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Jodi Cooley, James Loach, and Alan Poon

on behalf of the radiopurity.org collaboration

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Application

Persephone

A web application served by CouchDB, allowing data entry and search

Data format

MADF

An extensible JSON data format used to encode material assays

Database

www.radiopurity.org

A public installation of Persephone storing community data

Publication

J.C. Loach et al., Nucl. Instr. Meth. A 839 (2016).

Supporting institutions

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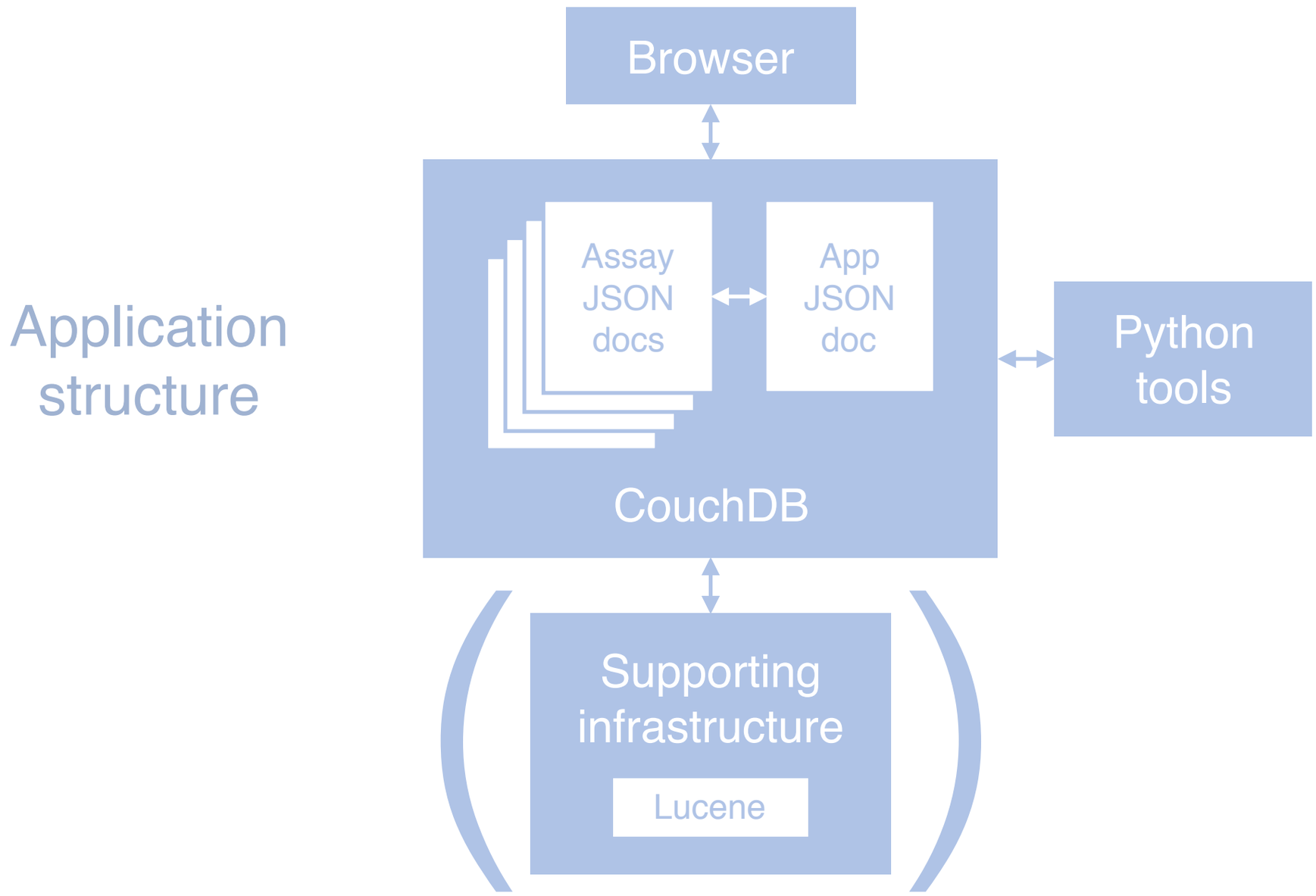
History

c. 2010	Origin as an in-house database for the LBNL LBF
2012	Start of association with AARM
2012	Formation of the core collaboration (James, Jodi, Adam & Alan)
2013-14	Development of current version of the software
2016	Publication
2017	Application re-development

Persephone

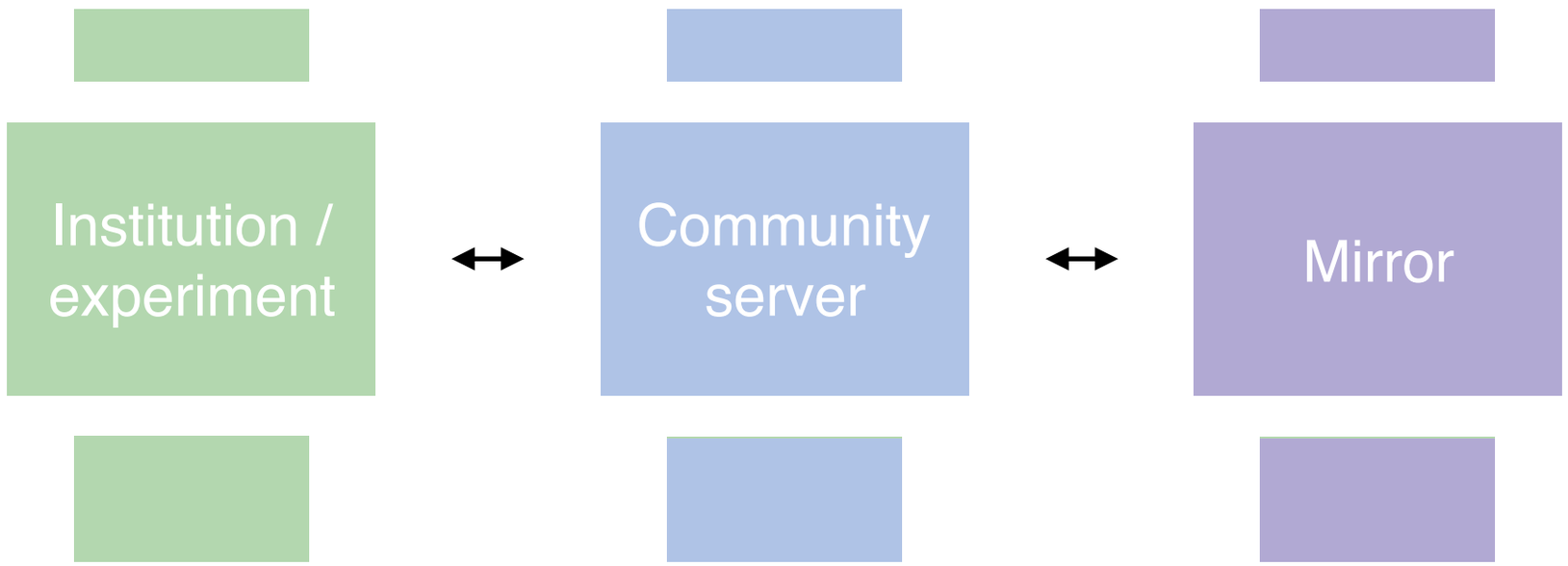
/pərˈsɛfəni/



Can be run locally or on a CouchDB cloud

Persephone

Data can be easily replicated between databases



Should there be an Asian mirror?

Repository

https://github.com/radiopurity/persephone

MADF

Material **A**ssay **D**ata **F**ormat

Assay

```
{
  "type":              "",
  "grouping":          "",
  "sample":            {...},
  "measurement":       {...},
  "data_source":       {...},
  "specification":  “3.00"
}
```

```
"measurement": {
  "institution":        "",
  "technique":          "",
  "date":               [],
  "requestor": {
    "name":             "",
    "contact":          ""
  },
  "practitioner": {
    "name":             "",
    "contact":          ""
  },
  "description":        "",
  "results": [
    {
      "isotope":        "",
      "type":           "",
      "value":          [],
      "unit":           ""
    },
    ...
  ]
}
```

```
"sample": {
  "name":            "",
  "description":     "",
  "id":              "",
  "source":          "",
  "owner": {
    "name":          "",
    "contact":       ""
  }
}
```

```
"data_source": {
  “reference":  "",
  "input": {
    "name":      "”,
    "contact":   "",
    "date":      []
  },
  "notes":       ""
}
```

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SNOLAB Github About

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Use wildcards PM?

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About

This is the world's largest public database of material radio-purity measurements. These measurements are used by members of the low-background particle/nuclear physics community to build experiments that search for neutrinos, neutrinoless double-beta decay, WIMP dark matter, and other exciting physics.

The project is maintained by an international collaboration of scientists from North America, Europe, and China, who are responsible for developing the database application (Persephone), defining the material assay data format (MADF), and helping people contribute their data.

The project originated at LBNL but as only grown through the generous support of the wider low-background community. Special thanks go to the AARM collaboration and to SNOLAB, which hosts the site.

Get in touch if you'd like to help the project. In particular, **we'd love to include your data.**

Contact James Loach or Jodi Cooley for more information.

Instructions

Searches are case-insensitive and OR by default. Examples:

- `"ofhc copper"`

version can be found in the project's github repository.

Data

These data sets are available online (click on the name to view the entries):

- Majorana (2016) from N. Abgrall *et al.*, Nucl. Instr. and Meth. A 828 (2016).
- LUX from D.S. Akerib *et al.*, Astropart. Phys. 62 (2014) 33-44.
- SuperCDMS from The SuperCDMS Collaboration (personal communication, 2014).
- BetaCage from Z. Ahmed *et al.*, JINST 9 (2014).
- EDELWEISS (2011) from E. Armengaud *et al.*, Astropart. Phys. 47 (2013).
- XENON100 (2011) from E. Aprile *et al.*, Astropart. Phys., 35 (2011).
- EXO (2008) from D.S.Leonard *et al.*, Nucl. Instr. and Meth. A 591 (2008).
- BOREXINO (2002) from C. Apresella *et al.*, Astropart. Phys., 18 (2002).
- Rau (2000) from W. Rau & G. Heusser, Applied Radiation and Isotopes, 53 (2000).
- ILIAS ANAIS from the ILIAS database.
- ILIAS CAST from the ILIAS database.
- ILIAS CRESST from the ILIAS database.
- ILIAS Edelweiss from the ILIAS database.
- ILIAS UKDM from the ILIAS database.
- ILIAS ROSEBUD from the ILIAS database.

These are in preparation:

- Xenon1T
- PandaX-II (2016) from T. Zhang et al., JINST 11 (2014).

Collaboration

The collaboration consists of:

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Search | Submit | Edit | Settings | Login

copper

Total results: 86

Grouping	Name	Isotope	Amount	Isotope	Amount	
ILIAS UKDM	Copper	Th-232	0.004 ppb	U-238	0.005 ppb	...
ILIAS UKDM	Copper	Th-232	0.5 ppb	U-238	0.5 ppb	...
ILIAS ROSEBUD	Copper, OFHC					...
ILIAS UKDM	Copper C101	Th-232	0.5 ppb	U-238	0.5 ppb	...
ILIAS UKDM	Rexalite, copper removed	Th-232	1 ppb	U-238	3 ppb	...
EDELWEISS (2011)	Copper, Apical, cables					

Sample — Description: Copper, Apical, cables

Measurement — Results:

Ra-226		26	(15)	mBq/kg
Th-228	<	50		mBq/kg
Pb-210		346	(110)	mBq/kg
K-40		167	(126)	mBq/kg
Co-60	<	25		mBq/kg

Report error
Export
Edit

Export JSON
Export CSV
Export XML
Export HTML

ILIAS UKDM	Copper alloy swarf	Th-232	0.5 ppb	U-238	0.5 ppb	...
ILIAS Edelweiss	Copper, Cuc2 Plate, CARLIER					...
XENON100 (2011)	Copper, Norddeutsche Affiinerie			U-238	11 mBq/kg	...
XENON100 (2011)	Copper, Norddeutsche Affinerie			U-238	70 uBq/kg	...
EDELWEISS (2011)	Copper, screens, support					...
EDELWEISS (2011)	Copper, CuC2, detector casings			U-238	1.4 mBq/kg	...

Data

XENON1T	In preparation
PANDAX-II	T. Zhang et al., JINST 11 (2014) (in preparation)
MAJORANA	N. Abgrall et al., Nucl. Instr. and Meth. A 828 (2016).
LUX	D.S. Akerib et al., Astropart. Phys. 62 (2014) 33-44.
SuperCDMS	The SuperCDMS Collaboration (personal communication, 2014).
BetaCage	Z. Ahmed et al., JINST 9 (2014).
EDELWEISS	E. Armengaud et al., Astropart. Phys. 47 (2013).
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BOREXINO	C. Apresella et al., Astropart. Phys., 18 (2002).
Rau	W. Rau & G. Heusser, Applied Radiation and Isotopes, 53 (2000).
ILIAS ANAIS	ILIAS database
ILIAS CAST	ILIAS database
ILIAS CRESST	ILIAS database
ILIAS Edelweiss	ILIAS database
ILIAS UKDM	ILIAS database
ILIAS ROSEBUD	ILIAS database

Send us your data!

Future plans

Application

- Software revamp. Switch to more sustainable web technologies (bootstrap & a modern templating engine).
- New python tools. Refactor into a proper python module.
- Make institutional deployment easier. Pull out various hard-coded settings into the 'settings' JSON document.
- Fix bugs. Data display and entry.
- Improve documentation.

Data

- Published/modern data. We upload published or semi-structured data as we're made aware of it.
- Structured historical data. We can port structured data from counting facilities that would like to donate it.
- Unstructured historical data. We don't have the resources.

More support is needed to help this project reach its potential

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Volunteers wanted! Data wanted!

Contact james.loach@gmail.com / cooley@physics.smu.edu