GRIT analysis with nptool v4

A. Matta, LPC Caen, CNRS/IN2P3

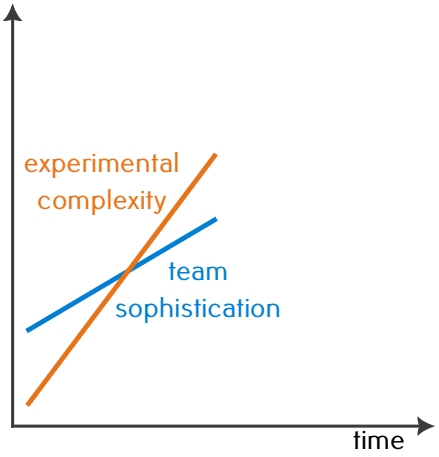
GRIT-AGATA-VAMOS workshop 11th-13th June 2025

UNIVERSITÉ
CAEN
NORMANDIE

Normandie Université

Why a framework?

Technological gap



Increased complexity

- Multidetector
- Multi-DAQ
- Short setup time
- Travelling detectors
- Triggerless DAQ
- Shared dataset

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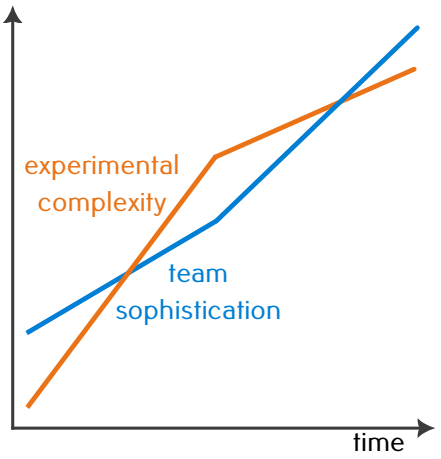

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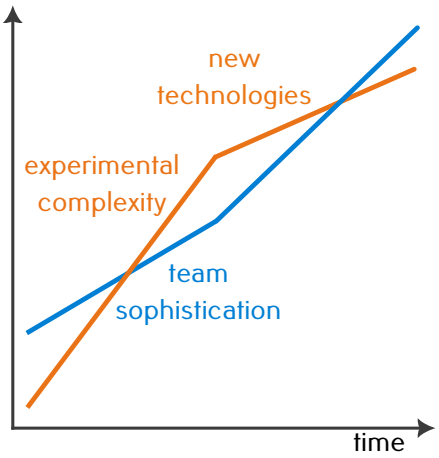

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new technologies:

- code (git) & data versionning (dvc?)
- workflow management (snakemake)
- container (apptainer,docker)
- e-logging (elog, or else?)

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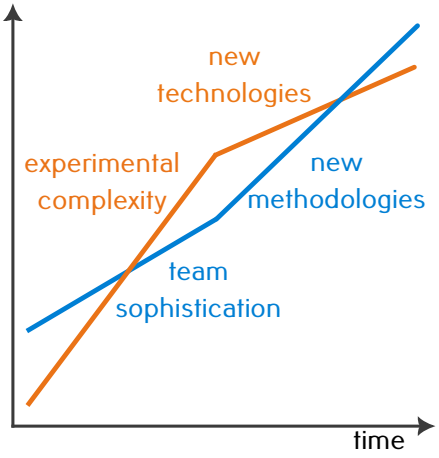

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new methodologies:

- team analysis
- trainning material
- simulation for debugging

nptool v4

V1: 2008 V2: 2014 V3: 2016 V4: 2022

Dynamic Loading → MultiThreading → Thirdparty Plugins

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nptool v4 concept orginally presented at ACAT 2021 (IBS)

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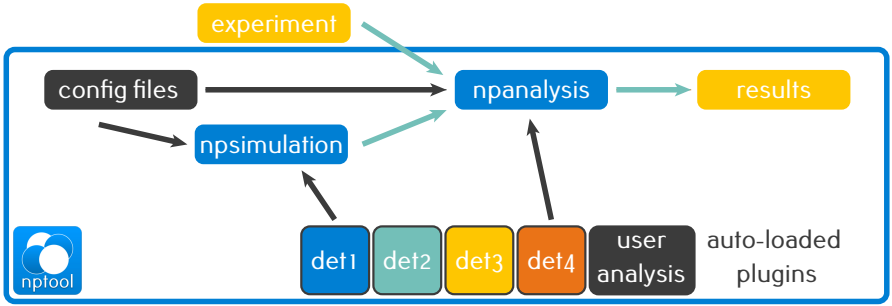
Working on a more formal Collaboration → Join the npteam!

Key Concept: **Analysis & Simulation modular framework** (for low energy nuclear physics)

- Repository:
  → gitlab.in2p3.fr/nptool/nptool
- Website:
  → nptool.in2p3.fr
- Open source, open collaboration
  → everybody is welcome!

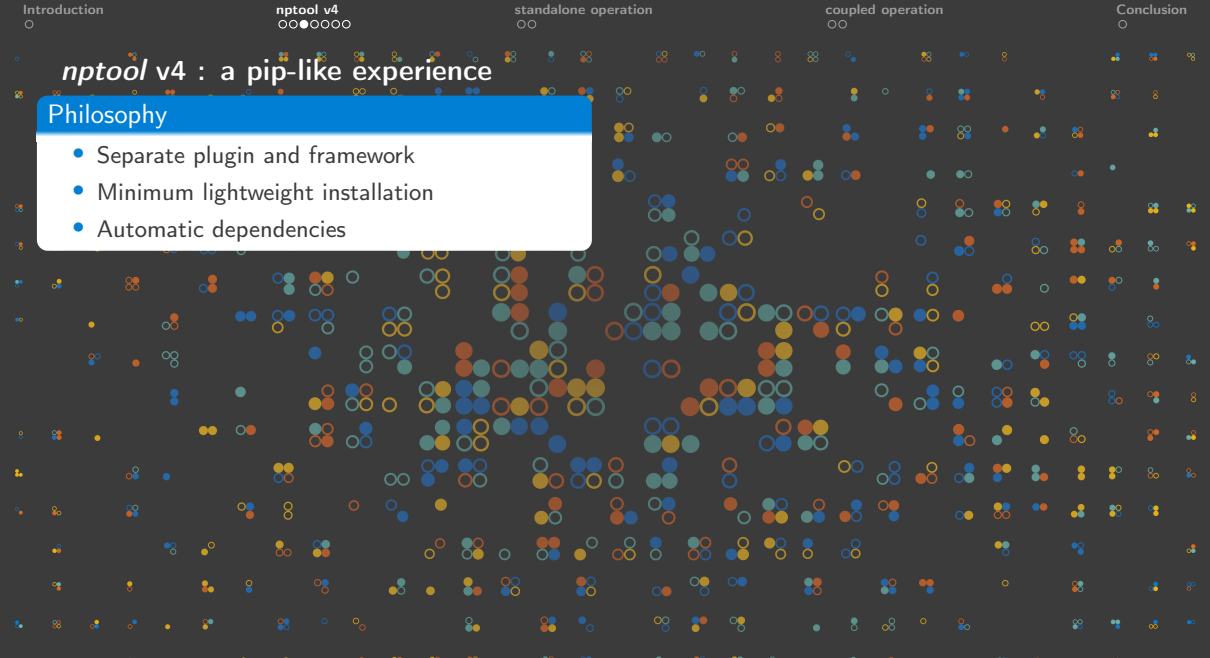
- User base:
  → V3(2008-now) ∼ 100 users
  → V4(2022-now) ∼ 20 users
- Support
  → matta@lpccaen.in2p3.fr



nptool v4 : a pip-like experience

Philosophy

- Separate plugin and framework
- Minimum lightweight installation
- Automatic dependencies



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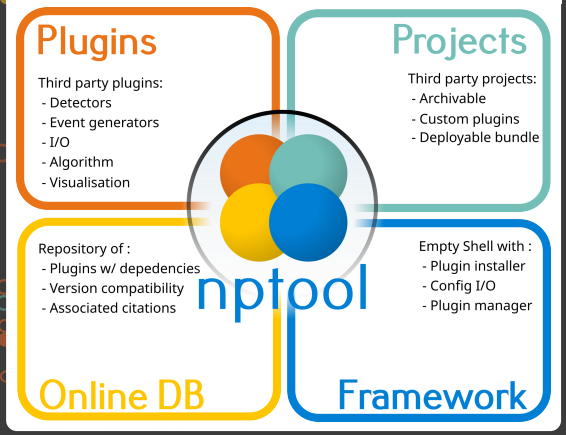

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- Easy CI/CD workflow
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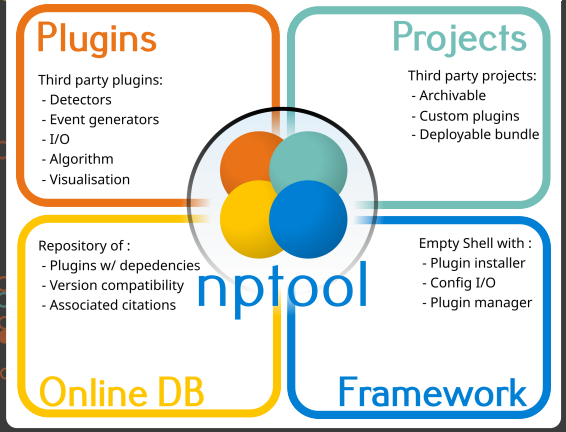

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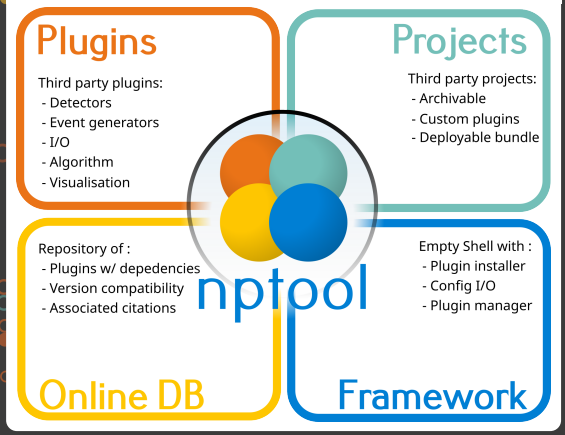
For end users

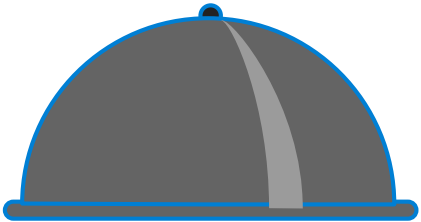
- Plugins on demand
- Hassle free installation
- Custom projects w/ duplicate plugins
- Open science friendly

Modular, Open, Lightweight



nptool v4 : publication opportunities

Lifting the lid



Soft(ware)-power

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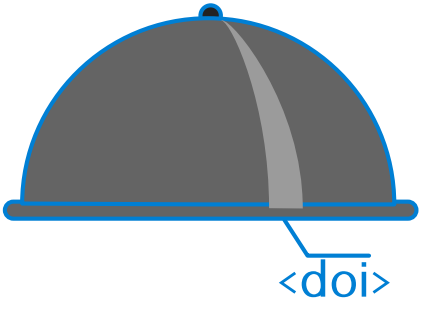

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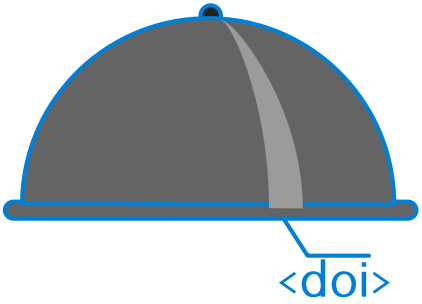

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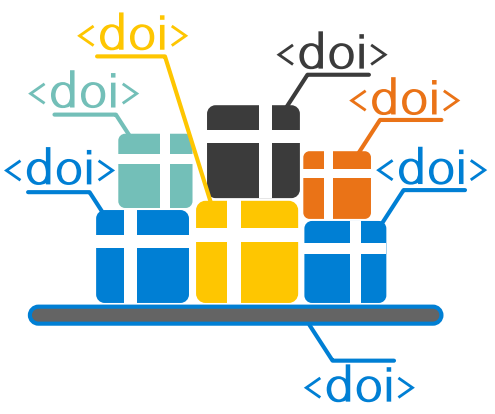

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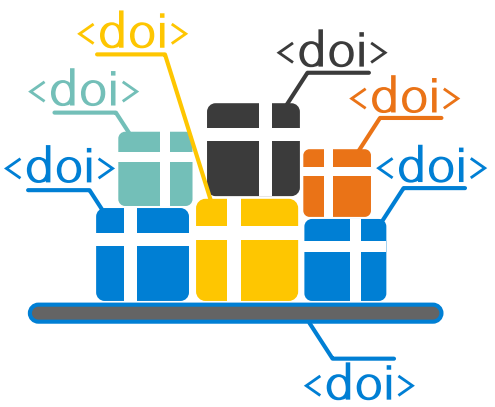

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Where?

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- JOSS (IF4.7)

nptool v4 : modular workflow

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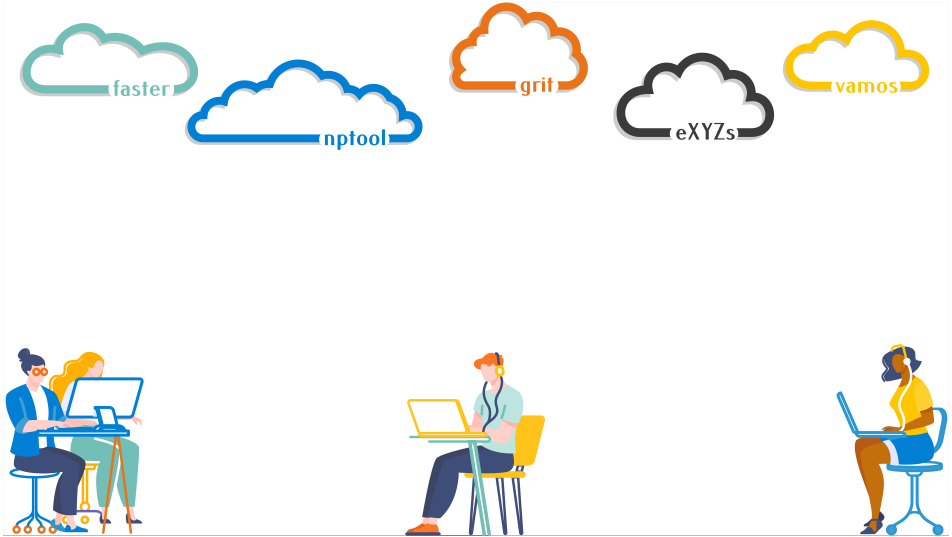

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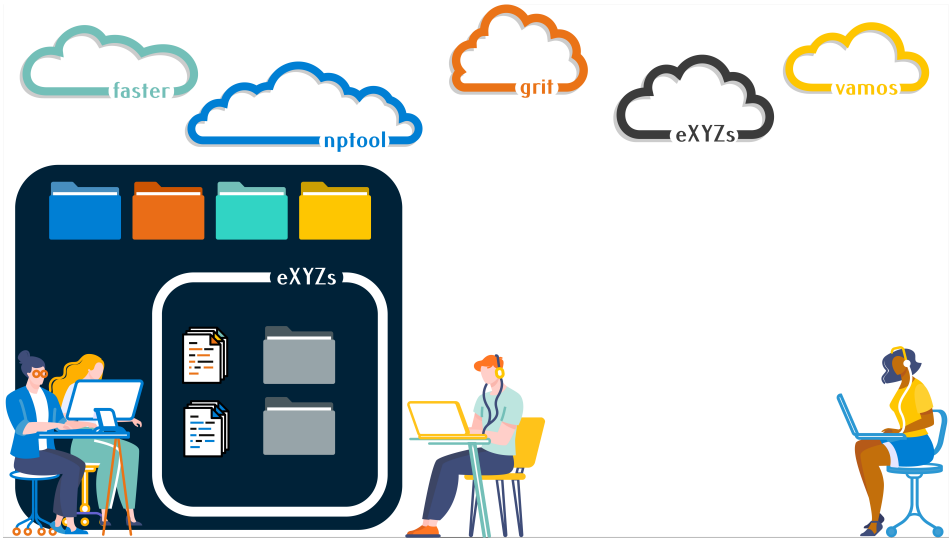

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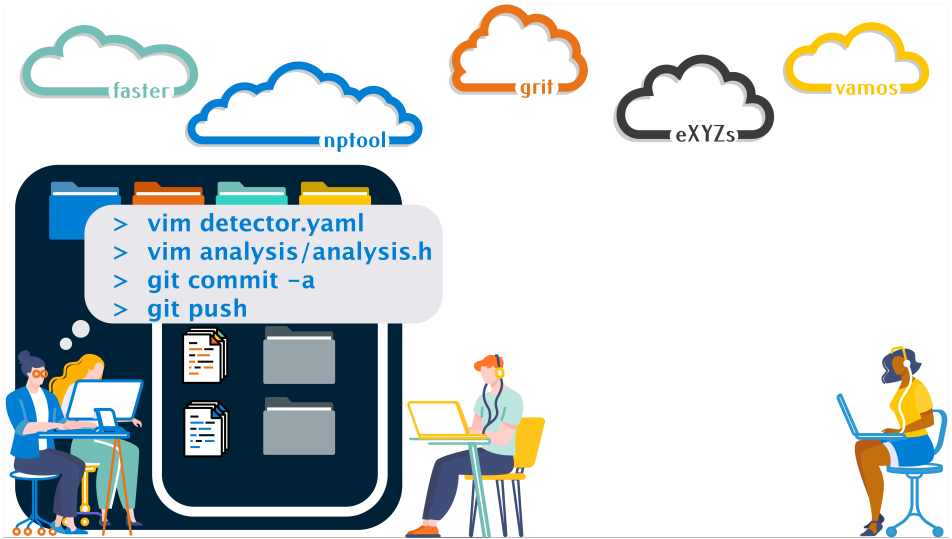

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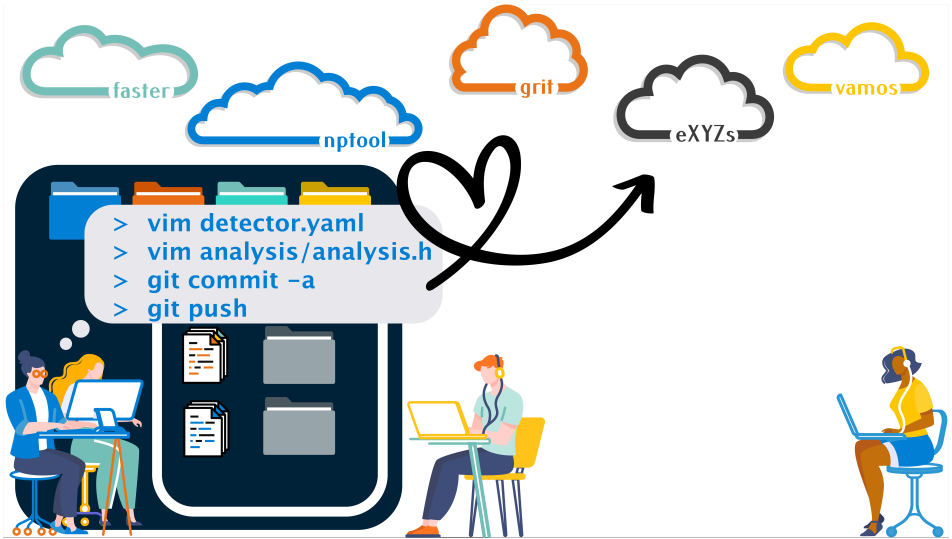

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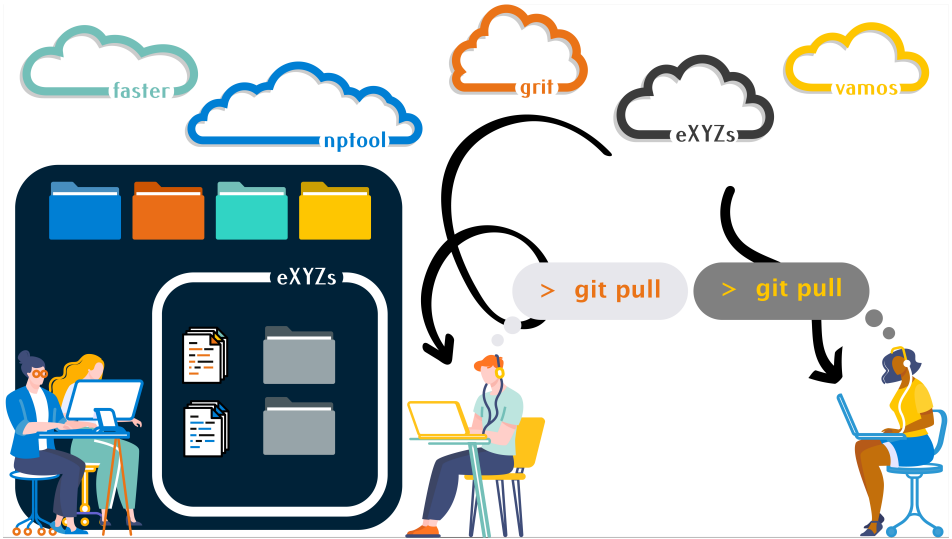

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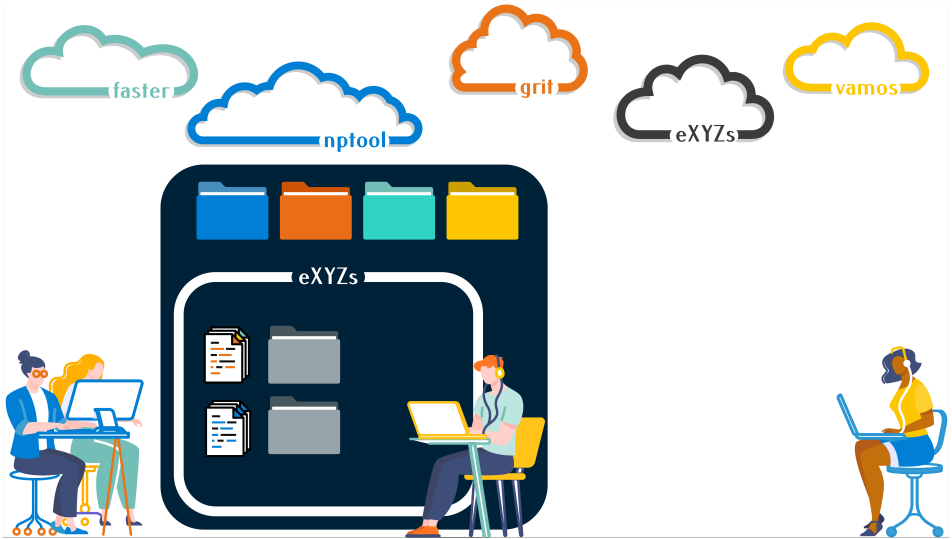

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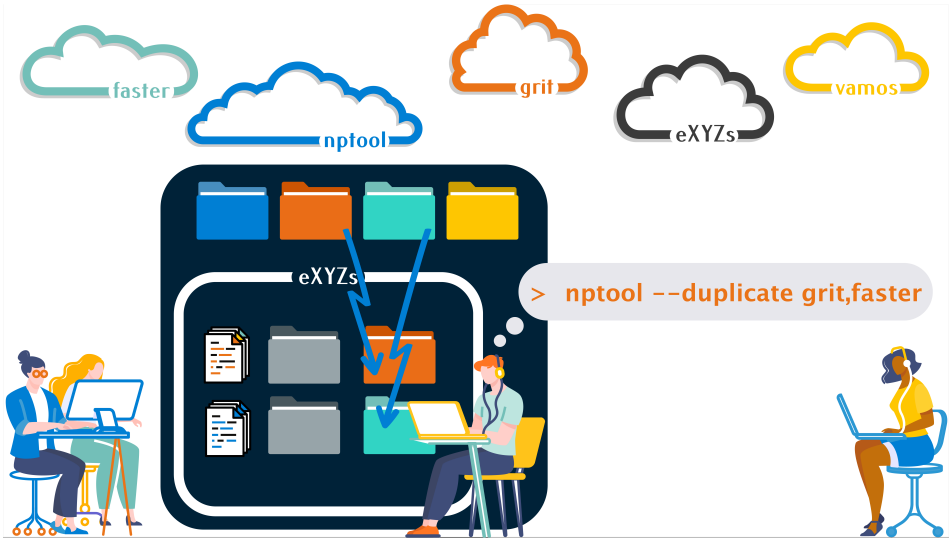

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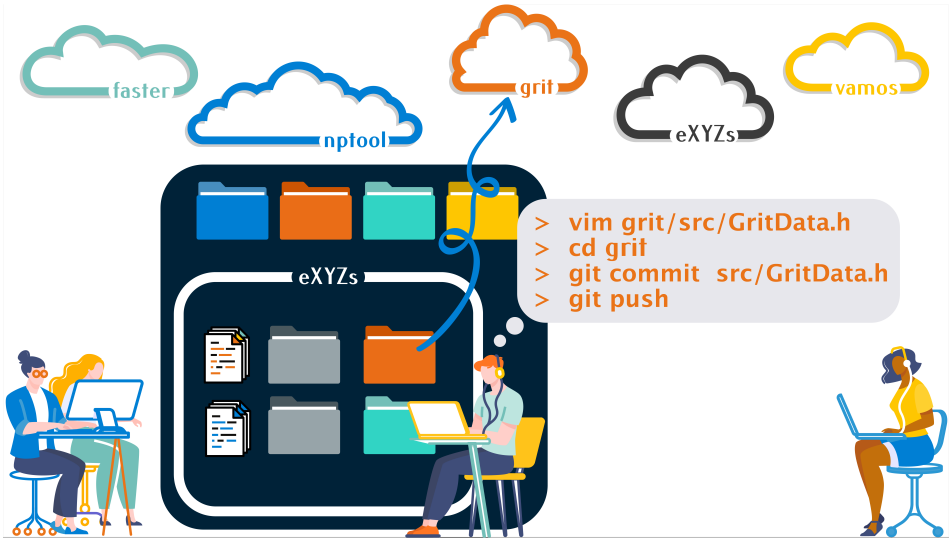

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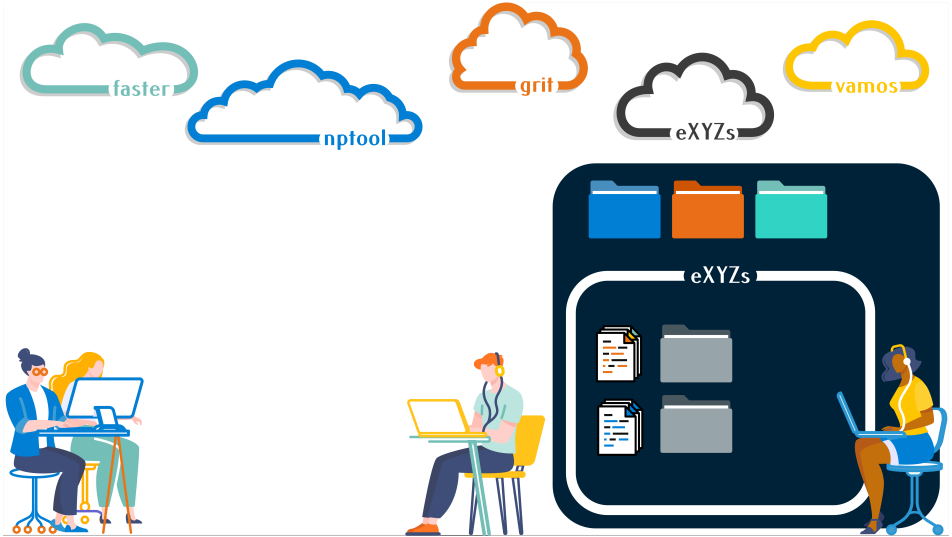

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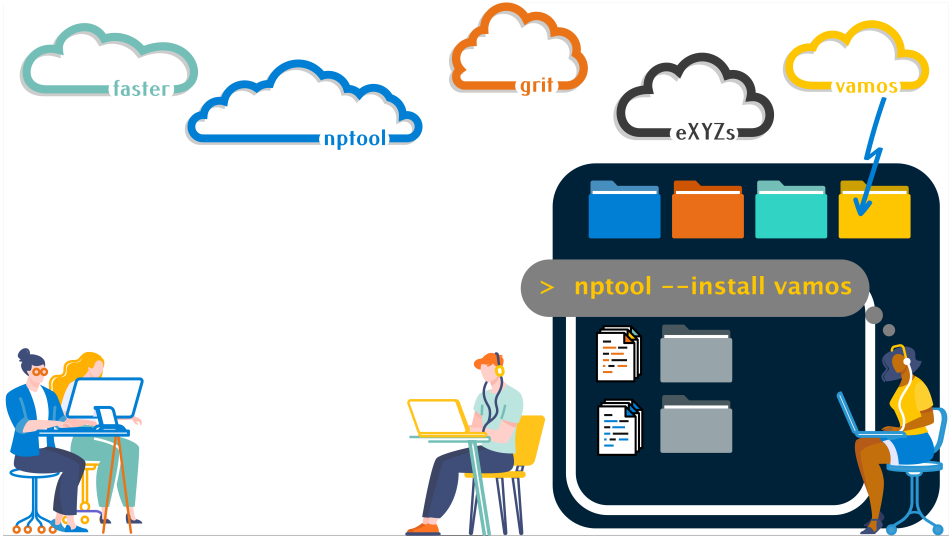

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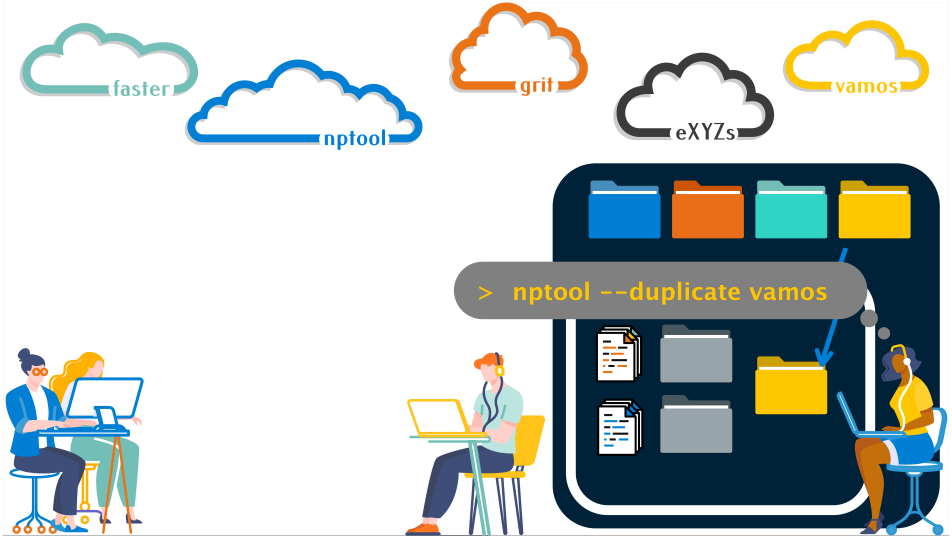

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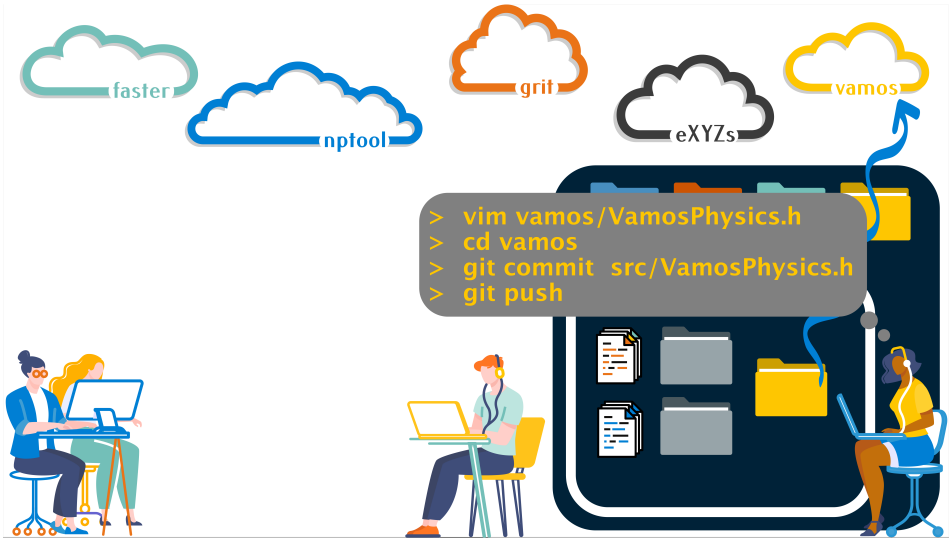

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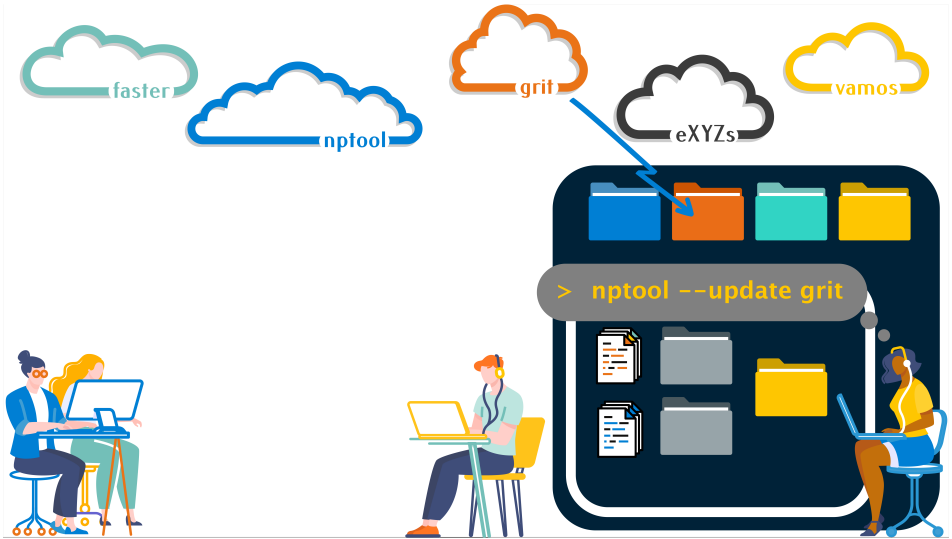

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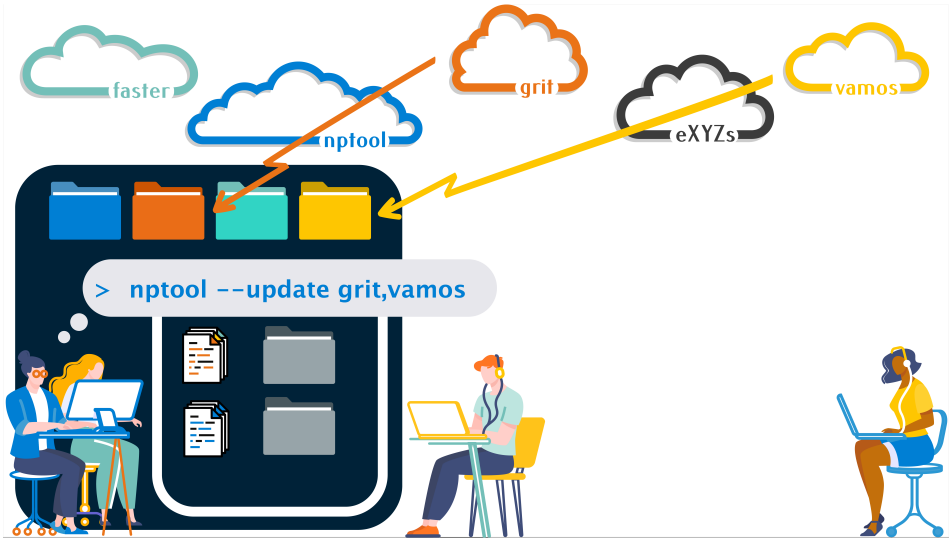

nptool v4 : road map

new features

- Full simulation framework
- MESYTEC DAQ (PM)
- Data version control (CP)

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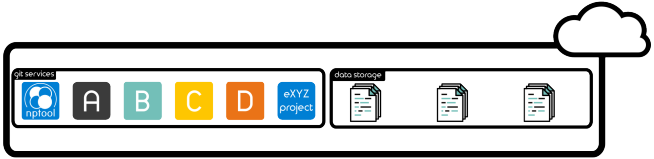
→ ✓ Website tutorial
→ ✓ Supporting video
→ ✓ **In person coding week**

nptool v4 : a data quality tool box (C. J. Paxman)



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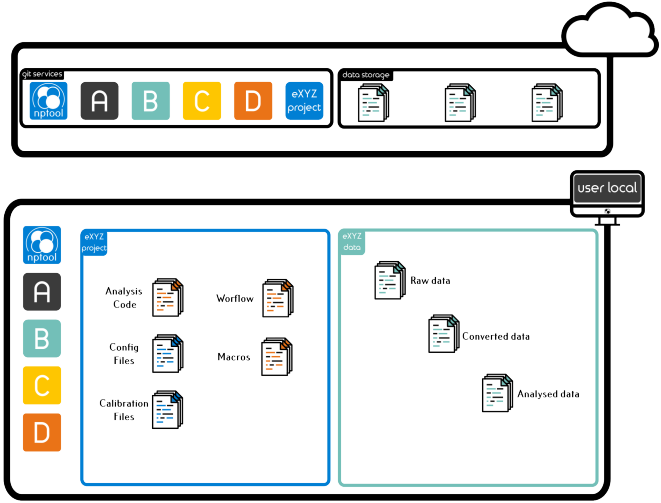

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- Subcomponent versionning (Plugins)
  - Tracking/Citation/Autorship/...
- All inputs versioning (Projects)
  - All file in one place

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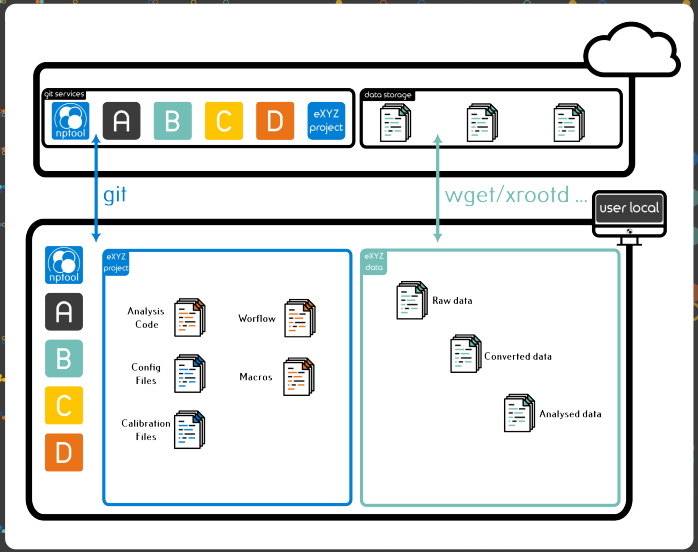

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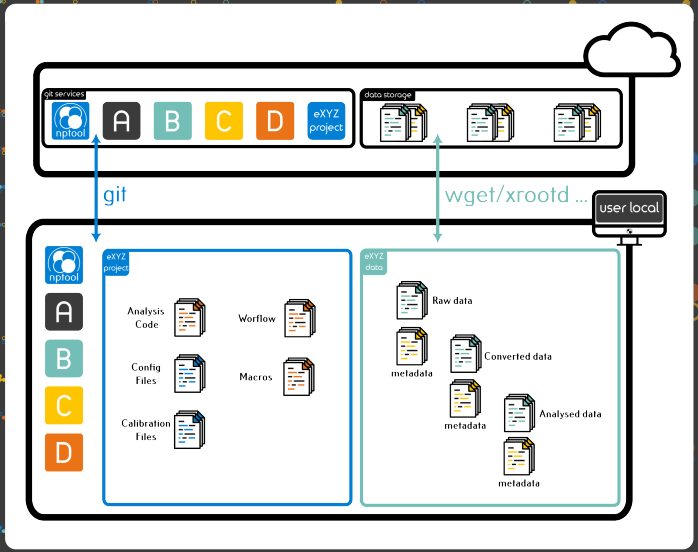

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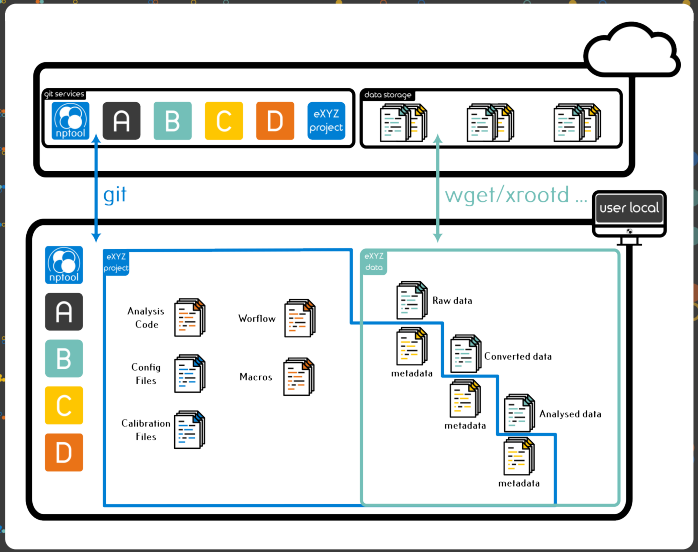

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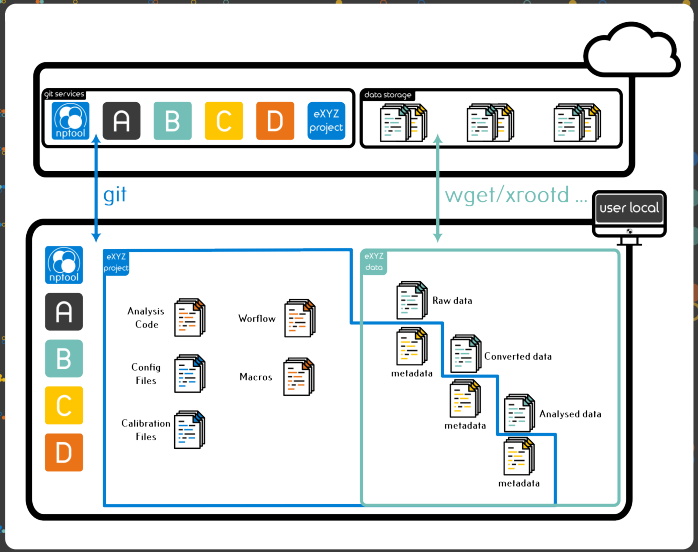

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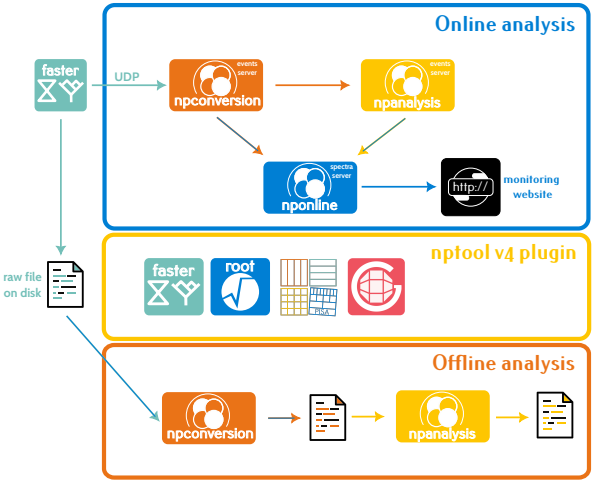
nptool v4 beyond tommorrow

- Recover data files from metadata
- Reproduce files on demand

nptool v4 analysis model

A. Matta, F. Flavigny, D. Etasse, V. Girard-Alcindor, P. Morfouace, C. Lenain,



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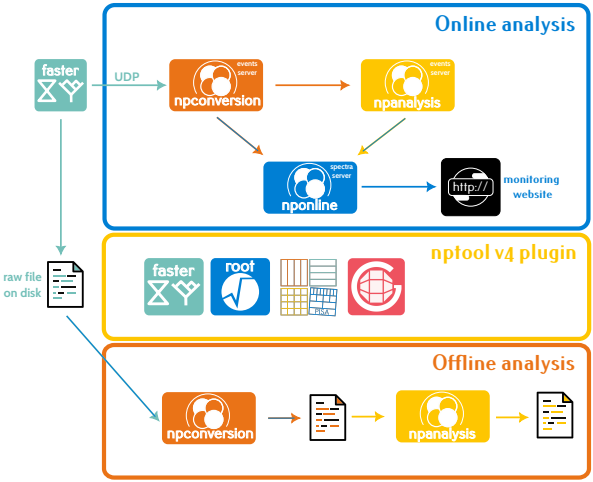

Tested and deployed:

- GANIL (MFM)
- CEA (Mesytec)
- RIKEN (FASTERv2/STRASSE)
- Los Alamos (FASTERv2)

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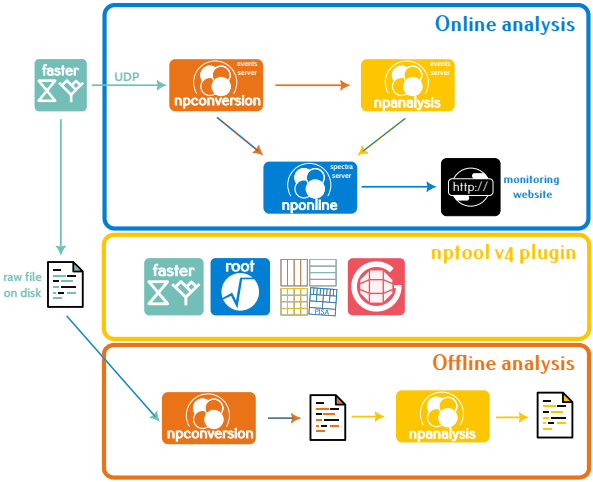

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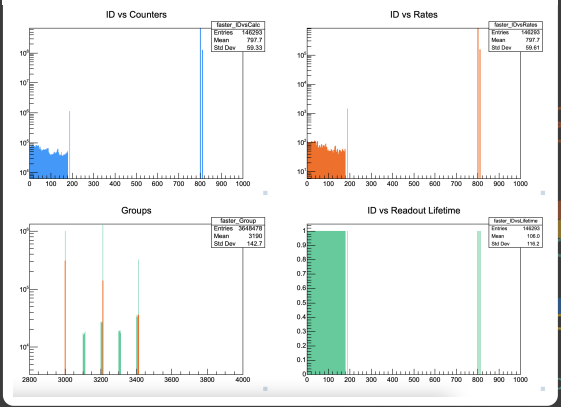
nptool v4 Benefits:

- **Support any DAQ system**
- **Support any File format**
- **Remote computing** ready
- **git and snakemake** friendly
- multi-user friendly
- distributed computing
- handle large number of channels

Faster online analysis with nptool v4

Online canvas

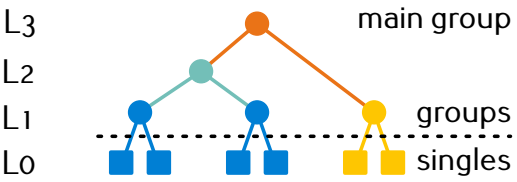


→ standard online solution for faster

Highlights

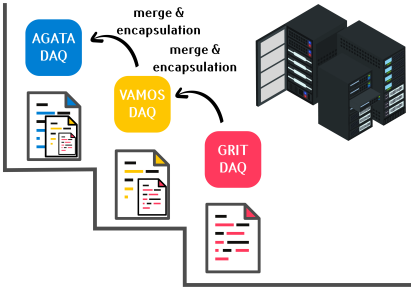
- Global DAQ monitoring
  - total count per channel
  - rate & lifetime per channel
  - Arbitrary level Trigger content
- Auto histo for "orphan" labels

Faster software trigger



nptool GRIT-AGATA-VAMOS data scheme

Scenario 1 : Matrioshka



Key points:

- Successive merge
- Data encapsulation

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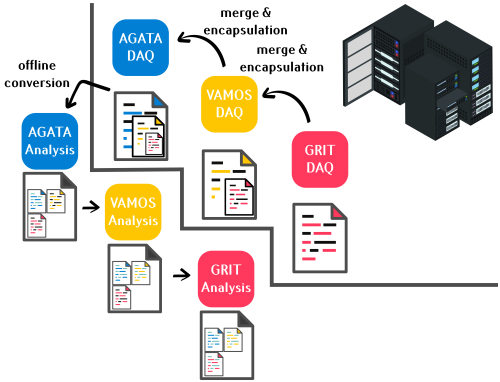

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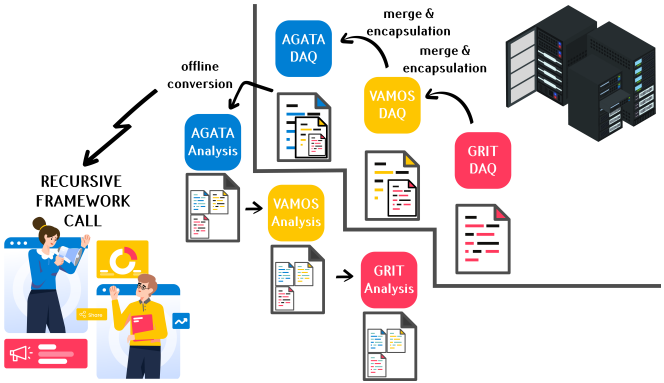
- Data encapsulation
- Successive analysis

nptool GRIT-AGATA-VAMOS data scheme

Scenario 1 : Matrioshka



Key points:

- Successive merge
- Data encapsulation
- Successive analysis

Issues:

- Framework interoperability
- High latency
- Reprocessing difficult
- Communication needed

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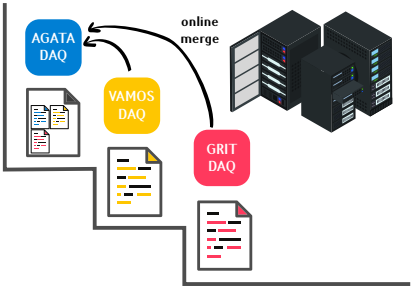

Key points:

- Successive merge
- Common data format

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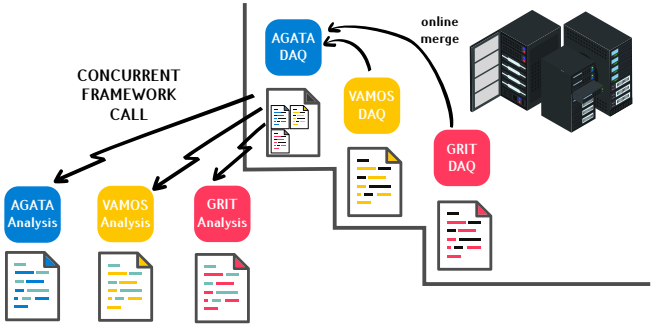

Key points:

- Successive merge
- Common data format
- Parrallel analysis

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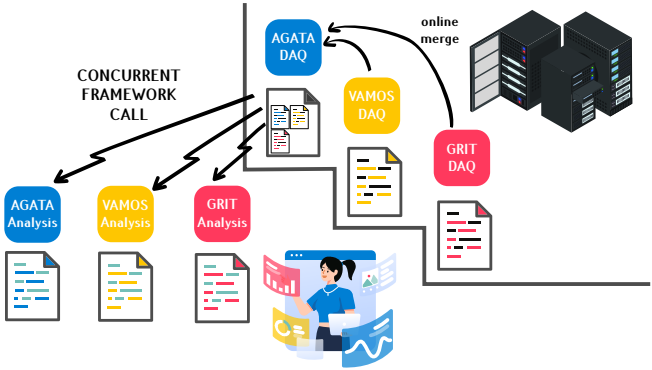

Key points:

- Successive merge
- Common data format
- Parrallel analysis

Benefits:

- Independent Analysis
- Pull data model
  - low latency
- Easy reprocessing

nptool Conclusion

Opportunities

- Create an integrated dataworflow
  → Snakemake
- Unified data file format for better data management
  → ADF?
- Distributed computing for faster analysis
  → Docker and Slurm

nptool Conclusion

Opportunities

- Create an integrated dataworflow
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Open questions

- Logging facility
- DMP