SOTA
Software Over The Air

AURIX™ TC4xx Microcontroller

V1.0.0 2024-09

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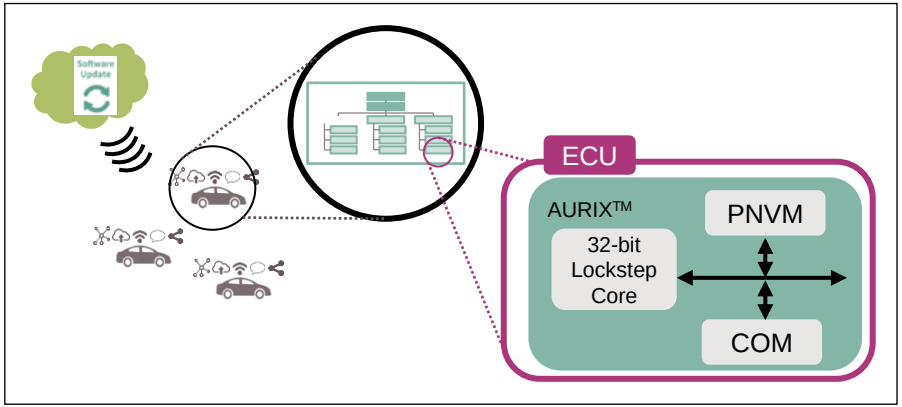
DRE
Data Routing Engine



Highlights

- Foreground or Background software updates
- Fast SW activation in background mode
- Extensive symmetric and asymmetric security functions for securing the update process
- Reliability features to achieve high amount of update cycles

Key Features

A/B SWAP

Independent SOTA/SWAP configurations

Customer Benefits

- Configuration to split PNVM into two regions
- Individual configuration for the Real-Time-System and the Cybersecurity subsystem

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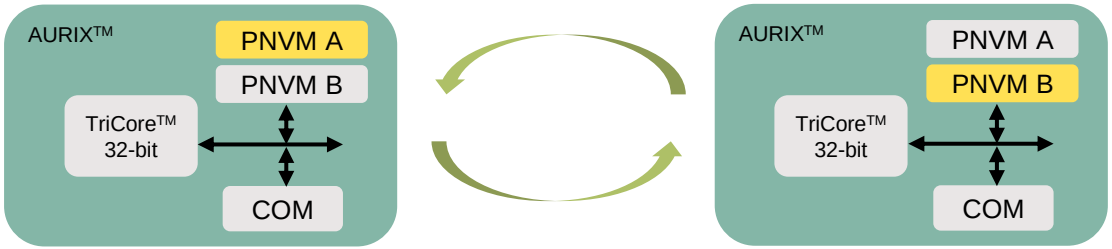
SOTA
A/B SWAP

› Principle

- The memory is split in two parts with equal size, one memory block A and a second block B
- The SW project is setup to use only one PNVM block typically the block A
- Ability to write and configure the new software image in the background and quickly activate it after the next system reset
- The new software becomes active by mapping the inactive partition into the executive address range and the active one in the non-executive address range



All devices of the AURIX™ TC4XX family offer A/B SWAP except those with a single PNVM bank.

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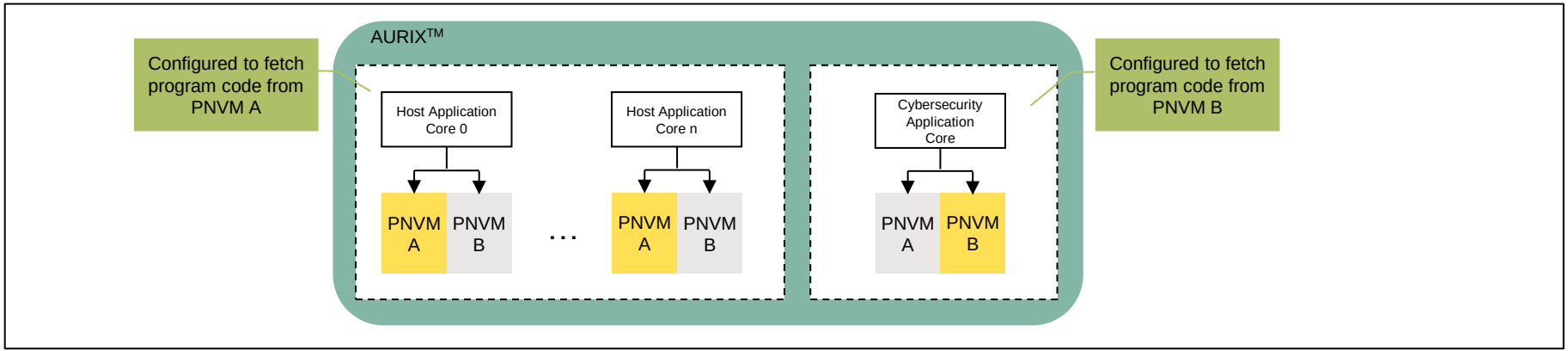
SOTA
Independent SOTA configurations



- Configuration
  - Independent User Control Block (UCB) structures enable dedicated configurations for the Host and the Cybersecurity subsystem
  - The User Control Block (UCB) structures are designed to allow upto 32 swap configurations until the user control block must be erased/reprogrammed to be prepared for the next set of swap configurations.

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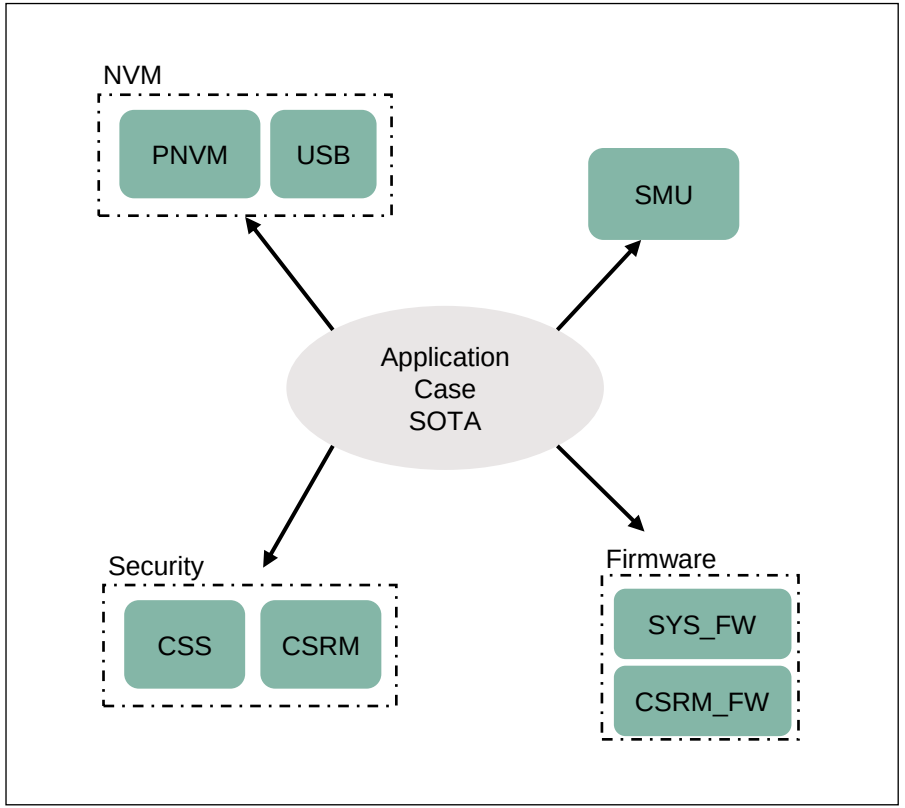
SOTA
System integration

- SOTA is not a module, it is more of an application use case involving various functionalities of different modules:
  - Specific user control blocks (UCB) of the NVM store the configurations for A/B swap
  - The PNVM memory structured in banks is programmed with the application SW and built-in hardware checks offer a verification of the write operations
  - Alarms inside the SMU are existing and notify in case of an unintentional swap occurrence
  - The Firmware evaluates the SWAP configurations from the UCB and installs the configured banks
  - Symmetric and Asymmetric security functions are needed for authenticity check and decryption



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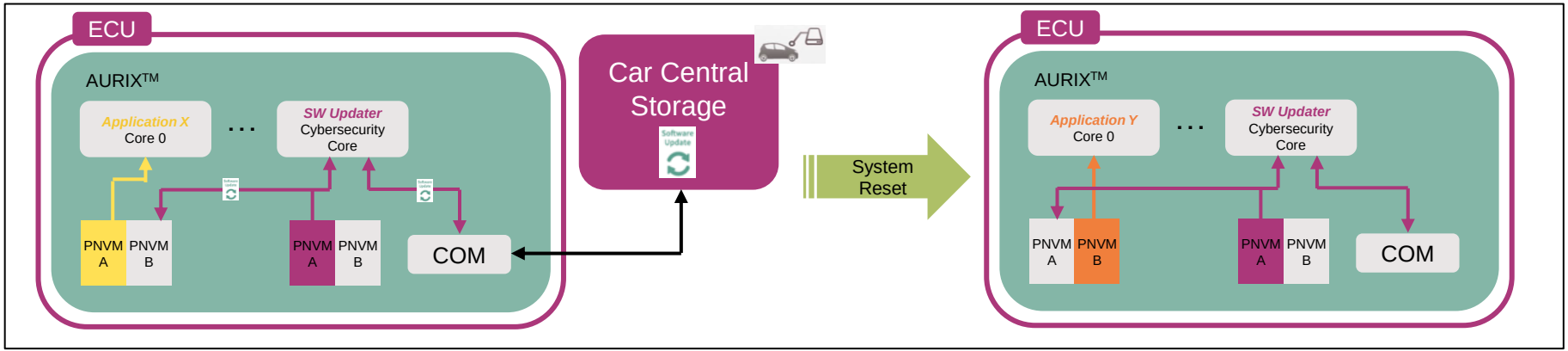
Application example
Background SW Update



Overview

- ‘Application X’ runs on Core 0 and is updated by ‘Application Y’
- A SW Updater runs as a separate application or service on a different core
- The new Software Update from the Central Car Storage is written into the inactive PNVM B

Advantages

- Current Application keeps running - Freedom from Interference for the current Application
- Short downtime due to activation by a system reset assertion
- Easily and quickly revert to the previous SW version in case of a failure

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