Memotec DCME Systems
The Direct Line to Increase Profits
DCME solution for Mobile and Telephony Operators

3G Migration
Streamline Operating Costs
Increase Revenue Stream
Guaranty Service Integrity
Catering to Mobile Operator’s Needs

Cellular networks deserve a dedicated voice compression solution when it comes to optimize A and E trunks. That’s because, unlike telephony networks, cellular networks already operate with compressed voice on the Radio Access Network (RAN) and carry a good proportion of data traffic (Signaling, SMS, GPRS/EDGE user traffic) in addition to voice traffic.

Being a key service differentiator, voice quality is a primary concern for Mobile Operators: adding a DCME system in an A or E link may result in severe voice quality degradation—delay, information loss—, if the solution is not engineered properly (for example, mobile to mobile communications needs voice to go through multiple compression-decompression cycles). This further deteriorates if the A/E links is going over satellite, due to the added delay of satellite transmission.

Therefore Mobile Operators will require specific features not found in traditional telephony DCME products.

Memotec understands Mobile Operator’s requirements and offers a dedicated Mobile DCME solution with a unique feature set that takes care of Mobile Operator’s network specific issues and minimizes voice quality degradation. The result is enhanced quality of service, un-compromised flexibility and maximum cost efficiency.

TELEPHONY SOLUTIONS

International Satellite Links is one of the most obvious applications where Memotec’s advanced DCME solutions can offer telephony operators significant OPEX savings.

Thanks to Memotec’s superior codec implementation and echo-cancellation performance, Memotec can deliver telephony operators improved voice quality while maintaining a top level bandwidth compression ratio, a definite competitive advantage and the best cost/performance ratio on the market.

CHOICE OF THE VOICE CODEC:

In Mobile networks, it is not all about the compression ratio performance. More important is the resulting quality (MOS score) of the DCME codec combined with the Mobile Radio Access Network (RAN) delays and codecs, which can be significantly different from the codec’s nominal MOS score.

Memotec’s DCME toll-grade voice codecs—G.729 and G.723—deliver a better voice quality when used in tandem operation with GSM codecs and over long delay transmission lines (satellite links, mobile radio links). Starting with a native compression ratio of 8:1, Memotec improves then the compression ratio through silence suppression and pre-emptive bandwidth management techniques, resulting in an impressive up to 16:1 bandwidth reduction factor, without further voice quality degradation.

Within a telephony context, similar codecs allow reaching a 20:1 reduction factor.

TRANSCODER FREE OPERATION (TFO):

Memotec’s proprietary voice trunking protocol delivers an end-to-end single voice compression/decompression cycle, whether the voice is carried over multiple satellite hops or a combination of satellite and terrestrial transmission links.

This applies in particular to local calls and Mobile to Mobile communications. Memotec’s TFO feature guarantees that the voice quality will not be further deteriorated by going through un-necessary additional compression cycles.

The potential distortion introduced into the speech signal from the conversion of the GSM Code into the PSTN PCM signal by the Transcoder Rate Adaptation Unit (TRAU) can also be eliminated.

CONGESTION MANAGEMENT

Memotec’s unique congestion avoidance technology avoids [tail] packet drop. This technology monitors the available bandwidth on the WAN vs. the input traffic load and adapts—or smooths—the input traffic load accordingly.

The traffic adaptation is based on advanced PLC—Packet Loss Concealment, a technology which was initially developed for being used by Media Gateways to compensate for packet loss in VoIP networks. Memotec’s specific implementation prevents packet drops and minimizes voice quality degradation in case of congestion.

SS7, FAX AND MODEM TRAFFIC

Memotec’s DCME solution also delivers the best bandwidth optimization performances for handling non-voice traffic, such as SS7, FAX and modem traffic, which can amount to a significant proportion of the overall international voice trunk compressed traffic.

In a telephony network, the SS7 traffic is often carried out-of-band over a dedicated transmission network distinct from the transmission network used for carrying voice traffic for reliability purposes. Given the very high availability level of satellite transmission (better than 99.9%), satellite links are often used for carrying SS7 links, or else used for backup purposes. However, the cost of backhauling SS7 traffic can become quite expensive.

Spoofing features are included that allow the detection and processing of repetitive frames. A fraction of the channel bandwidth is hence utilized providing up to 8:1 bandwidth savings.

This presents a cost effective solution to telephony operators for reducing dramatically their SS7 backhaul costs, where one single system can yield a return of investment of a few months.
Memotec DCME

A solution for reducing costs, increasing capacity and migrating to 3G

Large capacity SDH optical fiber networks are common place in Mobile core networks. However, there are always locations for which fiber is not appropriate or feasible. For those cases, a Mobile Operator has to seek other alternatives – leased lines, microwave or satellite links – to connect equipments (BSCs and MSCs), for which the cost of bandwidth is high, and capacity is limited.

Another dilemma facing mobile operators is the migration of their core network infrastructure. 3G and converged fixed/mobile core networks are based on packet (ATM, IP/MPLS) technology, while 2G/2.5G requires a TDM based transmission network. The migration process involves maintaining the co-existence of two transmission networks (TDM and packet), which results in additional cost overhead (network operation costs, transmission equipment like routers and switches). Also, the partition of the underlying transmission infrastructure between TDM and packet causes significant bandwidth inefficiencies.

Memotec’s Mobile DCME solutions offer Mobile Operators a simple and easy way to reduce their costs and increase capacity of their non-fiber transmission assets. It also lowers 3G and convergence migration costs through transparently converging 2G core networks into a single packet based network, based on a layered architecture concept.

Using advanced voice compression technology combined with state of the art packet processing, Memotec’s Mobile DCME offers a 3G core ready, highly scaleable carrier-grade solution tailored to Mobile Operators needs, delivering up to 16:1 bandwidth reduction on A & E voice trunks, while preserving voice quality.

The wide range of interfaces available on Memotec solutions as well as the varied processing capacity allow connectivity to diverse environments: from STM-1 to large trunks (up to 3 STM-1), E1, STM-1 or IP/Ethernet connecting to MPLS core over FE or GE interface – Electrical or Optical.

Key Benefits
- Best bandwidth efficiency: maximize OPEX savings
- 2G/2.5G/3G network consolidation: reduce OPEX/CAPEX
- Exceptional voice quality
- Improve network reliability
- One stop voice & data transport solution
- For Small, Medium and Large networks

Key Features
- Up to 16:1 bandwidth compression, Up to 20:1 for telephony
- Up to 8:1 SS7 traffic optimization
- High quality mobile friendly codec
- Voice and Data aggregation & compression
- Protocol independent backbone
- On-board traffic monitoring probe
- Versatile connection capability
- Unique Bandwidth Management feature
**ECHO CANCELLATION:**

The quality and performance of the echo canceller is instrumental to the overall voice quality end-user experience, even more when the link is going over long latency satellite links. Memotec has drawn upon its longstanding experience in providing voice compression solutions over satellite network, to implement a trusted, best of breed echo canceller, which has won multiple awards and praises from customers for its voice quality. It also provides up to 64ms echo tail, enough to match any network configuration and situation.

**DATA INTERFACES:**

Mobile communications are not just about voice. Data services play also a key role in the service offering (SMS, IN services, GPRS and EDGE user data services), which also needs to be carried between the BSC and the MSC, or between MSCs. Therefore, a Mobile DCME solution must also supports the various data services and interfaces present at the MSC or the BSC. This implies being able to aggregate, multiplex and compress SS7 traffic, GPRS/EDGE traffic at the Gb (BSC) or Gn (MSC) interface, and IP traffic.

Memotec’s DCME solution offers a wide range of Serial, Frame-Relay, Ethernet, IP and ATM interfaces handling the many types of physical interface, protocol and speeds found in Mobile networks. It also provides less loss line-rate hardware data compression, delivering up to 60% bandwidth reduction, together with a sophisticated SS7 traffic optimization algorithm delivering a 4:1 up to 8:1 bandwidth reduction on SS7 channels.

**REAL-TIME NETWORK MANAGEMENT:**

It is essential for the Operator to know what is the traffic going through the A/E links or with the PSTNs and how the DCME system handles it, in order to maximize transmission resources efficiency and control quality of service.

CXMON is a software based probe, embedded in the Memotec’s CX devices which enables the operator to monitor precisely each voice trunk digital interface with real time graphic visualization of the different traffic being forwarded (signaling, voice, data), and analyze the compression performance of the DCME system. As a result, CXMON allows the operator to control the quality of service delivered over the backhaul network and fine tune the network efficiency for optimal cost effective utilization.

**3G Migration**

An important issue with any capital investment in Mobile Telecommunications is: can the equipment adapt itself to the next generation, and how will it help migrate my network? Namely, for Mobile Networks DCME solutions:

- Can my system handle the increasing importance of data traffic in my network?
- How my DCME solution will adapt to a packet based (ATM or IP/MPLS) core network, with the introduction of 3G?

Unlike traditional [telephony] DCME solutions which are designed to run on TDM backbone infrastructure, Memotec’s DCME solution can operate on any data network infrastructure. Therefore, Mobile Operators can further reduce costs by running 2G A&E voice trunks on top of the data backbone (overlay mode), be it a 3G or a 2.5G data network.

Furthermore, Memotec DCME solutions complement 3G media gateways which are limited to 8:1 optimization rate with an increased bandwidth compression (up to 16:1).

**ADDITIONAL COST SAVINGS INCLUDE:**

- one single network to manage (OPEX savings);
- reduced bandwidth requirements thanks to the benefits of voice and data traffic statistical multiplexing (up to an additional 2:1 factor);
- a better utilization of the network equipment infrastructure (CAPEX savings).

Memotec’s DCME solution includes specific features to manage and guaranty the voice quality when carrying voice trunks over the data network:

- QoS policy management,
- Traffic Prioritization,
- Packet Loss Concealment [PLC],
- Rate adaptive jitter buffer (to compensate the variable jitter introduced by packet networks)
- Improved echo canceller
- Delay resilient codec

**Figure 2: CXMON A/E interface monitoring tool**

**Figure 3: 3G Migration**
Applications:

1. Satellite (or leased line) A or E Link Cost Reduction

Many mobile operators who have deployed satellite A or E links, are still carrying voice as plain PCM (G.711) 64 kbit/s channels or ADPCM (G.726) 32 kbit/s channels. The main reason being the fear of degrading voice quality by using more aggressive voice codecs. However the cost of those links is a heavy burden to the Mobile operator OPEX.

Memotec brings the solution: thanks to Memotec’s Mobile DCME unique features, Mobile Operators can now enjoy up to 16:1 bandwidth reduction on their A/E voice trunks while preserving voice quality.

For example, let’s consider an A link of 8 E1s, carrying 240 voice channels and 8 SS7 signaling channels. Assuming a conservative 35% silence ratio, Memotec’s DCME solution will reduce the bandwidth required on the satellite link down to less than 1,000 kbit/s.

If the Mobile Operator was previously using an ADPCM solution, introducing Memotec’s DCME will translate into a saving of $150,000/year,* yielding a payback period of a few months.

Note that a similar business case could be made for leased line backhaul or congested PDH (E3) microwave links: the same example would reduce the backhaul capacity from 8 E1s (or one E3) to a single E1.

(*) The calculation above assumes a transponder cost of $3,000/MHz/month, and a Comtech CinC modem 1.6 bit/Hz efficiency (3/4 TPC 8PSK with 1.4 spacing).

2. Ater to A Link Migration

In an Ater link configuration, the TRAU (Transcoding Unit) is located at the MSC, and voice information is carried between the BSC and the MSC in a compressed format (usually 16 kbit/s per voice channel). But as traffic increases, it might become necessary to locate the TRAU at the BSC, thus migrating the Ater link to an A link.

Voice being uncompressed in an A link, it occupies a full 64 kbit/s circuit as opposed to 16 or 8 kbit/s in an Ater link: an A link will require at least 4 times more transmission capacity than an Ater link, thus significantly increasing network OPEX.

Memotec’s MobileDCME brings the solution. Delivering from a 12:1 up to 16:1 voice compression ratio, an A link equipped with Memotec will then require about 3:1 to 4:1 less transmission bandwidth than the Ater link, thus allowing for significant network OPEX savings, or additional backhaul capacity for future growth and new services.

3. A/E Link Backup (disaster recovery)

Transmission infrastructure supporting A/E links shall guarantee the maximum availability and offer protection schemes against network outages. For example, a PDH E3 [34 Mb/s] outage, carrying 480 voice channels, will cost an Operator near $3,000/hour of revenue loss (at 10c/mn).

Network outages are particularly sensitive for Mobile operators using 3rd party leased lines networks, or unprotected fiber links (fiber cuts). Those can account for 30% up to 50% of all network faults, and amount to hundred of thousand of dollars of revenue loss for the Mobile Operator. The availability issue is further emphasized as Mobile services are more and more as being a critical public service, adding pressure to increase the network reliability and provision solutions for disaster recovery.

Unfortunately, cost and feasibility of link protection to ensure proper network reliability is often an issue for Mobile Operators.

Memotec’s DCME solution addresses this problem: it offers an inexpensive A/E link backup solution based on On-Demand satellite backhaul. The Memotec’s solution provides a global backup service for all the Mobile Operator critical A/E links, at a minimum operating cost. Opex is limited to the satellite bandwidth required by only one or a few A/E links after compression, and setup on demand at the location where the link outage happens.

The Memotec’s DCME backup solution is best implemented using Comtech’s Vipersat satellite modems (www.vipersat.com), which delivers the highest transponder bandwidth efficiency for bandwidth on-demand satellite applications. VMS – Vipersat’s NMS system – in conjunction with Memotec’s bandwidth management capabilities, also offers superior real-time monitoring functionalities, which enable the operator to accurately and timely tailor satellite resources where they need to be deployed.

4. Towards PSTNs

In many markets, the PSTN infrastructure is well developed and provides substantial revenues to the operator. It then becomes essential to preserve this business as well as continue to acquire more subscribers. And when the capacity is limited by the nature of transport infrastructure that is available, the Memotec DCME solutions can provide additional bandwidth that allows expanding the operator’s footprint. Even in the case where compression solutions may have been deployed but with a lower optimization rate, newer codecs can make a quantifiable difference in revenues.

Combined with Comtech CinC modems, the overall solution brings an unseen price-performance ratio in the industry.
Memotec DCME Systems: The direct line to increase profit

New services, technology migration, traffic growth, decreasing ARPU, inflating network infrastructure costs, improving operating margins: these are the multiple challenges facing Operators today. Memotec’s DCME solution can help address those challenges and deliver solutions to Operator’s current network issues, with a quick payback period. Whether you are using terrestrial landline, microwave transmissions or satellite links, be a traditional Mobile Operator, an MVNO or a Landline Operator, we do have the optimal network solution for your network, which will directly reduce costs and generate immediate profits.

Please contact the Memotec dedicated support team (COE@memotec.com) or call our local representative (www.memotec.com) to find out more on how Memotec DCME systems can increase your profits.

About Memotec

Memotec is the pioneering supplier of cellular network satellite backhaul and GSM and CDMA network optimization solutions. Memotec’s flagship product, the CX series, enables operators to reduce dramatically network operating expenses by cutting transmission costs, both at the access (BTS/Abis interface) and network core (MSC-BSC A/E interfaces).

Leveraging the satellite modem expertise of parent company, Comtech EF Data, Memotec’s CX Series offers operators a new solution paradigm for deploying profitable voice & data services in rural, low density or geographically challenged areas.

Memotec is headquartered in Montreal, Canada, with offices around the world, and is a wholly owned subsidiary of Comtech EF Data Corp., and its parent company Comtech Telecommunications Corp (NASDAQ: CMTL).