

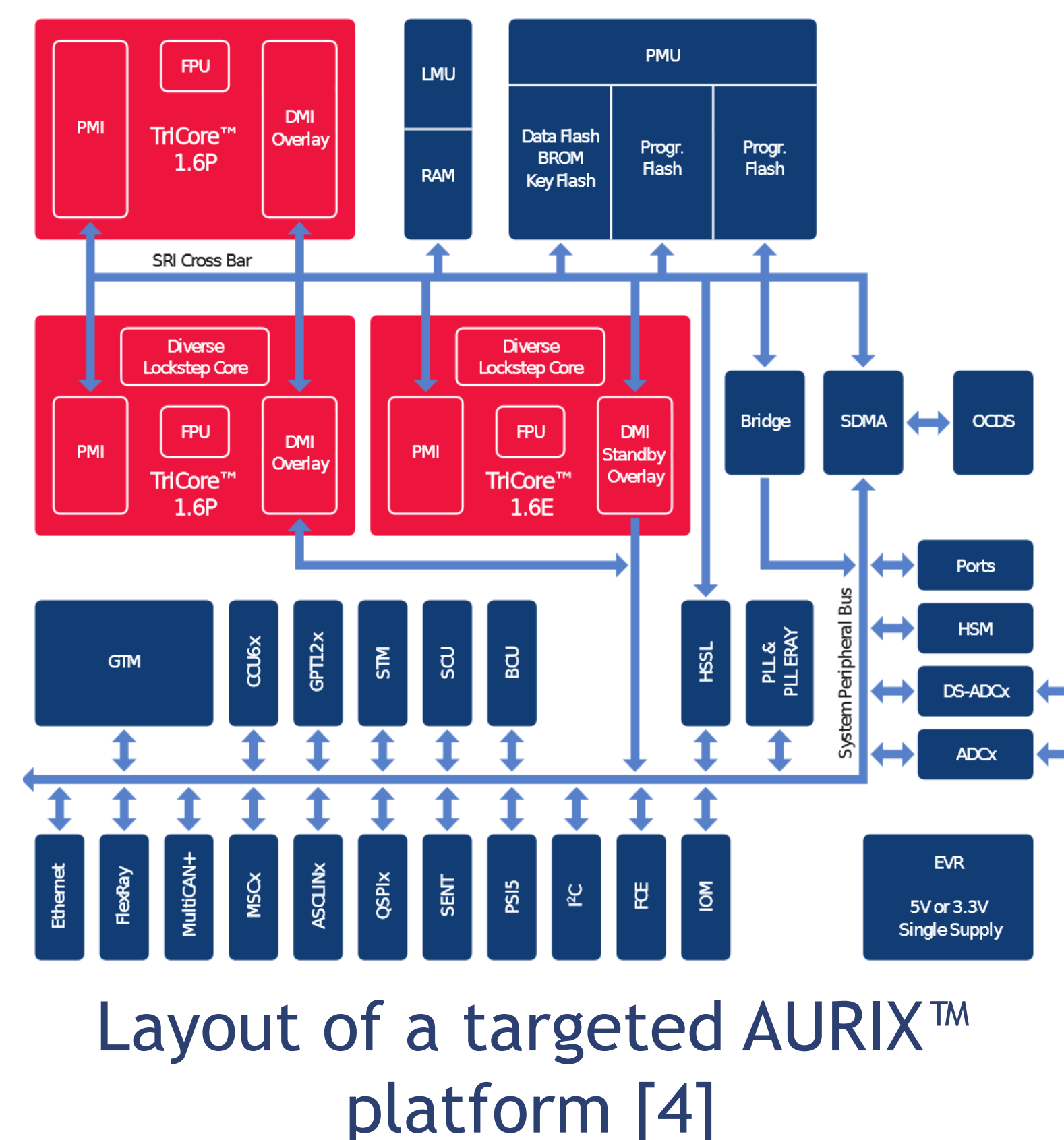
INTRODUCTION

TriCore™ :

- Popular processor core in automotive MCUs
- Combines RISC, MCU and DSP instructions

AURIX™ :

- 5th generation TriCore™
- Several cores in lockstep for increased reliability
- Entering market in 2014 and 2015



OBJECTIVES

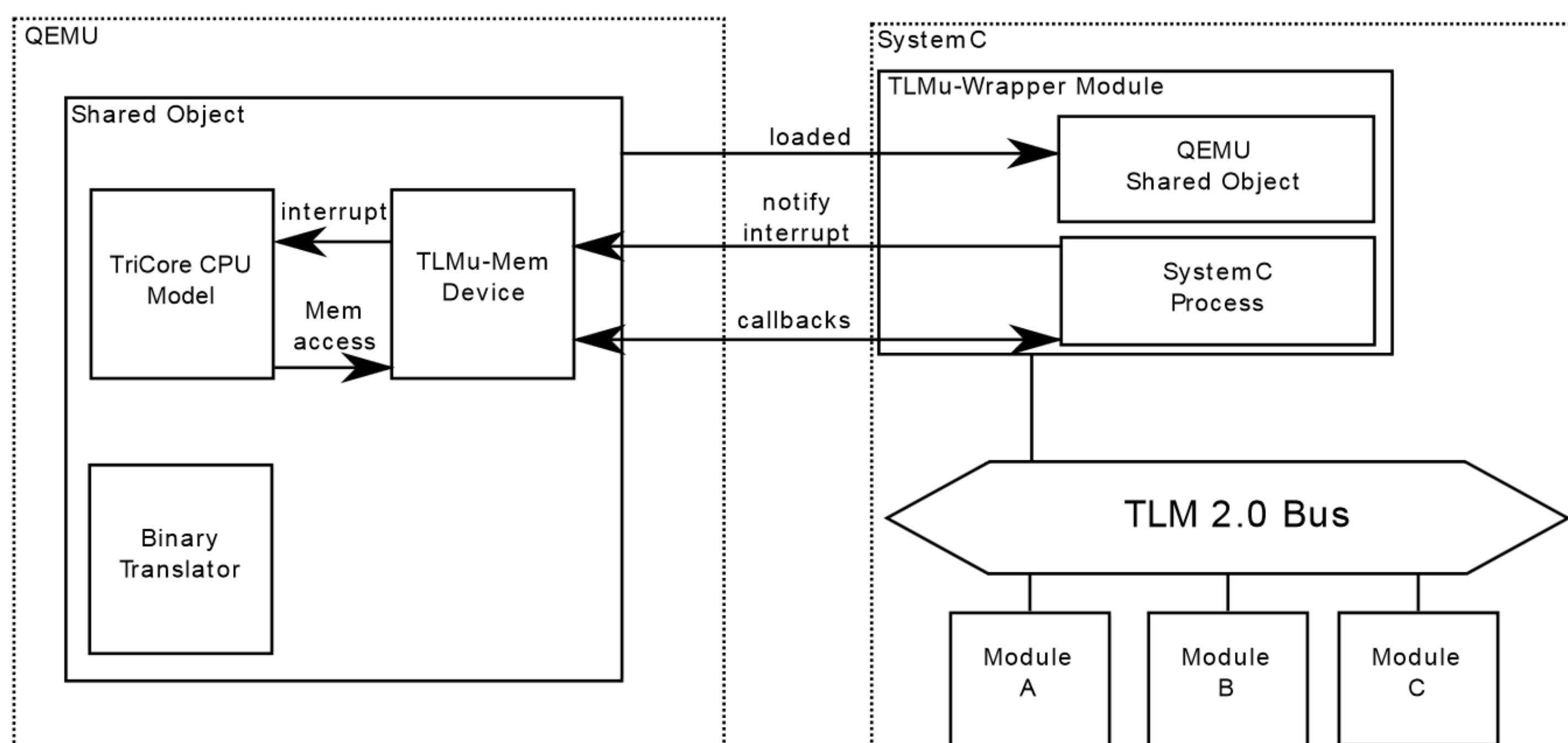
- A fast and open virtual platform targeting Infineon's AURIX™ processor family using
 - TriCore™-based QEMU for fast CPU emulation
 - SystemC and TLM-2.0 for device emulation
 - Transaction Level eMulator (TLMu)[1] to interface QEMU and SystemC/TLM-2.0

MILESTONES

- Implement TriCore™ QEMU emulation and verify its correctness
- Extend TLMu to support the TriCore™ architecture (interrupt, ...)
- Create a SystemC testbench
- Run a complete software stack on the platform

APPROACH

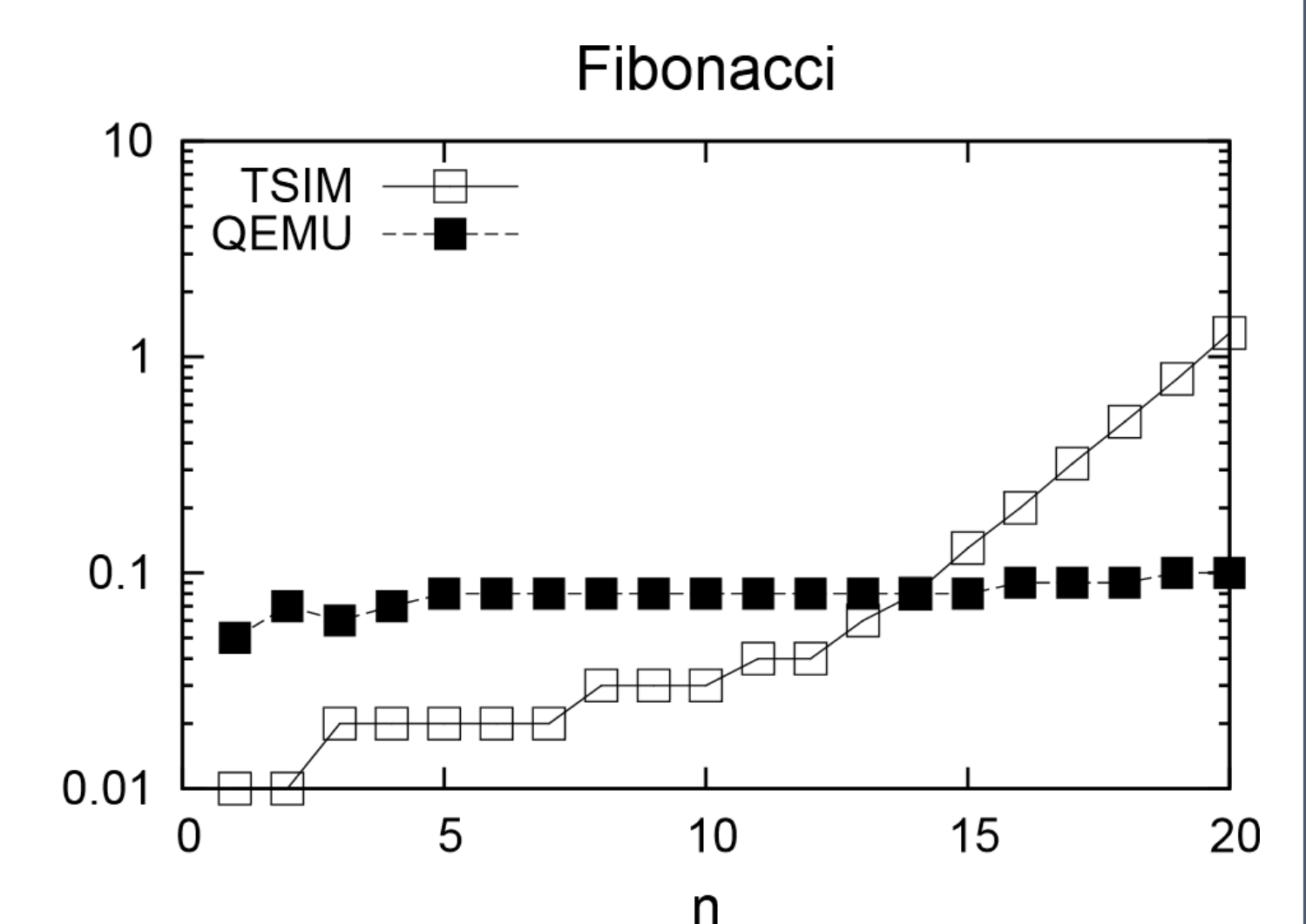
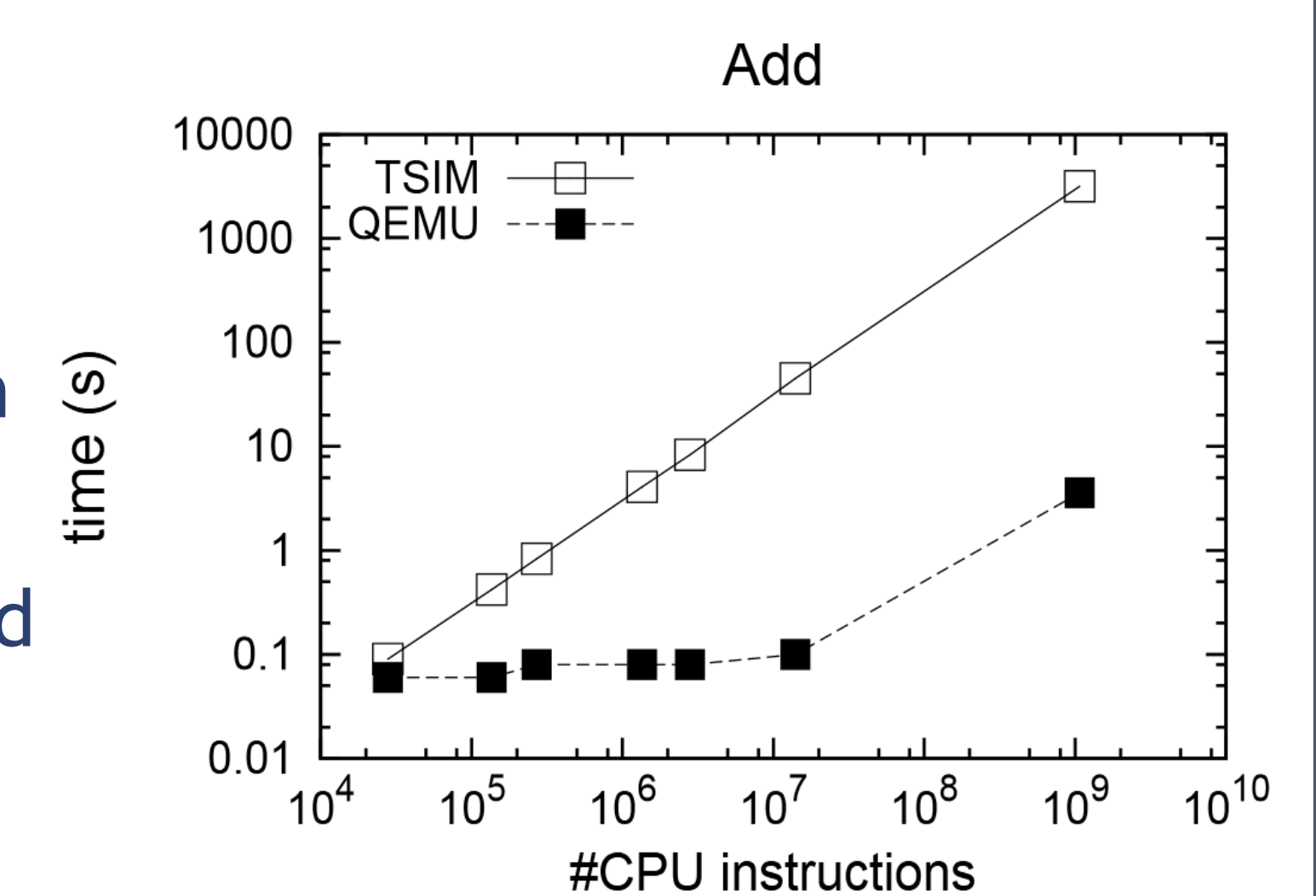
- Build main line QEMU with TriCore™-based binary translator as a shared library loaded by SystemC
- Memory device in QEMU maps the whole address space to callbacks mapped to SystemC write/read accesses
- SystemC models send interrupts to TLMu memory device, which interrupts the TriCore™ CPU model



RESULTS

Comparison with TSIM

- Functional correctness through
 - C programs
 - randomly generated and selected asm programs
- Speed comparison:
 - Fibonacci program (C)
 - Add program (C)
 - Up to 880x faster than TSIM for considerably long-running programs



CONCLUSIONS

- TriCore™-support added to official QEMU repository [2]
- Functional correctness of TriCore™ architecture in QEMU validated
- Up to 880x faster compared to TSIM
- TLMu supports integration of TriCore™ QEMU into SystemC/TLM-2.0 platform model

All 16 bit TriCore™ instructions now available at
<http://git.qemu.org>

OUTLOOK

- Add the remaining 200 of 700 TriCore™ instructions to QEMU
- Update TLMu to latest version of QEMU
- Test platform with Infineon's AURIX™ test software

REFERENCES

- [1] Transaction Level eMulator. <http://edgarigl.github.io/tlm>
- [2] QEMU version 2.1 <http://git.qemu.org>
- [3] Bastian Koppelman, Markus Becker, Wolfgang Müller. Portierung der TriCore-Architektur auf QEMU. In MBMV 2014.
- [4] Infineon Website. <http://www.infineon.com>.