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Science Ready Data Products

Lifecycle Phases and Concepts
Project 530
Released

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1 Introduction

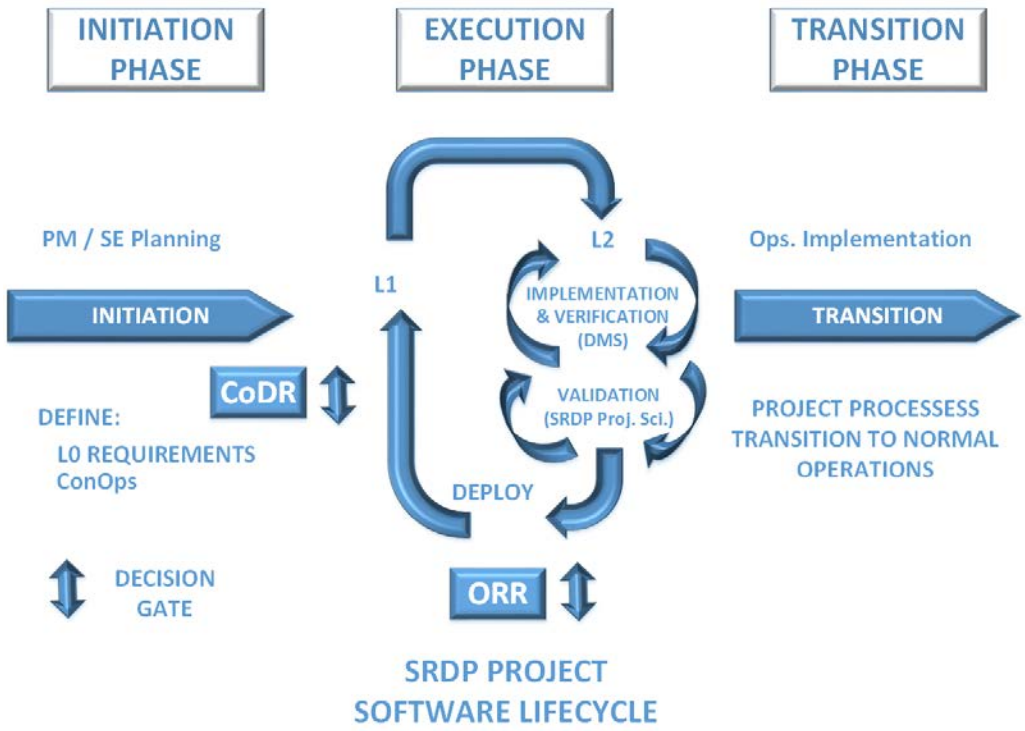
1.1 Background

High Level goals, objectives, and a description of the SRDP project can be found in the Project Charter [RD01]. A detailed description of the programmatic project elements is addressed in the Project Management Plan (PMP) [RD02], while the detailed technical elements are addressed in the System Engineering Management Plan (SEMP) [RD03].

The SRDP project (in collaboration with existing observatory management structures) will develop and implement the software tools, scientific heuristics, and operations structures to deliver science quality data products to the NRAO user community, both as it exists now, and the foreseen expansion of the community to include non-traditional radio astronomers.

1.2 Scope of this Document

This document will describe the project lifecycle phases and stages within those phases. Review gates are positioned as decision points within the lifecycle to assure progress is sufficient to continue. Entrance and exit criteria shall be identified to define review gates and will be broadly defied here. A detailed description of the review gates and criteria needed for success is defined in the SEMP. Differentiation is made here between the Software Lifecycle Management and the Data Management Lifecycle. The Software Lifecycle Management governs software releases containing tools and feature sets used to produce the data products. The Data Management Lifecycle governs data product production, archiving, and access to the data products. The SRDP Project Software Lifecycle is defined as follows:



The SRDP Project Software Lifecycle is defined as follows:

- SRDP Project Phases and Reviews
    - Initiation Phase
        - Project Charter
        - Project Initiation, key SRDP staff appointed
        - Project Management & System Engineering Planning
        - High Level Requirements Defined (L0)
        - Project Baseline Established
        - Ends in Conceptual Design Review (CDR, sometimes CoDR is used)
    - Execution Phase (includes multiple deployments)
        - Requirements Decomposition L0 to L1 to L2
        - Implementation
        - Verification
        - Validation
        - Operational Readiness Review
        - Deployment
    - Transition
        - Project processes yield to operational processes
        - Closeout Report and lessons learned
        - SRDP Project Office disbanded

In addition to the Project Lifecycle Phases, Concepts are also used to define and manage work as it transitions through the lifecycle phases.

- INCOSE Defines the following Lifecycle Concepts:
    - Acquisition / Production
    - Deployment
    - Operations
    - Support / Maintenance
    - Retirement

Each of these concepts is addressed, specifically as they are apply to SRDP. Although some of the phases and concepts may seem to overlap, the distinctions serve different purposes.

1.2.1 Reference Documents

[RD01] SRDP Project Charter 530-SRDP-001-MGMT

[RD02] SRDP Project Management Plan 530-SRDP-003-MGMT

[RD03] SRDP System Engineering Management Plan 530-SRDP-010-MGMT

1.3 Abbreviations and Acronyms

CoDR Conceptual Design Review

2 SRDP Project Lifecycle

2.1 Project Phases

2.1.1 Initiation Phase

The SRDP project is launched within the Initiation Phase. This begins with the Project Sponsor appointing a Project Director and Project Manager. The Project Director and Project Manager draft the Project Charter, which defines the project goals and objectives in high-level terms. The Observatory Director authorizes project leadership and pledges to commit departmental resources to the effort by virtue of approving the Charter. The Project Charter broadly identifies at a high level:

- Project description and benefits of adopting the project
- Project stakeholders and leadership team
- Project baseline:
    - Project scope, deliverables in terms of goals and objectives
    - A milestone schedule
    - Approximate cost and level of effort required
- Risks, Assumptions and Constraints

During the Initiation Phase; project management, systems engineering, and development effort is outlined to a level needed to describe the Concept of Operations to reach a steady state and transition to operations. The following items are included in the Initiation Phase:

- Formulate science goals and stakeholder design requirements
- Develop conceptual design, identify critical and high risk items
- Develop budget estimates for implementation and operations cost
- Develop initial Project Management and System Engineering Management Plans

2.1.2 Execution Phase

The Execution Phase begins with decomposition of use cases and stakeholder requirements (L0) to system level requirements (L1) and system element requirements (L2) and lead to the following iterative steps:

- Concepts are translated to System Requirements –shift from Stakeholder to System perspective.
- Key Performance Parameters are identified
- Multiple solutions that meet System Requirements are designed and trade studies conducted.
- System elements that meet requirements are implemented
- Simulations, calculations and/or prototype test and evaluations are conducted to demonstrate proposed solutions will satisfy System Requirements.
- Preliminary Design Reviews are conducted during the implementation and verification iterations as needed to develop a consensus on proposed algorithms, heuristics, and solutions.

A successful deployment includes the following:

- Multiple iterations of code development have transpired, code is periodically delivered to the SRDP Project Scientist for validation
- A pending release is scheduled and submitted for validation
- The release candidate is successfully validated by Project or Operations protocols, as determined by the oversight role in the lifecycle phase of the release
- Operations Readiness is assessed by review and the SRDP candidate is released for general

2.1.3 Transition Phase

The Project Transition Phase is entered when Deployment Phases have become manageable to incorporate into routine observatory operations and formal project treatment will terminate. SRDP data production continues beyond project termination as long as it serves as the state of the art mechanism to deliver data to PIs. Activities in this phase include but are not limited to:

- All necessary training and documentation are delivered to operations
- The D.O. approves a closeout report.
- The Project Scientist is reassigned for validation of releases under operations
- The Project Director releases all project resources
- The SRDP Project Office is decommissioned

2.2 SRDP Concepts

INCOSE identifies a number of System Concepts used for high level definition and planning. One purpose in defining concepts is the elicitation of high level requirements, a secondary purpose is to inform planning documents which are needed throughout the SRDP life cycle. The following concepts are addressed for SRDP.

2.2.1 Acquisition / Production

The Acquisition/Production Concept typically defines the approach used to develop and provide implementation agnostic, functional requirements to multiple vendors. Design and Production concepts map functional requirements to physical requirements needed for a specific implementation. In the case of SRDP, the acquired solution is already known to known to exist within the NRAO data processing and archiving infrastructure, primarily CASA, AAT/PPI, HPC, and existing tools and interfaces. Although SRDP is working into a known environment, architectural and operational planning must be done to accommodate SRDP processes. SRDP Development, Production, and Deployment are very closely integrated processes, which iterate in successive phases to produce the deliverables. These processes are taken together in the following section in the Concept of Deployment.

2.2.2 Deployment

The Deployment Concept includes translating physical requirements into architectural design and interface elements, implementing the elements, integrating those elements through defined interfaces, incremental verification of system elements, then verification and validation of the completed system. Trades are employed to optimize price, performance, and schedule; minimize risk, and leverage opportunities. For SRDP, deployments begin within the Execution Phase.

2.2.3 System Concept

SRDP builds upon the pipeline capability already available for ALMA and VLA Data. The System Concept includes system utilization in primary science drivers and use cases, human interfaces, scheduling, assumptions, constraints, and other specific operational details. The SRDP Project Office will establish operations processes with initial oversight of process execution. After several phases of tool deployment, SRDP operations will integrate into normal observatory operations. SRDP operations will routinely produce science ready images for most observation modes; store them directly in the archive, and allow PIs to retrieve their images through the archive interface. Once a proprietary period has passed, all images produced by SRDP operations will be available for community access. NRAO Telescope Operations personnel provide data processing and computing resources, however PIs may elect to install the CASA Pipeline tools and process data at their own institution. The SRDP Project office will establish metrics to track a variety of key performance indicators and statistics for continuous improvement and reporting purposes. Production of SRDP deliverables will evolve to include more bands and a higher degree of fidelity in the images. As requests are received to reprocess legacy data, policies and protocols for data management will also evolve. SRDP operations will make use of existing infrastructure where possible, otherwise requirements will be provided to develop necessary capabilities.

2.2.4 Support and Maintenance

The Support / Maintenance Concept is needed to assure the project goals can be sustained through all project phases. For SRDP, much of the support will include OS updates, CASA updates, updates to operational and archive interfaces, updates to high performance computing resources, and resolution of incompatibilities between all tools needed for the project. Most of these tasks overlap with other operational support, making it difficult to differentiate uniquely for SRDP Support. While under the SRDP Project Office, the PO will monitor quality of the SRDP processes and provide feedback to the appropriate groups if support and maintenance activities adversely affect data products. After the Project Office is decommissioned, this responsibility will transition to operations.

2.2.5 Closeout and Retirement

For systems with facilities and physical assets, this can be a significant concept to develop for disposal and restoration of environments. For SRDP, there is little to consider in retiring SRDP from operations outside of a closeout report and lessons learned.

3 Review / Decision-gates

The project lifecycle defines the following reviews:

- CoDR - Conceptual Design Review (External)
  Successful exit from this review enables start of the Execution Phase.
- PDR - Preliminary Design Review (Internal, informal working group level)
  The PDR will be an informal review, conducted within the Data Management System (DMS) group. The review is not a single event, but is conducted within the Implementation portion of the Execution Phase. There may be multiple PDRs within the Execution Phase, each associated with the commencement of each planning wave.
- ORR – Operations Readiness Review (Internal, Project Level)
  An ORR will occur prior to each deployment, where successful completion will lead to a production release
- Specific protocols, review package content, entrance and exit criteria, and other details pertaining to Reviews / Decision gates are addressed in the SRDP System Engineering Management Plan and each review will review will be conducted under a specific plan for the review..