



Integration tests of the

VLT

Telescope Control System

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Introduction

VLT Telescope Control System is in advanced integration phase

This paper presents the current status

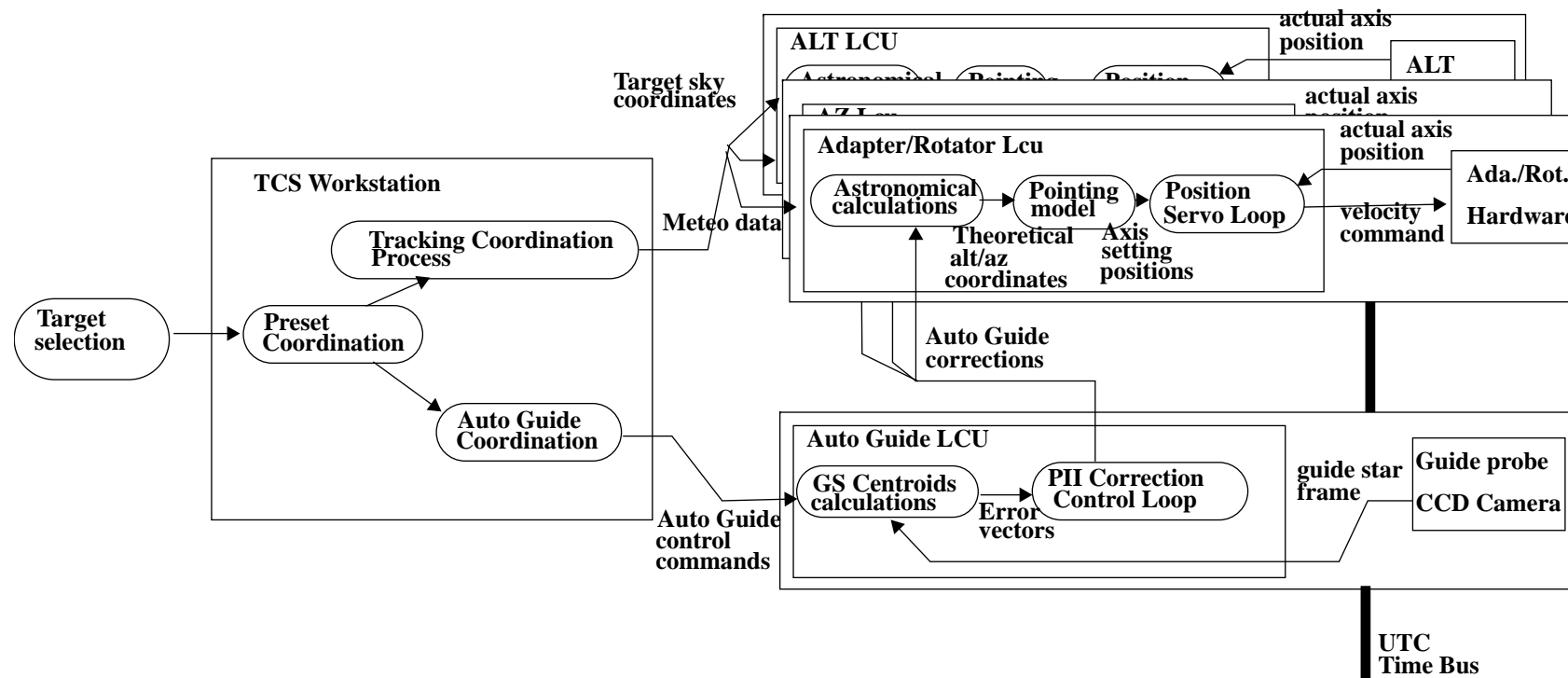
and

the results of the most important tests done up to now

- **VLT Telescope Control System is a distributed system based on the “standard architecture”**
- **Coordination software runs on UNIX workstations without hard real time requirements**
- **Subsystem control software with real time requirements run on VxWorks LCUs**
- **TCS software is based on full use of OO technology, with extensions for real-time requirements**
- **Configuration control and automated testing.**

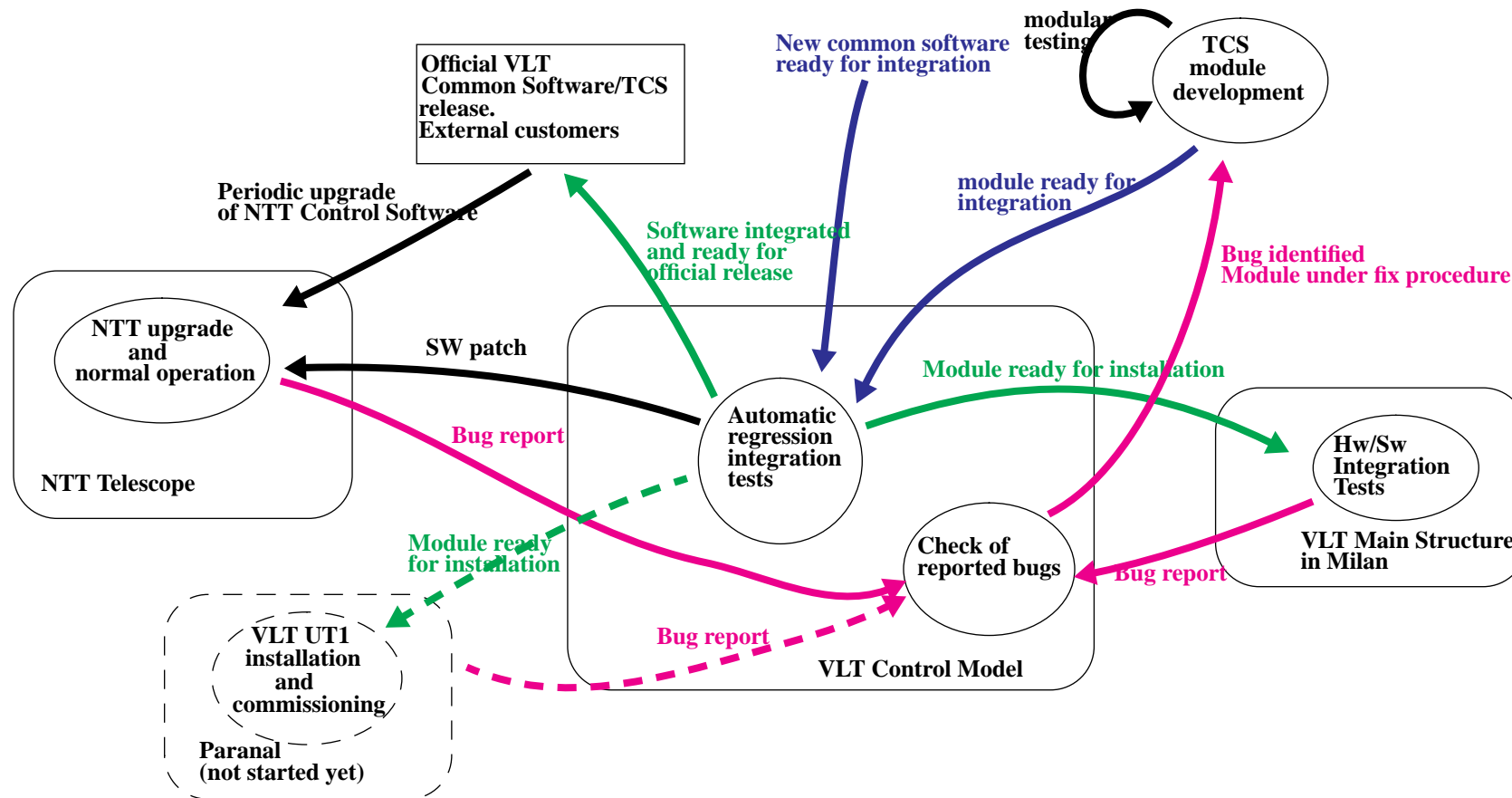


VLT TCS Tracking and Auto Guiding





VLT Software Testing Strategy

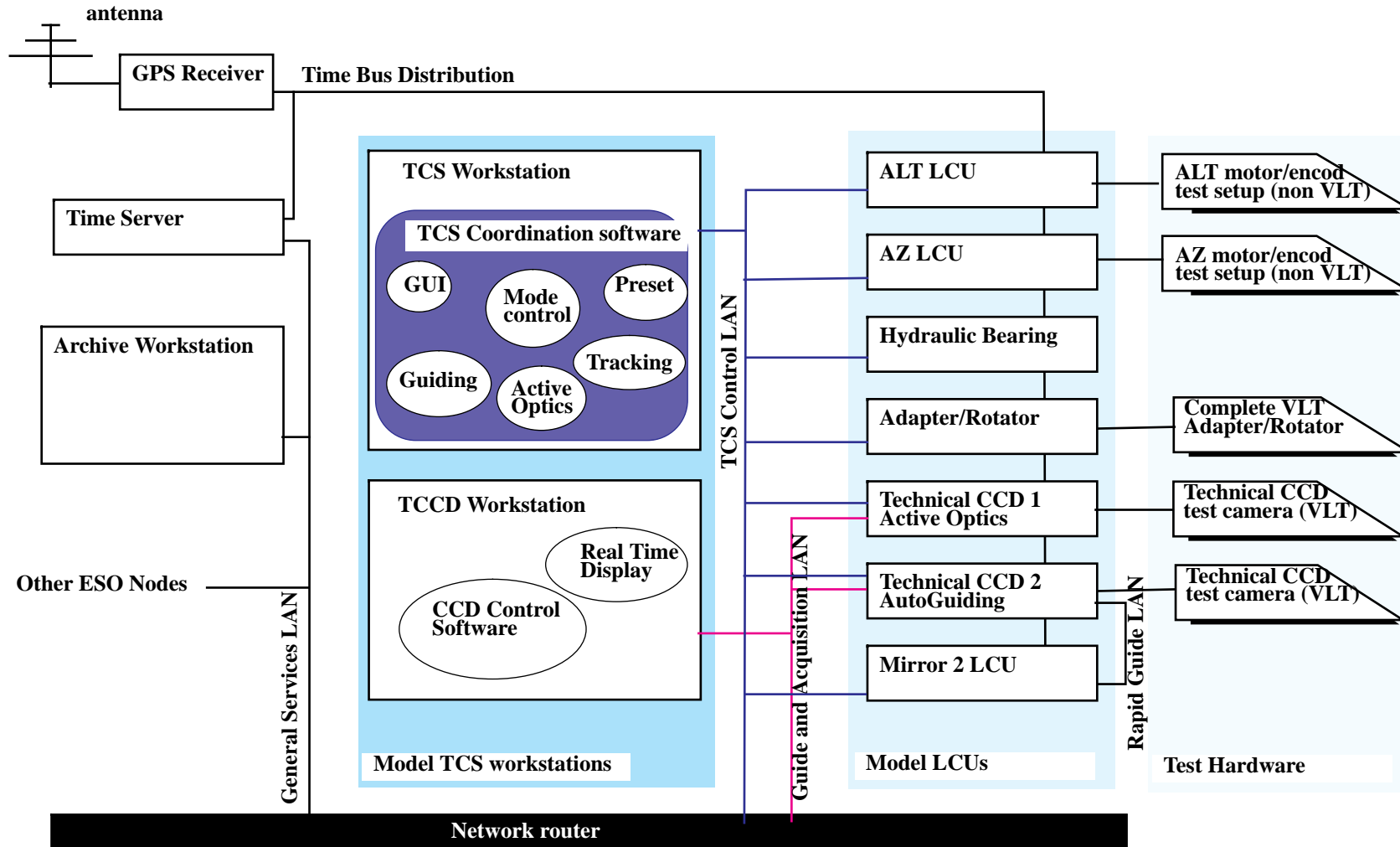




VLT TCS Software Modules - Present status

Module	Status	Tested on
TCS Interface. User, eng. and instrument/ application interfaces	Complete for NTT To be ext. for VLT	NTT, Model No problems for Milan
Presetting and mode switching. High level WS coordination modules	Complete	NTT, Control Model No problems for Milan
Tracking. WS and LCU SW for tracking and pointing	Complete	NTT, Control Model No problems for Milan
Axes control. Low level LCU control software. Implements control loops for tracking.	Complete for NTT Not tested for the VLT on real HW	NTT, Control model. HW dependent parts to be tested in Milan.
Enclosure control	Complete	Control model, Paranal
Auto Guiding	Small changes VLT	NTT, Control model
Field Stabilisation	Under development	
Active Optics	Complete for NTT. To be ext. for VLT.	NTT, Control model
Optics Control	Under development	
Adapter/Rotator	Under development	

VLT Telescope Control Model





Telescope Structure in Milan

- **Notch Frequency:**

Axis	Spec.	Measure
Az	10Hz	6Hz (ESO)
Alt	8Hz	6Hz (AES)

- Milan soil is weaker than Paranal rocks
- ... but mirror effect (vs. dummy) will also play a role

- **Hydrostatic bearing stick friction:**

Axis	Spec.	Measure
Az	200Nm	400Nm

- Measure will improve (still polluted)
- This is **even today an unsurpassed value**
- **Very good tracking at low speed** (0.2 arcsec/sec, vel. loop only)

cont...



Telescope Structure in Milan (cont.)

- **Encoders (Laser Doppler Displacement Measurement - LDDM)**
 - Repetibility criteria already met (0.05 arcsec rms over 1 hour)
 - On-going calibrations
 - Resolution criteria already met (0.01 arcsec)
 - Accuracy requirement (0.1 arcsec rms) not yet verified.

- **Status now (Milan control system tests just started):**
 - AZ LCU connected. HW interfaces tested
 - AZ velocity loop tuned; measured bandwidth: 3.1Hz



Other subsystem tests

- **M1/M3 support control system: Tested in France**
 - 150 supports -> 150 VLT standard LCUs
 - TMCs proved capable of setting forces (-500 to 800 N) with differential accuracy of 0.05 N
 - tuning still on-going before provisional acceptance at Paranal
- **M2 control system: Preliminary acceptance ok, control hw under tests**
 - Mirror 1.1m. Chopping up to 5Hz. Max amplitude 2 arcmin
 - Chopping requirements verified
 - Step response 20ms, closed loop bandwidth 70/80Hz
 - Positioning accuracy and coupling between motions measured
- **Adapter/Rotator: Acceptance test at manufacturer site ok**
 - All parameters in spec.
 - One adapter at ESO, used for tests and control software devel.
- **Enclosure: First part Acceptance Tests in Paranal 14-28 July 1997**
 - Second part later in '97, when tel. and aux. systems installed.



Conclusion

Integration of VLT Control System is very advanced

We are convinced will be completed within deadlines

All basic concepts verified on NTT or Control Model

High level software now stable

Milan tests concentrate on electronics and low level software