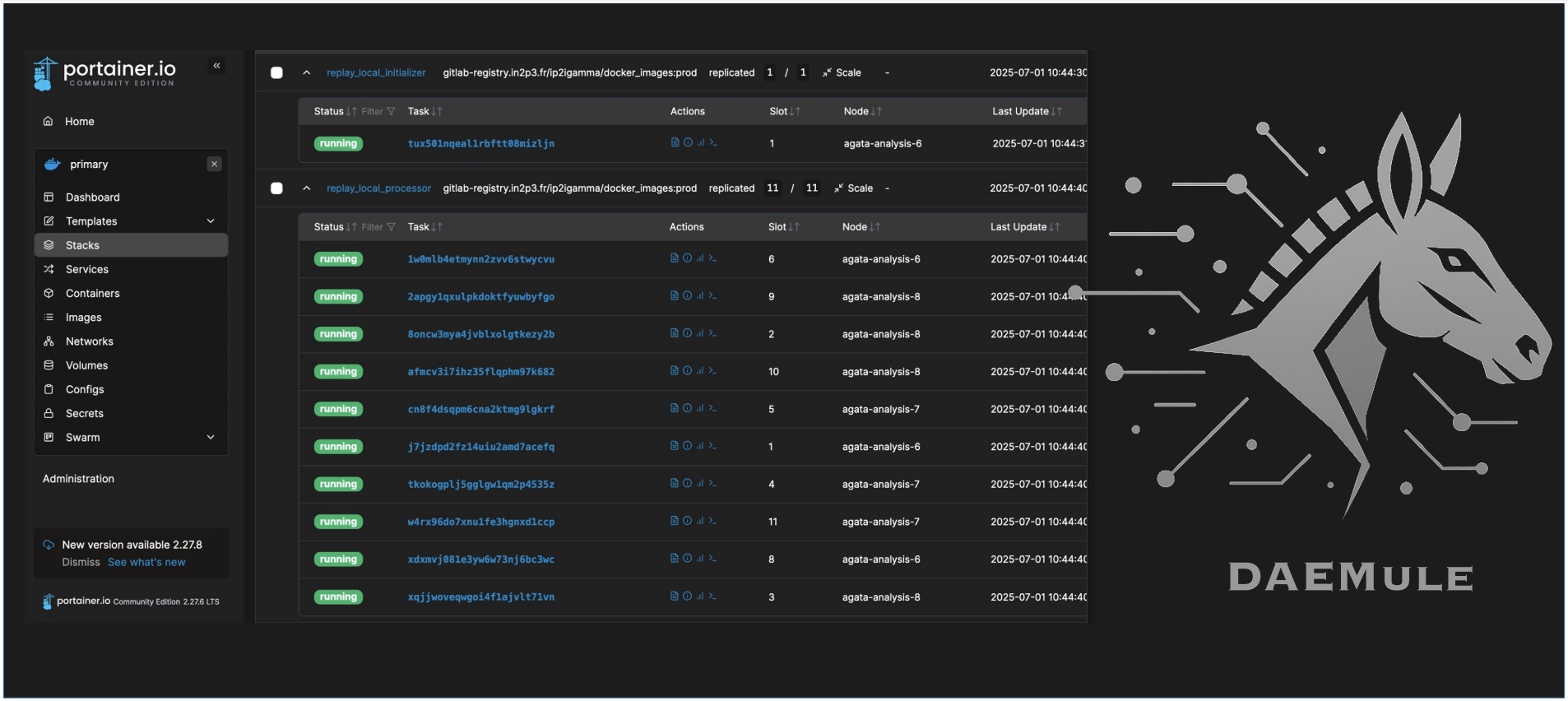
A Distributed Agata Emulator



Cluster and Scalability
Local level Processing
Global Level Processing

G. Baulieu

New analysis servers set up at Legnaro (P. Le Jeannic)

- 4 new machines
  - 2 x Xeon Silver 4310 (48 threads) @ 2.1 GHz
  - 128 GB of RAM
  - 10 Gbs access to data (anodeds5)

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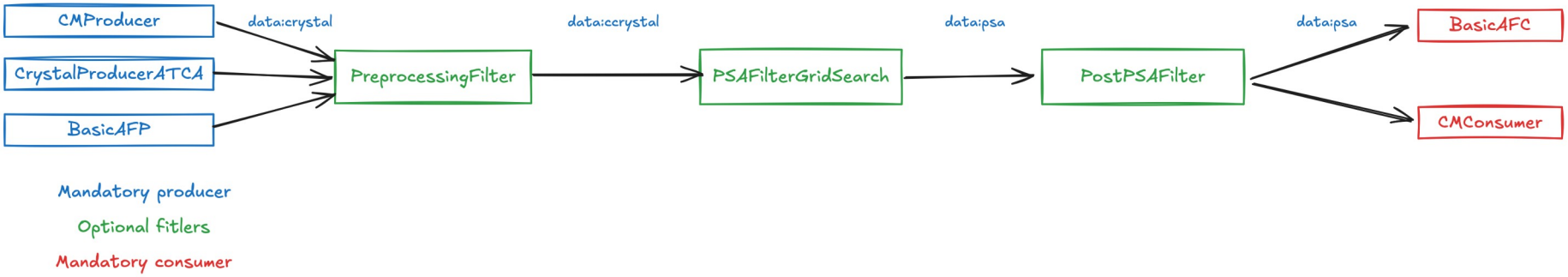
We need to be able to use computing power where it is : dispatched on different servers

Distributed Agata Emulator (DAEmule)

- A new AGAPRO emulator
- Designed to be scalable and able to run on clusters
- Using the same actors and configuration folders (from genconf.py)
- Different instances can communicate through a Central Memory system (REDIS implemented)
- Still under development, first tests and data validation performed at Legnaro end of July.

Local level processing

- Subset of actors available



- Each actor runs in its own thread
- Producer : choice between Central Memory, .cdat files or ADF files
- Filters : On/Off on Preprocessing, PSA and PostPSA
- Consumer : choice between ADF file and Central Memory
- 3 run modes :
  - Simple
  - Parallel
  - Batch

Local level processing

- Simple mode :

  A single emulator on a single crystal folder, on a single machine.

- Parallel mode :

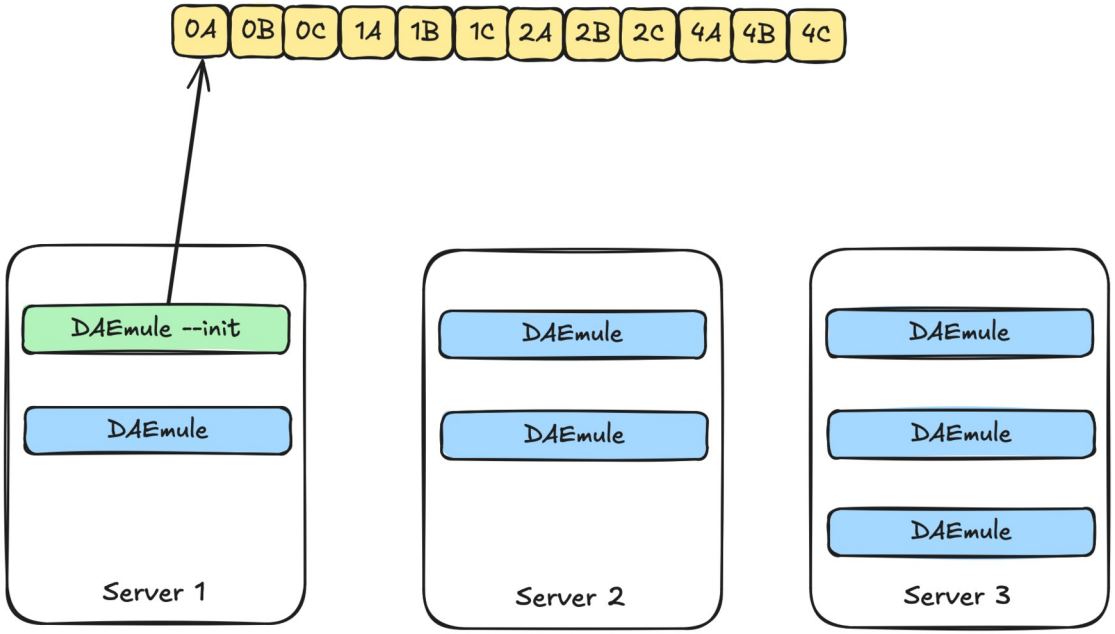
  As many emulators as crystal folders, on a single machine. Define the number of emulators run in parallel. (~FEMUL behaviour)

- Batch mode :

  A single emulator per DAEmule instance but many instances on different servers.
  Each DAEmule instance run on one crystal folder and then ask for a new one.

Local level processing

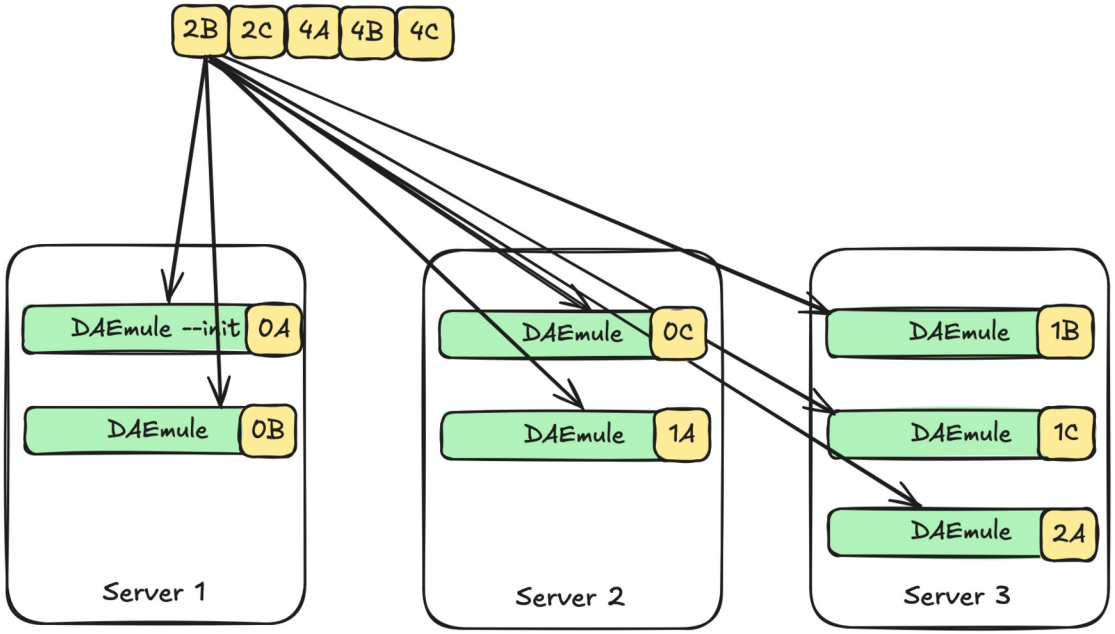
- Batch mode overview :



→ from configuration file to Central Memory list

Local level processing

- Batch mode overview :



→ each instance fetches a workload from central memory (atomic)

Local level processing

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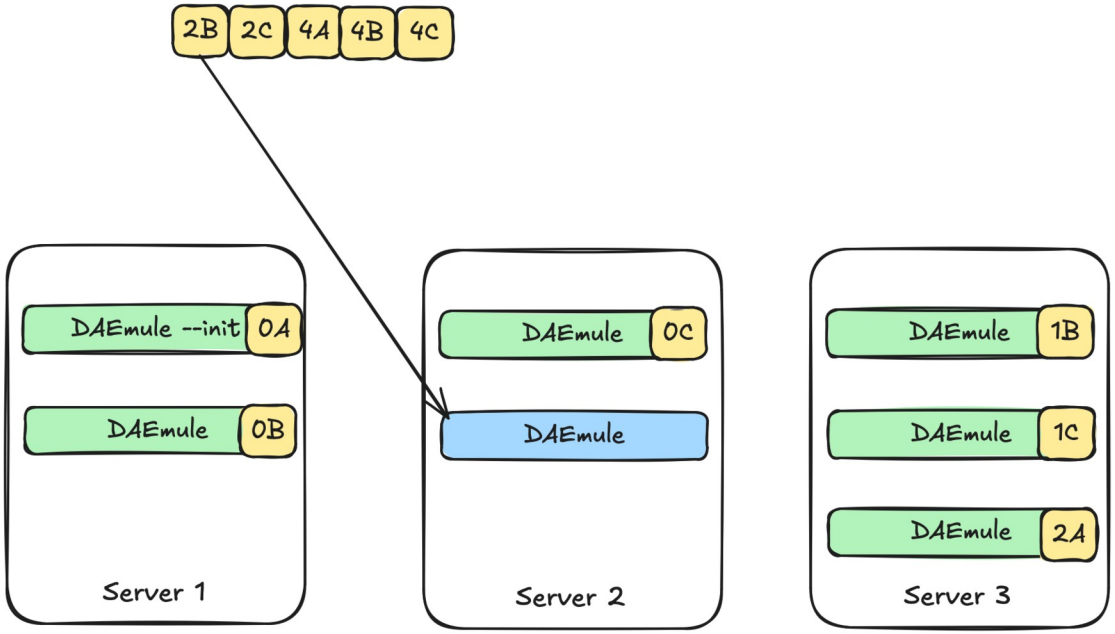

→ when an instance is done with its workload, it asks for a new one

Local level processing

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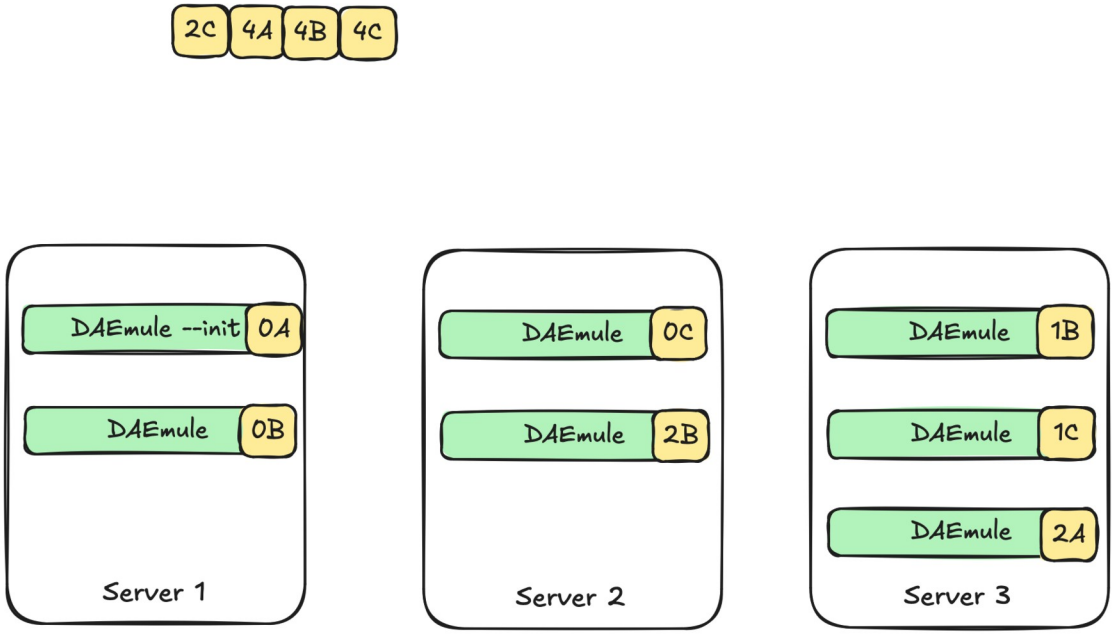
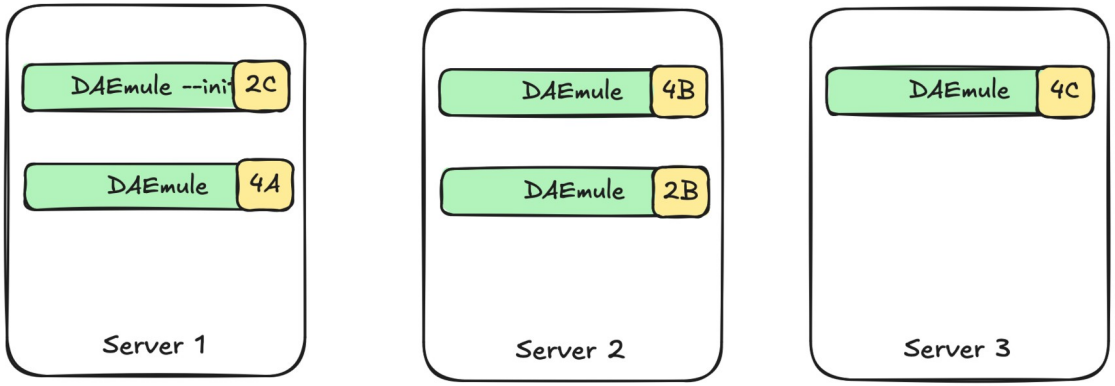


Local level processing

- Batch mode overview :



→ if the workload list is empty, the instance stops

Handling the cluster

- Launching many instances on different servers is a pain

  → we can automatize this process using **Docker Swarm** and **Portainer**

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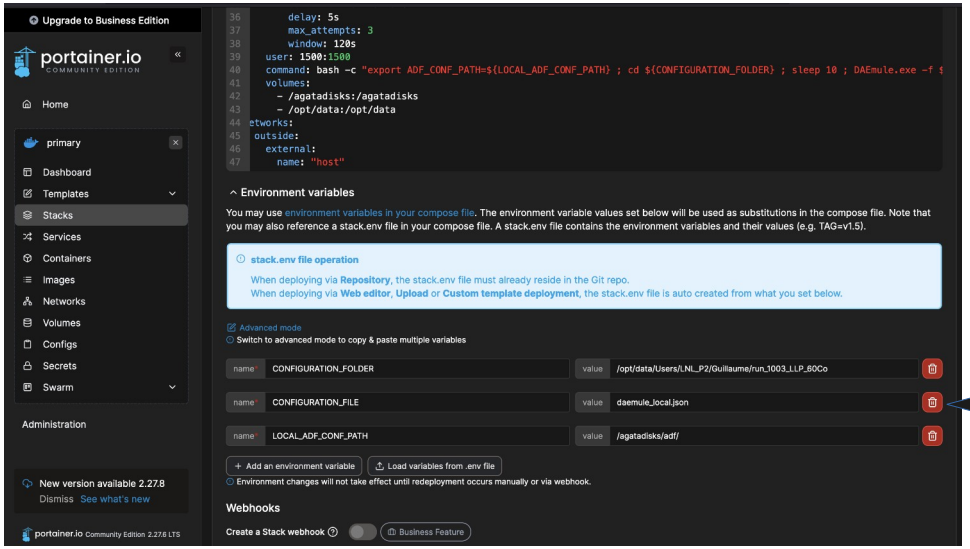

Define the configuration file location

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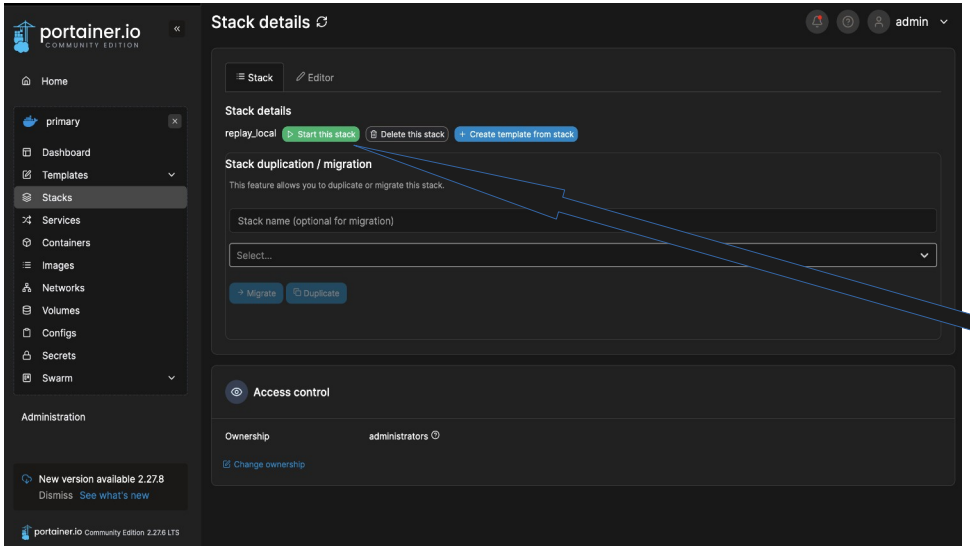

Click on the Start button

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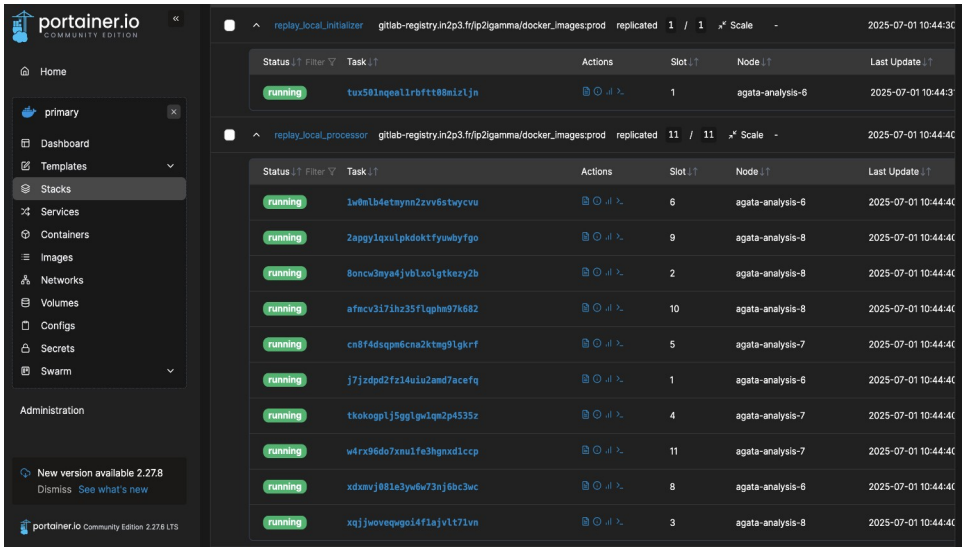
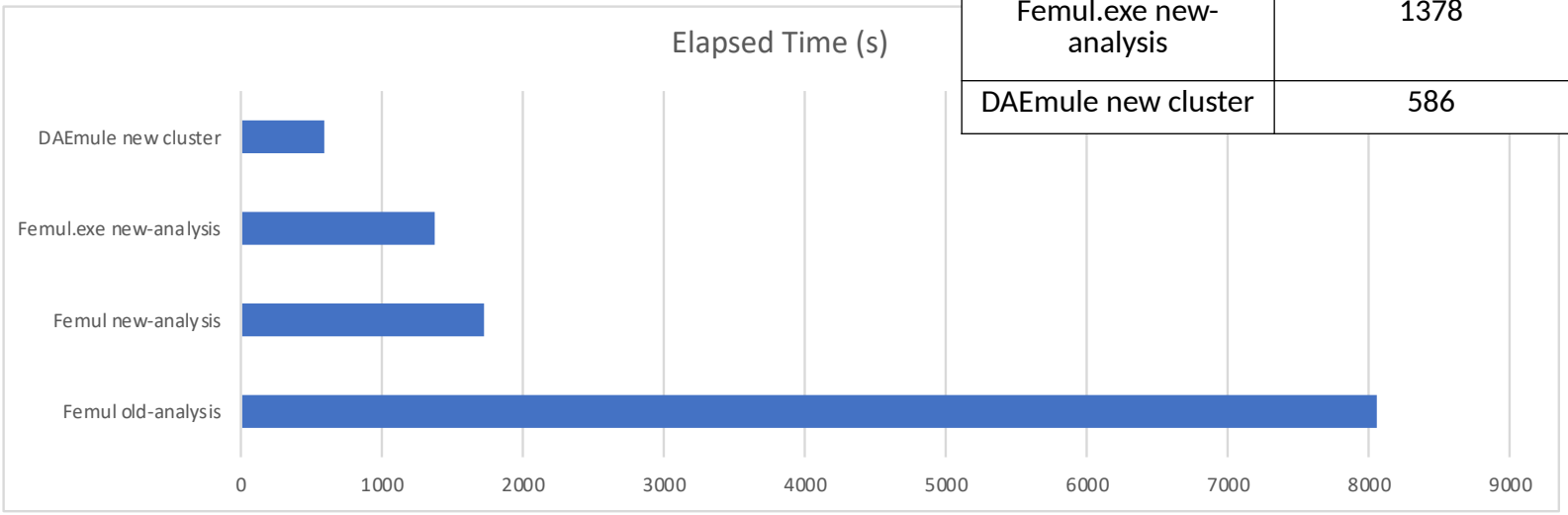


It's running !

Tests on analysis cluster @ Legnaro

- Data from /opt/data/LNL/EXP_049/AgaPrep/run_1004_LLP_60Co/ (29 crystals)
  - Read .cdat files
  - PreProcessingFilter
  - PSAFilter
  - Write .adf files

	Elapsed Time (s)	%
Femul old-analysis	8050	
Femul new-analysis	1718	-78,66
Femul.exe new-analysis	1378	-82,88
DAEmule new cluster	586	-92,72



Global level processing

- New actors added to Agapro to manage global level :
  - *Multi-Channels Agata Time Sorter* (MCats) : N entries from Central Memory → One sorted output
  - *AgataEventBuilder* : from data:psa to event:data:psa
  - *AgataEventMerger* : from event:data:psa + event:ranc to event:data

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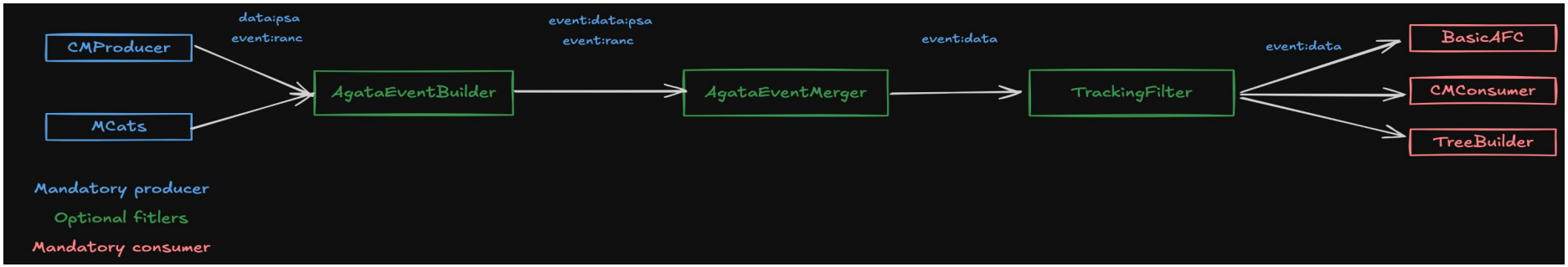

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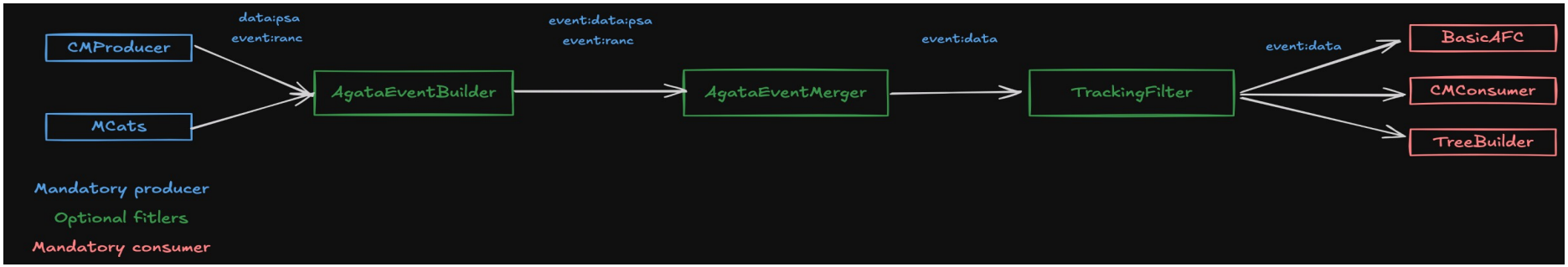
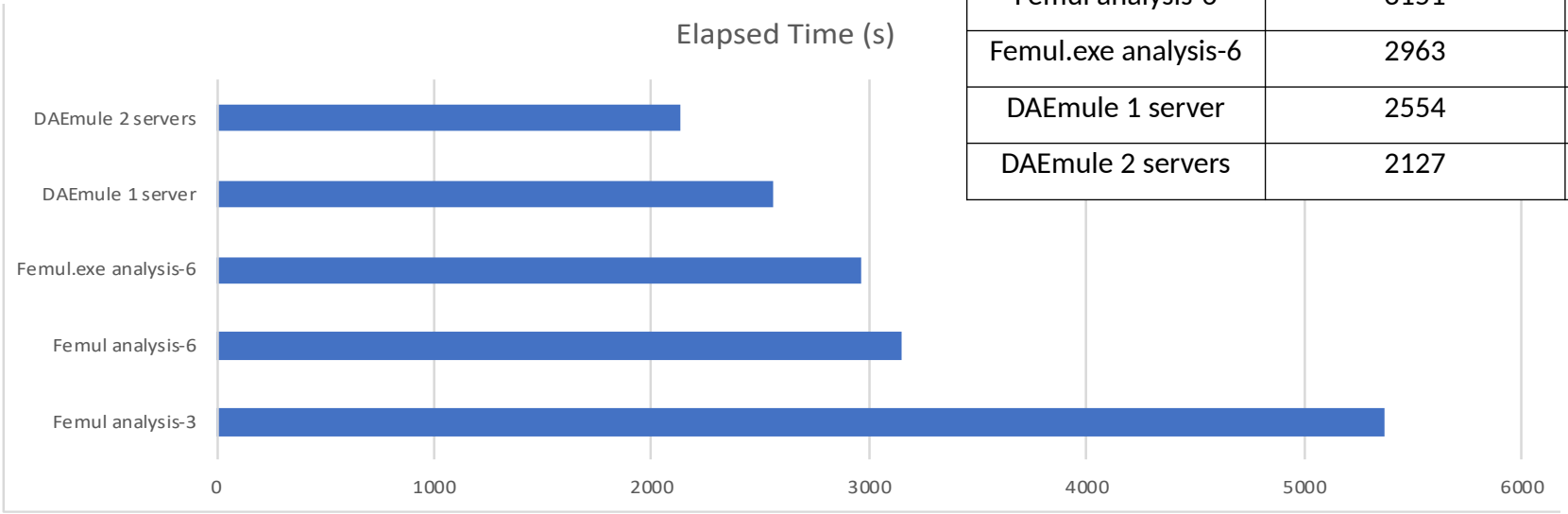


CMProducer and CMConsumer are used to split the processing on 2 servers, for example :
- Mcats + EventBuilder + EventMerger + CMConsumer on server 1
- CMProducer + TrackingFilter + TreeBuilder on server 2

Tests on analysis cluster @Legnaro

- Data from /opt/data/LNL/EXP_049/Replay/run_0078/ (29 crystals)

	Elapsed Time (s)	%
Femul analysis-3	5364	
Femul analysis-6	3151	-41,26
Femul.exe analysis-6	2963	-44,76
DAEmule 1 server	2554	-52,39
DAEmule 2 servers	2127	-60,35



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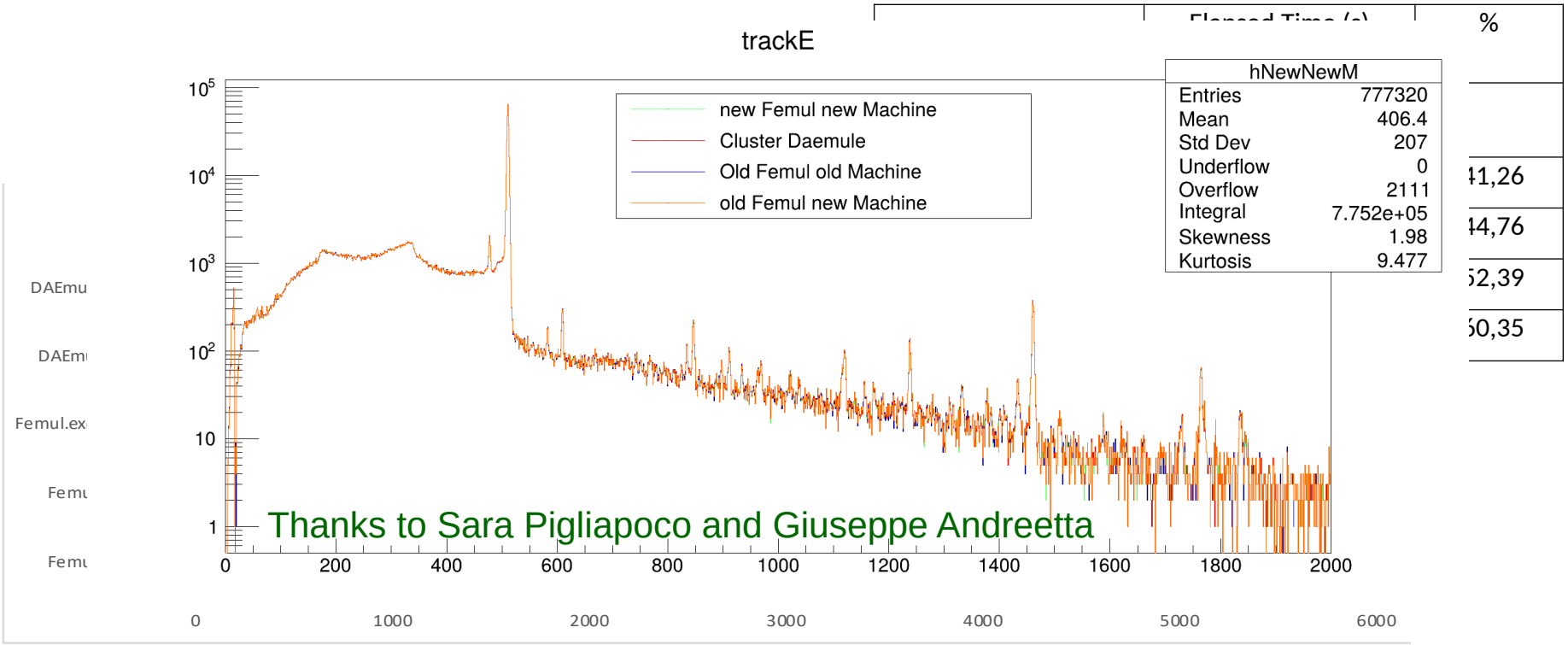

Conclusion

- First version of an Agapro emulator able to run on clusters
- Tests at Legnaro on both local and global level processing are fine
- Need to improve integration with Docker Swarm and Portainer.io to ease usage
- Some documentation at https://gbaulieu.pages.in2p3.fr/handbook-dev/binaries/DAEmule/
- Need to organize a first tutorial session : goal is to be ready for next experiment!