ATLAS Rucio DB characteristics
(based on the Oracle RDBMS)

Rucio community workshop, Oslo, Feb-March 2019

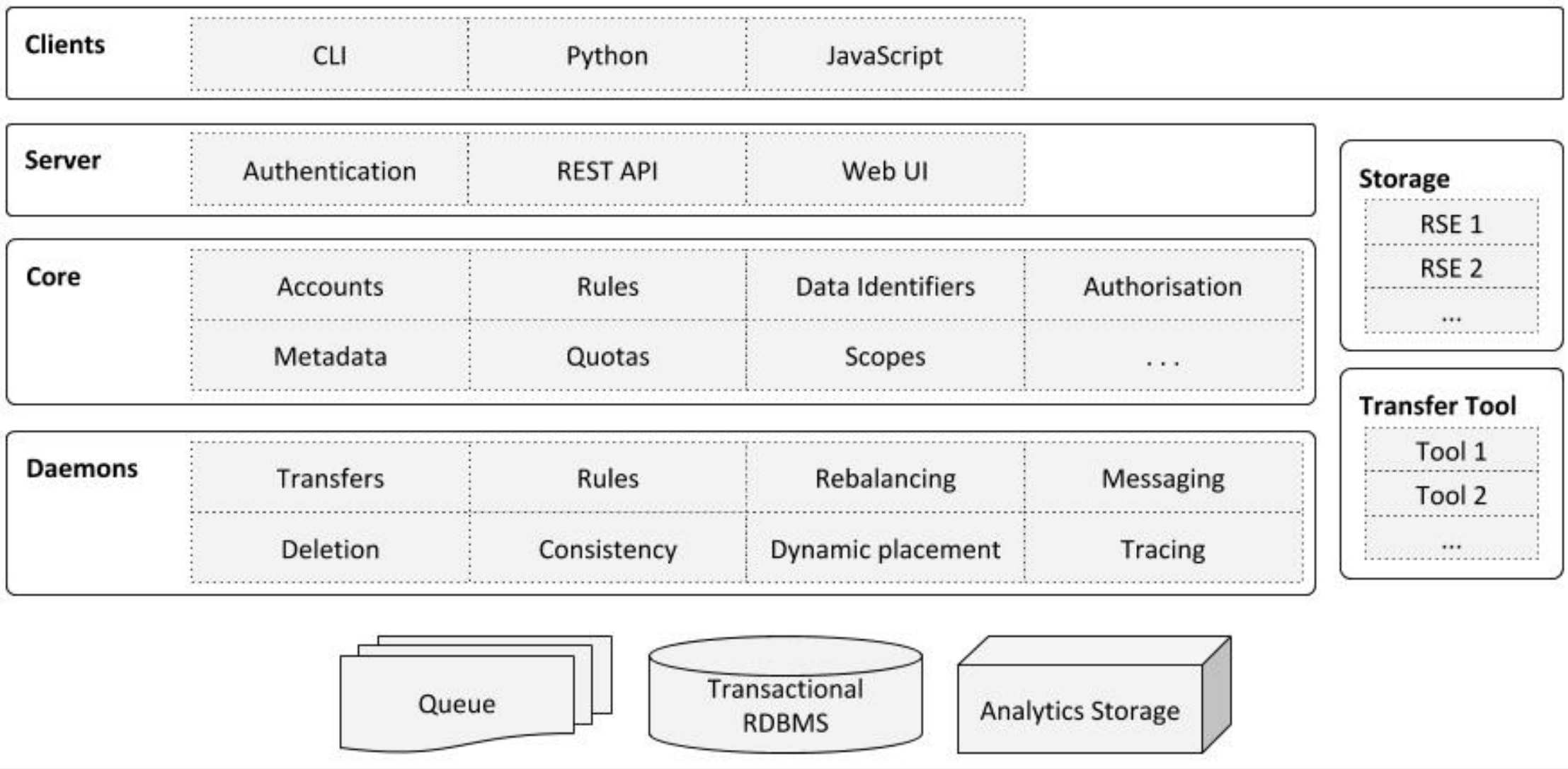
Gancho Dimitrov (CERN)

About me

- Member of the ATLAS database group since 2006
- Acquired (some) DB related knowledge throughout the last 15+ years
- Main focus on :
  - data management
  - database schema design
  - database performance tuning
- Certified in Oracle RDBMS

- Regular speaker at Oracle User Group community conferences in UK, Bulgaria and Germany

Rucio architecture



Rucio database schema

Designed in 2013

Rucio database schema

61 tables

Rucio database schema

74 indices

Rucio database schema

5 triggers

Rucio database schema

3 functions

Rucio database schema

12 procedures

Rucio database schema

17 jobs

Table segments

Physically organised based on Rucio's scope unit

scope data = table partition*

*** separate segment (provides flexibility in set of operations)**

Rucio scope generation

In 2014: 5140 scopes (system startup)

2015-2018 = ~400 per year

Currently

About 7000 scopes are mapped to 34500 table partitions

DIDS (Data IDentifierS)*

1014 million

(AVG row size: 220 bytes)

*** The primary addressable unit of data (files, datasets, containers)**

DIDS replicas on the Grid

1106 million

(AVG row size: 150 bytes)

Rucio <--> DB interaction

SQL commands generated by SQLAlchemy ORM*

*** Object-Relational Mapper**

DB sessions

1100-1400 DB sessions

15-25 active sessions

Rucio insert/update/delete rate

~ 2-4K exec /sec

Rucio DB queries rate

~ 4-8K exec /sec

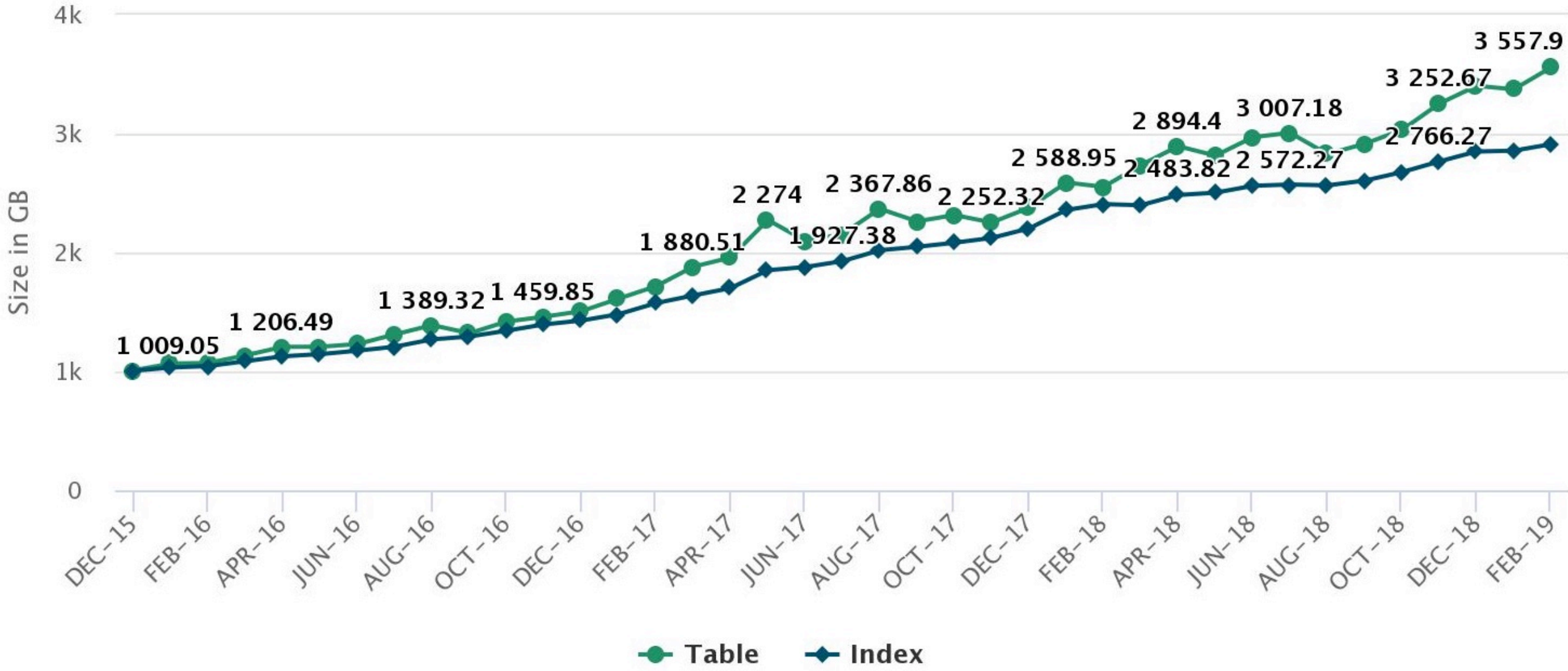
2M block reads (15GB)/sec

DB server CPU usage

~ 30-40%

```
CPU: Intel E5-2630 v4 @ 2.2GHz - 20 CPU cores
RAM: 512 GB
Interconnect: 2x10 GigE for storage and DB cluster access
Storage: NetApp NAS with SSDs only
```

Rucio DB volume growth 2016-2019



April-June 2019

Exciting period:

Test and validation on Oracle 18c

DB server upgrade from 11g to 18c

Spring 2020

Expected to have new DB hardware

Rucio DB schema extension

Enrich Rucio DIDS with metadata stored in JSON*

*** CERN computing seminar on DB built-in JSON features planned for 15th May 2019**

Take-home messages

- Rucio DB setup on Oracle RDBMS keeps on performing well several consecutive years.
- Work for smooth DB server upgrade is necessary
- Planned extension of the current DB schema to support DIDS metadata in JSON

Special thanks to the Rucio team for the collaborative work in the years.

Well tuned DB = good night's sleep for all!