

# iOS Accessories

Session 701

**Edwin Foo**

Manager, Accessory Interface  
iPod, iPhone, and iPad Accessories

These are confidential sessions—please refrain from streaming, blogging, or taking pictures

# Introduction

- How to make your app take advantage of iOS accessories
  - Use the External Accessory framework
  - Provide Now Playing metadata
  - Handle remote-control events
- How to get started developing your own iOS accessories
  - Made for iPod/iPhone/iPad (MFi)
  - Bluetooth on iOS
  - AirPlay

# Working with iOS Accessories

# External Accessory Framework



# External Accessory (EA) Framework

## At a glance

- Declare supported protocols
- Handle connections
- Open sessions
- Interact with streams



# External Accessory Framework

## Backgrounded operation

- Start/Stop UI required



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- Start/Stop UI required
- Declare UIBackgroundModes key



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Accessory



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# External Accessory Framework

## Tips and reminders

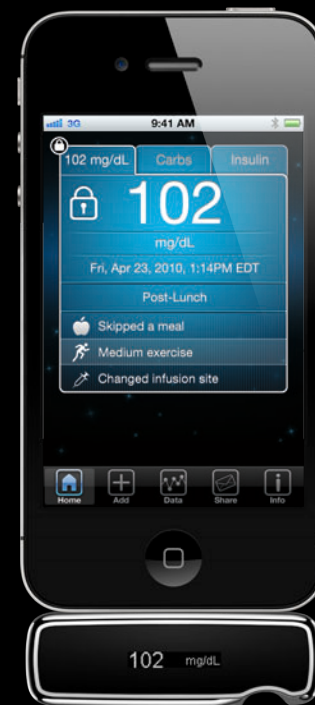
- Deal gracefully with accessory disconnect and reconnect events
- Do not assume error-free delivery
- Keep security in mind
- Work closely with the accessory developer



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# Provide Now Playing Metadata





# Provide Now Playing Metadata

## At a glance

- Use Now Playing Info Center
- Provide as much Now Playing information as possible
- Supported metadata

Album Title

Album Track Count

Album Track Number

Artist

Artwork

Composer

Disc Count

Disc Number

Genre

Persistent ID

Playback Duration

Title

Elapsed Playback Time

Playback Rate

Playback Queue Index

Playback Queue Count

# Handle Remote Control Events



# Handle Remote Control Events

## At a glance

- Your app must:
  - call `beginReceivingRemoteControlEvents`
  - implement `remoteControlReceivedWithEvent`

# Handle Remote Control Events

## At a glance

- Events may come from:
  - iOS Lock Screen
  - Headphone remotes
  - Made for iPod, iPhone, and iPad (MFi) accessories
  - AirPlay speakers
  - Bluetooth Advanced Video Remote Control Profile (AVRCP) controllers

# Developing iOS Accessories

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## Key questions

- Should you be in the MFi Program?

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- What accessory interface features do you want to support?

# Developing iOS Accessories

## Key questions

- Should you be in the MFi Program?
- What accessory interface features do you want to support?
- Do you want to also write apps for your accessory?



# MFi Accessories

# MFi Program

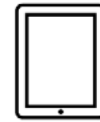
Made for



**iPod**



**iPhone**



**iPad**

# MFi Licensing Program

## At a glance

- Technical information
- Product certification
- Logos and compatibility icons

# MFi Accessories

## Available interfaces

- AirPlay



# MFi Accessories

## Available interfaces

- AirPlay
- AirPrint



# MFi Accessories

## Available interfaces

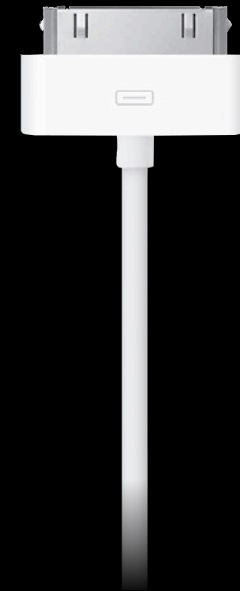
- AirPlay
- AirPrint
- Headphone and remote microphone



# MFi Accessories

## Available interfaces

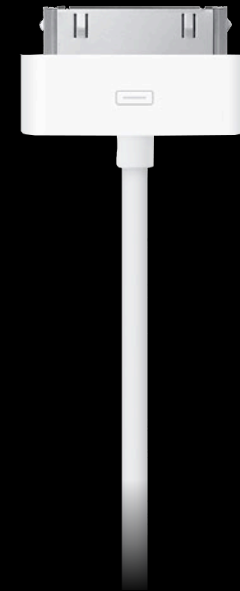
- AirPlay
- AirPrint
- Headphone and remote microphone
- Dock Connector



# MFi Accessories

## Available interfaces

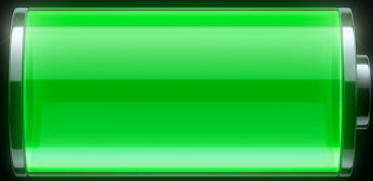
- AirPlay
- AirPrint
- Headphone and remote microphone
- Dock Connector
- iPod Accessory Protocol (iAP)
  - Supported over Dock Connector
  - Also supported over Bluetooth





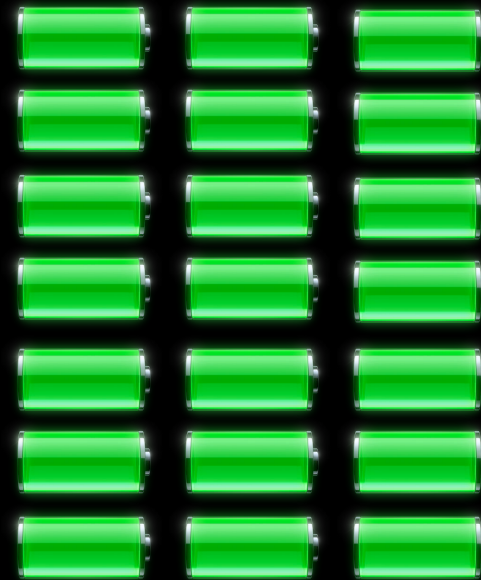
# Dock Connector

## Power



# iPhone Is Not a Battery

Do not treat an iPhone as a battery source

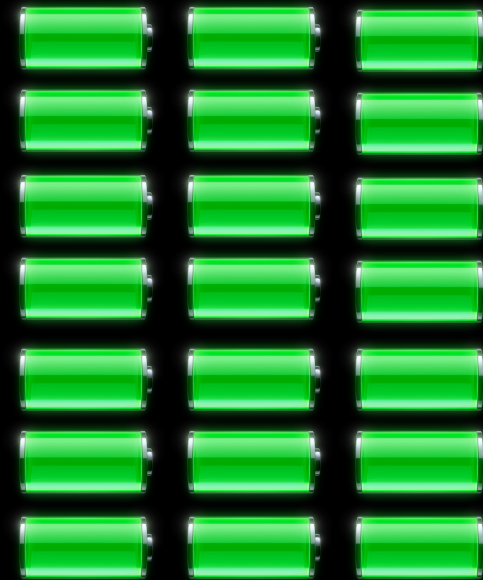


# iPhone Is Not a Battery

Do not treat an iPhone as a battery source



≠



# Dock Connector

## USB Audio and MIDI



# Dock Connector

## USB Audio and MIDI

- Supported by
  - iPhone 3GS
  - iPhone 4 (all models)
  - iPhone 4S
  - iPad (all generations)
  - iPod touch (4th generation)
- Works with
  - Core Audio Framework
  - Core MIDI Framework



# New in iOS 6

## USB Audio multichannel output



# iPod Accessory Protocol



# iPod Accessory Protocol

## App matching

- Declare a preferred app
- If no matching app is installed, user will be directed to App Store
- User may also search for all apps that work with your accessory from Settings





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# iPod Accessory Protocol

## App launch

- Any installed app may be launched
- User consent is required



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# iPod Accessory Protocol

## Wi-Fi login sharing

- User must agree to share login
- iOS device must be unlocked and connected to Wi-Fi
- Accessory requirements
  - Dedicated button or UI
  - Wi-Fi connection status indicator
- Recommended for AirPlay speakers



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# iPod Accessory Protocol

## Bluetooth AutoPairing

- Connect accessory to iOS device
- Inform iOS device of Bluetooth component MAC addresses
- Pairing will start automatically
- That's it



# Accessibility



# Accessibility

## Assistive accessories using iAP

- VoiceOver

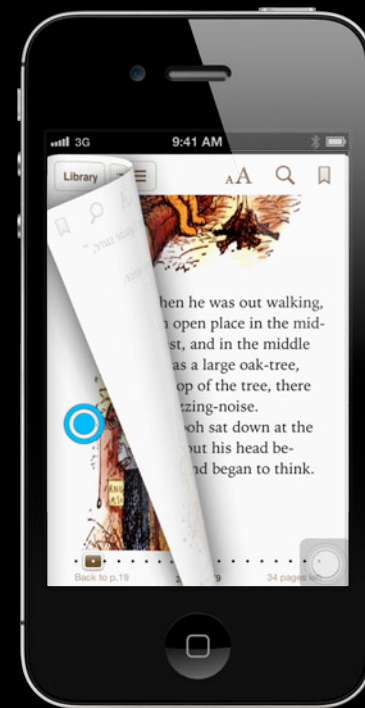




# Accessibility

## Assistive accessories using iAP

- VoiceOver
- AssistiveTouch



# New in iOS 6

## Made for iPhone hearing aids

- High quality wireless audio
- Low power consumption
- Adjust your hearing aids from iOS
- Supported by iPhone 4S
- Working with top manufacturers



# iPod Accessory Protocol

## Other features

- Previously discussed
  - External Accessory framework
  - Remote control events
  - Now Playing metadata
- Power management
- Media library database download
- And more...



# Bluetooth on iOS

**Aarti Kumar**  
Engineer  
Wireless Technologies

# New in iOS 6



- Message Access Profile
- Siri integration
- A2DP high quality audio codecs
- AVRCP media browsing
- Bluetooth low energy
- In-App accessory connection

# Message Access Profile



- Sends iOS notifications to the accessory
- Based on Notification Center
- Notifications enabled in lock screen setting
- Message format
  - Name (N) and Full Name (FN) are included
  - Telephone number (TEL) may not be included
- Message reply is not supported

# Siri Integration



- Supported via Hands-Free Profile
- Added new AT commands for Siri support
- Improved voice recognition
- Integrated Eyes Free mode
- What can you do?
  - Remote activation
  - Obtain Siri status information
  - Request Eyes Free mode
  - Support Wide Band Speech (WBS)

# A2DP High Quality Audio Codecs



- AAC-LC codec at 256 kbps
- AAC-Enhanced Low Delay (AAC-ELD) codec
- Playback latency reporting from accessories



# AVRCP Media Browsing



- Browse and search music library
- Browse Now Playing list
- View active music player
- Volume control and reporting

# Bluetooth Low Energy



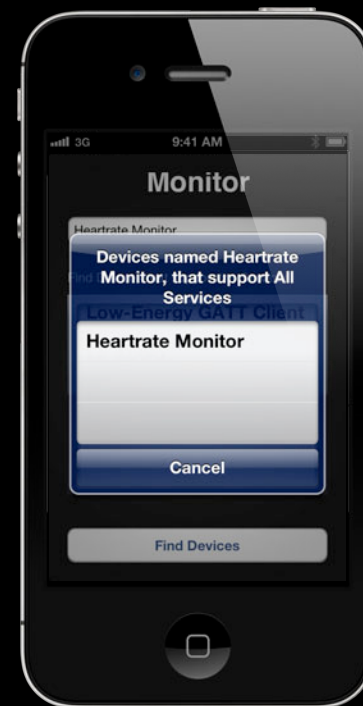
- Support both Central and Peripheral roles
- iOS to iOS and iOS to Mac communication
- Multiple services can be hosted by multiple apps
- Multiple connections as Peripheral allowed

# In-App Accessory Connection



- Discover and connect to MFi accessories from within your app
- New API

`showBluetoothAccessoryPickerWithNameFilter`  
`wakeAccessoryWithToken`



# Bluetooth Standard Update



## iOS 5

HFP	HFP 1.6
PBAP	PBAP 1.0
A2DP	A2DP 1.2
AVRCP	AVRCP 1.4
HID	HID 1.0
PAN	PAN 1.0
DID	DID 1.2
LE Central Manager	BT 4.0

# Bluetooth Standard Update



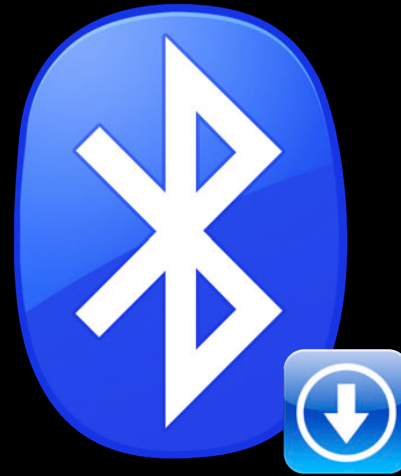
## iOS 5

HFP	HFP 1.6
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HID	HID 1.0
PAN	PAN 1.0
DID	DID 1.2
LE Central Manager	BT 4.0

## New in iOS 6

<b>Message Access Profile</b>	MAP 1.1
<b>LE Service Manager</b>	BT 4.0
<b>LE Peripheral Role</b>	BT 4.0

# Bluetooth Accessory Design Guidelines for Apple Products R6 Draft D1



Download from iOS Dev Center

# AirPlay Accessories

**Peter Langenfeld**  
Engineering Manager  
AirPlay Accessories

**Audio**

**Video**

**Photos**

**Mirroring**





**Audio**



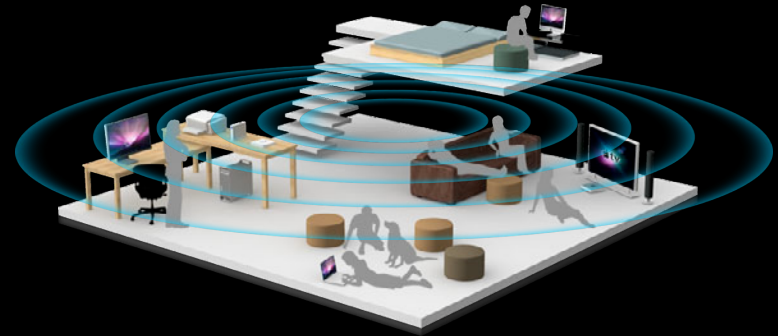
# Advantages of AirPlay

- Wi-Fi based



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- Wi-Fi based
- Whole home audio range



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- Whole home audio range
- Multiuser experience



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- Multiuser experience
- Synchronous audio playback



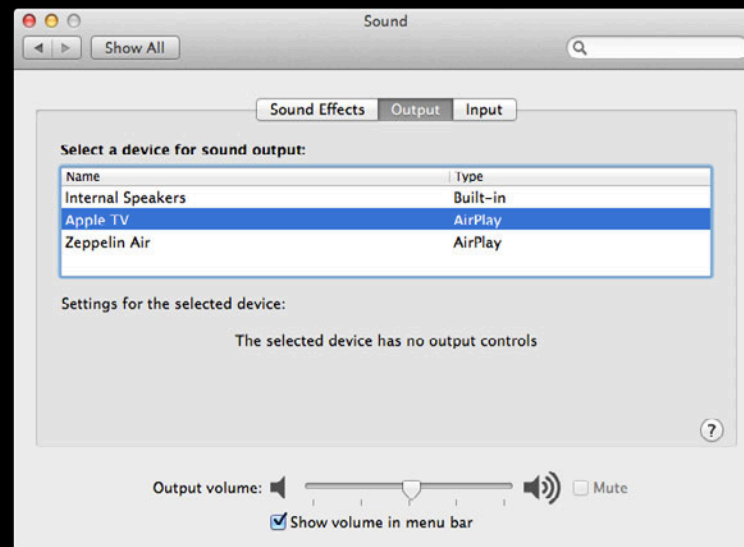
# Advantages of AirPlay

- Wi-Fi based
- Whole home audio range
- Multiuser experience
- Synchronous audio playback
- ALAC Audio
  - Open source, lossless CD quality— 44.1 kHz, 16 bit



# AirPlay Sources

- iOS
  - Mirroring and system audio or video output
  - All apps, including iTunes Match and web content
- iTunes
  - Mac and PC
- Mountain Lion
  - Mirroring and system audio output
  - All apps, including iTunes Match and web content







Sound

Show All

Sound Effects Output Input

Select a device for sound output:

Name	Type
Internal Speakers	Built-in
Apple TV	AirPlay
Zeppelin Air	AirPlay

Settings for the selected device:

The selected device has no output controls

Output volume:  Mute

Show volume in menu bar



# Getting on the Network

- Custom apps
- Wi-Fi login sharing
- Accessory as soft Access Point not Ad Hoc network
  - Support HTTP Bonjour record and Safari
  - iOS compatible setup pages

# Wireless Performance

- Wireless Multimedia (WMM)
  - Quality of service available in all 802.11n Wi-Fi certified access points
  - WMM is now required of all AirPlay accessories
- Proper antenna placement and connection
  - Eliminate product dead spots
  - Minimize production variability due to cable routing
- Properly shielded module
  - Eliminate interference from your own electronics

# Interruption Behavior

- Explicit user interaction always takes priority
- AirPlay should have interruption capability for the device as a whole
- New AirPlay streams can interrupt current

# Room to Room Sync

- Let the user determine audio location by speaker position
- Specification allows 5 ms of phase delay
  - Approximately 5 feet of shift in the soundstage
- Accessory API to adjust phase alignment
  - The closer to 0 ms you adjust to, the better the user's experience

# AirPlay Accessories

- Products shipping range from simple speakers to audio-video receivers
  - Hundreds of products shipping today
- Design and innovate with your customers in mind
  - Room for innovation and quality

# More Information

## Stephen Chick

iPhone Evangelist  
[chick@apple.com](mailto:chick@apple.com)

## Craig Keithley

MFi Technology Evangelist  
[keithley@apple.com](mailto:keithley@apple.com)

## Developer Programs

MFi Program  
<http://developer.apple.com/mfi/>

## Developer Technical Support

<http://developer.apple.com/support/technical/>

## Bluetooth Accessory Design Guidelines

<http://developer.apple.com/hardwaredrivers/>

## Reporting Bugs

<http://bugreport.apple.com>

## Apple Developer Forums

<http://devforums.apple.com>

# Related Sessions

Core Bluetooth 101

Russian Hill  
Tuesday 11:30AM

Advanced Core Bluetooth

Russian Hill  
Tuesday 2:00PM



# Labs

iOS Accessories Lab

Core OS Lab A  
Tuesday 11:30AM

Bluetooth Lab

Core OS Lab A  
Tuesday 3:15PM

# Wrapping Up

- Get excited about developing products
- MFi Program offers custom protocols and optimized experiences
  - Wired and wireless interfaces
- Bluetooth standards-based offerings expanding
  - iOS 6 expands messaging, audio, and low-energy capabilities
- AirPlay
  - High quality, whole home audio

 WWDC2012

