



# Audio Application Development Kit



## PRODUCT OVERVIEW

The GainSpan Audio Application Development Kit (ADK) is a complete reference design that demonstrates an audio streaming application based on the GainSpan GS2011MiZ Wi-Fi Module, audio application board and the associated embedded and mobile software suite. The Audio ADK targets applications such as wireless speakers, wireless microphones, headphones, walkie-talkies and baby monitors.

The Audio ADK includes the Audio Application board, hardware design package and complete software suite including embedded software and mobile reference applications for iOS smartphones. An evaluation version of the ADK, the Audio Application Evaluation Kit (AEK) is also available that will include the application hardware and binary-only software.

The Audio ADK supports a variety of use cases - streaming music from smartphones to a remote speaker or headphones, streaming voice audio data from the audio board to the smartphone, or walkie-talkie mode for two-way half-duplex audio communication. The ADK provides customers a foundation to rapidly build custom features suited to their end application.

## OPERATIONAL MODES

The GainSpan Audio ADK board running the audio application may operate as a limited access point (Limited AP Mode) or as a client within an existing network infrastructure (Client/Station Mode).

In Limited AP Mode, the Audio ADK board forms a point-to-point connection with a smartphone. Once the smartphone has established connection with the Audio ADK board, the Audio mobile application discovers the Audio application profile being advertised by the embedded application and selects it to enable audio streaming from the smartphone to the Audio board or from the Audio board to the smartphone, depending on the use case selected.

In Client/Station modes, the GainSpan module and the smartphone connect to an AP as clients. The smartphone now discovers the Audio embedded application profile, and upon selection, starts the audio streaming.

Both the Limited AP mode and client/station modes provide mDNS/DNS-SD based discovery methods. The embedded application advertises availability, and clients automatically discover the audio profile and connect to it.

Discovery allows clients to locate and connect to audio board without the need to know the URL.

Provisioning of the GainSpan node in Limited AP or Client/Station modes and Over-the-air firmware updates (OTAFU) of the GS2011M module firmware can be done using Provisioning and OTAFU web or mobile applications.

## BENEFITS:

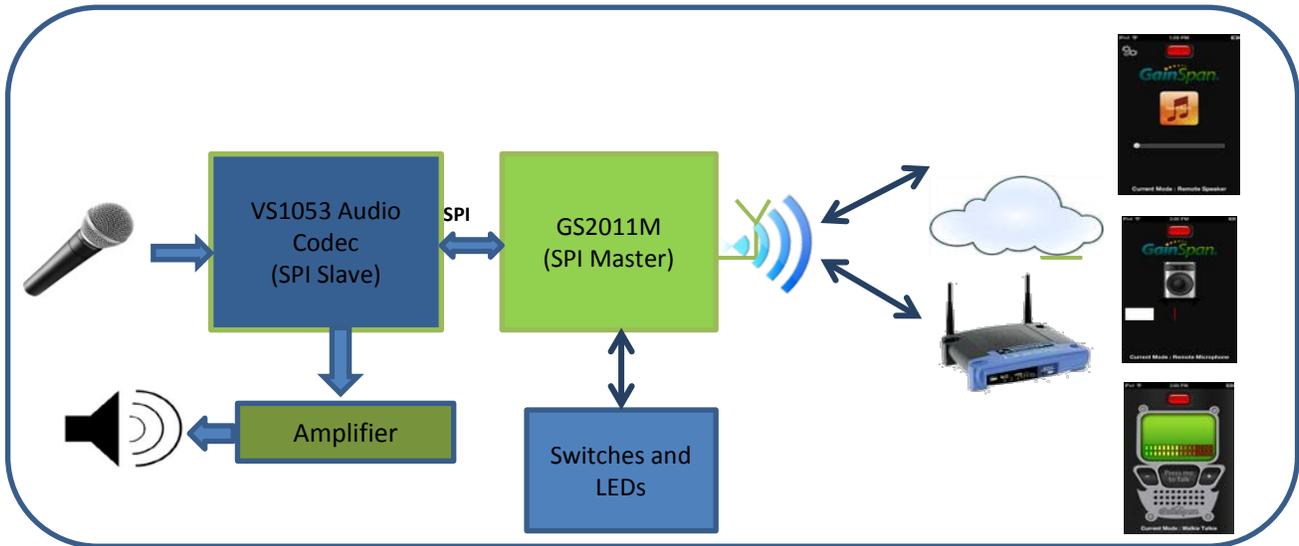
- Complete audio reference design for audio streaming between the Audio Application board and iOS based smartphones
- Target applications are audio streaming applications such as wireless speakers, headphones, walkie-talkies and baby monitors
- Accelerated time-to-market using GainSpan's solution that includes complete hardware design package and software suite (embedded software source and mobile reference apps)

## FEATURES:

- Audio ADK hardware features
  - GainSpan GS2011MiZ Wi-Fi module
  - Communicates with audio codec via SPI
  - VS1053 Audio codec
    - Decodes most common audio formats – MP3, AAC-LC, WMA, WAV, FLAC
    - Encodes 16-bit PCM from mic input
    - On-chip stereo DAC
- Audio ADK software features
  - Complete networking and Wi-Fi stack; Wi-Fi Security (WPA/2, WEP)
  - Allows automatic discovery by clients using mDNS/DNS-SD discovery methods
  - Remote Speaker
    - Music streaming with improved audio buffering
    - Support for MP3 and AAC (.m4a) audio formats
  - Remote Microphone
    - Voice streaming from microphone to mobile app
    - Linear PCM format encoding; app does decoding and playback
  - Walkie-talkie
    - Push-To-Talk button on board and mobile app
    - Half-duplex, two-way communication

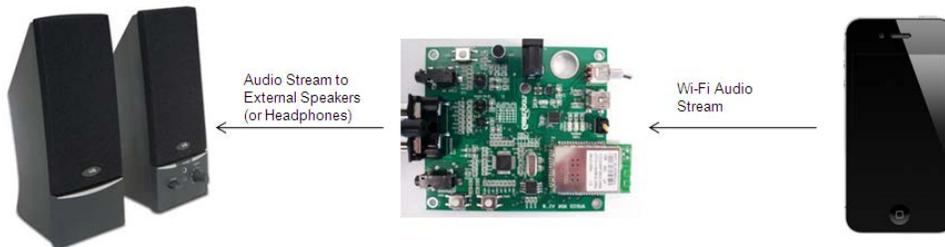
**APPLICATION USE CASES**

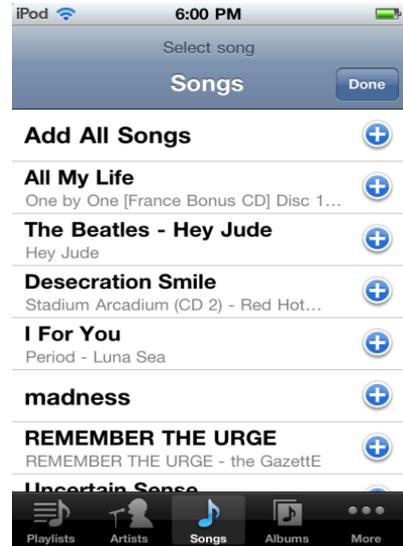
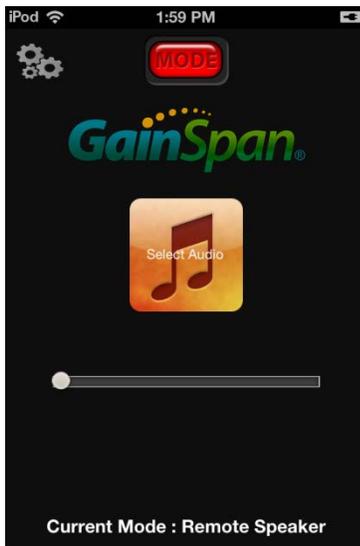
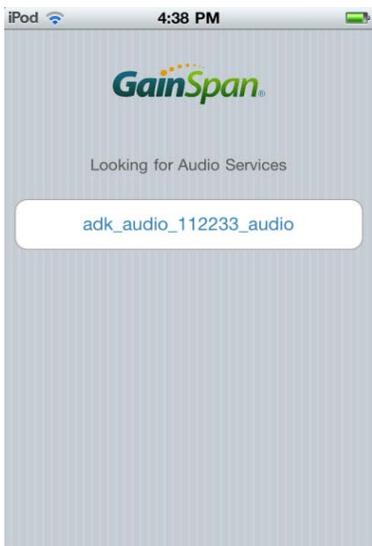
The GainSpan Audio ADK supports audio streaming to and from an iOS smartphone. All communication between the GS2011 and audio codec chip occurs via SPI. The transport mechanism used for audio streaming is TCP or UDP.



**MUSIC STREAMING TO WI-FI REMOTE SPEAKER**

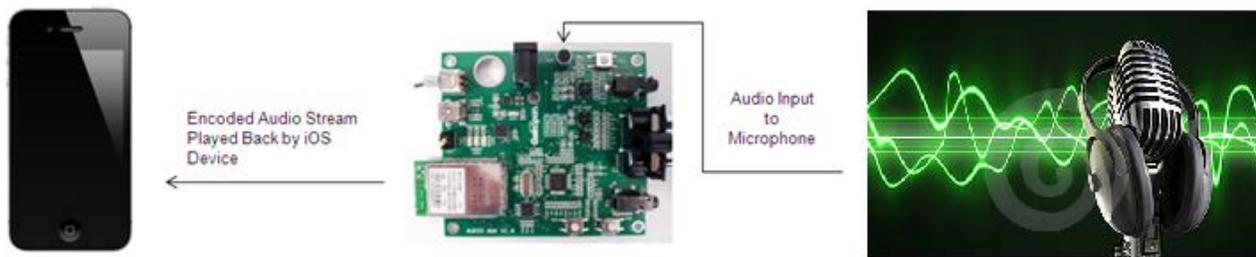
The GainSpan Wi-Fi music streaming use case demonstrates a Wi-Fi speaker application - music is streamed from the smartphone to a remote speaker, over Wi-Fi. Packets are received and buffered on the Wi-Fi module and sent to the audio codec chip for decoding.





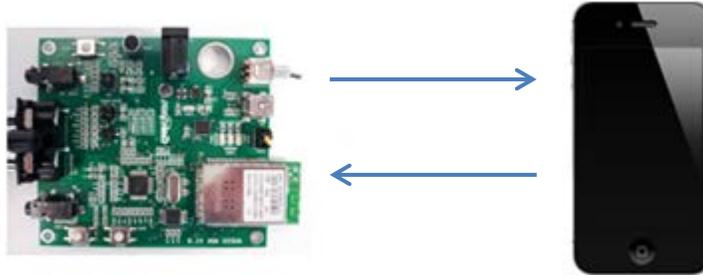
**WI-FI REMOTE MICROPHONE APPLICATION**

In this use case, audio is encoded in mono, linear PCM, 8KHz, 16-bit samples and sent to the iOS application for decoding and playback over UDP.



### WALKIE-TALKIE

This use case showcases two-way half-duplex walkie-talkie operation, triggered using either the “Push-to-Talk” (PTT) button on the audio board or the smartphone app. Pressing the Push-to-talk button puts the audio board or the smartphone in “sender” mode, starts audio encoding and sends stream to the audio board or smartphone for playback.



**USE CASE SELECTION**

Use case selection is done using the iOS app or by holding down the WPS/Use Case Selection button for 10 seconds. More details on programming and using the Audio application board to demonstrate the three use cases is provided in the “Audio ADK/AEK Quick Start Guide”, included in the ADK and AEK packages.



**GAINSPAN AUDIO HARDWARE DESCRIPTION**

The GainSpan Audio ADK uses an audio board based on GS2011MIZ Wi-Fi module interfaced to the VS1053 audio codec and features the following components –

Components	Description
GainSpan W-Fi Module	GS2011MIZ module streams audio data over Wi-Fi
VS1053 Audio Codec	Audio codec chip from VLSI Solutions, which decodes most common audio formats such as MP3, AAC, WMA and MPEG-4 (.m4a)
Microphone	On-board audio sensor
Audio Amplifier	Drives external speaker
Line-in feed and Headphone Jack	Supports line-in feed from external microphone, external speaker connector and external headphone jack
Serial Flash	Used for storage of provisioning or custom application web pages and/or backup firmware
Switches and Buttons	Push-to-Talk walkie-talkie operation, Use Case selection, WPS/Provisioning and Restore Backup Firmware
LEDs	Indicates Power On, Operation mode (Limited AP or Client), Use Case selected and Run/Program mode
USB port	Used to power the board and upgrade firmware on the Wi-Fi module

**AUDIO ADK AND AEK CONTENTS**

Components	ADK	AEK
Audio Embedded Firmware Application	Binary and Source	Binary Only
Audio Mobile Application for iOS Smartphones	Mobile Application and Source	Mobile Application
GainSpan Audio Application Board	Hardware	Hardware
USB Cable	Hardware	Hardware
External mini-speakers	Hardware	Hardware

**AUDIO ADK/AEK ORDERING INFORMATION**

ITEM	PART NUMBER	Description
<b>GainSpan Audio ADk</b>	GS-ADK-Audio2000	GainSpan Audio ADK based on GS2011MIZ Wi-Fi modules
<b>GainSpan VGA Video AEK</b>	GS-AEK-Audio2000	GainSpan Audio AEK based on GS2011MIZ Wi-Fi modules