GLOBAL IP SOLUTIONS

GIPS RCU

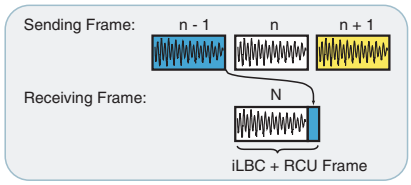
Robustness enhancement of low bit-rate telephony applications

The GIPS Redundant Coding Unit (RCU) is a generic robustness enhancement unit that provides increased packet loss robustness for low bit-rate codecs in IP telephony products.

GIPS RCU, together with the GIPS iLBC codec will enable high speech quality to:

- Providers that require very high robustness
- Markets with constrained bandwidth requirements
- Providers that use the Internet as their main communication network

The algorithm for RCU is based on a technique that extracts and compresses vital speech codebook information from each frame and sends that as a RCU extension with the next packet. This information can then be used to recreate lost information in case of packet loss.



The GIPS RCU provides better robustness than packet loss concealment by predicting neighboring packets from the current one at the price of just a few kbps addition in bit rate. The RCU, in combination with iLBC, generates very little extra overhead in terms of code size while RCU takes full advantage of the iLBC codec implementation technique.

The RCU is more advanced than the most common FEC (Forward Error Correction) techniques, such as IETF's Redundant Audio Coding (RFC 2198) and generic FEC (RFC 2733). The drawback with RFC 2198 is that it requires a complete encoding of the previous frame using a standard codec, which most commonly is achieved by sending the same encoded data twice. This results in more than double the bandwidth usage. The generic FEC technique is designed for protecting any type of bits in its data protection scheme rather than exploiting characteristics of the underlying signal, which results in a very inefficient solution.

The RCU algorithm adds no extra delay in a clean channel condition. In a packet loss scenario, the RCU, in combination with iLBC and GIPS NetEQ, provides less than a frame delay. The reason for this low delay is that GIPS NetEQ is designed with a high jitter buffer resolution and therefore can utilize fractions of a late packet.

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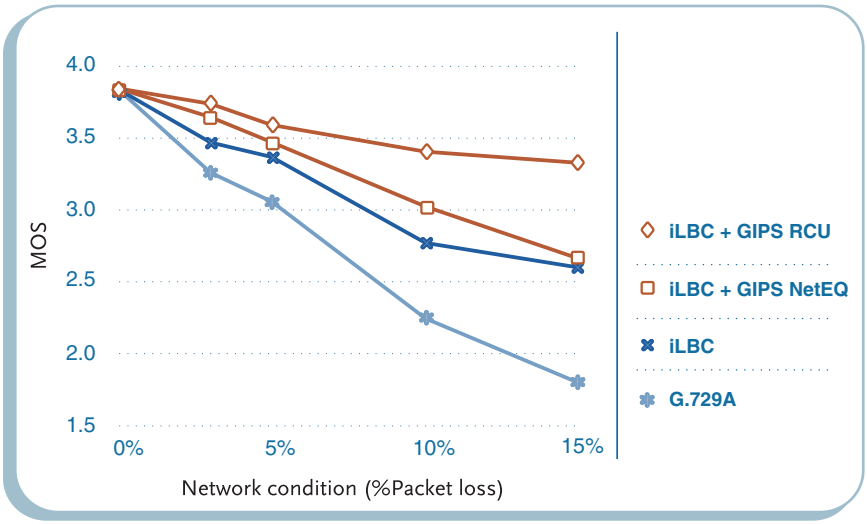
RCU performance:



Tests were performed by Dynastat, Inc., an independent test laboratory.
Score system range: 1 = bad, 2 = poor, 3 = fair, 4 = good, 5 = excellent.

Specification	
Supported Codecs	Any low bit-rate codec such as GIPS iLBC, G.729 and G.723.1
Supported frame sizes	Same as codec
Bit rate	2.4 kbps
Sampling rate	8 kHz
Implementation	Fixed point ANSI C and DSP[1]
Complexity	Low
Packet loss robustness	Very high
Standard compliance	Supported by the IETF protocol for redundant coding RFC 2198. Supporting RFC 2198 adds another 2.0 kbps for 20 ms packets, or 1.33 kbps for 30 ms packets
Delay	0 ms for clean channel and between 0 to packet frame size during packet loss, in conjunction with GIPS NetEQ

1) Please contact a GIPS sales representative for a complete list of implementations.