



Lecture 3 Creating User Interfaces

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Today's Topics

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- Views
- Layout
- UI Event
 - Event Listener
- Menu
- Dialog

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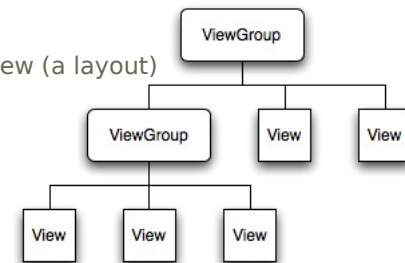
Layout

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View, ViewGroup, and Activity

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- The user interface is built using View and ViewGroup objects.
- View Hierarchy
 - View object
 - The basic unit of user interface expression.
 - ViewGroup object
 - The base for subclasses called "layouts."
- Activity
 - To display a user interface, assign a View (a layout) to an Activity.
 - setContentView()
 - Activity must call this method.



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Creating Activity UI w/ Views

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- The `setContentView` method accepts either a layout resource ID or a single View instance.

■ Example

■ 1) Using a layout resource

```
■ @Override
public void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.main);
    TextView myTextView = (TextView) findViewById(R.id.myTextView);
}
```

■ 2) Creating a UI layout in code

```
■ @Override
public void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    TextView myTextView = new TextView(this);
    myTextView.setText("Hello, Kettering");
    setContentView(myTextView);
}
```

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Common Layout Objects

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■ RelativeLayout

- It lets child views specify their position relative to the parent view.

■ FrameLayout

- The simplest type of layout object.

- It is a blank space on your screen that you can later fill with a single object.

■ LinearLayout

- It aligns all children in a single direction - vertically or horizontally.

- All children are stacked one after the other.

■ TableLayout

- It positions its children into rows and columns.

- `TableRow` is the child view of a `TableLayout`

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Layout

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- The name of an XML element is respective to the Java class.

- `<TextView>` element creates a `TextView` in your UI.

- `<LinearLayout>` element creates a `LinearLayout` view group.

- Layout manager is the extension of the `ViewGroup` class

- Used to position child controls for your UI.

■ Layout classes

- `RelativeLayout`

- `LinearLayout`

- `FrameLayout`

- `TableLayout`

- `Gallery` (deprecated: see `ViewPager`)

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Element Size

wrap_content and fill_parent

■ wrap_content

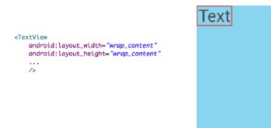
- Sets the size of a View to the minimum required to contain the contents it displays.

■ match_parent

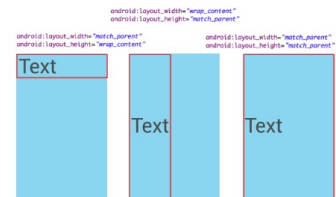
- Expands the View to fill the available space within the parent View.

- The width and height can be set by `wrap_content` and `match_parent` rather than an exact height or width in pixels.

wrap_content



match_parent



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RelativeLayout Example

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- Note: fill_parent is deprecated. See match_parent.

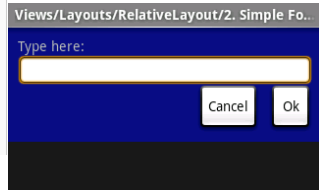
```
<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="fill_parent"
    android:layout_height="wrap_content"
    android:background="@drawable/blue"
    android:padding="10px" >

    <TextView android:id="@+id/label"
        android:layout_width="fill_parent"
        android:layout_height="wrap_content"
        android:text="Type here:" />

    <EditText android:id="@+id/entry"
        android:layout_width="fill_parent"
        android:layout_height="wrap_content"
        android:background="@android:drawable/editbox_background"
        android:layout_below="@id/label" />

    <Button android:id="@+id/ok"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_below="@id/entry"
        android:layout_alignParentRight="true"
        android:layout_marginLeft="10px"
        android:text="OK" />

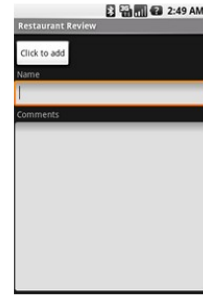
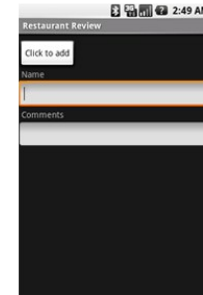
    <Button android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_toLeftOf="@id/ok"
        android:layout_alignTop="@id/ok"
        android:text="Cancel" />
</RelativeLayout>
```



LinearLayout Example

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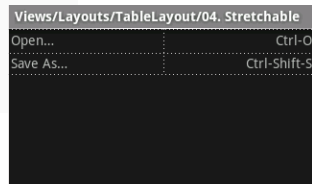
- Size of elements
 - match_parent vs. wrap_content
 - Text boxes have their widths: match_parent
 - Other elements have their width: wrap_content.
- Gravity (alignment):
 - The gravities of all elements are left.
- Weight:
 - The left version: 0 for all UI components.
 - The right version:
 - Comments text box has 1.
 - If the Name text box has also 1, then
 - Two text boxes would have the same height.



TableLayout Example

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```
<?xml version="1.0" encoding="utf-8"?>
<TableLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="fill_parent"
    android:layout_height="fill_parent"
    android:stretchColumns="1">
    <TableRow>
        <TextView
            android:text="@string/table_layout_4_open"
            android:padding="3dip" />
        <TextView
            android:text="@string/table_layout_4_open_shortcut"
            android:gravity="right"
            android:padding="3dip" />
    </TableRow>
    <TableRow>
        <TextView
            android:text="@string/table_layout_4_save"
            android:padding="3dip" />
        <TextView
            android:text="@string/table_layout_4_save_shortcut"
            android:gravity="right"
            android:padding="3dip" />
    </TableRow>
</TableLayout>
```

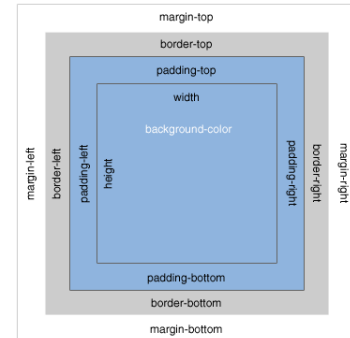


Layout Parameters

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Box Model for View Dimension

- ViewGroups** provide **Margin**.
 - ViewGroup.LayoutParams.leftMargin
 - ViewGroup.LayoutParams.topMargin
 - ViewGroup.LayoutParams.rightMargin
 - ViewGroup.LayoutParams.bottomMargin
- Views** support **Padding**.
 - GetPaddingLeft();
 - GetPaddingTop();
 - GetPaddingRight();
 - GetPaddingBottom();



Event Listener

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UI Events

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- Now you have some Views on the screen.
- How to connect user's interactions with Views?
- You need to do one of these
 - Event Listener
 - Define an event listener and register it to the View.
 - The View class contains a collection of nested listener interfaces.
 - Examples
 - View.On**C**lickListener
 - View.On**T**ouchListener
 - Override an existing callback method for the View.
 - When you've implemented your own UI class.

Event Listener

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Event Listener

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- For example,
 - A View is touched.
 - onTouchEvent() method is called on that object.
 - In order to intercept this event, we must extend the class and override the method.
 - This approach is OK for a single view.
 - What if there are many different types of views on one Activity?
 - Extending each class and override the method for each View are not practical.
- Event Listener!
 - An interface in the View class that contains a single callback method.
 - Set your own event handler to the Listener. Then Android framework will call it when a corresponding event occurs.

Callback methods and EventListener interface

- Callback method and Event listener interfaces
 - onClick View.OnClickListener
 - onLongClick View.OnLongClickListener
 - onFocusChange View.OnFocusChangeListener
 - onTouch View.OnTouchListener
 - onCreateContextMenu View.OnCreateContextMenuListener
- Examples

```
private OnClickListener myButtonListener = new OnClickListener() {
    public void onClick(View v) {
        // do something when the button is clicked
    }
};

protected void onCreate(Bundle savedInstanceState) {
    ...
    Button button = (Button)findViewById(R.id.myButton);
    // Register the onClick listener with the implementation above
    button.setOnClickListener(myButtonListener);
    ...
}
```

Menu

Menu

Three types of application menus

■ Options Menu

- The primary menu for an Activity
- When the user presses the device MENU key (being phased out) or Three-dot-overflow (Toolbar or ActionBar).
- Two groups of Option Menu
 - Icon Menu (old style)
 - The menu items visible at the bottom of the screen (max six).
 - Icon menu items do not support checkboxes and radio buttons.
 - Expanded Menu
 - The vertical list of menu items exposed by the “More” menu item in the Icon Menu.
- Also see Toolbar (latest) and ActionBar (being phased out).

■ Context Menu

- A floating list of menu items.

■ Submenu

- A floating list of menu items that the user opens by pressing a menu item in the Options Menu or Context Menu.

Options Menu

Inflating a Menu Resource

- Use `MenuInflater.inflate()` to inflate a menu resource in `onCreateOptionsMenu()` callback method.

```
@Override
public boolean onCreateOptionsMenu(Menu menu) {
    MenuInflater inflater = getMenuInflater();
    inflater.inflate(R.menu.main, menu);
    return true;
}
```

Options Menu

Definition of Options Menu

- Define a menu and its items in an XML.
 - Create an XML file inside `res/menu/` directory.
- XML items
 - `android:id`
 - Unique id to the item.
 - `android:title`
 - Visible to the user.

```
<menu xmlns:android="http://schemas.android.com/apk/res/android">
  <item android:id="@+id/item01" android:title="@string/item01"></item>
  <item android:id="@+id/item02" android:title="@string/item02"></item>
  <item android:id="@+id/item03" android:title="@string/item03"></item>
</menu>
```

Options Menu

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Selecting an Item

- When the user selects a menu item from Options Menu, `onOptionsItemSelected()` method will be called with `MenuItem` by the system.

```
public boolean onOptionsItemSelected(MenuItem item) {
    // Handle item selection
    switch (item.getItemId()) {
        case R.id.item01:
            doSomething01();
            return true;
        case R.id.item02:
            doSomething02();
            return true;
        case R.id.item03:
            doSomething03();
            return true;
        default:
            return super.onOptionsItemSelected(item);
    }
}
```

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Creating Submenus

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- No nested submenus
 - A submenu cannot have another submenu.
- Adding a `<menu>` element as the child of an `<item>`.

```
<menu xmlns:android="http://schemas.android.com/apk/res/android">
    <item android:id="@+id/item01" android:title="@string/item01">
        <!-- "item01" submenu -->
        <menu>
            <item android:id="@+id/item01_new"
                android:title="@string/item01_new" />
            <item android:id="@+id/item02_open"
                android:title="@string/item01_open" />
        </menu>
    </item>
    <item android:id="@+id/item02" android:title="@string/item02"></item>
    <item android:id="@+id/item03" android:title="@string/item03"></item>
</menu>
```

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Context Menu

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- A context menu is displayed when the user long-presses an item.
- Conceptually similar to Right-click menu on a PC.
- Use `onCreateContextMenu()`.

```
public void onCreateContextMenu(ContextMenu menu, View v,
    ContextMenuInfo menuInfo) {
    super.onCreateContextMenu(menu, v, menuInfo);
    MenuInflater inflater = getMenuInflater();
    inflater.inflate(R.menu.context, menu);
}
```

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Dialog

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Dialog

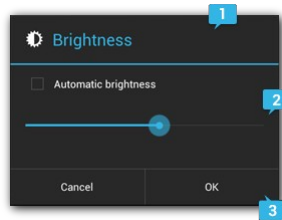
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- A small window that appears in front of the current Activity.
- Dialog object types.
 - AlertDialog
 - A dialog that has buttons or selectable items.
 - DatePickerDialog
 - A dialog that allows the user to select a date.
 - TimePickerDialog
 - A dialog that allows the user to select a time.

Creating an AlertDialog

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- Use AlertDialog.Builder to make an AlertDialog.
 - A title
 - Content area
 - Button(s)
 - A list of selectable items.

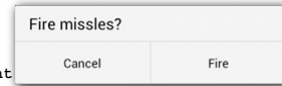


```
AlertDialog.Builder builder = new AlertDialog.Builder(this);
builder.setMessage("Are you sure you want to exit?")
    .setTitle("Confirmation")
    .setCancelable(false)
    .setPositiveButton(R.string.ok, new DialogInterface.OnClickListener() {
        public void onClick(DialogInterface dialog, int id) {
            HelloKettering.this.finish();
        }
    })
    .setNegativeButton(R.string.cancel, new DialogInterface.OnClickListener() {
        public void onClick(DialogInterface dialog, int id) {
            dialog.cancel();
        }
    });
AlertDialog alert = builder.create();
alert.show();
```

Creating a Dialog Fragment

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- Extend DialogoFragment and create AlertDialog
- Example:



```
public class FireMissilesDialogFragment extends DialogFragment {
    @Override
    public Dialog onCreateDialog(Bundle savedInstanceState) {
        // Use the Builder class for convenient dialog construction
        AlertDialog.Builder builder = new AlertDialog.Builder(getActivity());
        builder.setMessage(R.string.dialog_fire_missiles)
            .setPositiveButton(R.string.fire, new DialogInterface.OnClickListener() {
                public void onClick(DialogInterface dialog, int id) {
                    // FIRE ZE MISSILES!
                }
            })
            .setNegativeButton(R.string.cancel, new DialogInterface.OnClickListener() {
                public void onClick(DialogInterface dialog, int id) {
                    // User cancelled the dialog
                }
            });
        // Create the AlertDialog object and return it
        return builder.create();
    }
}
// Then you can instantiate the dialog. And use .show()
FireMissilesDialogFragment dlg = FireMissilesDialogFragment.newInstance();
dlg.show(getFragmentManager(), "dialog");
```

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Supporting Multiple Screens

Variety of Android Devices

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- Android runs on a variety of devices that offer different screen size and densities.
- Developers should make the effort to optimize your app for different screen size and densities.



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Density-independent pixel (dp)

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- dp is equivalent to one physical pixel on a 160 dpi screen (medium density screen), the baseline density.
- At runtime, the system transparently handles any scaling of the dp units, as necessary, based on the actual density of the screen in use.
- The conversion of dp units to screen pixels is simple:
 - $px = dp * (dpi / 160)$.
 - For example, on a 240 dpi screen, 1 dp equals 1.5 physical pixels.
 - You should always use dp units when defining your application's UI, to ensure proper display of your UI on screens with different densities.

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Screen

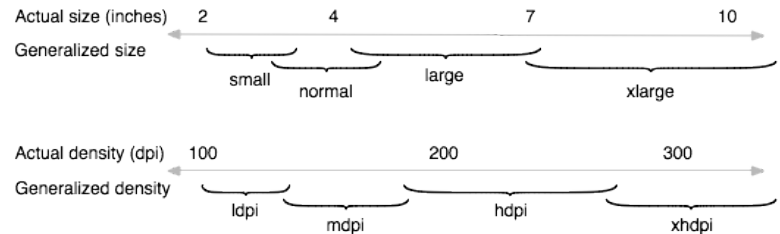
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- Screen size
 - Actual physical size measured as the screen's diagonal.
 - All actual screen sizes into four generalized sizes:
 - small, normal, large, and extra large.
- Screen density
 - The quantity of pixels with a physical area of the screen. (usually referred to as dots per inch (dpi)).
 - All actual screen densities into four generalized densities:
 - low, medium, high, and extra high.
- Density independent pixel (dp)
 - A virtual pixel unit that you should use when defining UI layout, to express layout dimensions or position in a density-independent way.

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Range of Screens

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- layout
 - xlarge screens are at least 960dp x 720dp
 - large screens are at least 640dp x 480dp
 - normal screens are at least 470dp x 320dp
 - small screens are at least 426dp x 320dp

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Best Practices

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- Use `wrap_content`, `fill_parent`, or `dp` units when specifying dimensions in an XML layout file.
- Do not use hard coded pixel values in your application code.
- Do not use `AbsoluteLayout` (it's deprecated).
- Supply alternative bitmap drawables for different screen densities.

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ProgressDialog

Add this as a class variable
`private ProgressDialog progress;`

In `onCreate()` add this.
`progress = new ProgressDialog(this);`

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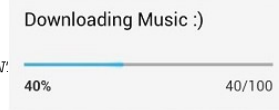
- Two types of `ProgressDialog`.

■ HORIZONTAL / SPINNER

```
progress.setProgressStyle(ProgressDialog.STYLE_HORIZONTAL);  
progress.show();
```

```
final int total = 100;  
new Thread() {  
    @Override  
    public void run() {  
        int i = 0;  
        while( i < total ) {  
            try {  
                sleep(100);  
            } catch (InterruptedException e) {  
                e.printStackTrace();  
            }  
            i ++;  
            progress.setProgress(i);  
        }  
    }  
}.start();
```

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Further Readings

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Pickers - DatePickerDialog

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- To use `DatePickerDialog` using `DialogFragment`, you need to define a fragment class that extends `DialogFragment` and return a `DatePickerDialog` from the fragment's `onCreateDialog()` method.

- Create a new class.

```
public class TimePickerFragment extends DialogFragment  
    implements TimePickerDialog.OnTimeSetListener {  
  
    @Override  
    public Dialog onCreateDialog(Bundle savedInstanceState) {  
        // Use the current time as the default values for the picker  
        final Calendar c = Calendar.getInstance();  
        int hour = c.get(Calendar.HOUR_OF_DAY);  
        int minute = c.get(Calendar.MINUTE);  
  
        // Create a new instance of TimePickerDialog and return it  
        return new TimePickerDialog(getActivity(), this, hour, minute,  
            DateFormat.is24HourFormat(getActivity()));  
    }  
  
    public void onTimeSet(TimePicker view, int hourOfDay, int minute) {  
        // Do something with the time chosen by the user  
    }  
}
```

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Pickers - DatePickerDialog

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- Create an instance of `TimePickerFragment` and call `.show()` method of the instance.
- This method must be called to show the `TimePickerDialog`.

```
public void showTimePickerDialog(View v) {  
    DialogFragment newFragment = new  
    TimePickerFragment();  
    newFragment.show(getFragmentManager(),  
    "timePicker");  
}
```

Pickers - TimePickerDialog

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- Pretty much same as `DatePickerDialog`.

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Questions?