



DEVELOPING MULTI-OS NATIVE MOBILE APPLICATIONS WITH INTEL® INDE

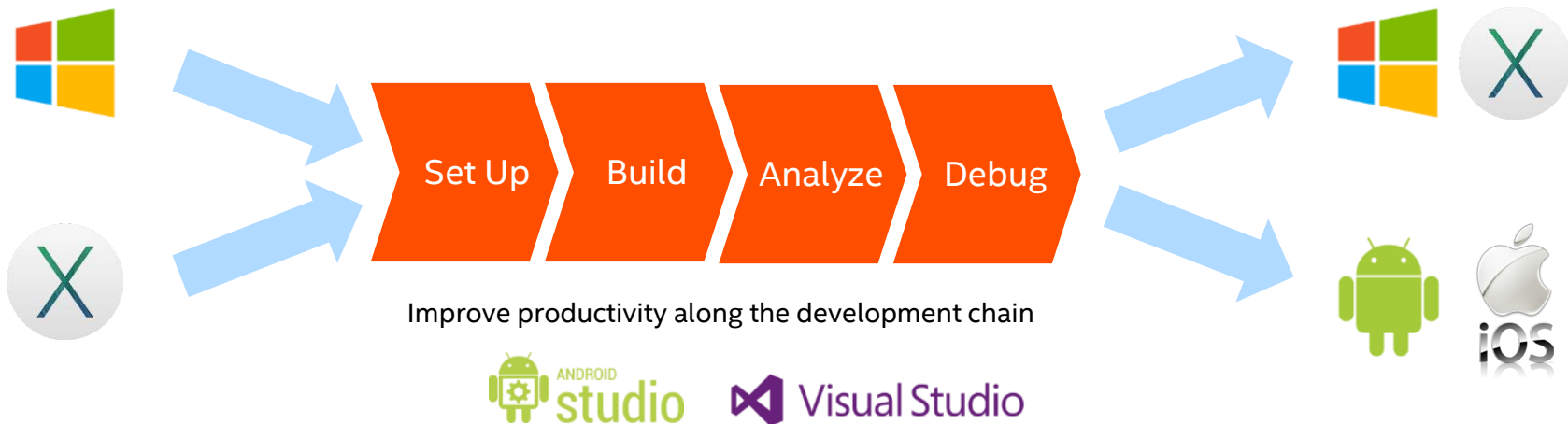
Peng Tu, Ph.D. Intel® INDE Chief Architect, Sravanthi Venkata, Senior Software Engineer,
Dmitry Rizshkov, Software Architect

Intel® INDE Suite for X-OS and X-Arch development

Develop Native Apps
on Preferred Host OSs
and IDEs

Utilize Consistent Tools and Libraries
on Intel® Architecture and ARM*

Deploy on Multiple Device
Operating Systems and
Architectures



Cross-platform Meets Native Experience



Intel® INDE is a suite of tools that let you write fast C++/Java code that targets multiple operating systems and multiple architectures, and speeds your time to market.

Developer Needs



Cross-OS, Cross-Architecture

- C++/Java* tools and libraries for Android* on ARM* and Intel® architecture and Windows* & OS X* development on Intel® architecture.
- Now, with Java on iOS preview



More Performance, Less Time

- Code native applications, expose underlying architecture, and deliver higher performance, differentiated apps.



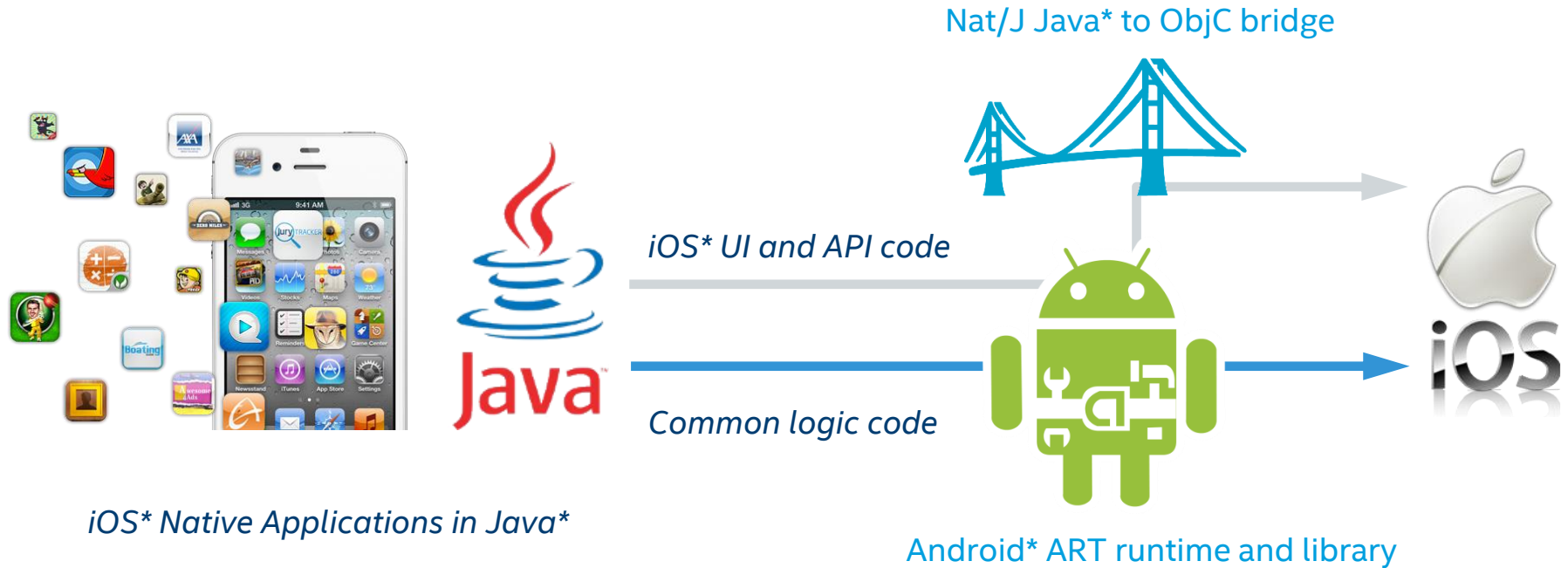
IDE Choice

- Freedom to integrate into your preferred IDE: Visual Studio*, Android Studio*
- Download: [intel.com/software/inde](https://www.intel.com/software/inde)

Download: www.intel.com/software/inde

INTRODUCING MULTI-OS ENGINE, A NEW FEATURE OF INTEL® INDE JAVA* PROGRAMMING FOR NATIVE IOS* APPS

Multi-OS Engine for iOS*



Android* Java* ART Runtime and Library

- State of the art Android*Java ART runtime
 - Ahead of Time (AOT) compilation on host for performance
 - Enhanced memory management and garbage collection
- Many INDE enhancements, including
 - Support 64 bit iOS* app image
 - Java 8 lambda support through *Retrolambda* integration
- Maximum compatibility with Android 's Java execution environment



Android* ART runtime and library

Nat/J Java* to Native Binding

Nat/J Java* to ObjC bridge



- Auto Java binding generation from ObjC and C header files from existing libraries or 3rd party packages
- Java* annotations and Nat/J runtime library
- No need to write JNI functions
- Prebuilt jar files interfacing iOS* API are provided in INDE MOE so you can start coding iOS* app in Java* immediately

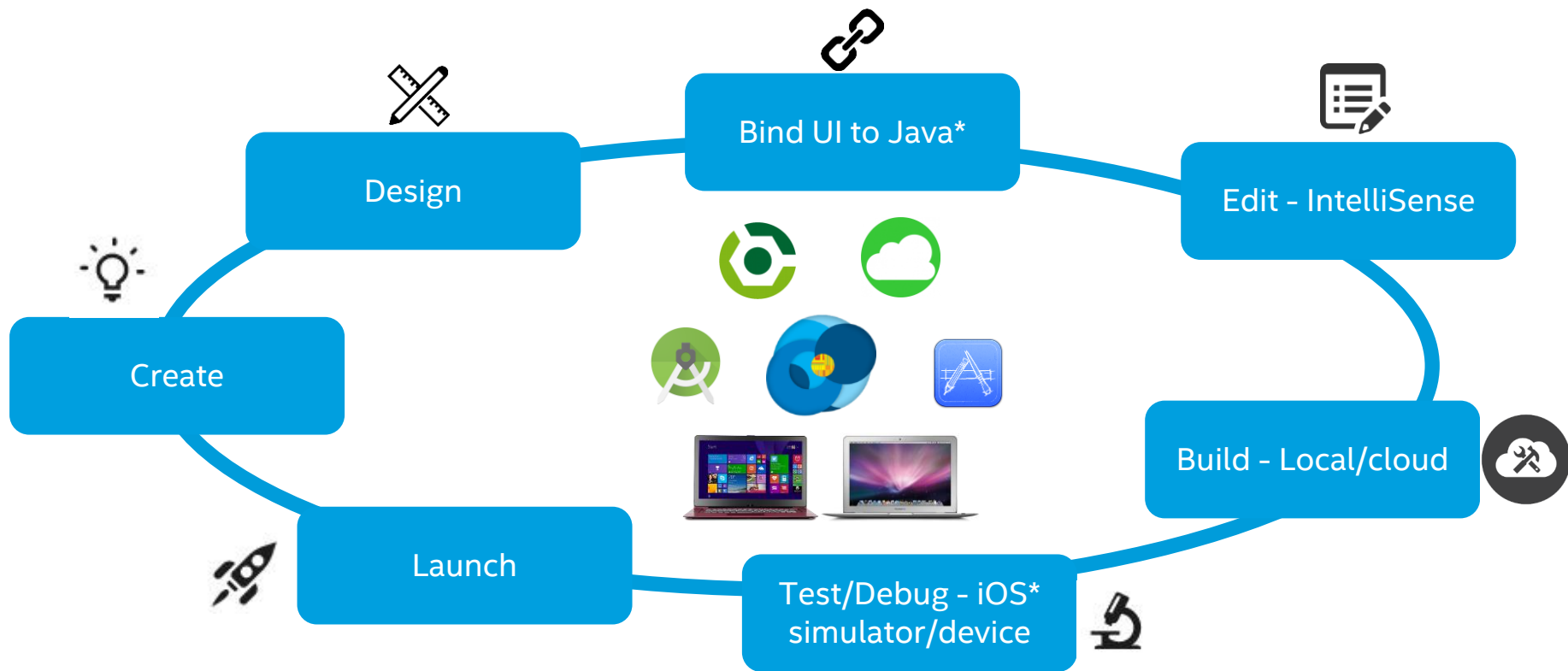
```
36 @Generated
37 @Runtime(ObjCRuntime.class)
38 public class NSObject extends NSObject implements ios.protocol.NSObject {
39     static {
40         NatJ.register();
41     }
42
43     @Generated
44     protected NSObject(Pointer peer) {
45         super(peer);
46     }
47
48     * <h1>Abstract:2/h1>[]
49
50     @Generated
51     @Selector("accessInstanceVariablesDirectly")
52     public static native boolean accessInstanceVariablesDirectly();
```

Bind everything with annotations

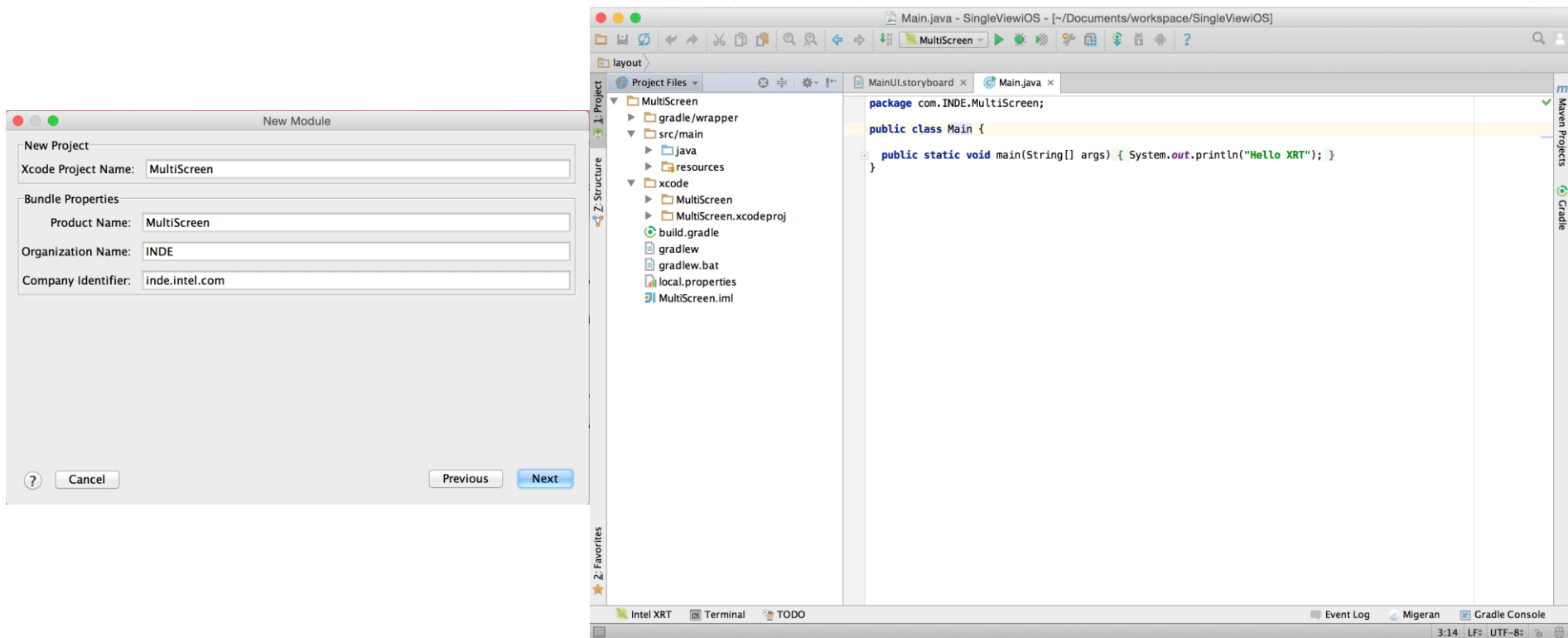
```
41 @Generated
42 @CFunction
43 public static native boolean CLLocationCoordinate2DIsValid(
44     @ByValue CLLocationCoordinate2D coord);
```

Even C functions

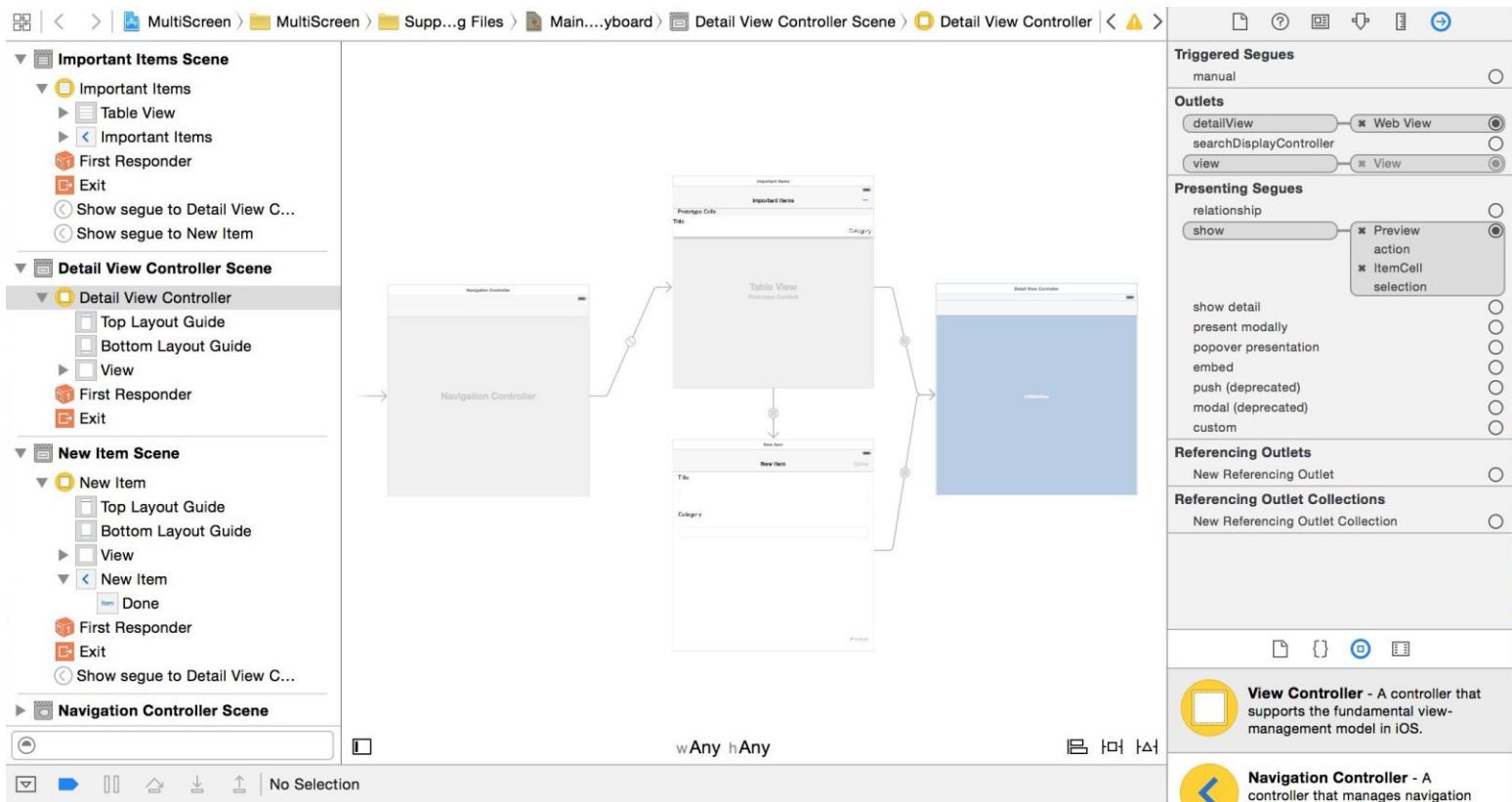
Development Flow



Create an iOS* Project in Android Studio*



Design iOS* Native UI in Xcode* Storyboard



Auto Generate Java* Interface to Xcode* UI Layout

The screenshot displays an IDE interface with the following components:

- Project View (Left):** Shows a package structure for 'MultiScreen' with sub-packages 'java', 'com.inde', and 'ui'. The 'ui' package contains four classes: 'AddViewController', 'DetailViewController', 'TableViewCell', and 'TableViewController'. Large yellow arrows point from these classes to the code in the main editor.
- Main Editor:** Displays the generated Java code for 'AddViewController.java'. The code includes annotations like `@Generated`, `@Selector`, and `@Mapped`, and methods like `categoryField()`, `doSave()`, `doneButton()`, `init()`, `initWithNibNameBundle()`, `previewButton()`, `setAnotherButton_unsafe()`, `setAnotherButton()`, and `setCategoryField_unsafe()`.
- Right Sidebar:** Shows 'Maven Projects' and 'Gradle' tabs.

```
@Generated
@Selector("categoryField")
public native UITextField categoryField();

@Generated
@Selector("doSave:")
public native void doSave(@Mapped(ObjCObjectMapper.class) Object sender);

@Generated
@Selector("doneButton")
public native UIBarButtonItem doneButton();

@{...}
public native AddViewController init();

@{...}
public native AddViewController initWithNibNameBundle(String nibNameOrNil,
    NSString nibBundleOrNil);

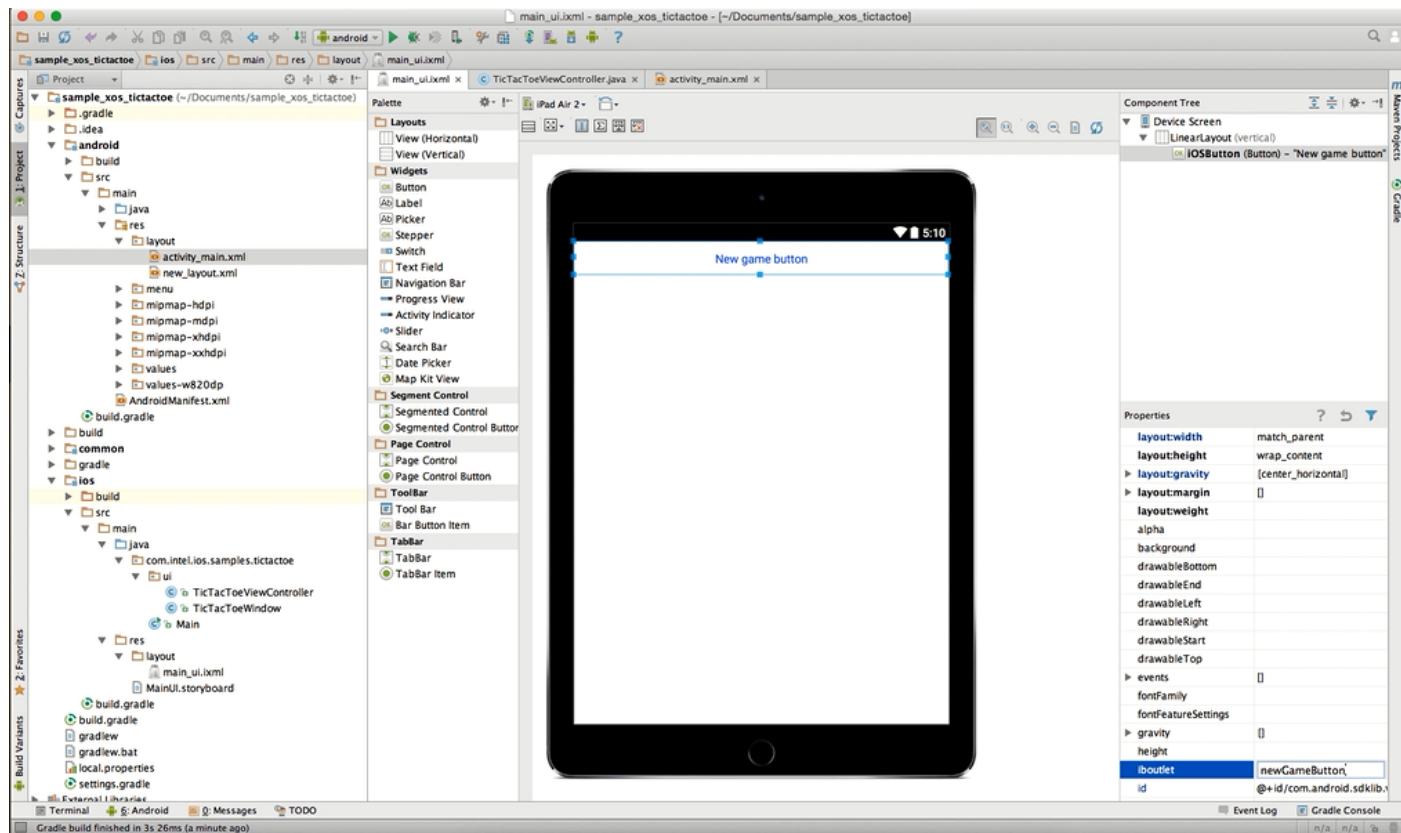
@{...}
public native UIButton previewButton();

@Generated
@Selector("setAnotherButton:")
public native void setAnotherButton_unsafe(UIButton value);

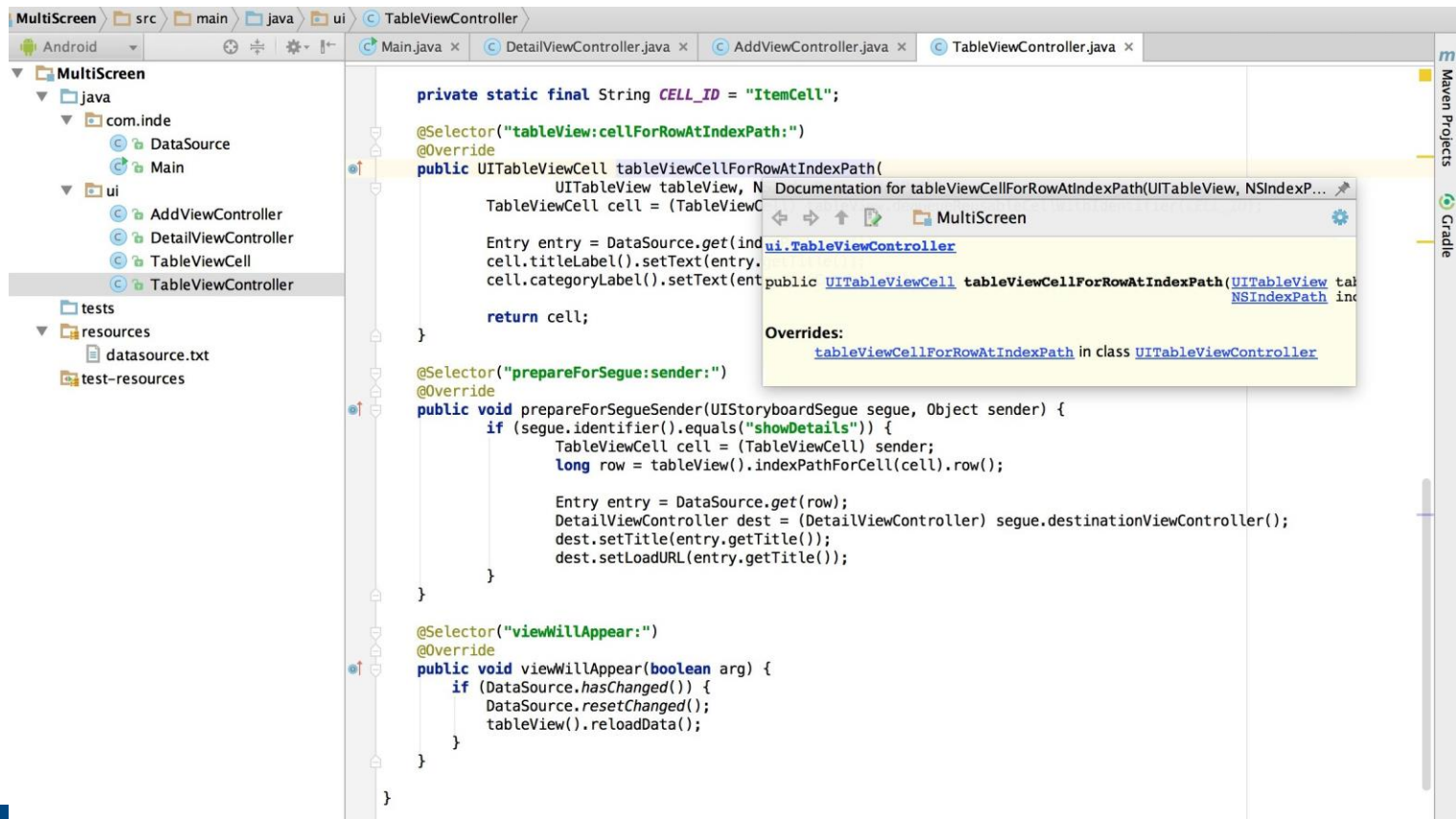
@Generated
public void setAnotherButton(UIButton value) {...}

@Generated
@Selector("setCategoryField:")
public native void setCategoryField_unsafe(UITextField value);
```

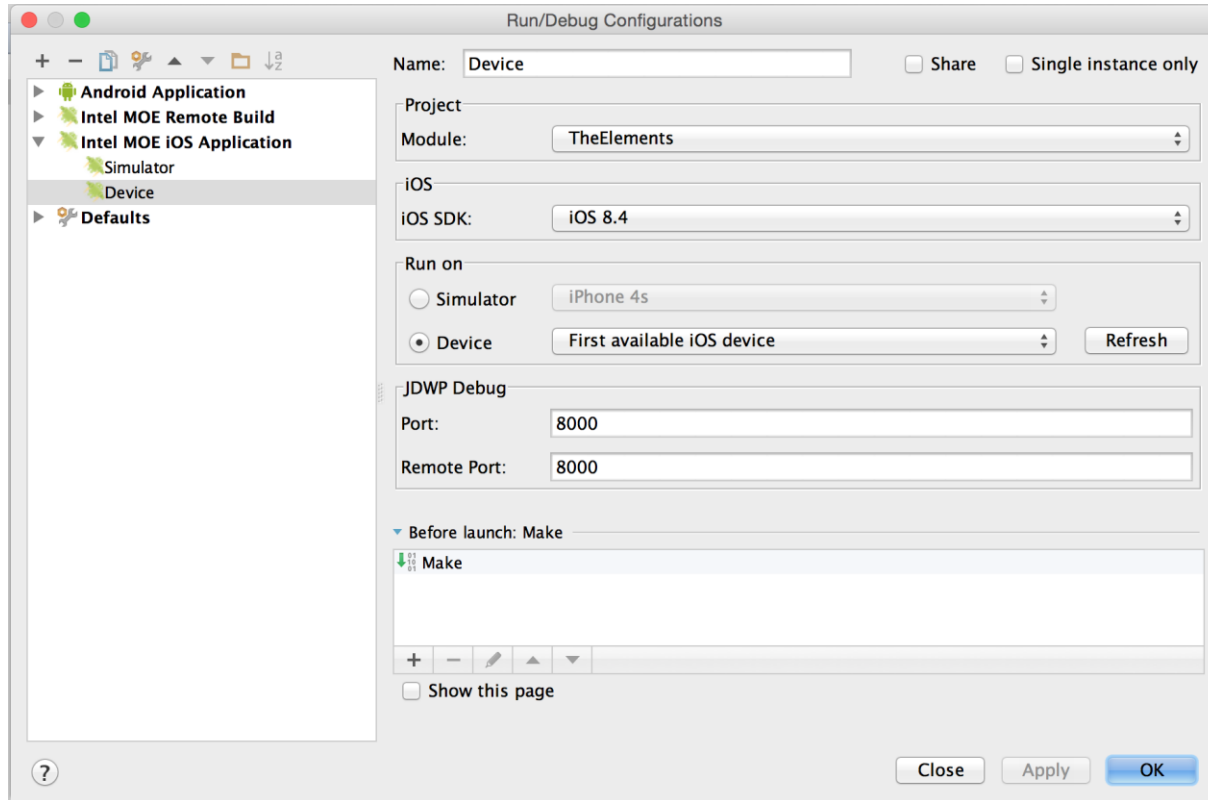
Alternatively, Design iOS* UI in Android Studio*



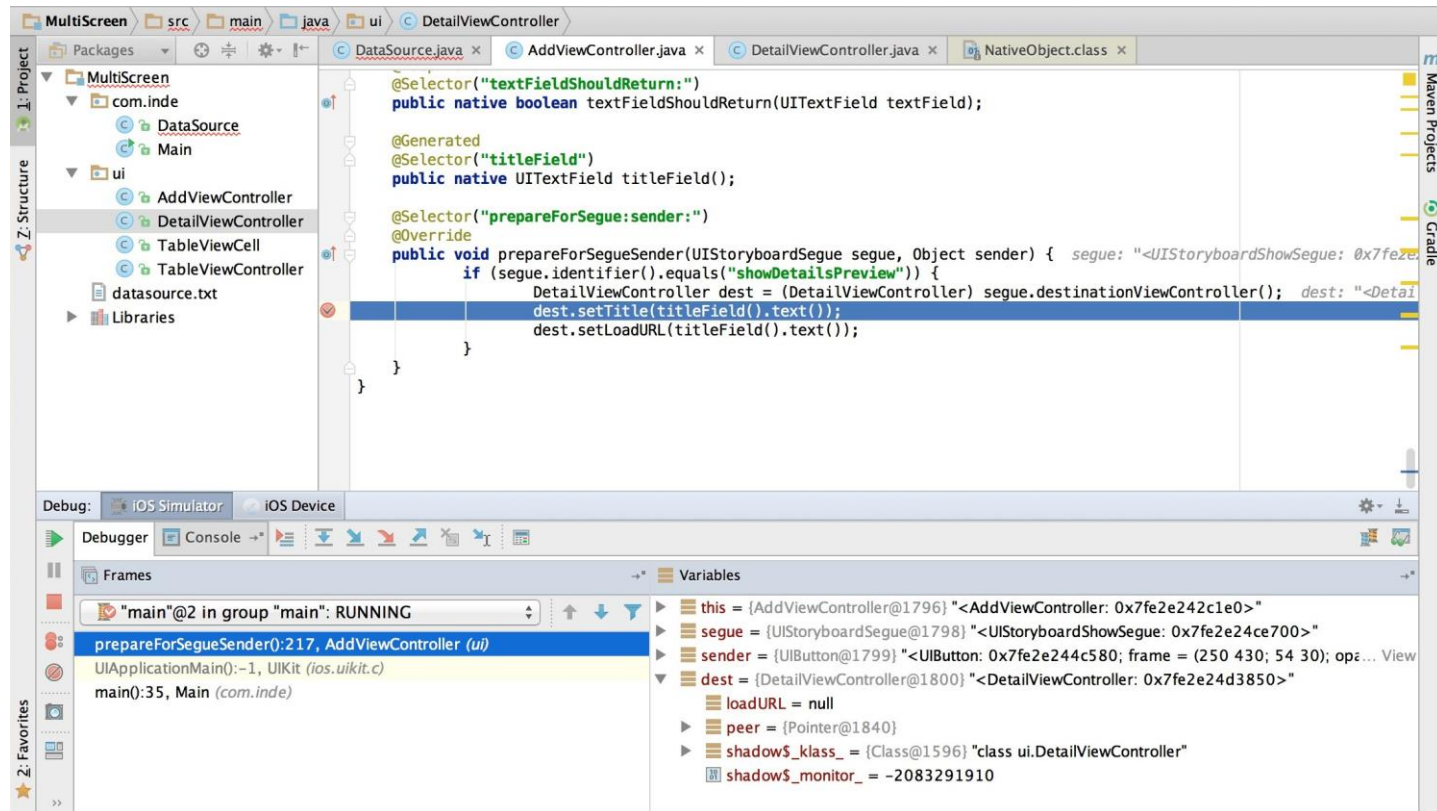
Interact with iOS* CocoaTouch API in Java*



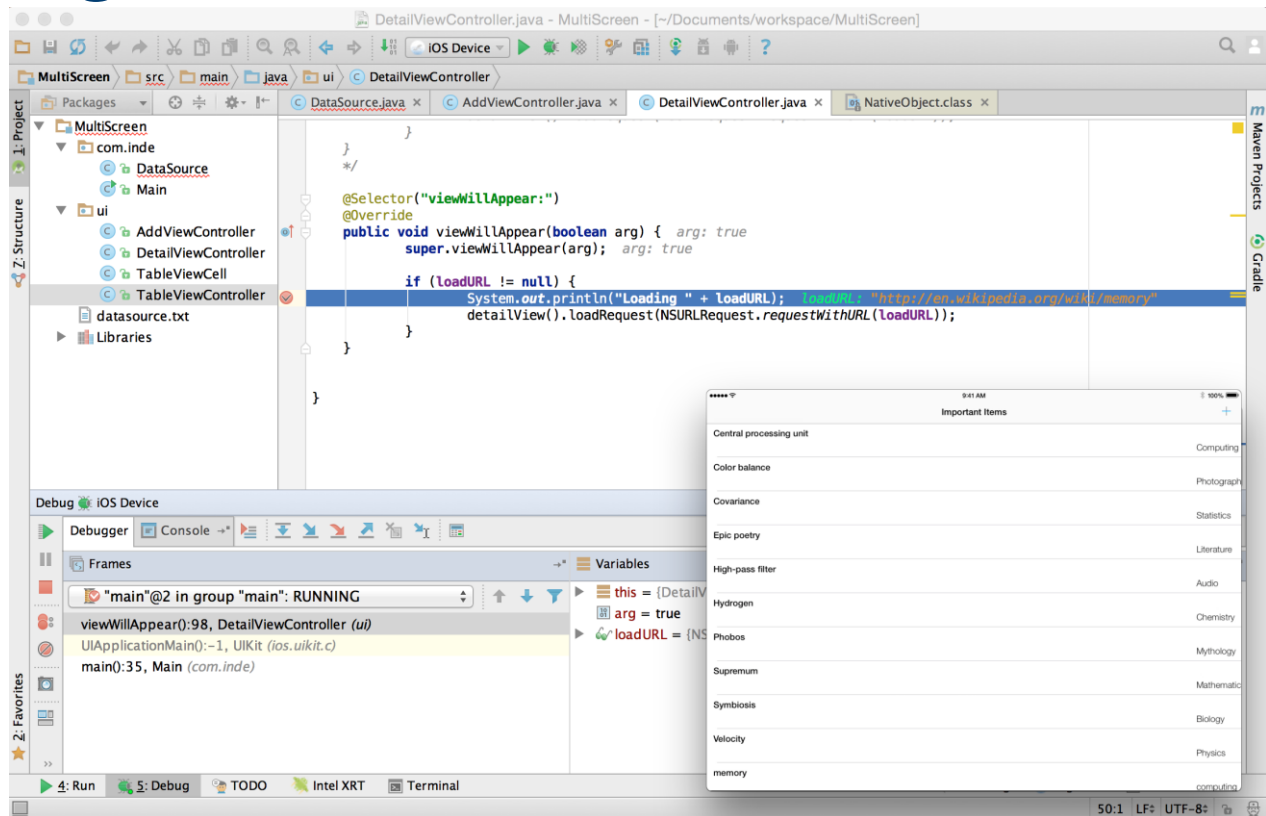
Configure iOS* Simulator or Device



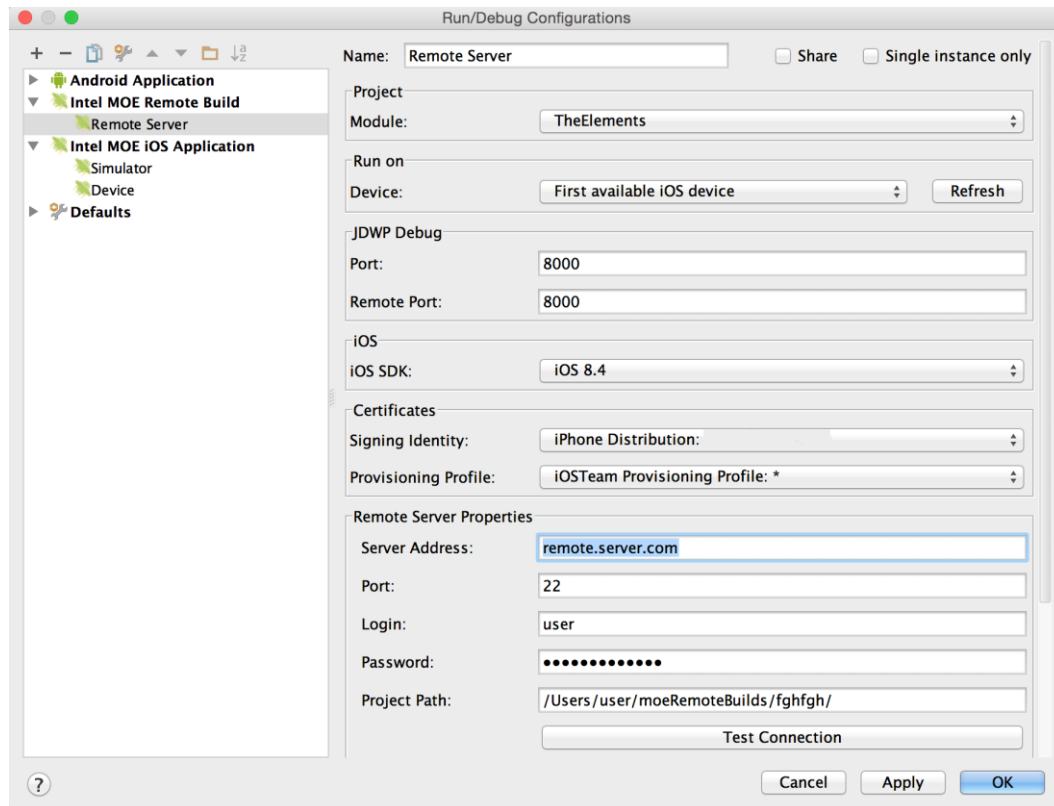
Debug on iOS* Simulator



Debug on iOS* Device



Cloud Build, Local Debug on Windows* Host



INDE MOE for iOS* Demo

Demo of building an iOS* application using Android Studio*

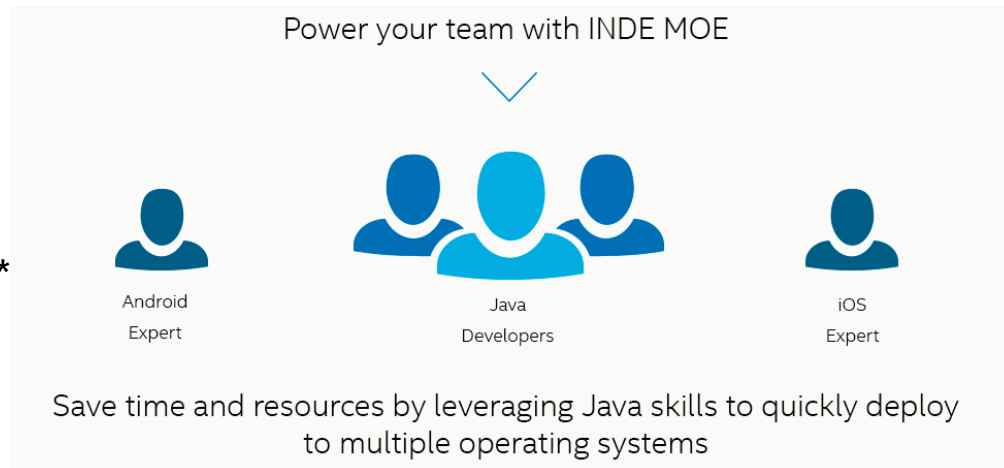
- 1) Project creation
- 2) UI design and Java coding
- 3) Debug and run on iOS* simulator
- 4) Debug and run on iOS* device
- 5) Cloud build and local on device debugging on Windows* host

Guidelines for Targeting Multiple OS

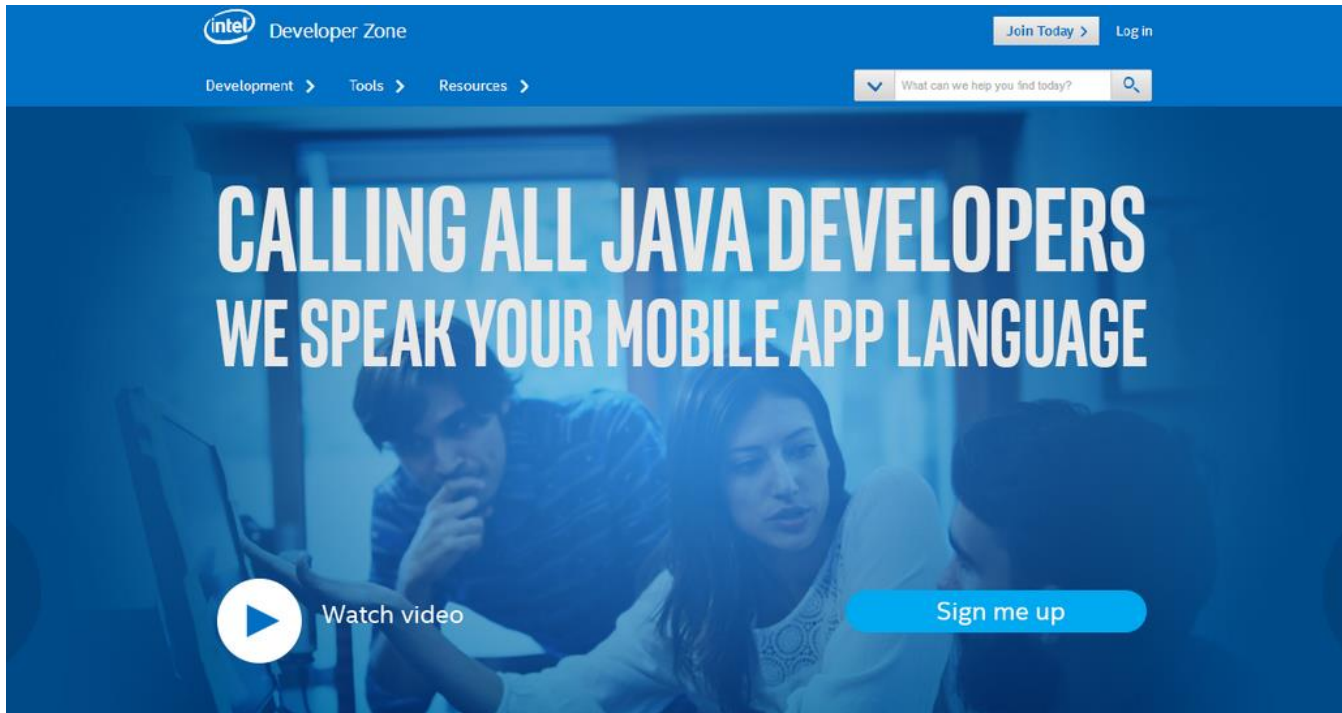
- 1) Separate the application backend logic from its frontend UI
 - Share the backend common data model
 - Make target specific modules for UI and device access
 - Make them separately testable and reusable
- 2) Use Nat/J generator to expose 3rd party ObjC and C library interface to your Java* application
- 3) Use an APK analysis tool such as Migeran's analyzer (<http://analyzer.migeran.com/>) for detailed analysis and guidance.

Single Team, Two UI

- Use common application logic to ensure same functionality on multiple OS
- Access native UI API for native look-and-feel
- Leverage Java* and Android* skills for iOS* development
- Shorten time to market and reduce maintenance cost through code sharing



Sign up for Early Access

A screenshot of the Intel Developer Zone website. The header is blue with the Intel logo and 'Developer Zone' text. Navigation links for 'Development', 'Tools', and 'Resources' are present. A search bar contains the text 'What can we help you find today?'. The main content area features a large blue banner with the text 'CALLING ALL JAVA DEVELOPERS WE SPEAK YOUR MOBILE APP LANGUAGE' in white. Below the text is a video player with a play button icon and the text 'Watch video'. To the right of the video player is a blue button with the text 'Sign me up'.

intel Developer Zone

Join Today > Log in

Development > Tools > Resources >

What can we help you find today?

**CALLING ALL JAVA DEVELOPERS
WE SPEAK YOUR MOBILE APP LANGUAGE**

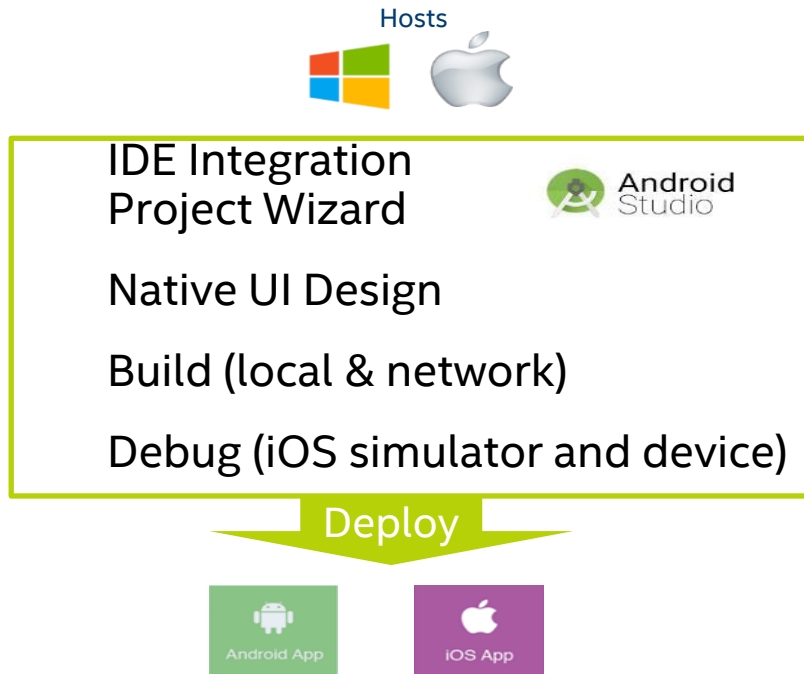
Watch video

Sign me up

<https://software.intel.com/intel-inde-multi-os-early-access>

SUMMARY

Intel® INDE Multi-OS Engine Summary



Separate OS Dev Teams
Redundant work
Resource inefficiencies



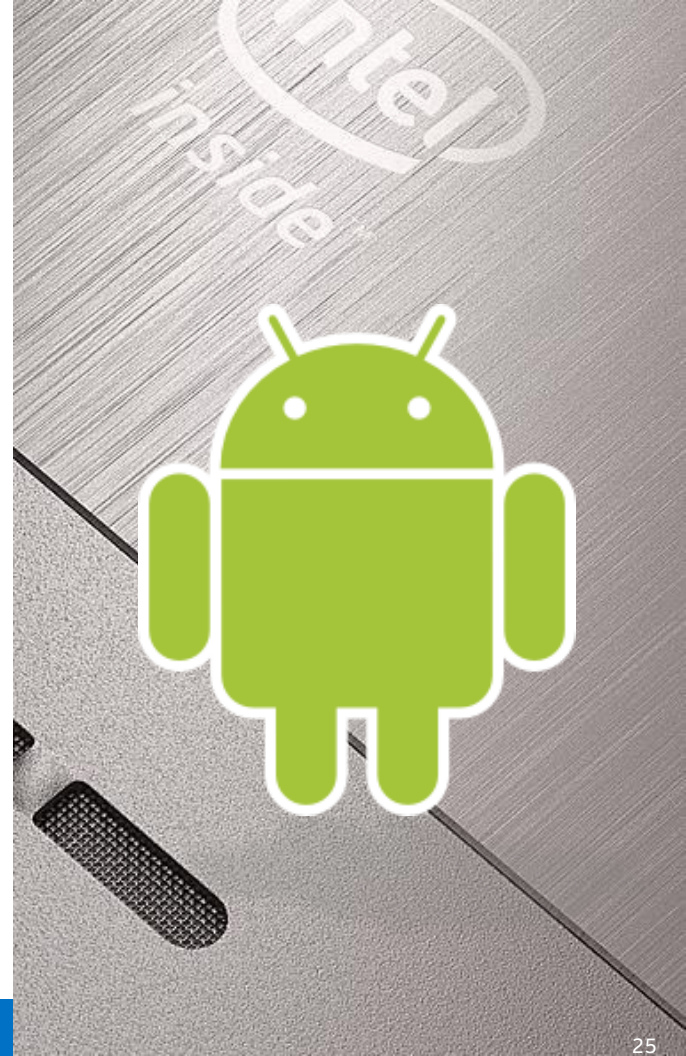
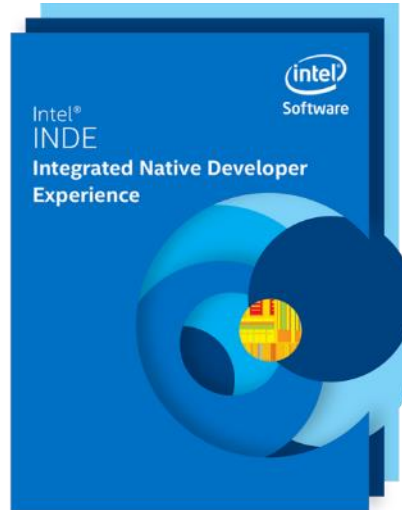
Save time and resources by leveraging Java skills to quickly deploy to multiple operating systems

Intel® INDE: Product Summary

Description	Intel® INDE: Intel® Integrated Native Developer Experience		
Target Audience	Cross-platform PC and mobile app developers		
Supported Hosts	<ul style="list-style-type: none">▪ Microsoft Windows* 7-8.1▪ Apple OS X* 10.9-10.10		
Target	<ul style="list-style-type: none">▪ Android* 4.3-5.x devices on ARM* and Intel® architecture▪ Microsoft Windows 7-8.1 devices on Intel® architecture▪ iOS 8		
Price	Professional: Free!		Ultimate: \$799
Web Site	www.intel.com/software/inde		
Support for Tools in Suite	Forums	Premier Support	Technical Articles
App Categories	Gaming, Video and Audio, Business, Entertainment, Industrial, Health and Fitness, Lifestyle, Education, Travel and Local, Music		

Intel® Integrated Native Developer Experience 2015

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AnDevCon

The Android Developer Conference

**Please take a moment to fill out
the class feedback form via
the app. Paper feedback forms
are also available in the back
of the room.**

eventmobi.com/adcboston

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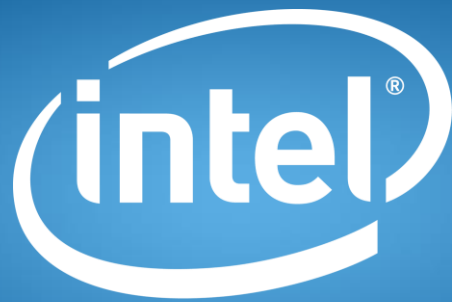
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experience
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