MMWAVE MCUPLUS SDK Release Notes

Product Release 4.7.0.1

Release Date: Nov 27, 2024

Release Notes Version: 1.0

CONTENTS

TEXAS INSTRUMENTS

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
AWR2944LC [1]	AWR294X EVM
AWR2X44P [1]	AWR2944P EVM AWR2E44P EVM

[1] These devices have an M4 core in DSS 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 SOCs/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
mmwave sdk	4.7.0.1	Source and Binary	Overall package release version

2.4. Tools dependency

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

Tool	Version	Download link
CCS	12.8.1	Download Link
MCU PLUS SDK (AWR294X / AWR2944LC)[1]	10.00.00.07	Included in mmwave mcuplus sdk installer
MCU PLUS SDK (AWR2544)[1]	10.00.00.07	Included in mmwave mcuplus sdk installer
MCU PLUS SDK (AWR2X44P)[1, 2]	10.00.00.07	Included in mmwave mcuplus sdk installer
SYSCONFIG	1.21.0	Download Link (Need to be installed separately).
TI ARM CLANG	3.2.2.LTS	Installed with CCS12.8.1 installer
TI CGT compiler	8.3.12	Installed with CCS12.8.1 installer
XDC	3.62.01.16	Installed with CCS12.8.1 installer
C66x DSPLIB	3.4.0.0	Included in mmwave mcuplussdk installer
C66x MATHLIB (little-endian, elf/coff format)	3.1.2.1	Included in mmwave mcuplussdk installer
mmWave Device Firmware Package (DFP - AWR2544 / AWR294X / AWR2944LC / AWR2x44P)	02.04.17.00	Included in mmwave mcuplus sdk installer (includes RSS firmware and mmwavelink library) **RadarSS Firmware Patch md5sum:** 58e8248729d0465563c75e2fbc5c41ff *xwr29xx_radarss_metarprc.bin 9139f88c9f8ee3eca7a71add370a241c *xwr25xx_radarss_metarprc.bin f022bf2beebd1d9d0540efabad54f8e0 *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>/hsmRtImg.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

⚠️ **AWR2944LC Support**

- Note that mcu_plus_sdk_awr294x_<version> is common for both AWR294x and AWR2944LC (GP). For differences between AWR2944 and AWR2944LC, refer device datasheet or section 3.1.1.1 in SDK user guide (mmwave_mcuplus_sdk_<ver> /mmwave_mcuplus_sdk_<ver>/docs/mmwave_mcuplus_sdk_user_guide.pdf).
- SysConfig Support
  - Currently, latest released SysConfig tool (1.21.0) does not support AWR2944LC device. For SysConfig tool to recognize AWR2944LC device and successfully build applications, follow below steps after mmwave_mcuplus_sdk installation is complete:
    - Copy "devices.json", "gpns.json" files and "AWR2944LC" folder available at: mmwave_mcuplus_sdk_<version> /mmwave_mcuplus_sdk_<version>/tools/sysconfig/ to SYSCFG_PATH/sysconfig_<version>/dist/deviceData to build applications in mmwave_mcuplus_sdk_<version> and mcu_plus_sdk_awr294x_<version>.
  - AWR2944LC does not appear as a separate device on the GUI. Choose Device: AWR2944 and Variant: AWR2944LC.

Welcome To **SysConfig**

⏻ Start a new Design ⓘ

Software Product:	MCU+ SDK for AWR2944 (10.00.00)
Device:	AWR2944
Package:	FCCSP (ALT)
Variant:	AWR2944LC
Context:	r5fss0-0

START
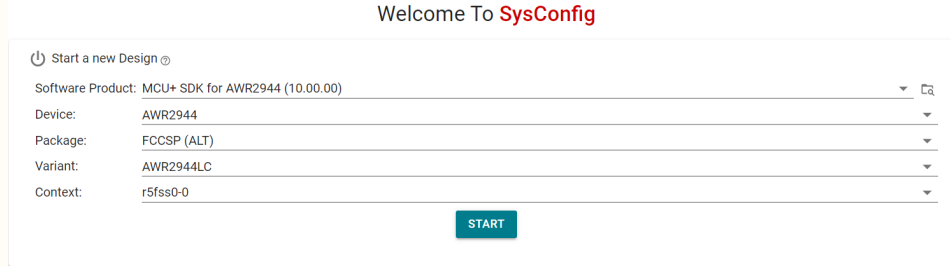
  - CCS installed SysConfig does not support AWR2944LC device by default. Copy "devices.json" file and "AWR2944LC" folder available at: mmwave_mcuplus_sdk_<version>/mmwave_mcuplus_sdk_<version>/tools/sysconfig/ to C:/ti/ccs1281 /ccs/utils/sysconfig_<version>

⚠️ **AWR2X44P Support**

- CCS Support:
  - CCS 12.8.1 version does not detect AWR2X44P by default. Chip Support Package "*AWR2X44P_CSP.zip*" is available at: mmwave_mcuplus_sdk_<version>/mmwave_mcuplus_sdk_<version>/tools
  - Steps to follow:
    - Unzip the CSP.
    - Copy the CSP files to corresponding folders in C:/ti/ccs_<version>/ccs_base.
    - Update the timestamp (<yyyyy><mm><dd><hr><min><sec> format) present at C:/ti/ccs_<version>/ccs_base /common/targetdb/timestamp to successfully import the example CCS project of the new device.
    - Restart the CCS.
  - CCS 20.0 onwards, AWR2x44P device is detected by default. Above steps can be skipped.
- SysConfig Support
  - Currently, latest released SysConfig tool (1.21.0) does not support AWR2X44P device. For SysConfig tool to recognize AWR2X44P device and successfully build applications, follow below steps after mmwave_mcuplus_sdk installation is complete:
    - Copy "devices.json" file and "AWR2X44P" folder available at: mmwave_mcuplus_sdk_<version> /mmwave_mcuplus_sdk_<version>/tools/sysconfig/ to SYSCFG_PATH/sysconfig_<version>/dist/deviceData to build applications in mmwave_mcuplus_sdk_<version> and mcu_plus_sdk_awr2x44p_<version>.
  - CCS installed SysConfig does not supportAWR2X44P device by default. Copy "devices.json", "gpns.json" files and "AWR2944LC" folder available at: mmwave_mcuplus_sdk_<version>/mmwave_mcuplus_sdk_<version>/tools/sysconfig/ to C:/ti/ccs1281/ccs/utils/sysconfig_<version>

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, AWR2944LC, AWR2x44P	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)	AWR2x44P
Out of Box (OOB TDM) demo executing on R5F and C66 core.	OOB Demo (TDM)	AWR2x44P
Out of Box (OOB DDM) demo executing on R5F, C66 and M4 core with ethernet streaming	OOB Demo (DDM)	AWR2x44P
Power saving hooks in TDM and DDM OOB Demos – configurable via CLI • Clock gate unused peripherals • HWA Dynamic clock gating • HWA Clock gate after frame processing • DSP Under clocking • DSP Power Gating • Digital and Analog Temperature Read	OOB Demo (TDM,DDM)	AWR2x44P
Different antenna geometry patterns support – configurable via CLI in TDM and DDM chain.	Datapath (TDM / DDM)	AWR2x44P
Use DSS L2 for DPC scratch buffer instead of MSS L2	Datapath (DDM)	AWR2x44P
Histogram based detection on Doppler - azimuth heatmap	Datapath (DDM)	AWR2x44P/ AWR294x/ AWR2944LC
Re-use radar cube memory to store the detected objects list.	Datapath (DDM)	AWR2x44P/ AWR294x/ AWR2944LC
Re-use L2 scratch buffer to store final detected objects list after intersection with Range CFAR.	Datapath (DDM)	AWR2x44P/ AWR294x/ AWR2944LC
Use EDMA instead of memcpy to move antenna samples of detected objects in Doppler DPU.	Datapath (DDM)	AWR2x44P/ AWR294x/ AWR2944LC
Add support for LOP antenna with array size of upto 64 elements	Datapath (DDM)	AWR2x44P/ AWR294x/ AWR2944LC
Datapath code optimizations to reduce memory footprint • Linked NORTOS and drivers release opt libs for M4 core • Single DPU object instead of subframe array • Disable DebugP by default • HWA lightweight APIs instead of HWA_configCommon • Single hwaParamCfg instead of array- saves stack size	OOB Demo, Datapath (DDM)	AWR2x44P/ AWR294x/ AWR2944LC
DDMA demodulation on HWA with band-wise transpose using EDMA	Datapath (DDM)	AWR294x
Max sub-band computation on HWA.	Datapath (DDM)	AWR294x
gPTP stack integration with OOB (Trigger frames through CPTS timestamp)	OOB Demo	AWR2544
Object parser script for ethernet captured data	Tools	AWR2x44P/ AWR294x
Windows support for python based AWR2544 data parser and decompression library	Tools	AWR2544
mmWave Demo Visualizer Updates • Add support for AWR2x44P • Enable scene selection tab for DDM Chain • Removed support for AM273x device	Demo Visualizer v4.7	AWR2x44P/ AWR294x
Gtrack and DPM library and test	Alg/Control	AWR2x44P
VMON, PMIC, CBUFF Stream, and Mailbox example.	Utils	AWR2x44P
mmWave library and test, and DFP link test	mmWave	AWR2x44P
Platform Support for DPL, Drivers, and SBL in mcu_plus_sdk_awr2x44p_<ver>.	Platform SW	AWR2x44P
Removed infrastructure for AM273x from MCU Plus SDK and mmWave SDK For AM273x SDK, download MMWAVE-MCUPLUS-SDK 04.06.01.02	Platform SW + Application	AM273x
Enabled GENF signal configuration through TSN stack	CPSW	AWR2x44P/ AWR294x/ AWR2544
CRC 64 bit ECMA driver support with example	CRC Driver	AWR2x44P

TEXAS INSTRUMENTS

C66 Context save/restore feature with example	DPL	AWR2x44P/ AWR294x
Autophy driver support (DP83TC812, DP83TG720)	CPSW	AWR2x44P
Autophy driver support (DP83TC812)	CPSW	AWR294x

3.1.2. Fixes

Jira	Bug fix	Module	Device
MMWSDK-3328	TDM Range DPU Test failure - Fixed EDMA data out transfer completion	DPU	AWR294x
MMWSDK-2560	Sensor restart issue fix - call freeDmaChannels on DPC deinit, instead of sensorStop	OOB Demo	AWR294x
MMWSDK-3229	UART Baudrate config fix - round off to nearest integer	UART	AWR294x/ AWR2944LC/ AWR2544
MMWSDK-3043	Fix MibSPI driver with CSHOLD configuration	MibSPI	AWR294x/ AWR2944LC/ AWR2544
MMWSDK-3307	Fixed M4 Example Applications: Debug build	DPL	AWR2944LC
MMWSDK-3312	Fixed Float value printing issue: Debug build	DPL	AWR2944LC
MMWSDK-3329	Fixed CPTS Clock frequency (250MHz)	SOC	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)	Sub-component (s)	Affected SoC	Affected SDK Version	Behavior of impact
'enableMailboxIpc' feature is removed from SysConfig	M4 Tests/ Applications	SysConfig	AWR2944LC	4.6.1.2/ 4.6.2.1	Remove 'ipc.enableMailboxIpc = false' line from .syscfg file or open .syscfg file using syscfg-gui, save and close it.
antGeometryCfg CLI to configure the antenna pattern.	Demo (TDM)	CLI	AWR2x44P / AWR294X	4.6.1.2	Mandatory CLI. For details, refer SDK User guide.
ddmPhaseShiftAntOrder CLI to configure DDM phase shifters.	Demo (DDM)	CLI	AWR2544	4.6.1.2/ 4.6.2.1	Mandatory CLI. For details, refer SDK User guide.

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-3470	DP83TG720 Phy is always in linkwait state. It does not go to linked state after connecting the cable.	AWR2x44P	It does not affect functionality.
Bug	MMWSDK-3471	Enet Streaming: • Placing of ENET DMA PKT MEMPOOL in MSS_L2 throws Data abort. • Post processing script to parse captured data is not available	AWR2x44P	Workaround: • In current demo ENET DMA PKT MEMPOOL is allocated in DSS_L3. • None.
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 aoaproc test case is not enabled	AWR294x	The same functionality has been tested in the objectdetection test case
Bug	MMWSDK-2972	IPC communication between the MCAL CDD IPC (R5F) and MCU+SDK IPC (DSP) does not work due to the differences IPC messaging.	AWR294x	PDK uses mailbox driver which is compatible with MCAL CDD IPC. As part of the migration to MCU Plus SDK mailbox driver is merged to IPC driver which is not compatible with MCAL CDD IPC driver.

Bug	MMWAVESDL-208	SDL: MCRC auto cpu r5f failing	AWR294x	EDMA transfer fails, hence MCRC test fails. It is an example issue not a driver issue.
Bug	MMWAVESDL-209	SDL: sdl_ecc_mss_tptc_r5f failing TPTC single bit and TPTC double bit errors are failing	AWR294x	Workaround: None
Bug	MMWSDK-3482	Spikes in RX1 range FFT output with TDM profile	AWR2544	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.

Sl No	Limitation	Platform	Workaround
1	SBL_QSPI_ENET: Limited memory section for SBL code section to execute ethernet stack.	AWR2x44P	Workaround: • 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
2	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_awr2x44p_<version>/source/drivers/soc/soc_rcm.c (SOC_rcmPopulateBSSControl). Refer DFP ICD for more details.
3	Uniflash GUI Tool cannot be used for flashing AWR2944LC, AWR2x44P and AWR2544 device.	AWR2944LC / AWR2x44P / AWR2544	Use the python script for flashing SBL and appimage.
4	No synchronization between HWA populated Radar cube and CPSW transferring 1D-FFT Data.	AWR2544	Triggering of first CPSW transfer is configurable via procChain CLI.
5	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.
6	ADC data transfer rate is limited by HSI Clock configured in SDK (1000MHz which is 500 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.
7	Ethernet data capture and validation is supported only on Linux PC.	AWR2544	No workaround.
8	Ethernet Streaming for DDM demo is not available.	AWR294x	No workaround.
9	CQ Data streaming for AWR294x is not tested as the OOB doesn't support continuous mode.	AWR294x / AWR2944LC	No workaround.
10	In DDM Chain, point cloud data of only limited number of objects can be exported due to UART baudrate constraints.	AWR294x / AWR2944LC	To transmit more objects, decrease the fps.
11	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.
12	enet_layer2_multi_channel example is deprecated	AWR294x	gptp example can be used for CPTS functionality
13	Ethernet packet drop with windows environment	AWR294X / AWR2544 / AWR2x44P	Use Linux machine for packet capture
14	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/mmw/mmw_mss_pm.mak

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,

TEXAS INSTRUMENTS

- 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 libxtst6: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.
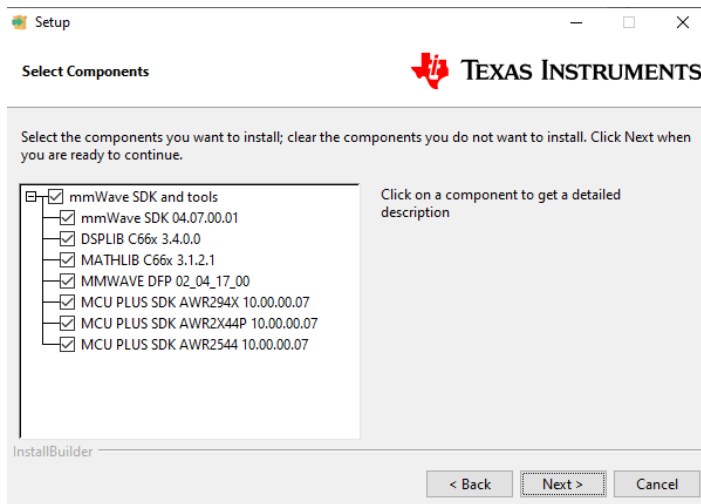
- Review installation decisions
- Ready to install
- Once installation starts all the selected components will be installed (if a component with the same version exists in the destination folder it will be overwritten)
- Installation complete

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	AWR2944LC EVM	AWR2x44P 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		
	LVDS streaming	X	X	X	X
	BSS Logging		X		

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	

TEXAS INSTRUMENTS

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. C66x core based libs and unit tests run on M4 core for AWR2944LC.
3. For AWR2x44P, datapath libs and tests are supported for both M4 and C66 core.
4. To run Object Detection DDMA DPC test on AWR2944LC, load two binaries that is, *.xer5f and *.xem4 on Cortex_R5_0 and Cortex_M4_1 respectively and then run both the cores.
5. 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	

[1]power 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)