S32 Design Studio Tools for S32 Platform

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NXP Automotive Microcontroller & Processors

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SECURE CONNECTIONS FOR A SMARTER WORLD

Agenda

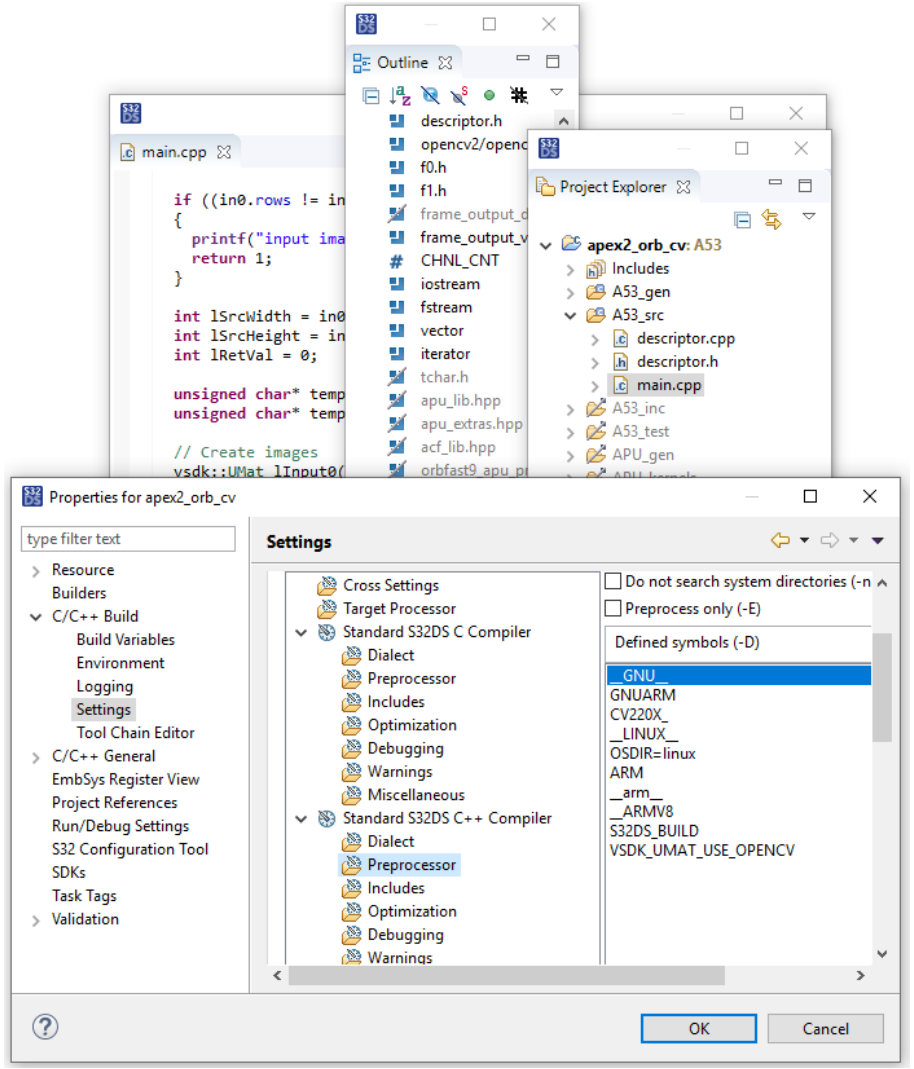
- Overview of S32 Design Studio for Next Generation Products
  - Modular Tooling
  - Base S32 Support Tools
  - Application S32 Specific Tools
  - New “Getting Started” Page
  - S32 Debugger + S32 Debug Probe
  - S32 Configuration Tool
    - Pins, Clock, Peripheral, DCD, and IVT Tools
  - FreeMASTER Lite
- Virtual Development Environment : VDK
- New S32 Design Studio Vision Tools vs S32 Design Studio for Vision Tool – What is the Difference?
- Conclusion

S32 Design Studio V3.x

for Next generation S32 Products

What is S32 Design Studio?

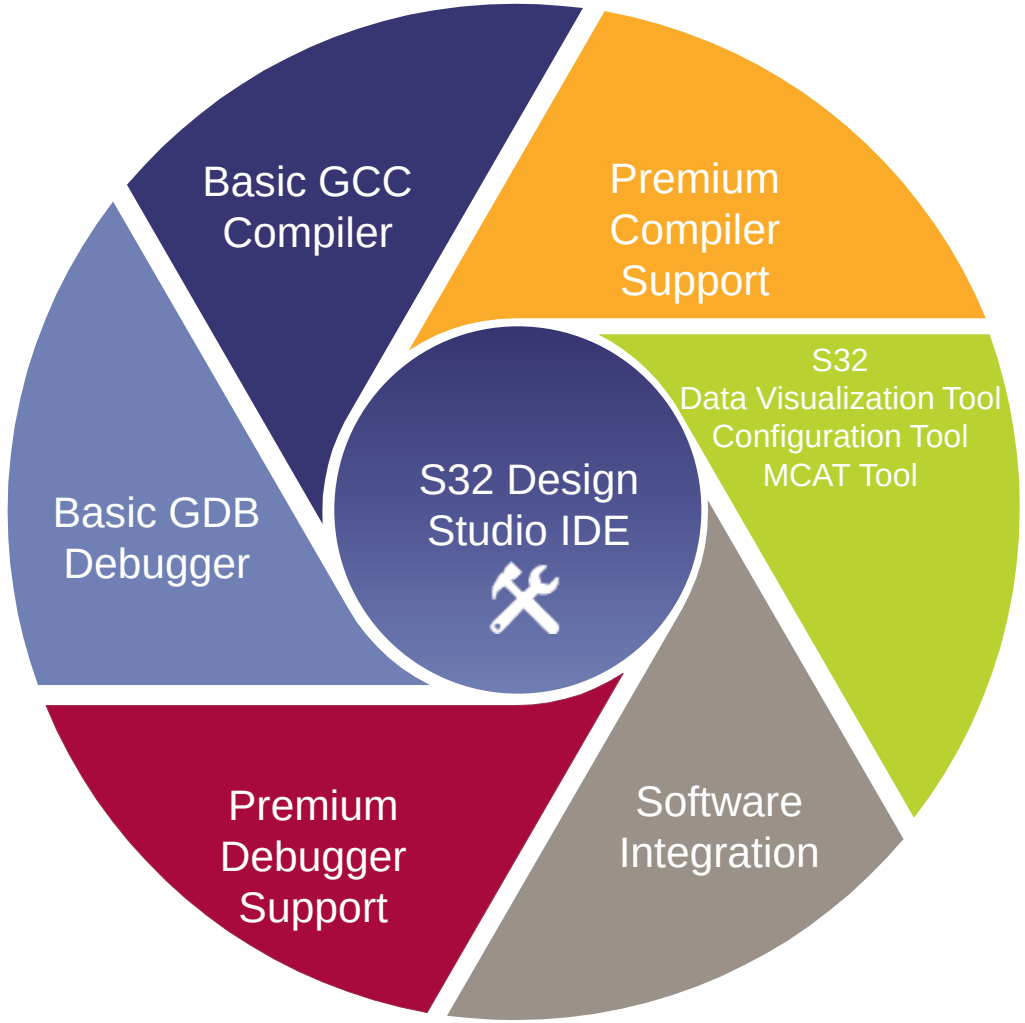
- Integrated Development Environment for NXP Automotive and Ultra-Reliable ARM® based microcontrollers
  - Component-based architecture
  - Build Integration for various toolchains (Managed Make Facility, error parser)
  - Resource Management (projects system, folders, and files)
  - Code Editor (syntax coloring, code-completion, source navigation, refactoring)
  - Debugging (breakpoints, disassembler, memory monitor, register view, variables)
- Based on Eclipse software framework
  - Free, open-source IDE platform
  - C/C++ Development Tools (CDT) plug-in
  - Extensible plug-in system
  - Allow customization for user-specific needs
  - Supports plugins from partners
  - Community collaborative effort



S32 Design Studio Features

Integrate additional features

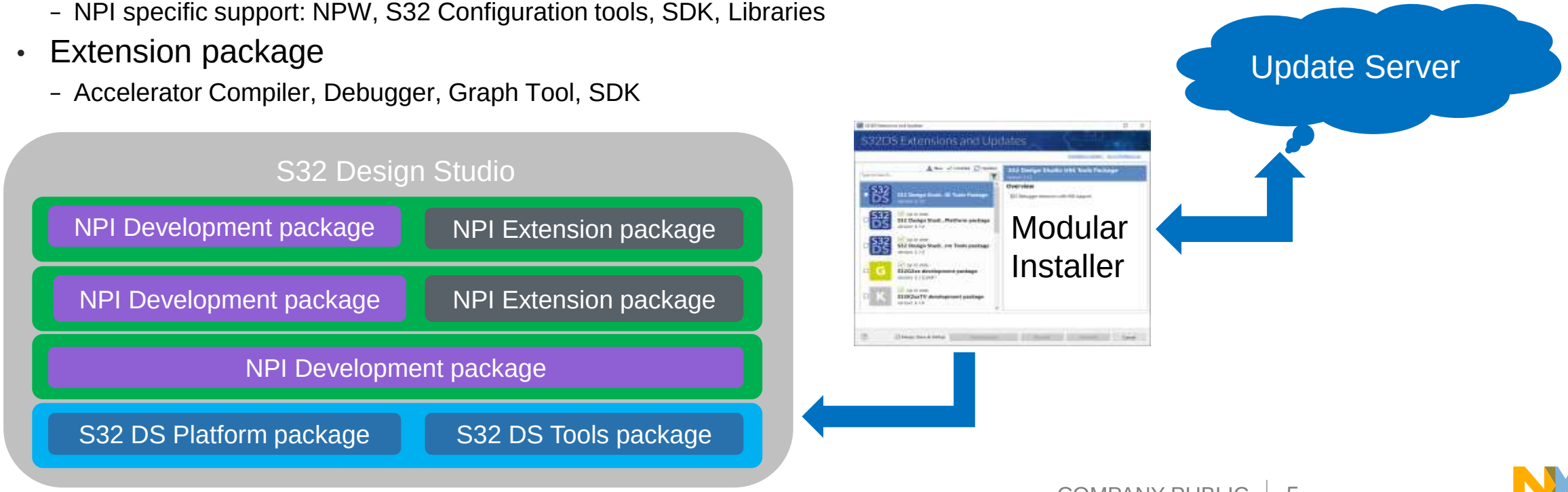
- NXP GNU toolchain for bare-metal and Linux ARM targets
- NXP toolchains for accelerators (APEX, ISP, PAX, SPT, LAX)
- GNU GDB Debugger with Python support
- Multicore debugging, Semihosting support
- S32 Debug Probe support provided with S32 Debugger and S32 Trace
- Support for Lauterbach and P&E debuggers
- Support for Simulators (VDK, VLAB)
- S32DS Extensions and Updates tool
- Visual graph tools to support accelerators program development
- S32 Configuration Tool framework
- Integrated NXP Software (S32 SDKs, Math and Motor Control Libraries)
- SDK Manager
- S32 Flash Tool
- RTOS aware debug support (FreeRTOS, MQX)
- Peripherals Register View
- DDR configuration and validation tools
- Collateral page providing convenient access to product manuals, tool guides, how-to videos and application notes
- Supported 64 bit host operating systems: Windows 7/8/10, Ubuntu 16.04, Debian 8, CentOS 7

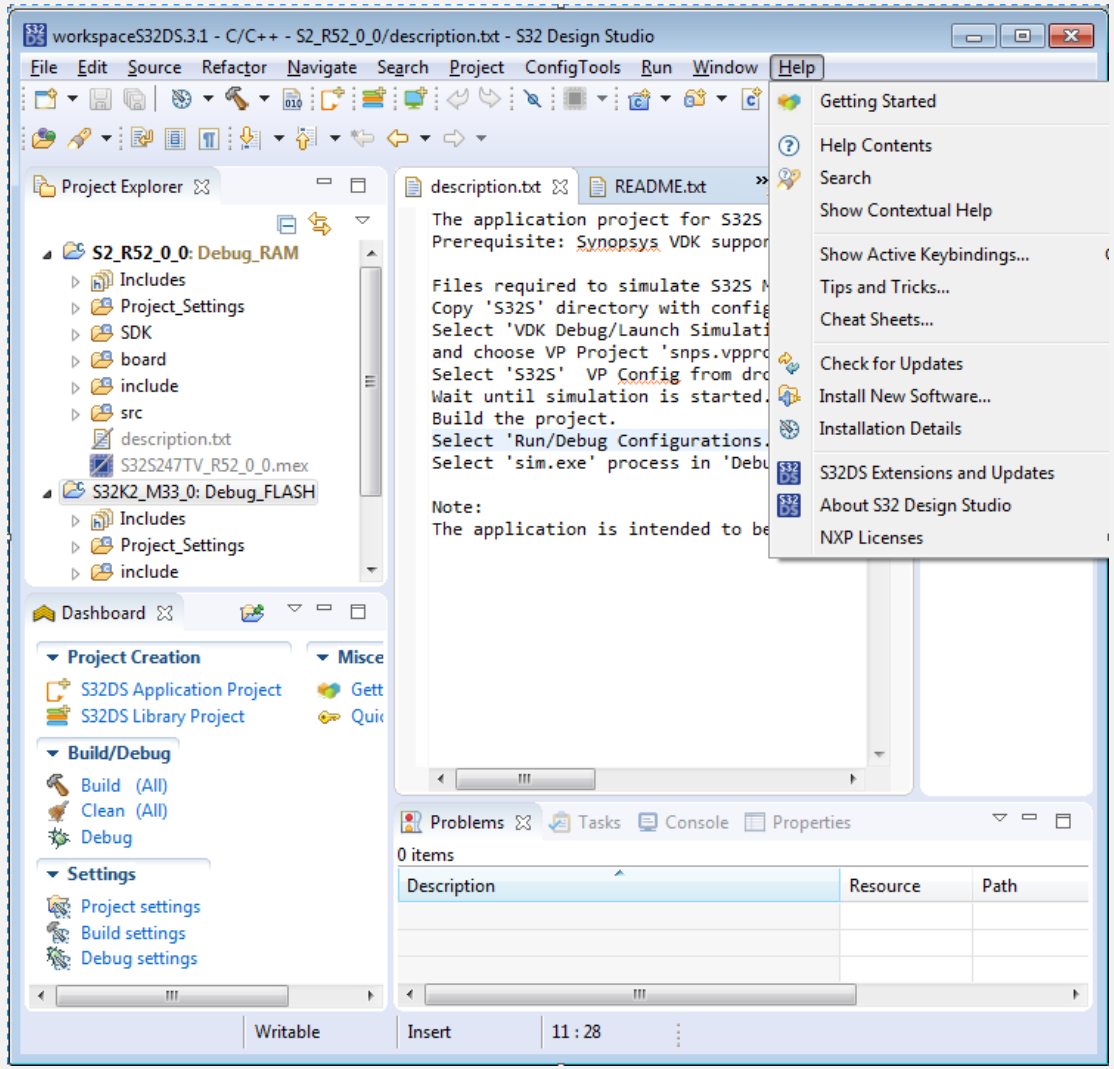


S32 Design Studio V3.x Modular Design

New Component-based Architecture for more Flexible Product Support and Enablement

- Platform package (Base Tools)
  - Basic IDE, Modular Installer, Documentation, Integration mechanisms
- Tools package
  - Compilers, Debuggers, MSYS2, S32 Configuration tools
- Development package
  - NPI specific support: NPW, S32 Configuration tools, SDK, Libraries
- Extension package
  - Accelerator Compiler, Debugger, Graph Tool, SDK





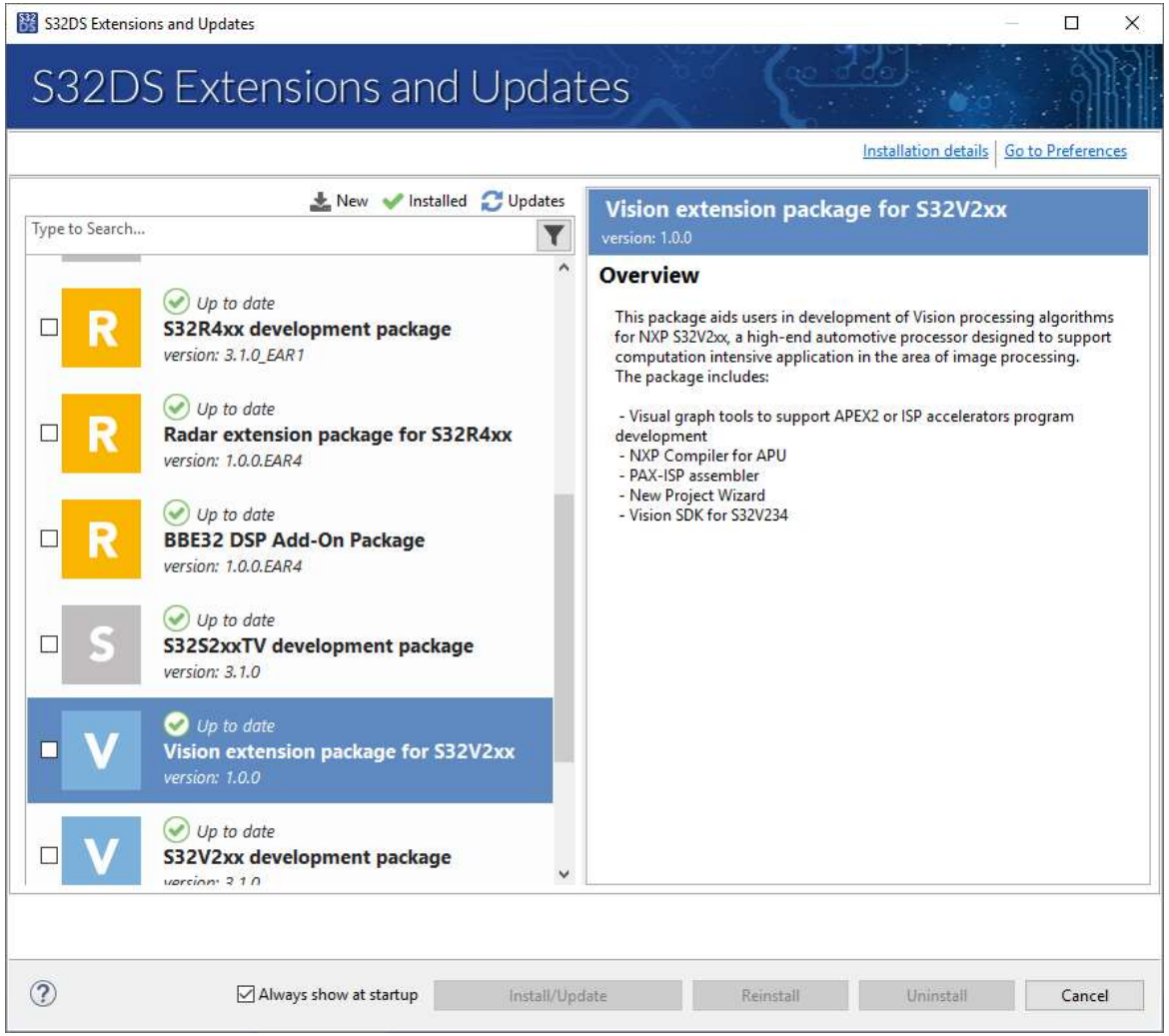
S32 Design Studio Base Tools

- S32 Design Studio Base Download
  - GCC 6.3.x Compilers for all ARM Cores
  - S32 Debugger and S32 Debug Probe
  - S32 Configuration Tool
  - S32 Flash Tool
  - Software Library Manager
  - New Project Wizard
  - "Getting Started" – Collateral Access Page

S32DS Extensions and Updates

Special tool to install, update and install packages

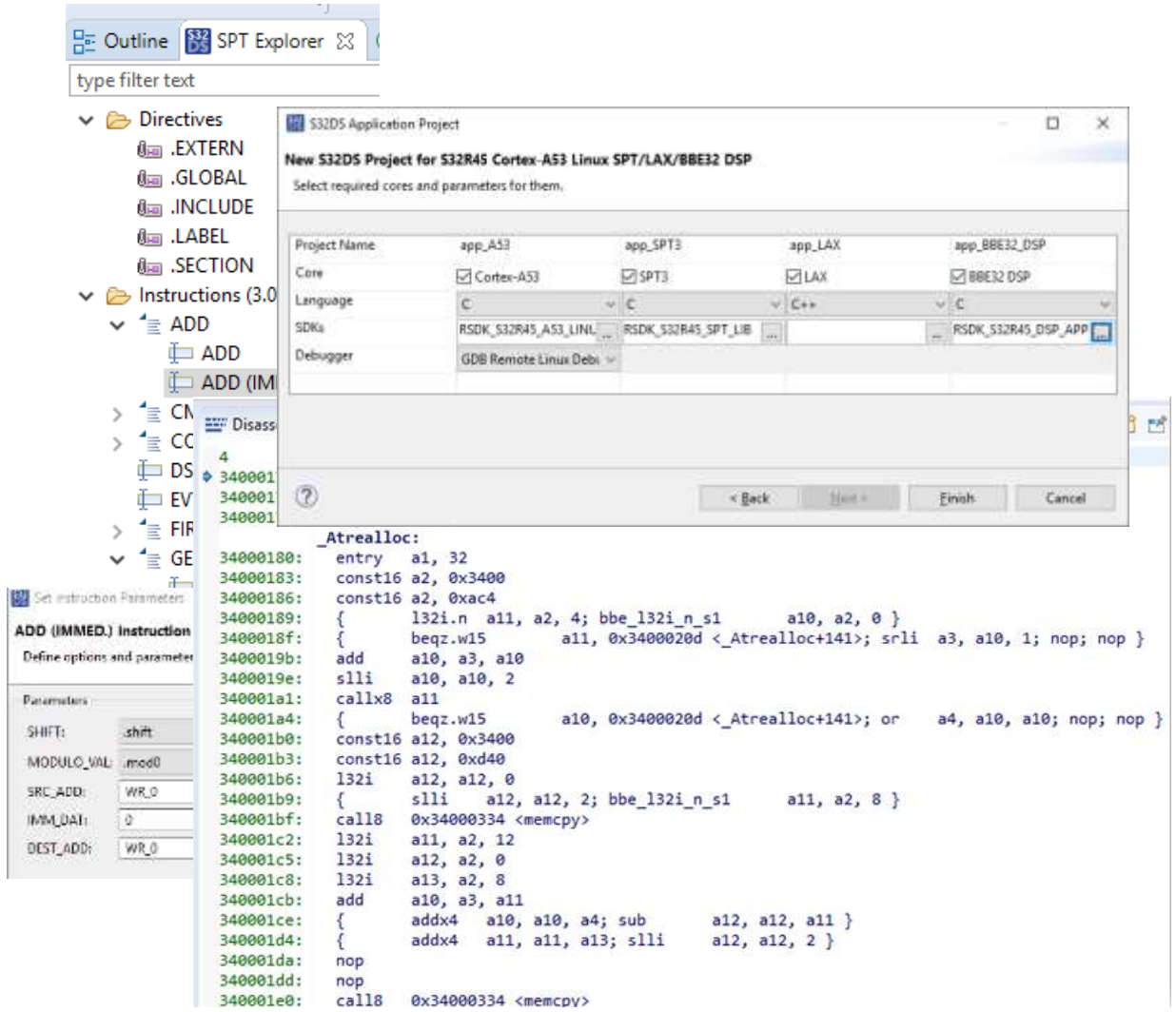
- Communicates with the product's website
- Access to new products and features
- Reduce DS download size
- Display actual information about packages
- Pop-up notification about updates
- User can download the latest product updates manually



Radar Extension Packages for S32R: SPT, DSP, LAX

- Radar Extension Package
  - LAX Compiler
  - SPT assembler
  - Radar SDK integration
  - Wizard to create project with SPT/LAX
  - Examples with SPT using RSDK
  - Software manifests for RSDK
  - Simulation on Synopsys VDK
  - SPT Explorer
  - S32 Debugger support for accelerators

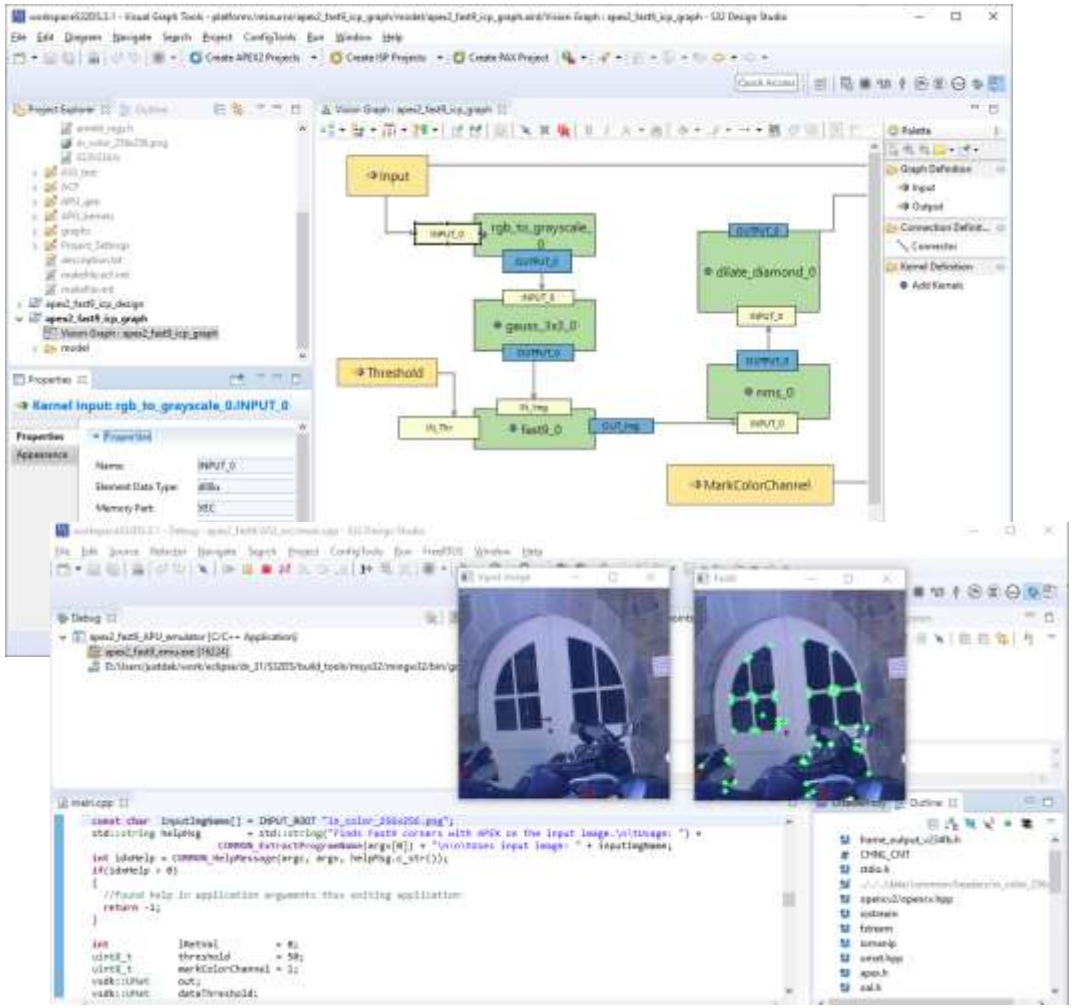
- DSP Add-On Package
  - Xtensa Software Developer's Toolkit
  - IDE integration for Xtensa build tools
  - Wizard to create project with DSP
  - ISS debugging via standard GBD interface



Vision Extension Packages for S32V: APEX, ISP/PAX

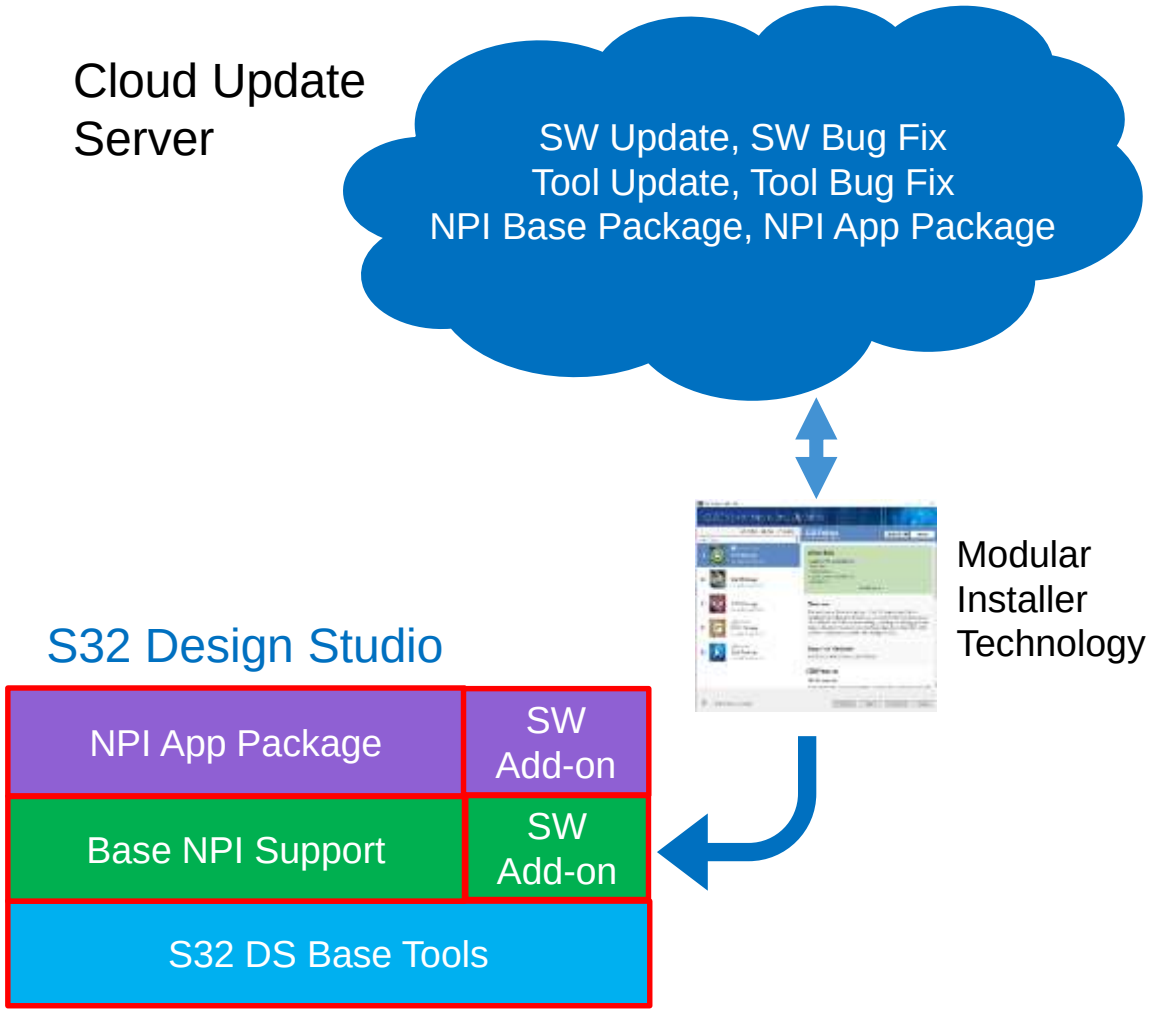
- S32V support
  - NXP APU Compiler
  - ISP assembler
  - Vision SDK integration
  - Wizard to create project with APEX/ISP
  - Examples with APEX and ISP using VSDK
  - Software manifests for VSDK
  - Graph tools to support APEX/ISP program development
  - S32 Debugger support for accelerators
  - APEX and ISP GDB clients

- S32V support
  - PAX assembler and IDE integration
  - VSKY SDK EAR 0.4.9 integration
  - Wizard to create project with PAX
  - Graph tools to support PAX program development



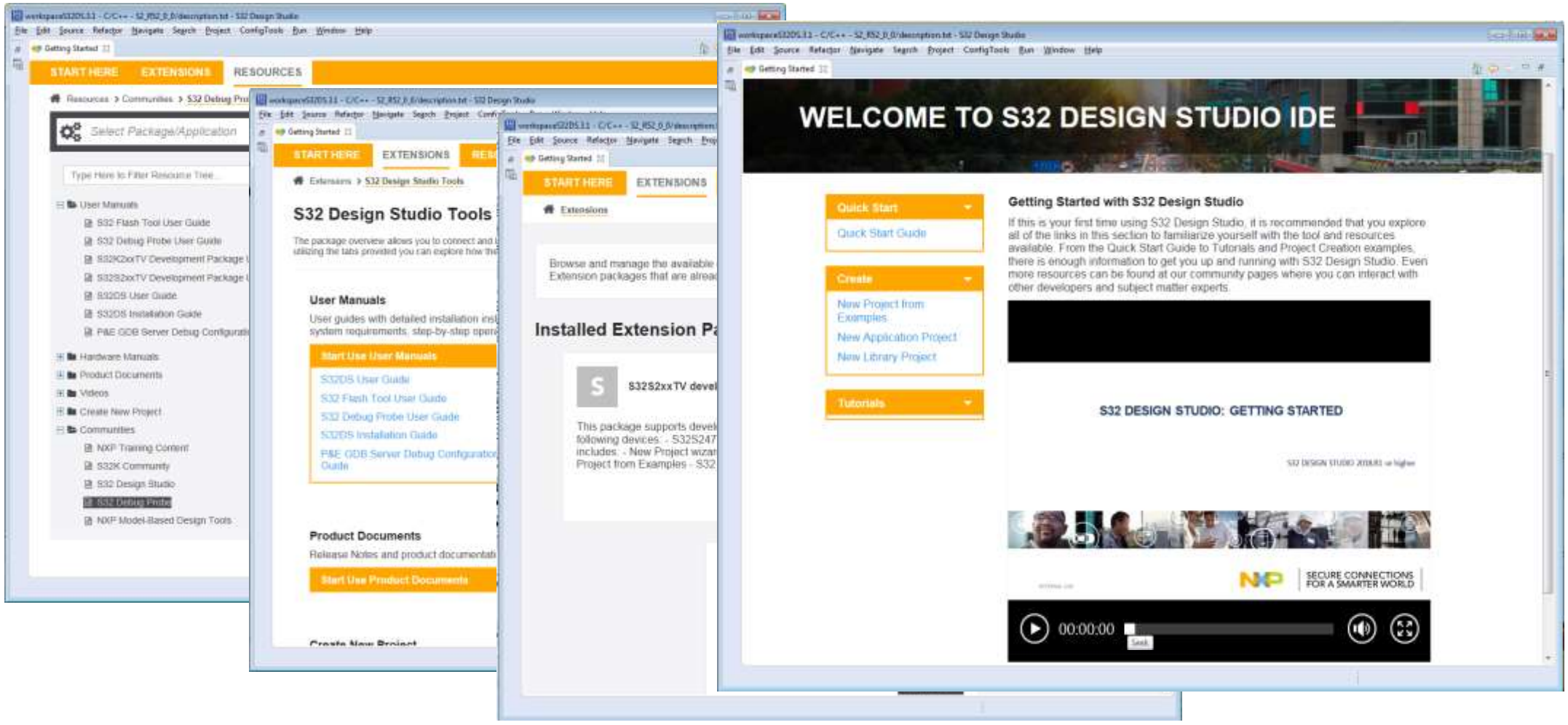
Tool and SW Download

- Different Elements of the end Environment
- Base NPI Support
- App NPI Support
- SW Base Support
- SW App Support
- Tool and SW Bug fixes
- Tools Team does Tool Package
- SW Team Does SW Packages



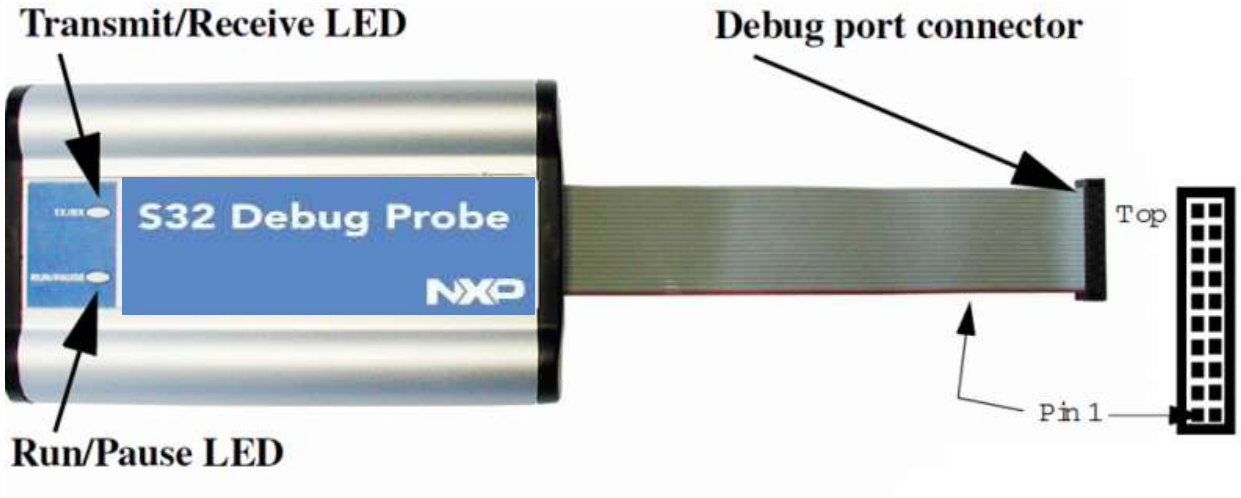
S32 Design Studio – New “Getting Started” Page

Created for Users to Have Easy Access to Collateral



S32 Debugger: S32 Debug Probe

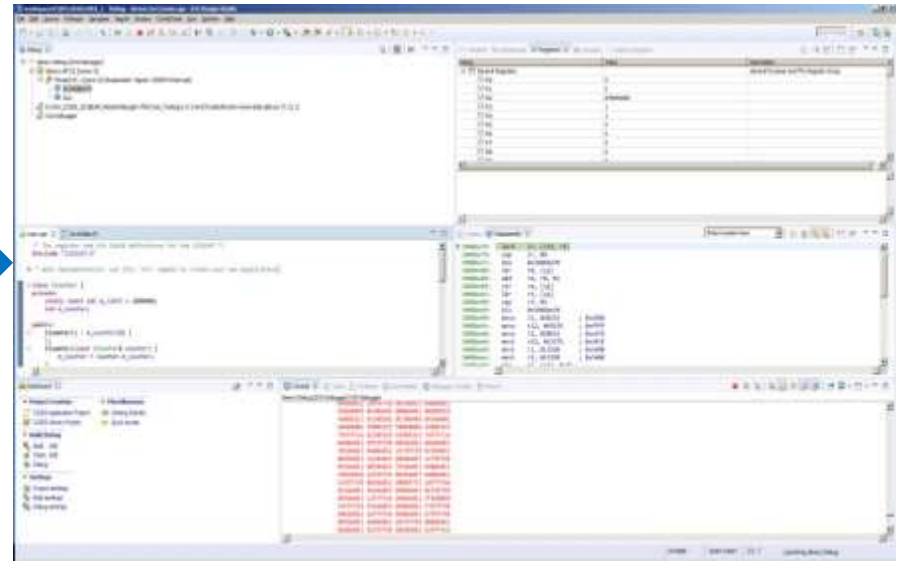
- USB and Ethernet connections
- Supports Remote access to target system, allowing to interactive debug with target system over the network
- Mid-range ~ $500 (Includes 10 pin and 20 pin JTAG probe tips)
- 400 MHz, 16MB DDR
- Debug features
  - Read Write access to registers and memory
  - Automatic core recognition
  - Scripting and logging
  - GDB, command line
  - Asymmetric multicore debug with cross trigger support
    - Start/Stop cores simultaneously or individually
    - Step through 1 core while others are running or stopped
    - BP on 1 core stops execution on all cores
    - BP on core A with conditions on core B
  - Semi-hosting support for single and multicore devices
  - Flash programming (through JTAG)
  - Target Reset Supported
  - Debug through Reset and Low Power
  - Hot connect
  - Secure debug authentication
  - Debug and Trace support for accelerators
    - APEX-D, LAX, PAX, SPT

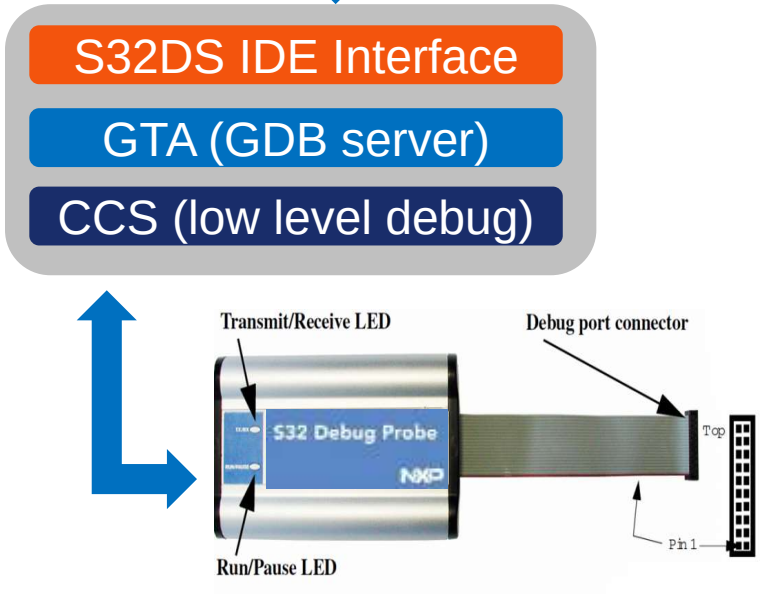


S32 Debugger

- New NXP Debugger for AMP Common Chassis Devices

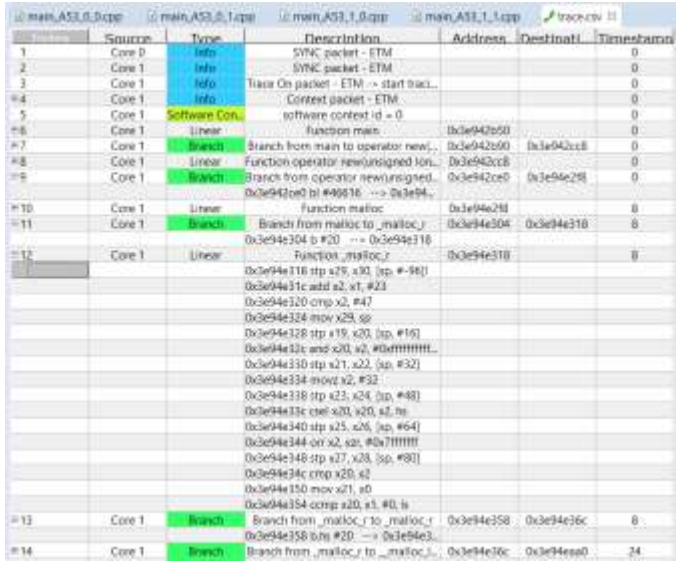
- S32 Debugger is an S32 Design Studio component
  - Standard GNU Debug Views
    - Breakpoints
    - Expressions
    - Memory
    - Disassembly
  - Multi-Core Support
  - Attach scenario
  - Accelerator Core Support
  - Source Code Debug
  - Specialized Register View
  - General Core Register Views
  - Trace Configuration
  - Trace Visualization Support
  - Flash Programmer



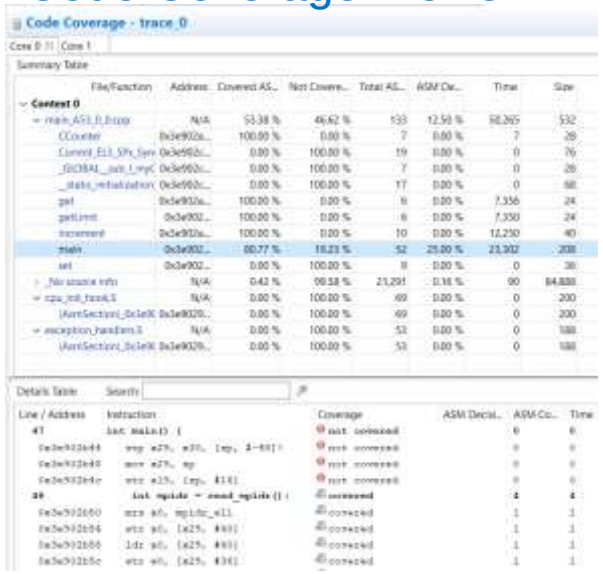


S32 Debugger: Trace/Profiling Features Support

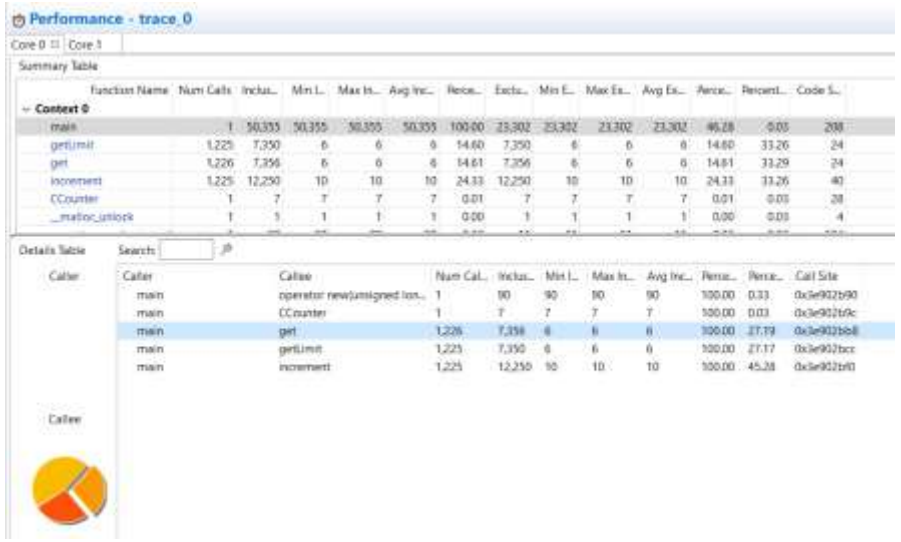
Trace Viewer



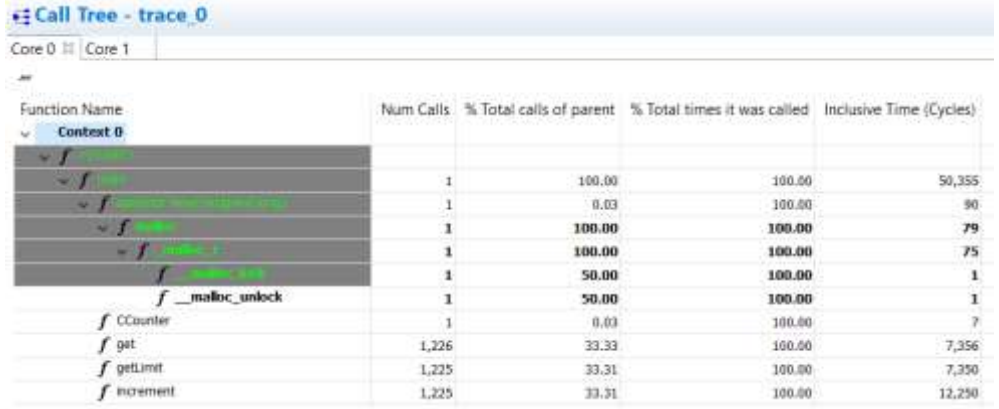
Code Coverage Viewer



Hierarchical Profiler Viewer



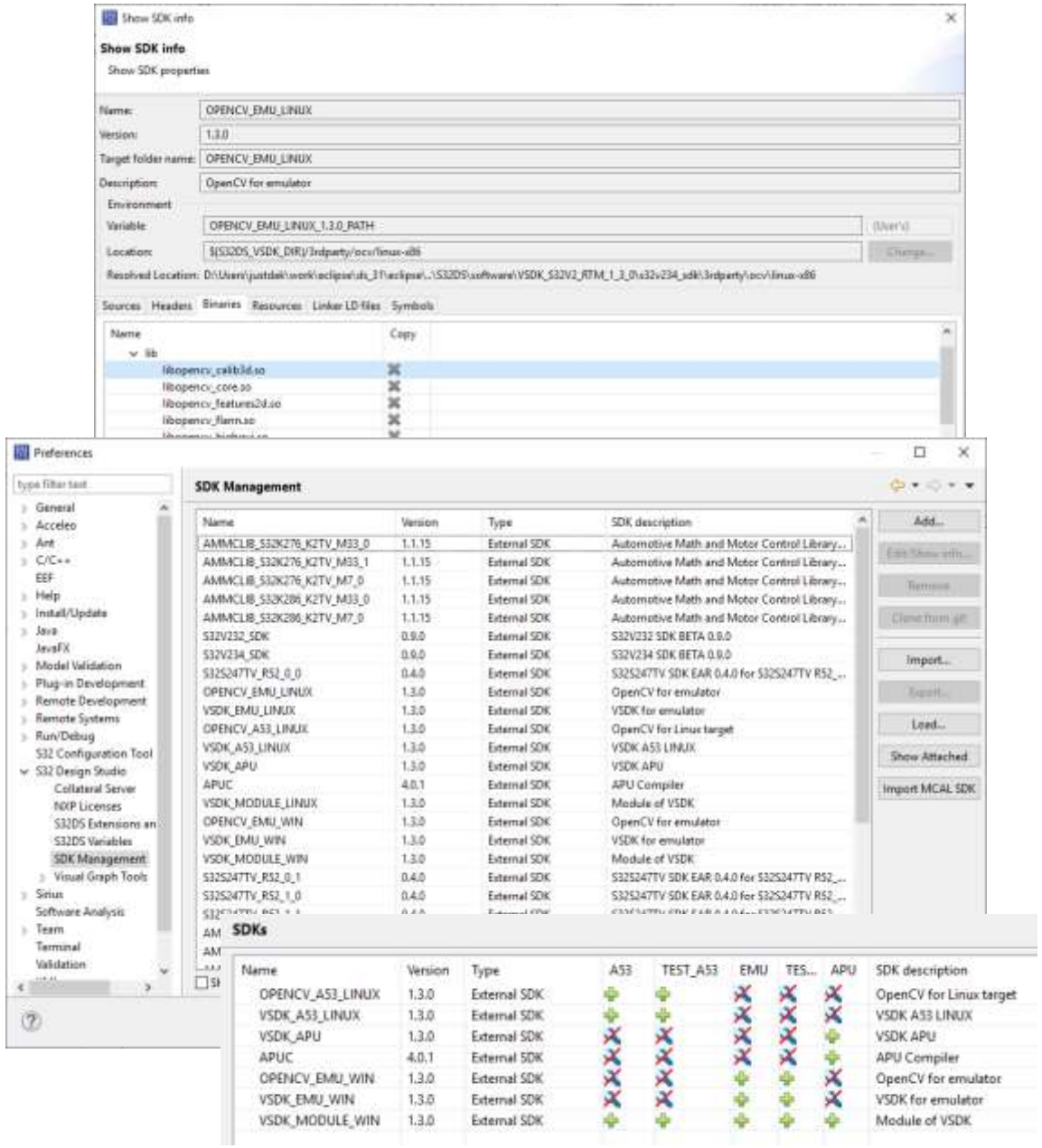
Call Tree Viewer



Timeline Viewer

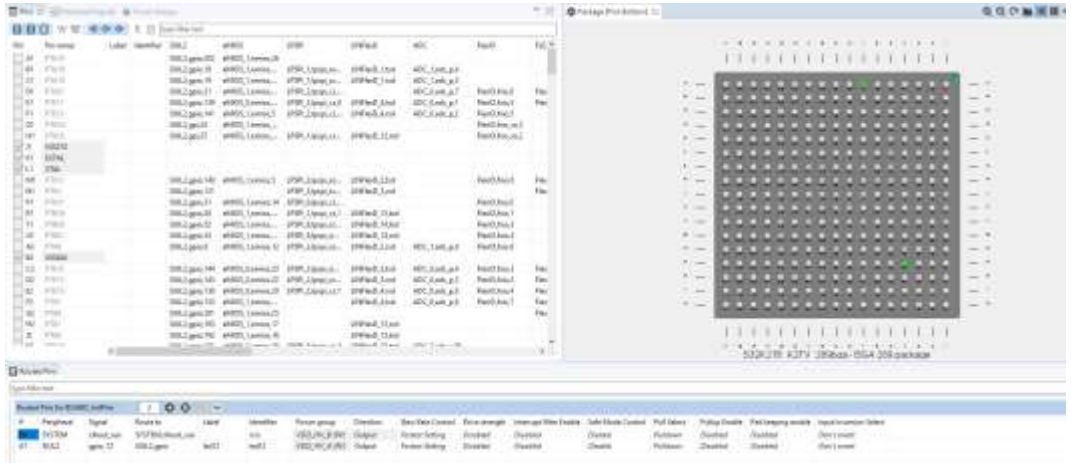
SDK Management

- Mechanism to inject SDK dependencies to project
  - Toolchain build options
  - Libraries
  - Includes
  - Source files
  - Linker file
  - Startup files
- External SDKs support
- User can create Custom SDK
- SDK descriptors
  - XML file to describe SDK dependencies
  - Hierarchical structure: SDKs can be combined in one module
  - Easy can be used by SDK teams to provide dependencies for DS
- New Project Wizard Integration
  - Build options are taken from XML descriptors, no “hardcode” in Wizard’s template

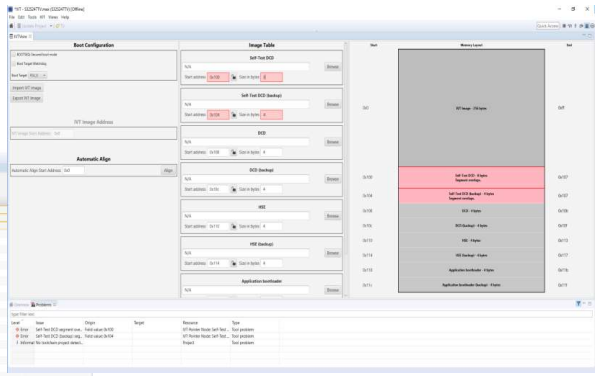


S32 Configuration Tools

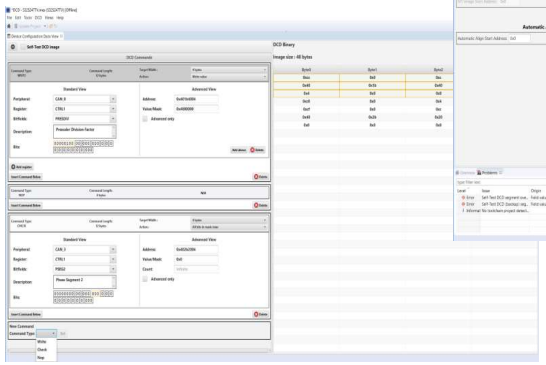
Pins Tool



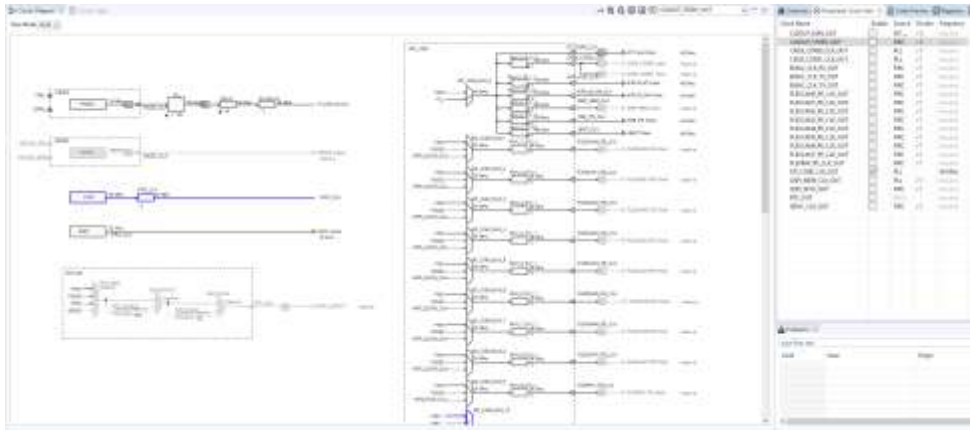
IVT Tool



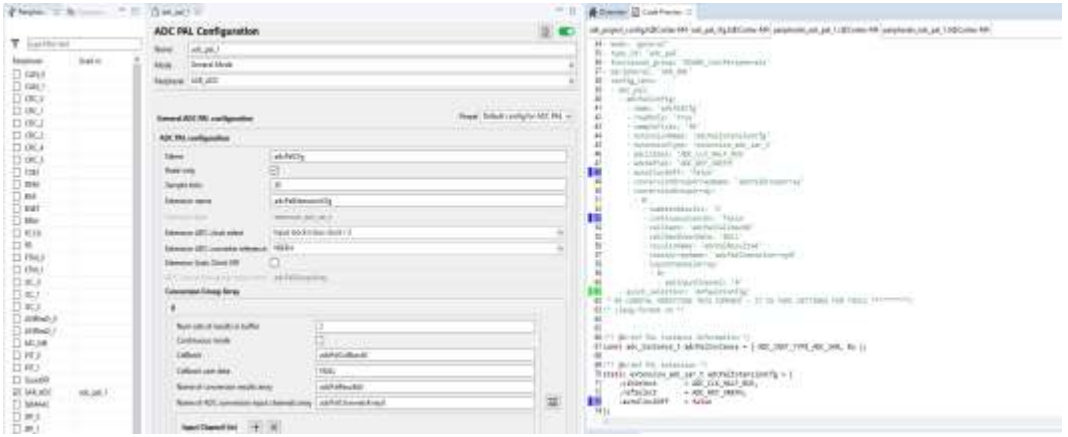
DCD Tool



Clocks Tool

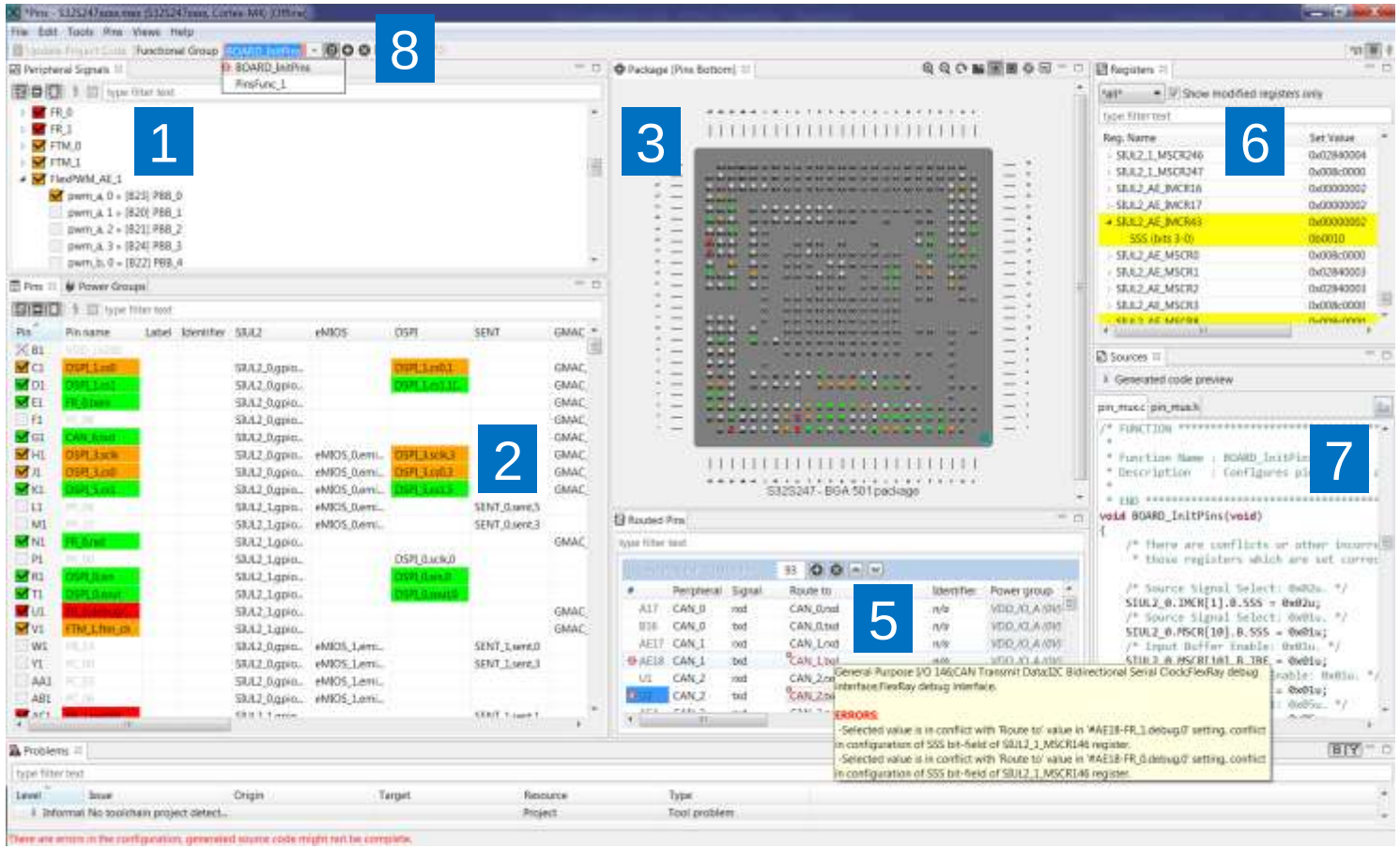


Peripherals Tool



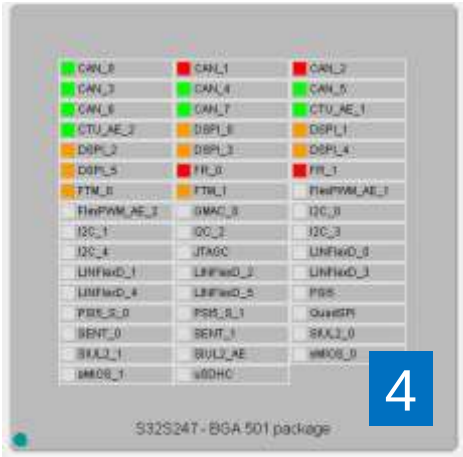
S32 Configuration Tool: Pins Tool

Caption showing Pins Tool for S32S2xx – BGA501 package



Quick configuration of pins from:

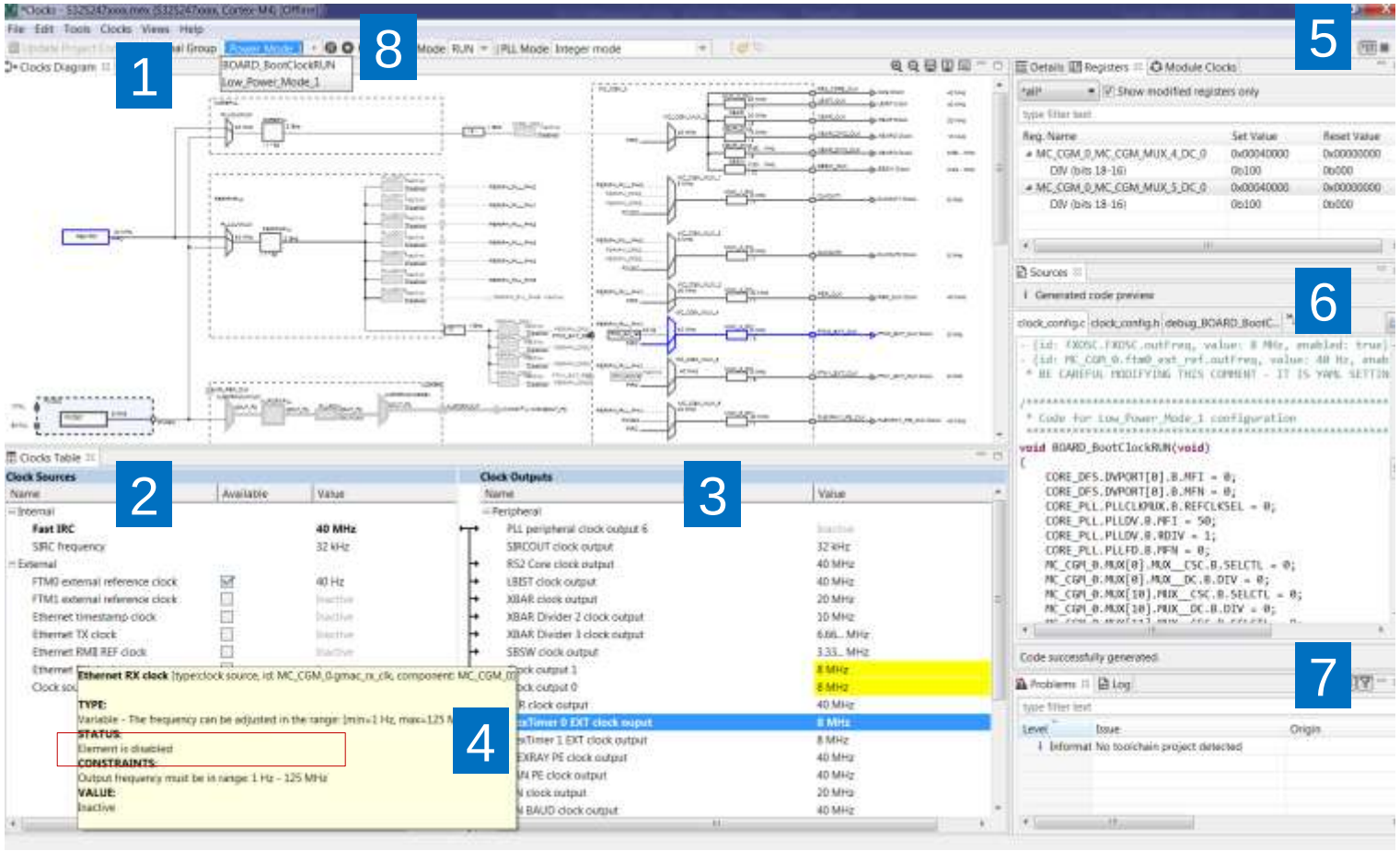
1. Peripherals View
2. Pins View
3. Package View
4. Resource View



- Setting allowed properties for each pin (5)
- Validation of pins selection (5)
- Support & help for managing conflicts (5)
- Registers modified information (6)
- Configuration C - Code Generation (7)
- Multiple Configuration Support (8)
- Wizard for quick configuration
- Power Groups Highlight

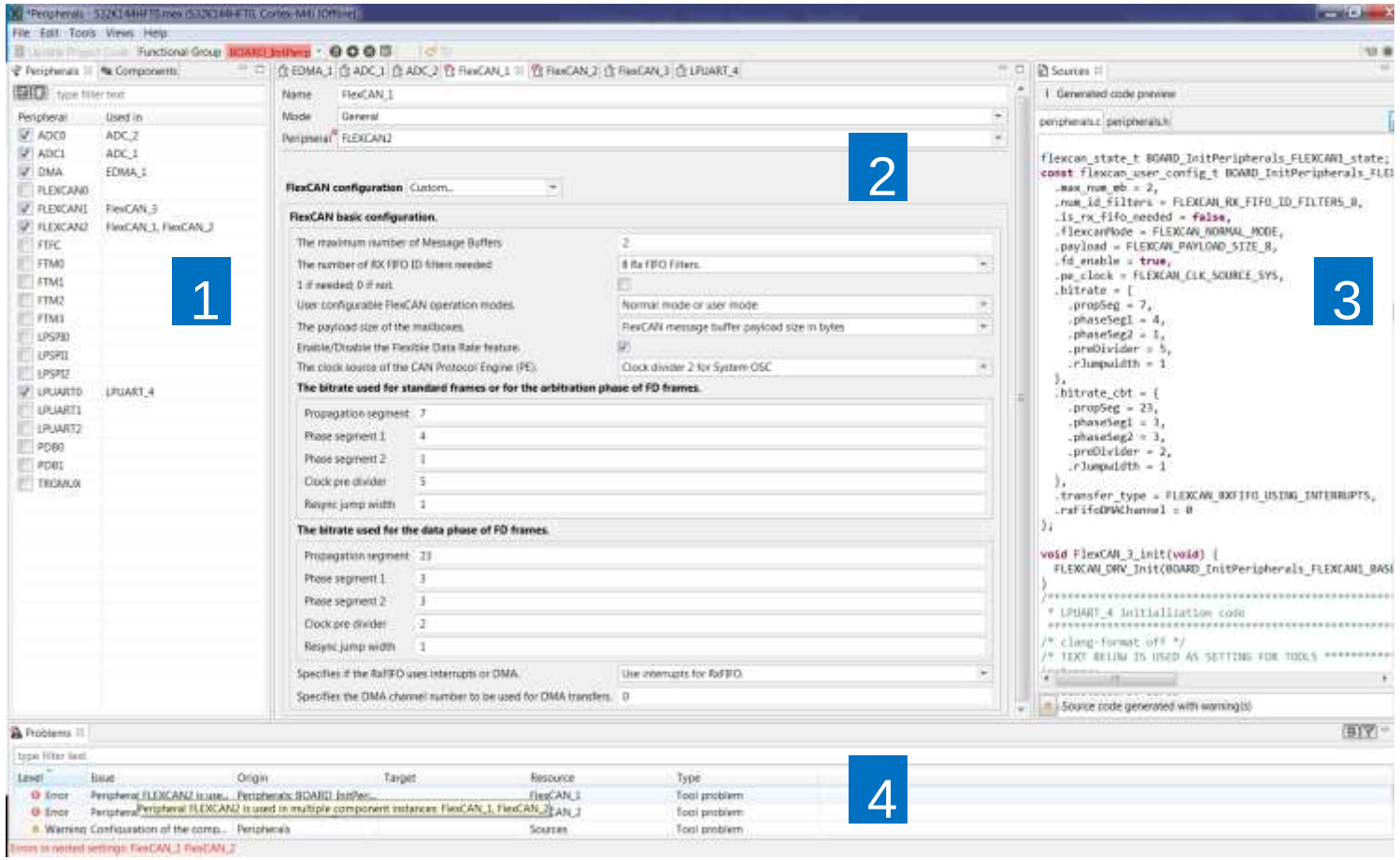
S32 Configuration Tool: Graphical Clock Tool

Caption Showing Clock Tool for S32S2xx



- Quick configuration of clock from:
  - Clock Diagram View (1)
  - Clock Summary Table
    - Sources (2)
    - Outputs (3)
- Setting values for clock tree elements
  - PLLs
  - DFS
  - Dividers
  - Selectors
- Validation of selected choices (7)
- Support & help for managing conflicts (4)
- Registers modified information (5)
- Configuration C - Code Generation (6)
- Multiple Configurations Support (8)
  - Various power modes for example

S32 Configuration Tools: Peripheral Tool



- Quick configuration of IP with code generation on top of AMP SDK

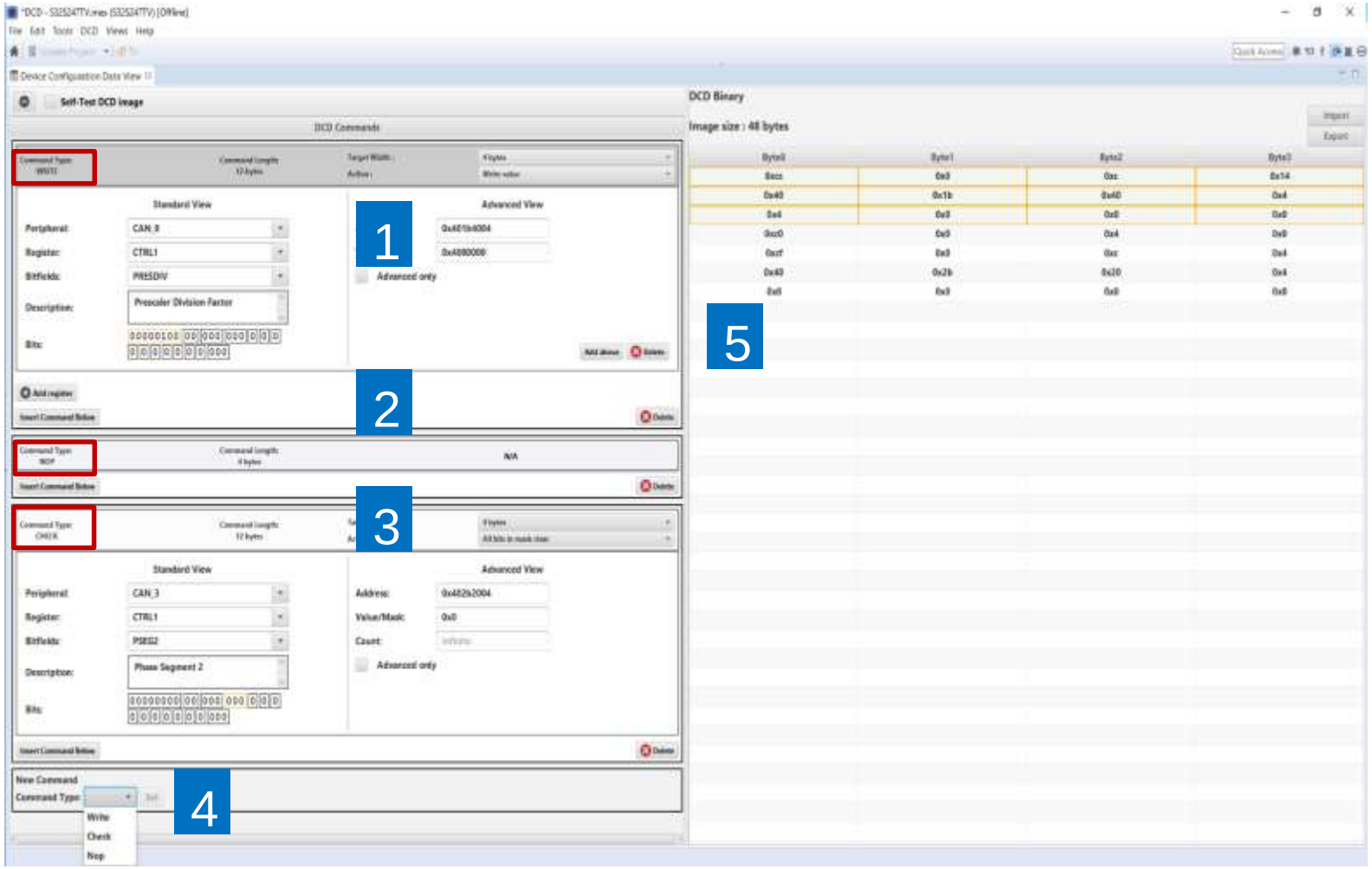
1. Select the peripherals to configure
2. Apply desired setup
3. Generate Configuration C - Code
4. Validation of Selected Choices

- Multiple Configurations Support

- Supports Configuration of SDK
- Device Drivers and RTOS

Note: No Common Chassis SDK in 2018

S32 Configuration Tools – Device Configuration Data (DCD) Tool



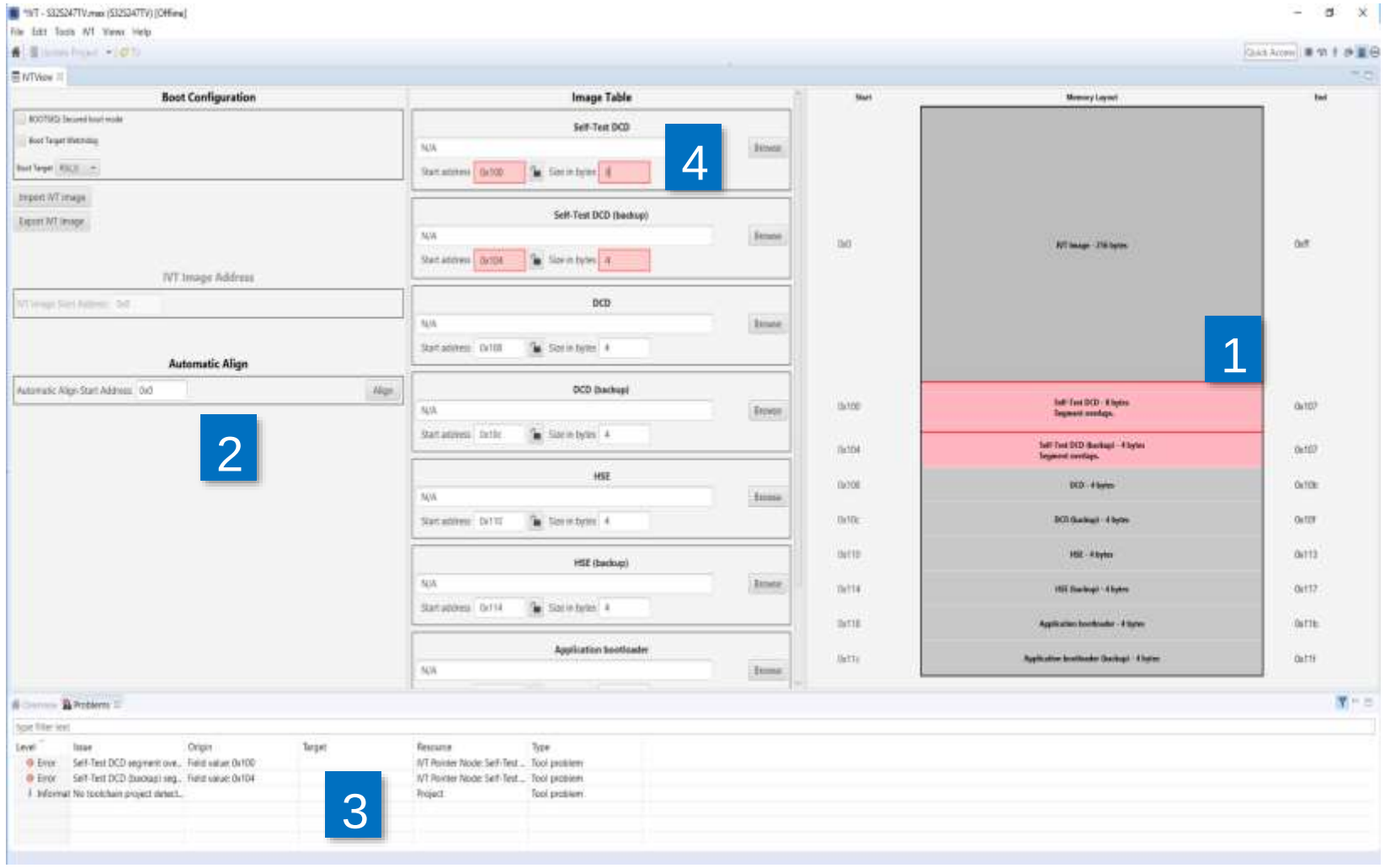
- DCD Tool used mainly to define SoC IP configurations prior to HSE Firmware boot-up or Application Boot Code execution.
- DCD Tool Supports following commands:
  - 1.WRITE – writes a memory area
  - 3.CHECK – checks a memory area
  - 2.NOP – introduces a wait
- DCD Tool generates a binary (5) which incorporates all the settings done.
- Main scenario flow:
  - Import an existing DCD binary image
  - Update it with graphical view
  - Save it and export it in binary or C format.

What is Image Vector Table (IVT) Tool?

- IVT is the main entry point in the boot flow:
  - Aggregates required images for the entire boot flow
  - Provides a fail-safe mechanism for corrupted images
  - Configures the boot flow (secure / non-secure)

- IVT Composer tool
  - Assembles the required information from all the component images into a single flash binary
  - Provides a flash memory mapping mechanism
  - Guards against memory overlapping errors
  - Automatic alignment of images to avoid memory segments overlapping

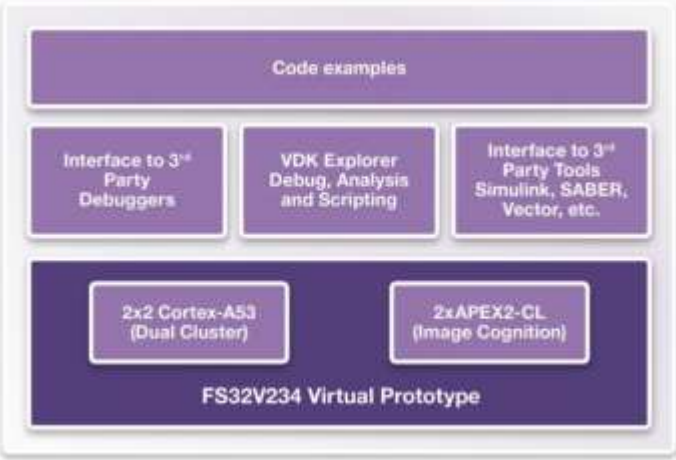
S32 Configuration Tools – IVT Tool Features Summary

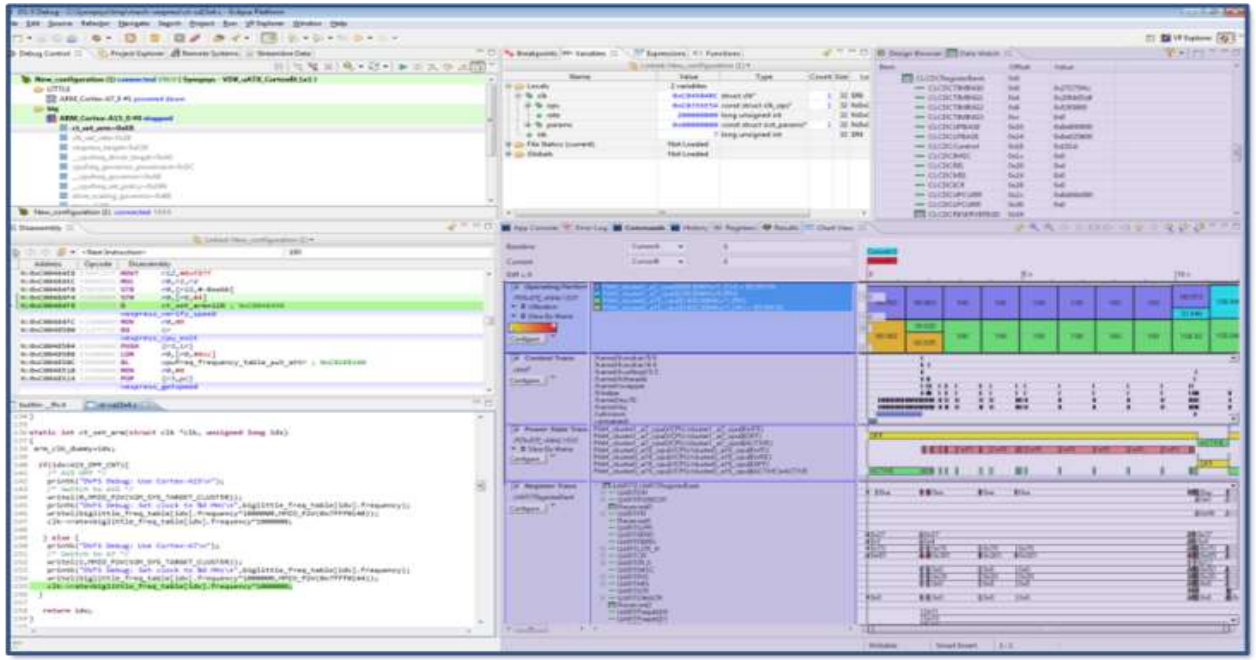


- Memory layout overview and segment overlapping detection. (1)
- Automatic memory segments alignment. Using a starting alignment address the tool will generate start address for all images. (2)
- Export in binary and C format.
- Validation of selected choices. (3)
- Table with the list of images. Size of the image can be automatically determine if the user provides full path of the file. (4)

S32 Design Studio Simulation Environment

- Pre-Silicon Development
- Allows the software development to take place before the hardware is ready, thus helping to validate design decisions
- Synopsys Virtualizer Development Kits (VDKs)
  - Virtual prototypes (a simulation model of an embedded system) for S32S, S32G, S32V, S32R
  - Embedded software samples and debugging tools
  - VP Explorer Plug-In
- VLAB
  - S32K2 support
  - S32 Virtual Platform Toolbox

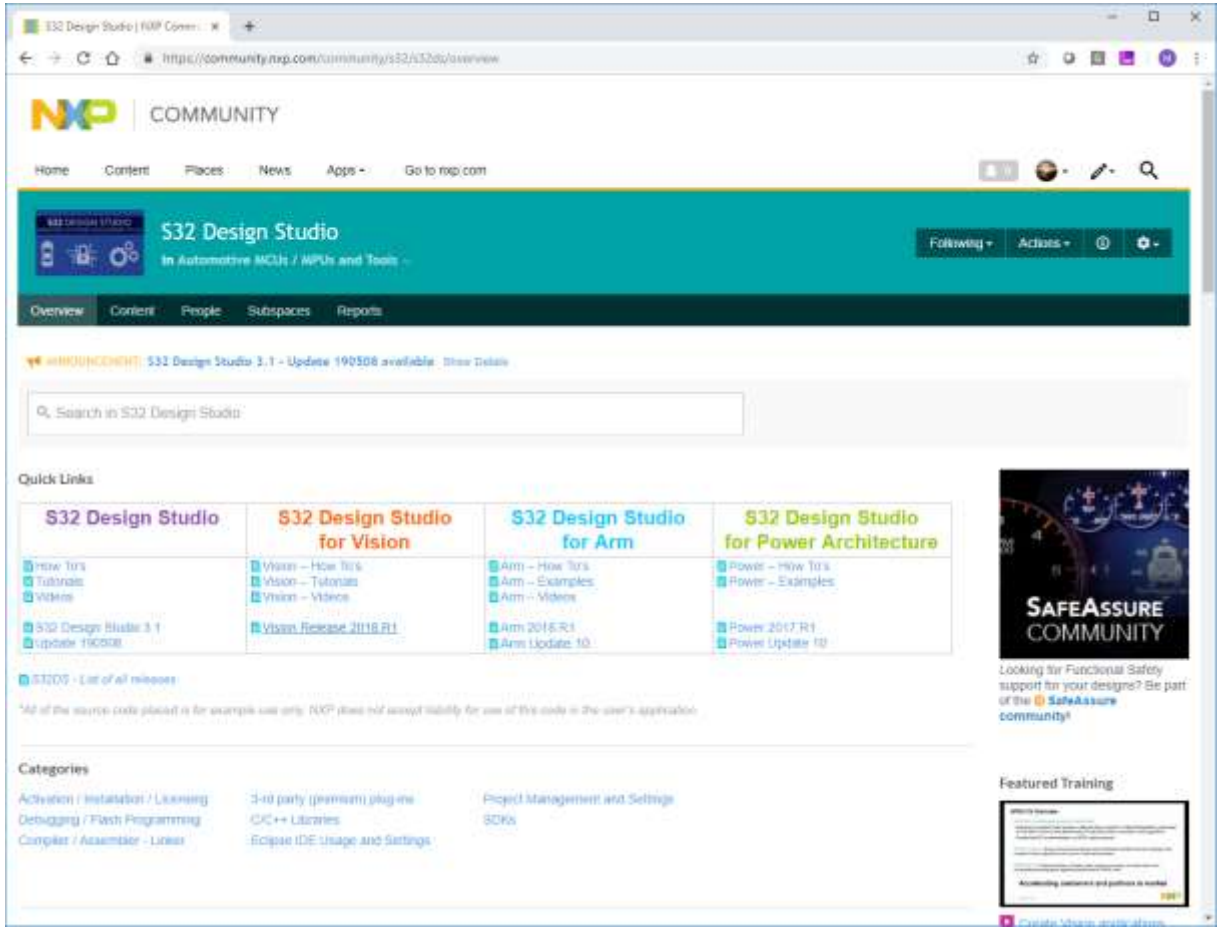




S32 Design Studio: Community

Created for users to have easy access to support & latest documentation

- Can post questions
  - Supported by NXP experts
  - Any community member can respond, reducing demand for NXP support
  - Browse existing threads, questions may have already been answered
- HOWTOs, videos, tutorials, examples
  - Can be posted anytime instead of waiting for next release
- Announce releases
  - New products
  - New versions
  - Updates/bug patches
  - Advertisements for other communities
- Links to other communities
- Gather metrics
  - Identify popular topics/issues



https://community.nxp.com/community/s32/s32ds

S32 Design Studio for Vision 2018.R1	S32 Design Studio V3.x
GNU Tools for ARM® (v4.9)	
GNU Bare-Metal Targeted Tools for ARM® 32-bit/64-bit (GCC version 6.3)	GNU Bare-Metal Targeted Tools for Arm® 32-bit/64-bit (GCC version 6.3)
GNU Linux Targeted Tools for ARM® 64-bit (GCC version 6.3)	GNU Linux Targeted Tools for Arm® 64-bit (GCC version 6.3)
Libraries: NewLib, NewLib Nano, EWL, and EWL Nano	Libraries: NewLib, NewLib Nano, EWL, and EWL Nano
NXP APU compiler version 4.0.1	NXP APU compiler version 4.0.1
ISP assembler	ISP assembler
Semihosting for Arm® 32-bit and 64-bit bare-metal target toolchains	Semihosting for Arm® 32-bit and 64-bit bare-metal target toolchains
MSYS2 32bit version 1.0.0	MSYS2 32bit version 1.0.0
GDB 7.12.1 with Python support	GDB 7.12.1 with Python support
GNU GDB clients for APEX2 and ISP coprocessor	GNU GDB clients for APEX2 and ISP coprocessor
S32 Flash Tool	S32 Flash Tool
The wizards for creating application, library projects and projects from project examples for the supported processor families	The wizards for creating application, library projects and projects from project examples for the supported processor families
	A53 Trace/Profiling Tools
S32 Debugger	S32 Debugger
S32 Debug Probe support	S32 Debug Probe support
P&E Multilink/Cyclone/OpenSDA (with P&E GDB Server)=	P&E Multilink/Cyclone/OpenSDA (with P&E GDB Server)
Integrated Vision SDK v1.2.0, Vision SDK project examples, Support for wizard creating projects from Vision SDK project examples	Integrated Vision SDK v1.3.0, Vision SDK project examples, Support for wizard creating projects from Vision SDK project examples
New project wizard to create application, library and Visual Graph Tools	New project wizards to create Visual Graph Tools projects
Visual Graph Tools to support ISP and APEX2 targeted software development	Visual Graph Tools to support the ISP and APEX2 targeted software design
Lauterbach debugger supported by the project creation wizard	Lauterbach Trace32® support
EmbSys Registers view	EmbSys Registers view
DDR Configuration and Validation	S32 Configuration Tool (provided by MCU-specific development packages) with the Pin, Clock, Peripheral (Part of S32 SDK for S32V23x) and DDR Configuration Tools
DDR Stress Test tool	DDR Stress Test tool
Kernel Aware debugging for FreeRTOS, OSEK	Kernel Aware debugging for FreeRTOS, OSEK
SDK management	SDK management
	Integrated S32 SDK for S32V23x BETA 0.9.0 (Windows only)
	Integrated AMMCLIB SDKs for S32V234 version 1.1.15
	Support for importing MCAL configuration to a custom SDK
The Getting Started page	The Getting Started page

Support provided via S32V2xx Extension Package

Support provided via S32V2xx Development Package

Conclusion S32 Design Studio for Next Generation Devices

- New S32 Design Studio Tool
- Modular Tooling
  - Base NPI Support Development Packages
  - Accelerator Support Extension Packages
- Support for all S32 Next Gen Parts
- Enhanced SDK Management
  - SDK decoupling
- New "*Getting Started*" Page
  - Extended Support for users
- New S32 Debugger
  - New S32 Debug Probe
  - Trace and Profiling Capability
- S32 Configuration Tool
  - Pins Tool
  - Graphical Clock Configuration
  - DCD Tool
  - Peripheral Configuration Tool
  - IVT Composer Tool
  - DDR Configuration Tool
- Virtual Development Environment
  - Integration with S32 Design Studio
  - Supports pre-silicon development
  - Support SW test and validation development

SECURE CONNECTIONS
FOR A SMARTER WORLD