OAK RIDGE National Laboratory

Current Status of AMPX

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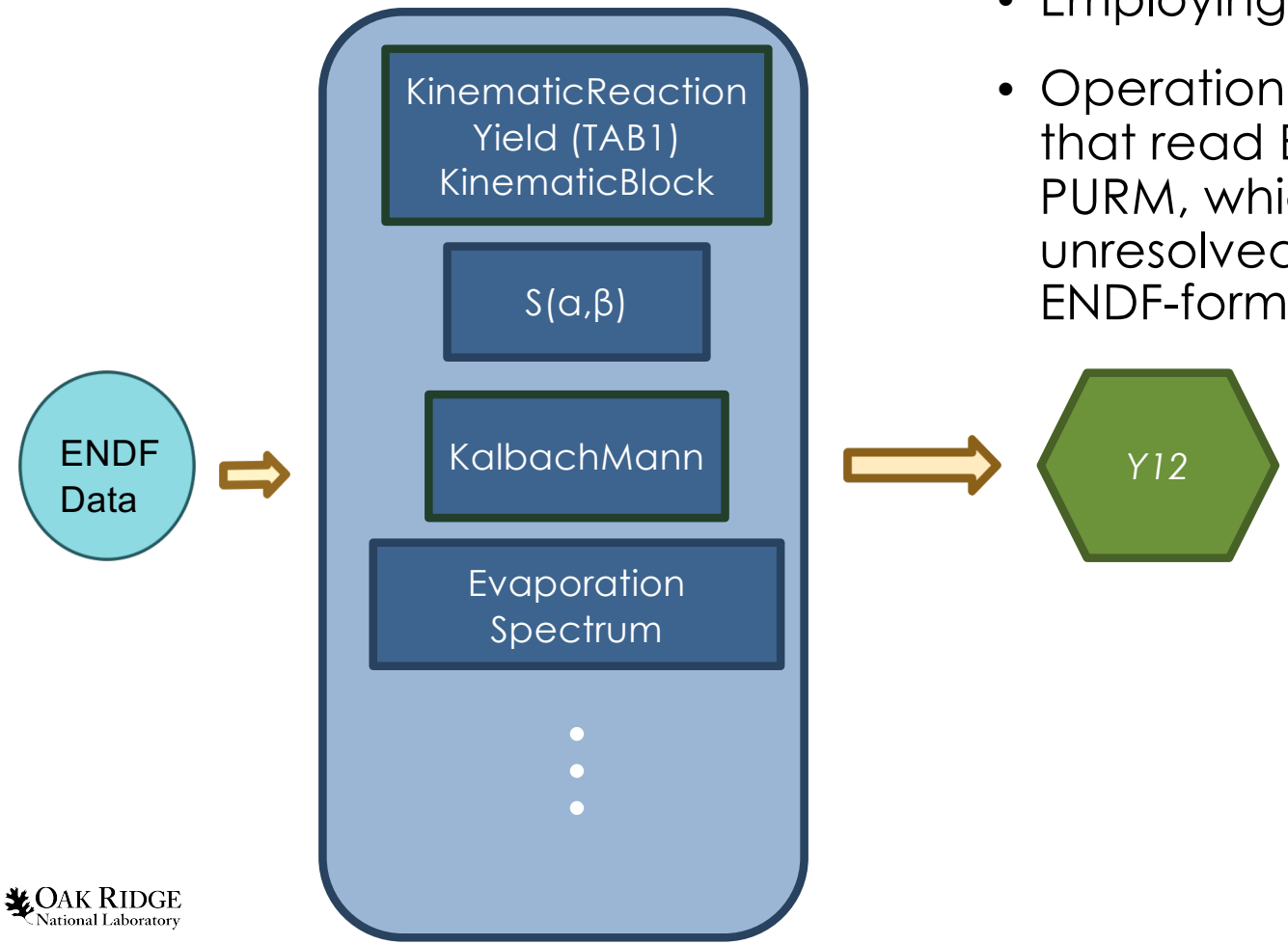
Overview

- GNDS and AMPX
- SCALE Libraries
- AMPX training

Reminder: ENDF Access in AMPX



- Employing the "onion" principle
- Operational for almost all codes that read ENDF data (except PURM, which is used to create unresolved probability tables) for ENDF-formatted files

Operational "Hand-coded" GNDS classes

As reported last CSEWG:

- We have code to read GNDS files and process 1-D data (includes resonance parameters) and covariance data.
- With this code we can compare the results from ENDF formatted and GNDS formatted files.
- In order to support kinematic data a lot more coding is needed.

Since GNDS is now defined by JSON…

- Write code that translates JSON files to C++ low level classes.
- This worked well (again for 1-D and covariance data):
  - Some low-level data containers (XY-1D and array) are not generated by the JSON translator.
- Kinematic data needs to make sure that data containers with the same name have different name spaces:
    - Example: Tag name "Energy" is used for energy of a nuclide level and for energy distribution.

  Documentation generation code has solved this problem, but not yet implemented in AMPX

AMPX classes generated from JSON are not an API

- The classes generated from JSON follow exactly the description in the manual.
- There is a lot of code needed to put the data into the AMPX in-memory structure. Of course we can reuse most of the code from the "hand-coded" GNDS.
- For testing we ran the same comparison between GNDS and ENDF formatted files from ENDF/B-VIII.0
- The classes are not yet merged into the main branch, but because it is easier to track GNDS specifications, these are the ones we will use going forward.

SCALE Libraries

- Beginning with SCALE -6.3b3 SCALE contains ENDF/B-VIII.0 based libraries.
- ENDF/B-VII.0 based libraries have been removed (Libraries from previous release still work with the current SCALE release).
- Exception: All covariance libraries are still available.
- ENDF/B-VIII.0 CE libraries are distributed in new HDF5 format.

Libraries available with SCALE

- Updated ENDF/B-VII.1 MG libraries:
  - Updated probability tables (normalization issue)
  - Added incident gamma and gamma production data
- Updated ENDF/B-VII.1 CE libraries:
  - Updated probability tables (normalization issue)
- All ENDF/B-VIII.0 libraries are coupled libraries
  - 252 neutron 47 gamma group library as the main transport library
  - 56 neutron 19 gamma group library
  - 200 neutron 47 gamma group library mainly for shielding
  - 27 neutron 19 gamma group library

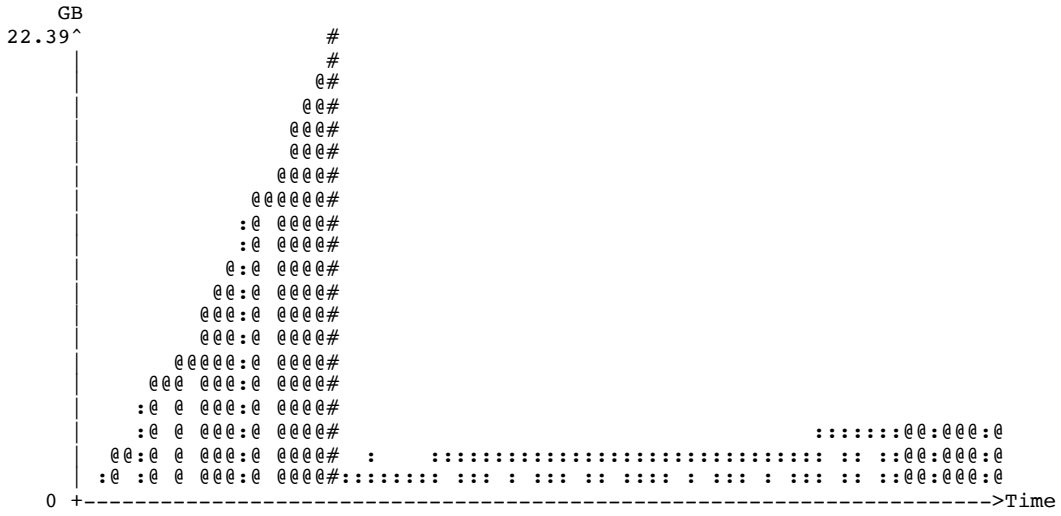
All libraries contain homogenous f-factors, the 252n and 56n libraries also contain heterogeneous f-factors for selected nuclides.

1597-group MG library

- For high fidelity MG calculations we added a very fine MG library.
- The energy range from 0.1 keV to 20 MeV was divided into 1,323 groups with an equivalent lethargy width of $1/120$
- The energy range from 10^{-5} eV to 0.1 keV is represented by 274 groups based on the AMPX 252-group structure.
- The boundaries of the 1597-group library were chosen such that the fine-groups can be collapsed directly onto the 252-group structure

Memory requirement

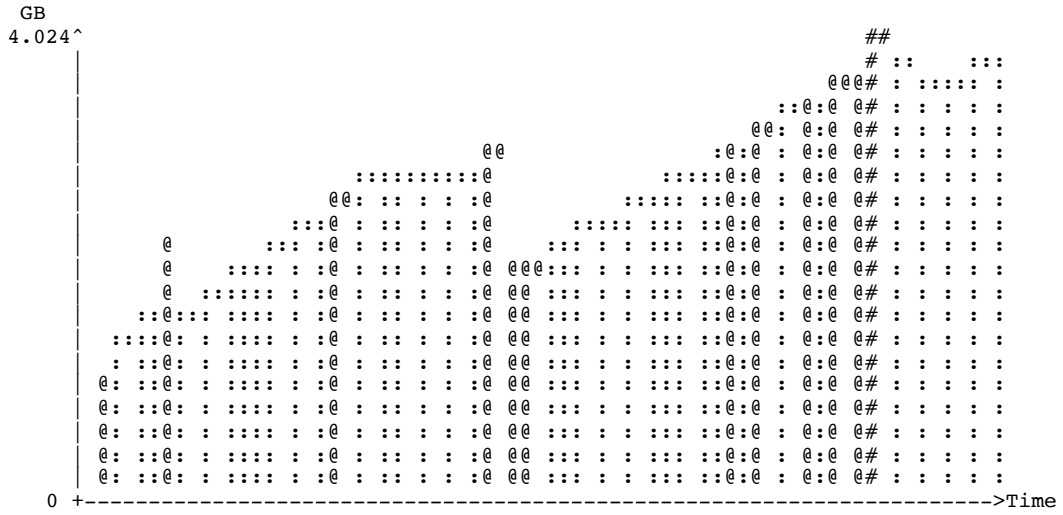
- Unfortunately, SCALE loads the ENTIRE library first, and then selects the nuclides actually needed. This is a side effect of the change to an in-memory structure for MG loading.
- The plot below is for a simple model, memory requirement will grow with more complex modules.



Some older SCALE modules do not allow more than 999 groups.

Memory requirement cont.

- We updated SCALE to:
  - Initially Only load the header information
  - Fully only load the nuclides needed.
- This allows to run simple problems
- More changes are needed to not duplicate unshielded information for more complex problems.



AMPX training

- We developed an AMPX training course
  - Hands-on exercises
  - Theory
- The week long course was given in Oak Ridge and at NRC head quarters
- A 2-hour course gives an overview on how to generate libraries with AMPX.

Summary

- Added additional GNDS functionality to AMPX which we intend to share with SAMMY
- Generated new ENDF/B-VIII.0 libraries for SCALE
- Prepared and presented AMPX training

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