Enhancing VoIP Apps with CallKit

Session 230

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How do VoIP apps work today?
Wouldn’t it be nice if...
Mama Appleseed
Speakerbox Audio

Yesterday
What can I help you with?
Settings

- Airplane Mode
- Wi-Fi
- Bluetooth
- Cellular
- Personal Hotspot
- Notifications
- Control Center
- Do Not Disturb
- General
- Display & Brightness
- Wallpaper
- Sounds
- Siri
Agenda

Architecture
Incoming Call
Outgoing Call
API Details
Architecture

System Services

VoIP App

System
Architecture

System Services

CallKit

VoIP App

System
Architecture

System Services

CallKit

VoIP App

CallKit

System
Architecture

VoIP App

CallKit

System
Architecture

VoIP App

CallKit

System
Architecture

System
Architecture
Architecture

Speakerbox

App Code

App UI

System
Architecture

Speakerbox

App Code

CallKit

App UI

System
Architecture

- Speakerbox
  - App Code
  - App UI
  - CXProvider
  - CallKit
  - CXCallController
- System
CXProvider vs. CXCallController
CXProvider vs. CXCallController
CXProvider vs. CXCallController

CXProvider

Out-of-band notifications
CXProvider vs. CXCallController

CXProvider

Out-of-band notifications
Not user actions
CXProvider vs. CXCallController

CXProvider

Out-of-band notifications
Not user actions
External events
• Incoming call
CXProvider vs. CXCallController

CXProvider
- Out-of-band notifications
- Not user actions
- External events
  - Incoming call

CXCallController
CXProvider vs. CXCallController

CXProvider
Out-of-band notifications
Not user actions
External events
• Incoming call

CXCallController
Requests from app
CXProvider vs. CXCallController

**CXProvider**
- Out-of-band notifications
- Not user actions
- External events
  - Incoming call

**CXCallController**
- Requests from app
- Local user actions
CXProvider vs. CXCallController

CXProvider
- Out-of-band notifications
- Not user actions
- External events
  - Incoming call

CXCallController
- Requests from app
- Local user actions
- Internal events
  - Start call
CXProvider vs. CXCallController

**CXProvider**
- Out-of-band notifications
- Not user actions
- External events
  - Incoming call

**CXCallController**
- Requests from app
- Local user actions
- Internal events
  - Start call
- Interplay with other providers
  - Hold and Start Call
CXProvider vs. CXCallController

Example uses
CXProvider vs. CXCallController

Example uses

Use CXProvider to report

Incoming call
Outgoing call connected
Call ended on remote side
CXProvider vs. CXCallController

Example uses

Use CXProvider to report
- Incoming call
- Outgoing call connected
- Call ended on remote side

Use CXCallController to request
- Start outgoing call
- Answer call
- End call
Architecture

- Speakerbox
- App Code
- CXProvider
- CallKit
- CXAction
- System
Incoming Call
Architecture

Speakerbox

App Code

CallKit

System
Architecture

Speakerbox

App Code

CXProvider

CallKit

System
Architecture

Speakerbox

App Code

CXProvider

CallKit

System

CXCallUpdate

System UI

Incoming Call
Architecture

Speakerbox

App Code

CXProvider CallKit

System

System UI

Answer
Architecture

- Speakerbox
  - App Code
    - CXProvider
    - CallKit
  - System
    - CXAnswerCallAction
  - System UI
Architecture

Speakerbox

App Code

App UI

CXProvider
CallKit
CXCallController

CXTransaction(CXEndCallAction)

System
Architecture

Speakerbox

App Code

App UI

CXProvider

CallKit

CXCallController

CXEndCallAction

CXTransaction(CXEndCallAction)

System
Architecture

[Diagram showing the architecture of the system with labels for Speakerbox, CXProvider, CallKit, CXCallController, App Code, App UI, System, CXEndCallAction, and CXTransaction(CXEndCallAction).]
Demo

Incoming Call

Stuart Montgomery
Recap

Incoming call
Recap

Incoming call

Reported incoming call to system

```swift
provider.reportNewIncomingCall(with: UUID, update: CXCallUpdate) { error in /* ... */ }
```
Recap

Incoming call

Reported incoming call to system

```
provider.reportNewIncomingCall(with: UUID, update: CXCallUpdate) { error in /* ... */ }
```

Performed the CXAnswerCallAction

```
func provider(_ provider: CXProvider, perform action: CXAnswerCallAction) { /* ... */ }
```
Recap

Incoming call

Reported incoming call to system

```
provider.reportNewIncomingCall(with: UUID, update: CXCallUpdate) { error in /* ... */ }
```

Performed the CXAnswerCallAction

```
func provider(_ provider: CXProvider, perform action: CXAnswerCallAction) { /* ... */ }
```

Fulfilled the CXAnswerCallAction

```
answerCallAction.fulfill()
```
Call Actions

CX Answer CallAction
CX Start CallAction
CX End CallAction
CX SetHeld CallAction
CX SetGroup CallAction
CX Play DTMF CallAction
CX Set Muted CallAction
Managing Multiple Calls
Managing Multiple Calls

CXTransaction
Managing Multiple Calls

CXTransaction

• List of multiple actions
Managing Multiple Calls

CXTransaction

- List of multiple actions
- CXEndCallAction and CXAnswerCallAction
Managing Multiple Calls

CXTransaction

- List of multiple actions
- CXEndCallAction and CXAnswerCallAction
- Fulfill each action individually
Managing Multiple Calls

CXTransaction

- List of multiple actions
- CXEndCallAction and CXAnswerCallAction
- Fulfill each action individually
Outgoing Call
Outgoing Call

Call controller
Outgoing Call
Call controller

Handle start call intent

Speakerbox

Start Call
Outgoing Call
Call controller

Handle start call intent

Introducing SiriKit

Presidio  Wednesday 5:00PM
Outgoing Call

Call controller

Handle start call intent
Create start call action
Outgoing Call

Call controller

- Handle start call intent
- Create start call action
- Request start call action

Start Call
Outgoing Call

Call controller

Handle start call intent
Create start call action
Request start call action
Receive start call action
Outgoing Call

Call controller

- Handle start call intent
- Create start call action
- Request start call action
- Receive start call action
- Execute start call action

Start Call
Outgoing Call

Lifecycle
Outgoing Call

Lifecycle
Outgoing Call

Lifecycle

Starting
Outgoing Call
Lifecycle

Starting
Outgoing Call
Lifecyle

Starting

Started

Mama Appleseed
calling mobile...
Outgoing Call

Lifecycle

Starting

Started
Outgoing Call
Lifecycle

Starting  Started  Connecting

Mama Appleseed
Speakerbox Audio connecting...
Outgoing Call
Lifecycle

- Starting
- Started
- Connecting
Outgoing Call
Lifecycle

Starting  Started  Connecting  Connected
Demo
Outgoing Call

Stuart Montgomery
Recap
Outgoing call
Recap

Outgoing call

Request start call action with Call Controller

callController.request(startCallTransaction) { error in /* ... */ }
Recap
Outgoing call

Request start call action with Call Controller

callController.request(startCallTransaction) { error in /* ... */ }

Fulfill start call action with Provider

startCallAction.fulfill()
Recap
Outgoing call

Request start call action with Call Controller

callController.request(startCallTransaction) { error in /* ... */ }

Fulfill start call action with Provider

startCallAction.fulfill()

Send call state updates

provider.reportOutgoingCall(with: call.uuid, startedConnectingAt: call.connectingDate)
provider.reportOutgoingCall(with: call.uuid, connectedAt: call.connectDate)
API Details
API Details

Authorization
Configuration
Action Errors
System Restrictions
Audio
Provider Authorization
Provider Authorization

Check authorization status
Provider Authorization

Check authorization status

Request authorization
Provider Authorization

Check authorization status
Request authorization
Observe authorization changes
Provider Configuration
Provider Configuration

Customized experience
Provider Configuration

Customized experience

• Localized name for display
Provider Configuration

Customized experience
• Localized name for display
• Video support
Provider Configuration

Customized experience
- Localized name for display
- Video support
- Masked image icon
Action Errors

Failing actions appropriately
Action Errors
Failing actions appropriately
Action Errors
Failing actions appropriately

Starting

Receive action
Action Errors
Failing actions appropriately

Starting

Receive action
Failing actions appropriately

Action Errors

Starting | Started

Receive action
Action Errors
Failing actions appropriately

Starting  Started

Receive action
Action Errors

Failing actions appropriately

Starting  Started

Receive action
Fail action
Action Errors
Failing actions appropriately

Starting → Started

Receive action
Fail action
Action Errors

Failing actions appropriately

Starting → Started

Receive action
Fail action
Action Errors

Timeouts
Action Errors

Timeouts
Action Errors

Timeouts

Enforce app responsiveness
Action Errors

Timeouts

Enforce app responsiveness

Respond to actions in a timely manner
Action Errors

Timeouts

Enforce app responsiveness
Respond to actions in a timely manner
React to action timeouts
System Restrictions

Incoming call
System Restrictions

Incoming call

Not authorized
System Restrictions

Incoming call

Not authorized

Block list
System Restrictions

Incoming call

Not authorized

Block list

Do not disturb
System Restrictions

Incoming call

Not authorized

Block list

Do not disturb

• React to completion handler

```swift
provider.reportNewIncomingCall(with: UUID(), update: CXCallUpdate()) { error in
    if let incomingCallError = error,
        incomingCallErrorCode = CXErrorCodeIncomingCallError(rawValue: incomingCallError.code)
    where incomingCallErrorCode == .filteredByDoNotDisturb {
        // handle do not disturb
    }
}
```
Audio

Benefits
Audio

Benefits

High priority session
Audio

Benefits

High priority session
Fewer interruptions
Audio
Benefits

High priority session
Fewer interruptions
Audio routing hints
Audio
Incoming call
Audio
Incoming call
Audio
Incoming call

Answer Received
Answer Fulfilled
Audio
Incoming call

Answer Received

Answer Fulfilled
Audio

Incoming call

- Answer Received
- Configure AVAudioSession
- Answer Fulfilled
Audio

Incoming call

Answer Received

Configure AVAudioSession

Answer Fulfilled
Audio

Incoming call

Answer Received

Configure AVAudioSession

Answer Fulfilled
Audio

Incoming call

Answer Received

Configure AVAudioSession

Answer Fulfilled
Audio

Incoming call

Answer Received

---

Configure AVAudioSession

Answer Fulfilled

Did activate AVAudioSession
Recap

API details

Authorization
Configuration
Action Errors
System Restrictions
Audio
Summary
Summary

Integration into the system
Summary

Integration into the system

Feature parity
Summary

Integration into the system
Feature parity
Better app visibility
More Information

## Related Sessions

<table>
<thead>
<tr>
<th>Session</th>
<th>Location</th>
<th>Date/Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introducing SiriKit</td>
<td>Presidio</td>
<td>Wednesday 5:00PM</td>
</tr>
<tr>
<td>Extending Your Apps with SiriKit</td>
<td>Nob Hill</td>
<td>Thursday 1:40PM</td>
</tr>
<tr>
<td>Networking with for the Modern Internet</td>
<td>Pacific Heights</td>
<td>Thursday 3:00PM</td>
</tr>
<tr>
<td>Delivering an Exceptional Audio Experience</td>
<td>Nob Hill</td>
<td>Friday 1:40PM</td>
</tr>
<tr>
<td>Labs</td>
<td>Frameworks Lab A</td>
<td>Frameworks Lab B</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>CallKit Lab</td>
<td>Frameworks Lab A</td>
<td>Frameworks Lab B</td>
</tr>
<tr>
<td>SiriKit Lab</td>
<td>Frameworks Lab B</td>
<td>Frameworks Lab B</td>
</tr>
<tr>
<td>Networking Lab 2</td>
<td>Frameworks Lab D</td>
<td>Frameworks Lab D</td>
</tr>
<tr>
<td>Audio Lab</td>
<td>Graphics, Games, and Media Lab D</td>
<td>Friday 3:00PM</td>
</tr>
</tbody>
</table>