Backend Systems for mini-ICAL

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The mini-ICAL is a scaled down (by ~600) version of the proposed ICAL. The design proposed for the DAQ of the ICAL has been successfully implemented in the mini-ICAL. It has validated the design goals and has given us valuable insights. The "Backend" is that part of the DAQ that refers to the set of servers and software that receive, record, visualize and act upon various kinds of data that are pushed/pulled from the FrontEnd of the mini-ICAL.

Backend System Requirements:
• Acquisition of physics data from RPCs at Frontend
• Control and command of all devices, operations, with GUI
• DQM from physics data (online, near online, offline)
• GUI for various monitors, logs. Historical plots, ambient conditions, critical settings
• Warnings, alarms, notifications, escalations, event handlers, interlocs

Backend System Desirable Aspects:
• Low cost technology, components
  • Leverage FOSS, standard protocols,
  • Avoid proprietary items
• Stability, reliability, longevity
• Ease of design and development and deployment
• Scalability: ICAL, ICAL-EM, mini-ICAL

LAN Scheme: RPC's and Backend systems are hosts on private LAN
• Protocols used: TCP and UDP, (no network congestion or issues)
• DataConcentrator (DC) : in house developed s/w on Linux, G++ using Boost libraries
• EventBuilder (EB) : in house developed s/w, F# (credit ED-BARC)
• Off the shelf components (N/w switches, cables, computers)
• Straightforward scalability, Seamless replication
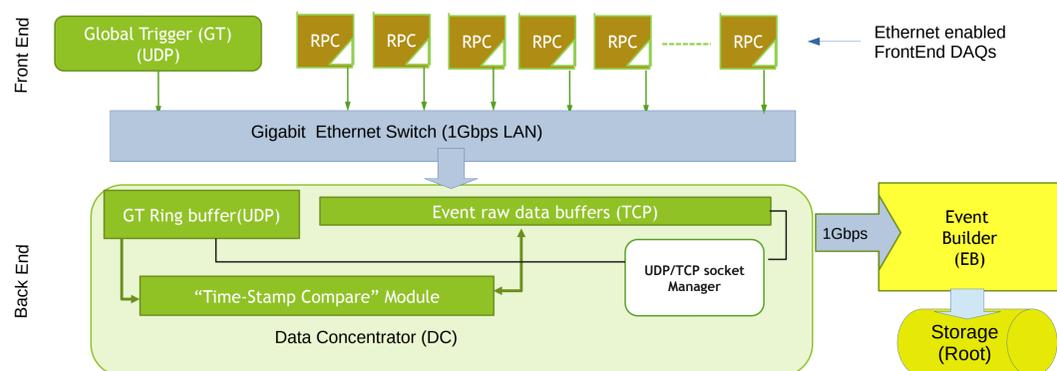
• DC and EB are multithreaded, lock-free applications
• All three are scalable : DC, EB & LAN
• Commodity products and open technologies

Mini-ICAL : 2.5K ch	:	400	Hz evt rate
EM-ICAL : 51K ch	:	4000	Hz evt rate
ICAL : 4M ch	:	40	Hz evt rate

Monitoring:
• Mini-ICAL has more than 100 crucial parameters
  • HV,LV, currents, gas flow, T,P,H, network metrics, daemon activity, ports
• **Nagios® Core :** Popular software used in IT infrastructure
  • Alerts, events, event handlers,
  • Plugins in any language, simple and quick
  • Scalable to several thousand metrics
• **Grafana, Graphite:** Popular FOSS for logging, plotting, dashboards
  • Just send the data to it! At present handling approx 80 metrics
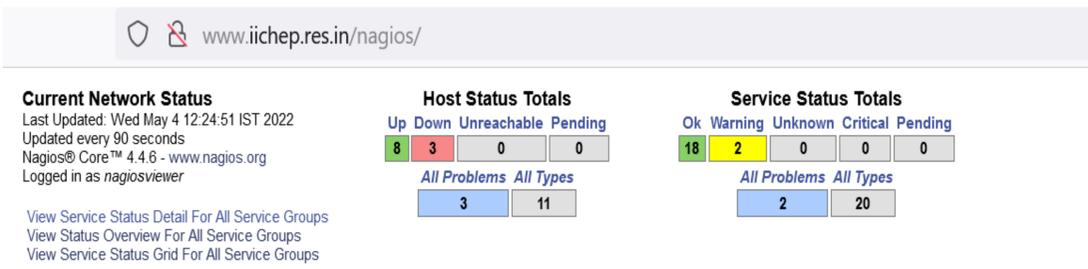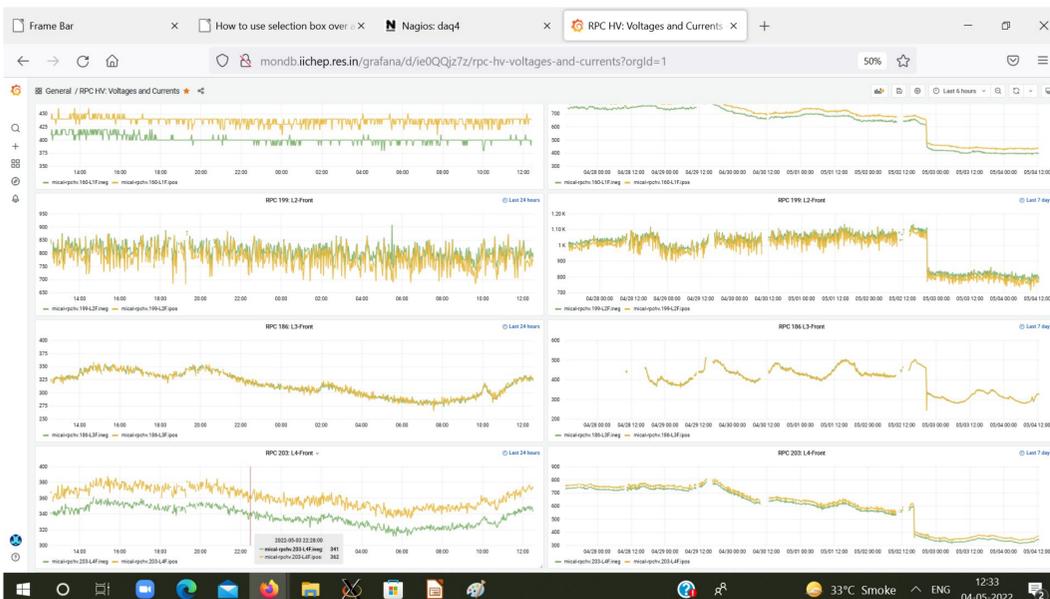
Conclusion:

• UsIng mini-ICAL as platform we have successfully demonstrated the design proposed for the Backend systems of ICAL.
• We are confident that the same scheme will be efficient for the proposed addition of CMVD as also the ICAL Engineering Module
• Chosen technology has low Cost, cabling, complexity
• Scalability is the key, and we are confident of this.
• Some work in progress:
  • Custom GUI, Run Control Center, DQM