



SARAO
South African Radio
Astronomy Observatory



Asynchronous Execution of Tango Commands in the SKA Telescope Control System

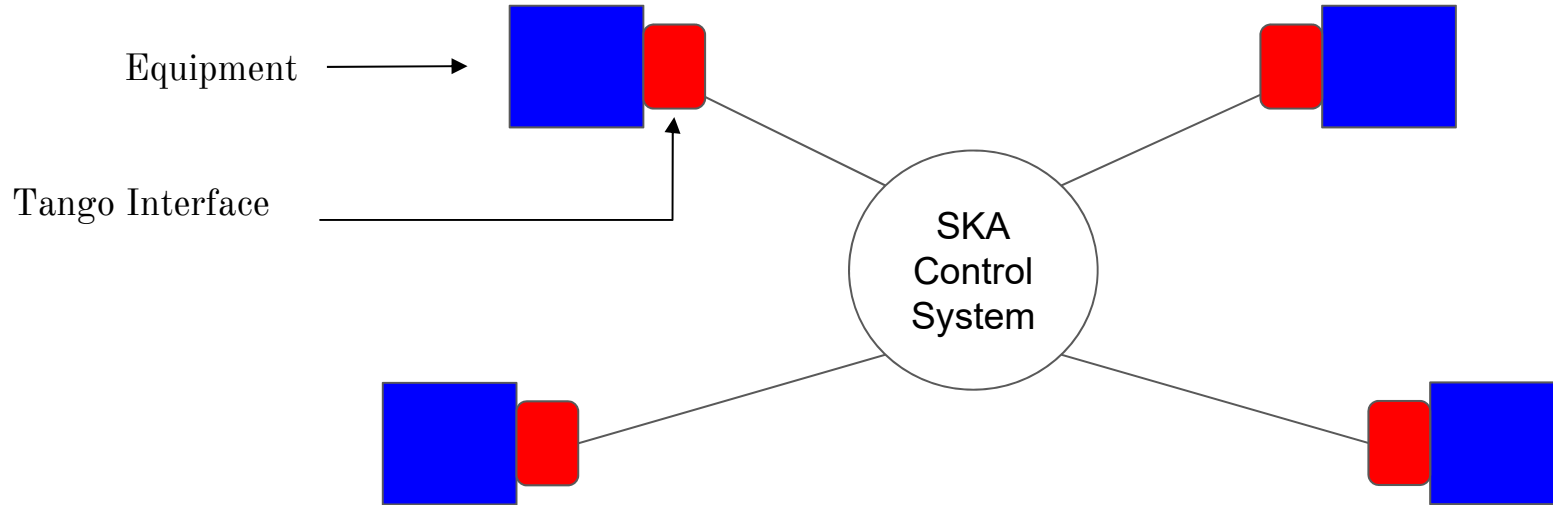
An Alternative to the Tango Async Device

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Background

“ world’s largest radio telescope ”



Limitations

TANGO

SKA

Timeouts

3000 milliseconds

10 milliseconds



Long Running Command (LRC)

LRC > 3000 milliseconds

LRC > 10 milliseconds



Solution to LRCs

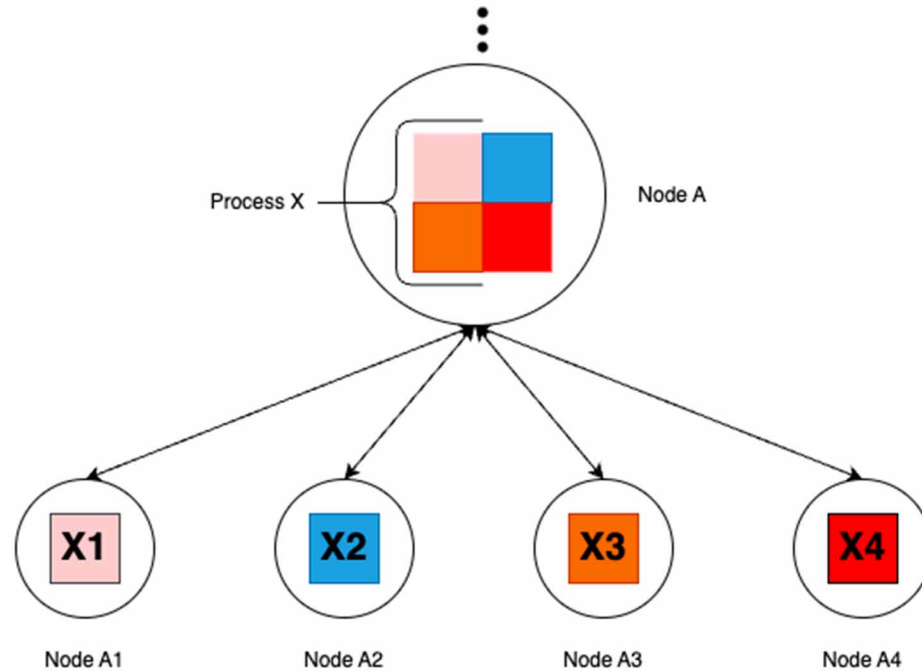


Asynchronous execution of tasks

Coroutine - Task on event loop

Custom solution - “ska-tango-base”

Hierarchy of Tango nodes



Pillars of Solution

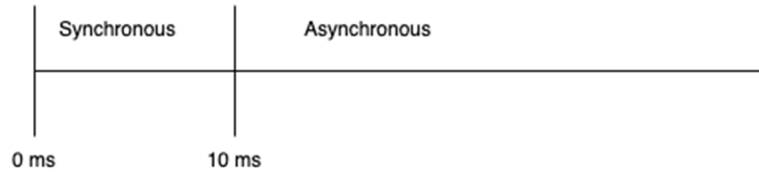
NON-FUNCTIONAL REQUIREMENTS

Criterion	Explanation
Performance	Responsiveness of TANGO devices need to be improved because in the current synchronous implementation while the device is executing a long running command it does not service other requests (attribute reads & writes; other commands, including another high priority, urgent command).
	TANGO devices should support more than one client .
Dependability	Error and fault reporting shall not be paused while the TANGO device is executing a command. Similarly, a device that waits on another device should still be able to report its state and status.
Interoperability	The telescope control system shall be able to interact with various components, including ones that have long response times .
Usability	The complexity of a client due to interaction & coupling with a device, and assumptions about the future state of the device should not be too high.

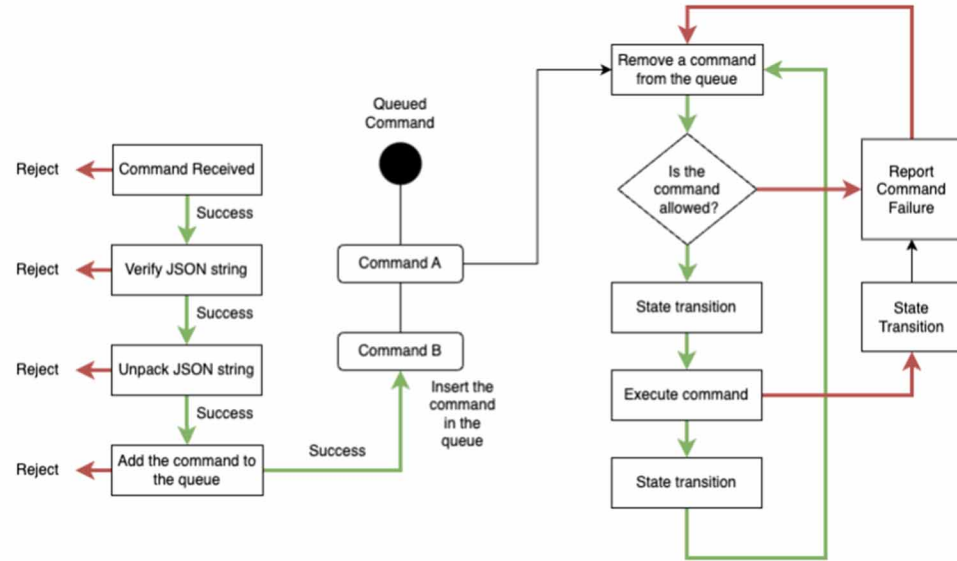
Asynchrony + Synchrony + Concurrency +

Solution

Hybrid Approach



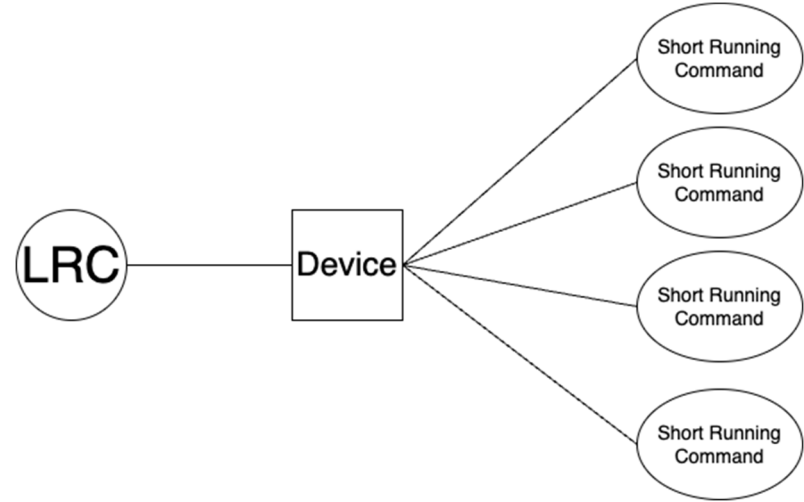
Queuing



Solution Cont.

Concurrency

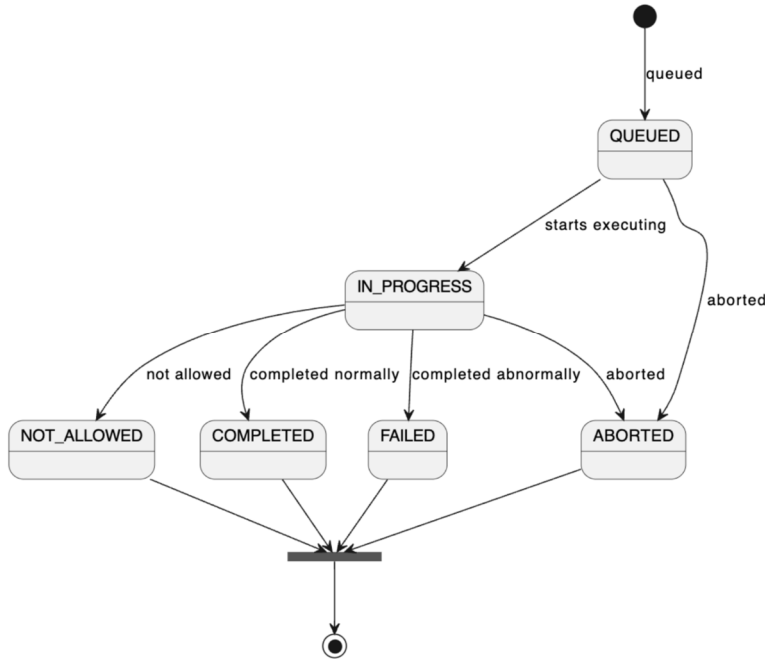
- Multiple executions



Solution Cont.

Reporting

Commands



“CheckLongRunningCommandStatus”

- The current LRC is aborted.
- All enqueued LRCs are cleared out.
- The operation is communicated to the client irrespective of the commands success or failure.

AbortCommands

Solution Cont.

Reporting

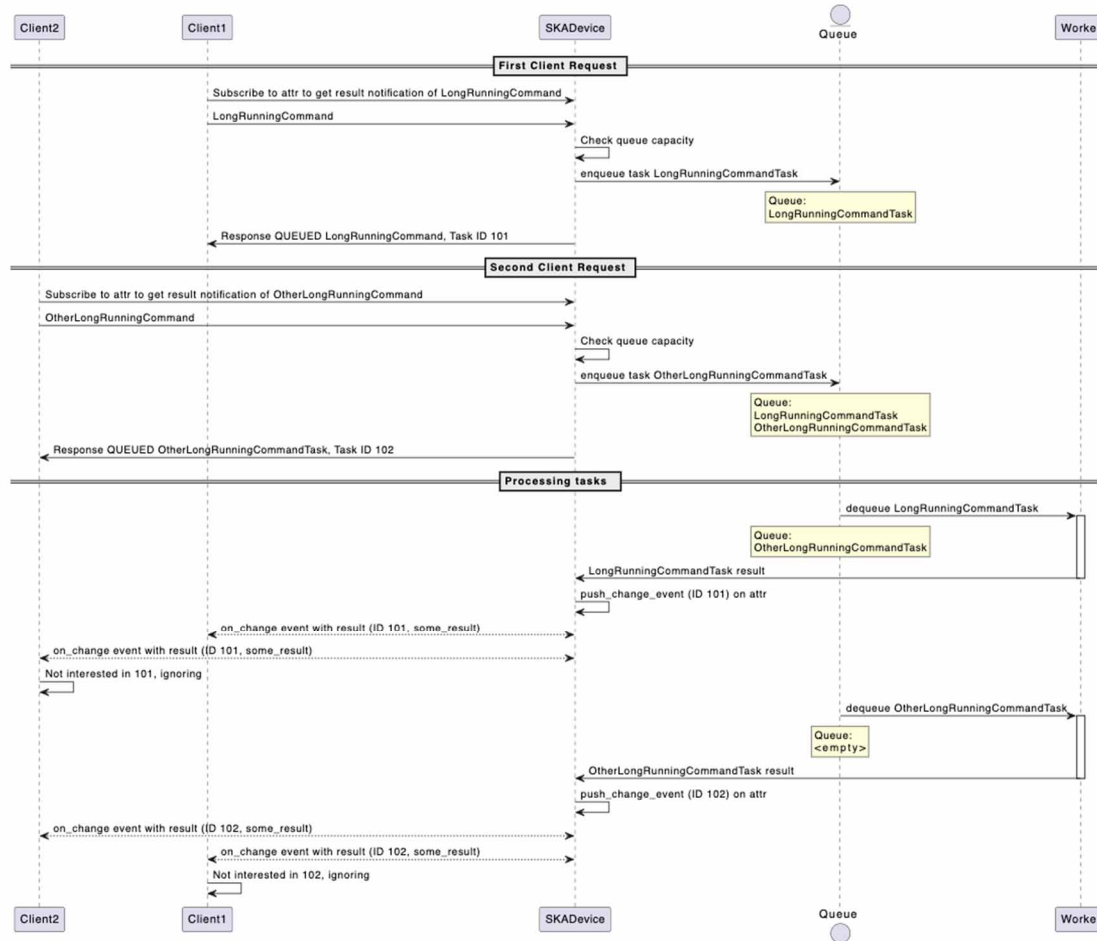
- LRC Attributes
 - Received
 - Execution
 - Completed
 - Removed from a queue
 - Return value



Client Responsibilities

- Monitoring
 - Subscriptions (ID)
- Multiple devices
- Retry strategy
 - Full queue
 - AbortCommands

Example



Conclusion & ...

- LRCs
 - negative impact
 - complex systems
- Asynchronous executions
 - Tango (Basis)
 - SKA (Custom design)
 - Monitor and control the network of devices in a precise manner

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... Extra Information

- Base Repo: `ska-tango-base`
- SARAO
- SKAO

Thank you!



English: Thank you

Afrikaans: Dankie

Zulu: Ngiyabonga

Xhosa: Enkosi

Swati: Ngiyabonga

Tswana: Ke a leboga

Venda: Ngiyabonga

Pedi: Ke a leboga

Sotho: Ke a leboga

Tsonga: Ngiyabonga

Ndebele: Ngiyabonga