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VDSL & VoIP Briefing – A Spitfire Review

The Truth about VDSL and VoIP

Briefing Paper
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Why we don't consider VDSL to be "voice approved"

VDSL (Very High Speed Digital Subscriber Line) technology is widely established in the UK and offered by a number of suppliers through wholesale connectivity arrangements. Connectivity from the Exchange to roadside cabinets is over fibre hence it also gets referred to as "fibre broadband" though the DSL connection to the end user is still done over copper telephone lines.

VDSL is increasingly being used by businesses for high speed Internet access. With download speeds of up to 80Mbps it is not difficult to see why. However a broadband circuit optimised for Internet browsing is not necessarily the best choice for VoIP (voice over IP).

At Spitfire we discourage the use of VDSL for voice because, whilst anecdotally many people have found it "good enough", it offers no guarantees of voice quality or any route to resolution should voice quality become unacceptable.

Here we discuss why we don't consider VDSL suitable for business voice use.

What does VoIP need?

As one of the first companies in the UK to offer business quality SIP trunks, Spitfire pioneered the use of circuits that are specifically purposed for voice traffic. These circuits have technical characteristics that make them suitable for VoIP with guarantees to back them up.

To give satisfactory voice quality, it is generally considered that, a circuit must meet these technical requirements for VoIP:

Maximum latency 150ms end to end (mouth-to-ear)

Packet loss less than 1%

Jitter less than 45ms

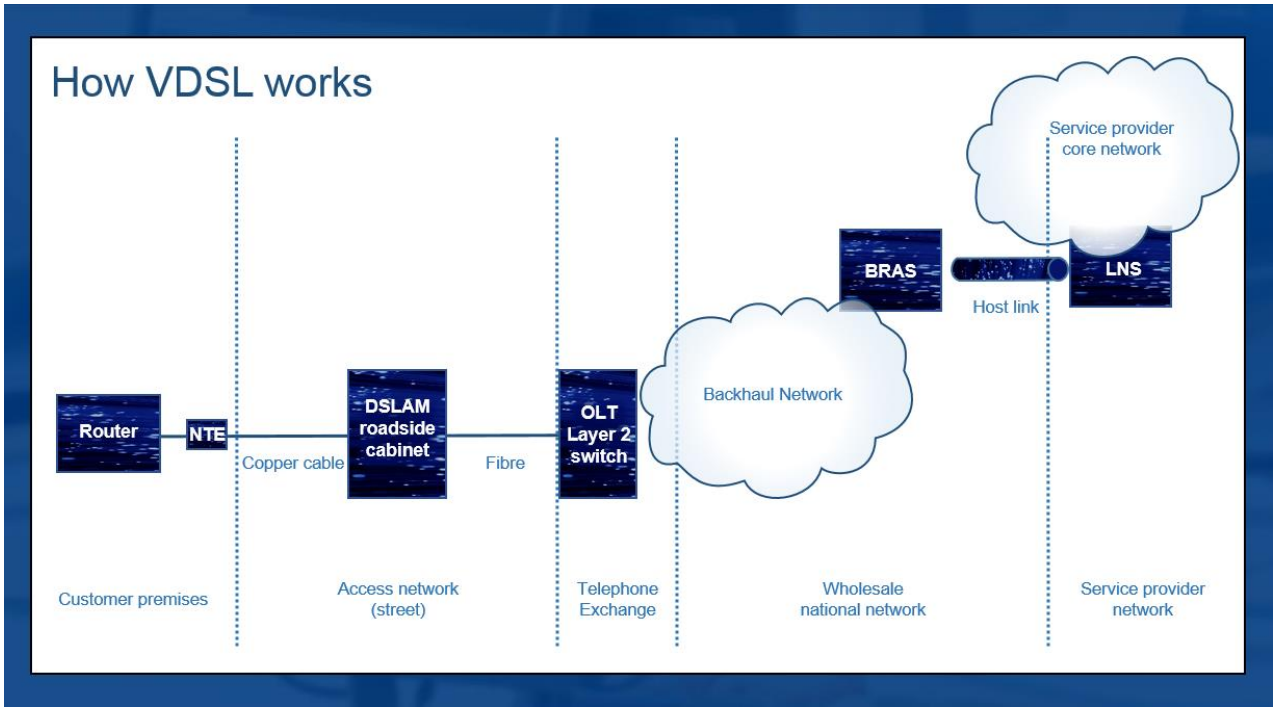
These requirements may be met on a VDSL service most of the time; however they are not guaranteed to be met for all or any of the time. A 500ms delay on a web page is barely noticeable; such delay during a telephone call is very noticeable.

How VDSL works

VDSL is often referred to as "Fibre To The Cabinet" (FTTC) technology. In order to achieve higher speeds than normal ADSL the DSLAM is moved from the telephone exchange to a roadside cabinet. This reduces the length of the copper cable from the customer premises to the DSLAM.

A fibre circuit connects the DSLAM to the telephone exchange. At the telephone exchange the fibres connect onto Optical Line Termination and, via a layer 2 switch, to the backhaul network.

The backhaul network links telephone exchanges to nodes where Broadband Remote Access Servers (BRAS) aggregate traffic and forward it onto the service providers' L2TP Network Servers (LNS).



Like all broadband services the network is shared with all other users. There will be many customers connecting to the DSLAMs accessing many different service providers.

Host link

Each service provider connects to the national network using "host links". They are either 1Gbps or 10Gbps Ethernet circuits connecting a service providers' LNS routers to the national broadband network. Service providers purchase discrete amounts of traffic capacity on these host links and it is the job of the service provider to manage this potential traffic bottleneck by ensuring that they have purchased sufficient capacity.

Wholesaler's backhaul network

Traffic from each exchange across the country is delivered to individual service providers who sell connectivity to end users. This is a shared backhaul and this network is a potential area of congestion unless managed. The most likely places for congestion are the circuits that aggregate traffic from each exchange into the core national network. These are known as shared VLANS (SVLANS).

Capacity on these links is managed by setting thresholds at which bandwidth is upgraded on these links. However various issues mean that this is not always done before it becomes customer affecting. In other words, there is packet loss at busy times.

Recognising that the SVLANS are the part of the network most likely to be contended some wholesale providers offer ways to try and mitigate packet loss, jitter and delay.

Real Time QoS

As a chargeable option Quality of Service is available on VDSL. VDSL supports two types of services - Best Efforts and Real Time. By default all traffic is "Best Efforts" meaning that in the event of congestion, voice traffic could get dropped equally as likely as all other best efforts traffic.

Real Time QoS is an additional service that can be purchased for VDSL. It is purchased in increments from 220kbps. What Real Time QoS does is prioritise traffic on the Service VLAN (SVLAN) from the BRAS to the exchange and on the CVLAN to each individual end user. These are considered to be the components that are most likely to become congested.

Traffic is only prioritised downstream from the BRAS. There is no prioritisation upstream from the DSLAM to the BRAS, as it is not considered necessary based upon experience of how the national network currently performs.

There is no QoS mechanism deployed upstream on VDSL, as this as not considered necessary given the intended planning rules in place for their backhaul network. However it is seen that SVLANs are operated outside the rules in place and occasionally run 'hot' SVLANs. This is not intended, but happens.

So what guarantees does Real Time QoS give?

No actual latency, jitter or packet loss targets are stated for Real Time QoS, the service just offers to prioritise marked packets over others. In the event of poor voice quality on VDSL faults may be reported, however, fault investigation is limited to the underlying broadband service.

Guaranteed throughput?

Doesn't VDSL have guaranteed throughput? Network capacity is planned so that on FTTC users can achieve a throughput of 12Mbps or 16Mbps (depending on what product has been purchased) but importantly this is for 90% of the time over the busiest 3 hour period.

What we expect from a "voice approved" circuit.

We expect to see published absolute maximum levels for packet loss, latency and jitter. We expect this to backed by a willingness to investigate and resolve issues where circuits fail to meet these specifications.

Averages

One of the most abused words in circuit service level guarantees is “average”. It is often there in the small print. Providers guarantee specifications that are met “on average” over the course of a day or a month or year. The problem with providing a business quality voice solution is that average just doesn’t cut it. If you have a poor quality call to an important customer that reflects badly on your business it is of little comfort that on average over the month your calls were OK. You need every call to be of satisfactory quality all the time.

On our voice approved circuits we have guarantees that have **maximum** values placed on them. Absolute maximum values, not maximum values 90% of the time or on average.

What do you want from a guarantee?

Most people expect that a guarantee means that a product will do what you say it will do all the time. Failing that if it doesn’t do what it is supposed to then you will fix it so that it does.

In the real world we accept that circuits won’t always perform as they should but what we look for in a guarantee is that the supplier will first of all accept the fault report and then solve the problem. On our voice approved circuits this is exactly what you get. If the circuit falls out of its technical specification that makes it suitable for business quality VoIP then the circuit is repaired. On the very rare occasions it has proved impossible to resolve, the circuit can be cancelled and customers will not be held to 12 or 24 or 36 month terms.

With VDSL there are no guarantees that the circuit will perform as suitable for business voice quality and the supplier will not accept faults on such circuits on the basis that they are not suitable for voice. What is more, if you are locked into a contract, you may have to continue to pay for that circuit until the contract ends. It may also be that by the time problems become apparent, it is not possible to obtain a voice approved circuit, without lengthy delays or at all.

But other providers are selling VDSL as being suitable for voice why don’t we?

VDSL is probably OK for now for many customers. It is considered by many to be adequate for voice based on how the wholesale network is currently dimensioned and performing.

A large amount of money is currently being invested in national broadband network, however business climates change and investment may not always be as readily available or technically feasible. In a future business cycle it may not be that VDSL performs as it currently does in which case there are no guarantees to fall back on, no contractual commitments have been broken.

Network usage is growing all the time. A current important development is television delivery over broadband with new service providers such as Amazon Prime, BT Vision, Netflix and NOW TV requiring assured data rates needed for their subscribers. As this grows other traffic may have to take lower priority. High definition TV is already here and Ultra HD (4K) has been launched that uses 30Mbps per TV channel. As competition grows to become a leader in the streaming TV market, the national network will have to meet this new objective. Given the amount of money being spent on content for TV services, internet broadcasters will be keen to ensure that viewers on VDSL have priority access to available bandwidth on the backhaul and from the DSLAM down to the customers’ premises.

As video traffic grows it will take priority over VoIP traffic and voice may get squeezed out resulting in call quality issues that the end user nor the service provider have any recourse to resolve.

If VDSL proves unsuitable over time can't I swap it for another circuit that will work?

If in time your VDSL circuit proves unsuitable you may consider replacing it with an Ethernet circuit, or complementing it with a voice approved circuit such as SDSLM. One problem that can occur is that this is dependent on the supplier chosen being active in your local exchange, and also that there is spare capacity to provide the circuit. These conditions may have applied when you initially installed a VDSL circuit but not when you wish to replace it. You may also find that your premises is not suitable for copper or fibre Ethernet, and it can take up to one year or more to install a new Ethernet circuit.

During this period of time, while you are waiting for your new circuit to be delivered and installed your business will continue to experience voice calls of an unsatisfactory quality which may prove unacceptably detrimental to your business.