

## UTC003



### KEY FEATURES

- Single-width, full-height module per AMC.0
- 400MHz RISC CPU with 64MB DDR for MCMC (MicroTCA Carrier Management Controller) and Shelf Manager
- Redundant boot system to ensure fail-safe upgrades
- Fail-over with dual UTC003 in system
- GbE to each AMC (layer two managed)
- Non-blocking PCIe x4 Gen 2 to each AMC slot with option for SRIO or 10GbE (layer three managed)
- Fabric clock with Spread Spectrum capability
- Linux 2.6 embedded OS
- IPMI 2.0 compliant
- HPM.1 compliant
- UTC003 can run as an IPMI protocol analyzer to monitor all the I<sup>2</sup>C Busses

The VadaTech UTC003 is the most feature-rich MCH (MicroTCA Carrier Hub) for the Conduction Cooled  $\mu$ TCA chassis in the market. It's management software is based on VadaTech's robust Carrier Manager and Shelf Manager which have been deployed for many years with proven results. The MCMC manages the power modules, the two CU (Cooling Units) and the 12 AMCs within the  $\mu$ TCA chassis. It also interfaces to and manages the on-board fabric interfaces. The module is available with PCIe, SRIO, 10GbE layer three managed, and GbE layer two managed.

The UTC003 runs Linux 2.6 on it's MCMC CPU and is hot-swappable and fully redundant when used in conjunction with a second instance of the module. The firmware is HPM.1 compliant which allows for ease of upgrade.

The UTC003 provides Fabric (100 Mhz HCSL) clock to each AMC.

VadaTech can modify this product to meet special customer requirements without NRE (minimum order placement is required).

**$\mu$ TCA™**

# MCH for Conduction Cooled $\mu$ TCA Chassis

## SPECIFICATIONS

Architecture		
Physical	Dimensions	Width: 2.89in. (73.5 mm) not including the wedge locks
		Depth: 7.11 in. (180.6 mm), not including the front handle
Type	Controller	$\mu$ TCA Carrier Hub
Standards		
Module Management	IPMI	IPMI Version 2.0
	ATCA	PICMG 3.0 Revision 2.0 (AdvancedTCA)
	AMC	PICMG AMC.0 Revision 1.0 (AdvancedMC)
	$\mu$ TCA	PICMG MicroTCA.0 Revision 1.0
	HPM	HPM.1 Revision 1.0
Configuration		
Power	UTC003	Option load dependent (as the MCMC and shelf only < 3 W)
Environmental	Temperature	Operating Temperature: -20° to 70° C (-40° to +80° C is available upon request)
		Storage Temperature: -45° to +90° C
	Vibration	MIL-810 (TBD) and DO-160 (TBD)
	Shock	TBD
	Relative Humidity	5 to 95 percent, non-condensing
Features	External interface	RS-232 console port (RJ-45)
		Out-of-band LAN 10/100 from MCMC/Shelf Manager (RJ-45)
		Dual in band 10/100/1000 from GbE Switch Fabric (RJ-45)
		Dual QSFP for Fabric Expansion (PCIe and SRIO Option)
		Dual SFP+ for Fabric Expansion (10GbE option)
		Fabric - PCIe, SRIO or XAUI
	LEDs	IPMI Management Control LNK/ACT, BIST pass
	Switch	Hot-swap switch input with +/-15KV ESD protection
	Temp Sensor	Multiple temp sensors on-board
Other		
MTBF	MIL Spec 217-F TBD	
Certifications	Designed to meet FCC, CE and UL certifications where applicable	
Standards	VadaTech is certified to both the ISO9001:2000 and AS9100B:2004 standards	
Compliance	RoHS and NEBS	
Warranty	Two (2) years	
Trademarks	The VadaTech logo is a registered trademark of VadaTech, Inc. Other registered trademarks are the property of their respective owners. AdvancedMC™, AdvancedTCA™ and $\mu$ TCA™ logo are trademarks of the PCI Industrial Computers Manufacturers Group. All rights reserved. Specification subject to change without notice.	

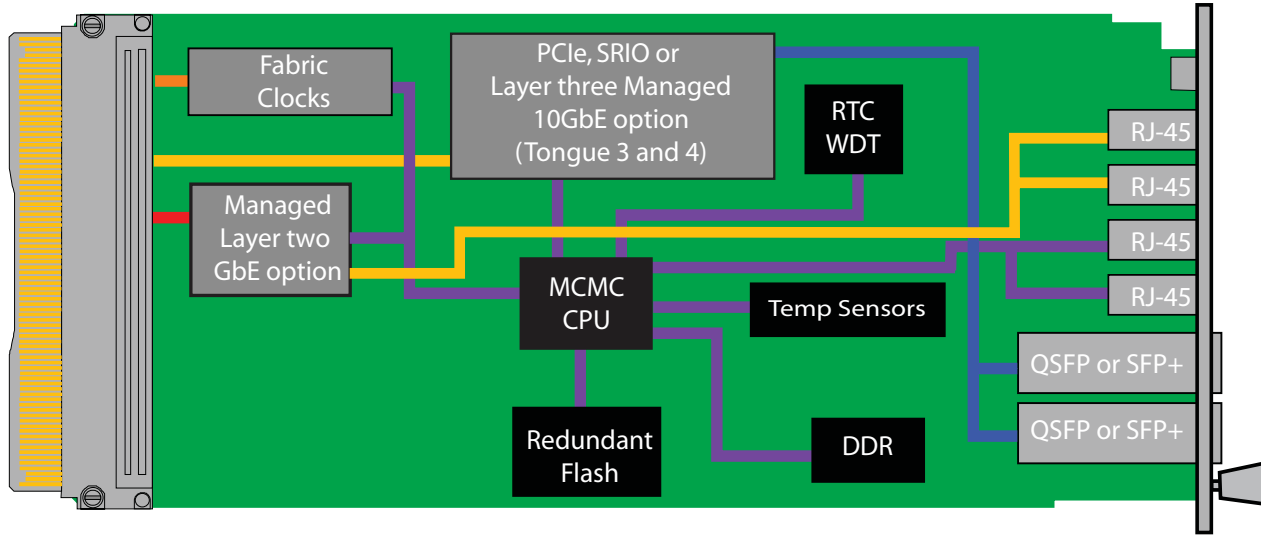


FIGURE 1. UTC003 Functional Block Diagram

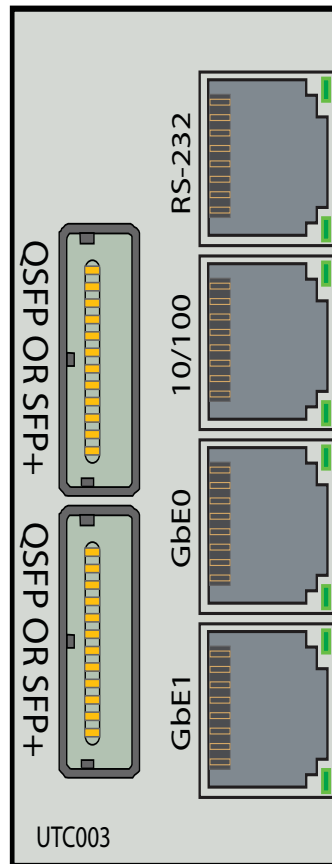


FIGURE 2. UTC003 Front Panel Diagram

## Key Software Features

- ❖ Linux 2.6 embedded OS
- ❖ IPMI version 2.0
- ❖ Interface to Sensor Data Record repositories, System Event logs, FRU inventory storage devices
- ❖ Monitors temperature, voltage and current sensors
- ❖ Shelf cooling policy
- ❖ Shelf activation and power management
- ❖ Alarm controls
- ❖ Event notification and flexible alerting policies
- ❖ E-Keying
- ❖ CLI, SNMP, RMCP+, HTTP and HPI
- ❖ IPMI 1.5 compatibility
  - ◆ IPMI device global
  - ◆ Watchdog timer
  - ◆ Session management
  - ◆ Event management
  - ◆ PEF and alerting
  - ◆ Sensor device
  - ◆ FRU device access and update
  - ◆ SDR device access and update
  - ◆ SEL device access and management
  - ◆ LAN device configuration
- ❖ IPMI 2.0 extension
  - ◆ Enhanced encryption
  - ◆ Firmware firewall
  - ◆ Enhanced authentication

## Carrier Manager Functions

- ❖ Dual-redundant CM with negotiation and fail-over
- ❖ Support for dual-redundant Power Modules
- ❖ Cooling Management
- ❖ LED Controls
- ❖ AMC Management
  - ◆ Radial IPMB-L
  - ◆ Support for 12 AMCs
  - ◆ AMC Payload Control
  - ◆ Electronic Keying
- ❖ Power and Cooling Management

## Shelf Manager Functions

- ❖ Sensor monitoring and alerting
  - ◆ Actively monitors local and remote temperature, voltage and current sensors on the shelf FRUs
  - ◆ Access to raw sensor readings
  - ◆ Logs all critical events reported by shelf FRUs
  - ◆ Events are processed using Platform Event Filtering (PEF)
  - ◆ Alerts using SNMP trap and PEF alert policy
  - ◆ Capability to reset major/minor alarms with timeout
  - ◆ Controls major/minor/critical alarm LEDs
  
- ❖ Shelf manager interface
  - ◆ Command Line Interface (CLI)
    - CLI connects to the Shelf Manager and the boards on the shelf
    - IPMI-based library of commands
    - Accessible via telnet, SSH or shelf serial port
    - Commands provide access to information such as the current state of the system, sensor values, events, health, fan speeds, FRU storage, etc.
  - ◆ SNMP
    - Supports v1 and v3 of the Simple Network Management Protocol (SNMP)
    - The Shelf Manager can support SNMP queries and send SNMP traps in either v1 or v3
    - Provides custom *Management Information Base (MIB)* tree accessed using SNMP
    - The MIB hierarchy is defined in a text file that describes the shelf and platform objects to be managed and can be used by a remote application such as an SNMP/MIB manager
  - ◆ HPI
    - Provides HPI interface to the shelf resources
    - Access to resource tables to enable applications to discover, manage, and monitor the resources in the system:
      - + Reset state management
      - + Power state management
      - + Managed hot swap
      - + Alarm management
      - + Management instruments associated with entities
      - + Event notifications
      - + Configuration
      - + System and resource event logs

## Layer Two Managed GbE

The GbE layer two managed switch fabric routes GbE to each of the AMC slots. The GbE fabric has an interface to the onboard Carrier/Shelf manager. It also has a port routed to the front for uplink.

### Key features:

- ❖ Configuration
  - ◆ Ethernet/IEEE 802.3 Packet size (64 bytes to 1522 bytes)
  - ◆ Jumbo packets up to 9216 bytes
- ❖ L2 Switching
  - ◆ Supports up to 8K MAC address
  - ◆ Line rate switching for all packet sizes
  - ◆ Independent VLAN learning
  - ◆ VLAN flooding for broadcast and DLF packets
  - ◆ Hardware-based address learning
  - ◆ Six CPU-managed learning (CML) modes per port
  - ◆ Hardware-and-software-based aging
  - ◆ Software insertion/deletion/lookups of the L2 table
  - ◆ Same port bridging supported
  - ◆ Station movement control
- ❖ L2 Multicast
  - ◆ 4K VLANs
  - ◆ Protocol-based VLANs
  - ◆ IEEE 802.1p
  - ◆ IEEE 802.1Q
  - ◆ Independent VLAN learning (IVL)
  - ◆ Ingress filtering for IEEE 802.1Q VLAN security
  - ◆ VLAN-based packet filtering
  - ◆ MAC-based VLAN
- ❖ Source Port Filtering
  - ◆ Egress port block masks
  - ◆ Trunk group blocking masks
- ❖ Storm Control Per-Port:
  - ◆ Unknown unicast packet rate control
  - ◆ Broadcast packet rate control
  - ◆ Multicast packet rate control
- ❖ Spanning Tree:
  - ◆ IEEE 802.1D spanning tree protocol (single spanning tree per port)
  - ◆ IEEE 802.1s for multi spanning trees
  - ◆ IEEE 802.1w rapid spanning tree protocol-delete and/or replace per:
    - Port
    - VLAN
    - Port, per VLAN
  - ◆ Spanning tree protocol packets detected and sent to the CPU
- ❖ Double-Tagging:
  - ◆ Unqualified learning/forwarding
  - ◆ IEEE 802.1 Q-in-Q
- ❖ Mirroring
  - ◆ Ingress/egress mirroring support
  - ◆ Mirror-to-port receives the unmodified packet for ingress mirroring
  - ◆ Mirror-to-port receives the modified packet for egress mirroring

- ❖ Content Aware Filter Processing
  - ◆ Intelligent Protocol Aware processor with backward-compatible, byte-based classification option
  - ◆ Parses up to 128 bytes per packet
  - ◆ -512 ACL rules support
  - ◆ Multiple matches and actions per packet
  - ◆ ACL-based policing
  - ◆ Ingress/egress port based filtering
  - ◆ MAC destination address remarking
  - ◆ Traffic class definition based on the filter
  - ◆ Programmable meters allows policing of flows
  - ◆ Metering granularity from 64 Kbps to 1Gbps
  - ◆ Multiple look-ups per packet
  - ◆ Metering support on ingress ports and CPU queues
- ❖ QoS Features
  - ◆ Four CoS queues per port
  - ◆ Per-port, per CoS drop profiles
  - ◆ Port level shaping
  - ◆ Traffic shaping available on CPU queues
  - ◆ Programmable priority to CoS queue mapping
  - ◆ Provides two levels of drop precedence per queue
  - ◆ Strict Priority (SP), Weighted Round Robin (WRR), and Deficit round Robin (DRR) mechanisms for shaped queue selection
- ❖ DSCP
  - ◆ DSCP-based prioritization
  - ◆ Back pressure metering
  - ◆ DSCP to IEEE 802.1p mapping
- ❖ Port Security
  - ◆ Per port blocking
  - ◆ Supports IEEE 802.1x
  - ◆ MAC address blocking
- ❖ DoS Prevention
  - ◆ Denial of Service detection/prevention
- ❖ Management Information Base
  - ◆ SMON MIB, IETF RFC 2613
  - ◆ RMON statistics group, IETF RFC 2819
  - ◆ SNMP interface group, IETF RFC 1213, 2836
  - ◆ Ethernet-like MIB, IETF RFC 1643
  - ◆ Ethernet MIB, IEEE 802.3u
  - ◆ Bridge MIB, IETF RFC 1493

## Clocks

The  $\mu$ TCA specification defines a set of clocks for Telcom and non-Telcom applications. The VadaTech UTC003 supports only the Fabric clock which is 100Mhz HCSL. If other clocking options are desired please contact VadaTech.

### Fabric Clock

The UTC003 has the capability to provide Fabric clocks. The Fabric clocks are HCSL and run at 100MHz with a very low Jitter to meet the PCIe Gen 2 specification.

#### *Key features:*

- ❖ 0.7V Current mode differential HCSL output
- ❖ Output frequency of 100MHZ
- ❖ RMS period Jitter 3 ps (maximum)
- ❖ Cycle-to-cycle jitter: 35 ps (maximum)
- ❖ Spread Spectrum capable for EMI reduction



## Fabrics on Tongue Three and Four

The UTC003 supports the following fabrics on tongue three and four:

- ❖ PCIe Gen 2
- ❖ 10 GbE layer three managed (option for unmanaged)
- ❖ SRIO

### PCIe Gen 2

The PCIe fabric is Gen 2 and is non-blocking on all the ports. It further allows expansion to another  $\mu$ TCA chassis or other systems via the front panel I-PASS connector. PCIe Gen 2 allows 5 Gbps on each link, which is twice the speed of Gen 1 at 2.5 Gbps.

Each of the AMCs receives 4 lanes of PCIe which each AMC can negotiate down to PCIe Gen 1 independent of other ports. This allows modules in the system to be mix of Gen 1 and Gen 2 PCIe.

#### Key features:

- ❖ 48 Lanes with 12 independent ports
- ❖ Fully non-blocking
- ❖ Dynamic speed negotiation (2.5 or 5.0 Gbps)
- ❖ Dynamic link width negotiation
- ❖ Non-Transparent bridging capability
- ❖ Enable Dual-Host, Dual-Fabric, and Host-Fail-over applications
- ❖ 480 GT/s aggregated bandwidth
- ❖ Cut-Thru packet latency of less than 140ns

### 10 GbE Layer 3 Managed switch

The 10GbE switch fabric is layer three managed and each of the AMC modules has a 10GbE interface to the Fabric. Further there is an uplink port on the front I-PASS connector for expansion. This allows expansion to another chassis or uplink to an external switch. This switch has the richest set of features in the market by running carrier grade management software under Linux.

#### Key features:

- ❖ Spanning Tree Protocol (STP)
- ❖ Rapid Spanning Tree Protocol (RSTP)
- ❖ Multiple Spanning Tree Protocol (MSTP)
- ❖ Virtual LANs (VLANs)
- ❖ Generic Attribute Registration Protocol (GARP)
- ❖ Generic Multicast Registration Protocol (GMRP)
- ❖ Generic VLAN Registration Protocol (GVRP)
- ❖ Port Authentication
- ❖ Internet Group Management Protocol (IGMP) (Version 1, 2, and 3) Snooping/Proxy
- ❖ Multicast Listener Discovery (Version 1, 2) Snooping/Proxy
- ❖ Provider Bridging IEEE802.1ad/D6.0
- ❖ Multiple Registration Protocol (MRP) IEEE802.1ak/D4.0
- ❖ Multiple multicast Registration Protocol (MMRP) IEEE802.1ak/D4.0
- ❖ Multiple VLAN Registration Protocol (MVRP) IEEE802.1ak/D4
- ❖ Link Layer Discovery Protocol IEEE802.1AB 2005

# MCH for Conduction Cooled $\mu$ TCA Chassis

- ❖ Ethernet OAM IEEE 802.3ah -2004 clause 57
- ❖ Connectivity Fault Management IEEE802.1ag -d6.0
- ❖ Link Aggregation - Static; IEEE802.3ad (2002); IEEE8023 LAG-MIB
- ❖ Open Shortest Path First (OSPFv2/OSPFv3)
- ❖ Routing Information Protocol (RIP/RIPng)
- ❖ Border Gateway Protocol (BGP4/BGP4+)
- ❖ Intermediate System-to-Intermediate System (IS-IS)
- ❖ Multi Protocol Label Switching (MPLS)
- ❖ ReReservation Protocol - Traffic Engineering (RSVP-TE)
- ❖ Label Distribution Protocol
- ❖ Diffserv (RFC 3270 and RFC 4124)
- ❖ Layer 3 VPN RFC2547bis: MPIS BGP VPN
- ❖ Layer 2 VPNs
- ❖ MPLS OAM (RFC 4379)
- ❖ Protocol Independent Multicast - Sparse Mode (PIM-SM)
- ❖ PIM Boot Strap Router (BSR)
- ❖ PIM-source specific Multicast (PIM-SSM)
- ❖ PIM-Dense Mode (PIM-DM)
- ❖ Distance Vector Multicast Routing Protocol (DVMRP)
- ❖ IP Multicast MIBs
- ❖ Internet Group Management Protocol (IGMP)
- ❖ Multicast Listener Discovery (MLD)
- ❖ Virtual Router Redundancy Protocol (VRRP)

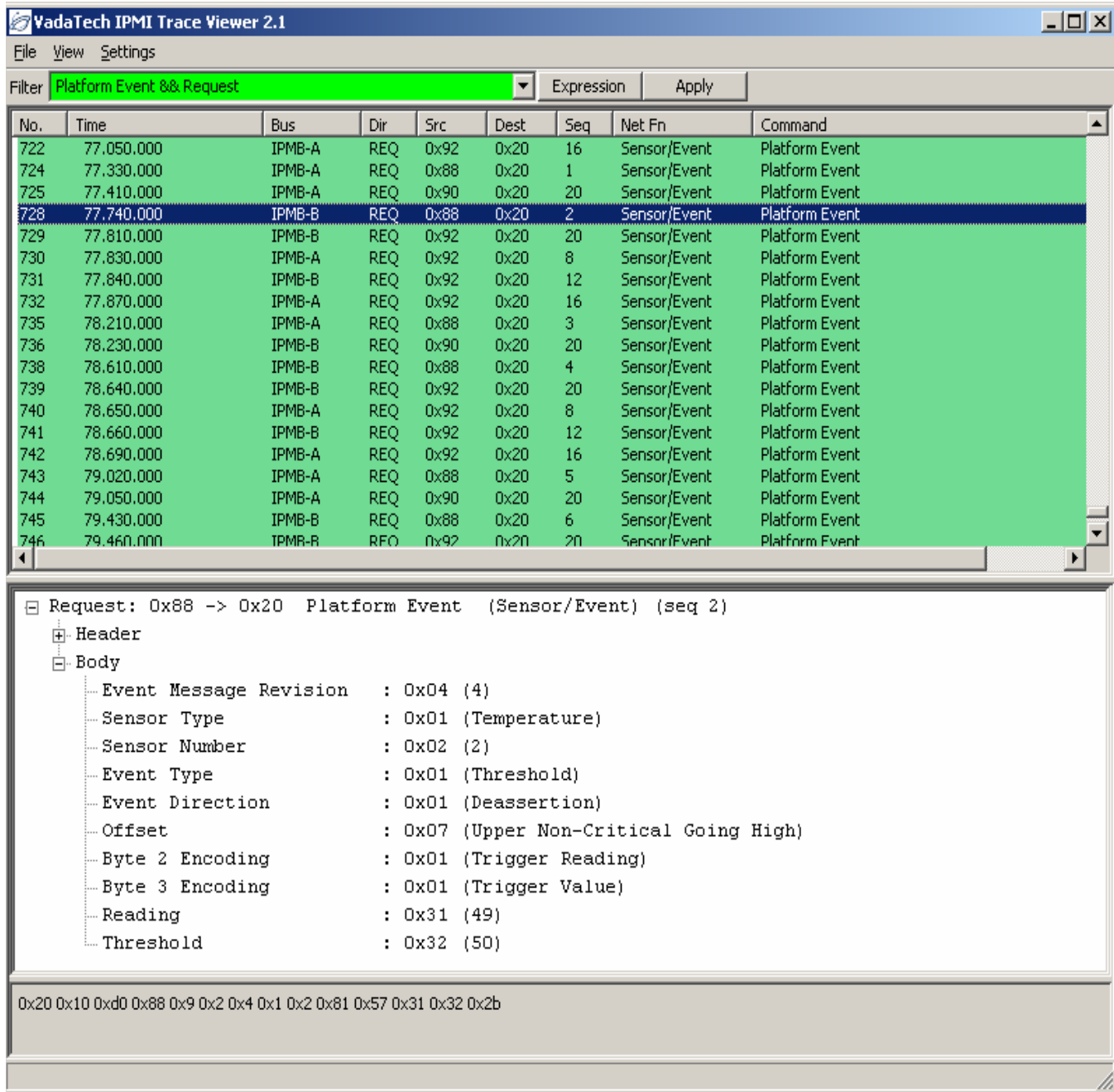
## SRIO Fabric

The SRIO switch Fabric supports revision 1.3 of the RapidIO Interconnect Specification. There are two SRIO chips (40 lanes each) on-board connected back to back via x8 lane. All the 12 AMC slots have an x4 connection. Four of the AMC can be configured as four x1 ports or a single x4 ports. Also there is SRIO x4 coming to the front via I-PASS for expansion. Further there is an SRIO x4 lane that goes to the update channel to the second MCH.

### Key Features:

- ❖ Port frequency configuration from 1.25, 2.5 and 3.125 Gbits/s
- ❖ 100Gbps of switching bandwidth per switch Fabric
- ❖ 64,000 Endpoints through hierarchical lookup
- ❖ Independent unicast and multicast routing mechanism
- ❖ Supports up to 40 simultaneous multicast masks per fabric chip
- ❖ Error management extensions
- ❖ All configurations are via I2C bus
- ❖ Packet Trace function: It allows filtering out packets that contain a match

**FIGURE 3:** Viewing a captured trace when running the UTC003 as an IPMI Protocol Analyzer



Running the UTC003 as the protocol analyzer allows monitoring, injecting, capturing and validating I<sup>2</sup>C traffic on any of the Intelligent Platform Management Busses (IPMB). A Graphical User Interface (GUI) validates and displays the IPMI packets or schedules IPMI messages for injection into the system. The GUI application communicates with the integrated UTC003 IPMI controller through an Ethernet port.

## ORDERING OPTIONS

### UTC003 - ABO - DEF - GHJ

#### A = Management Software

- 1 = MCMC
- 2 = MCMC and Shelf Manager
- 3 = Protocol Analyzer

#### B = GbE Switch

- 0 = None
- 1 = Managed Layer Two GbE

#### D = Fabric Switch

- 0 = None
- 1 = PCIe
- 2 = SRIO
- 3 = Layer 3 Managed 10GbE
- 4 = Layer 2 Light Managed 10GbE

#### E = Telecom/GPS Clock

- 0 = None
- 1 = Telecom TCXO \*\*
- 2 = GPS VCTCXO \*\* 30.72MHz<sup>†</sup>
- 3 = GPS VCTCXO \*\* 10.00MHz<sup>†</sup>
- 4 = Clock Distribution only
- 5 = GPS VCTCXO \*\* 50.00MHz
- 6 = Reserved

#### F = Fabric Clock

- 0 = None
- 1 = Fabric 100MHz HCSL
- 2 = Reserved
- 3 = Reserved
- 4 = Reserved
- 5 = Reserved
- 6 = Reserved

#### G = Fabric B ports Configuration

- 0 = None
- 1 = Fabric clock shared with Fabric B (SAS)
- 2 = Telecom clock shared with Fabric B (SAS)
- 3 = No clocks - all Fabric B (SAS)
- 4 = Reserved
- 5 = Reserved

#### H = SFP+ Transceiver 10GbE/1GbE or QSFP for PCIe/SRIO

- 0 = None
- 1 = 10GBASE-SR
- 2 = Reserved
- 3 = 10GBASE-LR
- 4 = 1Gb LC/SX (850nm)
- 5 = 1Gb LC/LX (1310nm)
- 6 = Copper 1000 Mbit
- 7 = Reserved
- 8 = QSFP+

#### J = Operating Temp and Conformal Coating

- 0 = Commercial Temp
- 1 = Industrial Temp
- 2 = Commercial Temp and Humiseal 1A33 Polyurethane
- 3 = Commercial Temp and Humiseal 1B31 Acrylic
- 4 = Industrial Temp and Humiseal 1A33 Polyurethane
- 5 = Industrial Temp and Humiseal 1B31 Acrylic

