Mobile Application Development

Produced by

David Drohan (ddrohan@wit.ie)

Department of Computing & Mathematics
Waterford Institute of Technology
http://www.wit.ie

Waterford Institute *of* Technology
INSTITIÚID TEICNEOLAÍOCHTA PHORT LÁIRGE

Application Design

Agenda & Goals

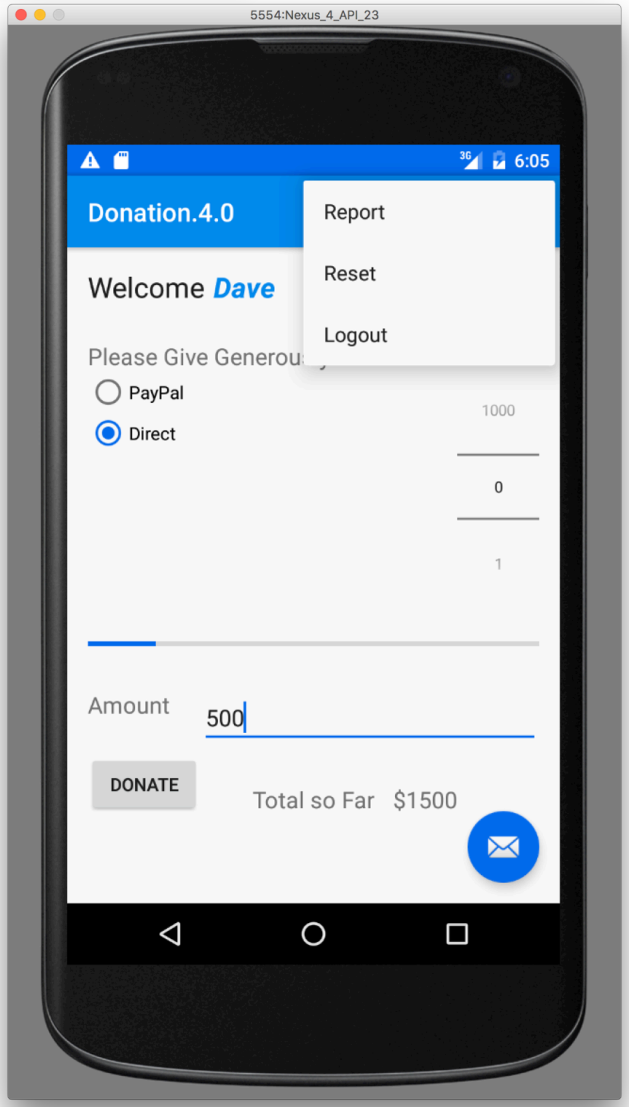
- ❑ Application Design
- ❑ Donation Data Model
- ❑ More Menu Navigation
- ❑ Creating and using Custom Adapters

Introduction – App Design

- The structure of an Android application is fairly rigidly defined. In order for things to work properly, you need to put certain files in the right places.
- As the complexity of an app increases, generally, so too does the design and structure of the app.
- From the developers perspective, it is important to try and maintain the rigid, highly organised, app structure, following well established guidelines and principles.
- Here, we try and follow these principles in refactoring our Donation App to include a Base Class and a Model.

Case Study

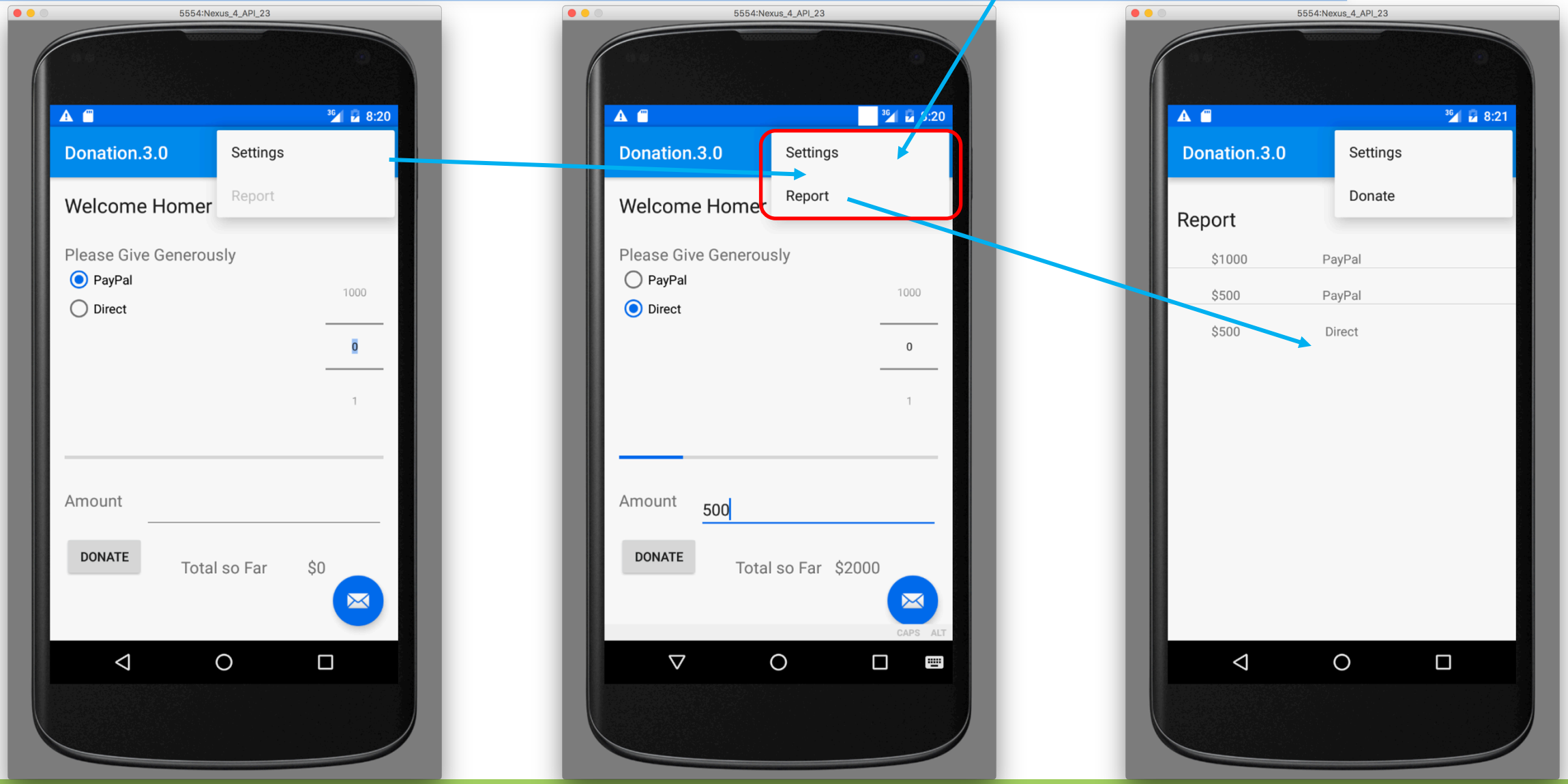
- *Donation* – an Android App to keep track of donations made to '*Homers Presidential Campaign* '.
- App Features
  - Accept donation via number picker or typed amount
  - Keep a running total of donations
  - Display report on donation amounts and types
  - Display running total on progress bar



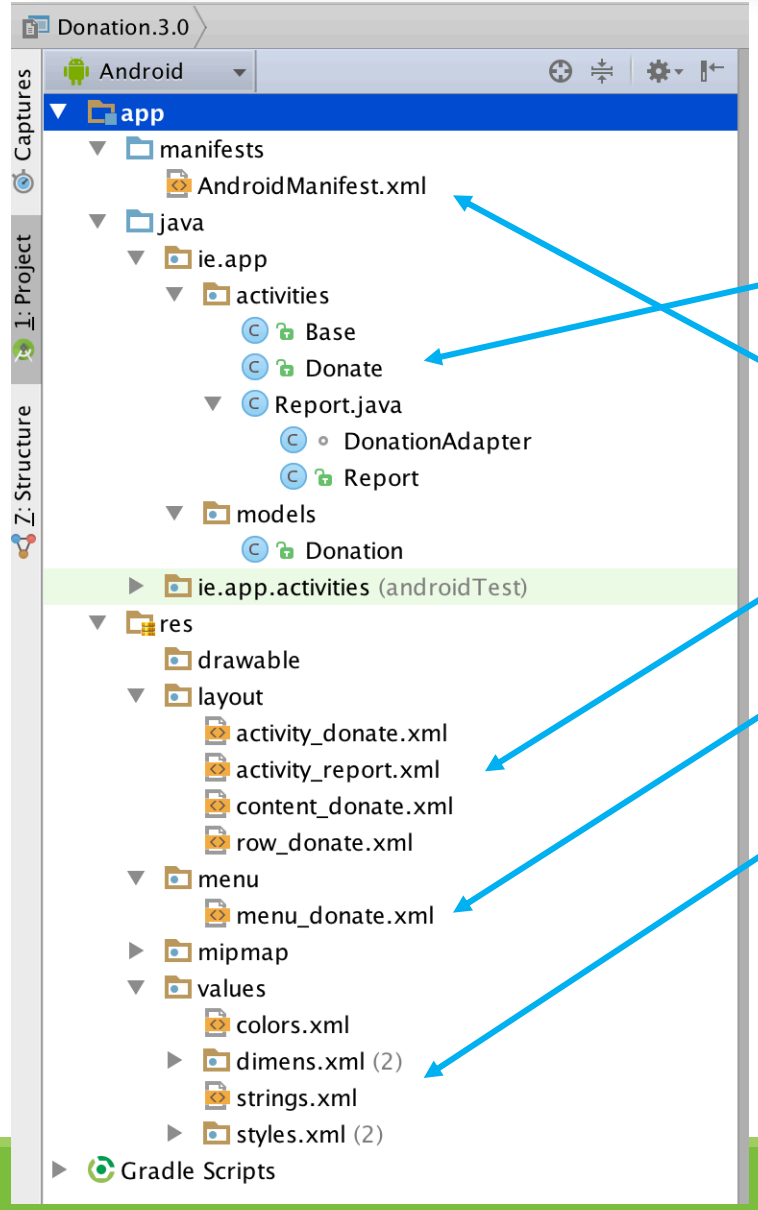
Donation.3.0

Introducing the Model
&
Base Class

Donation 3.0 *


Custom Menu
5554:Nexus_4_API_23
8:20
Donation.3.0
Settings
Report
Welcome Homer
Please Give Generously
PayPal
Direct
1000
0
1
Amount
DONATE
Total so Far $0
5554:Nexus_4_API_23
Donation.3.0
Settings
Report
Welcome Homer
Please Give Generously
PayPal
Direct
1000
0
1
Amount
500
DONATE
Total so Far $2000
5554:Nexus_4_API_23
8:21
Donation.3.0
Settings
Donate
Report
$1000 PayPal
$500 PayPal
$500 Direct

Donation 3.0 – Project Structure *



- 3 java source files
- 4 xml layouts
- 1 xml menu
- 6 xml files for resources
- 1 xml 'configuration' file

Donation 3.0 - Model

Donation.java

```
1  package ie.app.models;
2
3  public class Donation
4  {
5      public int    amount;
6      public String method;
7
8      public Donation (int amount, String method)
9      {
10         this.amount = amount;
11         this.method = method;
12     }
13 }
14
```

We'll refactor this class in Donation 4.0 to include an 'id'

Donation 3.0 – Base Class *

```
public class Base extends AppCompatActivity
{
    public final int       target       = 10000;
    public int             totalDonated = 0;
    public static List<Donation> donations    = new ArrayList<Donation>();

    public boolean newDonation(Donation donation)
    {
        boolean targetAchieved = totalDonated > target;
        if (!targetAchieved)
        {
            donations.add(donation);
            totalDonated += donation.amount;
        }
        else
            Toast.makeText(this, "Target Exceeded!", Toast.LENGTH_SHORT).show();

        return targetAchieved;
    }

    @Override
    public boolean onCreateOptionsMenu(Menu menu)
    {...}

    @Override
    public boolean onPrepareOptionsMenu (Menu menu){...}

    public void settings(MenuItem item)
    {...}

    public void report(MenuItem item) { startActivity (new Intent(this, Report.class)); }

    public void donate(MenuItem item) { startActivity (new Intent(this, Donate.class)); }
}
```

Our List of Donations

We'll take a closer look at these methods in "Menus Part 2"

Adding a 'donation'

Why a ‘Base’ Class?? *

- *Green* Programming – Reduce, Reuse, Recycle
  - Reduce the amount of code we need to implement the functionality required (Code Redundancy)
  - Reuse common code throughout the app/project where possible/appropriate
  - Recycle existing code for use in other apps/projects

- All good for improving Design

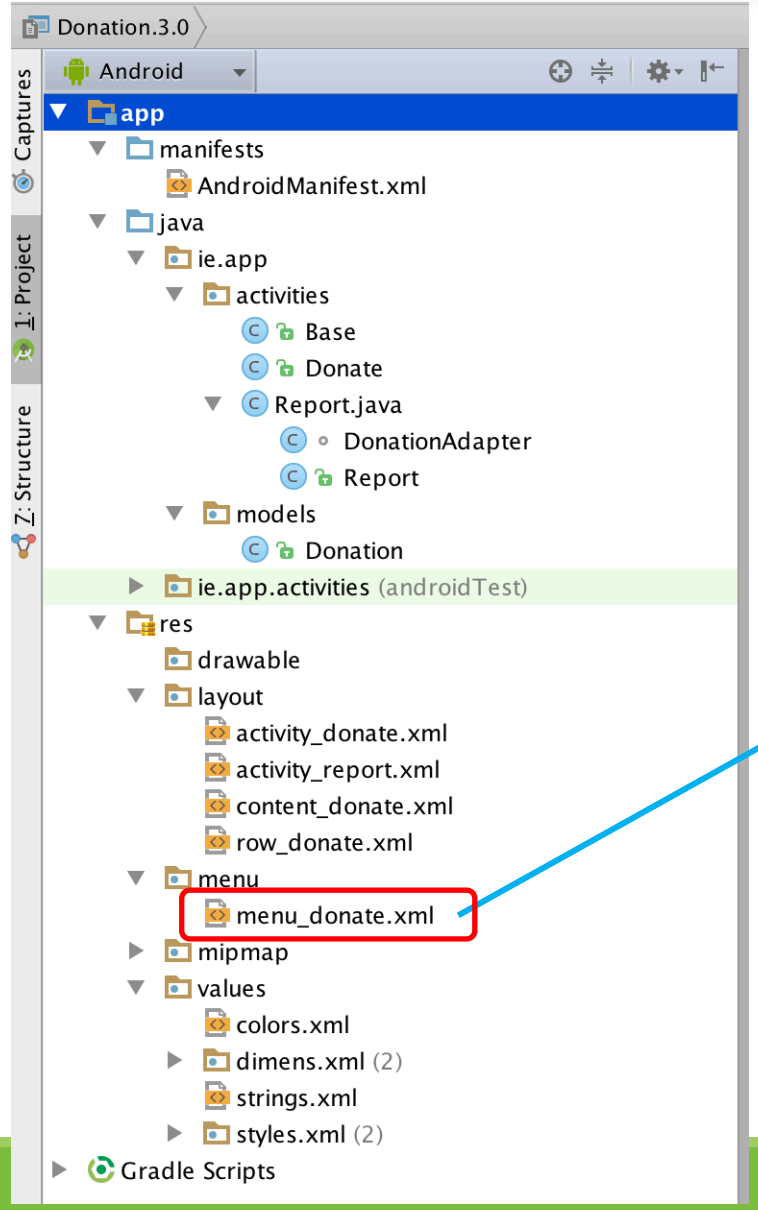
Donation.3.0

Using Menus
Part 2

Enabling/Disabling Menu Items on the fly

- There may be times where you don't want all your menu options available to the user under certain situations
  - e.g – if you've no donations, why let them see the report?
- You can modify the options menu at runtime by overriding the `onPrepareOptionsMenu()` method
  - called each and every time the user presses the *MENU* button.

Menus in *Donation 3.0 **



Menu Specification

```
<menu xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools" tools:context=".Donate">

    <item android:id="@+id/action_settings"
        android:title="Settings"
        android:orderInCategory="100"
        app:showAsAction="never"
        android:onClick="settings"/>

    <item
        android:id="@+id/menuReport"
        android:orderInCategory="100"
        android:title="Report"
        app:showAsAction="never"
        android:onClick="report"/>

    <item
        android:id="@+id/menuDonate"
        android:orderInCategory="100"
        android:title="Donate"
        app:showAsAction="never"
        android:onClick="donate"/>
</menu>
```

Note the use of an ‘onClick’ attribute

Donation 3.0 Menu Event Handler *

```
public class Base extends AppCompatActivity
{
    public final int       target       = 10000;
    public int             totalDonated = 0;
    public static List<Donation> donations    = new ArrayList<Donation>();

    public boolean newDonation(Donation donation)
    {...}

    @Override
    public boolean onCreateOptionsMenu(Menu menu)
    {...}

    @Override
    public boolean onPrepareOptionsMenu (Menu menu){...}

    public void settings(MenuItem item)
    {
        Toast.makeText(this, "Settings Selected", Toast.LENGTH_SHORT).show
    }

    public void report(MenuItem item)
    {
        startActivity (new Intent(this, Report.class));
    }

    public void donate(MenuItem item)
    {
        startActivity (new Intent(this, Donate.class));
    }
```

Menu Specification

```
<menu xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools" tools:context=".Donate">

    <item android:id="@+id/action_settings"
        android:title="Settings"
        android:orderInCategory="100"
        app:showAsAction="never"
        android:onClick="settings"/>

    <item
        android:id="@+id/menuReport"
        android:orderInCategory="100"
        android:title="Report"
        app:showAsAction="never"
        android:onClick="report"/>

    <item
        android:id="@+id/menuDonate"
        android:orderInCategory="100"
        android:title="Donate"
        app:showAsAction="never"
        android:onClick="donate"/>
</menu>
```

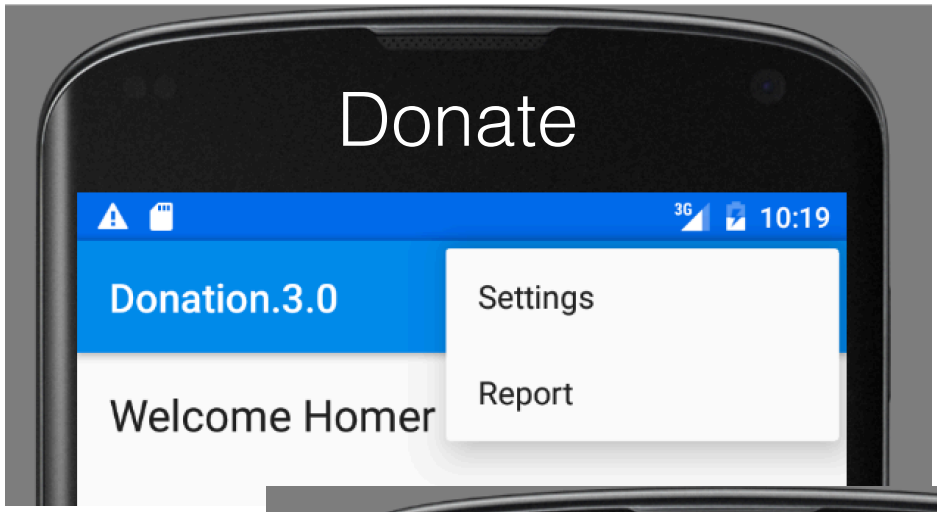
Donation 3.0 – onPrepareOptionsMenu()

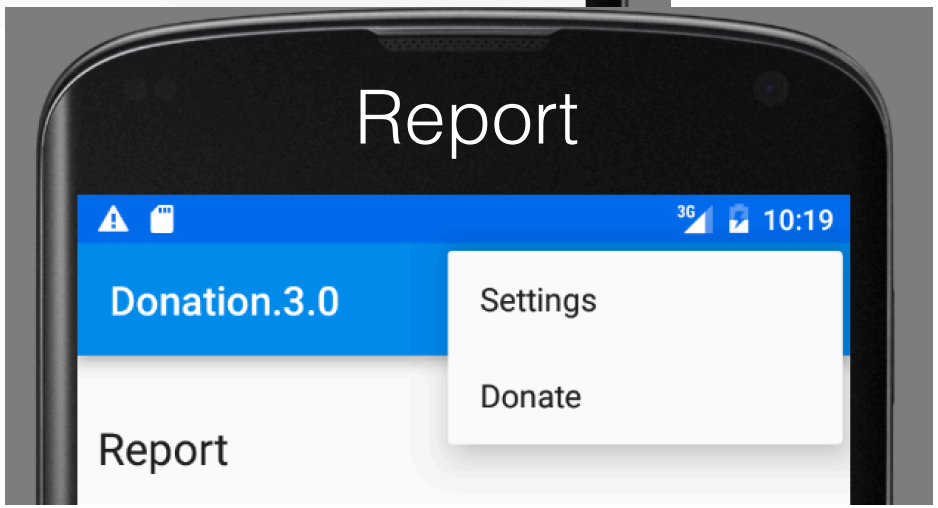
```
@Override
public boolean onPrepareOptionsMenu (Menu menu){
    super.onPrepareOptionsMenu(menu);
    MenuItem report = menu.findItem(R.id.menuReport);
    MenuItem donate = menu.findItem(R.id.menuDonate);

    if(donations.isEmpty())
        report.setEnabled(false);
    else
        report.setEnabled(true);

    if(this instanceof Donate){
        donate.setVisible(false);
        if(!donations.isEmpty())
            report.setVisible(true);
    }
    else {
        report.setVisible(false);
        donate.setVisible(true);
    }

    return true;
}
```



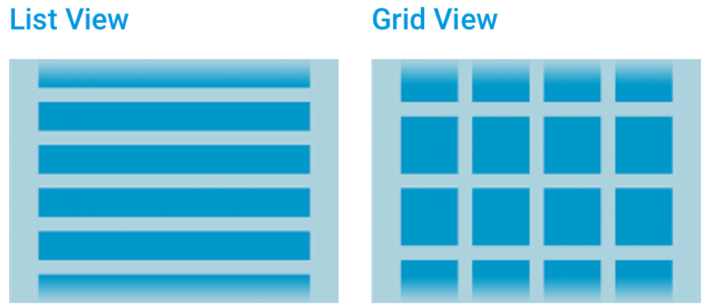


Donation.3.0

Using ArrayAdapters & ListViews

Introducing Adapters

- **`Adapters`** are bridging classes that bind data to **`Views`** (eg ListViews) used in the UI.
  - Responsible for creating the child Views used to represent each item within the parent View, and providing access to the underlying data
- Views that support adapter binding must extend the **`AdapterView`** abstract class.
  - You can create your own `AdapterView`-derived controls and create new custom `Adapter` classes to bind to them.
- Android supplies a set of `Adapters` that pump data into native UI controls and layouts



Building Layouts with an Adapter

- Because **`Adapters`** are responsible for supplying the data **AND** for creating the Views that represent each item, they can radically modify the appearance and functionality of the controls they're bound to.
- Most Commonly used Adapters
  - **`ArrayAdapter`**
    - uses generics to bind an **`AdapterView`** to an array of objects of the specified class.
    - By default, uses the **`toString()`** of each object to create & populate `TextViews`.
    - Other constructors available for more complex layouts (as we will see later on)
    - Can extend the class to use alternatives to simple `TextViews` (as we will see later on)
- See also **`SimpleCursorAdapter`** – attaches Views specified within a layout to the columns of Cursors returned from Content Provider queries.

Filling an Adapter View with Data

- You can populate an AdapterView such as ListView or GridView by binding the AdapterView instance to an Adapter, which retrieves data from an external source and creates a View that represents each data entry.

```
ArrayAdapter<String> adapter = new ArrayAdapter<String>(this,
                                                        android.R.layout.simple_list_item_1,
                                                        numbers);
```

- The arguments for this constructor are:
  - Your app Context
  - The layout that contains a TextView for each string in the array
  - The string array (*numbers*)
- Then simply call setAdapter() on your ListView:

```
listView = (ListView) findViewById(R.id.reportList);
listView.setAdapter(adapter);
```

Donation.2.0

Handling Click Events

- You can respond to click events on each item in an AdapterView by implementing the AdapterView.OnItemClickListener interface

```
// Create a message handling object as an anonymous class.
private OnItemClickListener mMessageClickedHandler = new OnItemClickListener() {
    public void onItemClick(AdapterView parent, View v, int position, long id) {
        // Do something in response to the click
    }
};

listView.setOnItemClickListener(mMessageClickedHandler);
```

- We won't be covering this in our Case Study, but would be desirable to see in your project

Donation.3.0

Custom Adapters

Customizing the ArrayAdapter *

- By default, the **`ArrayAdapter`** uses the **`toString()`** of the object array it's binding, to populate the **`TextView`** available within the specified layout.
- Generally, you customize the layout to display more complex views by..
  - Extending the **`ArrayAdapter`** class with a type-specific variation, eg

```
class DonationAdapter extends ArrayAdapter<Donation>
```

  - Override the **`getView()`** method to assign object properties to layout `View` objects. (see our case study example next)
  - Override the **`getCount()`** method to return the current size of the dataset

The `getView()` Method

- Used to construct, inflate, and populate the View that will be displayed within the parent **`AdapterView`** class (eg a ListView) which is being bound to the underlying array using this adapter.
- Receives parameters that describes
  - The position of the item to be displayed
  - The **`View`** being updated (or `null`)
  - The **`ViewGroup`** into which this new **`View`** will be placed
- Returns the new populated **`View`** instance as a result

- A call to **`getItem()`** will return the value (object) stored at the specified index in the underlying array.

Donation 3.0 – Report Activity *

```
public class Report extends Base
{
    ListView listView;

    @Override
    public void onCreate(Bundle savedInstanceState)
    {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_report);

        listView = (ListView) findViewById(R.id.reportList);
        DonationAdapter adapter = new DonationAdapter(this,  donations);
        listView.setAdapter(adapter);
    }
}
```

Donation 3.0 - DonationAdapter class

```
class DonationAdapter extends ArrayAdapter<Donation>
{
    private Context context;
    public List<Donation> donations;

    public DonationAdapter(Context context, List<Donation> donations)
    {
        super(context, R.layout.row_donate, donations);
        this.context   = context;
        this.donations = donations;
    }

    @Override
    public View getView(int position, View convertView, ViewGroup parent)
    {
        LayoutInflater inflater = (LayoutInflater) context.getSystemService(Context.LAYOUT_INFLATER_SERVICE);

        View     view       = inflater.inflate(R.layout.row_donate, parent, false);
        Donation donation   = donations.get(position);
        TextView amountView = (TextView) view.findViewById(R.id.row_amount);
        TextView methodView = (TextView) view.findViewById(R.id.row_method);

        amountView.setText("$" + donation.amount);
        methodView.setText(donation.method);

        return view;
    }

    @Override
    public int getCount() { return donations.size(); }
}
```

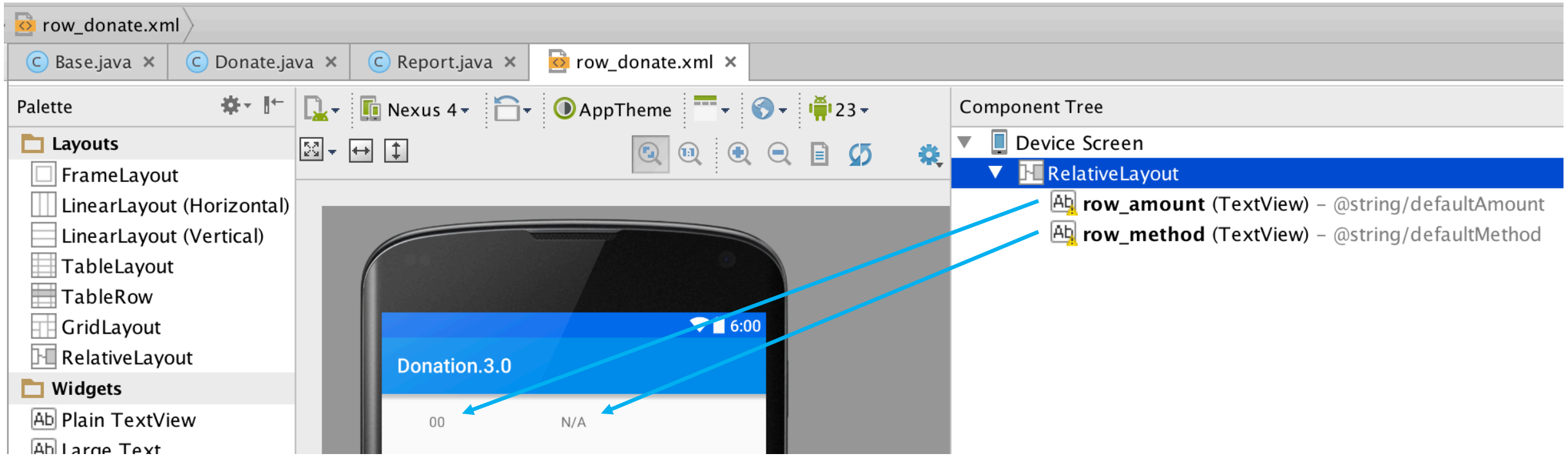
Custom ArrayAdapter of type 'Donation'

Custom Row Layout

Every time this method is called we create a new 'Row' (a Donation from our List) to add to the ListView

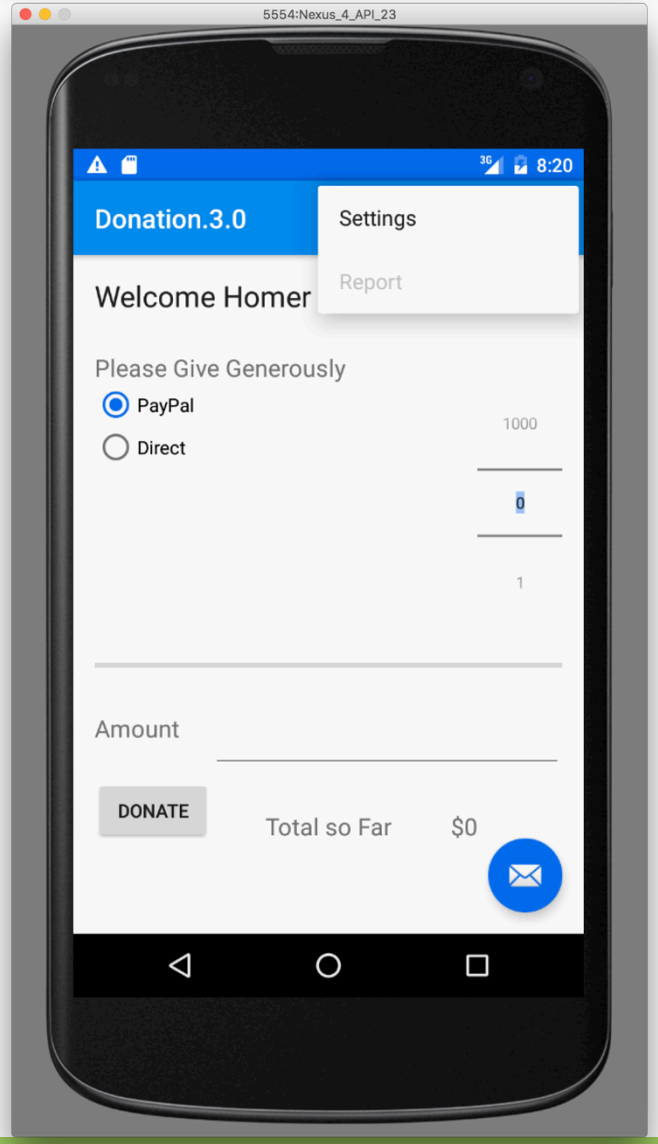
Very Important, so the adapter knows how many objects it has and how many times to call 'getView()'

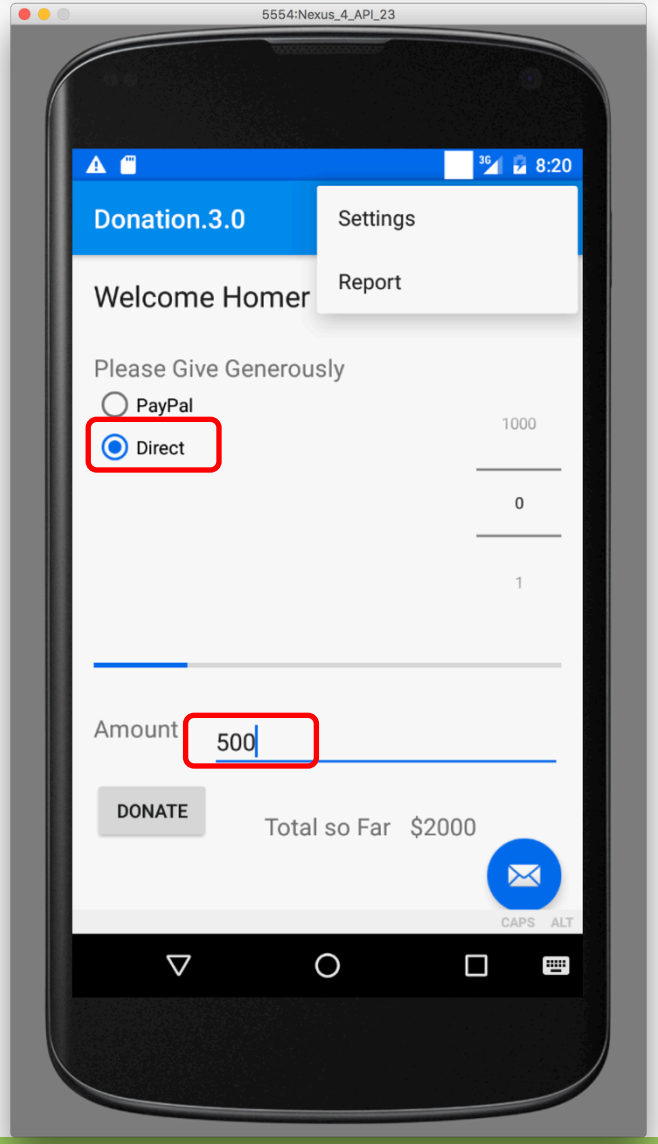
Donation 3.0 - row_donate.xml

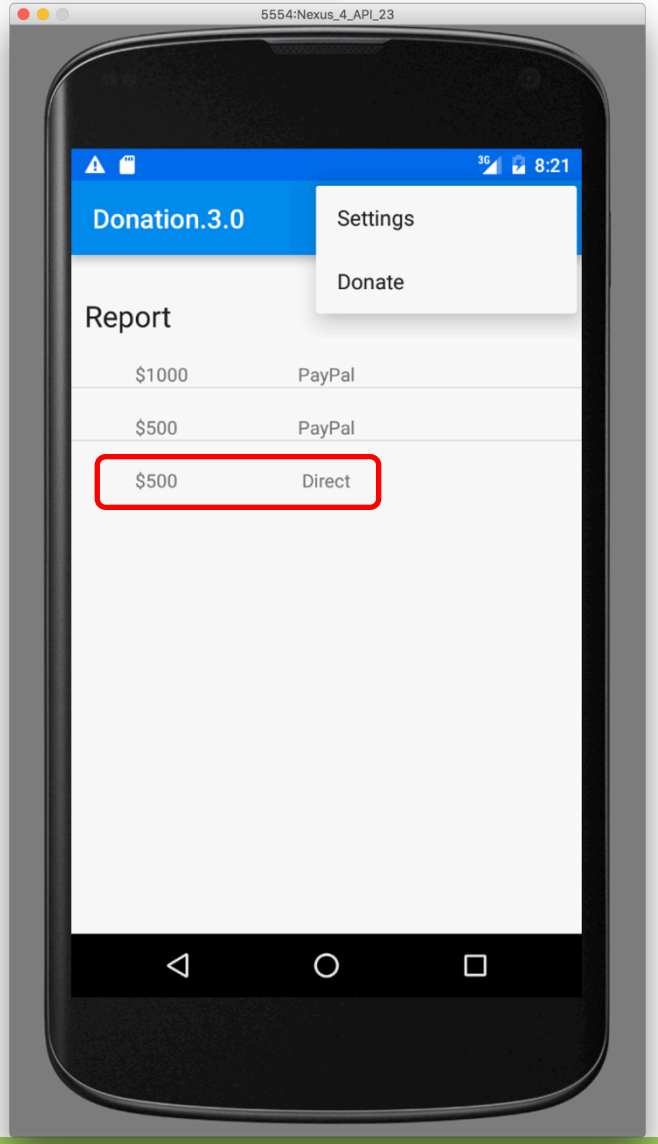


Each time `getView()` is called, it creates a new '`Row`' and binds the individual Views (widgets) above, to each element of the object array in the `ArrayAdapter`.

Resulting ListView (inside our Report) *







Summary

- We looked at Application Structure and Design
- We revisited the Structure of our App and introduced a ‘Donation Model’ and Base class
- We looked at more Menu Navigation
- We Created and used Custom **Adapters**

Questions?


Thanks!