REAL PROJECTS

Apache Spark & Kafka - January 2021

EDEM
Escuela de Empresarios

1. Regulatory Banking Project
2. Transactions Notifications
3. Panama Papers
4. Markets Data Lake
5. Risk Reporting

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Regulatory Banking Project

- **Volcker Rule**
  - The **Volcker Rule** is a federal regulation that generally prohibits banks from conducting certain investment activities with their own accounts and limits their dealings with hedge funds and private equity funds, also called covered funds.
  - Very strong restrictions for banking
  - It's necessary to provide multiple reports to prove that the bank is aligned with these restrictions
  - Very high penalties

Regulatory Banking Project

- **Requirements**
  - Ingestion of a high volume of trades and positions in the system
    - CSV, JSON, Text
  - Once the data is in the system. It's necessary to apply certain metrics in order to extract the information necessary to generate regulatory reports
  - Reports are monthly
  - The system doesn't generate reports itself. It's enough only data.

Brainstorming

Hands on

- Read trades files (csv and json). Each file is a different position
- Normalize schema
- Calculate PnL % of the position considering open & close prices
- The metric is to calculate the best position for each day, showing the following columns (date, open, close, pnl, position)

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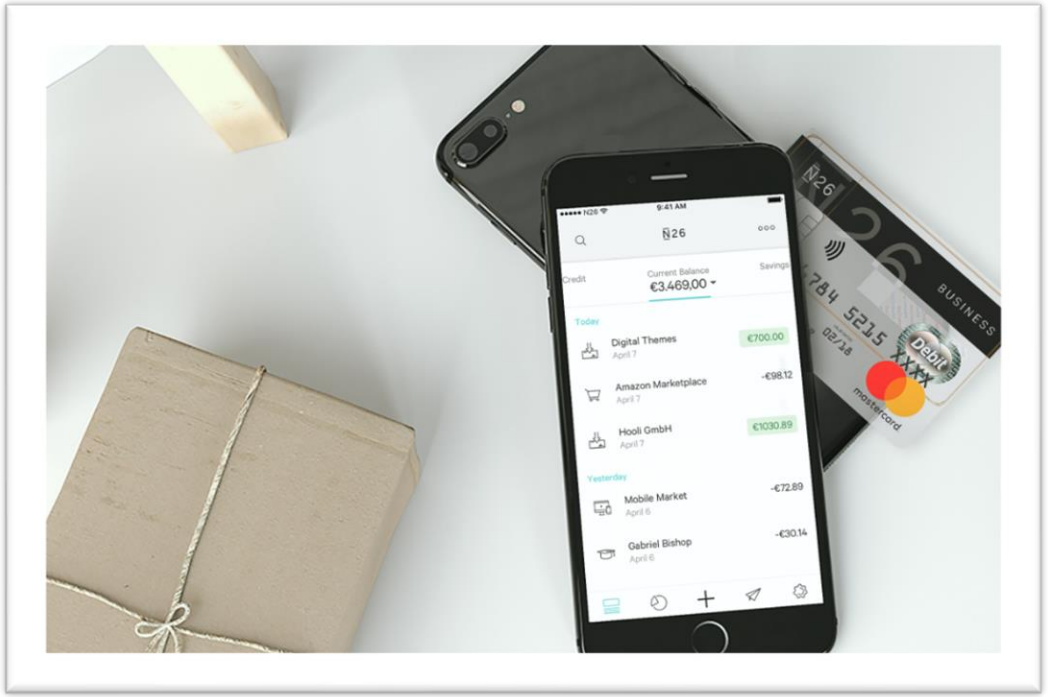
Transactions Notification

- Every transaction in the bank needs to be notified to the customer as soon as possible
- Clients and transactions are in a legacy system (**Oracle and DB2**)
- **High volume** of transaction in a bank
- It's necessary to notify to all customers for every transaction
- **Real Time** scenario



Transactions Notification

- **Requirements**
  - Data is ingested from legacy system (Oracle and DB2) to a new Data Lake
  - Legacy system needs to be synchronized with new Data Lake
  - Notifications can contain marketing data, with different priorities
  - It’s possible to schedule notifications
  - It’s necessary to manage alerts and metrics in the system

Brainstorming

Hands on

- Read from Kafka transactions topic
- Apply a fixed-window over the stream with 1 minute duration aggregating by "timestamp"

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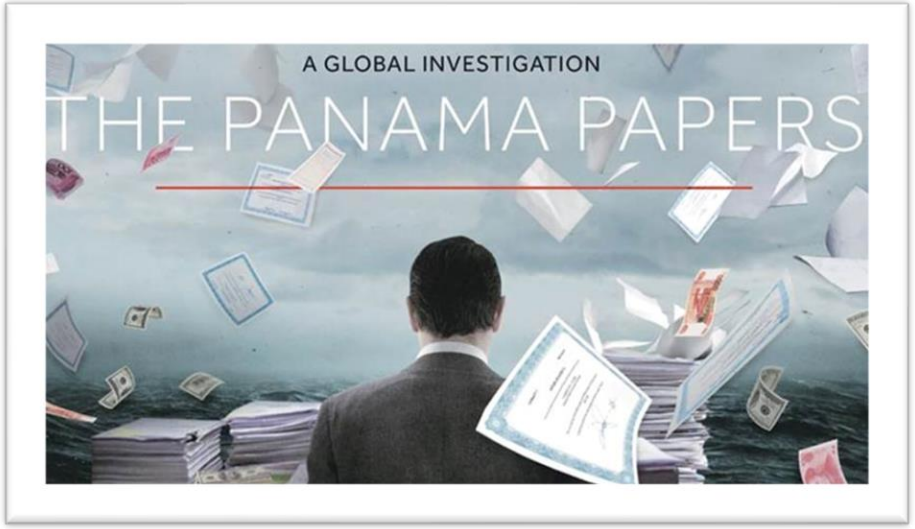
Panama Papers Project

- **Panama Papers**
  - 2.6TB of data (11.5 million documents) leaked that detail financial and attorney-client information for more than 214.488 offshore entities
  - The documents contain personal financial information about wealthy individuals and public officials
  - Companies created in Tax haven with low taxes.

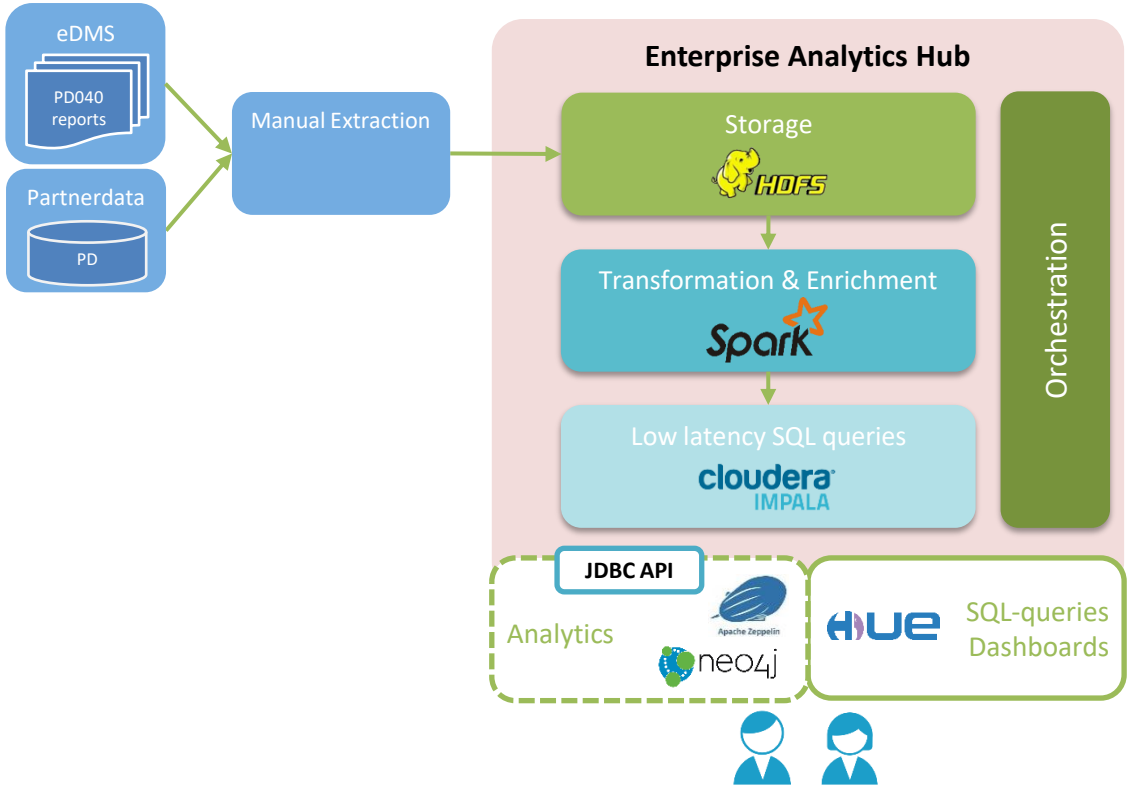


Panama Papers

- **Requirements**
  - Our client wants to know if a customer has been involved in Panama Papers
  - It's necessary to **extract from a Relational database** data form Panama papers into a Data Lake
  - Transformations are necessary to prepare data to be queried
  - It's necessary to **trace** a specific customer or organization in the database

Brainstorming

Architecture proposal



Hands on

- Trace “Spring Song International Co., Ltd” entity with Spark SQL using the Panama Papers dataset

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Market Data Project

- **Market data** is price and trade-related data for a financial instrument

- Delivery of price data from exchanges to users, such as traders is highly time-sensitive and involves **specialized technologies** designed to handle collection and throughput of massive data streams

Market Data Project

- **Requirements**
  - **Different sources** (SFTP, JMS, files, …), showing stock market in **real time**
  - **Batch processing will** be necessary to prepare data for different reports, apart from recalculations and other stuff
  - Different users will **consume data through API, reports and ad-hoc analysis**
  - It's necessary a platform to execute different algorithms (not necessarily real time here)
  - **Monitoring**, **logging**, **lineage** will be necessary
  - The solution needs to be **scalable**

Brainstorming

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Risk Reporting Project

- **Interest rate risk in the banking book (IRRBB)** refers to the current or prospective risk to the bank's capital and earnings arising from adverse moments in interest rates that affect the bank's banking book positions
- Specific reports are necessary for regulators

Scenario	ΔEVE	ΔNII
Parallel up	✓	✓
Parallel down	✓	✓
Steepener	✓	✗
Flattener	✓	✗
Short rate up	✓	✗
Short rate down	✓	✗

Table 3. Impact in EV and net interest income (NII) both of stability caps/ pass-through floor and a shorter duration for NMDs.

EV volatility of NMDs.

	Parallel Up	Parallel Dn	Steepener	Flattener	Short Rate Up	Short Rate Dn
Internal Model	134	-102	47	-48	100	-79
BCBS Proposal	56	-21	4	-2	47	-21

EV volatility of fixed rate loans (*).

	Parallel Up	Parallel Dn	Steepener	Flattener	Short Rate Up	Short Rate Dn
Internal Model	-134	102	-47	48	-100	79
BCBS Proposal	-134	102	-47	48	-100	79

(*) Trying to make it simple, we assume that the bank prepayment treatment = prepayment treatment of the CP.

Global EV volatility of the bank.

	Parallel Up	Parallel Dn	Steepener	Flattener	Short Rate Up	Short Rate Dn
Internal Model	0	0	0	0	0	0
BCBS Proposal	-78	80	-43	45	-52	58

Risk Reporting Project

- **Requirements**
  - More than 130 feeds imported to Data **Lake through Oracle Database**
  - **Build a ETL** with data ingested to ingest, enrich and prepare data to be consumed
  - **Official reports** need to be in Excel and PDF format
  - **Portal web** will be necessary to manage the system and generate reports
  - **Monitoring and log analysis** is a must.

Brainstorming