A Proposed Architectural Framework for SKA Monitor & Control

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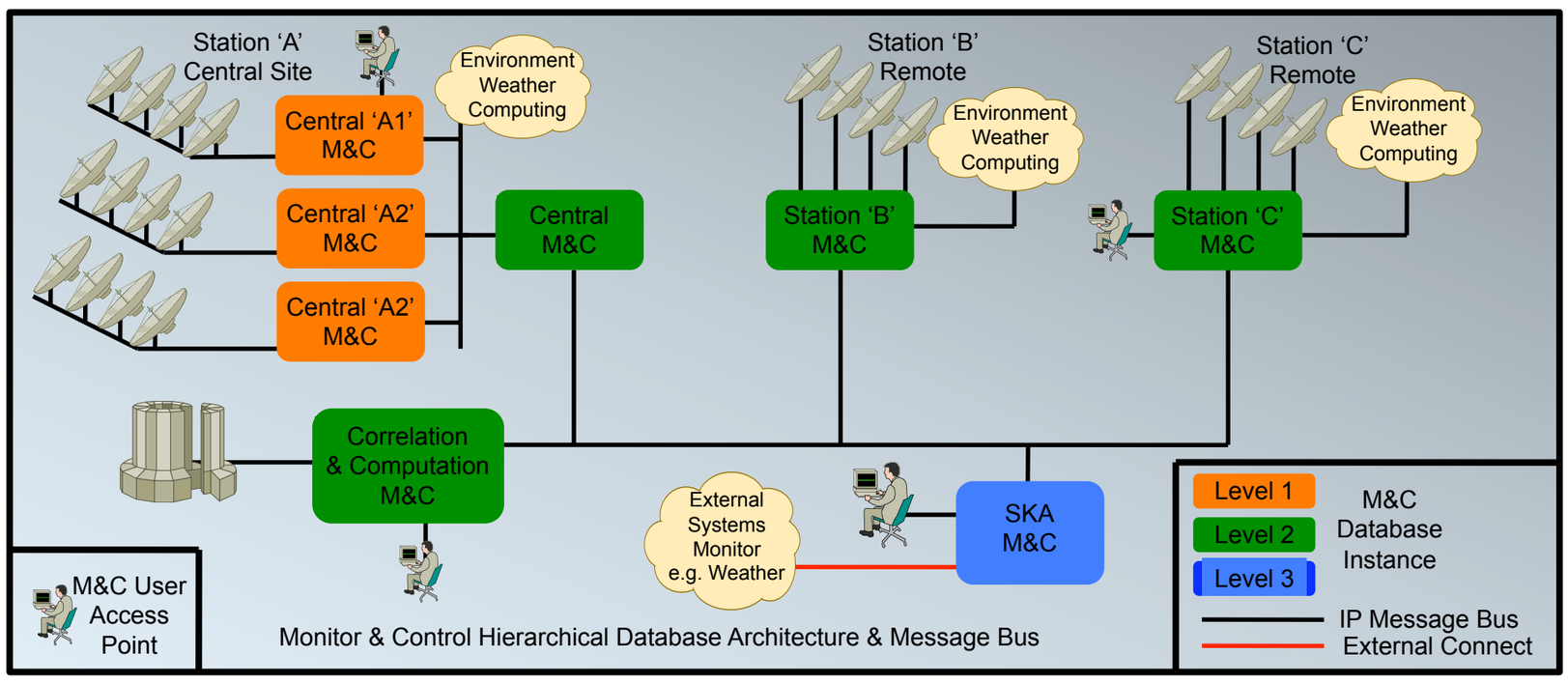
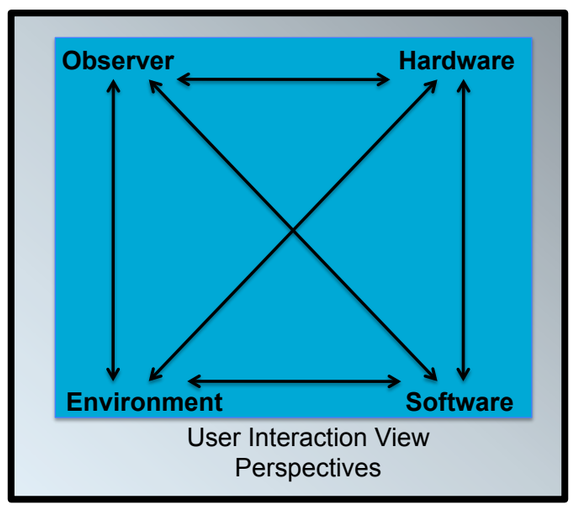
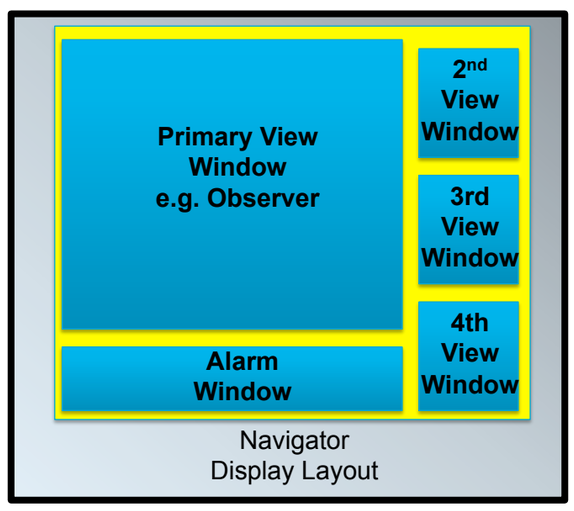
A distributed real-time M&C System using a geographic hierarchical model to accommodate the scale of the SKA; minimise traffic between locations and summarise northbound traffic to central facilities. User interactions are provided from the perspectives of the observer, hardware & software engineering and environment.

Architecture

- Ethernet used as the physical interface between M&C elements throughout the system.
- Common M&C management hardware for all interfaces to digital & analogue signalling points.
- A common protocol framework using IPv6 over Ethernet on Northbound interfaces of the digital M&C management hardware.
- Common messaging framework communicating with a distributed real-time database system.
  - SNMP ?
  - XML ?
  - HTTP ?
- Multicast messaging based upon function for alarm notification.
  - Environmental
  - Occupational Health & Safety
  - Security
  - Receiver Status
  - Power
  - User Defined Signal Tap's of interest
- Common API specifications and library for intersystem and messaging communication.
- Geographic Navigator view depicting the state change of equipment that is controlled and the scope of those changes.
- Hierarchical and summarisation information flow between database instance levels.







User Interface

A flexible user interface design allowing for multiple simultaneous views into the M&C of the SKA. Given the sheer number and complexity of monitoring points in the array and the dispersed geographic layout a traditional hardware based hierarchical tree implementation would not provide enough decision-making detail on perspectives of the SKA from critical areas such as the environment, current observation, software performance and availability.

M&C user navigation and interaction perspectives should incorporate views and their interactions based upon Hardware, Processes, Observations and the Environment.

This view from four perspectives; that of the astronomical observer, hardware engineer, software engineer or environment would display the impacts upon the total system in real-time while highlighting alarms & faults.

An observer sees what hardware and software resources he or she is operating for that particular observation period and can adjust parameters accordingly.

A hardware engineer can see what observations may be affected and what software resources are compromised if there is a fault in a particular board.

A software engineer can accordingly see what hardware would be unavailable and what observations may need rescheduling to better suit the operational requirements if there is a software or network failure.

An environmental view may be to alarm based upon some occupational health and safety issue being raised by a weather alert at a station given the large distances between stations in the SKA.

Real-Time Hierarchical Database

A distributed real-time database that provides a hierarchal view of the complete system. Databases implemented in three tiers, by sub-station, stations & master control. All low-level messaging and events are localized to an individual database instance.

Only when monitor or control information needs to be highlighted are messages or alarms passed via the message bus to the next level.

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Further information

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