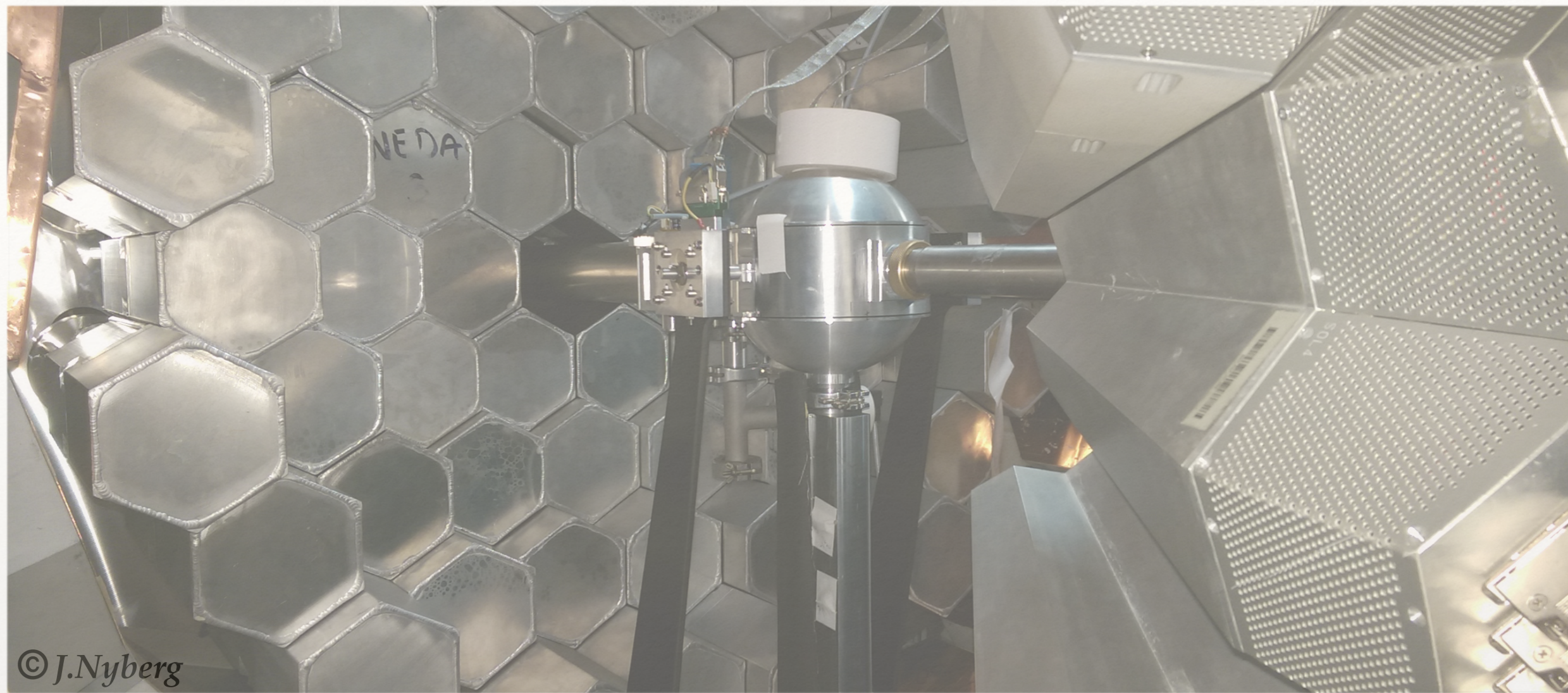




O. STEZOWSKI

Data Analysis Report

Developments 2017 → 2018



AGATA-NEDA-DIAMANT
campaign

AGAPRO
/
GANPRO

The AGATA-NEDA-DIAMANT campaign

The GANPRO project

- GANil PROcessing, MFM / NUMEXO2 / NARVAL
- Strong differences compared to the VAMOS campaign
 - PSA for NEDA, may need computing power (Neural Network)

Design proposal
2 iterations
(on ATRIUM)

Development of the 1st bricks
EXOGAM-NEDA-DIAMANT data



offline, with data from cards being debugged

1st test integration DAQ

2nd test DAQ source

06/17

09/17

11/17

02/18

03/18

04/18



Set up
software infrastructure

More advanced bricks (NN),
+ 'final' work on 1st ones



Producer
NUMEXO2
Fully available

The AGATA-NEDA-DIAMANT campaign

The GANPRO project: design proposal

few meetings, 2 iterations, the proposal is on ATRIUM

Constrains : new developments by Orsay & GANIL teams impossible

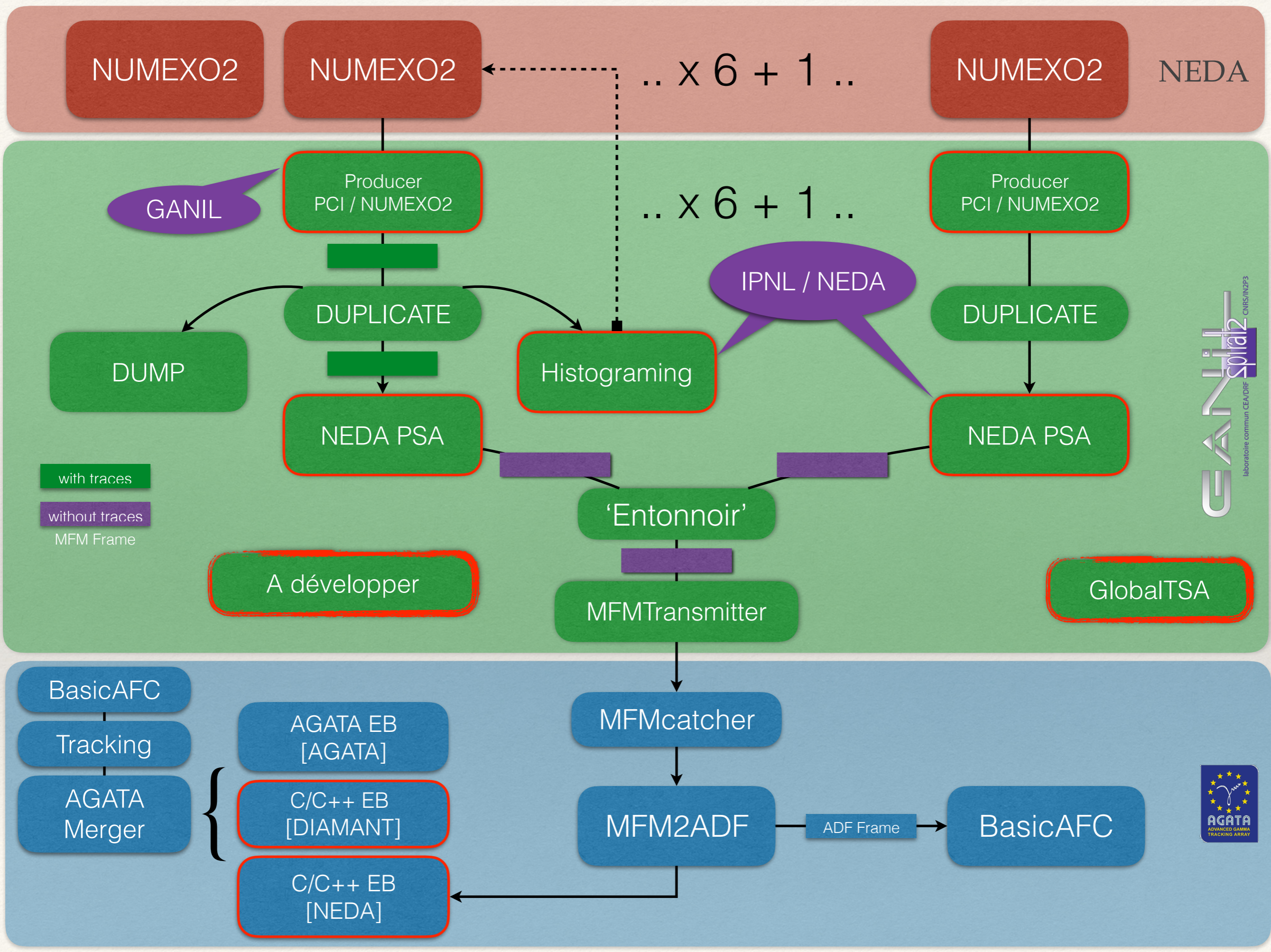
- ↪ Existing bricks should be used as much as possible
- ↪ New developments in C++ (**CXX11**)
- ↪ Local to global level should be done through a filter (one input, one output)

Difficulties : two by two 'worlds'

- ↪ MFM / ADF
- ↪ NARVAL GANIL / NARVAL/DCOD AGATA



Data processing from the design proposal ➡



The AGATA-NEDA-DIAMANT campaign

The GANPRO project: infrastructure

Solution implemented, **gitlab** hosted @ CCIN2P3 :

↪ collaboratif developments, historic, backup (migration from svn)

The AGATA-NEDA-DIAMANT campaign


The GANPRO project: infrastructure

MAINTENANCE DOWNTIME Wednesday 2018-07-04@8:30-9:30 -> Gitlab platform reconfiguration & upgrade

IPNL_GAMMA > Details

+ preprod branch to get last (possibly unstable) versions

Master branch : for production



IPNL_GAMMA
Developments on gamma spectroscopy

Leave group Watch

Filter by name... Last created New project

ganpro	Master	Package which contains ACTORS ('à la mode NARVAL/DCOD') able to process GANIL MFM data flows	★ 1	a week ago
agapro		Mirror of the SVN AGAPRO Package. USED for new developments mainly	★ 0	a month ago
scripts		Contains useful scripts to install some gamma packages	★ 0	2 weeks ago
2018 Agata Neda Diamant Campaign - TSelector			★ 0	a month ago
gammaware		General Tools to play with gamma-ray spectroscopy related data	★ 0	a month ago
docker_gamma		Docker image used for IPNL_GAMMA developments	★ 0	a month ago
stogs		Simulation Toolkit fOr Gamma-ray Spectroscopy	★ 0	2 weeks ago

The AGATA-NEDA-DIAMANT campaign

The GANPRO project: infrastructure

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Continuous integration process:

↪ full compilation automatically tested any time the git repository is changed

The AGATA-NEDA-DIAMANT campaign

IPNL_GAMMA > ganpro > Merge Requests > !101

Merged Opened 5 days ago by  Stezowski Olivier

Edit

Preprod

synchronisation

Request to merge **preprod** into **master**


✓ Pipeline #14130 passed for e176ca3e. ✓ ✓


✓ Merged by  Guillaume Baulieu 5 days ago **Revert** Cherry-pick

The changes were merged into **master** with 28f4f4c1



Discussion 0 Commits 33 Pipelines 5 Changes 15

 Guillaume Baulieu @gbaulieu merged 5 days ago

 Guillaume Baulieu @gbaulieu mentioned in commit 28f4f4c1 5 days ago

The AGATA-NEDA-DIAMANT campaign

The GANPRO project: infrastructure

IPNL_GAMMA > ganpro > Pipelines > #14130

passed Pipeline #14130 triggered 6 days ago by Guillaume Baulieu

Merge branch 'ReplayReadOrder' into 'preprod'

Replay read order

See merge request !100

2 jobs from preprod in 2 minutes 19 seconds (queued for 2 seconds)

Test compilation

Test quality of the code

Pipeline Jobs 2

Build

Publish

✓ compile



✓ sonar





Job #25410 triggered 6 days ago by Guillaume Baulieu



```
Running with gitlab-runner 11.0.0 (5396d320)
  on ccosvms0239@gitlab.in2p3.fr 96238d4c
Using Docker executor with image gitlab-registry.in2p3.fr/ipnl_gamma/docker_gamma:latest ...
Pulling docker image gitlab-registry.in2p3.fr/ipnl_gamma/docker_gamma:latest ...
Using docker image sha256:d21fdef36ed01675aa25df4c819da5bafdeadab24c5e6a71f7d933c2d78bfb48 for gitlab-registry.in2p3.fr/ipnl_gamma/docker_gamma:latest ...
Running on runner-96238d4c-project-3148-concurrent-0 via ccosvms0239...
Cloning repository...
Cloning into '/builds/IPNL_GAMMA/ganpro'...
Checking out e176ca3e as preprod...
Skipping Git submodules setup
$ cd ..
$ export CMAKE_BUILD_TYPE=debug
$ rm -rf AgataSoftware
$ mkdir AgataSoftware
$ cd AgataSoftware
$ git clone https://gitlab.in2p3.fr/IPNL_GAMMA/scripts.git
Cloning into 'scripts'...
$ (exit `python scripts/gRaySoftware.py --cmake="-DCMAKE_BUILD_TYPE=debug -- -j 4" --adf= all | grep "recipe for target" | grep failed | wc -l`)
Cloning into 'agaprodep/adf'...
fatal: A branch named 'master' already exists.
[ADF] adf
[ADF] Install is done in /builds/IPNL_GAMMA/AgataSoftware
[ADF] Narval has not been found on this machine
$ (exit `python scripts/gRaySoftware.py --cmake="-DCMAKE_BUILD_TYPE=debug -- -j 4" --mf= all | grep "recipe for target" | grep failed | wc -l`)
--2018-06-27 11:25:12-- http://anonymous:*password*@wiki.ganil.fr/gap/export/837/Documents/GRUdoc/package/GRUv_18_06_10_beta.tar
Resolving wiki.ganil.fr (wiki.ganil.fr)... 193.48.107.239
Connecting to wiki.ganil.fr (wiki.ganil.fr)|193.48.107.239|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 1084939 (1.0M) [application/x-tar]
Saving to: 'GANIL/GRUv_18_06_10_beta.tar'

 0K ..... 4% 2.11M 0s
 50K ..... 9% 2.12M 0s
100K ..... 14% 4.26M 0s
150K ..... 18% 100M 0s
200K ..... 23% 4.20M 0s
250K ..... 28% 4.29M 0s
300K ..... 33% 4.30M 0s
350K ..... 37% 78.7M 0s
400K ..... 42% 4.36M 0s
450K ..... 47% 95.5M 0s
```

Quality Gate **Passed**

Bugs Vulnerabilities

0 **A**
Bugs

0 **A**
Vulnerabilities

0 **A**
New Bugs

0 **A**
New Vulnerabilities

Leak Period: since previous version started 10 months ago

Code Smells

2h **A**
Debt

started 10 months ago

18
Code Smells

2h **A**
New Debt

18
New Code Smells

Coverage

22.5%
Coverage

19.6%
Coverage on 5.9k New Lines to Cover

Duplications

11.4%
Duplications

55
Duplicated Blocks

13.7%
Duplications on 16k New Lines

9.7k Lines of Code
C++ (Co... 9k
Python 706

No tags

Activity



September 10, 2018

1.0

September 9, 2018

Project Analyzed

September 8, 2018

Project Analyzed

Show More

Quality Gate

gamma

Quality Profiles

(C++ (Community)) Sonar way (outdated c...
(Python) Sonar way (outdated copy)

Key

matnuc:GanPro

Project Overview

GanPro

65 / 65 files

> Reliability ?

> Security ?

> Maintainability ?

> Coverage

> Duplications

> Size

▼ Complexity ?

Cyclomatic Complexity 1,959

> Issues

Leak Period: since previous version



Get quick insights into the operational risks. Any color but green indicates immediate risks: Bugs or Vulnerabilities that should be examined. A position at the top or right of the graph means that the longer-term health may be at risk. Green bubbles at the bottom-left are best.

The AGATA-NEDA-DIAMANT campaign

The GANPRO project: infrastructure

Solution implemented, **gitlab** hosted @ CCIN2P3 :

↪ collaboratif developments, historic, backup (migration from svn)

Continuous integration process:

↪ full compilation automatically tested any time the git repository is changed

First steps to implement **unit tests**:

↪ running code tested

To set up tests, virtual machines (**docker**) are used:

↪ generalization to distribute the different packages

The AGATA-NEDA-DIAMANT campaign

The GANPRO project: infrastructure

IPNL_GAMMA > docker_gamma > Details



docker_gamma

Docker image used for IPNL_GAMMA developments

Star 0 Fork 0 SSH git@gitlab.in2p3.fr:IPNL_GAMMA

Files (3.1 MB) Commits (18) Branches (2) Tags (0) CI/CD configuration

Add Changelog

Add License

Add Contribution guide

Add Kubernetes cluster

master docker_gamma / +

History Find file Web IDE



Install gcovr through apt-get

Guillaume Baulieu authored a week ago



052dc33c



Name	Last commit	Last update
gamma_dev	Install gcovr through apt-get	a week ago
gamma_gpu	Typo correction	4 months ago
.gitlab-ci.yml	Add identification to the registry	a month ago

The AGATA-NEDA-DIAMANT campaign

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↪ We will try to extend this solution for users

Documentation produced @ different levels **ATRIUM**, code via **doxygen**, **wiki**:

↪ We will try to keep on working continuously on that part

Different channels for discussion

Messages from bots gitlab

Messages from humans

☆ GANPRO
Anything related to the GANPRO package

2 2 Search

sonarQube (correction of the paths)

b7febed3: Merge branch 'coverage' into 'preprod'
Compatibility between gcovr and sonarQube
See merge request IPNL_GAMMA/ganpro!99 - Stezowski Olivier

df189063: Merge remote-tracking branch 'origin/preprod' into preprod
• Olivier Stezowski

aba4d30e: order of input run correctly read in case the run has more that 10 files
• Olivier Stezowski

e176ca3e: Merge branch 'ReplayReadOrder' into 'preprod'
Replay read order
See merge request IPNL_GAMMA/ganpro!100 - Guillaume Baulieu

28f4f4c1: Merge branch 'preprod' into 'master'
Preprod
See merge request IPNL_GAMMA/ganpro!101 - Guillaume Baulieu
[Show less...](#)

webhook BOT 3:57 PM
IPNL_GAMMA/ganpro: Pipeline #14137 of branch master by Guillaume Baulieu (gbaulieu) passed in 03:53

webhook BOT 4:08 PM
Guillaume Baulieu pushed new tag genesis_18.06.27 to IPNL_GAMMA/ganpro

webhook BOT 4:10 PM
IPNL_GAMMA/ganpro: Pipeline #14139 of tag genesis_18.06.27 by Guillaume Baulieu (gbaulieu) passed in 01:57

Guillaume Baulieu 4:19 PM
Le tag genesis_18.06.27 est créé, vous pouvez charger cette version du code de la même façon qu'une branche : `git fetch <nom du remote gitlab>` puis `git checkout genesis_18.06.27`

Write a message...

The AGATA-NEDA-DIAMANT campaign

The GANPRO project: infrastructure

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





The AGATA-NEDA-DIAMANT campaign







The GANPRO project: infrastructure

UsersGuides 

All User's Guides

Contenu | Résumé | Modifier | Références | Historique | Archive | Corbeille


Documents/page:      

<input type="checkbox"/>	Type ▲	Titre ▲	Atrium ID ▲	Créé le ▲	Auteur ▲	Modifié le ▼	Modifié par ▲	Vrs.	Etat ▲
<input type="checkbox"/>		AGATA_LL_P_UsersGuide	ATRIUM-174335	14 mars 2017	Olivier STEZOWSKI	2 juil. 2018	admin_agata	2.0+	En projet
<input type="checkbox"/>		GRSCookbook	ATRIUM-306685	23 mai 2018	Olivier STEZOWSKI	23 mai 2018	stezow@ipnl.in2p3.fr	0.1	En projet
<input type="checkbox"/>		GwUserGuide.odt	ATRIUM-3884	27 févr. 2015	Olivier STEZOWSKI	24 janv. 2018	j.dudouet@ipnl.in2p3.fr	3.0	Validé
<input type="checkbox"/>		IPNL Gamma Gitlab Cookbook	ATRIUM-281859	23 janv. 2018	Olivier STEZOWSKI	23 janv. 2018	admin_agata	2.0	Validé
<input type="checkbox"/>		Cookbook.odt	ATRIUM-3883	27 févr. 2015	Olivier STEZOWSKI	6 oct. 2017	stezow@ipnl.in2p3.fr	4.0	Validé
<input type="checkbox"/>		WatcherUsersGuide	ATRIUM-3982	5 mars 2015	Olivier STEZOWSKI	8 avr. 2016	admin_agata	3.0+	Validé

ATRIUM: <https://atrium.in2p3.fr>

The AGATA-NEDA-DIAMANT campaign

The GANPRO project: infrastructure

 ganpro

Main Page Related Pages Modules Classes Files

ganpro

- Main page
- Bug List
- Modules
- Classes
 - Class List
 - Class Index
 - Class Hierarchy
 - Class Members
- Files

Date
Commented in February 2018

Copyright
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(Some of this documentation is generated from doxyfiles/GANPRO_NEDA_CCPSA.dox)

PSA Tutorial

This PSA algorithm is configured with control parameters stored in the file 'CCPSA.conf'. The parameters are parsed from the configuration file and stored in a **NedaCtrl** custom struct. Once the PSA is done, the results are stored in a **NedaStruct** custom struct.

This tutorial aims at expliciting the effect of the parameters (**NedaCtrl**) on the results (**NedaStruct**) in order to allow one to fine tune the algorithm.

Multiple tasks are performed throughout the algorithm:

- **Zero-crossing check**
- **Baseline computation**
- **Constant Fraction Discrimination**
- **Energy computation**
- **Risetime computation**
- **Fast and Slow component integration**

The Neda traces shown here have a length of 232 samples.

Zero-crossing check

Parameters

[in] **NedaCtrl.ZCintegration** The number of points from the derived trace to include in the integration.

[in] **NedaCtrl.CFDthreshold** The threshold the integrated trace needs to cross in order to trigger a zero-crossing count.

[out] **NedaStruct.fNumberOfzc** The number of 'full' zero-crossings of the integrated trace.

In the following examples:

- **NedaCtrl.ZCintegration** = 2
- **NedaCtrl.CFDthreshold** = 2500

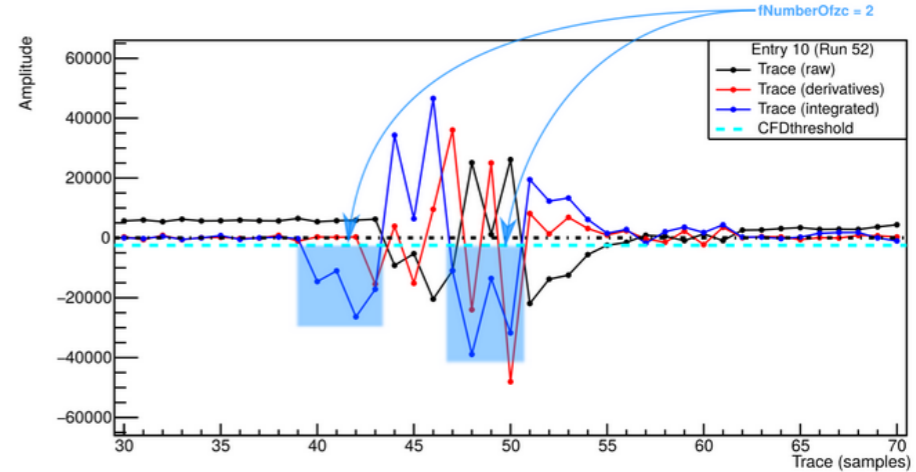



Fig. 1.4: Another trace where NedaStruct.fNumberOfzc is not equal to 1.

GANPRO NEDA CCPSA

Generated by  1.8.13

Documentation of the code via doxygen

Home

Last edited by **Guillaume Baulieu** a week ago

New page

Page history

Edit

GANPRO Main Wiki Page

Some useful documents

[How to replay NEDA/DIAMANT data](#)

[How to analyse the ROOT TTree containing merged branches from AGATA-NEDA-DIAMANT](#)

[How to use the docker container image](#)

[List of trained Neural Networks](#)

campaign

GANPRO project: infrastructure

New page

Page history

Edit

Continuous integration pipeline

↳ full compilation

First steps to implement unit tests

↳ running code tests

To set up tests, virtual machines

↳ generalization to other systems

For developments purpose

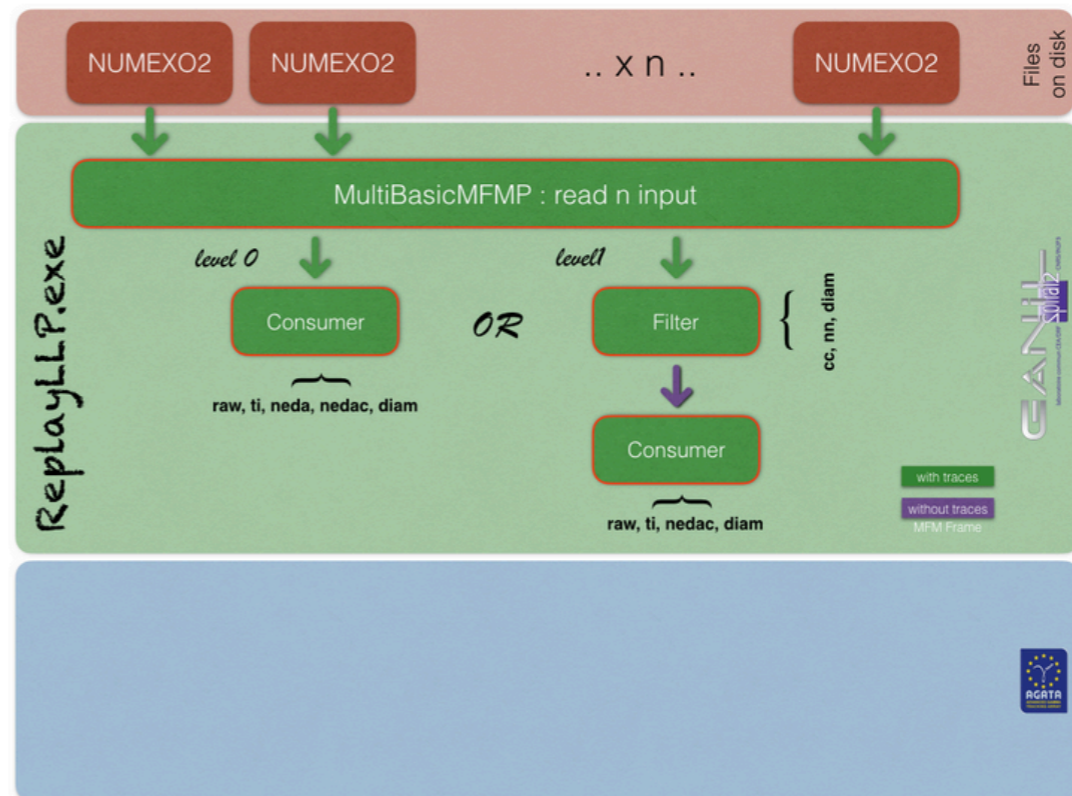
↳ We will try to extend the pipeline

Documentation produced

↳ We will try to keep it up to date

There are several executables available within GANPRO to Replay Data. Using such exe you should be able to check the whole system from raw mfm frames up to built events that can be merged together with AGATA Data.

- **ReplayLLP.exe** : the main purpose is to apply the PSA, for the NEDA part, or the Threshold Filter for the DIAMANT part. However it allows to replay also some part of the chain as given in the following picture:



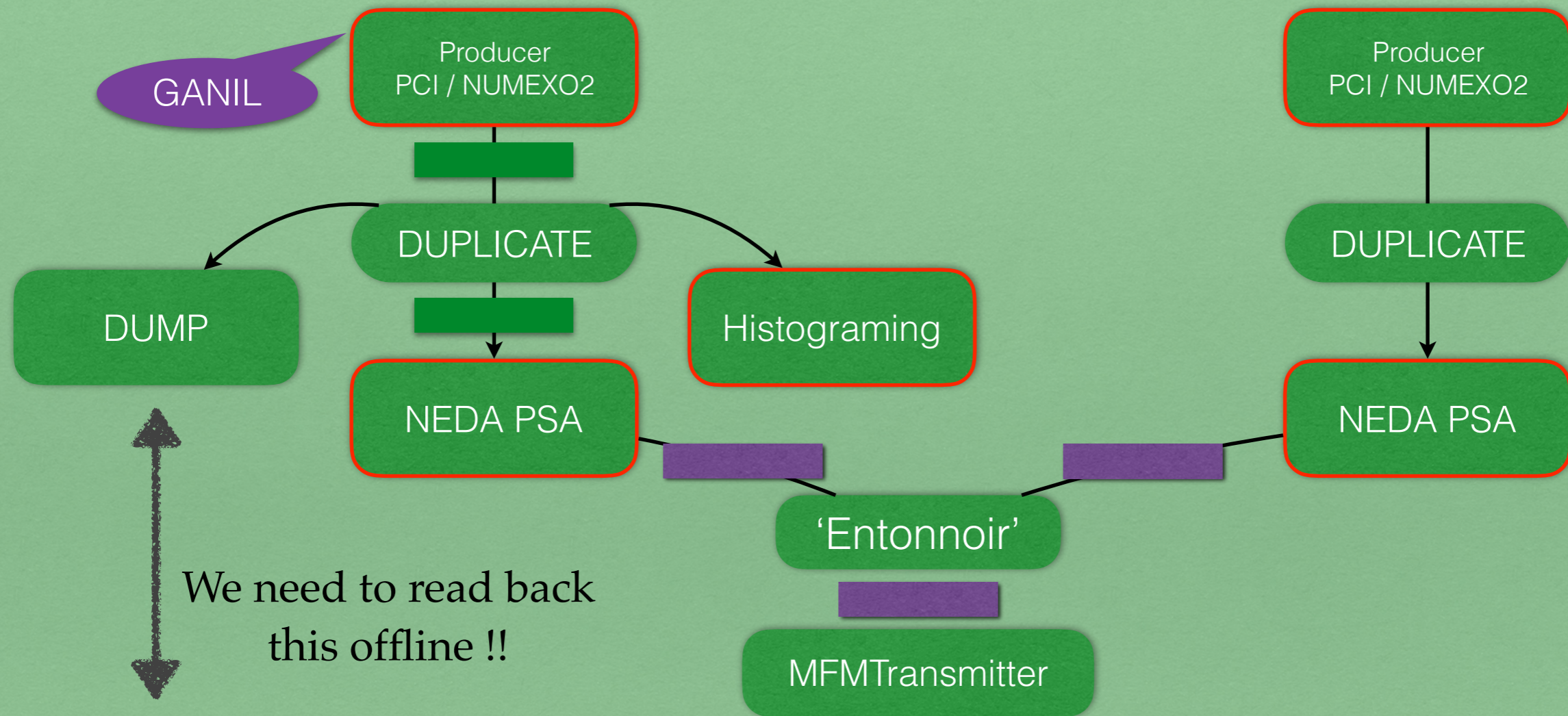
Here are some examples on how to use the command :

```
ReplayLLP.exe -idir /path/to/data/neda -numexo numexo44 -irun run_XXX -cdir /path/to/conffiles -odir /path/to/out/numexo44_psa -opattern run_XXX_ccpsa
```

--> to replay charge comparison psa for one neda card [44] in order to produce compressed neda mfm frames stored in files having run_XXX_ccpsa as pattern for names

The AGATA-NEDA-DIAMANT campaign

The GANPRO project: the **first** bricks



BasicMFMP

Producer
To read MFM frames from files

MultiBasicMFMP

Producer
To read MFM frames from several files in ||

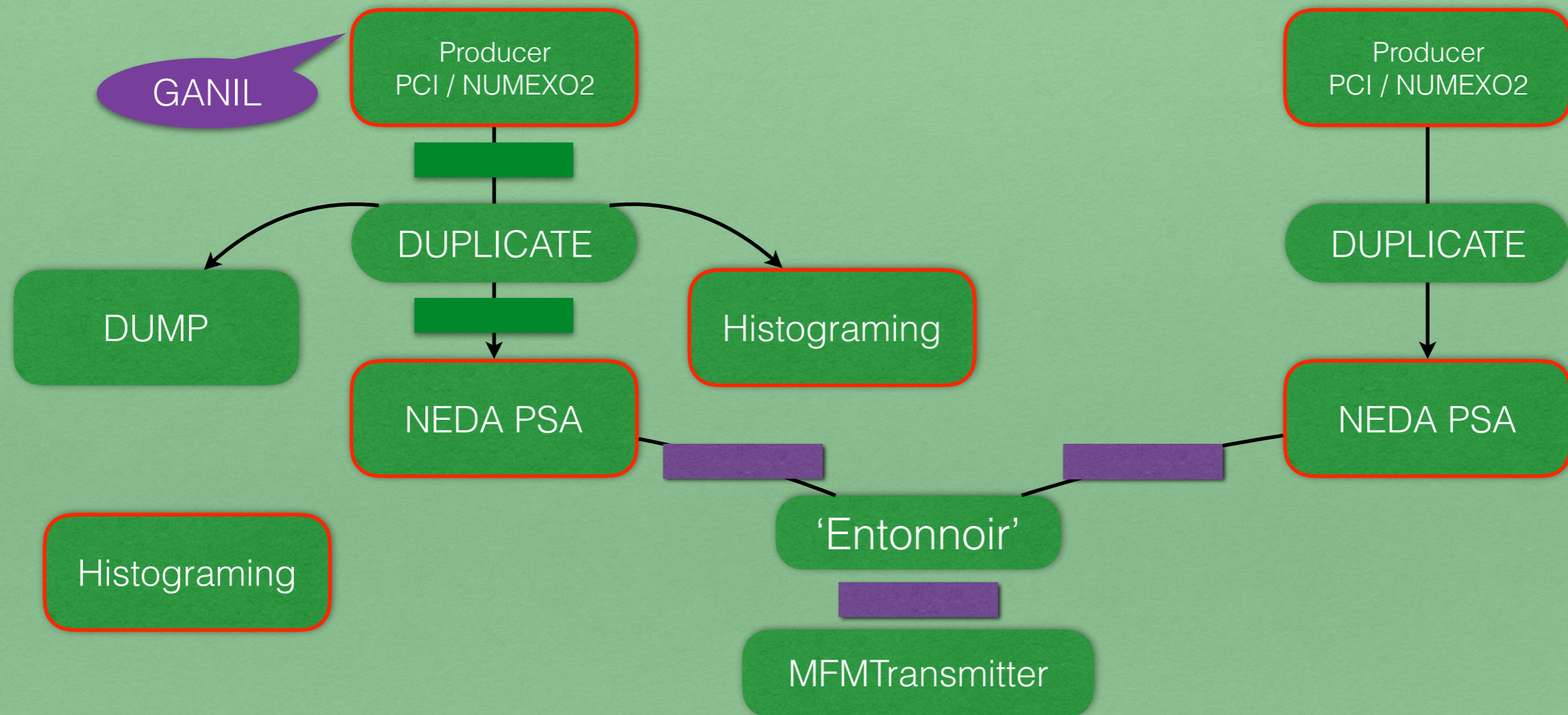
- 'Emule' un entonnoir
- Multi-tasks based
- Read compressed files !
(.Z, .gz, .bz2)



optimal ...

The AGATA-NEDA-DIAMANT campaign

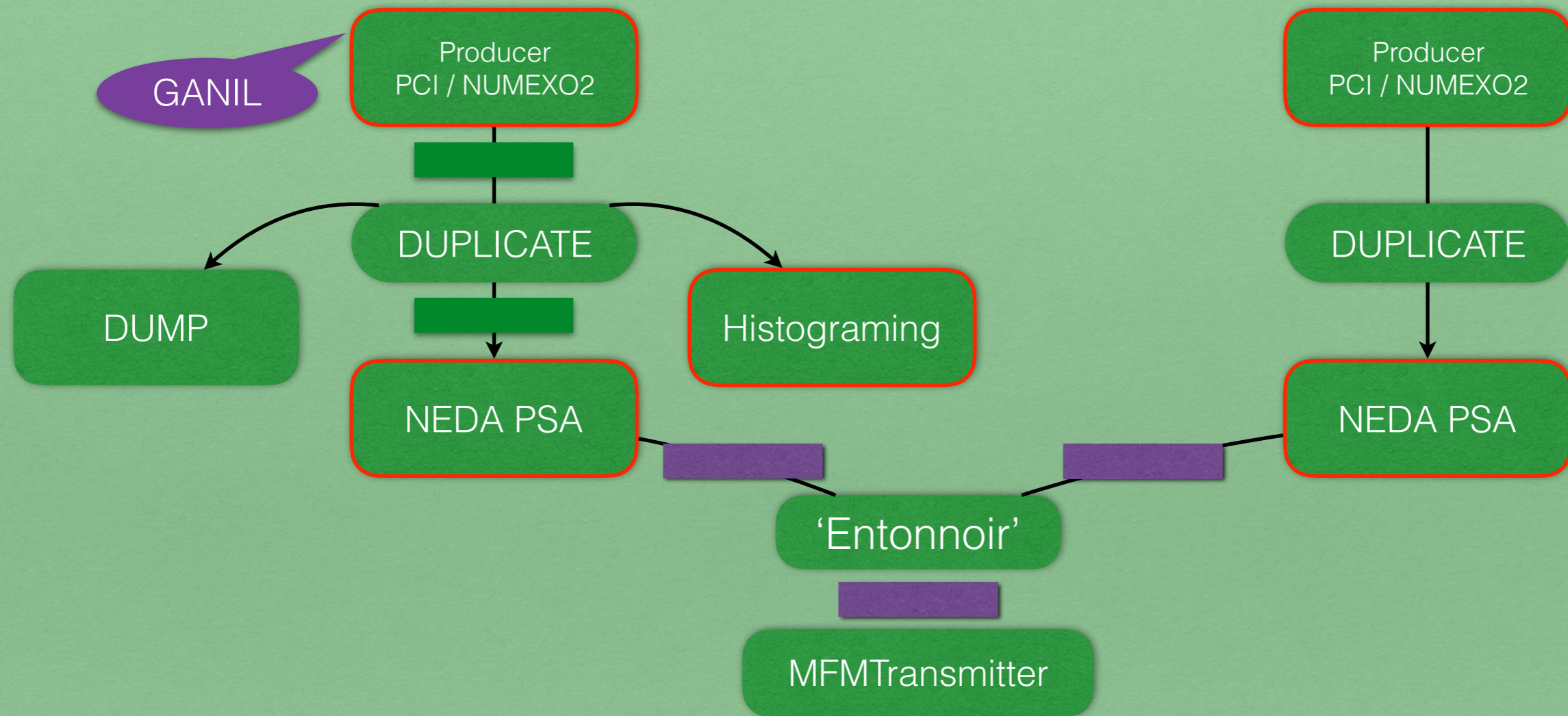
The GANPRO project: the first bricks



Produce spectra, ROOT TTrees, to play with raw MFM data @ different levels
Configurable by ascii files, basic actions @ running time (reset, snapshot)

The AGATA-NEDA-DIAMANT campaign

The GANPRO project: the first bricks



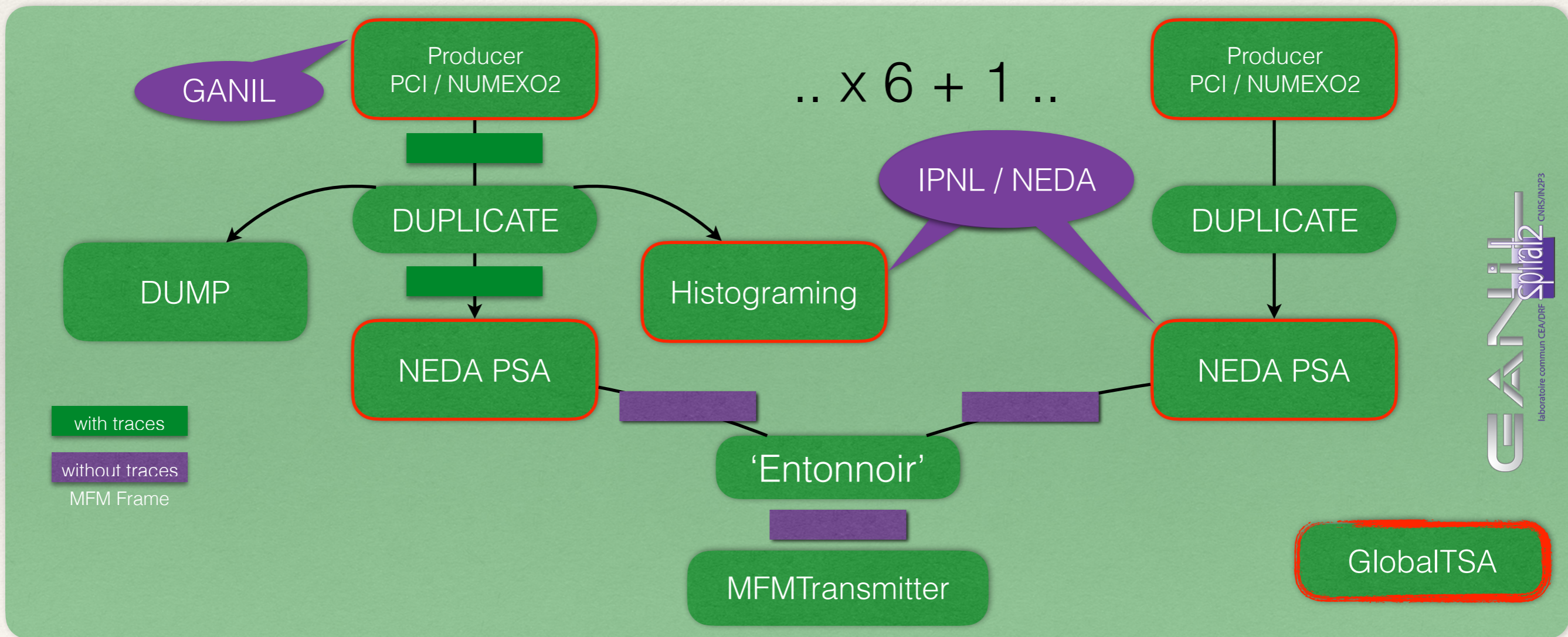
CCPSA

Soft from the NEDA collaboration,
1st implémentation in GANPRO by Joa

The AGATA-NEDA-DIAMANT campaign

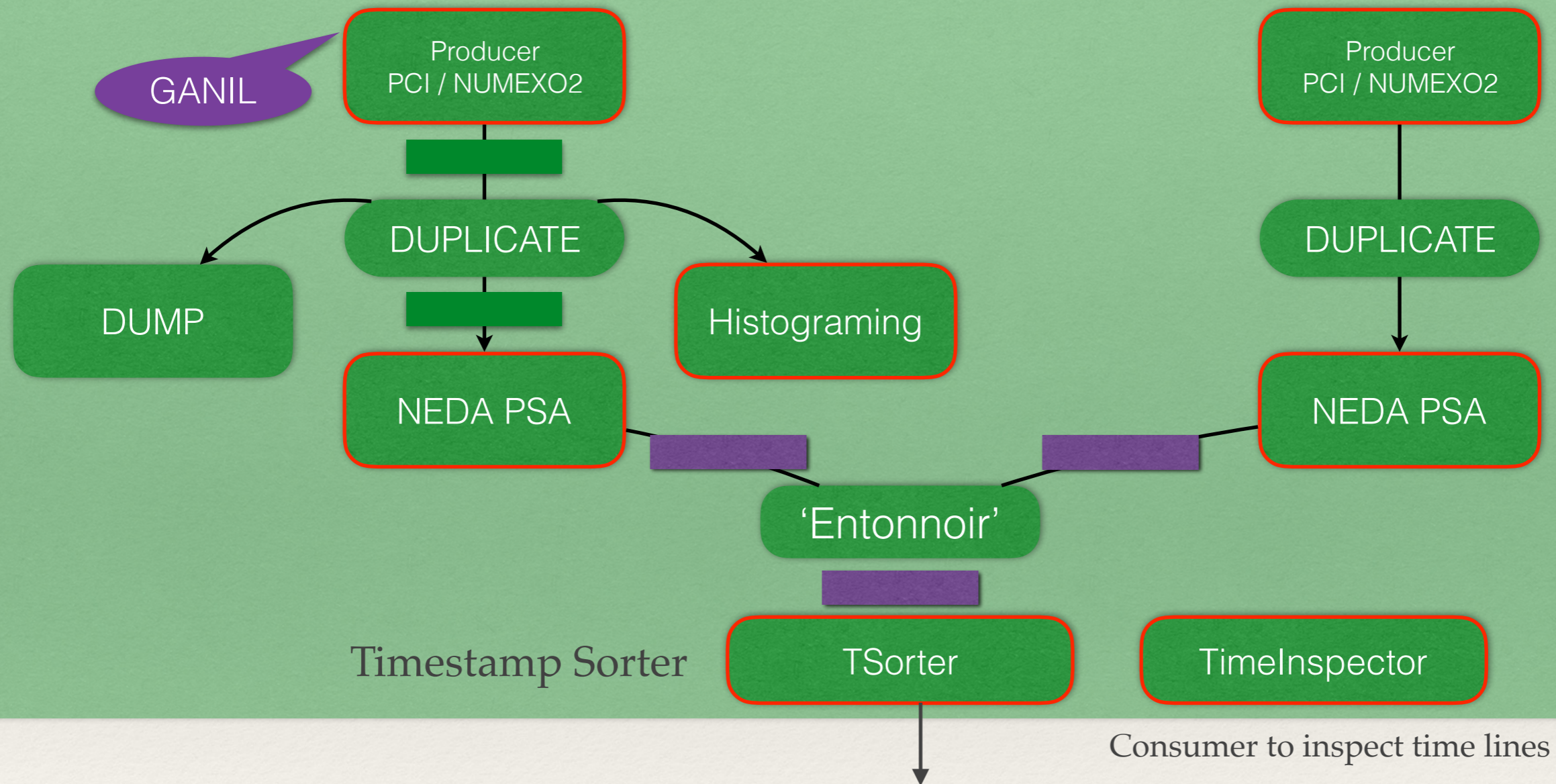
The GANPRO project: the first bricks

Data from the N numexo2 cards run unordered in time !



The AGATA-NEDA-DIAMANT campaign

The GANPRO project: the first bricks



The AGATA-NEDA-DIAMANT campaign

The GANPRO project: the **first** bricks

Data from one NUMEXO2 card are not ordered compared to another one :

↪ TimeStamp Sorter as a filter

- FIFO stored MFM frames ... should be deep enough
- Running conditions by 'burst' (some calls may produce empty buffers)
- This is a bootle neck ! (from local level to global level)

1 FIFO per detector

Algorithm construction

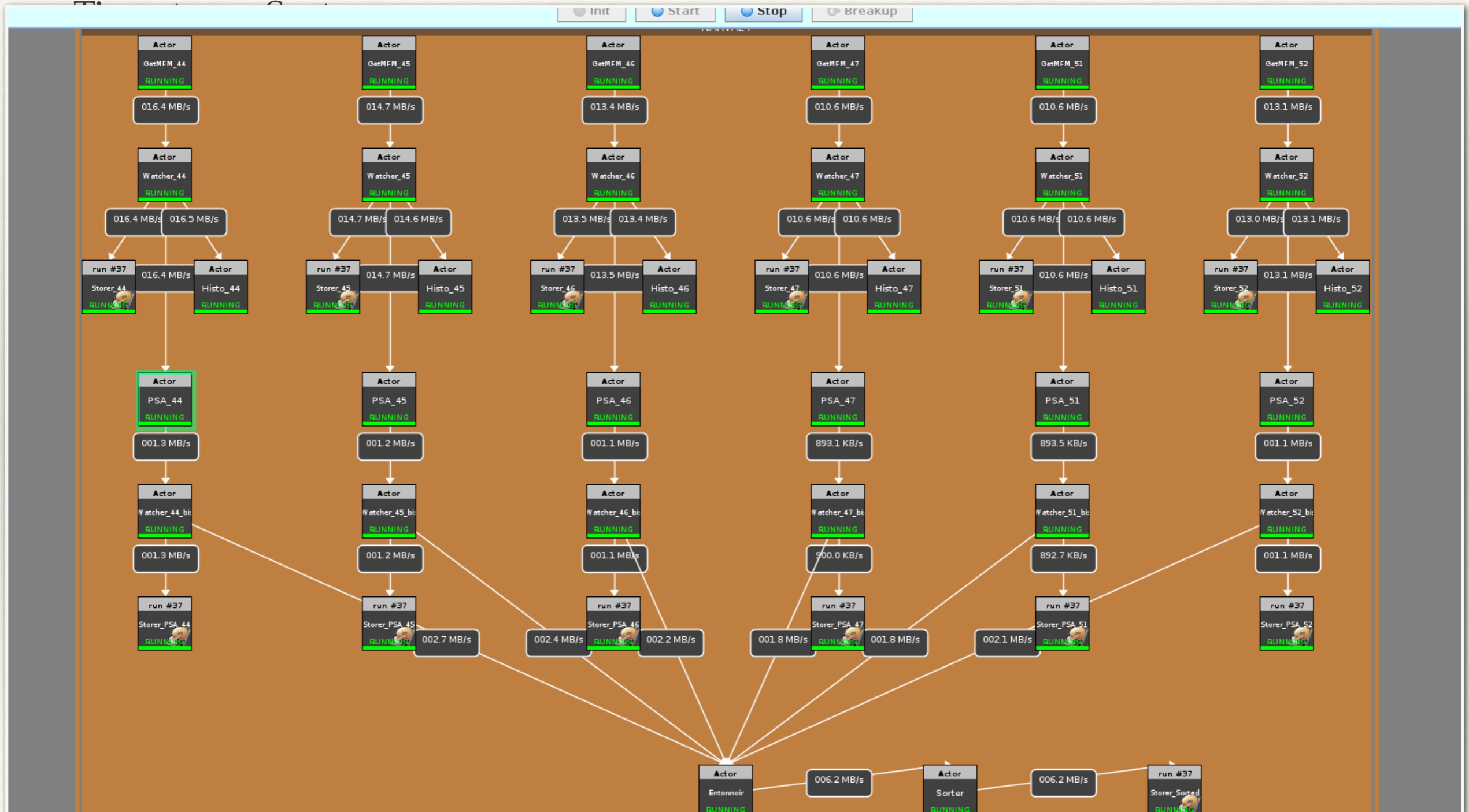
Hypothesis: for one detector, frames are produced ordered in TS

Problem: it is not what comes out of the cards !

- The developed algorithm ... quelques temporisation à ajuster
- There are three different triggers to take the decision to write out data
 1. All the detectors have at least one MFM frame reads from input
 2. All the NUMEXO cards have at least one MFM frame reads
 3. Thresholds on the distribution of the detector pressures
- It runs smoothly as soon as the whole system is 'stable' enough

The AGATA-NEDA-DIAMANT campaign

The GANPRO project: the first bricks



The AGATA-NEDA-DIAMANT campaign

The GANPRO project: the **first** bricks

Few snapshots of logs produced @ running time (multitask based to avoid penalties)

NEDA

```
LOOP# 1108890 | Elapsed Time 15:59:47 | MEMORY consumption: ~ 38 MBytes | [MFM-Read/Written/Rejected] 4514868101/4252346603/262258875 | [Board Pressure] 61504 14229 56042 62736 57 58459
```

```
LOOP# 236325 | Elapsed Time 09:21:59 | MEMORY consumption: ~ 10 MBytes | [MFM-Read/Written/Rejected] 967319750/967227925/14609 | [Board Pressure] 44 10653 4837 16072 9312 35633
```

DIAMANT

```
LOOP# 661230 | Elapsed Time 24:45:00 | MEMORY consumption: ~ 325 MBytes | [MFM-Read/Written/Rejected] 6042898548/6042824681/6851 | [Board Pressure] 15189 12136 24339 22 15109  
| [Pressure Distri 0/10/100/1000] 55/47/47/40 - Required Thresholds to trigg #3 : 56/52/16/2
```

```
[Load/Unload History]
```

```
[9226/31] [9096/56] [9173/28125] [9221/15701] [9196/23922] [9109/3] [9123/111] [9200/7] [9112/28] [9168/28125] [9224/1783] [9112/28125] [9138/8614] [9114/9] [9181/236]
```

```
[Trigger Load-Unload History] - Trigger 1/2/3 all_channels/all_boards/from_channel_pressure
```

```
[2 +9195] [2 +9040] [3 -18952] [3 -6480] [3 -14726] [2 +9106] [2 +9012] [2 +9193] [2 +9084] [3 -18957] [3 +7441] [3 -19013] [2 +524] [2 +9105] [2 +8945]
```

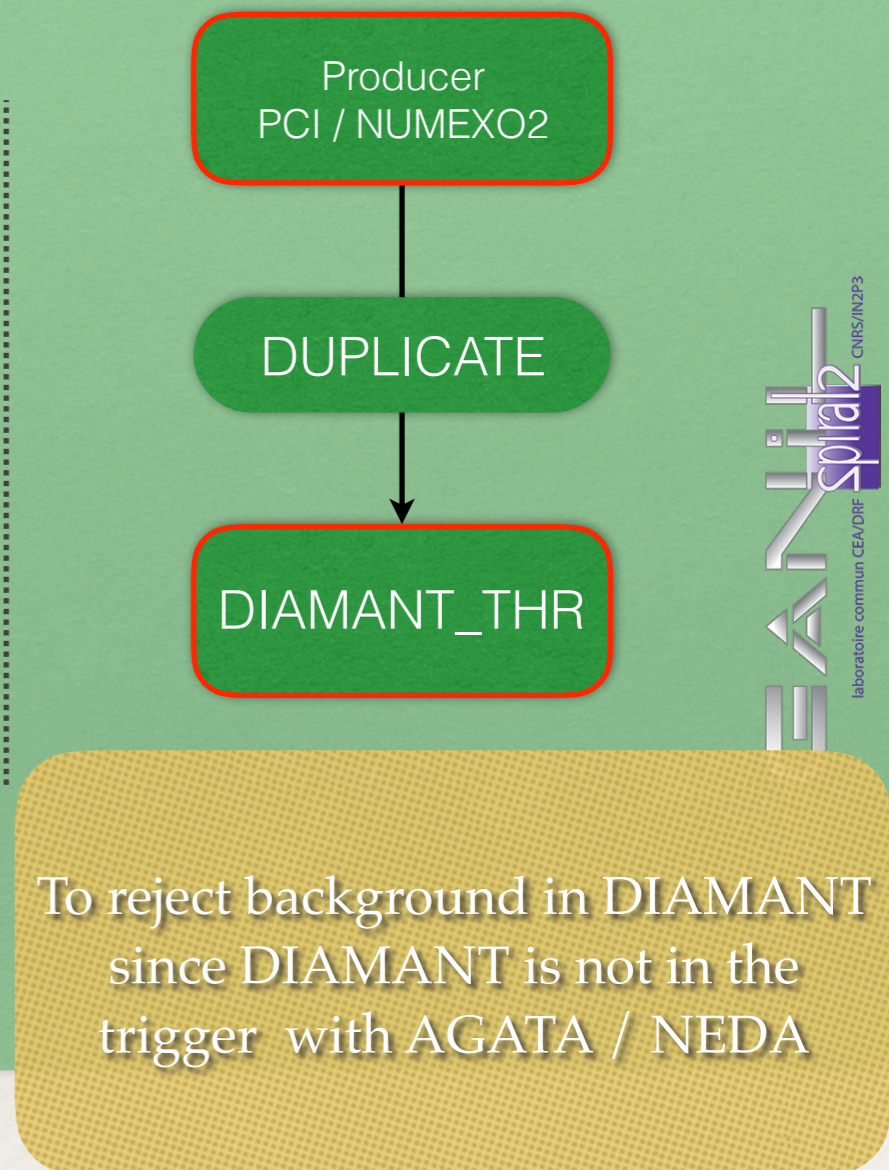
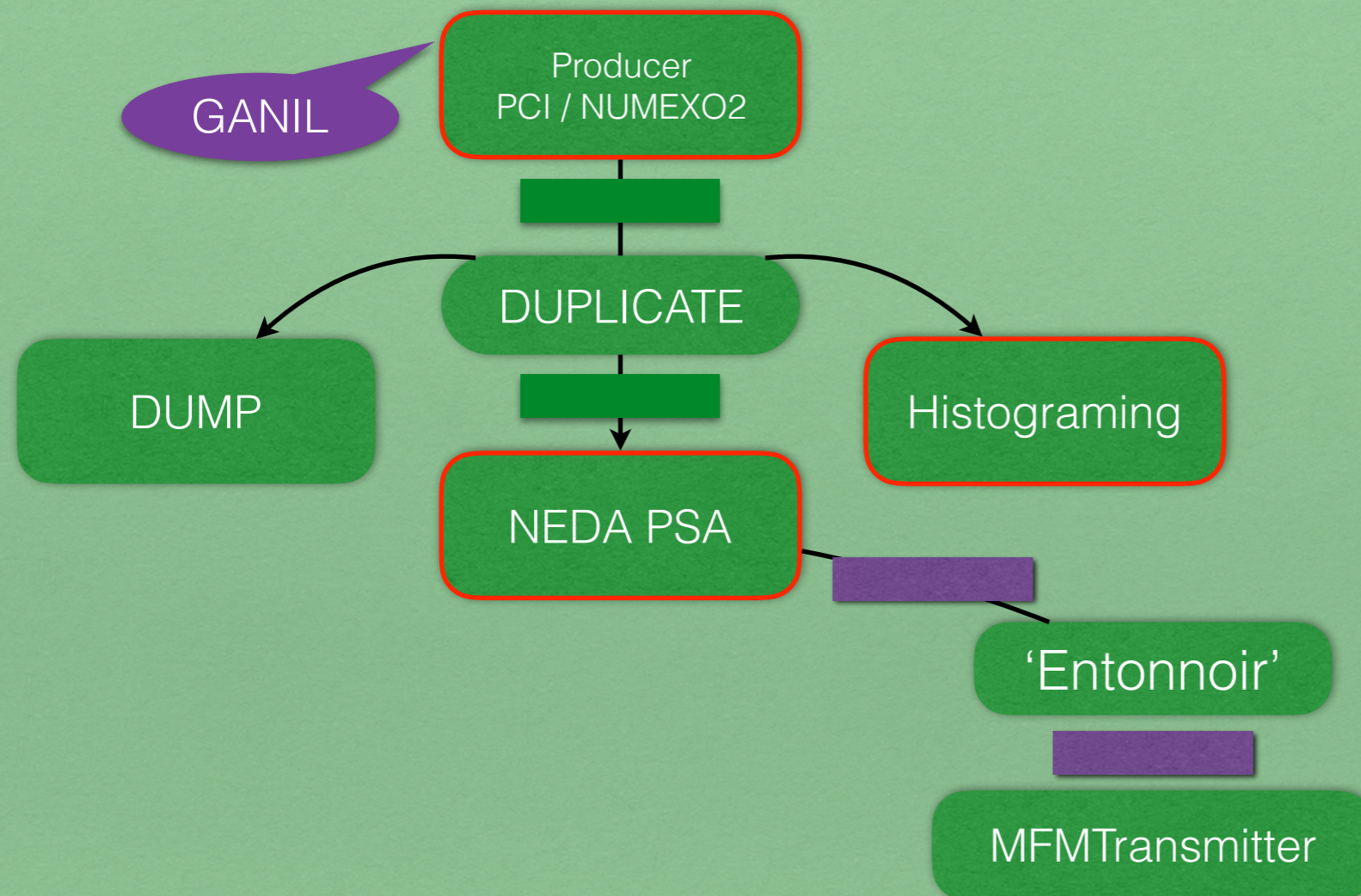
The TSorter filter required a configuration file :

- it should contains the mapping of the detectors to be aligned

- + it can aligned in Timestamp the different channels (useful to merge with AGATA)

The AGATA-NEDA-DIAMANT campaign

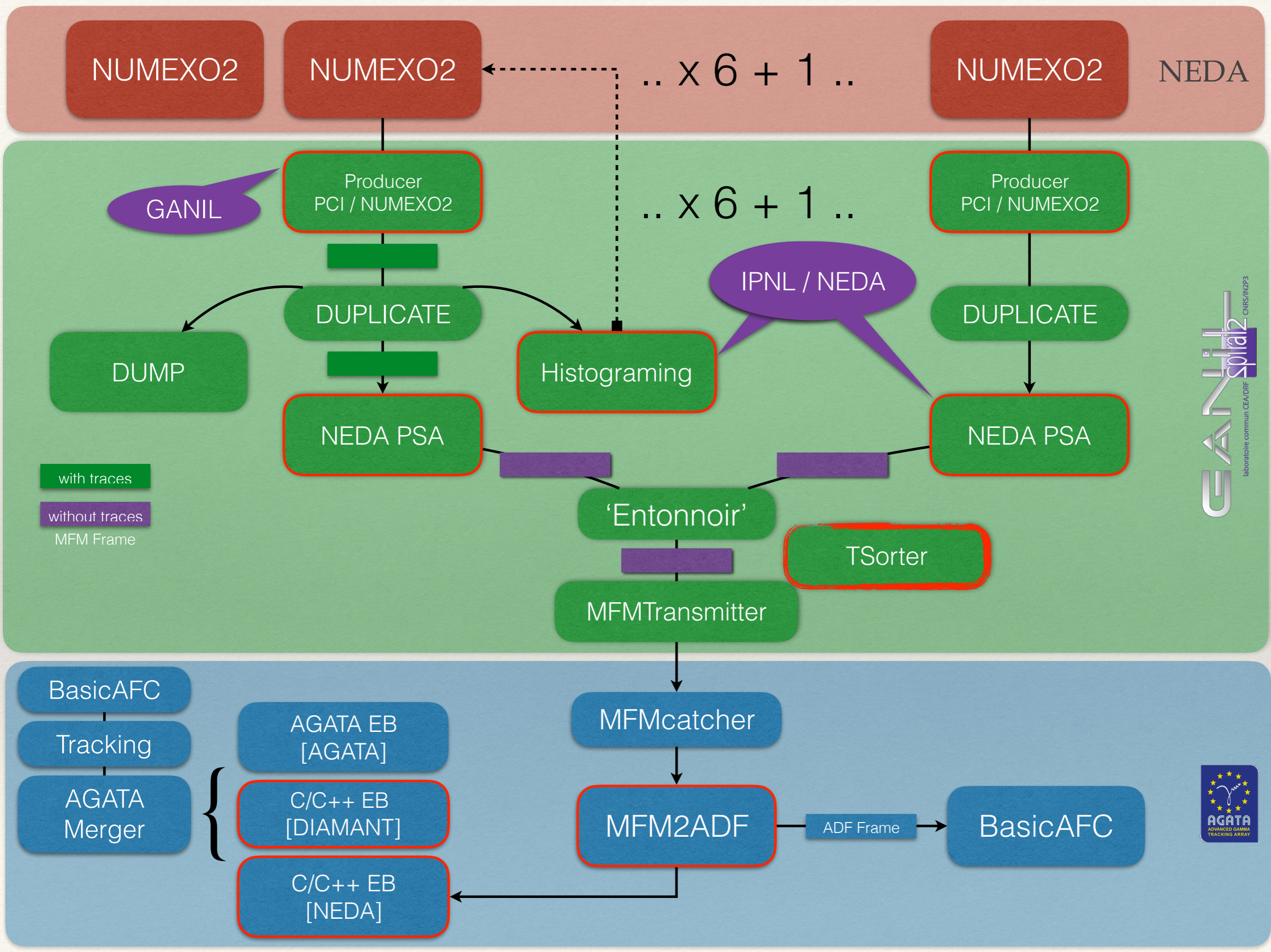
The GANPRO project: the **second** bricks



NNPSA

Neural Network version of PSA

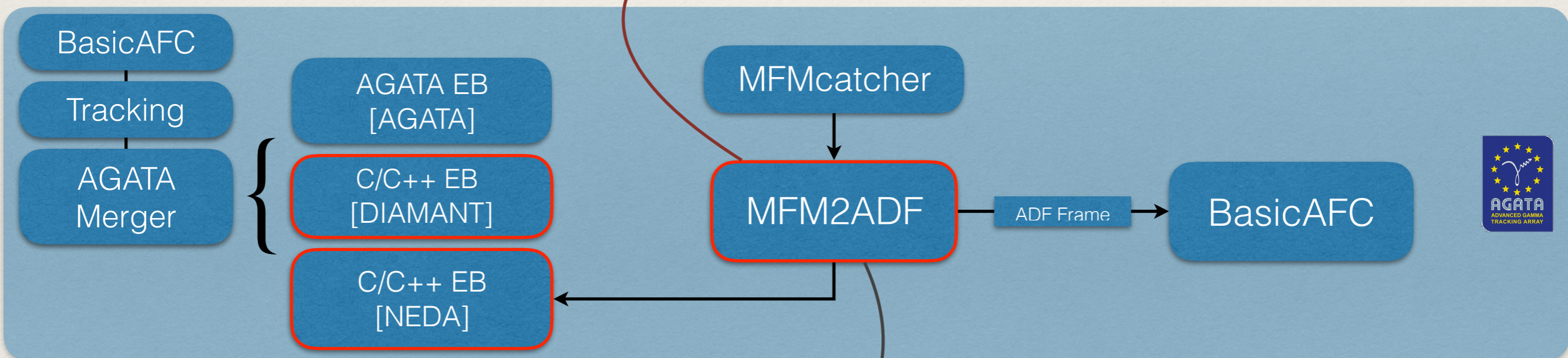
- about 40-50 times slower than CCPSA ...
- BUT runs online Thanks to tensor flow
- it changes the data flow structure (burst of data) ... but managed ...



The AGATA-NEDA-DIAMANT campaign

The GANPRO project: the **second** bricks

Online : the actor has been developed by Xavier (ADA) for the VAMOS campaign

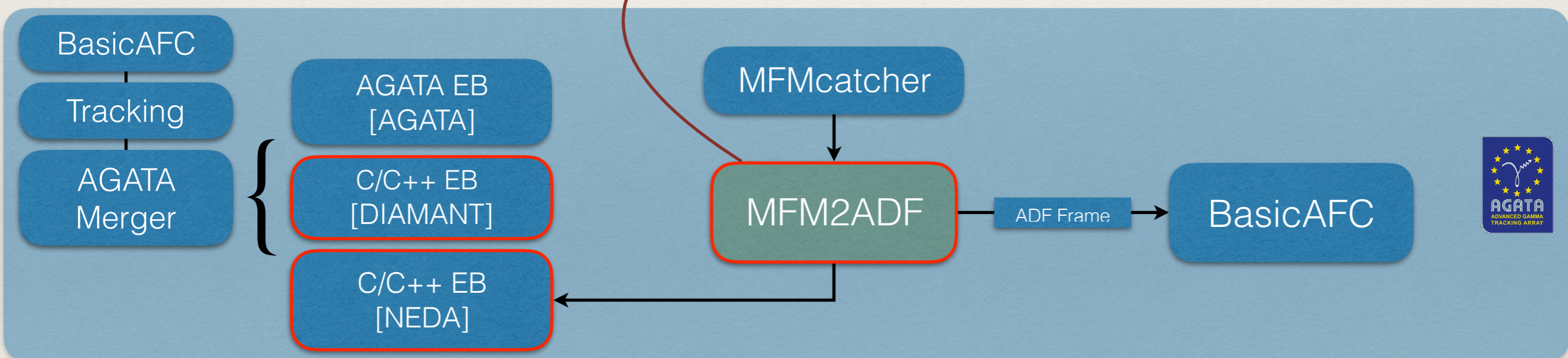


Offline : a C++ one is required to run offline !

The AGATA-NEDA-DIAMANT campaign

The GANPRO project: the **second** bricks

Online : the actor has been developed by Xavier (ADA) for the VAMOS campaign



Offline : a C++ one is required to run offline !

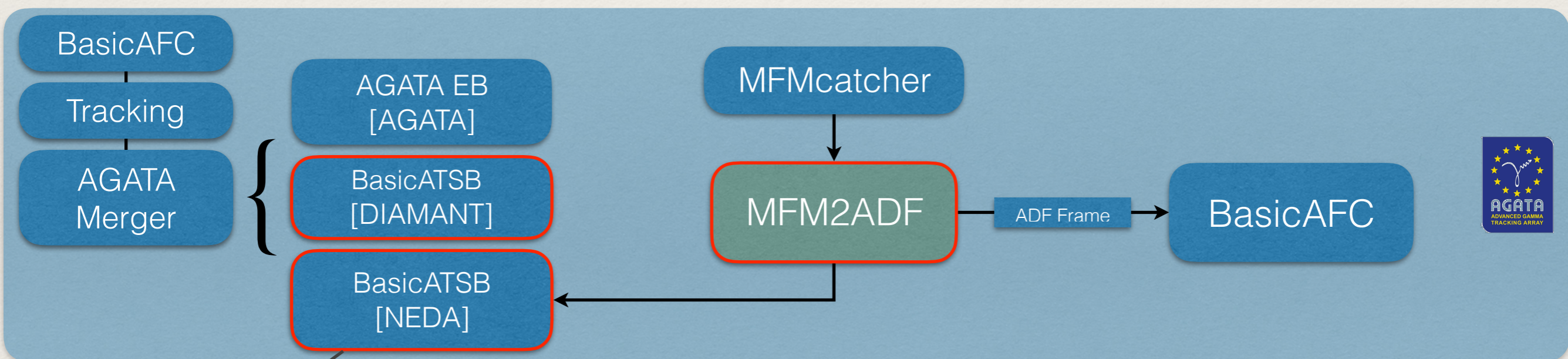
↔ This actor is available in the GANPRO package

The AGATA-NEDA-DIAMANT campaign

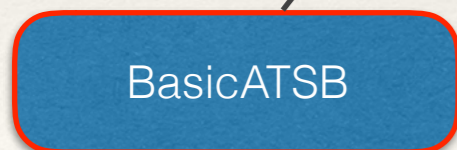
The GANPRO project: the **second** bricks

No global level processing online

ONLINE



OFFLINE



A C++ actor has been developed to build NEDA events and DIAMANT events

Classical algorithm : Window in Timestamp

NOTE : the input frames should be already ordered in time (through TSorter)

ATSB: AGATA TimeStamp Builder, in the AGAPRO package

The AGATA-NEDA-DIAMANT campaign

The GANPRO project: the **second** bricks

No global level processing online

ONLINE

BasicAFC

Tracking

AGATA
Merger

AGATA EB
[AGATA]

BasicATSB
[DIAMANT]

BasicATSB
[NEDA]

MFMcatcher

MFM2ADF

ADF Frame

BasicAFC



OFFLINE

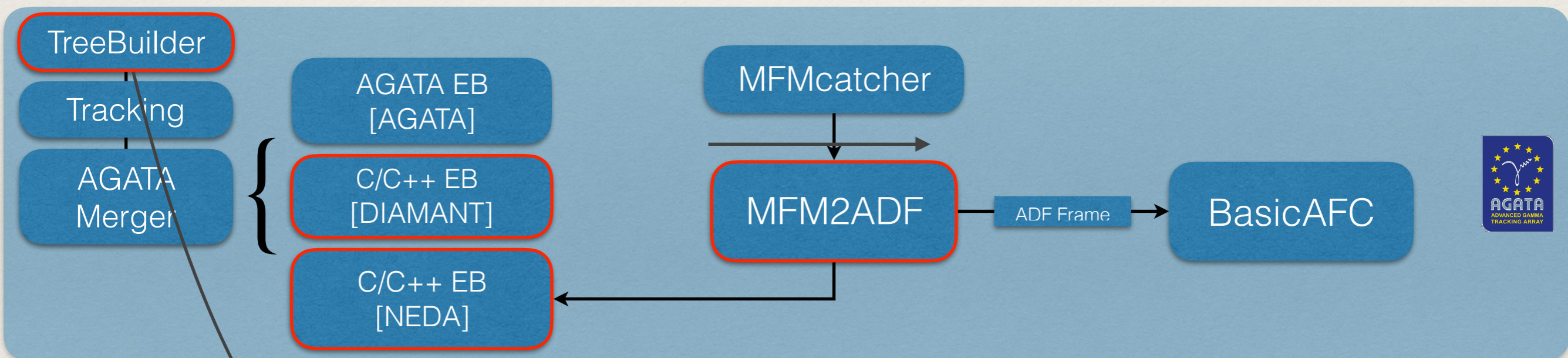
FEMUL

The AGATA-NEDA-DIAMANT campaign

The GANPRO project: the second bricks

No global level processing online

ONLINE



OFFLINE

Produces ROOT Tree as through Watchers but without producing intermediate ADF files



Conclusions

GANPRO + AGAPRO

Project started in September 2017 ... achieved on time in April 2018

↪ Huge effort !

↪ Many thanks to all the people involved @ganil @outganil @neda @diamant @agata

↪ Second campaign with physics (quasi)online

First papers of the VAMOS campaign < 2 years

Lets hope the same for the NEDA / DIAMANT campaign

↪ the good surprise for us, we are able to run Neural network online !

↪ What about using GPU online in the future ?