A Hardware/Software Platform for Real-time Ethernet Cluster Simulation in OMNeT++

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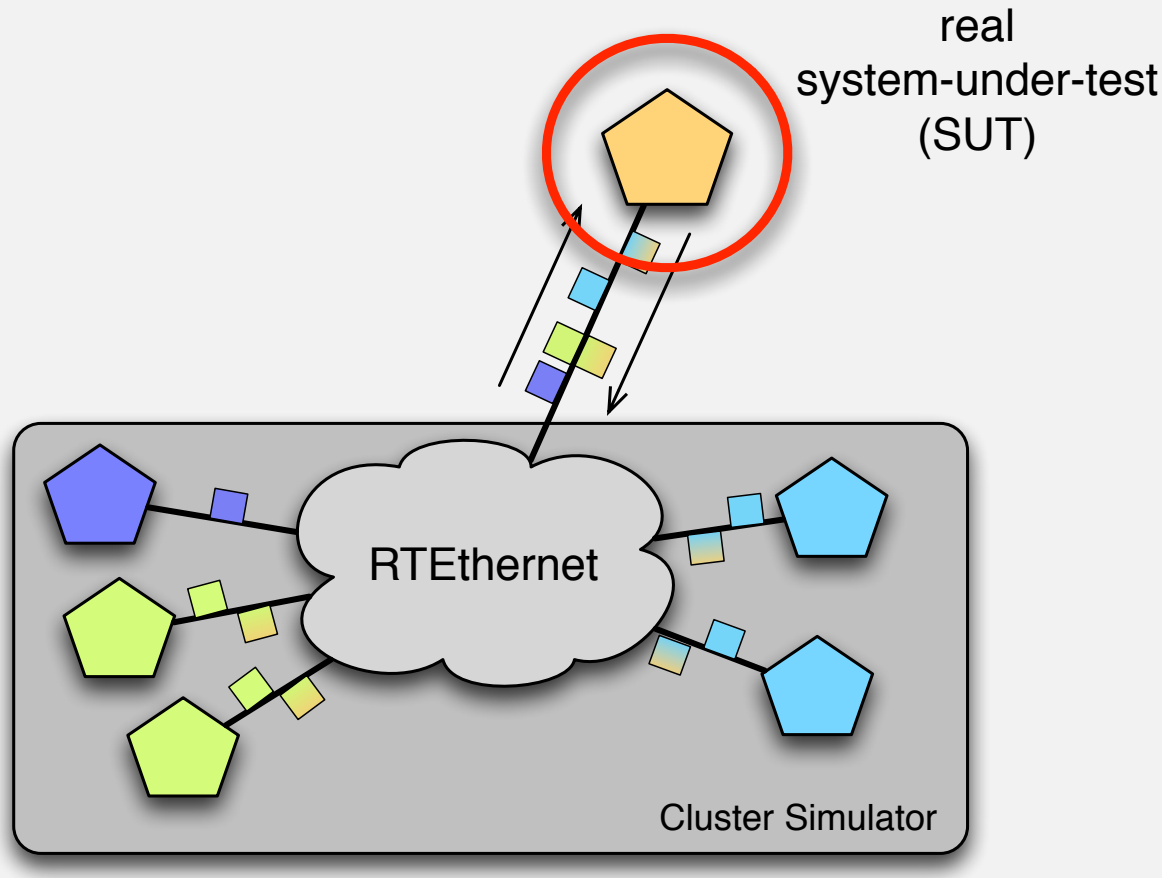
Introduction & Motivation

- Software simulation is established during design and reconfiguration phases
- Cluster simulation is useful during integration and setup phases
- Environments for cluster simulation need generally expensive real-time hardware platforms



- Real SUT connected via communication interface
- Cluster simulator simulates not available parts

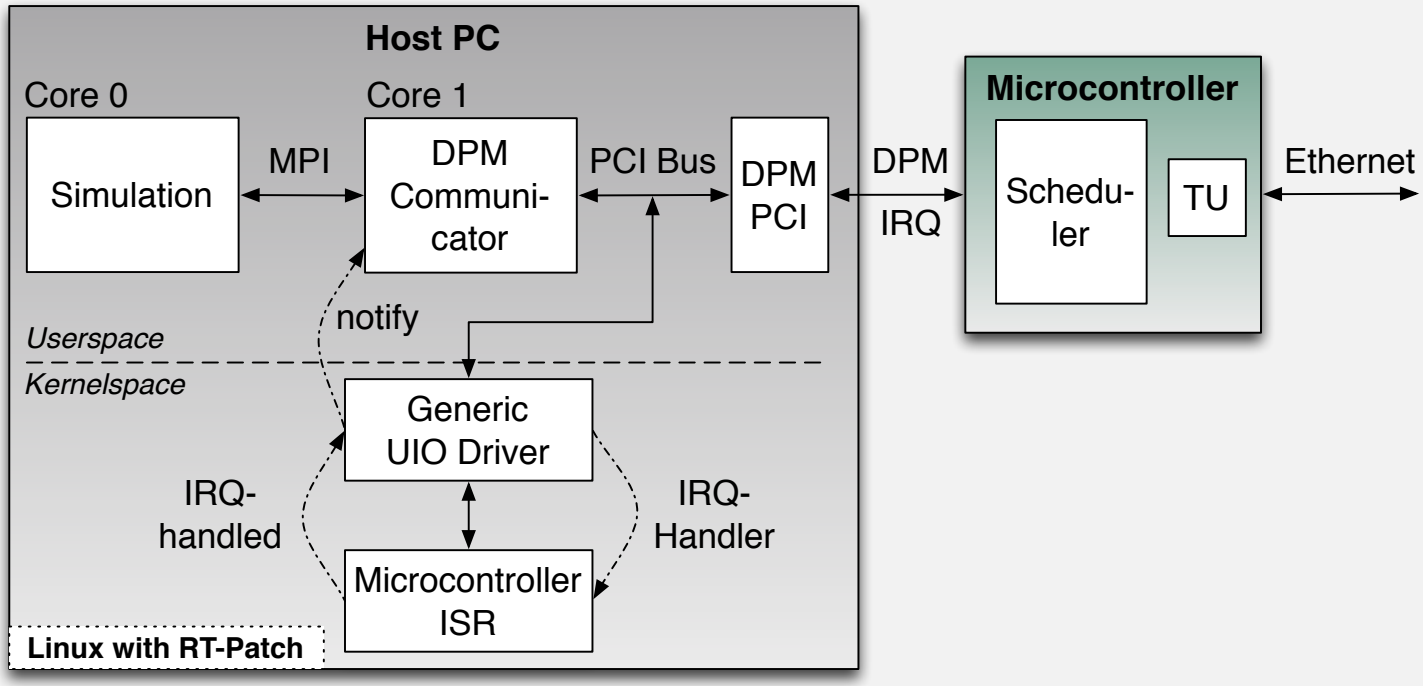
Time-triggered Ethernet

Mixed critical applications through IEEE 802 networks

- Extension to standard switched Ethernet
- Provides three traffic classes:
  1. Time-triggered (TT)
     highest priority, time-triggered, cyclic, requires synchronised time
  2. Rate-constrained (RC)
     event-triggered, bandwidth-based
  3. Best-effort (BE)
     lowest priority, standard Ethernet

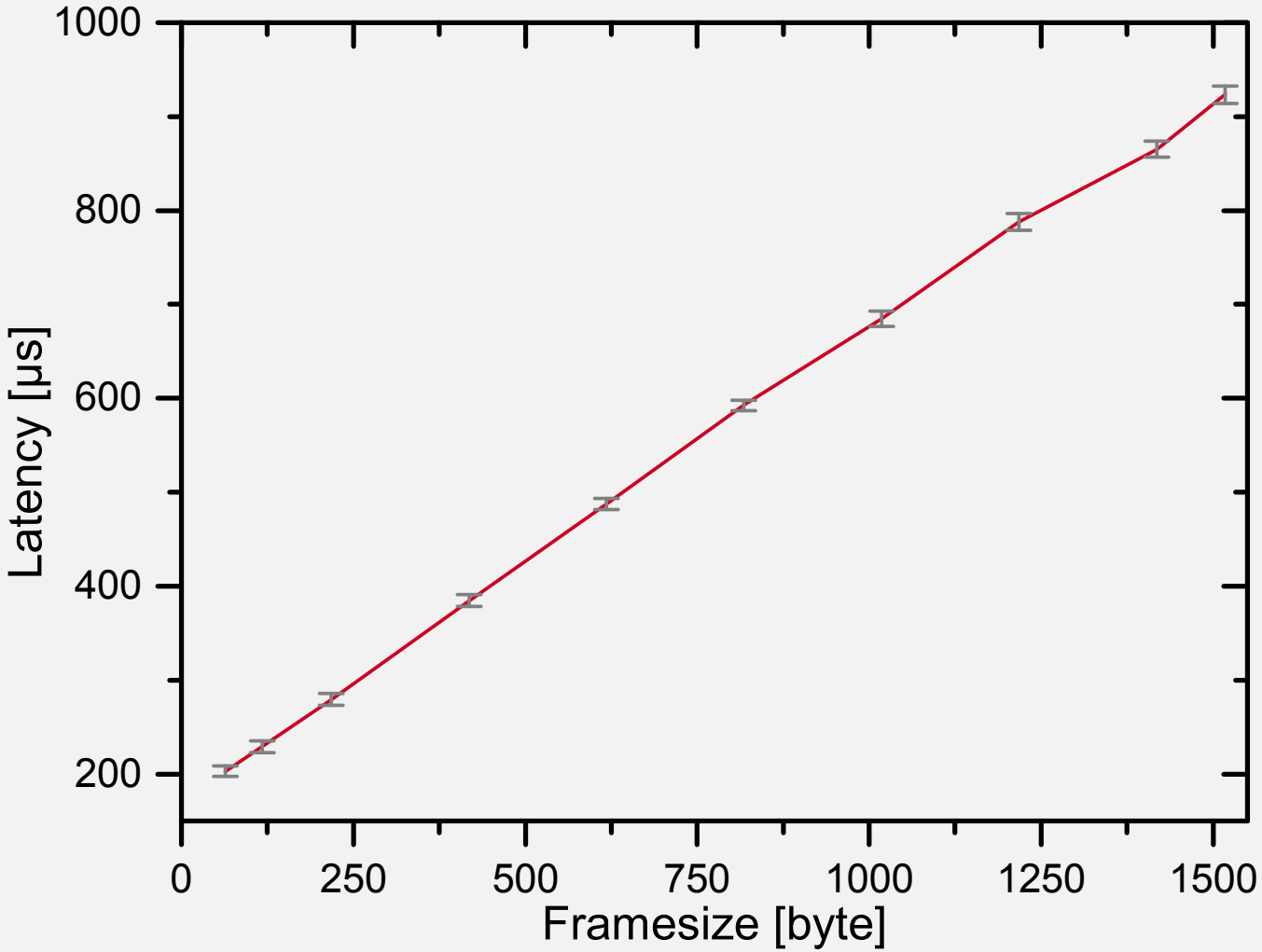
Architecture

Overview of the Cluster Simulation HW/SW Platform



Measurement Results

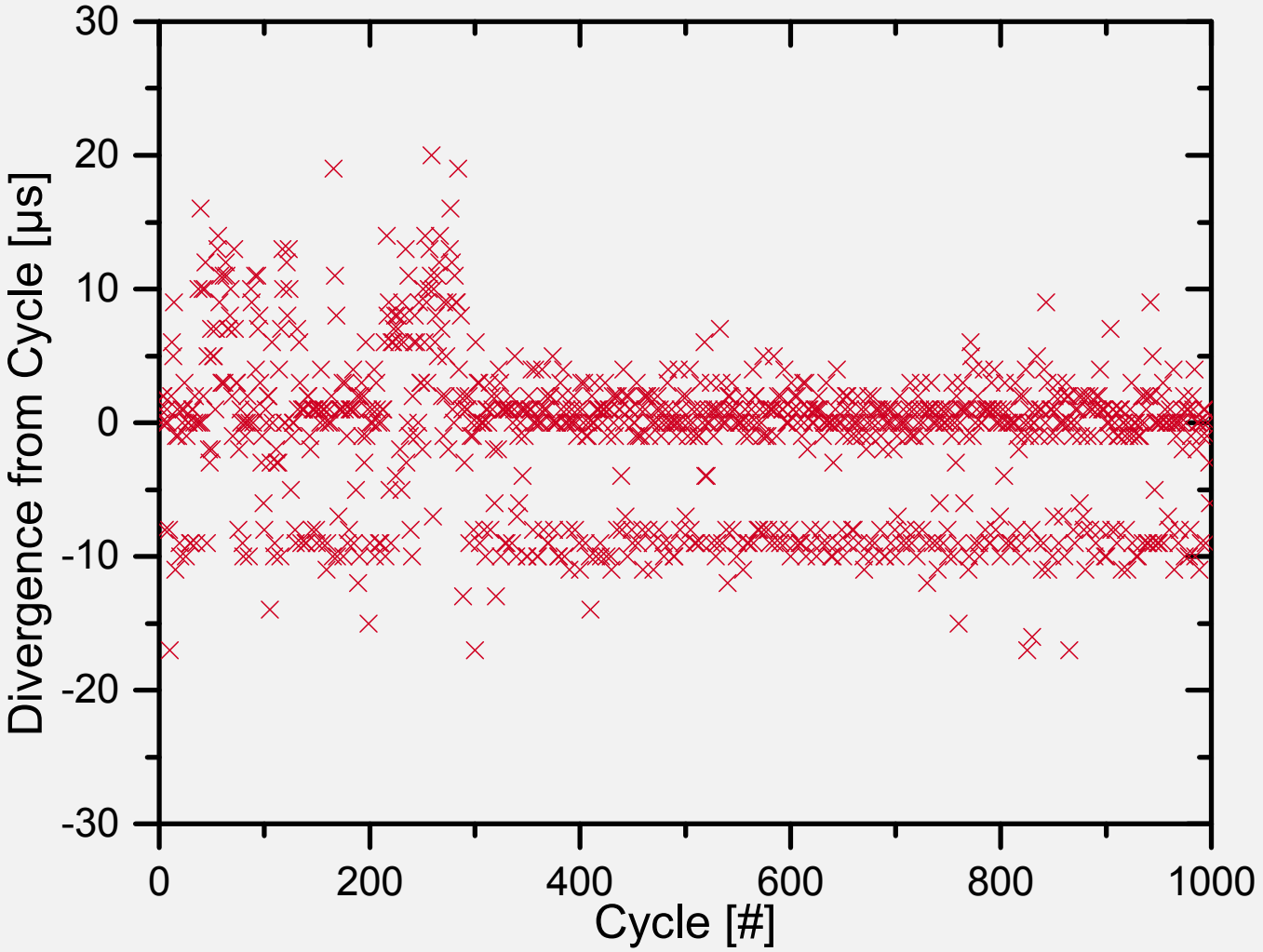
Latency



- Latency is 186.4µs for minimal sized frames

Measurement Results

Jitter



- Using off-the-shelf hardware results in a higher jitter

Outlook

- Replacing the microcontroller by a specialised NIC
  - Dedicated hardware time stamping unit
  - Higher bandwidth
- Multicore parallelisation of the simulation model
- Analysing different Linux real-time approaches

Thank you for your attention!

- Website of CoRE research group: http://www.haw-hamburg.de/core

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