FSC Architecture and Data Flow







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on behalf of the FSGS developing team

FSC Architecture Principles

The FSC architecture design henges on several key principles such as microservices, centralized messaging and orchestration, etc.

- The FSC is composed of serveral services, each handling a single well-defined task
- Distinct services have two ways of communicating between each other :
- One-to-one communication are performed through **REST API** interfaces (using standard HTTP protocol)
- One-to-many communications, such as broadcasts, are made using a centralized messaging system : **NATS**
- Relevant data produced by FSC services are saved in a **PostgreSQL database cluster**

FSC Architecture Principles

The FSC infrastructure has been defined especially to support the principles agreed upon in the architecture

- The FSC makes heavy use of **docker** as a solution to deploy and contain the FSC software
- The FSC is running on the cloud. There are **two independent instances of the FSC** running continuously 24/7 :
- The development instance of FSC is running on servers at **IJCLab** in Orsay. The software developped by our teams are deployed continuously on this FSC instance→ all webUls related to the FSC production site are hosted at https://fsc.svom.org/
- The production instance of FSC is running on servers at **CC-IN2P3** in Villeurbanne near Lyon. The software are deployed in production only after validation on the development instance → all webUIs related to the FSC production site are hosted at https://fsc.svom.eu/
- The FSC instances are as closed as possible, meaning few services communicate with the outside world. As a result of this choice, most monitoring and control is made through **dedicated web user interfaces**



Overview of the complete VHF data flow:





Focus on the preprocessing step :





Example of second-line pipeline execution :





Overview of the complete X-Band data flow:





The vhfmgr service at FSC is in charge of the reception of VHF packets and the storage of decoded packets in the VHF DB

- **Provides a REST API** on which the VHF antennas can post binary-encoded VHF packets in hexadecimal format
- **Decodes the packets** using the packets_decoder service REST API to get packet content in JSON format
- Removes duplicated and faulty packets
- Stores data in **VHF-DB**
- Broadcasts NATS messages notifying the availability of data (mostly for orchestrator and B.A. monitoring use)



The xbandmgr service at FSC is in charge of the download of X-Band packets and their storage in the X-Band DB

- **Triggered upon notification** that new data is available on the SSDC FTP server
- **Retrieves all packets** in LOc format from the FTP server
- **Uploads all retrieved files** in LOc to the X-Band DB
- Broadcasts **NATS messages** notifying the availability of data (mostly for orchestrator use)



The FSC orchestrator service is in charge of the pipelines orchestration. It is essential to the real-time aspect of the alert processing

- **Gathers information** from the various DB upon reception of NATS messages notifying the availability of new data
- Uses the **BURST_ID** to identify all data concerning a given event
- **Triggers pipelines automatically** when all their input are available
- Gives all necessary informations to the pipelines through the REST processing requests, in order to allow pipeline to retrieve the proper input data
- Monitors ongoing processings and handles delayed processings and queues
- **Stores all processings**, their status and their logs in a dedicated database



The orchestrator webUI provides real-time visualisation of the content of the orchestrator DB: https://fsc.svom.eu/orchestra-web/_(with access-control and permission handling)

Orchestrator webUI PROCESS TABLE GRAPH								FSC henri.louvin@cea.fr ▼
Utilities	c						Search	
Filter Data 👻	DATE -	PROCESS	BURSTID	OBSID	PASSID	STATUS	PIPELINE	
All time	2021-07-08T13:34:24	N1_NOTICE	sb21070855	2567973542		complete	notices_creator	0 C I
Process	2021-07-08T13:34:12	N1_NOTICE	sb21070855	2567973542		complete	notices_creator	0 C I
BurstID	2021-07-08T13:34:05	OBTLOC_ECL	sb21070855	2567973542		complete	vhfpreproc_obtloc	0 C'
sb21070855	2021-07-08T13:33:59	N1_NOTICE	sb21070855	2567973542		complete	notices_creator	 ⊘ C⁴
	2021-07-08T13:33:52	OBTLOC_ECL	sb21070855	2567973542		complete	vhfpreproc_obtloc	• C'
PassiD	2021-07-08T13:33:51	OBTLOC_ECL	sb21070855	2567973542		complete	vhfpreproc_obtloc	0 C
Status running queued failed complete vanished								12 - 1
Custom Filter Query 👻								
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