WP2.1.1
System CoDR and Delta CoDR

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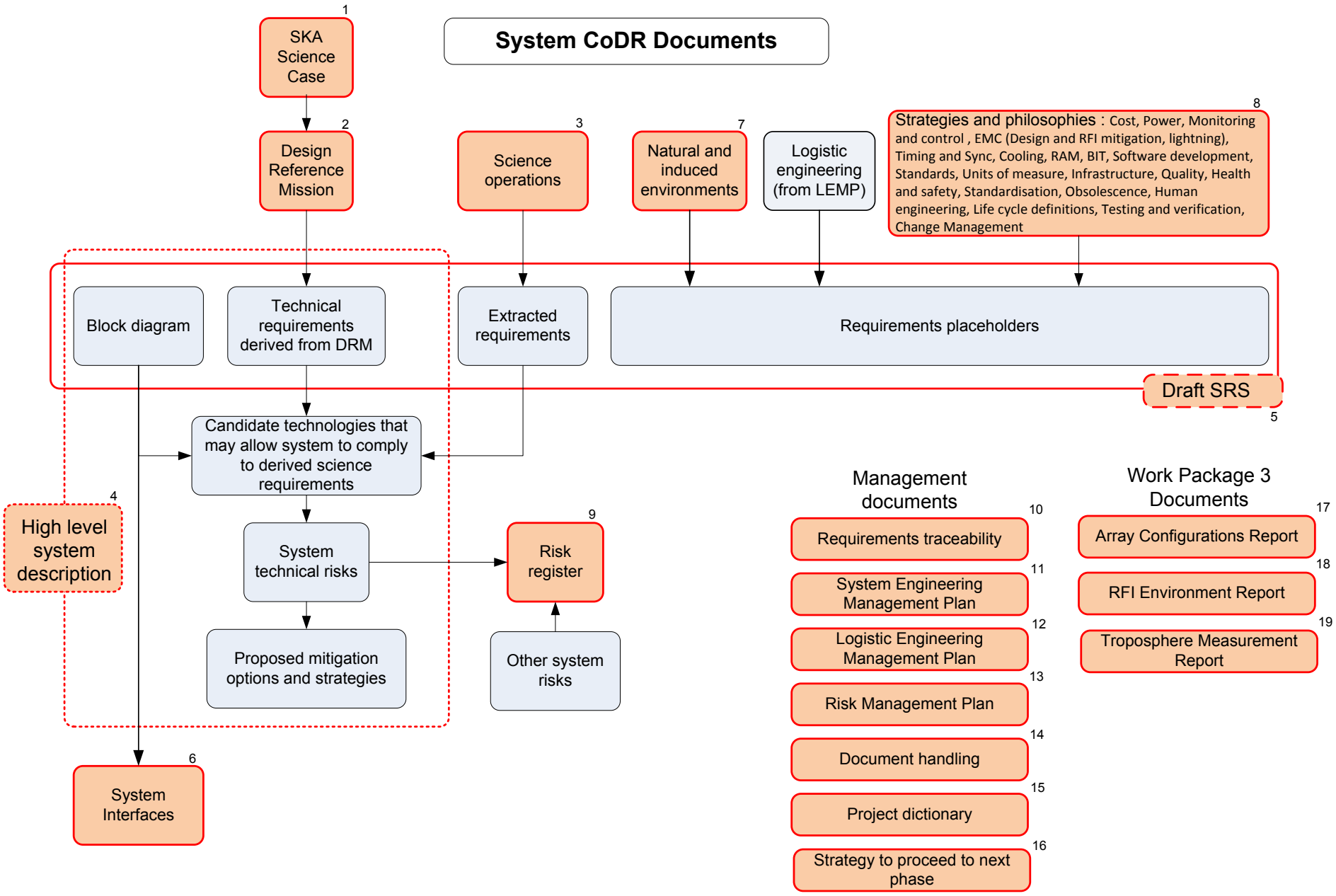
System CoDR

- Planning started middle of 2009
- Review was based on the principles and objectives for a CoDR as set out in the SEMP
- Documentation was based on:
  - The requirements as set out in the SEMP,
  - Additional system documents identified in the SEMP.
  - Supporting management and process documents.
  - Available at http://www.skatelescope.org/public/2010-02_System_CoDR_Documents/
- Contributions were received from a few contributing organisations.
- **We communicate through the documentation.**

Approach


System CoDR Documents
1
SKA Science Case
2
Design Reference Mission
3
Science operations
7
Natural and induced environments
Logistic engineering (from LEMP)
8
Strategies and philosophies : Cost, Power, Monitoring and control , EMC (Design and RFI mitigation, lightning), Timing and Sync, Cooling, RAM, BIT, Software development, Standards, Units of measure, Infrastructure, Quality, Health and safety, Standardisation, Obsolescence, Human engineering, Life cycle definitions, Testing and verification, Change Management
Block diagram
Technical requirements derived from DRM
Extracted requirements
Requirements placeholders
Draft SRS
5
Candidate technologies that may allow system to comply to derived science requirements
4
High level system description
System technical risks
9
Risk register
Proposed mitigation options and strategies
Other system risks
6
System Interfaces
Management documents
10
Requirements traceability
11
System Engineering Management Plan
12
Logistic Engineering Management Plan
13
Risk Management Plan
14
Document handling
15
Project dictionary
16
Strategy to proceed to next phase
Work Package 3 Documents
17
Array Configurations Report
18
RFI Environment Report
19
Troposphere Measurement Report

Documents

- First Draft SKA System Requirement Specification (SRS) was developed from inputs obtained from:
  - Design Reference Mission
  - High level operations plans
  - Draft environmental information
  - And a few others
- Traceability of Requirements was presented to illustrate:
  - Principles behind traceability
  - Origin of the some of the requirements in the SRS
  - Gaps in traceability

Documents

- Strategies and Philosophies document presented ways and means to take specific areas forward to the next phase. Areas included:
  - Costing,
  - Power,
  - Environmental studies and data gathering,
  - EMC,
  - Software,
  - Cooling and climate control,
  - Configuration management,
  - Quality, etc.

Documents

- Strategy to Proceed to the Next Phase aimed:
  - To provide guidance for the system work to proceed to the next phase
  - To provide guidance to the elements of the system to work toward their respective CoDR's
  - Included high level schedule and milestones, description of work, roles and responsibilities and reference to the decision making and decision making milestones in the next phase.

Documents

- System options and functional analysis were described in High Level Technical Description
  - Analysed various system architectures in terms of performance of the various receptors technologies considered for the SKA and the implications on the rest of the system
  - Supported the identification of risks and system interfaces
- Science-Technology Tradeoff Process document presented method for performing science/ technology/cost tradeoffs aimed at arriving at the costed system design at the end of PrepSKA

Documents

- Management and process document were presented to describe and establish the project framework in which all of the work shall be performed. Documents included:
  - System Engineering Management Plan
  - Risk Management Plan
  - Documentation handling procedure
  - Logistic Engineering Management Plan
  - Project Management Plan

Summary of CoDR Plan

- System CoDR laid out a plan to:
  - Utilise DRM as starting point
  - Be inclusive of all technologies
  - Move through phases and decision making/tradeoffs to arrive at full SKA design
  - Then select Phase 1 to be a subset of the full SKA (Phase 2).

Sys. CoDR Review Committee Top Level Questions

- Report on:
  - Overall progress;
  - Whether the technical adequacy obtained during the concept phase is at a sufficient level of maturity to allow the system to move into the next phase;
  - Whether all system aspects of the project have been covered and where gaps exist, whether adequate measures have been identified to address the shortcomings.

Committee Report
CoDR Preparation & Systems Framework

SPDO

- Panel was impressed by preparations
  - the degree and professionalism of systems engineering.
- Panel appreciates the rapid response to questions submitted shortly before the review.
  - >100 written questions answered.
- The SKA team seemed to have thought about almost everything.
  - Possible minor gaps
- Impressive amount and quality of documentation.
- A great systems engineering framework created for development and planning for construction/operations.
- We have a lot of confidence in the SPDO-led effort.

Committee Report
Technology Readiness & Requirements

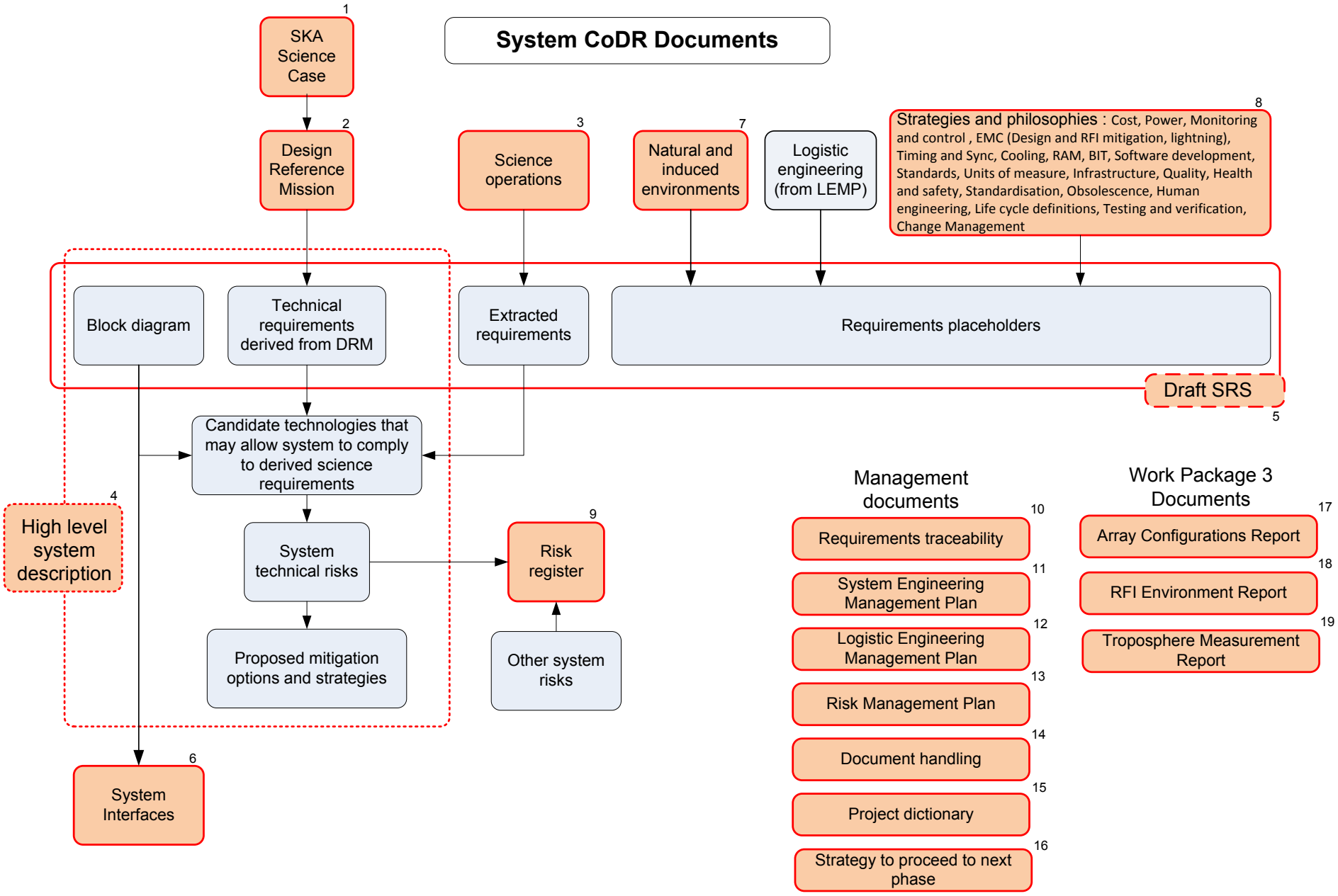
SPDO

- SKA in its present setup tries to push technology limits on pretty much all fronts.
- Some parameters are pushed orders of magnitude beyond state-of-the-art.
- Even things that traditionally have been minor problems are now an issue (e.g. power, computing, signal transport & processing, …).
- The panel did not see stable requirements which would allow a stable design for SKA.

Decision-Making

- The project needs to take important decisions on science and technology soon.
- A prioritization of the science cases should be done as soon as possible.
- Define “baseline” SKA project
- Future “enhancements”.
  - a roadmap should be planned for the introduction of innovative (higher risk) technologies which will become available at a later stage and enable wider science goals (“enhancements”).

Delta System CoDR Documents



Delta System CoDR Documents (1)

SPDO

	Document Title	Change to previous CoDR document	Description of work to be done for δCoDR	Document owner
0	**Delta CoDR Context**	New document	Describe the context of the Delta CoDR, the approach, what we try to achieve, background, and where do all the documents fit in and hang together.	
1	**SKA Science Case**	No change		
2	**Design Reference Mission**	No change, remain with V1.0	Initiate the process to work with scientists to understand the DRM and extract requirements. However, this is aimed at Phase 1 and will lag significantly behind Phase1 effort.	
2a	**Science for Phase 1**	New document	Subset of V1.0 DRM and should be the focus of our work for the δCoDR to get clarity on what the science the Phase 1 instrument needs to deliver.	
3	**Operations**	New document	Title changed from Science Operations to Operations because it will include support operations as well. Focus on Phase 1 but Phase 2 extensibility needs to be addressed as well	
4	**High-level System Description**	New document	Focus on Phase 1 instrument. In addition, describe the following three possible options for Phase 2. Use the work done in the previous CoDR document as basis of the description of these options. Rework risk section and align with risk register. Description of goals of AIP and potential benefits.	
5	**System Requirements Specification (SRS)**	New document	Will be a Phase 1 SRS with scalability to Phase 2 addressed Engage with scientists and start with extraction of system requirements from the Phase 1 science goals at high level. Include all possible requirements gathered from the other efforts such as modes and states from the science operations plan, environmental requirements from new info received from sites, etc… Outline plan to get requirements, analyse and validate requirements, manage requirements for Phase1.	

Delta System CoDR Documents (2)

SPDO

5a	**System Hierarchy**	New document	Review and publish hierarchy as a separate document.	
6	**System Interfaces**	Review	Review section in strategies document to ensure it is still relevant. Identify system interfaces in High Level System description and SRS.	
7	**Natural and Induced Environments**	New document	Request updated information from sites Integrate with the information we already have to write new document. Review section in SRS to make sure it complies to the data received	
8	**Strategies and Philosophies**	Rework	Add chapter to outline plan to get requirements, analyse and validate requirements these requirements, and manage the requirements for Phase 1. Refer to SEMP Explain what is stable requirements and how will we move from the DRM envelope requirements to the eventual requirements of the system. Include section on infrastructure	
9	**Risk Register**	Rework	Rework to focus on Phase 1 and risks and implications of delayed decision on Phase 2. Align with HLD. Prioritise risks.	
10	**Requirements Traceability**	New document	Map SRS requirements to relevant documents and inputs.	
11	**System Engineering Management Plan**	Rework	Rework document to reflect change in project strategy Describe SE Phases for Phase 1, Phase2 and AIP.	
12	**Logistics Engineering Management Plan**	Rework	Update document to reflect new strategy and dates	
13	**Risk Management Plan**	No change	Review to ensure that it is the way we want to go, especially for PrepSKA.	

Delta System CoDR Documents (3)

SPDO

15	**Project Dictionary**	New document	Compile and present a project dictionary.	
16	**Strategy to Proceed to the Next Phase**	New document	Change name of document because it is not only the next phase it is the entire project? Critical document that should be revised so that it is also compatible with SEMP changes. The role of the SRR in winnowing down options Incorporating the AIP and the decisions in 2016. The development of costing and the role of costs in the present phase. Transition from Phase 1 to Phase 2 (the plan). Role of current verification programs, especially DVP and AAVP.	
17	**Array Configurations Report**	Update	Present first draft Phase 1 configuration?	
18	**RFI Environment Report**	Update		
19	**Troposphere Measurement Report**	Update		
20	**Costing Strategy**	New document	Finalise, review internal, review external.	
21	**Science/Engineering Tradeoffs**	Review	Check document to confirm whether it is still in line with new philosophy and strategy.	
21	**Delta CoDR Plan**	New document	Similar to the previous plan with all the organisation, purpose and expected outcome, participants etc.	
22	**PMP**	Rework	Rework current PMP to include: 1) WP2MT 2) Decision making	
23	**Schedule and supporting plans from organisations**	New document	Collation of the current plans being developed and finalised by the lead organisations.	
24	**Description of Work (WP2)**	No change	Revised approach and DoW as submitted to EC	-

End