

Datomic

A modern database

Databases Perks

- Declarative Query Language (e.g. SQL)
- Indexes
- Transactions (ACI)
- Durability (D)

What are the Problems?

- Query as Strings
- Query Power "over there"
- Update in Place
- Inflexibility in Data Modeling
- Reaction by Polling.

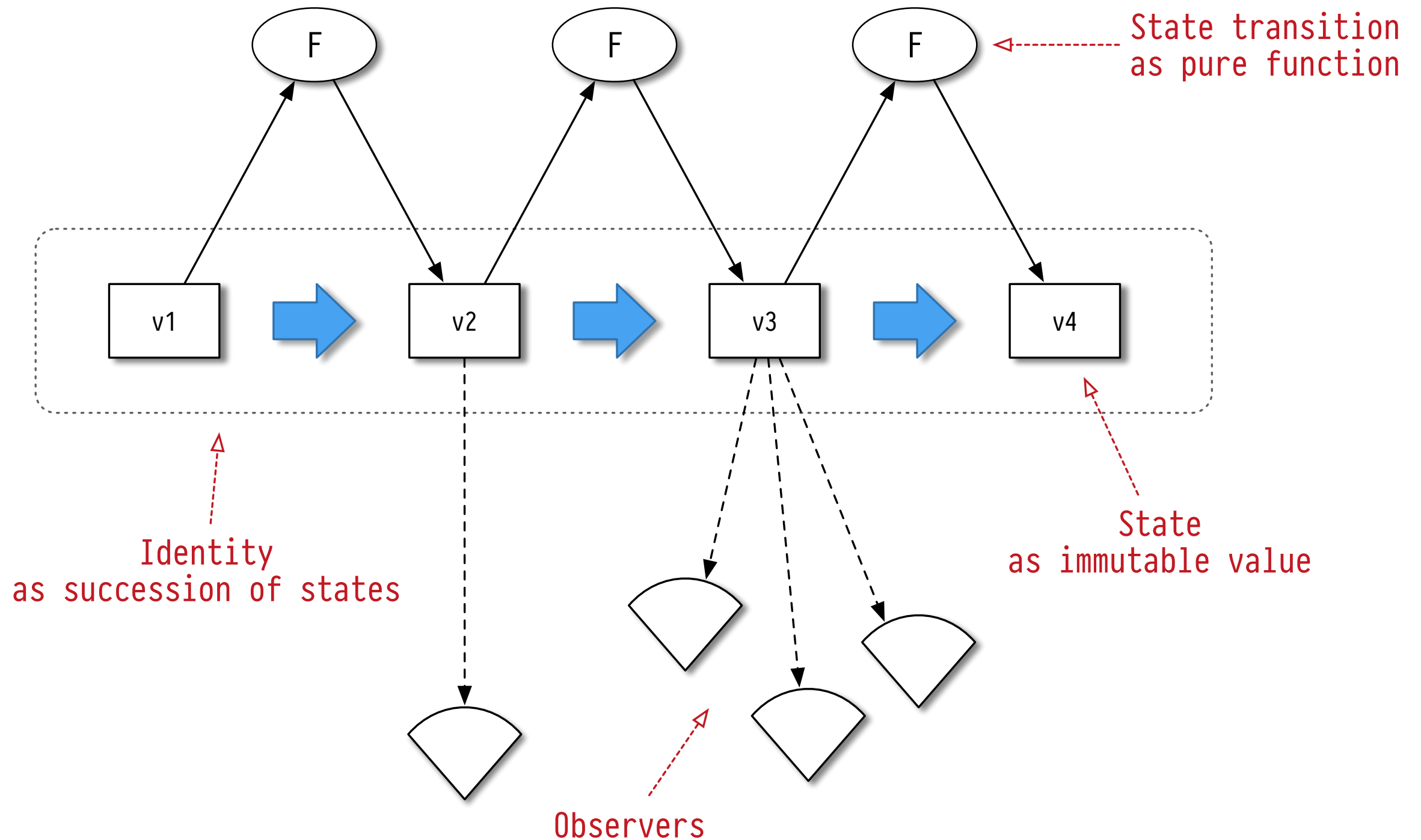
Datomic

- Database by Rich Hickey, creator of Clojure.
- Proposition to solve the preceding Problems.
- ... while retaining the Perks.

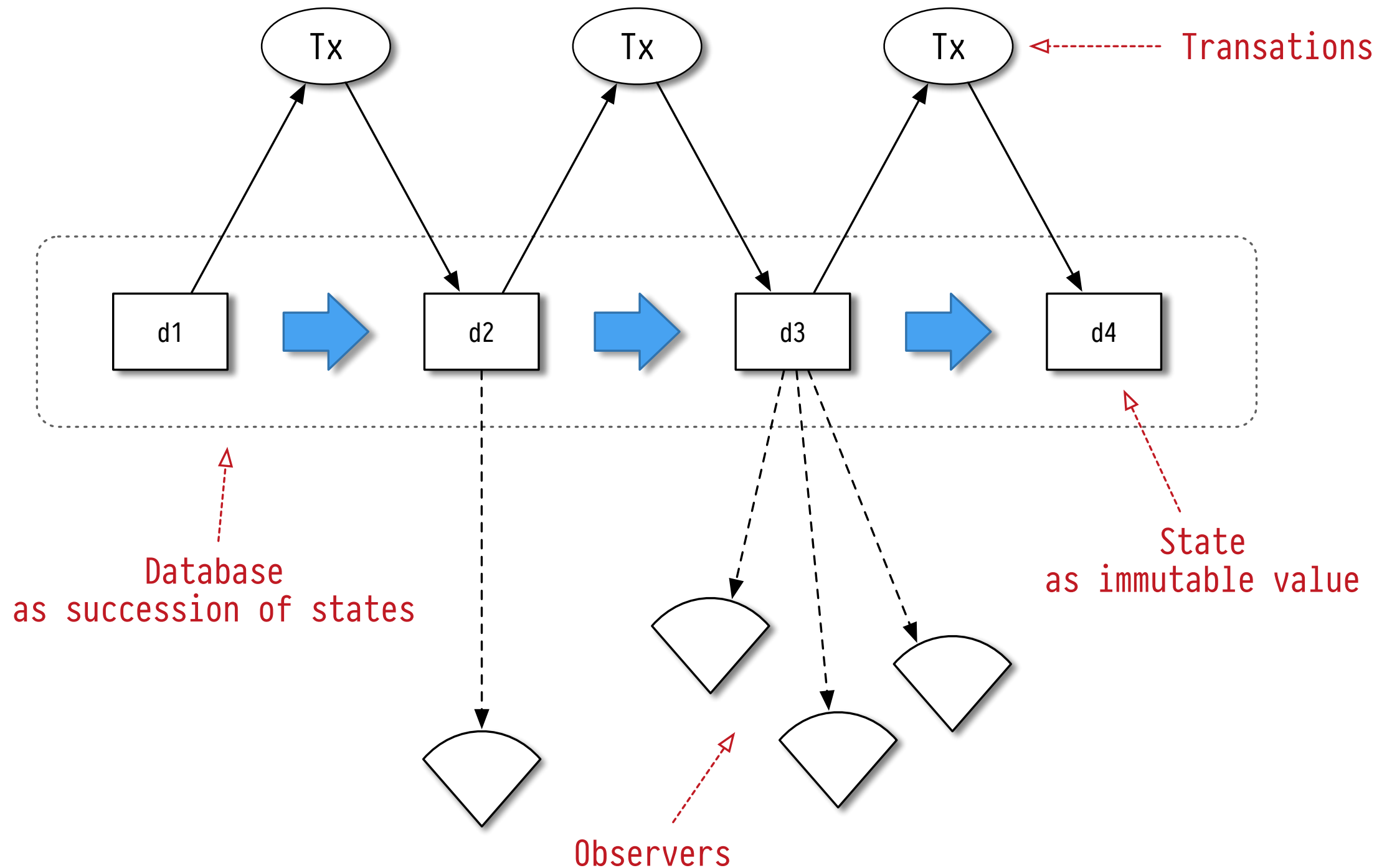
Clojure Crash Course

- Atomic Literals: Numbers, Strings, Keywords
- Symbols and Definitions
- Functions
- Composite Literals: Vectors, Maps
- Atoms and References

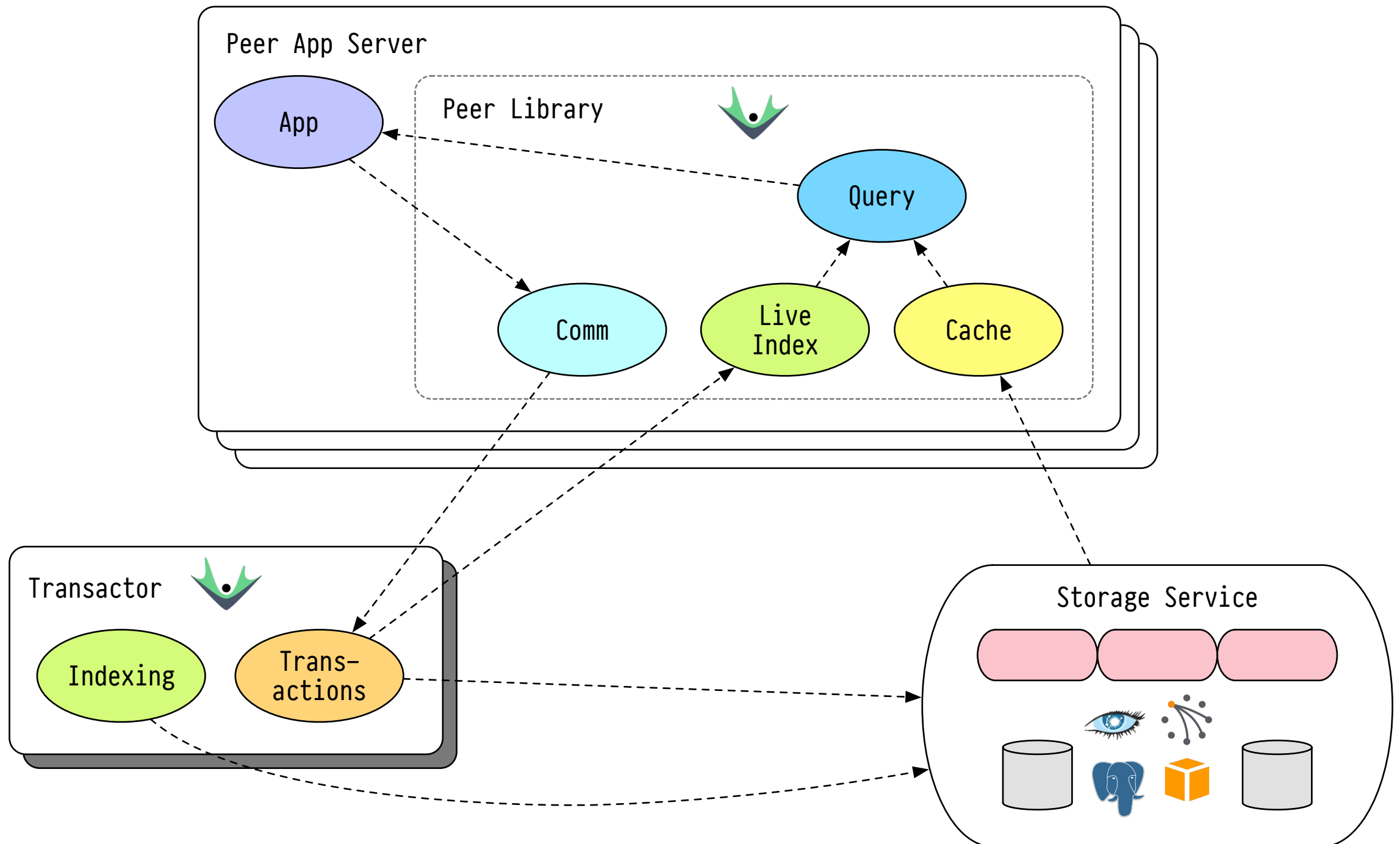
State in Clojure



State in Datomic



Architecture



Facts

| Entity Id | Attribute | Value | Transaction |
|----------------|--------------|--------------------|----------------|
| 17592186049940 | :artist/name | "Mani Matter" | 13194139538829 |
| 17592186049213 | :artist/name | "Walter Wegmüller" | 13194139538101 |
| 17592186047069 | :artist/name | "Krokodil" | 13194139535943 |

```
;e      a  v      t      added?  
[17592186049940 94 "Mani Matter" 13194139538829 true]  
[17592186049213 94 "Walter Wegmüller" 13194139538101 true]  
[17592186047069 94 "Krokodil" 13194139535943 true]
```

Entity

| Entity Id | Attribute | Value | Transaction |
|----------------|-------------------|---------------------|----------------|
| 17592186049940 | :db/id | 17592186049940 | 13194139538829 |
| 17592186049940 | :artist/name | "Mani Matter" | 13194139538829 |
| 17592186049940 | :artist/type | :artist.type/person | 13194139538829 |
| 17592186049940 | :artist/gender | :artist.gender/male | 13194139538829 |
| 17592186049940 | :artist/startYear | 1936 | 13194139538829 |
| 17592186049940 | :artist/endYear | 1972 | 13194139538829 |

Entity

```
{:db/id          17592186049940
 :artist/name    "Mani Matter"
 :artist/type    :artist.type/person
 :artist/country :country/CH
 :artist/gender  :artist.gender/male
 :artist/startYear 1936
 :artist/endYear  1972}
```

Schema / Attribute

```
{:db/id          94
  :db/ident      :artist/name
  :db/valueType  :db.type/string
  :db/cardinality :db.cardinality/one
  :db/index      true
  :db/doc        "The artist's name"}
```

Indexes (covering)

| Type | Ordering | Usage |
|------|---------------------------|---------------------------------|
| Log | Tx Order | Log |
| EAVT | Entity Attribute Value Tx | Search by entity |
| AEVT | Attribute Entity Value Tx | Column Store |
| AVET | Attribute Value Entity Tx | (optional) Search by value |
| VAET | Value Attribute Entity Tx | (optional) Reference Navigation |

Queries: DataLog

```
[ :find ?e  
  :where  
  [ ?e :artist/country :country/CH ] ]
```

```
⇒ #([17592186049940]  
     [17592186047989]  
     [17592186047069]  
     [17592186049213]  
     [17592186050318]  
     [17592186046896])
```

Queries: Datalog

- Data-Driven
- Declarative
- Unification
- Many Features: Rules, Aggregate, Ranges, ...

Entity API and Pull API

- Entity API
 - Lazy
 - Navigable
- Pull API
 - Declarative
 - Data-Driven
 - Hierarchical

Transactions

| Operation | Entity Id | Attribute | Value |
|------------|----------------|----------------|---------------------|
| :db/add | 17592186049940 | :artist/name | "Mani Matter" |
| :db/add | 17592186049940 | :artist/type | :artist.type/person |
| :db/add | 17592186049940 | :artist/gender | :artist.gender/male |
| :db/remove | 17592186046681 | :artist/name | "Prince" |
| :db/add | 17592186046681 | :artist/name | "†" |

Transactions

- Data-Driven
- Reified
- Before/After Database Values
- Subscription to Transaction Queue

Caveats

- Data Migration
- Proprietary Software

Resources

- Datomic — <http://www.datomic.com>
- The Value of Values — <https://www.youtube.com/watch?v=-6BsiVyC1kM>
- Deconstructing the Database — <https://www.youtube.com/watch?v=Cym4TZwTCNU>
- ¿Where is my data? — <https://www.youtube.com/watch?v=i3HDKNzZ5iw&index=6&list=PLZdCLR02grLoBx0Y5ZrpdmLxc160PIwzQ>
- Out of the Tar Pit; Moseley and Marks (2006)

Thank you

@stanhbb

<http://www.meetup.com/zh-clj-Zurich-Clojure-User-Group/>