App Frameworks #WWDC16

What's New in UICollectionView in iOS 10

Session 219

Steve Breen UIKit Frameworks Engineer
Peter Hajas UIKit Frameworks Engineer

Overview

Overview

Smooth scrolling

Overview

Smooth scrolling

Improvements to self-sizing cells

Overview

Smooth scrolling

Improvements to self-sizing cells

Interactive reordering

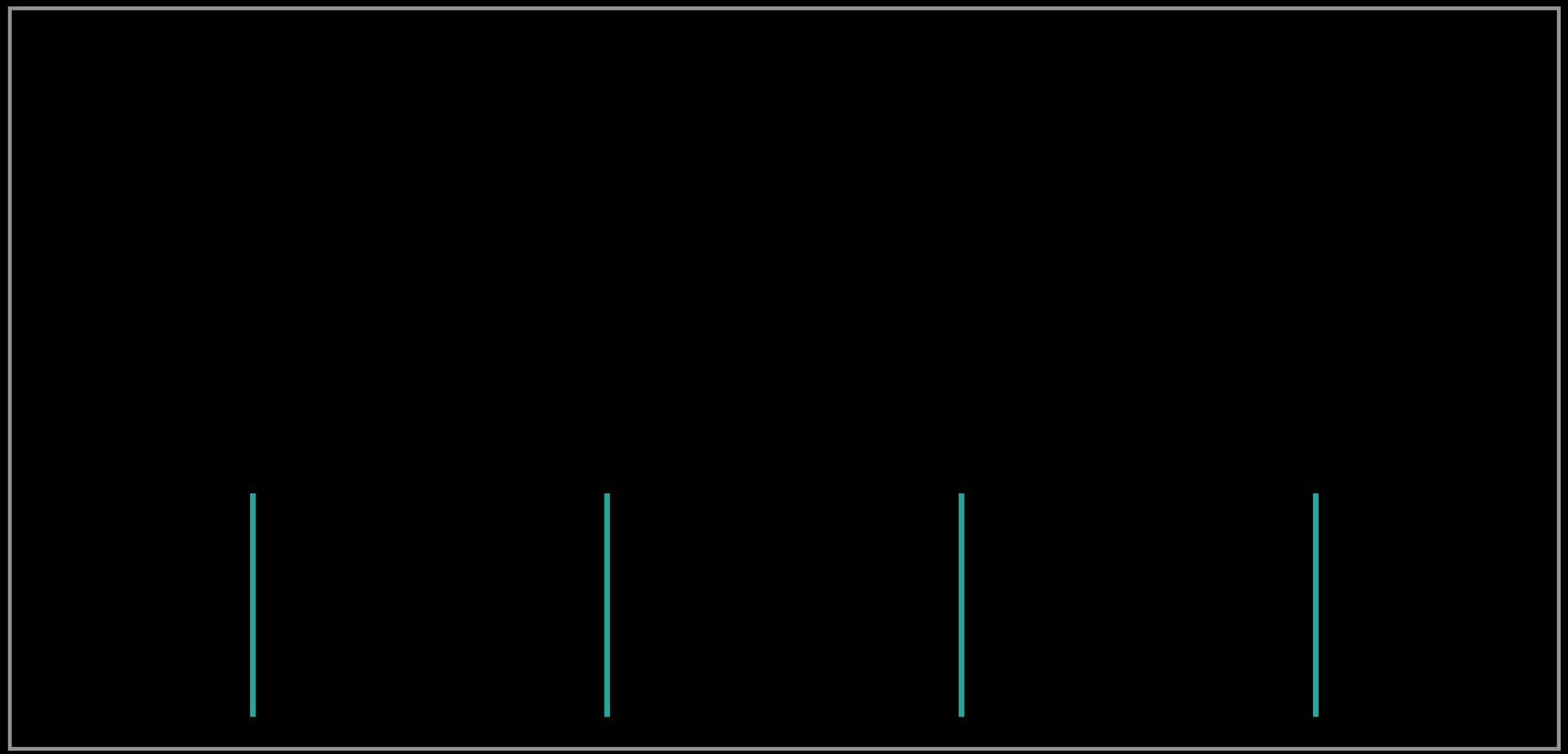
Smooth Scrolling

Combating choppy scrolling in your app

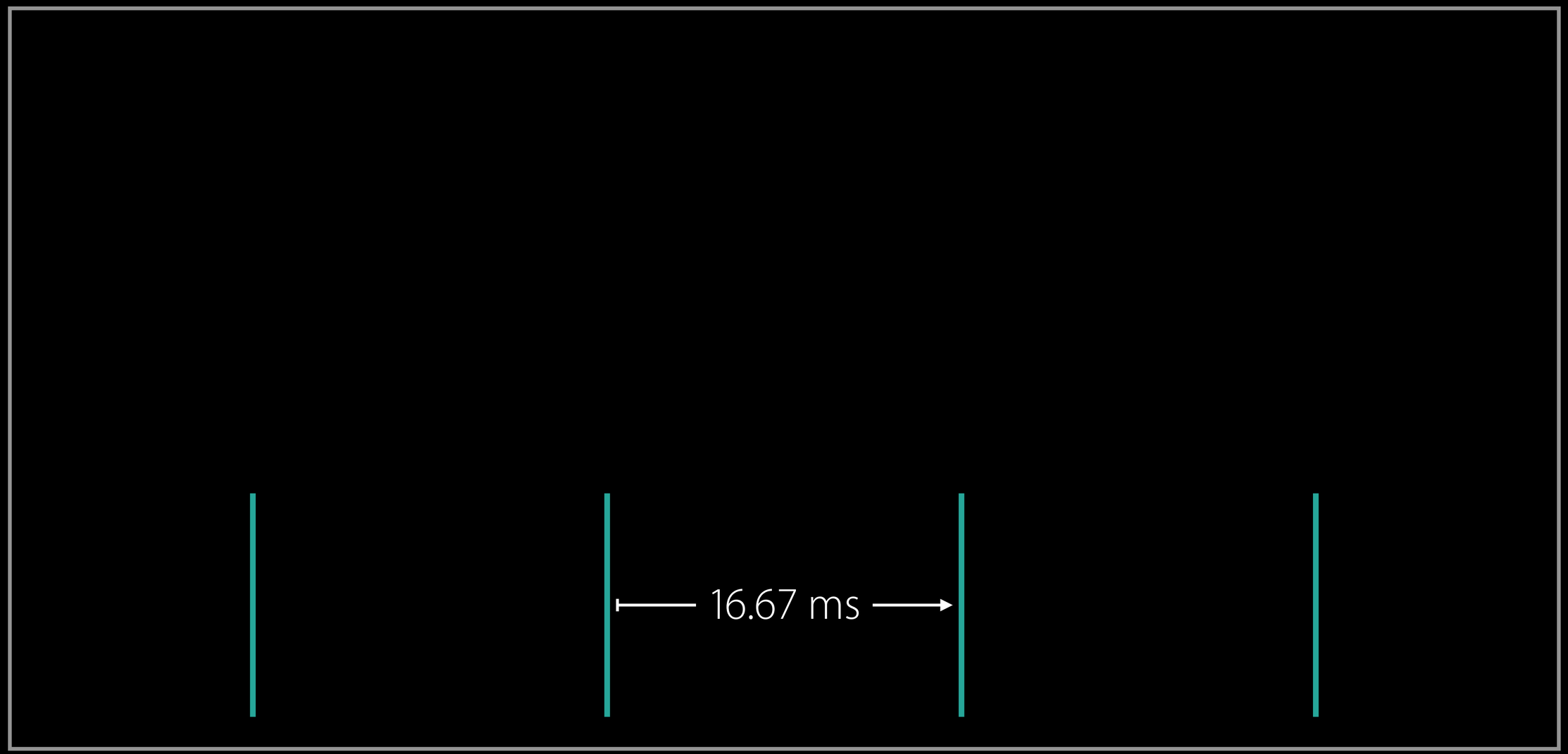
Demo

Scrolling like butter^W chunky peanut butter

Anatomy of a Dropped Frame



Anatomy of a Dropped Frame



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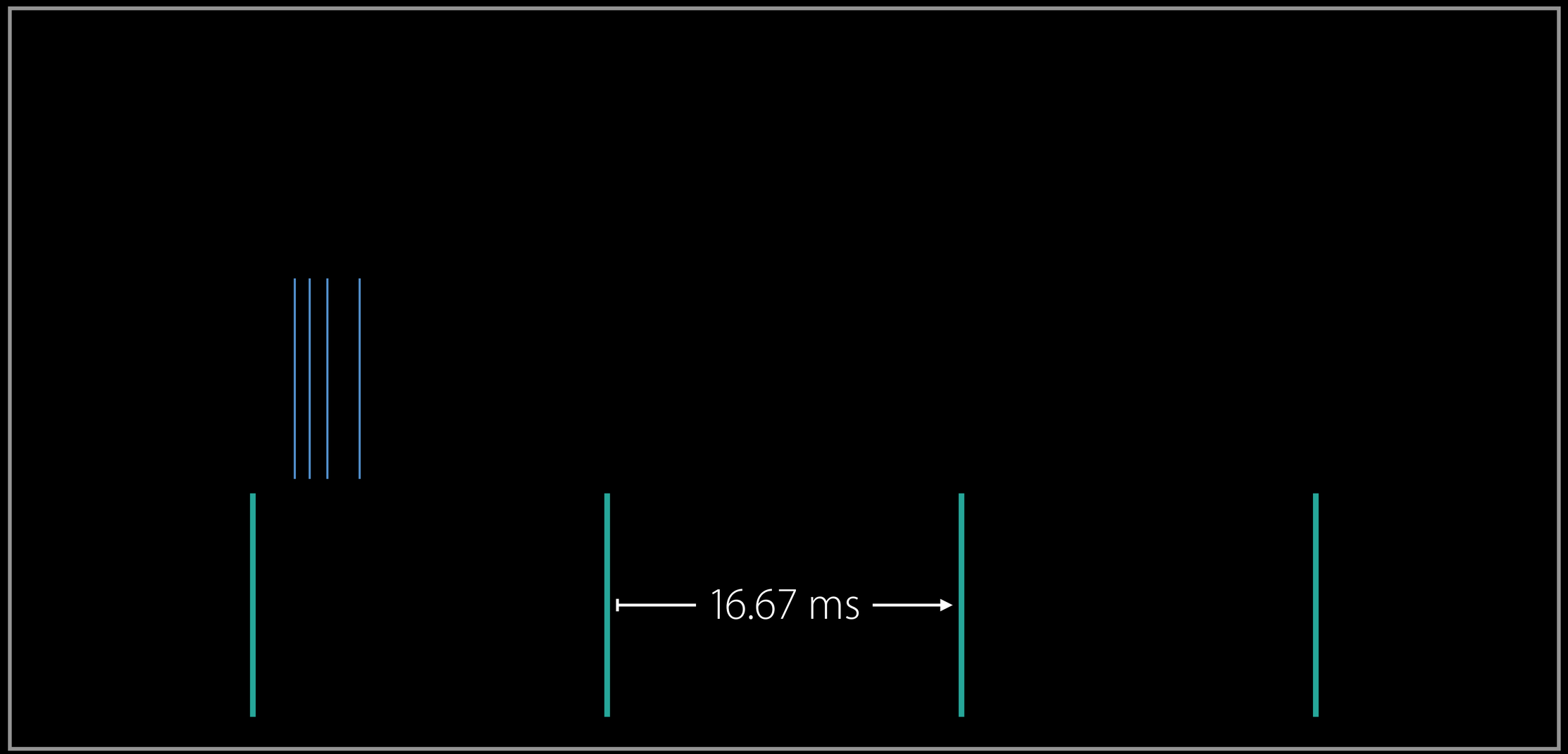

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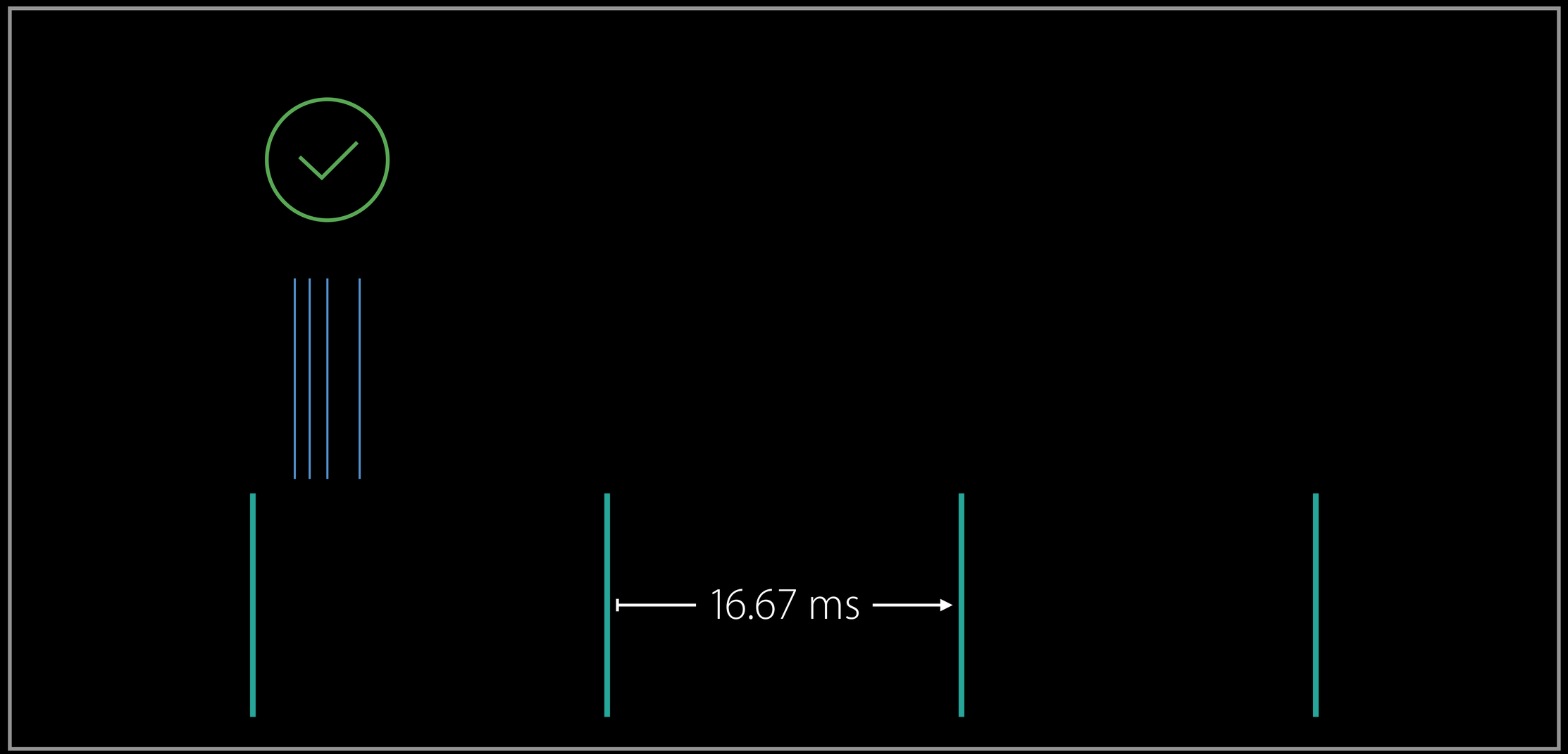
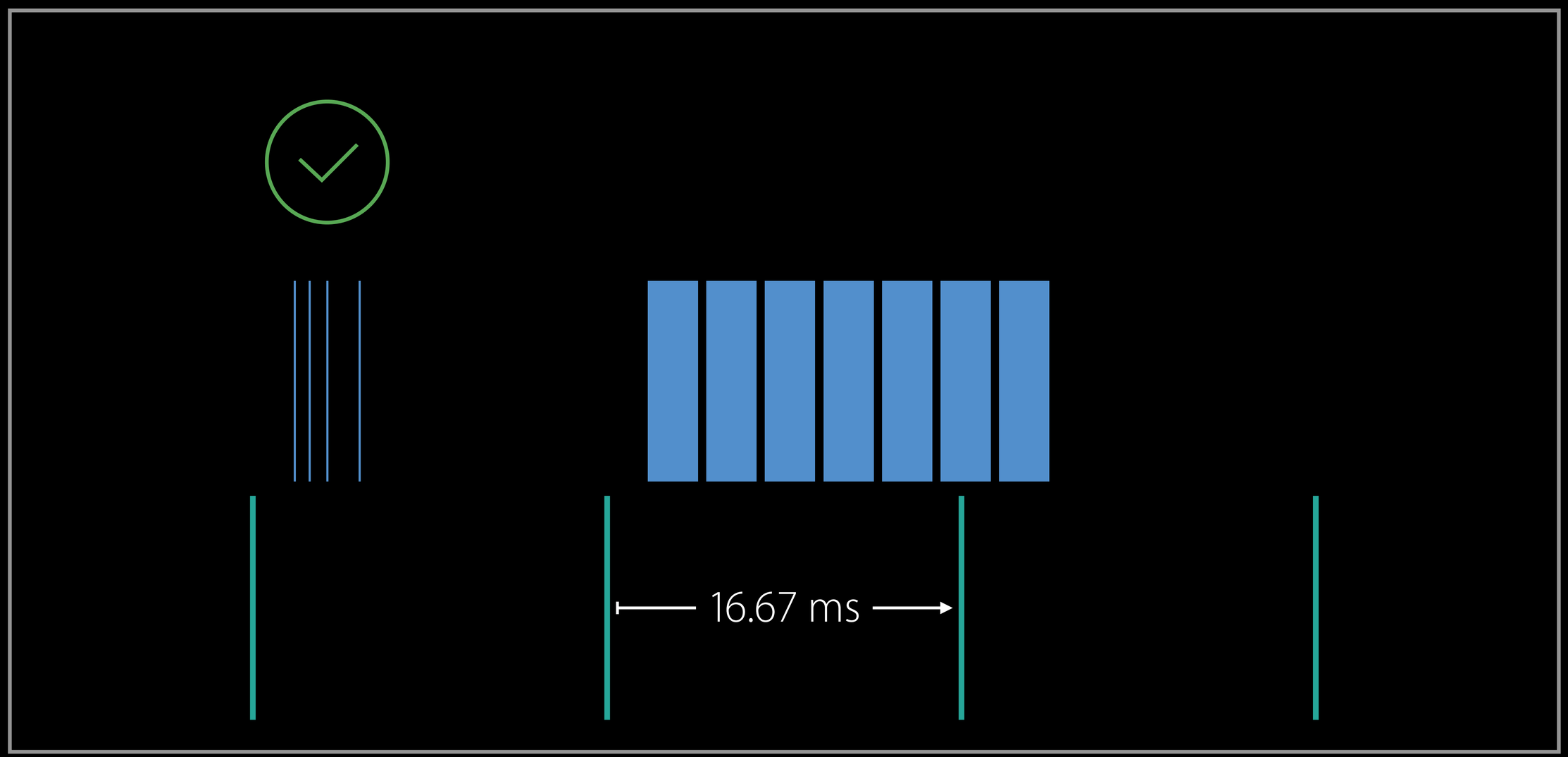
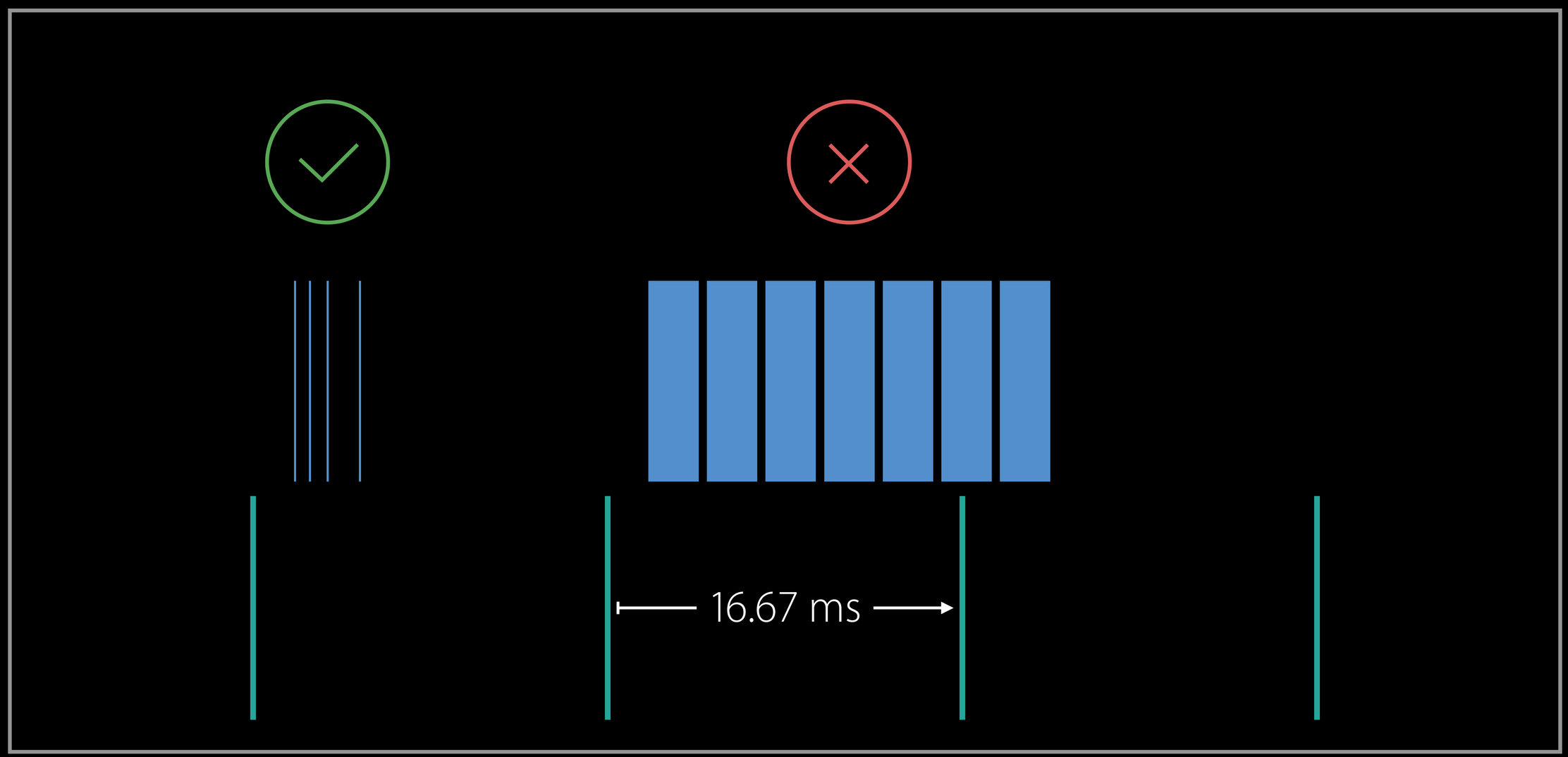


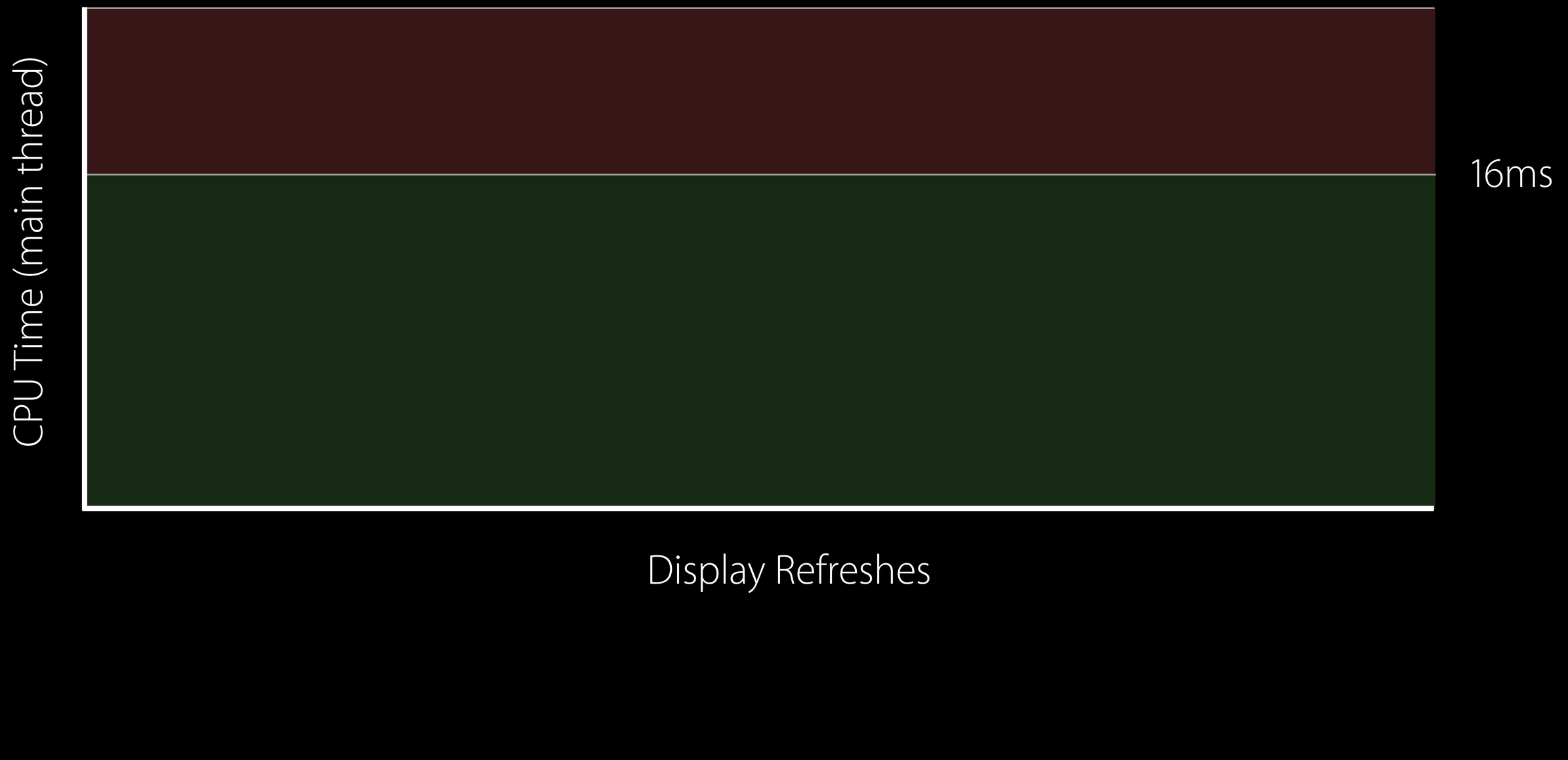
Anatomy of a Dropped Frame



Anatomy of a Dropped Frame




16ms


CPU Time (main thread)
16ms
Display Refreshes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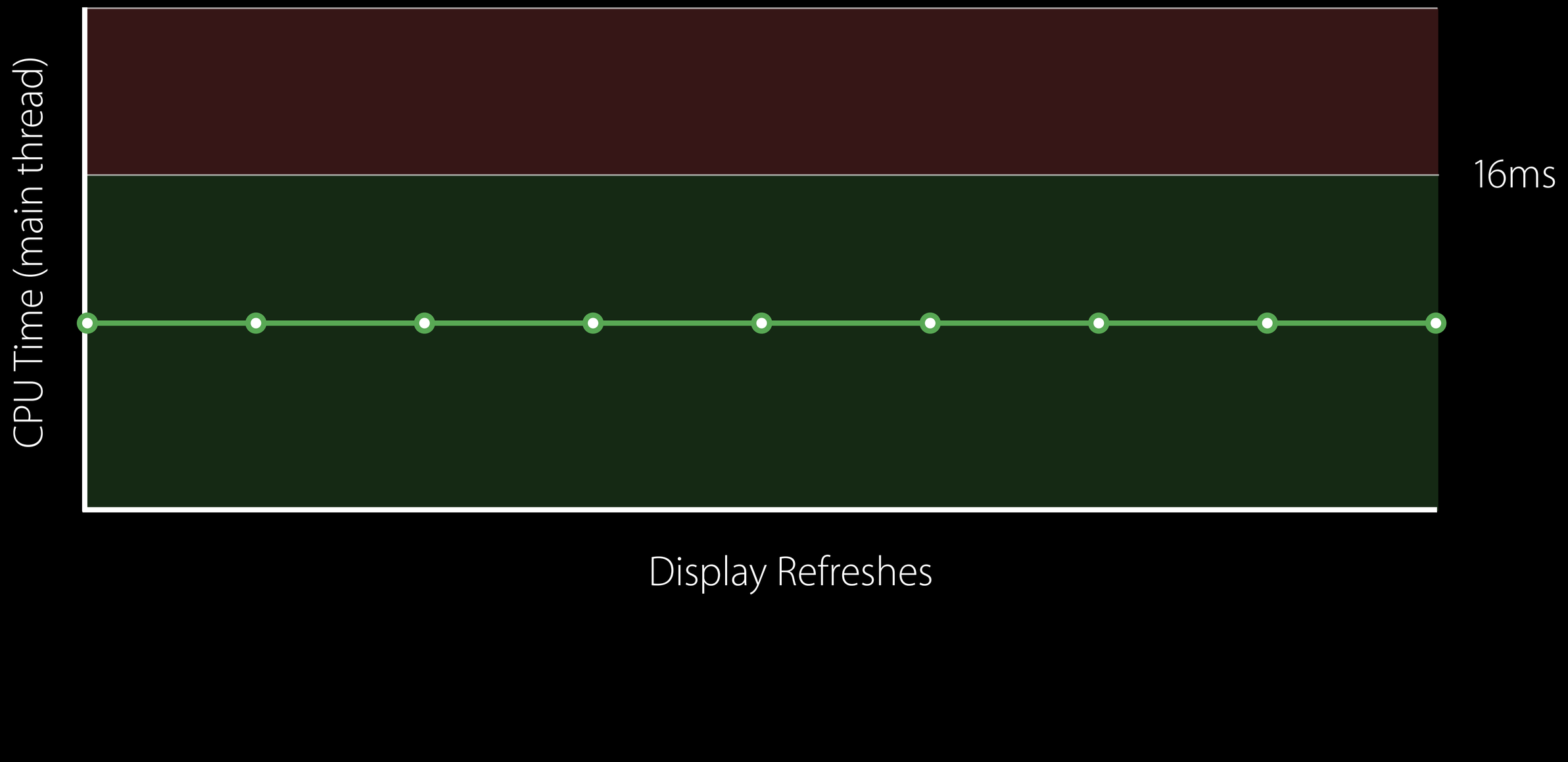
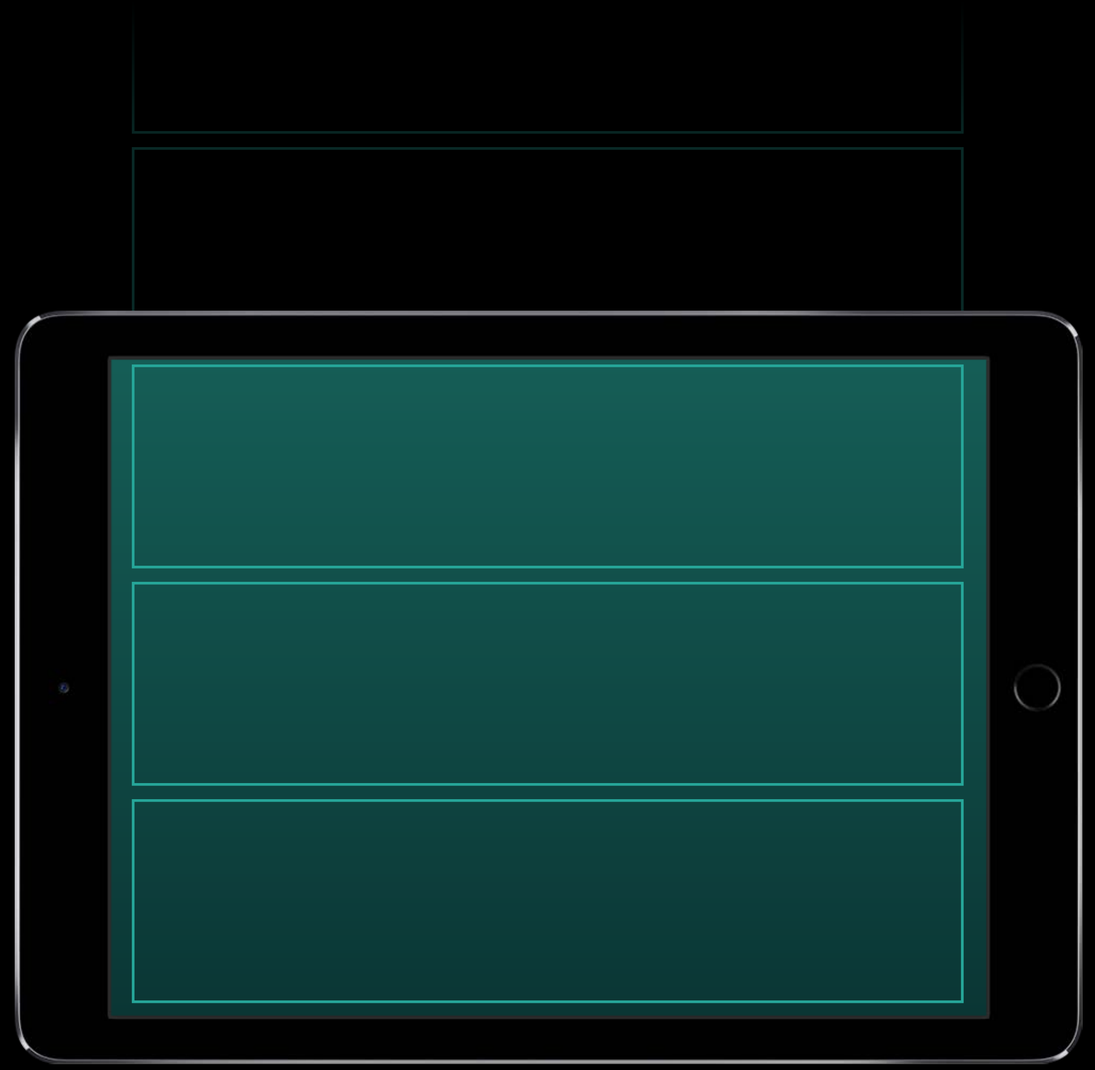

CPU Time (main thread)
16ms
Display Refreshes

Life Cycle of a Cell

iOS 9

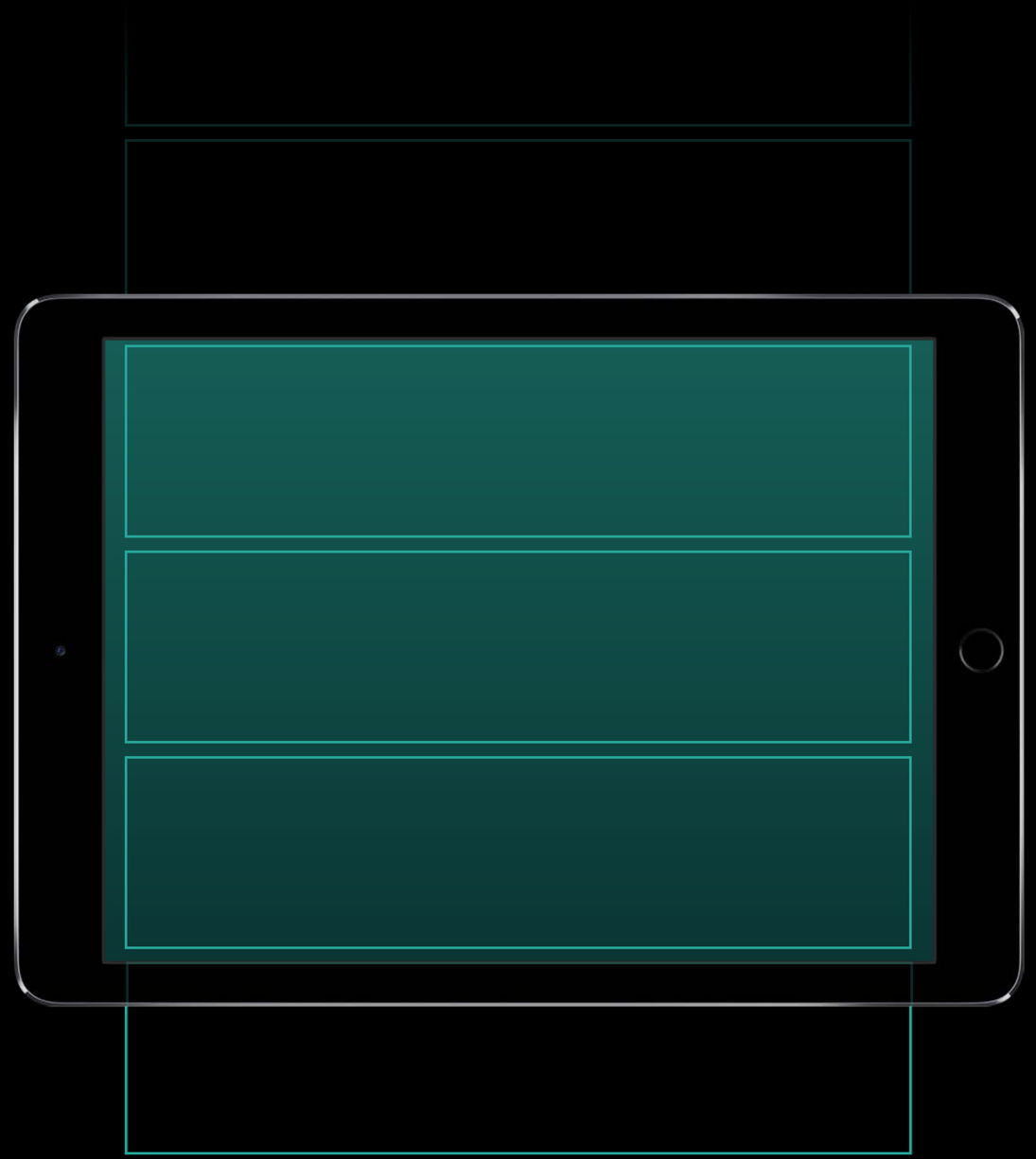
Life Cycle of a Cell

iOS 9



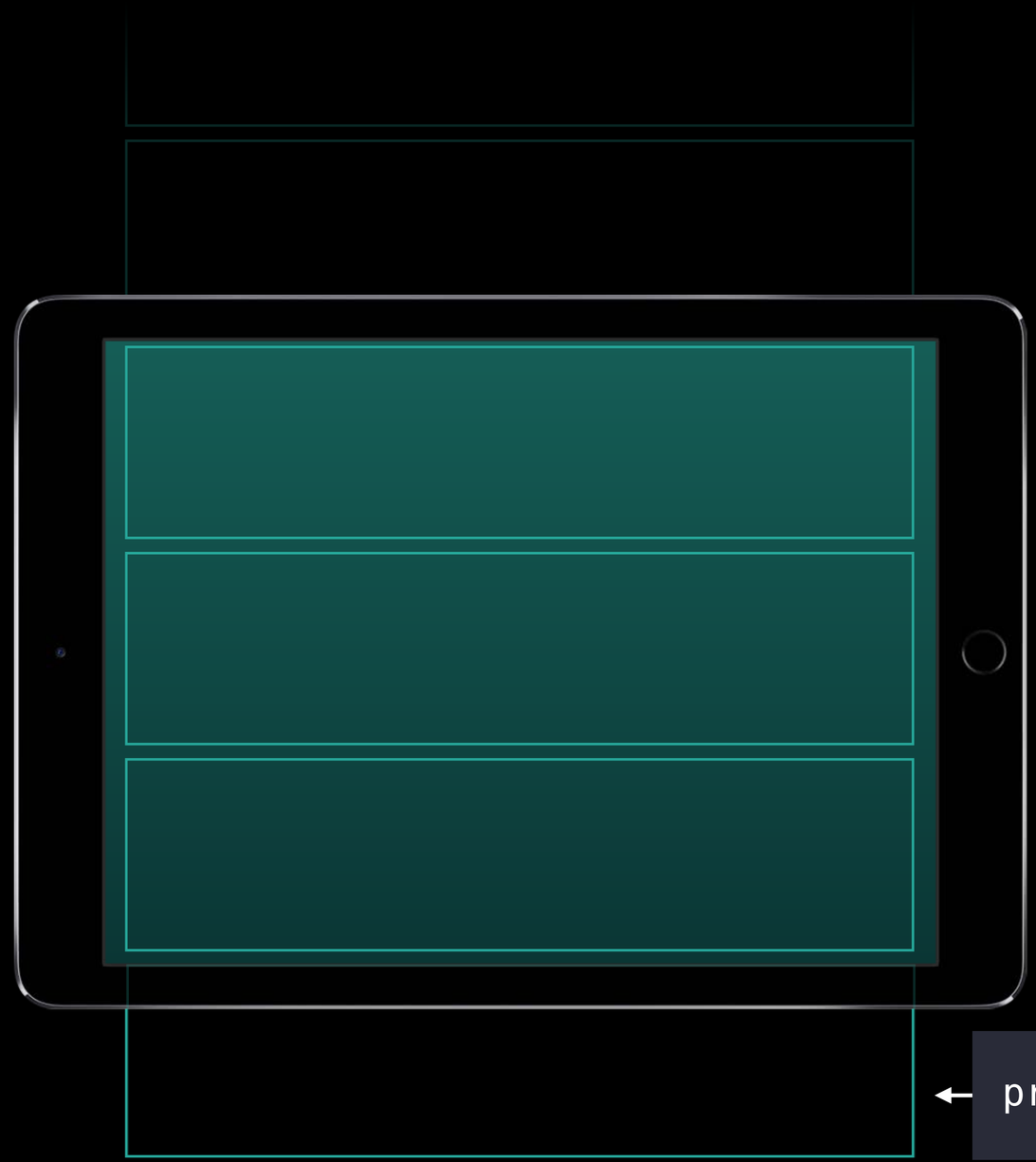
Life Cycle of a Cell

iOS 9



Life Cycle of a Cell

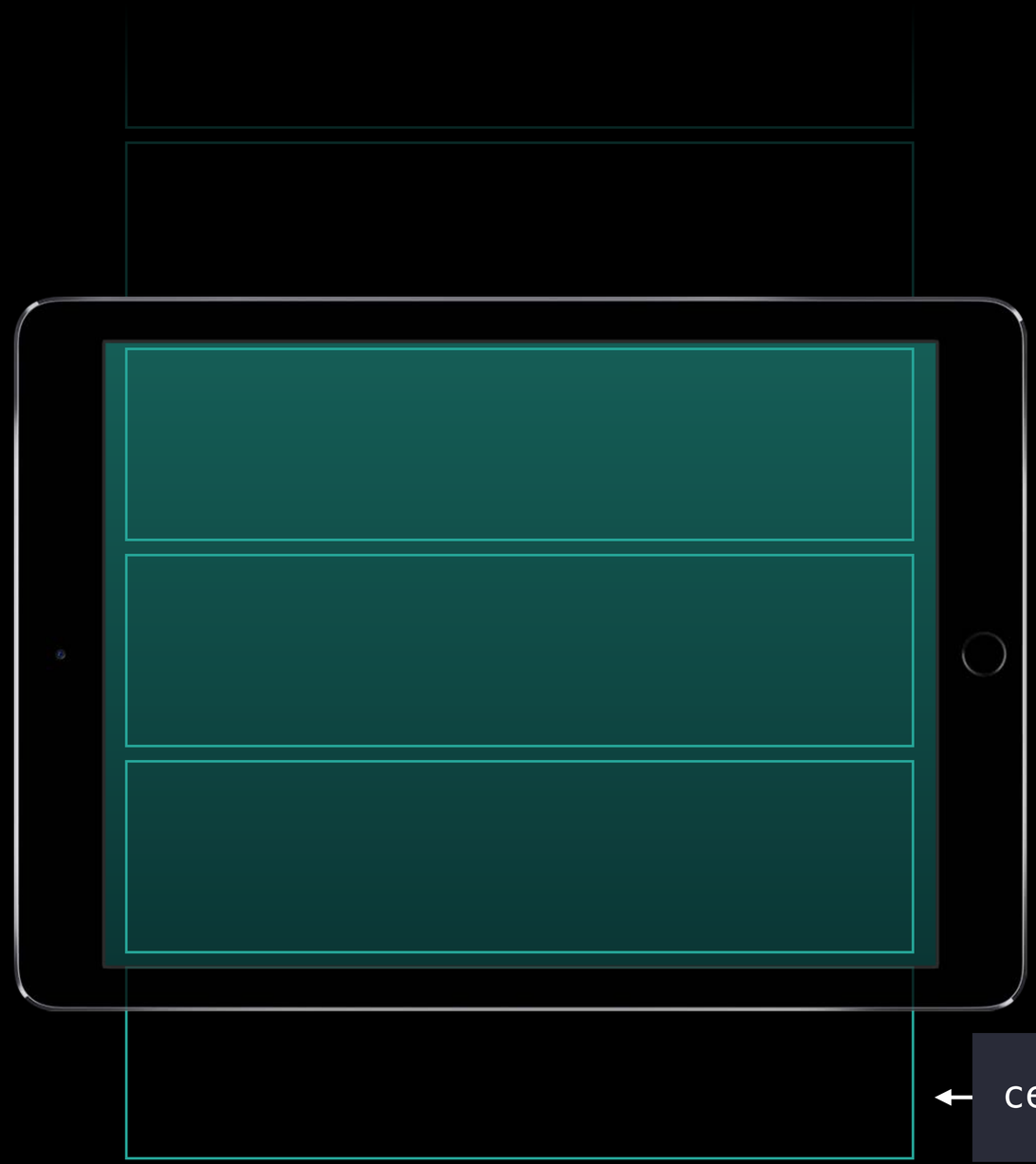
iOS 9



prepareForReuse

Life Cycle of a Cell

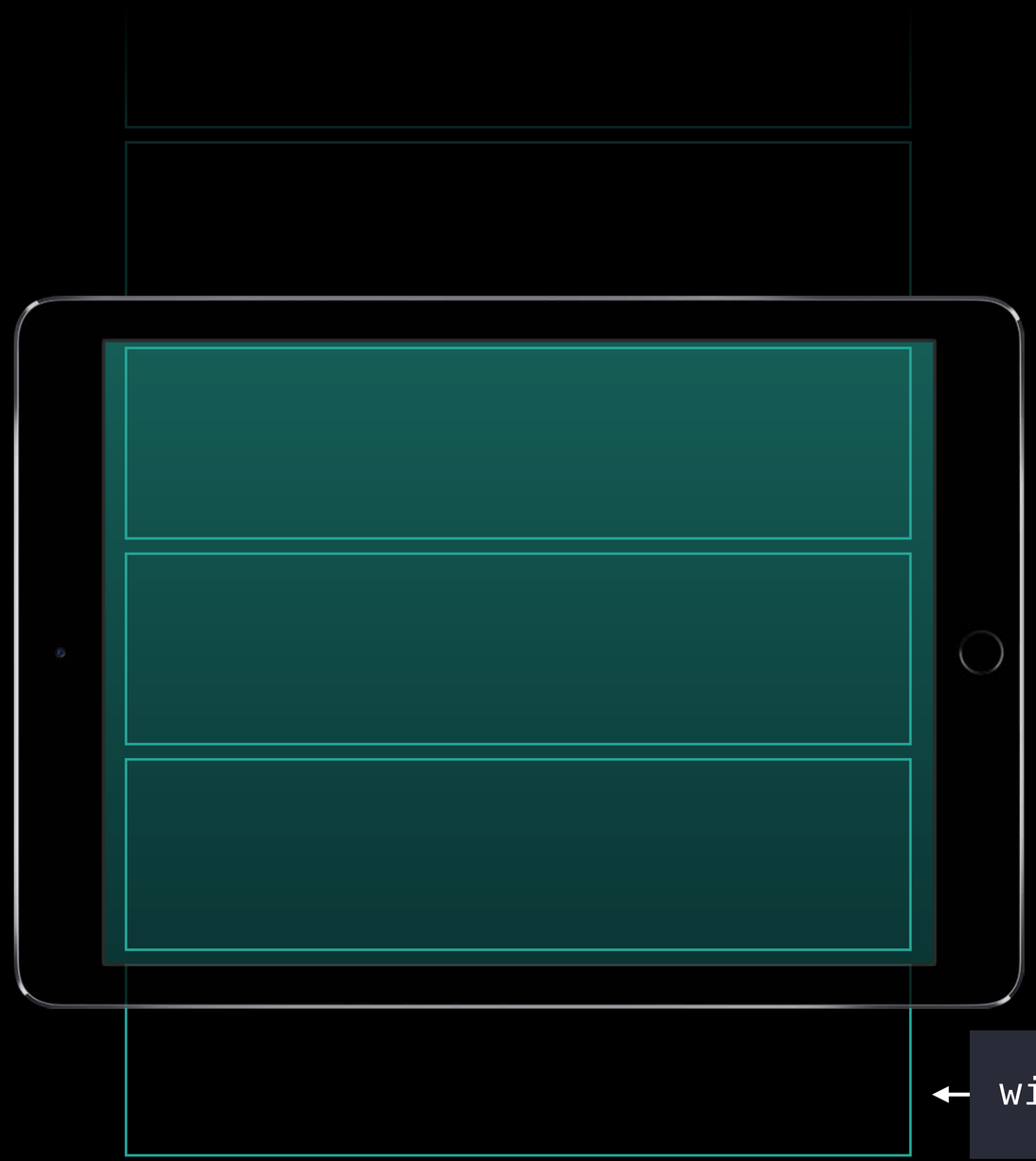
iOS 9



```
cellForItemAtIndexPath
```

Life Cycle of a Cell

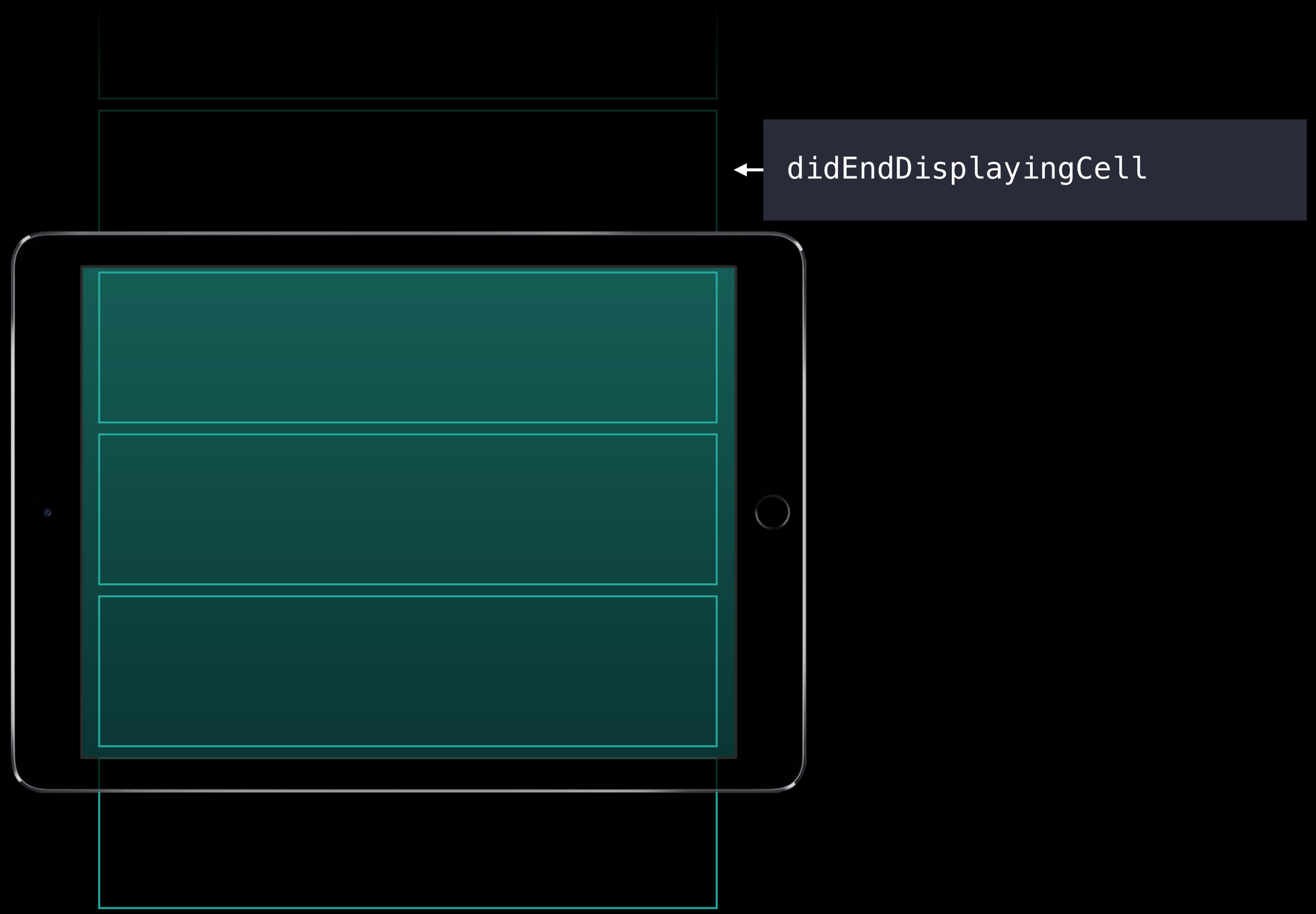
iOS 9



willDisplayCell

Life Cycle of a Cell

iOS 9



Life Cycle of a Cell

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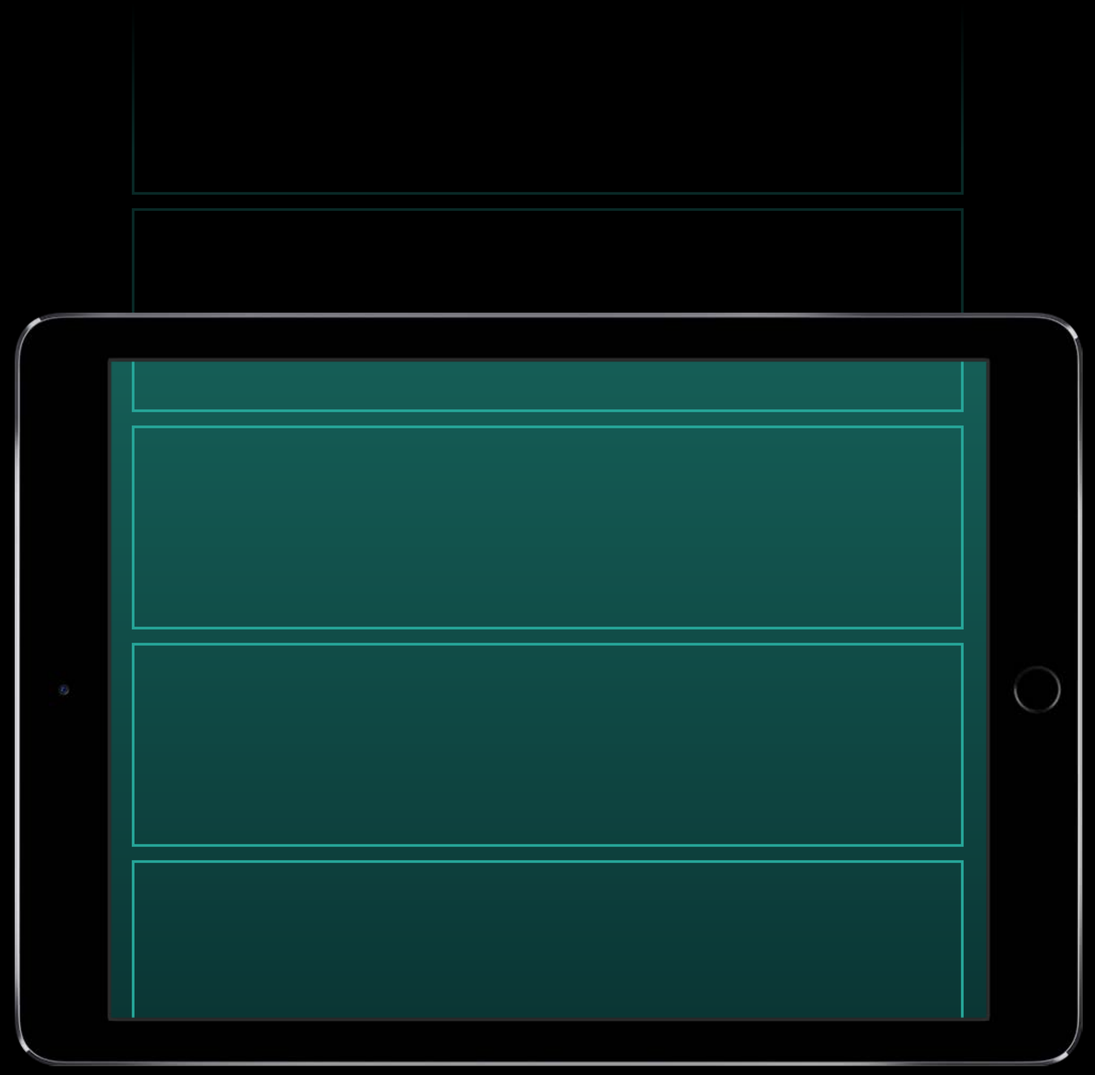
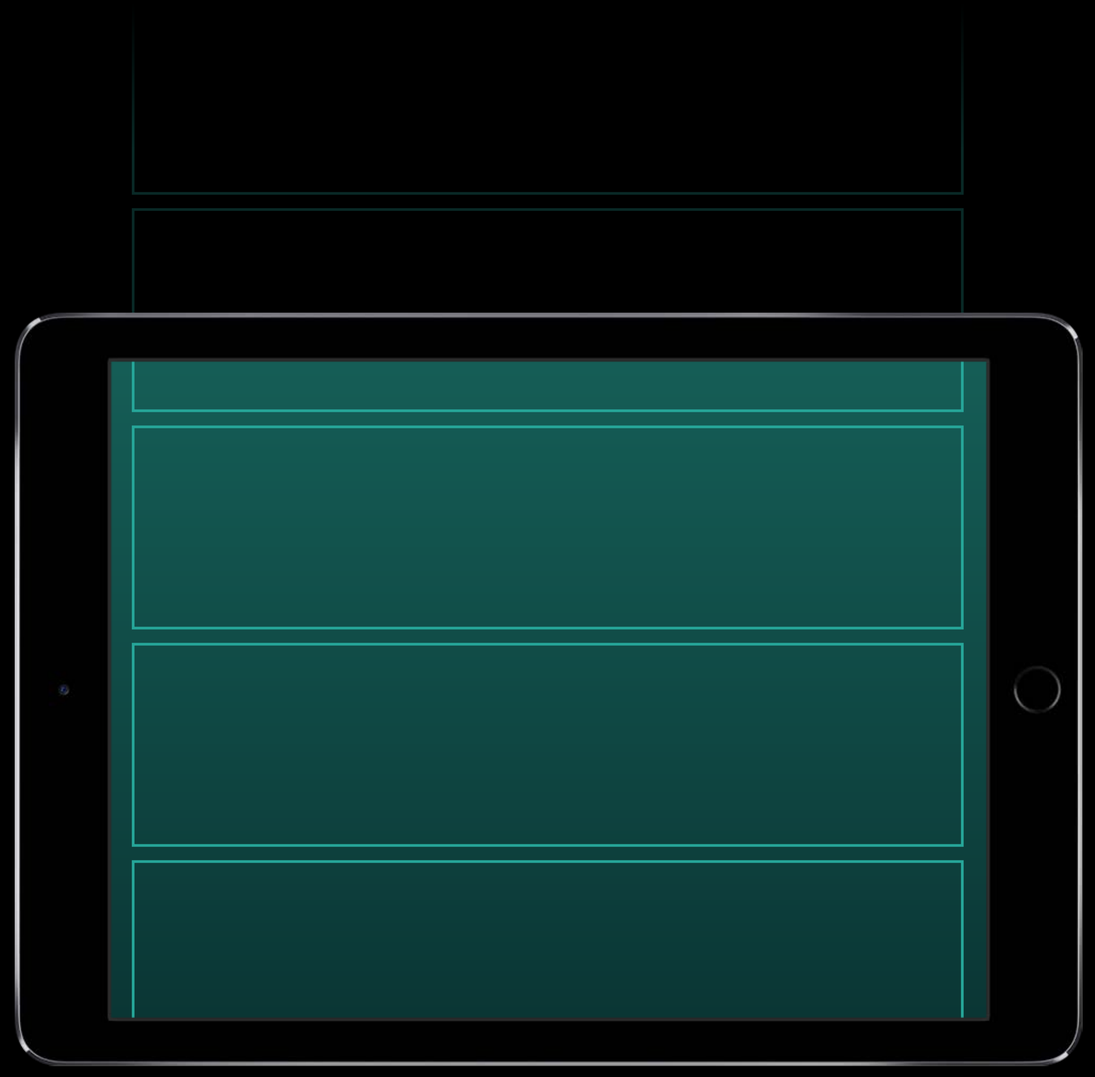


Life Cycle of a Cell

iOS 10

NEW



Life Cycle of a Cell

iOS 10

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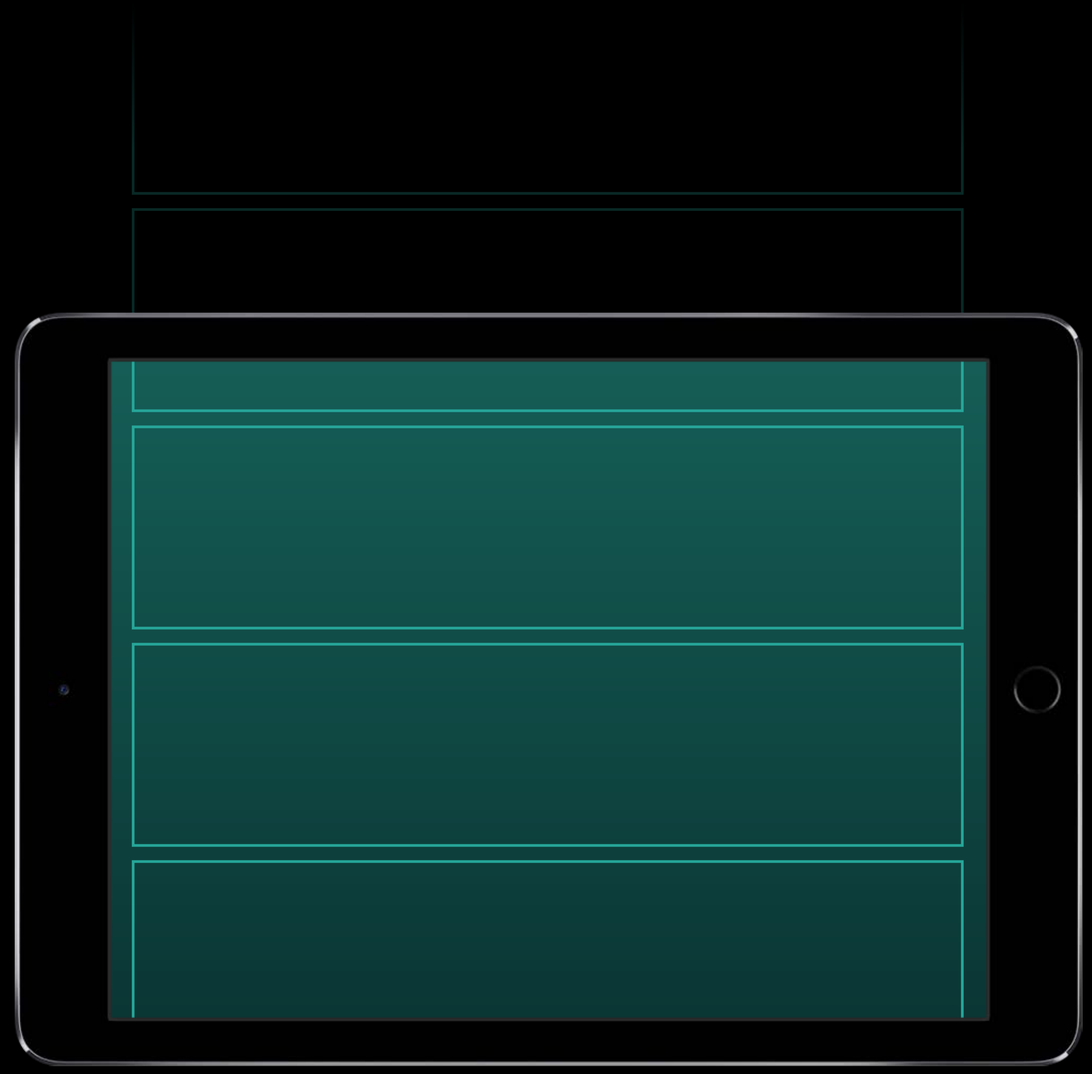
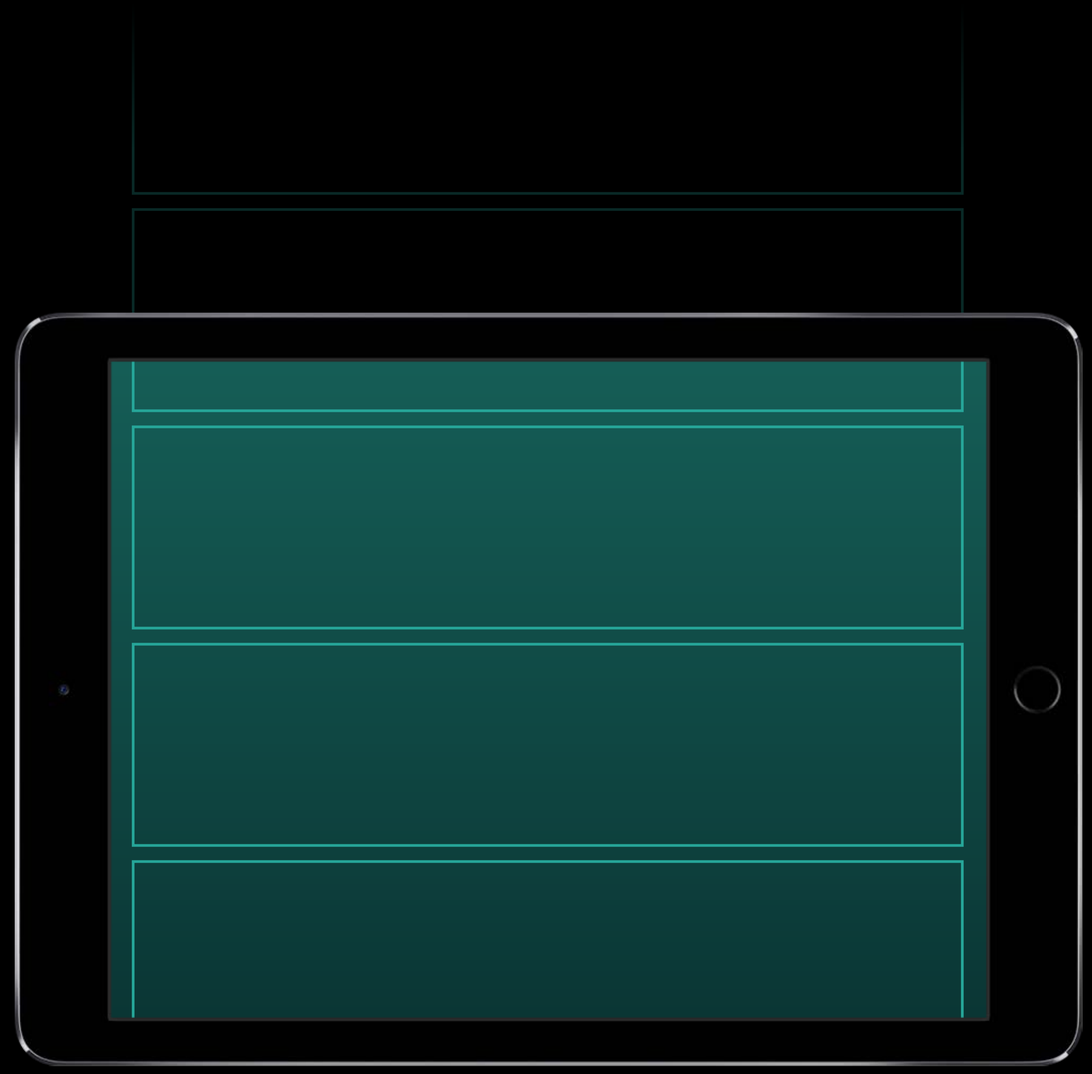


prepareForReuse

Life Cycle of a Cell

iOS 10

NEW

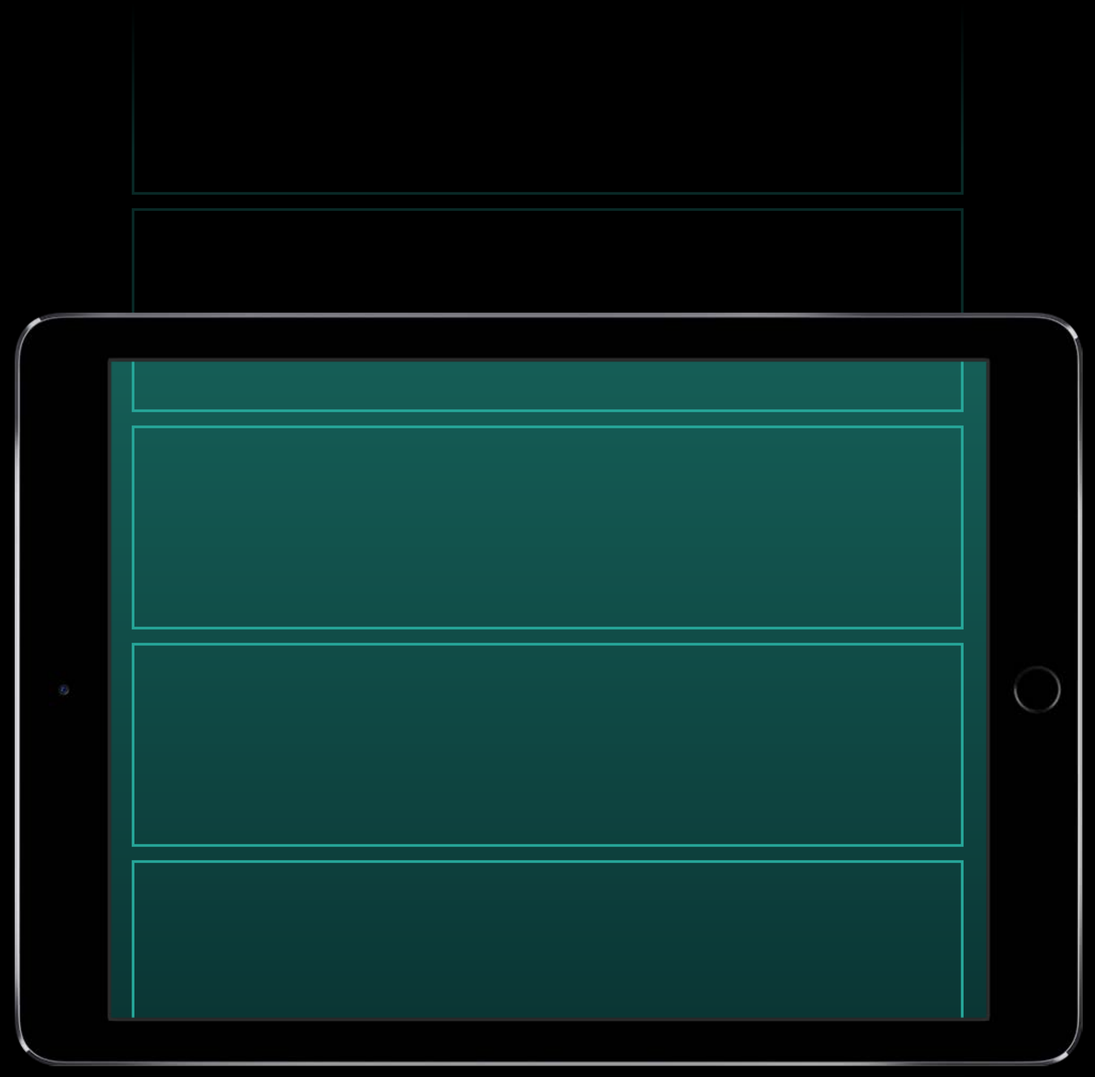


cellForItemAtIndexPath

Life Cycle of a Cell

iOS 10

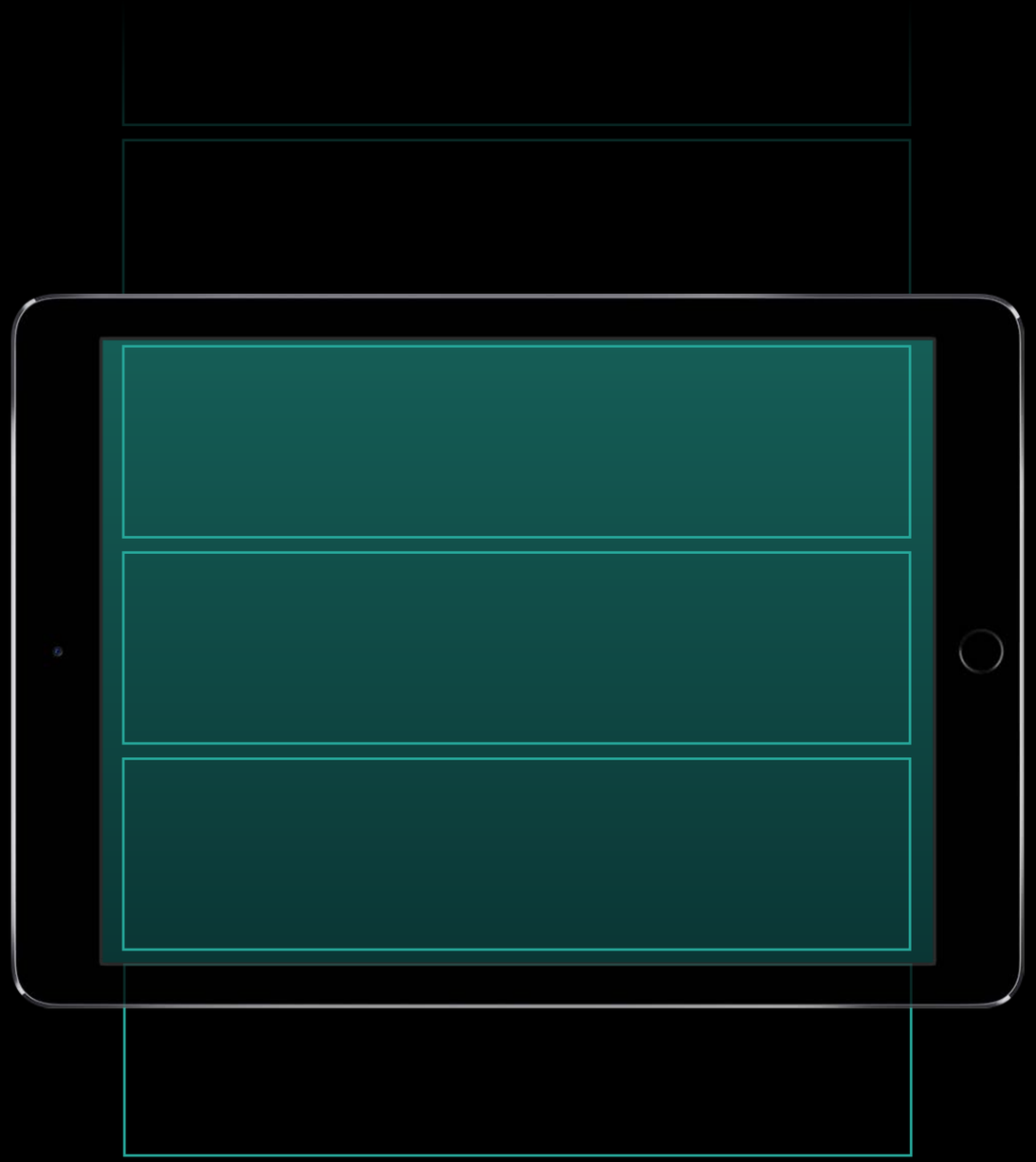
NEW



Life Cycle of a Cell

iOS 10

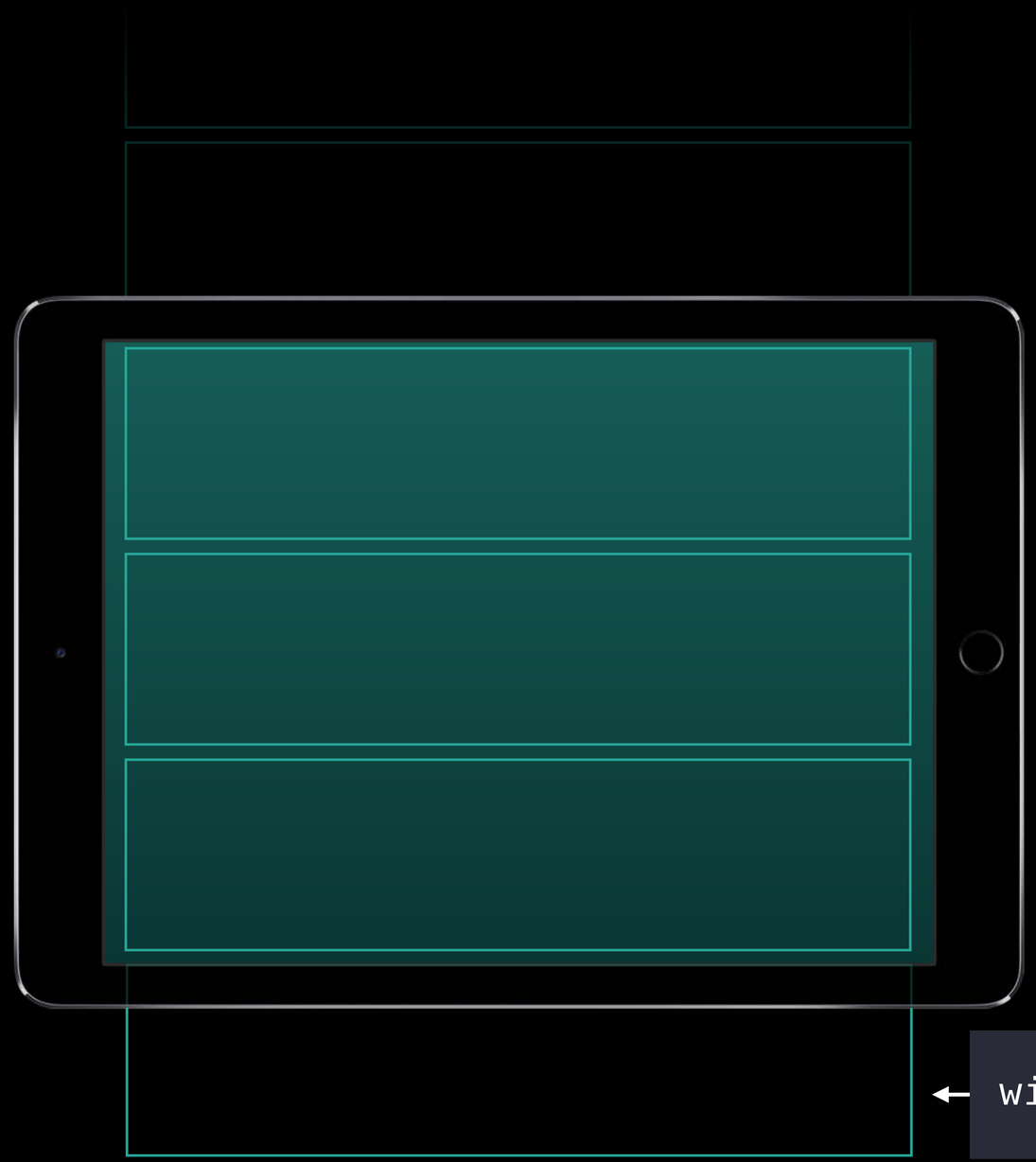
NEW



Life Cycle of a Cell

iOS 10

NEW

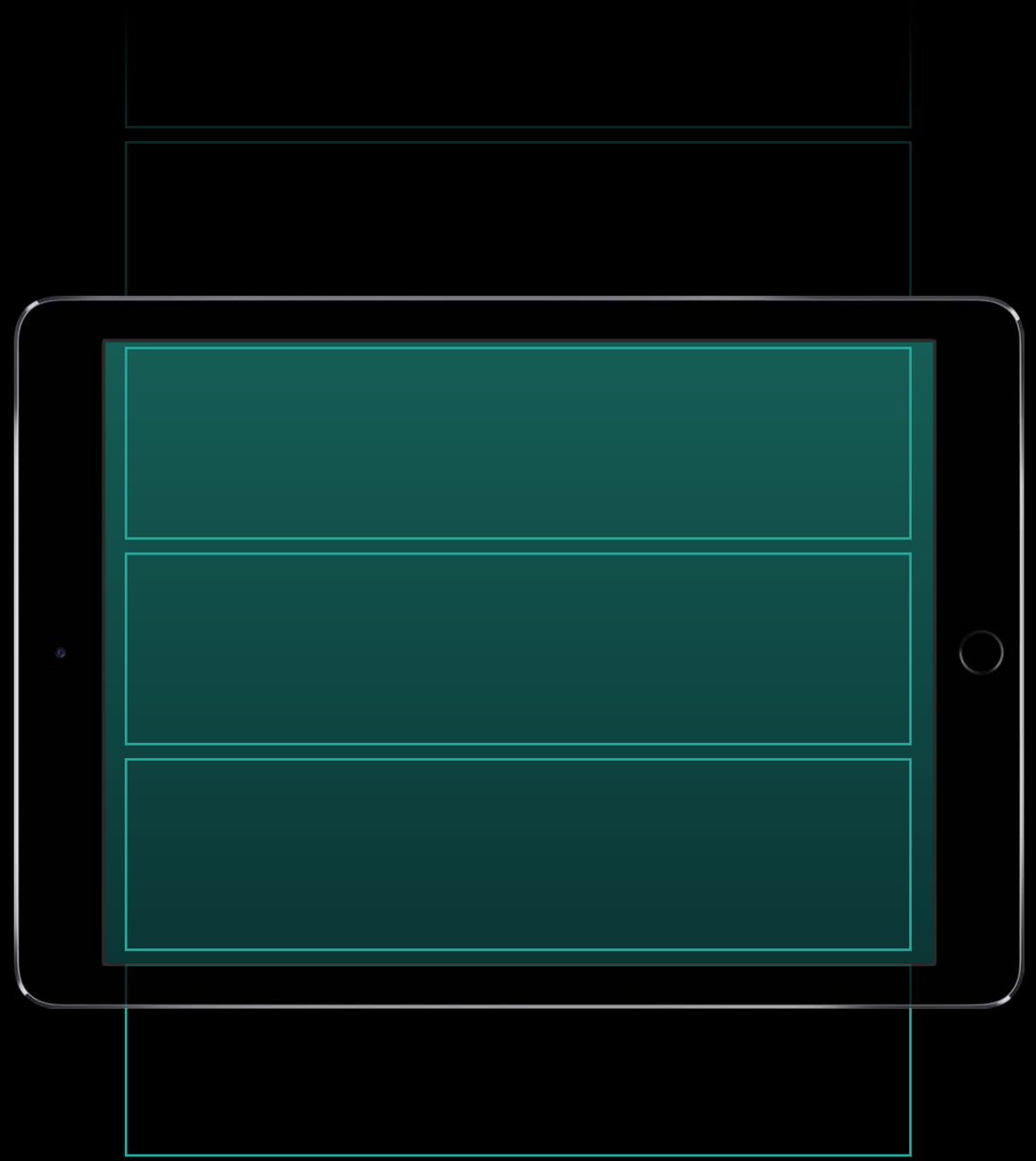


willDisplayCell

Life Cycle of a Cell

iOS 10

NEW



Life Cycle of a Cell

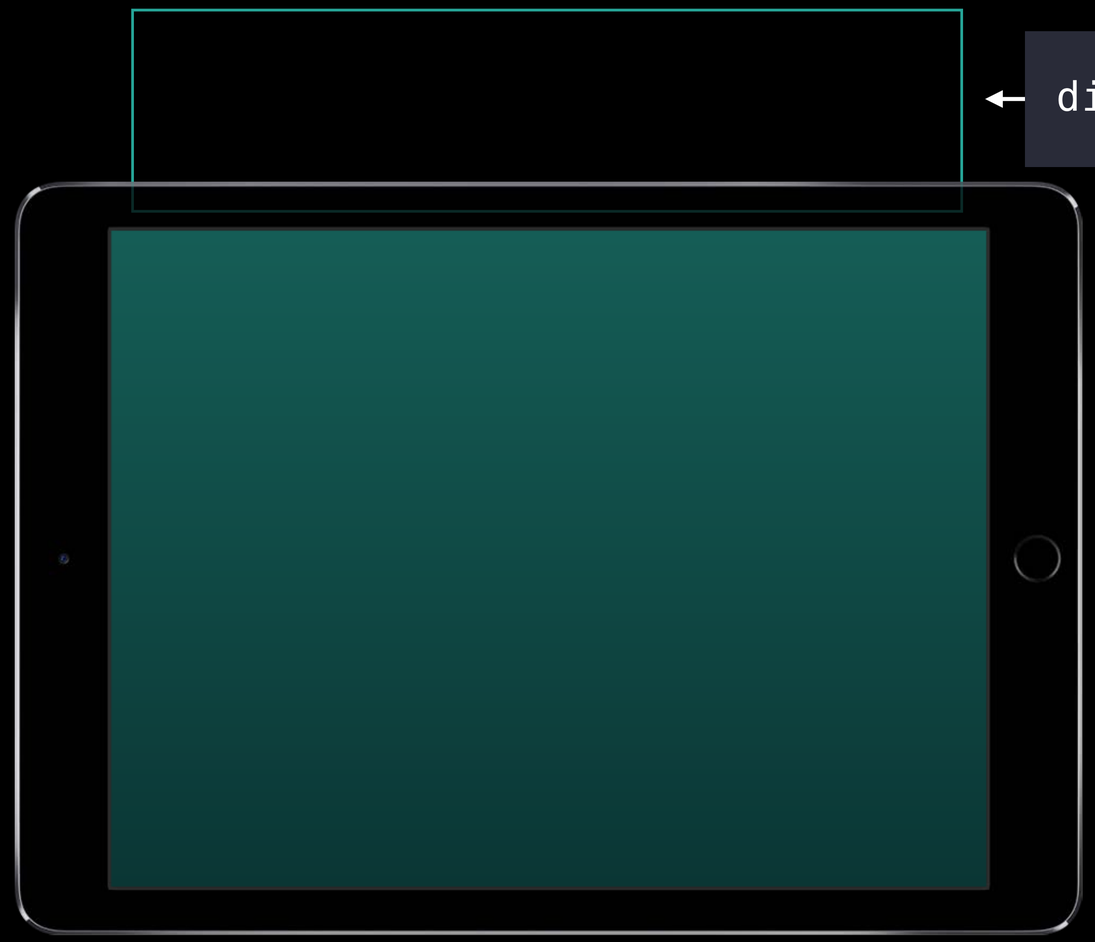
iOS 10

NEW

Life Cycle of a Cell

iOS 10

NEW



```
didEndDisplayingCell
```

Life Cycle of a Cell

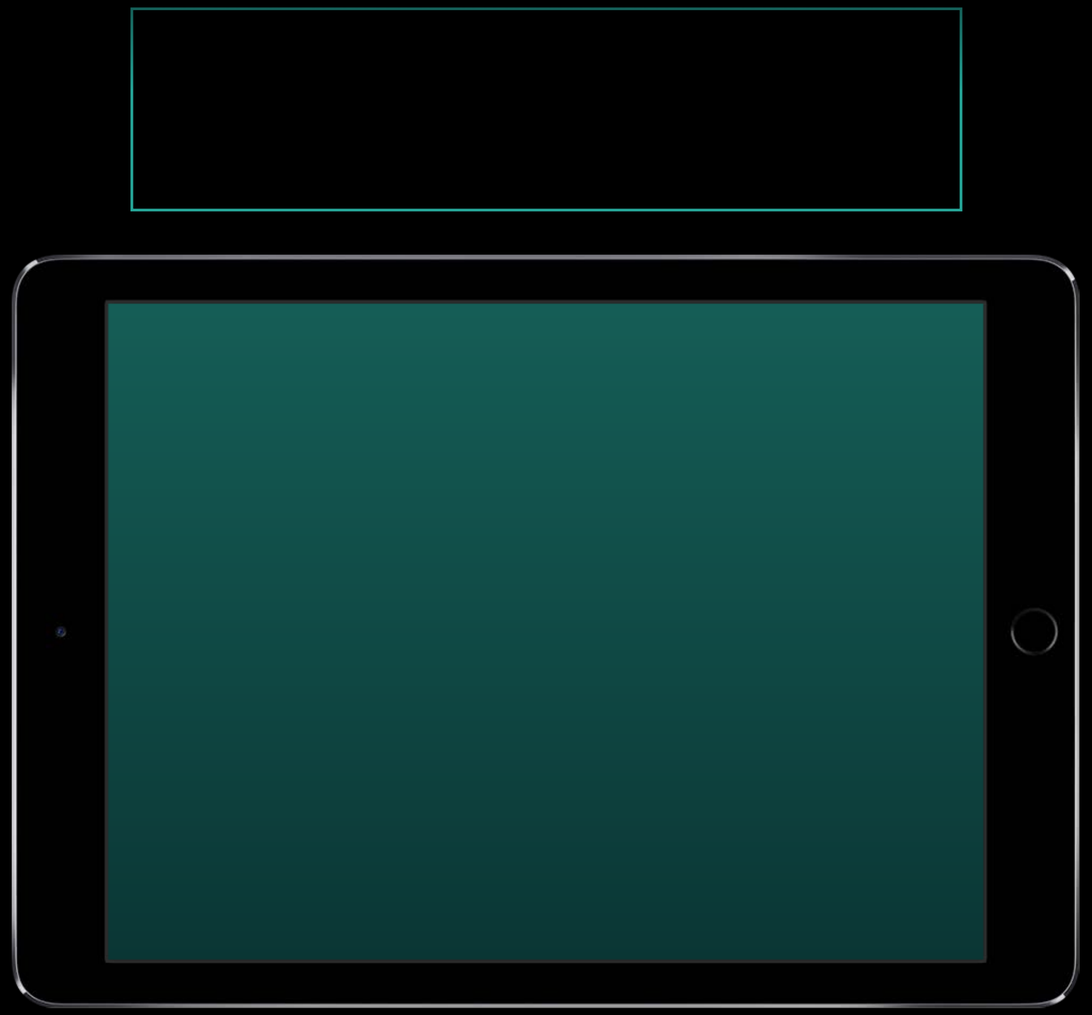
iOS 10

NEW

Life Cycle of a Cell

iOS 10

NEW



Life Cycle of a Cell

iOS 10

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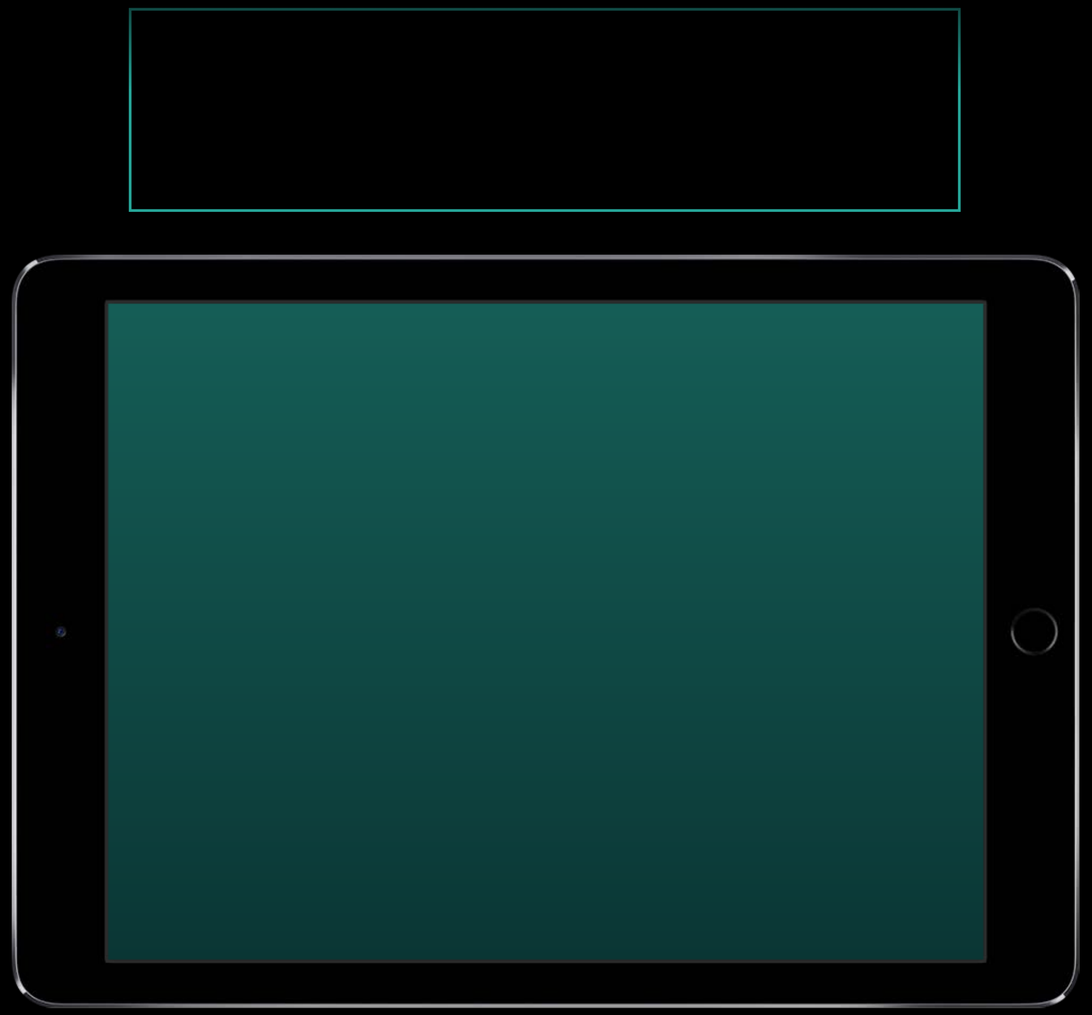

Life Cycle of a Cell

iOS 10

NEW

Life Cycle of a Cell

iOS 10

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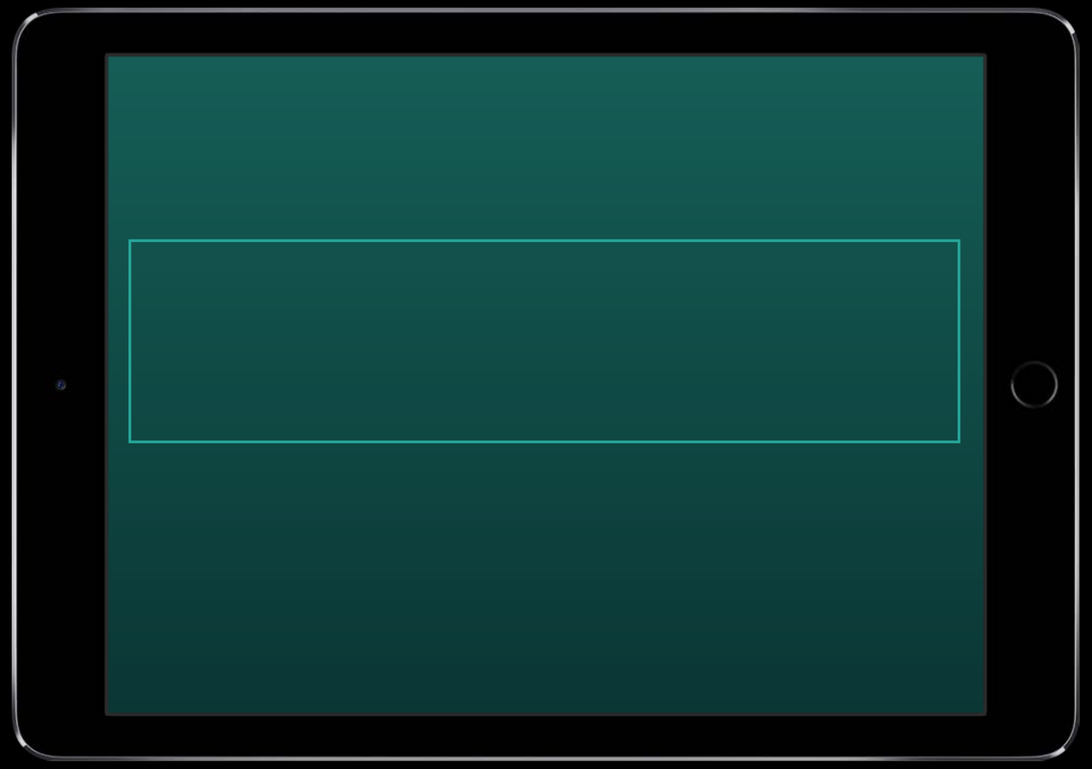
Life Cycle of a Cell

iOS 10

NEW



Life Cycle of a Cell

iOS 10

NEW

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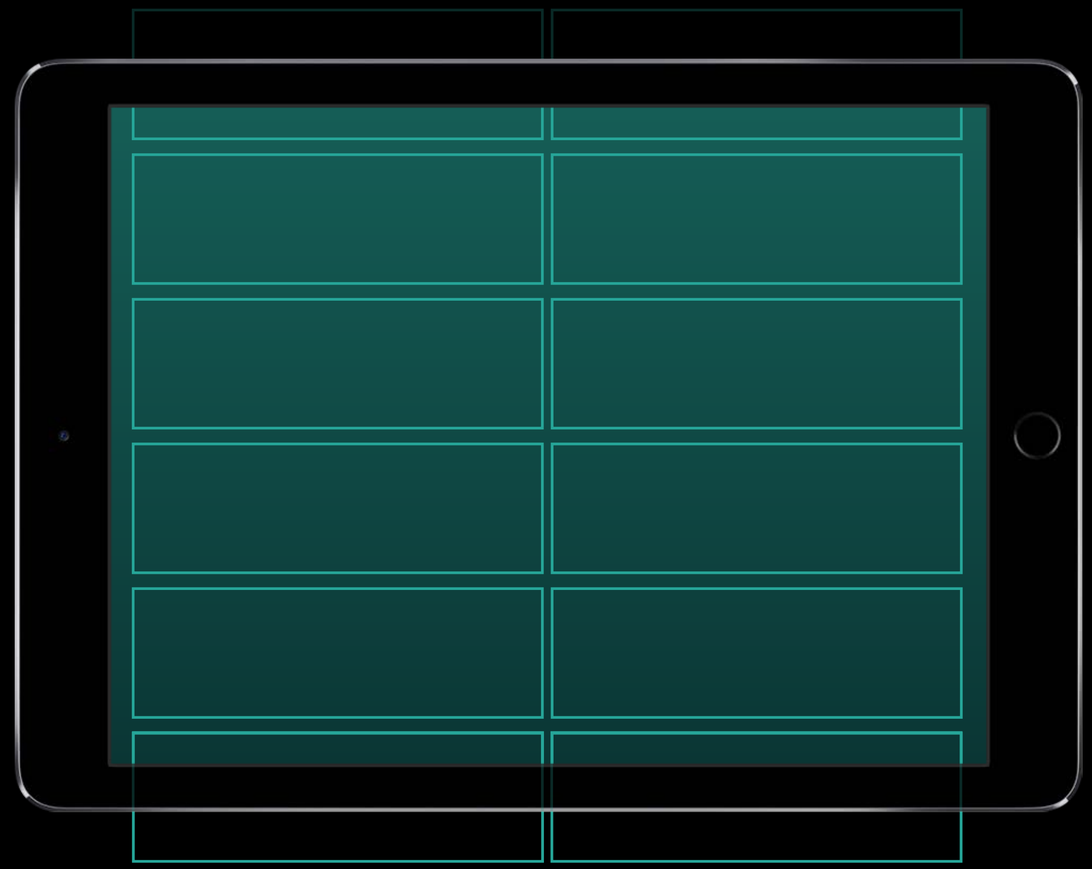
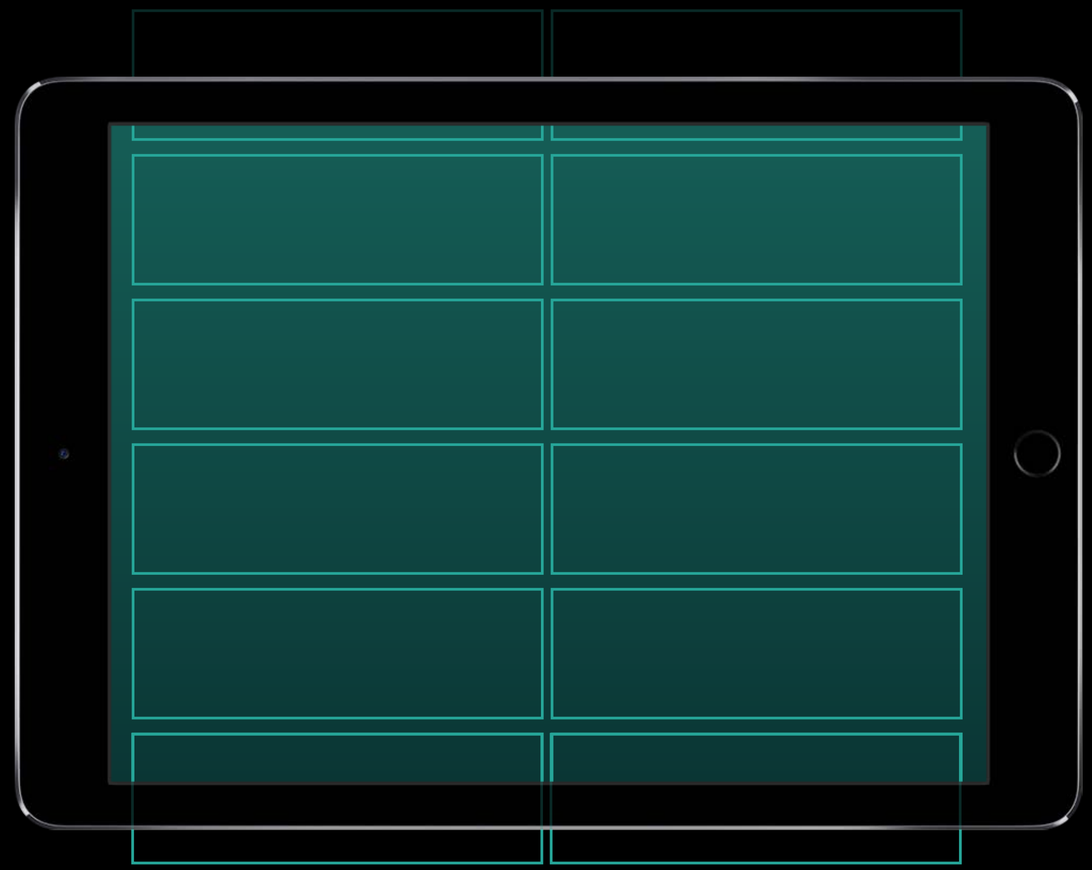


Life Cycle of a Cell

iOS 10

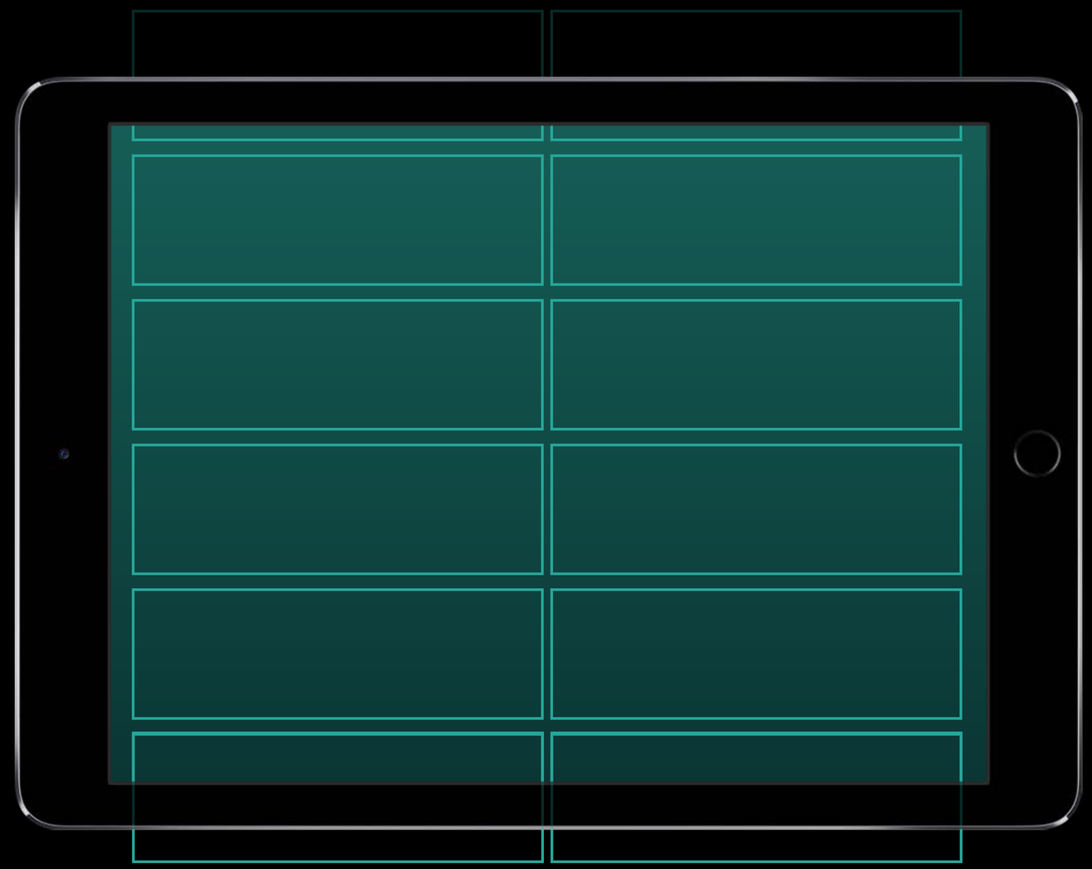
NEW



Life Cycle of a Cell

iOS 10

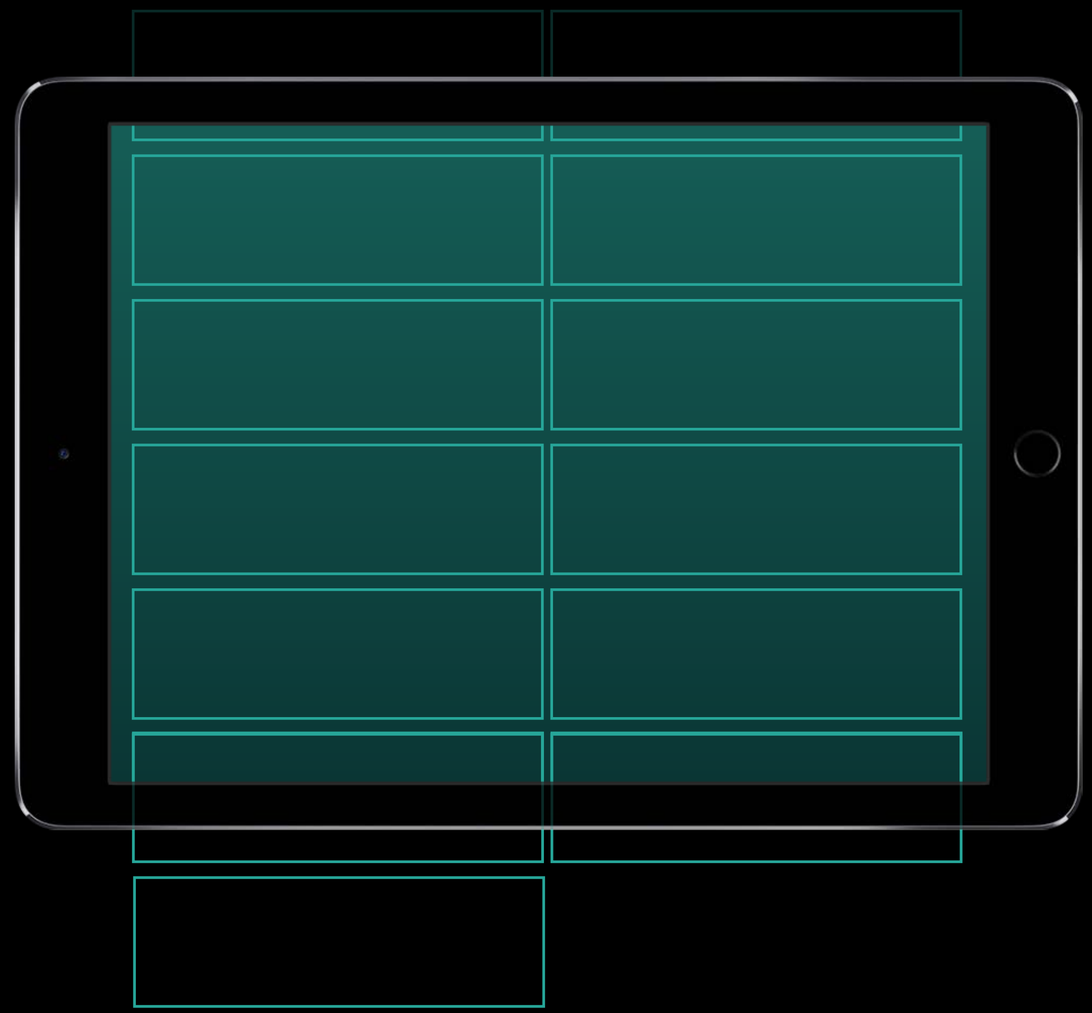
NEW



Life Cycle of a Cell

iOS 10

NEW



Life Cycle of a Cell

iOS 10

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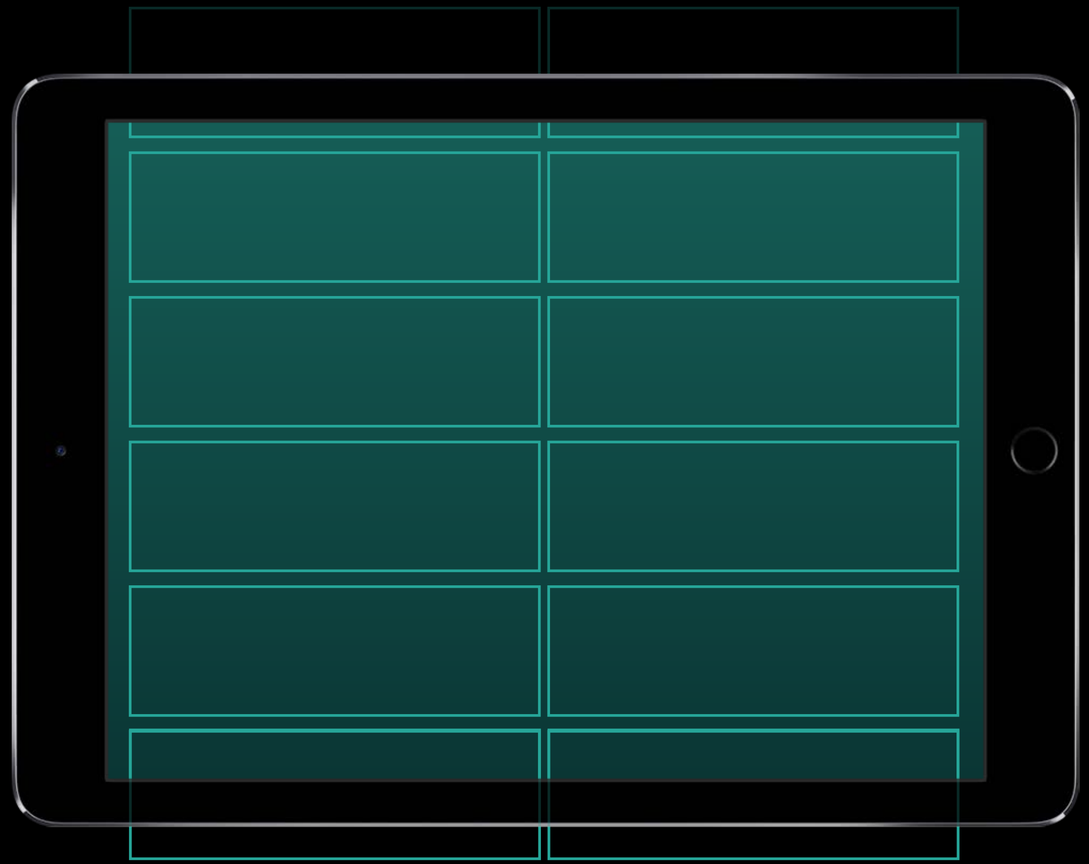
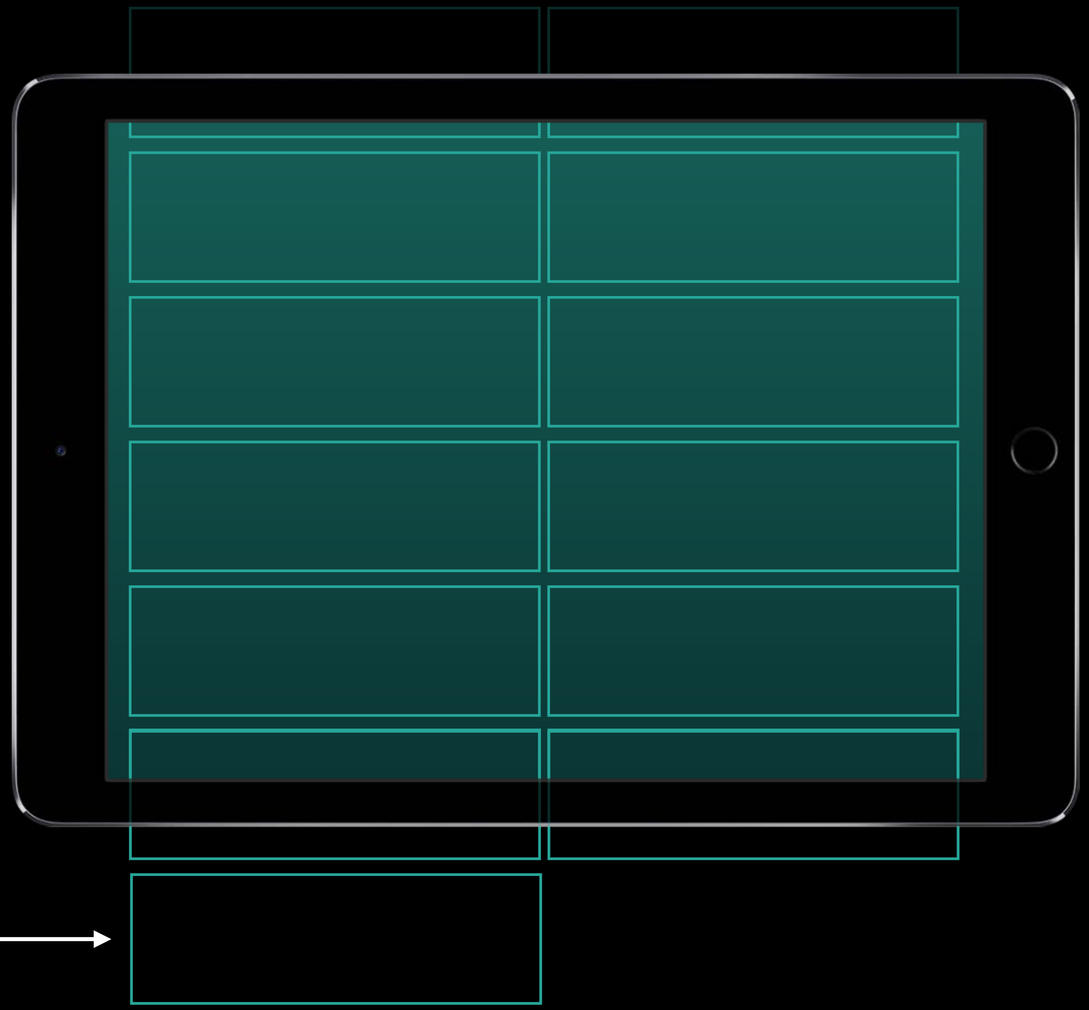


prepareForReuse

Life Cycle of a Cell

iOS 10

NEW

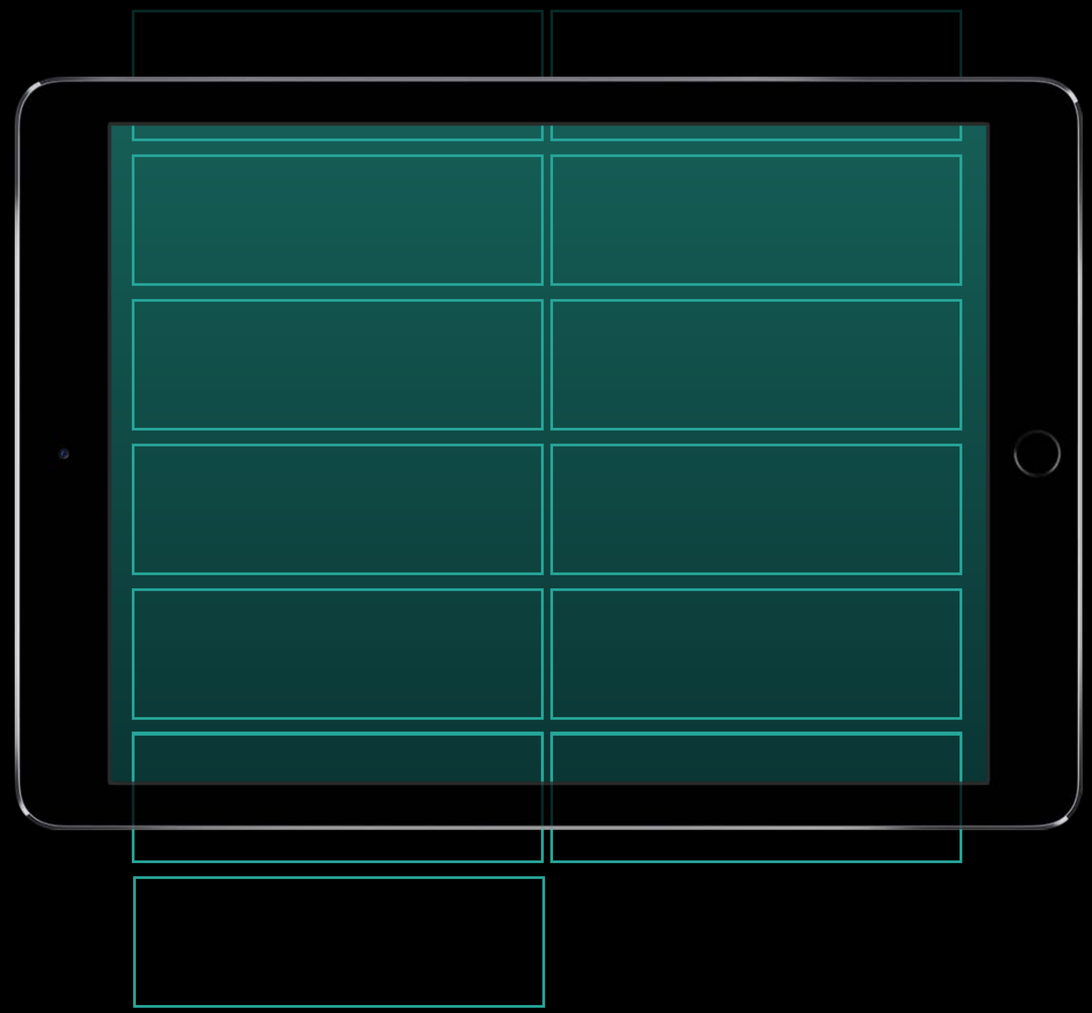


```
cellForItemAtIndexPath
```

Life Cycle of a Cell

iOS 10

NEW



Life Cycle of a Cell

iOS 10

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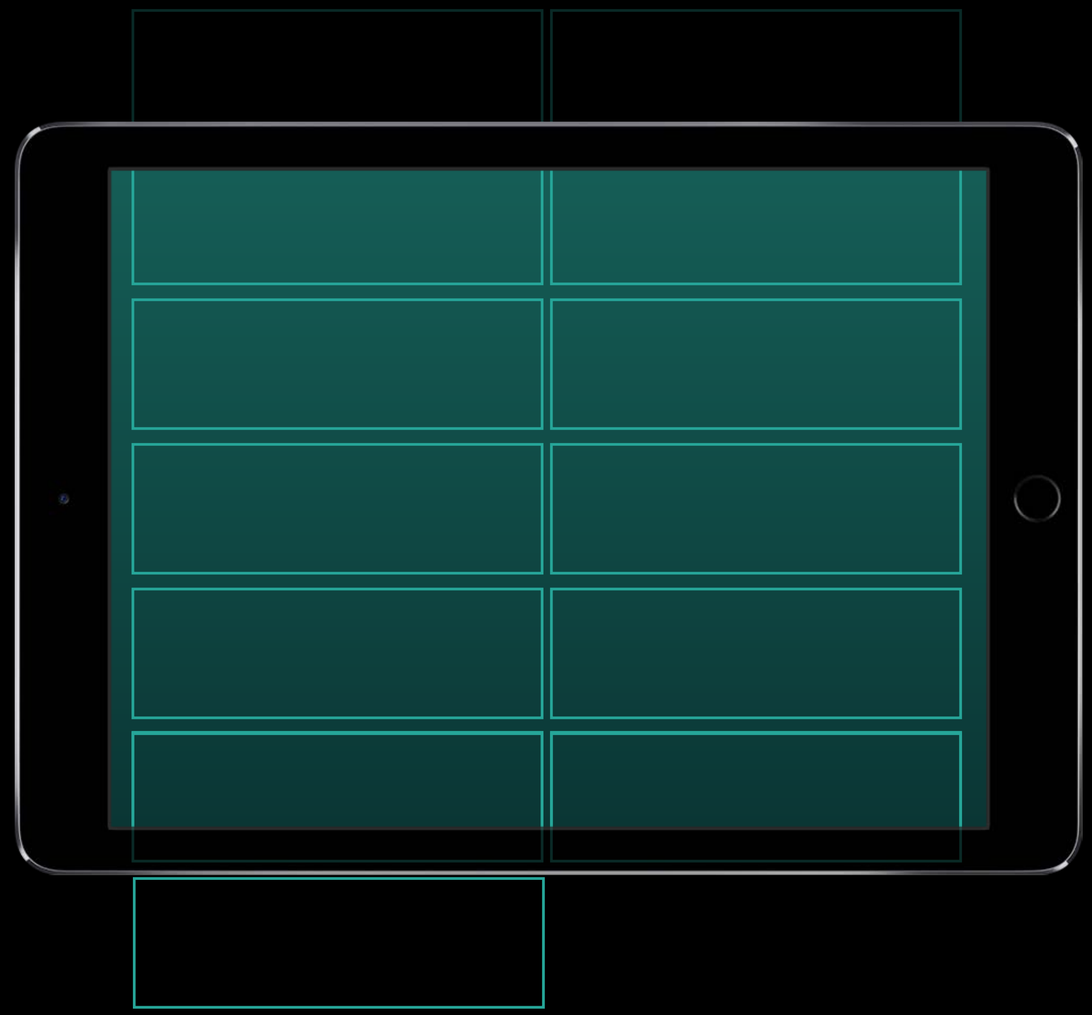

Life Cycle of a Cell

iOS 10

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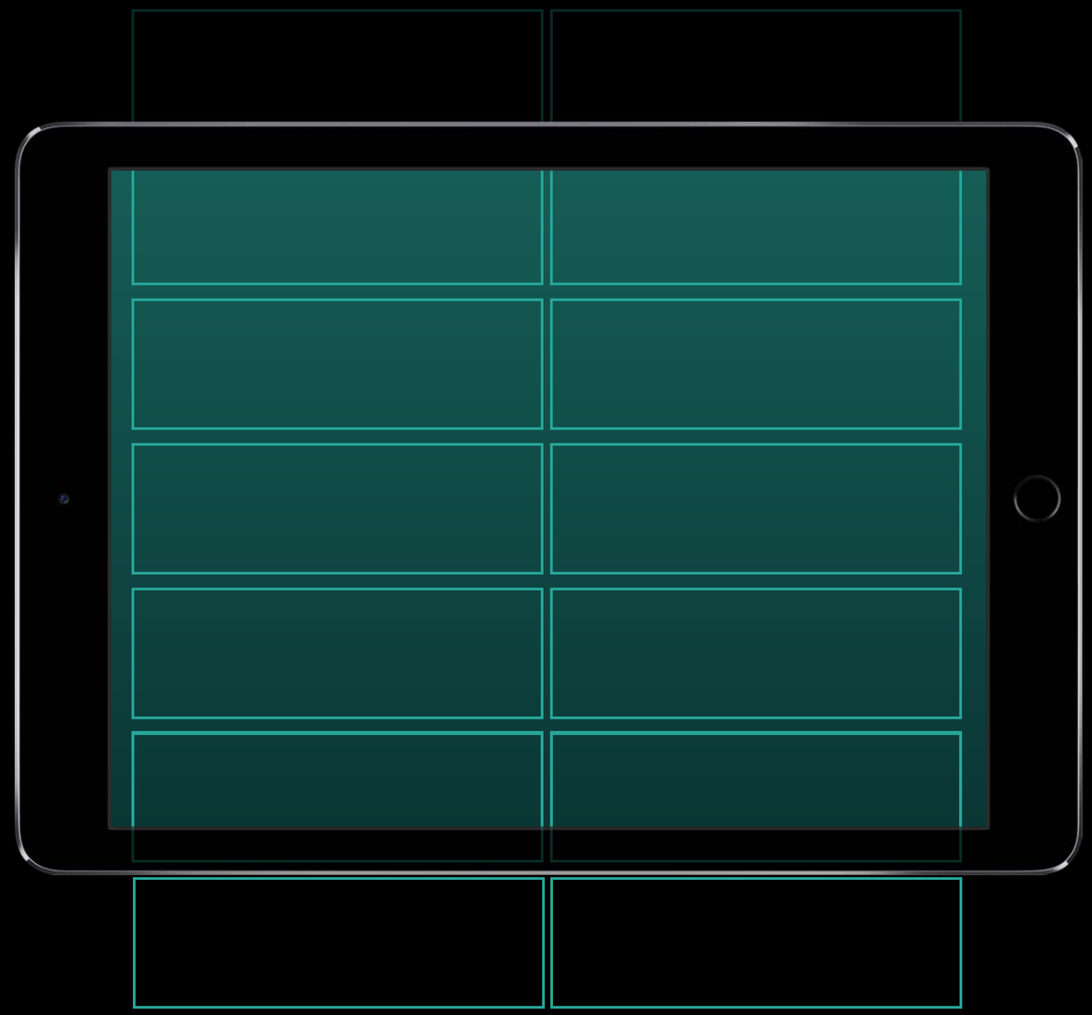

Life Cycle of a Cell

iOS 10

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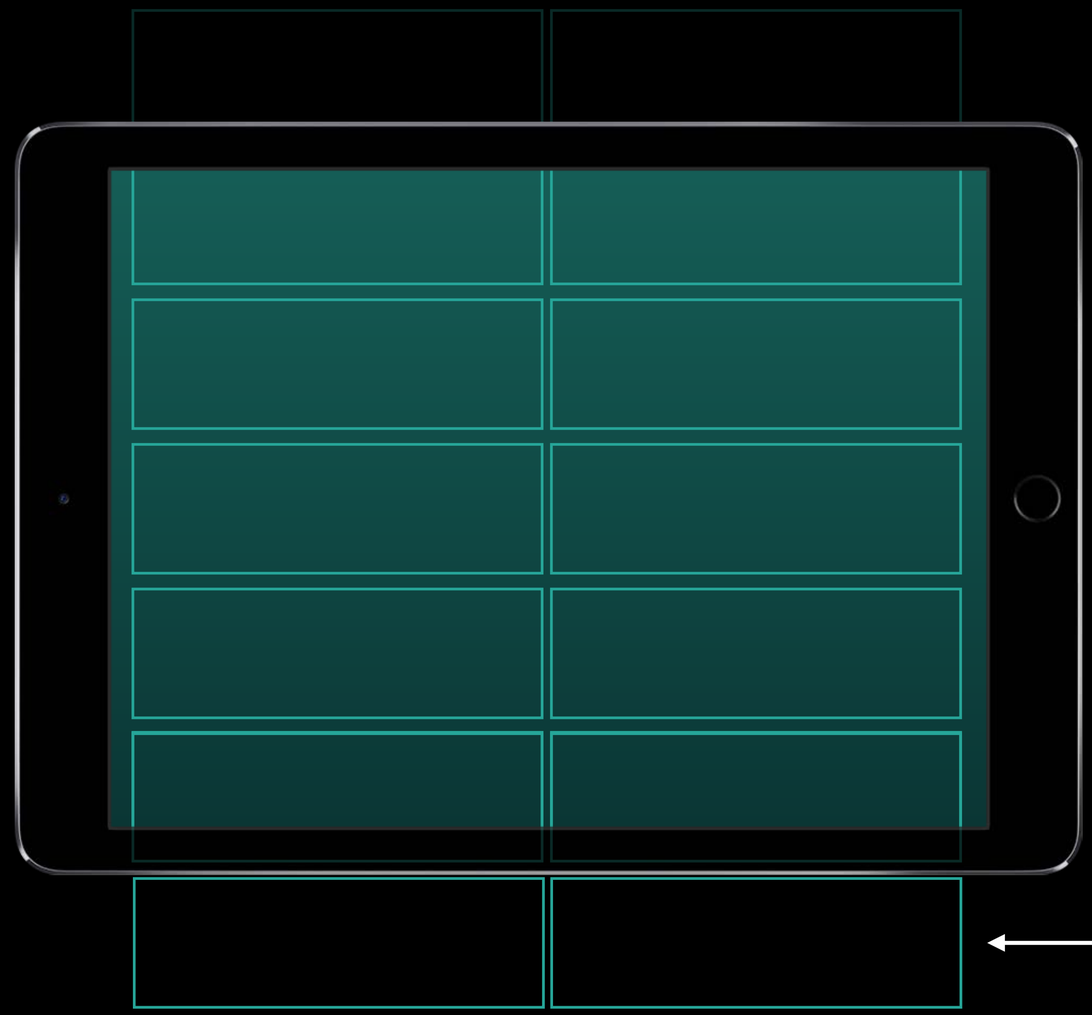

prepareForReuse

Life Cycle of a Cell

iOS 10

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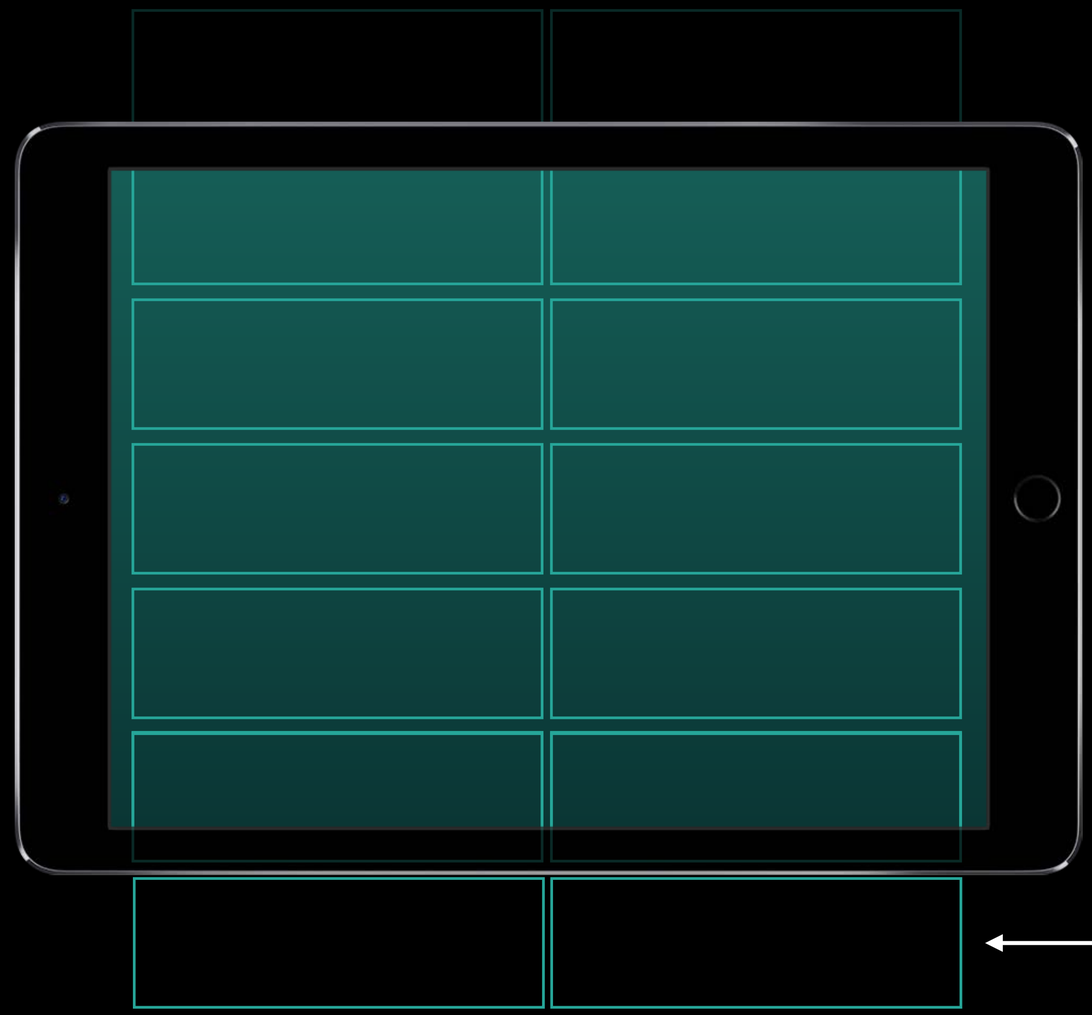
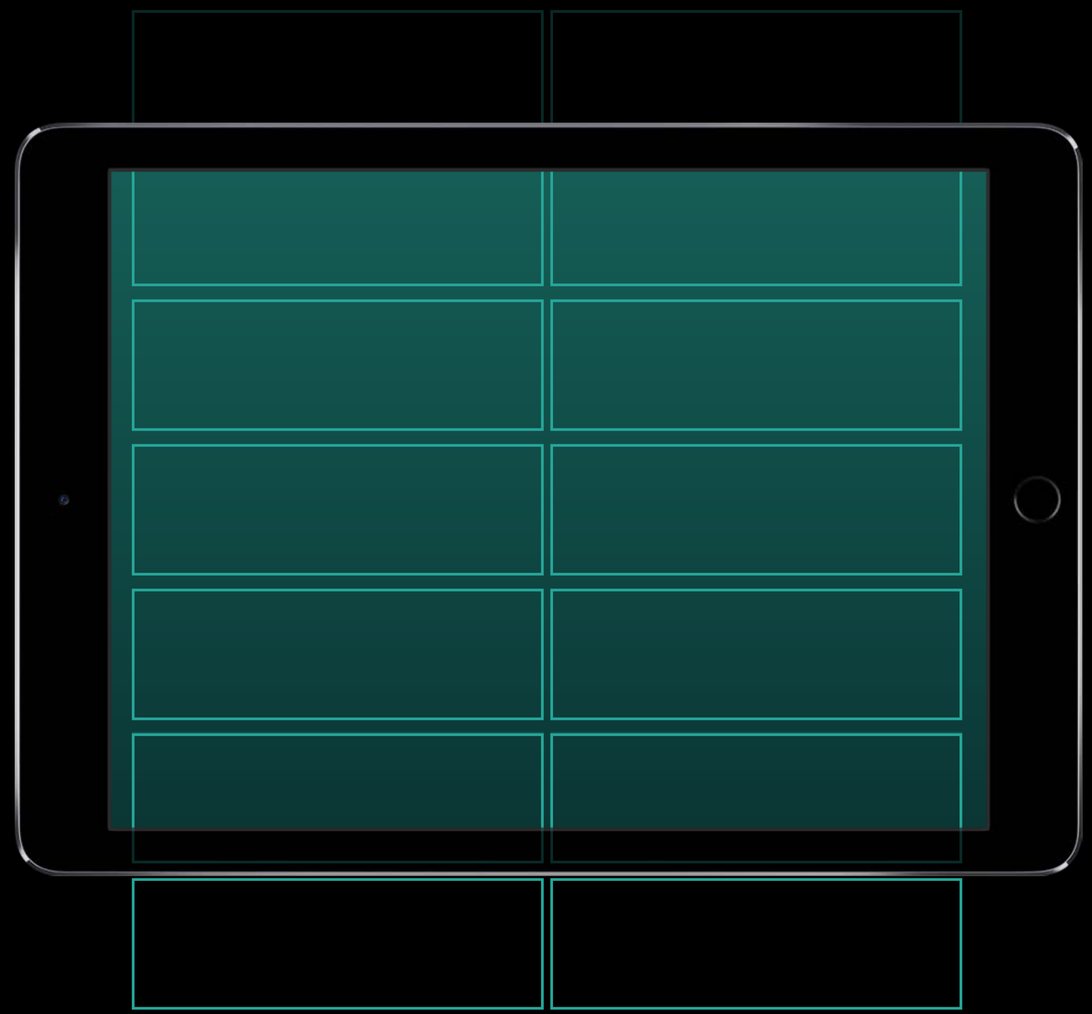


cellForItemAtIndexPath

Life Cycle of a Cell

iOS 10

NEW



Life Cycle of a Cell

iOS 10

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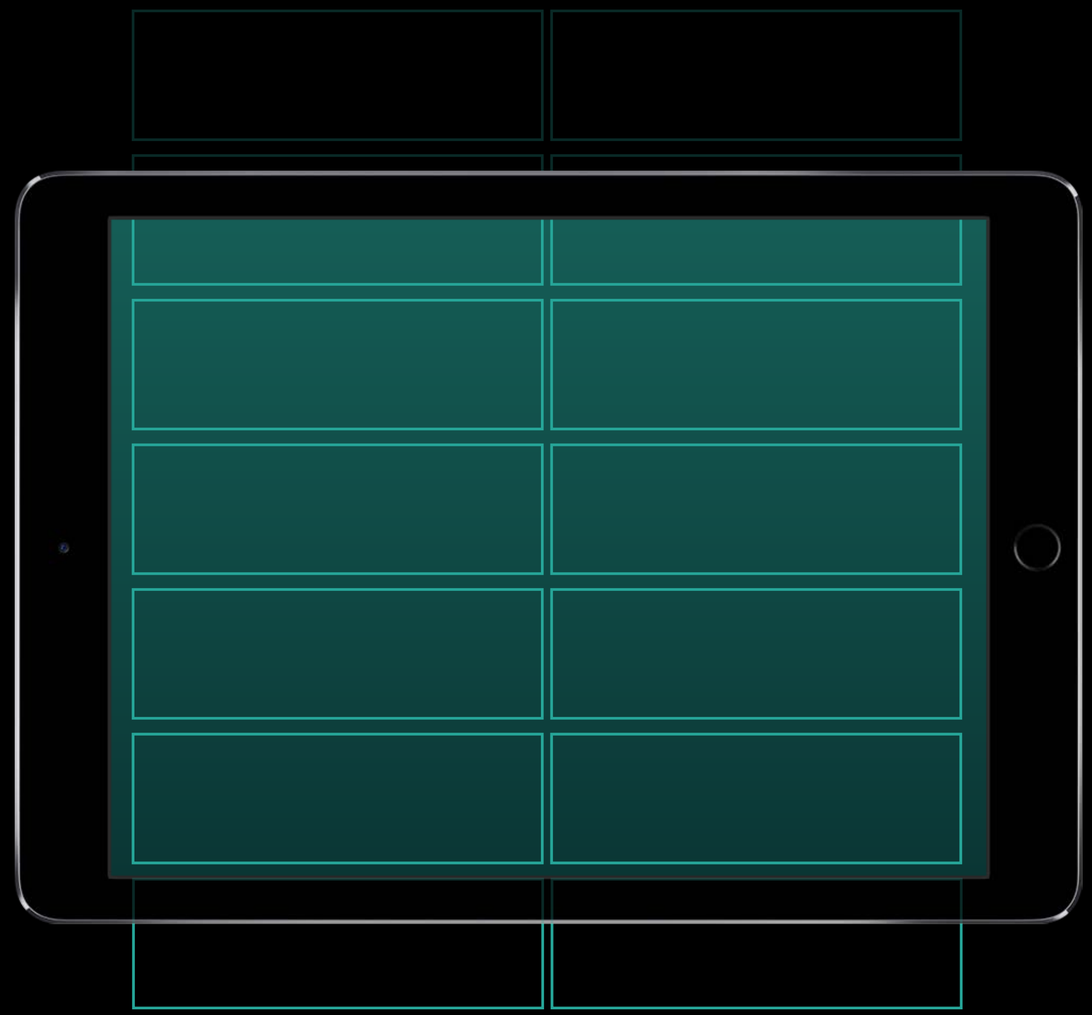

Life Cycle of a Cell

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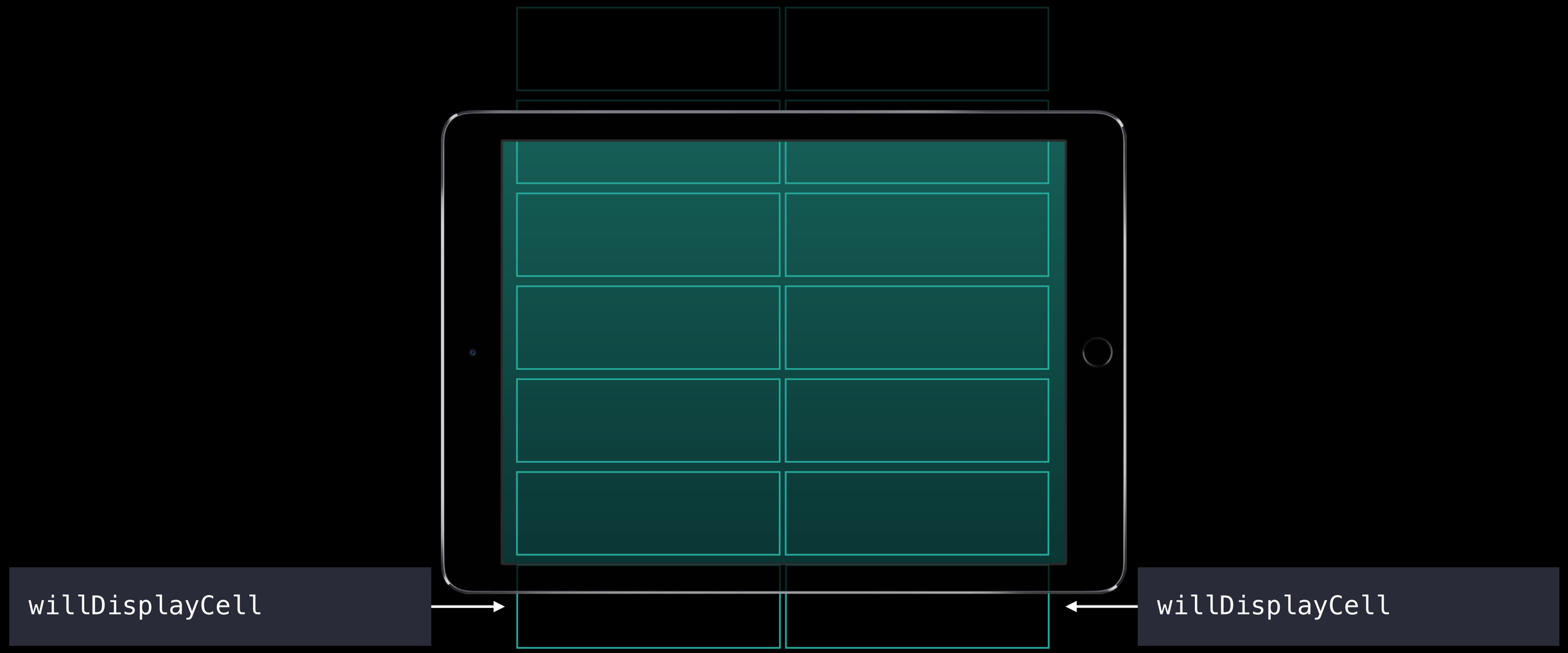

Demo

Scrolling like butter

Introducing Cell Pre-Fetching

NEW

Introducing Cell Pre-Fetching

NEW

Enabled by default for apps compiled on iOS 10

Introducing Cell Pre-Fetching

NEW

Enabled by default for apps compiled on iOS 10

There is no step one

Introducing Cell Pre-Fetching

NEW

Enabled by default for apps compiled on iOS 10

There is no step one

Opt-out is easy

```
collectionView.isPrefetchingEnabled = false
```

For Great Pre-Fetching Performance

For Great Pre-Fetching Performance

Do heavy lifting in `cellForItemAtIndexPath`

For Great Pre-Fetching Performance

Do heavy lifting in `cellForItemAtIndexPath`

Do minimal work in `willDisplayCell` / `didEndDisplayingCell`

For Great Pre-Fetching Performance

Do heavy lifting in `cellForItemAtIndexPath`

Do minimal work in `willDisplayCell` / `didEndDisplayingCell`

`cellForItemAtIndexPath` prepared cell may never display

What About Expensive Data Models?

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Many cells require expensive data access

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Many cells require expensive data access

Images, databases, Core Data

UICollectionView Pre-Fetching API

NEW

```
protocol UICollectionViewDataSourcePrefetching {
    func collectionView(_ collectionView: UICollectionView,
        prefetchItemsAt indexPaths: [NSIndexPath])
    optional func collectionView(_ collectionView: UICollectionView,
        cancelPrefetchingForItemsAt indexPaths: [NSIndexPath])
}
class UICollectionView : UIScrollView {
    weak var prefetchDataSource: UICollectionViewDataSourcePrefetching?
    var isPrefetchingEnabled: Bool
}
```

UICollectionView Pre-Fetching API

NEW

```
protocol UICollectionViewDataSourcePrefetching {
    func collectionView(_ collectionView: UICollectionView,
        prefetchItemsAt indexPaths: [NSIndexPath])
    optional func collectionView(_ collectionView: UICollectionView,
        cancelPrefetchingForItemsAt indexPaths: [NSIndexPath])
}
class UICollectionView : UIScrollView {
    weak var prefetchDataSource: UICollectionViewDataSourcePrefetching?
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```

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        cancelPrefetchingForItemsAt indexPaths: [NSIndexPath])
}
class UICollectionView : UIScrollView {
    weak var prefetchDataSource: UICollectionViewDataSourcePrefetching?
    var isPrefetchingEnabled: Bool
}
```

UICollectionView Pre-Fetching API

NEW

Works with your existing asynchronous solution

```
protocol UICollectionViewDataSourcePrefetching {
    func collectionView(_ collectionView: UICollectionView,
        prefetchItemsAt indexPaths: [NSIndexPath])
    optional func collectionView(_ collectionView: UICollectionView,
        cancelPrefetchingForItemsAt indexPaths: [NSIndexPath])
}
class UICollectionView : UIScrollView {
    weak var prefetchDataSource: UICollectionViewDataSourcePrefetching?
    var isPrefetchingEnabled: Bool
}
```

Demo

Putting it all together—with science!

Pre-Fetching API Tips

Pre-Fetching API Tips

Use GCD or NSOperationQueue

Pre-Fetching API Tips

Use GCD or NSOperationQueue

Pre-Fetching is an adaptive technology

Pre-Fetching API Tips

Use GCD or NSOperationQueue

Pre-Fetching is an adaptive technology

Use `cancelPrefetching` API to adapt to shifting user focus

UITableView Pre-Fetching API

NEW

```
protocol UITableViewDataSourcePrefetching {
   func tableView(_ tableView: UITableView, prefetchRowsAt indexPaths: [NSIndexPath])
   optional func tableView(_ tableView: UITableView, cancelPrefetchingForRowsAt indexPaths:
[NSIndexPath])
}
class UITableView : UIScrollView {
   weak var prefetchDataSource: UITableViewDataSourcePrefetching?
}
```

UITableView Pre-Fetching API

NEW

```
protocol UITableViewDataSourcePrefetching {
    func tableView(_ tableView: UITableView, prefetchRowsAt indexPaths: [NSIndexPath])
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UITableView Pre-Fetching API

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class UITableView : UIScrollView {
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```

UITableView Pre-Fetching API

NEW

Works with your existing asynchronous solution

```
protocol UITableViewDataSourcePrefetching {
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Improvements to Self-Sizing Cells

Self-Sizing Cells API Overview

Self-Sizing Cells API Overview

Full support in UICollectionViewFlowLayout

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- `layout.estimatedItemSize = CGSize(width:50,height:50)`

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Three options for specifying actual cell size

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- Auto Layout

Self-Sizing Cells API Overview

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- `layout.estimatedItemSize = CGSize(width:50,height:50)`

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- Auto Layout
- Override `sizeThatFits()`

Self-Sizing Cells API Overview

Full support in UICollectionViewFlowLayout

- `layout.estimatedItemSize = CGSize(width:50,height:50)`

Three options for specifying actual cell size

- Auto Layout
- Override `sizeThatFits()`
- Override `preferredLayoutAttributesFittingAttributes()`

Picking a Good estimatedItemSize

Picking a Good estimatedItemSize

Hard to guess

Picking a Good estimatedItemSize

Hard to guess

Can this be computed from actual sizes?

Automatic Self-Sizing Cells Estimates

NEW

Automatic Self-Sizing Cells Estimates

NEW

```
layout.estimatedItemSize = UICollectionViewFlowLayoutAutomaticSize
```

Automatic Self-Sizing Cells Estimates

NEW

```
layout.estimatedItemSize = UICollectionViewFlowLayoutAutomaticSize
```

Collection View will do the math for you

Demo

UICollectionViewFlowLayoutAutomaticSize

Interactive Reordering

Demo

Interactive Reordering

API Overview

```
class UICollectionView : UIScrollView {
    func beginInteractiveMovementForItem(at indexPath: NSIndexPath) -> Bool
    func updateInteractiveMovementTargetPosition(_ targetPosition: CGPoint)
    func endInteractiveMovement()
    func cancelInteractiveMovement()
}
```

API Overview

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class UICollectionView : UIScrollView {
    func beginInteractiveMovementForItem(at indexPath: NSIndexPath) -> Bool
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   func endInteractiveMovement()
   func cancelInteractiveMovement()
}
```

```
class UICollectionViewController : UIViewController {
   var installsStandardGestureForInteractiveMovement: Bool
}
```

Paging Support

Paging Support

```
collectionView.isPagingEnabled = true
```

Demo

Interactive reordering—with paging support

NEW

Demo

Interactive reordering—with paging support

JORDAN

UIRefreshControl!

UIRefreshControl!

UIRefreshControl now directly supported in UICollectionView!

UIRefreshControl!

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UITableView too!

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UITableView too!

UIScrollView too!

UIRefreshControl!

UIRefreshControl now directly supported in UICollectionView!

UITableView too!

UIScrollView too!

```
let refreshControl = UIRefreshControl()

refreshControl.addTarget(self, action: #selector(refreshControlDidFire(_:)),
for: .valueChanged)

collectionView.refreshControl = refreshControl
```

UIRefreshControl!

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UITableView too!

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Summary

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UICollectionView cell pre-fetching

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Interactive reordering

More Information

https://developer.apple.com/wwdc16/219

Related Sessions

Advances in UIKit Animations and Transitions	Pacific Heights	Wednesday 10:00AM
What's New in Core Data	Pacific Heights	Friday 10:00 AM
Concurrent Programming with GCD in Swift 3	Pacific Heights	Friday 4:00 PM

Labs

UIKit and UIKit Animations Lab	Frameworks Lab C	Thursday 1:00 PM
Cocoa Touch and 3D Touch Lab	Frameworks Lab C	Friday 10:30 AM

WWDC16