RPMsg to accelerate transition between multi-SoC and multi-processor SoC solutions.

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STMicroelectronics

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THE LINUX FOUNDATION

Who am I

Arnaud Pouliquen

- Embedded software Engineer at STMicroelectronics on STM32MP1 MPU.
  - Audio technical leader.
  - Coprocessor management technical leader:
    - ensure processors coexistence and inter-communication.
- Contributions:
  - Linux

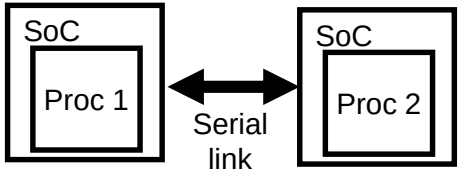
    Contributor and maintainer on some ST drivers (asoc / iio / remoteproc / rpmsg).
  - OpenAMP library

    Contributor to OpenAMP restructuring and footprint reduction.
  - Zephyr
    - Introduction of the stm32mp1 SoC in Zephyr.
    - Contributor/expertise for OpenAMP library integration.

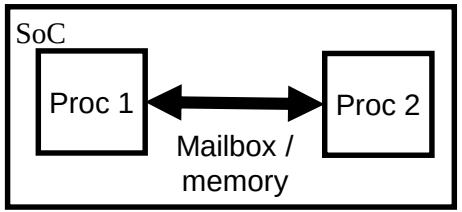
Scope of the presentation

"RPMsg to accelerate transition between muti-SoC and multi-processor SoC solutions."

- **Muti–SoC solution**:
  - several processors in separate devices
  - communicate together by a physical link (only common serial link is considered)



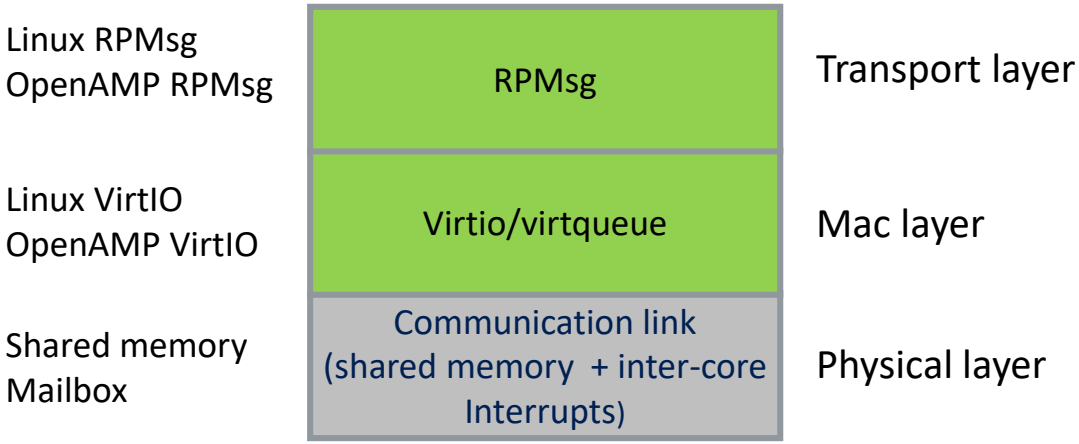
- **Multi-processor SoC solution**:
  - several processors embedded in one chip
  - hardware mailbox and optional shared memory for inter-processing communication.

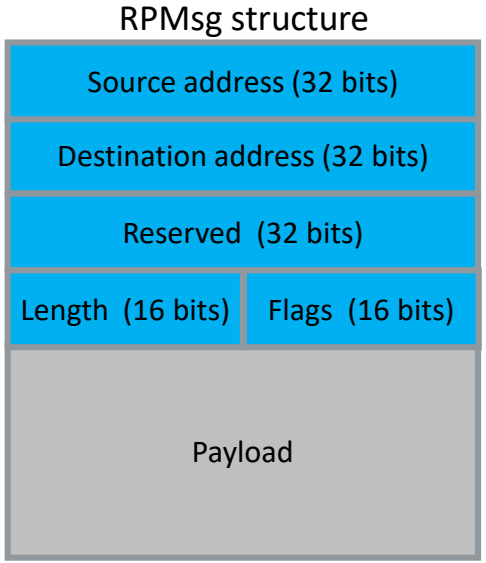


- Focus on the inter-processor communication.

Remote Processor Messaging

- ST implementation is based on open source solutions:
  - **VirtIO** and **RPMsg** frameworks for Linux (Ohad Ben-Cohen 2011)
  - **OpenAMP** library for the co-processor (Xilinx and Mentor Graphic 2014).





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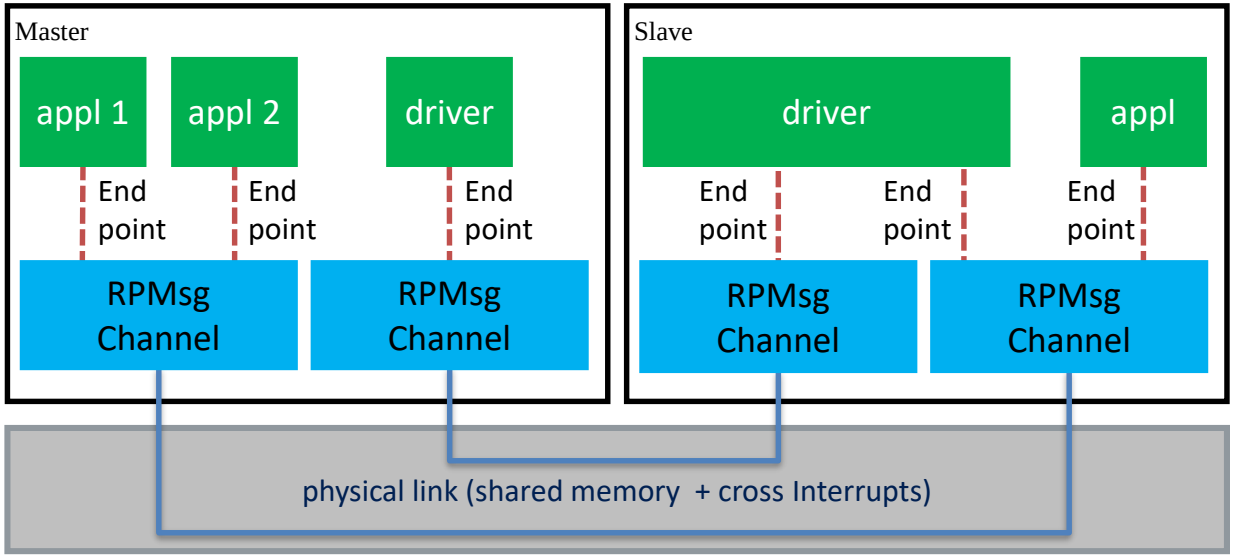
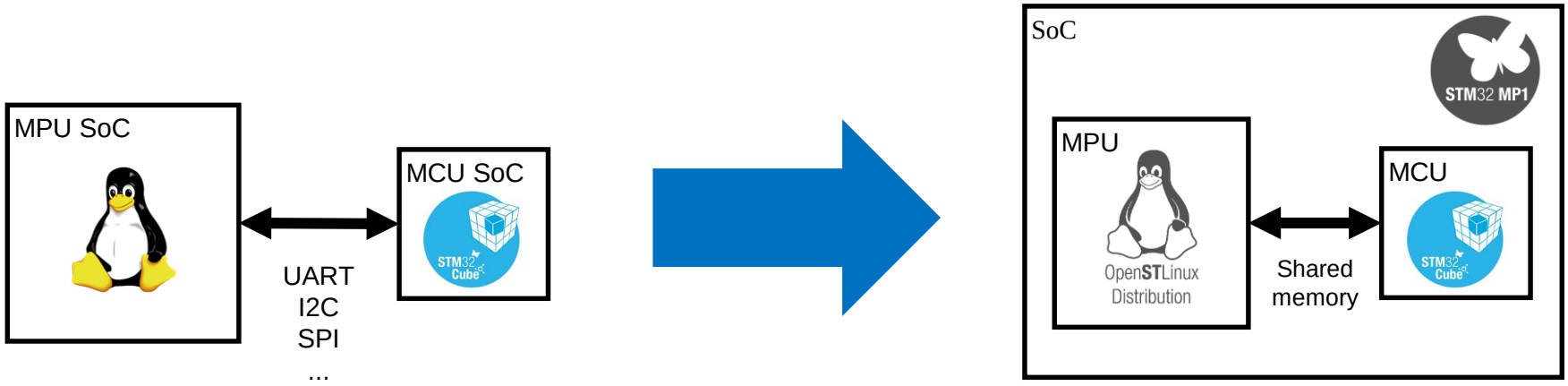
Remote Processor Messaging

- One physical link can offer multiple communication channels.
- A channel implements a service relying on one or several end-points.
- An end-point provides a logical connections through a channel.

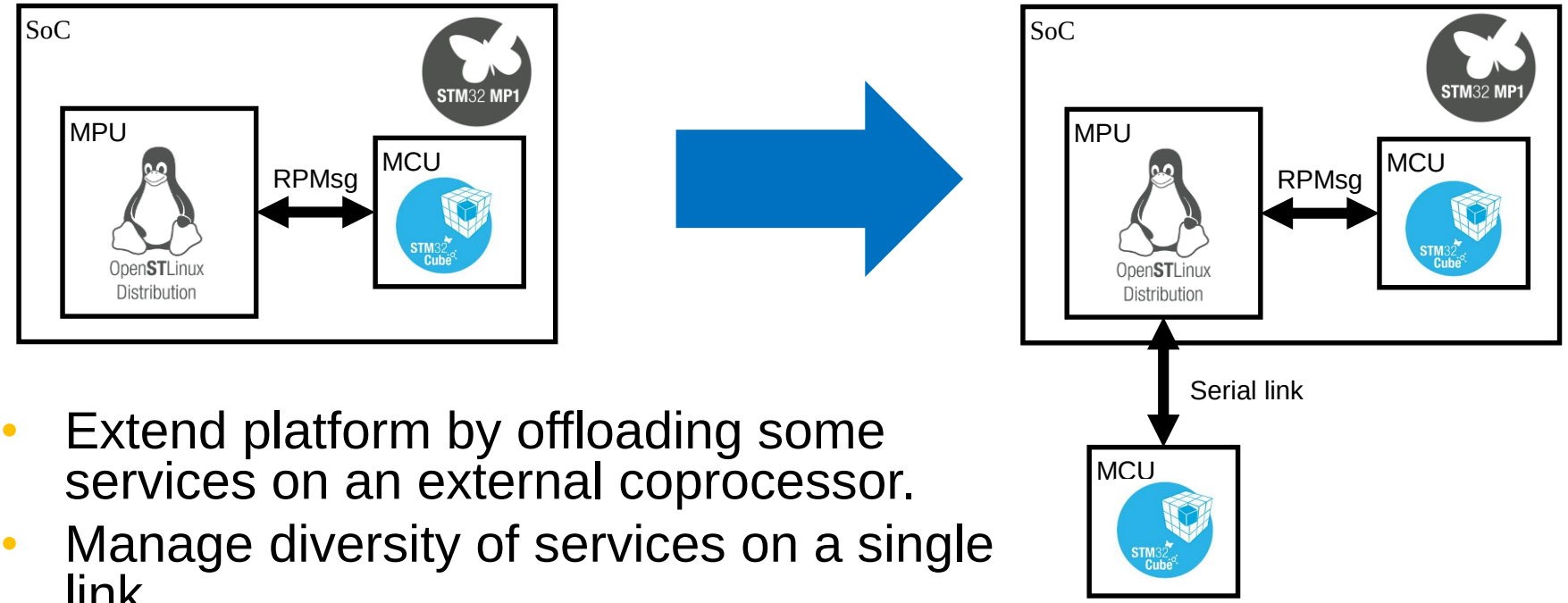


Motivation

- Preserve applications but migrate from a serial link to RPMsg.



Motivation



- Extend platform by offloading some services on an external coprocessor.
- Manage diversity of services on a single link.

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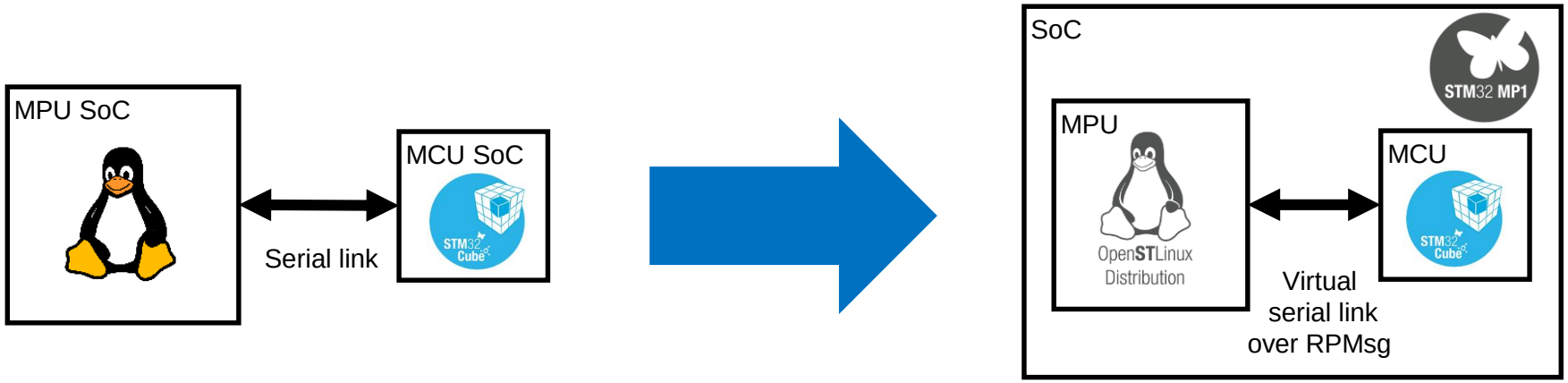
Migrate to an internal co-processor



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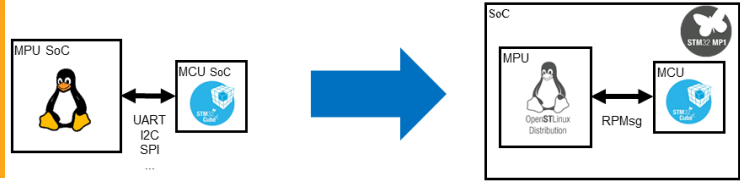

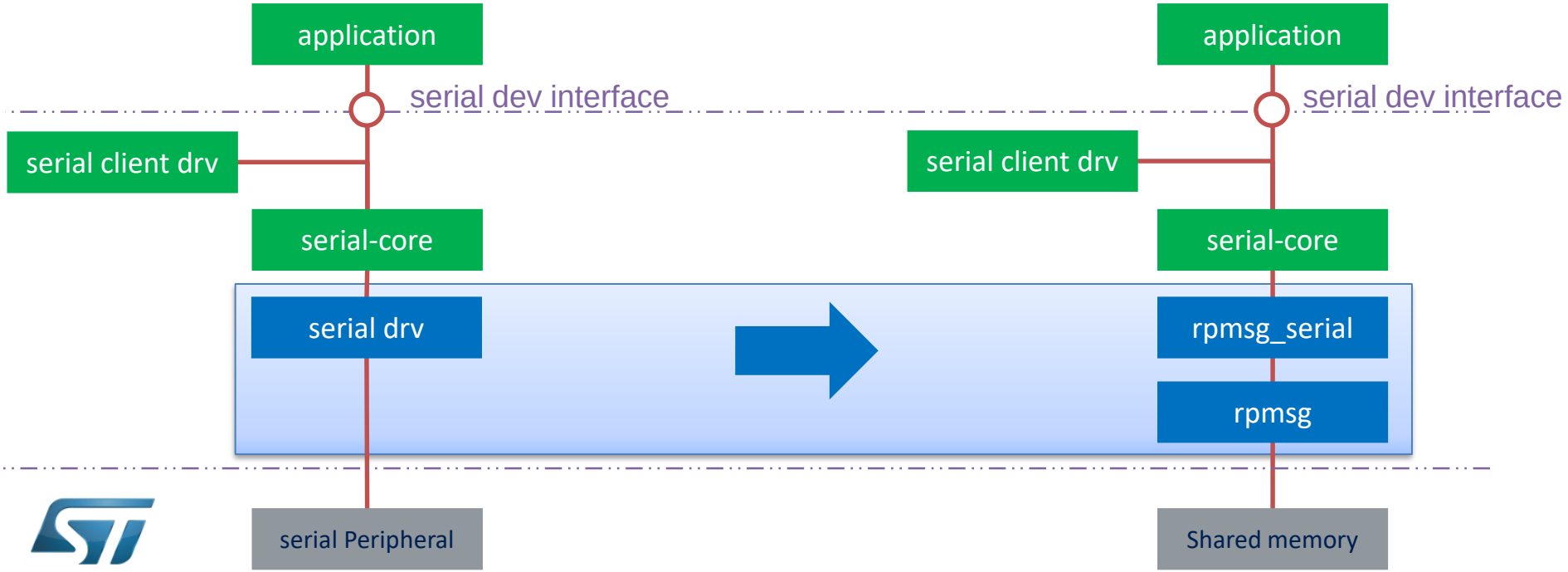

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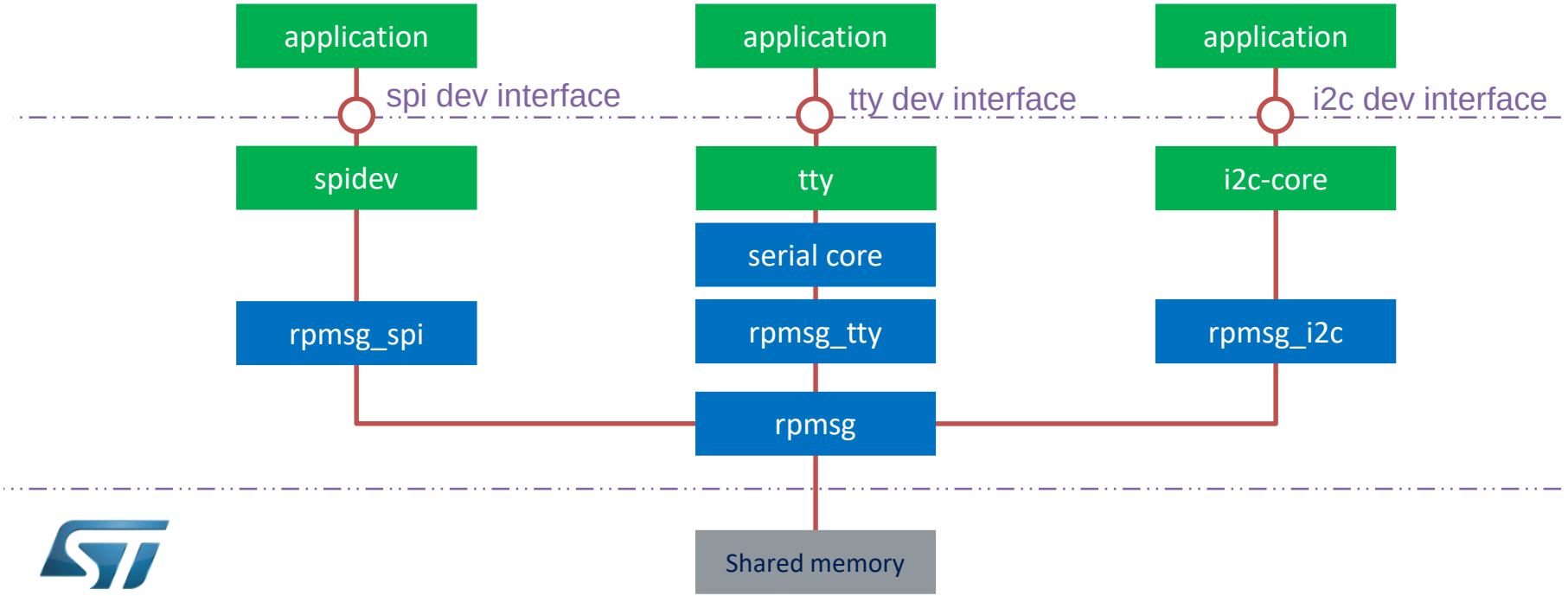
Linux



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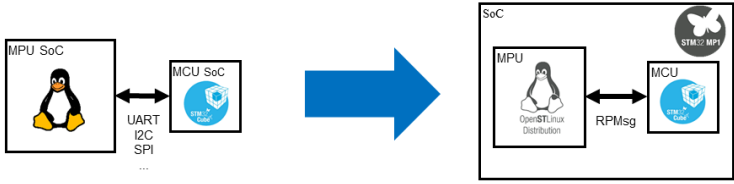
Co-processor



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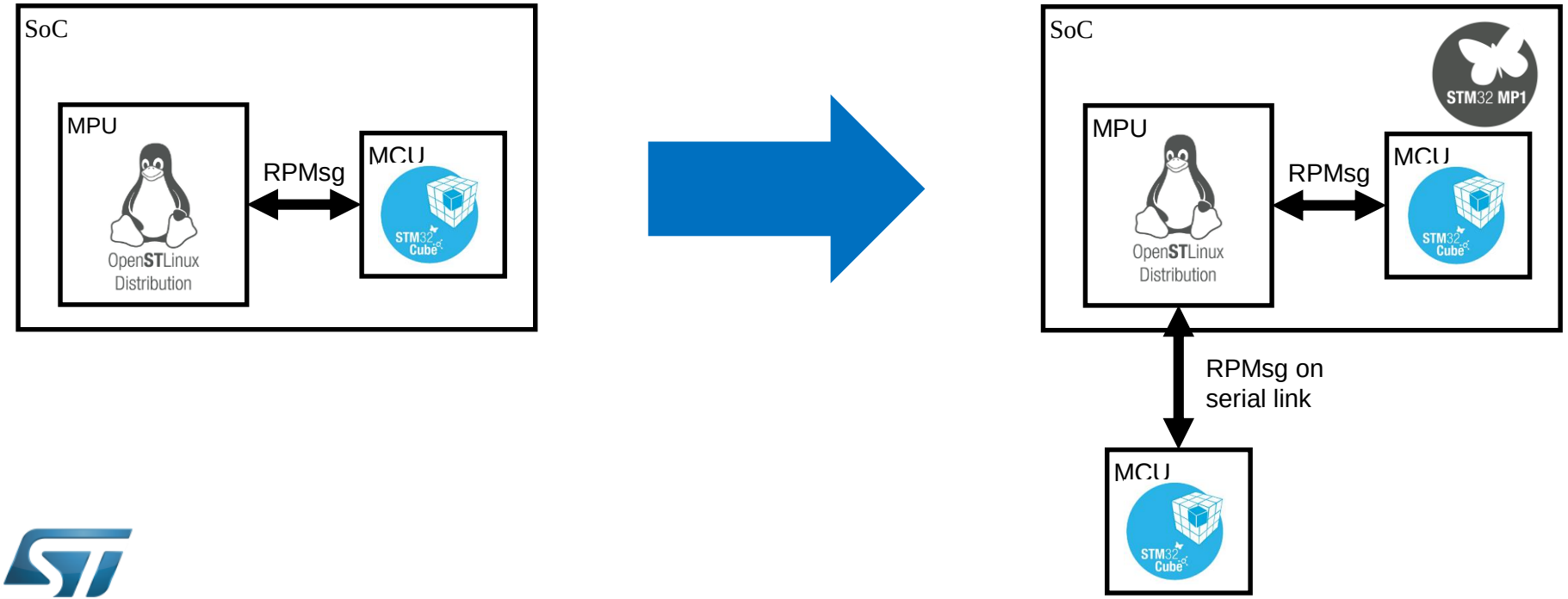
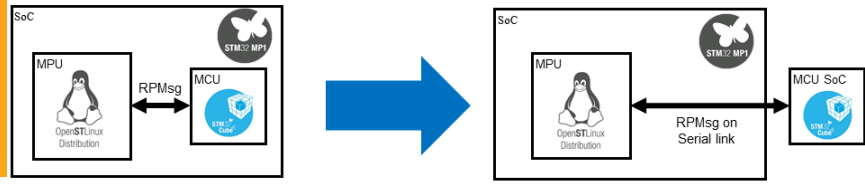
Implementation status

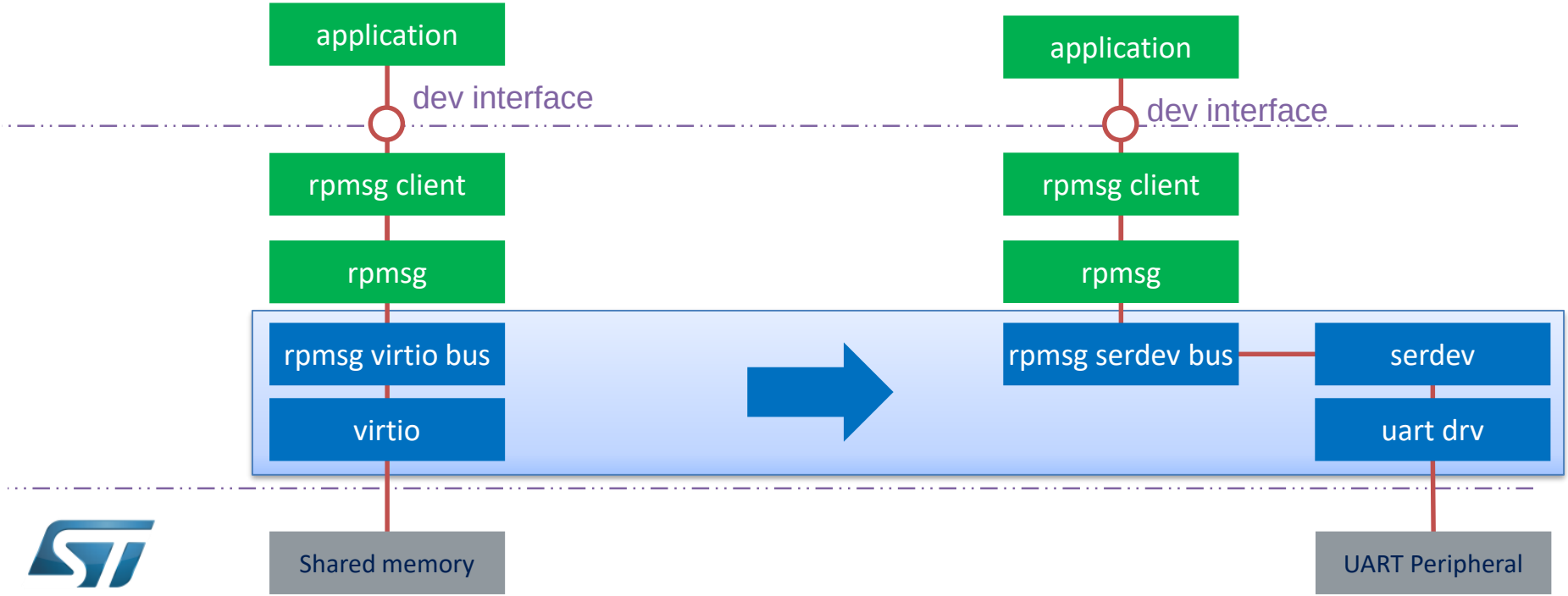
- Linux developments
  - Virtual serial drivers over RPMsg implemented.
    - rpmsg_tty driver
    - rpmsg_i2c driver
    - rpmsg_spi driver
- Co-processor firmwares
  - Virtual drivers over RPMsg and associated examples available:
    - on STM32Cube
    - on Zephyr

Extend to an external co-processor



Linux





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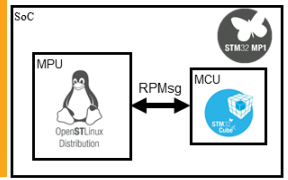
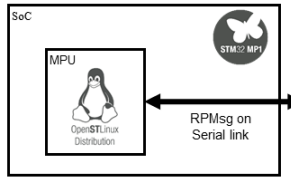
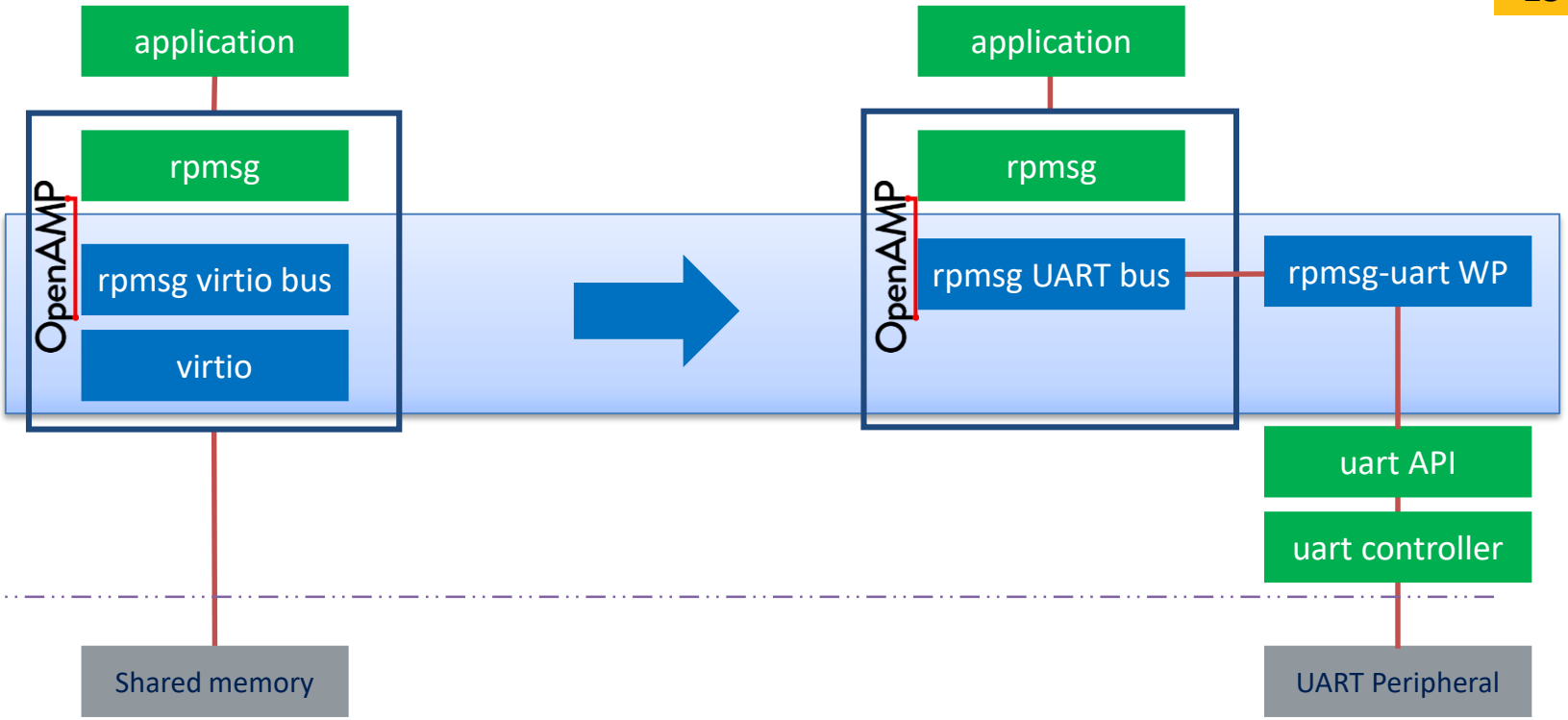
Co-processor







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Implementation status?

- Linux developments
  - RPMsg serial buses:
    - RPMsg serdev bus implemented,
    - RPMsg I2C/SPI bus not implemented
- Co-processor firmwares
  - Examples on STM32Cube distribution and Zephyr available
  - Serial buses not yet implemented in OpenAMP library.

What’s next (current target)

- Upstream of the Linux RPMsg clients drivers and RPMsg serial buses.
- Support serial buses in OpenAMP.
- Provide support of the virtual serial drivers in different ecosystems (STM32Cube, Zephyr, arm® Mbed, Arduino…).

Thank you !

Questions ? Suggestions, comments?

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Meet us and see the demos at the ST Booth!

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