How To

Allied Telesyn

Achieve Quality of Service over a low-speed WAN that has a non-QoS capable gateway device

Introduction

Firstly, to set the scene, let's review a few well-known facts of networking life.

- Wide Area Network (WAN) links are almost invariably of lower bandwidth than Local Area Networks (LANs).
- The desire for LAN users to access services via their WAN almost always exceeds the bandwidth available on the WAN, so packets are frequently being dropped at the WAN gateway point.
- Real-time applications like voice and video are very sensitive to packet loss or delay.

As a result, in an uncontrolled situation, real-time applications typically do not work well across WAN links.

To deal with this problem it is necessary to exert control over what applications get preferential access to WAN bandwidth. Network administrators achieve this by introducing Quality of Service policies on their WAN access devices.

But, they have a problem if either:

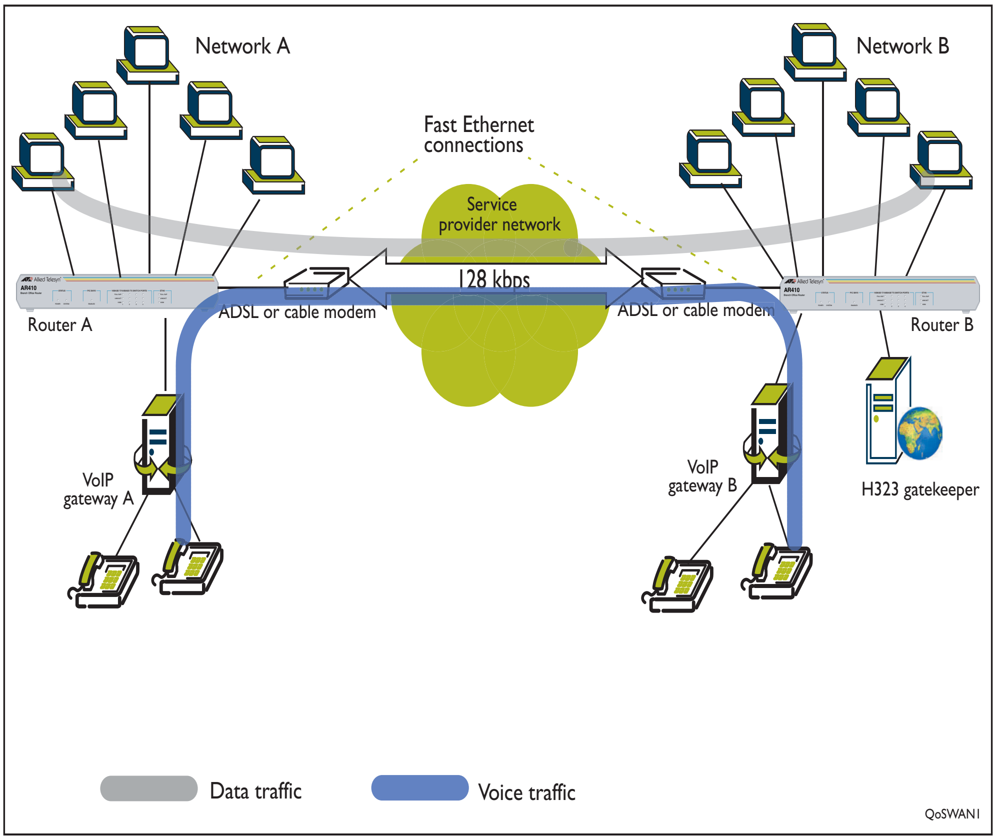
- the WAN access device is provided by the WAN service provider, so the network administrator is not allowed to alter its configuration, or
- the WAN access device is a low-featured device that simply does not support Quality of Service features.

The purpose of this document is to look at a solution to this problem that can be achieved using the AR410 router.

The network scenario

A common scenario in which this problem will be experienced is illustrated in Figure 1.

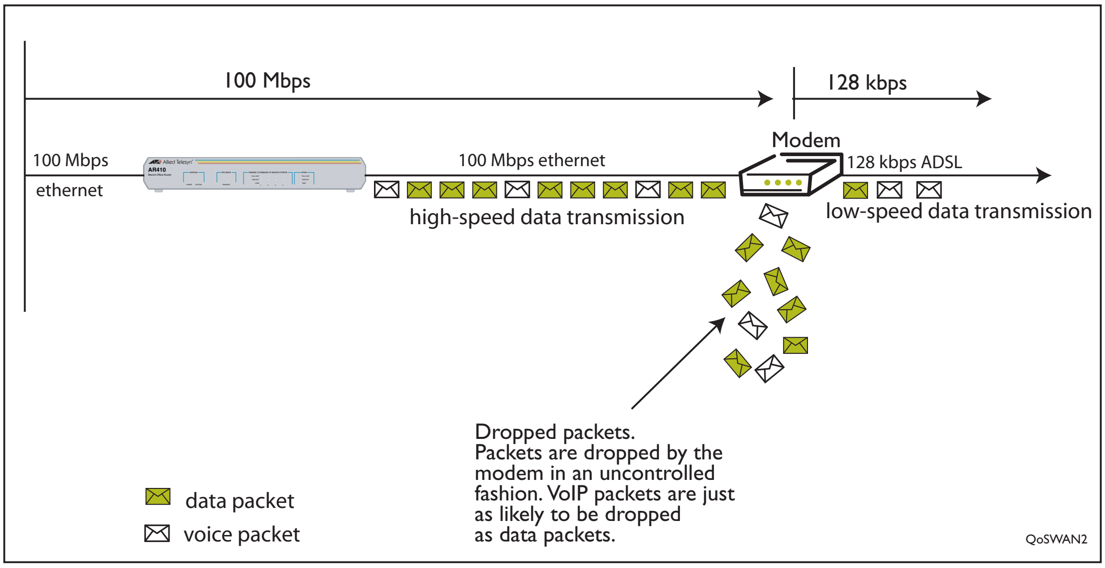
Figure 1: Large volumes of data and voice being transferred over a WAN link



Potentially large volumes of data are being exchanged between computer networks A and B, whilst Voice over IP (VoIP) calls are also being transported across the WAN link.

Given the relatively low bandwidth of the WAN link (128 kbps), it will be frequently oversubscribed, and packets will be dropped at the ASDL or cable modem. But if the modem has no QoS capability, packets will be dropped in an uncontrolled manner, as shown in Figure 2.

Figure 2: What happens if the modem has no QoS capability



This has a major impact on the quality of the VoIP calls that are being transported over the link.

The solution

The solution to the problem is to recognise the fact that the 100 Mbps link between the router and the modem is effectively a point-to-point link. So, the router has complete control over the data that is being put onto that link. Hence, if the router is a QoS-capable device, and a QoS policy is configured on the router, that effectively controls what data is sent over the WAN link.

However, it is not simply at a matter of configuring a packet prioritisation policy on the router. The fact is that packet prioritisation only has effect if the router has data queued on its egress interface, i.e. if the egress interface is oversubscribed.

But, the egress interface of the router is a 100 Mbps interface, and will not become oversubscribed until **well** after the modem's WAN interface has become oversubscribed. Therefore, you need to artificially clamp the egress bandwidth on the router's interface down to 128 kbps. That way, the router's egress interface becomes oversubscribed (and so the QoS policy starts to have effect) as soon as the LAN is directing more than 128 kbps of traffic towards the WAN.

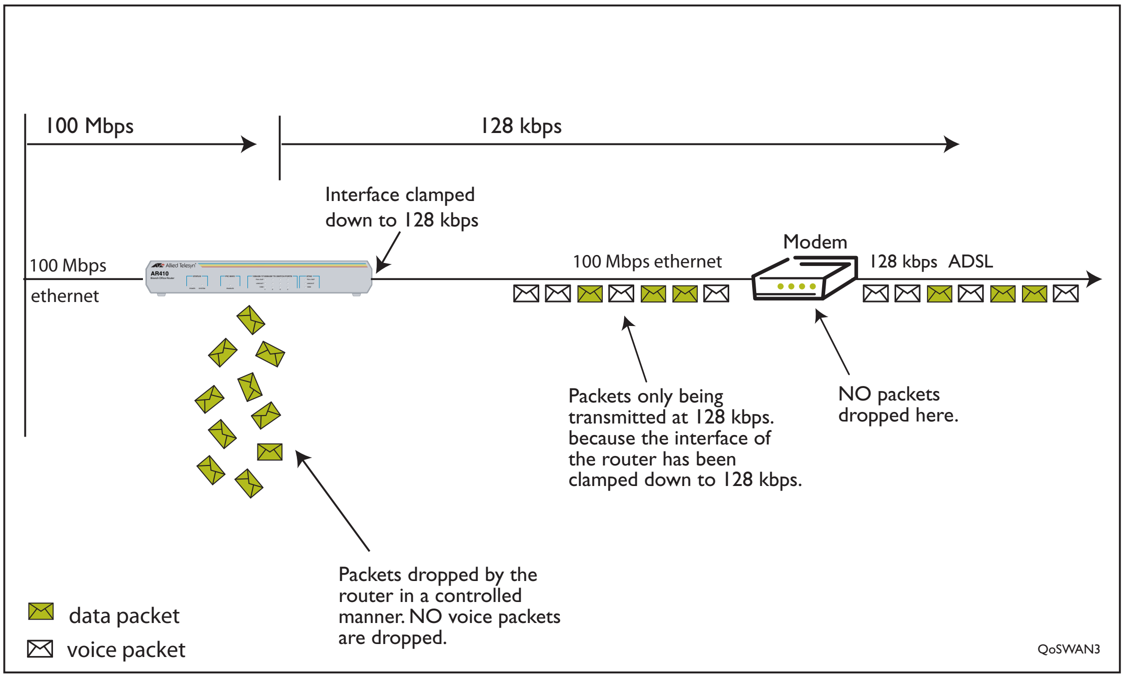
Additionally, it is very useful to force the egress interface on the AR410 to fragment packets. The reason for this is that it will limit the maximum delay time that any given voice packet will experience if it is queued behind a data packet. It can take some milliseconds for a 1500-byte packet to be placed onto a 128 k link, so if a voice packet is stuck behind a 1500-byte data packet, then the voice packet will be naturally delayed as it waits for the data packet to be sent out onto the line. If the maximum packet size sent out the egress interface of the AR410 is limited to 512 bytes, then the longest queueing delay a voice packet will experience is the time required to put a 512-byte packet onto the 128 k line.

In summary, the solution to the problem involves the following steps:

1. clamp the egress bandwidth on the router down to 128kbps.
2. institute a QoS policy on the router so that it ensures that VoIP packets are transmitted in preference to data packets.
3. set a maximum size for packets transmitted from the router to the modem.

Then you have a situation as illustrated in Figure 3.

Figure 3: Solution showing AR410 egress interface clamped to 128 kbps



The configuration commands

The *eth0* interface of the AR410 router supports the bandwidth limiting feature – the egress bandwidth can be clamped to multiples of 128kbps. The *eth0* interface of the AR410 must be connected to the Ethernet interface of the ADSL or cable modem.

Specific commands to enter on the router

To limit the egress bandwidth, enter the command:

```
set eth=eth0 maxbandwidth=128
```

Put the VoIP packets into the high priority egress queue on the eth0 port. This involves identifying the VoIP packets and putting them into the priority queue. There are different methods that you can use to identify the VoIP packets. One method would be to look at the UDP destination port of the packets and prioritise those packets whose UDP destination port was a port used by VoIP. The problem with this method is that VoIP can potentially use a large number of different UDP ports, so it becomes unwieldy to match them all.

A simpler method is to identify the IP addresses of all the VoIP devices on the local LAN, and prioritise all packets coming from those IP addresses.

The commands to achieve this are:

```
add ip filter=200 so=<address of VoIP device 1> prior=p4
add ip filter=200 so=<address of VoIP device 2> prior=p4
add ip filter=200 so=<address of VoIP device 3> prior=p4
add ip filter=200 so=<address of VoIP device 4> prior=p4
...
...
set ip int=eth0 pri=200
```

Set the maximum size for the packets transmitted:

```
set int=eth0 mtu=512
```

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