

# **Raytheon**

## **Blackbird Technologies**

**20150904-275-Cisco**  
**Rombertik**

**For**  
**SIRIUS Task Order PIQUE**

**Submitted to:**  
**U.S. Government**

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## 1.0 (U) Analysis Summary

(S//NF) This report is based on a blog post from Cisco on a piece of malware known as Rombertik. Rombertik uses heavy obfuscation to prevent static and dynamic analysis. If Rombertik detects it is being analyzed it will proceed to destroy the host MBR and if that isn't possible it will encrypt all documents in C:\Documents and Settings\Administrator.

(S//NF) As reported in the SentinelOne blog (Pique report 20150904-275-SentinelOne-Rombertik), the Cisco blog report states that 97% of the packed malware is “junk” code used to make static and dynamic code analysis difficult. Rombernik is distributed via spam and spear phishing email campaigns.

(S//NF) Upon execution, Rombertik stalls and then will run through a set of checks to determine if it's running in an analysis environment/sandbox. Once these checks are complete the malware proceeds to decrypt and install itself. Once installed, it will launch a second copy of itself. Before launching its credential stealing routines, it does one last check of memory to see if it's being debugged or running in a sandbox. If it detects it's being debugged or running in a sandbox, it acts destructively by overwriting the MBR or encrypting the Administrator files.

(S//NF) Rombertik uses a couple of interesting anti-sandbox/anti-analysis techniques. Many anti-sandbox methods involve relatively long sleep() cycles to wait-out the sandbox. Instead of using sleep(), Rombertik accomplishes the same effect but without calling sleep(). Instead, Rombertik writes a byte of random data to memory 960 Million times. This technique has several advantages in defeating sandboxes, it accomplishes a sleep() delay tactic without calling sleep(). Sandboxes won't be able to immediately determine the application is intentionally stalling because it isn't sleep()ing. The other advantage is the repetitive writing will flood application tracing tools. We recommend this anti-sandbox technique be developed as a PoC.

(S//NF) After stalling via random byte memory writing, Rombertik checks to see if any analysis tools have modified code in the ZwGetWriteWatch() API. It does this by calling ZwGetWriteWatch() with invalid arguments and if a specific return value isn't seen Rombernik terminates. This is an effective anti-analysis technique because sandboxes suppress errors returned from API calls. We recommend this anti-sandbox technique be developed as a PoC.

(S//NF) After the sandbox check is completed, Rombertik calls OutputDebugString() 335,000 times as an anti-debugging technique. Finally, the malware checks the executing process for strings indicating analysis platforms, strings such as “malwar”, “sampl”, “viru”, and “sandb.”

(S//NF) If all the anti-analysis checks pass, Rombertik completes the installation and proceeds to hook browser APIs that handle plain-text data in order to harvest website username/password combinations.

(S//NF) We recommend the following anti-analysis techniques be developed as PoCs:

- Rombertik's method for stalling to wait-out sandboxes by writing a random byte of data to memory 960 Million times.
- Rombertik's method for checking anti-analysis by checking to see if ZwGetWriteWatch() returns the expected value.

## **2.0 (U) Description of the Technique**

(S//NF) The techniques recommended for PoC development are anti-analysis techniques. One is an improved method for waiting-out a sandbox using memory write routine 960 Million times instead of using sleep(). The other PoC recommendation is an anti-analysis technique that checks for a specific return value from ZwGetWriteWatch().

## **3.0 (U) Identification of Affected Applications**

(U) Windows and a variety (un-named sandbox products).

## **4.0 (U) Related Techniques**

(S//NF) Anti-analysis and anti-sandboxing.

## **5.0 (U) Configurable Parameters**

(U) Varied.

## **6.0 (U) Exploitation Method and Vectors**

(S//NF) No exploitation methods are discussed in this blog post. The attack vector mentioned is spam and spear phishing email campaigns.

## **7.0 (U) Caveats**

(U) None.

## **8.0 (U) Risks**

(S//NF) The risk associated with the development of both recommended PoCs is deemed to be low due to technical complexity. We estimate that each PoC will take one FTE week each to complete for a total of two FTE weeks.

## **9.0 (U) Recommendations**

(S//NF) We recommend the following anti-analysis techniques be developed as PoCs:

- Rombertik's method for stalling to wait-out sandboxes by writing a random byte of data to memory 960 Million times.
- Rombertik's method for checking anti-analysis by checking to see if ZwGetWriteWatch() returns the expected value.