Case Communications August Newsletter

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Welcome,

Welcome to the case Communications August 2008 Newsletter.

CASE EXPANDS WiMAX CLIENT BASE

We recently launched our WiMAX solution to a small selection of trial users and we (and they!) are really pleased with the results.
[More]

HACKER GARY McKINNON LOOSES HIS APPEAL

"My country has disappointed me" says the man accused of the biggest military hack in history, Gary McKinnon.

[More]

NORTEL WINS ROUTERS, SWITCHES & NETWORKING FOR THE OLYMPICS

Nortel will provide BT with routers, switches and networking equipment required to build and support the network and communications infrastructure for the London 2012 Olympics.

[More]

OFCOM TO INVESTIGATE BT

Ofcom is to investigate complaints from network resellers Thus and Gamma Telecom that BT is trying to squeeze them out of the wholesale market in end-to-end voice calls.

[More]

The UK's Privacy Watchdog has given Google permission to use their street mapping system

Privacy campaigners attacked the plan to provide pictures of streets to online maps, but the Information Commissioner's Office (ICO) has said it is 'satisfied
[More]

LAPTOP WOES

We have all had a restrained laugh at the much publicised loss of various laptop computers in the public sector.

[More]

Technical - Overview WiMax

WiMAX, the *Worldwide Interoperability for Microwave Access,* is a telecommunications technology that provides wireless data in a variety of ways, from point-to-point links to full mobile cellular type access. It is based on the IEEE 802.16 standard, which is also called WirelessMAN.

[More]

BT Announce a £1.5 billion programme to roll out Fibre for Broadband

BT announce a £1.5 billion programme to roll out fibre based, super-fast broadband to up to 10m UK homes by 2012.
[More]

Could TV Over the Internet be set to replace broadcast TV

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CASE EXPANDS WiMAX CLIENT BASE

Following extensive testing and achieving speeds of over 108 Mbps over rough terrain, we are now rolling out WiMax nationally. For more information, please email sales@casecomms.com

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HACKER GARY McKINNON LOOSES HIS APPEAL

The self-confessed hacker lost his appeal in Britain's highest court against extradition to the United States where he faces charges that, if convicted, could lead to him spending the next 60 years in a US jail. He fought extradition to the US for six years after hacking into the Pentagon network. The hearing started in 1999, after McKinnon was charged with Hacking. He says he was looking for evidence of extraterrestrial beings and technology, which he believed the US government was hiding.

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NORTEL WINS ROUTERS, SWITCHES & NETWORKING FOR THE OLYMPICS

Nortel will be responsible for providing BT with the equipment to enable secure and robust Wide Area Networks, wireless Local Area Networks, call centre and fixed telephony infrastructure required to stage the games. The London 2012's communications would support more than 205 international sporting organisations, 20,000 worldwide media, nine million spectators and more than four billion television viewers.

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OFCOM TO INVESTIGATE BT

Thus and Gamma, supported by Cable & Wireless, allege that BT's pricing of wholesale voice calls to resellers since April 2005 amounts to an abusive margin squeeze and breaches Chapter II of the Competition Act 1998 and Article 82 of the EC Treaty. They allege BT's pricing may be below cost, which may force some players out of the market. "BT has previously been found to have significant market power in a number of network access markets," said Ofcom. The regulator will investigate the allegations and consider whether BT has abused its dominant position under UK and/or EC competition law.

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The UK's Privacy Watchdog has given Google permission to use their street mapping system

Privacy campaigners attacked the plan to provide pictures of streets to online maps, but the Information Commissioner's Office (ICO) has said it is 'satisfied

Officers from the ICO met with Google and sought reassurances after concerns were raised about the Street View application being intrusive.

Simon Davies, the director of Privacy International, was worried that Google's face-blurring technology did not blur everyone's faces on Street View.

But an ICO spokeswoman said: "We are satisfied that Google is putting in place adequate safeguards to avoid any risk to the privacy or safety of individuals."

The ICO was reassured by the fact that Google was blurring car registrations and faces, was open to removing images on request, and that the pictures were not viewed in real time so could not be used to track individuals.

The spokeswoman said: "Although it is possible that in certain limited circumstances an image may allow the identification of an individual, it is clear that Google are keen to capture images of streets and not individuals."

A spokeswoman for Google welcomed the decision and said Street View would be a boon to the UK.

She said: "We've always said we will not launch in UK until we are comfortable Street View complies with local law and that we will use technology, like face-blurring, licence plate blurring and operational controls. Street View is a valuable tool for people who wish to better understand a location and find information about the places they live and visit."

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LAPTOP WOES

However, the private sector is not much better and with the holiday season getting into full swing, perhaps a little warning is needed.

Recent research sponsored by Dell showed that about 175,000 laptops were lost last year in the major European airports. That is about 4,000 every week.

One of the hotspots is Heathrow, with 900 going astray every week. While some are stolen, the majority seem to disappear simply because the owners forget about them. Many of these turn on the lost property offices, where over half are never claimed. As most laptops have no identifying marks on them, it is impossible to track down the owners.

I could go on to talk about whether the laptops are properly backed up or secured, but the figures are so depressing that I will simply leave you to mull it over.

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Technical - Overview WiMax

The name "WiMAX" was created by the WiMAX Forum, which was formed in June 2001 to promote conformance and interoperability of the standard. The forum describes WiMAX as "a standards-based technology enabling the delivery of last mile wireless broadband access as an alternative to cable and DSL and also to High Speed Packet Access.

Technical information

WiMAX is a term coined to describe standard, interoperable implementations of IEEE 802.16 wireless networks, similar to the way the term Wi-Fi is used for interoperable implementations of the IEEE 802.11 Wireless LAN standard. However, WiMAX is very different from Wi-Fi in the way it works.

MAC layer/data link layer

In Wi-Fi the media access controller (MAC) uses contention access - all subscriber stations that wish to pass data through a wireless access point (AP) are competing for the AP's attention on a random interrupt basis. This can cause subscriber stations distant from the AP to be repeatedly interrupted by closer stations, greatly reducing their throughput. This makes services such as Voice over IP (VoIP) or IPTV, which depend on an essentially-constant Quality of Service (QoS) depending on data rate and interruptibility, difficult to maintain for more than a few simultaneous users.

In contrast, the 802.16 MAC uses a scheduling algorithm for which the subscriber station needs to compete only once (for initial entry into the network). After that it is allocated an access slot by the base station. The time slot can enlarge and contract, but remains assigned to the subscriber station, which means that other subscribers cannot use it. In addition to being stable under overload and over-subscription (unlike 802.11), the 802.16 scheduling algorithm can also be more bandwidth efficient. The scheduling algorithm also allows the base station to control QoS parameters by balancing the time-slot assignments among the application needs of the subscriber stations.

Physical layer

The original version of the standard on which WiMAX is based (IEEE 802.16) specified a physical layer operating in the 10 to 66 GHz range. 802.16a, updated in 2004 to 802.16-2004, added specifications for the 2 to 11 GHz range. 802.16-2004 was updated by 802.16e-2005 in 2005 and uses scalable orthogonal frequency-division multiple access (SOFDMA) as opposed to the OFDM version with 256 sub-carriers (of which 200 are used) in

802.16d. More advanced versions, including 802.16e, also bring Multiple Antenna Support through Multiple-input multiple-output communications (MIMO)

This brings potential benefits in terms of coverage, self installation, power consumption, frequency re-use and bandwidth efficiency. 802.16e also adds a capability for full mobility support. The WiMAX certification allows vendors with 802.16d products to sell their equipment as WiMAX certified, thus ensuring a level of interoperability with other certified products, as long as they fit the same profile.

Most commercial interest is in the 802.16d and .16e standards, since the lower frequencies used in these variants suffer less from inherent signal attenuation and therefore give improved range and in-building penetration. Already today, a number of networks throughout the world are in commercial operation using certified WiMAX equipment compliant with the 802.16d standard.

Architecture

The WiMAX Forum has defined an architecture that defines how a WiMAX network connects with other networks, and a variety of other aspects of operating such a network, including address allocation, authentication, etc. An overview of the architecture is given in the illustration. This defines the following components:

- SS/MS: the Subscriber Station/Mobile Station
- ASN: the Access Service Network
- BS: Base station, part of the ASN
- ASN-GW: the ASN Gateway, part of the ASN
- CSN: the Connectivity Service Network
- HA: Home Agent, part of the CSN
- AAA: AAA Server, part of the CSN
- NAP: a Network Access Provider
- NSP: a Network Service Provider

plus a number of interconnections (or reference points) between these, labeled R1 to R5 and R8.

It's important to note that the functional architecture can be designed into various hardware configurations rather than fixed configurations. For example, the architecture is flexible enough to allow remote/mobile stations of varying scale and functionality and Base Stations of varying size - e.g. femto, pico, and mini BS as well as macros

Comparison with Wi-Fi

Comparisons and confusion between WiMAX and Wi-Fi are frequent, possibly because both begin with the same two letters, are based upon IEEE standards beginning with "802.", and both have a connection to wireless connectivity and the Internet. Despite this, the two standards are aimed at different applications.

- WiMAX is a long-range system, covering many kilometers that typically uses licensed spectrum (although it is possible to use unlicensed spectrum) to deliver a point-to-point connection to the Internet from an ISP to an end user. Different 802.16 standards provide different types of access, from mobile (similar to data access via a cellphone) to fixed (an alternative to wired access, where the end user's wireless termination point is fixed in

location.)

- Wi-Fi is a shorter range system, typically tens of meters, that uses unlicensed spectrum to provide access to a network, typically covering only the network operator's own property. Typically Wi-Fi is used by an end user to access their own network, which may or may not be connected to the Internet. If WiMAX provides services analogous to a cellphone, Wi-Fi is more analogous to a cordless phone. It's important to note, however, that free community wifi networks have shown that with proper antennas, wifi can have very long ranges.

- WiMAX and Wi-Fi have quite different Quality of Service (QoS) mechanisms. WiMAX uses a mechanism based on setting up connections between the Base Station and the user device. Each connection is based on specific scheduling algorithms, which means that QoS parameters can be guaranteed for each flow. Wi-Fi has introduced a QoS mechanism similar to fixed Ethernet, where packets can receive different priorities based on their tags. This means that QoS is relative between packets/flows, as opposed to guaranteed.

- WiMAX is highly scalable from what are called "femto"-scale remote stations to multi-sector 'maxi' scale base that handle complex tasks of management and mobile handoff functions and include MIMO-AAS smart antenna subsystems.

Due to the ease and low cost with which Wi-Fi can be deployed, it is sometimes used to provide Internet access to third parties within a single room or building available to the provider, often informally, and sometimes as part of a business relationship. For example, many coffee shops, hotels, and transportation hubs contain Wi-Fi access points providing access to the Internet for customers.

Spectrum allocation issues

The 802.16 specification applies across a wide swath of the RF spectrum, and WiMAX could function on any frequency below 66 GHz, (higher frequencies would decrease the range of a Base Station to a few hundred meters in an urban environment).

There is no uniform global licensed spectrum for WiMAX, although the WiMAX Forum has published three licensed spectrum profiles: 2.3 GHz, 2.5 GHz and 3.5 GHz, in an effort to decrease cost: economies of scale dictate that the more WiMAX embedded devices (such as mobile phones and WiMAX-embedded laptops) are produced, the lower the unit cost. (The two highest cost components of producing a mobile phone are the silicon and the extra radio needed for each band.) Similar economy of scale benefits apply to the production of Base Stations.

In the unlicensed band, 5.x GHz is the approved profile. Telecom companies are unlikely to use this spectrum widely other than for backhaul, as they do not own and control the spectrum.

In the USA, the biggest segment available is around 2.5 GHz, and is already assigned, primarily to Sprint Nextel and Clearwire. Elsewhere in the world, the most-likely bands used will be the Forum approved ones, with 2.3 GHz probably being most important in Asia. Some countries in Asia like India and Indonesia will use a mix of 2.5 GHz, 3.3 GHz and other frequencies. Pakistan's Wateen uses 3.5 GHz.

Analog TV bands (700 MHz) may become available for WiMAX use, but await the complete rollout of digital TV, and there will be other uses suggested for that spectrum. In the USA the FCC auction for this spectrum began in January 2008 and, as a result, the biggest share of the spectrum went to Verizon Wireless and the next biggest to AT&T. EU commissioner Viviane Reding has suggested re-allocation of 500-800 MHz spectrum for wireless communication, including WiMAX.

WiMAX profiles define channel size, TDD/FDD and other necessary attributes in order to have inter-operating products. The current fixed profiles are defined for both TDD and FDD profiles. At this point, all of the mobile profiles are TDD only. The fixed profiles have channel sizes of 3.5 MHz, 5 MHz, 7 MHz and 10 MHz. The mobile profiles are 5 MHz, 8.75 MHz and 10 MHz. (Note: the 802.16 standard allows a far wider variety of channels, but only the above subsets are supported as WiMAX profiles.)

Since October 2007, the Radiocommunication Sector of the International Telecommunication Union (ITU-R) has decided to include WiMAX technology in the IMT-2000 set of standards. This enables spectrum owners (specifically in the 2.5-2.69 GHz band at this stage) to use Mobile WiMAX equipment in any country that recognizes the IMT-2000.

Spectral efficiency

One of the significant advantages of advanced wireless systems such as WiMAX is spectral efficiency. For example, 802.16-2004 (fixed) has a spectral efficiency of 3.7 (bit/s)/Hertz, and other 3.5-4G wireless systems offer spectral efficiencies that are similar to within a few tenths of a percent. The notable advantage of WiMAX comes from combining SOFDMA with smart antenna technologies. This multiplies the effective spectral efficiency through multiple reuse and smart network deployment topologies. The direct use of frequency domain organization simplifies designs using MIMO-AAS compared to CDMA/WCDMA methods, resulting in more-effective systems.

Limitations

A commonly-held misconception is that WiMAX will deliver 70 Mbit/s over 50 kilometers. In reality, WiMAX can do one or the other - operating over maximum range (50 km) increases bit error rate and thus must use a lower bitrate. Lowering the range allows a device to operate at higher bitrates.

Typically, fixed WiMAX networks have a higher-gain directional antenna installed near the client (customer) which results in greatly increased range and throughput. Mobile WiMAX networks are usually made of indoor "*customer premises equipment*" (CPE) such as desktop modems, laptops with integrated Mobile WiMAX or other Mobile WiMAX devices. Mobile WiMAX devices typically have an omni-directional antenna which is of lower-gain compared to directional antennas but are more portable. In practice, this means that in a line-of-sight environment with a portable Mobile WiMAX CPE, speeds of 10 Mbit/s at 10 km could be delivered. However, in urban

environments they may not have line-of-sight and therefore users may only receive 10 Mbit/s over 2 km. In current deployments, throughputs are often closer to 2 Mbit/s symmetric at 10 km with fixed WiMAX and a high gain antenna. It is also important to consider that a throughput of 2 Mbit/s can mean 2 Mbit/s, symmetric simultaneously, 1 Mbit/s symmetric or some asymmetric mix (e.g. 0.5 Mbit/s downlink and 1.5 Mbit/s uplink or 1.5 Mbit/s downlink and 0.5 Mbit/s uplink), each of which required slightly different network equipment and configurations. Higher-gain directional antennas can be used with a Mobile WiMAX network with range and throughput benefits but the obvious loss of practical mobility.

Like most wireless systems, available bandwidth is shared between users in a given radio sector, so performance could deteriorate in the case of many active users in a single sector. In practice, many users will have a range of 2-, 4-, 6-, 8-, 10- or 12 Mbit/s services and additional radio cards will be added to the base station to increase the capacity as required.

Because of this, various granular and distributed network architectures are being incorporated into WiMAX through independent development and within the 802.16j mobile multi-hop relay (MMR) task group. This includes wireless mesh, grids, network remote station repeaters which can extend networks and connect to backhaul.

Silicon implementations

A critical requirement for the success of a new technology is the availability of low-cost chipsets and silicon implementations.

Intel is a leader in promoting WiMAX, and has developed its own chipset. However, it is notable that most of the major semiconductor companies have to date been more cautious of involvement and most of the products come from specialist smaller or start-up suppliers. For the client-side these include ApaceWave, GCT Semiconductor, Altair Semiconductor, Beceem, Comsys, Runcom, Motorola with TI, NextWave, Sequans, Redpine signals, Wavesat, Coresonic and SySDSoft. Both Sequans and Wavesat manufacture products while TI, DesignArt, and picoChip are focused on WiMAX chip sets for base stations. The large number of suppliers during introduction phase of WiMAX demonstrates the low entry barriers for IPR.

Standards

The current WiMAX incarnation, Mobile WiMAX, is based upon IEEE Std 802.16e-2005, approved in December 2005. It is a supplement to the IEEE Std 802.16-2004, and so the actual standard is 802.16-2004 as amended by 802.16e-2005 - the specifications need to be read together to understand them.

IEEE Std 802.16-2004 addresses only fixed systems. It replaced IEEE Standards 802.16-2001, 802.16c-2002, and 802.16a-2003.

IEEE 802.16e-2005 improves upon IEEE 802.16-2004 by:

- Adding support for mobility (soft and hard handover between base stations). This is seen as one of the most important aspects of 802.16e-2005, and is the very basis

of 'Mobile WiMAX'.

- Scaling of the Fast Fourier Transform (FFT) to the channel bandwidth in order to keep the carrier spacing constant across different channel bandwidths (typically 1.25 MHz, 5 MHz, 10 MHz or 20 MHz). Constant carrier spacing results in a higher spectrum efficiency in wide channels, and a cost reduction in narrow channels. Also known as Scalable OFDMA (SOFDMA). Other bands not multiples of 1.25 MHz are defined in the standard, but because the allowed FFT subcarrier numbers are only 128, 512, 1024 and 2048, other frequency bands will not have exactly the same carrier spacing, which might not be optimal for implementations.

- Improving NLOS coverage by utilizing advanced antenna diversity schemes, and hybrid-Automatic Retransmission Request (HARQ)

- Improving capacity and coverage by introducing Adaptive Antenna Systems (AAS) and Multiple Input Multiple Output (MIMO) technology

- Increasing system gain by use of denser sub-channelization, thereby improving indoor penetration

- Introducing high-performance coding techniques such as Turbo Coding and Low-Density Parity Check (LDPC), enhancing security and NLOS performance

- Introducing downlink sub-channelization, allowing administrators to trade coverage for capacity or vice versa

- Enhanced Fast Fourier Transform algorithm can tolerate larger delay spreads, increasing resistance to multipath interference

- Adding an extra QoS class (enhanced real-time Polling Service) more appropriate for VoIP applications.

802.16d vendors point out that fixed WiMAX offers the benefit of available commercial products and implementations optimized for fixed access. It is a popular standard among alternative service providers and operators in developing areas due to its low cost of deployment and advanced performance in a fixed environment. Fixed WiMAX is also seen as a potential standard for backhaul of wireless base stations such as cellular, Wi-Fi or even Mobile WiMAX.

SOFDMA (used in 802.16e-2005) and OFDM256 (802.16d) are not compatible so most equipment will have to be replaced if an operator wants or needs to move to the later standard. However, some manufacturers are planning to provide a migration path for older equipment to SOFDMA compatibility which would ease the transition for those networks which have already made the OFDM256 investment. Intel provides a dual-mode 802.16-2004 802.16-2005 chipset for subscriber units. This affects a relatively small number users and operators.

Competing Technologies

Within the marketplace, WiMAX's main competition comes from existing widely deployed wireless systems such as UMTS and CDMA2000, as well as a number of Internet oriented systems such as HIPERMAN.

3G cellular phone systems usually benefit from already having entrenched infrastructure, being upgraded from earlier systems. Users can usually fall back to older systems when they move out of range of upgraded equipment, often relatively seamlessly.

The major cellular standards are being evolved to so-called 4G, high bandwidth, low latency, all-IP networks with voice services built on top. With GSM/UMTS, the move to 4G is the 3GPP Long Term Evolution effort. For AMPS/TIA derived standards such as CDMA2000, a replacement called Ultra Mobile Broadband is under development. In both cases, existing air interfaces are being discarded, in favour of OFDMA for the downlink and a variety of OFDM based techniques for the uplink, much akin to WiMAX.

In some areas of the world the wide availability of UMTS and a general desire for standardization has meant spectrum has not been allocated for WiMAX: in July 2005, the EU-wide frequency allocation for WiMAX was blocked.

Mobile Broadband Wireless Access

Mobile Broadband Wireless Access (MBWA) is a technology being developed by IEEE 802.20 and is aimed at wireless mobile broadband for operations from 120 to 350 km/h. The 802.20 standard committee was first to define many of the methods which were later funneled into Mobile WiMAX, including high speed dynamic modulation and similar scalable OFDMA capabilities. It apparently retains fast hand-off, Forward Error Correction (FEC) and cell edge enhancements.

The Working Group was temporarily suspended in mid 2006 by the IEEE-SA Standards Board since it had been the subject of a number of appeals, and a preliminary investigation of one of these "revealed a lack of transparency, possible 'dominance,' and other irregularities in the Working Group".

In September 2006 the IEEE-SA Standards Board approved a plan to enable the working group to continue under new conditions, and the standard is now expected to be finalized by Q2 2008.

Future development

Mobile WiMAX based upon 802.16e-2005 has been accepted as

IP-OFDMA for inclusion as the sixth wireless link system under IMT-2000. This can hasten acceptance by regulatory authorities and operators for use in cellular spectrum. WiMAX II, 802.16m will be proposed for IMT-Advanced 4G.

The goal for the long term evolution of both WiMAX and LTE is to achieve 100 Mbit/s mobile and 1 Gbit/s fixed-nomadic bandwidth as set by ITU for 4G NGMN (Next Generation Mobile Network) systems through the adaptive use of MIMO-AAS and smart, granular network topologies. 3GPP LTE and WiMAX-m are concentrating much effort on MIMO-AAS, mobile multi-hop relay networking and related developments needed to deliver 10X and higher Co-Channel reuse multiples.

Since the evolution of core air-link technologies has approached the practical limits imposed by Shannon's Theorem, the evolution of wireless has embarked on pursuit of the 3X to 10X+ greater bandwidth and network efficiency by advances in the spatial and smart wireless broadband networking technologies

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BT Announce a £1.5 billion programme to roll out Fibre for Broadband

The plans, still extremely dependent on regulatory approval, will see BT delivering a range of services with top speeds of up to 100 Mb/s with the potential for speeds of more than 1,000 Mb/s in the future.

There are still many questions to be answered yet, not least on the matter of funding with BT making references to Regional Development Agencies as potential partners in the deployment, but CEO Ian Livingston was bullish and positive about the planned roll out. "Broadband has boosted the UK economy and is now an essential part of our customers' lives" he said. "We now want to make a step-change in broadband provision which will offer faster speeds than ever before. This marks the beginning of a new chapter in Britain's broadband story."

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Could TV Over the Internet be set to replace broadcast TV

One of the killer applications that Next Generation Broadband would certainly look to deliver is video content and with speeds of higher than 100mbps being bandied around, some of the pointy heads doing scenario planning for content distribution in the medium to long term are predicting that TV over the web could replace broadcast TV as the primary distribution method. 'Not so' said leading academic Patrick Barwise, emeritus professor of management and marketing at the London Business School, who defined as 'B*llocks 2.0' claims about the threat to traditional media from innovations such as social networking and internet television.

In a refreshingly straight-talking address to a London Business School audience Barwise went on to say that 'Television is not a market going into catastrophic decline, advertising is bad, but it is not falling off a cliff' and that 'there is next to no demand for on-demand. The argument is wildly out of proportion about how important this is for television.

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Case Industrial Ethernet Switch gains Network Rail certification

July 2008

The Case Communications IFE 2G8T - MX Industrial Ethernet Switch has been approved for use on the Railways by Network Rail.

The IFE 2G8T - MX is an 8 x 10/100mbps Ethernet Switch with 2 Gigabit uplinks. It operates from -40 Degrees Centigrade to plus 75 degrees centigrade and can operate from 12V and 48 volt DC Power Sources.

The IFE 2G8T - MX supports the Industrial X-Ring standards which allows a number of switches to be connected in a reslient ring, and provide a re-route of data in under 30 ms in the event of ring failure being detected.

As well as standard SNMP Traps the siwtch also has the ability to generate a local alarm by use of relay contacts.

The IFE 2G8T - MX is managed by the CaseView network management system allowing a graphucal display of the switch from a single click on its Icon, alarm and fault warnings and up and down load of the switch configuration data, from a central point.