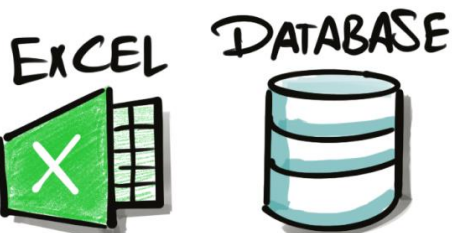
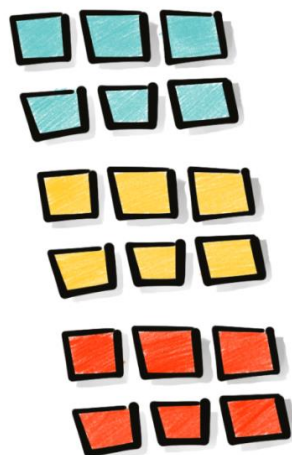


VARIETY

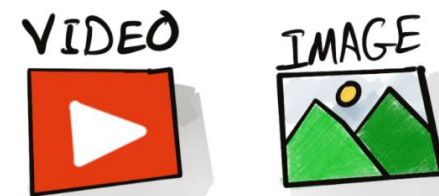
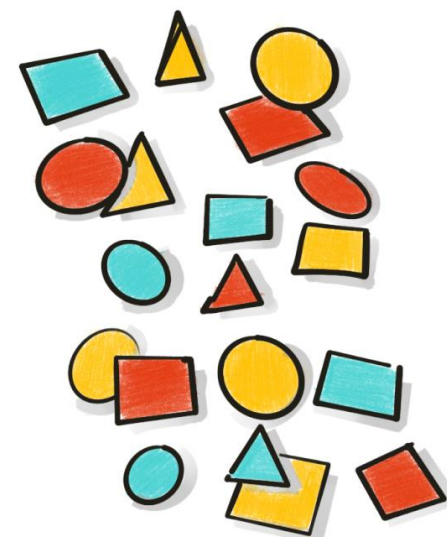
Structured



Semi-Structured



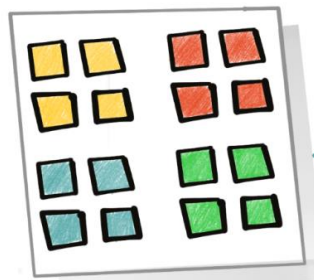
Unstructured




VELOCITY



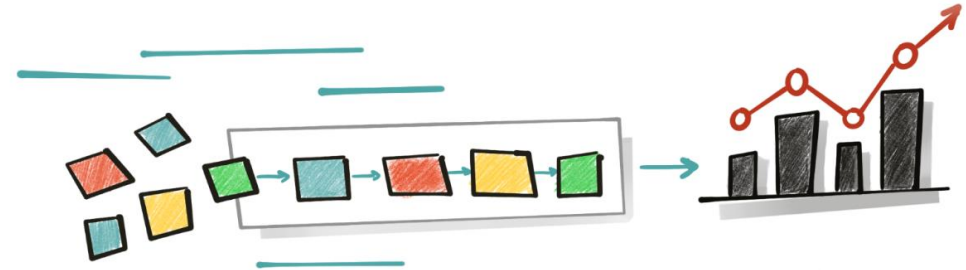
BATCH




 once a day
Hours → Mins



STREAM

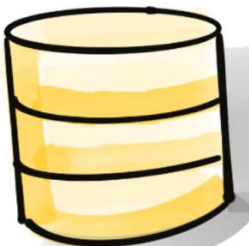


 24
SEC → MSEC

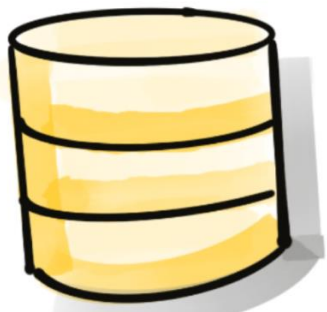
VOLUME



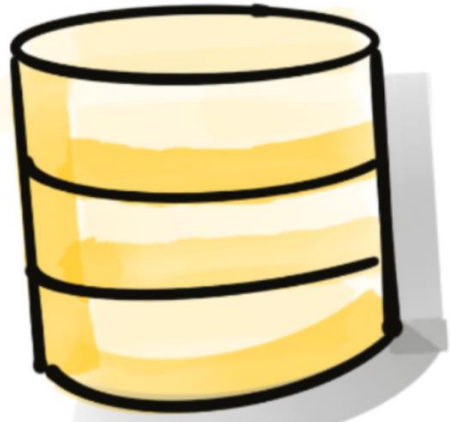
MB



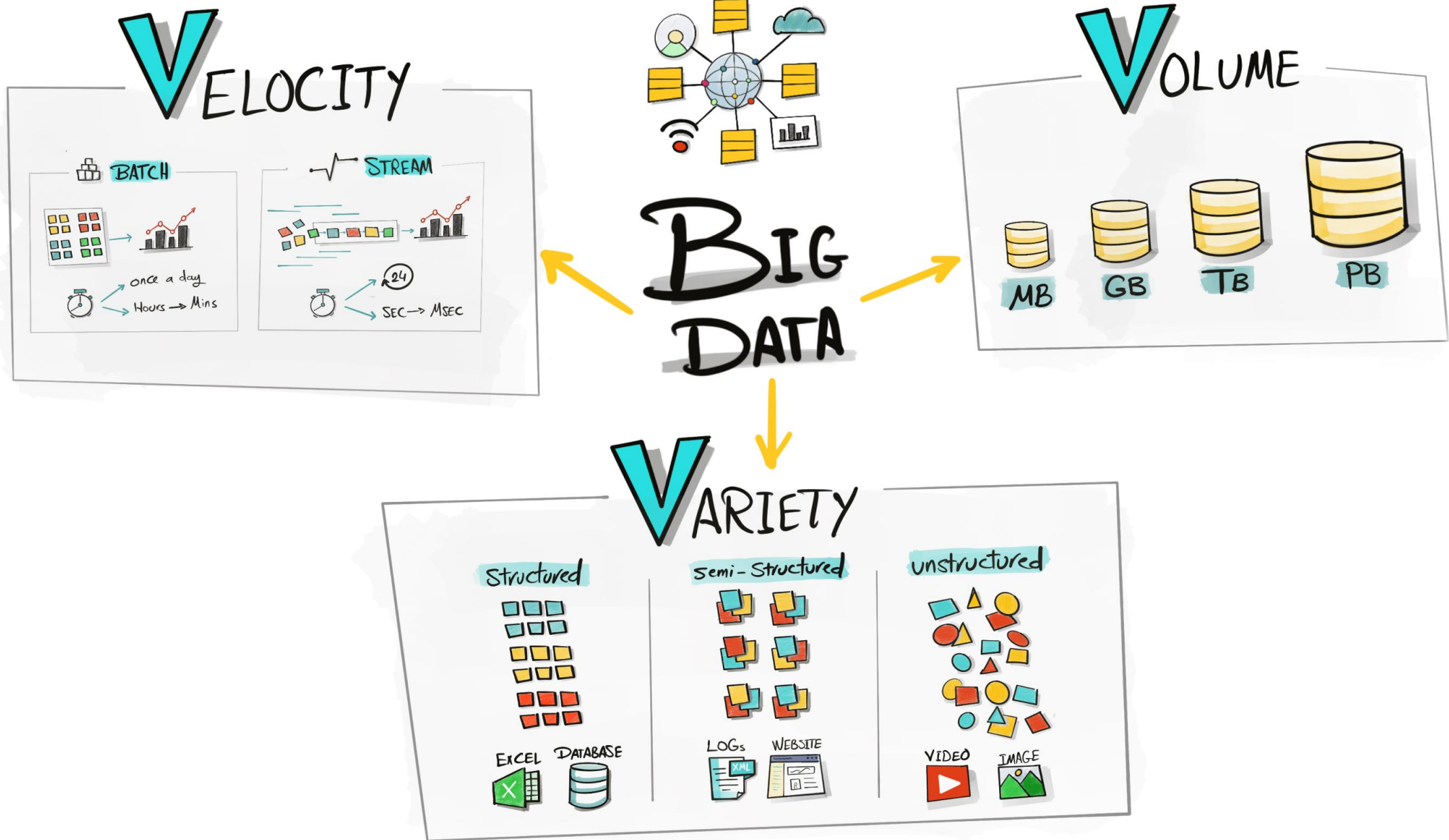
GB



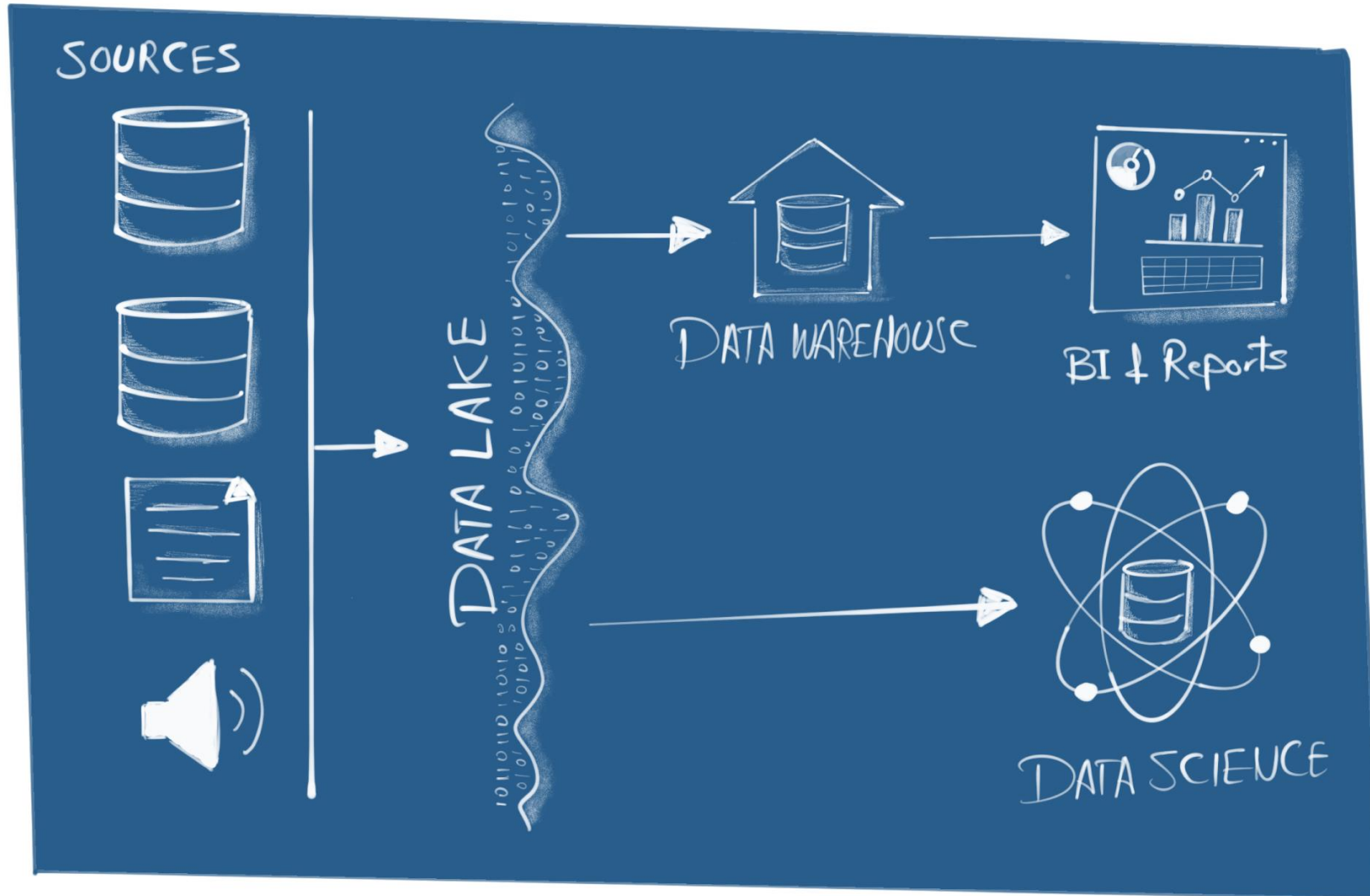

TB



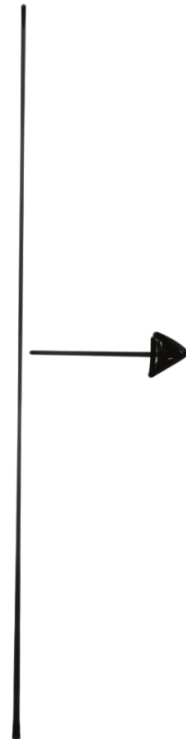
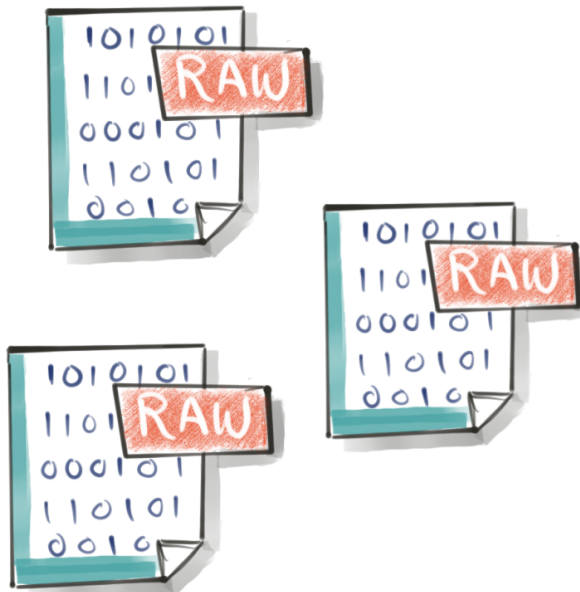
PB



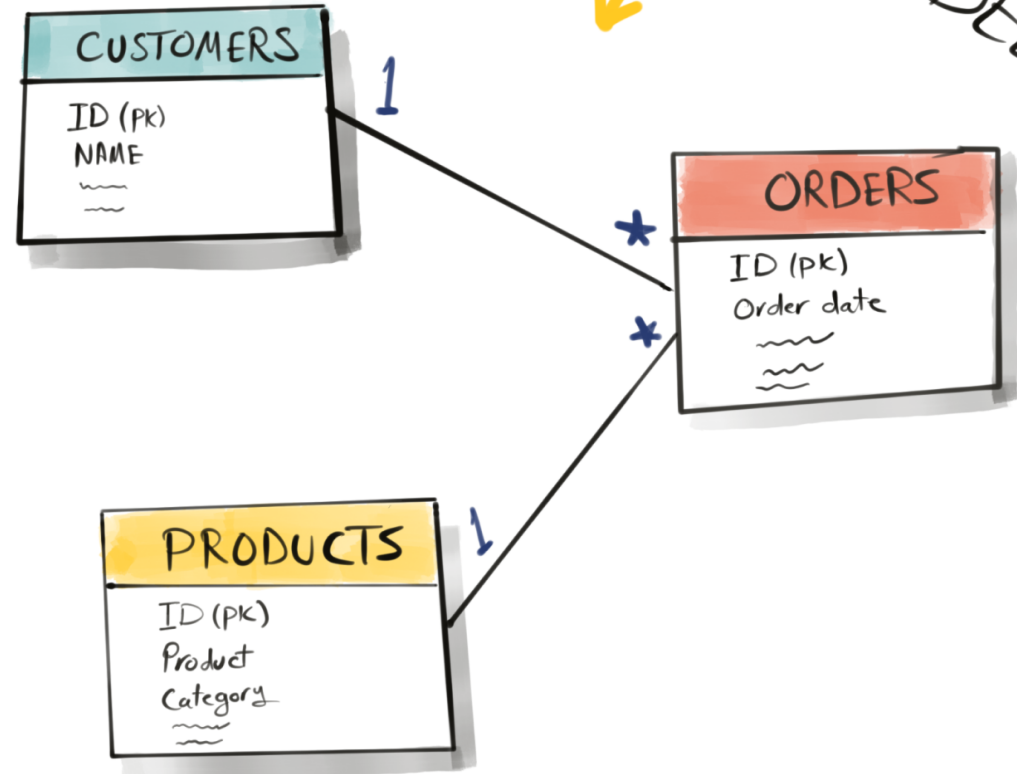
Blueprint



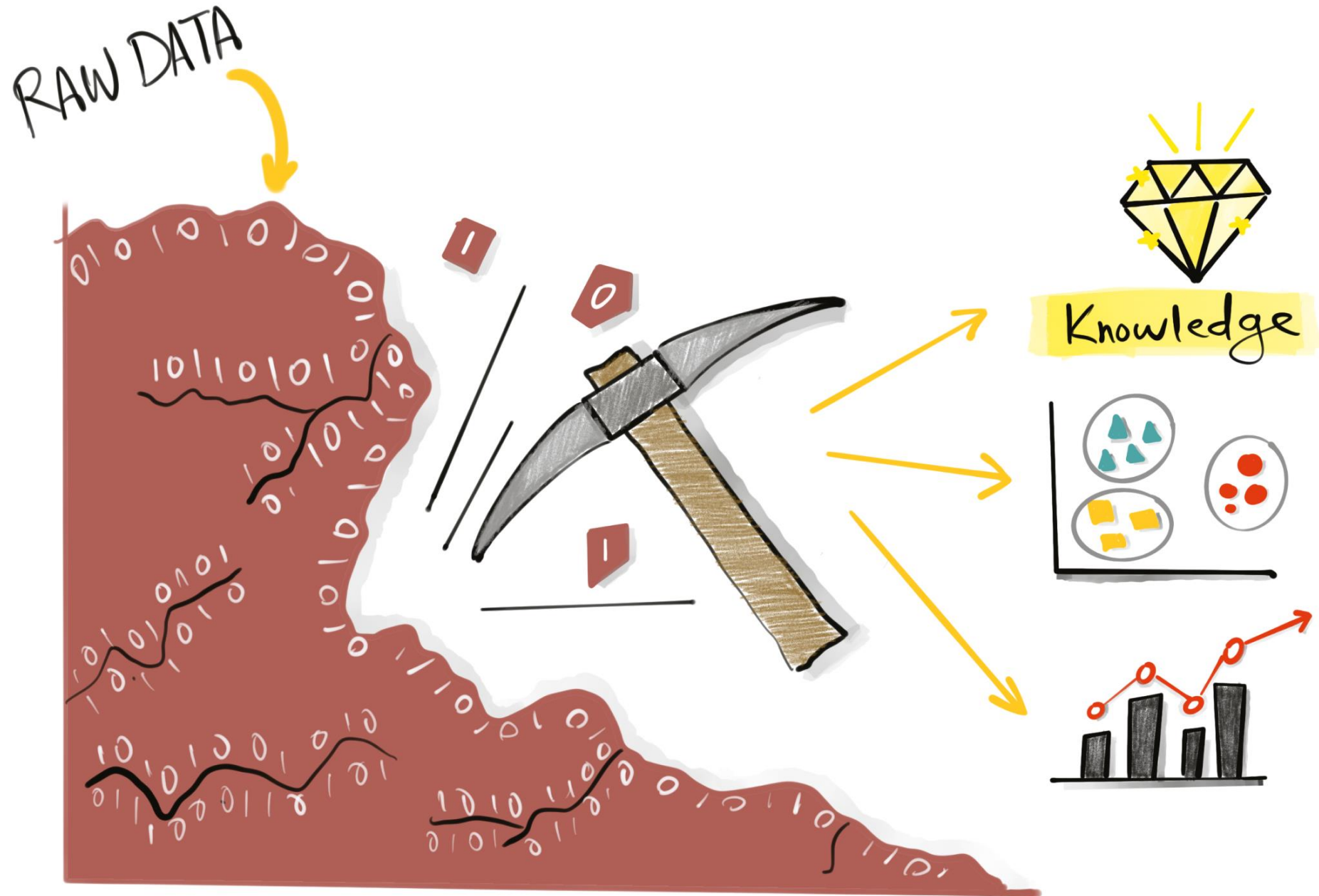
RAW DATA



Logical
DATA MODEL



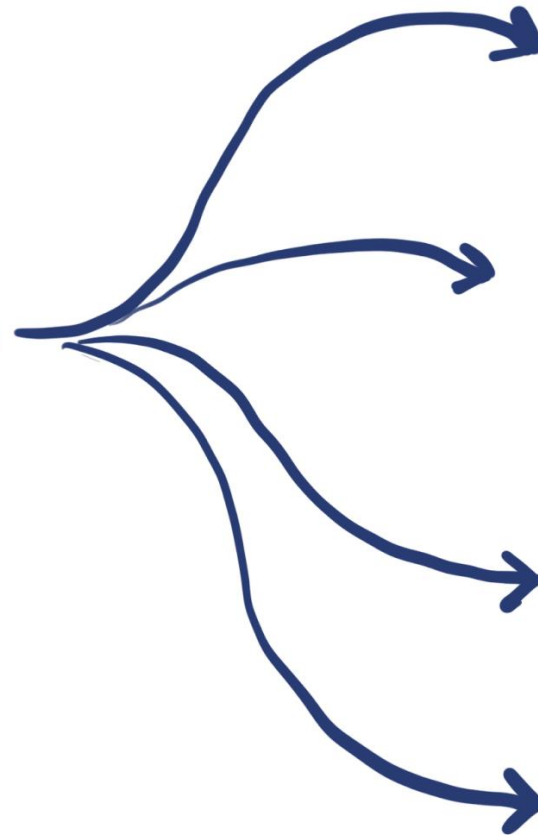
DATA MINING



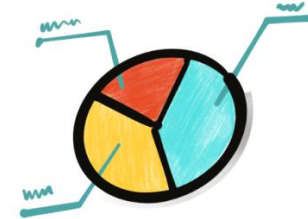
RAW DATA



101101010010101010



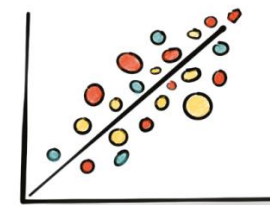
BARS



PIE

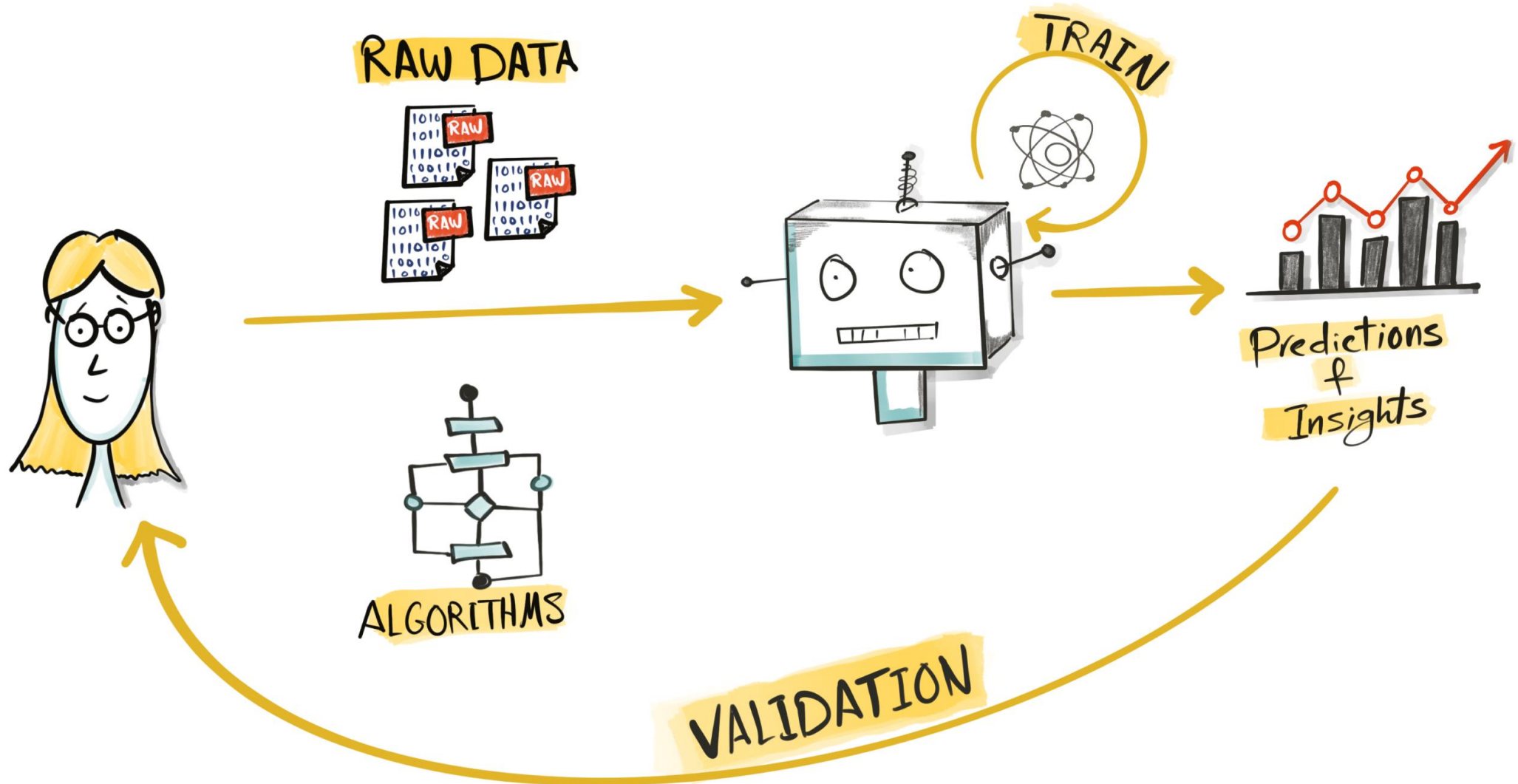


TREE



PLOTS

MACHINE LEARNING



DATA STORAGE

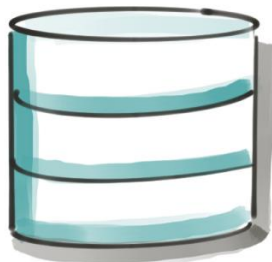


DATA PIPELINE

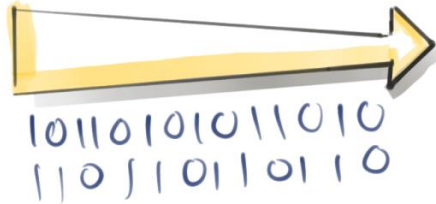


ETL

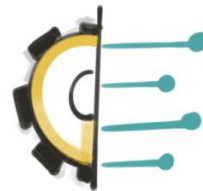
SOURCE



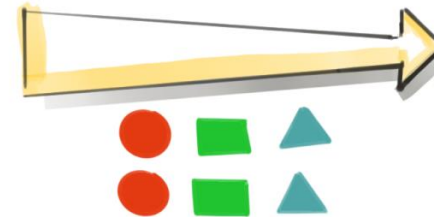
EXTRACT



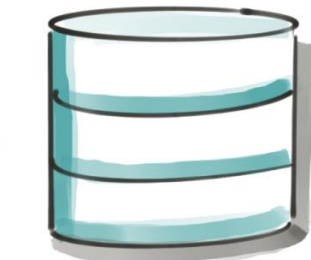
TRANSFORM

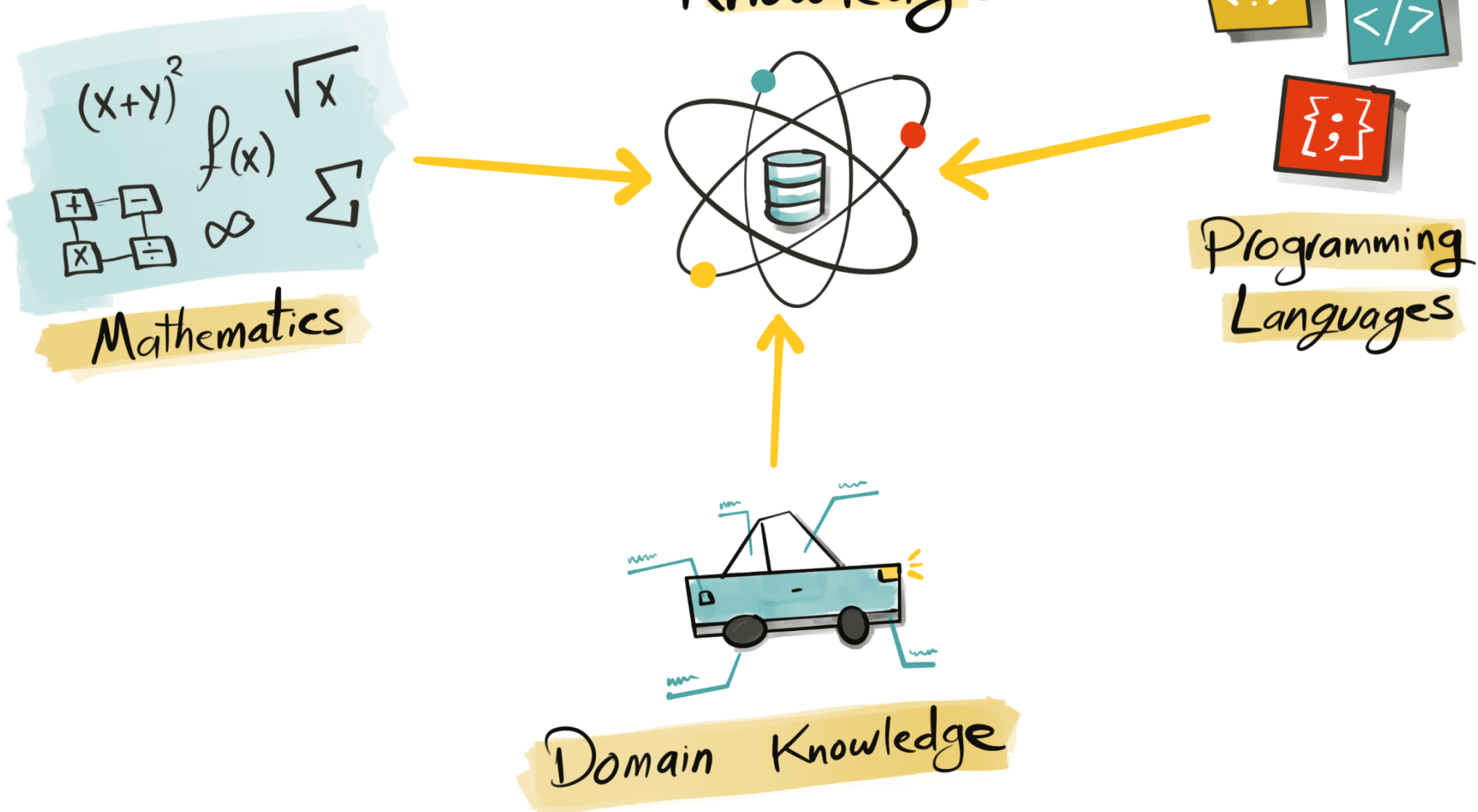


LOAD

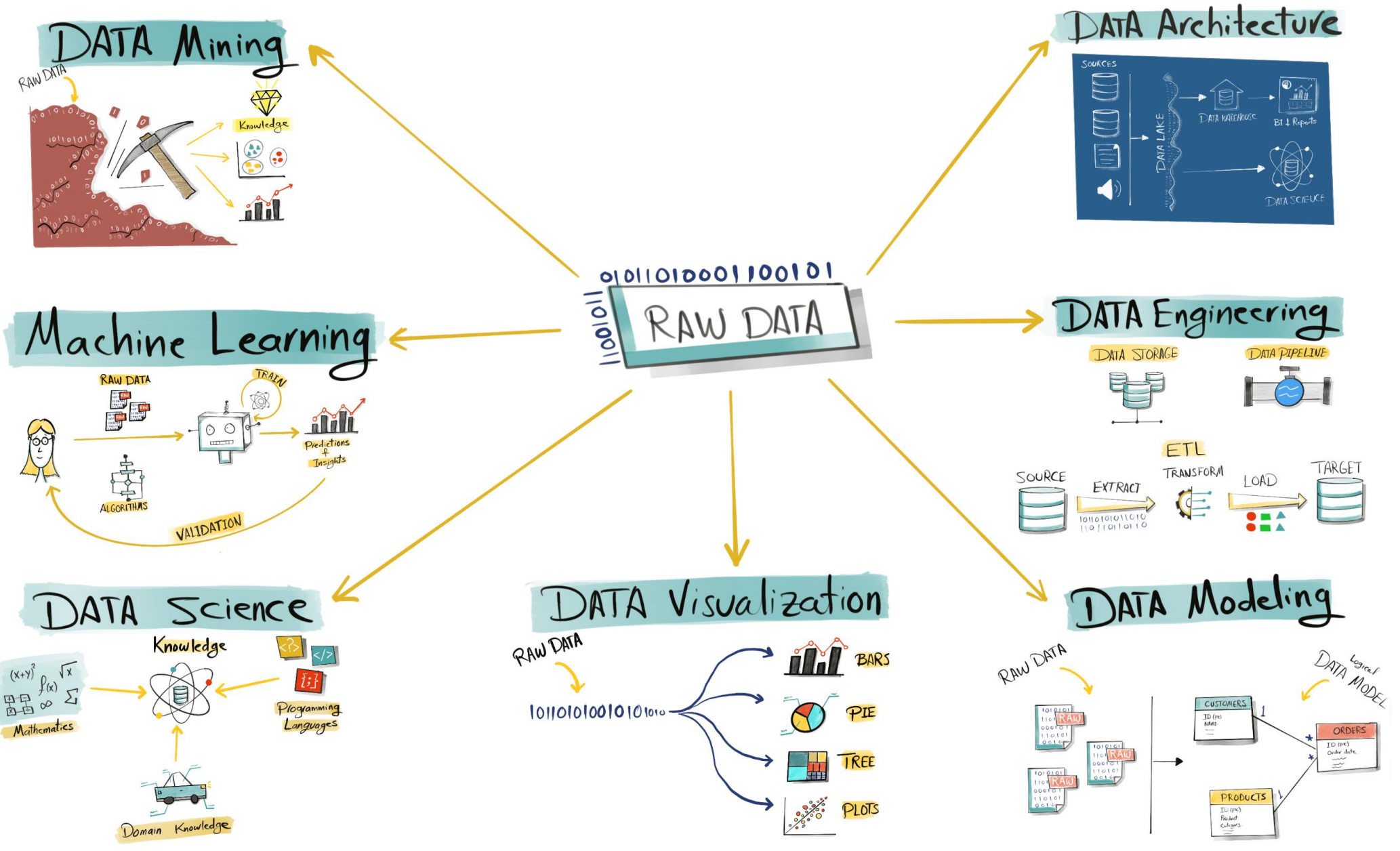


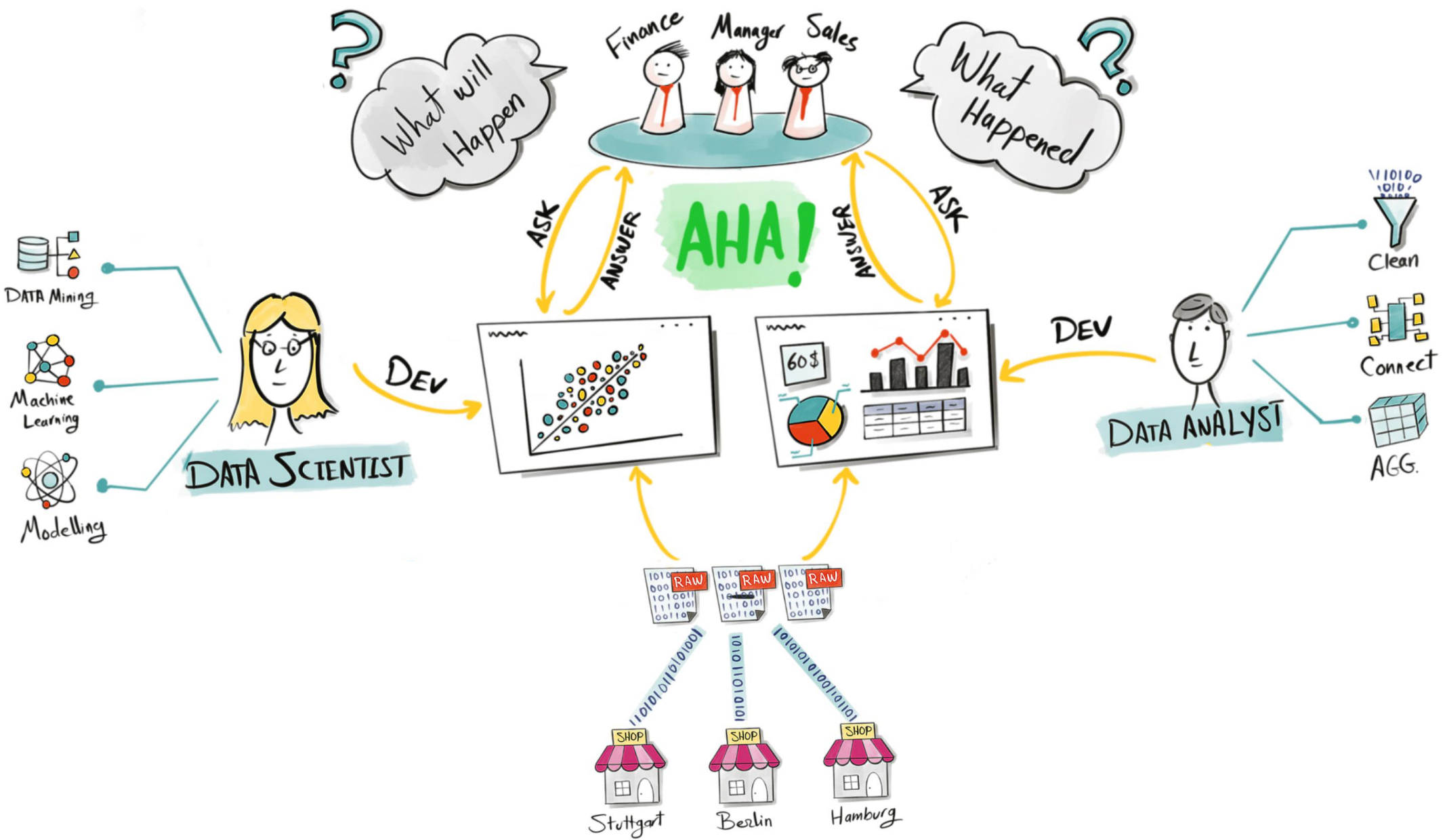
TARGET

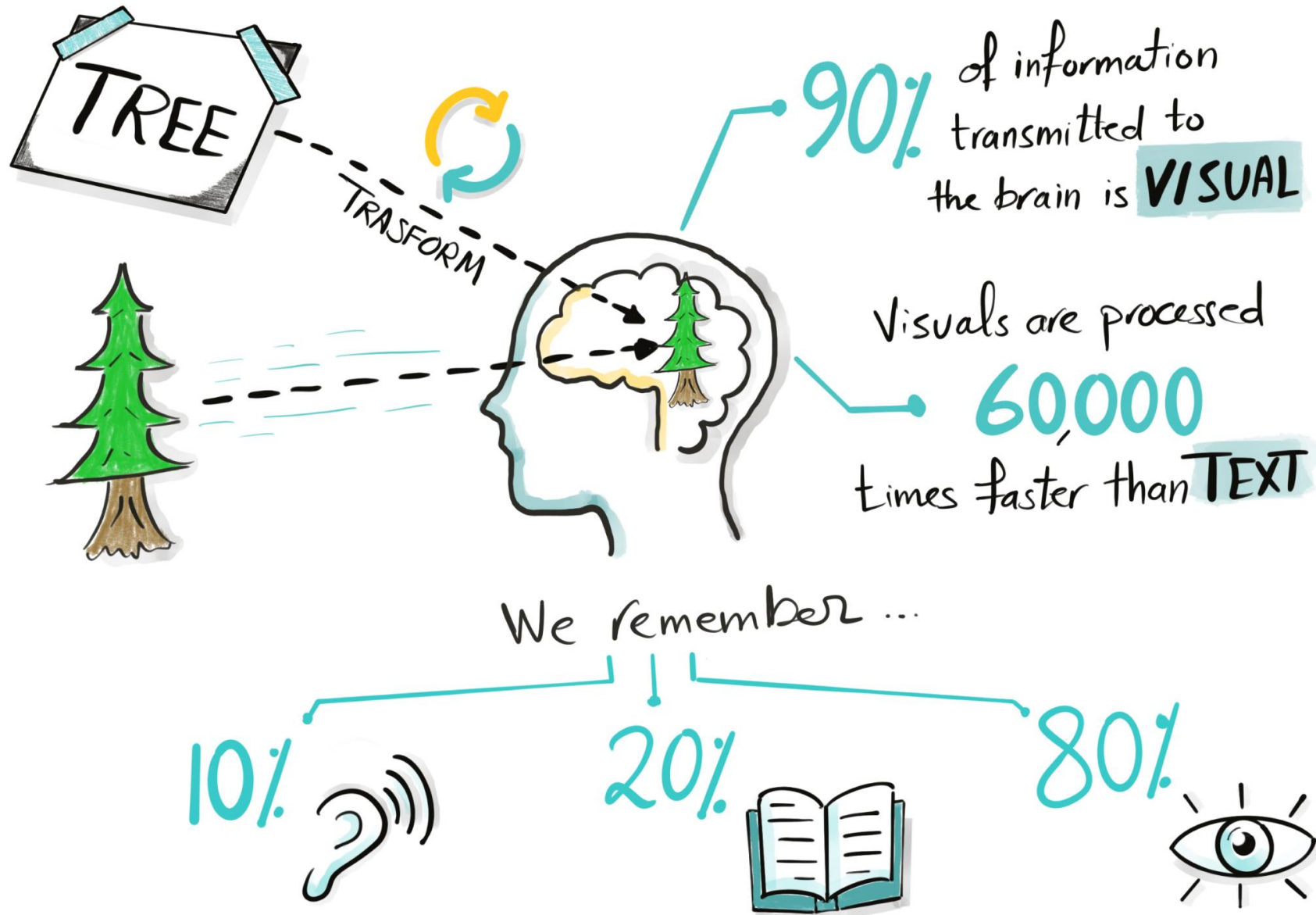




DATA BUZZWORDS

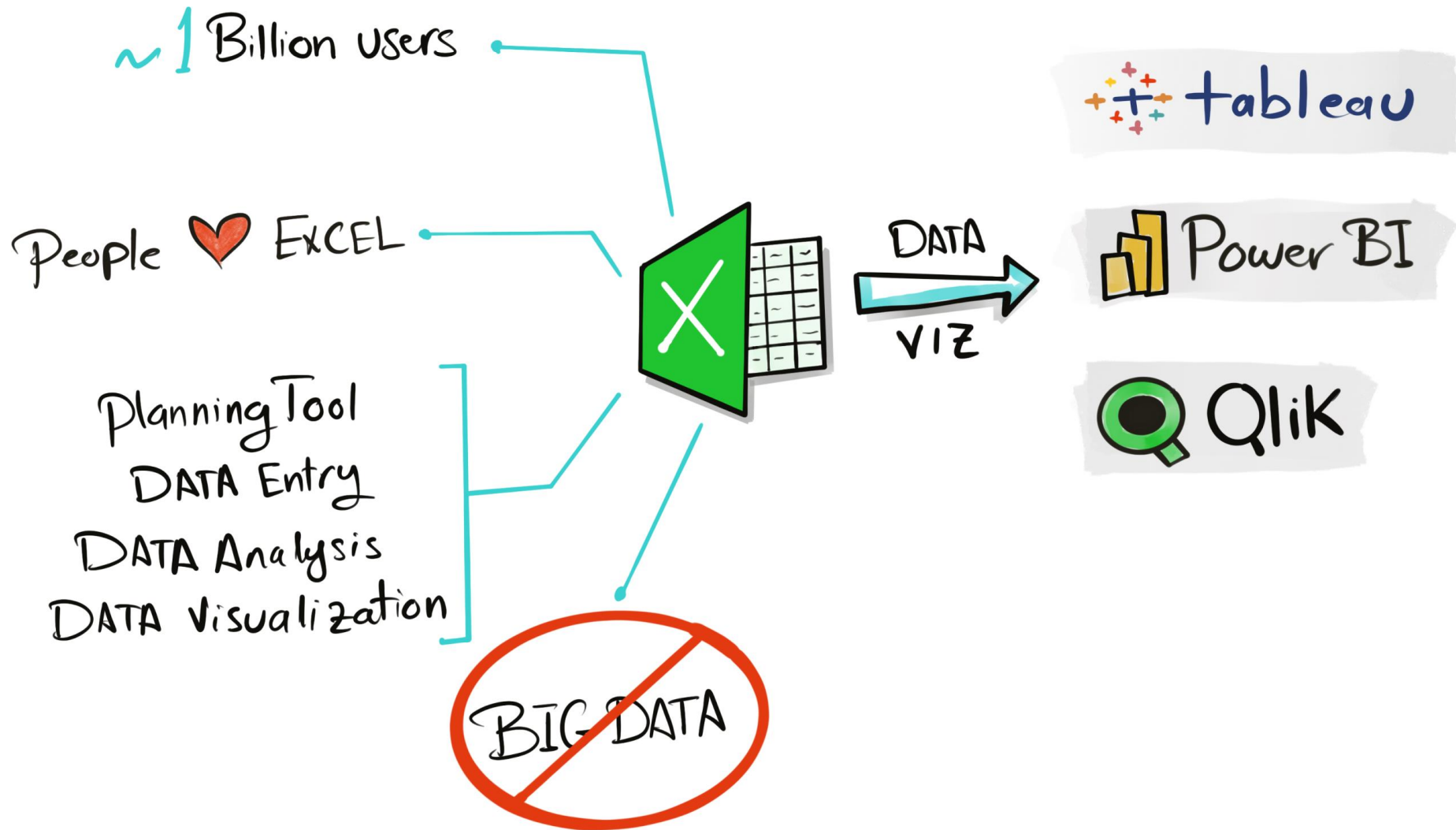


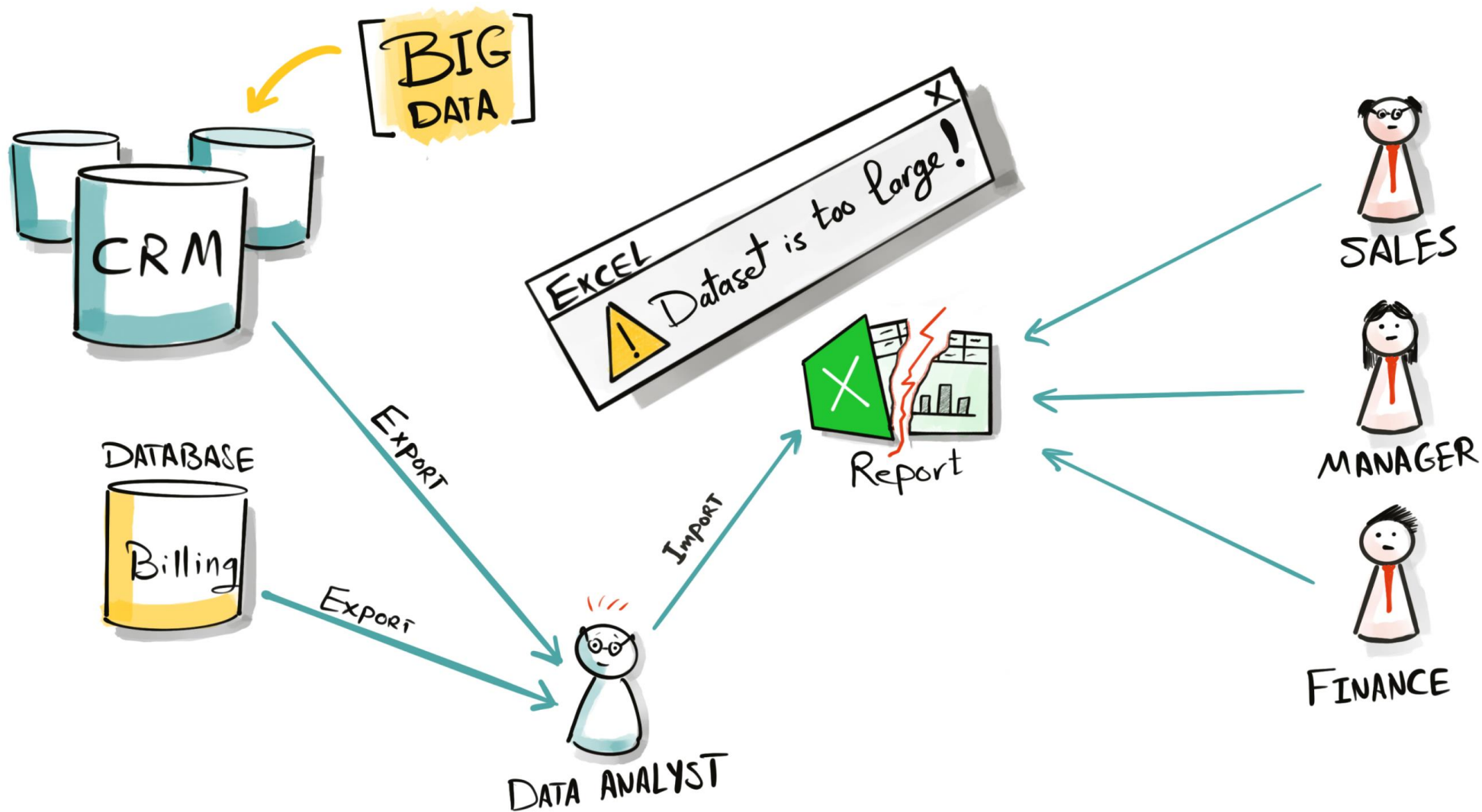


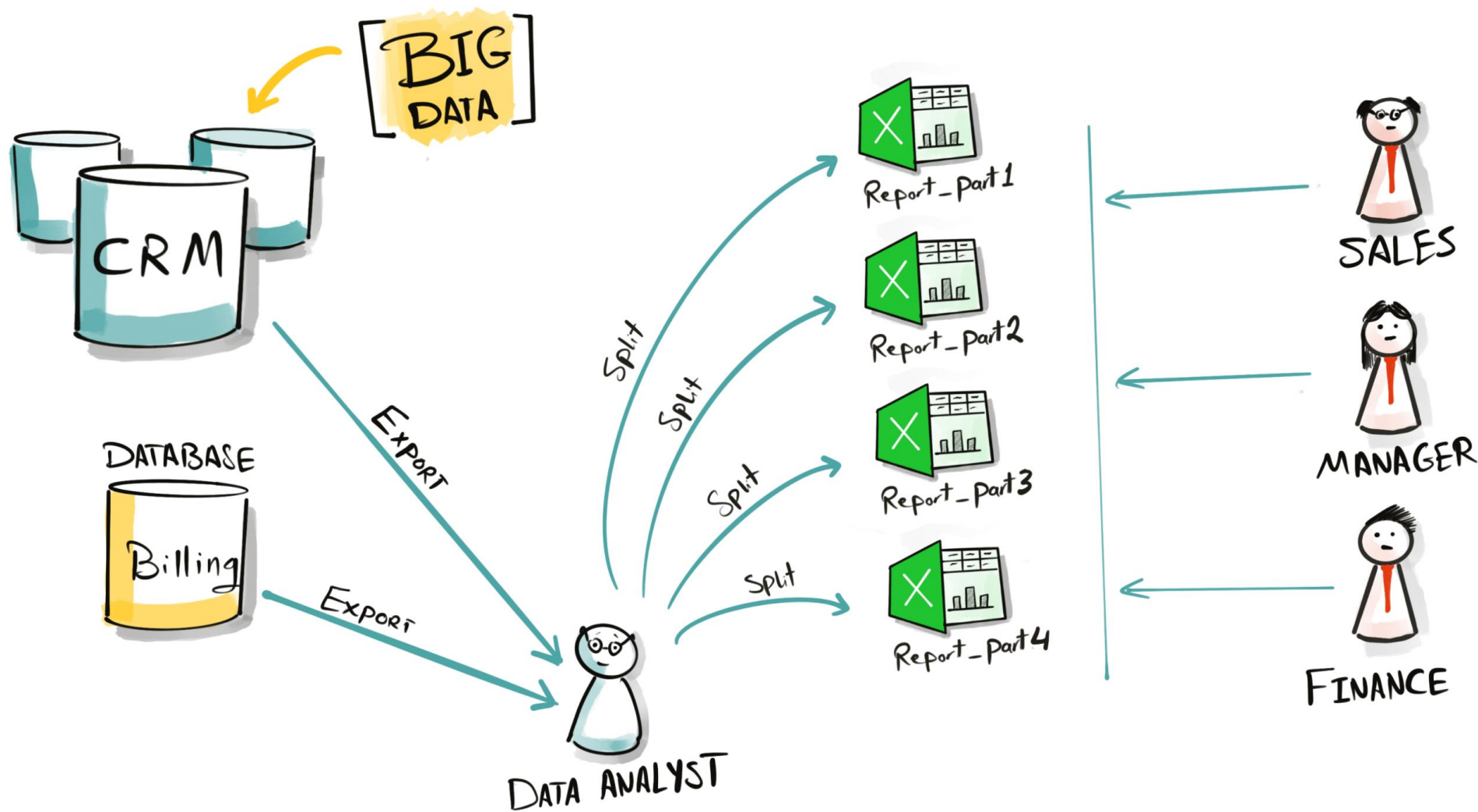


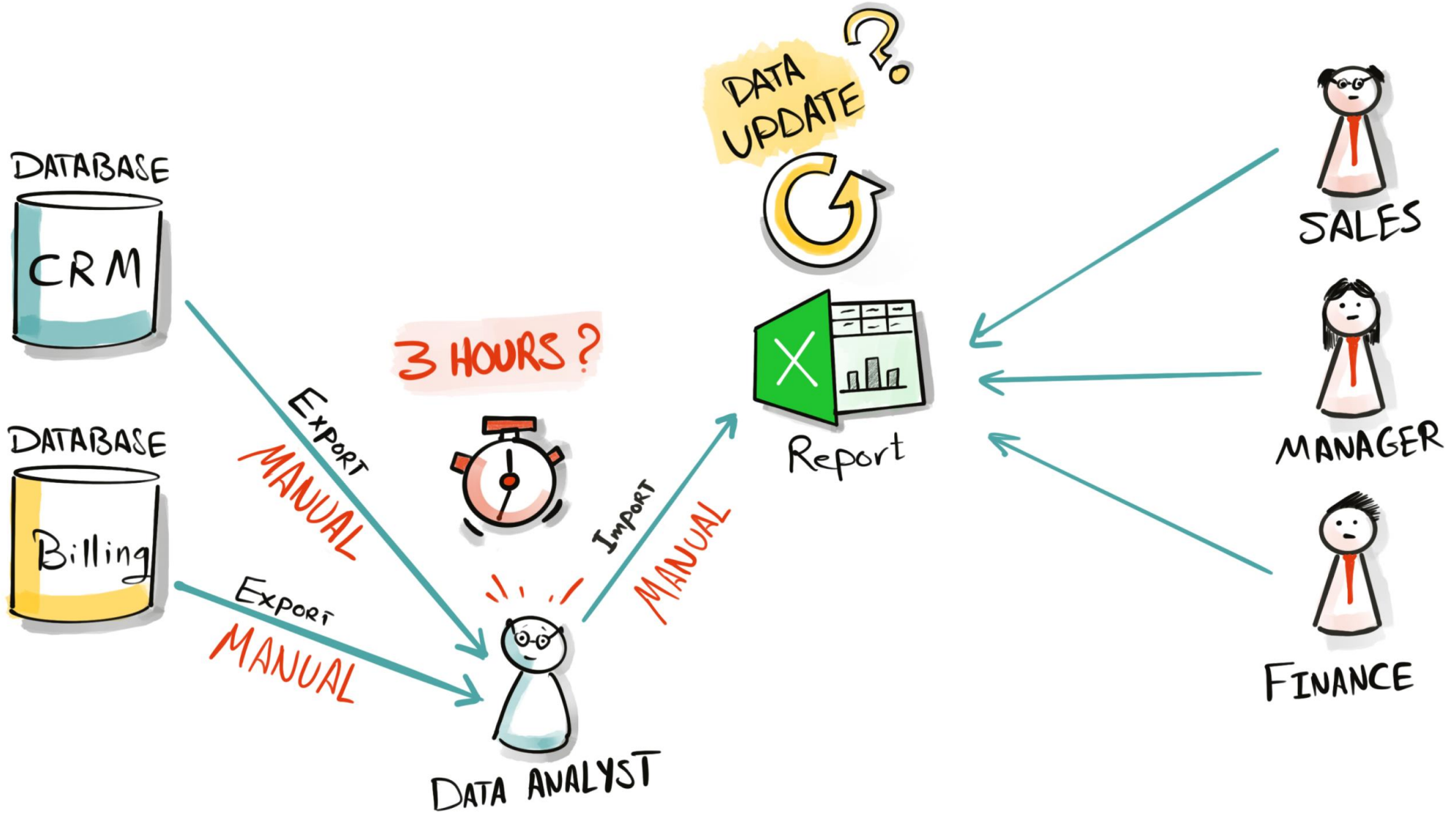


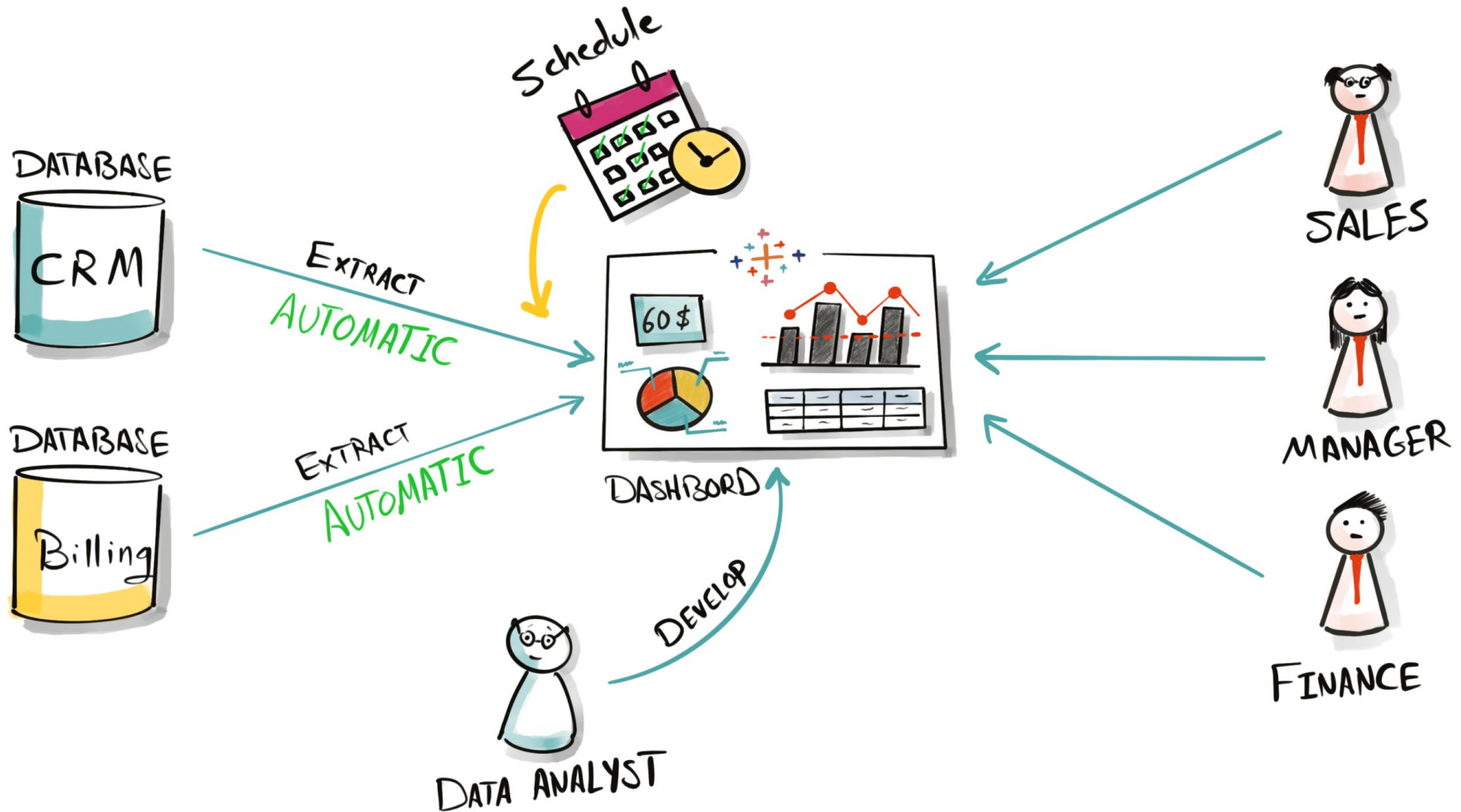
BI with Excel

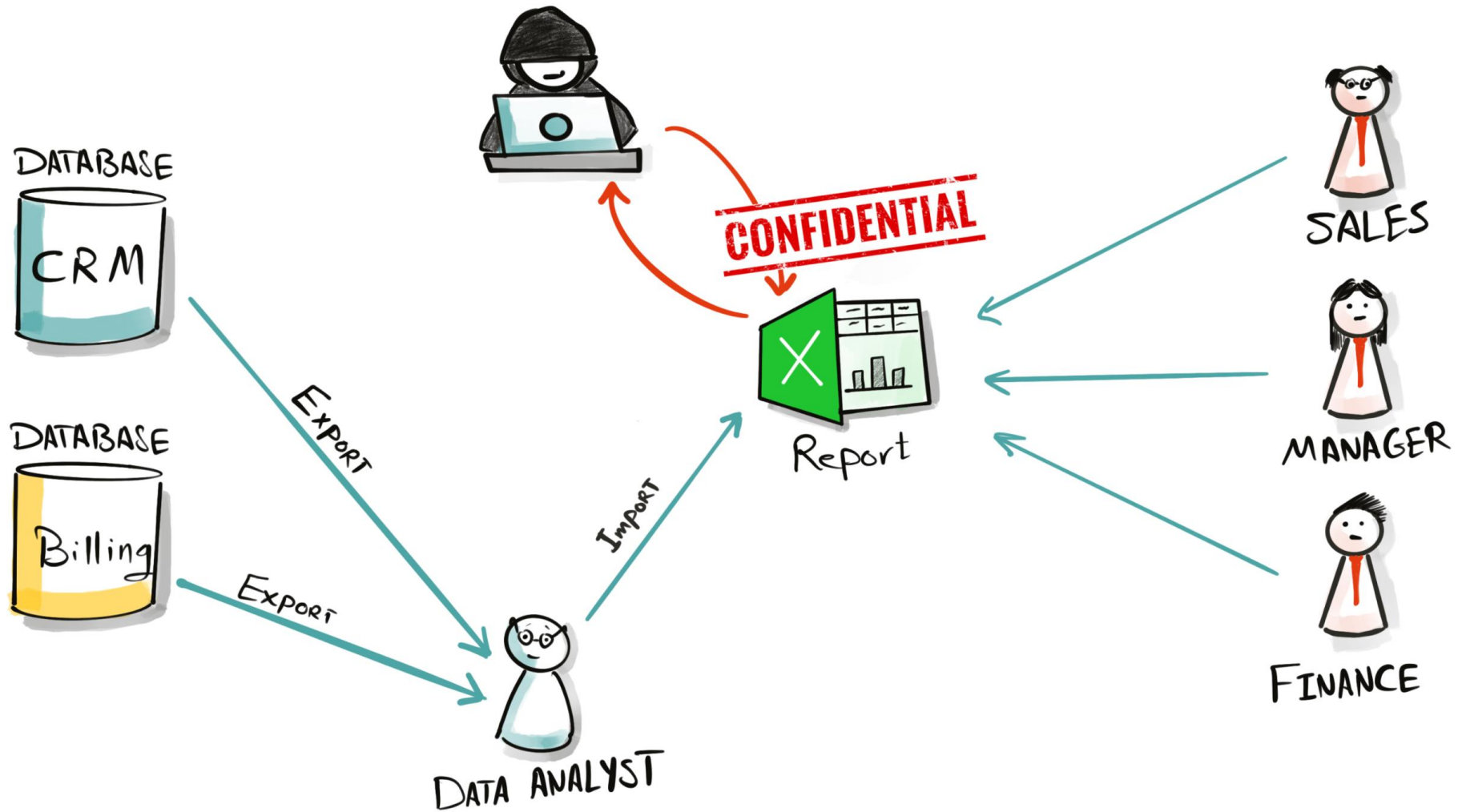


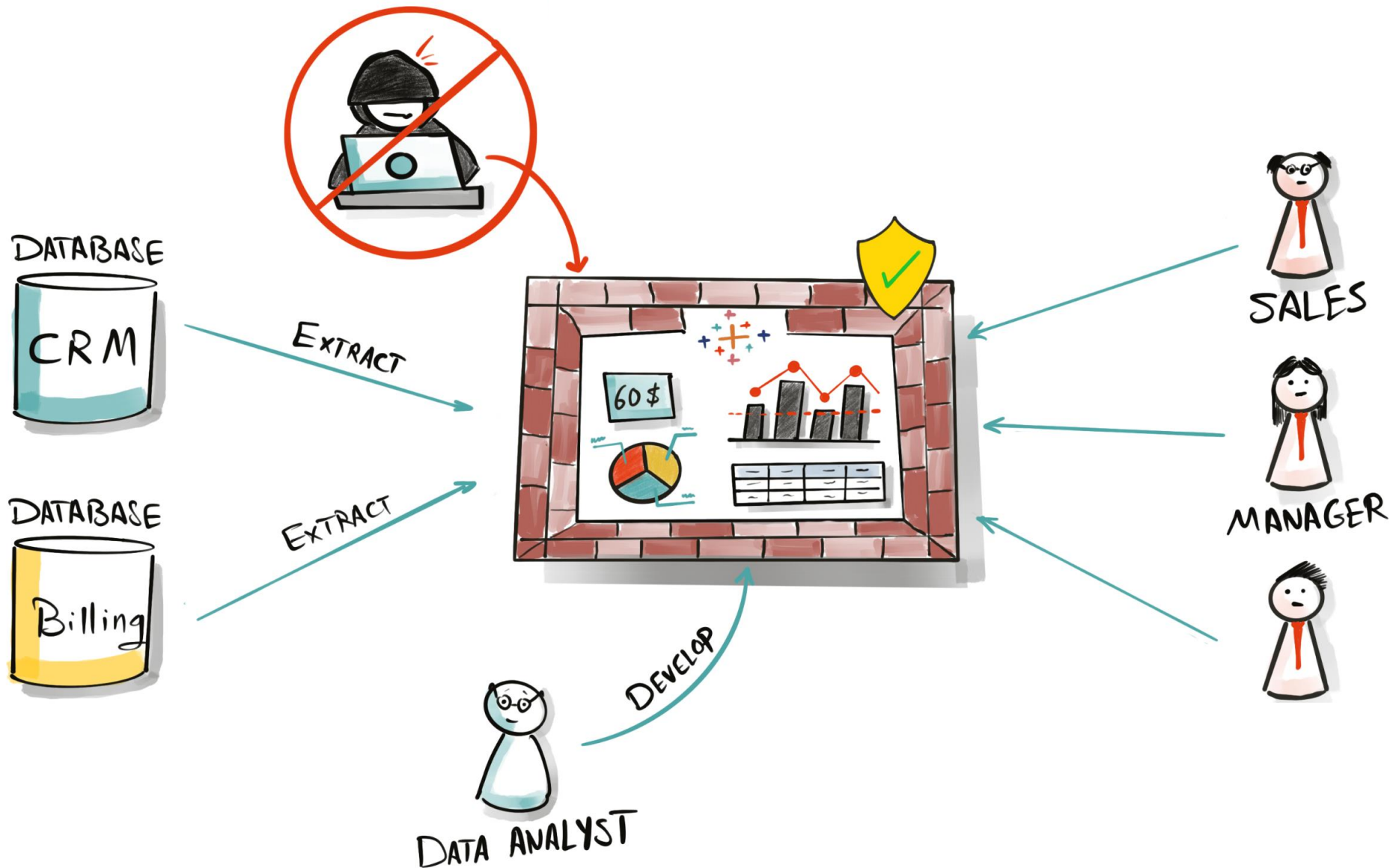












Row-Level-Security (RLS)

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

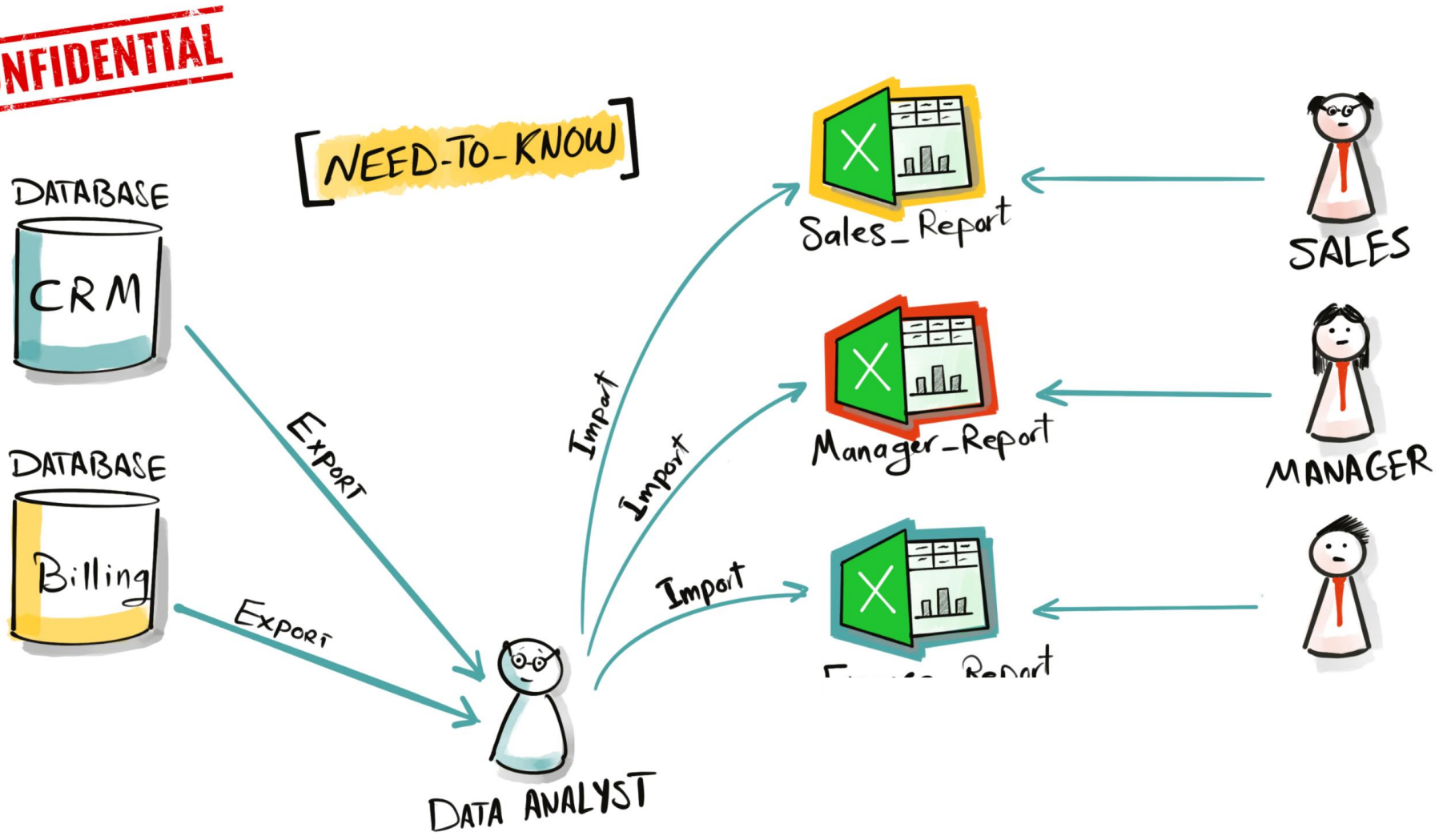
UserName	Country	Sales
Baraa	USA	9000
Baraa	Germany	8000

← Baraa's View

UserName	Country	Sales
John	France	10000
John	USA	7500

← John's View

CONFIDENTIAL



CONFIDENTIAL



[NEED-TO-KNOW]



EXTRACT

EXTRACT

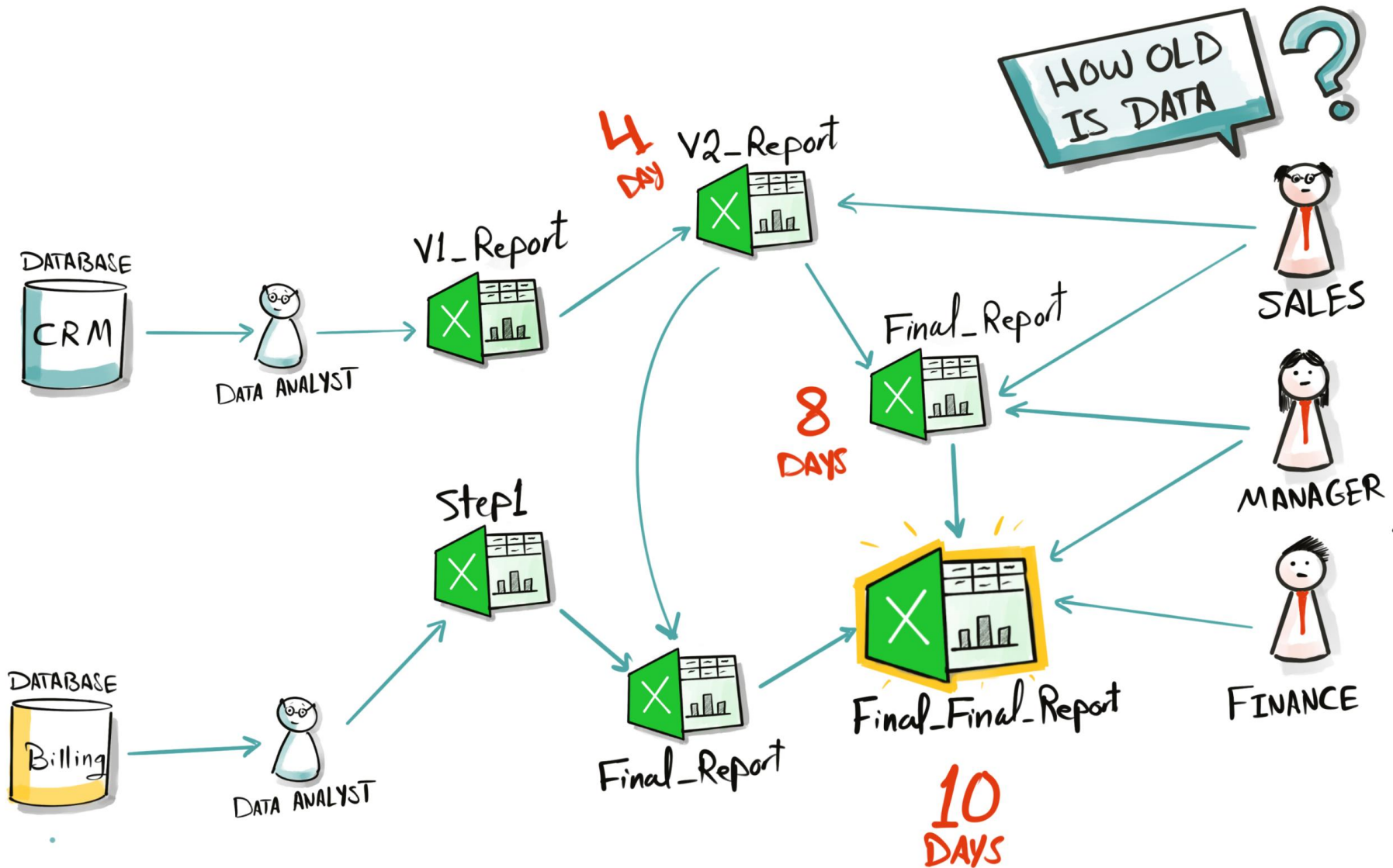


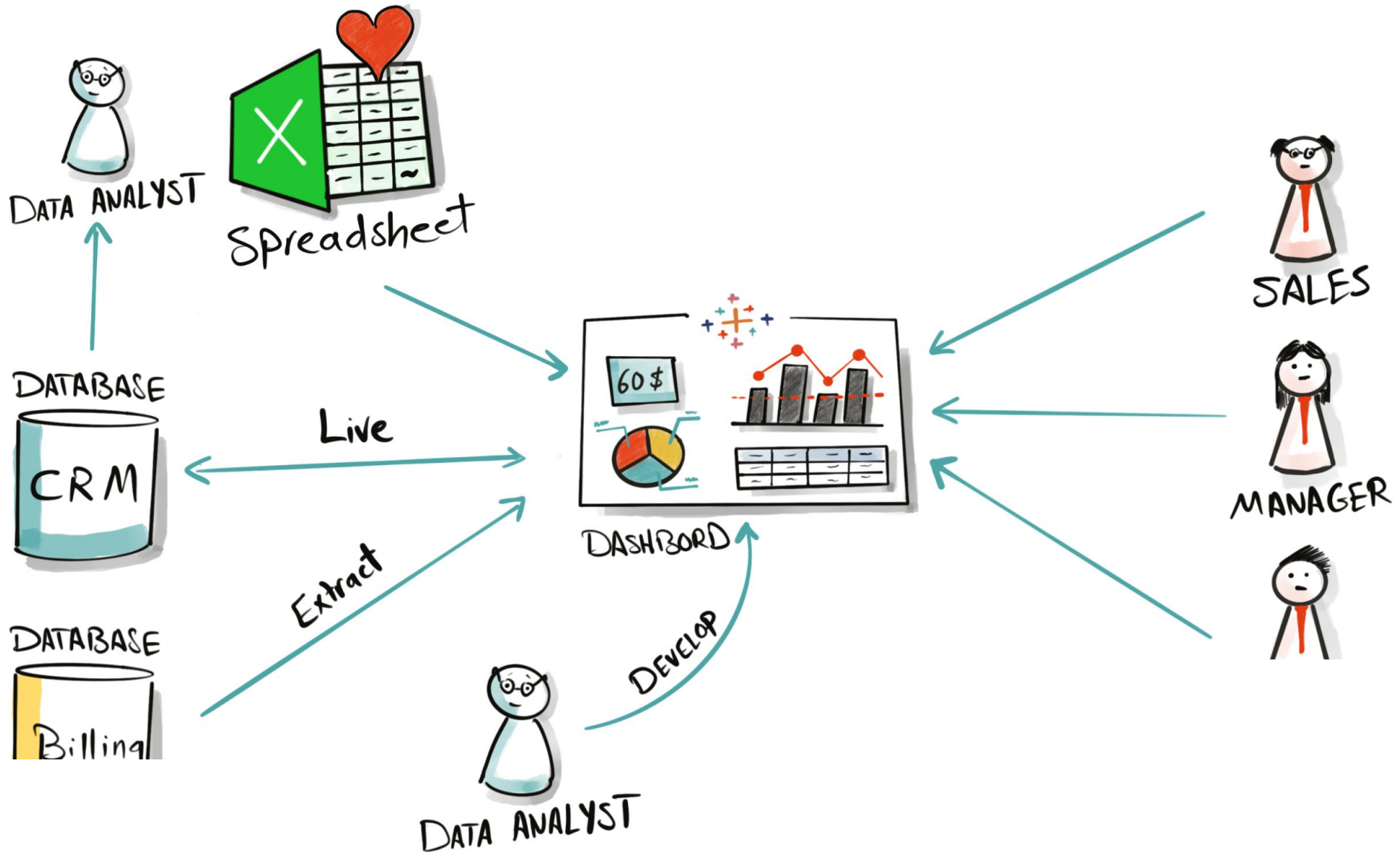
DASHBOARD

DEVELOP

DATA ANALYST







Benifits of Tableau vs Excel



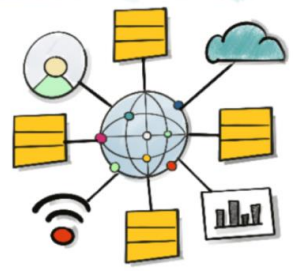
Automation ✓



Security ✓

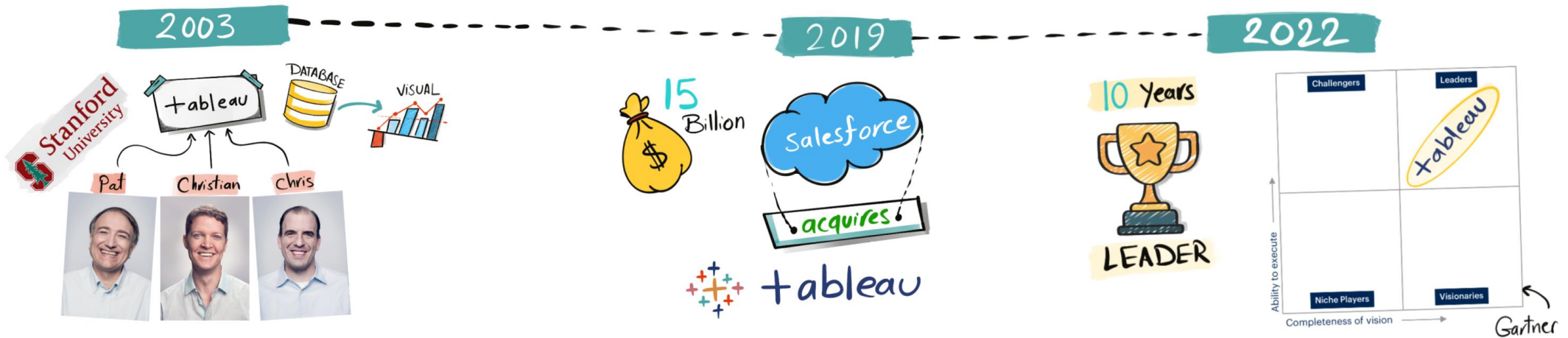


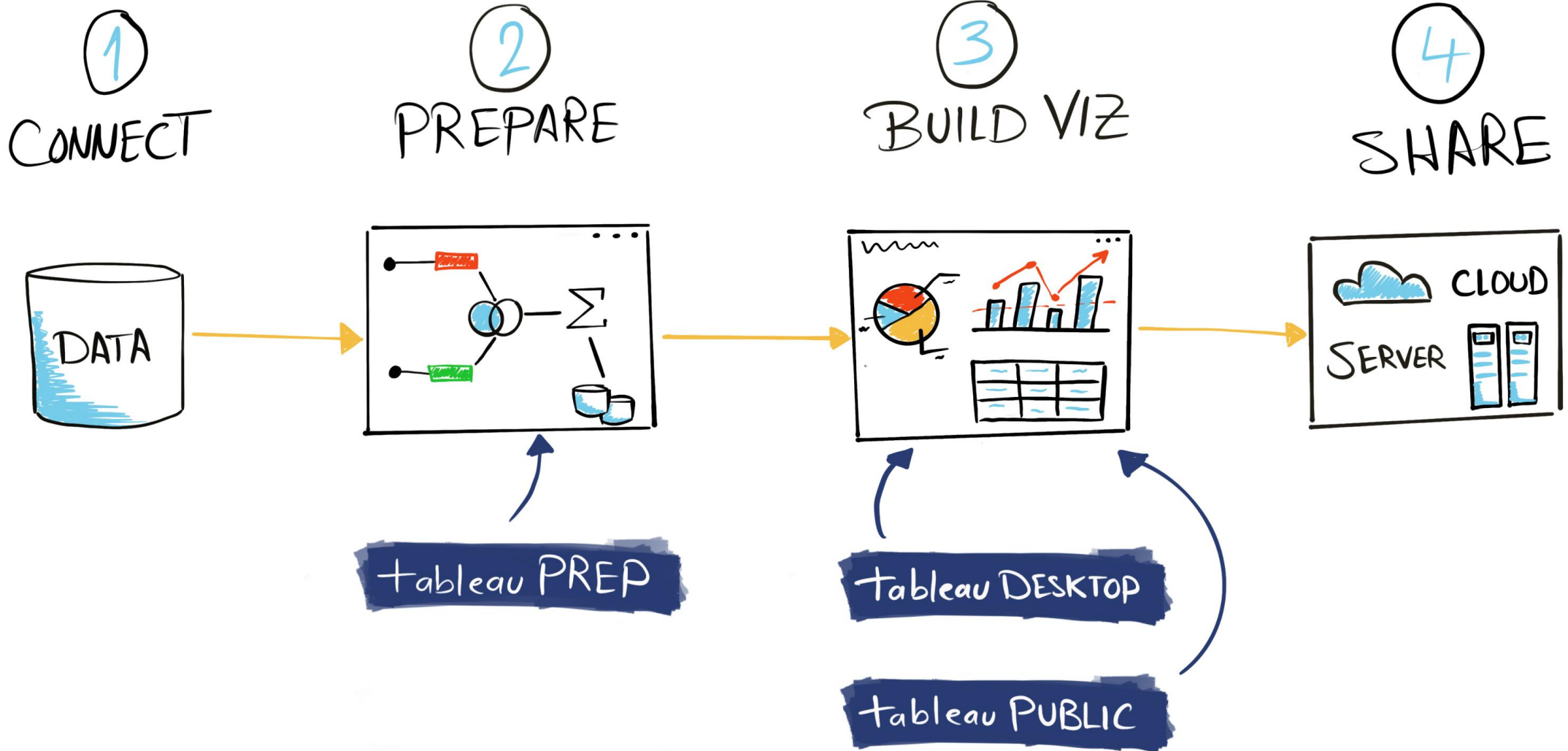
BIG DATA ✓



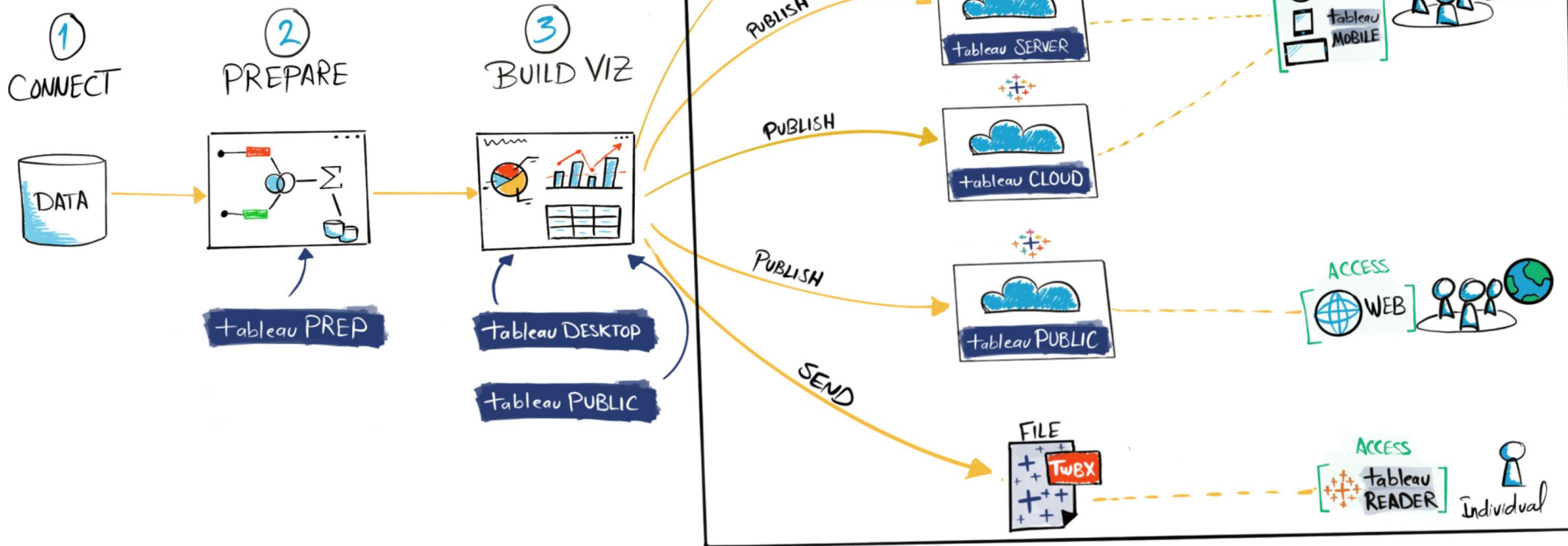
Interactive ✓







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



 
PUBLIC

Tableau Public

"Free Version of Tableau Desktop"

Developer tool for data visualization

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

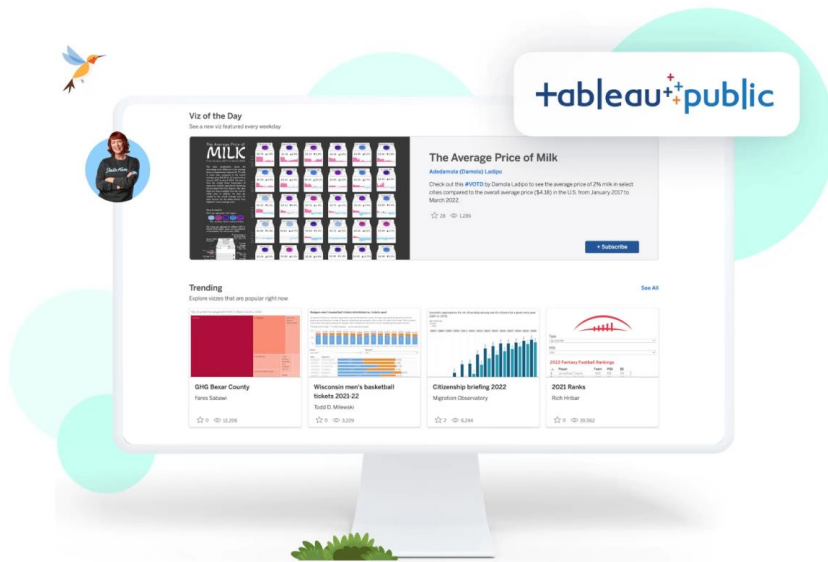
Free Tool

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



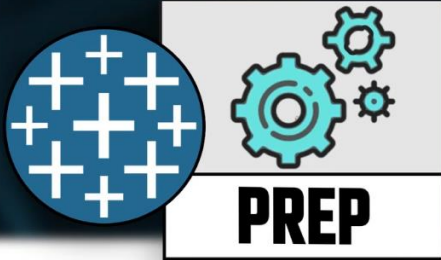


Tableau Prep

"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

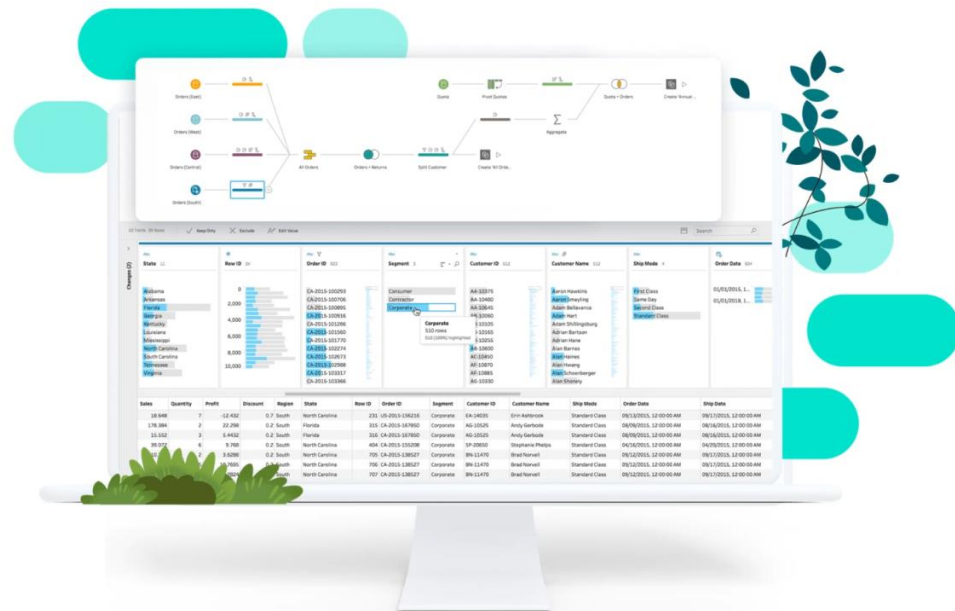
Output

- File
- Tableau Data Source
- Database Table

Publish

- Tableau Server
- Tableau Cloud

No public (free) version available.



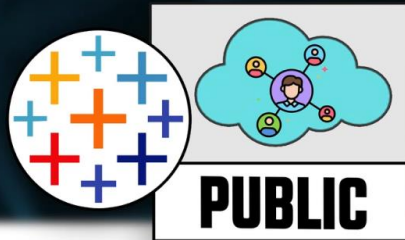


Tableau Public Cloud

"Social Media of Tableau"

Sharing tool for data visualization

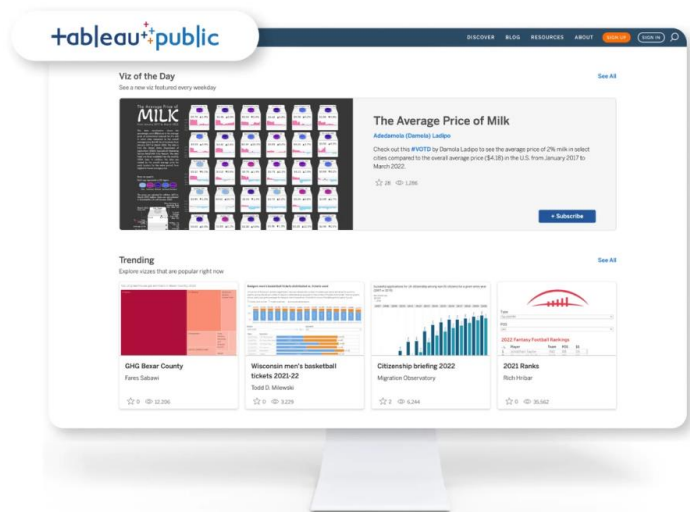
Free Cloud Service from Tableau

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



**READER**

Tableau Reader

"Free Tool to view Vizzes"

Sharing tool for data visualization

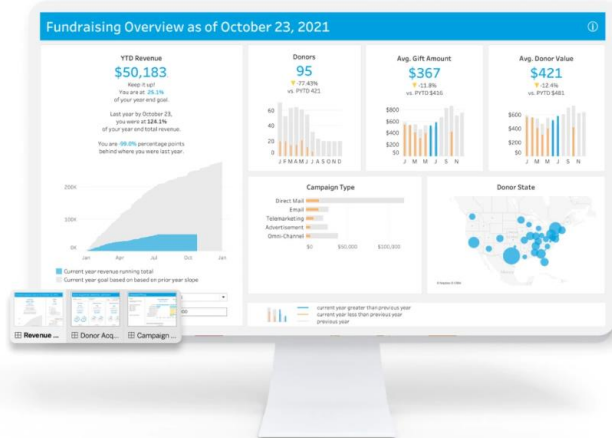
Free Tool

Only to view visualization

Main Limitations

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

Don't recommend using it in organization

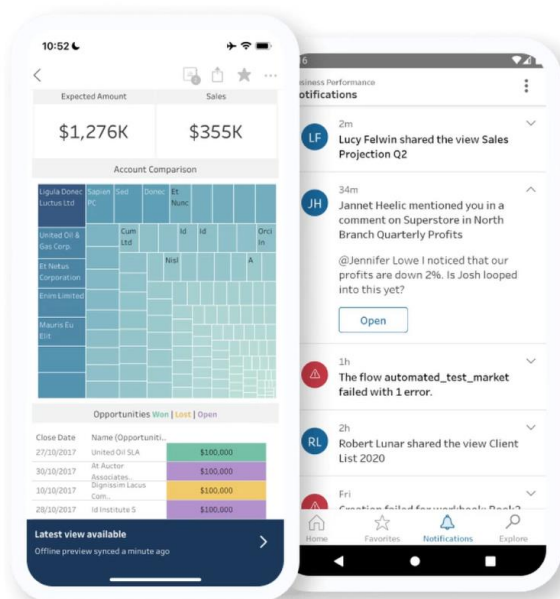





MOBILE

Tableau Mobile

"Access Vizses from anywhere"



Only to **view** visualization

Cant use it to **build** data visualization

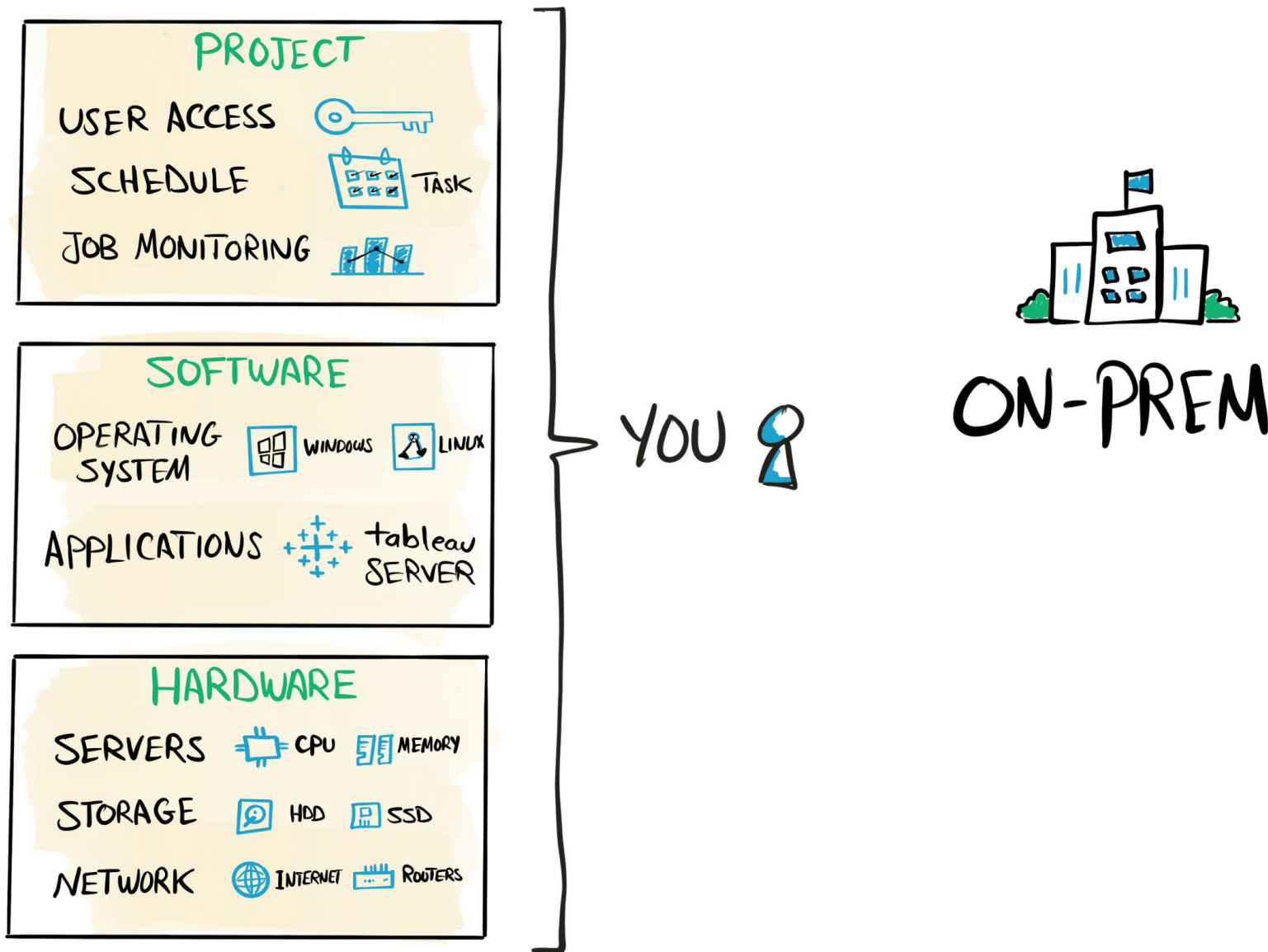
Free App to **download**

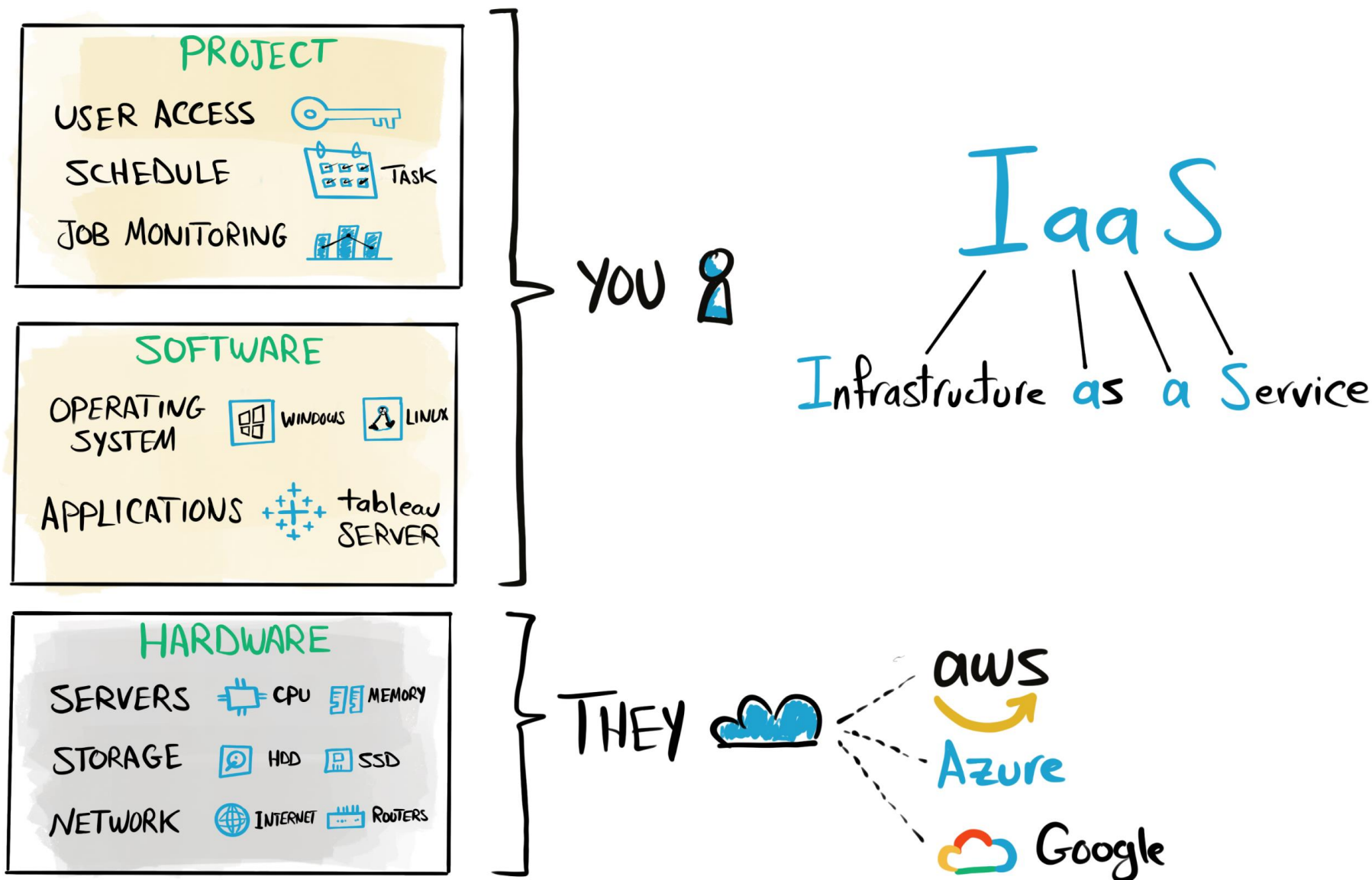
Require a **licence** to use

Connect to


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


Caching Dashboards for **offline** access







PROJECT



USER ACCESS 


SCHEDULE  TASK

JOB MONITORING 

YOU 



SOFTWARE



OPERATING SYSTEM  WINDOWS  LINUX



APPLICATIONS  tableau SERVER

THEY 

HARDWARE


SERVERS  CPU  MEMORY

STORAGE  HDD  SSD

NETWORK  INTERNET  ROUTERS












SaaS

Software as a Service

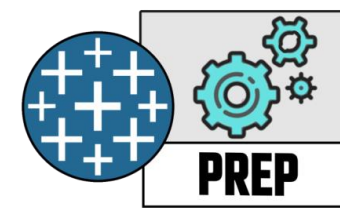
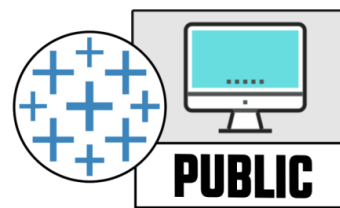
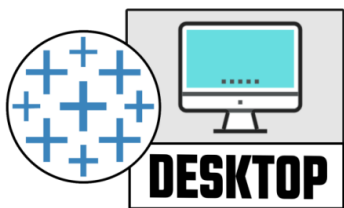
tableau CLOUD 












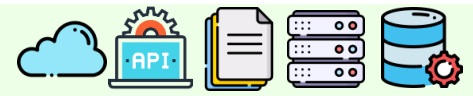

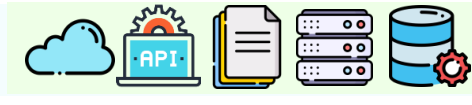









Dev Products Comparison

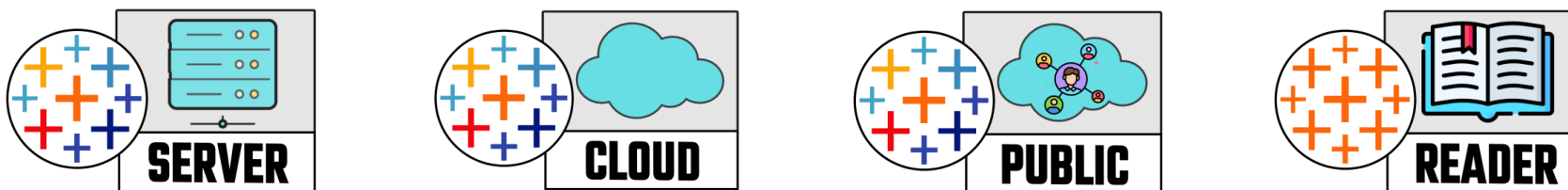


 Hosting	  SERVER	  SERVER	 CLOUD
 Hardware	YOU	THEY	THEY
 Software	YOU	YOU	THEY
 Project	YOU	YOU	YOU
 PROS	Full Control	Flexibility	Focus on Core Business
	Data behind Firewalls	No Upfront Costs	Always Up-To-Date
 CONS	High Upfront Costs	Software Administration	Loss of Control
	Inflexibility	Unexpected costs	Potential Networking Issue

Dev Products Comparison

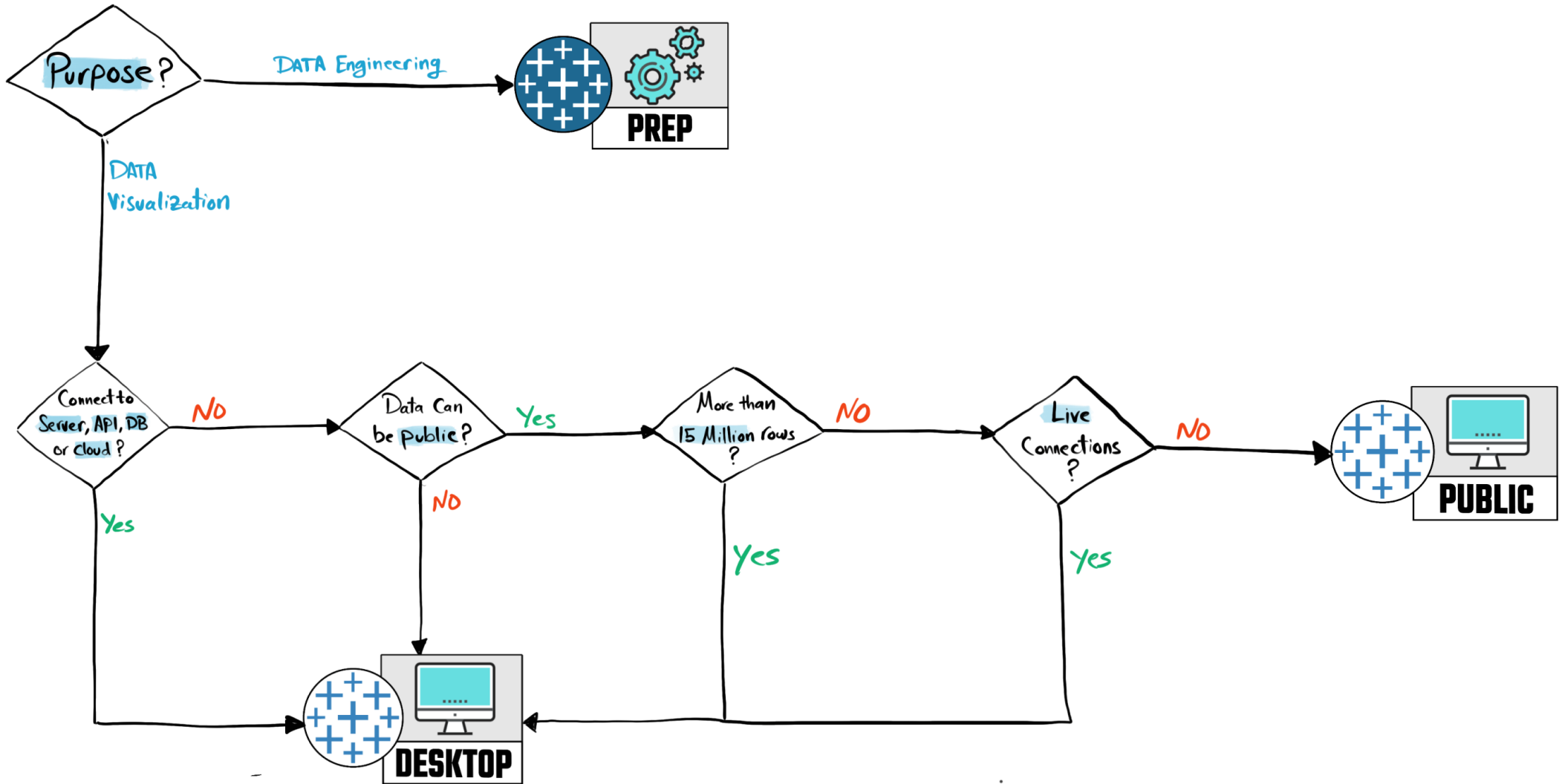


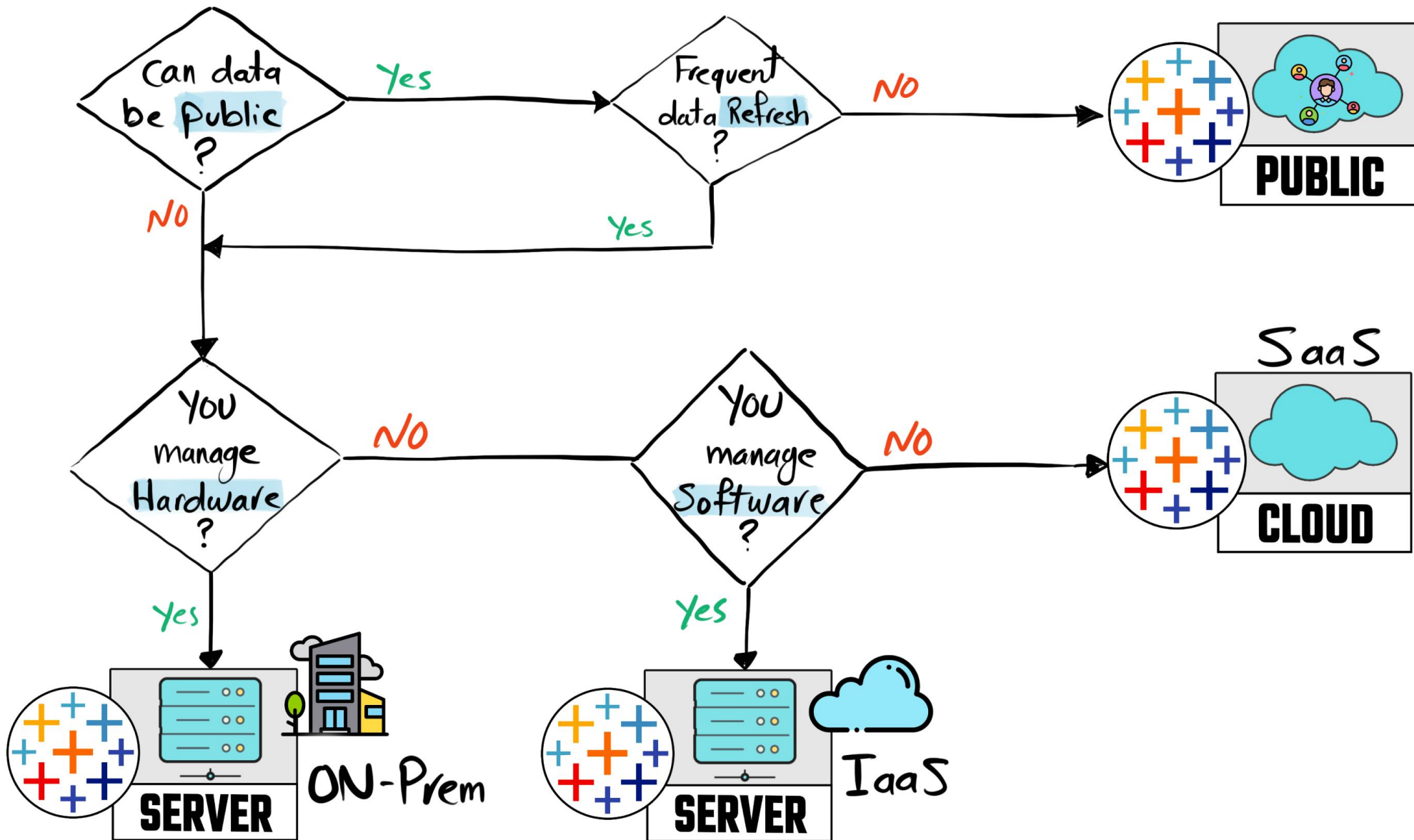
	DESKTOP	PUBLIC	PREP
 Purpose	Data Visualization	Data Visualization	Data Engineering
 Costs			
 Security			
 Data Limit	No Limit	15 Million Rows	No Limit
 Connectors			
 Live Con.			
 Store Locally			
 Audience	Data Scientists & Analysts	Everyone	Data Engineers



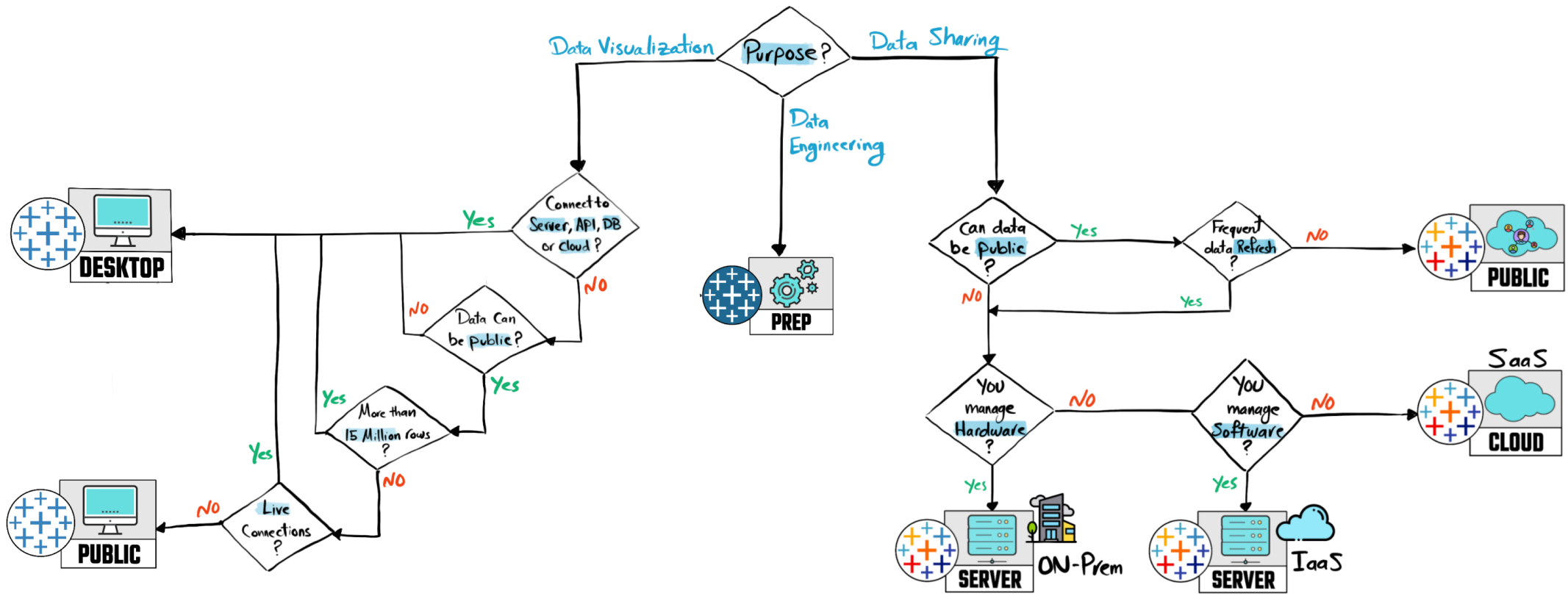
	SERVER	CLOUD	PUBLIC	READER
Project				
Software				
Hardware				
Storage Limit	Server Disk Space	No Limits	10 GB	No Limits
Connectors				
Automation				
Mobile				
Sharing				

Choose Right Dev Product





Choose Right Tableau Product



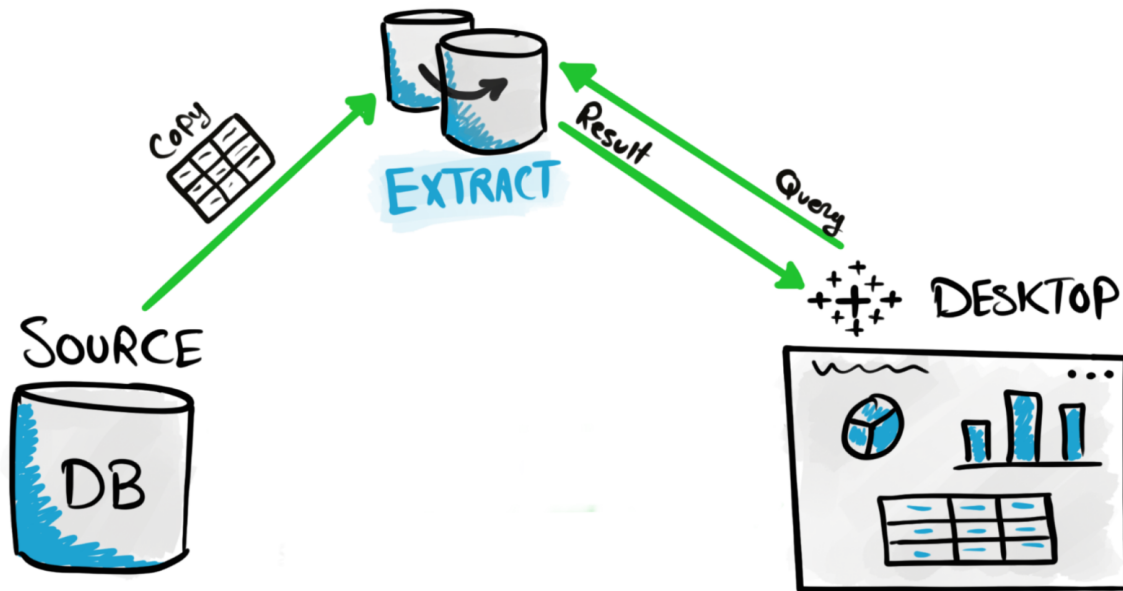
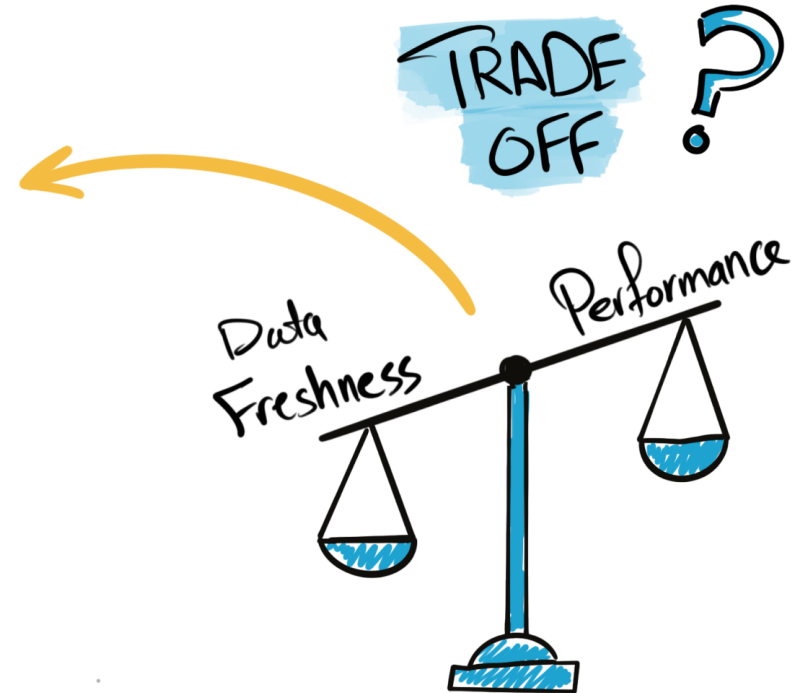
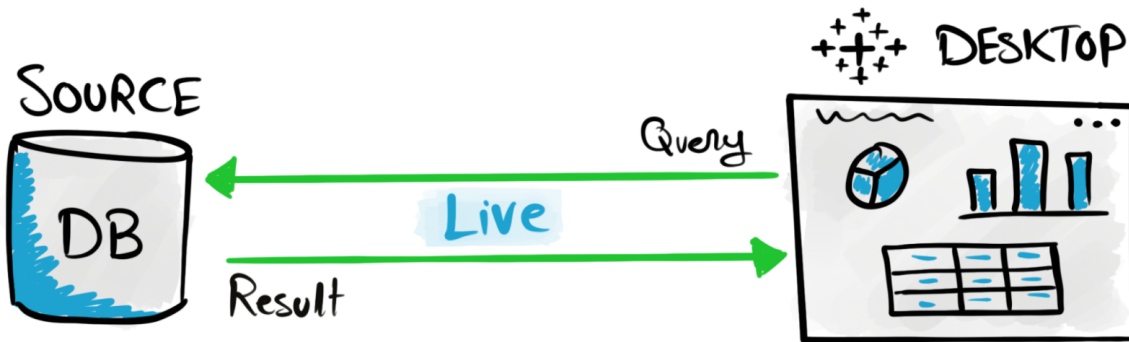
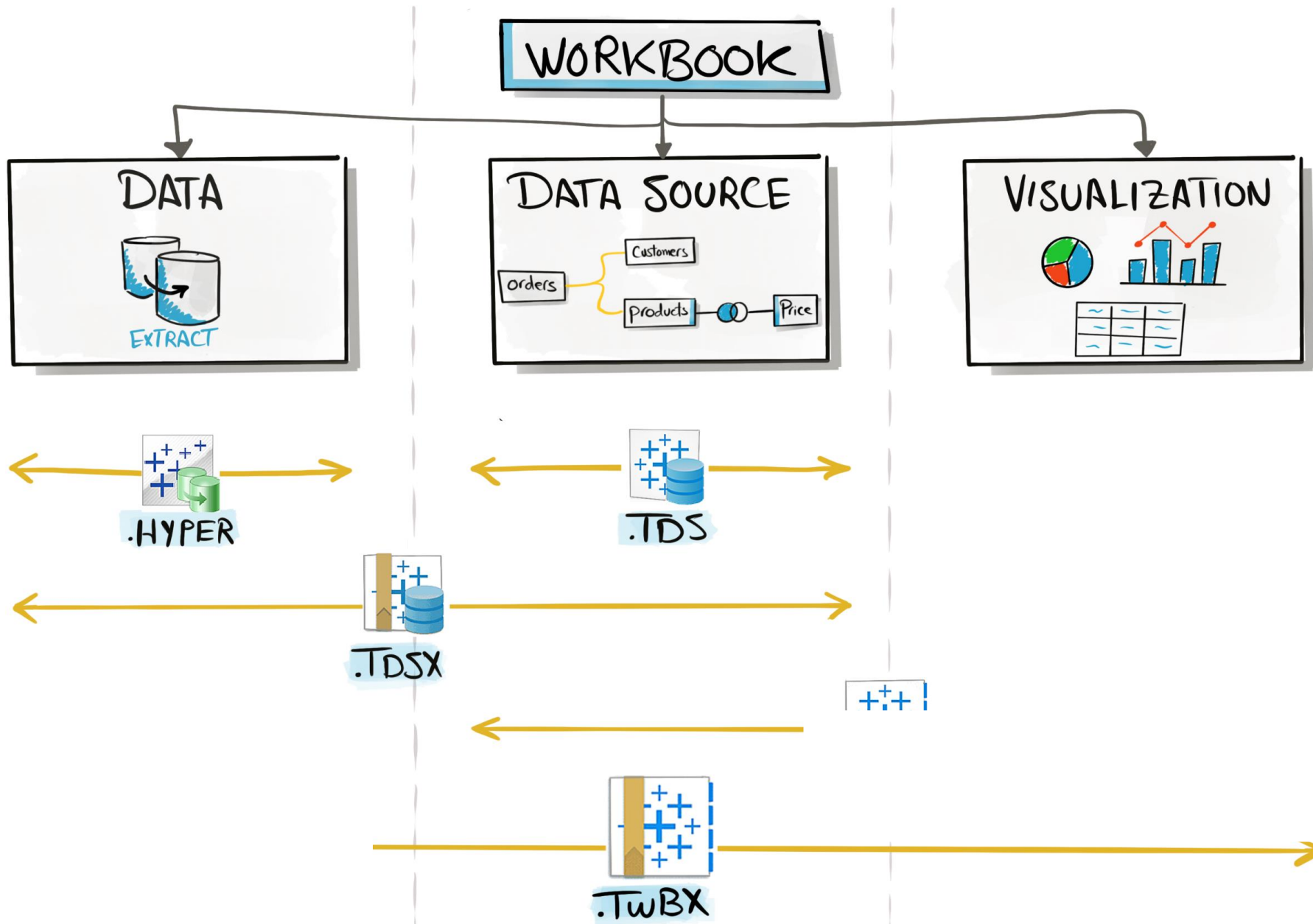


Tableau File Types



With Data

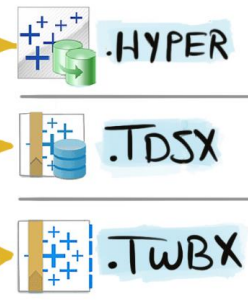
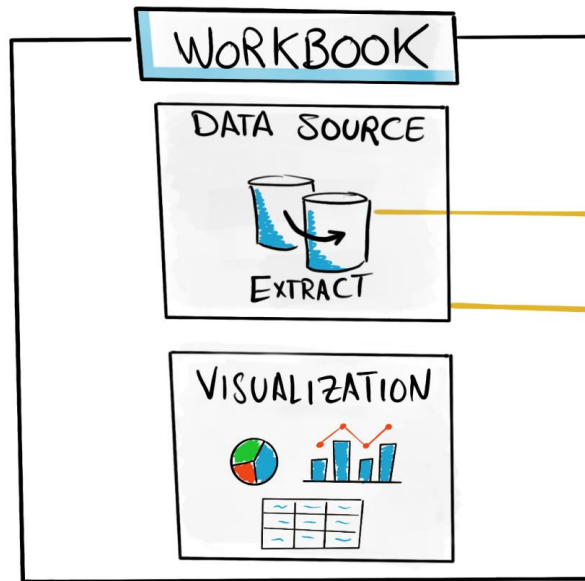
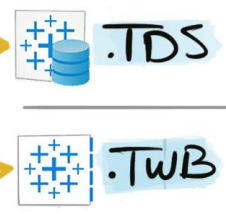
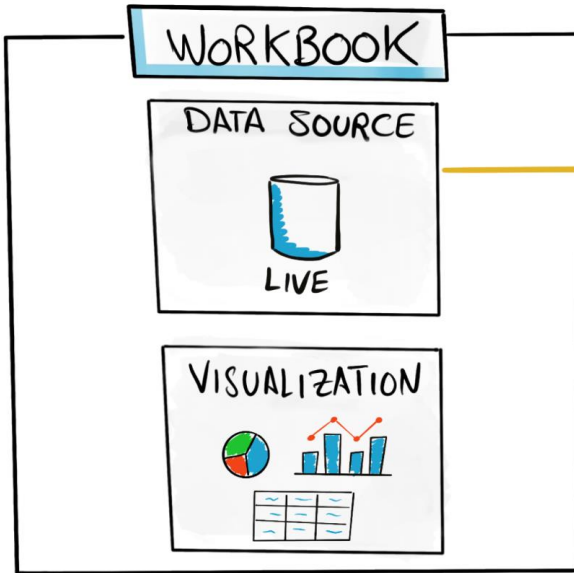


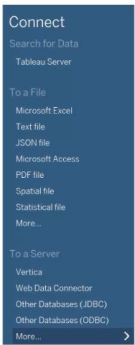
	tableau Desktop	tableau Reader	tableau Public
.HYPER	✓	✗	✗
.TDSX	✓	✗	✗
.TWBX	✓	✓	✓

Without Data



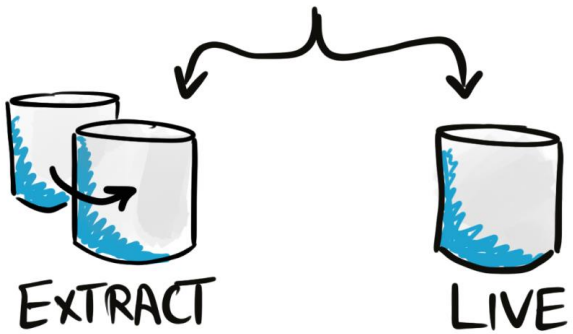
.TDS	✓	✗	✗
.TWB	✓	✗	✗

DATA CONNECTORS



} 90 CONNECTORS

CONNECTION TYPE



ACCESS INFO

Path → E:\User\Data\Tableau\sales.csv

DB Location → Server: localhost Port: 3306 Database: myfirstwebsitedb

Access token → czZCaGRSa3F0MzpnIUjK09lqErXJW

DATA MODEL

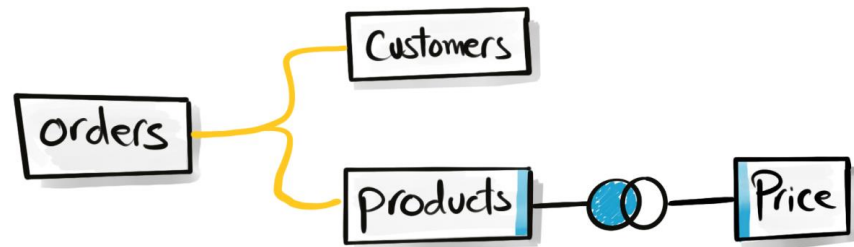
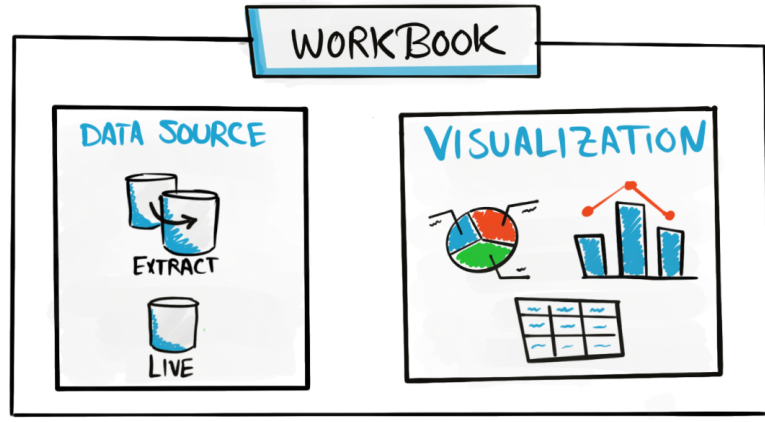


Tableau Workbook Files



DATA

METADATA



ID	Prod	Price
1	A	20.5
2	D	8.99
3	F	
4		

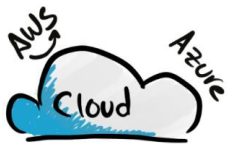
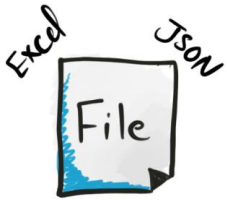


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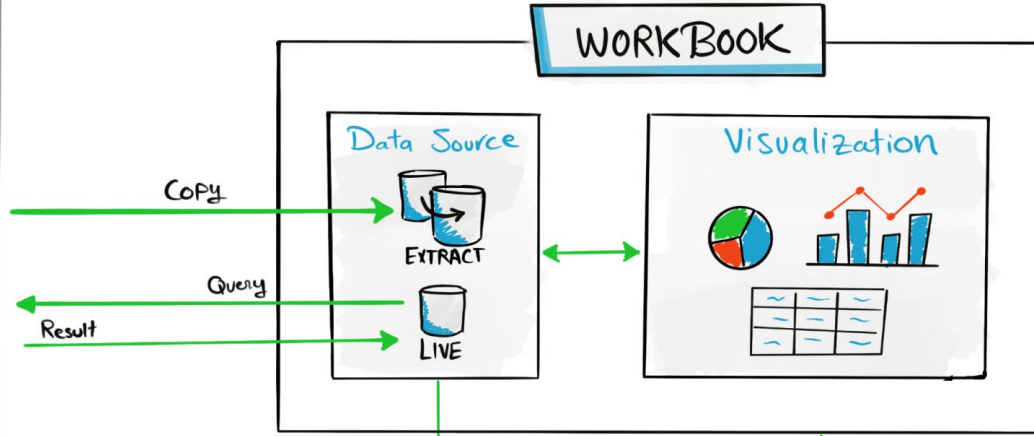
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SALES.TWB

SOURCE



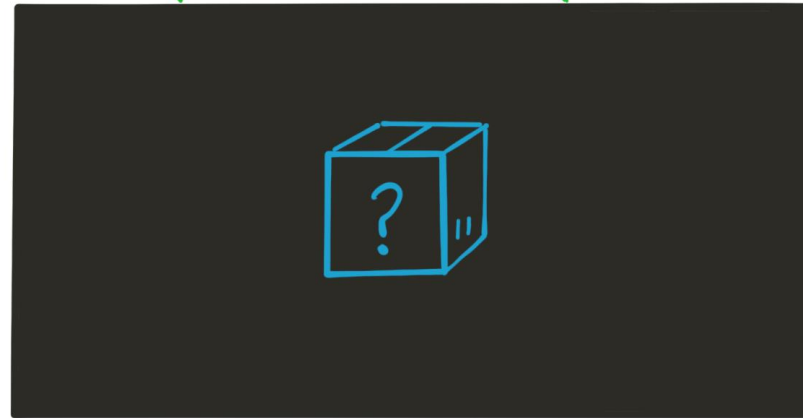
DESKTOP



Publish Data Source

Publish Workbook

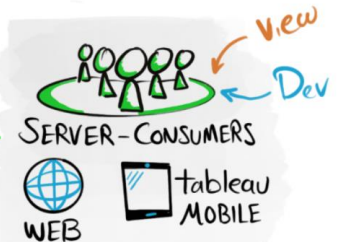
SERVER



CONSUMER

.TWBX

.HYPER .TDSX .TWBX
.TDS .TWB



REPOSITORY

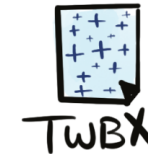


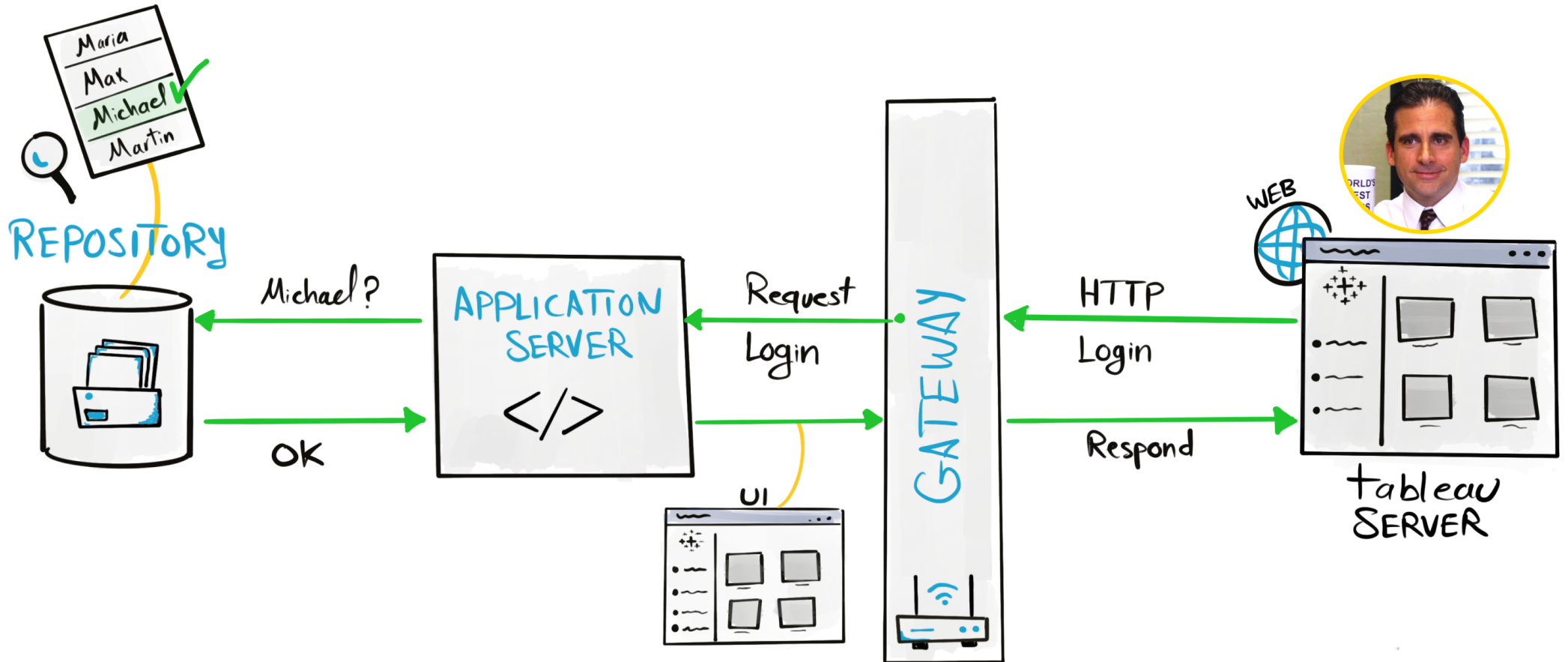
APPLICATION
SERVER
`</>`



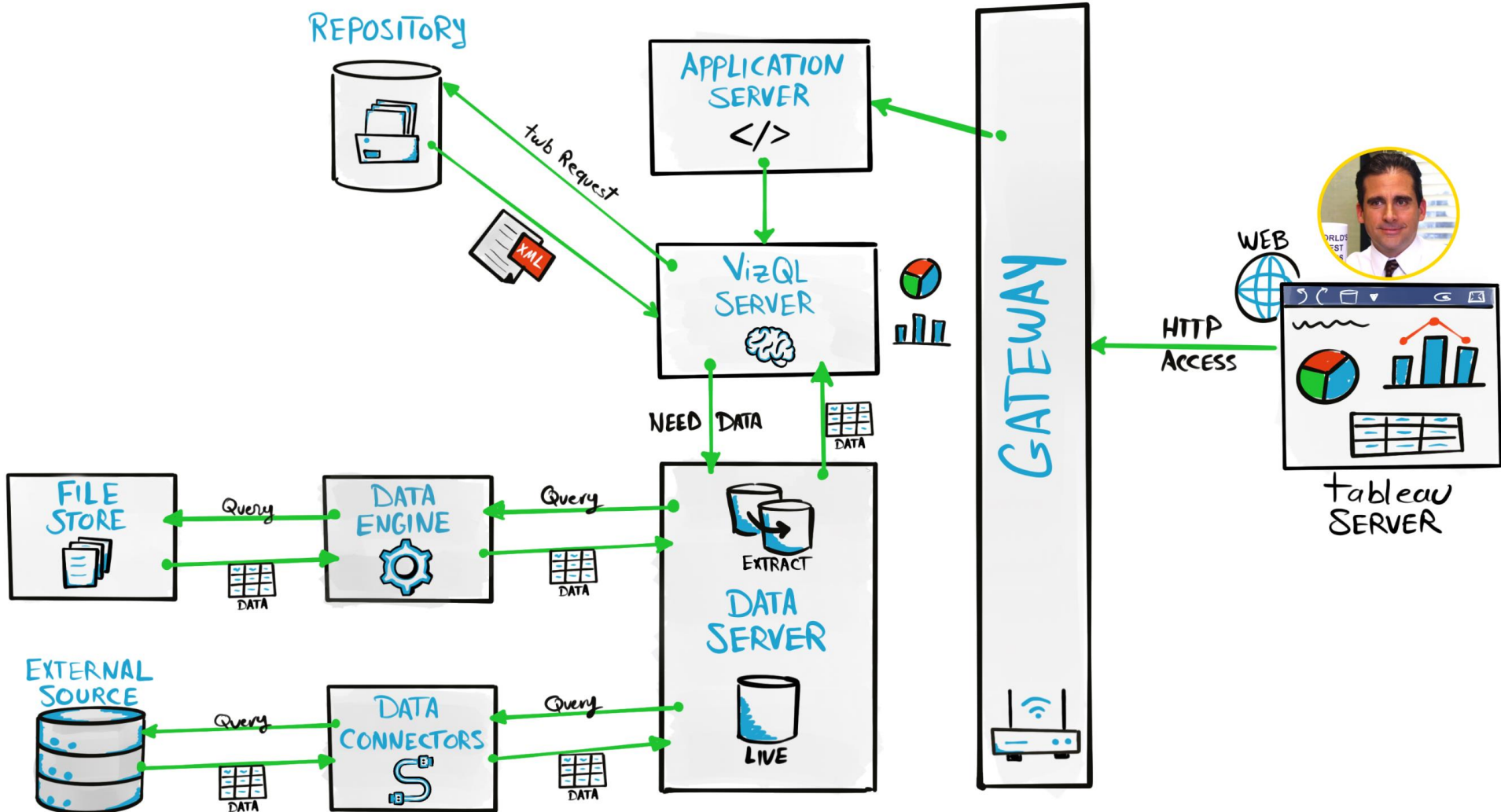
GATEWAY

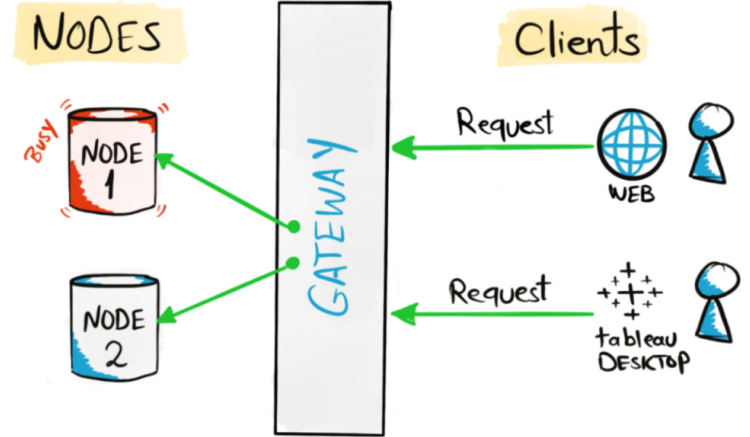
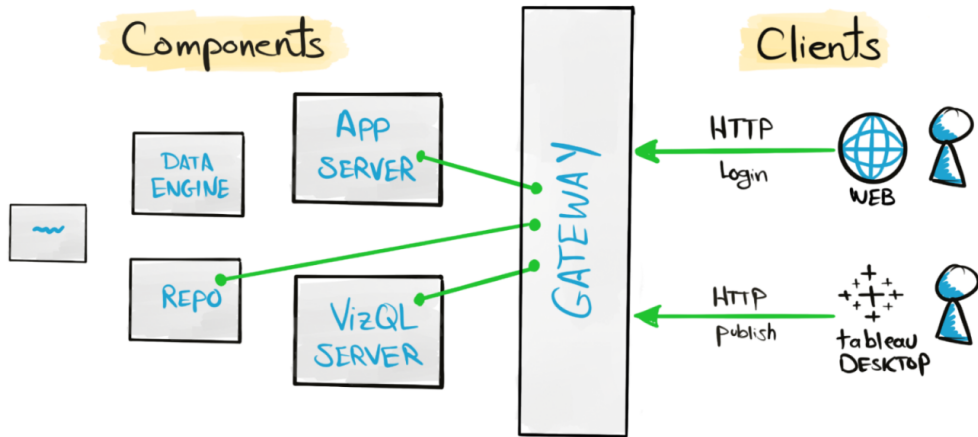
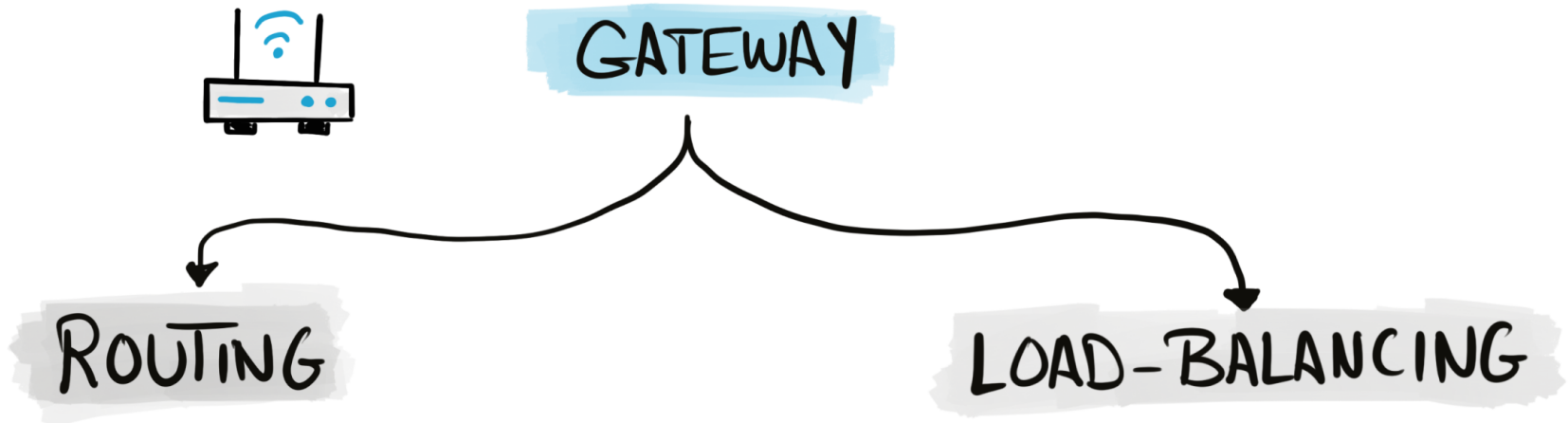

Publish





VIZ Access Process

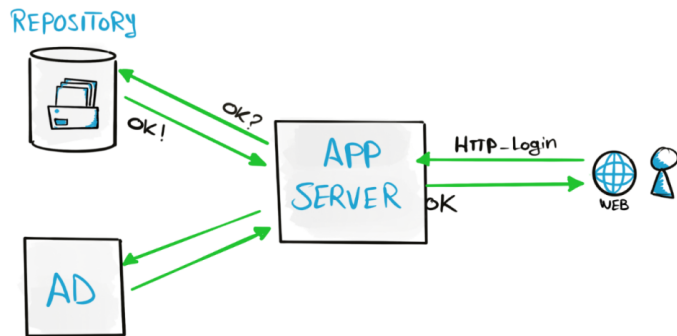




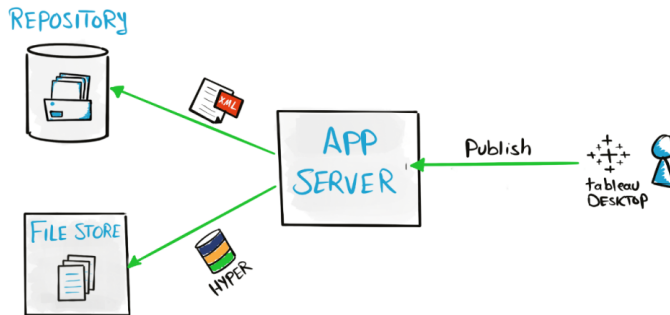
</>

APPLICATION SERVER

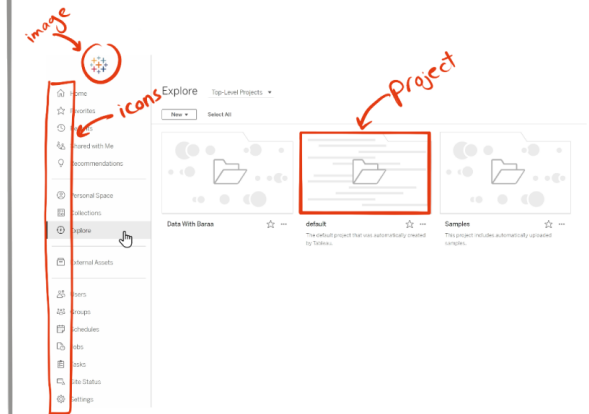
Authentication & Authorisation



Publishing

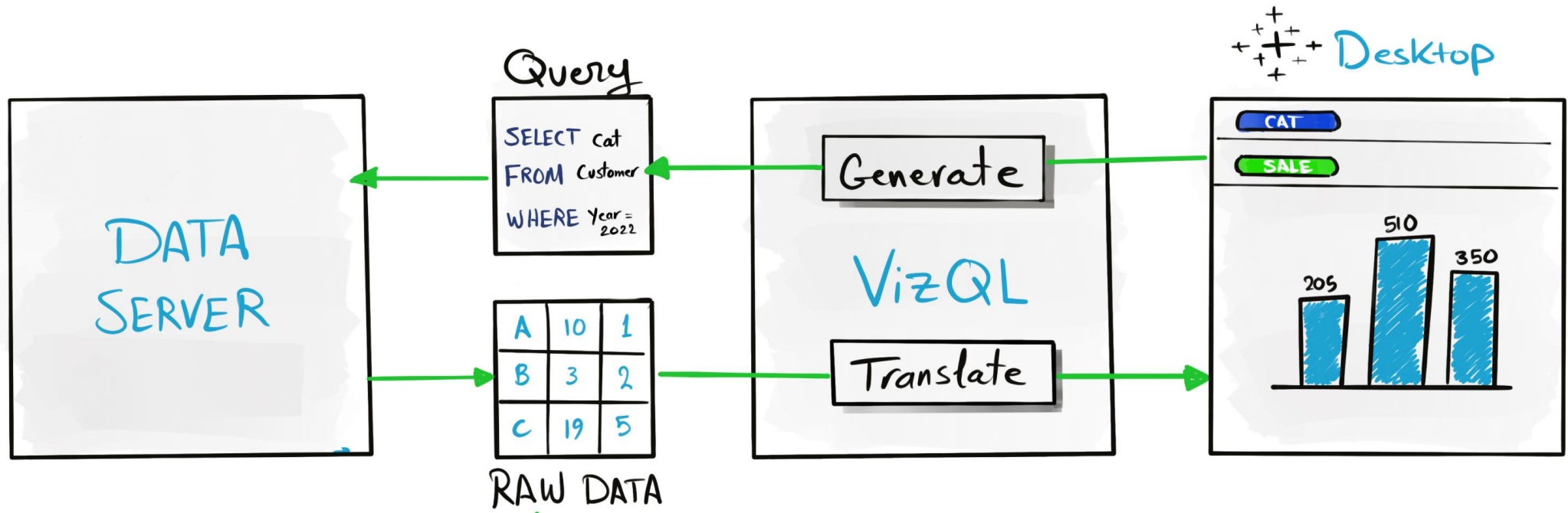


UI Rendering



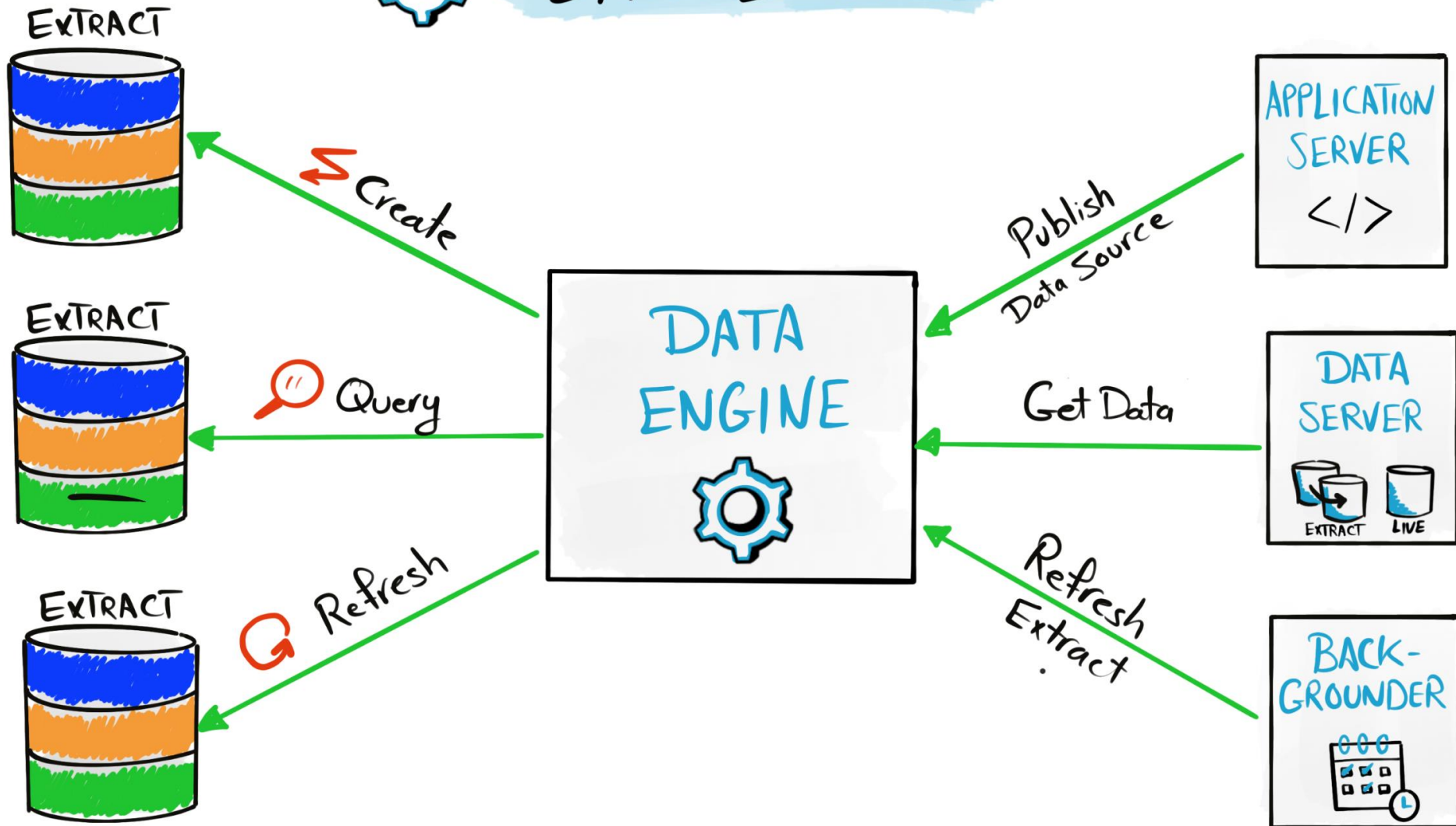


VizQL SERVER

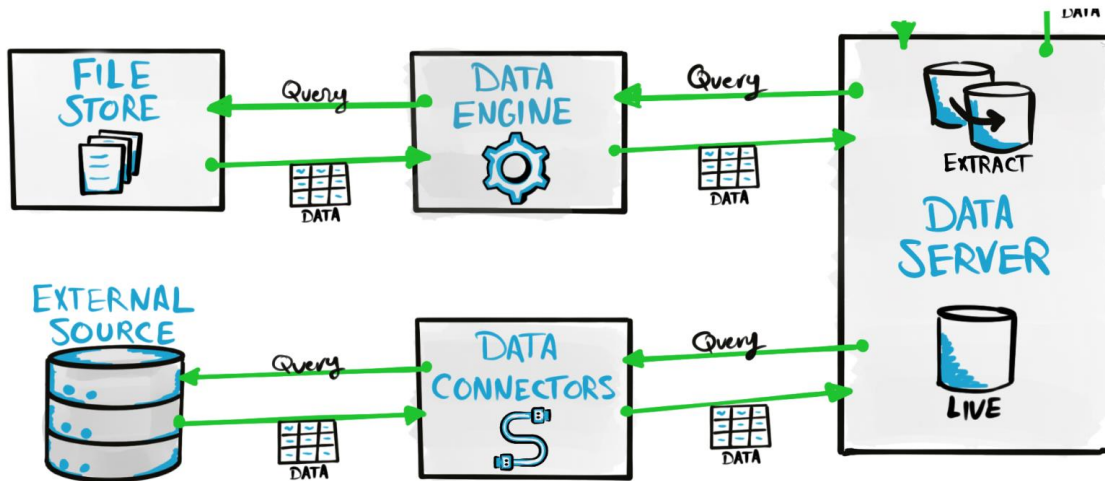




DATA ENGINE



DATA SERVER

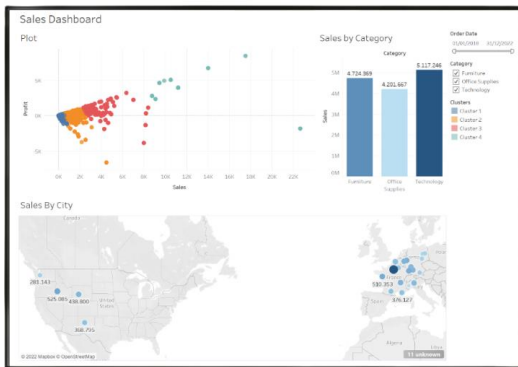


- Manages EXTRACT & LIVE dataSources
- Act as Proxy
- Enforces data Security
- Driver deployment



REPOSITORY

WORKBOOK DATA

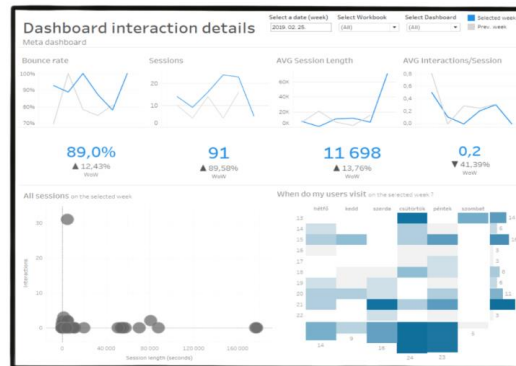


```

<metadata class = 'column'>
  <name> Code </name>
  <type> Integer </type>
  <count> 631 </count>
</metadata>
  
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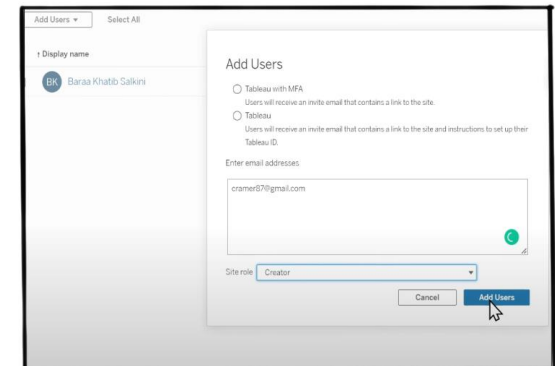
SALES.TWB

USAGE DATA



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

SECURITY DATA

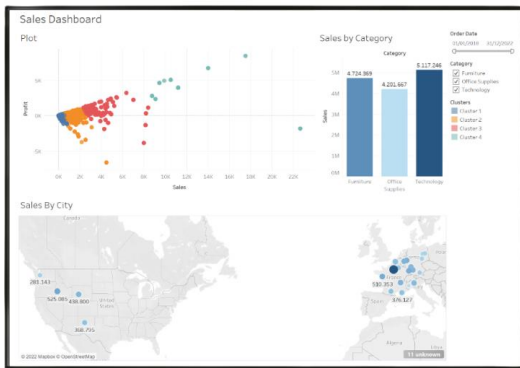


NAME	REPORT
John	Sales
Michael	Sales
Max	Finance



REPOSITORY

WORKBOOK DATA

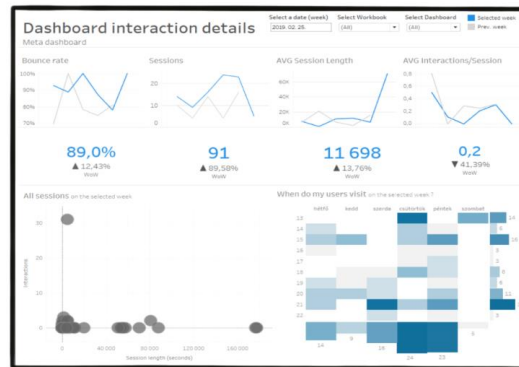


```

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

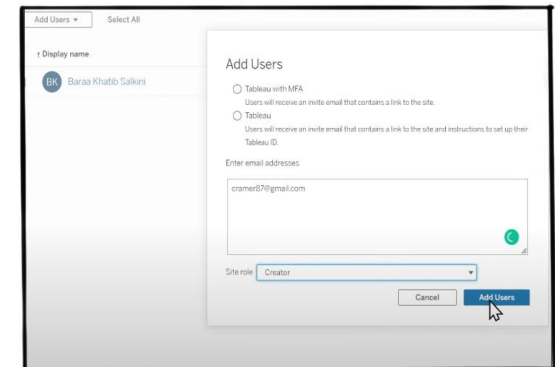
SALES.TWB

USAGE DATA



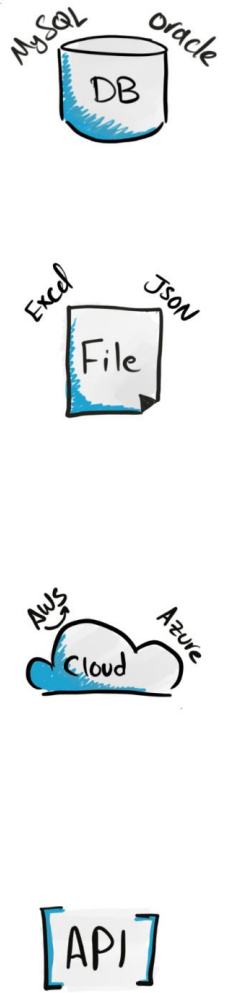
- Total active Users ?
- Total View Count ?
- Most used Data Sources

SECURITY DATA

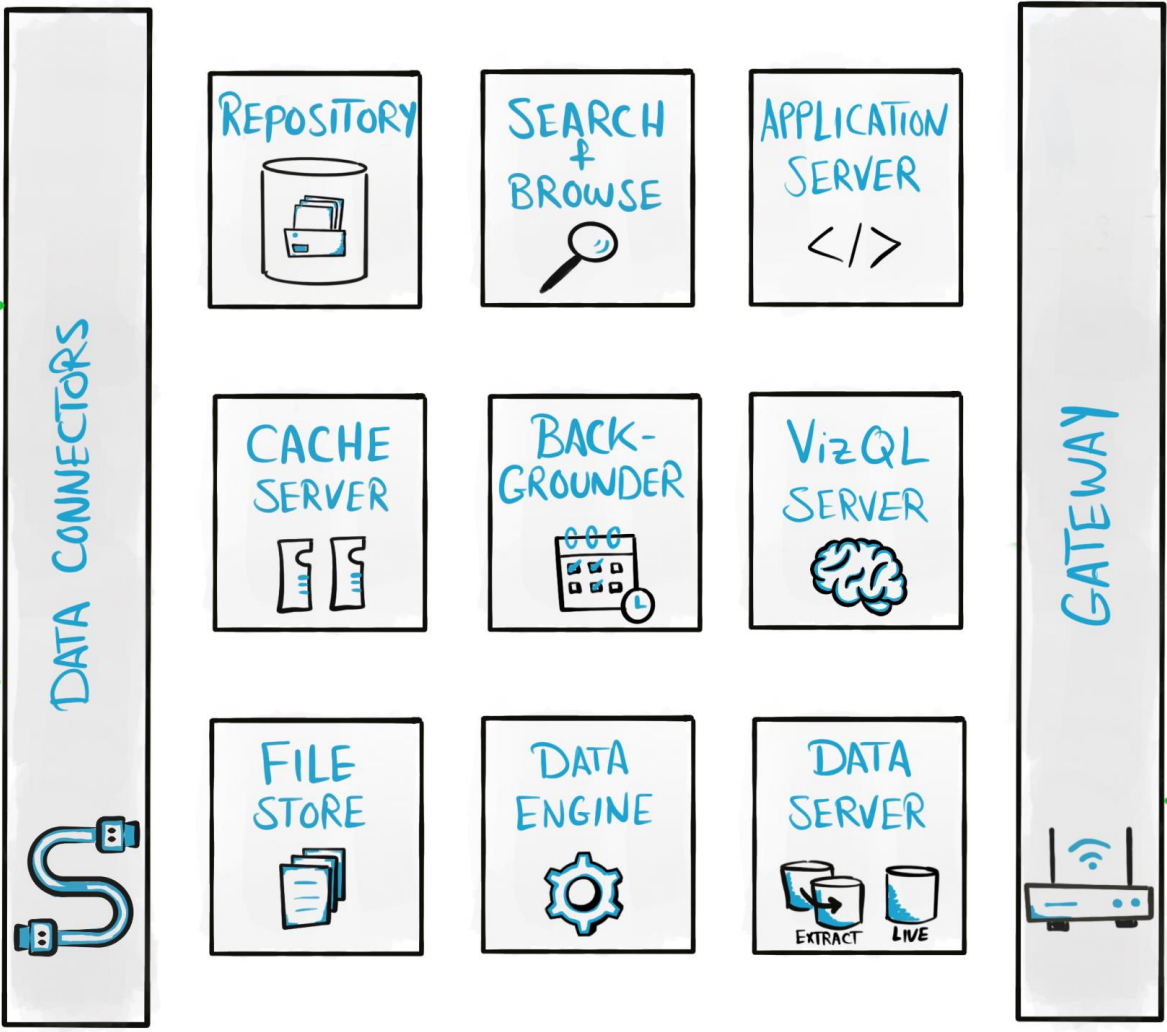


NAME	REPORT
John	Sales
Michael	Sales
Max	Finance

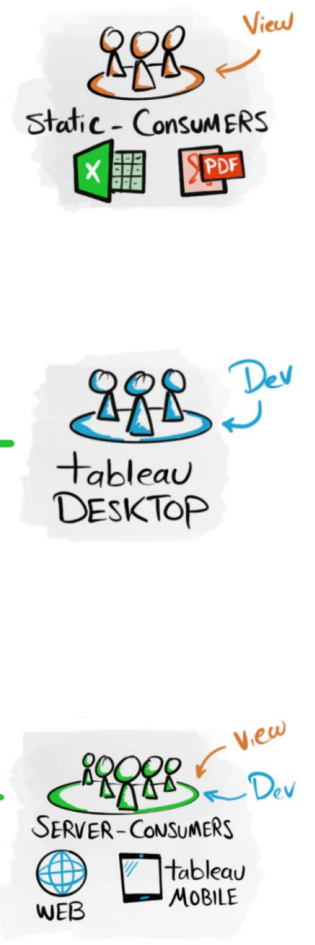
SOURCE



SERVER

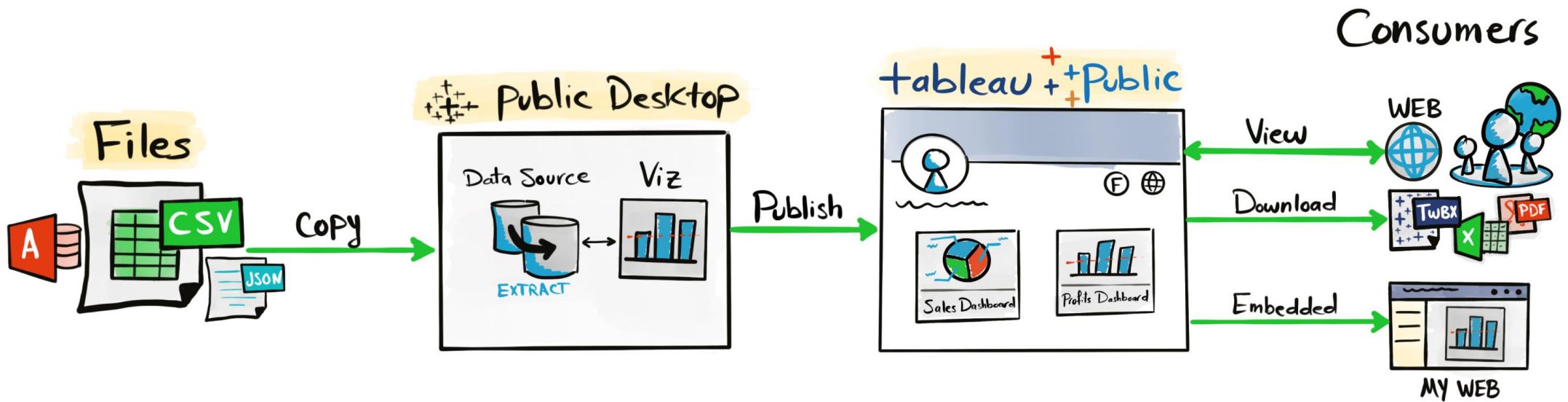


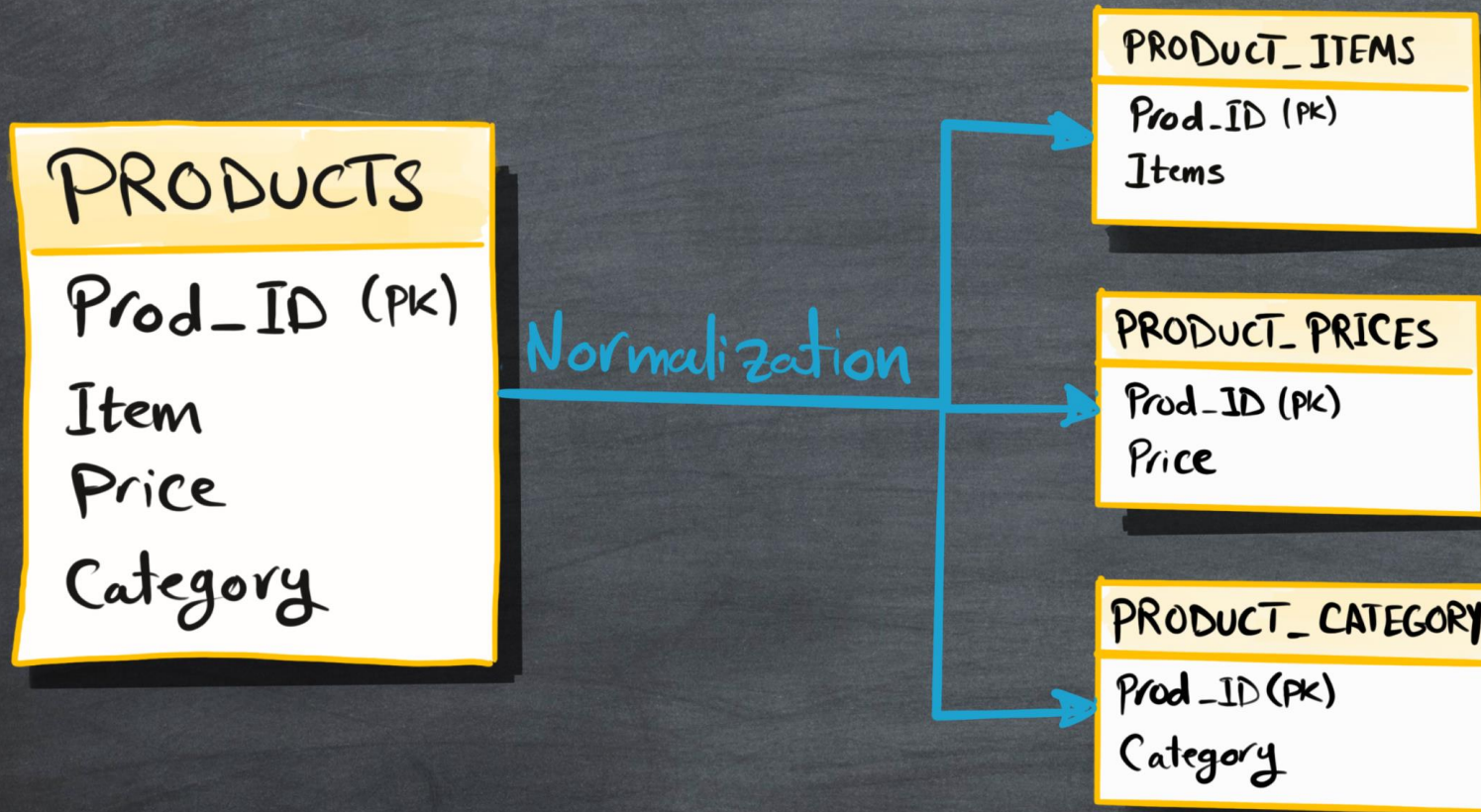
CONSUMER



Copy
Query
Result

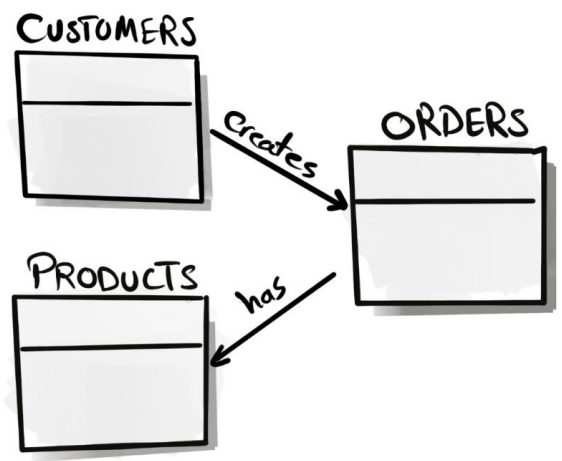
HTTP Publish
HTTP Access



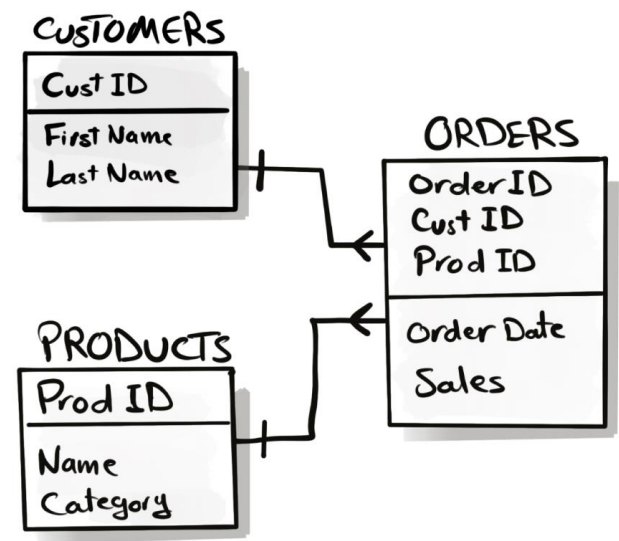


3 Types of Data Models

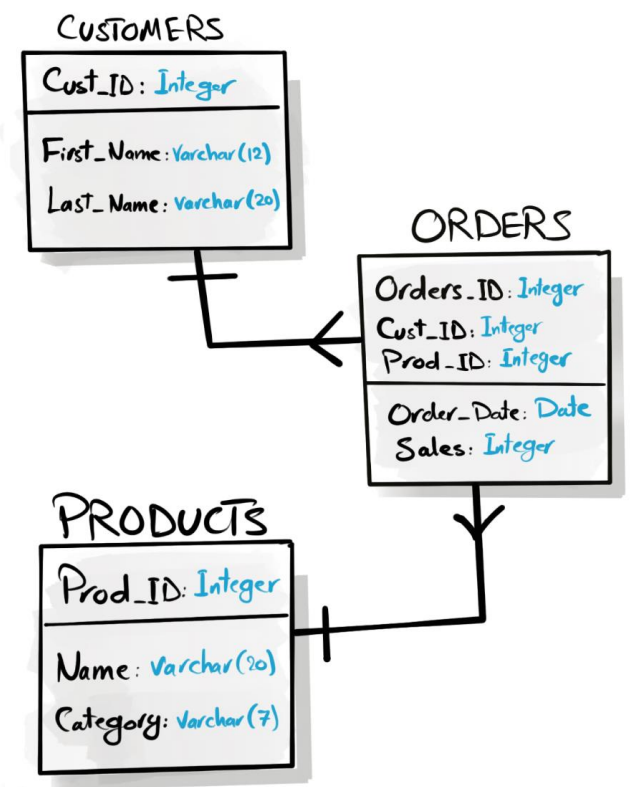
Conceptual Data Model



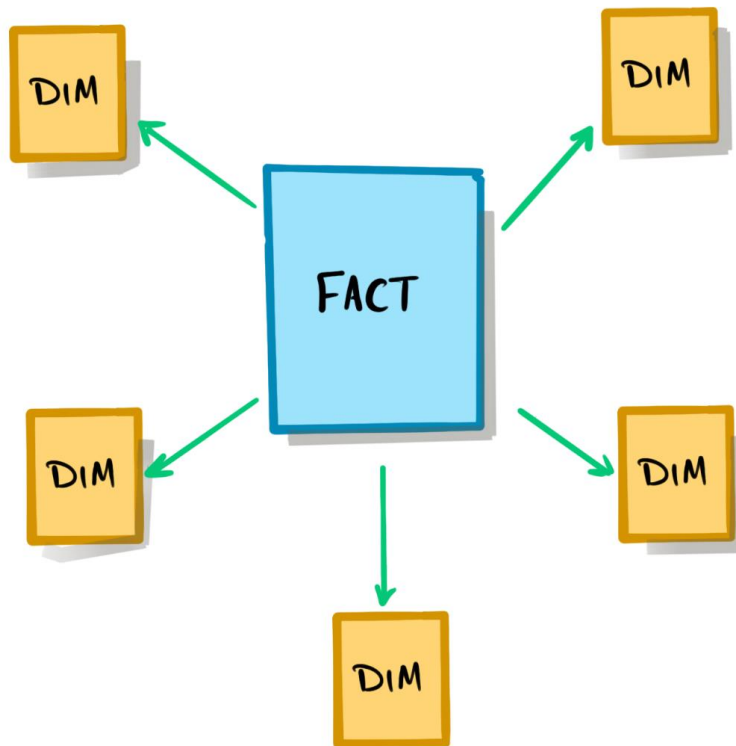
Logical Data Model



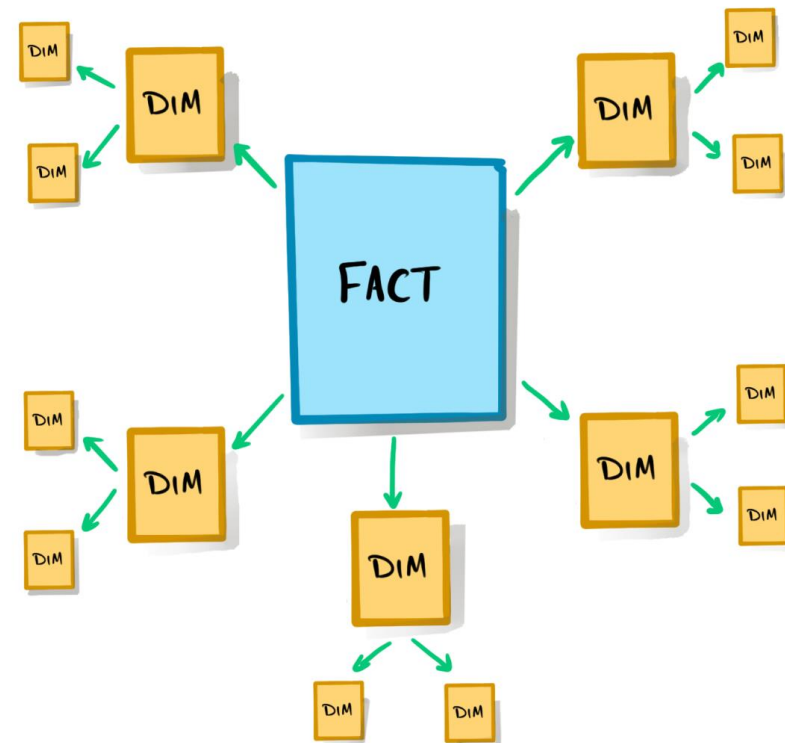
Physical Data Model



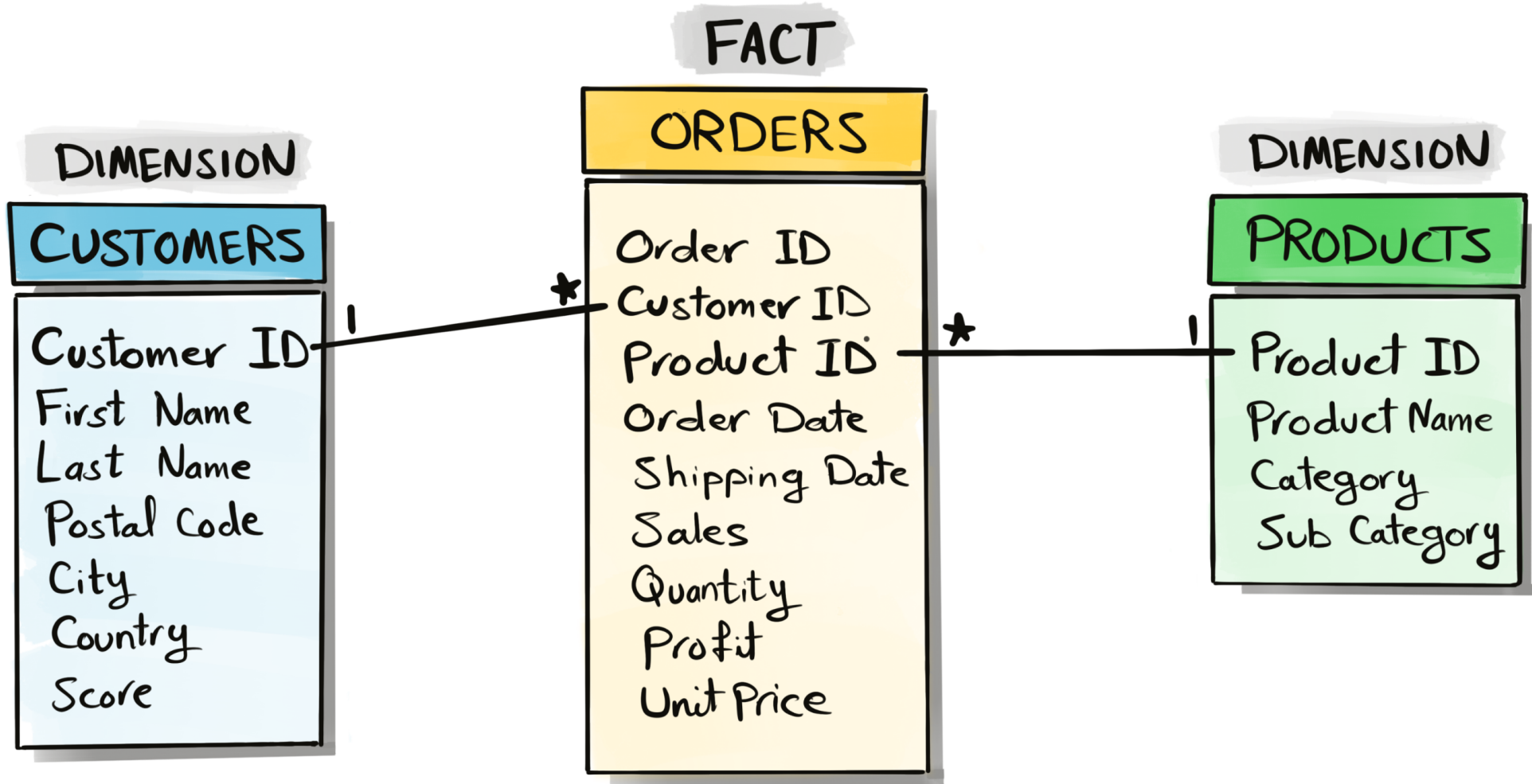
STAR SCHEMA

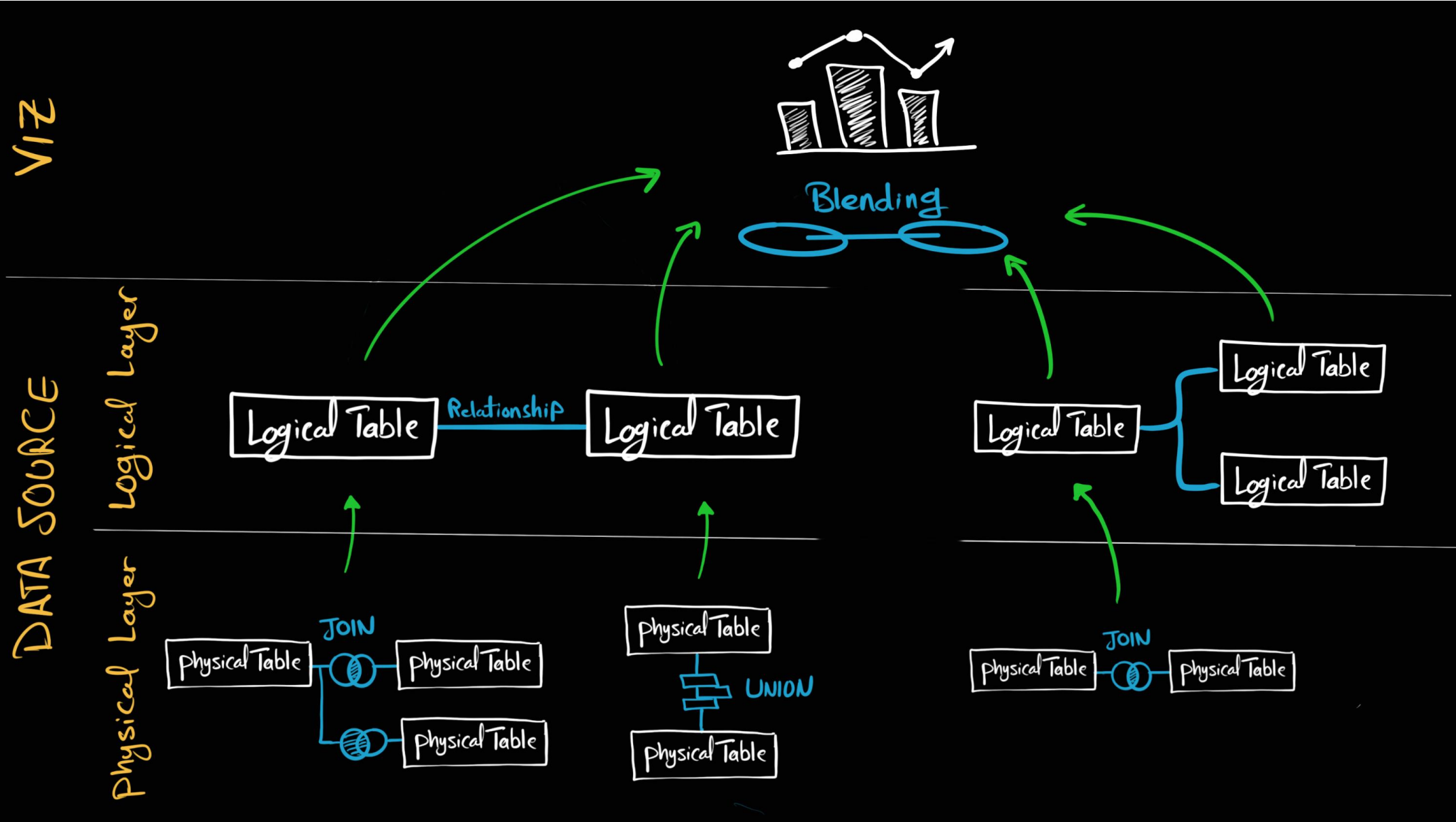


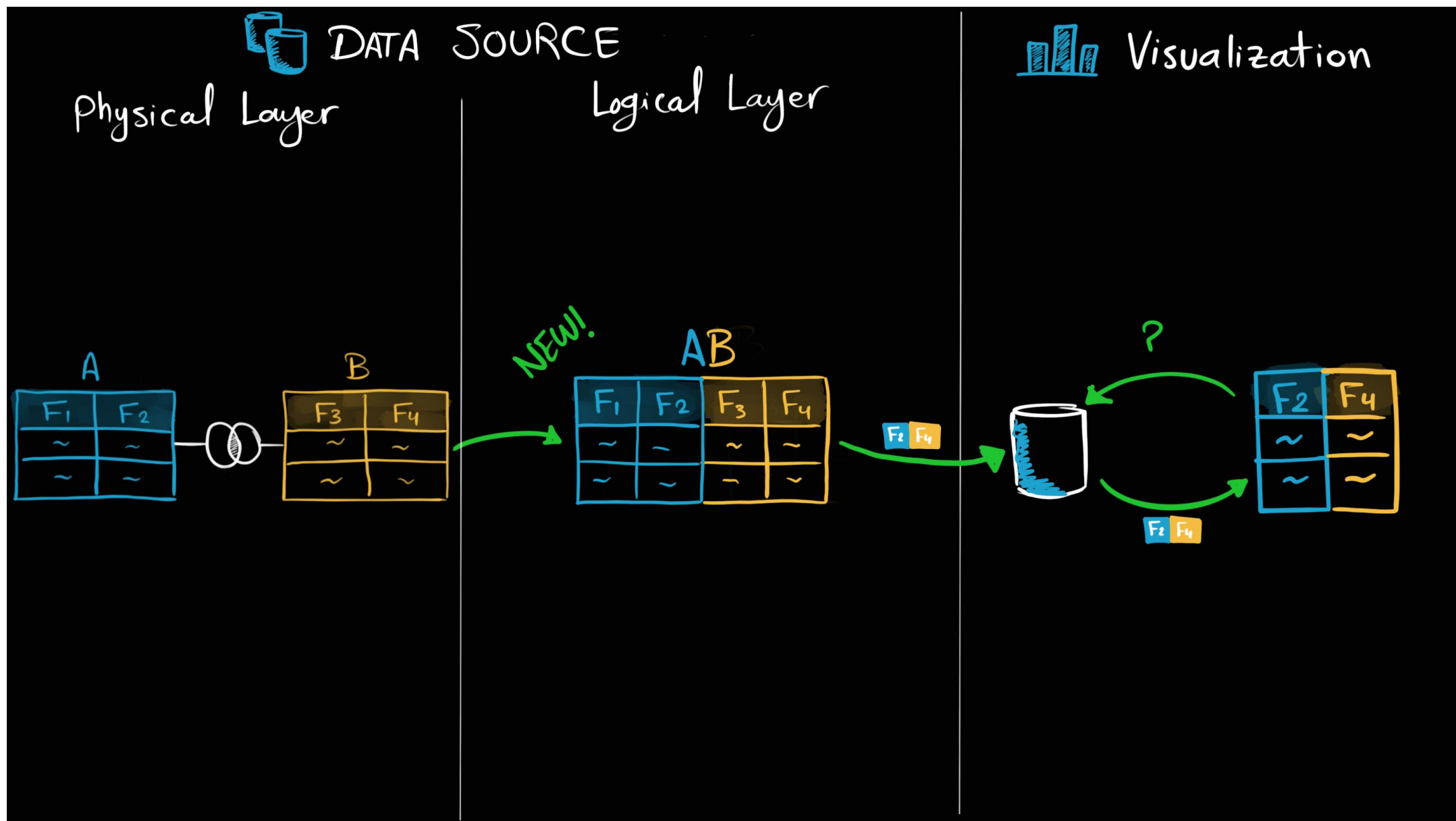
SNOWFLAKE SCHEMA

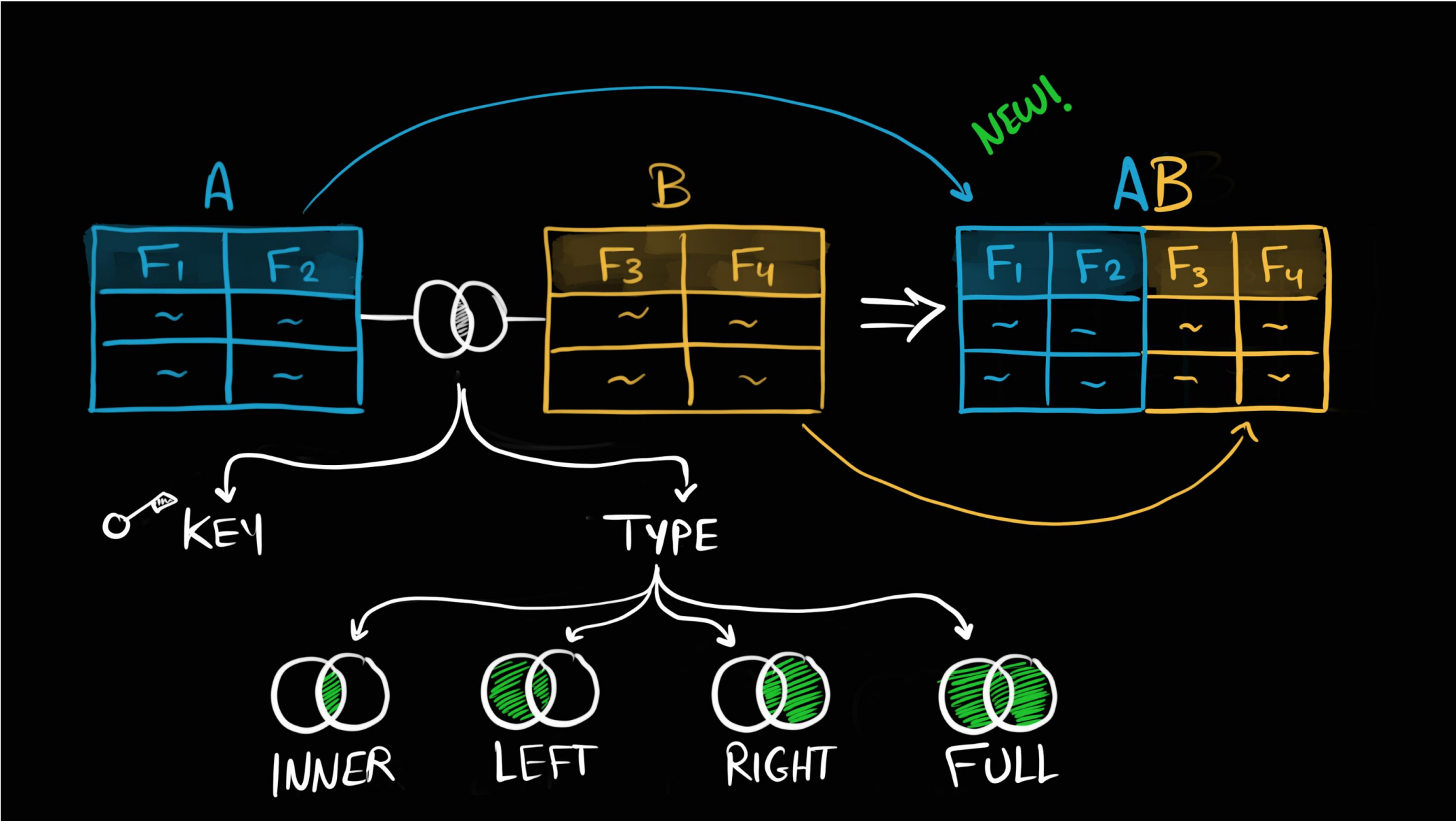


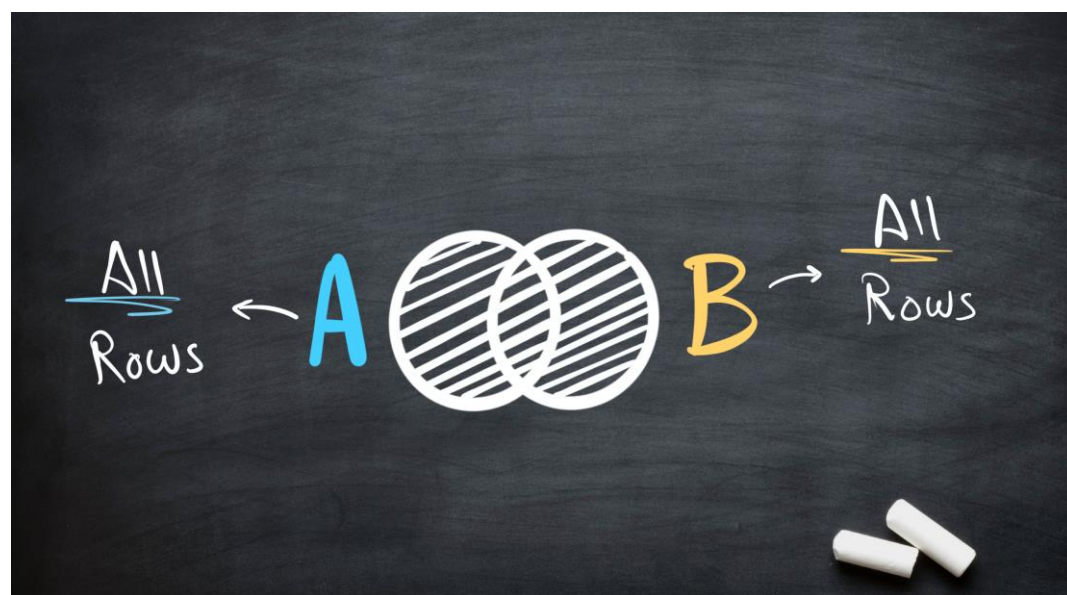
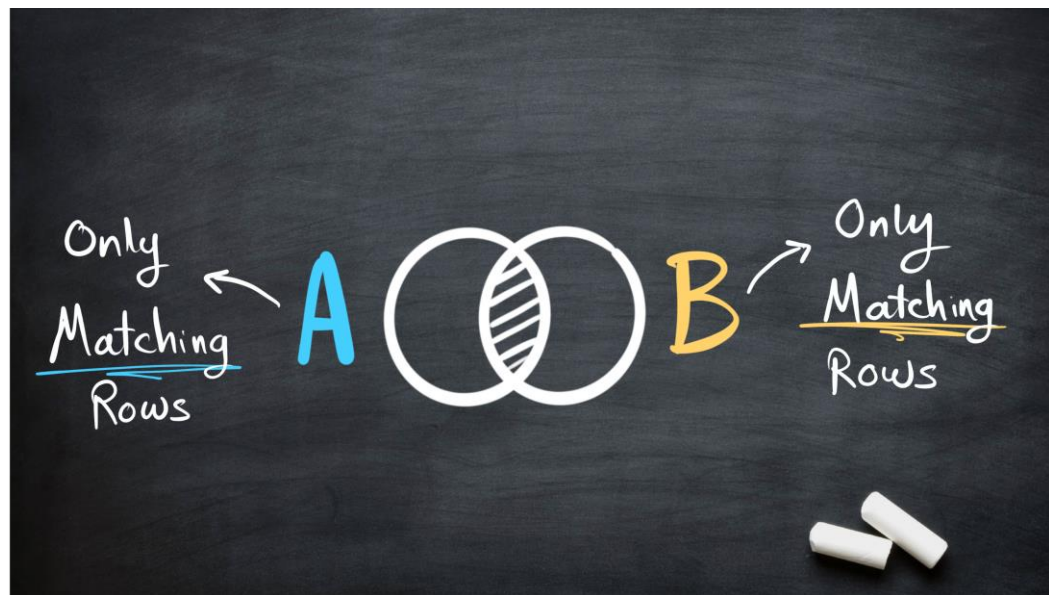
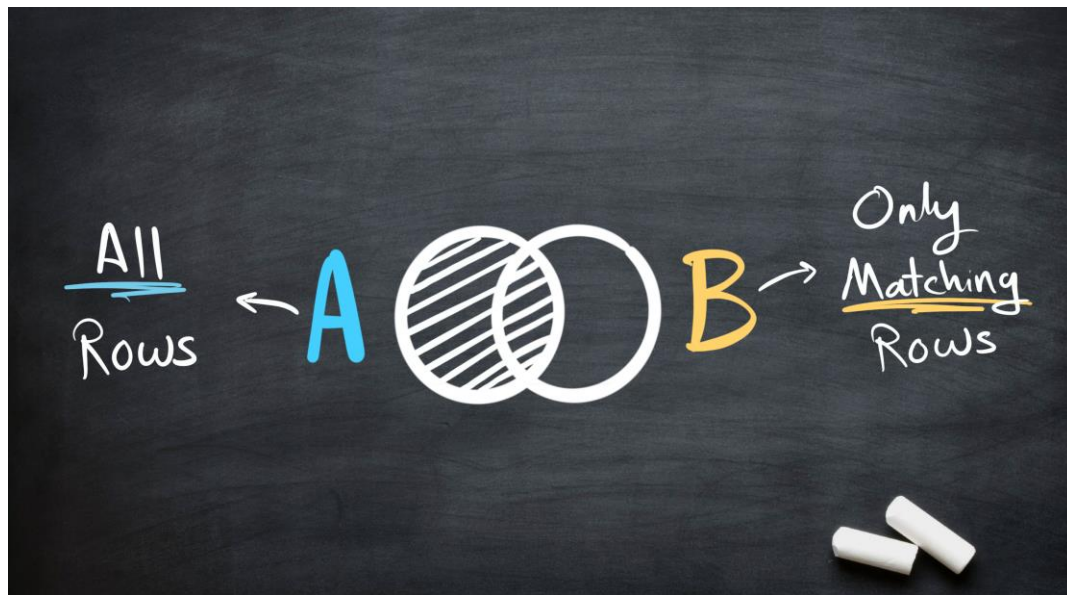
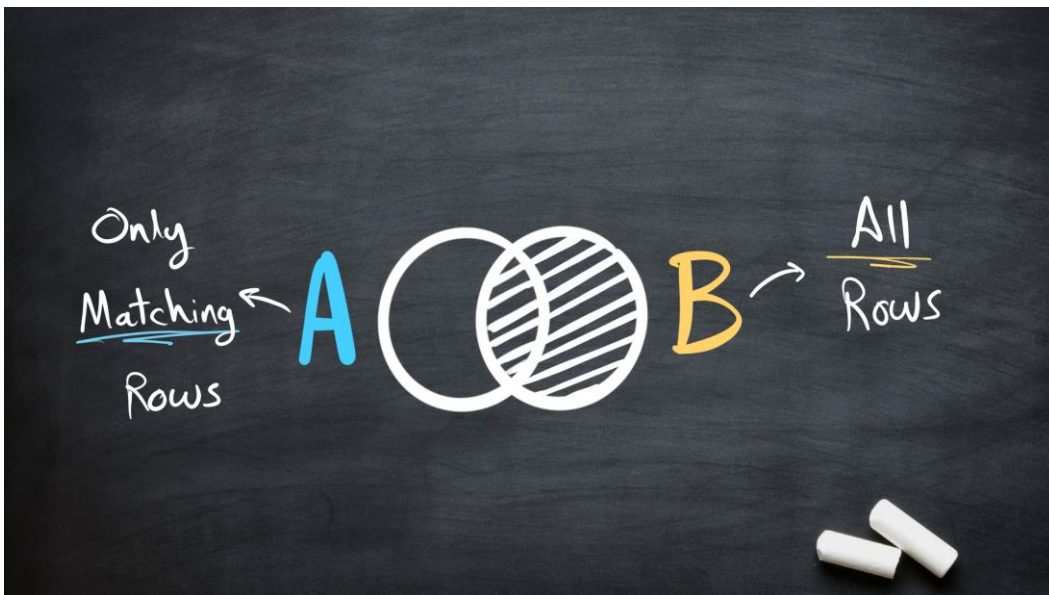
STAR SCHEMA











JOIN | How it Works

CustomerNames

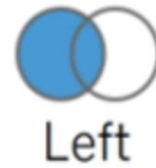
ID	Name
1	Maria
2	John

CustomerAges

ID	Age
1	20
3	35



ID	Name	ID	Age
1	Maria	1	20



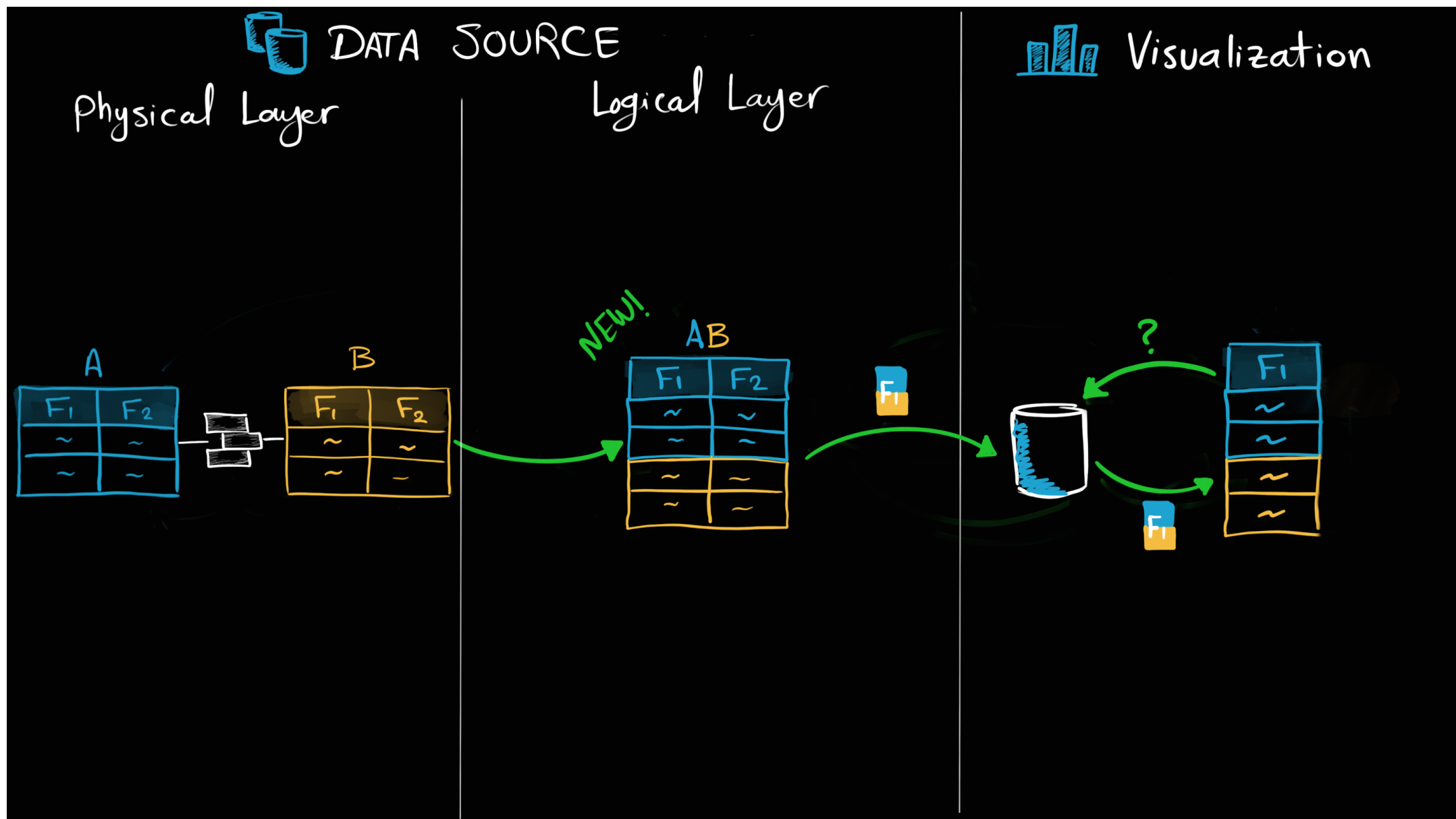
ID	Name	ID	Age
1	Maria	1	20
2	John	NULL	NULL



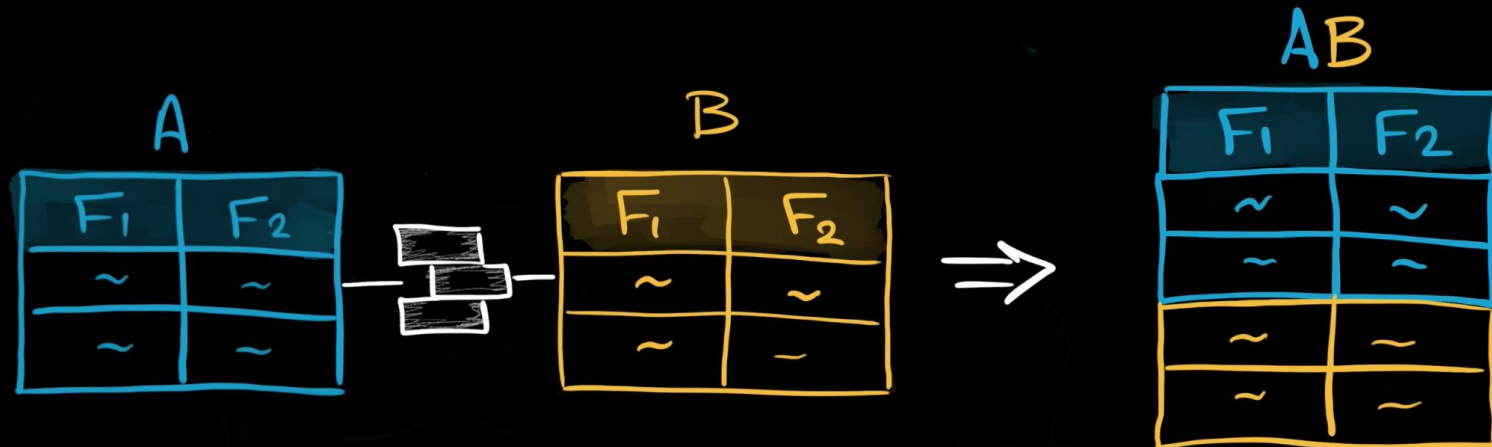
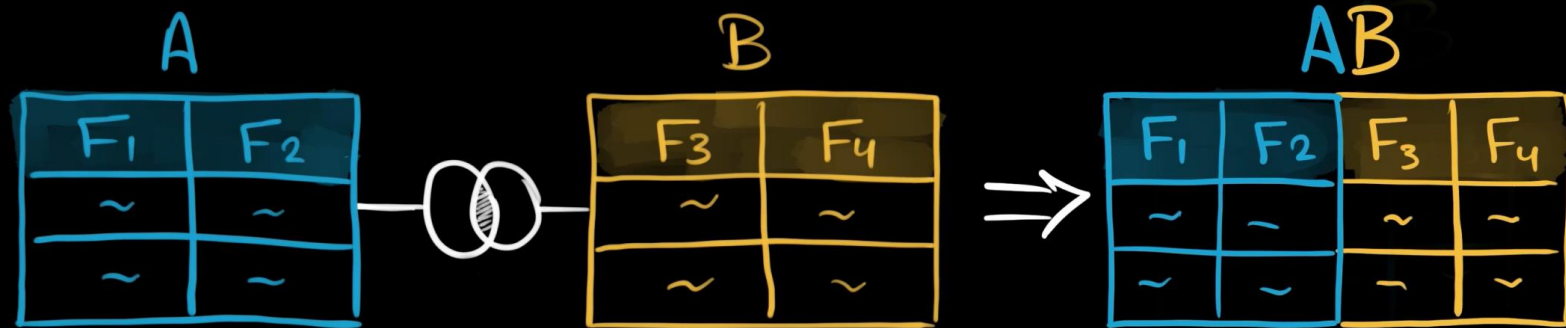
ID	Name	ID	Age
1	Maria	1	20
NULL	NULL	3	35



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



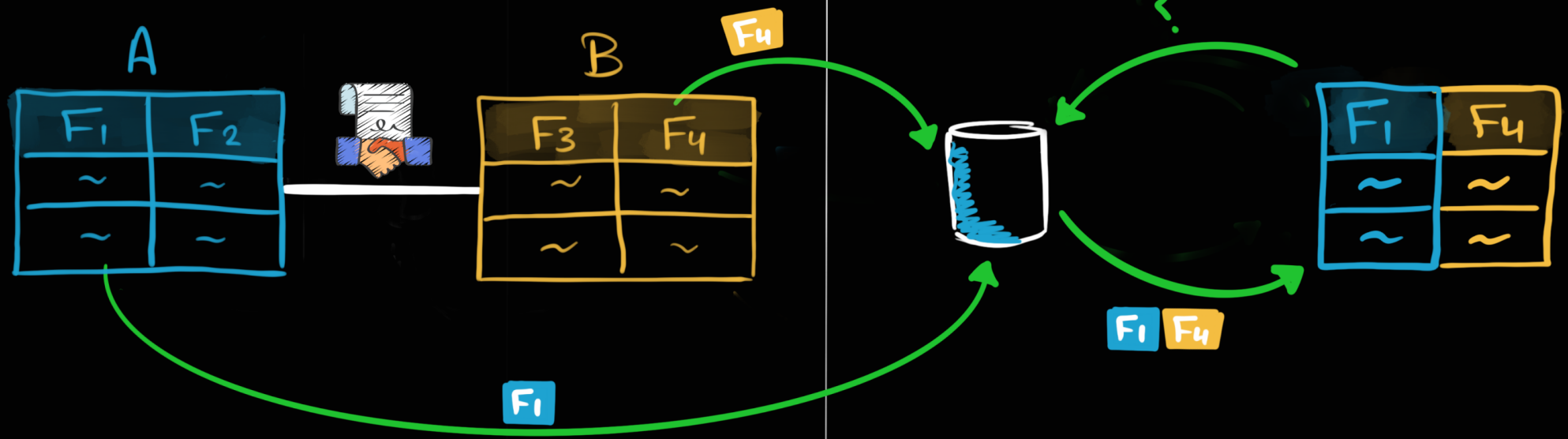
JOIN Combine the FIELDS of two Tables







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

Orders		Customers	
CustomerID	Sales	CustomerID	Name
1	50	1	Maria
2	20	2	John
2	10	3	Georg
1	30		

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		Cardinality	
OK	NOK	MANY	MANY
OK	OK	MANY	ONE
NOK	NOK	ONE	MANY
NOK	OK	ONE	ONE

DATA SOURCE
Logical Layer

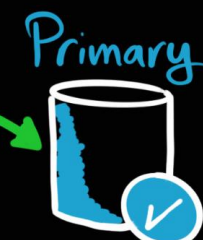
A

F ₁	F ₂
~	~
~	~

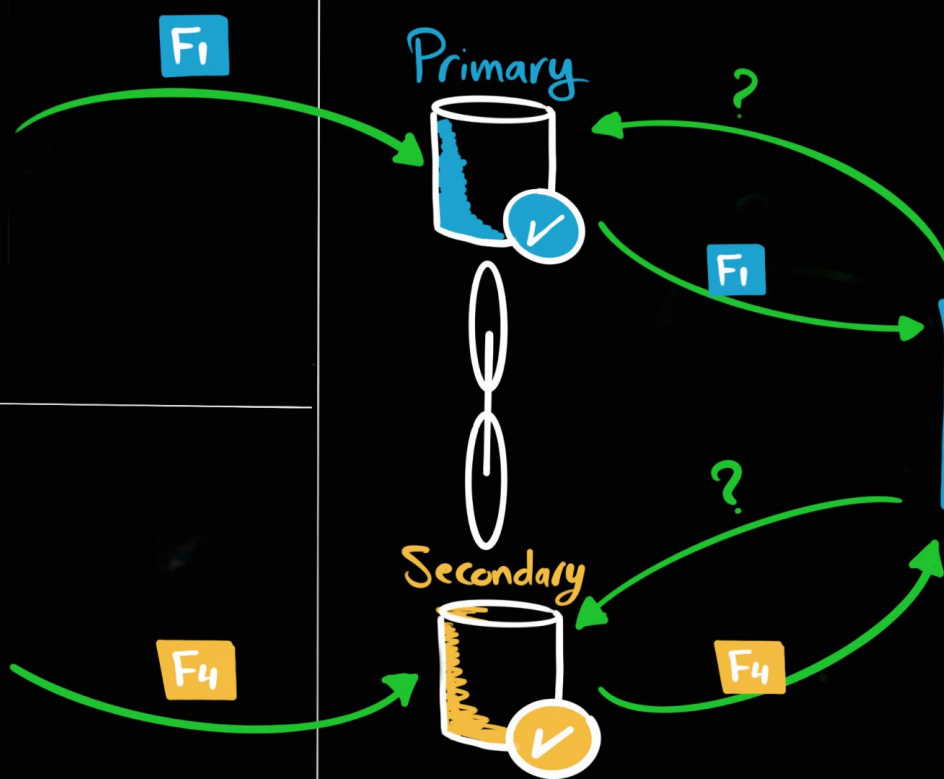
B

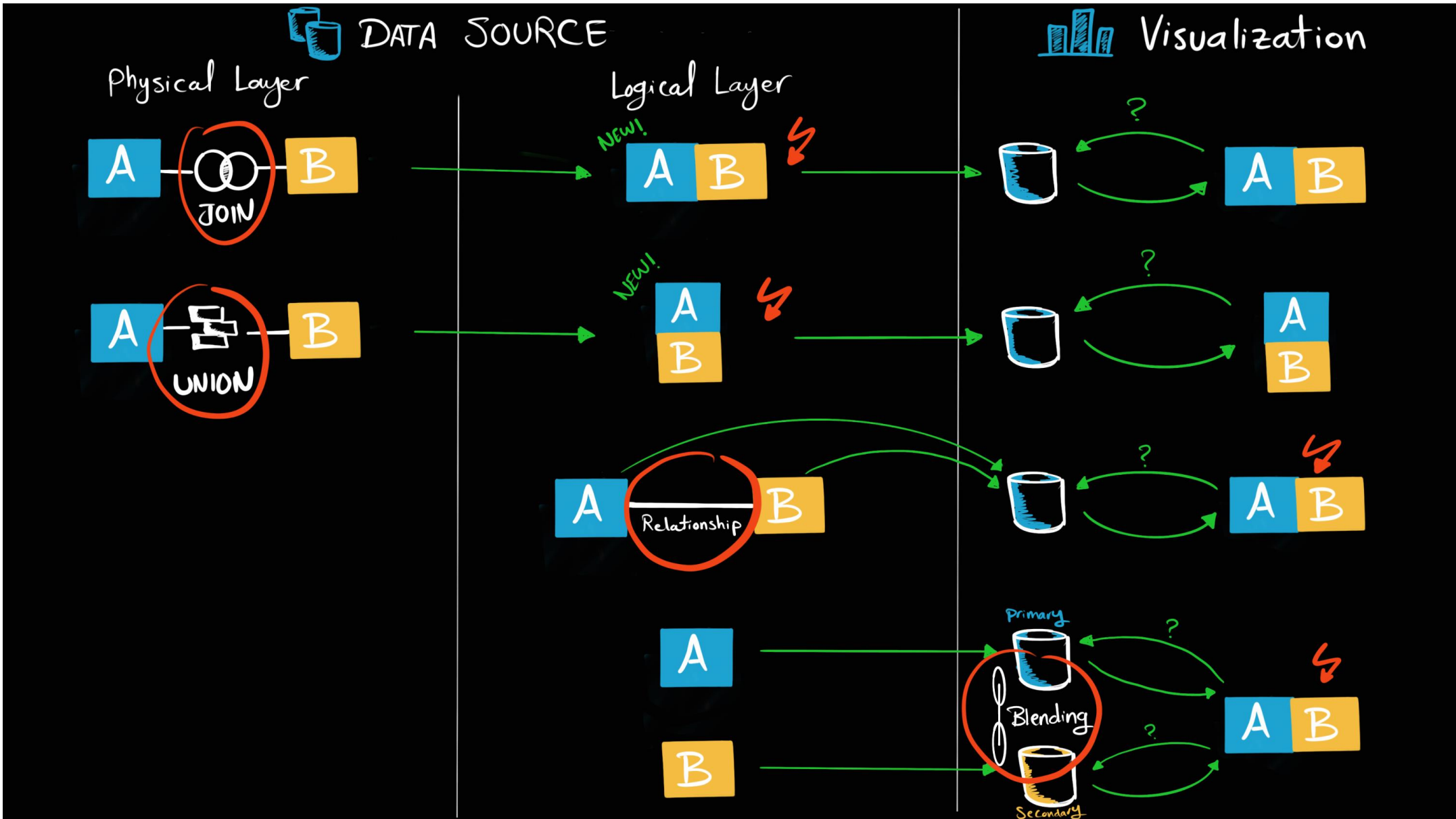
F ₃	F ₄
~	~
~	~

Visualization



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

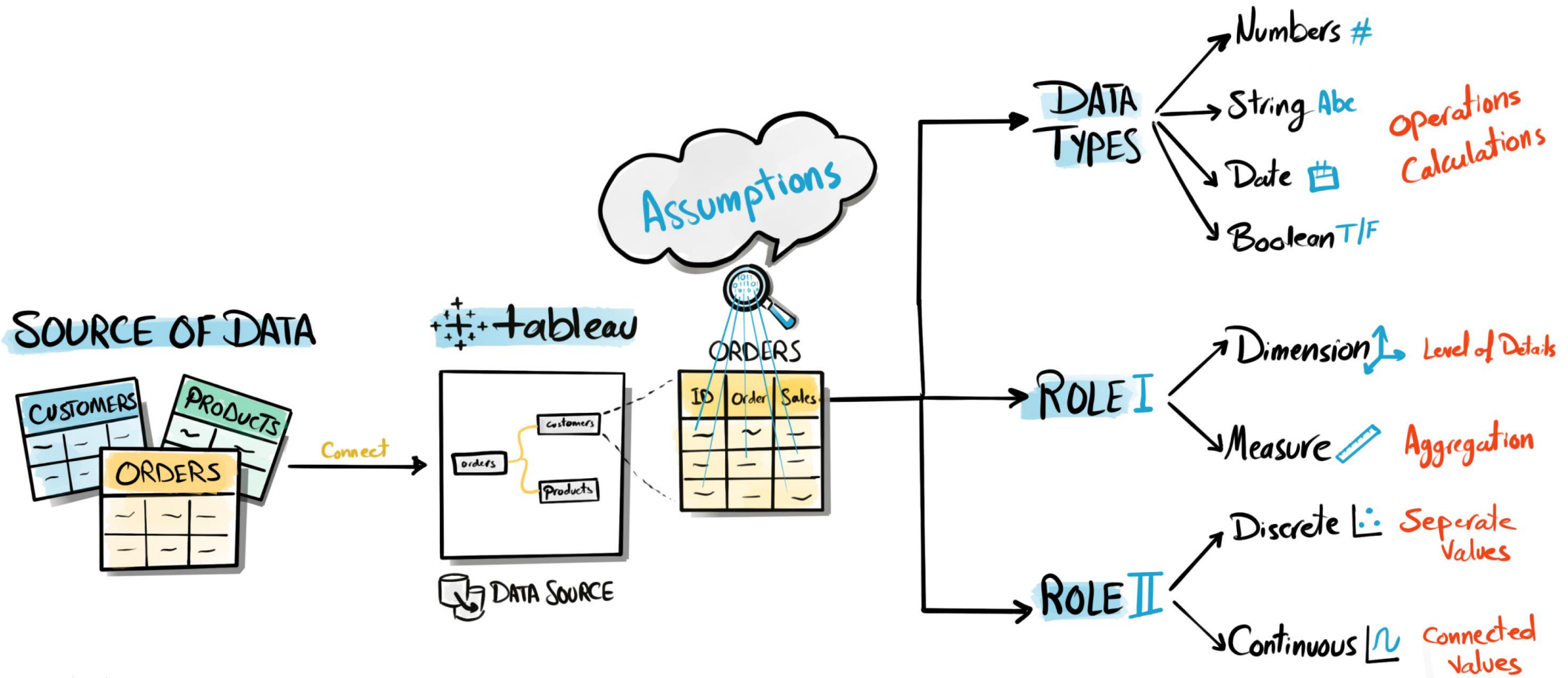
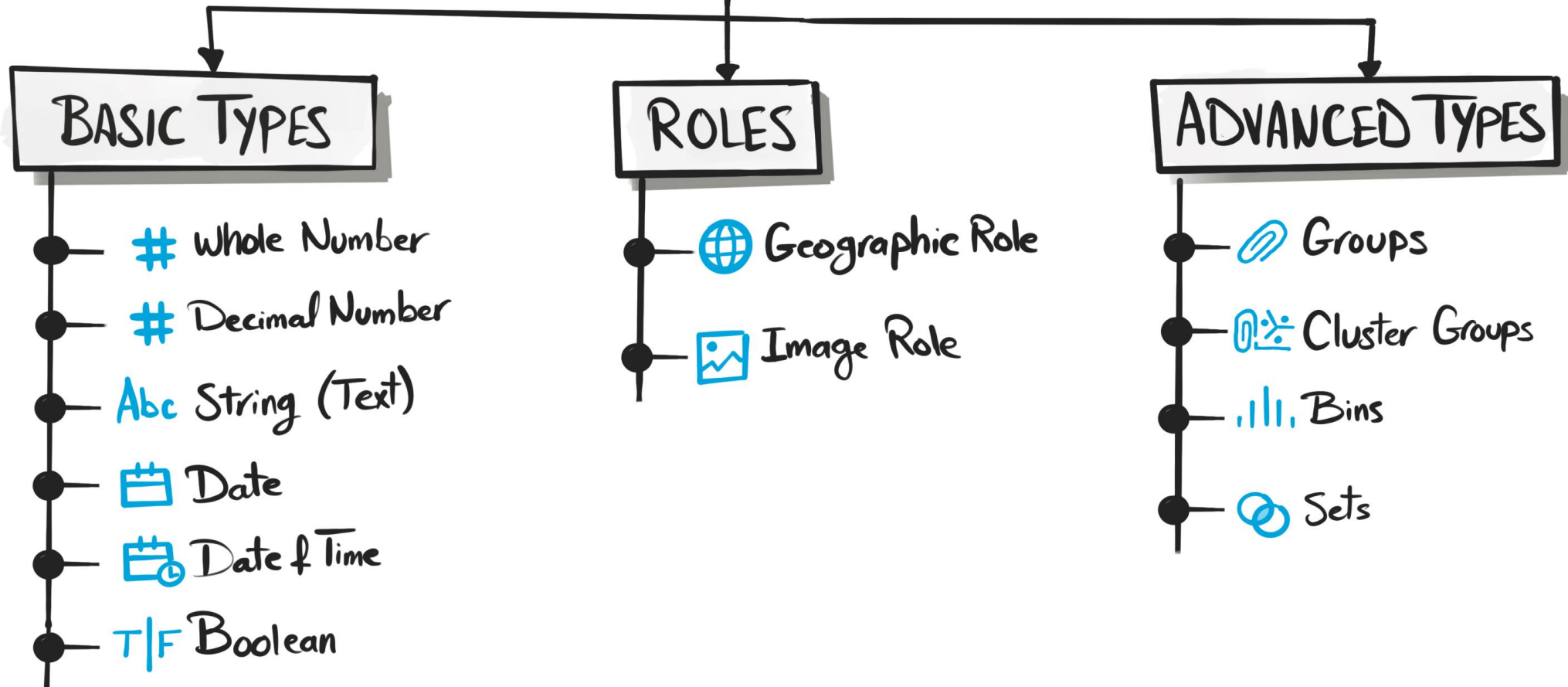




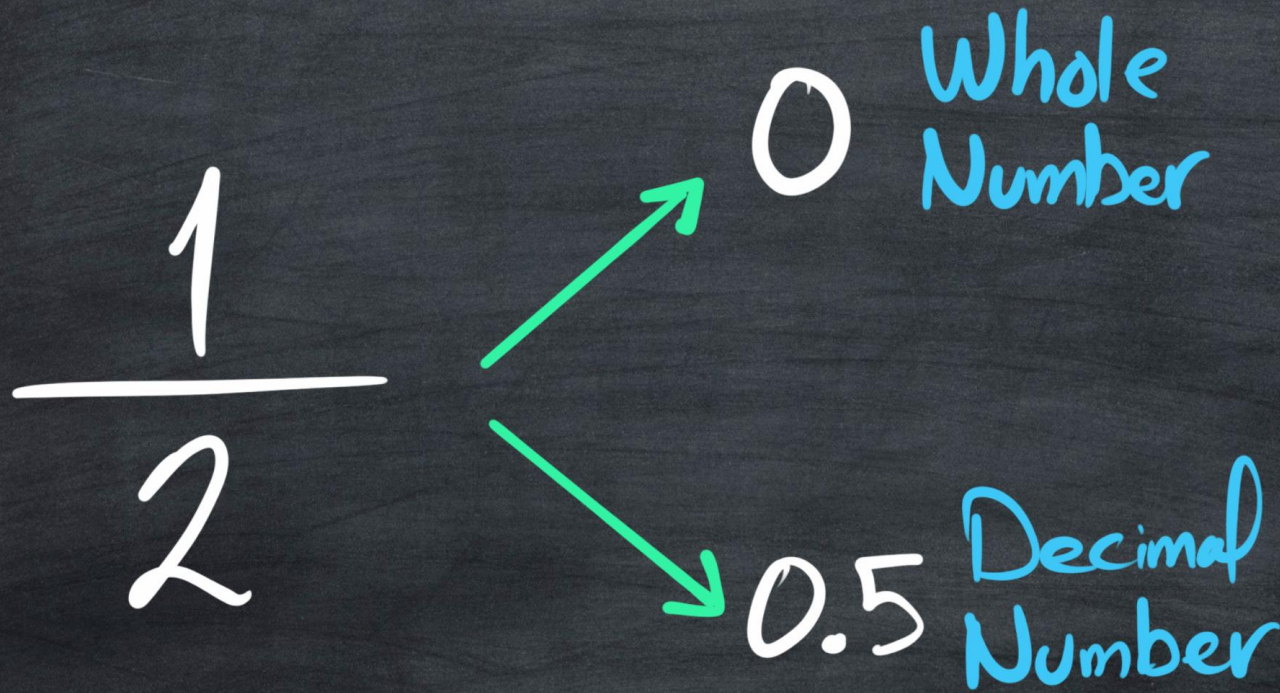
tableau DATA TYPES



BASIC TYPES

●	# Number (Whole)	1234
●	# Number (Decimal)	35.98
●	Abe String (Text)	Hello World!
●	 Date	20/08/2025
●	 Date & Time	20/08/2025 18:20:58
●	T/F Boolean	TRUE, FALSE

#



Abc

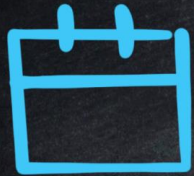
A B x 5 1 3 5 \$?

White
Space



Abc

A B x s 1 3 5 \$?White
Space



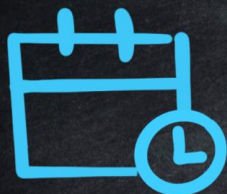
DATE

2025 - 08 - 20

YYYY - MM - dd

DATE FORMAT





DATE

2025 - 08 - 20

YYYY - MM - dd

DATE FORMAT

TIME

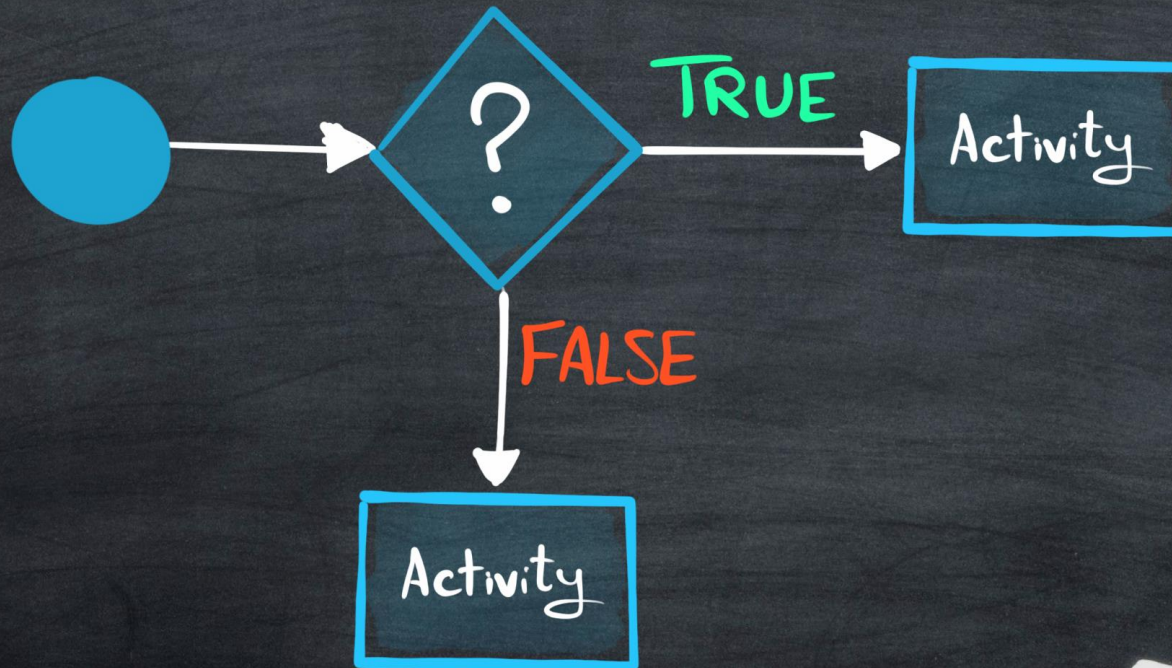
18 : 48 : 53

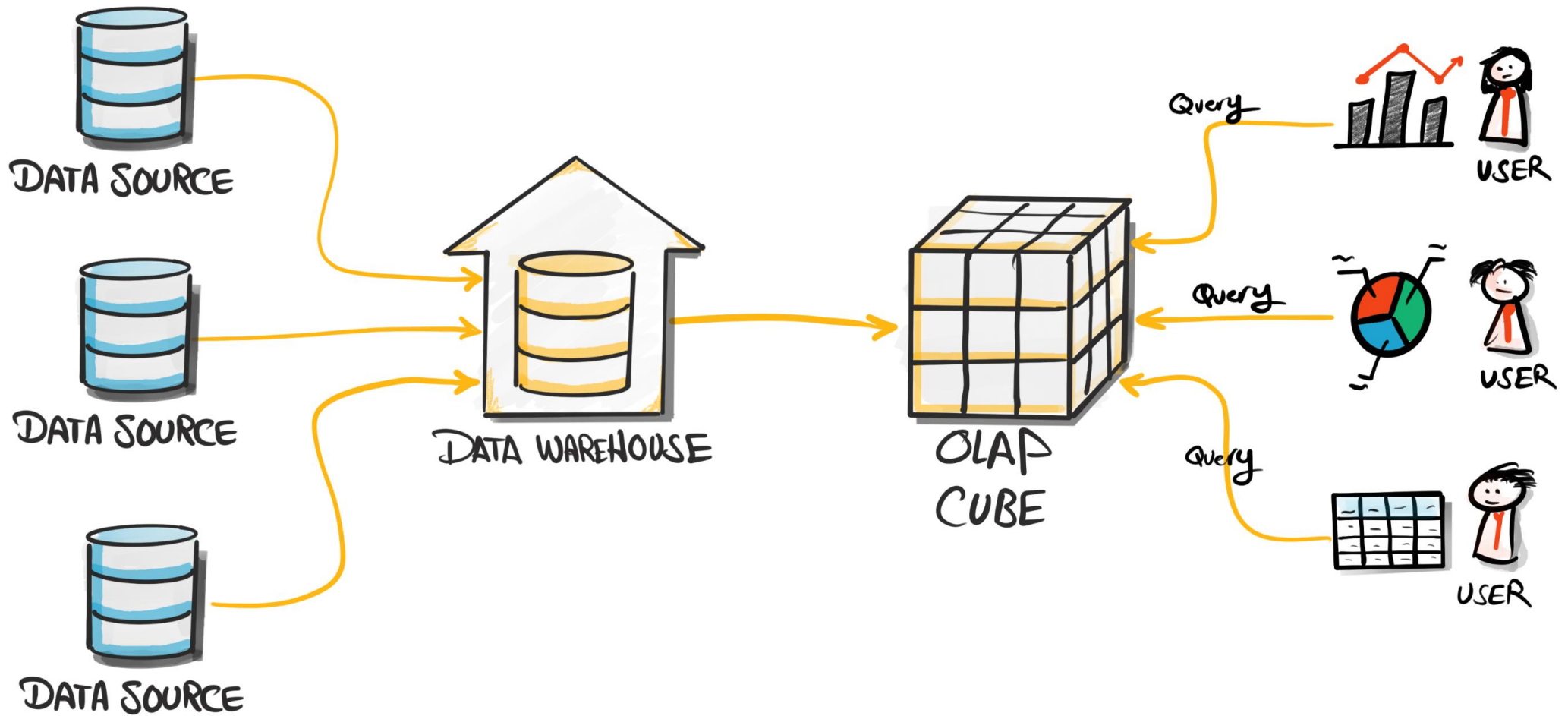
HH : MM : SS

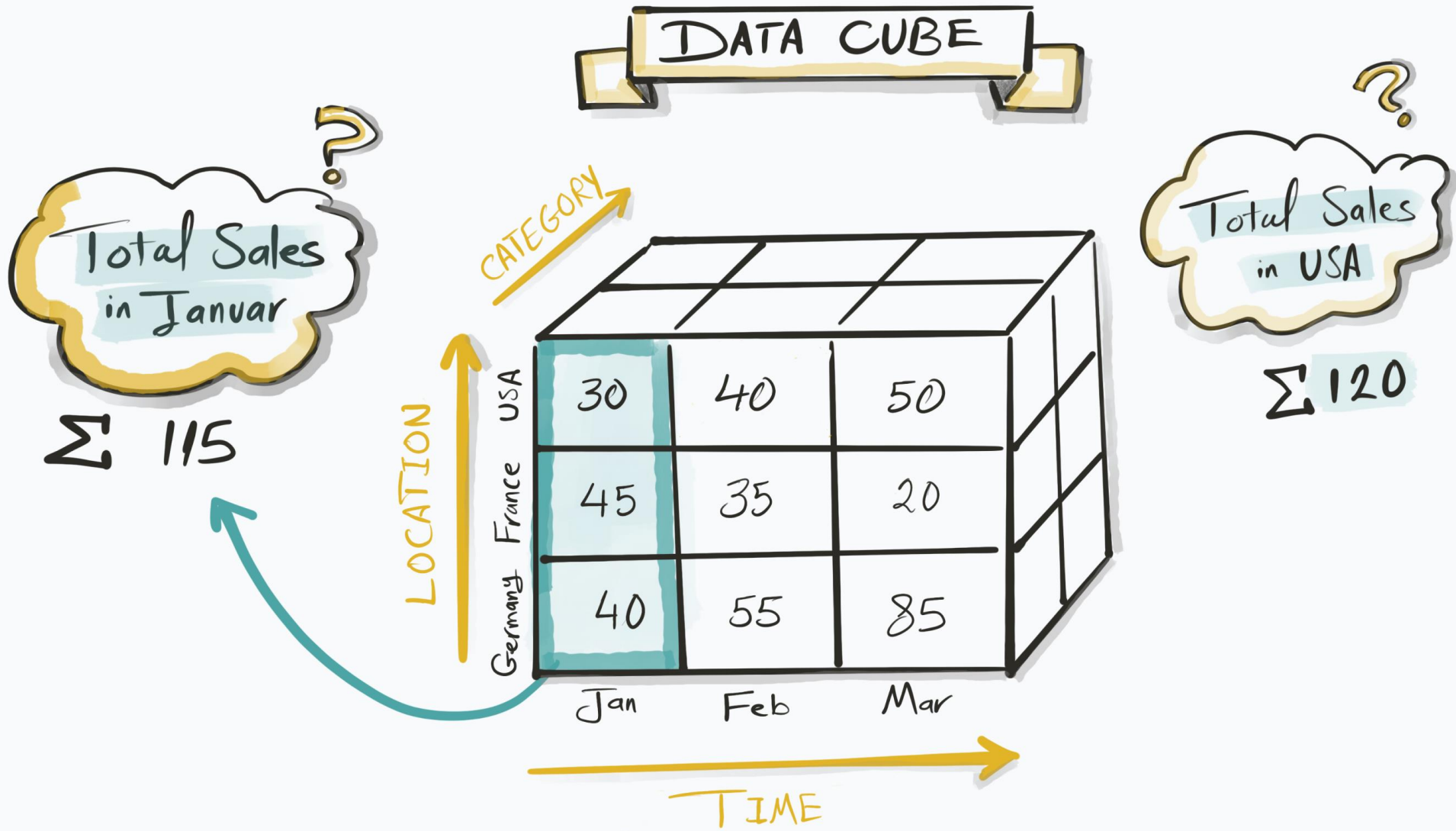
TIME FORMAT

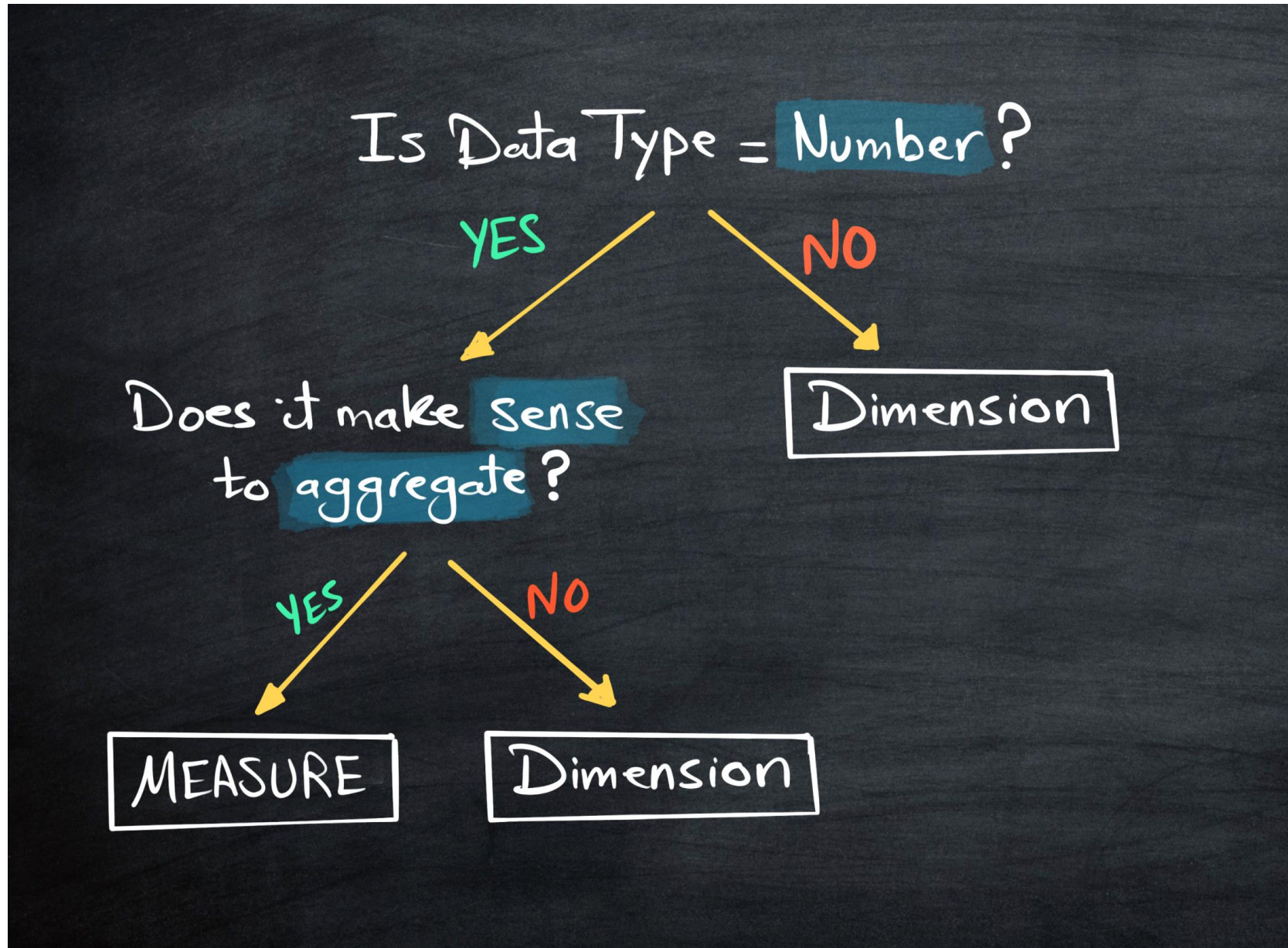



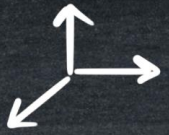

T/F









 tableau	<u>Dimensions</u> 	<u>Measures</u> 
<u>Definition</u>	Descriptive Values	Quantitative Values
<u>Example</u>	Category, Country, ID	Sales, Profit, Quantity
<u>Aggregation</u>	Can Not be aggregated	Aggregable [SUM, AVG, MIN, MAX]
<u>Data Types</u>	[String, Date, Boolean, Number] <small>Abc ☞ TIF #</small>	[Number] <small>#</small>
<u>Role of Analysis</u>	Filtering, Grouping, Organising Data	Calculations & Numerical Analysis
<u>Granularity</u>	LOD: Level of Details	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
- ~~~~

Distinct
Values

Continuous

Filter-Date

2018



Start
value

2026



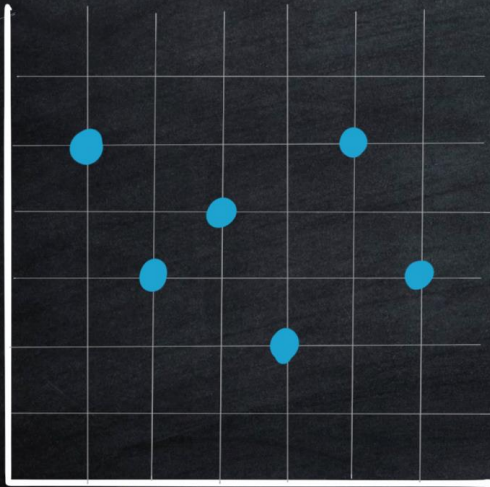
END
value



Range
values

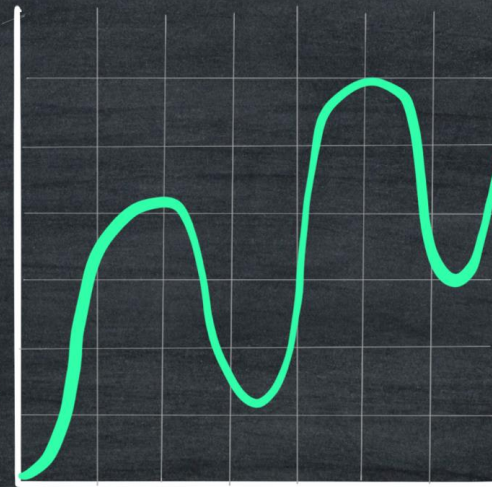
Discrete

Disconnected & Separated
Values



Continuous

Connected & unbroken chain
of Values



Discrete

Many Sorting options

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

Continuous

Limited Sorting Options

- Ascending
 - Descending
- 

Discrete

Purpose:

Deep Dive Analysis










Continuous

Purpose:

Big Picture Analysis



Discrete vs Continuous

 tableau	<h2>Discrete</h2>	<h2>Continuous</h2>
Definition	Disconnected values 	Connected values 
Example	$[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10]$	$[1, 1.11, 1.12, 1.13, 1.14, \dots, 2] \infty$
Colors	Blue Pill 	Green Pill 
Filters	Distinct values 	Range value 
Views	Header	Axis
Sorting	<h3>Many</h3> Sorting options	<h3>Limited</h3> Sorting options
Purpose	Specific Scenario Deep Dive	Big Picture Trends Analysis

Data Types

Dimension/Measure vs Discrete/Continuous

ORDERS

ID	Name	Order
~	~	~
~	~	~

String
Abc

→ Discrete Dimension

Boolean
T/F

→ Discrete Dimension

Date
📅

→ Discrete Dimension
→ Continuous Dimension

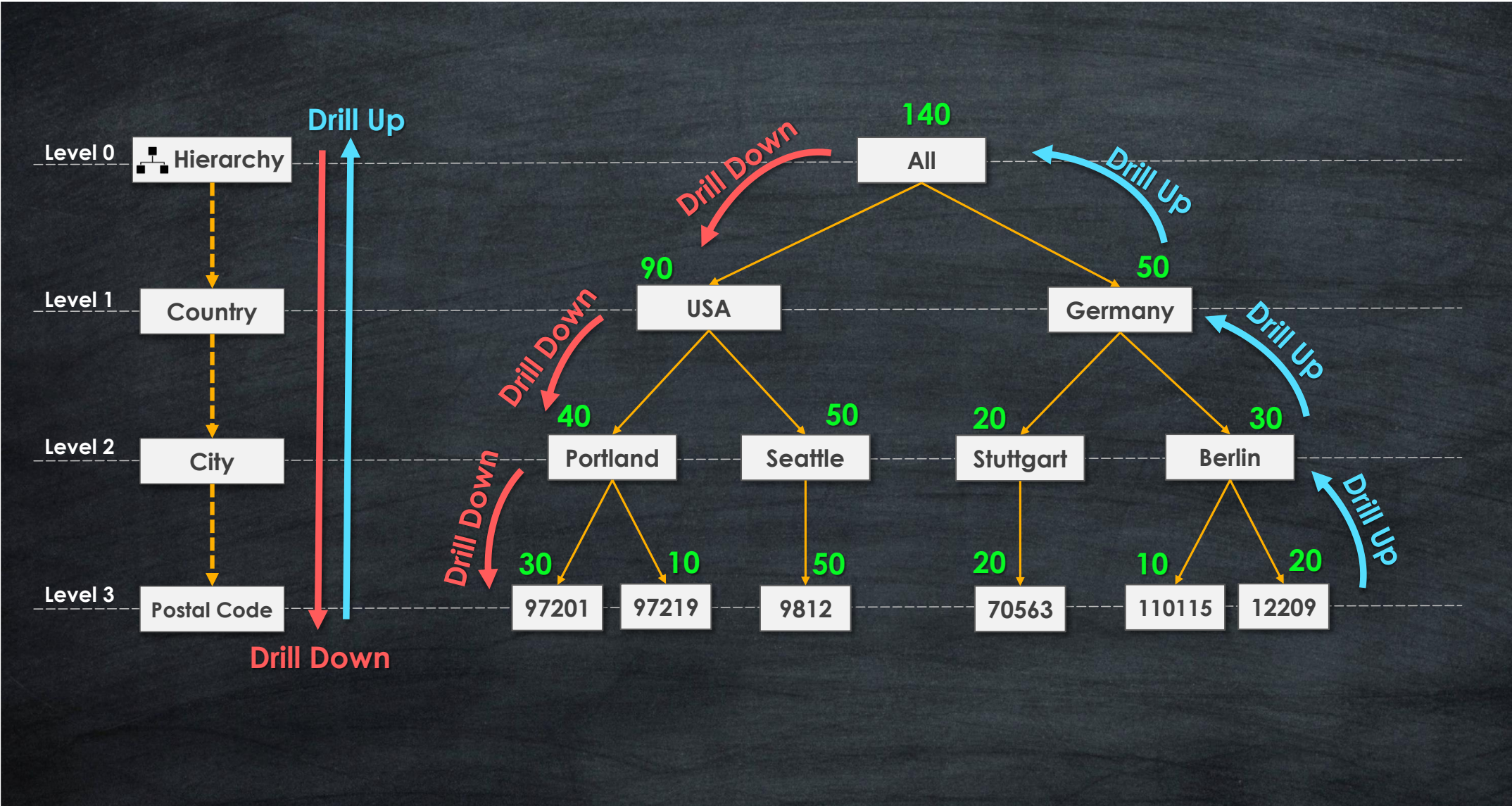
Number
#

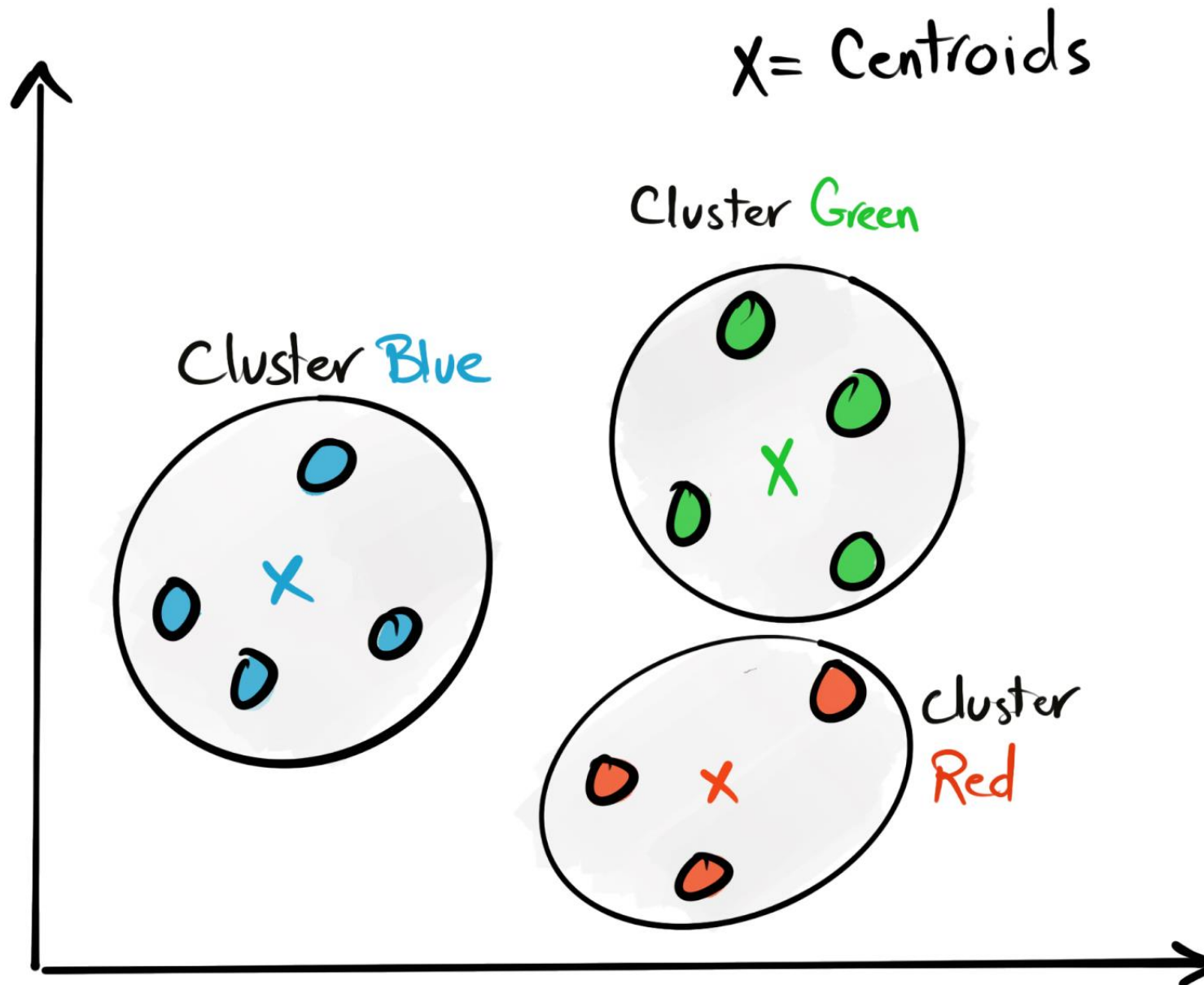
→ Discrete Dimension → More Common
 → Continuous Dimension
 → Discrete Measure → Less Common
 → Continuous Measure → More Common

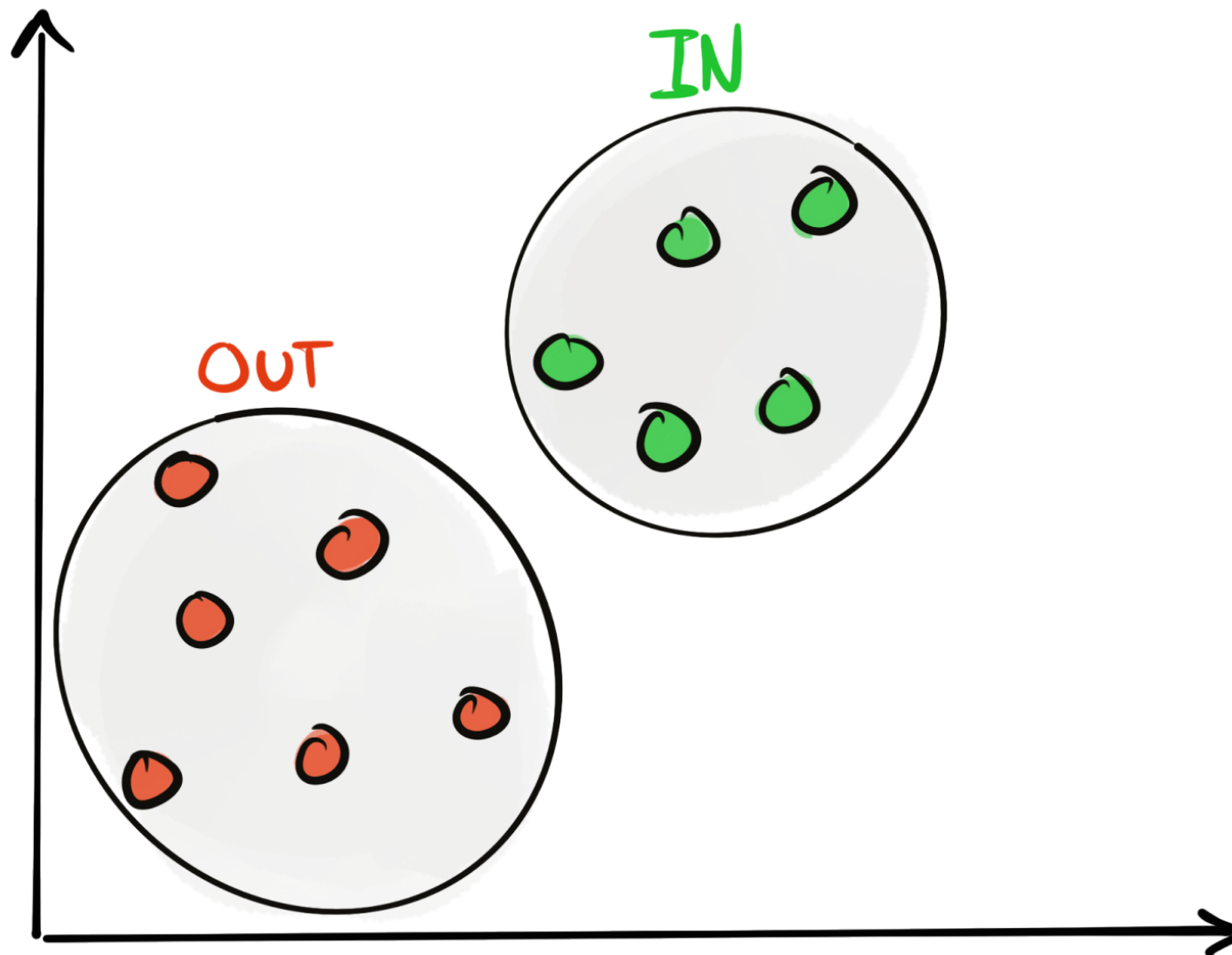
Example: CUSTOMER NAME

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 separation	Java, JavaScript, TypeScript
Pascal Case	CustomerName	capitalized	No separation	Java, C#
Kebab Case	customer-name	lowered case	Dash "-"	HTML, CSS
Title Case	Customer Name	capitalized	Space " "	Tableau
Your Convention	Customer_Name	capitalized	underscore "_"	

Hierarchy



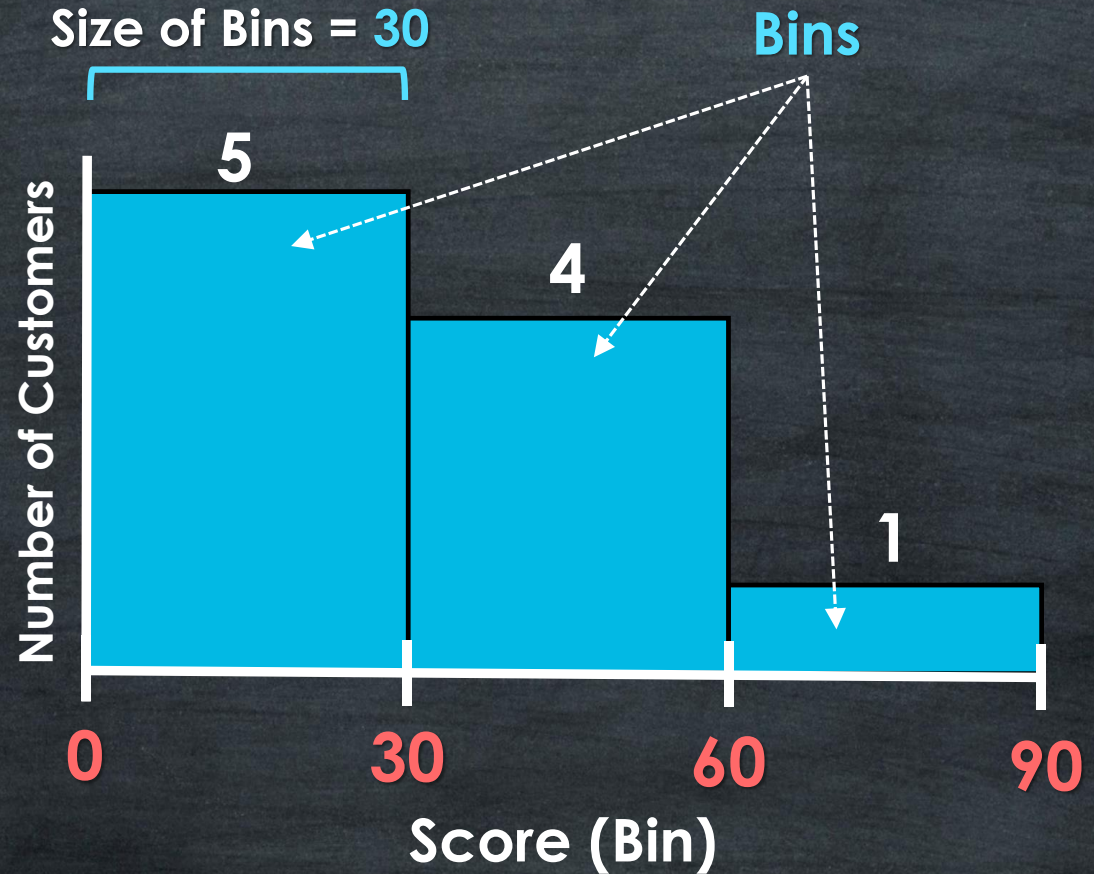




Customers

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

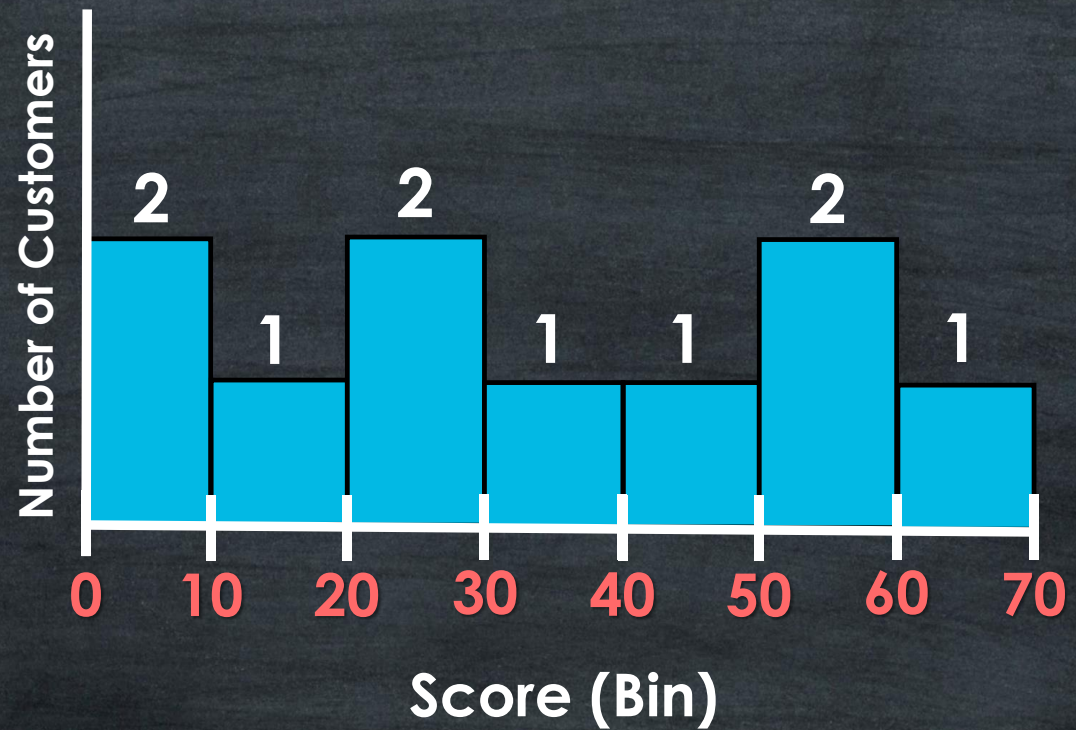
Size of Bins = 30

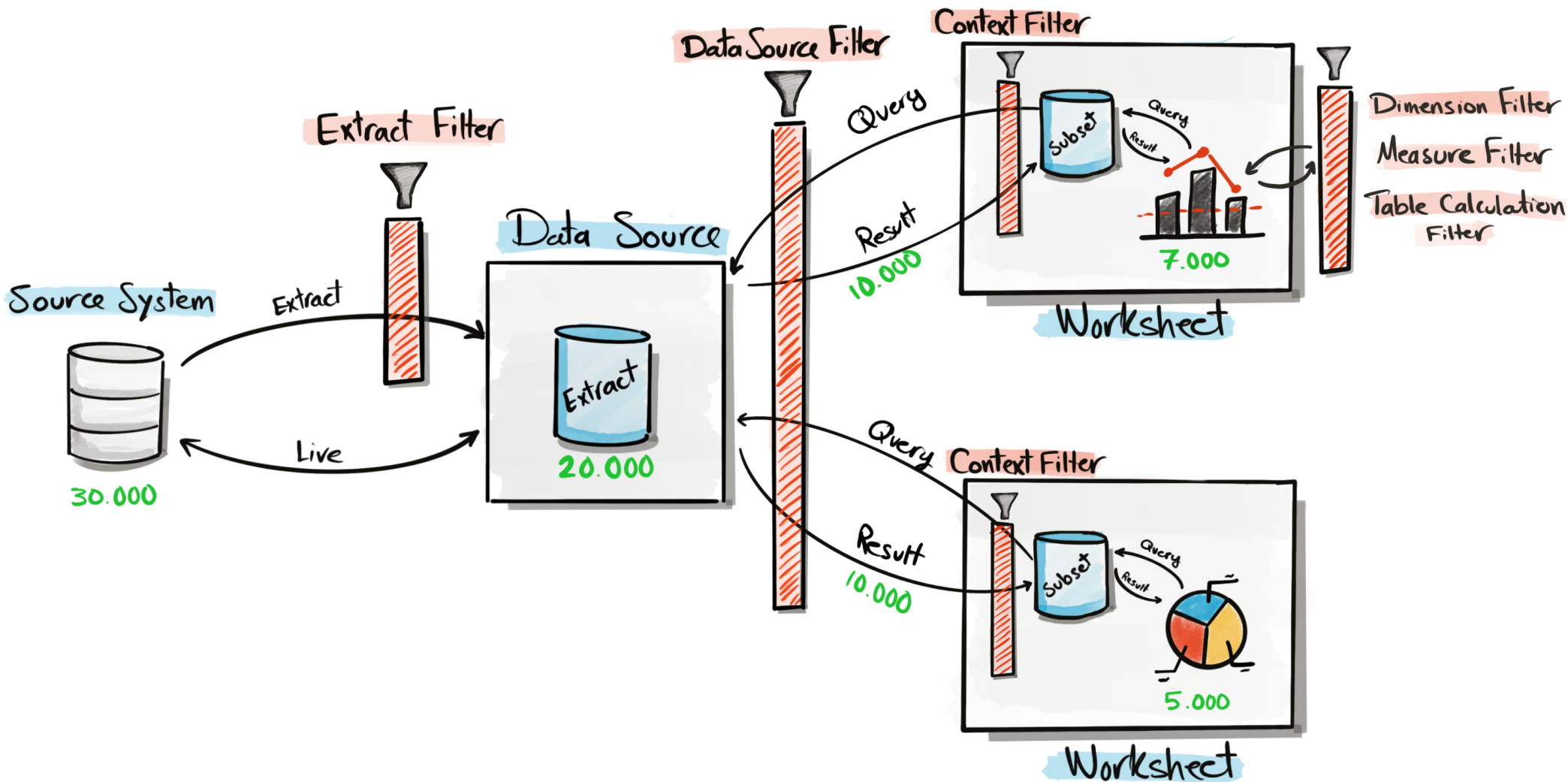


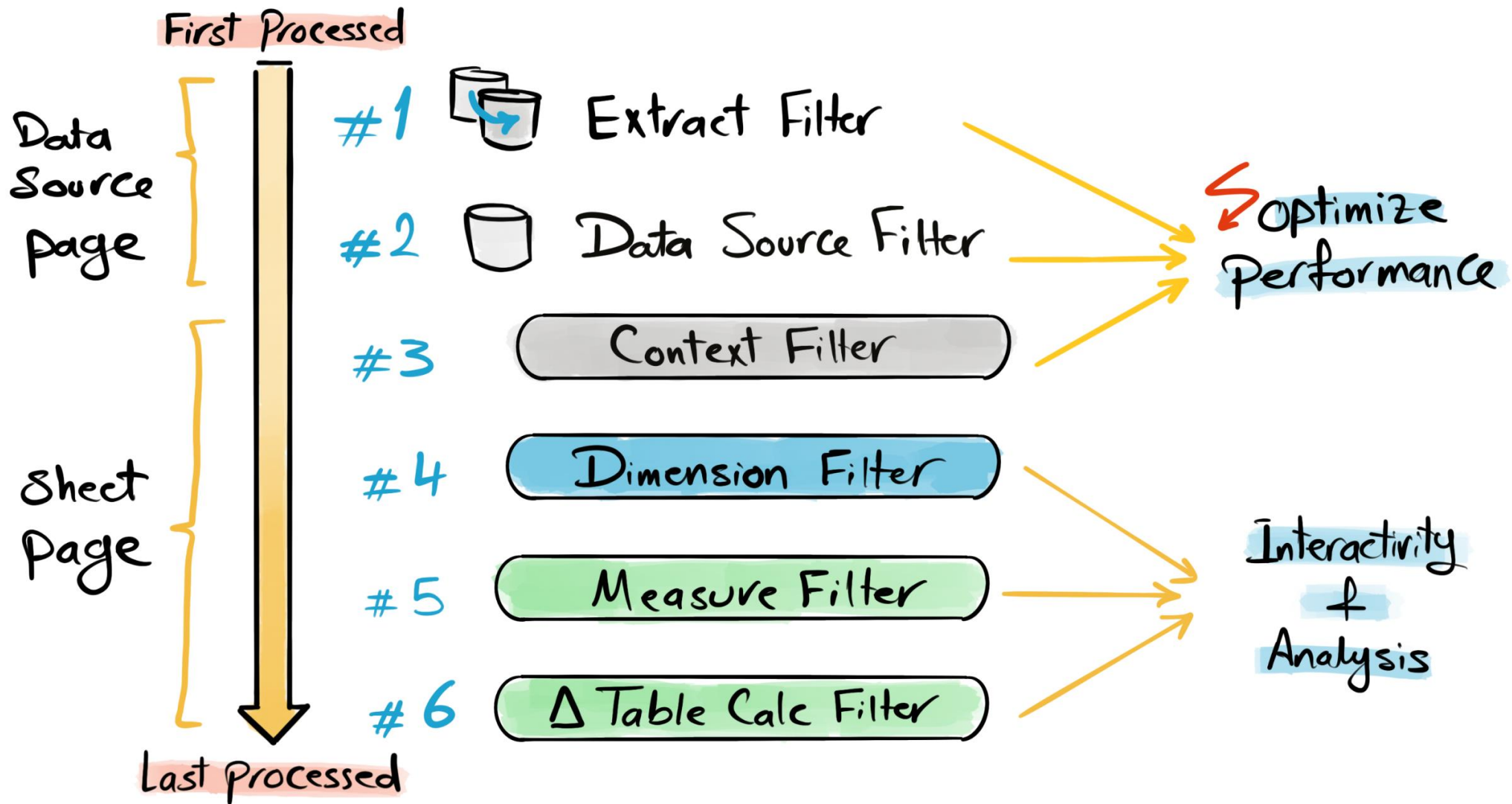
Customers

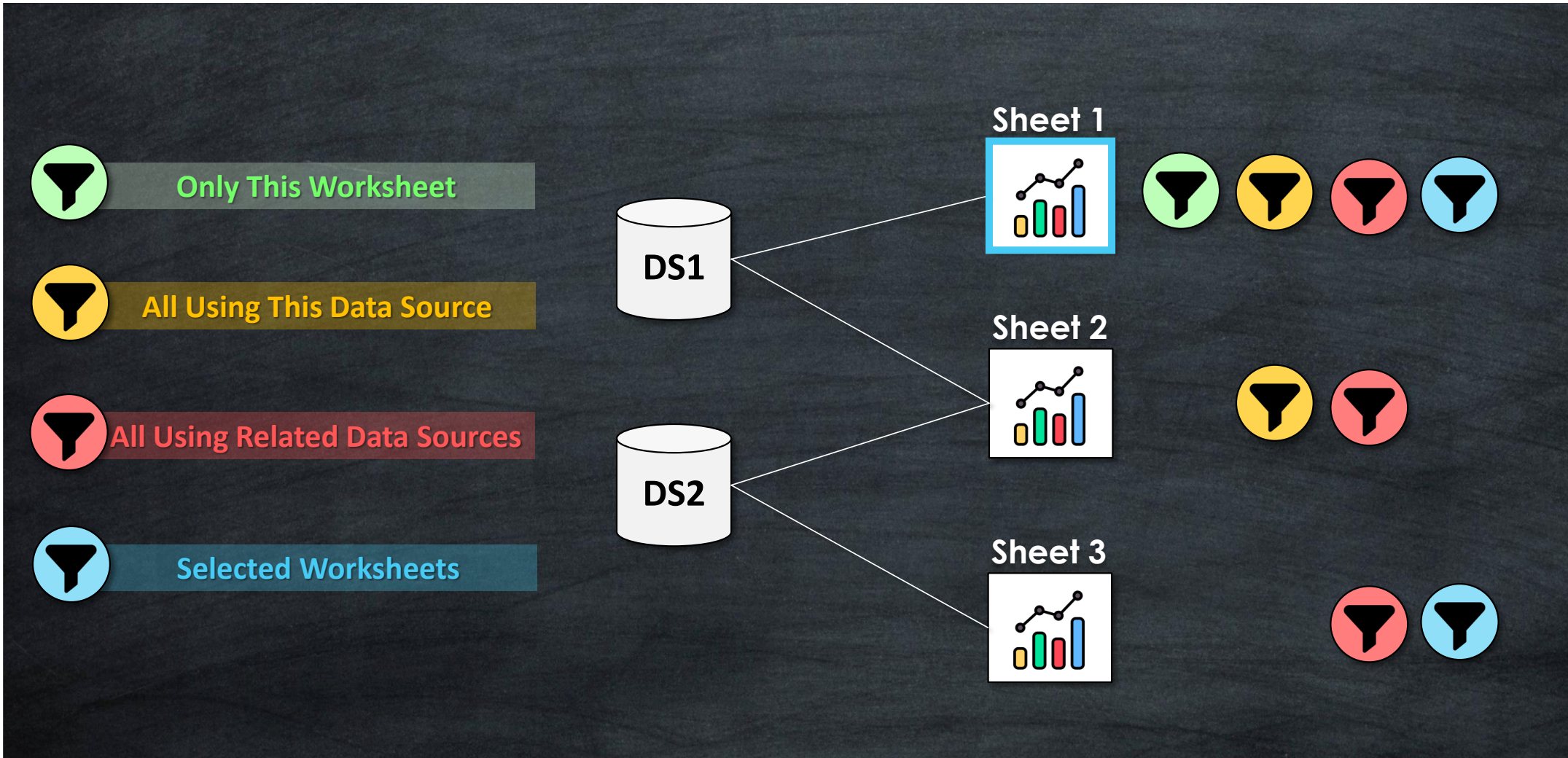
Customer_ID	First_Name	Score
1	Bill	63
2	Gerald	9
3	Harry	11
4	Dwight	25
5	Rutherford	57
6	Grover	35
7	Grover	24
8	Bill	44
9	Calvin	0
10	Dwight	55

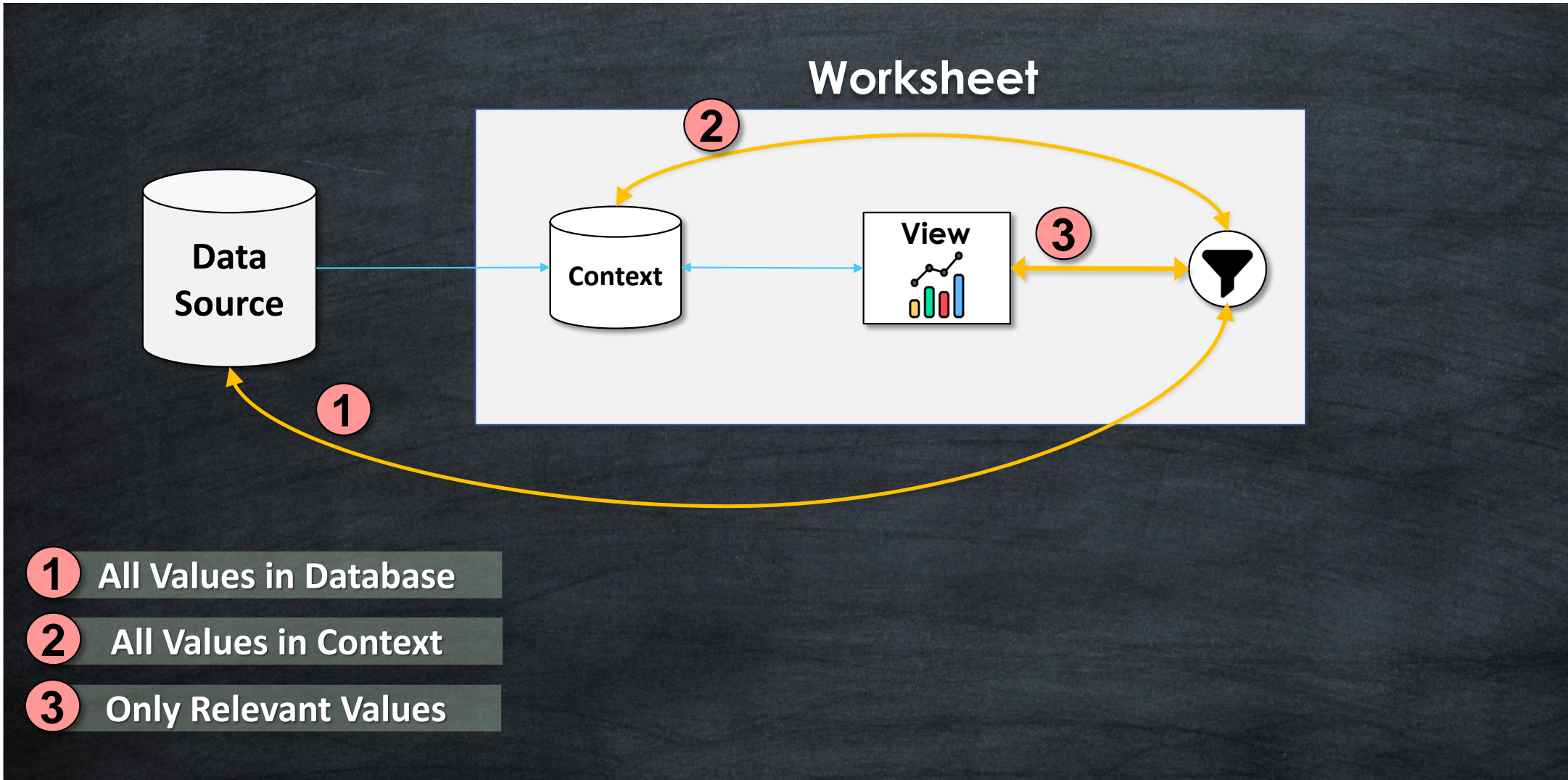
Size of Bins = 10



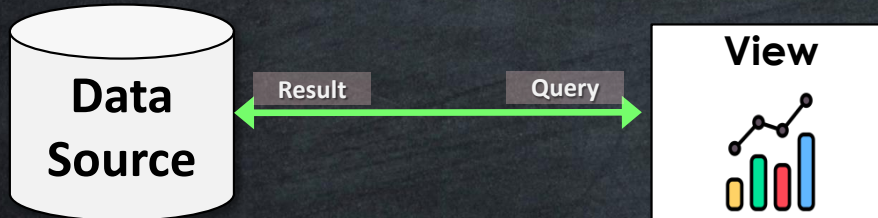






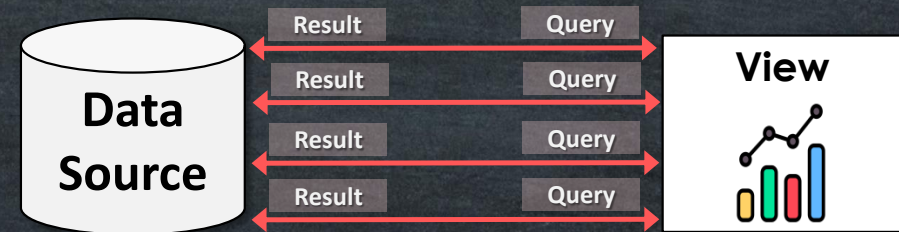


All Values

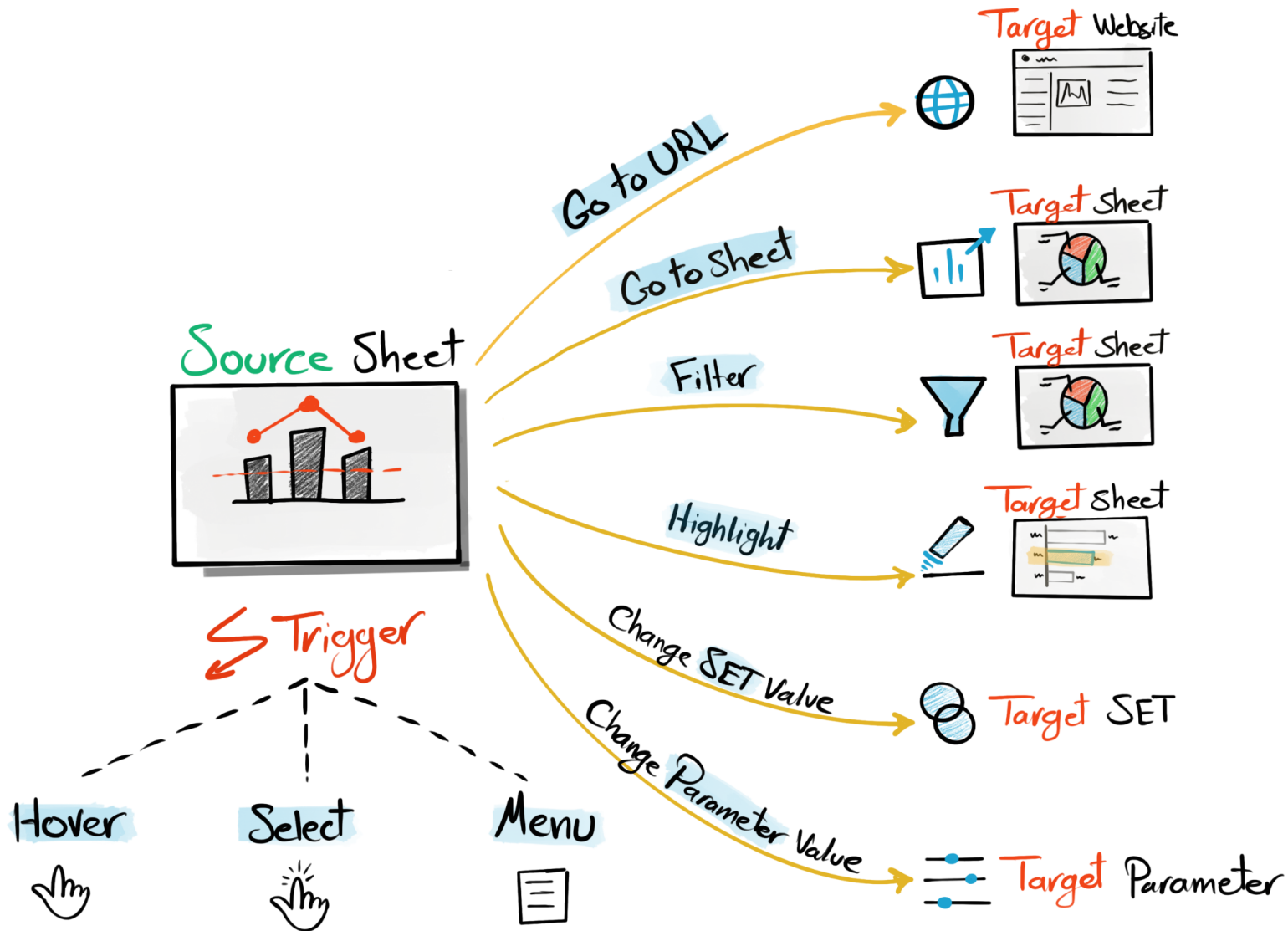


1 Initial Query as user starts View

Only Relevant



Multiple Queries for each user Interaction

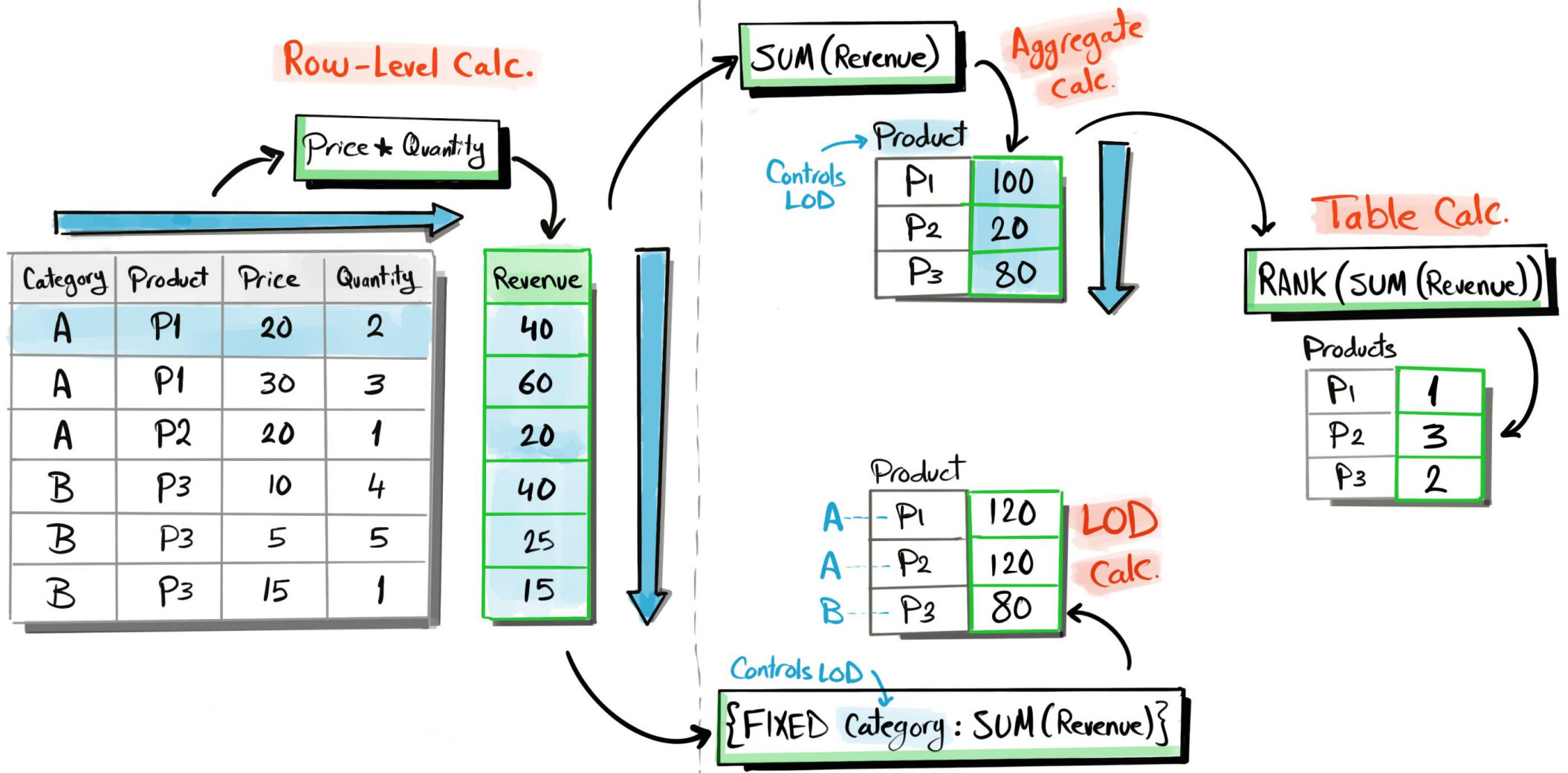




Calculation Types

Data Source

Visualization (VIZ)



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

1 Row-Level
Calculation

2 Aggregate
Calculation

3 Table
Calculation

Types of Calculations

Row-Level Calculation	Aggregate Calculation	LOD Calculation	Table Calculation
<code>[Quantity] * [Price]</code>	<code>SUM ([Revenue])</code>	<code>{FIXED [Category] : SUM ([Revenue]) }</code>	<code>RANK (SUM ([Revenue]))</code>
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

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

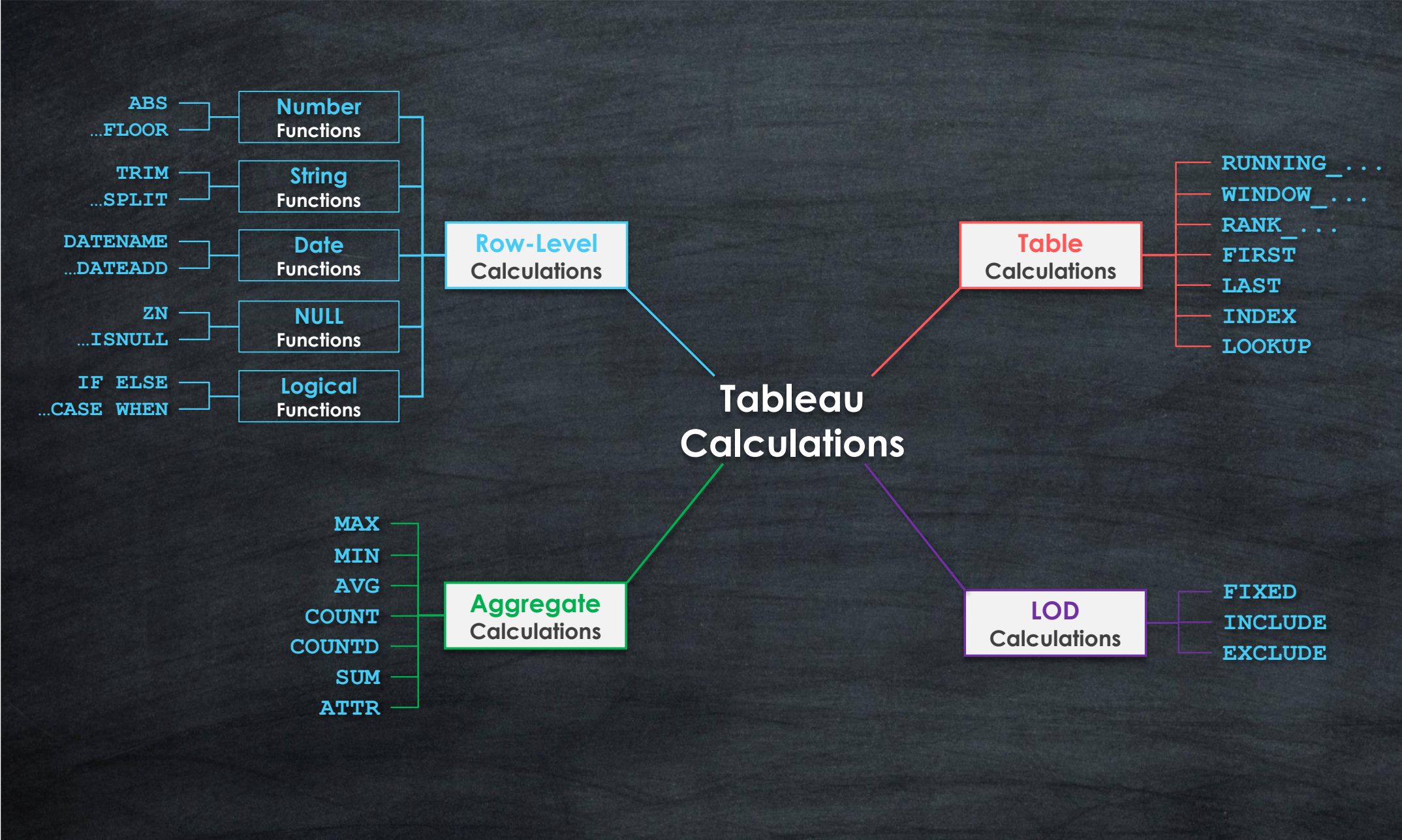
Q3: Is the Level of Details in VIZ matches the Question?

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

{ EXCLUDE } LOD Expression




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

{ INCLUDE } LOD Expression



LOD (VIZ)

View 1

Category	Country	Sales

View 2

Product	Category	Country	Sales



LOD (EXPRESSION)

```
INCLUDE [Customer] : SUM([Sales])
```

+1 DIM

Customer

Category	Country	Sales

+1 DIM

Customer

Product	Category	Country	Sales

{ LOD } Level Of Details



LOD (VIZ)

View 1

Category	Country	Sales



LOD (EXPRESSION)

FIXED

Category	Sales

EXCLUDE

-1 DIM

Category	Country	Sales

INCLUDE

+1 DIM

Customer	Category	Country	Sales

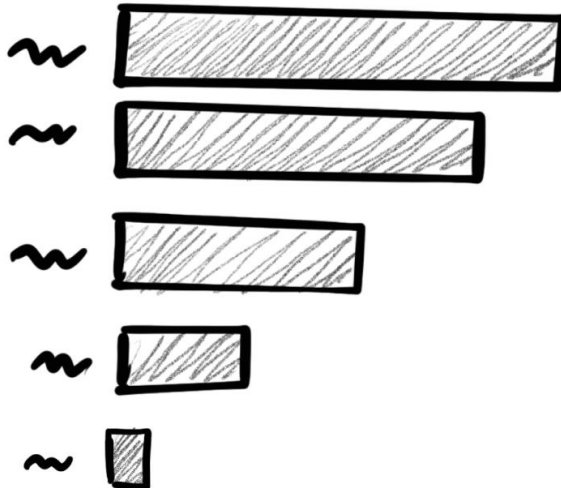
Sales Performance

\$30K
Sales

\$25K
Profit

60K
Quantity

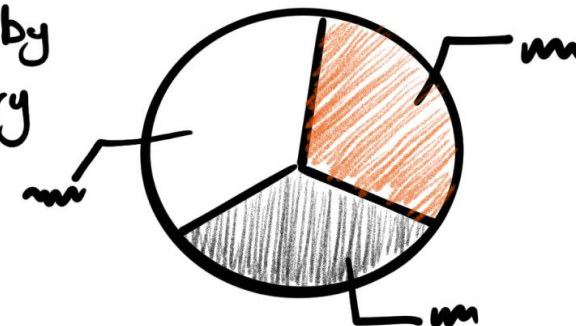
Top Category



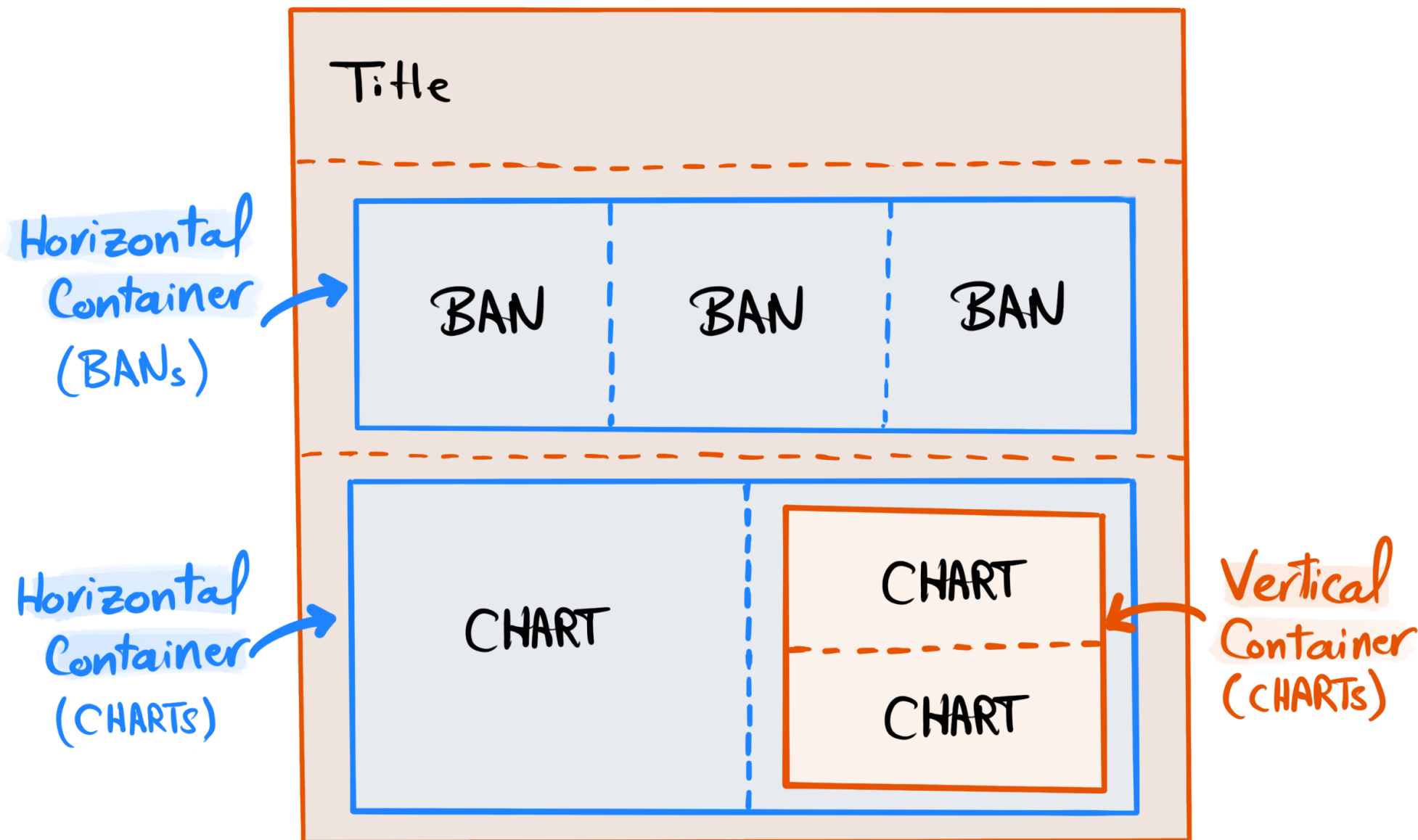
Sales vs Profit



Sales by Category



Vertical Container (Main) ↘



DASHBOARD DESIGN PROCESS

STEP 1

ANALYSE REQUIREMENTS

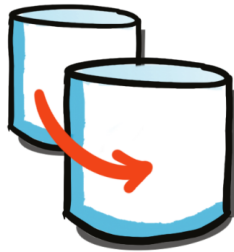


- Collect Requirements
- Choose Right Charts
- Draw Mockups
- Choose Colors

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

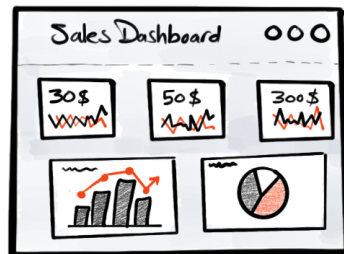


- Create Calculated Fields & Test
- Build Chart
- Format
 - Remove Lines & Grids
 - Clean up Axis & Headers
 - Coloring
 - Tooltips

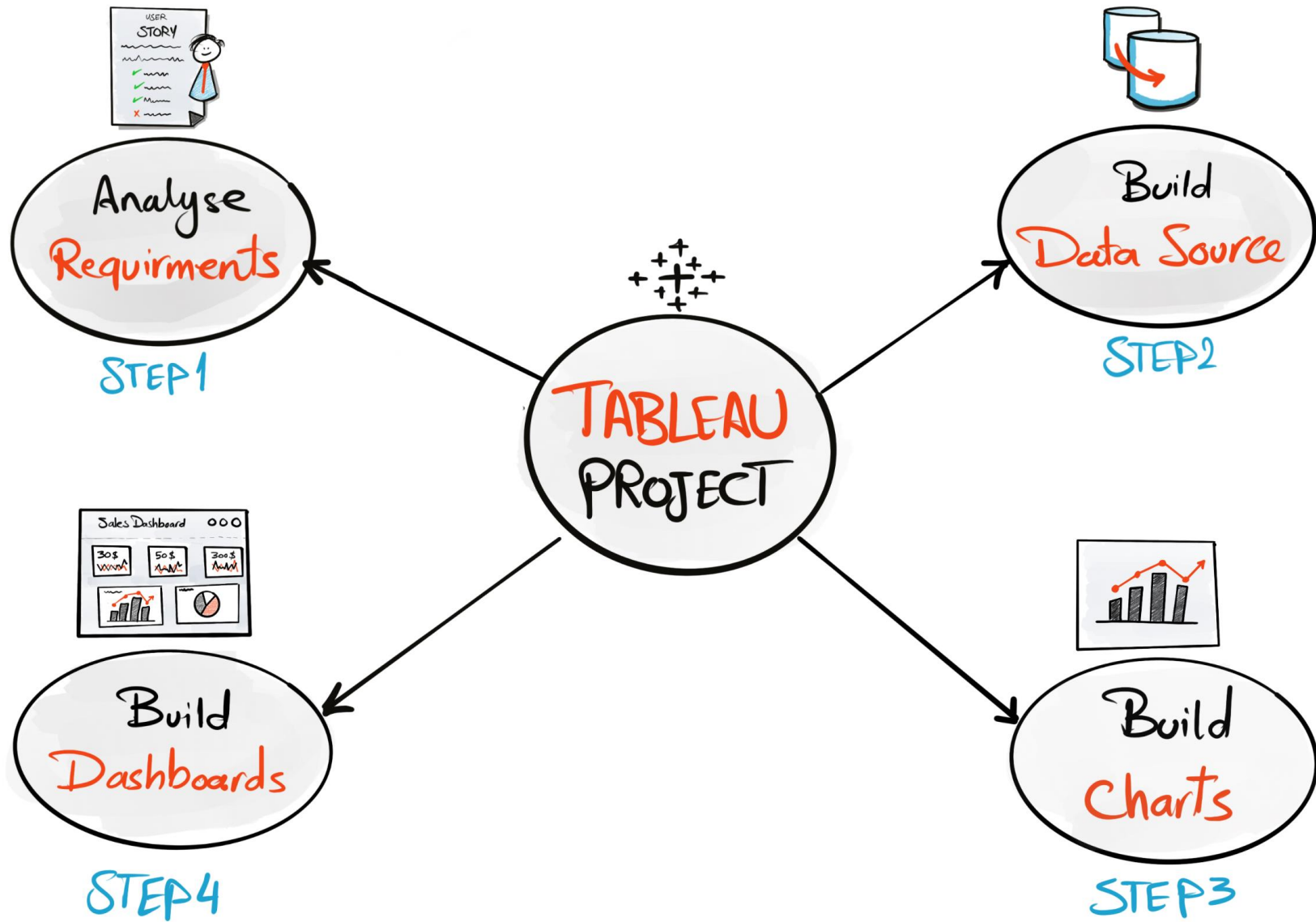
DASHBOARD DESIGN PROCESS

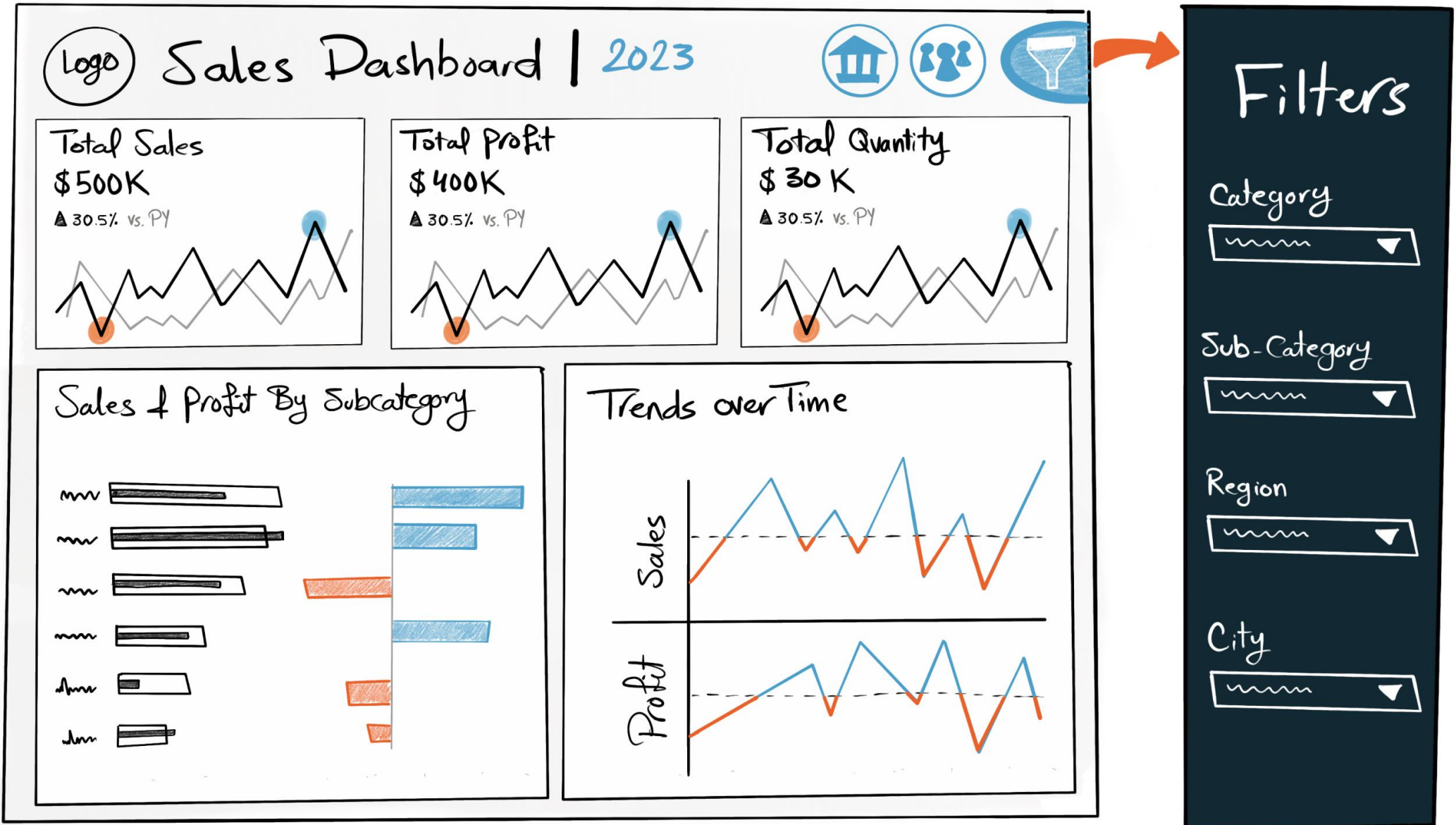
STEP 4

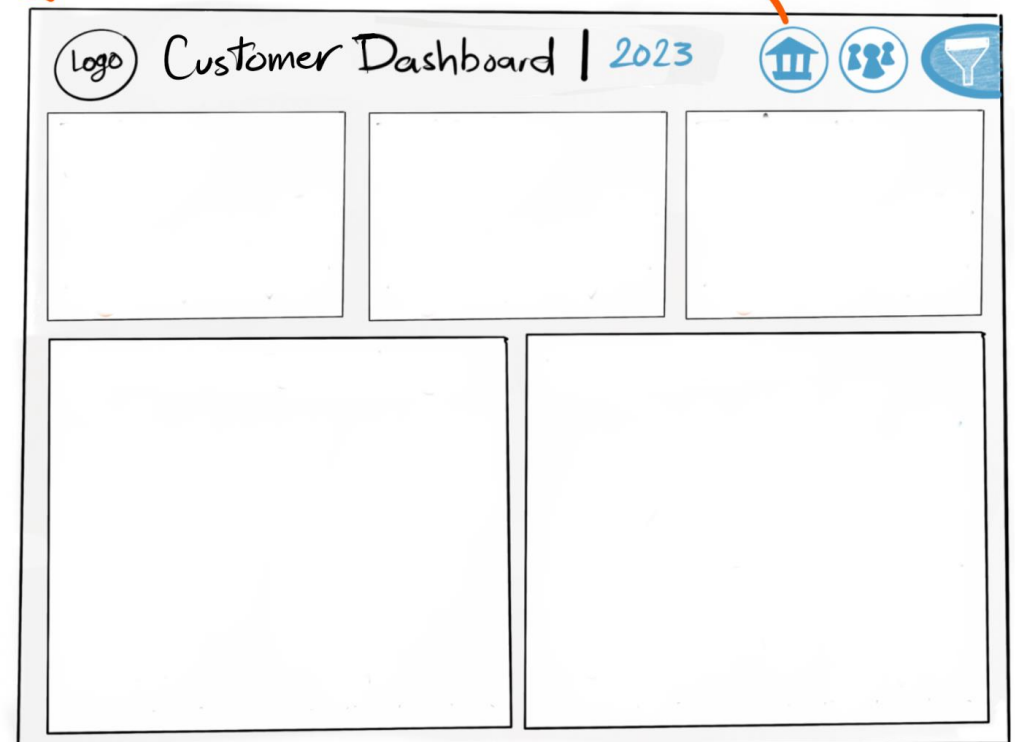
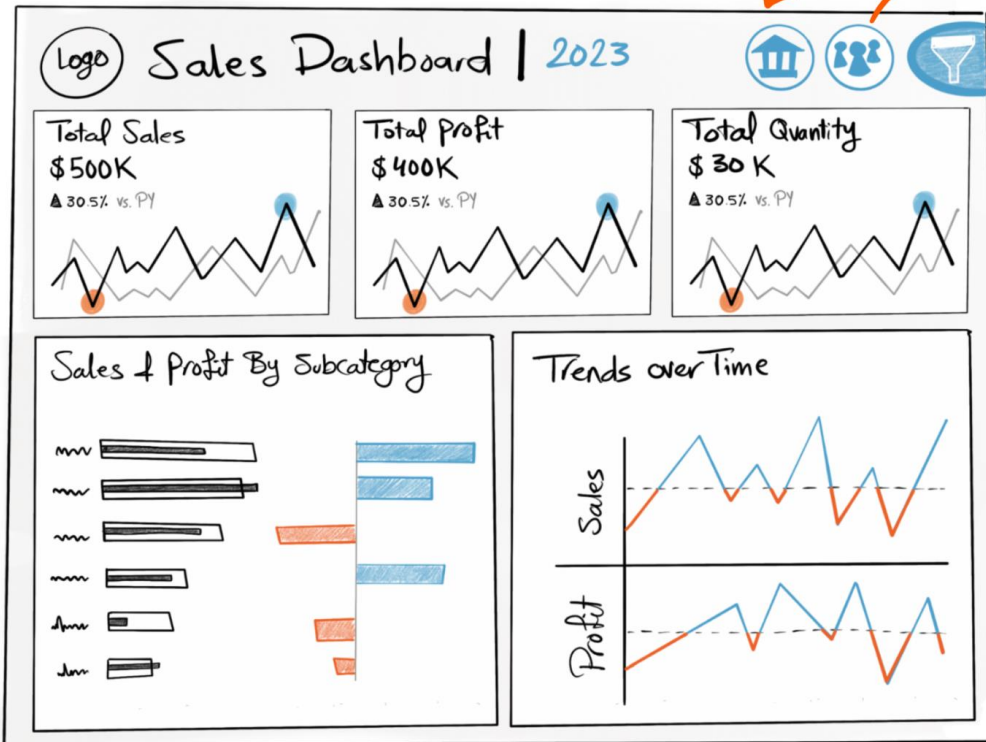
BUILD DASHBOARD



- 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







Container Mockup

