VOICE COMMUNICATION PACKAGE (VCP)

8TH Generation "VCP8"

DATASHEET

Revision 1.0

Preliminary/Confidential

ALANGO
Technologies and solutions

Revision History

Revision	Date	Description
1.0	Jan 23, 2017	Initial Release

ALANGO
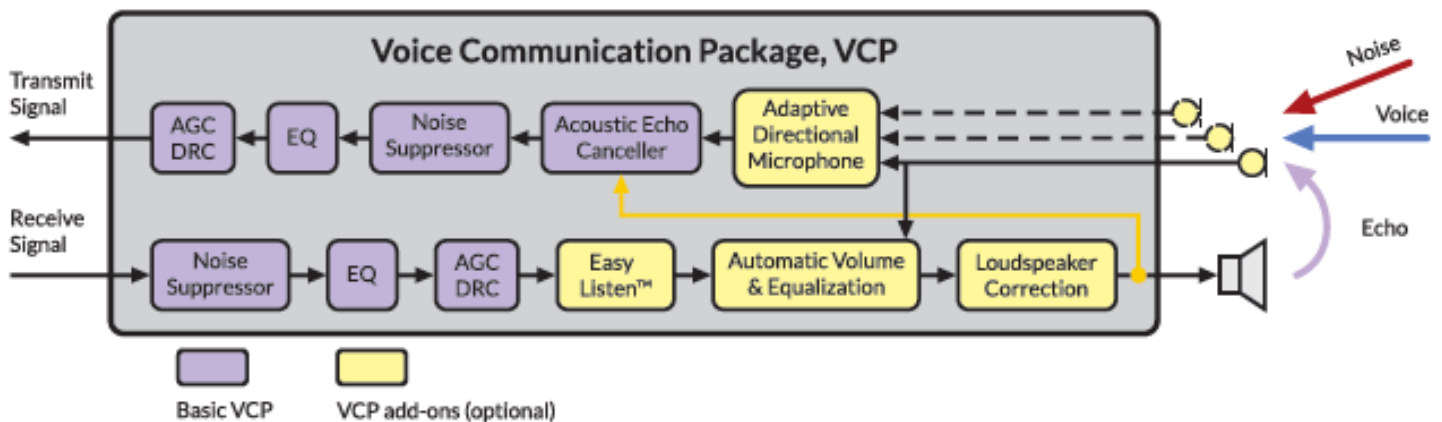Technologies and solutions

Voice Communication Package

General Description

Voice Communication Package (VCP) is a suit of digital signal processing technologies enabling high quality, full duplex, noise free voice communication for a variety of applications including automotive hands-free, mobile phones, Bluetooth headsets, hearables and wearables, audio and video conferencing systems, intercom systems and others. VCP was designed to enable the highest possible voice quality in various acoustic environments while consuming relatively low MIPS and memory resources.

VCP Gen8 "VCP8" accumulates many years of practical Alango experience providing a scalable, highly optimized solution for voice communication applications. In addition to the software DSP technologies Alango has developed an unique set of auxiliary software and hardware tools facilitating development, debugging, testing, acoustic tuning, problem identification and reporting.

The standard VCP8 package is a complete voice enhancement solution that addresses all required processing such as Acoustic Echo Cancellation, Noise Suppression, and Gains management. Additionally, VCP8 includes optional add-ons to further enhance the user experience.

Block Diagram and Description

A L A N G O

Technologies and solutions

Voice Communication Package

General Description – *continued -*

Adaptive Directional Microphone (ADM)	Two or more microphones in the device are positioned to adaptively discriminate between speech and noise utilizing Alango's beamforming algorithms.
Acoustic Echo Canceller (AEC)	Eliminates acoustic echo with multi-band residual echo suppressor ensuring full-duplex communication with minimal voice distortions.
Noise Suppressor (NS)	Detects and attenuates stationary and transient noises (traffic, pub, passing cars, etc.) in transmitted and received signals.
Automatic Gain Control (AGC) and Dynamic Range Compressor (DRC)	Equalizes voice levels in the microphone and loudspeaker signals ensuring clear intelligibility. Alango AGC technology is robust to ambient noises and allows fast signal equalization without increasing ambient noises.
Frequency Equalizer (EQ)	Allows fine frequency adjustment of microphone and loudspeaker frequency responses with high frequency resolution.
EasyListen™	Slows down incoming speech in real time improving intelligibility of fast talkers, foreign language, mailbox and numbers.
Automatic Volume & Equalization (AVQ)	Modifies the loudspeaker signal according to the ambient noise level and spectrum providing perceptually equal loudness and intelligibility in dynamically changing conditions (street, bus, train, etc.).

A L A N G O
Technologies and solutions

Technical Details

Performance

Echo canceller

       Fast convergence (< 300ms) with no initial echo

       Convergence in double talk and high noise

       Robustness to speaker signal distortions

       Long echo tail (up to 1000ms)

       Residual echo level < -60dB

Noise suppression

       Noise suppression with high frequency resolution

       Up to 30dB noise reduction with low distortions

       Fast noise adaptation (as low as 100ms for transient noises)

Maximal AGC gain of 24dB

Processing delay 24ms

Supported sampling rates: 8kHz, 16kHz, 24kHz, 32kHz

Fully compliant with ITU automotive specifications

Availability

VCP is available* on the following platforms:

ARM cores (all types)

CEVA TeakLite III, IV

Renesas SuperH family

Synopsys ARC cores

Cadence (Tensilica) HiFi2, HiFi3

Analog Devices, Blackfin

CSR BlueCore5 Multimedia, CSR 8670/8675 (with Kalimba DSP)

* Implementation and availability of specific VCP blocks may differ between platforms. Please, contact Alango technical support for specific information. Porting on other platforms can be performed quickly.

Resources

VCP8 comes in two versions; Full and Light. The Light version consumes less resources at the expense of increased latency. The numbers below are based on Cadence Tensilica (HiFi3) Core.

Mode	MCPS Mega Cycles Per Second (without RX channel processing)	ROM	RAM, bytes (without RX channel processing)
NBS (8KHz) Full	36 (27)	115 Kb	45488 (38676)
NBS (8KHz) Lite	22 (16)	115 Kb	32560 (26869)
WBS (16KHz) Full	61 (48)	115 Kb	77560 (67000)
WBS (16KHz) Lite	39 (29)	115 Kb	55036 (45496)

ALANGO

Technologies and solutions

VCP Advantages

VCP integrates a significant number of front-end voice processing technologies scalable for different applications. Overall, VCP component technologies provide multiple advantages:

Basic package advantages

1. Low computational and memory resources. This is achieved by:

a. Tight integration of processing blocks sharing computations and memory.

b. Special Assembly language optimization for particular DSP cores.

2. Highly efficient echo canceller

a. Sub-band scheme with a large number of frequency sub-bands (33Hz sub-band width) reducing the computational complexity of adaptive filters. This makes VCP very efficient for wideband voice with long adaptive filters.

b. Proprietary, complex LMS adaptive filtering with very fast adaptation time, robust convergence in double talk and special dis-convergence protection mechanism.

c. Sub-band echo suppressor blocking only those spectral parts of the uplink signal where echo is distorted and cannot be completely cancelled by adaptive filters.

3. Noise suppressor with fast noise adaptation time.

a. Utilization of a proprietary, very reliable voice activity detector reducing the adaptation time on "noise only" sections (voice is not detected).

b. Suppression of fast changing, transient noises (e.g. noises of passing cars). A proprietary detector of transient noises further reduces noise adaptation time when transient noise is detected.

4. Automatic Gain Control with almost instantaneous amplification of low level voice signals without being confused by ambient noises. Such noise robustness is enabled by the voice activity detector.

5. Narrow band equalizers with 33Hz (Rx) and (Tx) bandwidth allow precise compensation of loudspeaker or microphone frequency response irregularities

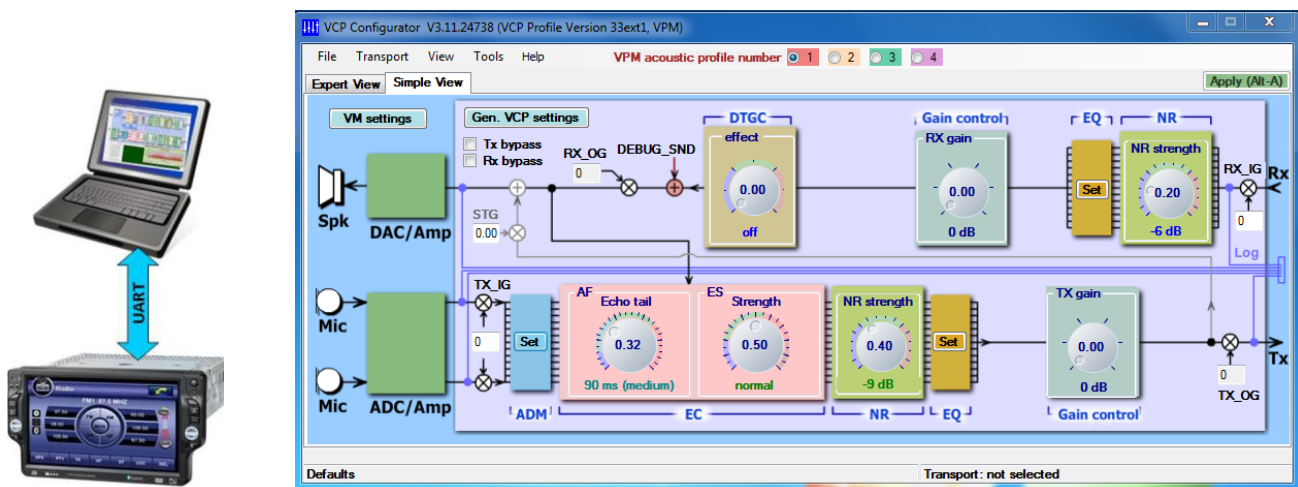# VCP Advantages – *continued* -

Advanced blocks advantages

1. Sub-band adaptive multi-microphone array with:

a. Very fast adaptation time allowing efficient cancellation of noises in changing environments.

b. Support for different configurations (end-fire, broadside, close talk, echo cancellation)

2. Automatic, ambient noise dependent speaker volume and frequency equalization technology with minimal computation requirements (borrowing noise estimation from uplink noise suppressor)

3. EasyListen™ - highly efficient, real time slowing down of incoming speech for better intelligibility of "fast talkers".

VCP Development Tools

VCP configurator

VCP Configurator is a PC Windows graphical application allowing control of VCP functionality. The configurator screen shot is depicted below. VCP blocks and their parameters are shown according to their real position in the signal processing chains. Parameters are provided with short prompts as well as detailed help. VCP configurator generates an acoustic profile structure that can be uploaded into a device under tuning in real time via UART or other available interface.
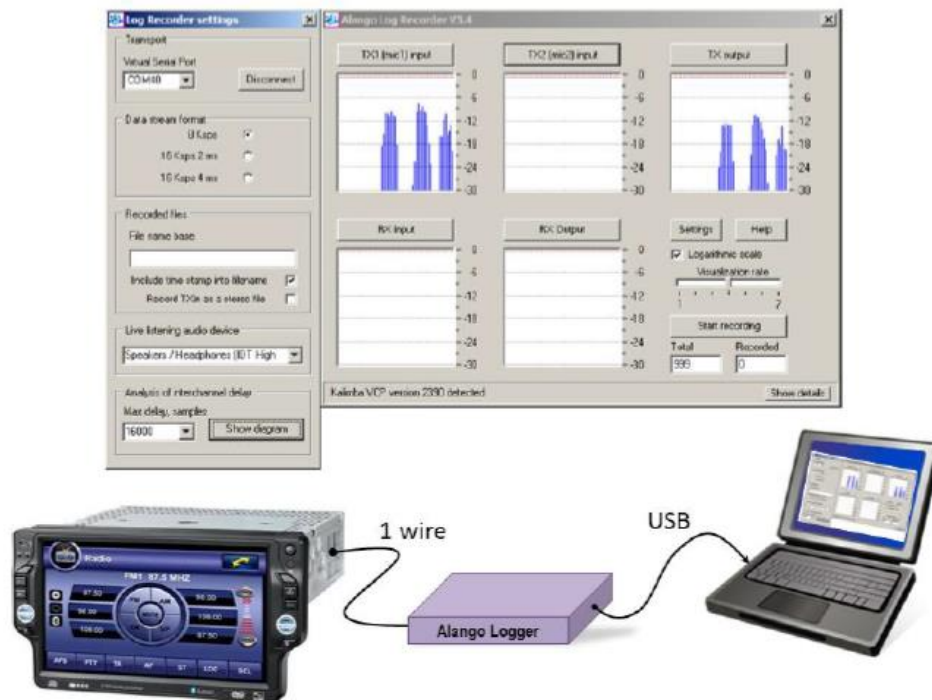
VCP Configurator Application

Alango Technologies Ltd., 2 Etgar Street, Tirat Carmel, 39100, Israel

VCP Development Tools – *continued* -

Signal and data logger

Alango Logger and the corresponding PC Windows application allows real time monitoring and storing of VCP input/output signals. Logger functionality helps during the device development stage, accelerates acoustic tuning and simplifies problem identification and reporting. The Logger screen shot is illustrated below.

<u>Alango Logger</u>

The device under development/testing/tuning is connected via 1 wire interface to the Alango Logger that is transferring accumulated data into a Windows computer via USB. Logger PC application parses the incoming stream separating input/output signals and auxiliary data. The input/output signal levels are shown in real time. It is possible to store the signals as well as to listen to one of the signals via headphones.

Alango Technologies Ltd., 2 Etgar Street, Tirat Carmel, 39100, Israel