

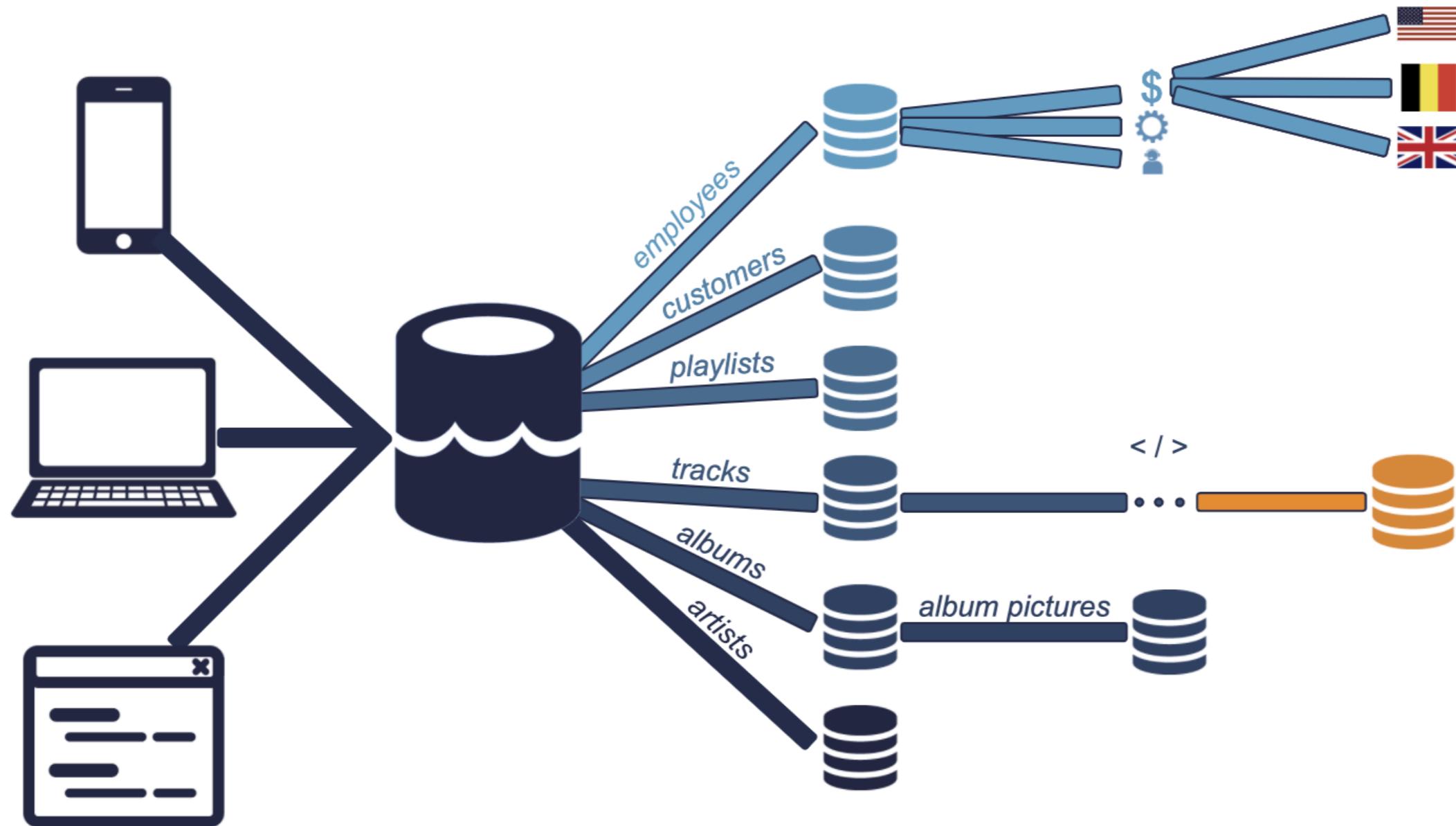
Processing data

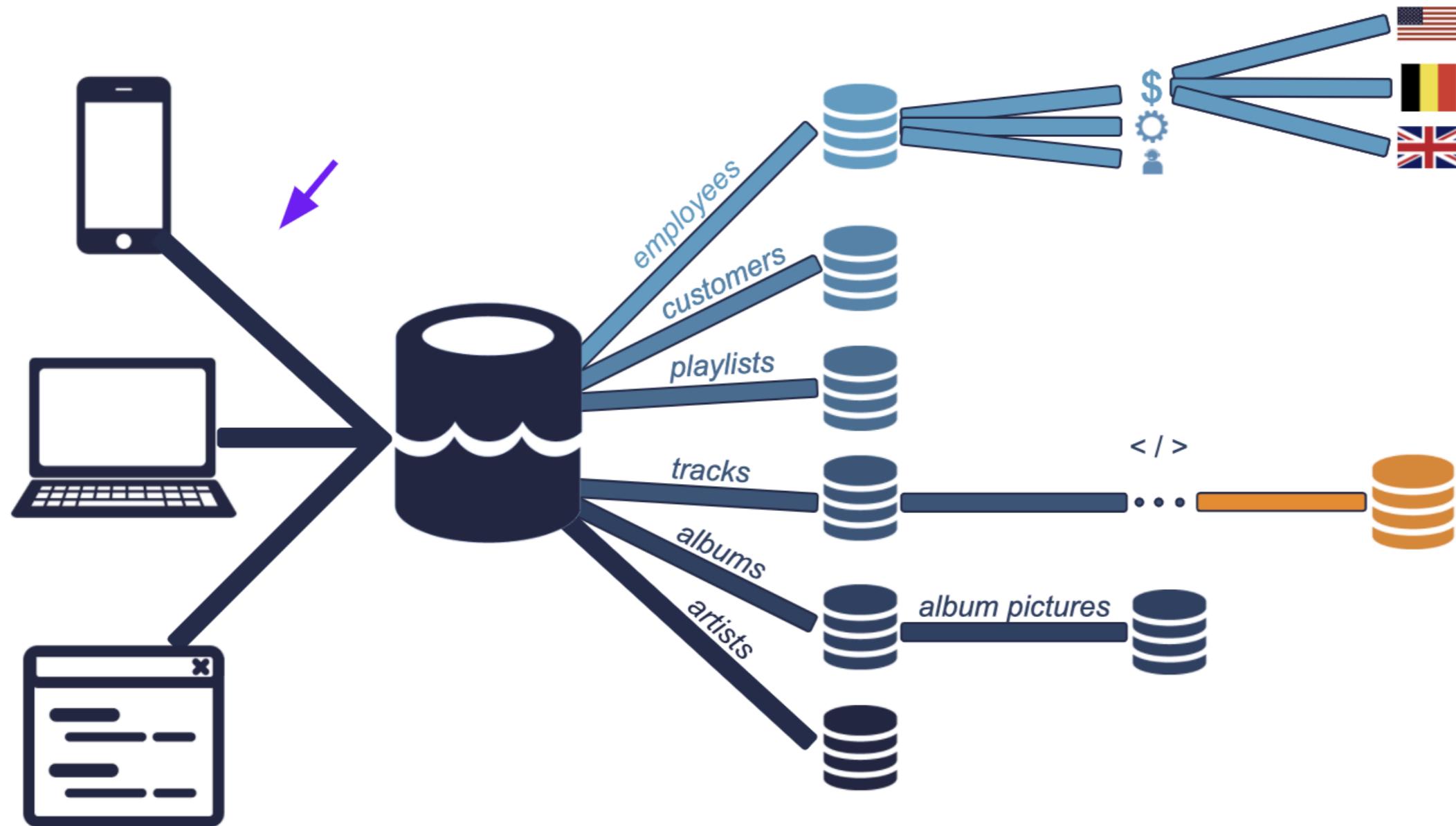
DATA ENGINEERING FOR EVERYONE

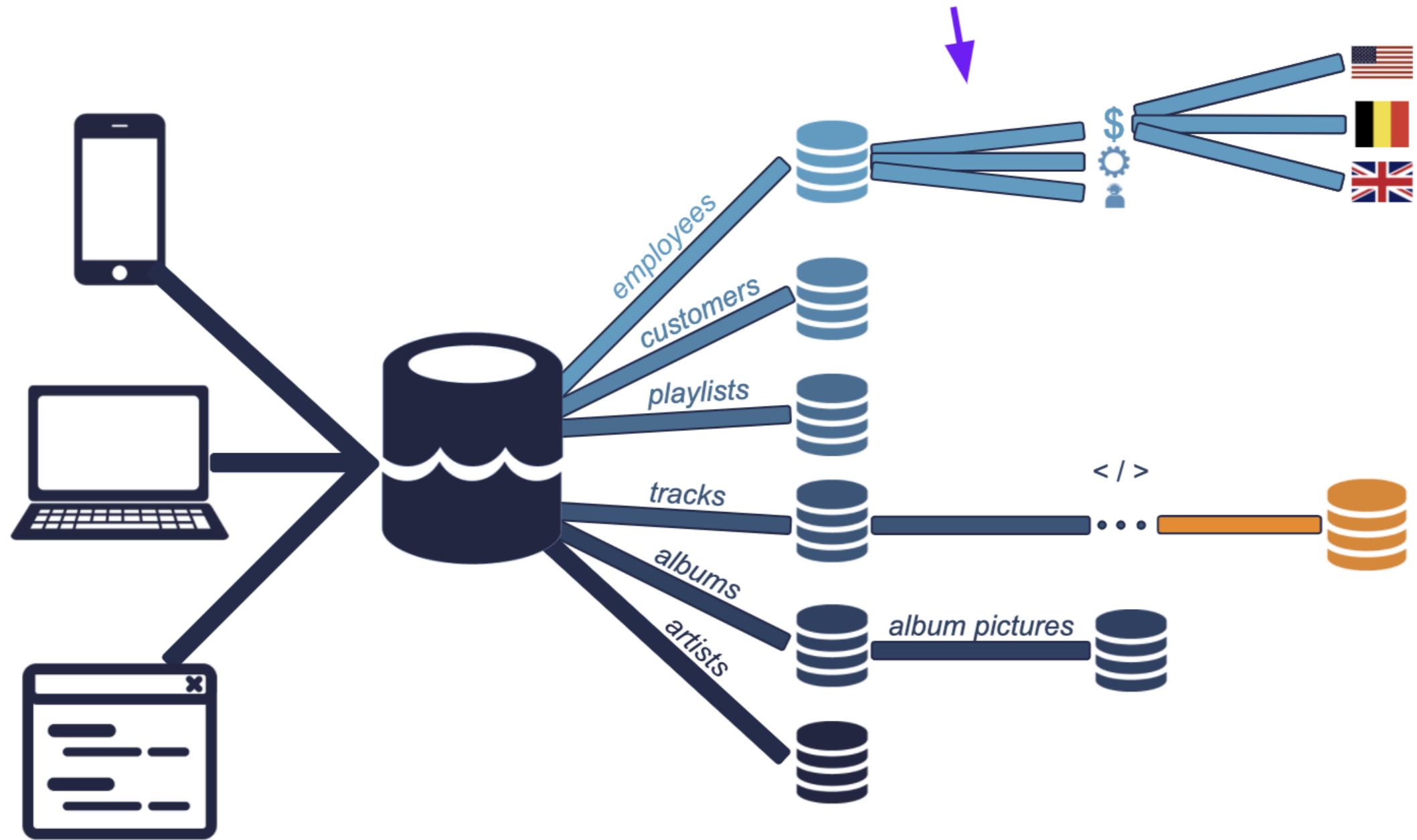


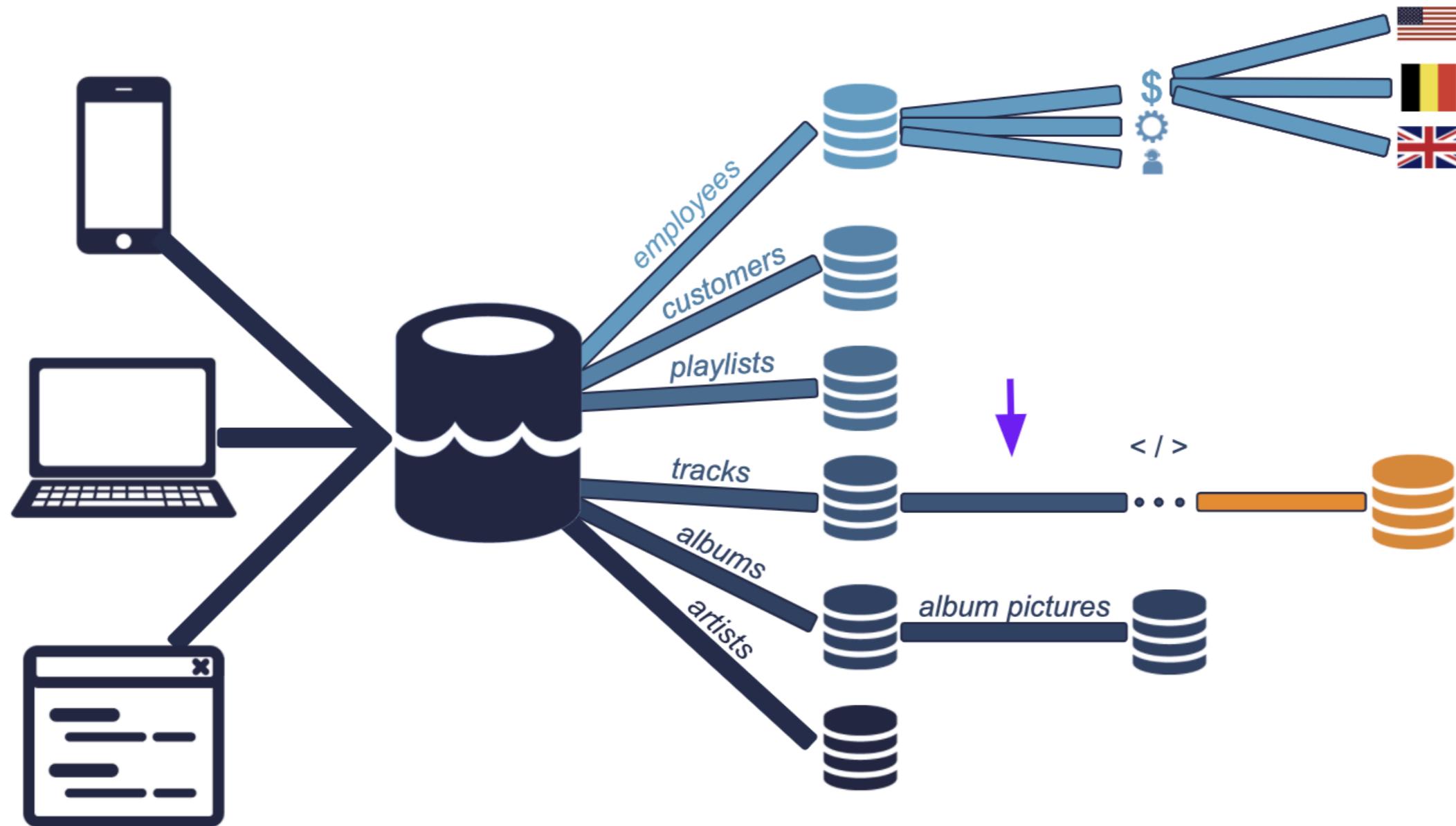
Hadrien Lacroix

Content Developer at DataCamp









A general definition

- Data processing: converting **raw** data into **meaningful** information

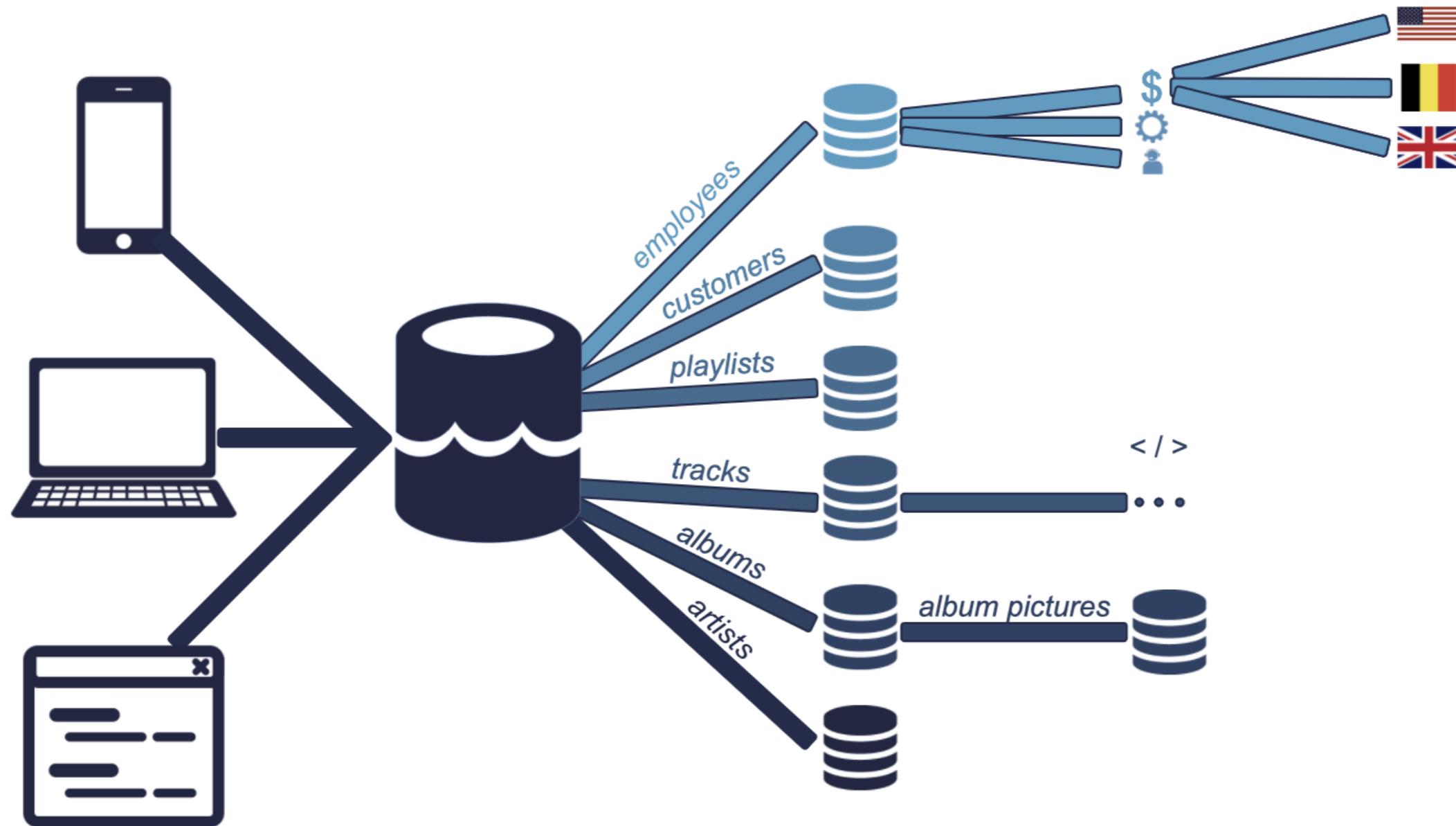
Data processing value

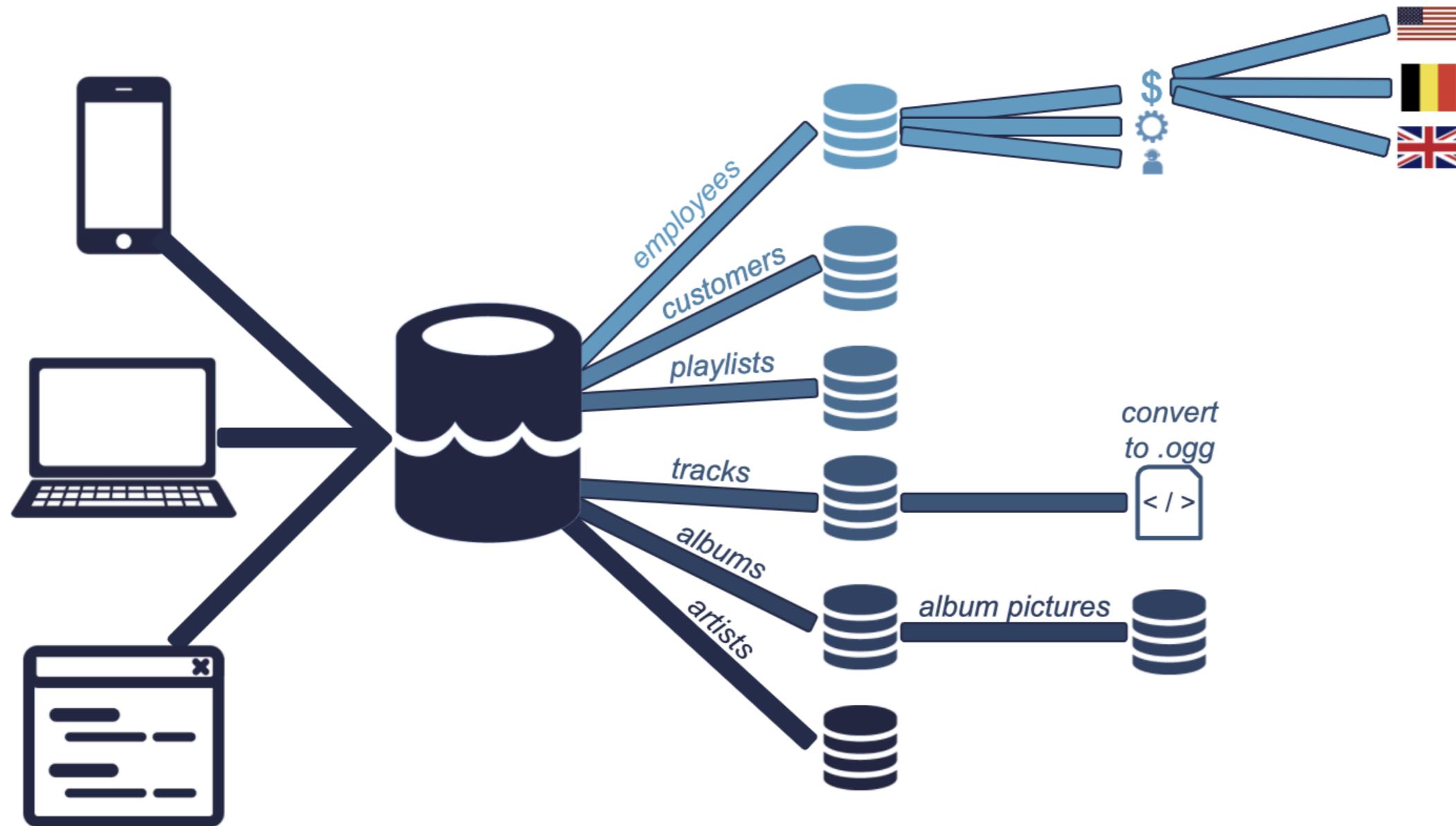
Conceptually

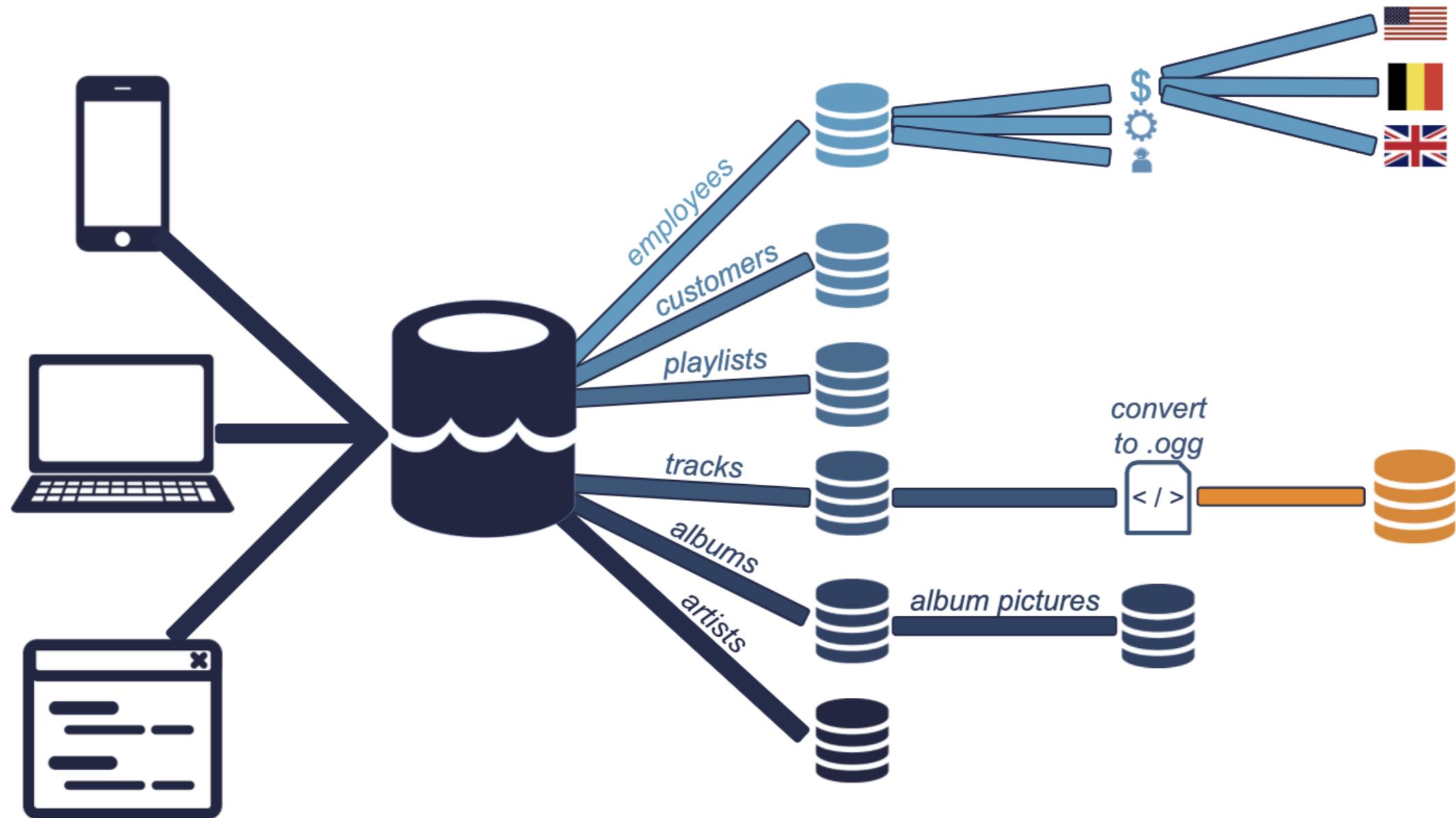
- Remove unwanted data
- Optimize memory, process and network costs
- Convert data from one type to another

At Spotflix

- No long term need for testing feature data
- Can't afford to store and stream files this big







Data processing value

Conceptually

- Remove unwanted data
- To save memory
- Convert data from one type to another
- Organize data
- To fit into a schema/structure
- Increase productivity

At Spotflix

- No need for lossless format
- Can't afford to store files this big
- Convert songs from `.flac` to `.ogg`
- Reorganize data from the data lake to data warehouses
- Employee table example
- Enable data scientists

How data engineers process data

- Data manipulation, cleaning, and tidying tasks
 - that can be automated
 - that will always need to be done
- Store data in a sanely structured database
- Create views on top of the database tables
- Optimizing the performance of the database
- Rejecting corrupt song files
- Deciding what happens with missing metadata
- Separate artists and albums tables...
- ...but provide view combining them
- Indexing

Batch processing



amazon
EMR



presto



Stream processing



APACHE
STORM™
Distributed • Resilient • Real-time



Spring Cloud
Data Flow



¹ The difference between batch and stream will be explained in the next lesson!



Summary

- What data processing is
- Why it's necessary
- What it consists in
- How we process data at Spotflix

Let's practice!

DATA ENGINEERING FOR EVERYONE

Scheduling data

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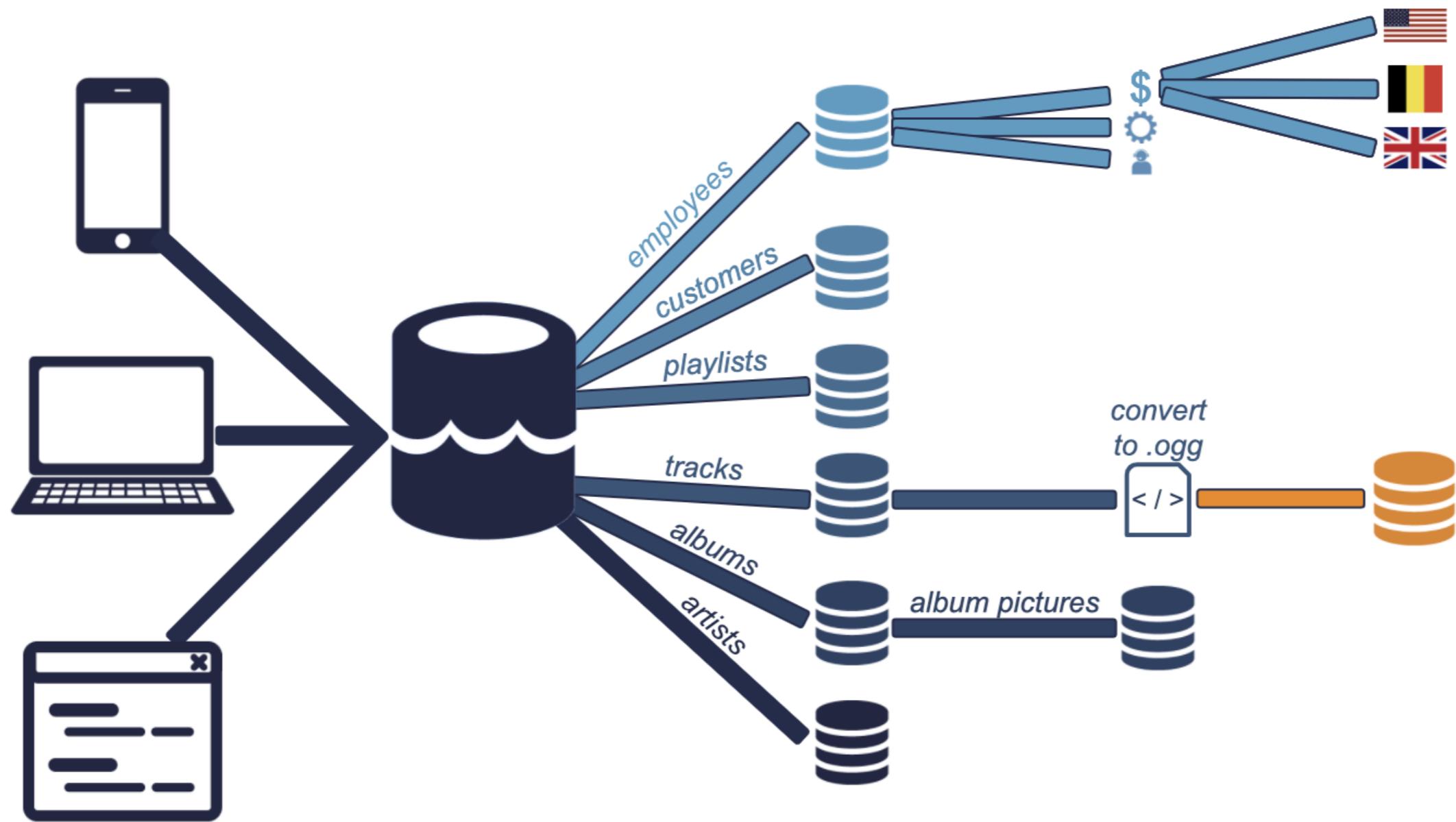
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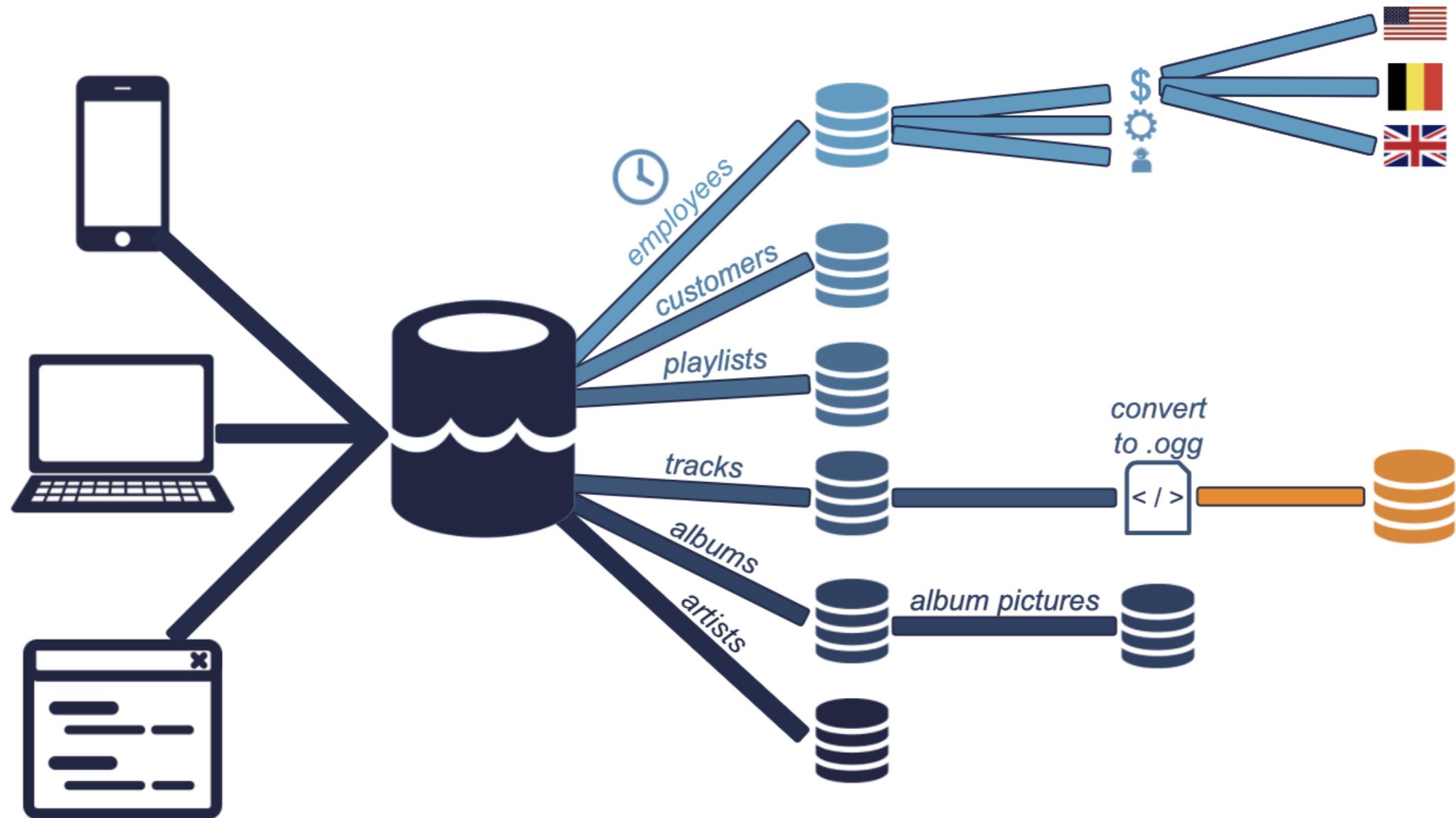
Scheduling

- Can apply to any task listed in data processing
- Scheduling is the glue of your system
- Holds each piece and organize how they work together
- Runs tasks in a specific order and resolves all dependencies

Manual, time and sensor scheduling

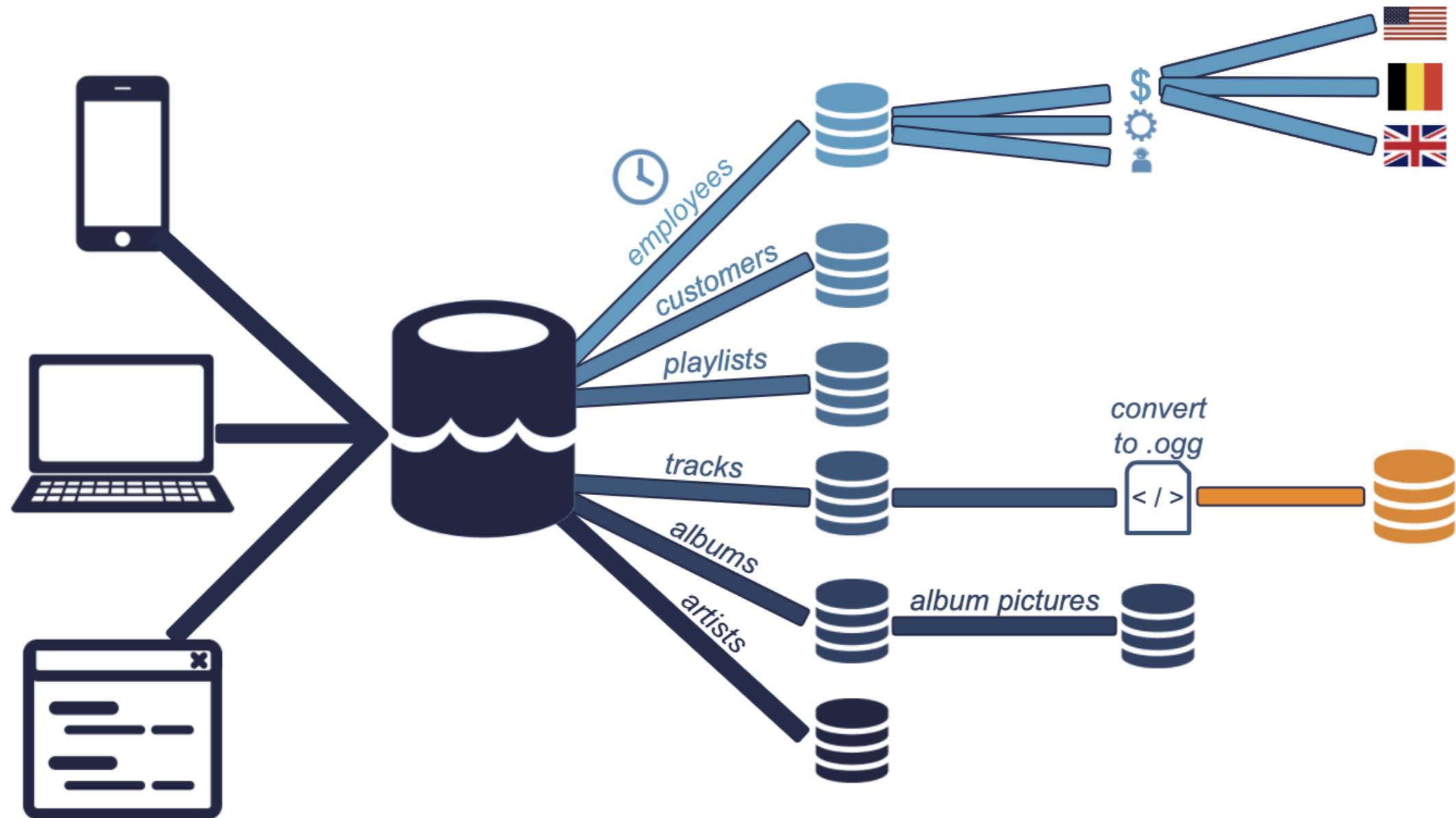
- Manually
 - Manually update the employee table

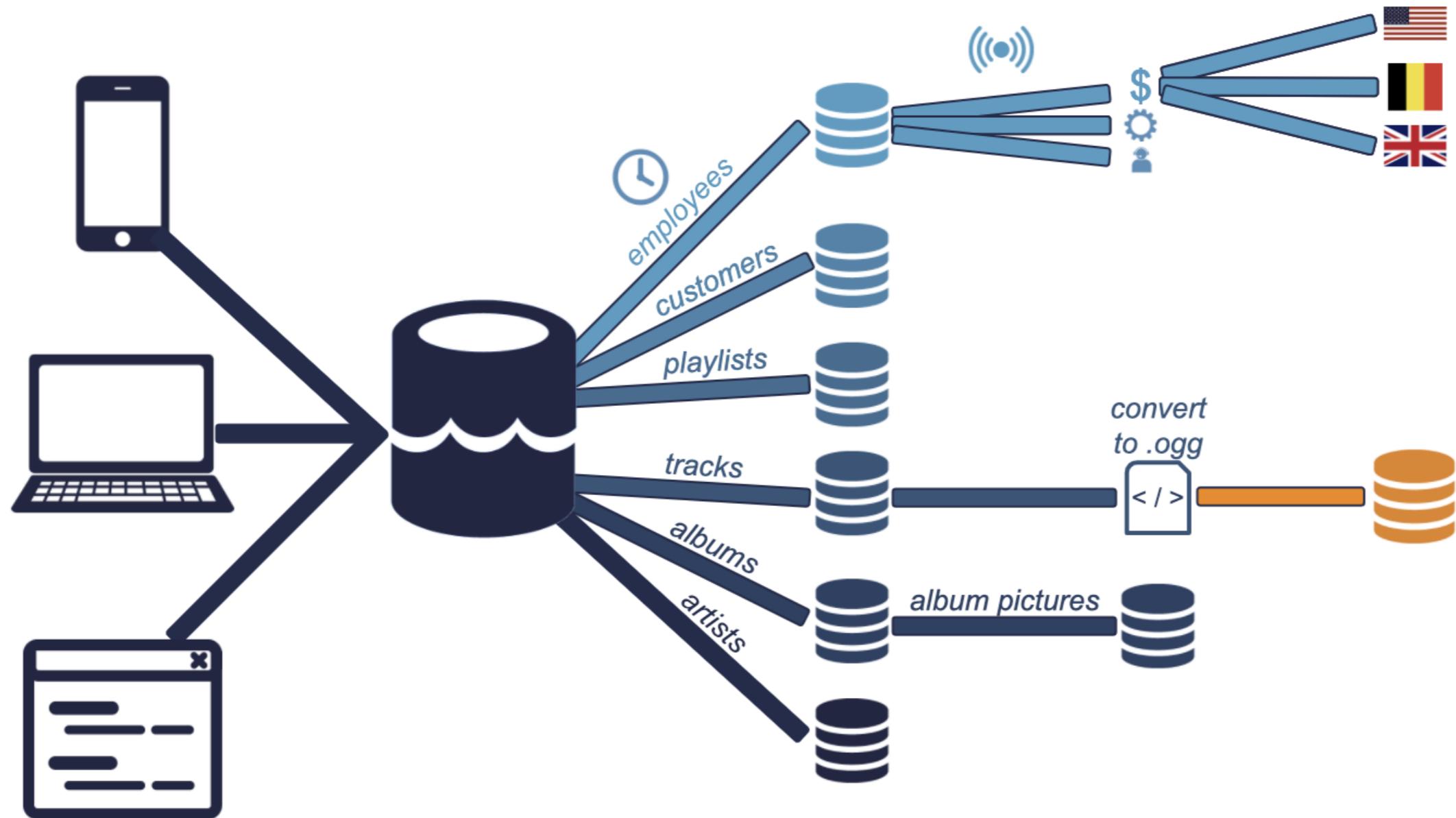




Manual, time and sensor scheduling

- Manually
- Automatically run at a specific time
- Automatically run if a specific condition is met
 - Sensor scheduling
- Manually update the employee table
- Update the employee table at 6 AM





Manual, time, and sensor scheduling

- Manually
- Automatically run at a specific time
- Automatically run if a specific condition is met
 - Sensor scheduling
- Manually update the employee table
- Update the employee table at 6 AM
- Update the department tables if a new employee was added

Batches and streams

- Batches
 - Group records at intervals
 - Often cheaper
- Streams
 - Send individual records right away
 - Songs uploaded by artists
 - Employee table
 - Revenue table
 - New users signing in
 - Another example: online vs. offline listening

Scheduling tools



Summary

- What scheduling is
- Different ways to set it up
- Difference between batches and streams
- How scheduling is implemented at Spotflix
- Airflow, Luigi

Let's practice!

DATA ENGINEERING FOR EVERYONE

Parallel computing

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Parallel computing

- Basis of modern data processing tools
- Necessary:
 - Mainly because of memory
 - Also for processing power
- How it works:
 - Split tasks up into several smaller subtasks
 - Distribute these subtasks over several computers



x 1,000

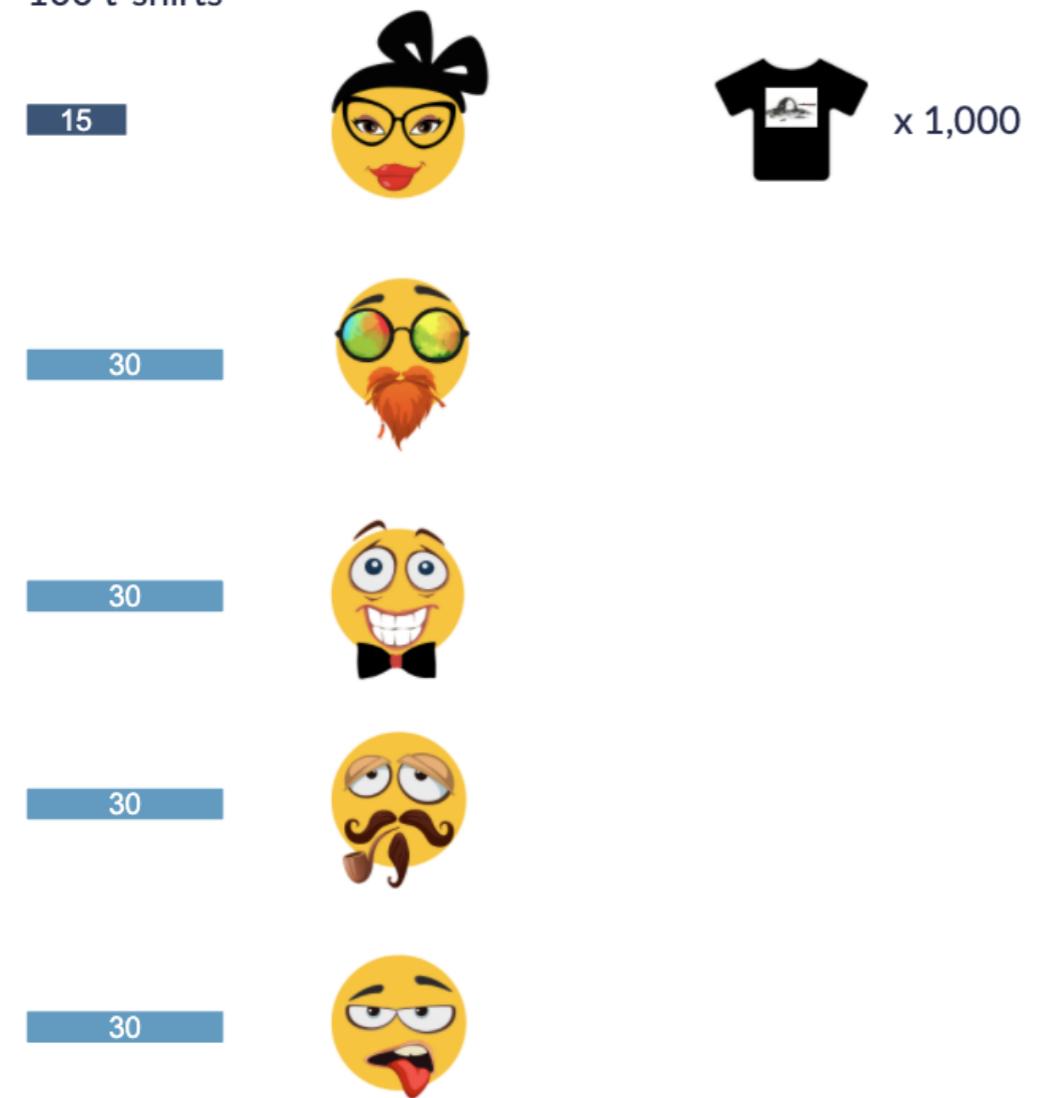
Time for
100 t-shirts

15



x 1,000

Time for
100 t-shirts



¹ Emojis by Mohamed Hassan

Time for
100 t-shirts

15



x 1,000

30



30



30



30



Time for
100 t-shirts

15



x 1,000

30



x 250

30



x 250

30



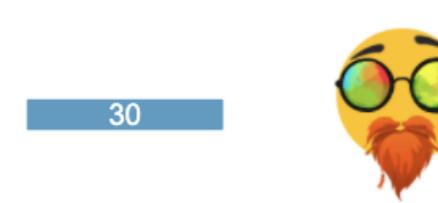
x 250

30

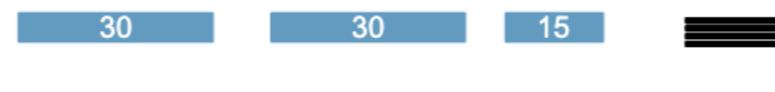
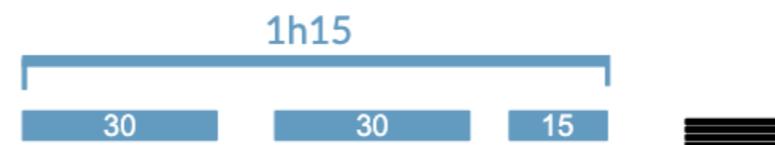


x 250

Time for
100 t-shirts



Time for 1,000 t-shirts



Time for
100 t-shirts



x 1,000

Time for 1,000 t-shirts

2h30

15 15 15 15 15 15 15 15 15



30



x 250

30 30 15



30



x 250

30 30 15



30



x 250

30 30 15



30



x 250

30 30 15



Benefits and risks of parallel computing

- Employees = processing units
- Advantages
 - Extra processing power
 - Reduced memory footprint
- Disadvantages
 - Moving data incurs a cost
 - Communication time

Time for
100 t-shirts



x 1,000

Time for 1,000 t-shirts

2h30

15 15 15 15 15 15 15 15 15



30



x 250

30 30 15



30



x 250

30 30 15



30

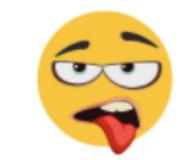


x 250

30 30 15



30

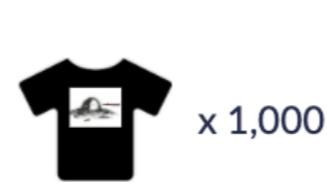


x 250

30 30 15



Time for
100 t-shirts



x 1,000

Time for 1,000 t-shirts

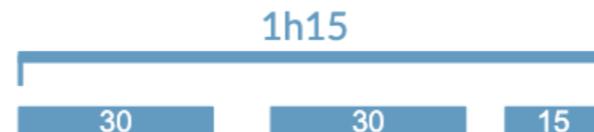
2h30



30



x 250



1h15



30



x 250



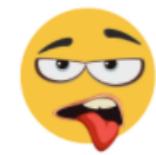
30



x 250



30



x 250



Time for
100 t-shirts



x 1,000

Time for 1,000 t-shirts

2h30



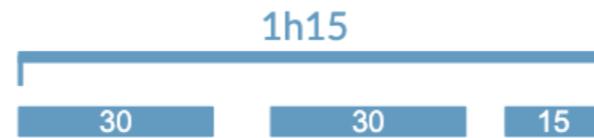
30



0h10



x 250



0h05

30



x 250



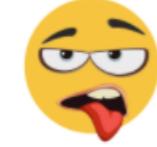
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x 250

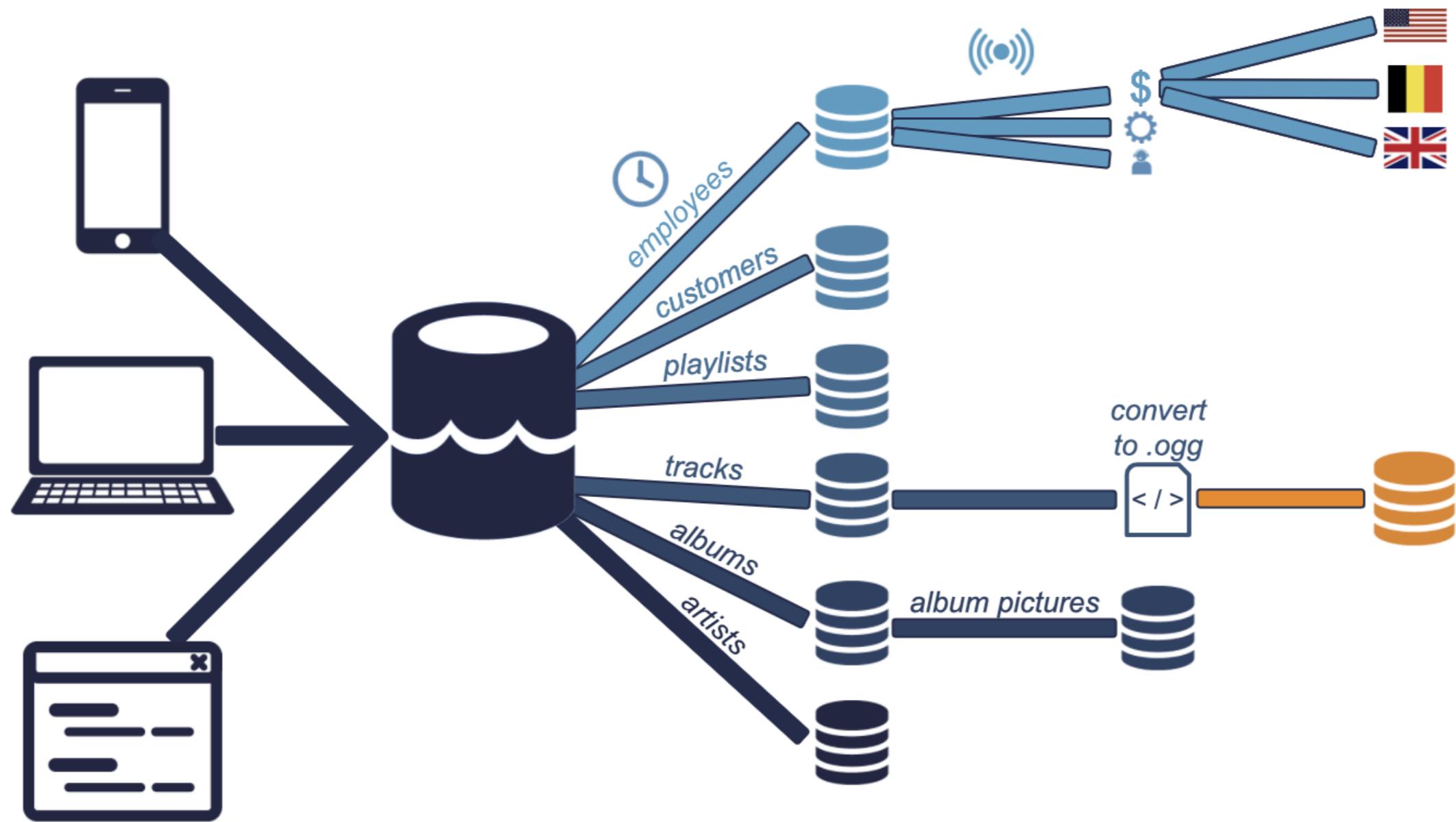


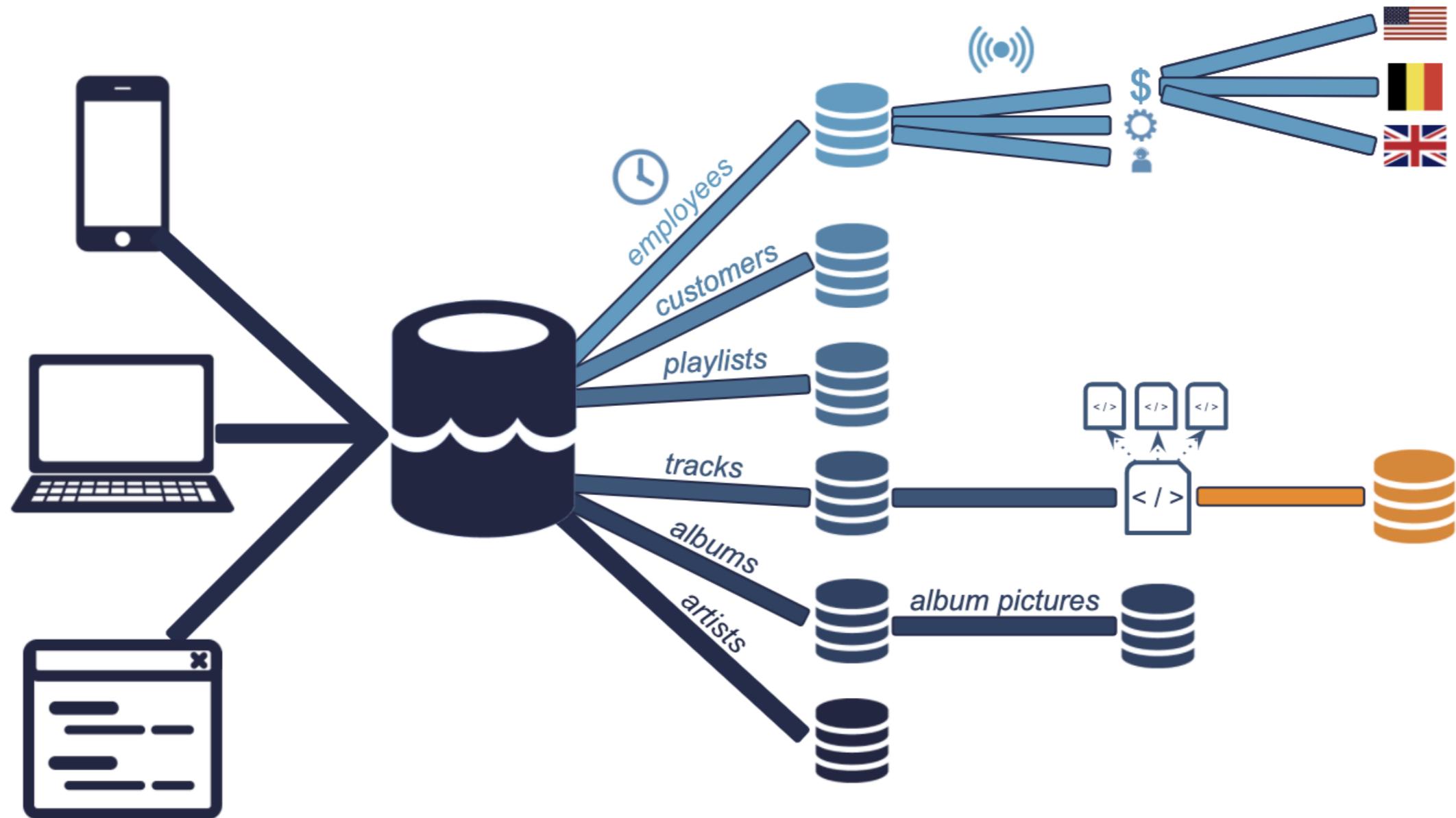
30



x 250







Summary

- Benefits and risks
- How it's implemented at Spotflix

Let's practice!

DATA ENGINEERING FOR EVERYONE

Cloud computing

DATA ENGINEERING FOR EVERYONE



Hadrien Lacroix
Content Developer

Cloud computing for data processing

Servers on premises

- Bought
- Need space
- Electrical and maintenance cost
- Enough power for peak moments
- Processing power unused at quieter times

Servers on the cloud

- Rented
- Don't need space
- Use just the resources we need
- When we need them
- The closer to the user the better

Cloud computing for data storage

- Database reliability: data replication
- Risk with sensitive data



32.4%



32.4%



17.6%



32.4%



17.6%



6%

File storage





File storage

AWS S3





File storage

AWS S3



Azure
Blob Storage





File storage

AWS S3



Azure
Blob Storage



Google
Cloud Storage





File storage

AWS S3



Azure
Blob Storage



Google
Cloud Storage



Computation



File storage

AWS S3



Azure
Blob Storage



Google
Cloud Storage



Computation

AWS EC2





File storage

AWS S3



Azure
Blob Storage



Google
Cloud Storage



Computation

AWS EC2



Azure
Virtual Machines





File storage

AWS S3



Azure
Blob Storage



Google
Cloud Storage



Computation

AWS EC2



Azure
Virtual Machines



Google
Compute Engine





File storage

AWS S3



Azure
Blob Storage



Google
Cloud Storage



Computation

AWS EC2



Azure
Virtual Machines



Google
Compute Engine



Databases



File storage

AWS S3



Azure
Blob Storage



Google
Cloud Storage



Computation

AWS EC2



Azure
Virtual Machines



Google
Compute Engine



Databases

AWS RDS





File storage

AWS S3



Azure
Blob Storage



Google
Cloud Storage



Computation

AWS EC2



Azure
Virtual Machines



Google
Compute Engine



Databases

AWS RDS



Azure
SQL Database





File storage

AWS S3



Azure
Blob Storage



Google
Cloud Storage



Computation

AWS EC2



Azure
Virtual Machines



Google
Compute Engine



Databases

AWS RDS

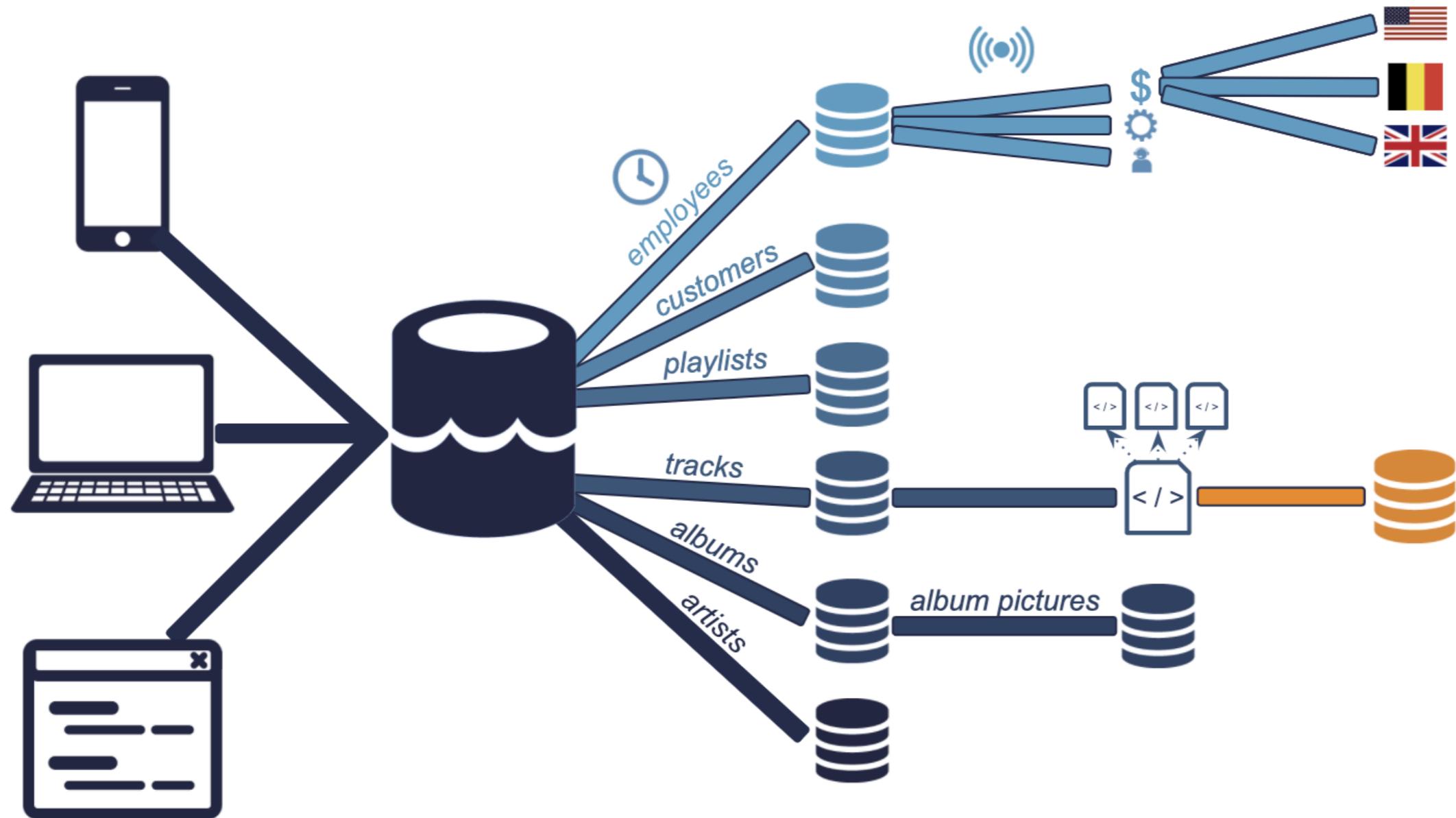


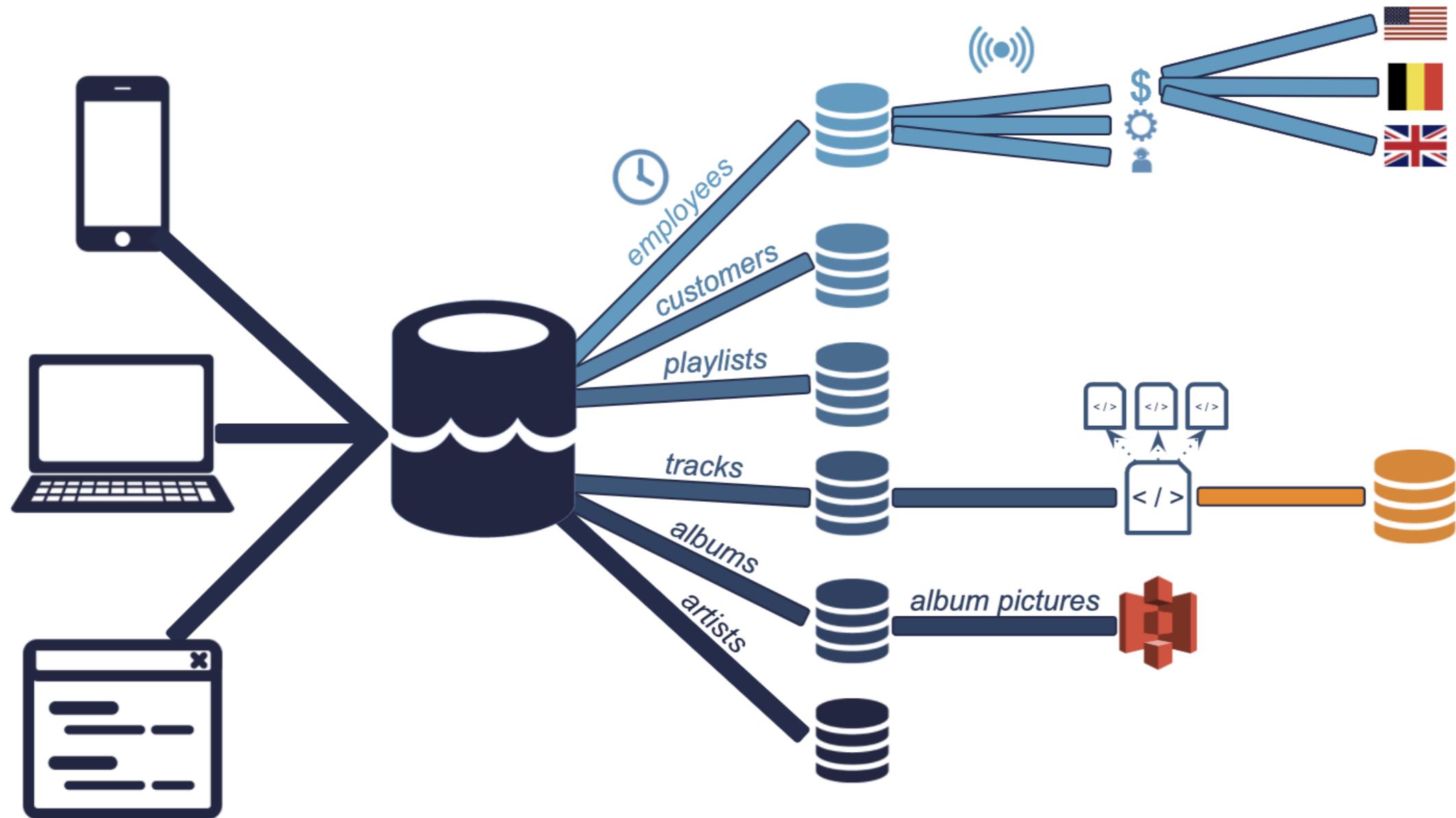
Azure
SQL Database

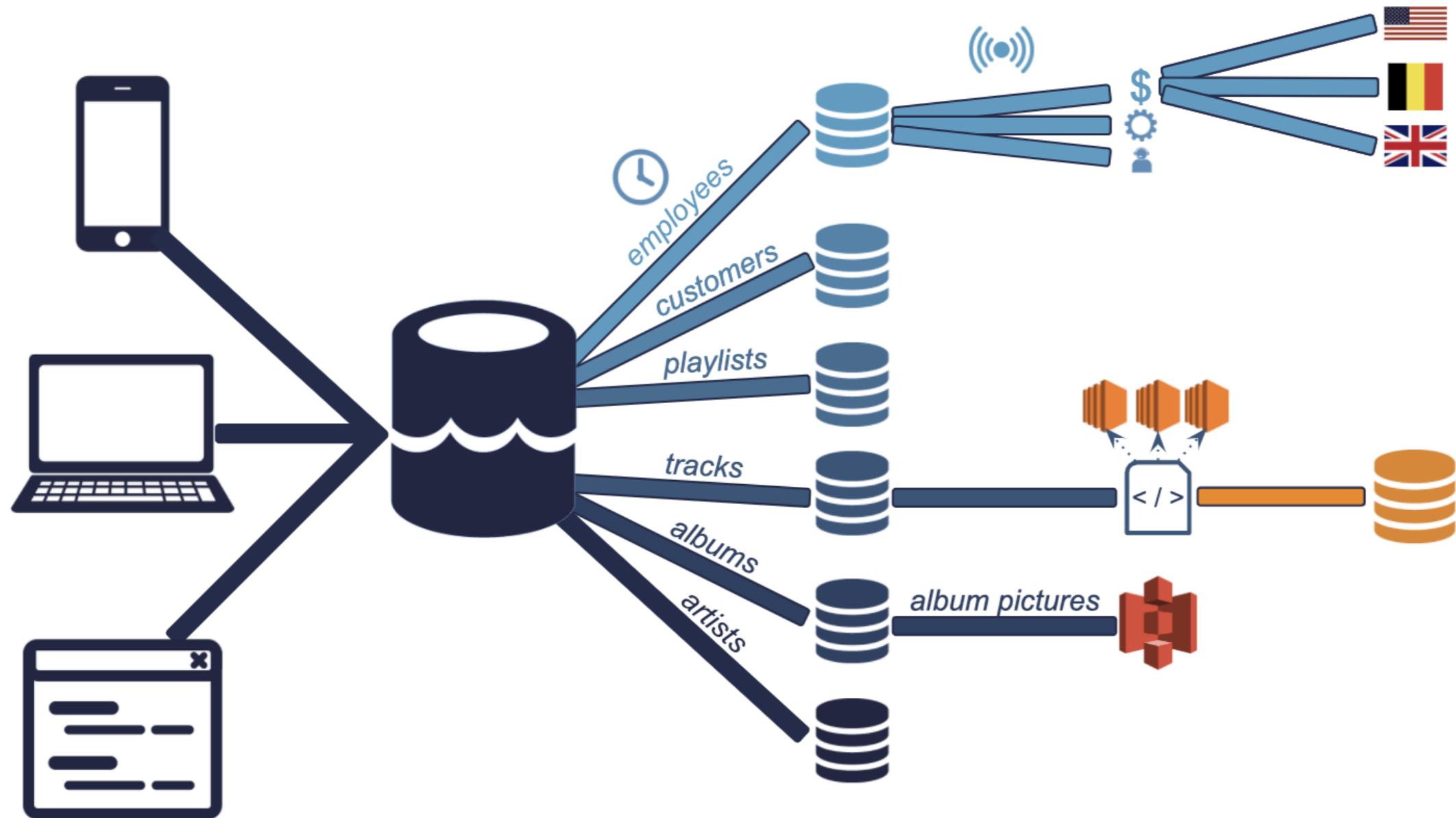


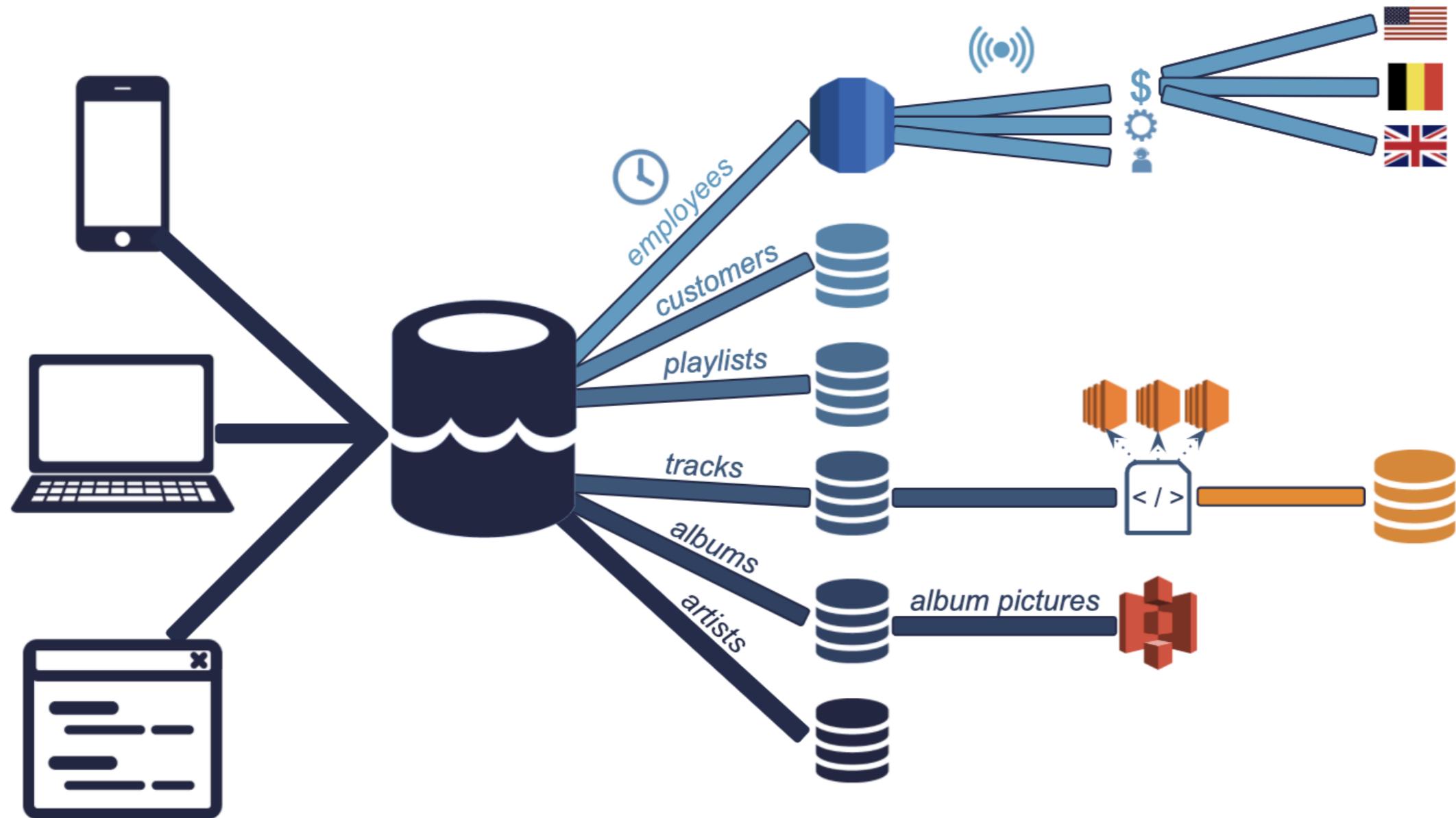
Google
Cloud SQL











Multicloud

Pros

- Reducing reliance on a single vendor
- Cost-efficiencies
- Local laws requiring certain data to be physically present within the country
- Mitigating against disasters

Cons

- Cloud providers try to lock in consumers
- Incompatibility
- Security and governance

Summary

- Benefits and risks of cloud computing
- How it is implemented at Spotflix
- Can cite the main cloud providers and their services

Let's practice!

DATA ENGINEERING FOR EVERYONE

We are the champions

DATA ENGINEERING FOR EVERYONE



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Actually, YOU are the champion!



What you learned - chapter 1

- What Data Engineering is
- How important it is
- How data engineers differ from data scientists
- What a data pipeline is and how it works

What you learned - chapter 2

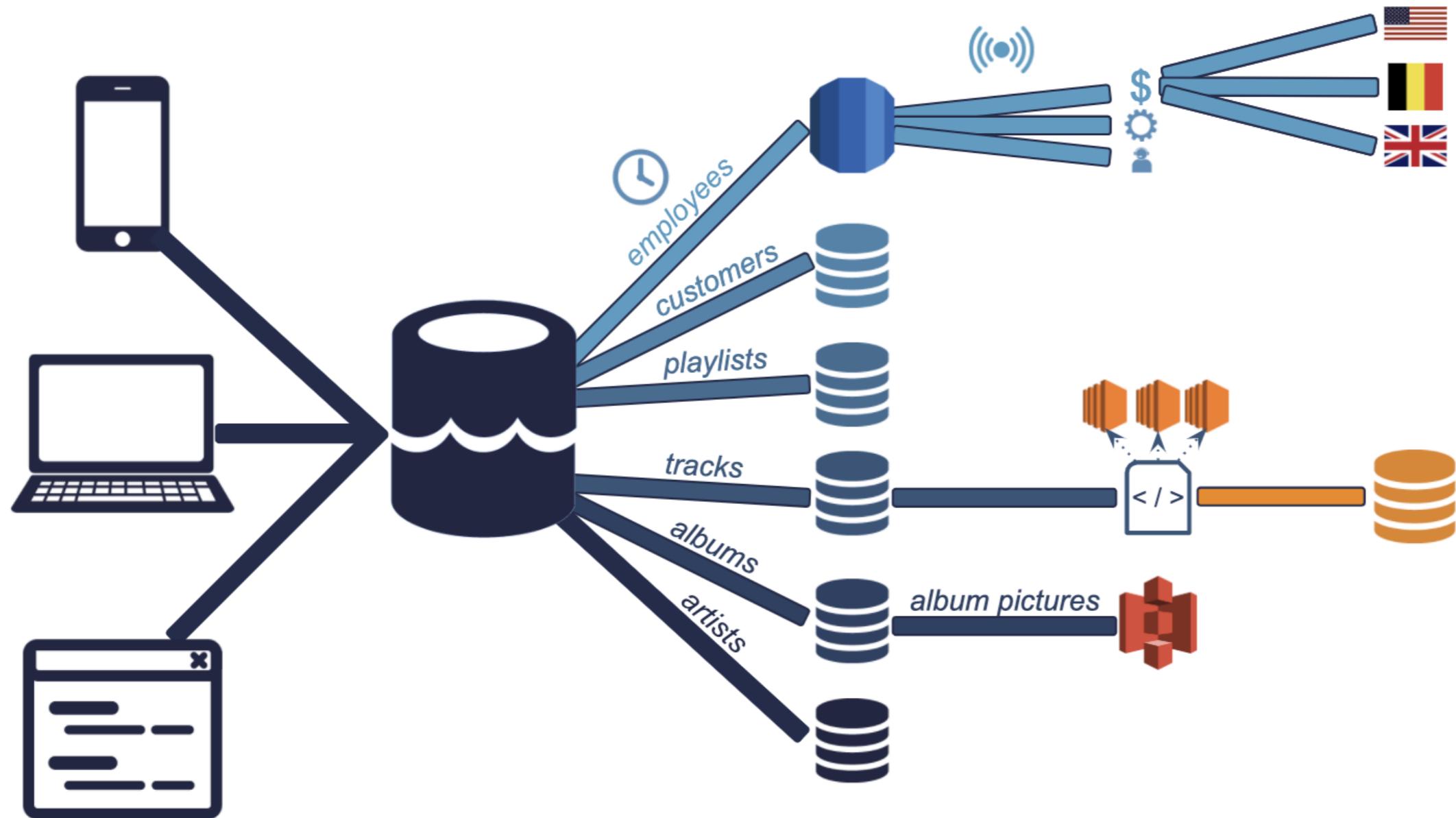
- The different structures data can take
- How fundamental SQL is
- The differences between data lakes, data warehouses and databases

What you learned - chapter 3

- How data is processed
- How scheduling holds it all together
- Parallel computing
- Cloud computing

And some more

- What SQL code actually looks like
- Main tools and technologies used in data engineering
- And some more



Data Engineering for Everyone - Lexicon

Data Engineering for Everyone - Lexicon

- **Airflow**: an open-source workflow management platform used to schedule data engineering tasks.
Started at Airbnb, now maintained by the Apache foundation.
- **AWS**: Amazon Web Services. Amazon's cloud computing services.
- **Azure**: Microsoft's cloud services.
- **Big data**: the systematic storage, management and analysis of datasets that are too large or complex to be dealt with by traditional data-processing application software. Big Data revolves around 4 Vs: volume, variety, velocity, and veracity.
- **Cloud computing**: the use of a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer.

A promise is a promise, DataChamps!

- All the exercises are song titles
- Search for "DataChamps" on Spotify

Congratulations!

DATA ENGINEERING FOR EVERYONE