Centralized System Management of IPMI Enabled Platforms using EPICS

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EPICS IPMI

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Diamond

DESY

SNS

Argonne National Laboratory

Oak Ridge National Laboratory

High Flux Isotope Reactor

Spallation Neutron Source

Iter
Externally available IPMI features

• Sensor Data Record (SDR)
• Field Replaceable Units (FRU)
  – Inventory cataloging
• System Event Log (SEL)
• Control functions
  – Power management
  – Change sensor threshold settings
  – Flashing EEPROM
  – Manage SEL

Multiple sensors on enterprise server motherboards
IPMI Security

• Powerful features
  – Always available
  – Manage power functions
  – BIOS interaction
  – Console redirection
  – Front panel buttons lock-out

• IPMI v2.0
  – Enhanced authentication
  – AES based encryption
  – Extended privilege levels
FreeIPMI library – leverage IPMI specification

- Open-source, multi-platform
- Most suitable among considered alternatives
  - ipmitool, openipmi
- Secure TCP/IP connection management
  - Authentication and encryption
  - Automatic reconnect
- Benefit from larger pool of users
  - Verified to work with many IPMI vendors
  - Thoroughly tested
EPICS device support

- New device driver
- Read-only monitoring
  - Sensors, FRU, lights
  - Supported records: ai, longin, stringin, mbbi
- Multiple IPMI connections
  - TCP/IP communication is 'blocking'
- Ready to use soft IOC
Device discovery and enumeration

- ipmiDumpDb() generates database file
  - Generate .db file with all supported entities as EPICS records
  - Pre-populate meta fields
  - Record names based on IPMI entity names
    - With support for custom prefix, ie. $(INSTRUMENT):DAQ:System:Fan0
  - Working database or template for customized applications

- ipmiScan() prints to IOC console
  - Same discovered entities as ipmiDumpDb()
    - Filtering based on entity type
  - Human readable format
EPICS database record

```c
record(ai, "Sys:LLRF1:CU130_40:CU:TEMP1") {
    field(SCAN, "1 second")
    field(DTYP, "ipmi")
    field(INP, "@ipmi CONN1 SENSOR 65:1:0:2")
    field(DESC, "Cooling Unit 97 CU TEMP1")
    field(EGU, "C")
    field(LOW, "10.000")
    field(LSV, "MINOR")
    field(HIHI, "75.000")
    field(HHSV, "MAJOR")
    field(PREC, "2")
    # Other record specification fields
    # FLNK, DISA, ADEL, etc.
}
```

Developer decides on update period
Versatile addressing
Fields obtained from SDR entity

Based on IPMI component/entity name

ai, longin, mbbi, stringin
Benefits of TCA static addressing

• Permanent record names
  – Consistent record value archiving across replacements
  – Modular build-up of record database and screens

• Component location information
  – Inventory traceability
  – Assisted identification of components
PICMG Support (ATCA, MicroTCA)

- **Monitoring of lights** (PICMG allows changing lights from SW)
  - Multi-state represented as different colors
  - Solid, blinking (short/long/interval)
  - Extract colors into mbbi

- **Extended FreeIPMI with custom messages**
  - PICMG specific message using “FreeIPMI Interface Definition” (fiid)
  - Use of generic FreeIPMI send/receive with fiid
Conclusion