

The 2nd MTCA/ATCA Workshop for Research and Industry

Report of Abstracts

No.1

Management System in MTCA

Heiko Koerte - NAT

Abstract: Formerly known as a must-have from the communication market only, today's applications demand a highly efficient system management which covers all aspects from the overall system view down to single sensors at board level. This requirement spreads through most of the vertical markets in industry and research as its implementation has a high impact on serviceability and operation of systems in all kind of environments. The tutorial will highlight how the common management approach IPMI (Intelligent Platform Management Interface) in the most recent open standard MTCA answers the demand for i.e. high availability and reliability, remote service, fault detection and isolation field replacement including hot-swap, platform control and management of data streams. At the example of MTCA the attendee will be armed with a good understanding on how to make best use of the system management in order to help him operating his system.

No.2

PICMG MTCA – the next generation

Heiko Koerte - NAT

Abstract: Upcoming applications clearly indicate an increasing demand for communication bandwidth. New versions of existing architectures such as PCIexpress or Ethernet which are commonly used in MCTA systems requires changes to the existing MTCA standards in almost every area, i.e. power, cooling, electrical and mechanical interconnect in order to name just a few. A PICMG technical workgroup has been installed to review the current MTCA base specification and propose necessary changes to it. The goal of the workgroup is a revised next generation MTCA specification which accommodates to the upcoming challenges of the next generation applications and meets the requirements of system users. The presentation will provide an overview about the areas of the current MCTA specification which need to be changed and also give some insights into the current status.

No.3

An implementation of module management controller for MicroTCA data processing system

Cong He - IHEP

Abstract: On the basis of full compatibility with advanced telecommunications computing architecture (ATCA) standard, micro telecommunications computing architecture (MicroTCA) standard has a evident advantage over ATCA in terms of space, cost and scalability. The MicroTCA standard has become a popular platform in high energy physics. For the advanced

mezzanine card (AMC) installed in the MicroTCA chassis, module management controller (MMC) is a prerequisite to fulfill its function. Although there are many MMC solutions, most of their firmware work in polling mode and rarely use the real-time operating system (RTOS). In order to overcome the lack of real-time performance in polling MMC solution, the novel firmware is developed based on FreeRTOS, which is an open source real-time operating system. This firmware implements the basic functions of MMC, such as hot swap, power management, firmware upgrade, and adds the feature of serial command debugging. To verify the difference in real-time performance between the FreeRTOS and the polling solutions, the interrupt reaction time test is carried out on both solutions. The test shows that the average interrupt reaction time of the FreeRTOS solution is about 300 ms shorter than that of the polling method. This result proves that the FreeRTOS-based solution can significantly improve the real-time performance of transaction processing.

No.4

The MicroTCA fast control board for generic control and data acquisition applications

Jie Zhang - IHEP

Abstract: To provide the generic clock, trigger and control function and fulfill the data transmission performance requirement in High Energy Physics (HEP) and High Energy Photon Source (HEPS) experiments, a new generation of MicroTCA Fast Control board (uFC) was developed based on the Advanced Mezzanine Card (AMC) specification. Built around the the latest Kintex FPGA from Xilinx, the uFC provides users with a platform with data memory, reference clock, and trigger connections that are required in general experiments. In addition, it has access to two on-board FPGA Mezzanine Card (FMC) sockets with a large array of configurable input/output and high-speed links up to 100 Gbps. This paper presents test results from the first set of pre-production prototypes and reports on the application in HEPS.

No.5

Current Status and Future Plans of the MicroTCA.4 compliant LO and CLK Generation Module

Uros Mavric - DESY , Jiaoni Bai - KVG Quartz Crystal Technology GmbH

Abstract: The DeRTM-LOG1300 (uLOG), a MicroTCA.4 compliant LO and CLK generation module, has been operating successfully in L3 of the EuXFEL for many years. At the same time, other experiments show their demand for the LO and CLK generation modules operating with different reference frequencies. Not all the required LO and CLK frequencies can be generated using the currently implemented architecture. Recently we have started the collaboration with the company KVG Quartz Crystal Technology GmbH to produce and test these modules. In this talk we will present other possible LO and CLK generation techniques which can provide LO and CLK signals with reference frequencies 500 MHz, 3 GHz and others. It will be possible to order all these modules from KVG Quartz Crystal Technology GmbH.

No.6

Experience with LLRF Systems using MicroTCA.4 at DESY

Julien Branlard - DESY

Abstract: This contribution present the experience gathered at DESY using MTCA LLRF systems on pulsed FEL such as EuXFEL and FLASH and possible applications for synchrotron LLRF systems such as PETRA-IV.

No.7

Summary MicroTCA Workshop 2020 @ DESY

Holger Schlarb - DESY

Abstract: In this talk news and updates are given from the 9th MicroTCA workshop held in December 2020 at DESY. The MicroTCA community steadily grows and further develops, new production have become available, and the focus is shifting towards data processing and data management applications.

No.8

Machine Protection System of XFEL and FLASH

Juergen Jaeger - DESY

Abstract: This talk introduces the uTCA-based machine protection system (MPS) of the European XFEL and FLASH accelerators. The scope of the system, the chosen hardware, and the multitude of monitored diagnostics and controlled subsystems are mentioned. Its graphical user interface for the control room is shown briefly.

No.9

Control software development for 324MHz superconducting spoke cavity coupler RF conditioning test platform

Song Li - IHEP/CSNS

Abstract: According to the CSNS-II upgrade plan, additional superconducting cavities will be installed in reserved space of CSNS LINAC tunnel for up to 300 MeV output beam energy. At present, two RF couplers which as one of the key components in superconducting proton linac have been fabricated. In order to test the power transferring capability of the coupler and take RF conditioning to it, a test stand was custom-designed and built in CSNS LINAC hall. The corresponding control software, which is realized on the MTCA based LLRF control system, has also been developed to ensure the RF conditioning working successfully and safety. In this paper, firstly we will introduce the hardware and software architecture required to implement the control system. And then the functions of control software will be discussed. In the last part, the results of the offline test will be given.

No.10

MicroTCA for photon science experiments

Martin Tolkiehn - DESY

Abstarct: In my presentation I will show several possible applications of MTCA.4 in photon

science. In particular I will highlight the new motion controller which is being developed at DESY.

No.11

How to realize your application on MicroTCA.4

Cagil Gumus - DESY

Abstract: This tutorial/talk will focus on giving people insights on steps necessary to build a complete MTCA.4 system to solve a specific application. It will give guidance on important topics such as; backplane configuration, component selection, software/firmware integration and more. The talk will include various examples from the industry with different applications such as LLRF, Data Acquisition/Aggregation and diagnostic systems.

No.12

Two low-level control systems for L-band (1300MHz) and S-band (2856MHz) based on MTCA

Haoran Fu - Beijing Gantel Co., Ltd.

Abstract: The main function of the low-level control system is to control the amplitude, phase and frequency of the electromagnetic field in the accelerator cavity to stabilize within the desired fluctuation range. The report mainly elaborated on the detailed design of two low-level control systems for L-band (1300MHz) and S-band (2856MHz) based on the 2U VT814 MicroTCA chassis architecture, including RF front-end design, digital processing board design, and thermostat design. The report mainly elaborated on the detailed design of two low-level control systems for L-band (1300MHz) and S-band (2856MHz) based on the 2U VT814 MicroTCA chassis architecture, including RF front-end design, digital processing board design, and thermostat design.

No.13

Recent developments from MicroTCA Tech Lab

Jan Marjanovic - DESY

Abstract: In this presentation the recent developments from MicroTCA Tech Lab are presented. The first one is the MMC Stamp, a system on a module that implements the AMC management. The presentation continues with two FMC carriers in AMC form factor, DAMC-FMC2ZUP and DAMC-FMC1Z7IO. The first one is based on Xilinx Zynq UltraScale+ MPSoC and the latter on Xilinx Zynq 7000. Some use cases and current and future projects including these two boards will be shown. The next development presented is DAMC-DS812ZUP, a high-speed digitizer with Zone 3 interface compliant to Class RF1, suitable for signals up to 3 GHz. The presentation concludes with highlights of various activities of the lab.

No.14

The X3Timer – A MTCA.4 based timing hardware for PETRA IV

Hendrik Lippek - DESY

Abstract: At DESY we are currently in the technical design phase for the upgrade of the PETRA III storage ring towards the fourth- generation synchrotron light source PETRA IV. Together with this machine upgrade almost all of its electronics including the existing timing system will be completely renewed. The hardware for the new timing system will be based on the MTCA.4 standard. Because of the good experience with the DESY developed timing system for the European XFEL we decided to develop a successor on this base for PETRA IV. We will present the first concepts of the major timing system hardware component, a MTCA.4 based AMC-Card called X3Timer. And further on we will show the state of our pre-tests and the state of the development.

No.15

Prototype of the HALF timing system based on MRF mTCA.4 hardware
Xiaokang Sun - USTC

Abstract: The Hefei Advanced Light Facility (HALF) is brought forward to be a new diffraction limited storage ring light source, the HALF timing system is proposed to be an event-driven system based on mTCA.4 hardware under EPICS architecture. The MicroTCA.4 300 series products, from the Micro-Research Finland (MRF) Oy, are used in the prototype of the HALF timing system. Device supports and drivers will be developed for EPICS general records to access the registers on the timing modules. At present, the system hardware test platform is set up, the system performance test and the development of EPICS drivers are in progress.

No.16

MicroTCA.4 in LLRF of BEPCII and HEPS
Xinpeng Ma - IHEP

Abstract: Development of MicroTCA.4-based new boards will be talked, including down-converting and direct-sampling RTM, digital IO AMC board etc. Applications in BEPCII and HEPS will be shown, such like upgrade of LLRF system of BEPCII Linac, conditioning of kinds of high power microwave components.

No.17

The MicroTCA.4 Standard: Development of an Eco-System for Advanced Applications
Kay Rehlich - DESY

Abstract: Designing, constructing, and maintaining control systems for complex facilities is a challenge. Such facilities have high requirements for reliability, diagnostics, automation and the flexibility to adapt evolving developments. All this leads to a well structured and modular hardware and software design with clear interfaces. Standardization is the best way to accomplish all these requirements. But how to select the right standard? The presentation will describe the development from the basic MicroTCA that was introduced by the telecom industry to a system that is used in many big scientific installations and industrial projects worldwide. A standard is not static. It must adapt from time to time new technology improvements and application needs. The MicroTCA standard lives from continuous support by Industry and science organizations and

active members in its working groups. The presentation will also describe possibilities to contribute and to use the standard from a users point of view and as member of the standardization group.

No.18

Femtosecond Synchronization system for Dalian Coherent Light Source
Zhichao Chen

Abstract: Dalian Coherent Light Source is the unique extreme ultraviolet band free electron laser user facility in the world. The user-level facility has very strict requirements on the stability of the machine, especially for High Gain High Harmonic running mode and ultrafast pump-probe user experiment. 10 fs level relative jitter for both of electron beam-seed laser and FEL-laser of experimental station is the core requirement for the synchronization system. The combination of pulse laser synchronization scheme and microwave synchronization scheme provides high-precision, high stable and fully automatic solution for Dalian coherent light source, while provides the guarantee for the long-term and high-quality operation of the light source.

No.19

MTCA.4 MMC with Open source evaluation
Chenyan Lu - IHEP

Abstract:

No.20

Introductions on the products of Struck and mTCA.4 based solutions
Rong Liu - Beijing DAQ Technology Co. Ltd.

Abstract:

No.21

Constant Temperature Control for the High-Precision Electronics of big science
Zhiqi Wang - nVent Electrical Products China Co., Ltd.

Abstract:

No.22

MTCA / ATCA Technology Brief
Junfeng Mao - nVent Electrical Products China Co., Ltd.

Abstract:

No.23

IHEP-EDHP-AMC a MicroTCA.4 Based Multifunction Digital Processing AMC Module

Wei Long - IHEP

Abstract:

No.24

Status of the HPES digital BPM Electronics development abstract:

Jing Yang - IHEP

Abstract:

No.25

Development of CSNS linac llrf based on MicroTCA

Zhexin Xie - IHEP/CSNS

Abstract:

No.26

MicroTCA system engineering, developing and domestic production

(MicroTCA 整机工程研产及国产化实践)

Rui Li - Shanghai Yuanzhong

Abstract:

No.27

Research on Electronic System of Digital Gamma Spectrometer Based on MicroTCA Platform

(基于 MicroTCA 架构的数字化伽马谱仪电子学系统研究)

Hongrui Cao - IPP

Abstract: