S32 Design Studio Tools for S32 Platform

Mike Doidge
Software Development Tools Engineering
NXP Automotive Microcontroller & Processors

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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

Cloud Update Server

SW Update, SW Bug Fix
Tool Update, Tool Bug Fix
NPI Base Package, NPI App Package

S32 Design Studio

- NPI App Package
- Base NPI Support
- S32 DS Base Tools
- SW Add-on
- SW Add-on

Modular Installer Technology
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

S32DS IDE Interface
GTA (GDB server)
CCS (low level debug)
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
- Clocks Tool
- DCD Tool
- Peripherals Tool
- IVT Tool
S32 Configuration Tool: Pins Tool

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

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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