OgierElectronics

BROADBAND SYSTEM FEATURES

Summary

- Licenced band for interference free operation
- Compatible with the DOCSIS open standard, with many millions of users worldwide
- With partners we can offer full turnkey solutions
- Scalable to high capacity in excess of 800 Mbps per Base Station
- Low cost CPEs for residential and SMEs
- Arris, Cisco and Big Band support for full Network Management, QoS, VPN and other services
- Compatible with Wi-Fi for local operation
- Backhaul and last mile transmission uses same equipment to simplify network design
- Simple and straightforward installation with no set up or adjustment

Licenced Band

The system operates in the 10.15 to 10.6 GHz licenced band. To optimise the use of the spectrum, it uses 64QAM modulation in the higher capacity downstream direction. The full 10 km range is available with this modulation under all conditions using standard CPEs with integrated antennas. Ranges of 25 km at the full data rates and in the worst weather conditions are available using separate larger antennas.

The system uses either QPSK or 16QAM in the upstream direction. The 10 and 25 km ranges will be achieved with QPSK, but they will be halved if the double capacity 16QAM modulation is used.

World Standard

A key feature is that the system interfaces directly to open standard routers and modems that are in use in almost every country in the world. Many manufacturers can supply these elements, which means that all their developments are available to the benefit the network. They include upgrades of the DOCSIS specifications, Voice over IP and higher data rate operation.

The standards are supported by some of the most respected companies in broadband and data transmission. All their equipment are compatible with the wireless system. Cisco systems, Arris and Big Band Networks supply the DOCSIS Routers. There are over 15 different manufacturers of modems, including Mororola, Ambit, Cisco, Texas Instruments and Samsung.

We will be pleased to advise on the most suitable products for any particular application, but in order to give an example of the system's capability, we have included descriptions here of two Cisco routers. One is the uBR 7100 series which is a low cost equipment ideal for Base Stations in small and medium size towns and cities. The other is the uBR 7246 series, which is scalable to provide very high capacities.

Proven Turnkey Solution

The equipment has been designed to be simple and straightforward to install. Should operators so chose, they can undertake all the installation work themselves. Indeed in Denmark, local electricians have installed Base Stations and many subscribers install their own CPEs.

High Capacity

Another important feature is the high capacity of the network. Assuming a licence of 84 MHz is available, a Base Station will have a capacity of 840 Mbps in the downstream direction and at least 260 Mbps in the upstream.

There is an overhead associated with DOCSIS, but it is small relative to Ethernet or similar systems, which are not designed for the mass market. Stripping out the overheads for multiple users, each Base Station will have a capacity of 560 Mbps of usable or net data in the downstream direction and 208 Mbps in the upstream. These capacities are conservative in that they assume the use of the QPSK modulation in the upstream direction. If 16QAM is used, it is effectively doubled in that direction.

The directivity of the CPE antennas is high. This, combined with extensive filtering allows maximum frequency re-use. The capability is enhanced even further by polarisation diversity in which different combinations of vertical and horizontal polarisation can be used at different Stations.

The overall effect is that 4 Base Stations with overlapping coverage in a city can provide in excess of 2 Gbps of usable downstream data. We believe that no other Point to Multipoint wireless system has a capability approaching these rates.

It is important to note that the performance and specifications quoted for the system apply at all ranges in the downstream direction and at the full range if QPSK is used in the upstream, or at half the range is 16QAM is used.

In contrast many radio systems are specified with a bewildering range of "adaptive" modulations, with and without lines of sight. In practice the maximum ranges only apply at low data rates with BPSK or QPSK with the higher data rates only applicable to higher modulations at 1/10th of the range. Because of this, a system with an apparent 30 km range is only able to provide the full data rate at 3 km or less.

Also, the use of mixed modulations effectively degrades the capacity of the network for all the other users, even those using higher modulations at short ranges. A single BPSK user at a long range takes more time, which inevitably reduces the time available for all the other users.

Low Cost

The system is scalable from low data rates as little as 30 Mbps. This means that the infrastructure cost need only be committed when it is needed, which makes it ideally suited to meet the growing needs of a developing market.

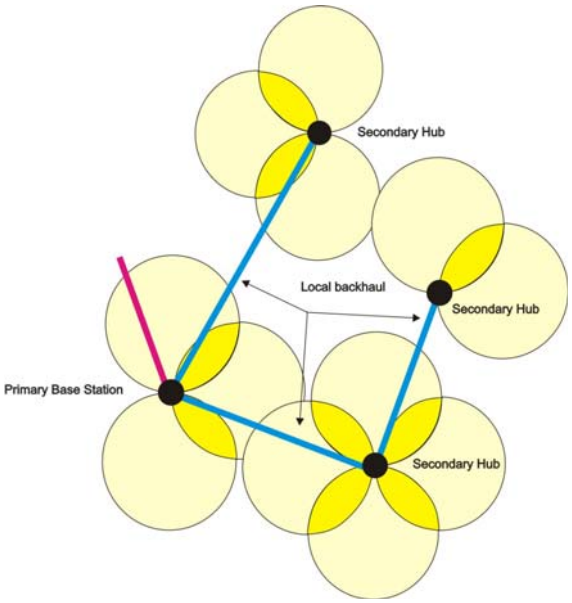
The growth in capacity, combined with the low cost of the customer premises equipment, a fraction of that of other proprietary systems operating in the licenced bands, means that the system is so inexpensive it is affordable to residential as well as business users. Financial models of the payback times show that it can compete head-on with fixed line systems, even if the requirement is to recover all the infrastructure costs within 18 months or less.

Backhaul and Last Mile

The system is unique in that it has the capacity and the range to provide the backhaul communications between the primary Base Station and Secondary Hubs, as well as the “last mile” transmission to the subscribers.

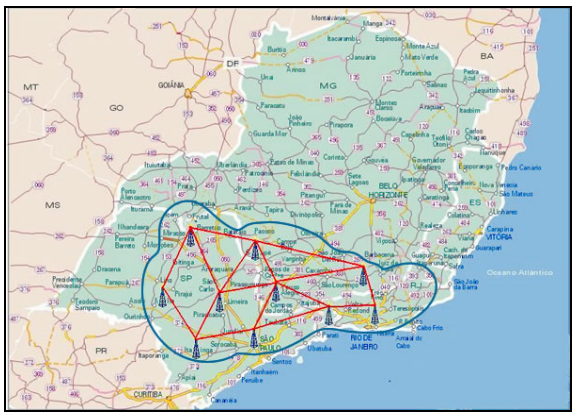
The configuration is illustrated in the Figure below. The Base Station and the Secondary Hubs have up to four 90 degree sectors for local subscribers, and use the same antennas,

transmitters and receivers to provide the backhaul. This arrangement avoids the need for an array of fixed point-to-point links and in so doing, simplifies the complexity, reduces the cost and increases the reliability of the network. We believe this is unique.



Backhaul and Last Mile

All the commercial operators of the equipment use this feature. As an example the following Figure shows the backhaul network deployed by Universal Communications in Belo Horizonte province (Rio de Janeiro) in Brazil. The same arrangement is used in Scandanavia where the system provides the backhaul linking local “last mile” systems.



Backhaul and Last Mile

Simple Installation

The innovative design employed in the equipment results in a number of benefits for the operator which ease the installation tasks. A minimum of hardware is needed and no adjustment or set up is required to any of the wireless units, either at the Base Stations or at the subscribers. The only tasks involved in bringing new subscribers on-stream are those that have to be done for any internet subscriber on a cable network. The effect of this is that it enables the complete Base Station or Secondary Hub to be installed and commissioned in a two days. It also allows CPEs to be installed and operational in hours. Subscribers can often install the CPEs themselves.

The system planning is straightforward. In many cases it is even simpler than that required for cable networks. The additive noise and mutual interference are not present, which means that the number of subscribers is not artificially limited in any way.

Software tools are available that model complex networks of Base Stations. The antenna, transmitter and receiver characteristics are modelled to predict the signal level at any subscriber in the coverage area with any Base Station transmitting on any frequency and polarisation. This allows the C/I levels to be established over the full area and the optimum frequency plan to be determined for the complete network.