

Install Keil Microcontroller Development Kit Version 5 for ST Microelectronics STM32F446

This tutorial is intended for the preparation to develop software with ST Microelectronics Nucleo-F446RE board using Keil Microcontroller Development Kit (MDK) version 5.24.2.0.

This document covers

- download/installation of Keil MDK-ARM v5.24
- installation of Device Family Pack for ST Microelectronics STM32F4 family
- installation of ST-Link USB driver for Windows

Starting version 5 the device support software components are separated from the MDK software and called Device Family Packs. As release v5.24, many ARM microcontroller Device Family Packs are available. Software development with Device Family Packs is slightly different from software development in MDK v4.

Although this document is written for Nucleo-F446RE board, the installation of Keil MDK v5 and ST-Link USB driver for other Nucleo boards should be similar.

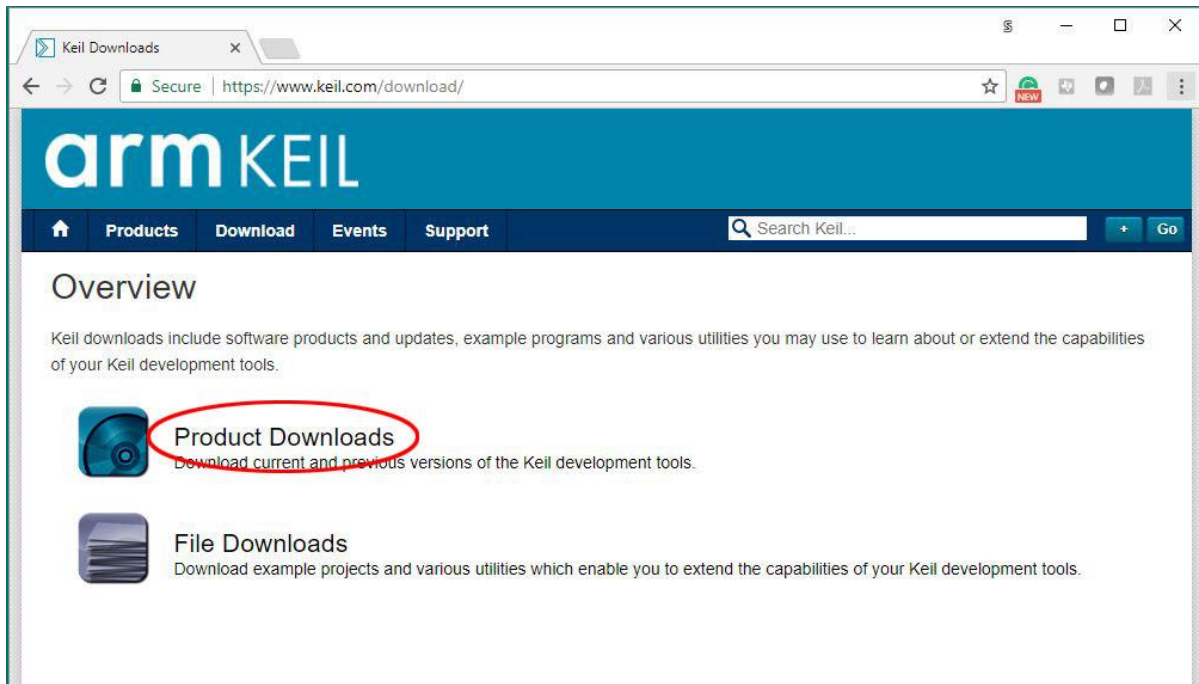
Download MDK v5

1. Browse to www.keil.com. And click on Download.

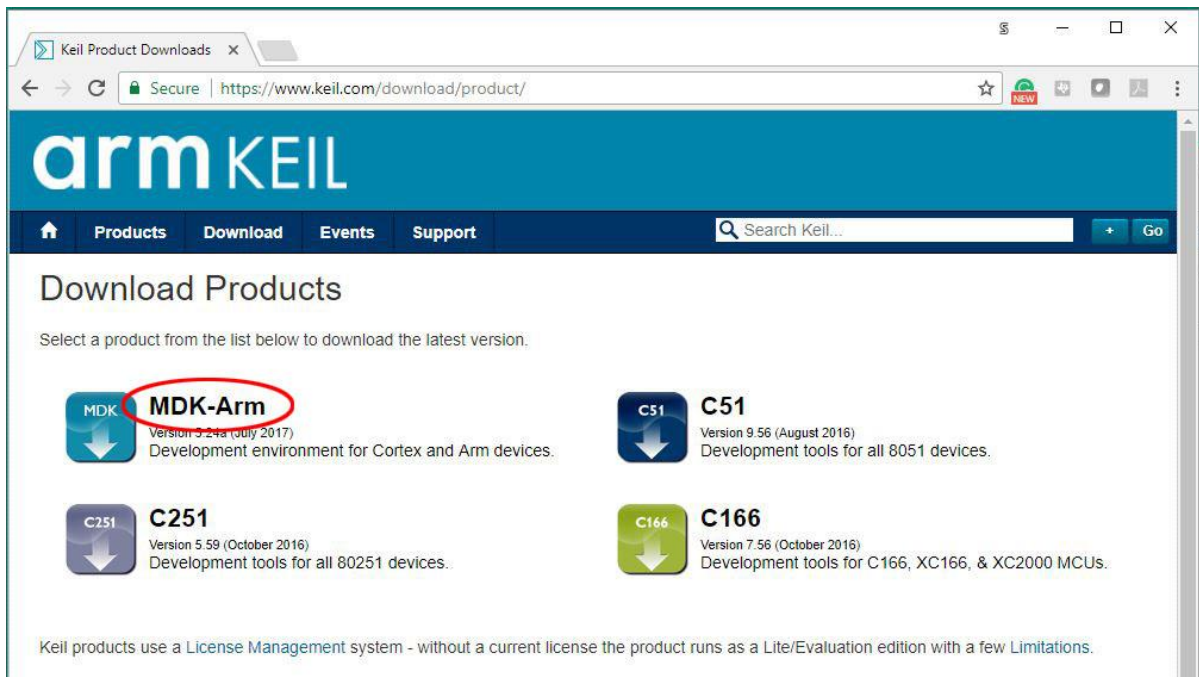
The screenshot shows the Keil Embedded Development Tools website. The navigation menu includes 'Products', 'Download' (circled in red), 'Events', and 'Support'. The main content area is titled 'Embedded Development Tools' and includes a 'Downloads' button and a 'Request a Quote' button. Below this, there are three featured items: 'Cortex-M7 Software Packs for Atmel and STM32', 'Learning Platform for Cortex-M', and 'Keil MDK for STM32F0/L0' (marked as 'free'). The 'MDK Microcontroller Development Kit' section describes it as a complete software development environment for ARM Cortex-M based microcontroller devices. At the bottom, there is a 'Code Size Comparison' chart comparing ROM and RAM sizes for different compilers.

Compiler	ROM Size	RAM Size
GCC Su2	1988	250
ARMCC 5.06	1084	200
ARM Compiler 6.6 O1	10168	200
ARM Compiler 6.6 O0	10168	200

2. In the next page, click on "Product Downloads."



3. In the next page, click on "MDK-Arm".



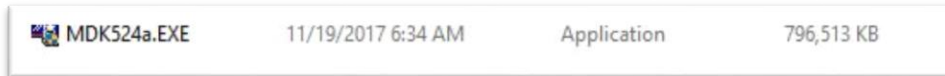
4. Fill up the form in the page and click "Submit."

The screenshot shows a web browser window with the URL <https://www.keil.com/demo/eval/arm.htm>. The page features the "arm KEIL" logo and a navigation menu with "Products", "Download", "Events", and "Support". A search bar is located in the top right. On the left, there is a sidebar with categories: "Product Information", "Device Database", "Compliance Testing", and "Distributors". The main content area is titled "MDK-ARM" and "MDK-ARM Version 5.24a". It contains a form titled "Enter Your Contact Information Below" with the following fields: "First Name", "Last Name", "E-mail", "Company", "Address" (with two sub-fields), "City", and "State/Province" (a dropdown menu). The breadcrumb trail is "Home / Product Downloads".

5. In the next page, click "MDK524A.EXE" to download the development software kit. The file is about 800 MB and will take a while to download.

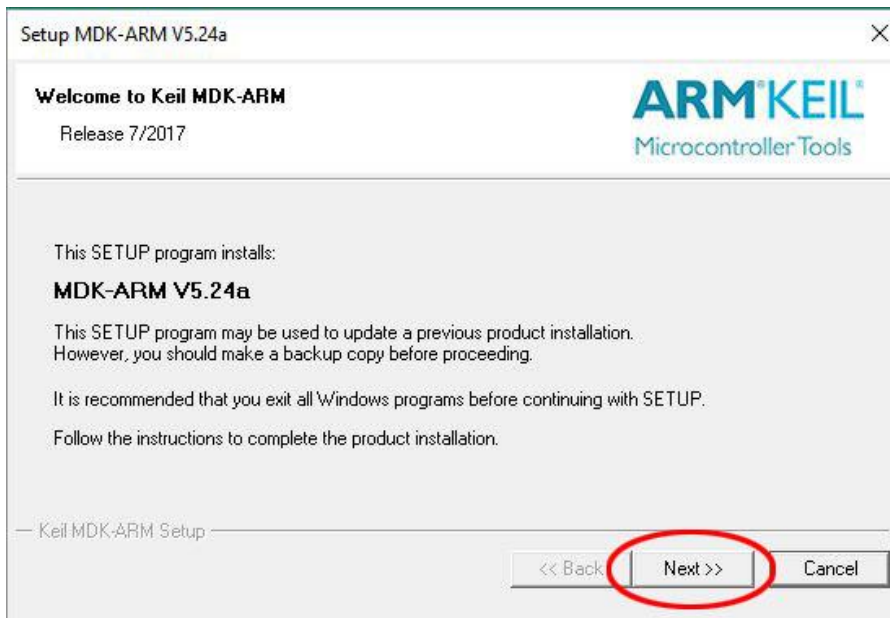
The screenshot shows the same web browser window, but the URL is <https://www.keil.com/demo/eval/arm.htm#/DOWNLOAD>. The page content is updated to show installation instructions. The breadcrumb trail is "Home / Product Downloads". The main content area is titled "MDK-ARM" and "MDK-ARM Version 5.24a". It includes a list of instructions: "Review the hardware requirements before installing this software.", "Note the limitations of the evaluation tools.", and "Further Installation Instructions for MDK5". Below this is a link to a PDF file: "(MD5:d75f933ce8cf87d0c19060362bf7686a)". The section "To install the MDK-ARM Software..." contains instructions: "Right-click on MDK524A.EXE and save it to your computer.", "PDF files may be opened with Acrobat Reader.", and "ZIP files may be opened with PKZIP or WINZIP." A download button for "MDK524A.EXE (795.513K)" is visible, with the text "Tuesday, July 4, 2017" below it. At the bottom, there is a note: "If you are evaluating the tools, be sure to request a quote for the full version of the tools."

6. After downloads are complete, you should see the file in your download folder.

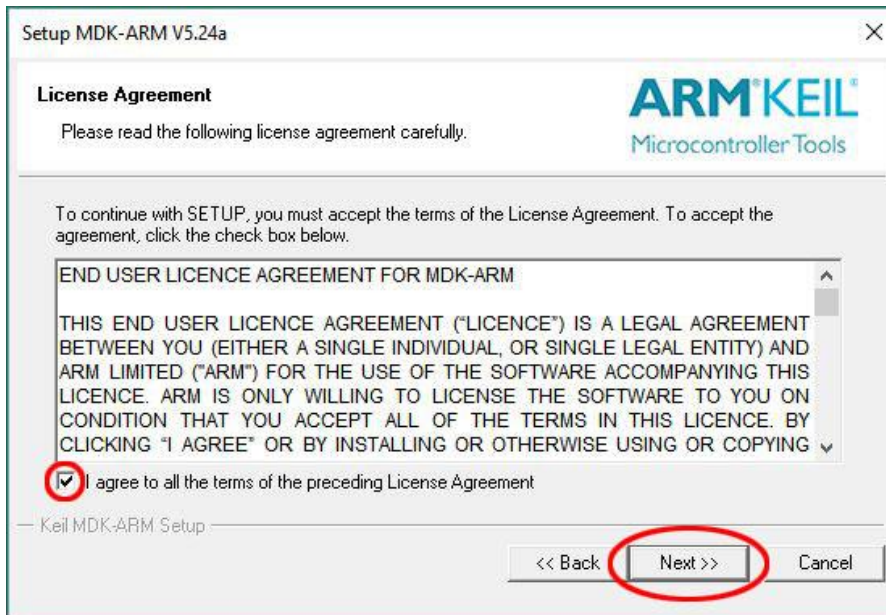


Installation of MDK v5

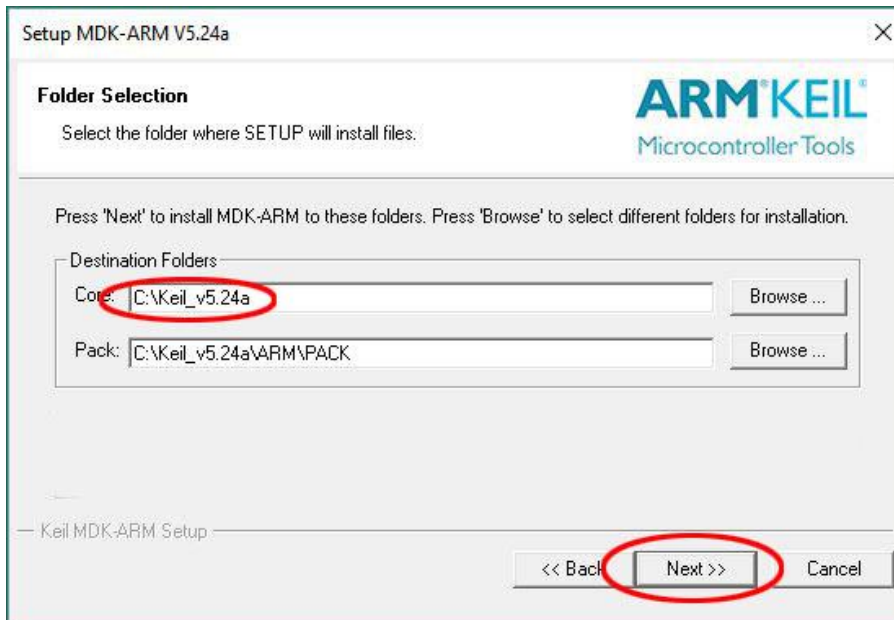
7. Double click on the icon of **mdk524a.exe** in the download folder. Windows may block the execution and display a warning screen. Click “Run anyway” button.
8. When the Welcome dialog box pops up, click “Next” button.



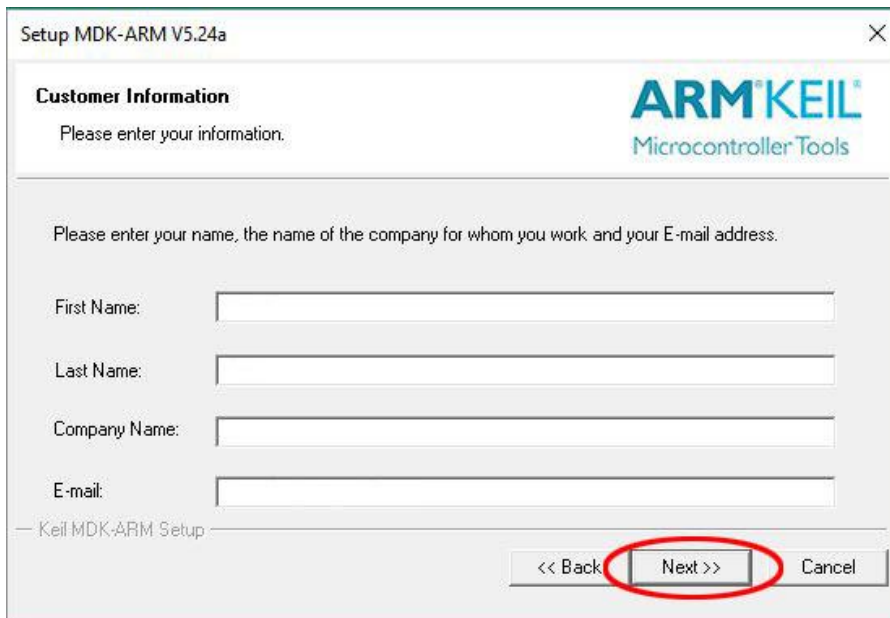
9. In the next License Agreement dialog box, check “I agree ...” and click “Next” button.



10. In the next Folder Selection dialog box, accept the defaults or edit the location then click “Next” button.

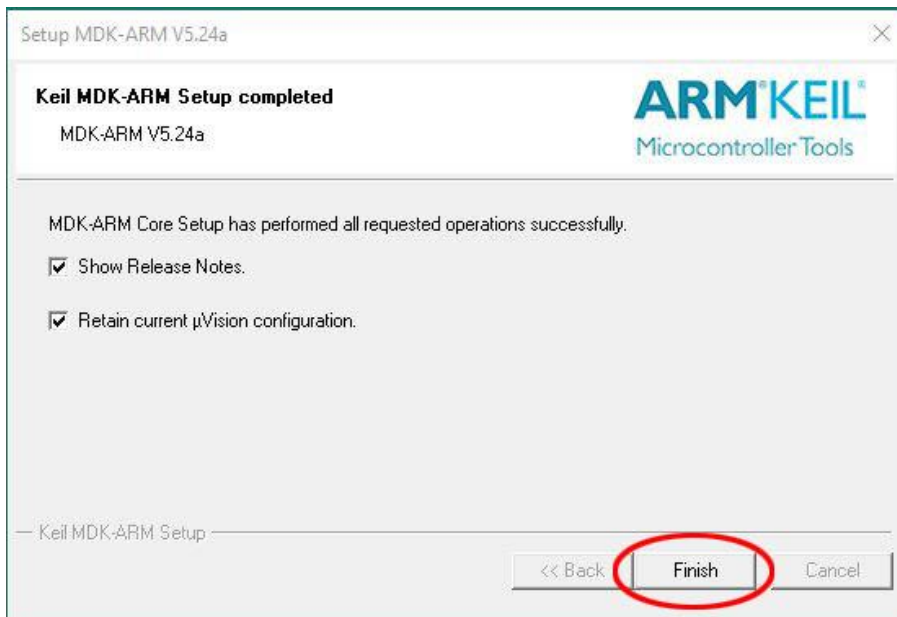


11. In the next Customer Information dialog box, fill the information and click “Next” button. The installation of MDK and several software packs will start.



The screenshot shows the 'Setup MDK-ARM V5.24a' dialog box with the 'Customer Information' tab selected. The title bar reads 'Setup MDK-ARM V5.24a'. The main content area has the ARM KEIL Microcontroller Tools logo and the text 'Please enter your information.' Below this, it says 'Please enter your name, the name of the company for whom you work and your E-mail address.' There are four input fields: 'First Name:', 'Last Name:', 'Company Name:', and 'E-mail:'. At the bottom, there are three buttons: '<< Back', 'Next >>', and 'Cancel'. The 'Next >>' button is circled in red.

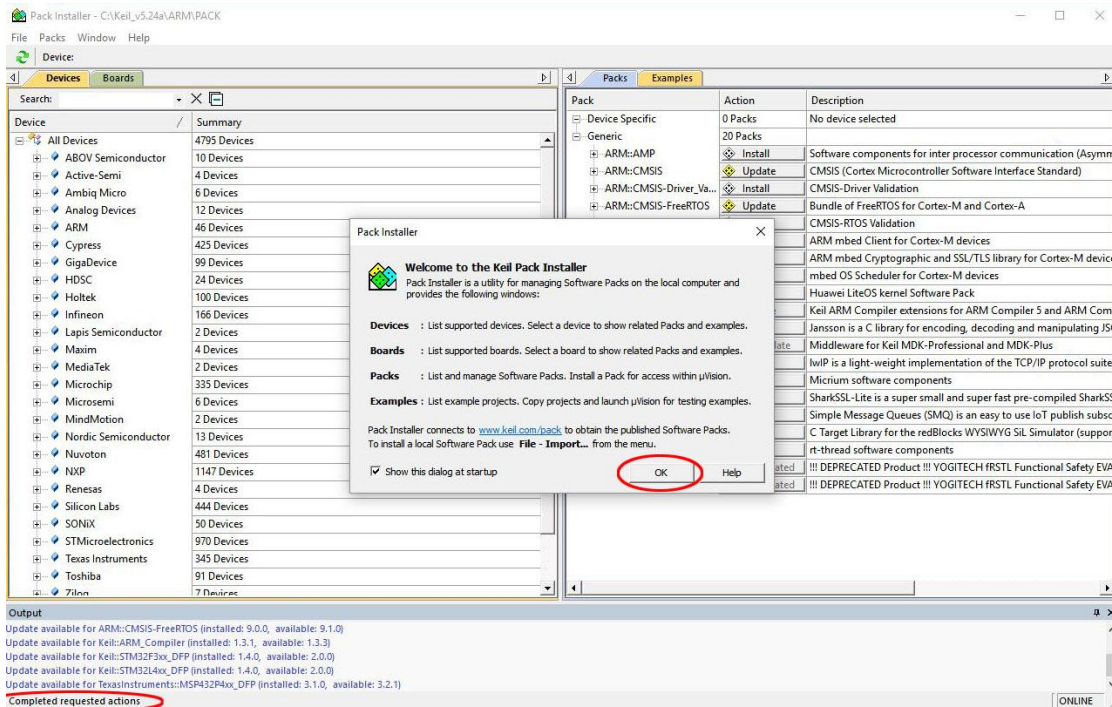
12. When the installation is complete, this dialog box will appear. Click “Finish” button.



The screenshot shows the 'Setup MDK-ARM V5.24a' dialog box with the 'Keil MDK-ARM Setup completed' tab selected. The title bar reads 'Setup MDK-ARM V5.24a'. The main content area has the ARM KEIL Microcontroller Tools logo and the text 'Keil MDK-ARM Setup completed' and 'MDK-ARM V5.24a'. Below this, it says 'MDK-ARM Core Setup has performed all requested operations successfully.' There are two checked checkboxes: 'Show Release Notes.' and 'Retain current µVision configuration.' At the bottom, there are three buttons: '<< Back', 'Finish', and 'Cancel'. The 'Finish' button is circled in red.

Installation of STM32F3 Series Device Family Pack

13. After MDK v5 is installed, it will automatically prompt the user to install the Device Family Packs. It may take several minutes for the Pack Installer to populate all the available devices. Wait until the message “Completed requested actions appears at the lower left corner of the window. Read the Pack Installer information dialog box then click **OK** button to close it.



14. To install a Device Family Pack, you need to select one of the devices or boards on the left panel of the Pack Installer. The required pack(s) to support your device/board selection will appear on the right panel. For example, if you plan to use Nucleo-F446RE board, drill down the Device list to select STMicroelectronics->STM32F4 Series->STM32F446. The required and optional packs appear on the right panel Packs tab. Minimally, you should install the Keil::STM32F4xx_DFP. While you are at it, you might want to update ARM::CMSIS and Keil::ARM_Compiler.

The screenshot shows the Pack Installer interface. On the left, the 'Device' pane lists various STM32F4 series devices, with 'STM32F446' selected and circled in red. The right pane shows a list of packs with their respective actions. The 'Update' button for 'ARM::CMSIS' and the 'Install' buttons for 'Keil::STM32F4xx_DFP' and 'Keil::ARM_Compiler' are circled in red. The bottom pane shows an output log with update notifications for various packs.

Pack	Action	Description
Device Specific	2 Packs	STM32F446 selected
Keil::STM32F4xx_DFP	Install	Microelectronics STM32F4 Serie
Keil::STM32NUCLEO_BSP	Install	STMicroelectronics Nucleo Boards
Generic	20 Packs	
ARM::AMP	Install	Software components for inter pro
ARM::CMSIS	Update	CMSIS (Cortex Microcontroller Sof
ARM::CMSIS-Driver_Validation	Install	CMSIS-Driver Validation
ARM::CMSIS-FreeRTOS	Update	Bundle of FreeRTOS for Cortex-M
ARM::CMSIS-RTOS_Validation	Install	CMSIS-RTOS Validation
ARM::mbedClient	Install	ARM mbed Client for Cortex-M de
ARM::mbedTLS	Install	ARM mbed Cryptographic and SSL
ARM::minar	Install	mbed OS Scheduler for Cortex-M
Huawei::LiteOS	Install	Huawei LiteOS kernel Software Pa
Keil::ARM_Compiler	Update	Keil ARM Compiler extensions for
Keil::Jansson	Install	Jansson is a C library for encoding,
Keil::MDK-Middleware	Up to date	Middleware for Keil MDK-Professi
lwIP::lwIP	Install	lwIP is a light-weight implementat
Micrium::RTOS	Install	Micrium software components
RealTimeLogic::SharkSSL-Lite	Install	SharkSSL-Lite is a super small and
RealTimeLogic::SMQ	Install	Simple Message Queues (SMQ) is
redlogix::redBlocks-Simulator	Install	C Target Library for the redBlocks
rt-thread::rtthread	Install	rt-thread software components
YOGITECH::fRSTL_ARMCMx...	Deprecated	!!! DEPRECATED Product !!! YOGITE
YOGITECH::fRSTL_STM32Fx...	Deprecated	!!! DEPRECATED Product !!! YOGITE

Output

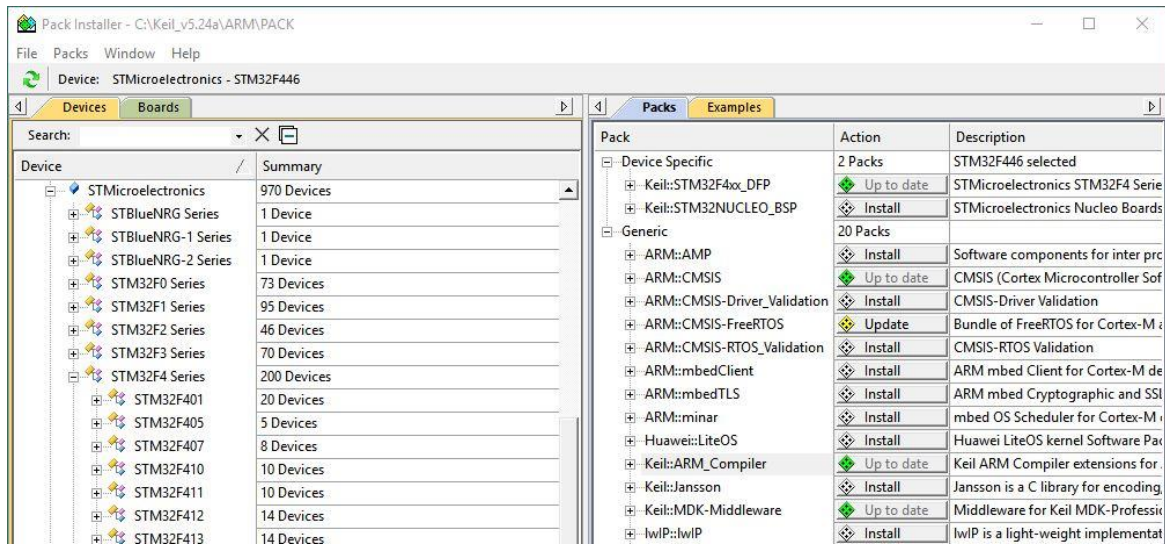
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Update available for ARM::CMSIS-FreeRTOS (installed: 9.0.0, available: 9.1.0)
Update available for Keil::ARM_Compiler (installed: 1.3.1, available: 1.3.3)
Update available for Keil::STM32F3xx_DFP (installed: 1.4.0, available: 2.0.0)
Update available for Keil::STM32L4xx_DFP (installed: 1.4.0, available: 2.0.0)
Update available for TexasInstruments::MSP432P4xx_DFP (installed: 3.1.0, available: 3.2.1)

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Ready ONLINE

15. A yellow diamond in Action column (such as ARM::CMSIS) indicates the pack is installed but an update is available. A grey diamond (Keil::STM32F4xx_DFP) shows that the device pack is available for download. A green diamond indicates the pack is current. Click on the Update button for CMSIS and Install button for STM32F4xx_DFP to download and install these packs. The installation/update requests are queued so you may click multiple requests. The packs are downloaded from Keil website and built locally. It takes several minutes depending on the computer and Internet speed. When the pack installations are complete, the diamonds in the button will turn green.

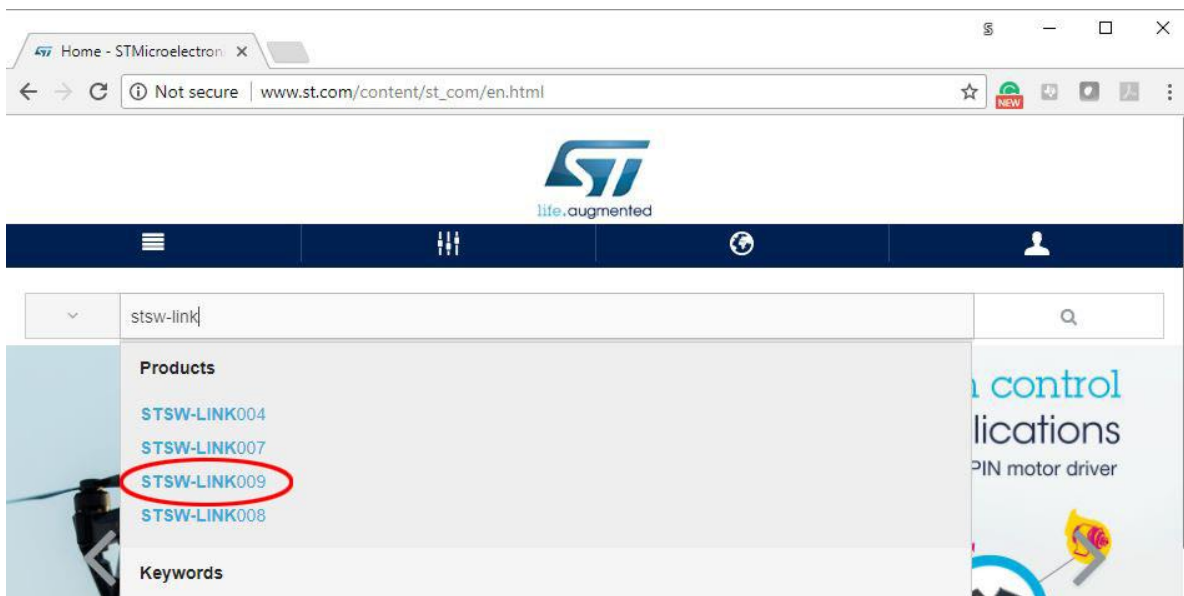


16. Now you have the Device Support Pack installed, you are ready to start a new software project. But before you connect the Nucleo board to the PC, you need to install the ST-Link USB driver.

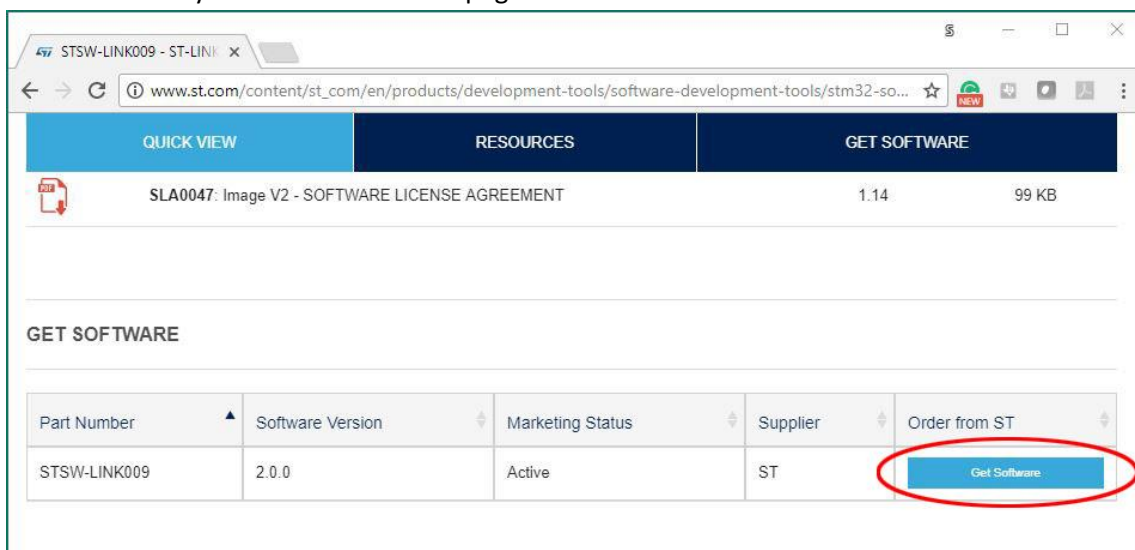
Install ST-Link USB Driver

ST-Link is the embedded debug agent on the Nucleo boards. It connects to the target MCU by SWD (Serial Wire Debug) on one side and the PC by USB on the other side. ST-Link USB driver must be installed on the PC before the Nucleo board is connected to it by the USB cable. ST-Link USB drivers are available for different versions of

17. Browse to the webpage www.st.com. In the search field type **stsw-link** then click STSW-LINK009 in the pull-down menu.



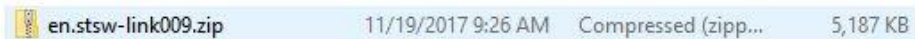
18. Scroll all the way to the bottom of the page and find **Get Software** button. Click the button.



19. You do need a free ST-micro account to download the driver. Once you registered and logged in, the **Get Software** button changes to **Download** button. Click on the **Download** button, accept the license agreement.



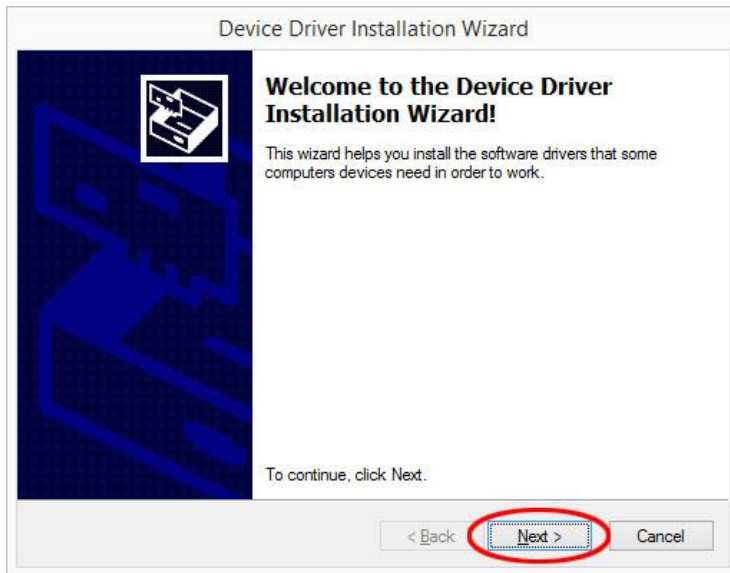
20. Locate the downloaded file, unzip the file and put the content in a new folder.



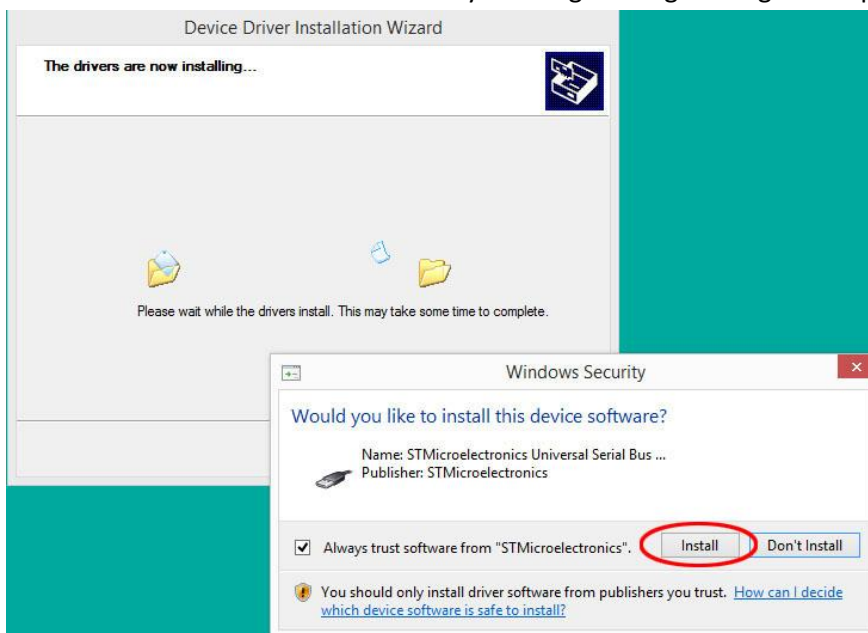
21. Double click on **stlink_winusb_install.bat** to install the driver.

Name	Date modified	Type	Size
amd64	11/19/2017 9:34 AM	File folder	
x86	11/19/2017 9:34 AM	File folder	
dpinst_amd64.exe	5/20/2015 10:42 AM	Application	665 KB
dpinst_x86.exe	5/20/2015 10:42 AM	Application	540 KB
readme.txt	7/4/2017 8:08 AM	TXT File	1 KB
stlink_dbg_winusb.inf	6/8/2017 9:40 AM	Setup Information	5 KB
stlink_VCP.inf	6/8/2017 9:42 AM	Setup Information	2 KB
stlink_winusb_install.bat	6/23/2017 9:16 AM	Windows Batch File	1 KB
stlinkdbgwinusb_x64.cat	6/8/2017 9:43 AM	Security Catalog	11 KB
stlinkdbgwinusb_x86.cat	6/8/2017 9:43 AM	Security Catalog	11 KB
stlinkvcp_x64.cat	6/8/2017 9:43 AM	Security Catalog	9 KB
stlinkvcp_x86.cat	6/8/2017 9:43 AM	Security Catalog	9 KB

22. Click **Next** button when Device Driver Installation Wizard window pops up.



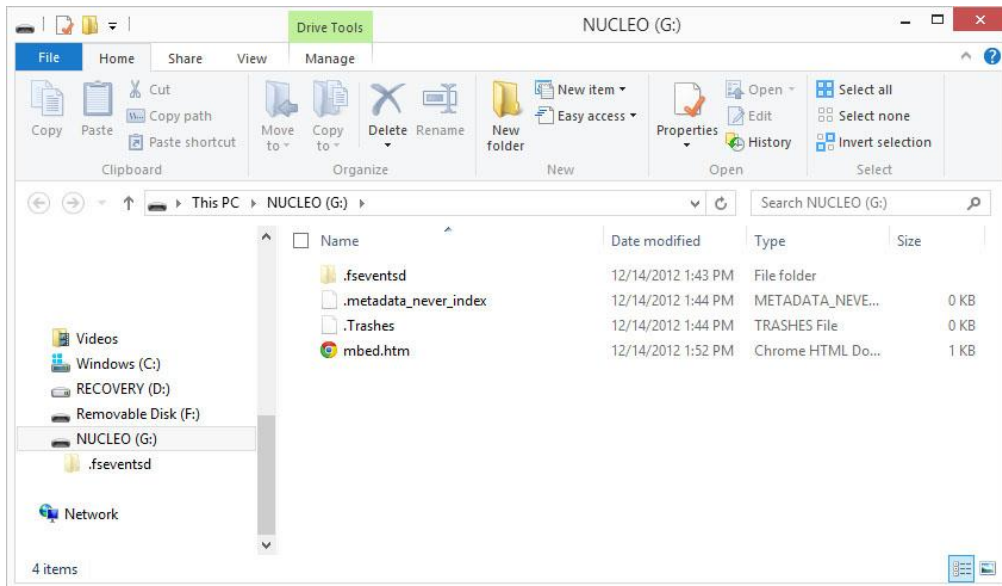
23. Click **Install** button in Windows Security warning message dialog box to proceed.



24. When the device driver installation is complete, click Finish button to close the window.



25. Connect the Nucleo board to the PC with a USB cable. The ST-Link is configured as USB MSD (mass storage device) and appears as an external drive with the label NUCLEO. ST-Link is mbed enabled.



26. You have completed the installations of Keil MDK-ARM v5 and ST-Link driver.