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Using BDD testing in SKAO: Challenges and Opportunities

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Telescope Design

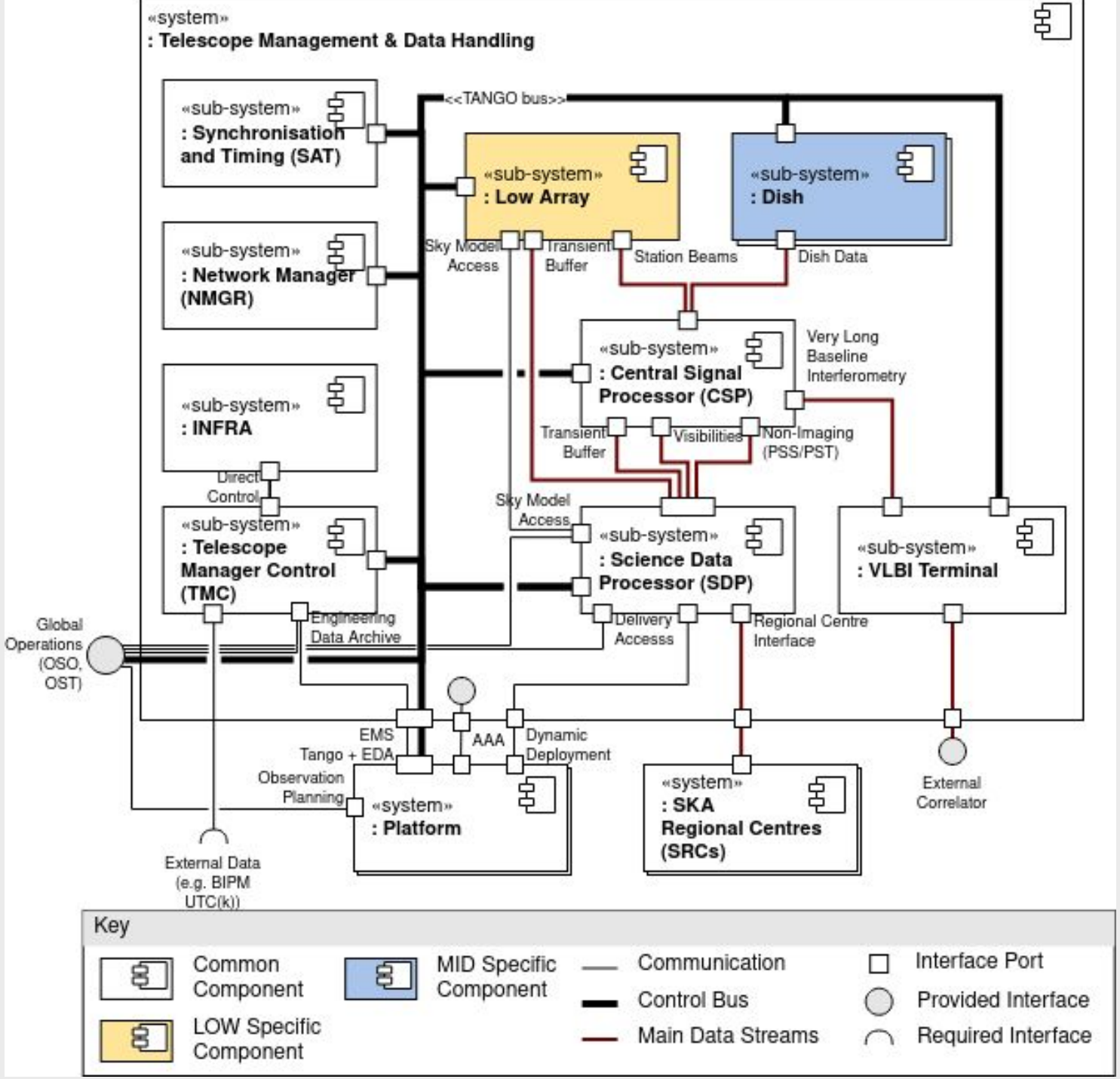
Component & Connector View of the Observatory software.

TMC = Telescope Monitoring & Control

SDP = Science Data Processor

CSP = Central Signal Processor

SRC = SKA Regional Centre



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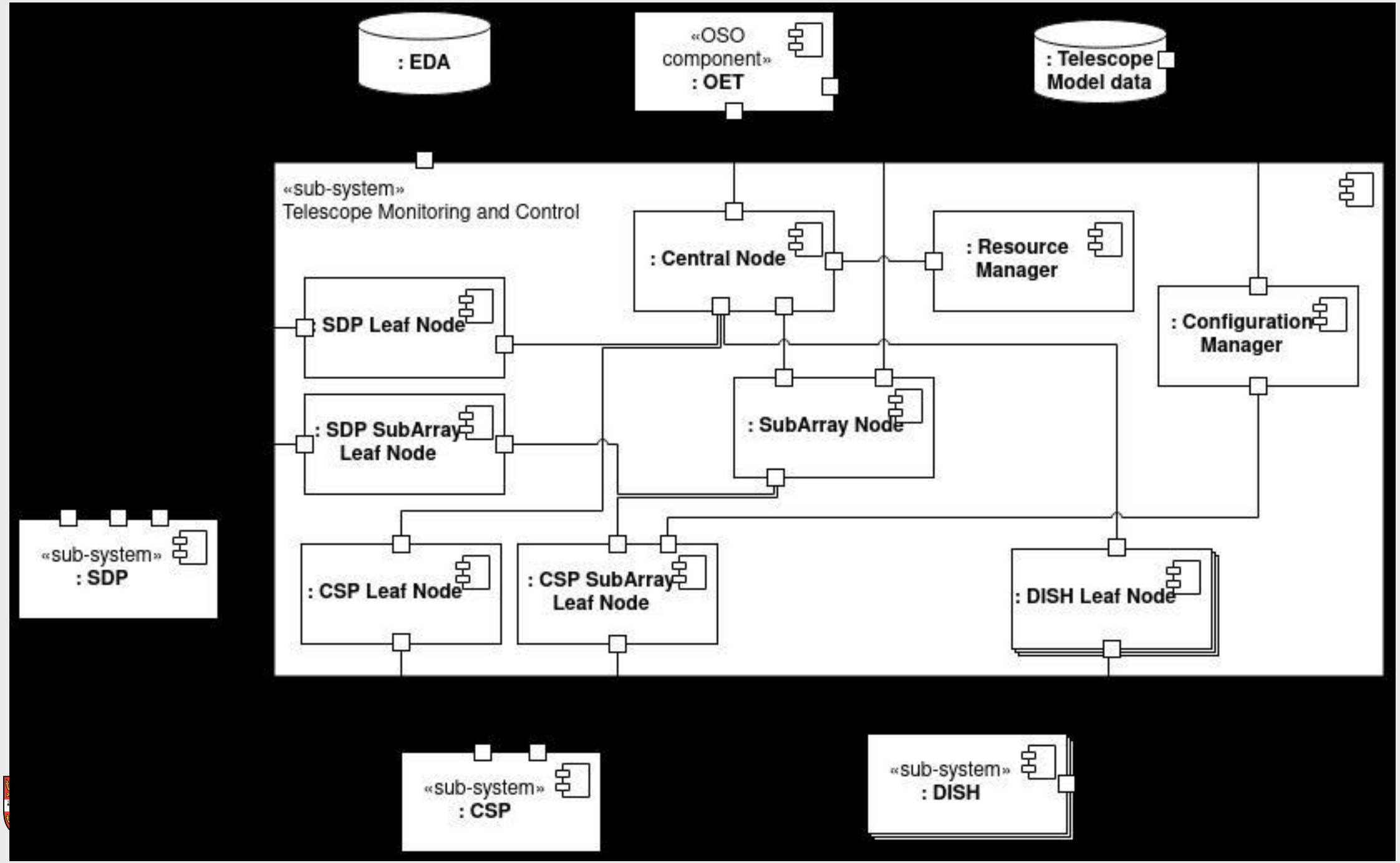
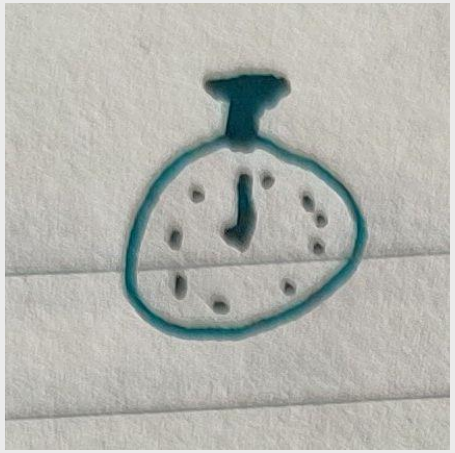

: EDA
«OSO component»
: OET
: Telescope Model data
«sub-system»
Telescope Monitoring and Control
: Central Node
: Resource Manager
: Configuration Manager
: SDP Leaf Node
: SDP SubArray Leaf Node
: SubArray Node
«sub-system»
: SDP
: CSP Leaf Node
: CSP SubArray Leaf Node
: DISH Leaf Node
«sub-system»
: CSP
«sub-system»
: DISH

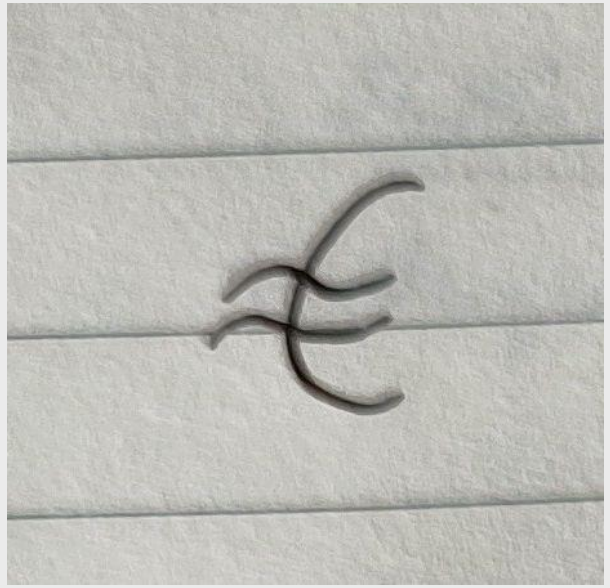
SAFe®

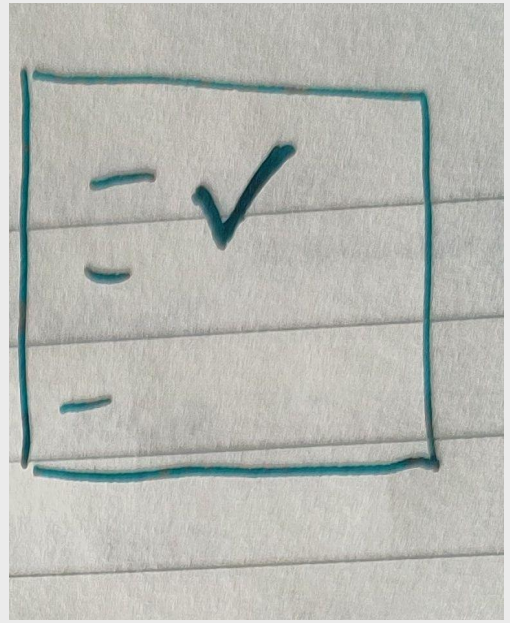
- Planning Intervals (PIs) lasting 1 quarter
  - containing a Planning week
- Agile teams

Goals



- test often & quickly
- help devs find bugs
- stakeholders can validate spec
- it’s economic





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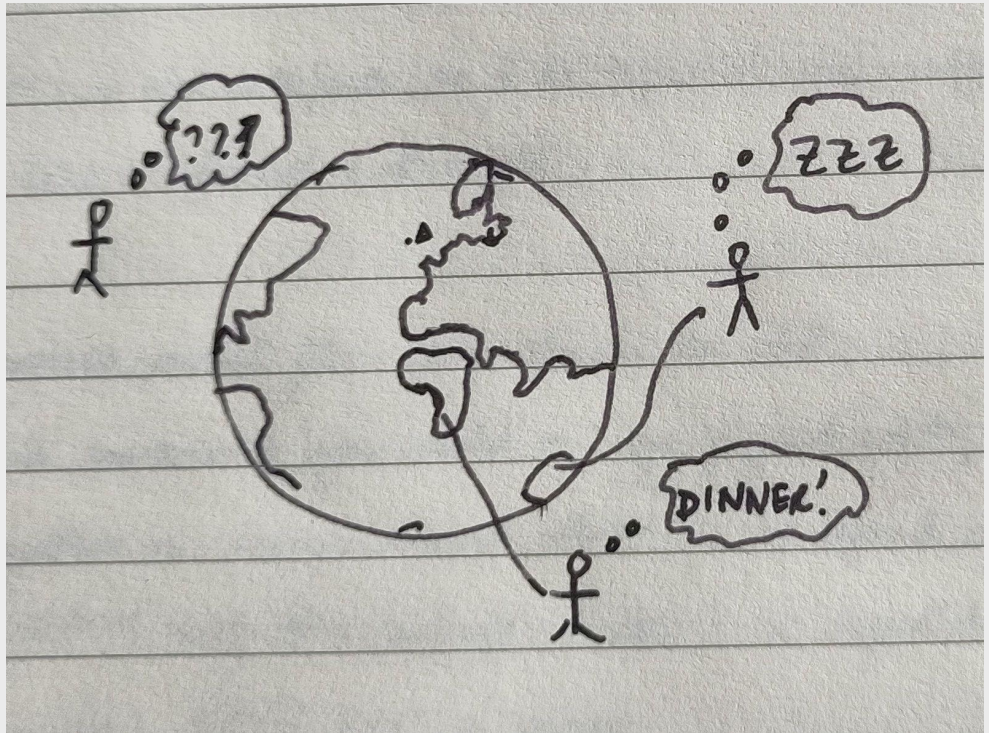
Challenges

- Many domains
- Diverse skill levels
- High autonomy
- needs multiple teams
- specialist hardware, requiring complex integration environments.
- under resourcing of integration
- highly distributed teams



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Why BDD?

- specification by example
  - you know what the system should do
- test steps specified in a simple format
- development of Domain specific language (DSL)
- results in living documation

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SDP scenario

Given I connect to an SDP subarray
And obsState is READY
When I call Scan
Then obsState is SCANNING
And scanID has the expected value

TMC BDD scenario with examples

```
Given I connect to an SDP subarray
        And obsState is <obs_state>
When I call <command> with an invalid JSON configuration
Then the device raises an API_CommandFailed exception

        Examples:
        | obs_state | command          |
        | EMPTY     | AssignResources  |
        | IDLE      | Configure        |
        | READY     | Scan             |
```

SKAO Test Environments

- Cloud 
- PSIs (Prototype System Integration environments):
  - Canada, Netherlands, Australia
- ITFs (Integrated Test Facilities):
  - South Africa & Australia

What can we test where?

Environment	unit tests	signal chain tests	software component integration tests	basic performance tests	large performance tests
Cloud	X		X	X	
PSI	X	X	X		
ITF	X	X	X		
HPC system	(X)				X

SDP Integration Tests

Edit | Add comment | Assign | More | In Progress | Admin

Details

Type:	Test Plan	Resolution:	Unresolved
Priority:	Not Assigned	Fix Version/s:	None
Affects Version/s:	None		
Component/s:	COM SDP SW		
Labels:	None		
Telescope(s):	MID, LOW		

Description

Test plan to support releases of the SDP.

This collects the tests performed in the SDP integration repository.

Tests

Add Tests | Create Test Execution | Trigger Build | Test Plan Board

Overall Execution Status

6 PASS 16 FAIL

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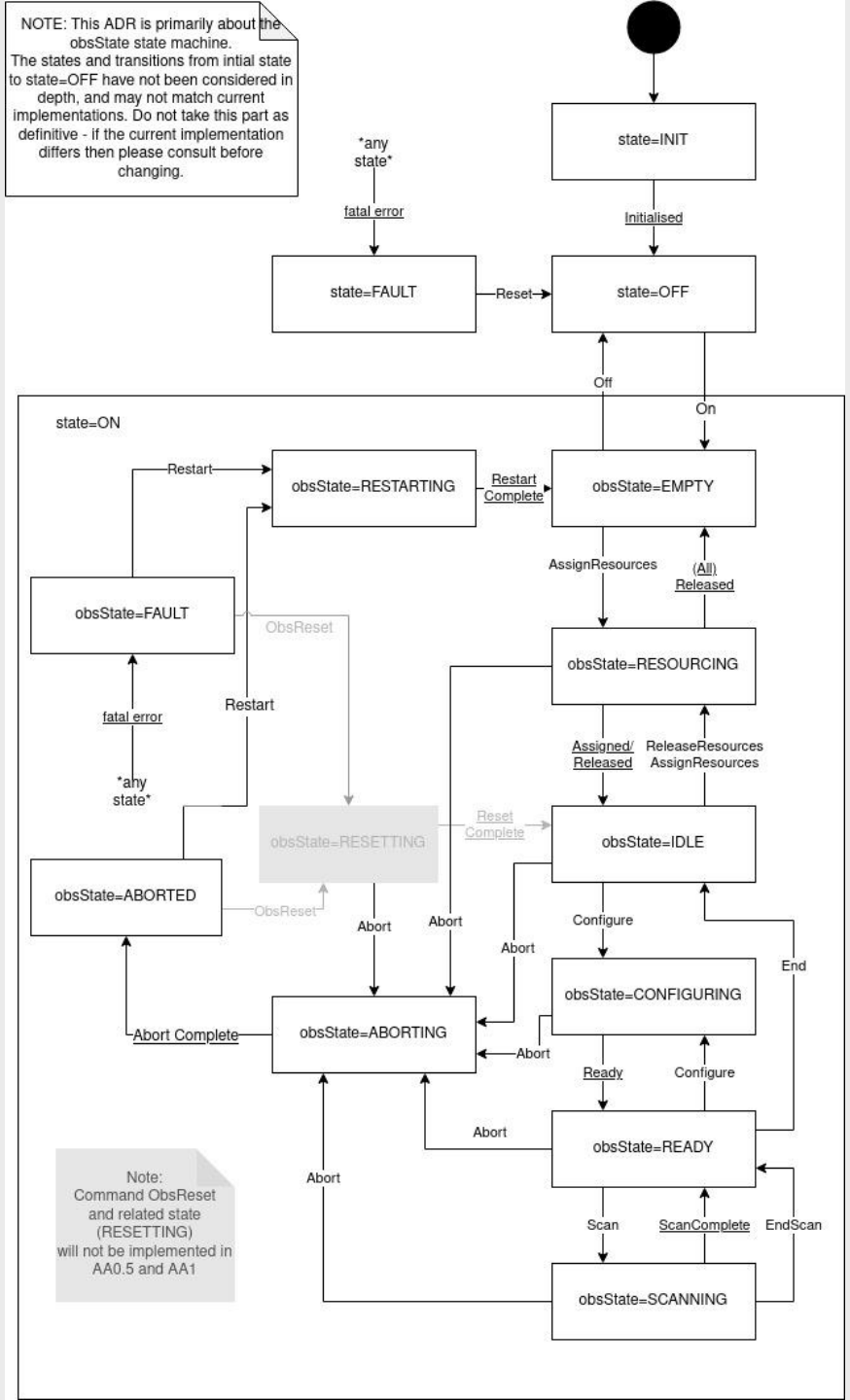
Observing State

To reach the READY state from the EMPTY state, we must pass through RESOURCING, IDLE, and CONFIGURING.



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What did we find? The bad bits

- Plenty of technical issues
  - testing finite state automata
  - details of Tango implementation
  - complexity of test setup/teardown
- Social issues:
  - lack of knowledge of how to specify tests
  - feeling that tests couldn’t be changed
  - communications issues with our distributed nature
  - resourcing for integration testing and testware

What did we find? (the good bits)

- We found new bugs
- We found gaps in our design
- Everyone involved got a better understanding of the system
- The nucleus of our DSL

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Conclusions

- BDD testing is a powerful tool
  - it can uncover issues in your organisation!
  - this will make your system better when fixed!
  - The nature of finite state automata means you need to take more time over testware.
    - This will pay off for long-lasting projects.

Any questions?

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