netSERVICES
alltogether® Business

# QoS DSL VPN

alltogether® Networks

**Converged networks, where voice and all data services use the same access circuit, are the ultimate goal for most businesses. The cost benefit of having one line, both from a provisioning and management perspective, are very often the key driver. It is ironic however, that in the circumstances where converged networks are most required i.e. small branch offices or to support teleworkers, they often don't cost in.**

DSL technology has become the access of choice in scenarios where cost is a key consideration. However, until now, this technology has not supported Quality of Service (QoS) to enable the prioritisation across the line.

NetServices have developed the ability to deliver QoS over DSL access. This capability allows prioritisations to be specified across the lowest cost access technology - IPStream DSL. QoS over ADSL is available at over 99% of UK locations and therefore opens up networking to areas where it previously would not have been possible, or economical, to connect.

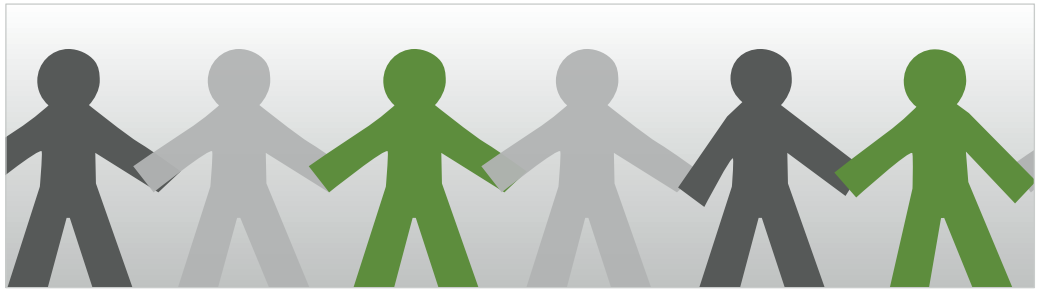
## Connect even the smallest of sites

Connecting, and more specifically converging, smaller sites has remained a challenge to many businesses as the cost of leased line and Ethernet technologies can be prohibitive and until now DSL has not been able to support convergence.

With QoS DSL IPStream now enabling prioritistion across DSL, even single user (e.g. teleworker) sites can be connected into a converged network ensuring projects such as IP telephony roll-outs can extend to even the smallest sites with a limited bandwidth requirement.

## Speed to install

The benefits of converged networks are now widely recognised, though the delay in upgrading the network can impact on the return on investment advantage.



QoS DSL IPStream has a minimal installation fee and faster lead times than traditional leased line and Ethernet technologies so can be virtually immediately installed to any site providing fast recuperation of the outlay.

## Extend existing WAN

With the QoS DSL VPN, service providers and systems integrators can now deploy converged infrastructure solutions to multi-site organisations where there are a number of branch or SOHO locations currently connecting outside of the existing converged WAN. The connectivity for their larger client sites can either remain with their existing MPLS VPN providers or can be provisioned by the use of the complementary NetServices Managed or Supported MPLS VPN services.

## The importance of QoS IPStream

Previously contended DSL offered a limited form of QoS in the upstream direction but not in the downstream direction. This has resulted in an inconsistent user experience especially when running a real-time data application.

For example when making a voice call, speech quality may be acceptable until a large data file starts downloading simultaneously. With no downstream QoS available, voice and data traffic are competing for bandwidth which can result in jitter, delay and packet loss ultimately causing speech quality to be detrimentally affected.

**NetServices QoS IPStream VPN is made of the following components:**

- QoS over ADSL circuit
- Managed CPE router-located at client sites
- QoS enabled nationwide MPLS Core Network connectivity
- Aggregation circuit options
  - Privately Managed Access Link into an organisation
  - MPLS Interconnection (Handover)

## QoS DSL – IPStream, Tail Access Circuit

The NetServices QoS DSL - IPStream offering provides downstream QoS over contended DSL circuits. NetServices utilise the Cisco feature "per session shaping and queuing over L2TP" providing a best effort QoS capability through the BT IPStream networks.

QoS IPStream tails are available with a fixed bandwidth and a finite number of service policy options in both converged and data-only formats. The downstream bandwidth of the converged offering is limited to 800kb/s, and the data offering 2Mb/s. Both services use ADSL MAX*.

Example Service Types

| Service Type[4] | Downstream Bandwidth | Upstream Bandwidth | Class of Service | | |
|---|---|---|---|---|---|
| | | | Platinum IP Precedence 5 | Gold Platinum IP Precedence 3 | Bronze IP Precedence 1 |
| Converged - Option 1 | 800Kb/s | 800Kb/s* | 50Kb/s | 300Kb/s | 450Kb/s |
| Converged - Option 6 | 800Kb/s | 800Kb/s* | 300Kb/s | 300Kb/s | 100Kb/s |
| Data Only - Option 1 | 2Mb/s | 800Kb/s* | NA | 500Kb/s | 1.5Mb/s |
| Data Only - Option 4 | 2Mb/s | 800Kb/s* | NA | 2Mb/s | 0Kb/s |

**ADSL Max uses rate adaptation and advanced line management tools to find the best service that a line can support. It will allow the end-user customer to achieve the highest stable line rate that their line can RELIABLY support from 288 kb/s up to 8,128 kb/s in the downstream direction and up to 812kb/s in the upstream direction.*

The difference in size between these offerings reflects the best efforts nature of the BT IPStream network, and the tolerance of non-real time data traffic in comparison to real-time traffic.

NetServices have the ability to configure real-time queues up to 500 Kb/s.

## Managed Cisco 877 Integrated Service Router

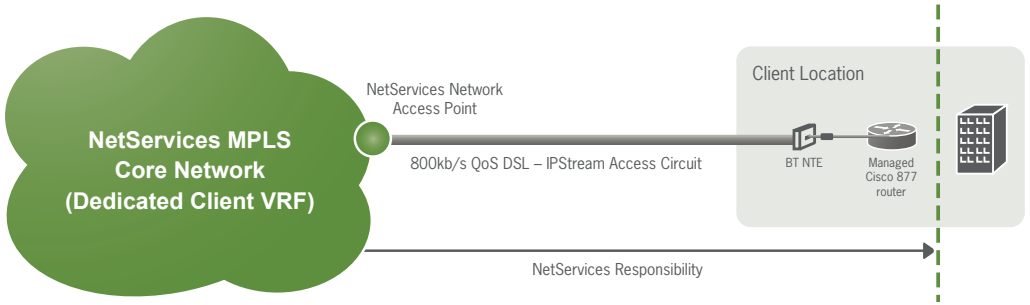
NetServices deploy best of breed hardware using the Cisco 877 Integrated Service Routers as standard for QoS IPStream access circuits.

NetServices will configure and manage the CPE in line with the defined client architecture. Routers are shipped to site with installation instruction or customers have the option to request NetServices engineers install and test the routers on-site.

All router configurations are tested within the NetServices Network Management Centre (NMC) prior to dispatch.

The router is managed by the NetServices management and monitoring platforms. The customer interface in all cases will be presented as an RJ45 copper Ethernet port which is the point of demarcation for this service.

**Figure 1. Managed MPLS VPN Service Demarcation**



## Class of Service

QoS DSL WAN is a fully managed solution where NetServices has complete control of end-to-end connectivity in order to guarantee quality of service. The network partitions traffic into three unique classes and then applies QoS accordingly.

These classes of service are deployed as follows:

| Class of Service | IP Precedence | Typical use |
|---|---|---|
| Platinum | 5 | Multi-media applications such as voice and video only. Expected performance is equivalent to a 1:1 DSL service |
| Gold | 3 | Mission critical data applications such as voice, video, SAP, Citrix, etc. Expected performance is equivalent to a 5:1 DSL service. |
| Bronze | 1 | Best effort data applications such as Internet, Email and FTP. Expected performance is equivalent to a standard 20:1 DSL service. |

The managed router receives the marked IP packets from the LAN which are then classified using QoS techniques incorporated into the agreed WAN service policy. The service policy is only acted upon during periods of network congestion so that the real time traffic is prioritised under these conditions. This can be achieved in a number of ways but most fundamentally a prioritised queuing mechanism is deployed on outbound network interfaces.

NetServices deploy LLQ (low latency queuing) in the outbound direction of network interfaces. This reserves a fixed portion of bandwidth for prioritised traffic at all times – in effect providing a bus lane so that even during congestion there is a clear path for that traffic.

## Support

Target uptime is 99.5% for customers with BT Enhanced Care on DSL lines and BT Total Care on the assigned PSTN.

On occasions where managed CPE hardware develops a fault for any reason, NetServices will arrange for onsite-hardware diagnosis, and device replacement if necessary.

The hours of coverage for the hardware maintenance contract will be harmonised with the fault management hours of coverage as either: Core Hours or Extended Hours. Typical hardware fault response time is four hours during the agreed hours of coverage.

ADSL MAX Office connectivity is provided under the BT Standard Care service. This is a 'best efforts' service and service level agreements are restricted by the limitations of the access circuits with a committed fix of 40 working hours.

In the event where CPE hardware or the line develops a fault for any reason, NetServices will perform line fault diagnostics and if necessary arrange for next working day device replacement. Line and hardware support for satellite sites is available from 08:00 to 20:00 Monday to Friday excluding bank holidays.

## Options

### Aggregation Circuit Options

Two options are available to aggregate site connectivity: a privately managed access connection can be provisioned to a location as detailed in the NetServices Managed MPLS VPN service or for service providers and many systems integrators. Alternatively a direct private peering connection with NetServices at one of the NetServices Super POPs can be used to aggregate connections. This connection can be in the form of an MPLS handover.

### Internet Breakout from the cloud

The majority of QoS DSL WAN solutions are architected to provide secure communications between satellite and central locations. In some scenarios, this may be extended to provide a breakout to the public internet.

### Enhanced Care

BT's Broadband Enhanced Care provides extended hours support for DSL circuits allowing NetServices to request BT investigate suspected DSL line faults on a 24 x 7 basis. For maximum protection, the underlying PSTN circuit should also be covered by BT's Total Care service offering. The target fault resolution time is sub 24 hours when the enhanced care option taken and sub 40 working hours when this option is not taken.

### PSTN Line Provisioning

NetServices can optionally provision and manage the PSTN bearer circuits providing that an outbound calling block is placed on the PSTN line. This integrates complete billing of solution so can apportion costs to all cost centres.

### Who does this solution suit?

- A QoS DSL network is an ideal solution for the retail industry e.g. making a converged network for voice and EPOS feasible even for small outlets.
- Business voice quality can be delivered to remote workers, the QoS feature ensuring that call quality is not spoiled by simultaneous data transfer.
- Short lead times and minimal contract terms mean that transient sites can be serviced e.g. construction and leisure industry.
- QoS DSL networks allow businesses to extend existing applications to sites previously excluded from the current WAN on cost ground, e.g. extending Cisco Call Manager to remote sites and teleworkers.

## Sample Solution

### Requirement

Company X have 5 key sites across the UK. A number of much smaller branch offices nationwide have closed over recent years and now a substantial number of sales and technical staff work from home on a permanent basis.

The main sites are connected by an MPLS wide area network with citrix applications managed centrally at head office. Home workers provision their broadband on an individual basis and recoup the cost on expenses submitted to the accounts department. Provision of telephony varies with some home workers having a separate phone line and some using mobile.

The current solution is clumsy, time-consuming and expensive for head office to operate and an alternative solution is being sought.

### Solution

A QoS DSL VPN running alongside the MPLS WAN would enable the business to provide home workers with a fully converged VPN in a highly cost-effective manner. This would ensure that home workers could expect the same level of voice and application delivery as office based staff. The QoS DSL-VPN ensures voice is prioritised above all other network traffic, with applications having a level 2 priority and the remaining bandwidth delivering the non-prioritised data.