Integrating HOOPS Native Platform w/Android

Virtual Training – December 1st, 2020

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Agenda

- Dependencies & Setup
  - What you need to follow along.
- Introduction to the HOOPS Native SDKs
  - Data Visualization
  - Data Conversion/Import.
- Basic Android Overview
  - Explain Android Components Involved
- The Java Native Interface (JNI)
- Use the HOOPS Native SDKs! (Fill in the blanks)
- Help, Questions, etc..

Dependencies

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- Android Studio (4.1.1)
  - Native Dev Kit (NDK) v18 – Install in Android Studio
  - CMake 3.10.2 - https://cmake.org/download/
  - Python >2.7
- HOOPS Visualize for Android (2020 Service Pack 2)
  - https://developer.techsoft3d.com/hoops/hps/downloads/latest/
  - https://virtual-training-2020.s3.amazonaws.com/HOOPS_Visualize_2020_SP2_Android.zip
- Skeleton Project:
  - https://virtual-training-2020.s3.amazonaws.com/Visualize_Training.zip
- Android Virtual Device (This demo uses API 28, should be compatible w/ 14+)

HOOPS Native Platform

HOOPS Visualize – 3D CAD Visualization SDK

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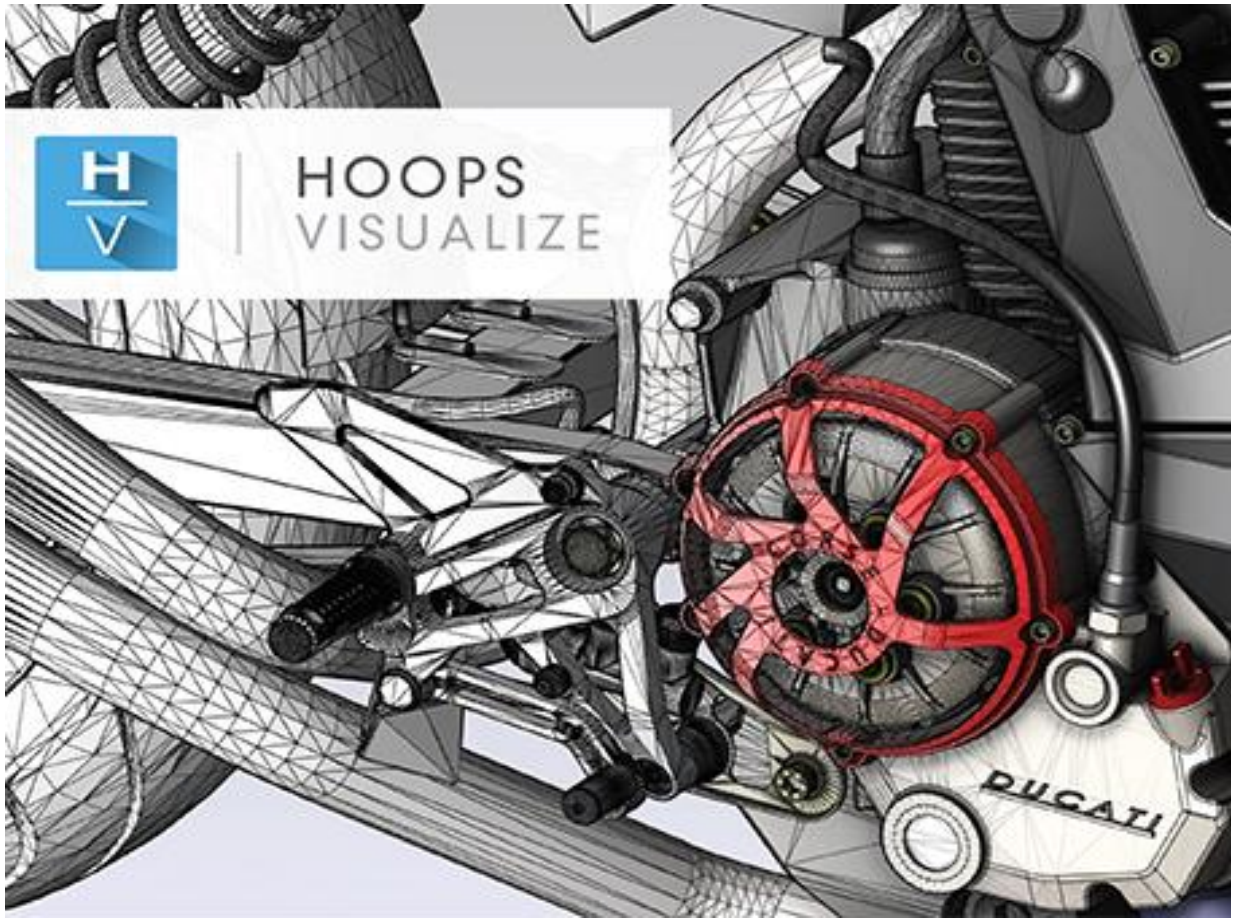
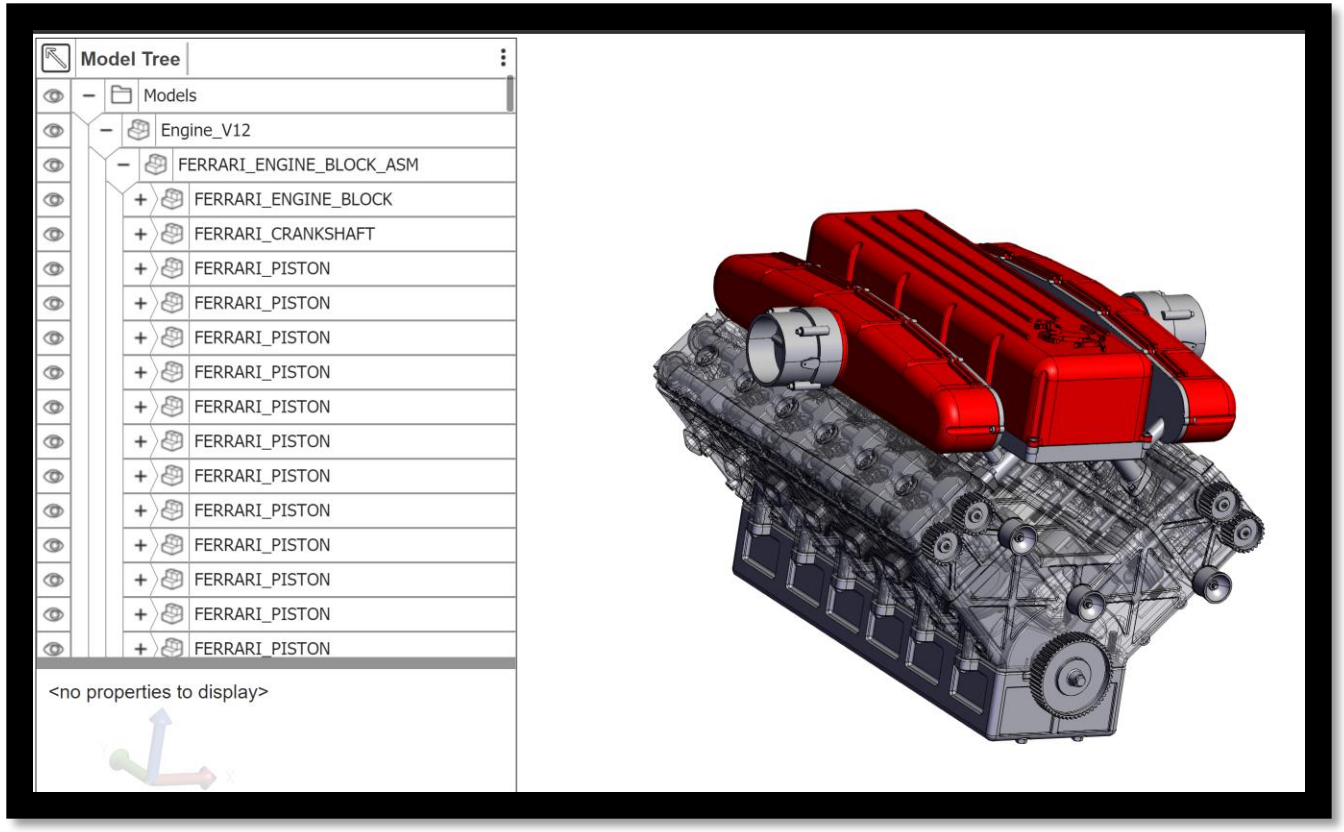
HOOPS Visualize

- High Performance 3D CAD Engineering SDK
- Create/Enhance professional-grade engineering Applications.
- Support for: C, C++, C#
- Support for multiple Graphics Drivers



HOOPS Exchange – CAD Translation SDK



HOOPS Exchange

- Access to 30+ CAD Formats in one Toolkit
- Enrich and empower applications with 3D CAD Access and Translation
- Available on Windows/Linux/Mac & Mobile

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Android Native Development

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Java Native Interface

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- Allow Java interoperability with C/C++, Assembly, etc.
- Programming Interface – not language
- Generate the *Interface Language* Programatically! (swig.org)

Java code using **native** keyword

```
public class Main {
    public native int square(int i);
    public static void main(String[] args) {
        System.loadLibrary("Main");
        System.out.println(new Main().square(2));
    }
}
```

CPP Java Native Interface

```
#include <jni.h>
#include "Main.h"

JNIEXPORT jint JNICALL Java_Main_square(
    JNIEnv *env, jobject obj, jint i) {
  return i * i;
}
```

Java Native Interface – The Glue

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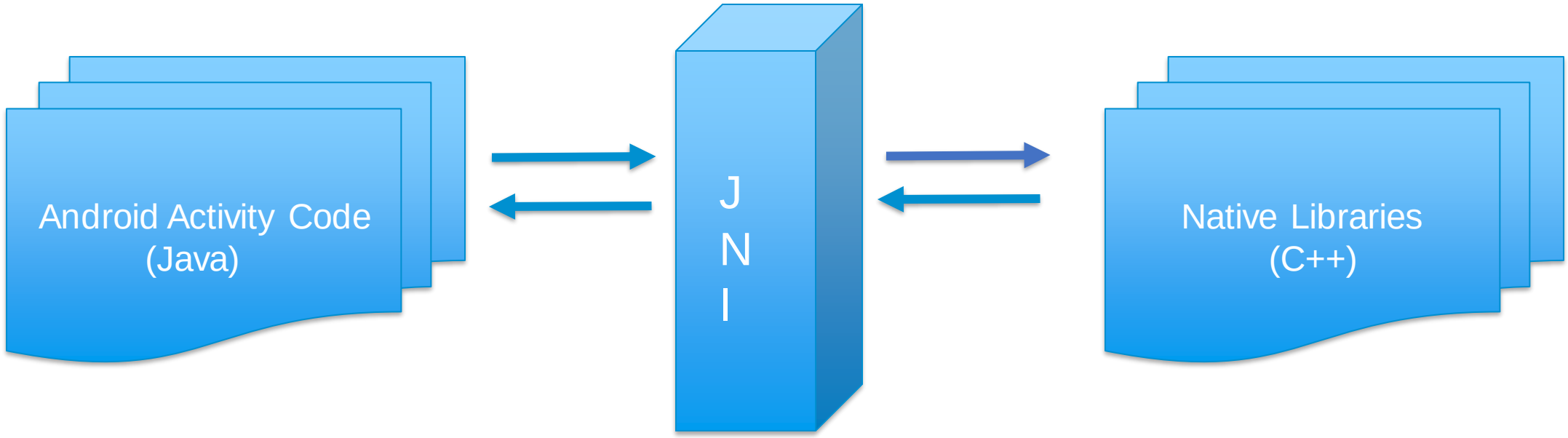

In Summary...

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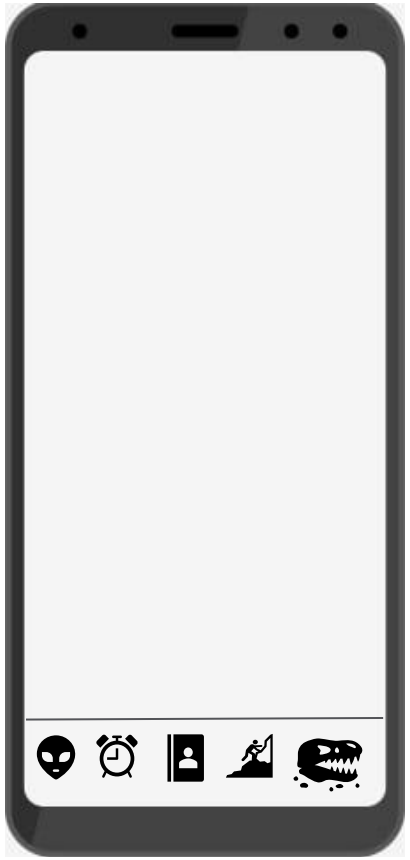
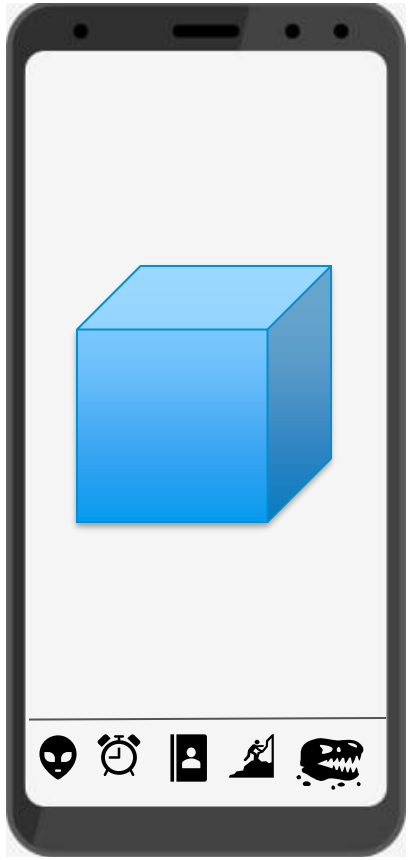


+ JNI(HOOPS VISUALIZE) =



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Android Sample Project – Lets code!

Android Application Basics

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Activity

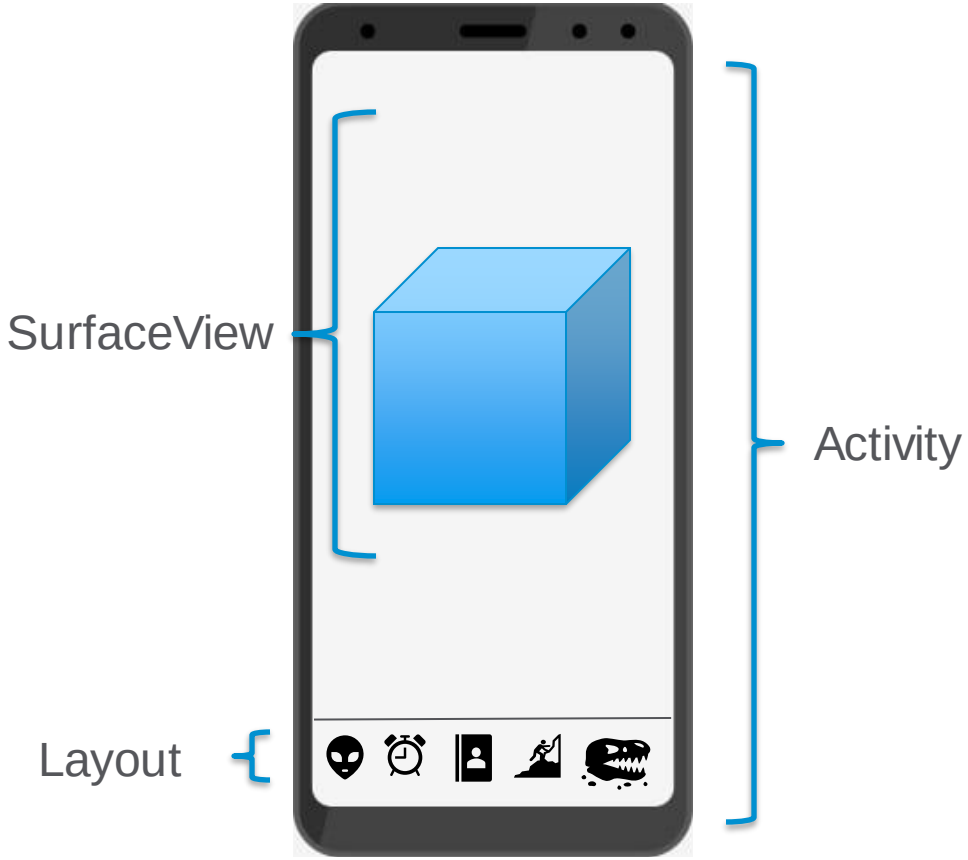
Implement App Logic with Java

Layout

Defines visual structure of User Interface (XML)

SurfaceView (View)

Dedicated drawing surface embedded within UI



.Java Code

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AndroidUserMobileSurfaceView.java

- Java Class containing Native method declarations.

- Programatically generated Native Interface, just instantiate it and execute logic!

MobileSurfaceActivity.java:

- Main entrypoint of Application.

- Instantiate Classes to access Native Interface methods.

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.CPP Code

MobileSurface (cpp/h)

- Contains methods to setup and interact with Mobile Surface.
- OnTap, onPress, GestureDetection, etc.
- No need to modify contents.

MobileApp (cpp/h)

- Setup event handlers for Errors and Warnings inside of Visualize code.

- **UserMobileSurface.cpp & .h**

  Implements MobileSurface & MobileApp instances.

  Write ***YOUR*** Application logic here.

  Load Files, interact with geometry, etc.

Connect the Dots...

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- ***MobileSurfaceActivity.java:***

  Instantiate AndroidUserMobileSurfaceView

  Invoke ***MSurfaceView.onUserCode1();***

  native OnUserCode1() -> AndroidMobileSurfaceViewJNI.cpp (/cpp/JNI/<here>)

  Native Wrapper invokes ***UserMobileSurface.cpp*** methods.

- Wrapper Generation

  SIP.py is invoked as part of build step.

  Targets CPP Source Files – Generates JNI.CPP Wrappers based on specified keywords (***SURFACE/APP_ACTION)***

  Output is Native Libraries (.so) generated in ***../jniLibs***. These are bundled and shipped with APK.

OnUserCode1()

- Toggle shadows on/off
- Use existing function: ***OnModeSimpleShadow(Boolean)***
- Create global Boolean: ***shadowEnabled***

- Toggle boolean: ***shadowEnabled = !shadowEnabled;***
- Invoke function***: onModeSimpleShadow(shadowEnabled)***

*Function is ***Void*** so don't worry about returning anything.

OnUserCode2()

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- Cycle the current Render Mode
  *(stored in **currentRenderingMode**)*
- HPS::Rendering::Mode::<Mode>
  Supported modes include:
  - Flat
  - Default
  - Wireframe
  - HiddenLine
  - Gouraund
  - More in Docs..

```
// Tell Visualize to use the new mode.
GetCanvas().GetFrontView()
        .SetRenderingMode(newMode)

GetCanvas.Update()
```

OnUserCode3()

- Implement Cutting Plane Operator.

- Create Boolean for toggle (Global Var)
- If Cutting Disabled – enable and create Operator.
  - Add Operator to Controls.
- If Cutting Enabled – Disable and update View to remove it.

OnUserCode4()

- Your turn!

  Visit the HOOPS Visualize Technical Documentation for countless samples/examples.

Implement a Custom Operator to satisfy your Business Logic needs.

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HOOPS Exchange Deep Dive

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- Works with Mobiles Apps identically to HOOPS Visualize.
- Ship applications capable of accessing any widely supported CAD Format
- Enhance and empower 3D CAD Applications with CAD Data Query and Traversal

For more detailed examples of Exchange:

Previous Training Session:

https://www.youtube.com/watch?v=GWIWLSZQaX0

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