Announcement

- Lab 3 is due on Wednesday October 4th by 11:59 PM

Today's Topics

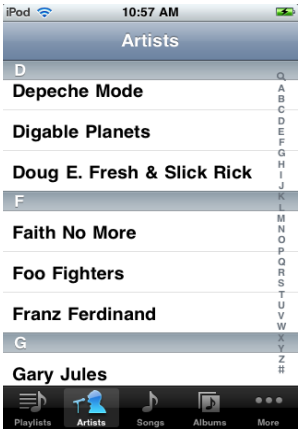
- Scroll views
- Table views
  - Displaying data
  - Controlling appearance & behavior
- UITableViewController
- Table view cells
- Collection views

Scroll Views

UIScrollView

- For displaying more content than can fit on the screen
- Handles gestures for panning and zooming
- Noteworthy subclasses: UITableView and UITextView

Scrolling Examples



Using a Scroll View

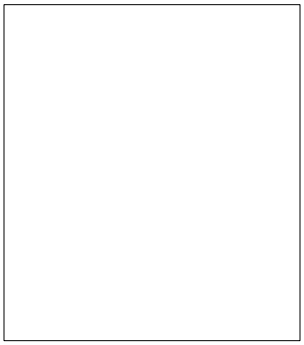
- **Create with the desired frame**
  let theFrame = CGRect(x:0, y:0, width:200, height:200)
  let scrollView = UIScrollView(frame: theFrame)

- **Add subviews (frames may extend beyond scroll view frame)**
  let bigFrame = CGRect(x:0, y:0, width:500, height:500)
  let myImageView = UIImageView(frame: bigFrame)
  scrollView.addSubview(myImageView)

- **Set the content size**
  - scrollView.contentSize = CGSize(width: 500, height: 500)

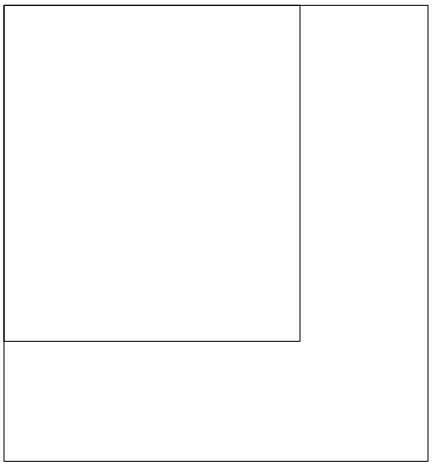
Frame and Content

scrollView.frame



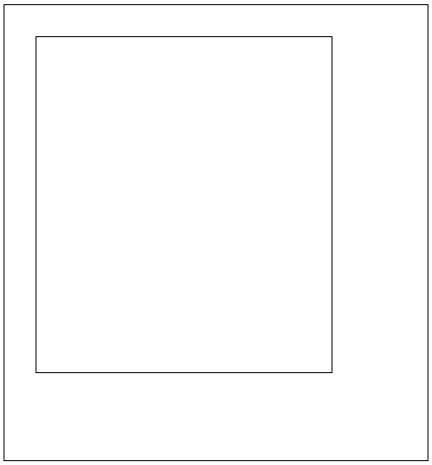
Frame and Content

scrollView.contentSize



Frame and Content

scrollView.contentOffset



Demo

Using a UIScrollView

Extending Scroll View Behavior

- **Applications often want to know about scroll events**
  - When the scroll offset is changed
  - When dragging begins & ends
  - When deceleration begins & ends

Extending with a Subclass

- **Create a subclass**
- **Override methods to customize behavior**
- **Issues with this approach**
  - Application logic and behavior is now part of a View class
  - Tedious to write a one-off subclass for every scroll view instance
  - Your code becomes tightly coupled with superclass

Extending with Delegation

- Delegate is a separate object
- Clearly defined points of responsibility
  - Change behavior
  - Customize appearance
- Loosely coupled with the object being extended

UIScrollView Delegate

```
public protocol UIScrollViewDelegate:NSObjectProtocol

// Respond to interesting events
optional public func scrollViewDidScroll(_ scrollView: UIScrollView)
 optional public func scrollViewDidZoom(_ scrollView: UIScrollView)
...
// Influence behavior
// return a yes if you want to scroll to the top. if not defined, assumes YES
 optional public func scrollViewShouldScrollToTop(_ scrollView: UIScrollView) -> Bool
```

Implementing a Delegate

- **Conform to the delegate protocol**

```
class ViewController: UIViewController, UIScrollViewDelegate {
```

- **Implement all required methods and any optional methods**

```
 func scrollViewDidScroll(_ scrollView: UIScrollView){
// Do something in response to the new scroll position
     if (scrollView.contentOffset ...) {

     }
  }
```


Zooming with a Scroll View

- **Set the minimum, maximum, initial zoom scales**

```
 scrollView.maximumZoomScale = 5.0
 scrollView.minimumZoomScale = 1.0
```

- **Implement delegate method for zooming**

```
func viewForZooming(in scrollView: UIScrollView) -> UIView? {
   return someViewThatWillBeScaled
}
```

Demo

Zooming with a UIScrollView

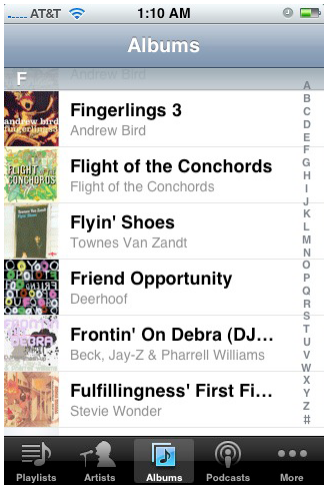
Table Views

Table Views

- **Display lists of content**
  - Single column, multiple rows
  - Vertical scrolling
  - Large data sets
- **Powerful and ubiquitous in iPhone applications**

Table View Styles

UITableViewStylePlain



UITableViewStyleGrouped

Table View Anatomy – Plain Style

Table Header ->

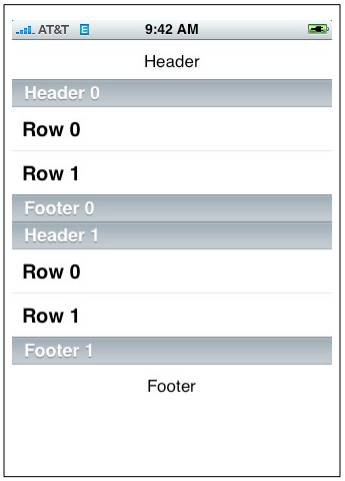


Table View Anatomy – Plain Style

Section Header ->

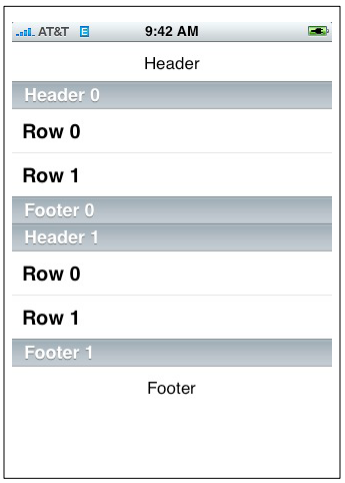


Table View Anatomy – Plain Style

Table Cell->

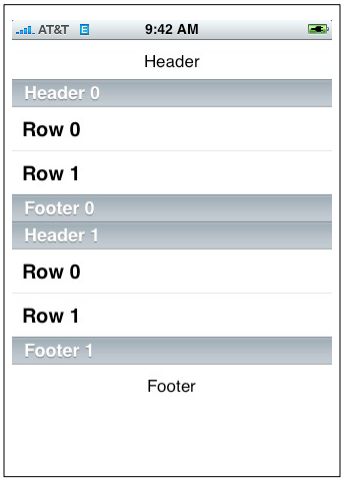


Table View Anatomy – Plain Style

Section Footer ->

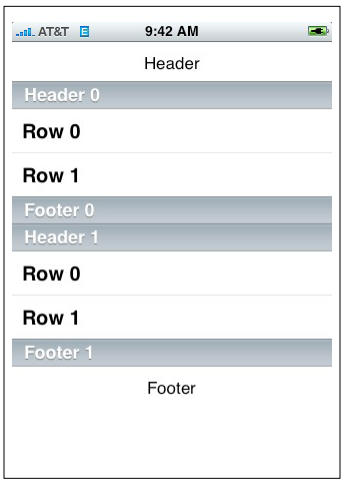


Table View Anatomy – Plain Style

Section ->

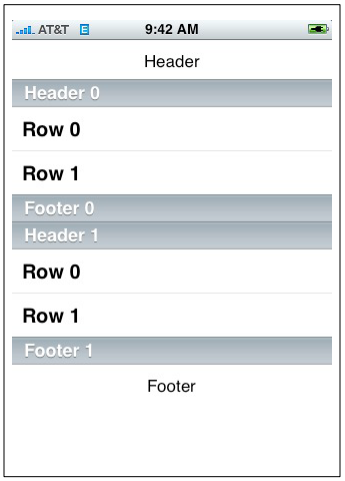


Table View Anatomy – Plain Style

Table Footer->

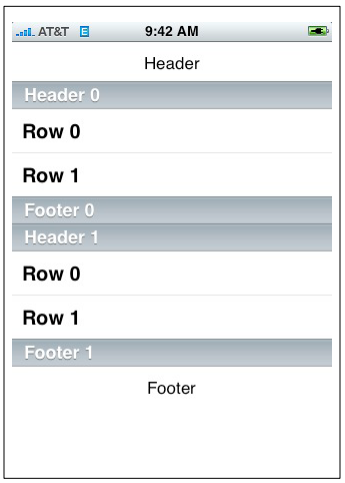


Table View Anatomy – Plain Style

Table Header ->
Section Header ->

Table Cell->
Section Footer ->

Section ->

Table Footer->

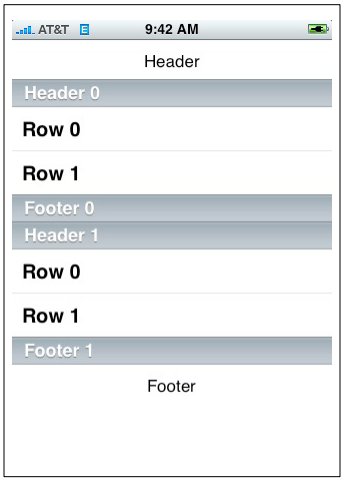


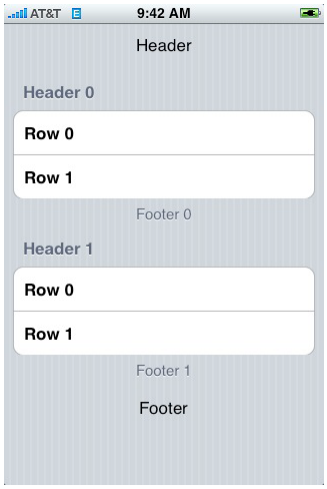
Table View Anatomy – Grouped Style

Table Header ->
Section Header ->

Table Cell->
Section Footer ->

Section ->

Table Footer->



Displaying Data in a Table View

A Naïve Solution

- **Table views display a list of data, so use an array**
  myTableView.setList(myListOfStuff)

- **Issues with this approach**
  - All data is loaded upfront
  - All data stays in memory

A More Flexible Solution

- **Another object provides data to the table view**
  - Not all at once
  - Just as it's needed for display
- **Like a delegate, but purely data-oriented**

UITableViewDataSource

- **Provide number of sections and rows**

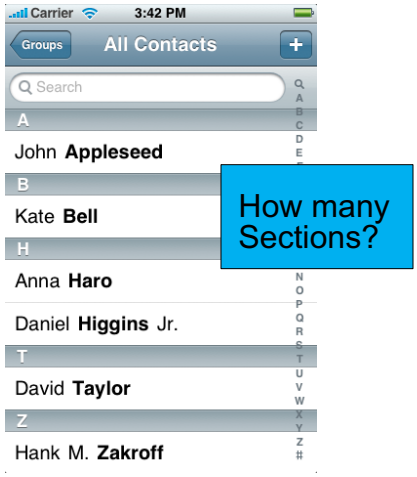
```
// Optional method, defaults to 1 if not implemented
func numberOfSections(in tableView: UITableView) -> Int

// Required method
func tableView(_ tableView: UITableView, numberOfRowsInSection
    section: Int) -> Int
```

- **Provide cells for table view as needed**

```
// Required method
func tableView(_ tableView: UITableView, cellForRowAt indexPath:
    IndexPath) -> UITableViewCell
```

Datasource Message Flow

numberOfSections(in tableView: UITableView) -> Int



Datasource

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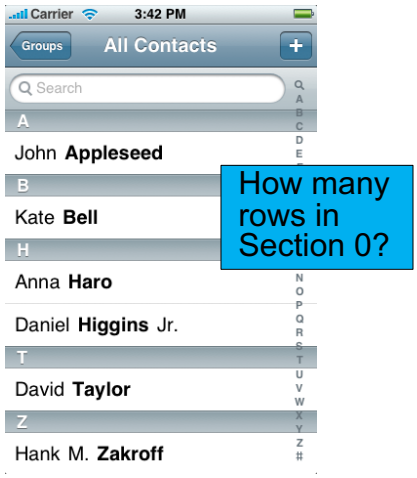
Update Datasource Message Flow

tableView(_ tableView: UITableView, numberOfRowsInSection section section:Int) -> Int



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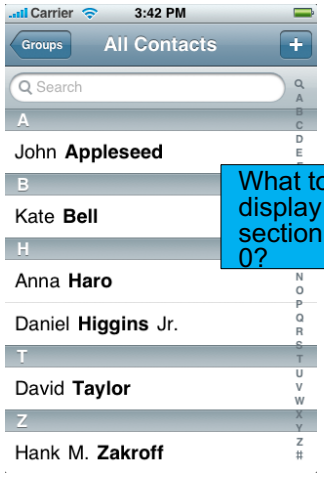
Datasource

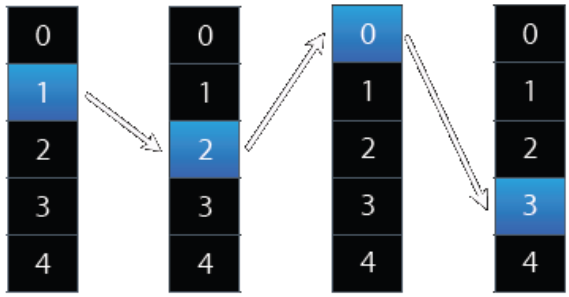
Datasource Message Flow

tableView(_ tableView: UITableView, cellForRowAt indexPath: IndexPath) -> UITableViewCell



IndexPath

- Generic class in Foundation
- Path to a specific node in a tree of nested arrays



Single Section Table View

Return the number of rows

```
override func tableView(_ tableView: UITableView, numberOfRowsInSection
    section: Int) -> Int {
{
   return myStrings.count
}
```

Provide a cell when requested

```
override func tableView(_ tableView: UITableView, cellForRowAt indexPath:
    IndexPath) -> UITableViewCell {
   let cell = …
   cell.textLabel.text = myDataArray[indexPath.row]
   return cell
}
```


Creating Cells without reuse

```
func tableView(_ tableView: UITableView, cellForRowAt indexPath: IndexPath) ->
    UITableViewCell {

let myCell = UITableViewCell(style: .default, reuseIdentifier: nil)

myCell.textLabel.text = myStrings[indexPath.row]

   return myCell
}
```

Cell Reuse

- **When asked for a cell, it would be expensive to create a new cell each time.**
  - First register the class for use in creating new cells

```
override func viewDidLoad(){
…
   tableView.register (UITableViewCell.self, forCellReuseIdentifier: “theCell”)
}

func tableView(_ tableView: UITableView, cellForRowAt indexPath: IndexPath) ->
     UITableViewCell {

let myCell = tableView.dequeueReusableCellWithIdentifier(”theCell")! as UITableViewCell
  cell.textLabel.text = myStrings[indexPath.row]
  return cell
}
```


Triggering Updates

- **When is the datasource asked for its data?**
  - When a row becomes visible
  - When an update is explicitly requested by calling -reloadData

```
override func viewWillAppear(animated: Bool) {
  super.viewWillAppear(animated)
  tableView.reloadData()
}
```

Basic properties

- UITableViewCell has image and text properties

```
cell.imageView?.image = UIImage.init(named: "obama.png")
cell.textLabel?.text = "Barack Obama"
```

Demo

UICollectionView

- **Convenient way to show information in a grid format**
- **Similar to a UITableView**
  - But with multiple columns
- **Flow based layout makes displaying rows and columns of data very easy**

UICollectionView

```
func numberOfSections (in collectionView: UICollectionViews) -> Int {
  //return number of sections
}

func collectionView(_ collectionView: UICollectionView, numberOfItemsInSection section:
Int) -> Int {
  //return number of items per section
}

func collectionView(_ collectionView: UICollectionView, cellForItemAtIndexPath indexPath:
IndexPath) -> UICollectionViewCell {

let cell = collectionView.dequeueReusableCell(withReuseIdentifier: ”someCellNameId” for:
indexPath)
 // configure the cell
 // return UICollectionView cell for item at IndexPath
  return cell
}
```

UICollectionView Demo

Lab 4 Demo