

XAM311

# Using ListView in Xamarin.Forms

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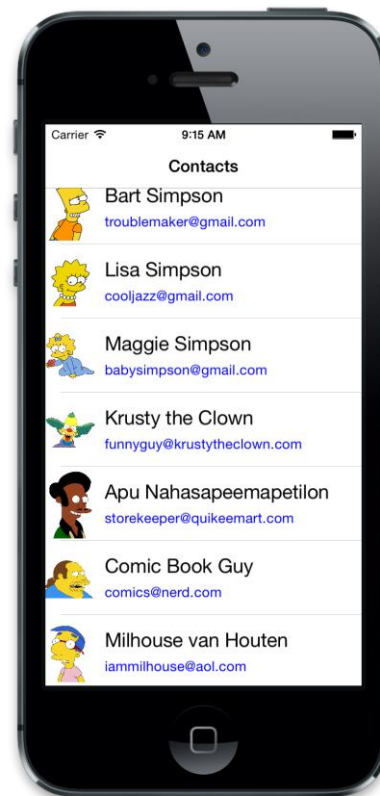
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# Objectives

1. Displaying Collections with ListView
2. Adding and removing items dynamically
3. Customizing the rows





# Displaying Collections with ListView

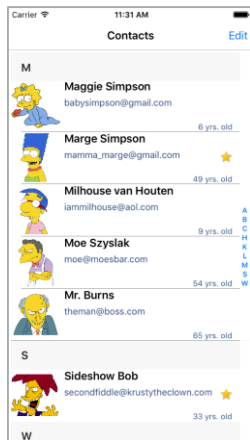
# Tasks

1. What is a ListView?
2. Providing data to a ListView
3. Managing selection

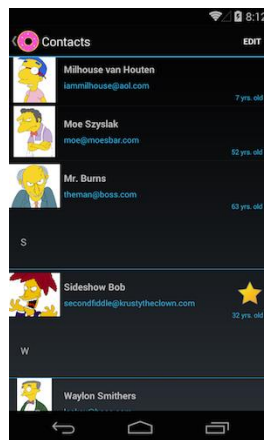


# Displaying Lists of Data

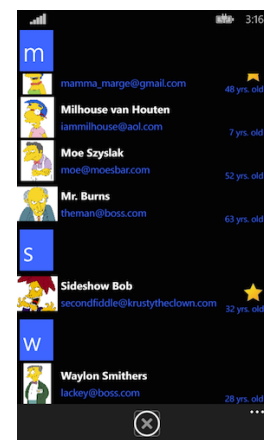
- ❖ **ListView** enables a common navigation style in your Xamarin.Forms applications – displaying homogenous data in a scrollable, interactive way



UITableView



ListView



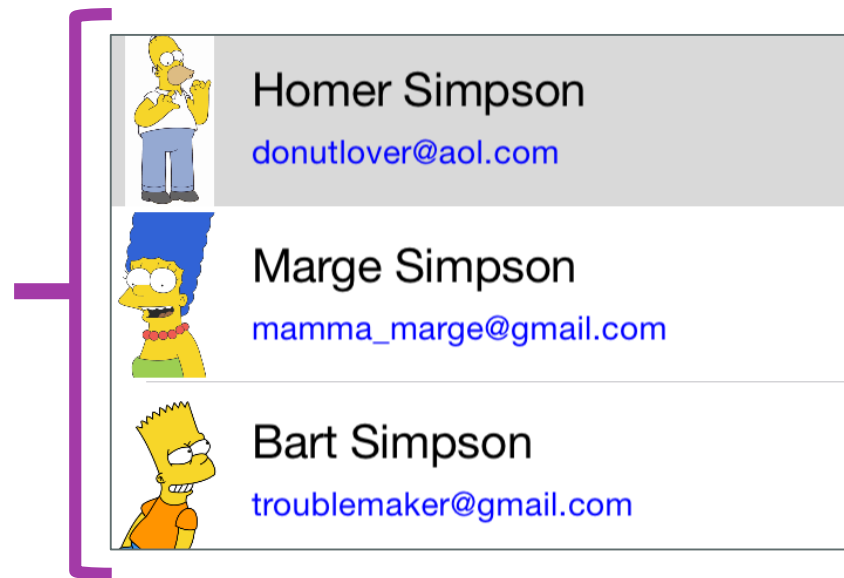
ListView

# Providing Data to a ListView

- ❖ ListView generates rows at runtime from a *collection source* assigned to the **ItemsSource** property

**ItemsSource** takes data in the form of an **IEnumerable<T>**

Each object in the **IEnumerable** data source becomes a row in the **ListView**



# Setting the ItemsSource property

❖ **ItemsSource** must be set to an **IEnumerable** data source

```
contactList.ItemsSource = SimpsonFactory.Characters;
```

or

```
<ListView x:Name="contactList" ...  
    ItemsSource="{x:Static local:SimpsonFactory.Characters}" ...>
```

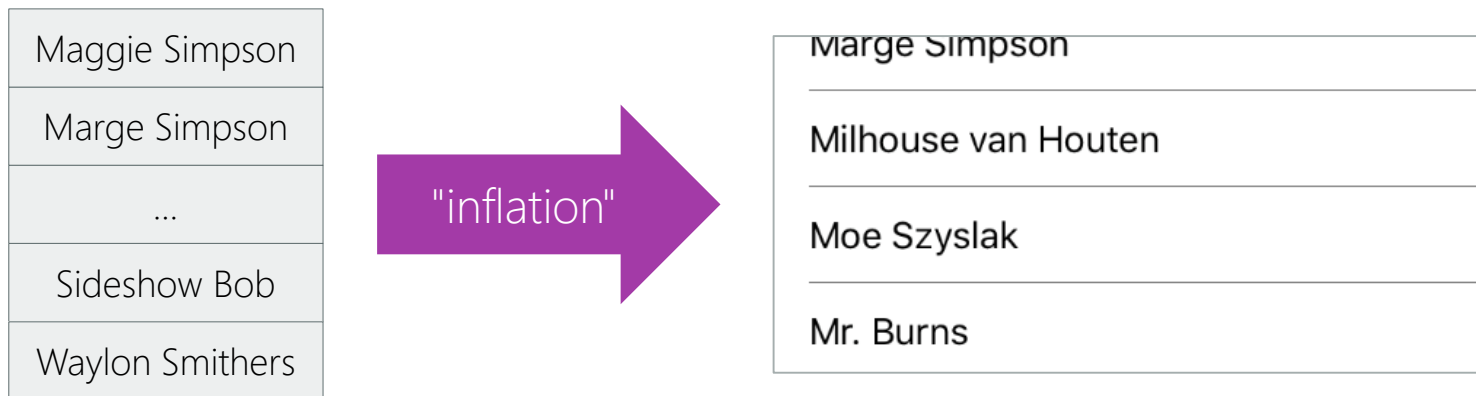
**ItemsSource** can data bind to a property of a model that exposes an **IEnumerable** or **IList**

```
public static class SimpsonFactory  
{  
    public static IList<Person> Characters  
    { set; private set; }  
}
```



# Creating the rows

- ❖ The **ListView** will then generate a single row in the scrolling list for each item present in the collection



by default, it will use **ToString** on each item that is visible and create a **Label** to display the text in the **ListView**

# Flash Quiz

# Flash Quiz

- ① ListView can use a LINQ expression as it's data source
- a) True
  - b) False

# Flash Quiz

- ① ListView can use a LINQ expression as it's data source
- a) True
  - b) False

# Individual Exercise

Displaying a list of contacts with a ListView



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# Managing Selection

- ❖ Set or retrieve the current selection with the **SelectedItem** property

```
listView.SelectedItem = SimpsonFactory.Characters.Last();  
...  
  
Person currentPerson = (Person) listView.SelectedItem;
```

- ❖ Can also use **data binding** to manage selection

```
<ListView ...  
    SelectedItem="{Binding SelectedPerson, Mode=TwoWay}">
```



No need to deal with selection events with this approach, can treat selection as "activation" and place code into your property setters

# Dealing with Activation

- ❖ Can separate "activation" from selection using **ItemTapped** event – this can be useful for master / detail navigation

```
<ListView ItemTapped="OnPersonTapped" ...>
```

```
async void OnPersonTapped(object sender, ItemTappedEventArgs e)
{
    Person selection = (Person) e.Item;
    await Navigation.PushAsync(new DetailsPage(selection));
}
```

# Individual Exercise

Selecting a contact in the list



# Summary

1. What is a ListView?
2. Providing data to a ListView
3. Managing selection



# Adding and removing items dynamically

# Tasks

- ❖ Adding, removing and updating data in the ListView
- ❖ UI-safe collection changes
- ❖ Modifying collections in the background



# Working with dynamic data

- ❖ Sometimes, the list of items we want to display is *dynamic* in nature – we add and remove elements over time as the application runs



New data available



Data removed



Data sorted/moved  
or changed

# Adding and Removing ListView items

- ❖ There are no explicit APIs for this, instead you modify the collection of data assigned to the **ItemsSource** property



```
SimpsonFactory.Characters.Add(new Person { Name = "Mr. Burns" });
```



```
SimpsonFactory.Characters.RemoveAt(0);
```



```
SimpsonFactory.Characters[0] = new Person { Name = "Flanders" }
```

# Modifying Collections

- ❖ But .. adding, removing or replacing items in the collection at runtime *will not alter the UI* unless the collection reports **collection change notifications**

```
public static class SimpsonFactory
{
    public static List<Person> Characters
        { get; private set; }
}
```



`List<T>` doesn't know anything about `Xamarin.Forms`...

```
SimpsonFactory.Characters.Add(new Person { Name = "Mr. Burns" });
```

... so this change only happens in the collection .. not the UI!

# INotifyCollectionChanged

- ❖ Microsoft defined the **INotifyCollectionChanged** interface to provide this notification – any collections which supply data to a UI element must implement this interface

```
namespace System.Collections.Specialized
{
    public interface INotifyCollectionChanged
    {
        event NotifyCollectionChangedEventHandler CollectionChanged;
    }
}
```

# ObservableCollection

- ❖ Can use **ObservableCollection<T>** as the underlying collection type
  - this implements the necessary collection change notifications

```
public static class SimpsonFactory
{
    public static IList<Person> Characters { get; private set; }

    public SimpsonFactory() {
        Characters = new ObservableCollection<Person>();
    }
}
```

Can expose an interface so implementation can be changed if / when necessary





# Individual Exercise

Add support to delete contacts



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# Modifying collections

- ❖ Normally, changes to **ObservableCollection<T>** must be done on the UI thread – otherwise you will get an exception at runtime

```
void OnProcessWebServiceUpdates(Person[] people)
{
    Device.BeginInvokeOnMainThread(() => {
        foreach (var person in people) {
            Characters.Add(person);
        }
    });
}
```

Must make sure to  
switch to the UI thread  
before altering the  
collection data

# Modifying collections in the background

- ❖ Alternatively, can instruct the binding system to manage that collection in a *thread-safe fashion*

```
BindingBase.EnableCollectionSynchronization(  
    Characters,  
    null,  
    (list, context, action, writeAccess) => {  
        lock (list) {  
            action();  
        }  
    }  
);
```

Pass the instance of the collection that is assigned to the ListView

# Modifying collections in the background

- ❖ Alternatively, can instruct the binding system to manage that collection in a *thread-safe fashion*

```
BindingBase.EnableCollectionSynchronization  
Characters,  
null,  
(list, context, action, writeAccess)  
    lock (list) {  
        action();  
    }  
};
```

Can supply an optional *context* parameter which will be passed to the locking method each time, or use **null** if you don't need it

# Modifying collections in the background

- ❖ Alternatively, can instruct the binding system to manage that collection in a *thread-safe fashion*

```

BindingBase.EnableCollectionSynchronization(
    Characters,
    null,
    (list, context, action, writeAccess) => {
        lock
    }
)

```

Must pass in a **delegate** that the **ListView** will use to access the collection. Method is passed the **Collection**, **Context**, an **Action** to run, and whether this call will alter the collection (to distinguish read & write)

# Modifying collections in the background

- ❖ Alternatively, can instruct the binding system to manage that collection in a thread-safe fashion

```
BindingBase.EnableCollectionSynchronization(  
    Characters,  
    null,  
    (list, context, action, writeAccess) => {  
        lock (list) {  
            action();  
        }  
    }  
);
```

Method used to protect the collection – this can use whatever locking mechanism you prefer but must invoke the passed **Action**

# Flash Quiz

# Flash Quiz

- ① If you intend to alter the collection providing the data, you should use a \_\_\_\_\_ to make sure the UI is notified about the changes
- a) `List<T>`
  - b) `NotifyableCollection<T>`
  - c) `ObservableCollection<T>`
  - d) Any collection type will work



# Flash Quiz

- ① If you intend to alter the collection providing the data, you should use a \_\_\_\_\_ to make sure the UI is notified about the changes
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# Flash Quiz

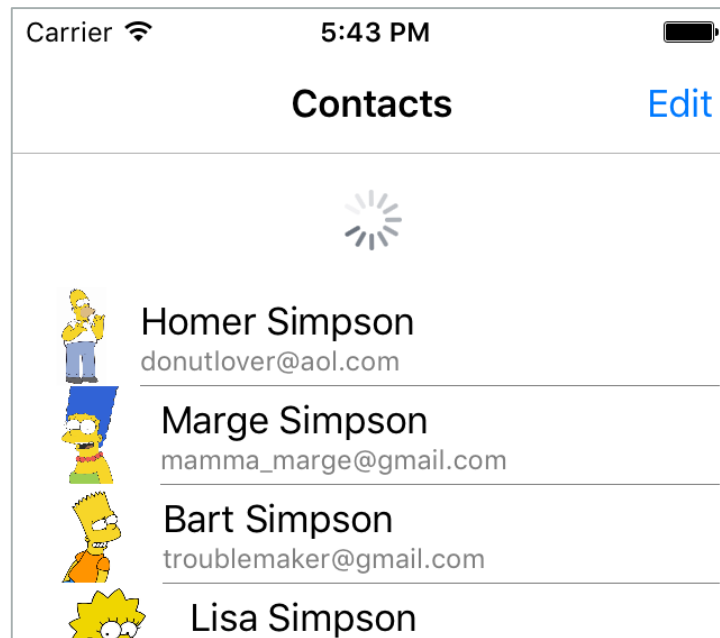
- ② To add a new item to the ListView you can \_\_\_\_\_.
- a) `ListView.Items.Add(...)`
  - b) `ListView.ItemsSource.Add(...);`
  - c) `ListView.Add(...);`
  - d) None of the above

# Flash Quiz

- ② To add a new item to the ListView you can \_\_\_\_\_.
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  - b) `ListView.ItemsSource.Add(...);`
  - c) `ListView.Add(...);`
  - d) None of the above

# Pull to refresh

- ❖ A very popular gesture used with **ListViews** that display external data is "pull-to-refresh" to get new data from the external source
- ❖ Refresh is activated by "pulling down" on the **ListView** – indicator is shown while the data is being updated



# Implementing Pull to refresh

- ❖ Must turn on support through **IsPullToRefreshEnabled**

```
<ListView ... IsPullToRefreshEnabled="True">
```



can be data bound or changed at runtime if  
you want to turn support on and off

# Implementing Pull to refresh

- ❖ Control raises **Refreshing** event when refresh gesture is detected

```
<ListView ... IsPullToRefreshEnabled="True"  
    Refreshing="OnRefreshing" >
```

```
void OnRefreshing(object sender, EventArgs e)  
{  
    ... // Code to do the refresh goes here ..  
    ... // This is called on the UI thread!  
}
```

# Implementing Pull to refresh

- ❖ Must set **IsRefreshing** to false when refresh is complete

```
void OnRefreshing(object sender, EventArgs e)
{
    ... // Code to do the refresh goes here ..
    ((ListView)sender).IsRefreshing = false;
}
```

# Implementing Pull to refresh [MVVM]

- ❖ Can also use **RefreshCommand** property to implement refresh logic as a MVVM-compatible command

```
<ListView ... IsPullToRefreshEnabled="True"  
    IsRefreshing="{Binding IsRefreshing, Mode=TwoWay}" >  
    RefreshCommand="{Binding RefreshCommand}" >
```

```
public class TheViewModel : INotifyPropertyChanged  
{  
    public ICommand RefreshCommand { get; private set; }  
    public bool IsRefreshing ...
```



# Manually starting a Refresh

- ❖ Can manually start and stop a refresh using the **BeginRefresh** and **EndRefresh** methods; this is useful if you have some other way to perform a refresh but want the same built-in experience

```
ListView lv;  
void OnServerUpdatedData(object sender, EventArgs e)  
{  
    lv.BeginRefresh();  
    ... // Update data  
    lv.EndRefresh();  
}
```

# Group Exercise

Add Pull to Refresh support to our app

# Summary

- ❖ Adding, removing and updating data in the ListView
- ❖ UI-safe collection changes
- ❖ Modifying collections in the background





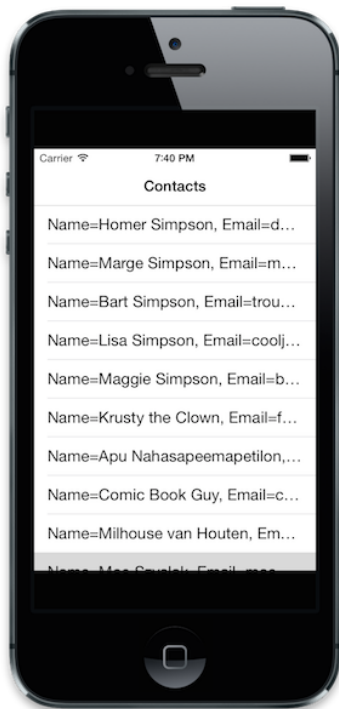
# Customizing the rows

# Tasks

1. Altering the row visuals
2. Using Data Templates
3. Changing the separator
4. Using built-in cell templates



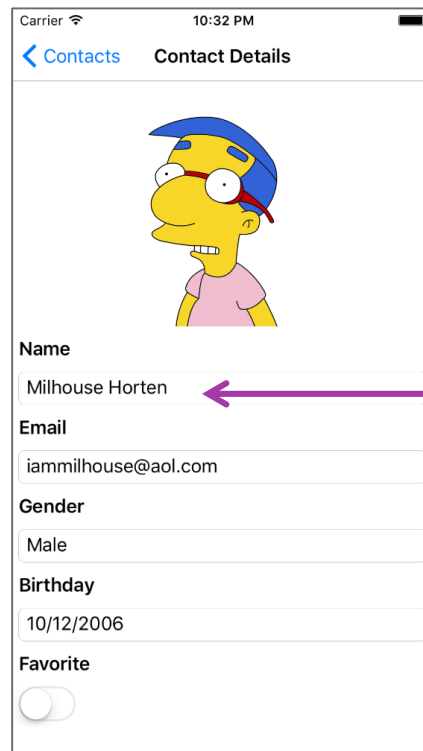
# Displaying ListView Items



- ❖ Default behavior for **ListView** is to use **ToString()** method and display a single string for each row
- ❖ Acceptable for basic data, but has little to no visual customization of colors, position, or even data displayed

# Mutating data

- ❖ A second problem with using the default visualization is that it is considered *read-only*
- ❖ If the data *inside* the object is changed at runtime, the **Listview** will *not* see the change – *even if a property change notification is raised!*

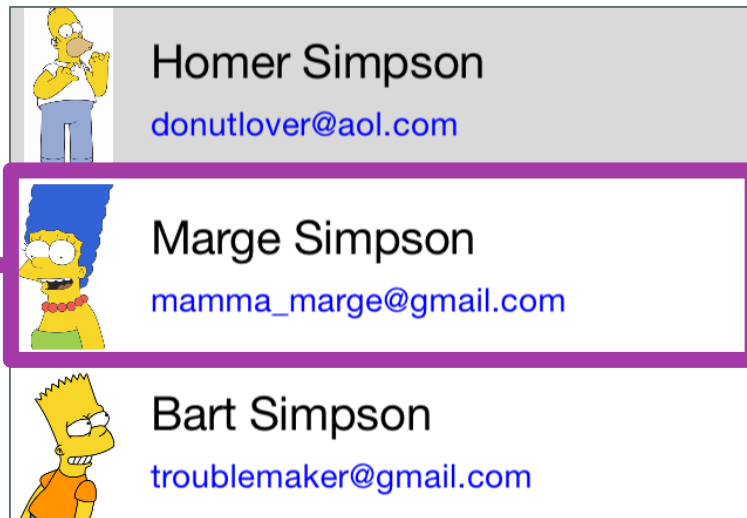


Try changing the data for a record and then going back ... see what happens ..

# Altering the row visuals

- ❖ Can customize the row by setting **ItemTemplate** property

**ItemTemplate** describes visual representation for each row





# Setting an ItemTemplate [XAML]

❖ **DataTemplate** provides visual "instructions" for each row

```
<ListView ...>
  <ListView.ItemTemplate>
    <DataTemplate>
      ...
    </DataTemplate>
  </ListView.ItemTemplate>
</ListView>
```

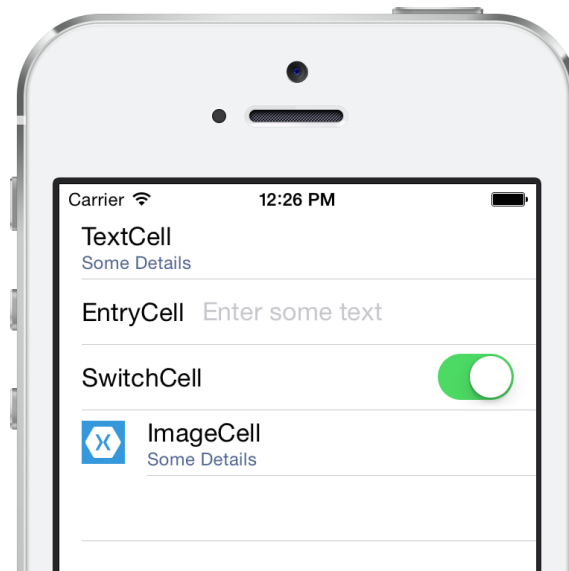
```
contactList.ItemTemplate =
  new DataTemplate(...);
```

**ListView** uses the **DataTemplate** definition to create the runtime visualization, once per row in the **ItemsSource**

# Data Template

- ❖ **DataTemplate** must describe a **Cell**, several built-in variations available


<b>TextCell</b>	Text + Details
<b>EntryCell</b>	Editable Text + Label
<b>SwitchCell</b>	Switch + Label
<b>ImageCell</b>	Image + Text + Details



# Providing Data

- ❖ Cell provides "template" for each row, bindings used to fill in the details

```
<ListView.ItemTemplate>
  <DataTemplate>
    <TextCell Text="{Binding Name}"
              DetailColor="Gray" Detail="{Binding Email}" />
  </DataTemplate>
</ListView.ItemTemplate>
```




**BindingContext** for the generated row will be  
a single item from the **ItemsSource**

# Setting an ItemTemplate [C#]

- ❖ Can create and assign a **DataTemplate** in C# for more dynamic content or if you prefer to not use XAML

```
var dt = new DataTemplate(typeof(TextCell));  
dt.SetBinding(TextCell.TextProperty, "Name");  
dt.SetBinding(TextCell.DetailProperty, "Email");  
dt.SetValue(TextCell.DetailColorProperty, Color.Gray);  
  
contactList.ItemTemplate = dt;
```



Use **SetBinding** for data-bound values that come from the **BindingContext** and **SetValue** for static values to set in the template

# Defining custom cells

- ❖ Can use derived class to keep bindings with definition

Bindings can be set in the constructor with this approach


```
contactList.ItemTemplate =  
    new DataTemplate(typeof(CustomTextCell));
```

```
public class CustomTextCell : TextCell  
{  
    public CustomTextCell() {  
        this.SetBinding(TextCell.TextProperty,  
            new Binding("Name"));  
        this.SetBinding(TextCell.DetailProperty,  
            new Binding("Email"));  
    }  
}
```

# Setting an ItemTemplate [C#]

- ❖ **DataTemplate** can also use a callback function – this can be used to dynamically select a specific template based on runtime characteristics

```
contactList.ItemTemplate = new DataTemplate(  
    () => new TextCell()) {  
    Bindings = {  
        { TextCell.TextProperty, new Binding("Name") },  
        { TextCell.DetailProperty, new Binding("Email") },  
    }  
};
```



Can set a **Bindings** dictionary property to establish the required bindings

# Flash Quiz

# Flash Quiz

- ① Data Templates can be defined in code or XAML
  - a) True
  - b) False



# Flash Quiz

- ① Data Templates can be defined in code or XAML
- a) True
  - b) False

# Flash Quiz

- ② For ListView, the Data Template must define a \_\_\_\_\_ type
- a) View
  - b) Visual
  - c) Cell
  - d) ViewCell

# Flash Quiz

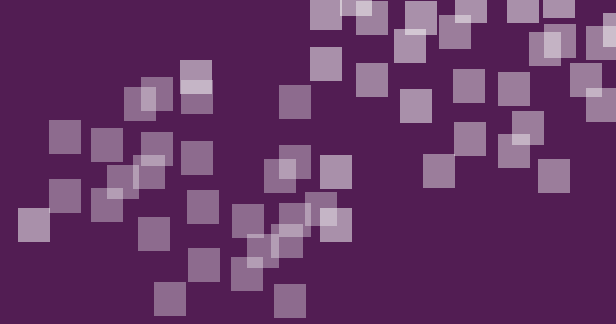
- ② For ListView, the Data Template must define a \_\_\_\_\_ type
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# Flash Quiz

- ③ Which is not a built-in Cell type?
- a) TextCell
  - b) ImageCell
  - c) SliderCell
  - d) All of these are available

# Flash Quiz

- ③ Which is not a built-in Cell type?
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# Individual Exercise

Using the built-in ImageCell to display our Contact List

# Changing the separator

- ❖ Xamarin.Forms supports the ability to change the line that separates each displayed entry through two properties:

```
<ListView ... SeparatorVisibility="None">
```

Can be **None** or **Default**, currently there is no option for **Always** as not all platforms have separators as part of their UX

# Changing the separator

- ❖ Xamarin.Forms supports the ability to change the line that separates each displayed entry through two properties:

```
<ListView ... SeparatorVisibility="None">
```

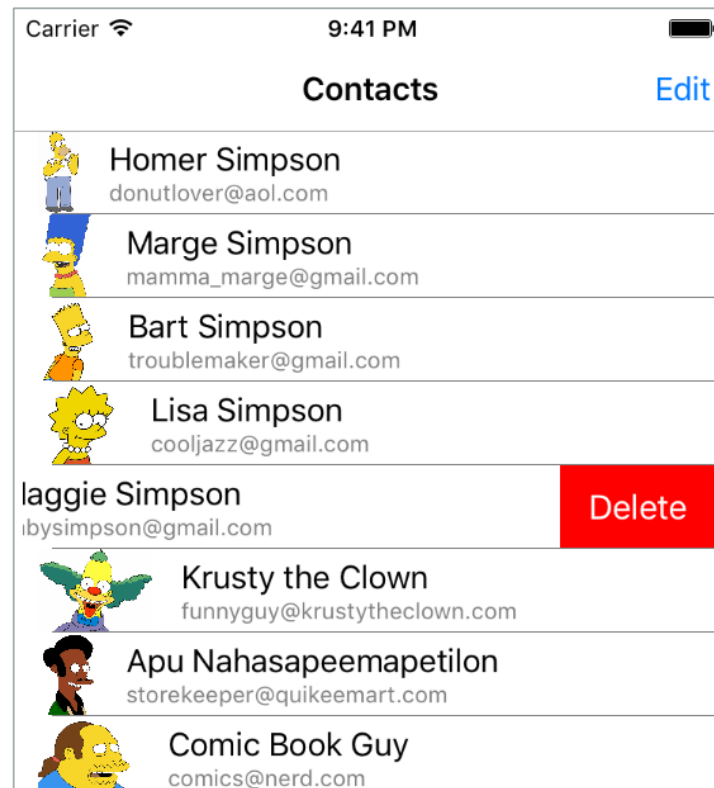
```
<ListView ... SeparatorColor="#90C0C0C0">
```

Can supply an **Argb** value to set the color, or one of the known colors – including **Color.Default**



# Context actions


- ❖ Rows can have *actions* associated with them which are displayed through "swipe to the left" gesture (iOS) or a long-click gesture (other platforms)
- ❖ Allows for one or more "actions" to be displayed and invoked inline with the row
- ❖ Applied through a **ContextAction** property array on the **Cell** definition



# Adding Context Actions

- ❖ Each item in the **ContextActions** collection is a **MenuItem** – can set **Text** and provide an event handler to process the action

```
<TextCell ...>
  <TextCell.ContextActions>
    <MenuItem Clicked="OnMarkAsRead" Text="MarkAsRead" />
    <MenuItem Clicked="OnDelete" Text="Delete"
              IsDestructive="true" />
  </TextCell.ContextActions>
</TextCell>
```




Button is rendered with platform "danger" background, on iOS this results in a red button

# Getting the data out of the handler

- ❖ Can grab **BindingContext** from **MenuItem** sender to determine the data item being interacted with in the event handler

```
void OnDelete(object sender, EventArgs e)
{
    MenuItem item = (MenuItem)sender;
    Person person = (Person)item.BindingContext;
    SimpsonFactory.Characters.Remove(person);
}
```




Never forget that the **BindingContext** is the underlying *model* data for the row  
– this is almost always what you want to work with

# Commanding support in MenuItem

- ❖ MenuItem also has **Command** and **CommandParameter** properties useful for MVVM style implementations

```
<TextCell ...>
  <TextCell.ContextActions>
    ...
    <MenuItem Text="Delete" IsDestructive="True"
              Command="{Binding DeleteContact}"
              CommandParameter="{Binding .}" />
  </TextCell.ContextActions>
</TextCell>
```



Can bind **CommandParameter** to **BindingContext** to get access to the specific element this action is being invoked on

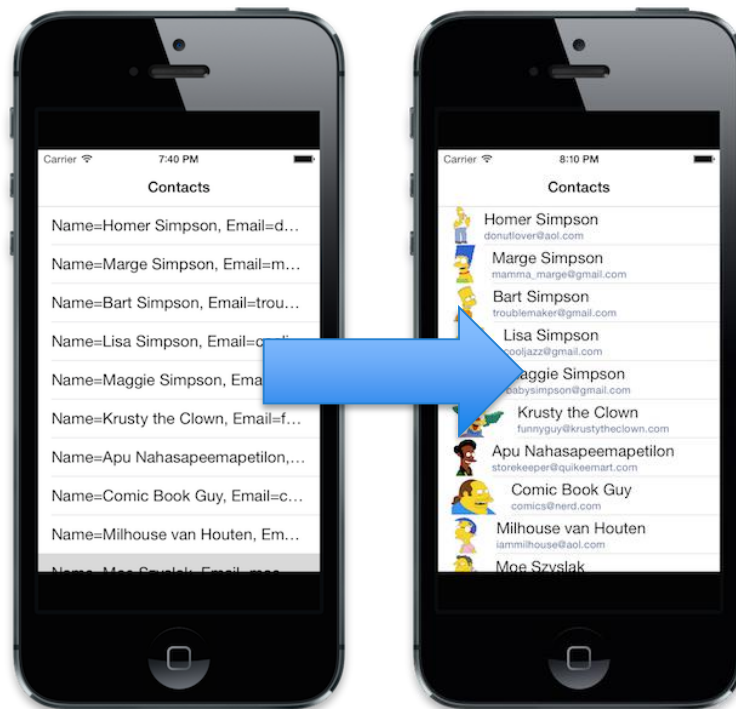


# Homework Exercise

Add a context action to delete a contact

# Summary

1. Altering the Row Visuals
2. Using Data Templates
3. Built-in Cell Templates



# Thank You!

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