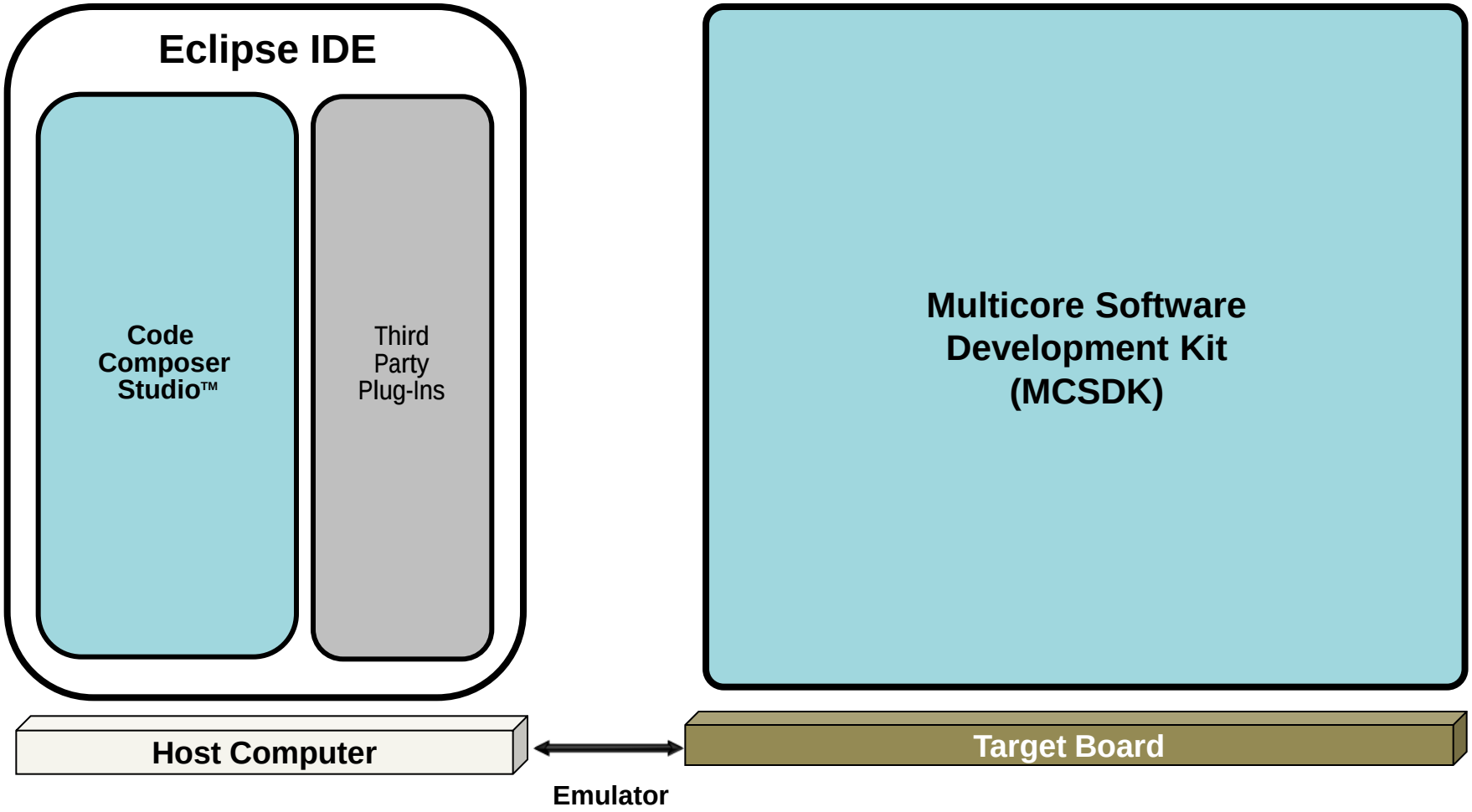
KeyStone Multicore Software Development Ecosystem

Agenda

- Multicore Development Ecosystem
  - Code Composer Studio (CCS)
  - Multicore Software Development Kit (MCSDK)
  - Third Party Software
  - C66x Lite Evaluation Module (EVM)
- Additional Support Resources

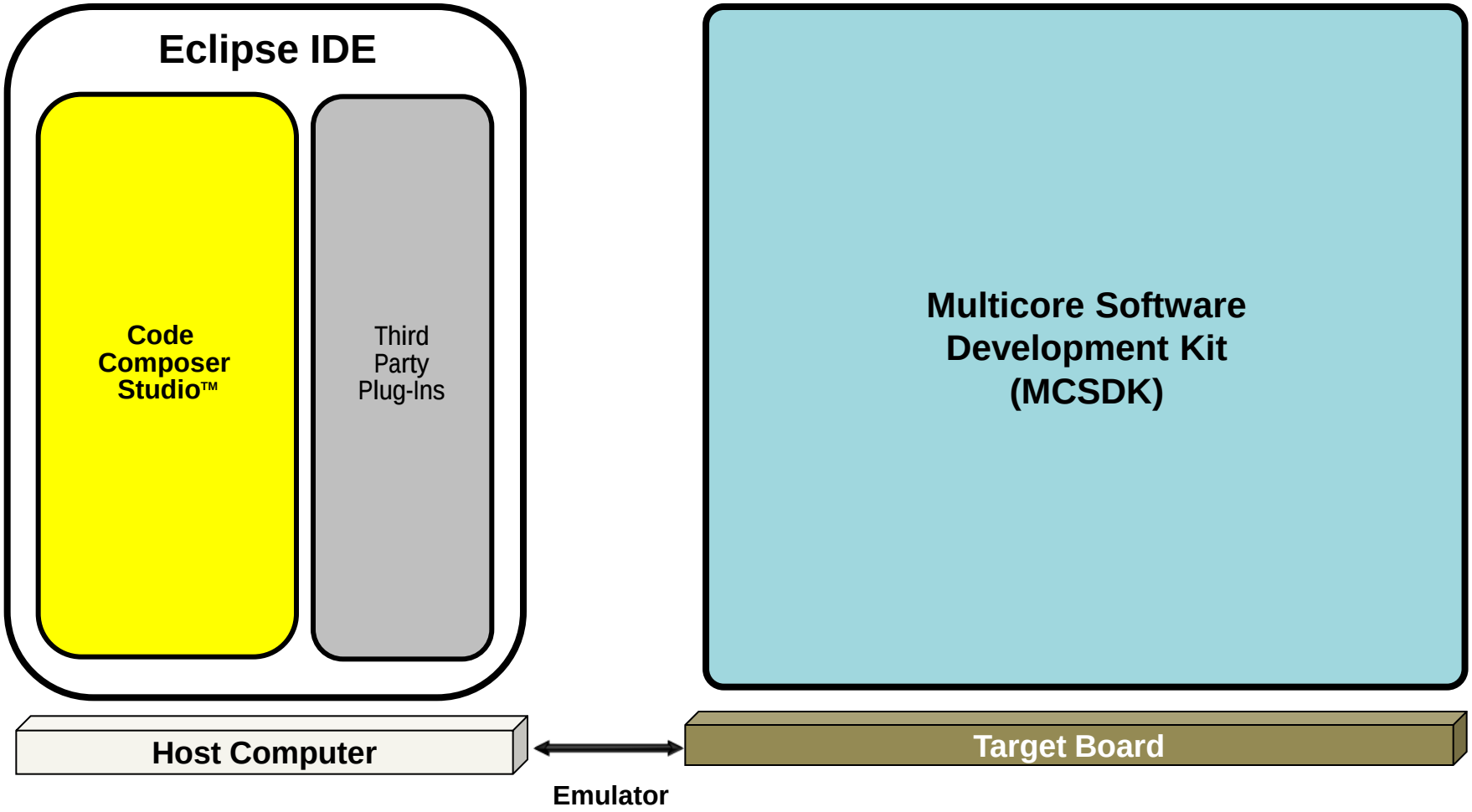
TI Software Development Ecosystem

Multicore Performance, Single-core Simplicity



TI Software Development Ecosystem

Code Composer Studio + Eclipse IDE

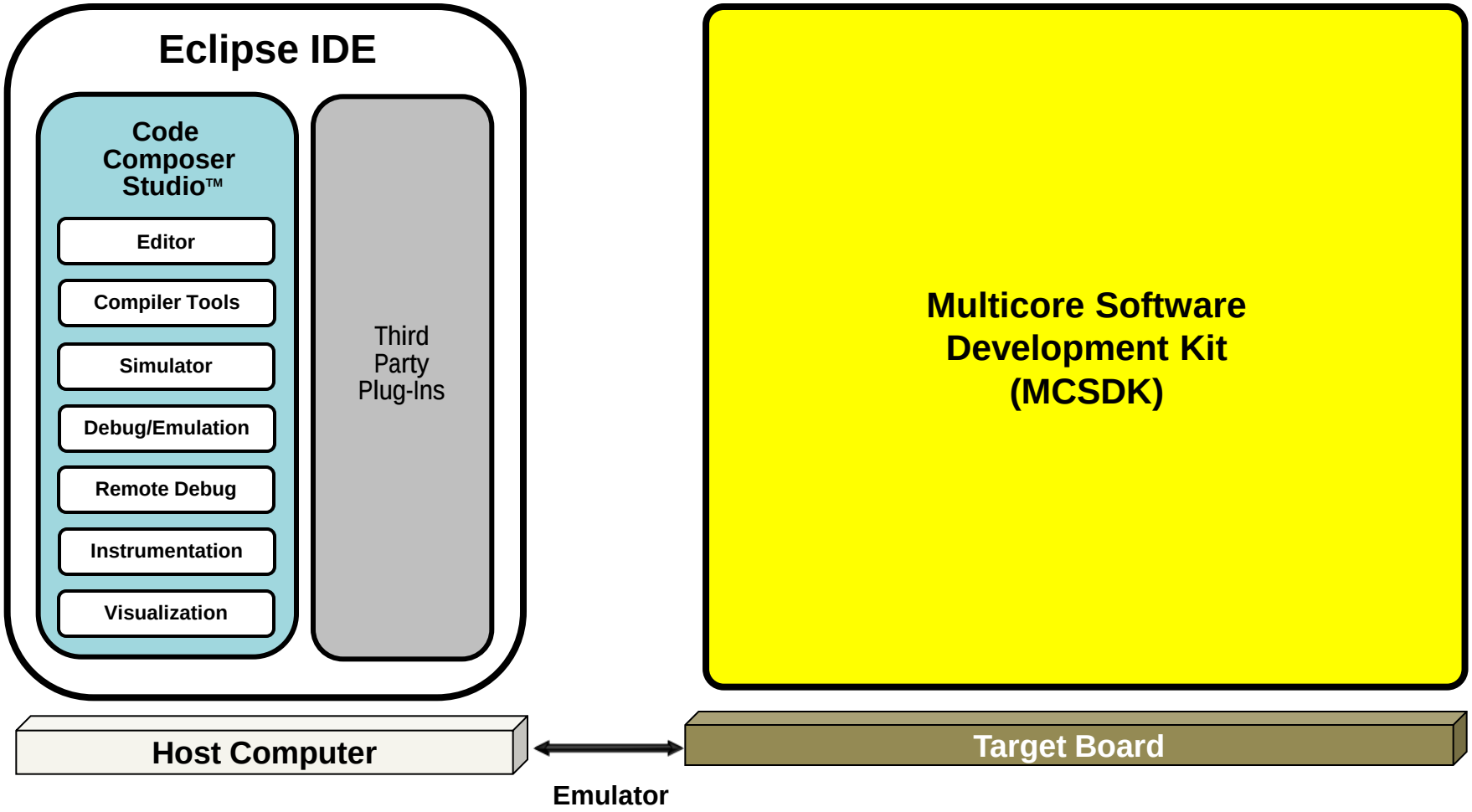


Code Composer Studio (CCS)

- Code Composer Studio (CCS) is an Eclipse-based IDE that supports application development on multiple cores/devices:
  - GUI interface for SYS/BIOS, project-based system to build drivers and utilities for developer's target platform.
  - Multiple perspectives (default and custom)
  - Advance debugging, monitoring, and profiling
  - Multiple configurations allow a single executable or multiple executables to be generated for the same project.
- Editor
- Integrated compiler tools
  - Support for OpenMP
- Simulator
- Debug/Emulation
- Remote Debug
- Instrumentation
- Visualization

TI Software Development Ecosystem

Multicore Software Development Kit



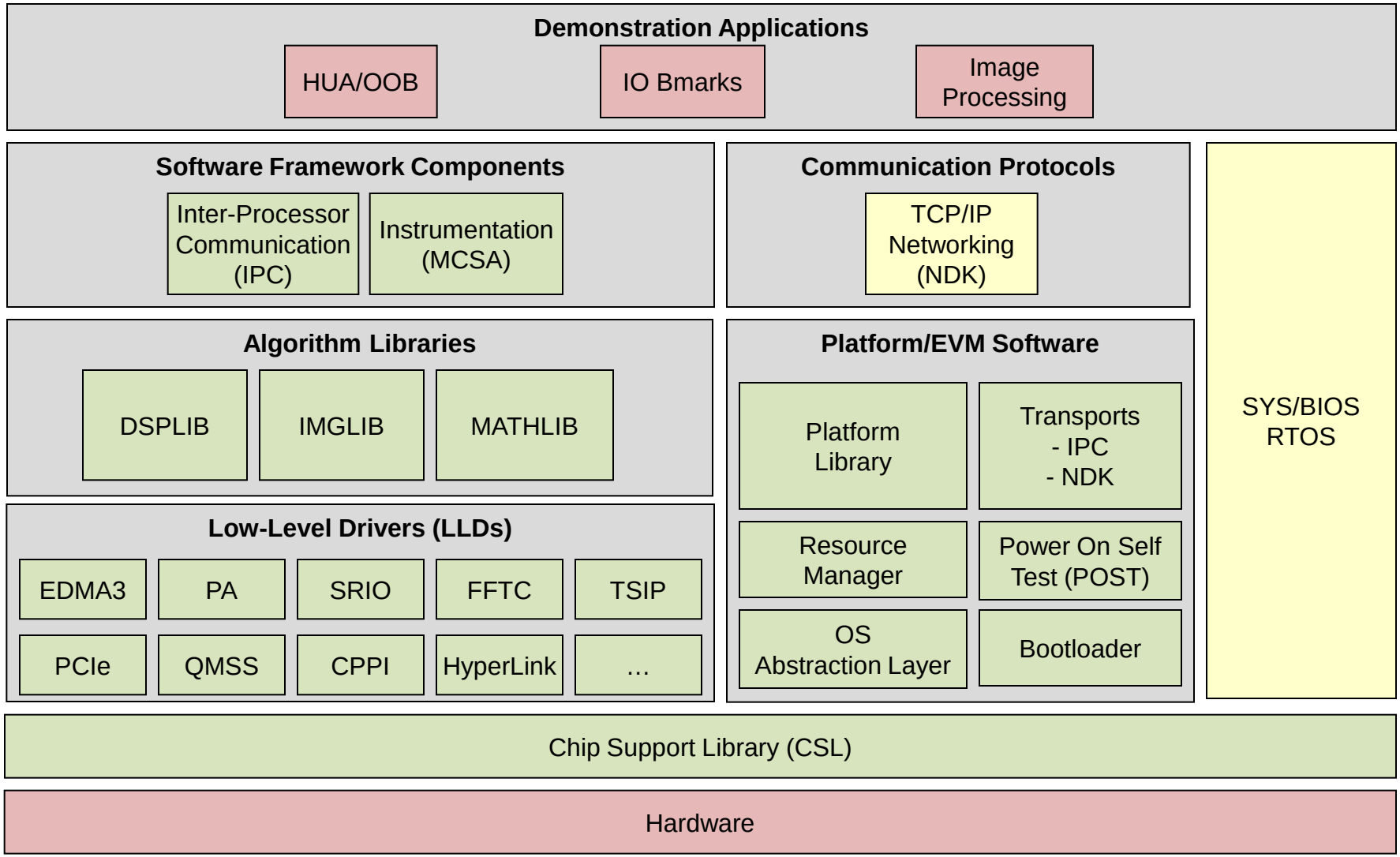
MCSDK Overview

- Standard set of APIs to configure and utilize peripherals, accelerators, and other hardware resources
- Compliant implementation of packet- and network-based protocols
- Utilities to boot, test, debug, and monitor execution
- Individual core-based real-time operating system
- Communication and facilitated cooperation between processes, cores, and devices, as well as between peripherals and cores
- Optimized, ready-to-use algorithm libraries, example code, and demonstration applications

MCSDK Advantages

- Provides the core foundational building blocks for customers to quickly start developing embedded applications on TI high-performance multicore DSPs:
  - Uses either the SYS/BIOS or Linux real-time operating system
  - Accelerates time-to-market by focusing on ease of use and performance
  - Provides multicore programming methodologies and utilities
- Simplifies porting of applications:
  - To a standard evaluation platform
  - From a standard evaluation platform to customer's target platform
  - To next generation platform hardware
- Available as a free download on TI.com, bundled in one installer as source code along with pre-built libraries

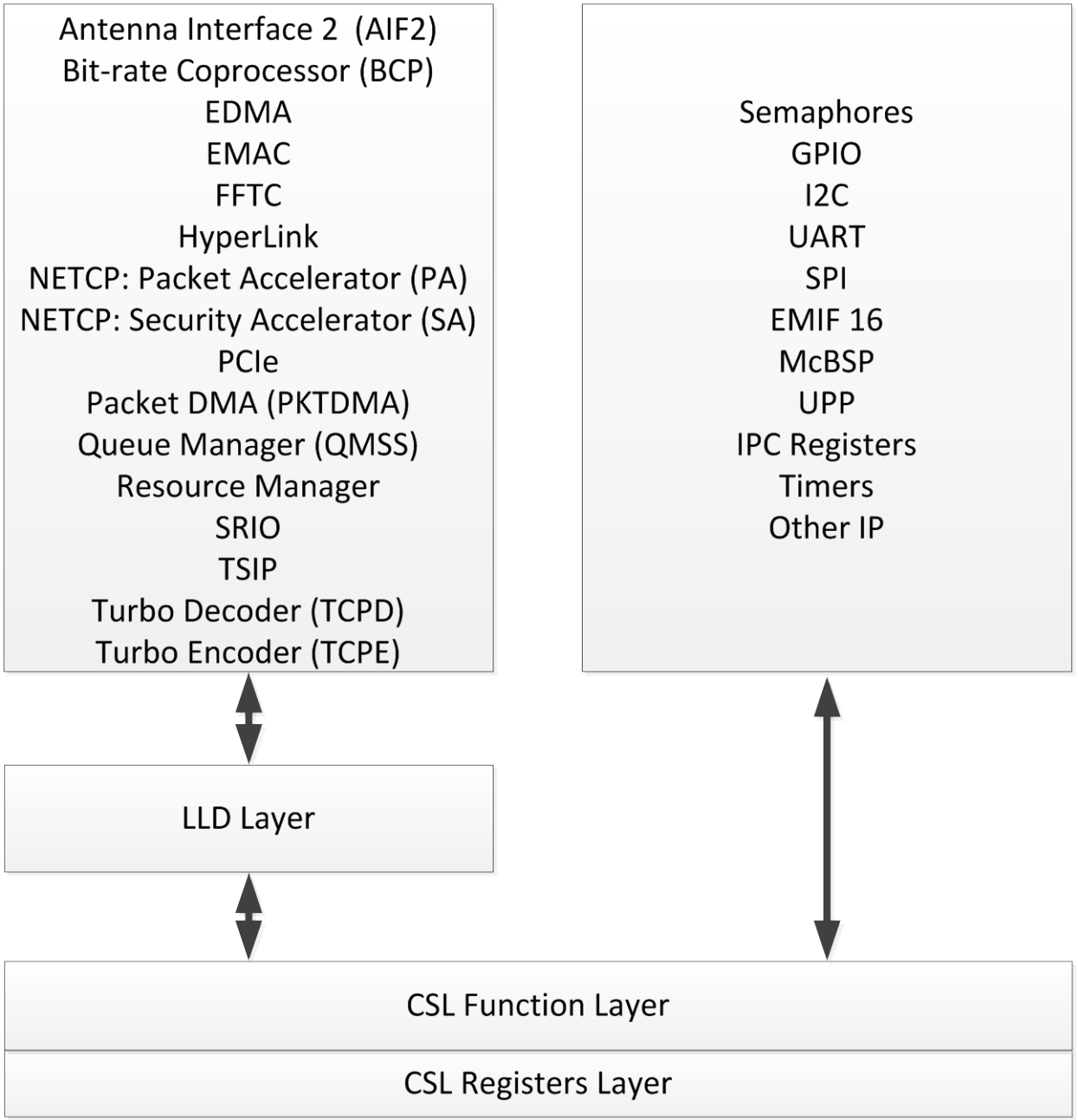
BIOS-MCSDK Software Layers



Development Requirements > MCSDK Solutions

Development Requirement	MCSDK Solution
Hide hardware details from the user to simplify process of porting to new hardware.	Chip Support Library (CSL) is the only MCSDK layer that depends on the hardware. This layer is completely transparent to the user/application.
Standard API to talk to peripherals, accelerators, and other resources	Low Level Drivers (LLD) provide standard API to initialize, configure, and utilize peripherals and other resources. LLD blocks include SRIO, PCIe, PA, CPPI, QMSS, FFTC, and many more.
Utilities to facilitate system operations	Platform/EVM Software provides platform-level utilities such as bootloader, Power On Self Test (POST), resource manager, and platform utilities.
Efficient real-time individual core operating system	SYS/BIOS provides an efficient, mature, real-time operating system with a low memory footprint.
Reliable interface to external networks	Network Development Kit (NDK) provides a standardized interface for common packet- and network-based communication protocols (e.g., IPV4 and IPV6-compliant TCP/IP).
Coordination of tasks/process across multiple cores	Inter-Processor Communication (IPC) provides several-high level utilities and libraries to communicate between cores and enable multiple cores to work together.
Facilitate application development	Optimized algorithm libraries with standard APIs.
A starting point for multicore application development	Demonstration applications (e.g., Image Processing) show how to build and run a complete multicore application.

Communication via LLD and CSL Layers



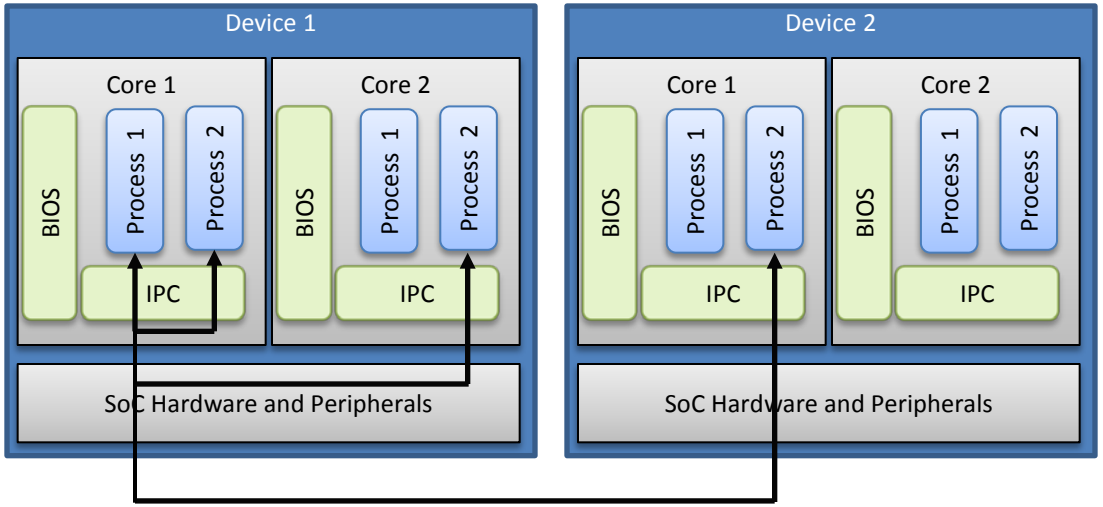
MCSDK Algorithm Libraries

Algorithm libraries contain C66x C-callable, hand-coded, assembly-optimized functions for specific usage:

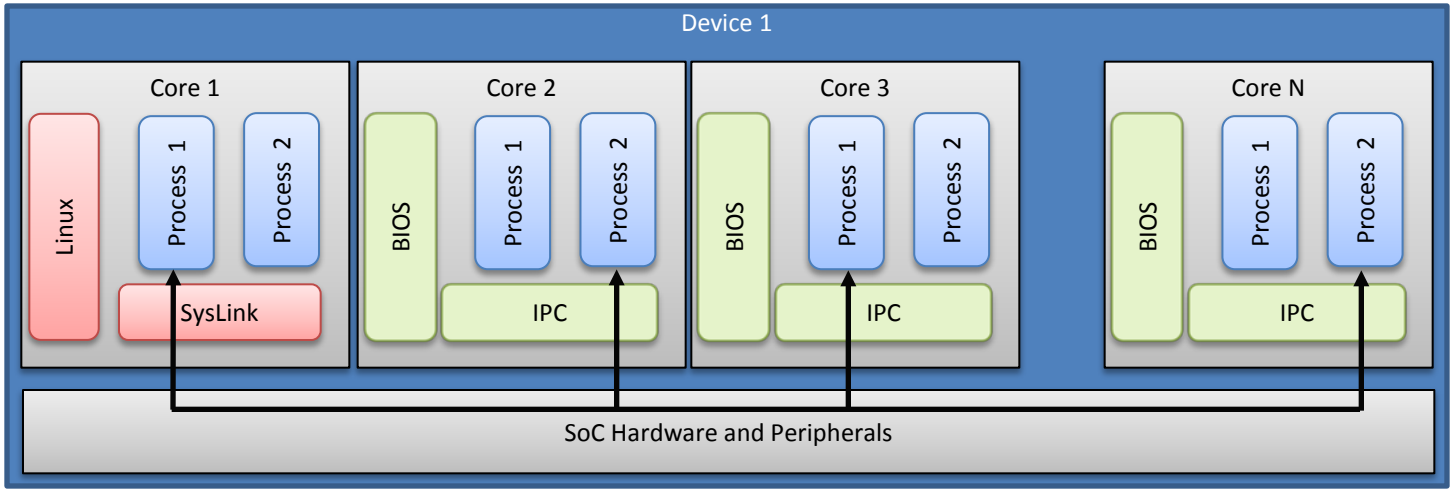
- **DSPLIB** provides signal-processing math and vector functions:
  - Adaptive filtering
  - Correlation
  - FFT (e.g. FFT functions for 'npoint' FFTs)
  - Filtering and Convolution (e.g., FIR, IIR filter functions, etc.)
  - Matrix (e.g., single and double precision matrix multiplication, etc.)
- **IMGLIB** provides image/video processing functions:
  - Compression & Decompression (e.g., forward and inverse DCT, motion estimation, quantization, etc.)
  - Image Analysis (e.g., edge detection, histogram, thresholding, etc.)
  - Image Filtering and Conversion (e.g., color space conversion, convolution, correlation, error diffusion, etc.)
- **MathLIB** provides floating-point math functions:
  - Single-precision (e.g., cosine/sine/tangent of a floating point number, etc.)
  - Double precision (e.g., similar functions as above with argument type and return values to be of type double)
- More info: http://processors.wiki.ti.com/index.php/Software_libraries

Inter-Processor Communication (IPC) Usage

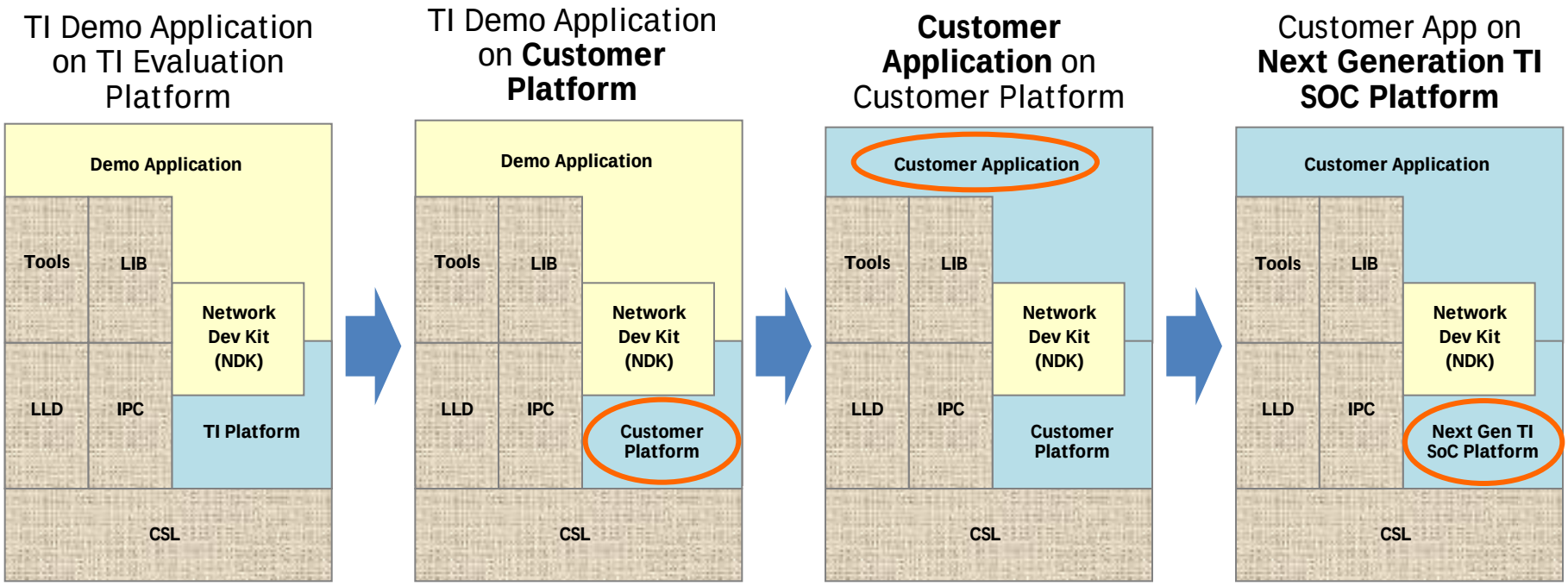
IPC provides a standard interface between processes/threads in the same core, between two cores, and between two devices.



IPC Transports	Task to Task	Core to Core	Device to Device
Shared Memory	x	x	
Navigator/QMSS	x	x	
Serial Rapid IO (SRIO)	x	x	x



Simplified Development & Migration

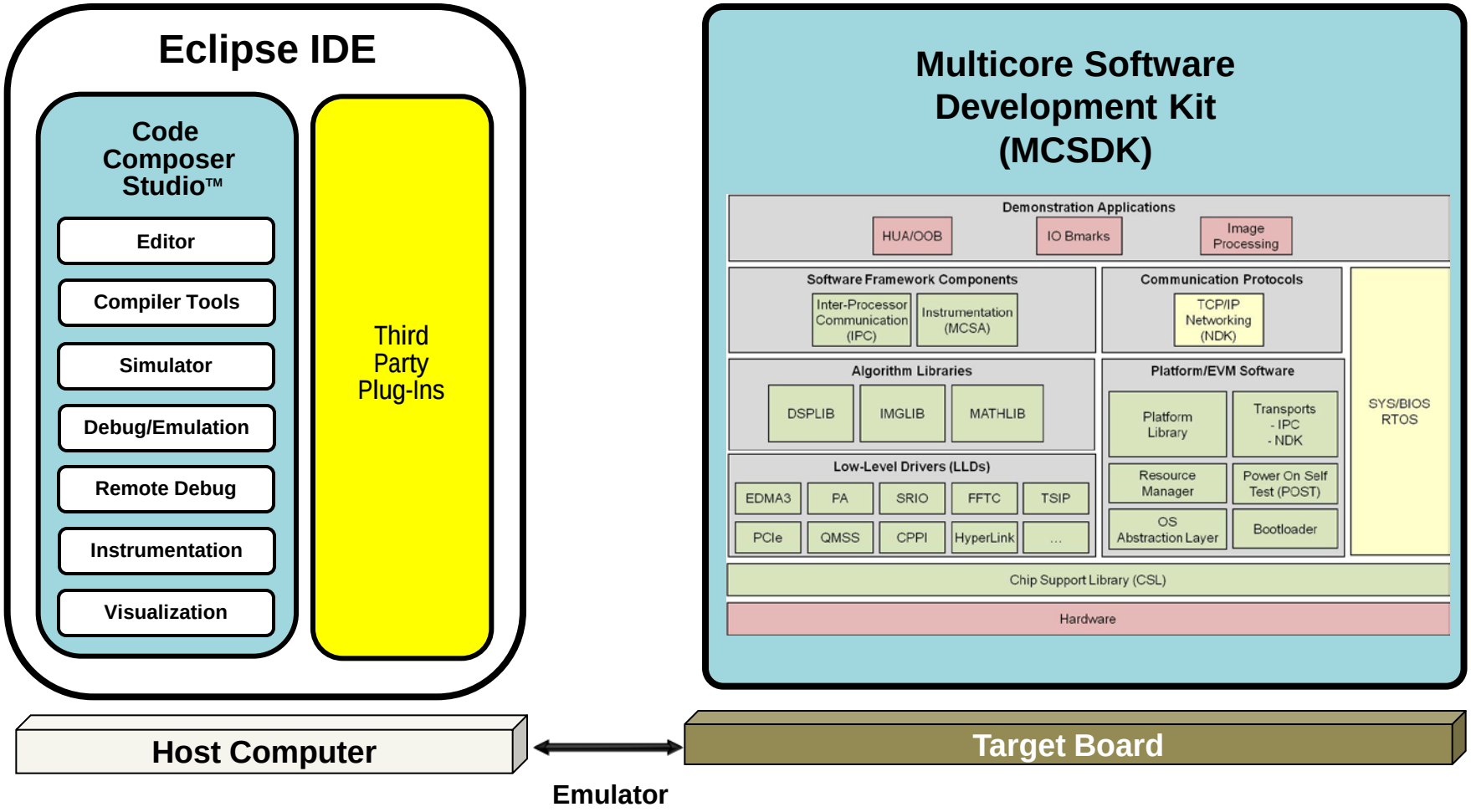


MCSDK Top-level Directory Folders

- /mcsdk
- /pdk
- /edma3
- /bios
- /dsplib
- /imglib
- /mathlib
- /ipc
- /ndk

TI Software Development Ecosystem

Third Party Software Plug-ins



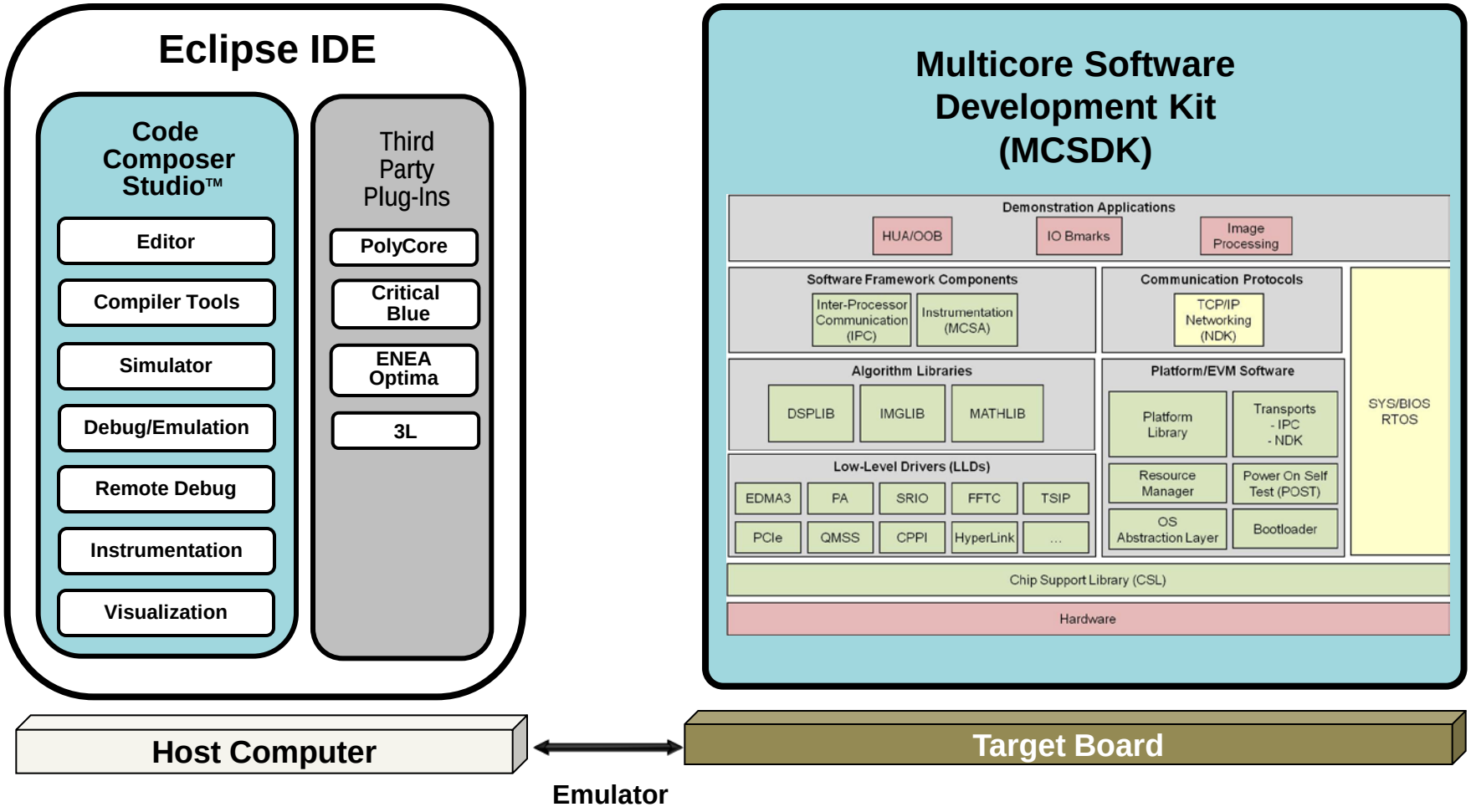
Third Party Plug-Ins

Eclipse allows developers to integrate third-party software tools that provide additional multicore programming, profiling and analysis capabilities:

- **Poly-Platform from PolyCore** http://polycoresoftware.com is a development framework consisting of tools and run-time software that provide a programming model for applications to scale from one to many cores.
- **Prism from CriticalBlue** http://www.criticalblue.com provides multicore analysis and exploration tools to evaluate parallelization strategies of existing software applications.
- **Optima from ENEA** http://www.enea.com includes overview and management tools for multicore systems, profiling tools showing resource usage, and debug tools that track execution of application and operating system events.
- **Diamond from 3L** http://www.3l.com is a tool-suite and model that provides a highly automated development flow from concept through to applications running in multiprocessor hardware.

TI Software Development Ecosystem

Multicore Performance, Single-core Simplicity

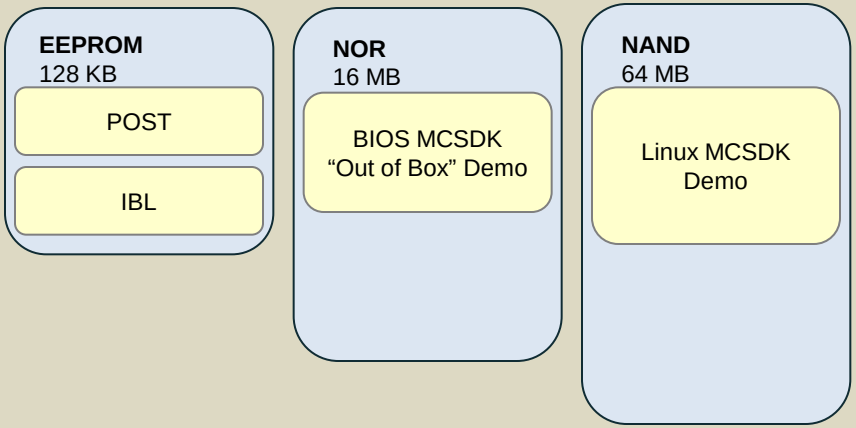


Linux/BIOS MCSDK C66x Lite EVM Details

DVD Contents

- **Factory default recovery**
  - EEPROM: POST, IBL
  - NOR: BIOS MCSDK Demo
  - NAND: Linux MCSDK Demo
  - EEPROM/Flash writers
- **CCS 5.0**
  - IDE
  - C667x EVM GEL/XML files
- **BIOS MCSDK 2.0**
  - Source/binary packages
- **Linux MCSDK 2.0**
  - Source/binary packages

EVM Flash Contents



Online Collateral

TMS320C667x processor website
http://focus.ti.com/docs/prod/folders/print/tms320c6678.html
http://focus.ti.com/docs/prod/folders/print/tms320c6670.html

MCSDK website for updates
http://focus.ti.com/docs/toolsw/folders/print/bioslinuxmcsdk.html

CCS v5
http://processors.wiki.ti.com/index.php/Category:Code_Composer_Studio_v5

Developer’s website
Linux: http://linux-c6x.org/
BIOS: http://processors.wiki.ti.com/index.php/BIOS_MCSDK_2.0_User_Guide

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  - Multicore Software Development Kit (MCSDK)
  - Third Party Software
  - C66x Lite Evaluation Module (EVM)
- Online Support Resources
  - Product Folder
  - E2E Forum
  - Embedded Processors Wiki

Product Folders

- Multicore SoC Product Folders:
  http://www.ti.com/product/tms320c6654
  http://www.ti.com/product/tms320c6655
  http://www.ti.com/product/tms320c6657
  http://www.ti.com/product/tms320c6670
  http://www.ti.com/product/tms320c6671
  http://www.ti.com/product/tms320c6672
  http://www.ti.com/product/tms320c6674
  http://www.ti.com/product/tms320c6678

Consider the C6678 product folder …

- MCSDK Product Folders:
  http://www.ti.com/tool/bioslinuxmcsdk
  http://www.ti.com/tool/demovideo-multicore

TMS320C6678

(ACTIVE) Multicore Fixed and Floating-Point Digital Signal Processor

Alert me about changes

Description & Features | Sample & Buy | Technical Documents | Software & Tools | Support & Community

Datasheet

- TMS320C6678 Multicore Fixed and Floating-Point Digital Signal Processor (Rev. C) (PDF , 2437 KB) 22 Feb 2012
- TMS320C6678 Multcore Fixed & Floating-Point DSP Silicon Errata (Revs 1.0, 2.0) (Rev. E) (PDF , 892 KB) 07 May 2012
- KeyStone I Multicore Processors Documentation Portfolio Package (ZIP , 98411 KB) 05 Sep 2012

View All Technical Documents

Software & Development Tools

- Power Management for C667x DSP AVS Core (CVDD) (Reference Designs)
- CODECS- Video, Speech - for C66x-based Devices (Software Codecs)
- Multicore Video Infrastructure Demo for Multicore Software Development Kit (MCSDK) (Application Software & Frameworks)

View All

Description

The TMS320C6678 Multicore Fixed and Floating Point Digital Signal Processor is based on TI's KeyStone multicore architecture. Integrated with eight C66x CorePac DSPs, each core runs at 1.0 to 1.25 GHz enabling up to 10 GHz. The device supports high-performance signal processing applications such as mission critical, medical imaging, test, and automation. The C6678 platform is power efficient and easy to use. The C66x CorePac DSP is fully backward compatible with all existing C6000 family of fixed and floating point DSPs.

Show More

Features

- Eight TMS320C66x DSP Core Subsystems at 1.00 GHz and 1.25GHz
  - 320 GMAC/160 GFLOP @ 1.25GHz
  - 32KB L1P, 32KB L1D, 512KB L2 Per Core
  - 4MB Shared L2

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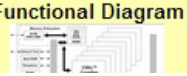
Products You Recently Viewed

- TMS320C6654: Fixed and Floating Point Digital Signal Processor
- TMS320C6671: Fixed and Floating-Point Digital Signal Processor
- TMS320C6674: Multicore Fixed and Floating-Point Digital Signal Processor
- TMS320C6672: Multicore Fixed and Floating-Point Digital Signal Processor
- TMS320C6670: Multicore Fixed and Floating-Point System-on-Chip

Diagrams (1)

Functional Diagram Print



Latest Blog Posts:

- Think Parallel
- Seeing is believing.
- New low power KeyStone devices announced this week
- Going to Design West and Multicore DevCon? We'll see you there!
- Get solutions to your multicore performance challenges!

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Harikrishna Vuppala, ozhan duzenli, Avi Elbaz, Bernd Erbe
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Senthil Kumar, Michael P, Yatsir Shmueli, striker Qian

C6000 Multicore DSP

Welcome to the C6000 Multicore DSP Section of the TI E2E Support Community. Ask questions, share knowledge, explore ideas, and help solve problems with fellow engineers. To post a question, click on the forum tab then "New Post".

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New Post

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Forum	Posts	Last Post
C64x Multicore DSP Forum The C64x multicore forum supports the TMS320C6472 and TMS320C6474 multicore DSPs for technical queries related to silicon and hardware behavior and performance. Additionally, baremetal programming questions are supported on this forum.	756	Today
C66x Multicore DSP Forum The C66x multicore forum supports all KeyStone devices for technical queries related to silicon and hardware behavior and performance. Built on the KeyStone architecture, all devices within this family are share common CorePacs and peripherals.	1,989	Today

Forums

All Recent | Unverified

Topic	Date	Replies	Views

Embedded Processors Wiki

http://processors.wiki.ti.com

Main Page

Main Page
There are security restrictions on this page

Welcome to the Texas Instruments Embedded Processors Wiki

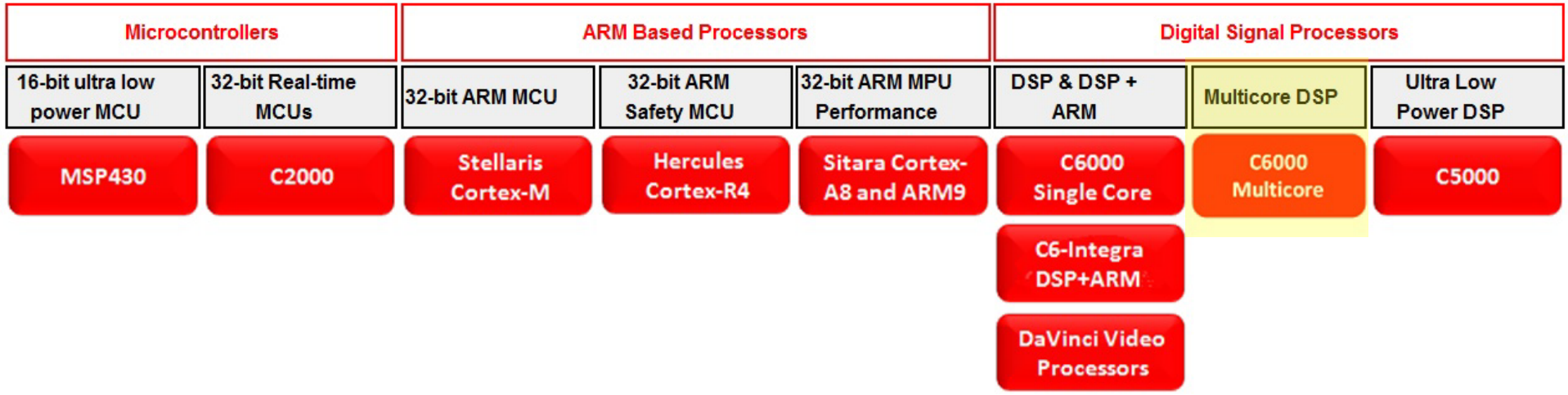
Searching and RSS Feed

- Search for an article here:

Google™ Custom Search Search

- Embedded Processors Technology Developers.
- Check out the FAQ section, GSG category for Getting Started Guides or **Training** homepage for online training material.

Embedded Processors



For More Information

- MCSDK Product Folder:
  http://www.ti.com/tool/bioslinuxmcsdk
- Download CCSv5 and MCSDK software:
  http://software-dl.ti.com/sdoemb/sdoemb_public_sw/bios_mcsdk/latest/index_FDS.html
- KeyStone C66x Multicore Wiki Resources
  http://processors.wiki.ti.com/index.php/Keystone_Device_Architecture
- For questions regarding topics covered in this training, visit the support forums at the TI E2E Community website http://e2e.ti.com