"Exploring the Universe with the world's largest radio telescope"

2011
SKA System delta CoDR
Strategies and Philosophies

Kobus Cloete

23 February 2011

Overview of presentation

- Context of the SKA Strategies and Philosophies
- SKA Strategies and Philosophies Document
  - Changes and updates to Feb 2010 CoDR document
- SKA Monitoring and Control Strategy

Context

- Strategies and philosophies
  - There are three documents in this set viz. SKA Strategies and Philosophies, SKA Monitoring and Control Philosophy, SKA costing Strategy.
  - The documents describe the strategies to obtain inputs for the further development of the system requirements.
  - Site Climate and Geotechnical Information document presented during Feb 2010 CoDR no longer applicable due to change in strategy (part of site selection process).
- The documents also provide guidance on the way forward for the majority of the aspects covered.

SKA Strategies and Philosophies

SKA Strategies and Philosophies Document

SPDO

- 1: Introduction
- 2: References
- 3: Cost
- 4: Power
- 5: Electromagnetic Compatibility (EMC)
- 6: Software Engineering
- 7: Cooling and Temperature Stabilisation
- 8: Reliability, Availability, Maintainability (RAM)
- 9: Standards and Standardisation
- 10: Units of Measure
- 11: Quality
- 12: Health and Safety
- 13: Obsolescence
- 14: Human Factors Engineering
- 15: Testability and Fault Diagnosis Requirements
- 16: Configuration and Change Management
- 17: Data Packs
- 18: Interface management

Changes to Feb 2010 CoDR Document

- Cost
  - Separate strategy developed (see earlier presentation)
- Power
  - Updated the section with the progress in this domain during the past year (see earlier presentation)
- Environmental and Geotechnical
  - Strategy as presented during Feb 2010 CoDR changed (see earlier presentation)
- Minor updates to other chapters
  - Included proposed responsibilities of SPO where possible
- Details with regards to changes reflected in the last chapter of the document

Monitoring and Control Strategy

Scope of M&C system

- Scope
  - Functionality to monitor and maintain the health of the instrument and all its elements
  - Capabilities to configure and control the system to achieve the desired science goals
  - Obtaining and providing information to enable control
  - Publishing metadata
  - Provision of monitoring and control HMIs to operators and engineers
  - Maintaining operational logs and providing reports to management
  - Tracking the location and movement of maintenance personnel and vehicles, combining this with system status and operational information for safety assurance
  - Facilitating system changes

Challenges and Development Phasing

- Challenges
  - Scale
  - Co-existence of multiple hardware and software versions
  - Control latency
- Phasing
  - An initial version of the M&C solution that implements the core monitoring and control functions as well as the standard interfaces available by 2016.
  - The M&C solution for SKA1 needs to meet all of the identified system requirements including extensibility of the solution from SKA1 to SKA2.
  - SKA2 may require some evolution of the M&C solution, to accommodate longer control latencies and greater scale.

Architectural Drivers and Concerns

- The key areas currently identified are:
  - Functional Drivers
  - Performance
  - Operations Support
  - Human Machine Interface
  - System Integrity and Assurance
  - Fault Tolerance and Availability
  - Evolution
  - Cost
- This section of the document expanded slightly in what was contained in the document for the Feb 2010 CoDR.

M&C Design Concept

(from Feb 2010 presentation)

SPDO

- Hierarchical architecture
- Separation of science data pipeline from the M&C nodes
- Support for dynamic sub-arrays

•Hierarchical architecture

Four levels - central controller, station and antenna & antenna subsystems

•Separation of science data pipeline from the M&C nodes

•Support for dynamic sub-arrays

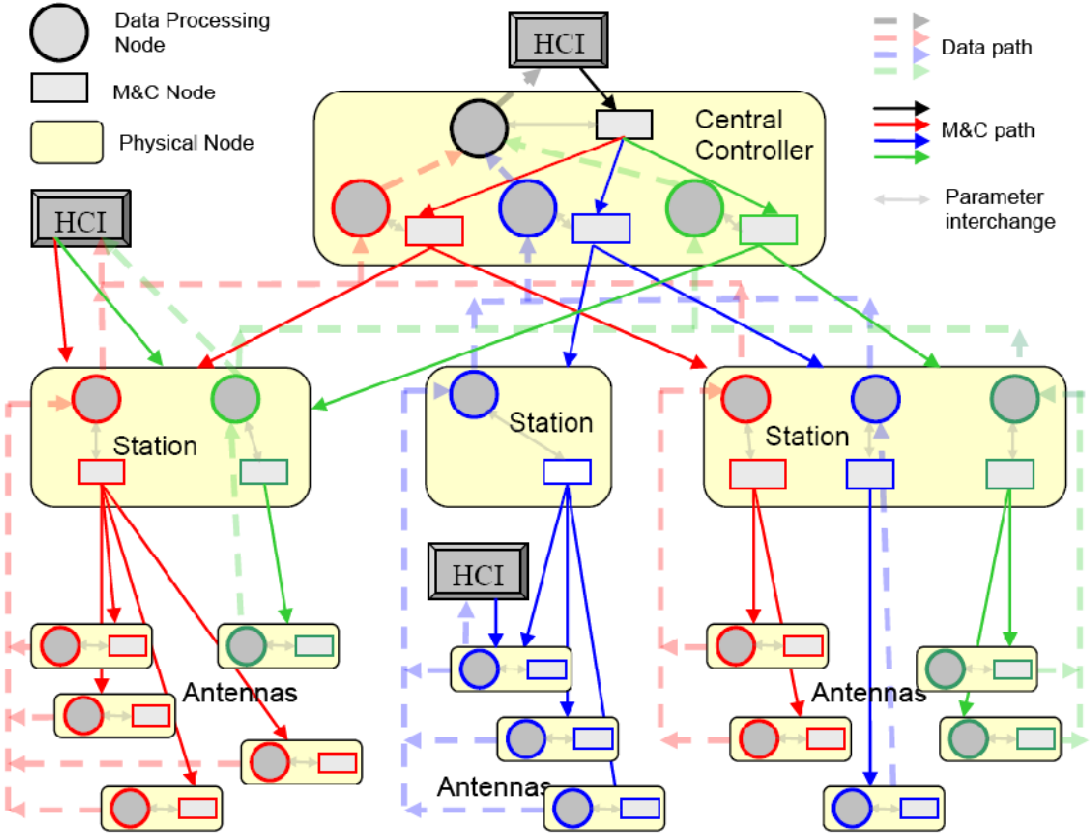
Is there a need for dynamic sub-arrays?

•Integrity boundaries

Each M&C node is a semi-autonomous entity

•Definable HMIs

HMIs may be provided at the central controller, station and/or antenna level



M&C Way Forward

- Requirements development
- Development of Candidate Architecture
  - Recent major radio astronomy projects
  - Technologies and techniques used in other large scientific instruments and industrial systems
  - Gather design knowledge and learnings and analyse how they can inform the design and development of SKA M&C.
- Health and safety
  - Development and analyses of a safety threats model

Timeline

- Timelines
  - March 2011: Initial draft M&C requirements specifications.
  - June 2011: Updated requirements specification, candidate architectures and technologies.
  - October 2011: Baselined requirements specification, analysis of candidate architectures.
  - December 2011: Initial draft documents for the SRR
- Design group established under leadership of NCRA-TIFR

Thank you

SPDO