

#WWDC18

# Deliver an Exceptional Accessibility Experience

Session 230

Skylar Peterson, Software Engineer

Bhavya Garg, Software Engineer



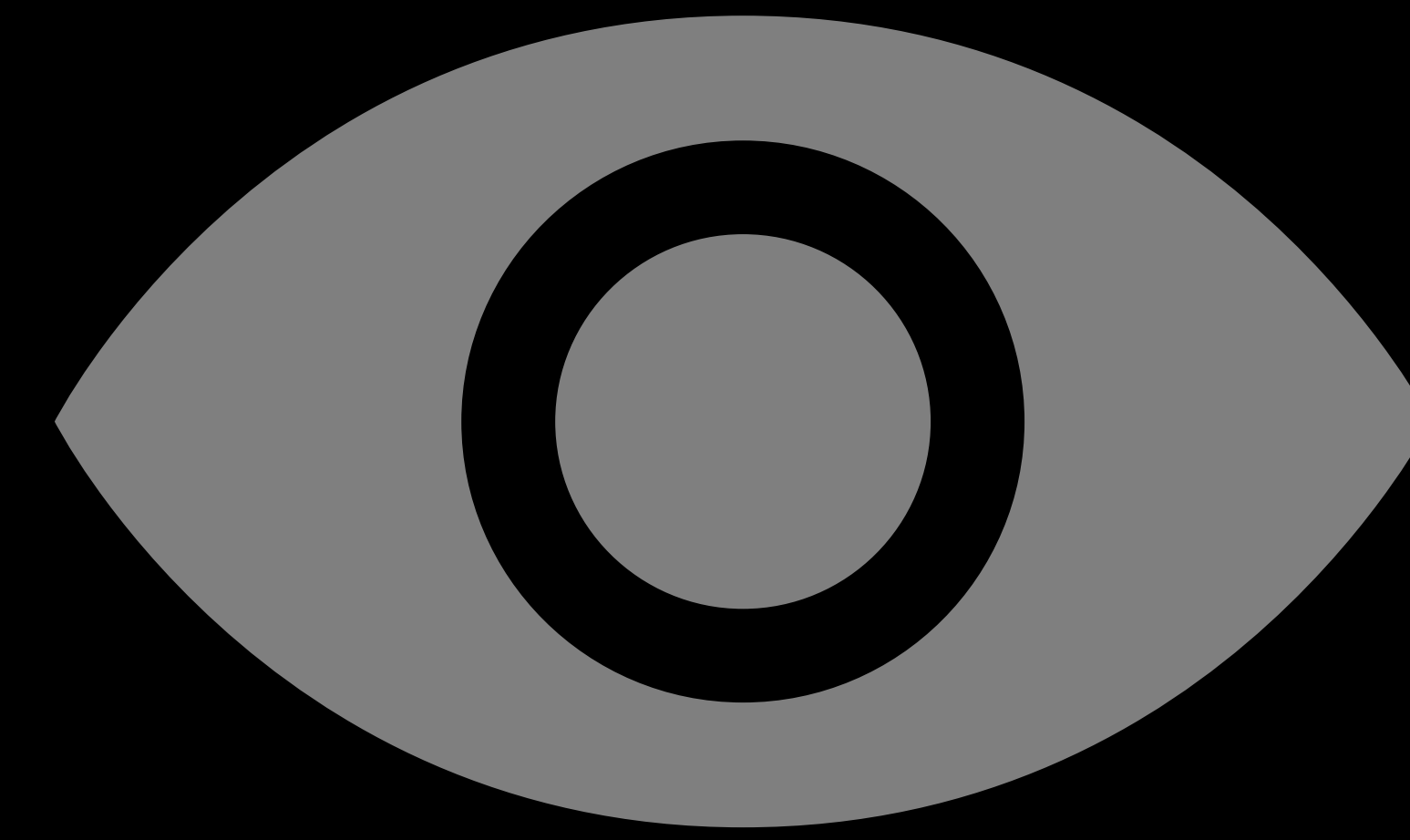
Making technology usable by everyone



Cognitive



Motor



Vision



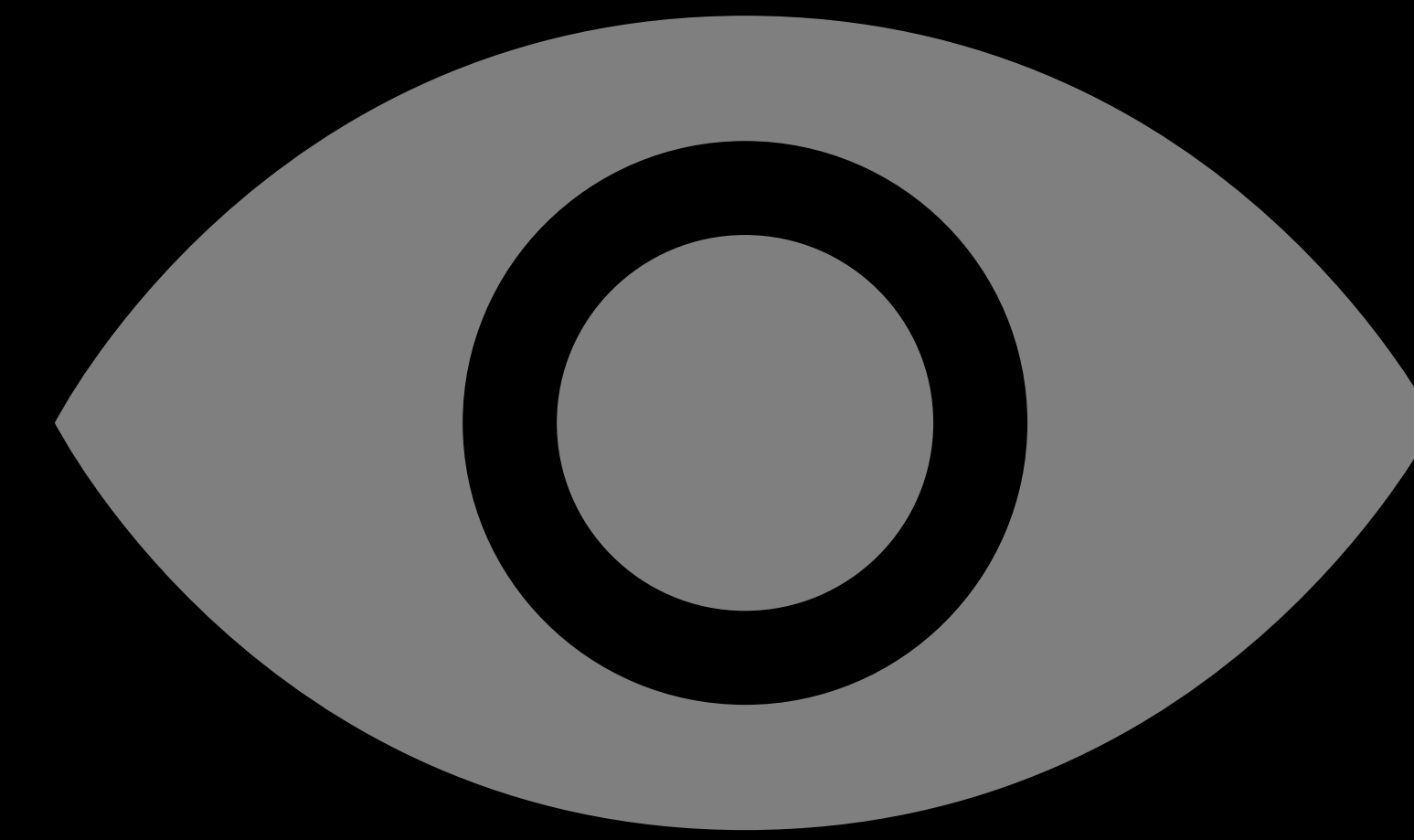
Hearing



Cognitive



Motor



Vision



Hearing

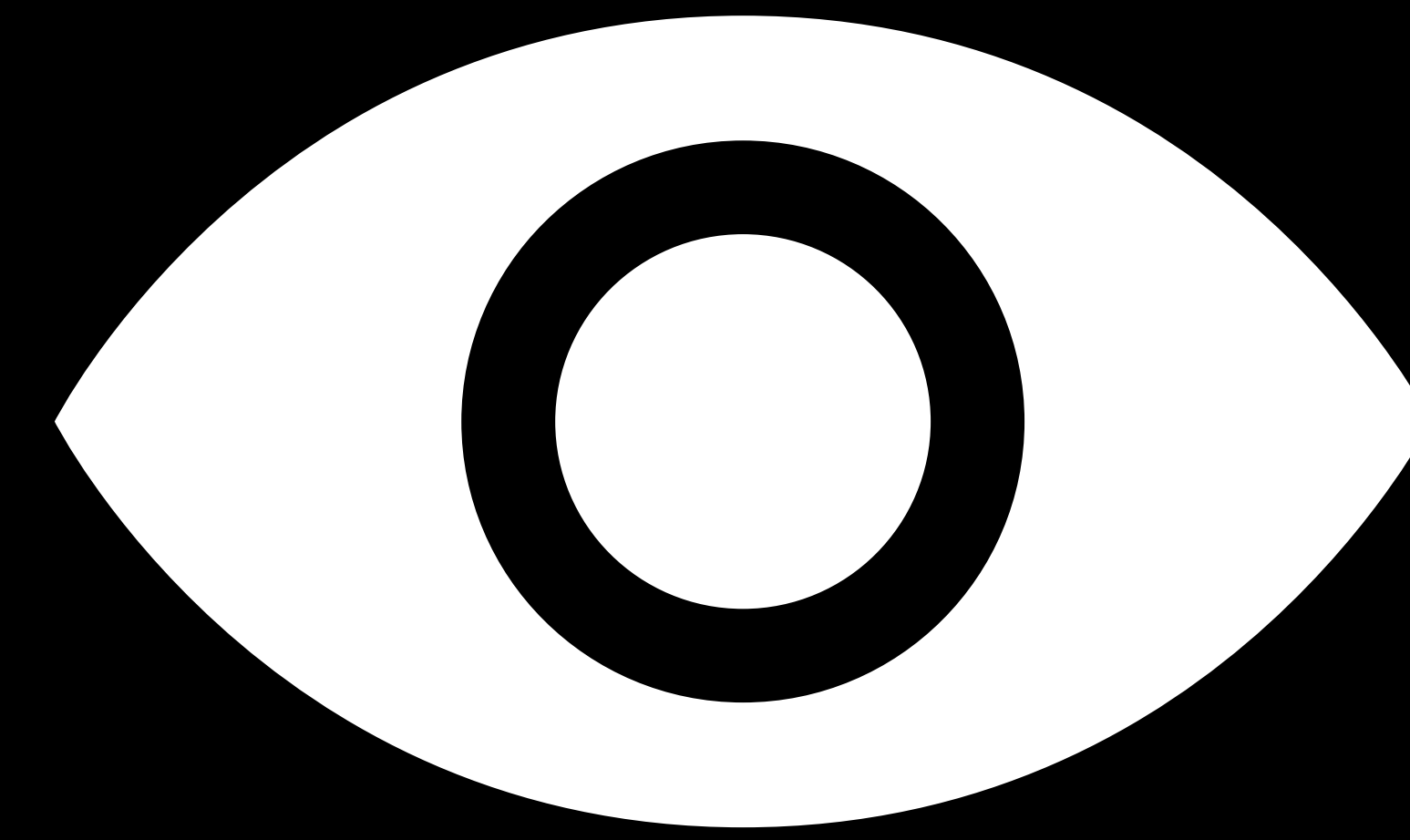




Cognitive



Motor



Vision



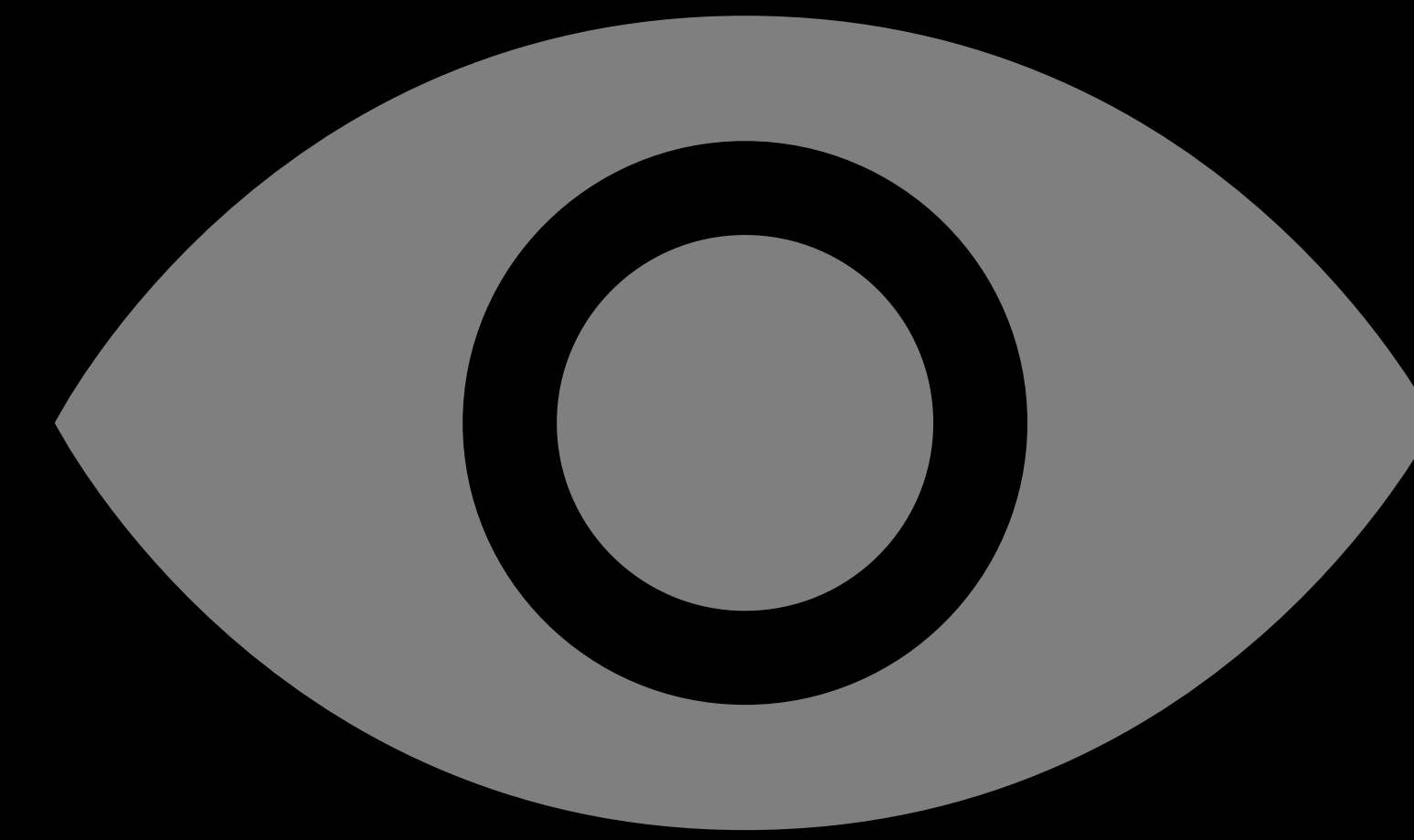
Hearing



Cognitive



Motor



Vision



Hearing



+



# The Basics

Check out existing resources

Still lots to gain from today's session

---

What's New in Accessibility

WWDC 2017

---

Design for Everyone

WWDC 2017

---

Media and Gaming Accessibility

WWDC 2017

---



Making technology usable by everyone

usable

usable

exceptional



Visual Design

Assistive Technology Experience

Visual Design

Assistive Technology Experience

# Visual Design

Transparency and Blurring

Contrast

Sizing

Motion

Complexity

# Utilities



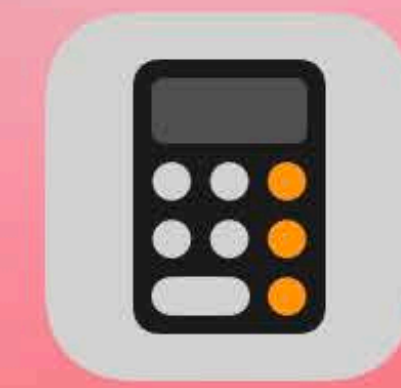
Voice Memos



Compass



Measure



Calculator





9:41



Search  Cancel

SIRI SUGGESTIONS

Show More



Weather



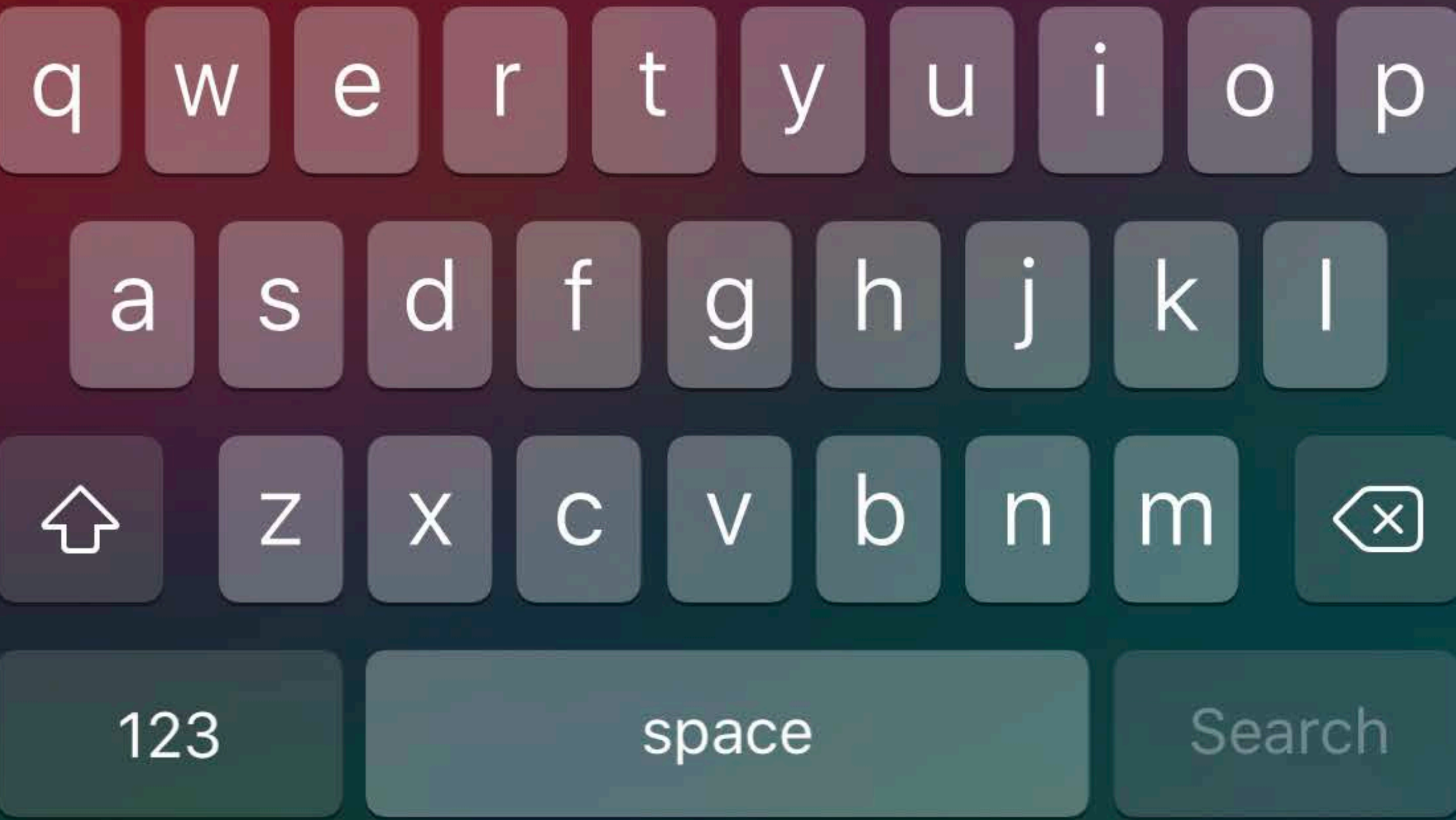
Messages



Calendar



Clock







Battery 

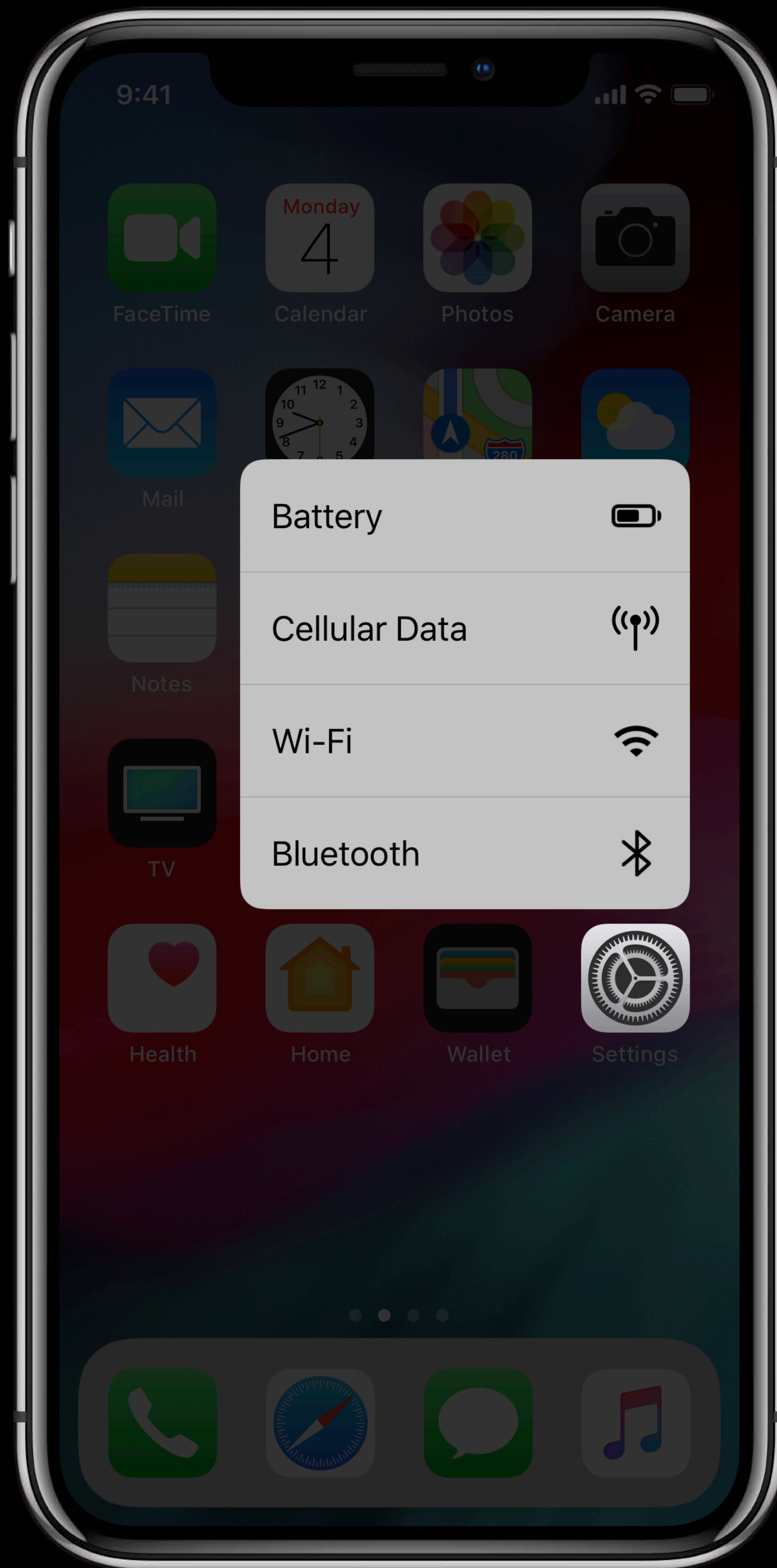
Cellular Data 

Wi-Fi 

Bluetooth 







9:41



FaceTime



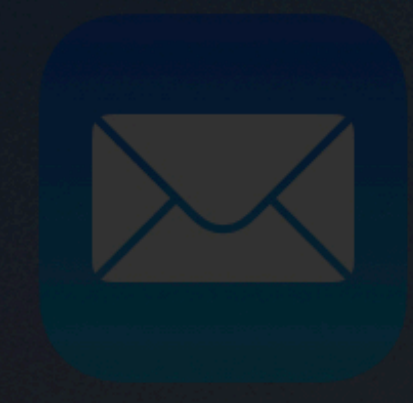
Calendar



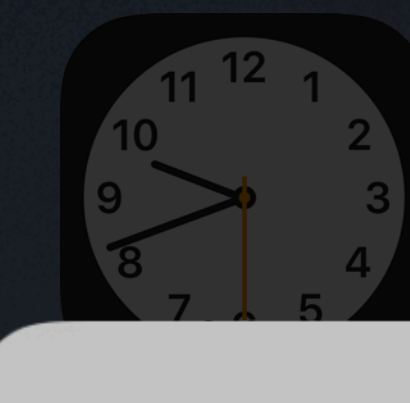
Photos



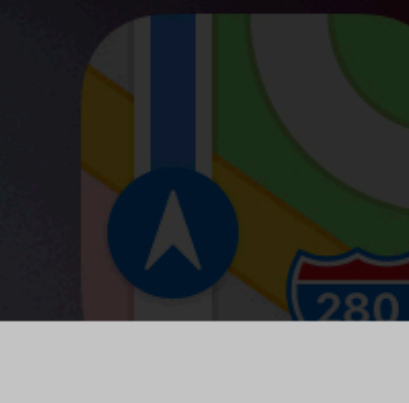
Camera



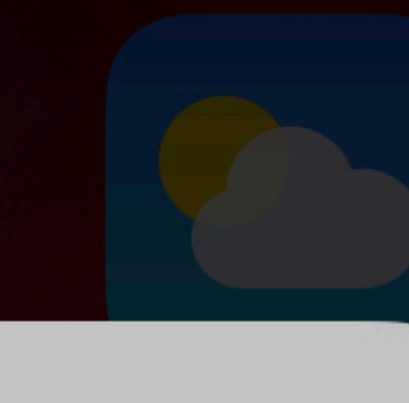
Mail



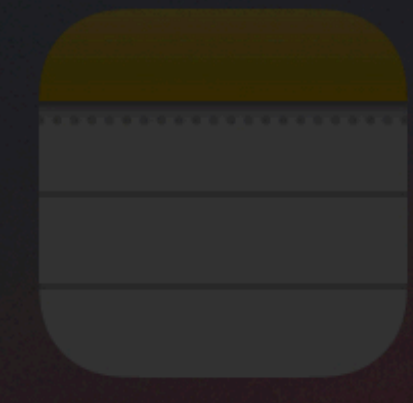
Clock



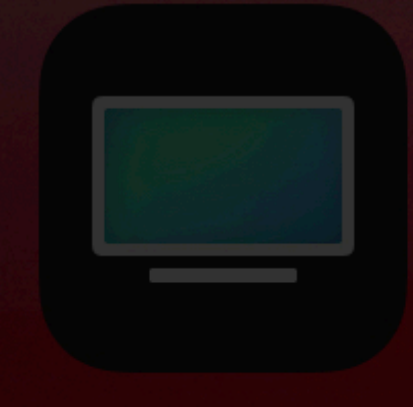
Maps



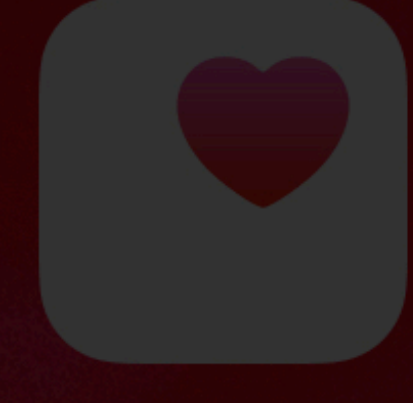
Weather



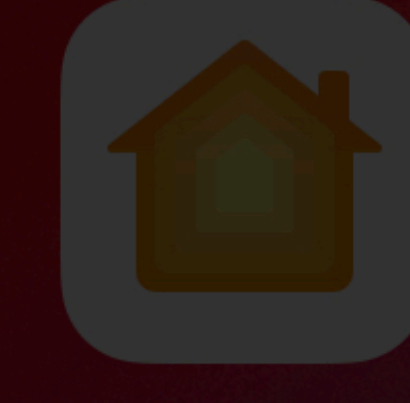
Notes



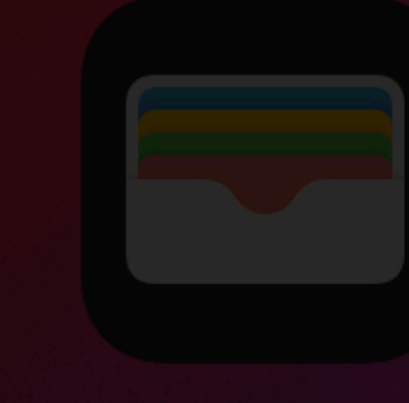
TV



Health




Home





Wallet




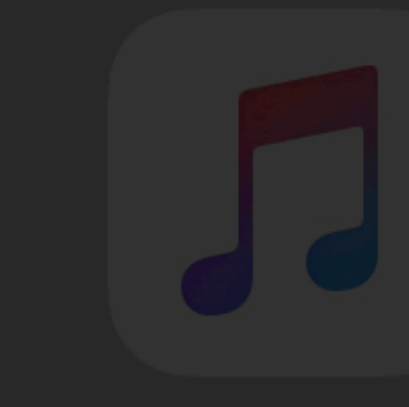
Settings

Battery 

Cellular Data 

Wi-Fi 

Bluetooth 





# Utilities



Voice Memos



Compass



Measure



Calculator



9:41



# Utilities



Voice Memos



Compass

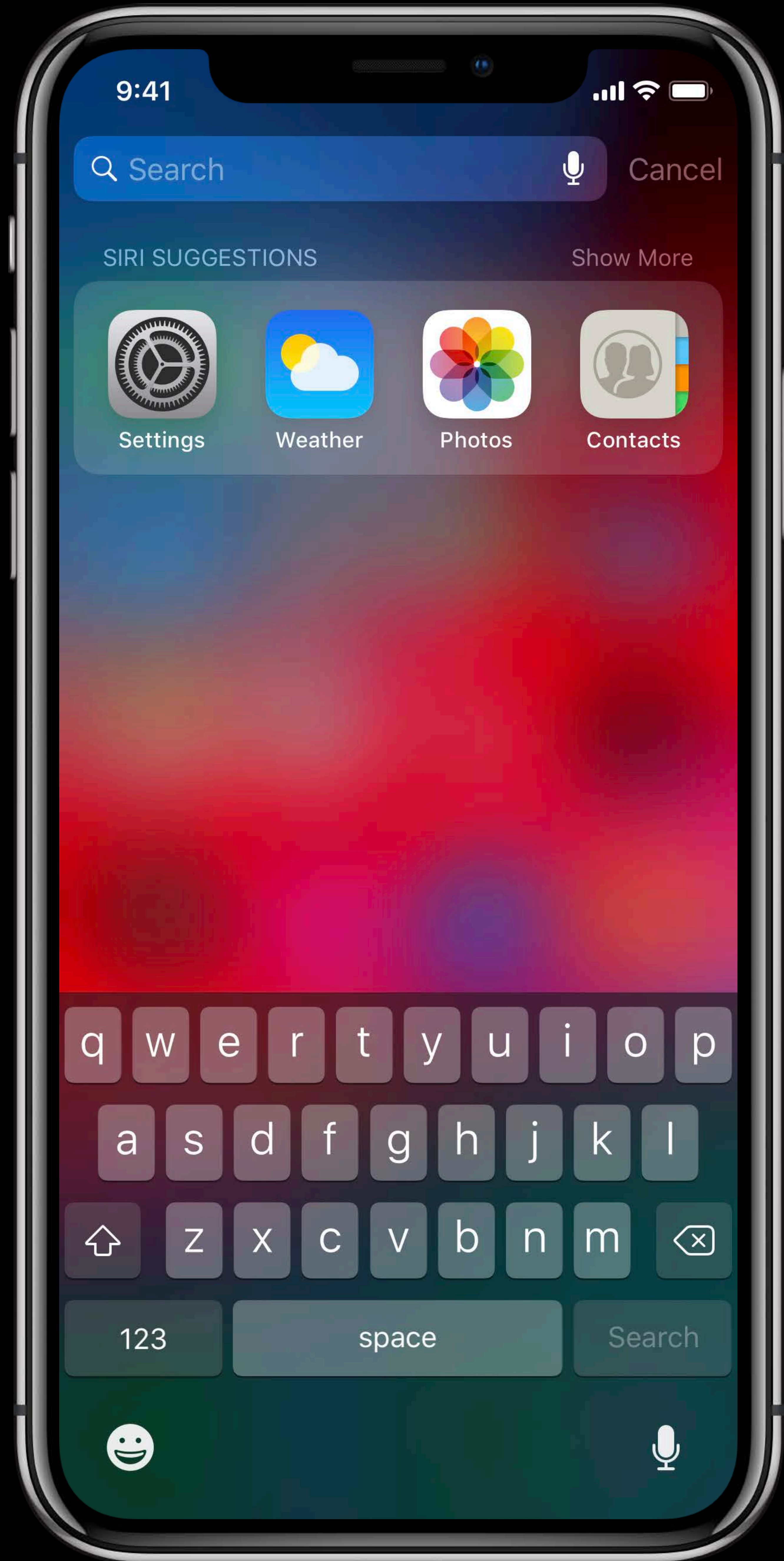


Measure

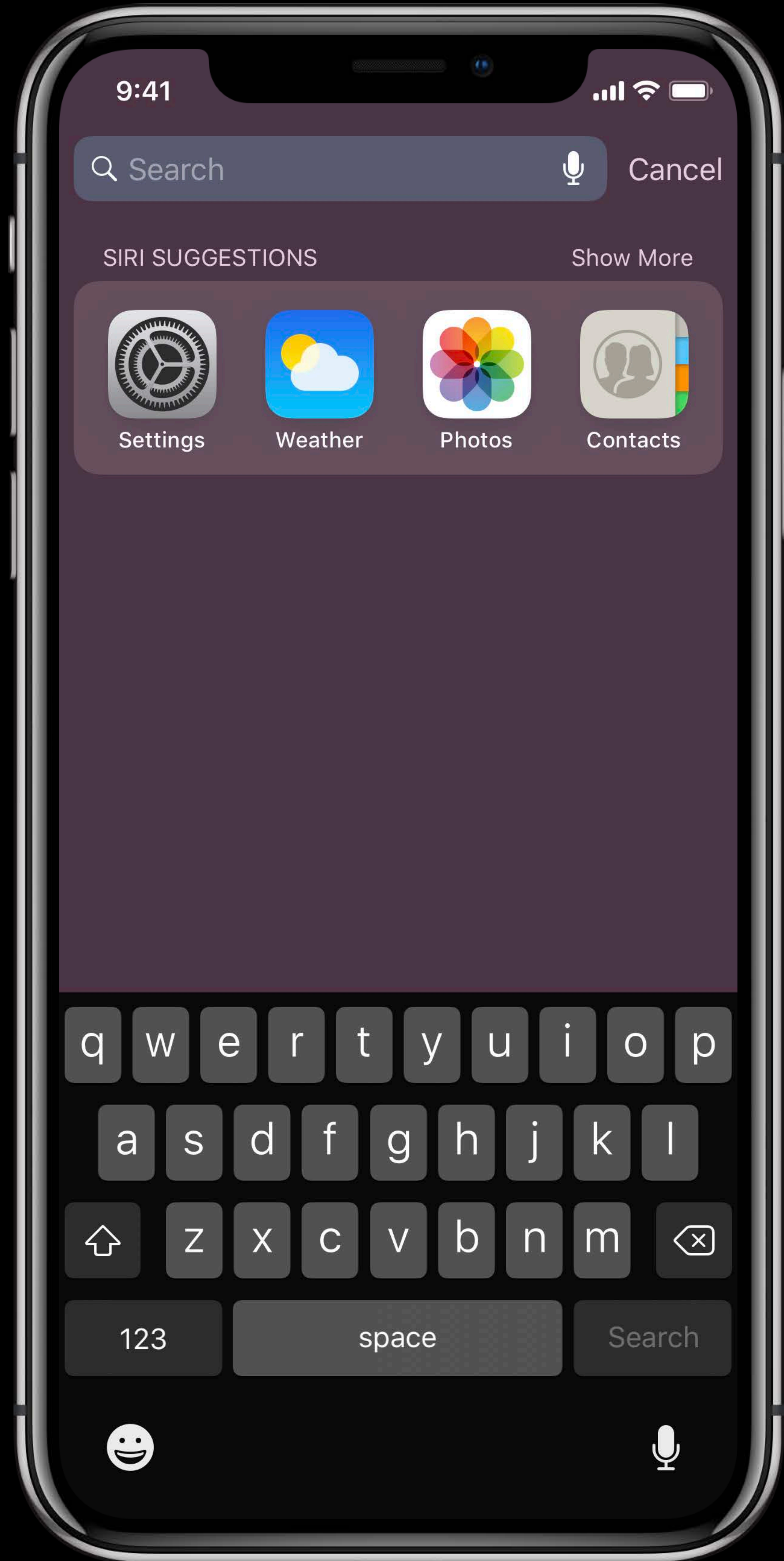


Calculator









9:41



Search Cancel

SIRI SUGGESTIONS Show More



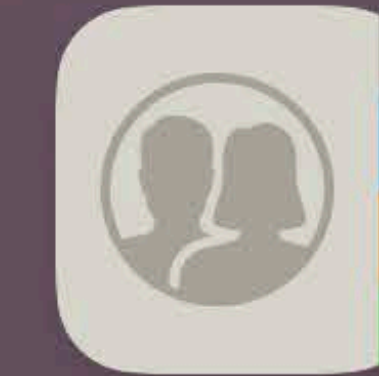
Settings



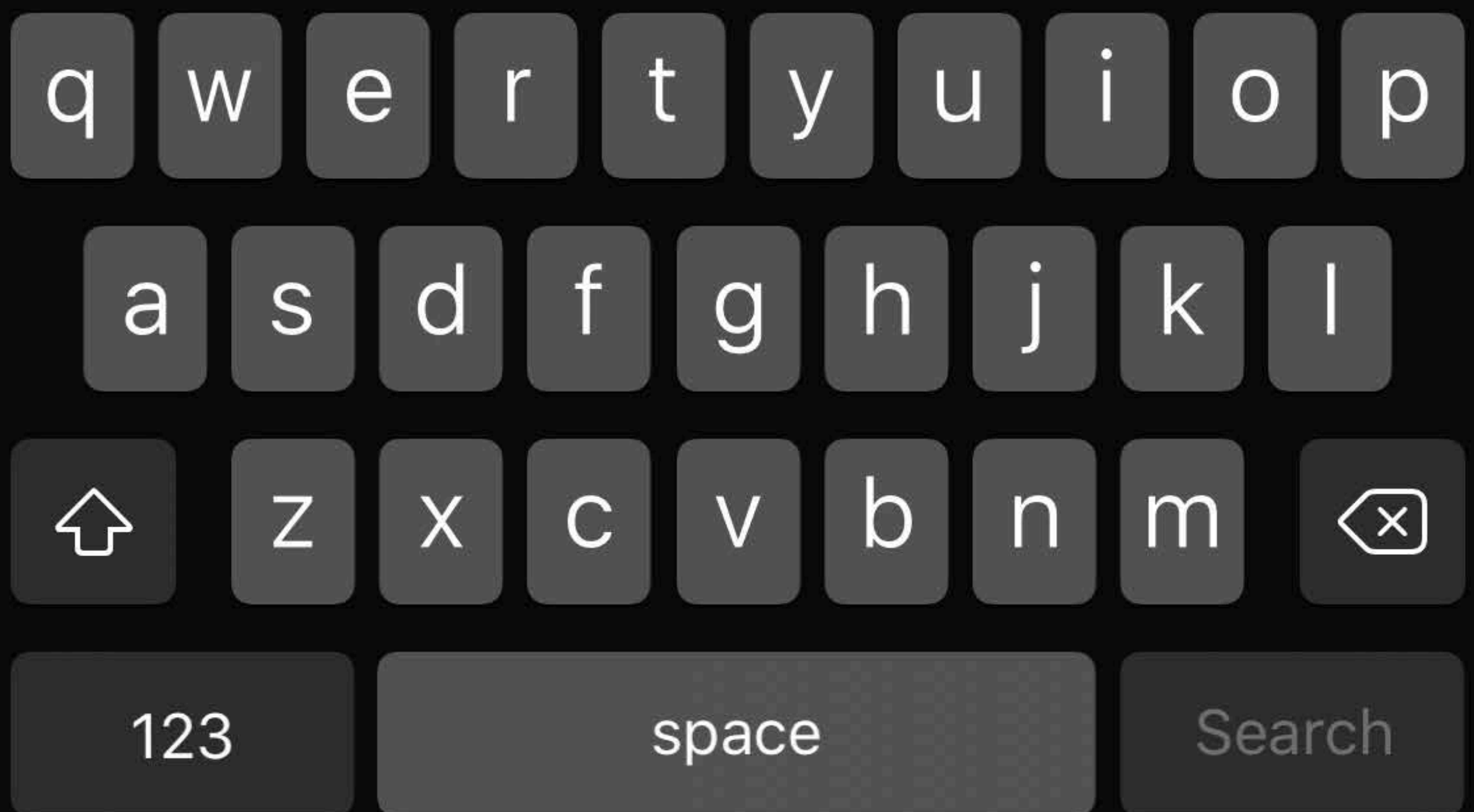
Weather



Photos



Contacts



```
// Transparency and Blurring

// iOS
extension UIAccessibility {
    public static var isReduceTransparencyEnabled: Bool { get }
}

// macOS
extension NSWorkspace {
    open var accessibilityDisplayShouldReduceTransparency: Bool { get }
}
```

```
// Transparency and Blurring
```

```
// iOS
```

```
extension UIAccessibility {  
    public static var isReduceTransparencyEnabled: Bool { get }  
}
```

```
// macOS
```

```
extension NSWorkspace {  
    open var accessibilityDisplayShouldReduceTransparency: Bool { get }  
}
```

```
// Transparency and Blurring
```

```
// iOS
```

```
extension UIAccessibility {  
    public static var isReduceTransparencyEnabled: Bool { get }  
}
```

```
// macOS
```

```
extension NSWorkspace {  
    open var accessibilityDisplayShouldReduceTransparency: Bool { get }  
}
```

# Visual Design

Transparency and Blurring

Contrast

Sizing

Motion

Complexity



Contrast



Contrast

Contrast

Contrast

Contrast

Contrast

Contrast

Contrast

Contrast

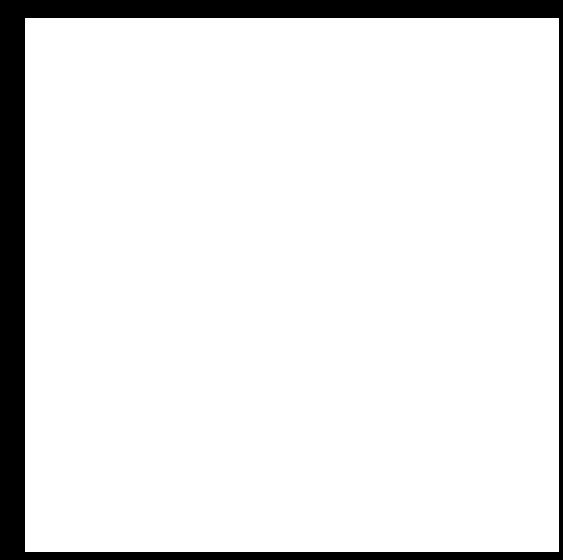
Contrast

# Minimum Contrast Ratio

Follow the WCAG 2.0 guidelines

- Minimum contrast should be 4.5:1
- <https://www.w3.org/TR/WCAG20/>

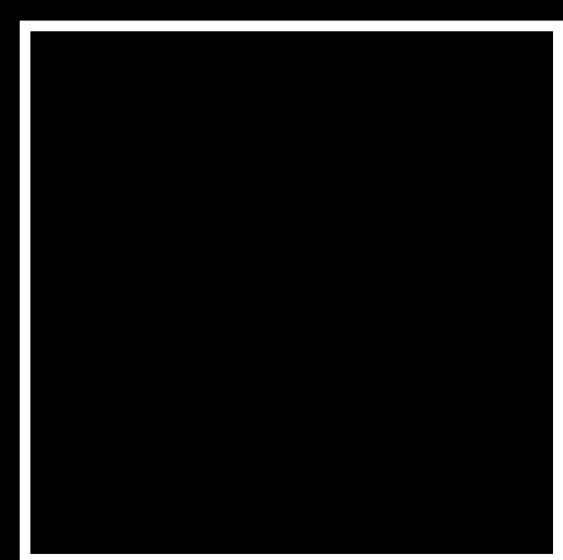
# 21 : 1



R: 255

G: 255

B: 255



R: 0

G: 0

B: 0

Lorem ipsum dolor sit amet, consectetur adipiscing elit. In nec ultrices mauris, a blandit nulla.



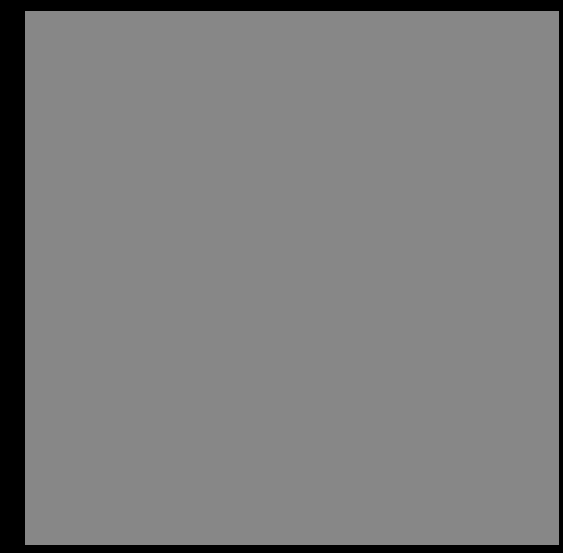
Lorem ipsum dolor sit amet, consectetur adipiscing elit. In nec ultrices mauris, a blandit nulla. Aliquam ac libero nec nunc lobortis varius.



Lorem ipsum dolor sit amet, consectetur adipiscing elit. In nec ultrices mauris, a blandit nulla. Aliquam ac libero nec nunc lobortis varius. Praesent et mi vulputate, rutrum ligula in, ultrices nisi.



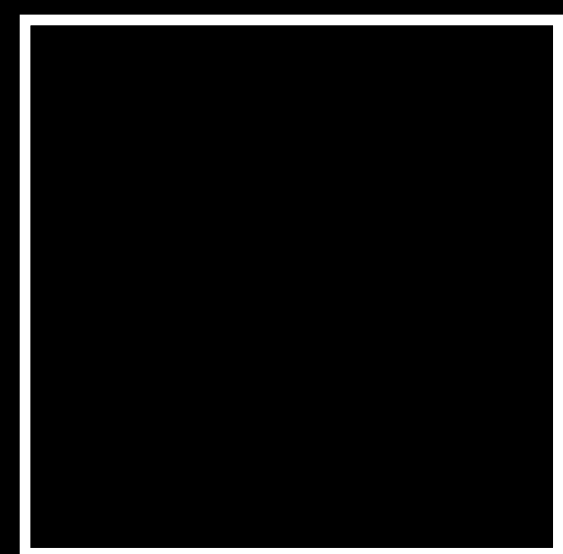
# 4.5 : 1



R: 135

G: 135

B: 135



R: 0

G: 0

B: 0

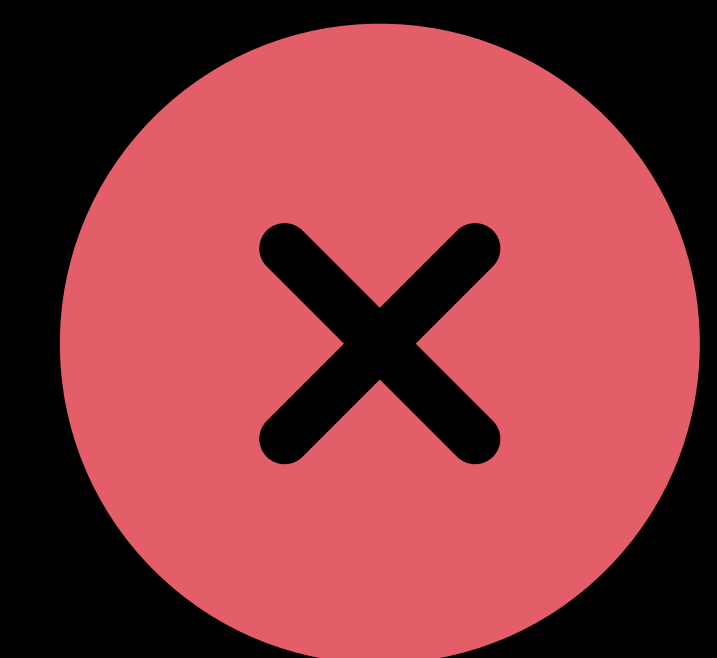
Lorem ipsum dolor sit amet, consectetur adipiscing elit. In nec ultrices mauris, a blandit nulla.



Lorem ipsum dolor sit amet, consectetur adipiscing elit. In nec ultrices mauris, a blandit nulla. Aliquam ac libero nec nunc lobortis varius.



Lorem ipsum dolor sit amet, consectetur adipiscing elit. In nec ultrices mauris, a blandit nulla. Aliquam ac libero nec nunc lobortis varius. Praesent et mi vulputate, rutrum ligula in, ultrices nisi.





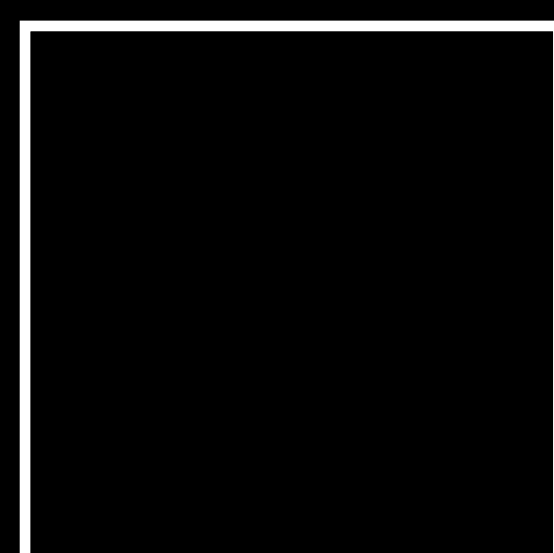
# 2.9 : 1



R: 87

G: 87

B: 87



R: 0

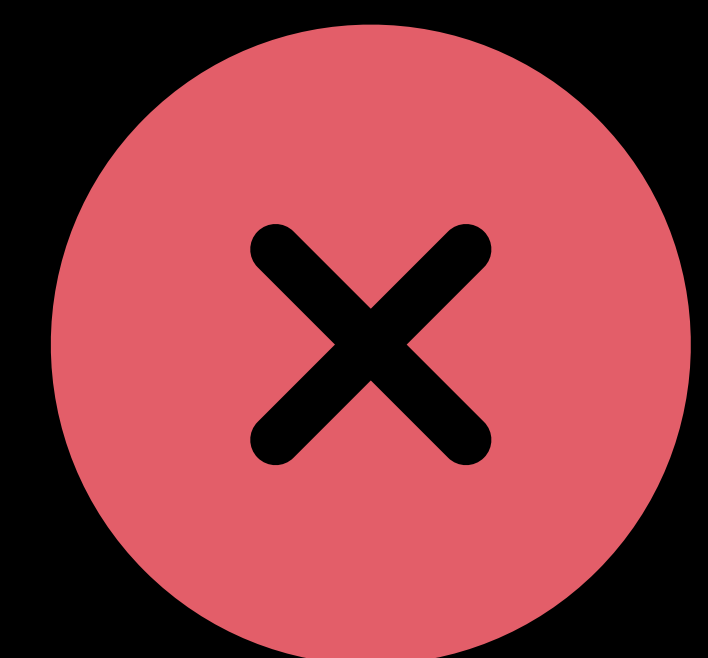
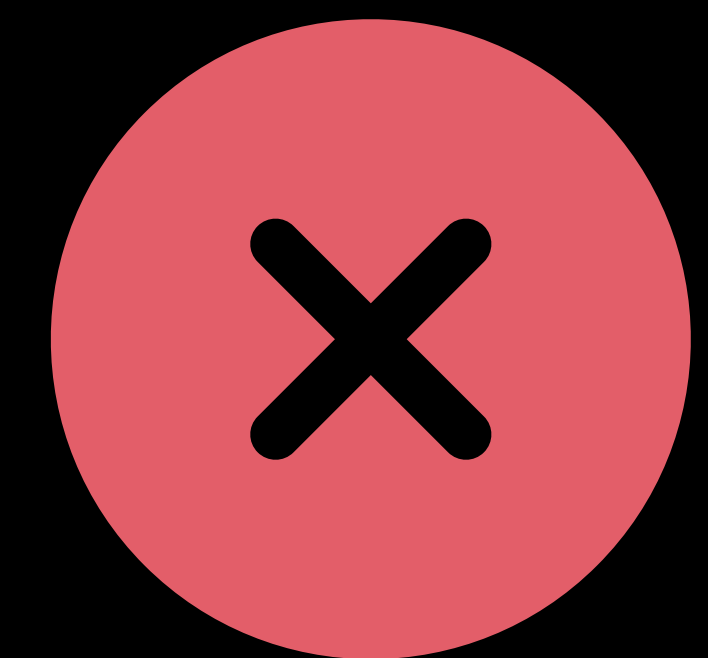
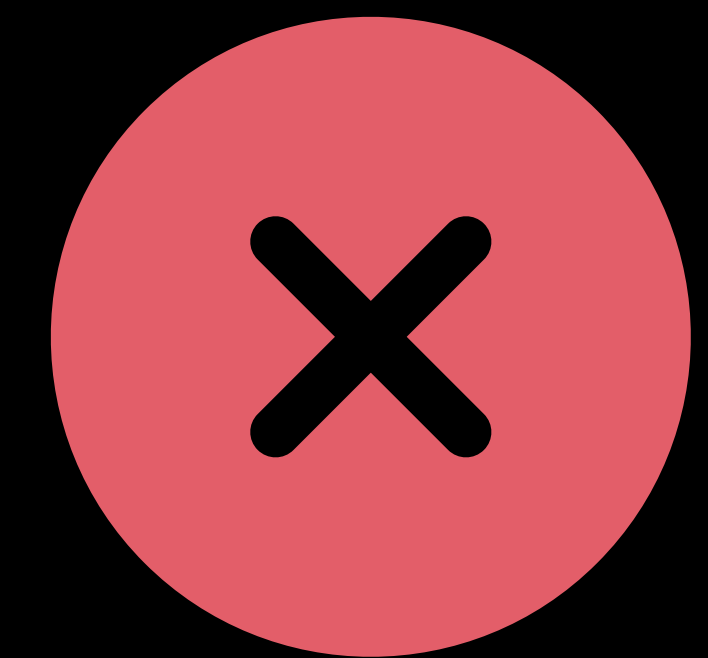
G: 0

B: 0

Lorem ipsum dolor sit amet, consectetur adipiscing elit. In nec ultrices mauris, a blandit nulla.

Lorem ipsum dolor sit amet, consectetur adipiscing elit. In nec ultrices mauris, a blandit nulla. Aliquam ac libero nec nunc lobortis varius.

Lorem ipsum dolor sit amet, consectetur adipiscing elit. In nec ultrices mauris, a blandit nulla. Aliquam ac libero nec nunc lobortis varius. Praesent et mi vulputate, rutrum ligula in, ultrices nisi.





# Color Contrast Calculator

## Text

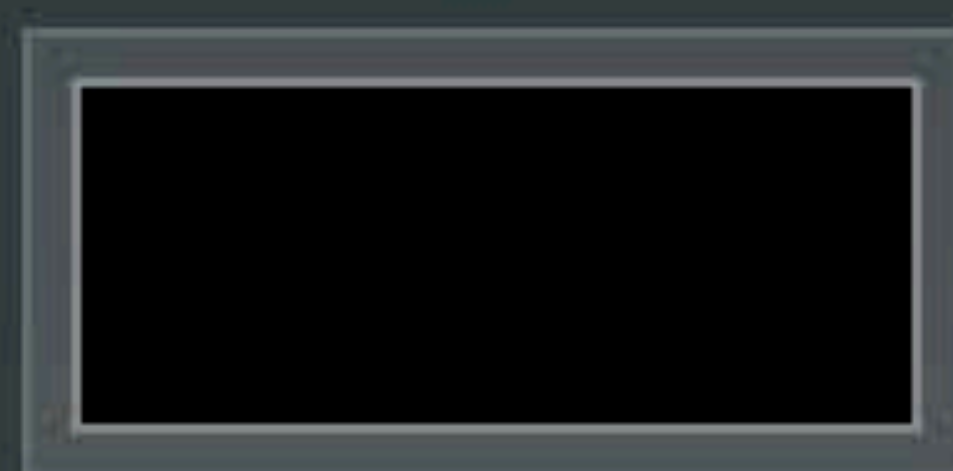


Red

Green

Blue

## Background



Red

Green

Blue



Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat

Text Size:  13 pt



Passes 18pt Regular and 14pt Bold

# 3.3:1



```
// Increase Contrast (Darken Colors)

// iOS
extension UIAccessibility {
    public static var isDarkerSystemColorsEnabled: Bool { get }
}

// macOS
extension NSWorkspace {
    open var accessibilityDisplayShouldIncreaseContrast: Bool { get }
}
```



```
// Increase Contrast (Darken Colors)
```

```
// iOS
```

```
extension UIAccessibility {
```

```
    public static var isDarkerSystemColorsEnabled: Bool { get }
```

```
}
```

```
// macOS
```

```
extension NSWorkspace {
```

```
    open var accessibilityDisplayShouldIncreaseContrast: Bool { get }
```

```
}
```

```
// Increase Contrast (Darken Colors)
```

```
// iOS
```

```
extension UIAccessibility {
```

```
    public static var isDarkerSystemColorsEnabled: Bool { get }
```

```
}
```

```
// macOS
```

```
extension NSWorkspace {
```

```
    open var accessibilityDisplayShouldIncreaseContrast: Bool { get }
```

```
}
```

# Visual Design

Transparency and Blurring

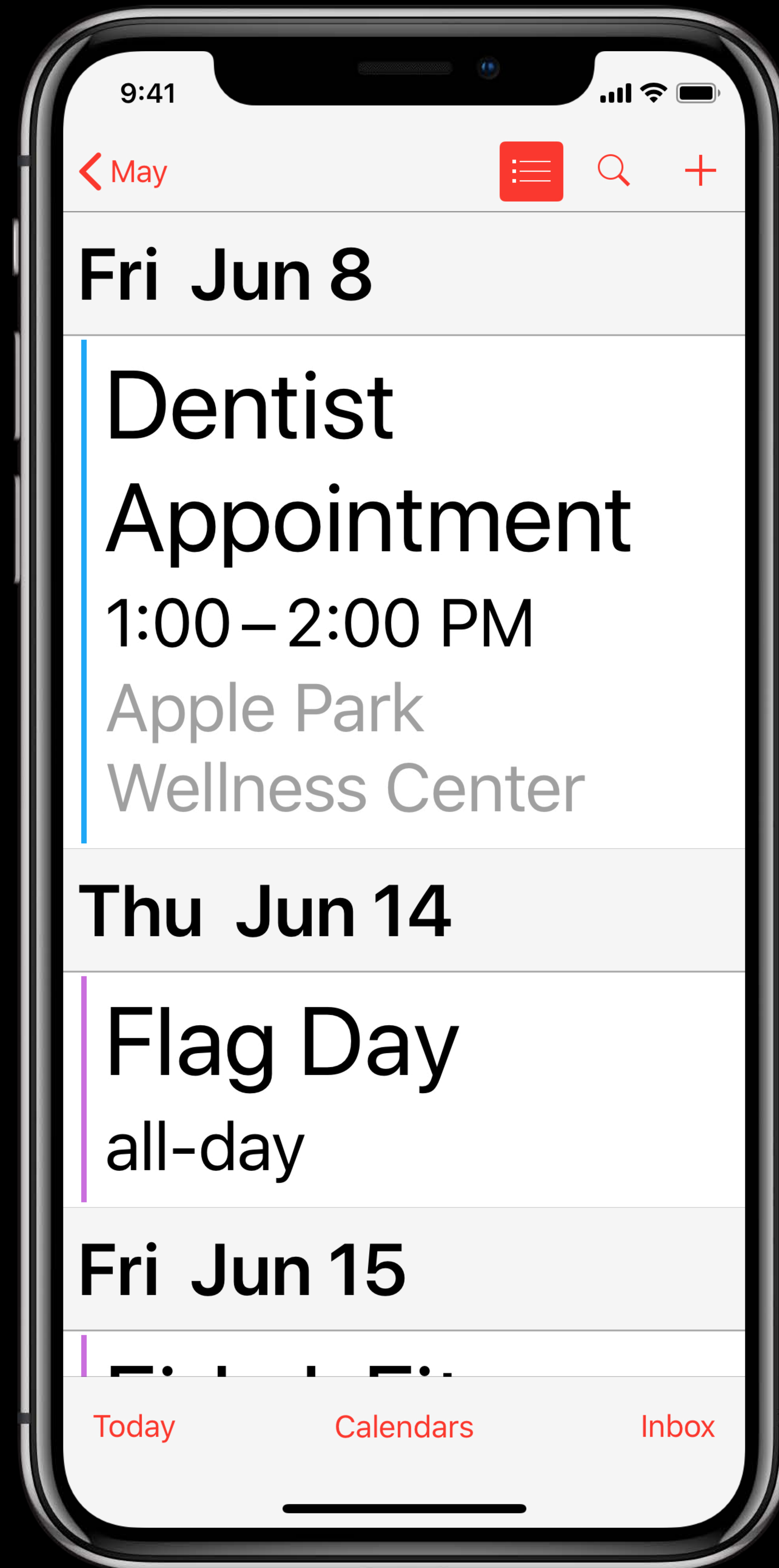
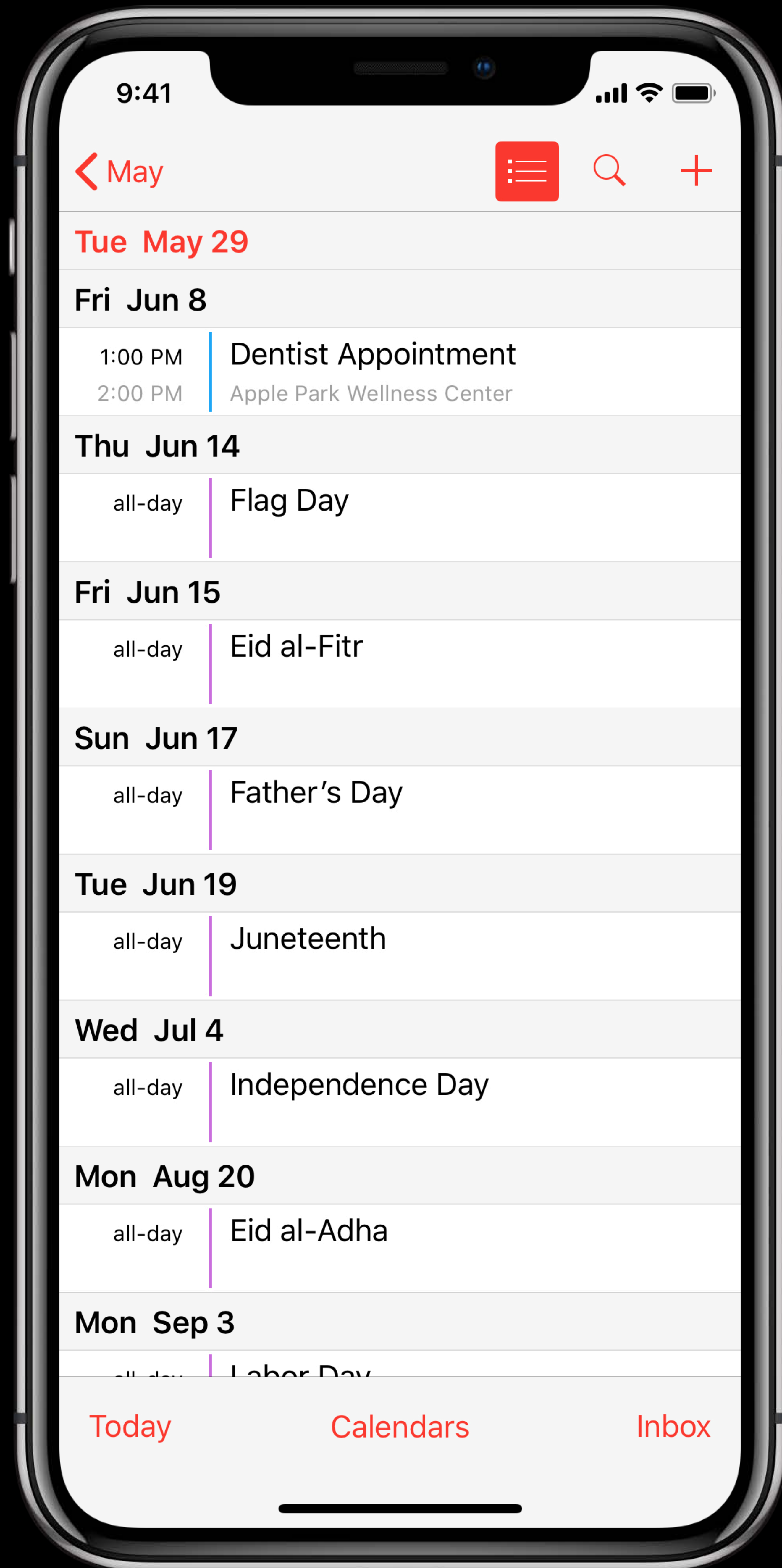
Contrast

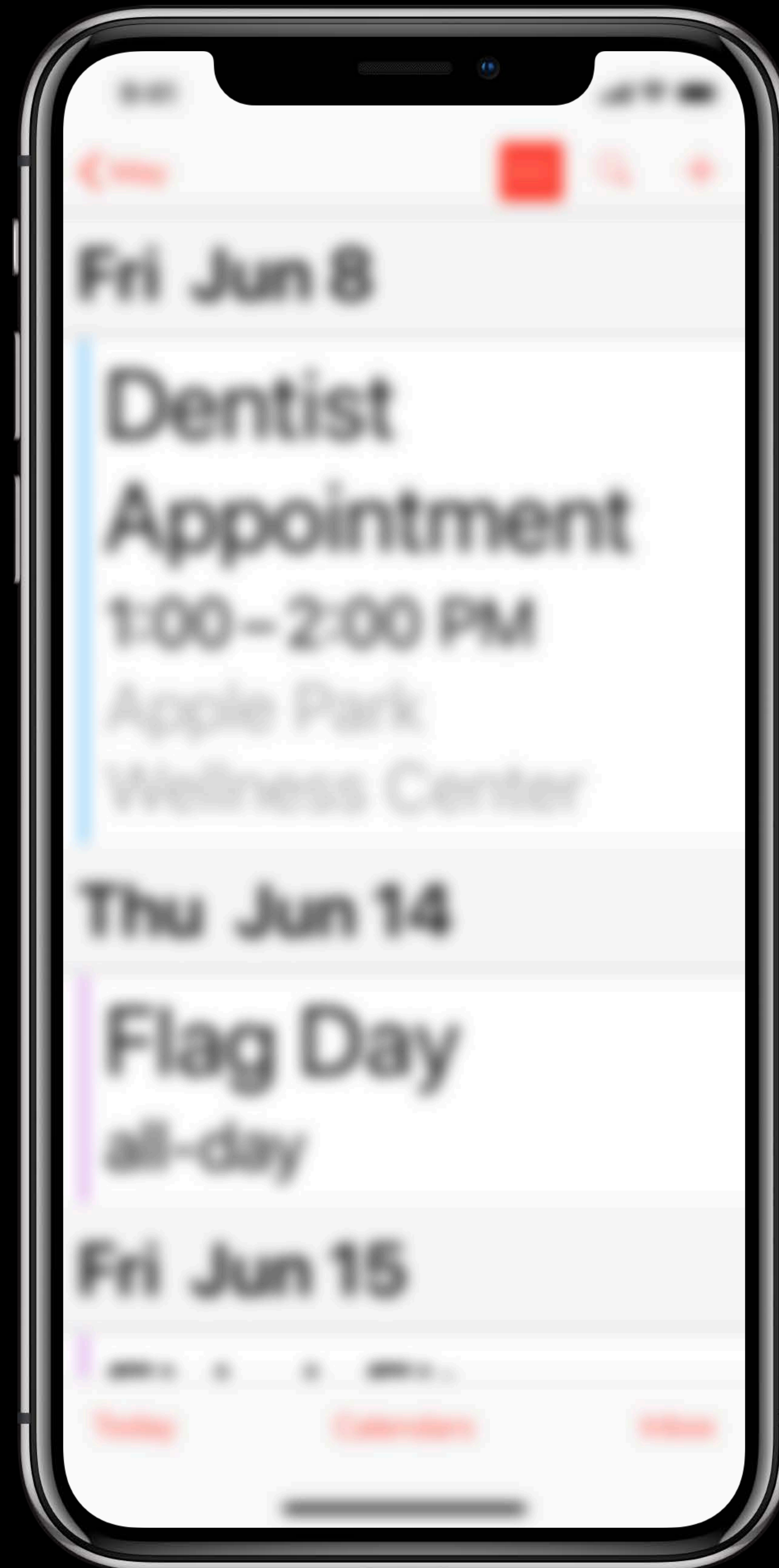
Sizing

Motion

Complexity

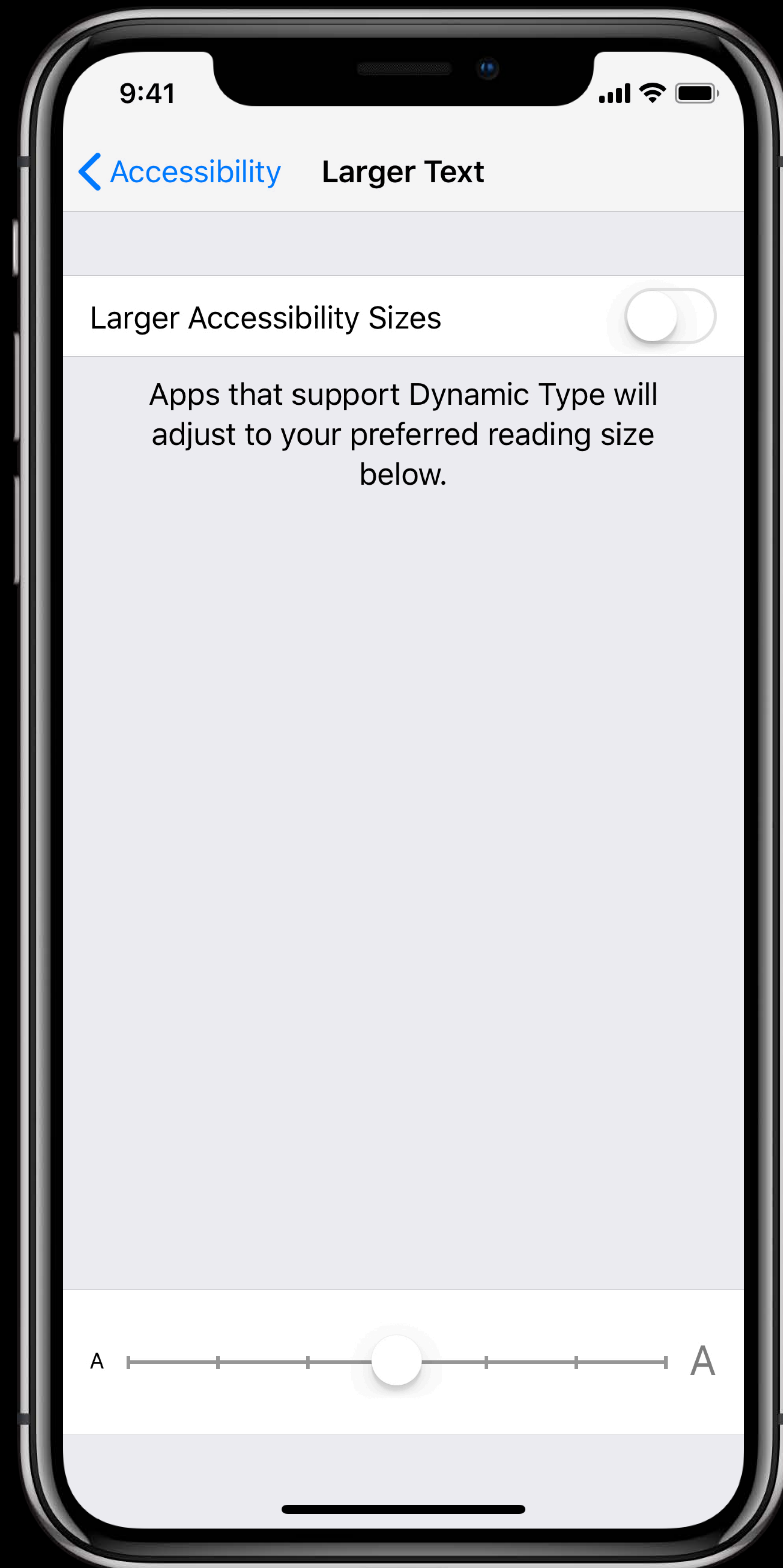








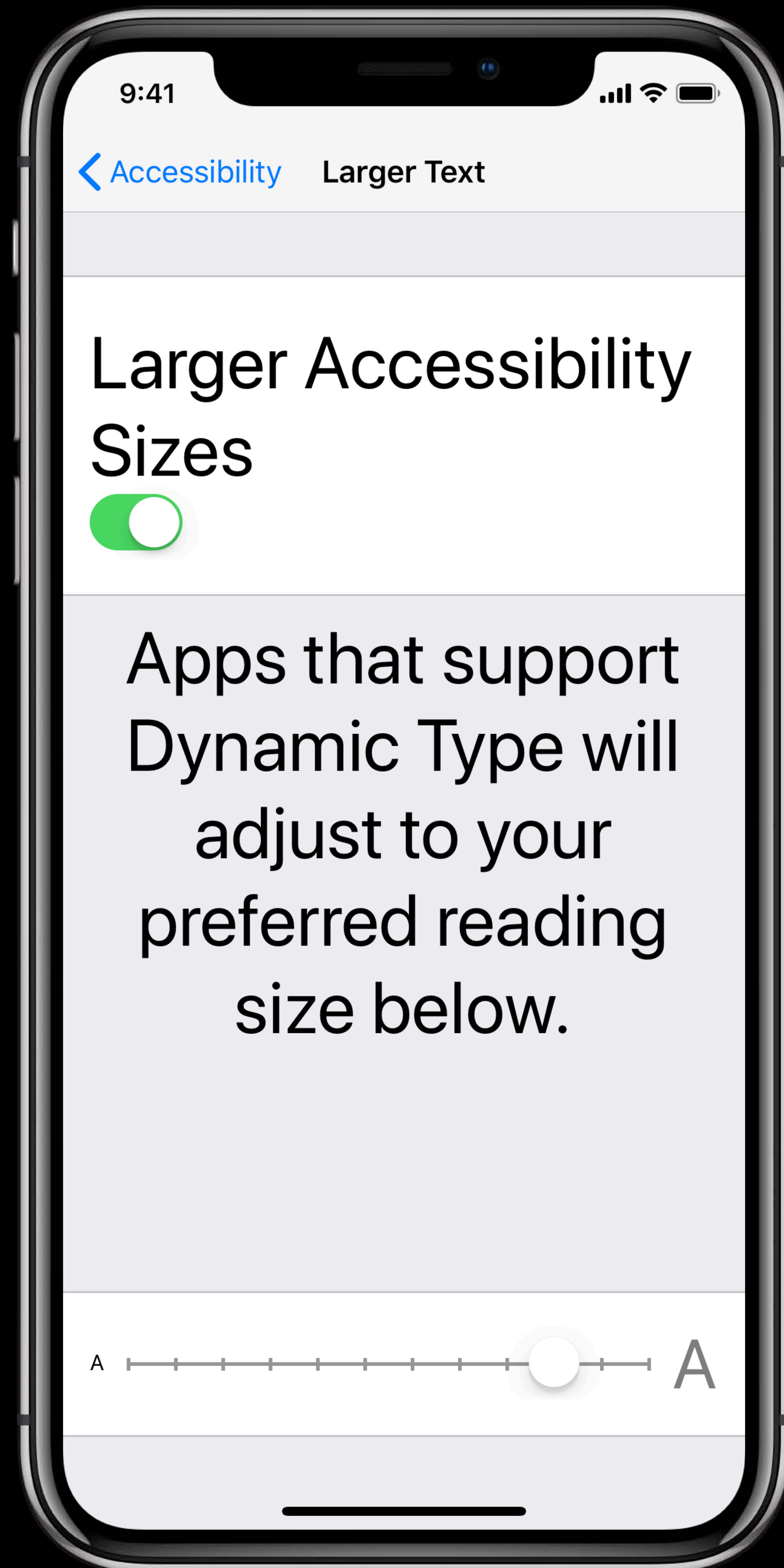
# UIContentSizeCategory



extraSmall  
small  
medium  
large  
extraLarge  
extraExtraLarge  
extraExtraExtraLarge



# UIContentSizeCategory



extraSmall

small

medium

large

extraLarge

extraExtraLarge

extraExtraExtraLarge

accessibilityMedium

accessibilityLarge

accessibilityExtraLarge

accessibilityExtraExtraLarge

accessibilityExtraExtraExtraLarge

# Dynamic Type Resources

<https://developer.apple.com/design/human-interface-guidelines/ios/visual-design/typography/>







```
// Bold Text
```

```
extension UIAccessibility {  
    public static var isBoldTextEnabled: Bool { get }  
}
```

```
// Bold Text
```

```
extension UIAccessibility {  
    public static var isBoldTextEnabled: Bool { get }  
}
```

# Visual Design

Transparency and Blurring

Contrast

Sizing

**Motion**

Complexity



# Warning!

Vestibular motion triggers

# Motion Trigger 1

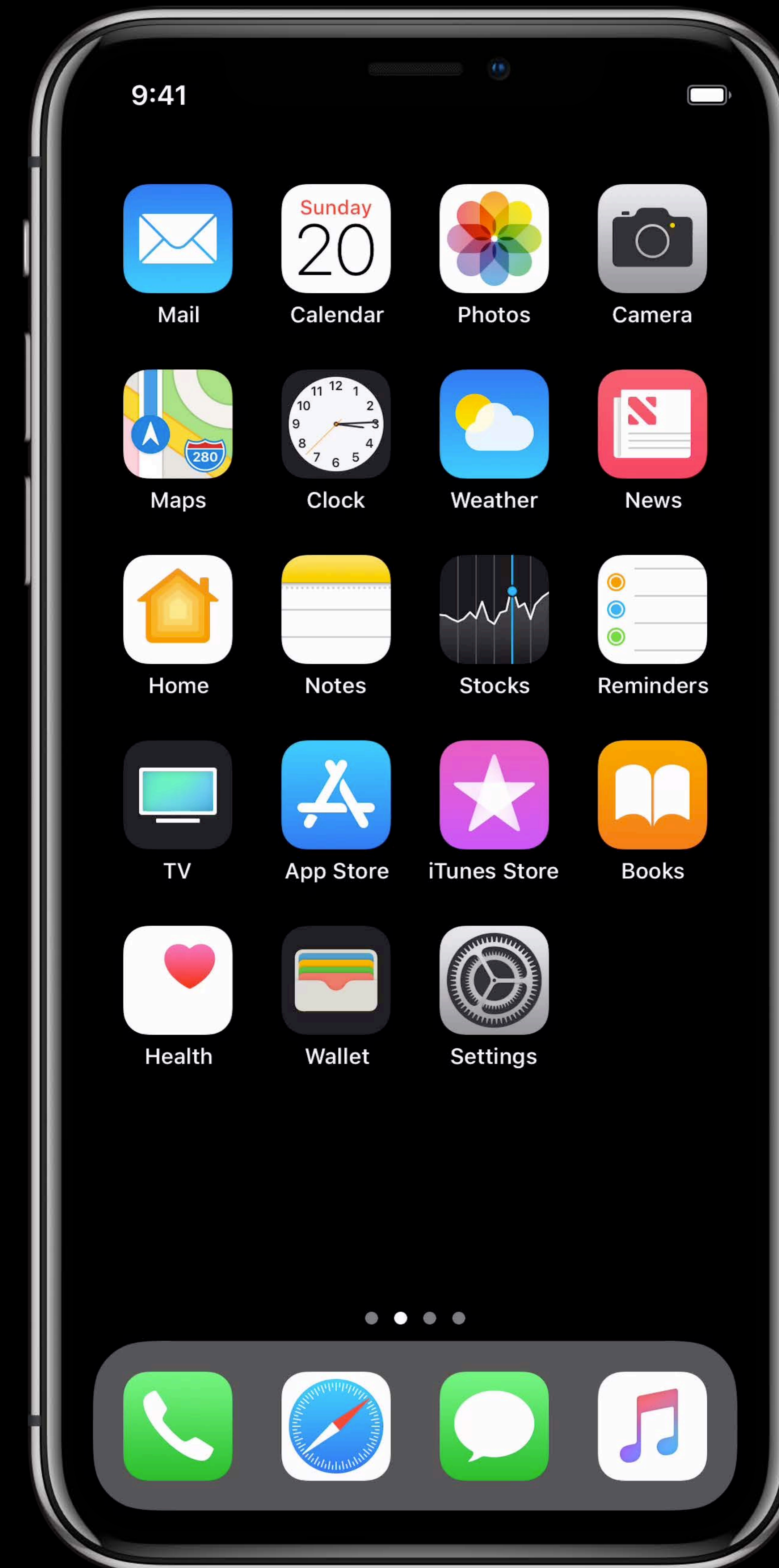
## Scaling and zooming





# Motion Trigger 1

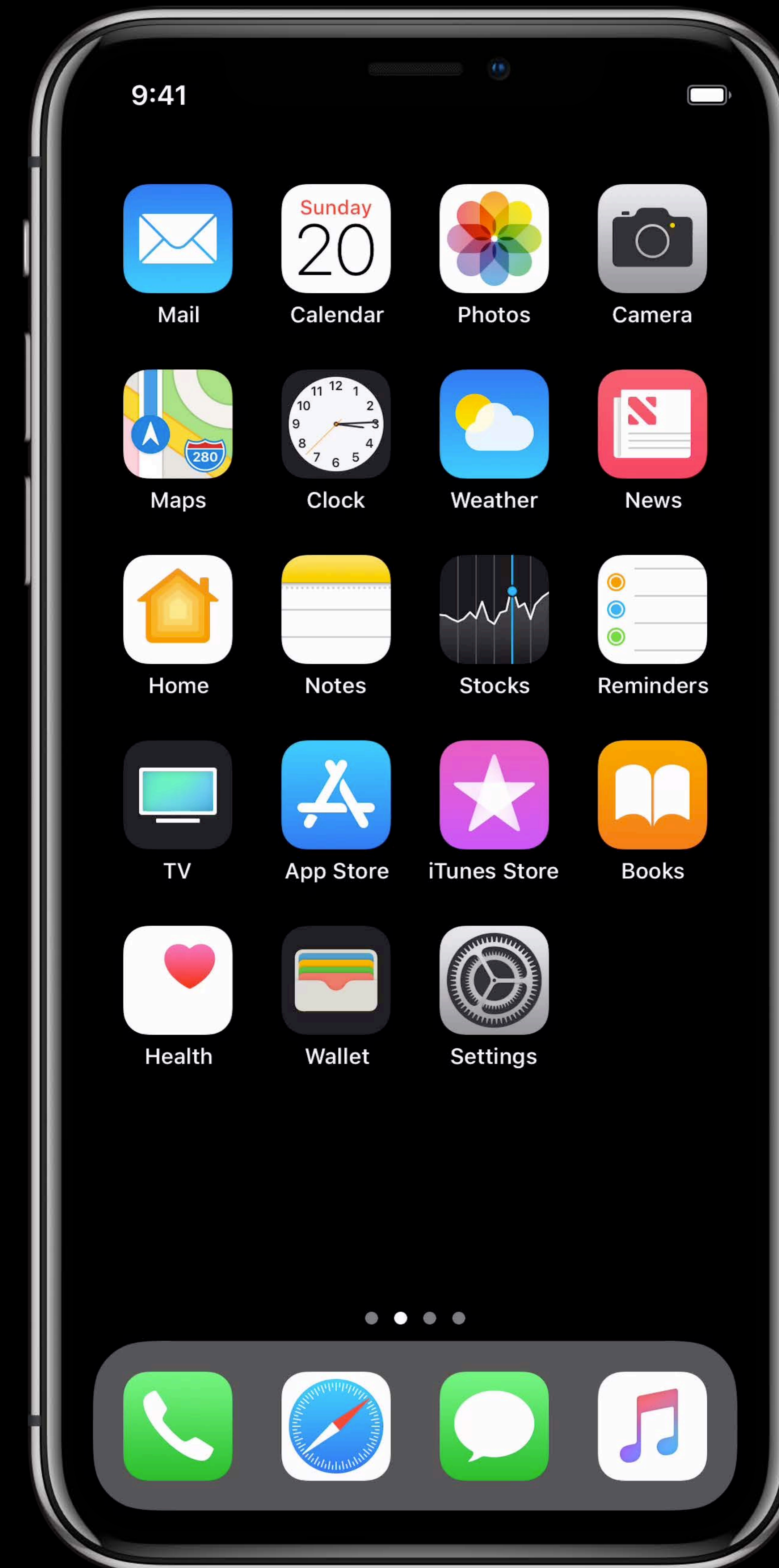
## Scaling and zooming





# Motion Trigger 1

## Scaling and zooming





# Motion Trigger 2

## Spinning and vortex effects





# Motion Trigger 2

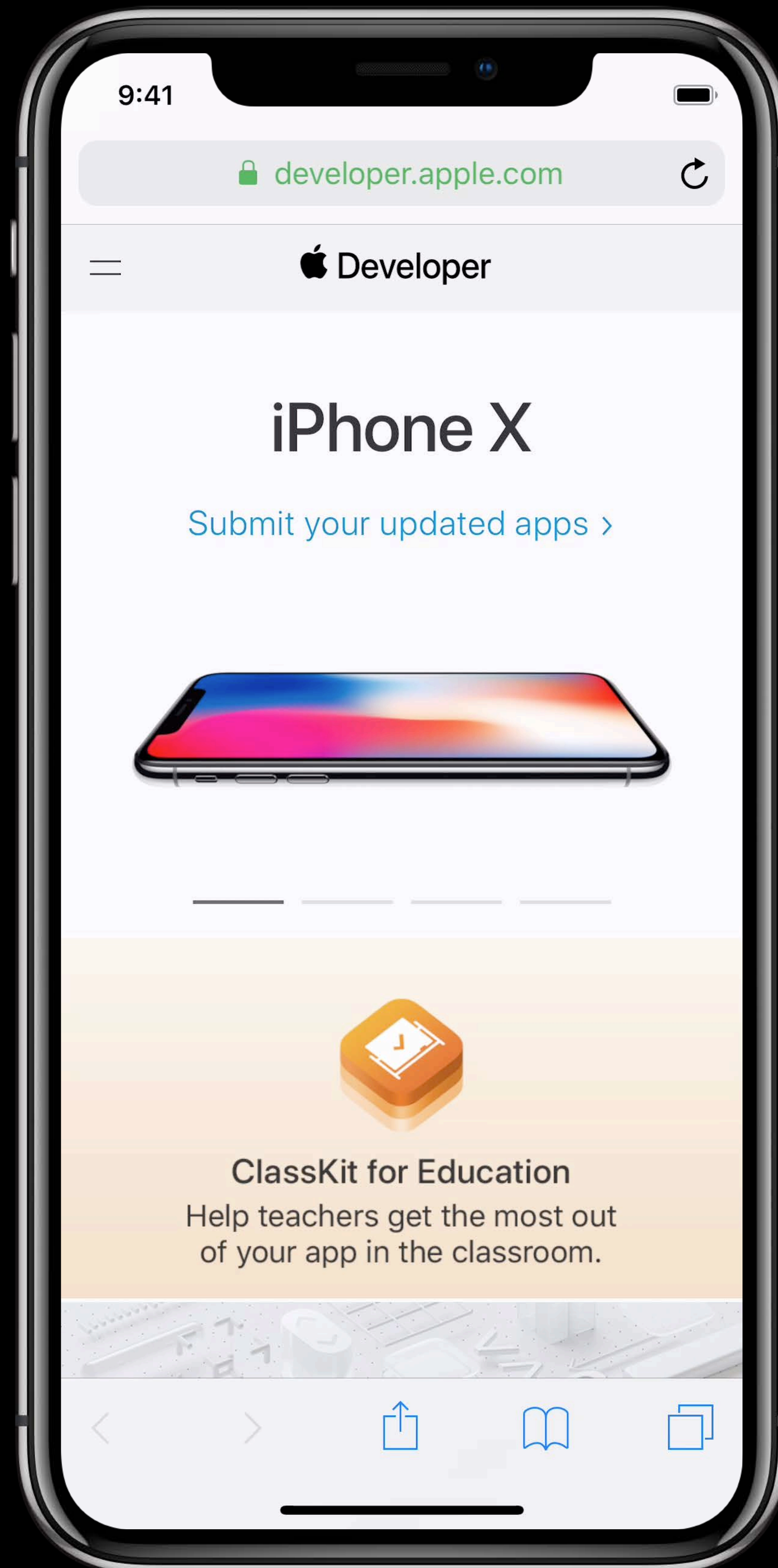
## Spinning and vortex effects





# Motion Trigger 3

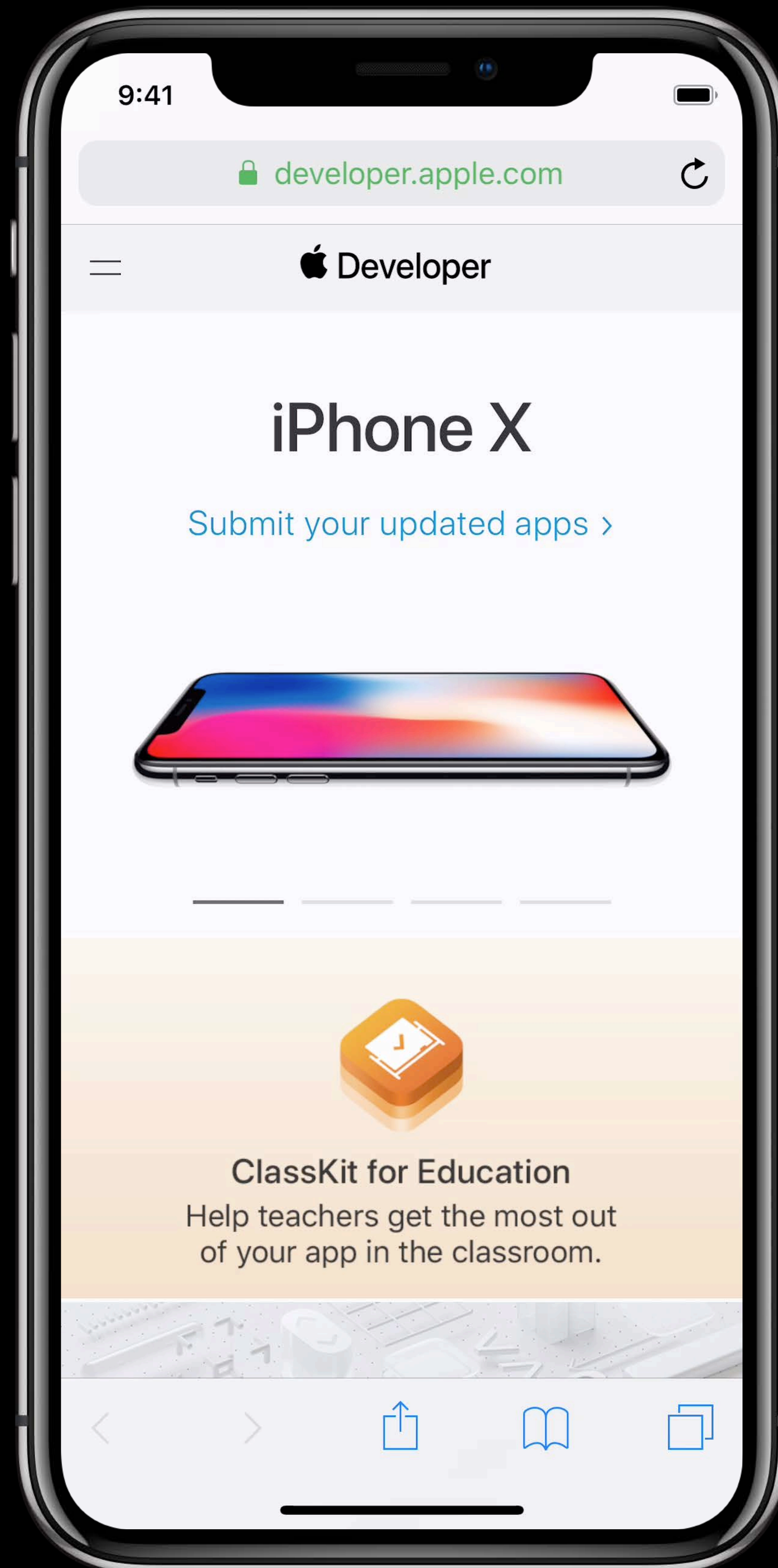
## Plane shifting animations





# Motion Trigger 3

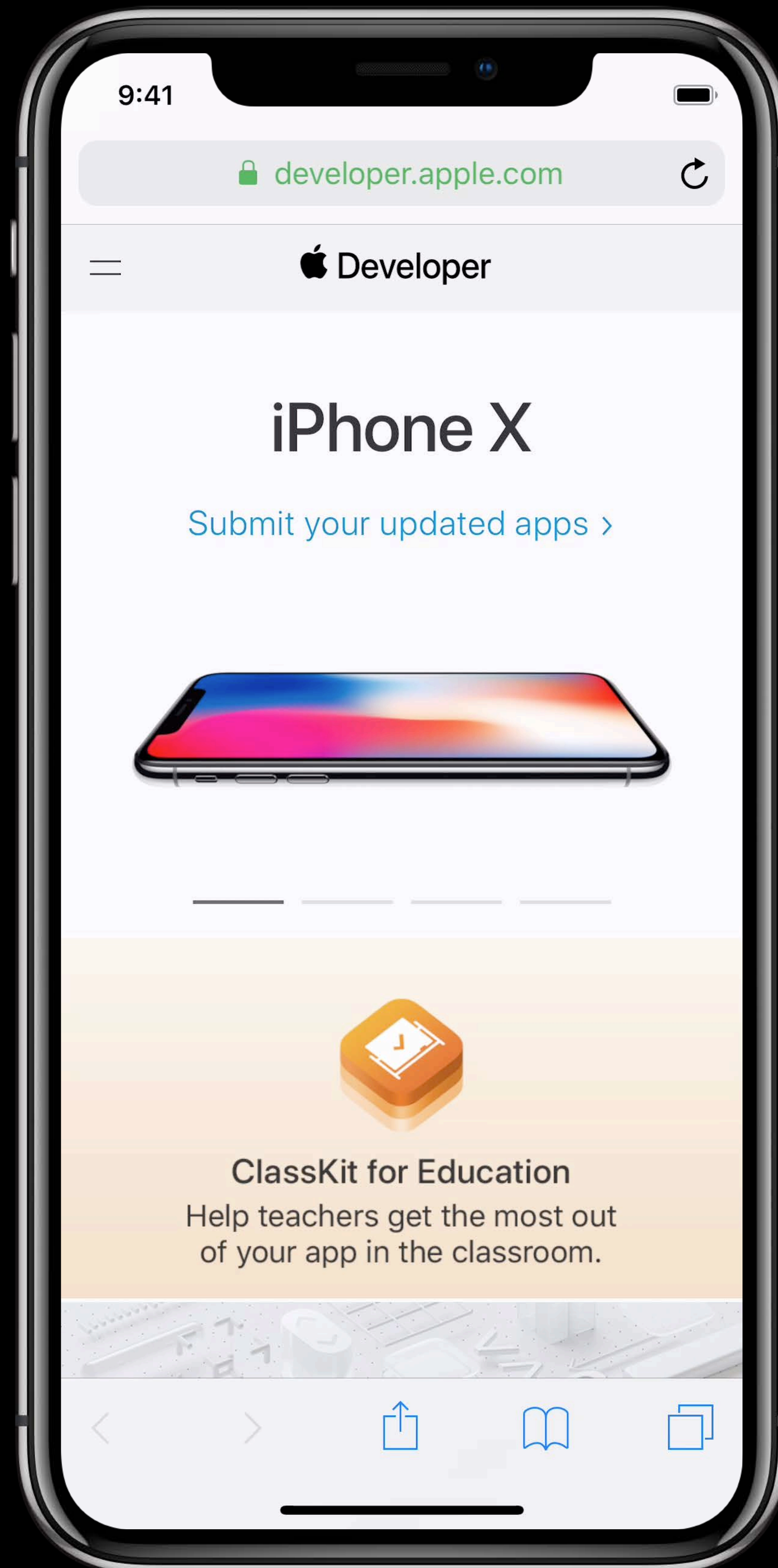
## Plane shifting animations





# Motion Trigger 3

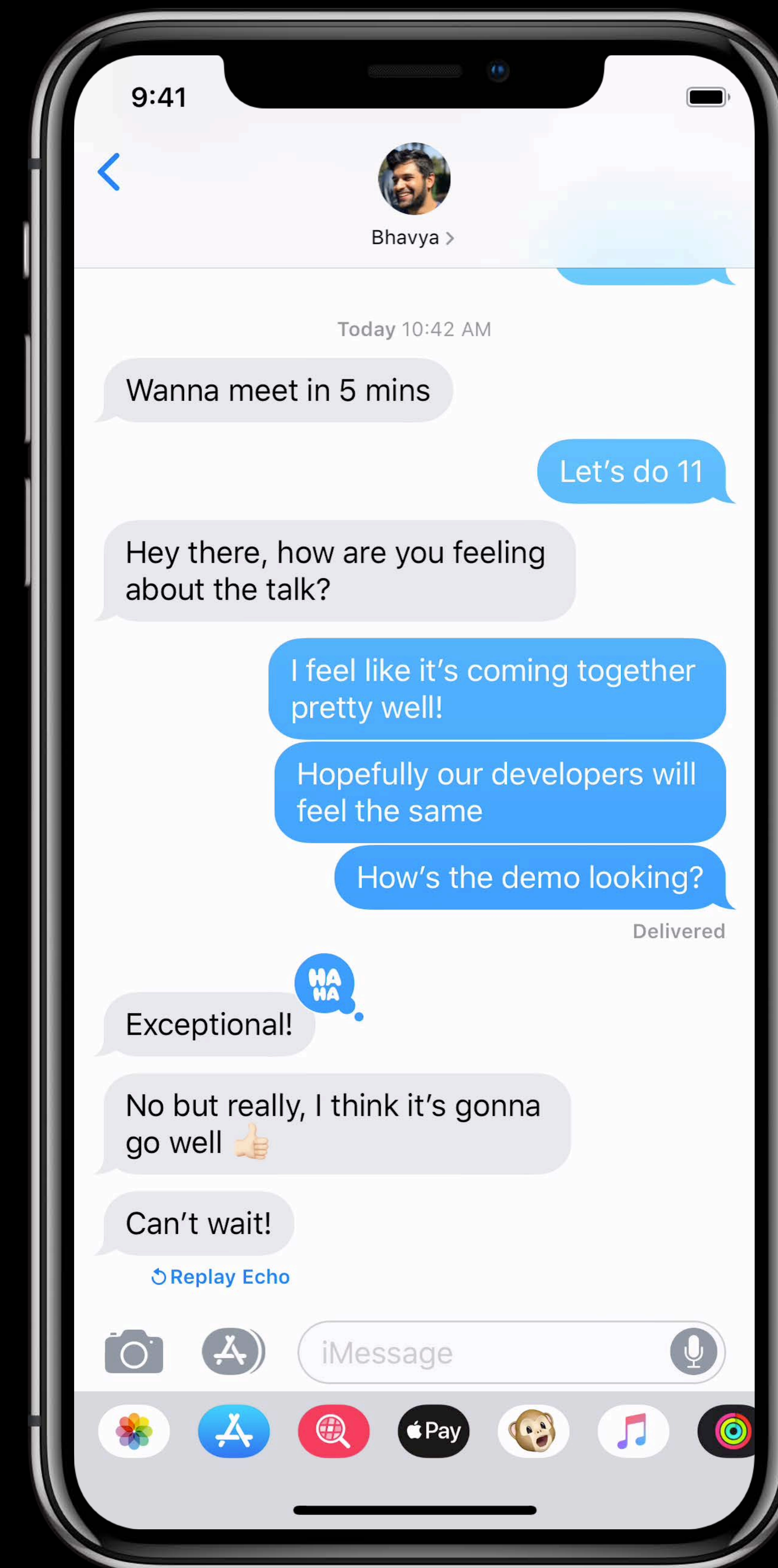
## Plane shifting animations





# Motion Trigger 4

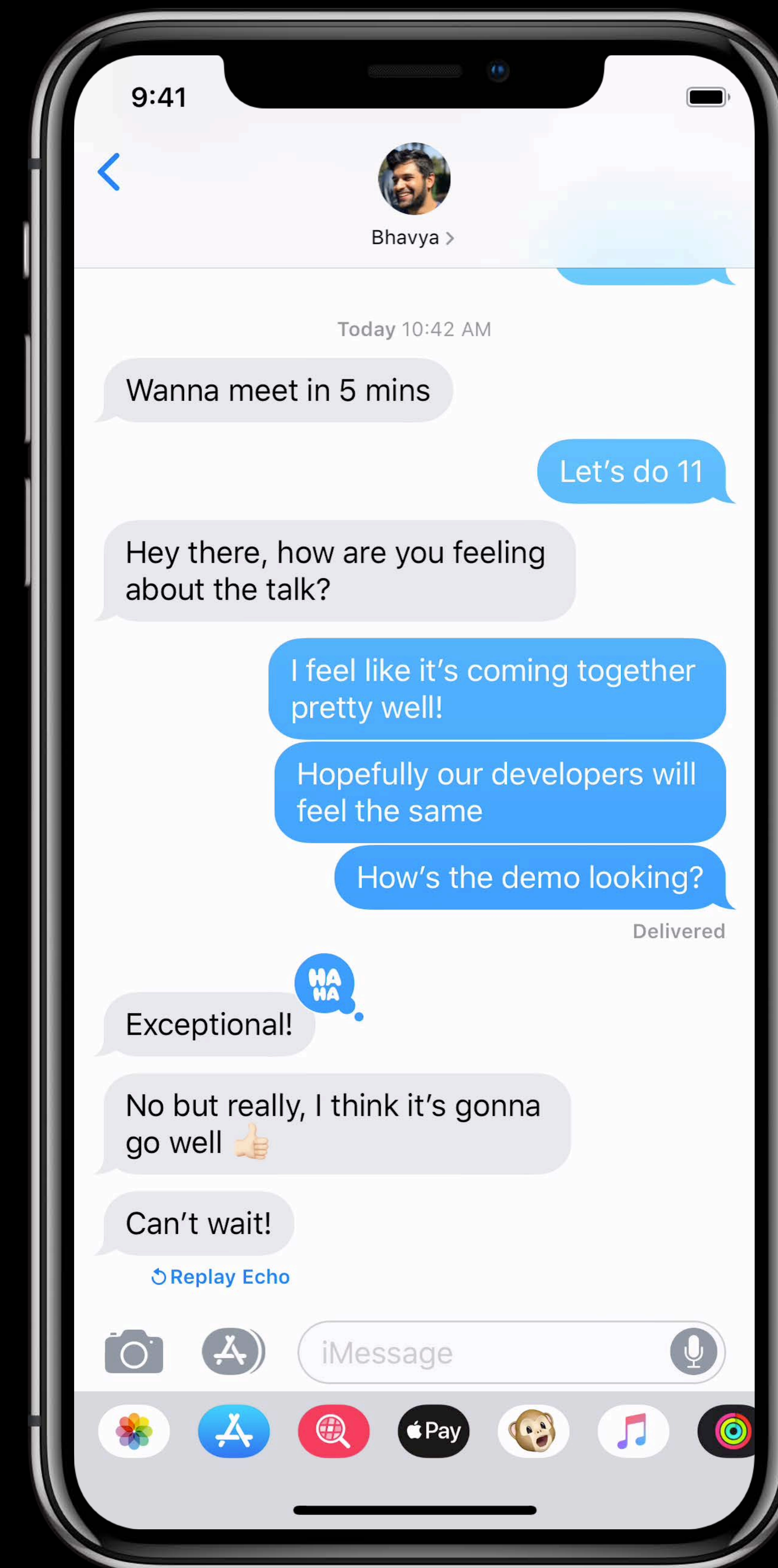
Multi-directional or multi-speed motion





# Motion Trigger 4

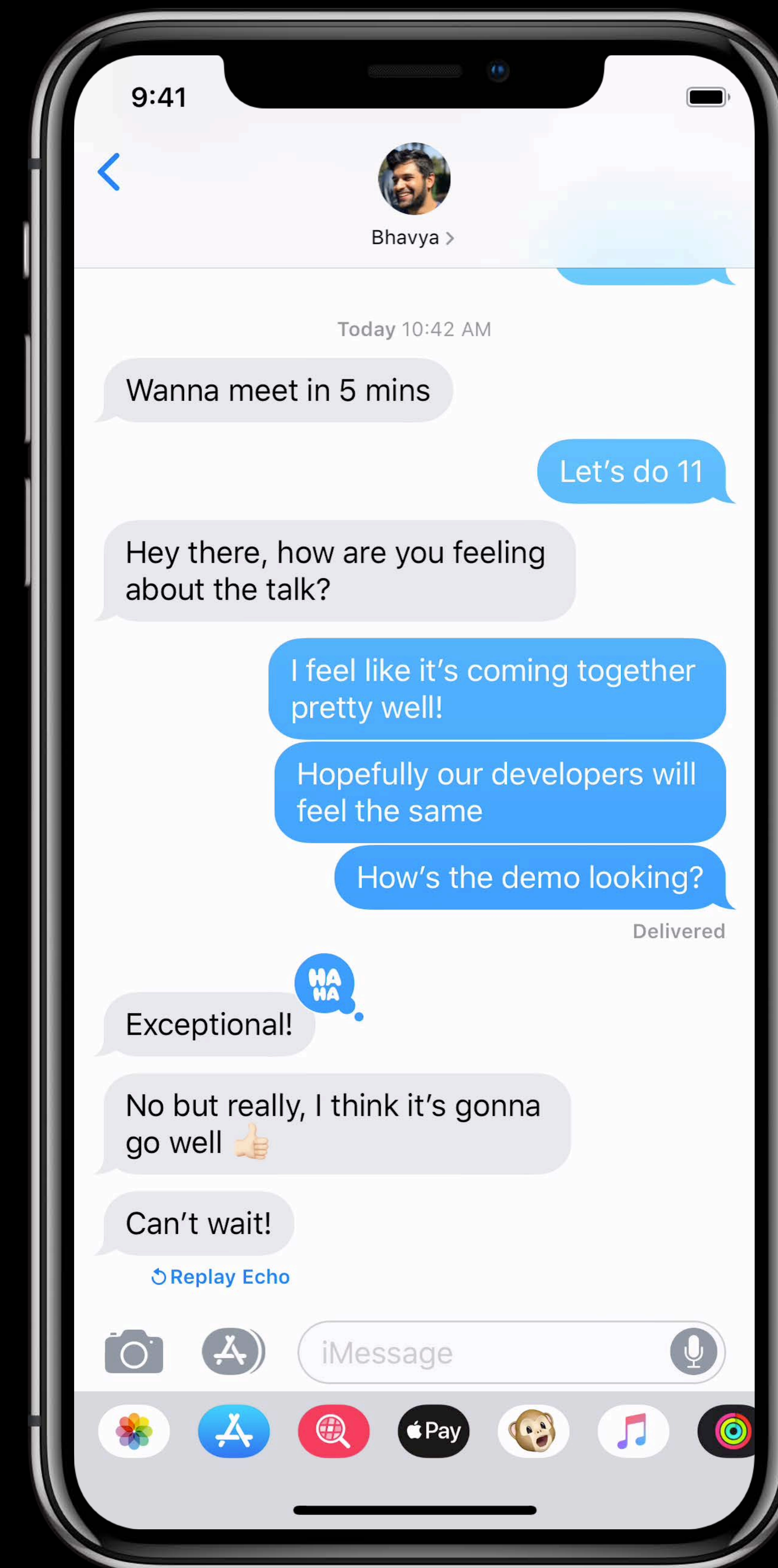
Multi-directional or multi-speed motion





# Motion Trigger 4

Multi-directional or multi-speed motion





# Motion Trigger 5

Peripheral movement





# Motion Trigger 5

Peripheral movement





```
// Motion
```

```
// iOS
```

```
extension UIAccessibility {
```

```
    public static var isReduceMotionEnabled: Bool { get }
```

```
}
```

```
// macOS
```

```
extension NSWorkspace {
```

```
    open var accessibilityDisplayShouldReduceMotion: Bool { get }
```

```
}
```

```
// Motion
```

```
// iOS
```

```
extension UIAccessibility {
```

```
    public static var isReduceMotionEnabled: Bool { get }
```

```
}
```

```
// macOS
```

```
extension NSWorkspace {
```

```
    open var accessibilityDisplayShouldReduceMotion: Bool { get }
```

```
}
```



```
// Motion
```

```
// iOS
```

```
extension UIAccessibility {
```

```
    public static var isReduceMotionEnabled: Bool { get }
```

```
}
```

```
// macOS
```

```
extension NSWorkspace {
```

```
    open var accessibilityDisplayShouldReduceMotion: Bool { get }
```

```
}
```

# Visual Design

Transparency and Blurring

Contrast

Sizing

Motion

Complexity



**1 in 6**

Children has a developmental disability in the U.S.

Easy to navigate



Quick to get started

Consistent behavior



Experience

Visual Design

Assistive Technology Experience



















What makes an accessible  
experience exceptional?

It works



It works well

# An Exceptional Experience

Easy to navigate

Quick and prioritized interaction

Predictable

Context



***Demo***

Auditing an app's accessibility experience

Bhavya Garg, Software Engineer



9:41



NAME

**Bro**

BREED

**Corgi**

AGE

**7.0 years**

WEIGHT

**25.0 lbs**

GENDER

**Male**

FOSTERED

**Yes**

ATTITUDE

**energetic, loyal**

Skylar's Animal Shelter





9:41



NAME

**Bro**

BREED

**Corgi**

AGE

**7.0 years**

WEIGHT

**25.0 lbs**

GENDER

**Male**

FOSTERED

**Yes**

ATTITUDE

**energetic, loyal**

Skylar's Animal Shelter





Reachable



```
// Custom Accessibility Elements

public class UIAccessibilityElement : NSObject {
    public init(accessibilityContainer container: Any)
}

extension NSObject {
    open var accessibilityElements: [Any]?
}
```

```
// Custom Accessibility Elements
```

```
public class UIAccessibilityElement : NSObject {  
    public init(accessibilityContainer container: Any)  
}
```

```
extension NSObject {  
    open var accessibilityElements: [Any]?  
}
```



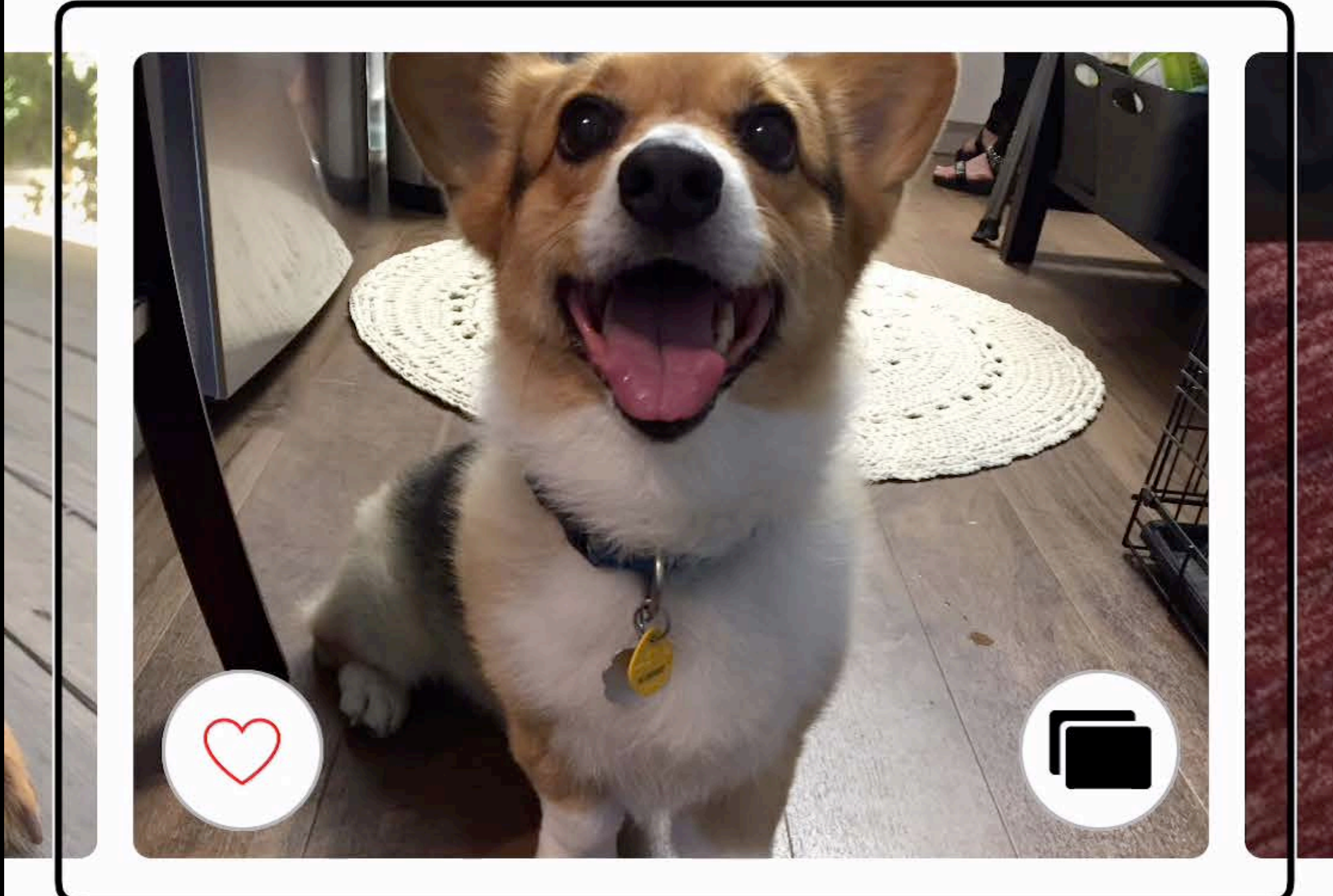
```
// Custom Accessibility Elements
```

```
public class UIAccessibilityElement : NSObject {  
    public init(accessibilityContainer container: Any)  
}
```

```
extension NSObject {  
    open var accessibilityElements: [Any]?  
}
```



9:41



NAME

**Bro**

BREED

**Corgi**

AGE

**7.0 years**

WEIGHT

**25.0 lbs**

GENDER

**Male**

FOSTERED

**Yes**

ATTITUDE

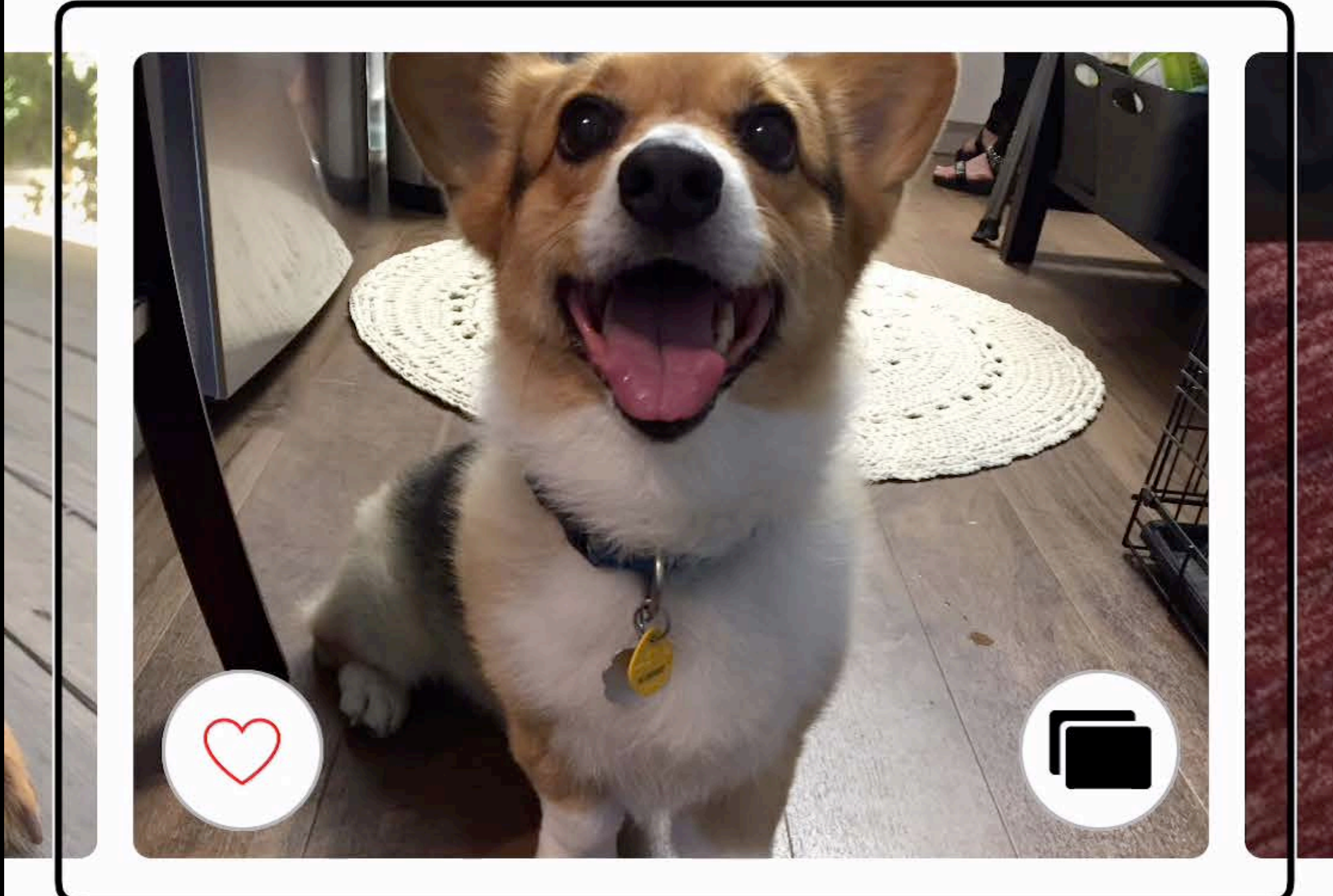
**energetic, loyal**

Skylar's Animal Shelter





9:41



NAME

**Bro**

BREED

**Corgi**

AGE

**7.0 years**

WEIGHT

**25.0 lbs**

GENDER

**Male**

FOSTERED

**Yes**

ATTITUDE

**energetic, loyal**

Skylar's Animal Shelter





```
// Increment and Decrement

extension NSObject {
    // Must have UIAccessibilityTraits.adjustable
    open func accessibilityIncrement()
    open func accessibilityDecrement()
}
```

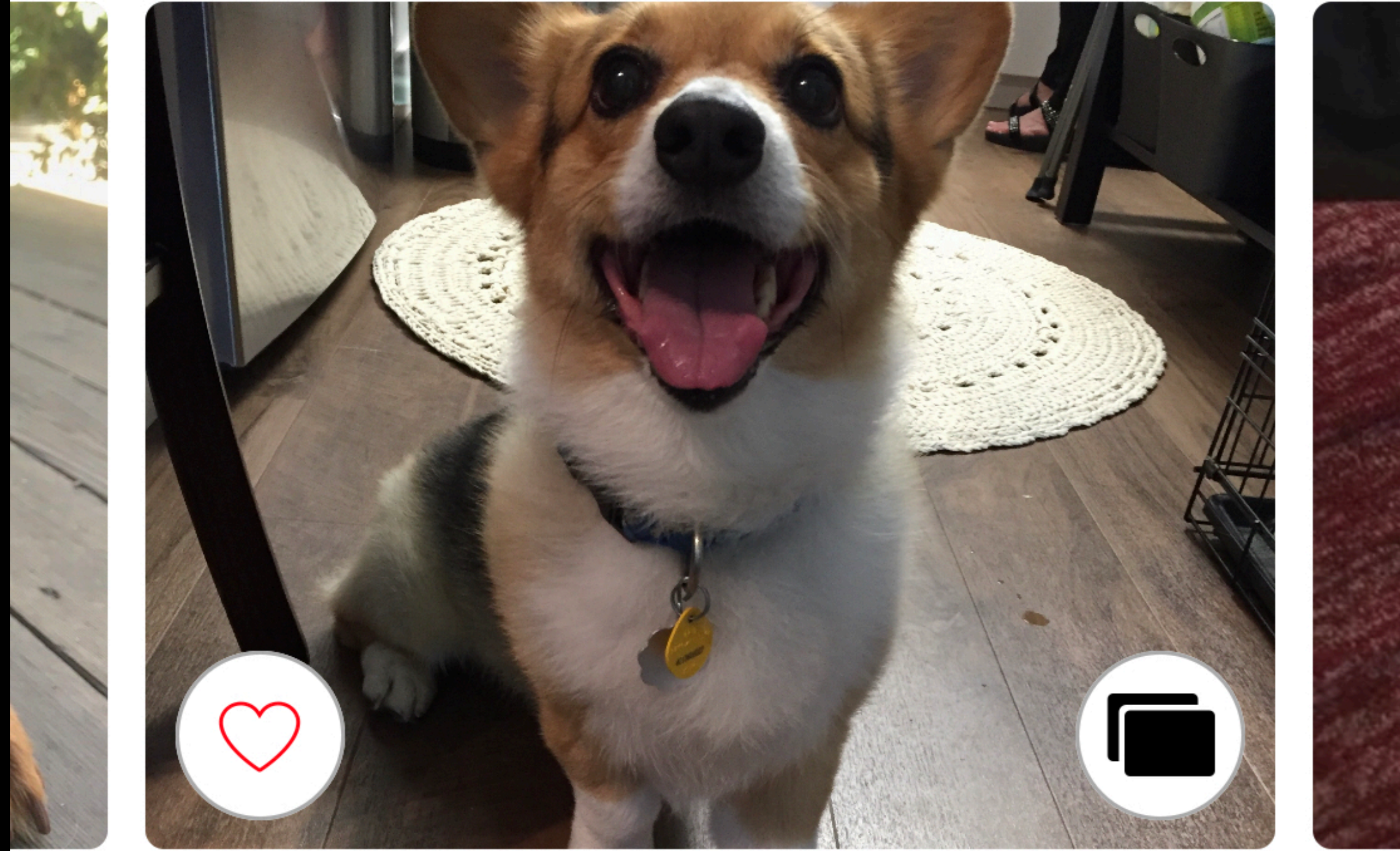


```
// Increment and Decrement
```

```
extension NSObject {  
    // Must have UIAccessibilityTraits.adjustable  
    open func accessibilityIncrement()  
    open func accessibilityDecrement()  
}
```



9:41



NAME

**Bro**

BREED

**Corgi**

AGE

**7.0 years**

WEIGHT

**25.0 lbs**

GENDER

**Male**

FOSTERED

**Yes**

ATTITUDE

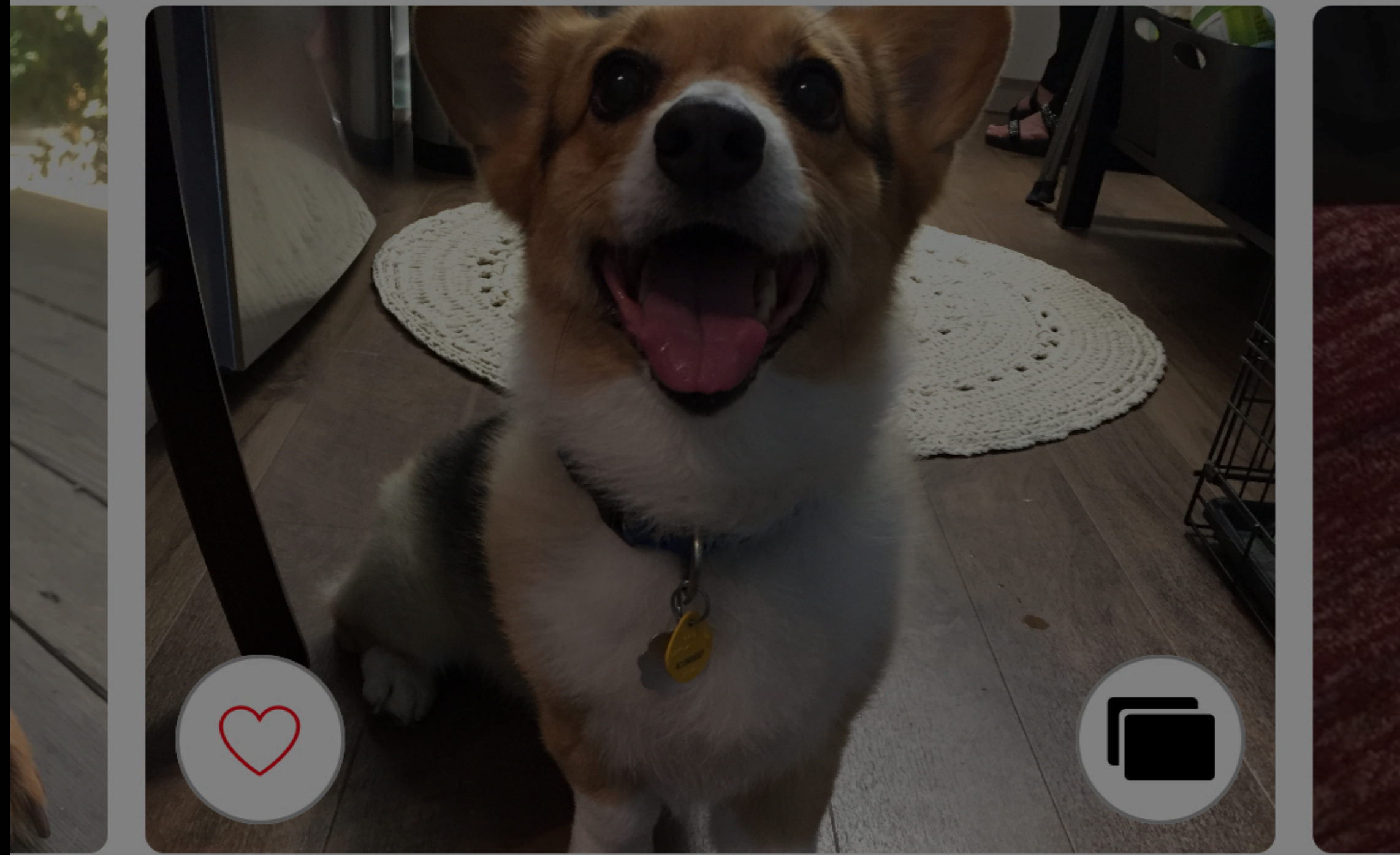
**energetic, loyal**

Skylar's Animal Shelter





9:41



NAME

**Bro**

BREED

**Corgi**

AGE

**7.0 years**

WEIGHT

**25.0 lbs**

GENDER

**Male**

FOSTERED

**Yes**

ATTITUDE

**energetic, loyal**

Skylar's Animal Shelter

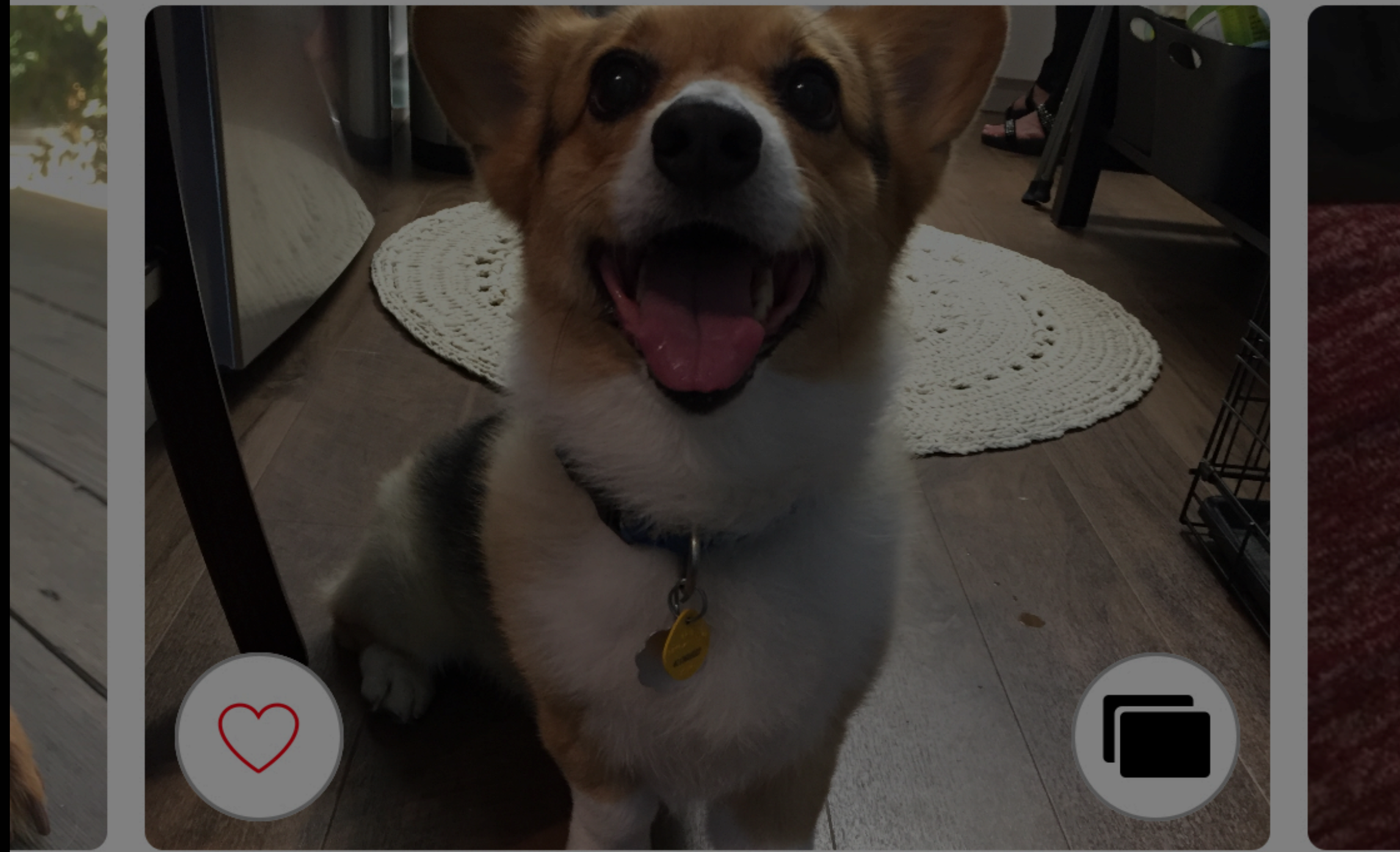


Context



Quick navigation

9:41



NAME

**Bro**

BREED

**Corgi**

AGE

**7.0 years**

WEIGHT

**25.0 lbs**

GENDER

**Male**

FOSTERED

**Yes**

ATTITUDE

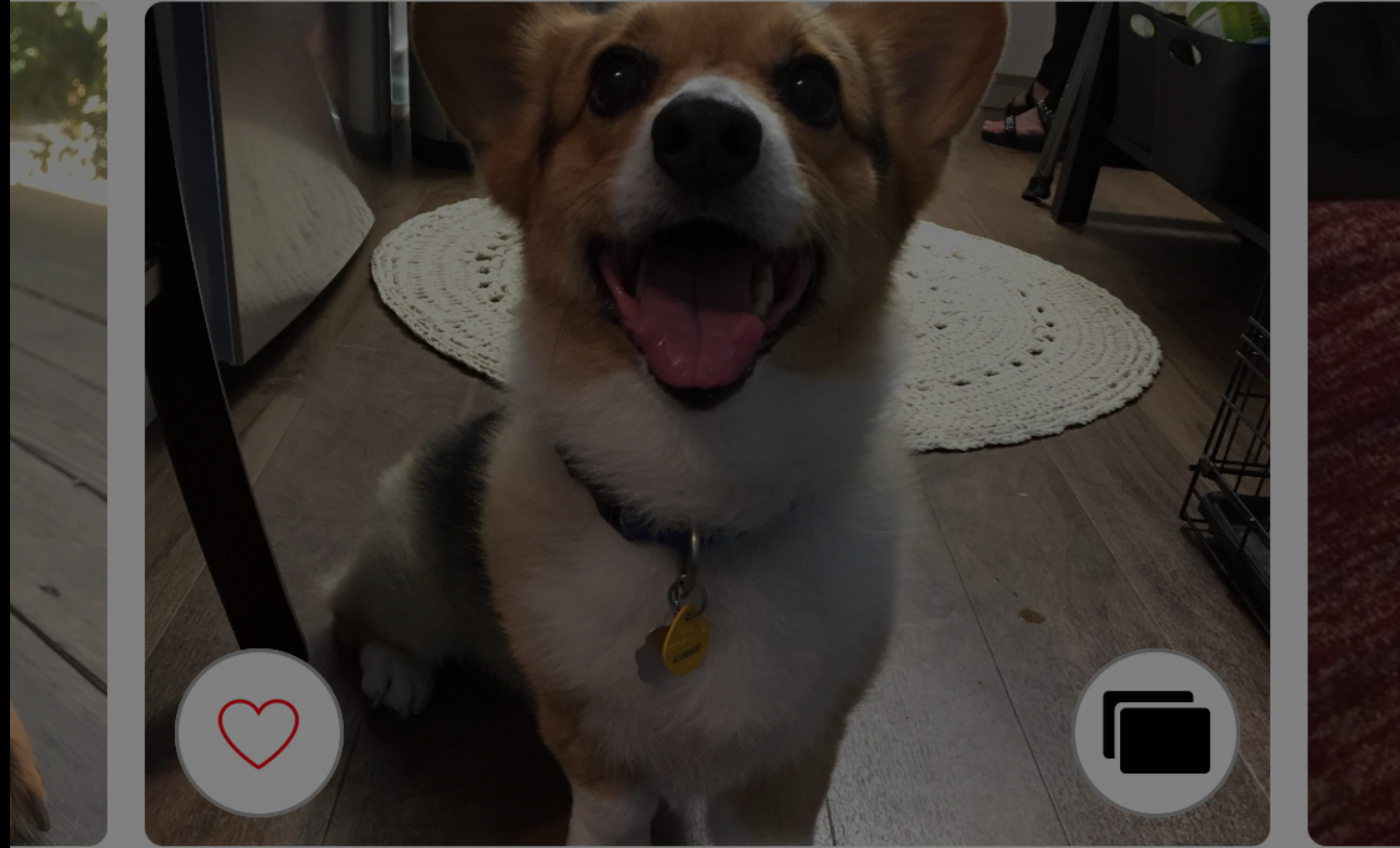
**energetic, loyal**

Skylar's Animal Shelter





9:41



NAME

**Bro**

BREED

**Corgi**

AGE

**7.0 years**

WEIGHT

**25.0 lbs**

GENDER

**Male**

FOSTERED

**Yes**

ATTITUDE

**energetic, loyal**

Skylar's Animal Shelter





9:41



NAME

**Bro**

BREED

**Corgi**

AGE

**7.0 years**

WEIGHT

**25.0 lbs**

GENDER

**Male**

FOSTERED

**Yes**

ATTITUDE

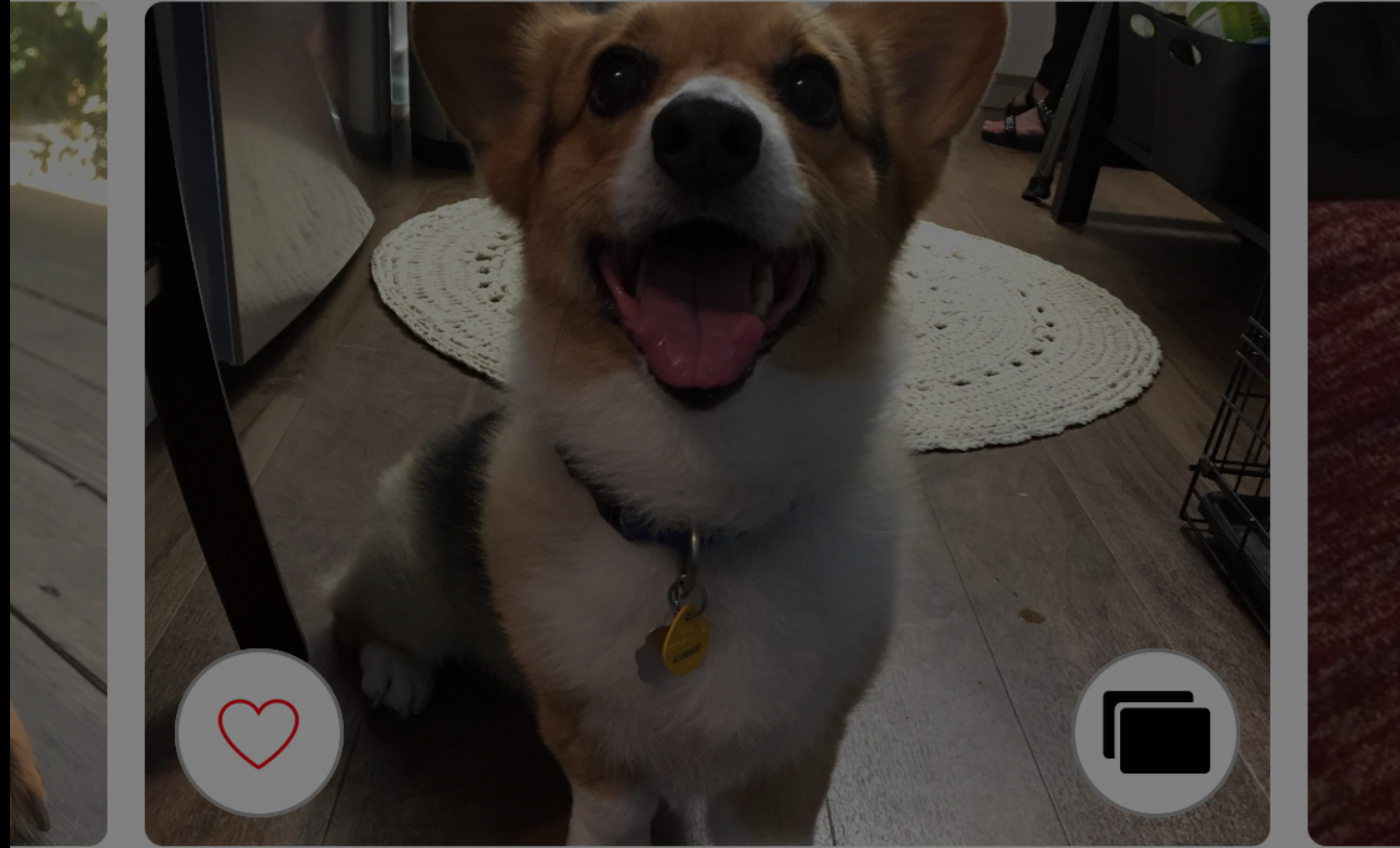
**energetic, loyal**

Skylar's Animal Shelter





9:41



NAME

**Bro**

BREED

**Corgi**

AGE

**7.0 years**

WEIGHT

**25.0 lbs**

GENDER

**Male**

FOSTERED

**Yes**

ATTITUDE

**energetic, loyal**

Skylar's Animal Shelter



Context



Quick navigation

Prioritized



```
// Custom Actions

extension NSObject {
    open var accessibilityCustomActions: [UIAccessibilityCustomAction]?
}

class UIAccessibilityCustomAction : NSObject {
    open var name: String
    open var target: AnyObject?
    open var selector: Selector

    public init(name: String, target: Any?, selector: Selector)
}
}
```

```
// Custom Actions
```

```
extension NSObject {  
    open var accessibilityCustomActions: [UIAccessibilityCustomAction]?  
}
```

```
class UIAccessibilityCustomAction : NSObject {  
    open var name: String  
    open var target: AnyObject?  
    open var selector: Selector  
  
    public init(name: String, target: Any?, selector: Selector)  
}
```



```
// Custom Actions
```

```
extension NSObject {  
    open var accessibilityCustomActions: [UIAccessibilityCustomAction]?  
}
```

```
class UIAccessibilityCustomAction : NSObject {  
    open var name: String  
    open var target: AnyObject?  
    open var selector: Selector  
  
    public init(name: String, target: Any?, selector: Selector)  
}
```

```
// Custom Actions

extension NSObject {
    open var accessibilityCustomActions: [UIAccessibilityCustomAction]?
}

class UIAccessibilityCustomAction : NSObject {
    open var name: String
    open var target: AnyObject?
    open var selector: Selector

    public init(name: String, target: Any?, selector: Selector)
}
}
```



9:41



NAME

**Bro**

BREED

**Corgi**

AGE

**7.0 years**

WEIGHT

**25.0 lbs**

GENDER

**Male**

FOSTERED

**Yes**

ATTITUDE

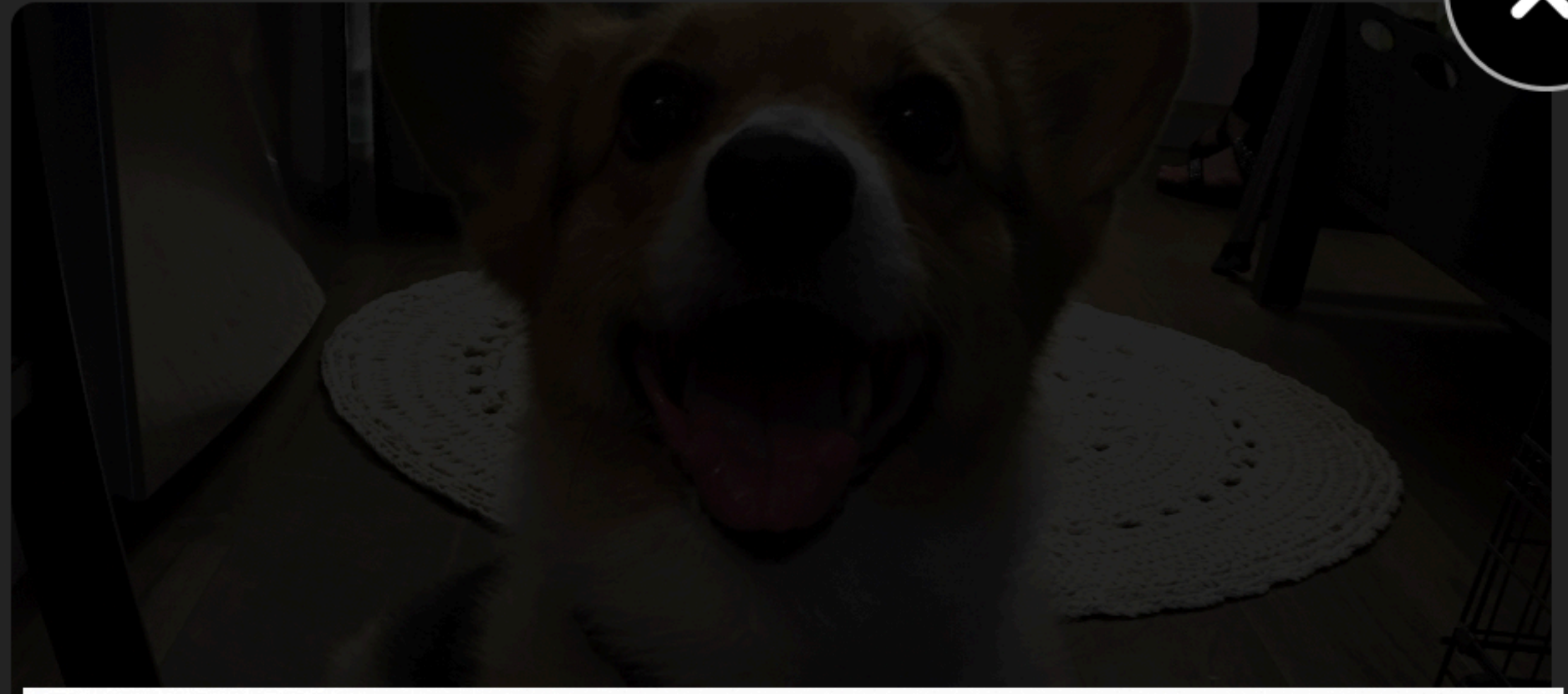
**energetic, loyal**

Skylar's Animal Shelter





9:41



Skylar's Animal Shelter





Where am I?

```
// Modality
```

```
extension UIView {
```

```
    open var accessibilityViewIsModal: Bool
```

```
}
```



```
// Modality
```

```
extension UIView {  
    open var accessibilityViewIsModal: Bool  
}
```

```
// Screen Change
```

```
extension UIAccessibility {  
    public static func post(notification: UIAccessibility.Notification, argument: Any?)  
}
```

```
extension UIAccessibility.Notification {  
    public static var screenChanged: UIAccessibility.Notification  
}
```



```
// Screen Change
```

```
extension UIAccessibility {  
    public static func post(notification: UIAccessibility.Notification, argument: Any?)  
}
```

```
extension UIAccessibility.Notification {  
    public static var screenChanged: UIAccessibility.Notification  
}
```

```
// Screen Change
```

```
extension UIAccessibility {  
    public static func post(notification: UIAccessibility.Notification, argument: Any?)  
}
```

```
extension UIAccessibility.Notification {  
    public static var screenChanged: UIAccessibility.Notification  
}
```



***Demo***

Developing an exceptional experience

Bhavya Garg, Software Engineer

usable



exceptional

# Summary



# Summary

Design your app for accessibility from the beginning

# Summary

Design your app for accessibility from the beginning

Tweak based on enabled settings when necessary



# Summary

Design your app for accessibility from the beginning

Tweak based on enabled settings when necessary

Craft the accessibility experience purposefully

# More Information

<https://developer.apple.com/wwdc18/230>



 **WWDC18**