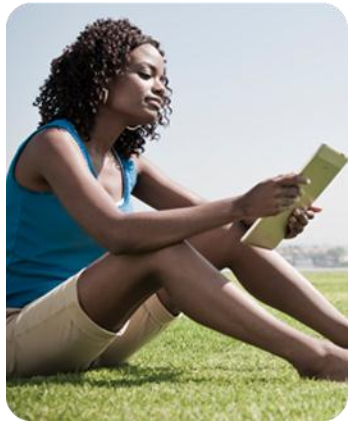
Open Source. Open Possibilities.



AllJoyn™ Overview and Integration Tips & Tricks

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August 30, 2012

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Agenda

- What is AllJoyn?
- What About Other Peer-to-peer Solutions?
- AllJoyn Fundamentals
- Add AllJoyn to an Android Application
- Simple Client/Service Sample Walkthrough
- How to build and run AllJoyn at OS layer
- Q&A

What is AllJoyn?

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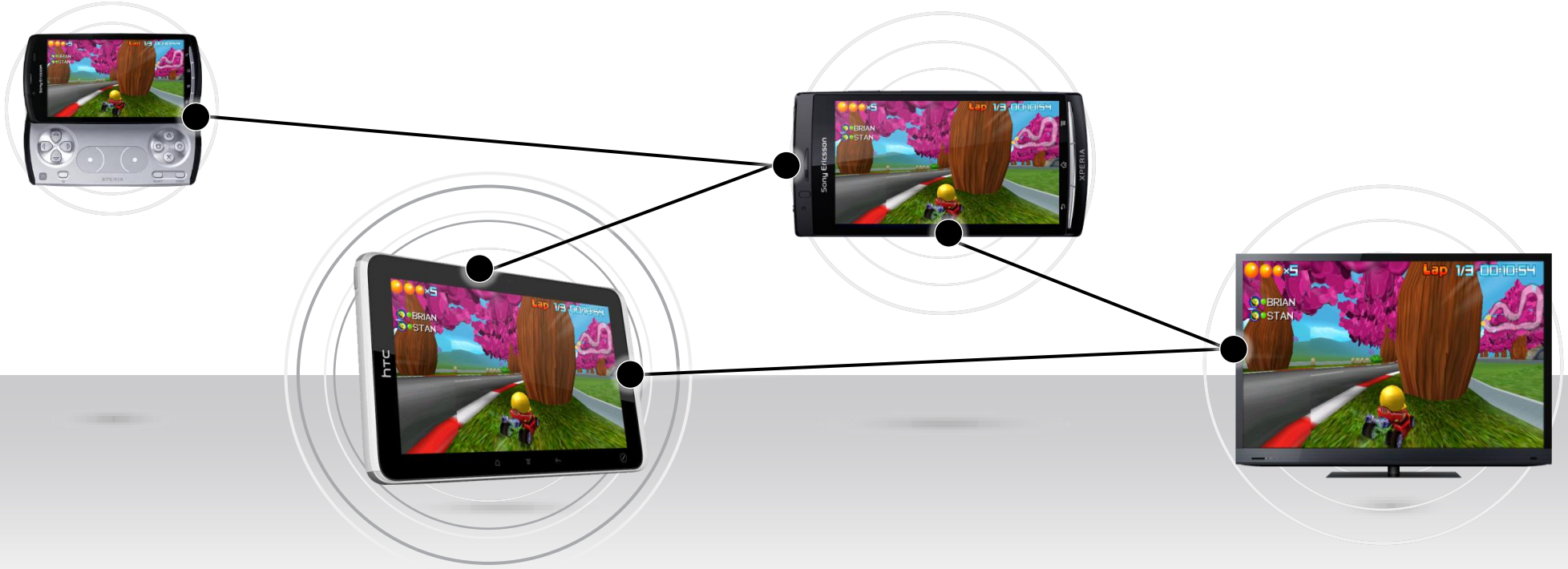
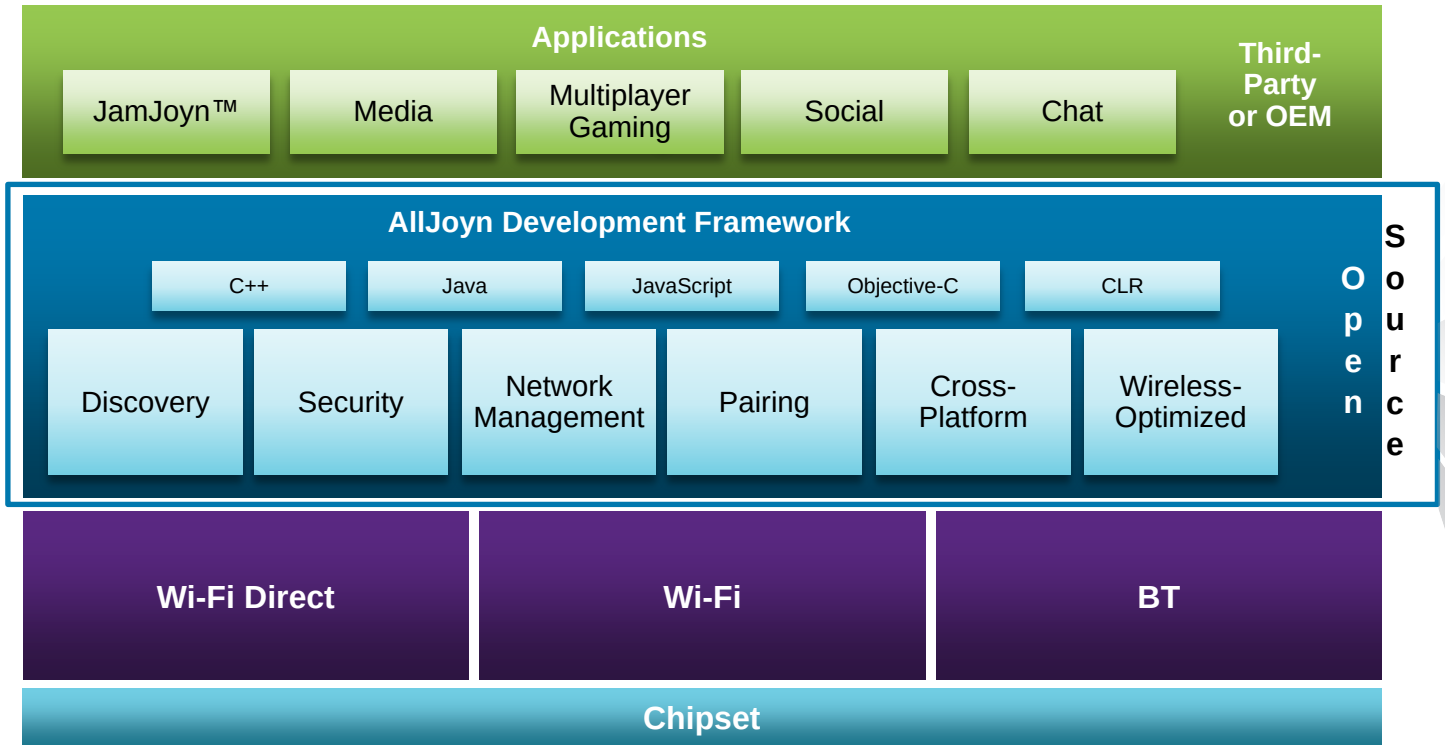
What Is AllJoyn?

Open Source Application Development Framework to Enable Ad Hoc, Proximity-based, Peer-to-peer Networking



AllJoyn brings proximity awareness to mobile apps, unleashing a whole new set of user experiences to smartphones, tablets, PCs, TVs and more

AllJoyn is a Software Framework



Tablets Mobiles Televisions Laptop/PC

- Open Sourced (Apache 2.0 License)
- Enables Developers to Easily Add P2P Experiences to Their Apps
- Application Layer Discovery
  (What services are running on nearby devices that are reachable)
- Application Layer Security
  (What information can a service access on your phone, what's off limits)
- Interoperate Across Different OS and Bearers
  (Developer does not need to know anything about Bluetooth, Wi-Fi, Android, Windows, etc.)

What About Other P2P Solutions?

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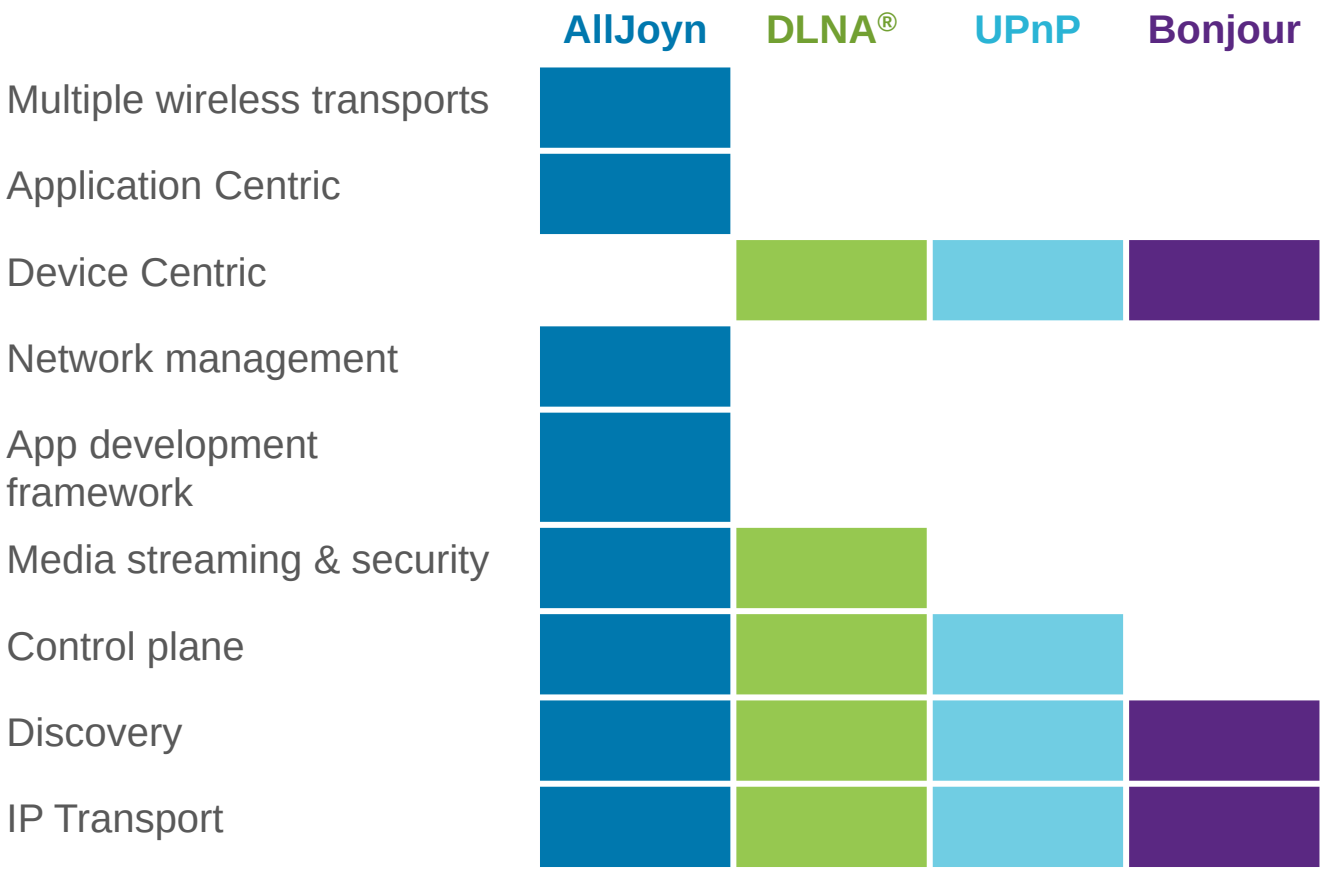
What About Existing Protocols?

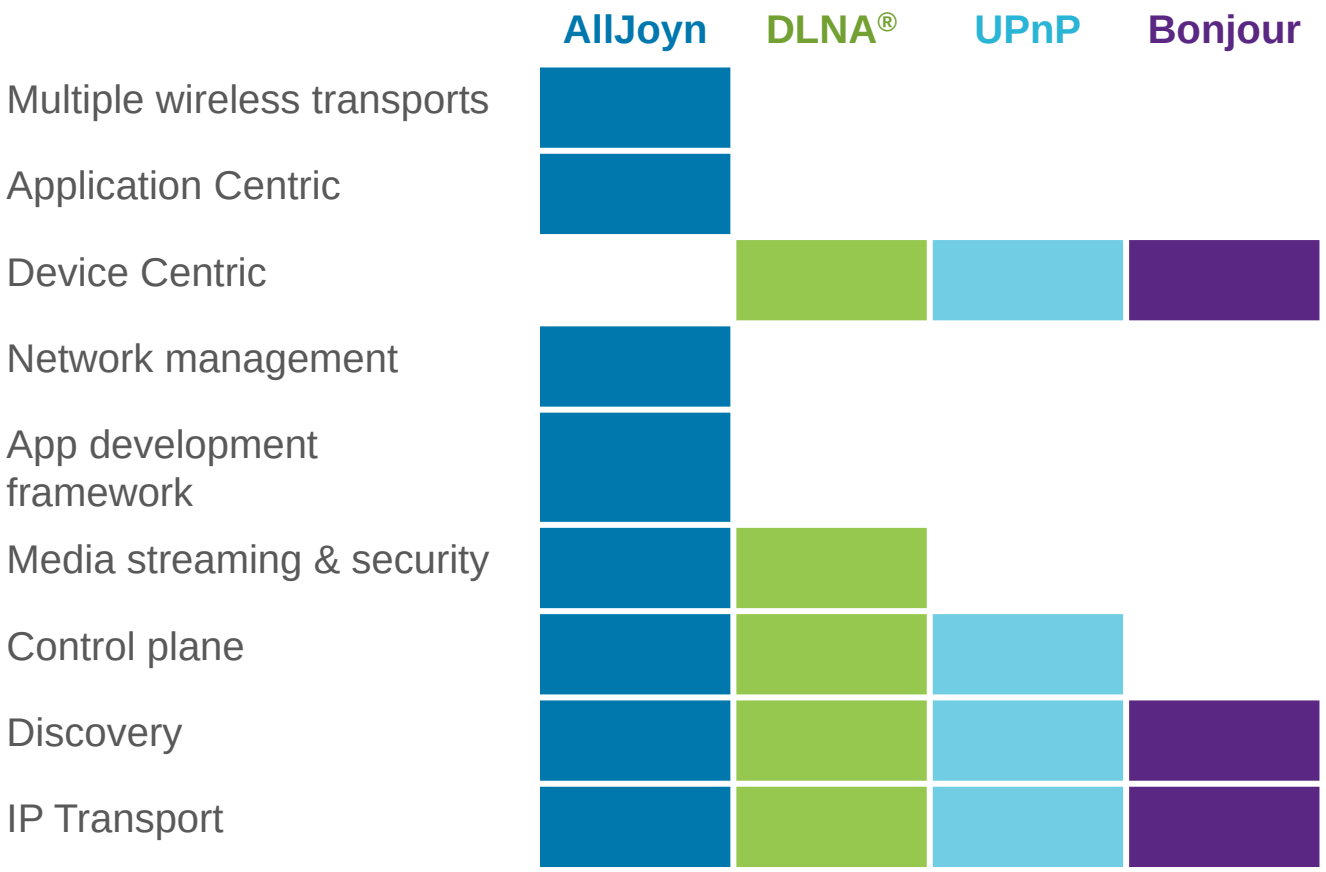


Other peer-to-peer platforms focus on their own ecosystem

Could be standards that are slow to change and fixed in design

AllJoyn is a complete package that works across different operating systems and programming languages to provide a complete solution

What About Existing Protocols?

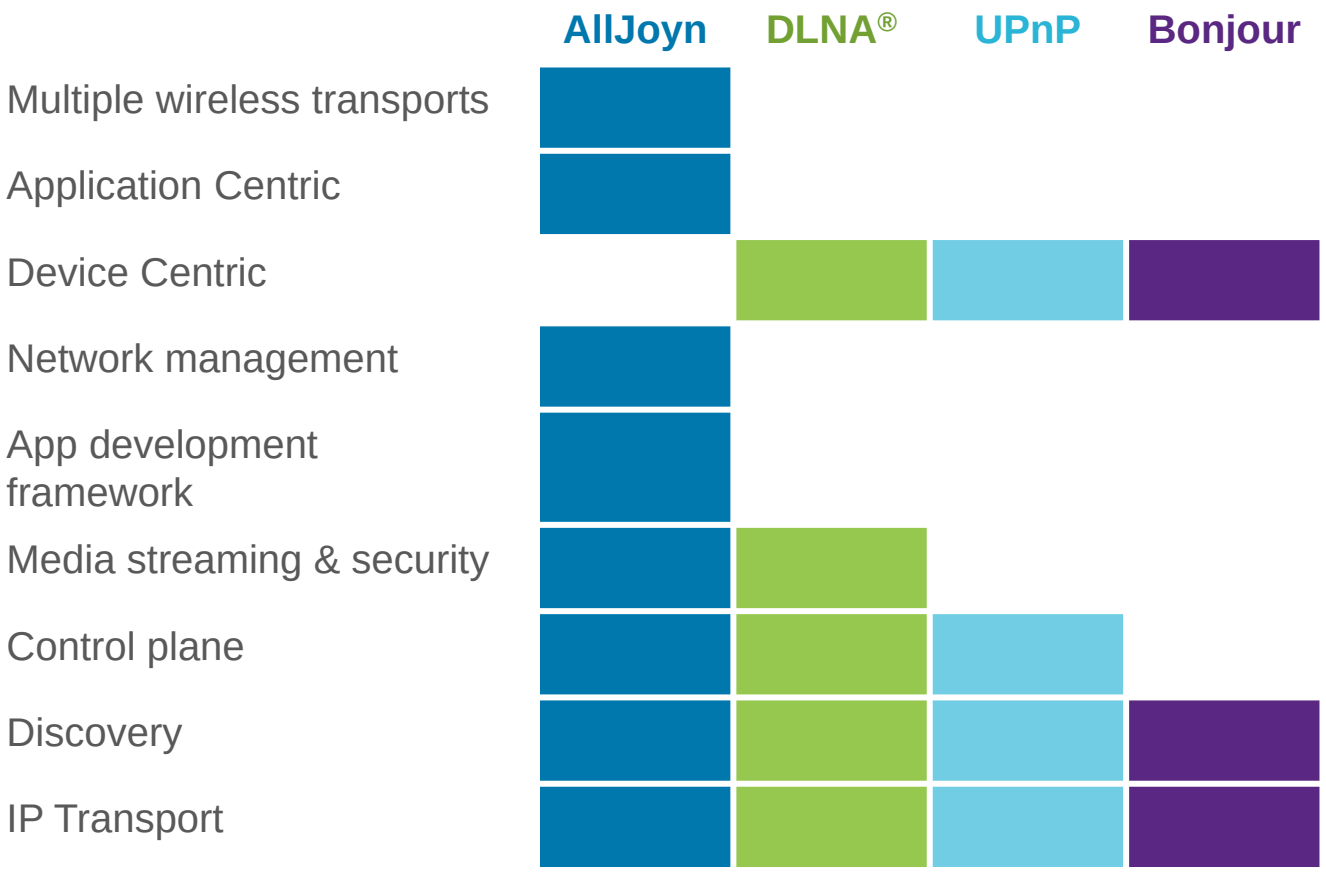


NFC is for small data loads and devices must be touching

AllJoyn can de adopted to use NFC as a transport

- Could be a great discovery transport with communication occurring over WiFi or BT

What About Existing Protocols?



WiFi Direct is much like BT with device pairing

- Focus is on establishing IP networks

AllJoyn avoids the complications of pairing devices

- Provides higher level API's that work across different wireless protocols

What Operating Systems and Languages?

TODAY

- Android 2.1 (Éclair) and newer
- Windows® 7 and XP
- Linux

BETA RELEASE

- Windows® RT

IN DEVELOPMENT

- iOS

AllJoyn is open source and available

http://www.alljoyn.org

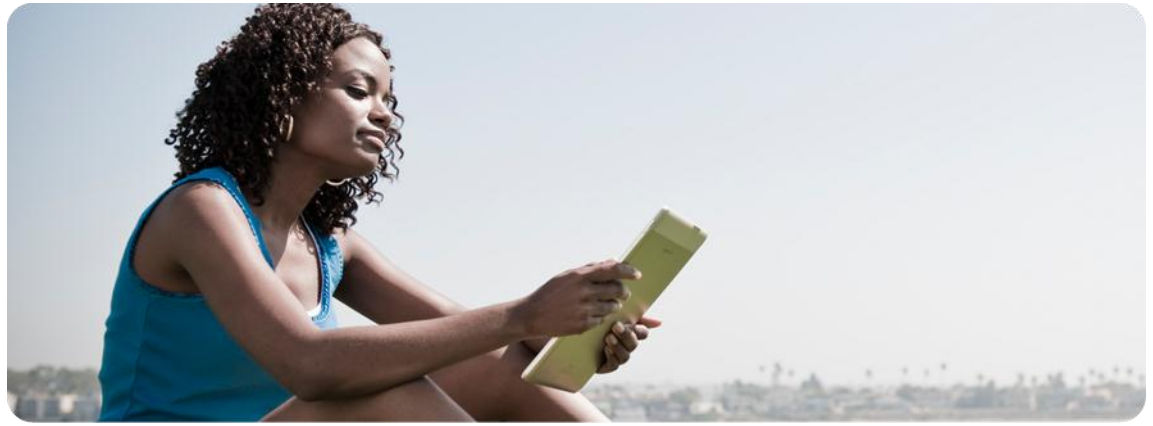
LANGUAGE BINDINGS

- C++ (native implementation)
- Java
- C
- C# (Unity)

IN DEVELOPMENT/DEMONSTRATED

- JavaScript
- C# (General)

AllJoyn Fundamentals



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AllJoyn Fundamentals

AllJoyn is a distributed software bus

- Each device runs a bus daemon
- Applications communicate directly only with the daemon
- Daemons on each device communicate with daemons on other devices
- Daemons do message routing and namespace management

Bus formation is ad hoc

- Based on proximal discovery
- Abstracts multiple discovery mechanisms

Protocol is transport independent

- Supports Wi-Fi and Bluetooth currently
- Working on Wi-Fi Direct

Bus Attachments, Objects, Proxy Objects

An application needs a Bus Attachment to communicate with the bus

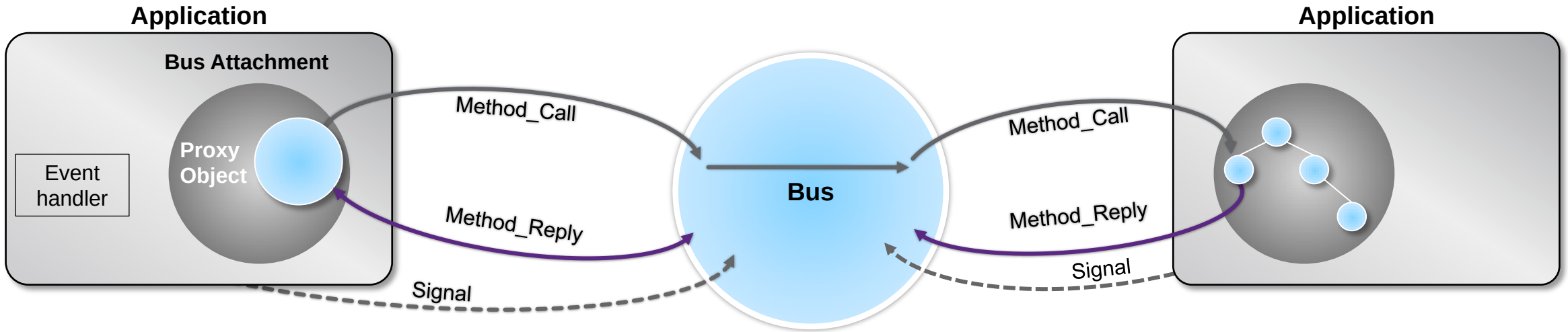
- Bus Attachments provide a root (/) for the object hierarchy

Bus Objects implement interfaces

- Bus Objects path names look like file paths, e.g. /org/AllJoyn/Games/chess
- Bus Object have methods than can be called remotely
- Bus Objects can emit signals

Proxy Bus Objects are local representations of remote Bus Objects.

- Applications use proxy bus objects to make method calls to remote objects



Connect to the AllJoyn Bus

```
mBus = new BusAttachment(getClass().getName(), BusAttachment.RemoteMessage.Receive);
mBus.useOSLogging(true);
mBus.setDebugLevel("ALLJOYN_JAVA", 7);
mBus.registerBusListener(new LocalBusListener());
```

This object represents the connection to the bus (daemon)

```
status = mBus.connect();
if(Status.OK != status) {/*ERROR */}
```

Connect the attachment to the bus

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Register Bus Objects

```
/* Define an interface that will be your AllJoyn interface for P2P communication */
@BusInterface (name = "org.alljoyn.bus.samples.training")
public interface AllJoynTrainingInterface {
   @BusMethod(signature = "s")
   public void TraningMethod(String arg) throws BusException;
}
```

Define the Interface that represents the methods of your P2P application

---

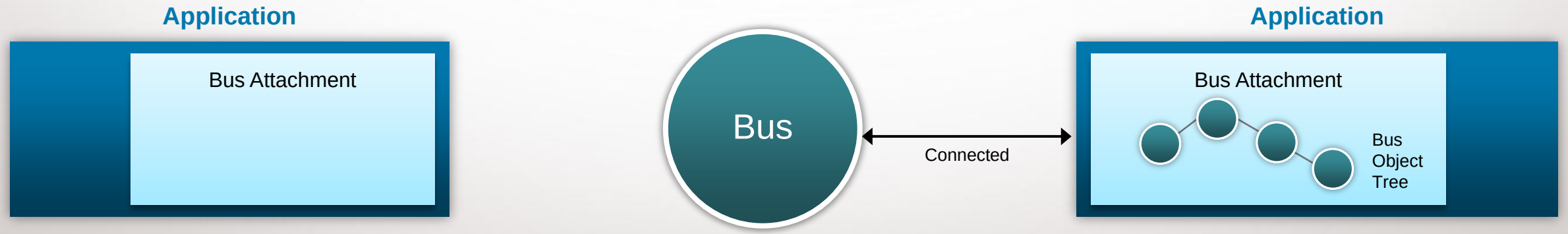
```
class TrainingService implements AllJoynTrainingInterface, BusObject {
     public void TraningMethod(String arg)  { /* some code */ }
}
```

Implement the interface and BusObject so we can register this with the bus

---

```
theService = new TrainingService();
Status status = mBus.registerBusObject(theService, “/TrainingService”);
 if(Status.OK != status) {/*ERROR */}
```

Create an object for the service and register with the AllJoyn Bus



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Register Signal Handler

```
/* Define an interface that will be your AllJoyn interface for P2P communication */
@BusInterface (name = "org.alljoyn.bus.samples.training")
public interface AllJoynTrainingInterface {
    @BusSignal(signature = "s")
    public void SignalMethod(String arg) throws BusException;
}
```

Define the Interface that represents the methods of your P2P application

```
----------
/* in the application  register the class that implements the SignalMethod  handler*/
status = mBus.registerSignalHandlers(this);
if(Status.OK != status) {/*ERROR */}
```

Let the Bus know what class contains the handler for signals

```
---------
/* Here is the handler */
@BusSignalHandler(iface = "com.alljoyn.bus.samples.training", signal = "SignalMethod")
public void SignalMethod(String arg) { /* some code */ }
```

This method executes when a signal is sent out assuming device is connected on same session

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Advertise Well-Known Name

```
Status status = mBus.advertiseName(“com.alljoyn.org.samples.training”, SessionOpts.TRANSPORT_ANY);
if(Status.OK != status) {
/*ERROR – Failed to advertise name*/
status = mBus.releaseName((“com.alljoyn.org.samples.training”);
}
```

Register with the bus that we are going to be aliased the com.alljoyn.org.samples.training class

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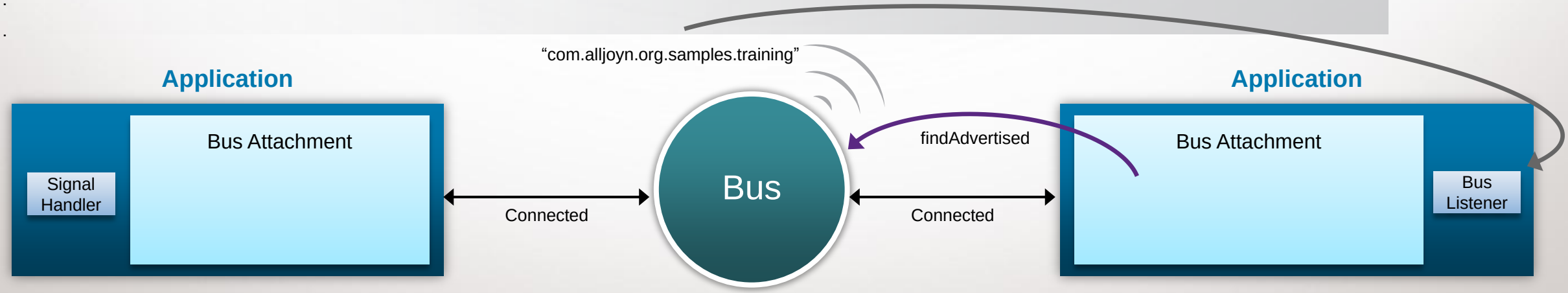
Discover Well-Known Names

```
class LocalBusListener extends BusListener {
    public void foundAdvertisedName(String name, short transport, String namePrefix) {
    }
    public void lostAdvertisedName(String name, short transport, String namePrefix) {
    }
    public void nameOwnerChanged(String busName, String previousOwner, String newOwner) {
    }
}
```

Listener class for discovery events. This is where we are informed of other services

```
…
...
Status status = mBus.findAdvertisedName("com.alljoyn.org.samples.training");
if(Status.OK != status) {/*ERROR */}
…
…
```

Look for a com.alljoyn.org.samples.training service



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Create a Session

```
class MySessionPortListener extends SessionPortListener {
    public boolean acceptSessionJoiner(short sessionPort, String joiner, SessionOpts sessionOpts) {
        return true;
    }
    public void sessionJoined(short sessionPort, final int sessionId, String joiner) {
        mBus.setSessionListener(sessionId, new MySessionListener());
    }
}
```

Listener class for session events. Lets us accept sessions and informs when users join.

```
----------
Mutable.ShortValue agreedUponPort = new Mutable.ShortValue(55); /* value can be 1 to 32767 (max short) */
SessionOpts sessionOpts = new SessionOpts();
sessionOpts.traffic = SessionOpts.TRAFFIC_MESSAGES;
sessionOpts.isMultipoint = true;
sessionOpts.proximity = SessionOpts.PROXIMITY_ANY;
sessionOpts.transports = SessionOpts.TRANSPORT_ANY;
Status status = mBus.bindSessionPort(agreedUponPort, sessionOpts, new MySessionPortListener());
if(Status.OK != status) { /*ERROR – Could not create a session*/ }
```

We create the session based on the Session Options we pass. We can specify the transport interface here for the supported types

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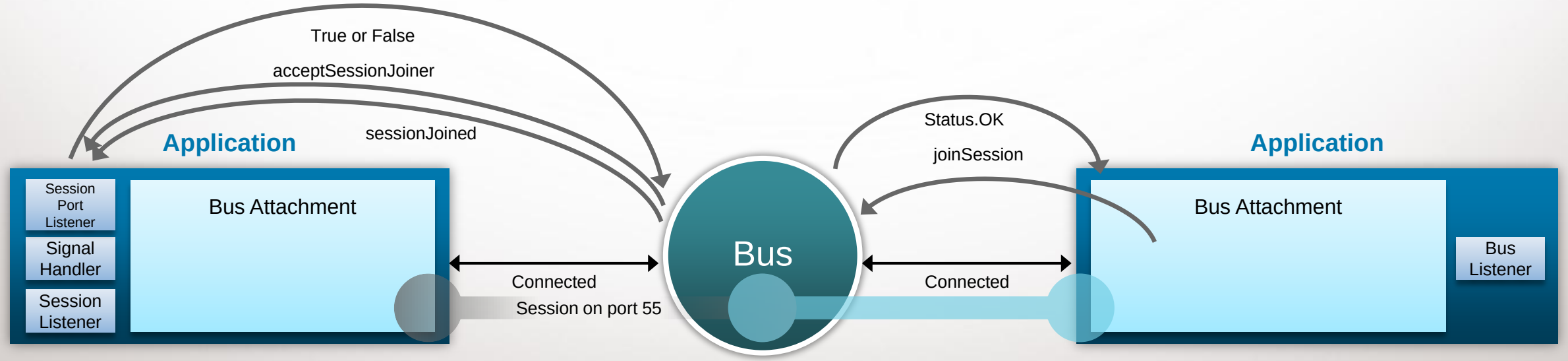
Join a Session

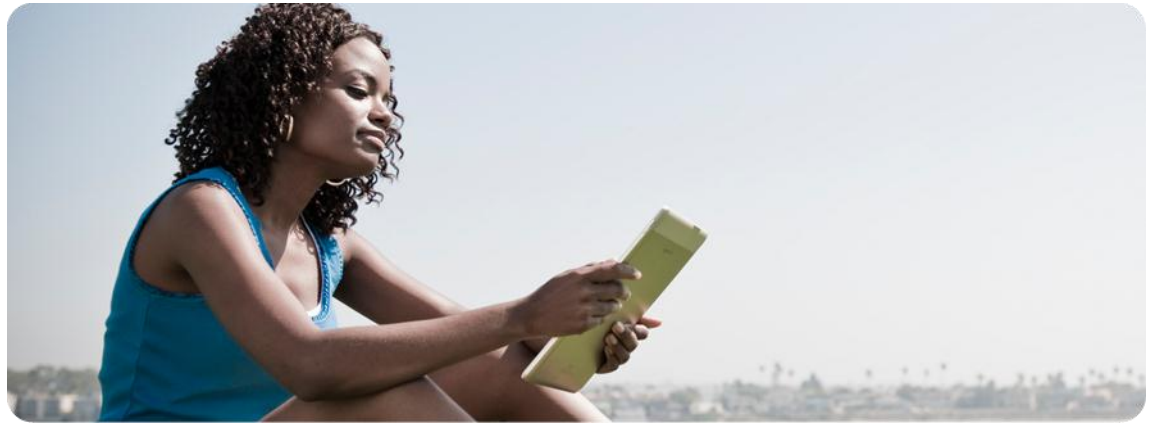
```
short agreedUponPort = 55; /* value can be 1 to 32767 (max short) */
SessionOpts sessionOpts = new SessionOpts();
Mutable.IntegerValue sessionId = new Mutable.IntegerValue();
Status status = mBus.joinSession("com.alljoyn.org.sample.training", agreedUponPort , sessionId,
                                 sessionOpts, new MySessionListener());
if(Status.OK == status) {
    /* NOW CONNECTED */
} else if(status == Status.ALLJOYN_JOINSESSION_REPLY_ALREADY_JOINED) {
    /* ALREADY JOINED */
} else {
    /* ERROR */
}
```

We have already found the name so we now join the session

```
class MySessionListener extends SessionListener {
    public void sessionLost(int sessionId) { }
    public void sessionMemberAdded(int sessionId, String uniqueName) {}
    public void sessionMemberRemoved(int sessionId, String uniqueName) {}
}
```



Add AllJoyn to an Android Application



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Download Packages

Download Android SDK

- http://developer.android.com/sdk/index.html

Download & Setup Eclipse

- http://eclipse.org/downloads/packages/eclipse-classic-372/indigosr2
- Install ADT: http://developer.android.com/sdk/eclipse-adt.html

Download AllJoyn SDK

- http://alljoyn.org/docs-and-downloads

Steps to Add AllJoyn to Existing Application

Download complete documentation here:

- https://www.alljoyn.org/content/guide-alljoyn-development-using-java-sdk
- https://www.alljoyn.org/docs-and-downloads/documentation/alljoyn-android-environment-setup-guide

First: Import AllJoyn libraries

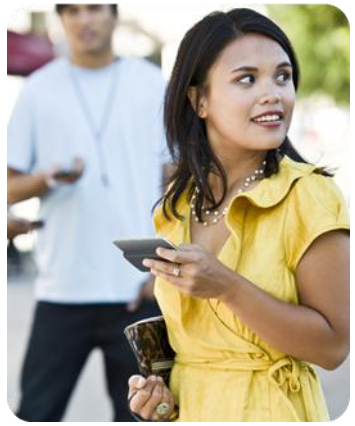
- Create libs folder that contains:
  - alljoyn.jar
  - armeabi/liballjoyn_java.so

Second: Modify manifest to include permissions

Third: Add AllJoyn code

Simple Client/Server Sample Code Walkthrough — C++

Found in SDK



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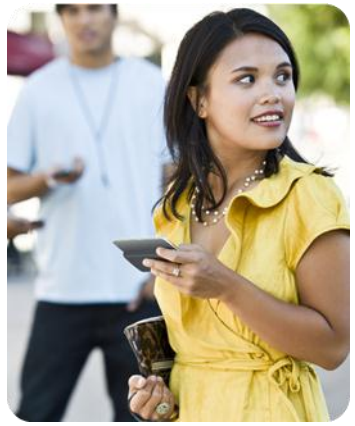
Simple Client/Service Sample Walkthrough — C++

C++ Simple sample found in the SDK:

- alljoyn-sdk-2-3-6-android-rel\samples\simple\client
- alljoyn-sdk-2-3-6-android-rel\samples\simple\service

How to build and run AllJoyn at OS layer



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Linux build instructions

Complete documentation here:

- https://www.alljoyn.org/docs-and-downloads/build-environment/configuring-build-environment-linux-platform

Download & Setup Environment

- These tools are need at a minimum:
  - Python
  - SCons
  - Git
  - Repo
  - Java

Download AllJoyn source code

- http://alljoyn.github.com/download-source.html

Linux build instructions

Compile for Linux:

scons CPU=x86 VARIANT=release

scons CPU=x86-64 VARIANT=release

Compile for Android: *

scons OS=android CPU=arm ANDROID_NDK=/local/mnt/workspace/brian/android-ndk-r6b ANDROID_SRC=/local/mnt/workspace/ICS ANDROID_TARGET=generic VARIANT=release

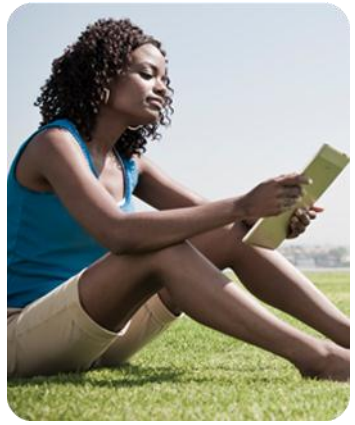
*Android Source code required to build for Android

Live demonstration

Qualcomm Innovation Center, Inc.
5775 Morehouse Drive
San Diego, CA. 92121-1714
U.S.A.

Questions?

Thank you!



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