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Lecture 3 Creating User Interfaces

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Today's Topics

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

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Layout

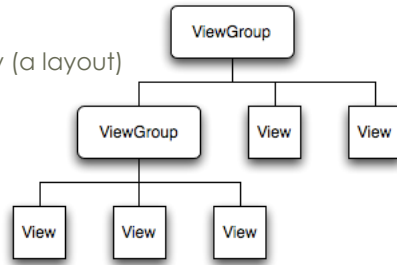
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View, ViewGroup, and Activity

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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.



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);
}
```

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
 - Displays a single row of items in a horizontally scrolling list.

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 you screen that you can later fill with a single object.
- LinearyLayout
 - 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

Element Size

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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.

RelativeLayout Example

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```
<?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" >

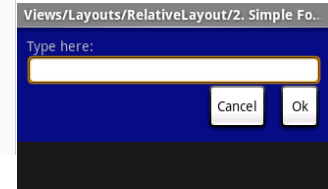
    <TextView android:id="@+id/label"
        android:layout_width="fill_parent"
        android:layout_height="wrap_content"
        android:text="Type here:" />

    <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" />

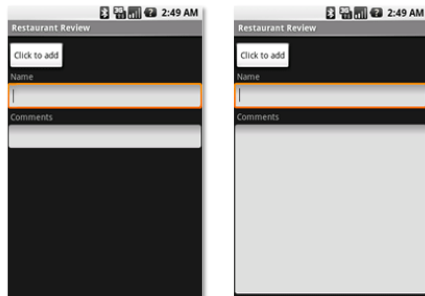
</RelativeLayout>
```



LinearLayout Example

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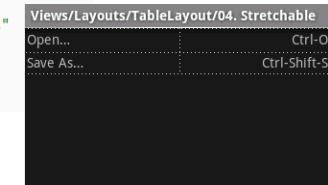
- Size of elements
 - match_parent vs. wrap_content
 - Text boxes have their widths: match_parent
 - Other elements have their width: wrap_content.
- Gravity (alignment):
 - The gravities of all elements are left.
- Weight:
 - The left version: 0 for all UI components.
 - The right version:
 - Comments 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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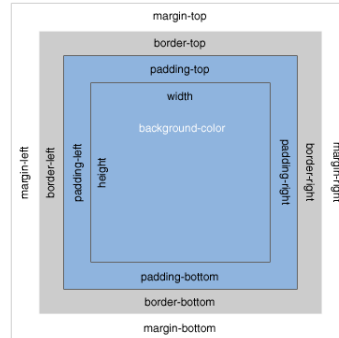
```
<?xml version="1.0" encoding="utf-8"?>
<TableLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="fill_parent"
    android:layout_height="fill_parent"
    android:stretchColumns="1">
    <TableRow>
        <TextView
            android:text="@string/table_layout_4_open"
            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

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

UI Events

- 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.OnClickListener
 - View.OnTouchListener
 - Override an existing callback method for the View.
 - When you've implemented your own UI class.

Event Listener

- 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.

Event Listener

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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.OnCreateContextMenu

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

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Menu

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Three types of application menus

- Options Menu
 - The primary menu for an Activity
 - When the user presses the device MENU key.
 - Two groups of Option Menu
 - Icon Menu
 - The menu items visible at the bottom of the screen.
 - Maximum of six menu items.
 - 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.
- 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

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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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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

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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);
    }
}
```

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);
}
```

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>
```

Dialog

Dialog

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

AlertDialog

- Use `onCreateDialog(int)` callback method to create dialogs.
- Use `showDialog(int)` to show a dialog.
- Call `onPrepareDialog(int, Dialog)` if you want to change any properties of the dialog.
- Example:

```
// 1. define an integer ID for your dialog
static final int DIALOG_ID = 0;

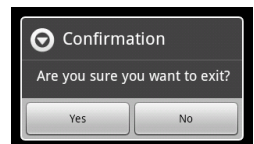
// 2. Then, define the onCreateDialog(int) callback
protected Dialog onCreateDialog(int id) {
    Dialog dialog;
    switch(id) {
        case DIALOG_ID :
            // Build a dialog!!
            break;
        default:
            dialog = null;
    }
    return dialog;
}

// 3. Now, you can show the dialog
showDialog(DIALOG_ID);
```

Creating an AlertDialog

- Use `AlertDialog.Builder` to make an `AlertDialog`.
 - A title
 - A text message
 - 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("Yes", new DialogInterface.OnClickListener() {
        public void onClick(DialogInterface dialog, int id) {
            HelloKettering.this.finish();
        }
    })
    .setNegativeButton("No", new DialogInterface.OnClickListener() {
        public void onClick(DialogInterface dialog, int id) {
            dialog.cancel();
        }
    });
AlertDialog alert = builder.create();
alert.show();
```



Supporting Multiple Screens

Variety of Android Devices

- 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.



Screen

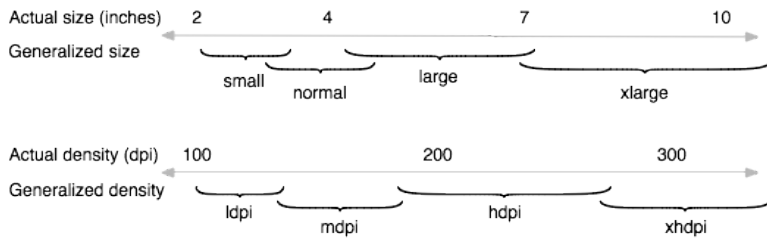
- Screen size
 - Actual physical size measured as the screen's diagonal.
 - All actual screen sizes into four generalized sizes:
 - small, normal, large, and extra large.
- Screen density
 - The quantity of pixels with a physical area of the screen. (usually referred to as dots per inch (dpi)).
 - All 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.

Density-independent pixel (dp)

- 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.

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

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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Further Readings

ProgressDialog

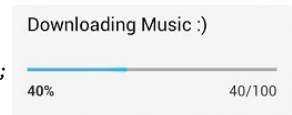
Add this as a class variable
`private ProgressDialog progress;` 35
 In onCreate() add this.
`progress = new ProgressDialog(this);`

- 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();
```



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");
}
```

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Pickers - TimePickerDialog

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- Pretty much same as DatePickerDialog.

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Questions?