

Introdução à Banco de dados

Trilha de Banco de Dados Relacional

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Mestre em modelagem computacional | Cientista de dados

@in/juliana-mascarenhas-ds/



<https://github.com/julianazanelatto>

Juliana Mascarenhas

Tech Education Specialist

@SimplificandoRedes

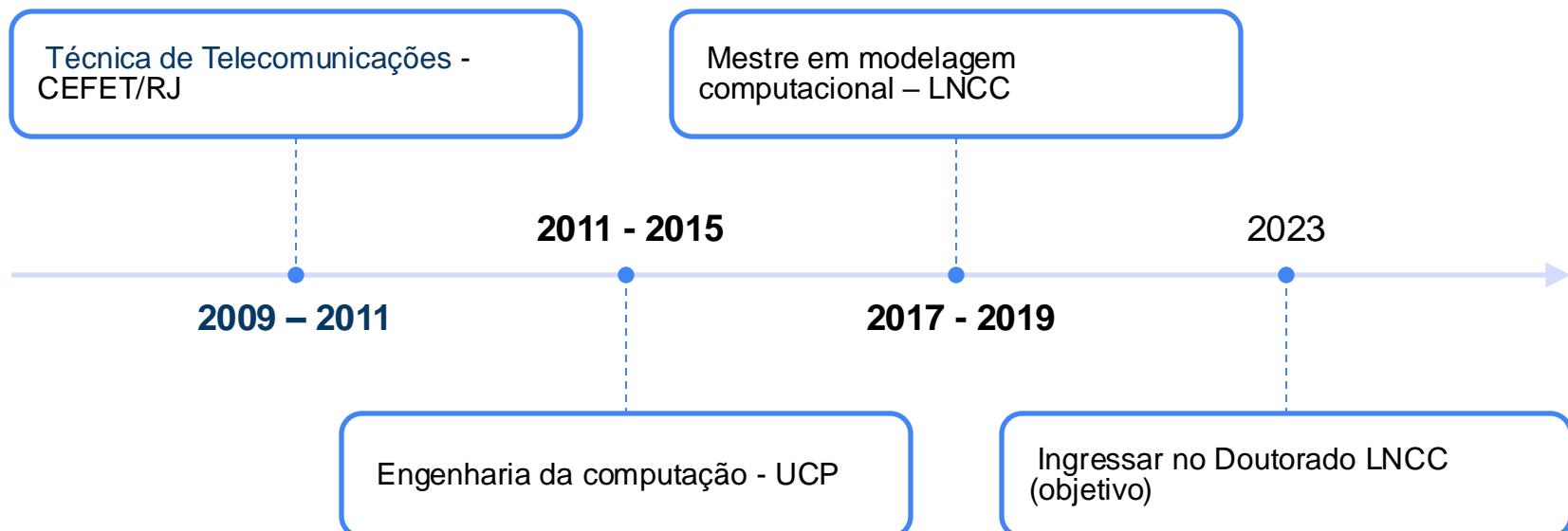
@SimplificandoProgramação

Cientista de dados

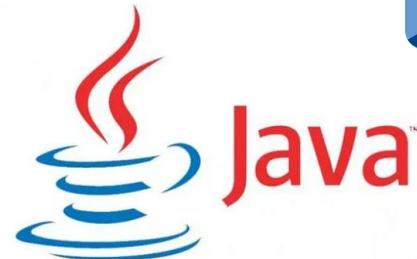
Desenvolvedora Java/Python

Me Modelagem Computacional - LNCC

Sobre Mim



Sobre Mim



PostgreSQL



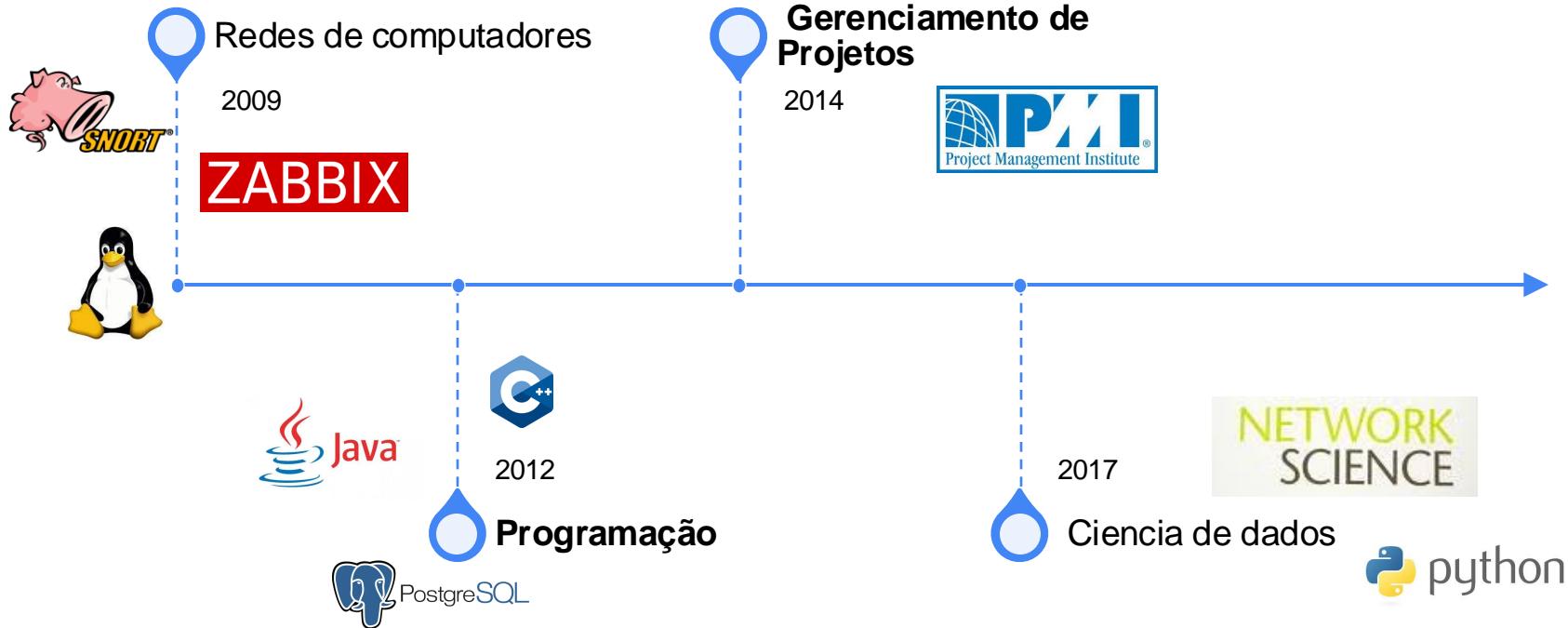
APACHE



ZABBIX



Sobre Mim



Cursos

Conhecendo os principais protocolos de comunicação da internet

HTTP | Web socket

Juliana Mascarenhas

Tech Education Specialist / Sócia - criadora de conteúdo no @Simplificandoredes e @SimplificandoProgramação

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Introdução à Programação e Pensamento Computacional

Curso base para iniciante

Juliana Mascarenhas

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Criando um Microserviço de Upload de Imagens com o Amazon S3

Juliana Mascarenhas
Me. Modelagem Computacional



Criando uma API REST conectada a Amazon RDS com Java

Juliana Mascarenhas
Me. Modelagem Computacional



Java Spring com RabbitMQ

Juliana Mascarenhas
Mestre em modelagem computacional

Objetivo Geral

Objetivo deste módulo é apresentar o mundo da modelagem de dados voltado para um sistema de banco de dados. Dessa forma, o dev irá dar seu primeiro mergulho no mundo de Banco de dados obtendo uma visão geral sobre o assunto.

Objetivo Geral



Contextualização

Histórico
O que são BDs ?
Era dos dados



Introdução à Modelagem de Dados

Modelagem e SQL
Instalando e Configurando seu SGBD



Características principais
StakeHolders
Vantagens e quando não usar?

Explorando SGBDs



Modelos, Esquemas, linguagens, ambientes

Arquitetura de SGBDs

Etapa 1

Contextualizando – O que são banco de dados?

// Introdução à Banco de dados

Conversa

Cenário de dados

Contextualizando

SGBDs

Sistemas de Gerenciamento de BDs

O que são Banco de dados?

Contextualizando



Contextualizando

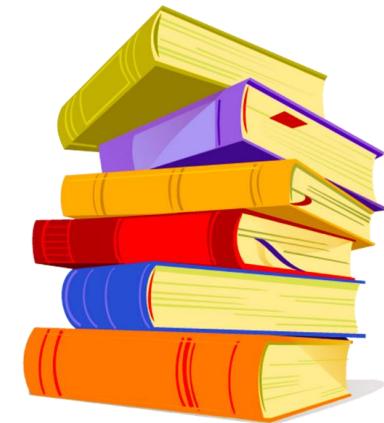


Contextualizando



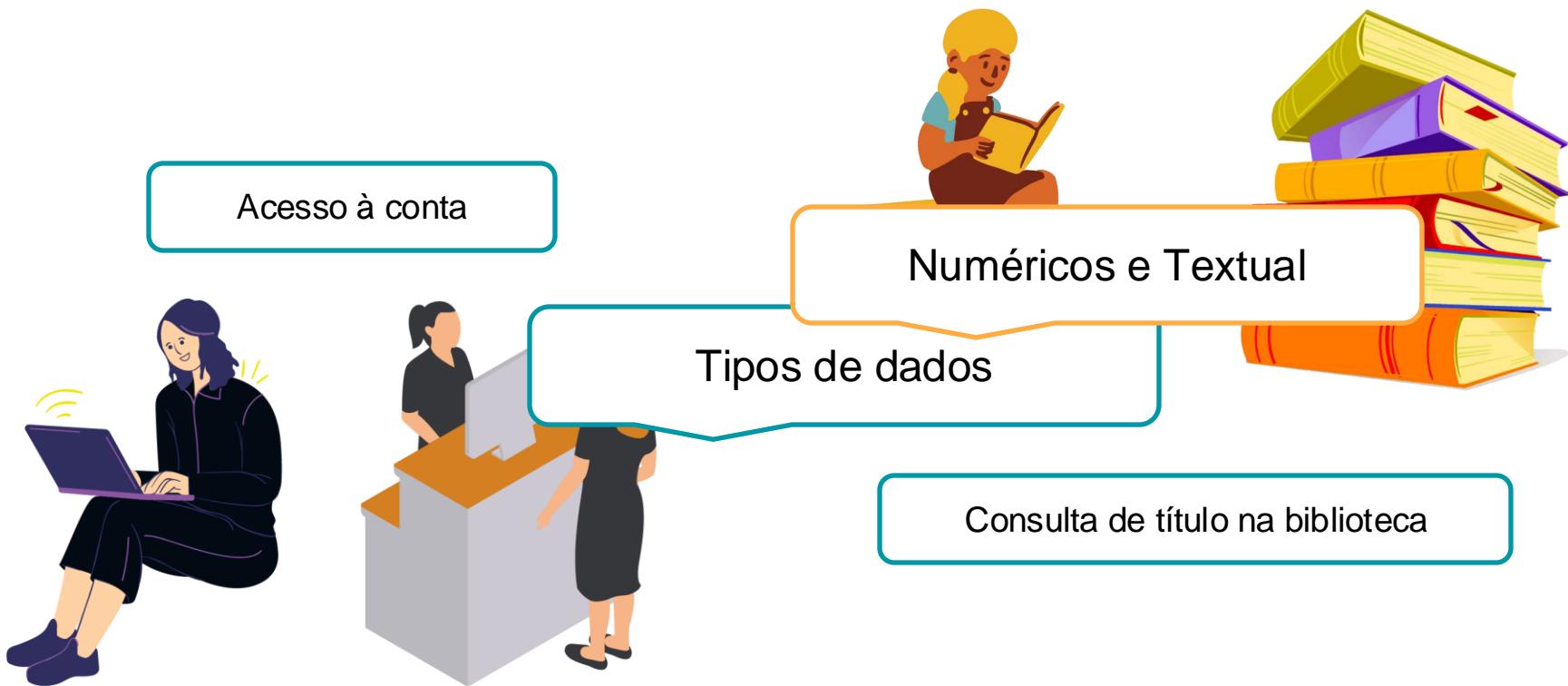
Contextualizando

Acesso à conta

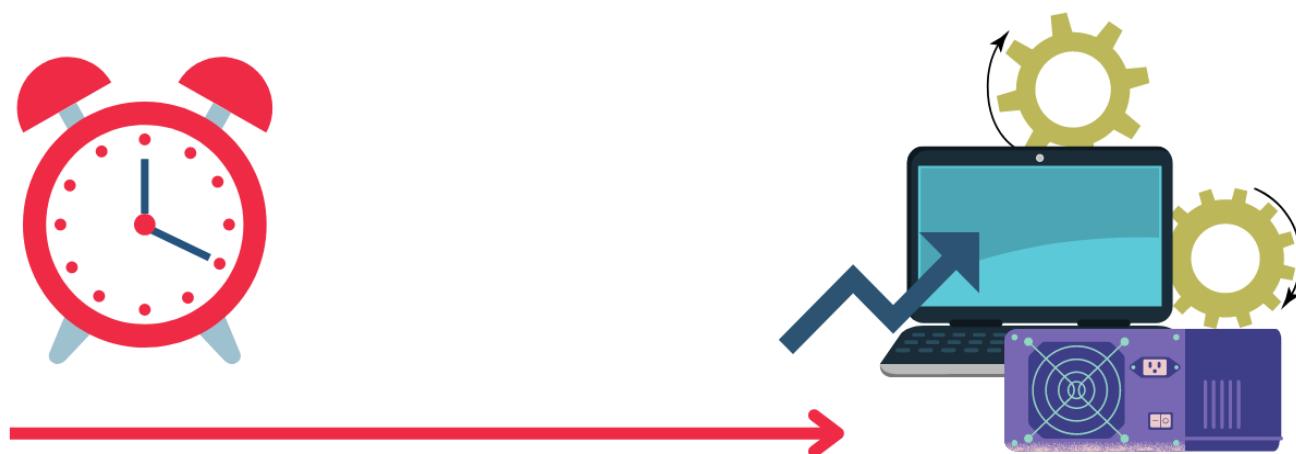


Consulta de título na biblioteca

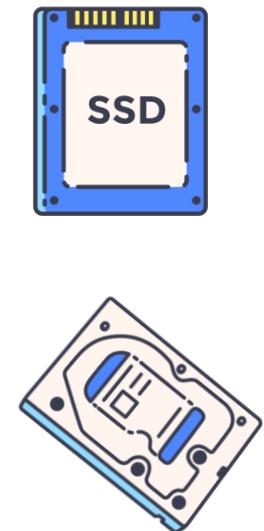
Contextualizando



Contextualizando



Contextualizando



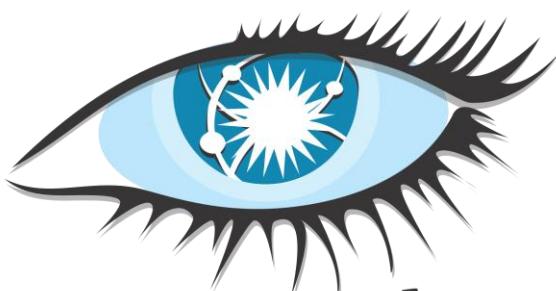
Contextualizando



Contextualizando



Contextualizando



cassandra



redis

O que são banco de dados?



O que são Banco de Dados?

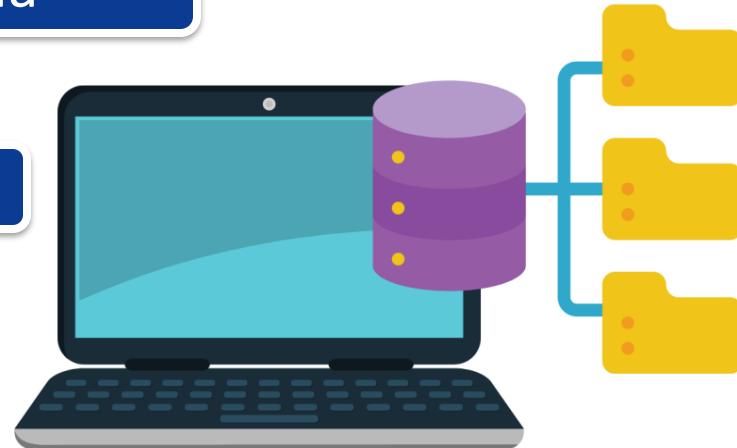
Negócios

E-commerce

Engenharia

Medicina

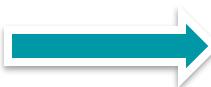
Social Media



O que são Banco de Dados?

Formalmente:

- Dados relacionados



Database



Fatos

O que são Banco de Dados?

CADASTRO

Nome
Telefone
Email
Whats app



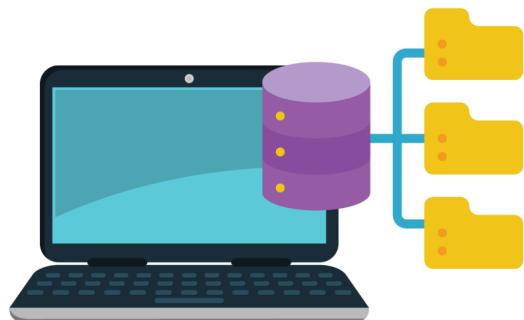
Significado

O que são Banco de Dados?

Podemos considerar uma coleção de palavras, que dentre elas há relacionamentos entre dados, constituindo então um banco de dados.

Definição geral

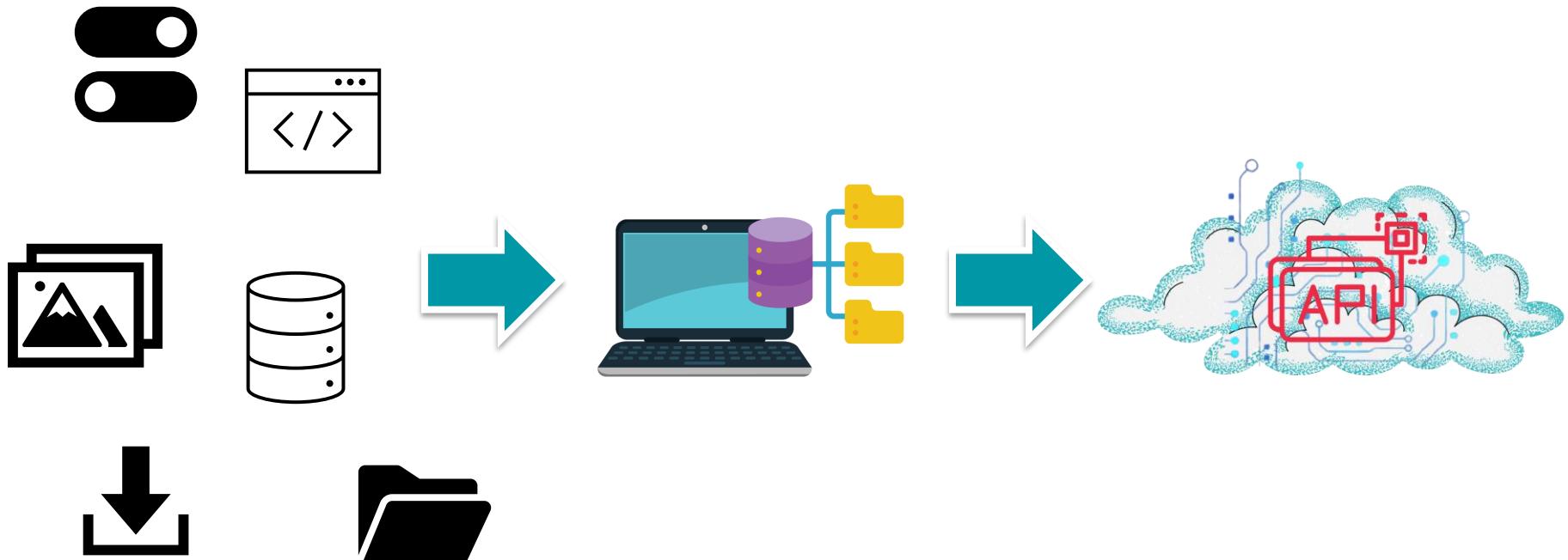
O que são Banco de Dados?



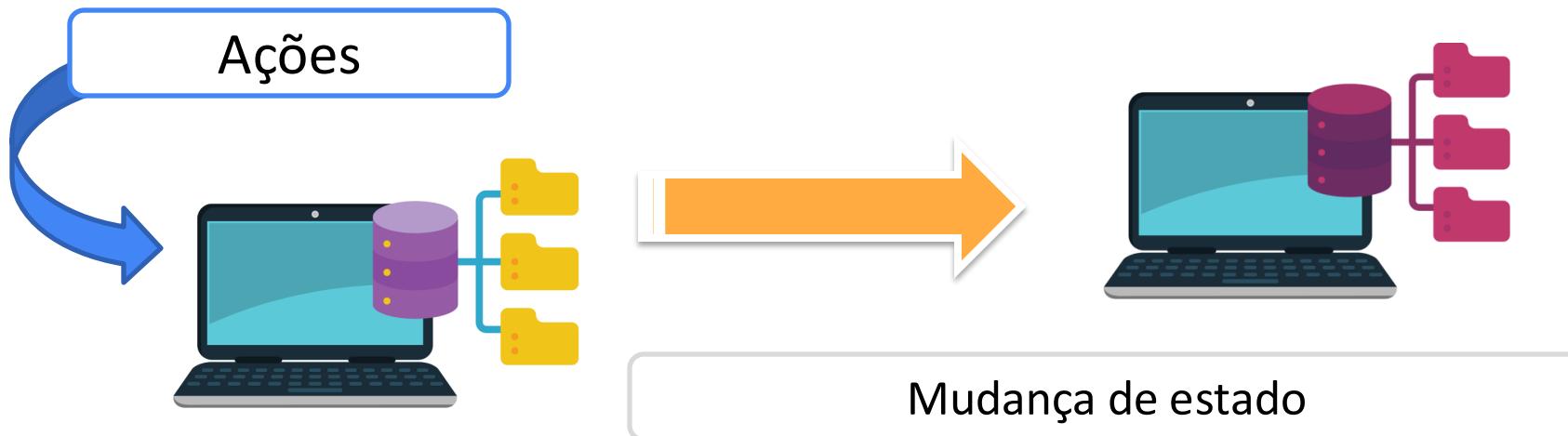
- Contexto - representação do mundo real;
- Coerência;
- Propósito

Uso + restrito

O que são Banco de Dados?



O que são Banco de Dados?

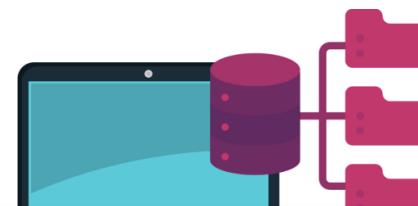
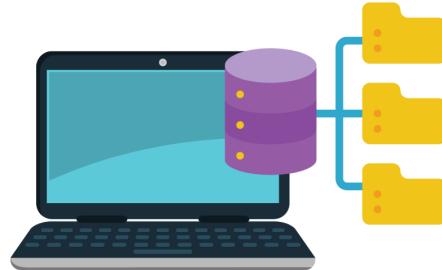


O que são Banco de Dados?

Confiável

Acurado

Ações



Reflexo "imediato"

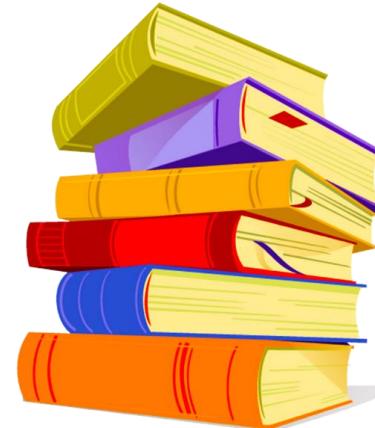
Mudança de estado

O que são Banco de Dados?

Tamanho?



Centenas



Bilhões



O que são Banco de Dados?



friends

Complexidade



Manutenção do modelo e estado do bd

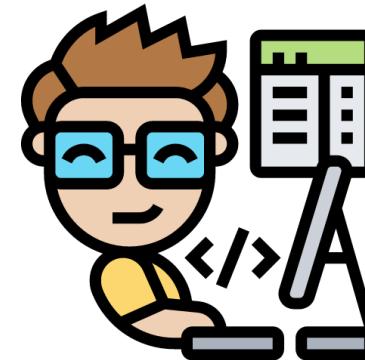
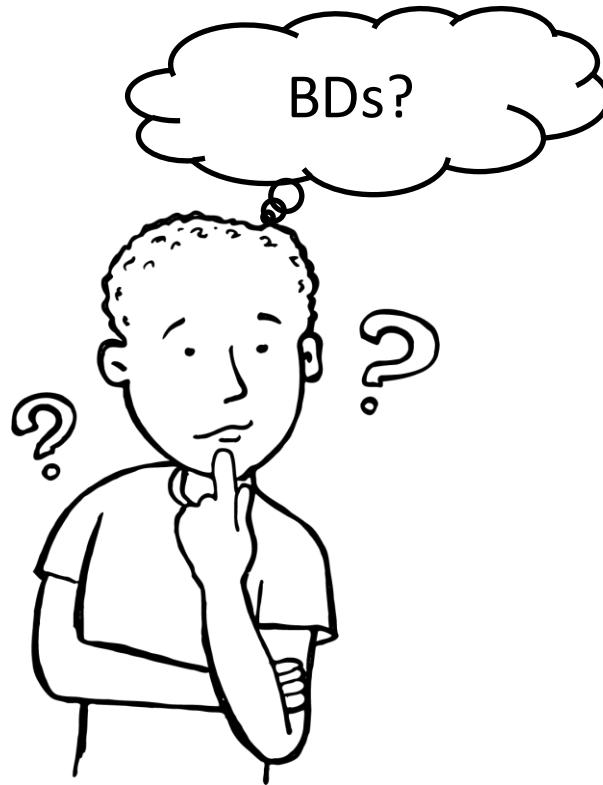
O que são Banco de Dados?



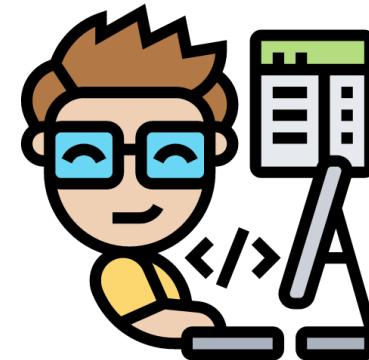
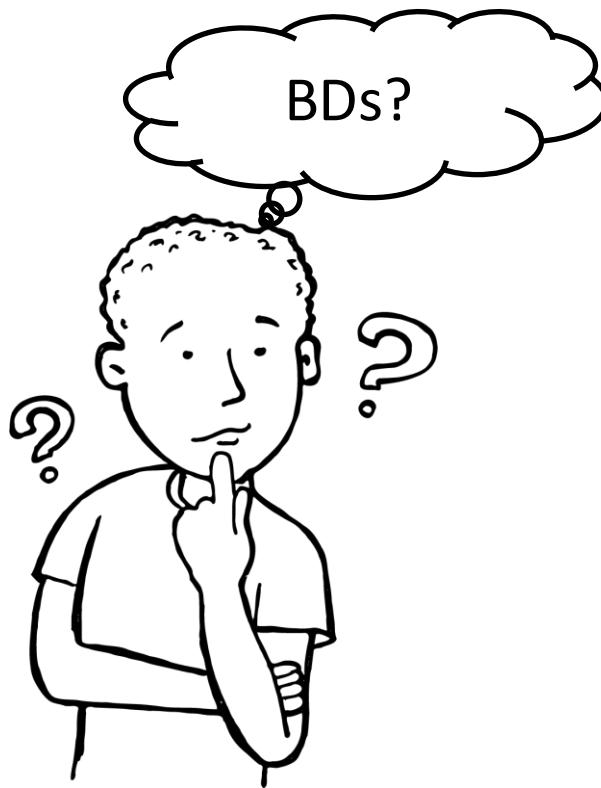
amazon

- 60 milhões de users
- 42 Terabytes
- SGBD distribuído

O que são Banco de Dados?



O que são Banco de Dados?



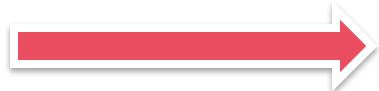
Manualmente

SGBDs - Sistemas de Gerenciamento de Banco de Dados



SGBDs

- Definição
- Construção
- Manipulação
- Compartilhamento



Tipo de dados

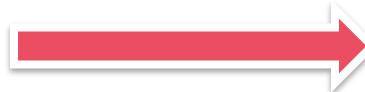
Estrutura

Constrains

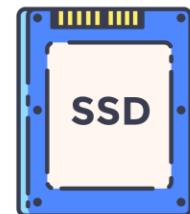
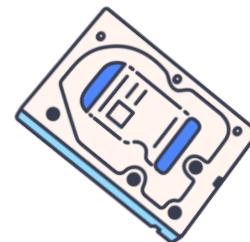
Software de propósito geral

SGBDs

- Definição
- Construção
- Manipulação
- Compartilhamento



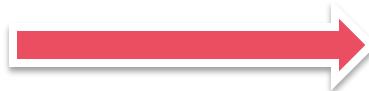
Inserção de dados



Software de propósito geral

SGBDs

- Definição
- Construção
- Manipulação
- Compartilhamento



Recuperação

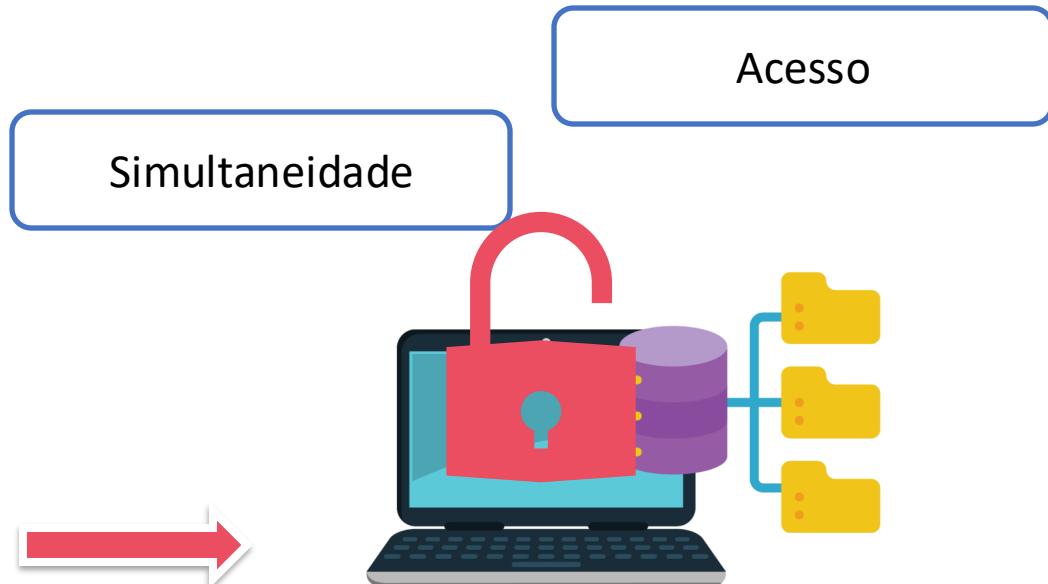
Relatórios



Software de propósito geral

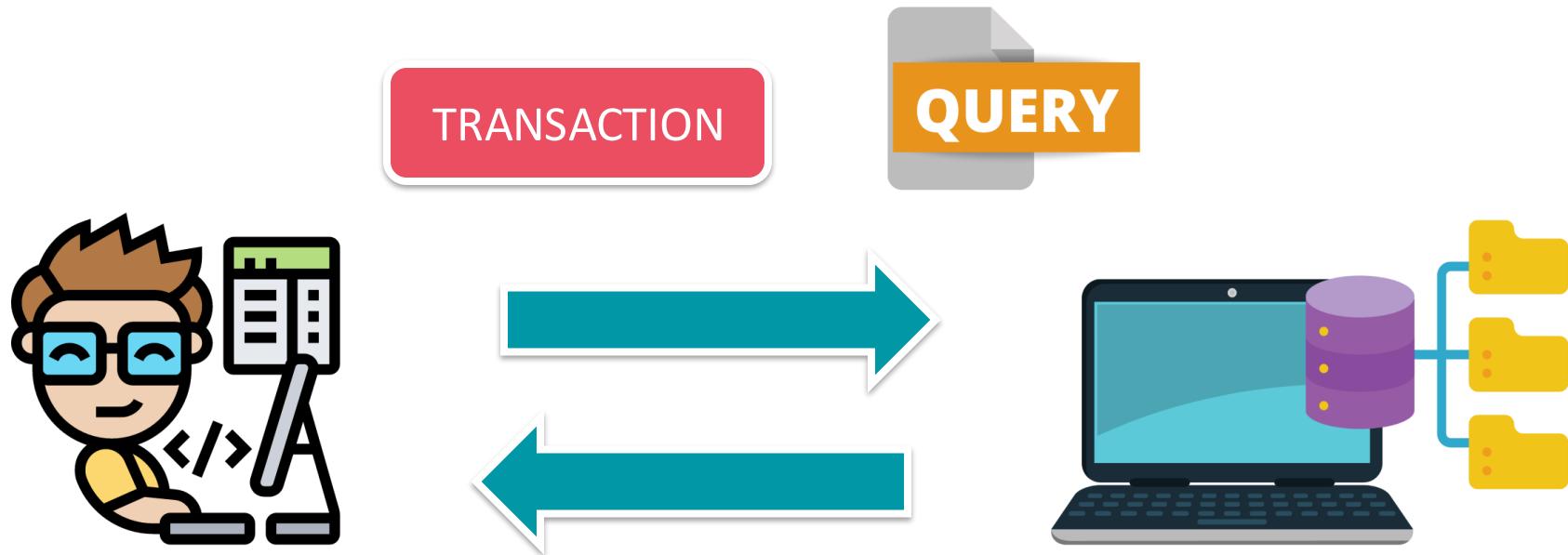
SGBDs

- Definição
- Construção
- Manipulação
- Compartilhamento



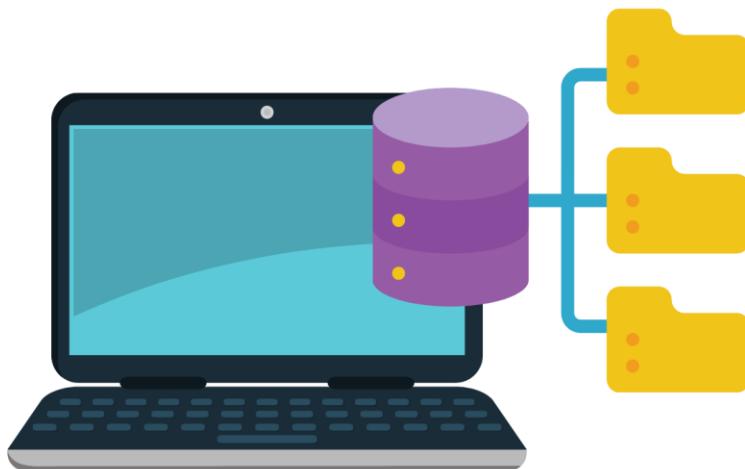
Software de propósito geral

SGBDs



Retorno: dados

SGBDs



Além disso ...

Acesso

Mal funcionamento

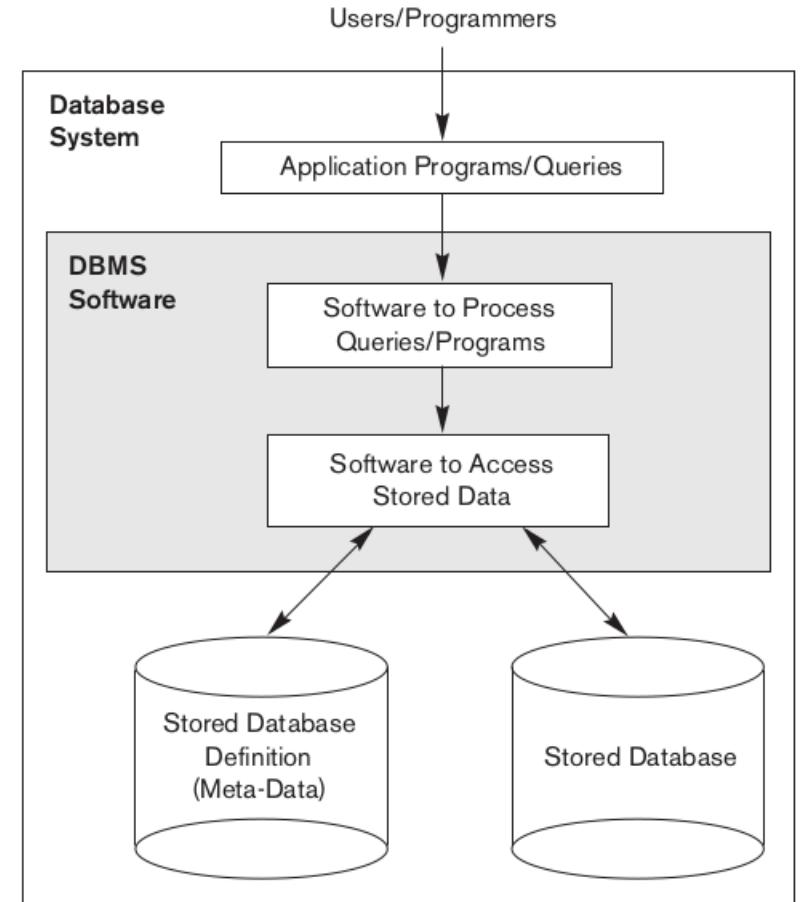
Proteção

Ciclo de vida de longo prazo

SGBDs - Exemplo

Contexto: Universidade

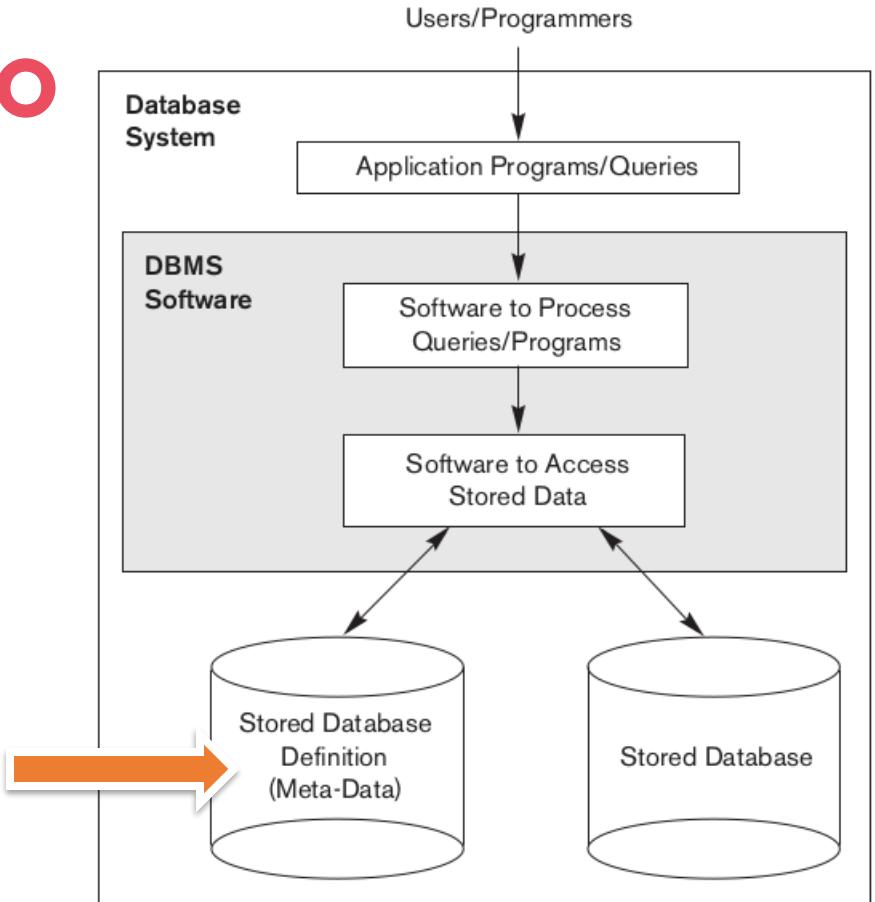
- Nome completo
- Matrícula
- Endereço
- Campus
- Curso
- Telefone
- Email
- ...



SGBDs - Exemplo

Definição

- Estudantes
- Cursos
- Seção
- Pré-requisitos
- Report da grade



SGBDs - Exemplo

Definição

- Estudantes
- Cursos
- Seção
- Pré-requisitos
- Report da grade

COURSE

| Course_name | Course_number | Credit_hours | Department |
|---------------------------|---------------|--------------|------------|
| Intro to Computer Science | CS1310 | 4 | CS |
| Data Structures | CS3320 | 4 | CS |
| Discrete Mathematics | MATH2410 | 3 | MATH |
| Database | CS3380 | 3 | CS |

STUDENT

| Name | Student_number | Class | Major |
|-------|----------------|-------|-------|
| Smith | 17 | 1 | CS |
| Brown | 8 | 2 | CS |

SECTION

| Section_identifier | Course_number | Semester | Year | Instructor |
|--------------------|---------------|----------|------|------------|
| 85 | MATH2410 | Fall | 07 | King |
| 92 | CS1310 | Fall | 07 | Anderson |
| 102 | CS3320 | Spring | 08 | Knuth |
| 112 | MATH2410 | Fall | 08 | Chang |
| 119 | CS1310 | Fall | 08 | Anderson |
| 135 | CS3380 | Fall | 08 | Stone |

GRADE_REPORT

| Student_number | Section_identifier | Grade |
|----------------|--------------------|-------|
| 17 | 112 | B |
| 17 | 119 | C |
| 8 | 85 | A |
| 8 | 92 | A |
| 8 | 102 | B |
| 8 | 135 | A |

PREREQUISITE

| Course_number | Prerequisite_number |
|---------------|---------------------|
| CS3380 | CS3320 |
| CS3380 | MATH2410 |
| CS3320 | CS1310 |

SGBDs - Exemplo

Definição

- Estudantes
- Cursos
- Seção
- Pré-requisitos
- Report da grade

Tipos de dado

COURSE

| Course_name | Course_number | Credit_hours | Department |
|---------------------------|---------------|--------------|------------|
| Intro to Computer Science | CS1310 | 4 | CS |
| Data Structures | CS3320 | 4 | CS |
| Discrete Mathematics | MATH2410 | 3 | MATH |
| Database | CS3380 | 3 | CS |

STUDENT

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SECTION

| Section_identifier | Course_number | Semester | Year | Instructor |
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| 85 | MATH2410 | Fall | 07 | King |
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| 102 | CS3320 | Spring | 08 | Knuth |
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| 135 | CS3380 | Fall | 08 | Stone |

GRADE_REPORT

| Student_number | Section_identifier | Grade |
|----------------|--------------------|-------|
| 17 | 112 | B |
| 17 | 119 | C |
| 8 | 85 | A |
| 8 | 92 | A |
| 8 | 102 | B |
| 8 | 135 | A |

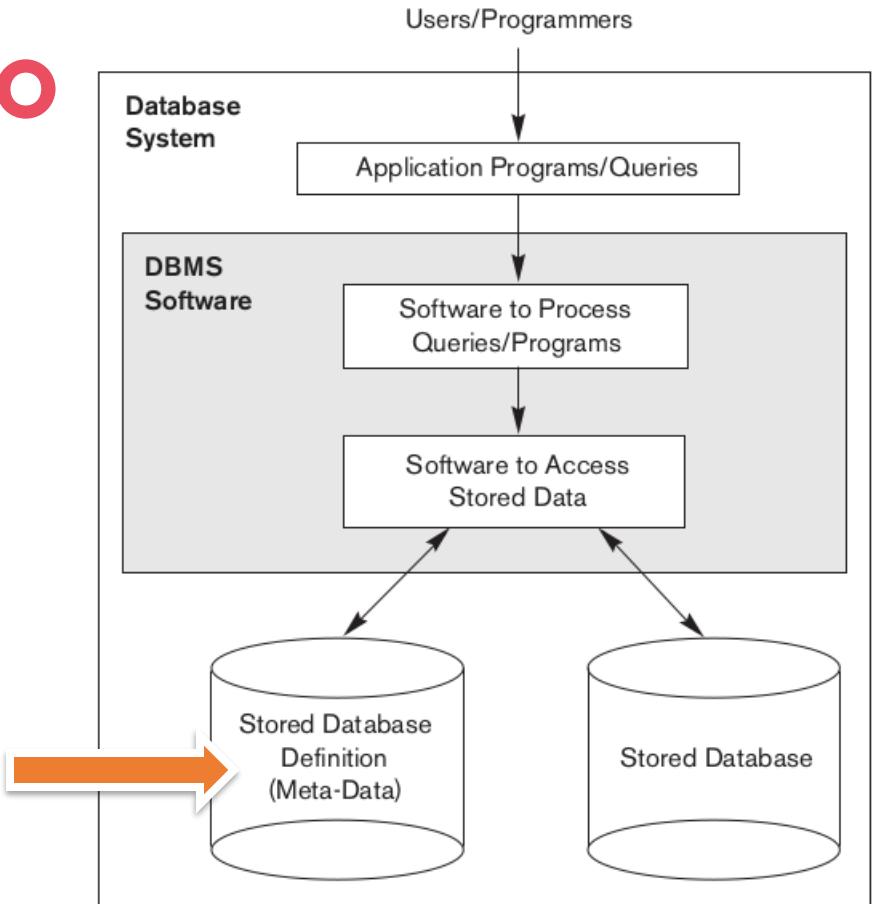
PREREQUISITE

| Course_number | Prerequisite_number |
|---------------|---------------------|
| CS3380 | CS3320 |
| CS3380 | MATH2410 |
| CS3320 | CS1310 |

SGBDs - Exemplo

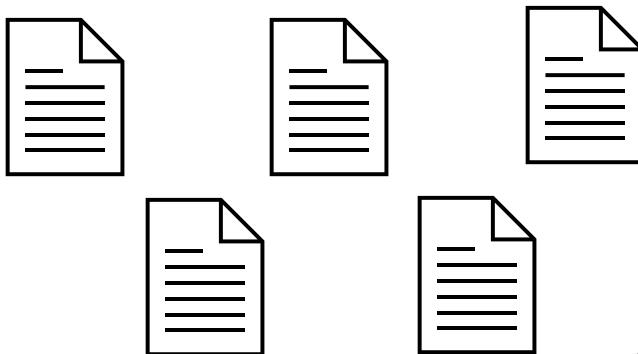
Metadados

Informações que fornecem uma descrição concisa dos dados contidos no BD

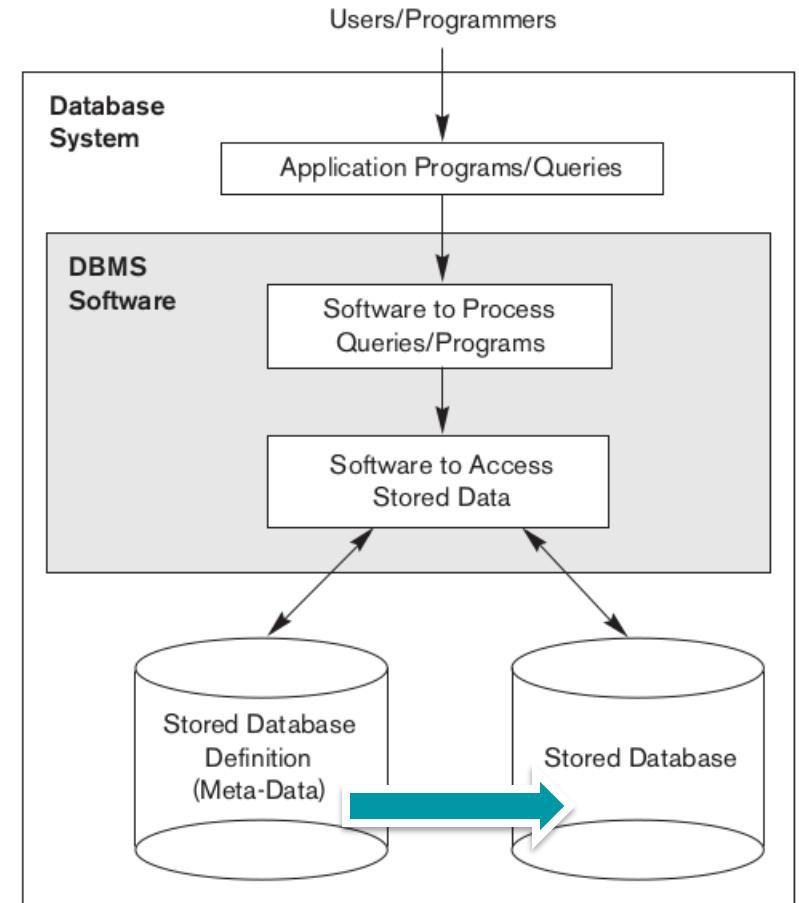


SGBDs - Exemplo

Construção



Arquivos

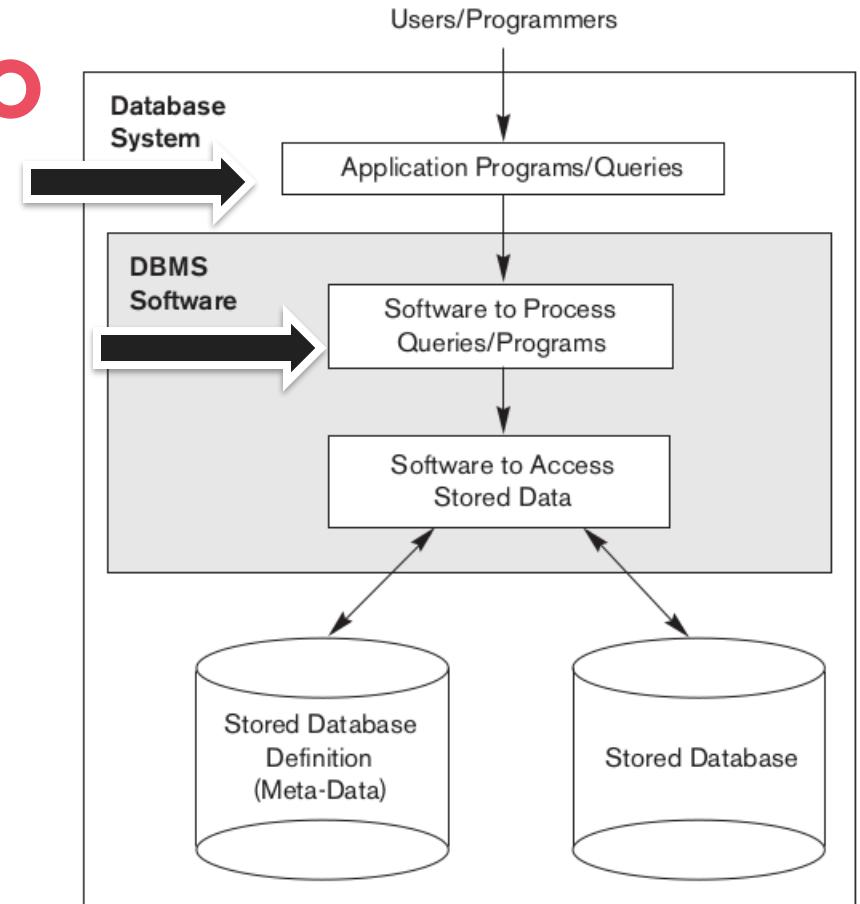


SGBDs - Exemplo

Manipulação

QUERY

Updates

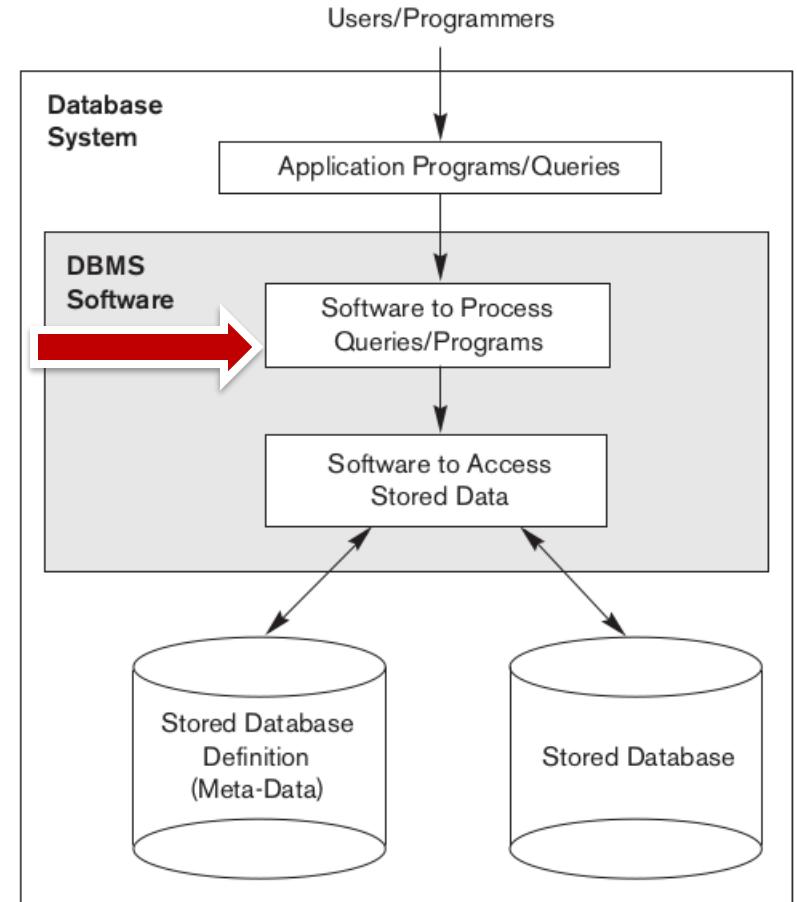


SGBDs - Exemplo

Compartilhamento

Por padrão o BD realiza o bloqueio e a liberação das tabelas

Transações



Etapa 2

Contextualizando – breve histórico e conceitos

// Introdução à Banco e dados

Conversa

Breve histórico

Como surgiu?

Mercado

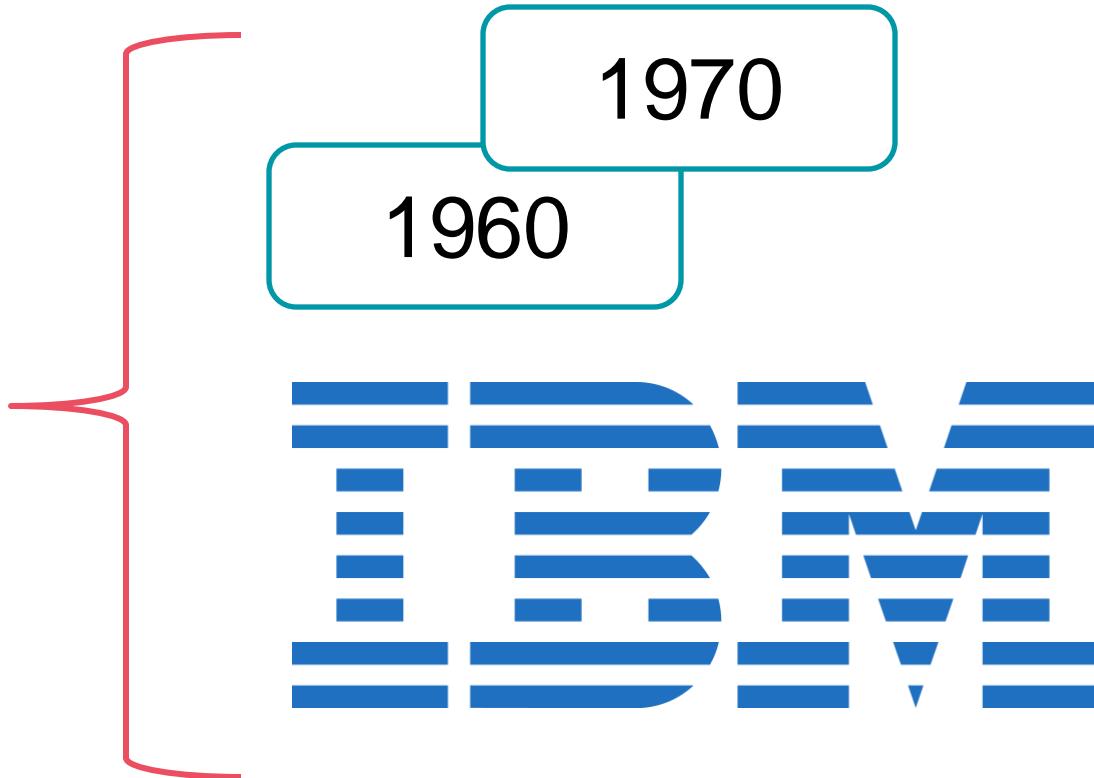
Sistemas de Gerenciamento de BDs mais utilizados

Visão geral de características e propriedades

Modelo de BD Relacional

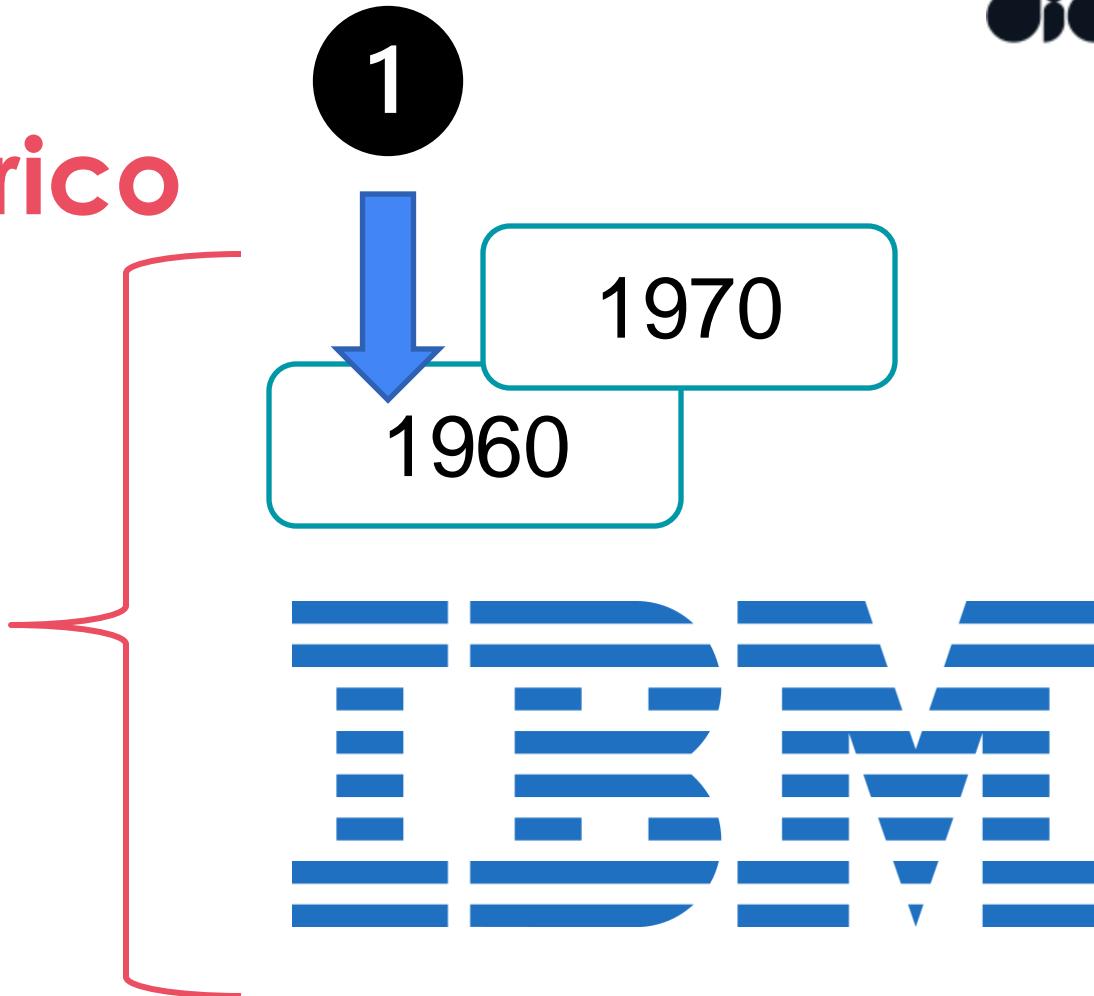
Breve Histórico

Modelo Relacional
de BDs

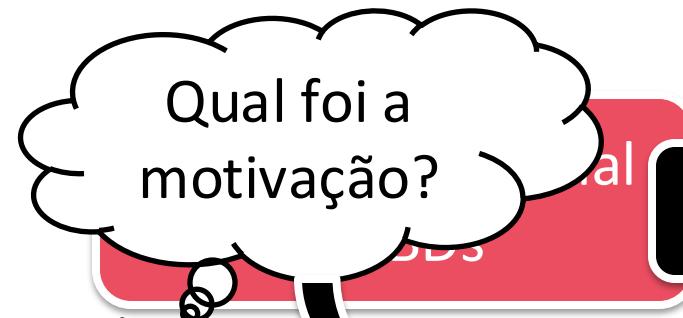


Breve Histórico

Modelo Relacional
de BDs



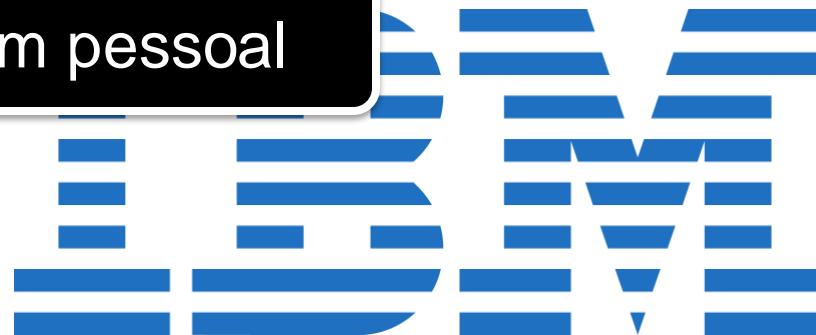
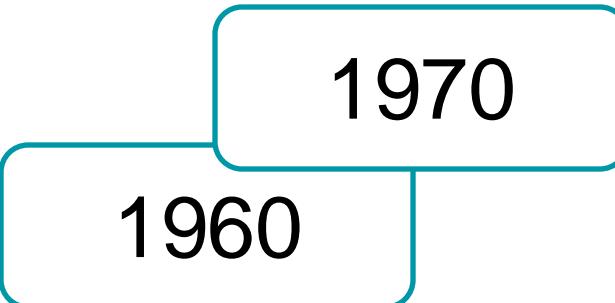
Breve Histórico



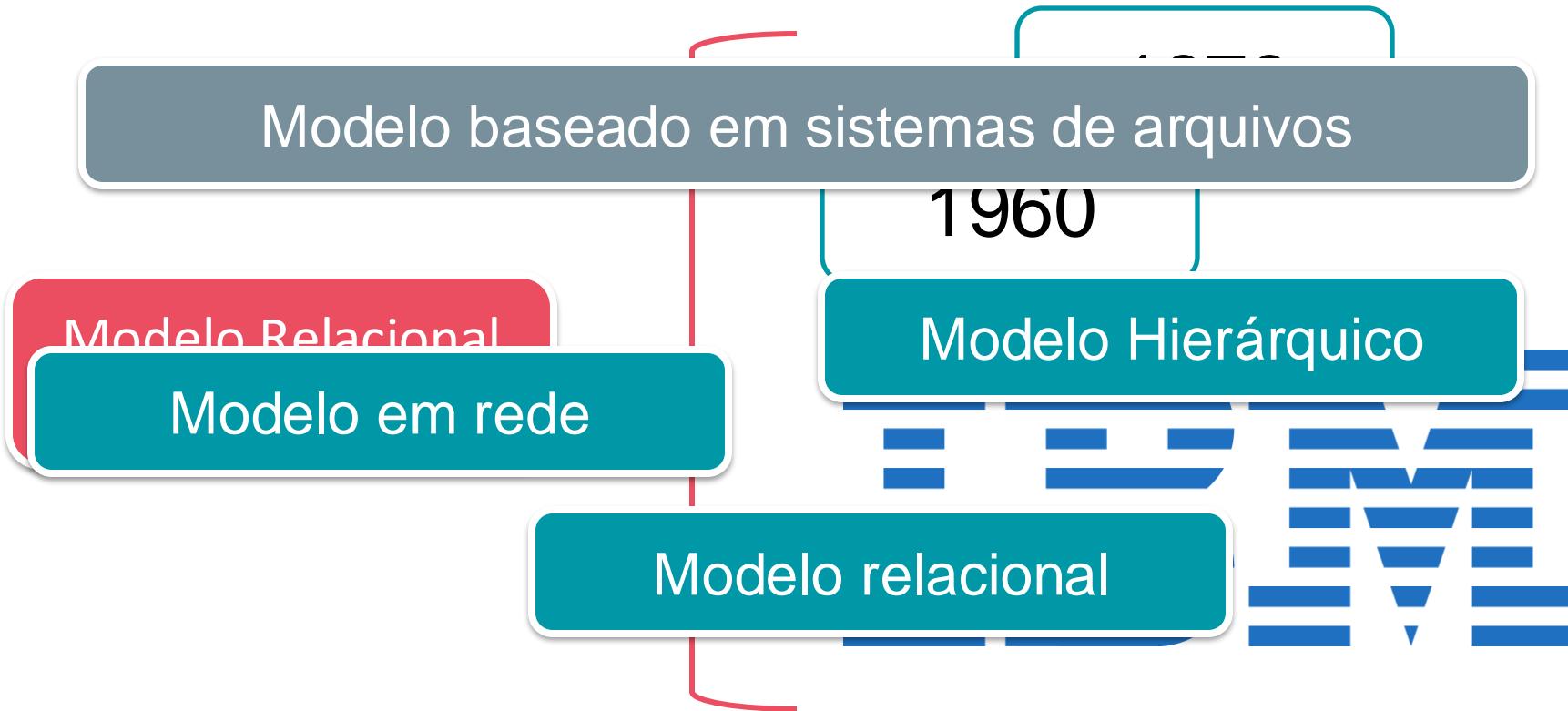
Custo com pessoal

1960

1970

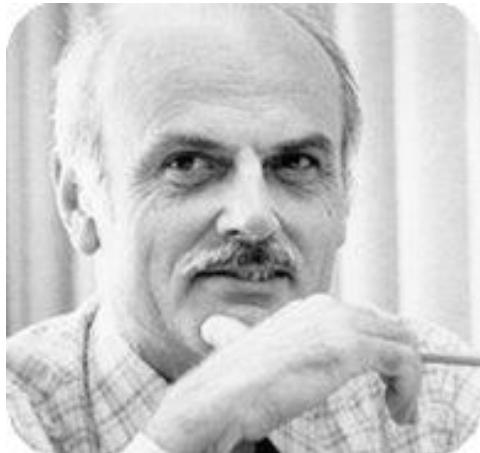


Breve Histórico



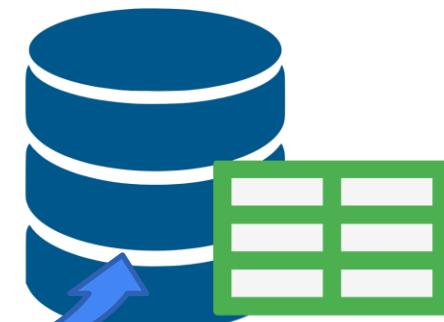
Breve Histórico

Cálculo e Álgebra Relacional



Criador: Ted Codd

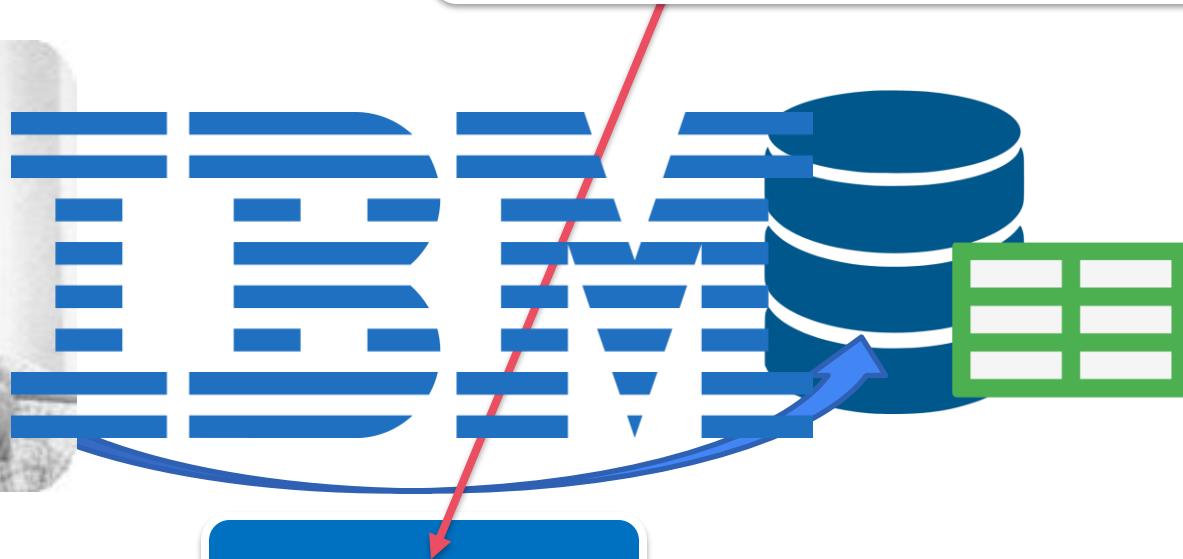
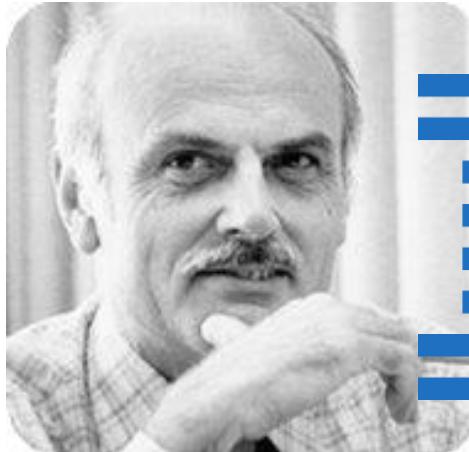
Artigo



1970

Breve Histórico

Cálculo e Álgebra Relacional

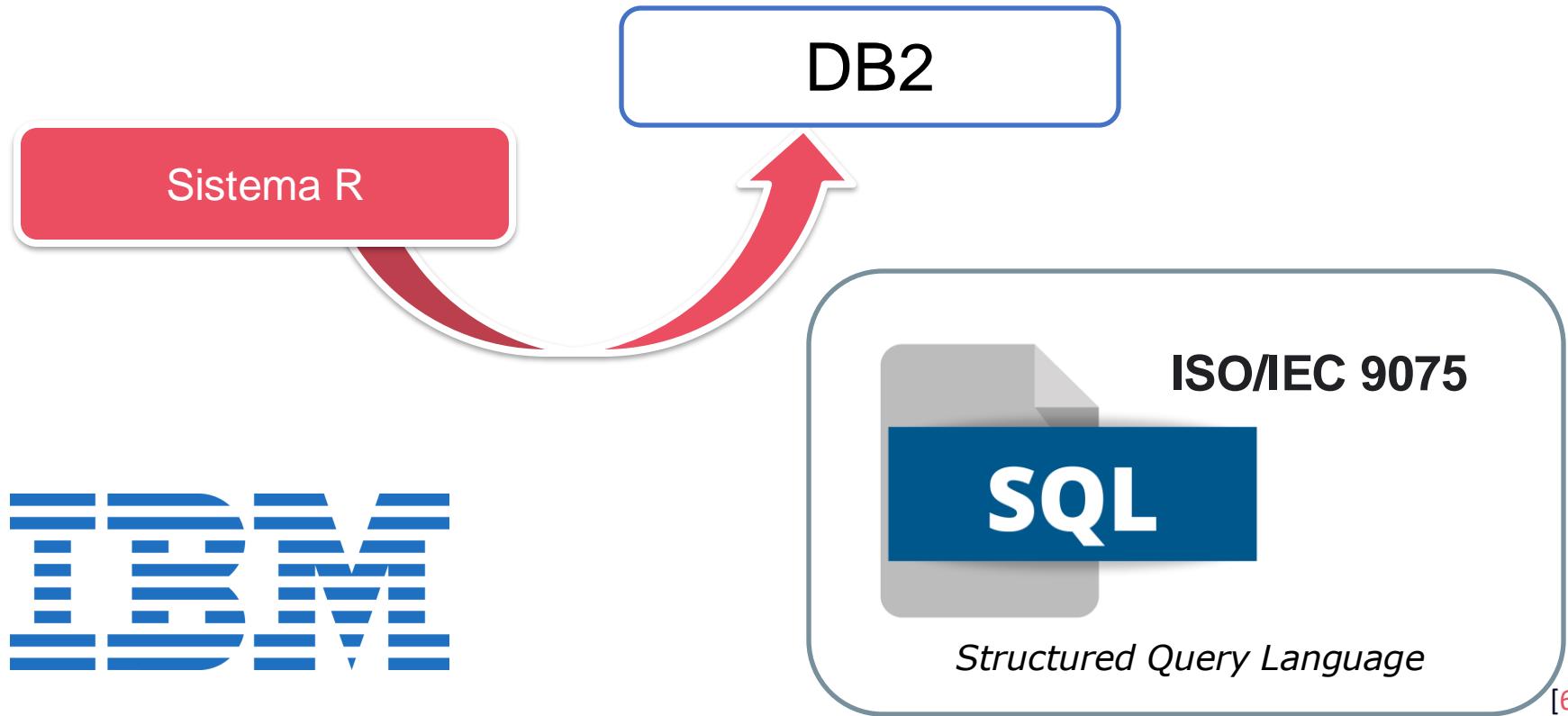


Criador: Ted Codd

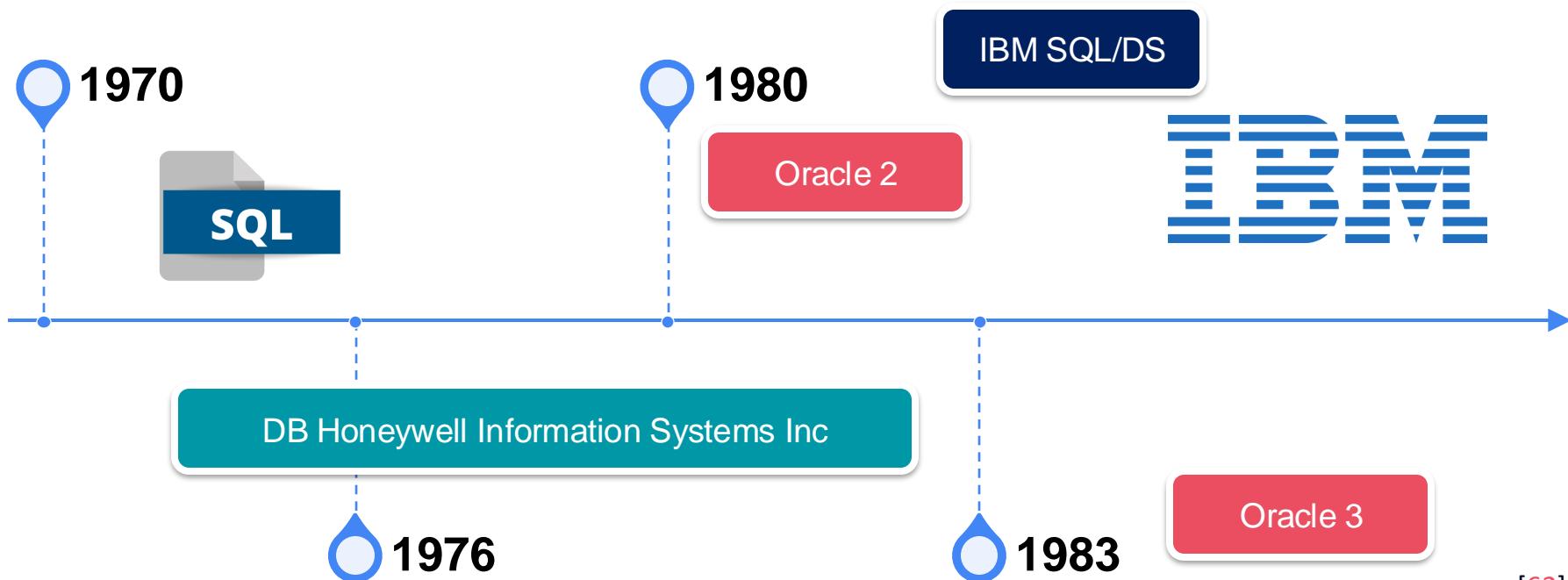
Artigo

1970

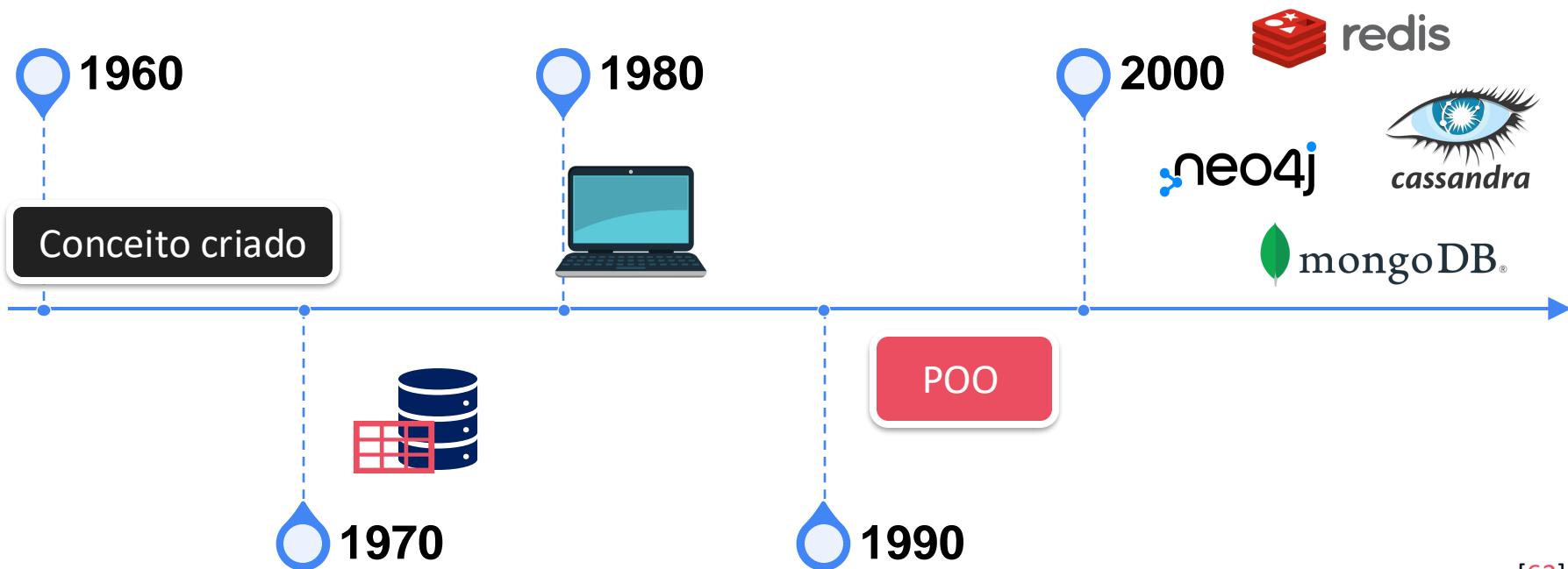
Breve Histórico



Sequência de Eventos



Linha do Tempo



Primeiros do Mercado

Uso dos pcs



Evolução do modelo relacional - 80's

Feedback

Sistemas distribuídos

Desenvolvimento dos sistemas

8 MB

TeraBytes



1980

Modelo Hierárquico

Clipper

BDDBase

COBOL

Fox Pro

IMS – Information Management

- Registros: links e dados
- TAD tree – com raiz

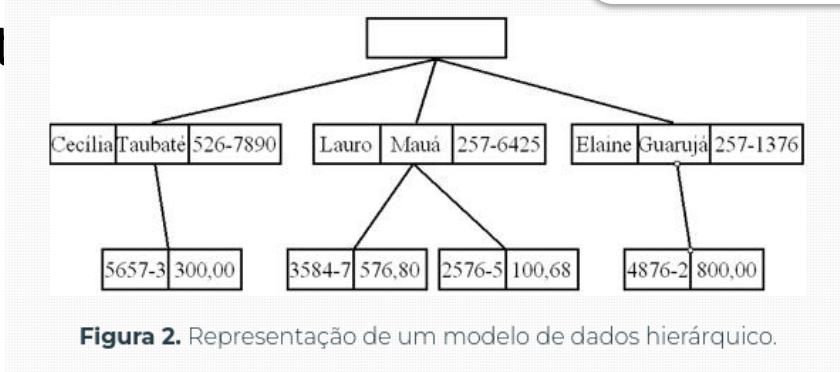


Figura 2. Representação de um modelo de dados hierárquico.

Modelo Hierárquico

Modelo em Rede

Relacionamento  N:M

CODASYL

- Links - Ponteiros entre nós
- 1964

Conhecimento da estrutura física do BD

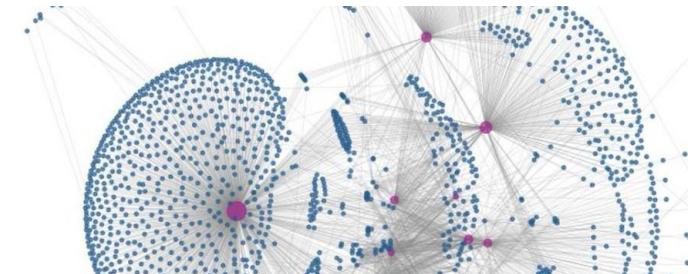


Figura 1. Representação de um modelo de dados em rede.

Modelo em rede

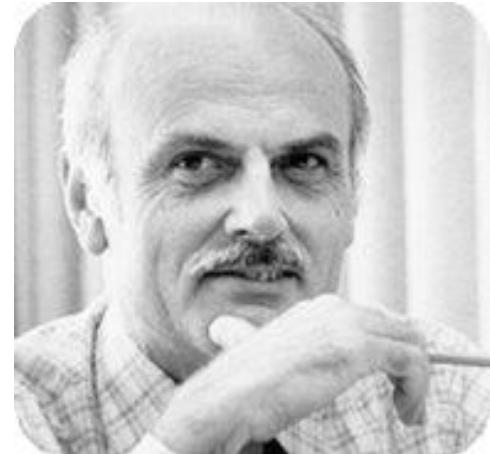
Modelo de Banco de dados Relacional



Modelo Relacional

Características

- Álgebra relacional
- Relações
- TAD para armazenamento
- Transparência



1970

Codd, E. F. A relational model for large shared data banks. Communications of the ACM 13(6):377-387, 1970.

Modelo Relacional

Modelo Relacional

Usuários de BDs



User convencional



Administrador do BD

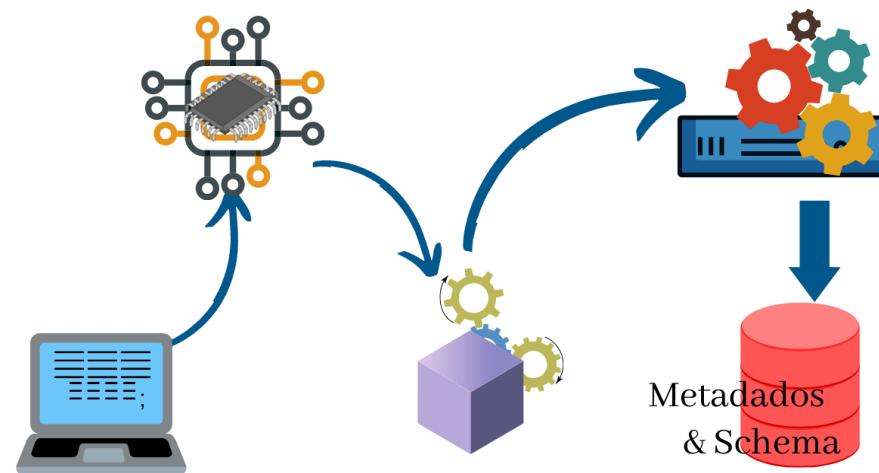
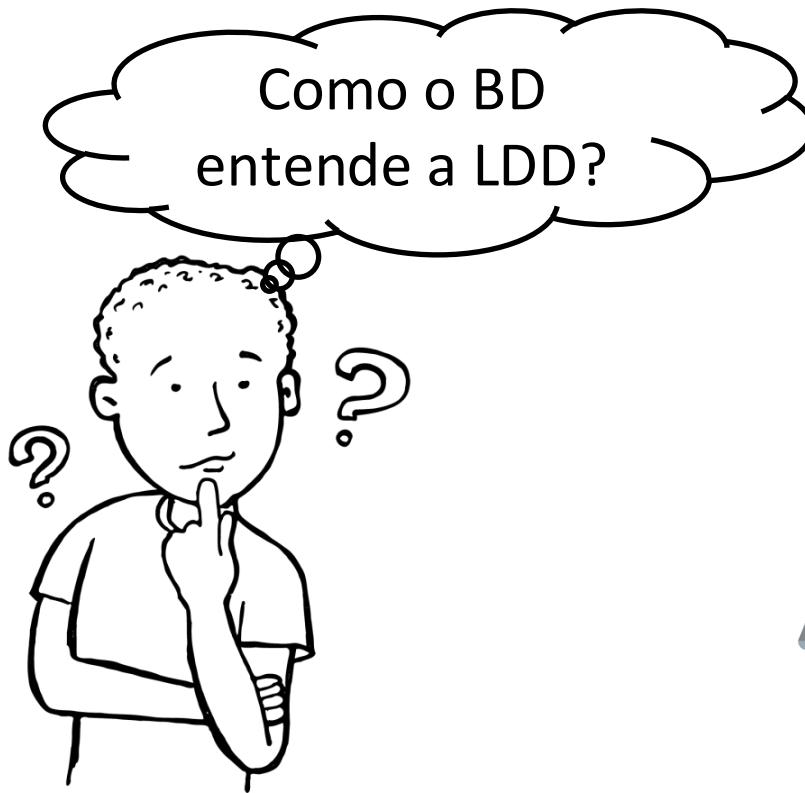
Modelo Relacional

- Definição das tabelas e constraints para dados
- Comandos traduzidos pelo processador LDD

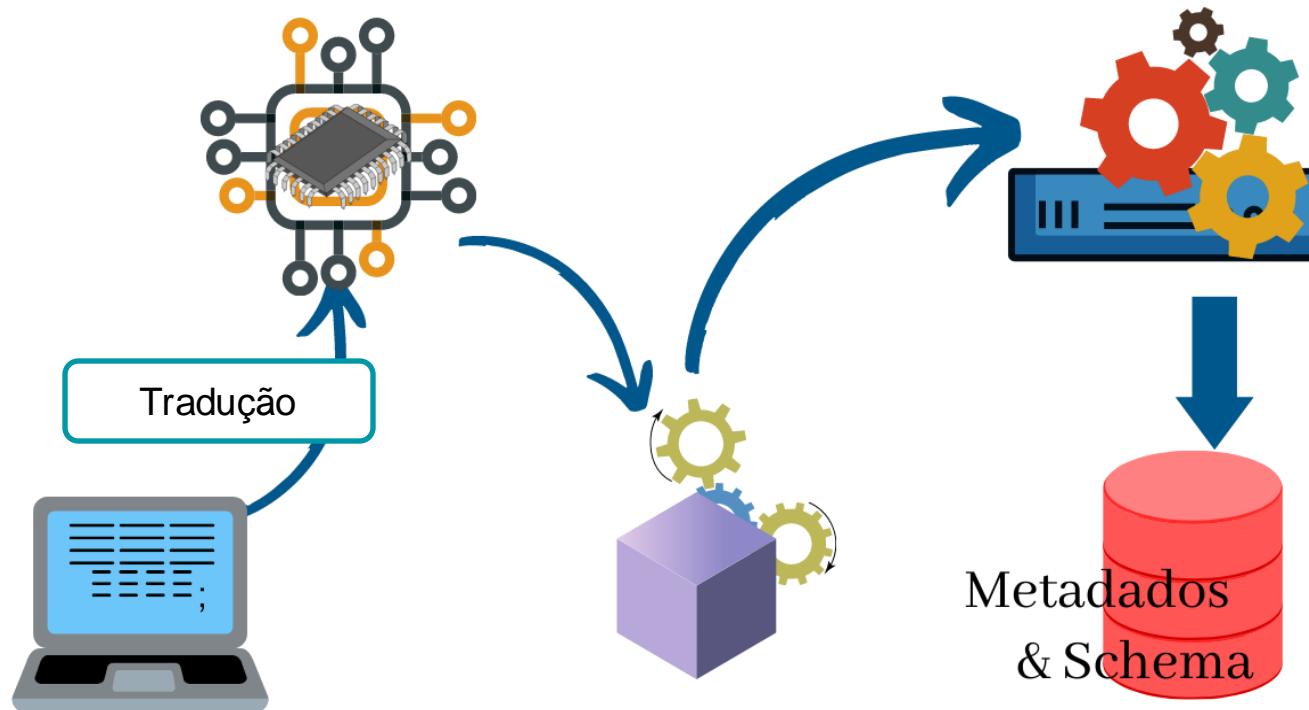


LDD – Linguagem de Definição de Dados

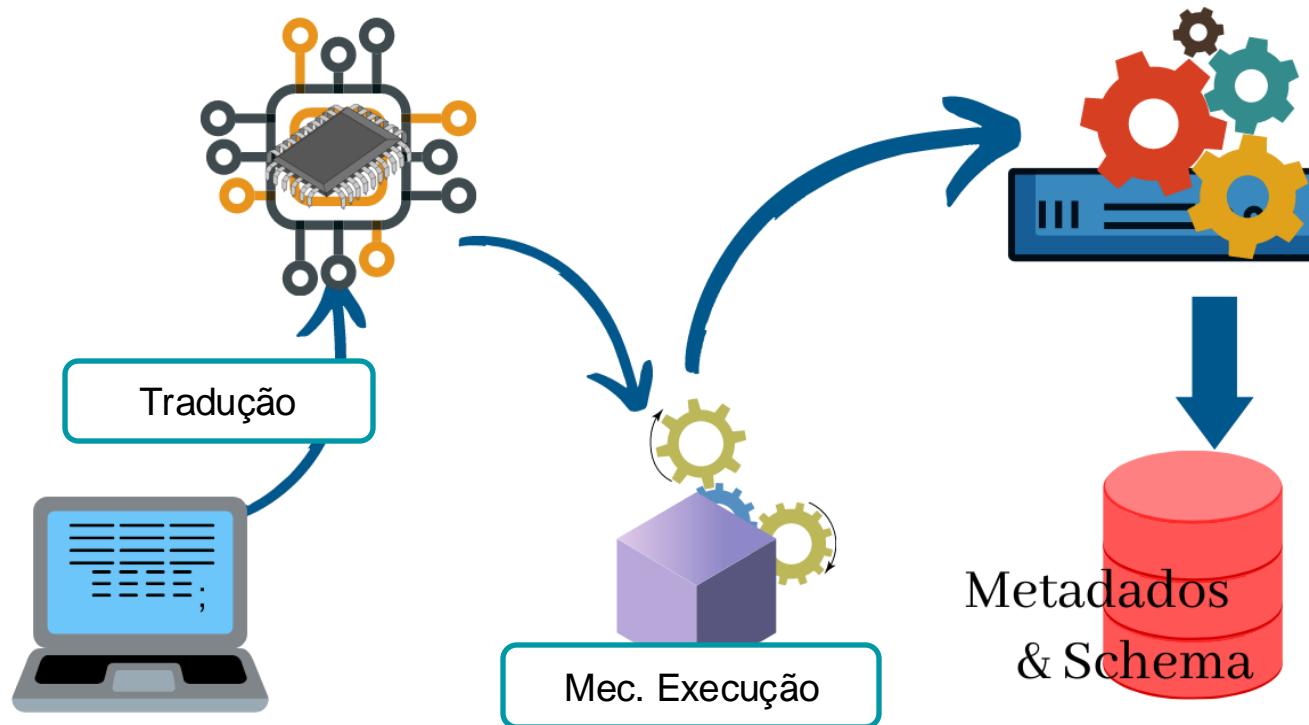
Modelo Relacional



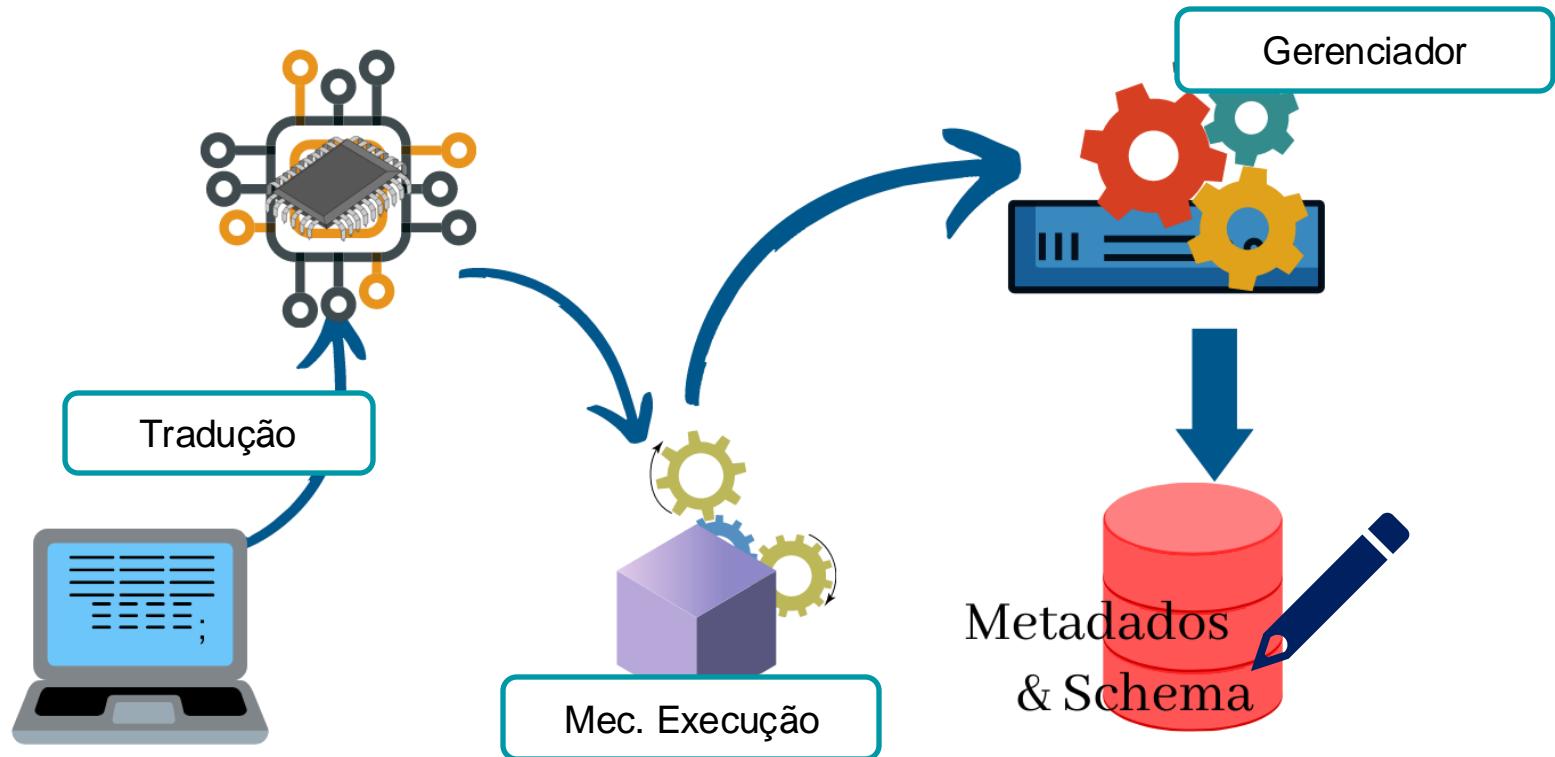
Modelo Relacional



Modelo Relacional



Modelo Relacional



Modelo Relacional

Características:

- Altera e extrai informações
- Duráveis

Transações



LMD – Linguagem de Definição de Dados

Modelo Relacional

Características:

- Altera e extrai informações
- Duráveis

Agrupar para executar

Transações

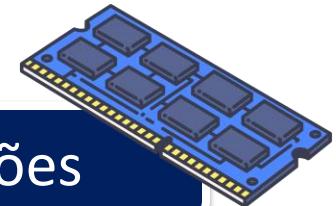


LMD – Linguagem de Definição de Dados

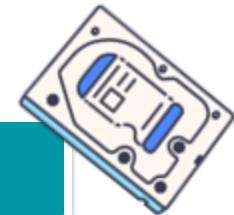
Storage & Buffer

- Gerenciador de armazenamento
- Gerenciador de buffer

Ações



Dados



LMD – Linguagem de Definição de Dados

Storage & Buffer

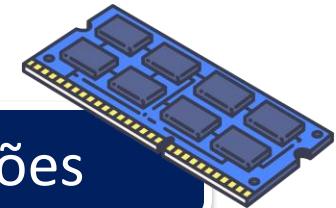
Movimento

- Gerenciador de armazenamento

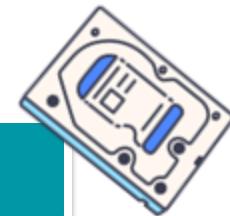
Troca

- Gerenciador de buffer

Ações

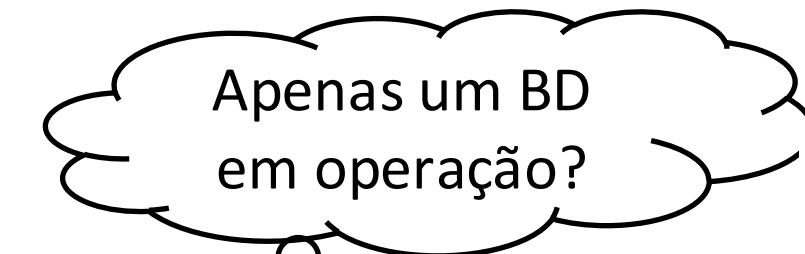


Dados

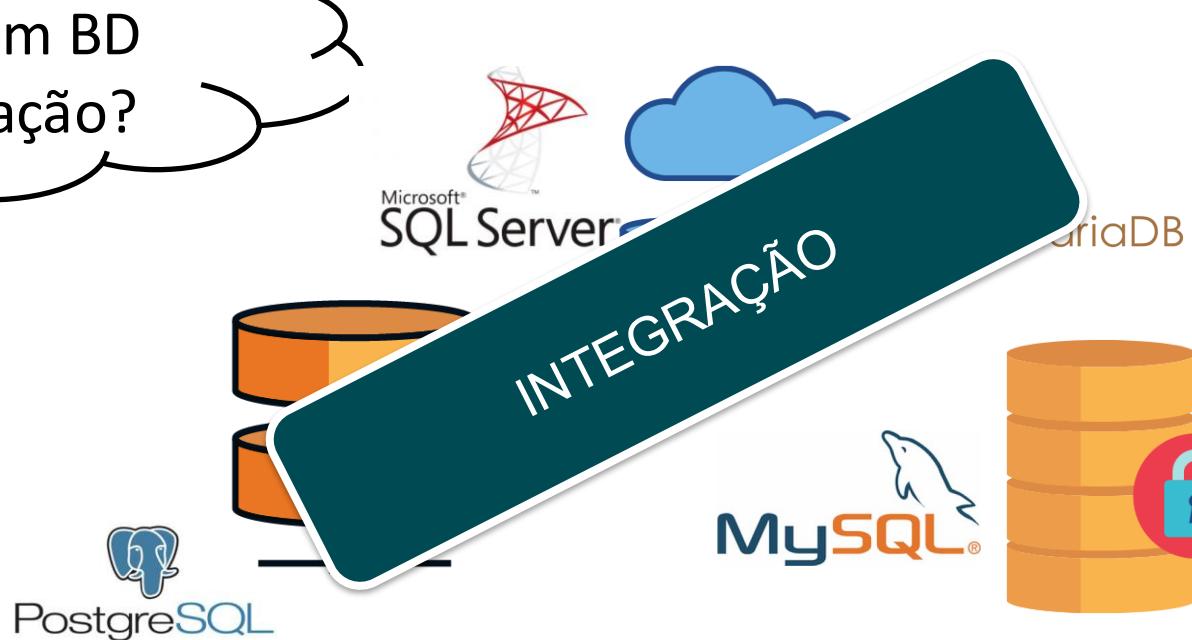


LMD – Linguagem de Definição de Dados

Cenário



Cenário



Cenário



Data warehouses

- Repositórios centralizados
- Mediadores



Middleware



Robertson, T., et al. (2014). The GBIF Integrated Publishing Toolkit: Facilitating the Efficient Publishing of Biodiversity Data on the Internet. PLoS ONE, 9(8), e102623.

SGBDs utilizados pelo mercado



Mais utilizados pelo mercado

1

ORACLE®



2

3

Microsoft®
SQL Server®

T-SQL

4



PostgreSQL



mongoDB®

5



redis

6

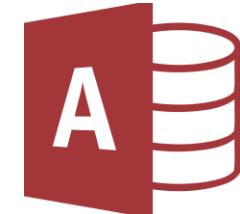
<https://db-engines.com/en/ranking>

Mais utilizados pelo mercado



ElasticSearch

7



9

12



MariaDB



cassandra

11

Mais utilizados pelo mercado

Popularidade

Tempo de marcado

Documentação

Robustez

Confiabilidade

Segurança

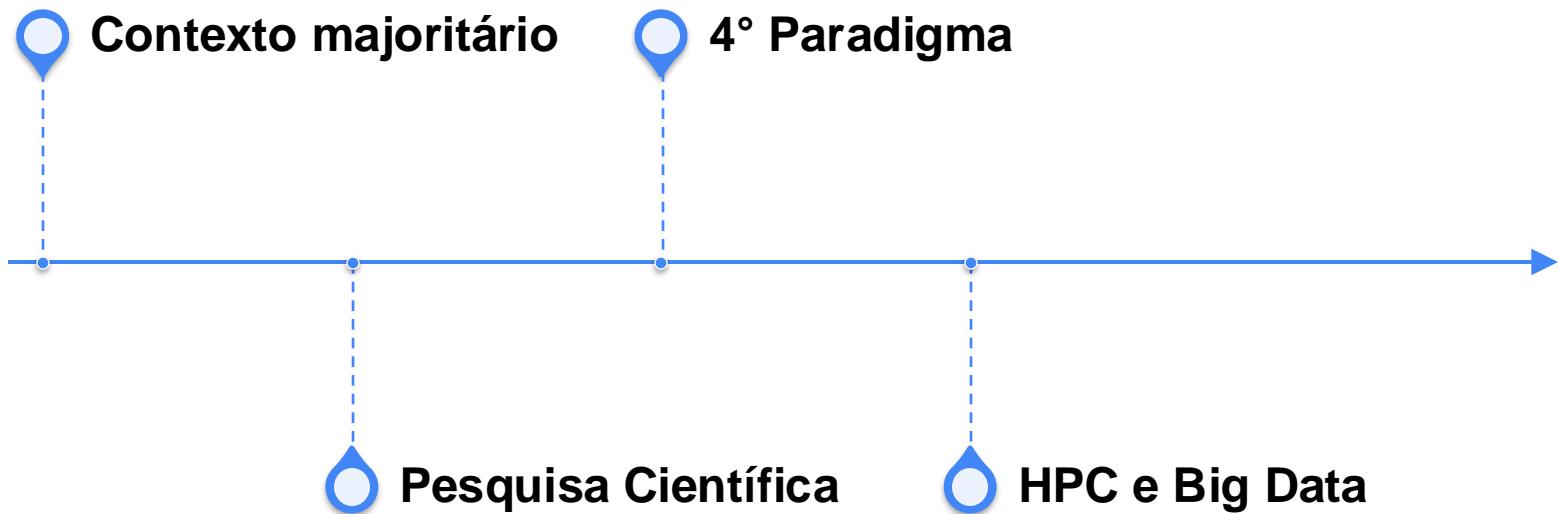
Multiplataforma

Etapa 3

A era dos dados e o futuro da modelagem

// Introdução à Banco e dados

Conversa



Contexto dos dados

- Papel central – Sistemas Corporativos

MIN/MAX

COUNT

MÉDIA

SOMA

Maioria dos cenários



Researching



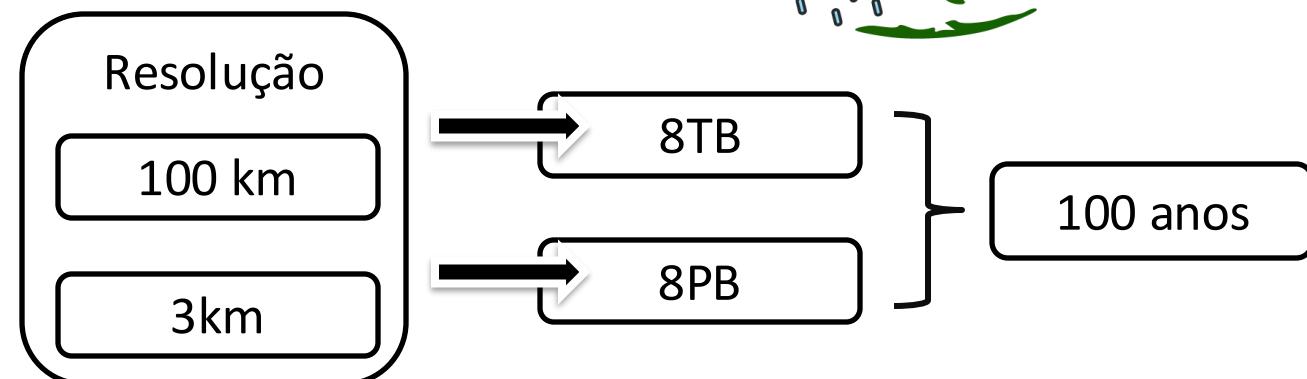
Researching



- N° de tarefas computacionais
- Quantidade de dados
- Heterogeneidade
- Computação paralela e distribuída

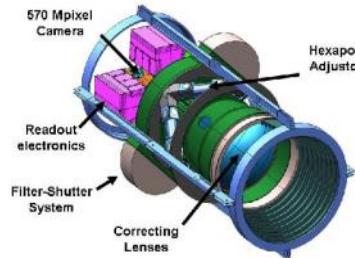
Researching

Exemplos



Researching

Exemplos

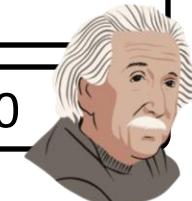


Mapeamento de galáxias,
supernovas e padrões

6.6TB/dia

400

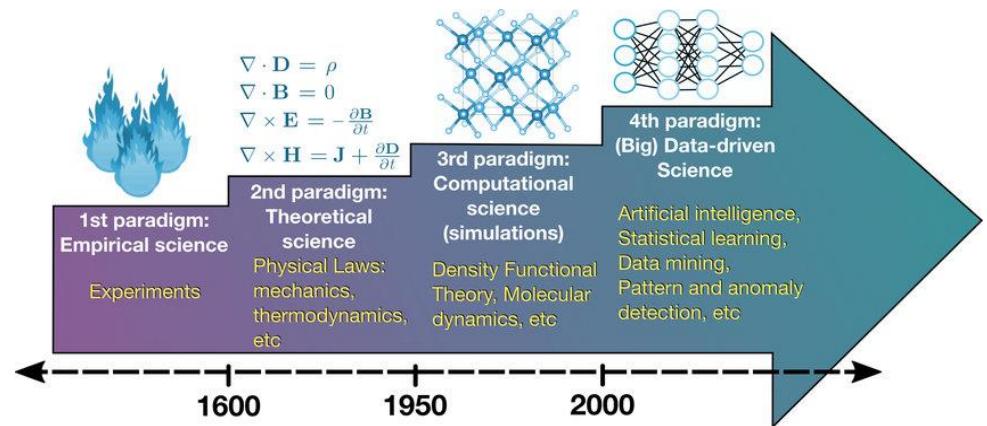
25 instituições



Fonte: Dark Energy Survey (<http://www.darkenergysurvey.org>)

4º Paradigma

Instrumentos e simulações que geram grande volume de dados



Novo modelo: base na análise e exploração de dados (e-Ciência)

Modelo anterior: empírico, teórico e computacional

4º Paradigma



4º Paradigma

Experimentos
realizados em larga
escala



Paralelismo
Múltiplos processadores operando concorrentemente



Big Data
Processamento paralelo de dados persistentes e particionados

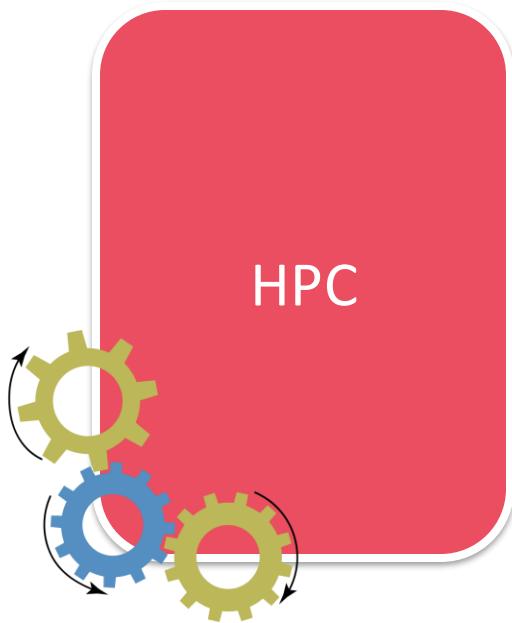


Cloud

Recursos de terceiros - Soluções de tecnologia como serviço

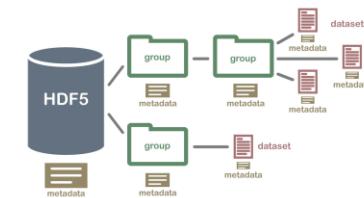


High Performance Computing



- Nós de processamento
- Sistema de arquivos paralelos – sem persistência
- Modelos: MPI, OpenMP, OpenCL
- Acesso: HFF5 e NetCDF

lustre™



Big Data



- Process e Storage: nós de processamento
- Sistema de arquivos paralelos – persistente
- Modelos: MapReduce, Spark, SGBDs paralelos

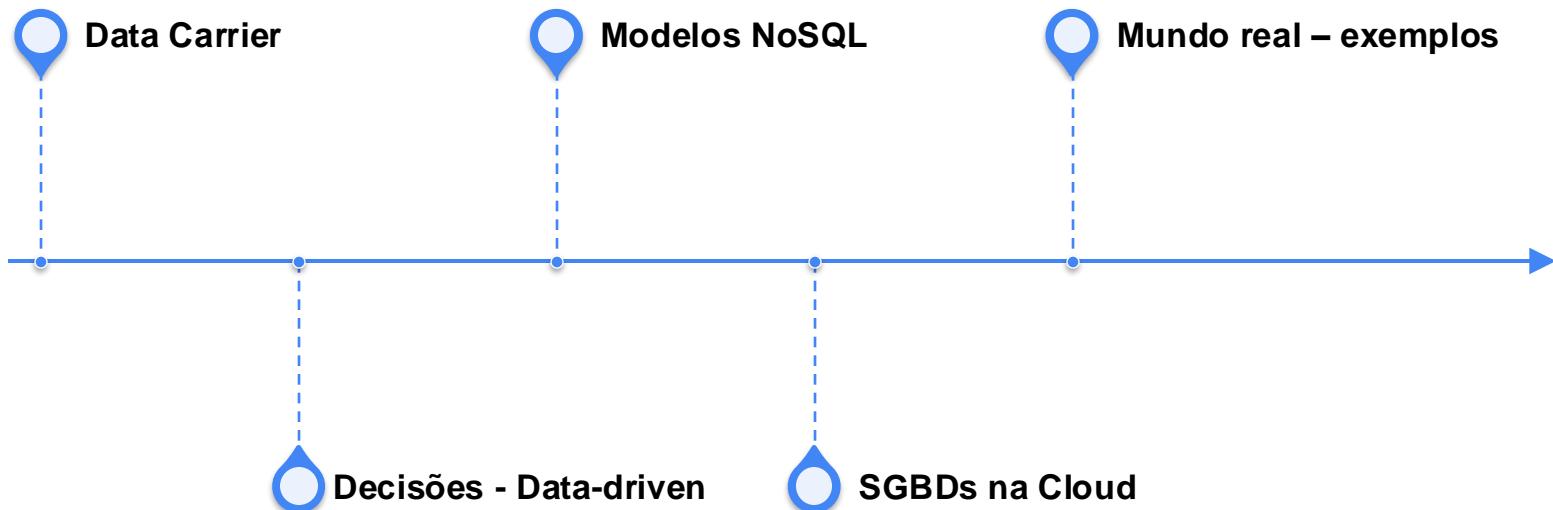
The Spark logo, featuring the word "Spark" in a bold, black, sans-serif font. An orange five-pointed star is positioned above the letter "k".The Hadoop logo, featuring a yellow cartoon elephant to the left of the word "hadoop" in a blue, lowercase, sans-serif font.

Etapa 4

Novo cenário e novas tecnologias - E agora?

// Introdução à Banco e dados

Conversa



Novo cenário



- Carreira Tech em Data
- Data-driven
- Novos modelos de SGBDs



Mercado de data



Perfil de profissional em data

Mercado de data



Engenheiro de dados

- Desenho/Construção/
- Sustentação das soluções de dados

Extração de dados de fontes heterogêneas
Disponibilizar os dados para serem
consumidos pelos analistas e cientistas

Engenheiro de dados

Mercado de data



Cientista de dados

- Modelagem
- Reconhecimento de padrões / Predição

Busca responder perguntas atreladas ao contexto do negócio. Buscando insights através de técnicas de modelagem

Cientista de dados

Mercado de data

Analista de dados

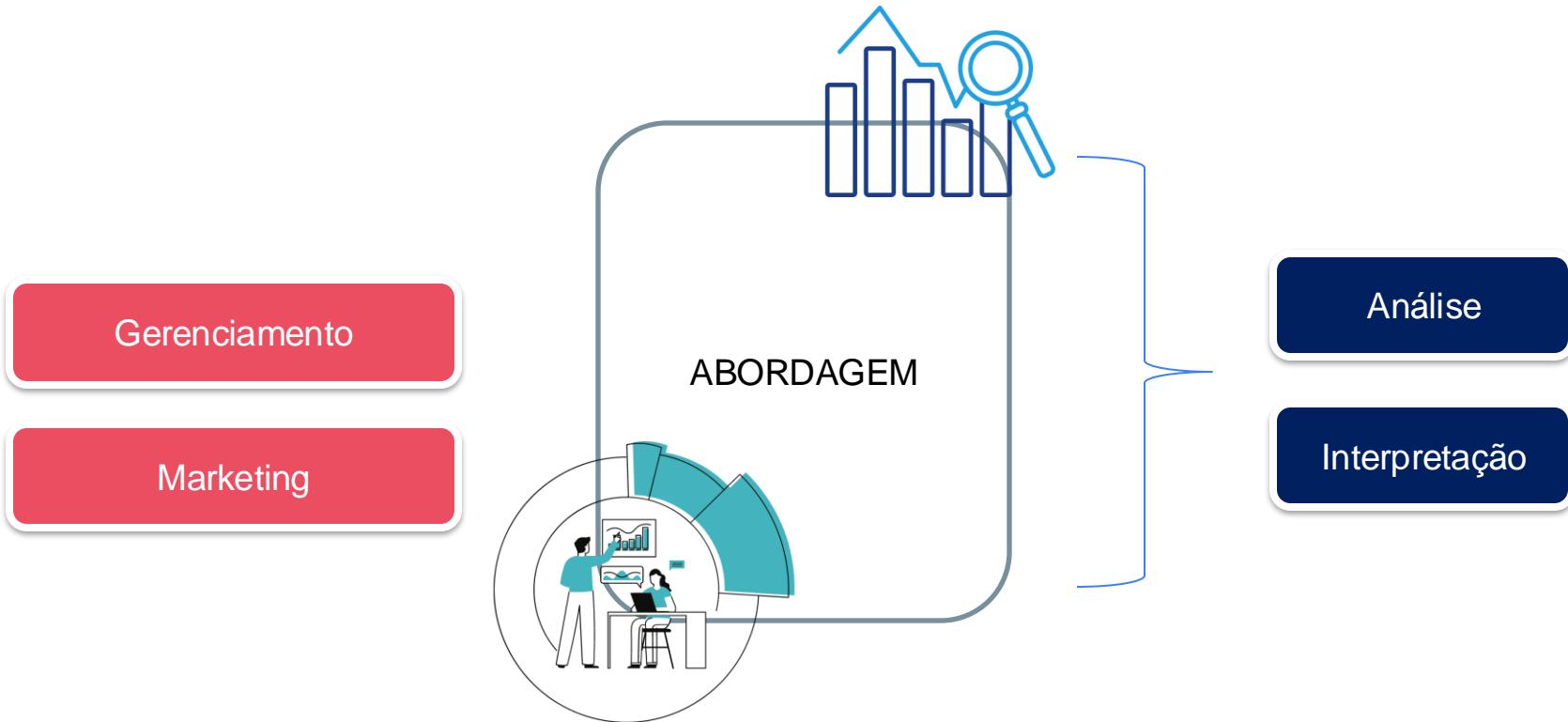


- Criação de dashboards
- Apresentação visual dos dados

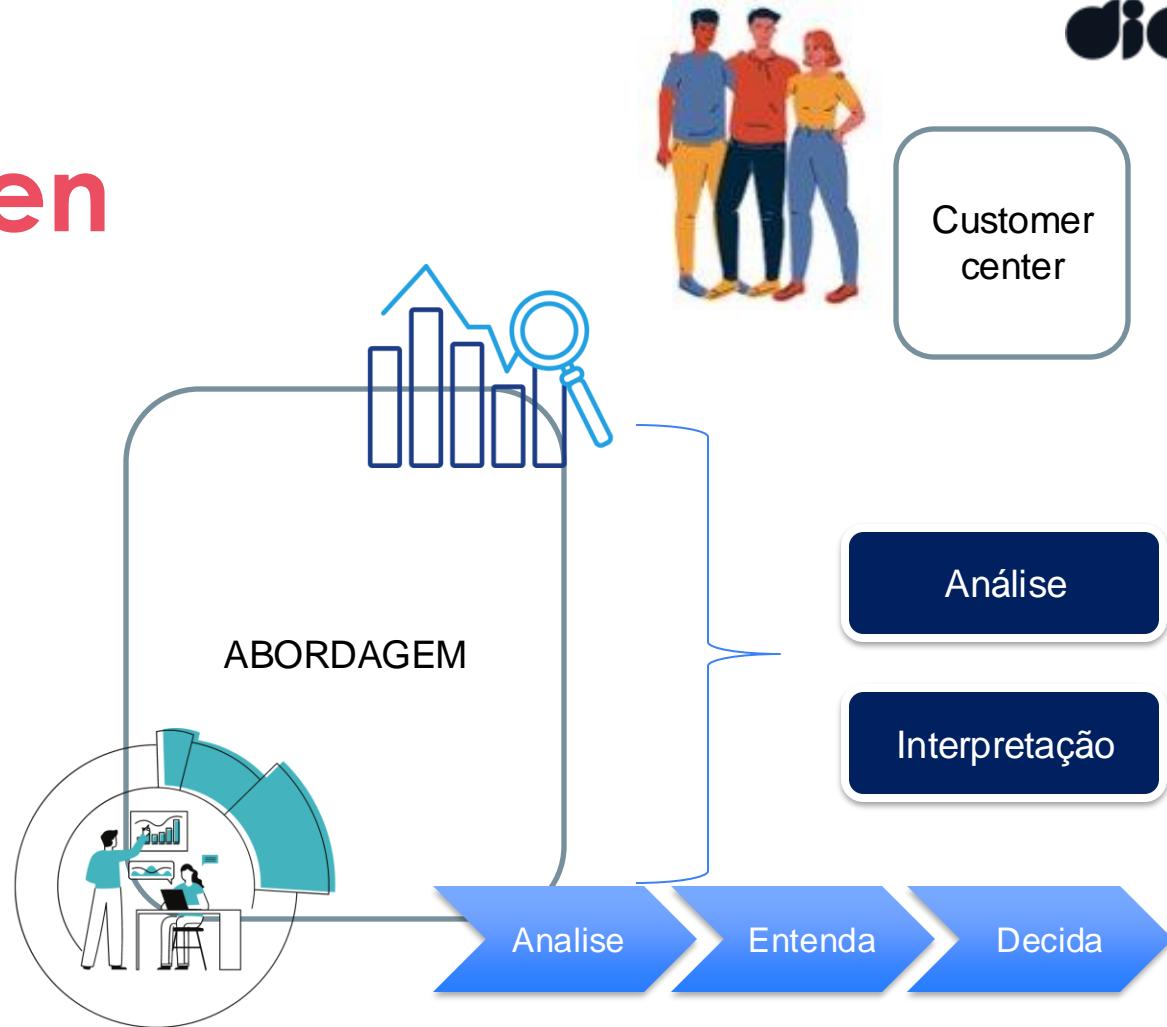
Busca entender o comportamento do negócio a partir dos dados. Realiza o diagnóstico, identifica possíveis motivos para comportamentos e verifica métricas

Analista de dados

Data-driven



Data-driven



Modelos NoSQL

SGBDs NoSQL

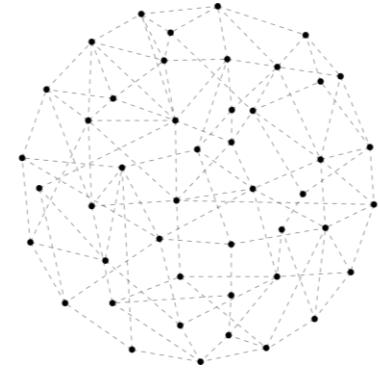
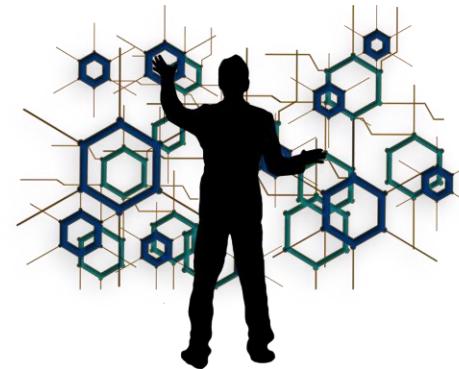
Documentos

Wide-columns

Key-Value

Grafos

Orientado à Objetos



Modelos NoSQL

SGBDs NoSQL

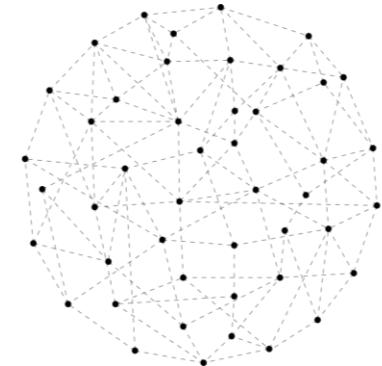
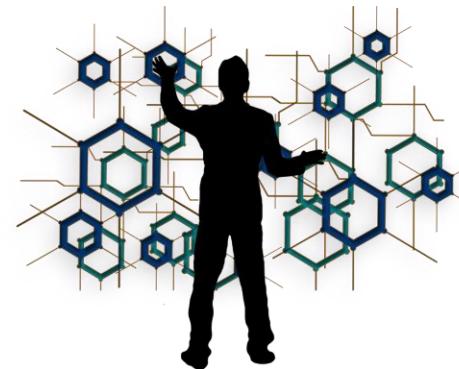
Documentos

Wide-columns

Key-Value

Grafos

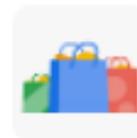
Orientado à Objetos



Black Friday

Friday, November 25, 2022

...



Modelos NoSQL

SGBDs NoSQL

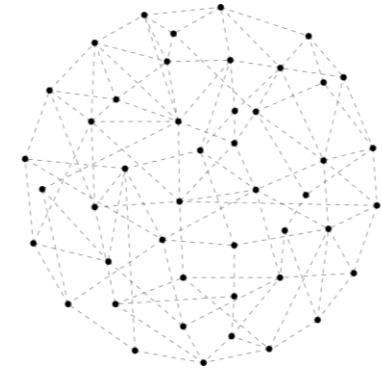
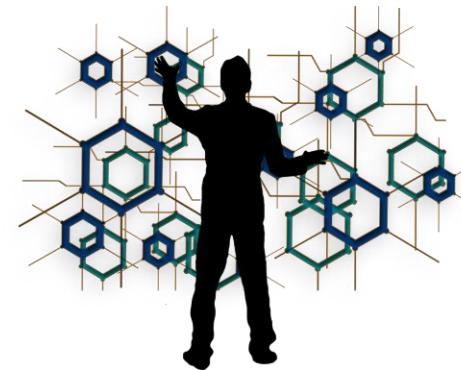
Documentos

Wide-columns

Key-Value

Grafos

Orientado à Objetos



NoSQL

Not only SQL



Modelos NoSQL

SGBDs NoSQL

Documentos

Wide-columns

Key-Value

Grafos

Orientado à Objetos



Orientado à Documentos

- Baixa curva de aprendizado
- Baseado em JSON
- Escalabilidade horizontal
- Multi-plataforma
- Transações ACID para multi-documento
- Consultas: Suporta javascript

Modelos NoSQL

SGBDs NoSQL

Documentos

Wide-columns

Key-Value

Grafos

Orientado à Objetos



Orientado à Colunas

- Origem: Facebook
- Open-source: 2008
- Performático
- Descentralizado
- Consultas: CQL



Modelos NoSQL

SGBDs NoSQL

Documentos

Wide-columns

Key-Value

Grafos

Orientado à Objetos



Orientado à Key-Value

- 2009 - Escrito em C
- Compatível c/ outras linguagens
- Performático
- Support: strings, lists, maps, sets, JSON, Graphs ...

Modelos NoSQL

SGBDs NoSQL

Documentos

Wide-columns

Key-Value

Grafos

Orientado à Objetos



Orientado à Grafos



- 2007- escrito em java
- TAD: grafos
- Cypher: query para grafos
- Data science
- Compatível: Python, NodeJS, GO, .NET e Java ...

Modelos NoSQL

SGBDs NoSQL

Documentos

Wide-columns

Key-Value

Grafos

Orientado à Objetos



Orientado à Objetos

- 2008 – open-source
- Escrito em .NET e Java
- Cross-plataform

db4o contains a function to store any object:

```
objectContainer.store(new SomeClass());
```

DB & Cloud



Amazon **Aurora**



DynamoDB



Amazon **Redshift**



Azure BD



Mundo Real



ORACLE
D A T A B A S E



ORACLE
D A T A B A S E

NETFLIX **MySQL**

DB
DB.io
Database of
Databases

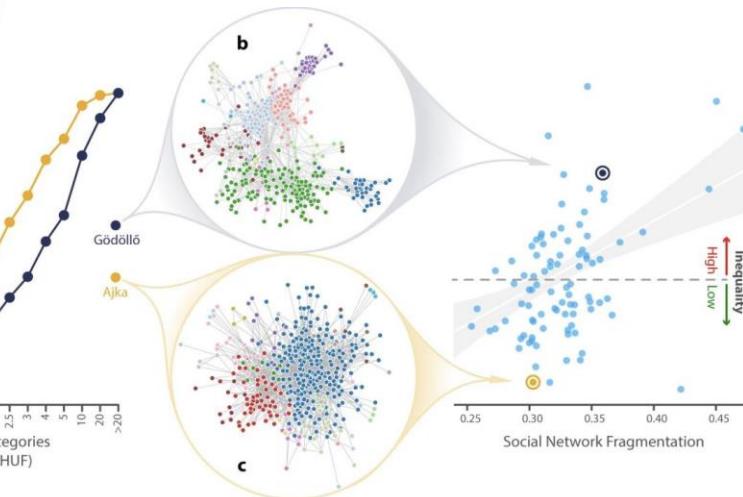
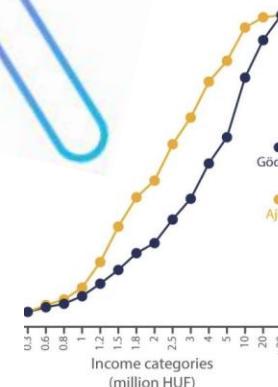


Mundo Real



Black Friday

Friday, November 25, 2022



Etapa 5

Explorando a abordagem de um SGBD – Isolamento, Auto-descrição, Compartilhamento e Visões

// Introdução à Banco e dados

Conversa

Abordagem de BDs

Por que utilizar?

Isolamento de dados e programa

2º das principais característica de SGBD

Compartilhamento e Processamento de transações

4º das principais característica de SGBD

Auto-descrição

1º das principais característica de SGBD

Múltiplas Visões

3º das principais característica de SGBD

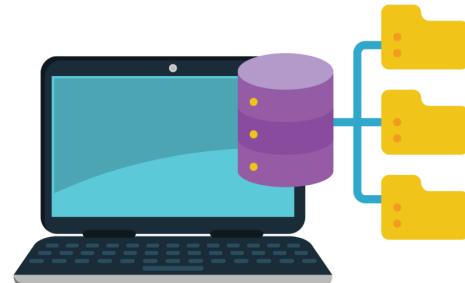
Abordagem de BD



Abordagem de BD



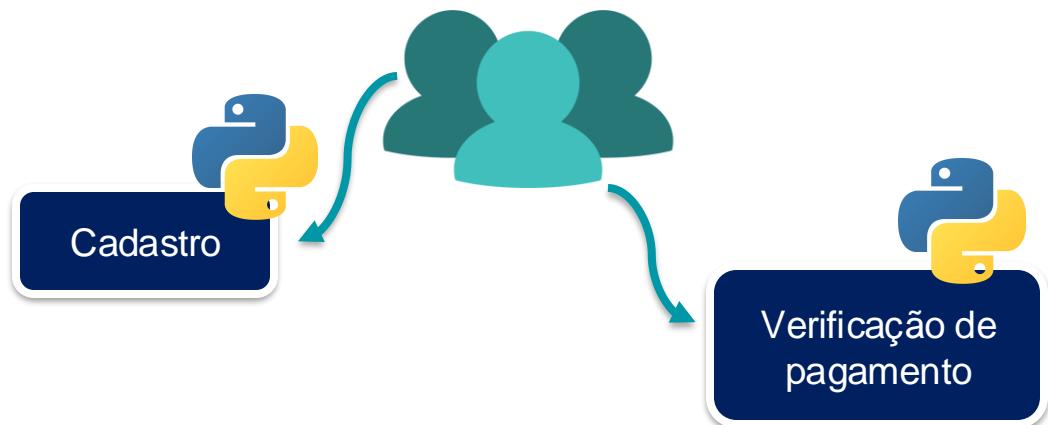
Abordagem tradicional



Abordagem BDs

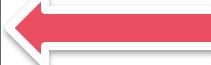
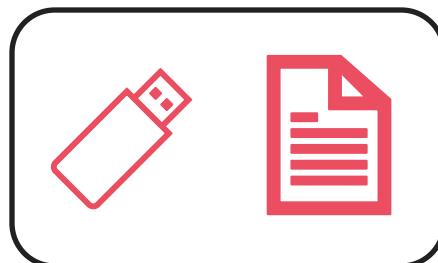
Abordagem de BD

Suponha as aplicações



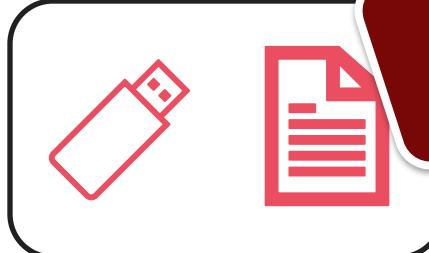
Abordagem de BD

Suponha as aplicações



Abordagem de BD

Suponha as aplicações:



Redundância

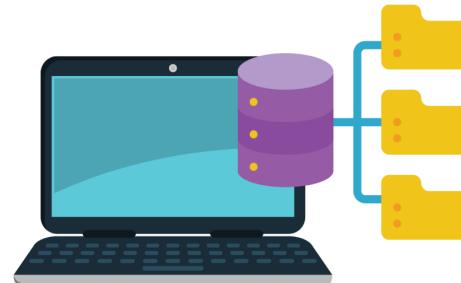
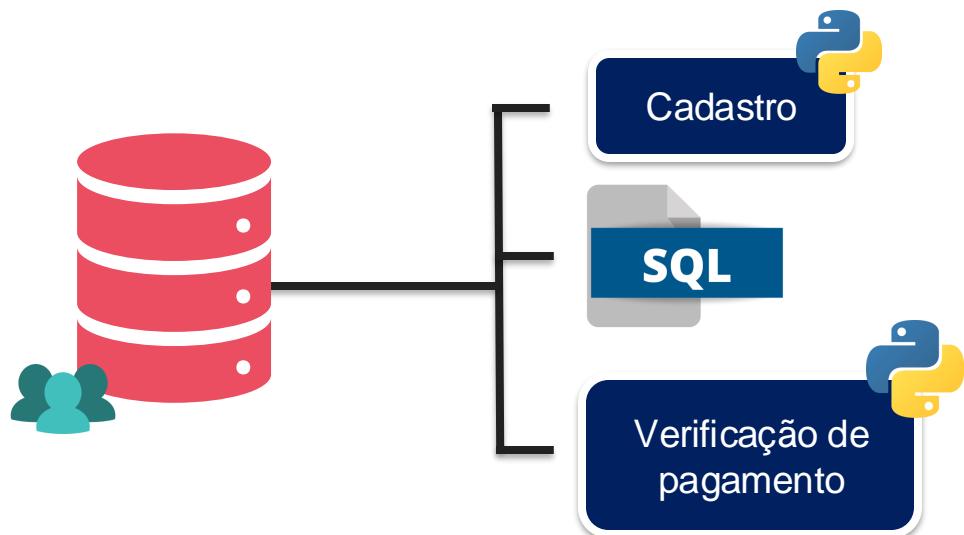
Cadastro



Esforço repetido

Identificação de pagamento

Abordagem de BD



Abordagem BDs

Abordagem de BD

Características principais:

Abstração

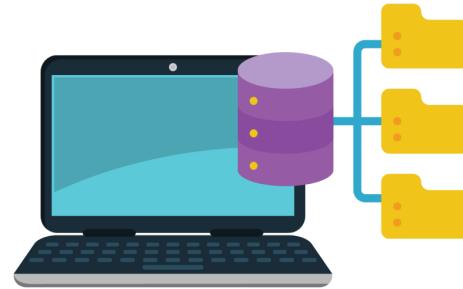
Auto-descrição

Isolamento

Compartilhamento

Múltiplas visões

Transação
multiuser



Abordagem BDs

Natureza auto-descritiva da abordage de BD



Natureza Auto-descritiva



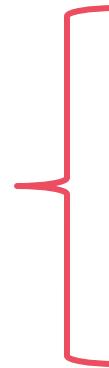
Descrição da estrutura
e constraints

DB schema



Metadados
& Schema

Natureza Auto-descritiva



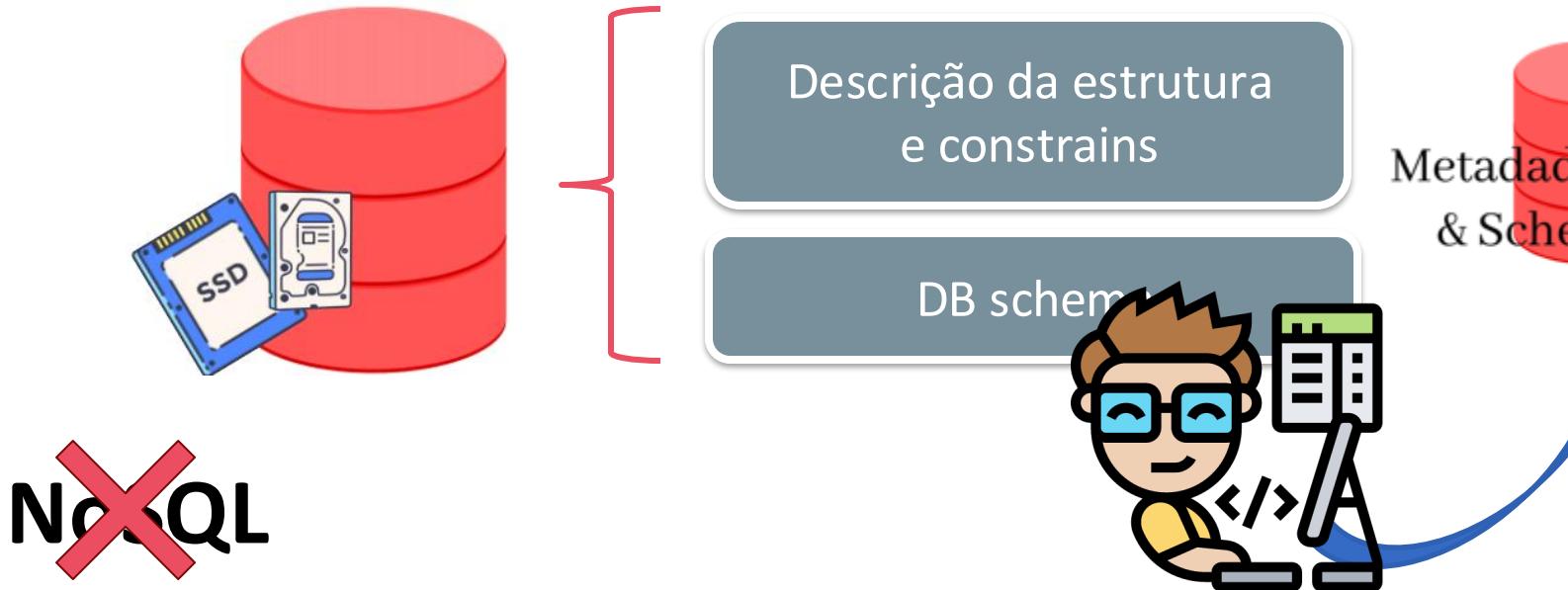
Descrição da estrutura
e constraints

DB schema



NoSQL

Natureza Auto-descritiva



Natureza Autônoma

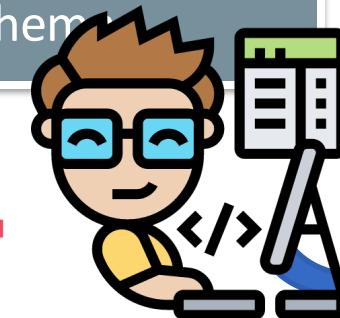
amazon.com.br



critivo

Descrição da estrutura
e constraints

DB schema



Natureza Auto-descritiva



Abordagem tradicional



Programa da Aplicação

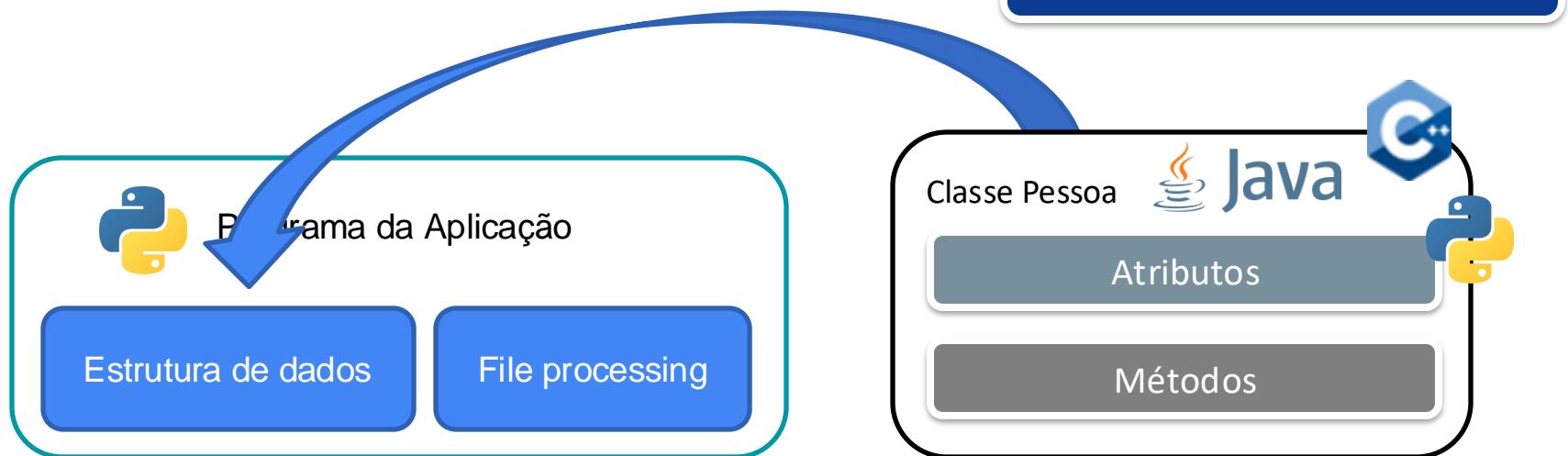
Estrutura de dados

File processing

Natureza Auto-descritiva



Abordagem tradicional



Catálogo

RELATIONS

| Relation_name | No_of_columns |
|---------------|---------------|
| STUDENT | 4 |
| COURSE | 4 |
| SECTION | 5 |
| GRADE_REPORT | 3 |
| PREREQUISITE | 2 |

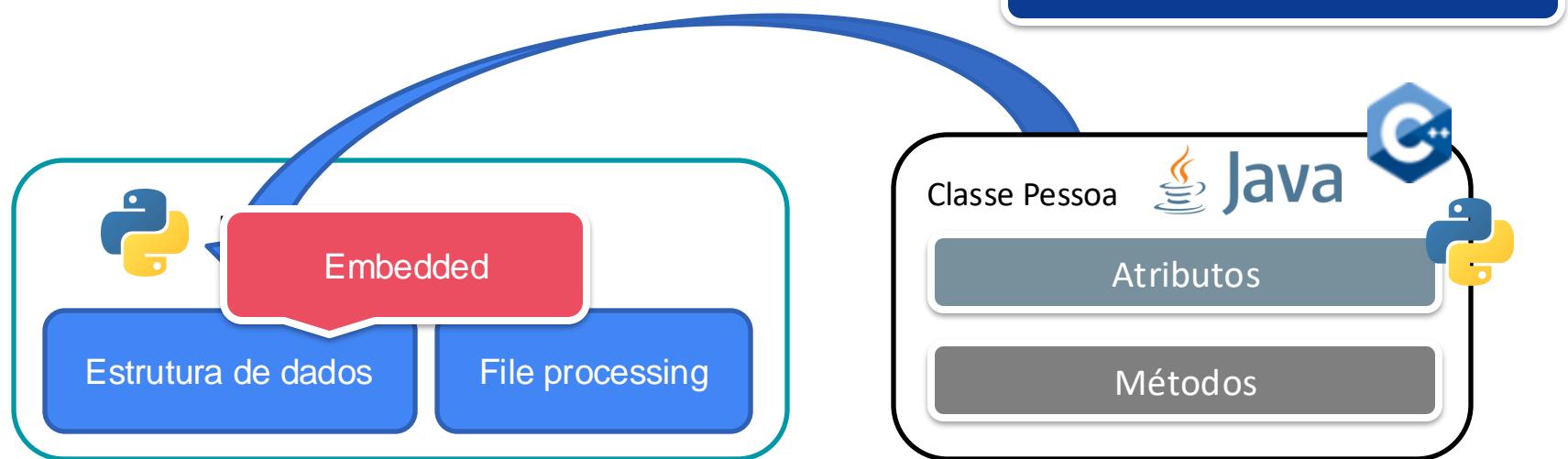
COLUMNS

| Column_name | Data_type | Belongs_to_relation |
|---------------------|----------------|---------------------|
| Name | Character (30) | STUDENT |
| Student_number | Character (4) | STUDENT |
| Class | Integer (1) | STUDENT |
| Major | Major_type | STUDENT |
| Course_name | Character (10) | COURSE |
| Course_number | XXXXNNNN | COURSE |
| | | |
| | | |
| | | |
| Prerequisite_number | XXXXNNNN | PREREQUISITE |

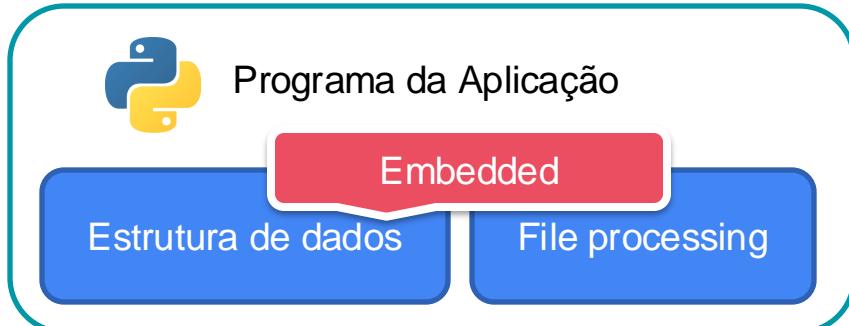
Isolamento entre Program/Data e Abstração



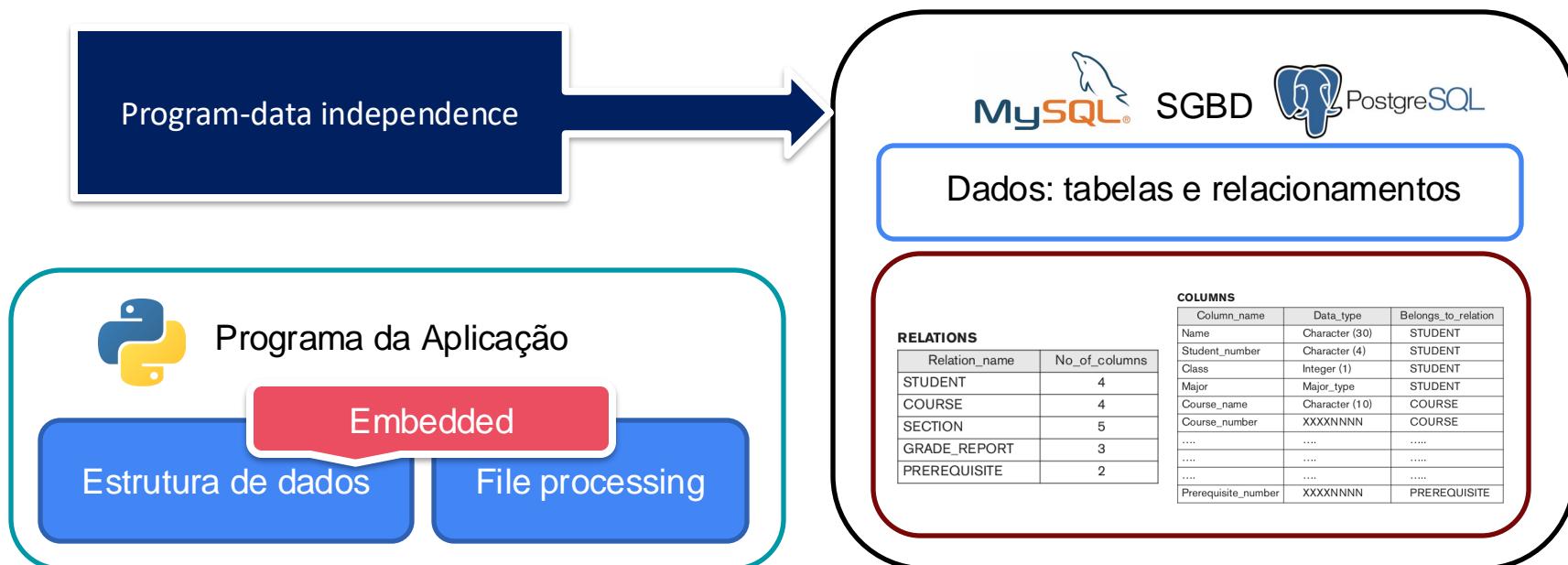
Isolamento e abstração



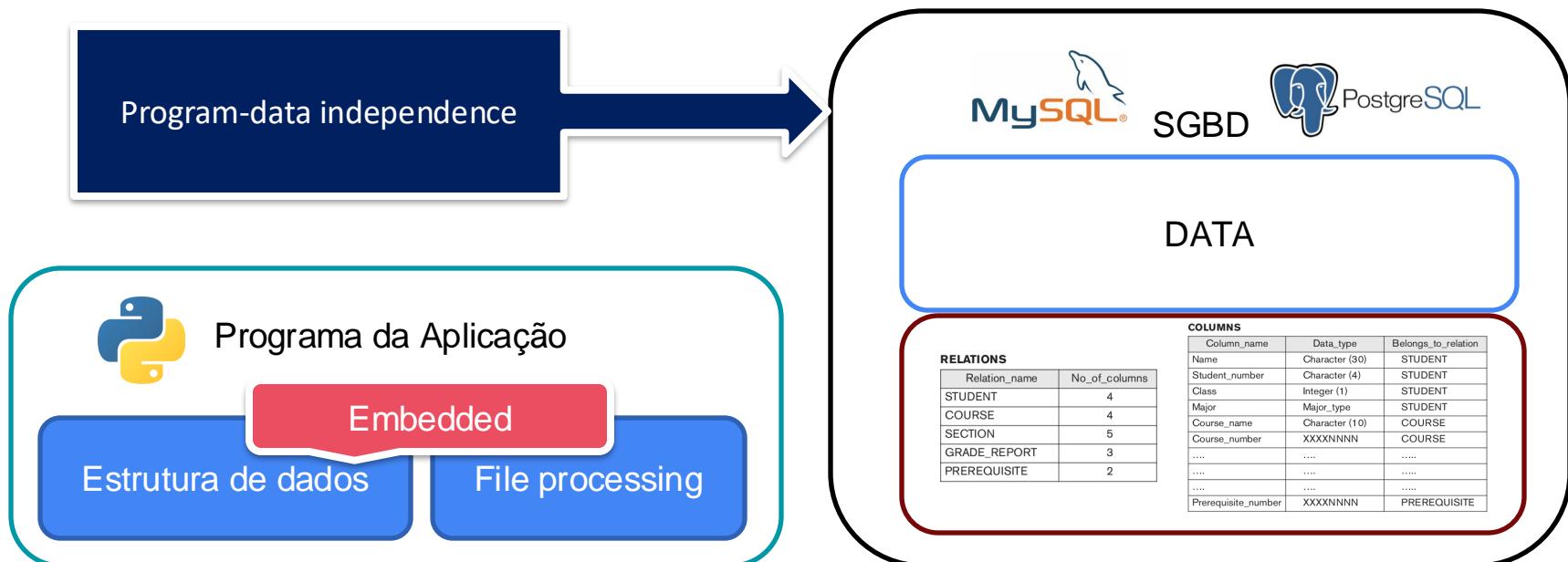
Isolamento e abstração



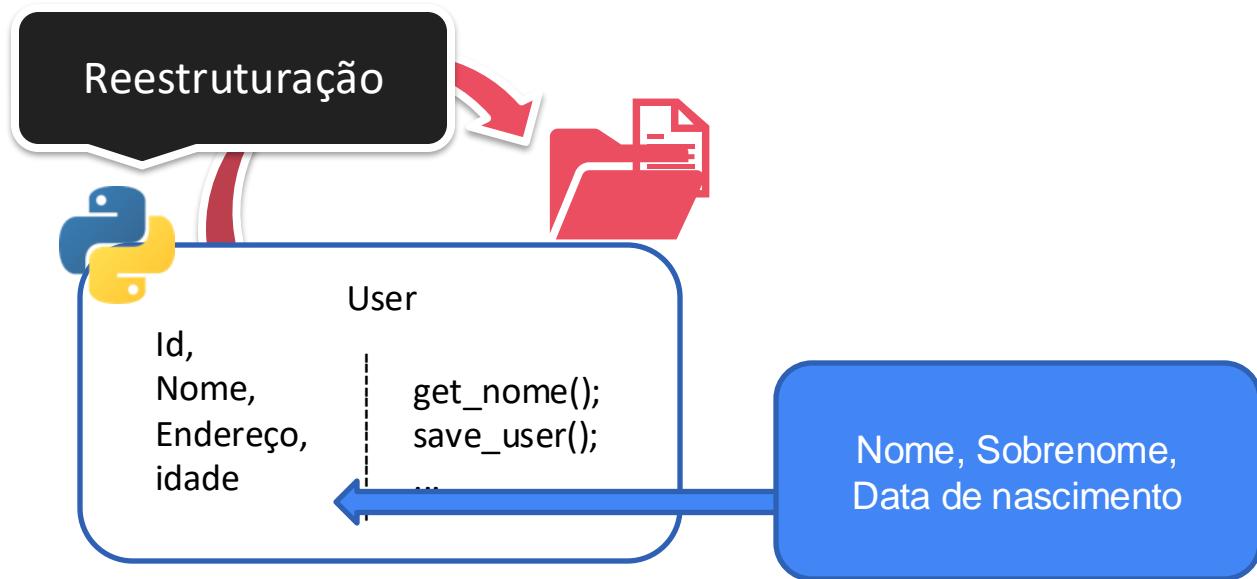
Isolamento e abstração



Isolamento e abstração



Isolamento e abstração



Isolamento e abstração



Isolamento e abstração

- Abstração
- Transparência



Independência do
programa e dados

Isolamento e abstração

- Abstração
- Transparência



Isolamento e abstração

| Data Item Name | Starting Position in Record | Length in Characters (bytes) |
|----------------|-----------------------------|------------------------------|
| Name | 1 | 30 |
| Student_number | 31 | 4 |
| Class | 35 | 1 |
| Major | 36 | 4 |



Catálogo

Suporte a Múltiplas Visões dos dados



Table Views

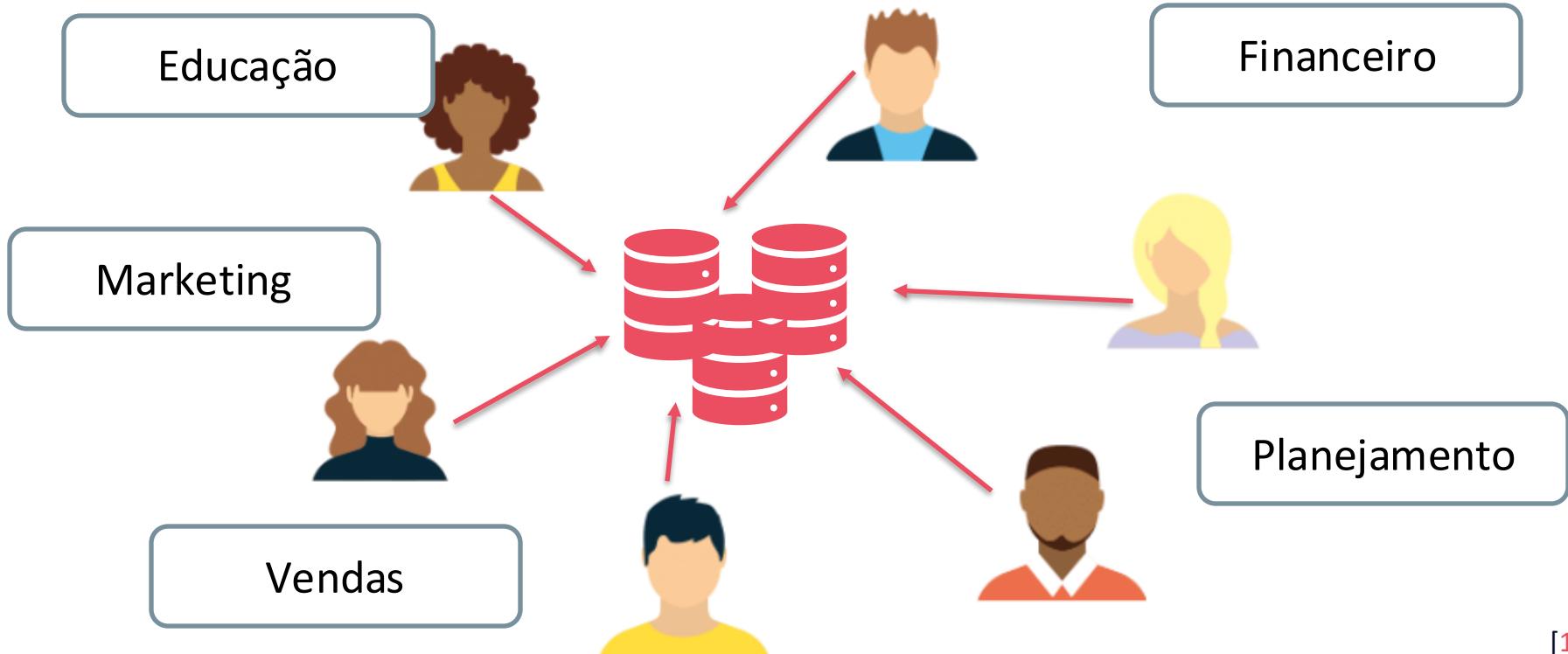


Table Views

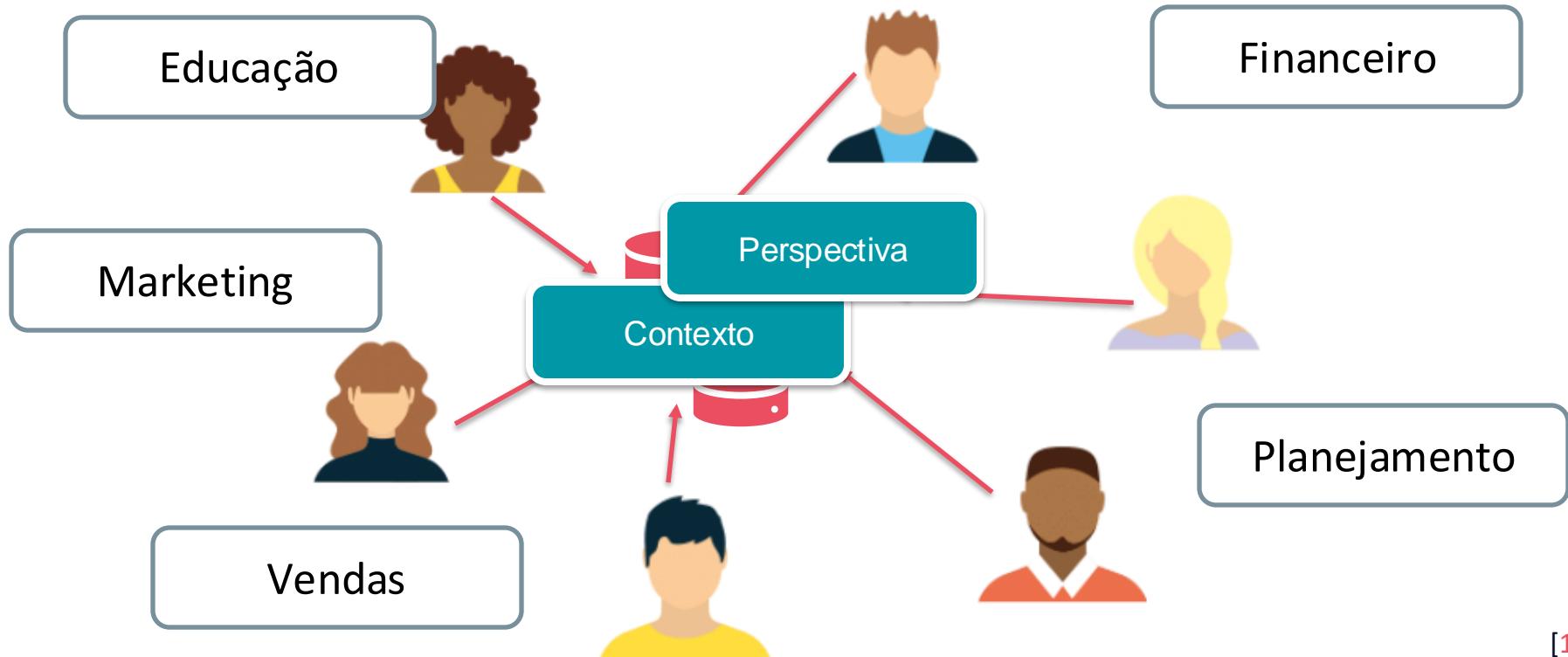


Table Views

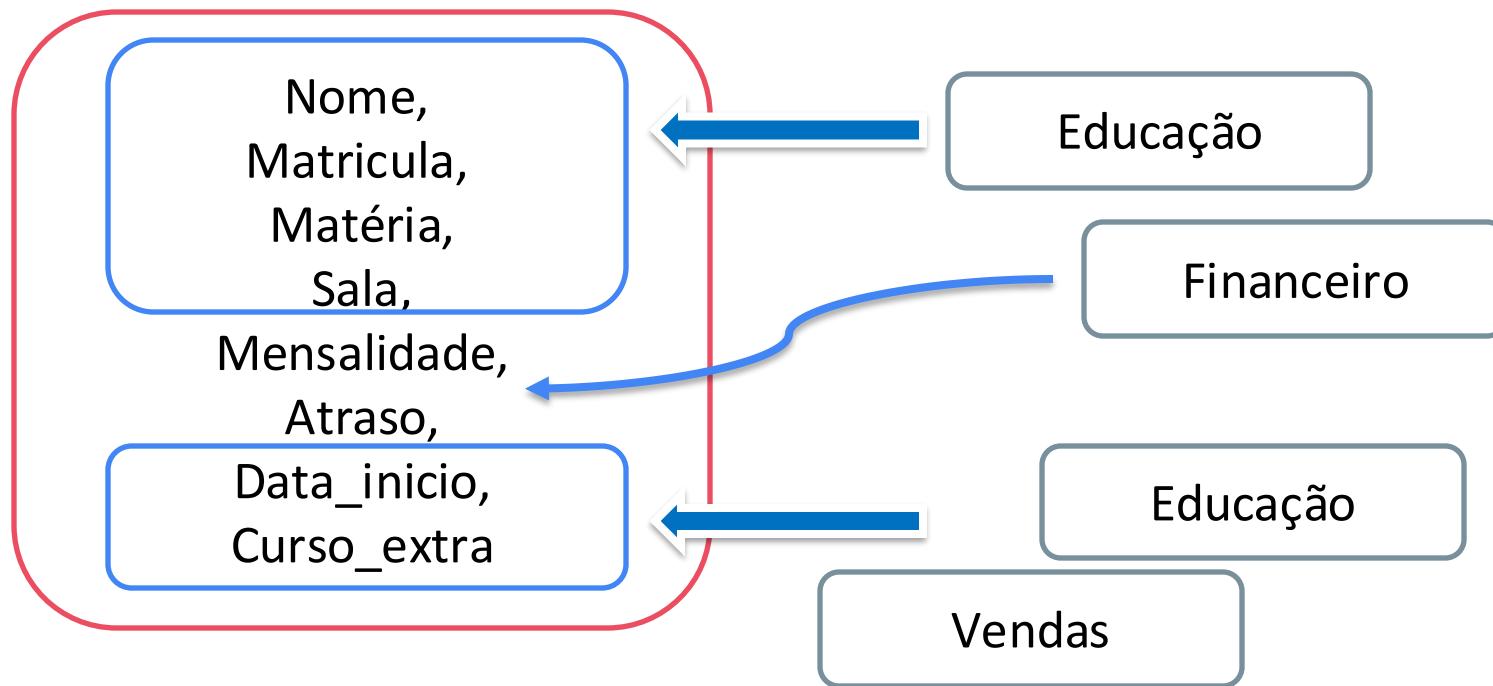


Table Views

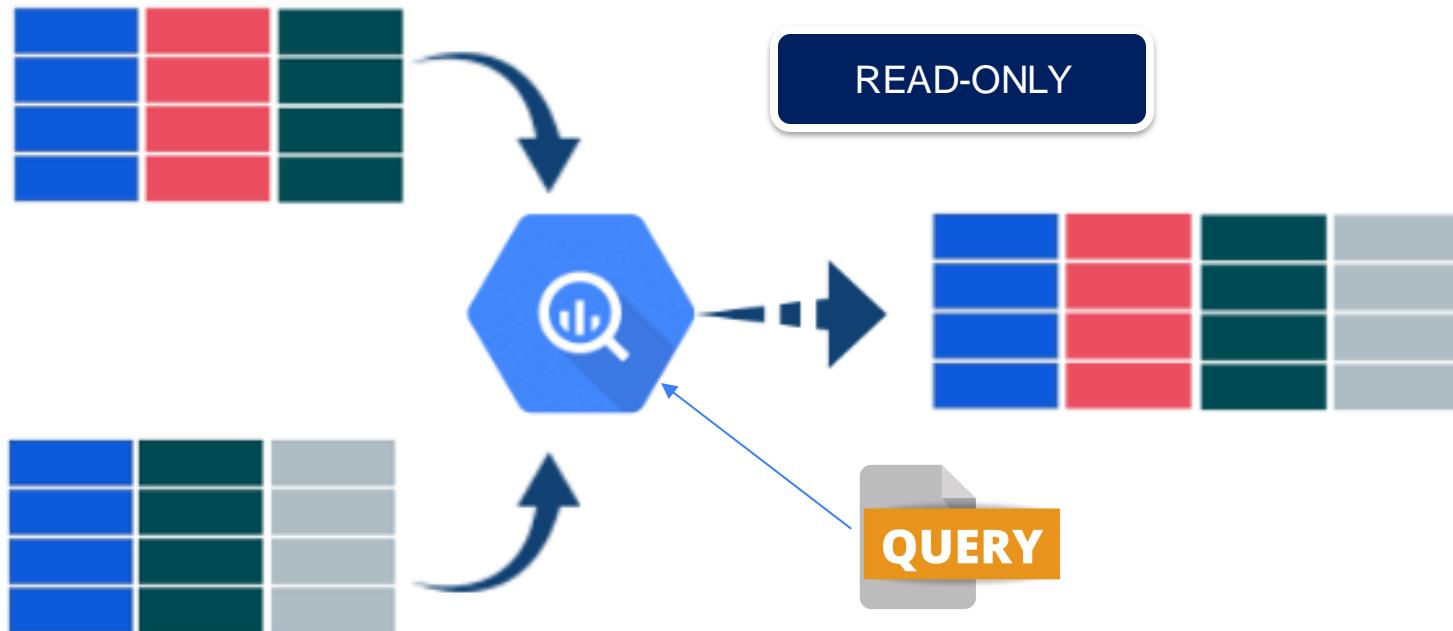


Table Views

PREREQUISITE

| Course_number | Prerequisite_number |
|---------------|---------------------|
| CS3380 | CS3320 |
| CS3380 | MATH2410 |
| CS3320 | CS1310 |

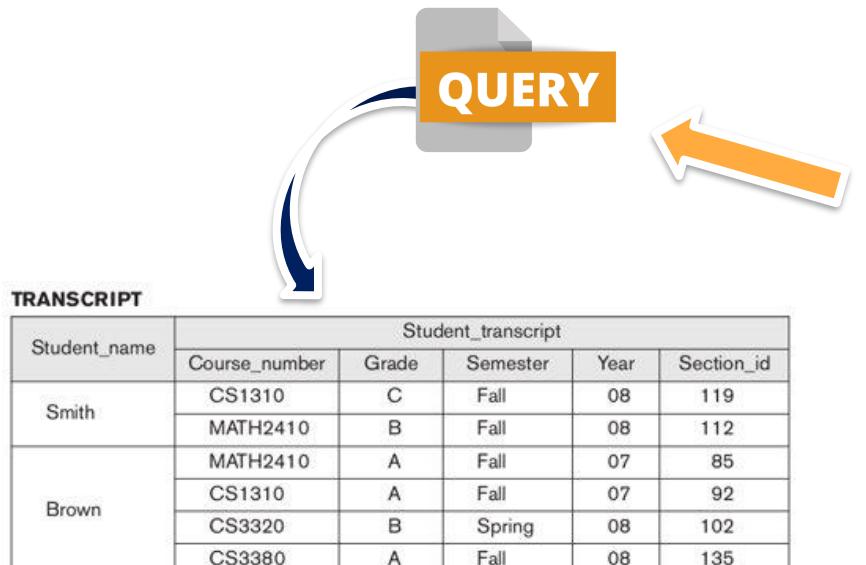
COURSE

| Course_name | Course_number | Credit_hours | Department |
|---------------------------|---------------|--------------|------------|
| Intro to Computer Science | CS1310 | 4 | CS |
| Data Structures | CS3320 | 4 | CS |
| Discrete Mathematics | MATH2410 | 3 | MATH |
| Database | CS3380 | 3 | CS |

**COURSE_PREREQUISITES**

| Course_name | Course_number | Prerequisites |
|-----------------|---------------|---------------|
| Database | CS3380 | CS3320 |
| | | MATH2410 |
| Data Structures | CS3320 | CS1310 |

Table Views



STUDENT

| Name | Student_number | Class | Major |
|-------|----------------|-------|-------|
| Smith | 17 | 1 | CS |
| Brown | 8 | 2 | CS |

GRADE_REPORT

| Student_number | Section_identifier | Grade |
|----------------|--------------------|-------|
| 17 | 112 | B |
| 17 | 119 | C |
| 8 | 85 | A |
| 8 | 92 | A |
| 8 | 102 | B |
| 8 | 135 | A |

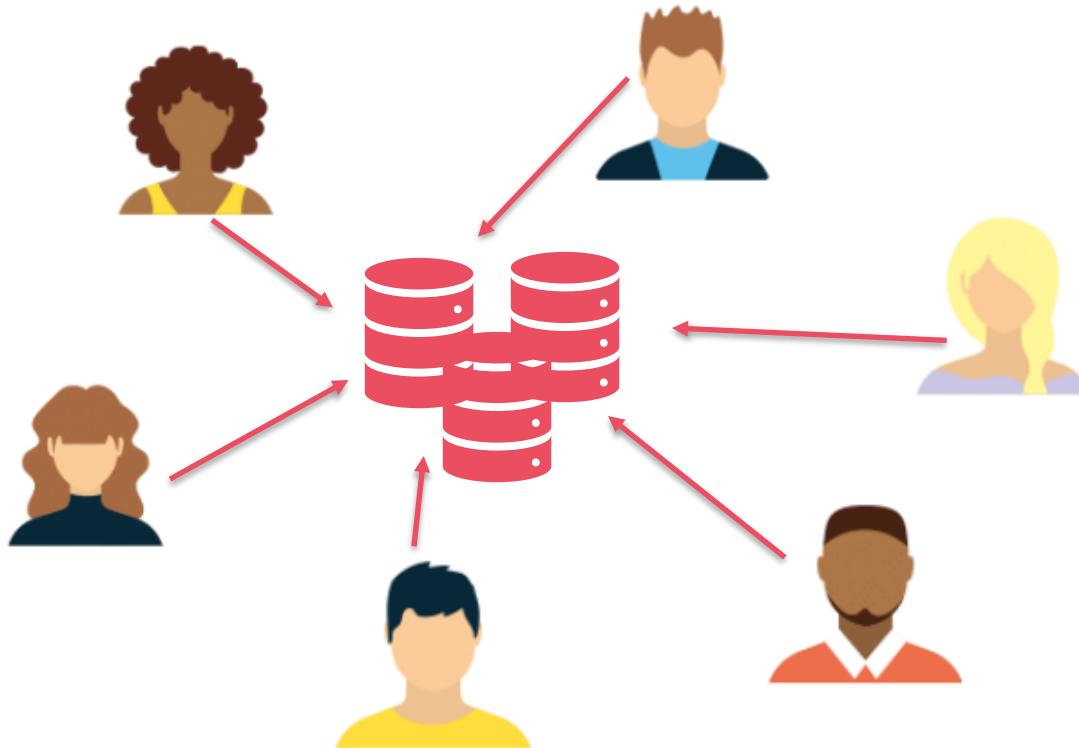
SECTION

| Section_identifier | Course_number | Semester | Year | Instructor |
|--------------------|---------------|----------|------|------------|
| 85 | MATH2410 | Fall | 07 | King |
| 92 | CS1310 | Fall | 07 | Anderson |
| 102 | CS3320 | Spring | 08 | Knuth |
| 112 | MATH2410 | Fall | 08 | Chang |
| 119 | CS1310 | Fall | 08 | Anderson |
| 135 | CS3380 | Fall | 08 | Stone |

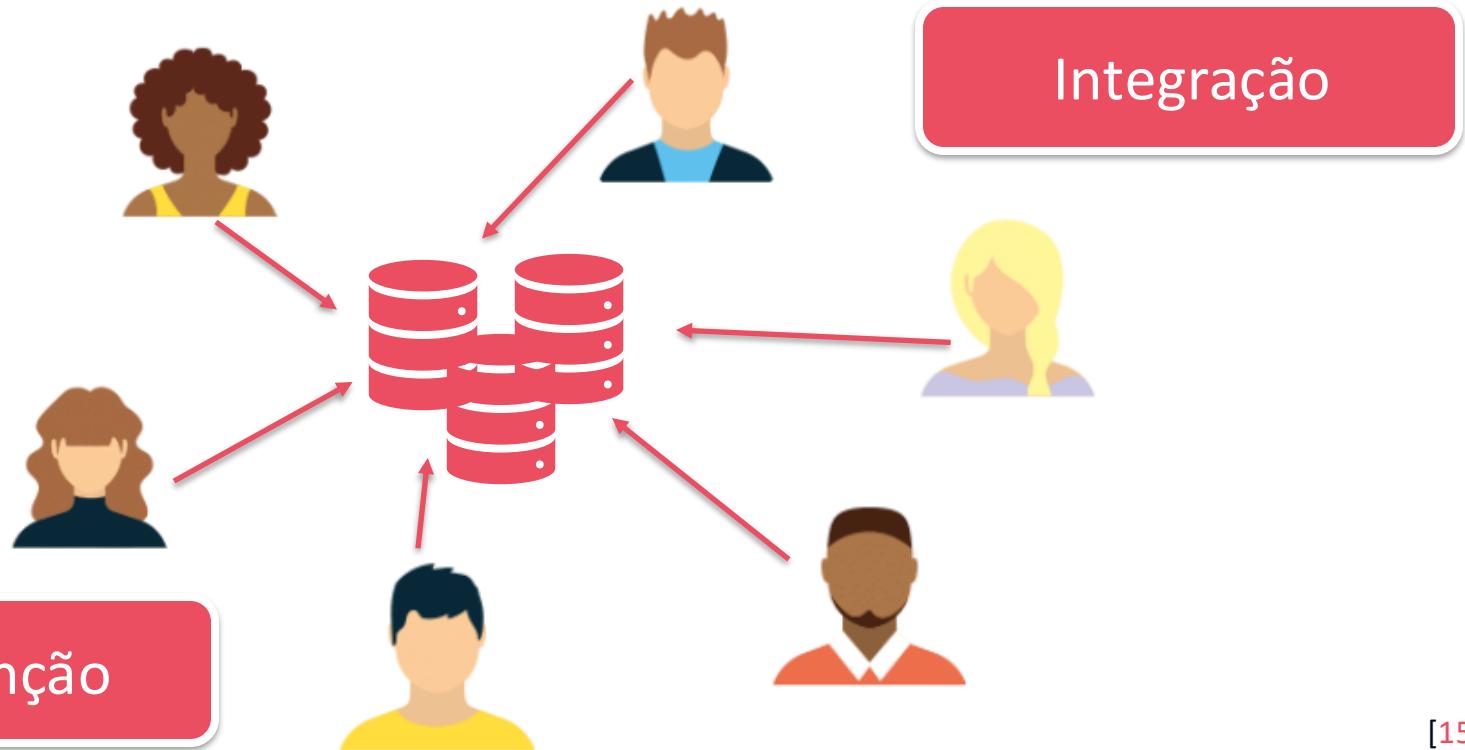
Compartilhamento de dados e processamento de transações multiusuários



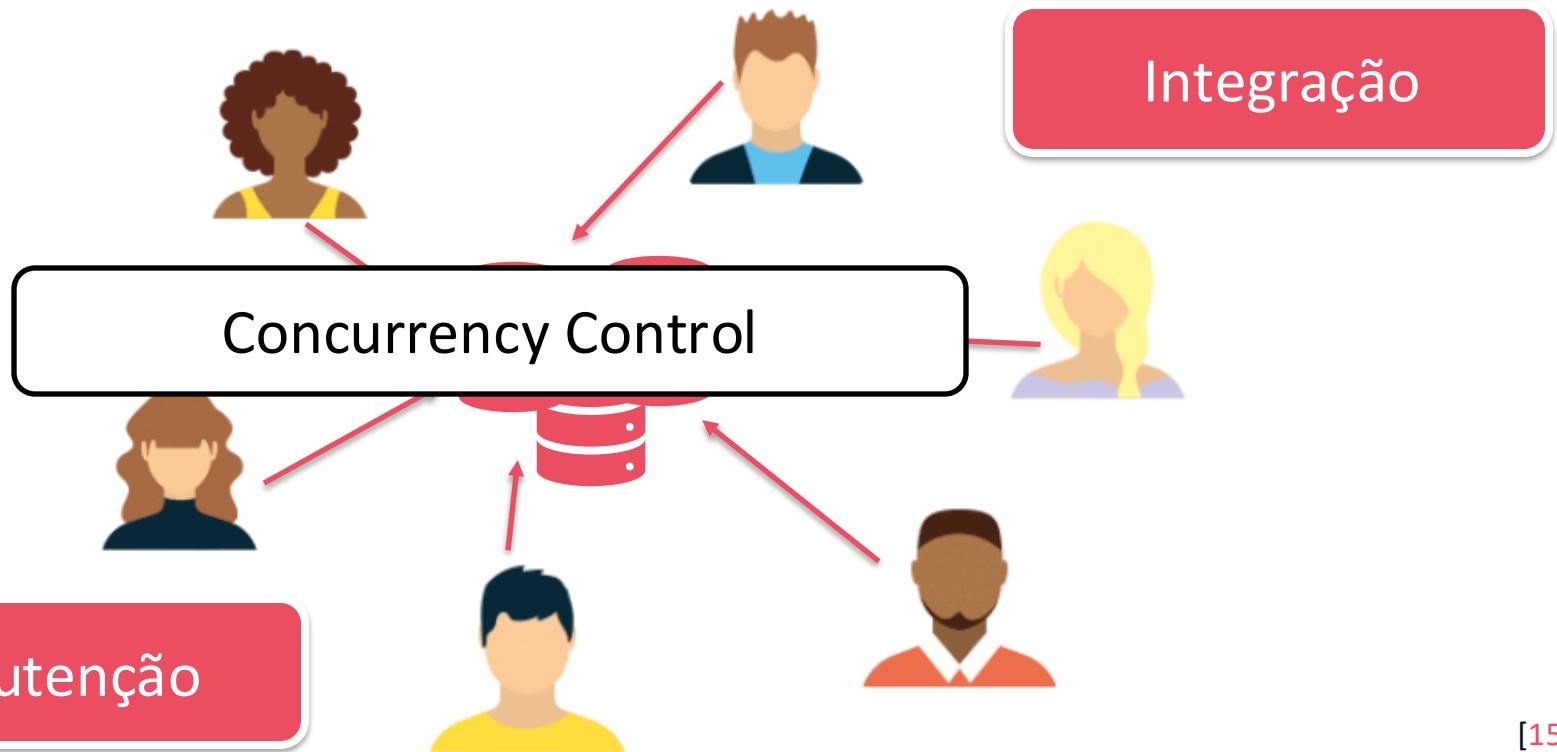
Design – Múltiplos acessos



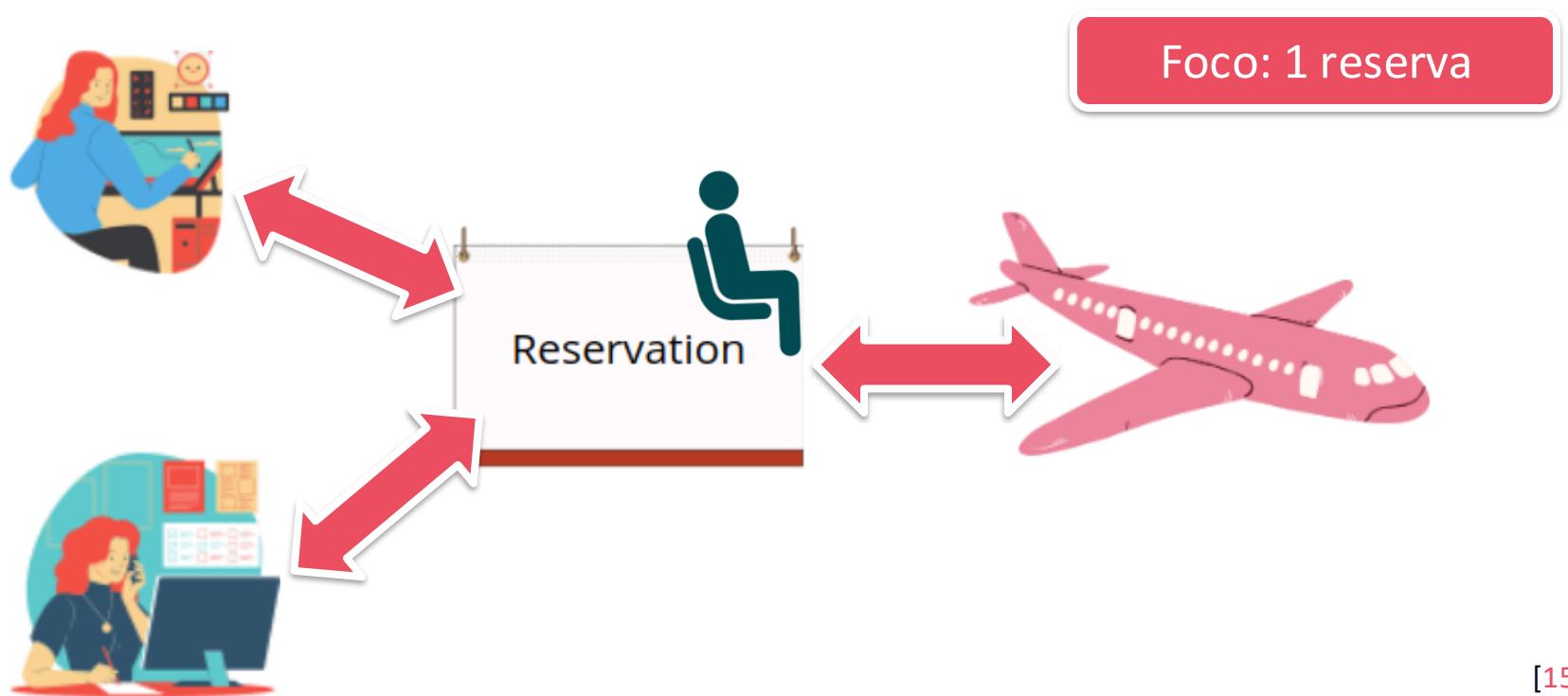
Design – Múltiplos acessos



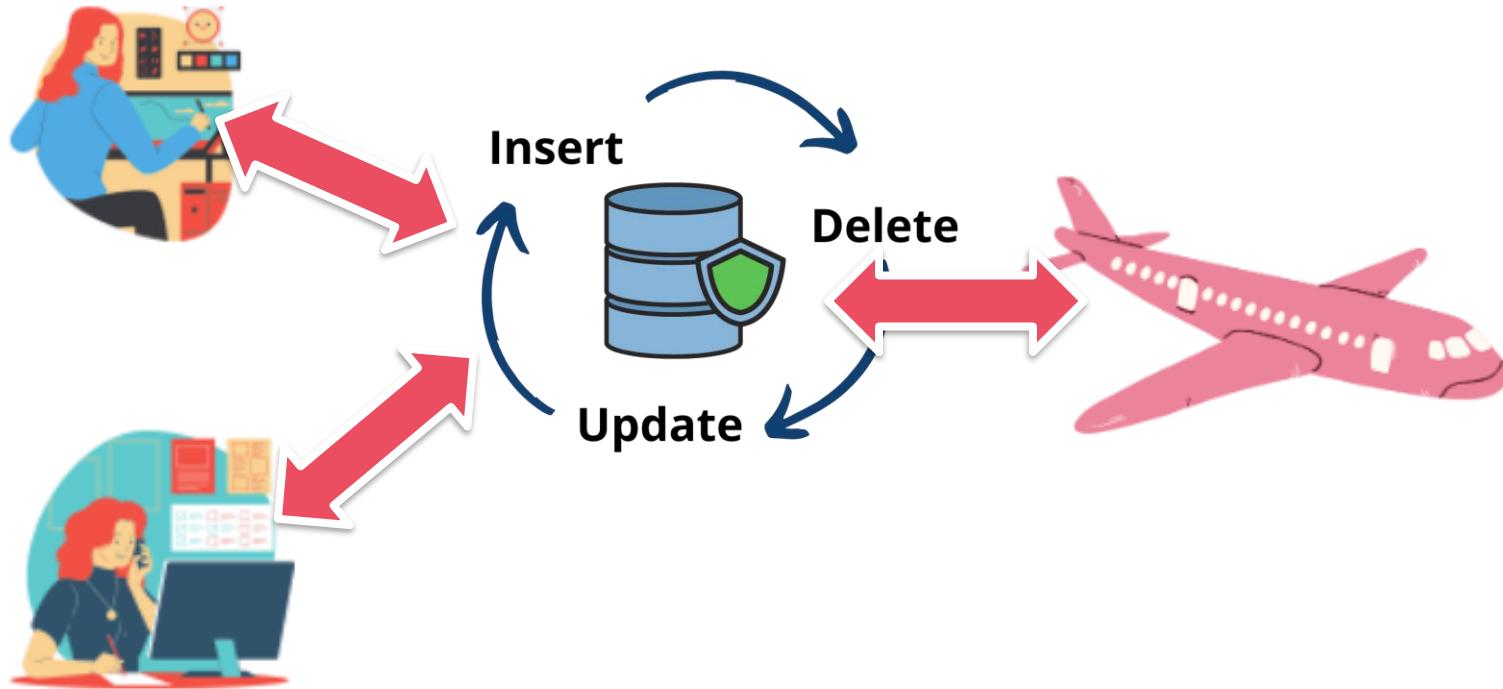
Concorrência



Múltiplos acessos



OLTP



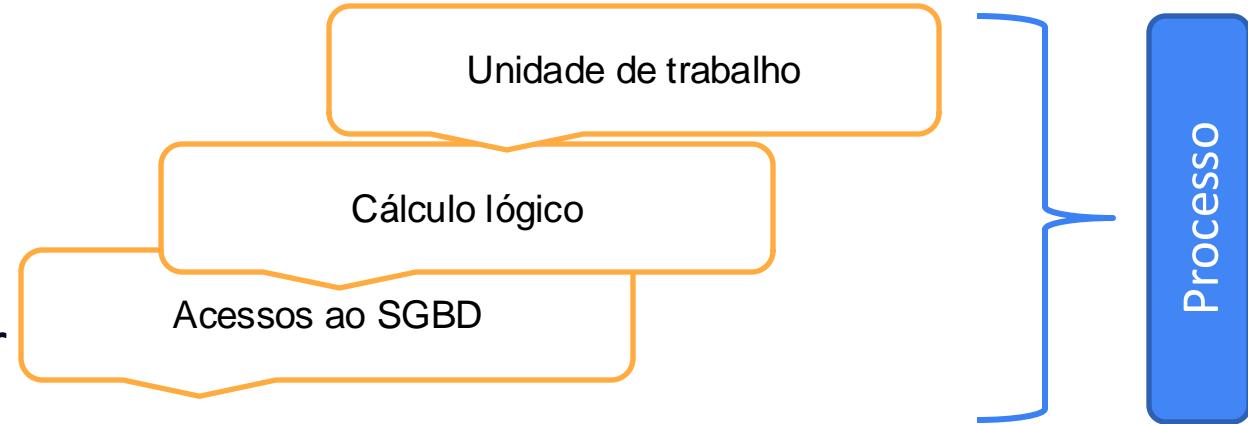
OLTP

- App multiuser
- Gerenciador: transações concorrentes

Online Transaction Processing

OLTP

- App multiuser
- Gerenciador: transações concorrentes



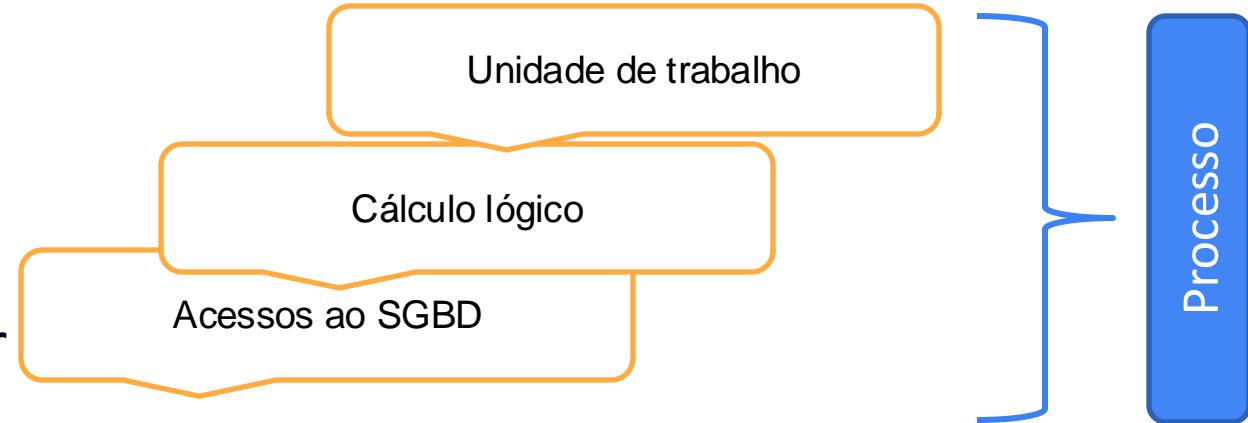
Execução sem interferência

Isolamento

Online Transaction Processing

OLTP

- App multiuser
- Gerenciador: transações concorrentes



Execução sem interferência

Atomicidade

8 ou 80!

Online Transaction Processing

OLTP



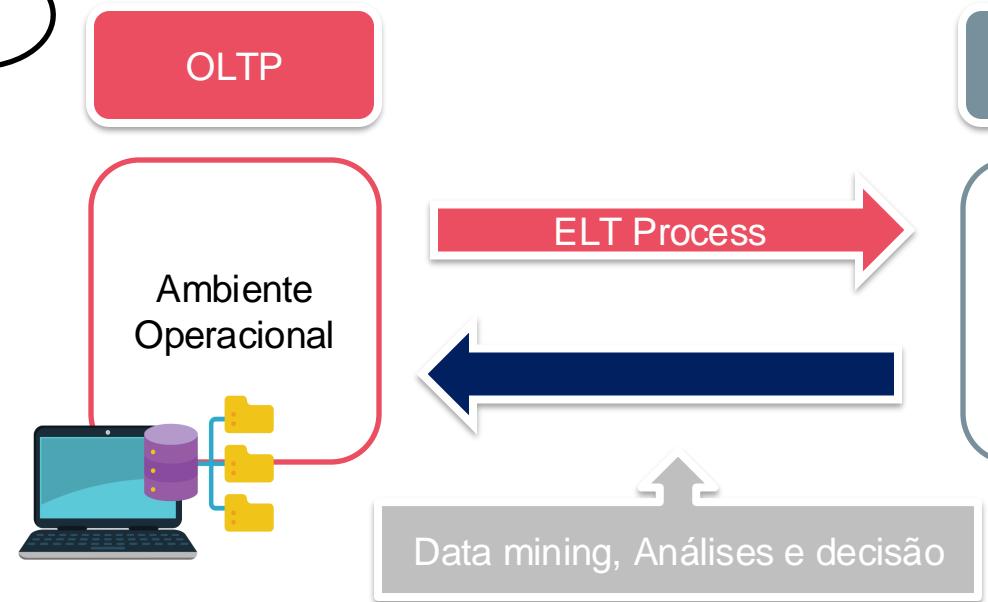
Operacional

Processamento de dados

Processamento de dados

Transaction-driven

OLTP

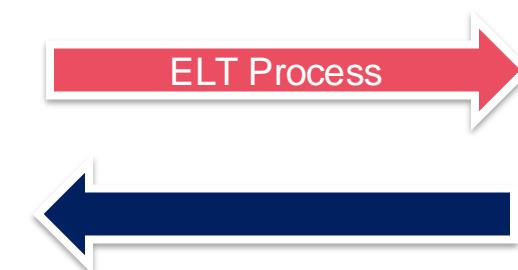


Data mining, Análises e decisão

OLTP



Data mining, Análises e decisão

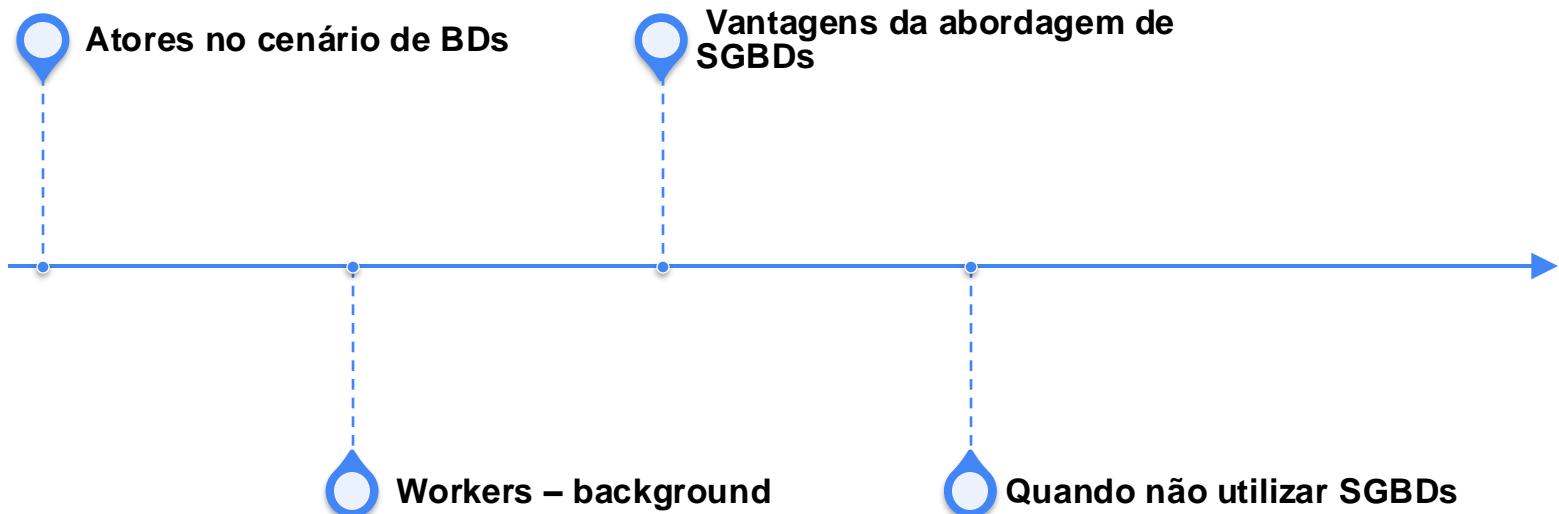


Etapa 6

Explorando abordagem de SGBDs – Atores, Workers nos bastidores, Vantagens e Quando não utilizar?

// Introdução à Banco de dados

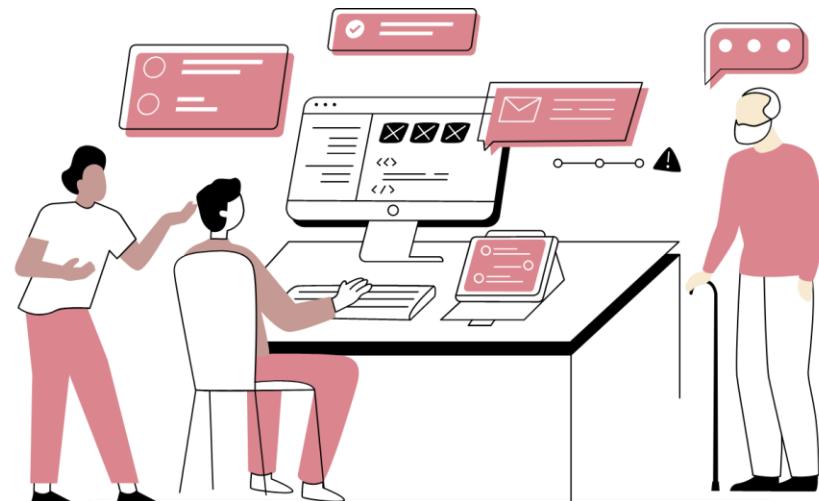
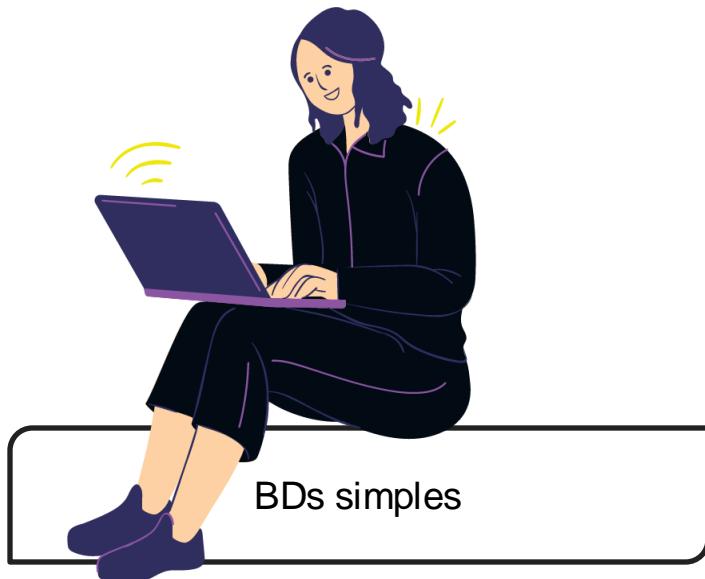
Conversa



Quais são os atores em Banco de Dados?

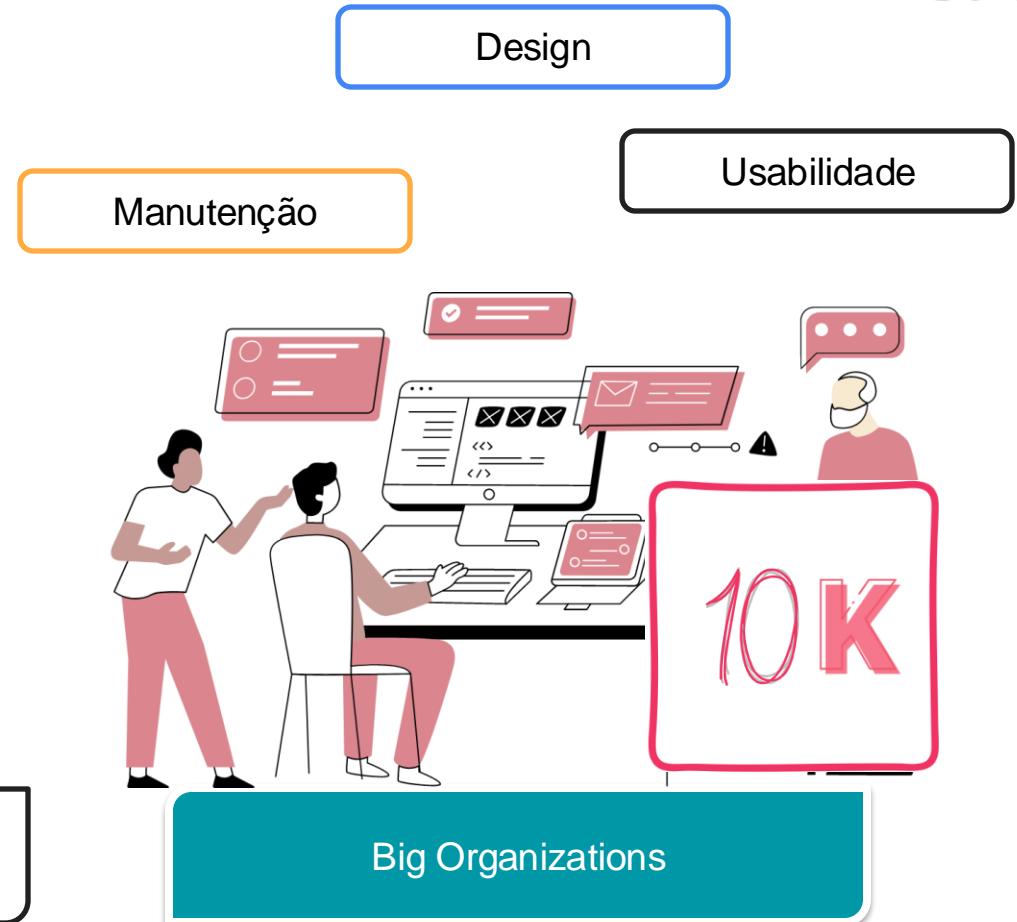
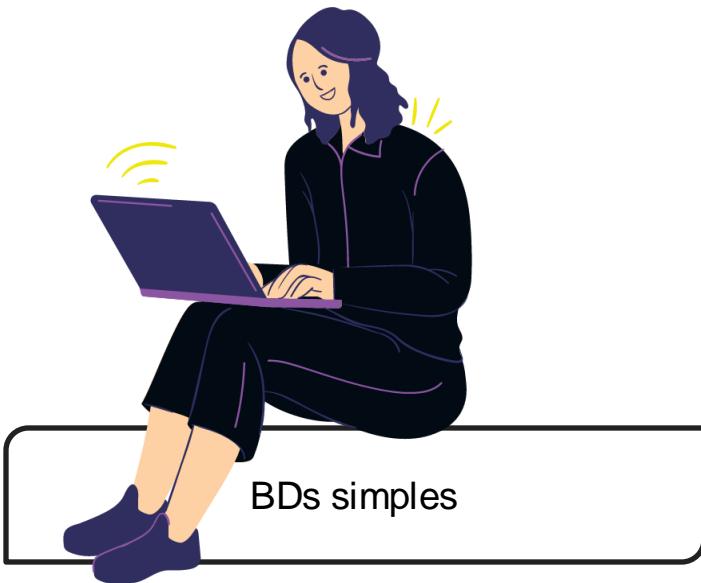


Atores



Big Organizations

Atores



Atores



Administrador

Designers

- Dia-a-dia
- Diretamente ligados ao contexto

Usuários finais



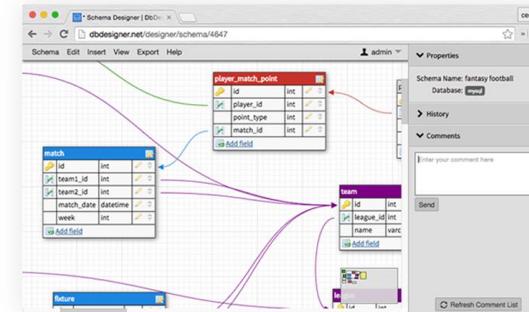
Atores - Designer



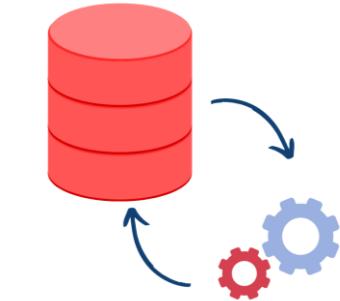
Designer

- Identificar dados e requisitos
- Represenação e Estrutura
- Fase preliminar

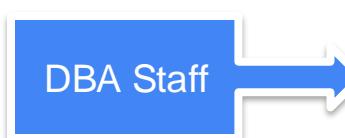
Modelagem



Atores - Administrador



- Gerencia Recursos
- Orquestração
- Autorização de acesso



Atores - Usuários Finais



- Acesso -> Querying
- Categorizados



Atores - Usuários Finais

- Casuais
- Ingênuos
- Sofisticados
- Standalone

Acessos ocasionais

Diferentes informações

Uso de APIs



Propósito do SGBD

Atores - Usuários Finais

- Casuais
- **Ingênuos**
- Sofisticados
- Standalone

Considerável porção

Canned Transactions

Erro: raro



Propósito do SGBD

Atores - Usuários Finais

- Casuais
- **Ingênuos**
- Sofisticados
- Standalone



Propósito do SGBD

Atores - Usuários Finais

- Casuais
- Ingênuos
- **Sofisticados**
- Standalone



Propósito do SGBD

Atores - Usuários Finais

- Casuais
- Ingênuos
- Sofisticados
- **Standalone**

BD pessoal



Propósito do SGBD

Atores - Usuários Finais

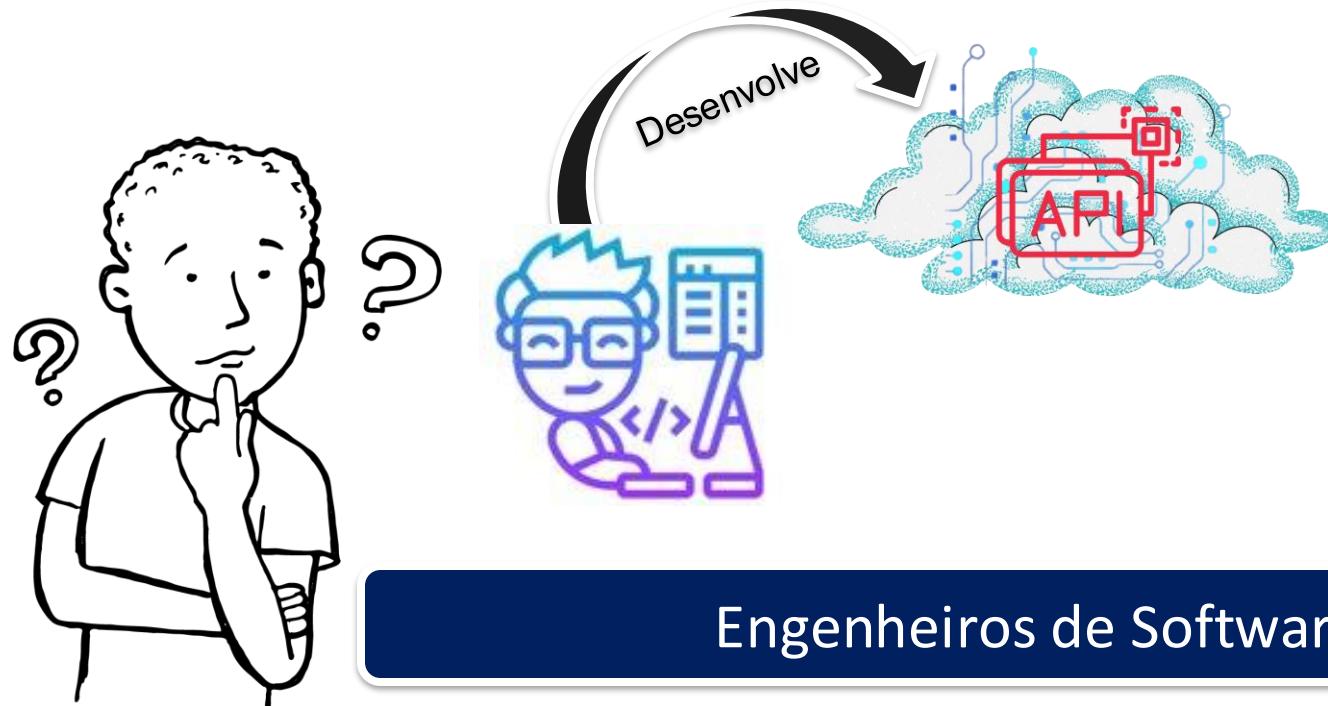


Diversas facilidades são implementadas para os users do SGBD

Atores

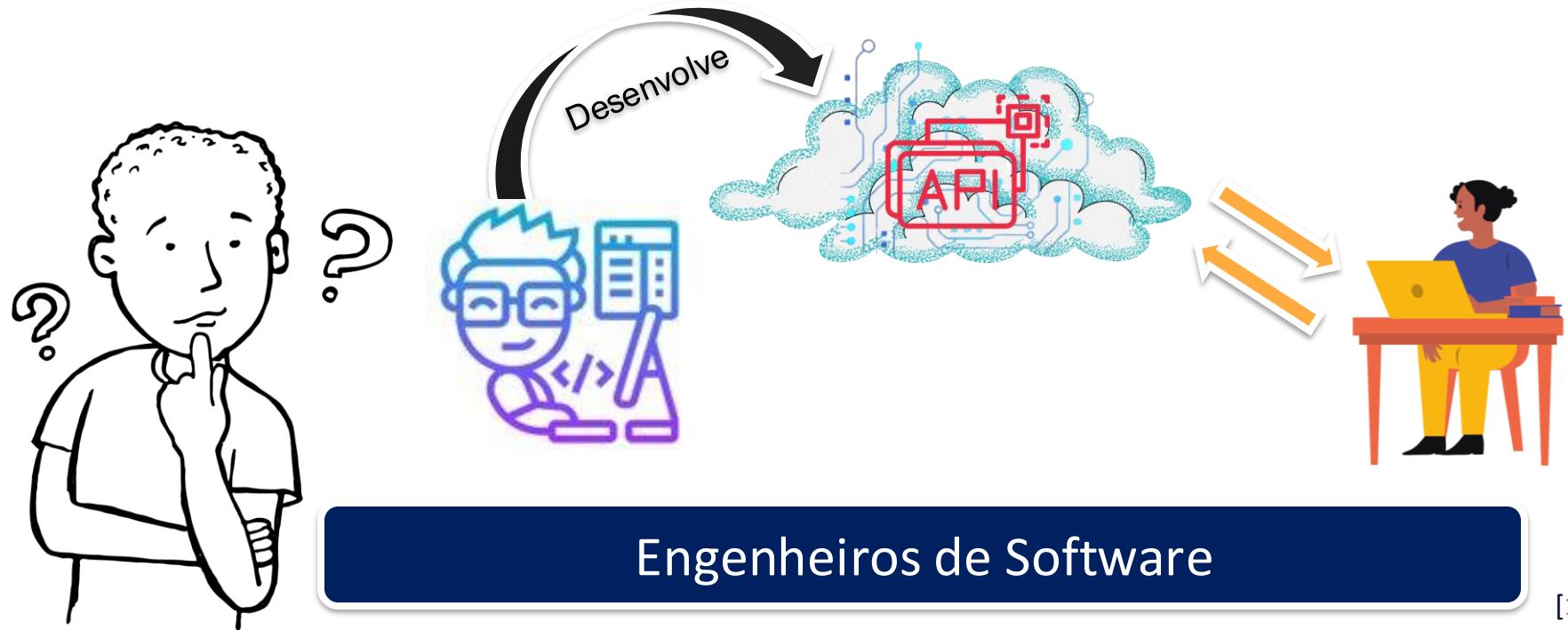


Atores

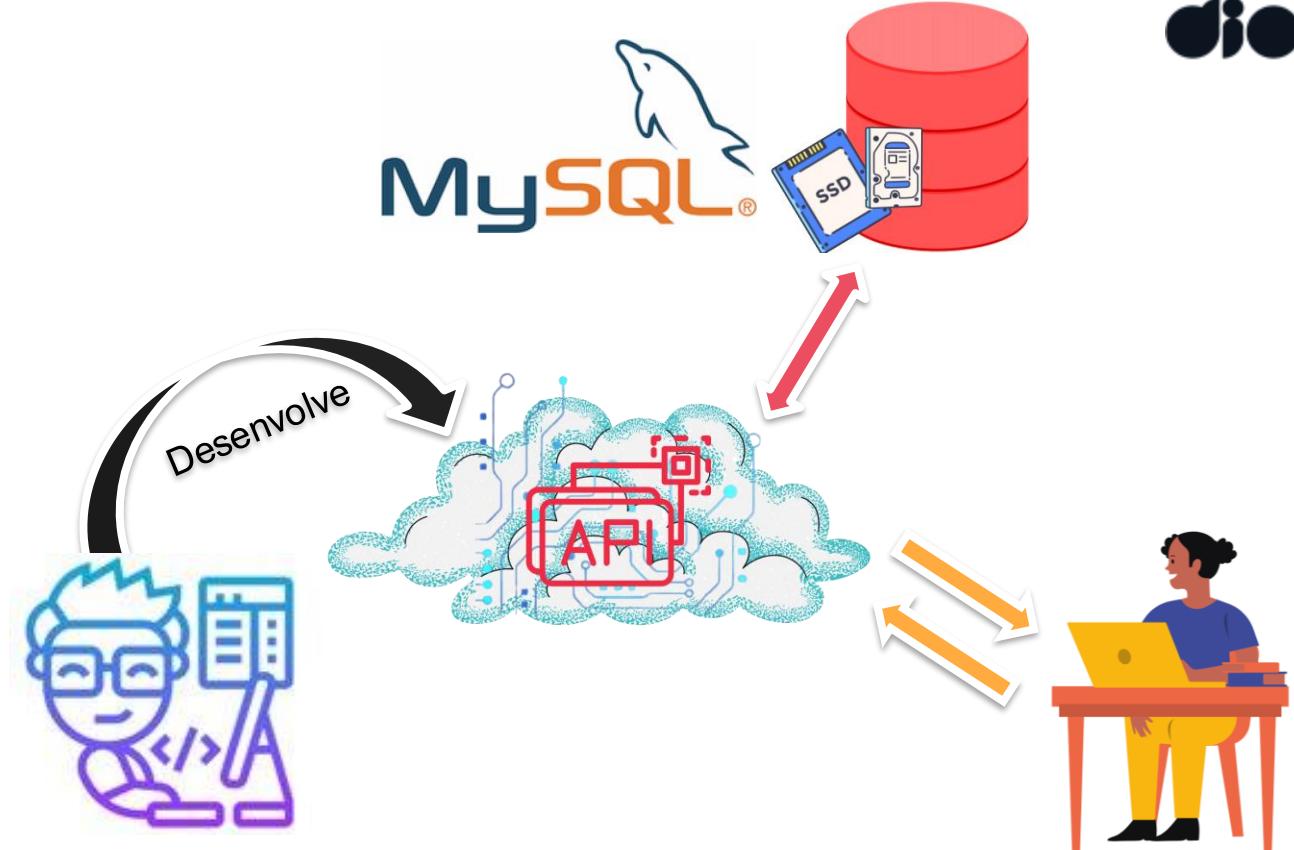


Engenheiros de Software

Atores



Atores



Engenheiros de Software

Atores

Análise de Sistema

Desenvolvimento da
aplicação

Teste e documentação da
aplicação



Engenheiros de Software

Workers em background – Banco de dados



Background

Fora do contexto de BD

Designer do sistema de SGBD

Pessoal de operação e manutenção

Implementação do sistema de SGBD

Desenvolvedores de ferramentas

Background

Mantém o SGBD disponível para users

Designer do sistema de SGBD

Pessoal de operação e manutenção

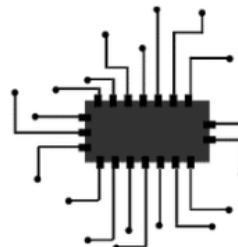
Implementação do sistema de SGBD

Desenvolvedores de ferramentas

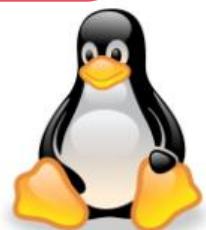
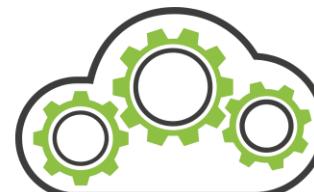
Background



Background



Responsável pelo ambiente de hardware e software para SGBD



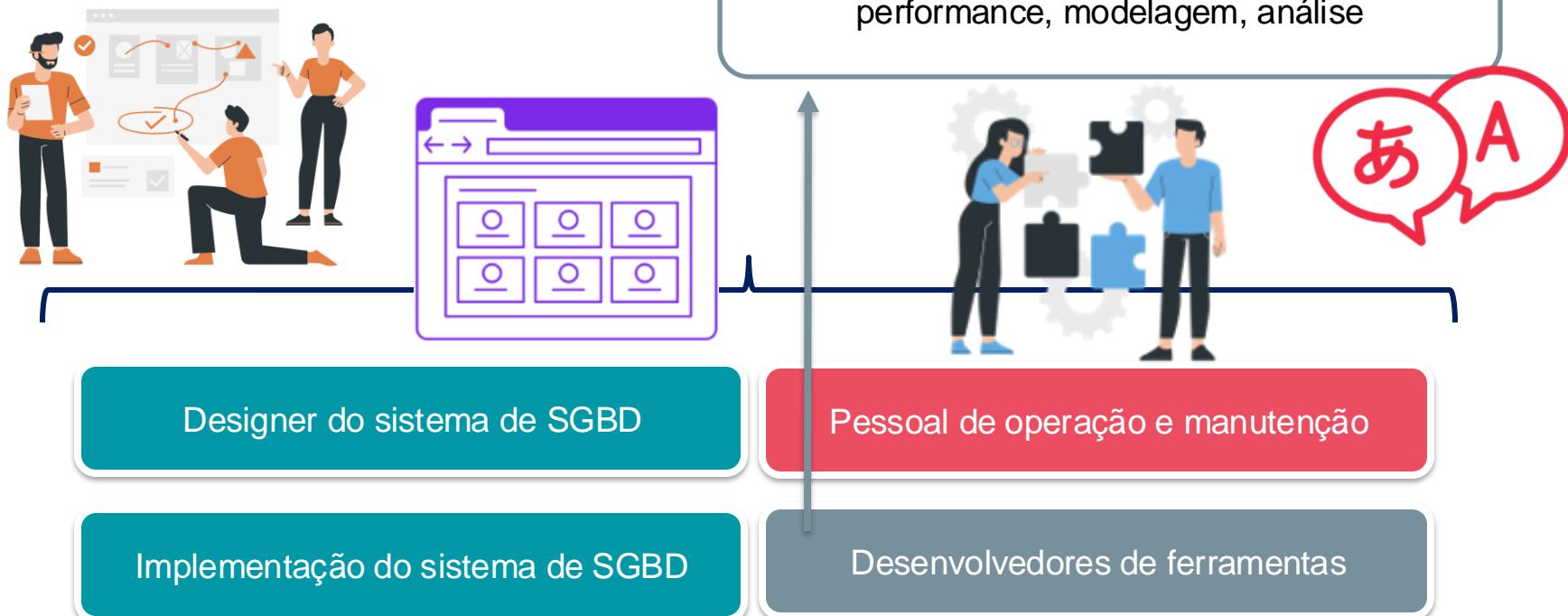
Designer do sistema de SGBD

Pessoal de operação e manutenção

Implementação do sistema de SGBD

Desenvolvedores de ferramentas

Background



Vantagens de utilizar a abordagem com SGBD



Vantagens do SGBD

Abstração

Auto-descrição

Isolamento

Compartilhamento

Múltiplas visões

Transação
multiuser

Além das 4 características...

Vantagens do SGBD



Controle de Redundância

Restrição de acesso

Storage – prove persistência

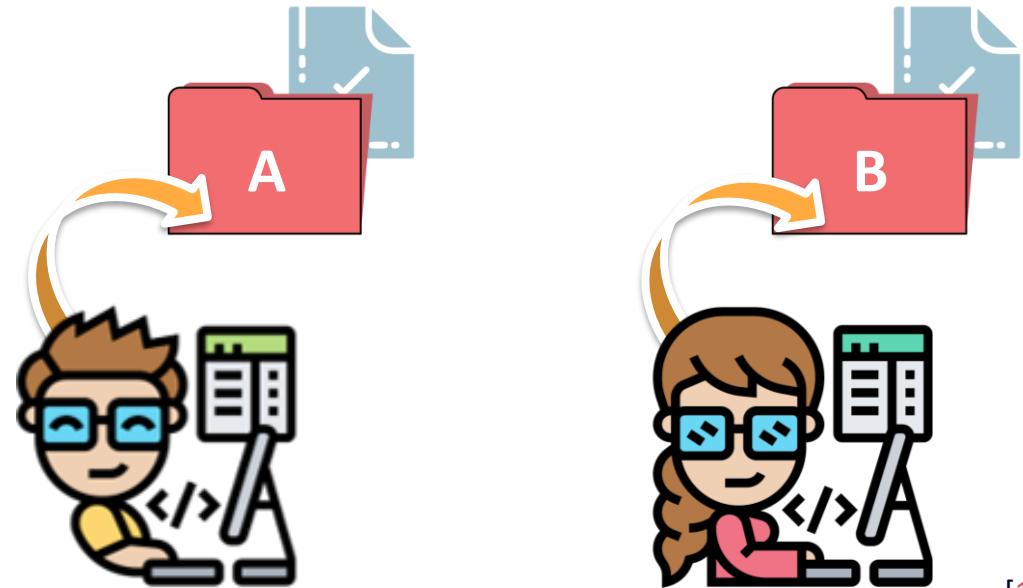
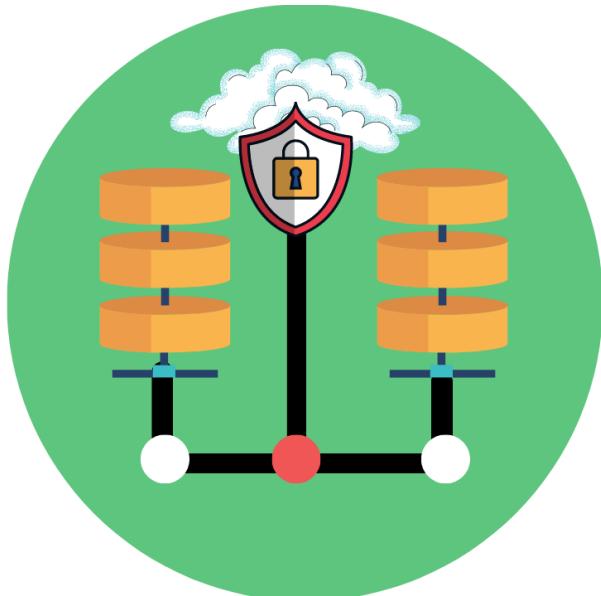
Storage – prove estrutura

Backup e Recovery

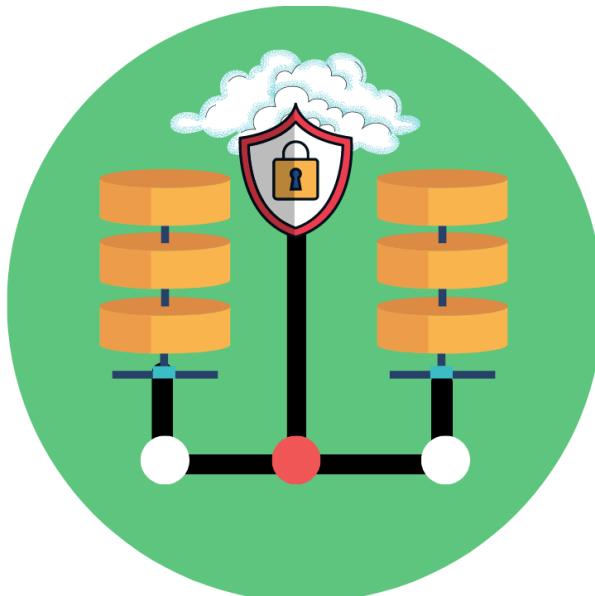


Vantagens do SGBD

Controle de Redundância



Vantagens do SGBD



Controle de Redundância

C: (storage)
Estudantes
Cursos
Relação alunoxcurso
...



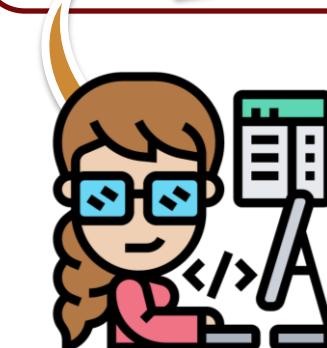
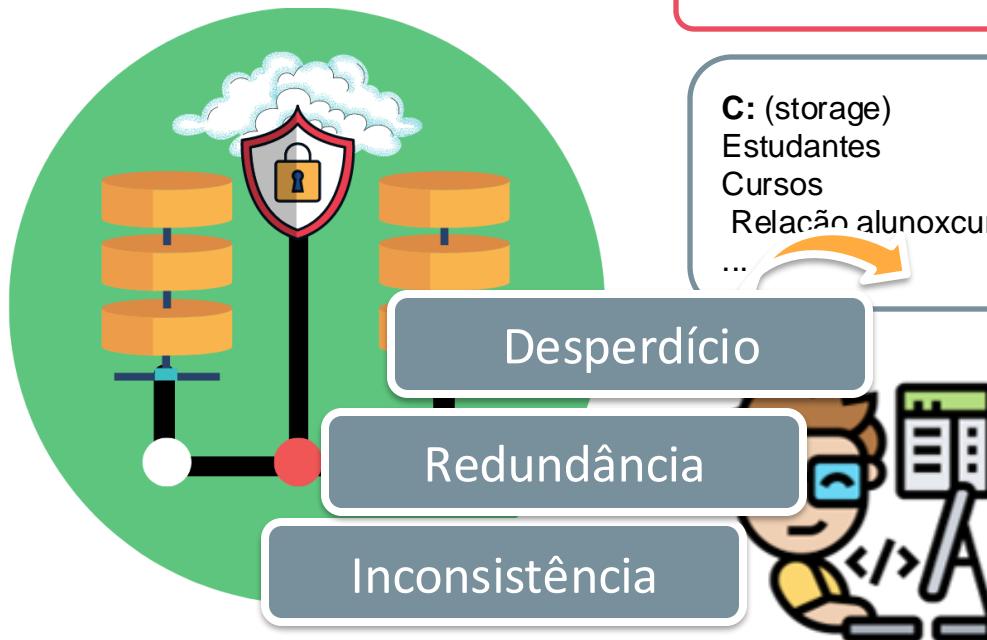
D: (storage)
Estudantes
Cursos
Relação alunoxcurso
...



Vantagens do SGBD

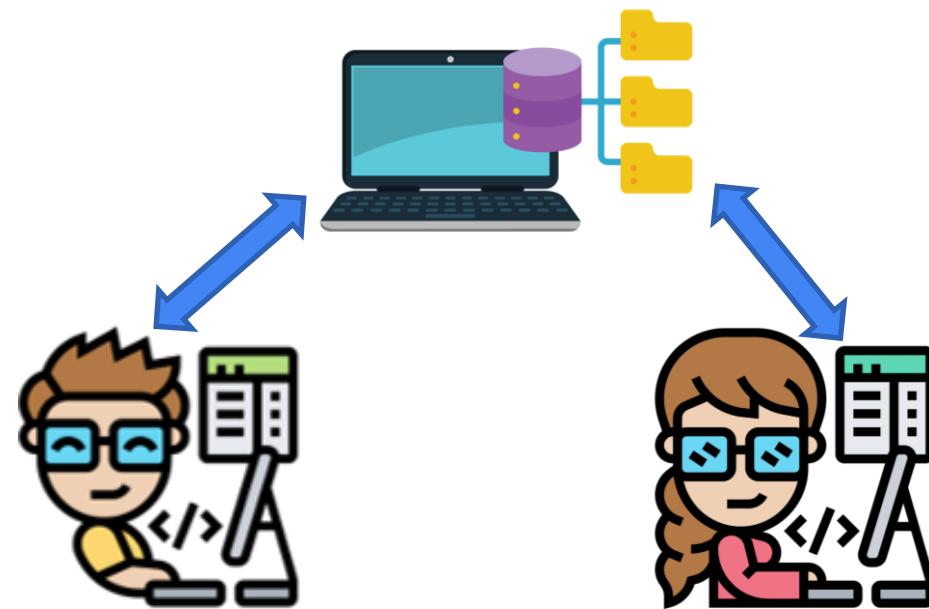
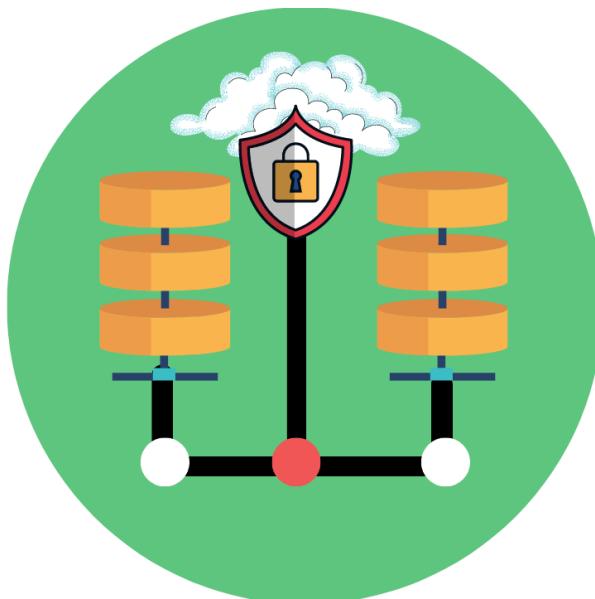
Updates desnecessários

Controle de Redundância

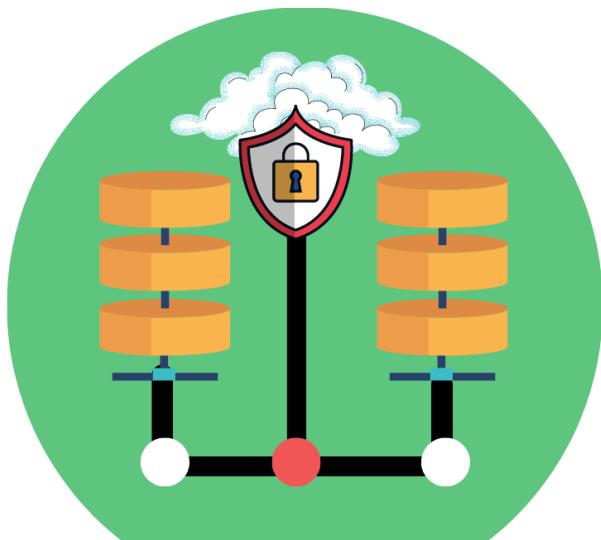


Vantagens do SGBD

Controle de Redundância



Vantagens do SGBD

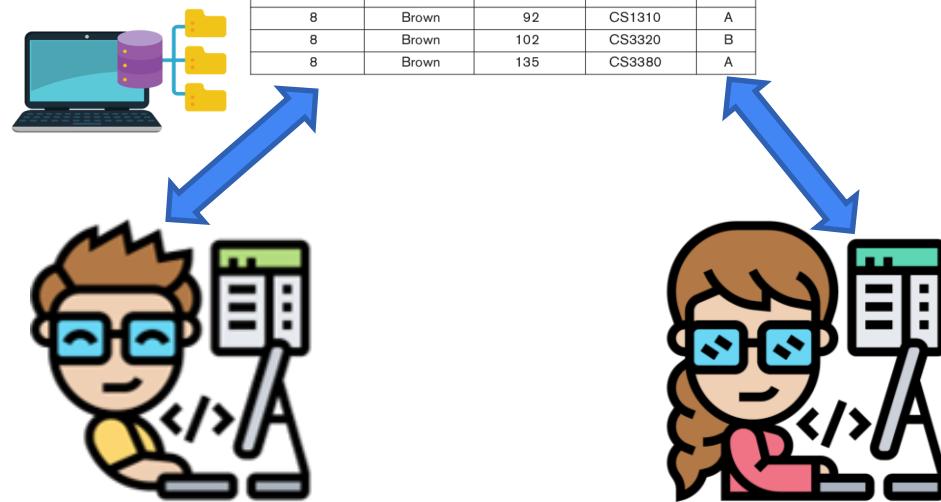


Desnormalização

Controle de Redundância

GRADE_REPORT

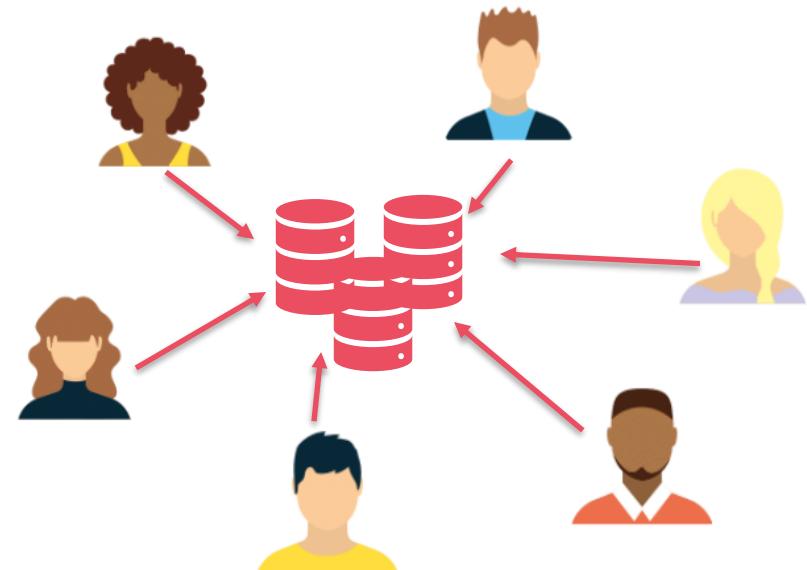
| Student_number | Student_name | Section_identifier | Course_number | Grade |
|----------------|--------------|--------------------|---------------|-------|
| 17 | Smith | 112 | MATH2410 | B |
| 17 | Smith | 119 | CS1310 | C |
| 8 | Brown | 85 | MATH2410 | A |
| 8 | Brown | 92 | CS1310 | A |
| 8 | Brown | 102 | CS3320 | B |
| 8 | Brown | 135 | CS3380 | A |



Vantagens do SGBD



Restrição de acesso



Vantagens do SGBD

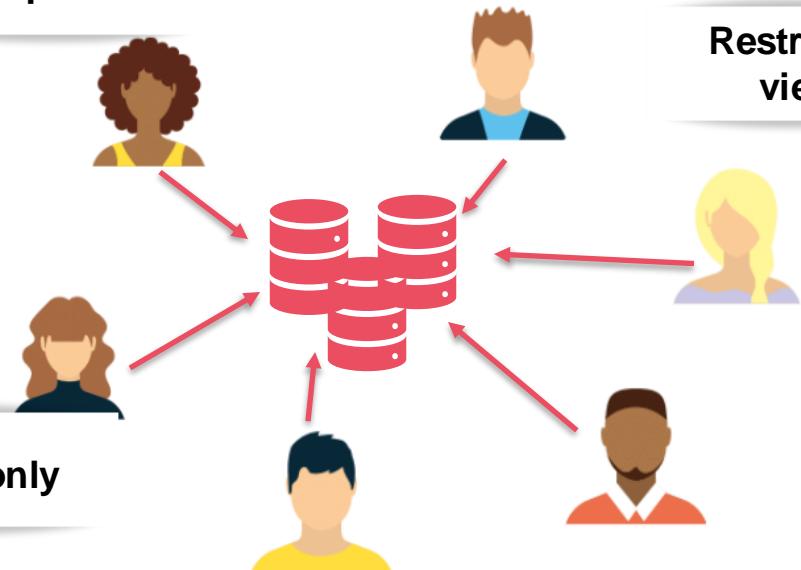


Restrição de acesso

Update

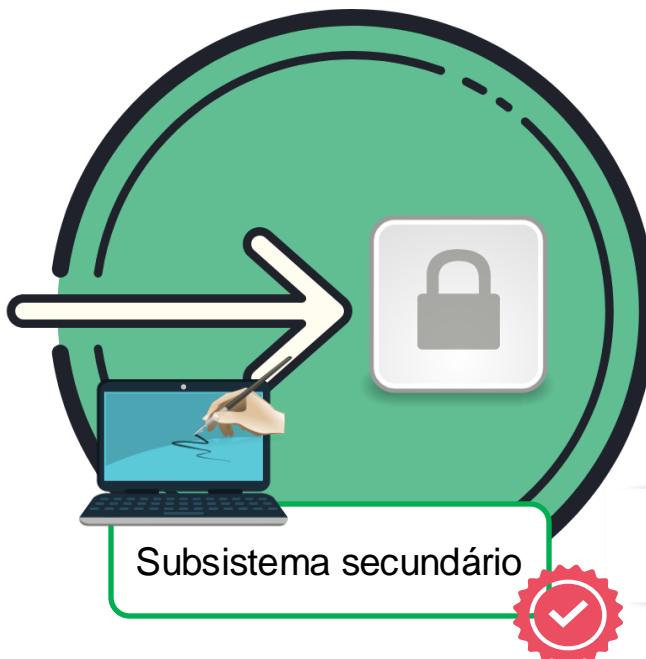
Restricted view

Read-only



Vantagens do SGBD

DBA



Restrição de acesso

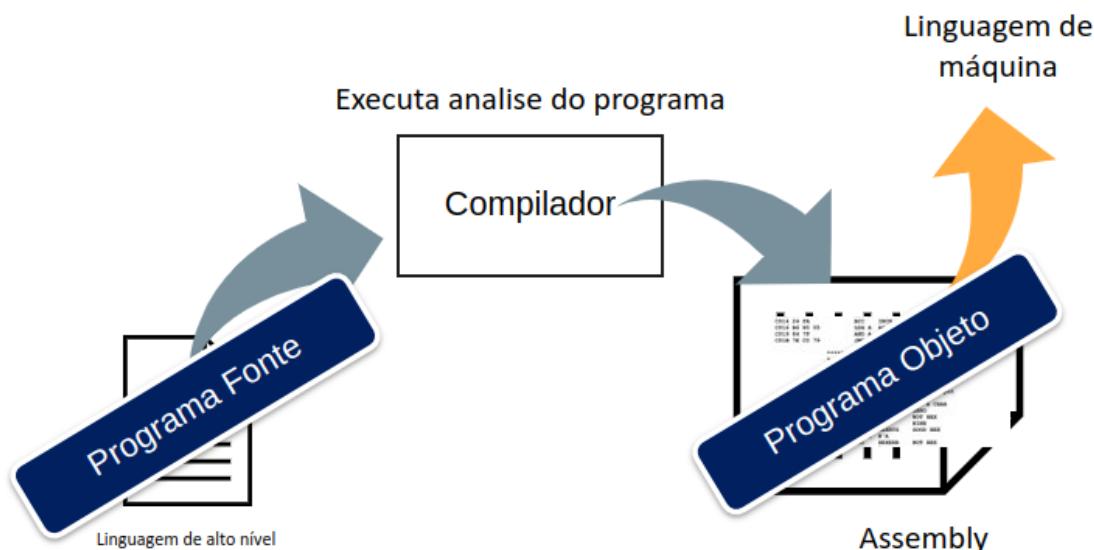
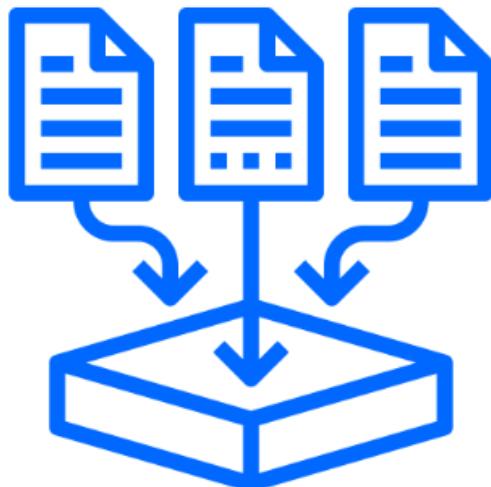
Update

Restricted view

Read-only

Vantagens do SGBD

Provendo Persistência

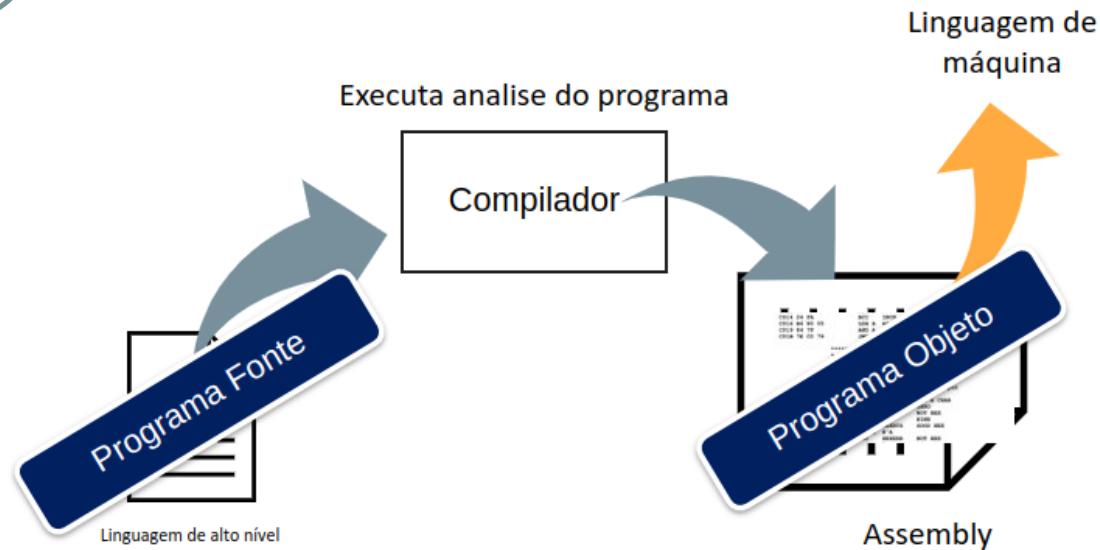


Vantagens do SGBD

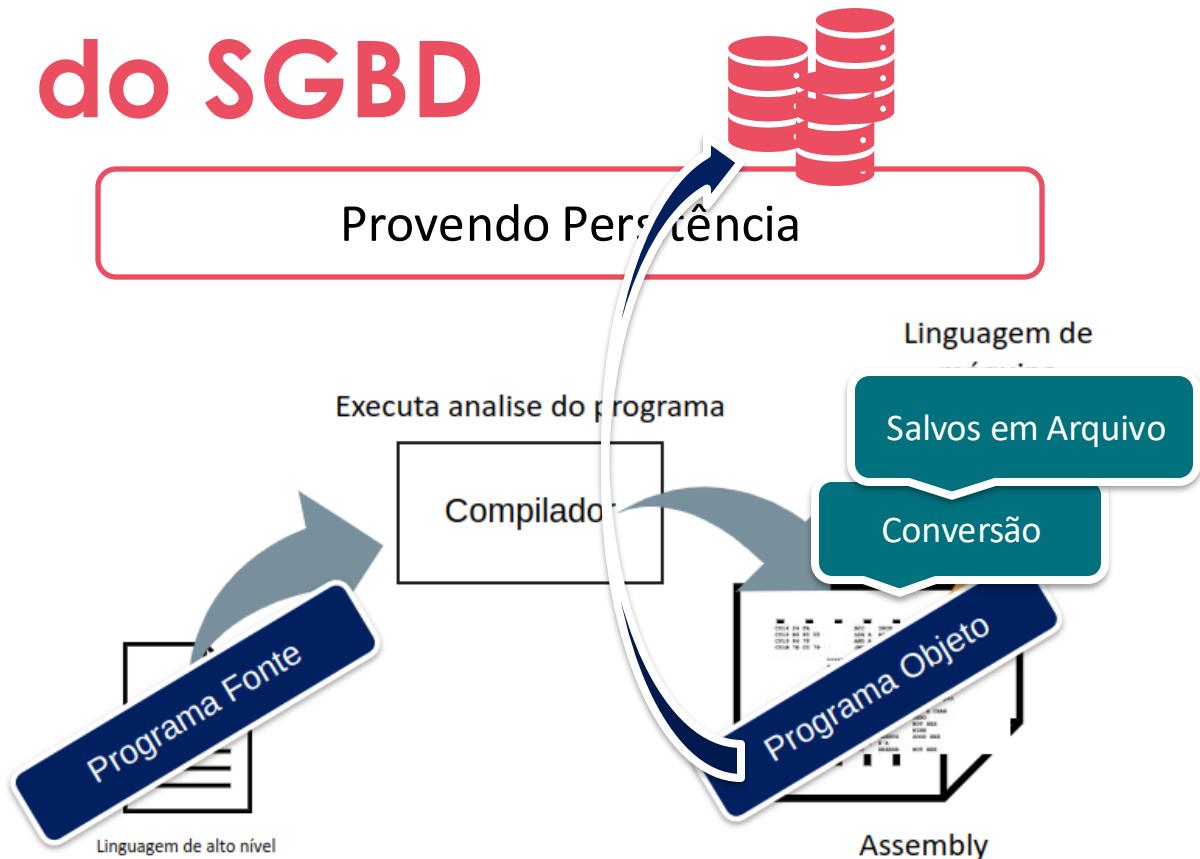
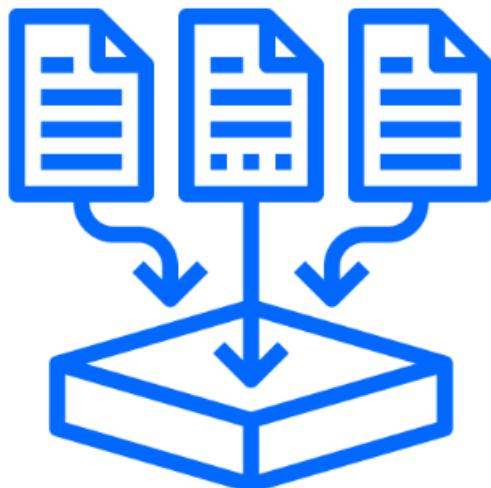
O que acontece com
os dados de um
programa objeto?



Provendo Persistência

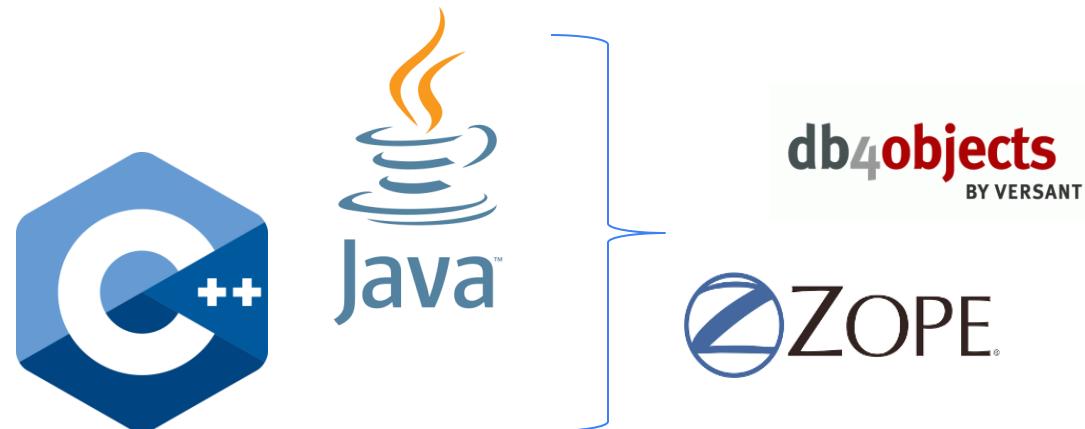
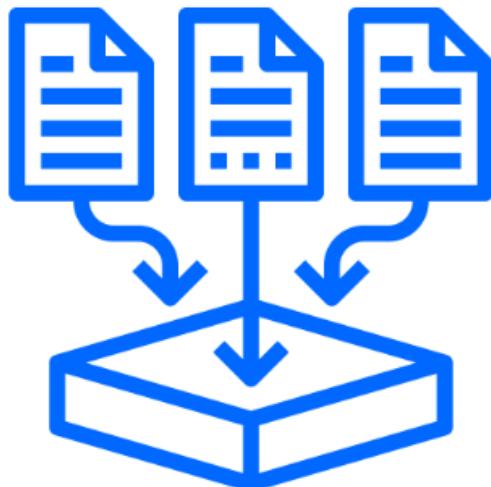


Vantagens do SGBD



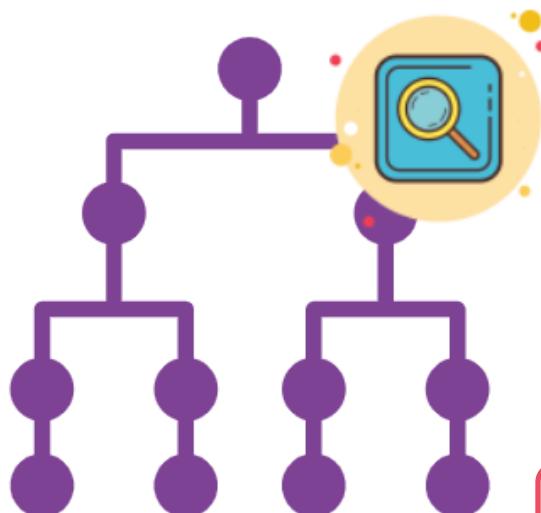
Vantagens do SGBD

Provendo Persistência



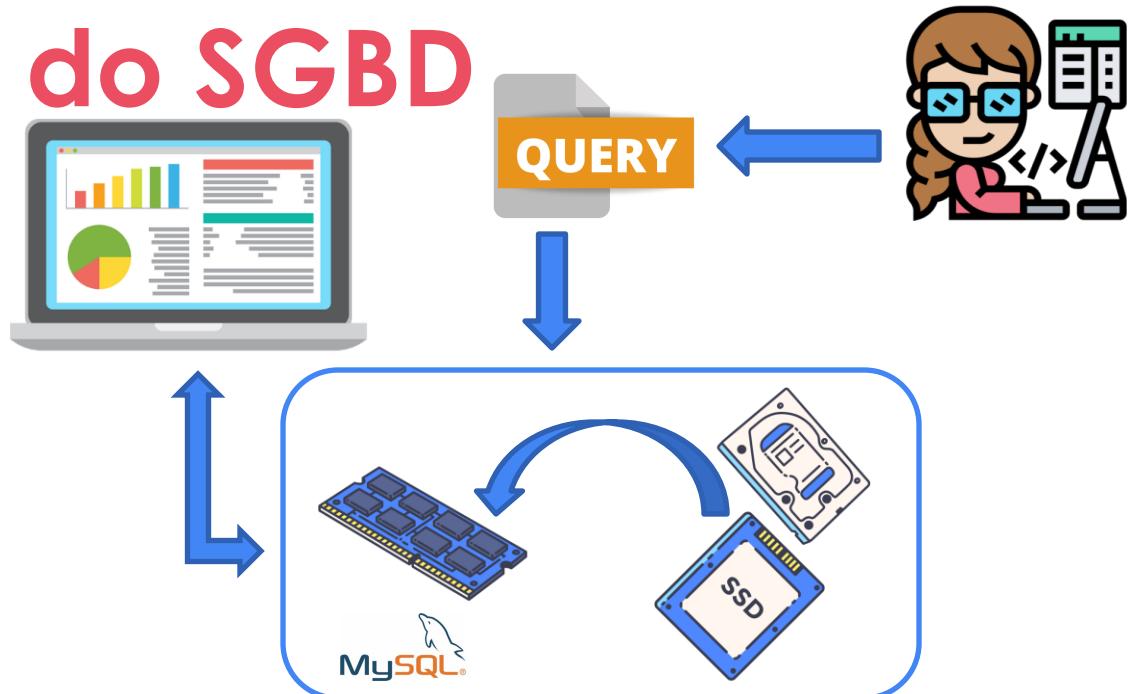
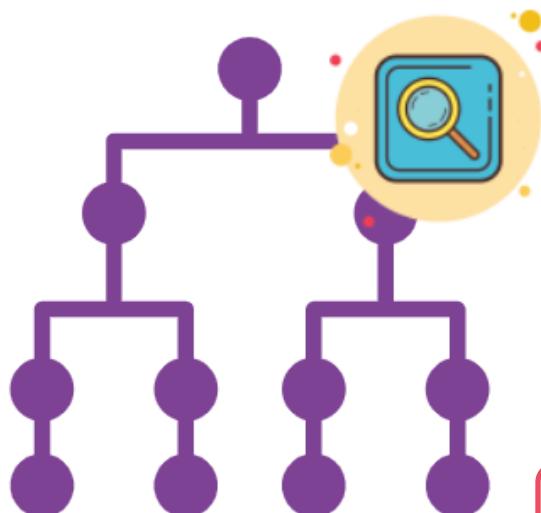
Impedance Mismatch Problem

Vantagens do SGBD



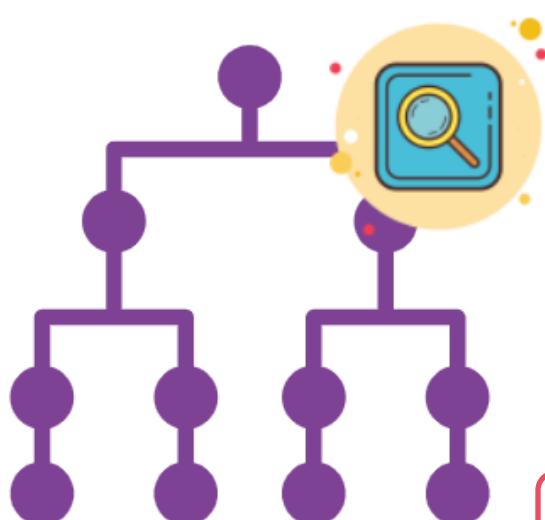
Estrutura de armazenamento e Técnicas de busca

Vantagens do SGBD



Estrutura de armazenamento e Técnicas de busca

Vantagens do SGBD



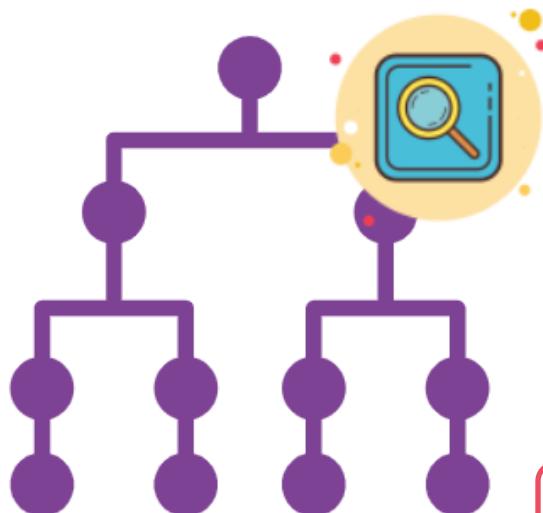
```
SELECT course_nome FROM COURSES WHERE  
Credit_hours = MAX(Credit_hours)
```

COURSE

| Course_name | Course_number | Credit_hours | Department |
|---------------------------|---------------|--------------|------------|
| Intro to Computer Science | CS1310 | 4 | CS |
| Data Structures | CS3320 | 4 | CS |
| Discrete Mathematics | MATH2410 | 3 | MATH |
| Database | CS3380 | 3 | CS |

Estrutura de armazenamento e Técnicas de busca

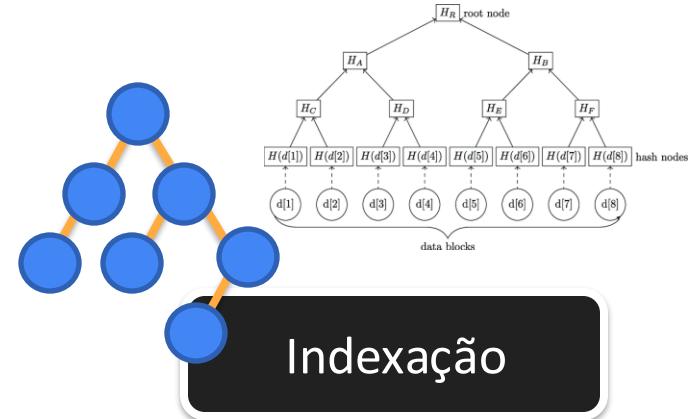
Vantagens do SGBD



Caching

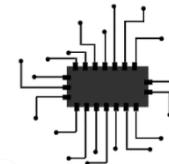
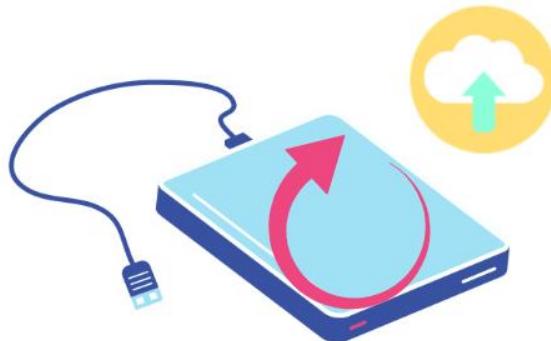
Buffering

Estrutura de armazenamento e Técnicas de busca

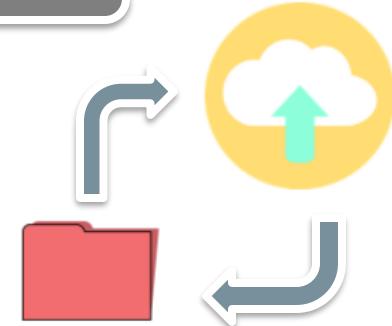


Vantagens do SGBD

Backup e Recovery

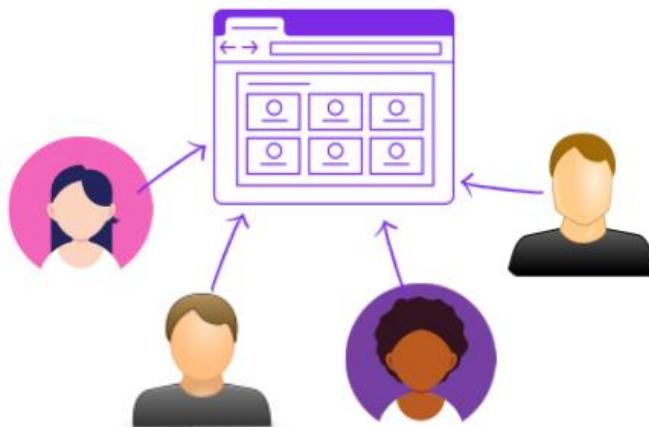


Recursos de Recovery



Vantagens do SGBD

Provendo interface Multi-user



Perfis de usuário

Interfaces

Vantagens do SGBD

Mobile apps

Provendo interface Multi-user

Natural Language Interface

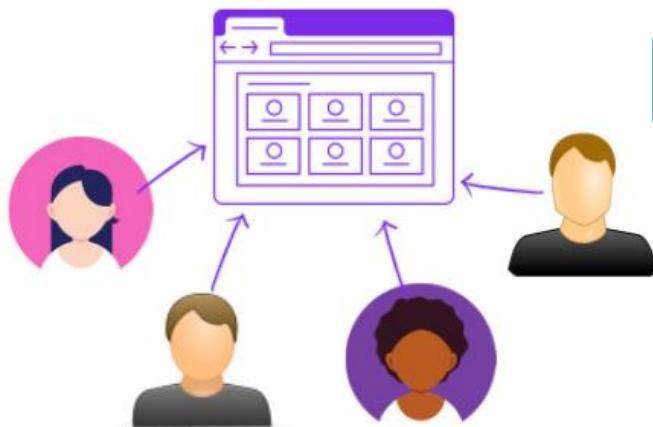
Query language

Forms & command codes



Menu-driven

Programming lang. interface



Vantagens do SGBD



Repres. Relações complexas

- Variedade de dados inter-relacionados

STUDENT

| Name | Student_number | Class | Major |
|-------|----------------|-------|-------|
| Smith | 17 | 1 | CS |
| Brown | 8 | 2 | CS |

GRADE_REPORT

| Student_number | Section_identifier | Grade |
|----------------|--------------------|-------|
| 17 | 112 | B |
| 17 | 119 | C |
| 8 | 85 | A |
| 8 | 92 | A |
| 8 | 102 | B |
| 8 | 135 | A |

Vantagens do SGBD

Integridade de dados



Data type



Definição e Imposição



Vantagens do SGBD

Integridade de dados



COURSE

| Course_name | Course_number | Credit_hours | Department |
|----------------------------------|---------------|--------------|------------|
| Introduction to Computer Science | CS1310 | 4 | CS |
| Data Structures | CS3320 | 4 | CS |
| Discrete Mathematics | MATH2410 | 3 | MATH |
| Database | CS3380 | 3 | CS |

SECTION

| Section_identifier | Course_number | Semester | Year | Instructor |
|--------------------|---------------|----------|------|------------|
| 85 | MATH2410 | Fall | 07 | King |
| 92 | CS1310 | Fall | 07 | Anderson |
| 102 | CS3320 | Spring | 08 | Knuth |
| 112 | MATH2410 | Fall | 08 | Chang |
| 119 | CS1310 | Fall | 08 | Anderson |
| 135 | CS3380 | Fall | 08 | Stone |



Integridade
de
Referência

Vantagens do SGBD

Integridade de dados



Regras de Domínio

Asserções

Integridade Referencial

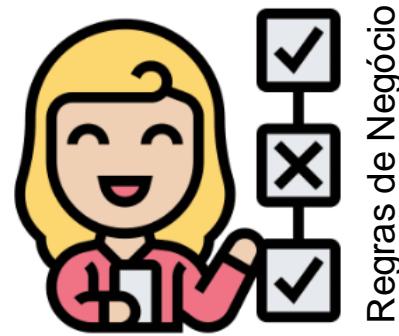
Gatilhos

Dependências Funcionais

Constrains and Triggers

Vantagens do SGBD

Integridade de dados

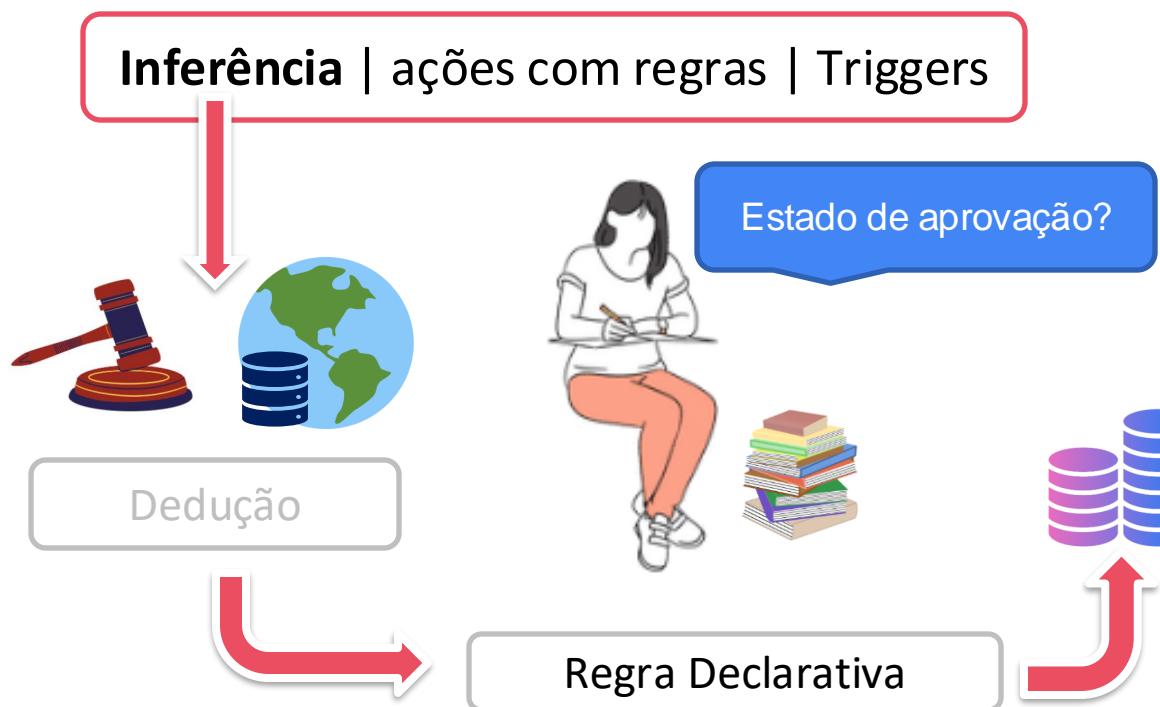
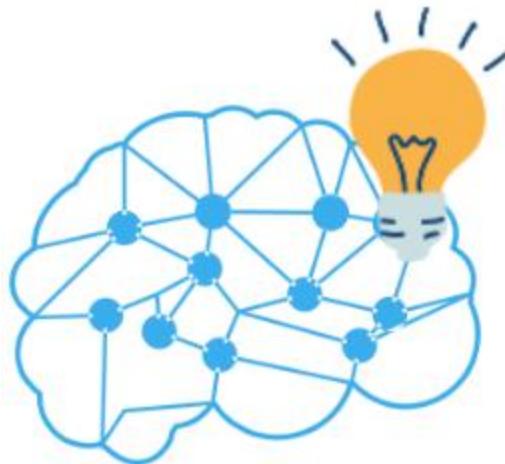


Regras de Negócio

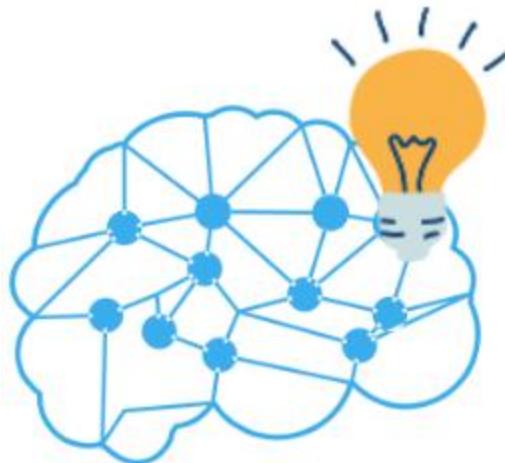


Semântica

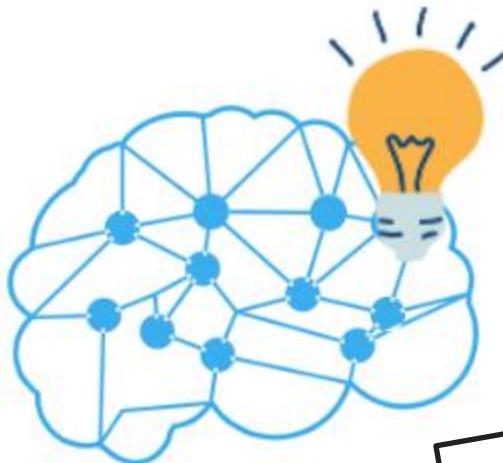
Vantagens do SGBD



Vantagens do SGBD



Vantagens do SGBD



Inferência | ações com regras | Triggers

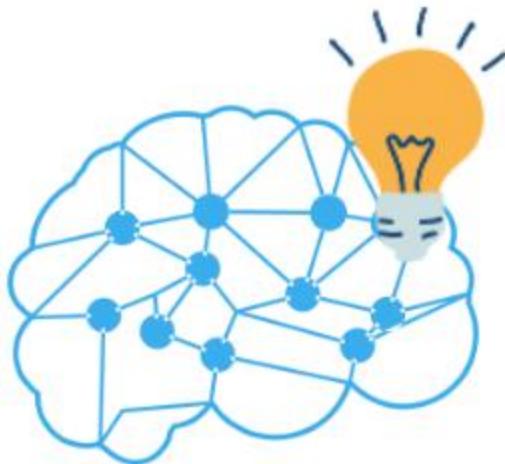
Regras e dedução

Prog. Procedural

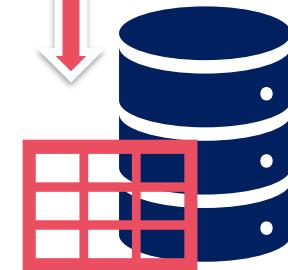
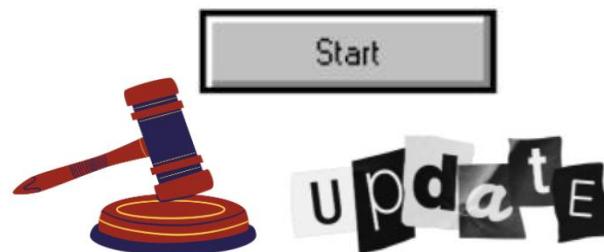
Regra Declarativa



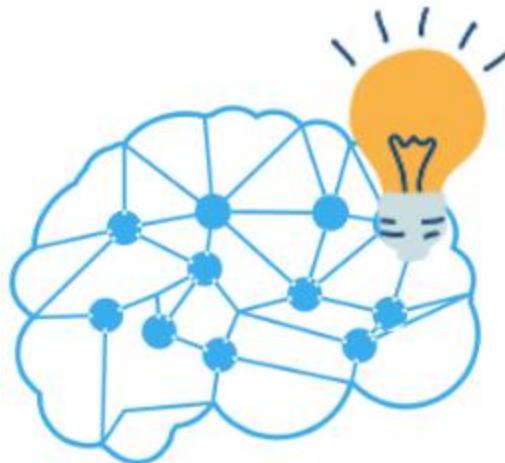
Vantagens do SGBD



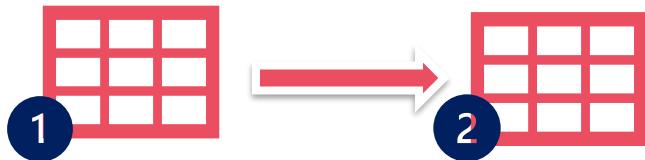
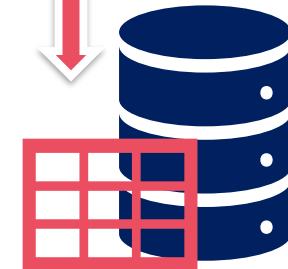
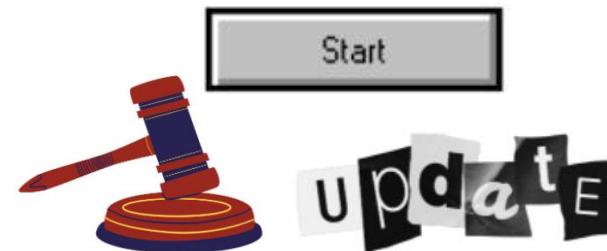
Inferência | ações com regras | Triggers



Vantagens do SGBD



Inferência | ações com regras | Triggers



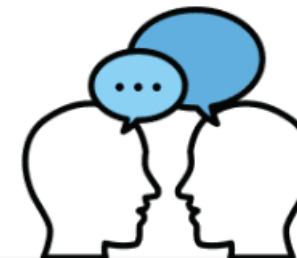
Ganhos em utilizar Sistemas de Gerenciamento de Banco de Dados



Ganhos com SGBD



- Padronização
- Redução de tempo no desenvolvimento da aplicação
- Flexibilidade
- Disponibilidade de info atualizadas
- Economia com escalabilidade



Ganhos com SGBD

Entre databases dentro da organização.



- Padronização

• Redução de tempo no desenvolvimento da

Tipos de dados

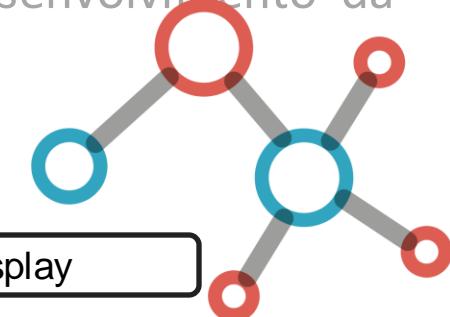
• Flexibilidade

• Disponibilidade de

Display

• Economia com escalabilidade

Relatórios



Padronização

PREREQUISITE

| Course_number | Prerequisite_number |
|---------------|---------------------|
| CS3380 | CS3320 |
| CS3380 | MATH2410 |
| CS3320 | CS1310 |

STUDENT

| Name | Student_number | Class | Major |
|-------|----------------|-------|-------|
| Smith | 17 | 1 | CS |
| Brown | 8 | 2 | CS |

COURSE

Tipo de dados

| Course_name | Course_number | Credit_hours | Department |
|---------------------------|---------------|--------------|------------|
| Intro to Computer Science | CS1310 | 4 | CS |
| Data Structures | CS3320 | 4 | CS |
| Discrete Mathematics | MATH2410 | 3 | MATH |
| Database | CS3380 | 3 | CS |

SECTION

Estrutura definida

| Section_identifier | Course_number | Semester | Year | Instructor |
|--------------------|---------------|----------|------|------------|
| 85 | MATH2410 | Fall | 07 | King |
| 92 | CS1310 | Fall | 07 | Anderson |
| 102 | CS3320 | Spring | 08 | Knuth |
| 112 | MATH2410 | Fall | 08 | Chang |
| 119 | CS1310 | Fall | 08 | Anderson |
| 135 | CS3380 | Fall | 08 | Stone |

Base dos relatórios

GRADE REPORT

| Student_number | Section_identifier | Grade |
|----------------|--------------------|-------|
| 17 | 112 | B |
| 17 | 119 | C |
| 8 | 85 | A |
| 8 | 92 | A |
| 8 | 102 | B |
| 8 | 135 | A |

Ganhos com SGBD



- P Features do app descontinuadas: **retrieval**
- Redução de tempo no desenvolvimento da aplicação
- Flexibilidade
- Disponibilidade de info atualizadas
- Economia com escalabilidade



Ganhos com SGBD



- Padronização
- Redução de tempo no desenvolvimento da aplicação
- Flexibilidade
- Disponibilidade de info atualizadas
- Economia com escalabilidade



Ganhos com SGBD



- Padronização
- Redução de custos no desenvolvimento da aplicação
- Flexibilidade
- Disponibilidade de info atualizadas
- Economia com escalabilidade



Novo requisito



Time

PREREQUISITE

| Course_number | Prerequisite_number |
|---------------|---------------------|
| CS3380 | CS3320 |
| CS3380 | M |
| CS3320 | C |

Adicionar ano que cursou matéria

STUDENT

| Name | Student_number | Class | Major |
|-------|----------------|-------|-------|
| Smith | 17 | 1 | CS |
| | | 2 | CS |

Adicionar coordenador

COURSE

| Course_name | Course_number | Credit_hours | Department |
|---------------------------|---------------|--------------|------------|
| Intro to Computer Science | CS1310 | 4 | CS |
| Data Structures | CS3320 | 4 | CS |
| Discrete Mathematics | MATH2410 | 3 | MATH |
| Database | CS3380 | 3 | CS |

SECTION

| Section_identifier | Course_number | Semester | Year | Instructor |
|--------------------|---------------|----------|------|------------|
| 85 | MATH2410 | Fall | 07 | King |
| 92 | CS1310 | Fall | 07 | Anderson |
| 102 | CS3320 | Spring | 08 | Knuth |
| 112 | MATH2410 | Fall | 08 | Chang |
| | CS1310 | Fall | 08 | Anderson |
| | CS3380 | Fall | 08 | Stone |

GRADE REPORT

| Student_number | Section_identifier | Grade |
|----------------|--------------------|-------|
| 17 | 112 | B |
| 17 | 119 | C |
| 8 | 85 | A |
| 8 | 92 | A |
| 8 | 102 | B |
| 8 | 135 | A |

Ganhos com SGBD

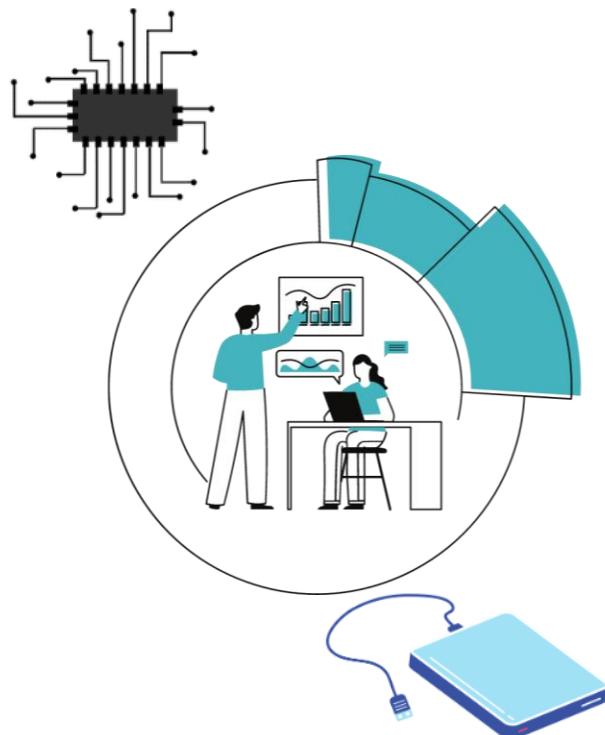


- Padronização
- Redução de tempo no desenvolvimento da aplicacão
- Flexibilidade
- Disponibilidade de info up-to-date
- Economia com escalabilidade

Update imediato



Ganhos com SGBD



- Padronização
- Redução de tempo no desenvolvimento da aplicação
- Flexibilidade
- Disponibilidade
- Economia de escala



Operacional & Gerenciamento



Overlap

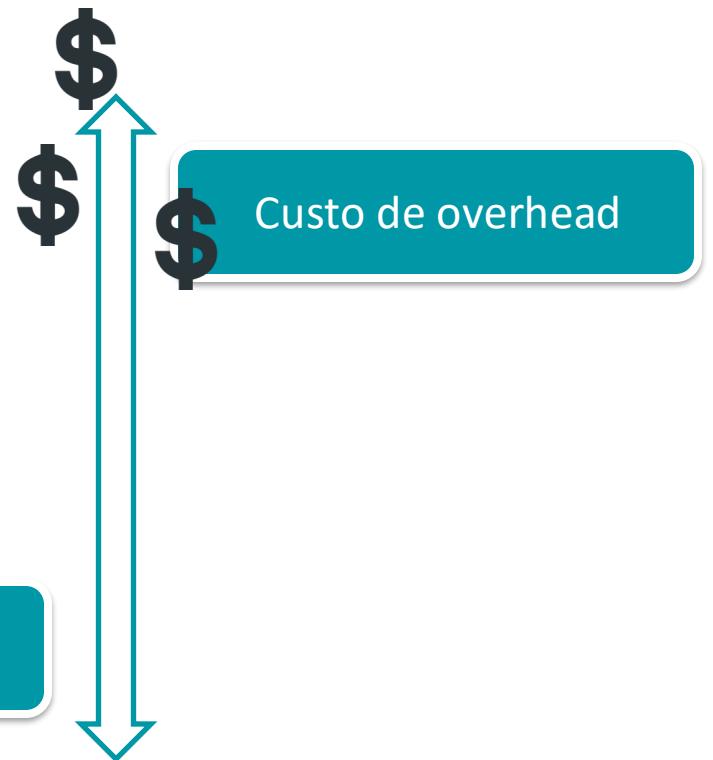
Quando não usar um SGBD?



Not use!



Custo-benefício



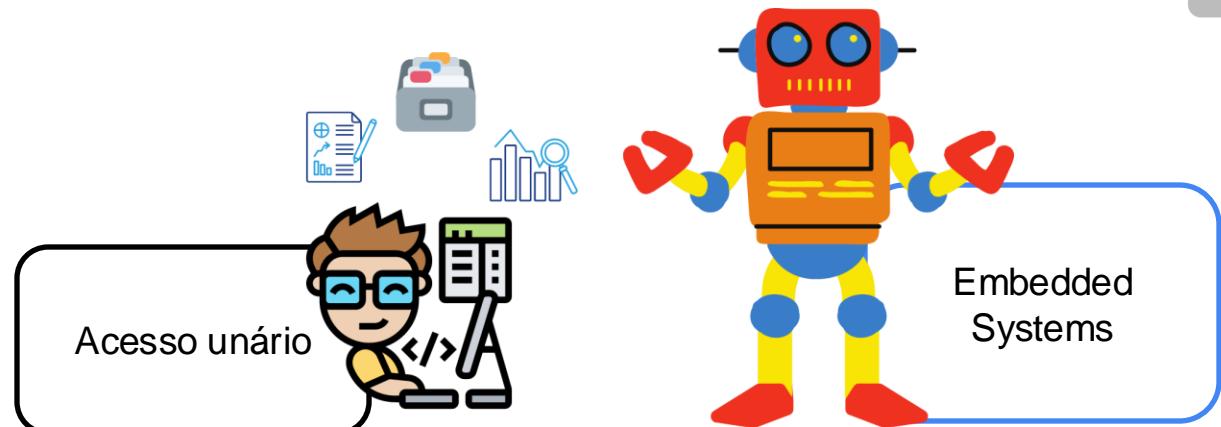
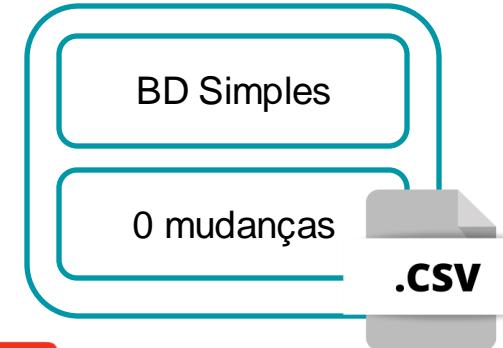
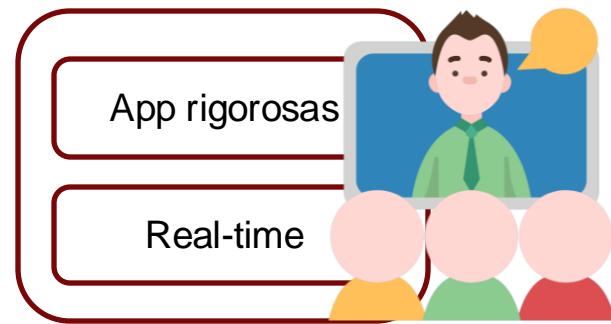
Not use!



Custo

- Investimento inicial
- Generelidade na definição e processamento
- Segurança, controle de concorrência, recovery, funções de integridade

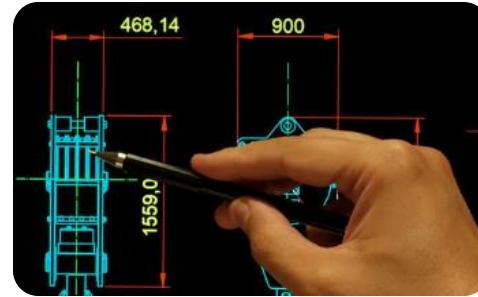
Not use!



Not use!



COMUTAÇÃO



GIS Systems



Etapa 7

Introdução à Modelagem de Banco de Dados e SQL

// Introdução à Banco e dados

Conversa



Por que modelar?



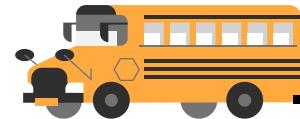
Construção
Plantas baixa

Desenvolvimento
Protótipos

Eletrônicos
Esquema de circuitos



Compreensão do sistema



Modelagem

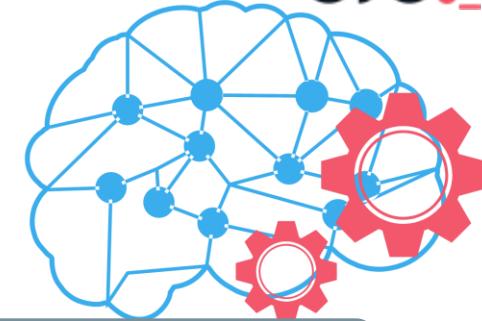


Modelagem

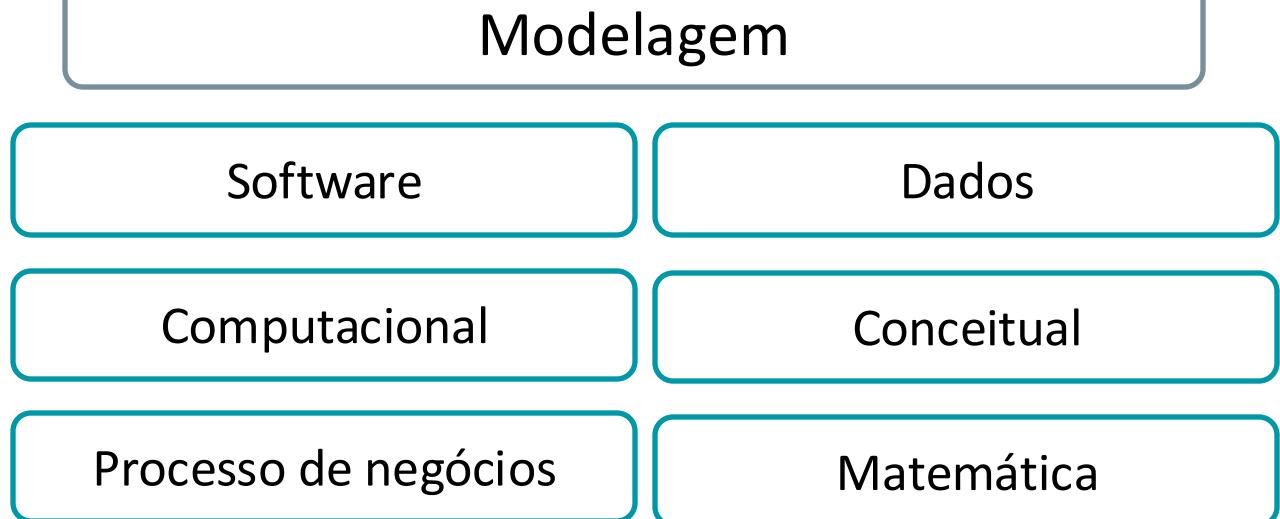
Representação

Modelo

Referência



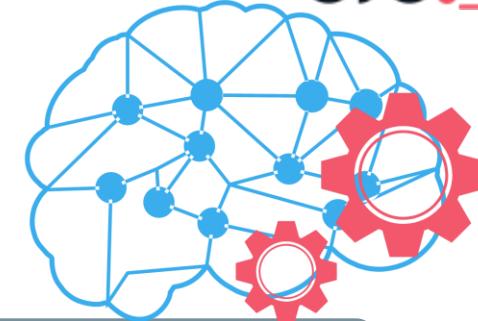
Modelagem



Modelagem



Modelagem



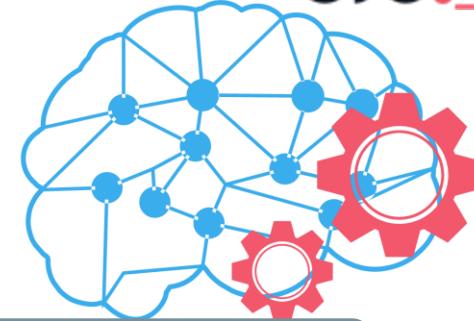
Possui foco na descrição e relacionamento dos elementos que compõem a representação do contexto (mini-mundo)



Modelagem



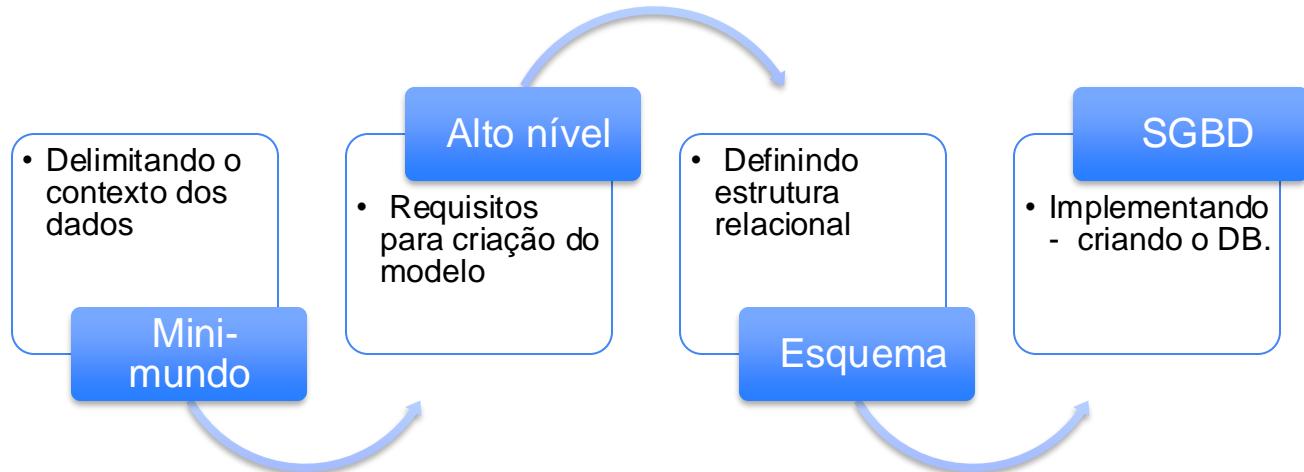
Modelagem



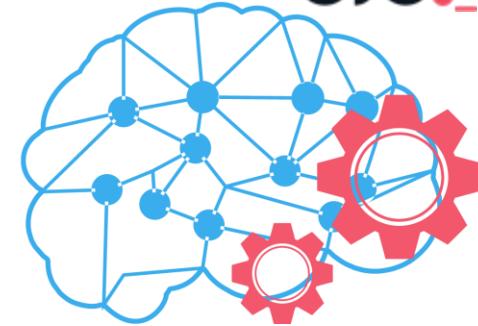
Possui foco na descrição e relacionamento dos elementos que compõem a representação do contexto (mini-mundo)



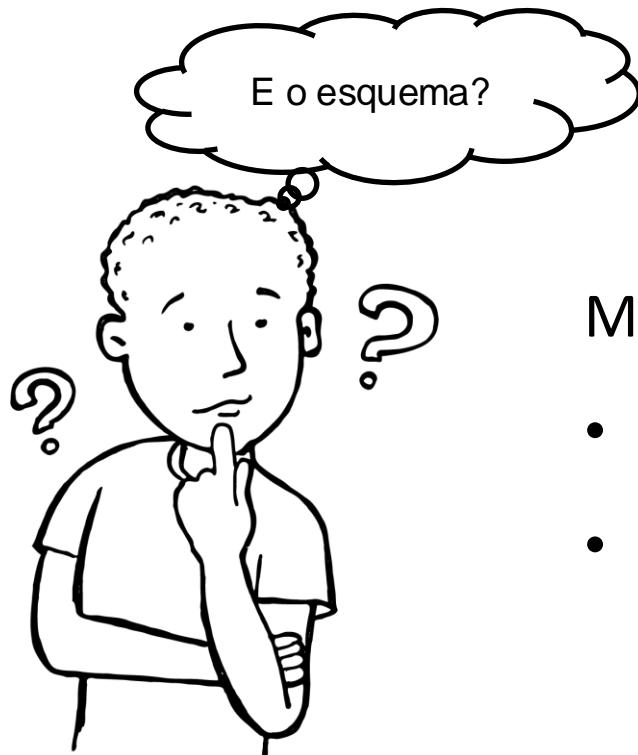
Modelagem



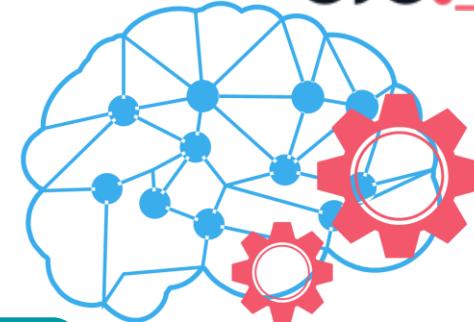
Modelagem



Modelagem



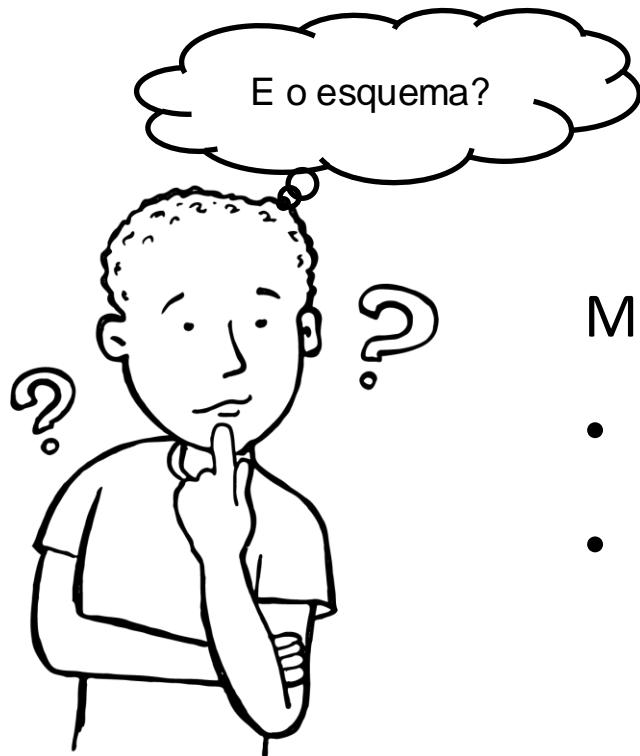
Facilita a compreensão do contexto dos dados



Modelos de alto nível:

- Entidade-Relacionamento
- UML (Unified Modeling Language)

Modelagem



Facilita a compreensão do contexto dos dados

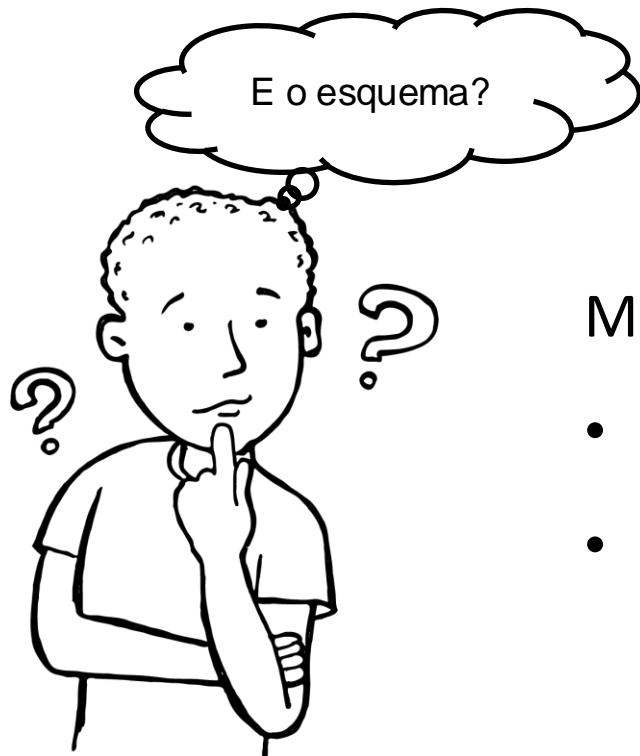
Modelos de alto nível:

- Entidade-Relacionamento
- UML

Modelos



Modelagem



Facilita a compreensão do contexto dos dados

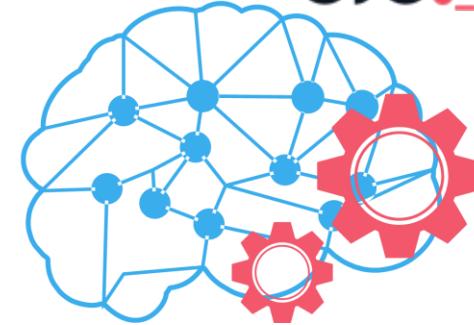
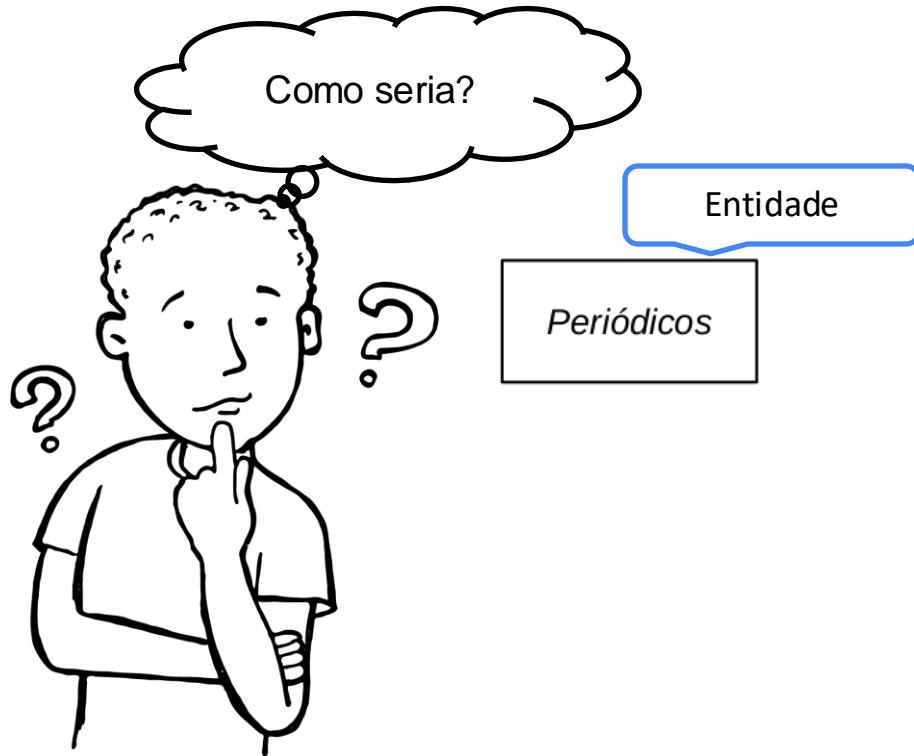
Modelos de alto nível:

- **Entidade-Relacionamento**
- **UML**

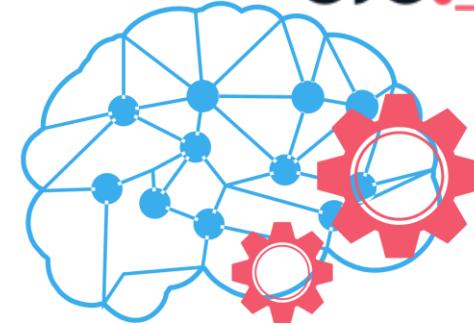
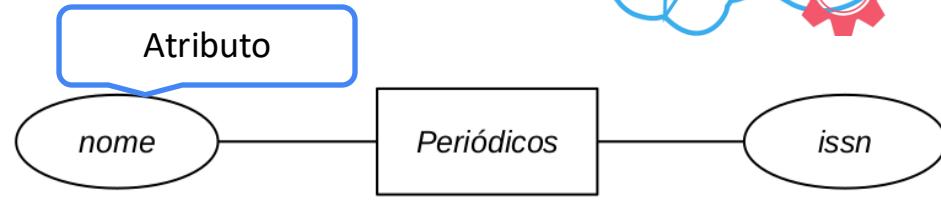
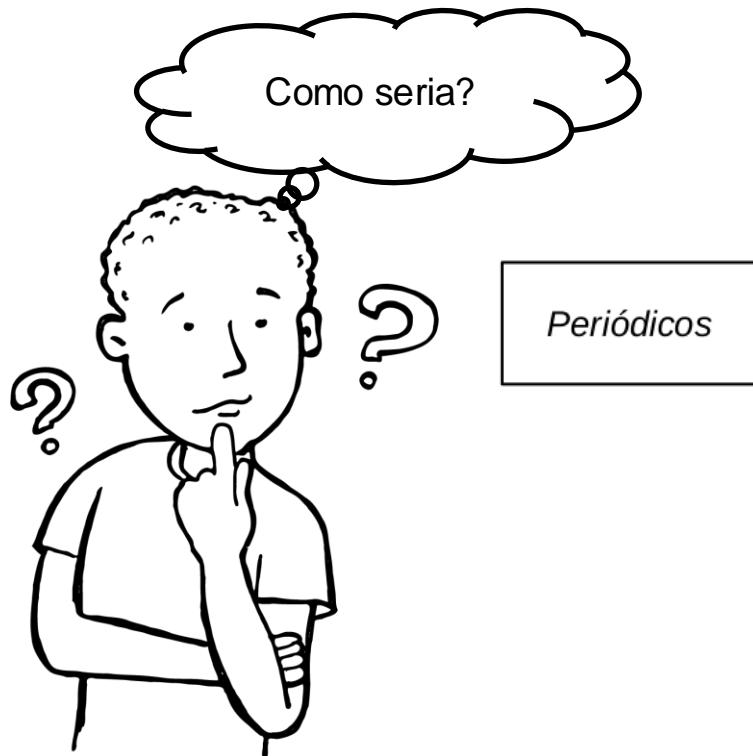
Modelos



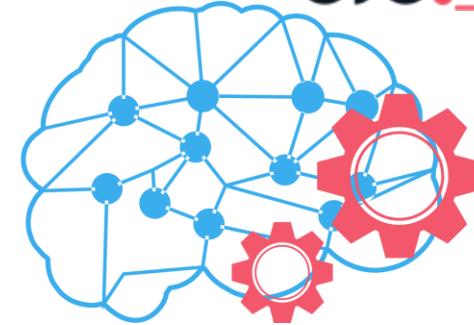
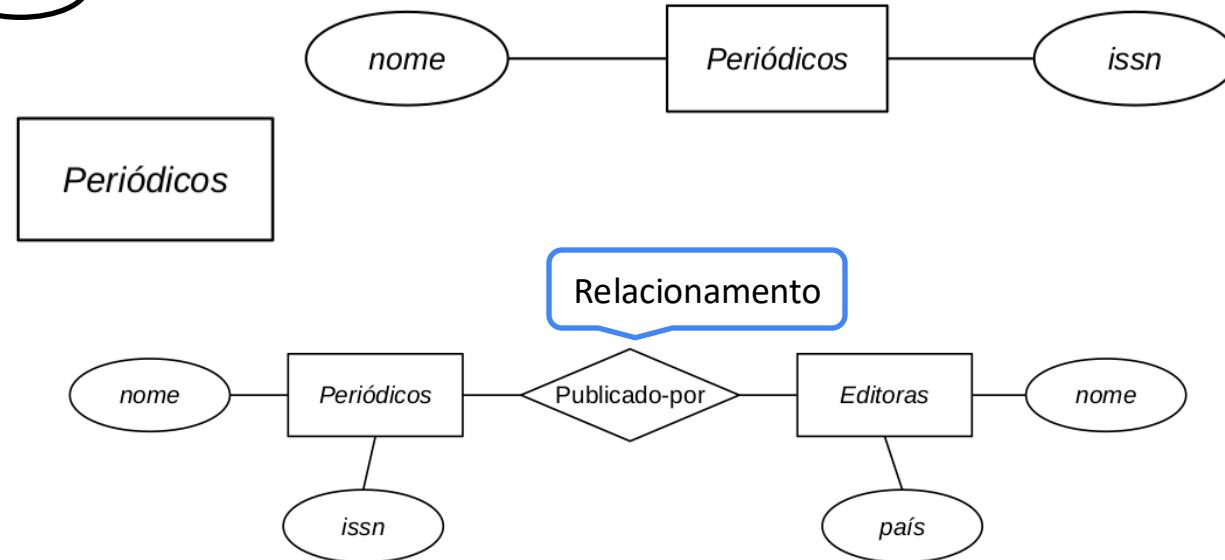
Modelagem



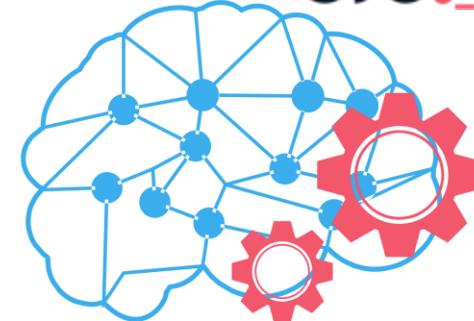
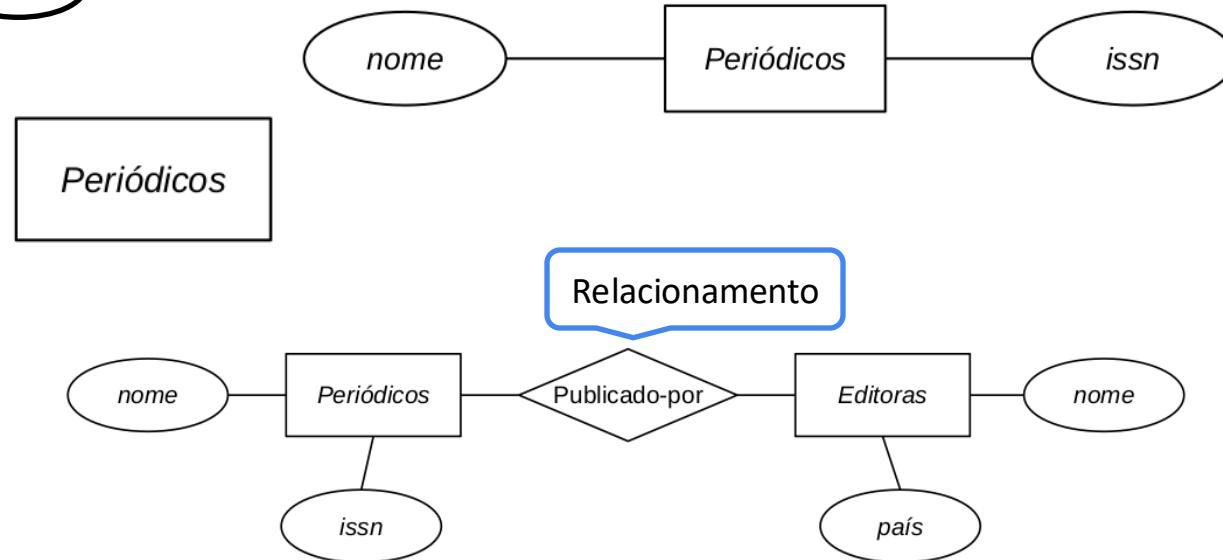
Modelagem



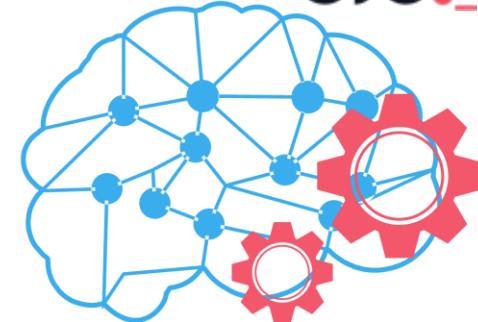
Modelagem



Modelagem



Modelagem



Instâncias

Multiplicidade

Chaves e constraints

Integridade de dados ...

Modelagem



Facilita a compreensão do contexto dos dados

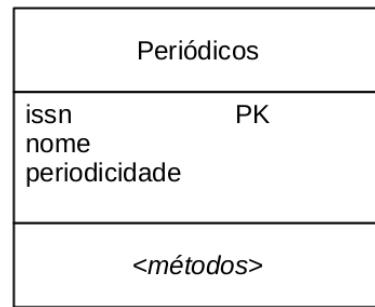
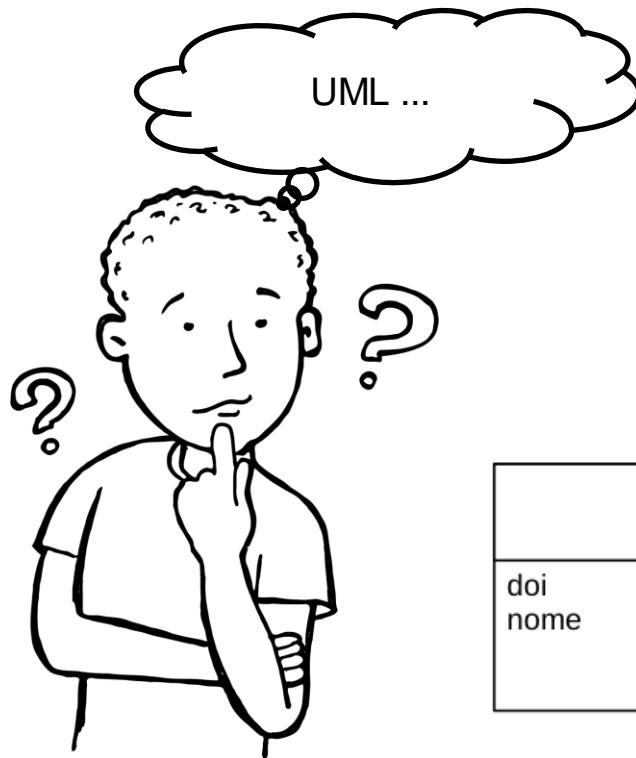
Modelos de alto nível:

- Entidade-Relacionamento
- UML

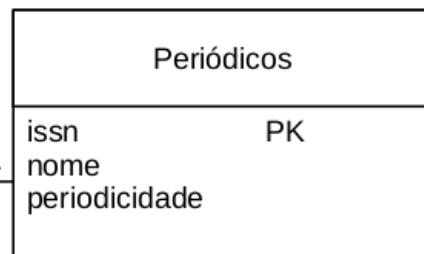
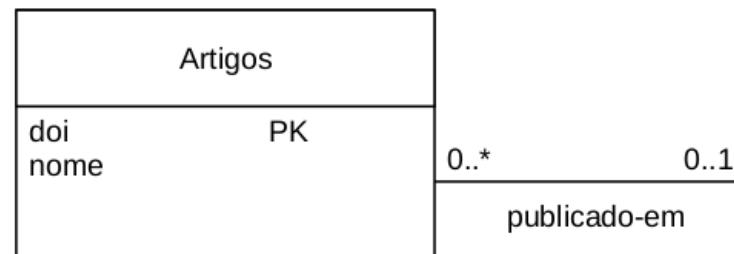
Modelos



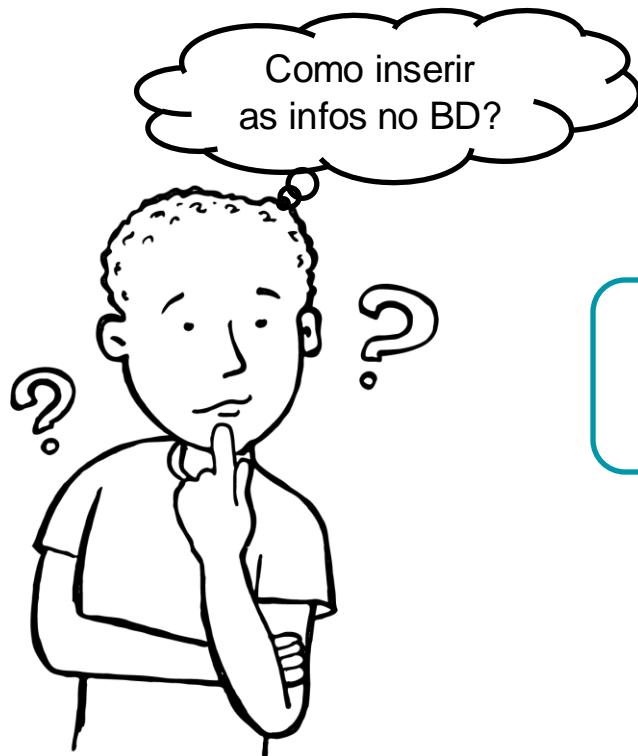
Modelagem



- ← Nome da classe
- ← Atributos
- ← Métodos



Modelagem



CREATE, ALTER, DROP ...

SELECT, INSERT, UPDATE ...



Linguagem declarativa

SQL – como acessar?

The screenshot shows the phpMyAdmin interface with the following details:

- General Settings:** Shows the MySQL connection is set to "localhost".
- Apache module settings:** Includes "Language" (English), "Time (Epoch)" (auto), and "Port" (80).
- MySQL connections:** Lists "Apache/2.2.17 (Ubuntu) PHP/7.2.17 (Ubuntu) MySQL/5.7.26-cll PHP/7.2.17" and "MySql client version 8.0.21".
- MySQL & PHP:** Lists "Version information: 5.7.21", "Documentation", "MySQL", "Official homepage", "Downloads", "Get support", and "List of changes".

```
jm@jm-HP-G42-Notebook-PC:~$ sudo mysql
[sudo] password for jm:
Welcome to the MySQL monitor. Commands end with ; or \g.
Your MySQL connection id is 8
Server version: 8.0.29-0ubuntu0.20.04.3 (Ubuntu)

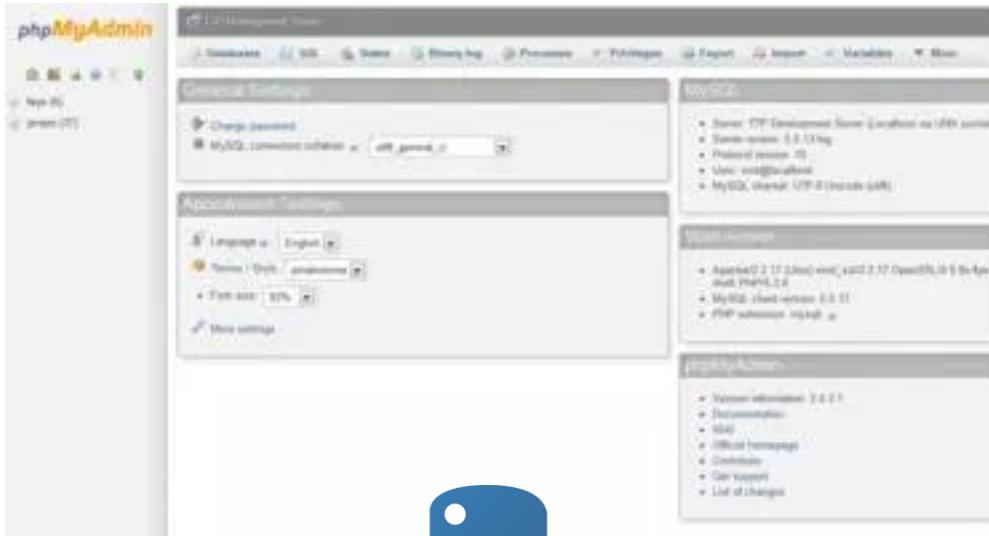
Copyright (c) 2000, 2022, Oracle and/or its affiliates.

Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> 
```

SQL – como acessar?



```
jm@jm-HP-G42-Notebook-PC: ~
[jsudo] password for jm:
Welcome to the MySQL monitor. Commands end with ; or \g.
Your MySQL connection id is 8
Server version: 8.0.29-0ubuntu0.20.04.3 (Ubuntu)

Copyright (c) 2000, 2022, Oracle and/or its affiliates.

Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> 
```



SQL – 1º exemplo

```
CREATE DATABASE firstexample;
```

```
CREATE TABLE periodicos(
```

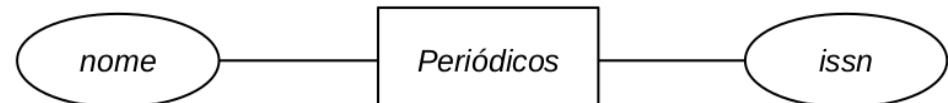
```
    id integer,
```

```
    nome varchar(120),
```

```
    issn integer
```

```
);
```

Criando a tabela periódicos



SQL – 1º exemplo

```
CREATE DATABASE firstexample;
```

```
CREATE TABLE periodicos(
```

```
    id integer,
```

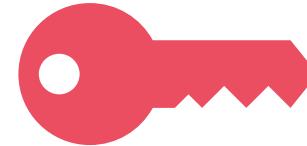
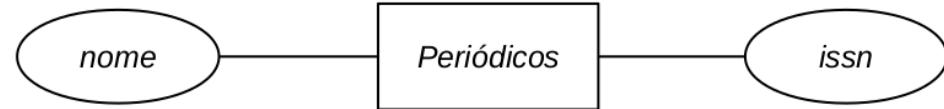
```
    nome varchar
```

```
    issn :
```

Como garantir unicidade?

```
);
```

Criando a tabela periódicos



Primary Key

SQL – 1º exemplo

```
CREATE DATABASE firstexample;
```

```
CREATE TABLE periodicos(
```

```
    id integer,
```

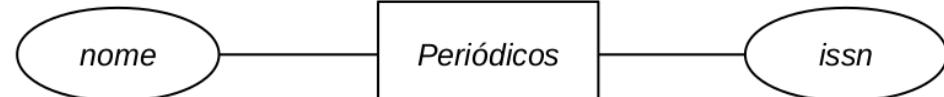
```
    nome varchar(120),
```

```
    issn integer,
```

```
    PRIMARY KEY (id)
```

```
);
```

Criando a tabela periódicos



Primary Key



SQL – 1º exemplo

```
CREATE TABLE editora(
```

```
    id integer,
```

```
    nome_editora varchar(120),
```

```
    País integer,
```

```
PRIMARY KEY (id)
```

```
);
```

Criando a tabela editoras



SQL – 1º exemplo

CREATE TABLE periodicos(

id integer,

nome varchar(120),

issn integer,

PRIMARY KEY (id),

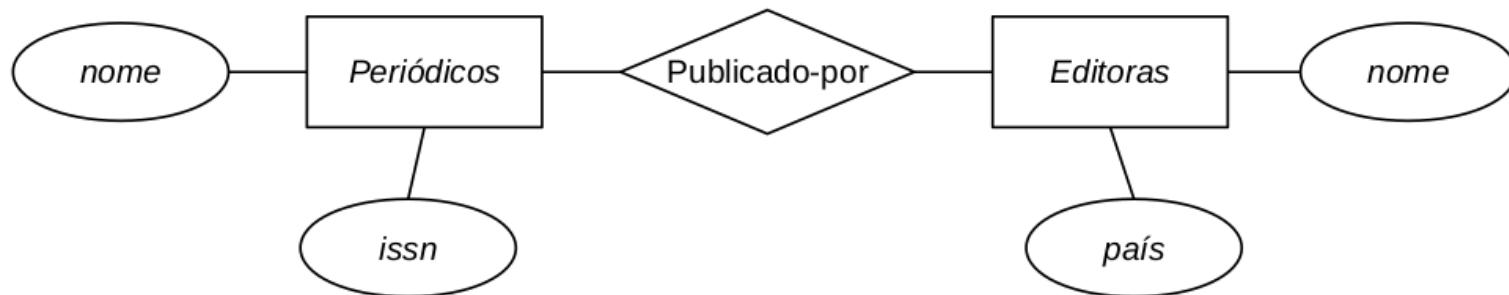
FOREIGN KEY (id) REFERENCES editora(id)

);

Definindo relacionamento



Desafio

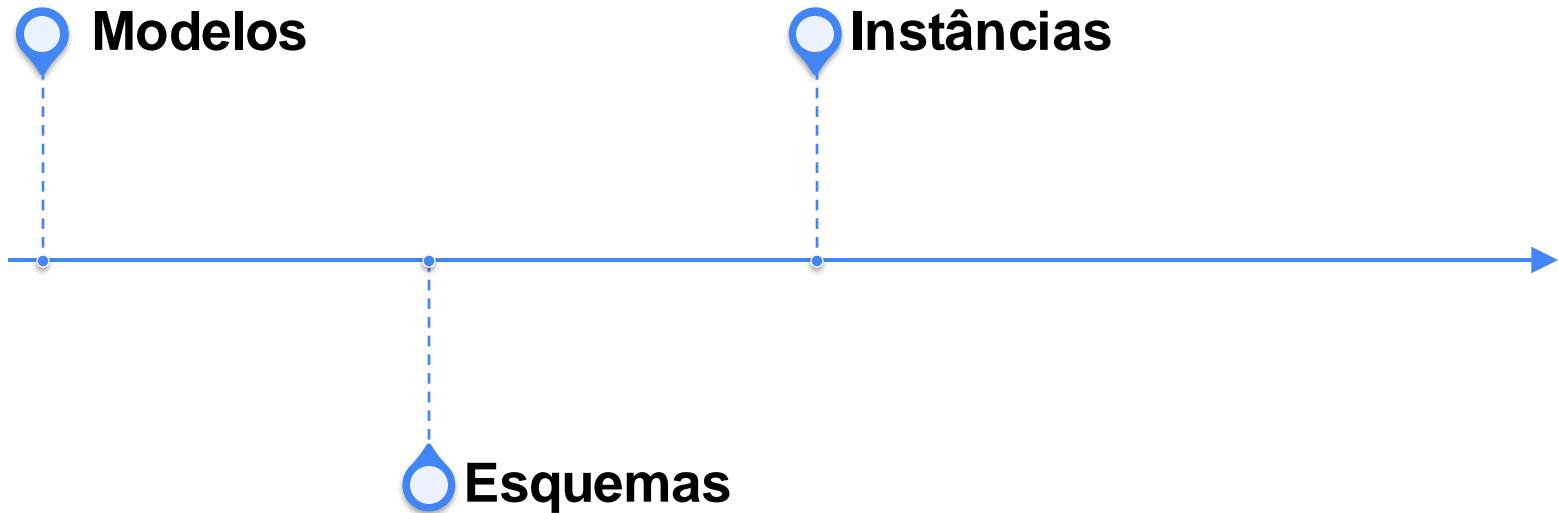


Etapa 8

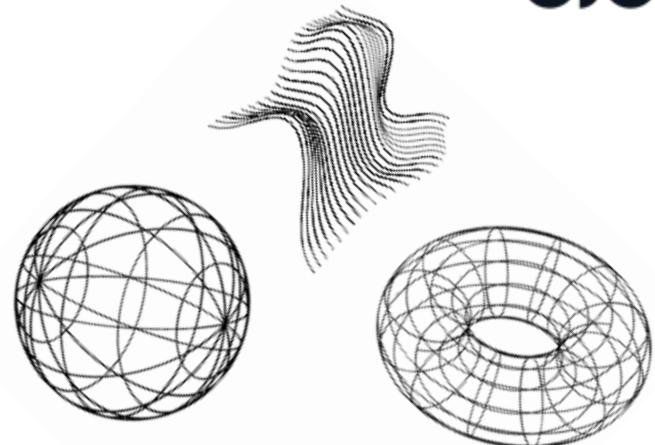
Arquitetura: Modelos, Esquemas e Instâncias

// Introdução à Banco de dados

Conversa



Modelo

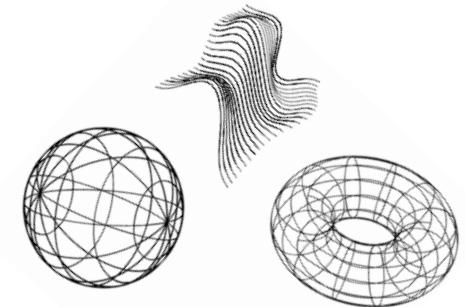
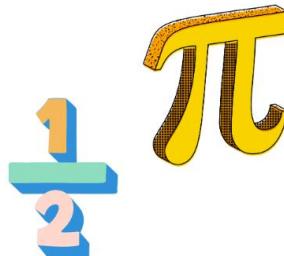


Abstração



essencial

Modelo



Data model

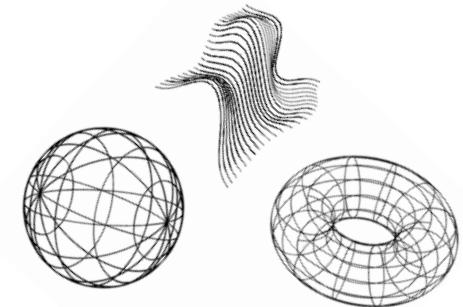
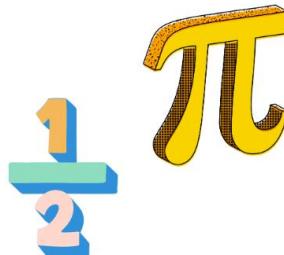


Abstração



essencial

Modelo



Operações

Data model

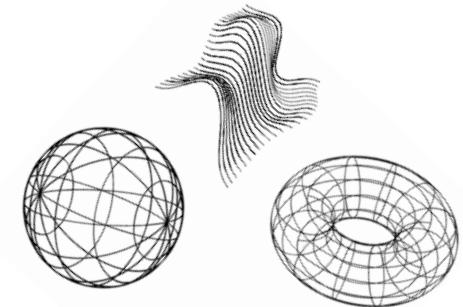
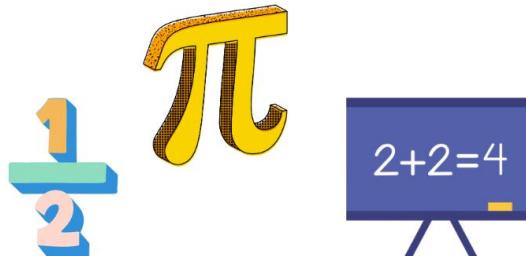


Abstração

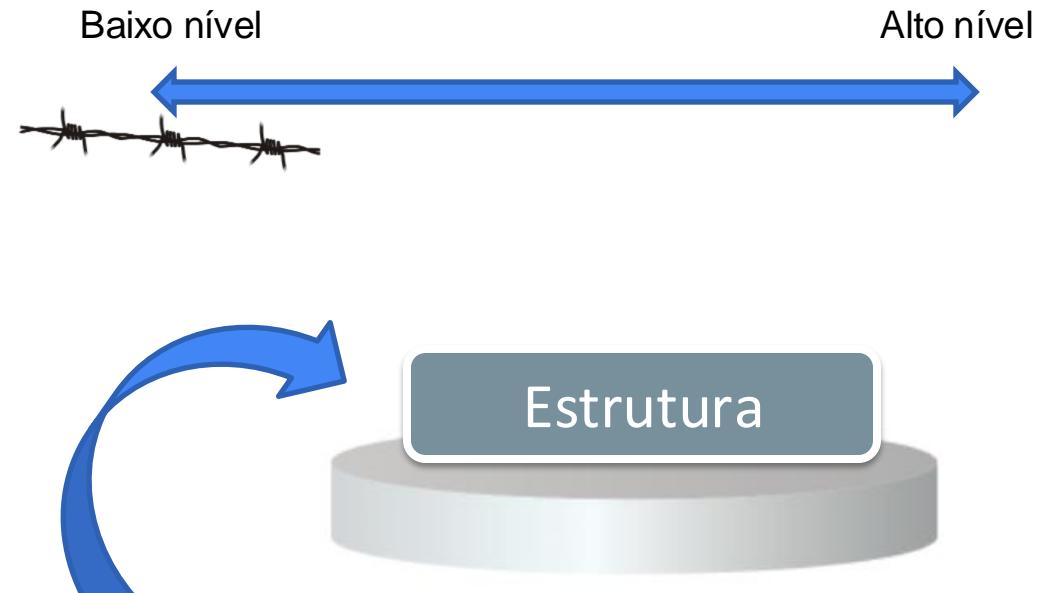


essencial

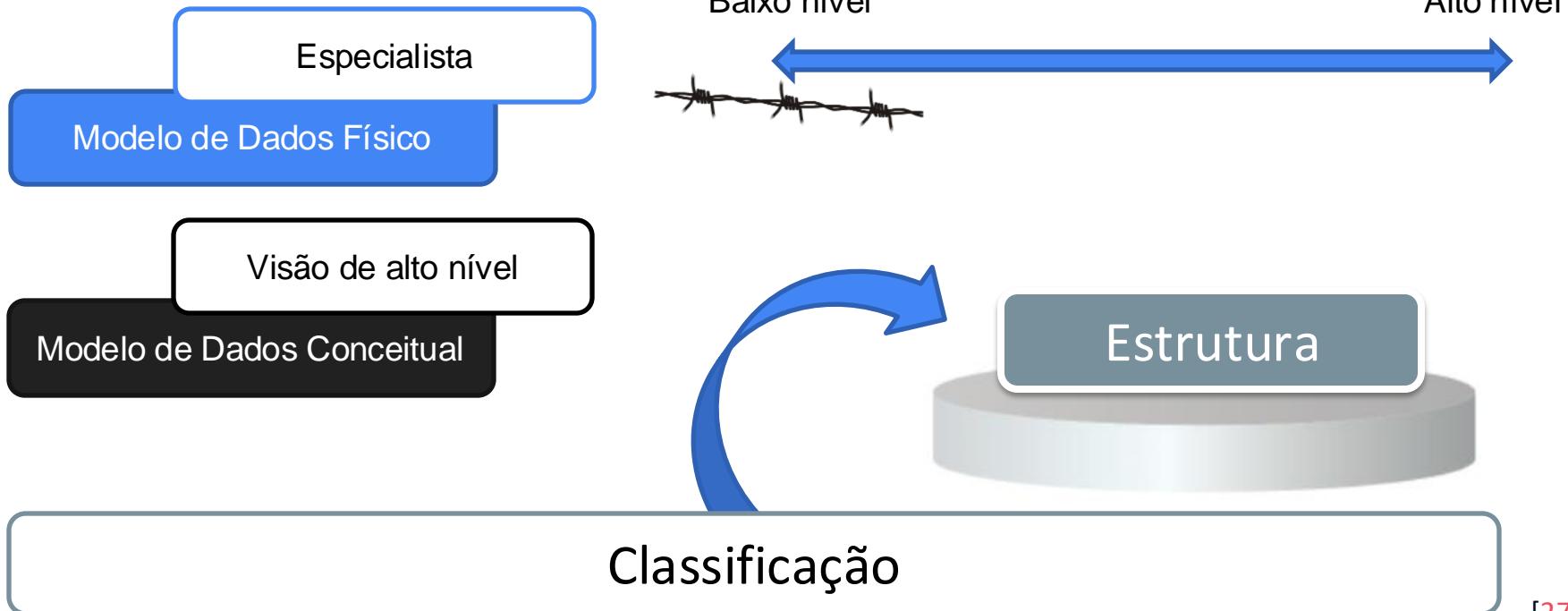
Modelo



Modelo



Modelo



Modelo

Especialista
Modelo de Dados Físico

Visão de alto nível
Modelo de Dados Conceitual

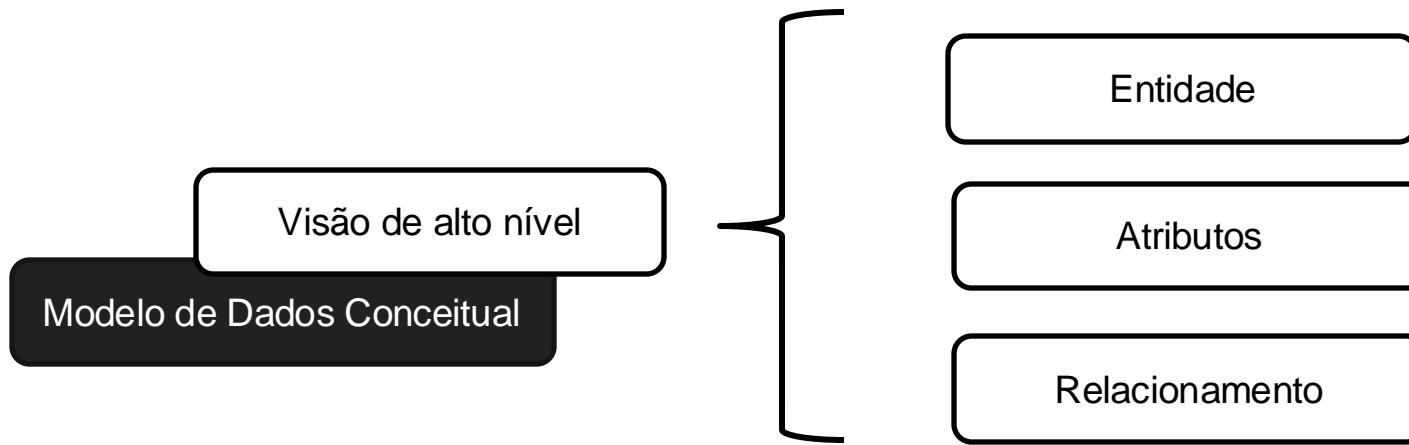
Classificação



Representacional
Modelo de Dados de implementação

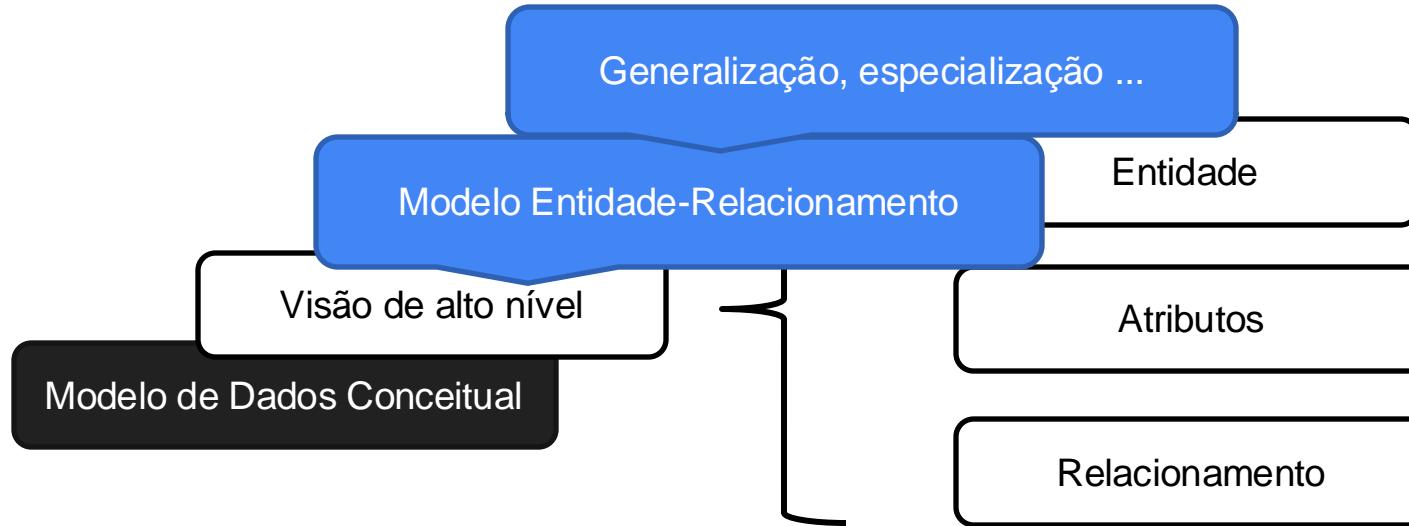


Modelo



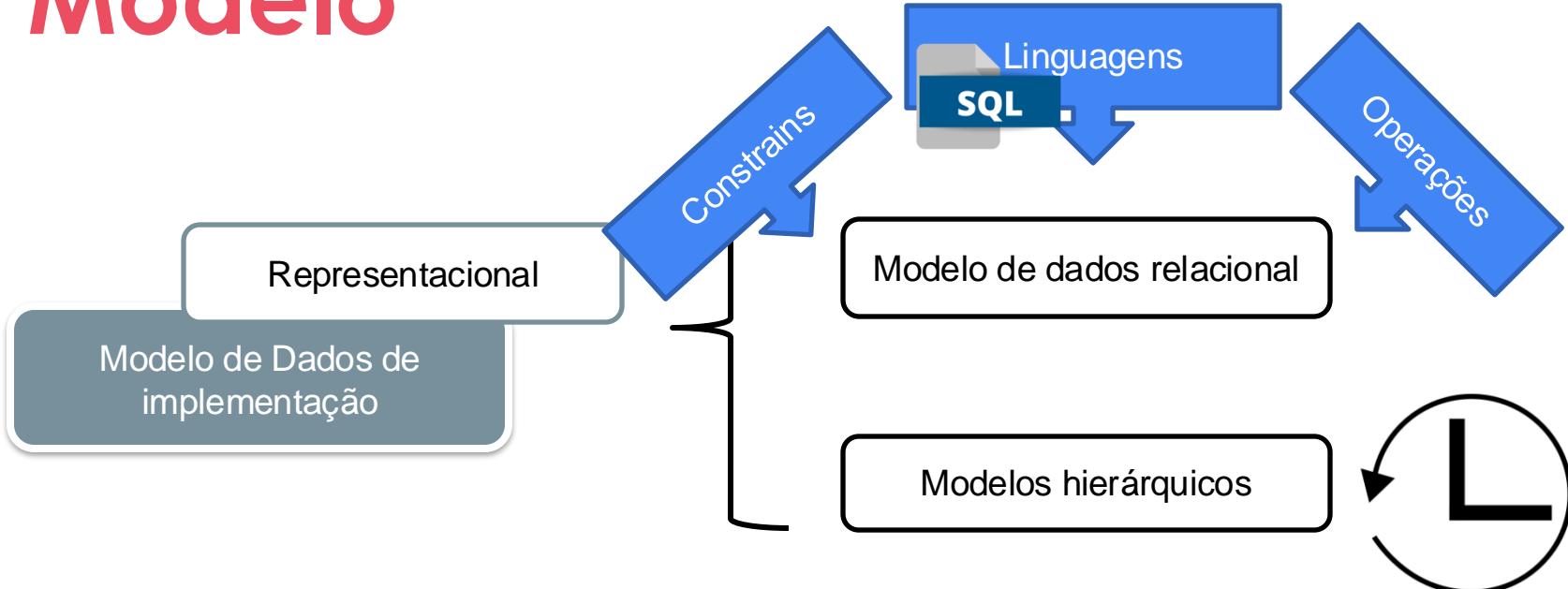
Classificação

Modelo



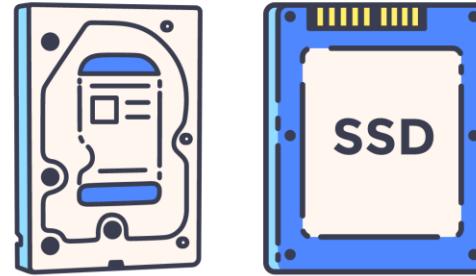
Classificação

Modelo



Classificação

Modelo



Modelo de Dados Físico

Especialista

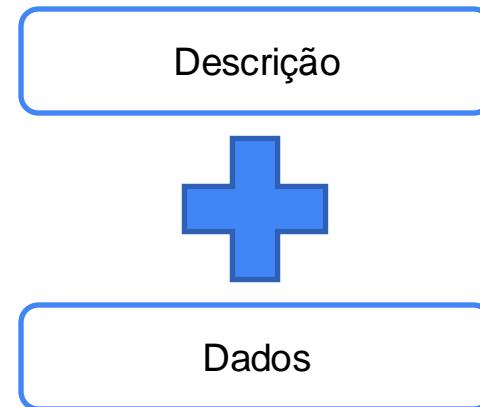


.CSV

Classificação

Modelo

Modelo de Dados
Auto-descritivo



XML

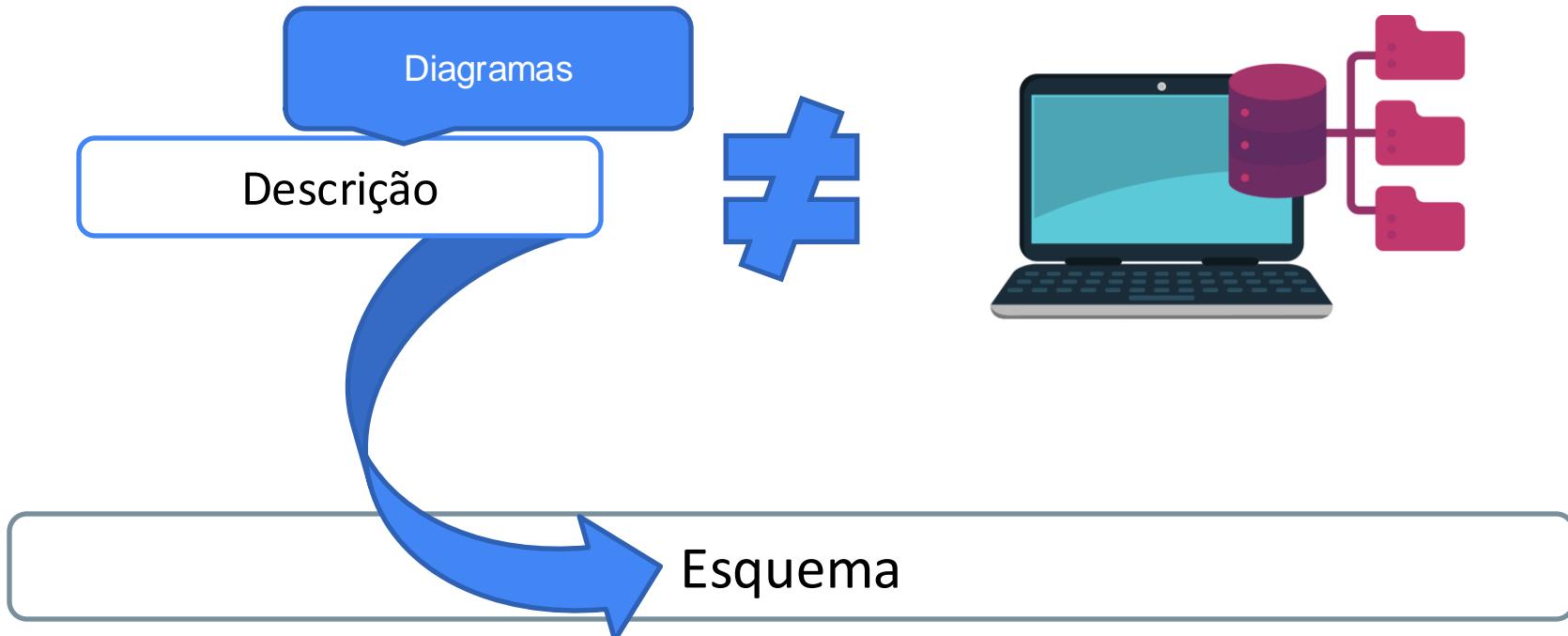
KEY-VALUE

Classificação

Esquemas, Instâncias e Estados do BD



Esquema



Esquema

Diagramas

Descrição

STUDENT

| | | | |
|------|----------------|-------|-------|
| Name | Student_number | Class | Major |
|------|----------------|-------|-------|

COURSE

| | | | |
|-------------|---------------|--------------|------------|
| Course_name | Course_number | Credit_hours | Department |
|-------------|---------------|--------------|------------|

PREREQUISITE

| | |
|---------------|---------------------|
| Course_number | Prerequisite_number |
|---------------|---------------------|

SECTION

| | | | | |
|--------------------|---------------|----------|------|------------|
| Section_identifier | Course_number | Semester | Year | Instructor |
|--------------------|---------------|----------|------|------------|

GRADE_REPORT

| | | |
|----------------|--------------------|-------|
| Student_number | Section_identifier | Grade |
|----------------|--------------------|-------|

Esquema

Esquema

Diagramas

Descrição

Construct

STUDENT

| | | | |
|------|----------------|-------|-------|
| Name | Student_number | Class | Major |
|------|----------------|-------|-------|

COURSE

| | | | |
|-------------|---------------|--------------|------------|
| Course_name | Course_number | Credit_hours | Department |
|-------------|---------------|--------------|------------|

PREREQUISITE

| | |
|---------------|---------------------|
| Course_number | Prerequisite_number |
|---------------|---------------------|

SECTION

| | | | | |
|--------------------|---------------|----------|------|------------|
| Section_identifier | Course_number | Semester | Year | Instructor |
|--------------------|---------------|----------|------|------------|

GRADE_REPORT

| | | |
|----------------|--------------------|-------|
| Student_number | Section_identifier | Grade |
|----------------|--------------------|-------|

Esquema

Esquema

Diagramas

Descrição

Tipos de dados & Itens

Construct

STUDENT

| | | | |
|------|----------------|-------|-------|
| Name | Student_number | Class | Major |
|------|----------------|-------|-------|

COURSE

| | | | |
|-------------|---------------|--------------|------------|
| Course_name | Course_number | Credit_hours | Department |
|-------------|---------------|--------------|------------|

PREREQUISITE

| | |
|---------------|---------------------|
| Course_number | Prerequisite_number |
|---------------|---------------------|

SECTION

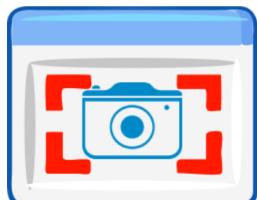
| | | | | |
|--------------------|---------------|----------|------|------------|
| Section_identifier | Course_number | Semester | Year | Instructor |
|--------------------|---------------|----------|------|------------|

GRADE_REPORT

| | | |
|----------------|--------------------|-------|
| Student_number | Section_identifier | Grade |
|----------------|--------------------|-------|

Esquema

Snapshot



Dados mudam

Instância | Ocorrência

STUDENT

| | | | |
|------|----------------|-------|-------|
| Name | Student_number | Class | Major |
|------|----------------|-------|-------|

COURSE

| | | | |
|-------------|---------------|--------------|------------|
| Course_name | Course_number | Credit_hours | Department |
|-------------|---------------|--------------|------------|

PREREQUISITE

| | |
|---------------|---------------------|
| Course_number | Prerequisite_number |
|---------------|---------------------|

SECTION

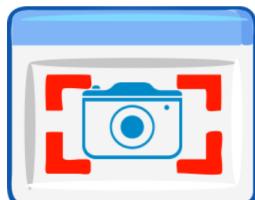
| | | | | |
|--------------------|---------------|----------|------|------------|
| Section_identifier | Course_number | Semester | Year | Instructor |
|--------------------|---------------|----------|------|------------|

GRADE_REPORT

| | | |
|----------------|--------------------|-------|
| Student_number | Section_identifier | Grade |
|----------------|--------------------|-------|

Esquema

Snapshot



Dados mudam

Instância | Ocorrência

Esquema

Insert, Delete

STUDENT

| | | | |
|------|----------------|-------|-------|
| Name | Student_number | Class | Major |
|------|----------------|-------|-------|

COURSE

| | | | | |
|-------------|---------------|----------|----------|----------|
| Course_name | Course_number | Offering | Capacity | Duration |
|-------------|---------------|----------|----------|----------|

PREREQUISITE

| | |
|---------------|---------------------|
| Course_number | Prerequisite_number |
|---------------|---------------------|

SECTION

| | | | | |
|--------------------|---------------|----------|------|------------|
| Section_identifier | Course_number | Semester | Year | Instructor |
|--------------------|---------------|----------|------|------------|

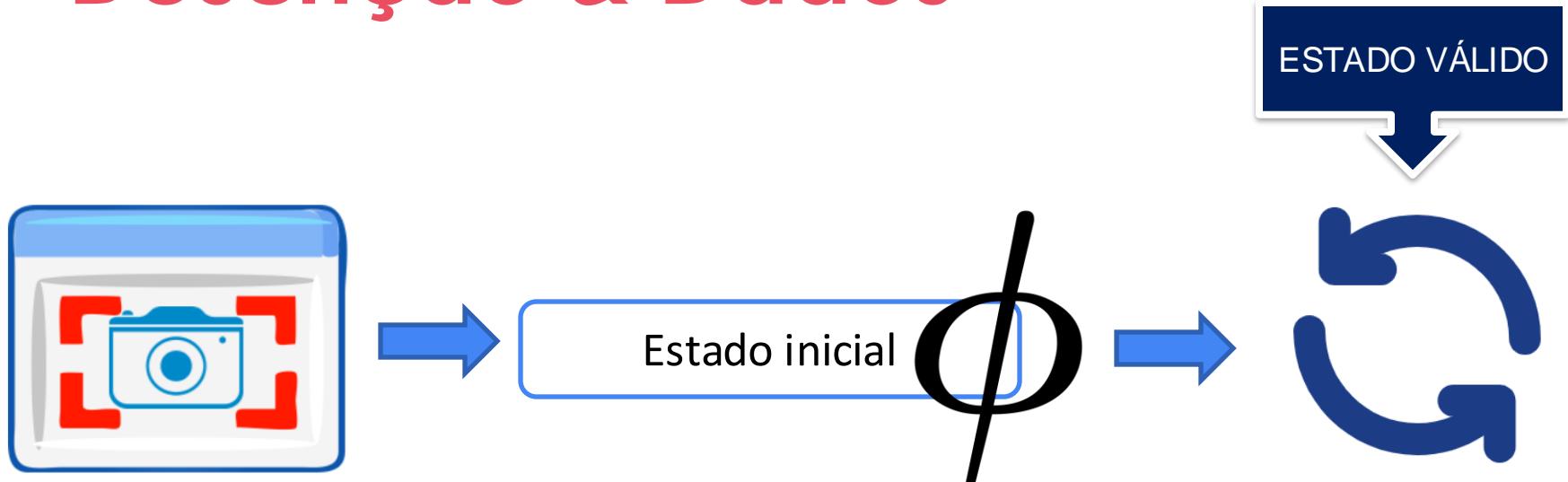
GRADE_REPORT

| | |
|----------------|-------|
| Student_number | Score |
|----------------|-------|

Mudança de estado

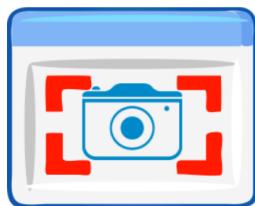
Update

Descrição & Dados



Esquema

Snapshot



Dados mudam

Instância | Ocorrência

Mudança = evolução

STUDENT

| | | | |
|------|----------------|-------|-------|
| Name | Student_number | Class | Major |
|------|----------------|-------|-------|

COURSE

| | | | |
|-------------|---------------|--------------|------------|
| Course_name | Course_number | Credit_hours | Department |
|-------------|---------------|--------------|------------|

PREREQUISITE

| | |
|---------------|---------------------|
| Course_number | Prerequisite_number |
|---------------|---------------------|

SECTION

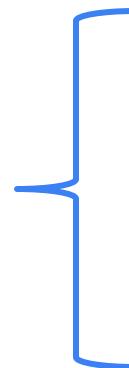
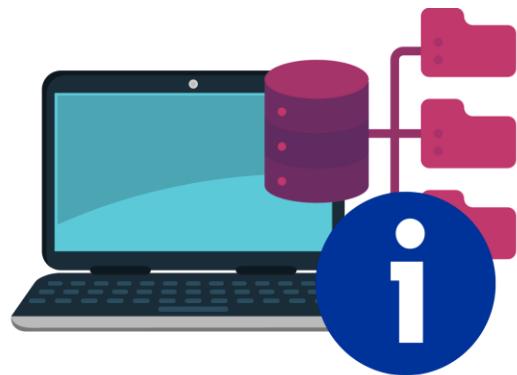
| | | | | |
|--------------------|---------------|----------|------|------------|
| Section_identifier | Course_number | Semester | Year | Instructor |
|--------------------|---------------|----------|------|------------|

GRADE_REPORT

| | | |
|----------------|--------------------|-------|
| Student_number | Section_identifier | Grade |
|----------------|--------------------|-------|

Esquema

Meta dados



Descrição esquema

Construtores

Constrains

Esquema

Three-Schema Architecture



Three-Schema

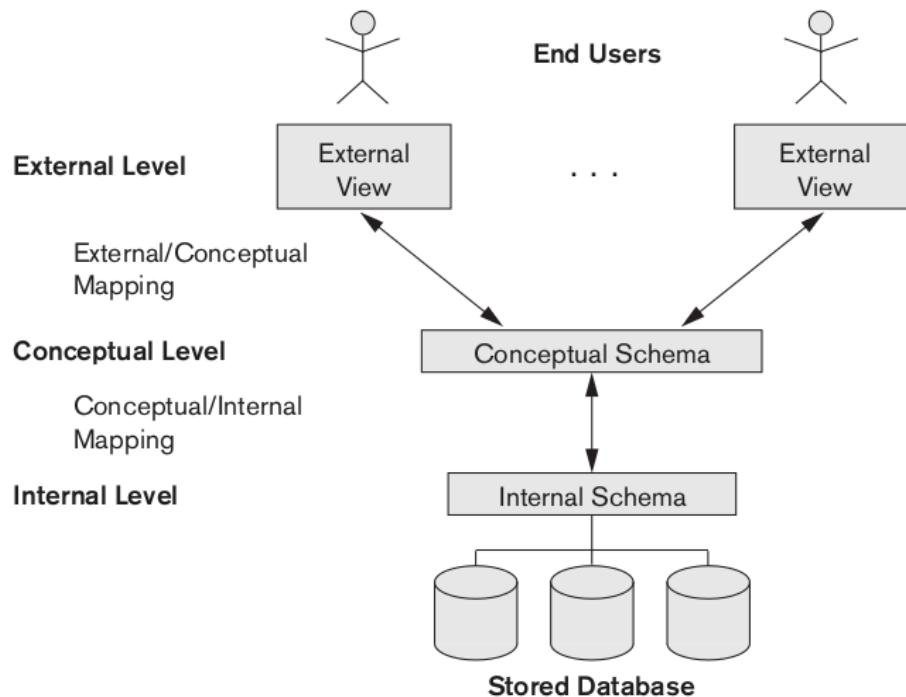
Catálogo

Isolamento
data/program

Views

Esquema

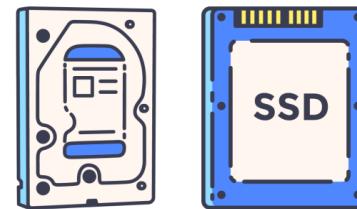
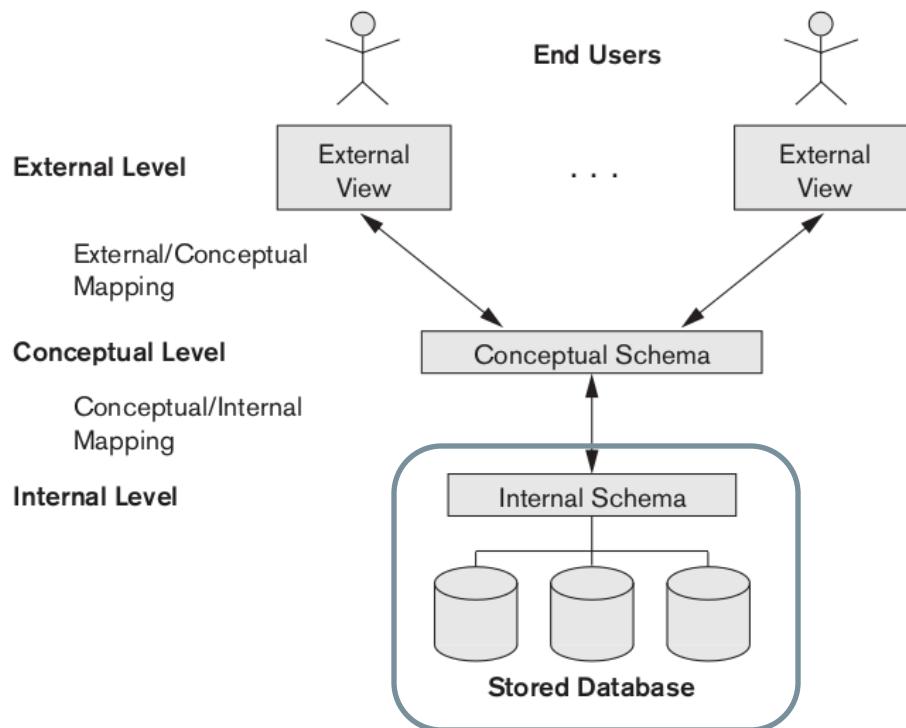
Arquitetura



Aplicações de Usuário

Físico BD

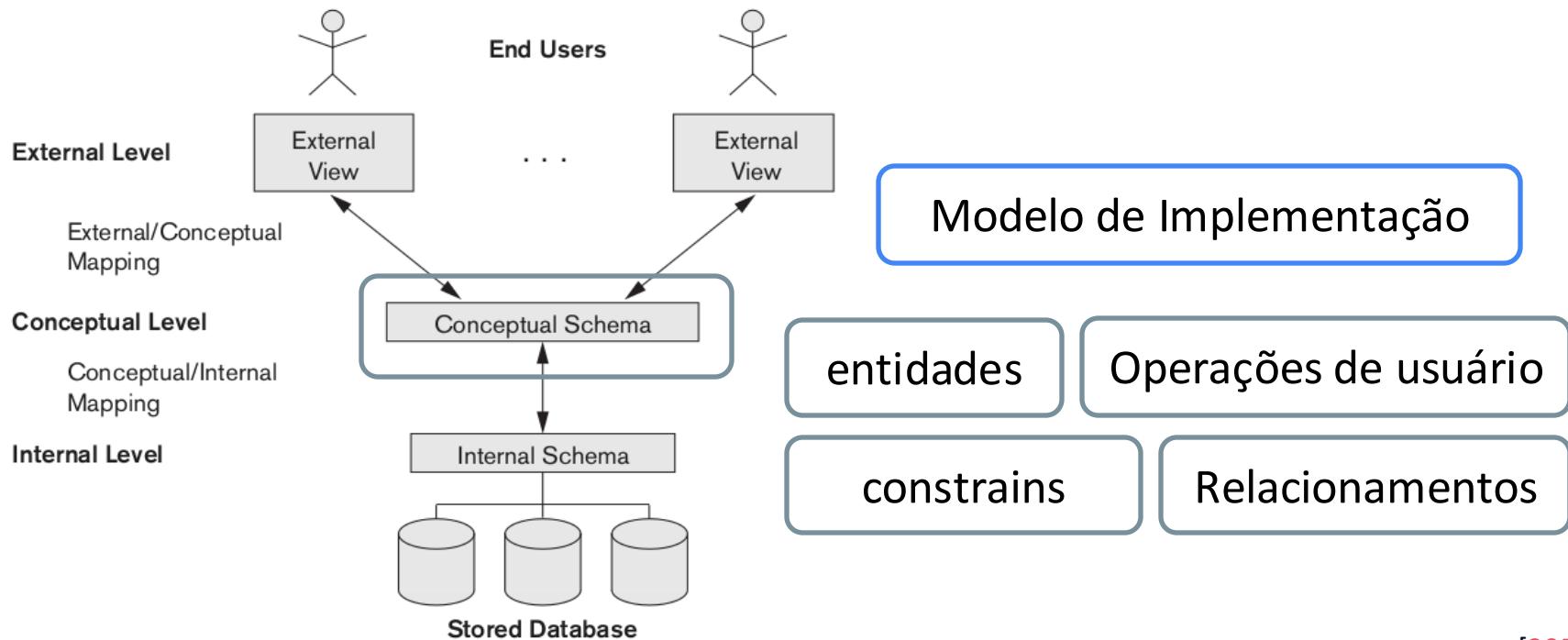
Arquitetura



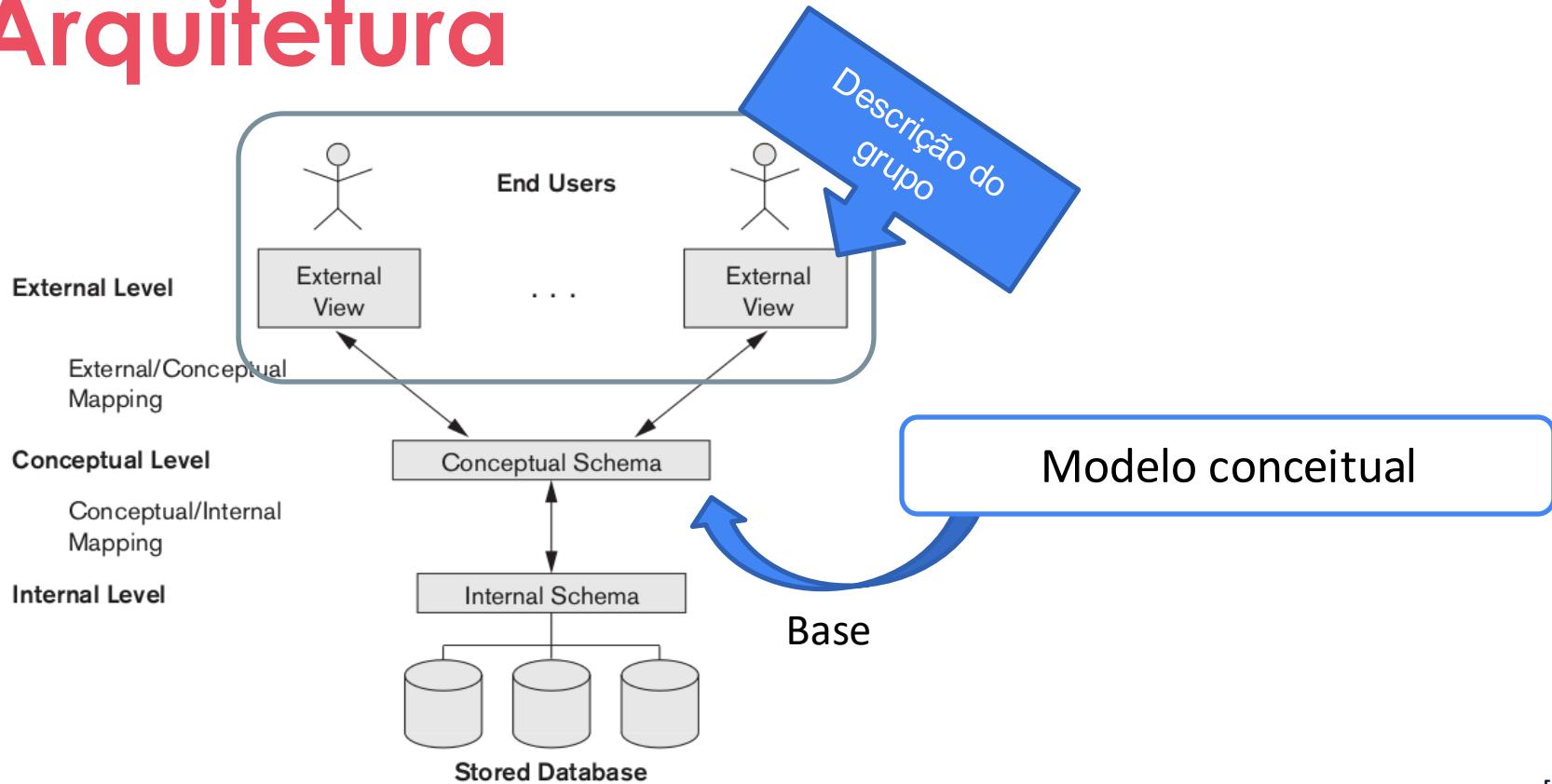
Modelo de dados físico



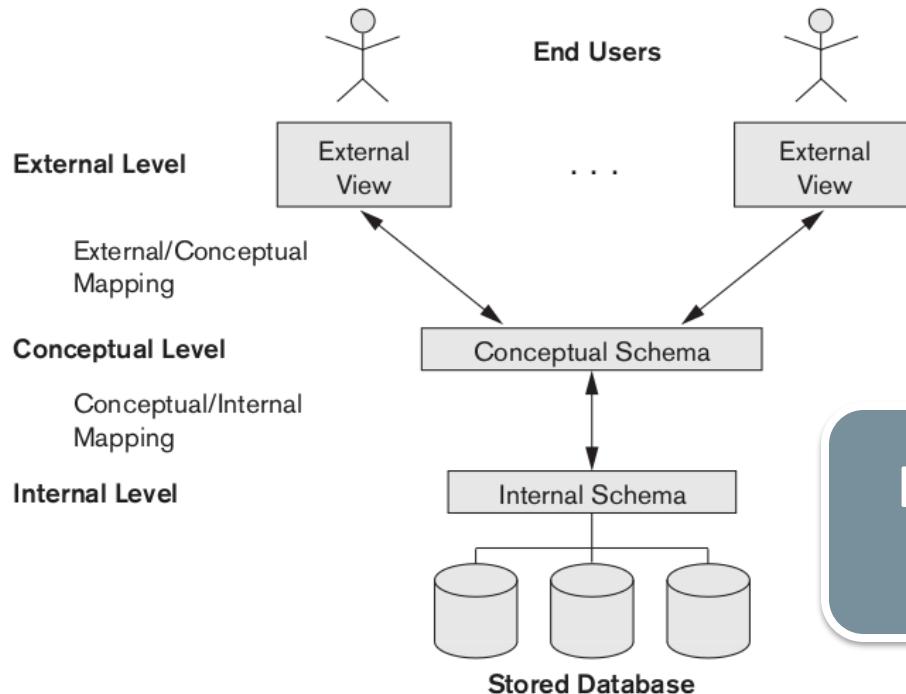
Arquitetura



Arquitetura



Arquitetura



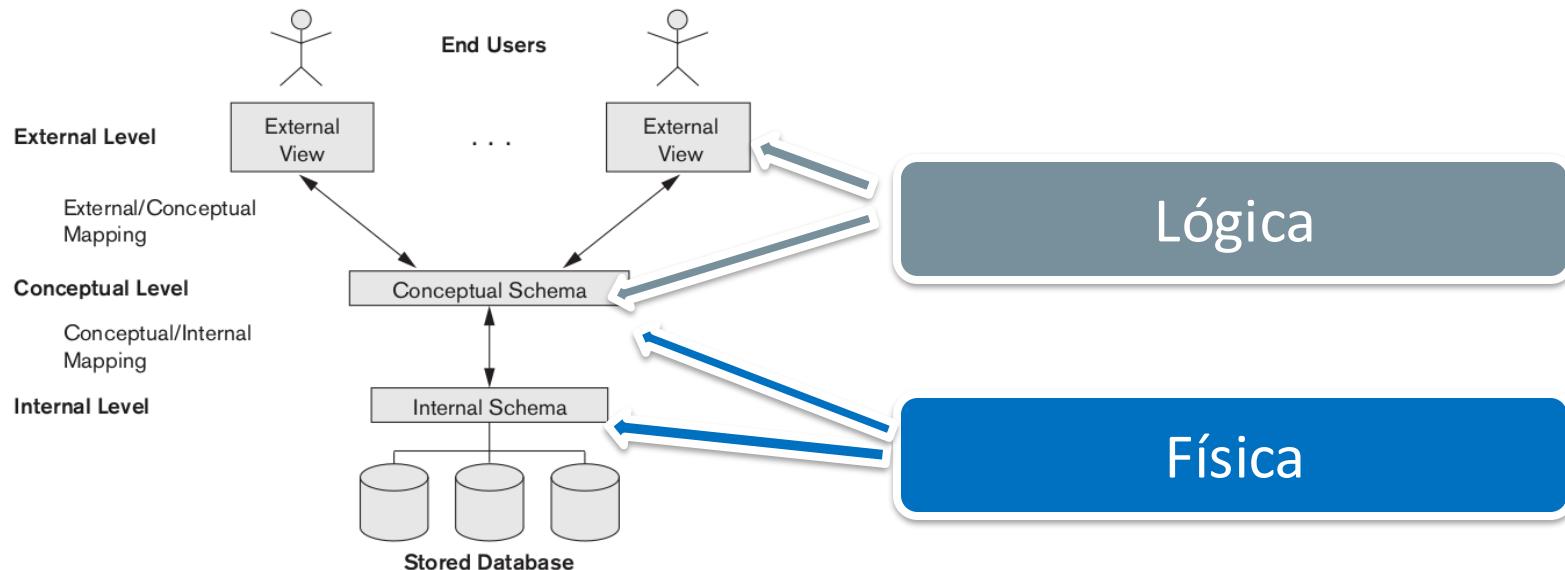
Explicitamente

NOT

Completamente

Desenvolvimento e Design
do sistema

Independência de dados

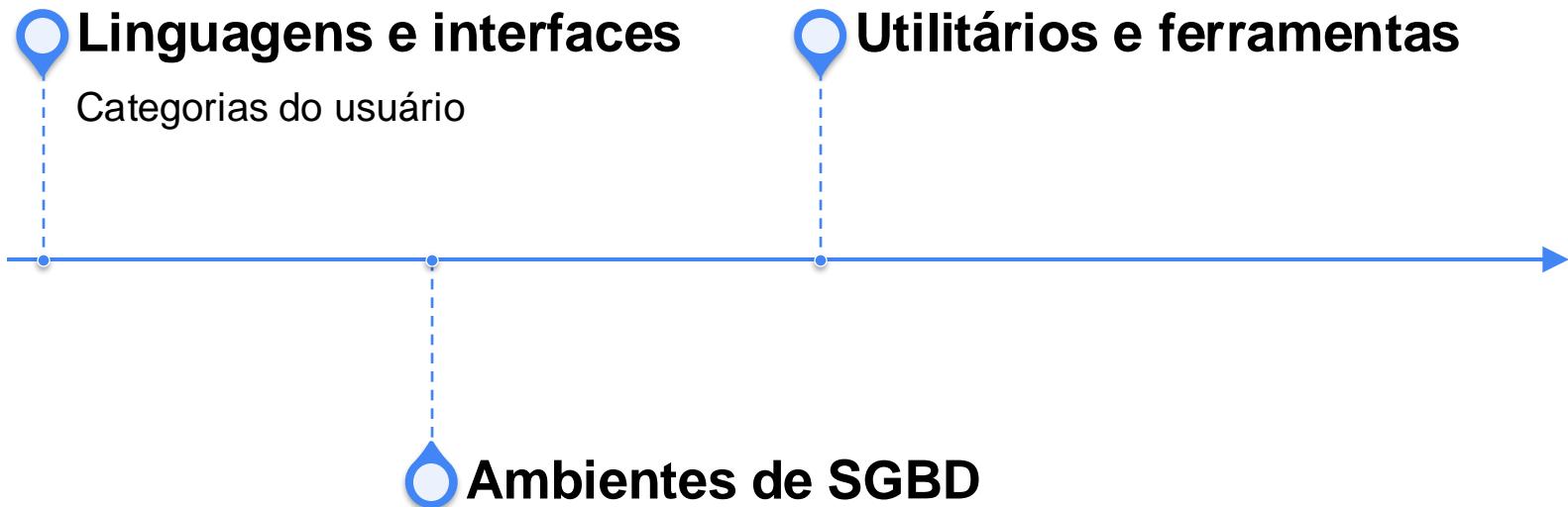


Etapa 9

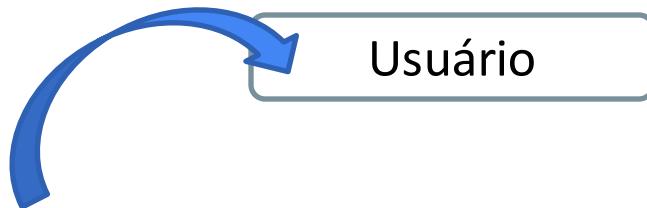
Arquitetura: Linguagem, Interface e Ambiente de SGBDs

// Introdução à Banco de dados

Conversa



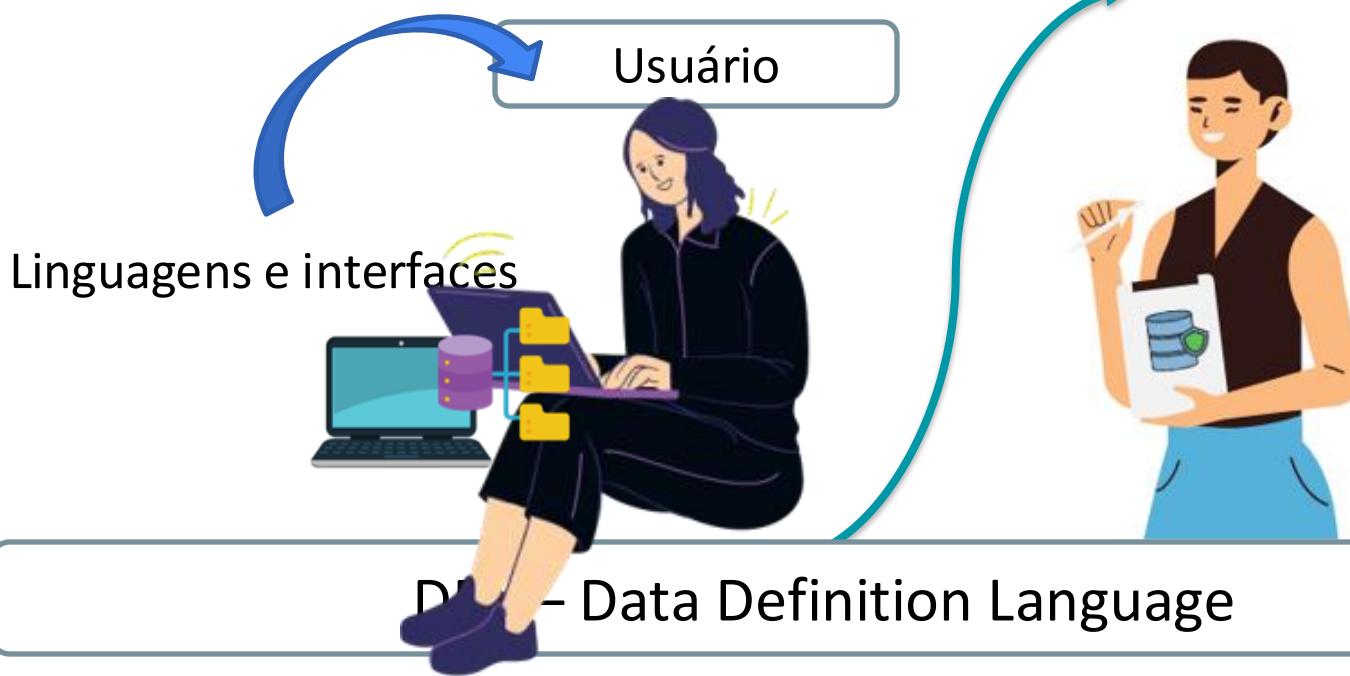
Linguagens



Linguagens e interfaces

DDL – Data Definition Language

Linguagens



STUDENT

| | | | |
|------|----------------|-------|-------|
| Name | Student_number | Class | Major |
|------|----------------|-------|-------|

COURSE

| | | | |
|-------------|---------------|--------------|------------|
| Course_name | Course_number | Credit_hours | Department |
|-------------|---------------|--------------|------------|

PREREQUISITE

| | |
|---------------|---------------------|
| Course_number | Prerequisite_number |
|---------------|---------------------|

SECTION

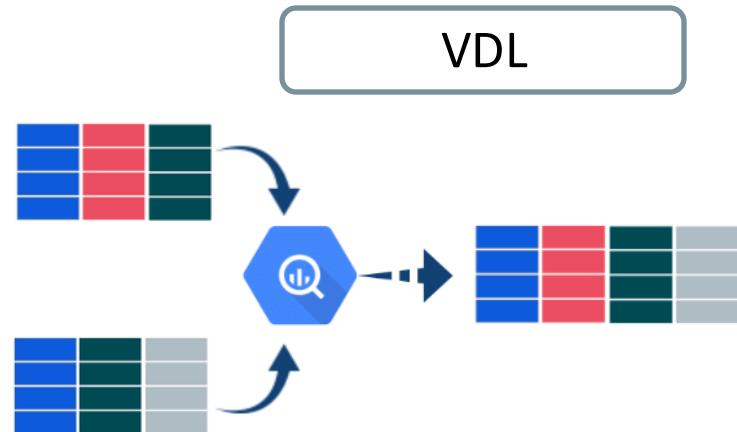
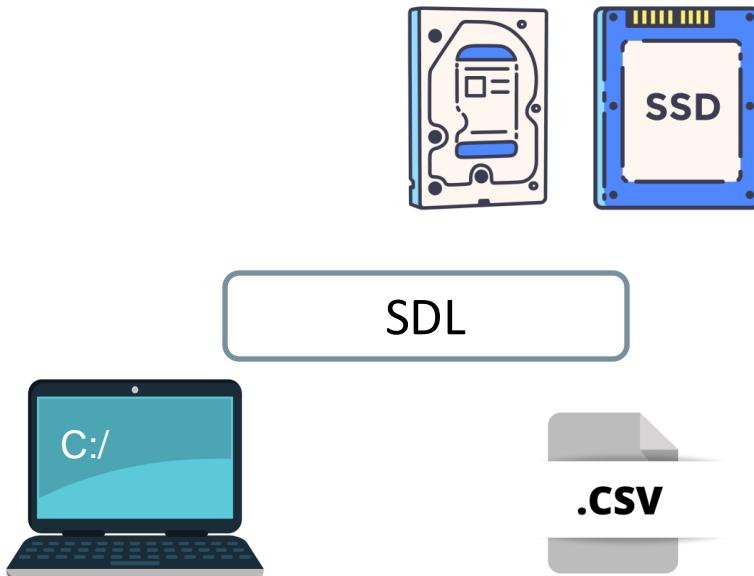
| | | | | |
|--------------------|---------------|----------|------|------------|
| Section_identifier | Course_number | Semester | Year | Instructor |
|--------------------|---------------|----------|------|------------|

GRADE_REPORT

| | | |
|----------------|--------------------|-------|
| Student_number | Section_identifier | Grade |
|----------------|--------------------|-------|

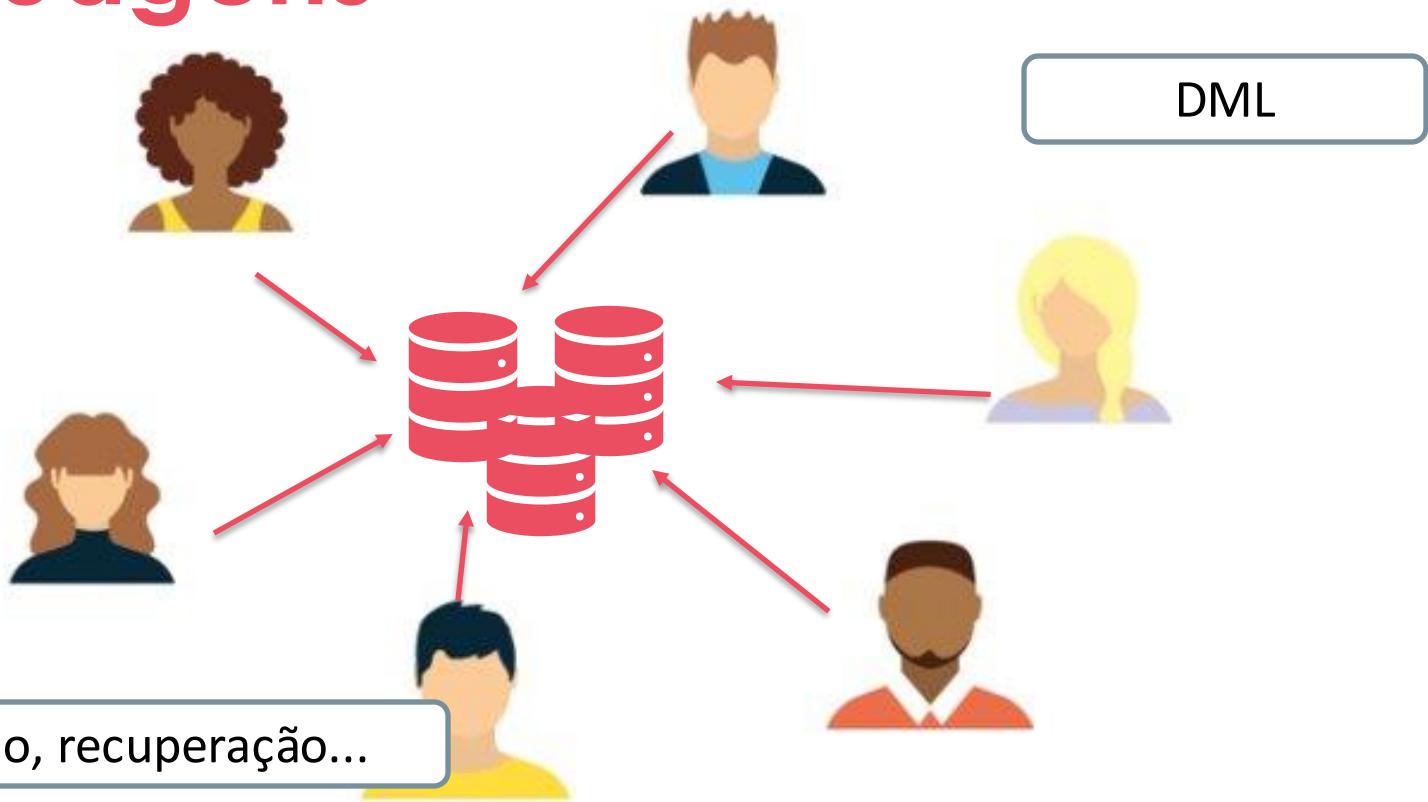


Linguagens

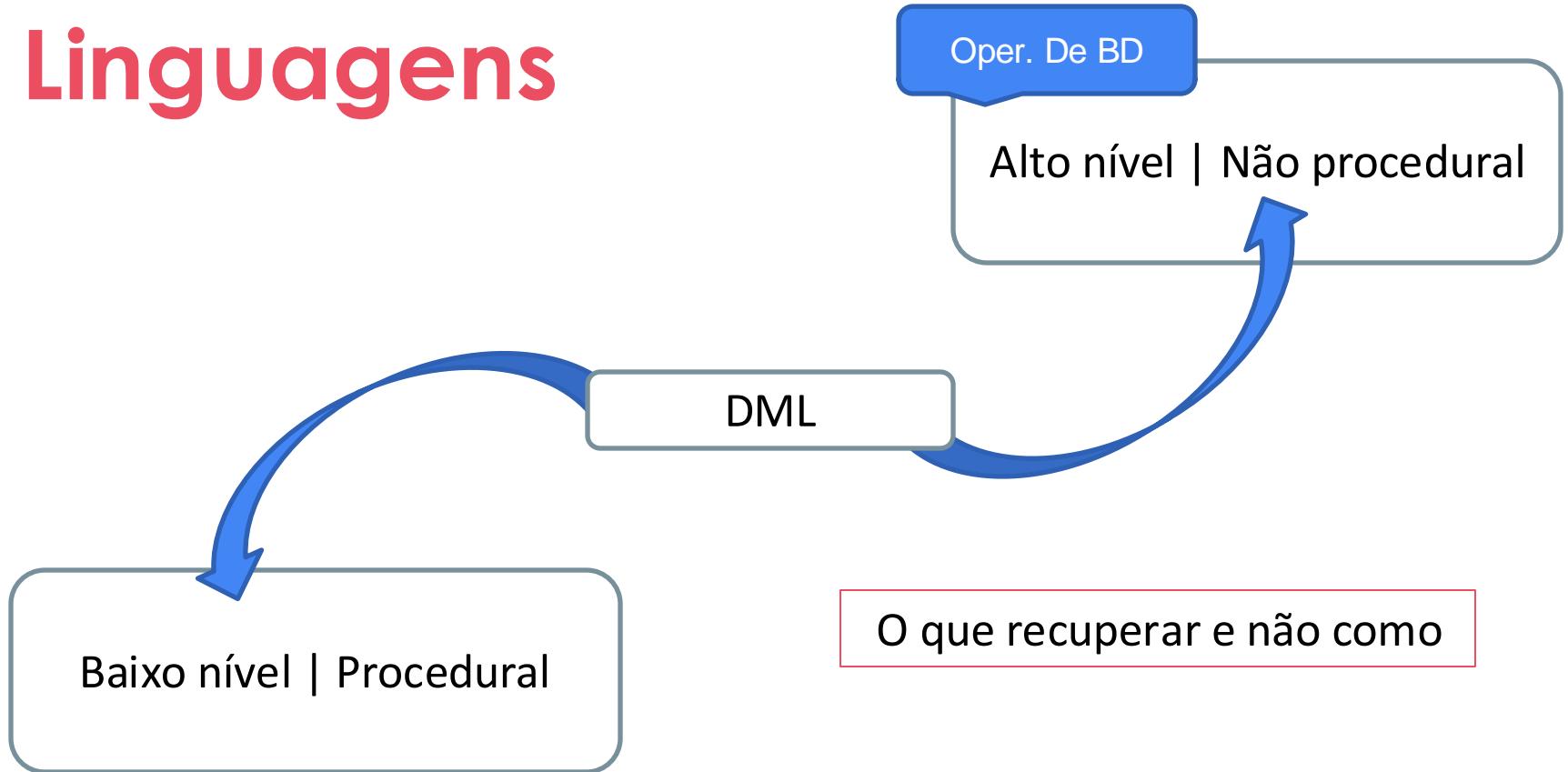


Separação explícita

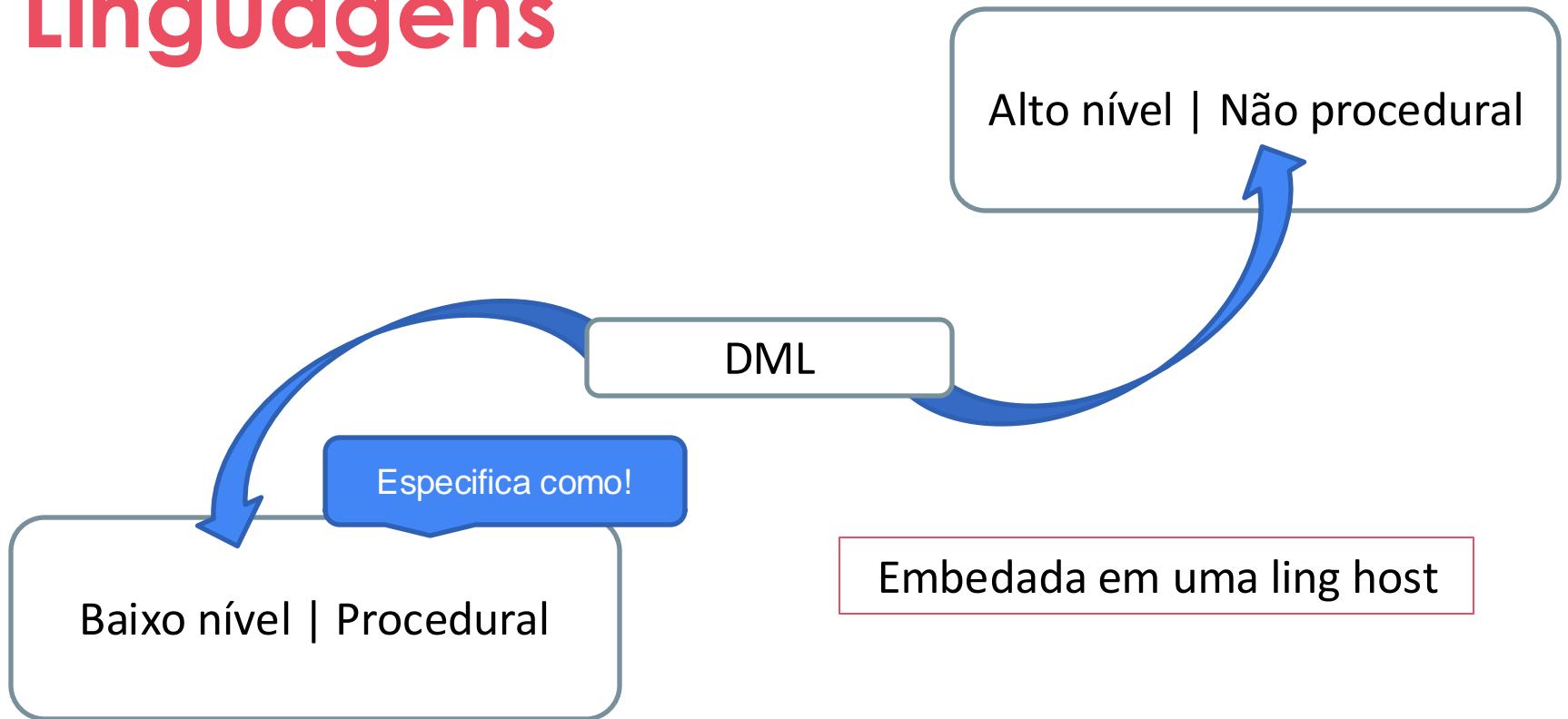
Linguagens



Linguagens



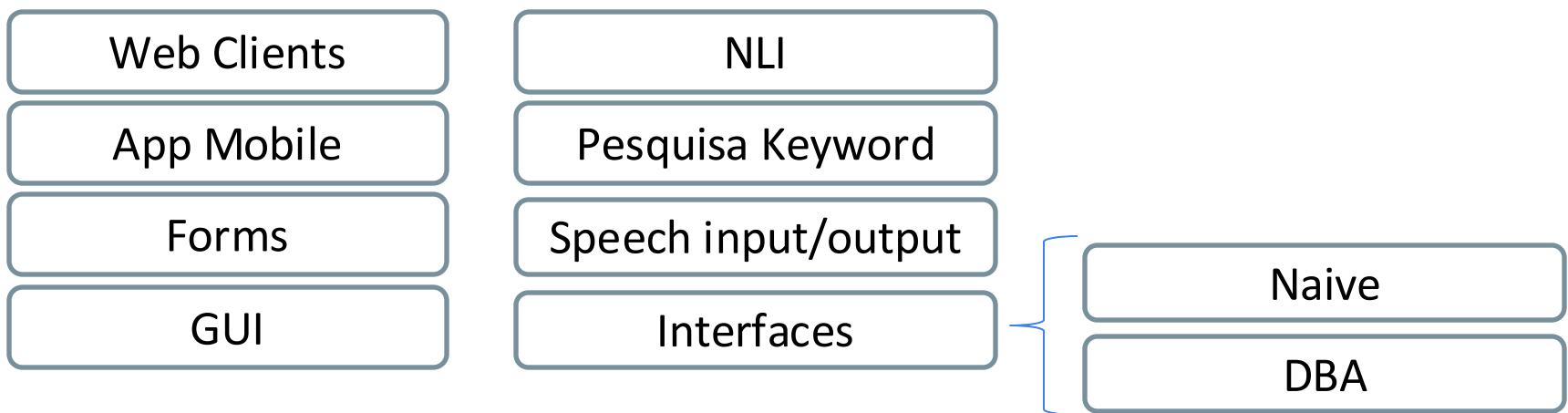
Linguagens



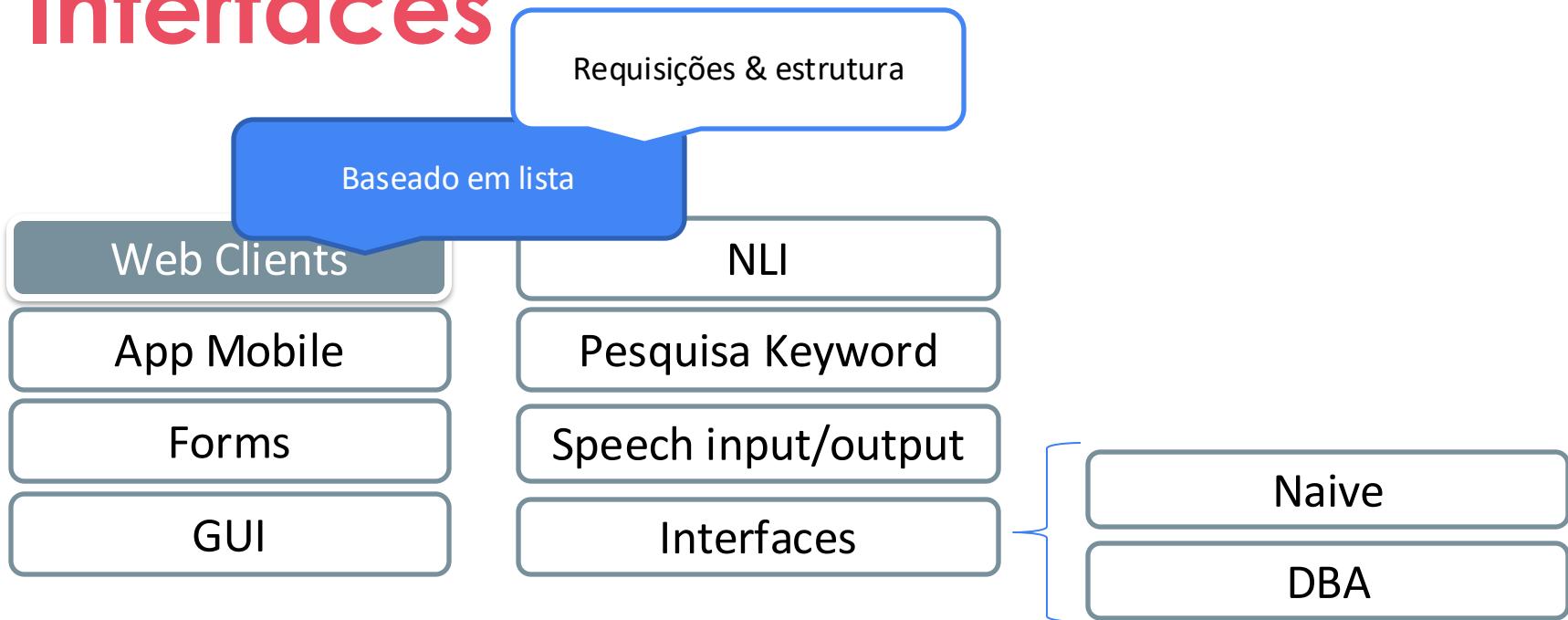
Interfaces



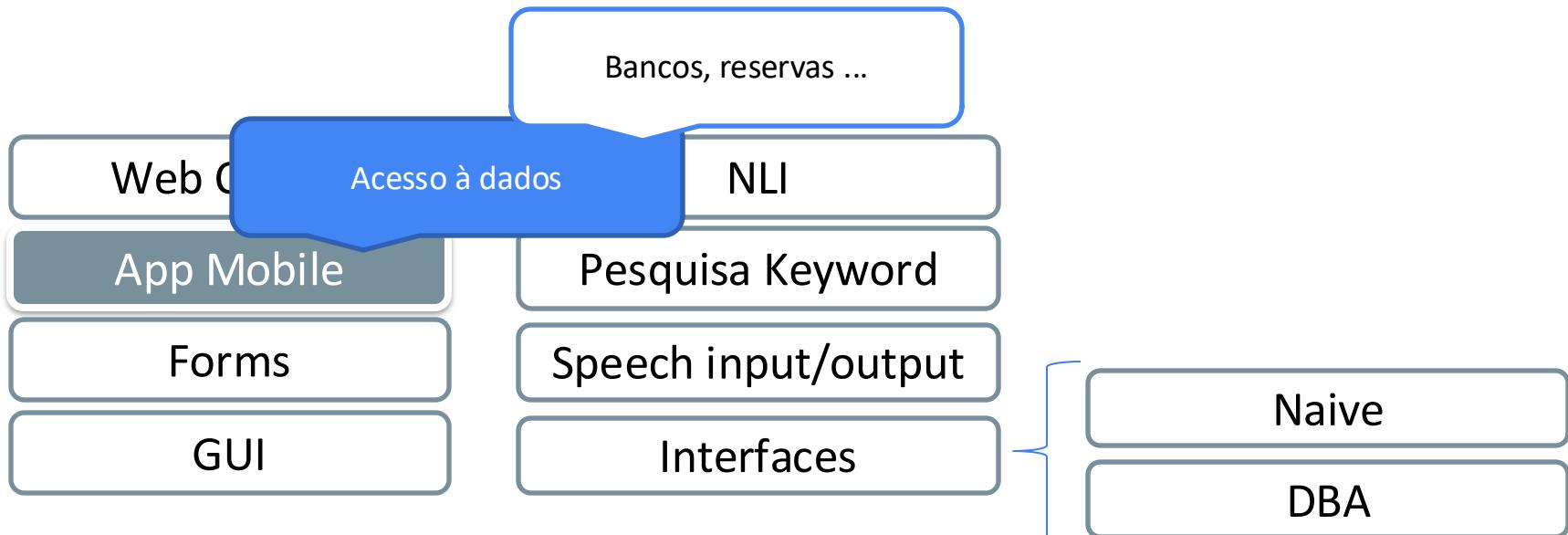
Interfaces



Interfaces

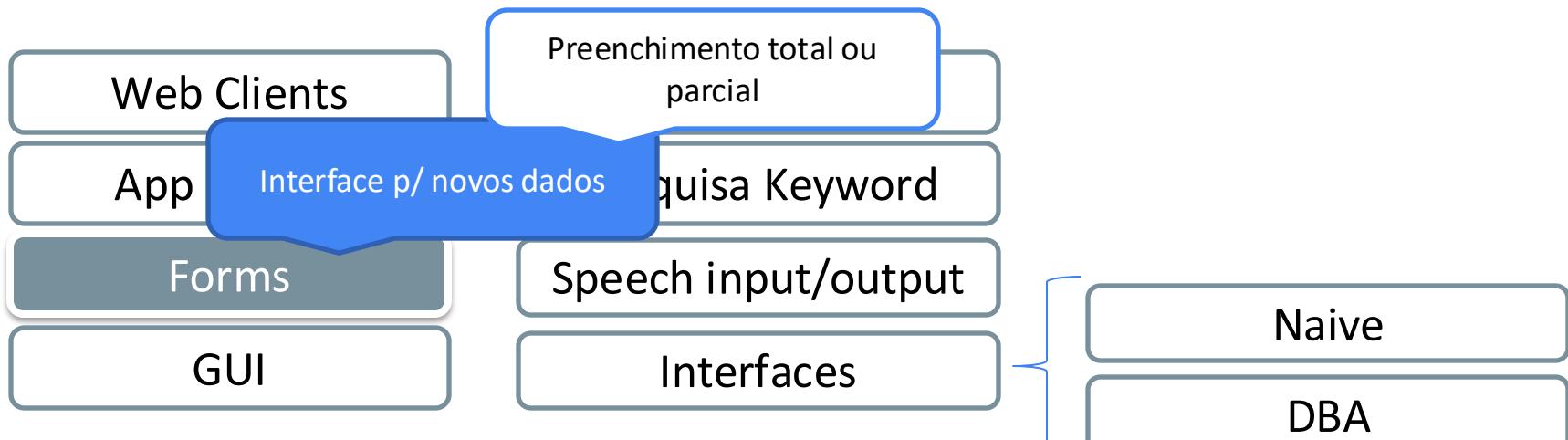


Interfaces



Menu limitado pelo app

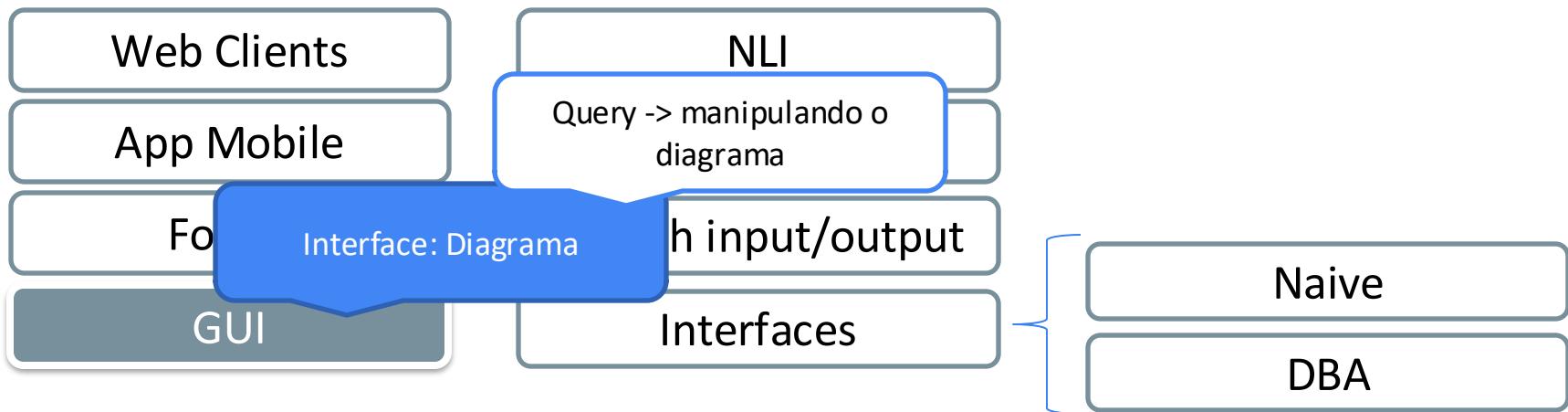
Interfaces



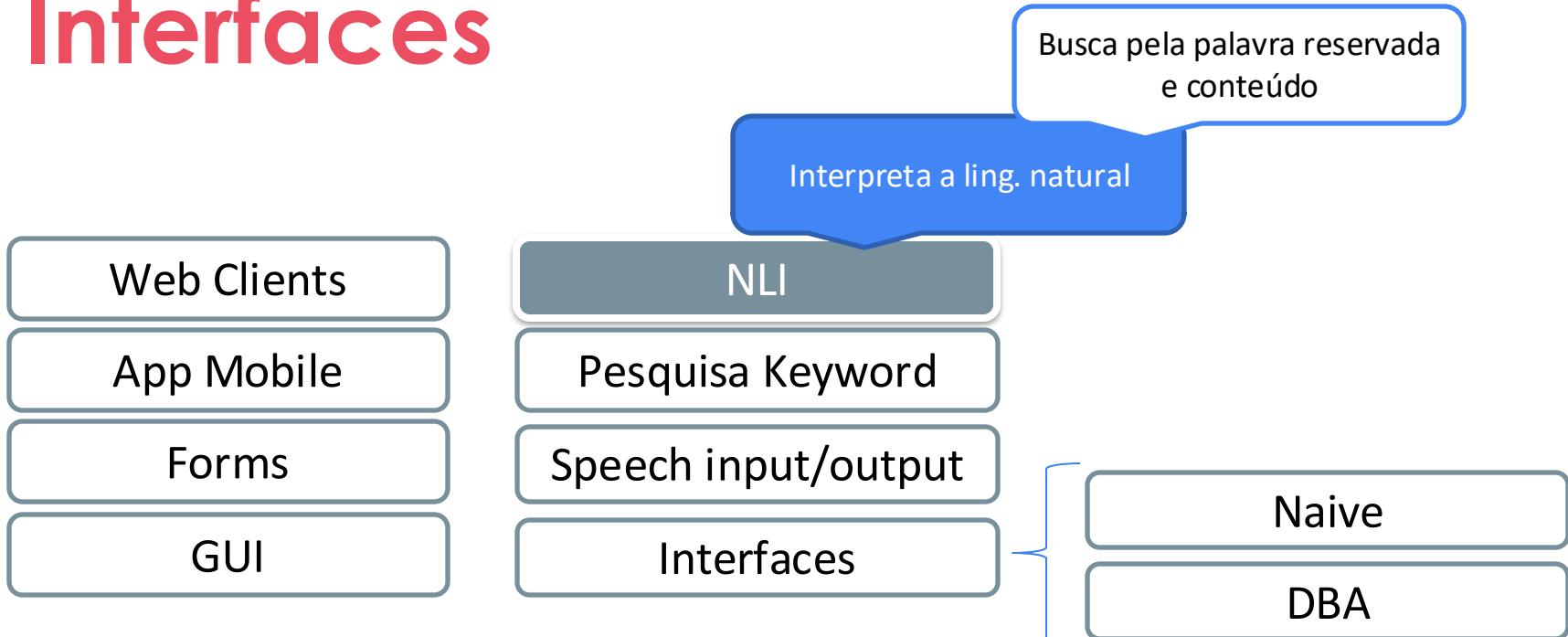
Voltados para Naive com transações canned

SQL*Forms

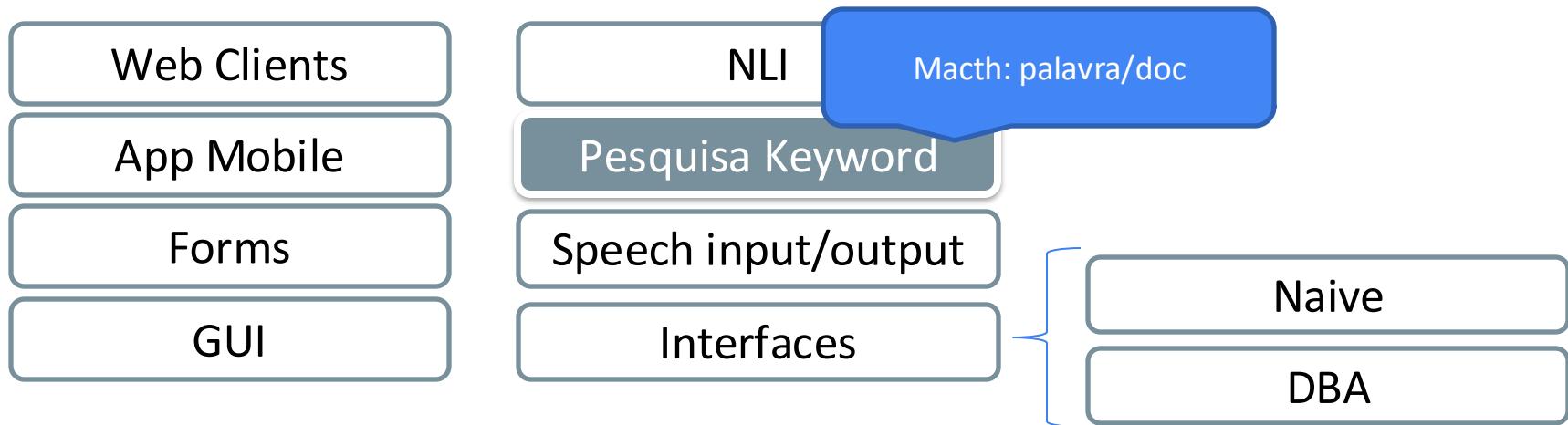
Interfaces



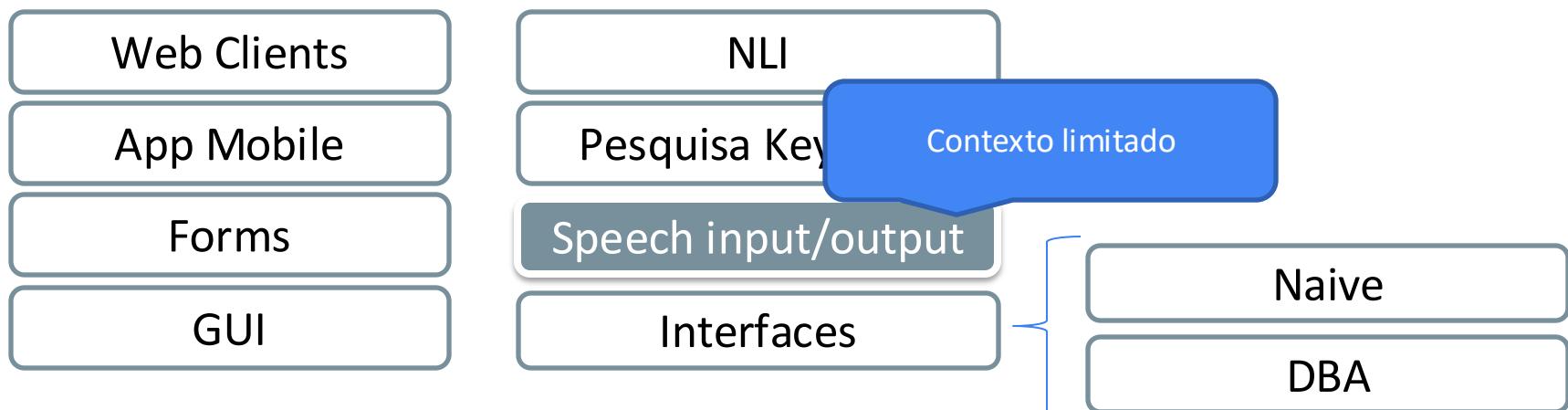
Interfaces



Interfaces

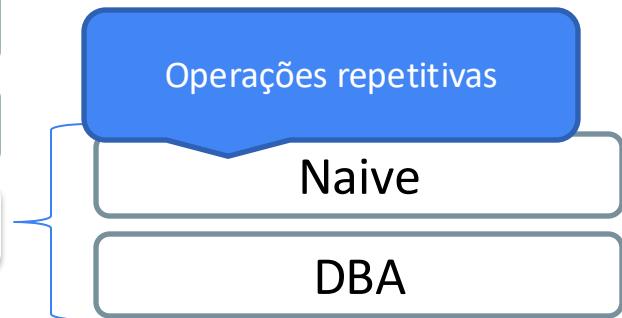
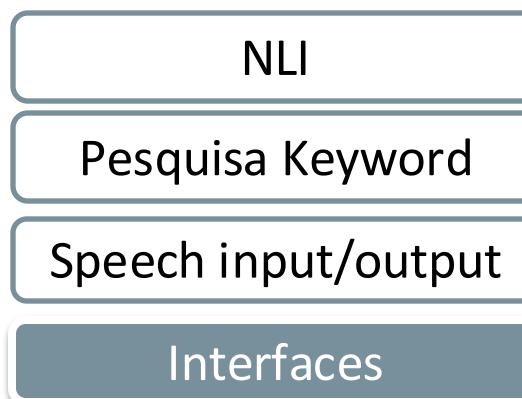


Interfaces



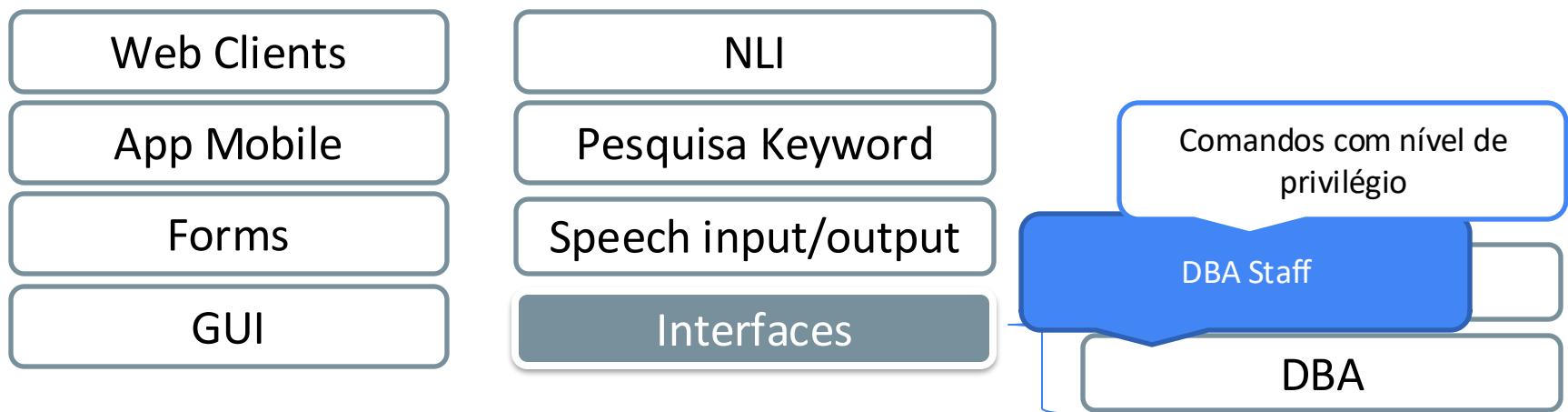
Speech como input e resposta

Interfaces



Transações de rotina e repetitivas - saldo do banco

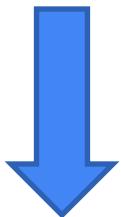
Interfaces



Ambiente



Componentes



Software



Modularizado

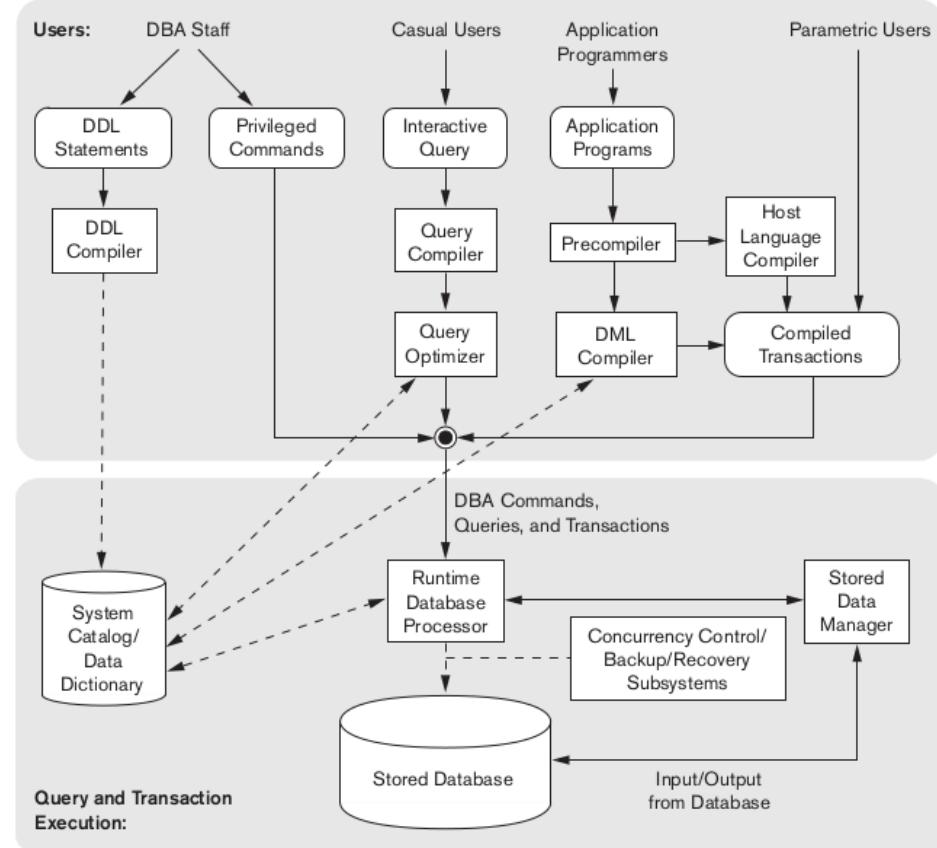


Figure 2.3

Component modules of a DBMS and their interactions.

Componentes

Ambiente de BD

Módulos internos

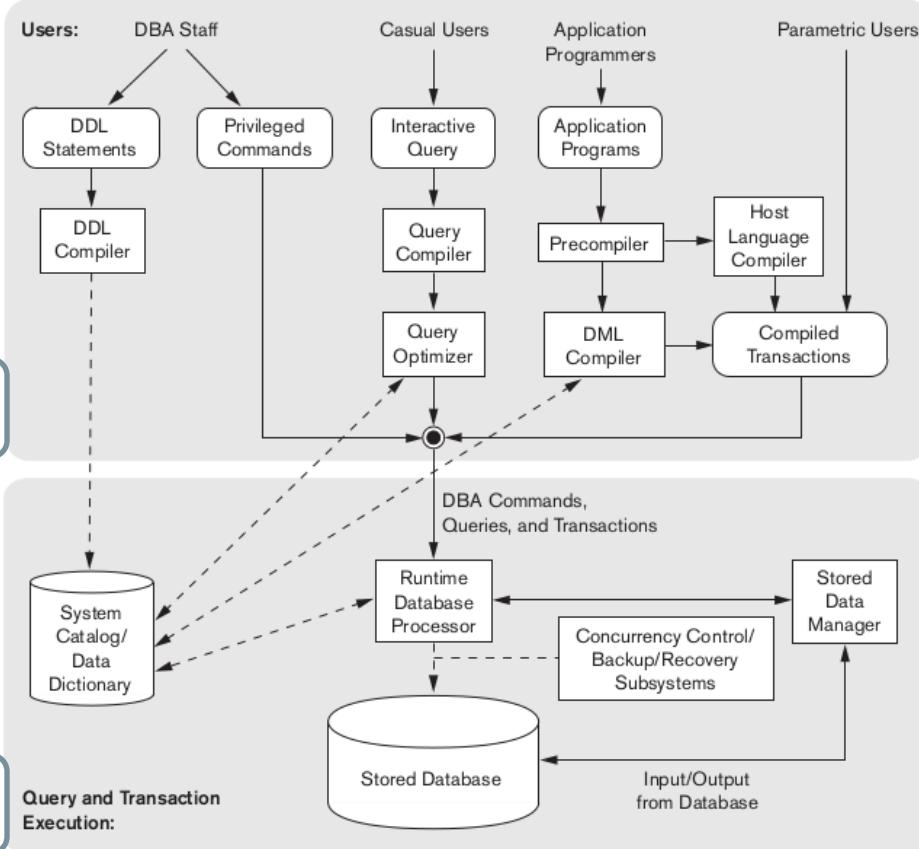


Figure 2.3

Component modules of a DBMS and their interactions.

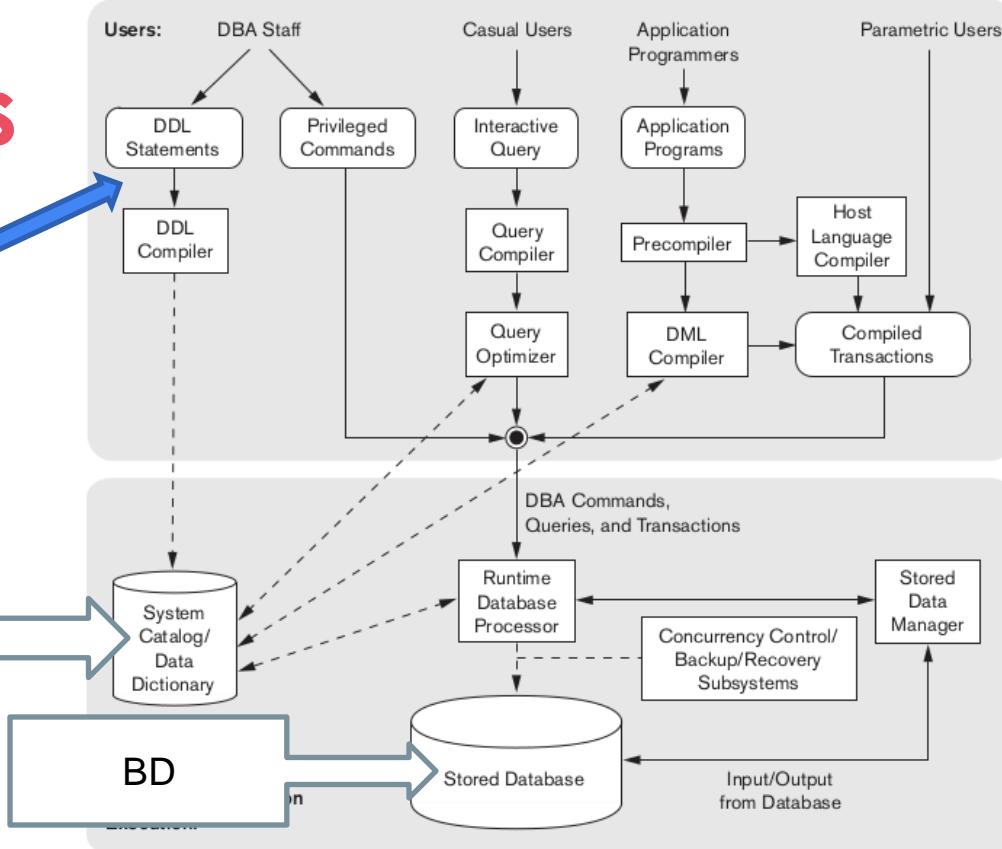
Componentes

Esquema

Info de módulos

Figure 2.3

Component modules of a DBMS and their interactions.



Componentes

Acesso ocasional

Ex: Reordenação de operações

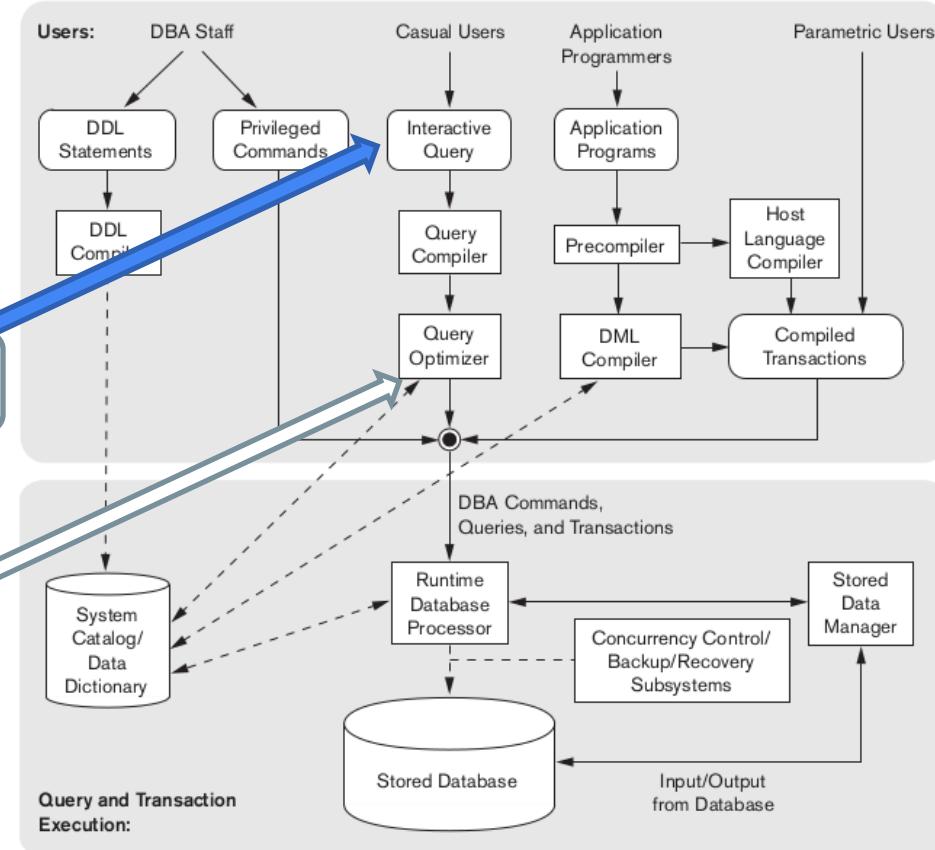


Figure 2.3

Component modules of a DBMS and their interactions.

Componentes

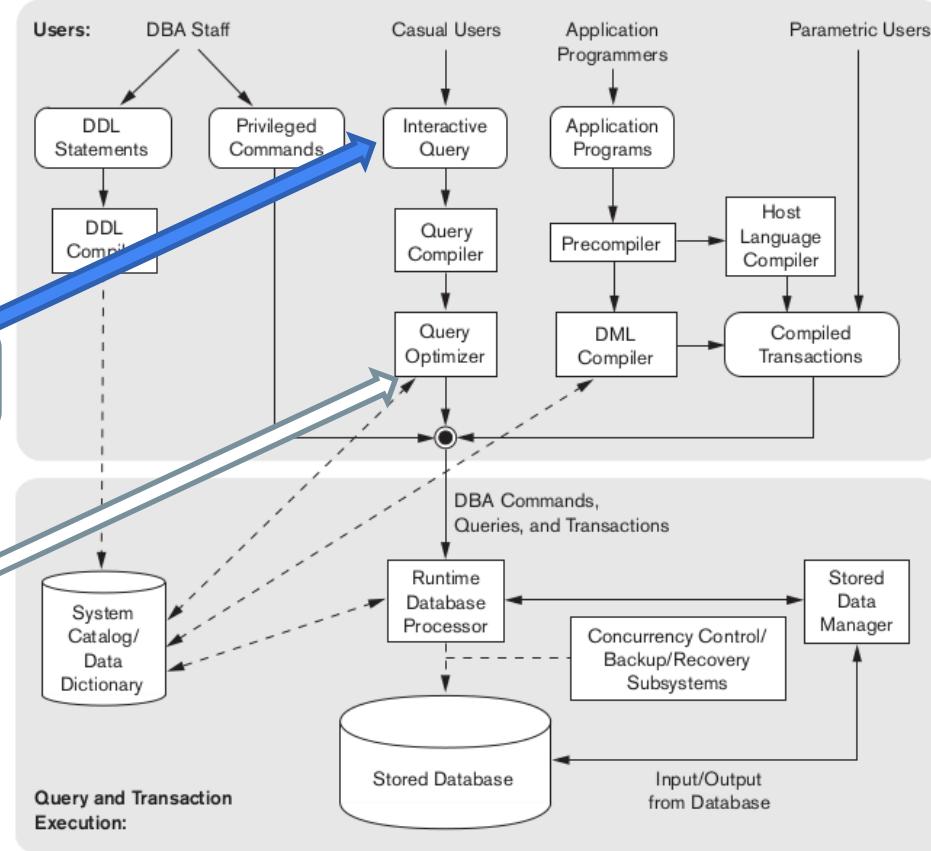
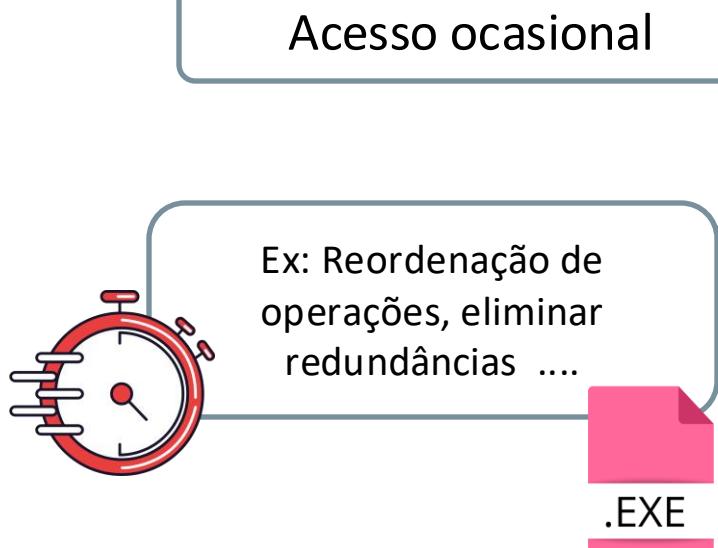


Figure 2.3
Component modules of a DBMS and their interactions.

Componentes



Linguagens de prog.



Extrai DML

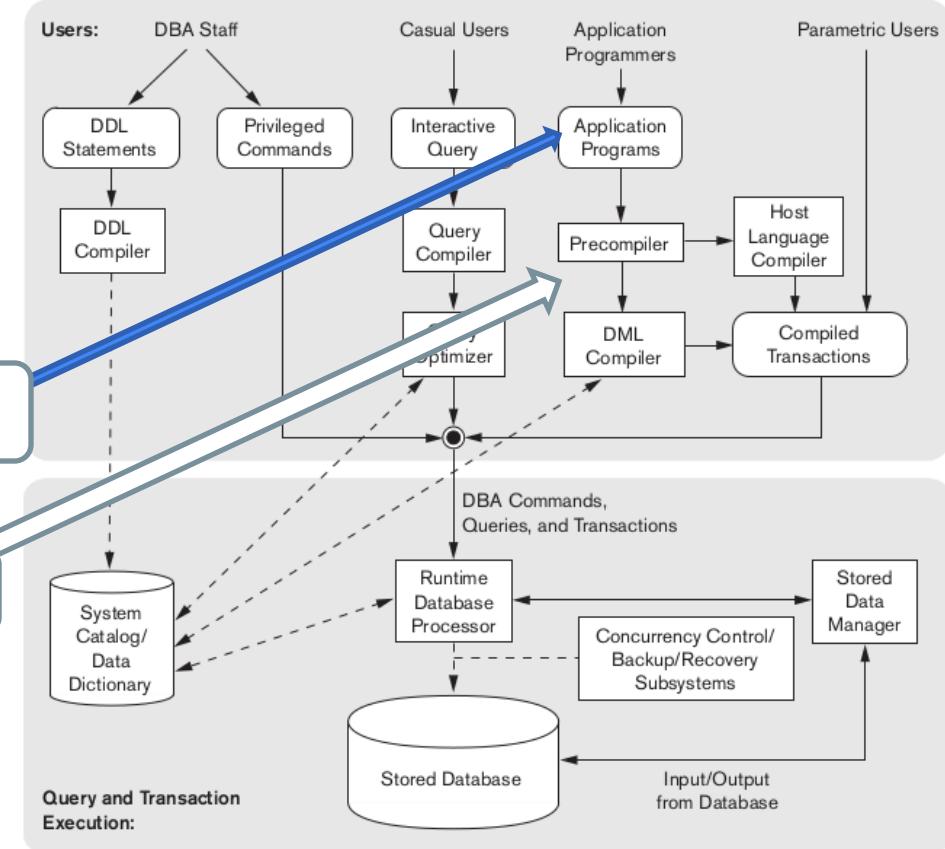


Figure 2.3

Component modules of a DBMS and their interactions.

Componentes

Canned Transaction

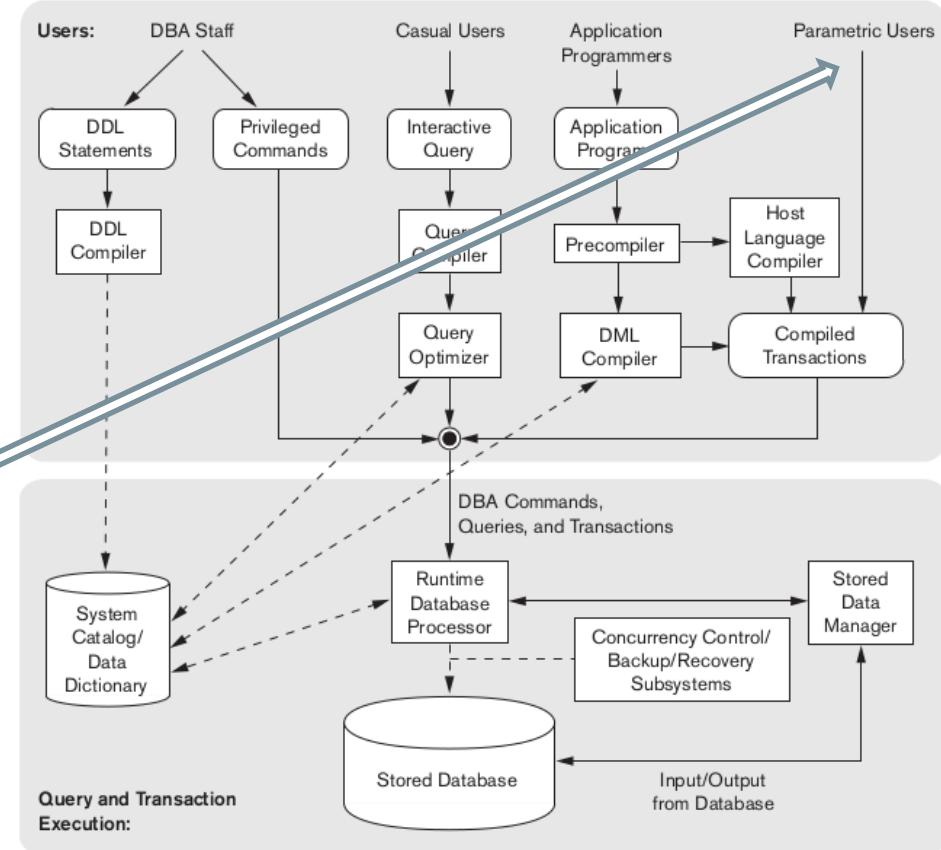


Figure 2.3

Component modules of a DBMS and their interactions.

Componentes

Privileged commands,
Query plans,
Canned transactions ...

Infos de hd/ram

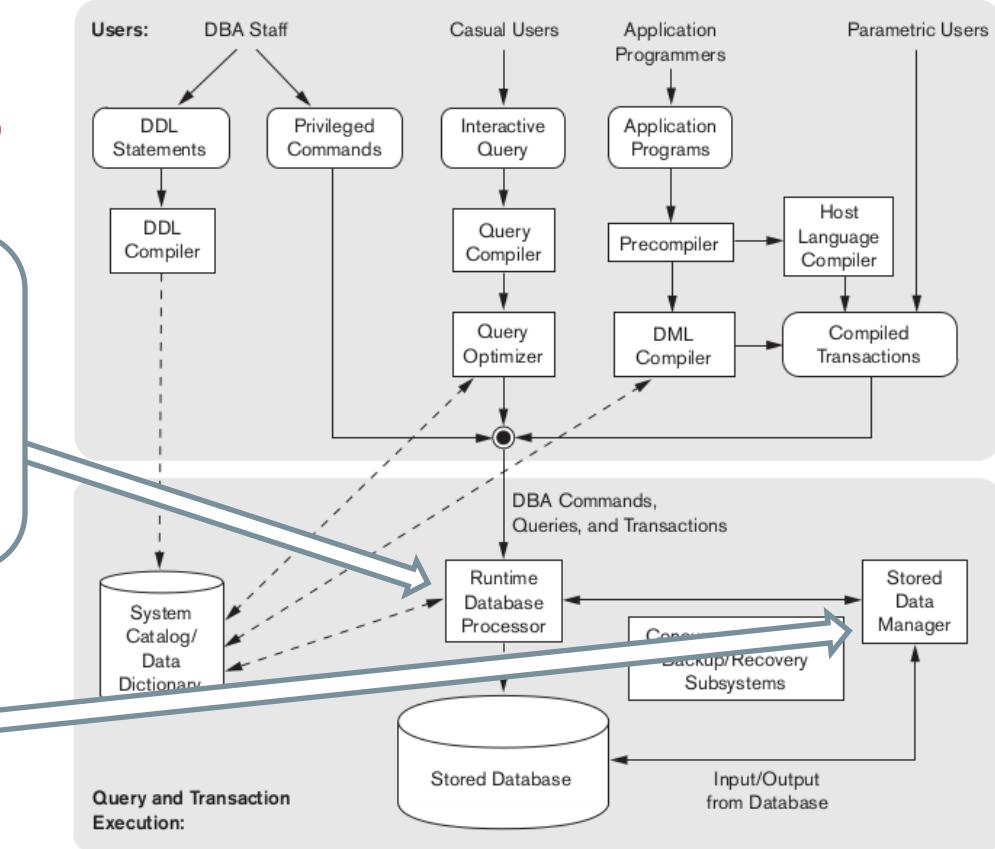


Figure 2.3

Component modules of a DBMS and their interactions.

Componentes

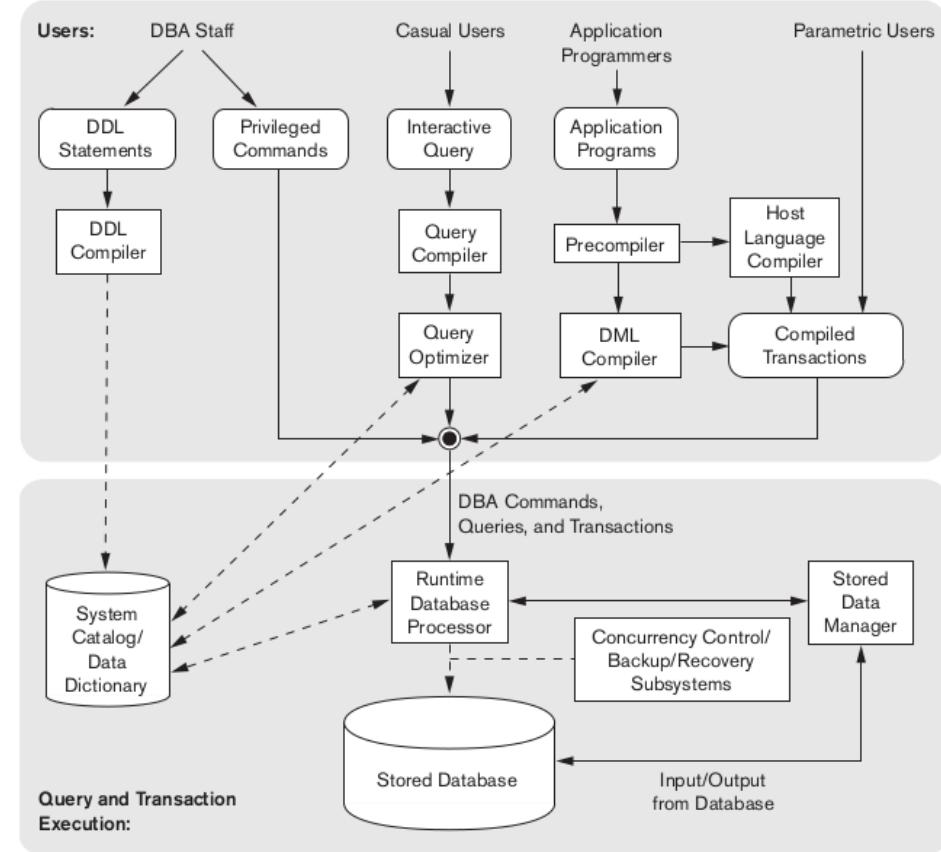
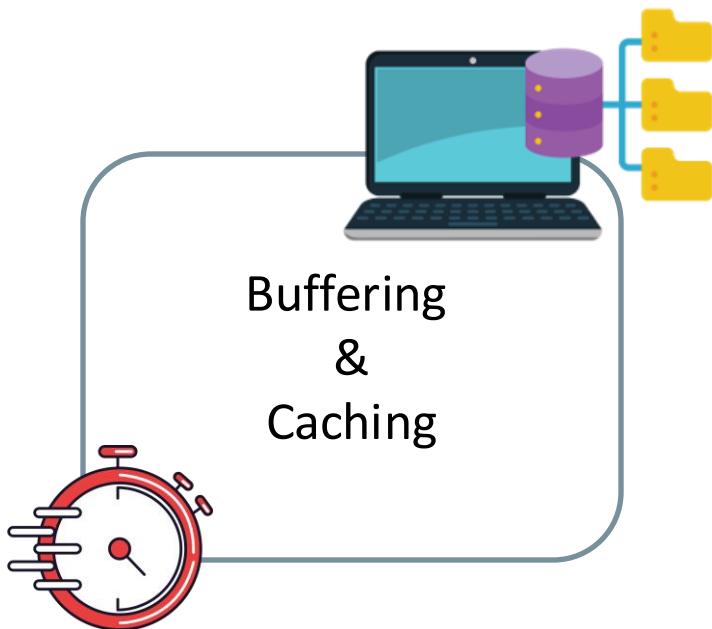
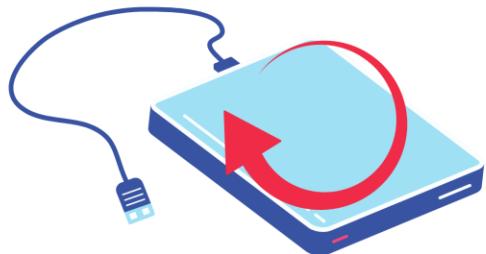


Figure 2.3

Component modules of a DBMS and their interactions.

Utilities – Gerenciamento



Monitoramento

Reorganização do storage

Backup

Loading

Reformatar os dados



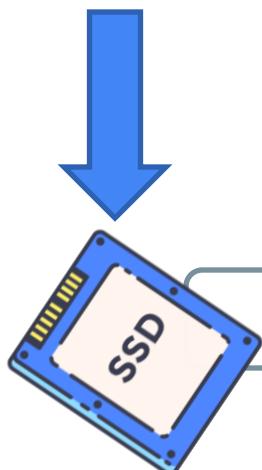
Utilities – Gerenciamento



Monitoramento

Reorganização do storage

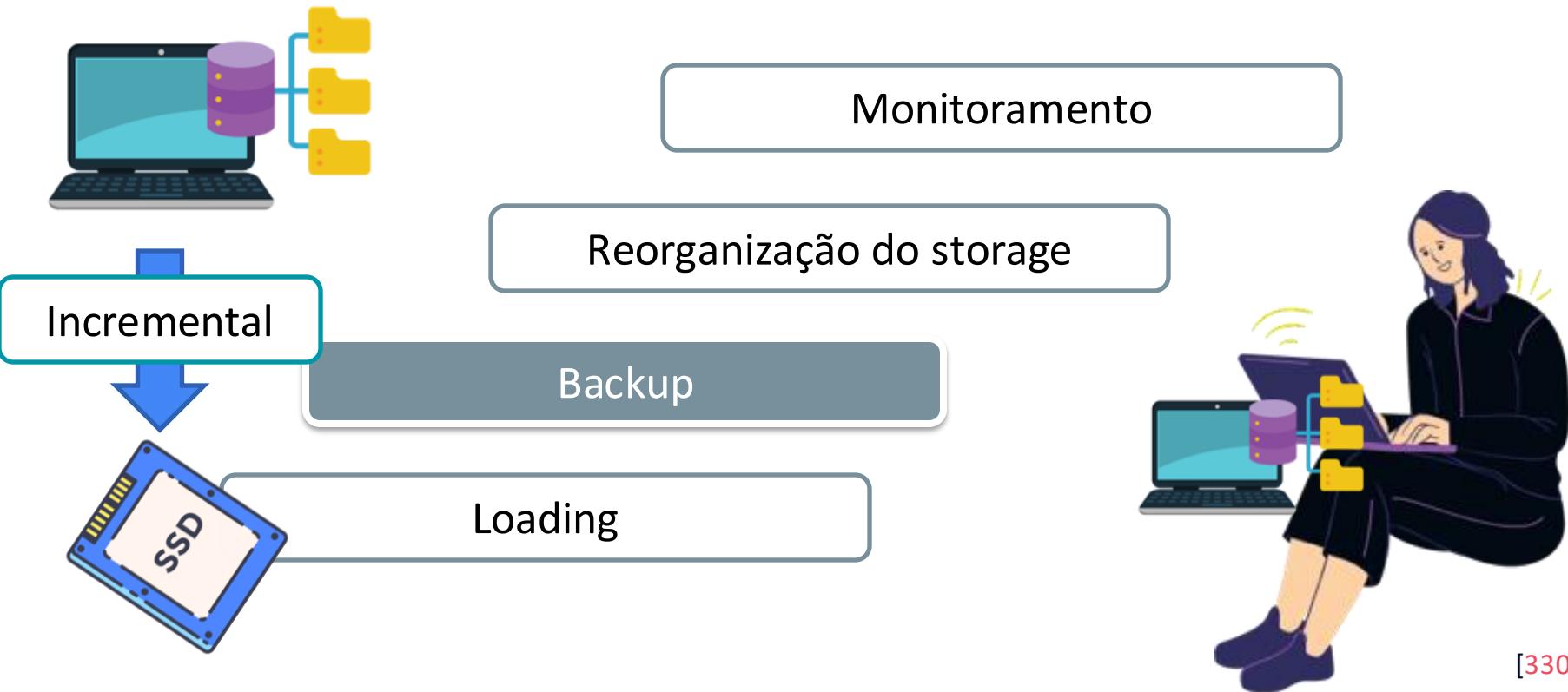
Backup



Loading



Utilities – Gerenciamento



Utilities – Gerenciamento



Monitoramento

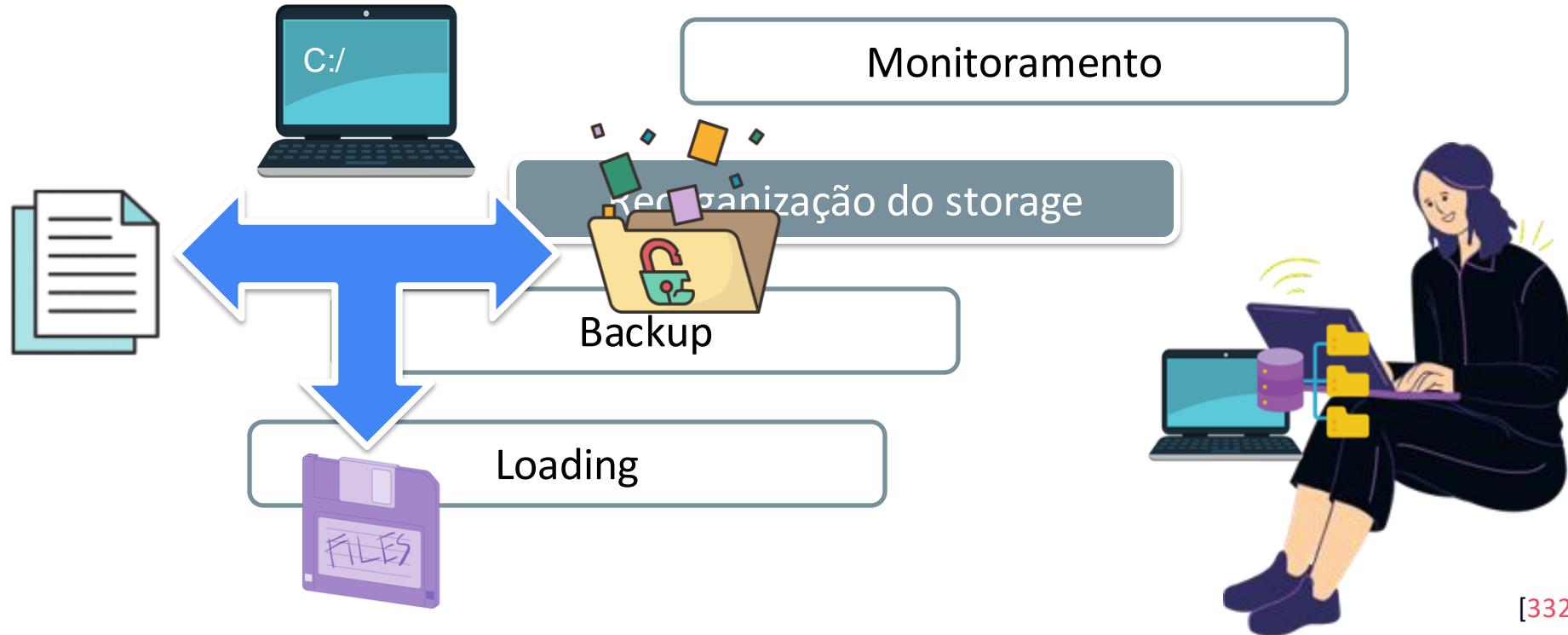
Reorganização do storage

Backup

Loading



Utilities – Gerenciamento



Utilities – Gerenciamento



Monitoramento

Reorganização do storage

Backup

Loading

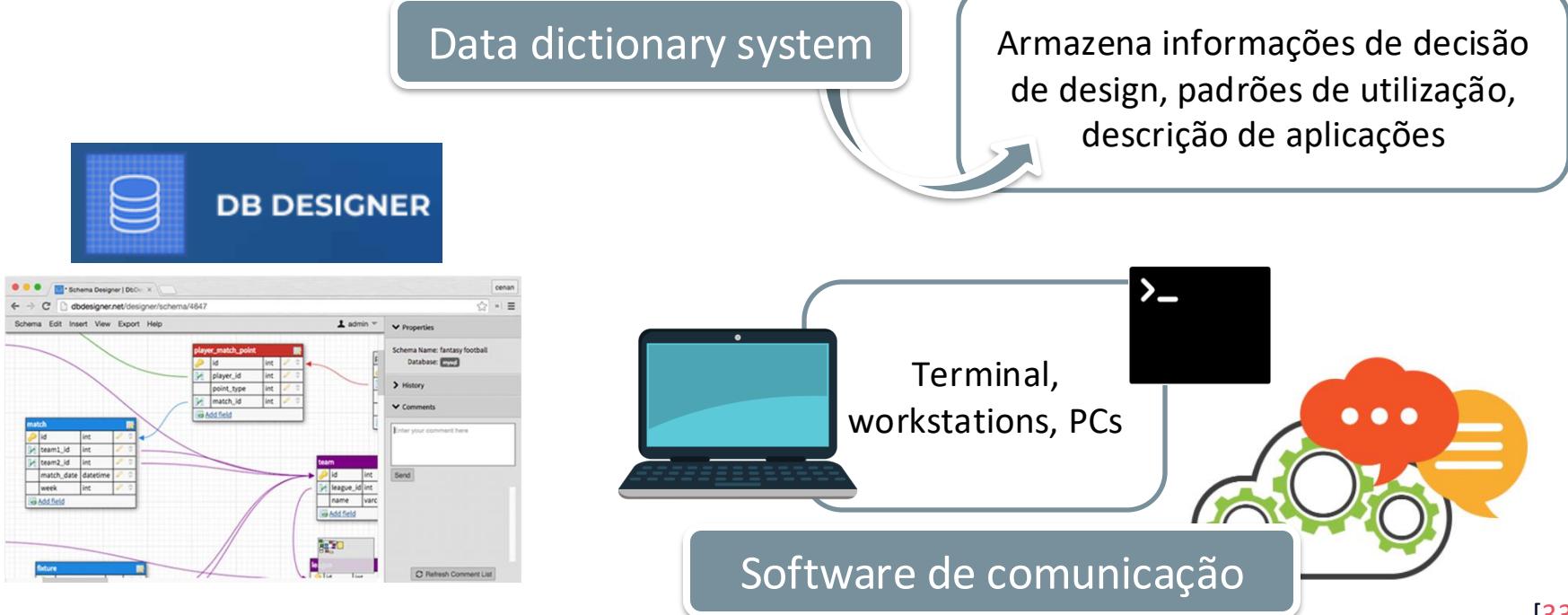
Estatísticas do BD



Decisões



Ferramentas e aplicações

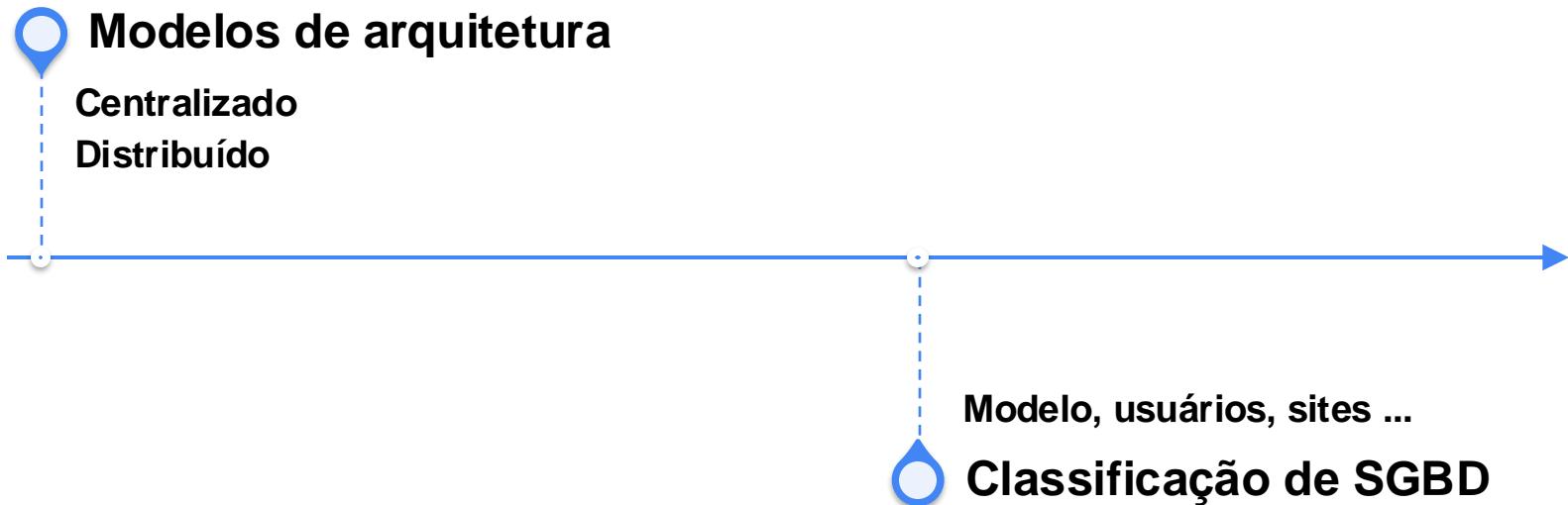


Etapa 10

Arquitetura: Modelo Cliente-servidor e Classificação de SGBDs

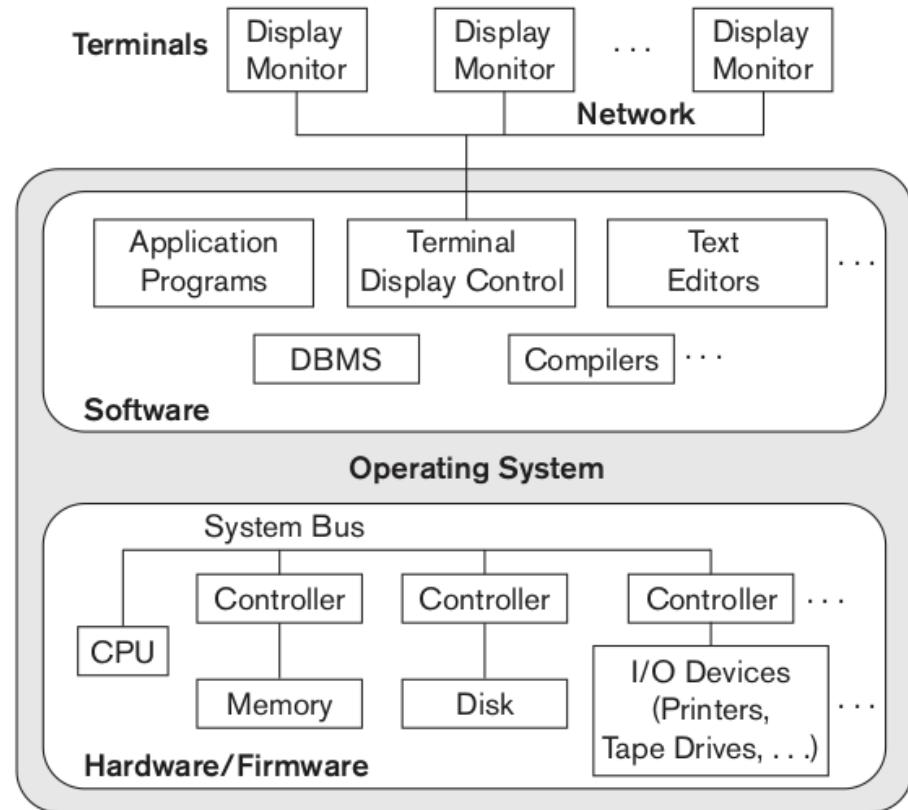
// Introdução à Banco de dados

Conversa

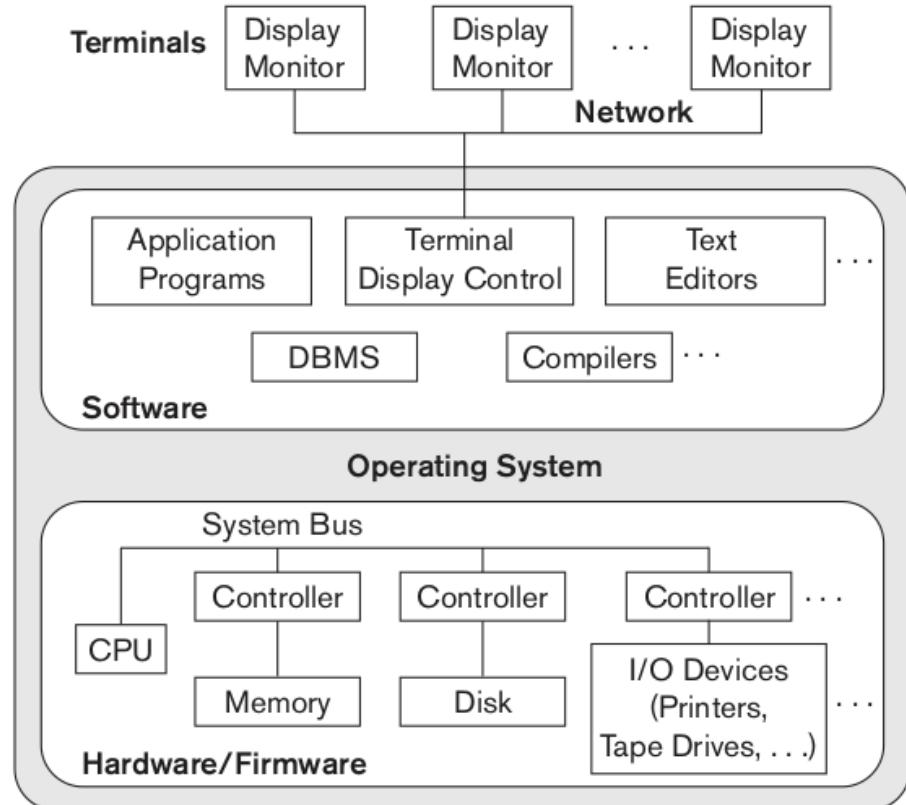
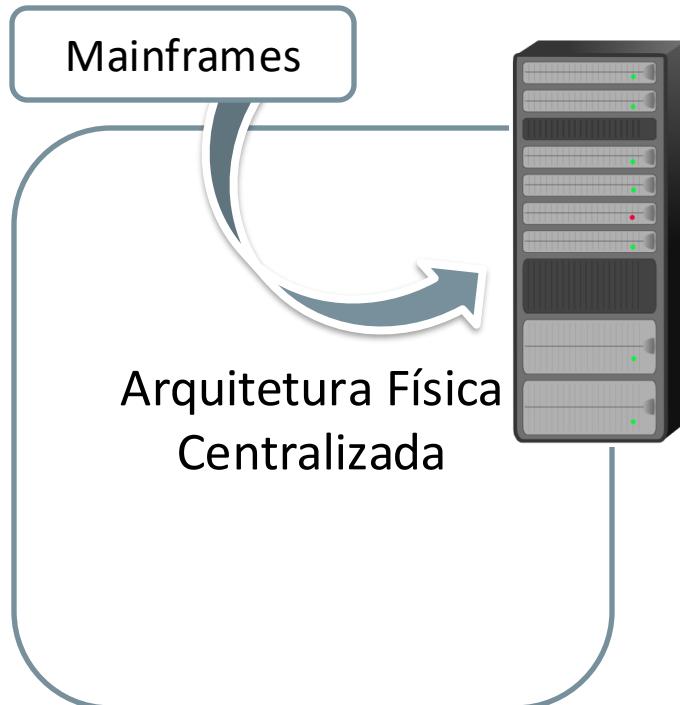


Arquitetura

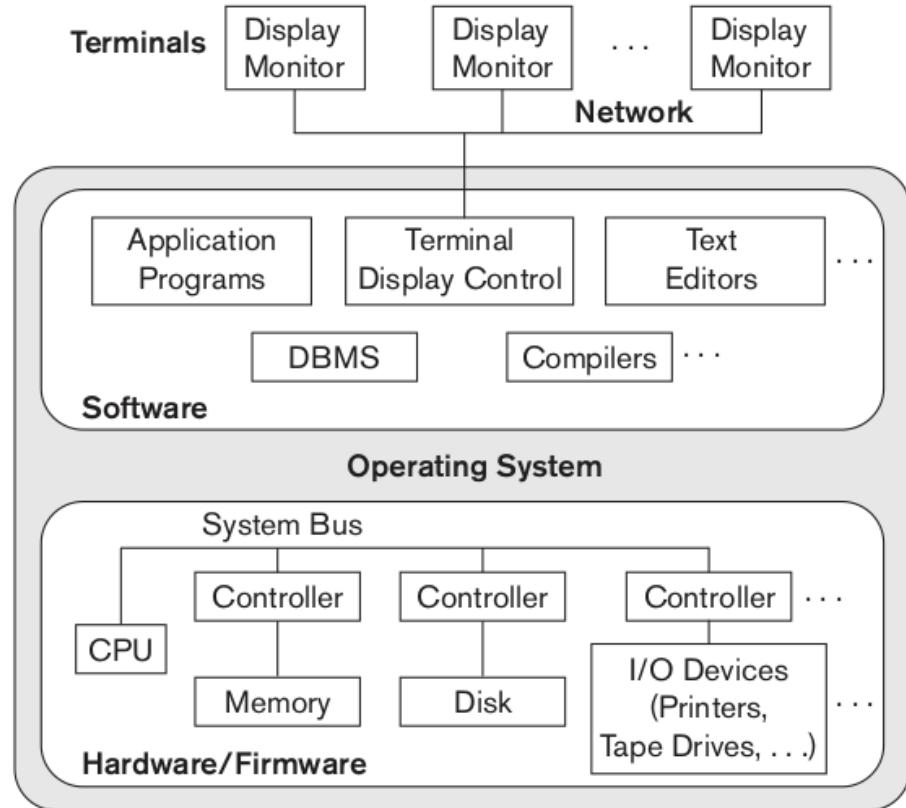
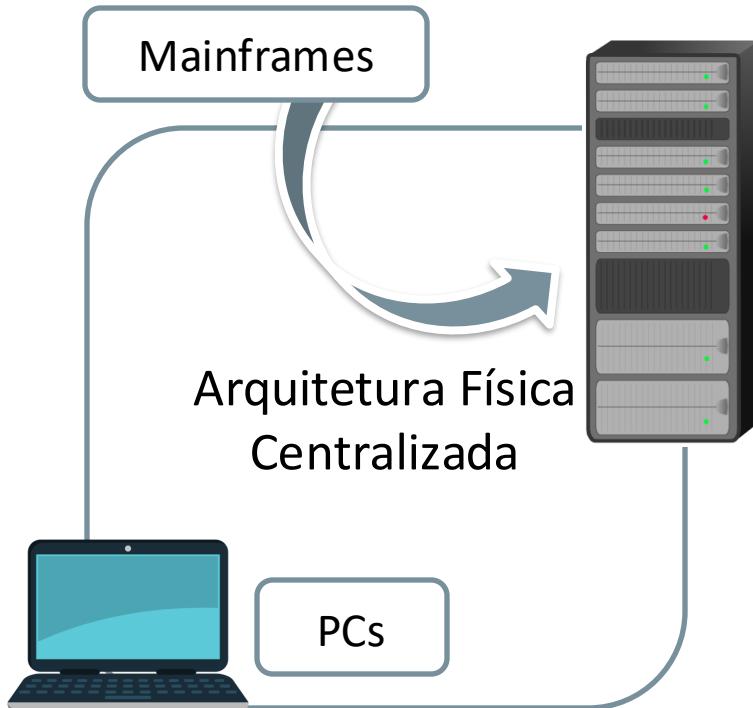
Arquitetura Física
Centralizada



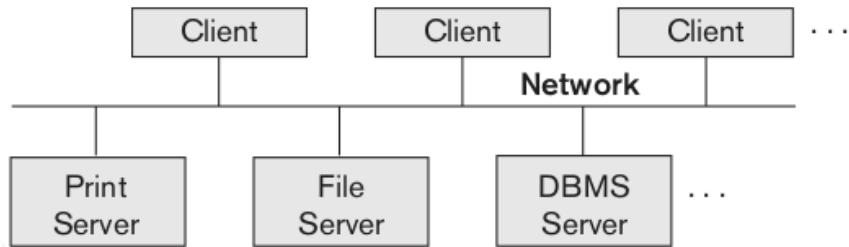
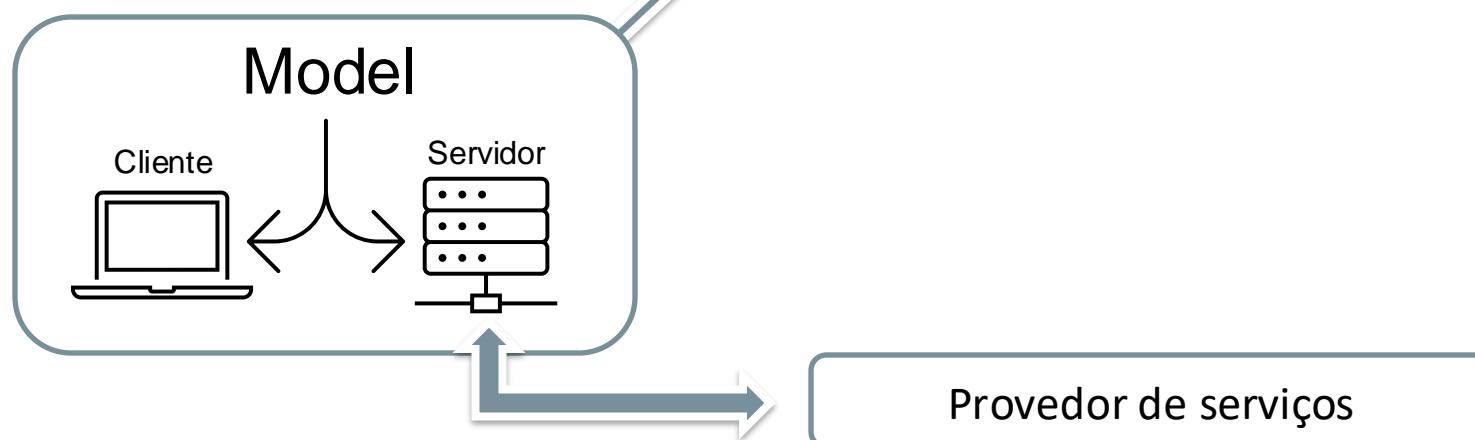
Arquitetura



Arquitetura



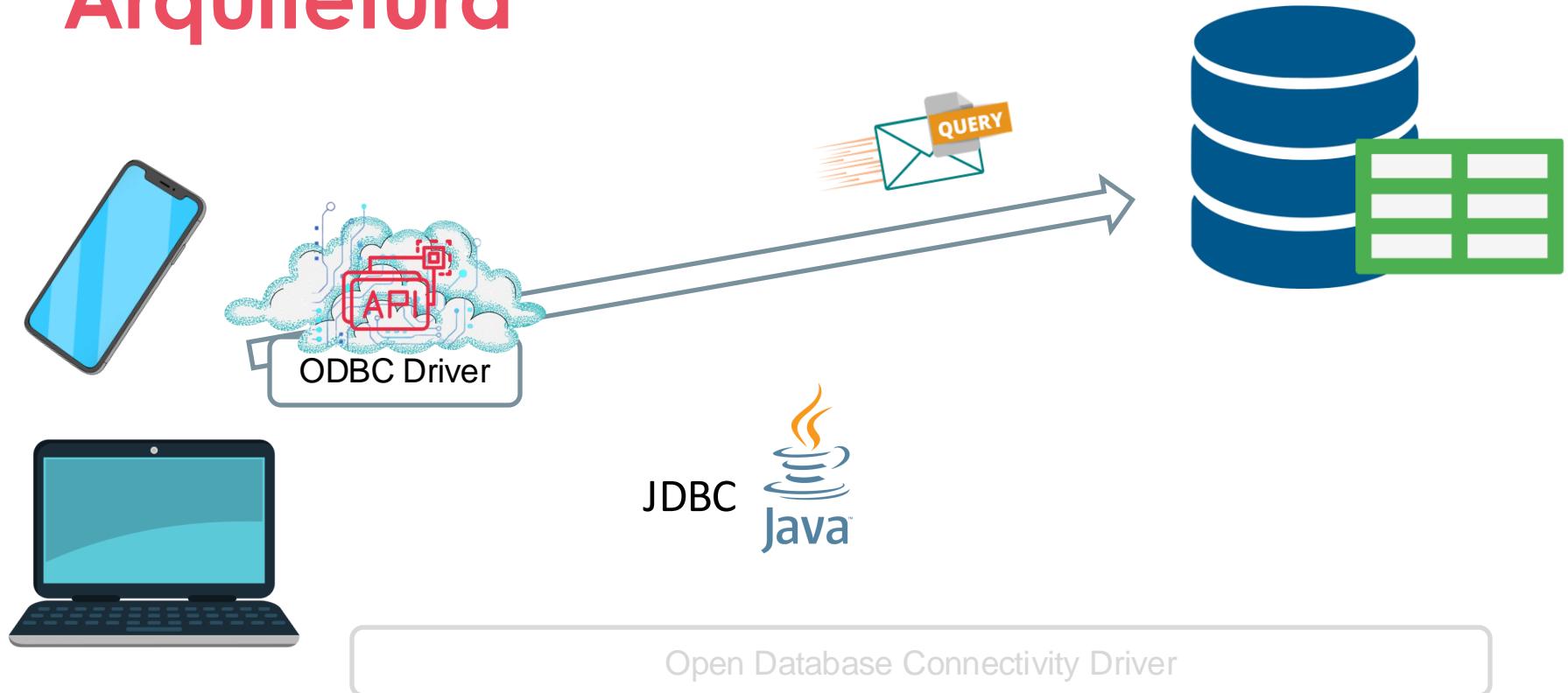
Arquitetura



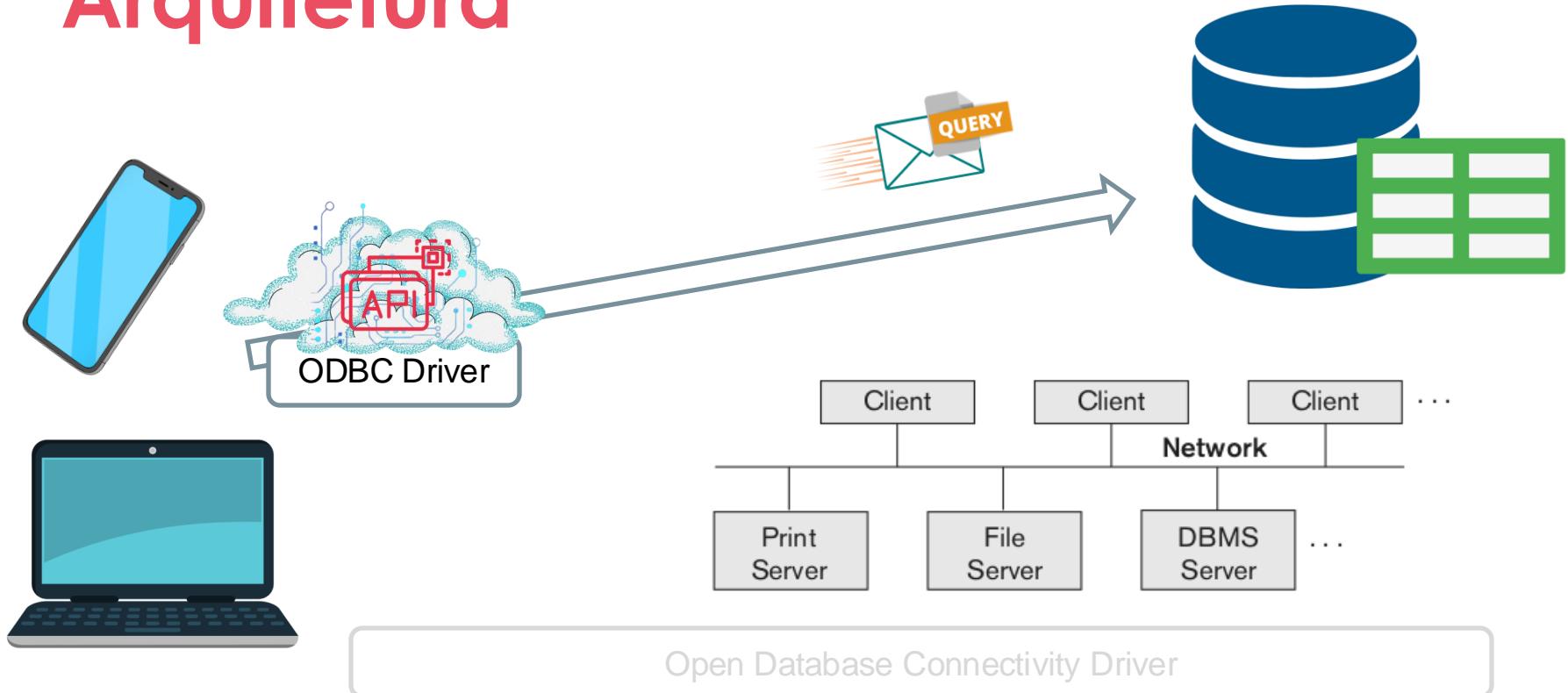
Arquitetura



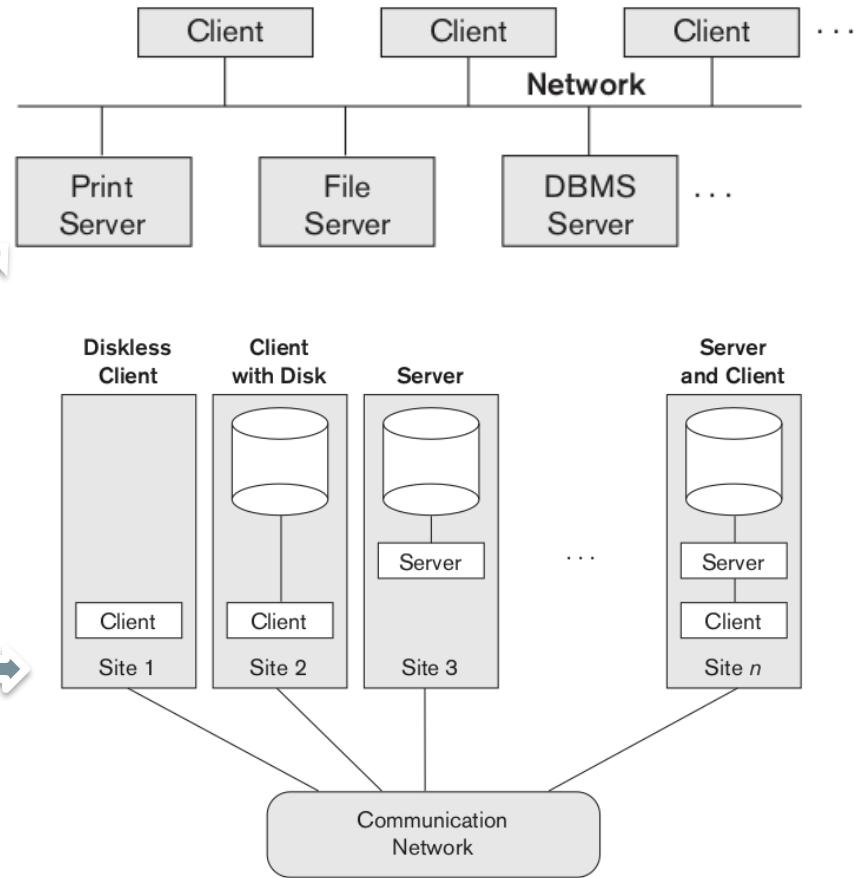
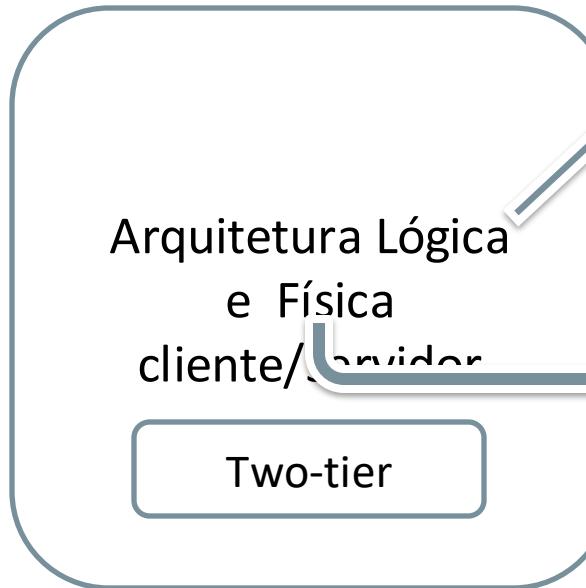
Arquitetura



Arquitetura



Arquitetura

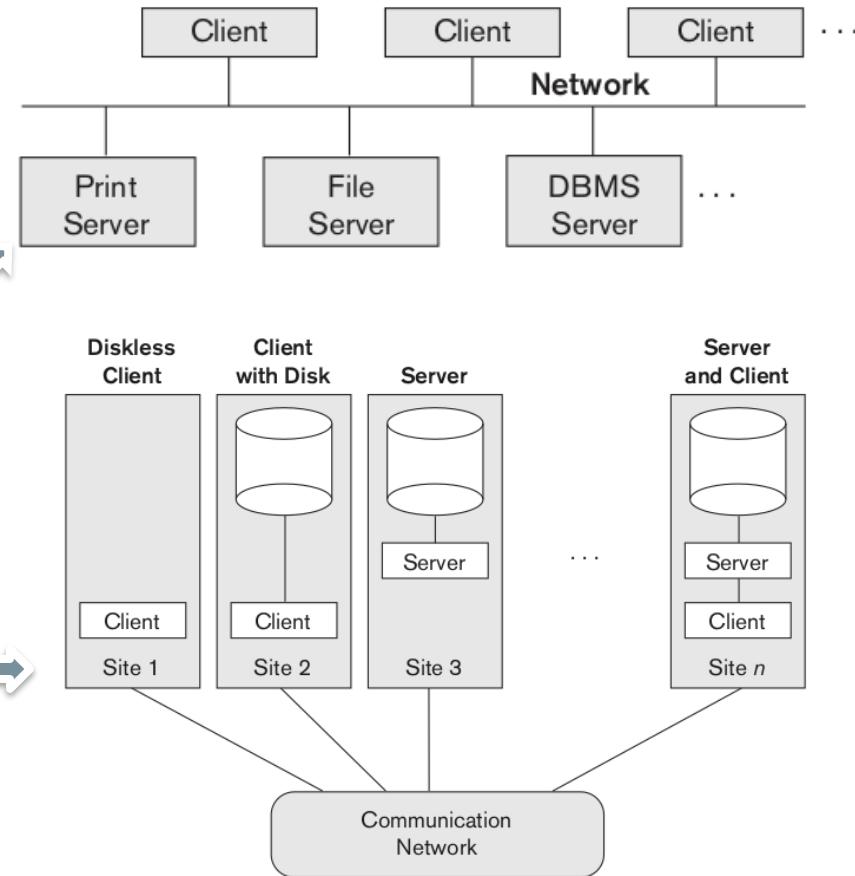


Arquitetura

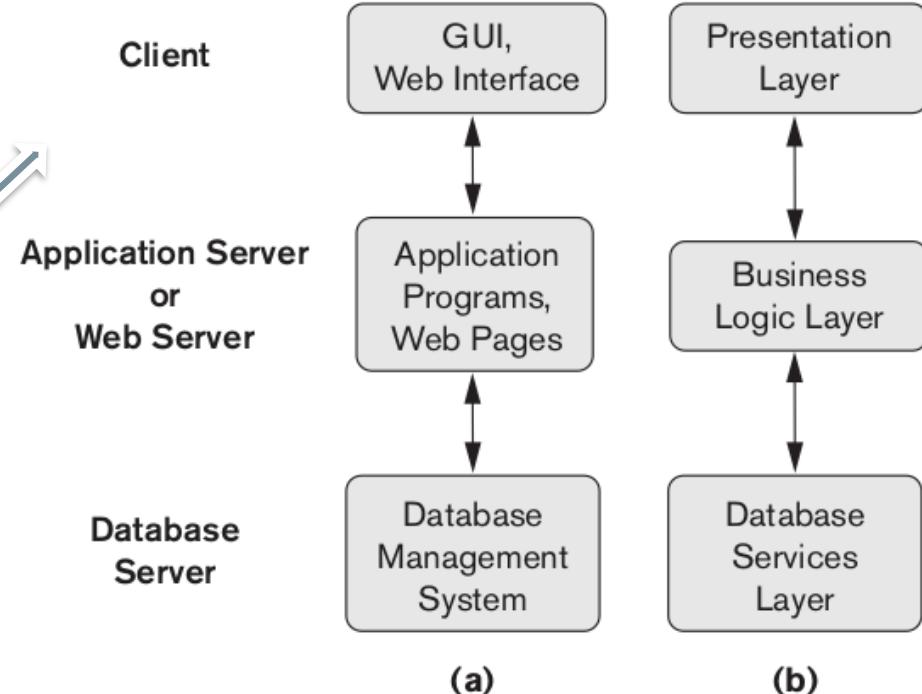
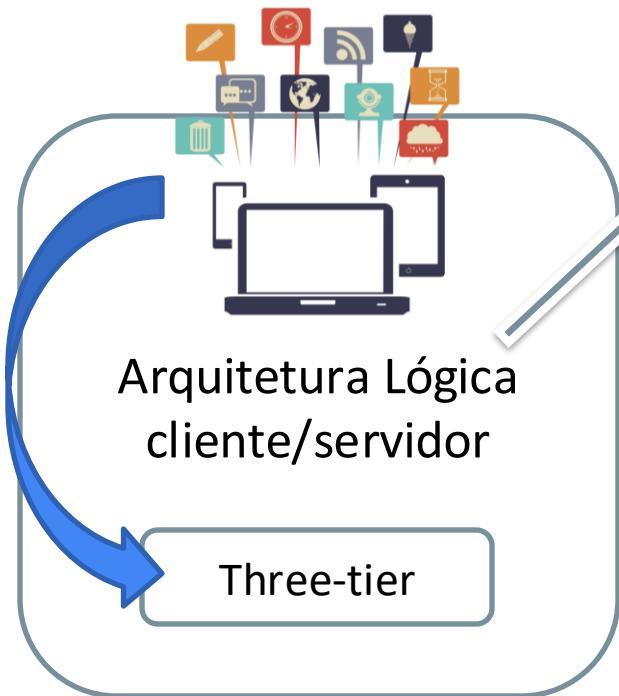
Simplicidade & Compatibilidade

Arquitetura Lógica
e Física
cliente/prov

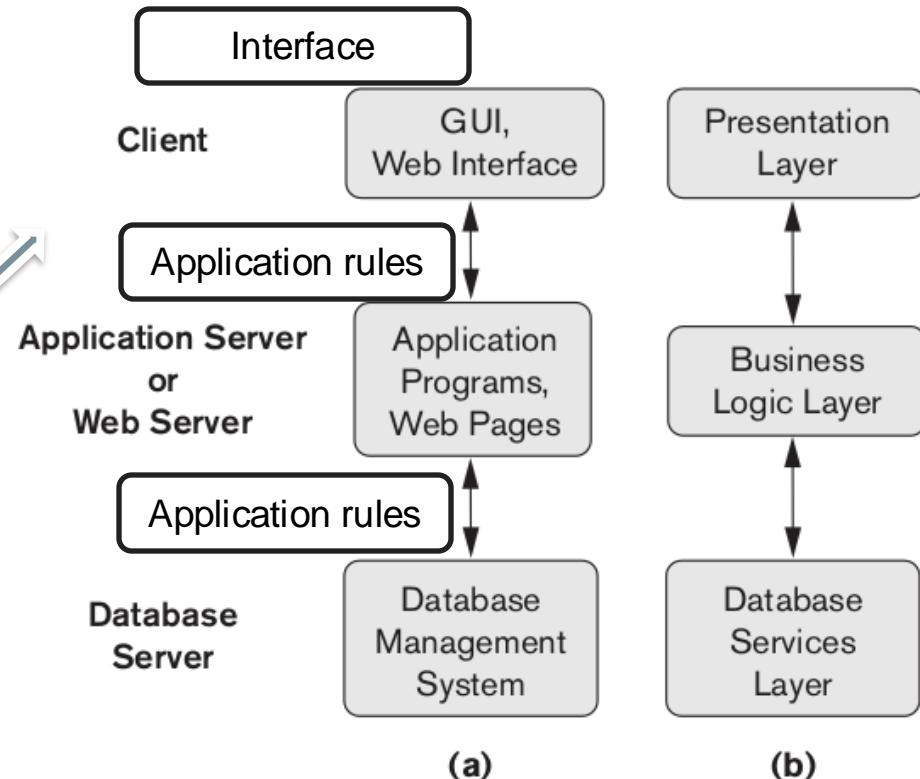
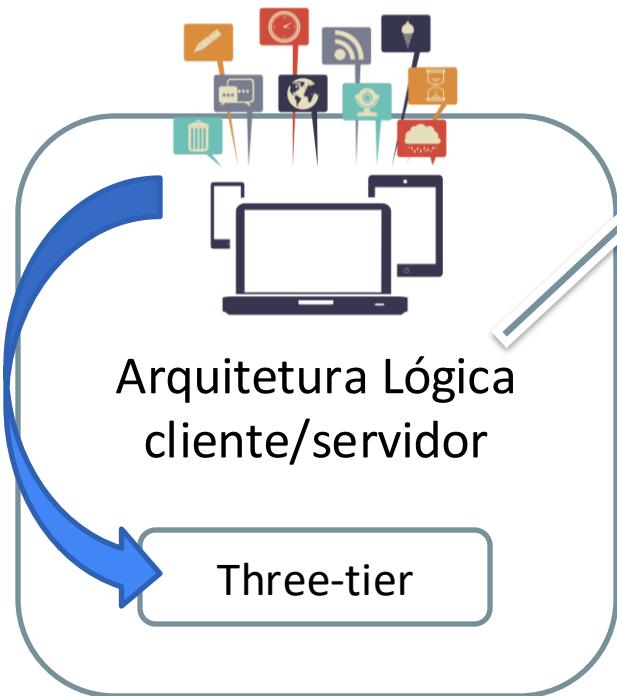
Two-tier



Arquitetura



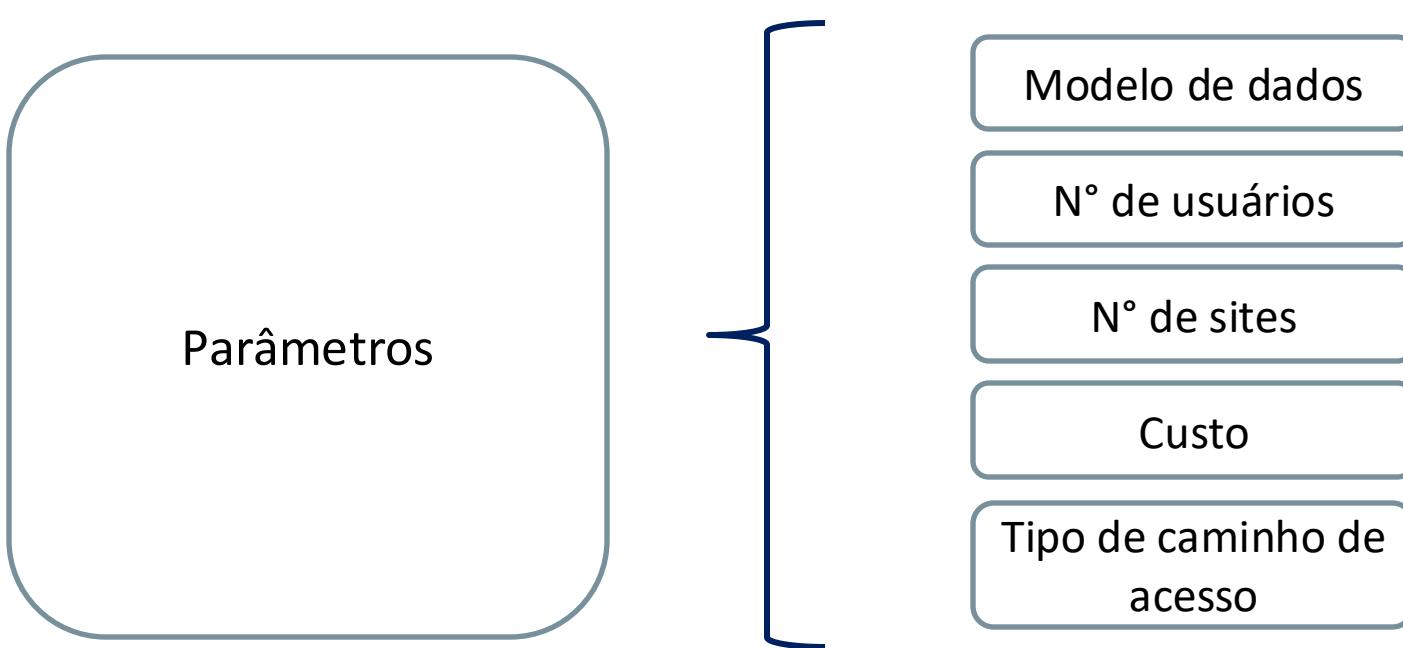
Arquitetura



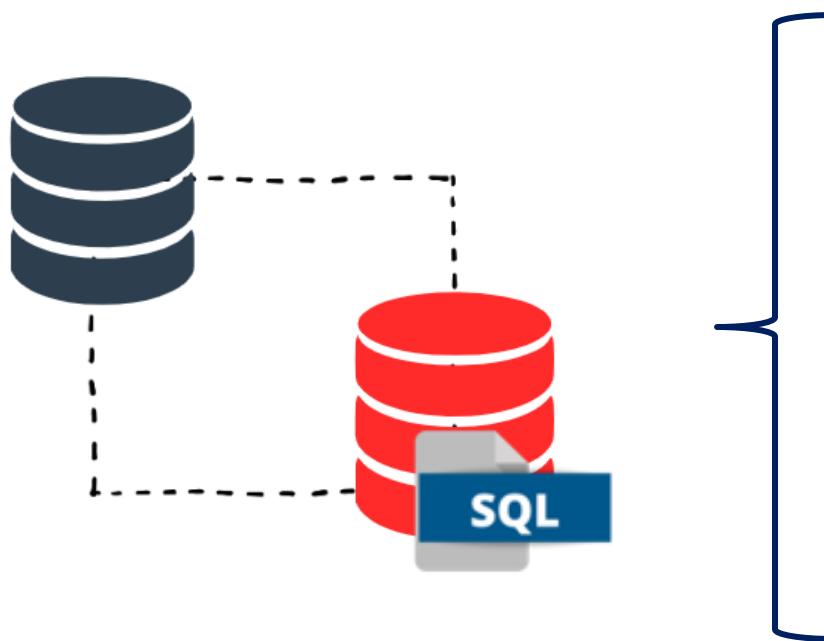
Classificação de SGBDs



Classificação



Classificação



Modelo de dados

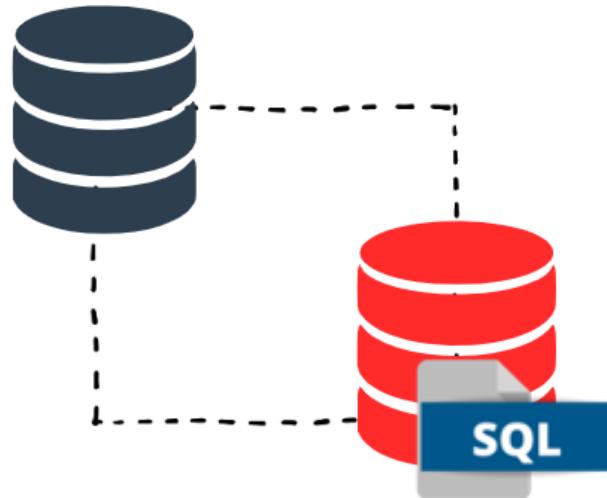
Nº de usuários

Nº de sites

Custo

Tipo de caminho de
acesso

Classificação



Modelo de dados

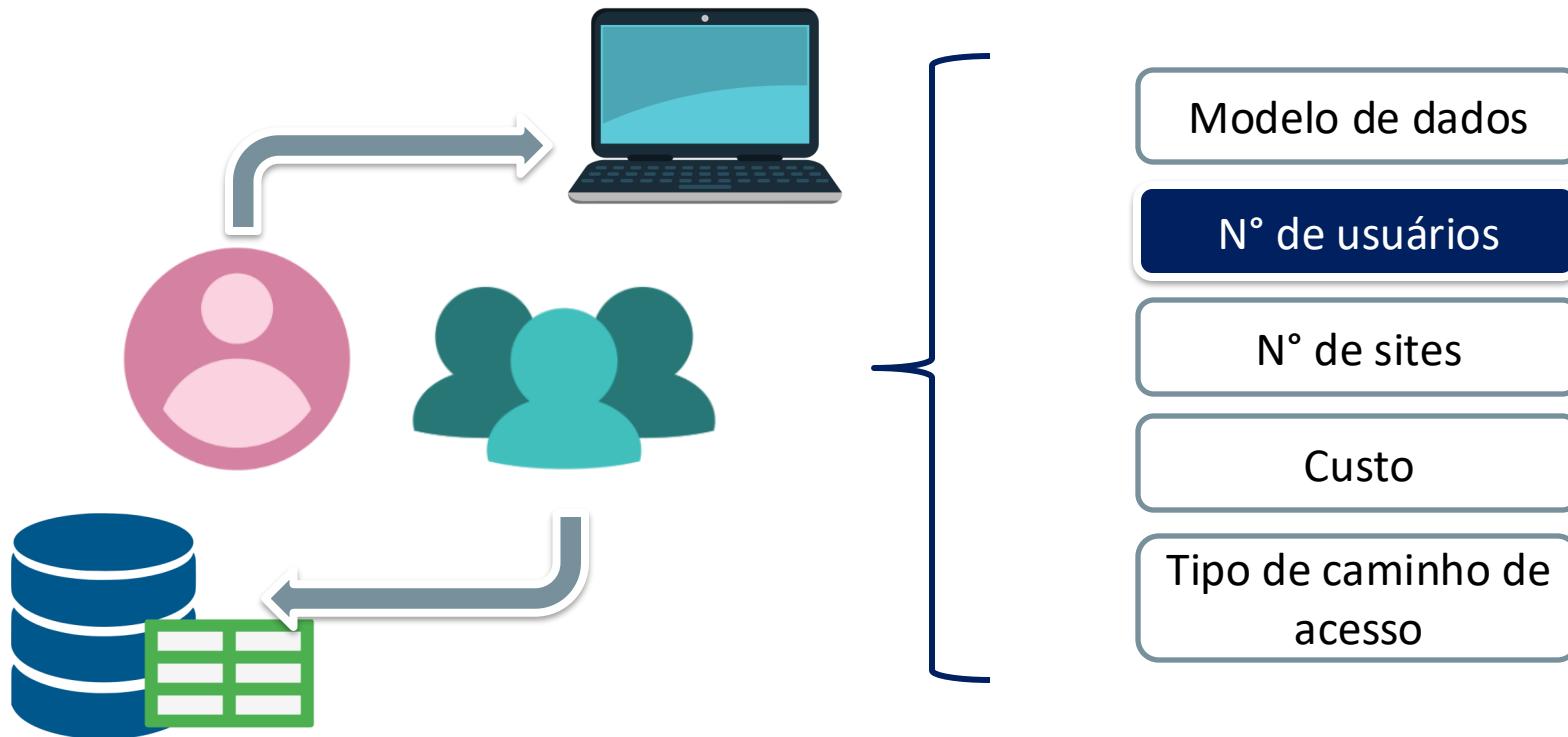
Nº de usuários

Nº de sites

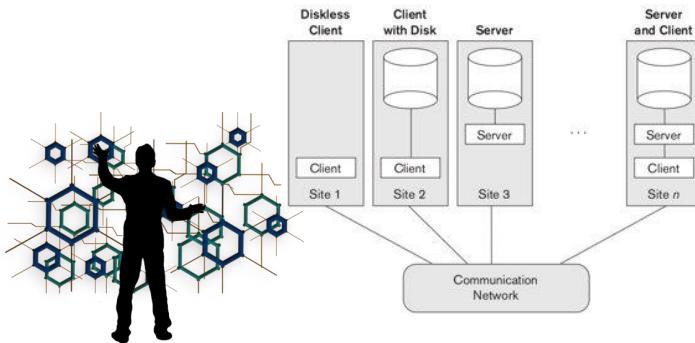
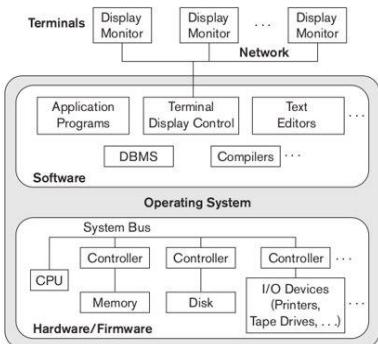
Custo

Tipo de caminho de
acesso

Classificação



Classificação



Modelo de dados

Nº de usuários

Nº de sites

Custo

Tipo de caminho de acesso

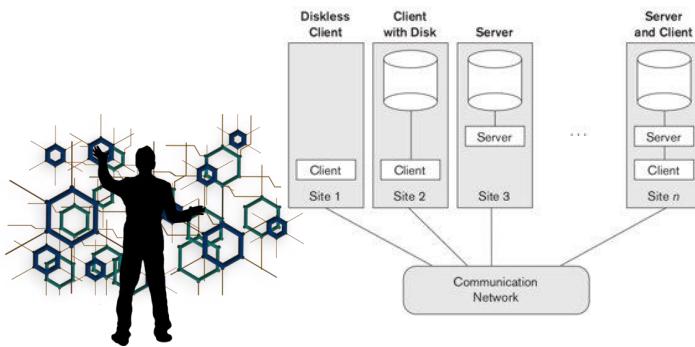
Classificação

Big data

Replicação

DB federado

Heterogeneidade



Modelo de dados

Nº de usuários

Nº de sites

Custo

Tipo de caminho de acesso

Classificação



ORACLE®

User licences

Módulos: replicação, paralelismo



Modelo de dados

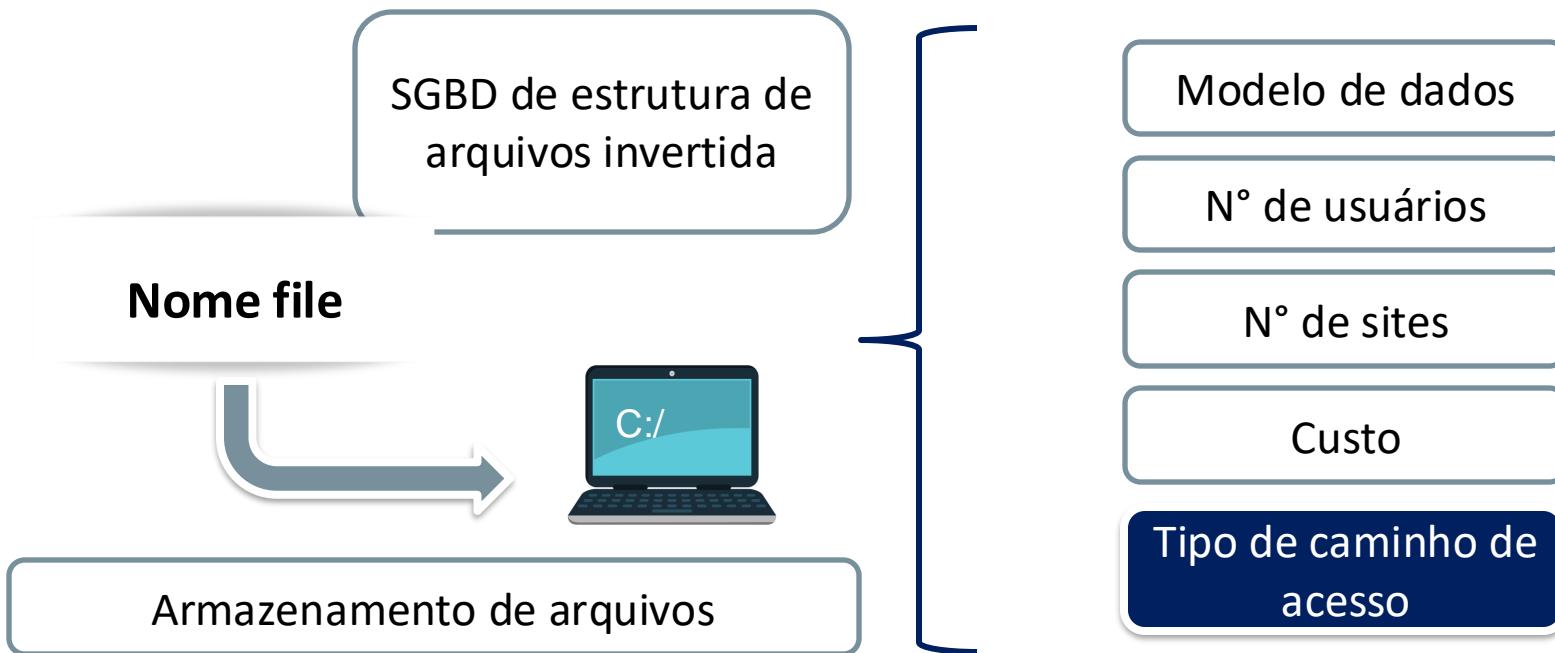
Nº de usuários

Nº de sites

Custo

Tipo de caminho de
acesso

Classificação



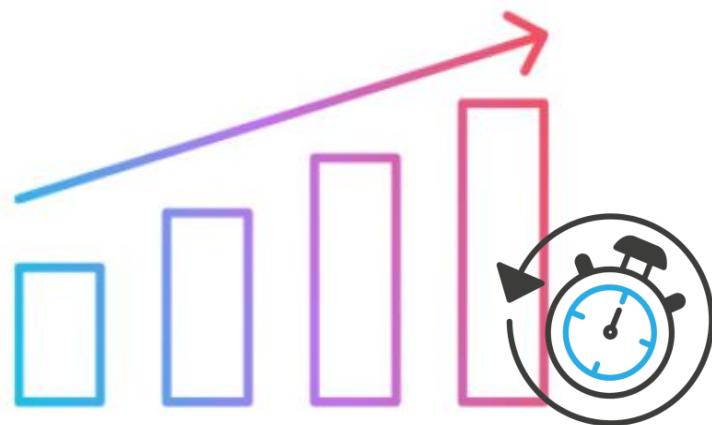
Classificação

Performance



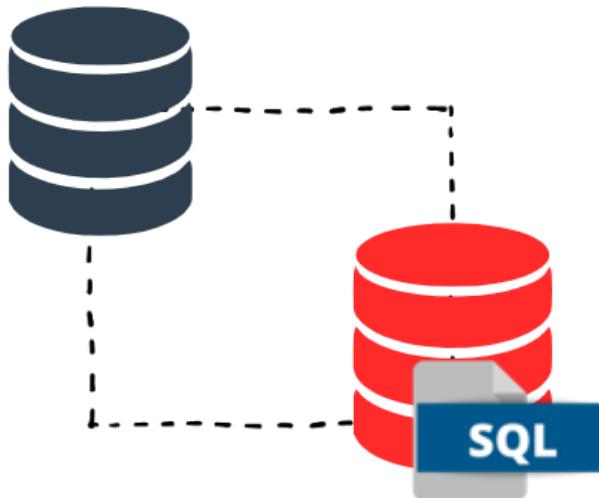
SGBD de Propósito Geral

Classificação



SGBD de Propósito Geral

Classificação - Relacional



Coleções de tabelas

Tabela



File

Alto Nível

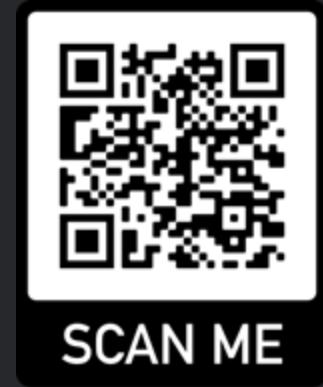
View



User

Dúvidas?

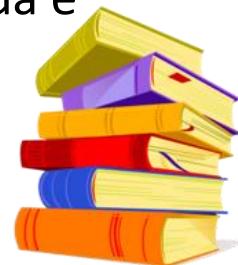
- > Fórum/Artigos
- > Comunidade Online (Discord)



Para saber mais

Referências principais:

- Referência bibliográfica: Fundamentals of Database Systems – Navathe, 7º edição editora: Pearson
- Projeto de banco de dados: Uma visão prática - Edição revisada e ampliada - Machado 17º edição, editora: Saraiva



Para saber mais

Outras referências:

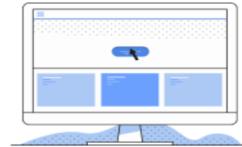
<https://www.ime.usp.br/~andrers/aulas/bd2005-1/aula3>

<https://www.devmedia.com.br/a-historia-dos-banco-de-dados/1678>

<https://db-engines.com/en/ranking>

<https://www.opservices.com.br/banco-de-dados/>

<https://www.quora.com/What-is-a-canned-transaction>

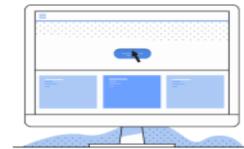


Para saber mais

Outras referências:

<https://www.geeksforgeeks.org/impedance-mismatch-in-dbms/#:~:text=Impedance%20mismatch%20is%20the%20term,Attributes%20and%20their%20data%20types>

<https://www.oreilly.com/library/view/mysql-reference-manual/0596002653/ch03s05.html>



Para saber mais

Outras referências:

<https://docs.oracle.com/pt-br/solutions/deploy-lustre-fs/index.html#:~:text=Lustre%C3%A9um%20sistema%20de,do%20Linux%20e%20do%20cluster.>

<https://stackoverflow.com/questions/1075074/opinions-on-netcdf-vs-hdf5-for-storing-scientific-data#:~:text=NetCDF%20starting%20with%20version%204.0,a%20much%20wider%20tool%20base>



Para saber mais

Empresas e SGBDs:

<https://www.quora.com/What-are-all-the-DBMS-that-are-being-used-by-Google-Facebook-and-Twitter-1>

<https://introbigdata.org/>

<https://www.mongodb.com/big-data-explained/examples>

<https://intellipaat.com/blog/10-big-data-examples-application-of-big-data-in-real-life/>

<https://instagram-engineering.com/instagreration-pt-2-scaling-our-infrastructure-to-multiple-data-centers-5745cbad7834>



Para saber mais

Empresas e SGBDs:

https://blog.twitter.com/engineering/en_us/topics/infrastructure/2017/the-infrastructure-behind-twitter-scale#:~:text=Twitter%20was%20built%20on%20MySQL,eventually%20many%20large%20database%20clusters.

<https://www.mysql.com/customers/view/?id=757>

<https://engineering.linkedin.com/espresso/introducing-espresso-linkedin-s-new-distributed-document-store#:~:text=To%20meet%20the%20needs%20of,both%20serving%20different%20use%20cases>



Desafio textual

Defina!

- Dados e banco de dados
- SGBD, Sistema de Banco de Dados e Catálogo de BD
- Independência program/data, user view
- DBA, transações canned, metadados e aplicação de processamento de transação

Desafio

