

MMWAVE MCUPLUS SDK Release Notes



Product Release 4.7.1.4

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1. Introduction

The mmWave mcuplus SDK enables the development of millimeter wave (mmWave) radar applications using TI mmWave sensors (see [list of supported Platform/Devices](#)). The SDK provides foundational components which will facilitate end users to focus on their applications. In addition, it provides few demo applications which will serve as a guide for integrating the SDK into end-user mmWave application. See what SDK components are supported by each device in the [Device-Specific Support](#) section.

Key mmWave SDK features:

- Building blocks
 - Layered approach to programming analog front end
- Demonstrations and examples
 - FreeRTOS based
 - Out of box demo with easy configurability via TI cloud based GUI
 - Representation of "point cloud" and benchmarking data from demo via GUI
 - Profiles tuned to common end user scenarios such as Range, Range resolution, Velocity, Velocity resolution.
- Documentation

mmWave SDK works along with the following external tools:

- Host tools including Pin Mux, Flashing utilities
- Code Composer Studio™ IDE for RTOS development



NOTICE: This software product is used to configure TI's mmWave devices, including RF emissions parameters for such devices. Note that many countries or regions impose regulations governing RF emissions. Users are responsible for understanding local RF emission regulations and operating the product within those regulations.

2. Release overview

2.1. What is new

- Support for devices mentioned in the [Platform and Device Support](#) section
- See what SDK components are supported by each device in the [Device-Specific Support](#) section
- New features can be found in [New Features](#) section.
- Tools update

2.2. Platform and Device Support

The devices and platforms supported with this release include:

Supported Devices	Supported EVM
AWR294X ES2.0	AWR294X EVM
AWR2544 ES1.0	AWR2544 EVM
AWR2X44P ¹	AWR2944P EVM AWR2E44P EVM
AWR2E44ECO ¹ AWR2944ECO ¹	AWR2E44P EVM AWR2944P EVM
AWR2E44LC ¹ AWR2944LC ¹	AWR2E44P EVM AWR2944P EVM

¹ These devices have an M4 core in DSP Subsystem which is referred as DSS_CM4 or HWA_CM4 interchangeably.



Silicon versions other than the ones in the table above are not supported.



This release of mmWave mcuplus SDK supports the foundation components for the devices mentioned in the table above. At system level, the mmWave SOC/EVM may interface with other TI ecosystem SOC/Launchpads/EVMs and software for these other devices will not be a part of the mmWave mcuplus SDK foundation components.

2.3. Component versions

Components inside mmwave_mcuplus_sdk that have their own versions are shown below.

Component	Version	Type	Comment
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mmwave sdk	4.7.1.4	Source and Binary	Overall package release version
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2.4. Tools dependency

For building and using mmwave sdk the following tool versions are needed.

Tool	Version	Download link
CCS	20.1.0	Download Link
MCU PLUS SDK (AWR294X) ^{1,2,3}	10.01.00.04	Included in mmwave mcuplus sdk installer
MCU PLUS SDK (AWR2544) ^{1,2}	10.01.00.05	Included in mmwave mcuplus sdk installer
MCU PLUS SDK (AWR2X44P / AWR2X44ECO) ^{1, 2}	10.01.00.04	Included in mmwave mcuplus sdk installer
SYSCONFIG	1.23.0	Download Link (Need to be installed separately).
TI ARM CLANG	4.0.2.LTS	Installed with CCS20.1.0 installer
TI CGT compiler	8.3.13	Installed with CCS20.1.0 installer
C66x DSPLIB	3.4.0.0	Included in mmwave mcuplus sdk installer
C66x MATHLIB (little-endian, elf/coff format)	3.1.2.1	Included in mmwave mcuplus sdk installer
mmWave Device Firmware Package (DFP - xWR254x, xWR294x, xWR2x4xP, xWR2x4xECO, xWR2x4xLC)	02.04.18.01	Included in mmwave mcuplus sdk installer (includes RSS firmware and mmwavelink library) RadarSS Firmware Patch md5sum: fa7154c43221e69ad31ae87886ead57d *xwr29xx_radarss_metarprc.bin 9139f88c9f8ee3eca7a71add370a241c *xwr25xx_radarss_metarprc.bin 881bae88eb5c5df48018597a092915cb *xwr2x4xp_radarss_metarprc.bin
OpenSSL (optional)	1.1.1 or above	Needed for signing secondary bootloader image, required only if you want to build the SBL dependency images from scratch
TI Emulators package	Latest	Upgrade to the latest using CCS update process (Contact TI Representative for latest version)
Pinmux tool (optional)	Latest	Contact TI Representative for latest tool
Doxygen (optional)	1.8.11	Only needed if regenerating doxygen docs
Graphviz (optional)	2.36.0 (20140111.2315)	Only needed if regenerating doxygen docs

¹ To re-build driver level example applications, SysConfig is expected to be installed at "C:\ti\" in Windows and at "/home/ti\" in Linux machine.

² Currently hsmrt is not available in mcu_plus_sdk. Without valid hsmrt, features for HS-SE devices such as secure boot, crypto examples will not work / execute. User needs to replace source/drivers/hsmclient/soc/<device>/hsmRtlmg.h with valid image. Get the TIFS package for the device from MySecure portal that has hsmrt to be loaded on HS-SE device. For further information please contact your TI representative or refer <https://e2e.ti.com/support/sensors-group/sensors/f/sensors-forum>

³ Excluded SDL libraries and examples from mcu_plus_sdk. Refer [SDK Version 04.04.00.01](#) for SDL.

The following tools are needed at runtime

Runtime tool	Version	Link
mmWave Demo Visualizer (AWR2544) Supported for AWR2544	Latest	Flashing, configuring mmWave sensors and visualizing the 1D FFT data generated by the mmWave SDK demo. https://www.ti.com/tool/download/MMWAVE-MCUPLUS-SDK User Guide: mmwave_mcuplus_sdk_<ver>/mmwave_mcuplus_sdk_<ver>/docs/mmWave_Demo_Visualizer_UserGuide.pdf
mmWave Demo Visualizer Supported for AWR294X, AWR2x44P, AWR2x44ECO, AWR2x44LC	Latest	TI Gallery APP for configuring mmWave sensors and visualizing the point cloud objects generated by the mmWave SDK demo. https://dev.ti.com/gallery/view/mmwave/mmWave_Demo_Visualizer/

2.5. Licensing

Please refer to the mmwave_mcuplus_sdk_software_manifest.html, which outlines the licensing status for mmwave_mcuplus_sdk package.

3. Release content



3.1. Change Summary

3.1.1. New Features

Feature	Module	Device
Out of Box (OOB DDM) demo executing on R5F, C66 and M4 core.	OOB Demo (DDM)	AWR2x44ECO
Out of Box (OOB DDM) demo executing on R5F, C66 and M4 core with ethernet streaming	OOB Demo (DDM)	AWR2x44ECO
Doppler DPU (DDM) optimizations for timing: <ul style="list-style-type: none"> 1. Transpose EDMA for Demodulation is removed, instead one HWA paramset for each Rx channel is used. 2. Demodulation, Azimuth FFT, Doppler CFAR and Local Max outputs being kept in HWA memory banks instead of copying to L2. 	Doppler DPU (DDM)	AWR2x44P, AWR2x44ECO, AWR2x44LC, AWR294x
Range DPU (DDM) provides two new features for better timing: <ul style="list-style-type: none"> 1. Real 2X mode for DC estimation, compensation and Interference Statistics 2. Using previous frame's DC estimate's average 	Range DPU (DDM)	AWR2x44P, AWR2x44ECO, AWR2x44LC, AWR294x
IPC Driver updates to enable custom config for compatibility with MCAL IPC CDD	ipc_notify driver	AWR2x44P, AWR294x
Added benchmark examples (Coremark Benchmark, Dhrystone Benchmark)	Example	AWR294x, AWR2544, AWR2x44P
Enable pinmux configurations for pins (FRAME_START, SYNC_OUT, SYNC_IN, PMIC_CLKOUT, MCU_CLKOUT, ADC_VALID, CHIRP_START, CHIRP_END) through Sysconfig	Sysconfig	AWR294x, AWR2544, AWR2x44P
Support configuration of PER PLL as clock source for Ethernet interface	SOC, Bootloader	AWR2544, AWR2x44P
Added handlers to data abort, prefetch abort and undefined exceptions for R5F No-RTOS, FreeRTOS to provide logs and information regarding cause of exception.	DPL (NoRTOS, FreeRTOS)	AWR294x, AWR2544, AWR2x44P
Enabled CFAR-CA(SO) option from the CLI to improve the overall execution timing	Doppler DPU (DDM), Range CFAR DPU (DDM), OOB Demo (DDM)	AWR2x44P, AWR2x44ECO, AWR2x44LC, AWR294x
Enabled compile time option to execute AoA elevation processing on R5F or DSP	OOB Demo (DDM)	AWR2x44P, AWR2x44ECO
Out of Box (OOB TDM) demo executing on R5F and C66 core.	OOB Demo (TDM)	AWR2x44ECO
Out of Box (OOB DDM) demo executing on R5F and M4 core.	OOB Demo (DDM)	AWR2x44LC
Deprecated AWR2944LC (device based out of AWR294x die) support	Drivers, DPL, OOB Demo, DPU, Documentation	AWR2944LC
Enabled direct interrupt configuration for DSP (C66 core)	DPL, C66 drivers	AWR294x, AWR2x44P
Modified SBL L3 scratch memory from (0x88100000 - 0x88200000) to (0x88000000 - 0x88100000)	SBL	AWR2x44P
Added CSI-TX driver with reference examples	CSITX, CBUFF Drivers	AWR2544
Per PLL clock configuration is updated to 1200 MHz to support CSITX operating at 600 Mbps per lane	SBL, Bootloader, SOC Drivers	AWR2544
Out of Box (OOB) demo executing on R5F core (streaming RAW ADC data over CSITX interface)	OOB Demo	AWR2544
Added MUSIC library with reference example MUSIC (Multiple Signal Classification) algorithm is a high-resolution eigen-based method to estimate the directions of arrival (DOA) of signals impinging on an antenna array.	Algo	AWR294x, AWR2x44P
Added DML library with reference example Deterministic Maximum Likelihood (DML) is a high-resolution algorithm based on Maximum Likelihood Estimation, used to estimate Direction of Arrival (DOA) of signals.	Algo	AWR294x, AWR2x44P
Added EDMA negative index transfer example	Example (EDMA)	AWR294x, AWR2x44P, AWR2544
Added EDMA error handling with an example	EDMA	AWR294x, AWR2x44P, AWR2544
Added application image decryption feature in SBL ¹	SBL_QSPI	AWR294x, AWR2x44P, AWR2544
Updated DPEDMA library to support data transfer with signed index	DPEDMA	AWR294x, AWR2x44P, AWR2544
Added TDM Enet OOB Demo	OOB Demo	AWR2x44P, AWR2x44ECO

¹ This is applicable only for secure (HS-SE) devices.

3.1.2. Fixes

Jira	Bug fix	Module	Device
MMWSDK-3471	Data abort with ENET DMA PKT MEMPOOL allocated in MSS_L2	ENET	AWR2x44P, AWR294x, AWR2544
MMWSDK-3502	CBUFF SW trigger example generating error interrupt	CBUFF	AWR2x44P, AWR294x, AWR2544
MMWSDK-3868	sbl_can_uniflash application debug build not working	SBL	AWR2x44P
MMWSDK-3305	CBUFF driver failure when configured to use the second lane only	CBUFF	AWR2x44P, AWR294x, AWR2544
MMWSDK-3706	SBL_QSPI_ENET not loading OOB demo application	SBL_QSPI_ENET	AWR2x44P, AWR294x, AWR2544
MMWSDK-4223	HWA Driver CFAR detection threshold is programmed to wrong register	HWA	AWR2x44P, AWR294x
MMWSDK-3159	GPADC code has wrong logic for the debug assert	GPADC	AWR2x44P, AWR294x, AWR2544
MMWSDK-4169	SBL_UART: issue in loading application	SBL_UART	AWR2544
MMWSDK-3562	Enable Runtime phase shifter configuration	MMWAVE	AWR2x44P, AWR294x, AWR2544
MMWSDK-3211	Enable ADV_ESMFAULT reporting in async event handler	MMWAVE	AWR2x44P, AWR294x, AWR2544
MMWSDK-4187	Fix elevation angle processing on R5F	DPC	AWR2x44P
MMWSDK-4281	Remove invalid register writes in HWA close API	HWA	AWR2x44P, AWR294x
MMWSDK-4223	HWA CFAR detection constant threshold is programmed to wrong register	HWA	AWR2x44P, AWR294x
MMWSDK-3510	No mux selection option to select PER PLL as CPSW clock source	SOC	AWR2x44P, AWR2544
MMWSDK-3484	Occasional large samples in Rx1 using out of box demo in 2X mode	OOB_Demo	AWR2544

3.2. Migration notes from Previous SDK versions

This section describes the changes that are relevant for users migrating to mmWave mcuplus SDK 4.7 release from previous release.

Summary	Component (s)	Affected SoC	Affected SDK Version	Behavior of impact
Platform linker scripts of AWR2x44P are moved to mmwave_mcuplus_sdk_<ver>/mmwave_mcuplus_sdk_<ver>/ti/platform/awr2x44x/awr2x44P	Applications using platform linker file	AWR2x44P	4.7.0.1	Change platform linker file path in the common makefile
XDC Tools are not available with CCS20.0.1, so gmake is obtained from CCS utils	Makefiles	AWR2x44P, AWR294x, AWR2544	4.7.0.1	User can expect build issues, which can be resolved by changing single quotes to double quotes, in build commands, or vice versa
RPRC generation tool is changed	All examples	AWR2x44P, AWR294x, AWR2544	4.7.0.1	No user impact but user needs to ensure that C66 linker sections have palign attribute with size of 8 bytes. (Refer C66 linker files in mmwave_mcuplus_sdk)
fastRangeProcCfg CLI is replaced with rangeProcCfg	OOB Demo (DDM)	AWR2x44P, AWR294x	4.7.0.1	Refer rangeProcCfg CLI command description in the SDK User Guide. FastRangeProc is now configurable as rangeProcChain parameter value 2 in rangeProcCfg command.
cfarCfg CLI also supports CFAR-CASO average mode	OOB Demo (DDM)	AWR2x44P, AWR294x	4.7.0.1	Refer cfarCfg CLI command description in the SDK User Guide.
SBL scratch memory is updated from (0x88100000 - 0x88200000) to (0x88000000 - 0x88100000) to support AWR2x44LC device	SBL	AWR2x44P	4.7.0.1	User needs to ensure that no load section is placed in (0x88000000 - 0x88100000)
HwiP API changes for C66 core specifically HwiP_enableInt, HwiP_disableInt, HwiP_restoreInt, HwiP_clearInt, HwiP_post	DPL (C66x)	AWR294x, AWR2x44P	4.7.0.1	Earlier these APIs used to take interrupt number but now take pointer to HwiP Object

3.3. Known Issues

3.3.1. mmWave Suite/Demos Known Issues

The following issues are known at the time of this release.

Issue Type	Key	Summary	Platform	Comments
Bug	MMWSOC_AWR2944P-498	Local Maxima Engine Output does not match with the Matlab expected results in threshold mode '10' and '01'.	AWR2x44P/ AWR294X	Workaround: Use Local Max Engine in '00' or '11' mode.
Bug	MMWSOC_AWR2944P-504	Issue in connecting to C66 core from CCS.	AWR2x44P	This issue occurs intermittently.
Bug	MMWSDK-3283	Enet scatter-gather phy loopback example is not working in release build.	AWR294x / AWR2x44P	Workaround: Use debug build for phy loopback.



Bug	MMWSDK-3169	BSS Logger enabled OOB not working when flashed	AWR2544	Workaround: 1. Flash CCS Debug image 2. Load BSS Logger enabled OOB executable through CCS
Bug	MMWSDK-3069	Run time calibration is disabled. This is done because bookkeeping registers (frame count, chirp count) get updated possibly due to calibration chirps.	AWR2544	This update in bookkeeping registers results in wrong Ethernet packet header value.
Bug	MMWSDK-2475	minmaxFlag in aoaprocs test case is not enabled	AWR294x	The same functionality has been tested in the objectdetection test case
Bug	MMWSOC_AWR2944P-506	CFAR OS takes significantly more time than CFAR CA. This is due to additional RTL path taking 80 cycles more in every iteration.	AWR294x, AWR2x44P	Workaround: None
Bug	MMWSDK-3470	DP83TG720 Phy is always in linkwait state. It does not go to linked state after connecting the cable.	AWR2x44P	Workaround: None

3.3.2. Limitations

3.3.2.1. mmWave Suite/Demos Limitations

Some of these limitations are captured in the "known issues" list shown in previous section.

SI No	Limitation	Platform	Workaround
1	Random spikes are observed in FFT data for RX0 in Real2X mode.	AWR2544	Enable HWA dynamic clock gating to suppress the issue. Refer Errata document (AWR2544 Errata) for more details.
2	SBL_QSPI_ENET: Limited memory section for SBL code section to execute ethernet stack.	AWR2x44P / AWR294x / AWR2544	Workaround: <ul style="list-style-type: none"> Linker file creates a memory section to place obj files and CPSW libraries which can be overwritten. enet-cpsw release library is linked for both release and debug builds
3	Only one core can have mailbox communication with BSS for a boot. By default, MSS is configured to communicate with BSS in SBL.	AWR2x44P	To enable DSS communication with BSS, update SBL mcu_plus_sdk_aws2x44p_<version>/source/drivers/soc/soc_rcm.c (SOC_rcmPopulateBSSControl). Refer DFP ICD for more details.
4	Uniflash GUI Tool cannot be used for flashing AWR2x44P and AWR2544 device.	AWR2x44P / AWR2544	Use the python script for flashing SBL and appimage.
5	No synchronization between HWA populated Radar cube and CPSW transferring 1D-FFT Data.	AWR2544	Triggering of first CPSW transfer is configurable via procChain CLI.
6	Simultaneous LVDS raw data transfer and 1d-FFT data on ethernet interface does not work for few profile configurations. This is because LVDS transfer needs longer chirp idle time while Ethernet transfers data at 1Gbps.	AWR2544	Configure Per-ADPLL to higher rate.
7	ADC data transfer rate is limited by HSI Clock configured in SDK (1200MHz which is 600 Mbps); ensure the generated data per chirp can be transferred within chirp idle time.	AWR2544	Ensure that Chirp idle time > ADC data per chirp / 500 Mbps where ADC data per chirp = Number of ADC samples * Number of Rx * 16 bits.
8	Ethernet data capture and validation is supported only on Linux PC.	AWR2544	No workaround.
9	Ethernet Streaming for DDM demo is not available.	AWR294x	No workaround.
10	CQ Data streaming for AWR294x is not tested as the OOB doesn't support continuous mode.	AWR294x	No workaround.
11	In DDM Chain, point cloud data of only limited number of objects can be exported due to UART baudrate constraints.	AWR294x	To transmit more objects, decrease the fps.
12	Enabling Host Receive Timestamp is supported in SysConfig generation, but this feature needs to be disabled for all the Enet examples due to CPSW IP limitation (Corruption with Host Timestamps enabled causes CPSW Port Lockup).	AWR294X / AWR2544 / AWR2x44P	Example syscfg update To disable this feature, uncheck 'Enable Host Receive Timestamp' under CPTS Configuration in example syscfg-gui.
13	enet_layer2_multi_channel example is deprecated	AWR294x	gtp example can be used for CPTS functionality
14	Ethernet packet drop with windows environment	AWR294X / AWR2544 / AWR2x44P	Use Linux machine for packet capture
15	LVDS Streaming is disabled in OOB due to memory limitation	AWR2544	User can enable this in PM demo by enabling compile flag define LVDS_STREAM in mmwave_mcuplus_sdk_<ver>/mmwave_mcuplus_sdk_<ver>/ti/demo/awr2544/mmwave_mss_pm.mak
16	ROV feature of CCS Theia is not tested	AWR294X / AWR2544 / AWR2x44P	No workaround.

4. Test reports

Results of the unit tests can be found in the mmwave_mcuplus_sdk_<ver>/ti/docs/testlogs folder.

5. Installation instructions

mmwave_mcuplus_sdk installer is available as a Windows Installer and a Linux installer.



- **mmwave_mcuplus_sdk_<version>-Windows-x86-Install.exe:** Windows installer verified on Windows 10 machines
- **mmwave_mcuplus_sdk_<version>-Linux-x86-Install.bin:** Linux installer verified on Ubuntu 18.04 64 bit machines.

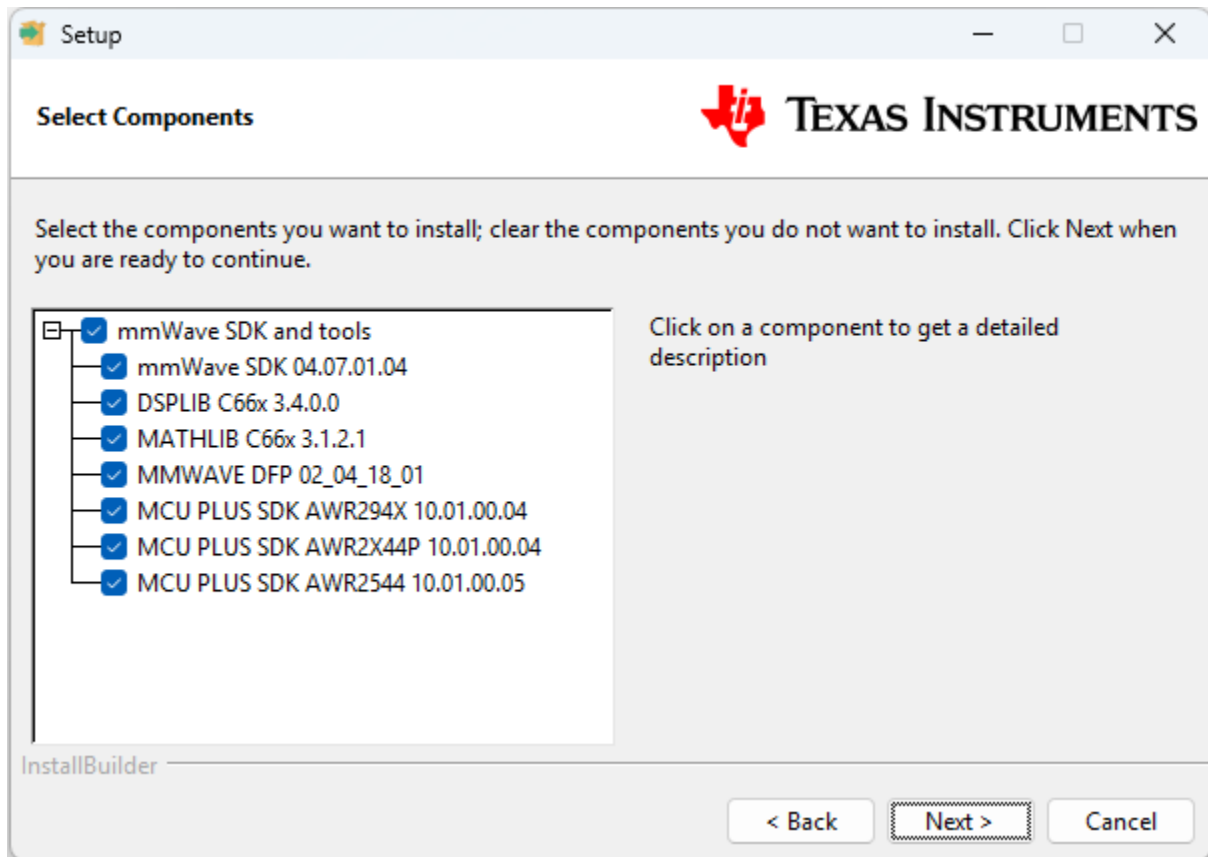
5.1. Installation in GUI mode

Depending on your development environment run the appropriate installer

- In Windows environment, double clicking the Windows installer from Windows explorer should start the installation process
- If in Linux environment,
 - On 64-bit machines: Since mmwave_mcuplus_sdk_<version>-Linux-x86-Install.bin is a 32-bit executable, install modules that allows Linux 32bit binaries to execute: "sudo dpkg --add-architecture i386"
 - Enable execute permission for the Linux installer by running "chmod +x mmwave_mcuplus_sdk_<version>-Linux-x86-Install.bin" command
 - Run the installer using "./mmwave_mcuplus_sdk_<version>-Linux-x86-Install.bin" command
 - On 64-bit machines if the GUI does not show up you may need to install additional packages: "sudo apt-get install libc6:i386 libgtk2.0-0:i386 libxst6:i386"

Installation steps:

- **Choose Destination Location:** Select the folder to install (default is c:\ti\mmwave_mcuplus_sdk_<version> on windows and ~/ti/mmwave_mcuplus_sdk_<version> on linux). **The installation folder selected should not have spaces in its full path.**
- **Select Components:** The installer includes all the tools needed for building the mmWave mcuplus SDK. You should see a screen like below (except that each component will also have version information appended). The only reason to deselect a tool is if the exact tool version is already installed in the destination folder.



- Review installation decisions
- Ready to install
- Once installation starts all the selected components will be installed (if a component with the same version exists in the destination folder it will be overwritten)
- Installation complete

5.2. Installation in unattended command line mode




The installers can be run in command line mode without user intervention

- In Windows environment
 - Run the installer using "mmwave_mcuplus_sdk_<version>-Windows-x86-Install.exe --prefix <installation folder> --mode unattended" command. This will install all the components in the installer.

















- Please note that even though the command may finish immediately it takes sometime for all the folders to show up in the destination folder (double check if you have the folder structure in "Post Installation" section before proceeding)
- For command line help including information about selective installation of components run the following command "mmwave_mcuplus_sdk_<version>-Windows-x86-Install.exe --help"
- In Linux environment:
 - On 64-bit machines: Since mmwave_mcuplus_sdk_<version>-Linux-x86-Install.bin is a 32-bit executable, install modules that allows Linux 32bit binaries to execute: "sudo dpkg --add-architecture i386"
 - Enable execute permission for the Linux installer by running "chmod +x mmwave_mcuplus_sdk_<version>-Linux-x86-Install.bin" command
 - Run the installer using ". /mmwave_mcuplus_sdk_<version>-Linux-x86-Install.bin --prefix <installation folder> --mode unattended" command. This will install all the components in the installer.
 - For command line help including information about selective installation of components run the following command ". /mmwave_mcuplus_sdk_<version>-Linux-x86-Install.bin --help"

5.3. Post Installation

After the installation is complete the following folder structure is expected in the installation folder (except that each component will have appropriate version number in place of the VERSION placeholder shown below)

 dsplib_c66x_[ver]	13-11-2024 11:30 AM	File folder
 mathlib_c66x_[ver]	13-11-2024 11:31 AM	File folder
 mcu_plus_sdk_awr2x44p_[ver]	13-11-2024 11:34 AM	File folder
 mcu_plus_sdk_awr294x_[ver]	13-11-2024 11:32 AM	File folder
 mcu_plus_sdk_awr2544_[ver]	13-11-2024 11:35 AM	File folder
 mmwave_dfp_[ver]	13-11-2024 11:31 AM	File folder
 mmwave_mcuplus_sdk_[ver]	13-11-2024 11:28 AM	File folder

Under the mmwave_mcuplus_sdk <ver> folder you should have the following directory structure.

▼  mmwave_mcuplus_sdk_[ver]
>  .metadata
>  docs
▼  scripts
 unix
 windows
▼  ti
>  alg
 board
 common
>  control
>  datapath
>  demo
>  platform
>  utils
>  tools

6. Device-Specific Support

The current release of mmwave SDK contains support for the following components

Component		AWR294X EVM	AWR2544 EVM	AWR2x44LC EVM	AWR2x44P / AWR2x44ECO EVM
Control	Datapath Manager (dpm)	X			X
	mmwave High Level API (mmwave)	X	X	X	X
Datapath	RangeProc DPU	X			X (R5F and C66)
	RangeProc DDMA DPU	X (C66 Only)		X (M4 Only)	X (M4 and C66)
	RangeprocReal2x DPU		X		

	Doppler DPU	X			X (R5F and C66)
	Doppler DDMA DPU	X (C66 Only)		X (M4 Only)	X (M4 and C66)
	CFAR DPU	X			X (R5F and C66)
	RangecfarProc DDMA DPU	X (C66 Only)		X (M4 Only)	X (M4 and C66)
	AoA DPU	X			X (R5F and C66)
	Datapath EDMA	X	X	X	X
	Object Detection DPC	X			X
	Object Detection DDMA DPC	X (C66 Only)		X	X
Alg	mmwavelib	X	X		
	Group Tracking (gtrack)	X			X
Utilities	Command Line Interface (CLI)	X	X	X	X
	CBUFF Streaming + HSI header	X	X	X	X
	Mailbox driver test	X	X		X
	MSS VMON self-test	X	X		X
	Math Utilities (mathutils)	X	X	X	X
	Test Logger (testlogger)	X	X		X
	CCS Debug Utility (ccsdebug)	X	X	X	X
Tools	Binaries for appimage flashing	X	X	X	X
Demo	OOB Demo TDM	X	X		X
	OOB Demo DDM	X	X	X	X
	Ethernet-based streaming DDM		X		X
	Ethernet-based streaming TDM	X	X		X
	LVDS streaming	X	X	X	X
	BSS Logging		X		



AWR2x44ECO and AWR2x44LC uses the same libraries as AWR2x44P with the device name awr2x44P.

7. Package Contents

The mmwave mcuplus sdk release package contains the following major components/folders.

7.1. Control

Control modules can be found under mmwave_mcuplus_sdk_<ver>/ti/control folder. Content of each of the control module is shown below

Component	Source & Prebuilt Library	API Document (doxygen)	Unittest (source & prebuilt binary)
datapath manager (dpm) ¹	X	X	X
mmwave high level api	X	X	X

¹ Applicable for AWR294x and AWR2x44P (TDM).

7.2. Datapath



Datapath modules can be found under mmwave_mcuplus_sdk_<ver>/ti/datapath folder. Content of each of the datapath module is shown below

Component	Source & Prebuilt Library	API Document (doxygen)	Unittest (source & prebuilt binary)
RangeProc DPU	X	X	X
RangeProc DDMA DPU	X (C66 Only)	X	X (C66 Only)
Doppler DPU	X	X	X
Doppler DDMA DPU	X (C66 Only)	X	X (C66 Only)
CFAR DPU	X	X	X
RangeCFARProc DDMA DPU	X (C66 Only)	X	X (C66 Only)
AoA DPU	X	X	X
Datapath EDMA	X	X	
Object Detection DPC	X	X	X
Object Detection DDMA DPC	X (C66 Only)	X	X (C66 Only)
RangeProcReal2x	X	X	X

Note:

1. No pre-built library for Object Detection DPC.
2. For AWR2x44P, datapath libs and tests are supported for both M4 and C66 core.
3. To run Object Detection DDMA DPC test on AWR2X44P, load two binaries that is, *.xe66 and *.xem4 on C66xx_DSP and Cortex_M4_1 respectively and then run both the cores.

7.3. Demos

Demos can be found under mmwave_mcuplus_sdk_<ver>/ti/demo/<platform>. The following demos are included in the mmwave sdk package. Details on running demos can be found in the mmwave_mcuplus_sdk_user_guide.

Component	Source & Prebuilt Binary	Demo document (doxygen)	Demo GUI
mmw	X	X	X
power optimization ¹	X	X	

¹power optimization demo is only for AWR294X platform.

7.4. Misc folders

Following folders are also part of mmwave_mcuplus_sdk_<ver>/ti folder.

- common: Common header files needed across all components.
- platform: platform specific files.
- utility: Contains
 - cli which is the cli helper utility used by the demos.
 - mathutils is used to perform some common operations such as log2, rounding, saturation based on the core they need to run on (R5F, C66x)
 - testlogger which is the helper utility for driver unit tests
 - ccsdebug which is a utility that can be flashed on QSPI, and will loop forever. Meanwhile, CCS can be attached and developers can download the application which needs to be debugged
 - test contains below utilities :
 - cbuff_stream application streams raw ADC data over LVDS interface
 - mailbox driver test application issues version command to BSS
 - MSS VMON self-test application preforms voltage monitor self-tests and verifies the ESM interrupt
 - PMIC Read Write application.

7.5. Scripts

Build scripts can be found in `mmwave_mcuplus_sdk_<ver>/scripts` folder. Build instructions can be found in `mmwave_mcuplus_sdk_user_guide`.

7.6. Tools

Dependencies needed for a successful flashing of binary images are located in `mmwave_mcuplus_sdk_<ver>/tools`. The User Guide details the steps for flashing the metaimages.

7.7. Docs

`mmwave_mcuplus_sdk_<ver>/docs` folder contains important documents related to the release such as

- `mmwave_mcuplus_sdk_software_manifest.html`: Software Manifest
- `mmwave_mcuplus_sdk_release_notes.pdf`: Release Notes (this document)
- `mmwave_mcuplus_sdk_user_guide.pdf`: User guide
- `mmwave_sdk_module_documentation.html`: Links to individual module's documentation
- `testlogs`: Unit test logs for mmWave SDK unit tests

`mmwave_mcuplus_sdk_<ver>/docs/testlogs` folder contains test results for each components in the package.

8. Related documentation/links

Other than the documents included in the `mmwave_mcuplus_sdk` package the following documents/links are important references.

- SoC links:
 - [Automotive mmWave Sensors](#)
 - [Industrial mmWave Sensors](#)
- Evaluation Modules (EVM) links:
 - [Automotive Evaluation modules](#) (Booster Pack, DEVPACK)
 - [Industrial Evaluation modules](#) (Booster Pack, ISK)

