



VARIETY

Structured



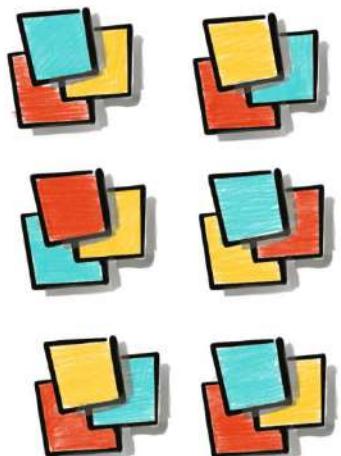
EXCEL



DATABASE



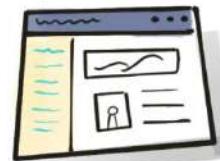
Semi- Structured



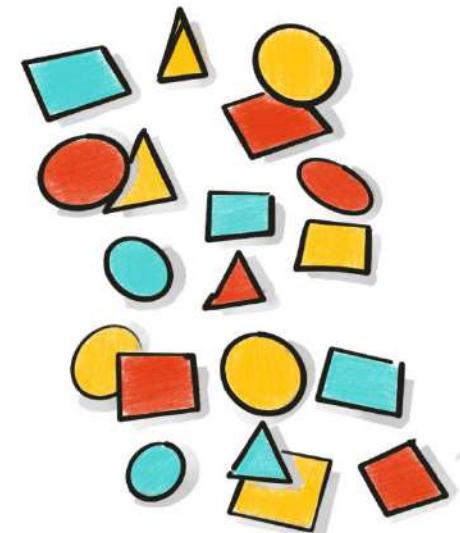
LOGs



WEBSITE



unstructured



VIDEO



IMAGE

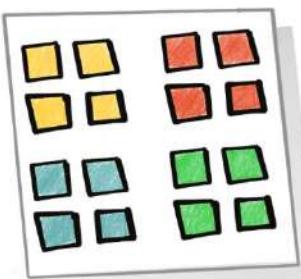




VELOCITY



BATCH



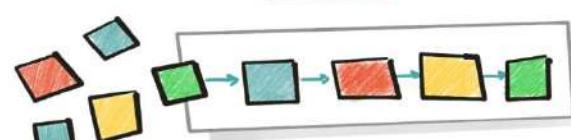
once a day



Hours → Mins



STREAM



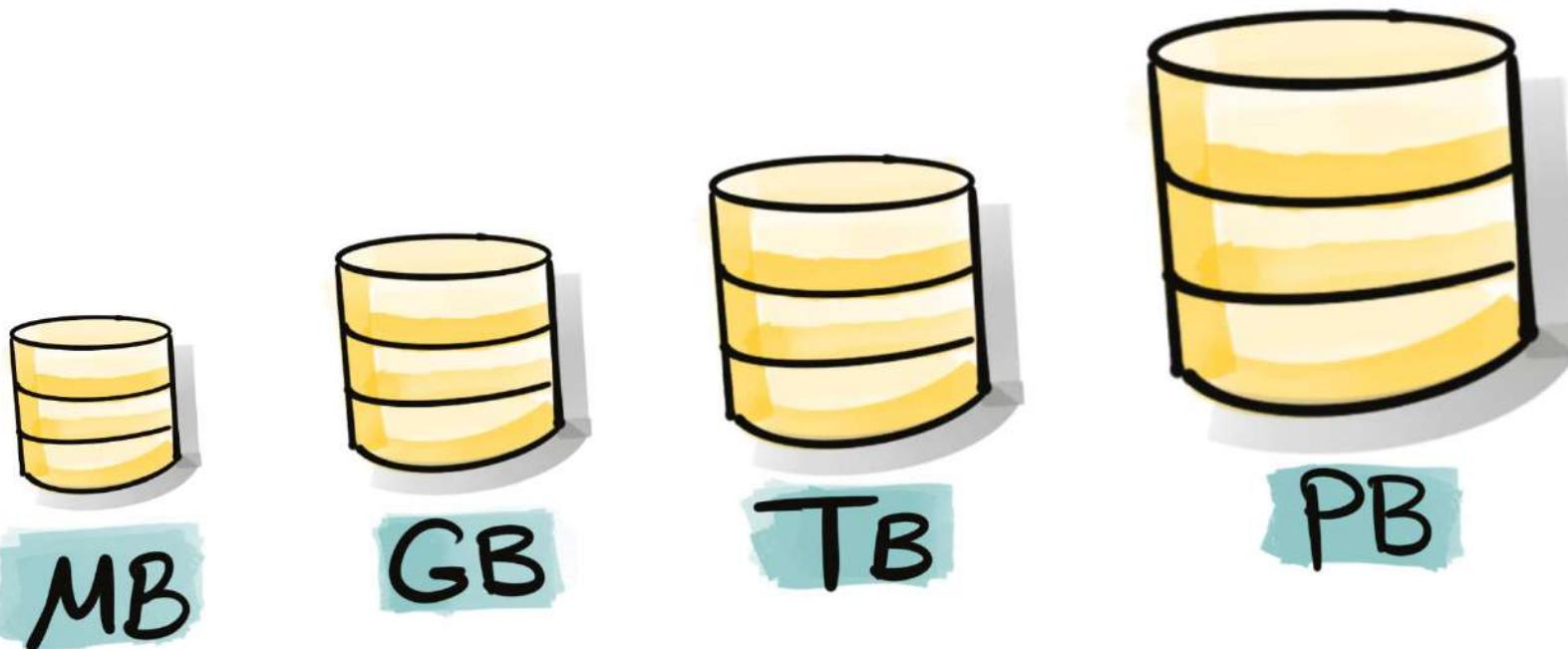
24



SEC → MSEC



VOLUME

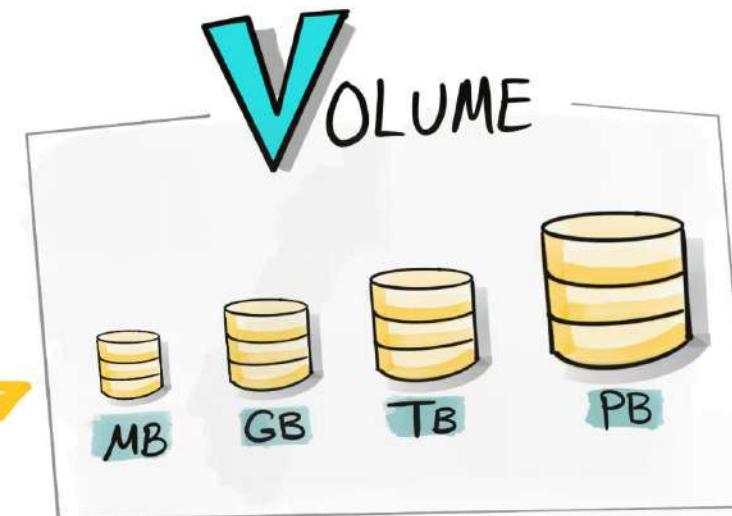




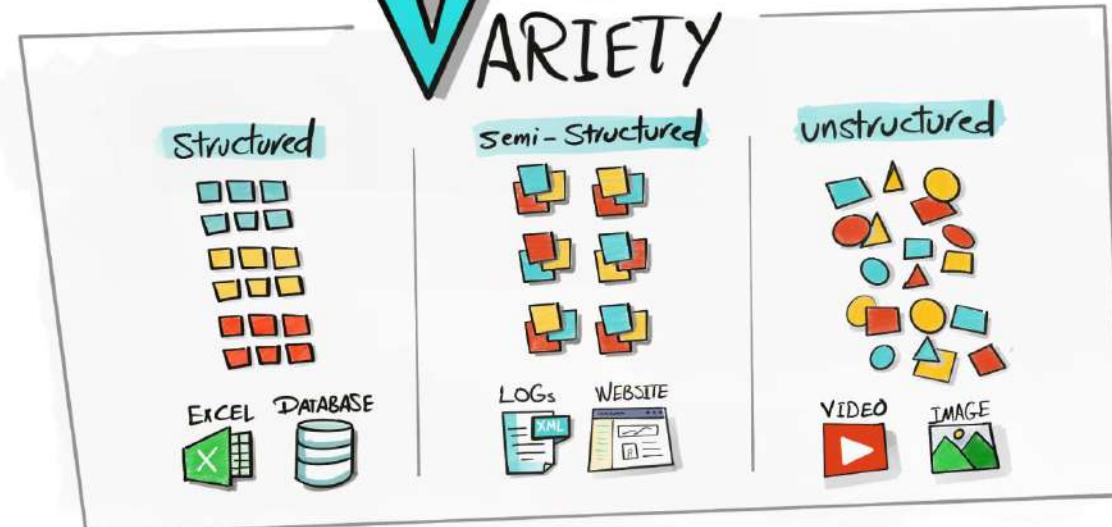
VELOCITY



BIG DATA



VARIETY





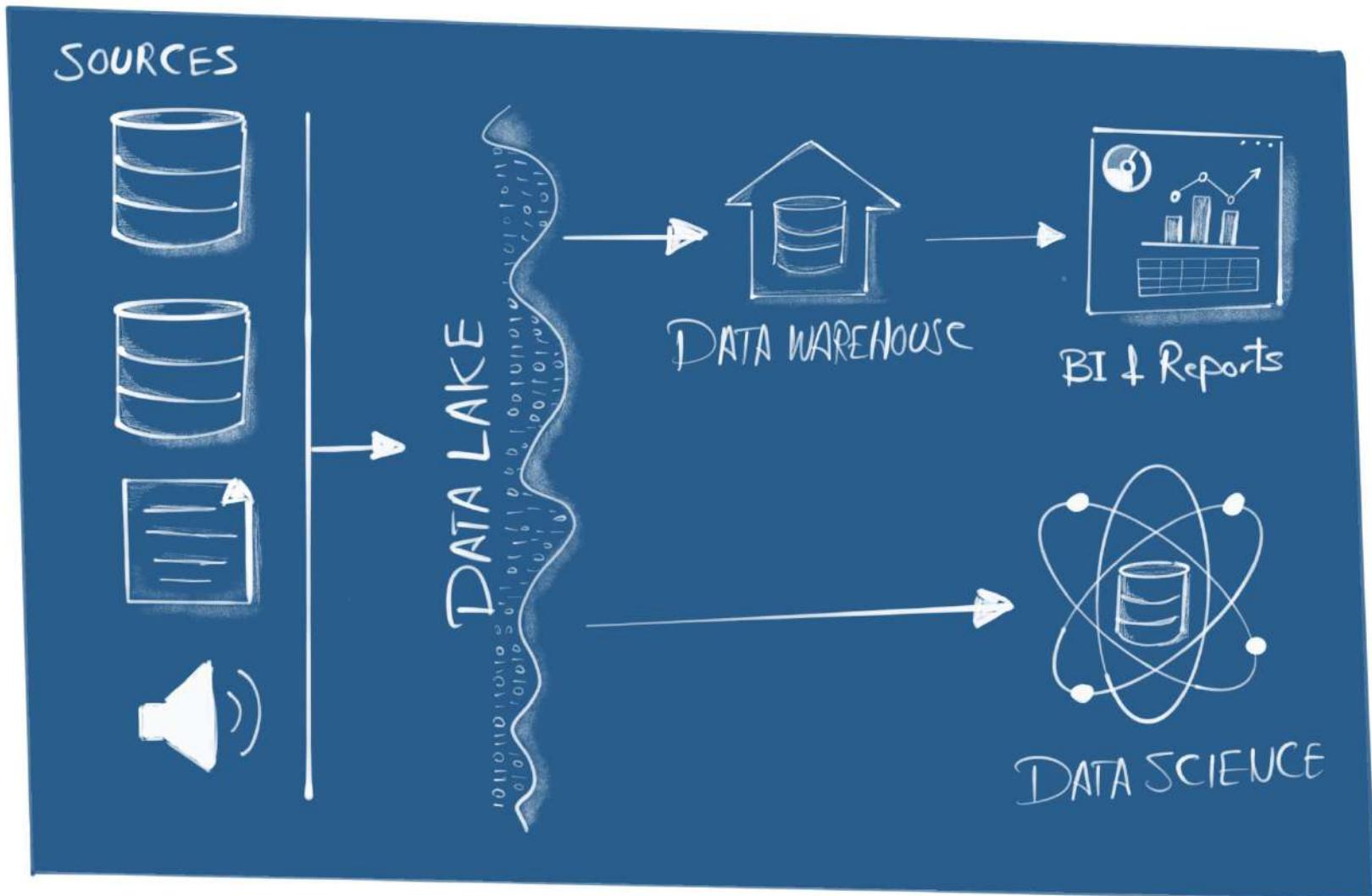
+ a b | e a u

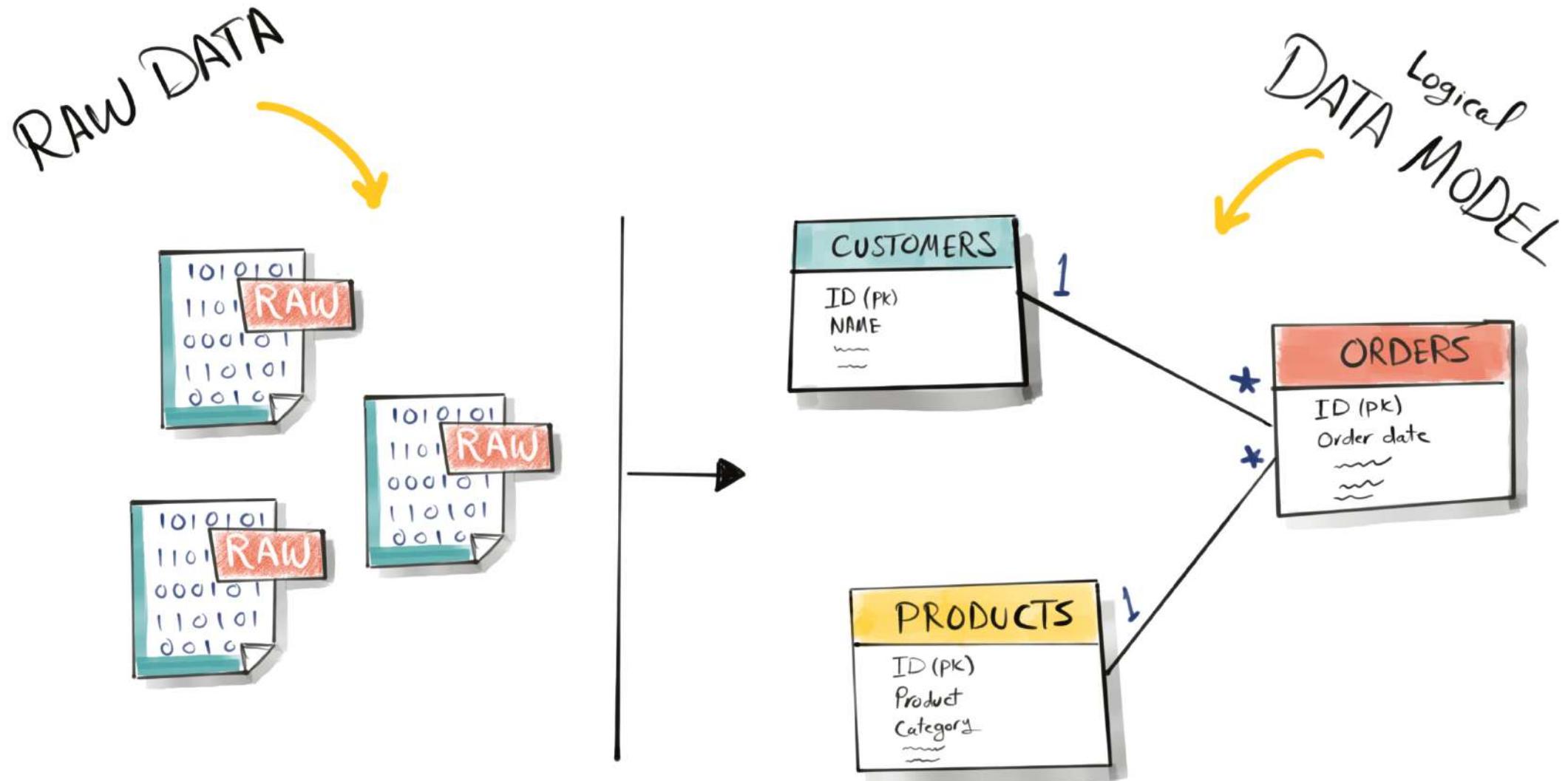
DATA ARCHITECTURE

DATA WITH BARAA



Blueprint



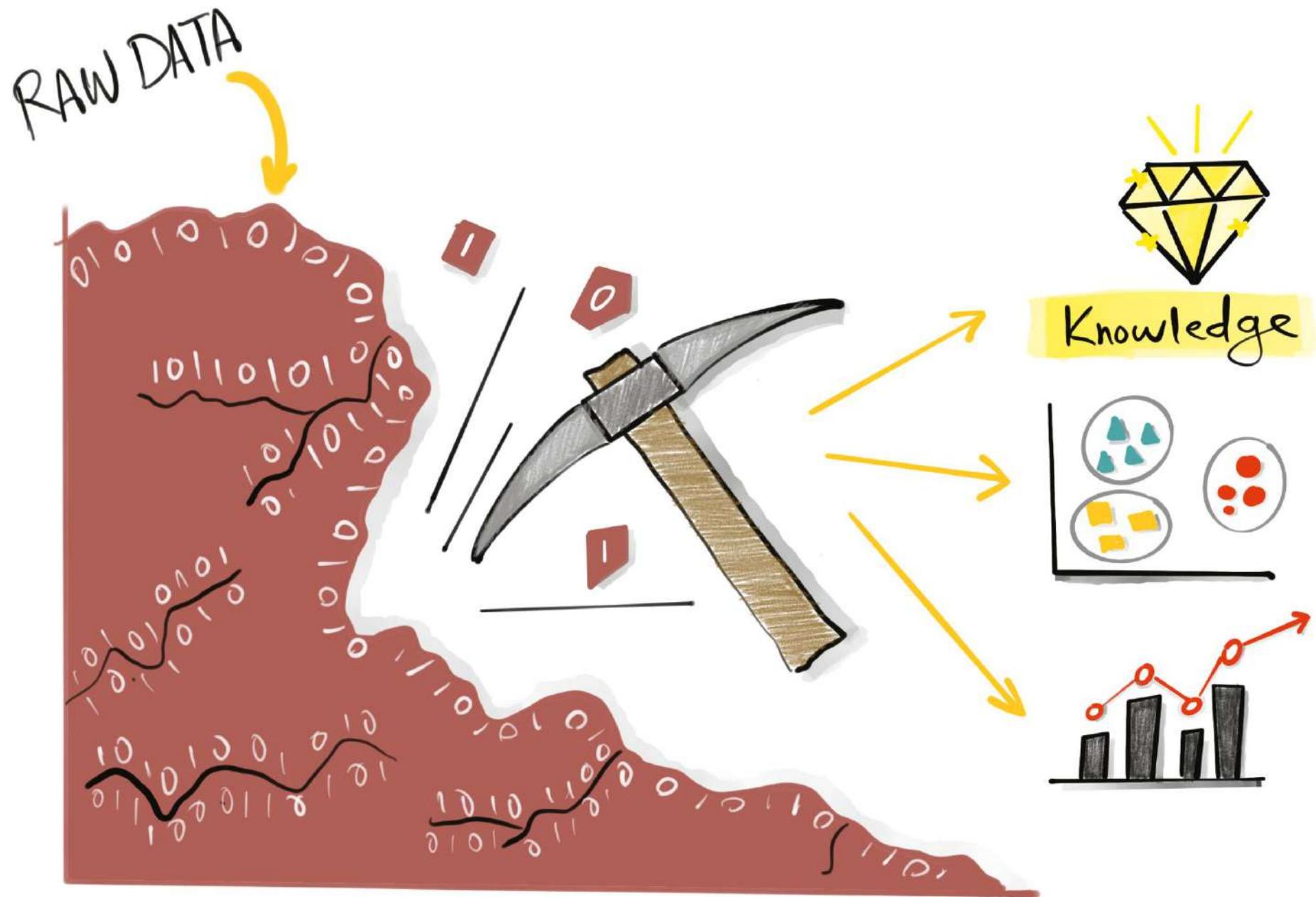




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DATA MINING

DATA WITH BARAA





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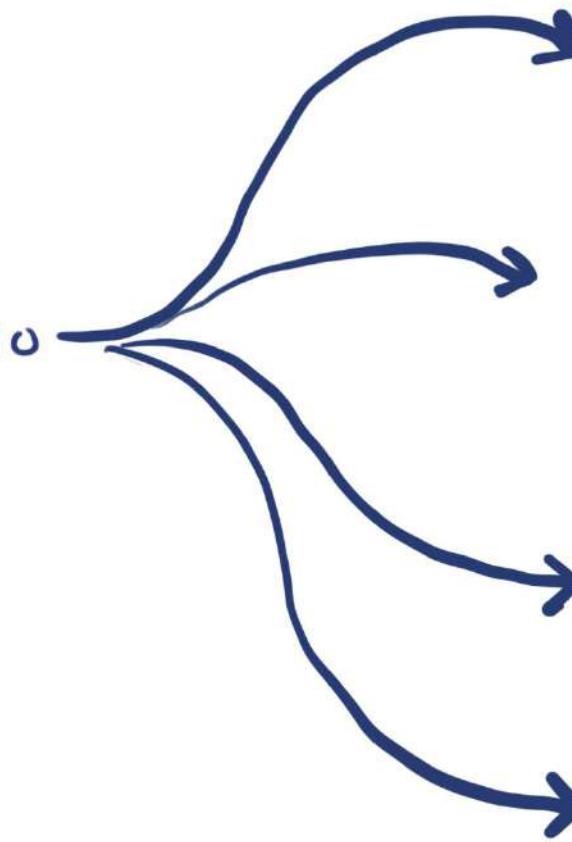
DATA VISUALIZATION

DATA WITH BARAA

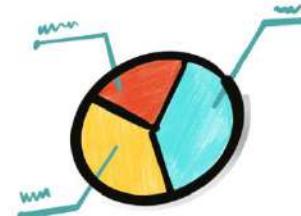


RAW DATA

101101010010101010



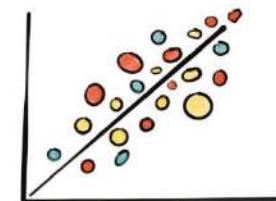
BARS



PIE



TREE



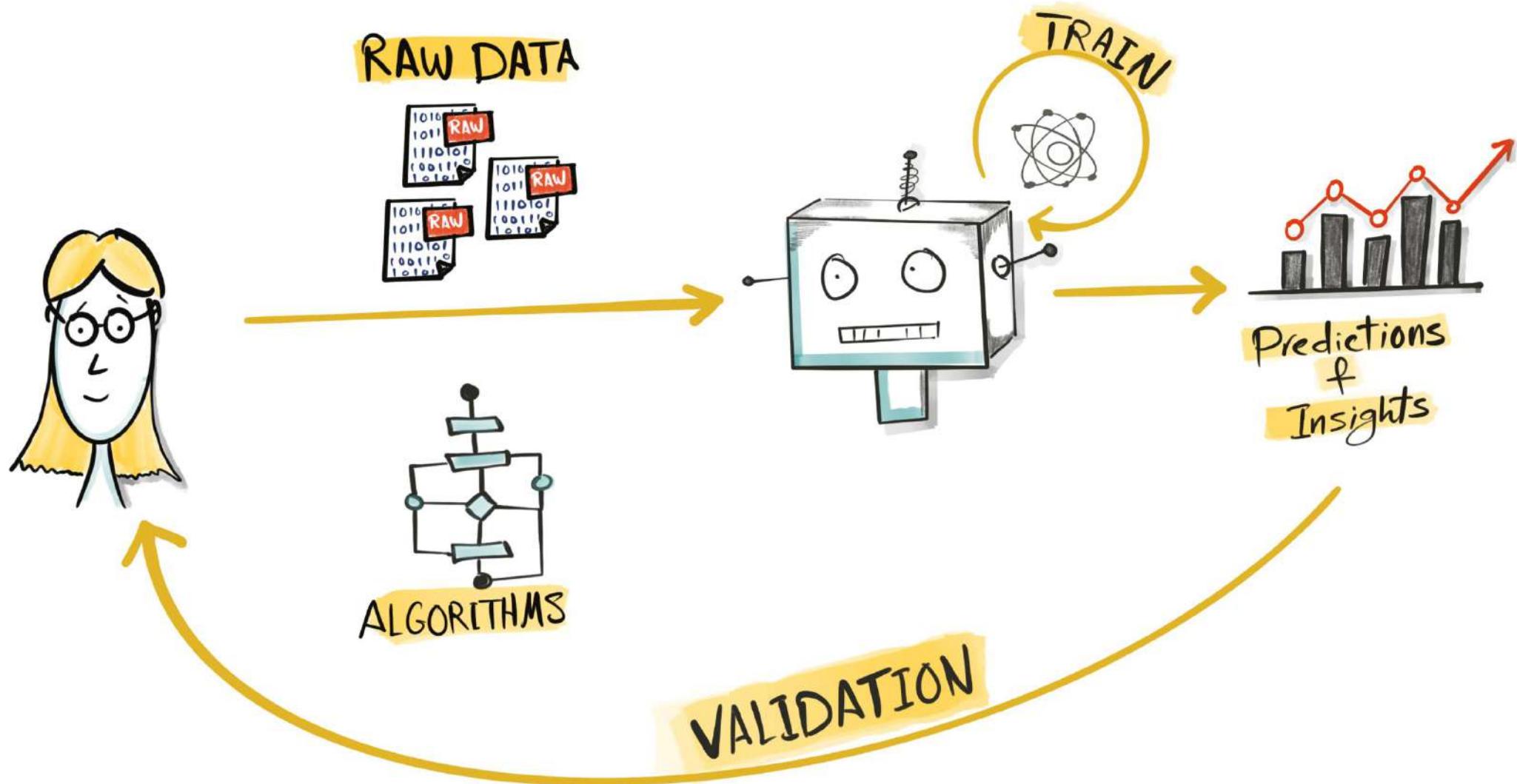
PLOTS



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MACHINE LEARNING

DATA WITH BARAA





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DATA ENGINEERING

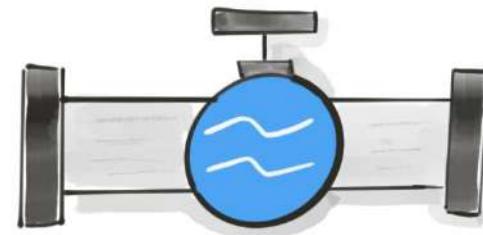
DATA WITH BARAA



DATA STORAGE



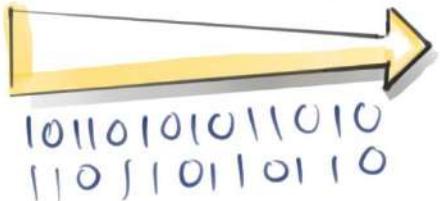
DATA PIPELINE



SOURCE

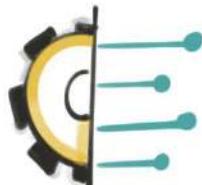


EXTRACT

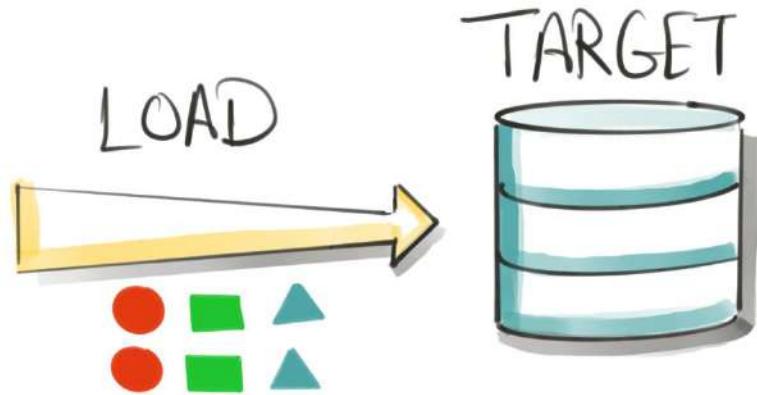


ETL

TRANSFORM



LOAD

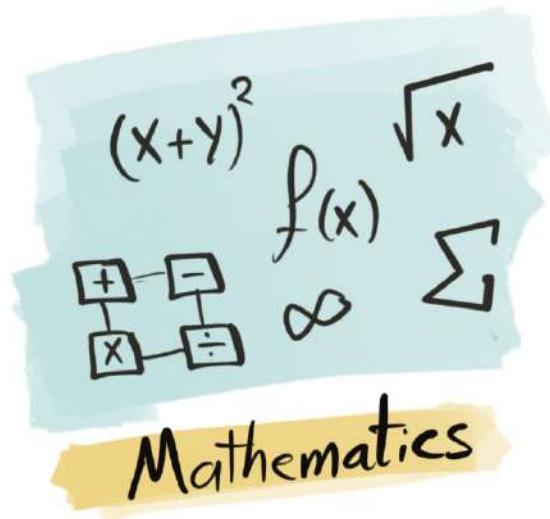




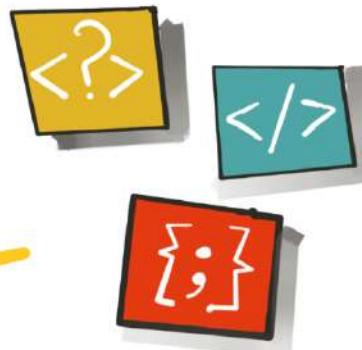
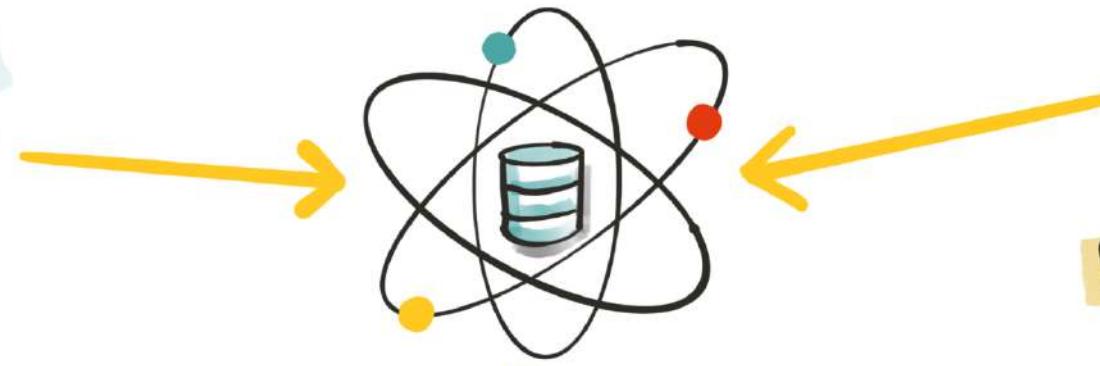
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DATA SCIENCE

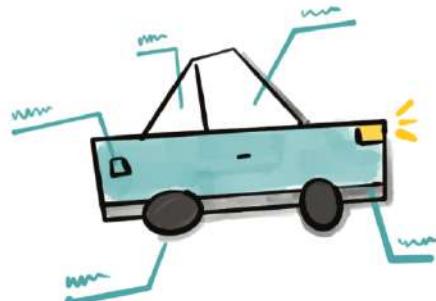
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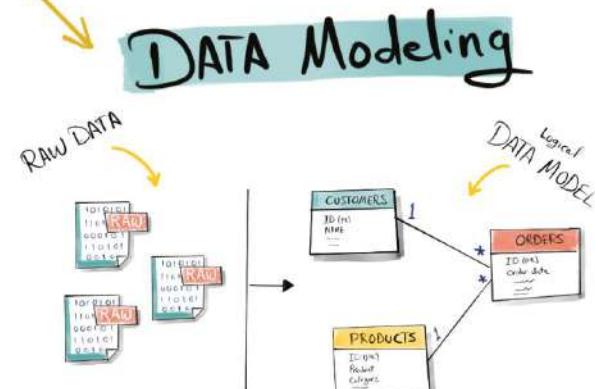
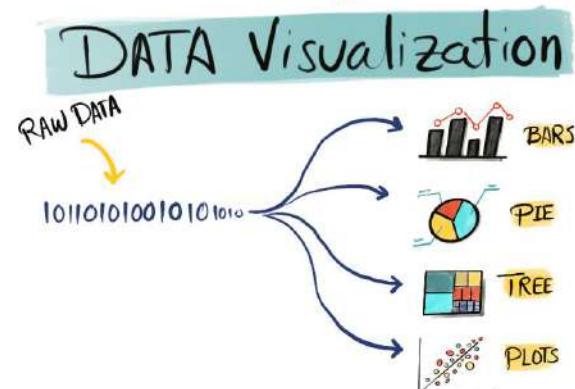
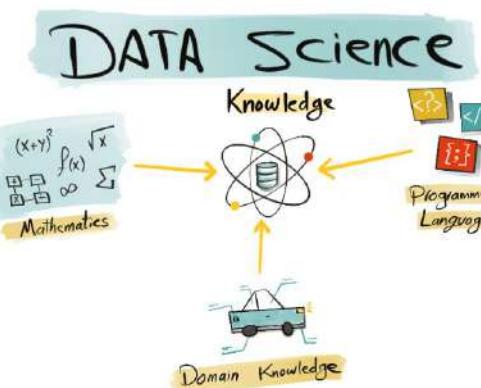
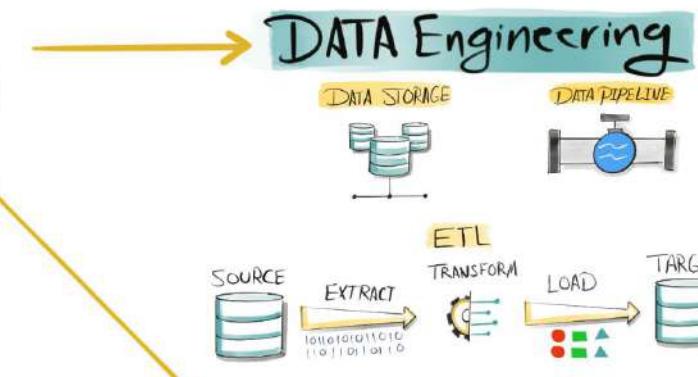
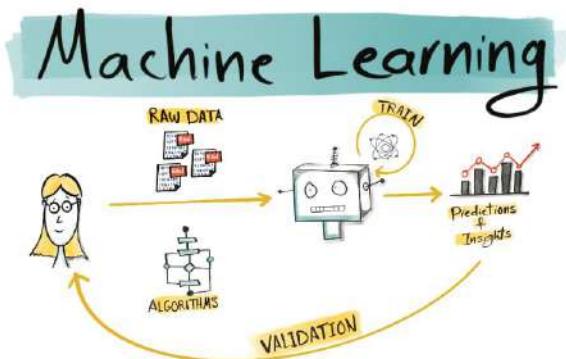
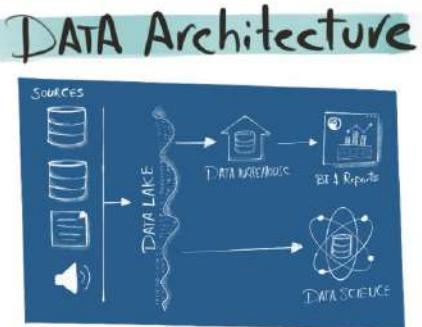
Knowledge



Programming Languages



Domain Knowledge

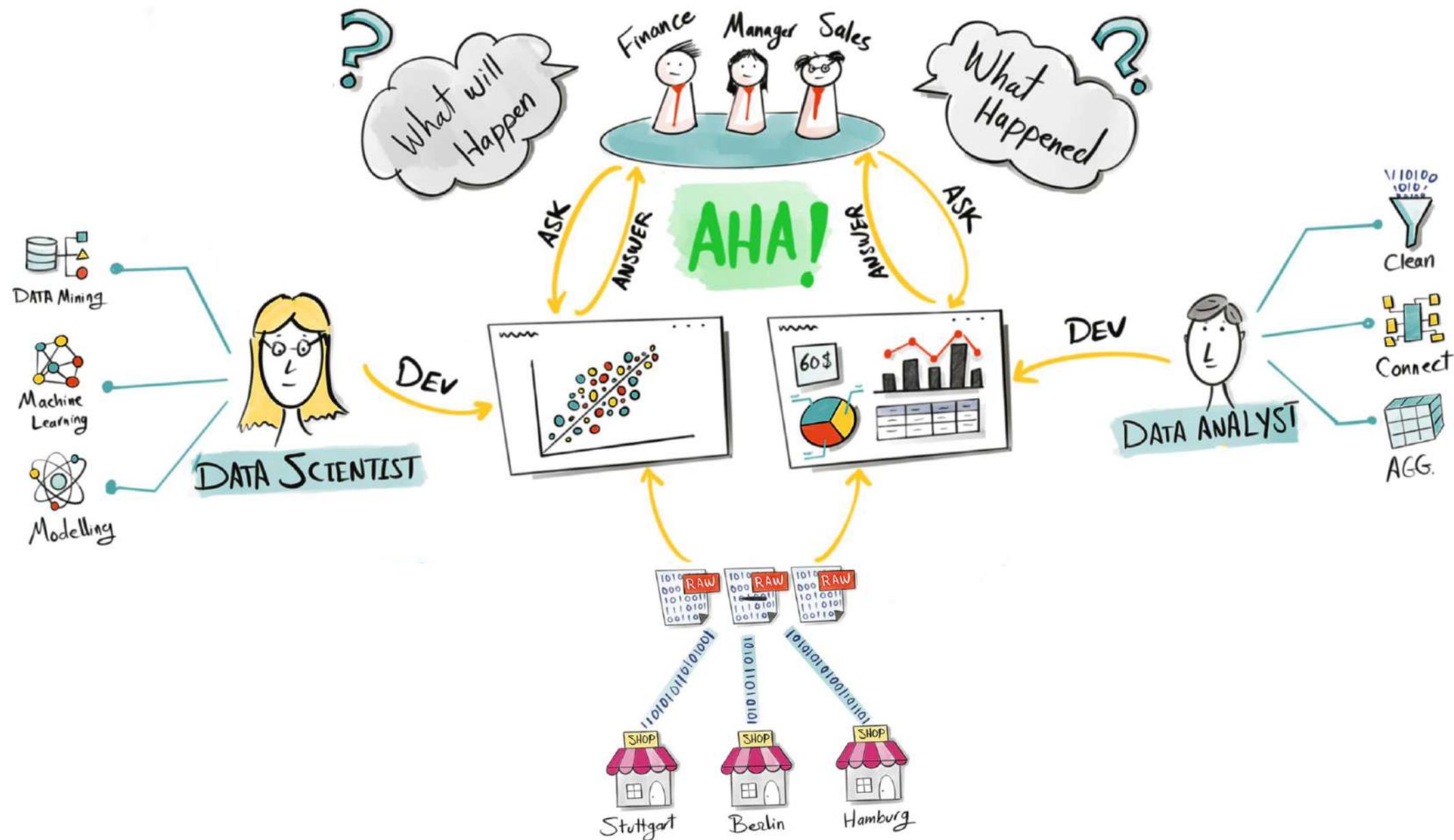


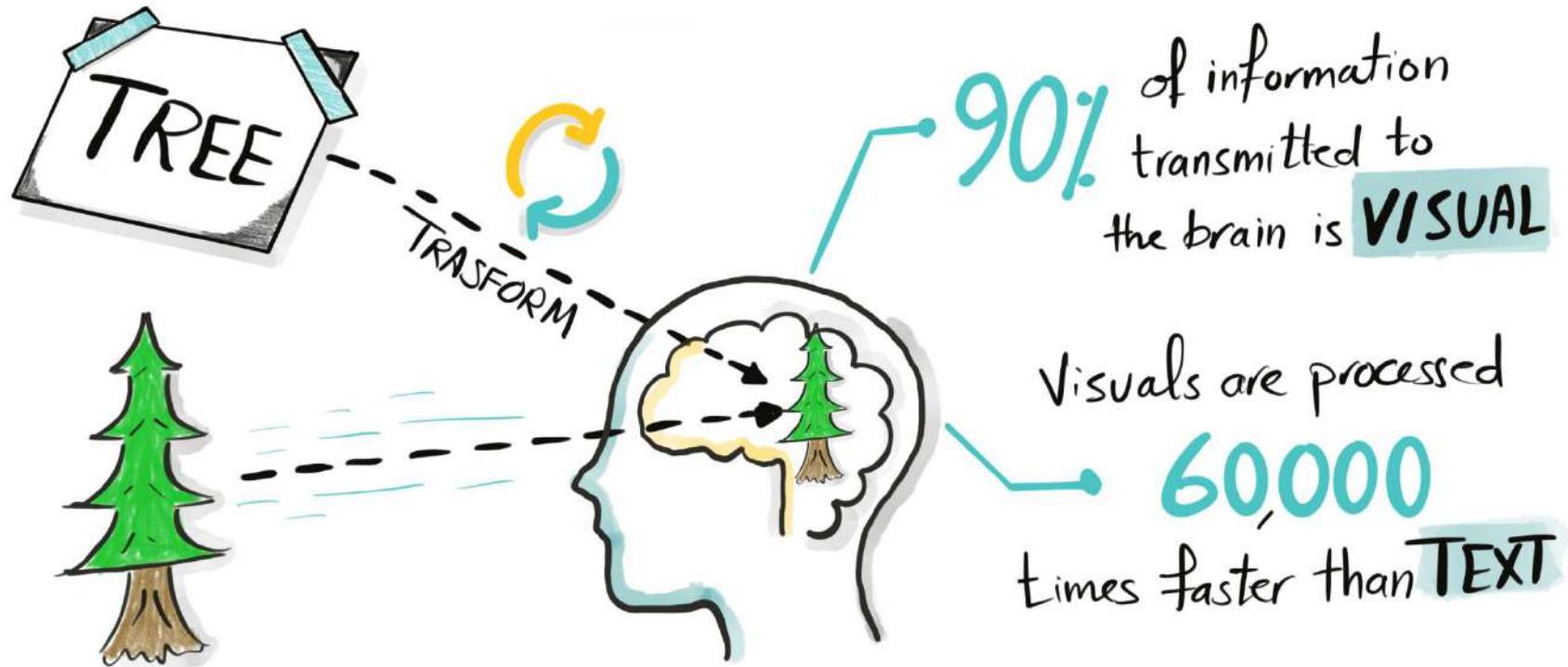


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BUSINESS INTELLIGENCE

DATA WITH BARAA





We remember ...



10%

20%



80%





Increase Engagement

Discover Unknown Facts

Faster & Smarter Decisions

Telling a Story

Seeing Big Picture

Tracking Trends

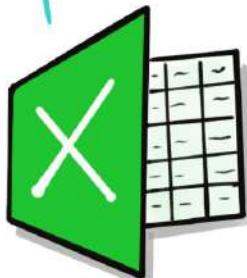




~1 Billion users

People ❤️ EXCEL

Planning Tool
DATA Entry
DATA Analysis
DATA Visualization



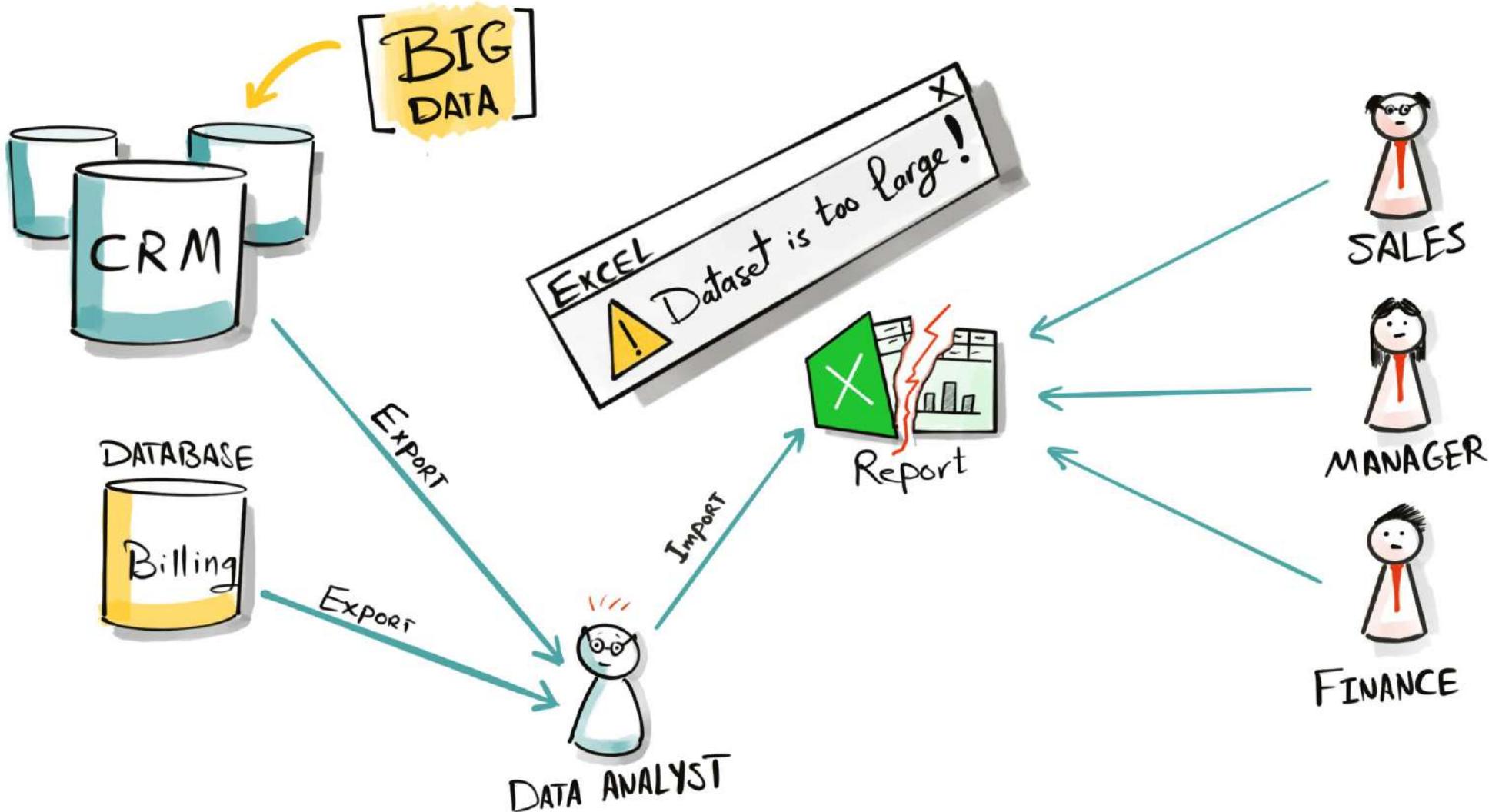
DATA
VIZ

tableau

Power BI

Qlik

BIG DATA

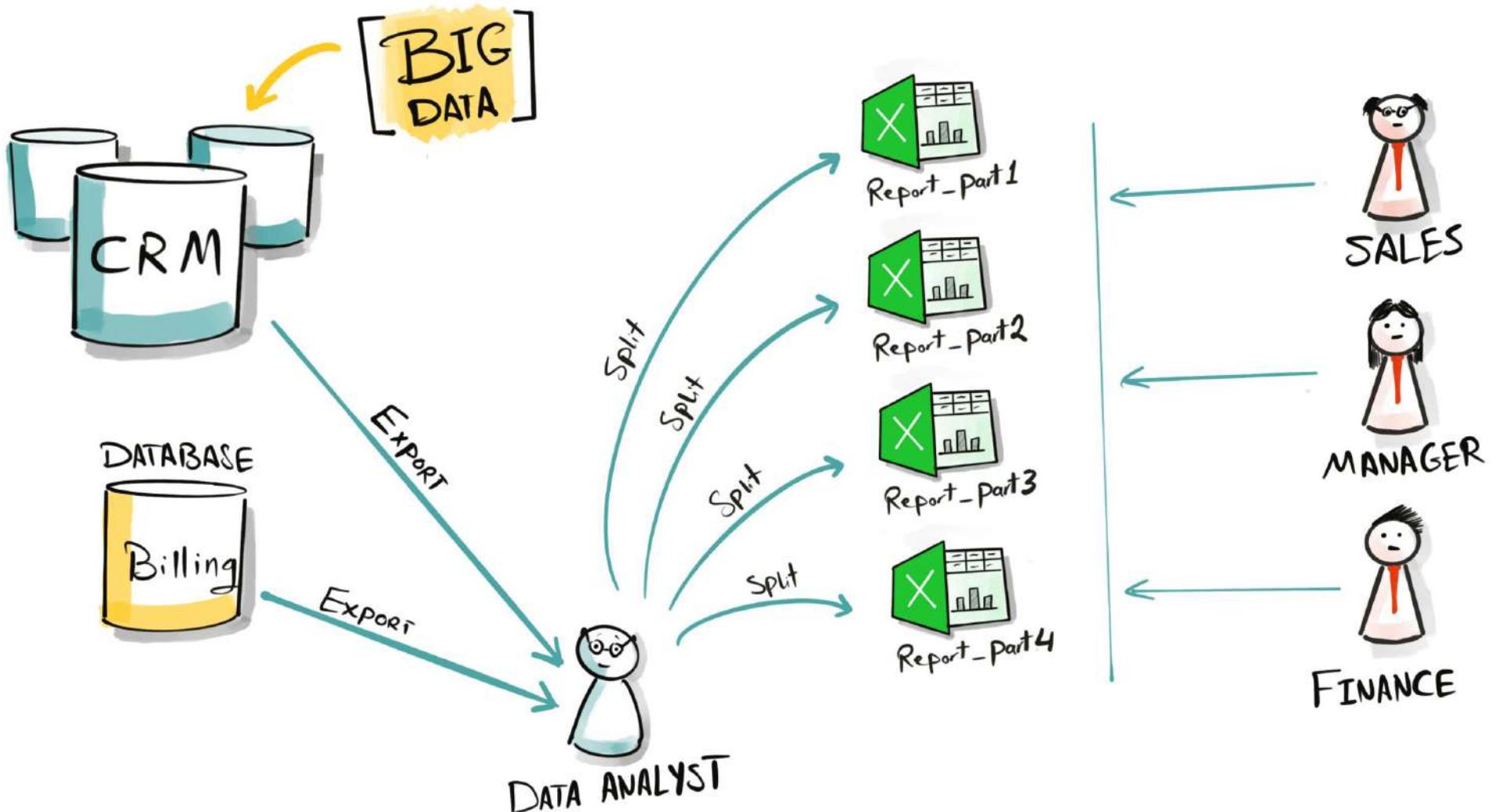


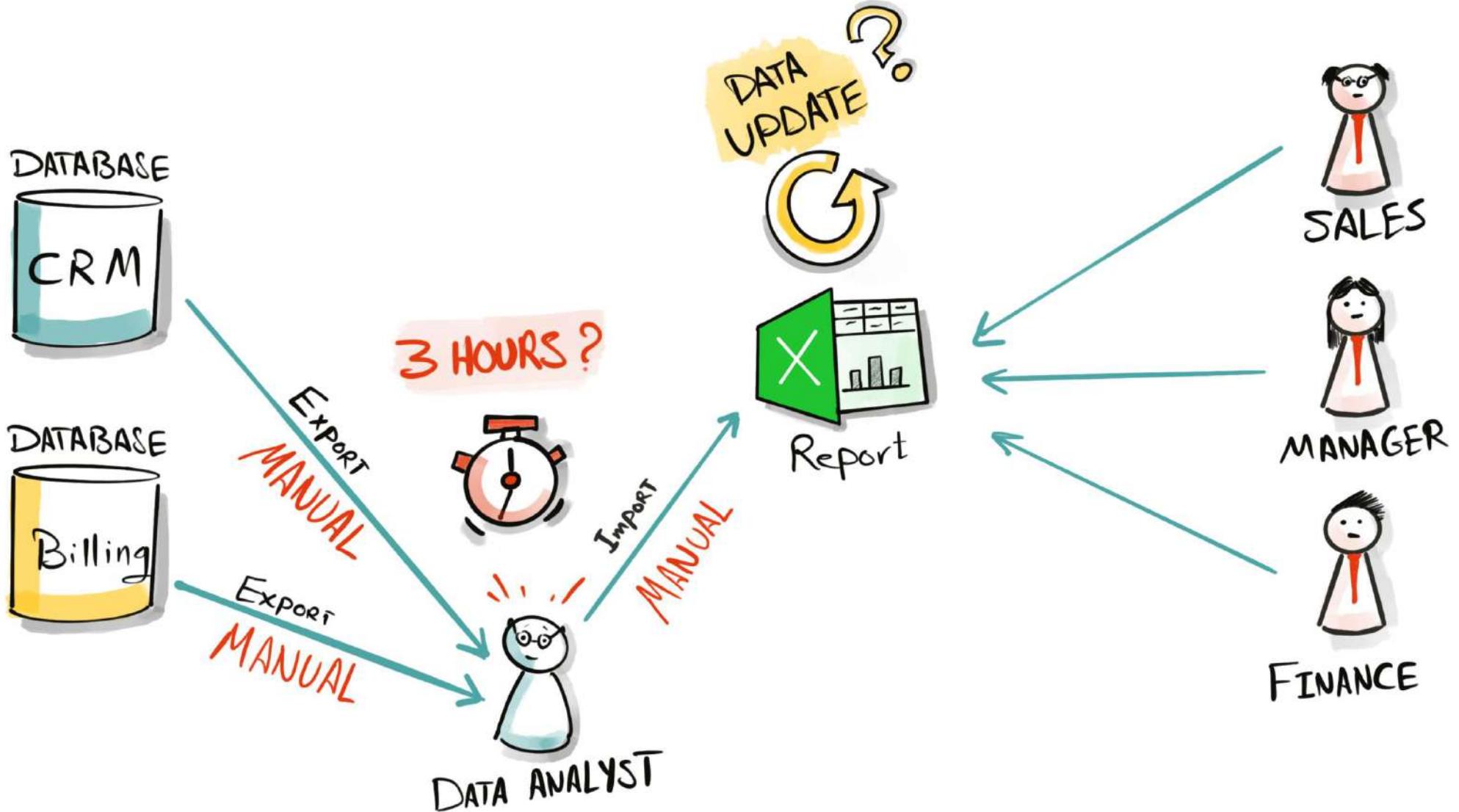


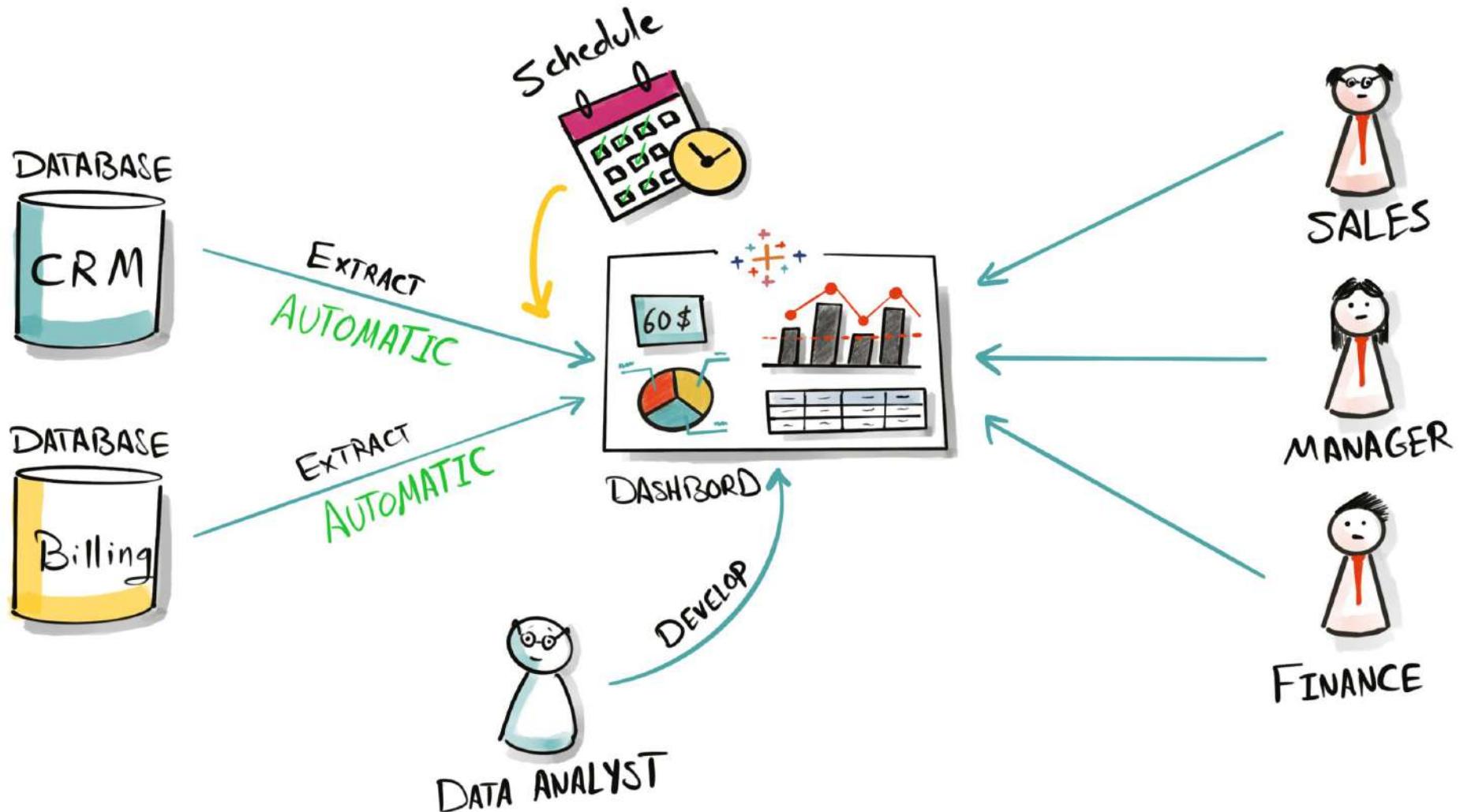
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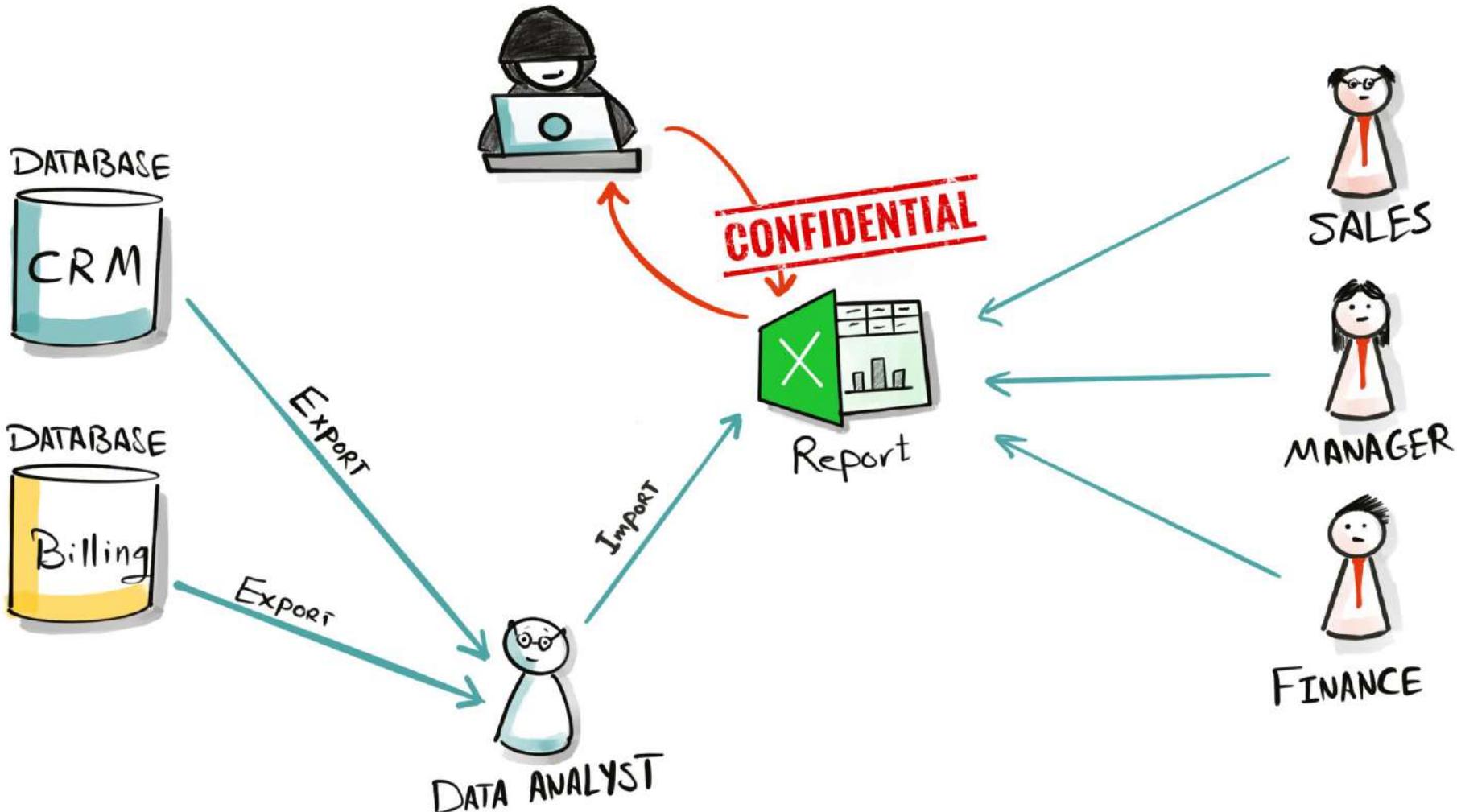
BI with Excel | Big Data

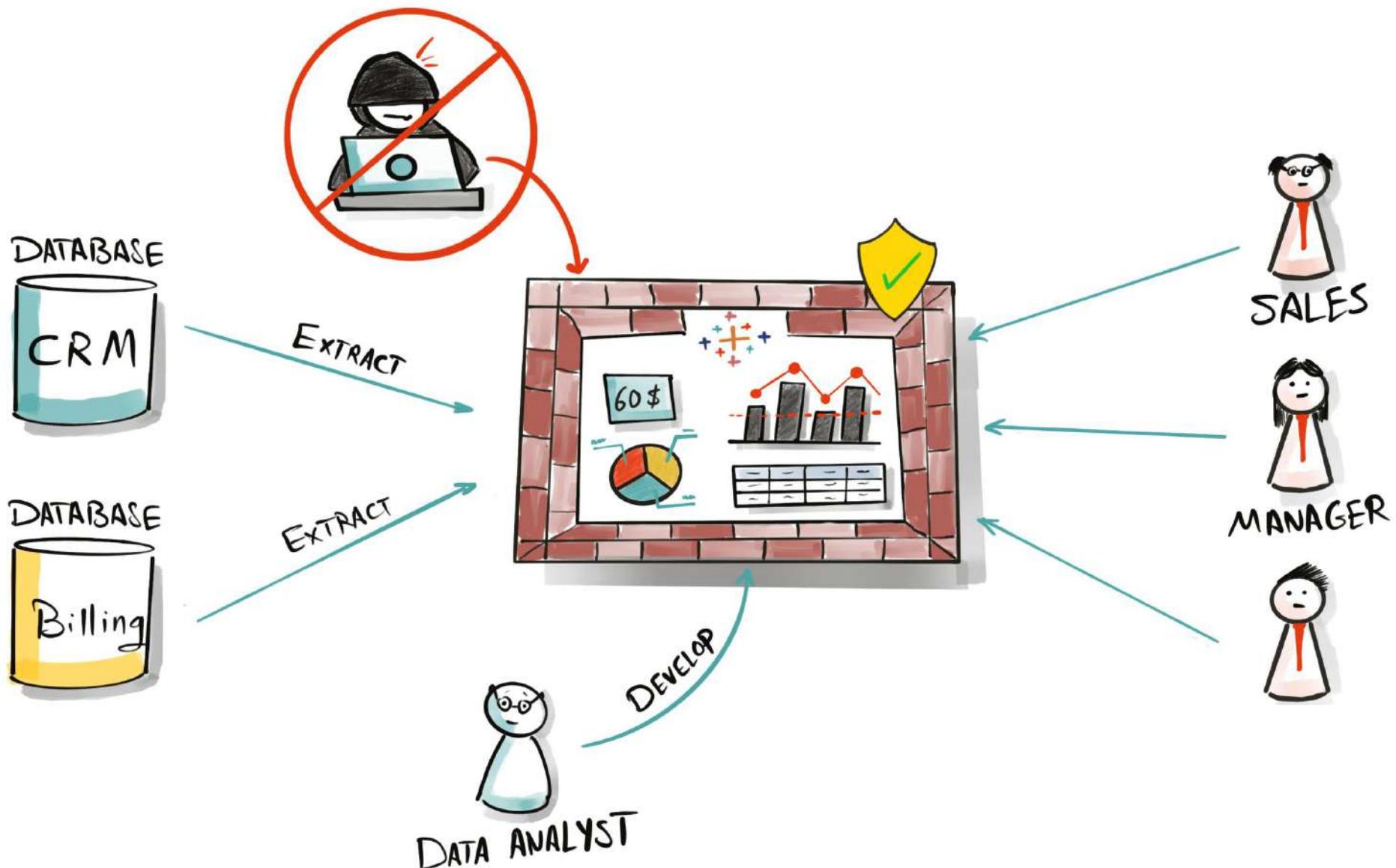
DATA WITH BARAA













Row-Level-Security (RLS)



UserName	Country	Sales
Baraa	USA	9000
Baraa	Germany	8000
Maria	USA	6500
John	France	10000
John	USA	7500
Peter	Spain	5900

All Rows in Sales

UserName	Country	Sales
Baraa	USA	9000
Baraa	Germany	8000

Baraa's View

UserName	Country	Sales
John	France	10000
John	USA	7500

John's View

**CONFIDENTIAL****[NEED-TO-KNOW]****DATA ANALYST**

Import

Import

Export

Export



Sales_Report

Manager_Report

Employee_Report



SALES

MANAGER

**CONFIDENTIAL**

DATABASE



[NEED-TO-KNOW]

EXTRACT

DATABASE



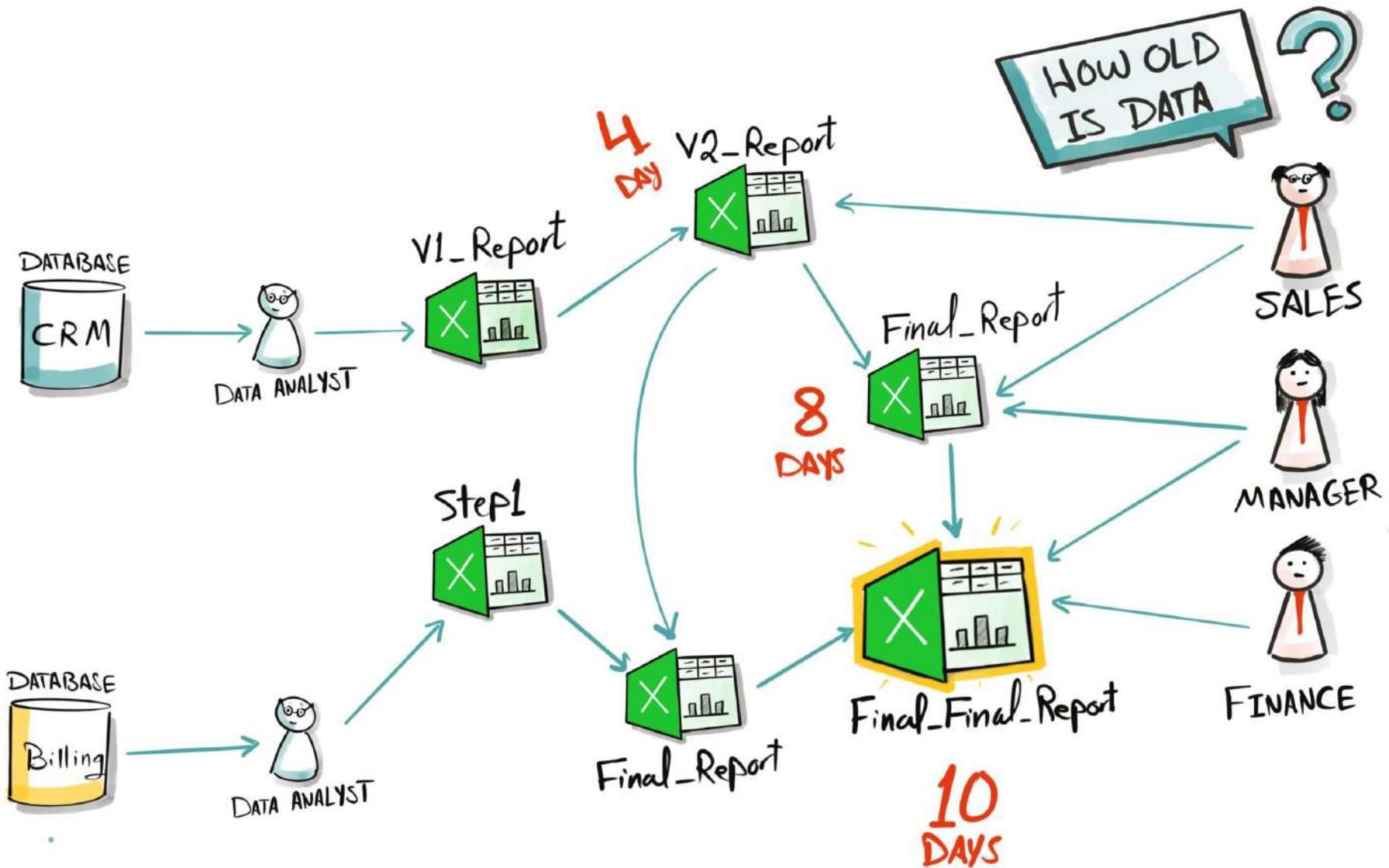
EXTRACT

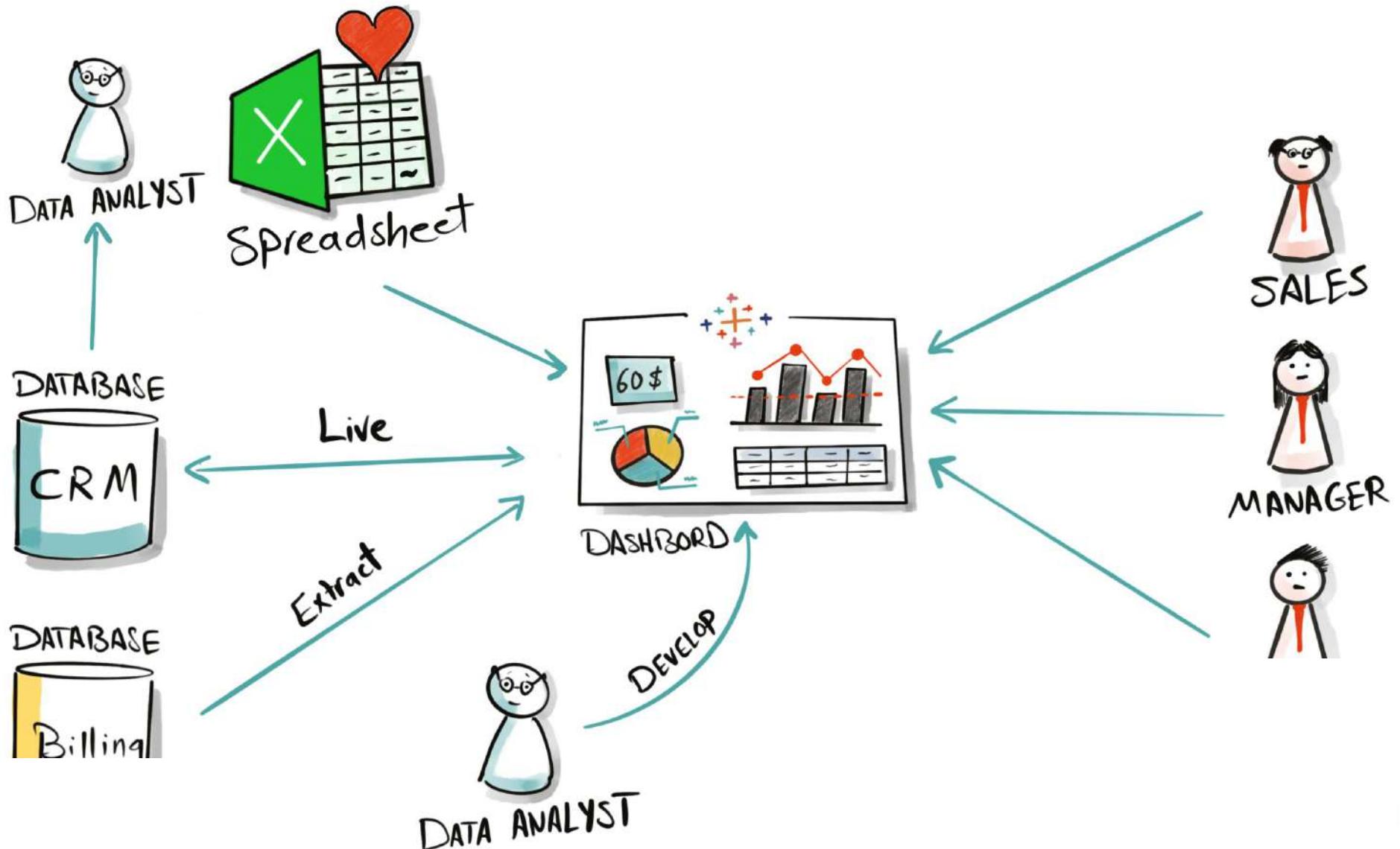
DATA ANALYST

DASHBOARD

DEVELOP









Automation ✓



Security ✓

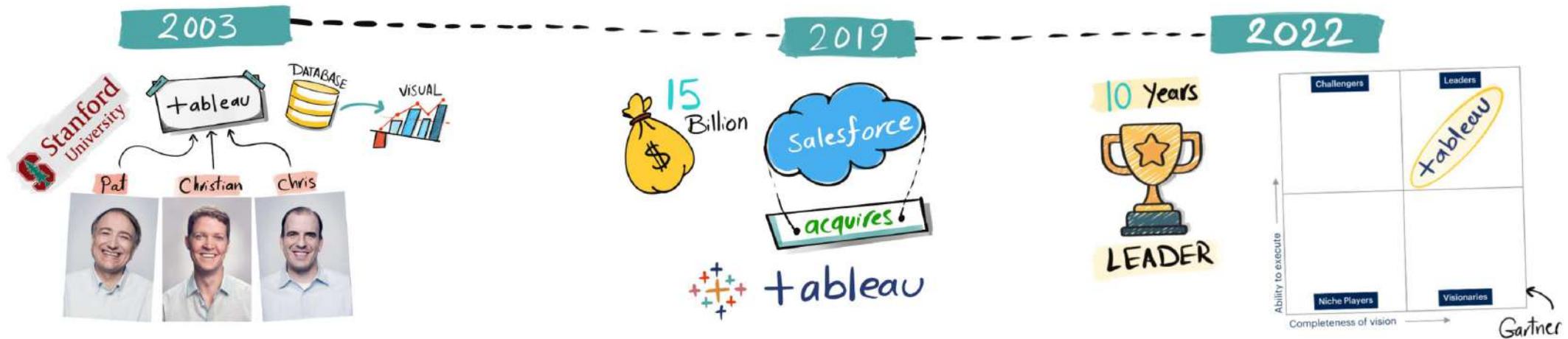


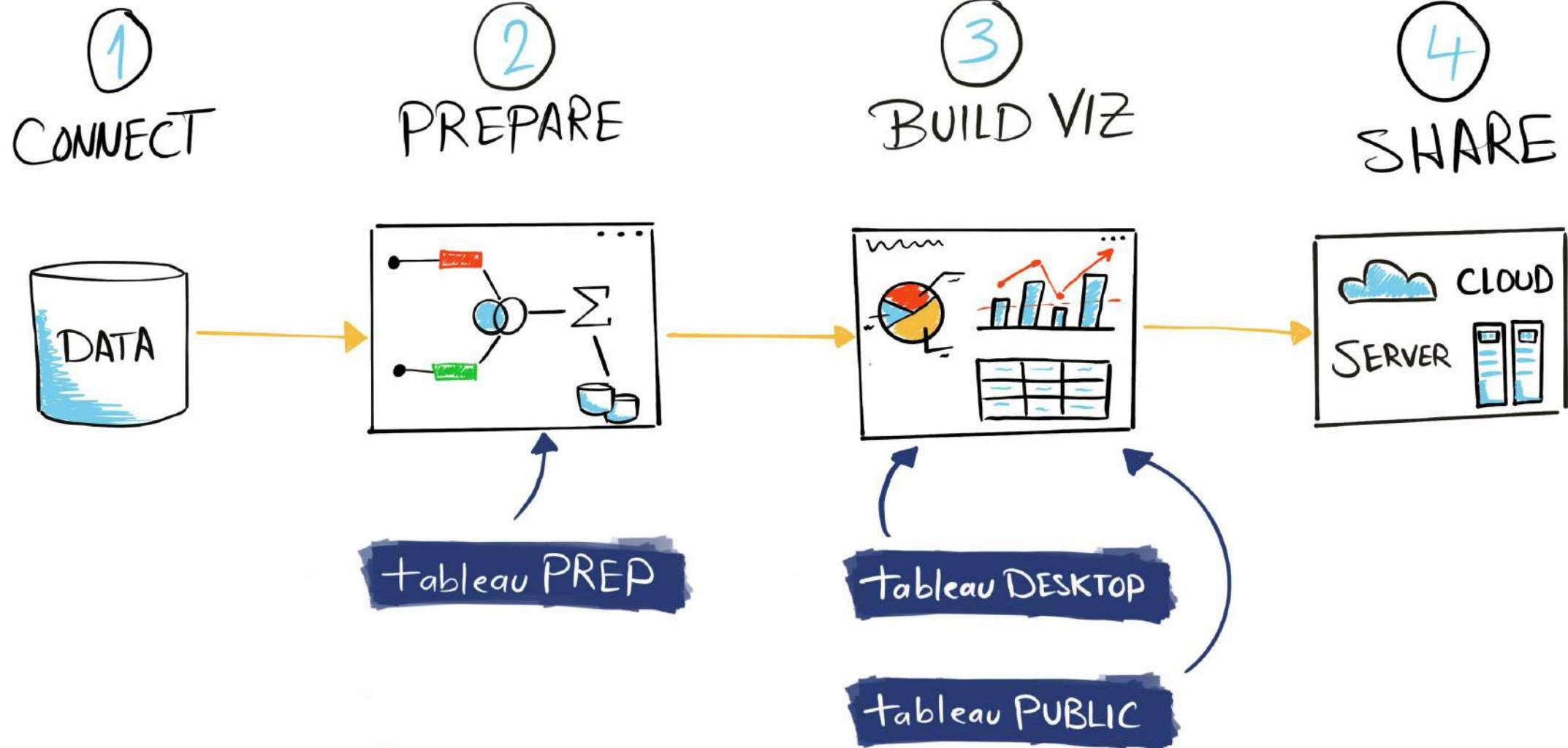
BIG DATA ✓



Interactive ✓





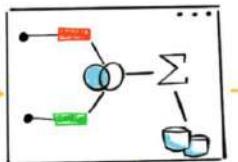




1
CONNECT



2
PREPARE

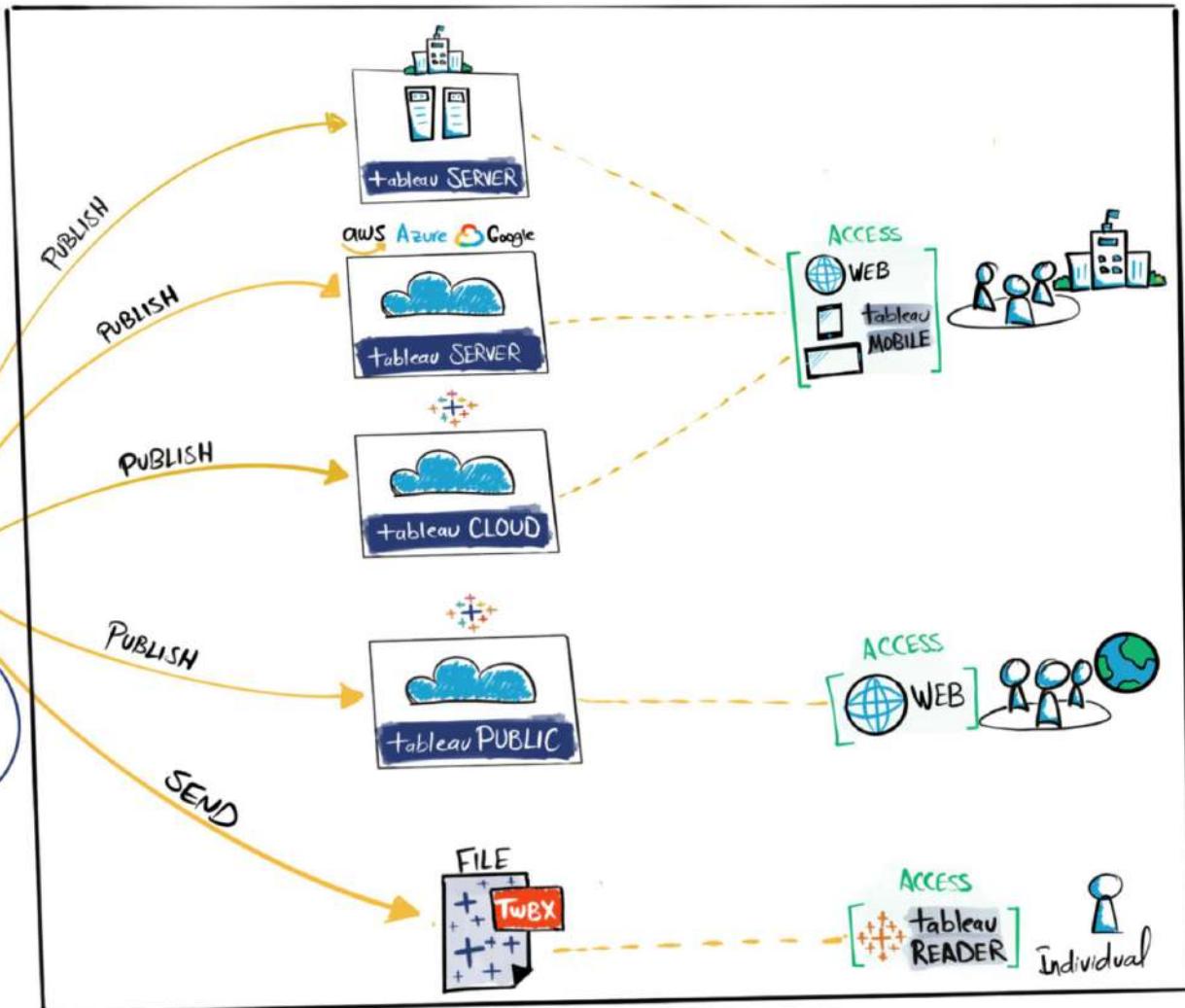


3
BUILD VIZ



Tableau DESKTOP
Tableau PUBLIC

4
SHARE





DESKTOP

Tableau Desktop

"Backbone Product of Tableau"



Developer tool for data visualization

- Connect data
- Build views, dashboards, stories
- Publish workbooks & data sources

Requires a license

90 Data connectors

Publish

- Tableau Server
- Tableau Cloud
- Tableau Public (cloud)

No Limitations

For Data scientists & Data analysts

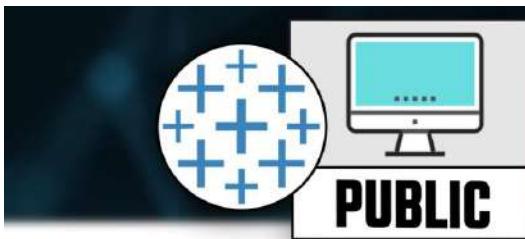
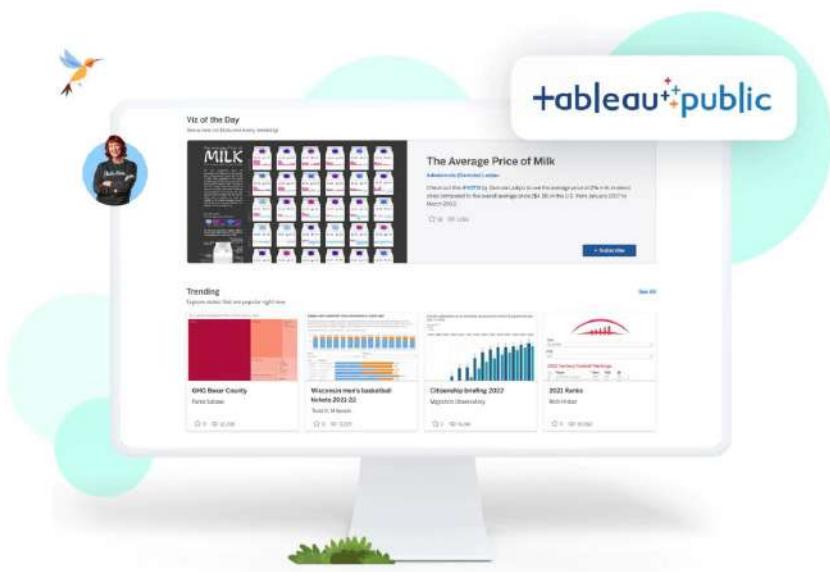


Tableau Public

"Free Version of Tableau Desktop"



Developer tool for data visualization

- Connect data
- Build views, dashboards, stories
- Publish workbooks & data sources

Free Tool

4 Main Limitations

- 10 Data connectors (only local files)
- Limited to 15 Million rows
- Publish to only Tableau Public (cloud)
- Can't save locally

All tools & functions to build Viz are available!

For Everyone

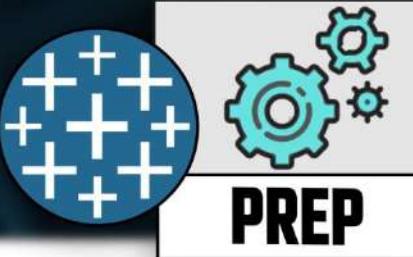
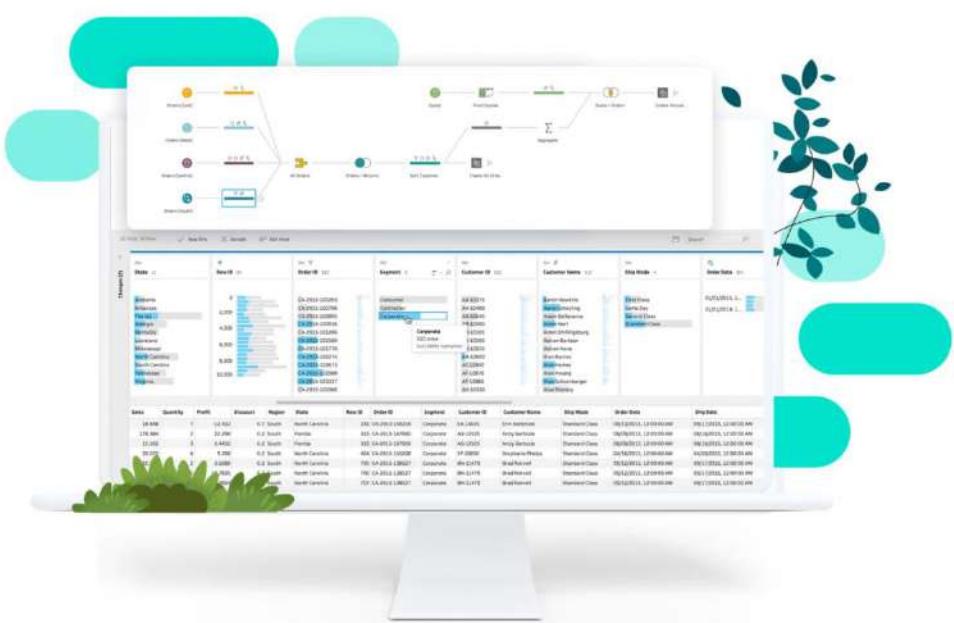


Tableau Prep

"Data Engineering Tool"



Developer tool for data engineering

- Connect data
- Build flows (clean, combine, aggregate ... etc)
- Publish flows & data sources

Requires a license

90 Data connectors

Output

- File
- Tableau Data Source
- Database Table

Publish

- Tableau Server
- Tableau Cloud

No public (free) version available.

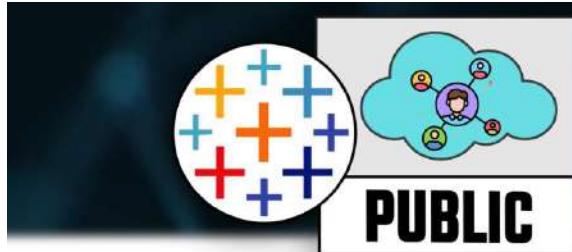
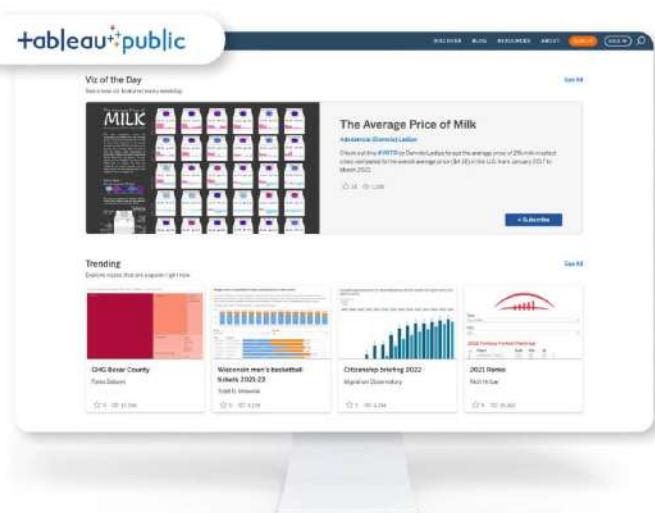


Tableau Public Cloud

"Social Media of Tableau"



Sharing tool for data visualization

Free Cloud Service from Tableau

Platform

- Inspiring
- Connecting to other developers
- Sharing your skills

Main Limitations

- Limited to 10 GB for each account
- No connection to sources
- No Security features

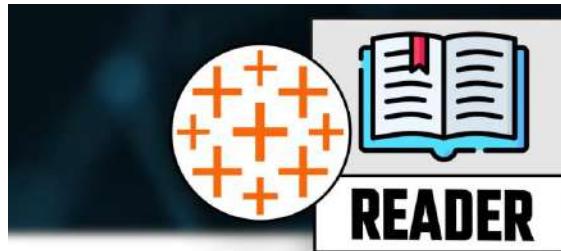


Tableau Reader

"Free Tool to view Vizzes"

Sharing tool for data visualization

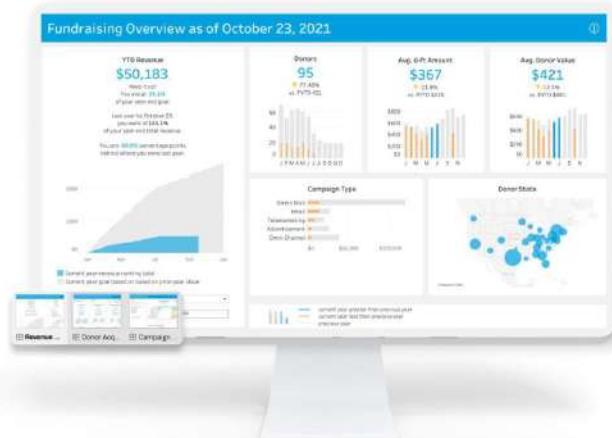
Free Tool

Only to view visualization

Main Limitations

- Can't build visualization
- Can't Refresh Data
- No Security features

Don't recommend using it in organization



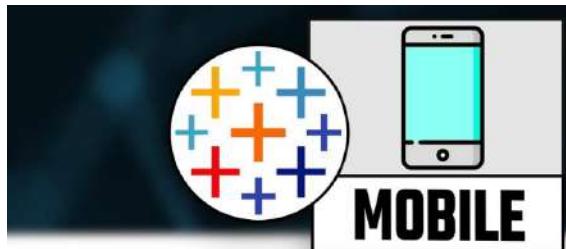
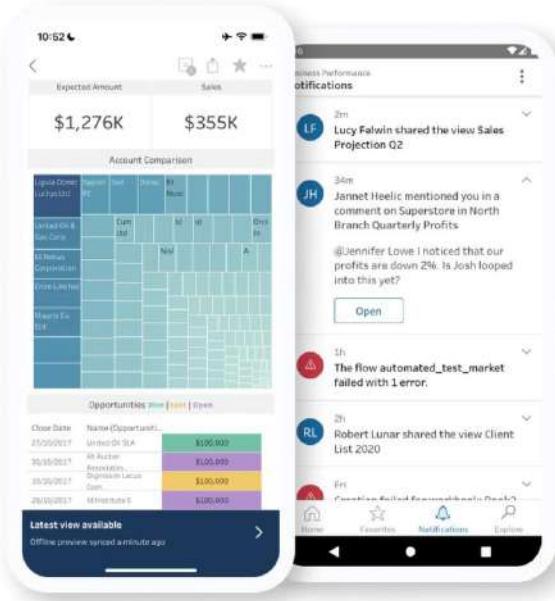


Tableau Mobile

"Access Vizzes from anywhere"



Only to **view** visualization

Cant use it to **build** data visualization

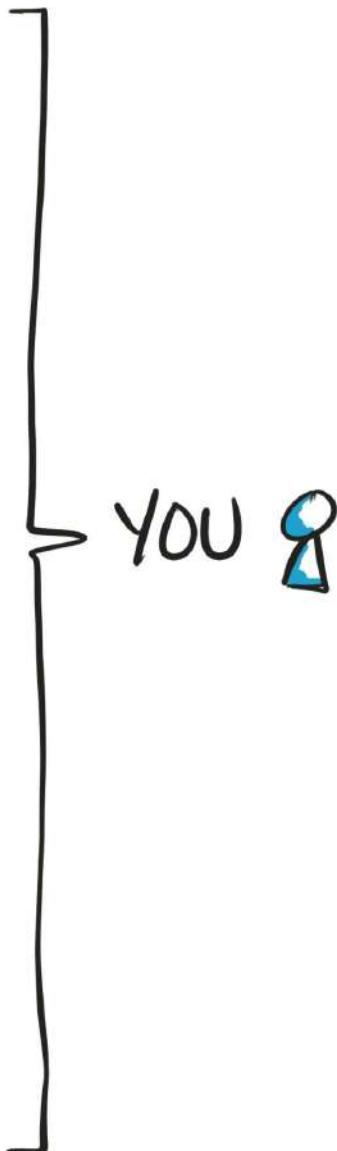
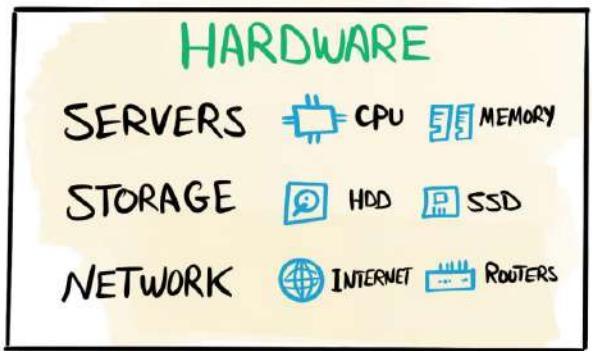
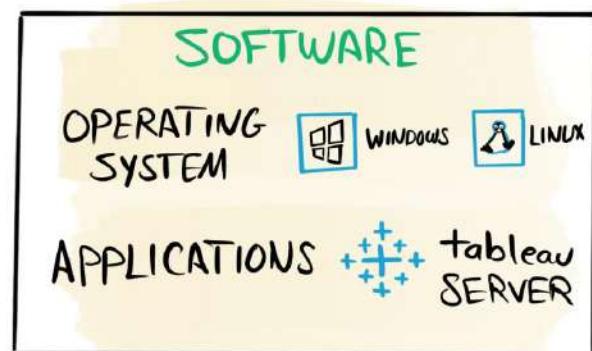
Free App to download

Require a **licence** to use

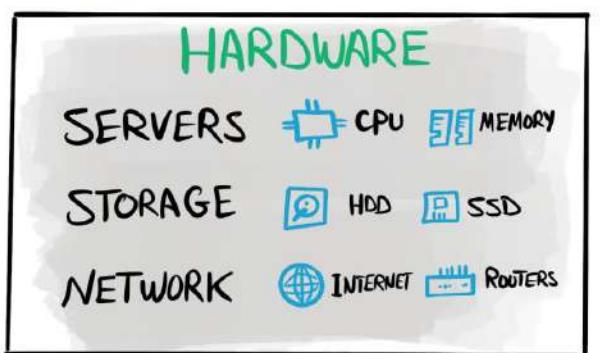
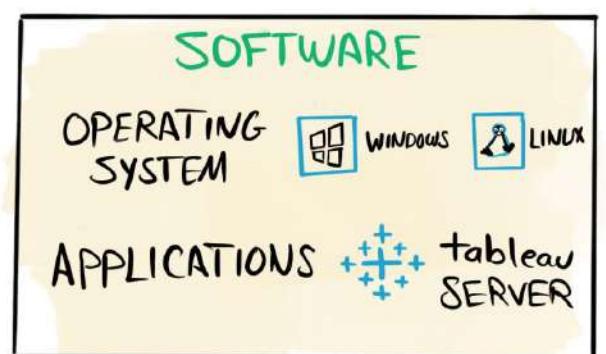
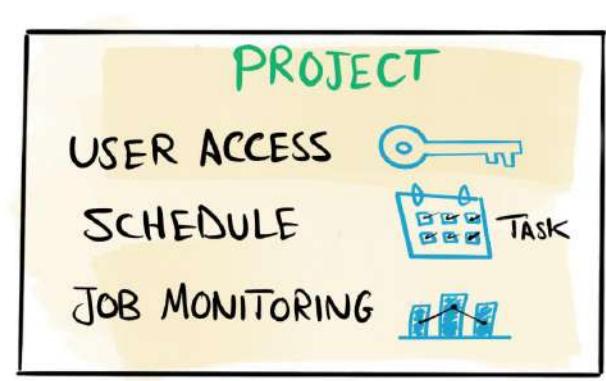
Connect to

- Tableau **Server**
- Tableau **Cloud**

Cashing Dashboards for **offline** access



ON-PREM

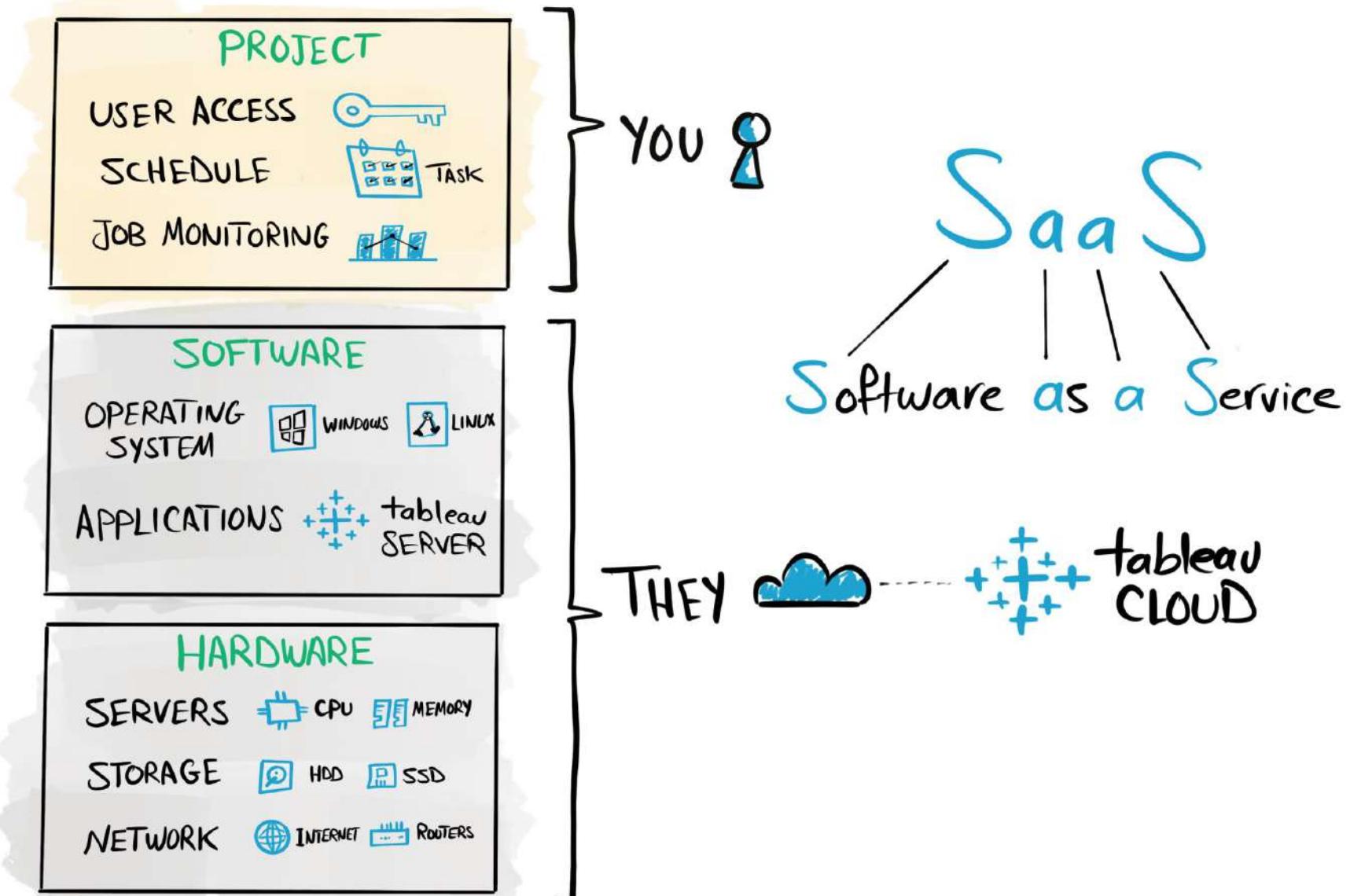


YOU

THEY

IaaS
Infrastructure as a Service

aws
Azure
Google





On-Prem



Hosting



SERVER



CLOUD



Hardware

YOU

THEY

THEY



Software

YOU

YOU

THEY



Project

YOU

YOU

YOU



PROS

Full Control

Flexibility

Focus on Core Business

Data behind Firewalls

No Upfront Costs

Always Up-To-Date



CONS

High Upfront Costs

Software Administration

Loss of Control

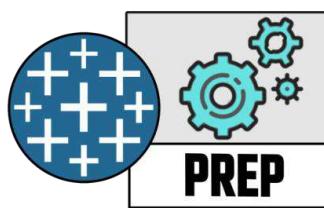
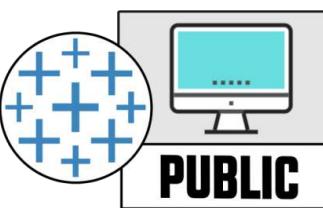
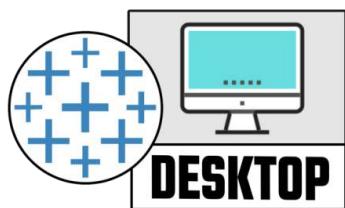
Inflexibility

Unexpected costs

Potential Networking Issue



Dev Products Comparison



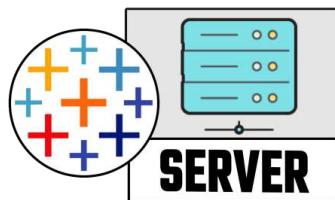
Purpose	Data Visualization	Data Visualization	Data Engineering
Costs			
Security			
Data Limit	No Limit	15 Million Rows	No Limit
Connectors			
Live Con.			
Store Locally			
Audience	Data Scientists & Analysts	Everyone	Data Engineers



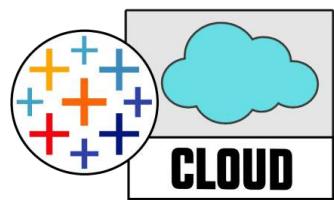
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Sharing Products Comparison

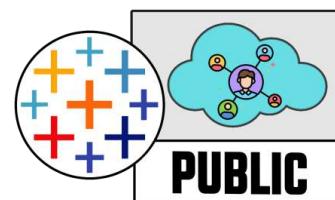
DATA WITH BARAA



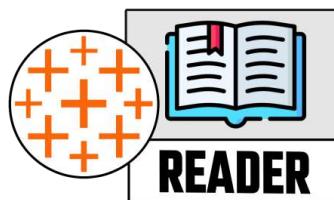
SERVER



CLOUD



PUBLIC

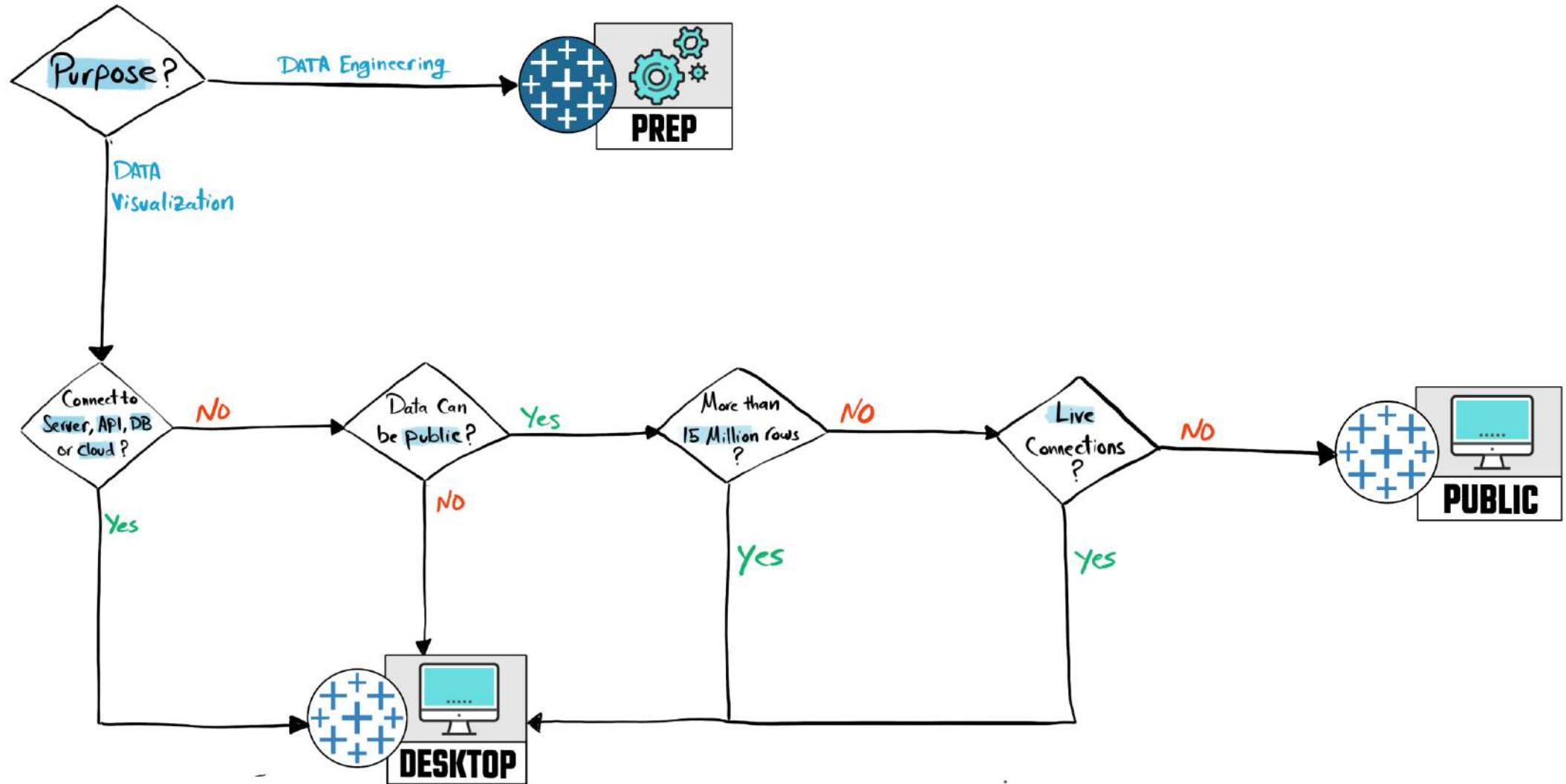


READER

	Project				
	Software				
	Hardware				
	Storage Limit	Server Disk Space	No Limits	10 GB	No Limits
	Connectors				
	Automation				
	Mobile				
	Sharing				



Choose Right Dev Product

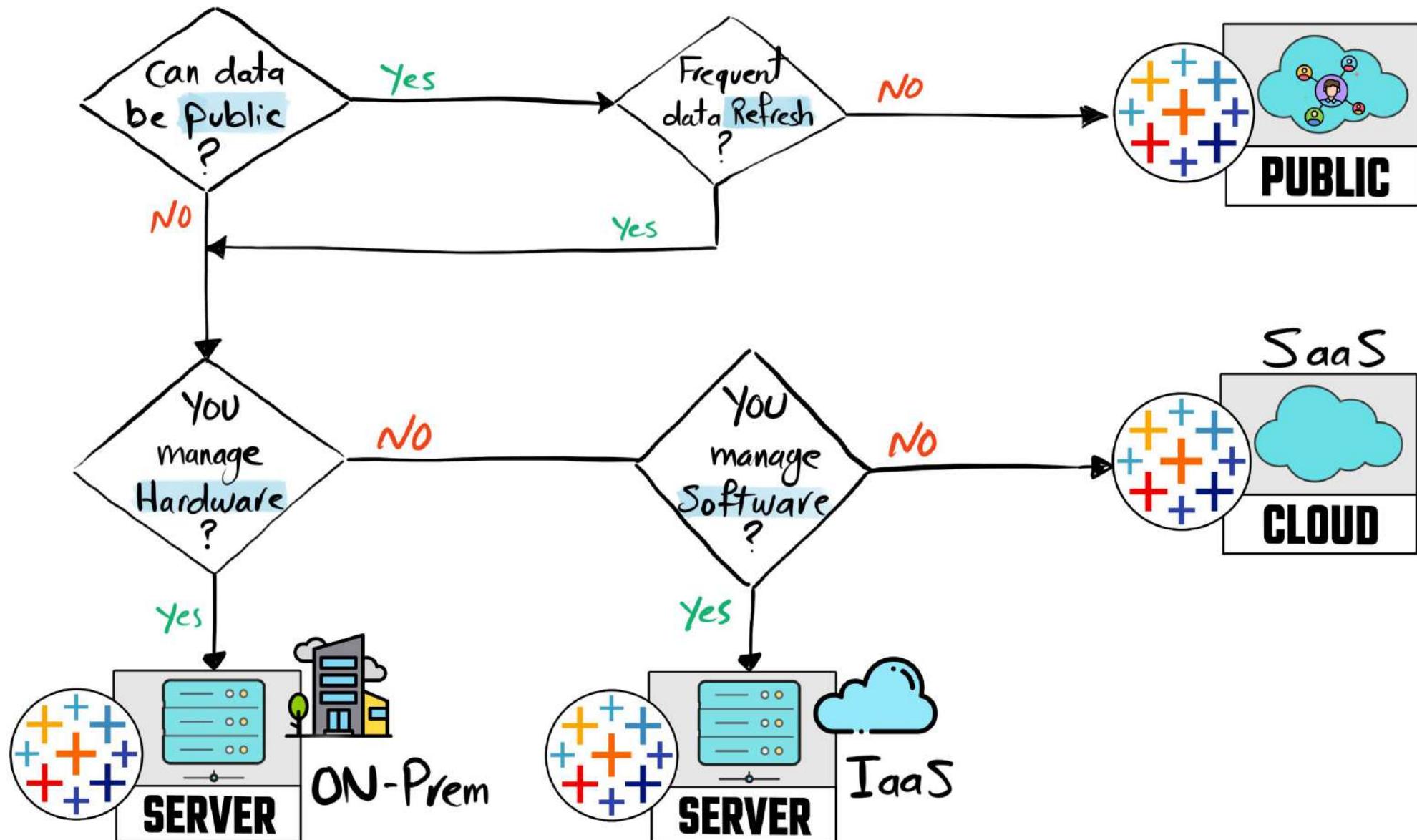




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Choose Right Sharing Product

DATA WITH BARAA

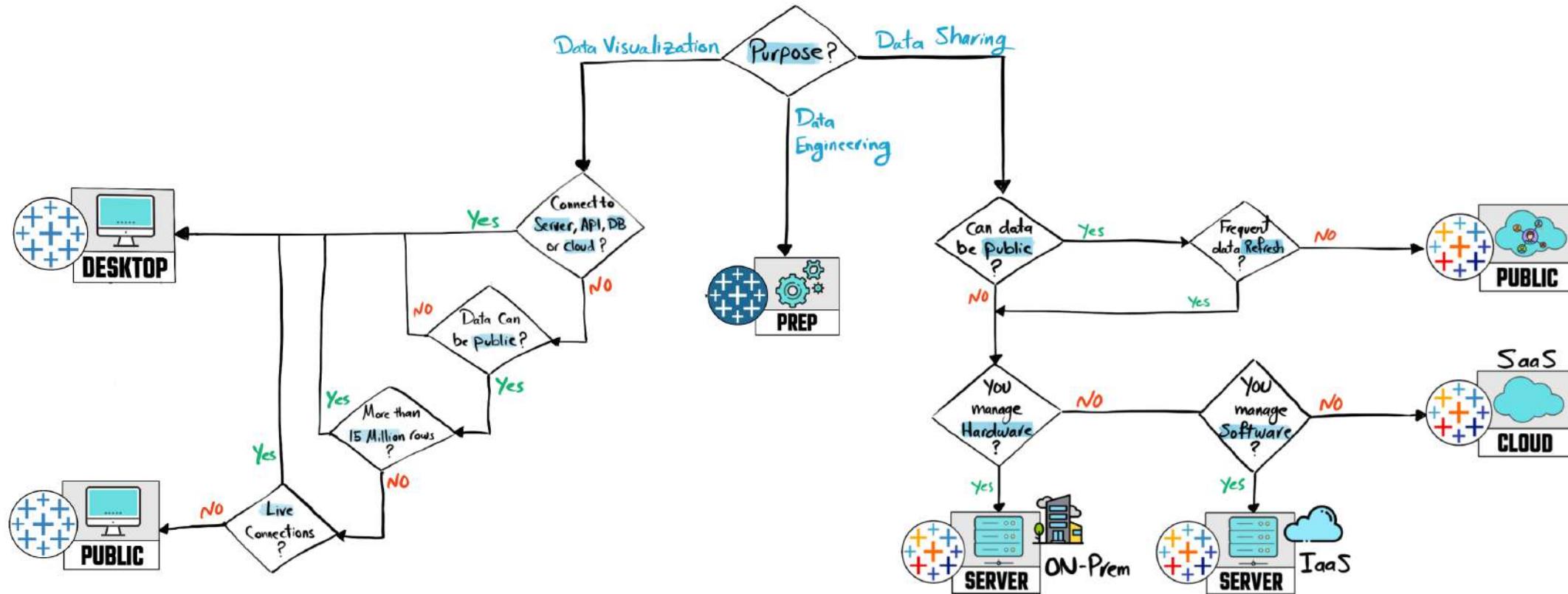




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Choose Right Tableau Product

DATA WITH BARAA



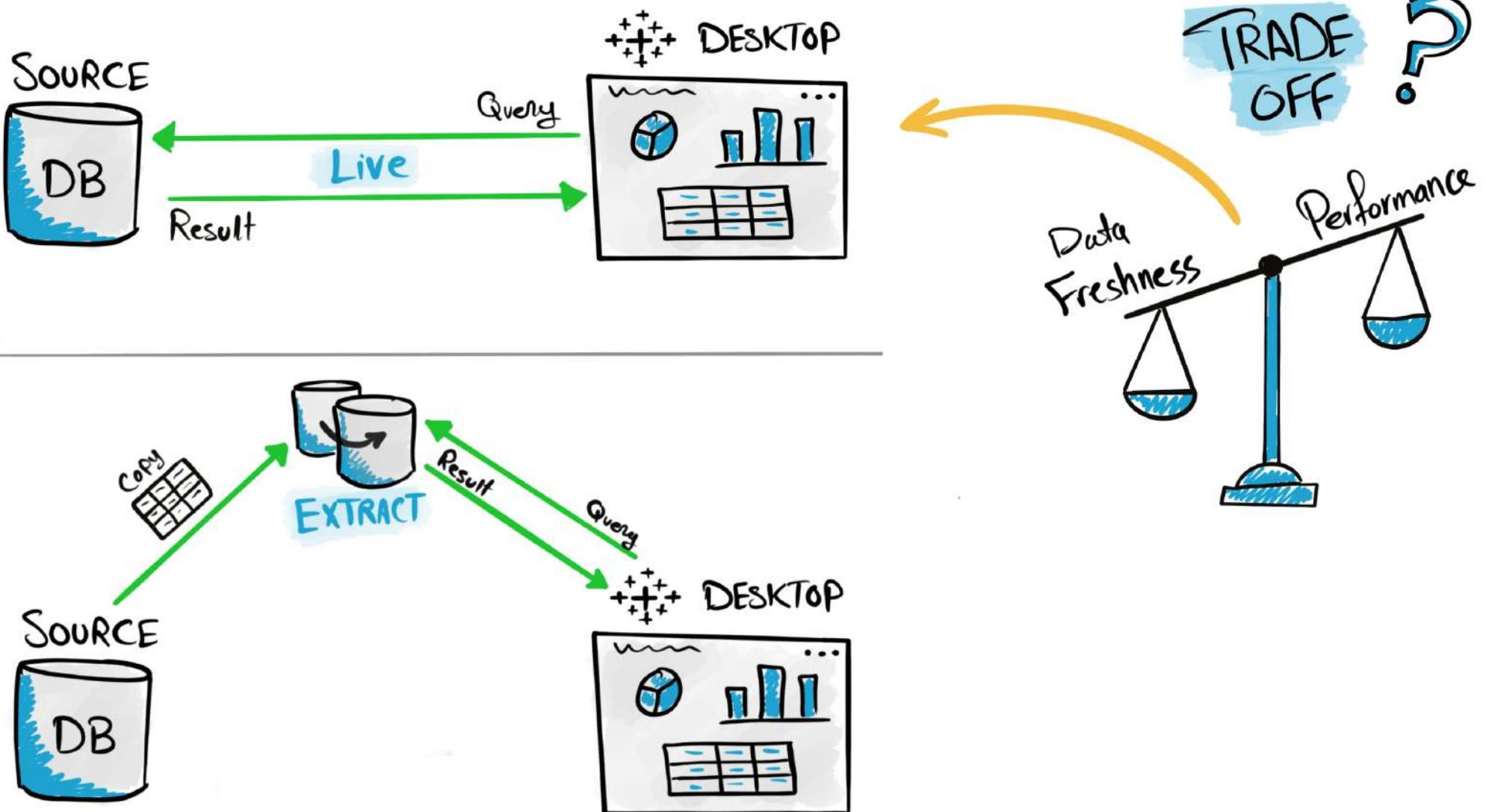
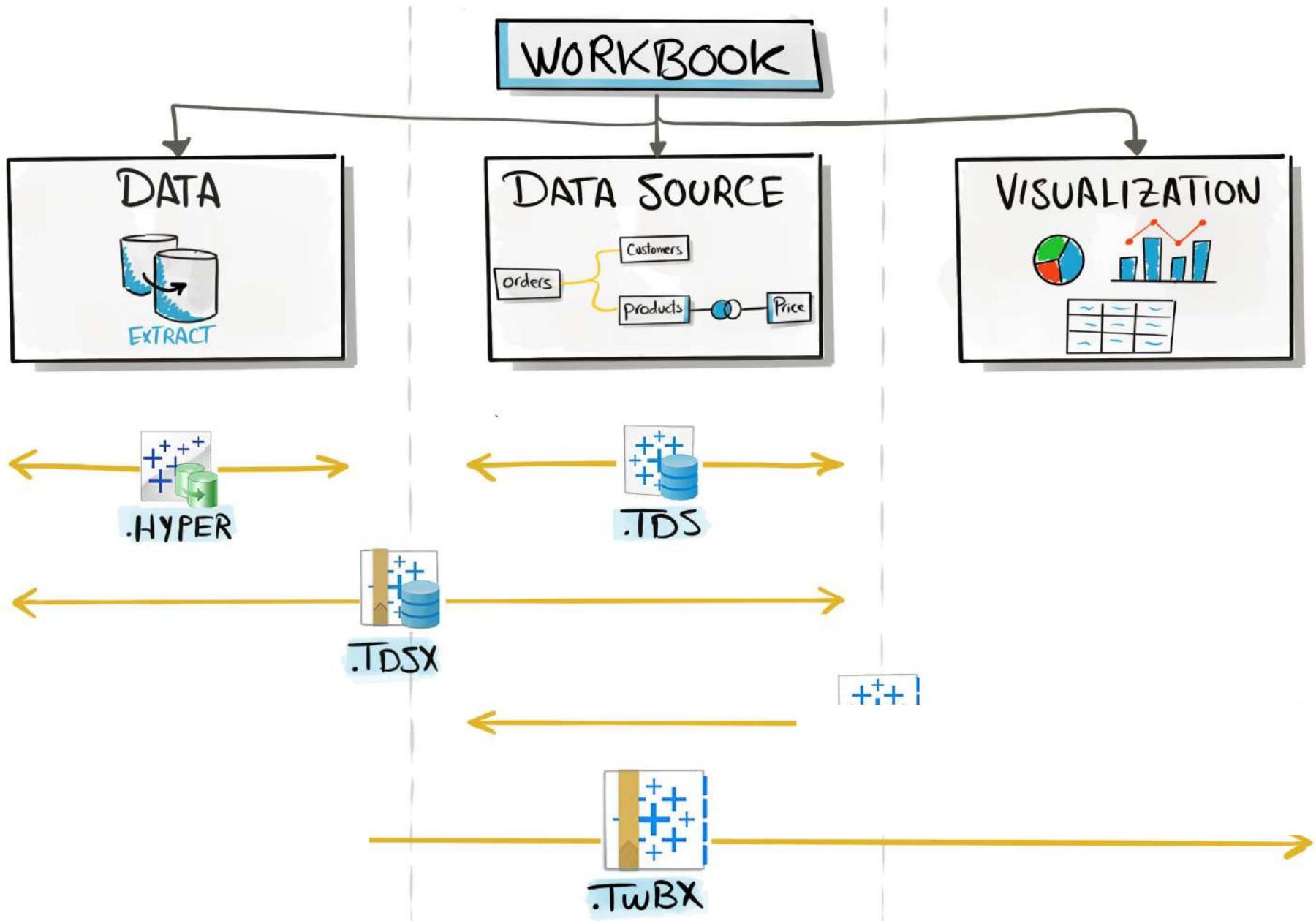




Tableau File Types



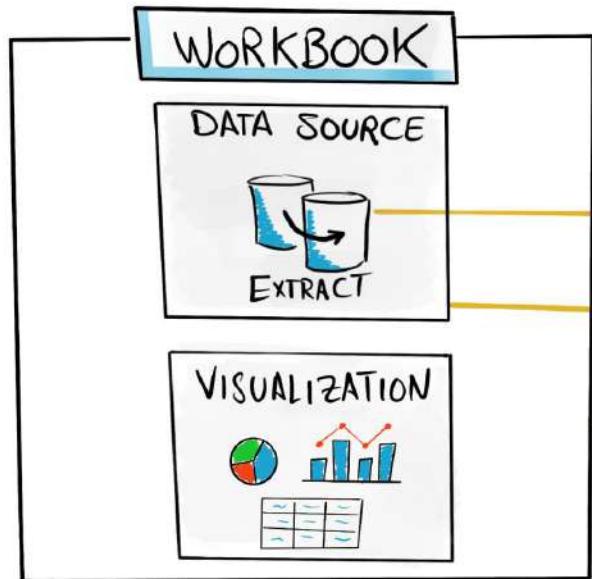
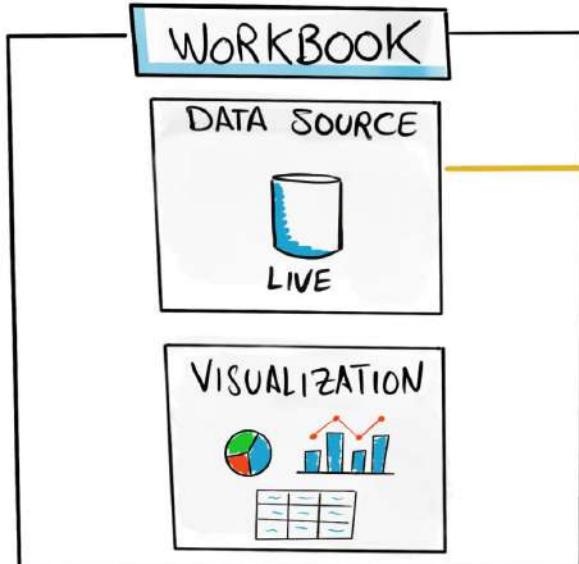


tableau Desktop	tableau Reader	tableau Public
✓	✗	✗
✓	✗	✗
✓	✓	✓



✓	✗	✗
✓	✗	✗



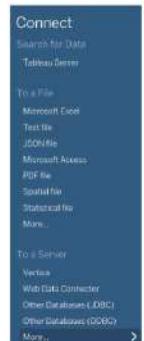
+ a b | e a u

Tableau Data Source

DATA WITH BARAA

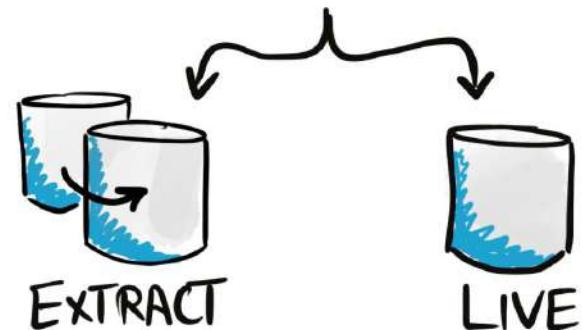


DATA CONNECTORS



90 CONNECTORS

CONNECTION TYPE



ACCESS INFO

Path

E:\User\Data\Tableau\sales.csv

DB
location
↗

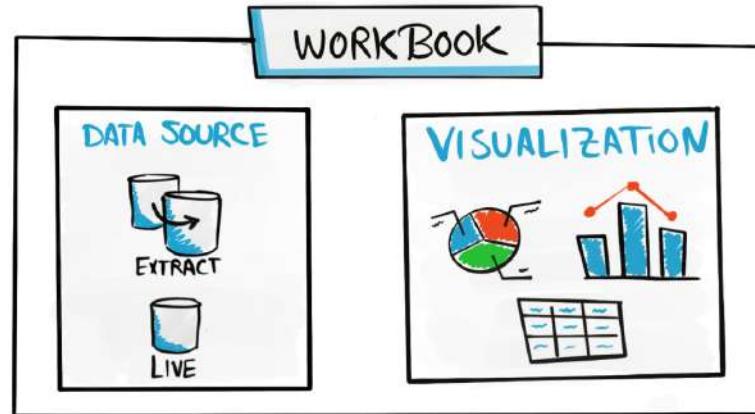
Server: localhost
Database: myfirstwebsitedb

Access
token

czZCaGRSa3F0MzpniiUjk091qErXJW ↗

DATA MODEL





DATA



ID
1
2
3
4

Prod
A
D
F

Price
20.5
8.99



METADATA

```
<metadata class='column'>
  <name> Code </name>
  <type> Integer </type>
  <Count> 631 </Count>
</metadata>
```

SALES.TWB



+ a b | e a u

Tableau Desktop Architecture

DATA WITH BARAA



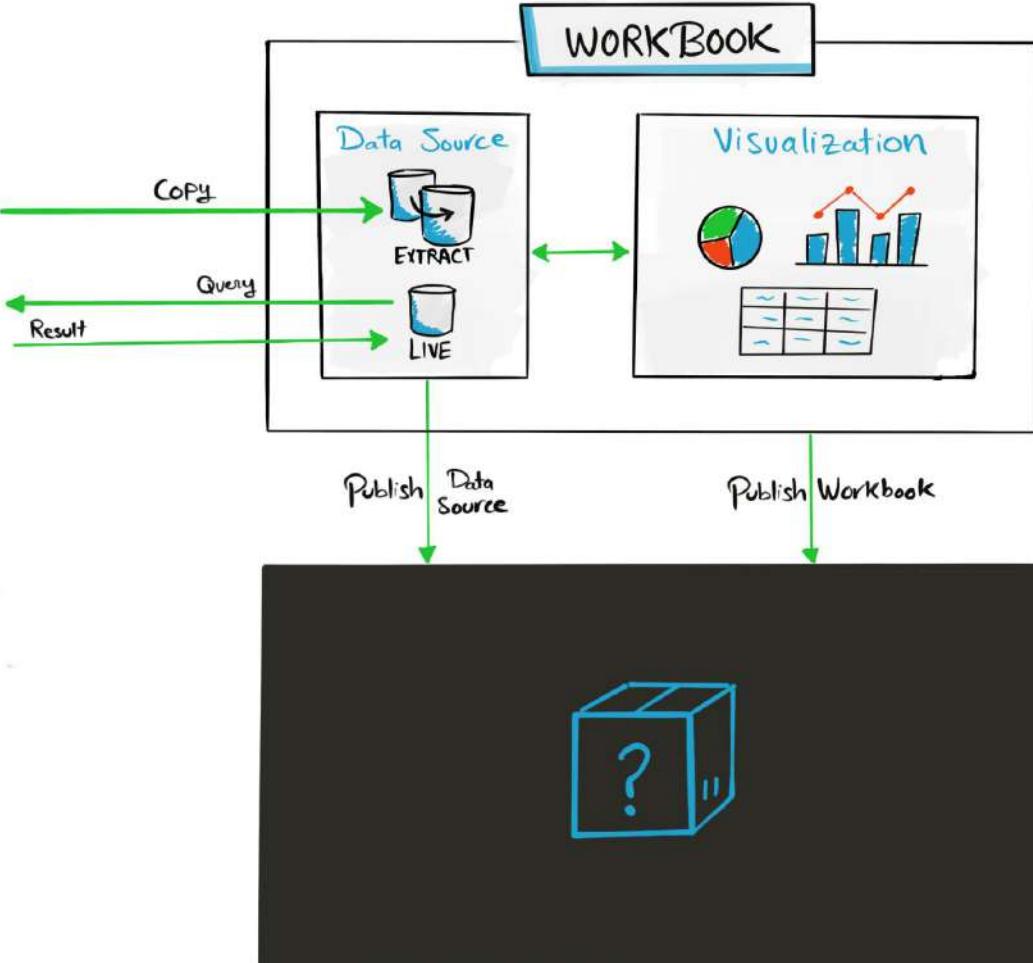
SOURCE



[API]

DESKTOP

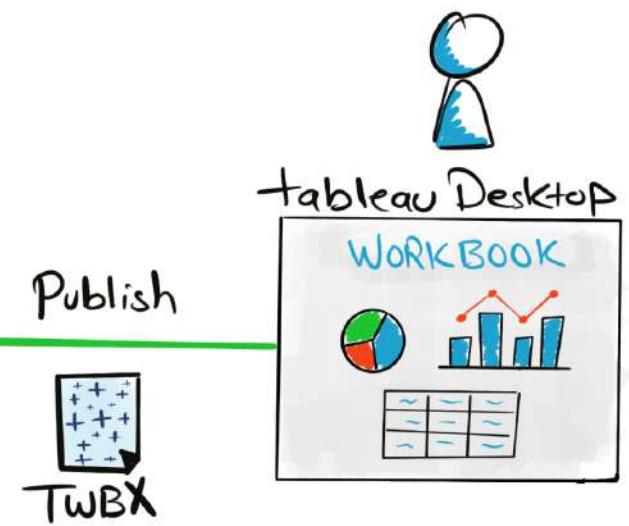
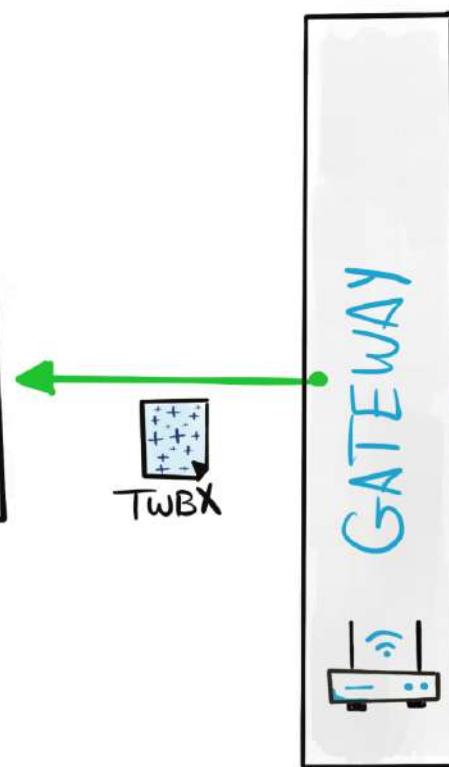
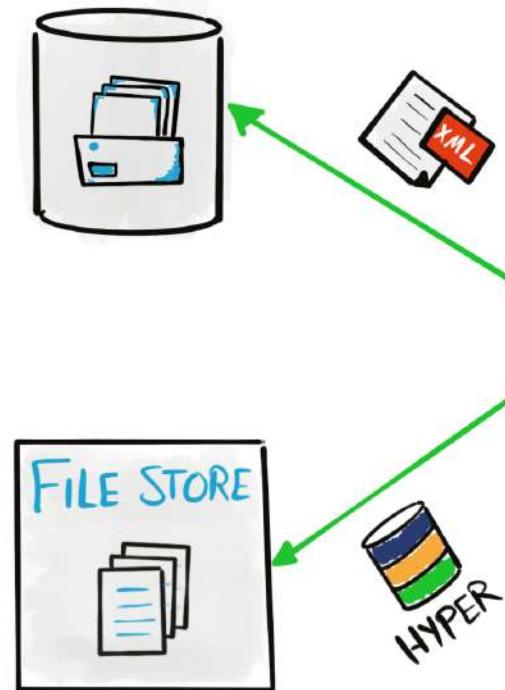
WORKBOOK



SERVER

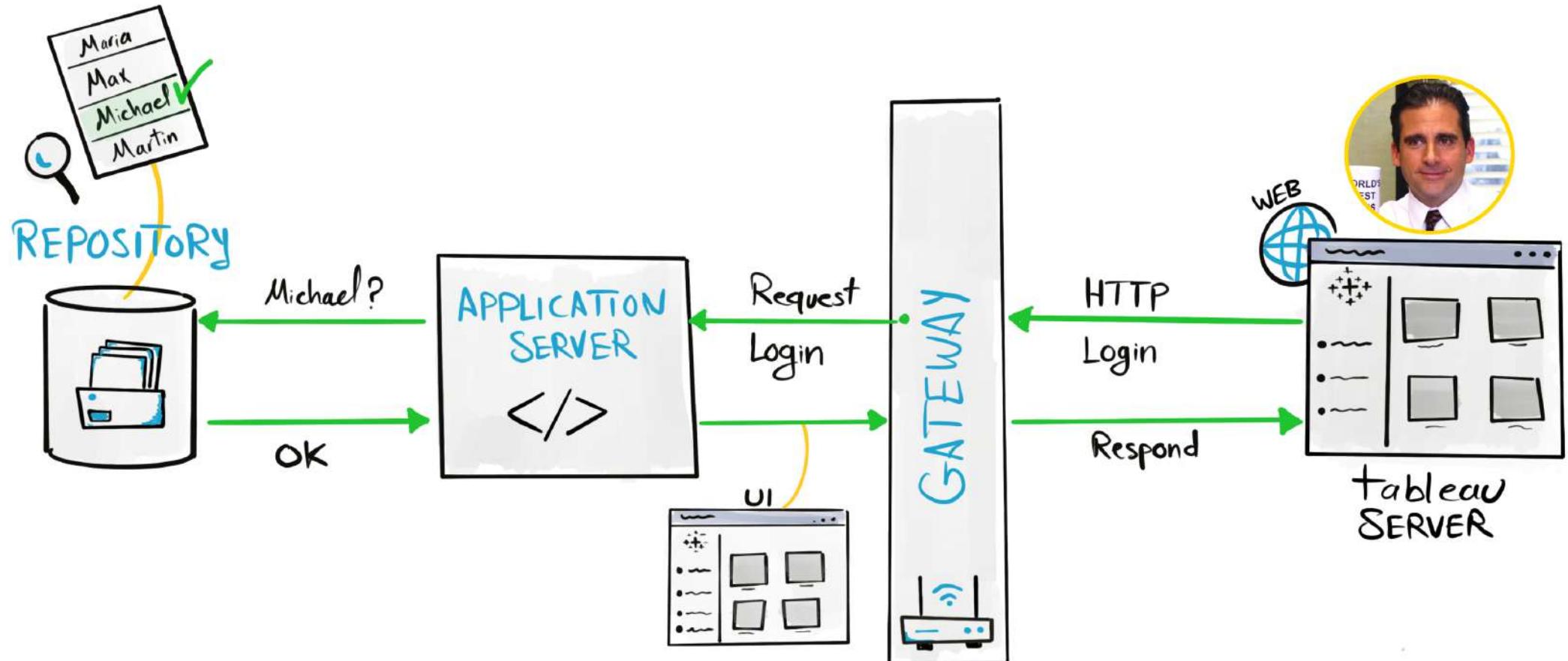


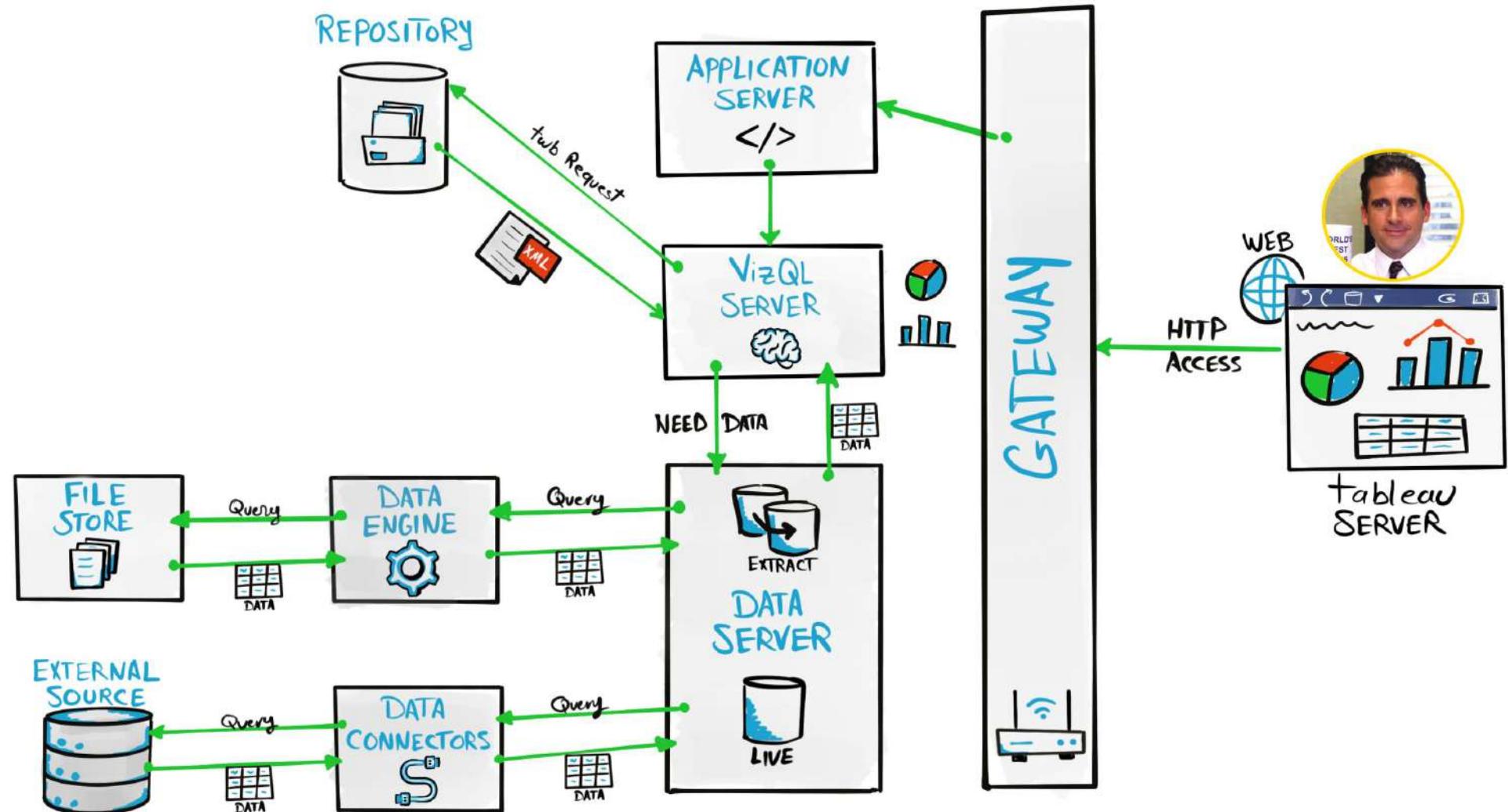
REPOSITORY

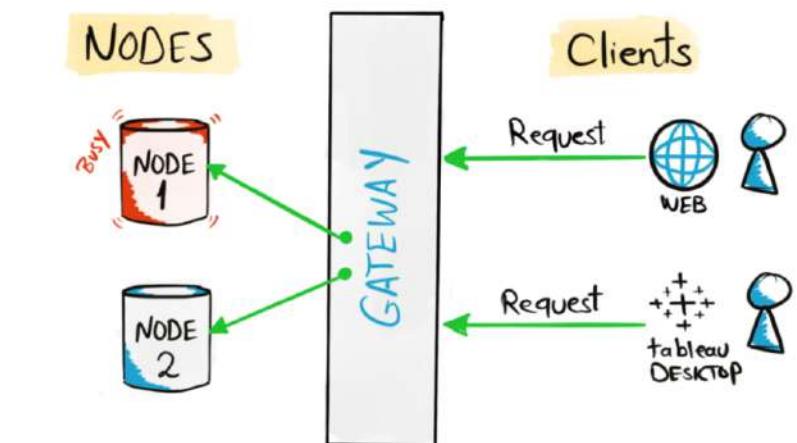
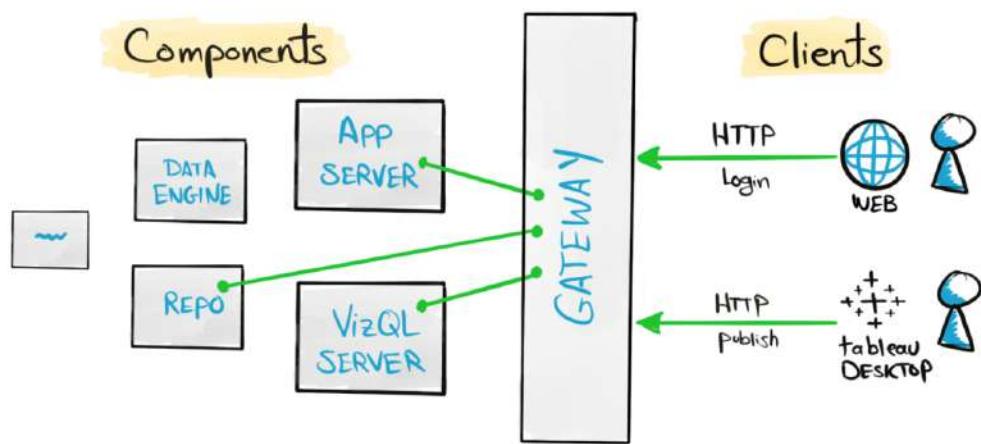
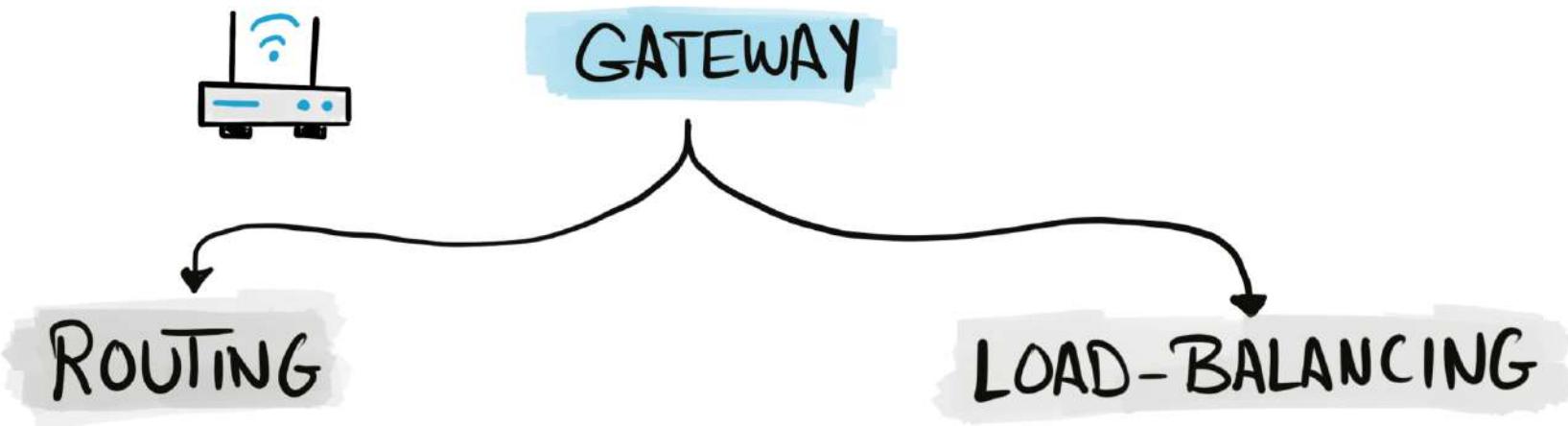




Authenticate Process





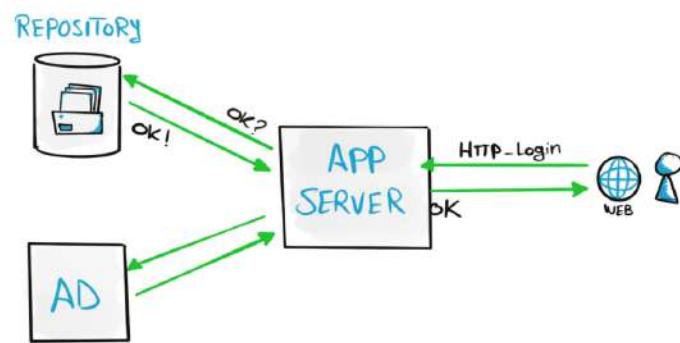




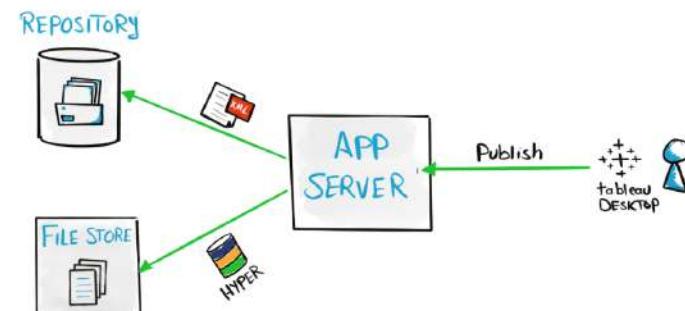
</>

APPLICATION SERVER

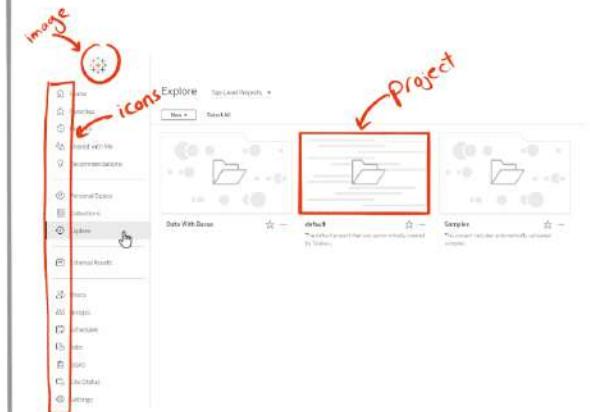
Authentication & Authorisation



Publishing

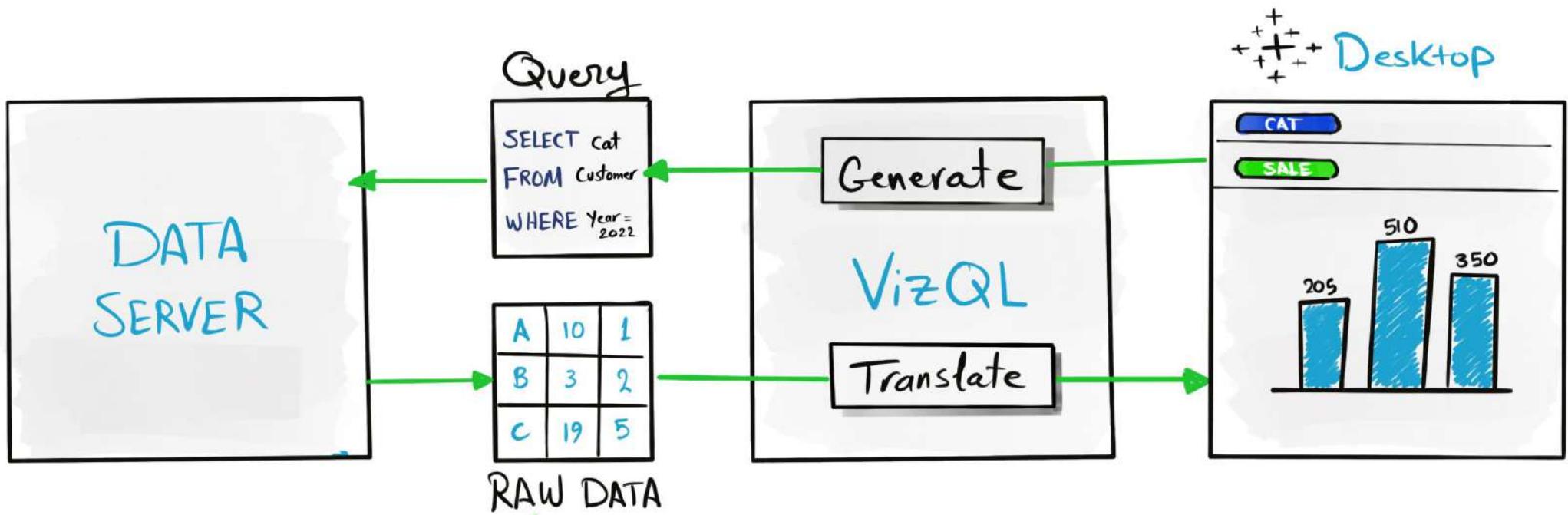


UI Rendering



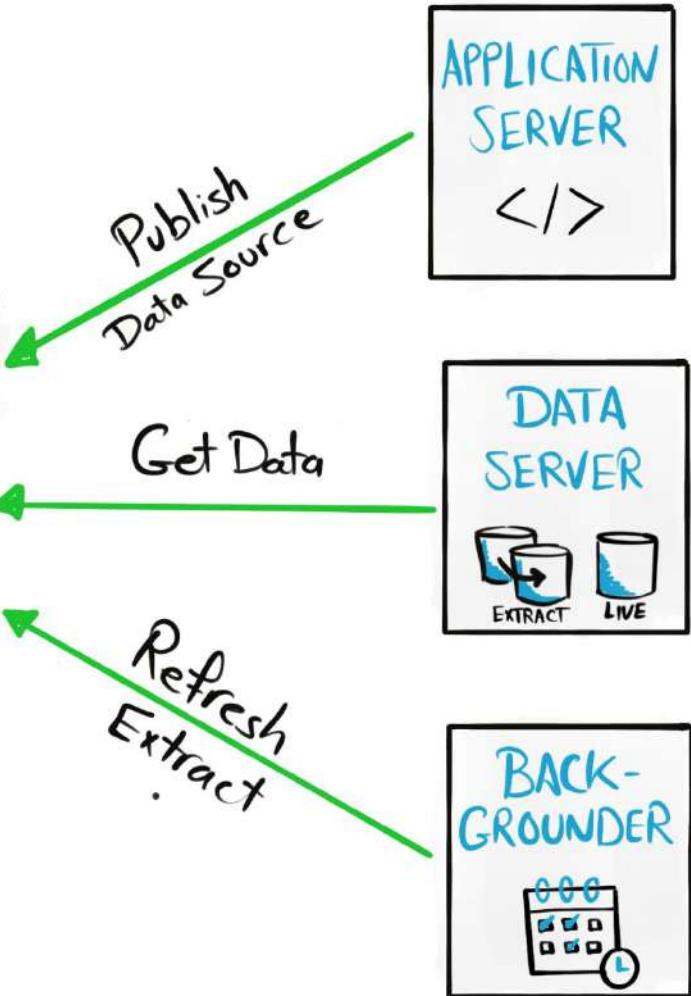
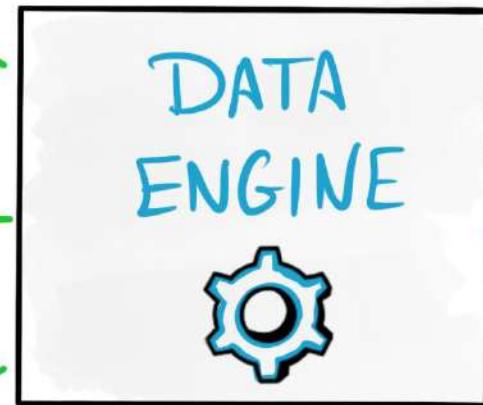
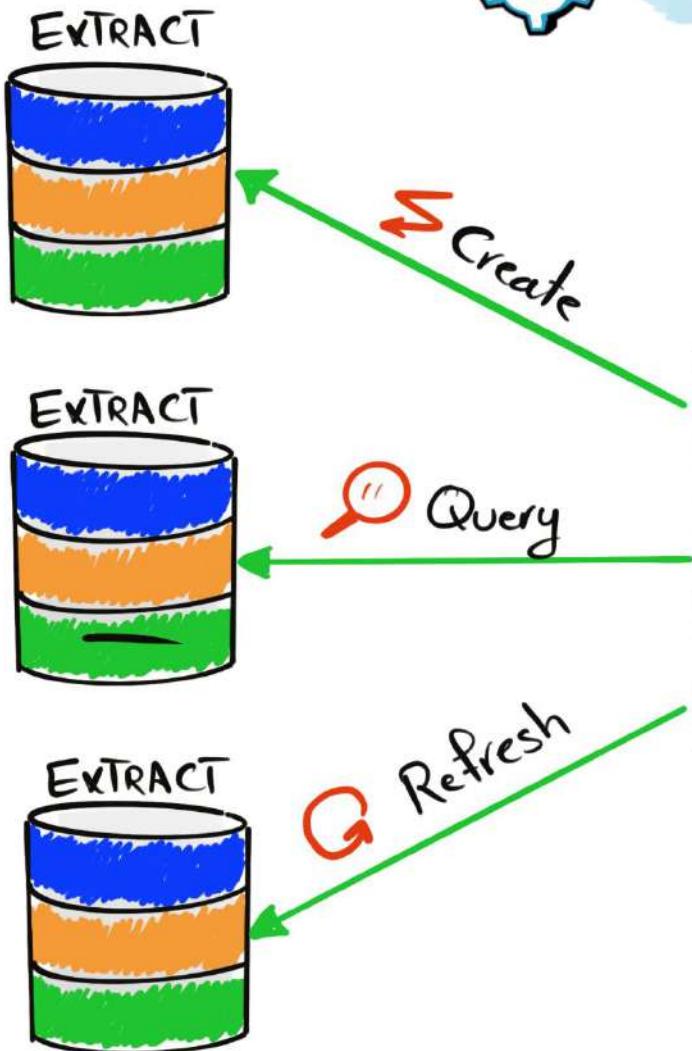


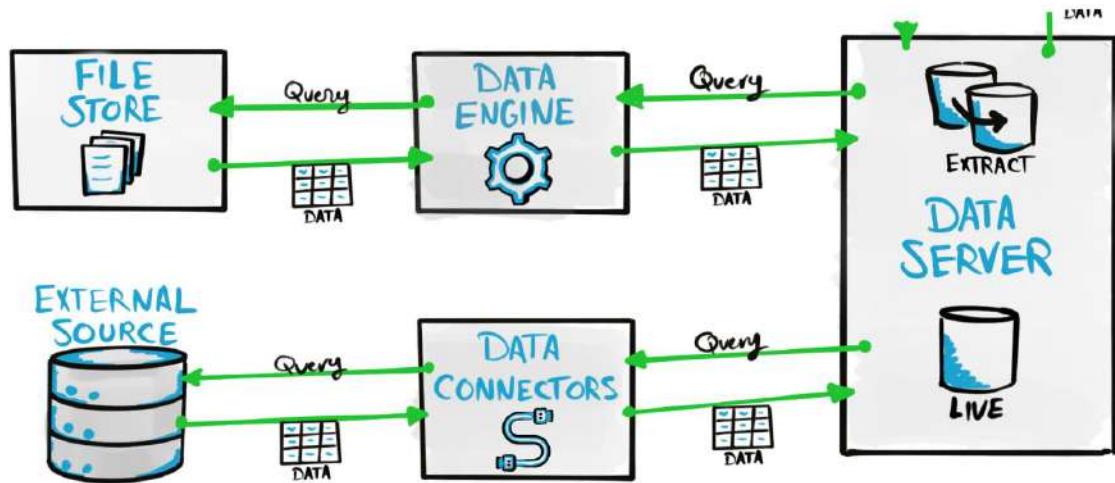
VizQL SERVER





DATA ENGINE





Manages EXTRACT & LIVE dataSources

Act as Proxy

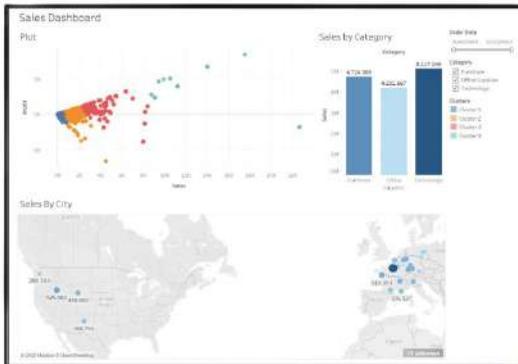
Enforces data Security

Driver deployment



REPOSITORY

WORKBOOK DATA



```
<metadata class='column'>
  <name> Code </name>
  <type> Integer </type>
  <count> 631 </count>
</metadata>
```

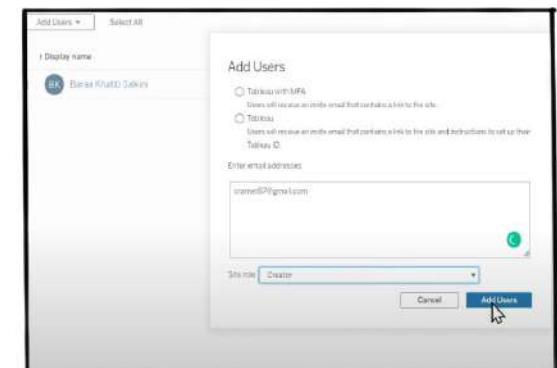
SALES.TWB

USAGE DATA



- Total active Users ?
- Total View Count ?
- Most used Data Sources

SECURITY DATA

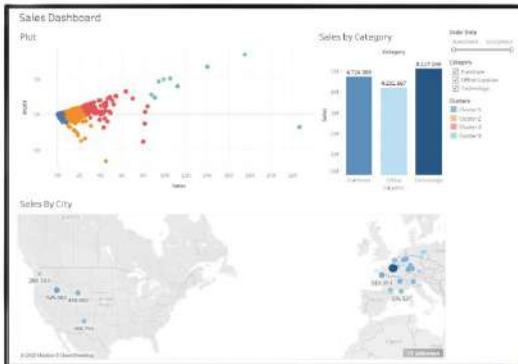


NAME	REPORT
John	Sales
Michael	Sales
Max	Finance



REPOSITORY

WORKBOOK DATA



```
<metadata class='column'>
  <name> Code </name>
  <type> Integer </type>
  <count> 631 </count>
</metadata>
```

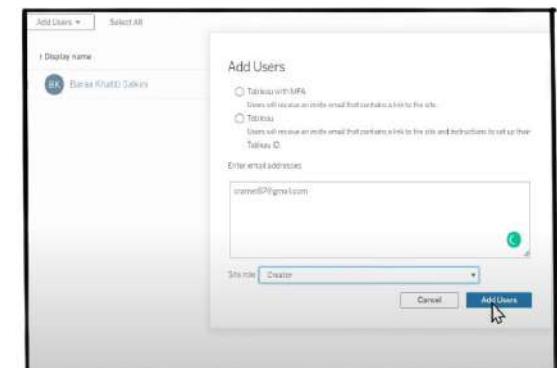
SALES.TWB

USAGE DATA

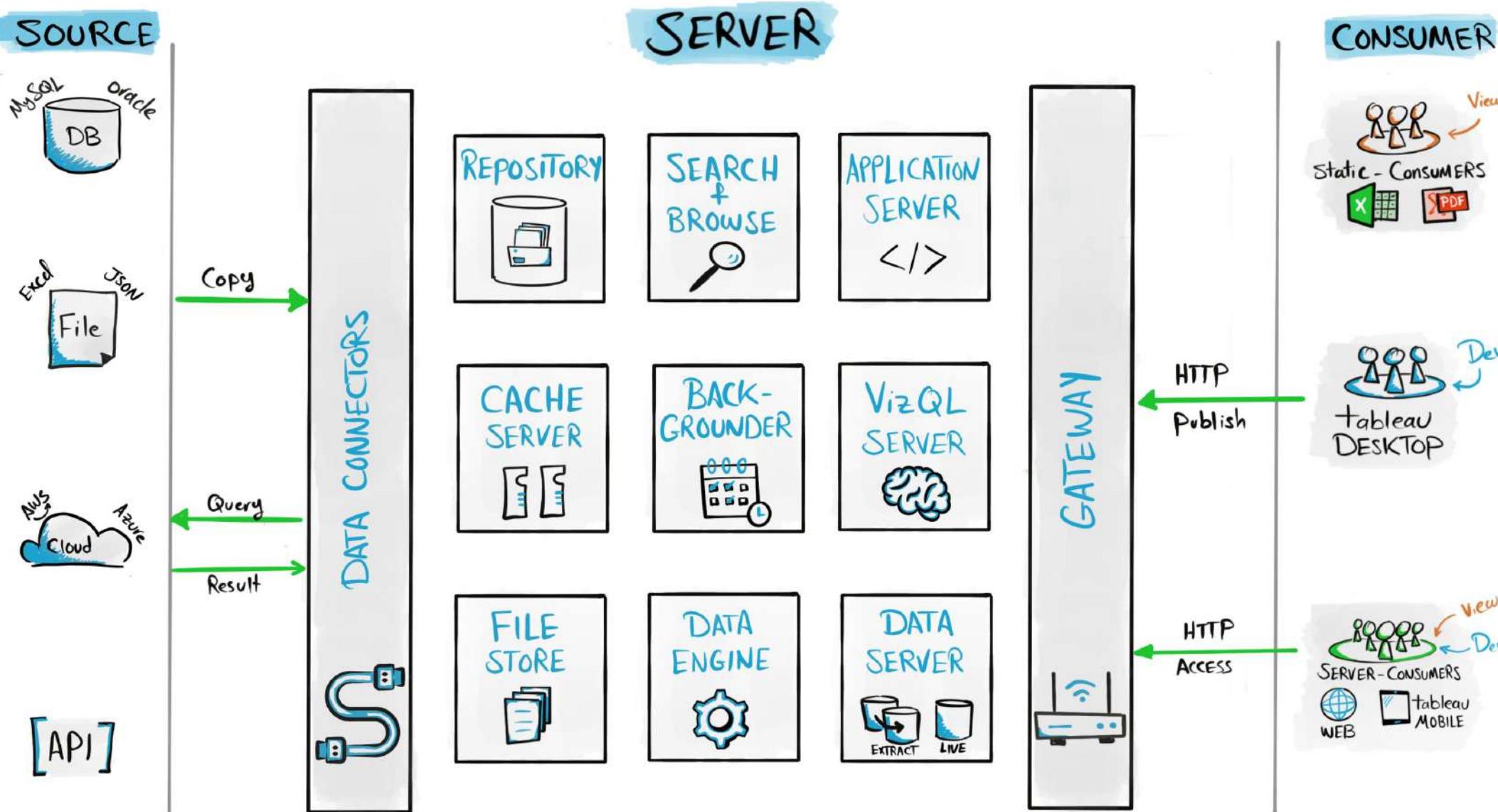


- Total active Users ?
- Total View Count ?
- Most used Data Sources

SECURITY DATA



NAME	REPORT
John	Sales
Michael	Sales
Max	Finance

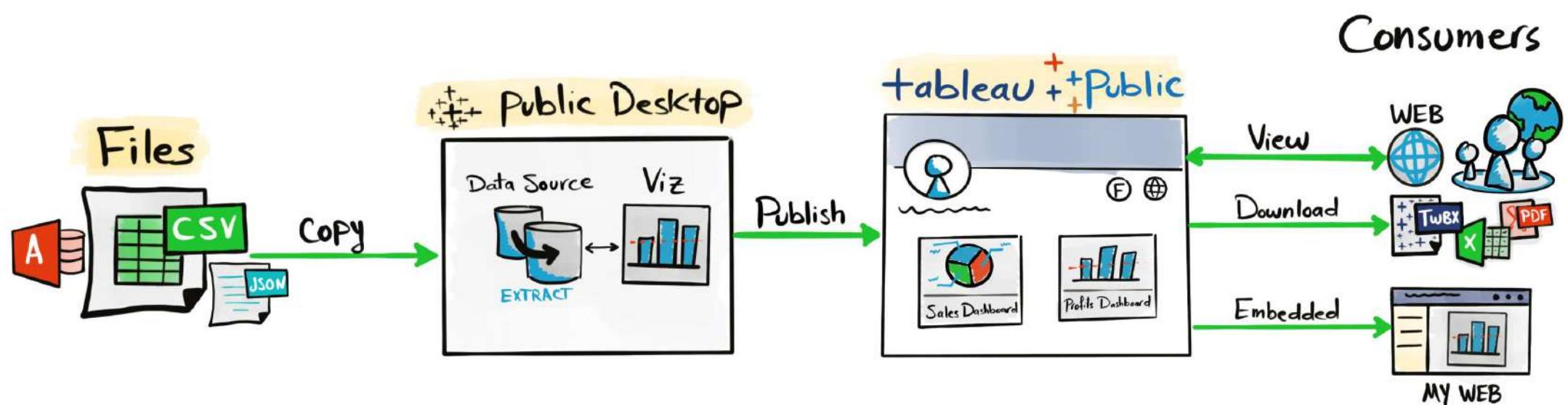


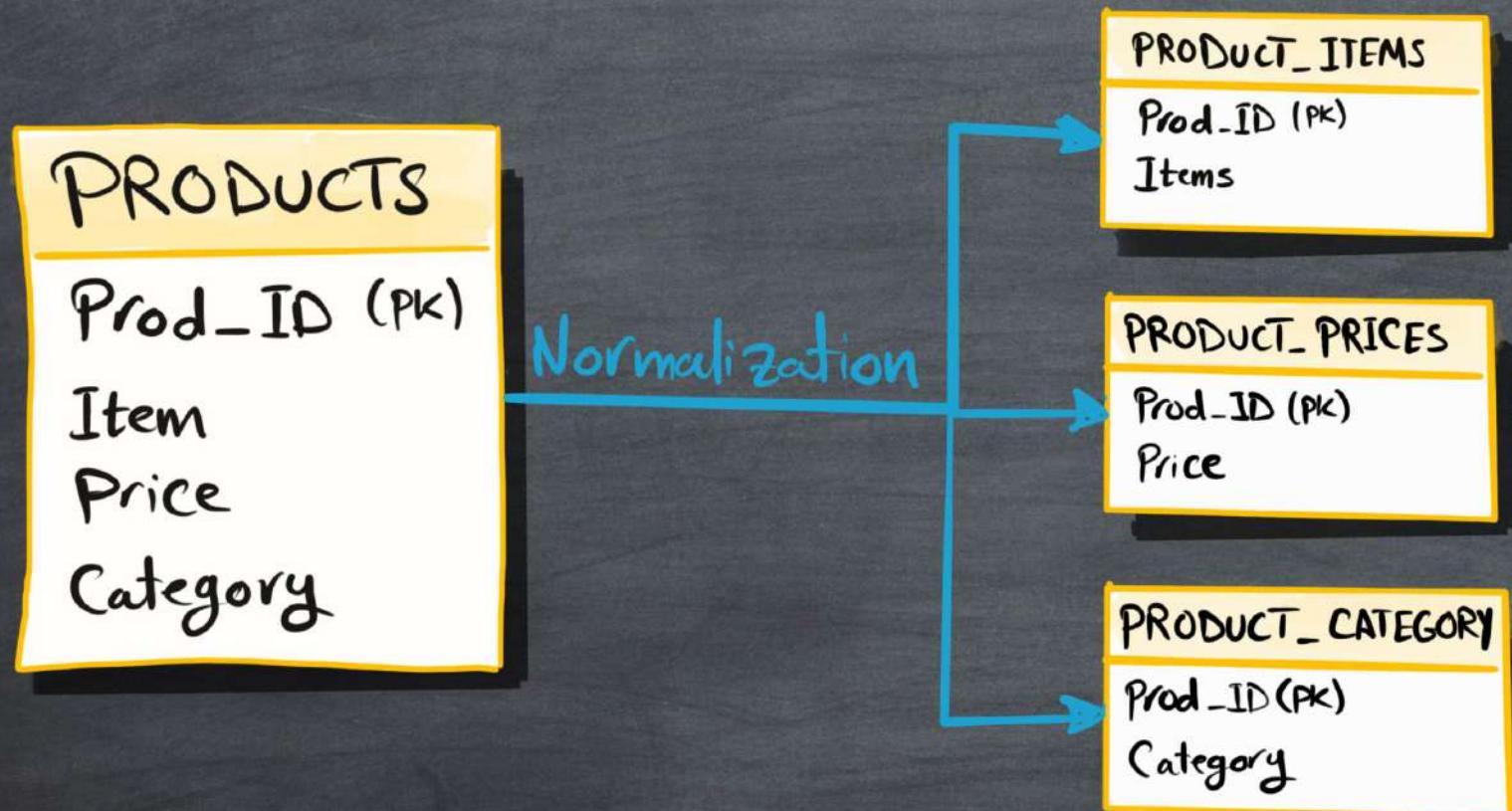


+ a b | e a u

Tableau Public Architecture

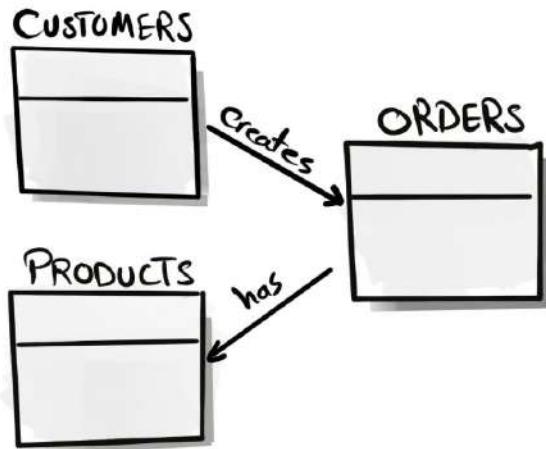
DATA WITH BARAA



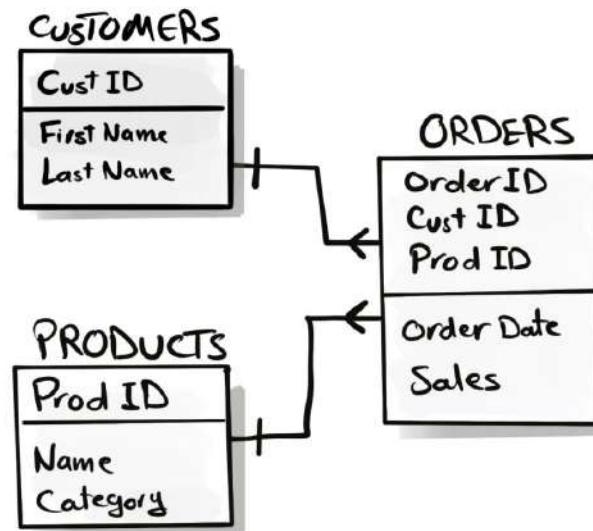




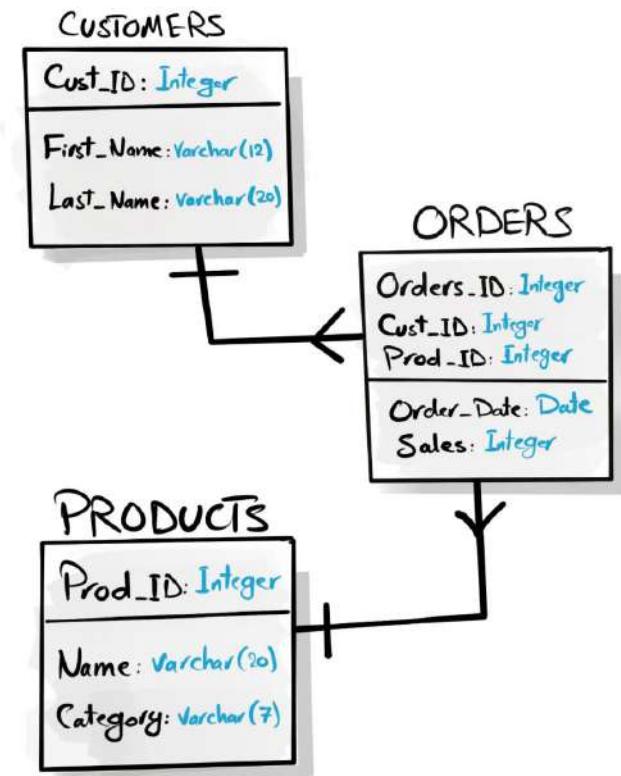
Conceptual Data Model



Logical Data Model

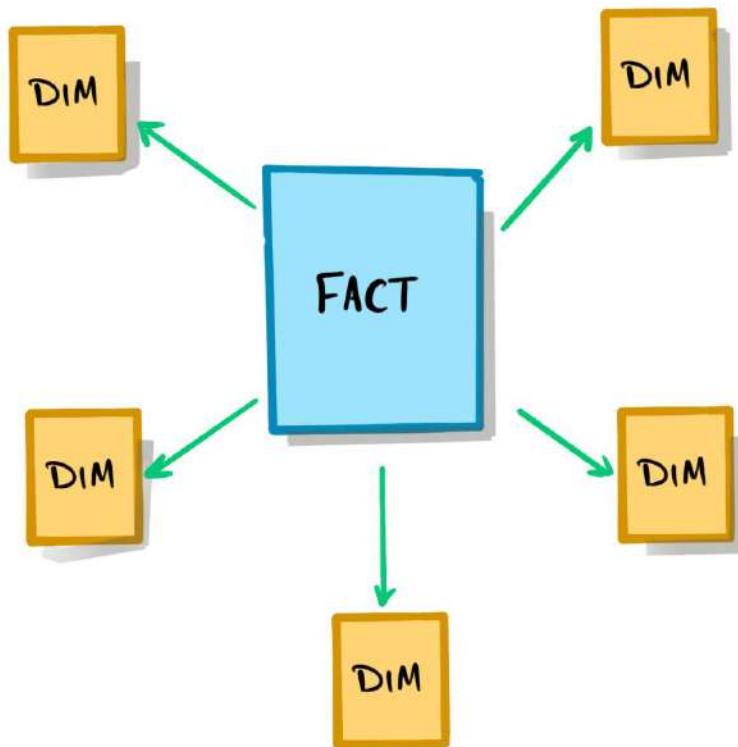


Physical Data Model

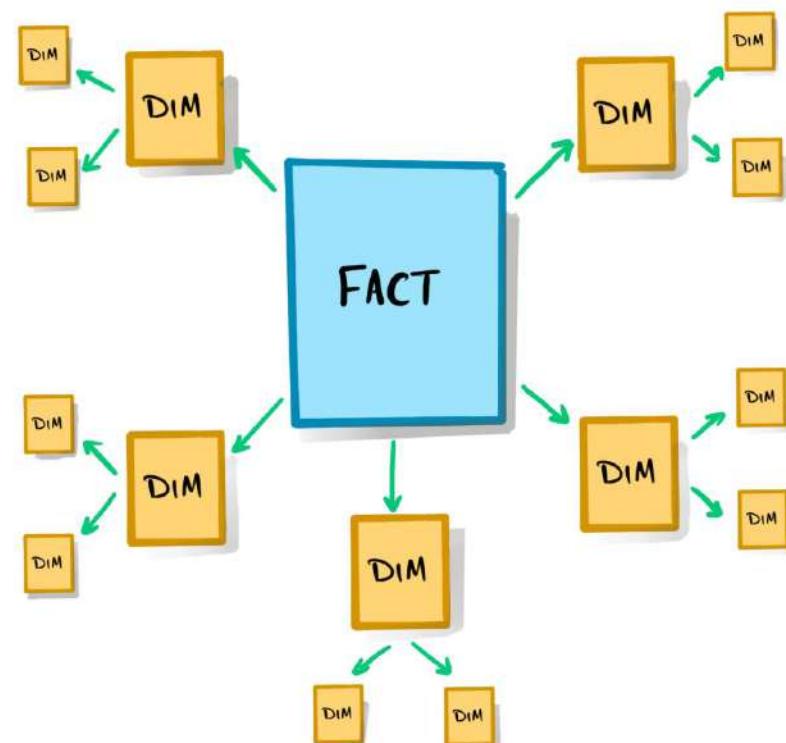




STAR SCHEMA

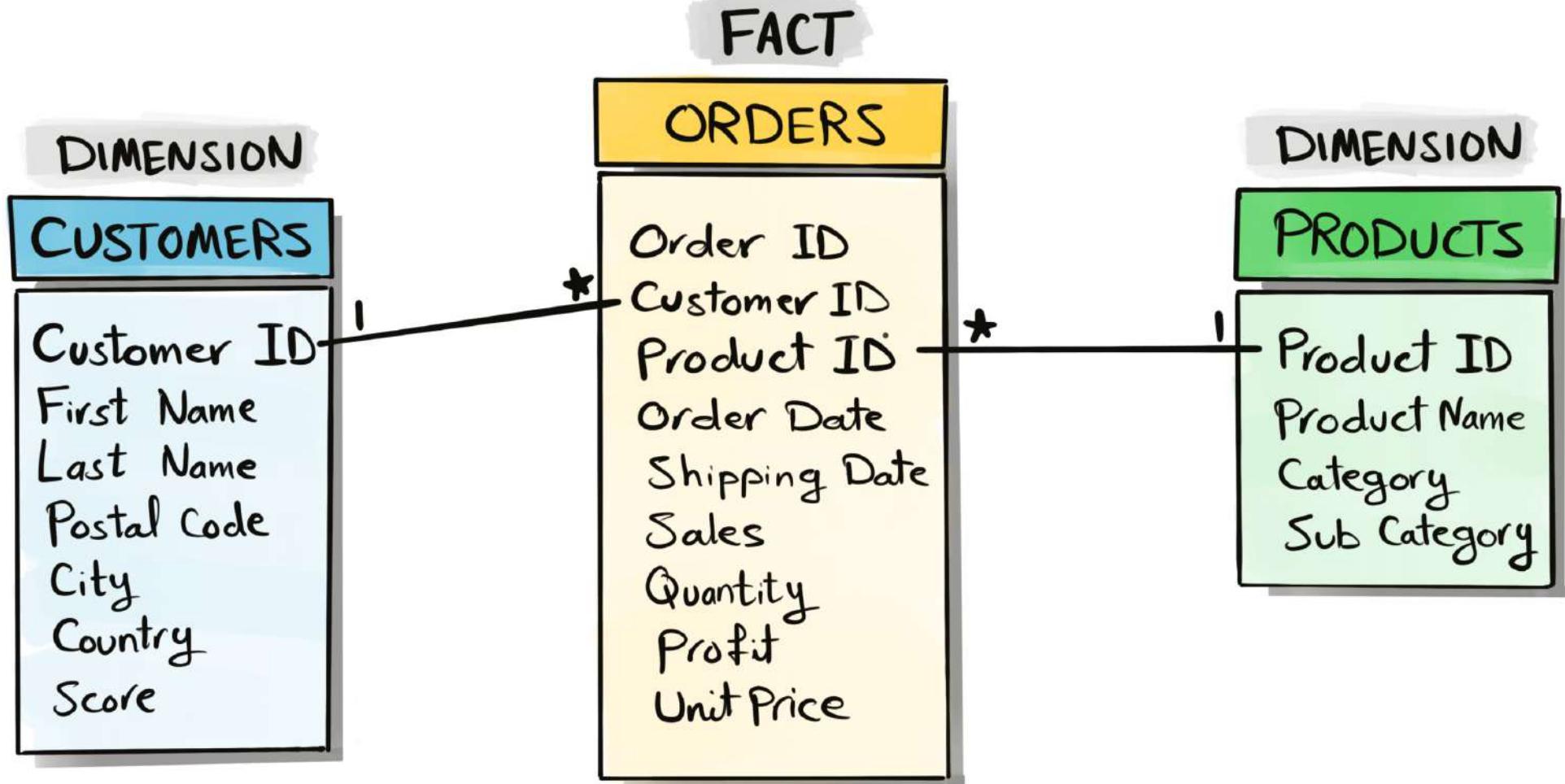


SNOWFLAKE SCHEMA





STAR SCHEMA





VIZ

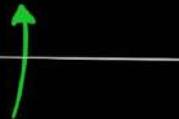
DATA SOURCE

Physical Layer

Logical Table

Relationship

Logical Table



Physical Layer

Physical Table

JOIN

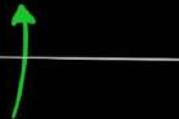
Physical Table



Physical Table

UNION

Physical Table



Logical Table

Logical Table

Logical Table

Logical Table



JOIN

Physical Table

Physical Table

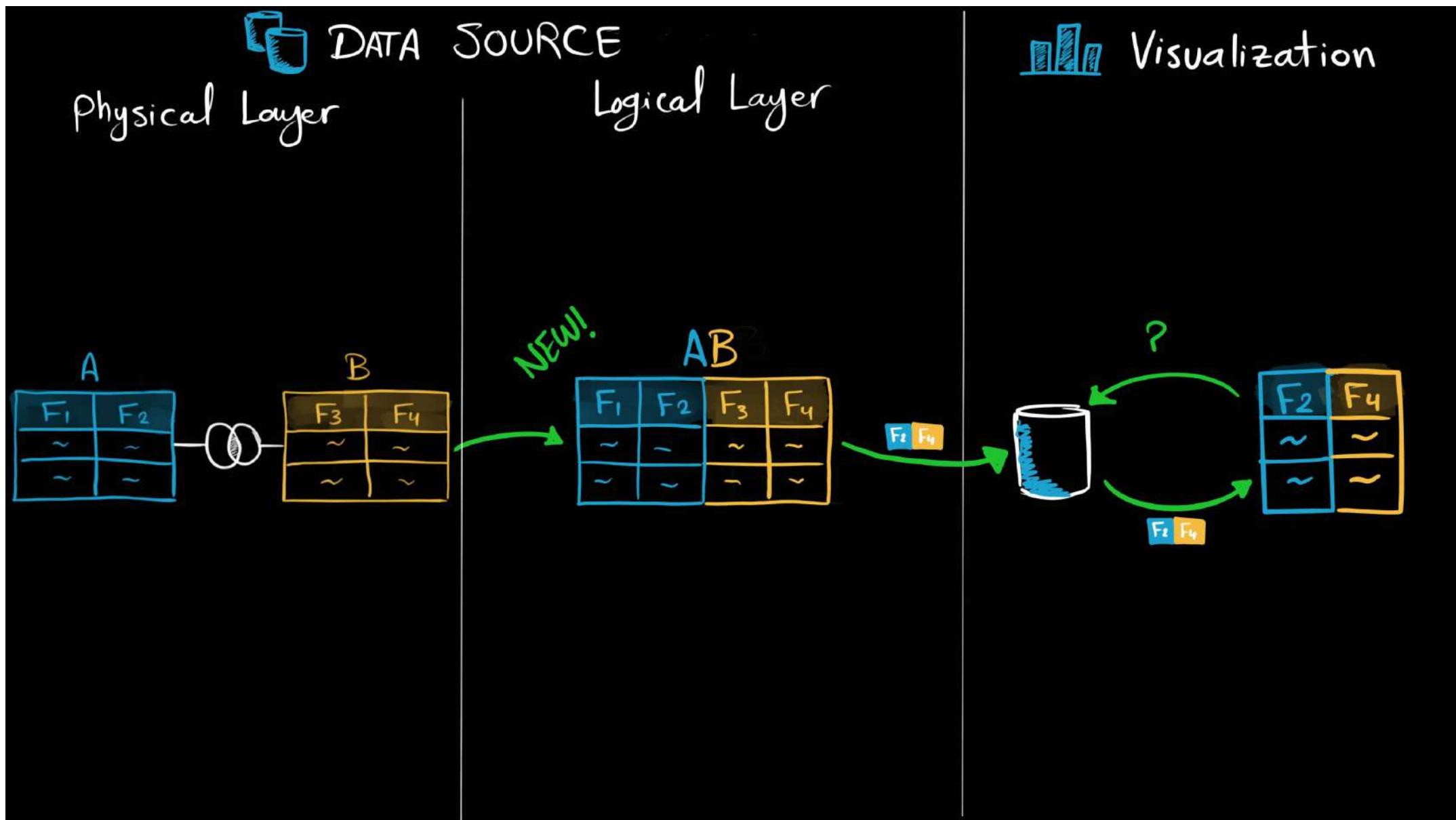


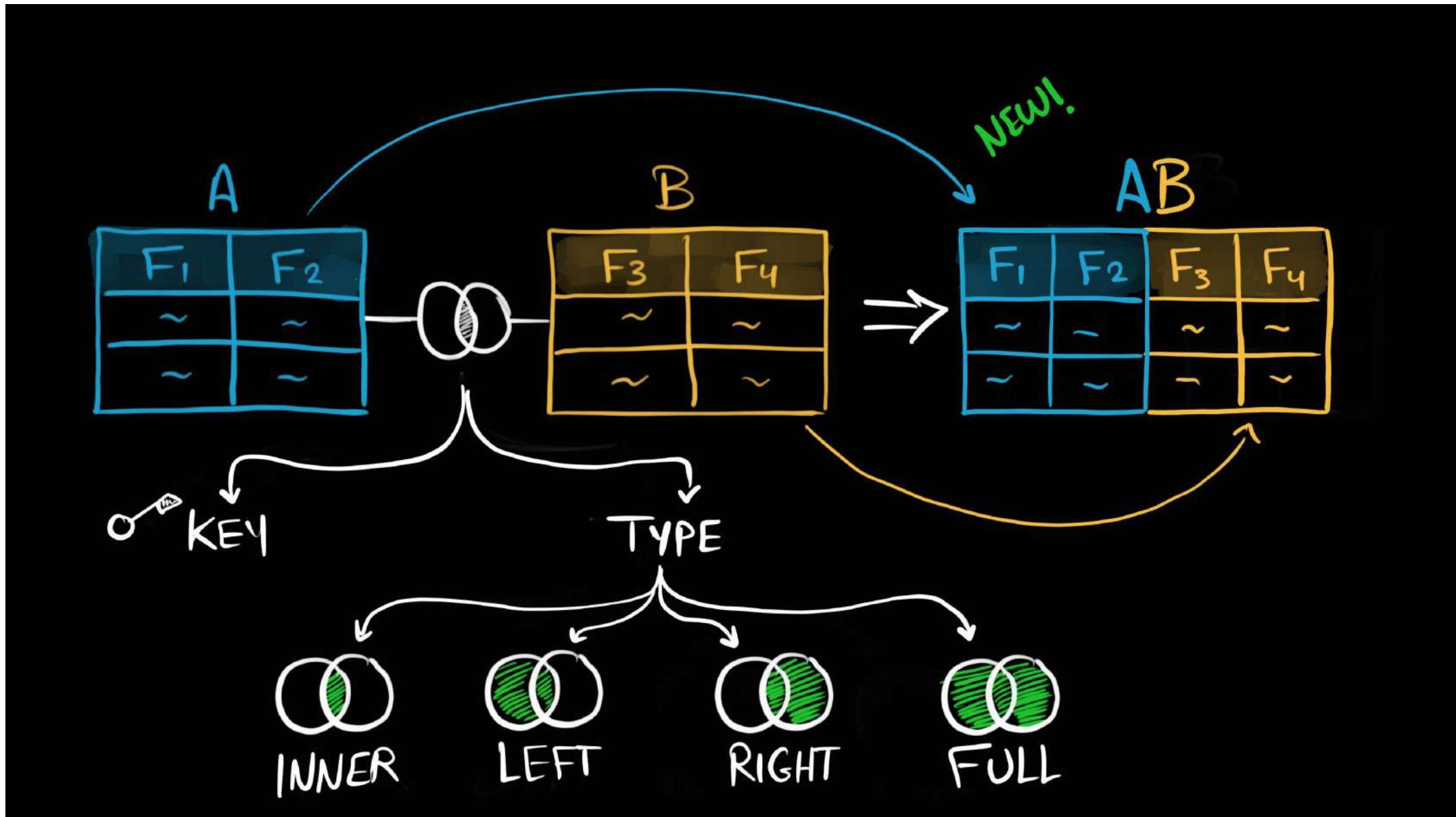
Blending

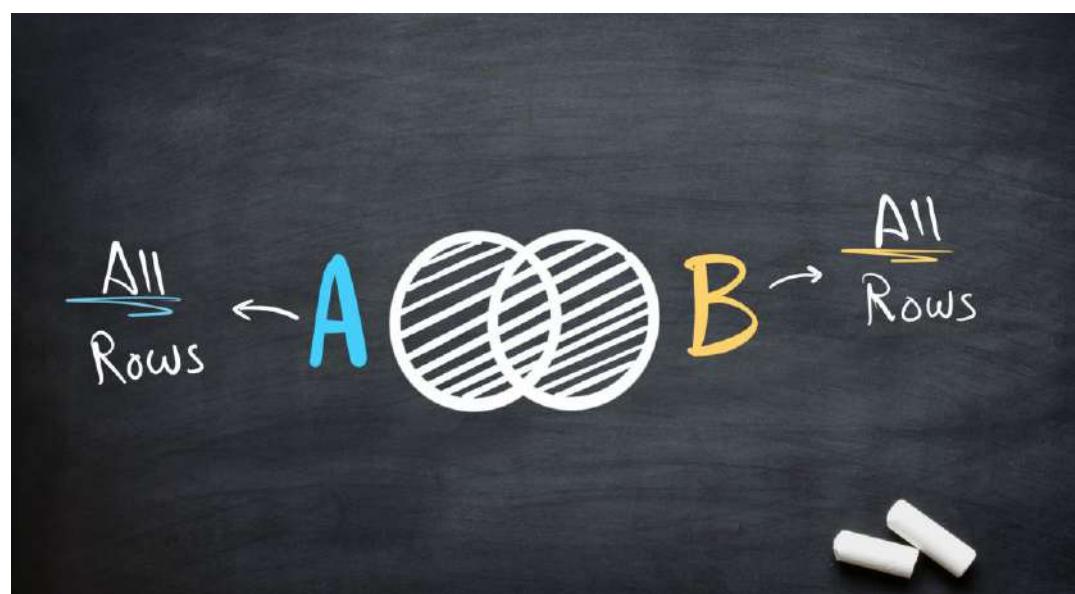
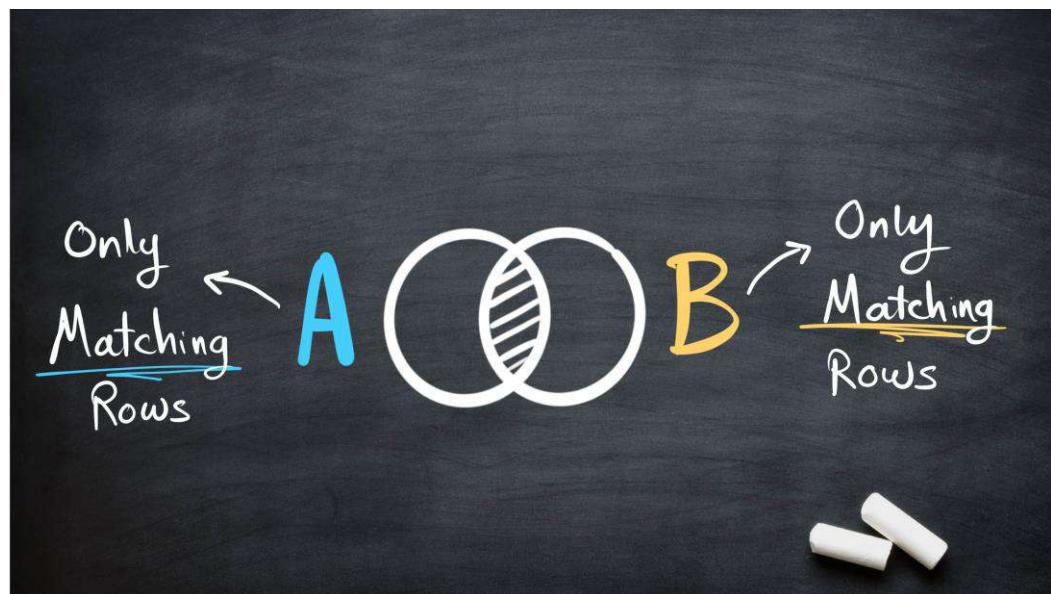
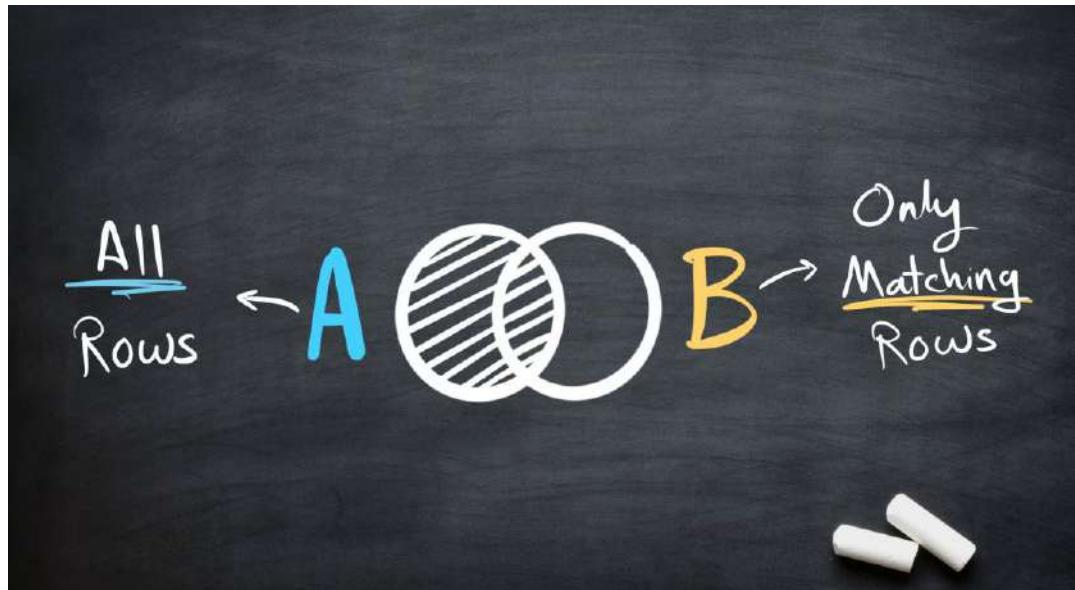


Logical Table

Logical Table









CustomerNames

ID	Name
1	Maria
2	John

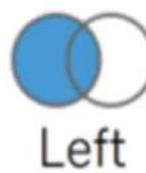


CustomerAges

ID	Age
1	20
3	35



ID	Name	ID	Age
1	Maria	1	20



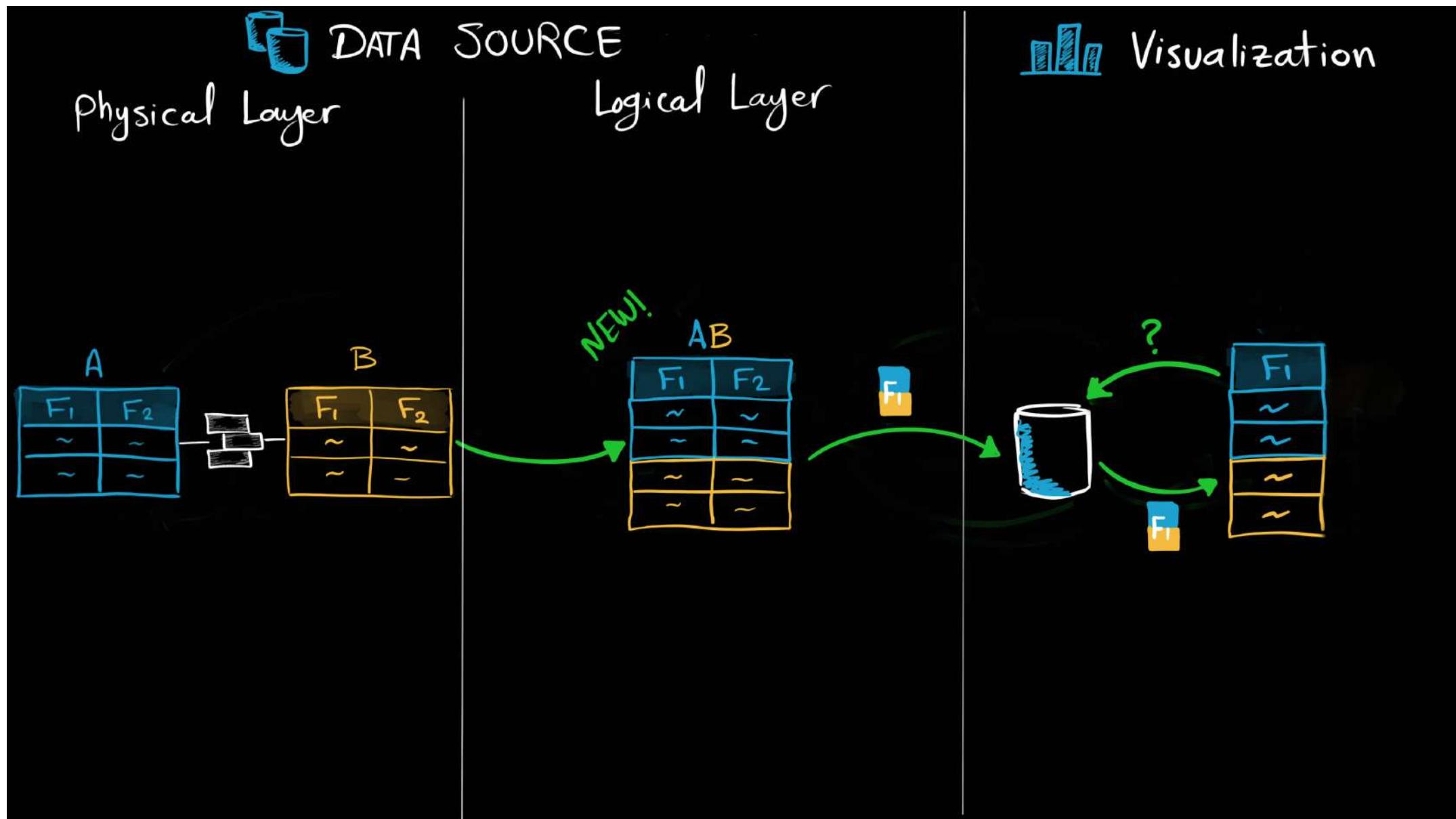
ID	Name	ID	Age
1	Maria	1	20
2	John	NULL	NULL



ID	Name	ID	Age
1	Maria	1	20
NULL	NULL	3	35

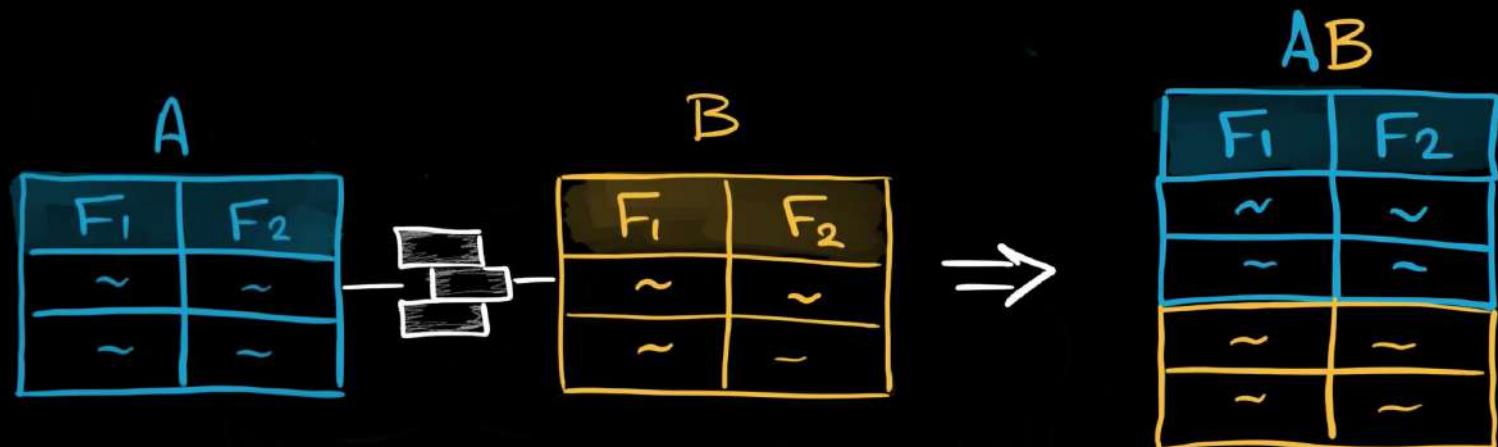
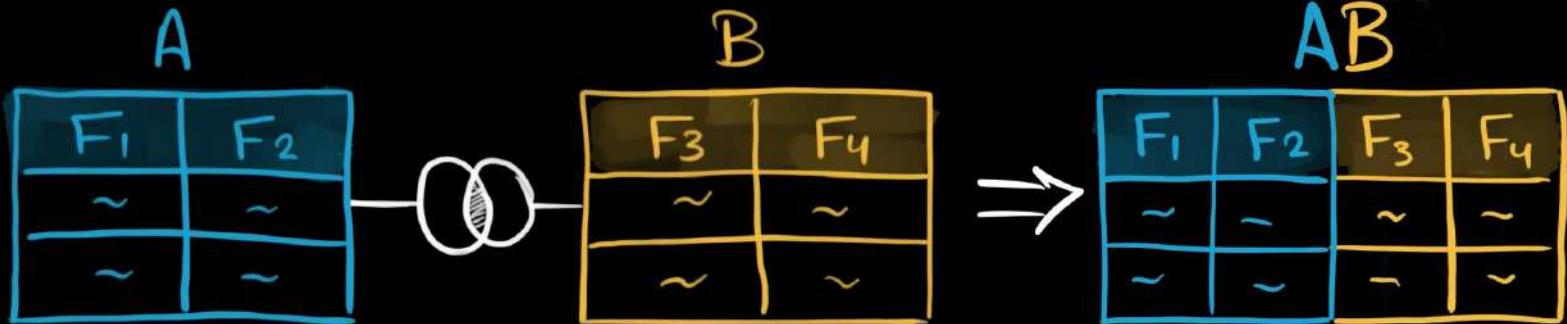


ID	Name	ID	Age
1	Maria	1	20
2	John	NULL	NULL
NULL	NULL	3	35





JOIN Combine the FIELDS of two Tables



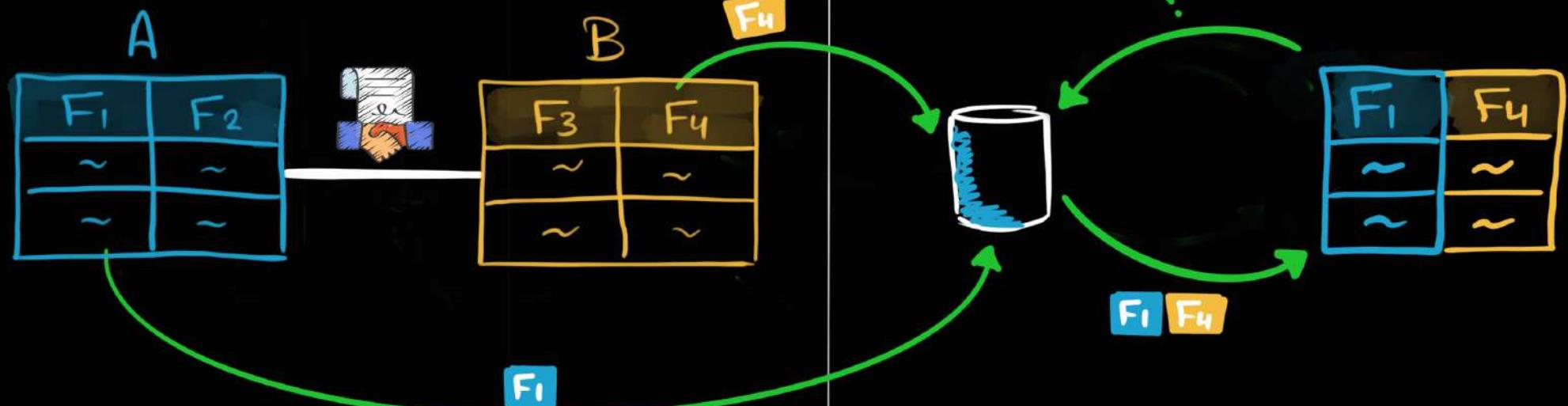
UNION Combine the ROWS of two Tables



DATA SOURCE
Logical Layer



Visualization

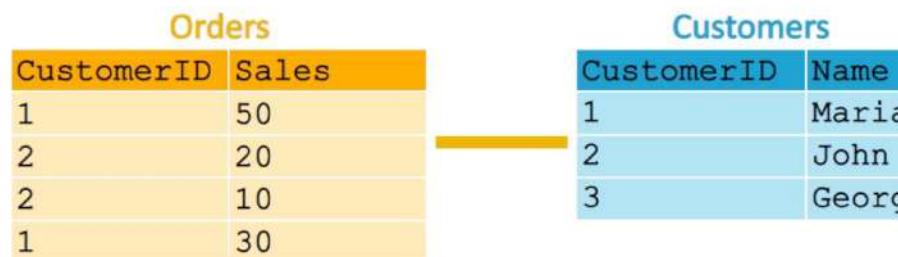




LEFT TABLE	RIGHT TABLE	JOIN TYPES
Some Record Match	Some Record Match	
All Record Match	Some Record Match	
Some Record Match	All Record Match	
All Record Match	All Record Match	



Relationships | How it Works



MANY-MANY

CustomerID	Sum(Sales)	Name
1	80	Maria
2	30	John

MANY-ONE

CustomerID	Sum(Sales)	Name
1	80	Maria
2	30	John

ONE-MANY

CustomerID	Sum(Sales)	Name
1	50	Maria
2	20	John

ONE-ONE

CustomerID	Sum(Sales)	Name
1	50	Maria
2	20	John

Correctness Performance

OK	NOK
----	-----

Cardinality

MANY	MANY
------	------

OK	OK
----	----

ONE	ONE
-----	-----

NOK	NOK
-----	-----

ONE	MANY
-----	------

NOK	OK
-----	----

ONE	ONE
-----	-----



DATA SOURCE
Logical Layer

A

F ₁	F ₂
~	~
~	~
~	~

F₁

B

F ₃	F ₄
~	~
~	~
~	~

F₄

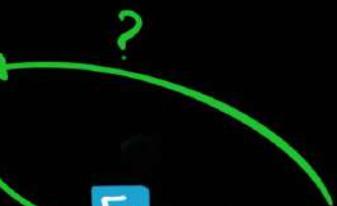
Visualization



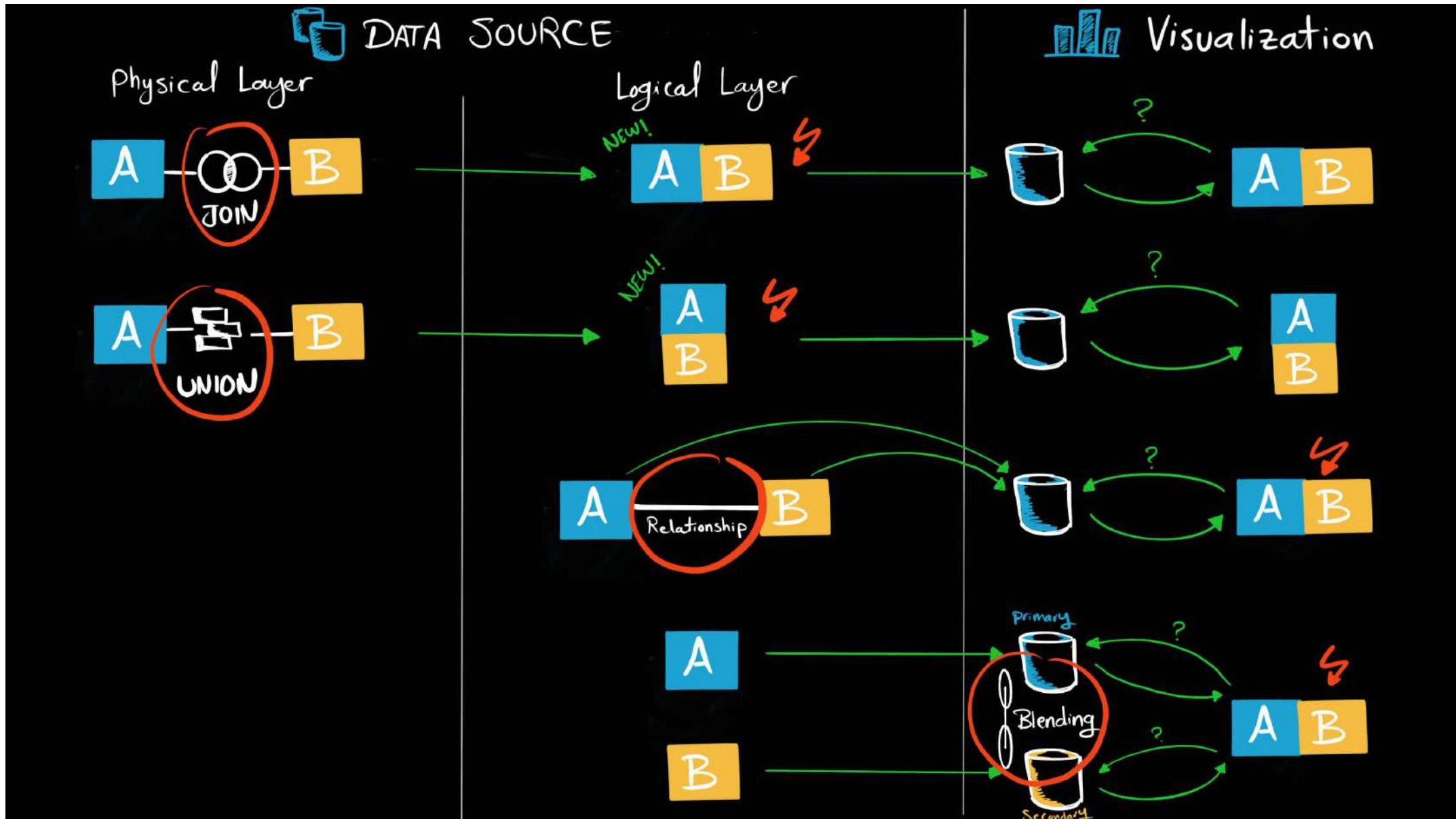
Primary



Secondary

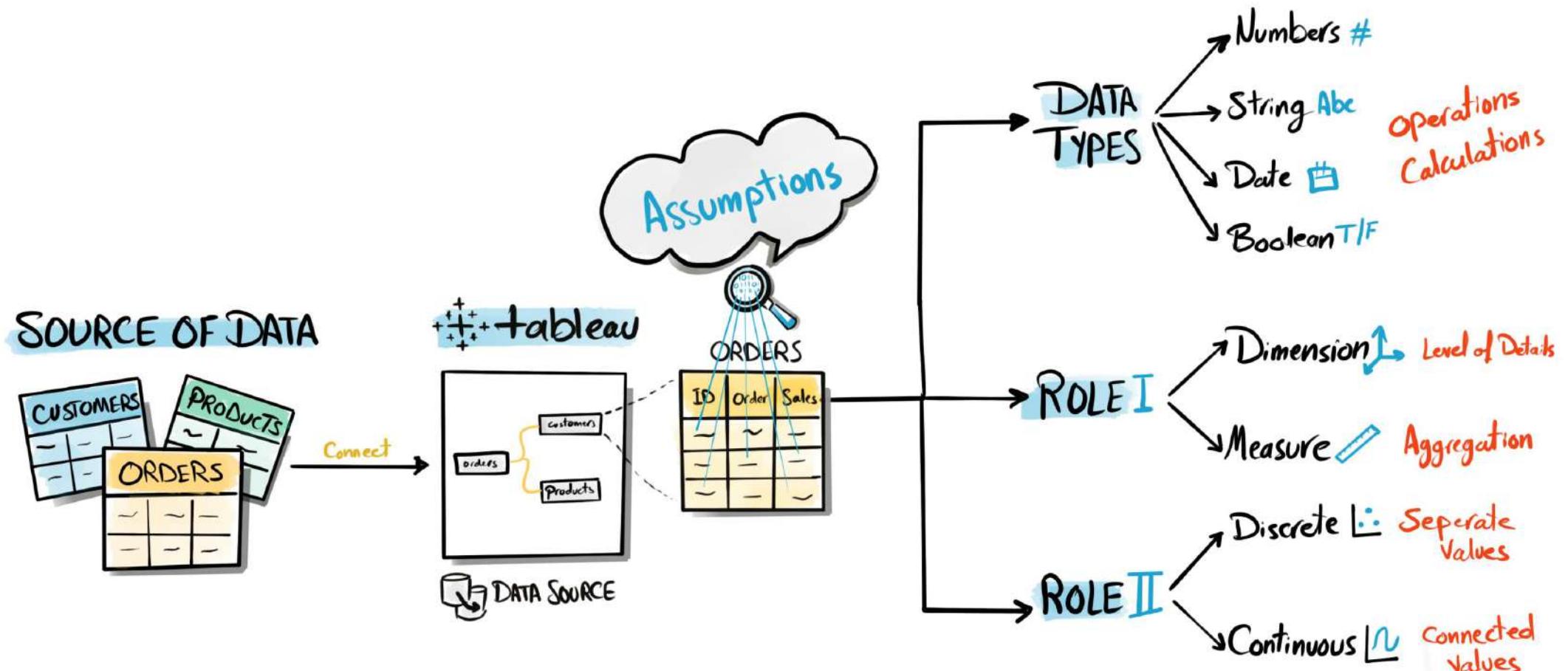


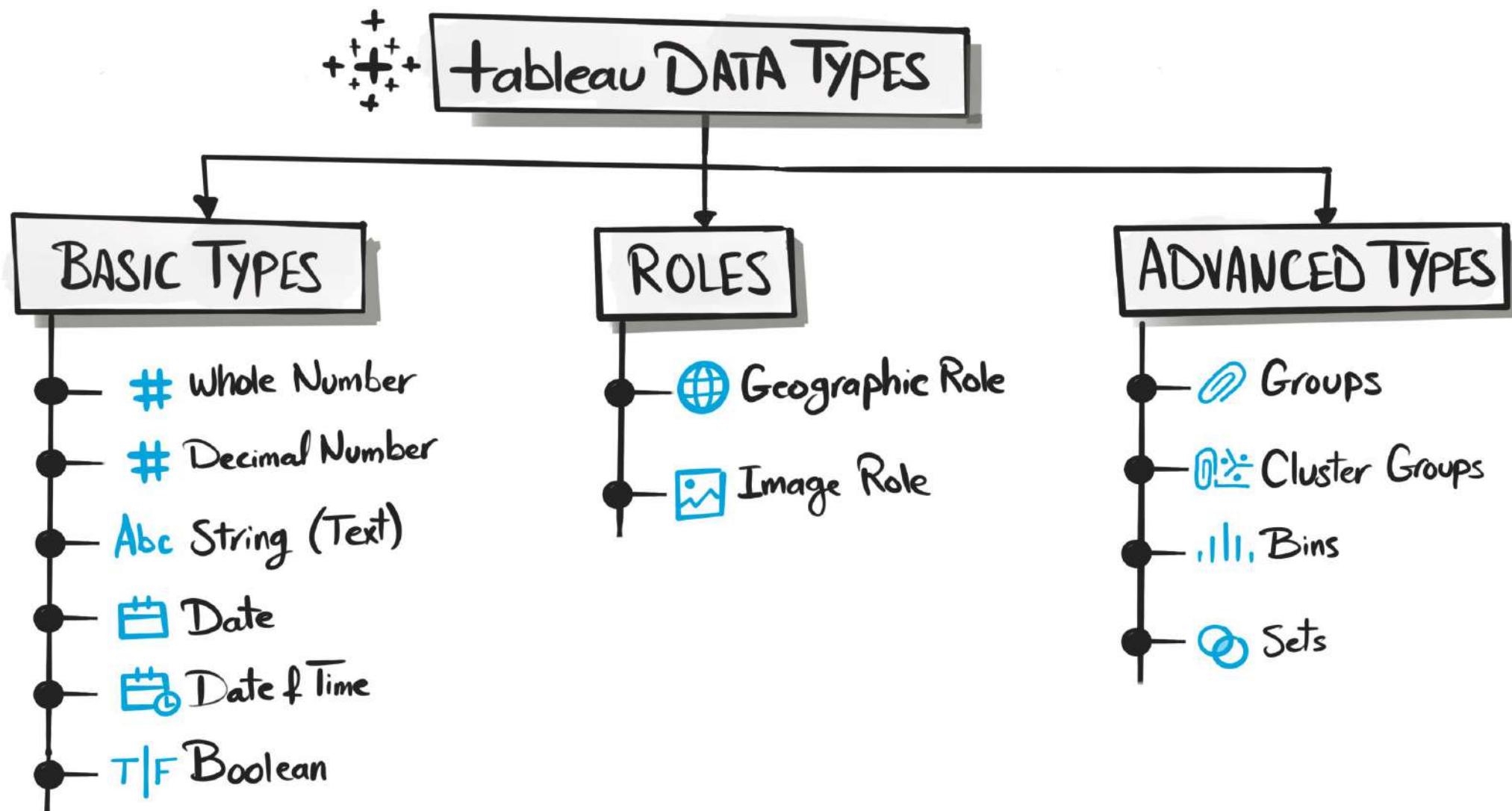
F ₁	F ₄
~	~
~	~
~	~

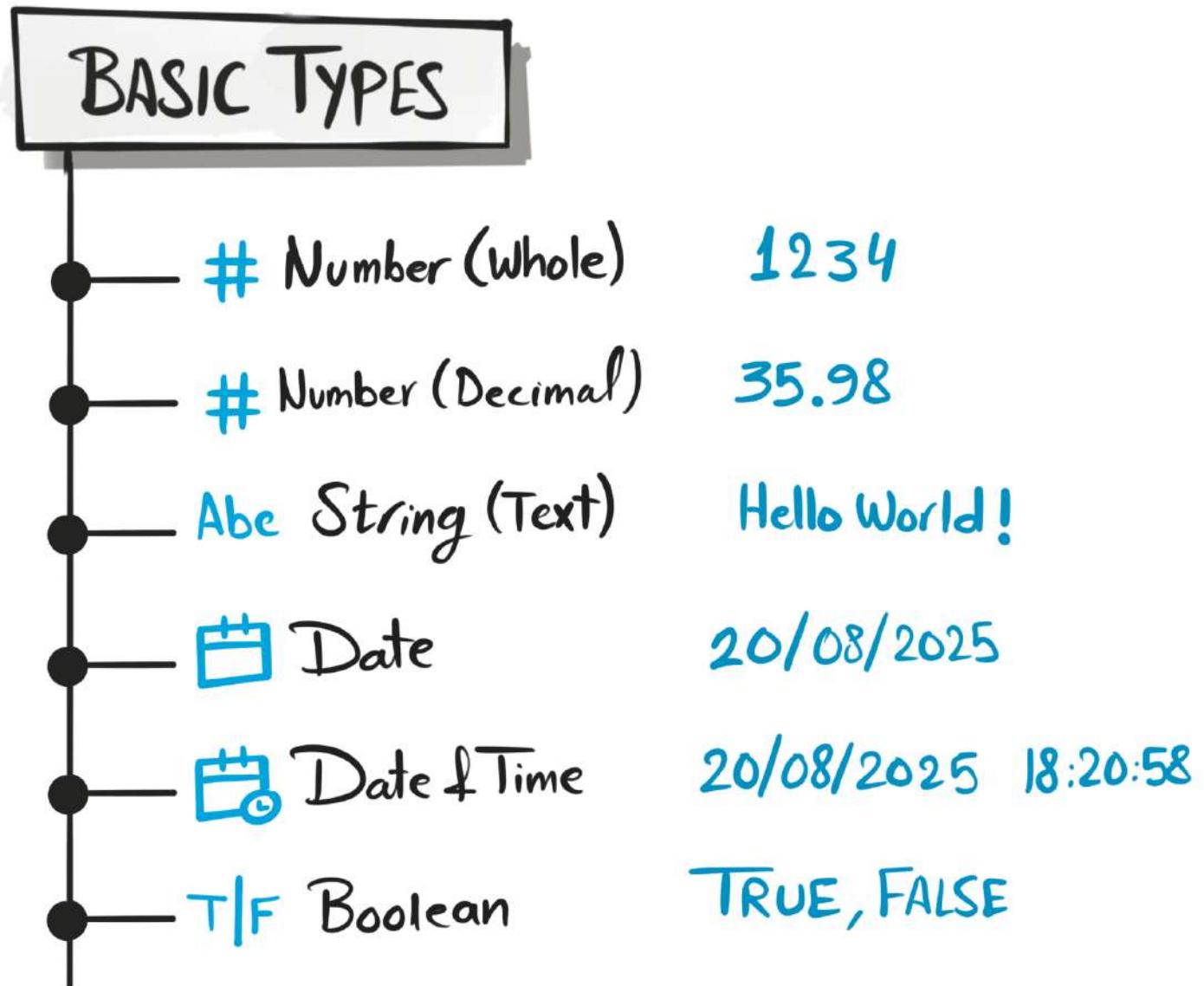




Layer	Physical Layer	Physical Layer	Logical Layer	Visualization Level
Multi-Data Sources	✗	✗	✗	✓
Merge Tables?	✓	✓	✗	✗
Flexibility	Static	Static	Flexible	Very Flexible (Page by Page)
Join Types	n/a	Inner, Left, Right, Full	All	Left
Rank	n/a	3	1 (Default)	2

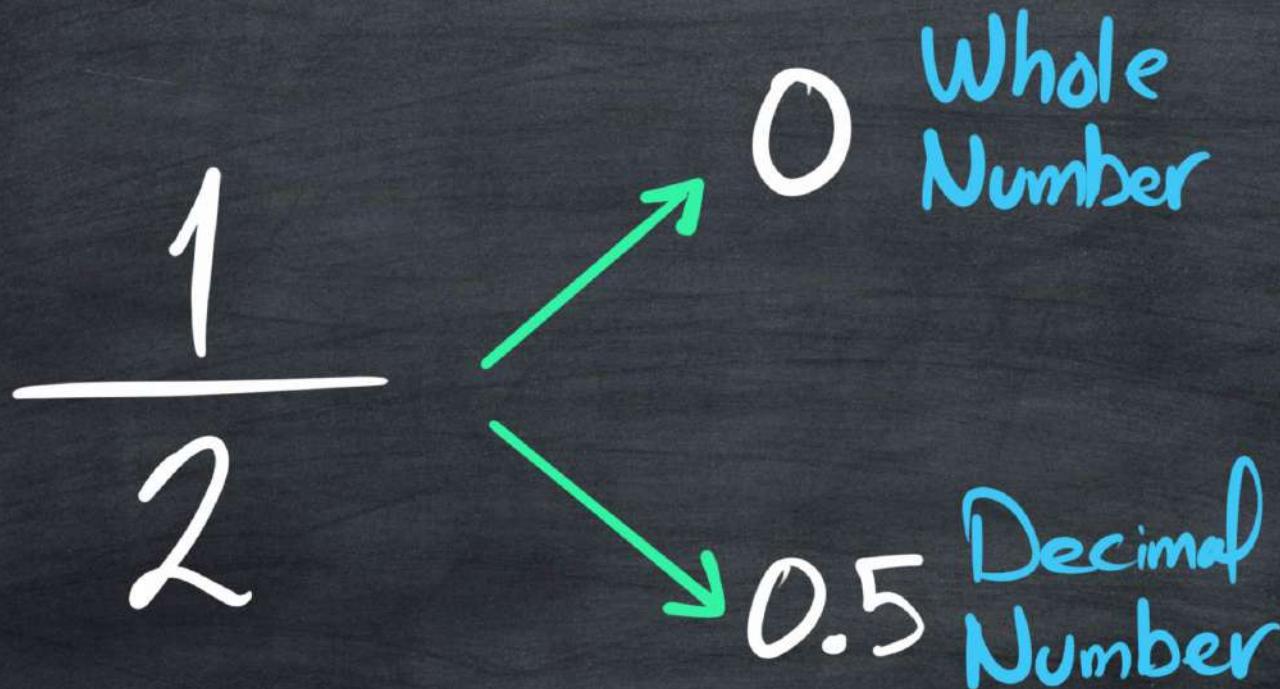








#





Abc

A B x s 1 3 5 \$?

White
Space





Abc

A B x s 1 3 5 \$?

White
Space





DATE

2025 - 08 - 20
Y Y Y Y - M M - d d

DATE FORMAT





DATE

2025 - 08 - 20
Y Y Y Y - M M - d d

TIME

18 : 48 : 53
H H : M M : S S

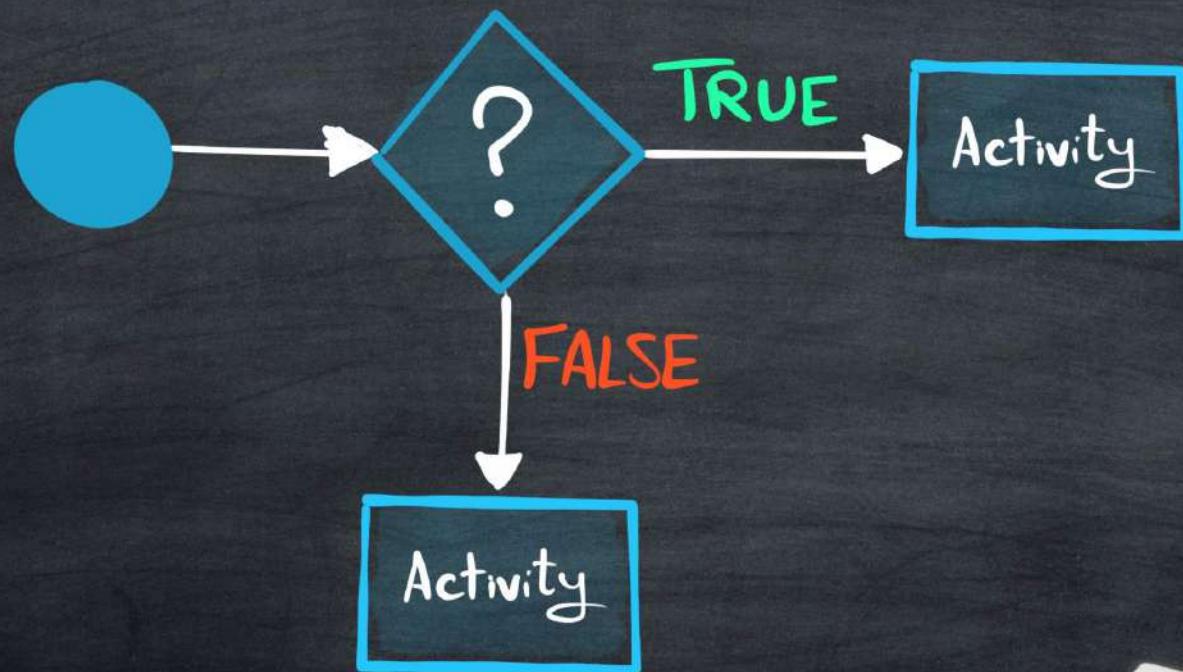
DATE FORMAT

TIME FORMAT





T|F

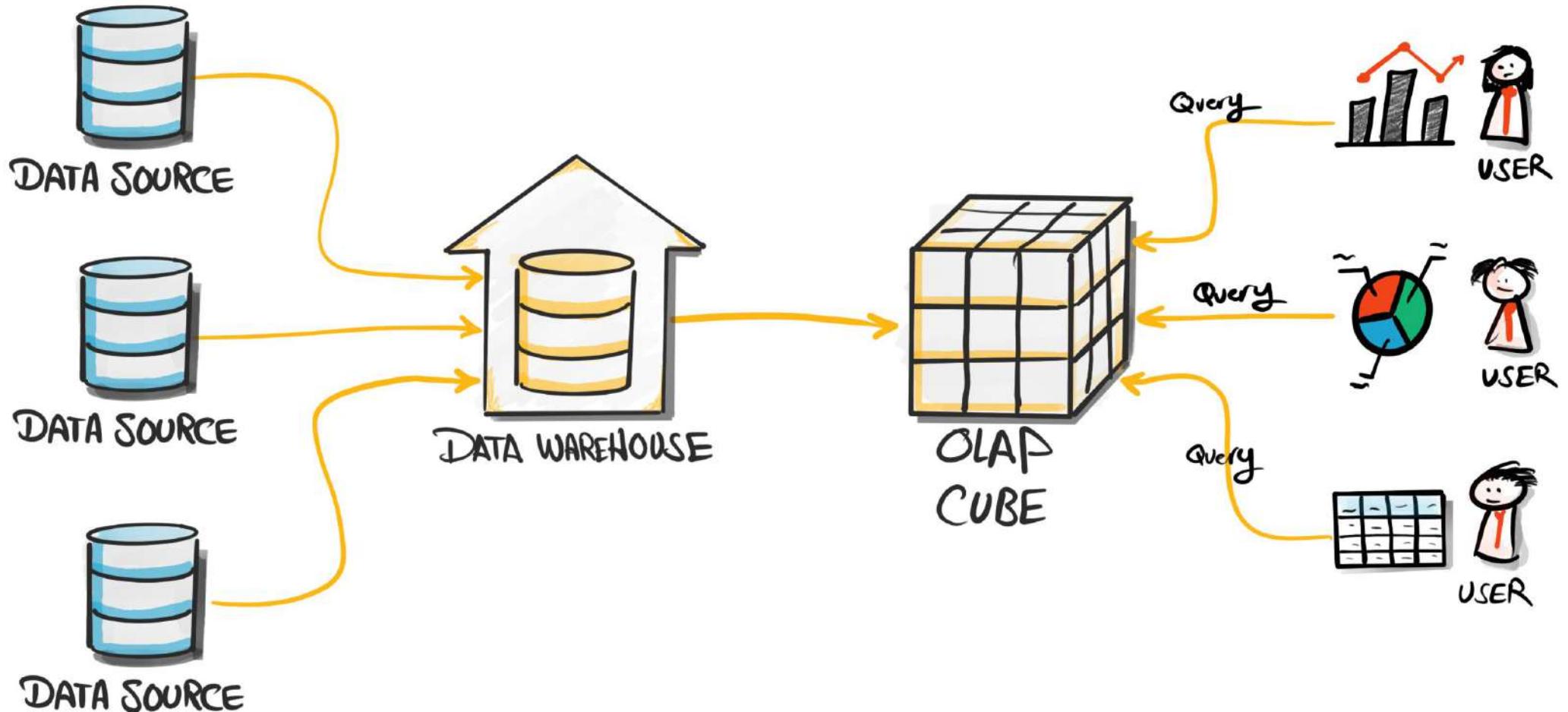


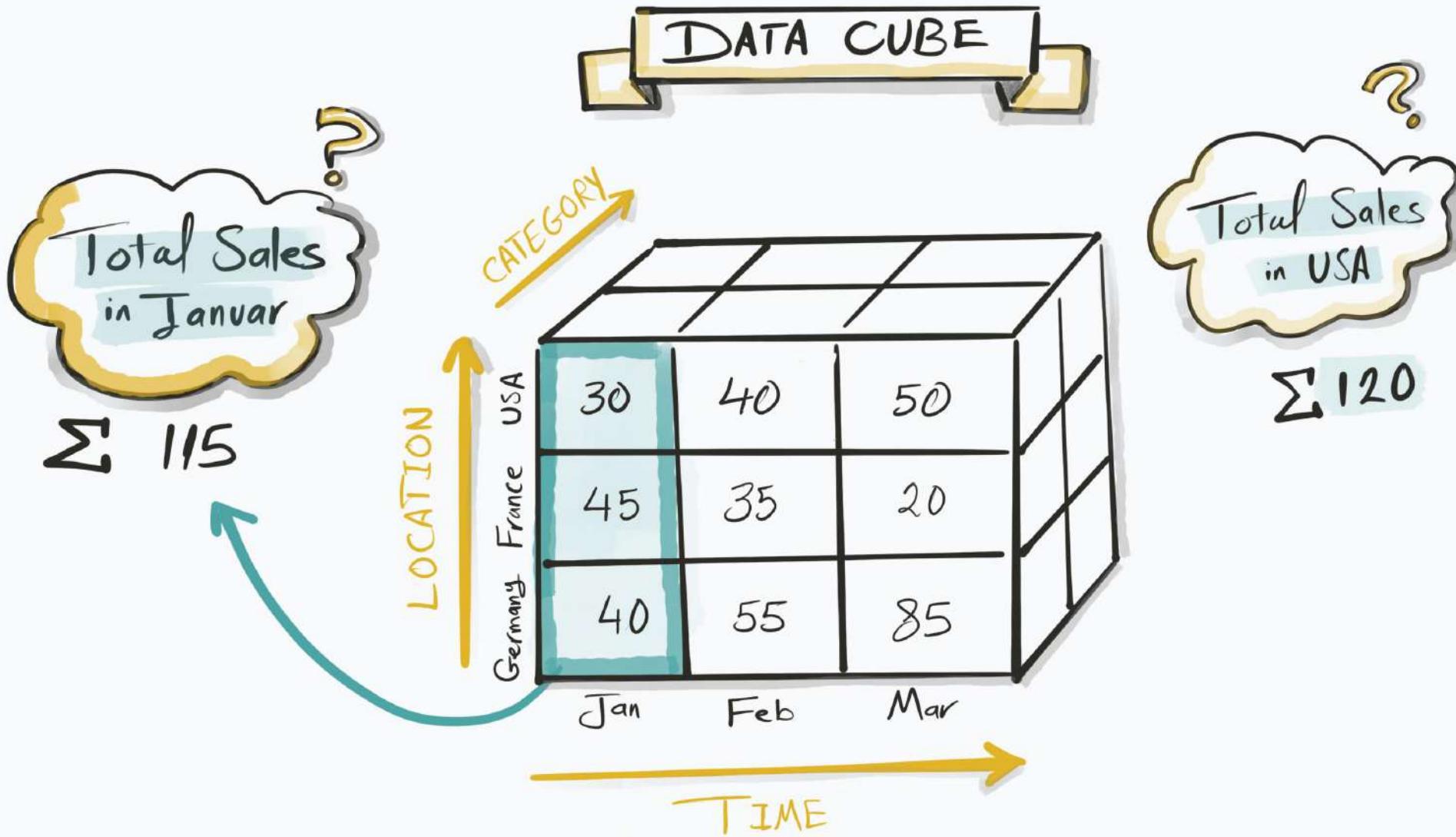


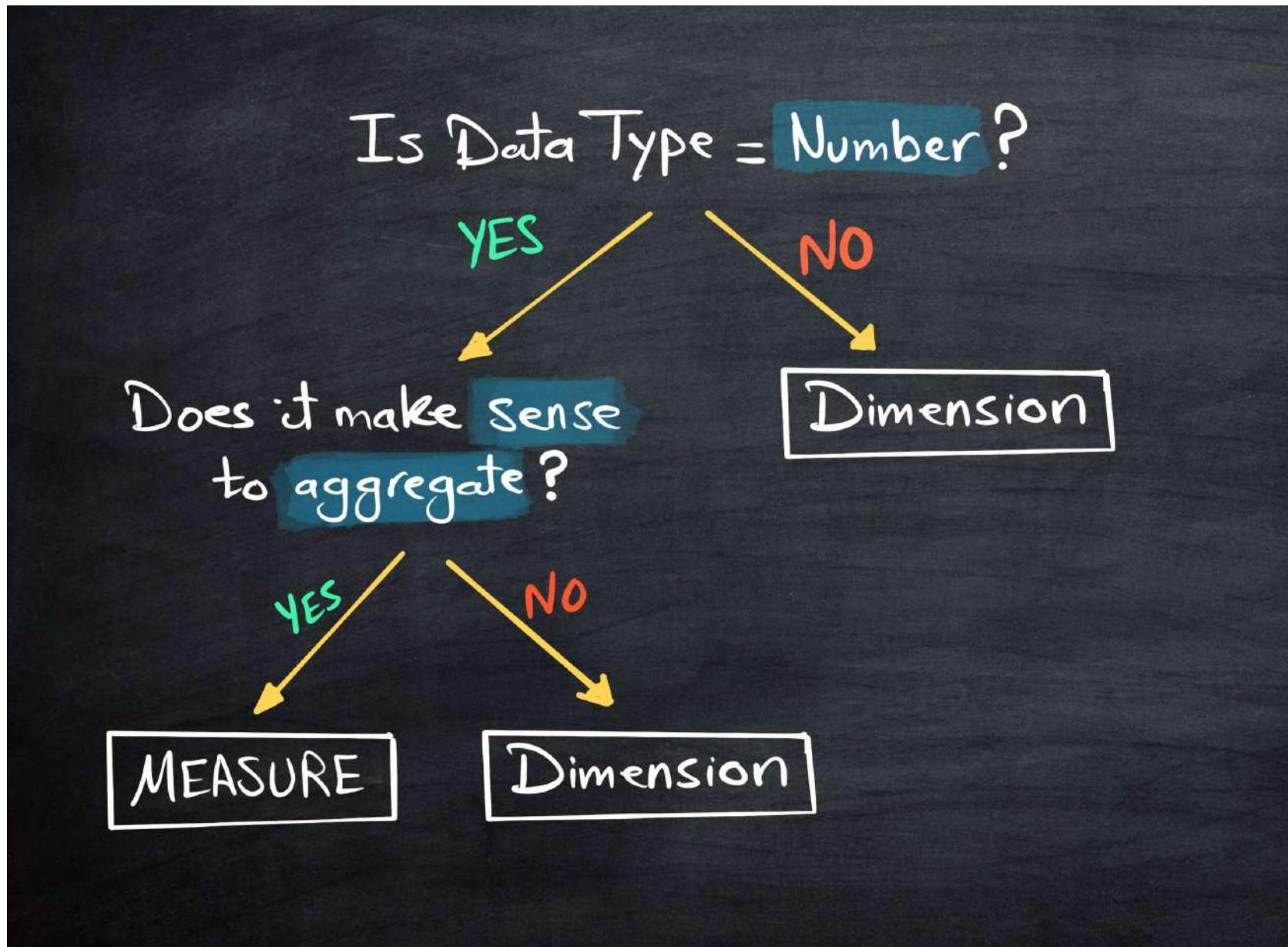
+ a b | e a u

Online Analytical Processing (OLAP)

DATA WITH BARAA









tableau

Definition

Example

Aggregation

Data Types

Role of Analysis

Granularity

Dimensions

Descriptive Values

Category, Country, ID

Can Not be aggregated

[String, Date, Boolean, Number]
Abe ☰ TIF #

Filtering, Grouping, Organising Data

LOD: Level of Details

Measures

Quantitative Values

Sales, Profit, Quantity

Aggregable [SUM, AVG, MIN, MAX]

[Number]
#

Calculations & Numerical Analysis

Determine Quantity being Measured



Discrete

11 Values

0
1
2
3
4
5
6
7
8
9
10

Continuous

∞ Values

1
1.11
1.12
1.13
1.14
1.15
.
⋮
⋮
2





Discrete

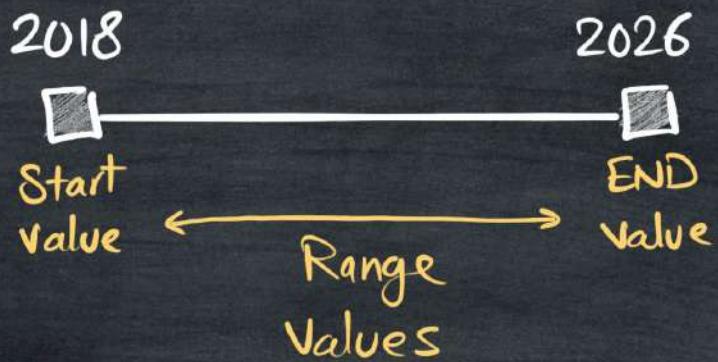
Filter-Category

- All
- Art
- Copiers
- Storage
- Tables
- more

Distinct
Values

Continuous

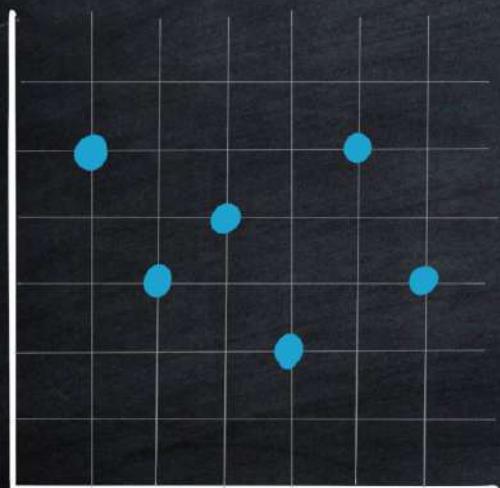
Filter-Date





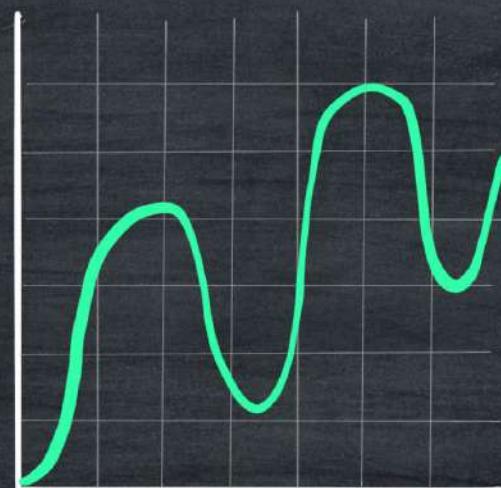
Discrete

Disconnected & Separated
Values



Continuous

Connected & unbroken chain
of Values





Discrete

Many Sorting options

- Ascending
- Descending
- Data Source order
- Alphabetic
- Field
- Manual
- Nested

Continous

Limited Sorting Options

- Ascending
- Descending





Discrete

Continuous

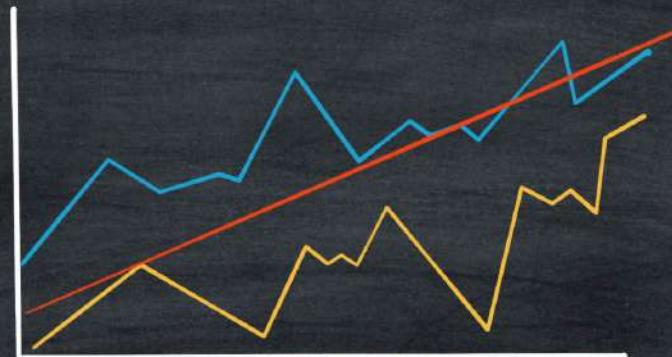
Purpose:

Deep Dive Analysis



Purpose:

Big Picture Analysis





tableau

Definition

Example

Colors

Filters

Views

Sorting

Purpose

Discrete

Disconnected Values



Continuous

Connected values



Blue Pill



Green Pill



Distinct Values



Range Value



Header

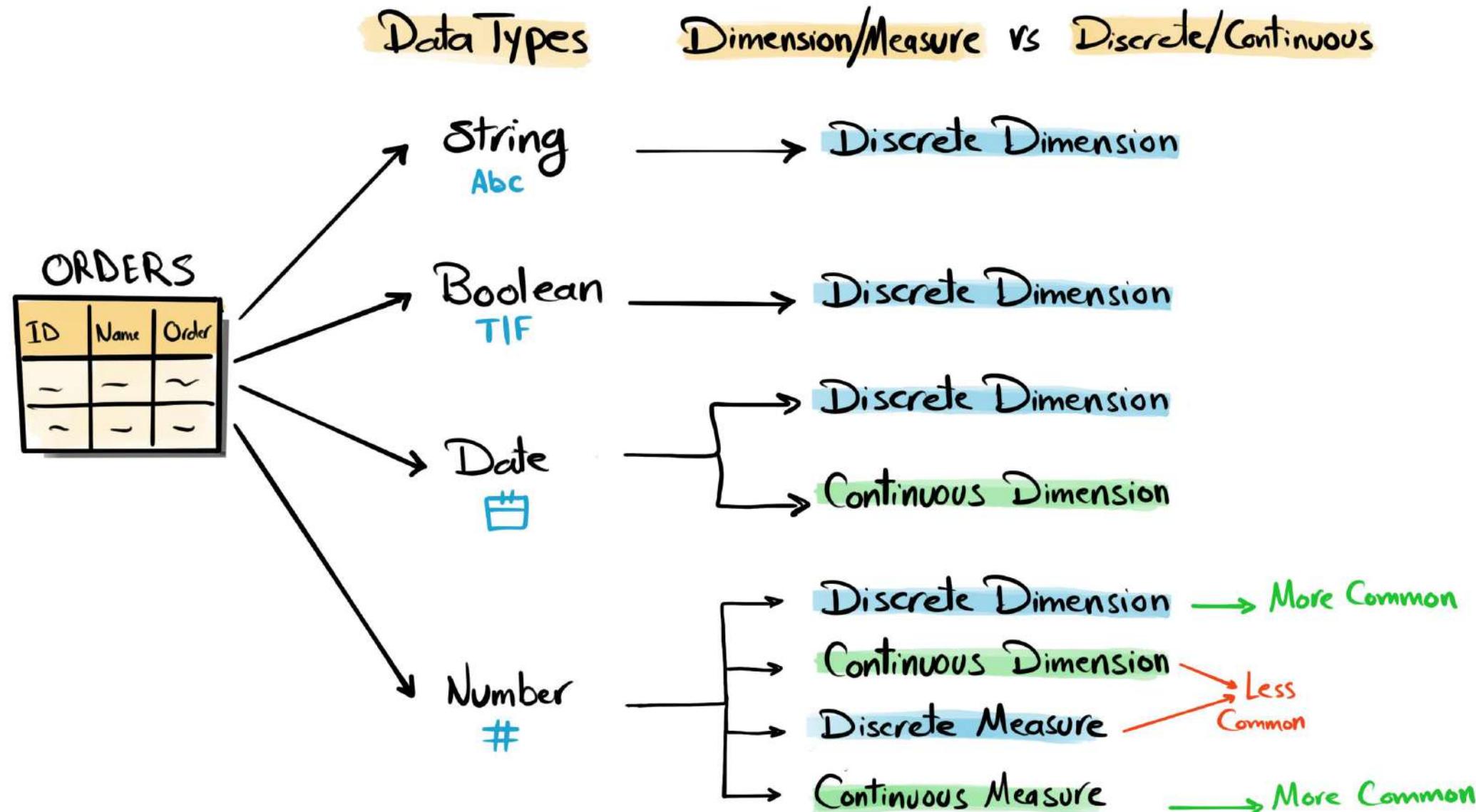
Many Sorting Options

Axis

Limited Sorting Options

Specific Scenario | Deep Dive

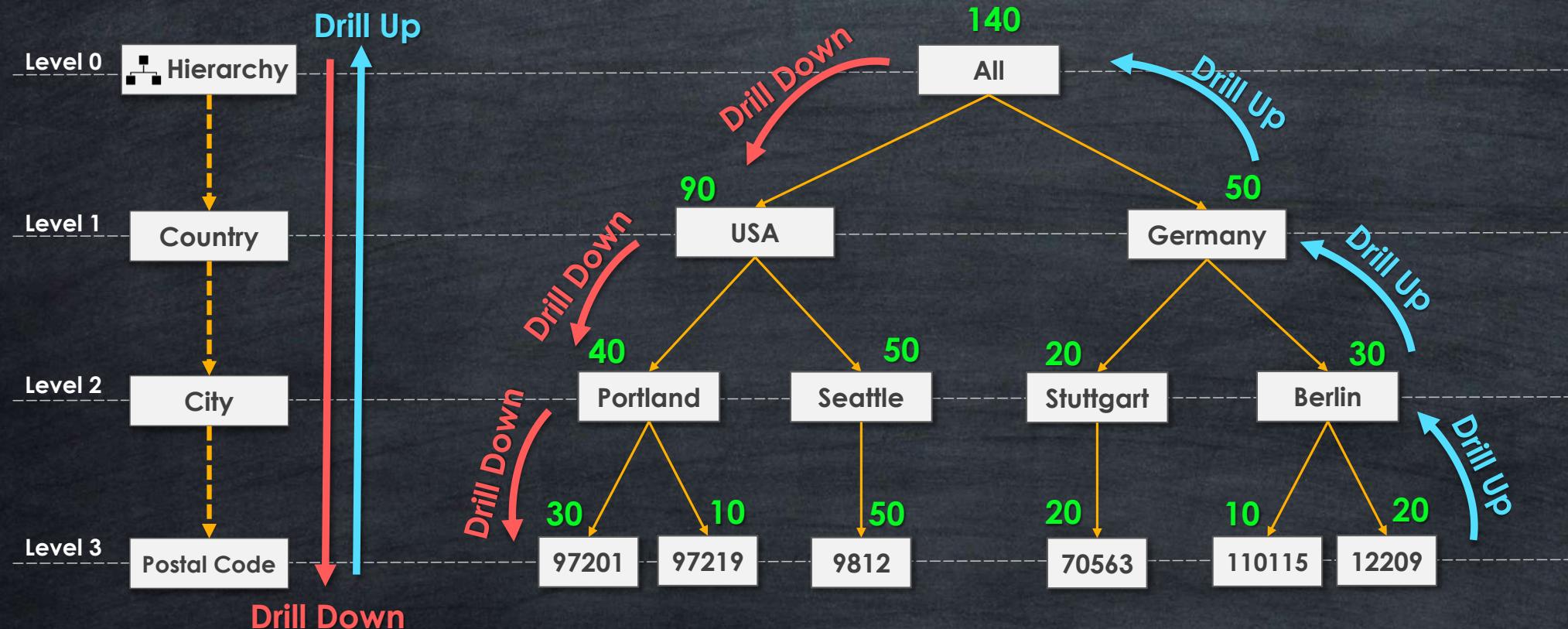
Big Picture | Trends Analysis

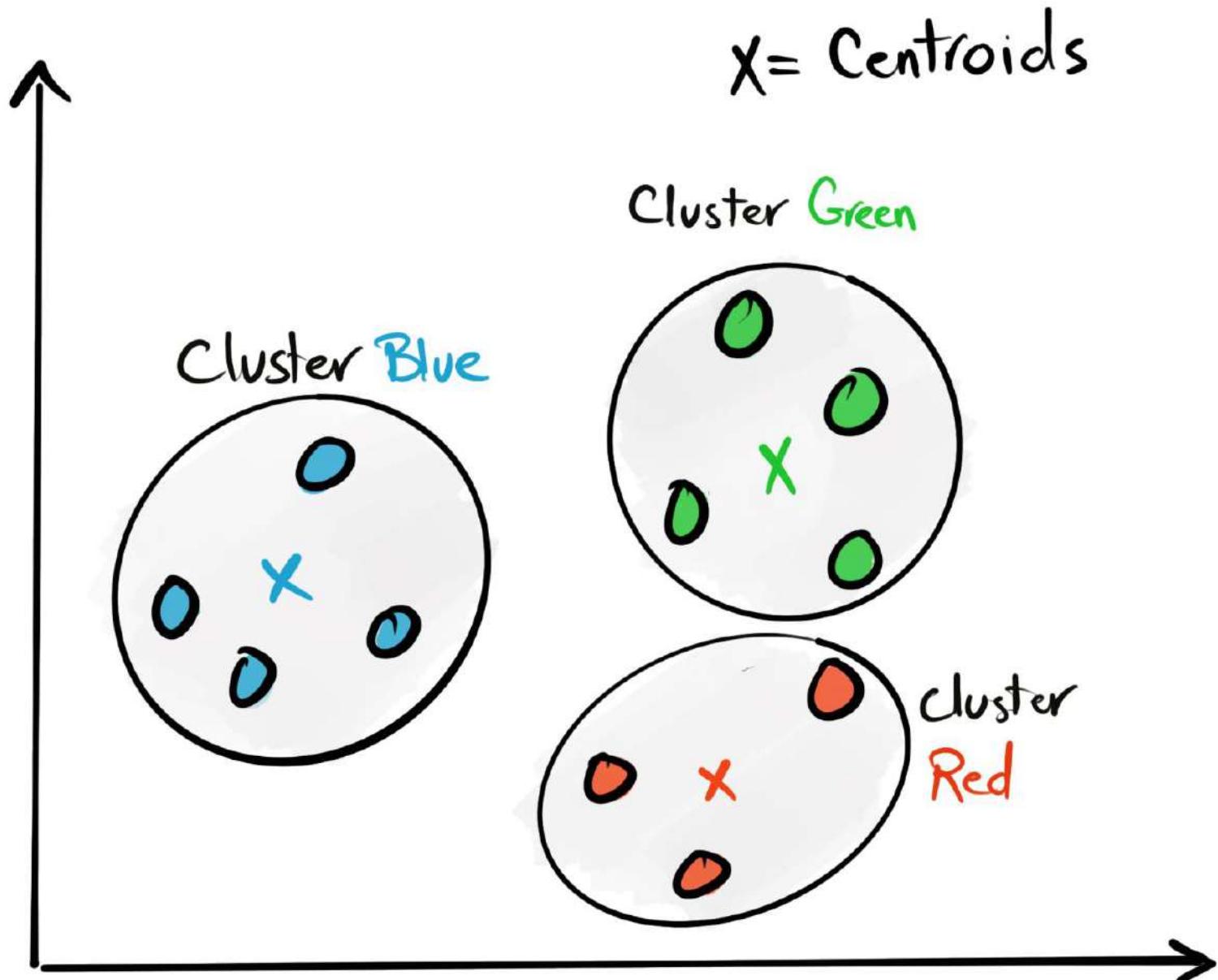


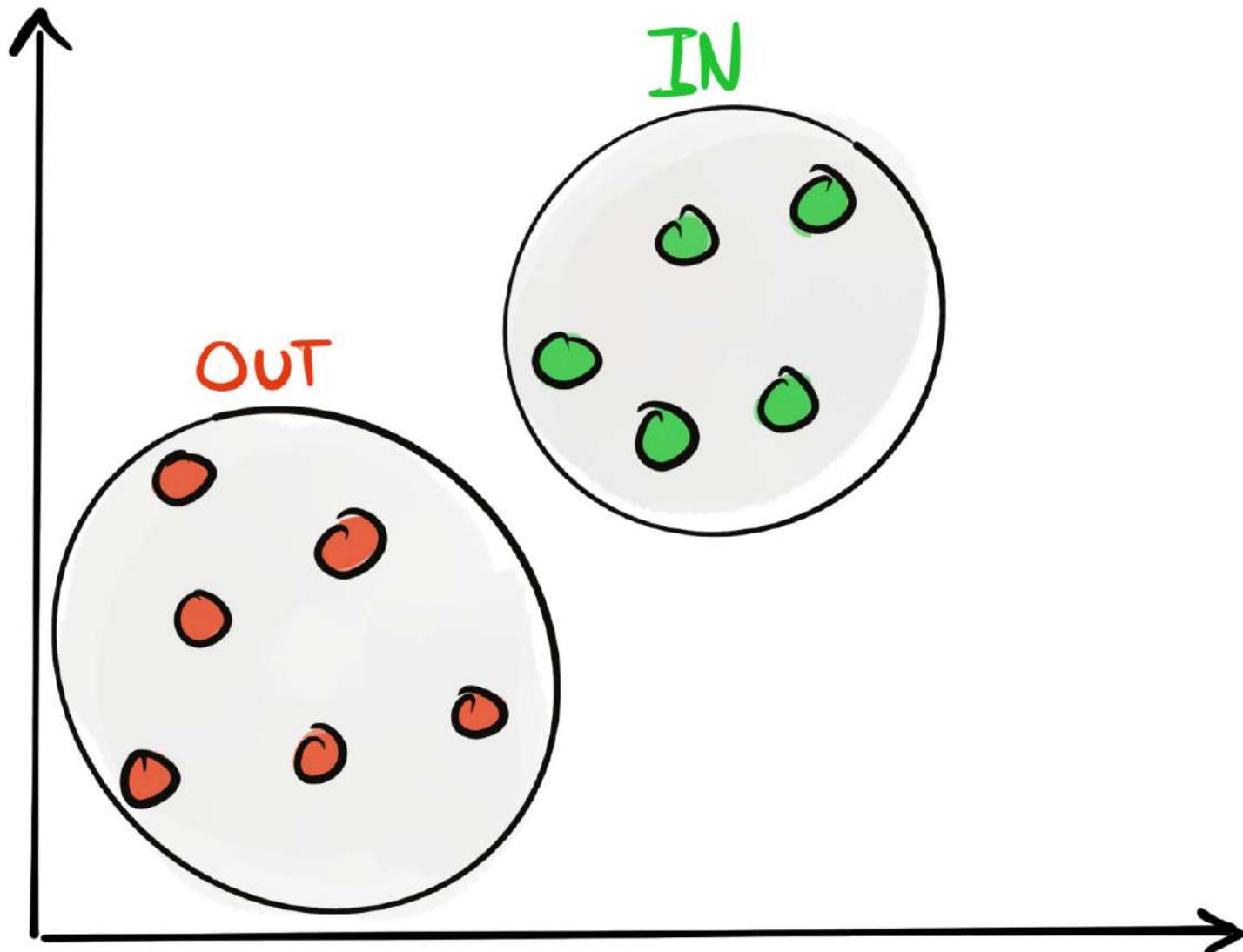


Example: CUSTOMER NAME

NAMING CONVENTIONS	EXAMPLE	Letter Case	Separation	APPLICATION
Snake Case	customer_name	lowered case	underscore "_"	Python, PHP, Ruby
Camel Case	customerName	1st is lower, Rest is Capitalized	No seperation	Java, JavaScript, TypeScript
Pascal Case	CustomerName	capitalized	No seperation	Java, C#
Kebab Case	customer-name	lowered case	Dash "-"	HTML, CSS
Title Case	Customer Name	capitalized	Space " "	Tableau
Your Convention	Customer_Name	capitalized	underscore "_"	

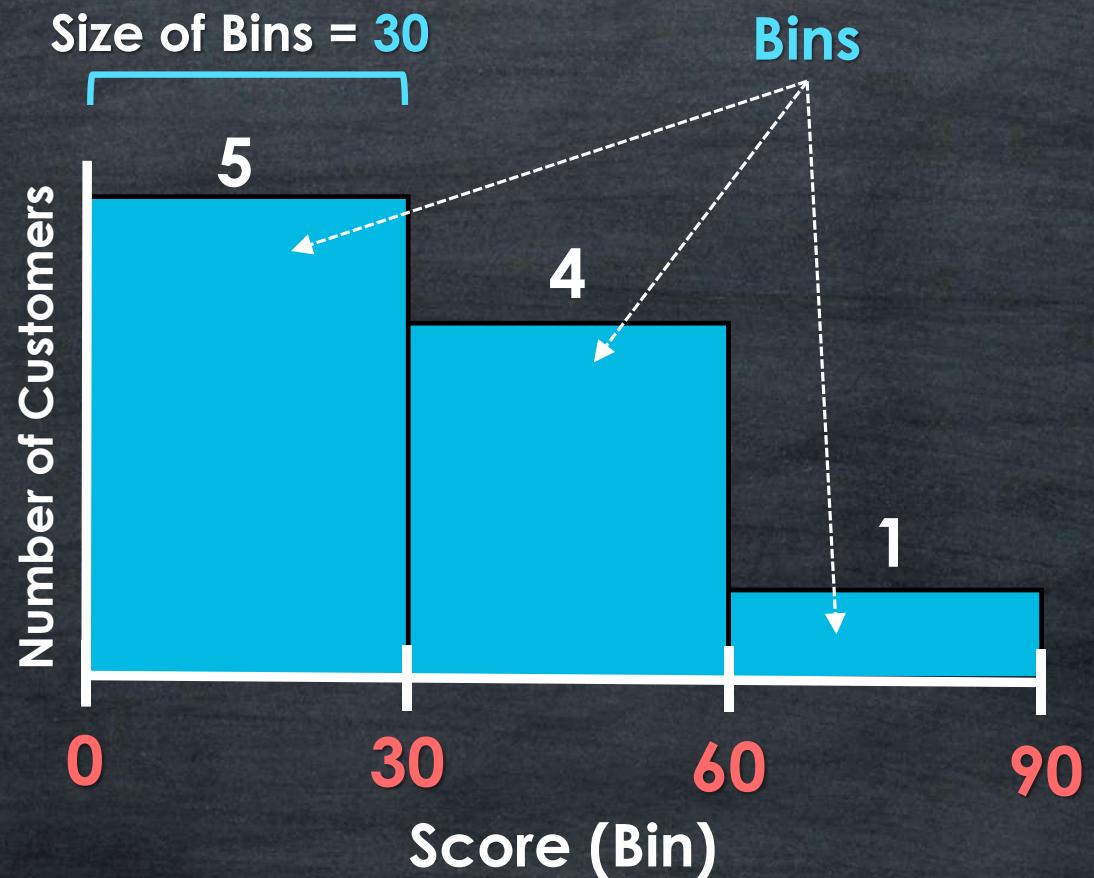






**Customers**

Customer_ID	First_Name	Score
1	Bill	63
2	Gerald	9
3	Harry	11
4	Dwight	25
5	Rutherford	57
6	Grover	35
7	Grover	24
8	Bill	44
9	Calvin	0
10	Dwight	55

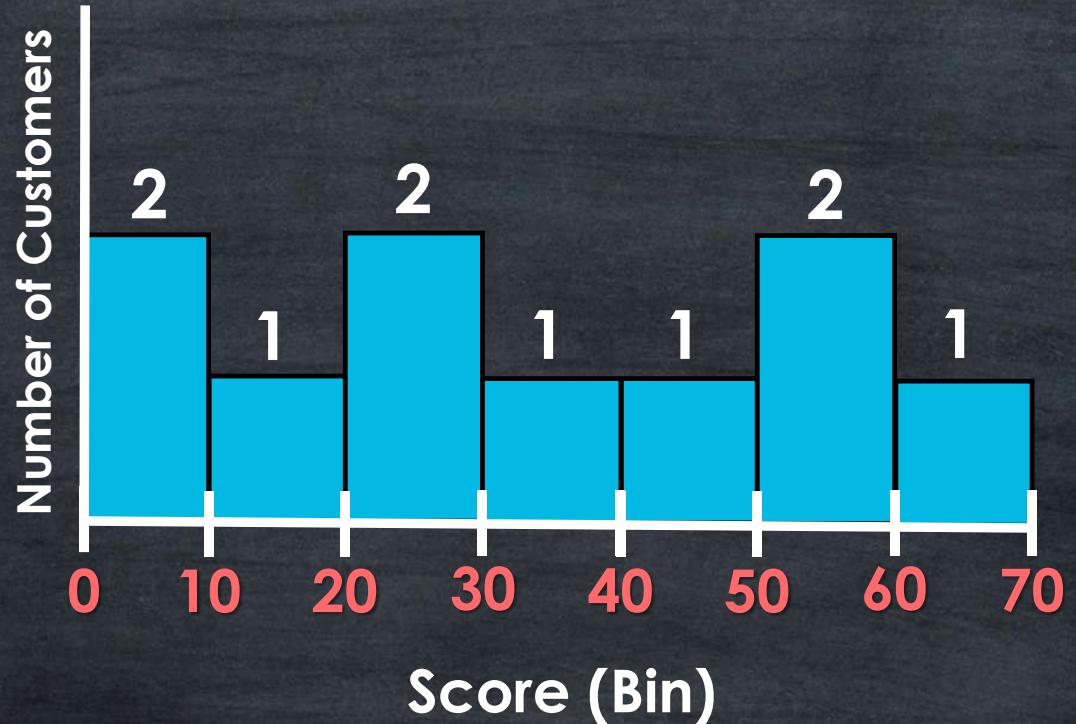
Size of Bins = 30

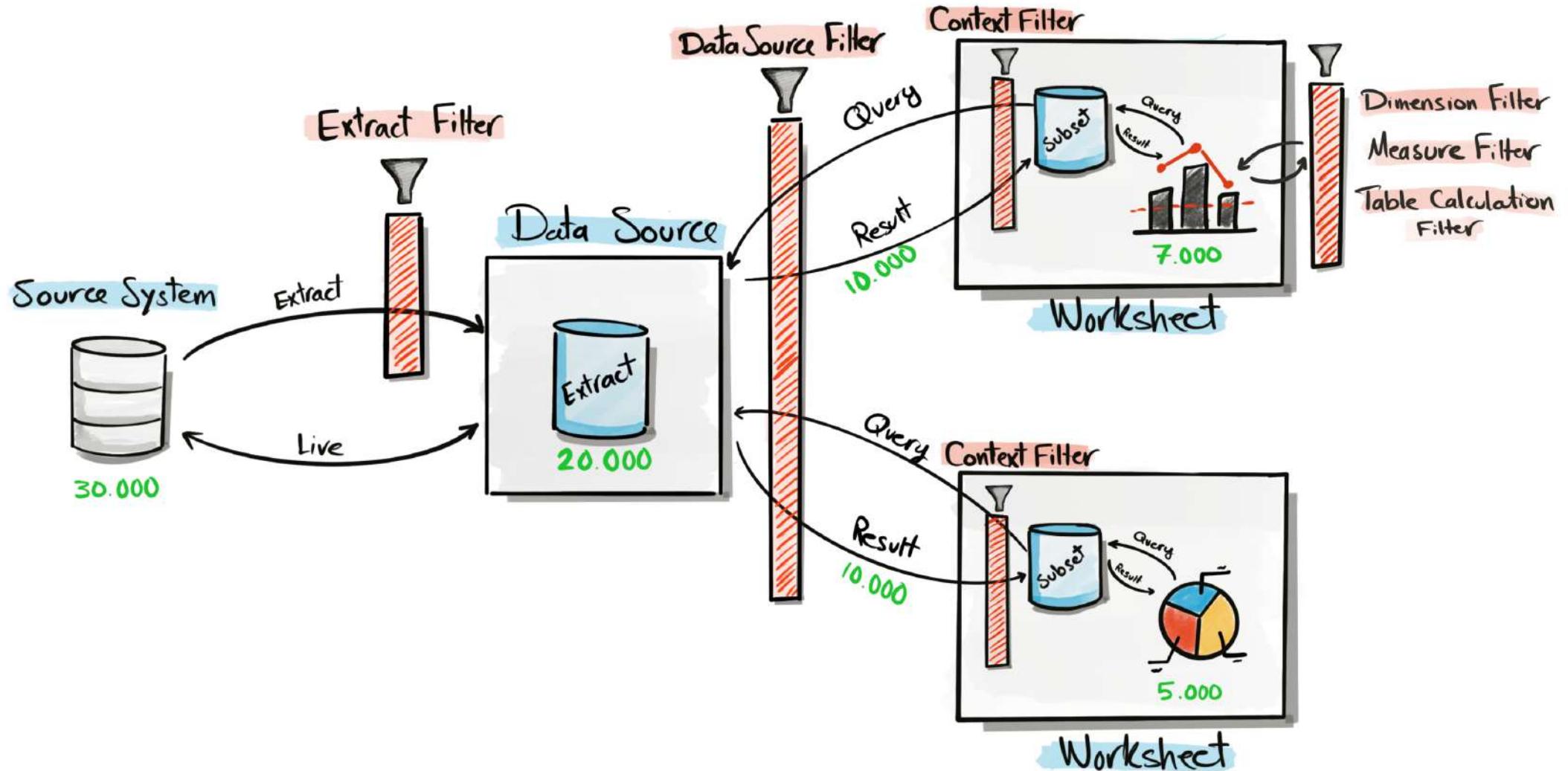


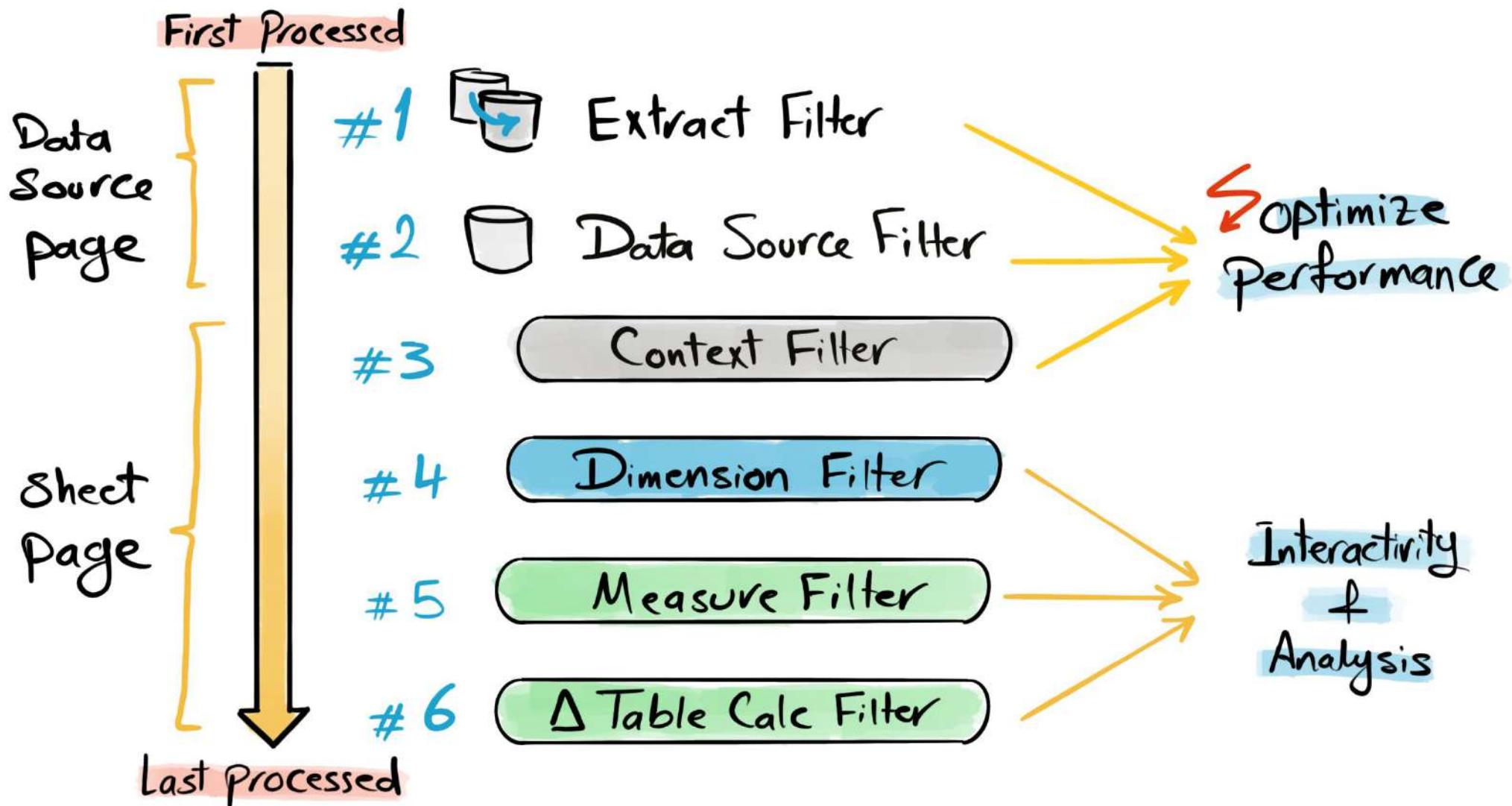
Customers

Customer_ID	First_Name	Score
1	Bill	63
2	Gerald	9
3	Harry	11
4	Dwight	25
5	Rutherford	57
6	Grover	35
7	Grover	24
8	Bill	44
9	Calvin	0
10	Dwight	55

Size of Bins = 10









Only This Worksheet



All Using This Data Source



All Using Related Data Sources



Selected Worksheets



Apply Filters

Sheet 1



Sheet 2

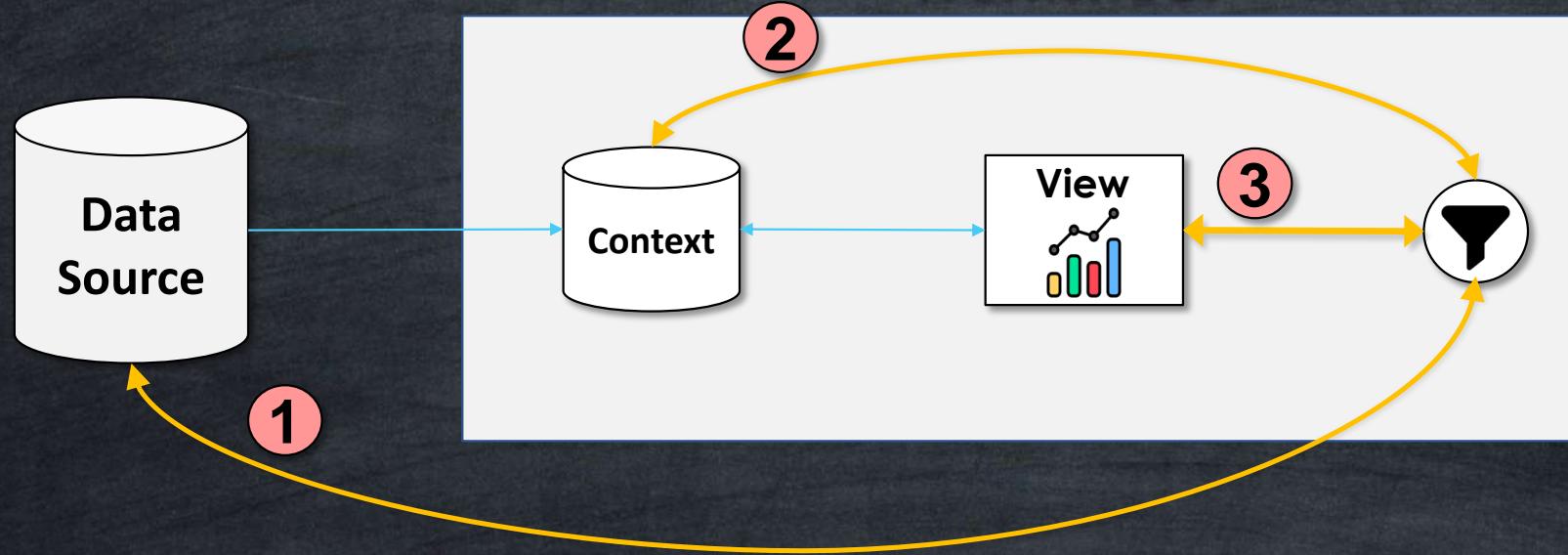


Sheet 3





Worksheet



- 1 All Values in Database
- 2 All Values in Context
- 3 Only Relevant Values

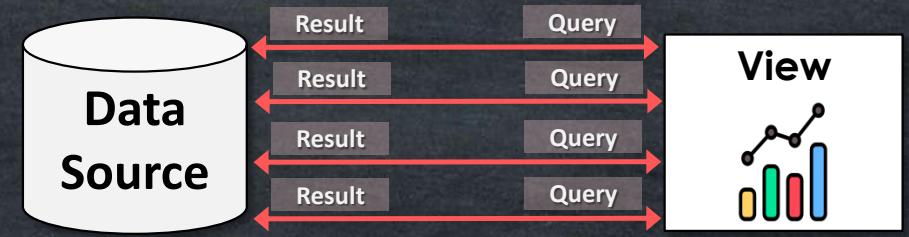


All Values

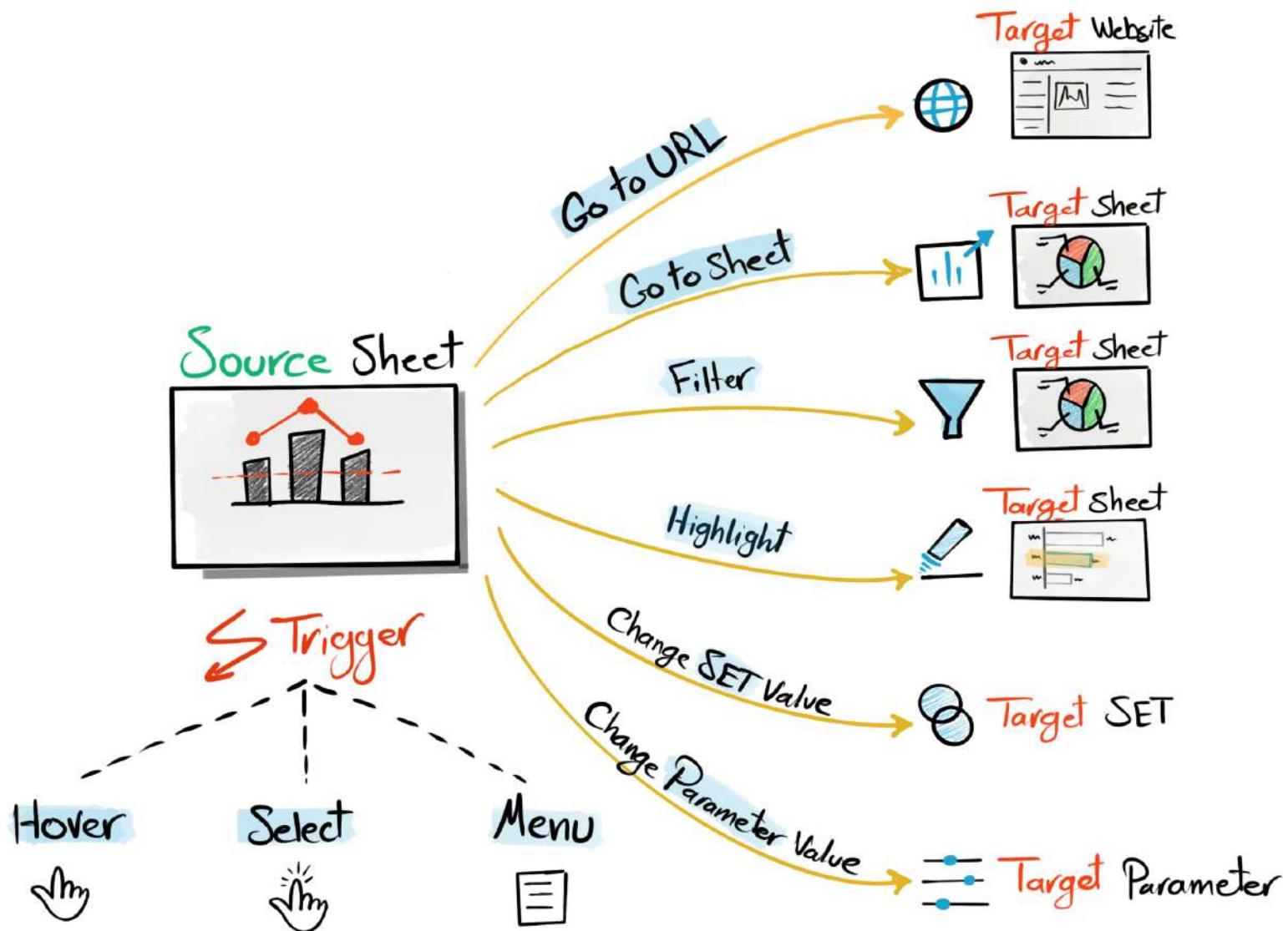


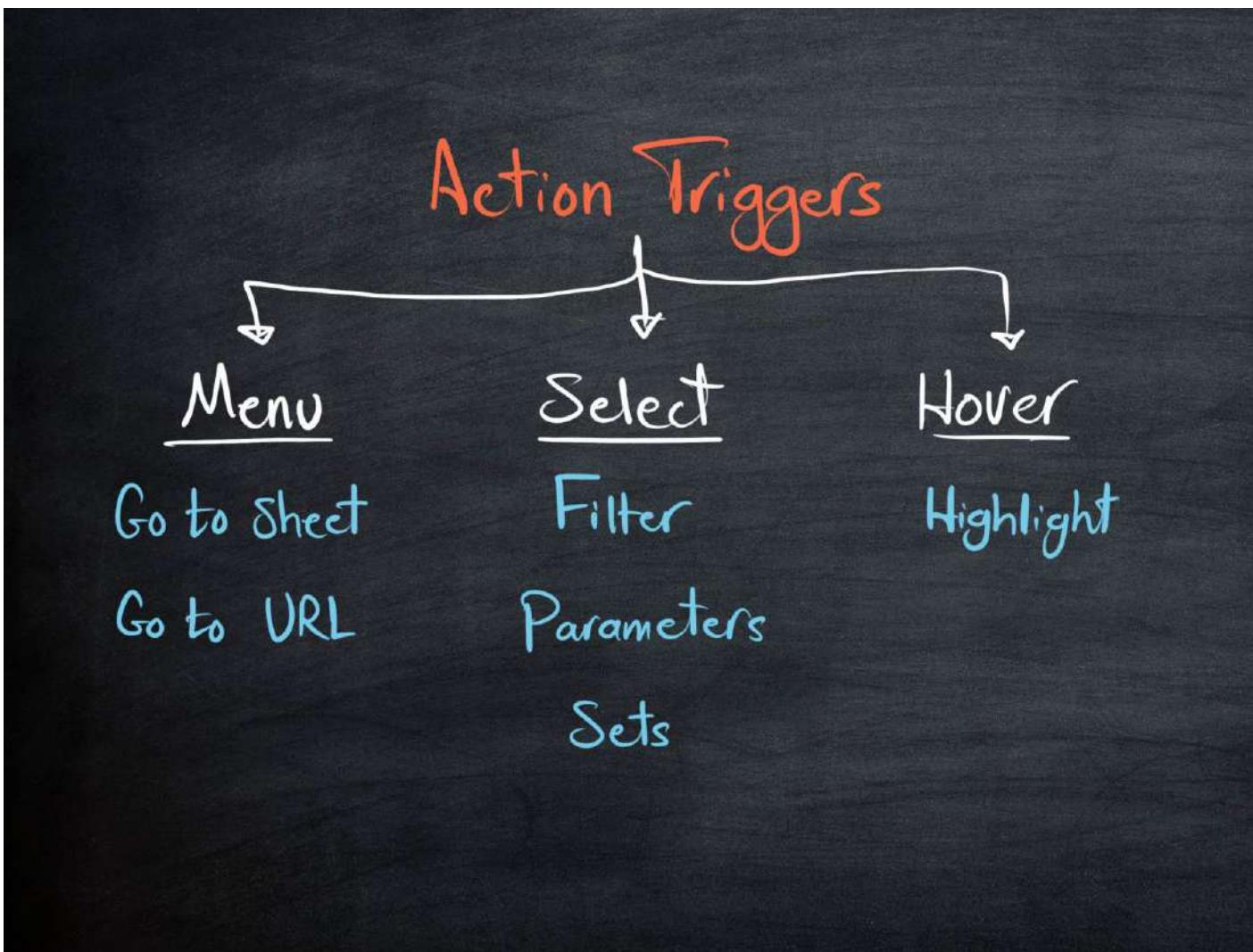
1 Initial Query as user starts View

Only Relevant



Multiple Queries for each user Interaction







Data Source

Row-Level Calc.

Price * Quantity

Category	Product	Price	Quantity
A	P1	20	2
A	P1	30	3
A	P2	20	1
B	P3	10	4
B	P3	5	5
B	P3	15	1

Revenue
40
60
20
40
25
15

SUM(Revenue)

Aggregate calc.

Controls LOD

Product	P1	100
Product	P2	20
Product	P3	80

Table Calc.

RANK(SUM(Revenue))

Products

P1	1
P2	3
P3	2

{FIXED Category : SUM(Revenue)}

Product

A	P1	120
A	P2	120
B	P3	80

LOD calc.

Controls LOD



RANK(SUM([Quantity]*[Price]))

1 Row-Level
Calculation

2 Aggregate
Calculation

3 Table
Calculation



Types of Calculations



Row-Level Calculation

[Quantity] * [Price]

Aggregate Calculation

SUM([Revenue])

LOD Calculation

{FIXED [Category]: SUM([Revenue])}

Table Calculation

RANK(SUM([Revenue]))

Do Not Aggregate Data

Aggregate Data

Aggregate Data

Aggregate Data

Row Level

VIZ Level Of Details

Specific Level Of Details

VIZ Level Of Details

Calculated using Data
in Data Source

Calculated using Data
in Data Source

Calculated using Data
in Data Source

Calculated using Data
in VIZ

Pre-Calculated

Calculated in the Fly

Calculated in the Fly

Calculated in the Fly

Simple Calculations

Simple Calculations

Complex Calculations

Complex Calculations



Choose Right Calculation Type



Q1: Do you have to aggregate the data?

NO

Row-Level
Calculation

YES

Q2: Is all the needed data already in the VIZ?

YES

Table
Calculation

NO

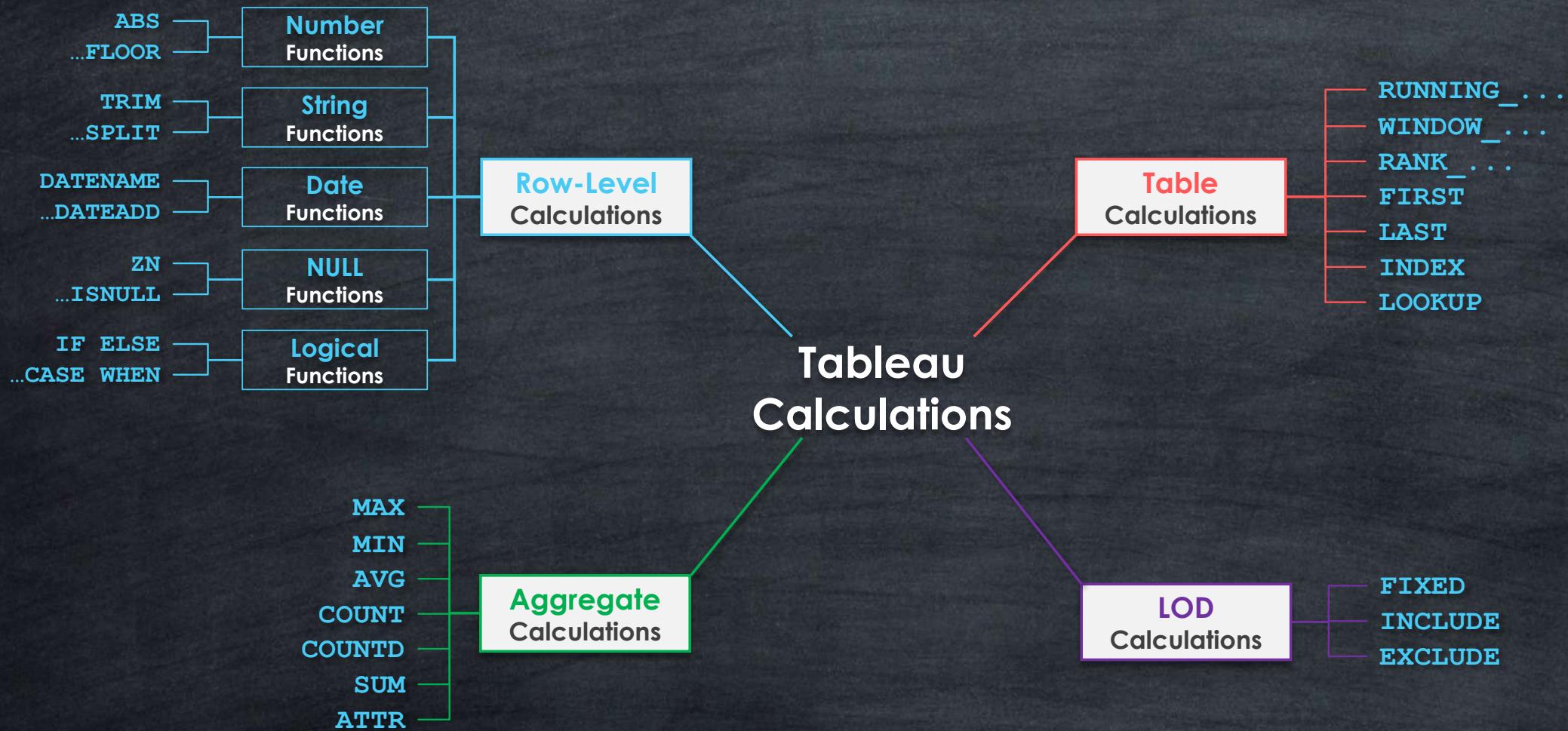
Q3: Is the Level of Details in VIZ matches the Question?

YES

Aggregate
Calculation

NO

LOD
Calculation





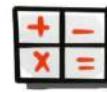
LOD (VIZ)

View 1

Category	Country	Sales

View 2

Product	Category	Country	Sales



LOD (Expression)

FIXED [Category] : SUM([Sales])

Category	Sales

Category	Sales



LOD (VIZ)

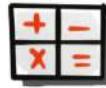
View 1

Category	Country	Sales



View 2

Product	Category	Country	Sales



LOD (Expression)

EXCLUDE [Category]: SUM([Sales])

-1 DIM

Category	Country	Sales

-1 DIM

Product	Category	Country	Sales



LOD (VIZ)

View1

Category	Country	Sales

View2

Product	Category	Country	Sales



LOD (Expression)

INCLUDE [Customer] : SUM([Sales])

+1 DIM

Customer

Category	Country	Sales

+1 DIM

Customer

Product	Category	Country	Sales



LOD (VIZ)

View 1

Category	Country	Sales



LOD (Expression)

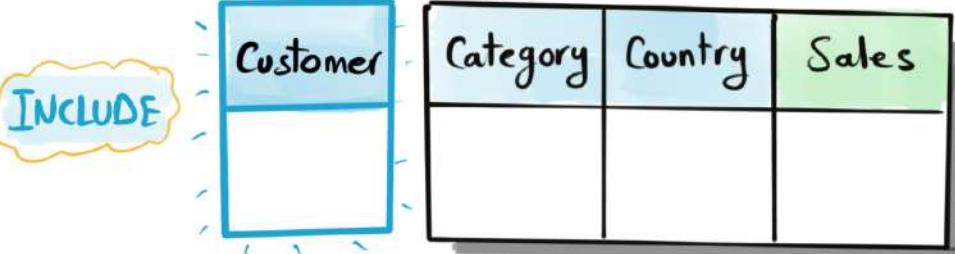
FIXED

Category	Sales

EXCLUDE

Category	Country	Sales

-1 DIM





Sales Performance

\$ 30K

Sales

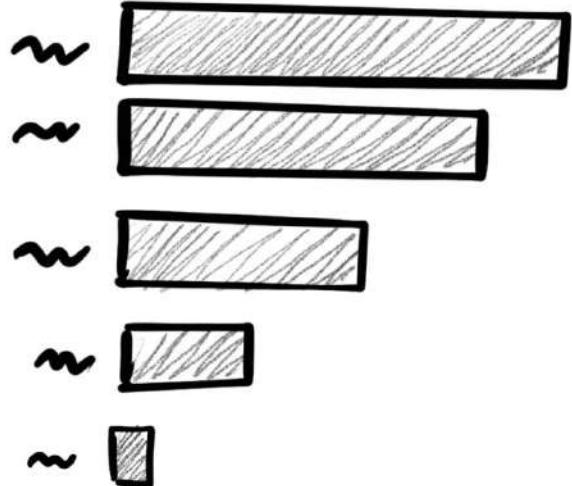
\$ 25K

Profit

60K

Quantity

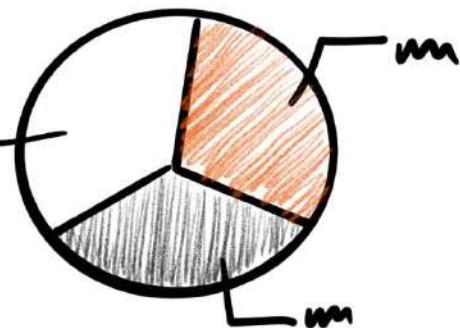
Top Category



Sales vs Profit

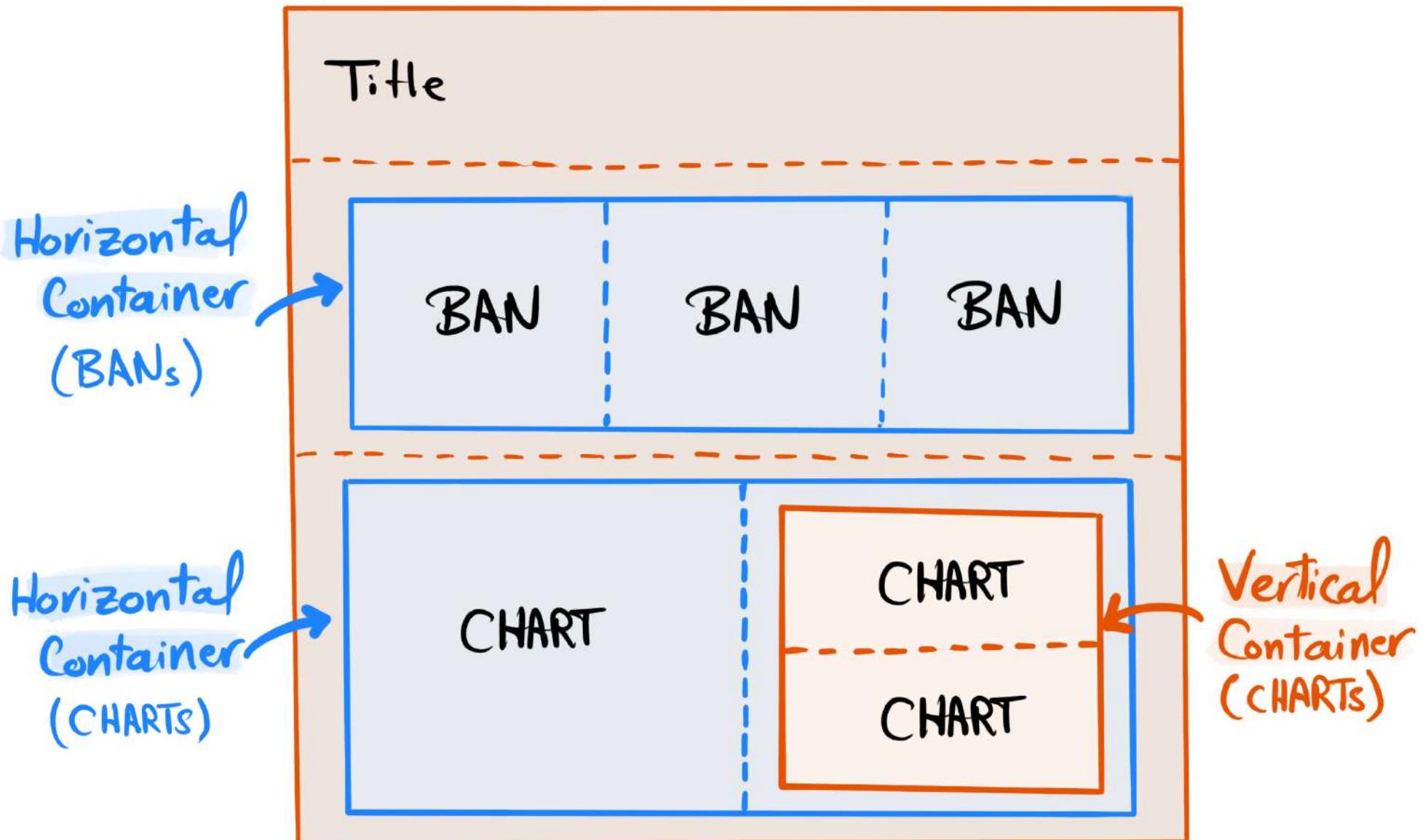


Sales by Category





Vertical Container (Main) ↴





DASHBOARD DESIGN PROCESS

STEP 1

ANALYSE REQUIREMENTS



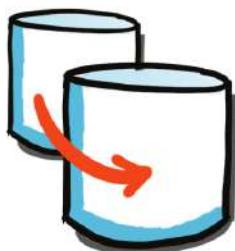
- Collect Requirements
- Choose Right Charts
- Draw Mockups
- Choose Colors



DASHBOARD DESIGN PROCESS

STEP 2

BUILD DATA SOURCE



- Connect Data
- Create Data Model
- Rename Fields & Tables
- Check Data Types
- Understand Data



DASHBOARD DESIGN PROCESS

STEP 3 BUILD CHARTS

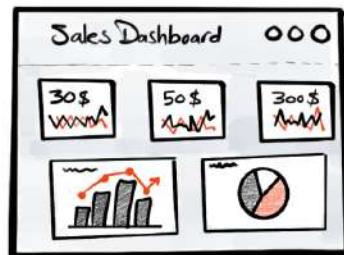


- Create Calculated Fields & Test
- Build Chart
- Format
 - Remove Lines & Grids
 - Clean up Axis & Headers
 - Coloring
 - Tooltips

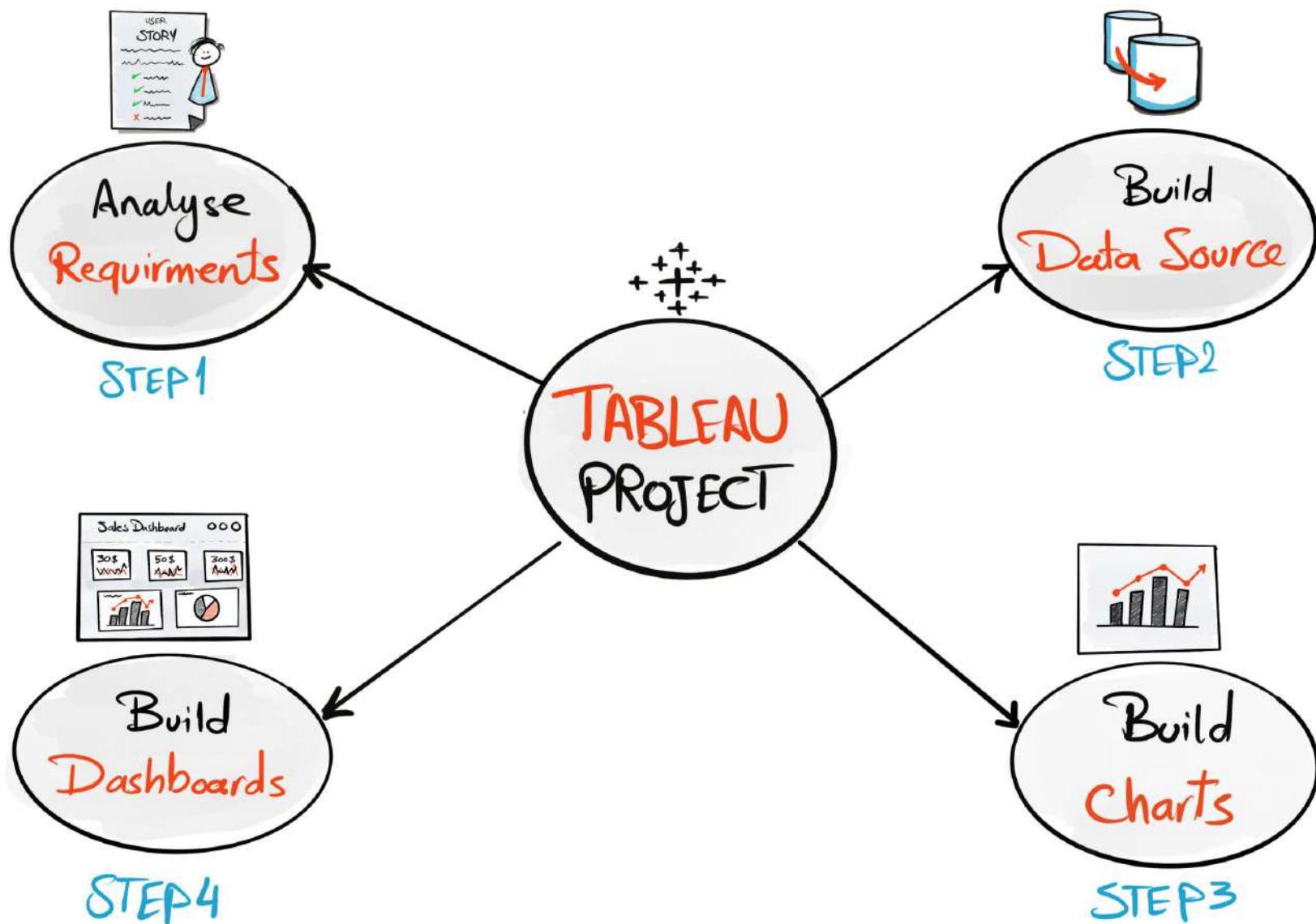
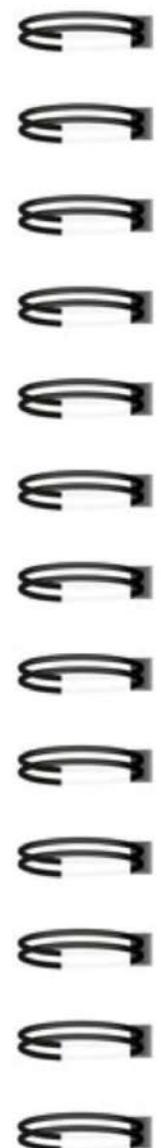


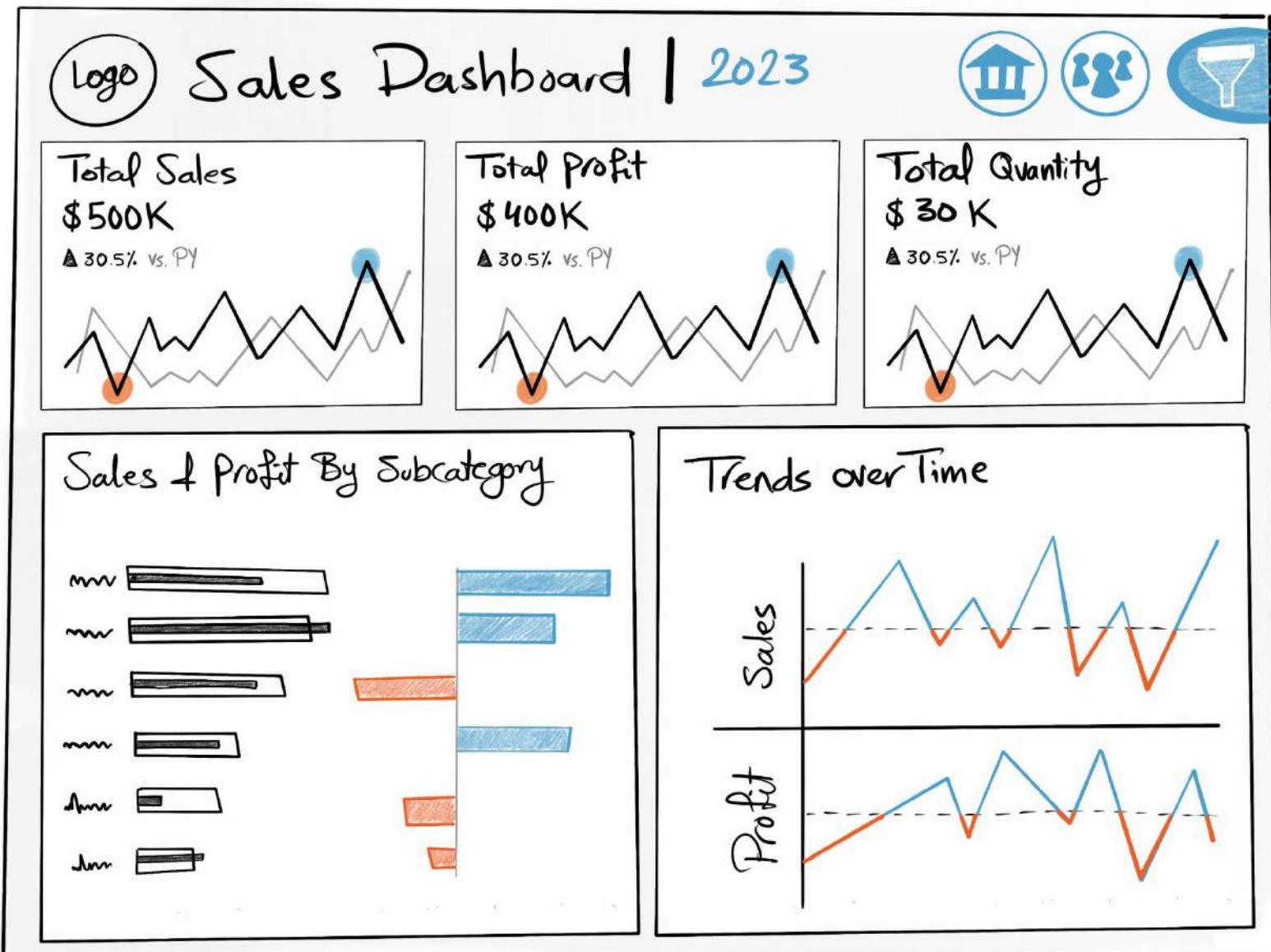
DASHBOARD DESIGN PROCESS

STEP 4 BUILD DASHBOARD



- Draw Mockup for Container
- Create Container Structure
- Put All Charts Together
- Format
 - Distribute Object Evenly
 - Format Colors, Size ... etc
 - Fit "Entire View"
 - Add Legends
 - Add Spaces (inner/outer Padding)
- Add Filters & Dynamic
- Add Icons





Filters

Category

Sub-Category

Region

City



+ a b | e a u

Dashboard Mockup

DATA WITH BARAA

