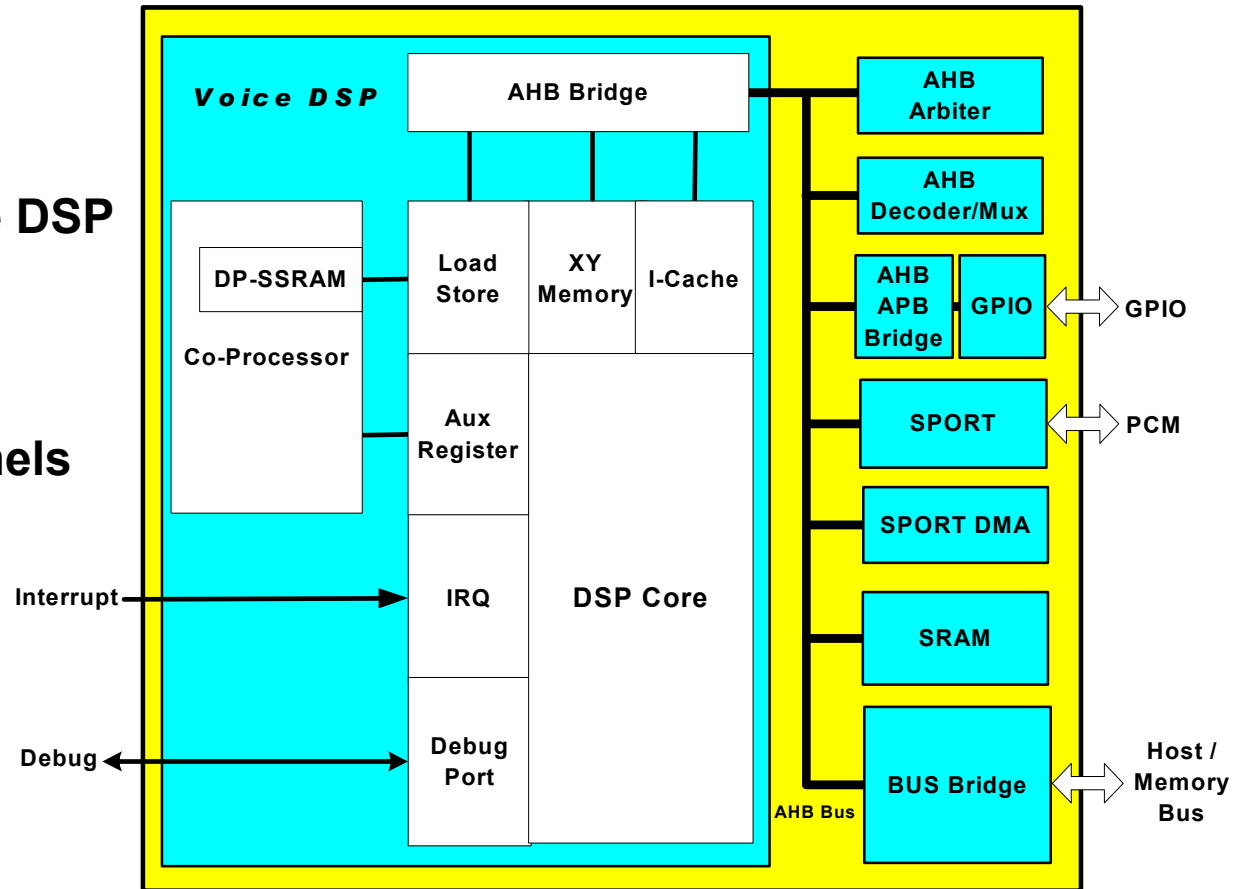


Fujitsu VOIP

VoIP DSP Macro

VoiceDSP

- Custom-designed voice DSP
- Consumer applications
- Highly scalable
- Single & multiple channels
- High performance
- Low power
- Synthesized for
 - 0.25 μ m
 - 0.18 μ m
 - 0.11 μ m



VoIP DSP Features

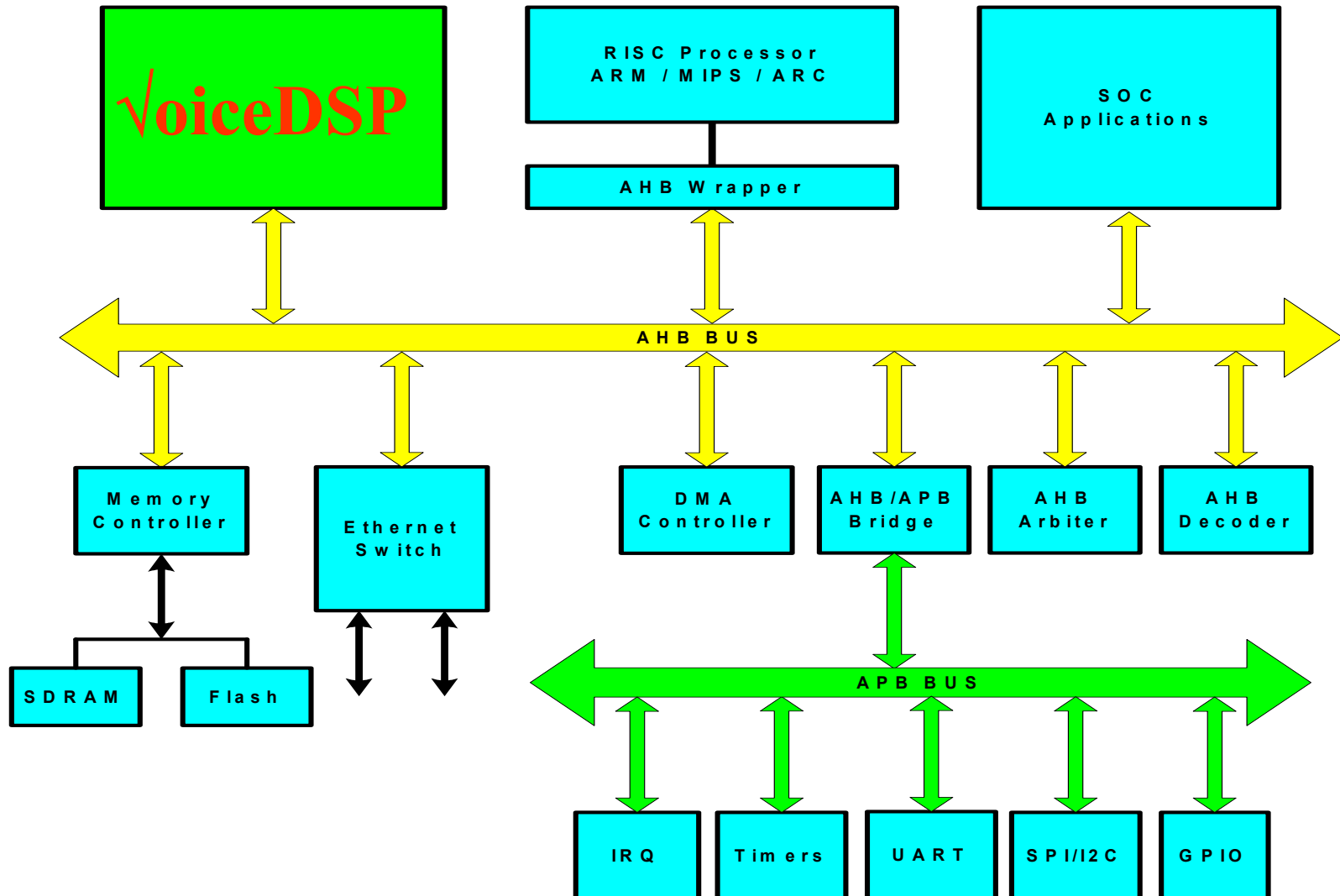
- **Custom-designed DSP with dual MAC**
- **On-board co-processor with multiple MACs**
 - Improves performance – lower speed clock
- **Scalable architecture supports various applications**
 - Single channel / multi channel
 - Maximum 4 simultaneous vocoders (most demanding algorithms)
- **On-board AHB bus**
- **PCM interface**
- **Debug interface**
- **Fully verified vocoders & telephony firmware**

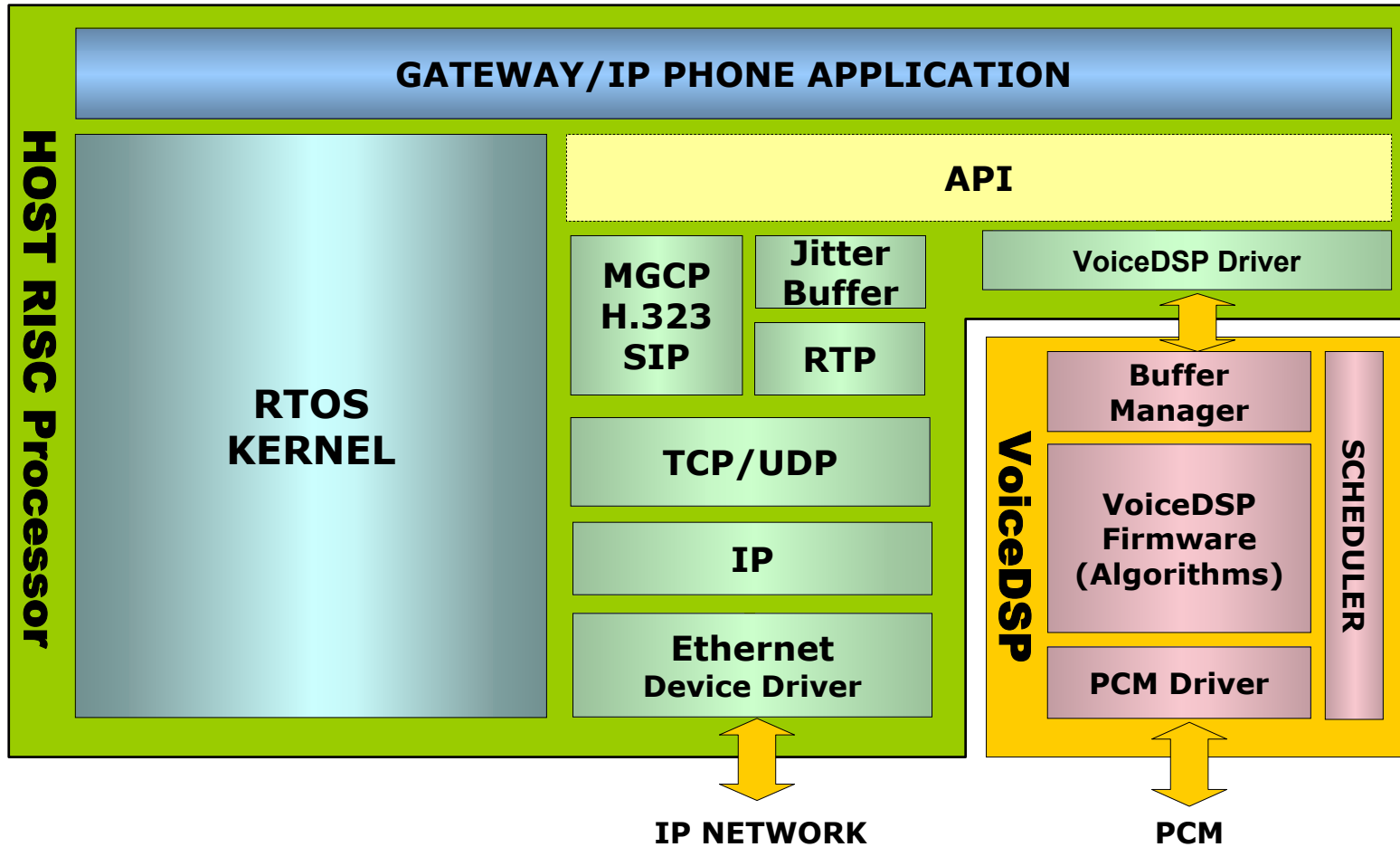
VoIP DSP Firmware (Algorithms)

- **Vocoders**
 - G.711, G.723.1A, G.726, G.728, G.729AB, G.729E
 - CNG/VAD
- **Telephony functions**
 - Echo cancellation: G.167, G.168
 - Comfort noise generation / voice activity detection (CNG/VAD)
 - DTMF detection / generation
 - Call progress tone (CPT)
 - Caller ID FSK modulation
- **Fax relay**
 - T.38/T.30
 - V.17, V.21, V.27ter and V.29

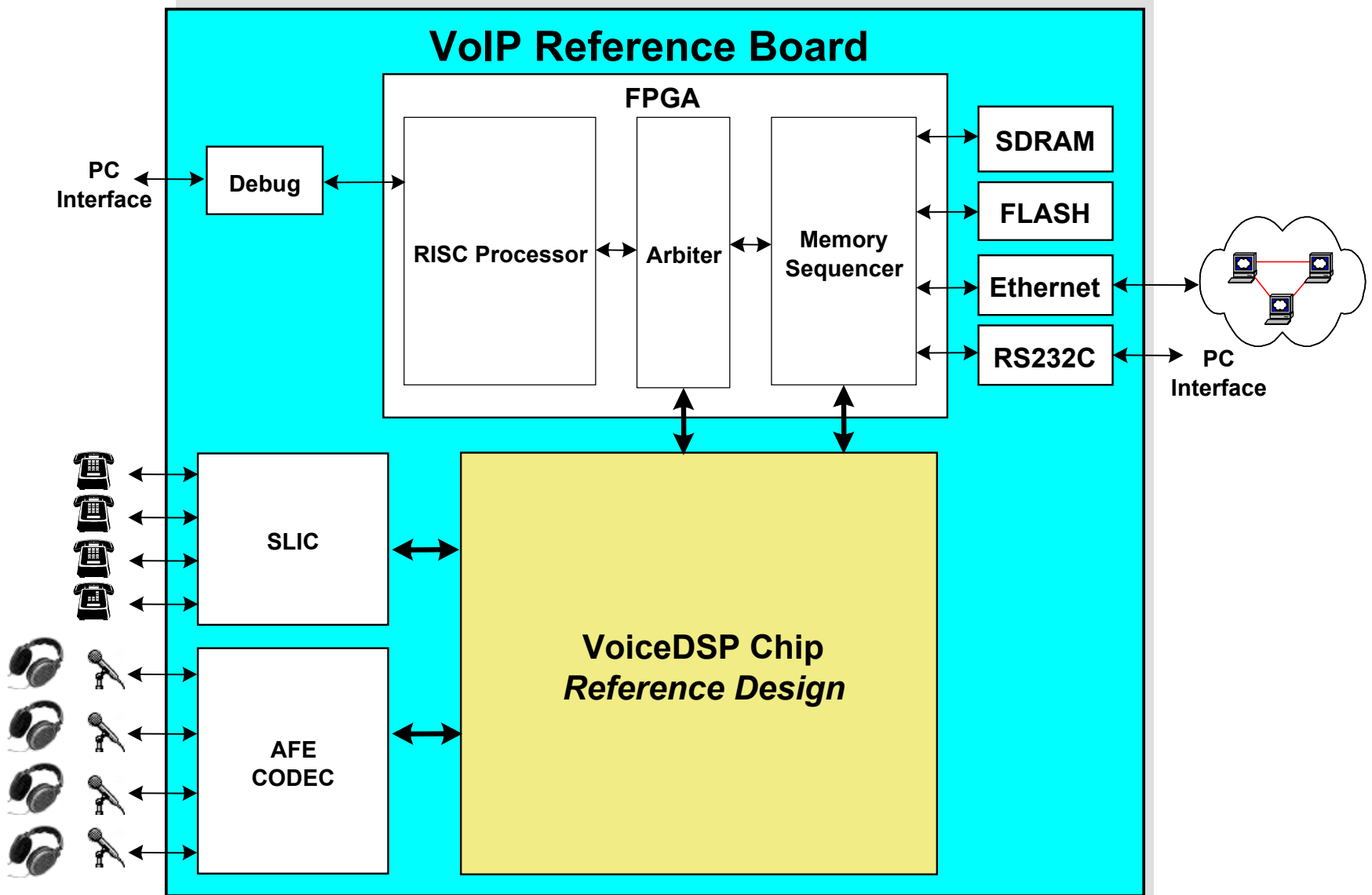
VoIP & SOC / ASIC Platform

AMBA Based VoIP SOC





Evaluation Platform (Block Diagram)



VoIP Evaluation System

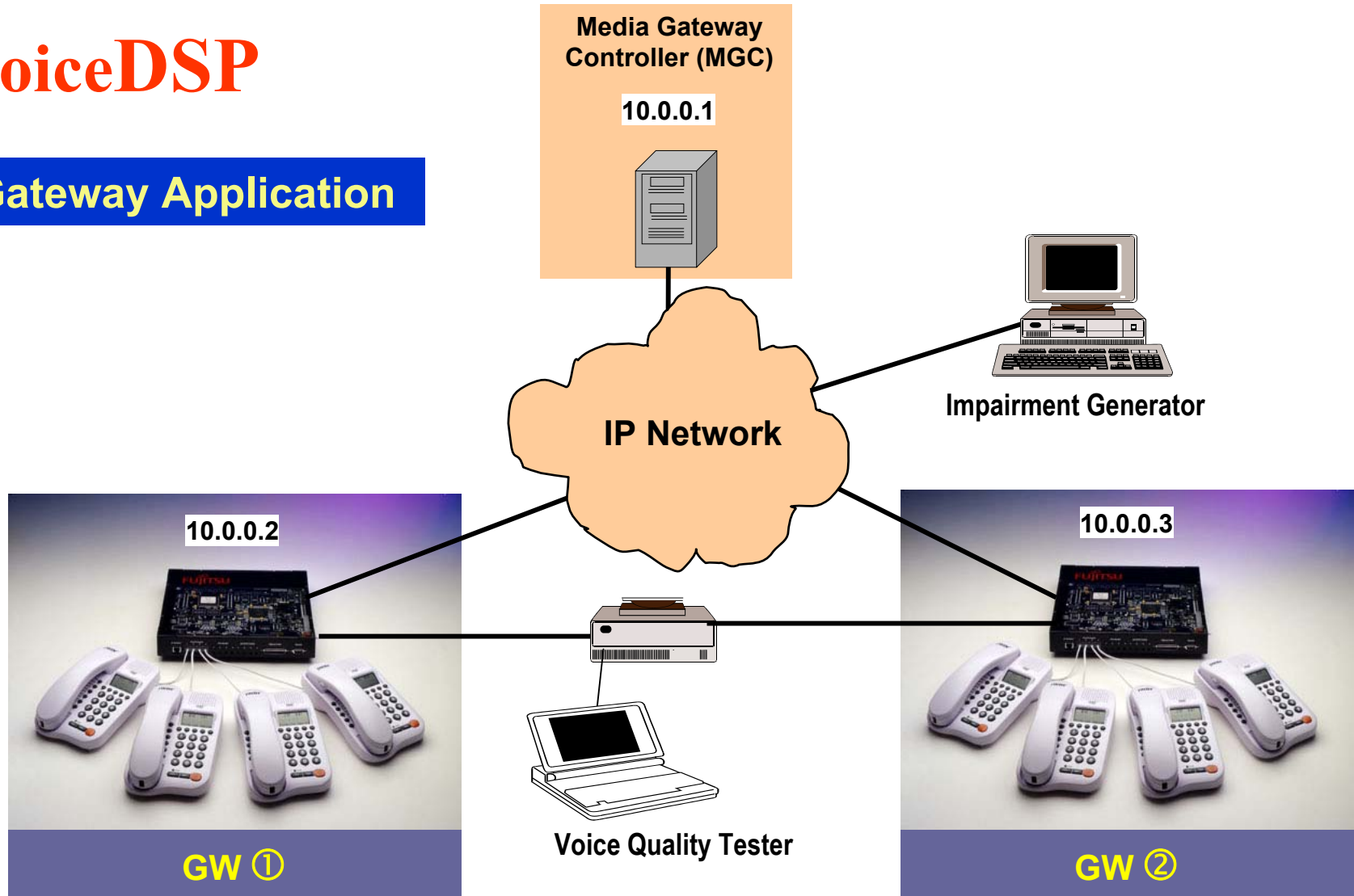
THE POSSIBILITIES ARE INFINITE



VoIP Verification Platform

VoiceDSP

Gateway Application



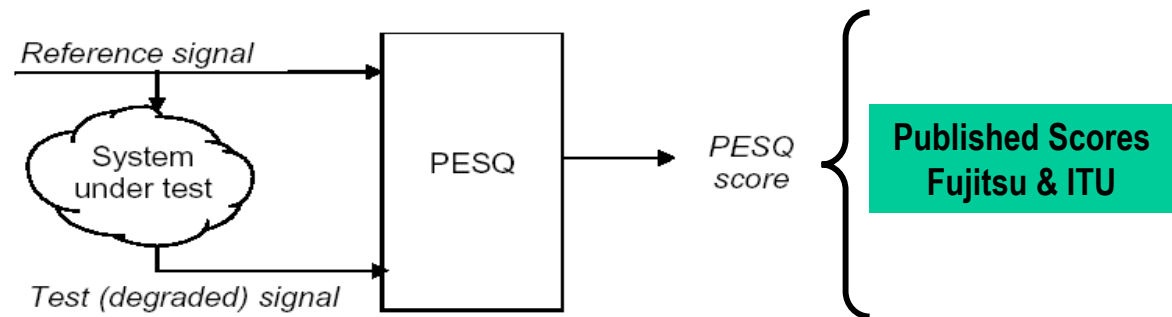
Voice Quality Measurements

End-to-End Speech Quality

- **Perceptual Evaluation Speech Quality - PESQ (ITU-T Rec. P.862)**
 - Compare objective quality with subjective Mean Opinion Score (MOS) for tests carried out according to ITU P.800/P/830
 - PESQ v1.42 introduces additional mapping for the PESQ score called PESQ-LQ. This exhibits better correlation to MOS scores

VoiceDSP

Clarity

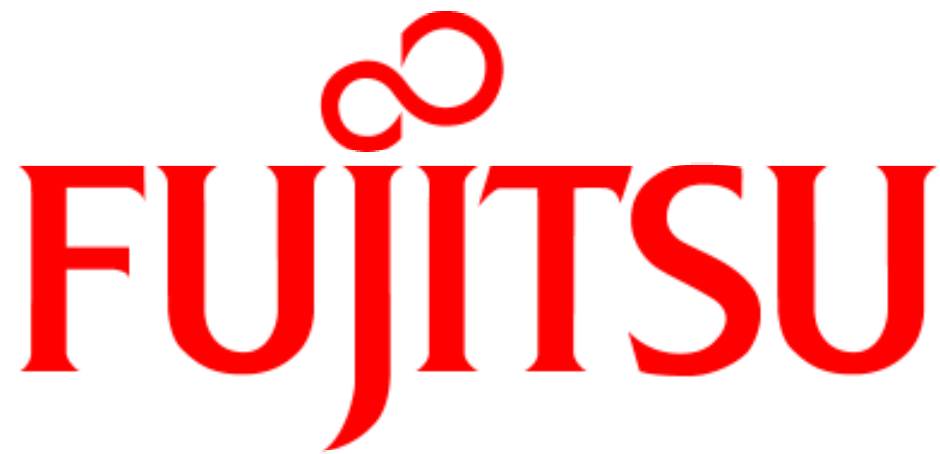


- **Clarity measurements based on PESQ-LQ were carried out for all algorithms with and without network impairments**
- **Echo measurements based on PESQ-LQ were carried out for single-talk and double-talk setup**
- **PESQ-LQ scores compared with published ITU results – matched results**

VoiceDSP

Support & Deliverables

Key Items
ASIC/SOC Implementation
VoiceDSP Firmware <ul style="list-style-type: none">VocodersTelephony Functions & Fax RelayJitter BufferVoice DSP Scheduler & Driver
System Software <ul style="list-style-type: none">API & DriversRTOS & Network StackSignaling Protocols (MGCP/H.323/SIP)
RISC Processor & support
VOIP Evaluation System



FUJITSU

THE POSSIBILITIES ARE INFINITE