

EG-GNDS Report

D. Brown

National Nuclear Data Center



EG-GNDS Agenda

- **Welcome**
- **Introductions & identify governing board members**
- **Review minutes of previous meeting**
- **Review & Update mandate**
- **SG-38 & SG-43 reports**
- **Status of codes**
- **GNDS-1.9 documentation status**
- **Our target date for a full release of specifications was not met**
- **Turns out, Rome was not built in a day**
- **Automating documentation generation**
- **Discuss plan for full release of format**
- **Discuss plan for collaboration platform**

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SG-38 & SG-43

SG-38 “closed”

- Requirements documents finished, must be edited into one main document (~150 pages)
- Specifications documents are a different story (>>200 pages)

SG-43 very active

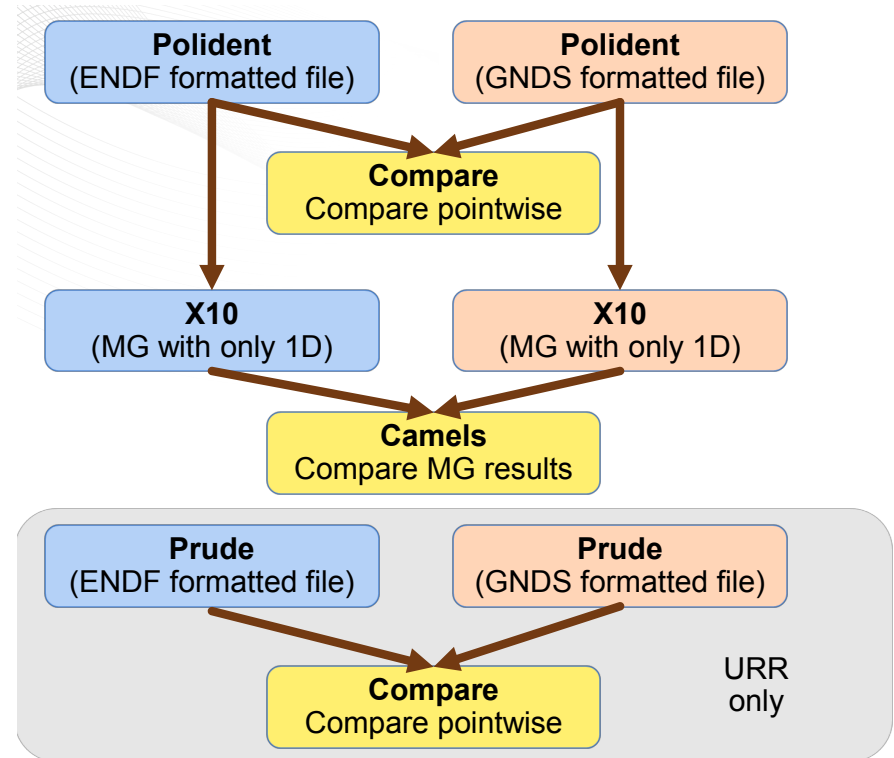
- Standing up API's at LLNL, ORNL & LANL;
SG-43 should keep them aimed in a common direction
- Establishing requirements for physics checking in processing codes

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Status of GNDS support in processing codes

- **FUDGE (LLNL)** — full support of GNDS-1.9, is reference implementation
- **AMPX (ORNL)** — covariance, resonances supported, partial support of main transport hierarchy
- **NJOY21 (LANL)** —planned, work not yet begun
- **NJOY2016 (LANL)** — will not get GNDS support
- **FRENDY (JAEA)** — not planned at this time
- **GALILEE (CEA)** — planned, work not yet begun



Current Status of Access Routines to ENDF Data in AMPX

AMPX support enabling cross-checks, is finding bugs & improvements in FUDGE

LLNL has 2.5 GNDS APIs

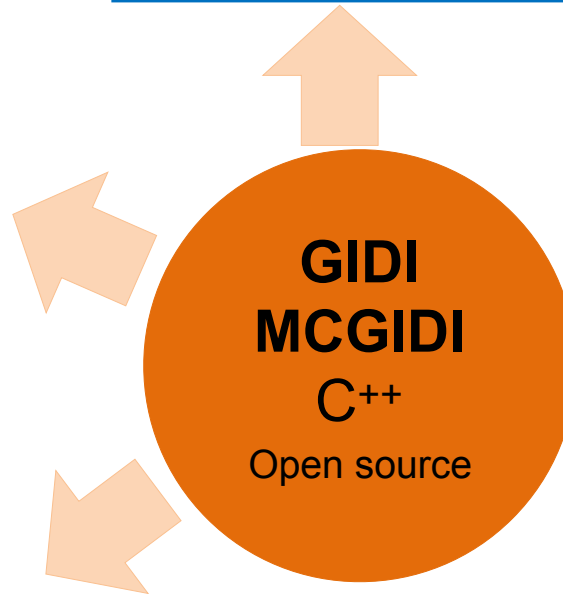
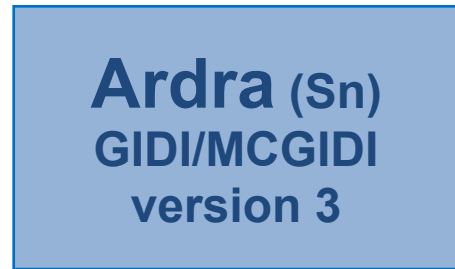
- PoPs — properties of particle XML markup has C++ API
- GIDI — I/O classes & routines for transport codes in C++
- MCGIDI — extensions to GIDI for Monte-Carlo transport

**More details in
SG-43 report**

GNDS is in production now



G4LND collision kernel
GIDI/MCGIDI version 2
Written in C



- **Data QA in ADVANCE**
 - Plotting
 - Rigorous tests
 - Since ENDF/B-VII. 1 (2011)
- **Data Visualization on NNDC and IAEA websites**

Slide from M.-A. Descalle
slide based on slide from D. Brown

Testing ENDF/B libraries in GNDS format

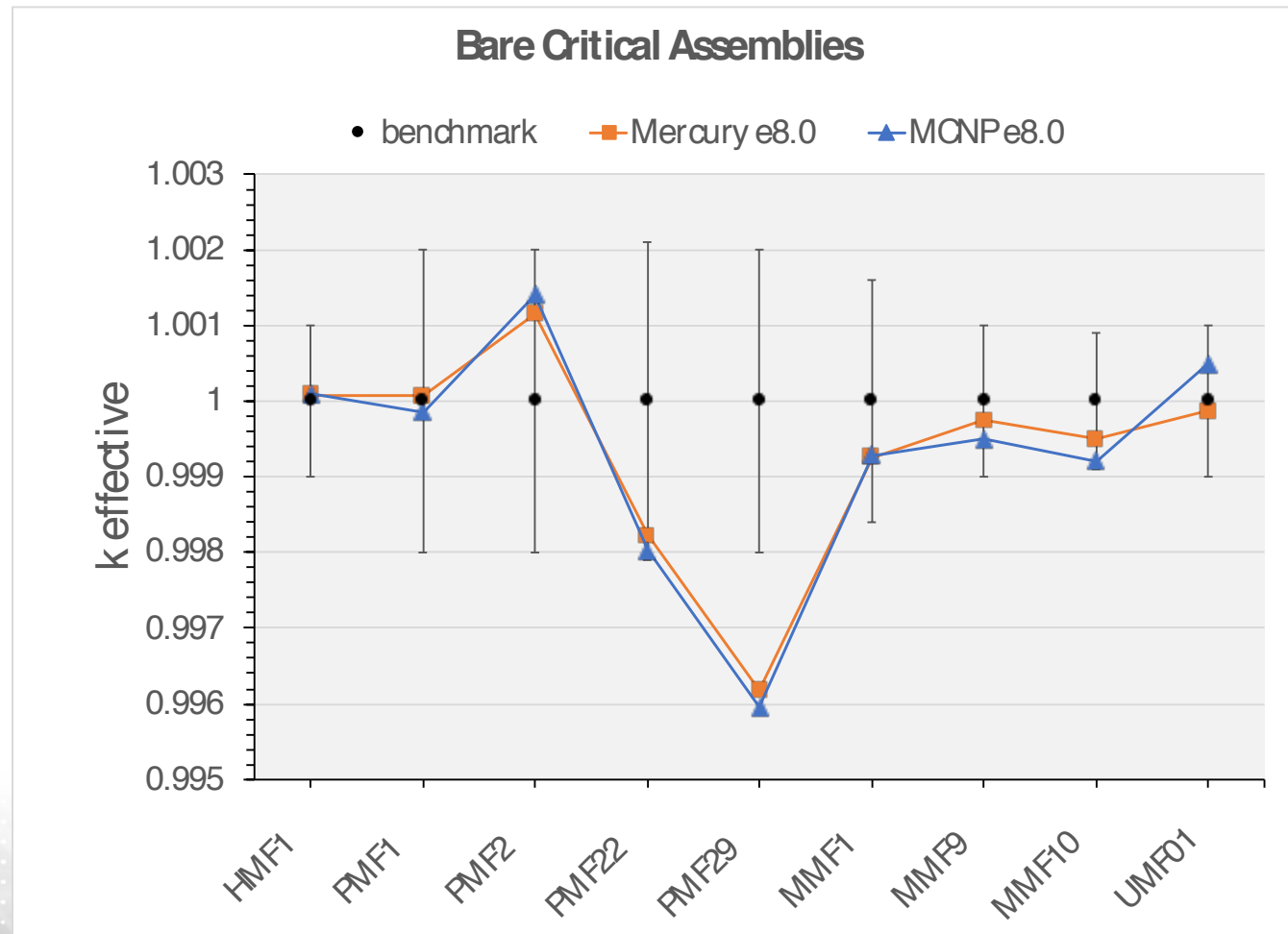
- Two ENDF libraries were translated and processed with FUDGE into GNDS format
 - ENDF/B-VII.1
 - ENDF/B-VIII.0

Code	Code Type	Run mode	Data Format/API	Benchmark tests	Cross-sections
Mercury	Monte Carlo	Batch	GNDS/ GIDI/ MCGIDI	Criticality: 123 fast assemblies Reaction ratios: 3 assemblies	Continuous Energy
Ardra	Deterministic Sn	Interactive	GNDS/ GIDI	Criticality: 79 assemblies	Multigroup: 230 groups

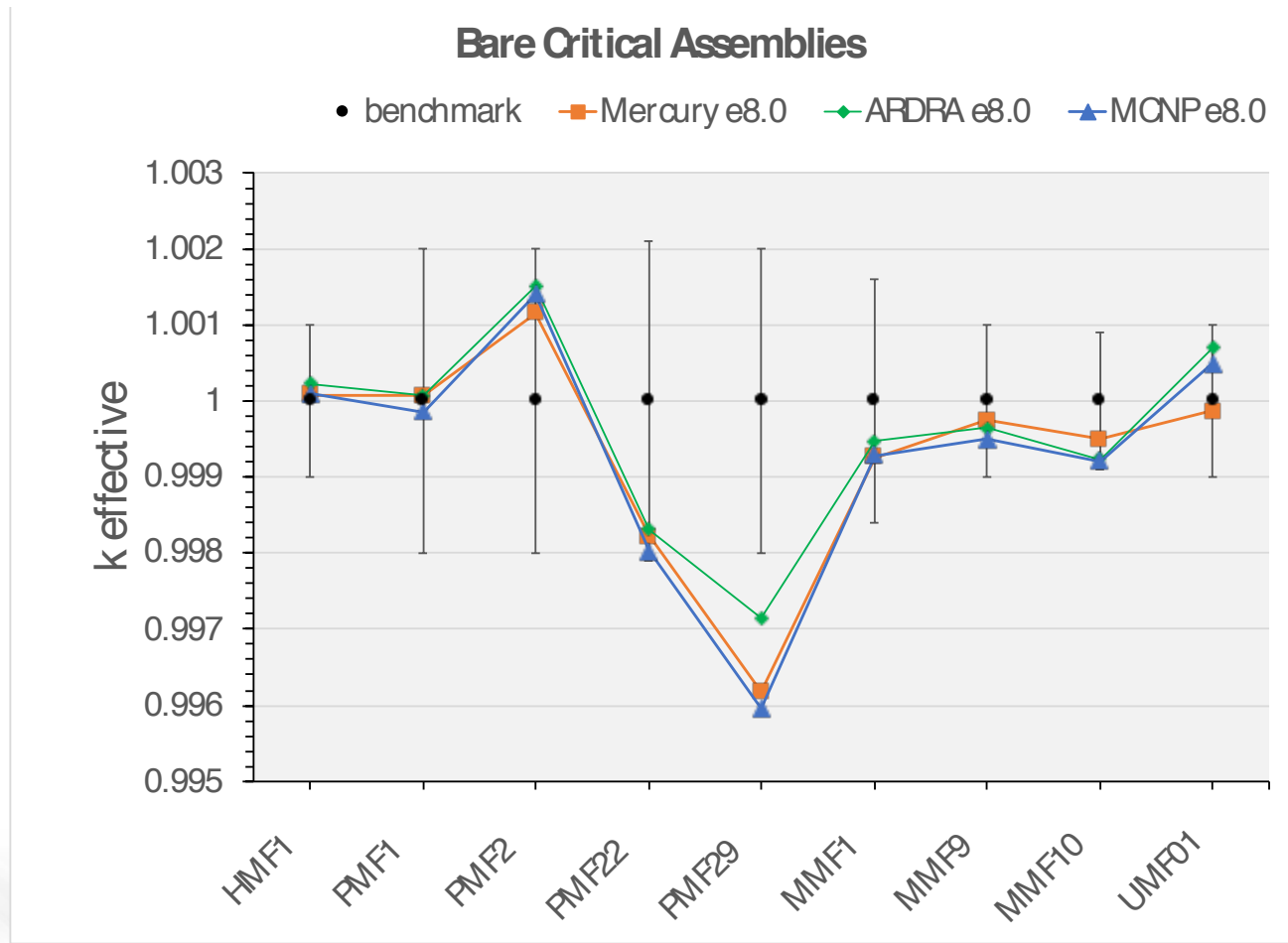
- Results were compared to MCNP6 - ENDF/B-VII.1 and VIII.0 results (2017)

Slide from M.-A. Descalle

Bare assemblies: Godiva, Jezebel, Jezebel240,...



Adding Ardra results



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Multiple sources of formatting information

- **Specifications documents** (*GPDC, documentation, top level, PoPs*) — all partially out of date with GNDS-1.9
- **Requirements document** — only source for planned, but not yet properly implemented formats (TSL, FPY)
- **XML schema file** (*gnd.xsd*) — partially out of date with GNDS-1.9, has no descriptive information
- **XML files themselves** — most up to date, including examples of current (not final) implementation of TSL, FPY

All provide partial information and complement one another.
There is no authoritative reference.

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A technological solution

Develop data structures that contain all information required to describe format

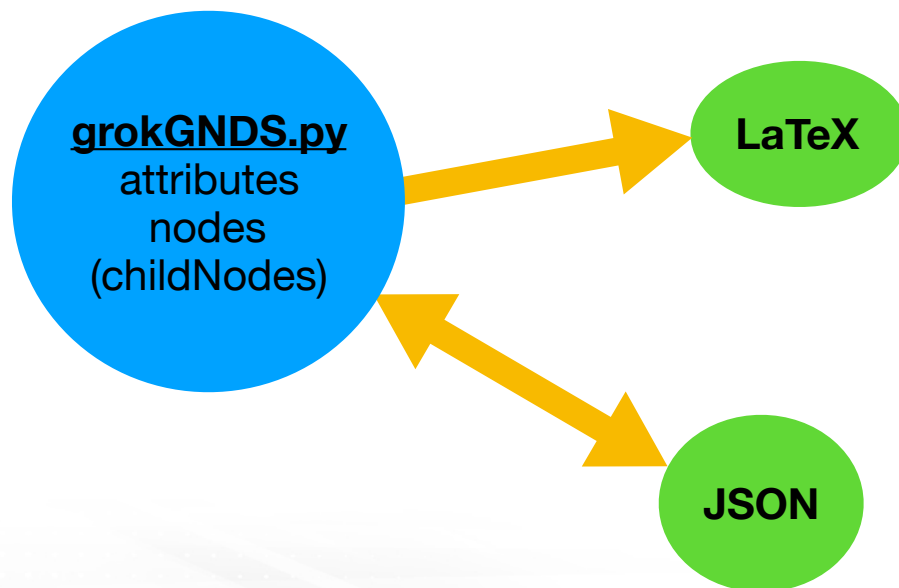
reactionSuite
+ projectile : XMLName
+ target : XMLName
+ evaluation : attributeValue
+ projectileFrame : frame
+ format : attributeValue

Include:

- Occurrence limits
- Required or not
- Root node or not
- Data type information
- List of child nodes
- Detailed descriptions coded in LaTeX

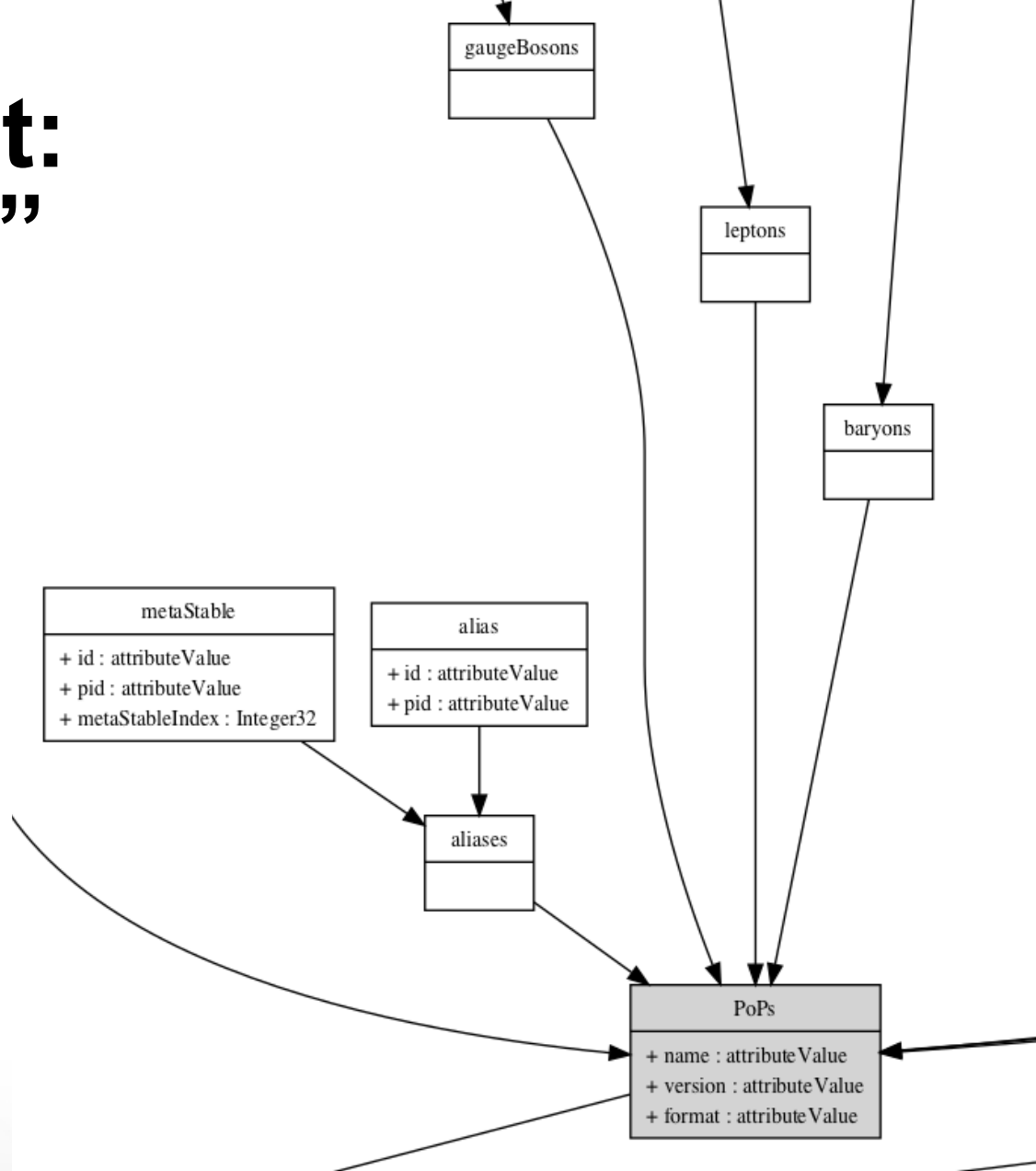
Additional functionality

- Read/write variety of formats
- LaTeX and/or UML output
- Updating functionality



Key ingredient: a “tree walker”

- Since we’ve designed a data hierarchy, we need need to crawl it to find out what is in it
- Standard computing algorithm: recursive “Tree walking”
- Very easy to implement
- As visit nodes in a given hierarchy, can update node attributes/ children



The plan

- 1. Initialize database of formats with schema (gnd.xsd)**
- 2. Crawl representative sample of XML files to update database**
 - Neutrons (w/ & w/o covariance, fission)
 - Charged particles
 - Photo nuclear
 - Decay
 - Fission product yields
 - Atomic data
 - Processed data
- 3. Serialize output to JSON (or equivalent)**
- 4. Update descriptions by hand using specifications draft documents**
- 5. Serialize result to LaTeX files**
- 6. Frame file can be used to organize specifications using `\include{}`**
- 7. If develop xsd back-translator, then can keep specifications and xsd file in sync**

Problem areas remain

- Corrections in resonances formats (e.g. <spin> used differently in RRR and particle specifications)
- Correction in covariance formats
- Other inconsistencies uncovered during tree-walking of existing files & schema
- TSL data: quick translation of ENDF-6, modest revisions to make it consistent with rest of transport data
- FPY data: quick translation of ENDF-6, significant changes needed to satisfy users & requirements

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Plan for completing specifications

Target date is WPEC meeting, May 2019

This will be GNDS-2.0

- “Freeze” GNDS at GNDS-1.9 with only modest changes between now and the May 2019 WPEC meeting.
- **ACTION:** Complete the requirements documents, **ASAP**
- **ACTION:** Complete the following extensions/corrections
 - Corrections to resonances per D. Wiarda EG-GNDS talk
 - Corrections to covariances per D. Wiarda EG-GNDS talk
 - Consistency corrections in TSL data per D. Brown SG-42 talk (<styles> addition, correct <reactionSuite> layering, use of <XYs1d>)
- **ACTION:** By Summer 2018, the following format extensions/corrections will be made or abandoned:
 - Iterate with A. Sonzogni & J.-C. Sublet the proposed FPY format from B. Beck.
- **ACTION:** All changes to GNDS must be complete by June 21, 2018 so that the specifications documents can be updated by September 30, 2018.
- **ACTION:** Review release candidate GNDS-2.0 format at the November CSEWG meeting at BNL, with a teleconferencing option for CNDC, JAEA, CEA and NEA collaborators.

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Collaboration platform discussion

Continue investigating various GitHub-like options to determine if one can satisfy the following requirements:

- Aim for non-nation specific solution (Current NNDC GForge is a US system)
- In-progress work must not be accessible without some level of password protection.
- Work can only be released after proper reviews have occurred.
- We want to have complete control of the data (i.e. not owned by say Google)
- We have to be able to afford the system (by the way, we have no budget)

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OECD/NEA has stood up a GitLab instance, we'll be test driving it between now and June 2019