

Universal mobile

For regions such as Africa and the Middle East, cellular backhaul is proving to be a popular and cost effective way of expanding a mobile operator's reach. Here, Satellite Evolution explores satellite solutions for cellular backhaul.

It is a well-known fact that satellite is the 'last mile' solution but now mobile operators are turning to the technology to help them reach further and further a-field. In towns and cities mobile telephony is a given part of everyday life. Mobile communications have achieved huge success in towns and cities all over the world. However, in those less densely populated areas, the infrastructure required to allow access to mobile technology is simply not available. It is too expensive to roll-out terrestrial equipment to more remote areas and it is just not worth the expense for the ARPU it will create.

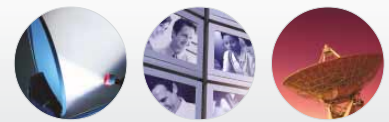
Satellite cellular backhaul has a range of different uses. It is pri-

mary use, as we have seen, in areas that are geographically challenging or remote and where there are no terrestrial links. It can also be used in emergency situations where infrastructure has been damaged or is non-existent. Other uses include on board cruise ships, industrial ships and other forms of transport, oil rigs, at sporting and other types of event that require a provisional communications service. The solutions provided are numerous and primarily support voice, data and narrowband communications.

At present, GSM represents the vast majority of cellular traffic and is responsible for around 80 percent with CDMA in second place with 14 percent and TDMA at six percent. Satellite has become the de-facto standard in order to meet the huge demand for the GSM mobile service. Satellite provides the mobile operator and the consumer with a range of benefits. The user can roam further a-field and know that their mobile telephone will work in more remote areas. It expands the market opportunity into areas that were previously unserviceable. It also helps meet targets set by governments in terms of their Universal Service Obligations (USO) that promotes access to communications technology for all.

The basics

So, how does satellite cellular backhaul work? There are three prin-



cial components that make up the system – MSC, BSC, and BTS. Firstly, there is a Mobile Switching Centre (MSC) that is the interface from the Base Station Controller (BSC) to the external networks such as the PSTN or mobile network. Secondly, the BSC provides all the control functions between the MSC and Base Tower System (BTS). Finally, the BTS handles radio interface to the mobile stations and provides the radio equipment that is required to service each cell in a network.

The interface located between the BSC and BTS is known as Abis. The acronym EDGE stands for Enhanced Data Rates for GSM Evolution. This is a digital technology that allows increased data transmission rates and improved data transmission reliability. When mobile operators wish to expand their footprint, they must expand the network between the BSC and the BTS.

In terrestrial networks, a microwave radio link is often adequate to reach its destination in a single hop. However, this link will not reach more remote areas. This very much depends on the radio frequency and whether it has line of sight. However, if satellite is used to provide this link, there is no issue with location or obstacles and it provides a perfect alternative to installing connections that would require a large amount of time and money to realise.

So, how does an operator go about extending their GSM network? What must be taken into account? Well, the extended network must be achievable at a low cost, reliable, flexible and must also provide coverage in even the most remote and challenging areas. There are plenty of options.

Cellular backhaul at sea

RAD's Vmux-400 GSM Abis/Ater optimisation gateway maximises bandwidth utilisation in large, central or remote site installations by eliminating redundant silence and idle frames in the Abis protocol. Supporting both point-to-point and point-to-multipoint GSM Abis/Ater optimisation, the Vmux-400 GSM Abis/Ater optimisation gateway is particularly useful in applications where landlines do not exist or are not available, and expensive satellite and/or microwave links, with their limited bandwidth, are used to backhaul the GSM traffic. When used in conjunction with other Vmux voice compression and bandwidth optimisation components, cellular operators can significantly reduce both their OpEx and CapEx. RAD's Vmux-400 was used to enable GSM backhaul for use on board cruise ships and ferries.

Maritime Communications Partner AS (MCP), a Norwegian-based provider of onboard cell phone connectivity to cruise ships and ferries that provides global coverage through leading suppliers of maritime satellite services, has come up with an ideal solution to help crew and passengers keep in touch via their mobile telephones regardless of being at sea and far away from their usual network's reach.

MCP employs an Ericsson Base Station System. The Base Station Controller at MCP's headquarters in the Norwegian coastal town of Grimstad, is connected over IP satellite modems to Base Transceiver Stations on a fleet of cruise ships that each year transport approximately 1.8 million passengers and 200,000 cars on eight North Sea routes between Denmark, Sweden, Norway, Holland, and Great Britain. MCP connected RAD's Vmux-400 GSM A-bis optimisation gateways at both ends of those satellite links.

The Vmux-400 enables cellular operators to lower backhaul costs across the Radio Access Network by optimising A-bis (BTS-to-BSC) bandwidth by a factor of up to 3:1, significantly reducing operating expenses.

"Interoperable with equipment from other major vendors, the Vmux-400 ensures that satellite links are utilised as efficiently as possible, eliminating inefficiencies by not transmitting idle and silent frames," explains Toby Korall, Senior Product Line Manager at RAD. "In this way, the Vmux-400 can reduce satellite, microwave or wireline bandwidth by 50 percent and more, enabling service providers to offer their customers a more attractive complete solution."

A unique feature incorporated into the Vmux-400 provides reli-

able regeneration of very accurate and sensitive 2.048 MHz TDM-based clocks for synchronised network operation between the BSC and BTS. This enables the use of packet-switched networks and, in this case, the IP satellite modems on-board the ships for the transport of cellular voice traffic.

By dynamically supporting different speech codecs, moreover, RAD's Vmux-400 allows up to twelve simultaneous calls using the higher-quality Full Rate codec when demand is low and up to 24 simultaneous calls using the Half Rate codec when demand peaks, doubling the number of cellular calls that are made to and from a ship at any one time.

"RAD's Vmux-400 enables us to offer mobile services over an IP network with optimal bandwidth usage," adds Roar Walderhaug, MCP's Chief Technology Officer. "The Vmux-400 operates very satisfactorily and has proven its high stability and robustness."

Gilat's SkyAbis

The SkyAbis satellite solution drastically reduces operational costs incurred by operators by up to 80 percent making GSM over satellite a profitable and efficient solution. Gilat created SkyAbis for cellular backhaul over satellite. It enables GSM operators to quickly and seamlessly expand their wireless services to remote areas and minimise operational costs associated with leasing satellite bandwidth. Meeting the high quality standards of mobile operators, Sky Abis is an easy to install, flexible solution with central control and real-time management. Extending services to accommodate higher traffic loads or cover more geographical area can be done quickly and economically with SkyAbis since additional sites require minimal additional infrastructure.

SkyAbis transparently connects multiple base transceiver stations (BTS) to a base station controller (BSC) in a satellite without changing the interface at either end. Sky Abis analyses the payload inside the E1 timeslots and removes timeslots with "idle" or "silence" codes. It then converts the original BTS to BSC traffic to IP packets. By only transmitting information-carrying bits, SkyAbis drastically reduces bandwidth needs. At the BSC, SkyAbis converts the packets back to Abis interface with timeslots that carry voice and data information together with code for "idle" and "silence" in the E1.

As opposed to traditional solutions such as SCPC that occupy permanent bandwidth regardless of actual traffic, SkyAbis uses Bandwidth on Demand (BoD) to dynamically allocate bandwidth. The result is significant space segment savings. The bandwidth controller, located at the SkyEdge hub continuously monitors traffic generated by each BTS allocating bandwidth from a common pool to each VSAT according to real-time demand.

Using BoD presents a major advantage over traditional technology which uses a predefined 'busy hour' to determine permanent bandwidth required to ensure satisfactory service. BoD results in 80 percent savings in space segment usage.

Vivo, Latin America's largest mobile network operator, recently deployed a major GSM network and Telesp (Telecomunicacoes de Sao Paulo) is using Gilat's SkyAbis technology to provide cost-effective backhaul and trunking (DCME) to remote Vivo sites in the north, north-east and central west of Brazil. As part of the turnkey satellite network, Gilat provided a fully redundant SkyAbis GSM solution to meet Vivo's high reliability requirements. SkyAbis features traffic optimisation and dynamic bandwidth allocation enabling low cost of ownership for mobile network operators.

Russell Ribeiro, Gilat do Brasil General Manager, said, "Our agreement with Telesp demonstrates our expertise in providing full turnkey networks. Telesp chose Gilat in 2006 to meet its Universal Service Obligation (USO) and we are proud to continue this relationship with the first phase of the Vivo project with other phases to follow."

Mr. Ribeiro added, "Using the Telesp SkyAbis satellite network, Vivo will be able to provide cellular service to the remote regions of Brazil in a most competitive way."



NetPerformer – HNS & Verso Technologies join forces

Verso Technologies, a global provider of next-generation network solutions, and Hughes Network Systems announced in the final quarter of 2007, that they have successfully concluded inter-operability testing of the Verso NetPerformer solution over the Hughes broadband satellite platform. As a result, Verso's optimised NetPerformer satellite solution is now being offered to wireless carriers worldwide for GSM and CDMA backhaul applications.

The combined Hughes and Verso solution quickly resulted in new customer wins. For example, a major Mexican telecom carrier has received initial delivery of the integrated solution to connect remote base stations, and a customer in the Middle East has installed the solution at 25 locations for VoIP services. These networks are expected to grow significantly over the next 12 months.

Verso conducted the tests over satellite using a Hughes HX System and its NetPerformer solution. Successful interconnection was demonstrated between a remote GSM BTS (Base Transceiver Station) and a GSM BSC (Base Station Controller), and involved multiple simultaneous phone calls supporting various voice codec rates as well as different handsets. This successful interoperability is significant as satellite offers the best transport mechanism for rural and remote cell sites. As cellular operators expand their service infrastructures in rural areas, a combination of challenging geography and lightly loaded traffic density makes satellite the natural choice for connectivity to these remote cell sites.

The Verso NetPerformer GSM backhaul solution reduces the cost of the network infrastructure between cell towers, base station controllers, and mobile switching centres by optimising bandwidth for several GSM interfaces such as Abis, which enables a superior re-

turn on investment without sacrificing quality of service.

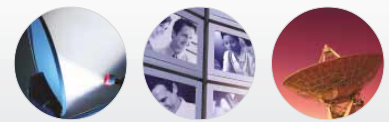
"As the cellular industry grows to the next billion subscribers, the challenge will be to economically reach rural and remote areas. With the Verso GSM backhaul solution over the Hughes satellite platform, we bring a cost-effective solution to cellular operators, enabling them to reach these hard-to-serve locations via satellite," said Ramesh Ramaswamy, Assistant vice President at Hughes.

"Having successfully completed integration testing with Hughes, we can now offer an optimised NetPerformer cellular backhaul solution that addresses the critical challenges faced by wireless providers globally. In addition, opportunities exist to position the new joint solution with Hughes' significant installed base of broadband satellite service providers to help wireless operators reduce costs while maintaining QoS," said Tim Peyla, Vice President, Verso Technologies. "We believe that this integrated solution presents a strong value proposition to all wireless operators, whether for fixed or mobile, voice or data applications."

Africa selects Memotec

Comtech Telecommunications' Montreal, Canada-based subsidiary, Memotec, received a \$2.7 million order to provide telecommunications equipment and services to a leading 2G/3G mobile operator in Africa. Memotec's new CX-UA solution was selected to enable the end customer to significantly increase the transmission capacity of its existing access and core network, connecting media gateways and base station equipment.

The operator selected Memotec's advanced CX-UA solution for its ability to reduce operating expenses through increased bandwidth efficiencies. The CX-UA will expand the operator's actual network



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capacity for supporting its GSM 2G subscriber growth and rolling out 3G services, without the need for a traditional costly upgrade.

The CX-UA Series is Memotec's next generation mobile voice and data compression product. It is the only product of its kind to combine 2G/3G mobile network access optimisation and DCME voice compression features together into one compact, carrier-grade unit. Featuring hot-standby redundancy with zero service down time, sophisticated monitoring functions, and the highest traffic compression ratio in the industry, the CX-UA delivers the quality and the variety of high quality and versatile features mobile operators require.

"It is an important achievement for Memotec to become a strategic supplier for this important service provider," stated Fred Kornberg, President and Chief Executive Officer of Comtech Telecommunications Corp. "The customer's increased GSM 2G and 3G transmission network capacity will enable access to vital communications services to a larger number of people in remote communities. This addition to the product family reaffirms Memotec's leading position in the cellular transport network optimisation market and demonstrates customer confidence in our ability to service and deliver carrier-grade, world-class infrastructure solutions to leading mobile operators."

Sky Reach

SkyReach Cellular Backhaul was introduced last year by Loral Skynet and Comtech EF Data. It is a one-stop, end-to-end managed solution that integrates design, implementation, monitoring and support for optimum network management. Sensitive to bandwidth costs, the service replaces costly E1/T1 lines with highly optimised satellite links to provide Abis connectivity between operators' Base Station Controller (BSC) and Base Transceiver Stations (BTS). This connectivity allows networks to expand over challenging geographic regions or for delivering license-mandated service.

The service leverages global coverage from Skynet's satellite fleet and market-leading compression and optimisation technologies from Comtech EF Data Corporation and its subsidiary, Memotec, to provide the most cost-effective means for mobile operators to expand their networks rapidly and seamlessly.

Increased flexibility is what differentiates Skynet's Cellular Backhaul service by allowing operators to retain full control of their network at their preferred hosting location, regardless of platform. The cellular backhaul-enabled satellite modems and link optimisation provided by Comtech EF Data and Memotec deliver the highest levels of voice quality, bandwidth efficiency and reliability.

Cellular backhaul for disaster recovery

Altobridge is a Ireland-based company that specialises in the development of cost-effective remote wireless communications solutions worked with Inmarsat on a trial in order to demonstrate a portable, easy-to-use first responder cellular communications solution over



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BGAN is the world's first mobile communications service to deliver voice and broadband data, accessible simultaneously through a truly portable device, on a global basis. This trial was based on Altobridge's patented AM Gateway Platform and offering a rapid standard communications capability from a unit small enough to be carried by a single individual, the Altobridge Remote Contiguous Communication (RCC) Unit was linked to Inmarsat's BGAN using a lightweight, highly portable terminal which provided RCC trial users with full access to the worldwide mobile broadband voice and data network.

The RCC is an easy-to-use communication solution, which rapidly establishes a standard cellular network of several miles radius. First responders remain in control of this emergency network and, critically, in control of key personnel who need access to the system via the Altobridge, user-friendly 'Subscriber Access Control'.

Monte Egeland, Altobridge's VP North America, said, "Altobridge is working closely with cellular carriers to meet the unique demands of the first responder market. Inmarsat's BGAN service offers a whole new multimedia dimension in emergency communications." In addition to first responder and secure military applications, Altobridge and Inmarsat continue to co-operate in R&D towards the aeronautical, maritime security and remote community markets.

Bridging the communications divide

The new techniques and voice compression used within the framework of cellular backhaul solutions via satellite have moved on to a great degree and enabling those who have not previously been able to access mobile technology to do so. Cellular backhaul is helping to bridge the Digital Divide but is it being taken seriously as a long-term solution, not simply a temporary solution for use in the aftermath of a disaster, for example? Cellular backhaul helps countries meet their Universal Service Obligations – an important aspect of bridging the communications divide. Satellite continues to break down the barriers and is sure to continue to be extremely popular in those countries where lack of infrastructure means that mobile technology is just not available or backhaul using E1/T1 lines is too costly. ●