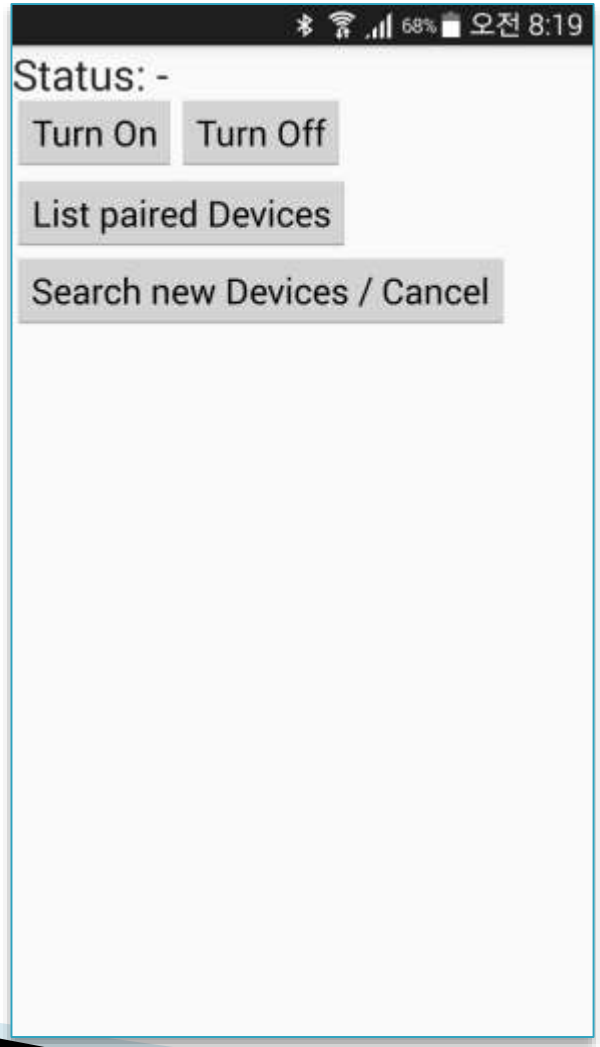
네트워크프로그래밍-12주
Android Bluetooth 통신

정인환교수

Bluetooth 통신

- Android Bluetooth 제어
  - BluetoothTest
    - On/Off/List
- Bluetooth 통신 관련 정보
- BluetoothChat
- Bluetooth Beacon

BluetoothTest




```
public void on(View view){
    if (!myBluetoothAdapter.isEnabled()) {
        Intent turnOnIntent = new Intent(BluetoothAdapter.ACTION_REQUEST_ENABLE);
        startActivityForResult(turnOnIntent, REQUEST_ENABLE_BT);

        Toast.makeText(getApplicationContext(),"Bluetooth turned on" ,
                Toast.LENGTH_LONG).show();
    }
    else{
        Toast.makeText(getApplicationContext(),"Bluetooth is already on",
                Toast.LENGTH_LONG).show();
    }
}
```

```
public void list(View view){
    // get paired devices
    pairedDevices = myBluetoothAdapter.getBondedDevices();

    // put it's one to the adapter
    for(BluetoothDevice device : pairedDevices)
        BTArrayAdapter.add(device.getName()+ "\n" +
device.getAddress());

    Toast.makeText(getApplicationContext(),"Show Paired Devices",
            Toast.LENGTH_SHORT).show();

}
```

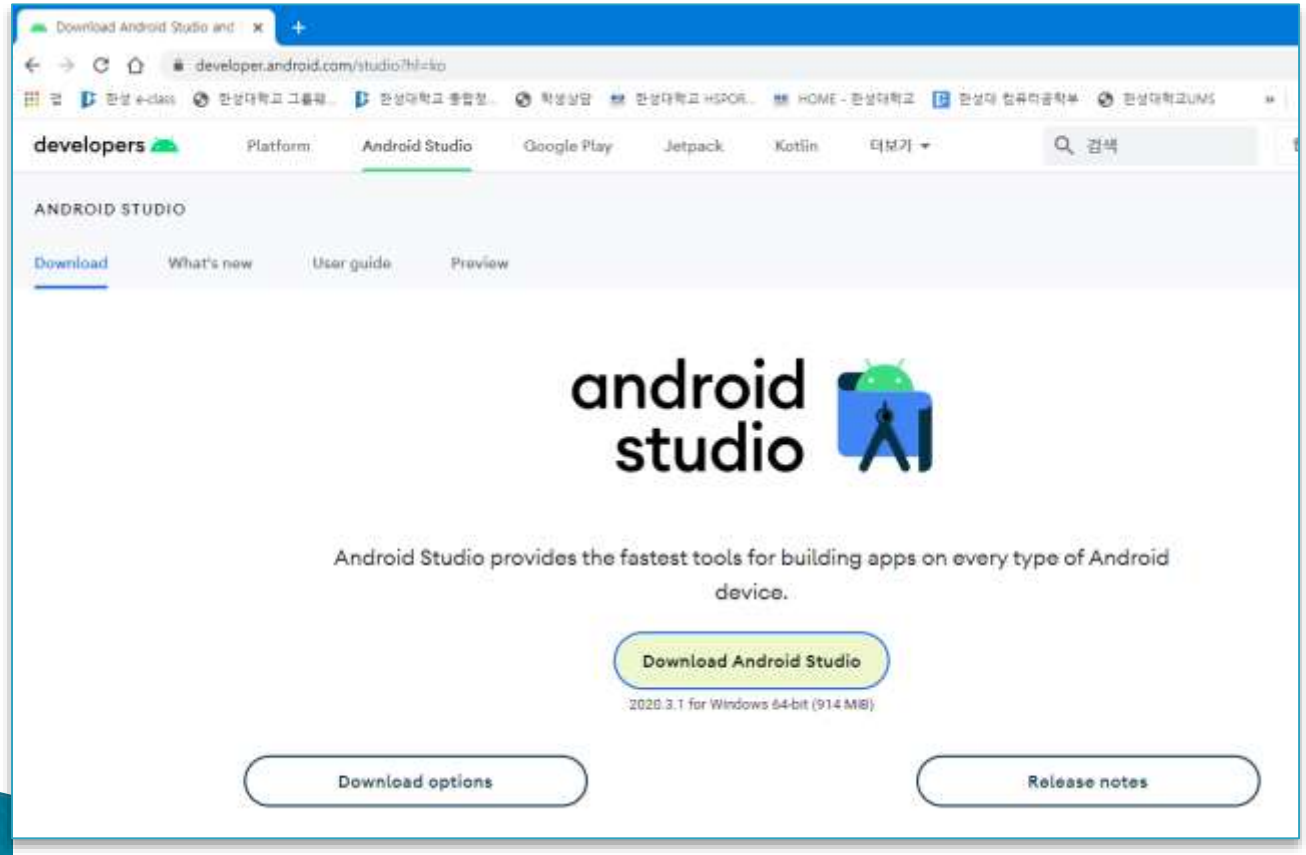
```
public void off(View view){
    myBluetoothAdapter.disable();
    text.setText("Status: Disconnected");

    Toast.makeText(getApplicationContext(),"Bluetooth turned off",
            Toast.LENGTH_LONG).show();
}
```

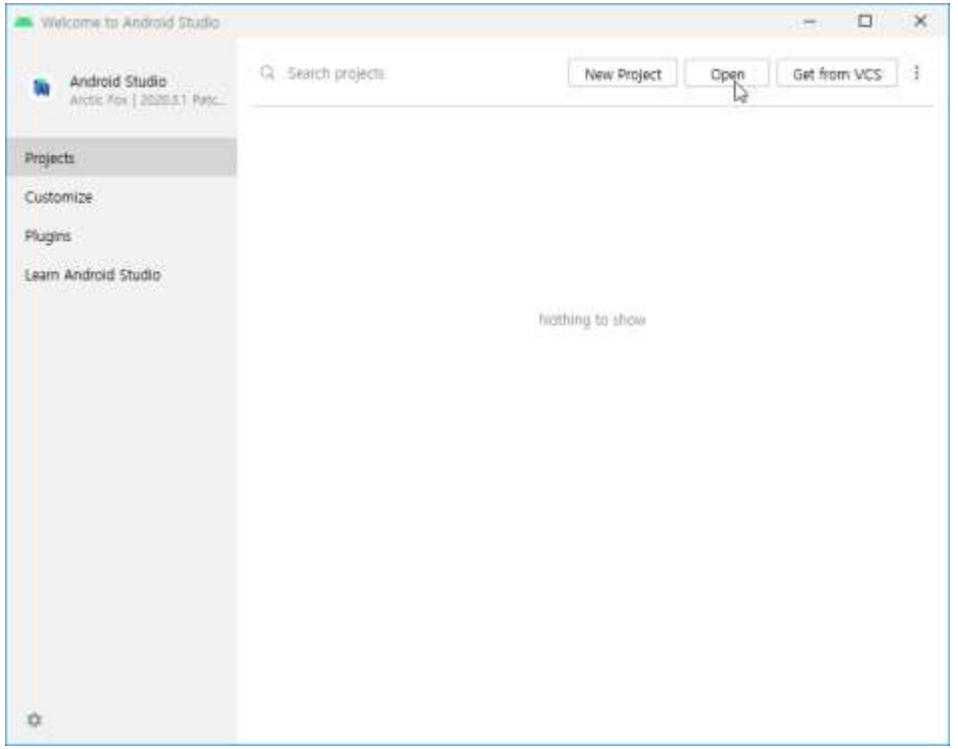
Bluetooth 통신 관련 정보

- google 에서 'android Bluetooth 통신' 검색결과
  - Android Bluetooth 문서
    - https://developer.android.com/guide/topics/connectivity/bluetooth?hl=ko
  - 안드로이드 블루투스 개발 방법
    - https://bugwhale.tistory.com/entry/android-bluetooth-application
  - Android / Aduino Bluetooth 통신하기
    - https://ddangeun.tistory.com/59
  - Bluetooth 예제
    - https://yeolco.tistory.com/110

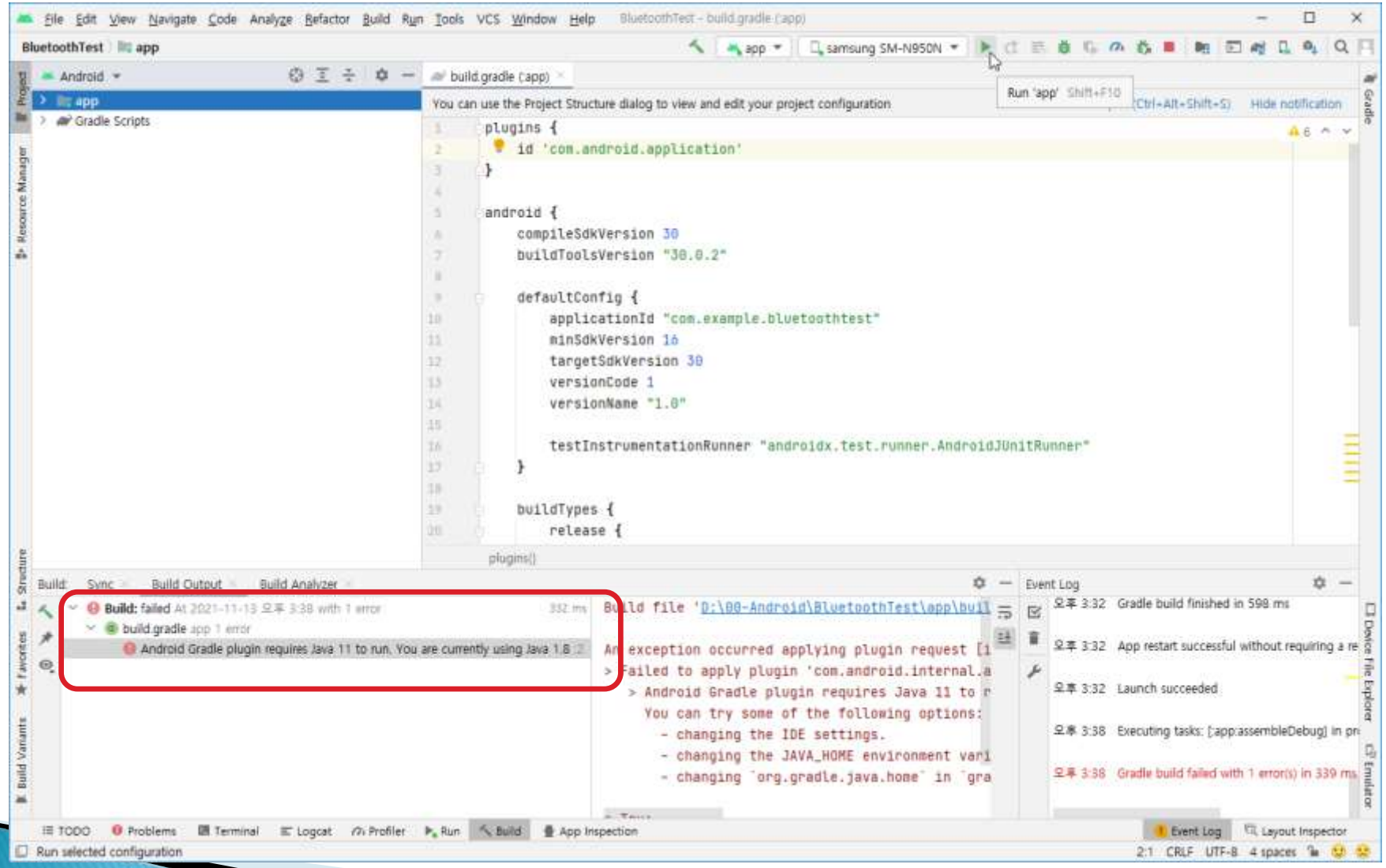
Android Studio 최신 버전 설치

- https://developer.android.com/studio/install?hl=ko
- https://developer.android.com/studio?hl=ko



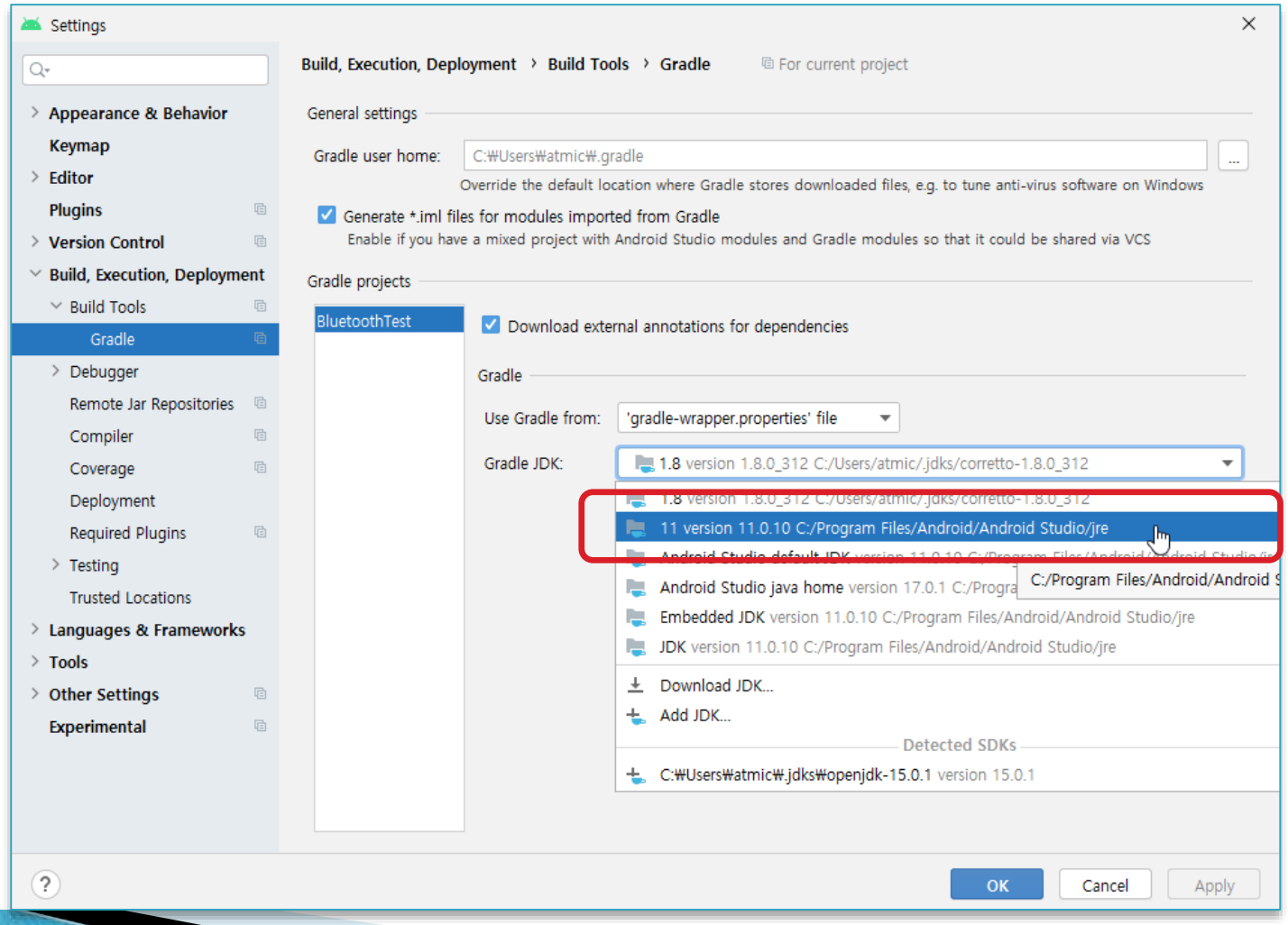


BluetoothTest (실행 누르면 Error 나는 경우)

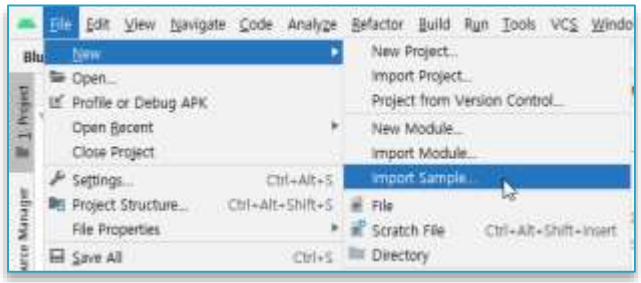


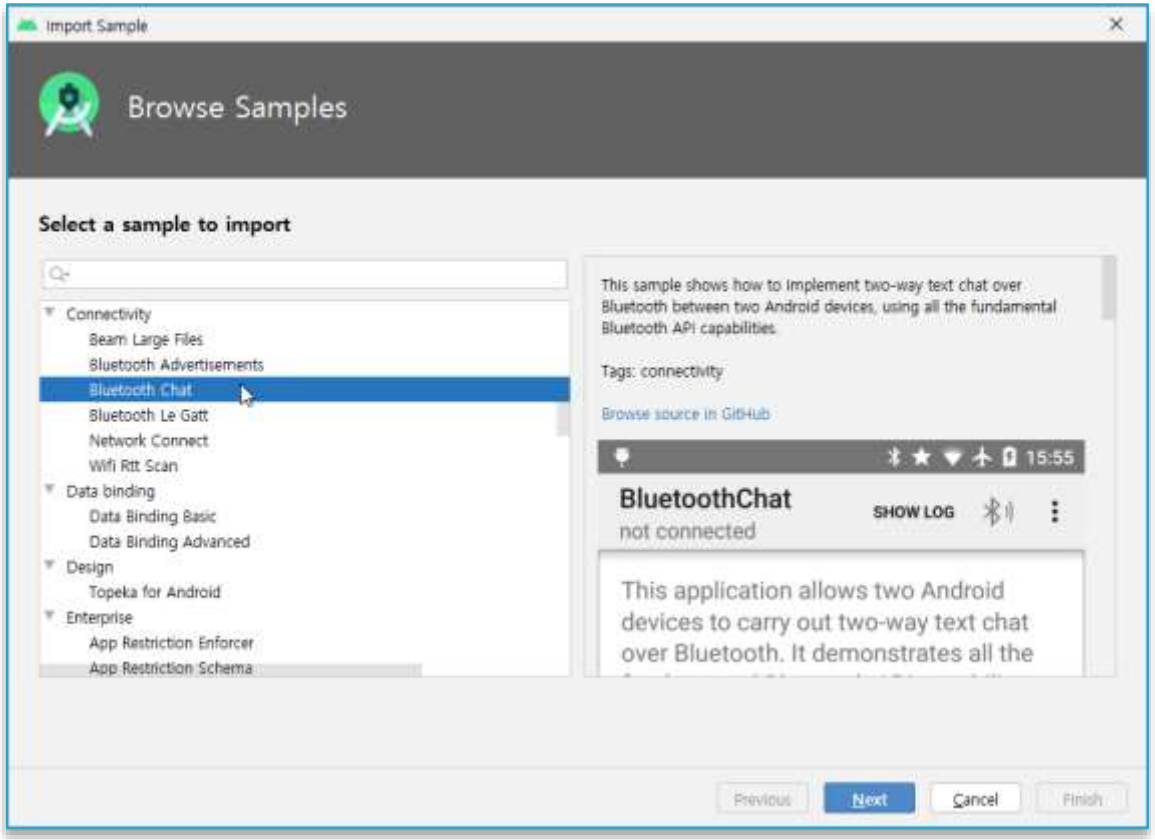
BluetoothTest (실행 누르면 Error 나는 경우)

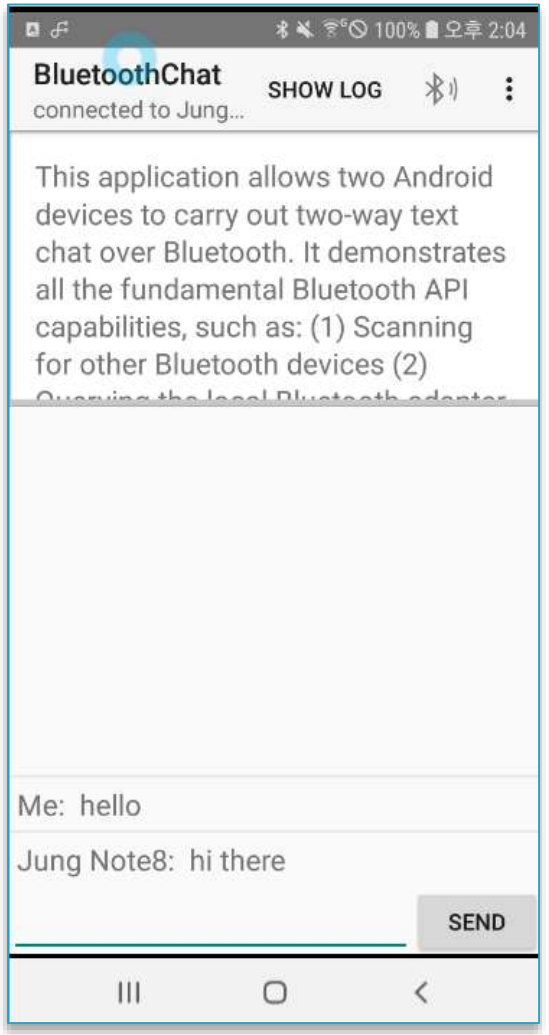
- File > Settings 에서 Grale JDK 를 11 version을 설정



BluetoothChat (Android 구버전)

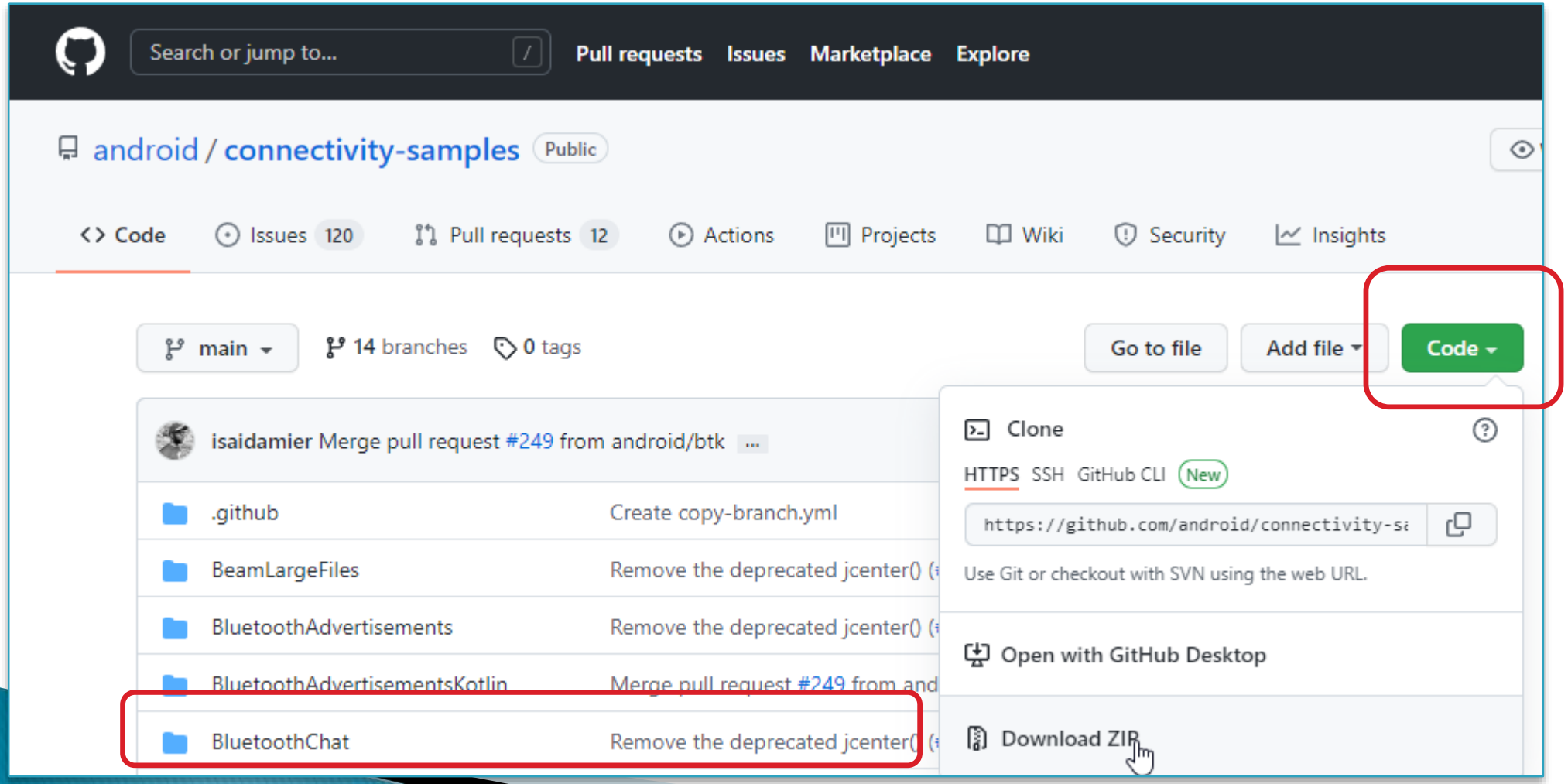






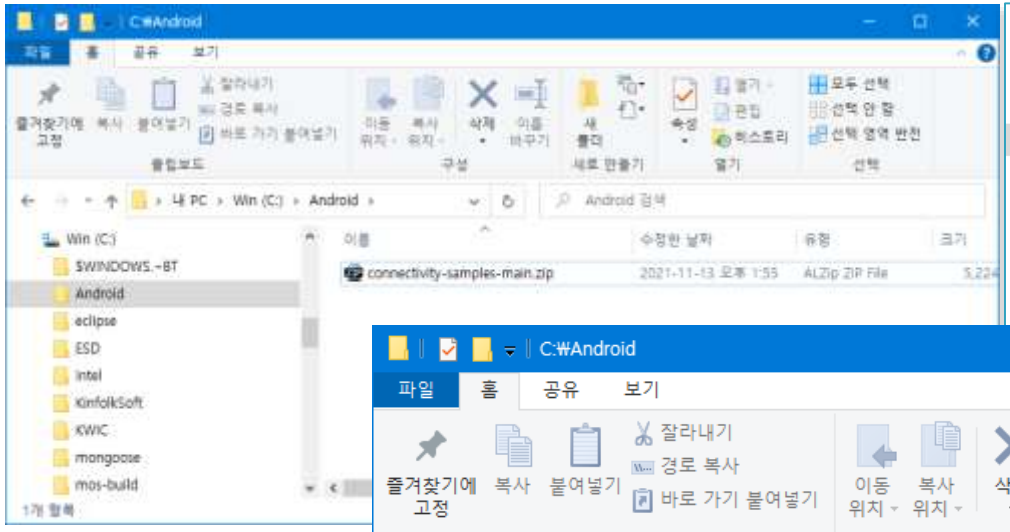
BluetoothChat (Android Sample Github)

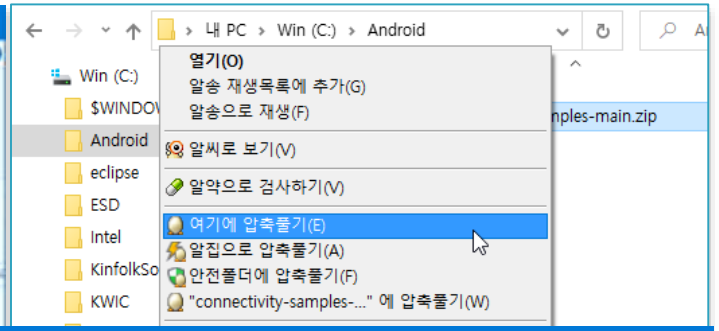
- https://github.com/android/connectivity-samples
- Code > Download ZIP

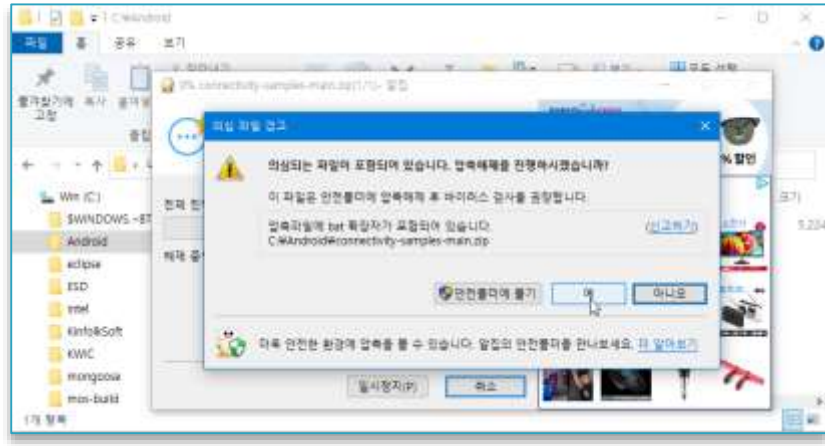


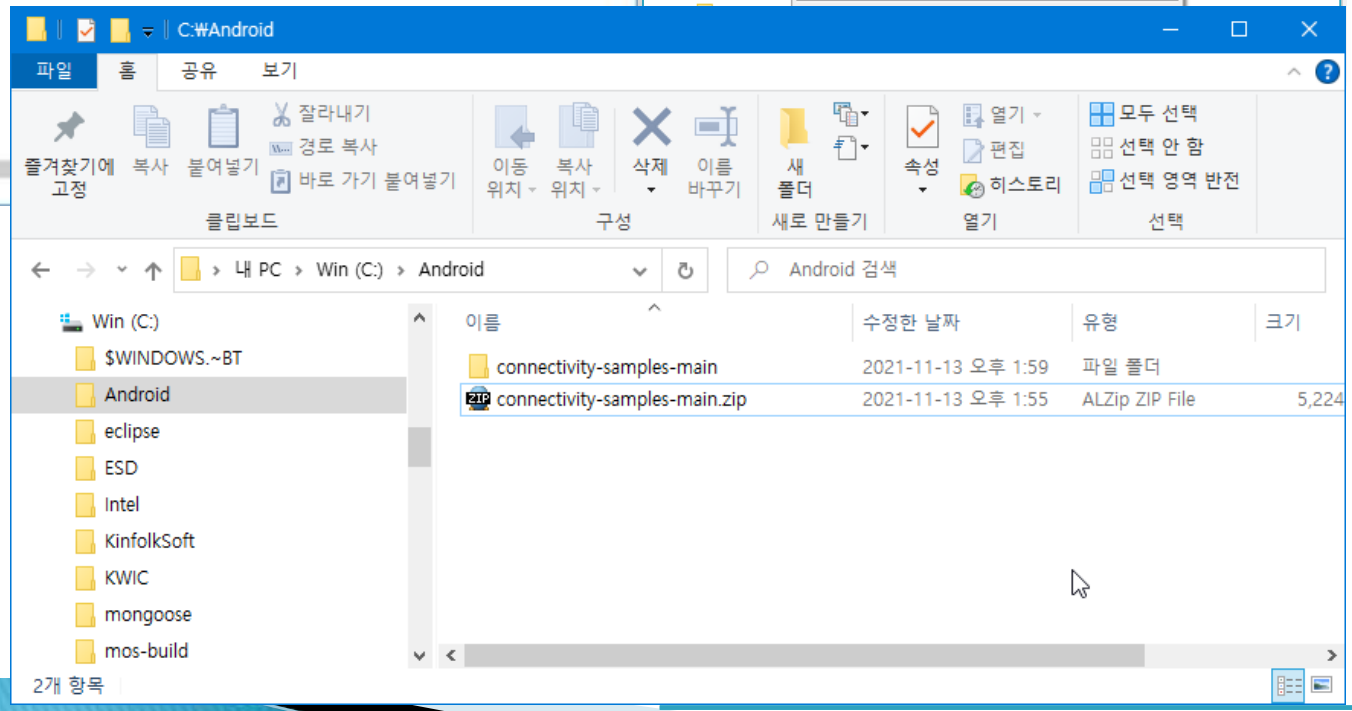
BluetoothChat (Android Sample Github)

- C:\Android에 압축 풀기 (반드시 영문 폴더)

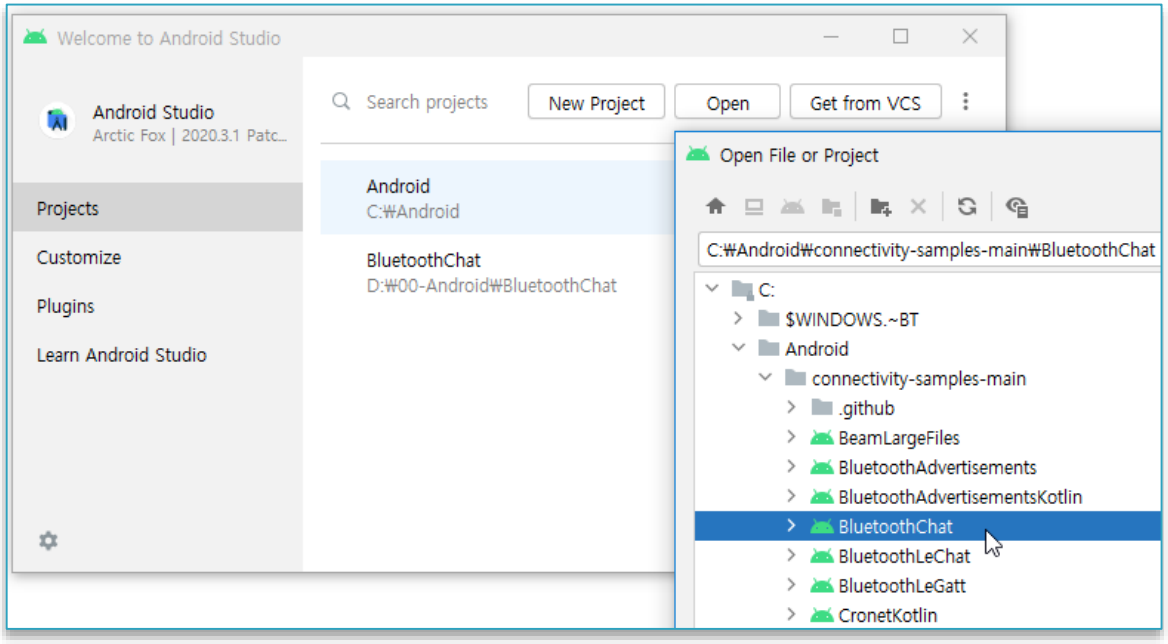


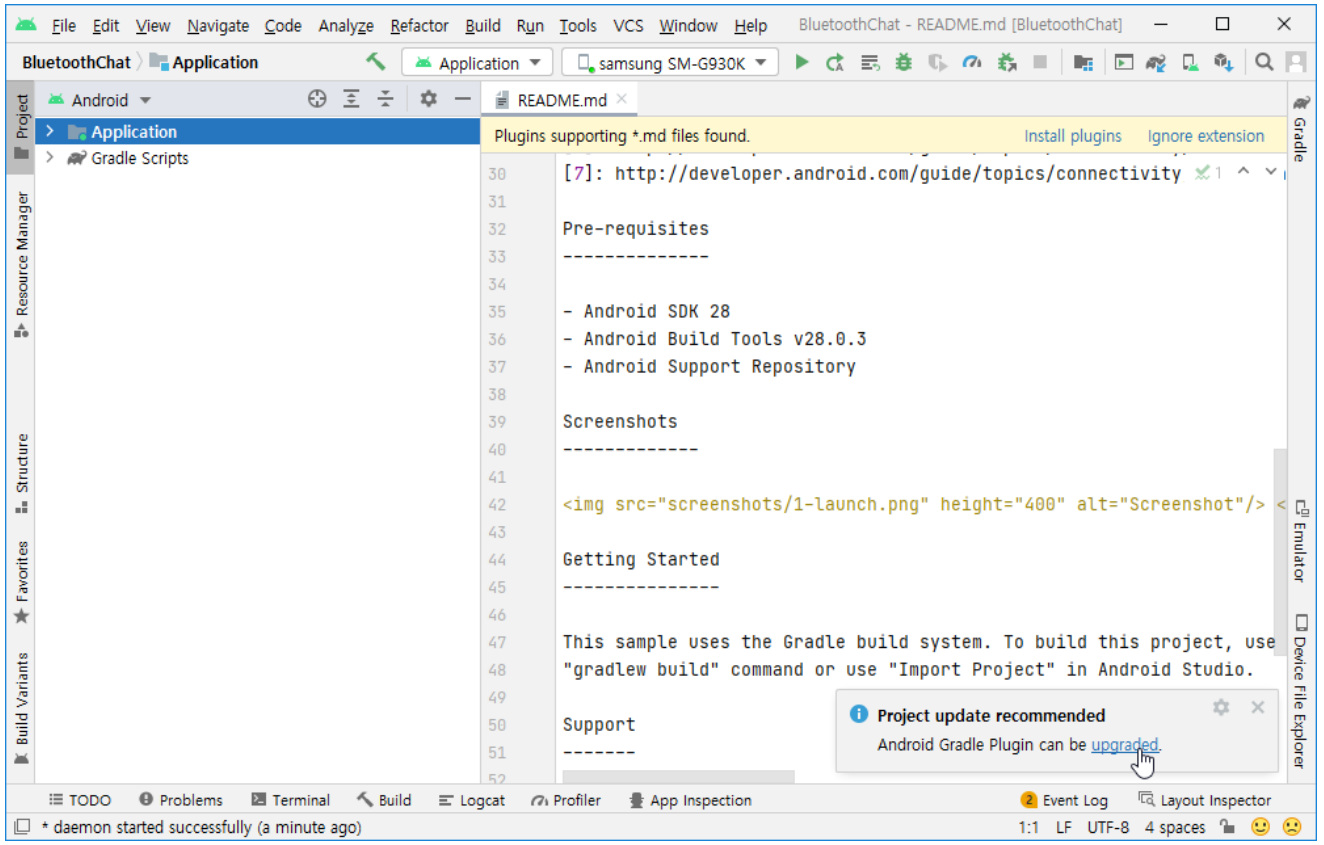




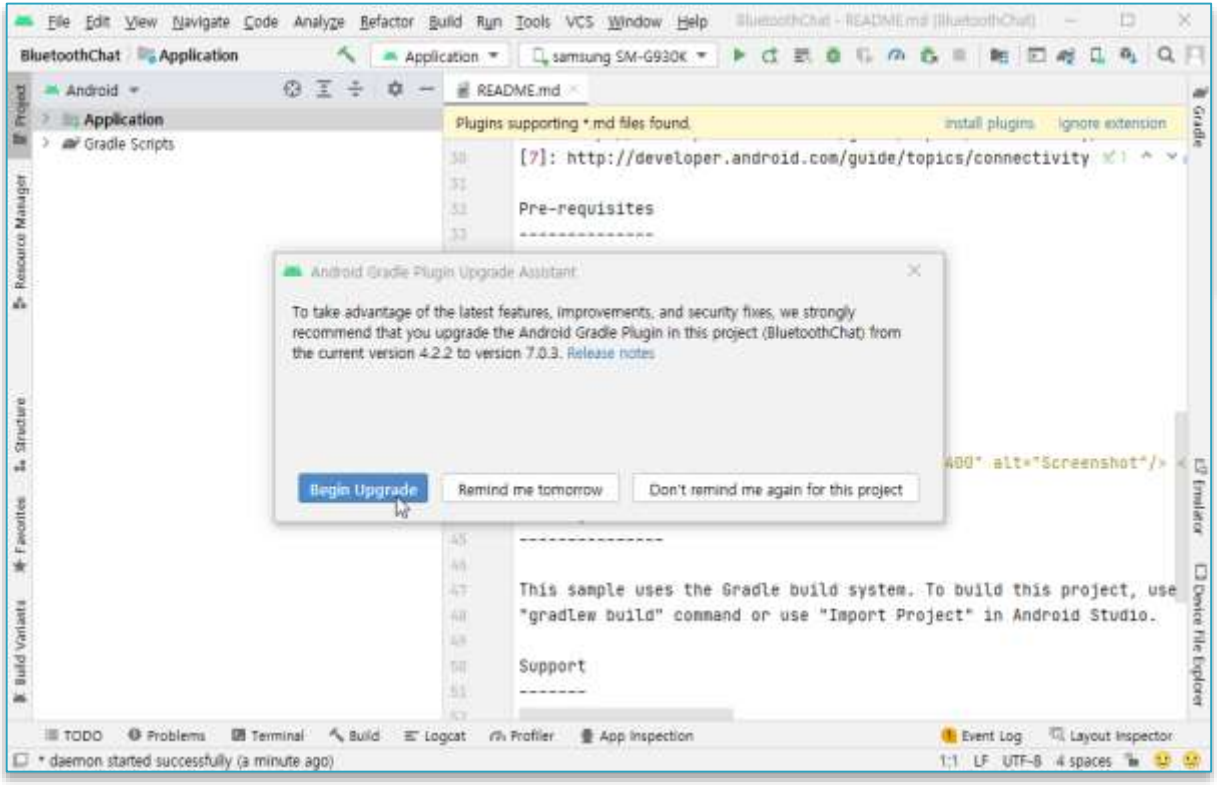


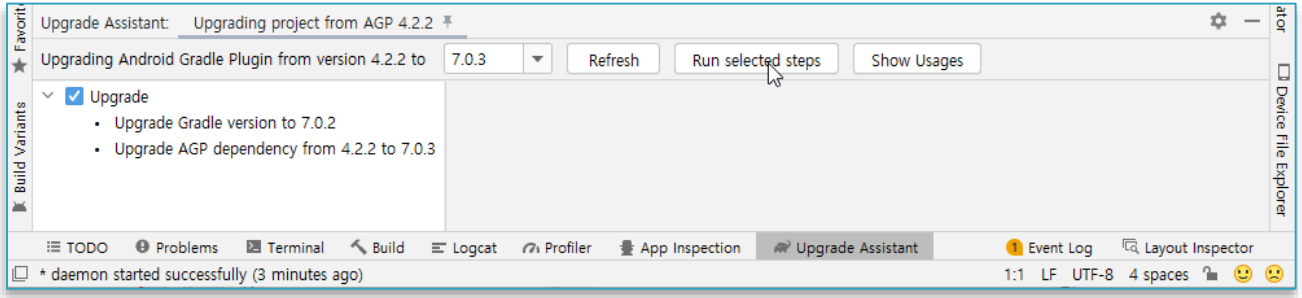
BluetoothChat (BluetoothChat 열기)



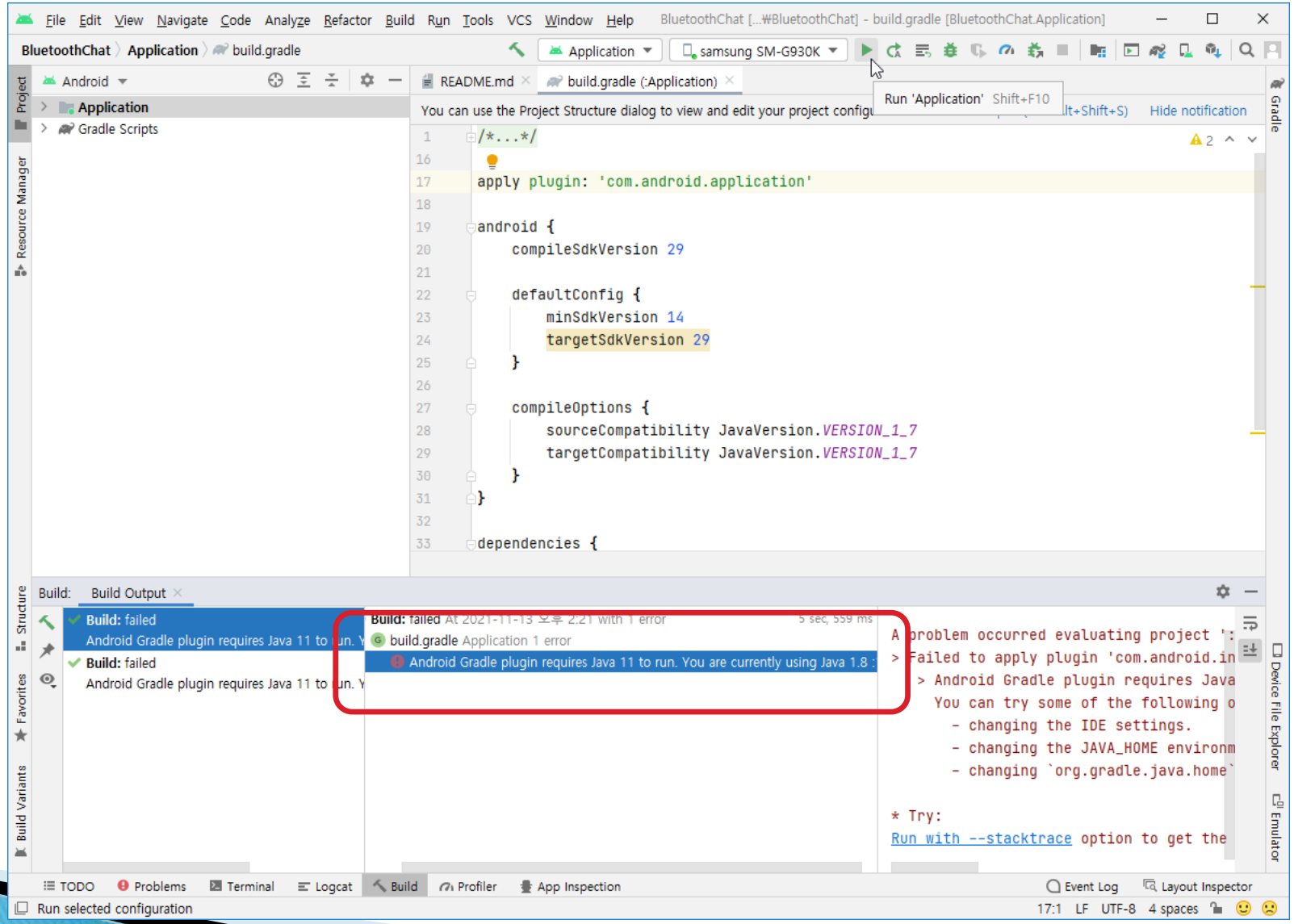


BluetoothChat (권장 Upgrade 실행)



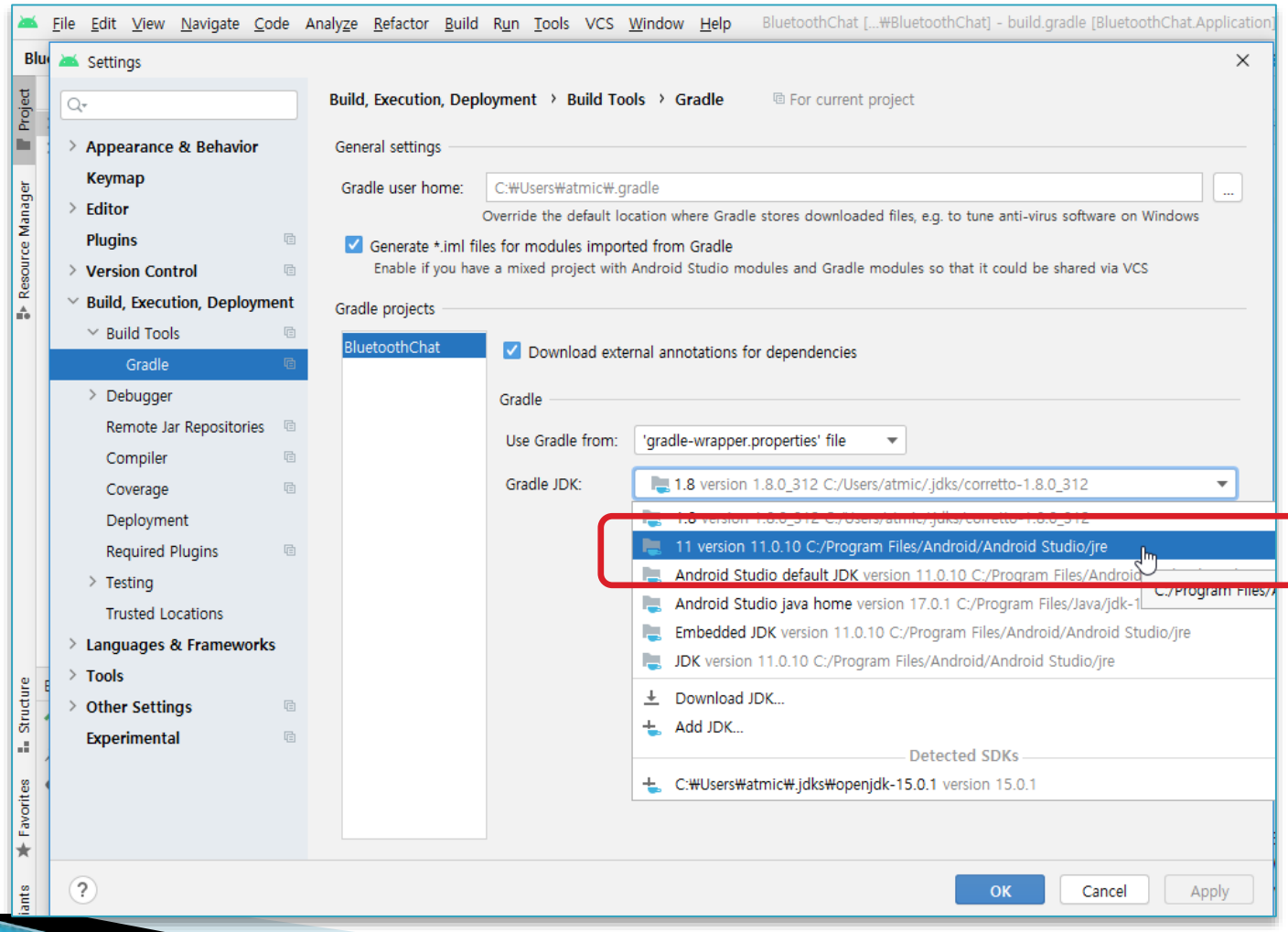


BluetoothChat (실행 누르면 Error 나는 경우)

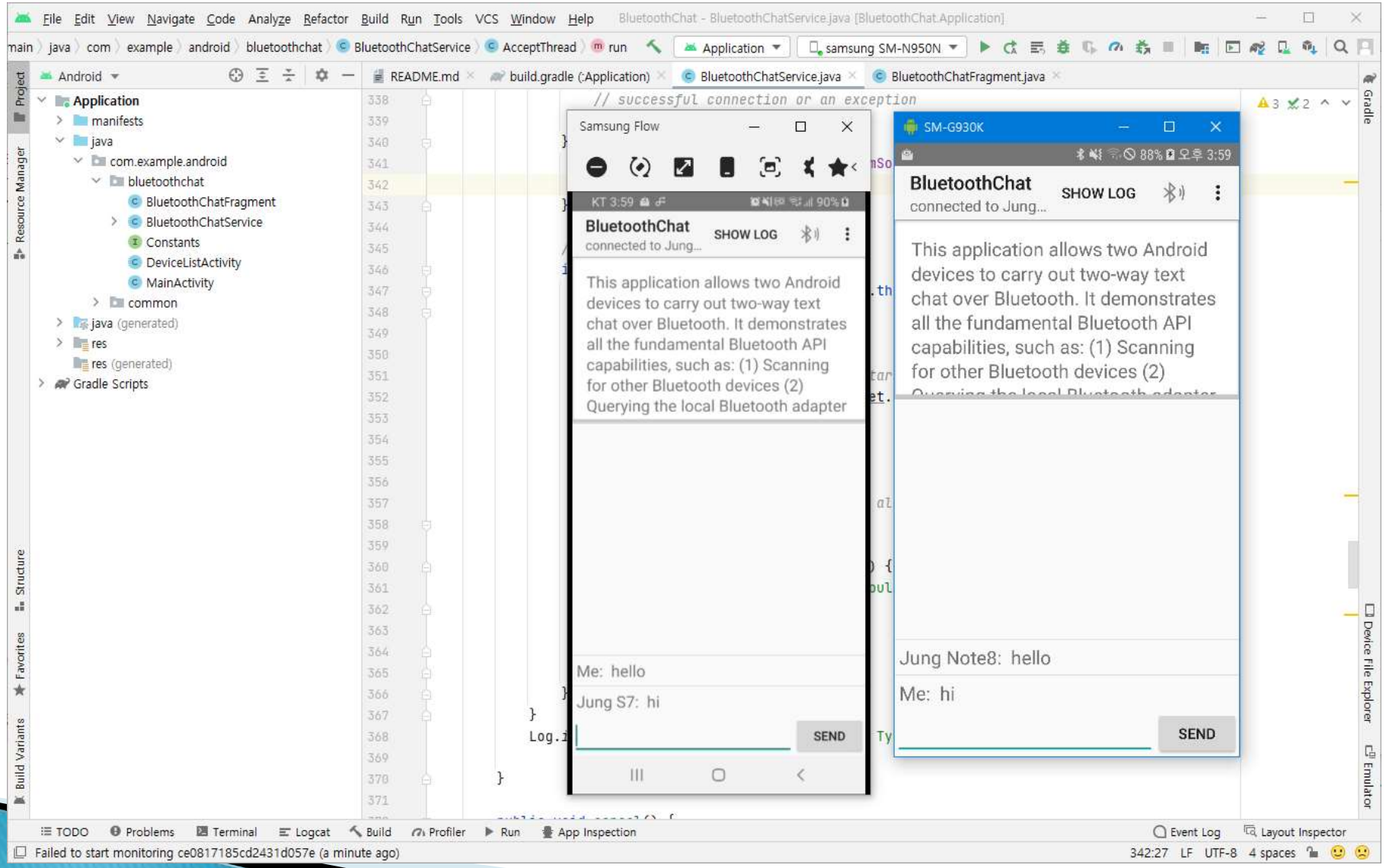


BluetoothChat (실행 누르면 Error 나는 경우)

- File > Settings 에서 Grale JDK 를 11 version을 설정



BluetoothChat (실행화면)



BluetoothChat Sample 코드 중요 부분

```
private class AcceptThread extends Thread {
    // The local server socket
    private final BluetoothServerSocket mmServerSocket;
    private String mSocketType;

    public AcceptThread(boolean secure) {
        BluetoothServerSocket tmp = null;
        mSocketType = secure ? "Secure" : "Insecure";

        // Create a new listening server socket
        try {
            if (secure) {
                tmp = mAdapter.listenUsingRfcommWithServiceRe
                        MY_UUID_SECURE);
            } else {
                tmp = mAdapter.listenUsingInsecureRfcommWithS
                        NAME_INSECURE, MY_UUID_INSECURE);
            }
        } catch (IOException e) {
            Log.e(TAG, "Socket Type: " + mSocketType + "liste
        }
        mmServerSocket = tmp;
        mState = STATE_LISTEN;
    }

    public void run() {
        Log.d(TAG, "Socket Type: " + mSocketType +
                "BEGIN mAcceptThread" + this);
        setName("AcceptThread" + mSocketType);

        BluetoothSocket socket;

        // Listen to the server socket if we're not connected
        while (mState != STATE_CONNECTED) {
            try {
                // This is a blocking call and will only return on a
                // successful connection or an exception
                socket = mmServerSocket.accept();
            } catch (IOException e) {
                Log.e(TAG, "Socket Type: " + mSocketType + "accept() failed", e);
                break;
            }
```

accept

```
private class ConnectedThread extends Thread {
    private final BluetoothSocket mmSocket;
    private final InputStream mmInStream;
    private final OutputStream mmOutStream;

    public ConnectedThread(BluetoothSocket socket, String socketType) {
        Log.d(TAG, "create ConnectedThread: " + socketType);
        mmSocket = socket;
        InputStream tmpIn = null;
        OutputStream tmpOut = null;

        // Get the BluetoothSocket input and output streams
        try {
            tmpIn = socket.getInputStream();
            tmpOut = socket.getOutputStream();
        } catch (IOException e) {
            Log.e(TAG, "temp sockets not created", e);
        }

        mmInStream = tmpIn;
        mmOutStream = tmpOut;
        mState = STATE_CONNECTED;
    }
```

socket > Stream 변환

```
public void run() {
    Log.i(TAG, "BEGIN mConnectedThread");
    byte[] buffer = new byte[1024];
    int bytes;

    // Keep listening to the InputStream while connected
    while (mState == STATE_CONNECTED) {
        try {
            // Read from the InputStream
            bytes = mmInStream.read(buffer);

            // Send the obtained bytes to the UI Activity
            mHandler.obtainMessage(Constants.MESSAGE_READ, bytes, arg2: -1, buffer)
                    .sendToTarget();
```

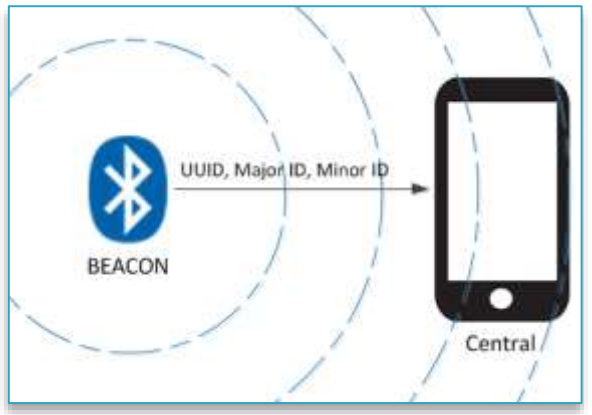
Read network > Display

```
public void write(byte[] buffer) {
    try {
        mmOutStream.write(buffer);

        // Share the sent message back to the UI Activity
        mHandler.obtainMessage(Constants.MESSAGE_WRITE, arg1: -1, arg2: -1, buffer)
                .sendToTarget();
    } catch (IOException e) {
        Log.e(TAG, "Exception during write", e);
    }
}
```

Send Data

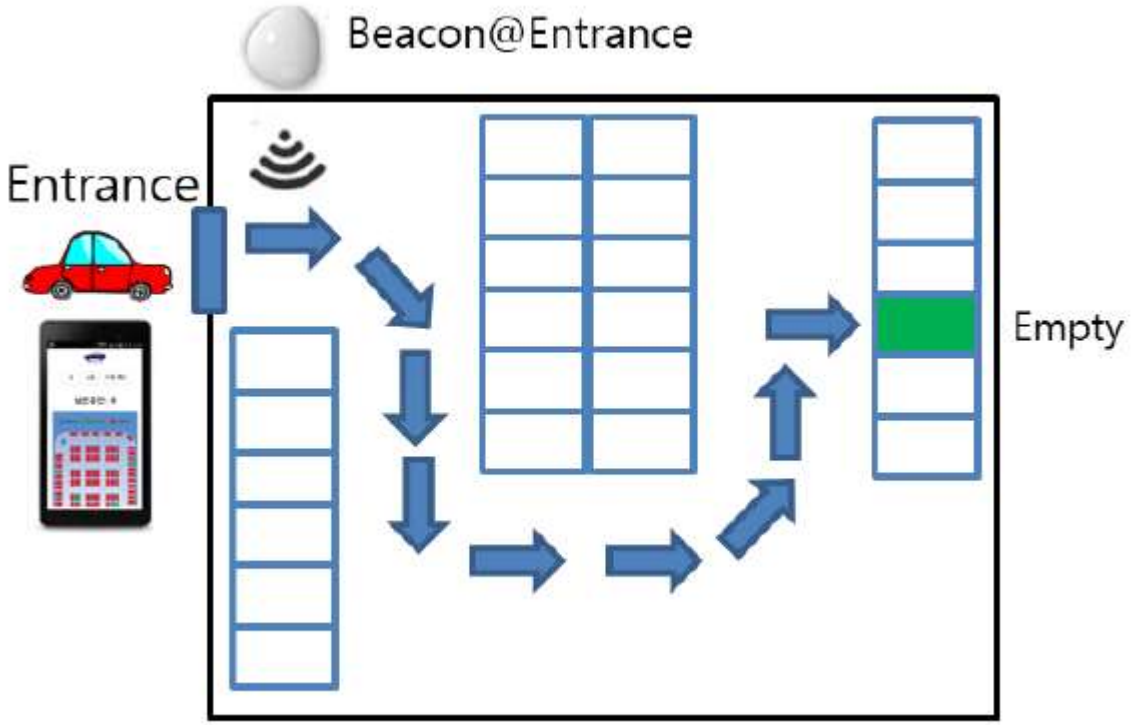
Bluetooth Beacon

- Beacon
  - 전통적인 의미에서의 비콘은 어떤 신호를 알리기 위해 주기적으로 신호를 전송하는 기기를 모두 의미
  - 등대, 봉화, 높은 건물의 신호, 비행기 신호
  - Beacon 활용
    - 사물과 상황인식, 콘텐츠 푸시, 실내위치 측위, 자동 체크인
  - Beacon 종류
    - 저주파 Beacon, LED 비콘, WiFi 비콘, Bluetooth Beacon
- Bluetooth Beacon
  - UUID, Major ID, Minor ID, 거리 계산

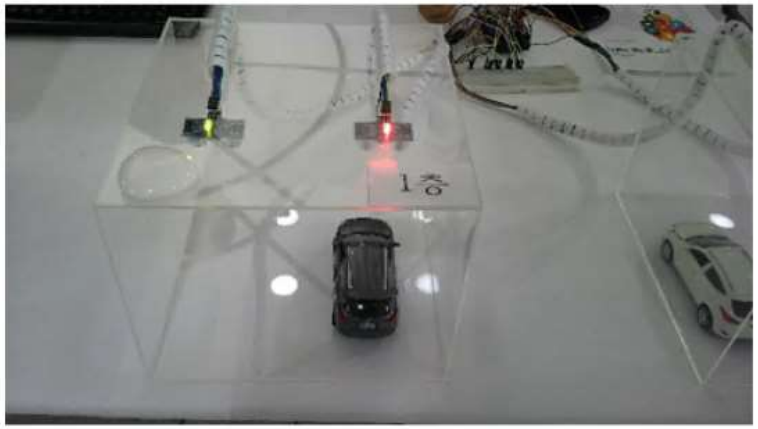


Bluetooth Beacon 활용예

- Beacon 을 이용한 주차안내

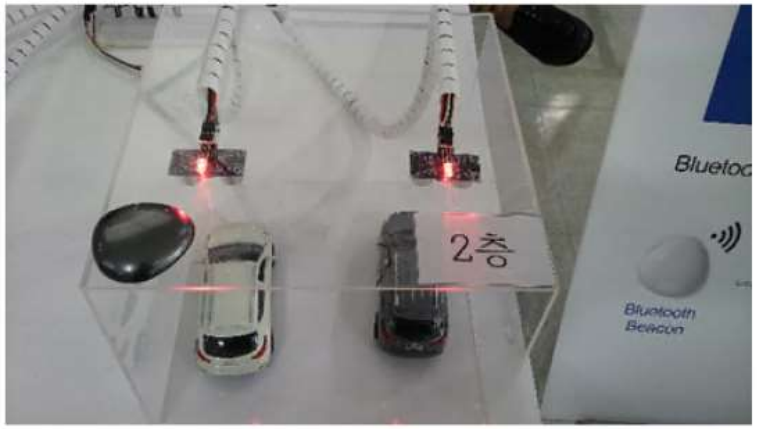


GREEN RED

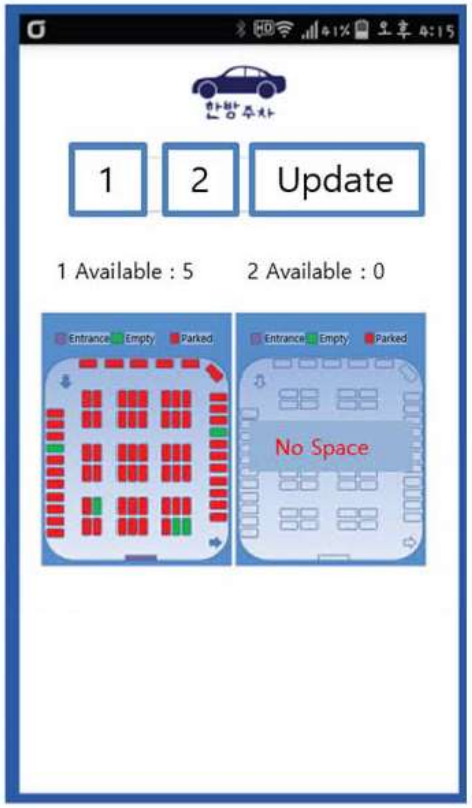


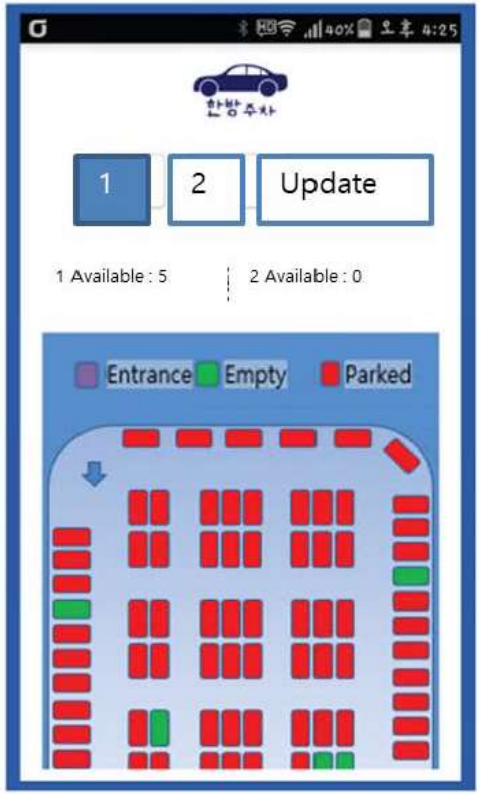
First floor

RED RED



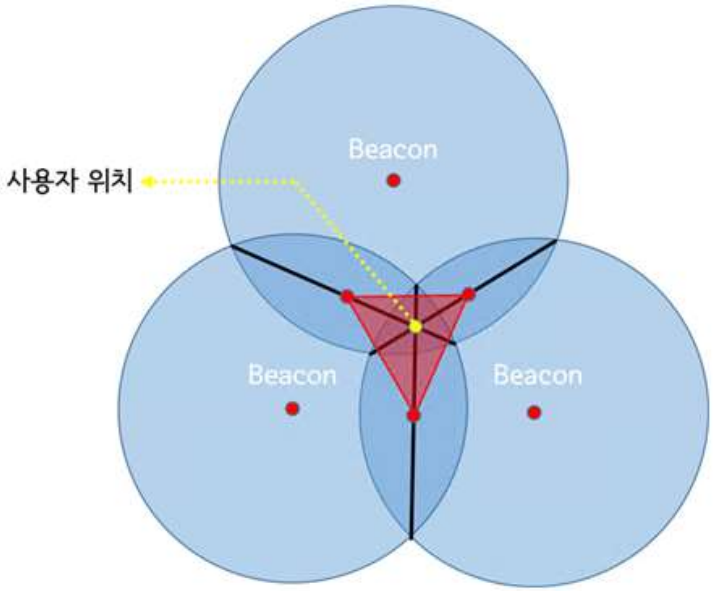
Second floor



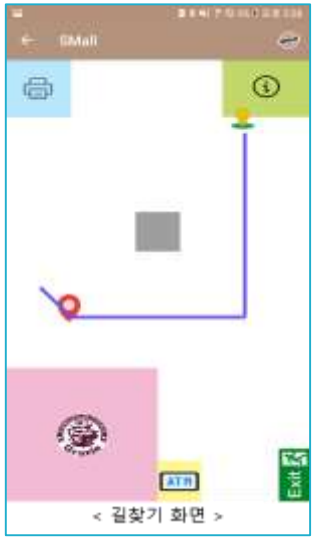


Bluetooth Beacon 활용예2

- 백화점 실내 위치 안내 시스템



< 어플 초기 화면 – 추천 페이지 >



< 길찾기 화면 >

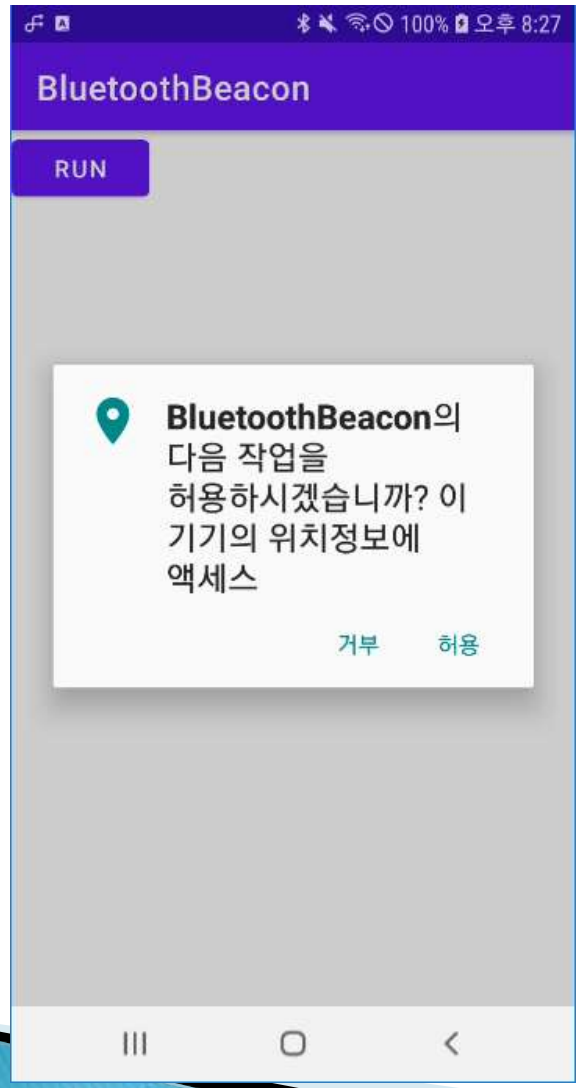
< 현재위치 화면 >

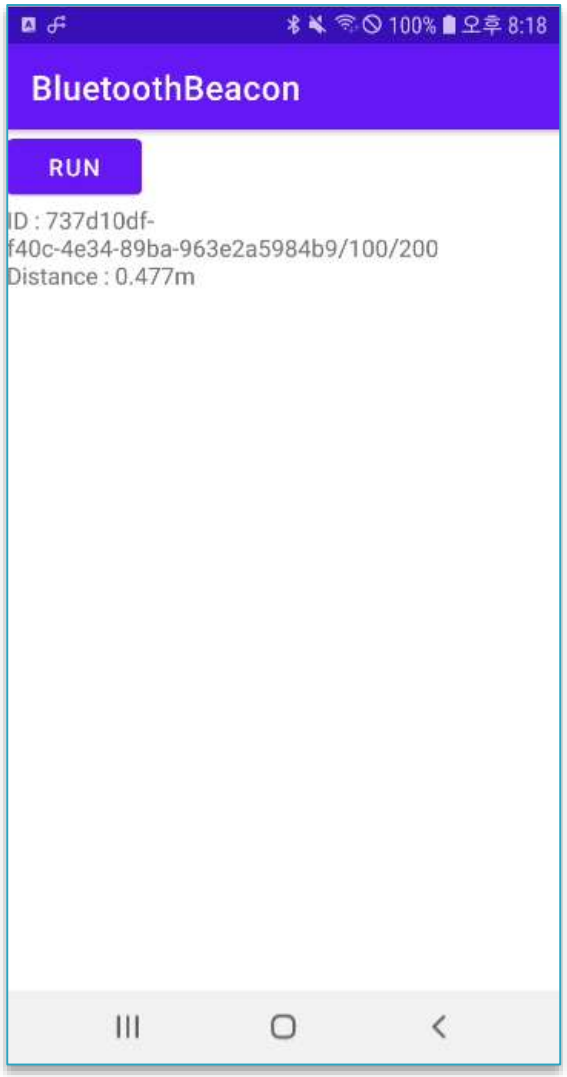
< 위치기반 팝업 광고 >

< 스탬프 획득 화면 >

< 스탬프 모으기 화면 >

BluetoothBeacon





BluetoothBeacon

- AndroidManifest.xml 추가

```
<uses-permission android:name="android.permission.BLUETOOTH"/>
<uses-permission android:name="android.permission.BLUETOOTH_ADMIN"/>
<uses-permission android:name="android.permission.ACCESS_FINE_LOCATION"/>
<uses-permission android:name="android.permission.ACCESS_COARSE_LOCATION"/>
<service
      android:foregroundServiceType="location"
       android:name=“.MainActivity” />
```

- build.gradle 추가

```
implementation ‘org.altbeacon:android-beacon-library:2+’
implementation ‘android.localbroadcastmanager:localbroadcastmanager:1.0.0’
```

- Beacon 정보 표시

```
// 비콘의 아이디와 거리를 측정하여 textView에 넣는다.
for(Beacon beacon : beaconList){
        textView.append("ID : " + beacon.getId1() + "/" + beacon.getId2()+"/" + beacon.getId3()+
        "\nDistance : " + Double.parseDouble(String.format("%.3f", beacon.getDistance())) + "m\n");
}
```

Beacon Simulator 사용

- 실제 Beacon 대신 Smartphone Beacon Simulator App 사용