Media

#WWDC15

What's New in Core Audio

Session 507

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Agenda

AVAudioEngine

- Recap
- What's New

Inter-device Audio

AVAudioSession

- What's New

Audio Unit Extensions — Nob Hill — Thursday 11:00 AM

AVAudioEngine

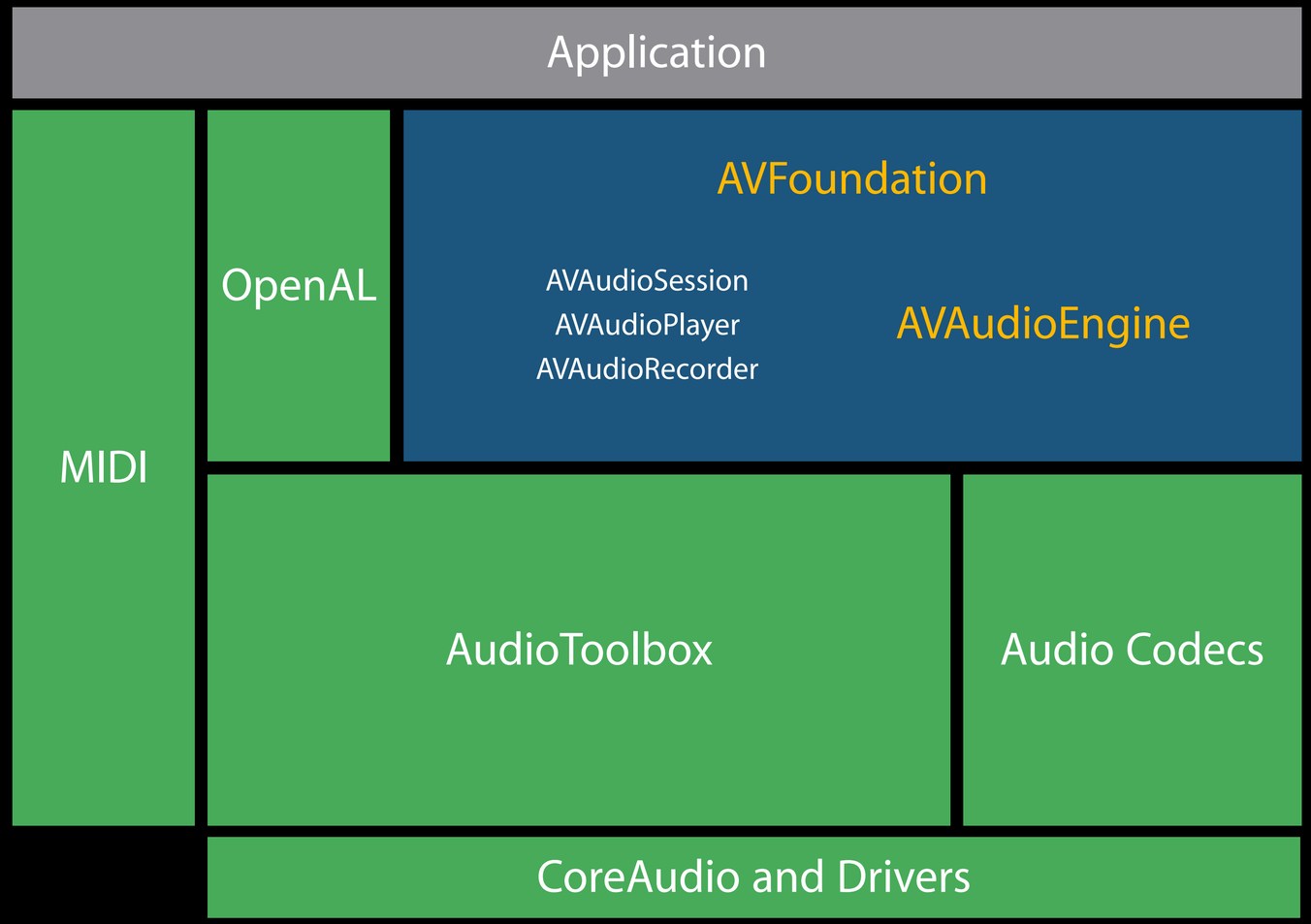
Recap

Core Audio Stack

iOS and OS X

AVAudioEngine

- Introduced in iOS 8.0/OS X 10.10
- Refer to WWDC14 session 502
  AVAudioEngine in Practice



AVAudioEngine

Goals

Provide powerful, feature-rich API set

Achieve simple as well as complex tasks

Simplify real-time audio

AVAudioEngine

Features

Objective-C / Swift API set

Low latency, real-time audio

Play and record audio

Connect audio processing blocks

Capture audio at any point in the processing chain

Implement 3D audio for games

AVAudioEngine

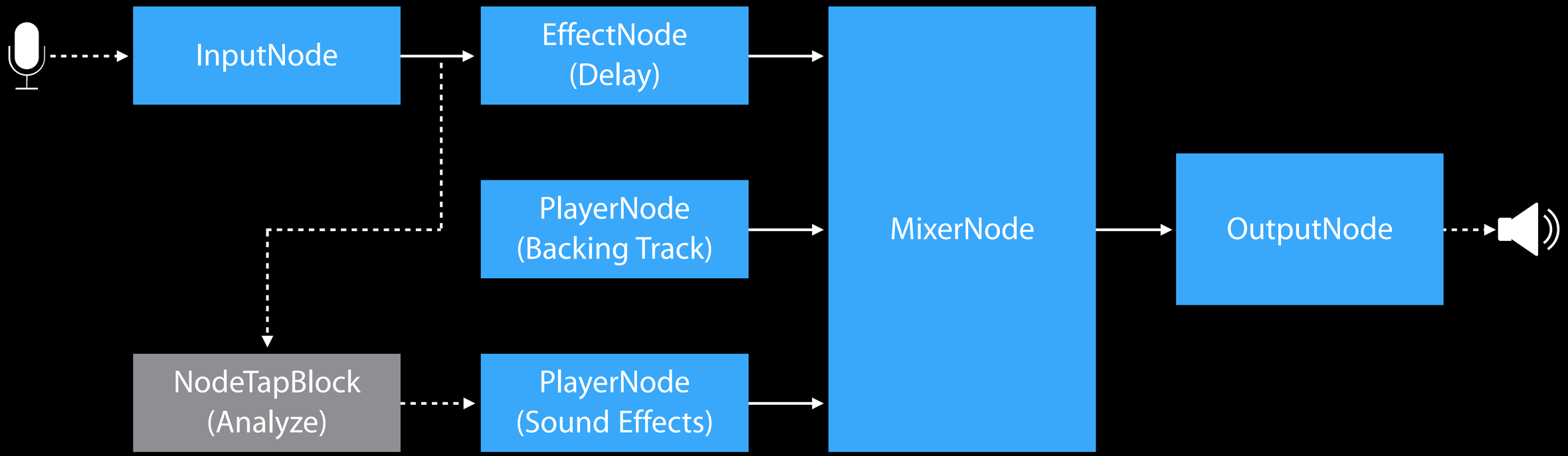
Building blocks

Node-AVAudioNode

- Source nodes: Provide data for rendering
- Processing nodes: Process data
- Destination node: Terminating node connected to output hardware

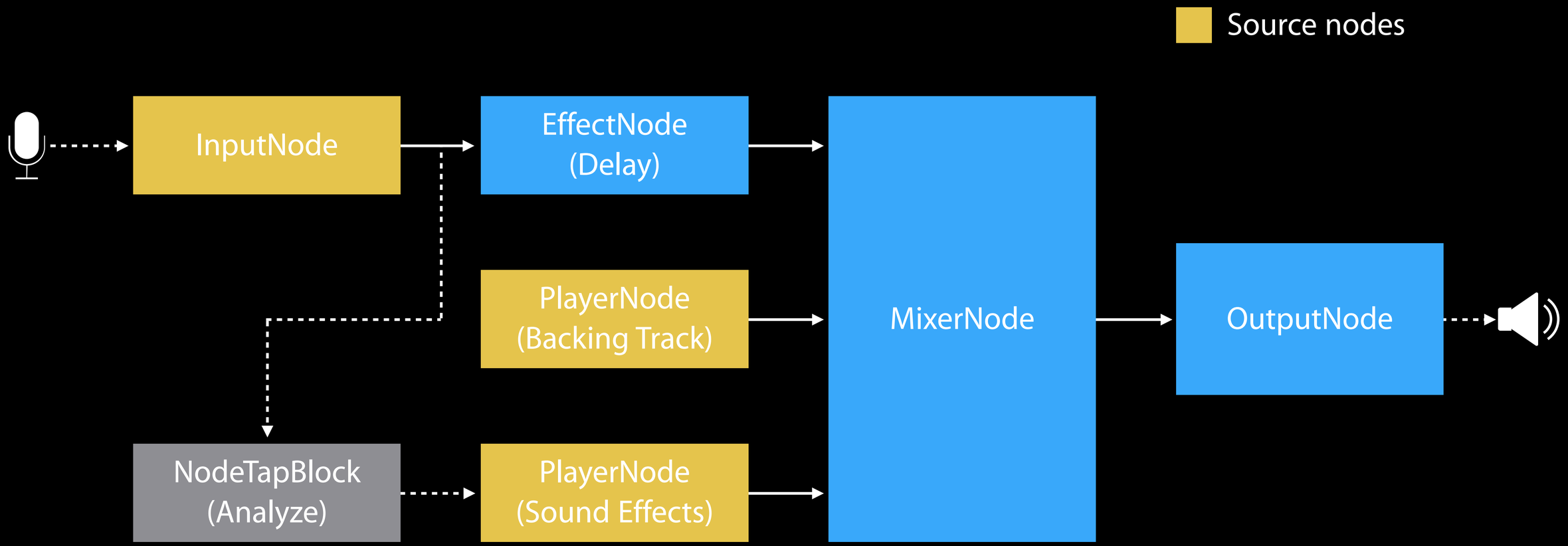
Sample Engine Setup

Karaoke



Sample Engine Setup

Karaoke



Sample Engine Setup

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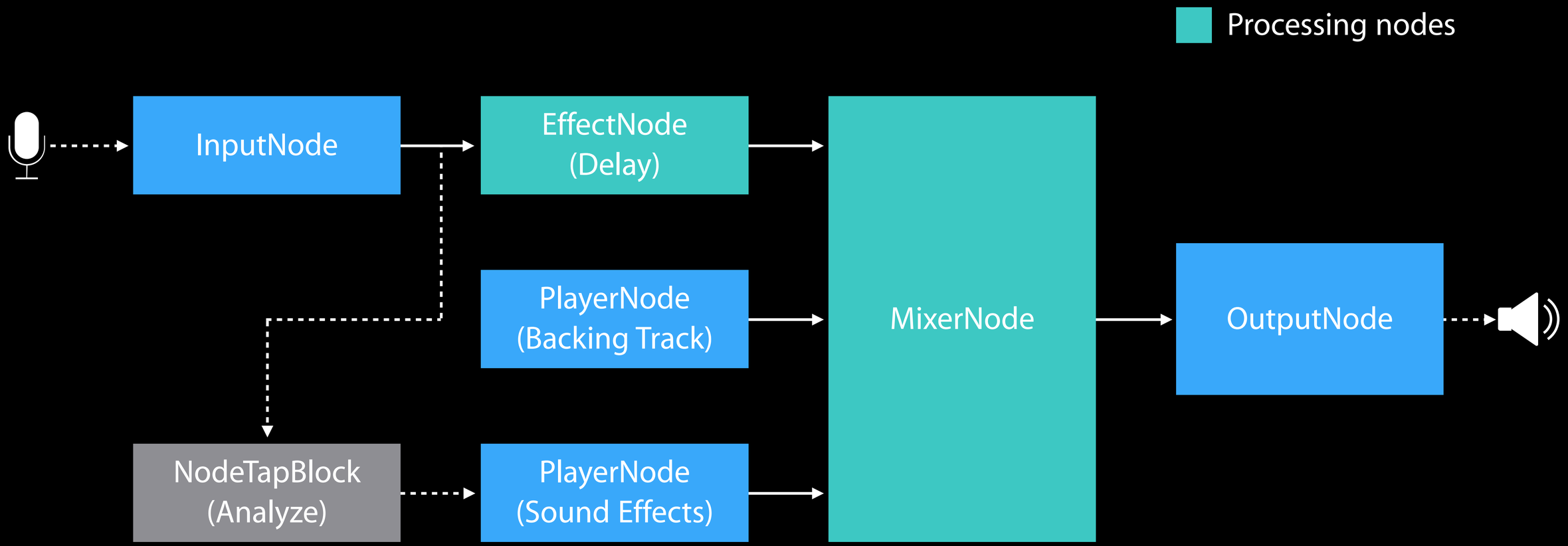
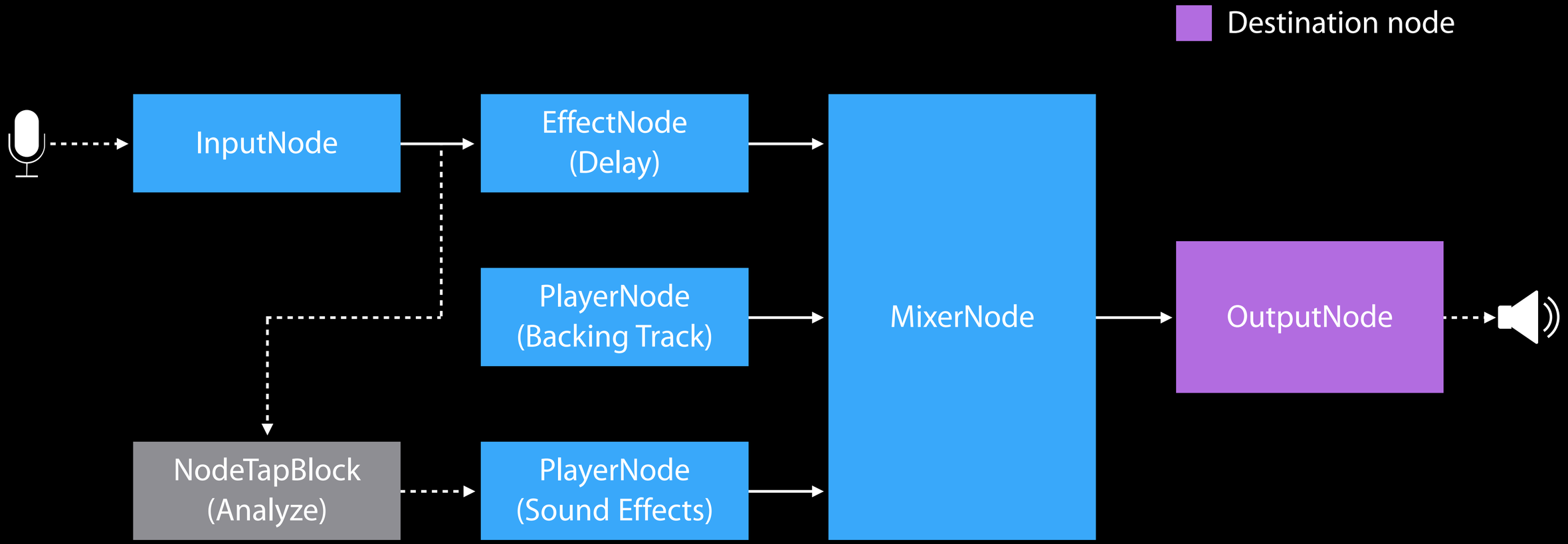


Sample Engine Setup

Karaoke



Mixer Nodes

AVAudioMixerNode

- Performs sample rate conversion, up/down mixing of channels
- Supports mono, stereo and multichannel inputs

AVAudioEnvironmentNode

- Simulates a 3D space (listener is implicit)
- Supports mono and stereo inputs
- Spatializes only mono inputs

AVAudioMixing Protocol

Defines properties for a mixer input bus

Source nodes conform to this protocol

- Properties cached when not connected to a mixer
- Properties applied on connection to a mixer

AVAudioMixing Protocol

Properties

Common (all mixer nodes)

- volume - `player.volume = 0.5`

Stereo (AVAudioMixerNode)

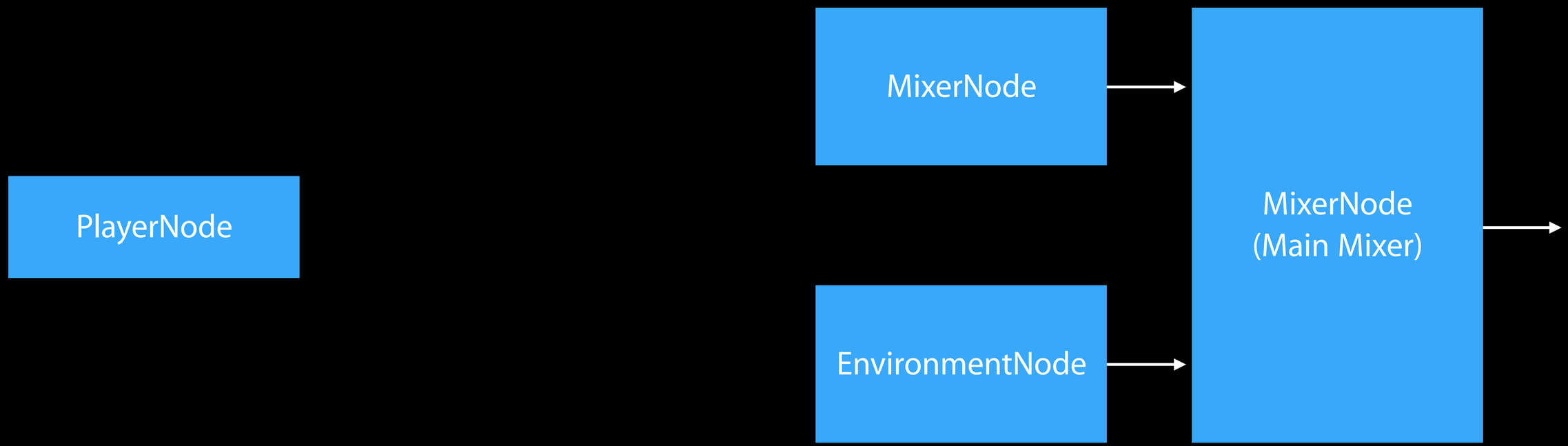
- pan - `player.pan = -1.0`

3D (AVAudioEnvironmentNode)

- position - `player.position = AVAudioMake3DPoint(-2.0, 0.0, 5.0)`
- obstruction, occlusion, renderingAlgorithm and more…

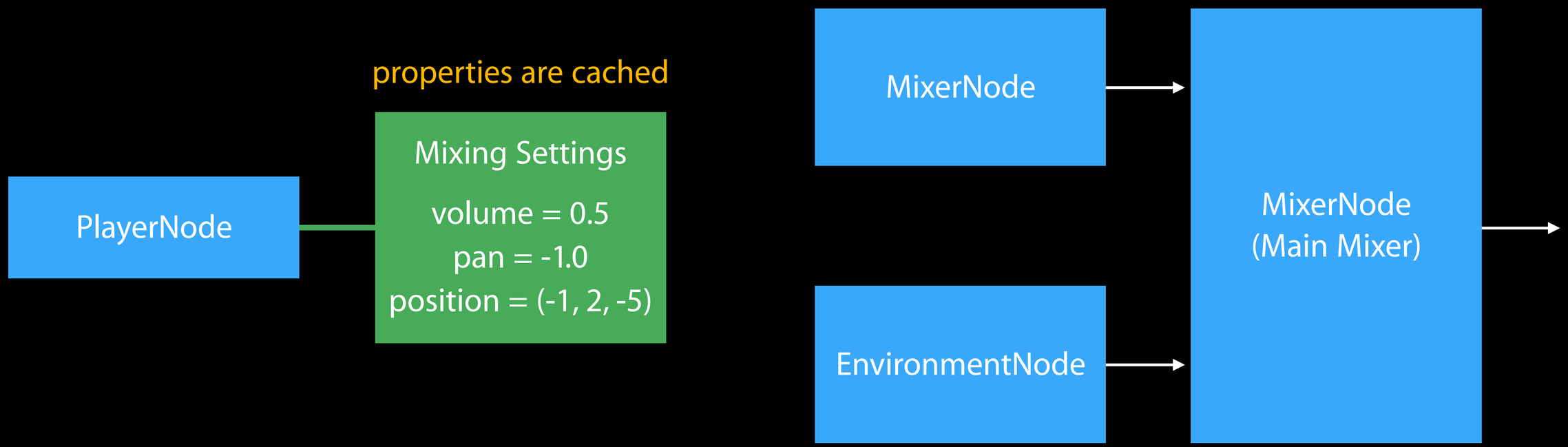
AVAudioMixing Protocol

Sample setup



AVAudioMixing Protocol

Sample setup



AVAudioMixing Protocol

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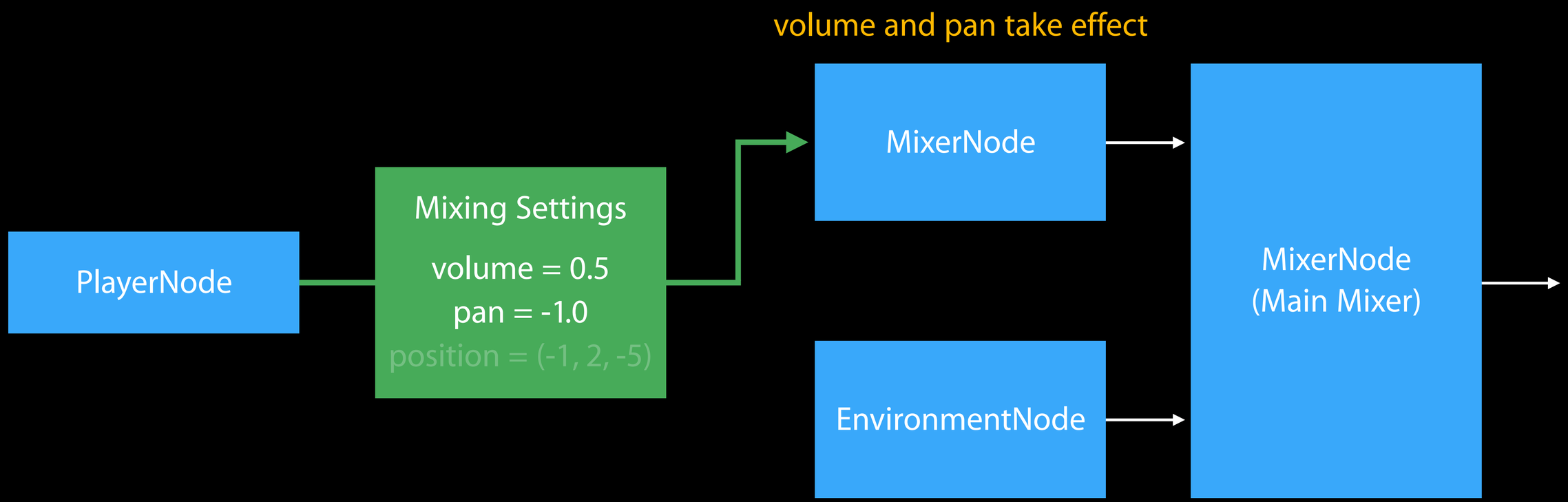
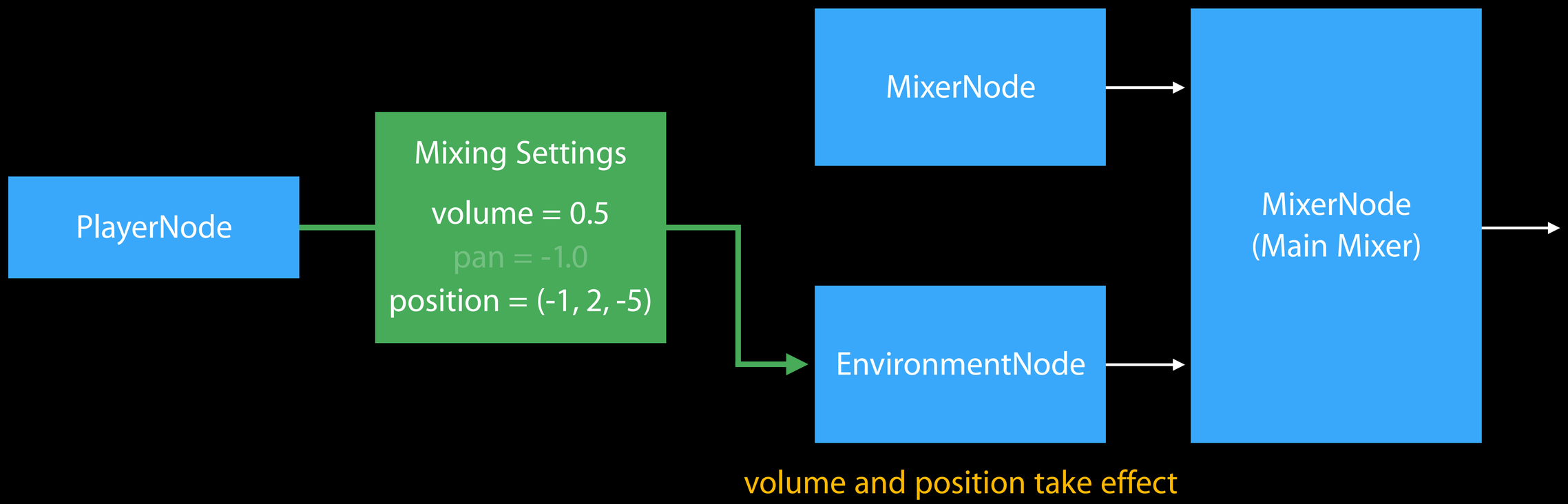


AVAudioMixing Protocol

Sample setup



Handling Multichannel Audio

Hardware setup

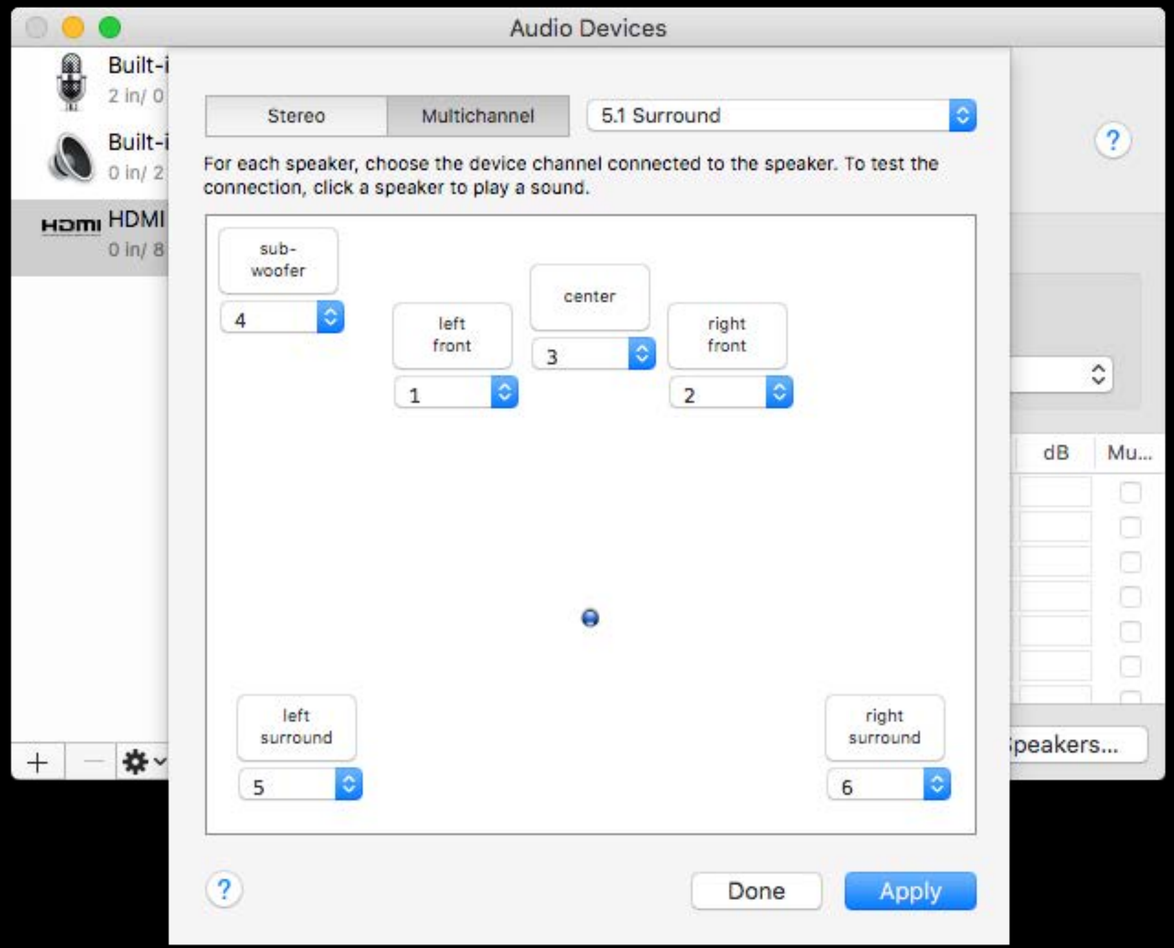
- OS X
- iOS

AVAudioEngine setup

Handling Multichannel Audio

Hardware setup: OS X

User can configure the hardware through Audio MIDI Setup



Handling Multichannel Audio

Hardware setup: iOS

Configure AVAudioSession

- Playback use case:
  - Activate audio session
  - Check maximumOutputNumberOfChannels
  - Set preferredOutputNumberOfChannels
  - Verify actual outputNumberOfChannels

Handling Multichannel Audio

Hardware setup: iOS-code example

```
// example: audio playback use case
do {
    let desiredNumChannels = 6 // for 5.1 rendering

    let audioSession = AVAudioSession.sharedInstance()
    let category = AVAudioSessionCategoryPlayback
    try audioSession.setCategory(category)
    try audioSession.setActive(true)

    // check maximum available output number of channels
    let maxChannels = audioSession.maximumOutputNumberOfChannels
```

Handling Multichannel Audio

Hardware setup: iOS-code example

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Handling Multichannel Audio

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    // check maximum available output number of channels
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```

Handling Multichannel Audio

Hardware setup: iOS-code example

```
if maxChannels >= desiredNumChannels {
    // set preferred number of output channels
    try
    audioSession.setPreferredOutputNumberOfChannels(desiredNumChannels)
}
    let actualChannelCount = audioSession.outputNumberOfChannels

    // adapt to the actual number of output channels
    ..
} catch {
    // handle errors
}
```

Handling Multichannel Audio

Hardware setup: iOS-code example

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if maxChannels >= desiredNumChannels {
    // set preferred number of output channels
    try
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Handling Multichannel Audio

AVAudioEngine setup: iOS / OS X

Multichannel content

- AVAudioMixerNode

Spatialized content (games)

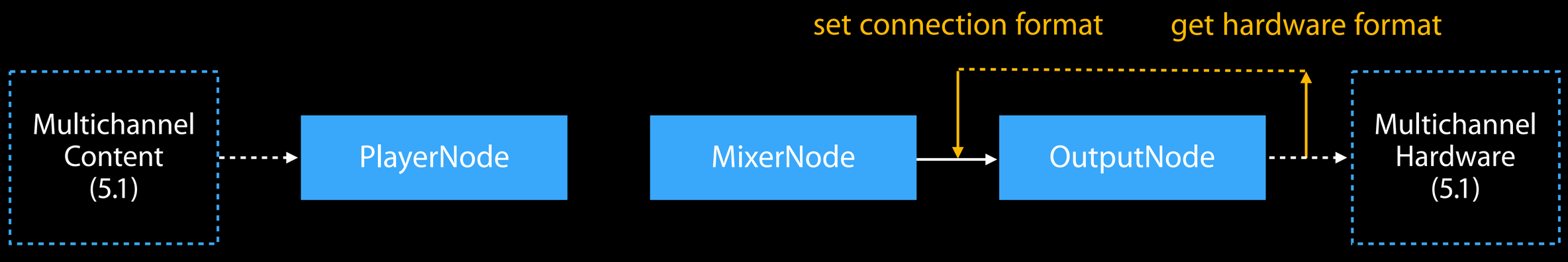
- AVAudioEnvironmentNode

Handling Multichannel Audio

AVAudioEngine setup: multichannel content

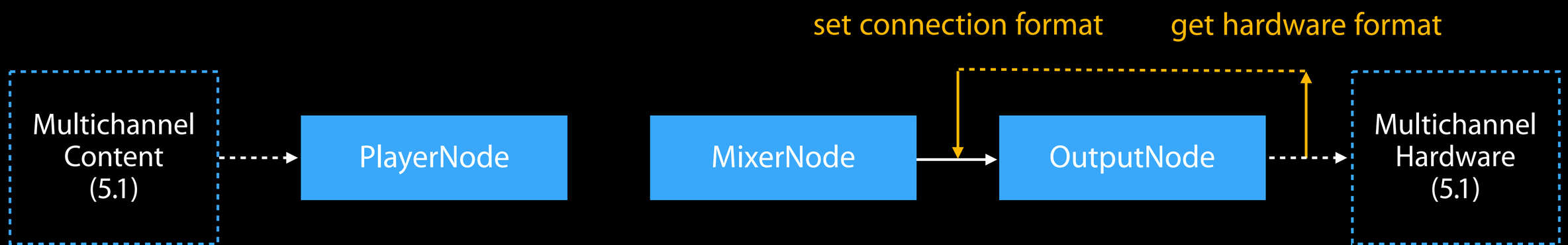
Handling Multichannel Audio

AVAudioEngine setup: multichannel content



Handling Multichannel Audio

AVAudioEngine setup: multichannel content

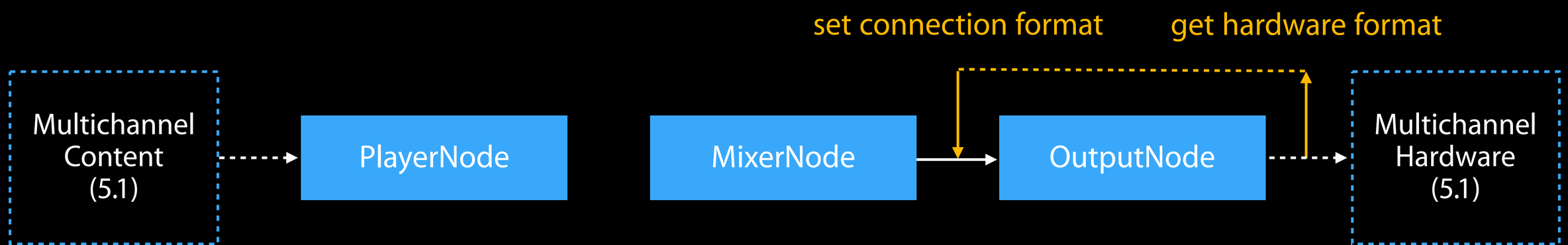



```
// get output hardware format
let output = engine.outputNode
let outputHWFormat = output.outputFormatForBus(0)

// connect mixer to output
let mainMixer = engine.mainMixerNode
engine.connect(mainMixer, to: output, format: outputHWFormat)
```

Handling Multichannel Audio

AVAudioEngine setup: multichannel content

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Handling Multichannel Audio

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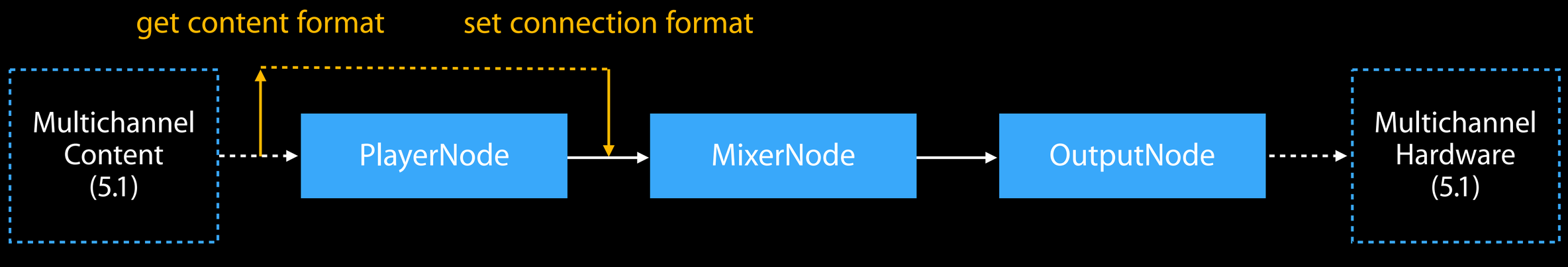
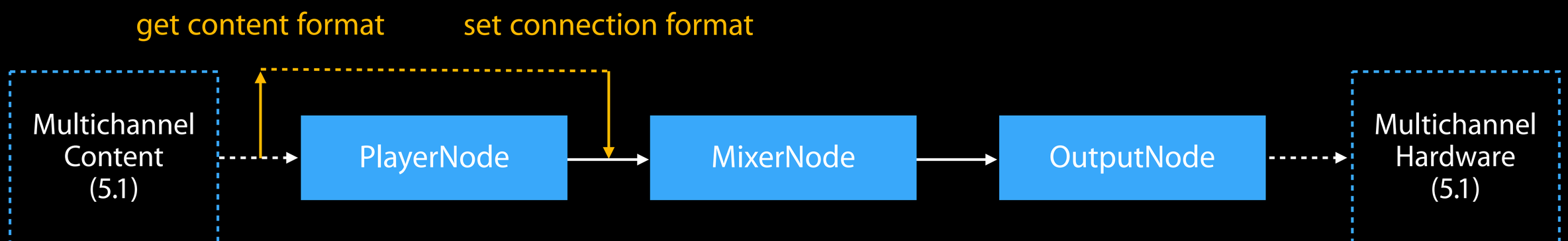


Handling Multichannel Audio

AVAudioEngine setup: multichannel content

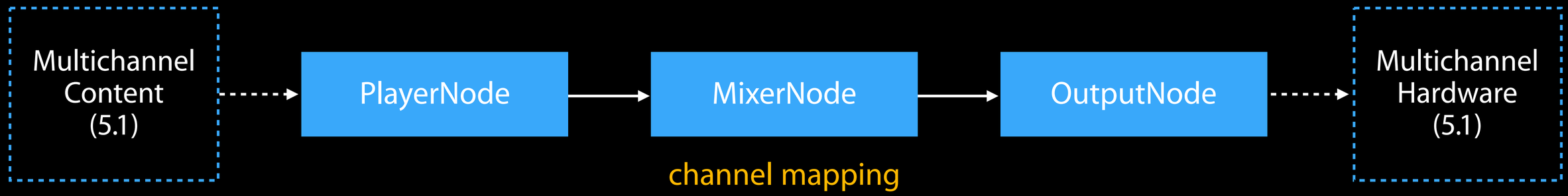



```
do {
    // open multichannel file for reading
    let mcFile = try AVAudioFile(forReading: fileURL)

    // connect player to mixer
    engine.connect(player, to: mainMixer, format: mcFile.processingFormat)
} catch { ..
}
```

Handling Multichannel Audio

AVAudioEngine setup: multichannel content



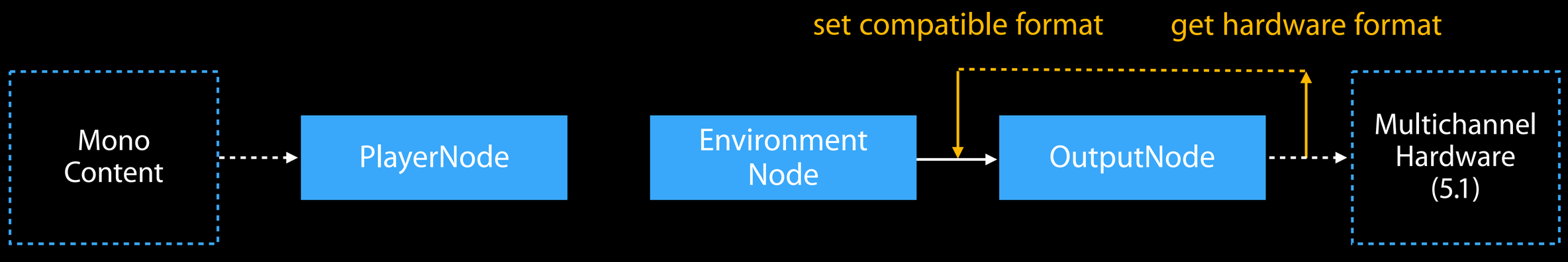

```
// schedule file on player
// start engine
// start player
```

Handling Multichannel Audio

AVAudioEngine setup: spatialized content

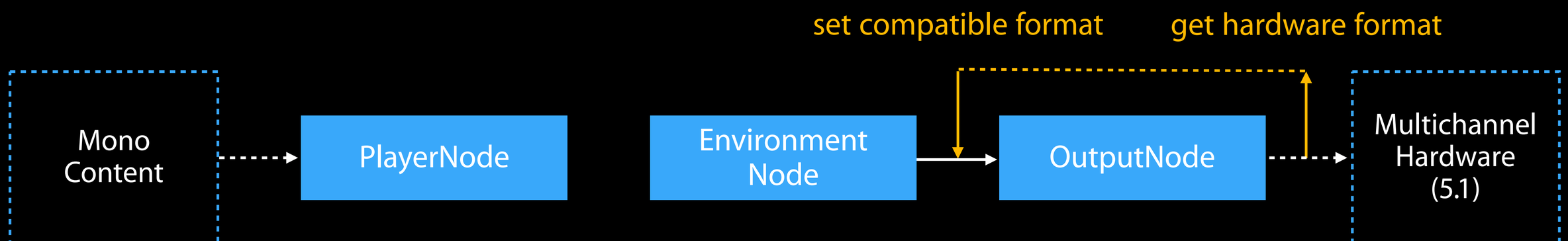
Handling Multichannel Audio

AVAudioEngine setup: spatialized content



Handling Multichannel Audio

AVAudioEngine setup: spatialized content

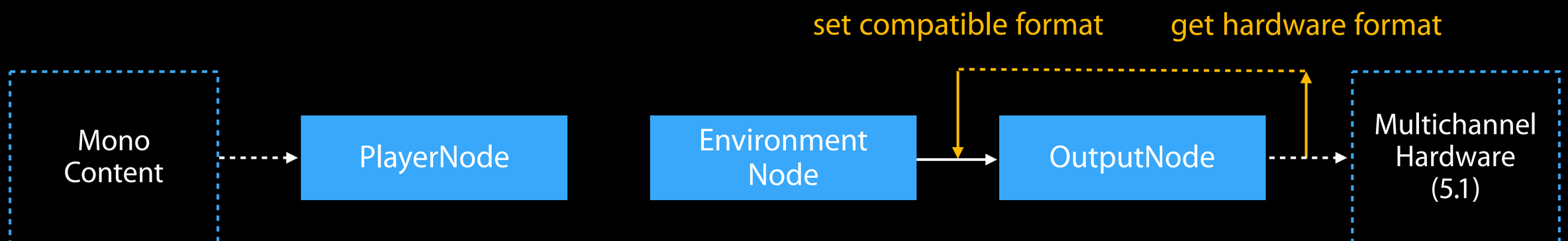



```
// map output hardware channel layout to a compatible layout
let layoutTag = kAudioChannelLayoutTag_AudioUnit_5_0 // for 5.1 HW layout
let layout = AVAudioChannelLayout(layoutTag: layoutTag)
let envOutputFormat = AVAudioFormat(
    standardFormatWithSampleRate: outputHWFormat.sampleRate,
    channelLayout: layout);

engine.connect(envNode, to: output, format: envOutputFormat)
```

Handling Multichannel Audio

AVAudioEngine setup: spatialized content

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Handling Multichannel Audio

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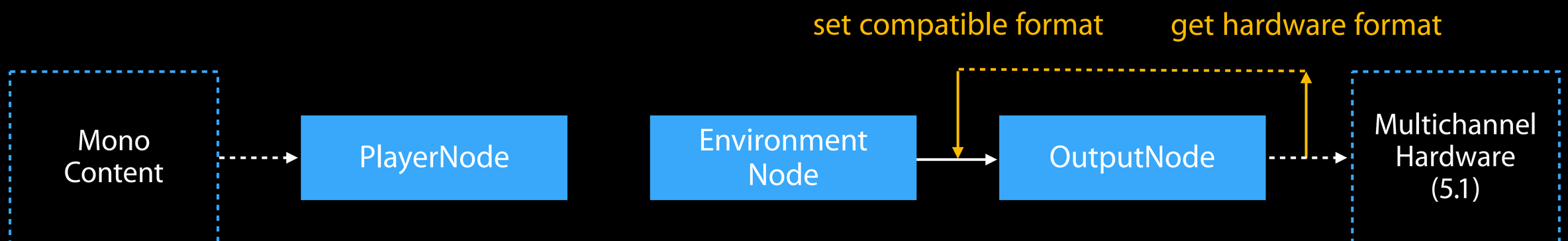


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Handling Multichannel Audio

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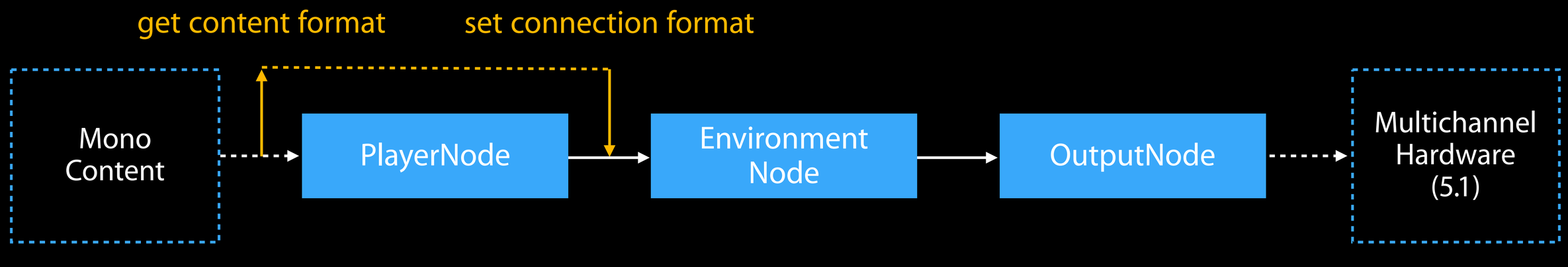
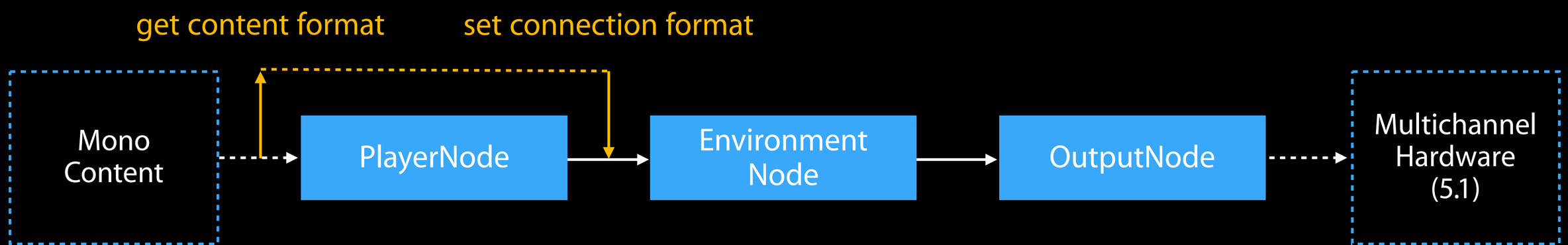


Handling Multichannel Audio

AVAudioEngine setup: spatialized content

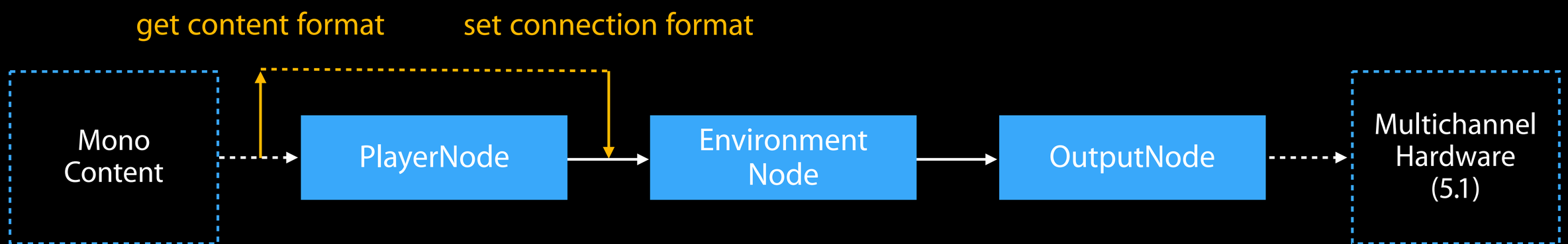



```
let file = try AVAudioFile(forReading: fileURL)
engine.connect(player, to: envNode, format: file.processingFormat)

// set multichannel rendering algorithm
player.renderingAlgorithm = AVAudio3DMixingRenderingAlgorithm.SoundField
```

Handling Multichannel Audio

AVAudioEngine setup: spatialized content

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Handling Multichannel Audio

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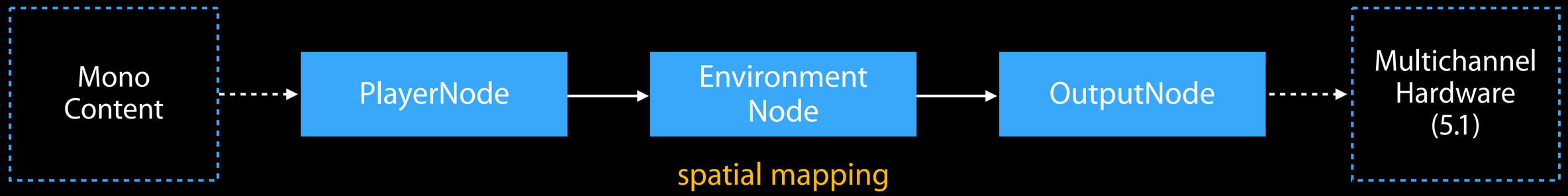



```
// schedule file on player
// start engine
// start player
```

AVAudioEngine

What's new

AVAudioEngine

What's new

NEW

Splitting support

Audio format conversion support

- AVAudioCompressedBuffer
- AVAudioConverter

AVAudioSequencer

AVAudioEngine

What's new

NEW

Splitting support

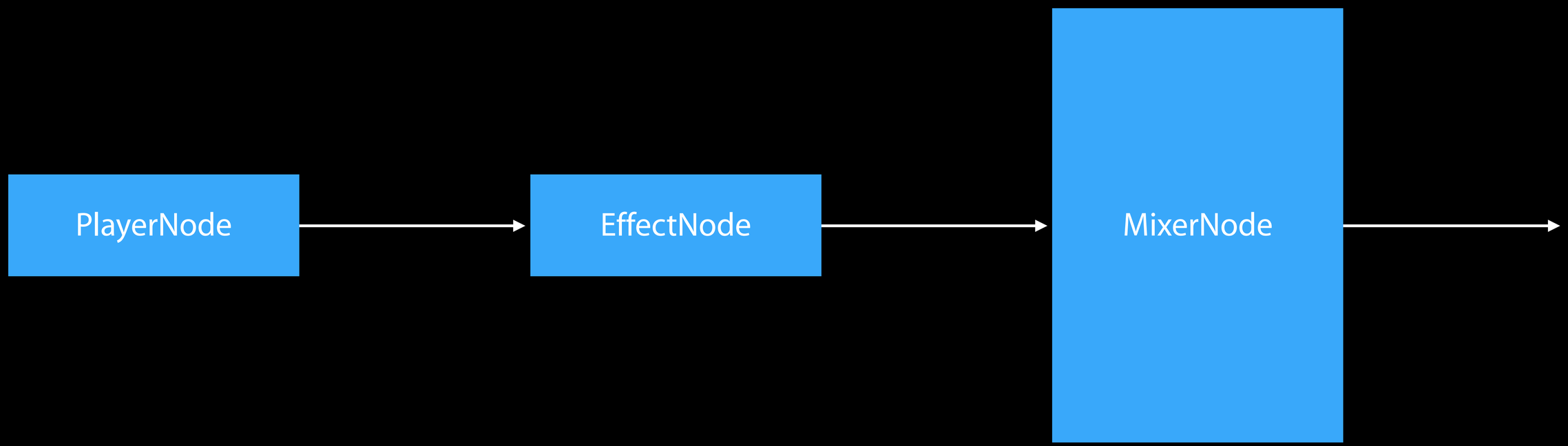
Audio format conversion support

- AVAudioCompressedBuffer
- AVAudioConverter

AVAudioSequencer

Splitting Support

Sample setup



Splitting Support

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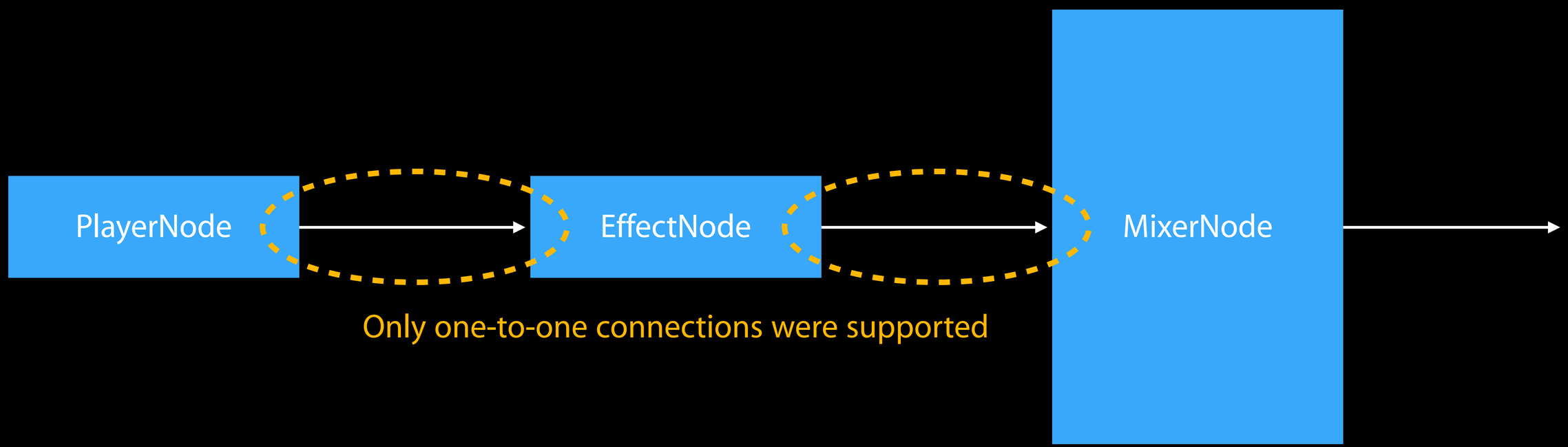

Splitting Support

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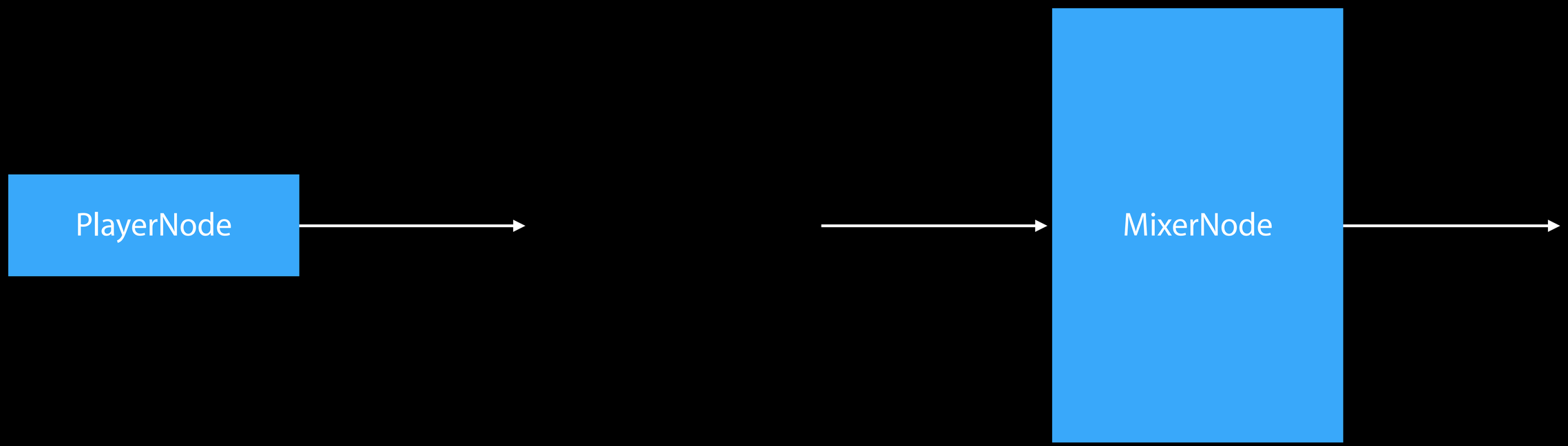
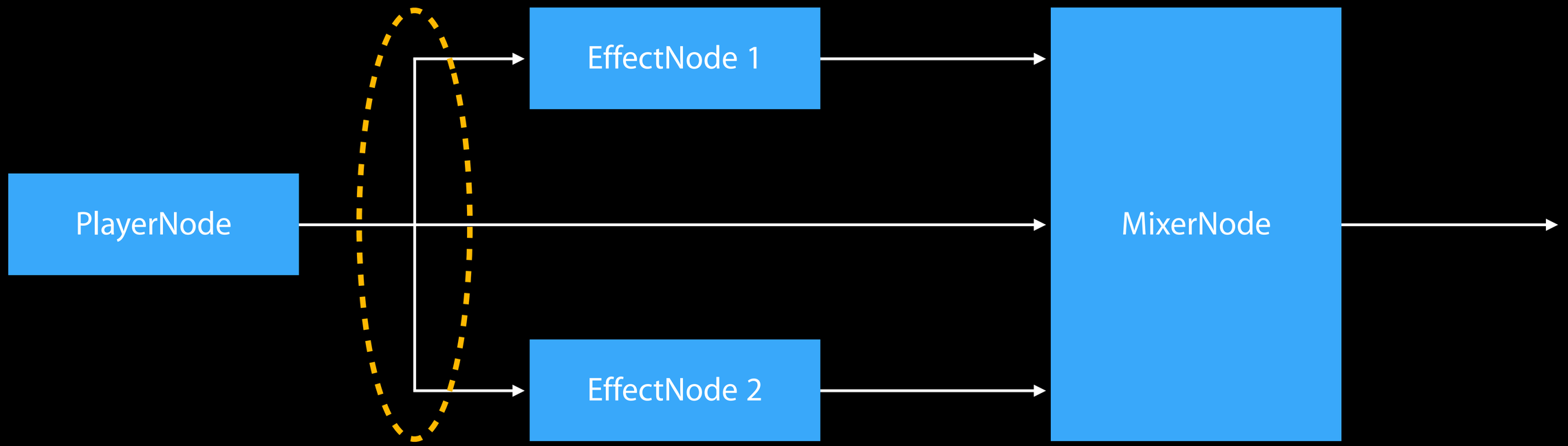


Splitting Support

Sample setup

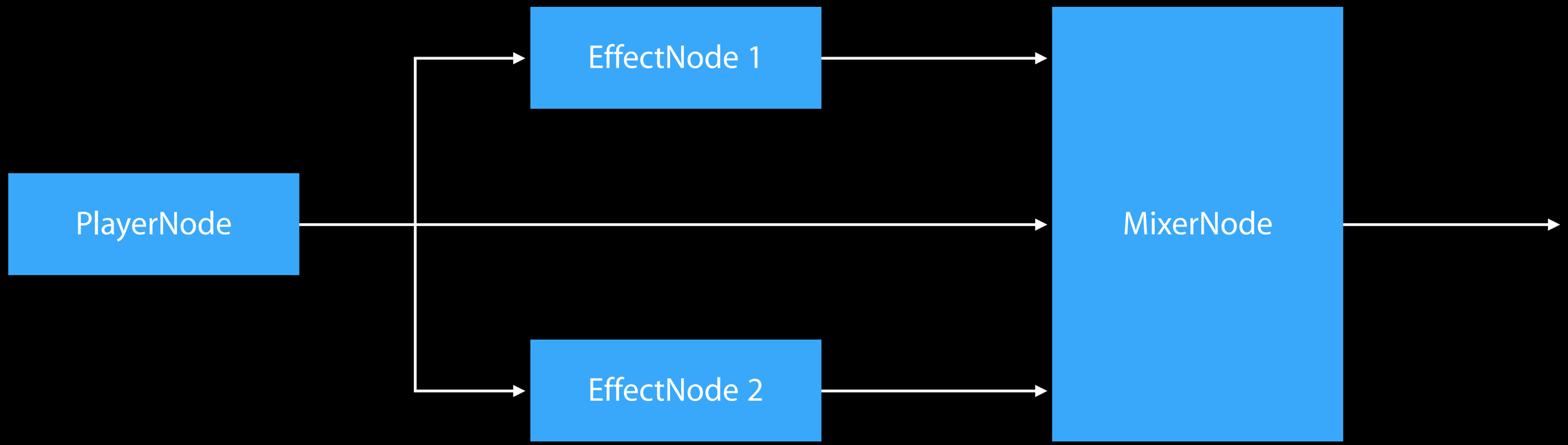
NEW



Splitting Support

Code example

NEW



Splitting Support

Code example

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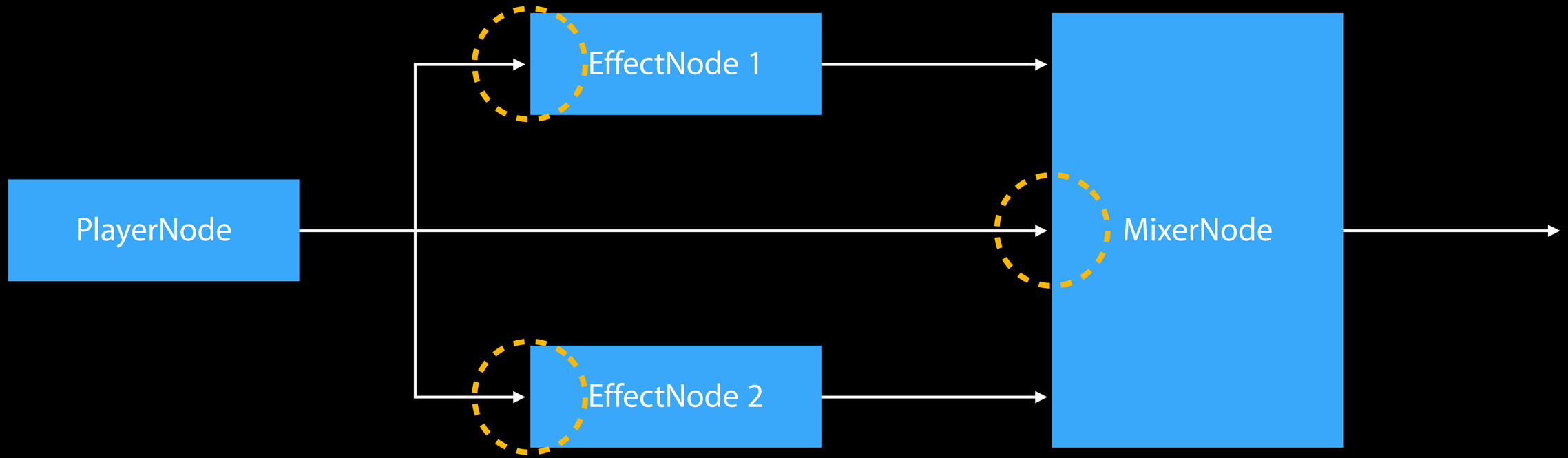

Connection points—AVAudioConnectionPoint [node, bus]

Splitting Support

Code example

NEW

```
// Create an array of player connection points
let connPoints = [
    AVAudioConnectionPoint(node: effect1, bus: 0),
    AVAudioConnectionPoint(node: mixer, bus: 1),
    AVAudioConnectionPoint(node: effect2, bus: 0)]
```

Splitting Support

Code example

NEW

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// Create an array of player connection points
let connPoints = [
    AVAudioConnectionPoint(node: effect1, bus: 0),
    AVAudioConnectionPoint(node: mixer, bus: 1),
    AVAudioConnectionPoint(node: effect2, bus: 0)]

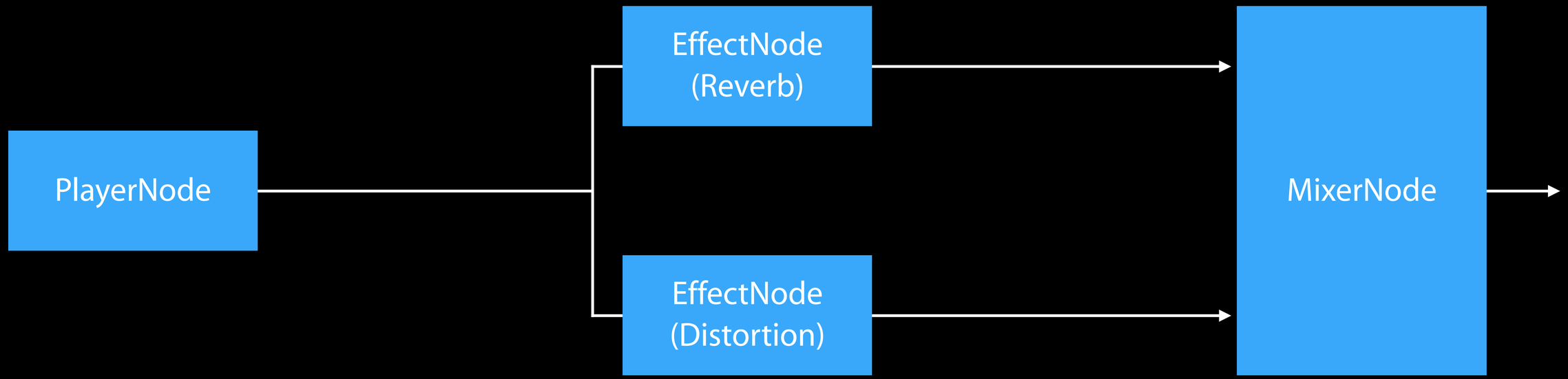
// Make player connections
engine.connect(player, toConnectionPoints: connPoints, fromBus: 0,
    format: playerFormat)

// Make effect nodes to mixer connections
..
```

AVAudioMixing Protocol

With splitting

NEW



AVAudioMixing Protocol

With splitting

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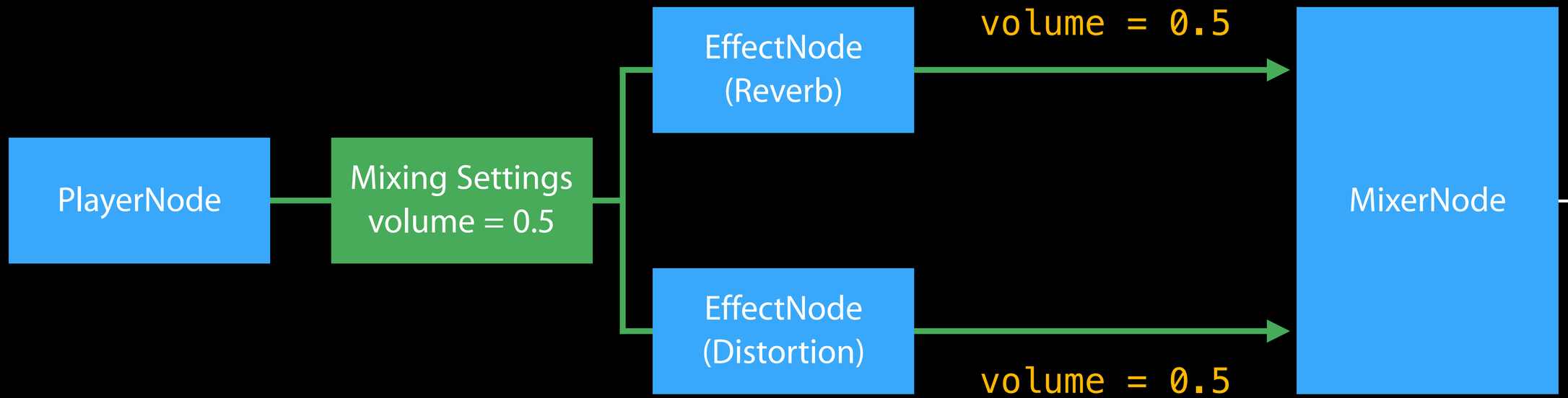
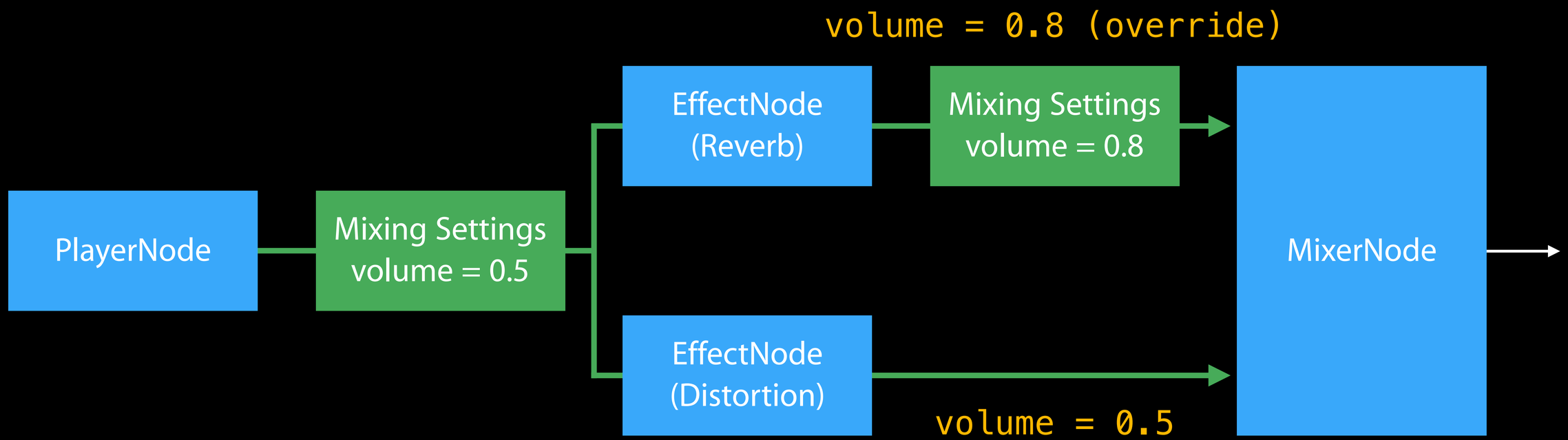



```
// set player’s global mixing setting
player.volume = 0.5
```

AVAudioMixing Protocol

With splitting

NEW

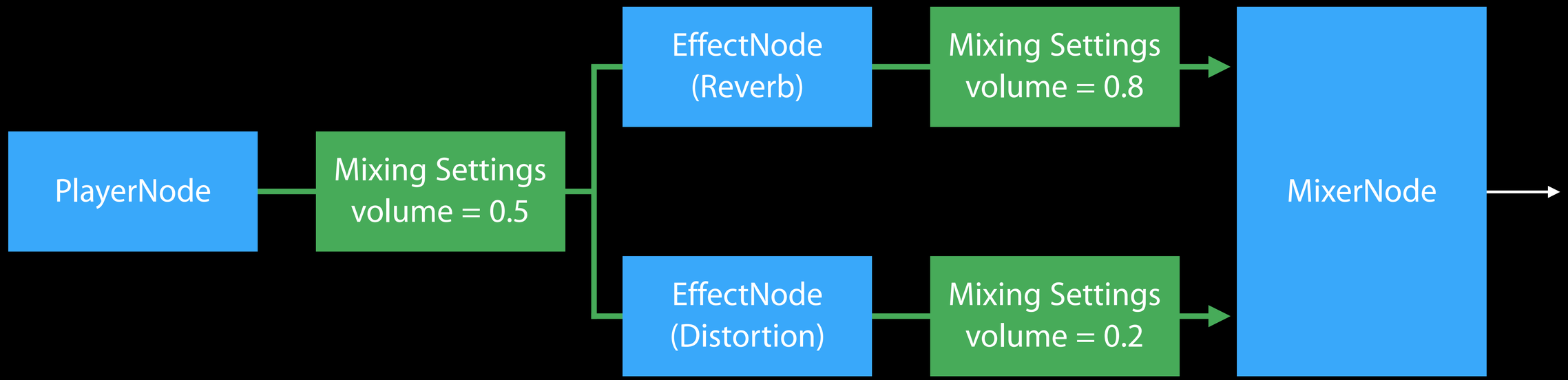



```
// override mixing settings of mixer bus0
if let mxDest0 = player.destinationForMixer(mixer, bus: 0) {
    mxDest0.volume = 0.8
}
```

AVAudioMixing Protocol

With splitting

NEW



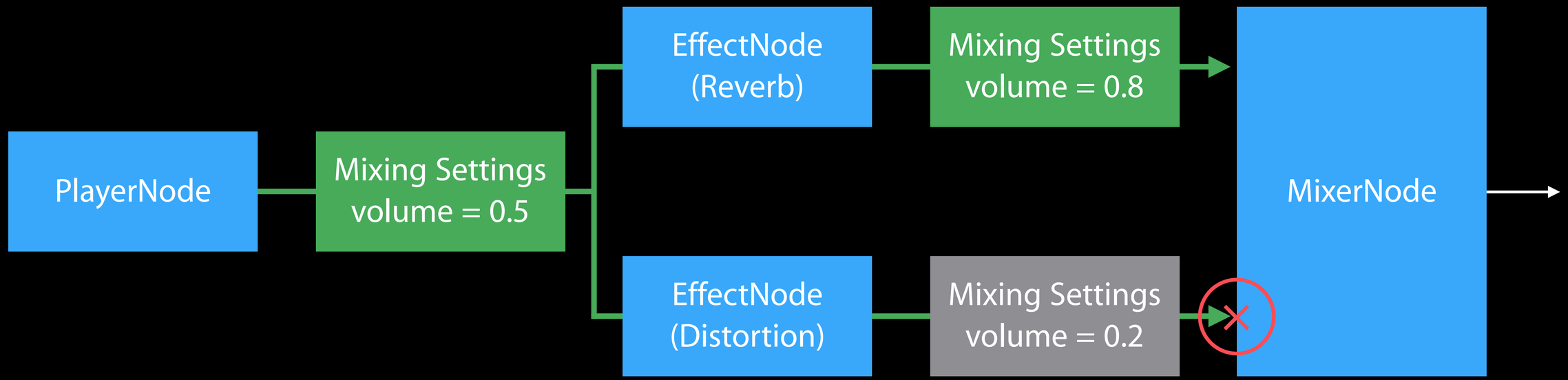

```
volume = 0.2 (override)
```

```
// override mixing settings of mixer bus1
if let mxDest1 = player.destinationForMixer(mixer, bus: 1) {
    mxDest1.volume = 0.2
}
```

AVAudioMixing Protocol

With splitting

NEW



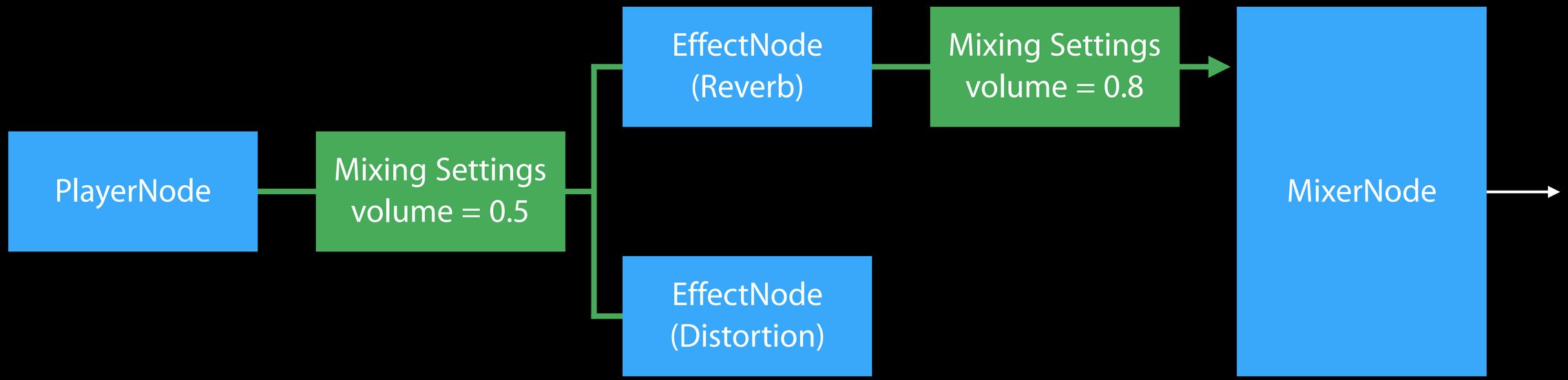
settings lost

```
// disconnect mixer bus1 input, corresponding mixing settings are lost
engine.disconnectNodeInput(mixer, bus: 1)
```

AVAudioMixing Protocol

With splitting

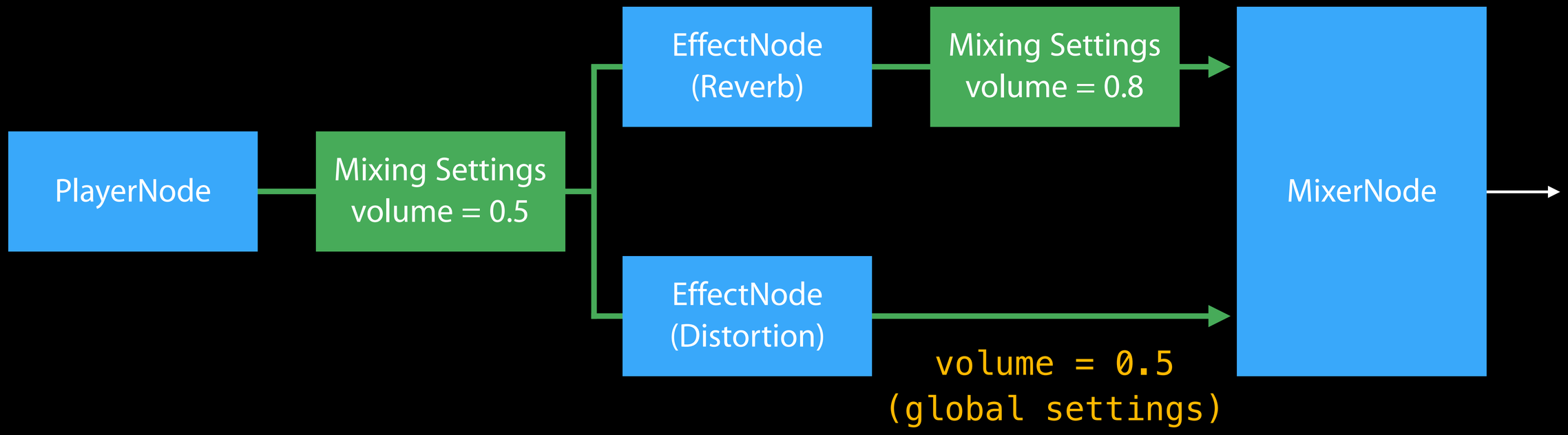
NEW



AVAudioMixing Protocol

With splitting

NEW




```
// make a new connection, player’s global mixing settings take effect
engine.connect(effect2, to:mixer, fromBus: 0, toBus: 1, format: format)
```

AVAudioMixing Protocol

With splitting

NEW

Source node with multiple mixer connections

- Properties changed on source node
  - Applied to all existing/new mixer connections
- Properties on individual mixer connections
  - Can be overridden
  - Not preserved on disconnections

Splitting support

Restrictions

NEW

From the split node to the mixer where all split paths terminate:

- Cannot have AVAudioUnitTimeEffect
- Cannot have any rate conversion

AVAudioEngine

What's new

NEW

Splitting support

Audio format conversion support

- AVAudioCompressedBuffer
- AVAudioConverter

AVAudioSequencer

AVAudioBuffer

AVAudioPCMBuffer

- Uncompressed (PCM) audio data

AVAudioCompressedBuffer (new in iOS 9.0 / OS X El Capitan)

- Compressed audio data
- Used with AVAudioConverter

AVAudioConverter

NEW

Utility class, higher-level equivalent for AudioConverter

Audio format conversion

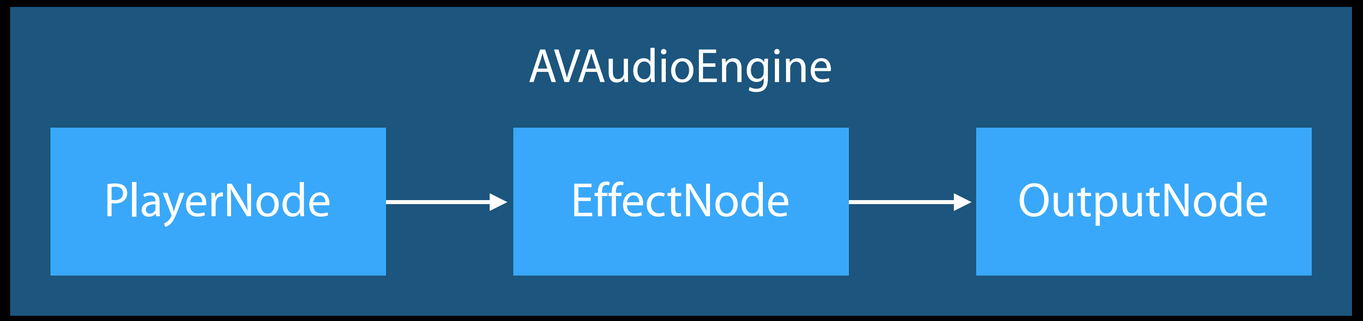
- PCM to PCM
  - Integer/float, bit depth, interleave/deinterleave, sample rate conversion
- PCM to/from compressed
  - Encoding
  - Decoding

Can be used in conjunction with AVAudioEngine

AVAudioConverter

With AVAudioEngine: sample use case

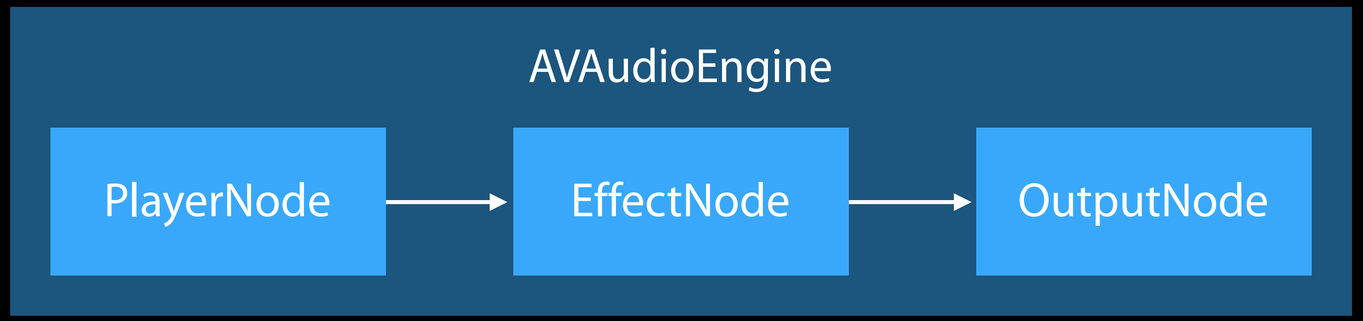
NEW



AVAudioConverter

With AVAudioEngine: sample use case

NEW

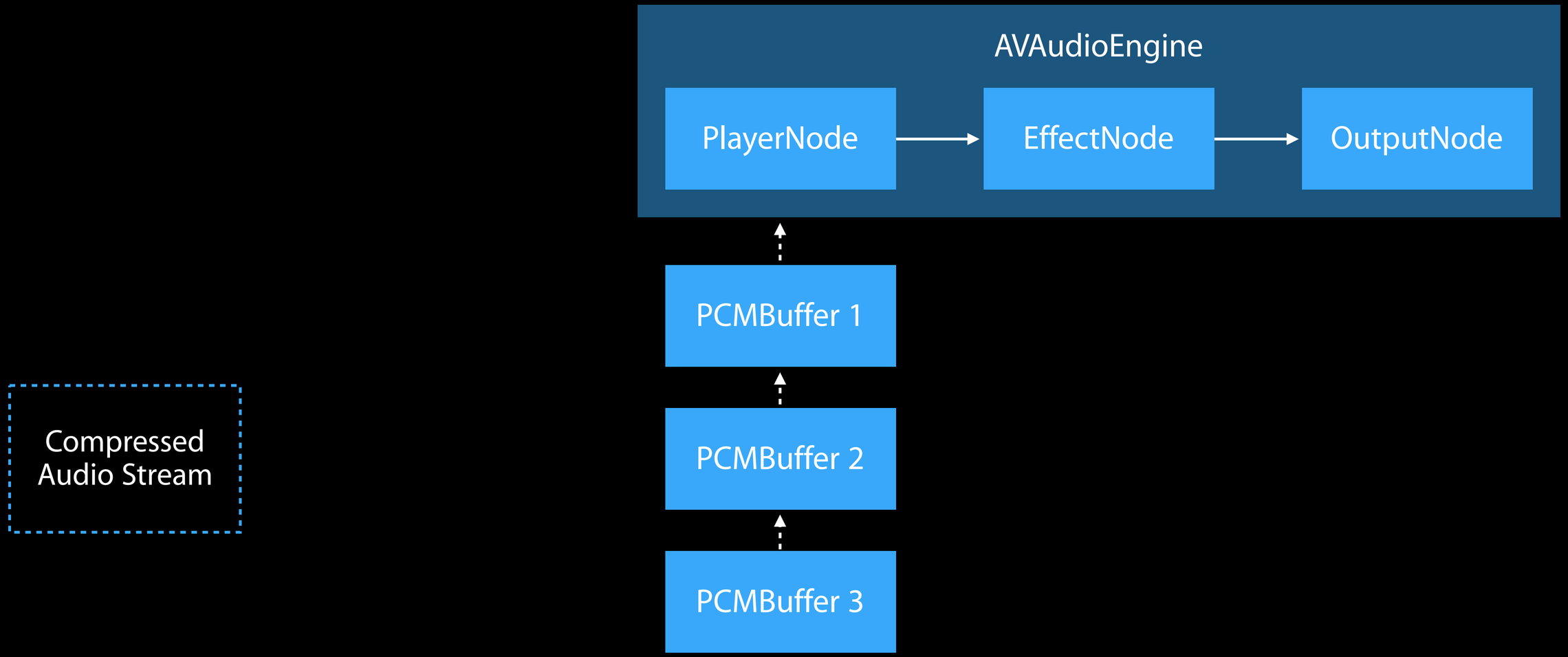


Compressed
Audio Stream

AVAudioConverter

With AVAudioEngine: sample use case

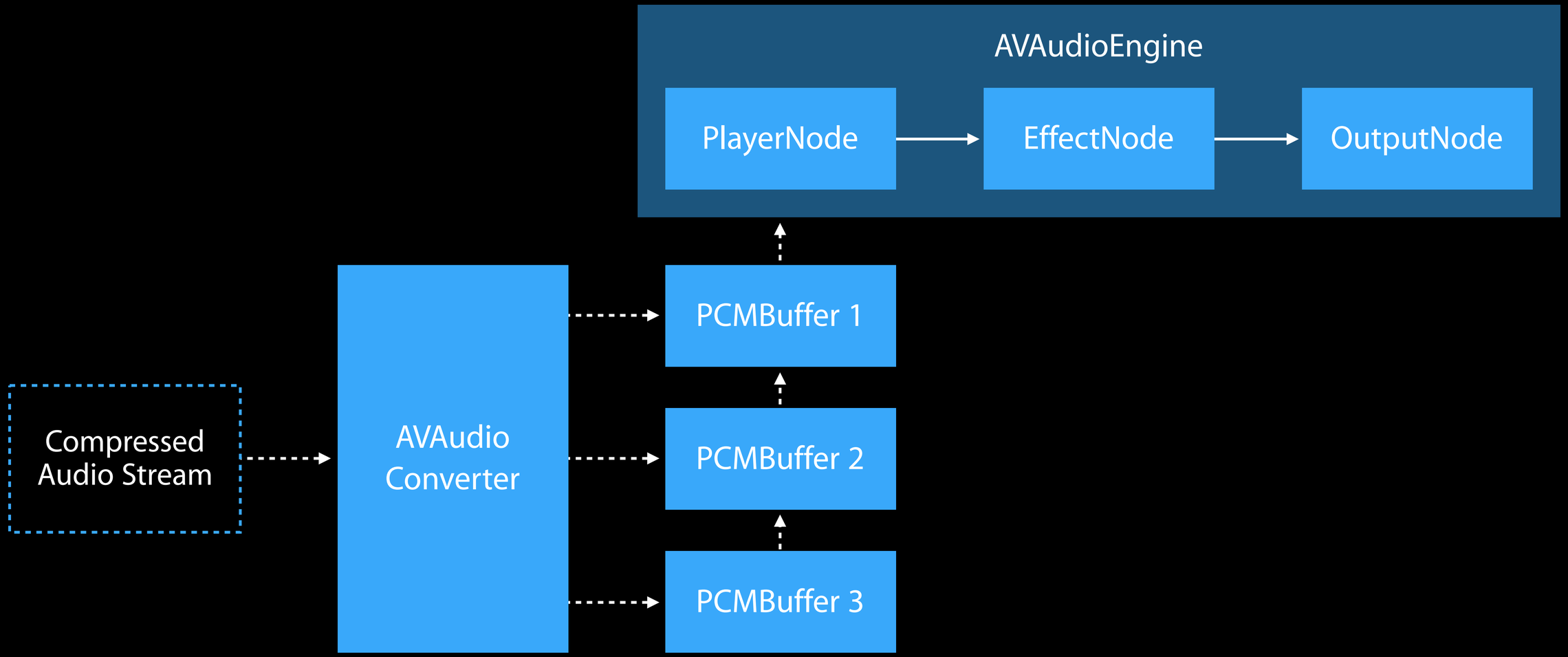
NEW



AVAudioConverter

With AVAudioEngine: sample use case

NEW



AVAudioConverter

Code example: encoding

NEW

```
// Input format: 44.1 kHz, 2 channel, non-interleaved, 16-bit signed integer
let inFormat = AVAudioFormat(
    commonFormat: AVAudioCommonFormat.PCMFormatInt16,
    sampleRate: 44100, channels: 2, interleaved: false)

// Output format: 44.1 kHz, 2 channel, AAC
var outDesc = AudioStreamBasicDescription(
    mSampleRate: 44100, mFormatID: kAudioFormatMPEG4AAC, mFormatFlags: 0,
    mBytesPerPacket: 0, mFramesPerPacket: 0, mBytesPerFrame: 0,
    mChannelsPerFrame: 2, mBitsPerChannel: 0, mReserved: 0)

let outFormat = AVAudioFormat(streamDescription: &outDesc)
```

AVAudioConverter

NEW

Code example: encoding

```
// Input format: 44.1 kHz, 2 channel, non-interleaved, 16-bit signed integer
let inFormat = AVAudioFormat(
    commonFormat: AVAudioCommonFormat.PCMFormatInt16,
    sampleRate: 44100, channels: 2, interleaved: false)

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    mBytesPerPacket: 0, mFramesPerPacket: 0, mBytesPerFrame: 0,
    mChannelsPerFrame: 2, mBitsPerChannel: 0, mReserved: 0)

let outFormat = AVAudioFormat(streamDescription: &outDesc)
```

AVAudioConverter

NEW

Code example: encoding

```
// Create a converter
let converter = AVAudioConverter(fromFormat: inFormat, toFormat: outFormat)

// Allocate an input PCM buffer
let inBuffer = AVAudioPCMBuffer(PCMFormat: inFormat, frameCapacity: 1024)

// Allocate an output compressed buffer
let outBuffer = AVAudioCompressedBuffer(
    format: outFormat,
    packetCapacity: 8,
    maximumPacketSize: converter.maximumOutputPacketSize)
```

AVAudioConverter

NEW

Code example: encoding

```
// Create a converter
let converter = AVAudioConverter(fromFormat: inFormat, toFormat: outFormat)

// Allocate an input PCM buffer
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    format: outFormat,
    packetCapacity: 8,
    maximumPacketSize: converter.maximumOutputPacketSize)
```

AVAudioConverter

Code example: encoding

NEW

```
// Create an input block that’s called when converter needs input
let inputBlock : AVAudioConverterInputBlock = {
    inNumPackets, outStatus in
    if (<no_data_available>) {
        outStatus.memory = AVAudioConverterInputStatus.NoDataNow; return nil;
    } else if (<end_of_stream>) {
        outStatus.memory = AVAudioConverterInputStatus.EndOfStream; return nil;
    } else {
        ..
        outStatus.memory = AVAudioConverterInputStatus.HaveData;
        return inBuffer; // fill and return input buffer
    }
}
```

AVAudioConverter

Code example: encoding

NEW

```
// Create an input block that’s called when converter needs input
let inputBlock : AVAudioConverterInputBlock = {
    inNumPackets, outStatus in
    if (<no_data_available>) {
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AVAudioConverter

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AVAudioConverter

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    } else {
        ..
        outStatus.memory = AVAudioConverterInputStatus.HaveData;
        return inBuffer; // fill and return input buffer
    }
}
```

AVAudioConverter

Code example: encoding

NEW

```
// Conversion loop
outError = nil
while (true) {
    let status = converter.convertToBuffer(outBuffer, error: outError,
    withInputFromBlock: inputBlock)
    if status == AVAudioConverterOutputStatus.EndOfStream ||
       status == AVAudioConverterOutputStatus.Error {
       break
    }
    // outBuffer contains output data
    ..
}
```

AVAudioConverter

NEW

Code example: encoding

```
// Conversion loop
outError = nil
while (true) {
    let status = converter.convertToBuffer(outBuffer, error: outError,
    withInputFromBlock: inputBlock)
    if status == AVAudioConverterOutputStatus.EndOfStream ||
       status == AVAudioConverterOutputStatus.Error {
       break
    }
    // outBuffer contains output data
    ..
}
```

AVAudioConverter

NEW

Code example: encoding

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// Conversion loop
outError = nil
while (true) {
    let status = converter.convertToBuffer(outBuffer, error: outError,
    withInputFromBlock: inputBlock)
    if status == AVAudioConverterOutputStatus.EndOfStream ||
       status == AVAudioConverterOutputStatus.Error {
        break
    }
    // outBuffer contains output data
    ..
}
```

AVAudioEngine

What's new

NEW

Splitting support

Audio format conversion support

- AVAudioCompressedBuffer
- AVAudioConverter

AVAudioSequencer

AVAudioSequencer

NEW

Plays MIDI files

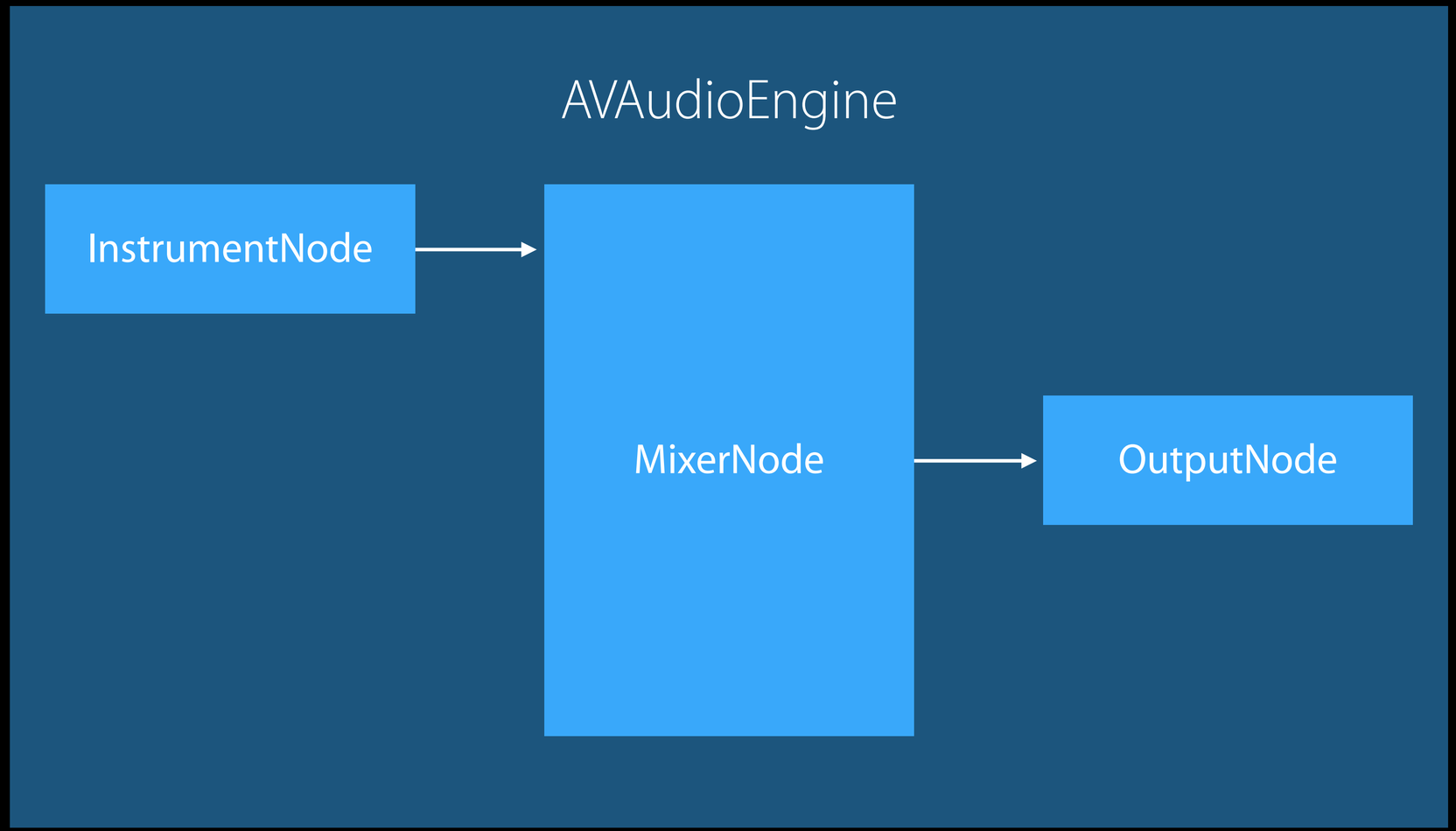
Associated with an AVAudioEngine during instantiation

Sends MIDI events to AVAudioUnitMIDIInstrument nodes in the engine

AVAudioSequencer

Sample setup

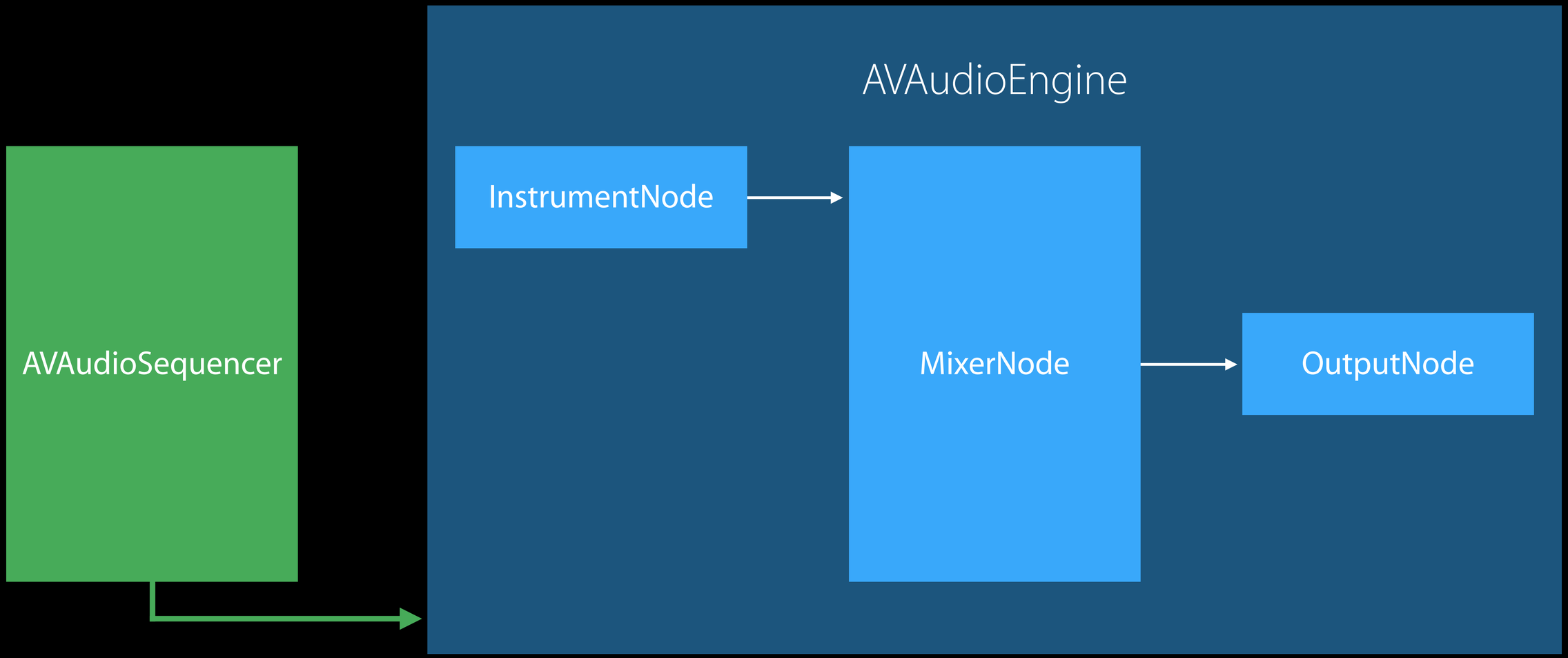
NEW



AVAudioSequencer

Sample setup

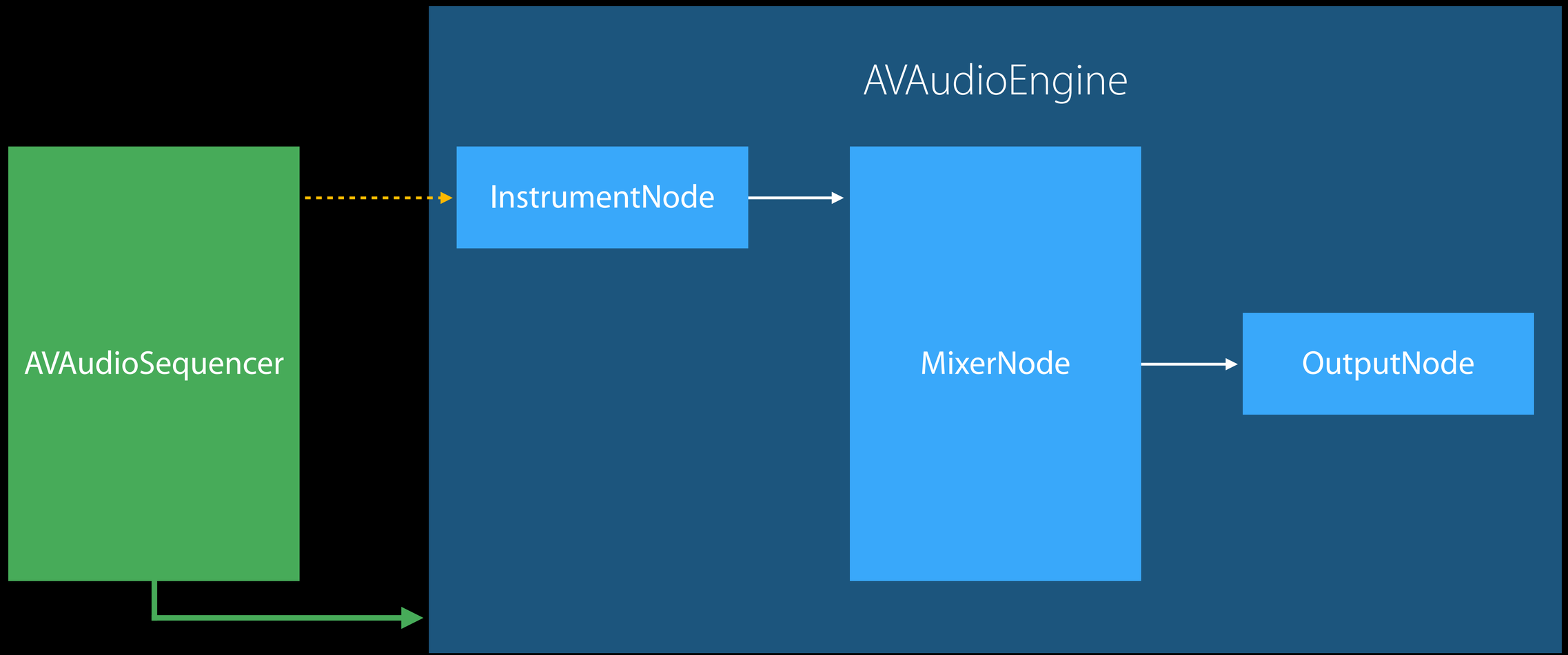
NEW



AVAudioSequencer

Sample setup

NEW



AVAudioSequencer

NEW

Code example: AVAudioEngine setup

```
do {
    // setup instrument node (e.g. sampler)
    let sampler = AVAudioUnitSampler()
    engine.attachNode(sampler)
    engine.connect(sampler, to: engine.mainMixerNode, format: format)
    try sampler.loadInstrumentAtURL(instURL)

    // start the engine
    try engine.start()
} catch {
    // handle errors
}
```

AVAudioSequencer

NEW

Code example: AVAudioEngine setup

```
do {
    // setup instrument node (e.g. sampler)
    let sampler = AVAudioUnitSampler()
    engine.attachNode(sampler)
    engine.connect(sampler, to: engine.mainMixerNode, format: format)
    try sampler.loadInstrumentAtURL(instURL)

    // start the engine
    try engine.start()
} catch {
    // handle errors
}
```

AVAudioSequencer

NEW

Code example: AVAudioSequencer setup

```
do {
    // create sequencer and associate with engine
    let sequencer = AVAudioSequencer(audioEngine: engine)

    // load MIDI file
    try sequencer.loadFromURL(fileURL,
        options: AVMusicSequenceLoadOptions.SMF_PreserveTracks)

    // start sequencer
    sequencer.prepareToPlay()
    try sequencer.start()
    // audio will start playing
} catch { // handle error
}
```

AVAudioSequencer

NEW

Code example: AVAudioSequencer setup

```
do {
    // create sequencer and associate with engine
    let sequencer = AVAudioSequencer(audioEngine: engine)

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    try sequencer.loadFromURL(fileURL,
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AVAudioSequencer

NEW

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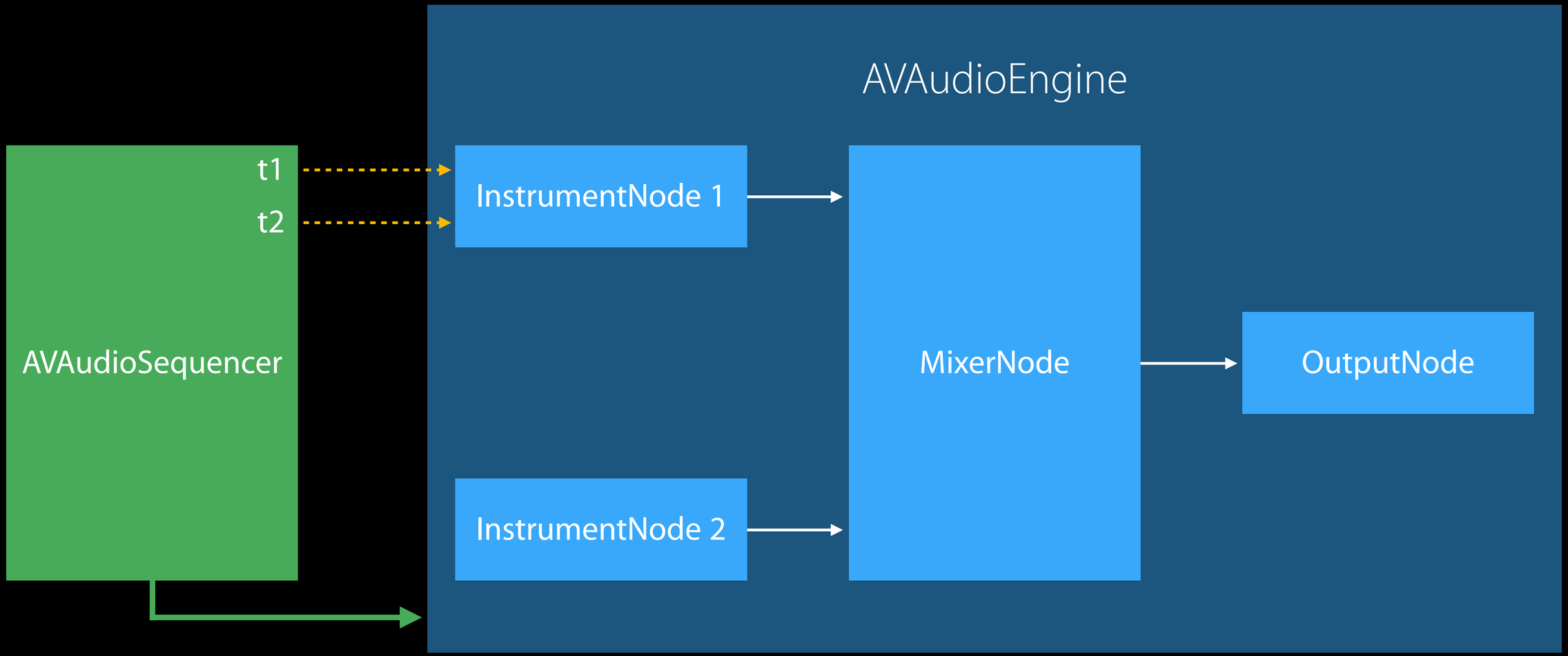
    // load MIDI file
    try sequencer.loadFromURL(fileURL,
        options: AVMusicSequenceLoadOptions.SMF_PreserveTracks)

    // start sequencer
    sequencer.prepareToPlay()
    try sequencer.start()
    // audio will start playing
} catch { // handle error
}
```

AVAudioSequencer

Handling multiple tracks

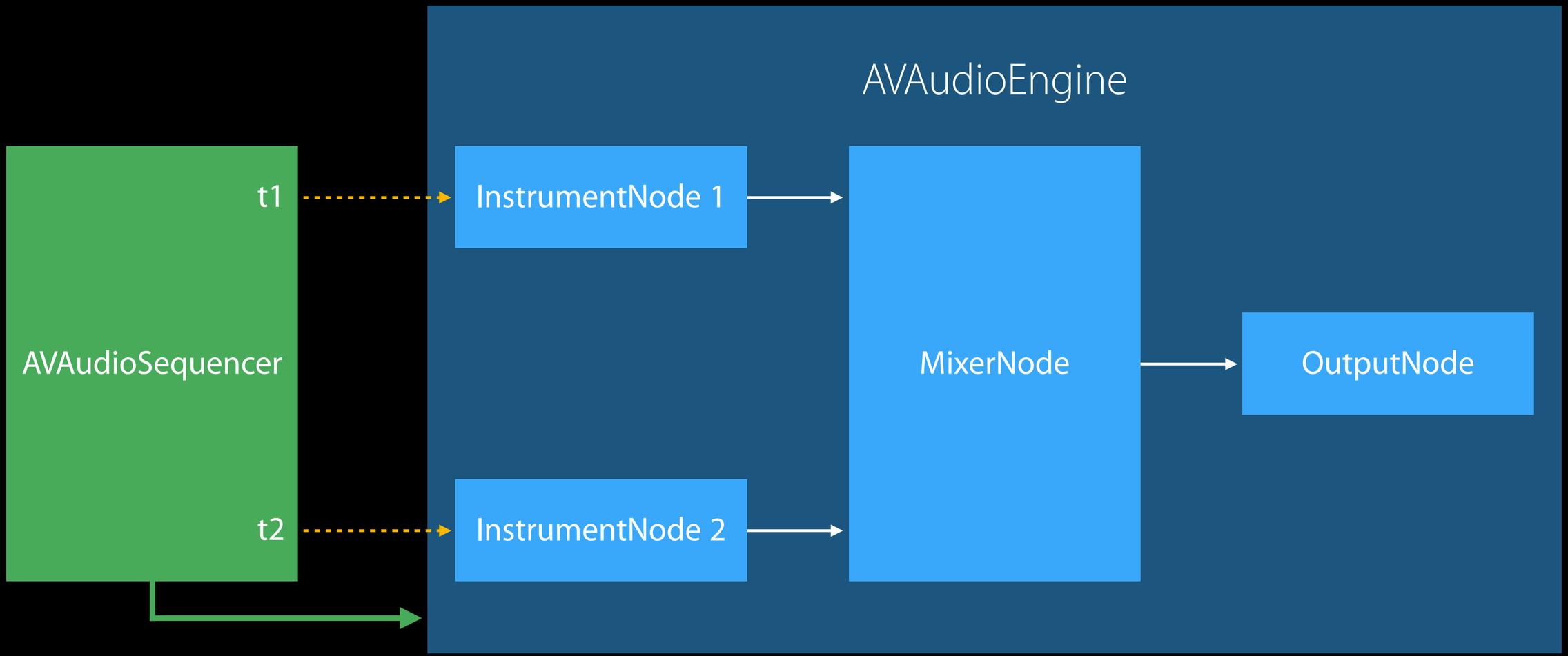
NEW



AVAudioSequencer

Handling multiple tracks

NEW



AVAudioSequencer

NEW

Code example: handling multiple tracks

```
// create and setup engine
// create sequencer
// load MIDI file
..
// send individual tracks to different instrument nodes in the engine
let tracks = sequencer.tracks
tracks[0].destinationAudioUnit = sampler
tracks[1].destinationAudioUnit = midiSynth

// start sequencer
..
```

AVAudioSequencer

Transport controls

NEW

Prepare to play, start, stop

Set playback position

- Seconds or beats

Set playback rate

Demo

AVAudioEngine

Akshatha Nagesh ‘AudioEngine’er
Torrey Holbrook Walker Senior New Feature Salesperson

Summary

AVAudioEngine

Recap

- Handling multichannel audio

What's new

- Splitting support
- Audio format conversion support
  - AVAudioCompressedBuffer
  - AVAudioConverter
- AVAudioSequencer

Inter-device Audio Mode for iOS

Torrey Holbrook Walker
Senior New Feature Salesperson

Recording From iOS Devices

Recording From iOS Devices

Recording From iOS Devices

Digital USB Audio

Digital USB Audio

Recording Audio From iOS

Digital recording is possible with USB host mode and USB hardware

3rd party software/frameworks

Couldn’t this be simpler?

Inter-device Audio Mode

NEW

Record audio digitally over the Lighting to USB cable

Stereo 24-bit @ 48 kHz stream format

USB 2.0 audio class-compliant implementation

Inter-device Audio Mode

NEW

No additional hardware

No additional software

No need to modify OS X or iOS applications

No system sounds routed to USB

Inter-device Audio Mode

NEW

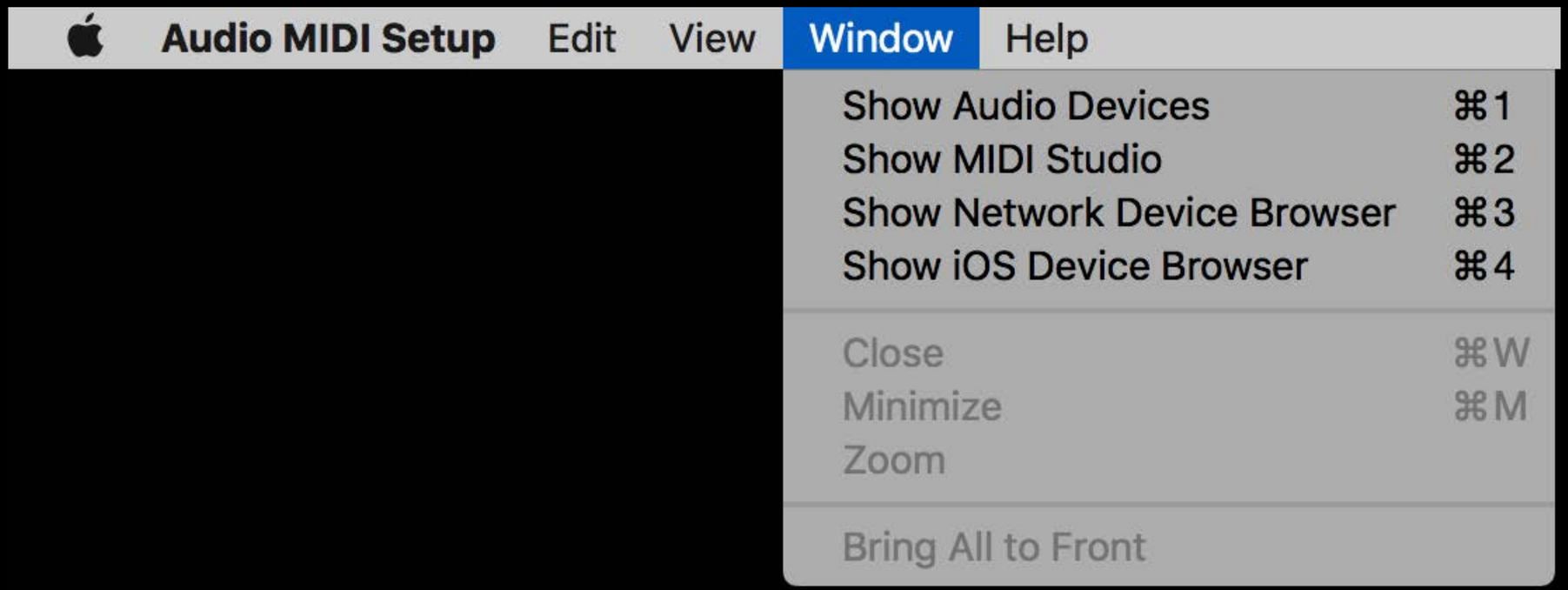
Device can charge and sync

Temporarily disabled functionality

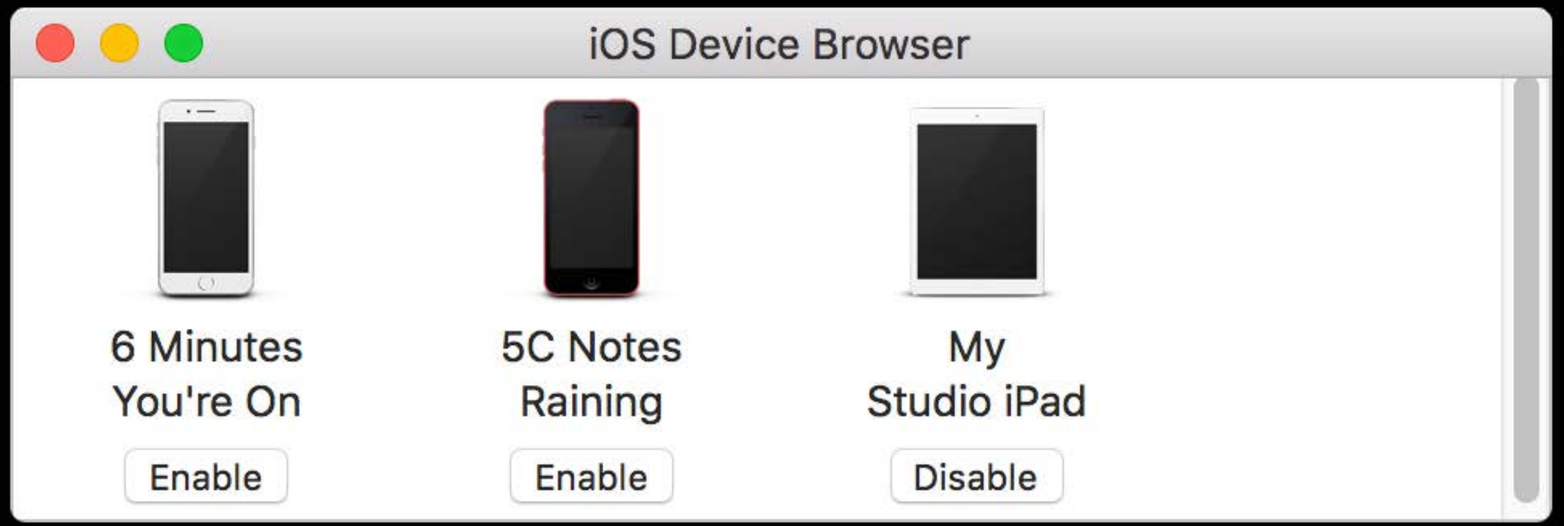
- Photo import
- Tethering
- QuickTime screen capture

Inter-device Audio Mode

Accessible via Audio MIDI Setup



Inter-device Audio Mode



Demo

Inter-device audio mode

Torrey Holbrook Walker
Senior New Feature Salesperson

Inter-device Audio Mode

Requires OS X El Capitan and iOS 9

Works on all iPhones with a lightning connector

Works on all iPads with a lightning connector except first-gen iPad mini

Supports multiple devices simultaneously (if you've got the hubs)

CoreAudioKit View Controller

NEW

```
@IBOutlet weak var viewContainer: NSView!
weak var iOSDeviceView: NSView?
var controller : CAInterDeviceAudioViewController?

@IBAction func toggleIOSDeviceView(sender: NSButton) {
        if iOSDeviceView == nil {
    controller = CAInterDeviceAudioViewController()
            iOSDeviceView = controller!.view
            viewContainer.addSubview(iOSDeviceView!)
        } else {
            iOSDeviceView!.removeFromSuperview()
            iOSDeviceView = nil
            controller = nil
        }
}
```

More CoreAudioKit View Controllers

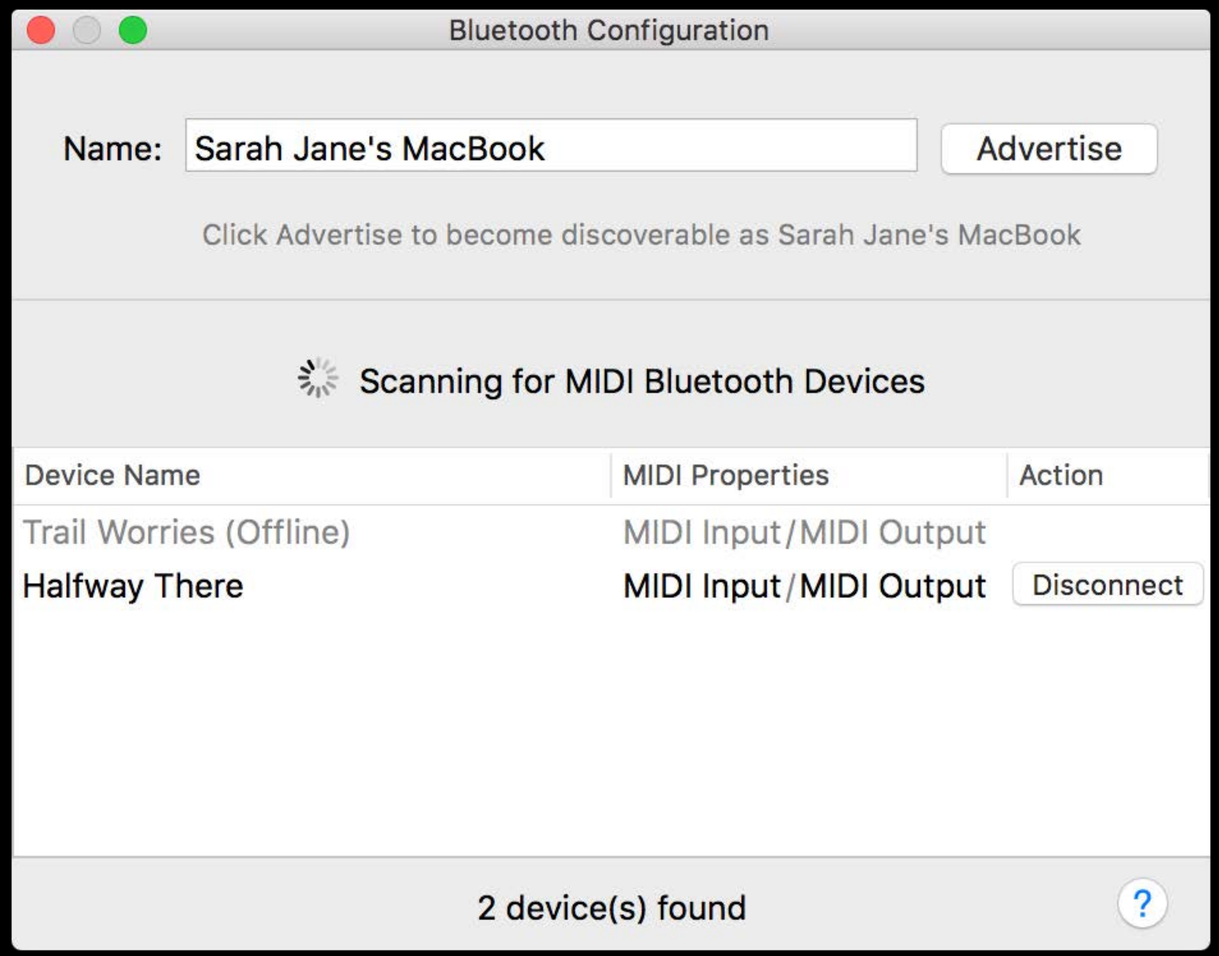
NEW

CABTLEMIDIWindowController

Displays UI for configuring Bluetooth LE MIDI devices

NSWindowController subclass

CABTLEMIDIWindowController



More CoreAudioKit View Controllers

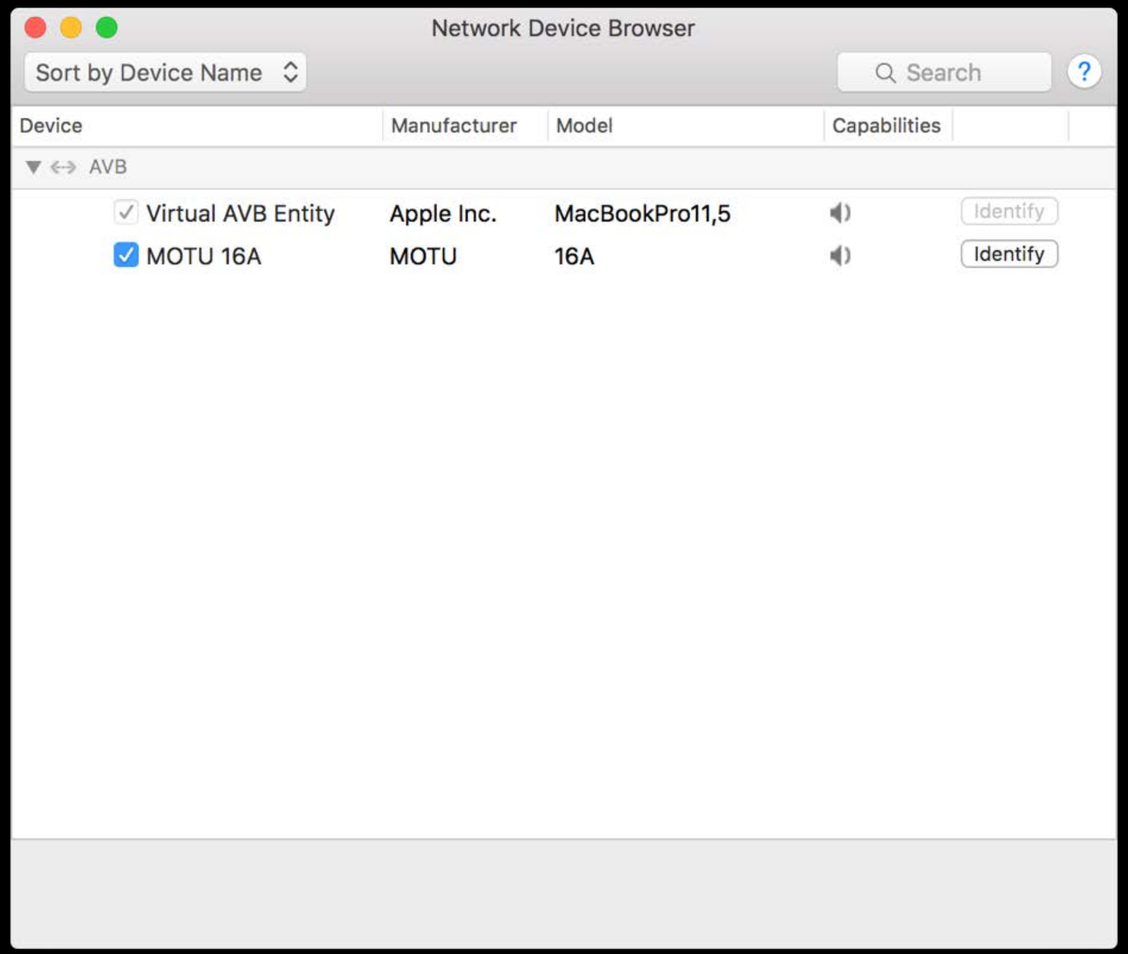
NEW

CANetworkBrowserWindowController

Displays UI for managing AVB audio devices

NSWindowController subclass

CoreAudioKit View Controller (cont.)



What's New in AVAudioSession

Torrey Holbrook Walker
Senior New Feature Salesperson

Navigation Prompts and Podcasts

Problem

Listening to podcast while driving

Navigation prompts duck podcast audio

—> Bad user experience!

Navigation Prompts and Podcasts

Solution

NEW

Podcast and audio book apps:

- Use AVAudioSessionModeSpokenAudio

Navigation and fitness apps:

- Use AVAudioSessionCategoryOptions.InterruptSpokenAudioAndMixWithOthers

1st party apps have opted in:

- Maps, Podcasts, iBooks

Navigation Application

Session setup

```
do {
  let audioSession = AVAudioSession.sharedInstance()
  let category = AVAudioSessionCategoryPlayback
  var categoryOptions = AVAudioSessionCategoryOptions.DuckOthers
  if #available(iOS 9.0, *) {
      categoryOptions.unionInPlace(.InterruptSpokenAudioAndMixWithOthers)
  }
  try audioSession.setCategory(category, withOptions: categoryOptions)
} catch {
  // handle errors ...
}
```

Navigation Application

Starting navigation prompts

```
func startNavPrompt(promptPath : NSURL) {
  do {
    let audioSession = AVAudioSession.sharedInstance()
    let player = try AVAudioPlayer(contentsOfURL: promptPath)
    player.delegate = self
    try audioSession.setActive(true)
    player.play()
  } catch {
    // handle errors ...
  }
}
```

Navigation Application

Completing navigation prompts

```
// AVAudioPlayerDelegate method
func audioPlayerDidFinishPlaying(player: AVAudioPlayer, successfully flag:
Bool) {
  do {
    let audioSession = AVAudioSession.sharedInstance()
    try audioSession.setActive(false,
                withOptions: .OptionNotifyOthersOnDeactivation)
  } catch {
    // handle errors ...
  }
}
```

Podcast Application

Session setup

```
do {
  let audioSession = AVAudioSession.sharedInstance()
  let category = AVAudioSessionCategoryPlayback
  var mode = AVAudioSessionModeDefault

  if #available(iOS 9.0, *) {
    mode = AVAudioSessionModeSpokenAudio
  }
  try audioSession.setCategory(category)
  try audioSession.setMode(mode)

...
```

Podcast Application

Session setup

```
...

  // add interruption handler
  NSNotificationCenter.defaultCenter().addObserver(self, selector:
"handleInterruption:", name:AVAudioSessionInterruptionNotification, object:
audioSession)

  // register for other important notifications

} catch {
  // handle errors ...
}
```

Podcast Application

Interruption handling

```
func handleInterruption(notification: NSNotification)
{
  let userInfo = notification.userInfo as! [String: AnyObject]
  let type = userInfo[AVAudioSessionInterruptionTypeKey] as!
AVAudioSessionInterruptionType

  switch type {
    case .Began:
    // update UI to indicate that playback has stopped
   if (state == isPlaying) {
     wasPlaying = true
     state = stopped
   }
...
```

Podcast Application

Interruption handling (cont.)

```
...
    case .Ended:
      if let flag = userInfo[AVAudioSessionInterruptionOptionKey] as?
AVAudioSessionInterruptionOptions {
        if flag == .OptionShouldResume && wasPlaying {
          // rewind the audio a little
          player.play()
          state = isPlaying
          // and update the UI to reflect that playback has resumed
        }
      }
  } // end switch
} // end func
```

Recap

Enhanced AVAudioEngine

Inter-device audio mode

CoreAudioKit View Controllers for IDAM, BLE MIDI, and AVB

AVAudioSessionModeSpokenAudio

AVAudioSessionCategoryOptions.InterruptSpokenAudioAndMixWithOthers

Related Sessions

Audio Unit Extensions	Nob Hill	Thursday 11:00 AM
What's New in SpriteKit	Mission	Wednesday 10:00 AM
Enhancements to SceneKit	Mission	Wednesday 2:30 PM

Related Labs

Audio Lab	Graphics, Games, and Media Lab A	Thursday 9:00 AM
Audio Lab	Graphics, Games, and Media Lab A	Thursday 1:30 PM

More Information

Technical Support

Developer Technical Support

http://developer.apple.com/contact

Apple Developer Forums

http://developer.apple.com/forums

Bugs

http://bugreport.apple.com

General Inquiries

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WWDC15