

## Bandwidth Optimization and Compression Solutions

### Bandwidth optimization and compression solutions - an approach to adding capacity

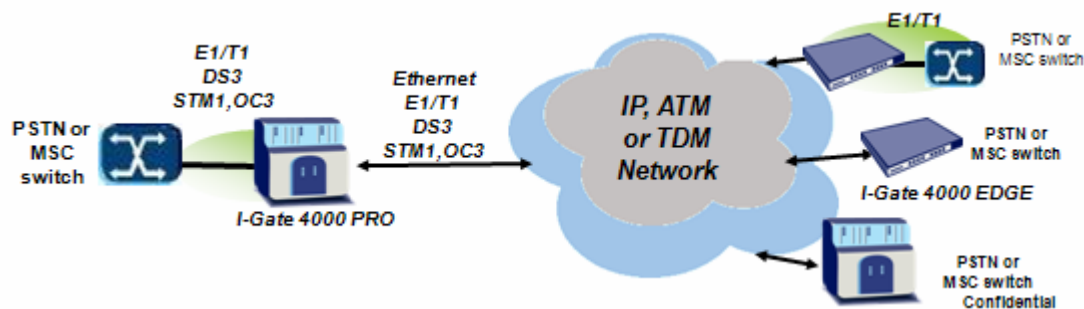
Today's advanced bandwidth optimization and compression techniques reduce the amount of bandwidth needed to support mobile 2G and 3G cellular voice & data legacy services. In addition to lowering OPEX and maintaining CAPEX under control, reducing for example the amount of bandwidth needed to support call completion, services liberates capacity to support more subscribers or introduce new low price services with the same equipment.

I-Gate bandwidth optimization and compression solutions can be deployed at hub/aggregation points.

They are based on three main techniques:

#### Convert all traffic to a common packet layer

All traffic (GSM 2G, 3G, CDMA) is aggregated into traffic packets, and then statistically multiplexed. The resulting transport network layer is then simplified providing substantial OAM cost savings. In addition, transmission resources are then mutualized between the different cellular technologies [GSM, UMTS, CDMA]: no dedicated and wasting of resources allocated to each different network. The transmission network is then seen as one single-managed shared big pipe, allowing efficient statistical multiplexing [bandwidth re-use] between the different services and wireless access technologies, maximizing transmission resources usage. The transport physical layer itself is technology agnostic (TDM, ATM, IP, Ethernet, Optical).



#### Reduce bandwidth payload

Deep packet inspection is carried out, and compression is performed to reduce size of payload. The overhead on mobile protocol layers is reduced and unused capacity (such as idle channels) is suppressed. Drop & insert mechanisms take the effective channels used on an E1 interface, drop the unused channels, and then map the channels onto the E1 network link.

#### Interface adaptation

In the access domain, interfaces are very often vendor dependent, requiring transparent processing. Throughout all operations, service integrity and QoS must be maintained. Additional OAM must be minimal, and all optimization and compression equipment must be essentially transparent when introduced in the network.

The results derived from these optimization and compression techniques can be impressive. Substantial OPEX savings can be gained and proportional revenue can be generated with for example

Up to 16:1 on DCME voice trunks (from MSC to MSC, BSC to MSC and to PSTN).

These OPEX savings from optimization and compression solutions are effective for leased lines and microwave links and backbone optimization. An optimization and compression solution is applied to avoid costly forklift upgrades from PDH to SDH microwave links.

This can be beneficial to operators with limited STM-1 ring bandwidth capacity due to spectrum allocation restrictions. Optimization and compression solutions allow existing STM-1 rings to handle more traffic, providing operators with the ability to generate additional revenue from the existing infrastructure.

### Improve voice quality without brute-force bandwidth provisioning

In many regions, voice traffic is still expensive to carry. Although voice transmission costs are decreasing with the introduction of network entities such as 2G-3G media gateways which offer some level of voice compression [usually a 4 to 6 bandwidth saving ratio], operators are still challenged to deliver consistent OPEX reductions even while traffic continues to grow. However, in practice, operators often deploy voice trunks that are sub-optimized. Recent technology advances have resulted in sophisticated codec (compression/decompression) solutions that deliver high quality voice with improved bandwidth efficiency.

I-Gate reduces the number of compression/decompression cycles, and smart algorithms provide management tools to handle voice congestion situations. When combined with optimization and compression solutions, these techniques allow substantial improvement in bandwidth utilization, including in networks where media gateways are deployed. The result is less OPEX and improved profitability (without procuring additional bandwidth capacity) on what still constitutes the core revenue of most mobile operators — voice traffic.

### Instantly extend reach

There are still hundreds of millions of potential subscribers in underserved rural/tier 3 regions. However, several aspects make it difficult to provide affordable coverage to these regions. In isolated areas, the cost of deploying microwave links becomes substantially inflated.

Long-haul link costs (CAPEX/OPEX) increase by a factor 3 or 4; daisy-chaining of mobile infrastructure sites is limited by the PDH microwave capacity; and radio range limitations force operators to deploy additional radio capacity and costly dedicated E1 backhaul lines to cover the entire subscriber area. This extra capacity will not be fully used in practice.

There are also simple geographic issues such as the curve line of the earth and hilly landscapes which limit microwave reach to 20 miles or less (line of sight), requiring more stations to provide decent cellular coverage.

In these areas where service reach is challenged, satellite based solutions, VSAT enables instant cellular coverage for large, previously under-served remote regions, while offering operators a solution that drastically reduces the inefficiencies and costs of dedicated digital T1/E1 backhaul lines.

VSAT solutions offer reliable connectivity that is applicable to GSM cellular coverage and DCME voice trunking, for traffic backhaul or disaster recovery.

An intelligent optimization and compression solution and a satellite modem solution that have been precisely engineered to work together can considerably reduce bandwidth requirements and improve performance, allowing operators to ensure bandwidth is accurately aligned with subscriber growth. This can represent a tremendous advantage in operating costs, deployment flexibility and return on investment. In most cases, the ROI is a matter of weeks!

### Case Study – An Africa Operator getting the most from their existing bandwidth

A Mobile operator in Africa, currently servicing over 2.5M subscribers, wanted to increase his service area for 2/3G voice and begin offering low-priced voice services. The deployment plan required an extra 221 E1 leased lines, bringing the total number to 400 E1.

The operator was already leasing four STM-1 rings to support the existing GSM network at \$34k/month each, and was faced with two upgrade options in order to provide short term additional capacity:

Either lease four additional STM-1 rings that would run an additional \$136k/month, or find a way of optimizing the existing GSM network capacity in order to support the additional bandwidth requirements of the new low price services.

The operator implemented an optimization and compression solution with I-Gate Pro.

The solution more than doubled the traffic capacity of the network, allowing the operator to service an additional number of mobile subscribers without procuring any additional capacity.

The bandwidth efficiency gains generated by the solution reduced overall E1 requirements from 400 to 172, freeing an equivalent of 228 E1s from the existing capacity — a saving of US\$5 million on OPEX over three years. The savings realized from reduced spending on bandwidth alone was enough to cover the costs of the 3G service roll-out.

In addition, had the operator chosen to wait until the fibre installation be completed in order to provide the additional capacity instead, the long deployment cycle would have resulted in revenue losses— \$20 million/year loss for example for each block of additional 100,000 2G subscribers @\$200 ARPU/year, and additional \$20 million/year loss from each block of 50,000 3G subscribers @\$400 ARPU/year.