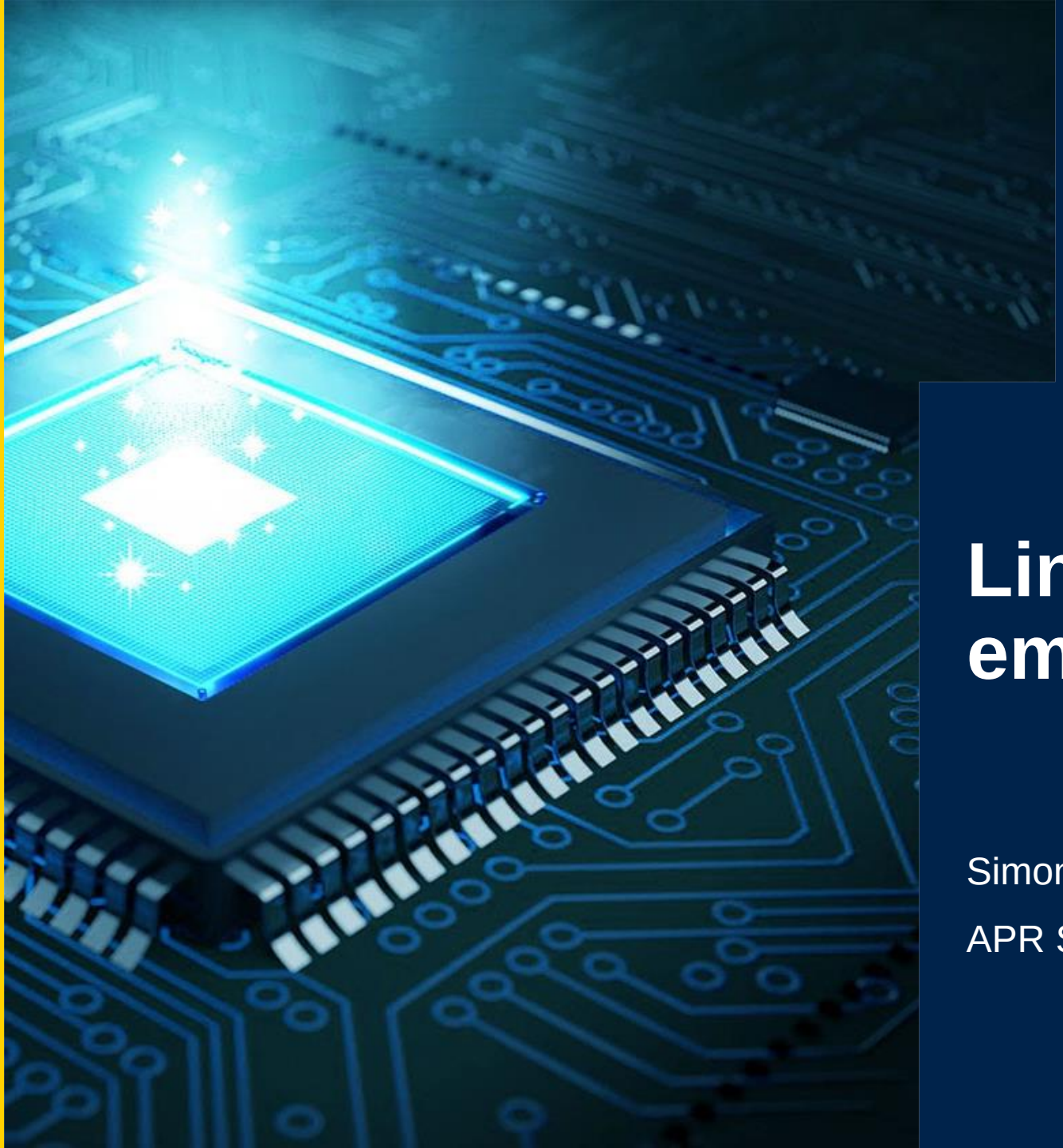

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LinFlex and I2S emulation via GTM

Simone Del Colle

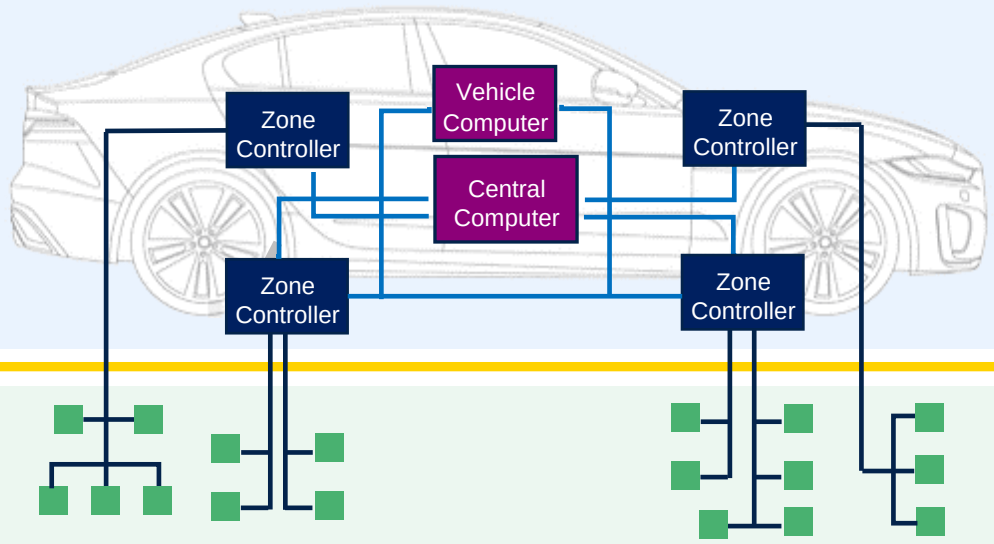
APR Software IPs & Tools

Stellar

Unified computing platform
for new vehicle architectures

SOFTWARE-DEFINED VEHICLE

Lead transformation towards lean & smart architecture



Stellar Platform

Complete value chain for EVs

from integration & control to efficient energy management

Functions INTEGRATION

Stellar P

Integration platform
Motion Control

- Domain Controller
- ICE/EV
- BMS
- Transmission

Stellar G

Integration platform
Gateway & Body

- Central Gateway
- Zone Controller
- Body integration
- Domain Controller

ACTUATION

Stellar E

Analog Performance

- Traction Inverter
- OBC
- BMS
- DC/DC

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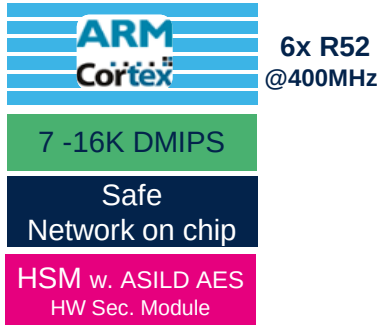
SR6 - Stellar Integration MCU

Innovation with Value

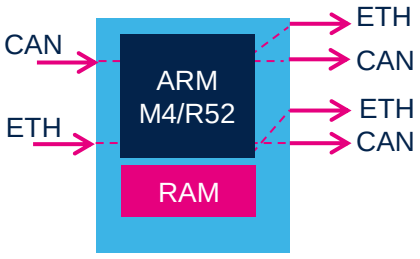
Future Proof Open Architecture



Top Performances

- **Real-time**
- **Safety**
- **Security**

Efficient routing Accelerators



Routing subsystem

Ultra real-time IN/OUT data processing

Offload of main CPU

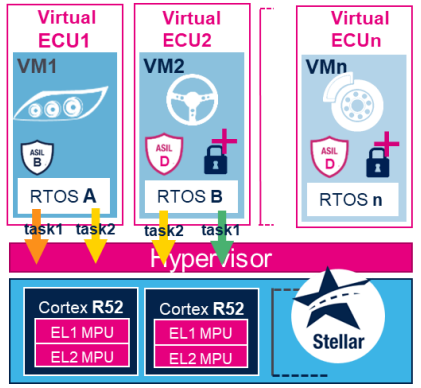
Stellar Integration MCU

Multi-ECU Integration

HW virtualization

to ensure safety

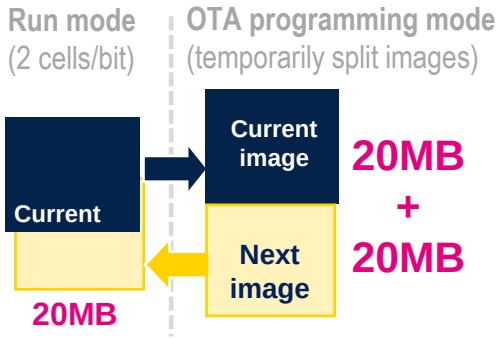
with no interference



Extensible Memory & efficient OTA

Built-in **memory duplication provision** for OTA (“X2 mode”)

No cost overhead
No Downtime for running SW code



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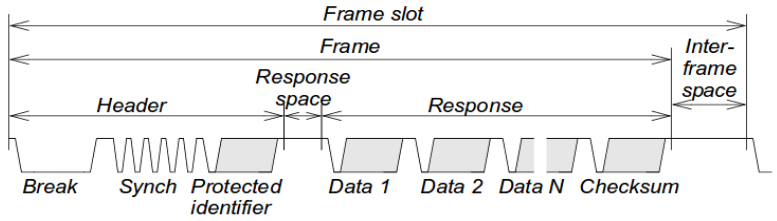
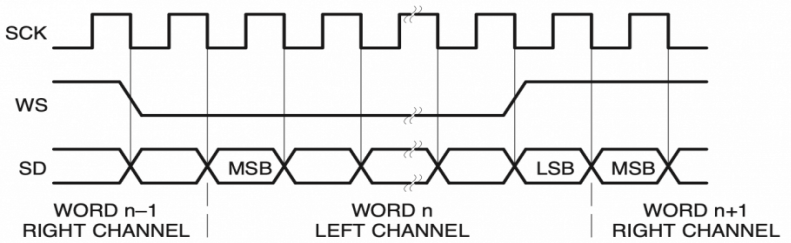
Use cases

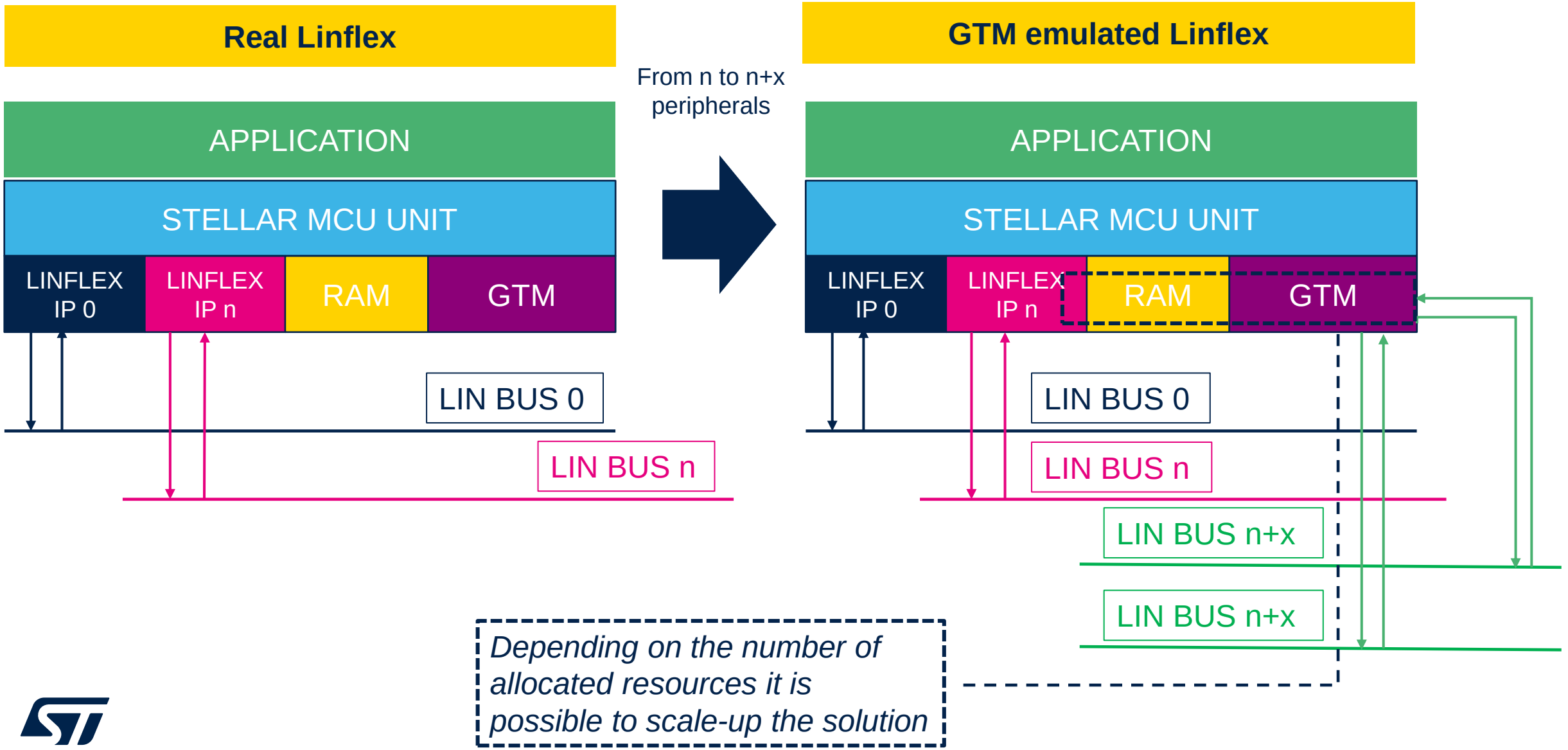
GTM emulated Linflex

GTM emulated I²S





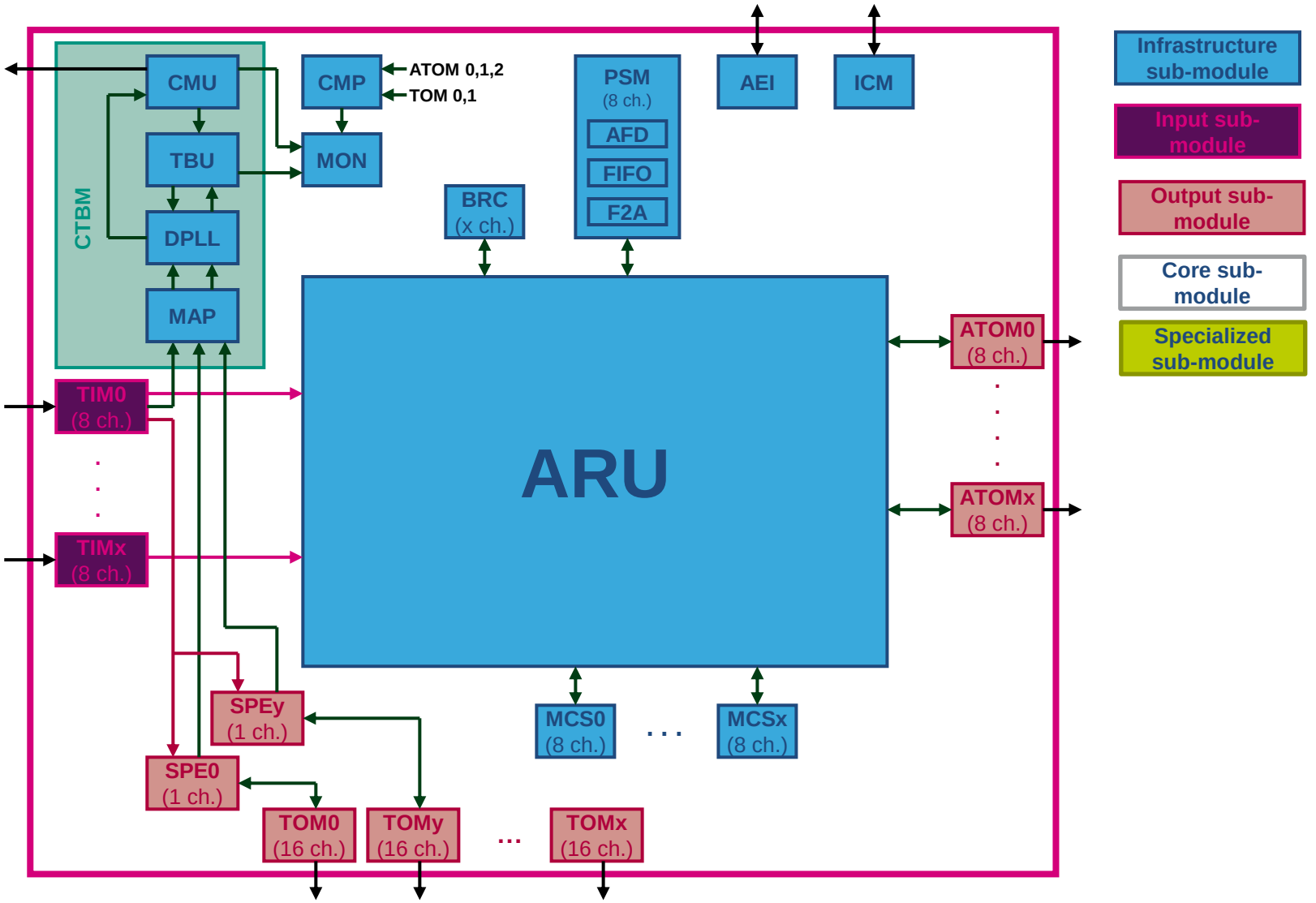
How it works



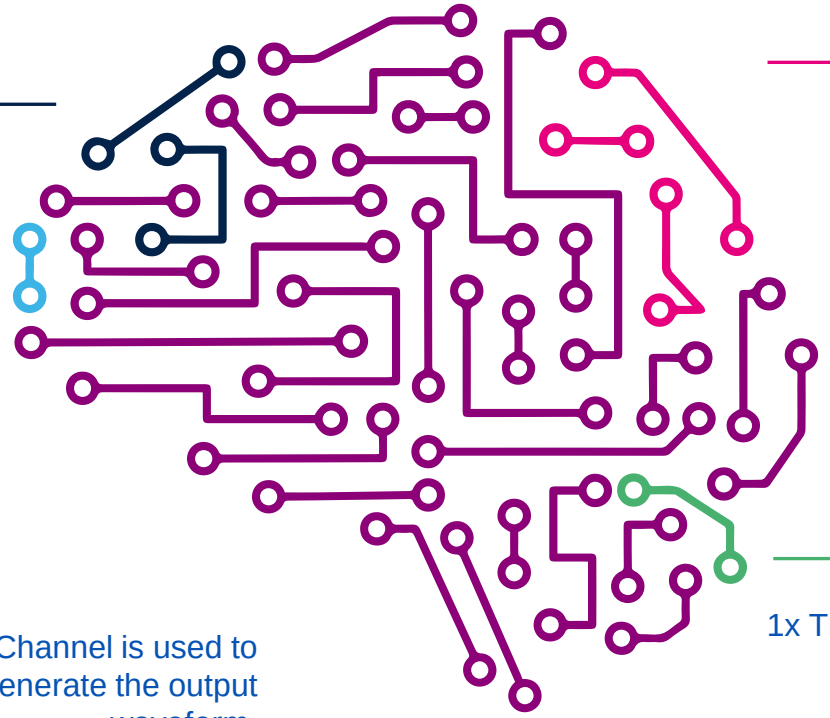
GTM architecture overview

What is needed?

- CMU
- MCS
- ATOM
- TIM
- ARU



Emulated Linflex resources



3x MCS channels are used to handle the memory map region and to drive the output/input peripheral.

4%
(3/80)

1x CMU is used to clock the input/output TIMs.

12%
(1/8)

1x ATOM Channel is used to generate the output waveform.

1%
(1/80)

1x TIM Channel is used to read the input data.

2%
(1/76)

GTM usage (2%)

Features comparison

Real Linflex	GTM emulated Linflex
LIN protocol version 1.3, 2.0, and 2.1	LIN protocol version 1.3, 2.0, and 2.1
Master mode	Master mode
Slave mode	Slave mode
Bit rates up to 20 Kbit/s	Bit rates up to 20 Kbit/s
Single 8-byte buffer	Single 8-byte buffer
Wakeup event	Wakeup event
Advanced LIN error detection	Advanced LIN error detection
16 possible Rx identifiers filters	16 possible Rx identifiers filters
Classic and Enhanced Checksum	Classic and Enhanced Checksum

Stellar

Same features/performance/behaviour as hardware peripheral

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Digital audio stream (I^2S)

Half-duplex communication (only transmitter or receiver)

Data format may be 16-bit, 24-bit or 32-bit / 2 channels Up to 48 KHz

DMA capability for transmission and reception

Memory mapped peripheral

Peripherals emulation ecosystem

- Software quality
  - ISO 26262 and ASPICE process compliancy (Architecture design, MISRA compliant, Unitary & Integration test)

- The software IP library will be:
  - Integrated in StellarStudio
  - Fully configurable either during compile and running time
  - Scalable, giving the possibility to instantiate more emulated peripheral within same GTM

- HighTec C compiler :
  - Improving readability, reusability & portability

- The peripheral emulation will give the possibility:
  - To Expand the number of available peripheral interfaces
  - To increase the freedom of application PCB layout design phase (Pinout choices)

Conclusions

ST Stellar and GTM extend connectivity capabilities :

- Possibility to add new peripheral via emulation.
- Possibility to increase the flexibility and configurability.
- No additional CPU load.

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Come to visit us

Thank you

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