Status of ALMA Software

T.C.Shen, J.Ibsen, R.Olguin, R.Soto,
ALMA Observatory, Santiago, Chile

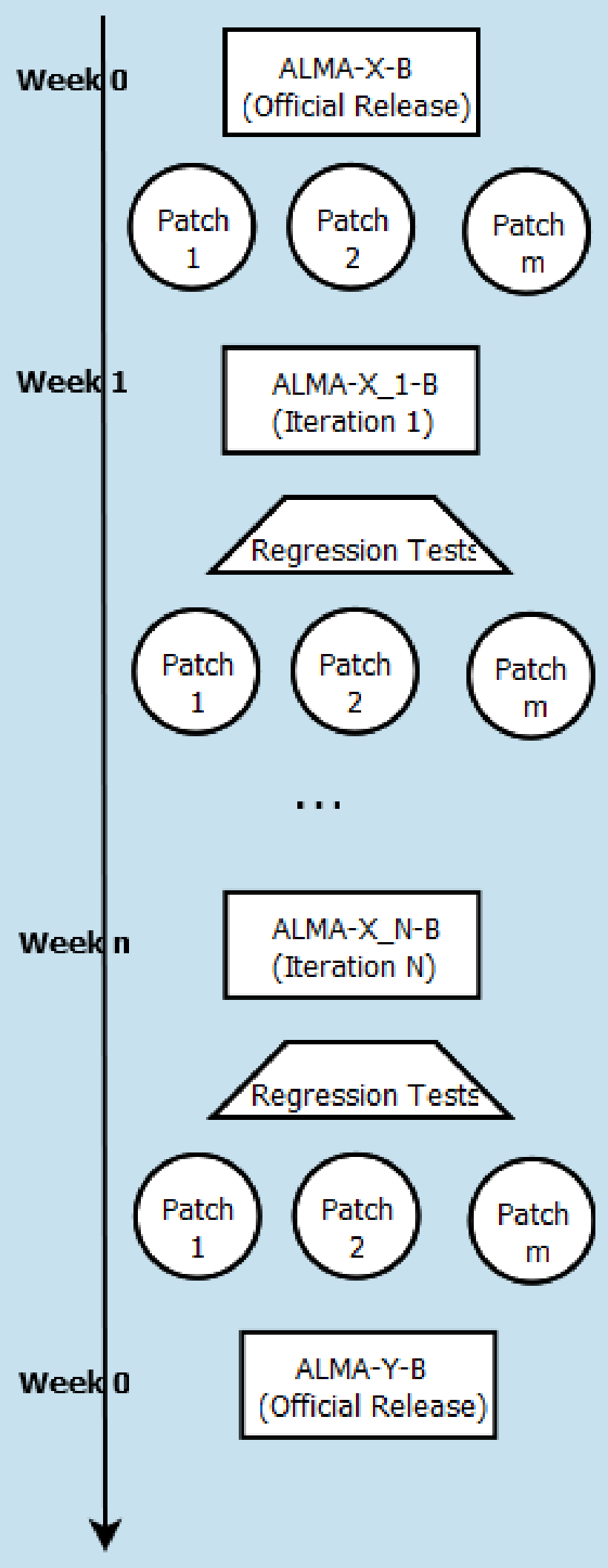
Abstract

The Atacama Large Millimeter /submillimeter Array (ALMA) will be a unique research instrument composed of at least 66 reconfigurable high-precision antennas, located at the Chajnantor plain in the Chilean Andes at an elevation of 5000 m. Each antenna contains instruments capable of receiving radio signals from 31.3 GHz up to 950 GHz. These signals are correlated inside a Correlator and the spectral data are finally saved into the Archive system together with the observation metadata. This paper describes the progress in the deployment of the ALMA software, with emphasis on the control software, which is built on top of the ALMA Common Software (ACS), a CORBA based middleware framework. In order to support and maintain the installed software, it is essential to have a mechanism to align and distribute the same version of software packages across all systems. This is achieved rigorously with weekly based regression tests and strict configuration control. A build farm to provide continuous integration and testing in simulation has been established as well. Given the large amount of antennas, it is imperative to have also a monitoring system to allow trend analysis of each component in order to trigger preventive maintenance activities. A challenge for which we are preparing this year consists in testing the whole ALMA software performing complete end-to-end operation, from proposal submission to data distribution to the ALMA Regional Centers. The experience gained during deployment, testing and operation support will be presented.

Array Elements Configuration

The ALMA Software deployment configuration is stored in the TMCDB. There are 1500 monitor variables per antenna. Template based configuration is used to minimize the configuration time.

Regression Tests



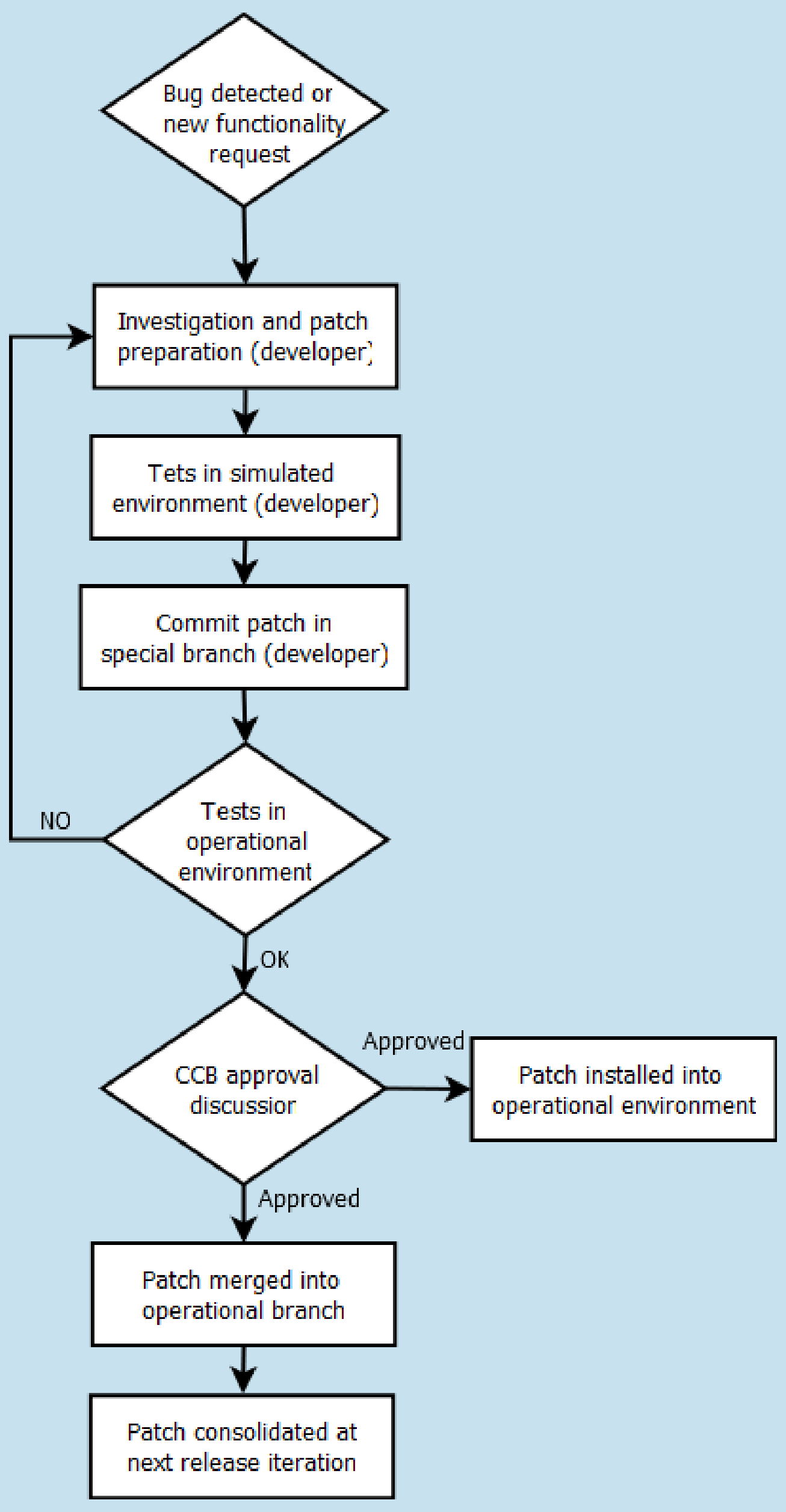
End-To-End Tests

(1) proposal submission phase, (2) proposal selection phase, (3) proposal scheduling and observation phase, (4) observation data replication from OSF to Santiago data centre and (5) data replication to ALMA regional centres.

Standard Test Environment

ALMA software was designed to run on top of a set of servers which are grouped as the minimum unit under the concept of Standard Test Environment (STE). There are 13 STEs across ALMA. STEs are being used for development, testing and operation. The biggest is the one dedicated to control de array and will eventually have up to 135 servers.

Software Patch


Bug detected or new functionality request
Investigation and patch preparation (developer)
Tets in simulated environment (developer)
Commit patch in special branch (developer)
Tests in operational environment
NO
OK
CCB approval discussion
Approved
Patch installed into operational environment
Approved
Patch merged into operational branch
Patch consolidated at next release iteration

Scalability Tests

(1) diskless real-time machines booting process, (2) CORBA notification services, (3) TMCDB access during software start up, (4) monitoring system, and (6) dynamic resource allocation during observation.

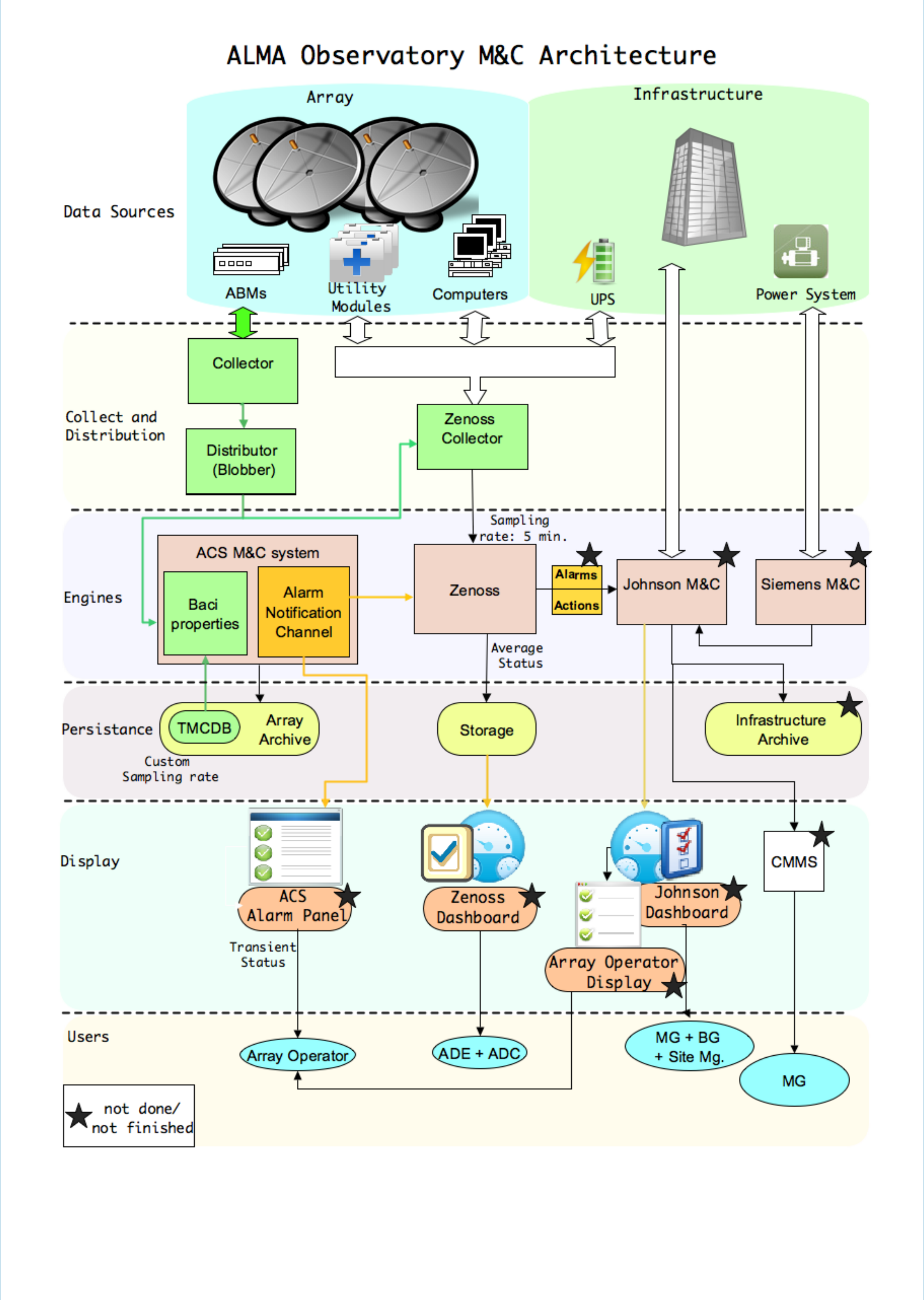
Virtualization

Based on VMWare ESX technology. Virtual machines are being consolidated over two Dell M610 Blade servers.

SW build farm

ALMA software is a four Gb. of source code which takes around ten hours to compile. There are four different active branches being used for operations. There are six nodes configured to generate daily builds.

Monitoring System



Conclusions

ALMA has started to operate in Early Science mode since September 30th of 2011.Testing infrastructure and simulation are important resources. Regression tests, performed systematically, are essential to guaranty stable software and detect bugs introduced involuntarily by developers.Projects with a big number of elements must validate the scalability feature.

Acknowledgements

The authors wish to acknowledge the contribution and cooperation of ALMA CIPT and especially to ALMA ADC Software Group. This poster reflects the results of their work.

References

[1] J. Schwarz, A. Farris, and H. Sommer, “The alma software architecture”, Proceedings of SPIE, 5496, p. 190 (2004).

[2] V. Gonzalez, M. Mora, Other, “Fist year of ALMA site software deployment: Where everything comes together”, Proceedings of the SPIE, 7737, p. 7731Z-77371Z-8 (2010).

[3] Zambrano, M., Arredondo, D., Other “Experience virtualizing the ALMA Common Software”, ADASS XIX, 434, 477. (2010)