



LOCAL LOOP UNBUNDLING OPERATORS

BROADBAND NETWORKS
FOR THE
UK PUBLIC SECTOR

Author: Bob Fletcher
Issue Final 1.1
4th January 2006
Office of Government Commerce
Trevelyan House
26-30 Great Peter Street
London SW1P 2BY

1 LOCAL LOOP UNBUNDLING

The local loop is the term given to the copper pair that runs from a customer's site to the local BT exchange. These circuits are owned by BT but from November 1999 other service providers have been able to rent these lines off BT. This is called local loop unbundling (LLU).

The advent of local loop unbundling has enabled a new generation of managed service providers to offer very cost effective networks to the public sector.

There are two operational models for Local Loop Unbundlers. Some companies unbundle exchanges and then sell broadband services to residential and small business customers within the exchange area. Other companies target their managed network offering to (primarily) local authorities and only install equipment within the BT exchanges once the contract has been secured. It is the latter model that public sector network suppliers tend to use.

2 LLU OPERATOR - NETWORK SOLUTION

2.1 Local Loop Broadband Technology

When building networks for local authorities LLU Operators mainly utilise a technology called SHDSL (Symmetric High Bit-rate Digital Subscriber Line). This technology offers a number of advantages over the type of broadband copper technologies which are used for residential consumer access.

- **Symmetric Connectivity:** Symmetric connectivity enables users to send data as fast as they can receive it, providing an ideal network for upcoming services such as IP Telephony and video conferencing.
- **High Data Rates:** The current version of SHDSL supports 2.3Mbit/s on a single copper pair. If higher data rates are required 4.6Mbit/s can be obtained by "bonding" together two circuits, 6.9Mbit/s by "bonding" three circuits and 9.2Mbit/s by "bonding" four circuits. A new version of SHDSL is now becoming available which will enable 3.1 Mbit/s to be achieved over a single copper pair. Bonding four circuits at this data rate enables a data rate of 12.4Mbit/s to be achieved. It is also possible to obtain even higher data rates by bonding more circuits and the technology is still evolving which may possibly lead to even higher data rates per copper pair in the future.
- **Coverage:** The physical reach of SHDSL is greater than that of ADSL (Asymmetrical Digital Subscriber Line - which is used for most residential broadband services). Current versions of SHDSL can reach up to 5km from the exchange, compared with only 3.5km with ADSL. However, it is not possible for an analogue telephone circuit to operate on the same line as SHDSL whereas this is possible with ADSL.
- **Quality of Service (QoS) fully supported:** SHDSL networks (with the appropriate equipment installed at the customer site and in the exchange) can support QoS including compliance with the IEEE802.1P/Q standard, the use of Type of Service (ToS) bits and the ability to deliver a specific flow marked by

one of the above standards with a pre-configured Committed Information Rate (CIR).

- **Low Latency:** The latency found in SHDSL networks is typically less than 4ms, which is similar to that achieved on a LAN.
- **IP Telephony Support:** Due to the symmetric connectivity, low latency and QoS support, the LLU Operator's network solution can carrying IP telephony traffic.

2.2 Managed Network Solution

When addressing the public sector marketplace LLU Operators usually provide a fully managed network solution, not just circuits.

The network solution consists of:

- **Circuits:** SHDSL access circuits, as described above, are used to connect the customer's sites to the BT local exchange. BT LES (LAN Extension Services) fibre circuits, or similar services from other operators, can be used to connect to sites if high(er) data rates are required. The LLU Operator locates equipment in the local exchange to terminate the access lines and to onward connect the traffic to a backhaul circuit(s) which connect the exchange to a backbone network.
- **Customer Premises Equipment:** A QoS & VLAN enabled, managed DSL router is installed on each customer site
- **Full Services:** Installation, network commissioning & acceptance, full network management and a maintenance service including Service Level Guarantees.

A typical LLU network for the public sector is shown below:

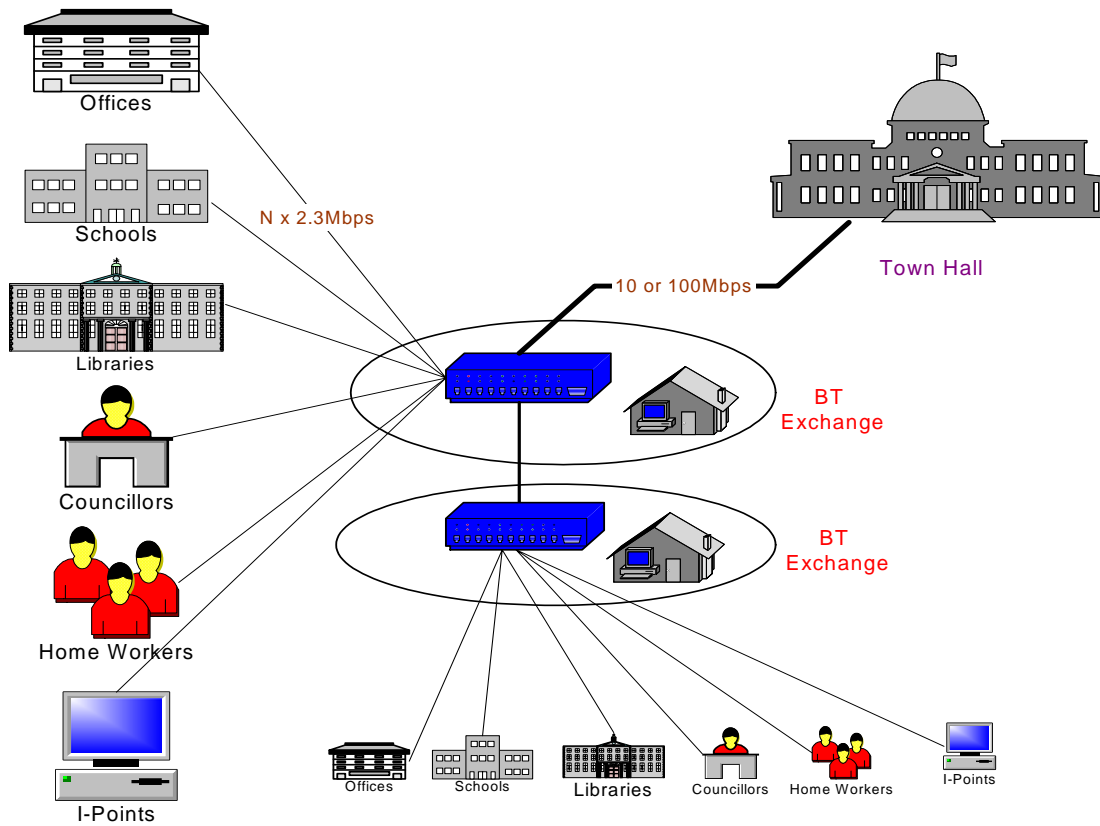


Figure 1 Typical LLU Network

3 TYPICAL LLU PRODUCT PRICING

A typical LLU Operator prices the network offering in three stages:

- Exchange Enablement
- Backhaul/Backbone Network
- Site Connections

3.1 Exchanges

Exchange enablement may be priced at around £30,000 per exchange plus an ongoing annual charge of £1,000-2,000 per annum.

3.2 Backbone/Backhaul Network

The backbone or backhaul network is the term given to that part of the network that links the equipment located within each broadband enabled exchange together. It also includes the connections to the main council sites. The design of the backbone network is unique to each network.

The design of the backbone network is very dependent on the capacity and reliability requirements of the network. The LLU operator designs the backbone network making use of the most appropriate technologies, for example, 9.2Mbit/s over copper

loops, 10 or 100Mbit/s BT BES (Backhaul Extension Services) or BT LES (LAN Extension Services), wireless etc.

Backbone networks will often take the form of rings to achieve high network resilience.

Connection charges and annual rental will be payable for the backbone network.

3.3 Connections

The prices for a SHDSL connection depend upon the data rate required. For example, a 2Mbit/s connection might cost around £1,000 p.a., a 4Mbit/s connection £1,500 p.a. and a 8Mbit/s connection around £2,500 p.a.

3.4 Price Comparisons

LLU Operators claim they can offer substantial price savings over Managed Service Providers who use Telco provided leased lines, Metro VPN products or fibre based services to build their networks.

LLU Operators claim that it is possible to save up to 45% of the network costs over a 3-year period, although a saving of 25% may be more typical.

3.5 Price Drivers

The price savings that can be derived by using a LLU Operator depends largely on the number of exchanges that the operator has to unbundle to provide service to the customer sites, as there are high fixed costs that the LLU Operator incurs for each exchange that is unbundled.

The most significant savings are obtained when the network has a high number of served customer sites and a small number of enabled exchanges. This tends to occur in urban and metropolitan areas rather than rural areas, although site clustering can occur in some rural networks which results in a high site density around certain exchanges.

4 POINTS FOR CONSIDERATION

LLU Operators claim they can build networks at significantly less cost compared with Managed Service Providers using Telco provided leased lines, Metro VPNs or fibre based services. Additionally, they claim that their networks are very scalable, being able to upgrade a circuit (by using multiple copper pairs) from 2 Mbit/s to over 10 Mbit/s in approximately 2 Mbit/s increments, whereas for Telco based services, particularly older ones, a change of service type may be needed, requiring the old service to be entirely replaced by the new service, as the data rate is increased.

However, a point to consider is that exchange based copper circuits are only suitable for data rates up to approximately 10Mbit/s with current technology, increasing to perhaps 15 Mbit/s with new technology. The question often arises about the future proofing of the network – what happens when data rates of in excess of 15 Mbit/s are required?

The LLU Operators' response to this is that they can, and do, use fibre circuits where required and as the data rate requirements grow an increasing number of fibre circuits will be used. The LLU Operator will source these fibre circuits from BT or another network operator or even install them himself. This will result in a mixed network with copper continuing to be used for those sites where a standard data rate is required and fibre being used for the higher data rate sites.

So, if fibre circuits are to be used eventually as the data rates increase why not use fibre circuits from the beginning. The LLU Operators' response to this is that the significant savings from copper based networks result in a very short payback time so why pay the substantially higher price required for a full fibre based network until this becomes absolutely necessary.

However, another point to take into consideration is that fibre circuits are on average more reliable than copper circuits. Copper circuits can, and do, give very acceptable performance but occasionally copper circuits, especially long circuits running over difficult terrain, can give unreliable performance. For this reason consideration should be given to including reliability guarantees into any contract and to have an option to upgrade any unreliable, important copper circuits to fibre within the life of the contract.

5 CASE STUDY

Essex County Council is implementing their schools' broadband programme in six phases. Phases 1-4 used BT's metroVPN product but at the end of 2005 Phases 3 & 4 were over-running, due mainly to difficulties in laying fibre to certain schools. Also, significant additional fibre installation charges were being incurred.

Phases 5 & 6 required an additional 260 primary schools to have 2 Mbit/s circuits installed and 80 secondary schools to have their circuits upgraded to 8Mbit/s. Essex County Council therefore decided to request competitive bids for these two phases of the project.

Most of the suppliers who were requested to bid proposed using an optical fibre based solution. However, one supplier proposed unbundling 60 exchanges in Essex and using the copper loops from these exchanges to deliver service to the schools.

This proposal was found to be extremely price competitive and over a four year period was 50% cheaper than the alternative solutions, representing a cashable saving of more than £9M for the period.

More information on Essex's schools network can be obtained from kevin.mansfield@essexcc.gov.uk

6 RECOMMENDATION

Public Sector organisations that are enhancing their wide area networks should consider including LLU Operators on their tender list.

7 MORE INFORMATION

For more information please contact Bob Fletcher (bob.fletcher@ogc.gsi.gov.uk) or the OGC Service Desk (4999@ogc.gsi.gov.uk)