Handling of GNDS in FRENDY and our recent activity

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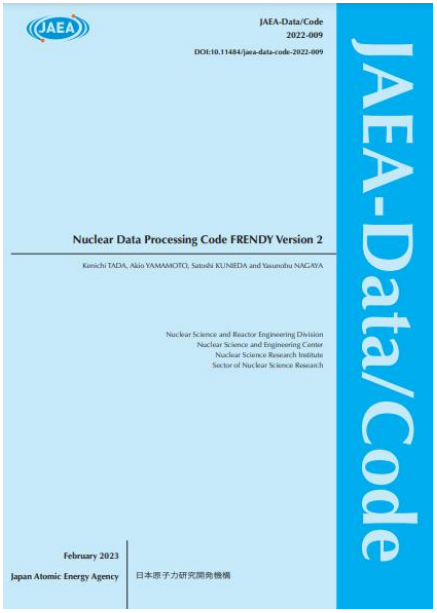
  - Coupling of neutronics and thermal-hydraulics calculations.
  - HDF5 formatted data file is used for the data container of JAMPAN.

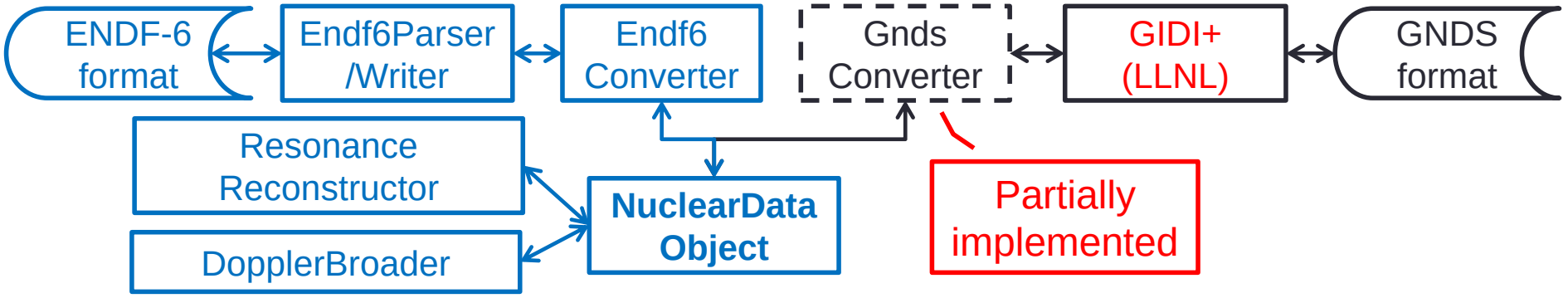
Recent Progress of FRENDY

- Release of FRENDY Ver. 2.01 (2022/Nov.)
- Publication of the new FRENDY manual (2023/Feb).
  - Nuclear data processing code FRENDY version 2
    - JAEA-Data/Code 2022-009
    - https://doi.org/10.11484/jaea-data-code-2022-009



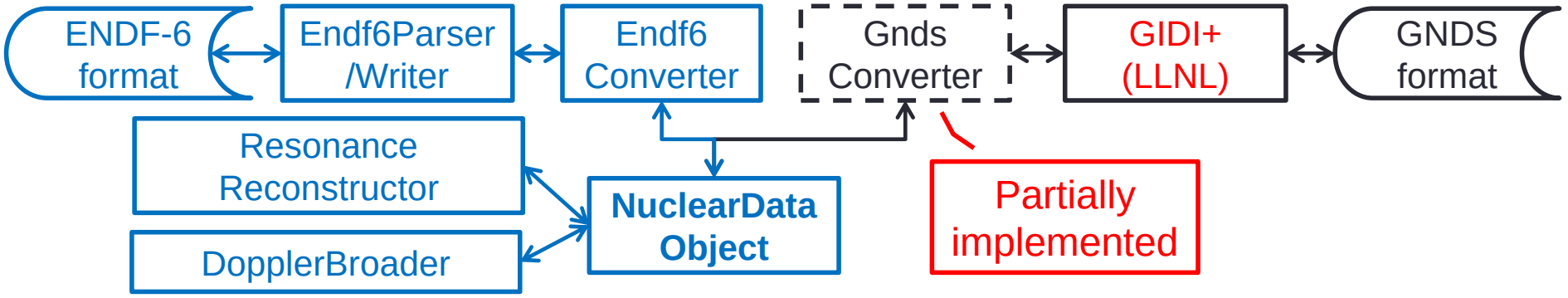
Implementation status of GNDS handling module in FRENDY

- I tried to use GIDI+ of LLNL as the FRENDY's parser and the writer modules to handle GNDS.
  - Cross section data and other data were successfully handled by GIDI+.
  - Converter module was developed to set data to NuclearDataObject in FRENDY.
    - But not completed.



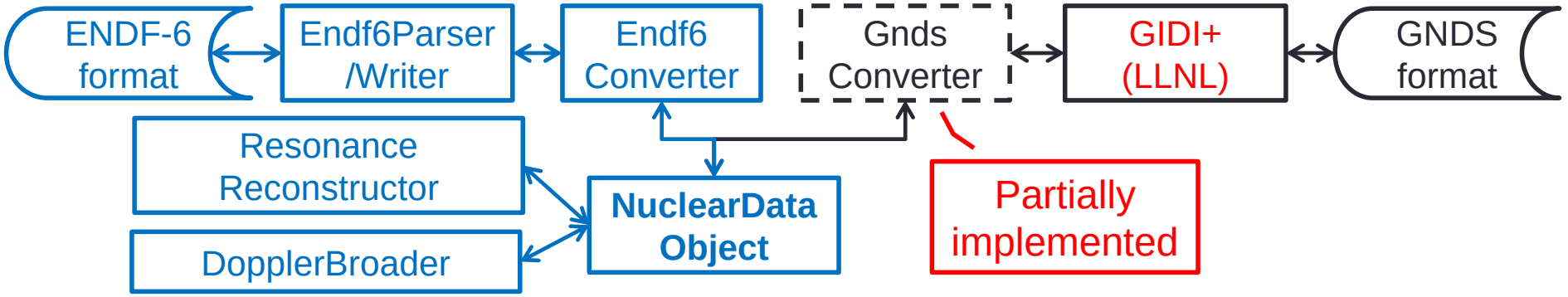
Difficulties in handling GNDS format

- It is difficult to find which data in GNDS format correspond to data in ENDF-6 format.
  - FRENDY can minimize the impact of nuclear data format changes.
  - However, FRENDY is developed on the premise that all data included in the ENDF-6 formatted file are included in the GNDS formatted file.
  - I had to check which data in GNDS format corresponds to data in ENDF-6 format to develop the converter module.



Request for GNDS format manual

- The correspondence table between the ENDF-6 and the GNDS formats will be very helpful.
  - The GNDS format has high flexibility.
    - It is difficult to understand how to put GNDS format data into FRENDY's NuclearDataObject.
  - Converter module had to be developed by carefully comparing nuclear data in ENDF-6 format with data in GNDS format.
    - It would be difficult for users, who want to change the nuclear data format from ENDF-6 format to GNDS format, to do it by themselves.
    - The correspondence table will help these users.
      - I would appreciate it if the correspondence table was prepared.



Impressions using GIDI+

- Excellent!
  - GIDI+ is a great +tool to treat GNDS formatted files.
  - Easy retrieval of all data in GIDI+.
    - I can easily find out which container has the data.
- Request for GIDI+
  - Implementation of resonance parameter handling function.
    - Current GIDI+ cannot read resonance parameters.
  - I hope this function will be implemented soon.

Future works

- Complete the GNDS handling module in FRENDY.
  - After implementing the resonance parameter handling function in GIDI+.
- Processing of GNDS formatted files.
  - For verification of the GNDS handling module.
  - Using TENDL and ENDF/B-VIII.0 libraries.

Development of a multi-physics simulation platform JAMPAN

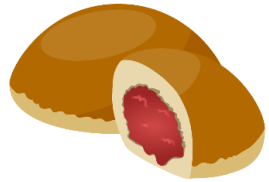
- I found that the purpose of this meeting includes "high-fidelity multi-physics simulation efforts".

> The purpose of the event is to assess the actual capabilities, successfully deployed methods, tools and protocols, and future needs in terms of nuclear model code outputs in the General Nuclear Data Structure and their processing into useful applications forms. At the same time and in support of high-fidelity multi-physics simulation efforts, build a modern durable partnership between fundamental sciences and applications needs.

- We are now developing a high-fidelity multi-physics simulation platform JAMPAN to supply reference results of core analysis codes.
  - I briefly introduce our multi-physics simulation platform JAMPAN.

Overview of JAMPAN

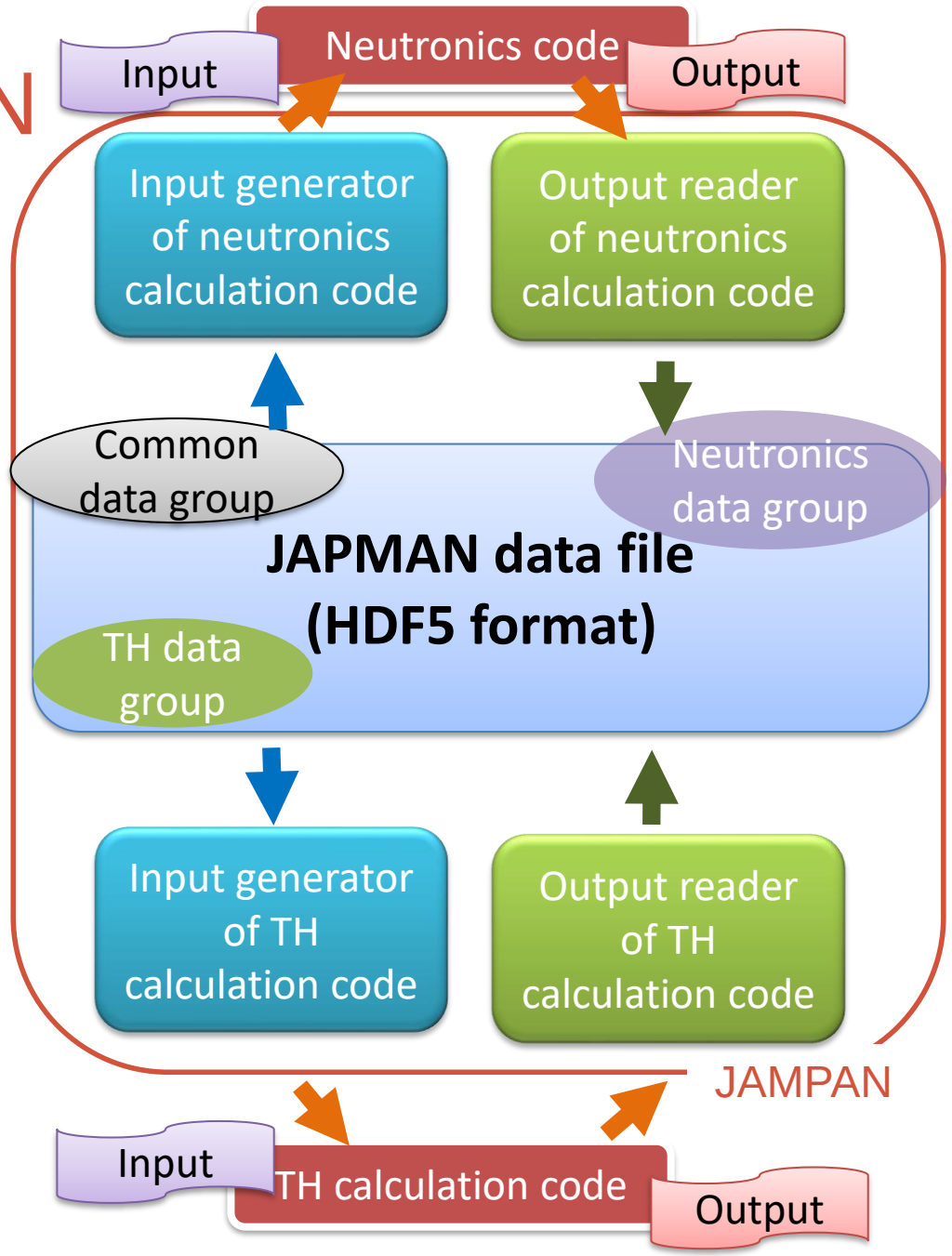
- JAMPAN is a Python-based high-fidelity multi-physics simulation platform.
  - JAEA Advanced Multi-Physics Analysis platform for Nuclear systems
    - JAMPAN: a bun with jam filling.



- The current target of the multi-physics simulation is the coupling of the neutronics and thermal-hydraulics (TH) calculations.
  - We will consider the coupling of the structure calculation, calculation of corrosion behavior, and so on in the future.

Structure of JAMPAN

- All calculation results are stored in the JAMPAN data file.
  - HDF5 file.
  - The JAMPAN data file format does not depend on calculation codes.
  - The GNDS format is a good reference to make JAMPAN data file format.
- Each calculation code can be easily exchanged.
  - Only the input generator and output reader functions are required to add another code.

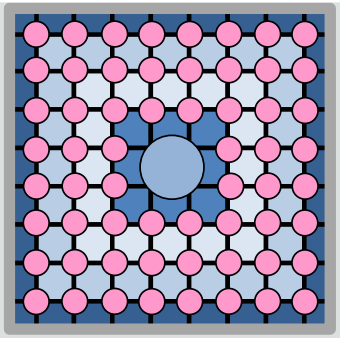
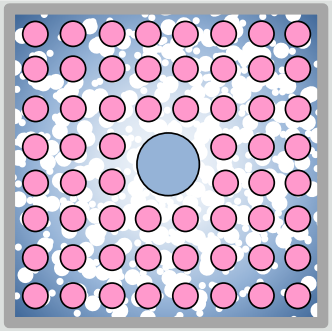


Conclusions

- Implementation status of GNDS handling module in FRENDY
  - GIDI+ of LLNL was used to handle a GNDS formatted file in FRENDY.
  - Request for GNDS format manual
    - The correspondence table between the ENDF-6 and the GNDS formats will be very useful information for changing the nuclear data format.
- Development of a multi-physics platform JAMPAN.
  - Coupling calculation of neutronics and thermal-hydraulics calculations.
  - HDF5 file is used for the JAMPAN database.
    - GNDS format is a good reference to make JAMPAN data file format.

Calculation target of neutronics and TH coupling calculation

- Two calculation cases are our calculation target
  - Core analysis
    - Sub-channel analysis
  - Assembly analysis
    - High-fidelity simulation

	Core analysis	Assembly analysis
Image of calculation		
Calculation target	Sub-channel calculation	High-fidelity simulation
Analysis scale	10 M meshes (Workstation)	More than 1 B meshes (supercomputer)
TH calculation code	NASCA ACE-3D	JUPITER TPFIT
Neutronics calculation code	MVP	MVP

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