

CONTROL AND ANALYSIS SOFTWARE DEVELOPMENT AT THE EUROPEAN XFEL



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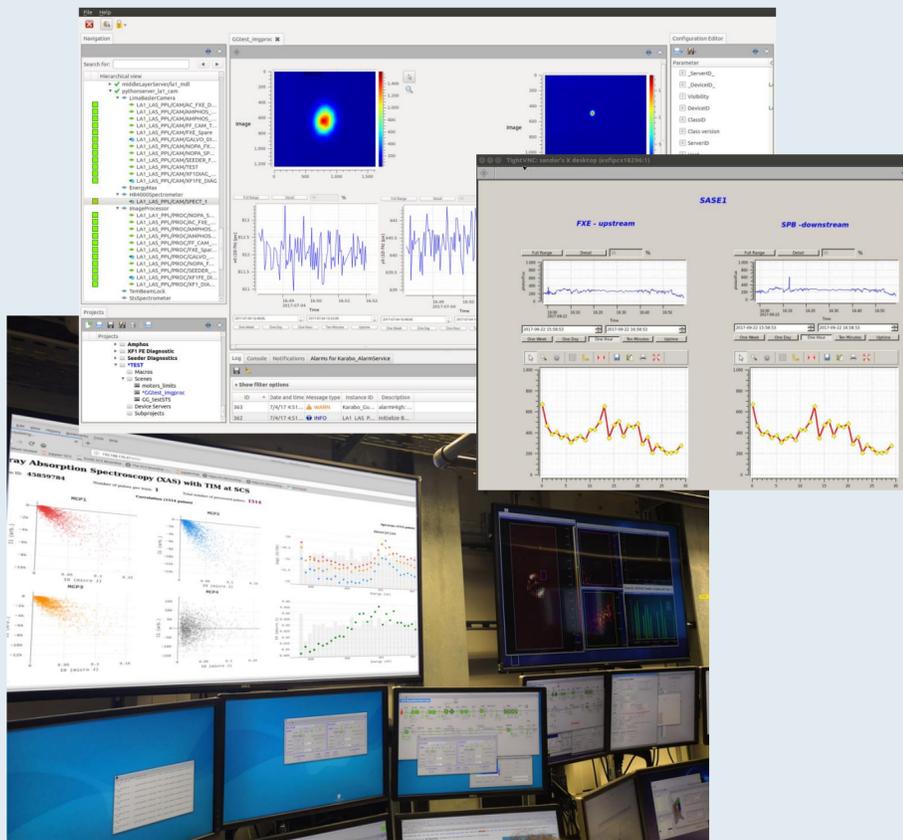
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Agile Project Management (Agile PM), coupled with the DevOps concept, has been worked out as a fundamental approach in a highly uncertain and unpredictable environment to achieve mature software development and to efficiently support concurrent operation. At the European XFEL, Agile PM and DevOps have been applied to provide adaptability and efficiency in the development and operation of its control system: Karabo. In this context, the Control and Analysis Software Group (CAS) has developed in-house a management platform composed of the following macro-artefacts: (1) Agile Process; (2) Release Planning; (3) Testing Infrastructure; (4) Roll-out and Deployment Strategy; (5) Automated tools for Monitoring Control Points (i.e. Configuration Items[5]) and; (6) Incident Management[6]. The software engineering management platform is also integrated with User Relationship Management to establish and maintain a proper feedback loop with our scientists who set up the requirements. This article aims to briefly describe the above points and show how agile project management has guided the software strategy, development and operation of the Karabo control system at the European XFEL.

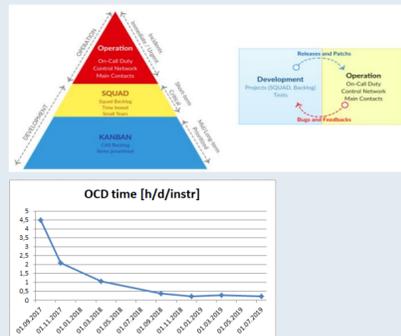
Karabo at European XFEL

In the last three years, the CAS group has managed an increase of its size from 12 to 28 while efficiently integrating the newcomers to the group structure by applying mentorship and a welcome structure with a training program. A good and motivating atmosphere has been achieved where the group members are happily volunteering to help one another or even take on-call support duties. During this period, a workable system was delivered in spite of a difficult task prioritization management environment. The Karabo control system has been made stable and reliable, and is ready to integrate newer and more sophisticated features.



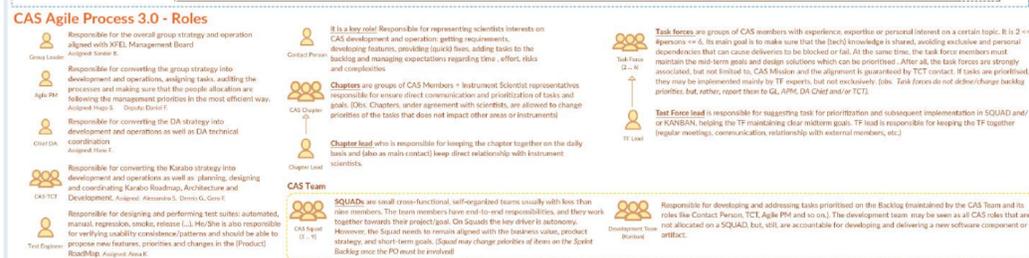
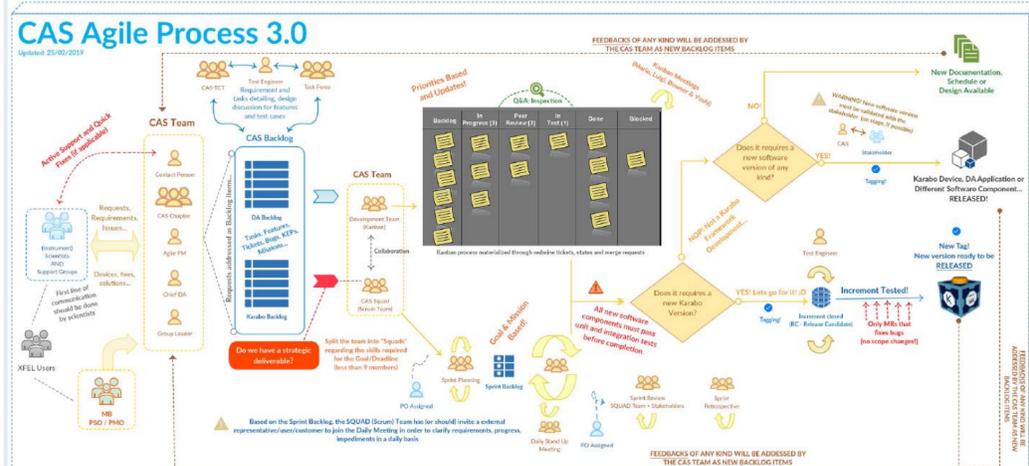
As the stability and robustness of the system has increased, the amount of required support by on-call has measurably decreased; the execution of experiments became more mature.

Year	Month	OCD overtime		[h/d]	[h]
		[h/d/instr]	[h/d]		
2017	Sept	14.09.2017	19.09.2017		43
		21.09.2017	26.09.2017	4,5	36
		28.09.2017	03.10.2017		56
	Nov	09.11.2017	14.11.2017		20
		16.11.2017	21.11.2017	2,1	39
2018	March	23.11.2017	28.11.2017		12
		30.11.2017	05.12.2017		12
	09.03.2018	13.03.2018	1,1	6	
	29.03.2018	03.04.2018		13	
2019	Apr-Sep	01.04.2018	30.09.2018	0,4	140
	Oct-Dec	01.10.2018	31.12.2018	0,2	80
	Jan-Mar	01.01.2019	31.03.2019	0,3	100
Apr-Jul	01.04.2019	31.07.2019	0,2	154	



Software Engineering Management Platform

Agile Management



clear roles and responsibilities
dynamic prioritization
work in Kanban and SCRUM

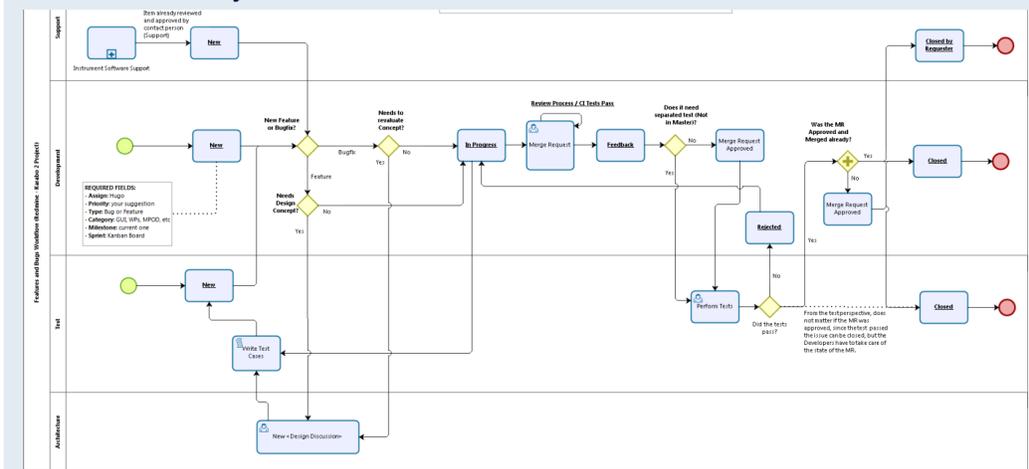
User Relationship Management

engagement by taking PO roles (Squads, and Chapters)
regular feedback collection
release demos, trainings, "Did you know?" snippets

Roadmap Management

Roadmap prepared for 1-1.5 years in advance

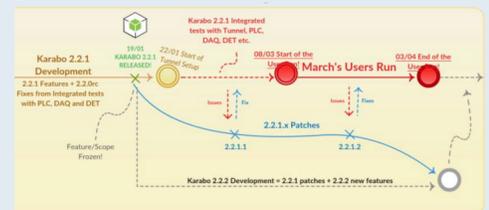
Software Quality Assurance



development process with unit tests, Gitlab code review, CI, acceptance tests
Automated Squish GUI tests, hw-in-the-loop and regression tests

Roll-out, Deployment Management

final tests on special hardware in shutdown
Ansible playbooks to maintain deployment
only hotfixes between deployments
support for on-the-fly development



Monitoring and Incident Management

Incidents and related actions are logged
weekly review of incidents
OCD Manager monitors all device serves in the control system