Product Brief Inter-Platform Communication Framework (IPCF) for S32N

Version 1

Rev. 1.0 — 30 October 2025 **Product brief**

1 Software Product Overview

Inter-Platform Communication Framework (IPCF) is a subsystem which enables applications, running on multiple homogenous or heterogenous processing cores, located on the same chip or different chips, running on different operating systems (FreeRTOS, baremetal, Linux, NXP RTOS, Zephyr), to communicate over Shared Memory.

IPCF is designed for NXP embedded systems and features low-latency and tiny-footprint. It exposes a zero-copy API that can be directly used by customers for maximum performance, minimum overhead and low CPU load. The driver ensures freedom from interference between local and remote shared memory by executing all writing operations only in local memory domain. Customers can enforce memory protection for their software with XRDC/SMPU peripherals.

Customers can choose to build exactly what they need in terms of HW and OS.

1.1 Use-cases

The following diagram illustrates some use-cases addressed by IPCF.

Figure 1. IPCF use cases on multiple homogenous or heterogenous processing cores

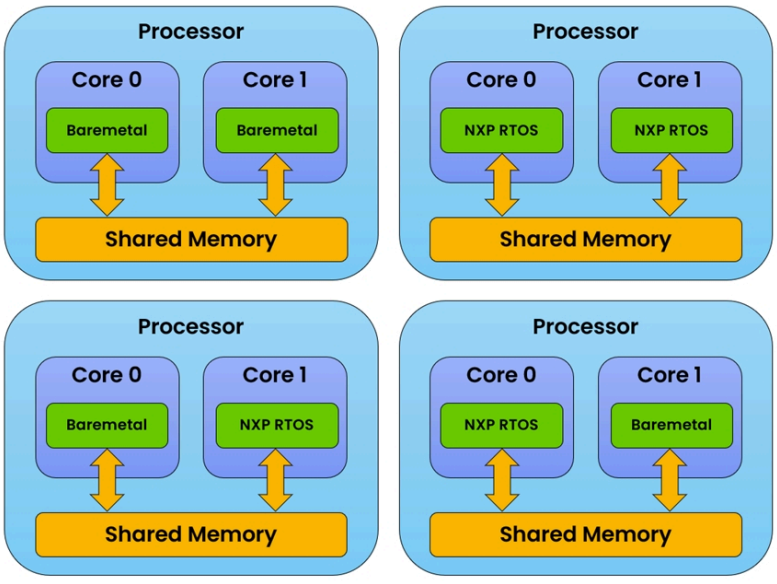
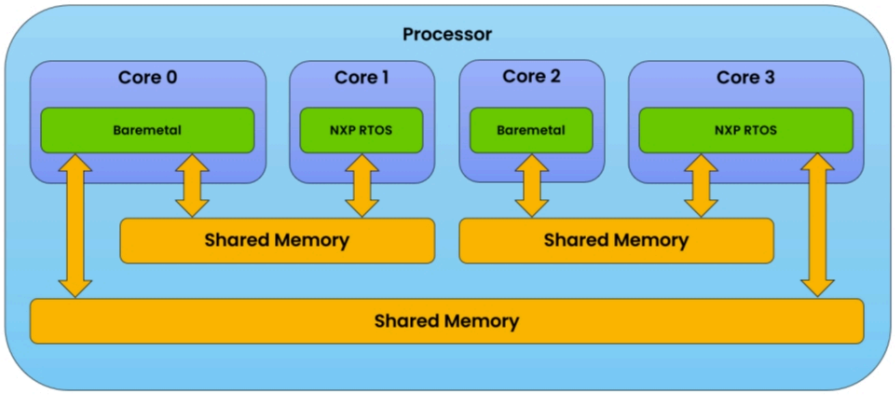


Figure 2. IPCF use case with multiple instances



2 Software Content

IPCF software package contains the communication driver over shared memory supporting FreeRTOS, Linux, NXP RTOS, Zephyr and baremetal.

The driver is accompanied by sample applications which demonstrate a ping-pong message communication (for more details see the samples readme file).

IPCF software package contain driver as plugin for Elektrobit Tresos or NXP S32 Design Studio for quick and easy configuration. This component is installed over NXP S32 Real Time Drivers releases and can be used with all Real Time Drivers components.

IPCF software package also contains:

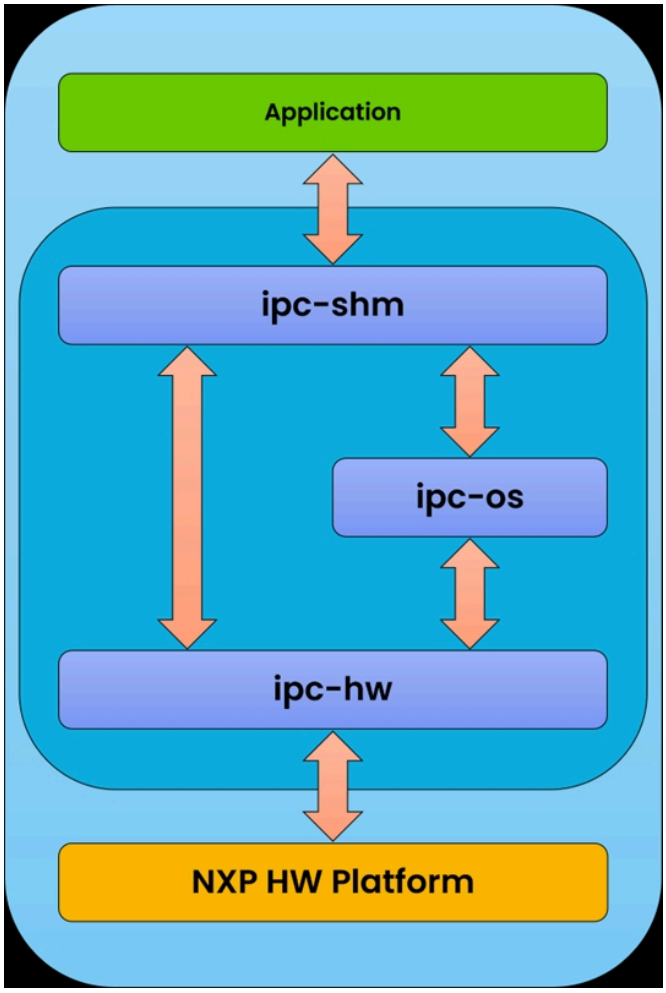
- **Release Notes(information about release):**
  - Supported platforms
  - Software dependencies
  - Validated compilers
  - Instructions about installation steps
  - New features
  - Known limitations
  - Licensing and support
- **IPCF Driver User Manual:**
  - Installation instruction for different integration
  - Driver usage, compile and configuration for different OSes and platforms
  - Instructions to compile, build and run the sample application
  - Describe driver APIs
- Safety Package - delivered to customers for PRC and RFP releases
- Quality Package - delivered to customers for PRC and RFP releases

2.1 Architecture

IPCF driver contains next layers:

- Shared memory generic implementation that is HW and OS agnostic
- Queue component implementation used in IPCF driver
- HW abstraction component: abstraction over various HW IP modules (MU and MRU)
- OS abstraction component: OS agnostic API for common OS services

Figure 3. IPCF System Architecture



2.2 Details

IPCF driver uses for buffer management:

- unmanaged channel data flow: buffer management is disabled, and application owns the entire channel memory; use-case example: video streaming or non-critical data exchange
- managed channel data flow: memory is split in buffer pools and buffer management is controlled by driver; use-case example: CAN forwarding or flash update

IPCF driver supports the following inter-core notification methods:

- Messaging Unit (MU): Interrupt messaging protocol
- Messaging Unit (MU): General-purpose interrupt messaging protocol
- Message Receive Unit (MRU)
- polling method (sending and receiving is managed by user)

IPCF driver reduces the receive interrupt overhead with interrupt coalescing technique, avoiding storming interrupt. When an receive interrupt is triggered the code disables the interrupt, processes all buffer descriptors in receive FIFO and then reenables the interrupt.

3 Supported Targets

The software described in this document is intended to be used with the following S32X microcontroller devices of NXP Semiconductors:

- Vehicle Communication and Networking Systems: S32N

4 Compatibility with other software

The software described in this document is compatible with following software:

Software Product	Version
NXP RTD	Version available in Release Notes
Linux	Version available in Release Notes
FreeRTOS	Version available in Release Notes
NXP RTOS	Version available in Release Notes
Zephyr	Version available in Release Notes

Compilers used to develop and test the software described in this document are:

Compiler	Version
NXP GCC	Version available in Release Notes
Green Hills MULTI	Version available in Release Notes
Windriver DIAB	Version available in Release Notes

5 Quality Standards Compliance, Safety Standard Compliance, Security Standard Compliance and Testing Approach

The software described in this document is developed according to NXP Software Development Process, that is Automotive-SPICE: 3.1, IATF 16949:2016, ISO 26262: 2018, ISO 21434:2021 and ISO 9001:2015 compliant.

The compilers used for driver validation are listed in the release notes document.

6 Document information

Revision Number	Date	Substantive change
1.0	October 2025	Initial version for S32N

Legal information

Definitions

Draft — A draft status on a document indicates that the content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included in a draft version of a document and shall have no liability for the consequences of use of such information.

Disclaimers

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. NXP Semiconductors takes no responsibility for the content in this document if provided by an information source outside of NXP Semiconductors.

In no event shall NXP Semiconductors be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, NXP Semiconductors' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the Terms and conditions of commercial sale of NXP Semiconductors.

Right to make changes — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using NXP Semiconductors products, and NXP Semiconductors accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NXP Semiconductors product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

NXP Semiconductors does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using NXP Semiconductors products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). NXP does not accept any liability in this respect.

Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

Terms and conditions of commercial sale — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at https://www.nxp.com/profile/terms, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. NXP Semiconductors hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of NXP Semiconductors products by customer.

No offer to sell or license — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Quick reference data — The Quick reference data is an extract of the product data given in the Limiting values and Characteristics sections of this document, and as such is not complete, exhaustive or legally binding.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

HTML publications — An HTML version, if available, of this document is provided as a courtesy. Definitive information is contained in the applicable document in PDF format. If there is a discrepancy between the HTML document and the PDF document, the PDF document has priority.

Translations — A non-English (translated) version of a document, including the legal information in that document, is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

Security — Customer understands that all NXP products may be subject to unidentified vulnerabilities or may support established security standards or specifications with known limitations. Customer is responsible for the design and operation of its applications and products throughout their lifecycles to reduce the effect of these vulnerabilities on customer's applications and products. Customer's responsibility also extends to other open and/or proprietary technologies supported by NXP products for use in customer's applications. NXP accepts no liability for any vulnerability. Customer should regularly check security updates from NXP and follow up appropriately.

Customer shall select products with security features that best meet rules, regulations, and standards of the intended application and make the ultimate design decisions regarding its products and is solely responsible for compliance with all legal, regulatory, and security related requirements concerning its products, regardless of any information or support that may be provided by NXP.

NXP has a Product Security Incident Response Team (PSIRT) (reachable at PSIRT@nxp.com) that manages the investigation, reporting, and solution release to security vulnerabilities of NXP products.

Suitability for use in automotive applications (functional safety) — This NXP product has been qualified for use in automotive applications. It has been developed in accordance with ISO 26262, and has been ASIL classified accordingly. If this product is used by customer in the development of, or for incorporation into, products or services (a) used in safety critical applications or (b) in which failure could lead to death, personal injury, or severe physical or environmental damage (such products and services hereinafter referred to as "Critical Applications"), then customer makes the ultimate design decisions regarding its products and is solely responsible for compliance with all legal, regulatory, safety, and security related requirements concerning its products, regardless of any information or support that may be provided by NXP. As such, customer assumes all risk related to use of any products in Critical Applications and NXP and its suppliers shall not be liable for any such use by customer. Accordingly, customer will indemnify and hold NXP harmless from any claims, liabilities, damages and associated costs and expenses (including attorneys' fees) that NXP may incur related to customer's incorporation of any product in a Critical Application.

NXP B.V. — NXP B.V. is not an operating company and it does not distribute or sell products.

ISO/SAE 21434 Compliance documentation — This document, including any documentation required by, or created pursuant to ISO/SAE 21434, does not obligate NXP to provide referenced data or supporting documentation, nor does it obligate NXP to provide support related to ISO/SAE 21434 compliance.

Trademarks

Notice: All referenced brands, product names, service names, and trademarks are the property of their respective owners.

NXP — wordmark and logo are trademarks of NXP B.V.

Amazon Web Services, AWS, the Powered by AWS logo, and FreeRTOS — are trademarks of Amazon.com, Inc. or its affiliates.

AMBA, Arm, Arm7, Arm7TDMI, Arm9, Arm11, Artisan, big.LITTLE, Cordio, CoreLink, CoreSight, Cortex, DesignStart, DynamIQ, Jazelle, Keil, Mali, Mbed, Mbed Enabled, NEON, POP, RealView, SecurCore, Socrates, Thumb, TrustZone, ULINK, ULINK2, ULINK-ME, ULINK-PLUS, ULINKpro, µVision, Versatile — are trademarks and/or registered trademarks of Arm Limited (or its subsidiaries or affiliates) in the US and/or elsewhere. The related technology may be protected by any or all of patents, copyrights, designs and trade secrets. All rights reserved.

Contents