

Optimal Satellite Abis Extensions

Until now...

Deploying remote base stations via VSAT links has for some time been a solution used by cellular operators. VSAT links to base stations in rural and low density 'islands' often proves to be a cost effective and more practical alternative to achieving or sustaining long haul terrestrial transmission links such as fiber or microwave.

Typically the Abis interface is extended over satellite, which effectively extends the geographical coverage area of an existing BSC. This allows the operator to avoid the cost of deploying multiple instances of major network elements in such areas where there is a requirement to provide coverage but the lack of sufficient local subscriber revenue to justify major infrastructure investment.

Using traditional methods the Abis interfaces from a BSC have typically been carried on dedicated fixed-bandwidth SCPC links. More recent developments in technology have seen protocol conversion to IP as a popular method of improving bandwidth efficiency over the satellite link.

Inefficiencies...

Efficiency gains in a traditional Abis-over-VSAT network are however limited by a number of factors. The weakness of GSM Abis satellite extensions until now has been the inherent waste of satellite bandwidth in SCPC links. A dedicated SCPC link to a BTS must be dimensioned to provide sufficient bandwidth during peak traffic conditions, which inevitably results unused bandwidth during periods of lower traffic flow. Idle GSM time slots are carried across the satellite link and usually 1 or more full E1 links are dedicated to each BTS.

At Globecom Systems we have developed an optimal Abis extension solution by combining our unmatched experience in deploying multiprotocol networks over satellite with best-of-breed technologies from vendors such as iDirect and Memotech.

Satellite IP-DAMA Techniques

Globecom Systems (GSI) has many years of experience working with cellular operators in the area of Abis extensions over satellite. We have developed a powerful solution that combines our ability to optimize the Abis stream for transmission over IP with the strengths of iDirect's DAMA Unified Trunking in the space segment. This creates an environment where ultimate space segment efficiencies are achieved by sharing a single IP stream between multiple Abis links and assigning access instantaneously on demand.

High efficiency gains are possible by suppressing idle GSM timeslots and allowing geographically diverse base stations to share a common pool of GSM time slots. In this way the GSM time slot (fractional E1) is used in the transport layer and E1's are no longer dedicated to individual base stations.

Example...

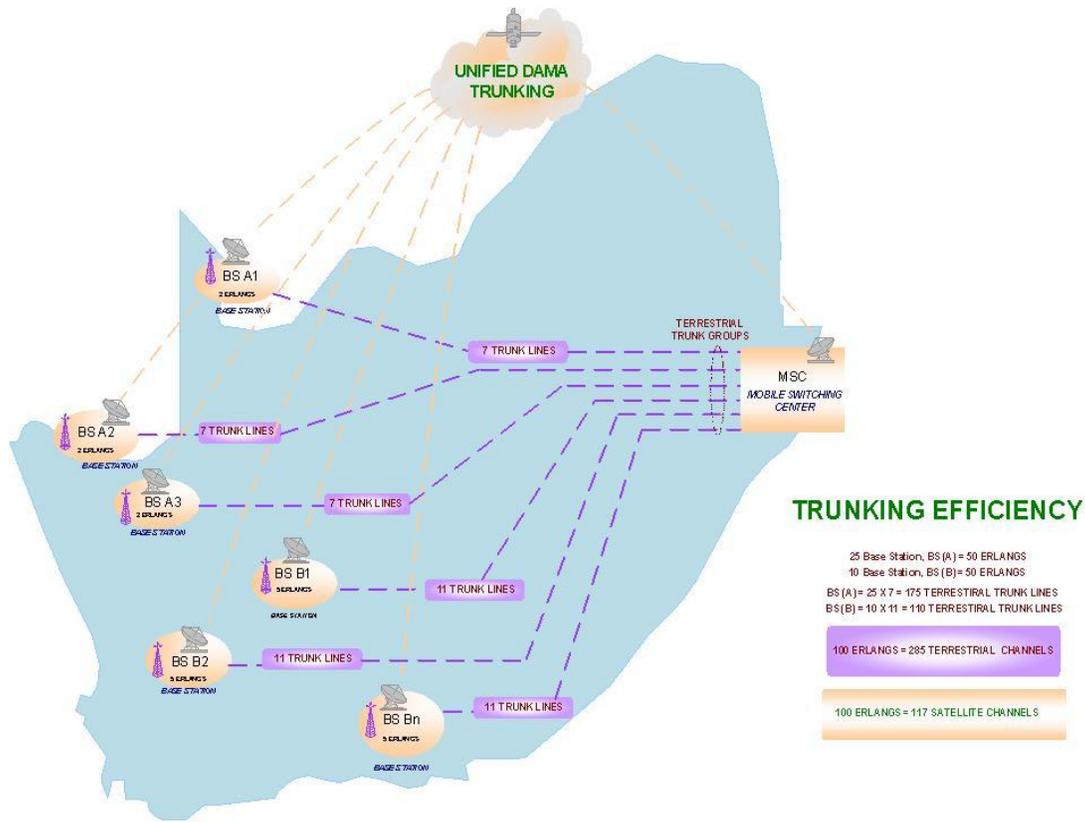


Figure 1. Comparing Satellite & Terrestrial Trunking Efficiencies

In the example network shown above 35 terrestrial E1's are required to support the BSS network. The satellite DAMA network creates the equivalent capacity of 35 E1's with only 100 GSM timeslots. Should any BTS experience an extraordinary quantity of traffic it can instantaneously access up to a full E1 from the pool of time slots.

The Abis Optimisation Process...

Mediation of the Abis streams to minimize bandwidth per time slot while maintaining QoS:

- Protocol Adaptation between the TDM BS and the IP based iDirect network;
- Elimination of Idle Packets;
- Compression of signaling overhead.

Typical iDirect DAMA Architecture

- Single Outbound carrier
 - Up to 9Mbps
- Multiple Demand Assigned Inbound Carriers
 - Up to 4Mbps
 - Use 256k, 512k, and 1024 Kbps to minimize remote terminal cost

Optimal network architecture can be designed to serve most effectively the varying traffic demands at remote locations and in long distance traffic flows.

For low density long distance traffic either a star or mesh DAMA architecture. For high density long distance traffic typically a DAMA overlay on an SCPC core using high order modulation schemes (BPSK, QPSK, 8PSK, 16QAM). Traffic correlation gains are highest for lower traffic base stations.

Cost Savings: Recurring Cost per Erlang...

Estimated Cost of BW per erlang of traffic*

(Presuming \$4000 per Mhz/per month for satellite BW)

256 Kbps	512Kbps	1024Kbps
\$70	\$67	\$59

* Terrestrial cost for serving the first erlang is typically \$1000 per month (E1)



Globecomm Systems Inc. (GSI)

Globecomm Systems Inc. (GSI) was established in 1994, by a management team that has been prominent in the satellite industry since the 1960's. In 2004 GSI recorded turnover of around US\$90m.

GSI provides end-to-end value-added satellite-based communication solutions by leveraging its core satellite ground segment systems and network capabilities, with satellite communication services capabilities. The solutions Globecomm offers include general contracted complex communications networks, GSM and CDMA cellular network solutions, militarised commercial off the shelf products and services, voice over Internet Protocol (VoIP), video broadcast, business recovery, satellite-based terrestrial restoral, content delivery and other networks on a global basis. Globecomm's customers include communications service providers, commercial enterprises, Internet Service Providers, content providers and government entities.



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