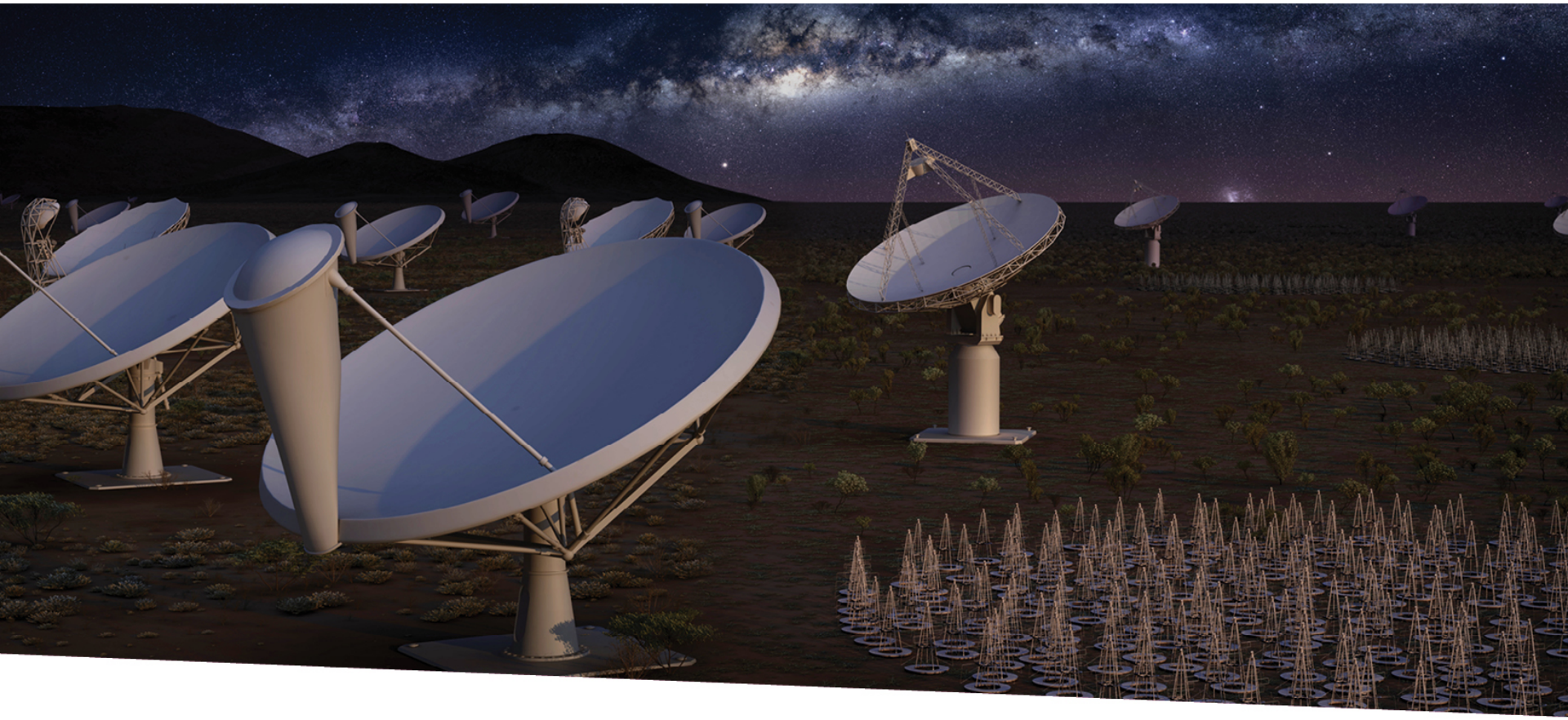
Integration Test Facilities

Proposal



SQUARE KILOMETRE ARRAY

Exploring the Universe with the world's largest radio telescope

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Introduction

- What is the Integration Test Facility Concept?
  - ITF is a general term. Can refer to any facility for performing integration testing at any level of the project.
  - For SKA we anticipate three tiers of ITF:
    - Element/contractor level ITF
      - Development testing of elements in isolation
      - Simulated interfaces
      - Rigorous testing of boundary conditions
    - System Level ITF
      - Elements are integrated and tested together for the first time
      - Validate L2 (element level interfaces)
      - Demonstrate higher-level functionality
    - On Site ITF
      - Elements are assembled, integrated and verified on site (or in situ)
      - As part of the growing / evolving telescopes
      - Supporting verification and validation of L1 requirements.

In this presentation we are discussing the purpose and scope of these specific ITFs.

Overview

- System Level ITF
  - Elements are integrated and tested together for the first time
  - Validate L2 (element level interfaces)
  - Demonstrate higher-level functionality
- These ITFs are not currently in scope of the project.
  - Wide acceptance that such facilities are needed.
- AIV is leading the work on advancing the concept and promoting these facilities.
  - Significant overlap with AIV's areas of responsibility
  - Significant overlap with AIV's areas of expertise

Purpose/Benefit of the ITF

- This facility will support initial integration of **complex** SKA1 sub-systems as part of a larger system.
    - It should allow interfaces and interoperability of the sub-systems to be demonstrated and fully tested.
    - It should provide a convenient environment for collaboration between teams working in different technical domains.
    - It should support early identification of issues and early retirement of risks.
    - It should allow ease of fault isolation and issue resolution. Most first-stage integration work is either impractical or infeasible to do at site.

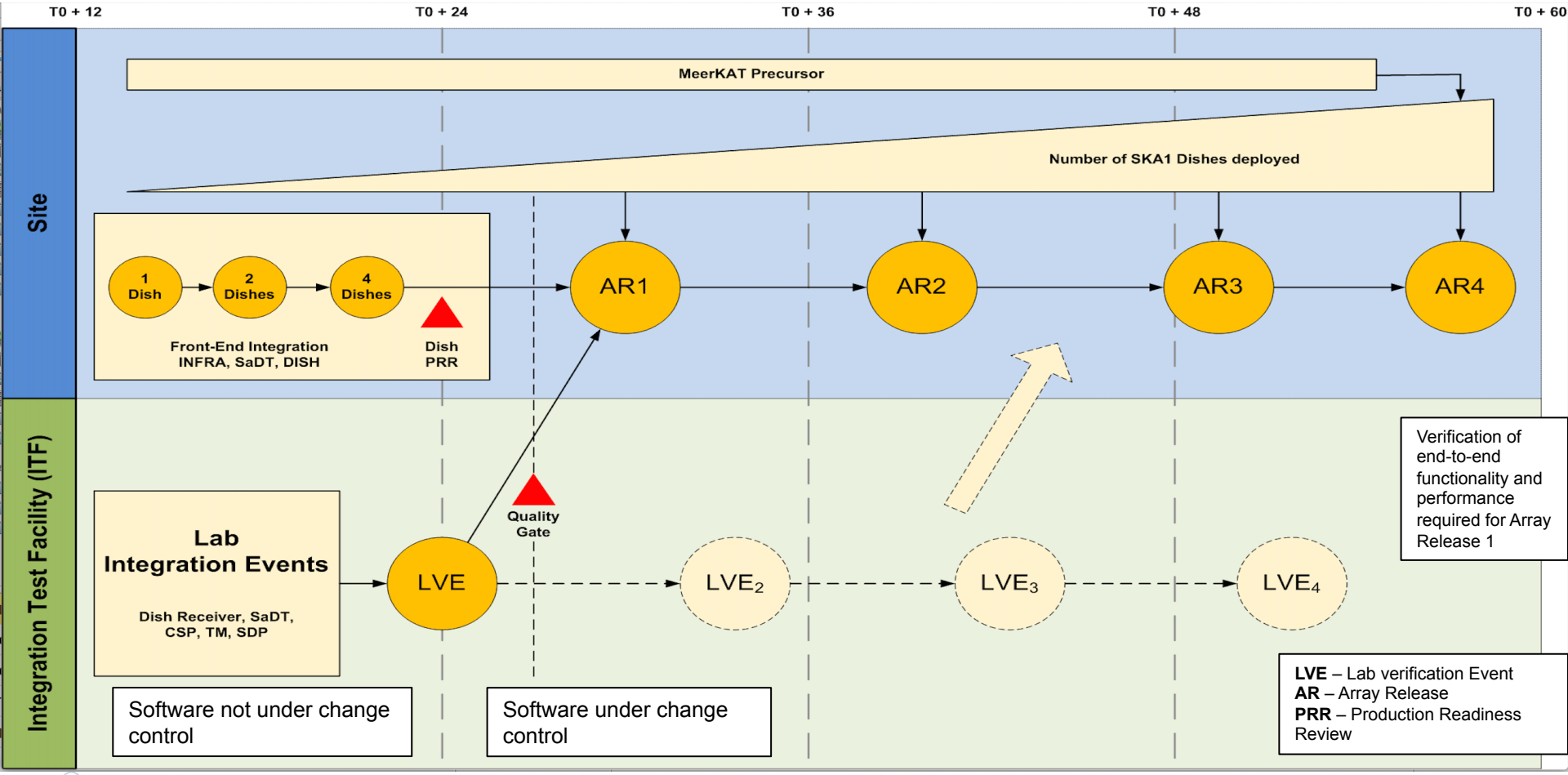
Purpose/Benefit of the ITFs

- For the contractors
  - Prove their interfaces. Isolate and address issues in a benign environment.
  - Knowledge transfer.
  - Facilitate incremental enhancements and regression testing.
  - Prove Integration Readiness as a part of sell off.
- For the AIV entity
  - Knowledge transfer. Observe and learn how to operate the subsystems.
  - Input into Integration Readiness/Handover quality gate.

Concept of the ITF

- SKA1 subsystems that would have first-stage integration at the ITF include those being designed by:
  - Dish and LFAA (Receivers and Beamformers),
  - CSP (Correlator and Pulsar Search Engines),
  - SDP (Science Processing Pipeline software & minimal HW),
  - SADT (Network Infrastructure, Data Transport, Timing and Synchronisation),
  - TM (Telescope Manager software and hardware),
  - INFRA-AUS / SA (Racks with cooling and power distribution).

Overview of Telescope Roll Out



Concept of the ITF

- The ITF system under test would be similar to AR1
  - Complete receive chains for at >4 dishes/stations, through to a correlator.
  - Support for simulated analog and digital inputs.
  - Basic facilities for performing Science Data Processing.
  - Supporting subsystems from SaDT, TM and INFRA

- The system would be maintained throughout construction
  - With representative versions of the respective elements.
  - Does not need to scale in size.
  - Wherever practical, functional enhancements and bug fixes would be tested and verified in the ITF before being deployed to site.

Concept of the ITF

- The ITFs will be used throughout the entire construction phase.
  - It would also be a useful resource to have pre and post construction.
- Most testing will be done by the contractors with oversight by the AIV entity.
  - Testing can be quite informal.
  - However CM will be a necessity.
  - 24 hour and remote access may be requirements
- The ITFs are not a production support facility.
  - It is used for qualification of the designs.
  - Including incremental enhancements and bug fixes.
  - A part of demonstrating Integration Readiness of configuration items.
- As a staging facility operated by the AIV entity, it may be suitable to have ITFs in each host country.
- The ITF concept may be expanded.
  - Through the addition of centralised EMC test facilities and laboratory environments.

AIV Next Steps

- Refinement of the concept
  - Business case and derived requirements
  - Bringing the ITFs into scope of the project
  - Increased detail on contractor input to the ITF (functionality and timelines, labour support)
  - Increased detail on the output of the ITF (L2 verification, contractor sell-off, integration readiness & handover, L1 verification)
  - This requires help from the consortia!

- To be reflected in AIV documentation including the Roll Out Plans, the Handover Checklist and (probably) the cost model.

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