

TrueSTUDIO®

Upgrade Guide

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INTRODUCTION

This document provides important information on how to upgrade the **Atollic TrueSTUDIO® for ARM®** product to the new **Atollic® TrueSTUDIO® for STM32** version 9.0 product. The new product is free to use and all features are fully enabled directly after installation.

Older versions of **Atollic TrueSTUDIO** do not have to be uninstalled before installing a new version. The **Atollic TrueSTUDIO Installation Guide** contains detailed installation information.

To upgrade **Atollic TrueSTUDIO**, do another installation of the software and follow the Important Upgrade Steps. This is intended, so that our users are able to choose what tool chain they want to use in their project. Switching tool chain should be done with care and a lot of testing. Switching tool chain is done as part of the Atollic TrueSTUDIO's Build Configuration.



This manual only contains the information needed for a successful upgrade. For information about the new features and improvements in the new version of **Atollic TrueSTUDIO**, please see the Release notes in the README-file.



Please note that this manual applies to users of STM32 target devices only.

ATOLLC TRUESTUDIO FOR STM32 v9.0

Atollic TrueSTUDIO for STM32 v9.0 is the first STMicroelectronics version of the product. There is no license system involved and all advanced features which earlier required a **Pro** license are enabled by default.

Compared to earlier version of **Atollic TrueSTUDIO** it contains the same version of **Atollic ARMTools Toolchain**, and Eclipse and CDT versions as used in **Atollic TrueSTUDIO** v8.1/v8.0. The license system has been removed and it only supports STMicroelectronics MCUs and boards using STMicroelectronics MCUs. Other features useful for development with STMicroelectronics devices are still included in the product.

STMicroelectronics recommends that a new workspace is created for the work done with **Atollic TrueSTUDIO** v9.0. Existing projects should be imported and copied into the new workspace.

Please study next chapters for information on how to upgrade from **Atollic TrueSTUDIO** v8.x and earlier **Atollic TrueSTUDIO** versions.

Please note that the upgrade information in this document has been reworked to fit STM32



Please note that this manual applies to users of STM32 target devices only.

IMPORTANT UPGRADE STEPS

Atollic recommends that each time a new version of *Atollic TrueSTUDIO* is installed; the following steps are also performed.

TOOLCHAIN CHANGES

Default runtime library has changed from newlib-standard to newlib-nano. The change was introduced in *Atollic TrueSTUDIO* v7.1.0 and will affect both old and new projects. To change your old project back to newlib-standard, the option is located at **Project Properties -> C/C++ Build -> Settings -> Tool Settings -> C/C++ Linker -> General -> Runtime Library**.

UPDATED GDB-SERVERS

Each new version of *Atollic TrueSTUDIO* will include the latest stable version of the GDB-servers. To fully be able to use the new features in the new release of *Atollic TrueSTUDIO*, the GDB-servers need to be updated during the installation.

The Segger J-Link gdbserver has an SWO clock setting feature which now is used by Atollic TrueSTUDIO v7.1 when configuring SWV. It is now possible to select **SWO clock Auto**, which will make the GDB server to automatically use the highest available frequency matching a given core clock. This is the setting recommended by Segger to use as the GDB server knows max SWO clock speed that can be used by the connected Segger J-Link probe.

USE A FRESH WORKSPACE

The metadata in workspaces are not backward compatible. If a workspace has been opened with *Atollic TrueSTUDIO* v7.x it will no longer work properly with older versions of the program.

Atollic recommends that a new workspace is created for the work done with *Atollic TrueSTUDIO* v7.x. Existing projects should be copied and imported into the new workspace.

This is an important step for those who want to be able to go back using older version of *Atollic TrueSTUDIO*.

CLEAR INCLUDE DIRECTORIES AND SYMBOLS FROM THE INDEXER

Atollic TrueSTUDIO has a mechanism for automatically discover included directories and symbols from a build. Each time those are changed from the outside, as for an example when a new version of **Atollic TrueSTUDIO** is installed, the discovered libraries should be cleared.

To clear the include directories and symbols in the indexer, do the following:

Right-click on your project in the Project Explorer and select **Properties** and in the **Properties** panel for the project select **C/C++ General, Preprocessor Include Paths, Macros etc.** and select the **Providers** tab first.

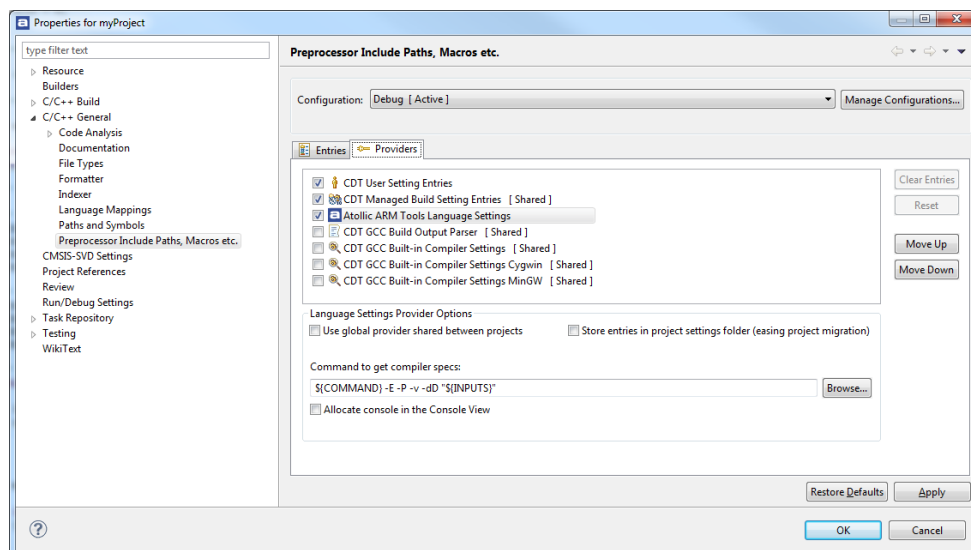


Figure 1 – Preprocessor Include Paths, Macros etc.

By pressing **Restore Default** all locally stored entries will be removed.

CHECK DEBUG SETTINGS

When opening a workspace created by an earlier version of **Atollic TrueSTUDIO**, please check that the correct GDB server is associated to correct debug hardware (JTAG-probe).

The settings are found by selecting **Window, Preferences, Run/Debug, Embedded C/C++ Application, Debug Hardware** menu.

Restore defaults will update to the preinstalled version (if any).



Atollic TrueSTUDIO v7.0 requires that ST-LINK_gdbserver v3.0.0 or newer is used when using an ST-LINK debug probe. Older versions of ST-LINK_gdbserver can not be used.

UPGRADE INFORMATION FOR v8.x USERS

Atollic TrueSTUDIO v8.0 is a major release which contains a new **Atollic ARMTools Toolchain**. The product is still based on the same version of Eclipse and CDT versions as used in **Atollic TrueSTUDIO** v7.x.

Atollic recommends that a new workspace is created for the work done with **Atollic TrueSTUDIO** v8.x. Existing projects should be imported and copied into the new workspace.

The new product includes the following main new features and updates:

- New Atollic ARMTools toolchain
- Product also available as a 64-bit application on the Linux platform.
- IAR Embedded Workbench projects can be imported to TrueSTUDIO projects using the new Project Import Converter.
- The selection to use Newlib or Newlib-nano runtime library has been moved
- ST-LINK serial number can be set in debug configuration making it easier to debug projects when several ST-LINK probes/boards are connected at same time.
- New updated ST-LINK_gdbserver, also built and available for Linux.

If you are updating from an earlier **Atollic TrueSTUDIO** version than v7.1, then also read Upgrade Information for vx.x Users chapters in this **Upgrade Guide**.

Release notes in the README-file contains complete update information.

ARMTOOLS TOOLCHAIN (BUILD 17.03)

The new Atollic ARMTools toolchain is based on ARM/embedded-6-branch revision 245512] + new patches.

Major upgrades:

- Built on new GCC, GDB and Newlib versions
- Newlib-nano is now included in Newlib
- Cortex-M23/M33 support

Please see the product readme file for version information.

NEWLIB OR NEWLIB-NANO SELECTION

The selection to use Newlib or Newlib-nano runtime library has been moved to a **General** node at the top of the **Tool Settings** tab of the **C/C++ Build Settings**.

This will make all tools to use the correct newlib header files. For example when using newlib-nano this will make the reent structure to be significantly smaller.

PREVENT “GCC NOT FOUND IN PATH” ERROR

Some old projects will issue an error in the **Problems** view saying **Program “gcc” not found in PATH**. The error is caused when the project uses a deprecated discovery method setting. The error can be removed by updating **Window Preferences** and **Project Properties** settings.

1. Open **Window, Preferences**. In **Preferences** dialog select **C/C++, Property Pages Settings** and enable checkbox: **Display “Discovery Options” page**.
2. Open **Project, Properties, C/C++ Build, Discovery Options** and disable checkbox: **Automate discovery of paths and symbols**.

ST-LINK GDBSERVER

The ST-LINK_gdbserver software has been redesigned to be platform independent. Currently, builds exists for Windows and Linux, but the Linux version requires ST-LINK/V2.

The new ST-LINK_gdbserver can list the unique serial number of connected ST-LINK devices. This is used in the **Debug Configurations** GUI for ST-LINK which contains a new **Scan** button. When scan is made, all detected ST-LINK serial numbers are listed in a list-box in the **Debug Configurations** GUI. A certain ST-LINK can thus be selected and used when debugging a project.

Monitor commands which are not needed for debugging have been removed. The ST-LINK Utility software from STMicroelectronics can be used for advanced device configuration such as block erase etc.

The latest version of `ST-LinkUpgrade.exe` (firmware version V2.J27) is included. The ST-LinkUpgrade.exe program can be started from the **Help-Tools** menu.

IAR EMBEDDED WORKBENCH PROJECT CONVERTER

How to import IAR Embedded Workbench Projects to TrueSTUDIO projects is described in a new chapter, Importing IAR EWARM Projects, in the **Atollic TrueSTUDIO** User Guide. Please read this section in the User Guide for more information.

UPGRADE INFORMATION FOR v7.x USERS

Atollic TrueSTUDIO v7.1 is a new release and the *Atollic TrueSTUDIO User Guide* is updated with new product information.

It can be mentioned that this version of the product includes the following new features:

- New **Static Stack Analyzer** visualizing Stack Usage and Call Graph
- New **Project Import Converter** supporting conversion of System Workbench for STM32 projects (SW4STM32 AC6) to TrueSTUDIO projects
- **Auto** can be used to select SWV clock when using Segger J-Link
- Updated **Build Analyzer** view to display end address for Memory Regions

Please also see the Release notes in the README-file for complete update information.

Atollic recommends that a new workspace is created for the work done with *Atollic TrueSTUDIO* v7.x. Existing projects should be imported and copied into the new workspace.

If you are updating from an earlier *Atollic TrueSTUDIO* version than v7.0, then also read Upgrade Information for vx.x Users chapters in this *Upgrade Guide*.



The ARMTools Toolchain (Build 16.04-3) used in *Atollic TrueSTUDIO* v7.x is the same as used in *Atollic TrueSTUDIO* v5.5.

UPGRADE INFORMATION FOR v6.0 USERS

Atollic TrueSTUDIO v7.0 is a major new release and is based on new Eclipse Neon.1a version 4.6.1 and CDT version 9.1.0. The new **Atollic TrueSTUDIO** User Guide manual is updated with new product information. Please also see the Release notes in the README-file.

When upgrading from v6.0 to the new version the GUI perspectives must be reset if a workspace created with previous version of **Atollic TrueSTUDIO** is used.

Atollic recommends that a new workspace is created for the work done with **Atollic TrueSTUDIO** v7.x. Existing projects should be imported and copied into the new workspace.

If you are updating from an earlier **Atollic TrueSTUDIO** version than v6.0, then also read upgrade information in next chapters.



The ARMTTools Toolchain (Build 16.04-3) used in **Atollic TrueSTUDIO** v7.0 is the same as used in **Atollic TrueSTUDIO** v5.5.

UPDATED GDB-SERVERS

The ST-LINK_gdbserver v3.0.0 included in **Atollic TrueSTUDIO** v7.0 is updated. Older versions of ST-LINK_gdbserver can not be used with **Atollic TrueSTUDIO** v7.0. This also means that the new ST-LINK_gdbserver can not be used with older versions of **Atollic TrueSTUDIO**.

UPGRADE INFORMATION FOR v5.5 USERS

Atollic TrueSTUDIO v6.0 is a major new release with big changes to the GUI concept and is based on new Eclipse version 4.5.2 and CDT version 8.8.1. The new **Atollic TrueSTUDIO** User Guide manual is updated with new product information. Please also see the Release notes in the README-file.

When upgrading from v5.5 to the new version the GUI perspectives must be reset if a workspace created with previous version of **Atollic TrueSTUDIO** is used.

Atollic recommends that a new workspace is created for the work done with **Atollic TrueSTUDIO** v6.x. Existing projects should be imported and copied into the new workspace.

If you are updating from an earlier **Atollic TrueSTUDIO** version than v5.5, then also read upgrade information in next chapters.



The ARMTTools Toolchain (Build 16.04-3) used in **Atollic TrueSTUDIO** v6.0 is the same as used in **Atollic TrueSTUDIO** v5.5.

UPGRADE INFORMATION FOR v5.0-v5.4

USERS

Atollic TrueSTUDIO v5.5 is a major new release with big changes to the GUI concept. When upgrading from v5.x to the new version the GUI perspectives must be reset if a workspace created with previous version of **Atollic TrueSTUDIO** is used.

Atollic recommends that a new workspace is created for the work done with **Atollic TrueSTUDIO** v5.x. Existing projects should be imported and copied into the new workspace.

ARMTOLS TOOLCHAIN (BUILD 16.04-3)

The new Atollic ARMTols toolchain is based on ARM/embedded-5-branch revision 234589] + new patches.

Major upgrades:

- Built on new GCC, GDB and Newlib versions
- System calls are now compiled into nosys library
- Hybrid combination of libraries nano_c, standard_c++ or vice versa are updated
- Unnecessary Interwork libraries are removed
- Newlib nano is renamed to libc_nano.a
- Cortex-M7 support
- Changed default page size allocation for malloc

BUILT ON NEW GCC, GDB AND NEWLIB VERSIONS

The new ARMTols Toolchain on new gcc, gdb and newlib versions. Please see the product readme file for version information.

NEW NOSYS LIBRARY

In **Atollic TrueSTUDIO** v5.5.0 the handling of system calls in the toolchain has been changed. The system calls are no longer compiled into the libc. Instead they are only located in the separate `nosys` library, `libnosys.a`, which is also bundled with the toolchain.

With a separate `nosys` library there is a need to link also with `--specs=nosys.specs`. **Atollic TrueSTUDIO** v5.5 adds this additional link option automatically when building managed projects and when creating new makefile projects.

When using old makefile projects the makefile needs to be updated using **--specs=nosys.specs** if the project does not contain a specific syscalls file.

The new library libnosys.a does not contain all functions in one single object file so it is no longer necessary to create all syscalls functions when there is a need to update a certain syscalls function. E.g `_write()`.

This change was done to increase our compatibility with different types of projects from different manufacturers who also supplies system call implementations.

Old makefile projects

Old projects which are built with `make` needs an update if the `nosys` library is needed. If system calls (through something like `printf`) is used without supplying system calls files in the application a linker error containing “undefined reference” is received. For example, this is the error message from an application which uses `printf`:

```
undefined reference to `_write'
collect2.exe: error: ld returned 1 exit status
makefile:53: recipe for target 'buildelf' failed
make: *** [buildelf] Error 1
```

To solve this error the `makefile` needs to be updated so linker uses the

--specs=nosys.specs argument to link in the standard system calls as well.

Makefile projects created with the new version of **Atollic TrueSTUDIO** will use the

--specs=nosys.specs option by default.

HYBRID COMBINATION OF NANO_C, STANDARD_C++ LIBRARIES

The implementation of hybrid combination of libraries `nano_c`, `standard_c++` or vice versa has been changed from **Atollic TrueSTUDIO** v5.5.1. The following hybrid combinations are effected:

- Standard C++, Reduced C
- Reduced C++, Standard C

This is handled automatically when using managed file projects.

Old makefile projects which are using any of these hybrid combinations of libraries needs to be updated and use specs files

--specs=nano_c_standard_cpp.specs

or

--specs=standard_c_nano_cpp.specs

UNNECESSARY INTERWORK LIBRARIES REMOVED

There is no need to have interwork libraries for new ARM architectures. Interwork libraries is now only built and included for the ARMv4T architecture which is used by ARM7TDMI, ARM7TDMI-S, ARM9, ARM920T, and ARM922T CPU cores.

NEWLIB NANO LIBRARY (NEW LIBRARY NAME)

The newlib nano library is renamed from `libc_s.a` to `libc_nano.a`

This shall not require any modifications on old managed projects as **Atollic TrueSTUDIO** v5.5 now uses the specs file, `--specs=nano.specs`, when linking managed projects. Note! Also previous version of the Atollic ARM Toolchain has `nano.spec` files included.

Please change old makefile projects to use `libc_nano.a`
E.g. Change option from `-lc_s` to `-lc_nano` or to `-specs=nano.specs`

CORTEX-M7 SUPPORT

The Cortex-M7 architecture is now supported and the `-mcpu=cortex-m7` option is used when building projects made for Cortex-M7 based microcontrollers. Old managed projects will use this option automatically when built with Atollic TrueSTUDIO v5.5. There is also a new version of floating point hardware in Cortex-M7 (FPv5) and both FPv5-sp-d16 (using 32-bit single-precision registers) and FPv5-d16 (using 64-bit double-precision registers) are supported.

Using an older ARMTTools toolchain inside Atollic TrueSTUDIO v5.5

If an older Atollic ARMTTools toolchain is used to build a project inside the new Atollic TrueSTUDIO then there will be a build error. Example:

arm-atollic-eabi-gcc: error: unrecognized argument in option '-mcpu=cortex-m7'

arm-atollic-eabi-gcc: note: valid arguments to '-mcpu=' are: arm1020e arm1020t arm1022e arm1026ej-s arm10e arm10tdmi arm1136j-s arm1136jf-s arm1156t2-s

Please change the Target Settings for the project to use a Cortex-M4 based microcontroller in this case so it can be built with the older toolchain. This will make TrueSTUDIO use option `-mcpu=cortex-m4`. The link script shall not be changed.

Old makefile projects

It is recommended to update old Cortex-M7 projects which are built with make to use the `-mcpu=cortex-m7` option. Please change the `-mcpu` option used for assembler, compiler and linker in the `makefile`.

USING LWIP WITH NEW TOOLCHAIN

The lwIP open source TCP/IP stack has an internal implementation of the `select()` function. This function is also implemented in newlib, which may cause build errors. Please see lwIP documentation on how to resolve this conflict.

MTB TRACING (CORTEX-M0+)

The CoreSight Micro Trace Buffer (MTB) is an optional hardware included on some Cortex-M0+ processor based devices. MTB contains a simple execution trace block which can log trace information in a memory buffer in the processor RAM. The buffer location and size are configurable. The new **MTB Trace Log** view in *Atollic TrueSTUDIO* is used to configure MTB and view instruction trace data from the device.

The new *Atollic TrueSTUDIO* User Guide manual contains a new chapter describing the **MTB Trace Log** view. Please read this section in the User Guide for more information.

PAGE SIZE ALLOCATION FOR MALLOC

The default page size setting for `malloc` has been changed from 4096 bytes to 128 bytes. The setting for a new project uses **`malloc_getpagesize_P=0x80`** instead of **`malloc_getpagesize_P=0x1000`** when building the project. This means that the heap increases in chunks of 128 bytes instead of 4096 bytes.

The page size allocation for `malloc` to be used by the project can be configured in the **Tool Settings** tab in the **Linker Optimization**. Please change the setting here if a page size of 4096 is preferred.

UPGRADE INFORMATION FOR v4.x USERS

Atollic TrueSTUDIO v5.0 is a major new release with big changes to the GUI concept. When upgrading from v4.x to the new version the GUI perspectives must be reset if a workspace created with previous version of **Atollic TrueSTUDIO** is used.

Atollic recommends that a new workspace is created for the work done with **Atollic TrueSTUDIO** v5.x. Existing projects should be imported and copied into the new workspace.

ETM TRACE PORT CONFIGURATION FILE REFERENCE

When Segger J-TRACE probe is used and ETM tracing selected the **Debugger** tab in the Debug Configurations dialog contains a file reference to a trace port configuration file. This file is by default located in the installation of **Atollic TrueSTUDIO**. This means that if such project made with an older **Atollic TrueSTUDIO** version is imported and used in a new **Atollic TrueSTUDIO** version the reference requires that the earlier version also is installed. Please update the reference to point to the ETM trace port configuration file available in the new installation.

Example of location of ETM Trace Port configuration file for STM32F1xx:

C:\Program Files (x86)\Atollic\TrueSTUDIO for ARM Pro

5.0.0\ide\plugins\com.atollic.truestudio.tsp.stm32_1.0.0.201403271711\tsp\etm\stm32f1xx.init



It is recommended to copy the ETM tracing port configuration file to the project and in the Debug Configurations dialog specify that the configuration file located in the project shall be used. With this solution the configuration file will be kept with other files in a project and it will be easier to export/import the project.

UPGRADE INFORMATION FOR v3.x USERS

Atollic TrueSTUDIO v4.0 is a major new release with big changes both to the GUI concept and the Atollic ARMTools tool chain. When upgrading from v3.x to the new version the GUI perspectives must be reset if a workspace created with previous version of **Atollic TrueSTUDIO** is used.

Atollic recommends that a new workspace is created for the work done with **Atollic TrueSTUDIO** v4.1. Existing projects should be imported and copied into the new workspace.

Additional details about product updates are provided below.

USING FPU

The earlier version of Atollic ARM toolchain had a problem with options `-mhard-float` and `-mfloat-abi=hard` for code using floating point variables. Therefore **Atollic TrueSTUDIO V3.x** replaced this option when hard floating point was selected and used the option `-mfloat-abi=softfp`. The ARM VFP hardware is used with `softfp` also but argument passing to functions are not made with VFP registers.

In **Atollic TrueSTUDIO V4.x** the `-mhard-float` option works correctly so now when selecting floating point “**Hardware implementation**” this option is used.

The only problem that can be seen when upgrading is if an old library built with **Atollic TrueSTUDIO** v3.x is used with a project using **Atollic TrueSTUDIO** v4.x. In this case it is best to rebuild the library using hard float. Select **Clean** toolbar button and **Rebuild** toolbar button on your project.

If the library not is available select to use “Mix HW/SW implementation when building the project and linking with the old library to make the register passing to work. Also for makefile projects the options `-mhard-float` and `-mfloat-abi=hard` can now be used as `LINKER_FLAGS` and `COMPILER_FLAGS` options when the FPU shall be used.

LINKER SCRIPT UPDATE

It is not necessary to change the linker script in old projects but there has been a minor update in the linker script files generated in **Atollic TrueSTUDIO** v4.x. In earlier version constant data “`*(.rodata*)`” was placed in `.text` section. Now constants, strings etc. are placed in an own output section called “`.rodata`”.

If `rodata` is placed in `.text` section as before the program executed correctly but in some circumstances the debugger could display wrong information because `gdb` handled the `const` symbol addresses in wrong way. Example of new implementation:

```
/* Constant data goes into FLASH */
.rodata :
{
    . = ALIGN(4);
    *(.rodata)          /* .rodata sections (constants,
strings, etc.) */
    *(.rodata*)         /* .rodata* sections (constants,
strings, etc.) */
    . = ALIGN(4);
} >FLASH
```

UPGRADE INFORMATION FOR v2.x USERS

Some additional linker script changes are needed for users of older versions of **Atollic TrueSTUDIO**.

It is therefore highly recommended to use the linker script wizard to generate a new linker script for the target.

Any customizations to the linker script will need to be transferred to the new linker script.

Use the linker script wizard to generate a new linker script by doing the following:

In the menu select **File, New, Linker script**. In the linker Script wizard, select the project folder using the **Browse** button.

Next fill in the target board and/or MCU and code location.

It is possible to customize the filename to anything preferred.

Click **Finish** to generate the linker script

After creating the linker script, the linker needs to be told that it should use the new script when linking.

Do this by right-clicking on the project in the **Project Explorer** and select **Properties**.

Select **C/C++ Build, Settings** and then select the **Tool Settings** tab to the right.

Expand and select the **C Linker, General** node.

Edit the Linker script field manually or press the browse button to locate the new script.