David Brown (BNL)

Status of EG-GNDS

33rd WPEC Meeting 13-14 May 2021

Our goal: resolve open format proposals & declare GNDS-2.0

Topic	
Introduction of participants	
Welcome	D. Brown
GNDS-2.0 status update	D. Brown
IAEA Experience and deployment	J-Ch. Sublet
NNDC Library Modernization	A. Hayes, E. McCutchen
LLNL code report	B. Beck, C. Mattoon
ORNL code report	D. Wiarda
LANL code report	W. Haeck
CEA code report	C. Jouanne
JAEA code report	K. Tada
Break	
Review of bugfixes	D. Brown
New format proposals	W. Haeck, D. Brown, B. Beck
Discussion on taskforces	W. Haeck, C. Mattoon, All
Discussion on GNDS-3.0+	All
Close	

Original GNDS-2.0 Goals

- **Satisfy SG-38 goals**
  - `<map>` format
  - `<documentation>` format (handled in May)
  - Major TNSL rewrite (handled in May)
- **Ensure "forwards compatibility" with ENDF-6**
- **Respond to user needs**
  - TNSL Covariance

We've more than met these goals

Detailed requirements for a next generation nuclear data structure

OECD/NEA/WPEC SubGroup 38*

(Dated: June 28, 2016)

This document attempts to compile the requirements for the top-levels of a hierarchical arrangement of nuclear data such as found in the ENDF format. This set of requirements will be used to guide the development of a new data structure to replace the legacy ENDF format.

CONTENTS

* *Edited by D.A. Brown (dbrown@bnl.gov)*

GNDS-2.0 Highlights

- **xsdir-like functionality:**
  `map` file and `checksum` support
- **Documentation markup:**
  supports all metadata needed for DataCite.org DOI assignment
- **Ground-up rewrite of TNSL**
  - In collaboration with SG-42,48
  - Mixed elastic scattering
  - TNSL covariance
- **Cleanups and bug fixes**
- **Full support for ENDF-6 data**
- **Met all SG-38 requirements**

```
<map library="neutrons" format="0.2"
        checksum="c180fbca8661de7e053ddbe1a7101ac371e79428" algorithm="sha1">
  <protare projectile="n" target="H1" evaluation="ENDF/B-8.0"
        path="n-001_H_001.xml" interaction="nuclear"
        checksum="32518f6f6ec82c801531ae120618bd99d3589304"/>
  <TNSL projectile="n" target="HinCH2" evaluation="ENDF/B-8.0"
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        standardTarget="H1" standardEvaluation="ENDF/B-8.0"/>
  <protare projectile="n" target="O16" evaluation="ENDF/B-7.1"
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  <protare projectile="n" target="Al27" evaluation="ENDF/B-8.0"
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  <TNSL projectile="n" target="tnsl-Al27" evaluation="ENDF/B-8.0"
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        dTarget="Al27" standardEvaluation="ENDF/B-8.0"/>
        ectile="n" target="Fe56" evaluation="ENDF/B-7.1"
        -026_Fe_056.xml" interaction="nuclear"
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        ectile="n" target="Th227" evaluation="JENDL-7.1"
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```
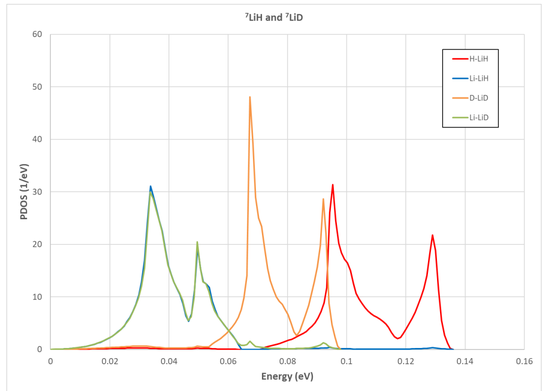
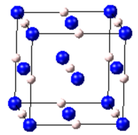
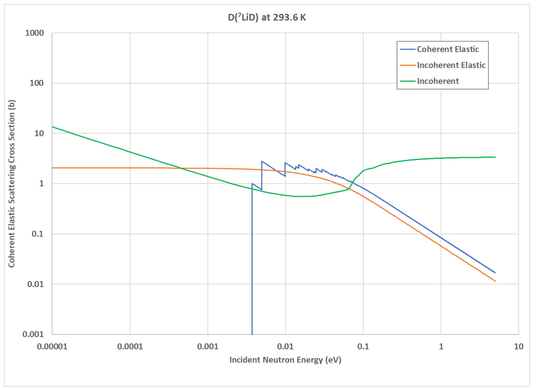





LiH unit cell
(4.0831 Å for LiH,
4.0684 Å for LiD)



What's left to do

At least as of now

- ~~**Approve MR where have consensus:**~~
  - ~~Stylistic fixes~~
  - ~~Documentation tweaks~~
  - ~~Covariances~~
  - ~~Map file~~
- ~~**Review "bug fixes":**~~
  - ~~RegEx fixes~~
  - ~~Enumeration fixes~~
  - ~~Atomic data~~

- **Discuss & hopefully resolve outstanding issues:**
  - ~~All the resonance proposals: *Resonance Taskforce* *~~
  - Dates, where should they be and what should they be called?
  - ~~Interpolation: *Interpolation Taskforce* *~~
- **EOB:**
  - Proposal/units
  - grokGNDS/JSON fixes: *JSON fix Taskforce*

Big question: are we ready for GNDS-2.0?

Yes

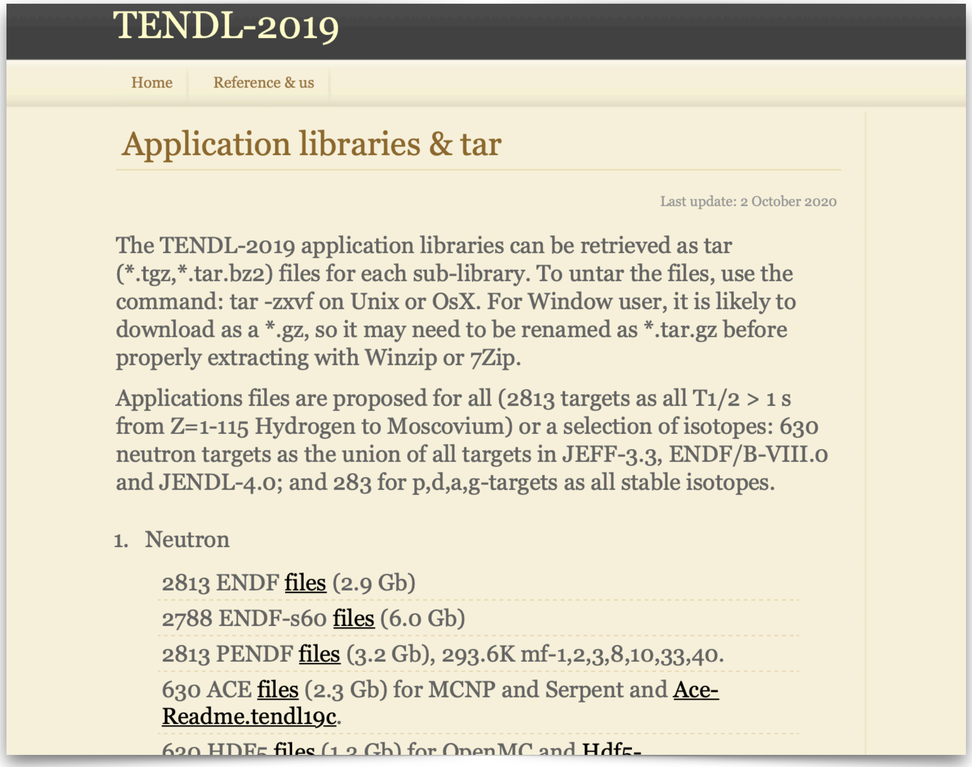
We’ll be editing the specifications for a while

Required for final preparation of document

- Passive voice is required in all OECD publications
- British, not American spelling
- Discussion point -> Tracker conversion
- Many, many branches
- Many unclear formulations remain (e.g. interpolation)
- Update appendix with changelist

ENDF, JEFF and TENDL data project releasing data in GNDS format

https://tendl.web.psi.ch/tendl_2019/tar.html



TENDL-2019

Home | Reference & us

Application libraries & tar

Last update: 2 October 2020

The TENDL-2019 application libraries can be retrieved as tar (*.tgz,*.tar.bz2) files for each sub-library. To untar the files, use the command: tar -zxvf on Unix or OsX. For Window user, it is likely to download as a *.gz, so it may need to be renamed as *.tar.gz before properly extracting with Winzip or 7Zip.

Applications files are proposed for all (2813 targets as all T1/2 > 1 s from Z=1-115 Hydrogen to Moscovium) or a selection of isotopes: 630 neutron targets as the union of all targets in JEFF-3.3, ENDF/B-VIII.0 and JENDL-4.0; and 283 for p,d,a,g-targets as all stable isotopes.

1. Neutron

   2813 ENDF files (2.9 Gb)

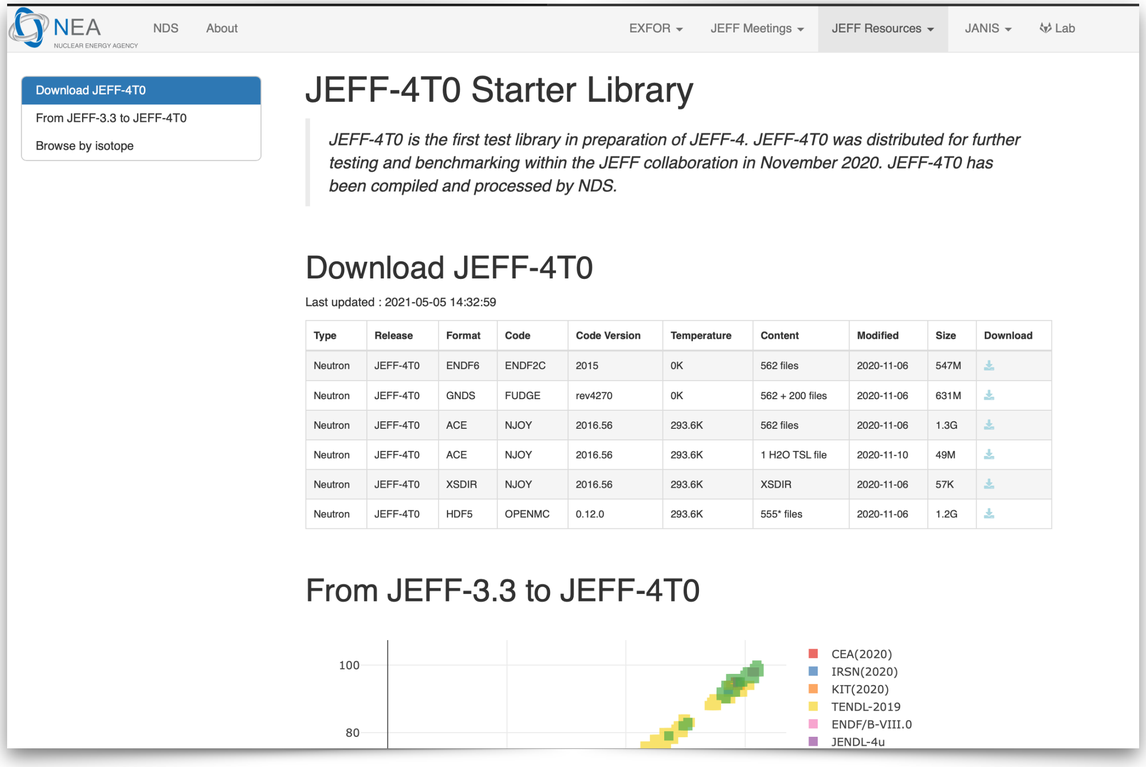
   2788 ENDF-s60 files (6.0 Gb)

   2813 PENDF files (3.2 Gb), 293.6K mf-1,2,3,8,10,33,40.

   630 ACE files (2.3 Gb) for MCNP and Serpent and Ace-Readme.tendl19c.

   630 HDF5 files (1.2 Gb) for OpenMC and Hdf5-

https://nds1.gitlab.io/nds/jeff4t0.html



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Download JEFF-4T0

From JEFF-3.3 to JEFF-4T0

Browse by isotope

JEFF-4T0 Starter Library

JEFF-4T0 is the first test library in preparation of JEFF-4. JEFF-4T0 was distributed for further testing and benchmarking within the JEFF collaboration in November 2020. JEFF-4T0 has been compiled and processed by NDS.

Download JEFF-4T0

Last updated : 2021-05-05 14:32:59

Type	Release	Format	Code	Code Version	Temperature	Content	Modified	Size	Download
Neutron	JEFF-4T0	ENDF6	ENDF2C	2015	0K	562 files	2020-11-06	547M	
Neutron	JEFF-4T0	GNDS	FUDGE	rev4270	0K	562 + 200 files	2020-11-06	631M	
Neutron	JEFF-4T0	ACE	NJOY	2016.56	293.6K	562 files	2020-11-06	1.3G	
Neutron	JEFF-4T0	ACE	NJOY	2016.56	293.6K	1 H2O TSL file	2020-11-10	49M	
Neutron	JEFF-4T0	XSDIR	NJOY	2016.56	293.6K	XSDIR	2020-11-06	57K	
Neutron	JEFF-4T0	HDF5	OPENMC	0.12.0	293.6K	555* files	2020-11-06	1.2G	

From JEFF-3.3 to JEFF-4T0

100

80

CEA(2020)
IRSN(2020)
KIT(2020)
TENDL-2019
ENDF/B-VIII.0
JENDL-4u

The GNDS community

Who are we?

Questions From November 2020

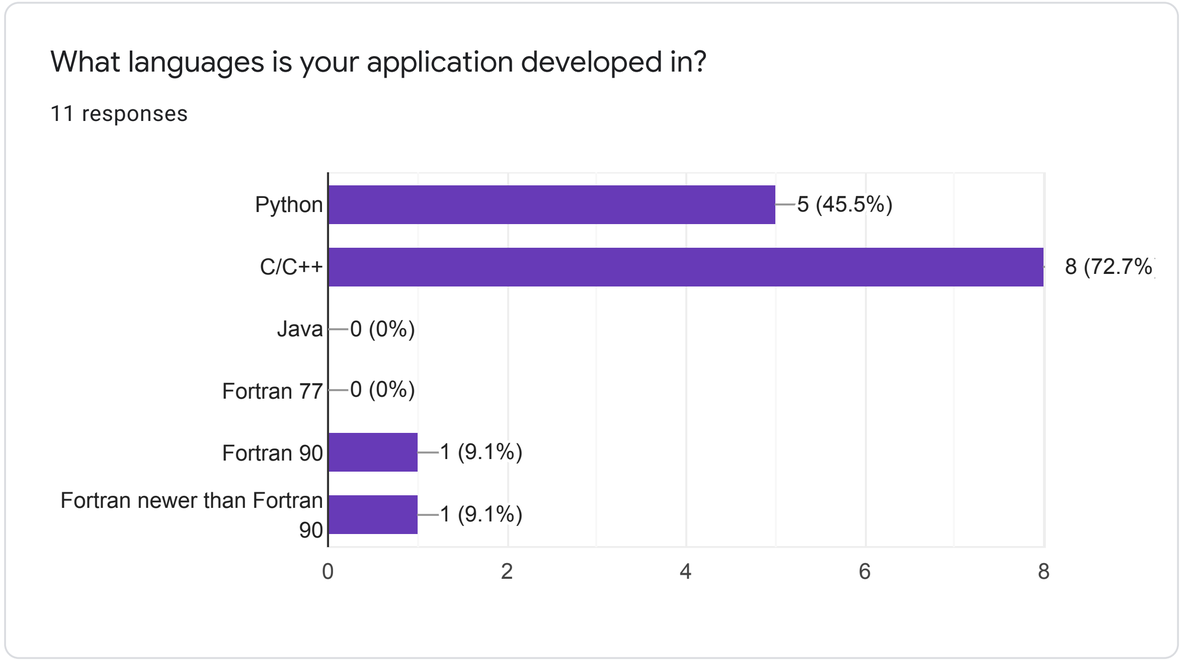
- **Part of GNDS's justification is "inspiring younger scientists", so…**
  - How many developers are working on your project (approximately)?
  - Are they young, mid-career, or senior developers?
- **How "close" are you to full GNDS-1.9 (or whatever) implementation?**
- **What license is your code released under?**

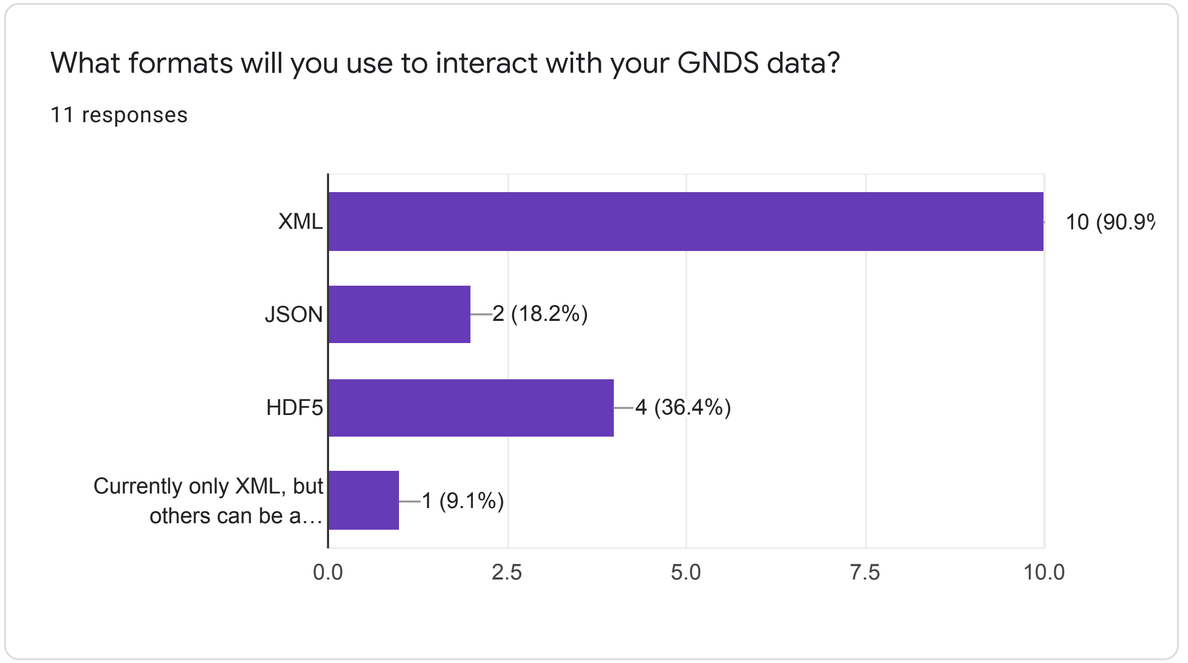
GNDS Implementation Status Questionnaire:
https://forms.gle/fPb21mFJbupK56wr7

GNDS Taskforce Questionnaire:
https://forms.gle/2QWXW8zYevKLjtJe7

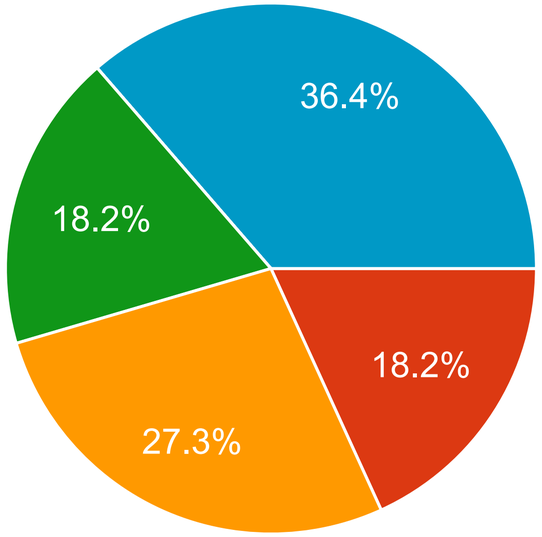
We did a little poll to find out more about how GNDS is being implemented

- AMPX
- SAMMY
- brownies (FUDGE extensions)
- FRENDY
- GIDI+
- OpenMC
- GALILEE
- TAGNDS (TALYS to GNDS)
- FUDGE
- NJOY



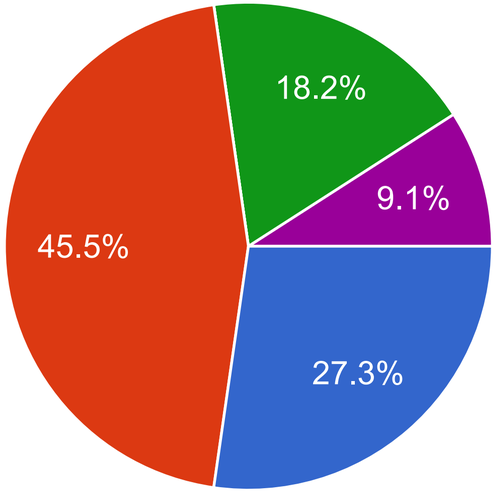


Some projects are far along in their GNDS support

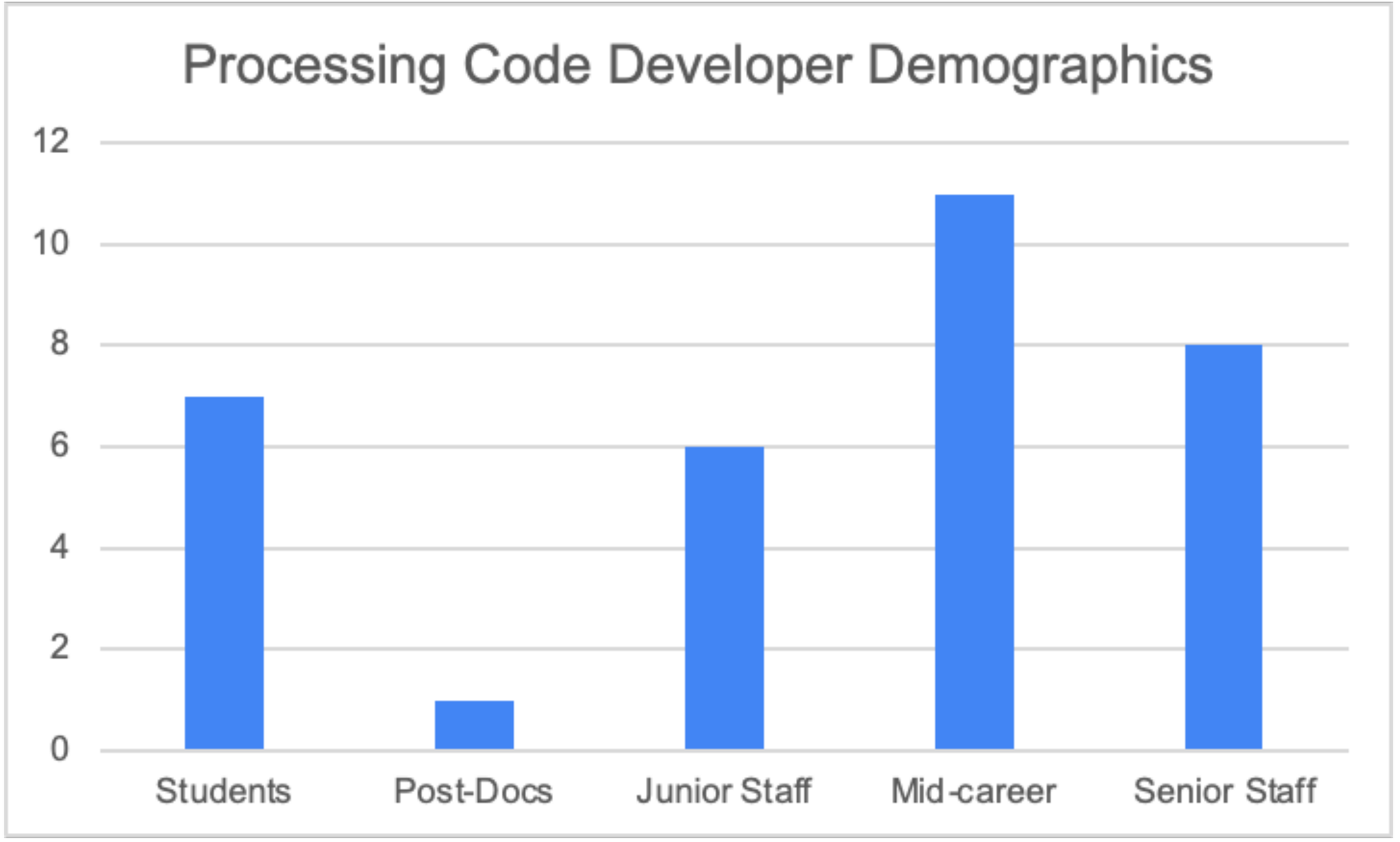


- No GNDS support planned
- Not yet started
- < 25% complete
- 25%-50% complete
- 50%-90% complete
- > 90% complete

Most are open source! Only ~20% of applications are closed source



- BSD or BSD-like
- MIT or MIT-like
- GPL
- Closed source/proprietary
- Closed source for AMPX, but in the process to change, SAMMY open source


Processing Code Developer Demographics
12
10
8
6
4
2
0
Students
Post-Docs
Junior Staff
Mid-career
Senior Staff