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European Coordination for Accelerator Research and Development

PUBLICATION

ATCA Carrier Board with Dedicated IPMI Controller
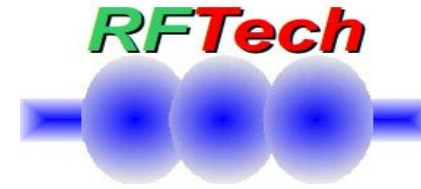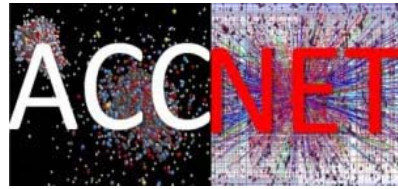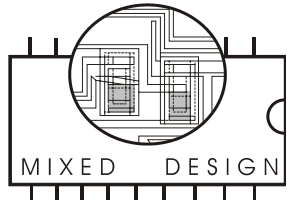
Predki, P (TUL)

28 October 2010

ATCA Carrier Board
with Dedicated IPMI Controller (2)

P. Predki, P. Perek, D. Makowski, A. Napieralski

Technical University of Lodz

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Outline

- Hardware structure of IPMC

- IPMC Software

- Summary
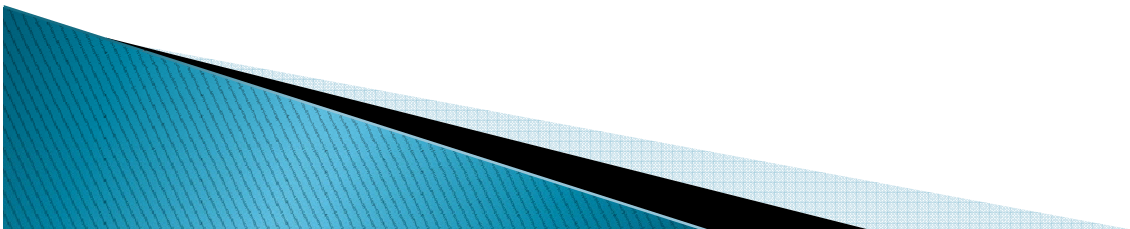
Structure of Renesas-based IPMC
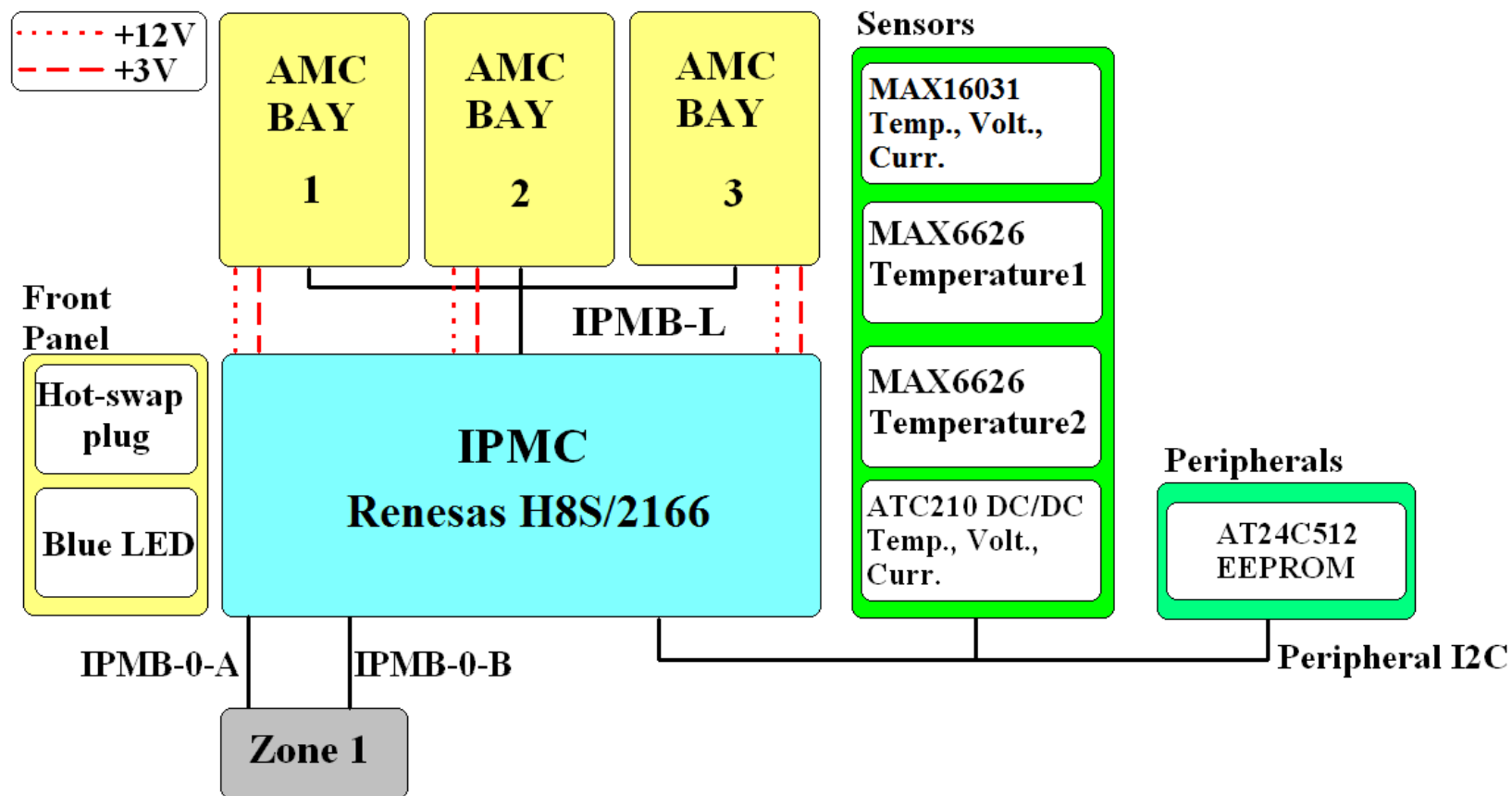
I2C connections

- Intelligent Platform Management Bus (IPMB-0)
  - 2 redundant channels

- Intelligent Platform Management Bus (IPMB-L)
  - Separate channels for AMC Modules

- Peripheral bus

Software

- Initialization part
  - Control register configuration
  - Peripheral configuration
- Main Loop
  - Event processing
  - IPMB-0 messages handling
  - IPMB-L messages handling
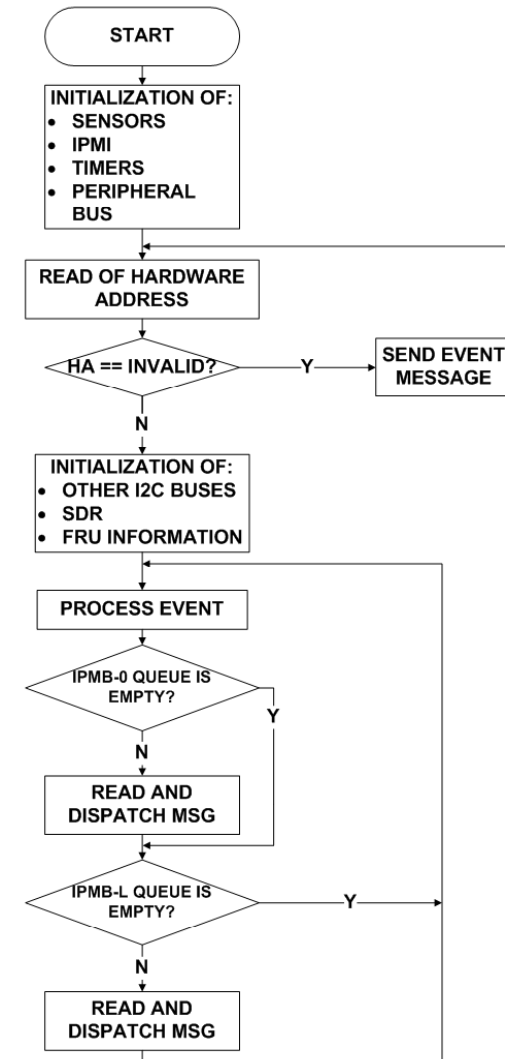
Event handling

▸ Problem:
  ◦ Low response times to various events are essential for LLRF control system
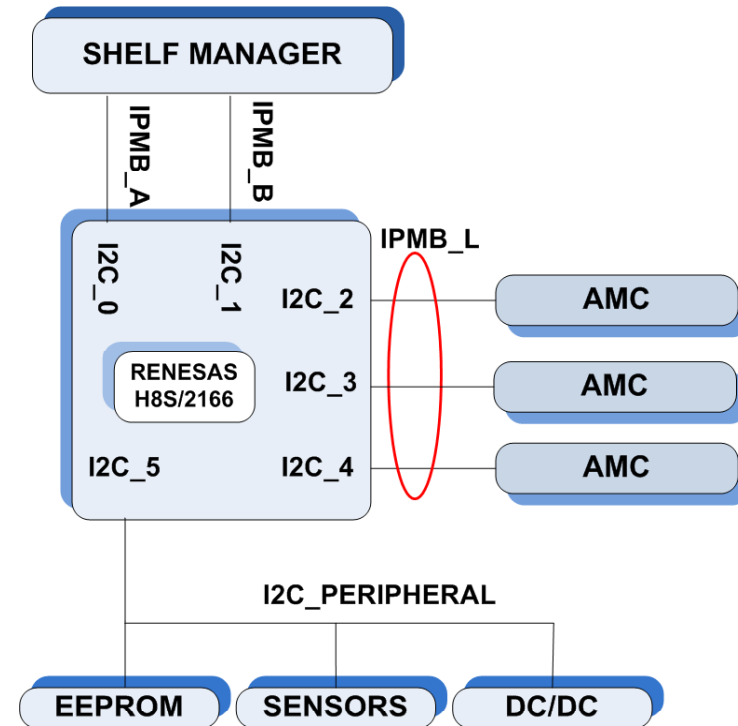 ◦ Long ISR execution time = missing other events

▸ Solution:
  ◦ Event-driven cyclic executives solution in conjunction with external device interrupts
  ◦ ISRs only feed the main event handling loop (if possible)
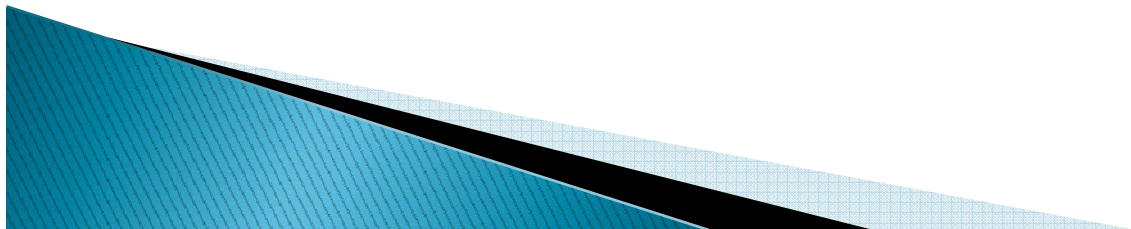
Message queuing

- ▶ IPMB-0
  - ◦ Single incoming queue
  - ◦ Single outgoing queue
  - ◦ Round robin algorithm
- ▶ IPMB-L
  - ◦ Single incoming queue
  - ◦ Separate outgoing queues
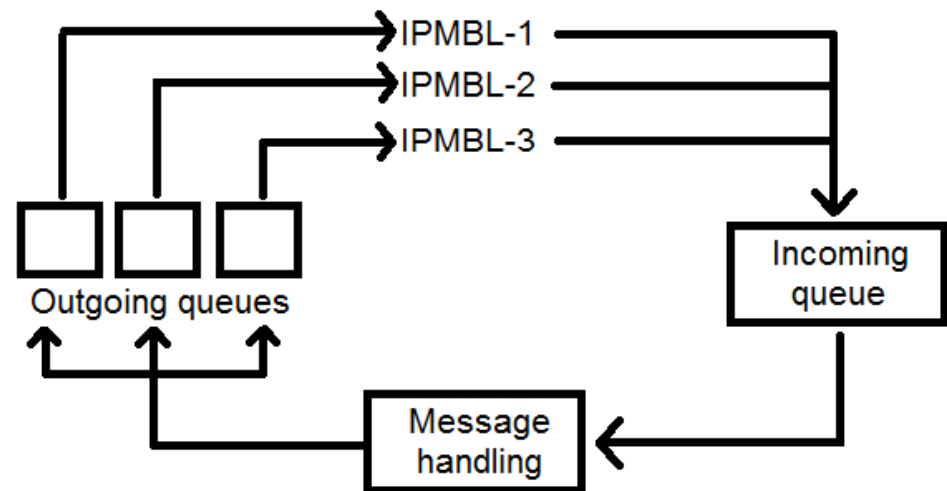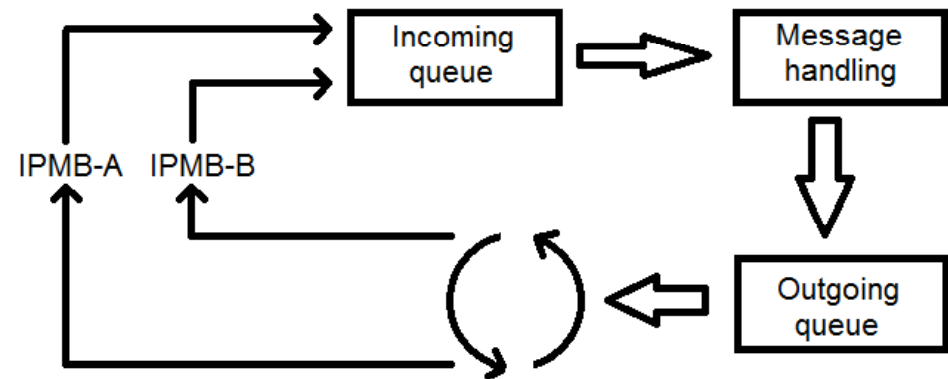
Summary

- Greater clock frequency speeds up the operation of the device
- Six I2C channels provide stable and parallel communication with all the components on the IPMB
- Single-device IPMC
  - Increases the reliability
  - Facilitates the software development and maintenance
  - Removes the need for interfacing between devices
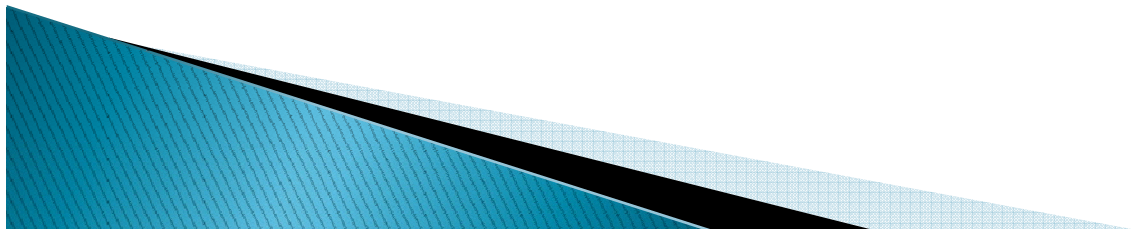
THE END

- Questions?
- Comments?
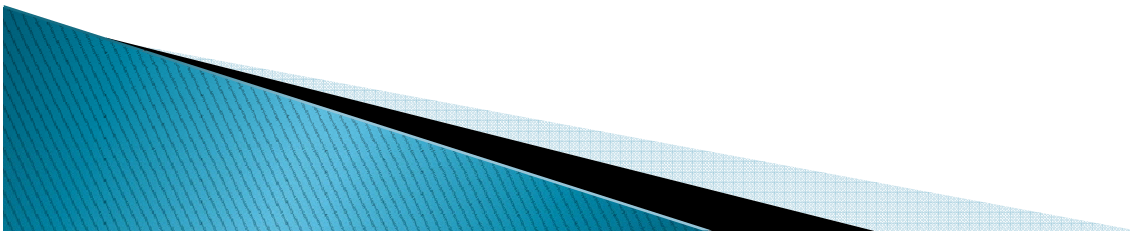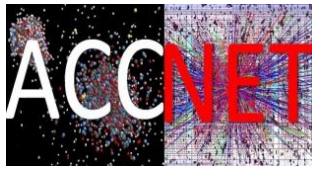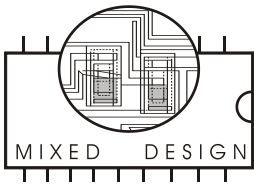
Report of RFTech presentation during Mixdes conference
(June 26-27, Wroclaw, Poland)

Title of presentation:

ATCA Carrier Board with Dedicated IPMI Controller (2)

Presenter:

Paweł Prędki (PhD student)

Department of Microelectronics and Computer Science

Technical University of Lodz

Lodz, Poland

Paweł Prędki co-presented a new solution of Intelligent Platform Management Controller for ATCA Carrier Board for prototype of LLRF control system of XFEL accelerator with Piotr Perek. The author of the previous version of the prototype, Paweł Prędki focused on the differences between the new and the old version of the Carrier Board. The most important improvement over the previous solution is in the stability of communication over IPMB-0 and IPMB-L buses. This is due to the fact that the Renesas microcontroller, used here, is equipped with six separate I2C controllers. Each controller can be directly connected to a device on one of the IPMB buses. Previously, all devices on the IPMB-L bus were connected to only one I2C controller, causing collisions.

Abstract: The Advanced Telecommunications Computing Architecture (ATCA) specification allows to meet the newest trends in high speed communication technologies. Furthermore, it provides manageability, availability and exceptional reliability at 99.999% level. Therefore, this architecture is perfect to use in control systems of complex projects like the Free-Electron Laser in Hamburg (FLASH) or the X-ray Free Electron Laser (X-FEL) that work with high-frequency signal processing, use high-speed communication protocols such as PCIe, Gigabit Ethernet or RocketIO and require continuous stable operation. Modular construction allows for flexible system configuration. What is worth emphasizing, in contrast to previous solutions like, VME (Versa Module Eurocard), it is possible to change the system configuration without the need for power shutdown. Hot-plug functionality is delivered by Intelligent Platform Management Interface (IPMI) system. For this reason, all ATCA units, which can be replaced in the field should have Intelligent Platform Management Controller (IPMC) that provides IPMI functionality.

The paper presents the newest solution of IPMC for Carrier Board for LLRF control system of XFEL accelerator. A microcontroller dedicated for IPMI management in ATCA systems fulfills the role of IPMC in this module.

Index Term: Intelligent Platform Management Interface, Advanced Telecommunications Computing Architecture, Carrier Board, X-ray Free Electron Laser, IPMC

Remarks: The conference was an excellent opportunity to get to know other people involved in development of uTCA / ATCA systems and the work they are performing. The presentations showed various approaches to different issues concerning such systems. The conversations with other presenters enabled Paweł Prędki to discuss in-depth the problems and solutions they encountered.

xTCA for Instrumentation special session in cooperation with EuCARD AccNet RFTech –EU Project

17th International Conference Mixed Design of Integrated Circuits and Systems
Wrocław, 24-26 June 2010, Poland