UC20-SL2000-OLAC-EC and similar

2638920000 (and others)

Application Note for initialization of SRAM

Information on handling the SRAM in u-control studio controller with HW revision 1.23

AN0069v01-UC20

Revision history

Version	Date	Change log	Author
00	2021-04	Draft	w011698
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Content

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2. Abstract

We got information about problems with the new SRAM feature in u-control studio.

This application note describes the necessary steps for…
- correct initialization of the SRAM after the "Create Target" process
- problems due to fragmentation of the available memory
- updating of the installed bootloader version from 01.02 to 01.09.

in u-create studio V1.20.2 .

3. Requirements

Hardware: UC20-SL2000-OLAC-EC w/o CAN interface - HW rev. 1.23
Software: u-create studio V1.20.2 including patch 1 to 4

It is recommended to have/create a ssh keypair in order to access the controller via ssh!

4. Initialization of SRAM after „Create Target" process

4.1. Issue

If data is already stored in SRAM on a controller (e.g. through an older PLC project),
this leads to a problem when creating a new target with retain data.

In this case the SRAM is not re-initialized and CODESYS tries to write the retain data of the new application into the remaining memory area. Since the memory area is usually not sufficient, an error message appears:
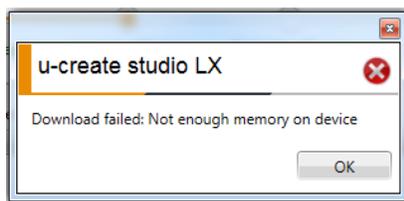

No login or download is possible at this point (regardless of whether with / without retain variables).

4.2. Workaround

After the "Create Target" process, the controller must be updated with the SD card.
Then restart the controller and wait until the Device is in the "Run" state again.

Now the Device must be set to "Stop" via the menu item "Device Manipulation".
To do this, the "Stop Device" entry must be selected (see the following figure).
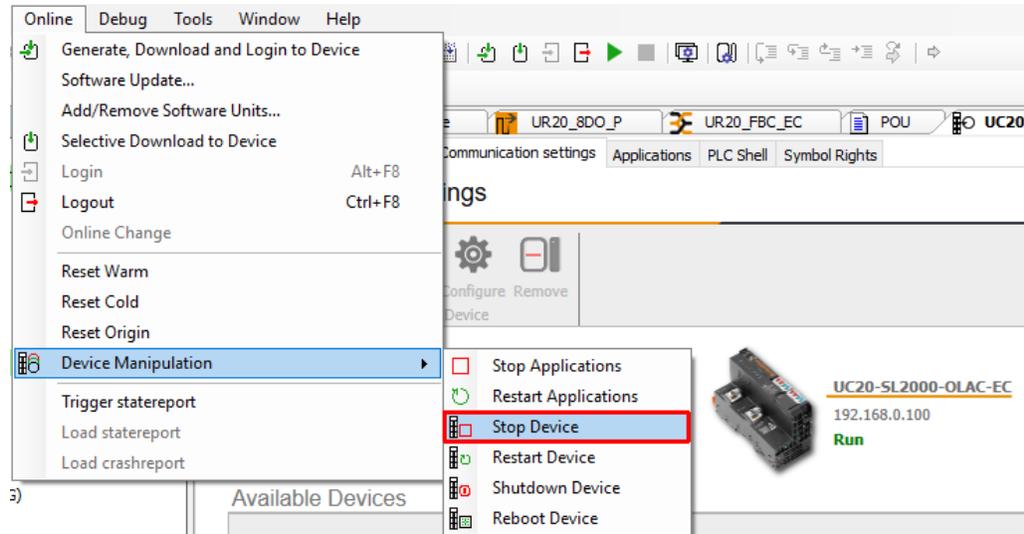
If the Device has changed to state "OsReady",
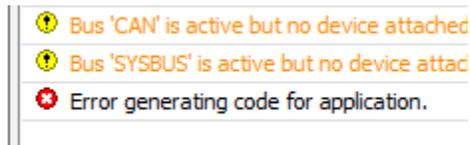the "Clear Retain Data" function is available.
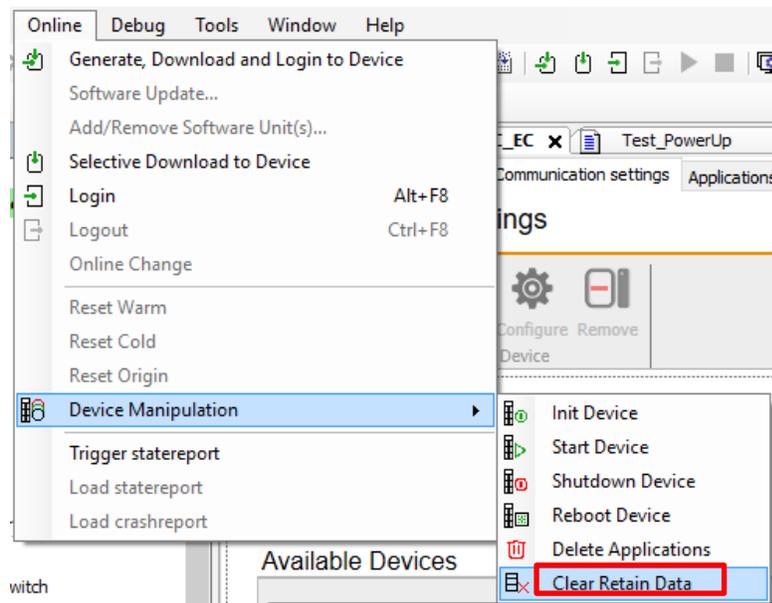
Explicit deletion releases the SRAM and re-initializes it.
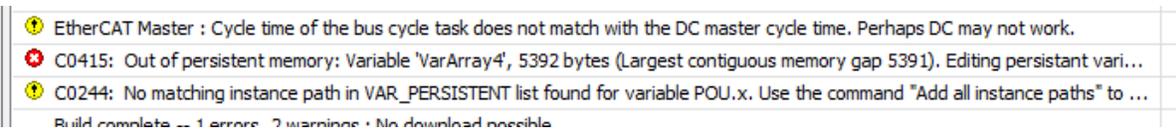The SRAM is then properly available. The download of a new project including retain data is now possible again.

5. Fragmentation of the available memory

5.1. Issue

If too much retain data is created, the following error message is reproducibly displayed:

If you check the error under the "Build" item, you will find detailed information:

Additional information from the tooltip:

C0415: Out of persistent memory: Variable 'VarArray4', 5392 bytes (Largest contiguous memory gap 5391). Editing persistant variable lists may produce fragmented memory. Perform "Declarations, Reorder list and clear gaps" to compact persistent variable lists.

This behavior is as expected. Unfortunately, it is the case that CODESYS now regards the memory as full and does not allow any further download of a project with retain data, even if the retain data of the project no longer exceeds the actual size of the SRAM.

Example 1:   create a project with following persistent variables:

> *VAR_GLOBAL PERSISTENT RETAIN*
> > *TEST: ARRAY[0..64999] OF BYTE;*
> > *TEST0:   ARRAY[0..4999] OF BYTE;*
> *END_VAR*

The size of the actual SRAM is exceeded and the error message appears.
If the array TEST0 is now removed, the error message still persists.

This behavior is also caused by unfavourable fragmentation in the CODESYS.

Example 2:

First create 12000 Byte according to example 1 and perform a download.
After that do the same with 48000 Byte.
This is not a problem as we do not exceed the actual size.

However, after you have removed and re-added the 12000 Bytes array again, you will come back to the point where a download is no longer possible.
This is due to the way retain variables are handled in CODESYS. If you add retain data to an application, a new GUID is created, if you delete it, it is not deleted and the memory is not really free.

5.2. Workaround

One possibility would be to create and download a project without retain data.
The SRAM structure in CODESYS will be cleaned, because there is no retain data.

The other option is to perform a "Clean all" (see the following illustration).
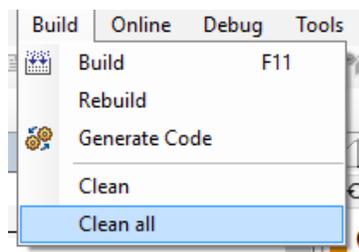
After that, the SRAM structure in CODESYS is also cleaned up and can be used.

6. Support of SRAM with Bootloader 01.02

6.1. Issue

The bootloader UC20_SL2000_BL_01.02 is included as standard in all UC20-SL2000-OLAC-EC devices produced. If such an UC20-SL2000-OLAC-EC is used, the SRAM cannot be used.
It is available and recognized as SRAM, but values that are written to the SRAM during runtime are not retained after a restart.

The reason for this is a faulty initialization of the SRAM in boot loader version 01.02 .
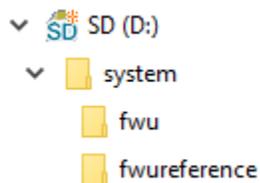
6.2. Workaround

Update the bootloader to the current version UC20_SL2000_BL_01.09.
This can be done via cli (command line interface) or SD card.

6.2.1. Update via SD card (preferred method)

You need a SD card with less or equal 32GB which has to be formatted FAT32.
Copy the extracted system folder to the SD card.

It should look similar to this:

Put the SD card in the controller and power up the device.
After a while, the RUN LED changes from static orange to flashing green.
The bootloader has been updated now.
You can now open the handle and remove the SD card.

After a restart, the SRAM is correctly initialized and available and properly stores the retain data.
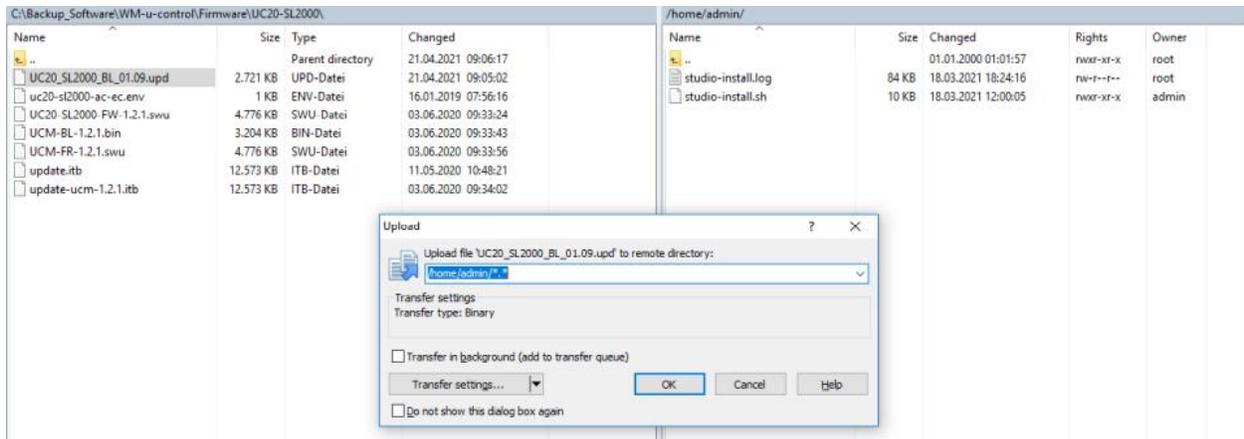
Note:
If you want to check the installed bootloader version, you will find information in the next chapter.

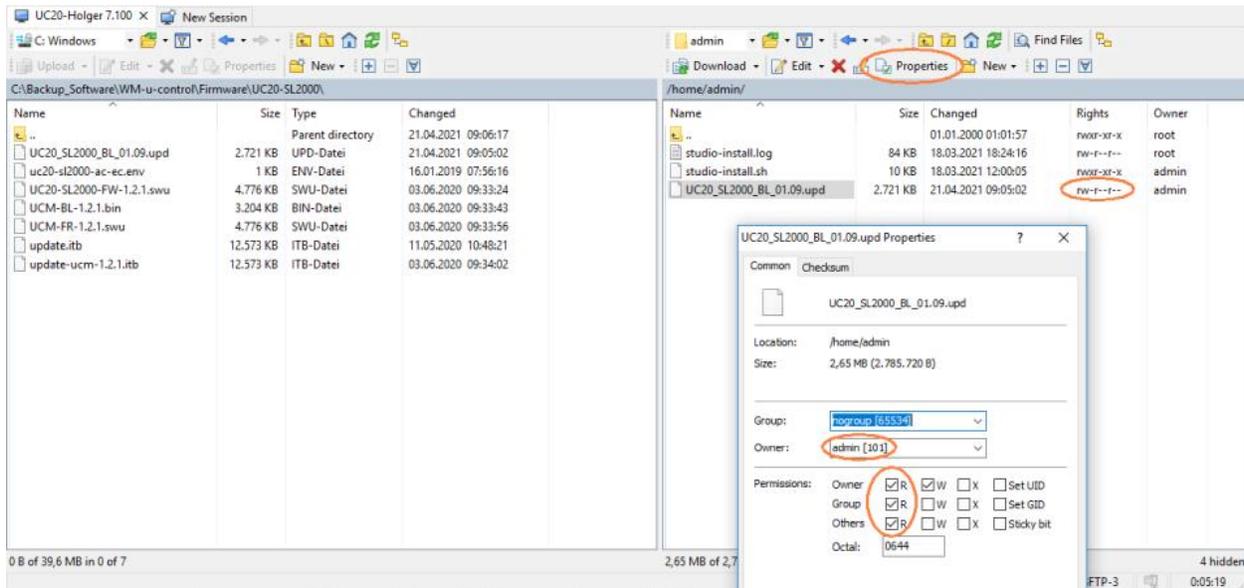### 6.2.2. Update via command line interface

The build-in command line tool "devupd" can be used for this.

The correct bootloader file .upd must be copied via SFTP to /home/admin folder on the controller
(e.g. with WinSCP).

Select the bootloader file on the controller, open the "Properties" menu and check / edit owner and permissions.

Connect to the controller via SSH (e.g. via PuTTY); you will need your corresponding private key.

Execute the following commands in order to check and update installed bootloader version:

"sudo cd /home/admin"
"sudo devupd –unit-info=BOOTLOADER"

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```
Last login: Thu Feb 14 11:16:17 2019 from 172.22.30.21
admin@UC20-SL2000-OLAC-EC:~$ sudo devupd --unit-info=BOOTLOADER
NAME=BOOTLOADER
VERSION=UC20_SL2000_BL_01.02
UPDATEABLE=true
UPDATEABLE_RT=true
DEVICEID=78
TYPEID=18
COMPATID=1
```

As you can see, Bootloader 01.02. is installed and must be updated.

"sudo devupd –update=BOOTLOADER UC20_SL2000_BL_01.09.upd –force versionstring"

```
admin@UC20-SL2000-OLAC-EC:~$ sudo devupd --update=BOOTLOADER UC20_SL2000_BL_01.0
9.upd --force versionstring
```

You should see this message:

```
Firmware update of BOOTLOADER successful
```

"sudo devupd –unit-info=BOOTLOADER"

```
admin@UC20-SL2000-OLAC-EC:~$ sudo devupd --unit-info=BOOTLOADER
NAME=BOOTLOADER
VERSION=UC20_SL2000_BL_01.09
UPDATEABLE=true
UPDATEABLE_RT=true
DEVICEID=78
TYPEID=18
COMPATID=1
admin@UC20-SL2000-OLAC-EC:~$
```

Otherwise try again.

Note:
For access to the controller via WinSCP / PuTTY you have to connect with user 'admin' and your private key. The corresponding public admin.key has to be put on the controller during the "Create Target" process.

After a restart, the SRAM is correctly initialized and available and properly stores the retain data.