Discussion with TSVV

AMNS Discussion Points

2024-04-26

David Coster

Max Planck Institute for Plasma Physics

This work has been carried out within the framework of the EUROfusion Consortium, funded by the European Union via the Euratom Research and Training Programme (Grant Agreement No 101052200 — EUROfusion). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Commission. Neither the European Union nor the European Commission can be held responsible for them.

Design principles?

- AMNS data should be centralized and managed
  - Version control of data imported to the IMAS AMNS data base is mandatory.
  - The provenance of the data must be accurate and stored in the IMAS AMNS database
  - For “production” runs with IMAS codes using AMNS data it is important that the data have been given a stamp of approval by an expert.
- The data should be comprehensive, ubiquitous and easily used
  - This means identifying what data is needed
  - The AMNS data must be communicated to IMAS codes via a standardised interface
  - All AMNS data used by codes should be available through the AMNS data interface (no back doors)

Are the design principles still relevant?

- AMNS data should be centralised and managed
  - Version control of data imported to the IMAS AMNS data base is mandatory.
  - The provenance of the data must be accurate and stored in the IMAS AMNS database
  - For “production” runs with IMAS codes using AMNS data it is important that the data have been given a stamp of approval by an expert.
- Do we still want a centralised AMNS database and system?
- I think the provenance of the data still needs to be captured and stored with the data
- Is there still a role for experts blessing the data?
  - If so, who are the experts?

Do we want to continue with the present philosophy or change it?

- The data should be comprehensive, ubiquitous and easily used
  - This means identifying what data is needed
    - Need to go beyond the currently available data
      - Essentially ADF11 rate coefficients and nuclear data (cross sections and rate coefficients)
        - Earlier version also supported surface data which didn't make the CPO/ IDS transition
  - The AMNS data must be communicated to IMAS codes via a standardised interface
    - Do we want to keep this?
    - Is the current interface sufficient or are changes needed?
  - All AMNS data used by codes should be available through the AMNS data interface (no back doors)
    - Currently it is expected that the AMNS library will provide data at particular values of the inputs (Te, ne, energies, angles, …) and not return data that the user's code will then interpolate or use
      - Do we stay with this?

Physics code

- Access to AMNS data only via interface
  - initialization (2)
  - finalization (2)
  - querying parameters (2)
  - setting parameters (2)
  - getting data (1)
  - Do we need more options?
- Separation between use of the data and the implementation of the data
- Code author doesn’t need to become an expert in AMNS
- Ensures compatibility between codes

AMNS implementation

- Only accessed by a set of defined calls
- Implementation by AMNS experts
- Different versions can be supported
- Different implementations possible
  - Analytic formulae
  - Table lookup
  - Do we need more options?
  - Current implementation in fortran with bindings for other languages — do we want to change this?
- “Old” versions should always be recoverable (even if wrong)
- Should become easier to implement “new” data

Some areas where more work is needed

- The fact that the IDSs (data dictionary and access layer) are still closed source limits the appeal outside the ITER community
  - Would like to see DD, AL and AMNS open sourced (in progress)
    - And easier to install (in progress)
  - Could also imagine an implementation not using IDS's for the backend
- Data ingestion is done by a driver written in Fortran (historical reasons)
  - Might make more sense to have this in Python (good ADAS bindings plus easier access to other formats for data input)
- Data storage is still in locally stored IDS's
  - Having a global IDS infrastructure would be useful
    - UDA?
    - CernVM-FS?
- Should have a push in the community to bring in more data (ADF15, beam stopping, more nuclear data, reintroduction of surface data, molecular data)
  - Then have a push in the code community to use the data

Developer / User Documentation

- Repository: ssh://git@git.iter.org/imex/amns.git
- Doxygen documentation:
  - module load AMNS/????
  - amns_doc
- Gateway:
  - module load imasenv/3.38.1/intel/rc
    - file:///afs/gw/swimas/extra/amns/1.4.0/intel/2020/imas/3.38.1/share/doc/AMNS/html/index.html
    - $AMNS_PREFIX/share/doc/AMNS/AMNS.pdf
      - /gw/swimas/extra/amns/1.4.0/intel/2020/imas/3.38.1/share/doc/AMNS/AMNS.pdf
- ITER
  - E.g. module load AMNS/1.5.0-GCC-10.2.0-DD-3.40.1
    - file:///work/imas/opt/EasyBuild/software/AMNS/1.5.0-GCC-10.2.0-DD-3.40.1/share/doc/AMNS/html/index.html
    - $AMNS_PREFIX/share/doc/AMNS/AMNS.pdf
      - /work/imas/opt/EasyBuild/software/AMNS/1.5.0-GCC-10.2.0-DD-3.40.1/share/doc/AMNS/AMNS.pdf