Android and JavaScript

Background:

Android has a tool named **WebView** allowing users to visit websites and view other content on the web. This web content normally consists of some HTML, CSS and JavaScript that are rendered in **WebView**. Android allows developers to enable or disable running JavaScript in **WebView** for security purposes. As JavaScript is client side, Android Allows JavaScript to read and write data to and from the device. For example, we could have JavaScript display an alert or open a new activity on the Android device. This means that anyone could view the source code of a web page that has Android JavaScript, get access to the script and use this script (in another website) to access data on the device.

Today we will investigate how sending and receiving sensitive data using JavaScript is not secure.

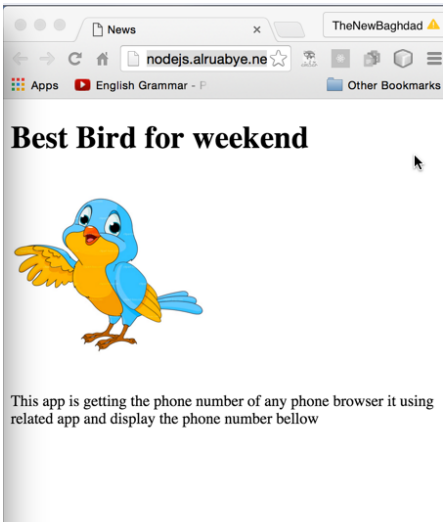
We will build an app that sends sensitive data like the user's phone number to the server, and then demonstrate how a hacker's app can read and get access to this data.

Steps to build the Webhost server

Open new file names News.html

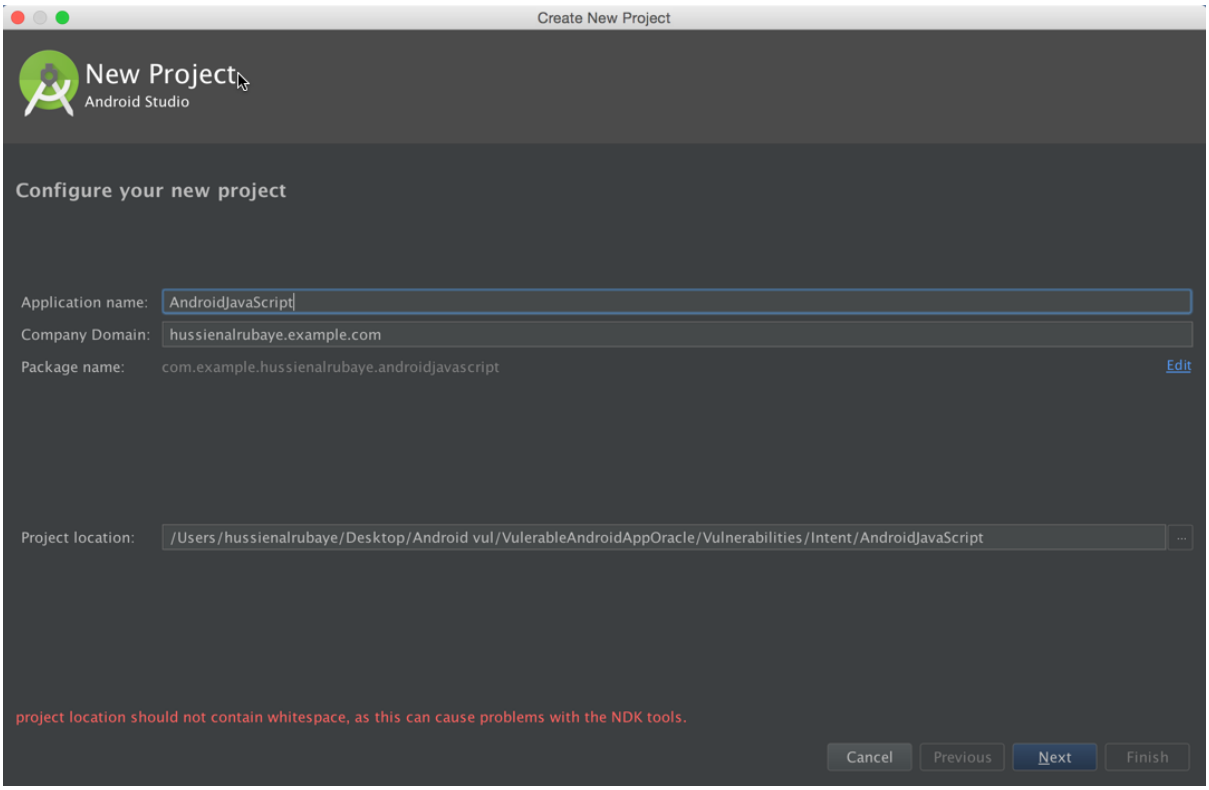
```
News.html — Website                                   UNREGISTERED
News.html    NewsAttack.html
1  <!DOCTYPE html>
2  <html lang="en">
3  <head>
4      <meta charset="UTF-8">
5      <title>News </title>
6  </head>
7  <body>
8  <h1> Best Bird for weekend</h1>
9  <img src="bird.jpg" width="200" hight="200">
10 <p>This app is getting the phone number of any phone browser it using
   related app and display the phone number bellow</p>
11
12 <br/>
13 <p id="phone"> </p>
14 <script type="text/javascript">
15 // functions call to get user phone number
16     function GetPhoneNumber() {
17  // gettting user phone number from android device
18     var PhoneNumber= Android.GetPhoneNumber();
19     document.getElementById("phone").innerHTML="Phone is "+ PhoneNumber
           ;
20     }
21     //call get phone number
22     GetPhoneNumber();
23 </script>
24
25 </body>
26 </html>
ck.html
```

The website should look like this. If you do not want to test it with a local server you can browse this url https://goo.gl/TIGDOb



Activity Instructions
Steps to build the News View App

1- Open new project with name "AndroidJavaScript", save the package name will will need next

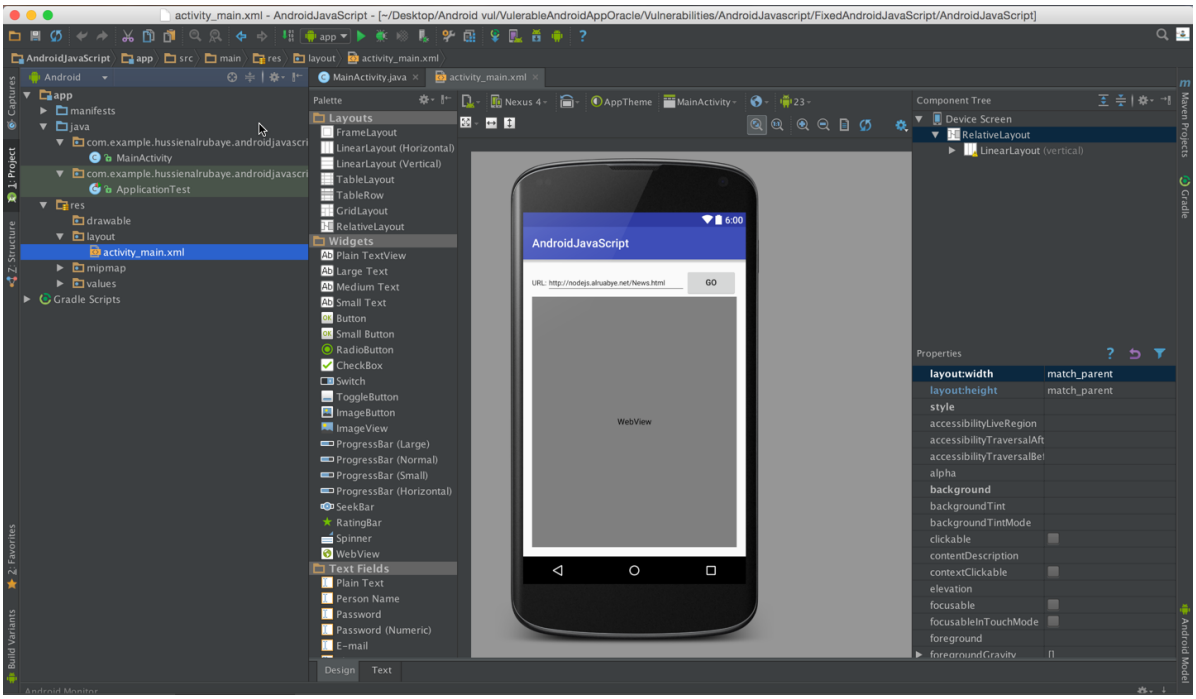


2- Paste the following code to activity_main.xml

```
<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:paddingBottom="@dimen/activity_vertical_margin"
    android:paddingLeft="@dimen/activity_horizontal_margin"
    android:paddingRight="@dimen/activity_horizontal_margin"
    android:paddingTop="@dimen/activity_vertical_margin"
    tools:context=".MainActivity">

    <LinearLayout
        android:orientation="vertical"
        android:layout_width="match_parent"
        android:layout_height="match_parent">

        <LinearLayout
            android:layout_width="match_parent"
            android:layout_height="wrap_content"
            android:orientation="horizontal">

            <TextView
                android:id="@+id/textView"
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                android:layout_weight="0"
                android:text="URL:"
                android:textAppearance="?android:attr/textAppearanceLarge"
                android:textSize="12dp" />

            <EditText
                android:id="@+id/etURL"
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                android:layout_weight="1"
                android:text="https://goo.gl/TIGDOb"
                android:textSize="12dp" />

            <Button
                android:id="@+id/buGo"
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                android:layout_weight="0"
                android:text="Go" />

        </LinearLayout>

        <LinearLayout
            android:layout_width="match_parent"
            android:layout_height="match_parent"
            android:orientation="horizontal">

            <WebView
                android:id="@+id/wvURL"
                android:layout_width="match_parent"
                android:layout_height="match_parent"
```

```
                    android:layout_alignParentLeft="true"
                    android:layout_alignParentStart="true"
                    android:layout_alignParentTop="true"
                    android:layout_weight="0" />
            </LinearLayout>

        </LinearLayout>
    </RelativeLayout>
```

The result should look like this



3- Add permission in AndroidManifest.xml files to access to network and user phone number

```
<uses-permission android:name="android.permission.INTERNET" />
<uses-permission android:name="android.permission.READ_PHONE_STATE"/>
```

4- The code will be like this code

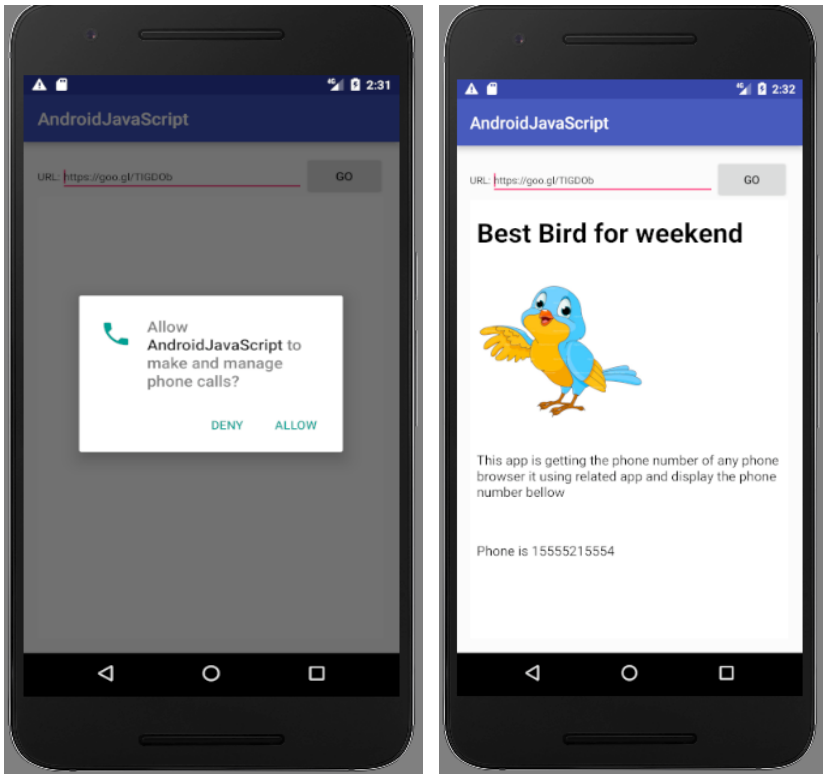
```
        public class MainActivity extends AppCompatActivity {

            EditText etURL; //navigation url
            WebView browser; // web browser

            @Override
            protected void onCreate(Bundle savedInstanceState) {
```

```
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);

        etURL = (EditText) findViewById(R.id.etURL);
        browser = (WebView) findViewById(R.id.wvURL);

        //Enable Javascript
        browser.getSettings().setJavaScriptEnabled(true);

        //Inject WebAppInterface methods into Web page by having
Interface name 'Android'
        browser.addJavascriptInterface(new WebAppInterface(),
"Android");

        browser.setWebViewClient(new WebViewClient() {

            @Override
            public boolean shouldOverrideUrlLoading(WebView view,
String url) {
                view.loadUrl(url);
                return true;
            }

        });

        // button that click to go to url
        Button buClick = (Button) findViewById(R.id.buGo);

        //  event to navigate to website
        buClick.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                //check if the API>=23 to display runtime request
permission
                if ((int) Build.VERSION.SDK_INT >= 23) {

                    // check if this permission is not grated yet
                    if
(ActivityCompat.checkSelfPermission(getApplicationContext(),
Manifest.permission.READ_PHONE_STATE) !=
                            PackageManager.PERMISSION_GRANTED) {

                        //shouldShowRequestPermissionRationale(). This
method returns true
                        // if the app has requested this permission
previously and the user denied the request.
                        if
(!shouldShowRequestPermissionRationale(Manifest.permission.READ_PHONE_
STATE)) {

                            // display request permission
                            requestPermissions(new
String[]{Manifest.permission.READ_PHONE_STATE},
                                    REQUEST_CODE_ASK_PERMISSIONS);
                            return;

                        }
```

```
                            return;
                        }
                    }

                    //load the url that written in edittext to the webview
                    LoadURL();
                }
            });
        }

        //Class to be injected in Web page
        public class WebAppInterface {

            //This method return user phone number to the javascript calls
    from website
            @JavascriptInterface   // must be added for API 17 or higher
            public String GetPhoneNumber() {
                return GetUserPhoneNumber();// "585-444-3234";
            }

        }

        /* this method is getting
        user phone number from his device
        */
        String GetUserPhoneNumber() {
            TelephonyManager tMgr = (TelephonyManager)
    getSystemService(Context.TELEPHONY_SERVICE);
            String mPhoneNumber = tMgr.getLine1Number();
            return mPhoneNumber;
        }

        void LoadURL() {

            //load the url that written in edittext to the webview
            browser.loadUrl(etURL.getText().toString());
        }

        //get access to mailbox
        final private int REQUEST_CODE_ASK_PERMISSIONS = 123;

        //request permsion result
        @Override
        public void onRequestPermissionsResult(int requestCode, String[]
    permissions, int[] grantResults) {
            switch (requestCode) {

                case REQUEST_CODE_ASK_PERMISSIONS:

                    if (grantResults[0] ==
    PackageManager.PERMISSION_GRANTED) {

                        // load the url data
                        LoadURL();

                    } else {
                        // Permission Denied
```

```
                        }
                        break;
                    default:
                        super.onRequestPermissionsResult(requestCode,
permissions, grantResults);
                }
            }
        }
```

View the page content



Steps to build the hacker app: Another website can embed the same permissions included in your website's script to gain access to user's data on the device.

1- A hacker could inspect your website's code and see that you are using Android function in your script

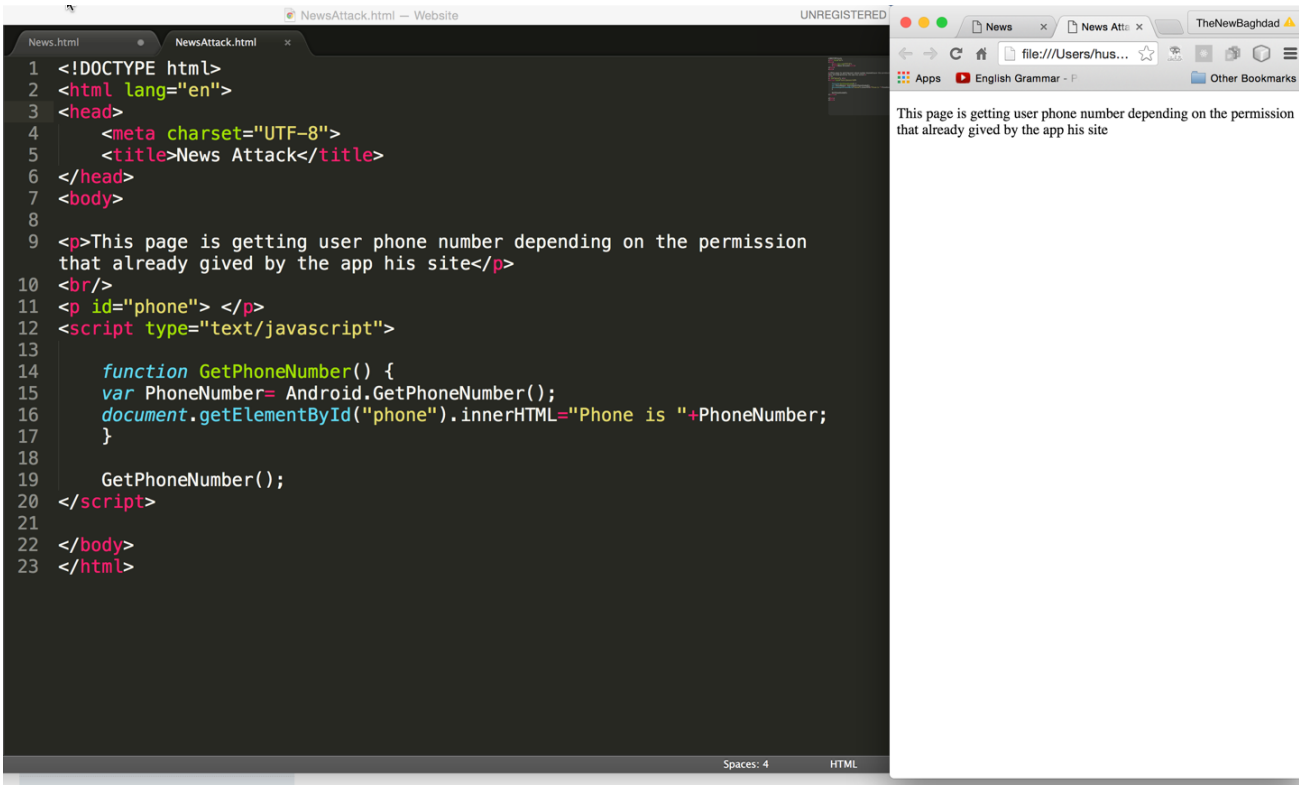
Best Bird for weekend

This app is getting the phone number of any phone browser it using related app and display the phone number bellow

Elements Console Sources Network Performance Memory Application Security Audits AdBlock

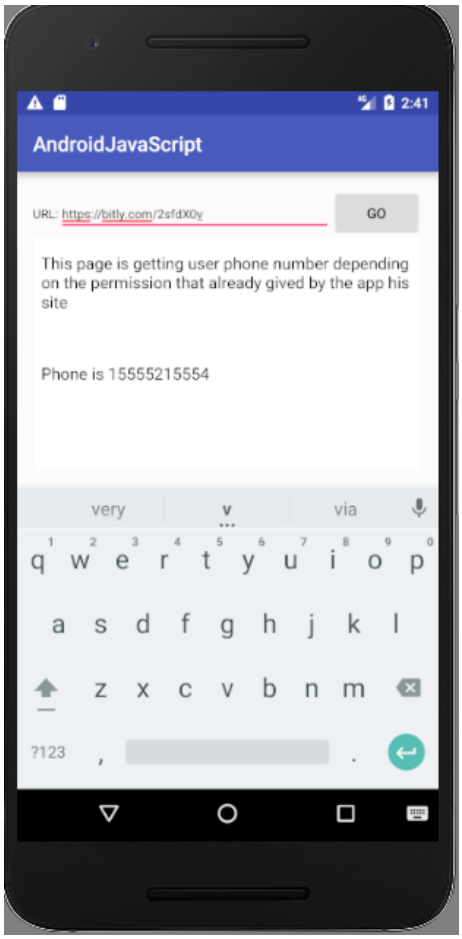
```
<!DOCTYPE html>
<html lang="en">
▶#shadow-root (open)
▶<head>…</head>
▼<body> == $0
  <h1> Best Bird for weekend</h1>
  <img src="bird.jpg" width="200" hight="200">
▶<p>…</p>
  <br>
  <p id="phone"> </p>
▼<script type="text/javascript">
   // functions call to get user phone number
       function GetPhoneNumber() {
    // gettting user phone number from android device
       var PhoneNumber= Android.GetPhoneNumber();
       document.getElementById("phone").innerHTML="Phone is "+ PhoneNumber;
       }
       //call get phone number
       GetPhoneNumber();
  </script>
```

2- Hacker will insert same JavaScript in his website. When your users view this website, he will get user's personal information through your app's permissions



Example of the user view hacker website, and the hacker get his phone number

If you do not want to run local server you can use this url https://bitly.com/2sfdX0v as the hacker url


2:41
AndroidJavaScript
URL: https://bitly.com/2sfdX0y
GO
This page is getting user phone number depending on the permission that already gived by the app his site
Phone is 15555215554
very
via

Fix This Problem

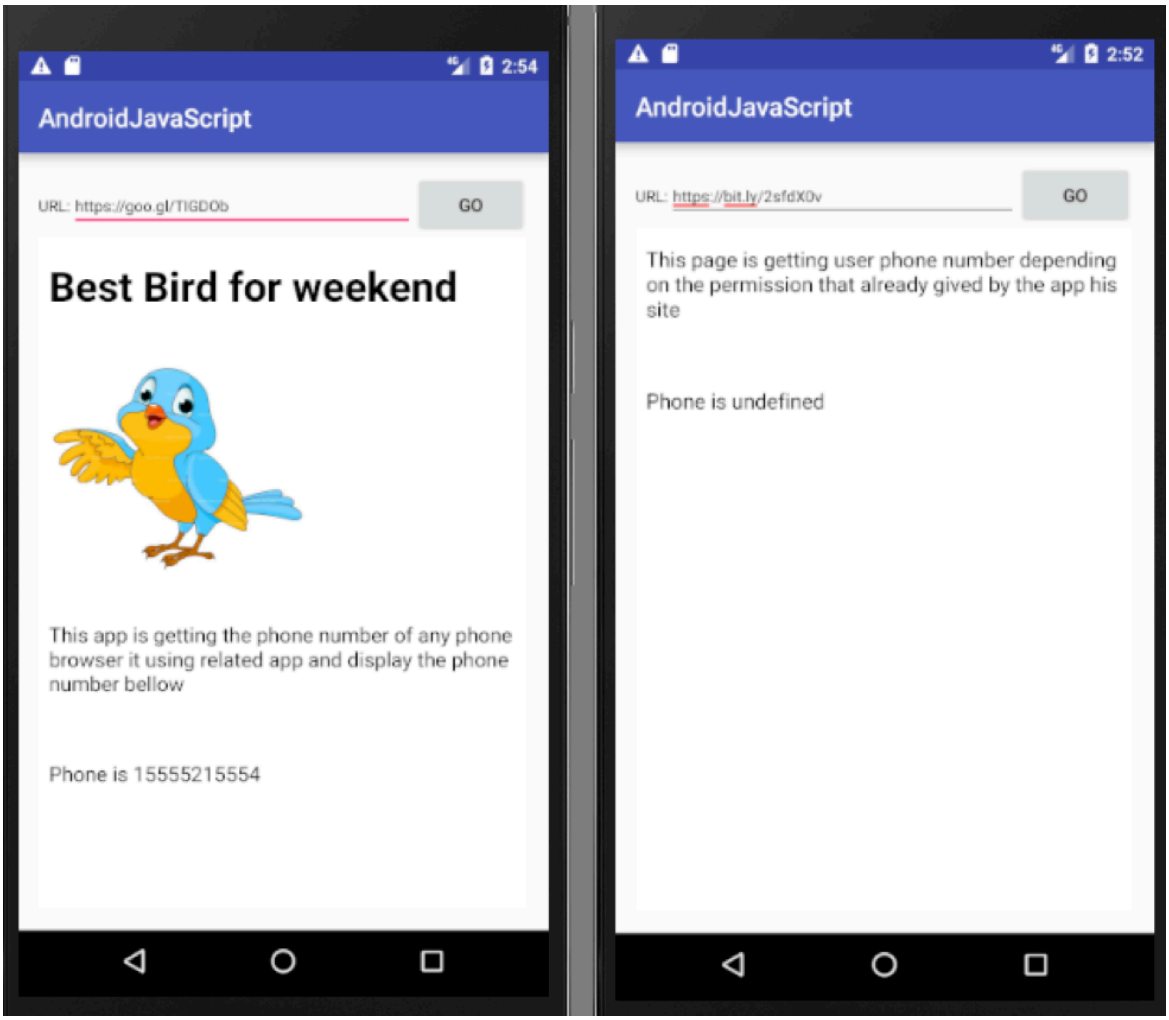
To fix this problem, we must send sensitive data only to the websites that we wish to authorize to access this data like our websites, or we could enable JavaScript to be run only in our website. The code below allows for sending sensitive data only to the websites that we authorize. Change the hotingURL if you are using a local server.

```
public class MainActivity extends AppCompatActivity {

    EditText etURL; //navigation url
    WebView browser; // web browser

    // host name
    String HostingURL = "https://goo.gl/TIGDOb";

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);

        etURL = (EditText) findViewById(R.id.etURL);
        browser = (WebView) findViewById(R.id.wvURL);

        //Enable Javascript
        browser.getSettings().setJavaScriptEnabled(true);

        //Inject WebAppInterface methods into Web page by having Interface name
'Android'
        browser.addJavascriptInterface(new WebAppInterface(), "Android");

        browser.setWebViewClient(new WebViewClient() {

            @Override
            public boolean shouldOverrideUrlLoading(WebView view, String url) {
                view.loadUrl(url);
                return true;
            }

        });

        // button that click to go to url
        Button buClick = (Button) findViewById(R.id.buGo);

        //  event to navigate to website
        buClick.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                //check if the API>=23 to display runtime request permission
                if ((int) Build.VERSION.SDK_INT >= 23) {

                    // check if this permission is not grated yet
                    if (ActivityCompat.checkSelfPermission(getApplicationContext(),
Manifest.permission.READ_PHONE_STATE) !=
```

```
                                PackageManager.PERMISSION_GRANTED) {

                            //shouldShowRequestPermissionRationale(). This method
returns true
                            // if the app has requested this permission previously and
the user denied the request.
                            if
(!shouldShowRequestPermissionRationale(Manifest.permission.READ_PHONE_STATE)) {

                                // display request permission
                                requestPermissions(new
String[]{Manifest.permission.READ_PHONE_STATE},
                                        REQUEST_CODE_ASK_PERMISSIONS);
                                return;

                            }

                            return;
                        }
                    }

                    //load the url that written in edittext to the webview
                    LoadURL();
                }
            });
        }

        //Class to be injected in Web page
        public class WebAppInterface {

            //This method return user phone number to the javascript calls from website
            @JavascriptInterface   // must be added for API 17 or higher
            public String GetPhoneNumber() {

                // only send the phone to authorize website
                if(etURL.getText().toString().indexOf(HostingURL)==0)
                    return GetUserPhoneNumber();

                else
                    return  null;

            }

        }

        /* this method is getting
        user phone number from his device
        */
        String GetUserPhoneNumber() {
            TelephonyManager tMgr = (TelephonyManager)
getSystemService(Context.TELEPHONY_SERVICE);
            String mPhoneNumber = tMgr.getLine1Number();
            return mPhoneNumber;
        }

        void LoadURL() {

            //load the url that written in edittext to the webview
```

```
        browser.loadUrl(etURL.getText().toString());
    }

    //get access to mailbox
    final private int REQUEST_CODE_ASK_PERMISSIONS = 123;

    //request permsion result
    @Override
    public void onRequestPermissionsResult(int requestCode, String[] permissions,
int[] grantResults) {
        switch (requestCode) {

            case REQUEST_CODE_ASK_PERMISSIONS:

                if (grantResults[0] == PackageManager.PERMISSION_GRANTED) {

                    // load the url data
                    LoadURL();

                } else {
                    // Permission Denied

                }
                break;
            default:
                super.onRequestPermissionsResult(requestCode, permissions,
grantResults);
        }
    }
}
```

As we see our website could access to phone number while hacker website cannot.


2:54
AndroidJavaScript
URL: https://goo.gl/TIGDOb
GO
Best Bird for weekend
This app is getting the phone number of any phone browser it using related app and display the phone number bellow
Phone is 15555215554
2:52
AndroidJavaScript
URL: https://bit.ly/2sfdX0v
GO
This page is getting user phone number depending on the permission that already gived by the app his site
Phone is undefined