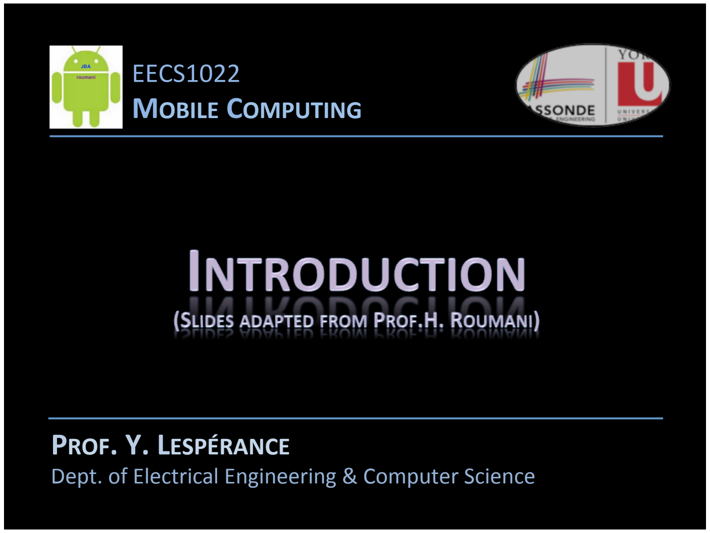


EECS1022

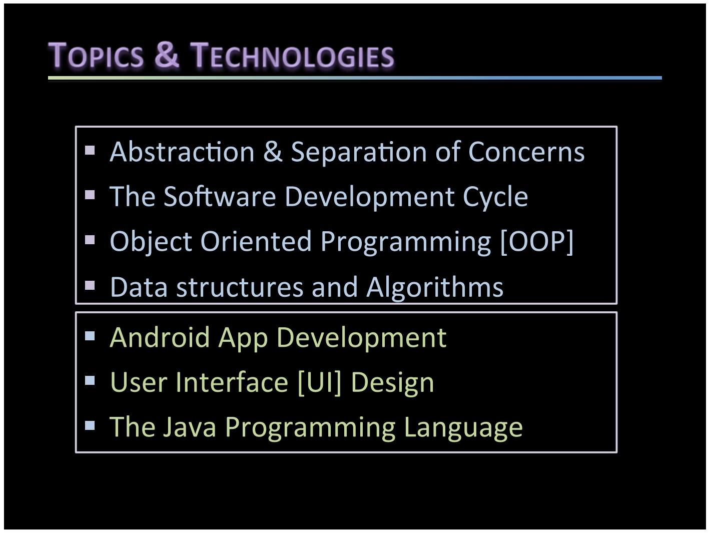
MOBILE COMPUTING

INTRODUCTION

(SLIDES ADAPTED FROM PROF.H. ROUMANI)

PROF. Y. LESPÉRANCE

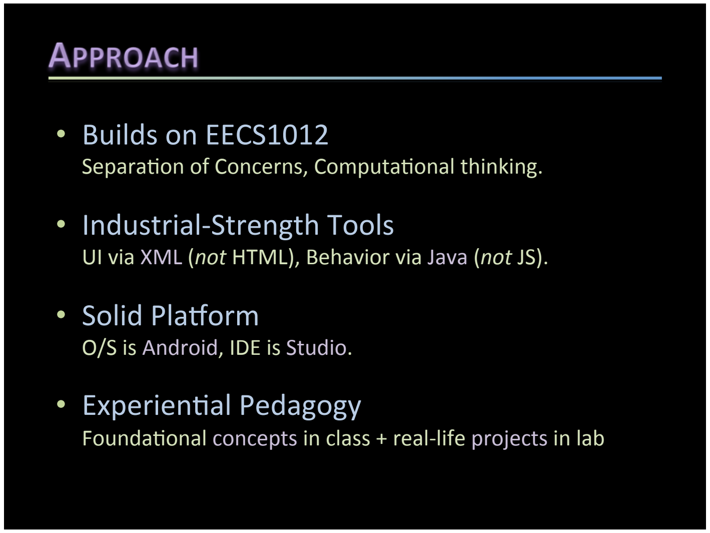
Dept. of Electrical Engineering & Computer Science



TOPICS & TECHNOLOGIES

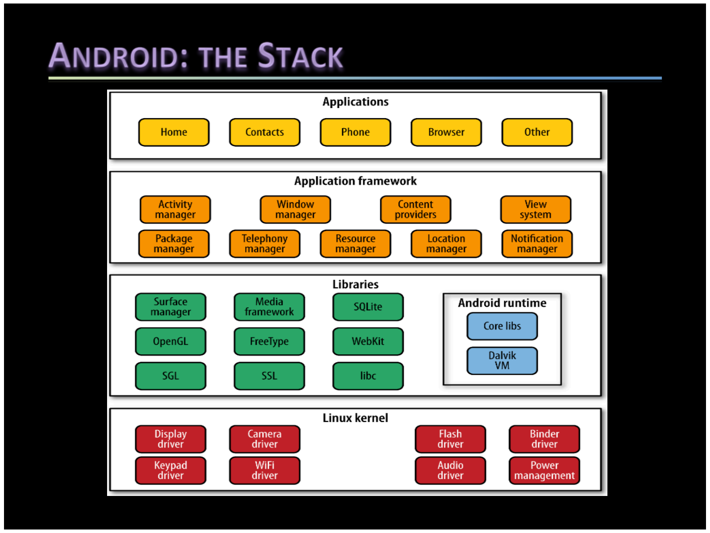
- Abstraction & Separation of Concerns
- The Software Development Cycle
- Object Oriented Programming [OOP]
- Data structures and Algorithms

- Android App Development
- User Interface [UI] Design
- The Java Programming Language



APPROACH

- Builds on EECS1012
  Separation of Concerns, Computational thinking.
- Industrial-Strength Tools
  UI via XML (*not* HTML), Behavior via Java (*not* JS).
- Solid Platform
  O/S is Android, IDE is Studio.
- Experiential Pedagogy
  Foundational concepts in class + real-life projects in lab



ANDROID: THE STACK

Applications

Home, Contacts, Phone, Browser, Other

Application framework

Activity manager, Window manager, Content providers, View system

Package manager, Telephony manager, Resource manager, Location manager, Notification manager

Libraries

Surface manager, Media framework, SQLite

OpenGL, FreeType, WebKit

SGL, SSL, libc

Android runtime

Core libs

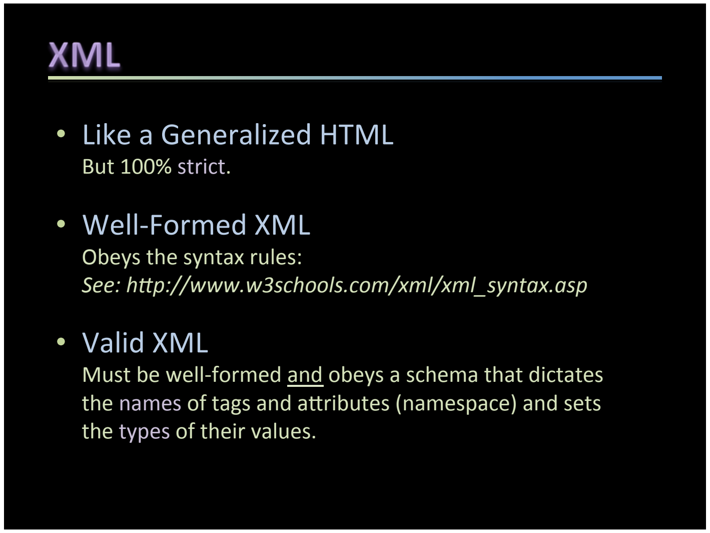
Dalvik VM

Linux kernel

Display driver, Camera driver, Flash driver, Binder driver

Keypad driver, WiFi driver, Audio driver, Power management

ANDROID VERSIONS [A/B IN 2008]

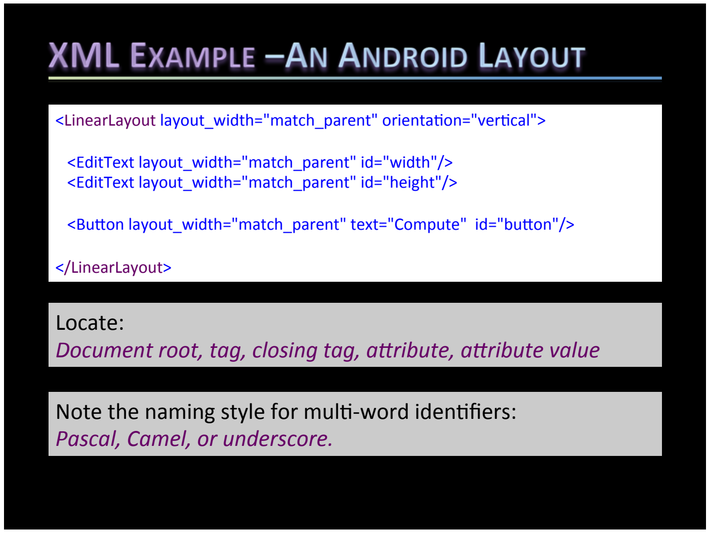


XML

- Like a Generalized HTML
  But 100% strict.

- Well-Formed XML
  Obeys the syntax rules:
  See: http://www.w3schools.com/xml/xml_syntax.asp

- Valid XML
  Must be well-formed and obeys a schema that dictates the names of tags and attributes (namespace) and sets the types of their values.

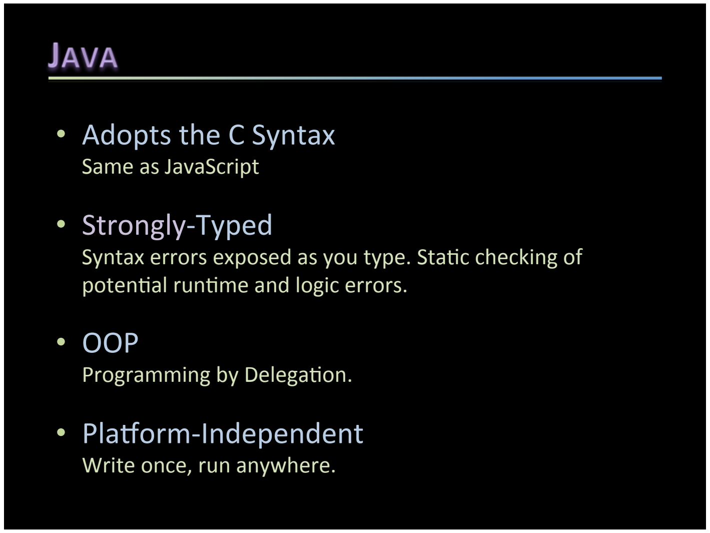


XML EXAMPLE –AN ANDROID LAYOUT

```
<LinearLayout layout_width="match_parent" orientation="vertical">

  <EditText layout_width="match_parent" id="width"/>
  <EditText layout_width="match_parent" id="height"/>

  <Button layout_width="match_parent" text="Compute"  id="button"/>

</LinearLayout>
```

Locate:
Document root, tag, closing tag, attribute, attribute value

Note the naming style for multi-word identifiers:
Pascal, Camel, or underscore.



JAVA

- Adopts the C Syntax
  Same as JavaScript

- Strongly-Typed
  Syntax errors exposed as you type. Static checking of potential runtime and logic errors.

- OOP
  Programming by Delegation.

- Platform-Independent
  Write once, run anywhere.

Java Example – A Class

```
public class Rectangle
{
    private int width;
    private int height;

    public Rectangle(int w, int h)
    {
        this.width = w;
        this.height = h;
    }

    public int getArea()
    {
       int result = this.width * this.height;
       return result;
    }
}
```

- *Class*
- *Block*
- *Attributes*
- *Constructor*
- *Method*
- *Method Return*
- *Parameter*
- *Variable*
- *Declaration*
- *Assignment*
- *Identifier*
- *Keyword*
- *Operator*
- *Separator*
- *Literal*

Using Library Classes

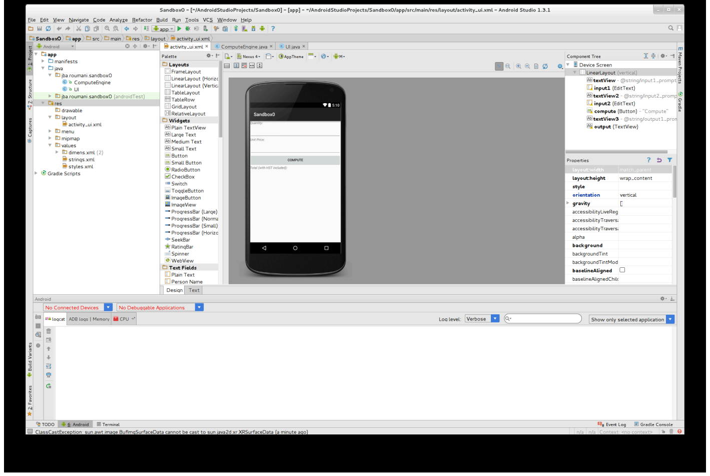
- Can use standard Java library classes
- Browse API to find out how to use
- Import the classes you use
- Can use non-standard Java libraries by installing and linking them to your project

Android Studio

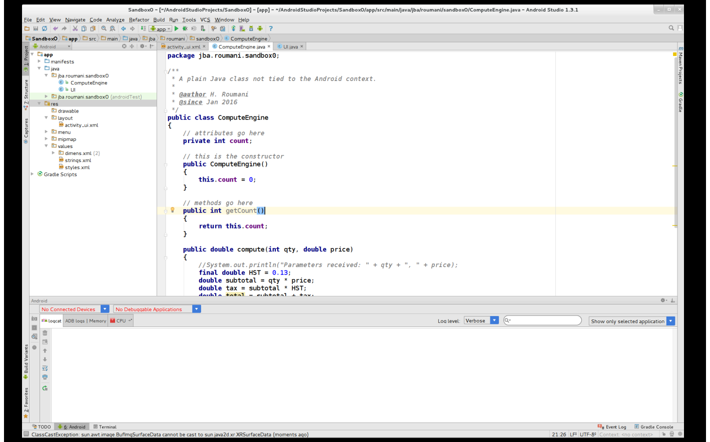
Makes writing code easier (compile-as-you-type); designing UI easier (drag widgets, set properties); running and debugging.

- Launch Studio
  From the *Application*, *Programming* menu.
- Start a New Project
  Programming by Delegation.
- Project Location
  /home/user/AndroidStudioProjects/

The Studio Ecosystem


Sandbox0 – [~/AndroidStudioProjects/Sandbox0] – [app] – ~/AndroidStudioProjects/Sandbox0/app/src/main/res/layout/activity_ui.xml – Android Studio 1.3.1
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
Sandbox0 app src main res layout activity_ui.xml
activity_ui.xml ComputeEngine.java UI.java
app
manifests
java
jba.roumani.sandbox0
ComputeEngine
UI
jba.roumani.sandbox0 (androidTest)
res
drawable
layout
activity_ui.xml
Palette
Layouts
FrameLayout
LinearLayout (Horizontal)
LinearLayout (Vertical)
TableLayout
TableRow
GridLayout
RelativeLayout
Widgets
Plain TextView
Large Text
Nexus 4
AppTheme
Sandbox0
Component Tree
Device Screen
LinearLayout (vertical)
textView - @string/input1_prompt
input1 (EditText)
textView2 - @string/input2_prompt
input2 (EditText)
compute (Button) - "Compute"
textView3 - @string/output1_prompt
output (TextView)
Properties
Design Text
No Connected Devices
No Debuggable Applications
Log level: Verbose
Show only selected application
TODO Android Terminal
Event Log Gradle Console

The Studio Ecosystem


Sandbox0 – [~/AndroidStudioProjects/Sandbox0] – [app] – ~/AndroidStudioProjects/Sandbox0/app/src/main/java/jba/roumani/sandbox0/ComputeEngine.java – Android Studio 1.3.1
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
app
Sandbox0 app src main java jba roumani sandbox0 ComputeEngine
Android
app
manifests
java
jba.roumani.sandbox0
ComputeEngine
UI
jba.roumani.sandbox0 (androidTest)
res
drawable
layout
activity_ui.xml
menu
mipmap
values
dimens.xml (2)
strings.xml
styles.xml
Gradle Scripts
activity_ui.xml
ComputeEngine.java
UI.java
1: Project
7: Structure
Captures
Build Variants
2: Favorites
Android
No Connected Devices
No Debuggable Applications
logcat
ADB logs
Memory
CPU
Log level: Verbose
Show only selected application
TODO
6: Android
Terminal
Event Log
Gradle Console
21:26 LF UTF-8 Context: <no context>

```java
package jba.roumani.sandbox0;

/**
 * A plain Java class not tied to the Android context.
 *
 * @author H. Roumani
 * @since Jan 2016
 */
public class ComputeEngine
{
    // attributes go here
    private int count;

    // this is the constructor
    public ComputeEngine()
    {
        this.count = 0;
    }

    // methods go here
    public int getCount()
    {
        return this.count;
    }

    public double compute(int qty, double price)
    {
        //System.out.println("Parameters received: " + qty + ", " + price);
        final double HST = 0.13;
        double subtotal = qty * price;
        double tax = subtotal * HST;
        double total = subtotal + tax;
```

```
ClassCastException: sun.awt.image.BufImgSurfaceData cannot be cast to sun.java2d.xr.XRSurfaceData (moments ago)
```

Computer Science

- Is concerned with information and its processing
- What problems are solvable by algorithms?
- Computational complexity of algorithms and problems
- Programming and abstraction

SEARCH FOR A GIVEN N

List:

26
30
12
2
17
7
5

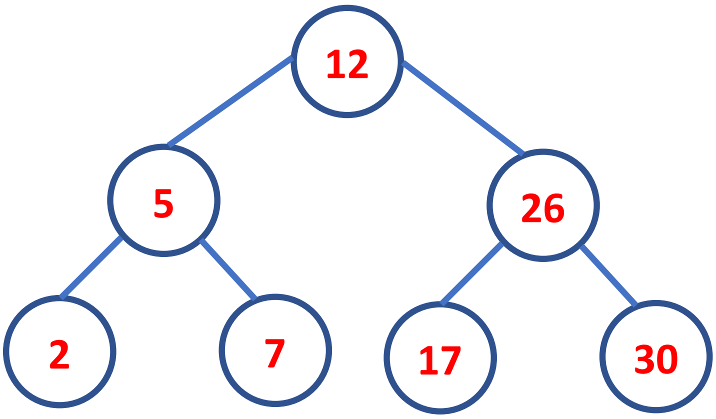
Complexity: O(N)

Sorted List:

2
5
7
12
17
26
30

Complexity: O(lgN)

Tree:



Complexity: O(lgN)

Hash Table:

0	0
1	0
2	1
3	0
4	0
5	1
6	0
7	1
8	0
9	0
10	0
11	0
12	1
13	0
14	0
15	0
16	0
17	1
18	0
19	0
20	0
21	0
22	0
23	0
24	0
25	0
26	1
27	0
28	0
29	0
30	1
31	0

Complexity: O(1)