

# eXpressDSP™ Software and Development Tools

## What's New in Code Composer Studio™ Tuning Edition

Code Composer Studio (CCStudio) Tuning Edition Integrated Development Environment (IDE) provides a collection of integrated tools that make it easier and faster than ever for DSP programmers to optimize their code for speed and size.

The new modules found in CCStudio Tuning Edition can automatically review program code, spot potential areas for improvement and make suggestions to the programmer to help reach the desired balance of system performance, memory usage, and cost. The easy-to-use tuning tools will not slow down the development process and allow developers to unleash the DSP's full potential.

### **CCStudio Tuning Edition has many new features:**

**Application Code Tuning (ACT)** takes weeks out of the optimization process with a collection of integrated tuning tools. These tools allow developers to extract maximum performance from their DSP system:

- **Tuning Dashboard** provides the user with a single interface for managing the optimization process. With a single mouse click, the user can launch any of the integrated tuning tools. A user-defined Goals window, allows the user to setup optimization targets and track progress towards the desired goals. The dashboard also contains a proactive Advice Window that provides specific optimization suggestions and advice on which tuning tools to use to achieve development goals. A Profile Setup and Viewer feature manages and displays the data collected during development.
- **Compiler Consultant** analyzes your application and makes recommendations for efficient coding. Each time the application is compiled, Compiler Consultant will examine the code and create suggestions for different optimization techniques to improve code efficiency.
- **CacheTune** makes it easier to identify non-optimal cache usage by graphically representing cache memory accesses. This visual/temporal view of cache accesses enables quick identification of problem areas (such as areas related to conflict, capacity, or compulsory misses) to help you greatly improve an application's overall cache efficiency.

- **CodeSizeTune (CST)** enables you to easily optimize the trade-off between code size and cycle count for an application. Using a variety of profiling configurations CST profiles the user's application, collects data on individual functions, and determines the best combinations of compiler options. CST then produces a graph of these function-specific option sets, permitting a choice of the configuration best suited for your needs.

**Connect/Disconnect** makes it easier to connect and disconnect with the target dynamically. This new functionality provides robust and resilient connection to the target board and even allows you to restore the previous debug state when connecting again.

## The eXpressDSP™ host tools provide an integrated development environment consisting of:

- **CCStudio Development Tools** – a powerful set of integrated development tools that can be enhanced with TI and third-party plug-ins. With all these tools in one integrated environment, CCStudio boosts your effectiveness and productivity.

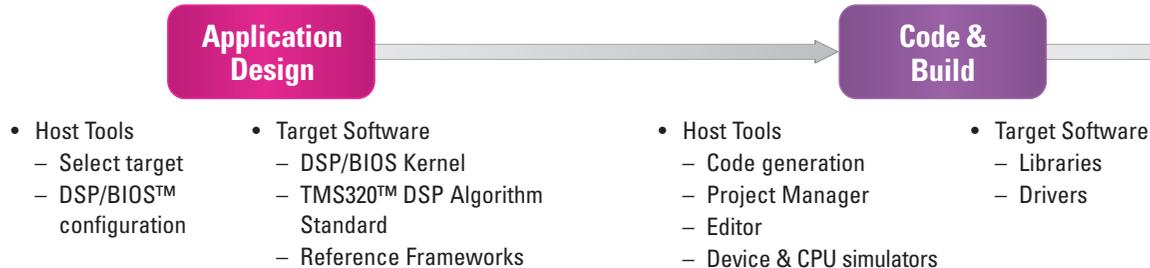
## The eXpressDSP real-time target-side software saves valuable time by providing:

- **DSP/BIOS™ Kernel** – a proven, scalable, real-time software kernel including chip support libraries that create the foundation for software development work, eliminating many low-level coding tasks and greatly simplifying real-time task scheduling.
- **TMS320™ DSP Algorithm Standard** – an interoperability coding standard that facilitates the reuse of software components from your previous projects, other developers and outside sources.
- **eXpressDSP Reference Frameworks** – a set of open source, C-based starterware templates optimized for multiple application parameters. Production-ready code, which is simple to modify, enables you to be up and running very quickly.

## The world's largest DSP Third Party Network

- **The TI DSP Third Party Network** provides a rich library of TMS320 DSP-based software modules and host tools plug-ins that are easily integrated to fit the needs of your application. This network also provides hardware platforms, emulators and consultant services.

# TI's Development Tools and Software



The tight integration of Code Composer Studio™ (CCStudio) software with eXpressDSP™ software and the TMS320 DSP and OMAP™ processors speed your design through each stage of the design cycle. Take advantage of the many features of eXpressDSP products to become more productive and accelerate time-to-market.

## Application Design

### Host Tools

**Quickly setup and configure** your application with CCStudio software. The drag-and-drop setup utility enables you to quickly select and setup hardware systems and initialize the CCStudio environment. Even a system with multiple boards and CPUs can be configured in a few seconds.

**Configure DSP/BIOS resources** during application design with the graphical DSP/BIOS configuration tool. View, create and configure DSP/BIOS objects used by your program and eliminate resource contention at this early stage.

### Target Software

Get started faster and eliminate many low-level coding tasks up front by using ready-to-go eXpressDSP Software.

**Jump start development** with eXpressDSP Reference Frameworks. Choose the framework which best fits your application: RF1 “Compact,” RF3 “Flexible” or RF5 “Extensive.” Built on the foundation of DSP/BIOS and the TMS320 DSP Algorithm Standard, this solid production-quality base code can get your applications off the ground quickly.

**Get productive faster** and eliminate the need to design and validate your own scheduler. Take advantage of the industry-proven scalable DSP/BIOS real-time kernel to perform time scheduling and synchronization. Use the built-in host-to-target communications and real-time instrumentation for real-time analysis in later stages of development. The kernel includes pre-emptive multi-threading, hardware abstraction, real-time analysis, configuration tools and chip support libraries so you can spend time on more innovative and productive activities.

Explore whether you need to **make, buy or reuse software**. Utilize the TMS320 DSP Algorithm Standard to make your code reusable and to take advantage of the rich offering of eXpressDSP-compliant algorithms ready to drop into your application.

## Code and Build

### Host Tools

**Spend more time connected to the target** with Connect/Disconnect. This feature makes it easier to connect and disconnect with the target dynamically, allowing you to disconnect from your hardware target and even to restore the previous debug state when connecting again.

**Manage your project effectively** using the visual Project Manager. It provides fast access and manipulation of single or multiple project files with drag-and-drop as well as double-click edit capabilities. The Project Manager also can integrate with a number of industry-standard source control systems, giving development teams better control of their project.

**Generate efficient DSP code**. CCStudio supports C/C++ and Assembly language coding. TI's compile tools are co-developed with the DSP architecture, offering you best-in-class performance with industry-leading global view analysis and architecture-specific optimizations that include interactive profiling, tuning and feedback.

**Start software development earlier** using TI's fast simulators to do more coding and validation. Start before your hardware system is ready. A wide array of simulators provide options to determine how much of the device to simulate: CPU only, CPU and memory or full device simulators.

### Target Software

Chip support libraries and drivers **reduce the need to open a data book** to correctly configure TMS320 DSP device peripherals.

# Available Throughout Design Cycle

## Debug

## Analyze & Tune

- Host Tools
  - Familiar debug interface
  - Device and CPU simulators
  - Multi-processor support
  - Data I/O and RTDX™
  - Scripting
- Emulators
  - XDS560™ Emulator
  - XDS510™ Emulator
- Host Tools
  - Profiler
  - Analysis Toolkit
  - Power Analyzer
  - Code Tuning
- Target Software
  - Real-time analysis
  - RTDX
  - Power-Scaling Library

TI's Third Parties are a valuable resource: In addition to eXpressDSP™-compliant algorithms, the TI DSP Third Party Network provides target boards, application starter kits, consultant services, as well as software tools, Code Composer Studio™ (CCStudio) plug-ins and additional hardware tools to help you through each stage of the design flow.

## Debug

### Host Tools

CCStudio's integrated debugger with a familiar easy-to-use interface has many features you would expect in a traditional debugger as well as many DSP-specific and multi-processor design capabilities.

**Control execution** of your code with regular breakpoints or with hardware and conditional breakpoints which can evaluate a C expression, a local variable or a CPU register location. Use global breakpoints to synchronize the debug of multiple processors on a multi-processor system.

**Input and output data** on your target with Probe Points™ data breakpoints to control when data displays are updated. Use Graph Options to display data in useful formats such as FFTs, eye diagrams, constellation plots and images.

**Examine** your data and program during run-time with the watch window or simply roll your cursor over a variable in the editor to use the ToolTip feature to see its value.

**Navigate** your code with CCStudio's symbol browser, which has detailed knowledge of your application and displays all associated files, functions, global variables, types and labels of a loaded COFF output file (\*.out).

**Automate repetitive tasks** using CCStudio Scripting and CCStudio GEL language. Use familiar languages such as Perl or Visual Basic to automate debug, testing and validation of applications with CCStudio software.

### Emulators

CCStudio supports TI's next-generation XDS560 Emulator. The XDS560 Emulator reaches real-time data rates of over 2 MB/second on enabled high-speed RTDX processors to provide an unparalleled level of real-time debug. The XDS560 Emulator is fully upward compatible with TI's XDS510 Emulator.

## Analyze and Tune

### Host Tools and Target Software

Get insight into your running application and determine how to maximize performance, minimize footprint, manage power consumption and/or make your code more robust.

**Examine operation of your system in real time** – find glitches and bottlenecks that may only show up in real-time operation. This is made possible by the advanced RTDX and DSP/BIOS™ technologies integrated with CCStudio which allow you to get data from your application while it runs in real time.

**Get continuous visibility and communicate** with your target application without halting the processor using RTDX data transfers between host and target. With real-time data rates of over 2 MB/second, some processors can transfer large data files such as video images in real time.

**Analyze task interaction** with DSP/BIOS run-time services on your running application to determine if tasks are well integrated and if your application is best utilizing resources.

**Optimize power consumption** for power-sensitive applications. CCStudio's power analyzer and power-scaling library allow developers to visualize power consumption across the DSP, I/O or system. Use the power-scaling library to automatically scale the frequency and voltage of power-hungry functions, resulting in lower power consumption for the full application.

**Extract maximum performance** and full feature utilization from your DSP system with a comprehensive tool chain designed specifically to optimize (or tune) your DSP system.

**Tuning Tools** are used to improve execution time, utilize cache more efficiently and decrease memory usage. These tools are wrapped with an interactive advisor that walks the user through the optimization process specific to the goals set by the developer.

# Code Composer Studio Features and Benefits

| Feature                   | C6000 CCStudio |      |      | C5000 CCStudio |      | C2000 CCStudio |      | OMAP CCStudio |      |      |      |
|---------------------------|----------------|------|------|----------------|------|----------------|------|---------------|------|------|------|
|                           | C62x           | C64x | C67x | C54x           | C55x | C24x           | C28x | C54x          | C55x | ARM7 | ARM9 |
| IDE                       | X              | X    | X    | X              | X    | X              | X    | X             | X    | X    | X    |
| C/C++ and Assembly        | X              | X    | X    | X              | X    | X*             | X    | X             | X    | X    | X    |
| DSP/BIOS™ Kernel          | X              | X    | X    | X              | X    |                | X    | X             | X    |      |      |
| TMS320™ DSP Algo. Std.    | X              | X    | X    | X              | X    | X              | X    | X             | X    |      |      |
| Reference Frameworks†     | X              | X    | X    | X              | X    |                |      | X             | X    |      |      |
| RTDX™                     | X              | X    | X    | X              | X    | X              | X    | X             | X    | X    | X    |
| Fast Simulation           | X              | X    | X    |                | X    |                |      |               | X    |      |      |
| Simulators                | X              | X    | X    | X              | X    | X              | X    | X             | X    | X    | X    |
| Update Advisor            | X              | X    | X    | X              | X    | X              | X    | X             | X    | X    | X    |
| Chip Support Libraries    | X              | X    | X    | X              | X    |                |      | X             | X    |      |      |
| Parallel Debug Manager    | X              | X    | X    | X              | X    | X°             | X°   | X             | X    | X    | X    |
| Pipeline Analysis         |                |      |      |                | X    |                |      |               | X    |      |      |
| Application Code Tuning ‡ | X              | X    | X    |                |      |                |      |               |      |      |      |
| Connect/Disconnect        | X              | X    | X    |                |      |                |      |               |      |      |      |
| Scripting†                | X              | X    | X    | X              | X    |                |      | X             | X    | X    | X    |
| Flashburn†                | X              | X    | X    | X              | X    |                |      | X             | X    | X    | X    |
| Data Converter†           | X              | X    | X    | X              | X    | X              | X    | X             | X    |      |      |
| Driver Development Kit†   | X              | X    | X    | X              | X    | X              | X    | X             | X    |      |      |
| Analysis Tool Kit†        | X              | X    | X    |                | X    |                |      |               | X    |      |      |

\* The C24x only supports C, not C++ ° Supports only homogeneous multi-processing † Available through Update Advisor for users with active CCStudio subscription ‡ Application Code Tuning (ACT) includes Tuning Dashboard, Compiler Consultant, Cache Tune and CodeSize Tune (formally called Profile-Based Compiler)

## Code Composer Studio™ (CCStudio) Key Benefits

- Quick start with familiar tools and interfaces
- Easily manage large multi-user, multi-site and multi-processor projects
- Utilize fast code creation, optimization and debugging tools
- Maximize reuse and portability for faster code development
- Run complex DSP simulation in minutes instead of hours
- Perform real-time analysis enabled by RTDX and DSP/BIOS technologies

## Update Advisor

All CCStudio registered users with a valid subscription have access to CCStudio's live update capability. The Update Advisor is a web-based application designed to allow you to keep your system efficient and up-to-date. The Update Advisor is aware of every CCStudio component installed on your system, and it is able to compare this information with the available CCStudio updates. It then compiles a custom list of available, easy-to-install system updates. This allows you to keep your system up-to-date with the latest software from TI and also gives you access to valuable resources on the web to cut your development time.

**For the latest product information on CCStudio Tuning Edition, please visit [www.ti.com/ccstudiotuningedition](http://www.ti.com/ccstudiotuningedition)**

## eXpressDSP™ Resources

Learn more about CCStudio and the eXpressDSP Software capability with the online tutorial, multimedia demos and built-in context-sensitive help. Go to CCStudio's Help Menu to access these resources. In addition, there are a number of other web-based resources available.

- **DSP Information:** [www.dspvillage.com](http://www.dspvillage.com)
- **Technical Documentation:** [www.ti.com/dspappnotes](http://www.ti.com/dspappnotes)
- **Online Training:** [www.ti.com/dsptraining](http://www.ti.com/dsptraining)
- **Workshops:** [www.ti.com/dspworkshops](http://www.ti.com/dspworkshops)
- **eStore:** [www.ti.com/dspstore](http://www.ti.com/dspstore)
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| Data Converters  | <a href="http://dataconverter.ti.com">dataconverter.ti.com</a>     | Automotive          | <a href="http://www.ti.com/automotive">www.ti.com/automotive</a>         |
| DSP              | <a href="http://dsp.ti.com">dsp.ti.com</a>                         | Broadband           | <a href="http://www.ti.com/broadband">www.ti.com/broadband</a>           |
| Interface        | <a href="http://interface.ti.com">interface.ti.com</a>             | Digital Control     | <a href="http://www.ti.com/digitalcontrol">www.ti.com/digitalcontrol</a> |
| Logic            | <a href="http://logic.ti.com">logic.ti.com</a>                     | Military            | <a href="http://www.ti.com/military">www.ti.com/military</a>             |
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