LatteDB *(in development)*

— Database oriented workflow management (for LQCD)

In collaboration with Jason Chang and

Christopher Körber | UC Berkeley | Feodor Lynen Fellow

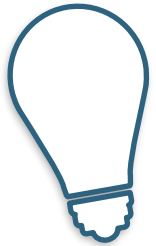
Unterstützt von / Supported by

Alexander von Humboldt
Stiftung/Foundation

Berkeley
UNIVERSITY OF CALIFORNIA

Workflow

- **Scientific Idea**
  - Specification of problem
  - Feasibility studies



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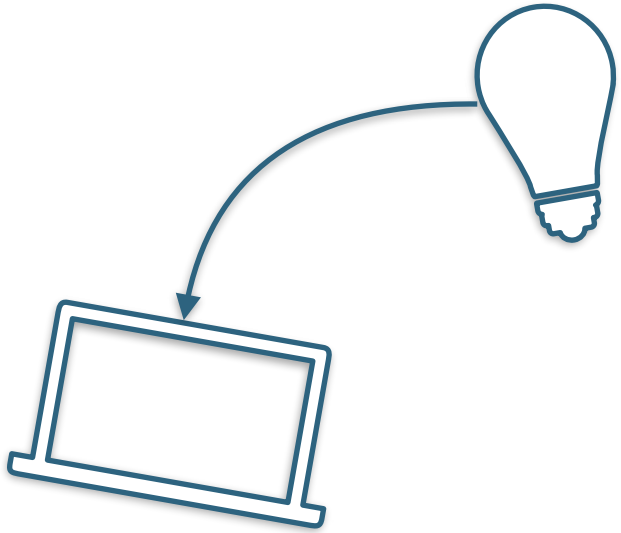

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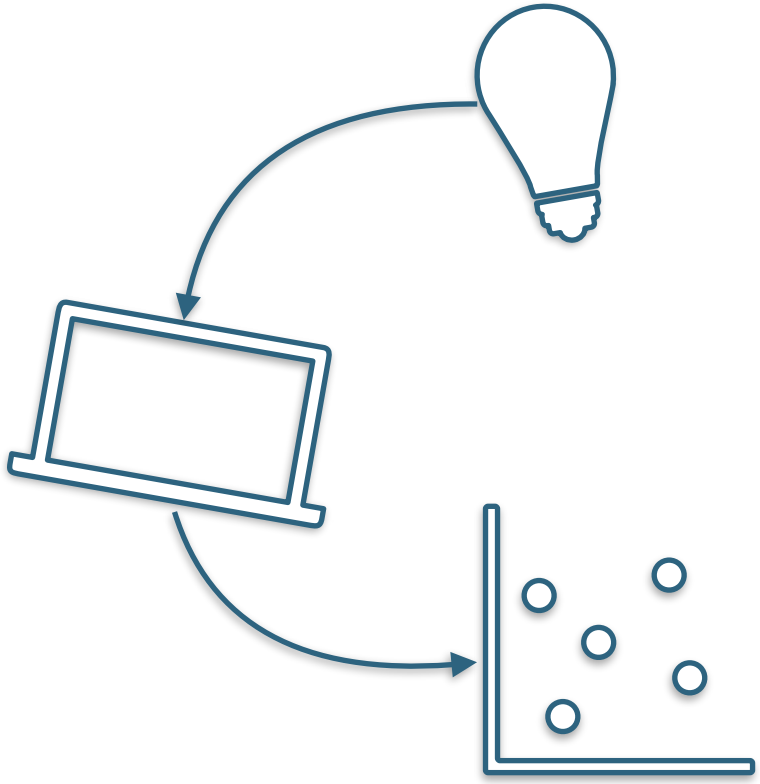

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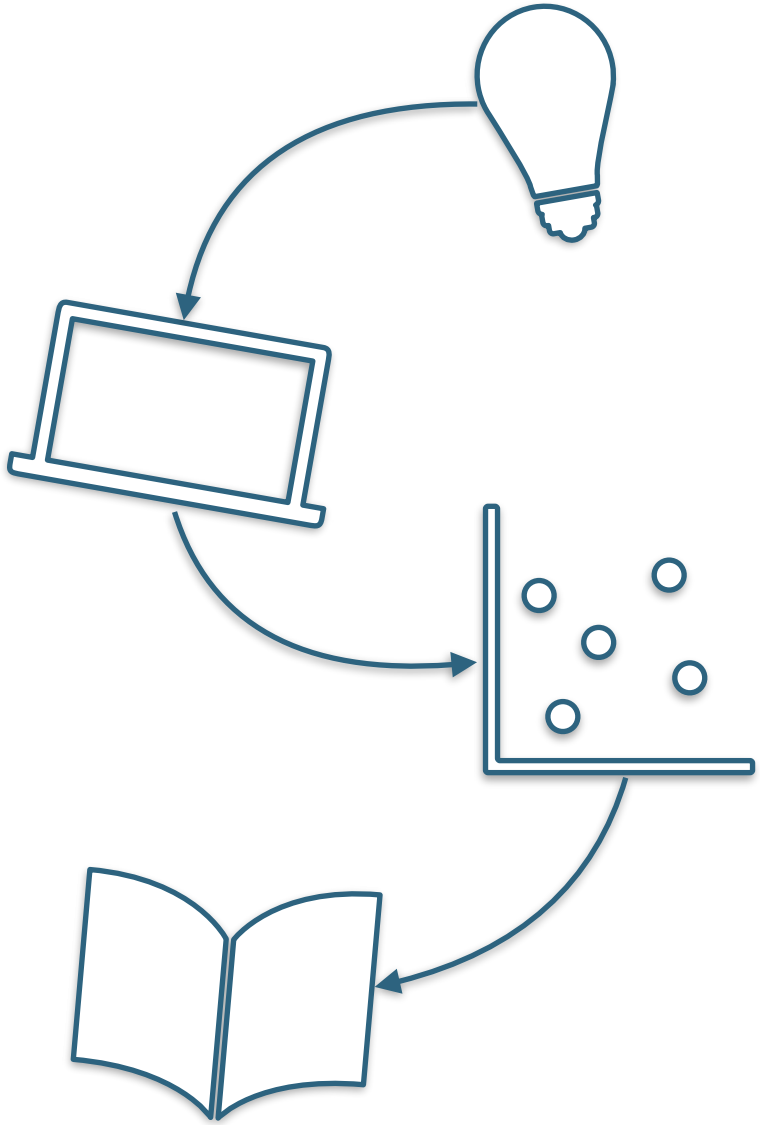
- **Writing Publication**



Time scales

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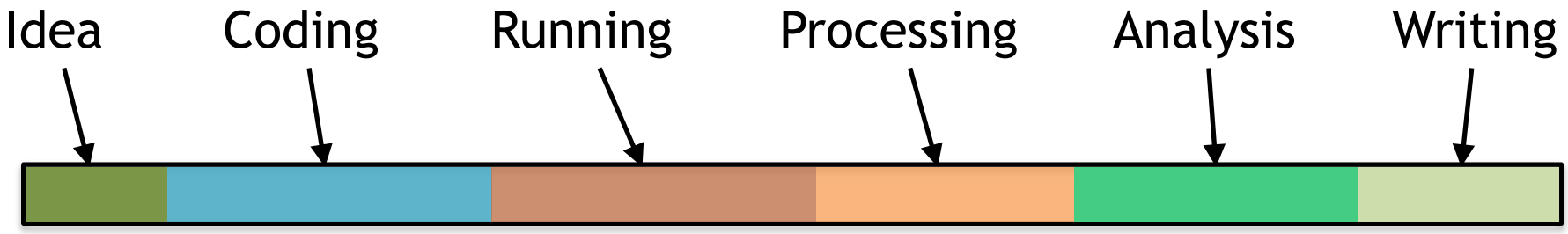

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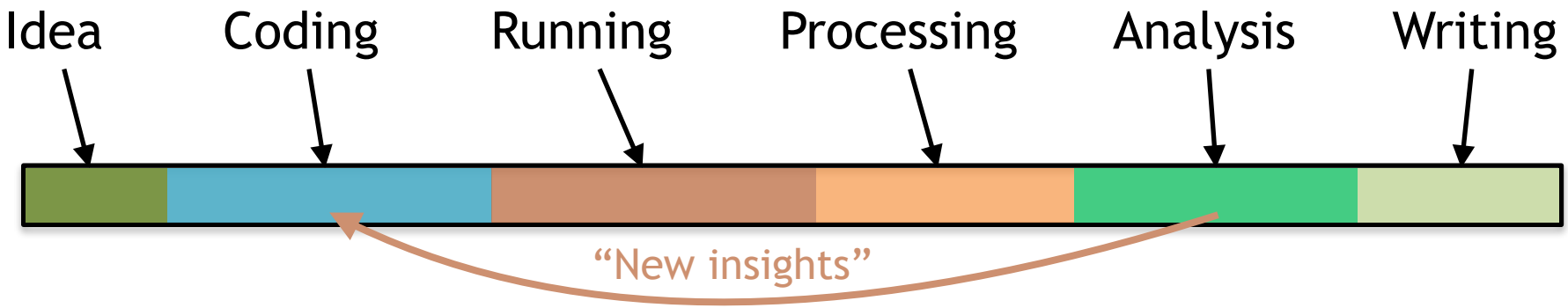

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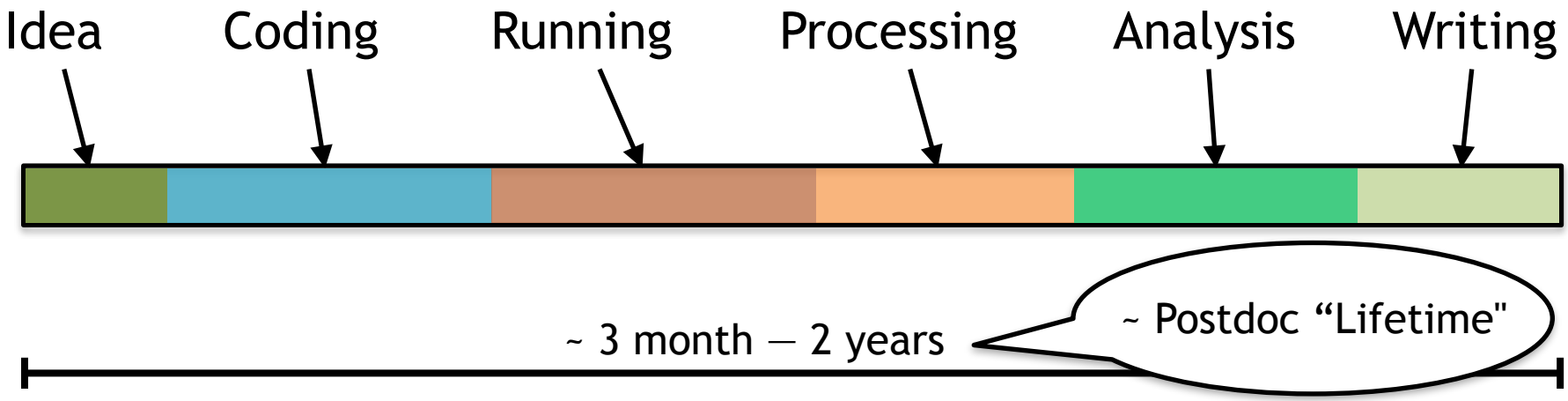

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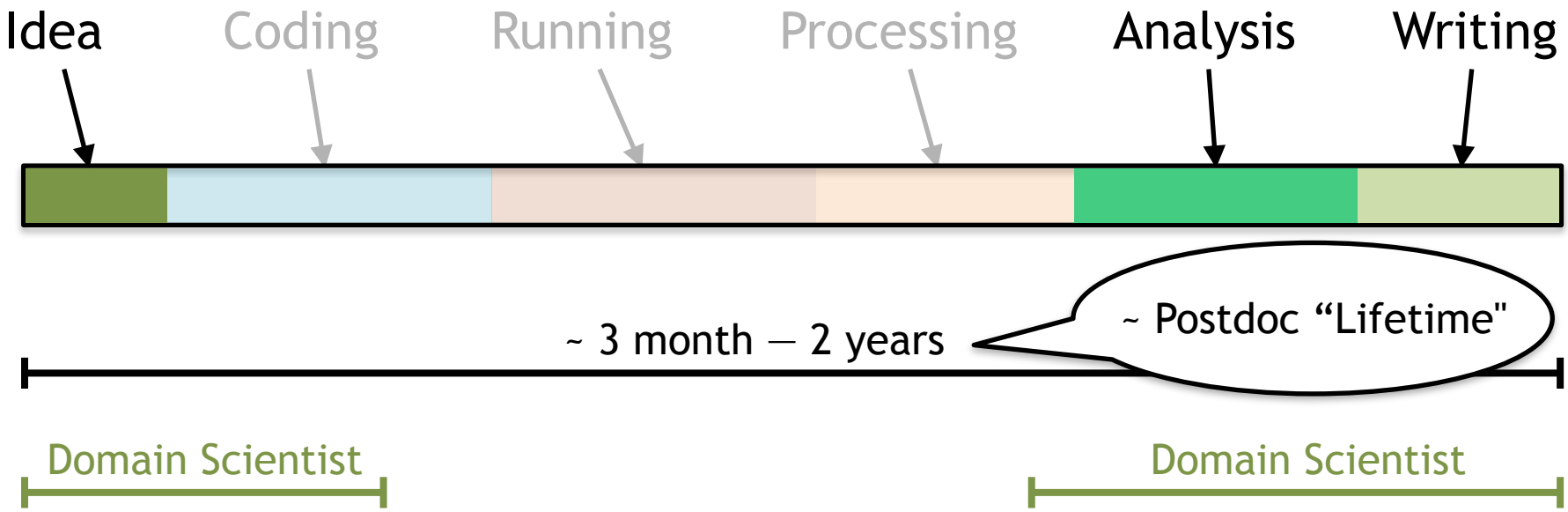

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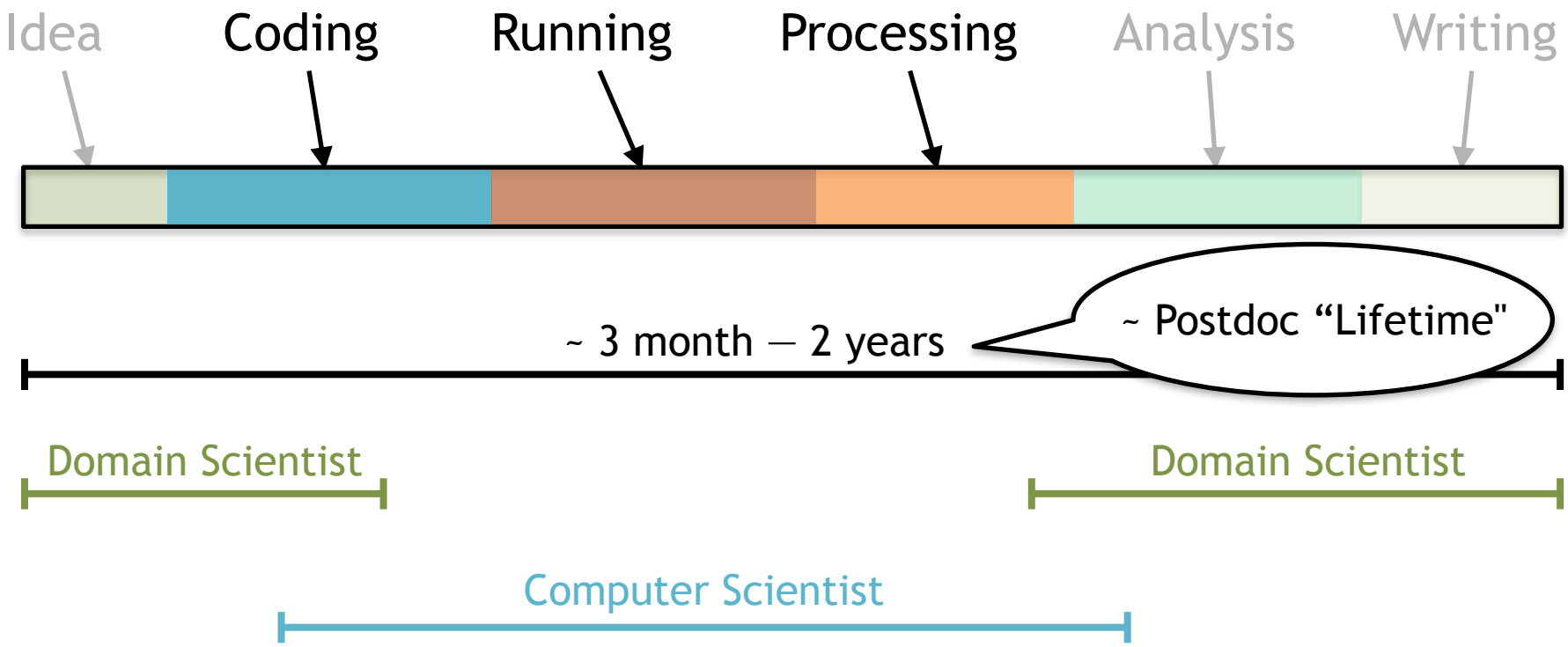

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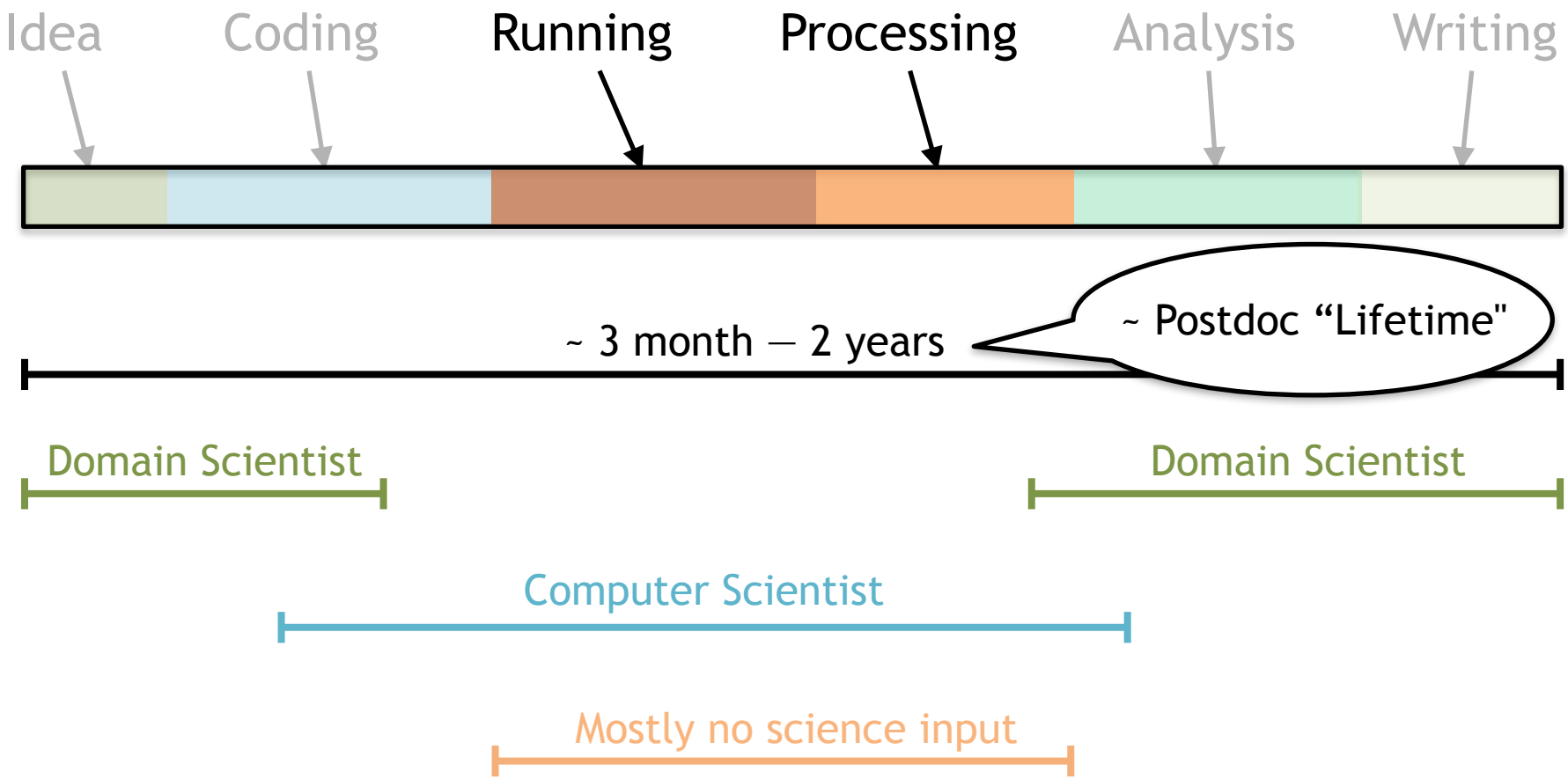

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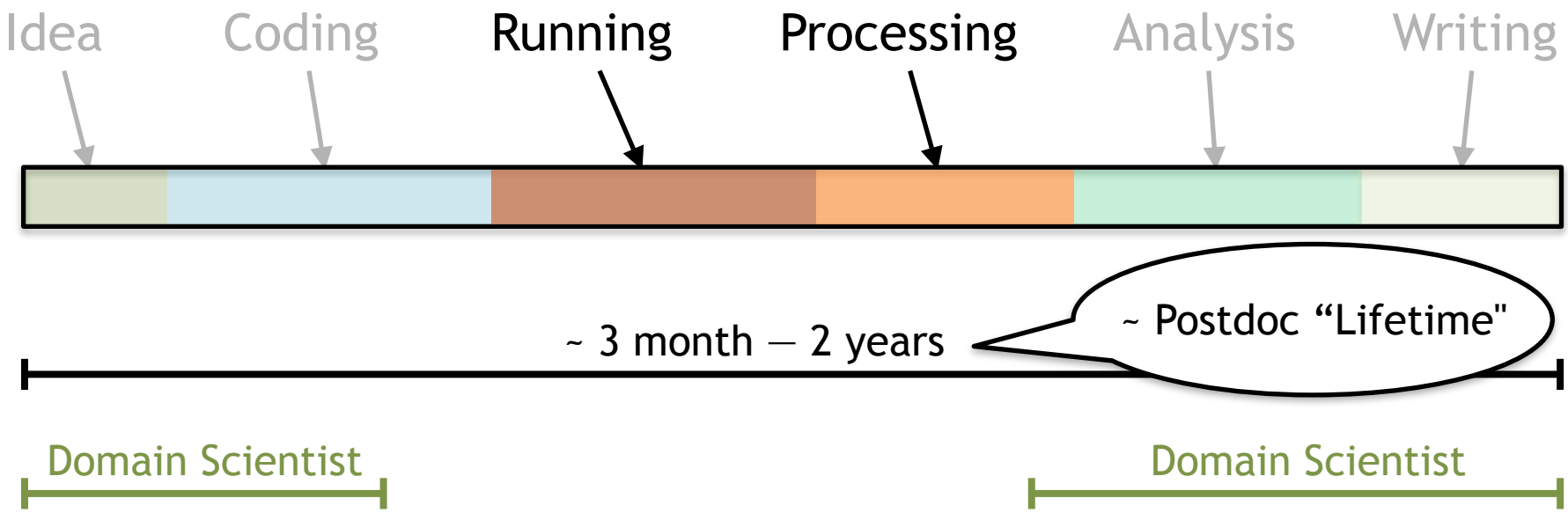

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→ We have many files…

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  - Job generation → large physics & computation parameter space
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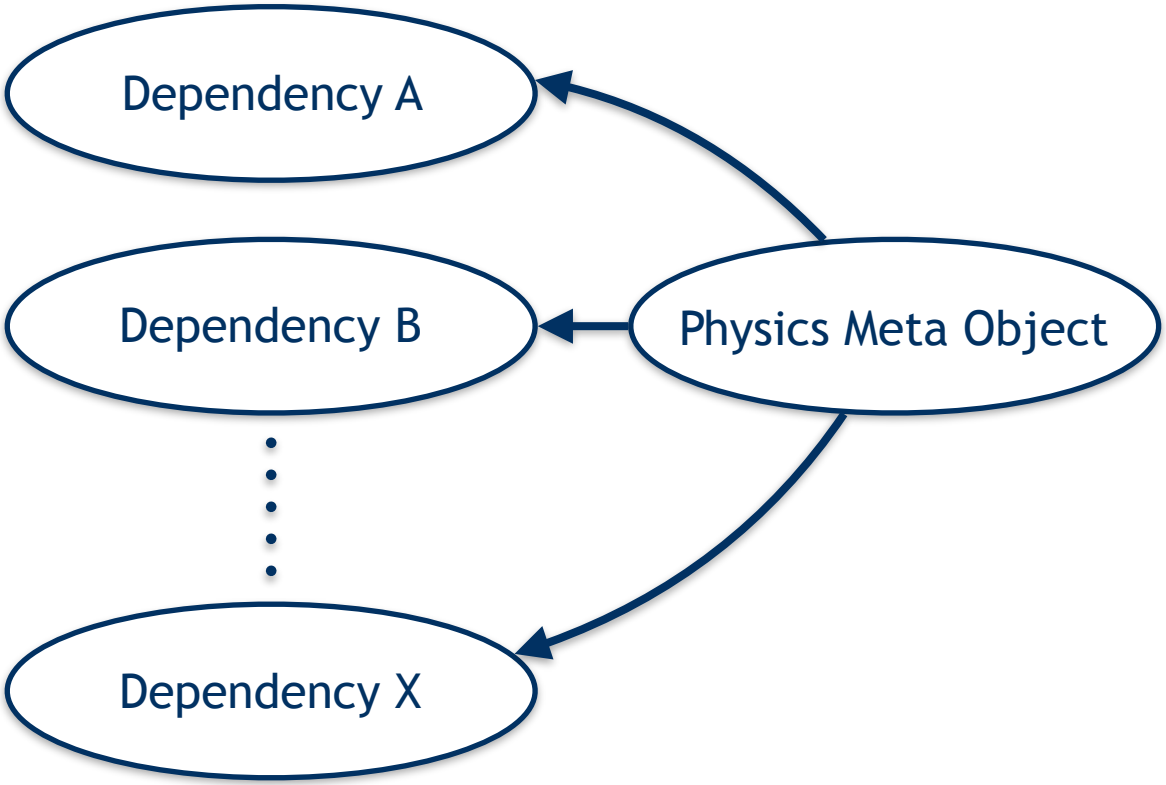
- **Analysis [4]**
  - Statistical data → Physical parameters
    - Input data, fit models → results & uncertainties

Abstraction:

→ Workflow controlled by physics meta objects



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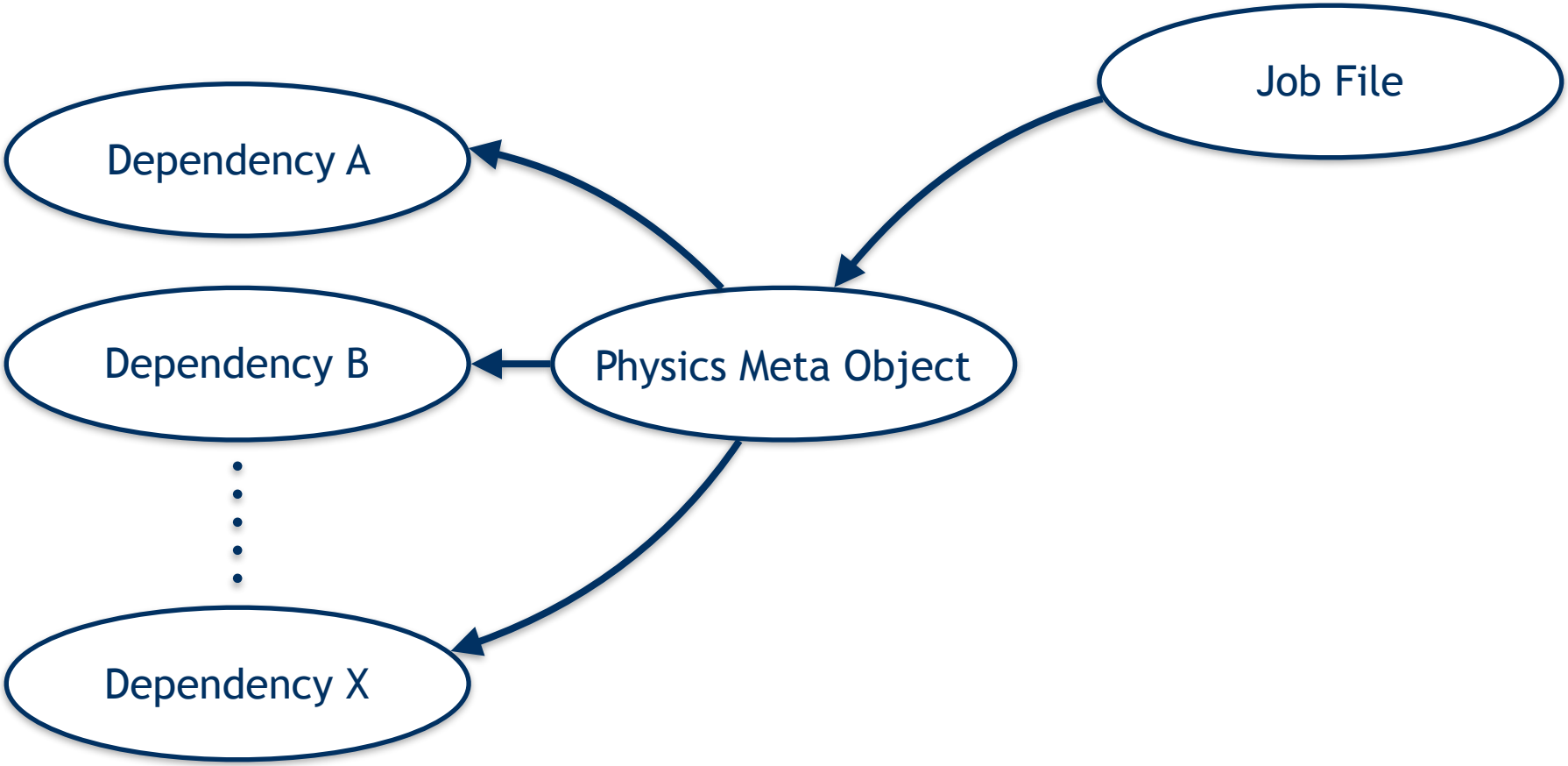

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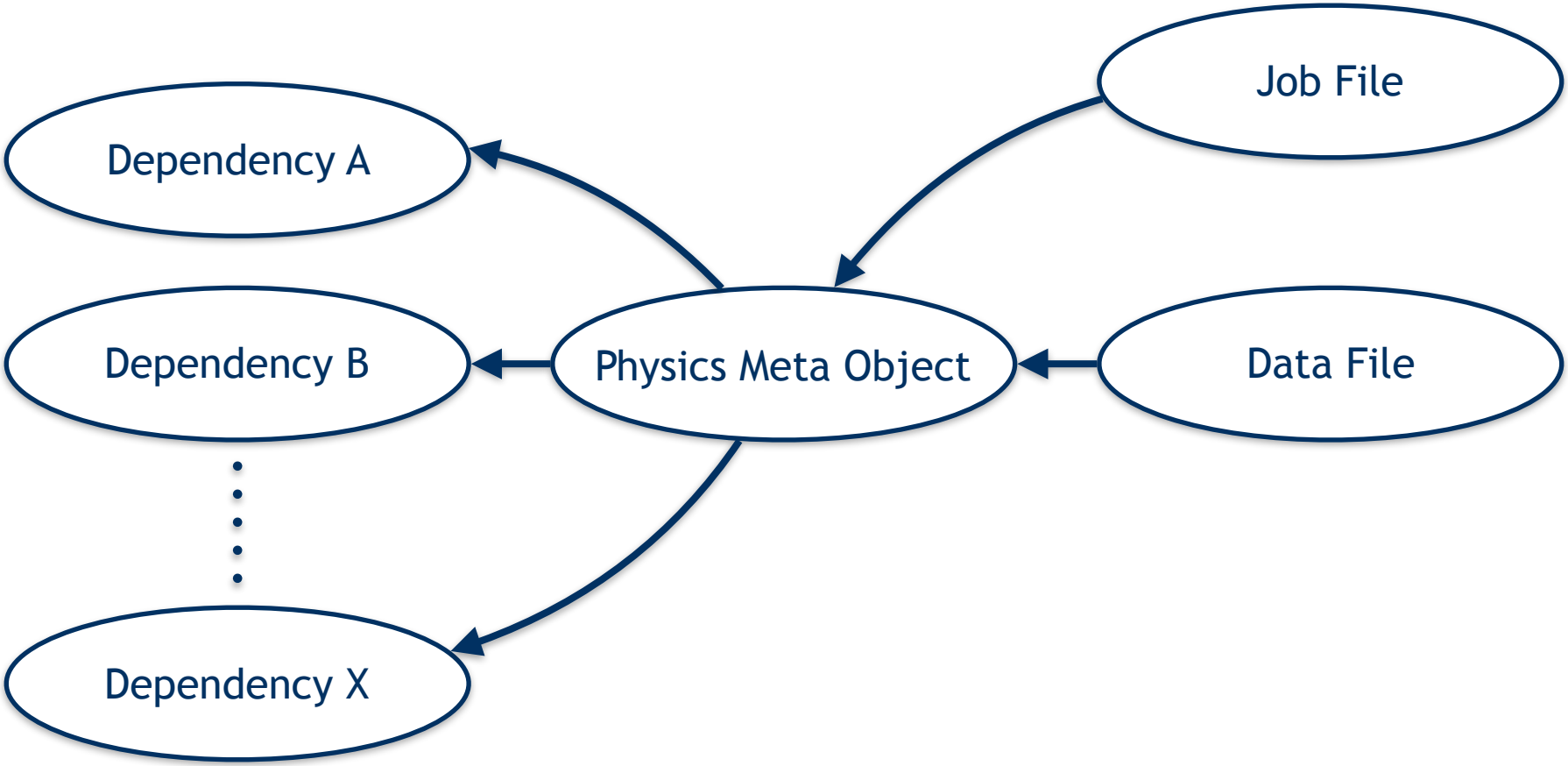

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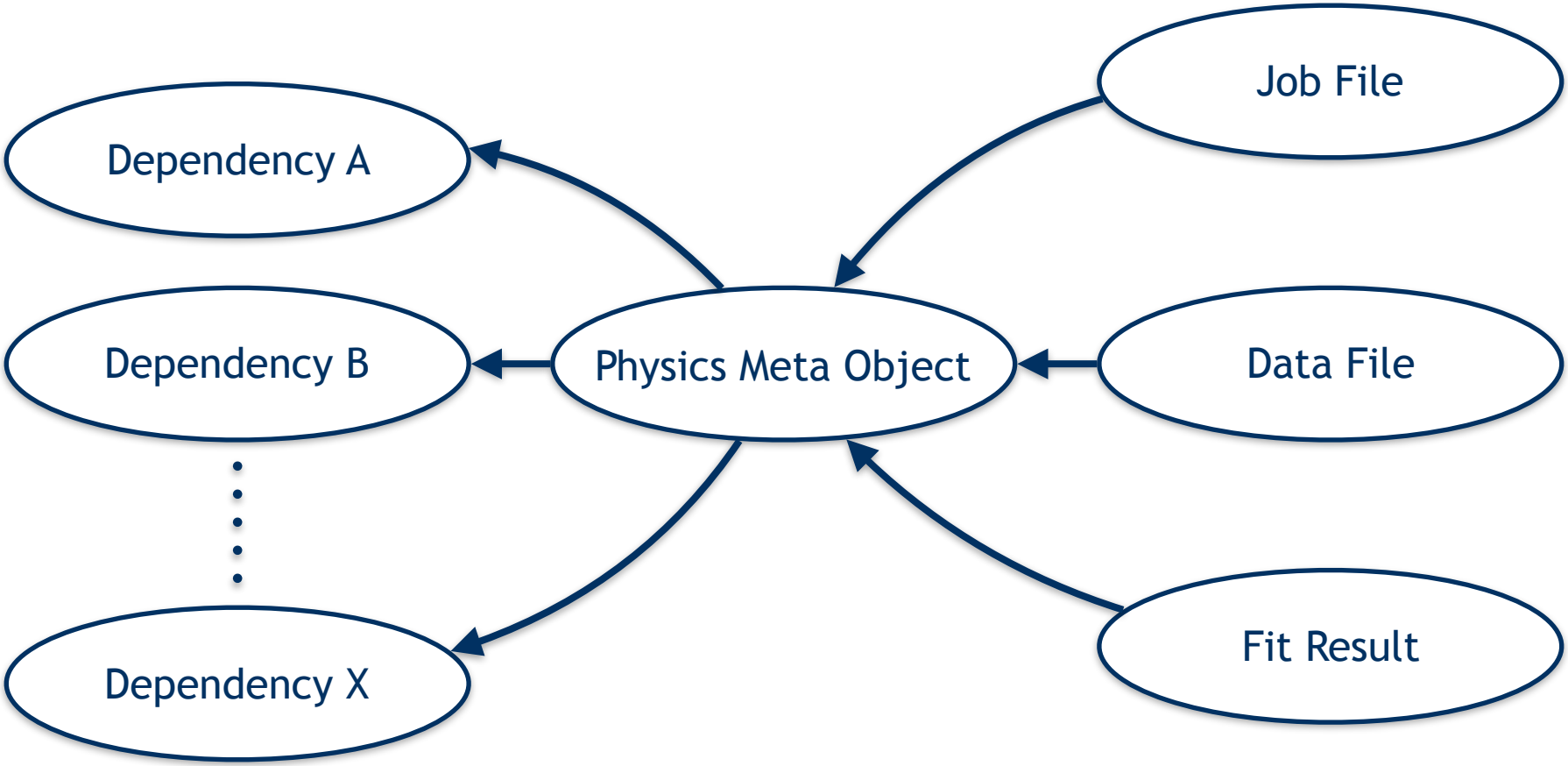

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→ Replace: file based approach → DataBase*d* approach

- **First Order Advantages of Database**
  - Systemic storage of data
    - no string parsing required (regex)

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propagator_ptr_id	origin_x	origin_y	origin_z	origin_t	fermionaction_id
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SELECT * FROM Propagator WHERE origin_x > 3;
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  - Map existing system to new structure
    - “Never change a running system”

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→ **Django: "The web framework for perfectionists with deadlines" [1]**

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Django

- Well maintained
  - Used by: Pinterest, Instagram, Bitbucket, Mozilla Support, …
- Well documented
  - Tutorials, multiple version history, multiple languages, …
- Open Source
  - Active development, many extensions, …

Python Classes ↔ Tables

Nf211(GaugeConfig) Table

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2nd Order Advantages:

- Consistency checks
- Auto-documentation
- High-level API support

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- `short_tag`
- `stream`
- `config`
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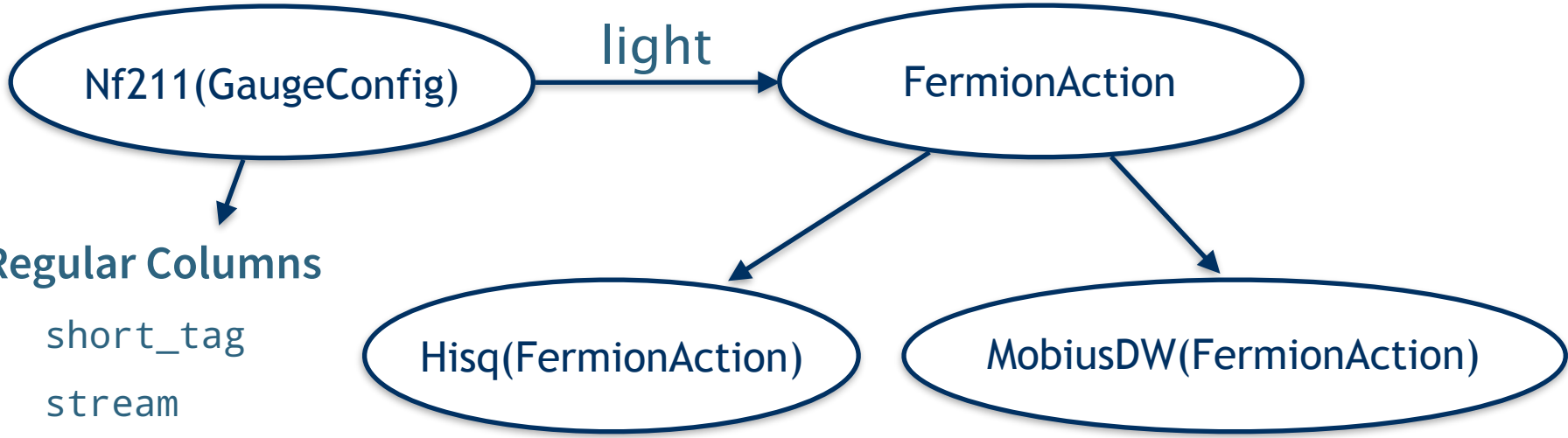

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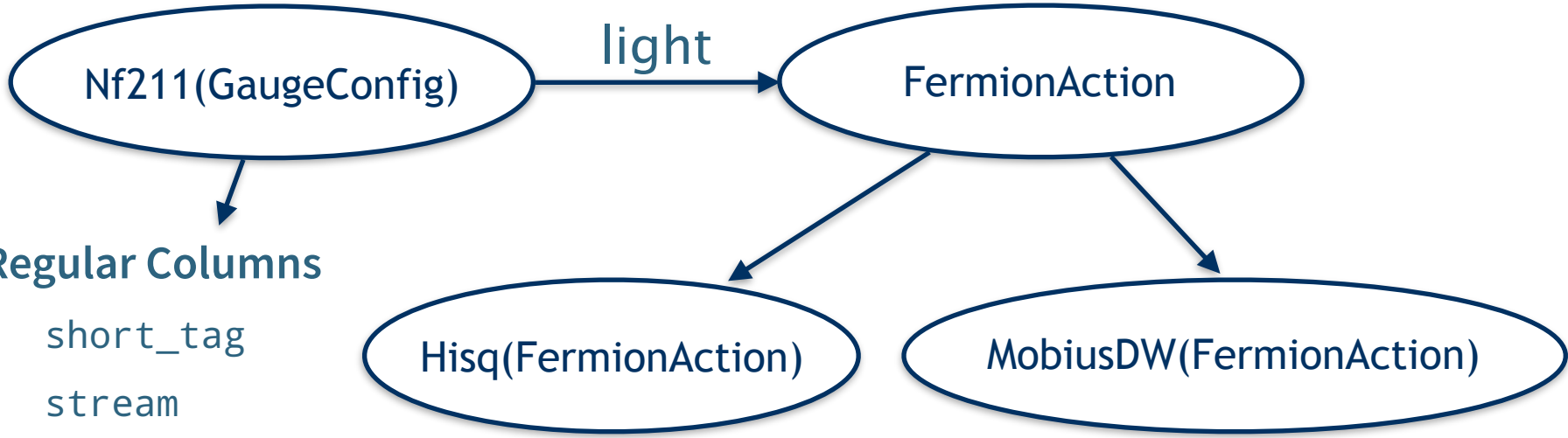

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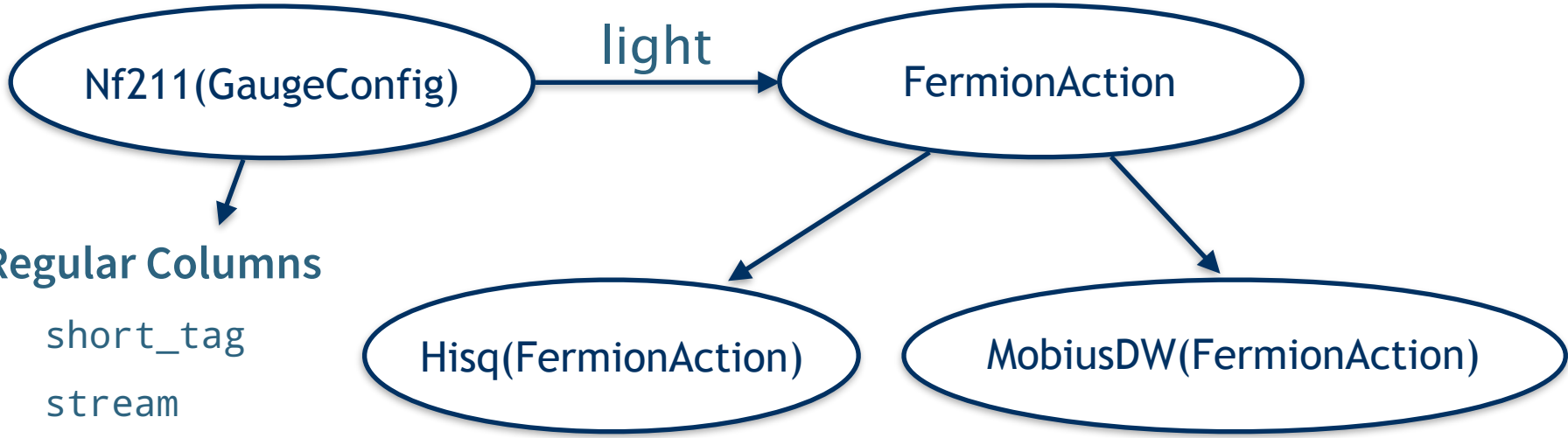

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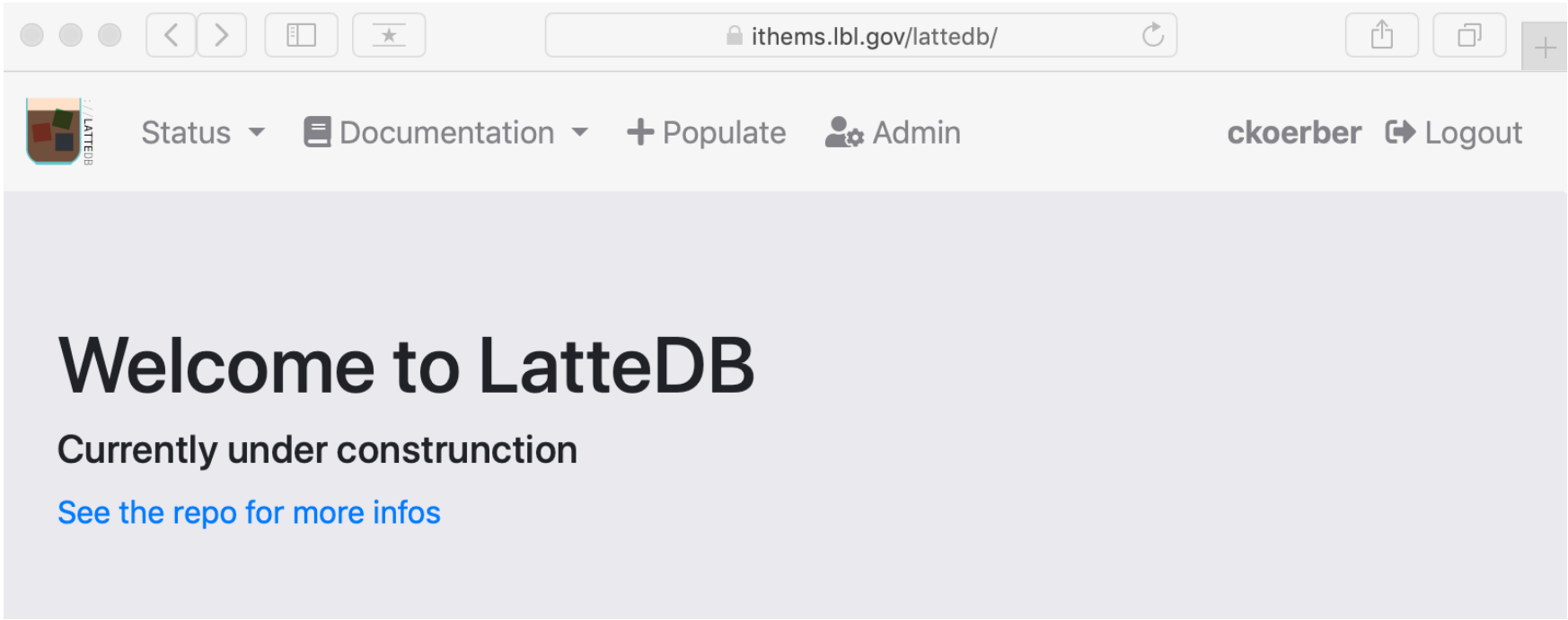
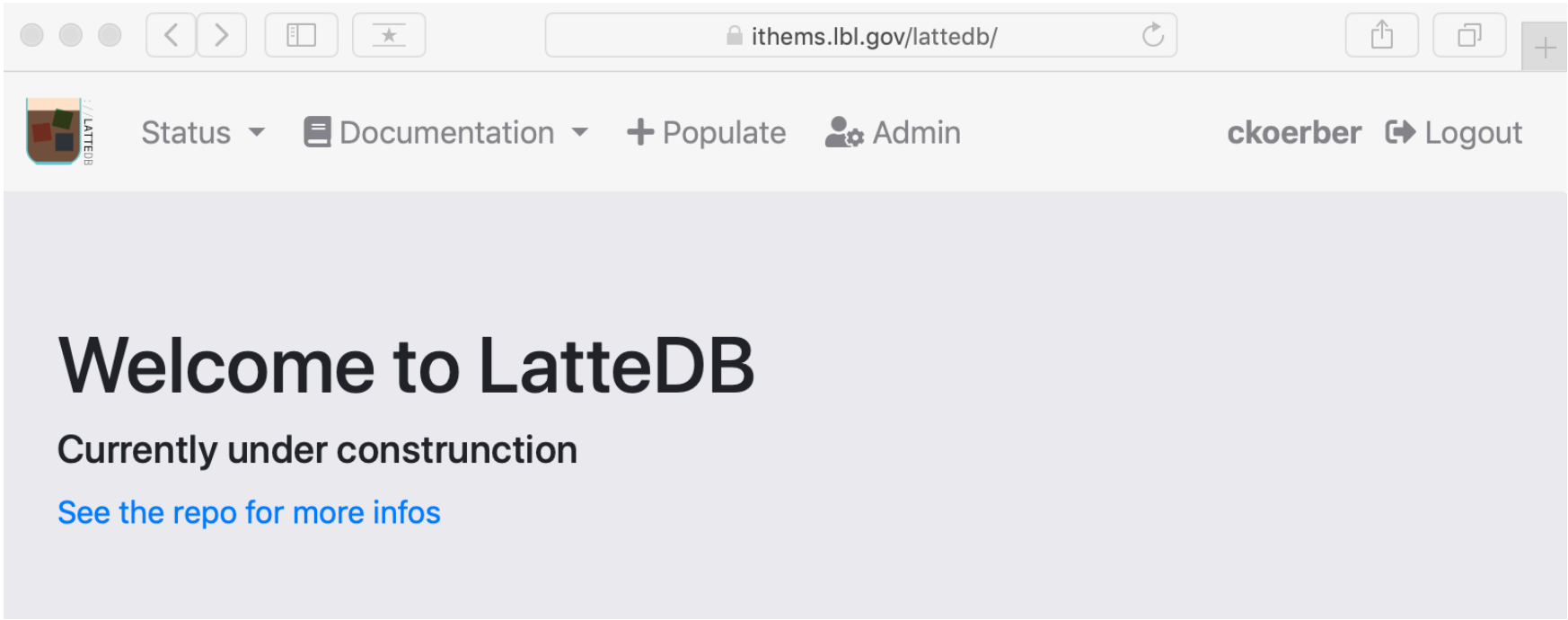
- Information reuse
- Flexibility

Features: Webpage



Features: Webpage



2nd Order Advantages:

- Automated progress reports
- Centralized source for information
- Easy to set up open data platform

Features: Table views

Real view – fake data

Home › Correlator › Baryon2pts

Select baryon2pt to view

Action: -------- Go 0 of 100 selected

ID	ENSEMBLE	CONFIG	TAG	ORIGIN (X, Y, Z, T)	PARITY	SPIN X2	SPIN Z X2	ISOSPIN X2	ISOSPIN Z X2
1888	a09m310	396	proton	(7, 29, 23, 41)	1	1	1	1	1
1887	a09m310	396	proton	(7, 29, 23, 41)	1	1	-1	1	1
1886	a09m310	396	proton	(7, 29, 23, 41)	-1	1	1	1	1
1885	a09m310	396	proton	(7, 29, 23, 41)	-1	1	-1	1	1
1884	a09m310	396	proton	(23, 13, 7, 41)	1	1	1	1	1
1883	a09m310	396	proton	(23, 13, 7, 41)	1	1	-1	1	1
1882	a09m310	396	proton	(23, 13, 7, 41)	-1	1	1	1	1
1881	a09m310	396	proton	(23, 13, 7, 41)	-1	1	-1	1	1
1880	a09m310	396	proton	(18, 21, 25, 89)	1	1	1	1	1
1879	a09m310	396	proton	(18, 21, 25, 89)	1	1	-1	1	1

FILTER

By tag

All

proton

By ensemble

All

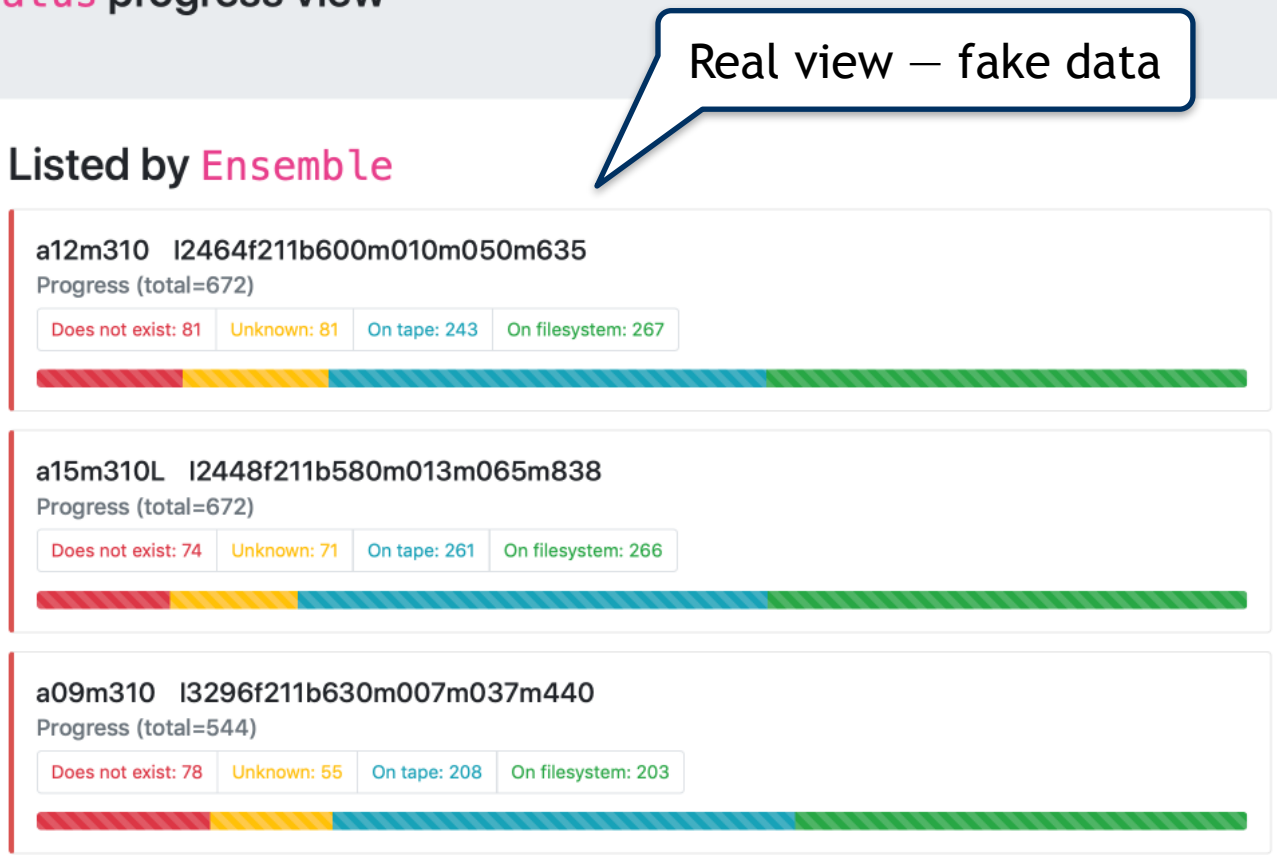
a15m310L

a09m310

a12m310

Features: Automatic Progress Report

`Baryon2pt Status` progress view



Features: Automatic Documentation

Documentation of `lattedb.propagator`

See table properties

`OneToAll`

Module: `lattedb.propagator.models`

Base: `Propagator[Base]`

Columns

Name	Type	Help
`tag`	`CharField` (Optional)	(Optional) Char(20): User defined tag for easy searches
`misc`	`JSONField` (Optional)	(Optional) JSON: {'anything': 'you want'}
`gaugeconfig`	`ForeignKey`: GaugeConfig	ForeignKey pointing to specific gauge configuration inverted on
`fermionaction`	`ForeignKey`: FermionAction	ForeignKey pointing to valence lattice fermion action
`origin_x`	`PositiveSmallIntegerField`	PositiveSmallInt: x-coordinate origin location of the propagator
`origin_y`	`PositiveSmallIntegerField`	PositiveSmallInt: y-coordinate origin location of the propagator
`origin_z`	`PositiveSmallIntegerField`	PositiveSmallInt: z-coordinate origin location of the propagator
`origin_t`	`PositiveSmallIntegerField`	PositiveSmallInt: t-coordinate origin location of the propagator

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5. or add new

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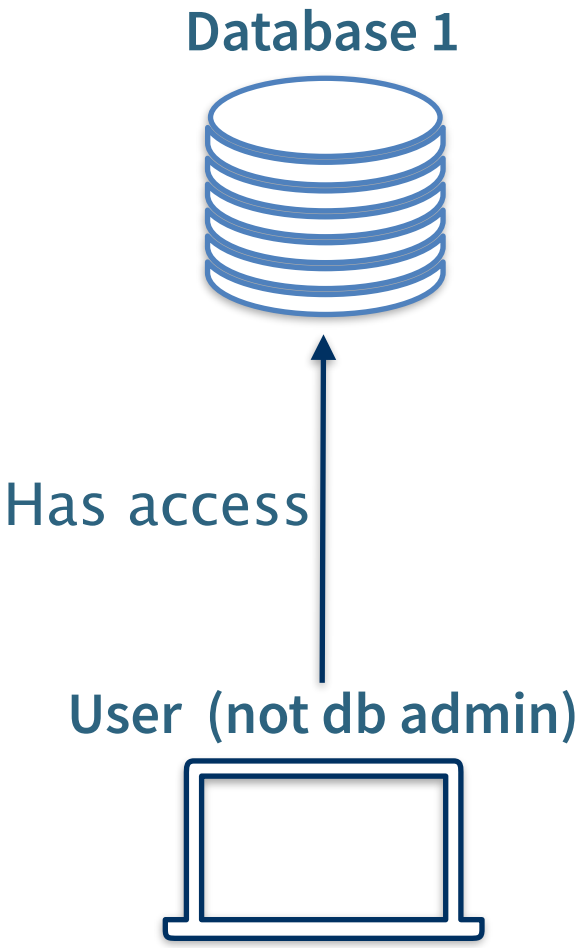
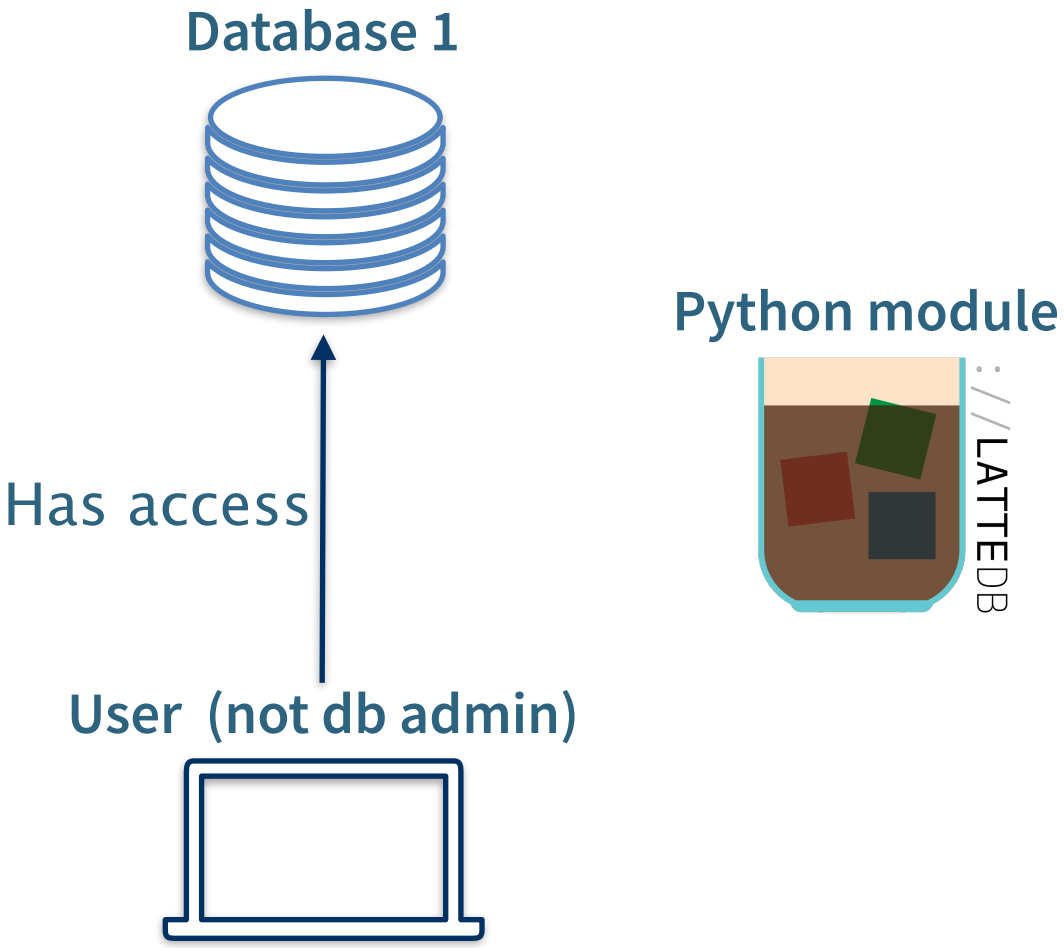
7. launch the webapp (on localhost)

```
> lattedb runserver
```

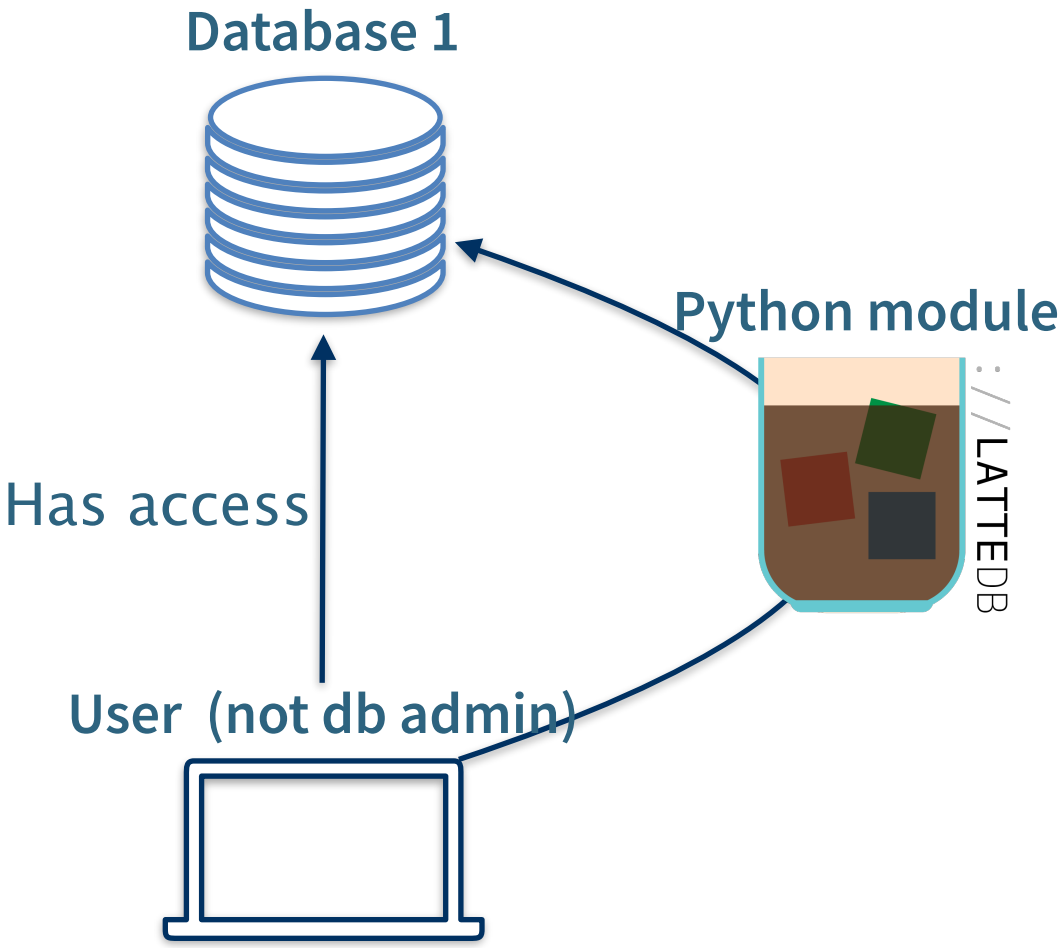
Security Layers (Python Module)



Security Layers (Python Module)



Security Layers (Python Module)



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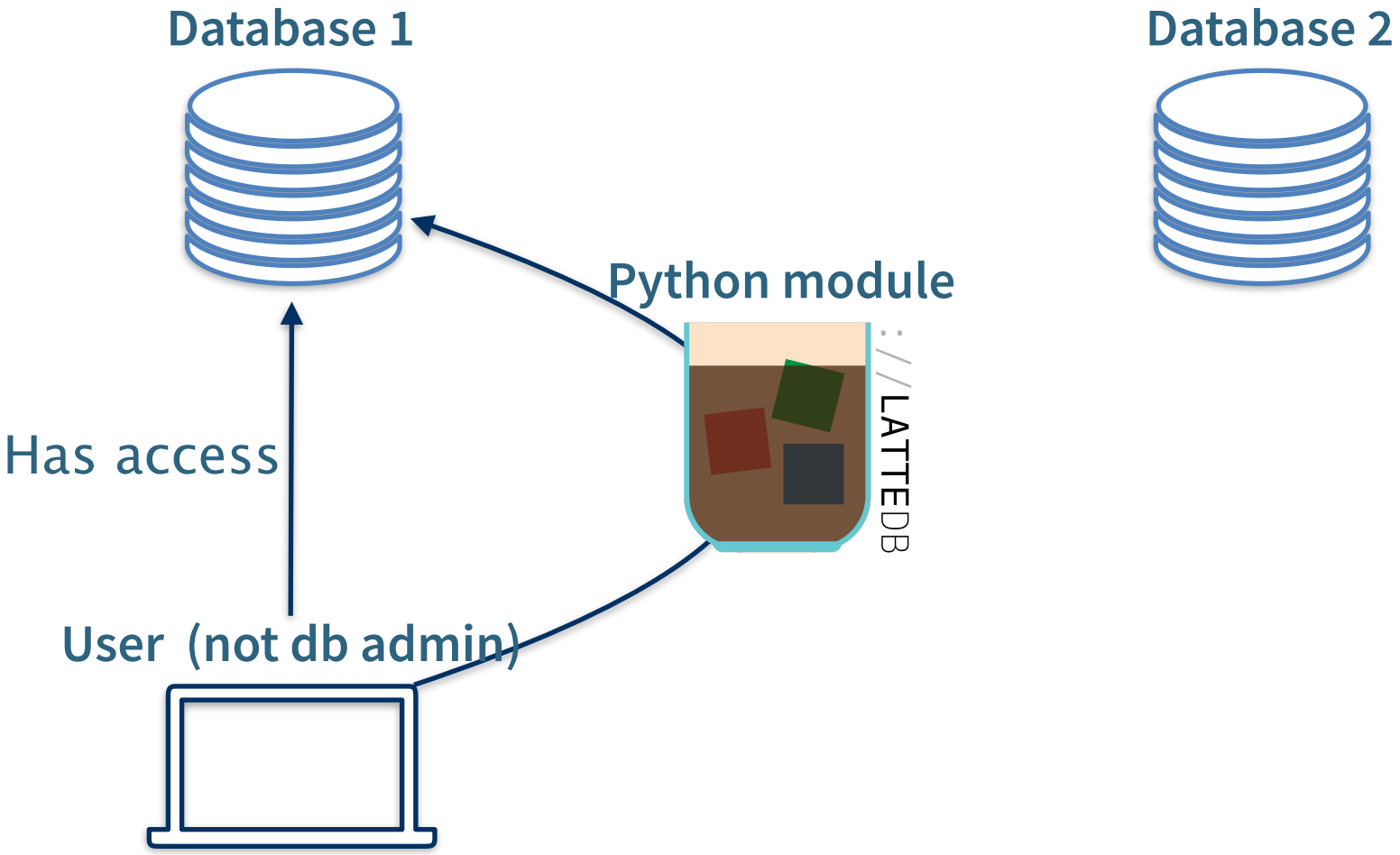
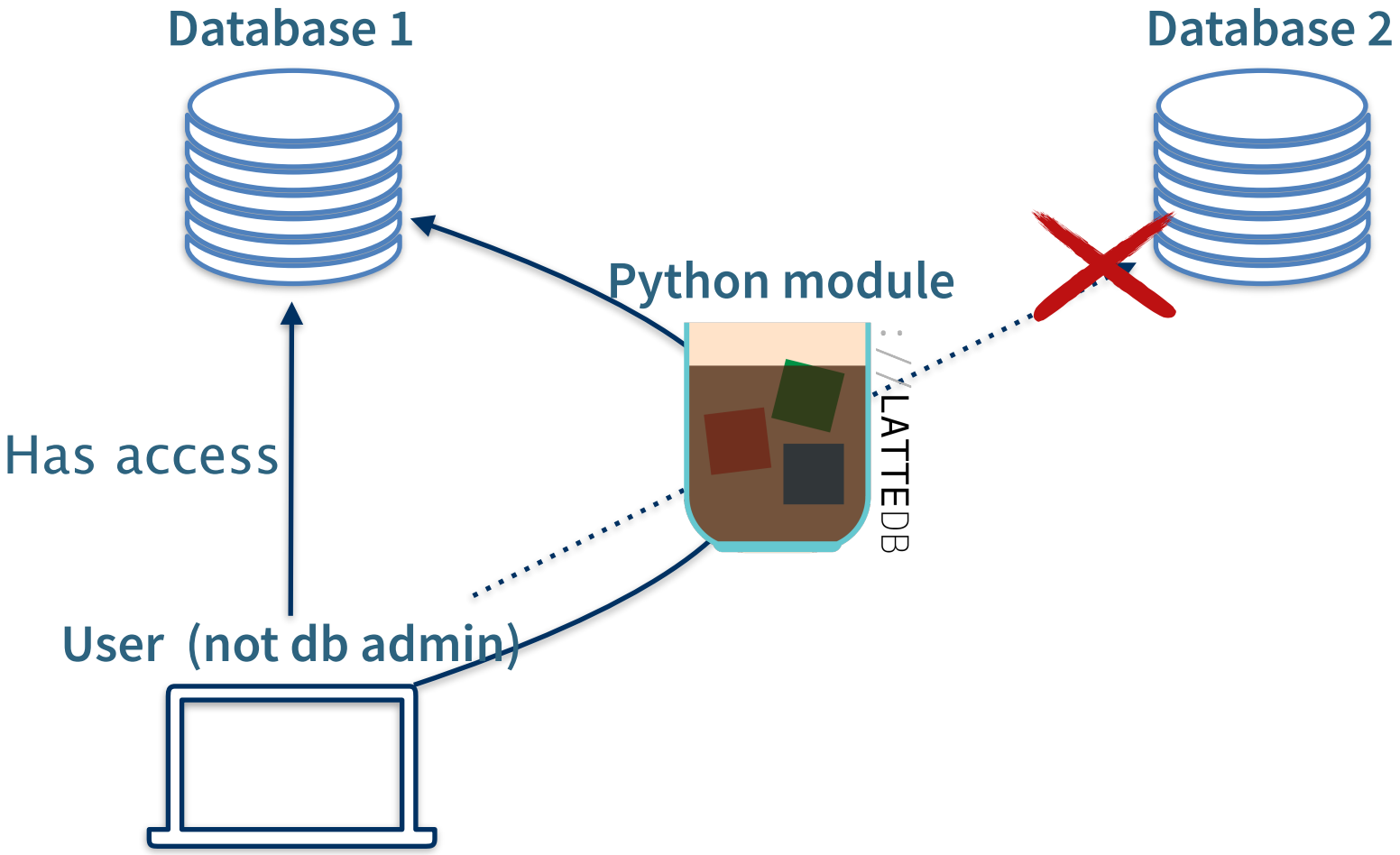
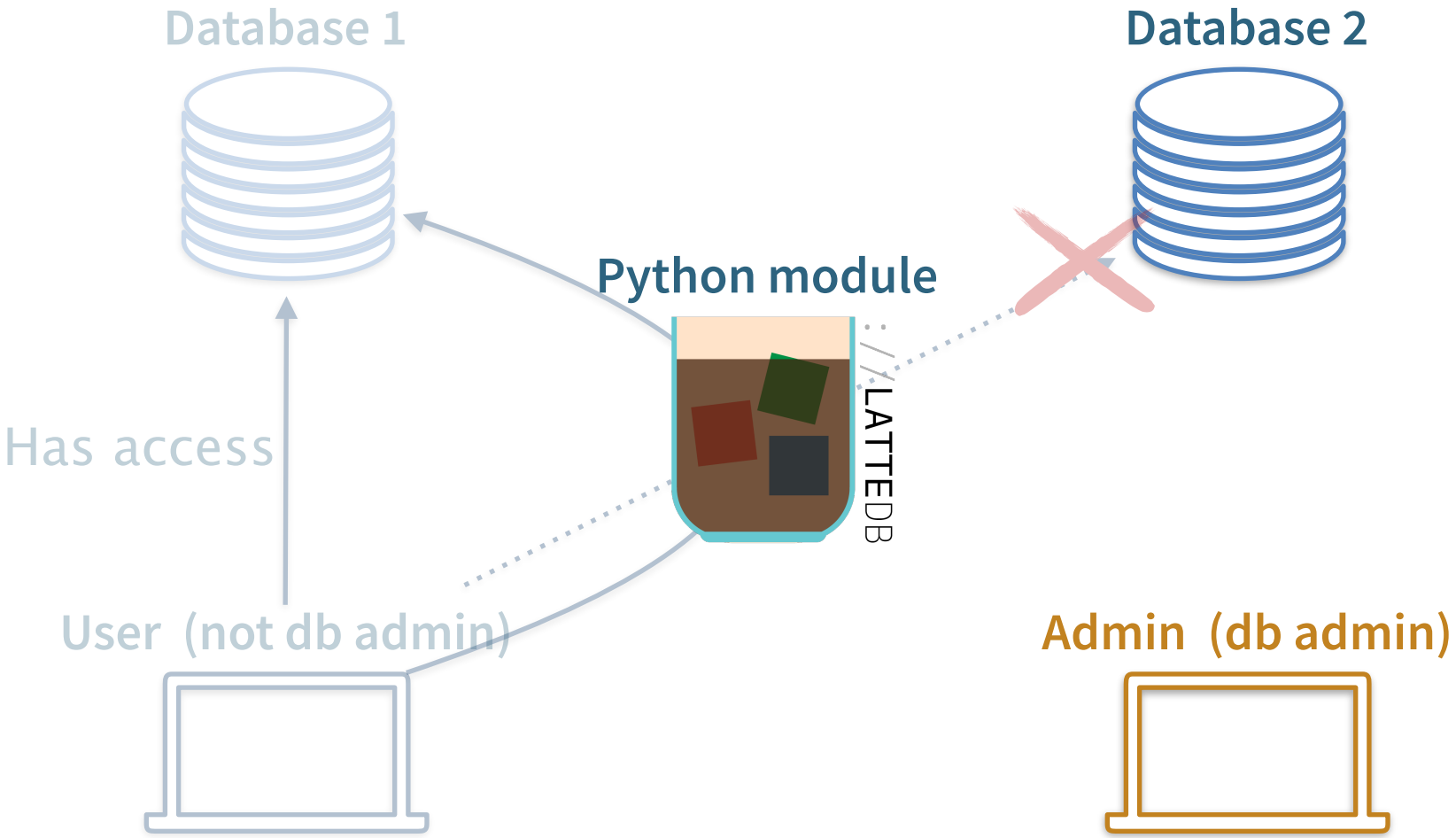


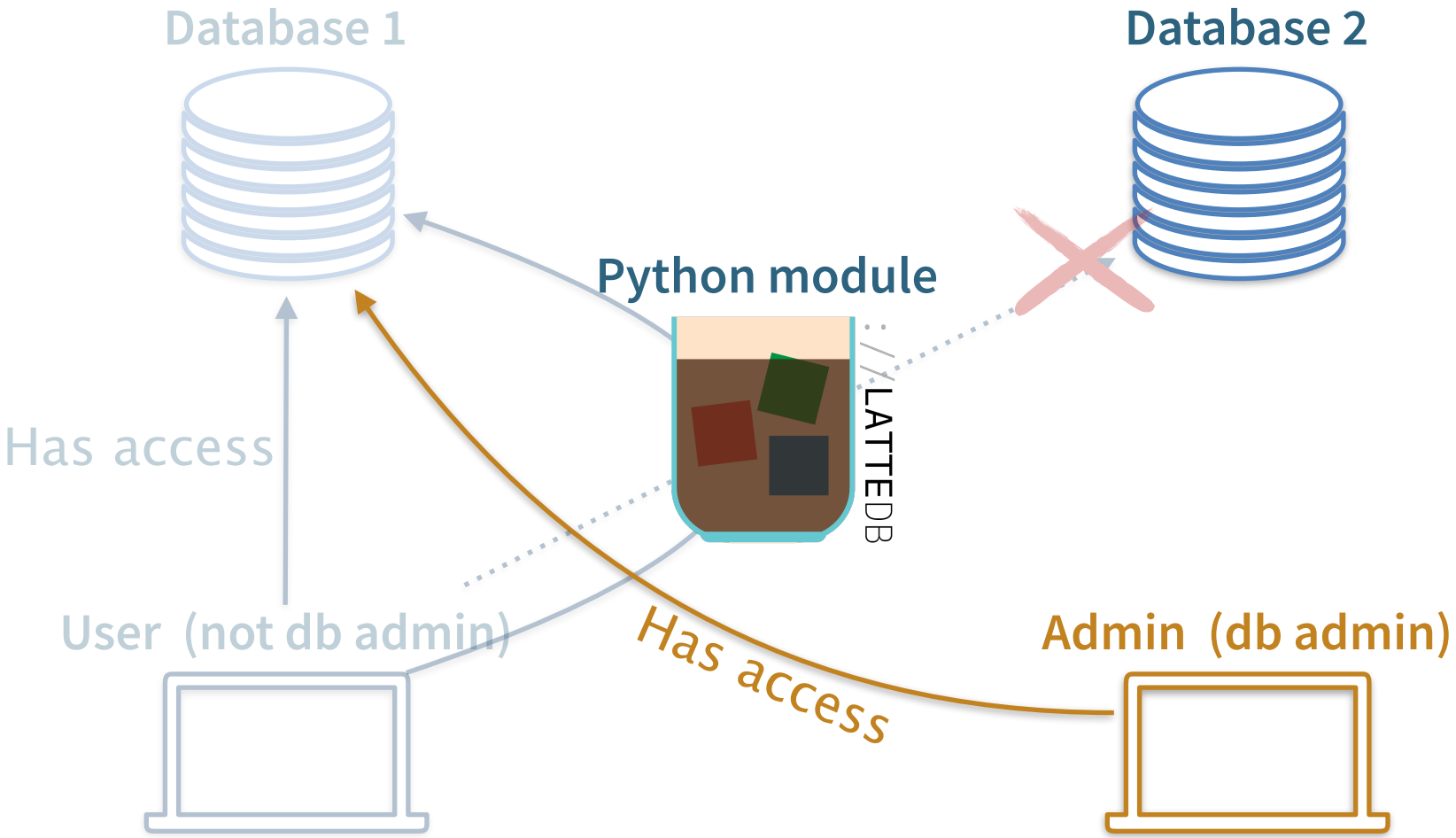
Security Layers (Python Module)



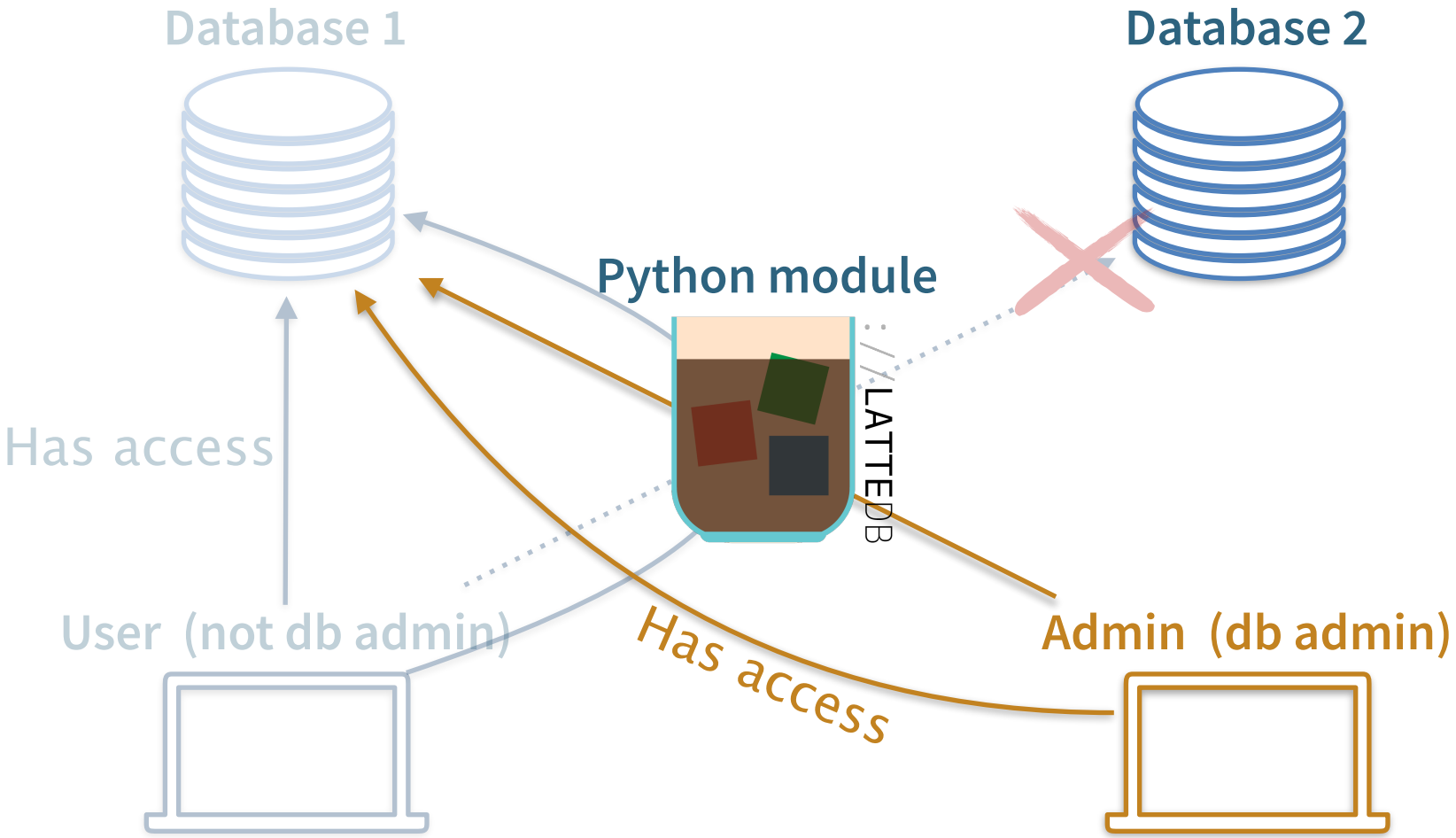
Security Layers (Python Module)



Security Layers (Python Module)



Security Layers (Python Module)



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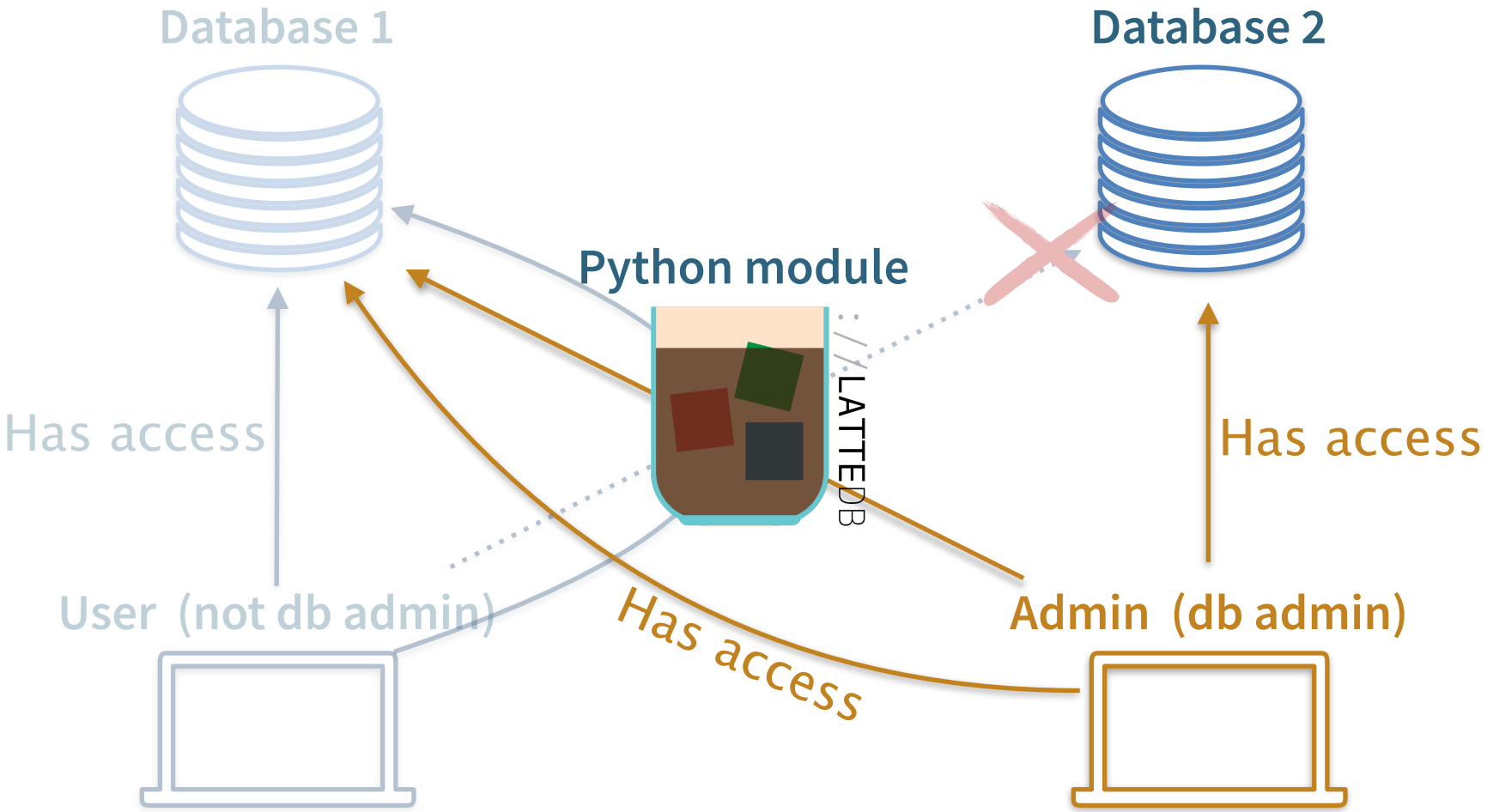

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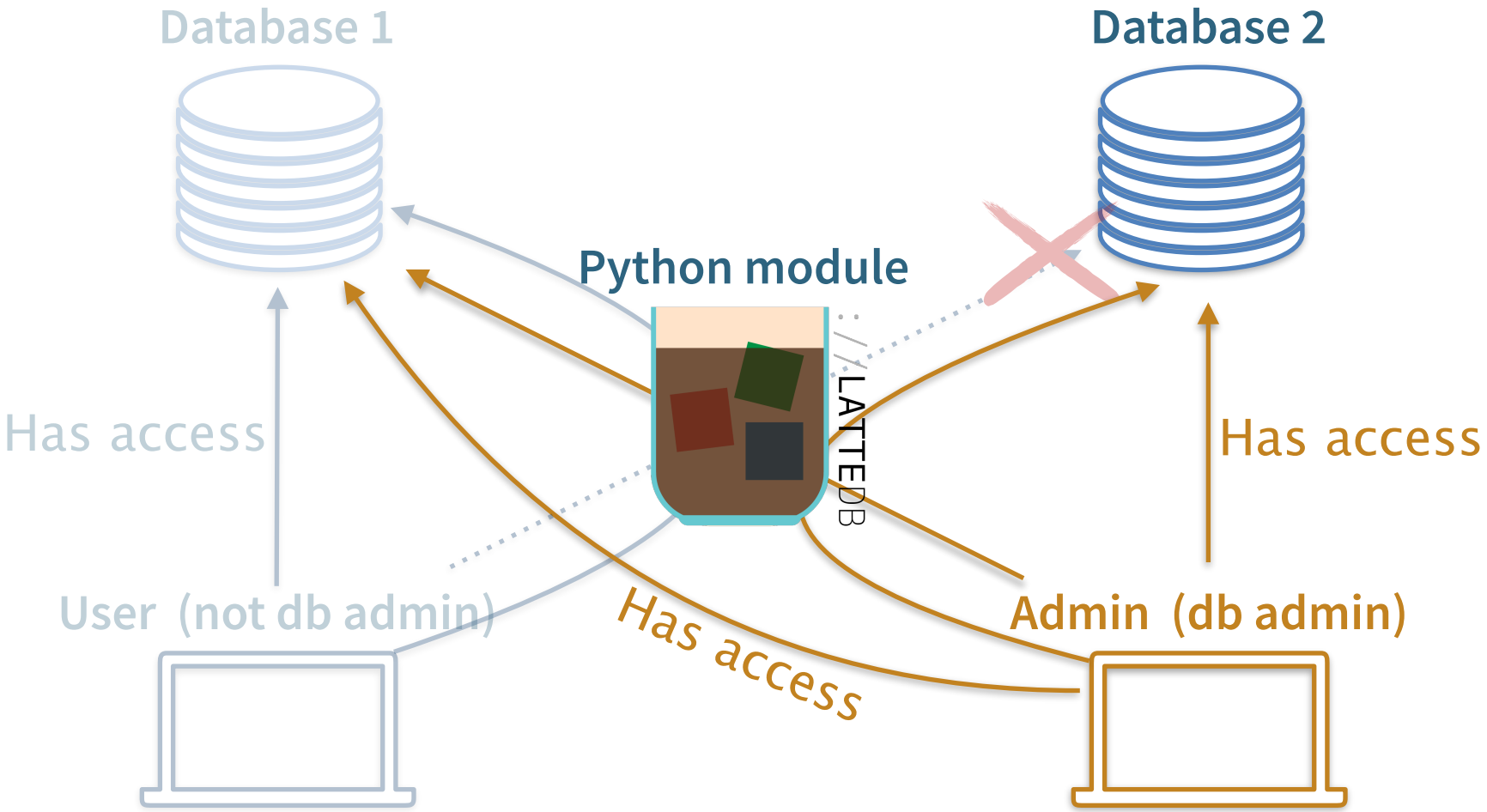
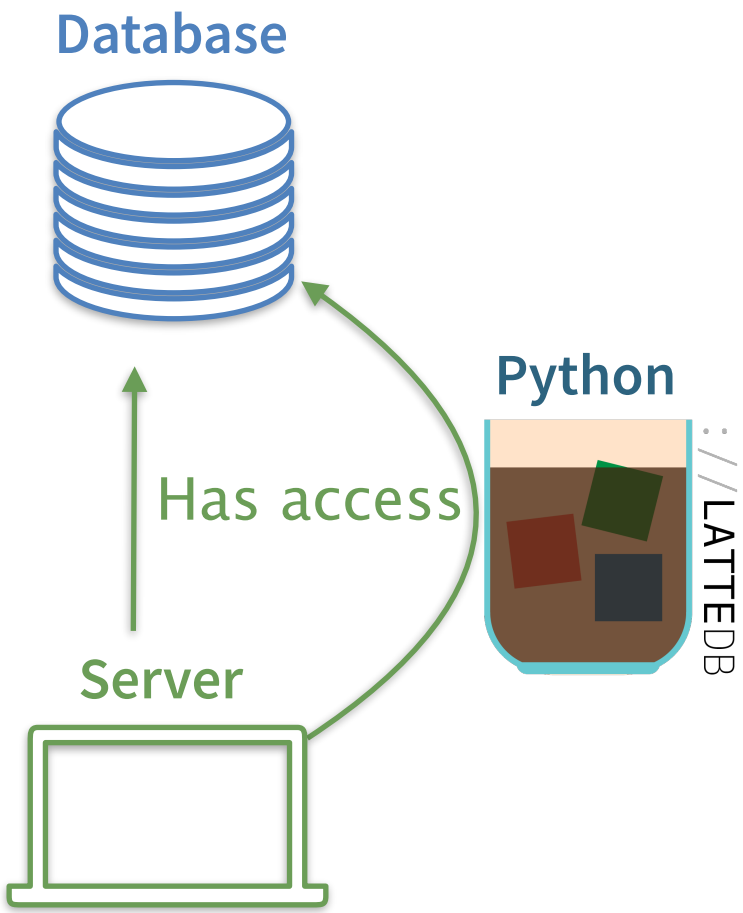


Security Layers (Webpage)



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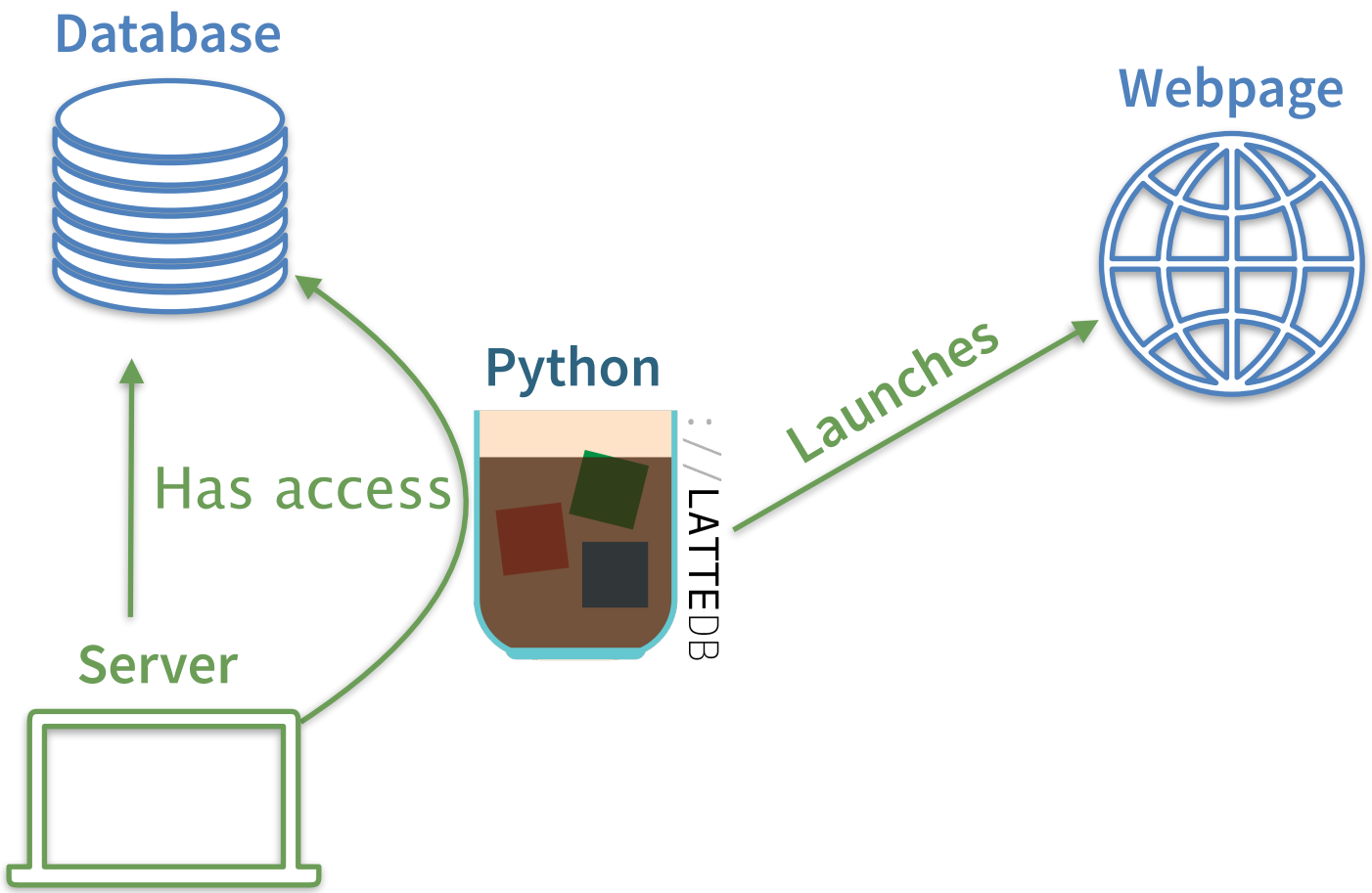

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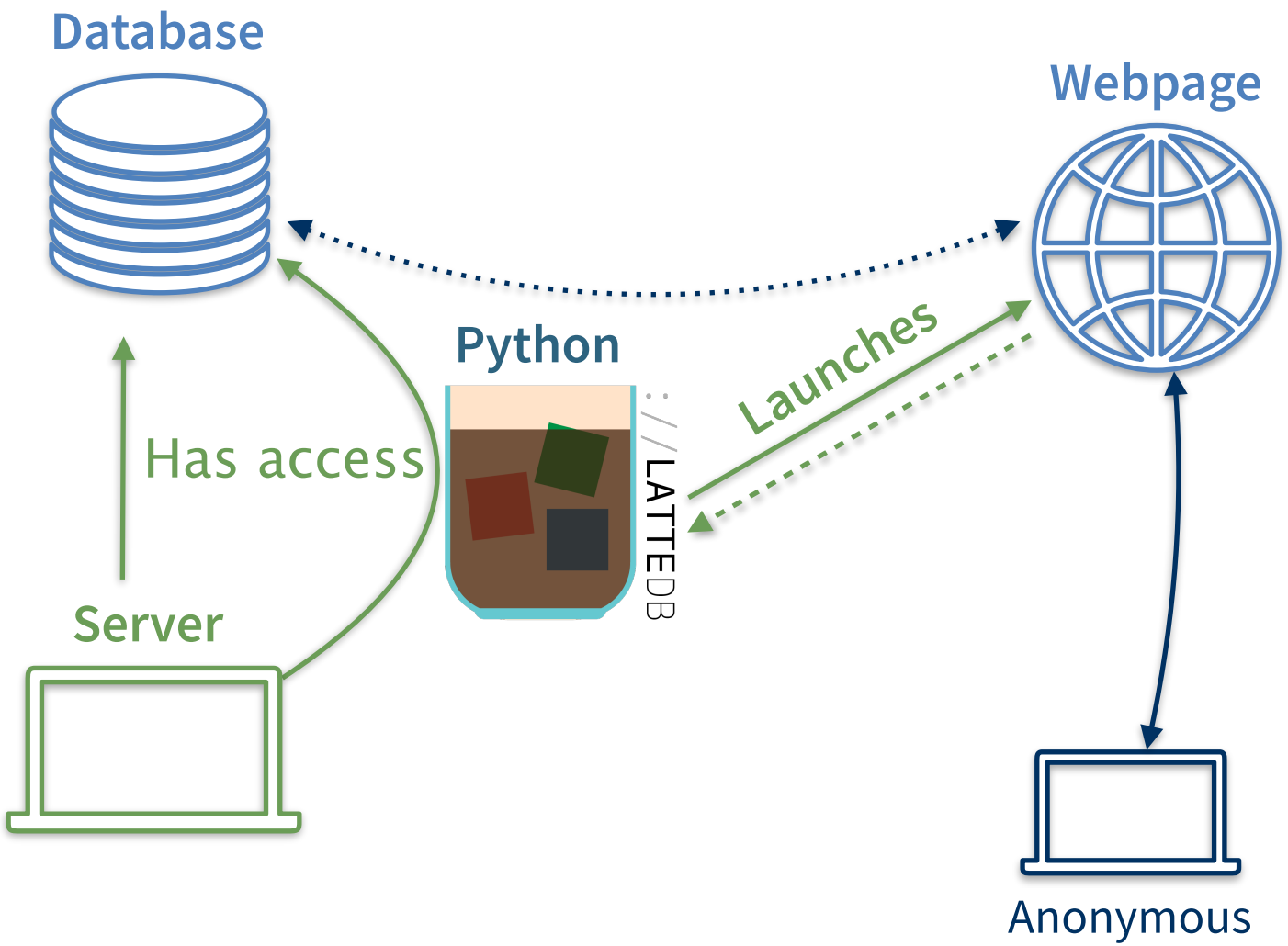

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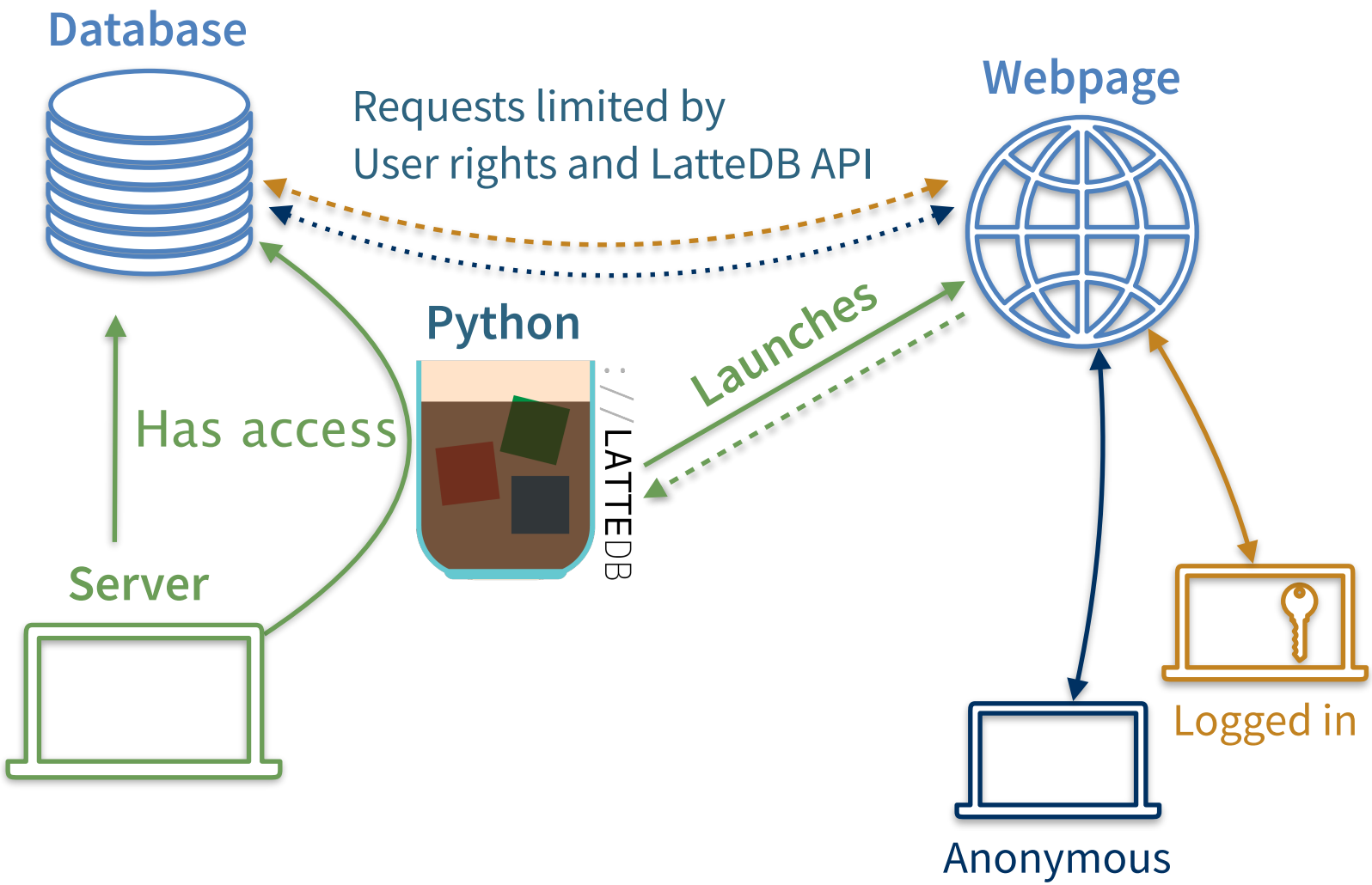

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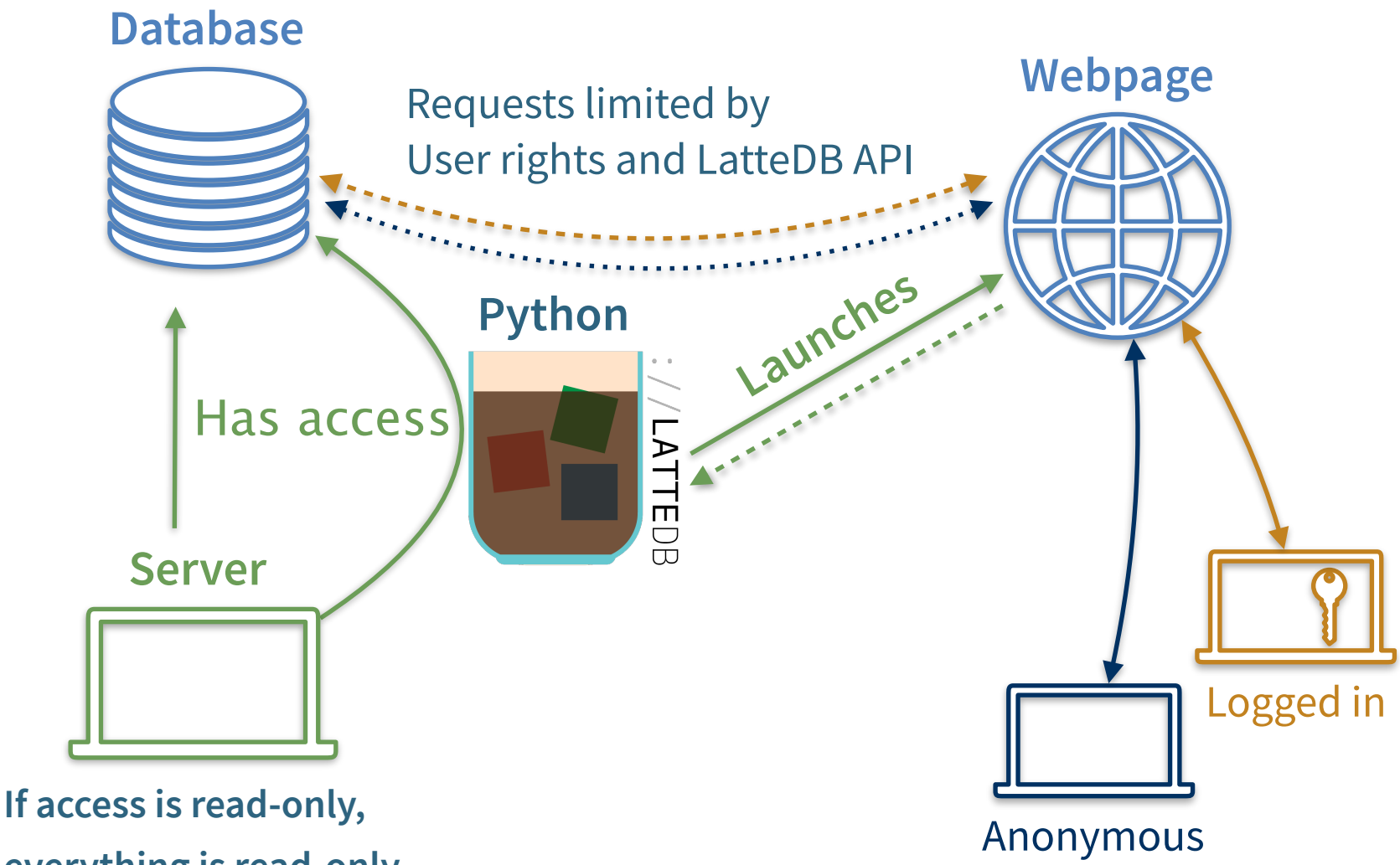

Future

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  - Test job management production on tiny example
  - Production runs: analysis & job management
  - Data connections (on remote machines)
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- **Extract & Publish Stand-Alone Mini-App**
  - Contains general framework
  - Documentation and usage guide
  - Unittests & module dock

Backup

Table Layout