Rango

Databases made easy

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Company:

- Open Analytics

Interests:

- parallel computing (ROpenCL)
- network theory
- databases
- performance improvement

Social Media:

- @wligtenberg
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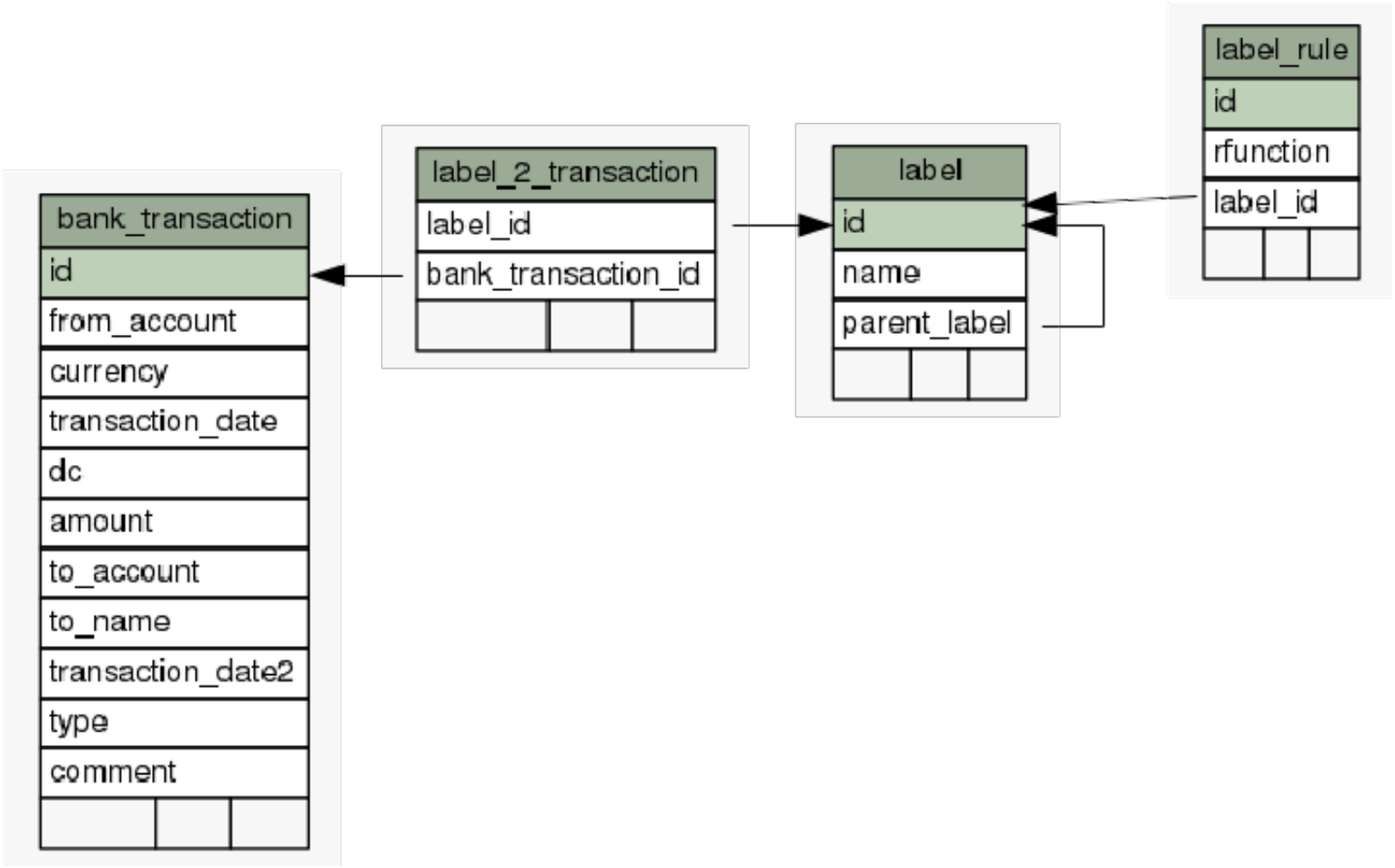
Why databases?

Why would you need a database?

- data was already in a database
- data is too large to fit in memory
- data has a complex structure which the database schema enforces
- make assumptions on data explicit

Database schema example



Before Rango

Manually create classes

```
setClass(
    Class = "Bank_transaction",
    representation = representation(
        id = "numeric", from_account = "character",
        currency = "character", transaction_date = "POSIXct",
        dc = "character", amount = "numeric",
        to_account = "character", to_name = "character",
        transaction_date2 = "POSIXct",
        type = "character", comment = "character"))

bank_transaction <- function(id, from_account, currency,
    transaction_date, dc, amount, to_account, to_name,
    transaction_date2, type, comment){
  new(Class = "Bank_transaction", id = id,
      from_account = from_account, currency = currency,
      transaction_date = transaction_date, dc = dc,
      amount = amount, to_account = to_account, to_name = to_name,
      transaction_date2 = transaction_date2, type = type,
      comment = comment)
}
```

Why use objects?

- clearly defines structure
- objects can inherit properties from each other
- function can be tailored to the object
- objects can refer to each other
- objects model the reality

Idea #1

Write script to produce these classes?

Idea #2

Automatically generate SQL based on instances of these classes

After Rango

Example

```
library(Rango)
```

```
## Loading required package: RPostgreSQL
## Loading required package: DBI
## Loading required package: RSQLite
```

```
rc <- rangoConnection(dbname = "bankData.db", type = "SQLite")
loadClasses(rc)

bt <- retrieve(bank_transaction(id = 7), rc)
```

Example

str(bt)

```
## Formal class 'Bank_transaction' [package "Rango"] with 12 slots
##   ..@ rangoBookKeeping :List of 2
##   .. ..$ retrieved: logi TRUE
##   .. ..$ dbc      :Formal class 'RangoSQLiteConnection' [package "Rango"] with 4 slots
##   .. .. .. ..@ dbname     : chr "bankData.db"
##   .. .. .. ..@ con        :Formal class 'SQLiteConnection' [package "RSQLite"] with 5 slots
##   .. .. .. .. .. ..@ Id                 :<externalptr>
##   .. .. .. .. .. ..@ dbname             : chr "bankData.db"
##   .. .. .. .. .. ..@ loadable.extensions: logi TRUE
##   .. .. .. .. .. ..@ flags              : int 6
##   .. .. .. .. .. ..@ vfs                : chr ""
##   .. .. .. ..@ objectCache:<environment: 0x7f1757190d88>
##   .. .. .. ..@ cache      : logi FALSE
##   ..@ id              : num 7
##   ..@ from_account    : chr "NL86RABO0129739596"
##   ..@ currency        : chr "EUR"
##   ..@ transaction_date : chr "20130307"
##   ..@ dc              : chr "D"
##   ..@ amount          : num 2.07
##   ..@ to_account      : chr(0)
##   ..@ to_name         : chr(0)
##   ..@ transaction_date2: chr "20130307"
##   ..@ type            : chr "ba"
##   ..@ comment         : chr "ALBERT HEIJN 1645 TILBURG Betaalautomaat 18:25 pasnr. 007"
```

Store

```
bt <- bank_transaction(from_account = "Open Analytics", currency = "DK",
    transaction_date = "20150401", dc = "d", amount = 3171,
    to_account = "UseR Account", to_name = "UseR2015 Conference",
    transaction_date2 = "20150401", type = "MA",
    comment = "Registration fee for the brilliant UseR 2015 conference")

bt <- store(bt, rc, returnType = "RangoObject")
print(bt$id)
```

```
## [1] 2903
```

Retrieve

```
tmp <- retrieve(bank_transaction(id %<=% 5), rc)
print(length(tmp))
```

```
## [1] 5
```

```
tmp2 <- retrieve(bank_transaction(id %<=>% c(5,6)), rc)
print(length(tmp2))
```

```
## [1] 2
```

```
tmp3 <- retrieve(bank_transaction(to_name %like% "%UseR2015%"), rc)
print(length(tmp3))
```

```
## [1] 1
```

Namespace clashes

Table names might clash with function names:

```
retrieve(Rango:::sample(name = "someSample"), rc)
```

This currently opens the Rango package namespace after loading

I think this is not CRAN compliant, but suggestions how to circumvent this are welcome

Supported databases

- SQLite
- PostgreSQL

Same code works on different database backends

```
rc <- rangoConnection(host = "dbhost", dbname = "db", user = "user",
    password = "password")
```

```
rc <- rangoConnection(dbname = "db", type = "SQLite")
```

Rango takes care of the backend differences e.g. store function

Logging

See what Rango is doing

```
library(logging)
rc <- rangoConnection(dbname = "bankData.db", type = "SQLite",
    logLevel = loglevels["DEBUG"])
```

```
## 2015-06-30 23:21:14 DEBUG::Creating SQLite connection
## Formal class 'RangoSQLiteConnection' [package "Rango"] with 4 slots
##   ..@ dbname     : chr "bankData.db"
##   ..@ con        :Formal class 'SQLiteConnection' [package "RSQLite"] with 5 slots
##   .. .. ..@ Id                :<externalptr>
##   .. .. ..@ dbname            : chr "bankData.db"
##   .. .. ..@ loadable.extensions: logi TRUE
##   .. .. ..@ flags             : int 6
##   .. .. ..@ vfs               : chr ""
##   ..@ objectCache:<environment: 0x7f1749d3b2c0>
##   ..@ cache      : logi FALSE
## 2015-06-30 23:21:14 DEBUG::
```

```
tmp <- retrieve(bank_transaction(to_name %like% "UseR2015"), rc)
```

```
## 2015-06-30 23:21:14 DEBUG::SELECT bank_transaction.* FROM bank_transaction WHERE bank_transaction.to_name  LIKE 'UseR2015'
```

Future

Enhancements

- R6 classes (speed)
- MySQL
- other operations

Crazy idea

- create tables from object definitions
- start project in SQLite
- project gets many users
- create PostgreSQL schema from objects
- load data from SQLite to PostgreSQL using objects

Acknowledgments

- DBI
- RSQLite
- RPostgreSQL

Where to get it

https://github.com/openanalytics/Rango.git