Composable Android Apps

Taylor Autry & Dale Pedzinski

Outline

- The Basics
  - Android
  - Android Networking 101
  - Wi-fi Direct
- The Project
  - Non-networking components
  - Networking components
  - Wi-fi Direct group discovery and setup
  - Failover
- Demo
- Lessons Learned

The Basics

- Android
  - What is it?
  - Popularity?
  - Compatibility?

- Why Android?
  - Experience
  - Ease of publishing
  - But mostly... Dale had two spare phones to build the application!

Version	Codename	API	Distribution
2.3.3 - 2.3.7	Gingerbread	10	0.5%
4.0.3 - 4.0.4	Ice Cream Sandwich	15	0.5%
4.1.x	Jelly Bean	16	2.2%
4.2.x		17	3.1%
4.3		18	0.9%
4.4	KitKat	19	13.8%
5.0	Lollipop	21	6.4%
5.1		22	20.8%
6.0	Marshmallow	23	30.9%
7.0	Nougat	24	17.6%
7.1		25	3.0%
8.0	Oreo	26	0.3%

https://developer.android.com/about/dashboards/index.html

Networking on Android

- Bluetooth
- NFC
- Telecom
- Wifi P2P
- Wi-Fi Aware
- USB
- SIP

https://developer.android.com/guide/topics/connectivity/index.html

https://www.pabloyglesias.com/wp-content/uploads/2013/02/android_AdHock.png

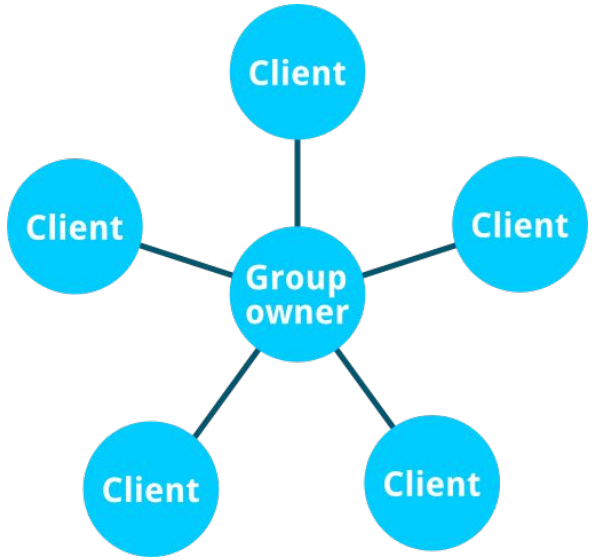
Wifi P2P

How it works?

1. Group gets created
2. Client discovers group
3. Client ask for permission to join
4. Group Owner says Yes or NO
5. if(yes) then Client gets added to group

Who uses it?

- Printers
- Media players
- Cameras
- Small peripherals

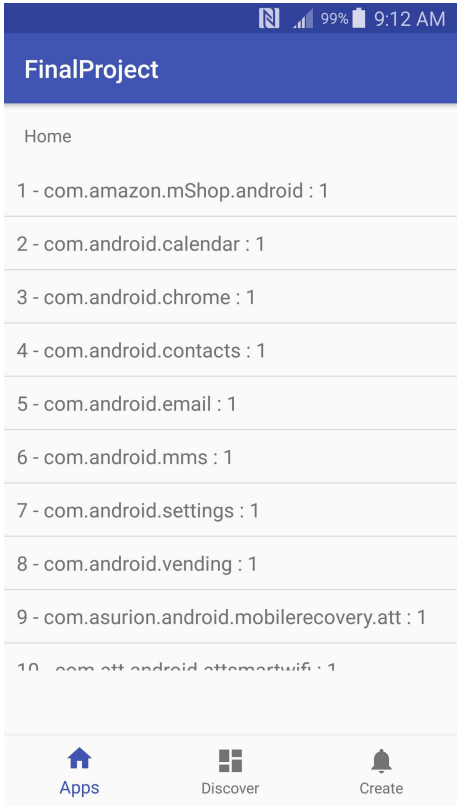


https://2r4s9p1yi1fa2jd7j43zph8r-wpengine.netdna-ssl.com/files/2015/01/wifi-direct-diagram.png

The Project

- Android Application
  - Min SDK: 17
  - Target SDK: 26 (Oreo)
  - Utilizing several modules native to Android
    - Package Manager
    - Local Storage
    - Wifi P2P

- The Project
  - Wouldn't it be cool to see the most install applications across several devices?



The Non-Networking Project Components

- Package Manager

```
List<ApplicationInfo> packages =
pm.getInstalledApplications(PackageManager.GET_META_DATA);
```

- Internal Storage

```
String FILENAME = "system_data";
fos = this.context.openFileInput(FILENAME);
String systemDataString= getFileContent(fos);
Gson gson  = new Gson();
systemData=gson.fromJson(systemDataString,System
Data.class);
fos.close();
```

The Networking Components

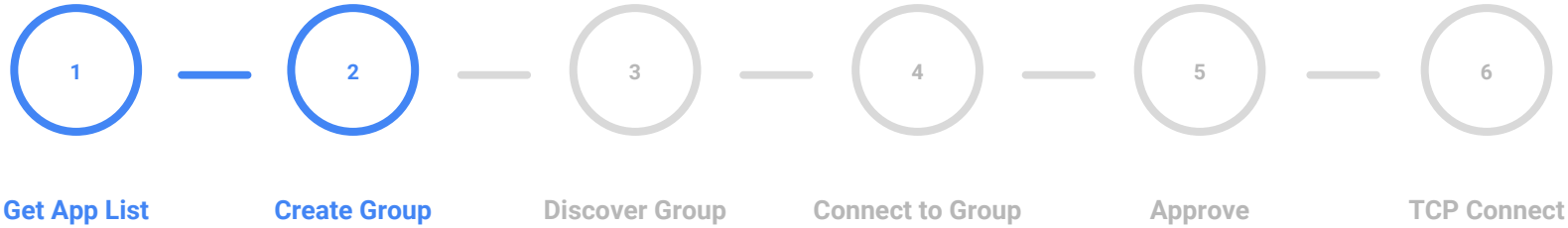
Intent filters

```
mIntentFilter = new IntentFilter();
mIntentFilter.addAction(WifiP2pManager.WIFI_P2P_STATE_CHANGED_ACTION);
mIntentFilter.addAction(WifiP2pManager.WIFI_P2P_PEERS_CHANGED_ACTION);
mIntentFilter.addAction(WifiP2pManager.WIFI_P2P_CONNECTION_CHANGED_ACTION);
mIntentFilter.addAction(WifiP2pManager.WIFI_P2P_THIS_DEVICE_CHANGED_ACTION);
```

BroadcastReceiver

```
public void onReceive(Context context, Intent intent) {
    String action = intent.getAction();
```

Code Process



Create Group - Owner

```
mManager.createGroup(mChannel, new WifiP2pManager.ActionListener() {
    @Override
    public void onSuccess() {
        Log.d( tag: "myBroadcastReceiver", msg: "Home-Nav-Groups Group Success");
        mActivity.isGroupOwner=true;
        mManager.requestGroupInfo(mChannel, new WifiP2pManager.GroupInfoListener() {
            @Override
            public void onGroupInfoAvailable(WifiP2pGroup group) {
                if(group!=null) {
                    Log.d( tag: "myBroadcastReceiver",  msg: "Home-Nav-Groups Group" + group.toString());
                }
            }
        });
    }
```

Discover Group

```
mManager.requestPeers(mChannel, new WifiP2pManager.PeerListListener() {
    @Override
    public void onPeersAvailable(WifiP2pDeviceList peers) {
        if (peers.getDeviceList().size() == 0) {
            Toast.makeText(mActivity.getApplicationContext(), "No Peers Found", Toast.LENGTH_LONG).show();
            return;
        }


...

        for (WifiP2pDevice device : peers.getDeviceList()) {
            deviceNameList.add(device.deviceName + ": " + device.deviceAddress);
        }


...
```

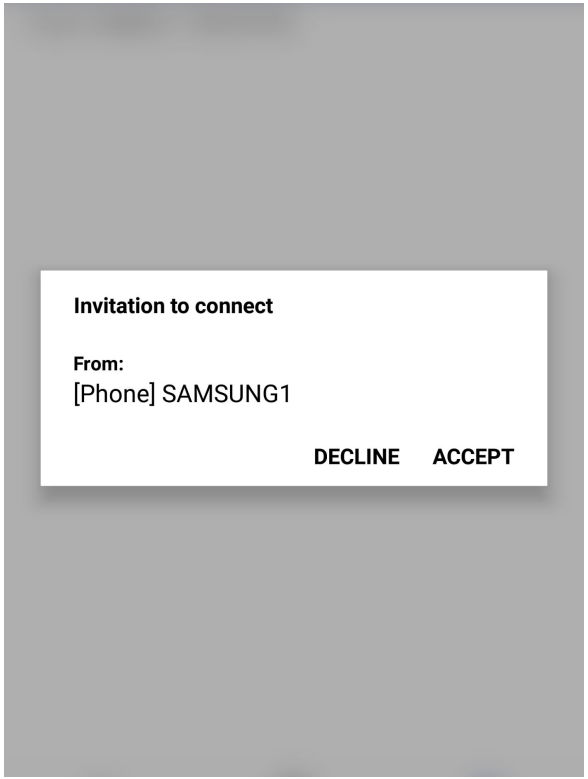
Connect Group

```
mManager.connect(mChannel, config, new ActionListener() {

    @Override
    public void onSuccess() {
        mActivity.isConnected = true;
        Toast.makeText(mActivity.getApplicationContext(), "connected", Toast.LENGTH_LONG).show();
        WifiP2pDevice device= (WifiP2pDevice) peerList.toArray()[position];
        SystemData systemState = mActivity.dataManager.getSystemData();
        systemState.nodeList.systemNodeArrayList.add(new SystemNode(device.deviceName,device.deviceAddress));


    }
...
```

Approve Connection



Exchange App Info

```
public class ServerTask extends
AsyncTask<TaskParameters,Integer,Void> {

...
    @Override
    protected Void
doInBackground(TaskParameters... taskData) {
   ...
```

```
public class ClientTask extends
AsyncTask<TaskParameters,Integer,Void> {

...
    @Override
    protected Void
doInBackground(TaskParameters... taskData) {
   ...
```

Failover

```
else if (WIFI_P2P_PEERS_CHANGED_ACTION.equals(action)) {
 …
}else if(mActivity.isSupported & mActivity.isConnected && !mActivity.isGroupOwner){
    if(mActivity.dataManager.getSystemData().groupOwnerAddress!=null &&
!executeCommand(mActivity.dataManager.getSystemData().groupOwnerAddress.getHostAddress())) {
        Toast.makeText(mActivity.getApplicationContext(), "Group was Disconnected",
Toast.LENGTH_LONG).show();
        Toast.makeText(mActivity.getApplicationContext(), "Resetting App information",
Toast.LENGTH_LONG).show();
        mManager.removeGroup(mChannel, new ActionListener() {
            ...
        mActivity.isSupported = false;
        mActivity.isConnected = false;
        mActivity.isGroupOwner = false;
        mActivity.dataManager.InitialSystemData(mActivity.getPackageManager());
        mActivity.generateAppListView(mActivity.dataManager.getSystemData());

    }
}
```

Demo


TIME FOR A LIVE DEMO
38
WHAT COULD GO WRONG?
memegenerator.net

Lessons Learned/ Improvements

- Android Implementation
- Android Emulator doesn’t support Networking functions like P2P
- Code Examples are fairly bug prone due to the rapid version releases
- P2P Intent filters were triggered a lot and not very specific in the documentation
- Hardware compatibility with brands - LG & Samsung don’t like each other
- No easy way to failover in this technology

Questions