

S32N5SDK

S32N5 software development kit (SDK)

Rev. 1.0 — 14 August 2026

Product brief

1 Software product overview

The S32N5 Software Development Kit (SDK) is the software package offered by NXP that enables the programming of the System on a Chip (SoCs) from the S32N5 device family, for its intended use in the automotive domain: Central compute, body control, powertrain, gateway and connectivity on virtual Electronic Control Units (ECUs).

SDK is the one-stop shop for S32N5 SoCs software, and contains NXP proprietary runtime software, tools, and reference integration examples as well as partner software.

Using the examples from the SDK one can quickly evaluate the S32N5 SoCs capabilities and reference use cases such as central compute and connected vehicle. The examples also act as a starting point for further application development.

The SDK can be downloaded from nxp.com portal.

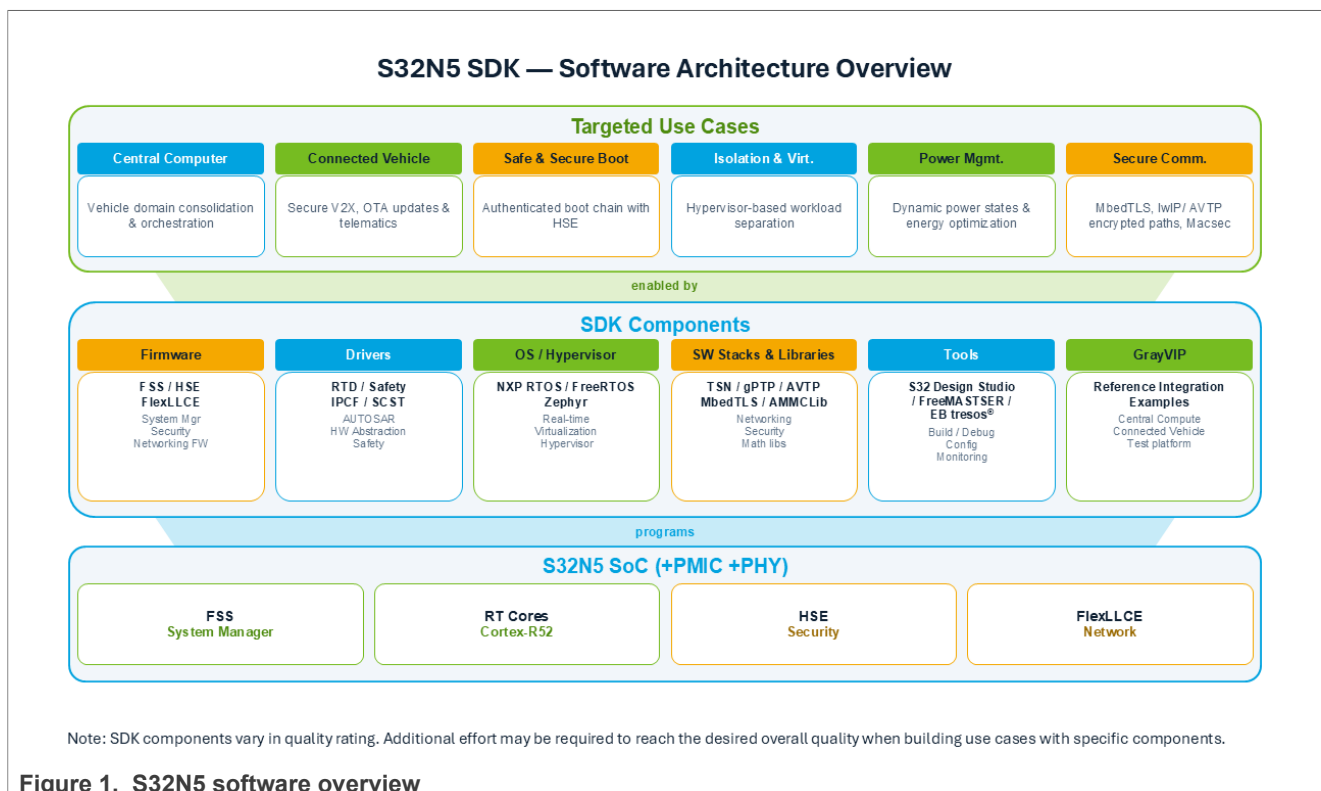


Figure 1. S32N5 software overview

2 Software content

This section describes the content of the S32N5 SDK.



2.1 Runtime software

These are the building blocks to program the S32N5 SoC. The runtime software is organized in the following sections.

2.1.1 Firmware

Firmware software helps to program specialized subsystems. It is composed of:

- **Foundation SubSystem (FSS)**
FSS fulfils the role of system manager on the S32N CEA SoCs. It abstracts the hardware complexity through an SCMI interface layer, while offering complex high-level functionality (safety, boot, system and isolation services).
- **Hardware Security Engine (HSE)**
HSE is a software acceleration firmware running on top of NXP dedicated security core. HSE enables offloading of the most common security algorithms from the CPU to dedicated hardware. Provides key storage and secure boot, while serving as a secure enclave.
- **Flexible Low-Latency Communication Engine (FlexLLCE)**
FlexLLCE is a high-performance, hardware-accelerated firmware on S32N, delivering deterministic, low-latency network processing for automotive workloads.

2.1.2 Drivers

The drivers provide software abstractions over the SoC capabilities. They are grouped in:

- **Real-Time Drivers (RTD)**
RTD is a set of AUTOSAR® compliant device drivers responsible for hardware abstraction and enablement of the NXP devices. The Complex Device Drivers (CDD) provided on top of the required AUTOSAR drivers create a rich ecosystem for developers and applications.
- **S32 Safety Software Framework (SAF)**
SAF is a premium software bundle designed to help developers build ISO 26262-compliant automotive and industrial safety applications. It provides comprehensive software coverage for hardware safety mechanisms, enabling latent fault detection, system recovery, and ASIL D integration.
- **Inter-Platform Communication Framework (IPCF)**
IPCF enables communication between software instances running on the same SoC. It uses the MRU IP to communicate between software, while permissions over memory are granted via Extended Resource Domain Controller (XRDC) configuration.
- **Structural Core Self-Test (SCST)**
SCST library consists of a set of atomic tests targeted for improving fault coverage on Cortex®-R52 cores.

2.1.3 Operating systems and hypervisors

Those are either NXP proprietary operating systems or ports from open source.

- **NXP Real-Time Operating System (RTOS)**
NXP RTOS is an AUTOSAR compliant operating system that offers system services to the software components running on the cohorts. It provides timing, stack and memory protection between tasks running on the same CPU.
- **FreeRTOS®**
FreeRTOS is a market-leading, open-source RTOS designed specifically for microcontrollers and small microprocessors, running on the Cortex-R52 Cores.
- **Zephyr RTOS**
Zephyr is an open-source, scalable RTOS built for resource constrained devices running on Cortex-R52 cores.

- Exception Level 2 (EL2) Monitor hypervisor
EL2 Monitor is a lightweight partitioning hypervisor which supports isolation of applications on the Cortex-R52 Core processors by providing GIC virtualization and EL2 MPU protection.

2.1.4 Software stacks and libraries

The software stacks are either NXP proprietary implementation of communication protocols or ports from open source. Libraries contain specialized, domain-specific software.

- MbedTLS stack
MbedTLS (previously PolarSSL) is an implementation of the TLS and SSL protocols and the respective cryptographic algorithms and support code required, integrated with NXP security accelerators.
- Time-Sensitive Networking (TSN) stack
TSN stack is a collection of software components that enable deterministic, time-synchronized communication over standard Ethernet networks. It uses the capabilities of the NETCv3 Ethernet switch.
- Generalized Precision Time Protocol (gPTP) stack
gPTP stack implements the IEEE 802.1AS standard, providing nanosecond-level time synchronization across networked devices. It ensures that all distributed sensors, actuators, and controllers share a single, highly accurate clock, crucial for real-time applications in automotive, industrial, and Audio-Video Bridging (AVB) domains.
- Audio Video Transport Protocol (AVTP) stack
AVTP stack is the software layer that encapsulates and transmits time-sensitive media, like uncompressed audio, compressed video, and automotive bus data, over deterministic Ethernet networks. Standardized under IEEE 1722, it serves as the transport layer for AVB and TSN systems.
- Transmission Control Protocol/Internet Protocol (TCP/IP) stack
TCP/IP stack provides an integration for the Lightweight IP (lwIP) stack running on top of S32N hardware. It is designed for resource-constrained microcontrollers, providing full User Datagram Protocol (UDP), TCP and IP capabilities with minimal RAM needs.
- Secure Digital Host Controller (SDHC) stack
SDHC stack is an embedded software library that provides APIs to access the SD bus interface via the uSDHC hardware driver and file system layers. It allows microcontrollers and processors to interface with SD, SDIO, and MMC cards from various vendors.
- MACsec Key Agreement (MKA) stack
MKA protocol is a management protocol defined in the IEEE 802.1X standard. Paired with MACsec hardware (IEEE 802.1AE), it secures Layer 2 Ethernet frames by providing device authentication, frame integrity, and payload encryption, while benefiting from NXP's security acceleration.
- Automotive Math and Motor Control Library (AMMCLib)
AMMCLib is a collection of easy to use production-ready software libraries tailored for motor control applications.

2.2 Tools

Tools helps the user to program the device, enabling ease of use for complex operations such as configuration, build, flash and debug.

- S32 Design Studio and Tools
S32 Design Studio is a complimentary, Eclipse-based Integrated Development Environment (IDE) by NXP Semiconductors, purpose-built for automotive and ultra-reliable Arm®-based microcontrollers and processors. It provides a seamless, code-size-unlimited environment for editing, compiling, and debugging C/C++ code, complete with rich graphical configuration tools to speed up development.
- FreeMASTER

FreeMASTER is a real-time data visualization and debugging tool developed by NXP Semiconductors. It allows embedded engineers to non-intrusively monitor, graph, and modify internal variables and parameters on a running microcontroller without halting its execution.

2.3 Reference integration examples

The reference integration examples are bundled under the S32N5 SDK.

S32N5 SDK provides the following functionalities:

- A reference software integration platform for S32N5 SoC applications. It streamlines S32N5 hardware evaluation and accelerates software development.
- Out-of-the-box integration of NXP software and strategic partner software on top of the S32N software ecosystem while acting as a development platform for applications.
- Multiple execution environments running on the same SoC and provides examples for different deployment models. The platform is designed around isolated cohorts/partitions that can host different software stacks and operating systems.
- Emphasizes rapid evaluation and bring-up through automation. The available capabilities include: One-click build flows, automated image generation, flash image creation, board deployment scripts, support for pre-built demonstrations.
- S32N5 SDK accelerates customer ramp-up by providing a pre-integrated, pre-configured, and automated software environment for S32N5, showcasing key differentiators and flows.

The targeted use cases include but are not limited to:

- Safe and Secure booting
- Isolation and Virtualization
- Power Management
- Secure Communication

2.4 Partner software

S32N5 SDK uses and/or distributes partner software under a redistribution license granted by the partners. Partner software is used to cover areas not addressed by NXP, but useful or required for programming the S32N5 SoCs.

The partner software used and/or distributed by S32N5 SDK are:

- Elektrobit Tresos
- L4Re Hypervisor

3 Supported targets

S32N5 SDK is intended to be used with the S32N5 family of devices.

It is usable out of the box on the NXP standard development board, code named S32N55-RDB-S. Custom boards might need adaptations.

4 Quality, standards compliance and testing approach

The SDK is developed according to NXP Software Development Processes that are Automotive-SPICE (including also various tailoring such as for open-source), IATF16949 and ISO9001 compliant.

5 Revision history

Table 1. Revision History

Document ID	Release Date	Description
S32N5SDK_PB v.1.0	14 August 2026	Initial release

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