Interfacing EPICS to the Widespread Platform Management Interface IPMI

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**Introduction**

The Intelligent Platform Management Interface (IPMI) is a standardized interface to management functionalities of computer systems. The data provided typically includes the readings of monitoring sensors, such as fan speeds, temperatures, power consumption, etc. It is provided not only by servers, but also by μTCA crates that are often used to host an experiment's control and readout system. Therefore, it is well suited to monitor the health of the hardware deployed in HEP experiments. In addition, the crates can be controlled via IPMI with functions such as triggering a reset, or configuring IP parameters. We present the design and functionality of an EPICS module to interface to IPMI that is based on ipmitool. It supports automatic scanning for IPMI sensors and filling the PV metadata (units, meaning of status words in mbmi records) from the IPMI sensor information. Most importantly, the IPMI-provided alarm thresholds are automatically placed in the PV for easy implementation of an alarm system to monitor IPMI hardware.

**Implementation**

The ipmitool software\(^1\) is used to implement the IPMI protocol. It is wrapped into code that provides access from EPICS.

\(^1\)http://sourceforge.net/projects/ipmitool/

**Automatic Scan**

On application startup, the IPMI system is automatically scanned for sensors. The implemented algorithm tries hard to find all available sensors on all modules. On completion of the scan, the detected sensors can be dumped to an EPICS database file.

epics> ipmiScanDevice 1
found 19 sensors @0x20. PICM detected.
found 16 sensors @0x10. found 79 sensors @0x20. found 114 sensors @0x82. found 19 sensors @0x94. Total sensor count: 228

**Typical PV for ATCA Crates**

```
record(ai, "Vcc 12v FRU0") {
  field(DTYP, "ipmitool")
  field(INP, "#L1 A130 C20 500 @0")
}
```

epics> dbpr "Vcc 12v FRU0" 2
DESC: Vcc 12v FRU0
DTYP: ipmitool HH:MAJOR
HIGH: 12.331 HIHIL: 12.567
HOPR: 15.045 HSV: MINOR
HYST: 0.118
INP:AB_T0 #L1 A130 C20 50 @0
LLSV: MAJOR LLOL: 11.387
LPR: 0 LOW: 11.623
LSV: MINOR RV: 204
VAL: 12.036

**Application in Belle II PXD**

The PXD readout system "ONSEN" uses FPGA cards hosted in an ATCA crate. The crate's IPMI interface is used to monitor the overall status of the crate. Custom-built AMC cards provide a low-level interface to the FPGAs via IPMI. The servers that run the slow-control system will also be monitored via IPMI to include hardware defects into the detector-wide alarm system.

**Availability**

The IOC will be released under an open license pending discussions with the University's legal department. Watch for an announcement on the EPICS mailing lists.

**Acknowledgement**

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The INTRODUCTION section outlines the role of IPMI in monitoring hardware health and its suitability for control and readout systems. The IMPLEMENTATION section describes how the IPMI protocol is wrapped into code to provide access from EPICS. The AUTOMATIC SCAN section explains the automatic scanning process for sensors. The TYPICAL PV FOR ATCA CRATES section provides an example of how the IPMI data is accessed. The APPLICATION IN BELLE II PXD section describes the use of IPMI in the ONSEN PXD system. The AVAILABILITY section announces the release of the IOC under an open license. The ACKNOWLEDGEMENT section credits the support from the German Federal Ministry of Education and Research.