Multi-drop & Point to Point Analogue Leased Line Replacement

Introduction

Recent innovation by the telecoms providers, means that the core or back haul networks are being replaced all over the world with a network of interconnected IP routers. This change in the core networks technology is having an effect on the types of services and the amount of bandwidth available. The traditional analogue leased line services do not fit well into the new infrastructure and use up a lot of resources that, from the telecoms providers point of view, could be better employed. Digital delivery services such as X.21 (Kilostream) and G.703 (Megastream) will ultimately follow the same route and will be discontinued.

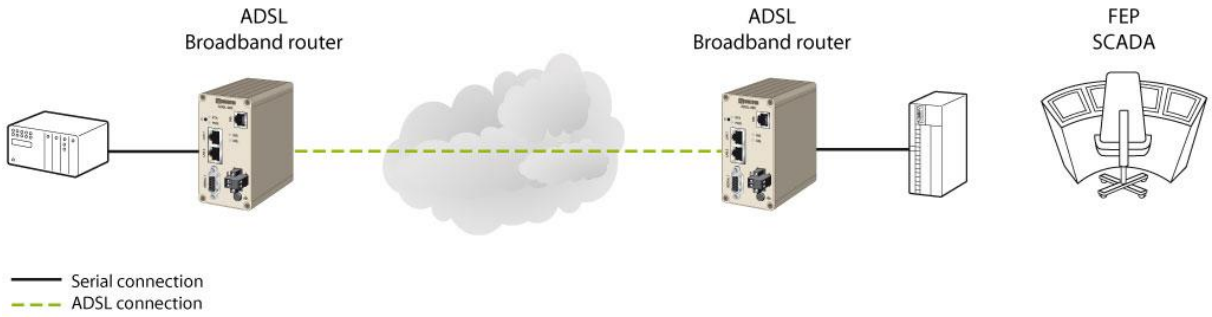
This move from the traditional telecoms core networks technology, to a system totally based on IP, is acting as a catalyst for change across the whole of the industrial telemetry and remote control industry.

The net effect of the upgrading of the back haul networks will be a drive by the telecoms providers to move customers from traditional leased line services and multi-drop leased lines, towards alternative solutions. This white paper will attempt to explain the viable alternatives and suggest the most cost effective and flexible way forward.

IP Based Replacement Solutions - Point to multi-point replacement

The direct wired replacement service for Leased Lines would be an ADSL or VDSL2 broadband Wires only connection. The reference to Wires Only refers to the ADSL or VDSL2 provision which does not include a router from the service provider. The routers provided are often not up to industrial application, requiring mains power or use unreliable power supplies with very poor MTBF (Mean Time Between Failures) figures. They are rarely able to cope with extremes of cold and moisture or are able to dissipate enough heat in a confined space, such as an unventilated control panel or instrument rack.

On the surface it would seen that it would not be possible to replace a slow serial/analogue based system with one based on the latest IP technology. This is not the case. There are a few rules to follow but essentially serial devices can easily be migrated onto an IP based solution without the need to change software at the remote device or the central SCADA, DCS or traffic control system.



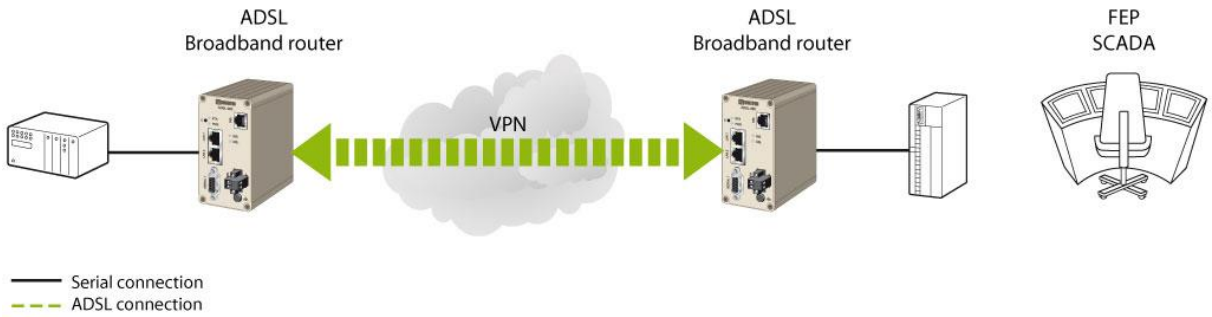
The main issue when looking to migrate a legacy serial system to an IP router based solution is how to interface between the legacy serial interface and IP. The legacy devices will still need a 25 or 9 way serial port to connect to and a means of interfacing to the IP network. All the broadband routers from Westermo are equipped with a legacy serial interface as standard.

The full description of how serial packets are captured and transported over the IP network is outside the scope of this document. Sufficient to say at this point the vast majority of asynchronous serial protocols can be transported over an IP network without the legacy device being aware of any change in the interconnecting media.

It is entirely possible when moving to an IP based solution to do away with the need for copper pairs and move to a 3G or GPRS based solutions or a hybrid of the two. A description of this can be found later in this document.

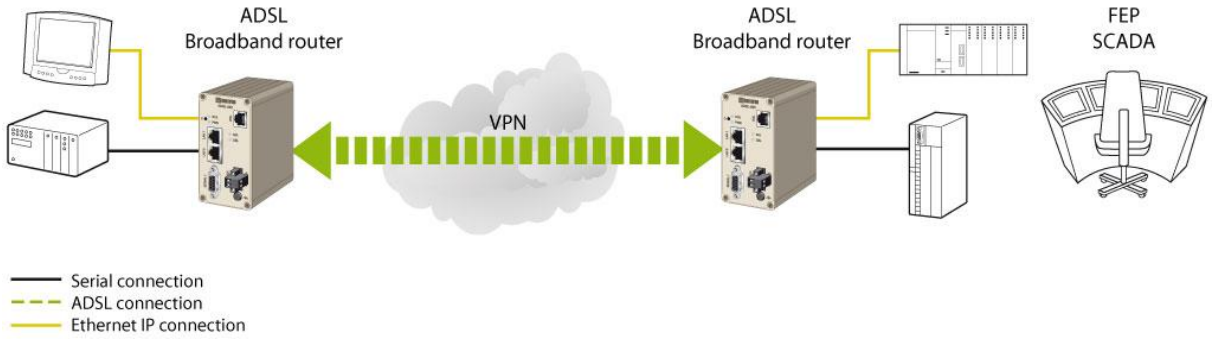
The next issue is how to create what will essentially be a secure virtual leased line running over the internet or interconnecting WAN (Wide Area Network). A number of IP technologies exist that will allow the transportation of serial data between two points on a WAN or the internet. We could simply transmit the data unencrypted, in the RAW, between two know IP address on the internet. This does work and in the early days was used as a transport mechanism. However we are now faced with a whole host of Cyber security issues that mean this is not a good idea.

To secure the data and prevent unwelcome Cyber security breaches data should be sent via a VPN (Virtual Private Network). The VPN is in effect a virtual leased line running between two points on the WAN (Wide Area Network) in the case in figure 4, this is the internet. Once a VPN link has been established between the two end points IP packets can pass from one node to other node with a high degree of certainty that data is safe and cannot be intercepted and read or altered.



Now that a virtual leased line exists between the sites, the serial port on one router can be configured to connect directly to the serial port on the remote router. This is often termed a TCP/IP socket connection or RAW TELNET. Once a connection has been established then serial data received on the local serial port is sent directly to the serial port on the remote router. The devices connected to the serial port are completely unaware that the media between the devices is now an IP based WAN or even that the media has been changed.

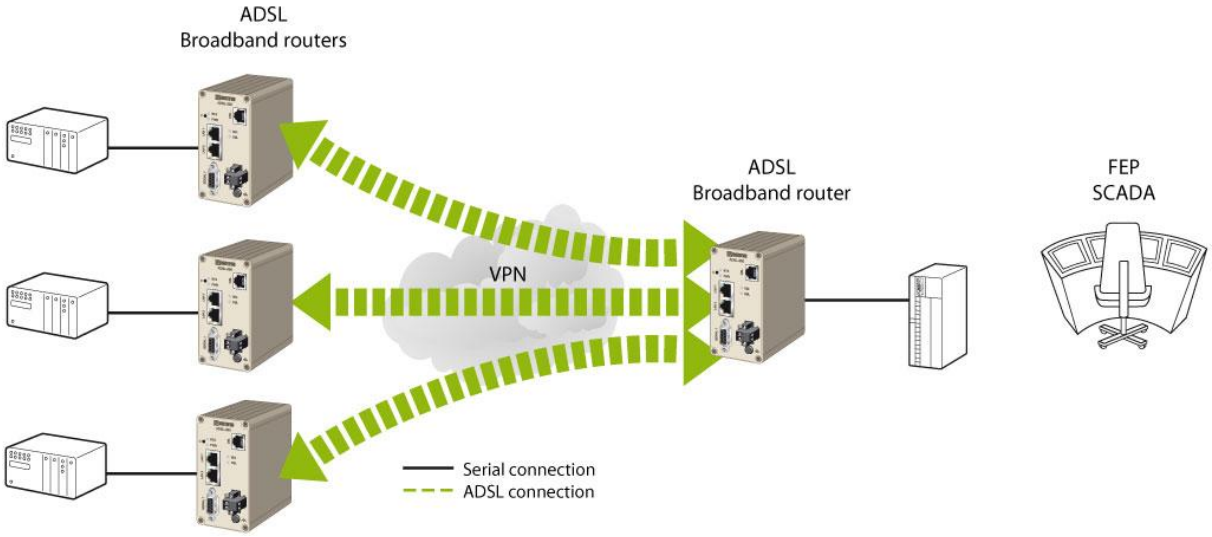
There is an additional benefit of changing to a broadband circuit, which is increased bandwidth. The legacy leased line circuits ran at a maximum line speed of 33600 bps. An ADSL 2+ circuit can operate at speeds of 20Mbit/s+ downstream and 1Mbit/s upstream. A VDSL2 line can run at 40Mbit/s downstream and up to 10Mbit/s upstream. This additional bandwidth can be used for other services or IP devices. Where assets are being replaced over a period of time the older legacy serial equipment can be run in tandem with its Ethernet IP based replacement.



Point To Multi-Point IP solutions

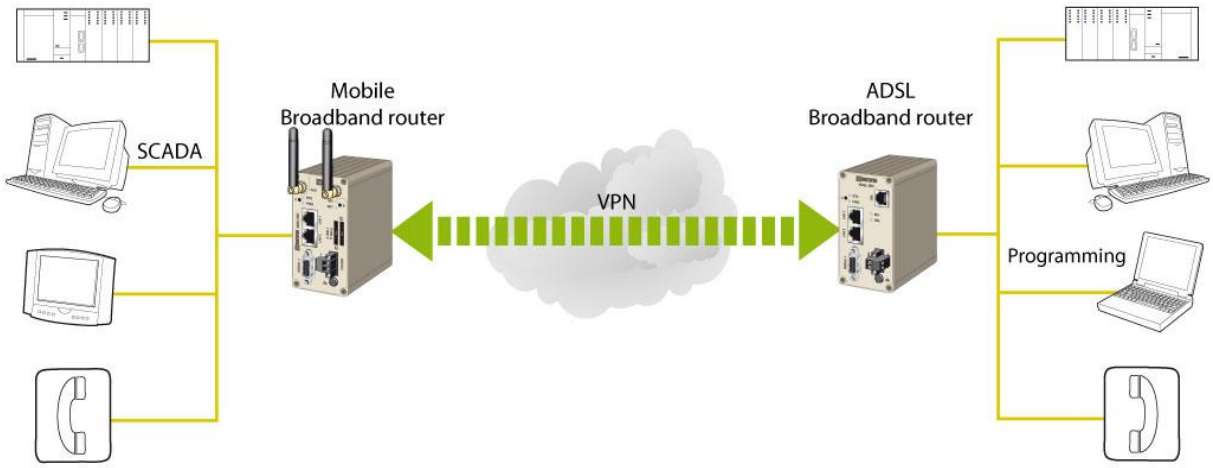
The IP based solution for Point to multi point leased lines is really an extension of the point to point replacement described above. The main difference is that the master router will terminate a number of VPNs. The VPNs will carry the serial or IP data to all the remote locations from the master site. In a typical point to multi point replacement system a packet

of serial data from the master site will be relayed to the serial ports on the slave routers. Response messages from the slave routers will only be seen by the master router.



Hybrid IP solutions

Once a move has been made towards an IP based solution it is only a short step to being able to integrate any media that can support IP. For example it is entirely feasible to move to a hybrid solution using both wired and wireless broadband in the same system. The ability to integrate wired and wireless system increases the flexibility of the new IP based solution and allows sites that were previously uneconomic to reach to be accessed via wireless broadband.



Conclusion

From the corporate customers view there is an economic case for changing the way that point to point or point to multipoint communications are approached. The traditional analogue leased lines are costly to maintain and rent from the telecom providers. The

alternative ADSL, VDSL, 3G services are more cost effective and offer higher bandwidths. There is also a case for future proofing any new installation, by installing an IP based solution from the outset, even though the devices on site may be based on legacy RS-232 or RS-485 serial communications.

The upgrading of the telecoms systems around the world is acting as a catalyst for change. There are a number of options in the voice band or analogue traditional networks, but there is a far greater choice of flexibility and opportunity for cost reduction in the IP environment. Once the first steps have been taken towards an IP based telemetry or control network it is a short step to re-evaluate the approach to all the other diverse communications media and look towards a hybrid system. Far from the need to reduce the number of devices or control system being scanned in real time, the IP based solution give the end users an opportunity to increase the number of real time access nodes and still have the scope to reduce costs.

Westermo is a specialist in the area industrial data communication specifically in the area of serial communication over analogue circuits or migrating legacy serial to IP based Wide area networks.

For more information visit **www.westermo.com**

Ray Lock
Network Technology Director
Westermo Teleindustri AB