SAFe® status

SQUARE KILOMETRE ARRAY

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

• Introduction
• Metrics
• Tooling
• What is it we do?
• Retrospective
SAFe® bridging vision

- Transition from consortia “islands” to single development “train”
- Program Increment (PI) Planning meetings are mileposts on the way
- Major milestones are “stations”.

Exploring the Universe with the world’s largest radio telescope
In words:

The SKA Enterprise Objectives over the bridging period is to successfully reach a milestone where construction can begin on a well funded project to build the two SKA telescopes under the guidance of the SKA Observatory. To do this we *must* pass the intermediate milestones of:

- Presenting a credible design at System CDR - which serves as a solid foundation for:
- Submitting a convincing construction proposal - which serves as the mechanism for:
- The SKA Observatory Council releasing funds for construction.

This is inherently, and unavoidably, a document based, stage gated process. To be successful we must align this with our vision for software development, which is that: *by the end of the bridging period we will have pivoted from a document based, earned value, stage gated set of processes arranged around pre-construction consortia to a code based, value flow driven, lean-agile set of processes unified around the Scaled Agile Framework.*

From: https://docs.google.com/document/d/1Qi5Qfh0YiwaCc7A16qQjKj7BuXfBl5Mzzrz4eMn3YvY/edit
Metrics
PI#4: Workforce and teams

- 16 Agile Teams ~4.7 FTE Average team size
- ~89 FTE committed from ~150 people (average commitment ~60%)
- ~13% of the effort from the SKA Office
Objectives analysis

PI4 still ongoing, therefore the results are still preliminary.
Up to the minute status information in Jira

<table>
<thead>
<tr>
<th>Key</th>
<th>Summary</th>
<th>Status</th>
<th>Progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPO-212</td>
<td>Fix bugs or refactor Perentie hardware, firmware, software and documentation to ensure quality and reliability is maintained - Refactored code, tested code</td>
<td>ACHIEVED</td>
<td></td>
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<tr>
<td>SP-536</td>
<td>Refactor Firmware Software - Refactor the Perentie firmware and software: add a build version date, fix bug in HBM memory download, control LFAA interface</td>
<td>RELEASING</td>
<td></td>
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<tr>
<td>AT6-208</td>
<td>Add a build version number to each FPGA accessible from Gemini - Add a build version number to each FPGA accessible from Gemini. Modify ARGs in</td>
<td>DONE</td>
<td></td>
</tr>
<tr>
<td>AT6-209</td>
<td>Change MACE/ICL to read the FPGAs version number and load the appropriate fpgmap file.</td>
<td>DONE</td>
<td></td>
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<tr>
<td>AT6-211</td>
<td>Control the rate at which the LFAA emulator sends data - Control the rate at which the LFAA emulator sends data, so as not to overrun the bandwidth</td>
<td>DONE</td>
<td></td>
</tr>
<tr>
<td>AT6-232</td>
<td>Investigate and refactor Gemini Tango Device based on Pogo</td>
<td>DONE</td>
<td></td>
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<tr>
<td>SP-535</td>
<td>Refactor Hardware &amp; Docs - Refactor the Perentie hardware: update the subrack backplane, install optical circuit, find leak sensor connector bulkhead, control</td>
<td>IMPLEMENTING</td>
<td></td>
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<tr>
<td>SPO-215</td>
<td>Implement custom 25G communications firmware between FPGAs to enable multi-LRU systems in preparation for optical circuit</td>
<td>NOT ACHIEVED</td>
<td></td>
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<tr>
<td>SP-540</td>
<td>Operational Optical Comms - Add 25G optical interfaces (QSFP) to the interconnect module to connect the Gemini to the Xilinx HBM Eval board</td>
<td>PROGRAM BACKLOG</td>
<td></td>
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<tr>
<td>AT6-226</td>
<td>Implement 25G inter-FPGA communications firmware - Implement 25G inter-FPGA communications firmware module and integrate into firmware</td>
<td>TO DO</td>
<td></td>
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<tr>
<td>AT6-227</td>
<td>Add QSFP to two development boards - Add QSFP to two development boards and connect with the appropriate pigtail of an optical breakout cable</td>
<td>TO DO</td>
<td></td>
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<tr>
<td>AT6-228</td>
<td>Basic testing of communications firmware in FPGA functions as expected over the optical link</td>
<td>TO DO</td>
<td></td>
</tr>
<tr>
<td>SPO-210</td>
<td>Integrate the Fine Corner Turner and Correlator to prepare for integration into the PISA signal path - Simulation results</td>
<td>ACHIEVED</td>
<td></td>
</tr>
<tr>
<td>SPO-209</td>
<td>Make the Correlator Coarse Corner Turner and Filterbank operational to further progress the PISA signal chain - Verification report</td>
<td>ACHIEVED</td>
<td></td>
</tr>
</tbody>
</table>

Exploring the Universe with the world's largest radio telescope
Tooling
Bridging organisation

Created by Bartolini, Marco, last modified by Nicolas Loubser on Sep 06, 2019

Software organisation in bridging is implemented in order to achieve the goals defined in the bridging vision.

Software development during the bridging phase is organized with the goal to implement an Essential SAFe structure as described at https://wwwscaledagileframework.com/essential-safe/.

The work will be organized in agile teams, coordinating among each other and with the program layer in a series of meetings as described below.

- Agile Teams
- Coordination
  - PI planning
  - PO Synch
  - Scrum of Scrums
  - Sprint Planning Cadence
- Software Architecture
- Other Information

Agile Teams

- NGCRA Team - AT1
- System Team - ST
- Architecture Team - SARCH
- Button (OSO-UI) Team
- SKANET (SKA Networks)
- Pulsar Timing (Australia / New Zealand)
- ORCA Team
Buttons Feature and Stories

Filter Results: BUTTONS - Active PI Objectives

<table>
<thead>
<tr>
<th>Key</th>
<th>Summary</th>
<th>Due Sprint</th>
<th>Current Confidenc</th>
<th>Business value</th>
<th>Actual Value</th>
<th>Links</th>
<th>Iterations</th>
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</thead>
<tbody>
<tr>
<td>SPO-265</td>
<td>O: Identify profiling tools and learning how to profile Webjive front-end and back-end. KR: Buttons team know how to measure the performance of frameworks similar to Webjive</td>
<td>Sprint 1</td>
<td>2 - ACHIEVED</td>
<td>2</td>
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<td>SP-296</td>
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<tr>
<td>SPO-276</td>
<td>O: Analyse the Webjive profiling results and identifying the top 2-3 bottlenecks. KR: Confirmation on webjive performance and key bottlenecks if any</td>
<td>Sprint 2</td>
<td>2 - ACHIEVED</td>
<td>10</td>
<td>10</td>
<td></td>
<td>SP-296</td>
</tr>
<tr>
<td>SPO-273</td>
<td>O: Measure and analyse the performance of Webjive in order to define the...</td>
<td>Sprint 2</td>
<td>2 - ACHIEVED</td>
<td>2</td>
<td>2</td>
<td></td>
<td>SP-296</td>
</tr>
</tbody>
</table>
SKA telescope developer portal

Welcome to the Square Kilometre Array software documentation portal. Whether you are a developer involved in SKA or you are simply one of our many users, all of our software processes and projects are documented in this portal.

Scope

This documentation applies to the bridging phase of the SKA project, further updates and scope changes will be published on this website. Part of the bridging phase goals will be to consolidate and enrich this portal with more detailed information. It is thus anticipated that in this phase the change rate of the documentation will be very frequent.

SKA developer community

SKA software development is managed in an open and transparent way.

- SKA Code of Conduct
- How to join the SKA developer community
- Agile teams and responsibilities
- SKA developer community decision making process
Code repository

Project ID: 10749136

861 Commits 15 Branches 5 Tags 3.9 MB Files

Setting up CI Pipeline for tmc-prototype.

- Pipeline running
- Project coverage: 84.29%
- Last build: 2019/11/22 09:36:38
- Tests failures: 0
- Tests errors: 0
- Tests total: 38
- Lint errors: 0
- Lint failures: 0
- Lint tests: 0

Badge creation for SubarrayNode. Update setup.cfg file for all the tmc devices.
JayantKumbhar authored 25 minutes ago

- README
- BSD 3-clause "New" or "Revised" License
- CHANGELOG
- CI/CD configuration

<table>
<thead>
<tr>
<th>Name</th>
<th>Last commit</th>
<th>Last update</th>
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<tr>
<td>.make</td>
<td>Merge branch 'code_cleanup' into 'master'</td>
<td>6 days ago</td>
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<tr>
<td>data</td>
<td>story_AT1-358: Commented activity message of Health...</td>
<td>2 weeks ago</td>
</tr>
<tr>
<td>docker-compose</td>
<td>story_AT1-377: Update tmc docker compose file to add ...</td>
<td>2 weeks ago</td>
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<tr>
<td>docs</td>
<td>AT1-283: Update a test case of CspSubarrayLeafNode. ...</td>
<td>3 months ago</td>
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<td>Status</td>
<td>Pipeline</td>
<td>Triggerer</td>
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</table>

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Languages

• Supported languages:
  • Python
  • C/C++
  • Javascript

• Also working on:
  • CUDA
    • Requires access to GPU platforms for automation tests
  • VHDL
    • Requires FPGA platforms for automated tests (e.g. PSI environments)
    • Developing infrastructure for automatic comparison of outputs with test vectors
What is it we do?
Process

• Towards the end of one 3 month program increment the program team develop goals and features for the next PI.
• Done in consultation with the project directorate and the Telescope Delivery Teams, relevant Product Delivery teams and team Product Owners.
• Features are prioritised based on size, risk/opportunity, estimated value and time criticality.
• Teams select features they want to do at the planning session
• Teams can also add features or their own, with the agreement of the program team.
Demos

• How we visualize software progress
• Held every two weeks and at PI planning.
• This week’s demo is at left - you are welcome to join
  • Thursday from 9-11 UTC
  • [https://skatelescope.zoom.us/j/2939114038](https://skatelescope.zoom.us/j/2939114038)

This System Demo will focus on:

- Gain calibration and improved quality, maintainability, reusability
  - [SPO-230 - Enhance the imaging pipeline with a gain calibration step to allow integrated imaging/calibration hardware-accelerated testing](https://skatelescope.zoom.us/j/2939114038) IN PROGRESS
  - [SPO-229 - Refactor the imaging evolutionary prototype into a controllable and modular pipeline to improve quality, maintainability and reusability](https://skatelescope.zoom.us/j/2939114038) IN PROGRESS

- SKA1-scale Ingest Pipeline on Summit, and Data Storage
  - [SPO-251 - To re-play the large scale ingest and imaging SUMMIT demo at the Shanghai SKA Engineering meeting and make the data products available for post processing](https://skatelescope.zoom.us/j/2939114038) READY FOR ACCEPTANCE
  - [SP-453 - SKA1-scale Ingest Pipeline on Summit](https://skatelescope.zoom.us/j/2939114038) RELEASING
  - [SP-470 - Data Storage Pilot for Summit Replay](https://skatelescope.zoom.us/j/2939114038) RELEASING

- Subarray fault isolation
  - [SPO-232 - Investigate the subarray fault isolation capability of the TMC architecture. Key Result: Report capturing TMC architecture’s behavior and possible architectural gaps if identified during fault conditions for an ongoing observation](https://skatelescope.zoom.us/j/2939114038) IN PROGRESS
  - [SP-478 - Investigate sub array isolation: Fault containment](https://skatelescope.zoom.us/j/2939114038) IMPLEMENTING

- CI metrics and/or SKAMPI deployment (to be confirmed)
  - [SPO-258 - Support teams’ adoption of the CI tooling so that metrics can be collected uniformly across all repositories](https://skatelescope.zoom.us/j/2939114038) READY FOR ACCEPTANCE
  - [SPO-327 - Deploy the SKAMPI prototype into the k8s cluster on E-SKA infrastructure automatically and run smoke test so that each team can confidently deploy new images](https://skatelescope.zoom.us/j/2939114038) IN PROGRESS

- Demonstrate Automated Mass Software Deployment
  - [SPO-309 - Improve software distribution and upgradability for SKA prototype hardware](https://skatelescope.zoom.us/j/2939114038) IN PROGRESS
  - [SP-568 - Improve software distribution and upgradability for SKA prototype hardware](https://skatelescope.zoom.us/j/2939114038) RELEASING

Roadmaps

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Goals for PI#5

• Shared Goals:
  • Create a culture for sharing information across developers, and create a documentation set for developers of software for SKA systems which is discoverable via the developer portal, is tailored to their needs, and can continually evolve.
  • Promote and improve a culture of DevOps and automated testing, which ultimately supports running all demos from an Integrated Test environment.
  • Demonstrate the ability for users to easily specify behavioural tests for Features and Stories, and trace them to architectural features, components, and requirements in the Solution Intent.

• OMC Goals:
  • Enhance the MVP to make it possible to configure it in order to run multiple scans which support multi-mode observations, across different subarrays, and in a single subarray.
  • Users/developers of TANGO systems are able to create and persist their own WebJive dashboards, and run demos from them.
  • Demonstrate the Observability and Testability of the OMC MVP

• DP ART Goals:
  • Provide enough tooling to run simple batch processing blocks in the DP MVP
  • Create an initial prototype for a SKA Data model library to be used within the DP MVP
  • Gradually incorporate simulation models/tools into a reusable toolset run from the standard test/integration environment
Keeping the train on the tracks

• Weekly:
  • PO synch meeting focusing on content delivery.
  • Scrum of Scrums focusing on process, impediments etc.

• These also act as communities of practice in these areas.

• Communities of practice:
  • Testing
  • Tango
  • Feature Owners
    • Largely office staff responsible for accepting content.
    • Somewhat sporadic meetings
  • Architecture
    • Still in development
Solution intent

- SAFe® term for all system engineering artefacts.
  - Dynamic database reflecting current state and history
  - Working to link it into the automation tools

- Make solution and its intent dynamic
- Keep options open with fixed and variable Solution Intent
- Collaboratively develop the Solution Intent
- Connect Solution Intents across the supply chain
- Create minimal, but sufficient documentation

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Retrospective
Generating Value

• Any agile process requires a clear and well understood concept of value
  • Value in a large science project is sometimes difficult to judge
• Looking at setting up a permanent operations room based on simulations
  • To allow even better visualization of software delivered.
• Planning to use precursors and pathfinders as ways to help in bridging
  • Developing a usable SKA SDP for MeerKAT+ extension
  • Similar goal with ASKAP and Rialto project
  • Would be great if we could do this with LOFAR as well
  • PST and PSS prototypes (MeerTrap) being used on MeerKAT.
• I would like to extend this into construction and so align a lot of radio astronomy software with SKA.
  • We are just the first with the scaling problem, but others will encounter it soon.
  • Will requires extra resource from outside the project, but should be a win-win.
Highs and lows

• Highs:
  • Delivery performance of teams
  • Behaviour/acceptance of teams
  • Openness of community
    • Great support from Persistent in India
    • Great help from Deutsche Bank
    • Great support from commercial tooling
    • Observers turning up to our PI planning events.
  • FPGA community fit
  • Adoption by others
    • SKA ESCAPEES SRC team
  • Building a great team.
    • Just offered the DevOps position to a great candidate.
  • Developing relationships
    • All the teams, but also others like AstroPy, NRAO, Max IV synchrotron, Tango community

• Lows
  • Still quality gaps – DoD not uniformly enforced.
  • Some teams haven’t turned up yet
  • Some may find the culture difficult
  • We are still working on aligning the TDT’s
    • Forcing the cadence is difficult
  • Some countries still having difficulty visualizing how it works in construction.
Find out more:

• Bridging confluence:
  • https://confluence.skatelescope.org/display/SE/Bridging+organisation

• Developer portal:
  • https://developer.skatelescope.org

• GitLab organization:
  • https://gitlab.com/ska-telescope

• SKA Jira:
  • https://jira.skatelescope.org/
  • Lots of links on the Confluence Dashboard pages:
    • https://confluence.skatelescope.org/display/SE/Dashboards

• Slack:
  • https://skasoftware.slack.com