

DE LA RECHERCHE À L'INDUSTRIE



# Svom Science Ground Segment KP Cnes

7 octobre 2019

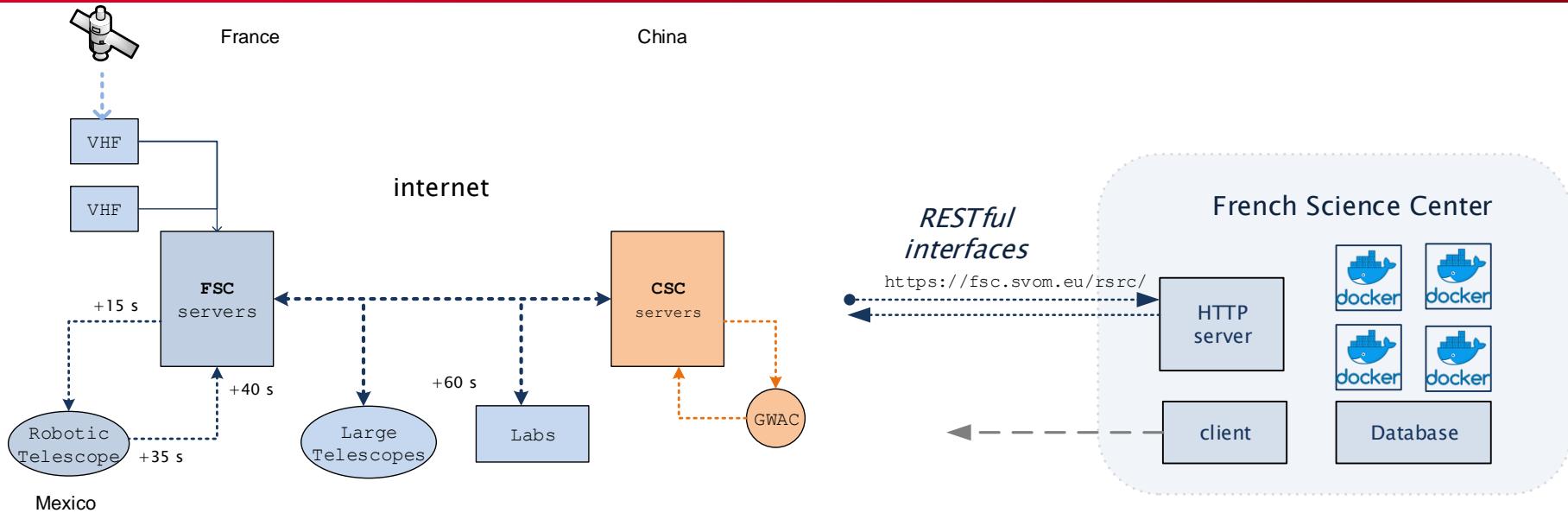


[www.cea.fr](http://www.cea.fr)

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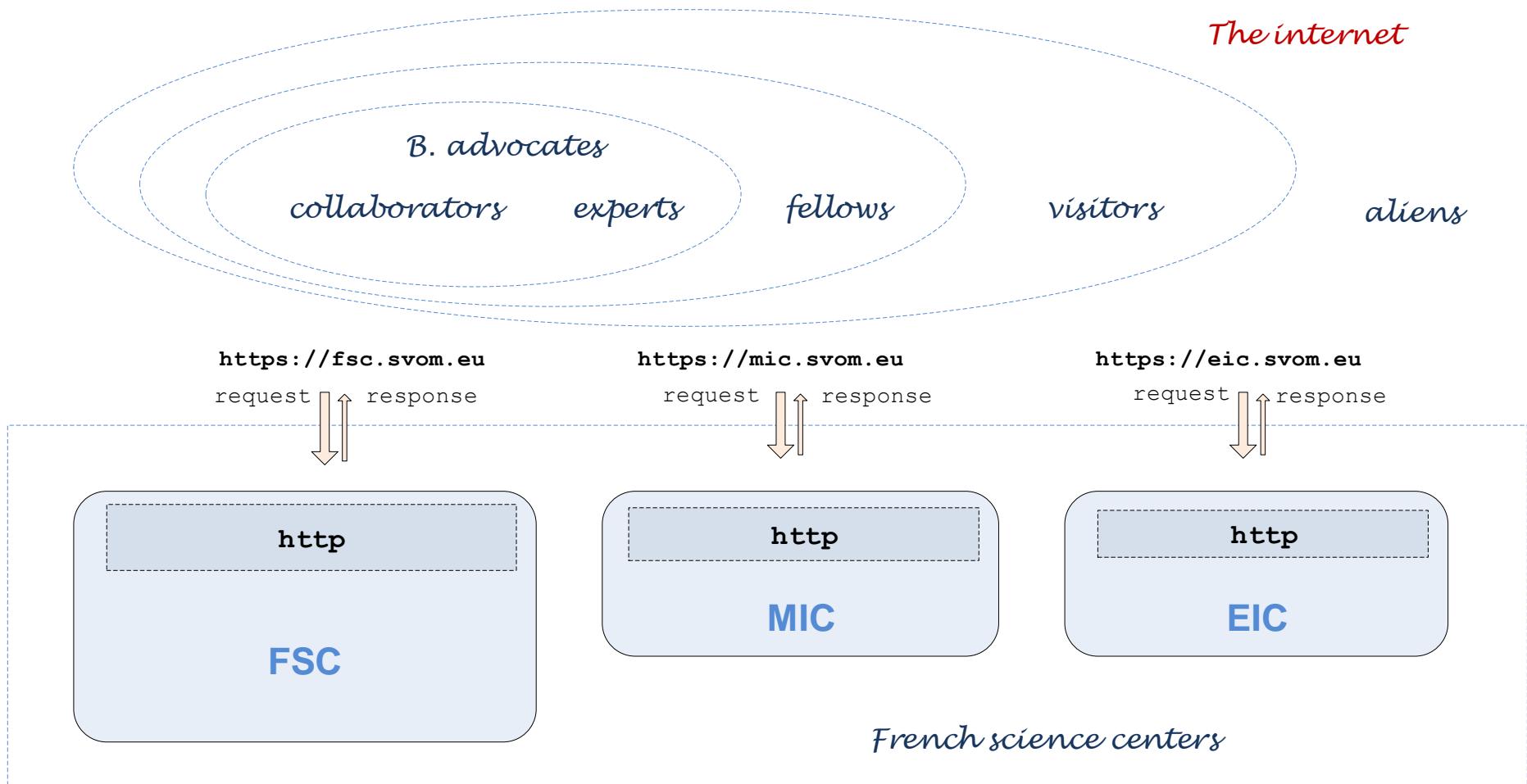
# SVOM SCIENTIFIC GROUND SEGMENT



- Micro services architecture based on Docker containers
- REST full interfaces
- Virtual Observatory compliance
- Production site in In2p3 computing center into a cloud infrastructure
  
- 11 French labs (In2p3, Insu, Irfu) involved in the collaboration
- 5 Dedip + 4 Dap Irfu engineers; QA support from Nexeya

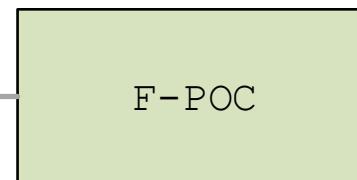
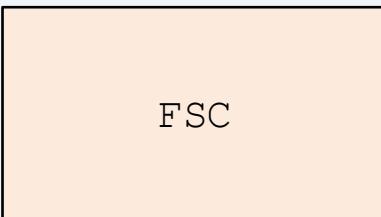
# THE SVOM COMPONENTS

Users access the Svom ground segment on the internet



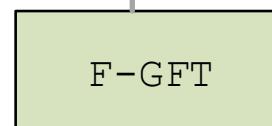
# SGS COMPONENTS

## French Science Ground Segment



Irfu

LAM, Irap, CPPM

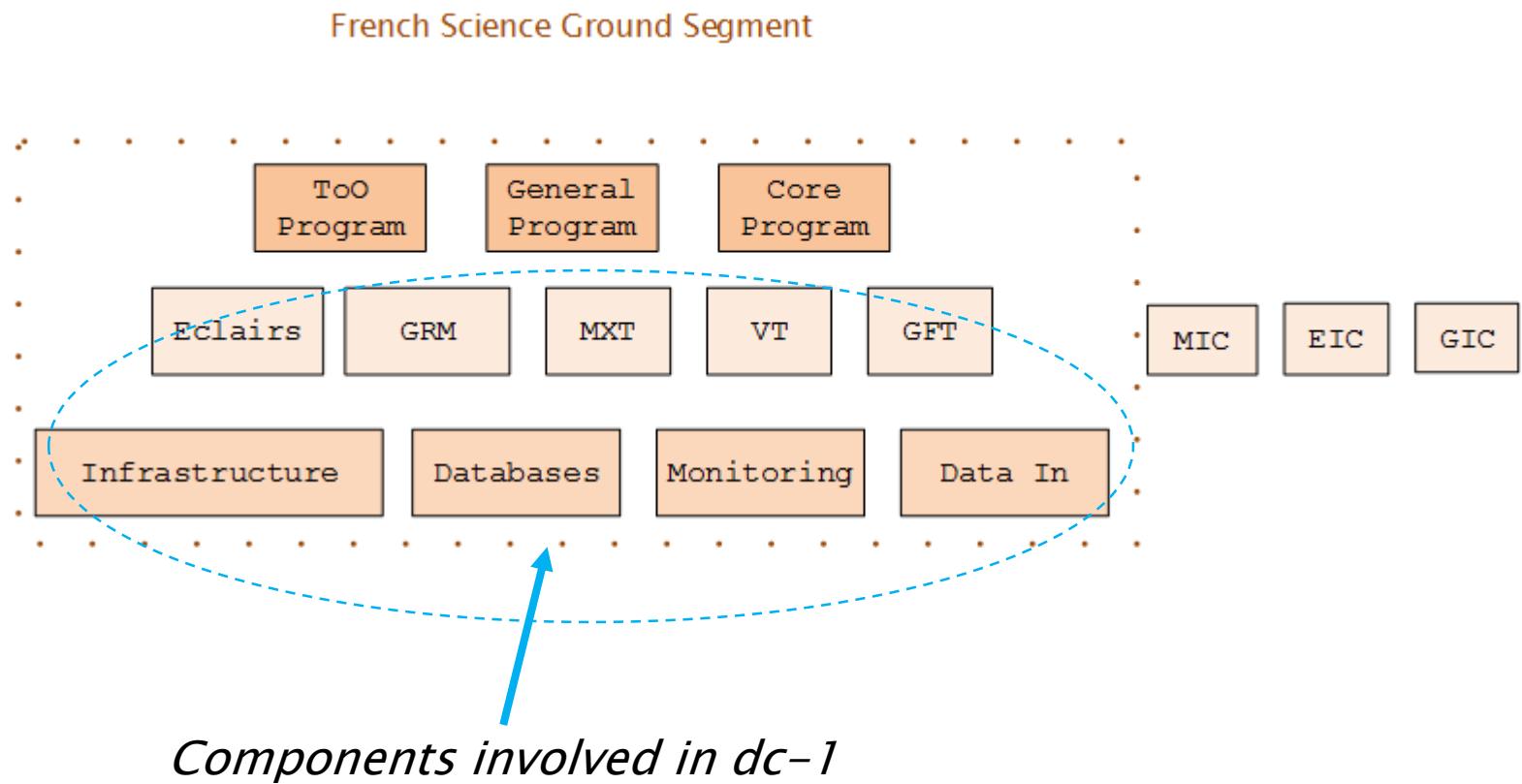


Cnes

From outside the FSC consists of 3 main applications :

1. The *monitor app* allowing the sysadmins to control the system
2. The *core program app* used by the physicists to take care of the GRB detected by the mission
3. The *general program app* dedicated to the programmed observations

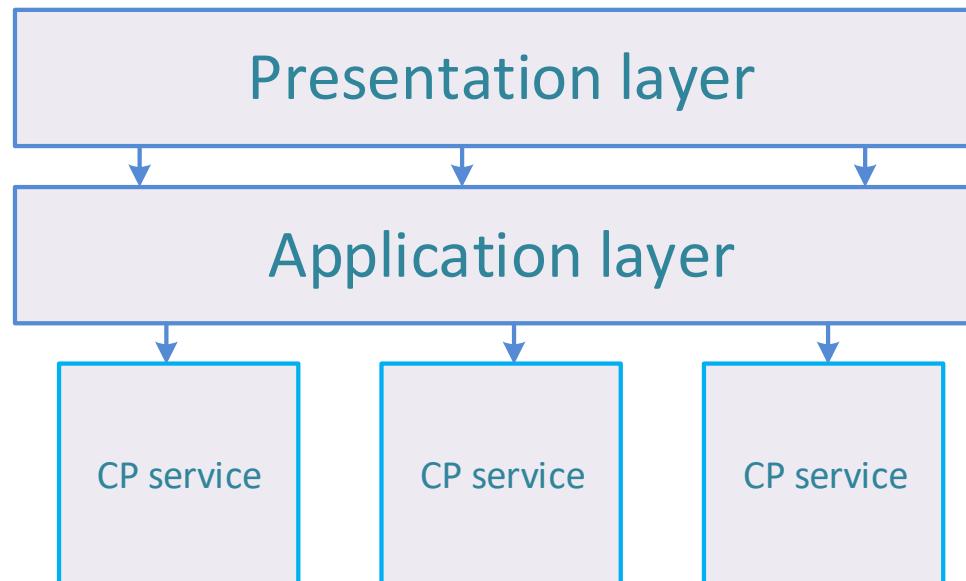
# FSC components & layers



- Goal : coping with the complexity of the FSGS
- 3 layers of software components:
  - Common utilities
  - Data processing
  - Main applications
- 3 <sup>(++)</sup> main applications
  - Core program app
  - General program app
  - Monitoring app
  - ToO app (?)
  - Mission app, BA tools app (?)
- Information hiding
- Separation of concerns

# THE CORE PROGRAM APPLICATION

- Provides the main user interface
- Is available online
- Is the façade to the various CP services



# SOME CP APP FEATURES

- Processing management
  - Current pipelines status
  - Processing manual control
  - Processing history
  - Reprocessing management
- User management, authorizations
  - Registration
  - Role control
- Data production and management
  - Data model
  - Visualization
- Alert management
  - broadcast
  - Follow-up

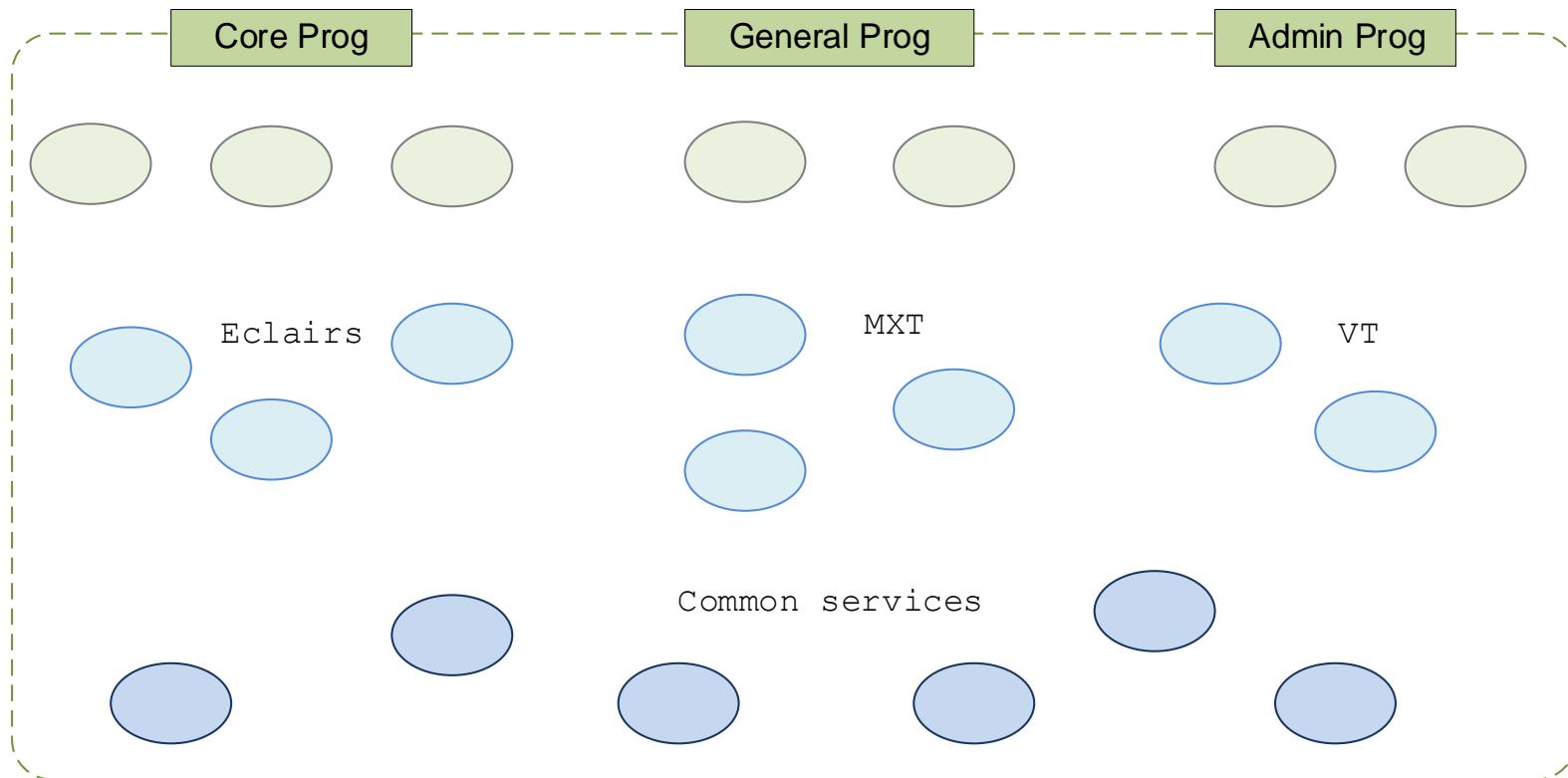
# THE GENERAL PROGRAM APPLICATION

- Provides the main user interface
- Is available online
- Is the façade to the various GP services
  
- Features very similar to the CP's ones
- Dealing with observations instead of alerts
  
- Easier to design since without strict time constraint

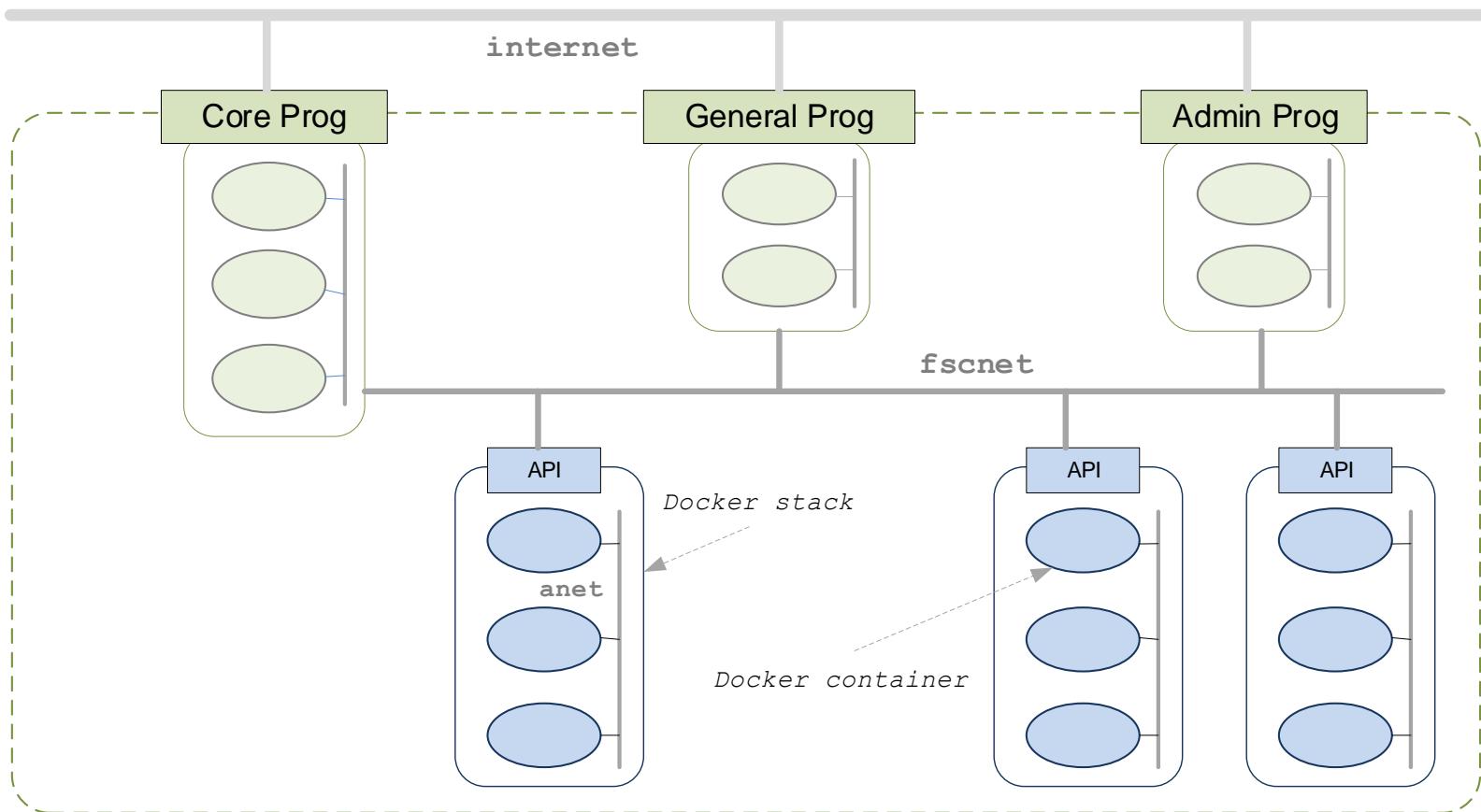
# OTHER MAIN APPLICATIONS

- FSC monitoring
  - Services status
  - Logs management
  - Security
- Mission information
  - Where is the spacecraft ?
  - How is it doing ?
  - VHF network status
  - SAA data
  - Telescopes status
  - Various contents aggregation
- Burst Advocate tools

## Collection of services :



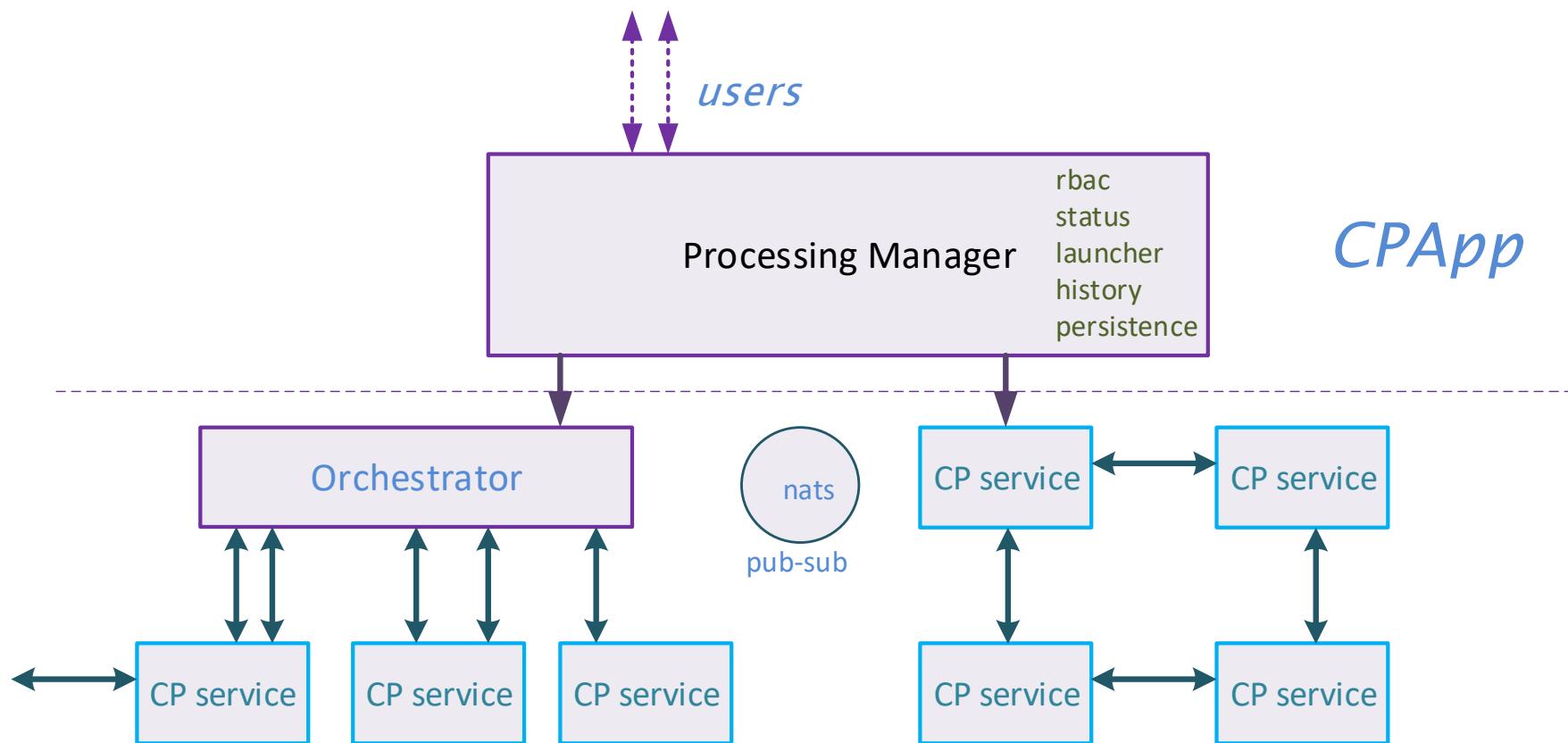
## The FSC swarm:



# MANAGING THE FLOCK OF M-SERVICES

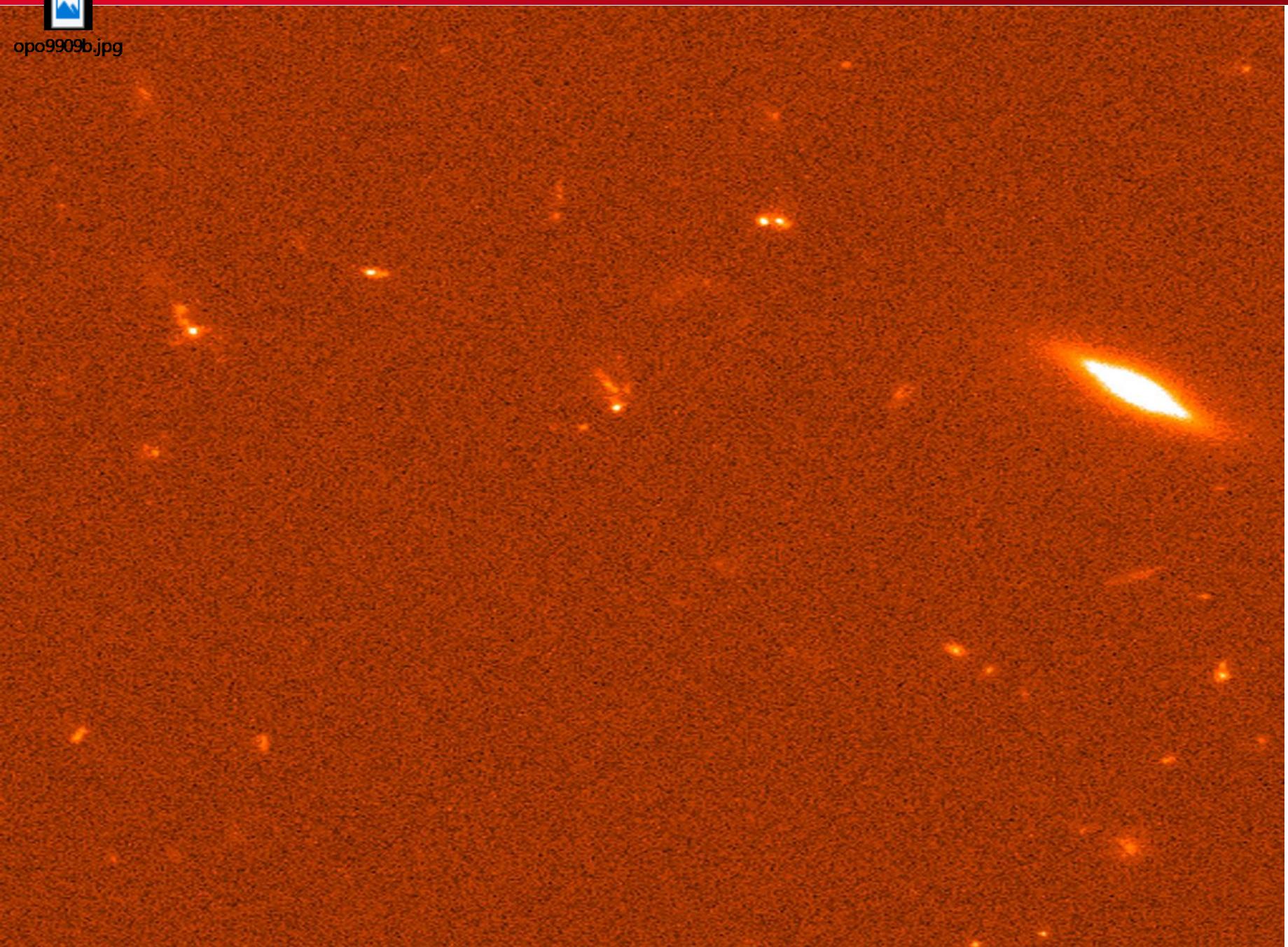


- Orchestration vs choreography vs other
- To achieve a good design we need:
  - to experiment various approaches
  - to read the literature



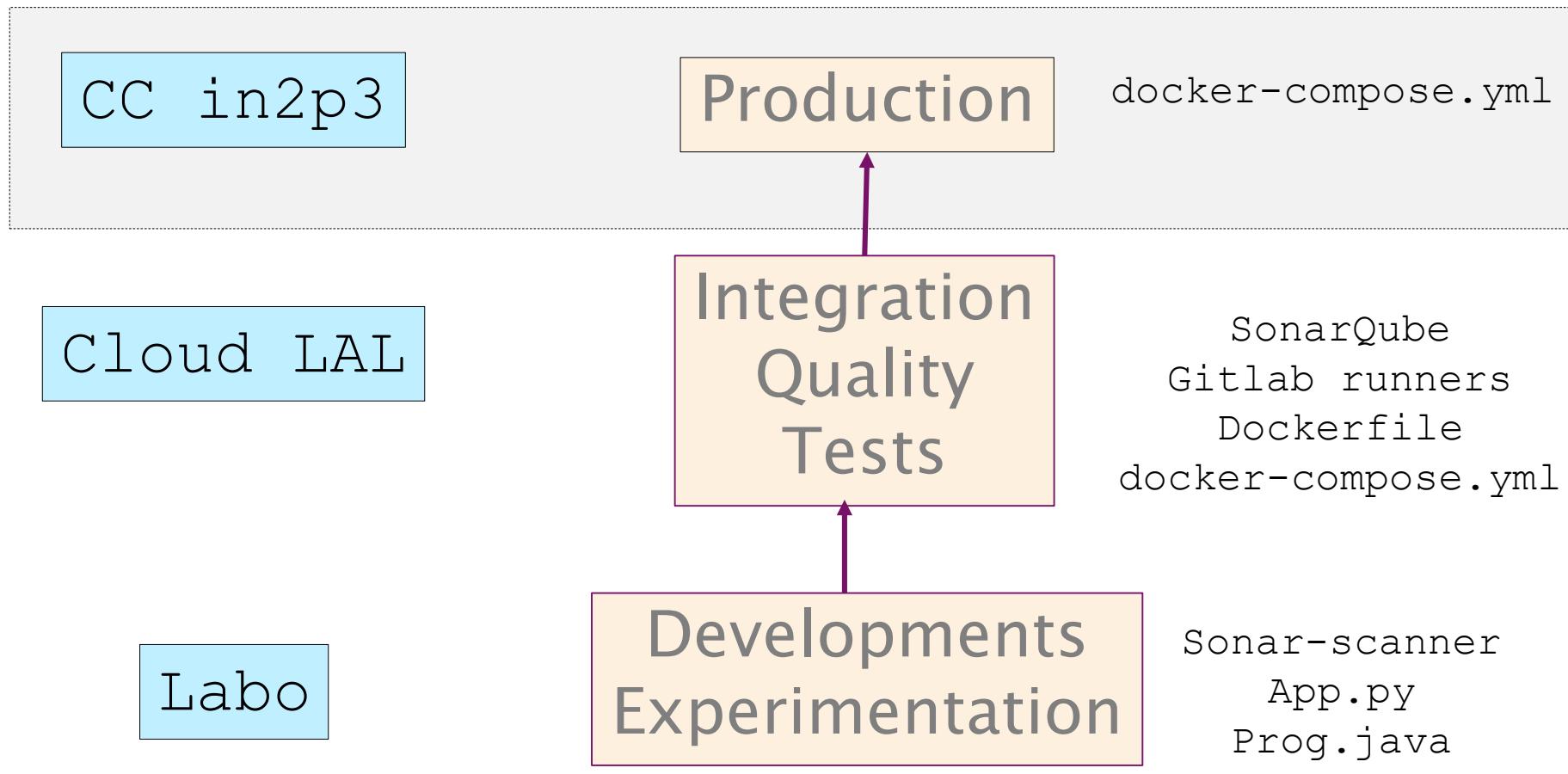


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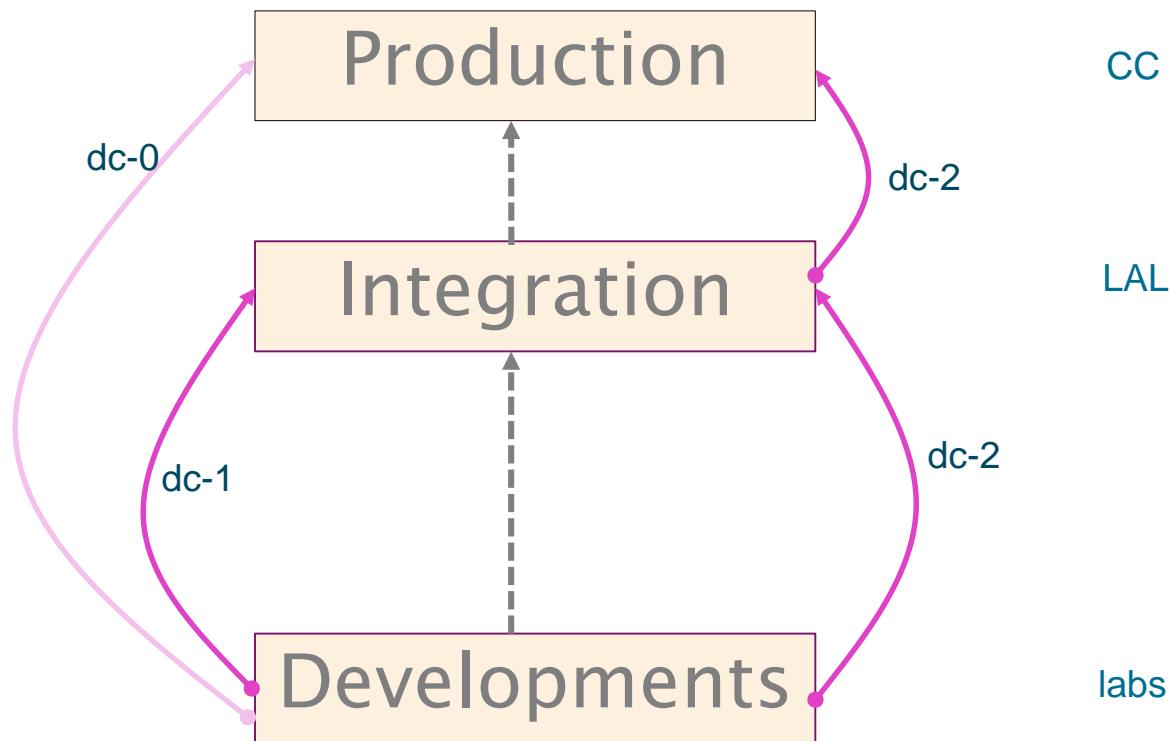
# THE WORK FLOW (1)

A 3 stages procedure :

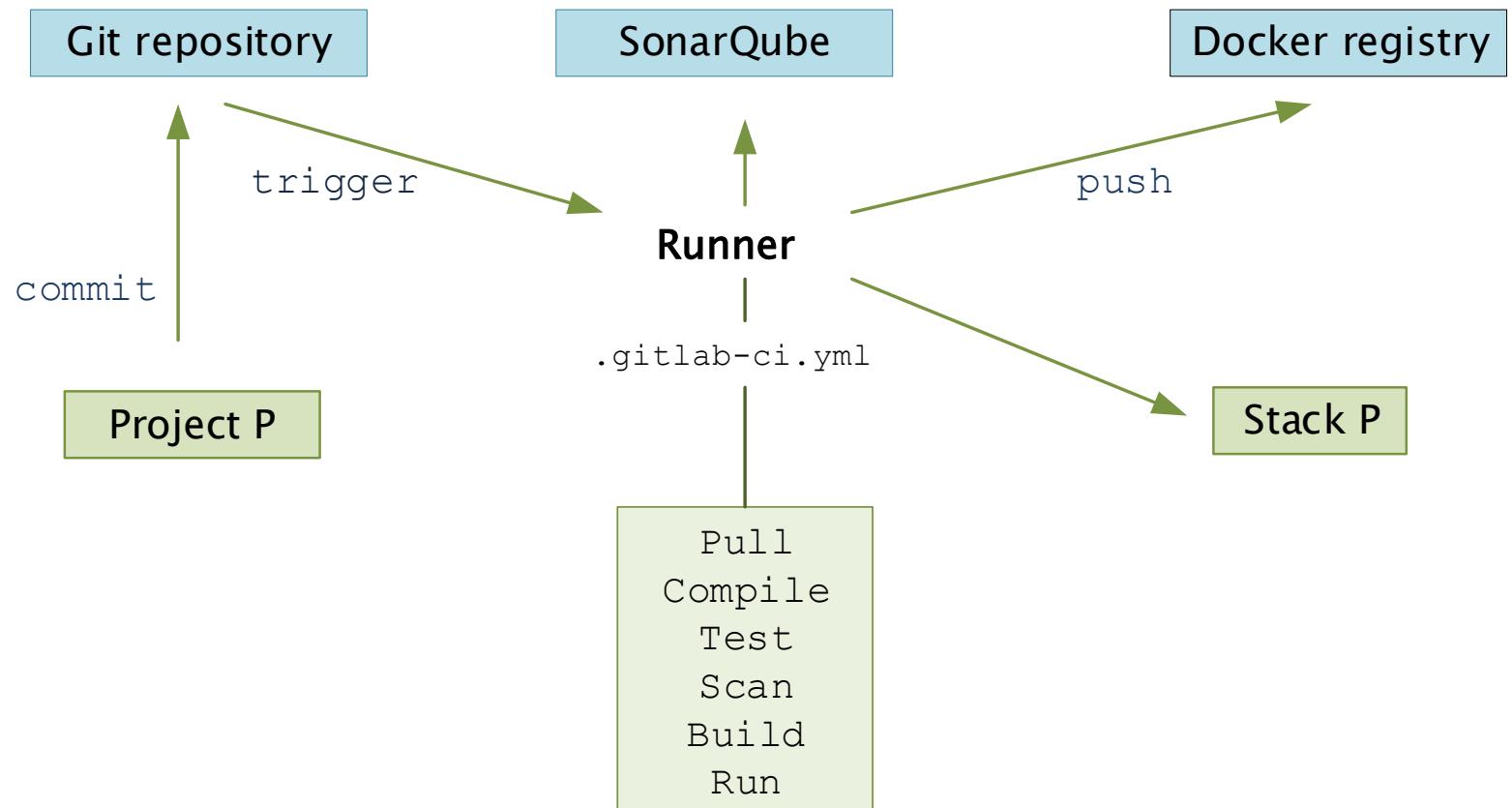


# THE WORK FLOW (2)

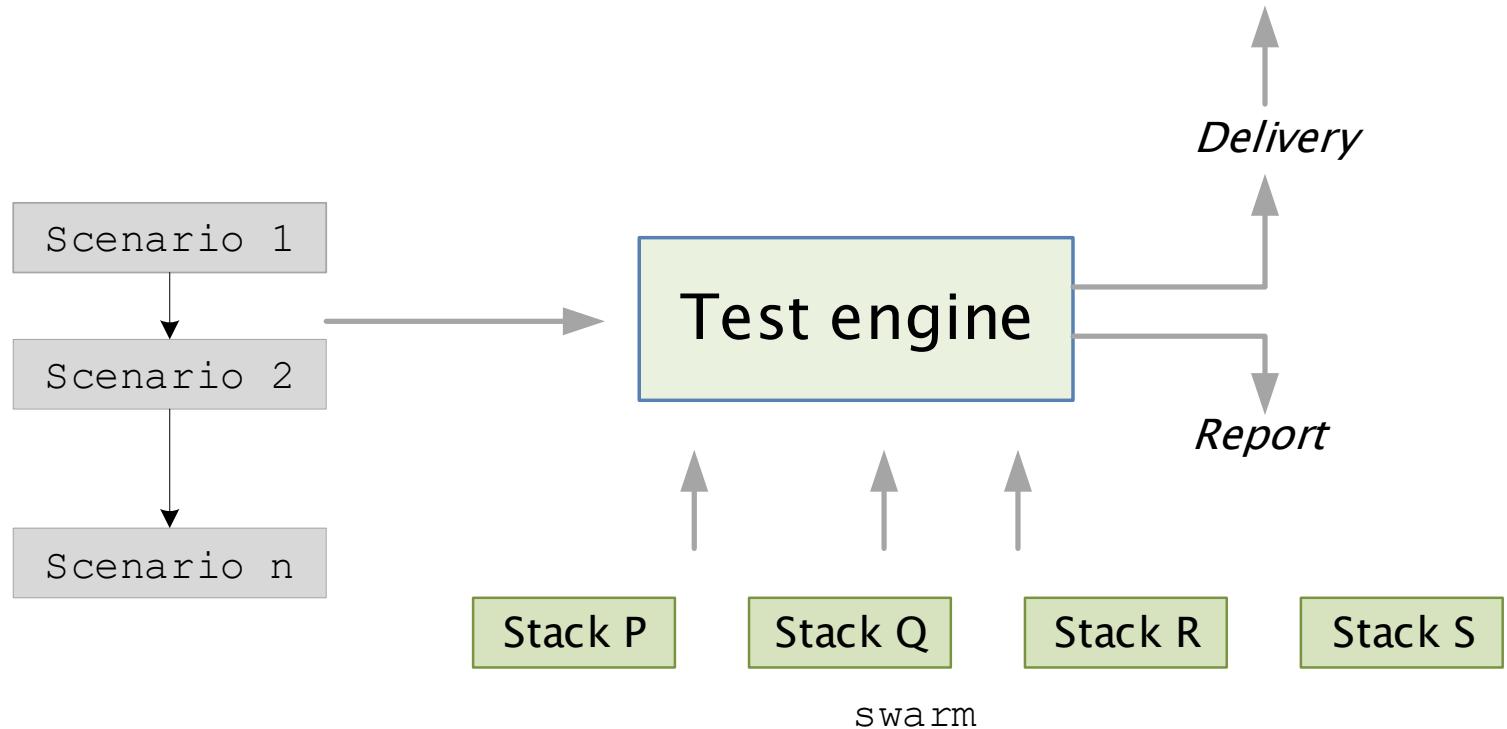
From manual to automatic integration



## First stage



## Second stage



- Objectifs atteignables d'ici la fin de l'année :
  - La liste des projets n'est pas complètement fixée
  - Le déclenchement par gitlab CI n'est pas encore complètement en place
  - Les projets Java sont mieux traités
  - C'est un peu plus délicat pour python
  - Les dettes techniques semblent soutenables
- La couverture des tests est encore beaucoup trop faible

## star eclair's grm common

Failed

Last analysis: October 1, 2019, 2:14 PM

0 A  
Bug

0 A  
Vulnerability

297 A  
Code Smell

82.4%  
Coverage

3.6%  
Duplications

2.1k S  
Python

## star eclair's gp

Failed

Last analysis: October 1, 2019, 11:18 AM

0 A  
Bug

0 A  
Vulnerability

92 A  
Code Smell

52.9%  
Coverage

3.3%  
Duplications

9k S  
Python

## star pipeline bricks

Failed

Last analysis: October 1, 2019, 12:03 PM

3 E  
Bug

0 A  
Vulnerability

47 A  
Code Smell

45.9%  
Coverage

0.0%  
Duplications

3.5k S  
Python, HTML, ...

## star vhf manager

Failed

Last analysis: October 1, 2019, 2:30 PM

0 A  
Bug

0 A  
Vulnerability

57 A  
Code Smell

34.9%  
Coverage

1.3%  
Duplications

8.5k S  
Java

## star orchestra

Failed

Last analysis: October 1, 2019, 2:28 PM

7 C  
Bug

0 A  
Vulnerability

16 A  
Code Smell

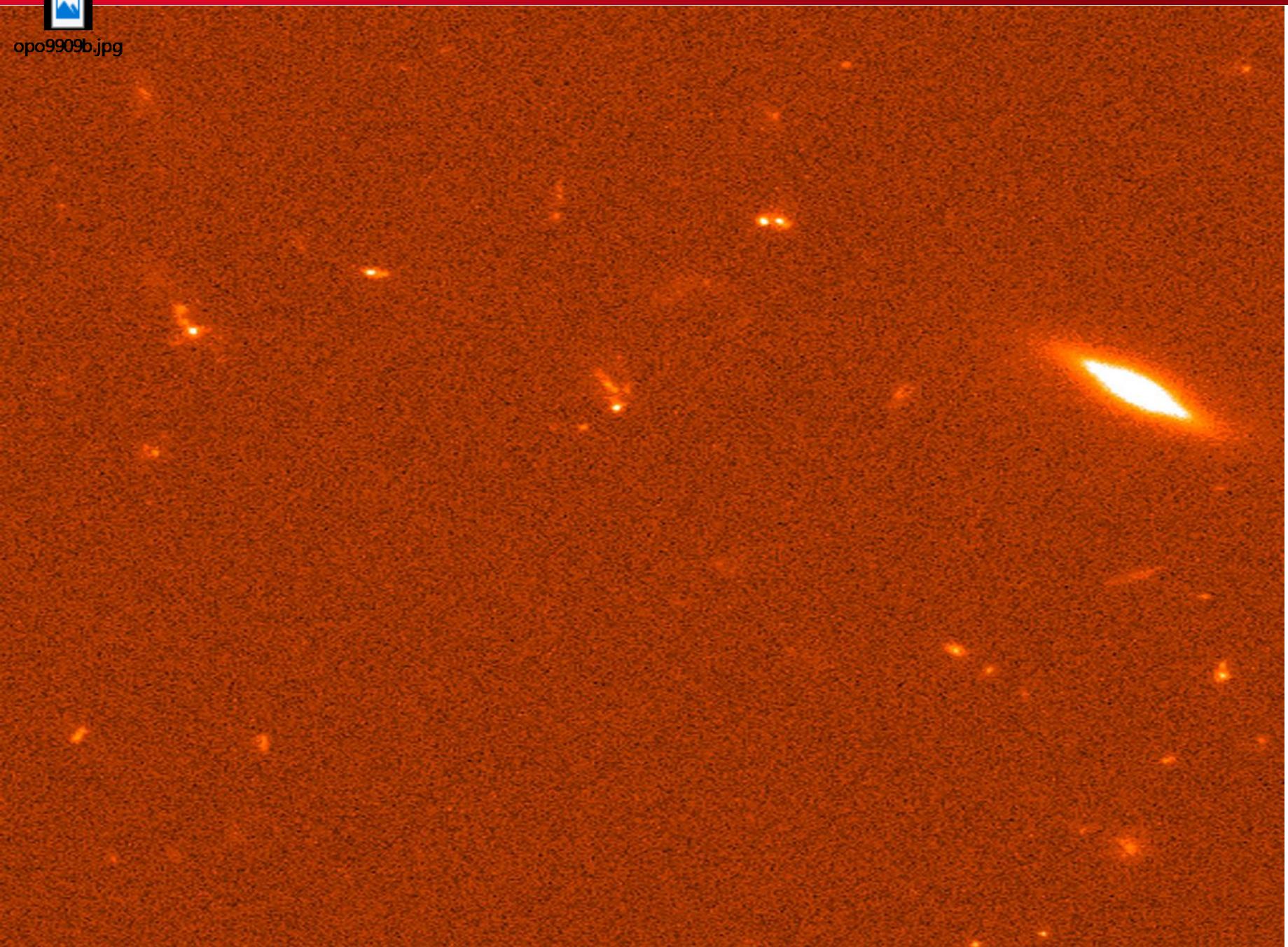
1.1%  
Coverage

1.3%  
Duplications

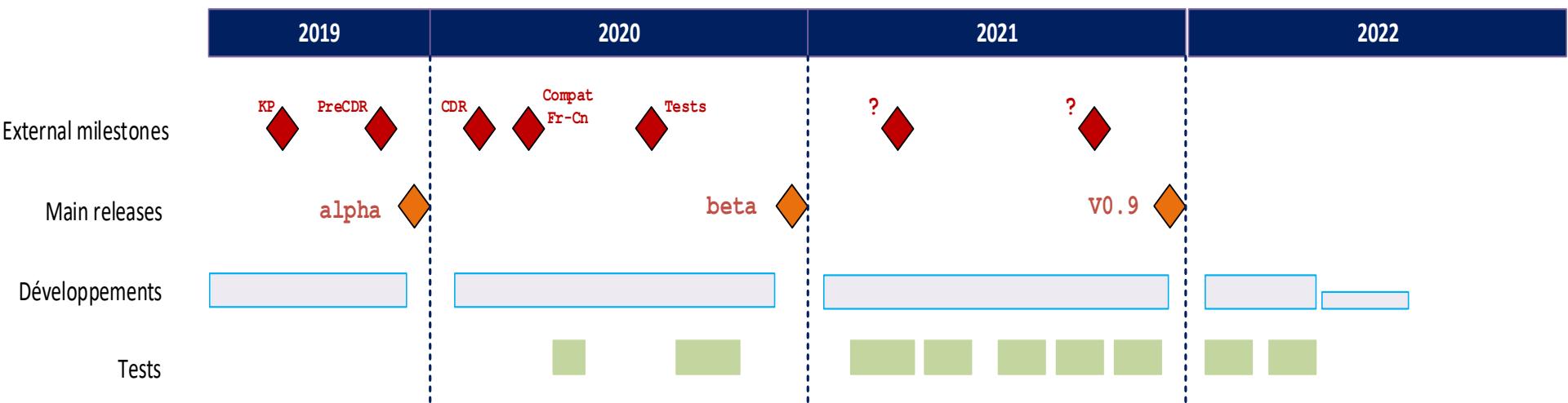
31k M  
XML, Python, ...



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## Main dates



1. KP-2 CEA Saclay 10 & 11 avril 2019
2. KP-3 Meudon 3 & 4 juillet 2019
3. KP-4 Toulouse 9 & 10 octobre 2019
4. KP-5 Strasbourg 18 & 19 décembre 2019

Revue Cnes début octobre les 7 & 8

Livraison version alpha : 13 décembre 2019  
Préparation CDR 2019

Clôture DC-1 fin janvier 2020

1. Terminer proprement l'intégration dc-0
  1. Laissé en stand-by : trop coûteux
2. Corriger tous les problèmes de qualité
  1. Assez avancé : le cadre est en place
  2. Le taux de couverture des tests reste encore faible
3. Mettre en place la procédure d'IC, DC
  1. L'intégration continue (IC) a avancé
  2. Le travail sur la livraison continue (DC) n'a pas commencé

1. Mettre en place l'utilisation de Jira
  1. Trop ambitieux, donc reporté
2. Mettre en place la sécurité
  1. Rien de sérieux encore en place mais prévu
3. Implémenter l'authentification
  1. En préparation
4. Initialiser le MXT IC
  1. Reporté

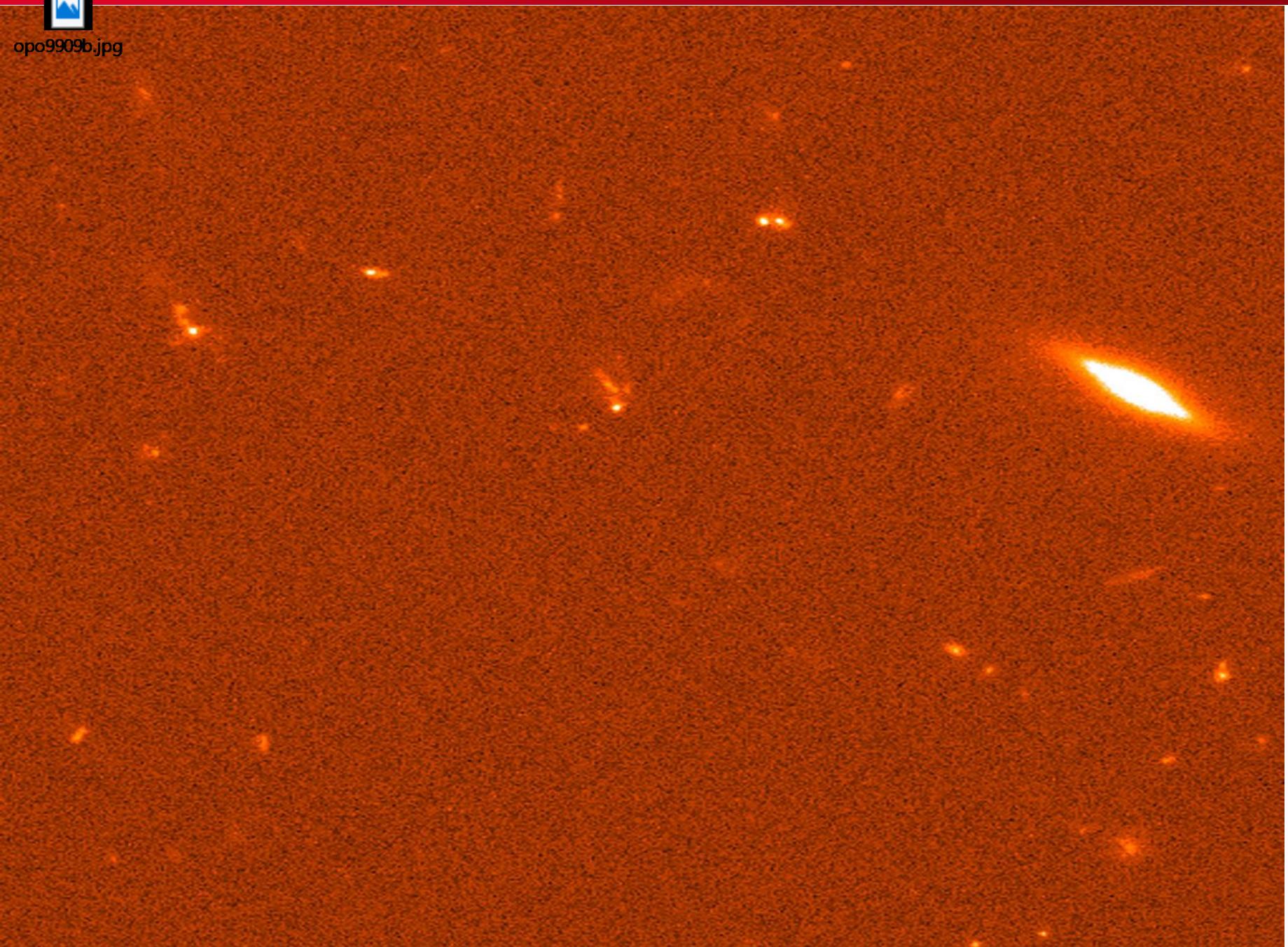
1. Développer les pipelines scientifiques
  1. En bonne voie
2. Préparer les applications CP, GP, ToO, Monitor
  1. CP : le problème est posé
  2. GP : le problème est posé mais non résolu
  3. ToO : éventuellement reporté à plus tard (?)
  4. Monitor : en bonne voie
3. Établir proprement l'architecture du FSC
  1. Respecter les principes de conception logicielle

# VALIDATION PLAN

- We will strive to keep a (at least partially) valid system at all times,
- A version is deployed if it passes all the tests.
- The validation plan for the FSC within the full ground segment will be designed later (DC-2).
- Actually, validation should be done continuously



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# THE DC-0 MAIN GOALS

1. To validate the architecture
  - a) to Identify the main components
  - b) to implement them in Docker containers
  - c) to implement the REST interfaces
  - d) to implement the messaging
2. To get familiar with the software toolkit
  - a) Gitlab, Slack, Polarion
  - b) Docker technology
  - c) Openstack cloud environment
3. With priority given to VHF data stream processing

# THE DATA CHALLENGE 0

- The FSC is developed continuously
- The *pre-alpha* version was delivered by the end of December 2018
- The goal of the dc-0 was to validate the implementation of this *pre-alpha* version
  
- The data challenge consists of a suite of tests formally defined
- The suite is managed by our tool Polarion

# THE DC-0 PERIMETER

- The two lowest layer : infrastructure & pipelines
- The FSC but not the instrument centers
- Artificially generated data with realistic format
- But without any actual physical content
- Built : 14 Docker stacks in the swarm and 19 services in production

# LA SITUATION EN FÉVRIER 2019

- Maintenant, avec un peu de retard, on a un groupe d'applications s'exécutant sur une machine du cloud au CC de Villeurbanne.
- Elles coexistent pacifiquement mais elles restent très timides dans leurs échanges
- Il faut maintenant les pousser à dialoguer par messagerie

# UN BILAN DU DC-0 (1)

- La collaboration a assez bien fonctionné
- Les délais ont été plus ou moins respectés
- Ce fut un premier entraînement pour la suite
- La procédure d'intégration est satisfaisante
- Les configurations sont maitrisées
- Il reste des améliorations à apporter
- Mais c'est maintenant un acquis pour la suite
- Les conteneurs docker ont démontré leur efficacité
- La gestion du système basée sur Swarm est satisfaisante
- La technologie semble maîtrisée par la collaboration

# UN BILAN DU DC-0 (2)

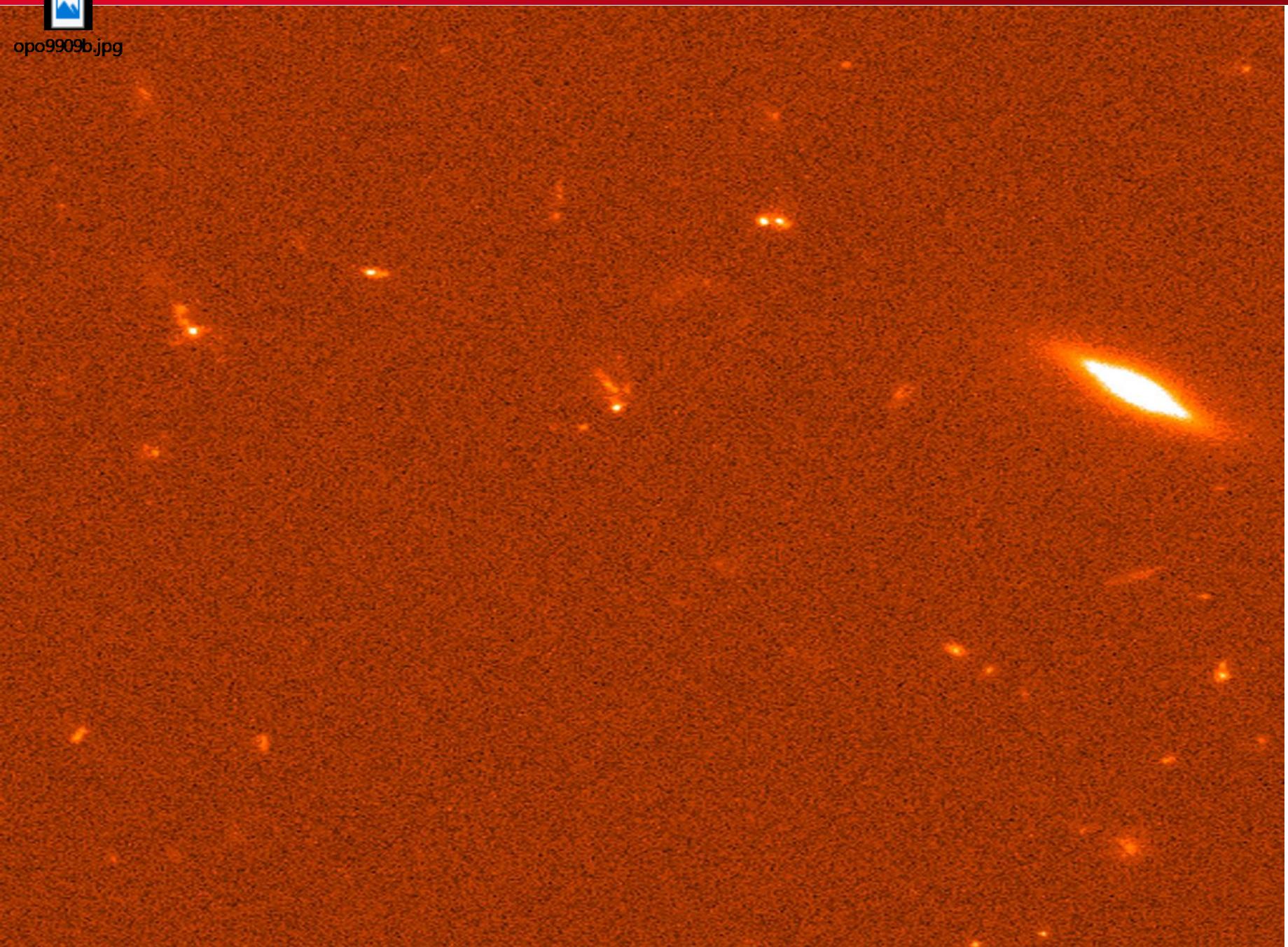
- Les applications dans leur version pre-alpha fonctionnent
- Les 3 langages de programmation utilisés (python, java & javascript) semblent maîtrisés
- Ils sont suffisants pour la suite
- La conception basée sur des interfaces Rest a montré son efficacité
- L'utilisation de la messagerie semble prometteuse
- La gestion de notre cloud est restée embryonnaire
- Le système OpenStack semble prometteur

# UN BILAN DU DC-0 (3)

- Il y a cependant des points qui devront être améliorés
- Les temps de développements ont été sous-estimés
- Les aspects AP/AQ ont été quelque peu négligés
- Il y a pas mal de doc, c'est bien, mais il n'y en a jamais assez
- Le traitement du flux VHF suivi d'envoi de VoEvent est fonctionnel.



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# THE DATA CHALLENGE 1

- The *alpha* version is due by the end of 2019
- The dc-1 will be run to validate this new version
  
- The data challenge consists of a suite of tests formally defined
  
- The suite is roughly defined in Polarion

# FSGS VERSION ALPHA (1)

The alpha version is expected :

- to accept incoming streams issued by the VHF stations,
  - In progress
- to accept incoming messages sent by ground telescopes,
  - postponed
- to authenticate and authorize securely S vom principals,
  - In progress
- to accept and manage user connections,
  - Soon available
- to be capable of ingesting X-band data,
  - In progress
- to communicate with the instrument centers,
  - In progress for EIC

# FSGS VERSION ALPHA (2)

The alpha version is expected :

- to communicate with the Chinese centers,
  - Not impossible
- to manage problems caused by communication failures,
  - Not done
- to run application servers giving access to mock scientific products,
  - Postponed
- to execute the set of scientific pipelines,
  - In progress
- to broadcast alert messages,
  - Almost ready
- to be sufficiently documented.
  - Documented, not sufficiently

- Must be edited in Polarion
- It must consist of lists of work items *test case*
- A WI must describe a set of test steps
- Each section of the DC-1 spec has to come with a **very short** introduction
- DC1 definition should have been frozen by July 3<sup>rd</sup>



# DC-1 VALIDATION

- A validation group should be nominated
- It will have to honestly evaluate the results
- the integration procedure (`gitlab-ci`) should work
- identified git projects should be successfully deployed in the LAL cloud
- SonarQube should find *0 bug and coverage > 50%*
- at least 50 % of the Polarion WI should pass

# TOWARD THE DC-2

- Definition available by the end of June 2020
- Main scientific pipelines version beta running
- Continuous integration + delivery working
- Core program application version beta running
- All instrument centers available

