capable router is required for this, and on the ISP's BRAS.

Not all BRAS installed in ISP networks are capable of providing QoS.

How is queuing implemented in a broadband network?

Interface queuing must take place on the CPE and on the ISP's BRAS. To support VoIP the queuing algorithm should support a priority or low latency queue. This queue ensures that VoIP traffic is always sent first, keeping delay and jitter to minimum.

What questions should I ask my ISP about their QoS enabled broadband?

- Q. What downstream and upstream contention is there on the QoS service?
- Q. What ATM service category is used for the QoS service?
- Q. Do you use IP Stream to deliver the QoS service?
- Q. How many classes of service do you support?
- Q. Are these classes of service fixed or bespoke?
- Q. What is the end-to-end delay?
- Q. What is the expected jitter?
- Q. What is the expected packet loss?
- Q. What Service Level Guarantees do you provide?
- Q. Can you monitor the service to ensure that the service I am receiving adheres to the service guarantees?

What should you consider when looking for QoS enabled broadband?

- Q. How much bandwidth is required for real-time, interactive and data traffic?
- Q. What broadband services are available at your location? (ADSL/SDSL)
- Q. How important is QoS for your business?

Node4's QoS enabled broadband

Node4 are one of only a few ISPs who can offer true QoS enabled broadband. This is backed by service guarantees which can be proactively monitored, with published Service Level Agreements which can be viewed in real-time.

- Node4 deliver QoS enabled broadband over BT Datastream using VBR or CBR paths or over a LLU network.
- Node4 provide Service Level Guarantees for delay, loss and jitter.
- Node4 can provide a bespoke service - QoS configuration can be tailored to the customer requests.
- Node4 supports up to 8 classes of service.
- None of our traffic traverses the public internet
- Node4's BRAS is capable of supporting 32,000 subscribers, 8,000 with QoS

The Node4 network is tried and tested, for example:

A major IP Enabled PBX manufacturer has chosen Node4's to provide QoS enabled broadband to their customers to carry their inter-site voice traffic.

HostTALK, a centrex IP telephony solution, delivers its services through Node4's QoS enabled broadband.

About the author

Chris Pagel is CCIE qualified with a focus on Voice over IP and Cisco IP Telephony. He has been involved in the design and implementation of many IP-VPN and IP Telephony projects with roll-outs of up to 1500 extensions and across 60 sites.

Chris has held previous technical engineer and consultant roles within Kingston Communications PLC, Milgo Solutions Ltd and Omnetica. He joined Node4 in May 2004 and heads up the Technical department.

About Node4

Node4 believe that any business should be able to take advantage of the benefits that technology brings. Node4 have developed a range of compelling solutions that can help any business use technology to give them a competitive advantage over their competitors.

Using their investment made in the data centre and national broadband network, the service portfolio includes:

- Business Class Broadband
- IP-BVN (QoS Enabled Broadband Network for multiple Sites)
- IP Telephony (Hosted & Dedicated)
- Hosting & Co-location
- Hosted Applications (Citrix & Microsoft)
- Professional Services & Support