Accessibility for iOS

Raising the bar

Session 210

Chris Fleizach
iOS Accessibility

Accessibility

Using technology to overcome challenges

Accessibility

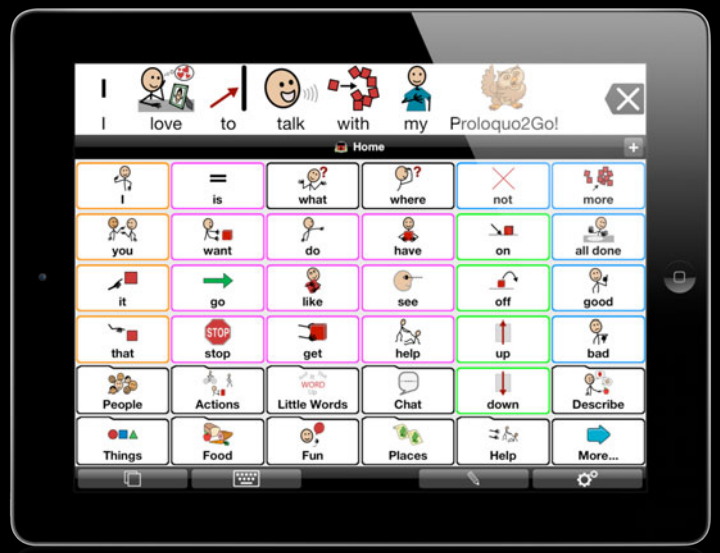
Using technology to overcome challenges

- Computer-controlled wheelchairs

Accessibility

Using technology to overcome challenges

- Computer-controlled wheelchairs
- Assistive communication



Accessibility

Using technology to overcome challenges

- Computer-controlled wheelchairs
- Assistive communication
- Screen readers

Accessibility

Using technology to overcome challenges

- Computer-controlled wheelchairs
- Assistive communication
- Screen readers
- Many others

iOS Accessibility Features

VoiceOver

iOS Accessibility Features

Zoom

iOS Accessibility Features

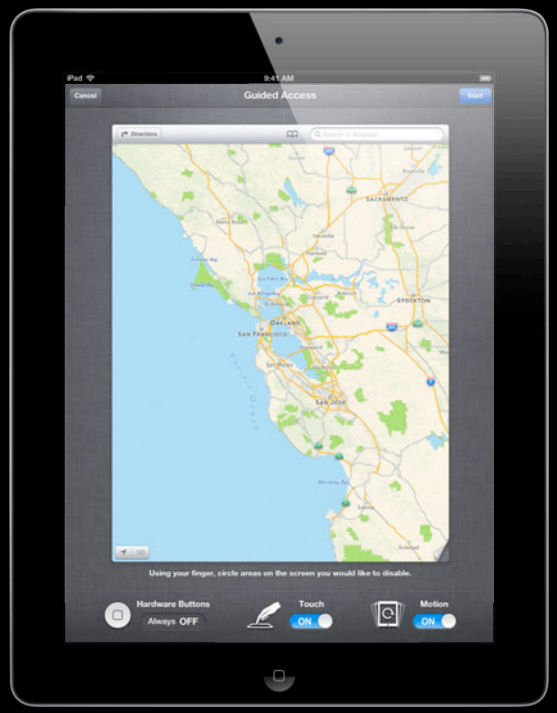
Zoom

iOS Accessibility Features

AssistiveTouch

New in iOS 6

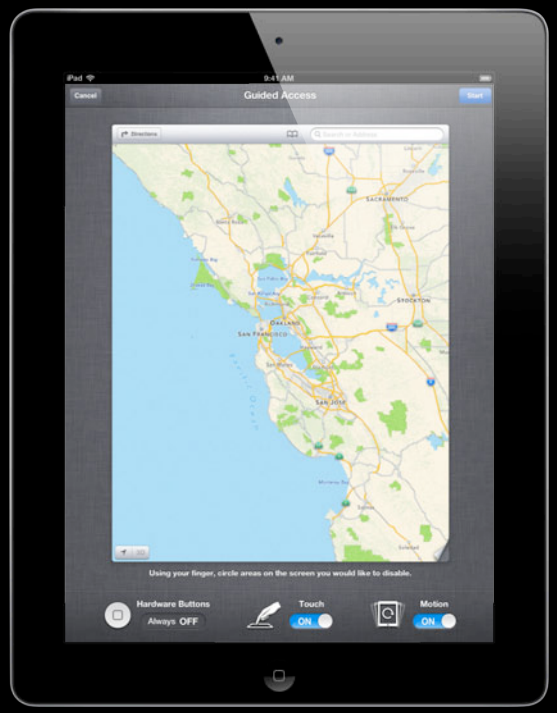
Guided Access



New in iOS 6

Guided Access

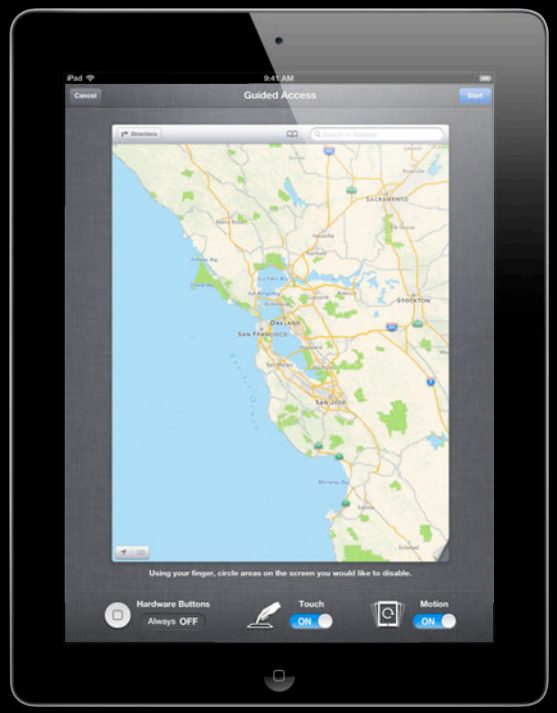
- Lock into a single App



New in iOS 6

Guided Access

- Lock into a single App
- Control access to hardware features



New in iOS 6

Made for iPhone hearing aids

New in iOS 6

Made for iPhone hearing aids

- High quality wireless audio

New in iOS 6

Made for iPhone hearing aids

- High quality wireless audio
- Low power consumption

New in iOS 6

Made for iPhone hearing aids

- High quality wireless audio
- Low power consumption
- Adjust hearing aid directly from iPhone

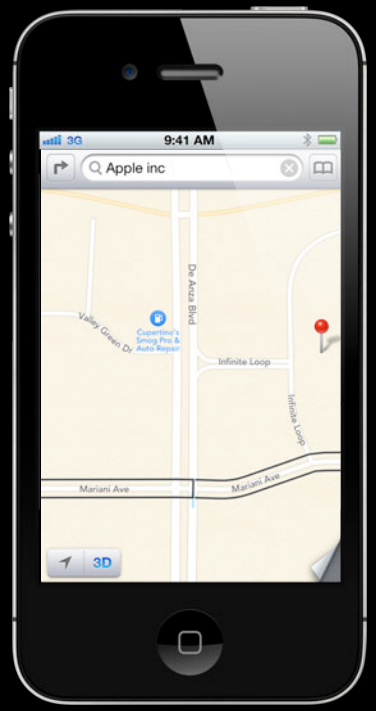
New in iOS 6

Made for iPhone hearing aids

- High quality wireless audio
- Low power consumption
- Adjust hearing aid directly from iPhone
- Partnering with top hearing aid manufacturers

New in iOS 6

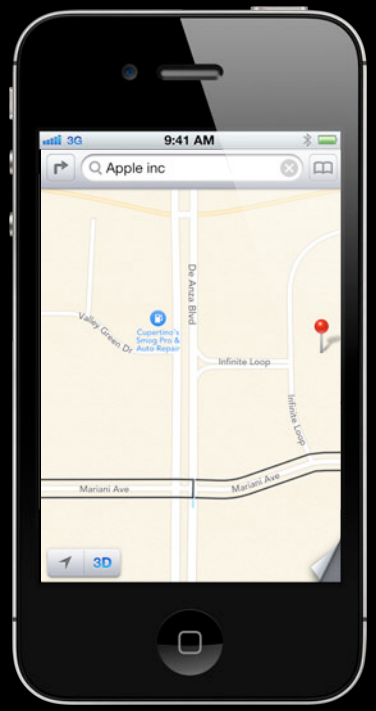
VoiceOver and Maps



New in iOS 6

VoiceOver and Maps

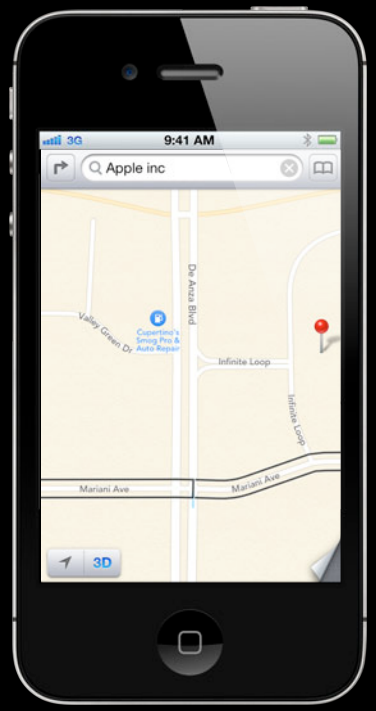
- Discover roads and points of interest



New in iOS 6

VoiceOver and Maps

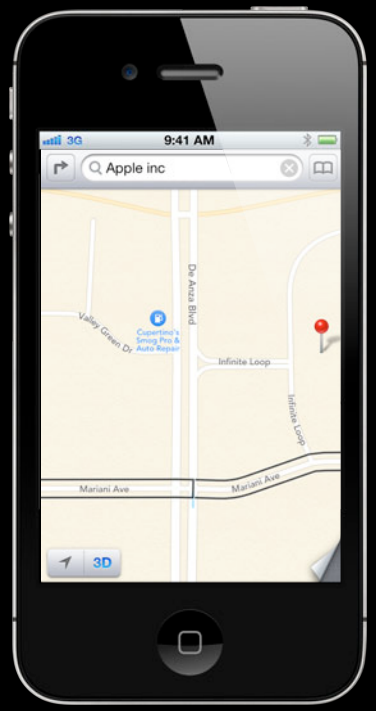
- Discover roads and points of interest
- Determine intersections



New in iOS 6

VoiceOver and Maps

- Discover roads and points of interest
- Determine intersections
- Integration with turn-by-turn directions



New in iOS 6

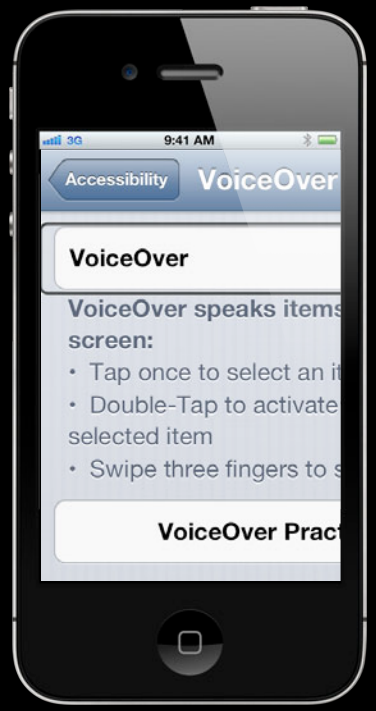
Enhancements

- Custom vibrations for all notifications

New in iOS 6

Enhancements

- Custom vibrations for all notifications
- VoiceOver and Zoom



New in iOS 6

Enhancements

- Custom vibrations for all notifications
- VoiceOver and Zoom
- Speak Selection improvements

Demo

Speak Selection

What You'll Learn

App accessibility

- UIAccessibility API
  - Basic
  - New
- In-depth UIAccessibility
  - Make anything accessible
  - Things you might not know

UIAccessibility

VoiceOver

UIAccessibility
UIKit

UIAccessibility

VoiceOver

What's the element at a point?

UIAccessibility

UIKit

UIAccessibility

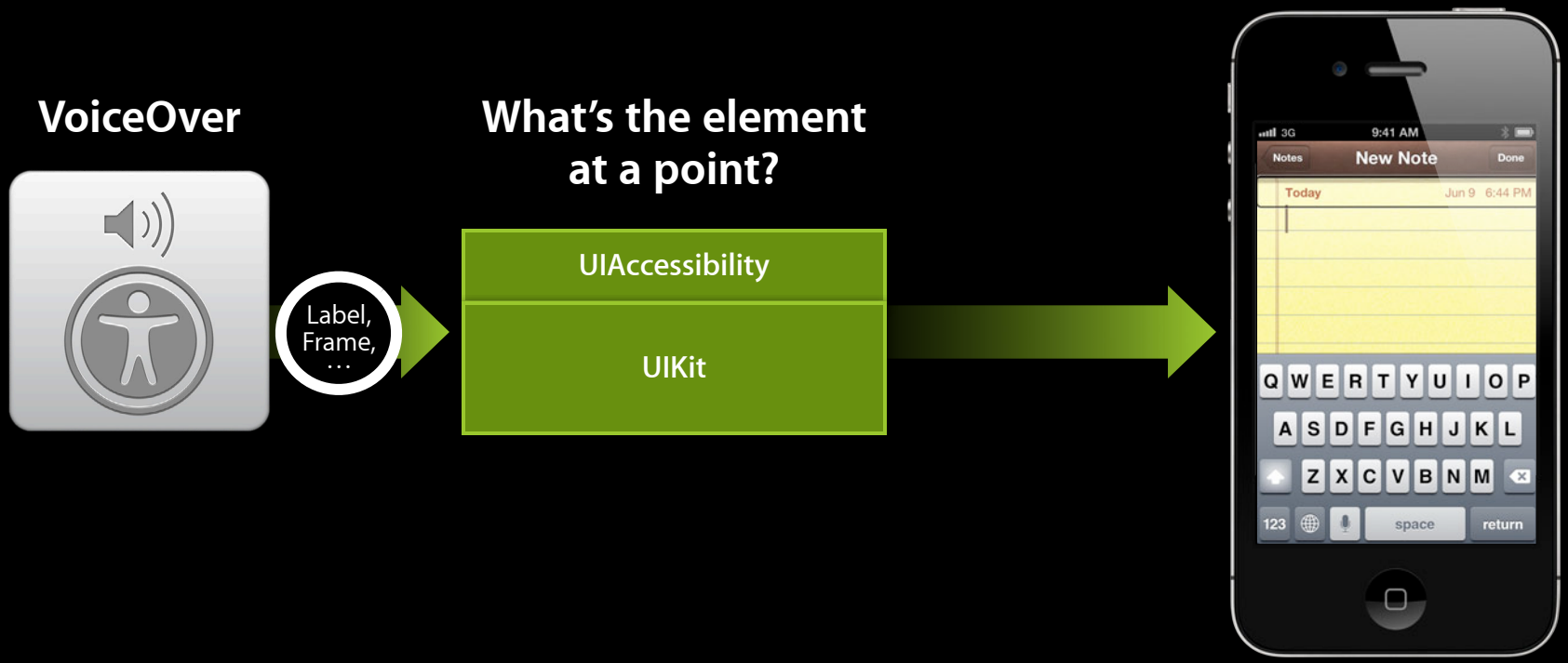
VoiceOver

What's the element at a point?

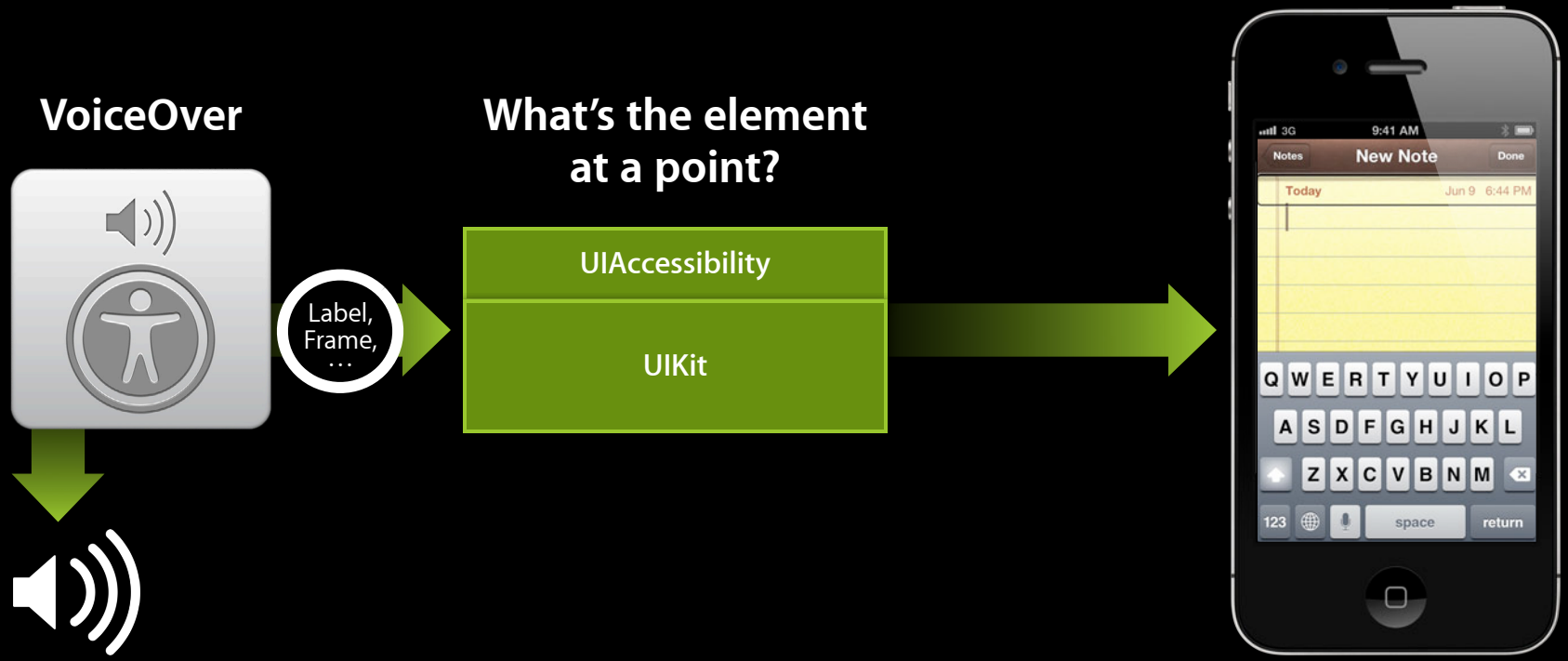
UIAccessibility

UIKit

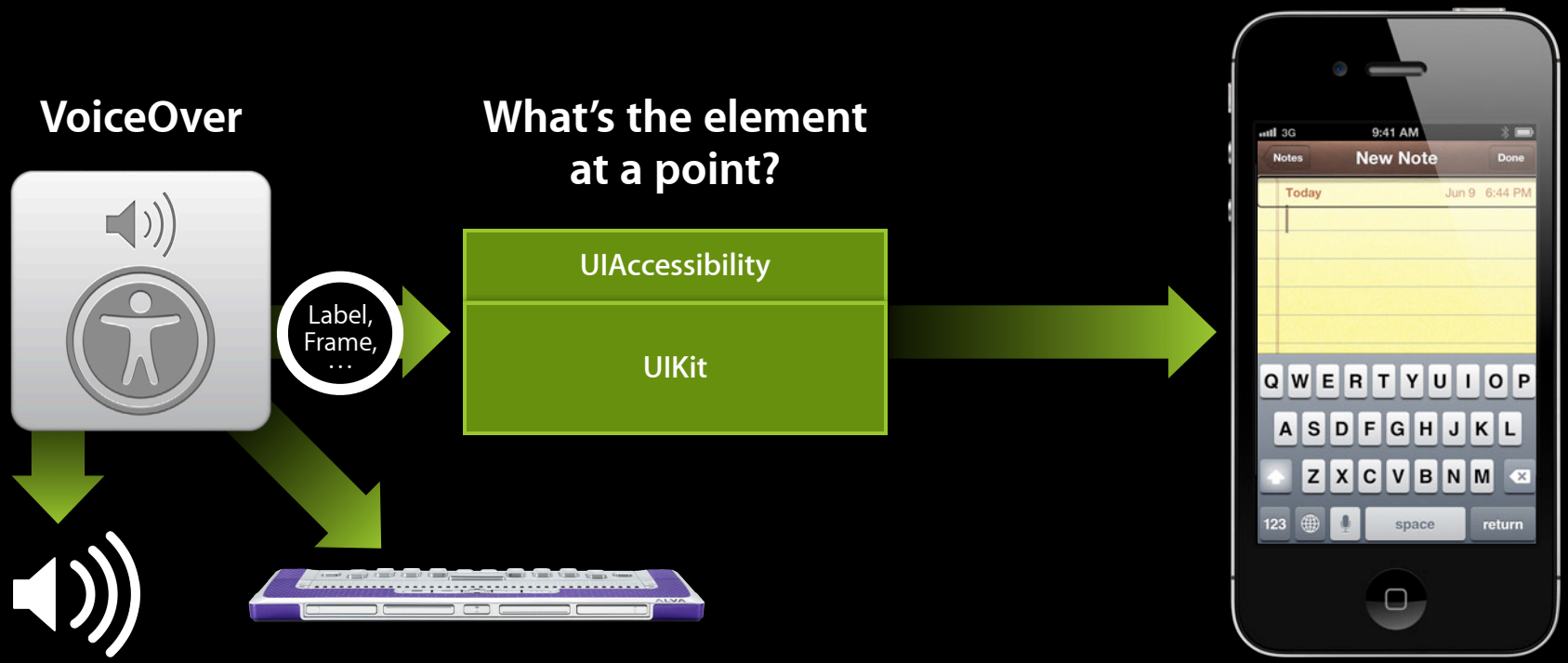
UIAccessibility



UIAccessibility



UIAccessibility



Adding Accessibility to Your App

- Simple
- A lot comes for free
- “Just add labels”

UIAccessibility API: Attributes

- Attributes convey information
- VoiceOver transforms that information

```
UIImageView *view = [[UIImageView alloc] initWithImage:image];
```

"apple_logo512x512, image"

UIAccessibility API: Attributes

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UIImageView *view = [[UIImageView alloc] initWithImage:image];
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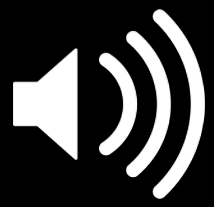


UIAccessibility API: Attributes

- Attributes convey information
- VoiceOver transforms that information

```
UIImageView *view = [[UIImageView alloc] initWithImage:image];
view.accessibilityLabel = @"Apple Logo";
```

"Apple logo, image"

UIAccessibility API: Attributes

- Attributes convey information
- VoiceOver transforms that information

```
UIImageView *view = [[UIImageView alloc] initWithImage:image];
view.accessibilityLabel = @"Apple Logo";
```

"Apple logo, image"

Common Accessibility Attributes


```
#import <UIKit/UIAccessibility.h>
```

```
@property BOOL isAccessibilityElement
```

- Return YES to make VoiceOver see this element
- Default is YES for UIKit controls

```
@property(copy) NSString *accessibilityLabel
```

- A textual representation of the element

Common Accessibility Attributes


```
@property(copy) NSString *accessibilityHint
```

- Optional
- Provides more information to aid VoiceOver users

```
@property UIAccessibilityTraits accessibilityTraits
```

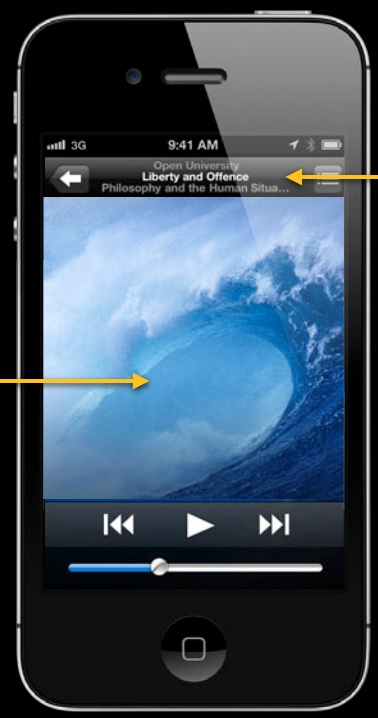
- Defines behavior
- Bitmask of integers

Accessibility Traits

Accessibility Traits

Static Text

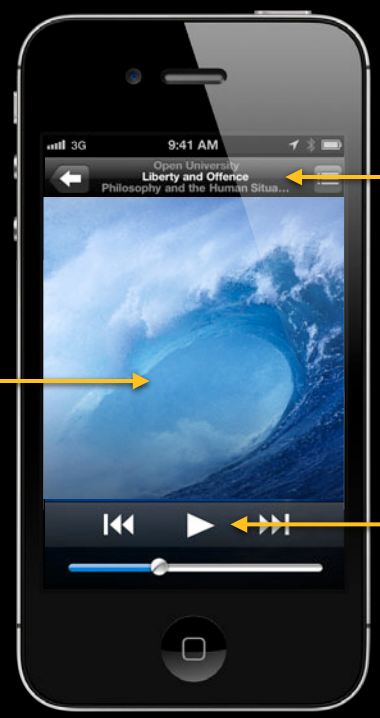
Accessibility Traits



Static Text

Image

Accessibility Traits

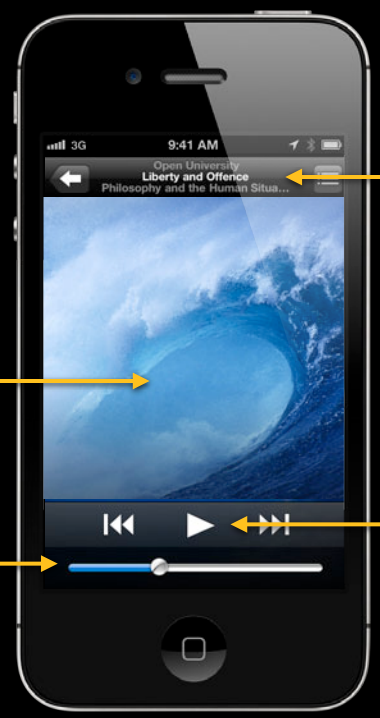


Static Text

Image

Button

Accessibility Traits



Static Text

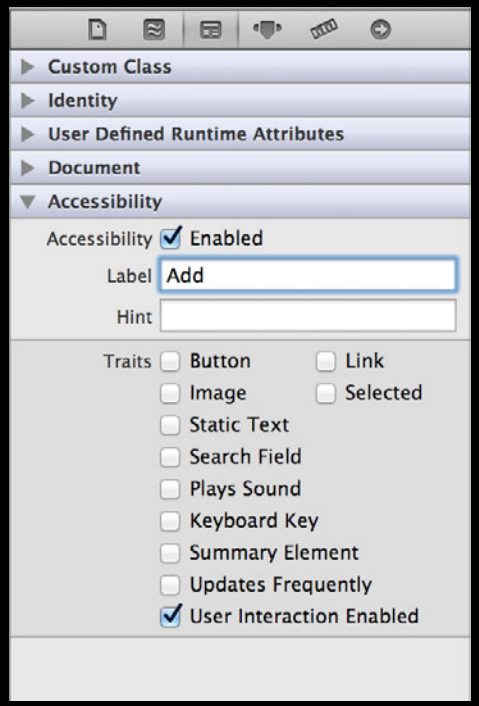
Image

Button

Adjustable

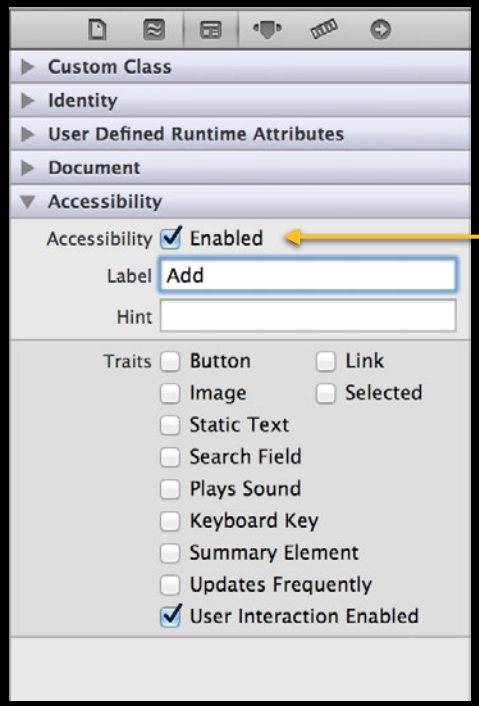
Accessibility in Interface Builder

Change static accessibility values



Accessibility in Interface Builder

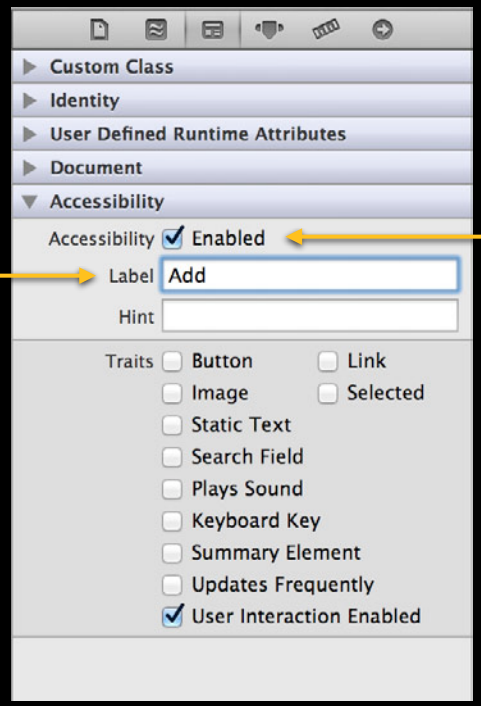
Change static accessibility values



isAccessibilityElement

Accessibility in Interface Builder

Change static accessibility values



accessibilityLabel

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Accessibility in Interface Builder

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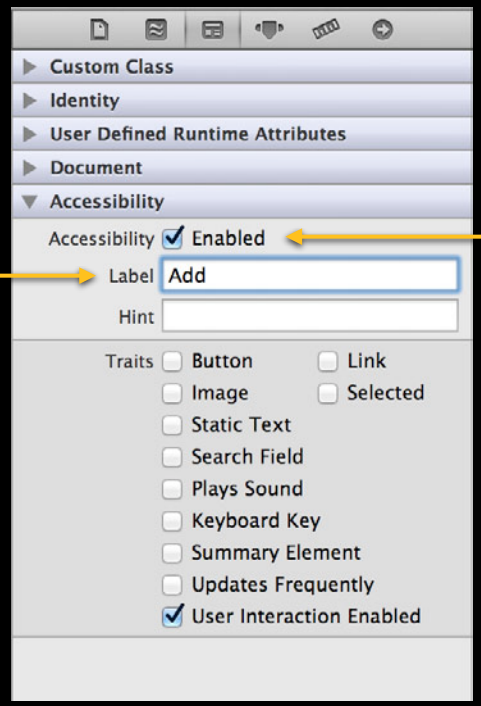

accessibilityLabel

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accessibilityHint

Accessibility in Interface Builder

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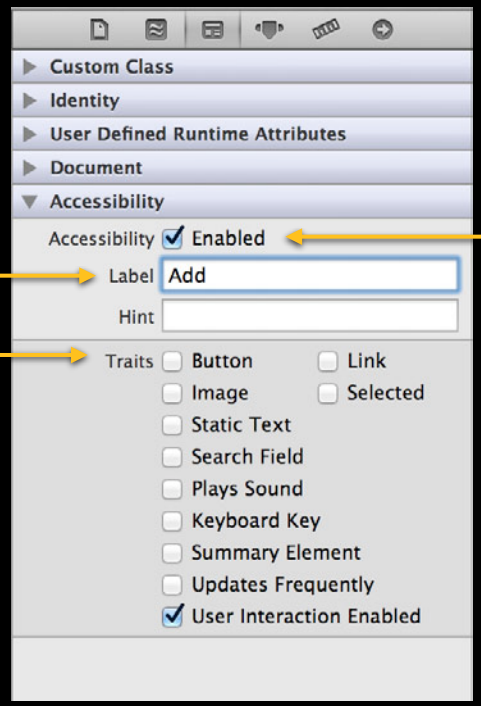

accessibilityLabel

accessibilityTraits

isAccessibilityElement

accessibilityHint

Adding Accessibility in Code

If accessibility values do not change, use setters

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If accessibility values do not change, use setters

```
- (void)awakeFromNib {

   MyControl *control = [[MyControl alloc] initWithFrame:frame];


   control.isAccessibilityElement = YES;
   control.accessibilityLabel = @"Play";


   [window addSubview:control];
}
```

Adding Accessibility in Code

If accessibility attributes change, override methods

Adding Accessibility in Code

If accessibility attributes change, override methods

```
@implementation ProductView



@end
```

Adding Accessibility in Code

If accessibility attributes change, override methods

```
@implementation ProductView

- (BOOL)isAccessibilityElement {
    return YES;
}

@end
```

Adding Accessibility in Code

If accessibility attributes change, override methods

```
@implementation ProductView

- (BOOL)isAccessibilityElement {
    return YES;
}

- (NSString *)accessibilityLabel {
    if (isMac())
       return @"Mac";
    else if (iPhone())
       return @"iPhone";
    ...
}
@end
```

Accessibility Notifications

Tell VoiceOver something happened

Accessibility Notifications

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- When a few items change, VoiceOver should “update”

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- When a few items change, VoiceOver should "update"

```
UIAccessibilityPostNotification(
    UIAccessibilityLayoutChangedNotification,
    nil);
```

Accessibility Notifications

Tell VoiceOver something happened

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Accessibility Notifications

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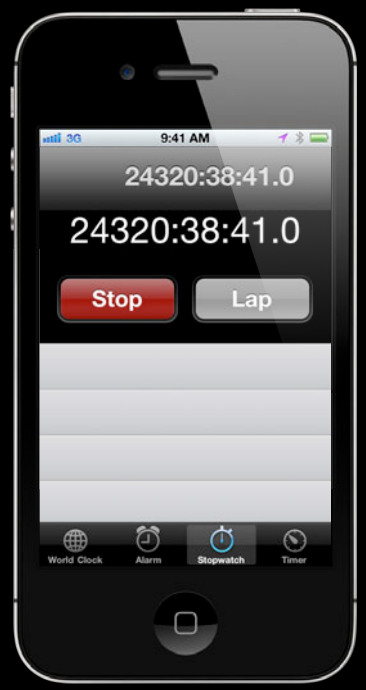


Accessibility Notifications

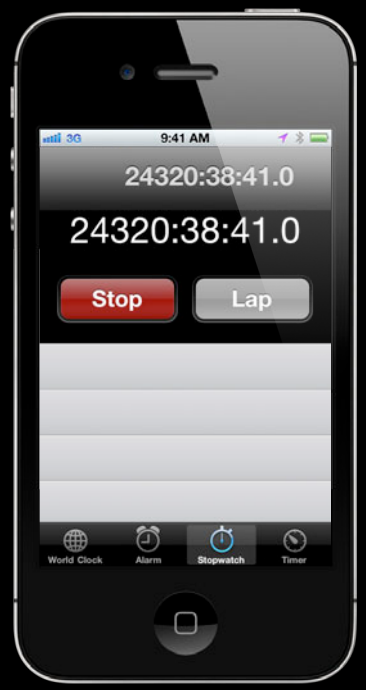
Tell VoiceOver something happened

- When a few items change, VoiceOver should "update"

```
UIAccessibilityPostNotification(
    UIAccessibilityLayoutChangedNotification,
    nil);
```

- When the screen changes, VoiceOver should "reset"

```
UIAccessibilityPostNotification(
    UIAccessibilityScreenChangedNotification,
    nil);
```



Demo

Introduction to VoiceOver and UIAccessibility

New API in iOS 6

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- Apps can become very accessible with basic attributes

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- But, we want more!

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- New API in iOS 6 allows
  - New ways to interact with VoiceOver

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  - New attributes and traits

New API in iOS 6

- Apps can become very accessible with basic attributes
- But, we want more!
- New API in iOS 6 allows
  - New ways to interact with VoiceOver
  - New attributes and traits
  - Custom text views based on UITextInput

New VoiceOver API


```
- (BOOL)accessibilityPerformMagicTap
```

- Control what happens when user does two-finger double-tap

New VoiceOver API


```
- (BOOL)accessibilityPerformMagicTap
```

- Control what happens when user does two-finger double-tap

New VoiceOver API

- Move VoiceOver focus
  - Use the element as the argument when posting
    UIAccessibilityLayoutChangedNotification or
    UIAccesibilityScreenChangeNotification

New VoiceOver API

- Move VoiceOver focus
  - Use the element as the argument when posting UIAccessibilityLayoutChangedNotification or UIAccesibilityScreenChangeNotification

```
UIButton *moveToButton = ...

UIAccessibilityPostNotification(
    UIAccessibilityScreenChangedNotification,
    moveToButton);
```

New VoiceOver API

Callbacks from UIAccessibilityAnnouncement

- Be notified when an announcement finishes
- Listen on the NSNotificationCenter for
  - `UIAccessibilityAnnouncementDidFinishNotification`
- Then look at the userInfo to gather
  - `UIAccessibilityAnnouncementKeyStringValue`
  - `UIAccessibilityAnnouncementKeyWasSuccessful`

New Accessibility API


```
@property BOOL shouldGroupAccessibilityChildren
```

- Group items together to control the order VoiceOver visits elements

New Accessibility API


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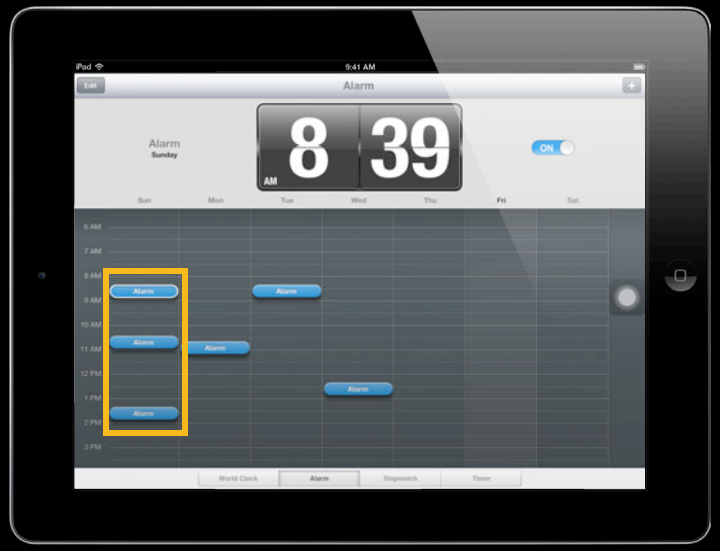


New Accessibility API

`UIAccessibilityTraits UIAccessibilityTraitHeader`

- New trait in order to mark elements as a header

New Accessibility API

`UIAccessibilityTraits UIAccessibilityTraitHeader`

- New trait in order to mark elements as a header

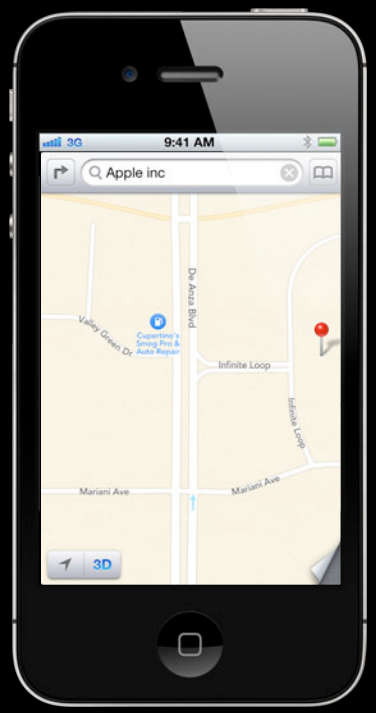
Demo

Using new API

Into the Deep End

What do you do if there is no view?

- If drawing happens with a UIView
  - drawAtPoint:
  - drawRect:
  - OpenGL



Into the Deep End

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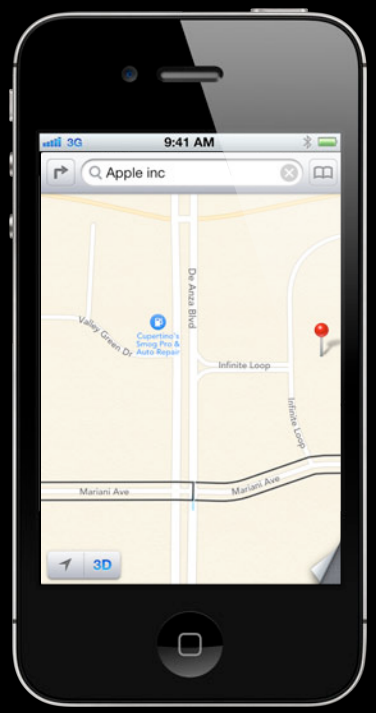
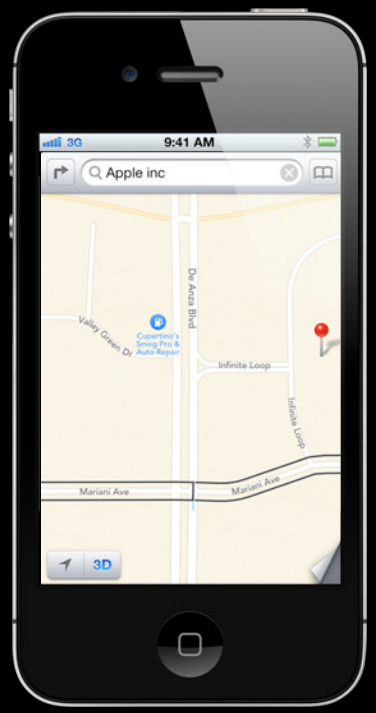


Into the Deep End

What do you do if there is no view?

- If drawing happens with a UIView
  - drawAtPoint:
  - drawRect:
  - OpenGL

- Make an array of UIAccessibilityElement's
- One for each distinct user interface object



Into the Deep End

What do you do if there is no view?

Into the Deep End

What do you do if there is no view?

```
- (NSArray *)roads {
   if (roads != nil) {
      return roads;
   }

   roads = [[NSMutableArray alloc] init];





   return roads;
}
```

Into the Deep End

What do you do if there is no view?

```
- (NSArray *)roads {
   if (roads != nil) {
      return roads;
   }

   roads = [[NSMutableArray alloc] init];

   UIAccessibilityElement *road =
     [[UIAccessibilityElement alloc] initWithAccessibilityContainer:self];



   return roads;
}
```

Into the Deep End

What do you do if there is no view?

```
- (NSArray *)roads {
   if (roads != nil) {
      return roads;
   }

   roads = [[NSMutableArray alloc] init];

   UIAccessibilityElement *road =
     [[UIAccessibilityElement alloc] initWithAccessibilityContainer:self];

   road.accessibilityLabel = @"Infinite Loop";


   return roads;
}
```

Into the Deep End

What do you do if there is no view?

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- (NSArray *)roads {
   if (roads != nil) {
      return roads;
   }

   roads = [[NSMutableArray alloc] init];

   UIAccessibilityElement *road =
     [[UIAccessibilityElement alloc] initWithAccessibilityContainer:self];

   road.accessibilityLabel = @"Infinite Loop";
   [roads addObject:road];

   return roads;
}
```

Into the Deep End

What do you do if there is no view?

Into the Deep End

What do you do if there is no view?

- Implement UIAccessibilityContainer protocol

Into the Deep End

What do you do if there is no view?

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```
- (NSInteger)accessibilityElementCount {
    return self.roads.count;
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Into the Deep End

What do you do if there is no view?

- Implement UIAccessibilityContainer protocol

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- (NSInteger)accessibilityElementCount {
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- (NSInteger)indexOfAccessibilityElement:(id)element {
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```

Into the Deep End

What do you do if there is no view?

- Implement UIAccessibilityContainer protocol

```
- (NSInteger)accessibilityElementCount {
    return self.roads.count;
}

- (NSInteger)indexOfAccessibilityElement:(id)element {
    return [self.roads indexOfObject:element];
}

- (id)accessibilityElementAtIndex:(NSInteger)index {
    return [self.roads objectAtIndex:index];
}
```

Into the Deep End

Get the right frame

- By default, UIAccessibilityElement's do not have a "frame"
- You must set the frame in "screen" coordinates

Into the Deep End

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```
UIAccessibilityElement *road =
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```

Into the Deep End

Get the right frame

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- You must set the frame in "screen" coordinates

```
UIAccessibilityElement *road =
  [[UIAccessibilityElement alloc] initWithAccessibilityContainer:self];

// Get the frame in "view" coordinates.
CGRect viewFrame = CGRectMake(0, 100, 50, 100);
```

Into the Deep End

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// Convert frame to "screen" coordinates.
viewFrame = [[self window] convertRect:viewFrame toWindow:nil];

road.accessibilityFrame = viewFrame;
```

Into the Deep End

Using announcements

- Announcements allow for immediate feedback
- Example: Moving things

Into the Deep End

Using announcements

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Into the Deep End

Using announcements

- Announcements allow for immediate feedback
- Example: Moving things

Into the Deep End

Using announcements

```
#define Post UIAccessibilityPostNotification

- (void)continueTracking:(id)touch {



}
```

Into the Deep End

Using announcements

```
#define Post UIAccessibilityPostNotification

- (void)continueTracking:(id)touch {

if (isNearEdge(touch))
   Post(UIAccessibilityAnnouncementNotification,
     @"Nearing %@ border", borderLabel(touch));

}
```

Into the Deep End

Using announcements

```
#define Post UIAccessibilityPostNotification

- (void)continueTracking:(id)touch {

if (isNearEdge(touch))
   Post(UIAccessibilityAnnouncementNotification,
     @"Nearing %@ border", borderLabel(touch));

if (isOnEmptySpace(touch))
   Post(UIAccessibilityAnnouncementNotification,
     @"On empty space. Lift finger to cancel");



}
```

Into the Deep End

Using announcements

```
#define Post UIAccessibilityPostNotification

- (void)continueTracking:(id)touch {

if (isNearEdge(touch))
   Post(UIAccessibilityAnnouncementNotification,
     @"Nearing %@ border", borderLabel(touch));

if (isOnEmptySpace(touch))
   Post(UIAccessibilityAnnouncementNotification,
     @"On empty space. Lift finger to cancel");

if (isOnDifferentIcon(touch))
   Post(UIAccessibilityAnnouncementNotification,
     @"On top of Artists. Lift finger to replace");

}
```

Into the Deep End

Using direct interaction

- Example
  - Musical instruments

Into the Deep End

Using direct interaction

- Example
  - Musical instruments
  - Explore elements within direct touch area

Into the Deep End

Using direct interaction

Into the Deep End

Using direct interaction

```
@implementation PianoView

- (id)initWithFrame:(CGRect)frame {
    ...



    ....
}

- (UIAccessibilityTraits)accessibilityTraits {
    return UIAccessibilityTraitAllowsDirectInteraction;
}

- (BOOL)isAccessibilityElement {
    return YES;
}
```

Into the Deep End

Using direct interaction

```
@implementation PianoView

- (id)initWithFrame:(CGRect)frame {
    ...
    KeyView *aKey = [KeyView new];
    aKey.isAccessibilityElement = YES;
    aKey.accessibilityLabel = @"A";
    ....
}

- (UIAccessibilityTraits)accessibilityTraits {
    return UIAccessibilityTraitAllowsDirectInteraction;
}

- (BOOL)isAccessibilityElement {
    return YES;
}
```

Demo

Into the deep end

Things You Might Not Know

Language selection

Things You Might Not Know

Language selection

- Control the language used for the entire App

Things You Might Not Know

Language selection

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```
[[UIApplication sharedApplication] setAccessibilityLanguage:@"fr-FR"]
```

Things You Might Not Know

Language selection

- Control the language used for the entire App

```
[[UIApplication sharedApplication] setAccessibilityLanguage:@"fr-FR"]
```

- Control the language for a range within a string

Things You Might Not Know

Language selection

- Control the language used for the entire App

```
[[UIApplication sharedApplication] setAccessibilityLanguage:@"fr-FR"]
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- Control the language for a range within a string

```
NSAttributedString *attr =
[[NSAttributedString alloc] initWithString:@"こんにちは, My Friends"];
```

Things You Might Not Know

Language selection

- Control the language used for the entire App

```
[[UIApplication sharedApplication] setAccessibilityLanguage:@"fr-FR"]
```

- Control the language for a range within a string

```
NSAttributedString *attr =
[[NSAttributedString alloc] initWithString:@"こんにちは, My Friends"];

[attr addAttribute:@"accessibilityLanguage" value:@"ja-JP"
     range:NSMakeRange(0, 5)];
```

Things You Might Not Know

Language selection

- Control the language used for the entire App

```
[[UIApplication sharedApplication] setAccessibilityLanguage:@"fr-FR"]
```

- Control the language for a range within a string

```
NSAttributedString *attr =
[[NSAttributedString alloc] initWithString:@"こんにちは, My Friends"];

[attr addAttribute:@"accessibilityLanguage" value:@"ja-JP"
     range:NSMakeRange(0, 5)];

[element setAccessibilityLabel:(id)attr];
```

Things You Might Not Know

Controls without views

- UISegmentedControls

Things You Might Not Know

Controls without views

- UISegmentedControls

Things You Might Not Know

Controls without views

- UISegmentedControls

Things You Might Not Know

Controls without views

- UISegmentedControls

```
NSString *title = @"∫";
title.accessibilityLabel = @"Integral";
```

Things You Might Not Know

Controls without views

- UISegmentedControls

```
NSString *title = @"∫";
title.accessibilityLabel = @"Integral";

UIImage *image = [UIImage imageNamed:@"GearImage.png"];
image.accessibilityLabel = @”Settings”;
```

Things You Might Not Know

Controls without views

- UISegmentedControls

```
NSString *title = @"∫";
title.accessibilityLabel = @"Integral";

UIImage *image = [UIImage imageNamed:@"GearImage.png"];
image.accessibilityLabel = @”Settings”;

[segmentedControl insertedSegmentedWithTitle:title];
[segmentedControl insertedSegmentWithImage:image];
```

Things You Might Not Know

Controls without views

- UITableView index titles

Things You Might Not Know

Controls without views

- UITableView index titles

```
- (NSArray *)sectionIndexTitlesForTableView:(id)tableView {

    NSString *a = @"A";
    NSString *b = @"B";




    return @[a, b];
}
```

Things You Might Not Know

Controls without views

- UITableView index titles

```
- (NSArray *)sectionIndexTitlesForTableView:(id)tableView {

    NSString *a = @"A";
    NSString *b = @"B";

    a.accessibilityLabel = @"Alpha";
    b.accessibilityLabel = @"Beta";

    return @[a, b];
}
```

Summary

Summary

- Add accessibility

Summary

- Add accessibility
- Increases user base

Summary

- Add accessibility
- Increases user base
- Great feedback from users

Summary

- Add accessibility
- Increases user base
- Great feedback from users
- Apple takes accessibility seriously

Summary

- Add accessibility
- Increases user base
- Great feedback from users
- Apple takes accessibility seriously
- You should too

Related Sessions

Keyboard Input in iOS	Russian Hill Wednesday 2:00PM
Improving Accessibility in iBooks	Russian Hill Thursday 9:00AM

Labs

Accessibility and Speech Lab	App Services Lab B Wednesday 11:30AM

More Information

Jake Behrens
User Experience Evangelist
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Documentation
Accessibility Programming Guide for iOS
Search on http://developer.apple.com/ for Accessibility

UIAccessibility Protocol Reference
Search on http://developer.apple.com/ for UIAccessibility

VoiceOver User Manual
http://support.apple.com/manuals/iphone

Apple Developer Forums
http://devforums.apple.com

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