Dev Cube

User Manual

Version: *1.0*

www.bouffalolab.com

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1 Dev CubeIntroduction

Dev CubeIt is a chip integration development tool provided by Bolu, which includesIoTProgram downloadMCUProgram download andRFPerformance testing has three functions. This document mainly introduces...IoT andMCUDownload the relevant configurations for the program.RFFor performance testing, please refer to the "RF Performance Testing User Manual".

Dev CubeIt provides users with the ability to download applications and supports configuring the clock.flashThe program can be encrypted and signed according to user needs, and it also has the function of burning user resource files and partition tables.

Dev CubeThe main functions are as follows:

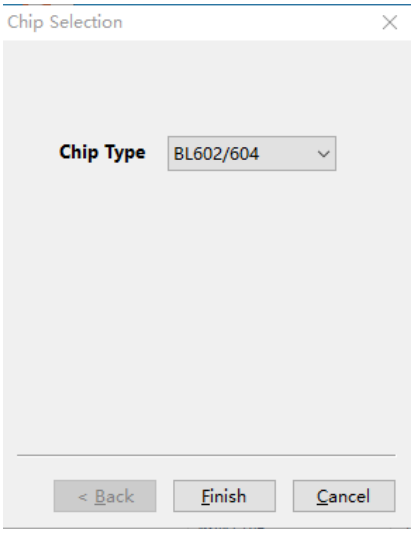
1.supportIoTApplications andMCUApplication download

2.Supports multiple modelsFlashErasing, writing, reading

3.Supports downloading various types of files.FlashAnd verify

4.Download communication interface supportUARTandJLink,Download speed is configurable

Users can Bouffalo Lab Dev CubeGet the latest version Dev CubeDouble-click the extracted folder.BLDevCube.exe,existChip SelectionSelect the corresponding chip model in the dialog box and click.FinishEnterDev CubeMain interface.

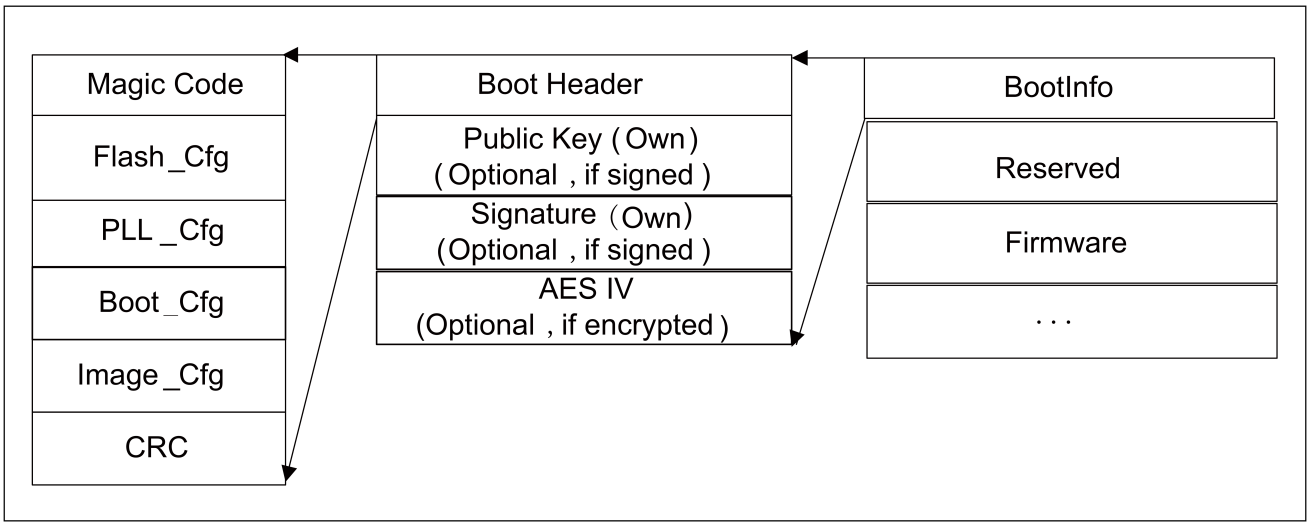


picture1.1: Dev CubeChip selection interface

2

Mirror composition

WhetherIoTProgram orMCUThe programs, their mirror images have the same structural composition, as shown in the following figure:



picture2.1:Boot image composition structure

The boot image mainly consists of two parts:

- BootInfoMainly includesBootInfoofMagic Code,FlashConfiguration information,PLLConfiguration information, boot parameters, and image configuration information, etc.
- FirmwareFirmware, i.e., application code

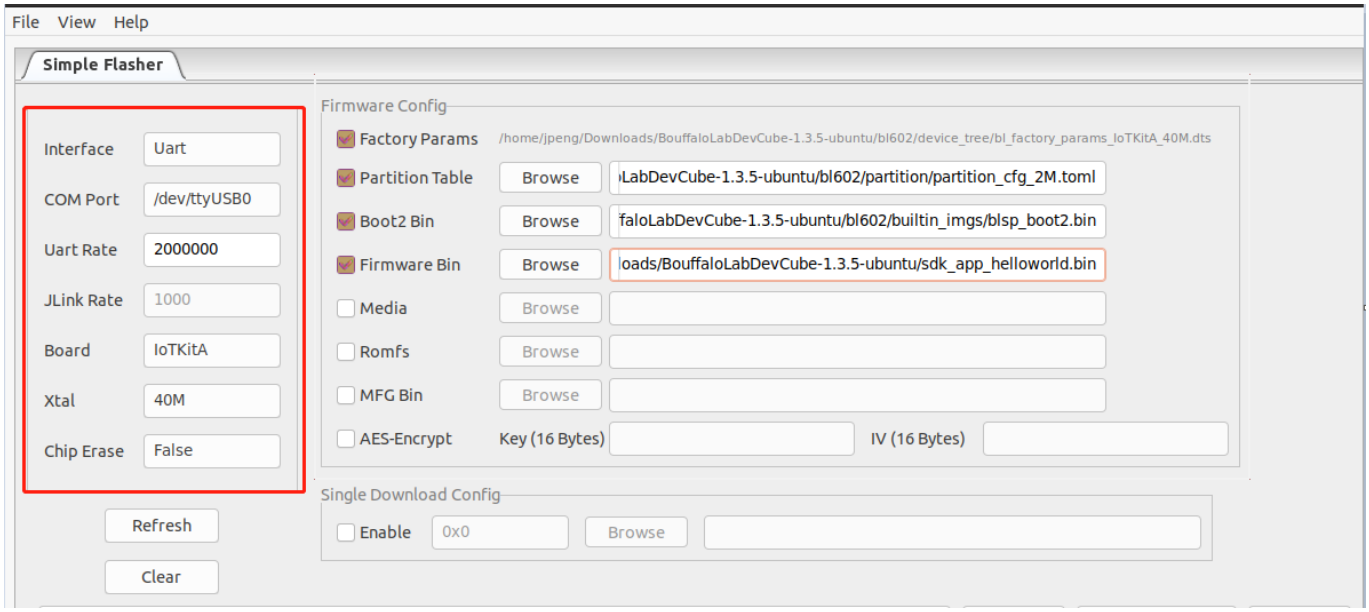
Simply downloading the application will not make the chip work properly; the startup information must also be downloaded.BootInfoDownload to the specified location. Taking single-core download as an example, the actual parameters of the hardware circuit need to be considered.XTAL,PLL,FlashOnce the configuration information is burned toBootinfo AddrThe corresponding address contains the compiled application.binFile burned toImage AddrIn the corresponding address.

3 IoTProgram Download

existViewSelect from menuIoTThe options will lead to...IoTThe program download interface is mainly divided into two parts: program download method configuration and burning file configuration.

3.1Configuration program download method

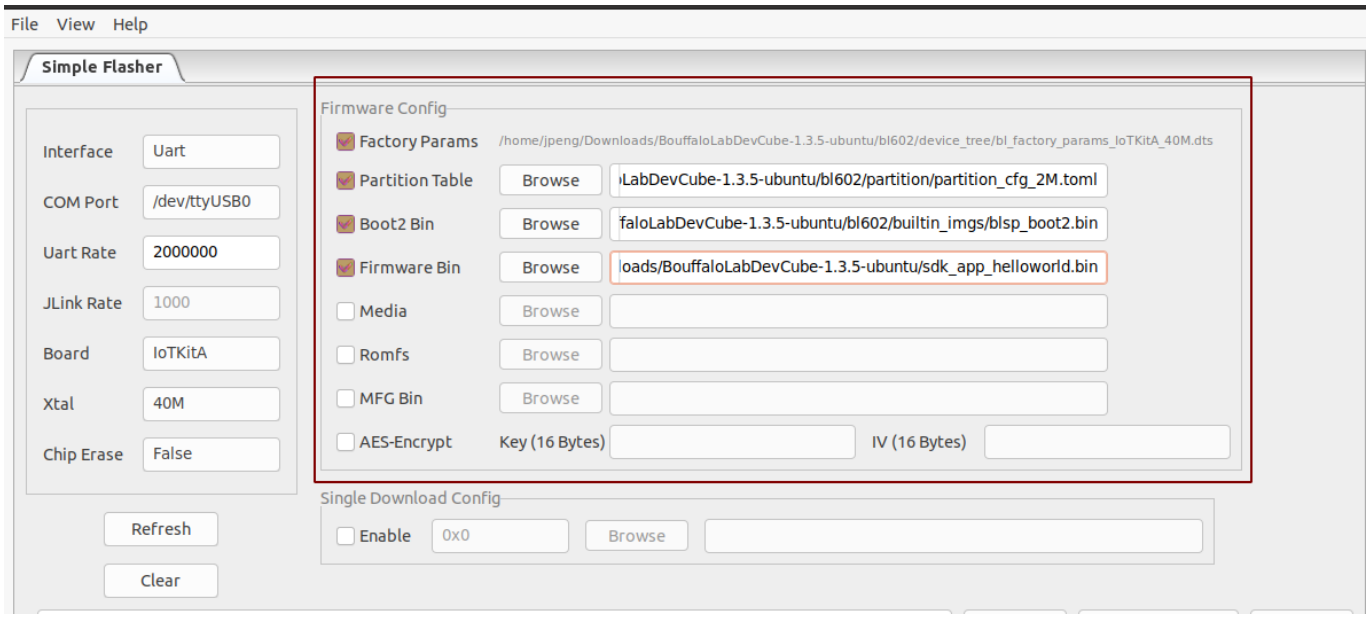
- Configuration parameters include:
  - Interface: Used to select the communication interface for downloading and burning.JlinkorUART,Users select based on actual physical connection.
  - COM PortWhen choosingUARTWhen downloading, select the option connected to the chip.COMSlogan, you can clickRefreshButton to proceed COMNumber refresh
  - Uart SpeedWhen choosingUARTWhen downloading, enter the baud rate and recommended download frequency.2M
  - BoardThe choice of board model, board model, and crystal oscillator type together determine the...DTSThe file, in other words, determines the board-level hardware configuration parameters.
  - Chip Erase: The default setting isFalseDuring download, erase according to the burning address and content size, select...TrueAt that time, before the program is burned, it will beFlashErase All
  - XtalUsed to select the type of crystal oscillator used on the board.



picture3.1: IoTProgram download method selection interface

3.2Configure download file

- Configuration parameters include:
  - Partition Table:useDev CubeCorresponding chip model in the directorypartitionThe partition table and partition files in the folder are mainly based on...Flash Size determined, default selection2MPartition table configuration file
  - Boot2 Bin:It is the first program to run after the system starts.FlashThe program is responsible for establishingBLSPA secure environment is provided, and the main program is guided to run. Dev CubeCorresponding chip model in the directorybuiltin_imgsIn the folderBoot2 Bindocument
  - Firmware BinUser-compiledbinFile, here select the generated onehelloworld.bin
  - Media/Romfs:MediaandRomfsChoose one of the two options; if you select one...MediaThe selected item is a file; if you check the box...RomfsThen the folder is selected.
  - MFG Bin:chooseMFGdocument,MFGThe file isRFThe application used during production testing should be selected based on the crystal oscillator type.Dev Cube Corresponding chip model in the directorybuiltin_imgs/mfgIn the foldermfg bindocument
  - AES-EncryptIf encryption is used, it is necessary to... AES-EncryptSelect the option and enter the encryption method used in the text box next to it. Key andIV The input is the hexadecimal representation of ".0"~"F" ,oneByteIt consists of two characters, soKeyandIVEach requires input32indivual Characters. It is important to note that...IVThe end8characters (i.e.)4 Bytes) must be all0
  - Single Download ConfigCheck the boxEnableYou can then download a single file.RawFile to specifiedFlashFor the download address, enter the starting address in the text box on the left.0xHead

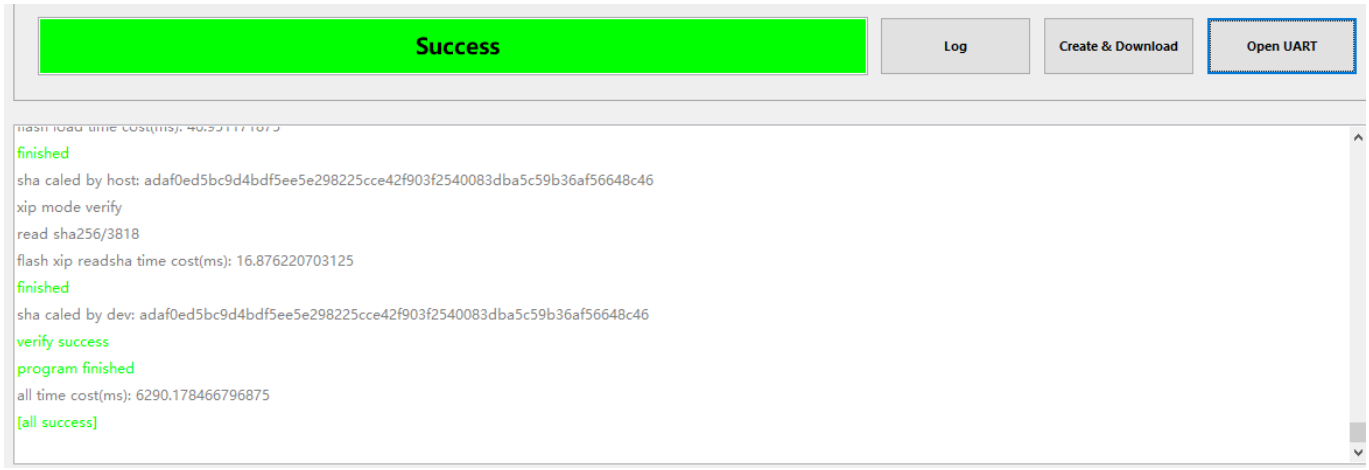


picture3.2:File selection interface for burning

3.3Download program

- When choosingUARTTo program the circuit, you need to burn the board with the necessary components.BOOTSet to high level to reset the chip, bringing it to a high state.UARTThe download status is being guided (if the user board has...).Bootpins andResetPins, all are withUSBSerial converterDTRandRTSFor connections, no manual setup is required; the download program will automatically configure them.Bootpins andReset(Chip). When selectingJlinkDuring the burning process, you can keep...BootSet the pin low to put it in a slave state.Flash Startup status

- ClickCreate & DownloadThe tool can then automatically generate the application image and startup parameter configuration file, and begin flashing the various configuration files. The following image will appear.logInformation: Program downloaded successfully.

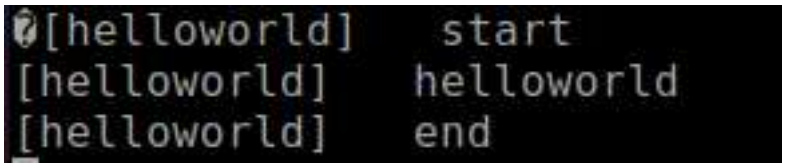


picture3.3: IoTDownload program

annotation:If no board is connected, simply generate the application image and startup parameter configuration file by clicking [click here].Create & ProgramButton

- After successful download, put the board...BOOTSetting the pin to low level resets the chip, causing it to...FlashOnce started, the application will begin running.

The image below ishello worldThe effect of the program running.



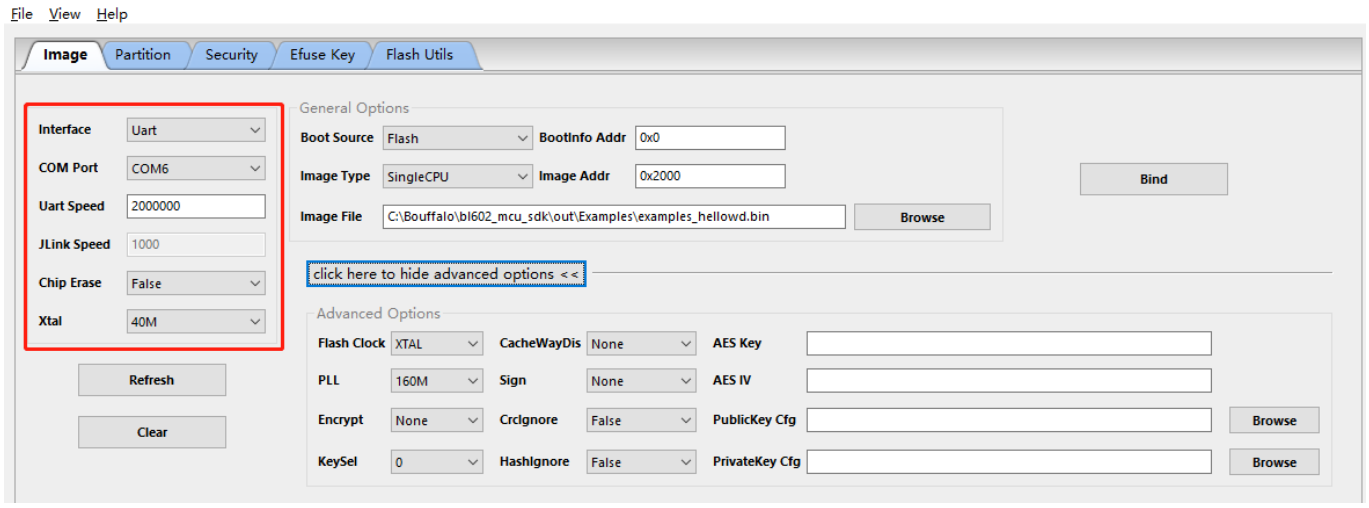
picture3.4: Hello worldProgram running effect

4 MCUProgram Download

existViewSelect from menuMCUThe options will lead to...MCUThe program download interface is mainly divided into three parts: firmware download method configuration, image parameter configuration, and advanced image parameter configuration.

4.1Configure firmware download method

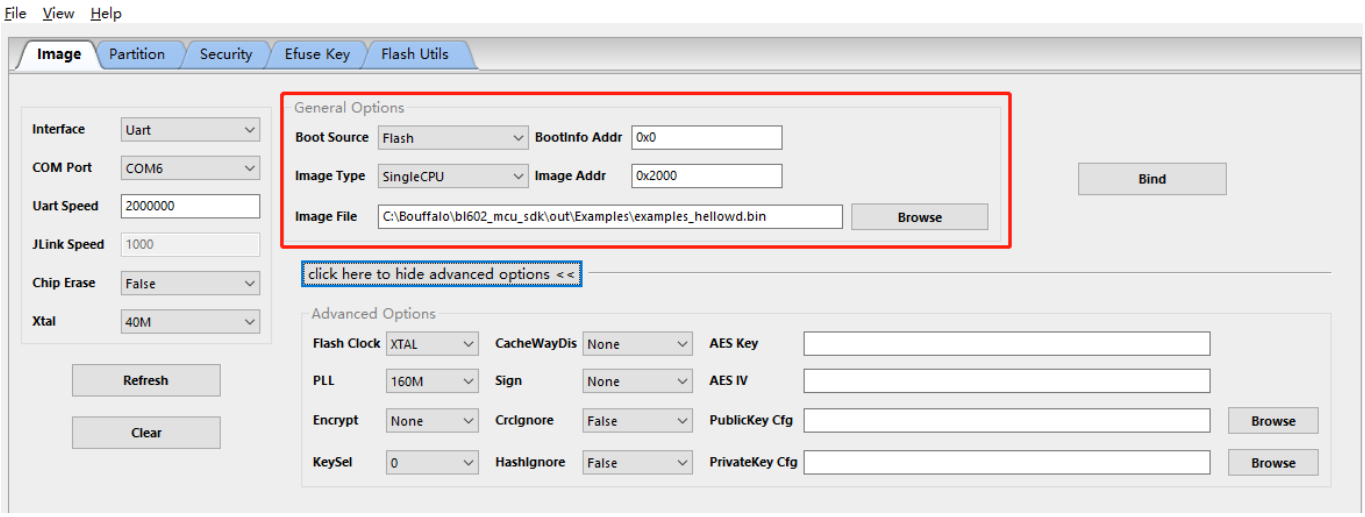
- Configuration parameters include:
  - Interface: Used to select the communication interface for downloading and burning.JlinkorUART,Users select based on actual physical connection.
  - COM PortWhen choosingUARTWhen downloading, select the option connected to the chip.COMSlogan, you can clickRefreshButton to proceed COMNumber refresh
  - Uart SpeedWhen choosingUARTWhen downloading, enter the baud rate and recommended download frequency.2M
  - Chip Erase: The default setting isFalseDuring download, erase according to the burning address and content size, select...TrueAt that time, before the program is burned, it will beFlashErase All
  - XtalUsed to select the type of crystal oscillator used on the board.



picture4.1: MCUFirmware download method selection interface

4.2Configure image parameters

- Configuration parameters include:
  - Boot Source: Default isFlashOnly when it is necessary to generate fromUARTorSDIOYou only need to select this option when booting the image.UART/SDIO
  - BootInfo Addr:BootinfoThe location where startup parameters are stored. For single-core programs, fill in...0x0,For dual-coreCPU0Mirror, fill in 0x0,For dual-coreCPU1Mirror, fill in0x1000
  - Image Type:SingleCPUUsed to generate a single-core image.CPU0Used to generate dual-coreCPU0The mirror image,CPU1Used to generate dual-coreCPU1 The mirror image,Boot2Used to generateBoot2Mirror imageRAWUsed to download user-defined raw resource files.
  - Image Addr: The location where the application is stored. It is recommended to fill in this.0x2000or0x2000Future address
  - Image File: Select applicationBinFiles or user resource files

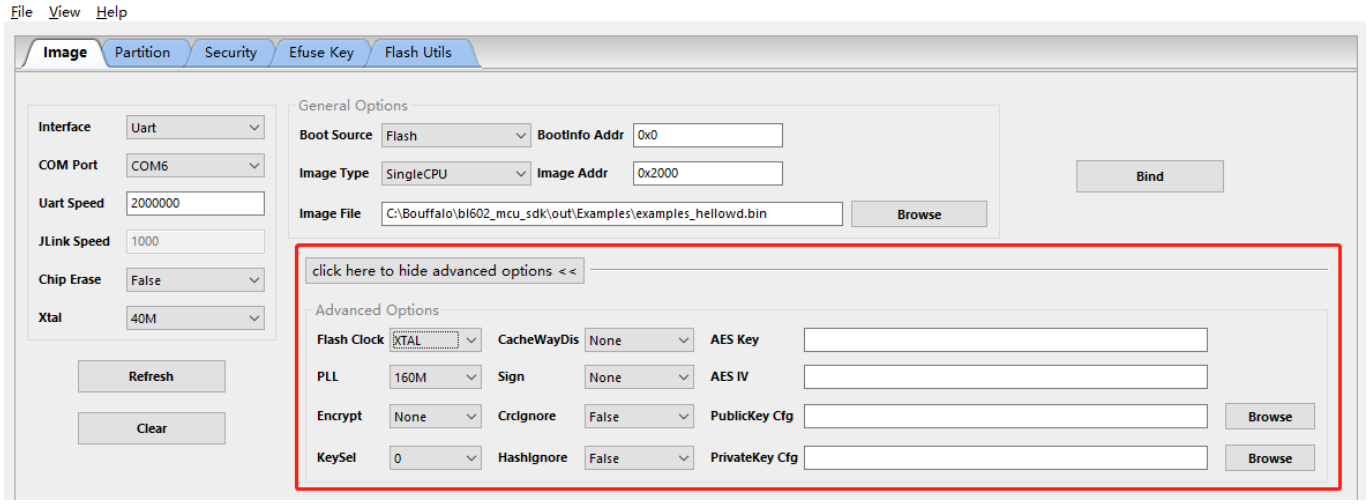


picture4.2:Mirror parameter selection interface

4.3Configure advanced image parameters

- When clickclick here to show advanced optionsWhen prompted, advanced image configuration will be displayed, and the configurable parameters include:
  - Flash ClockUsed for settingFlashclock
  - PLL : PLLClock configuration, default is160M
  - CacheWayDis: L1C Cacheof4stripwayThe setting is set to default.none,Even if all of them could4stripway
  - Sign:Choose whether to perform an image update.ECCsign
  - CrcIgnore :Is it necessary?CRCVerification. When parameters are selected.FalseAt that time, turn onBoot InfoofCRCVerify; otherwise, do not set.Boot Info of CRCcheck
  - HashIgnore:Is it necessary to ensure the integrity of the image?HashVerification. When parameters are selected.FalseIt is necessary to do it at the timeHashVerification is performed; conversely, no integrity verification is performed on the image.

- Encrypt:Select an encryption method and enable encryption for the program image. After enabling encryption, you need to...AESEncryption method inAES Key andAES IVEnter the corresponding value in the input field.

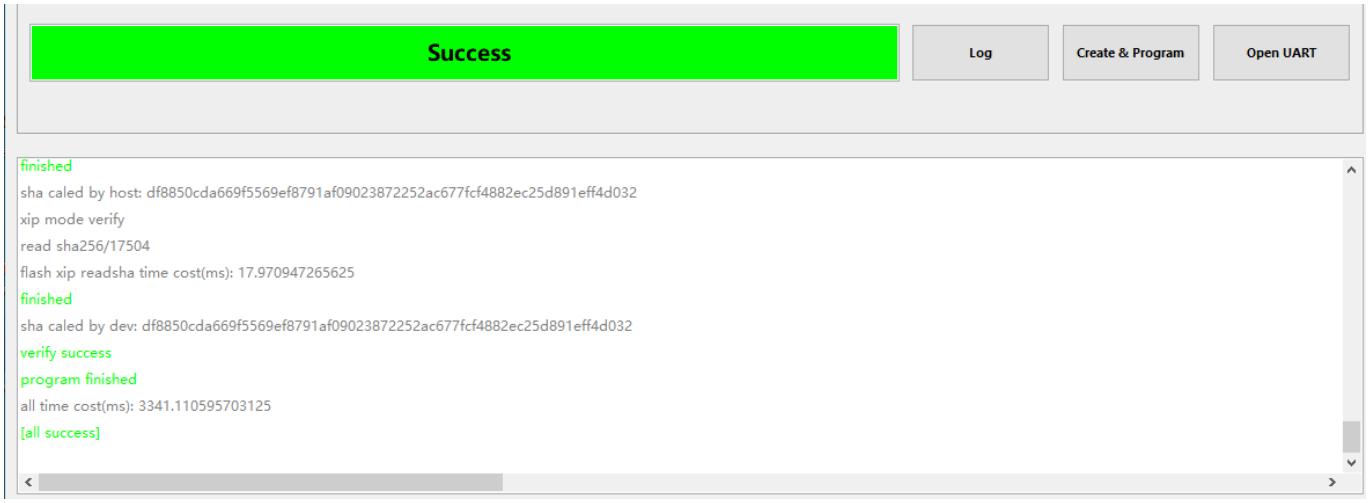


picture4.3:Advanced image parameter selection interface

4.4Download program

- When choosingUARTTo program the circuit, you need to burn the board with the necessary components.BOOTSet to high level to reset the chip, bringing it to a high state.UARTThe download status is being guided (if the user board has...).Bootpins andResetPins, all are withUSBSerial converterDTRandRTSFor connections, no manual setup is required; the download program will automatically configure them.Bootpins andReset(Chip). When selectingJlinkDuring the burning process, you can keep...BootSet the pin low to put it in a slave state.Flash Startup status

- ClickCreate & ProgramThe tool can then automatically generate the application image and boot parameter configuration file and begin the flashing process. (See the image below.)logInformation: Program downloaded successfully.



picture4.4:Download program

annotation:If no board is connected, simply generate the application image and startup parameter configuration file by clicking [click here].Create & ProgramButton

- After successful download, put the board...BOOTSetting the pin to low level resets the chip, causing it to...FlashOnce started, the application will begin running.

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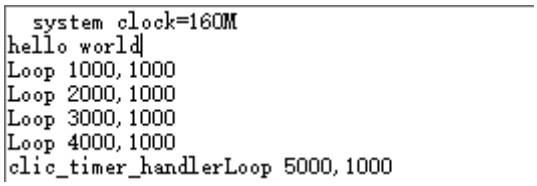
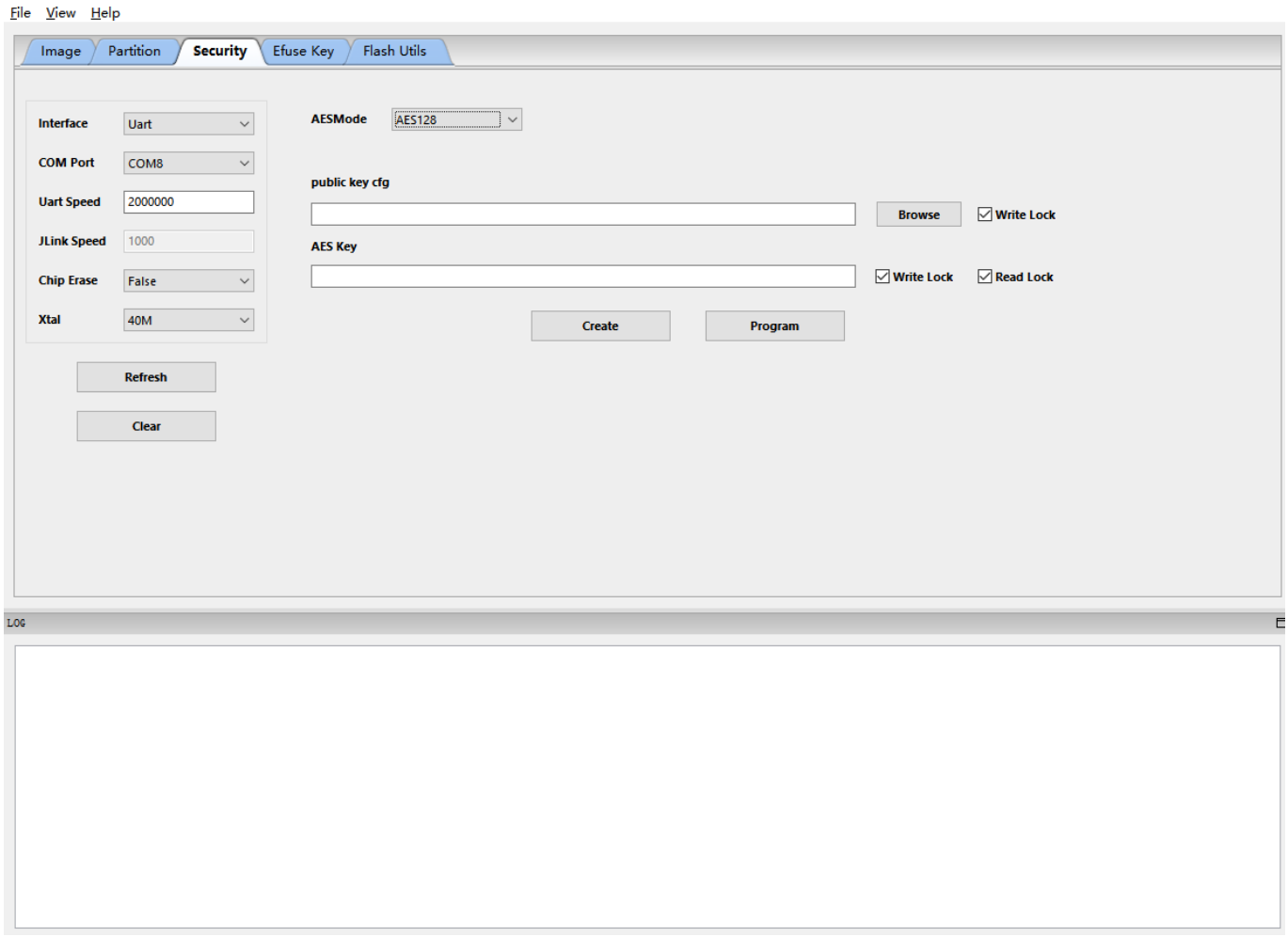


picture4.5: Hello WorldProgram running effect

5

Configure hardware security parameters

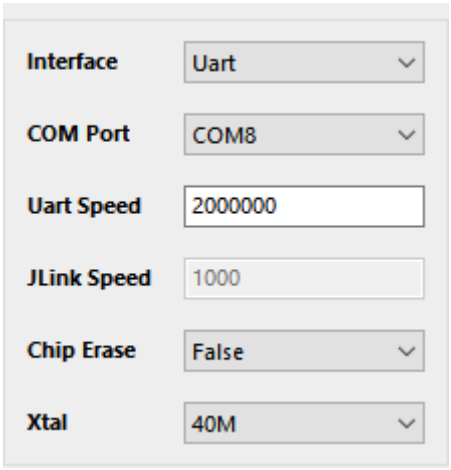
existViewSelect from menuMCUOptions, clickSecuritySelect the option to enter the hardware security parameter configuration interface. Configuration information includes firmware download method settings,AES Mode configuration and key configuration.



picture5.1:Hardware parameter configuration interface

5.1Configuration program download method

- Configuration parameters include:
  - Interface: Used to select the communication interface for downloading and burning.JlinkorUART,Users select based on actual physical connection.
  - COM PortWhen choosingUARTWhen downloading, select the option connected to the chip.COMSlogan, you can clickRefreshButton to proceed COMNumber refresh
  - Uart SpeedWhen choosingUARTWhen downloading, enter the baud rate and recommended download frequency.2M
  - Chip Erase: The default setting isFalseDuring download, erase according to the burning address and content size, select...TrueAt that time, before the program is burned, it will beFlashErase All
  - XtalUsed to select the type of crystal oscillator used on the board.



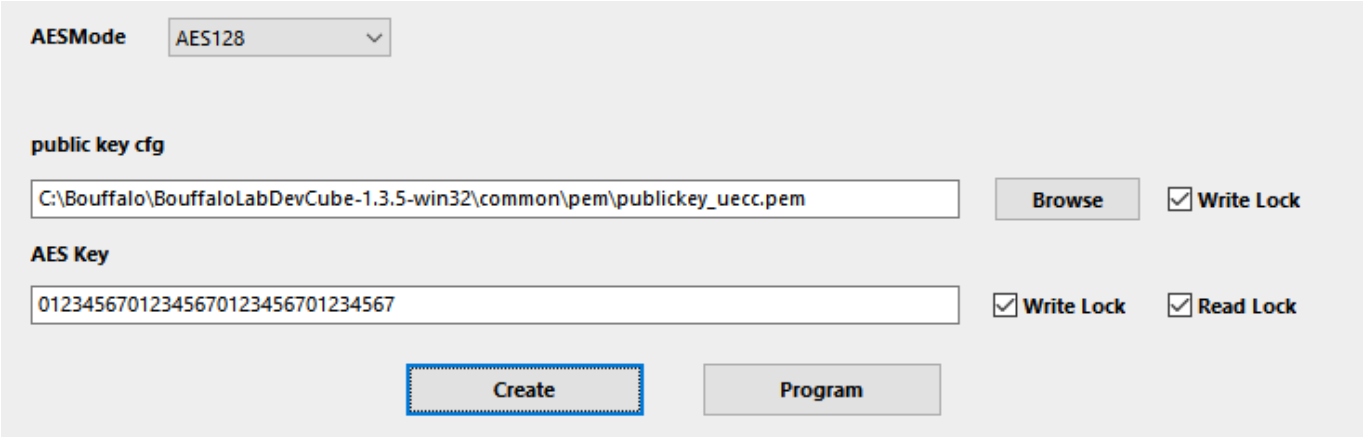
picture5.2:Download method interface

5.2Configure key parameters

To encrypt the chip, besides using [method/mechanism] during program download...ImageIn the functionAESSoftware encryption of the chip is followed by hardware encryption.

- existAESModeSelect the corresponding encryption mode; in this example, select [encryption mode].AES128
- existpublic key cfgSelect public keyPEMFile, in this example, we choose /common/pem/publickey_uecc.pem
- AES KeyEnter the same value as the software encryption.

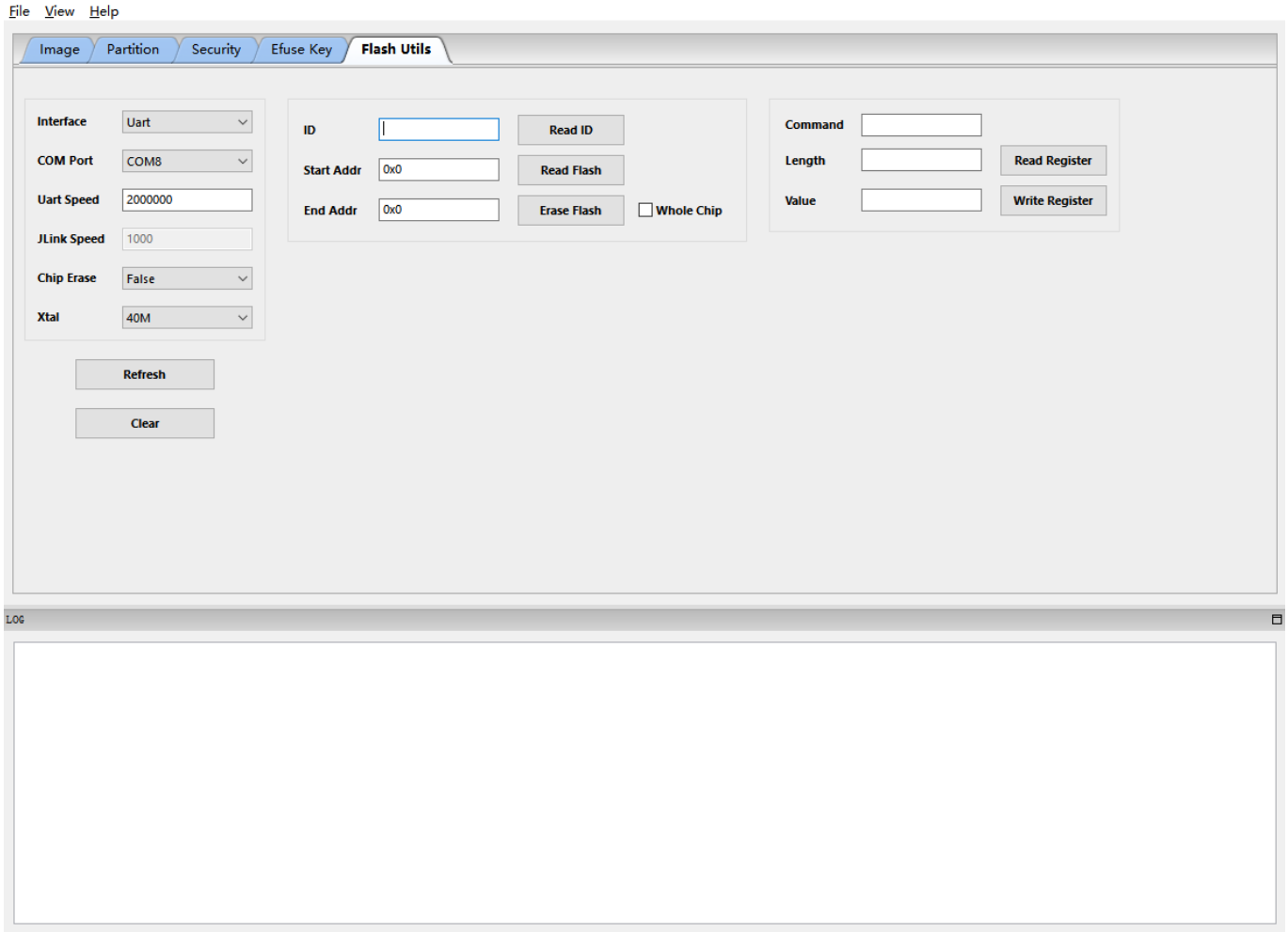
ClickCreate,generateEfuseFile, clickProgramBurningEfusedocument.



picture5.3:Key parameter configuration interface

6 FlashDebugging Assistant

existViewSelect from menuMCUOptions, clickFlash UtilsOptions, enterFlashDebugging assistant interface.FlashDebugging assistant is used to obtainFlash IDRead and eraseFlashThe content at the specified address, and the values of the corresponding registers can be read and written.



picture6.1: FlashDebugging Assistant Interface

6.1Configuration program download method

- Configuration parameters include:
  - Interface: Used to select the communication interface for downloading and burning.JlinkorUART,Users select based on actual physical connection.
  - COM PortWhen choosingUARTWhen downloading, select the option connected to the chip.COMSlogan, you can clickRefreshButton to proceed COMNumber refresh
  - Uart SpeedWhen choosingUARTWhen downloading, enter the baud rate and recommended download frequency.2M
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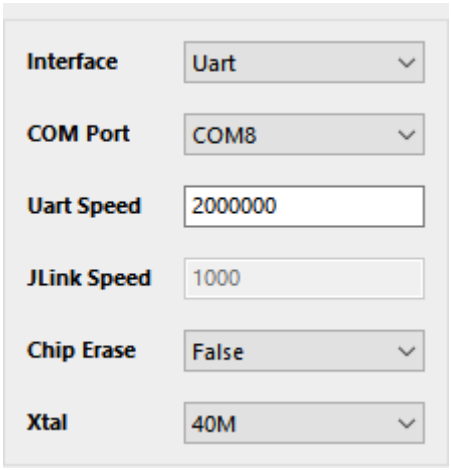
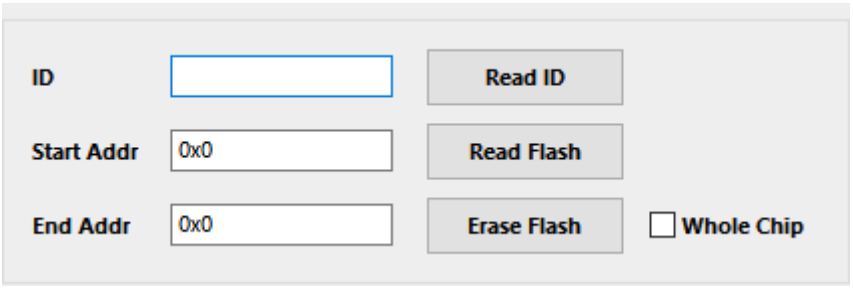


picture6.2:Download method interface

6.2Read and erase**Flash**content

- ReadFlashofIDClickRead ID
- ReadFlashFixed length value: inStart AddrSet the starting address of the data to be read in the middle;End AddrSet the end address of the data to be read in the middle, and click.Read FlashThe read content will be stored inflash.binThe file path is:BouffaloLabDevCube-1.3.4-win32/flash.bin
- eraseFlashFixed length value: inStart AddrSet the starting address of the data to be erased in the middle;End AddrSet the end address of the data to be erased in the settings, and click [here].Erase Flash(To erase the values of the entire chip, simply check the box.Whole Chip



picture6.3:Read and eraseFlashinterface

6.3Reading and writing register contents

- Reading the contents of the register:CommandEnter the read command0x05/0x35,LengthEnter the number of bits to be read in the field and click [click].Read RegisterThe read data is displayedValuemiddle
- Contents written to the register: CommandInput write command0x01,LengthEnter the number of digits to be written in the field, and then enter the data to be written in the field. Value In the middle, clickWrite Register

picture6.4:Read/Write Register Interface