Explorando a Linguagem de Consulta a Banco de Dados SQL – Structured Query Language

Formação de Banco de Dados Relacional

Juliana Mascarenhas

Tech Education Specialist DIO / Owner @Simplificandoredes e @SimplificandoProgramação

Mestre em modelagem computacional | Cientista de dados

@in/juliana-mascarenhas-ds/

Objetivo Geral

Criação do projeto Lógico a partir do esquema conceitual, para posteriormente utilizar a linguagem SQL para criação do Banco de Dados relacionado. Dessa forma, serão apresentados o mapeamento ER/Relacional, assim como a estrutura e comandos da linguagem de consulta a banco de dados SQL.

Pré-requisitos

- Pensamento Computacional
- Modelagem de dados
- Modelo Entidade Relacionamento

Percurso

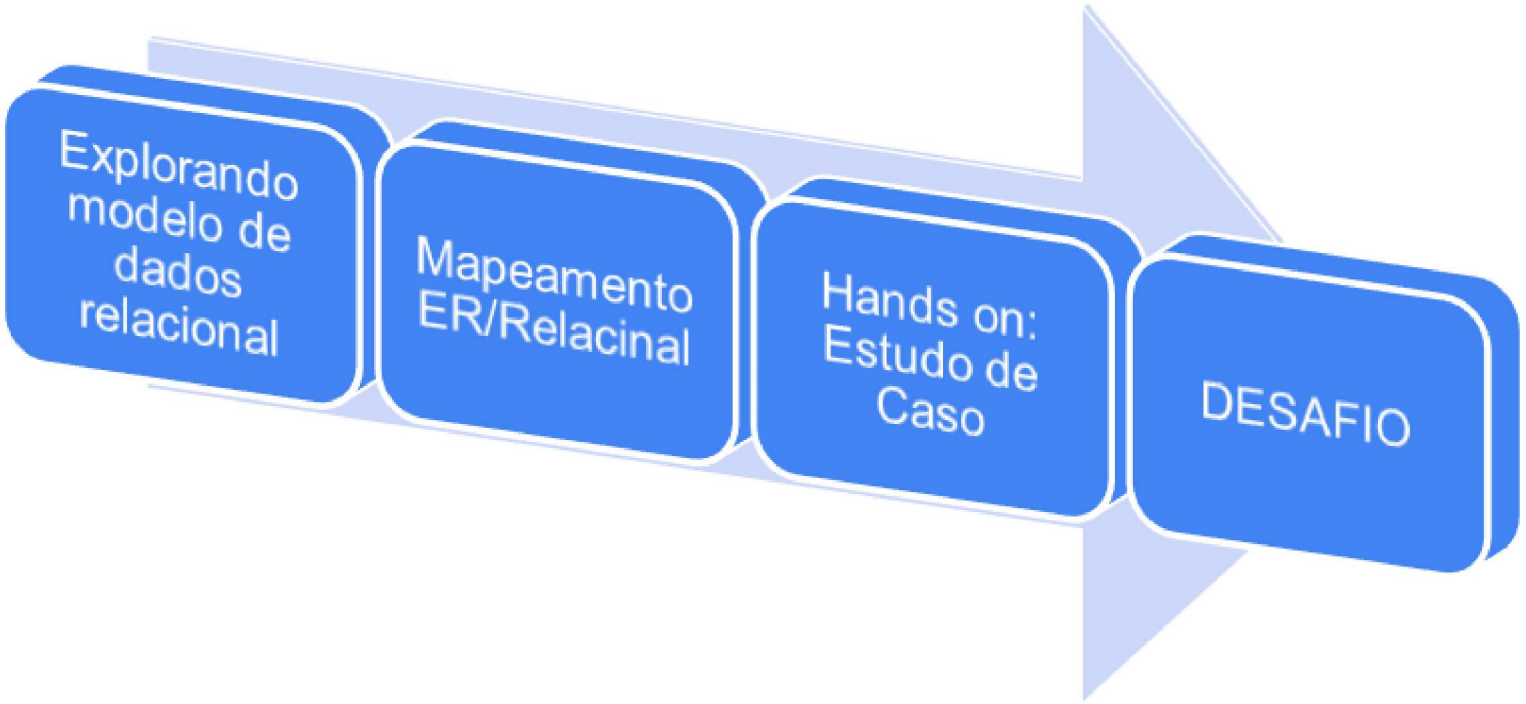
Etapa 1	Modelo Relacional e Mapeamento ER/Relacional
Etapa 2	Primeitos Passos com SQL
Etapa 3	Explorando Queries com SQL
Etapa 4	Agrupando Regsitros e Tabelas com SQL

Etapa 1

Modelo Relacional e Mapemamento ER/Relacinal

// Explorando a Linguagem de Consulta a Banco de Dados SQL

Modelo Relacional



[6]

Processo

Projeto Conceitual
O que vai ter?
Projeto Físico
Como implementar?
Como estruturar?
Projeto Lógico

[8]

Processo

Projeto Conceitual
O que vai ter?
Projeto Físico
Como implementar?
Como estruturar?
Projeto Lógico
MySQL®

Conceitos formais do Modelo Relacional

Conceitos

Coleção de Relação

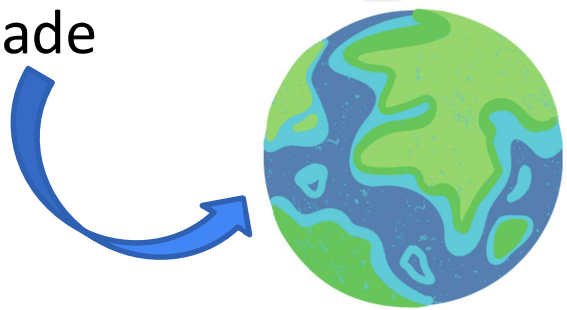
- Modelo Relacional
- Tabelas X Arquivos
- Entidade

Conceitos

Coleção de Relação

- Modelo Relacional
- Tabelas X Arquivos
- Entidade

Flat Files



Classe

Objeto

[12]

Conceitos

Domínio

- Tupla
- Atributo
- Relação

COURSE

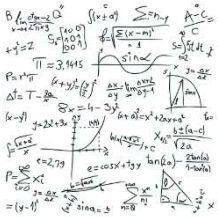
Course_name	Course_number	Credit_hours	Department
Intro to Computer Science	CS1310	4	CS
Data Structures	CS3320	4	CS
Discrete Mathematics	MATH2410	3	MATH
Database	CS3380	3	CS

Conceitos

- Valores atômicos
- Grupos: especificando nomes

Domínio

Nomes



Nota de Alunos

Brasil

Local

Contato de Usuários

ID Social

Conceitos

R(A1,A2,A3, ..., An)

- Esquema Relacional
- Ai: atributo
- D: domínio

Degree

STUDENT(Name, Ssn, Home_phone, Address, Office_phone, Age, Gpa)

Descrição de uma relação

Conceitos

Definição - R

STUDENT(Name: string, Ssn: string, Home_phone: string, Address: string, Office_phone: string, Age: integer, Gpa: real)

- Esquema Relacional
- Ai: atributo
- D: domínio

r: STUDENT(Name, Ssn, Home_phone, Address, Office_phone, Age, Gpa)

Descrição de uma relação

Conceitos

$r = \{t1, t2, t3, .., tm\}$

$t = \langle v1, v2, v3, .., vn \rangle$

- Esquema Relacional
- Ai: atributo
- D: domínio

$1 <= i <= n$

Descrição de uma relação

Conceitos

Relation Name

Attributes

STUDENT

Name	Ssn	Home_phone	Address	Office_phone	Age	Gpa
Benjamin Bayer	305-61-2435	(817)373-1616	2918 Bluebonnet Lane	NULL	19	3.21
Chung-cha Kim	381-62-1245	(817)375-4409	125 Kirby Road	NULL	18	2.89
Dick Davidson	422-11-2320	NULL	3452 Elgin Road	(817)749-1253	25	3.53
Rohan Panchal	489-22-1100	(817)376-9821	265 Lark Lane	(817)749-6492	28	3.93
Barbara Benson	533-69-1238	(817)839-8461	7384 Fontana Lane	NULL	19	3.25

Tuples

Conceitos

Cardinalidade

$$r(R) \subseteq (\mathrm{dom}(A_1) \times \mathrm{dom}(A_2) \times \ldots \times (\mathrm{dom}(A_n))$$

$$\underbrace{|\mathrm{dom}(A_1)| \times |\mathrm{dom}(A_2)| \times \ldots \times |\mathrm{dom}(A_n)|}_{\text{Total de instâncias}}$$

Relation Name

Attributes

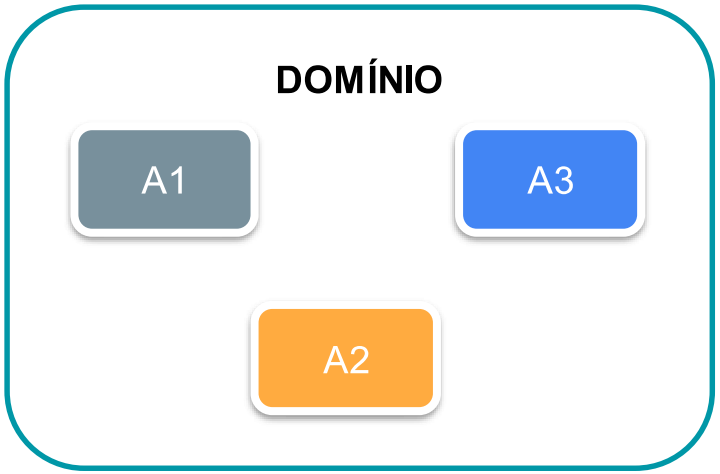
STUDENT

Name	Ssn	Home_phone	Address	Office_phone	Age	Gpa
Benjamin Bayer	305-61-2435	(817)373-1616	2918 Bluebonnet Lane	NULL	19	3.21
Chung-cha Kim	381-62-1245	(817)375-4409	125 Kirby Road	NULL	18	2.89
Dick Davidson	422-11-2320	NULL	3452 Elgin Road	(817)749-1253	25	3.53
Rohan Panchal	489-22-1100	(817)376-9821	265 Lark Lane	(817)749-6492	28	3.93
Barbara Benson	533-69-1238	(817)839-8461	7384 Fontana Lane	NULL	19	3.25

Tuples

Conceitos

Coleção de Relação



- Domínio
- Papel (Role)

Name	Ssn	Home_phone	Address	Office_phone	Age	Gpa
Dick Davidson	422-11-2320	NULL	3452 Elgin Road	(817)749-1253	25	3.53
Rohan Panchal	489-22-1100	(817)376-9821	265 Lark Lane	(817)749-6492	28	3.93

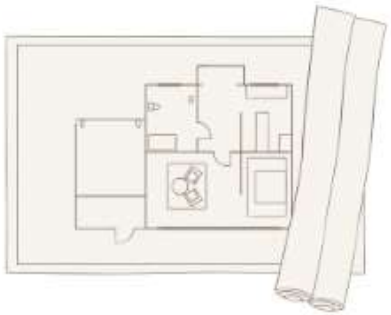
Características da Relação

Característcas

- Relação != Arquivo != Tabela

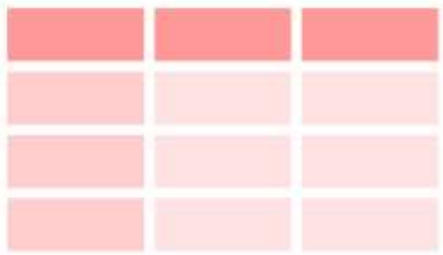
Características da Relação

Relação



Arquivos

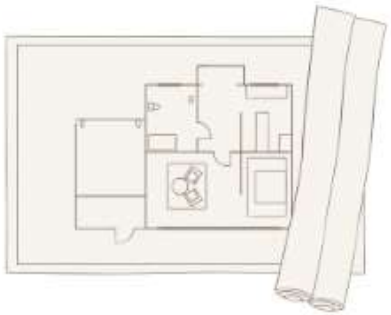
Tabelas



Ordenação de Tuplas na Relação

Características da Relação

Relação



Relation Name

Attributes

STUDENT

Tuples

Name	Ssn	Home_phone	Address	Office_phone	Age	Gpa
Benjamin Bayer	305-61-2435	(817)373-1616	2918 Bluebonnet Lane	NULL	19	3.21
Chung-cha Kim	381-62-1245	(817)375-4409	125 Kirby Road	NULL	18	2.89
Dick Davidson	422-11-2320	NULL	3452 Elgin Road	(817)749-1253	25	3.53
Rohan Panchal	489-22-1100	(817)376-9821	265 Lark Lane	(817)749-6492	28	3.93
Barbara Benson	533-69-1238	(817)839-8461	7384 Fontana Lane	NULL	19	3.25

Ordenação de Tuplas na Relação

Características da Relação

Ordenação

Lista de tuplas

Nível Abstrato

Conjunto de tuplas

$$R = \{A_1, A_2, \ldots, A_n\}$$

$$r = \{t_1, t_2, \ldots, t_m\}$$

$$D = \mathrm{dom}(A_1) \cup \mathrm{dom}(A_2) \cup \ldots \cup \mathrm{dom}(A_n)$$

Ordenação de valores dentro da Tupla

[24]

Características da Relação

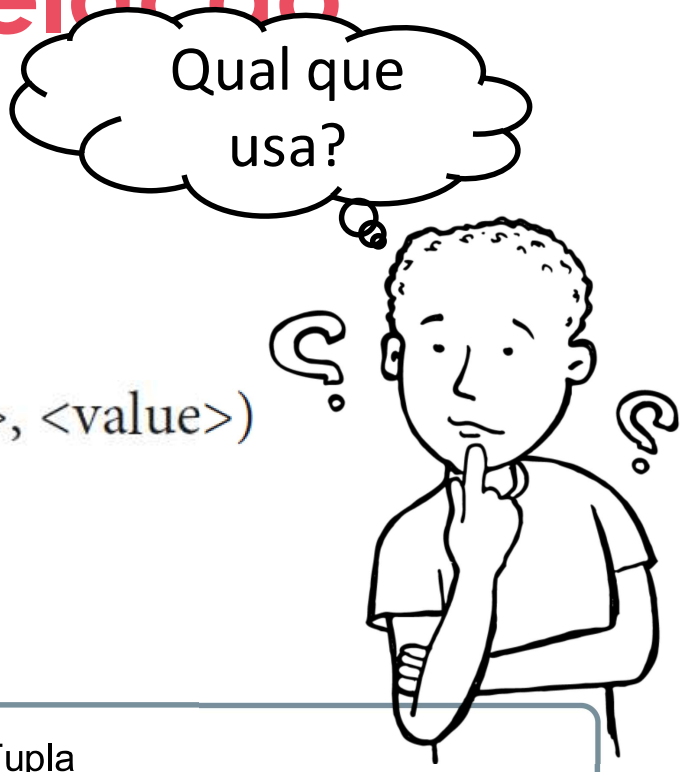
Lista de tuplas

Conjunto de tuplas

set of (<attribute>, <value>)

Ordenação de valores dentro da Tupla

Características da Relação



Lista de tuplas

Conjunto de tuplas

set of (<attribute>, <value>)

Ordenação de valores dentro da Tupla

Características da Relação

- Valores Nulos

Escritório

Casa

Valor desconhecido

Valor existente mas indisponível

Atributo não se aplica

Valor indefinido

Valores nulos nas tuplas

Características da Relação

- Valores Nulos

Escritório

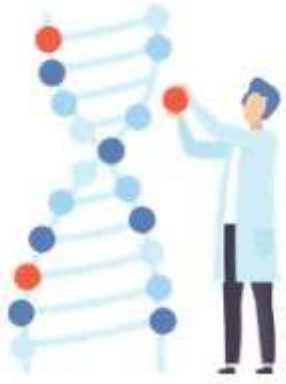
Casa

Alunos externos

- Valor desconhecido
- Valor existente mas indisponível
- Atributo não se aplica
- Valor indefinido

Valores nulos nas tuplas

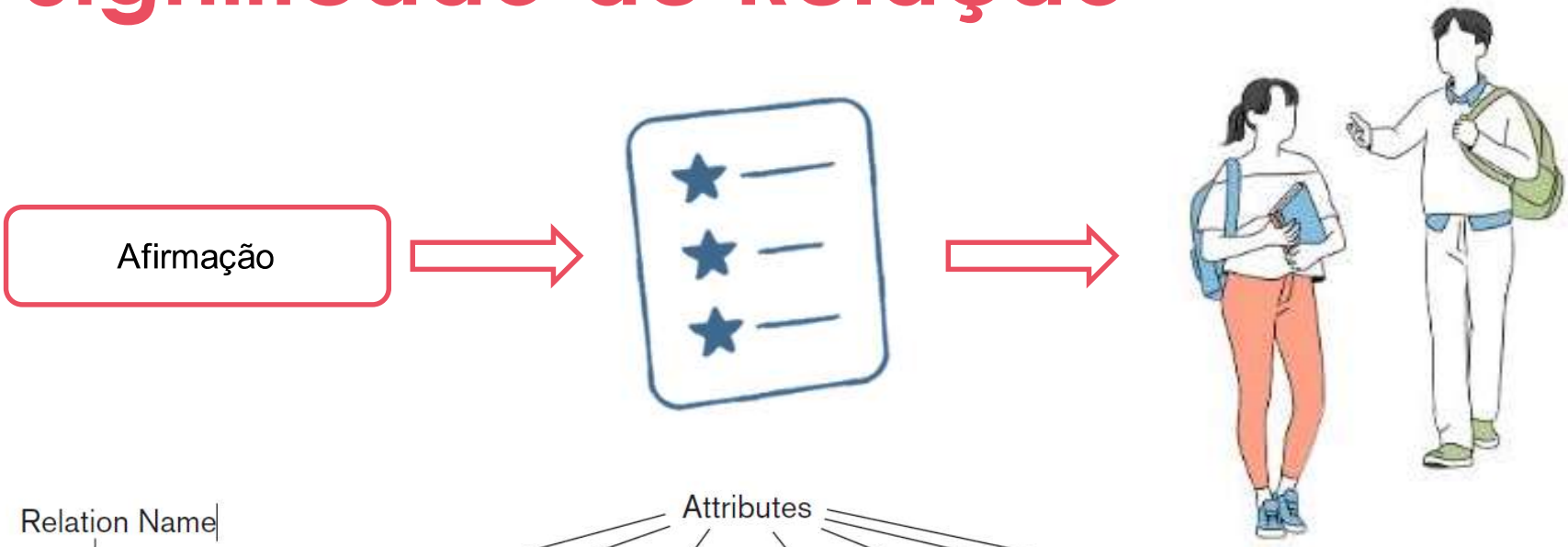
Características da Relação



- Valor desconhecido
- Valor existente mas indisponível
- Atributo não se aplica
- Valor indefinido

Valores nulos nas tuplas

Significado de Relação



Relation Name

STUDENT

Attributes

Name	Ssn	Home_phone	Address	Office_phone	Age	Gpa

Significado de Relação

Lúcia **correu semana passada**

Predicado

O **predicado**, formado por um ou mais verbos, é aquilo que se declara sobre a ação do sujeito, concordando em número e pessoa com ele.

Preposições

Tuples

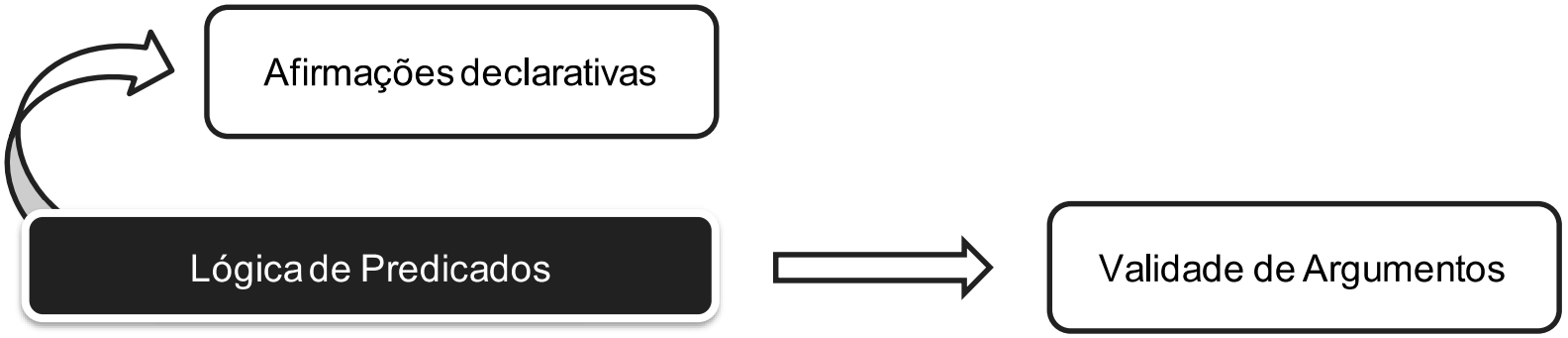
STUDENT

Name	Ssn	Home_phone	Address	Office_phone	Age	Gpa
Benjamin Bayer	305-61-2435	(817)373-1616	2918 Bluebonnet Lane	NULL	19	3.21
Chung-cha Kim	381-62-1245	(817)375-4409	125 Kirby Road	NULL	18	2.89
Dick Davidson	422-11-2320	NULL	3452 Elgin Road	(817)749-1253	25	3.53
Rohan Panchal	489-22-1100	(817)376-9821	265 Lark Lane	(817)749-6492	28	3.93
Barbara Benson	533-69-1238	(817)839-8461	7384 Fontana Lane	NULL	19	3.25

Significado de Relação

Predicado

O **predicado**, formado por um ou mais verbos, é aquilo que se declara sobre a ação do sujeito, concordando em número e pessoa com ele.



Características da Relação

- Uppercase: Relações - Q, R, S
- Lowercase: Estado de Relação - q, r, s
- Letras: Tuplas – t, u, v
- Nome atributo = papel

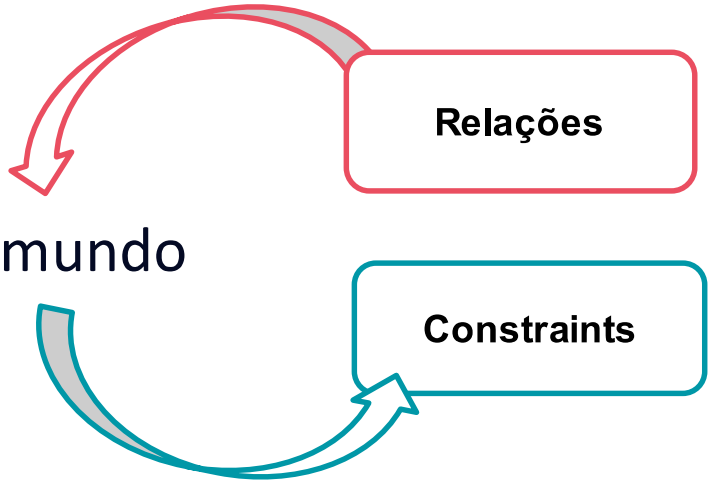
Nome
(ESTUDANTE)

$$t = <v_1, v_2, \ldots, v_n>$$

Constraints do Modelo Relacional

Constraints

- Composição do mini-mundo



Dados do Contexto de Banco de Dados

Constraints

- Categorizadas

Características das relações

Inheret Model-based Constraints

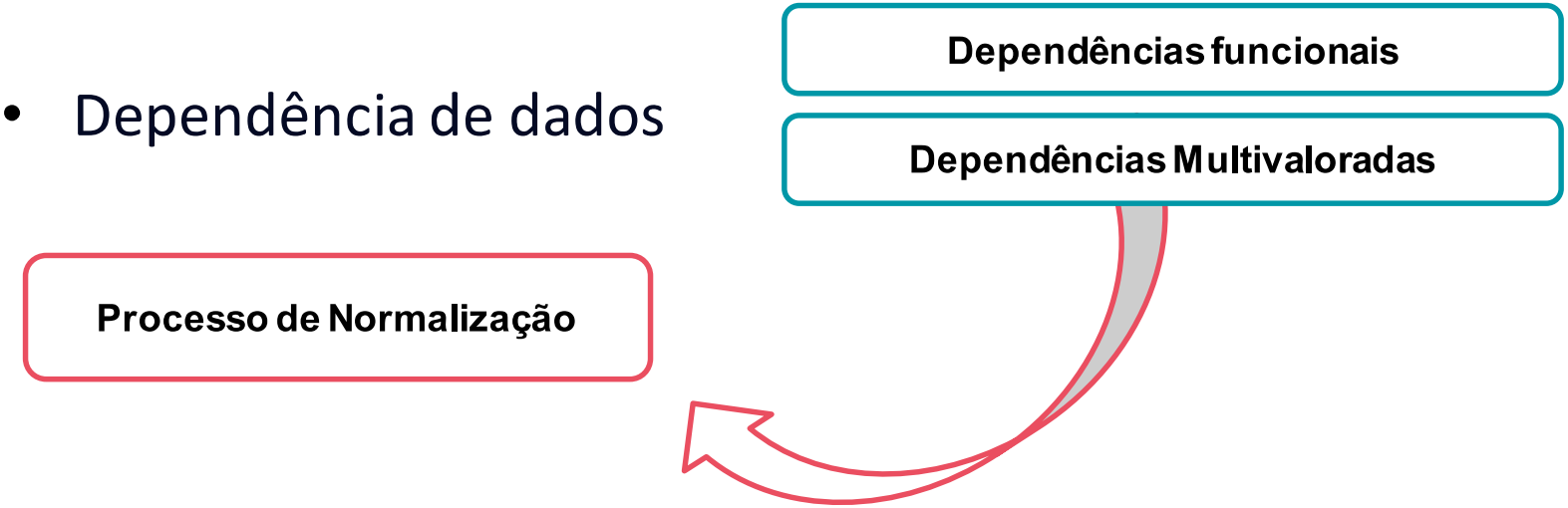
Schema-base Constraints ← DDL

Application-base Constraints

Dados do Contexto de Banco de Dados

Constraints

- Dependência de dados



Constraints baseadas no Esquema do Banco de Dados

Constraints de Domínio

Integer

Float

A = <v1> — dom(A)

Relation Name

STUDENT

Attributes

Tuples

Name	Ssn	Home_phone	Address	Office_phone	Age	Gpa
Benjamin Bayer	305-61-2435	(817)373-1616	2918 Bluebonnet Lane	NULL	19	3.21
Chung-cha Kim	381-62-1245	(817)375-4409	125 Kirby Road	NULL	18	2.89
Dick Davidson	422-11-2320	NULL	3452 Elgin Road	(817)749-1253	25	3.53
Rohan Panchal	489-22-1100	(817)376-9821	265 Lark Lane	(817)749-6492	28	3.93
Barbara Benson	533-69-1238	(817)839-8461	7384 Fontana Lane	NULL	19	3.25

[39]

Constraints de Domínio

Time	**Strings**	**Integer**
Timestamp	**Date**	**Float**

A = <v1> — dom(A)

Relation Name

STUDENT

Attributes

Tuples

Name	Ssn	Home_phone	Address	Office_phone	Age	Gpa
Benjamin Bayer	305-61-2435	(817)373-1616	2918 Bluebonnet Lane	NULL	19	3.21
Chung-cha Kim	381-62-1245	(817)375-4409	125 Kirby Road	NULL	18	2.89
Dick Davidson	422-11-2320	NULL	3452 Elgin Road	(817)749-1253	25	3.53
Rohan Panchal	489-22-1100	(817)376-9821	265 Lark Lane	(817)749-6492	28	3.93
Barbara Benson	533-69-1238	(817)839-8461	7384 Fontana Lane	NULL	19	3.25

Constraint de Chave

Name	Ssn	Home_phone	Address	Office_phone	Age	Gpa
Benjamin Bayer	305-61-2435	(817)373-1616	2918 Bluebonnet Lane	NULL	19	3.21
Chung-cha Kim	381-62-1245	(817)375-4409	125 Kirby Road	NULL	18	2.89
Dick Davidson	422-11-2320	NULL	3452 Elgin Road	(817)749-1253	25	3.53
Rohan Panchal	489-22-1100	(817)376-9821	265 Lark Lane	(817)749-6492	28	3.93
Barbara Benson	533-69-1238	(817)839-8461	7384 Fontana Lane	NULL	19	3.25

Relação -> conjunto de tuplas

Uniqueness Constraint

Name	Ssn	Home_phone	Address	Office_phone	Age	Gpa
Benjamin Bayer	305-61-2435	(817)373-1616	2918 Bluebonnet Lane	NULL	19	3.21
Chung-cha Kim	381-62-1245	(817)375-4409	125 Kirby Road	NULL	18	2.89
Dick Davidson	422-11-2320	NULL	3452 Elgin Road	(817)749-1253	25	3.53
Rohan Panchal	489-22-1100	(817)376-9821	265 Lark Lane	(817)749-6492	28	3.93
Barbara Benson	533-69-1238	(817)839-8461	7384 Fontana Lane	NULL	19	3.25

SK = Subconjunto de atributos

$$t_1[\mathrm{SK}] \neq t_2[\mathrm{SK}]$$

Uniqueness Constraint

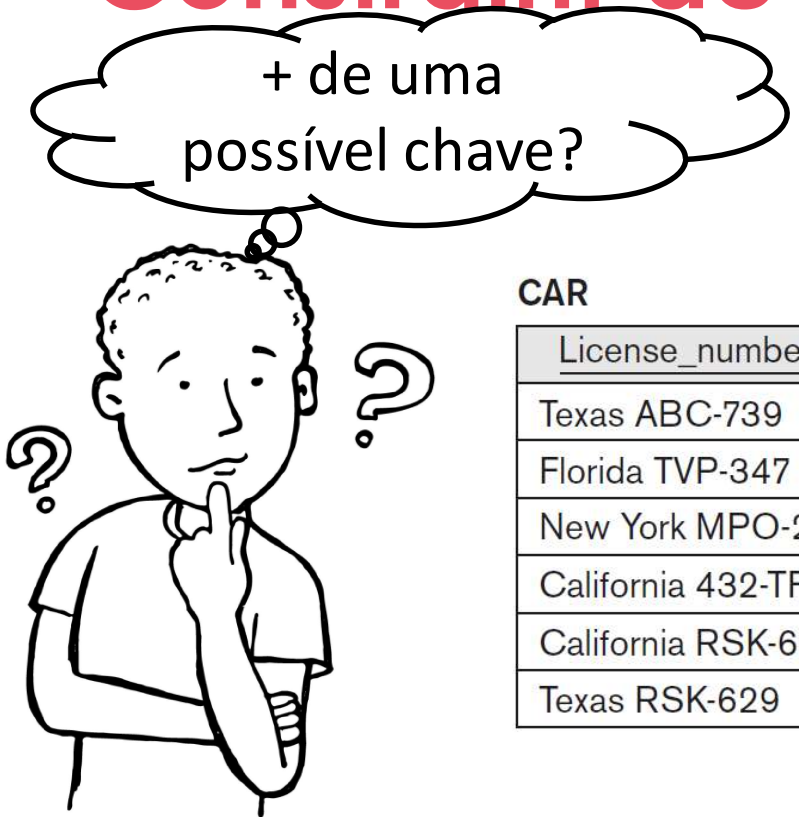
Name	Ssn	Home_phone	Address	Office_phone	Age	Gpa
Benjamin Bayer	305-61-2435	(817)373-1616	2918 Bluebonnet Lane	NULL	19	3.21
Chung-cha Kim	381-62-1245	(817)375-4409	125 Kirby Road	NULL	18	2.89
Dick Davidson	422-11-2320	NULL	3452 Elgin Road	(817)749-1253	25	3.53
Rohan Panchal	489-22-1100	(817)376-9821	265 Lark Lane	(817)749-6492	28	3.93
Barbara Benson	533-69-1238	(817)839-8461	7384 Fontana Lane	NULL	19	3.25

Chave & **Superchave**

$$t_1[\mathrm{SK}] \neq t_2[\mathrm{SK}]$$

[43]

Constraint de Chave



Chave candidata

CAR

License_number	Engine_serial_number	Make	Model	Year
Texas ABC-739	A69352	Ford	Mustang	02
Florida TVP-347	B43696	Oldsmobile	Cutlass	05
New York MPO-22	X83554	Oldsmobile	Delta	01
California 432-TFY	C43742	Mercedes	190-D	99
California RSK-629	Y82935	Toyota	Camry	04
Texas RSK-629	U028365	Jaguar	XJS	04

Constraint de Chaves

Valores nulos em atributos?

- Uniquinness constraints
- Chave primária e candidata

STUDENT

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

SGBDs e esquemas relacionais

Esquema relacional

SGBD É um subconjunto de relações

$$S = \{R_1, R_2, \ldots, R_m\}$$

Estado de um SGBD relacional

$$\mathrm{DB} = \{r_1, r_2, \ldots, r_m\}$$

Esquema relacional

EMPLOYEE

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno

DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date

DEPT_LOCATIONS

Dnumber	Dlocation

PROJECT

Pname	Pnumber	Plocation	Dnum

WORKS_ON

Essn	Pno	Hours

DEPENDENT

Essn	Dependent_name	Sex	Bdate	Relationship

Figure 5.5
Schema diagram for the COMPANY relational database schema.

Esquema relacional

EMPLOYEE

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno

DEPARTMENT

Dname	Dnumber	_start_date

DEPT_LOCATIONS

Dnumber

PROJECT

Pname	Pnumber	Plocation	Dnum

WORKS_ON

Essn	Pno	Hours

DEPENDENT

Essn	Dependent_name	Sex	Bdate	Relationship

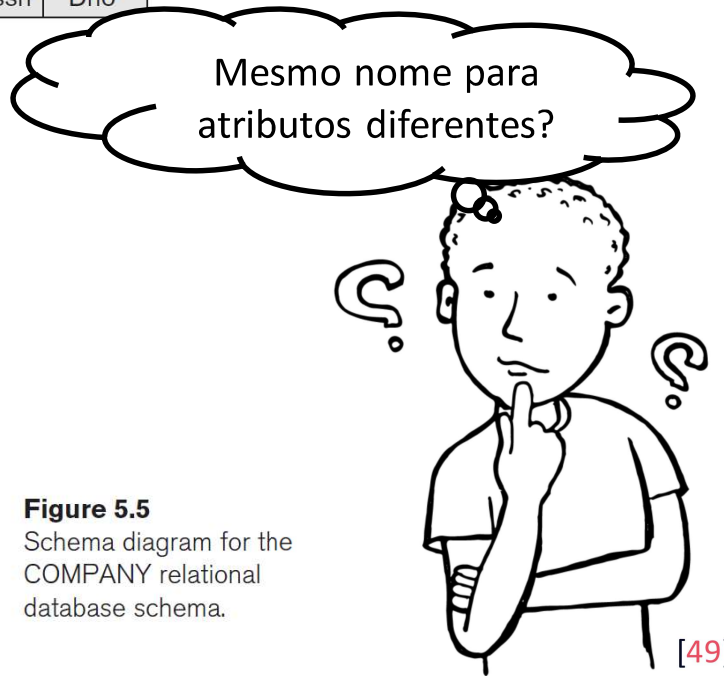


Figure 5.5
Schema diagram for the COMPANY relational database schema.

[49]

Esquema relacional

EMPLOYEE

Fname	Minit	Lname	Ssn	Address	Sex	Salary	Super_ssn

DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date

DEPT_LOCATIONS

Dnumber	Dlocation

PROJECT

Pname	Pnumber	Plocation	Dnum

WORKS_ON

Essn	Pno	Hours

DEPENDENT

Essn	Dependent_name	Sex	Bdate	Relationship

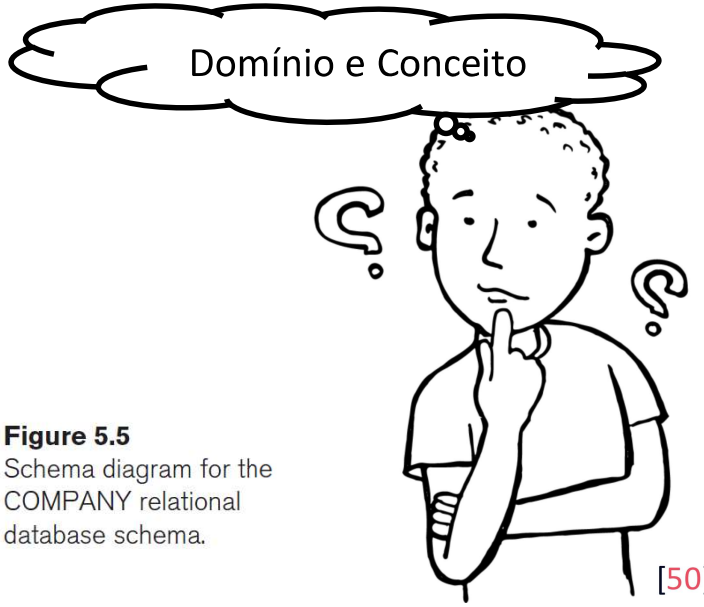


Figure 5.5
Schema diagram for the COMPANY relational database schema.

[50]

Esquema relacional

SGBD

$$S = \{R_1, R_2, \ldots, R_m\}$$

$$DB = \{r_1, r_2, \ldots, r_m\}$$

Restrições de integridade → Status do SGBD

Definição

DDL – Data Definition Language → Create, Drop, Insert, Rename...

Definição

DDL – Data Definition Language	Create, Drop, Insert, Rename...
DML – Data Manipulation Language	Insert, Update, Delete, Merge
DCL – Data Control Language	Grant, Revoke
DQL – Data Query Language	Select

Estado SGBD - Company

DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date
Research	5	333445555	1988-05-22
Administration	4	987654321	1995-01-01
Headquarters	1	888665555	1981-06-19

EMPLOYEE

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno
John	B	Smith	123456789	1965-01-09	731 Fondren, Houston, TX	M	30000	333445555	5
Franklin	T	Wong	333445555	1955-12-08	638 Voss, Houston, TX	M	40000	888665555	5
Alicia	J	Zelaya	999887777	1968-01-19	3321 Castle, Spring, TX	F	25000	987654321	4
Jennifer	S	Wallace	987654321	1941-06-20	291 Berry, Bellaire, TX	F	43000	888665555	4
Ramesh	K	Narayan	666884444	1962-09-15	975 Fire Oak, Humble, TX	M	38000	333445555	5
Joyce	A	English	453453453	1972-07-31	5631 Rice, Houston, TX	F	25000	333445555	5
Ahmad	V	Jabbar	987987987	1969-03-29	980 Dallas, Houston, TX	M	25000	987654321	4
James	E	Borg	888665555	1937-11-10	450 Stone, Houston, TX	M	55000	NULL	1

DEPT_LOCATIONS

Dnumber	Dlocation
1	Houston
4	Stafford
5	Bellaire
5	Sugarland
5	Houston

Estado SGBD - Company

PROJECT

Pname	Pnumber	Plocation	Dnum
ProductX	1	Bellaire	5
ProductY	2	Sugarland	5
ProductZ	3	Houston	5
Computerization	10	Stafford	4
Reorganization	20	Houston	1
Newbenefits	30	Stafford	4

DEPENDENT

Essn	Dependent_name	Sex	Bdate	Relationship
333445555	Alice	F	1986-04-05	Daughter
333445555	Theodore	M	1983-10-25	Son
333445555	Joy	F	1958-05-03	Spouse
987654321	Abner	M	1942-02-28	Spouse
123456789	Michael	M	1988-01-04	Son
123456789	Alice	F	1988-12-30	Daughter
123456789	Elizabeth	F	1967-05-05	Spouse

WORKS_ON

Essn	Pno	Hours
123456789	1	32.5
123456789	2	7.5
666884444	3	40.0
453453453	1	20.0
453453453	2	20.0
333445555	2	10.0
333445555	3	10.0
333445555	10	10.0
333445555	20	10.0
999887777	30	30.0
999887777	10	10.0
987987987	10	35.0
987987987	30	5.0
987654321	30	20.0
987654321	20	15.0
888665555	20	NULL

Integridade

SGBD

[56]

Integridade

- Constraints de Integridade
- Contraints de domínio, chave, Not Null

Integridade de entidade

Integridade Referencial

[57]

Integridade Referencial e de Entidade e Chaves Estrangeiras

Integridade

- Chave Primária != NULL
- Consitência entre entidades

Integridade de Entidade

Integridade Referencial

PROJECT

Pname	Pnumber	Plocation	Dnum
ProductX	1	Bellaire	5
ProductY	2	Sugarland	5
ProductZ	3	Houston	5
Computerization	10	Stafford	4
Reorganization	20	Houston	1
Newbenefits	30	Stafford	4

DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date
Research	5	333445555	1988-05-22
Administration	4	987654321	1995-01-01
Headquarters	1	888665555	1981-06-19

Integridade

Chave estrangeira

- Chave Primária != NULL
- Consitência entre entidades

Integridade de Entidade

Integridade Referencial

PROJECT

Pname	Pnumber	Plocation	Dnum
ProductX	1	Bellaire	5
ProductY	2	Sugarland	5
ProductZ	3	Houston	5
Computerization	10	Stafford	4
Reorganization	20	Houston	1
Newbenefits	30	Stafford	4

DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date
Research	5	333445555	1988-05-22
Administration	4	987654321	1995-01-01
Headquarters	1	888665555	1981-06-19

Chave estrangeira

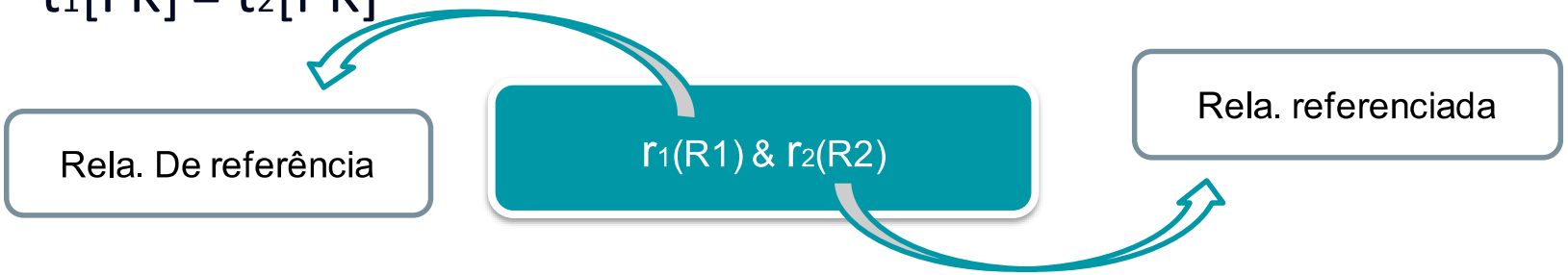
Regras:

- Domínio dos atributos de FK = Domínio dos atributos da PK
- $t_1[FK] = t_2[PK]$

Chave estrangeira

Regras:

- Domínio dos atributos de FK = Domínio dos atributos da PK
- $t_1[FK] = t_2[PK]$



Integridade Referencial

PROJECT

Pname	Pnumber	Plocation	Dnum
ProductX	1	Bellaire	5
ProductY	2	Sugarland	5
ProductZ	3	Houston	5
Computerization	10	Stafford	4
Reorganization	20	Houston	1
Newbenefits	30	Stafford	4

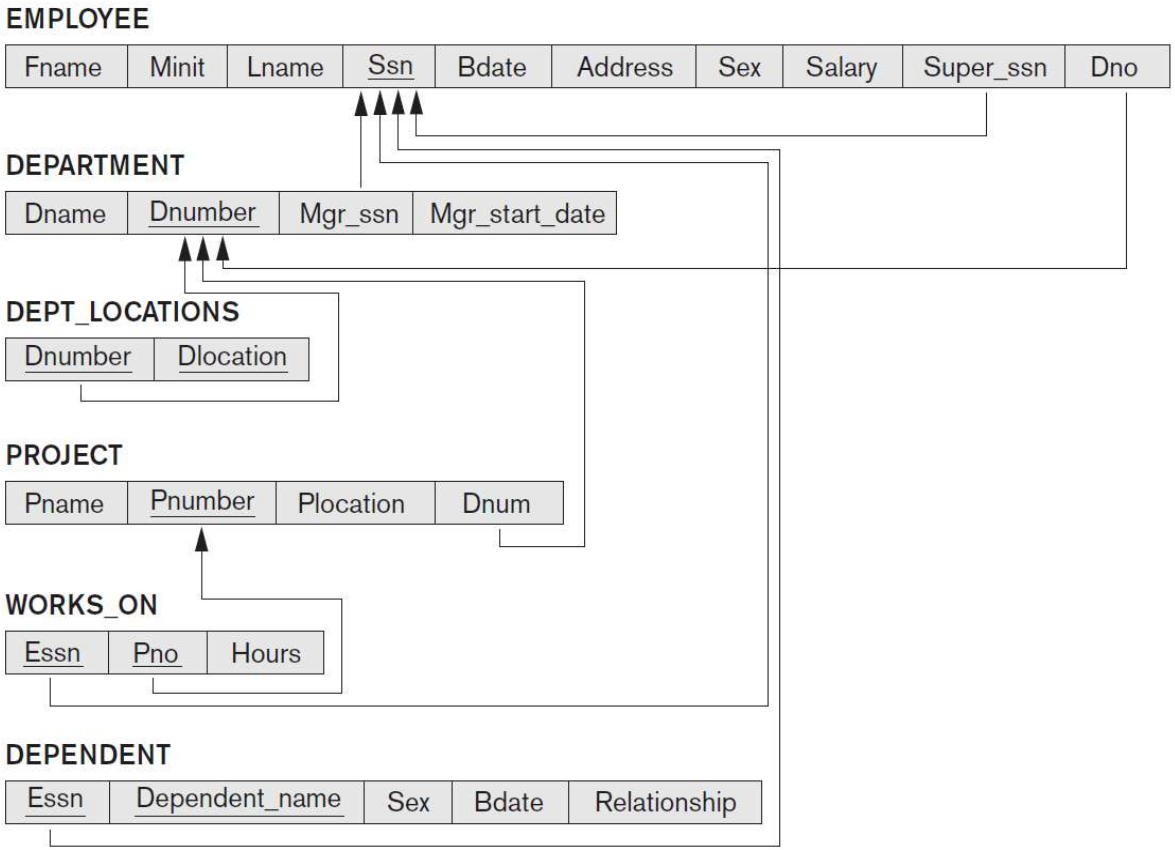
DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date
Research	5	333445555	1988-05-22
Administration	4	987654321	1995-01-01
Headquarters	1	888665555	1981-06-19

EMPLOYEE

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno
John	B	Smith	123456789	1965-01-09	731 Fondren, Houston, TX	M	30000	333445555	5
Franklin	T	Wong	333445555	1955-12-08	638 Voss, Houston, TX	M	40000	888665555	5
Alicia	J	Zelaya	999887777	1968-01-19	3321 Castle, Spring, TX	F	25000	987654321	4
Jennifer	S	Wallace	987654321	1941-06-20	291 Berry, Bellaire, TX	F	43000	888665555	4
Ramesh	K	Narayan	666884444	1962-09-15	975 Fire Oak, Humble, TX	M	38000	333445555	5
Joyce	A	English	453453453	1972-07-31	5631 Rice, Houston, TX	F	25000	333445555	5
Ahmad	V	Jabbar	987987987	1969-03-29	980 Dallas, Houston, TX	M	25000	987654321	4
James	E	Borg	888665555	1937-11-10	450 Stone, Houston, TX	M	55000	NULL	1

Chave estrangeira



DDL

Outras Contraints

Contraints - semântica

- Salário máximo do supervisor
- Carga horária máxima/semana

Triggers &
Assertions

Depende do contexto do banco de dados

Outras Contraints

Restrições de Estado

O salário do empregado só pode aumentar ...

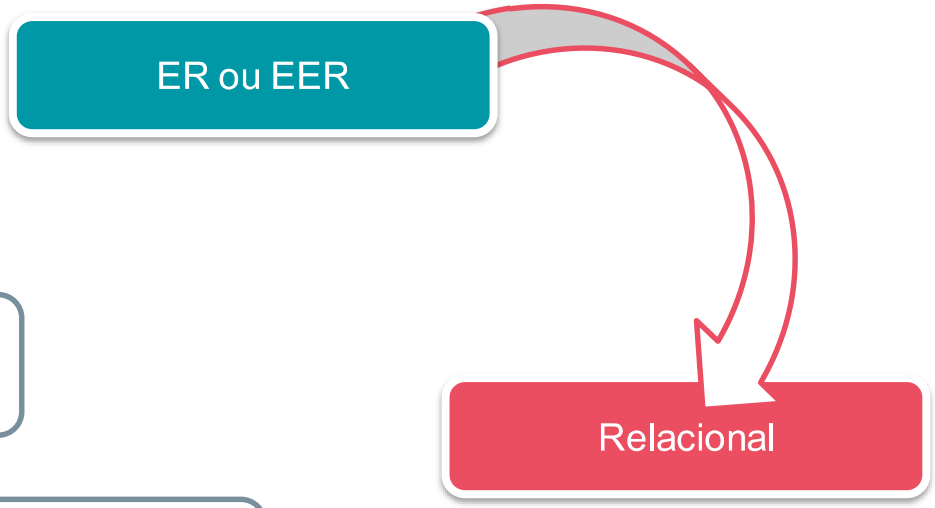
Restrições de Transição

Triggers & Assertions

Aplicação

Mapeando o modelo ER/Relacional

Mapeando

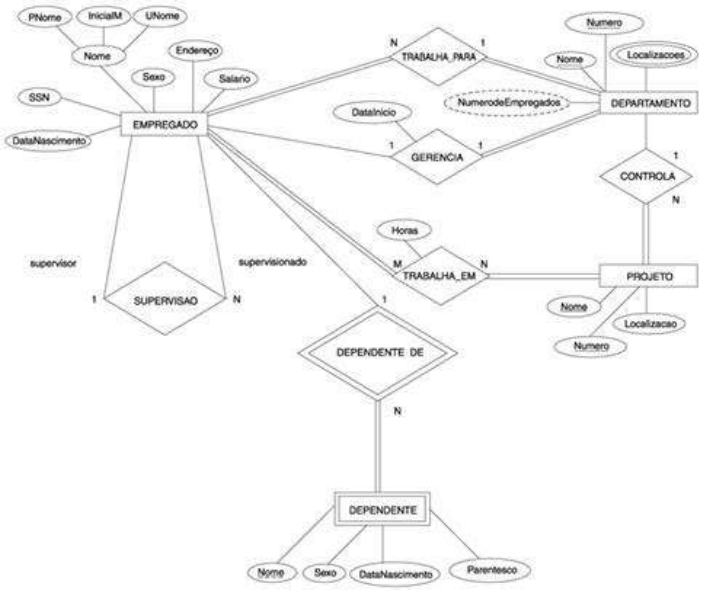


Design Lógico do Projeto

Mapeamento do Modelo de dados

Logical database desing

Projeto Lógico



EMPREGADO

PNOME	MINICIAL	UNOME	SSN	DATANASC	ENDERECO	SEXO	SALARIO	SUPERSSN	DNO

DEPARTAMENTO

DNOME	DNUMERO	GERSSN	GERDATAINICIO

DEPTO_LOCALIZACOES

DNUMERO	DLOCALIZACAO

PROJETO

PJNOME	PNUMERO	PLOCALIZACAO	DNUM

TRABALHA_EM

ESSN	PNO	HORAS

DEPENDENTE

ESSN	NOME_DEPENDENTE	SEXO	DATANASC	PARENTESCO

Fonte: livro de referência - Navathe

Mapeamento ER para Modelo Relacional

Algortimo de Mapeamento

Referência

- Atributos de valor único (single-values)
- PK – Primary Key & Unique Key
- Constraint de Entidade e Referencial

Algoritmo de Mapeamento

- Relação -> E (A1,A2,A3,...,A4)
- PK Simples ou Composta?
- Unique Constraint
- FK – Foreign Key

Entidades Fortes (Regulares)

Algoritmo de Mapeamento

- Relação -> E (A1,A2,A3,...,A4)
- PK
- Unique Constraint
- FK – Foreign Key

Simples ou Composta?

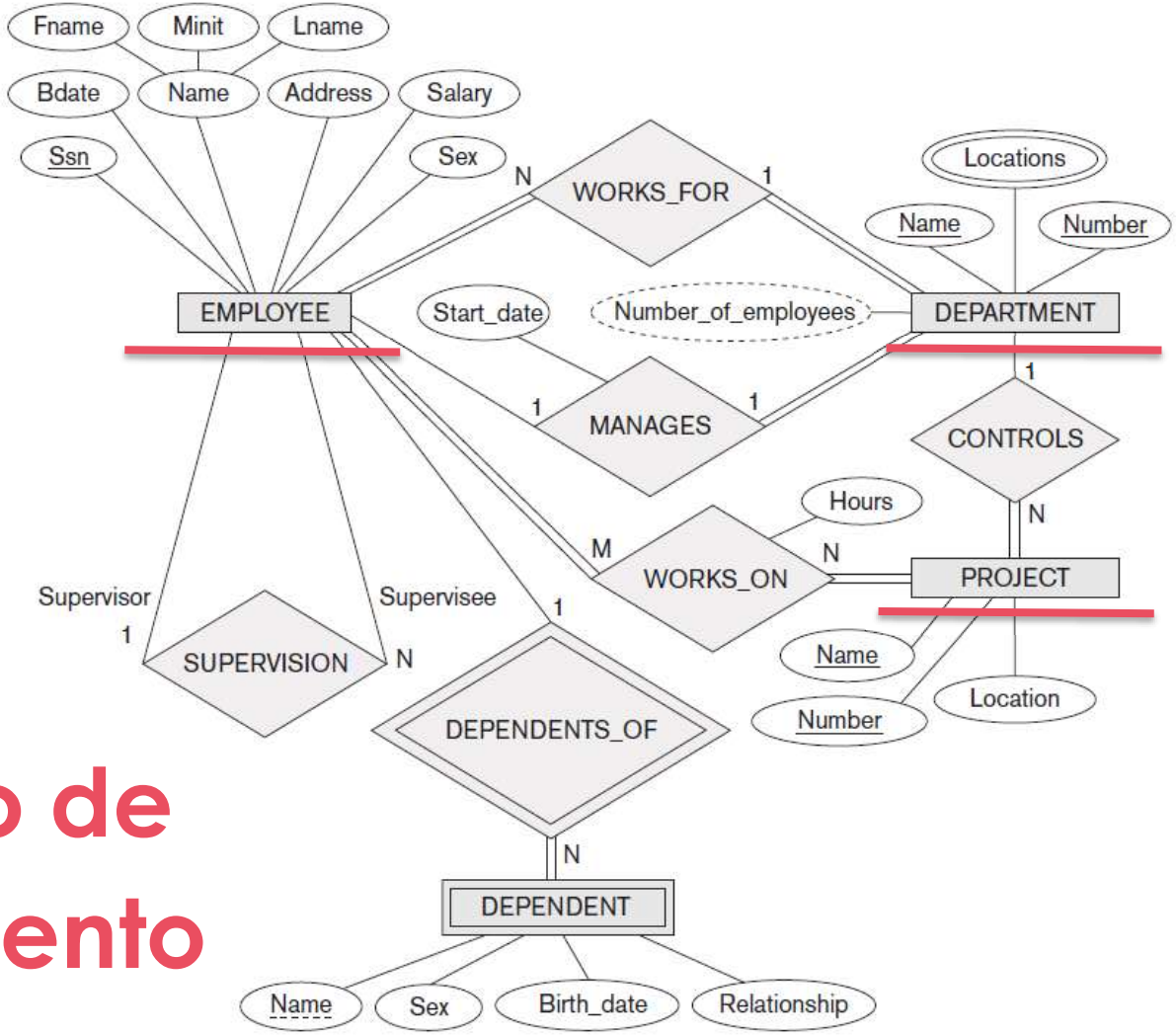
PROJECT

DEPARTMENT

EMPLOYEE

Entidades Fortes (Regulares)

Algoritmo de Mapeamento



Strong Entity Mapping

EMPLOYEE

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary

DEPARTMENT

Dname	Dnumber

PROJECT

Pname	Pnumber	Plocation

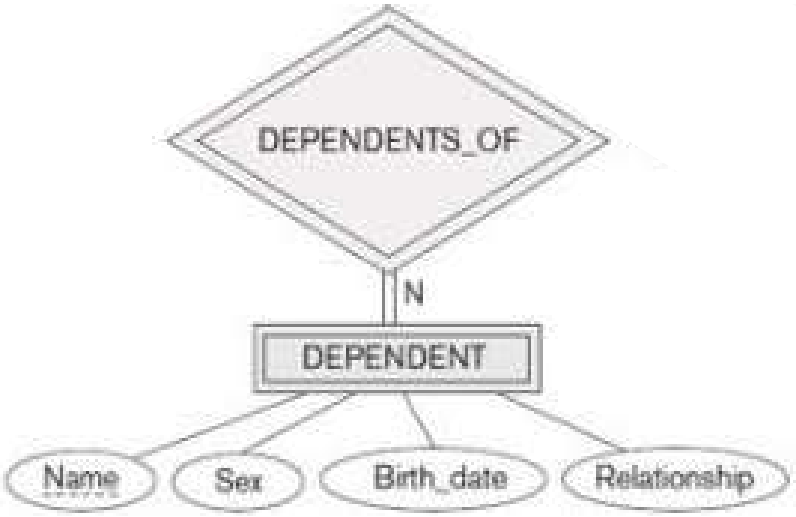
Relação de Entidade – **Entity Relation**

Algortimo de Mapeamento

- Relação -> E (A1,A2,A3,...,A4)
- PK Simples ou Composta?
- Unique Constraint
- FK – Foreign Key

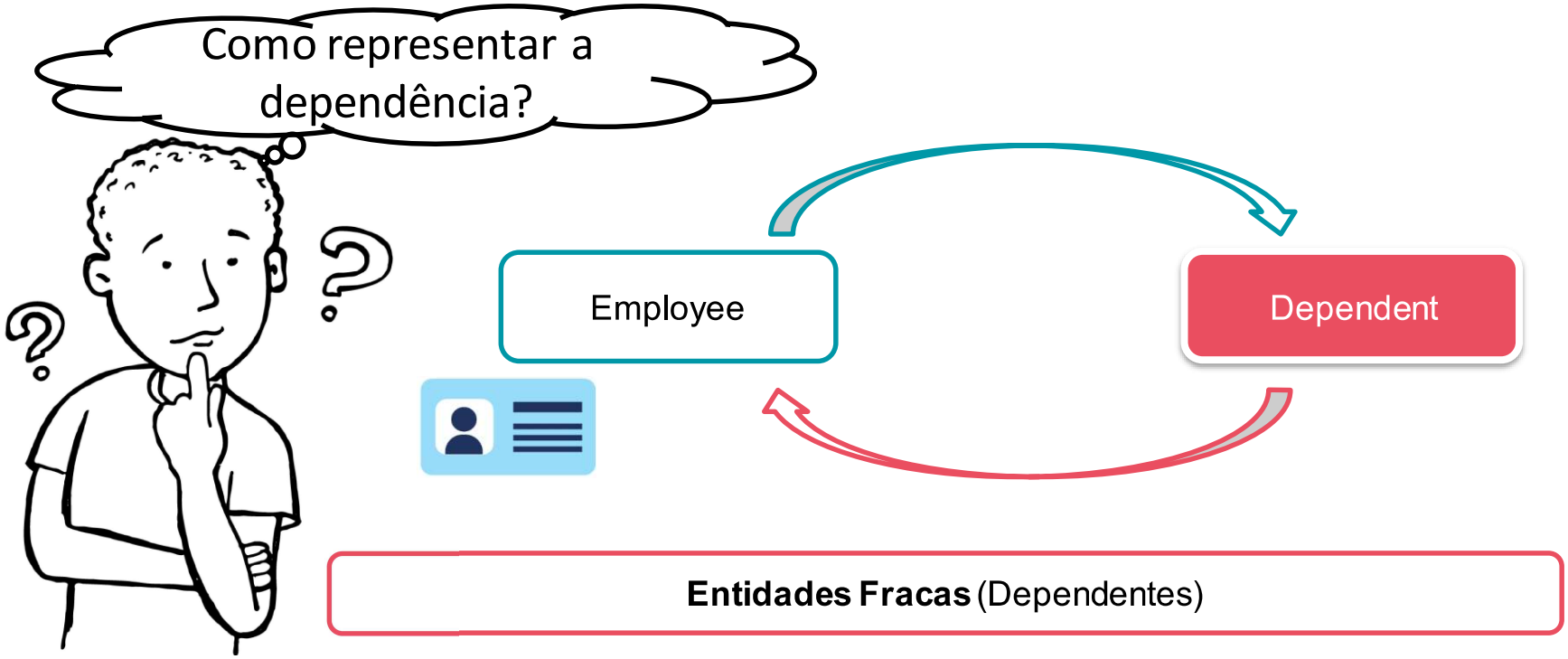
Entidades Fracas (Dependentes)

Algortimo de Mapeamento

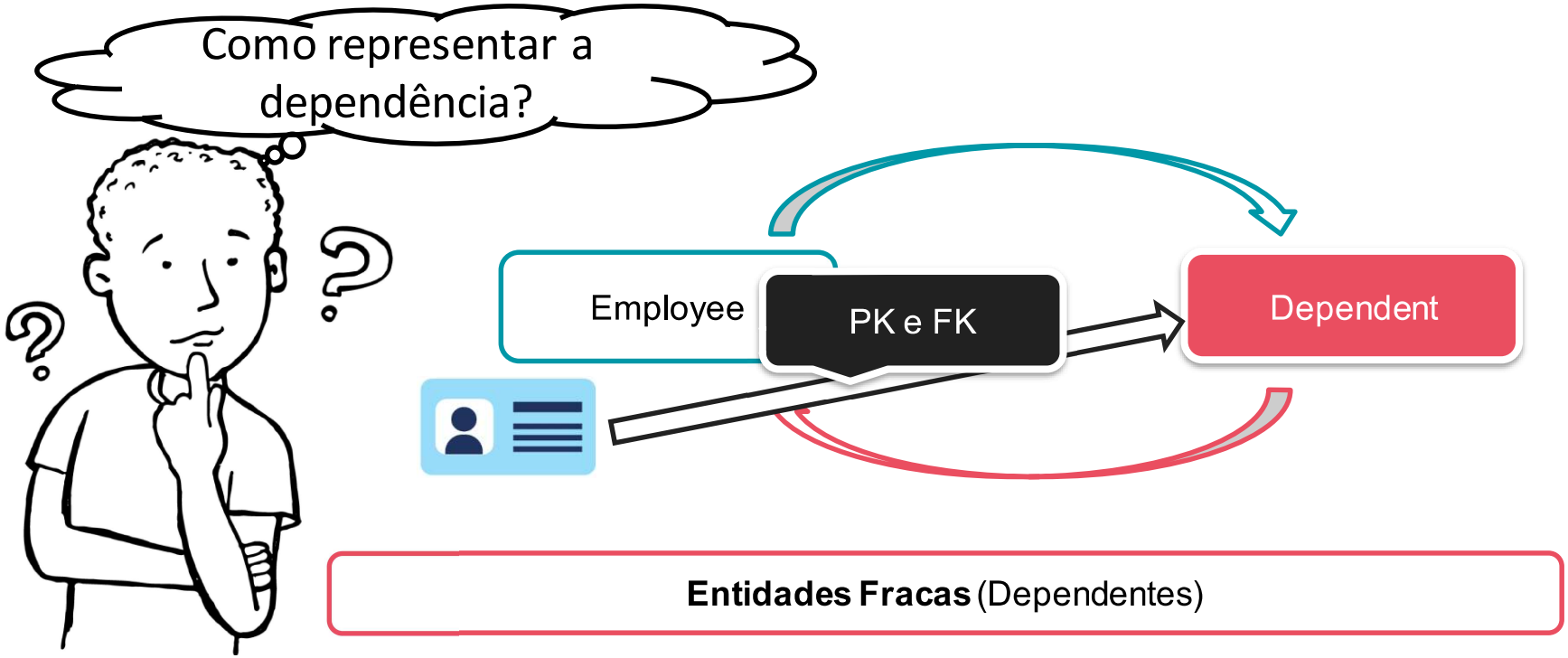


Entidades Fracas (Dependentes)

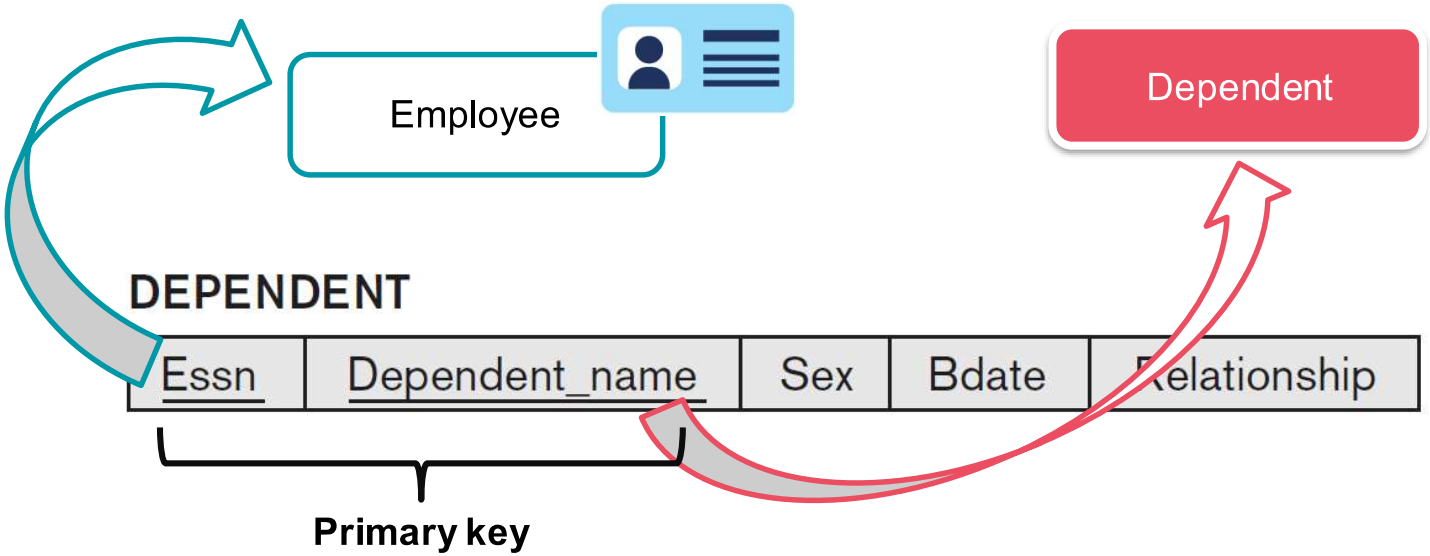
Algortimo de Mapeamento



Algortimo de Mapeamento



Mapeamento - Entidade Fraca



Entidade Fraca identificada pela Chave (PK e FK)

Algoritmo de Mapeamento

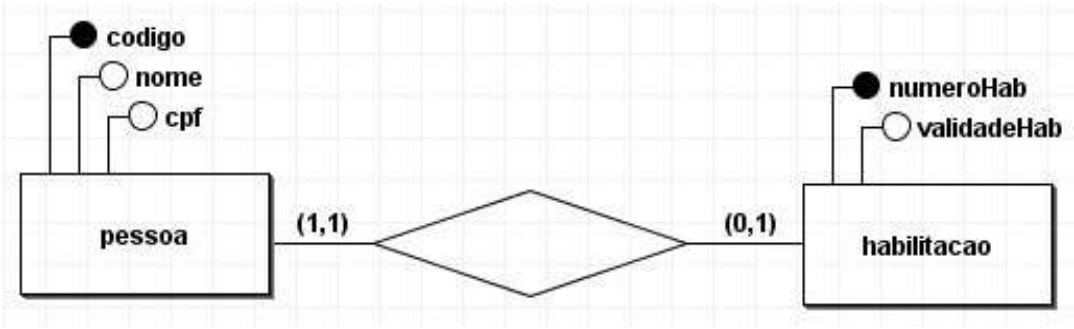
- Foreign Key
- Merge dos relacionamentos
- Cross-reference

Abordagem

Relacionamento Binário 1:1

Algoritmo de Mapeamento

- PK de S -> FK em T



Participação Total

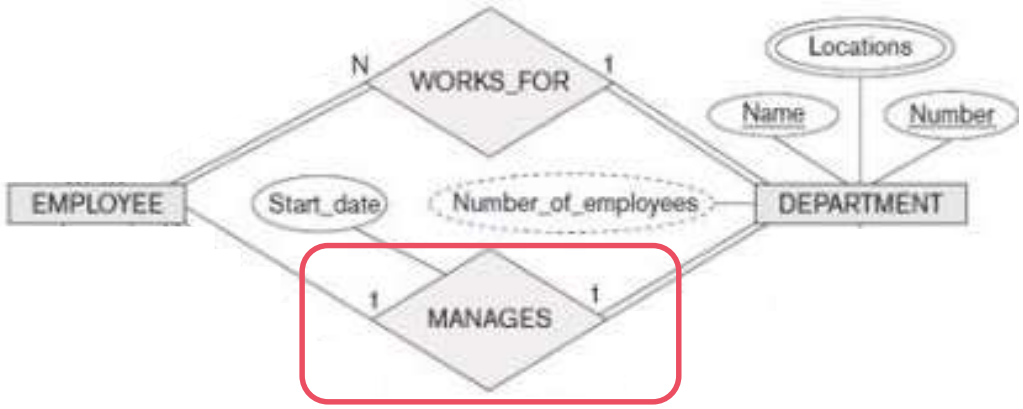
Abordagem FK

Relacionamento Binário 1:1

[81]

Algoritmo de Mapeamento

- PK de S -> FK em T



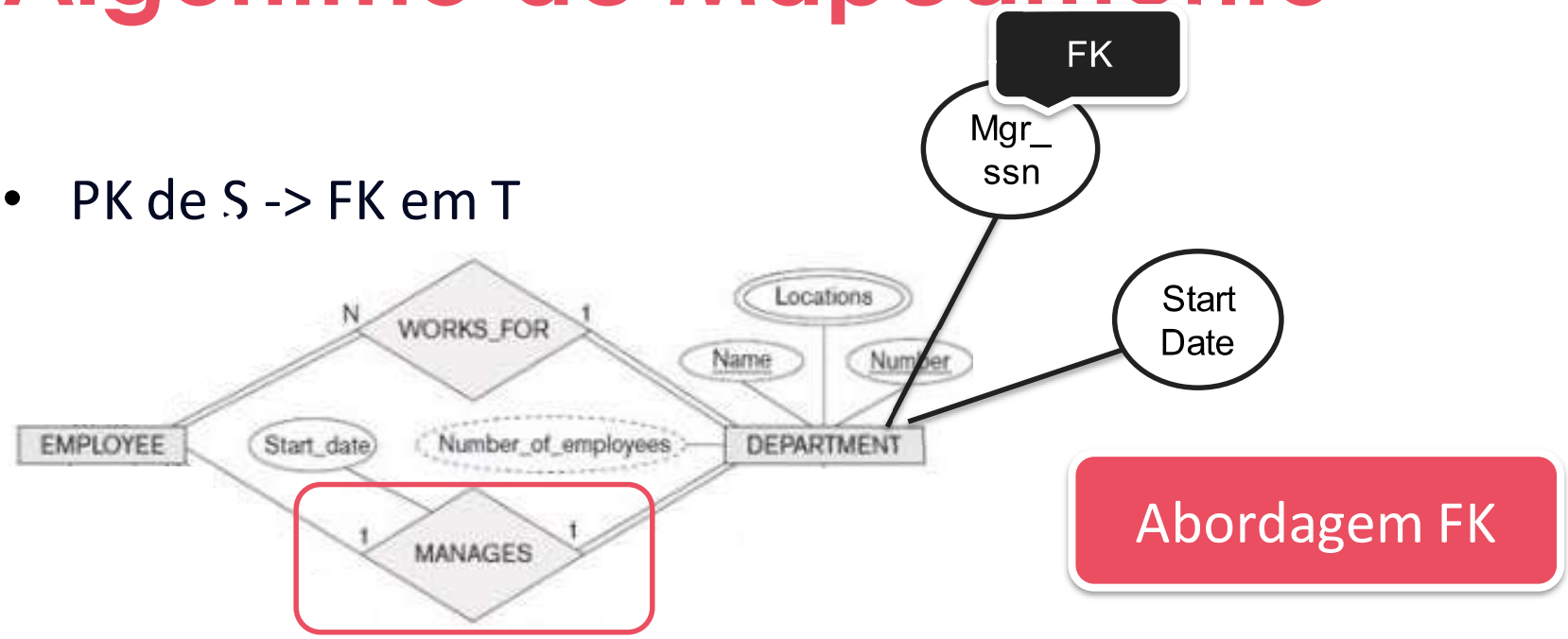
Participação Total

Abordagem FK

Relacionamento Binário 1:1

Algoritmo de Mapeamento

- PK de S -> FK em T



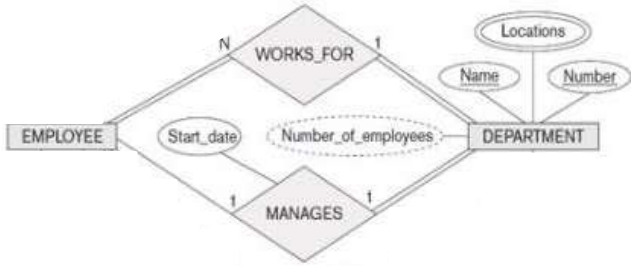
Abordagem FK

Relacionamento Binário 1:1

Algoritmo de Mapeamento

Relacionameno Total

- 2 entidades em 1 entidade



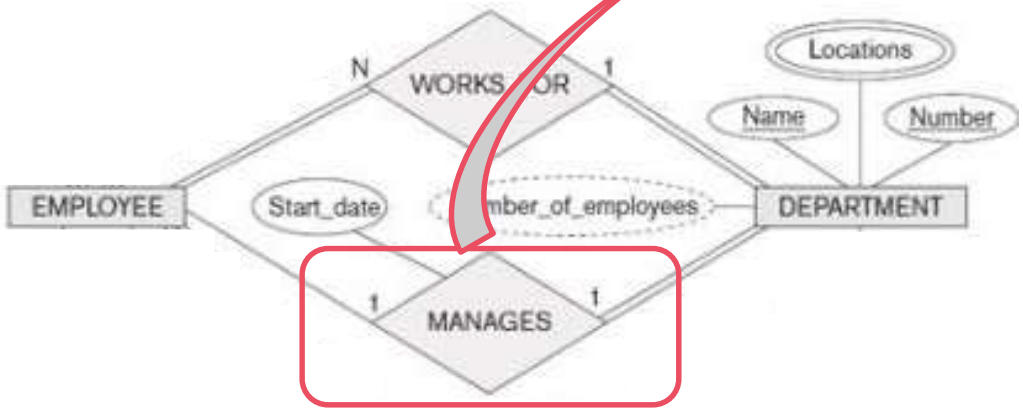
MgrDep

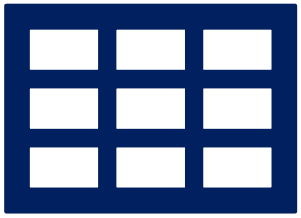
Merge

Relacionamento Binário 1:1

Algoritmo de Mapeamento

- Cross-reference





Entidade

M:N

Relacionamento Binário 1:1

Algoritmo de Mapeamento

Abordagens:

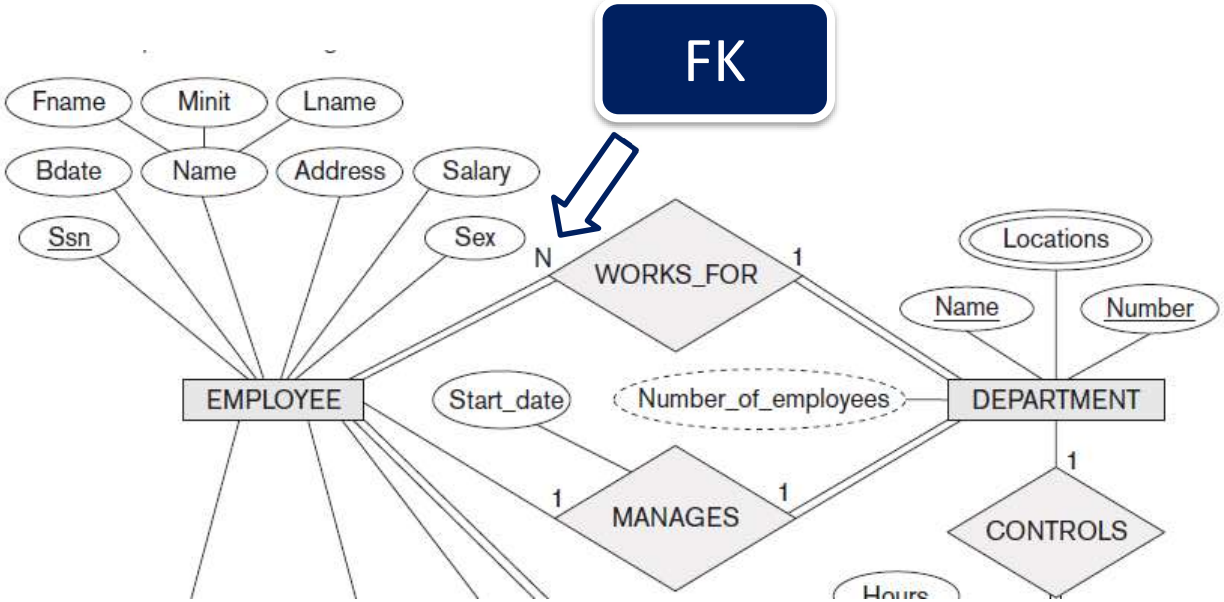
- Foreign Key
- Relationship relation

1:N

Relacionamento Binário 1:N

[86]

Algoritmo de Mapeamento

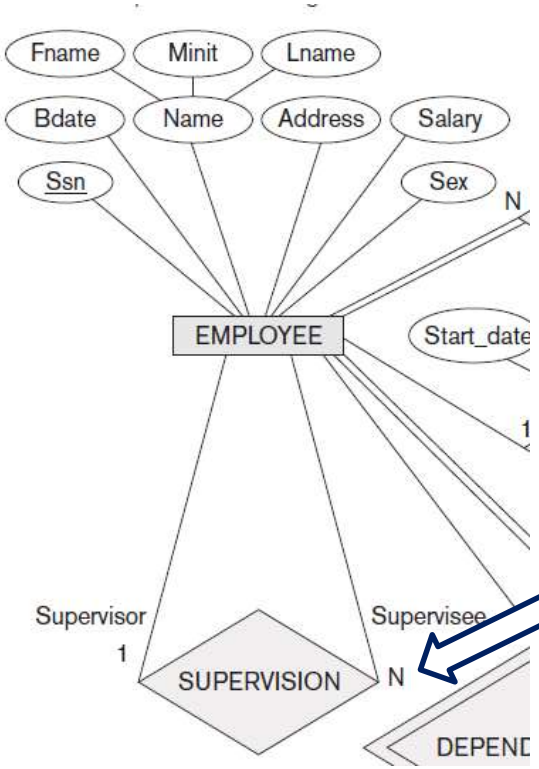


Relacionamento Binário 1:N

EMPLOYEE

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno

Algoritmo de Mapeamento



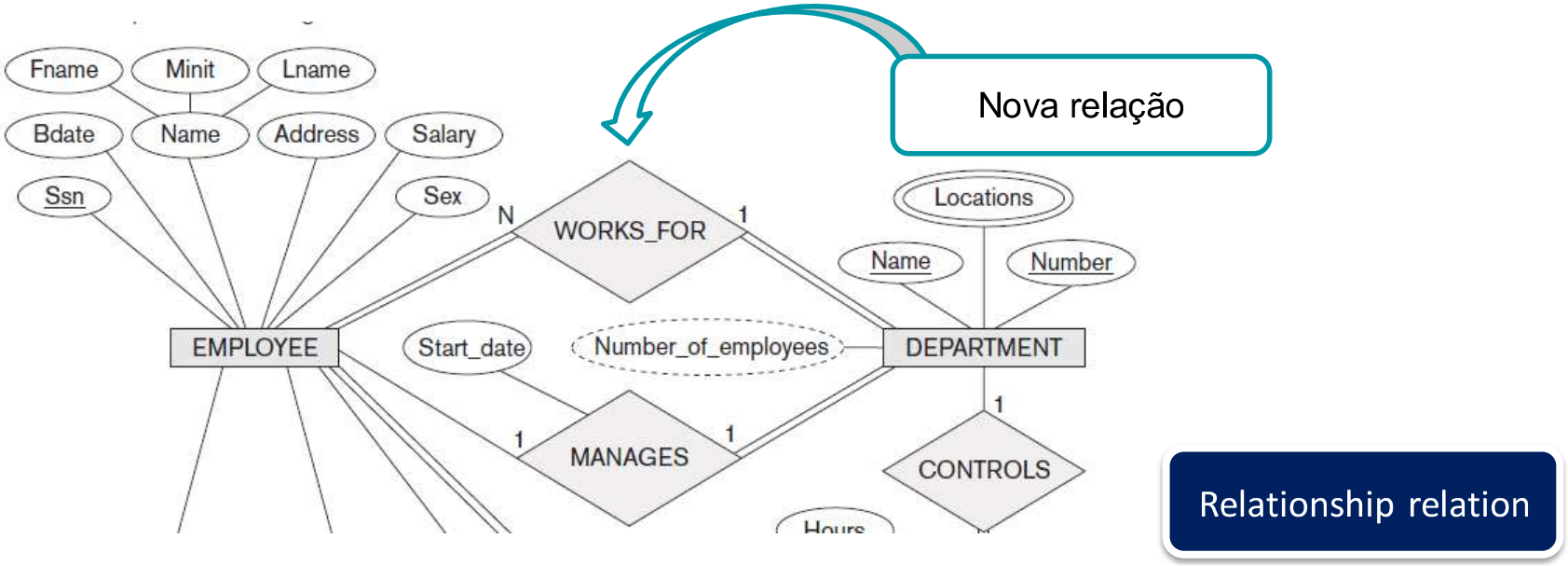
EMPLOYEE

Fname	Minit	Lname	Ssn	Bdate	Address

FK

Relacionamento Binário 1:N

Algoritmo de Mapeamento

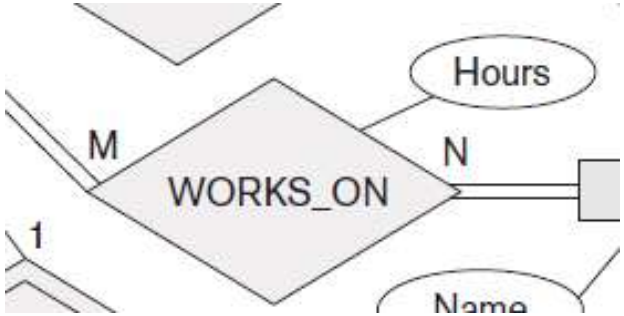


Relacionamento Binário 1:N

Algoritmo de Mapeamento

Abordagem:

- Relationship relation

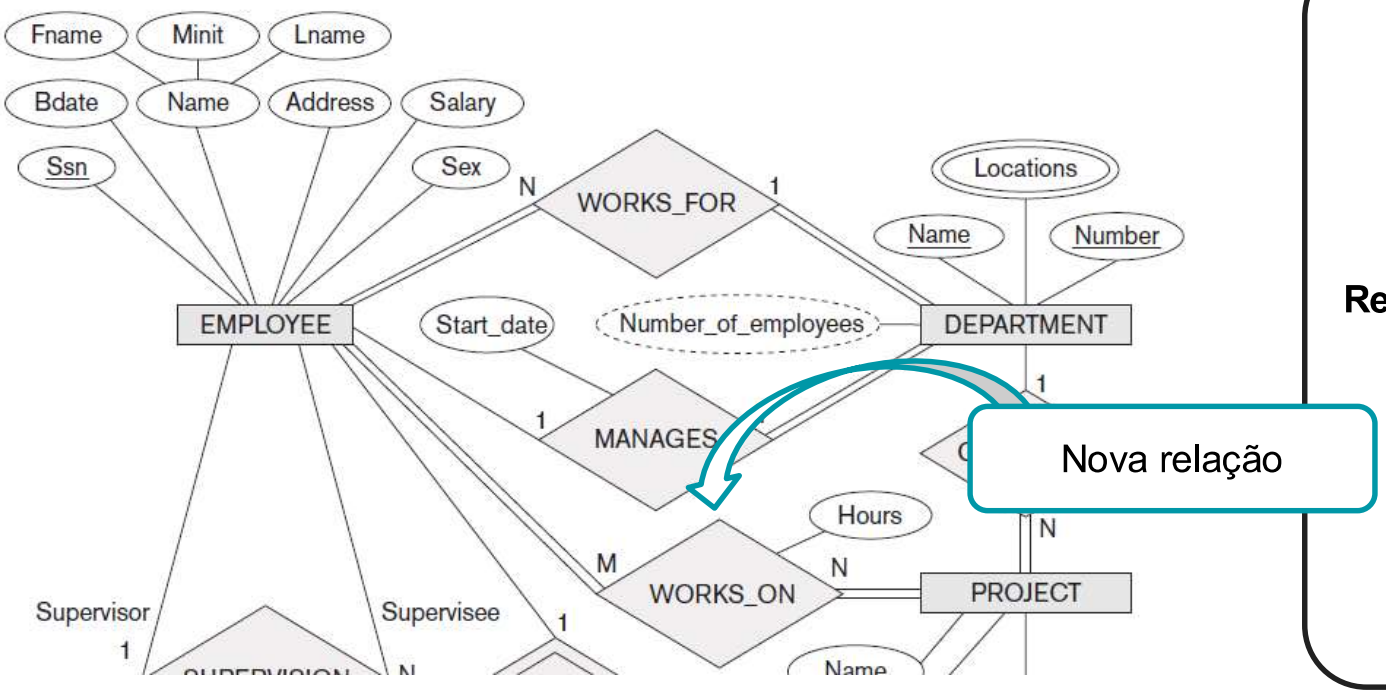


M:N

Relacionamento Binário N:M

[90]

Algoritmo de Mapeamento

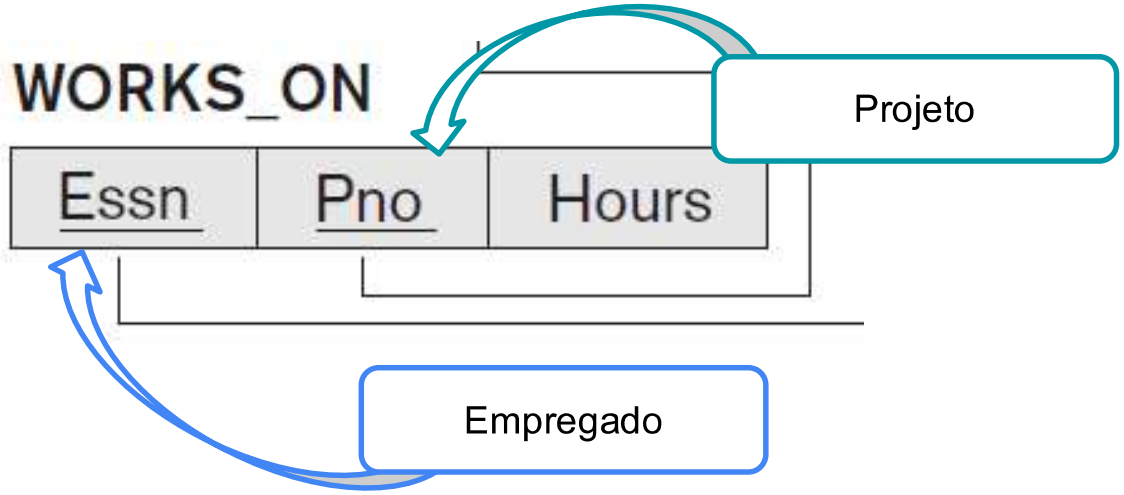


Nova relação

Relacionamento Binário N:M

[91]

Algoritmo de Mapeamento



Relacionamento Binário N:M

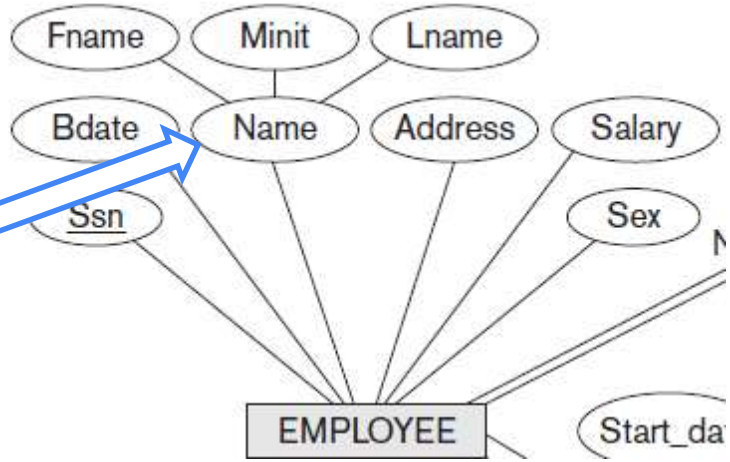
[92]

Algoritmo de Mapeamento

Abordagem:

- Componentes simples

Fname | Minit | Lname



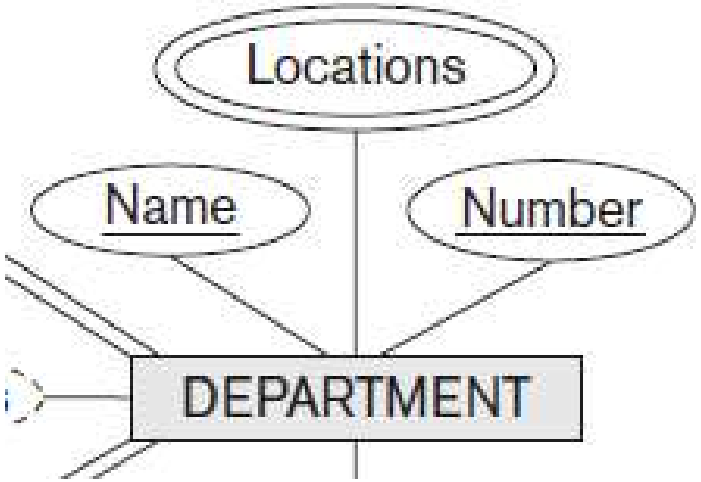
Atributos Compostos

[93]

Algoritmo de Mapeamento

Abordagem:

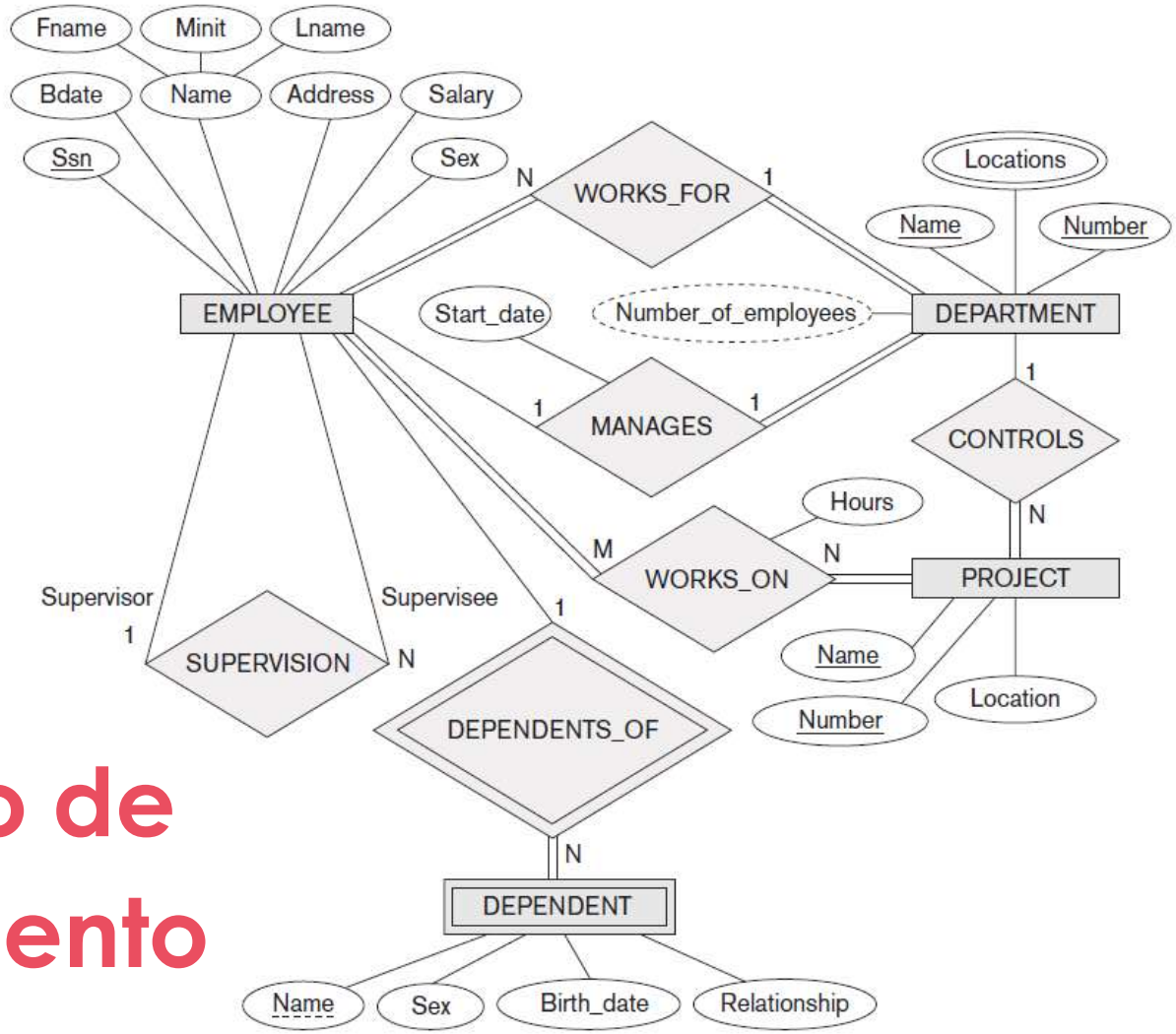
- Relationship Relation



Atributos Multivalorados

[94]

Algoritmo de Mapeamento



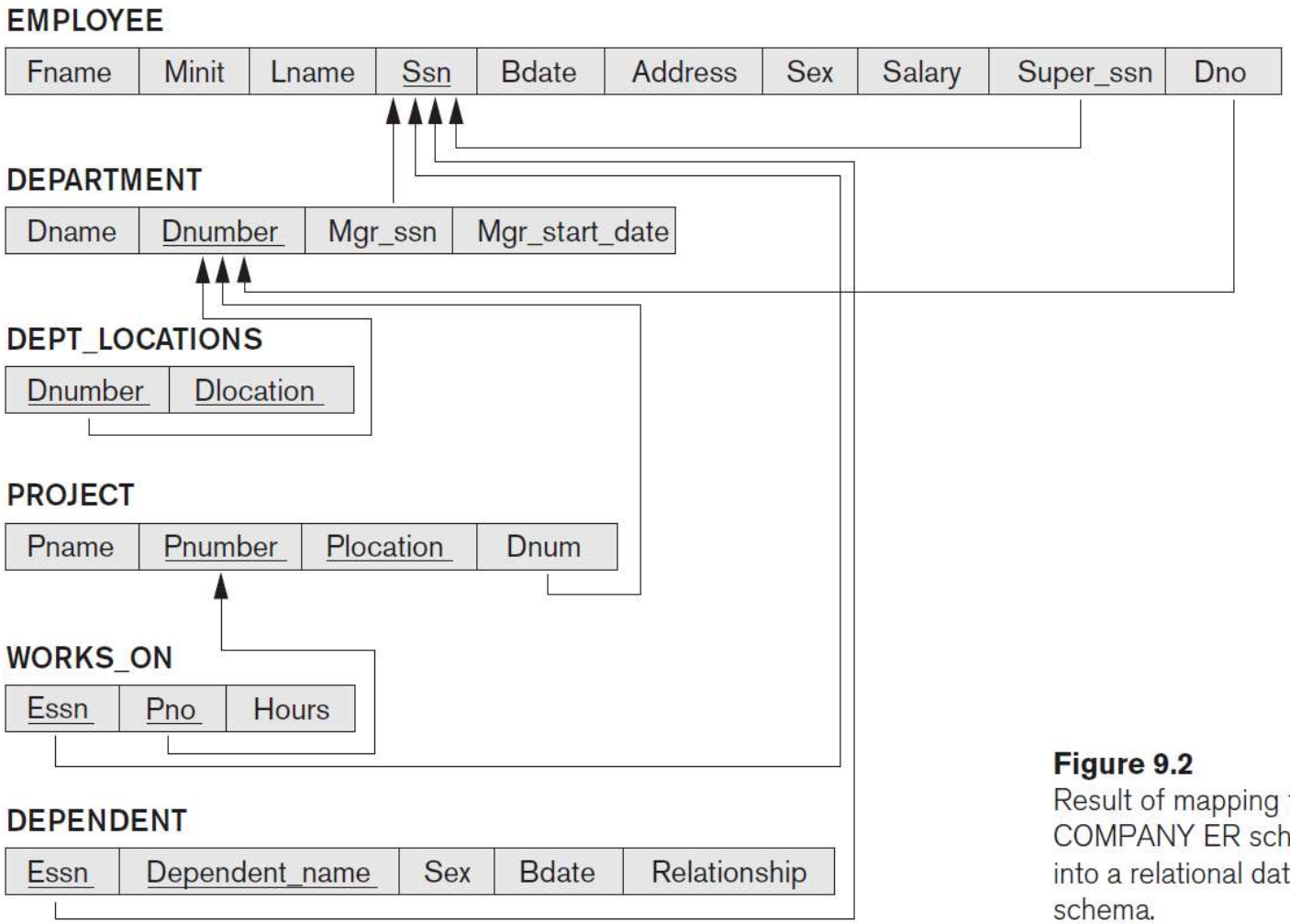
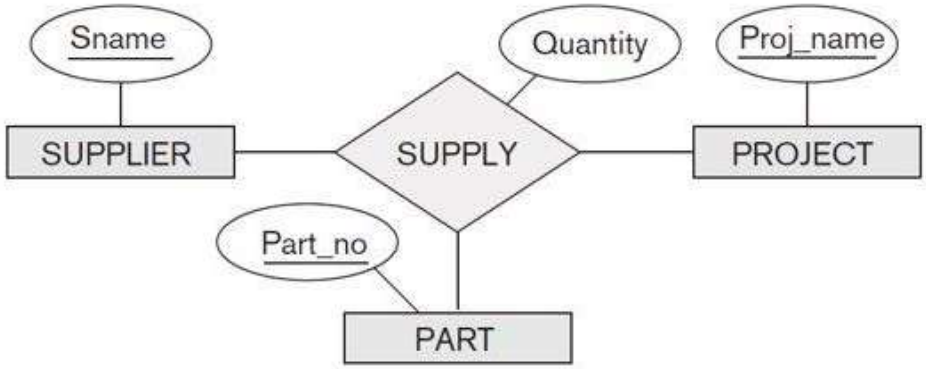


Figure 9.2
Result of mapping the COMPANY ER schema into a relational database schema.

Algoritmo de Mapeamento

Abordagem:

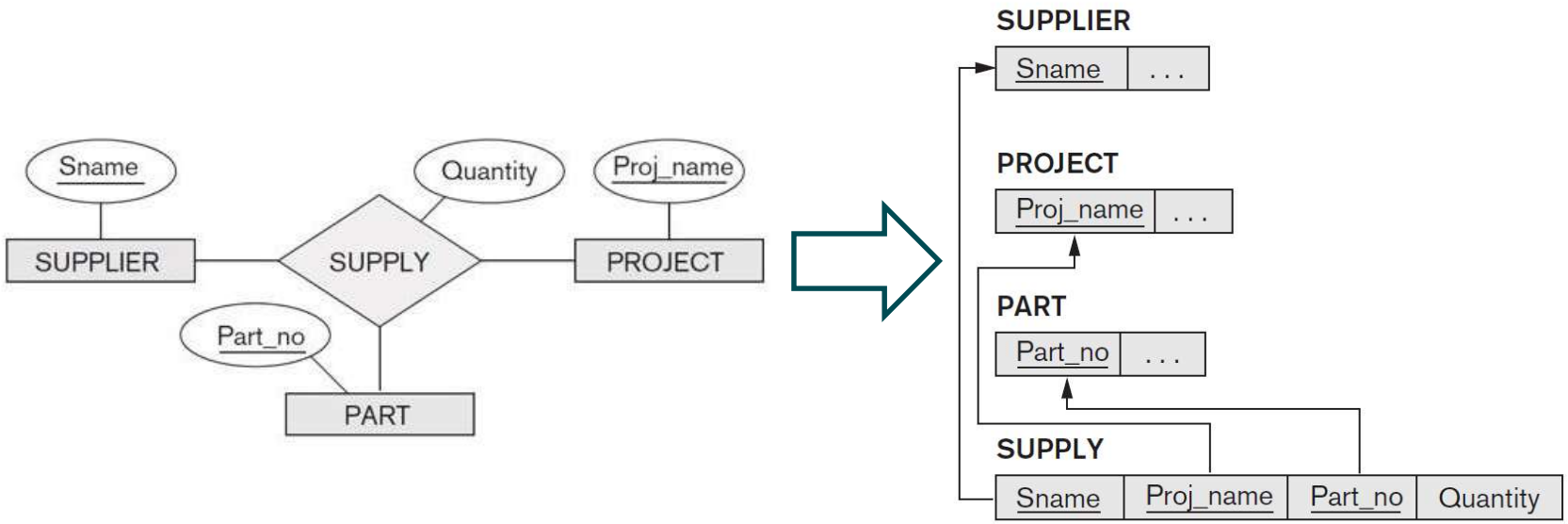
- Relationship relation



Relacionamento N-ário

[97]

Algoritmo de Mapeamento



Relacionamento N-ário

[98]

Algoritmo de Mapeamento

Modelo ER

- Entidade
- Relação 1:1 ou 1:N
- Relação M:N
- Relacionamento N-ário

Modelo Relacional

- Relação (enidade)
- FK ou relação
- Relação ou 2 FKs
- Relação ou N FKs

Resumo

Algoritmo de Mapeamento

Modelo ER

- Atributo Simples
- Atributos Composto
- Atributo Multivalorado
- Conjunto de valores
- Atributo chave

Modelo Relacional

- Atributo
- Conjunto de atributos
- Relação ou FK
- Domínio
- PK (ou secundária)

Resumo

Mapeando os components do EER

Algoritmo de Mapeamento

Especialização

- Única tabela
- Múltiplas tabela

{SECRETARY, TECHNICIAN, ENGINEER}

SubClasse

Algoritmo de Mapeamento

Especialização

- Única tabela
- Múltiplas tabela

Superclasse
e
Subclasse

SubClasse

{SECRETARY, TECHNICIAN, ENGINEER}

Algoritmo de Mapeamento

Opções

- Múltiplas relações - Sub/superclasse
- Múltiplas relações - Subclasse
- Relação única - 1 tipo de atributo
- Relação única - Múltiplos tipos de atributo

{SECRETARY, TECHNICIAN, ENGINEER}

SubClasse

Algoritmo de Mapeamento

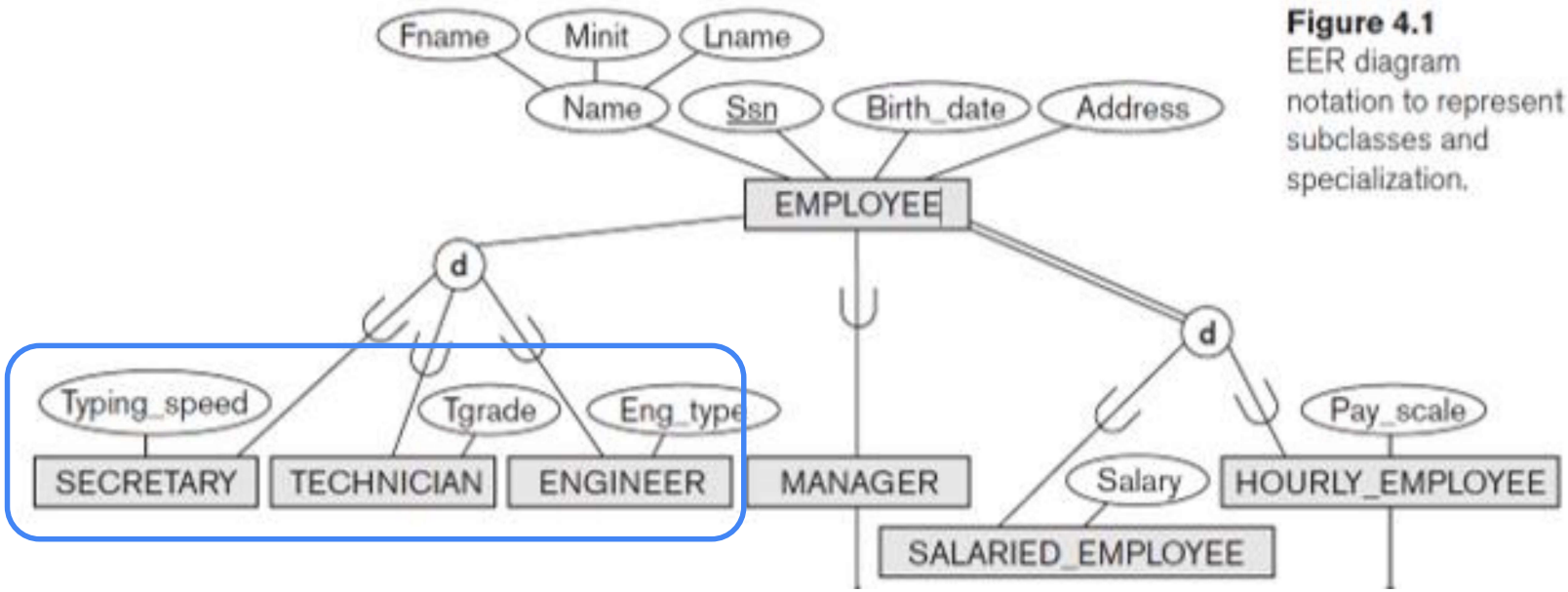


Figure 4.1
EER diagram notation to represent subclasses and specialization.

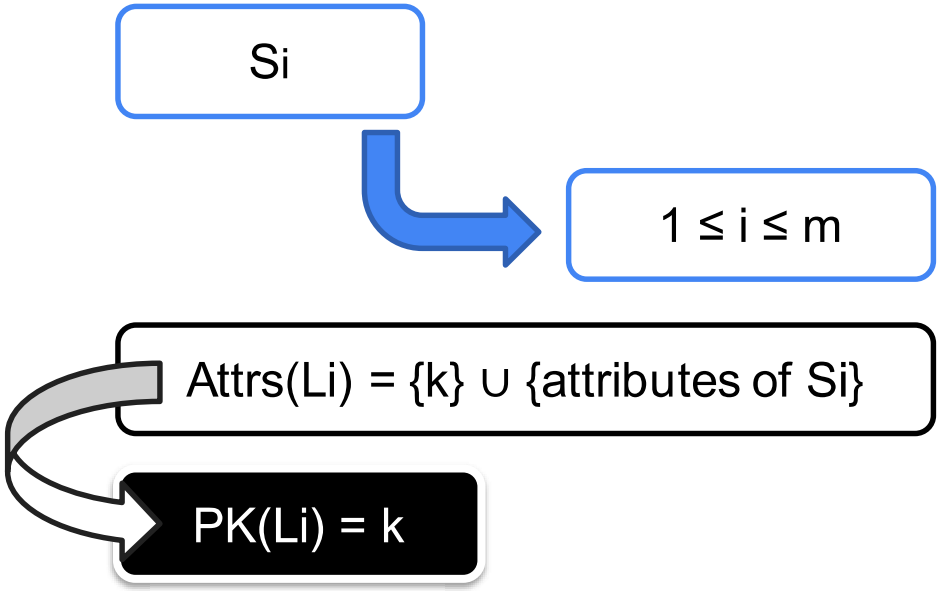
Algoritmo de Mapeamento

Relação L

- Attrs(L) = {k, a1, … , an}

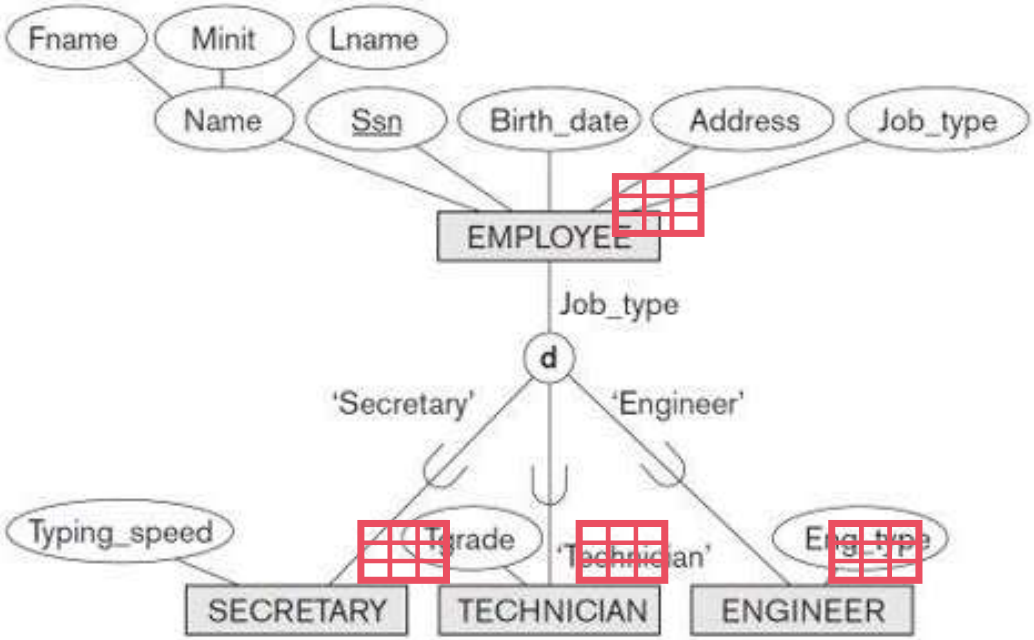
Relação Li

- Attrs(Li) = {k}



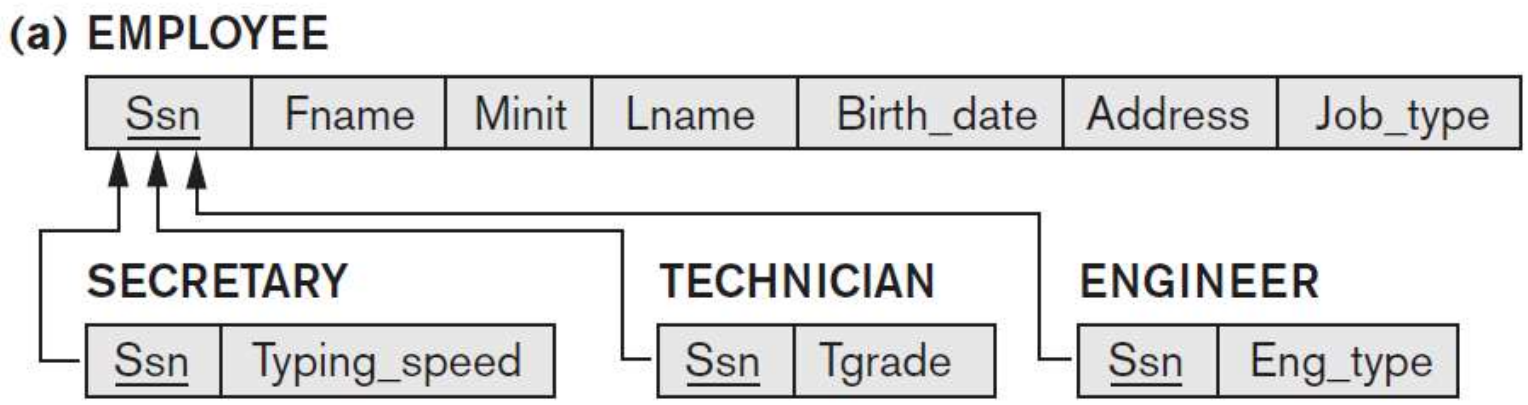
Múltiplas relações - Sub/superclasse

Algoritmo de Mapeamento



[107]

Algoritmo de Mapeamento



Múltiplas relações - Sub/superclasse

Algoritmo de Mapeamento

~~**Relação L**~~

- ~~Attrs(L) = {k, a1, … , an}~~

Relação Li

- Attrs(Li) = {k}

Si

$1 \leq i \leq m$

Attrs(Li) = {k} ∪ {attributes of Si}

PK(Li) = k

Múltiplas relações - Subclasse apenas

Algoritmo de Mapeamento

Si

$1 \leq i \leq m$

Relação Li

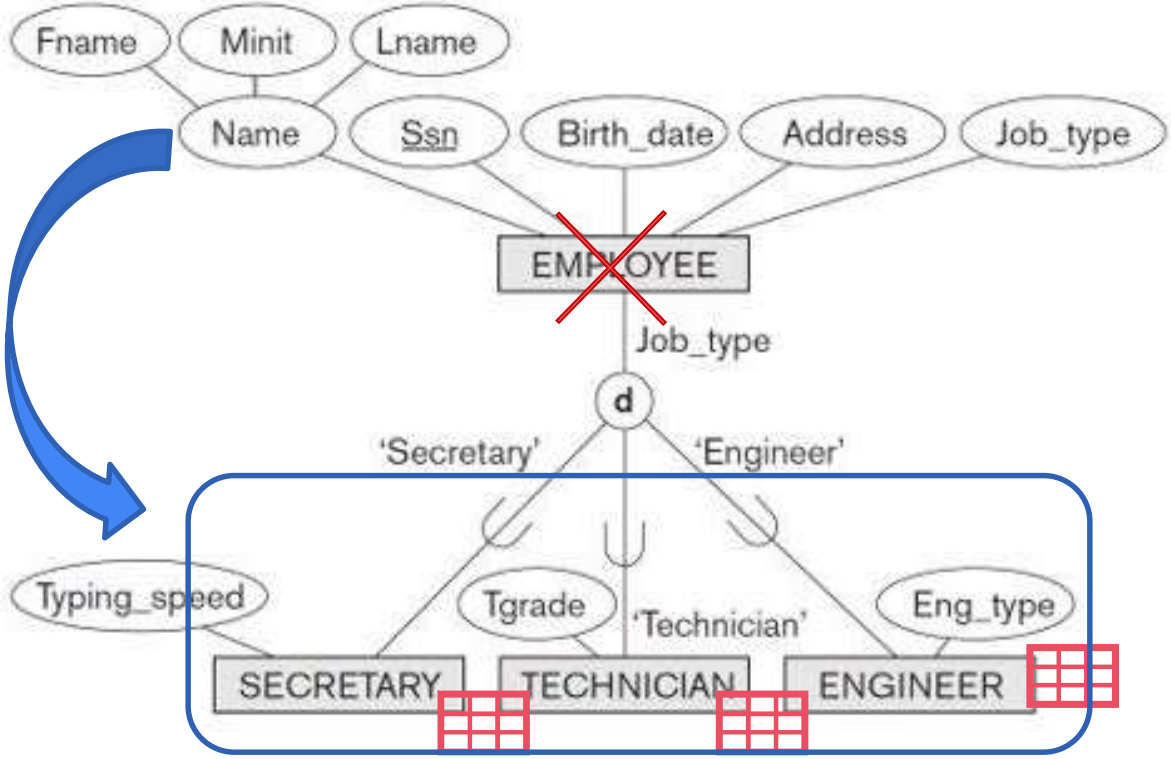
- Attrs(Li) = {k}

Attrs(Li) = {attributes of Si} ∪ {k, a1, … , an}

PK(Li) = k

Múltiplas relações - Subclasse apenas

Algoritmo de Mapeamento



Algoritmo de Mapeamento

(b) CAR

Vehicle_id	License_plate_no	Price	Max_speed	No_of_passengers

TRUCK

Vehicle_id	License_plate_no	Price	No_of_axles	Tonnage

Múltiplas relações - Subclasse apenas

Algortimo de Mapeamento

Relação L

- Attrs(L) = {k}

Attrs(L) = {k, a1, …, an} ∪ {attributes of S1} ∪ …
∪ {attributes of Sm} ∪ **{t}**

Type attribute

d

PK(L) = k

Relação única - 1 tipo de atributo

Algoritmo de Mapeamento

subclasse

ID | Nome | Endereço | Data de Nascimento | T (tipo)

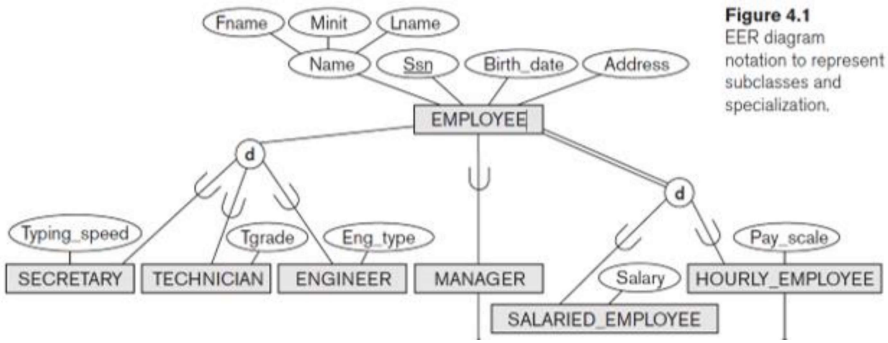


Figure 4.1
EER diagram notation to represent subclasses and specialization.

Relação única - 1 tipo de atributo

Algoritmo de Mapeamento

Atributos de tipo

(c) EMPLOYEE

Ssn	Fname	Minit	Lname	Birth_date	Address	Job_type	Typing_speed	Tgrade	Eng_type

Relação única - 1 tipo de atributo

Algoritmo de Mapeamento

Relação L

- Attrs(L) = {k}

Attrs(L) = {k, a1, …, an} ∪ {attributes of S1} ∪ …
∪ {attributes of Sm} ∪ {t1, t2, …, tm}

True OR False

PK(L) = k

Relação única - Múltiplos atributos Type

Algoritmo de Mapeamento

Subclasse

ID | Nome | Endereço | Data de Nascimento | Auxiliar | Técnico | Engenheiro

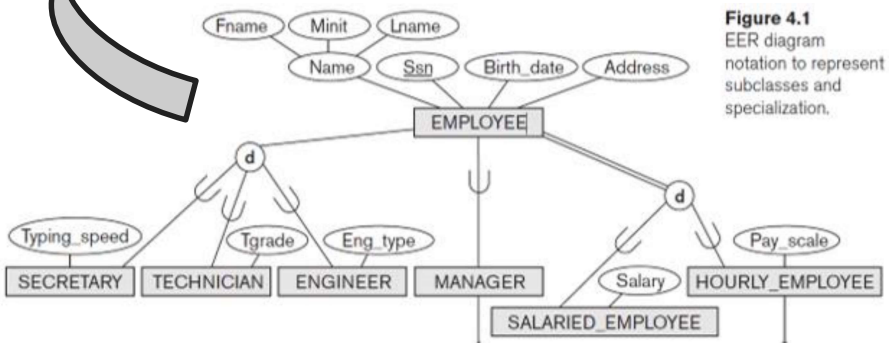


Figure 4.1
EER diagram notation to represent subclasses and specialization.

-Is_a_secretary, Is_a_engineer,

Is_a_technician ?

Relação única - Múltiplos atributos Type

[117]

Algoritmo de Mapeamento

Múltiplos Atributos de tipo

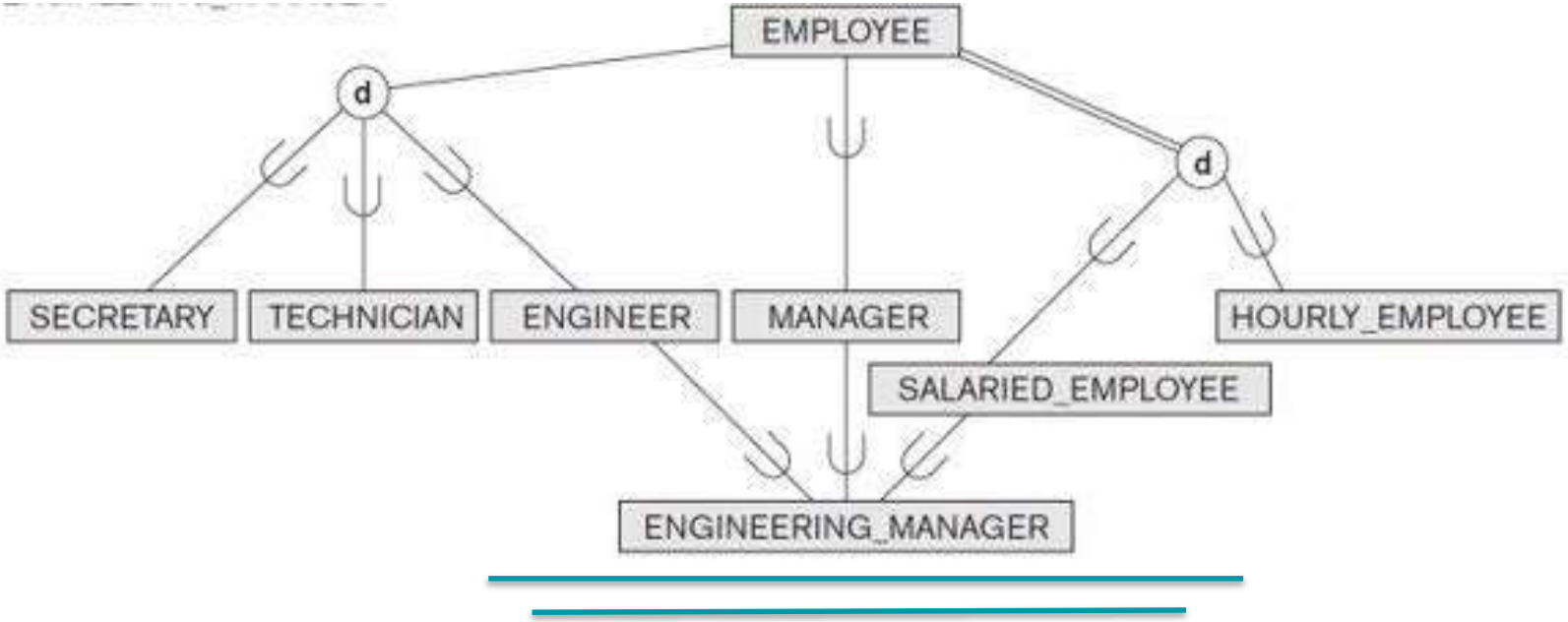
(d) PART

Part_no	Description	Mflag	Drawing_no	Manufacture_date	Batch_no	Pflag	Supplier_name	List_price

Relação única - Múltiplos atributos Type

[118]

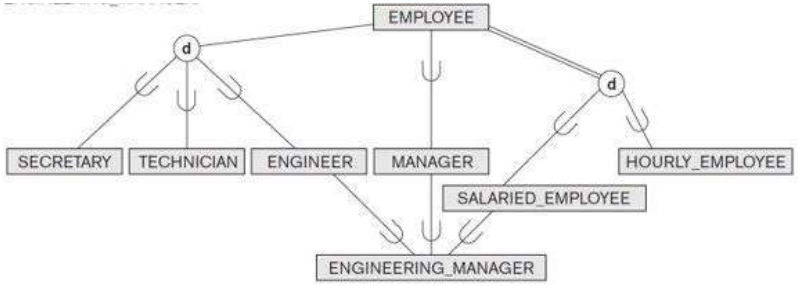
Algoritmo de Mapeamento



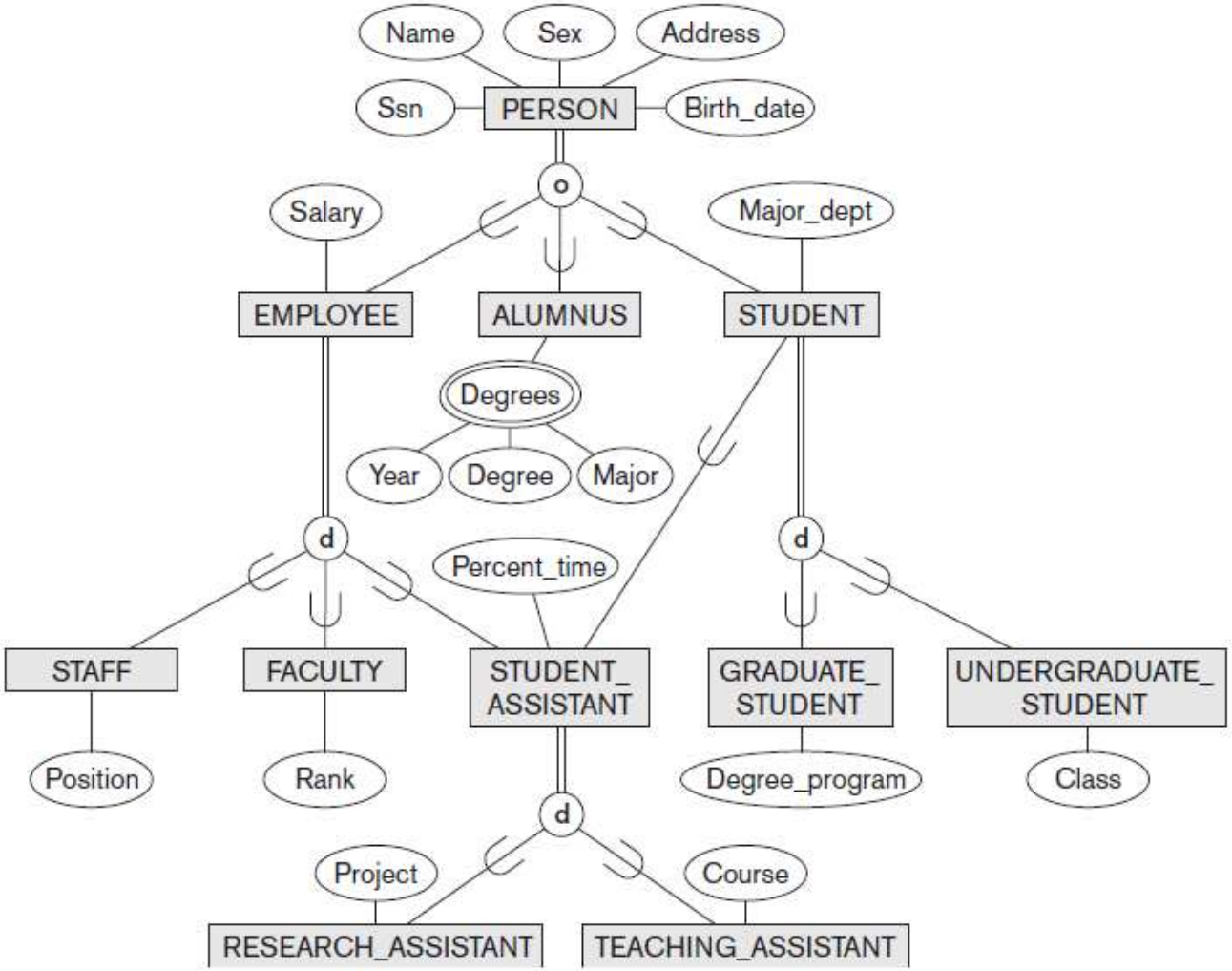
Herança Múltipla

Algoritmo de Mapeamento

- Mesmo atributo chave
- Mapeamento: Opções anteriores



Herança Múltipla



Herança Múltipla

Algoritmo de Mapeamento

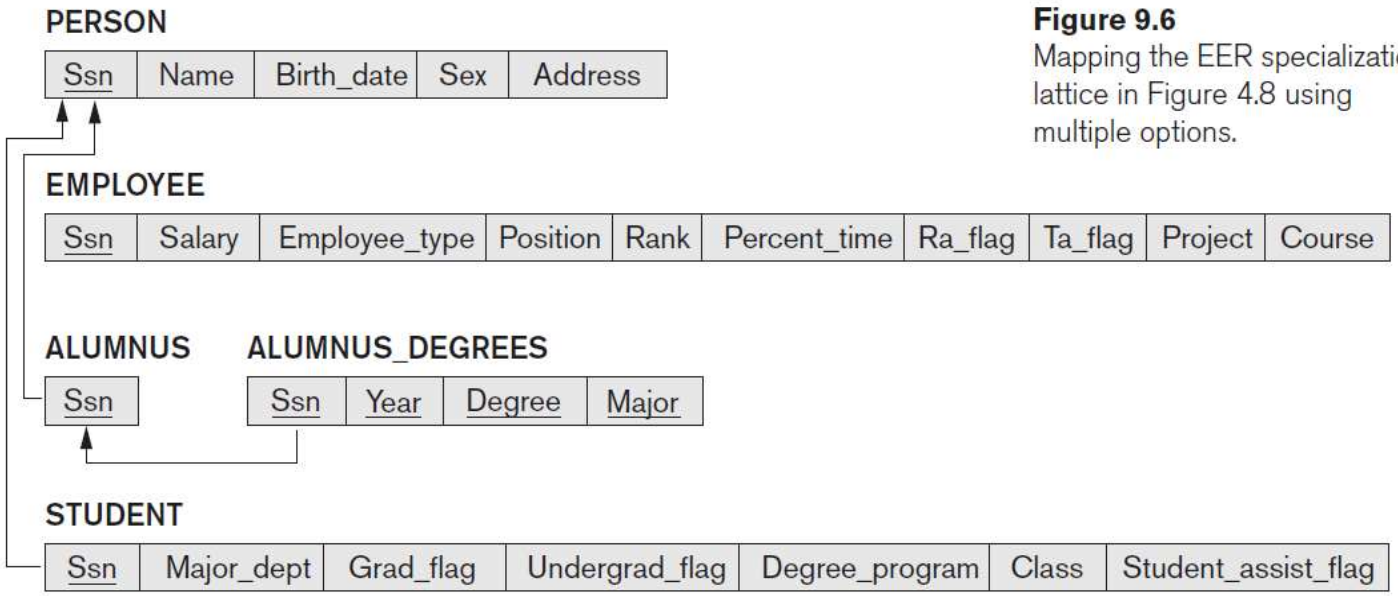


Figure 9.6
Mapping the EER specialization lattice in Figure 4.8 using multiple options.

Herança Múltipla

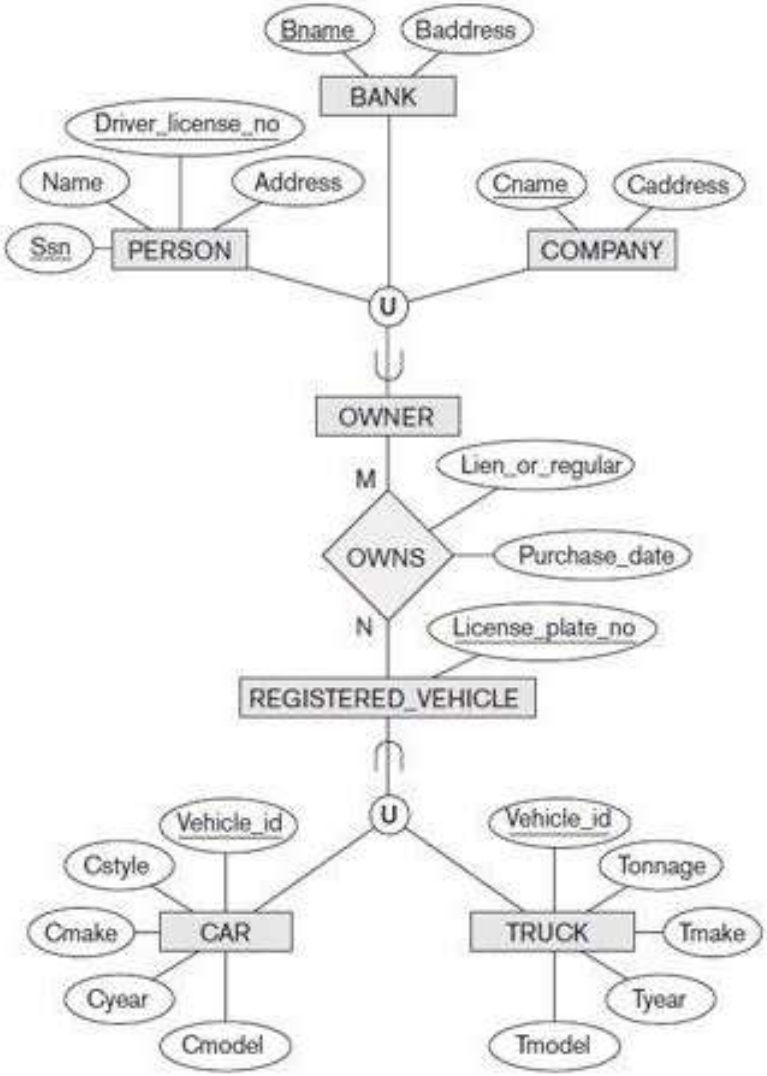
Algoritmo de Mapeamento

- Superclasses
- Tipos de entidades diferentes

UNION TYPE

[123]

Algoritmo de Mapeamento



UNION TYPE

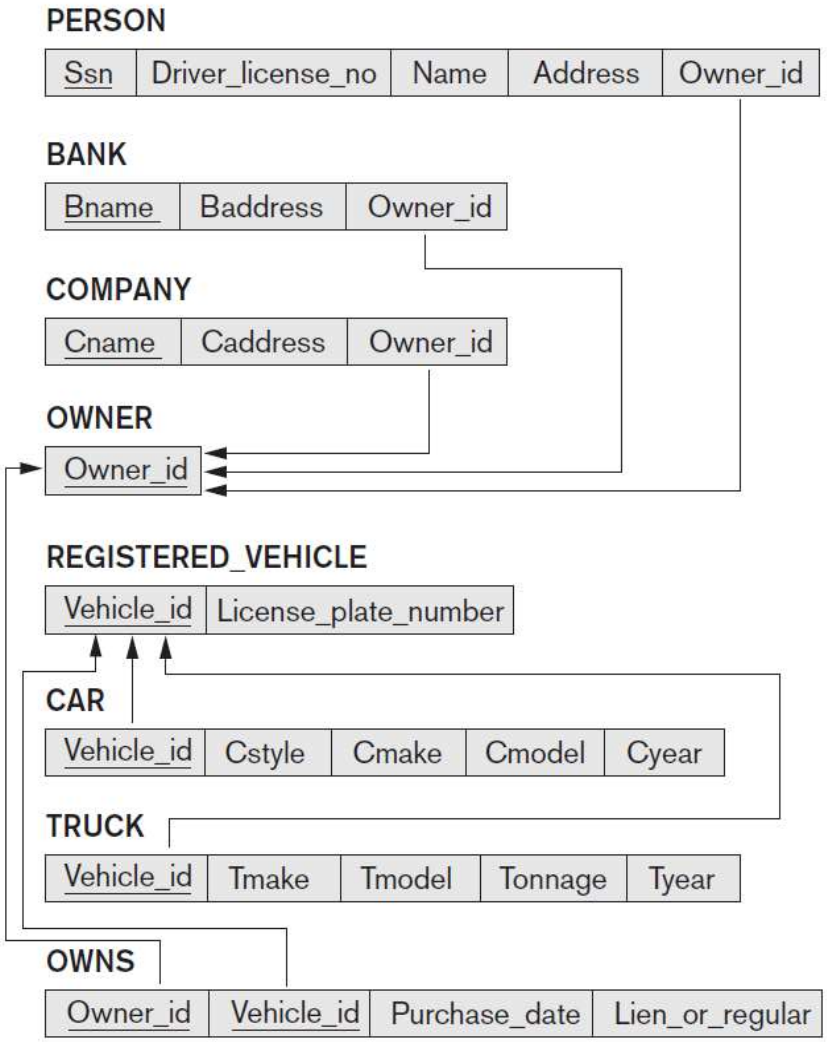
[124]

Algoritmo de Mapeamento

Chave substituta

Chave Primária

Chave Estrangeira



UNION TYPE

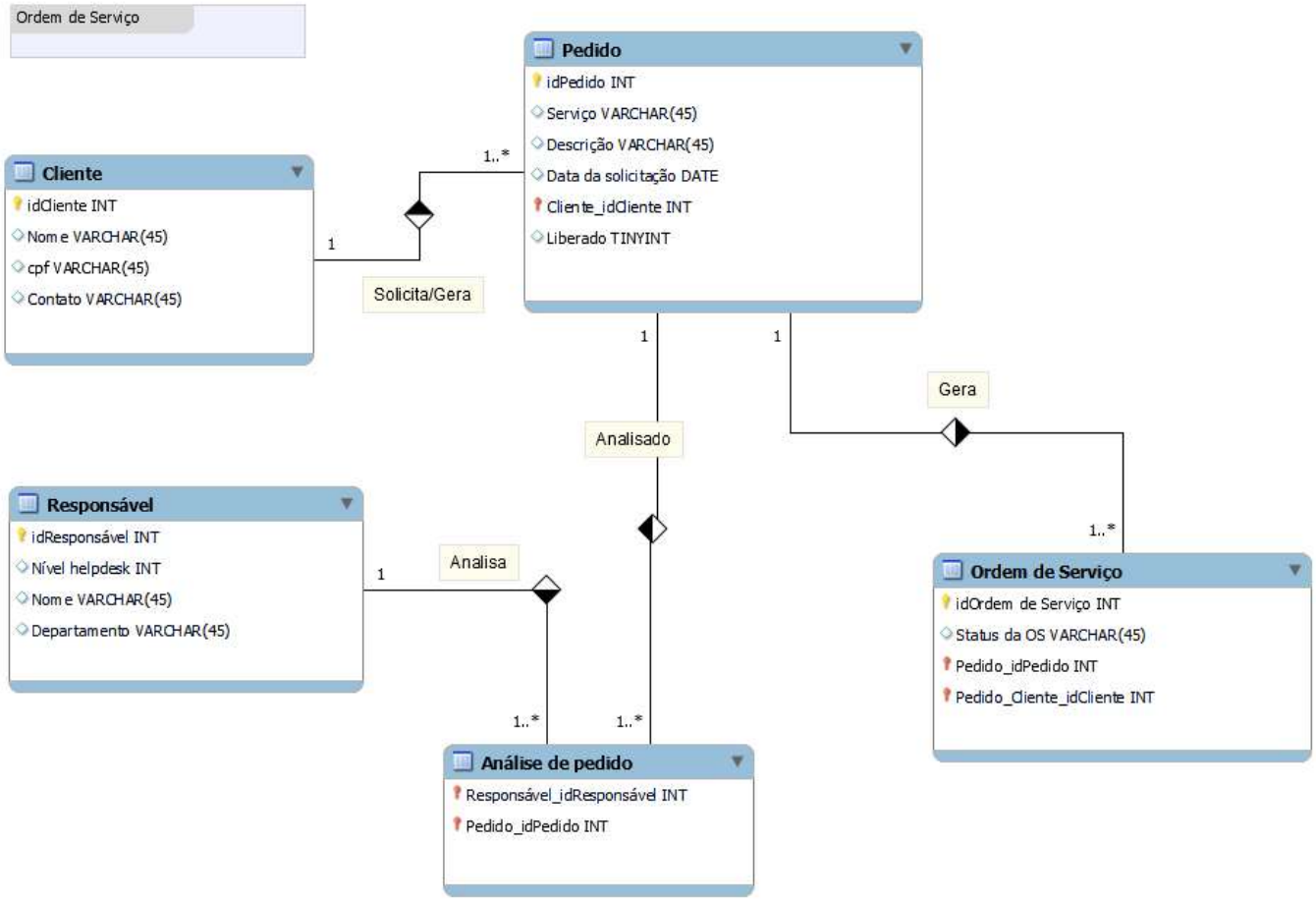
Handos on: Estudo de caso

Hands on

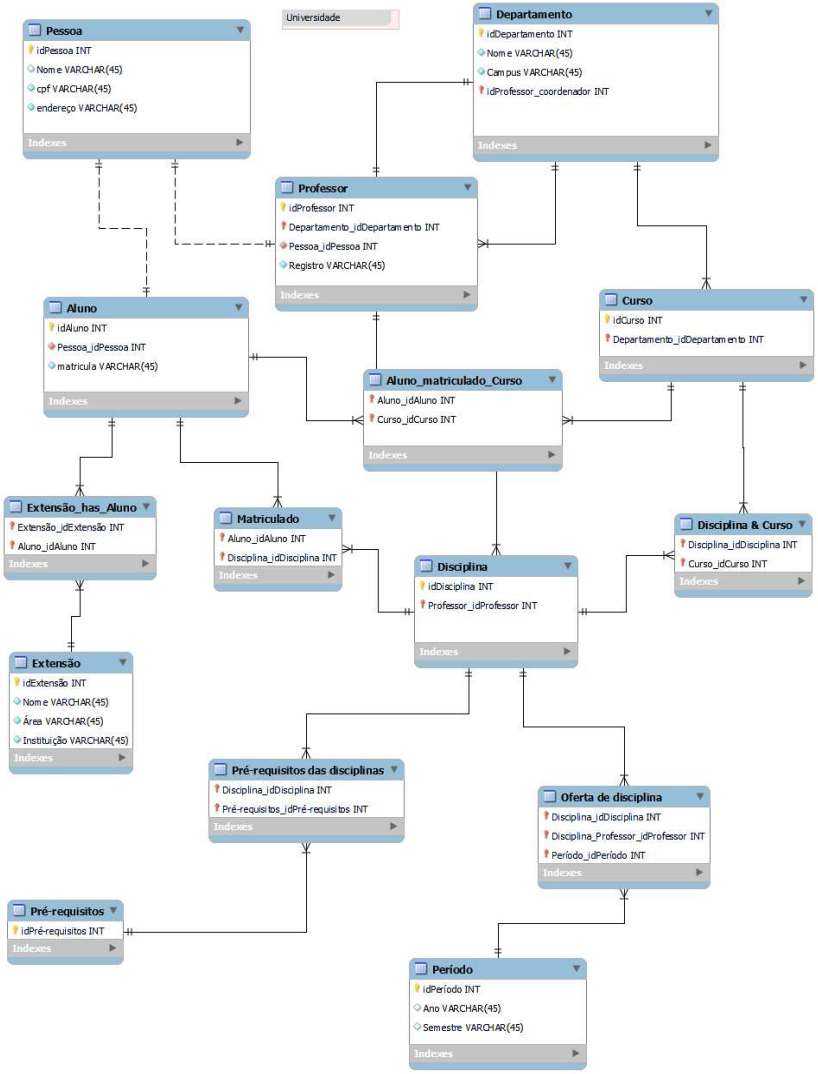
Objetivo:

- Mapear os esquemas conceituais de OS, Universidade e E-commerce

Hands on: OS


Ordem de Serviço
Pedido
idPedido INT
Serviço VARCHAR(45)
Descrição VARCHAR(45)
Data da solicitação DATE
Cliente_idCliente INT
Liberado TINYINT
Cliente
idCliente INT
Nome VARCHAR(45)
cpf VARCHAR(45)
Contato VARCHAR(45)
1..*
1
Solicita/Gera
1
1
Gera
Analisado
Responsável
idResponsável INT
Nível helpdesk INT
Nome VARCHAR(45)
Departamento VARCHAR(45)
1
Analisa
1..*
1..*
1..*
Ordem de Serviço
idOrdem de Serviço INT
Status da OS VARCHAR(45)
Pedido_idPedido INT
Pedido_Cliente_idCliente INT
Análise de pedido
Responsável_idResponsável INT
Pedido_idPedido INT

Hands on: Universidade



Etapa 2

Explorando a Linguagem SQL

// Explorando a Linguagem de Consulta a Banco de Dados SQL

Explorando a SQL

Introdução ao SQL

1970

Linguagem para:

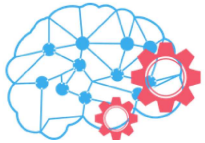
- Manipulação de dados
- Execução de operações

DS

DBAs

BI

Devs



Introdução ao SQL

Introdução ao SQL

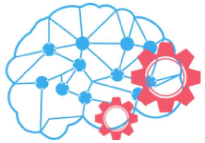
1970

Objetivo

- Modificação de dados e estrutura
- Adicionar, remover ou atualizar linhas
- Recuperação de um subconjunto de info do BD

OLTP

OTAP



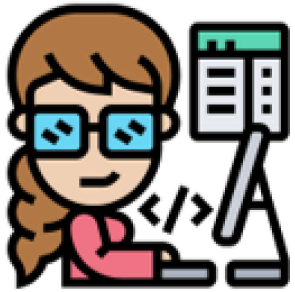
Introdução ao SQL

Introdução ao SQL

1970

Classificações

- **DDL** – Data Definition Language
- **DML** – Data Manipulation Language
- **DCL** – Data Control Language
- **DQL** – Data Query Language



Introdução ao SQL

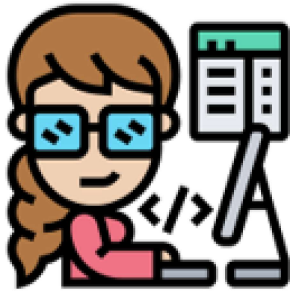
Classificações

- **DDL** – Data Definition Language

CREATE | DROP | ALTER

INSERT | UPDATE | DELETE

RENAME | TRUNCATE | MERGE

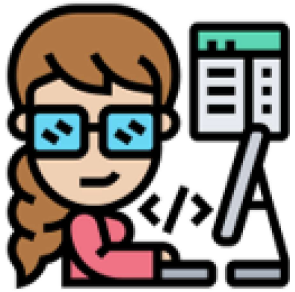


Introdução ao SQL

Classificações

- **DDL** – Data Definition Language

USUÁRIO
ESQUEMA
STATEMENTS
INDEXING



Introdução ao SQL

Introdução ao SQL

Classificações

- **DDL** – Data Definition Language

13.1.12 CREATE DATABASE Statement

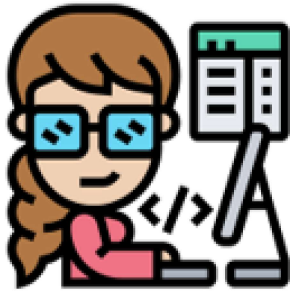
```
CREATE {DATABASE | SCHEMA} [IF NOT EXISTS] db_name
    [create_option] ...

create_option: [DEFAULT] {
    CHARACTER SET [=] charset_name
  | COLLATE [=] collation_name
  | ENCRYPTION [=] {'Y' | 'N'}
}
```

Introdução ao SQL

Classificações

- **DDL** – Data Definition Language



Introdução ao SQL

Classificações

- **DDL** – Data Definition Language

```
mysql> use teste;
Database changed
mysql> CREATE TABLE person
    -> (person_id SMALLINT UNSIGNED,
    -> fname VARCHAR(20),
    -> lname VARCHAR(20),
    -> gender ENUM('M','F'),
    -> birth_date DATE,
    -> street VARCHAR(30),
    -> city VARCHAR(20),
    -> state VARCHAR(20),
    -> country VARCHAR(20),
    -> postal_code VARCHAR(20),
    -> CONSTRAINT pk_person PRIMARY KEY (person_id)
    -> );
Query OK, 0 rows affected (0.08 sec)
```

Hands On! **Criando objeto pessoa**

"Falar é fácil. Mostre-me o código!"

Linus Torvalds

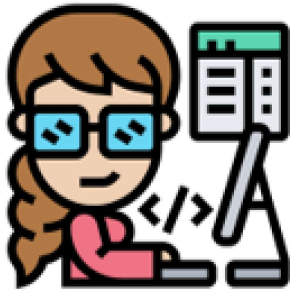
Introdução ao SQL

Classificações

- **DML** – Data Manipulation Language

INSERT | UPDATE

DELETE | MERGE



Introdução ao SQL

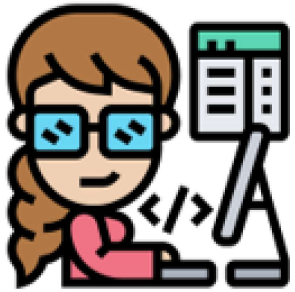
Classificações

GRANT | REVOKE

- **DCL** – Data Control Language

SELECT

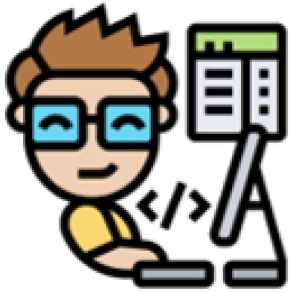
- **DQL** – Data Query Language



Introdução ao SQL

Statement

- Comando/instrução
- Reconhecido pelo BD
- Retorno: registro de dados

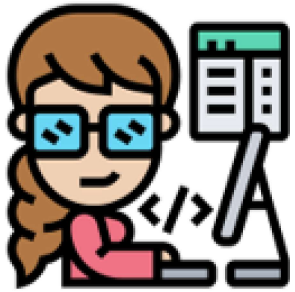


Introdução ao SQL

Cláusulas SQL

- Função -> instrução
- Algumas são obrigatórias

```
SELECT * FROM table_name;
```



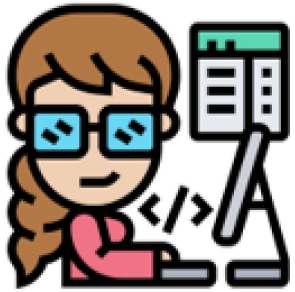
Introdução ao SQL

Cadê o FROM ?

SELECT now();

- Datatime da máquina

SELECT now() FROM **dual**;



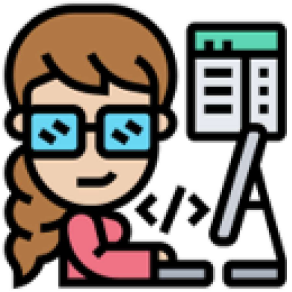
Introdução ao SQL

Cláusulas SQL

SELECT
FROM
WHERE

ORDER BY
GROUP BY
HAVING

```
SELECT * FROM table_name;
```



Introdução ao SQL

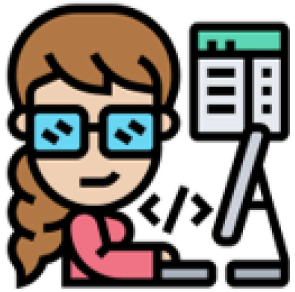
Termos – SQL

Identificador

Operador

Constante

Expressão



EMPLOYEE

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno

DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date

DEPT_LOCATIONS

Dnumber	Dlocation

PROJECT

Pname	Pnumber	Plocation	Dnum

WORKS_ON

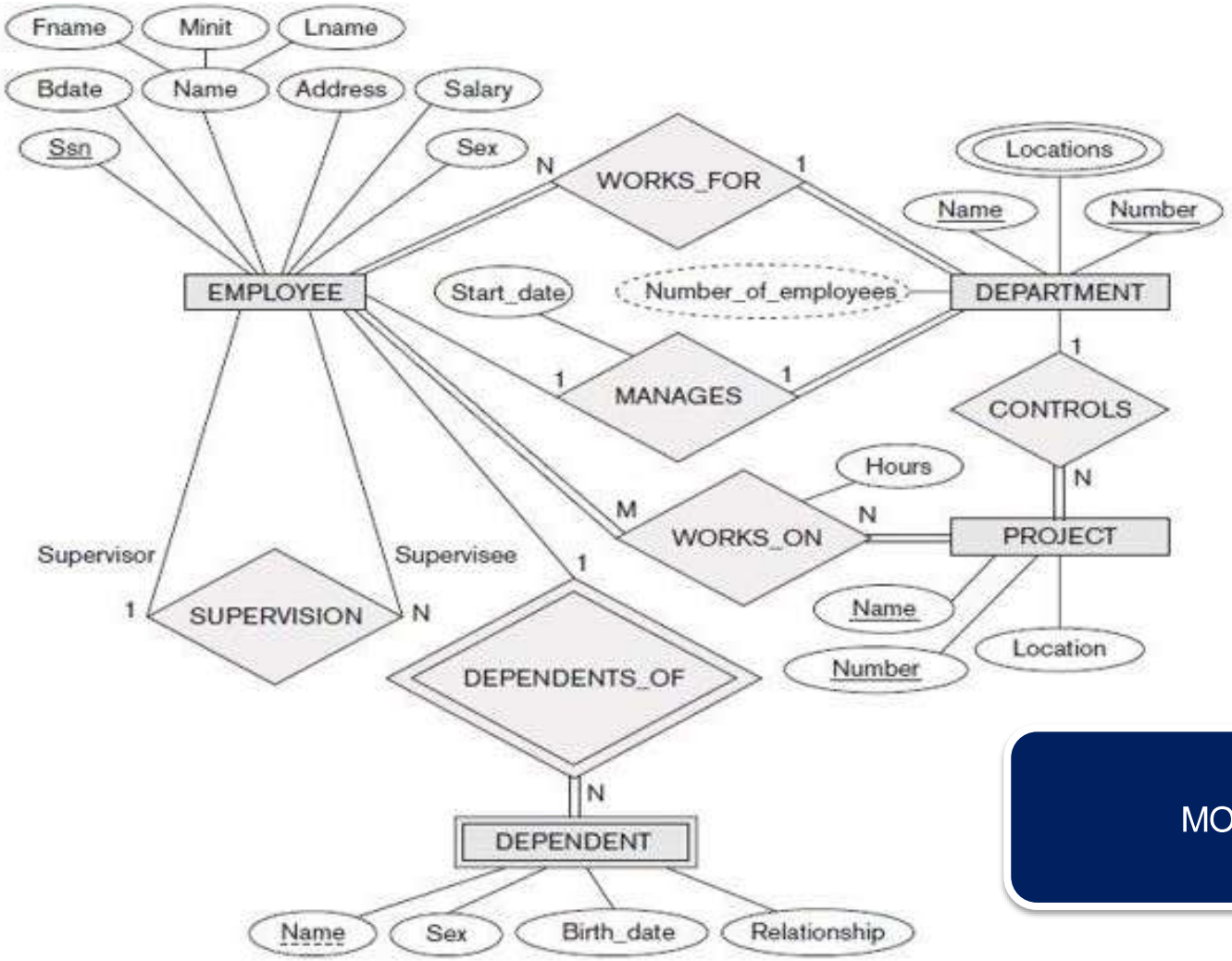
Essn	Pno	Hours

DEPENDENT

Essn	Dependent_name	Sex	Bdate	Relationship

MODELO RELACIONAL

Figure 5.5
Schema diagram for the COMPANY relational database schema.


Fname
Minit
Lname
Bdate
Name
Address
Salary
Ssn
Sex
N
WORKS_FOR
1
Locations
Name
Number
EMPLOYEE
Start_date
Number_of_employees
DEPARTMENT
1
MANAGES
1
1
CONTROLS
Hours
N
M
WORKS_ON
N
PROJECT
Supervisor
Supervisee
1
1
SUPERVISION
N
Name
Location
Number
DEPENDENTS_OF
N
DEPENDENT
Name
Sex
Birth_date
Relationship

MODELO ER

Hands On! **Manipulando o esquema do BD**

"Falar é fácil. Mostre-me o código!"

Linus Torvalds

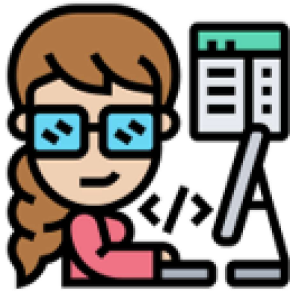
Tipos de dados no Mysql

Tipos de dados

Caracteres

- Fixo - 255 bytes
- Variável - 65.535 bytes

```
char(20)    /* fixed-length */
varchar(20) /* variable-length */
```



Tipos de dados

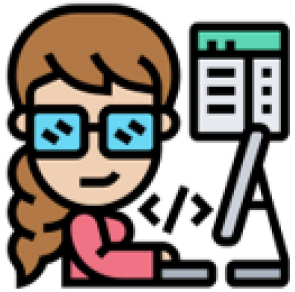
documents,

emails

, XML

Texts types

- mediumtext - 16,777,215 bytes
- longtext - 4,294,967,295 characters
- ...



Tipos de dados

Conjunto de caracteres

- Alfabeto, Português, Inglês...

SHOW CHARACTER SET;

Charset	Description	Default collation	Maxlen
big5	Big5 Traditional Chinese	big5_chinese_ci	2
dec8	DEC West European	dec8_swedish_ci	1
cp850	DOS West European	cp850_general_ci	1
hp8	HP West European	hp8_english_ci	1
koi8r	KOI8-R Relcom Russian	koi8r_general_ci	1
latin1	cp1252 West European	latin1_swedish_ci	1
latin2	ISO 8859-2 Central European	latin2_general_ci	1
swe7	7bit Swedish	swe7_swedish_ci	1
ascii	US ASCII	ascii_general_ci	1
ujis	EUC-JP Japanese	ujis_japanese_ci	3
sjis	Shift-JIS Japanese	sjis_japanese_ci	2
hebrew	ISO 8859-8 Hebrew	hebrew_general_ci	1
tis620	TIS620 Thai	tis620_thai_ci	1
euckr	EUC-KR Korean	euckr_korean_ci	2
koi8u	KOI8-U Ukrainian	koi8u_general_ci	1
gb2312	GB2312 Simplified Chinese	gb2312_chinese_ci	2
greek	ISO 8859-7 Greek	greek_general_ci	1
cp1250	Windows Central European	cp1250_general_ci	1
gbk	GBK Simplified Chinese	gbk_chinese_ci	2
latin5	ISO 8859-9 Turkish	latin5_turkish_ci	1

...

Fonte: livro 2 de referência

Tipos de dados

Conjunto de caracteres

- Alfabeto, Português, Inglês...

SHOW CHARACTER SET;

Maxlen > 1 = multibyte char set

Charset	Description	Default collation	Maxlen
big5	Big5 Traditional Chinese	big5_chinese_ci	2
dec8	DEC West European	dec8_swedish_ci	1
cp850	DOS West European	cp850_general_ci	1
hp8	HP West European	hp8_english_ci	1
koi8r	KOI8-R Relcom Russian	koi8r_general_ci	1
latin1	cp1252 West European	latin1_swedish_ci	1
latin2	ISO 8859-2 Central European	latin2_general_ci	1
swe7	7bit Swedish	swe7_swedish_ci	1
ascii	US ASCII	ascii_general_ci	1
ujis	EUC-JP Japanese	ujis_japanese_ci	3
sjis	Shift-JIS Japanese	sjis_japanese_ci	2
hebrew	ISO 8859-8 Hebrew	hebrew_general_ci	1
tis620	TIS620 Thai	tis620_thai_ci	1
euckr	EUC-KR Korean	euckr_korean_ci	2
koi8u	KOI8-U Ukrainian	koi8u_general_ci	1
gb2312	GB2312 Simplified Chinese	gb2312_chinese_ci	2
greek	ISO 8859-7 Greek	greek_general_ci	1
cp1250	Windows Central European	cp1250_general_ci	1
gbk	GBK Simplified Chinese	gbk_chinese_ci	2
latin5	ISO 8859-9 Turkish	latin5_turkish_ci	1

...

Fonte: livro 2 de referência

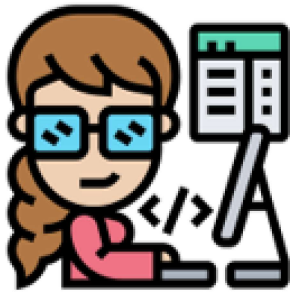
Tipos de dados

Texts data

- < 64KB

Text type	Maximum number of bytes
Tinytext	255
Text	65,535
Mediumtext	16,777,215
Longtext	4,294,967,295

Fonte: livro 2 de referência



Tipos de dados

Introdução ao SQL

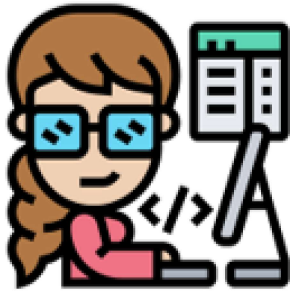
Dados numéricos

Table 2-4. MySQL floating-point types

Type	Numeric range
`Float(p,s)`	−3.402823466E+38 to −1.175494351E-38 and 1.175494351E-38 to 3.402823466E+38
`Double(p,s)`	−1.7976931348623157E+308 to −2.2250738585072014E-308 and 2.2250738585072014E-308 to 1.7976931348623157E+308

Table 2-3. MySQL integer types

Type	Signed range	Unsigned range
`Tinyint`	−128 to 127	0 to 255
`Smallint`	−32,768 to 32,767	0 to 65,535
`Mediumint`	−8,388,608 to 8,388,607	0 to 16,777,215
`Int`	−2,147,483,648 to 2,147,483,647	0 to 4,294,967,295
`Bigint`	−9,223,372,036,854,775,808 to 9,223,372,036,854,775,807	0 to 18,446,744,073,709,551,615



Fonte: livro 2 de referência

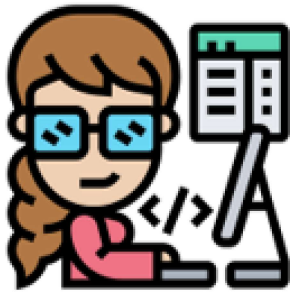
Tipos de dados

Introdução ao SQL

Dados temporais

Table 2-5. MySQL temporal types

Type	Default format	Allowable values
Date	YYYY-MM-DD	1000-01-01 to 9999-12-31
Datetime	YYYY-MM-DD HH:MI:SS	1000-01-01 00:00:00 to 9999-12-31 23:59:59
Timestamp	YYYY-MM-DD HH:MI:SS	1970-01-01 00:00:00 to 2037-12-31 23:59:59
Year	YYYY	1901 to 2155
Time	HHH:MI:SS	-838:59:59 to 838:59:59

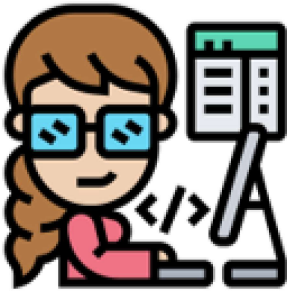


Fonte: livro 2 de referência

Constraints em SQL

Constraint

- NOT NULL
- PK & SK



Constraints

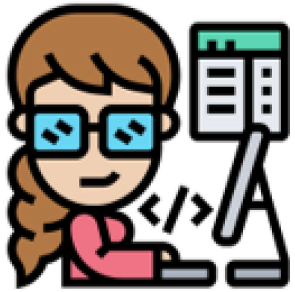
- NOT NULL
- PK & SK

VALOR

DEFAULT

DOMAIN

CHECK



Constraints

```
CREATE DOMAIN D_NUM AS INTEGER
CHECK (D_NUM > 0 AND D_NUM < 21);
```

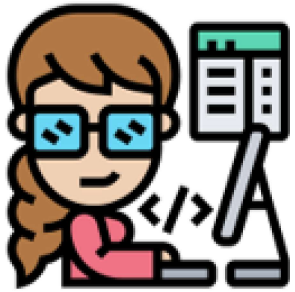
- NOT NULL
- PK & SK

VALOR

DEFAULT

DOMAIN

CHECK



Introdução ao SQL

Constraints

COMPORTAMENTO

DELETE

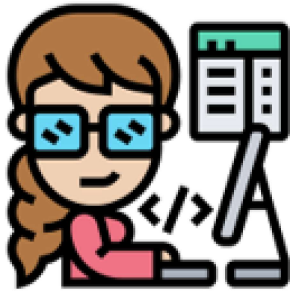
- NOT NULL
- PK & SK

VALOR

DEFAULT

DOMAIN

CHECK

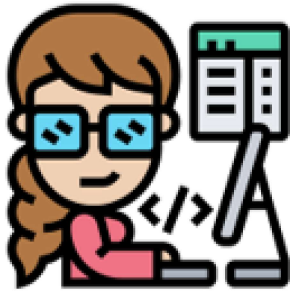


Constraints

- Primary Key
- UNIQUE

CREATE TABLE

Dnumber INT **PRIMARY KEY**,
Dname VARCHAR(15) **UNIQUE**,

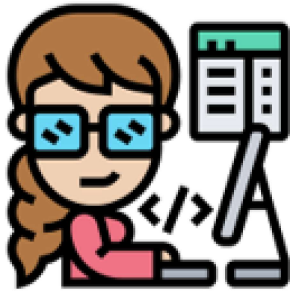


Violação de Constraints

- Primary Key
- UNIQUE

Referential Triggered Action

Dnumber INT **PRIMARY KEY**,
Dname VARCHAR(15) **UNIQUE**,

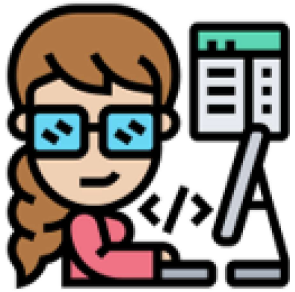


Violação de Constraints

- Nomear
- CHECK

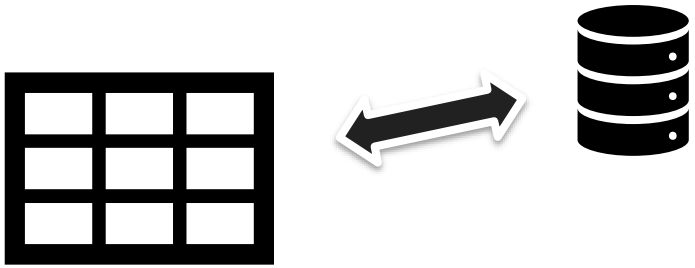
Row-based

```
CHECK (Dept_create_date <= Mgr_start_date);
```



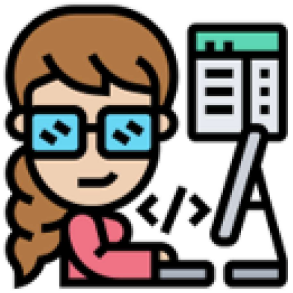
QUERIES / INSERTION COM SQL

SQL Queries

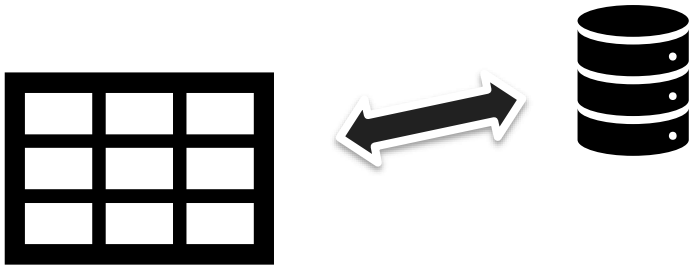


Comportamento

- Multiset – not set
- Duplicações (Redundâncias)



SQL Queries

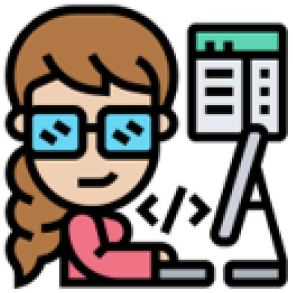


Comportamento

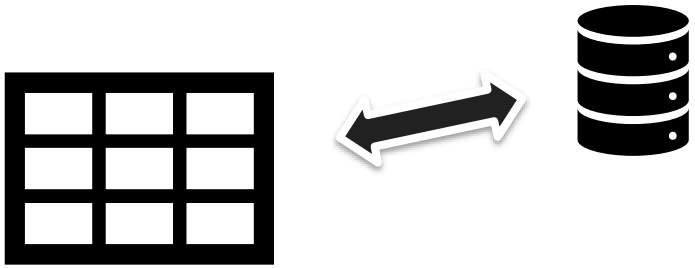
- Multiset – not set
- Duplicações (Redundâncias)

Custoso – melhor prevenir

Pode ser desejada pelo usuário



SQL Queries



Comportamento

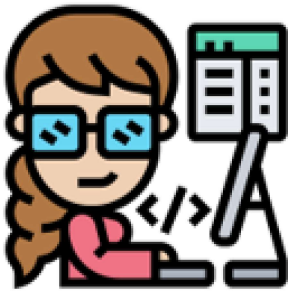
- Multiset – not set

DISTINCT

- Duplicações (Redundâncias)

```
SELECT    ALL Salary
FROM      EMPLOYEE;

SELECT    DISTINCT Salary
FROM      EMPLOYEE;
```

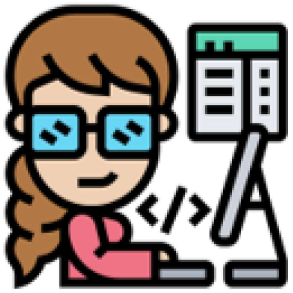


SQL Queries

Mapping

SELECT <lista de atributos> FROM <tabela> WHERE <condição>

```
SELECT   Bdate, Address
FROM     EMPLOYEE
WHERE    Fname = 'John' AND Minit = 'B' AND Lname = 'Smith';
```



[171]

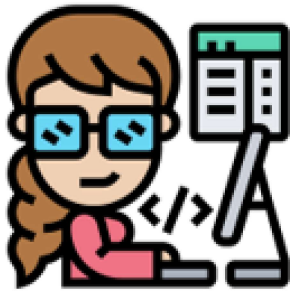
SQL Queries

Projeção de atributos

Mapping

SELECT <lista de atributos> FROM <tabela> WHERE <condição>

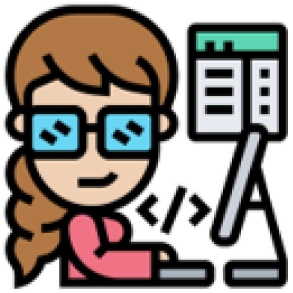
```
SELECT   Bdate, Address
FROM     EMPLOYEE
WHERE    Fname = 'John' AND Minit = 'B' AND Lname = 'Smith';
```



SQL Queries

Operadores

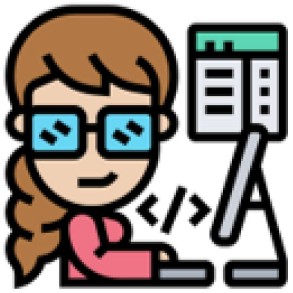
- =, <, <=, >, >=, e <> - SQL
- +, -, *, / - operadores básicos
- AND, OR, XOR, NOT – op. boleanos
- TRUE, FALSE – operadores lógicos



SQL Queries

DML

- Subconjunto do SQL
- Mais utilizado
- Comandos: INSERT, DELETE, UPDATE



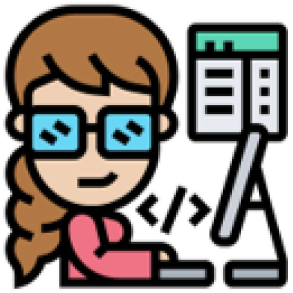
[174]

SQL Queries

NULL & Not NULL

DML

INSERT INTO <table> (<list-attributes>) VALUES (<list-values>);



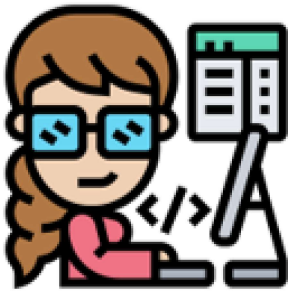
SQL Queries

NULL & Not NULL

DML

INSERT INTO <table> (<list-attributes>) VALUES (<list-values>);

Valores das PK?



SQL Queries

NULL & Not NULL

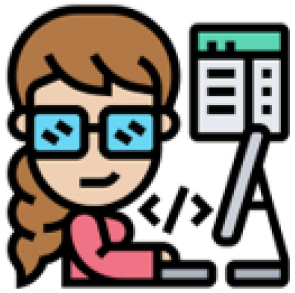
DML

INSERT INTO <table> (<list-attributes>) VALUES (<list-values>);

Valores das PK?

SMALLINT UNSIGNED ← 0 to 65535

INT, BIGINT



SQL Queries

```
mysql> DESC person;
+-------------+---------------------------+------+-----+---------+-----------------+
| Field       | Type                      | Null | Key | Default | Extra           |
+-------------+---------------------------+------+-----+---------+-----------------+
| person_id   | smallint(5) unsigned      |      | PRI | NULL    | auto_increment  |
| .           |                           |      |     |         |                 |
| .           |                           |      |     |         |                 |
| .           |                           |      |     |         |                 |
```

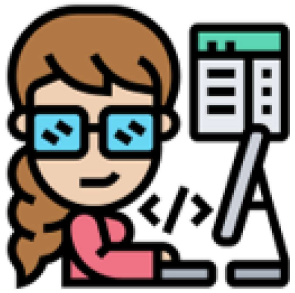
DML

INSERT INTO <table> (<list-attributes>) VALUES (<list-values>);

Valores das PK?

SMALLINT UNSIGNED ← **0 to 65535**

INT, BIGINT



EMPLOYEE

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno

DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date

DEPT_LOCATIONS

Dnumber	Dlocation

PROJECT

Pname	Pnumber	Plocation	Dnum

WORKS_ON

Essn	Pno	Hours

DEPENDENT

Essn	Dependent_name	Sex	Bdate	Relationship

Inserindo as Constraints

Figure 5.5
Schema diagram for the COMPANY relational database schema.

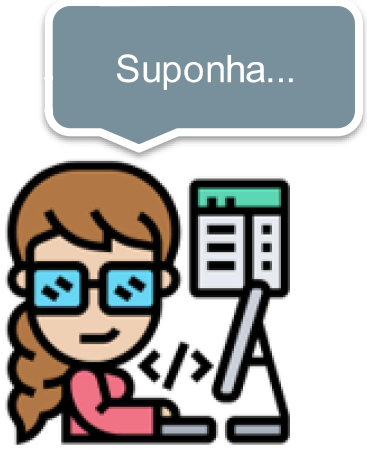
"Falar é fácil. Mostre-me o código!"

Linus Torvalds

Nomes, Aliasing e Variação de tuplas

Nomes de atributos

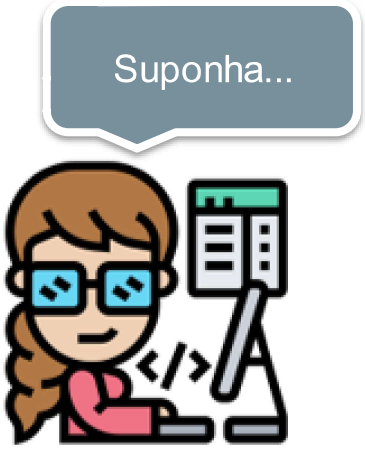
```
CREATE TABLE EMPLOYEE
        ( Fname          VARCHAR(15)        NOT NULL,
          Minit          CHAR,
          Lname          VARCHAR(15)        NOT NULL,
          Ssn            CHAR(9)            NOT NULL,
          Bdate          DATE,
          Address        VARCHAR(30),
          Sex            CHAR,
          Salary         DECIMAL(10,2),
          Super_ssn      CHAR(9),
          Dno            INT                NOT NULL,
        PRIMARY KEY (Ssn),
CREATE TABLE DEPARTMENT
        ( Dname          VARCHAR(15)        NOT NULL,
          Dnumber        INT                NOT NULL,
          Mgr_ssn        CHAR(9)            NOT NULL,
          Mgr_start_date DATE,
        PRIMARY KEY (Dnumber),
        UNIQUE (Dname),
        FOREIGN KEY (Mgr_ssn) REFERENCES EMPLOYEE(Ssn) );
```



Identificando a Tabela

```
SELECT    Fname, EMPLOYEE.Name, Address
FROM      EMPLOYEE, DEPARTMENT
WHERE     DEPARTMENT.Name = 'Research' AND
          DEPARTMENT.Dnumber = EMPLOYEE.Dnumber;
```

```
SELECT    EMPLOYEE.Fname, EMPLOYEE.LName,
          EMPLOYEE.Address
FROM      EMPLOYEE, DEPARTMENT
WHERE     DEPARTMENT.DName = 'Research' AND
          DEPARTMENT.Dnumber = EMPLOYEE.Dno;
```

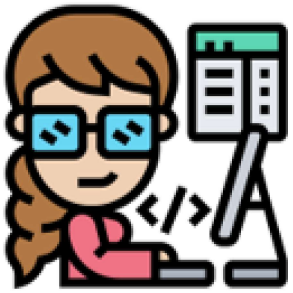


Nomes de atributos

Quando usar?

- Ambiguidade
- Esclarecimento

```
SELECT    EMPLOYEE.Fname, EMPLOYEE.LName,
          EMPLOYEE.Address
FROM      EMPLOYEE, DEPARTMENT
WHERE     DEPARTMENT.DName = 'Research' AND
          DEPARTMENT.Dnumber = EMPLOYEE.Dno;
```



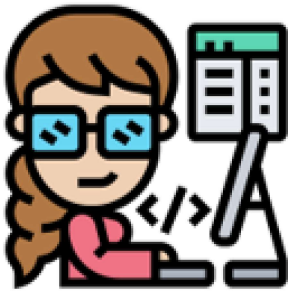
[184]

Nomes de atributos

Quando usar?

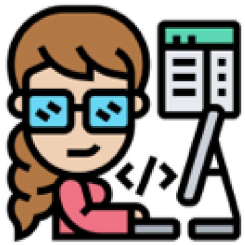
- Diferenciar atributos

```
SELECT   E.Fname, E.Lname, S.Fname, S.Lname
FROM     EMPLOYEE AS E, EMPLOYEE AS S
WHERE    E.Super_ssn = S.Ssn;
```



[185]

Renomeando



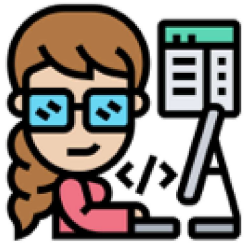
Renomear atributos?

- Nomenclatura diferente

Nova nomenclatura

EMPLOYEE **AS** E(Fn, Mi, Ln, Ssn, Bd, Addr, Sex, Sal, Sssn, Dno)

Renomeando



Renomear atributos?

- Nomenclatura diferente

Referências múltiplas

```
SELECT    E.Fname, E.LName, E.Address
FROM      EMPLOYEE AS E, DEPARTMENT AS D
WHERE     D.DName = 'Research' AND D.Dnumber = E.Dno;
```

Hands On! **Alias (AS Statement) em Queries SQL**

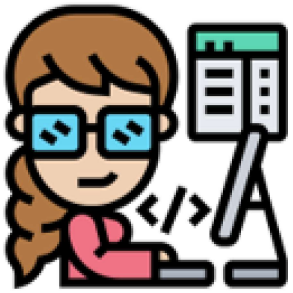
"Falar é fácil. Mostre-me o código!"

Linus Torvalds

When Good Statements Go Bad

Problemas

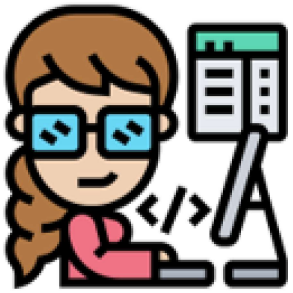
- PK & FK inexistente
- Valores violados
- Conversão inválida de datas



Problemas

- PK inexistente

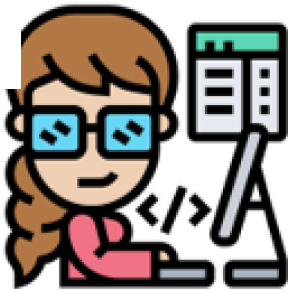
```
mysql> INSERT INTO person
    ->  (person_id, fname, lname, gender, birth_date)
    -> VALUES (1, 'Charles','Fulton', 'M', '1968-01-15');
ERROR 1062 (23000): Duplicate entry '1' for key 'PRIMARY'
```



Problemas

- FK inexistente

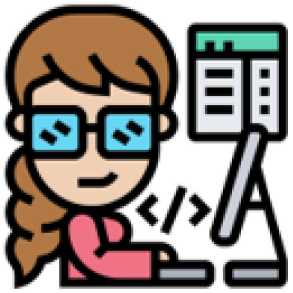
```
mysql> INSERT INTO favorite_food (person_id, food)
    -> VALUES (999, 'lasagna');
ERROR 1452 (23000): Cannot add or update a child row: a foreign key constraint
fails ('bank'.'favorite_food', CONSTRAINT 'fk_fav_food_person_id' FOREIGN KEY
('person_id') REFERENCES 'person' ('person_id'))
```



Problemas

- Violação de valores

```
mysql> UPDATE person
    -> SET gender = 'Z'
    -> WHERE person_id = 1;
ERROR 1265 (01000): Data truncated for column 'gender' at row 1
```

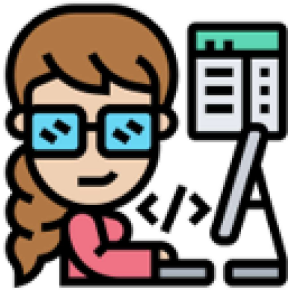


Problemas

- Conversão inválida

```
mysql> UPDATE person
    -> SET birth_date = 'DEC-21-1980'
    -> WHERE person_id = 1;
ERROR 1292 (22007): Incorrect date value: 'DEC-21-1980' for column 'birth_date'
at row 1

mysql> UPDATE person
    -> SET birth_date = str_to_date('DEC-21-1980' , '%b-%d-%Y')
    -> WHERE person_id = 1;
Query OK, 1 row affected (0.12 sec)
Rows matched: 1  Changed: 1  Warnings: 0
```



MySQL & PostgreSQL

Postegresql

- Otimizado para aplicações complexas
- Grande volume de dados \ informações críticas
- Ex:

E-commerce grande/médio porte

MySQL

- Possui agilidade e versatilidade
- Operações mas simples
- Processamento e tempo curto de resposta
- Ex:

Site | Fórum | Portal

Ponderações

- Precisa de Rollback? MySQL não possui

Enterprise

- Precisa de agilidade?
- Fácil utilização
- Operação mais simplificada

MySQL

Desafio 1 : Design do Esquema de BD Relacinal para Aplicação Oficina

Design de Esquema Relacional - Oficina

a. Declare suas relações usando o SQL DDL.
b. Especifique um número de consultas em SQL que são necessárias para seu banco de dados Oficina.
c. Com base no uso esperado do banco de dados, determine as *cronstraints* que fazem sentido para seu contexto
d. Implemente seu banco de dados com MySQL
e. Exporte o script SQL, adicione no Github para validação

Etapa 3

Explorando Queries com SQL

// Explorando a Linguagem de Consulta a Banco de Dados SQL

Explorando comandos DDL – Data Definition Language

Introdução ao SQL

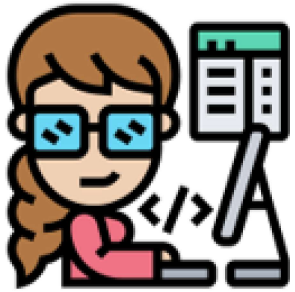
Classificações

- **DDL** – Data Definition Language

CREATE | DROP | ALTER

INSERT | UPDATE | DELETE

RENAME | TRUNCATE | MERGE



Introdução ao SQL

UPDATE
DROP
DELETE
ALTER

Introdução ao SQL

UPDATE

- Modificação a partir de uma condição

DROP

DELETE

ALTER

```
UPDATE table_name
SET column1 = value1, column2 = value2, ...
WHERE condition;
```

Introdução ao SQL

UPDATE

DROP

- Remoção de estruturas

DELETE

ALTER

```
DROP DATABASE databasename;
```

Introdução ao SQL

UPDATE

DROP

DELETE

- Remoção de registros

ALTER

```
DELETE FROM table_name WHERE condition;
```

Introdução ao SQL

```sql
ALTER TABLE Customers
ADD Email varchar(255);
```

UPDATE

DROP

DELETE

ALTER

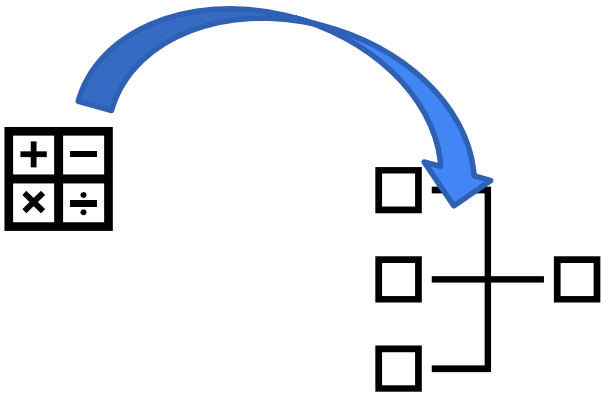
- Modificação da estrutura do BD

“Falar é fácil. Mostre-me o código!”

Linus Torvalds

Expressões em Statements SQL

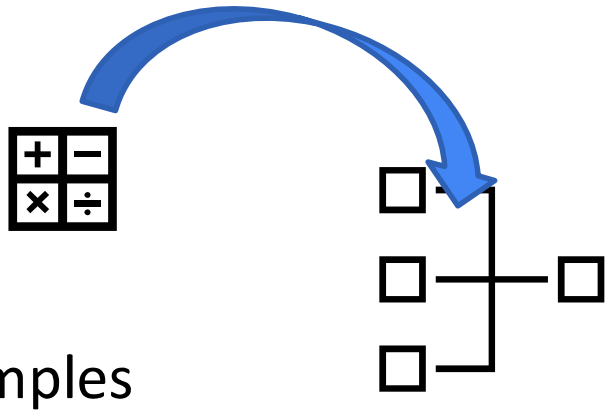
Expressões



Atributos aritméticos
Operações matemáticas
Tipos de dados: string e numérico

```
SELECT Fname, Lname, Salary, Salary * 0.11 AS INSS FROM
EMPLOYEE;
```

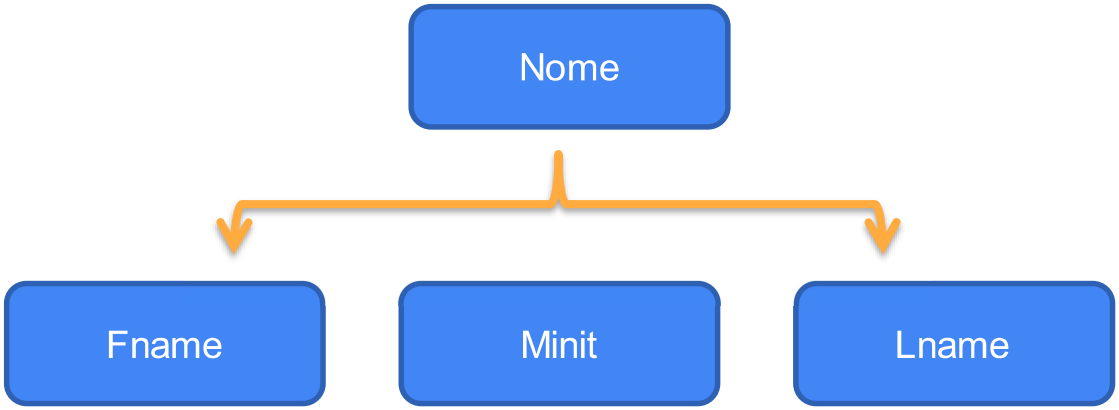
Expressões



- Armazenamento: dados simples
- Resultado de expressões: dados complexos
- Plus: utilizar alias

```
SELECT Fname, Lname, Salary, Salary * 0.11 AS INSS FROM
EMPLOYEE;
```

Concatenando Strings



[218]

Expressões - Strings

Atributos distintintos -> único sentido

Nome:

- Fname, Mint, Lname

[219]

Expressões - Strings

Atributos distintintos -> único sentido

Nome:

- Fname, Mint, Lname

```
SELECT concat(Fname, ' ', Minit, ' ', Lname) AS
Complete_name FROM EMPLOYEE;
```

[220]

Hands On! **Utlizando Expressões em SQL**

"Falar é fácil. Mostre-me o código!"

Linus Torvalds

Introdução a operação de conjuntos com SQL

Like | Between

- **Comparação**
- String Matching
- Caracteres especiais: % e _

```
SELECT    Fname, Lname
FROM      EMPLOYEE
WHERE     Address LIKE '%Houston,TX%';
```

Strings

- ‘AB_CD%EF’
- " -> ""

‘AB_CD\%EF’ ESCAPE ‘\’

Like | Between

- **Intervalo**
- Numérico
- Ex: salário, idade ...

```
SELECT    *
FROM      EMPLOYEE
WHERE     (Salary BETWEEN 30000 AND 40000) AND Dno = 5;
```

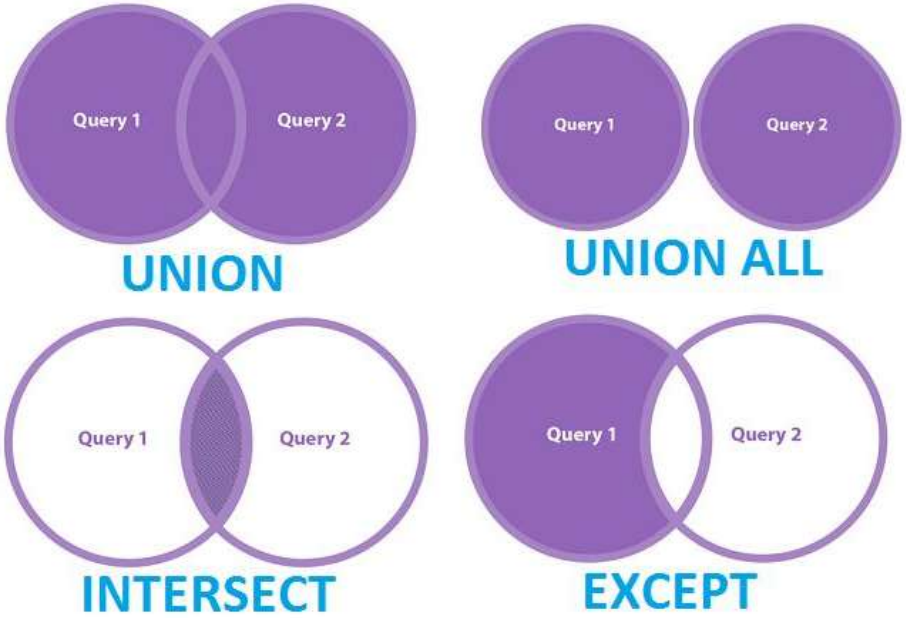
Hands On! **Utilizando like e between com SQL**

"Falar é fácil. Mostre-me o código!"

Linus Torvalds

Comandos baseados em Operações Matemáticas: UNION, INTERSECTION & EXCEPT

Union | Intersection | Except



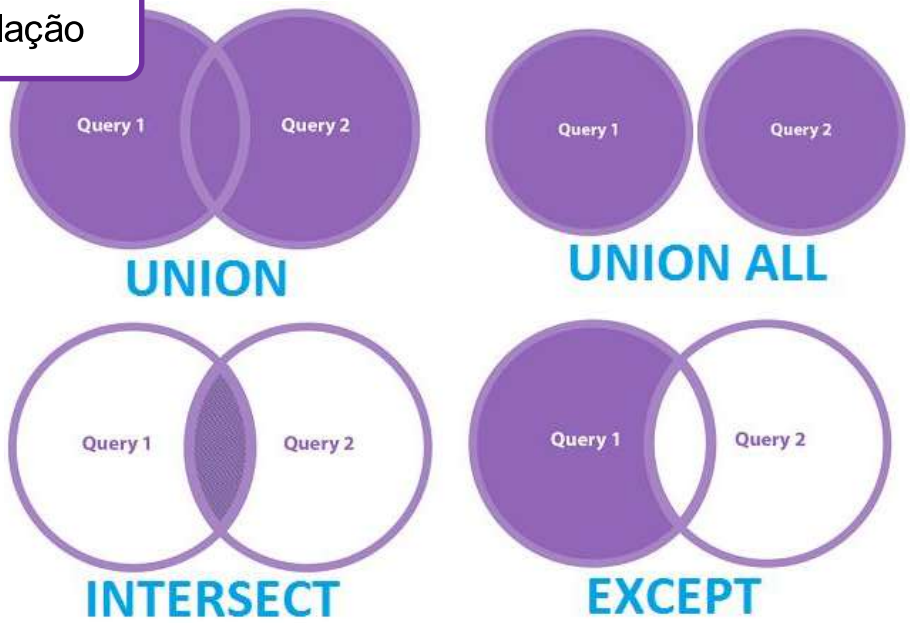
Fonte: c-sharpcorner

[228]

Union | Intersection | Except

Mesmo Tipo de Relação

- UNION
- UNION ALL
- INTERSECTION
- EXCEPT



Union | Intersection | Except

Mesmo Tipo de Relação

- UNION
- UNION ALL
- INTERSECTION
- EXCEPT

R

A
a1
a2
a2
a3

S

A
a1
a2
a4
a5

(b) T

A
a1
a1
a2
a2
a2
a3
a4
a5

R -> S

A
a1
a2

R -> S

A
a3

S -> R

A
a4
a5

Union | Intersection | Except

Mesmo Tipo de Relação

- UNION
- UNION ALL
- INTERSECTION
- EXCEPT

```
( SELECT   DISTINCT Pnumber
  FROM     PROJECT, DEPARTMENT, EMPLOYEE
  WHERE    Dnum = Dnumber AND Mgr_ssn = Ssn
           AND      Lname = 'Smith' )
  UNION
( SELECT   DISTINCT Pnumber
  FROM     PROJECT, WORKS_ON, EMPLOYEE
  WHERE    Pnumber = Pno AND Essn = Ssn
           AND      Lname = 'Smith' );
```

Hands On! **Utilizando operadores com SQL**

"Falar é fácil. Mostre-me o código!"

Linus Torvalds

Nested Queries com SQL

Nestes Queries

- Comparação por atributos buscados
- Nested Query – Consulta aninhada
- Consulta externa e interna

[234]

Nestes Queries

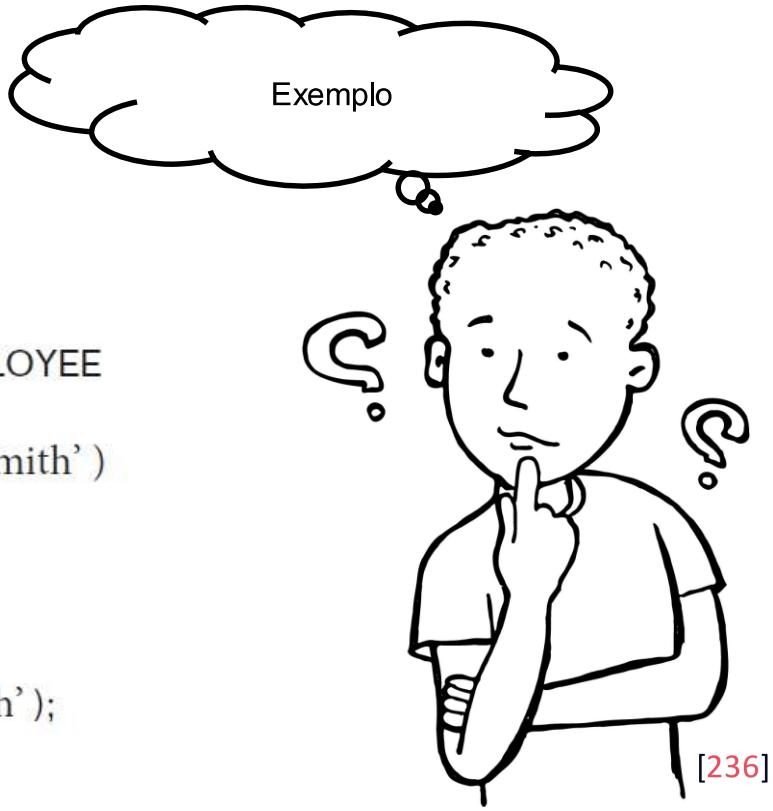
- Comparação por atributos buscados
- Nested Query – Consulta aninhada
- Consulta externa e interna

SELECT | FROM | WHERE

[235]

Nestes Queries

```
SELECT    DISTINCT Pnumber
FROM      PROJECT
WHERE     Pnumber IN
          ( SELECT     Pnumber
            FROM       PROJECT, DEPARTMENT, EMPLOYEE
            WHERE      Dnum = Dnumber AND
                       Mgr_ssn = Ssn AND Lname = 'Smith' )
          OR
          Pnumber IN
          ( SELECT     Pno
            FROM       WORKS_ON, EMPLOYEE
            WHERE      Essn = Ssn AND Lname = 'Smith' );
```



[236]

Nestes Queries

- IN – comparação com set
- = – comparação com unidades
- Retorno: tabela

SELECT | FROM | WHERE

[237]

Nestes Queries

Keywords:

- ANY, SOME, ALL

Operadores:

- >, >=, <, <=, and <>

SELECT | FROM | WHERE

[238]

Nestes Queries Correlacionadas

```
SELECT    E.Fname, E.Lname
FROM      EMPLOYEE AS E, DEPENDENT AS D
WHERE     E.Ssn = D.Essn AND E.Sex = D.Sex
          AND E.Fname = D.Dependent_name;
```

SELECT | FROM | WHERE

[239]

Cláusulas EXISTS & UNIQUE

- EXISTS: TRUE se o resultado da consulta aninhada contiver pelo menos uma tupla
- NOT EXISTS: TRUE se o resultado da consulta aninhada não contiver tuplas
- UNIQUE: retorna TRUE se único

[240]

Cláusulas EXISTS & UNIQUE

```
Q16B:   SELECT   E.Fname, E.Lname
        FROM     EMPLOYEE AS E
        WHERE    EXISTS ( SELECT   *
                          FROM     DEPENDENT AS D
                          WHERE    E.Ssn = D.Essn AND E.Sex = D.Sex
                                   AND E.Fname = D.Dependent_name);
```

Conjuntos Explícitos

Query 17. Retrieve the Social Security numbers of all employees who work on project numbers 1, 2, or 3.

```
Q17:    SELECT    DISTINCT Essn
        FROM      WORKS_ON
        WHERE     Pno IN (1, 2, 3);
```

Etapa 4

Criando Queries com Funções/Cláusulas de Agrupamentos

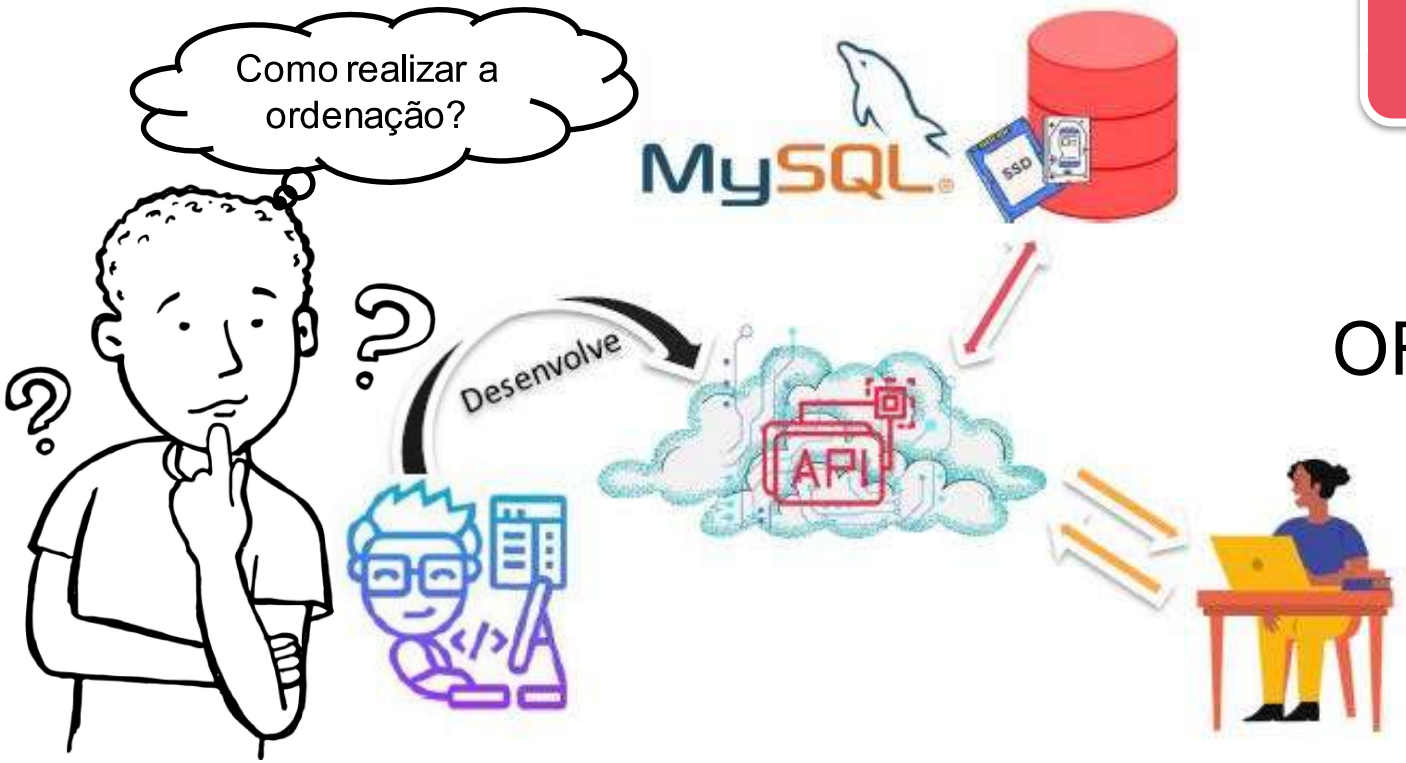
// Explorando a Linguagem de Consulta a Banco de Dados SQL

Cláusulas de Ordenação com SQL

Ordenação em Queries SQL

Recuperação dos dados é ordenada?

Ordenação em Queries SQL



Recuperação dos dados é ordenada?

ORDER BY

Ordenação em Queries SQL

ORDER BY

- Cláusula SQL
- Ordenação por coluna
- Expressões baseadas em dados
- + de um valor

Ordenação em Queries SQL

ORDER BY

- Cláusula SQL
- Ordenação por coluna
- Expressões baseadas em dados
- + de um valor

Select Fname, Lname, Dno from employee order by (Dno);

≠

Select Fname, Lname, Dno from employee;

Ordenação em Queries SQL

Ascendente

- Sentido da ordenação

Descendente

Ordenação em Queries SQL

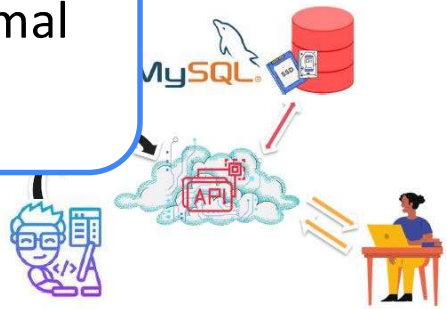
```
SELECT <attribute list>
FROM <table list>
[ WHERE <condition> ]
[ ORDER BY <attribute list> ];
```

Estrutura das Clásulas SQL

WHERE STATEMENT?

Critério a ser considerado na query ao recuperar a informação. A tupla (linha ou instância) deve conter a condição definida em where

Definição formal

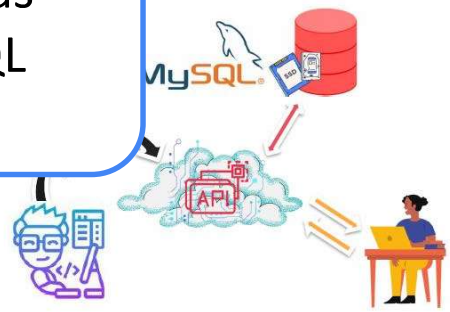


Ordenação em Queries SQL

Ordenação

```
SELECT <attribute list>
FROM <table list>
[ ORDER BY <attribute list>
DESC];
```

Estrutura das Clásulas SQL



Ordenação em Queries SQL

Exemplo

```
SELECT idAccount
FROM accounts
ORDER BY amount LIMIT 5;
```

Expressão

Estrutura das Clásulas SQL

Ordenação em Queries SQL

Order + Expressões

```
SELECT <attribute list>
FROM <table list>
[ WHERE <condition> ]
[ ORDER BY <attribute list> ];
```

Estrutura das Clásulas SQL

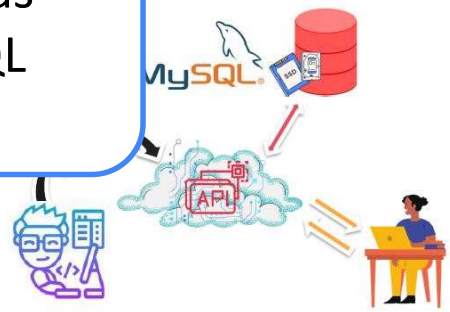
Ordenação em Queries SQL

Exemplo

```
SELECT idAccount
FROM accounts
WHERE type = 'PJ'
ORDER BY amount LIMIT 5;
```

Expressão

Estrutura das Clásulas SQL



Hands On! **Ordenando dados recuperados com SQL**

"Falar é fácil. Mostre-me o código!"

Linus Torvalds

Ordenação com SQL Utilizando Expressões

Classificação de dados

ORDER BY

- Cláusula SQL
- Ordenação por coluna
- Expressões baseadas em dados
- + de um valor

[258]

Classificação de dados

Ordenação dos dados para trazer consistência e sequência

Alias para fornecer nomenclatura adequada à dados derivados ou armazenados

[259]

Classificação de dados

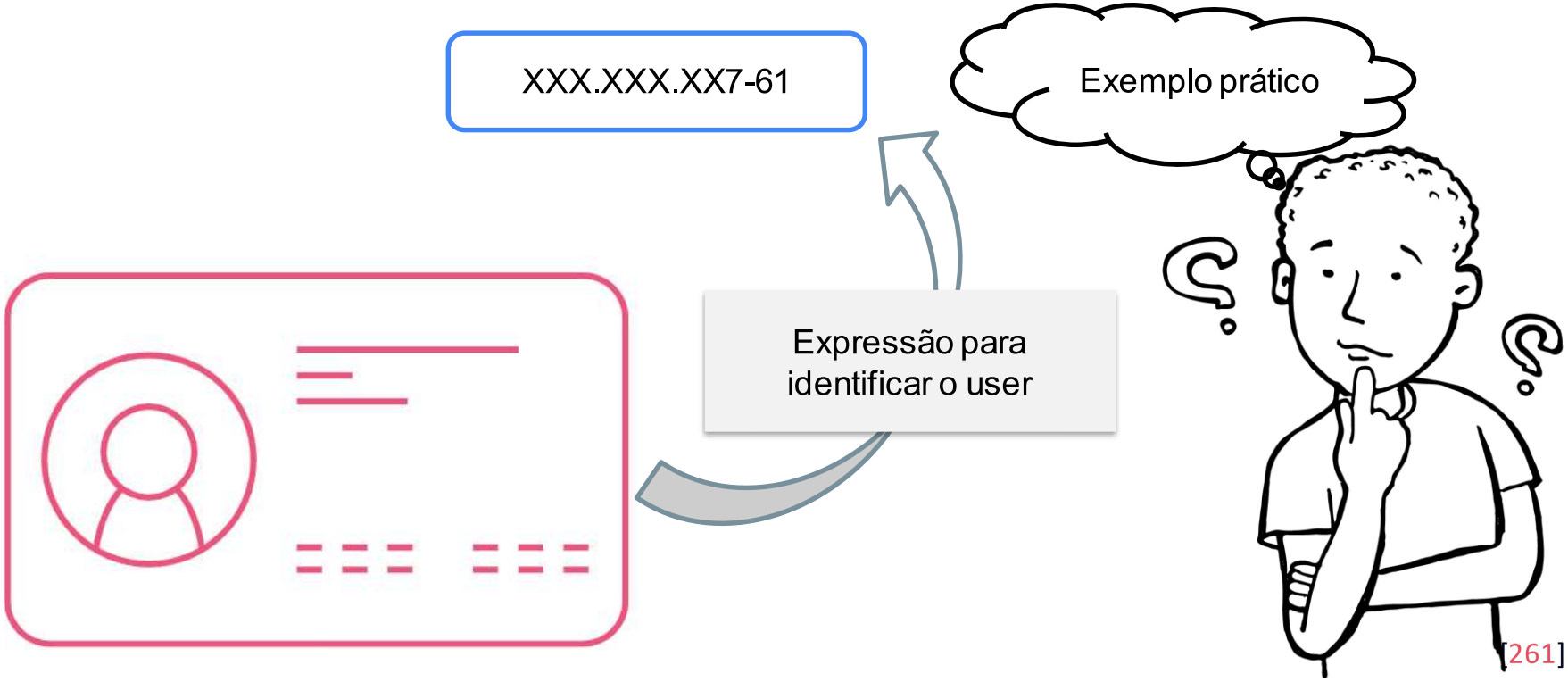
Order + Expressões

```
SELECT <attribute list>
FROM <table list>
[ WHERE <condition> ]
[ ORDER BY <attribute list> ];
```

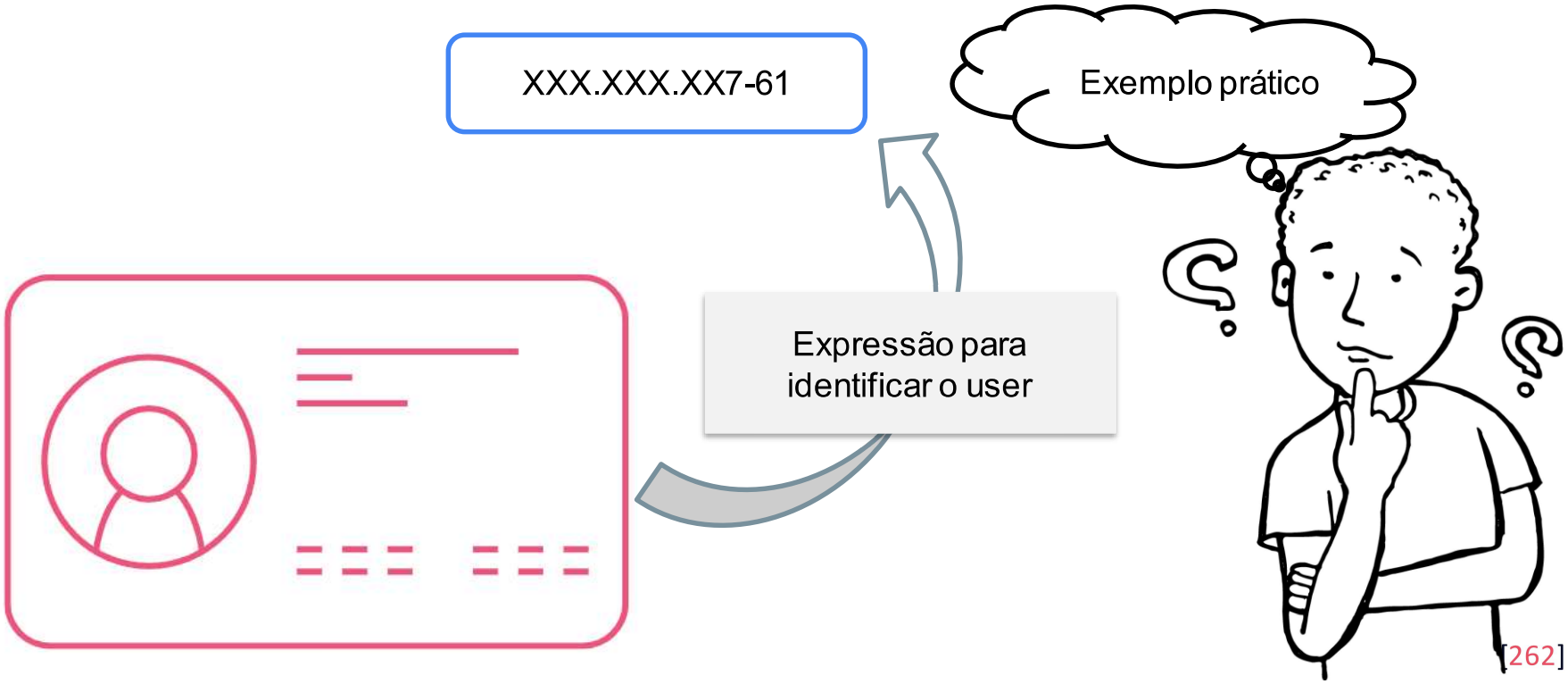
Tratar dados não armazenados

Adicionar expressão

Classificação de dados



Classificação de dados



Classificação de dados

- Operadores numéricos
- Nomes dos atributos
- + de um atributo
- DESC ou ASC

Como ordernar os registros?

[263]

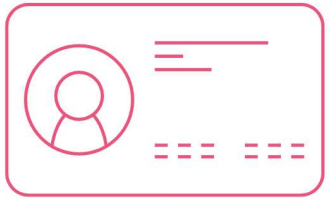
Classificação de dados

```
SELECT <attribute list>
FROM <table list>
[ WHERE <condition> ]
[ ORDER BY <atribute a, atribute b> ]
[DESC | ASC];
```

[264]

Classificação de dados

```
SELECT <attribute list>
FROM <table list>
[ WHERE <condition> ]
[ ORDER BY <EXPRESSION> ]
[DESC | ASC];
```



Hands On! **Ordenando dados recuperados com SQL**

"Falar é fácil. Mostre-me o código!"

Linus Torvalds

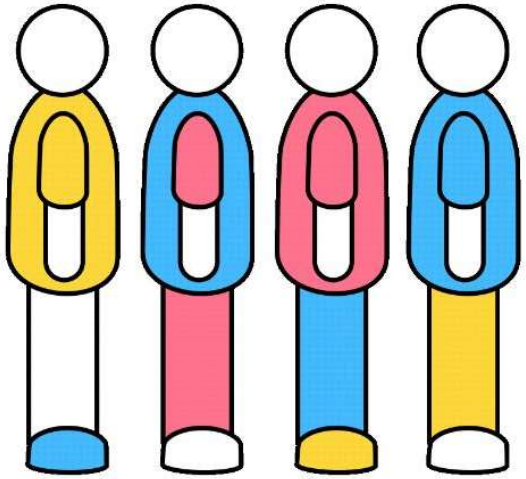
Funções de Agregação com SQL

Funções de Agrupamento

Agregar

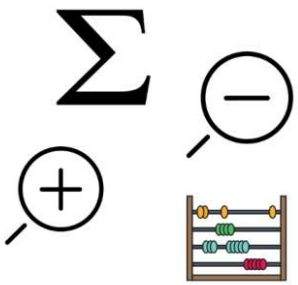
Aglutinar

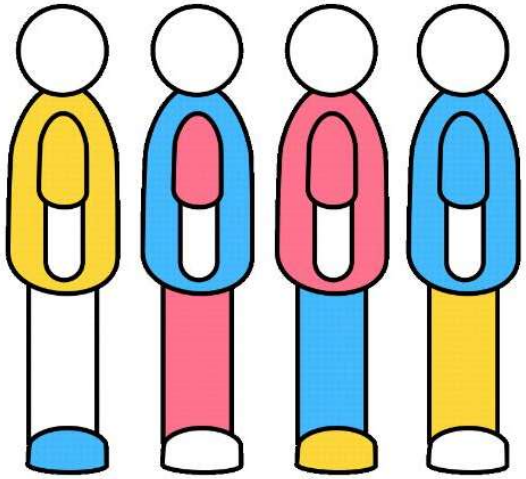
Agrupar



Agrupamento de Registros

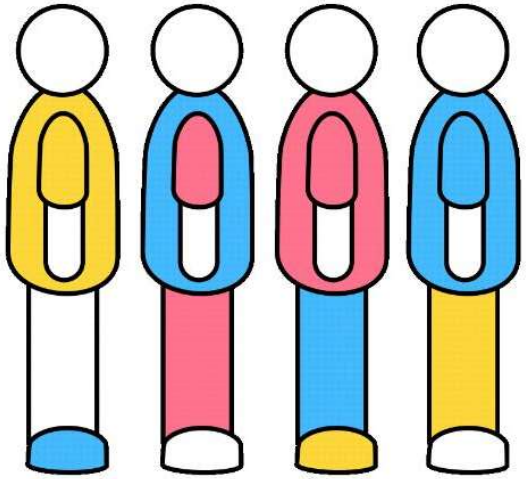
- COUNT
- SUM
- MIN
- MAX
- AVERAGE





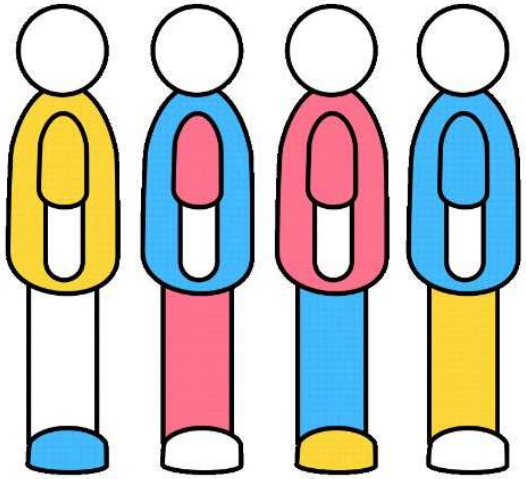
Agrupamento de Registros

- COUNT: registros
- SUM: somatório
- MIN: valor mínimo - atributo
- MAX: valor máximo - atributo
- AVERAGE: média de valor - atributo



Agrupamento de Registros

- COUNT: registros
- SUM: somatório
- MIN: valor mínimo - atributo
- MAX: valor máximo - atributo
- AVERAGE: média de valor - atributo



SELECT

HAVING

Agrupamento de Registros

Station number | report code | year | month | day | temp | pressure |visibility | wind speed | temperature | precipitation | fog | rain | hail | thunder | tornado

Grid view | Form view

Total rows loaded: 28000

	station number	report code	year	month	day	temp	dew point	station pressure	visibility	wind speed	temperature	precipitation	snow depth	fog	rain	hail	thunder	tornado
1	143080	34DDA7	2002	12	21	36	33.8	987.4	3.4	0.2	69	0	NULL	true	true	true	true	true
2	766440	39537B	1998	10	1	83.3	72.7	1014.6	5.9	6.7	62	0	NULL	false	false	false	false	false
3	176010	C3C6D5	2001	5	18	69.1	55.7	NULL	7.3	4.3	31	0	NULL	false	false	false	false	false
4	125600	145150	2007	10	14	39.7	33	NULL	6.9	2.5	79	0	NULL	false	false	false	false	false
5	470160	EF616A	1967	7	29	72.4	65.6	NULL	9.2	1.2	38	0.04	NULL	false	false	false	false	false
6	821930	1F8A7B	1953	6	18	81.3	72.8	1007.1	12.4	3.6	31	0	NULL	false	false	false	false	false
7	478070	D028DB	1981	6	27	77	73.4	NULL	7.9	3	58	1.93	NULL	false	false	false	false	false
8	719200	C74611	1978	2	5	1.6	-4.4	962.9	14.9	13.3	84	0	9.8	false	false	false	false	false
9	477460	737090	1962	8	14	84.5	72.3	1009.6	24.1	5.1	40	0	NULL	false	false	false	false	false
10	598550	C5C66E	2006	10	15	82	72.9	NULL	14.2	1.7	39	0	NULL	false	false	false	false	false
11	471100	6A6704	1990	9	19	62.5	50.5	NULL	6	4.1	62	0	NULL	false	false	false	false	false
12	29880	921894	1986	12	26	16.8	13.9	NULL	6.6	14.7	46	0.02	8.7	false	false	false	false	false
13	292090	515EFF	1953	5	8	37.8	34.2	NULL	NULL	6	42	NULL	NULL	false	false	false	false	false
14	484750	A38C90	1988	6	24	87.5	72.6	NULL	8.7	3.1	54	0	NULL	false	false	false	false	false
15	724500	777F09	1988	3	28	63.1	47.2	958.1	13.6	18.3	82	0.01	NULL	false	false	false	false	false
16	30110	85F8C2	2004	10	31	49.8	47.6	NULL	NULL	19.6	38	0	NULL	false	false	false	false	false
17	410610	D6A909	1991	6	27	96.8	42.1	930.9	6.2	3.3	54	0	NULL	false	false	false	false	false
18	724320	207979	1988	3	4	35.1	33.1	999.4	3.1	9.3	40	0.23	NULL	true	true	true	true	true
19	941830	229317	2007	4	19	76.3	66.5	994.9	NULL	4	80	0	NULL	false	false	false	false	false
20	743920	2ABE7D	1996	5	21	70	57.6	NULL	5.8	7.5	75	0	NULL	true	true	true	true	true
21	150630	4ADE04	1996	12	10	32	28.3	990.4	4.9	3.9	44	0	NULL	false	false	false	false	false
22	724460	B980B2	1986	10	2	65.4	64.2	976	5.5	6.5	80	0.61	NULL	true	true	true	true	true
23	992210	34B13D	2000	5	5	45.4	NULL	1011.9	NULL	14.6	45	0	NULL	false	false	false	false	false
24	932920	E86580	2009	5	17	59.4	52.1	NULL	12.4	7.3	72	0	NULL	false	false	false	false	false
25	986440	612C7C	1977	2	22	81	72	NULL	20.5	5.6	86	0.01	NULL	false	false	false	false	false
26	722788	2C7749	1995	10	16	89.7	35.6	NULL	35	3.7	33	0	NULL	false	false	false	false	false

Fonte: Getting Start with SQL

Grid view | Form view

Total rows loaded: 28000

	station number	report code	year	month	day	temp	dew point	station pressure	visibility	wind speed	temperature	precipitation	snow depth	fog	rain	hail	thunder	tornado
1	143080	34DDA7	2002	12	21	36	33.8	987.4	3.4	0.2	69	0	NULL	true	true	true	true	true
2	766440	395378	1998	10	1	83.3	72.7	1014.6	5.9	6.7	62	0	NULL	false	false	false	false	false
3	176010	C3C6D5	2001	5	18	69.1	55.7	NULL	7.3	4.3	31	0	NULL	false	false	false	false	false
4	125600	145150	2007	10	14	39.7	33	NULL	6.9	2.5	79	0	NULL	false	false	false	false	false
5	470160	EF616A	1967	7	29	72.4	65.6	NULL	9.2	1.2	38	0.04	NULL	false	false	false	false	false
6	821930	1F8A78	1953	6	18	81.3	72.8	1007.1	12.4	3.6	31	0	NULL	false	false	false	false	false
7	478070	D028D8	1981	6	27	77	73.4	NULL	7.9	3	58	1.93	NULL	false	false	false	false	false
8	719200	C74611	1978	2	5	1.6	-4.4	962.9	14.9	13.3	84	0	9.8	false	false	false	false	false
9	477460	737090	1962	8	14	84.5	72.3	1009.6	24.1	5.1	40	0	NULL	false	false	false	false	false
10	598550	C5C66E	2006	10	15	82	72.9	NULL	14.2	1.7	39	0	NULL	false	false	false	false	false
11	471100	6A6704	1990	9	19	62.5	50.5	NULL	6	4.1	62	0	NULL	false	false	false	false	false
12	29880	921894	1986	12	26	16.8	13.9	NULL	6.6	14.7	46	0.02	8.7	false	false	false	false	false
13	292090	515EFF	1953	5	8	37.8	34.2	NULL	NULL	6	42	NULL	NULL	false	false	false	false	false
14	484750	A38C90	1988	6	24	87.5	72.6	NULL	8.7	3.1	54	0	NULL	false	false	false	false	false
15	724500	777F09	1988	3	28	63.1	47.2	958.1	13.6	18.3	82	0.01	NULL	false	false	false	false	false
16	30110	85F8C2	2004	10	31	49.8	47.6	NULL	NULL	19.6	38	0	NULL	false	false	false	false	false
17	410610	D6A909	1991	6	27	96.8	42.1	930.9	6.2	3.3	54	0	NULL	false	false	false	false	false
18	724320	207979	1988	3	4	35.1	33.1	999.4	3.1	9.3	40	0.23	NULL	true	true	true	true	true
19	941830	229317	2007	4	19	76.3	66.5	994.9	NULL	4	80	0	NULL	false	false	false	false	false
20	743920	2ABE7D	1996	5	21	70	57.6	NULL	5.8	7.5	75	0	NULL	true	true	true	true	true
21	150630	4ADE04	1996	12	10	32	28.3	990.4	4.9	3.9	44	0	NULL	false	false	false	false	false
22	724460	B988B2	1986	10	2	65.4	64.2	976	5.5	6.5	80	0.61	NULL	true	true	true	true	true
23	992210	34B18D	2000	5	5	45.4	NULL	1011.9	NULL	14.6	45	0	NULL	false	false	false	false	false
24	932920	EB6580	2009	5	17	59.4	52.1	NULL	12.4	7.3	72	0	NULL	false	false	false	false	false
25	986440	612C7C	1977	2	22	81	72	NULL	20.5	5.6	86	0.01	NULL	false	false	false	false	false
26	722788	2C7749	1995	10	16	89.7	35.6	NULL	35	3.7	33	0	NULL	false	false	false	false	false
27	700450	77D24F	1995	11	4	7.2	12.2	1023.7	6.2	16.2	45	0	0.8	true	true	true	true	true

Agrupamento de Registros

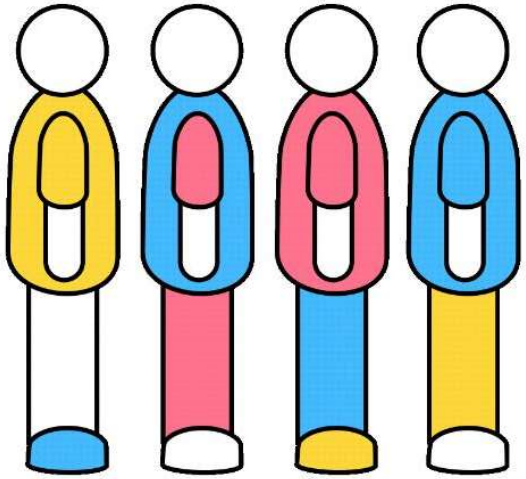
```
SELECT year, COUNT(*) AS record_count FROM station_data WHERE tornado = 1 GROUP BY year;
```

```
SELECT year, month, COUNT(*) AS record_count FROM station_data WHERE tornado = 1 GROUP BY year, month
```

```
SELECT COUNT(*) AS record_count FROM station_data;
```

Agrupamento de Registros

```
SELECT month, round(AVG(temp),2) as avg_temp
FROM station_data
WHERE year >= 2000
GROUP BY month
```



Hands On! **Exemplos com BD Employee**

"Falar é fácil. Mostre-me o código!"

Linus Torvalds

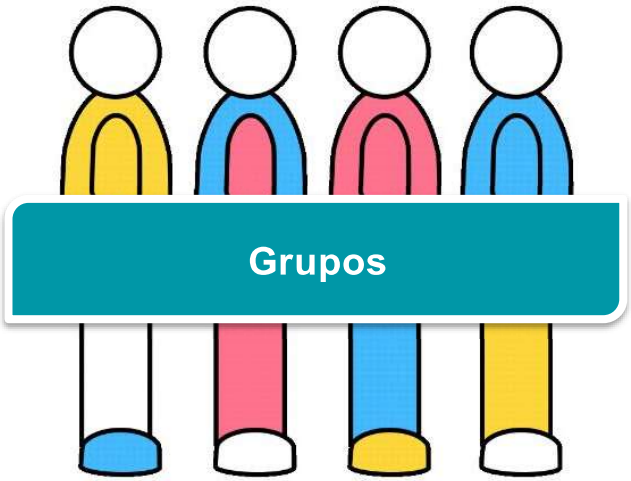
GROUP BY: Cláusula de Agrupamento com SQL

Funções de Agrupamento

Agregar

Aglutinar

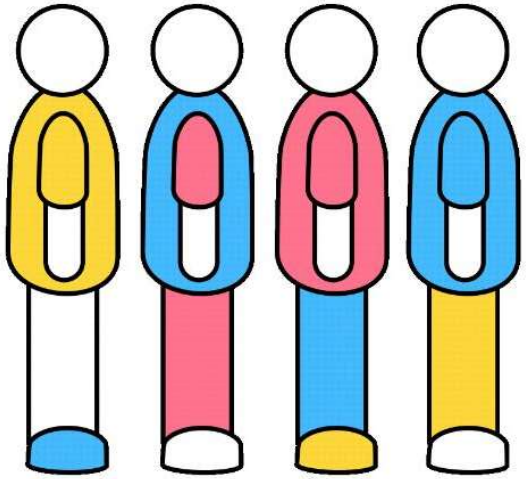
Agrupar



Agrupamento de Registros

- Atributos de Relacionamentos
- Grupos de valores

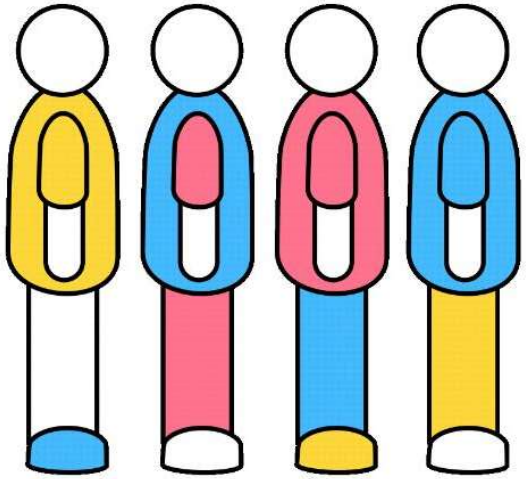
```
SELECT      Dno, COUNT (*), AVG (Salary)
FROM        EMPLOYEE
GROUP BY    Dno;
```



Agrupamento de Registros

- Atributos de Relacionamentos
- Grupos de valores

```
SELECT      Dno, COUNT (*), AVG (Salary)
FROM        EMPLOYEE
GROUP BY    Dno;
```



Agrupamento de Registros

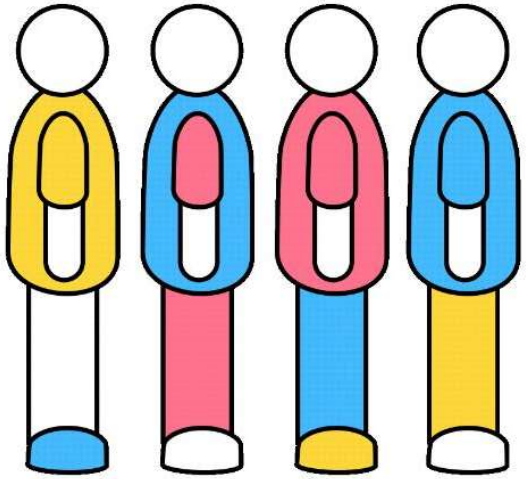
(a)

Fname	Minit	Lname	Ssn	...	Salary	Super_ssn	Dno
John	B	Smith	123456789		30000	333445555	5
Franklin	T	Wong	333445555		40000	888665555	5
Ramesh	K	Narayan	666884444		38000	333445555	5
Joyce	A	English	453453453	...	25000	333445555	5
Alicia	J	Zelaya	999887777		25000	987654321	4
Jennifer	S	Wallace	987654321		43000	888665555	4
Ahmad	V	Jabbar	987987987		25000	987654321	4
James	E	Bong	888665555		55000	NULL	1

Grouping EMPLOYEE tuples by the value of Dno

Dno	Count (*)	Avg (Salary)
5	4	33250
4	3	31000
1	1	55000

Result of Q24



Hands On! **Exemplos com BD Employee**

"Falar é fácil. Mostre-me o código!"

Linus Torvalds

Entendendo o HAVING Statement

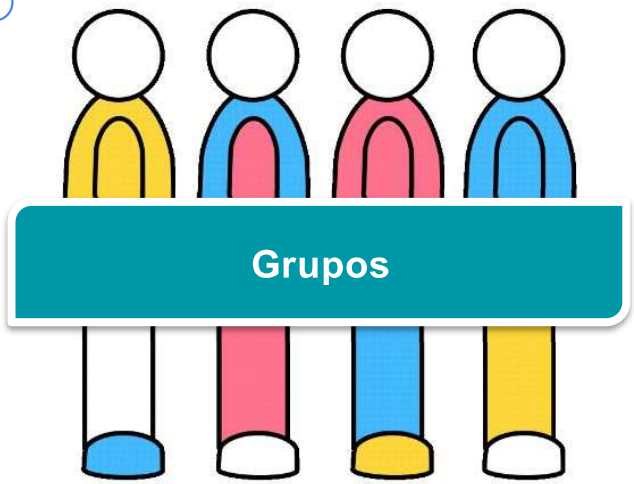
Funções de Agrupamento

Condição?

Agregar

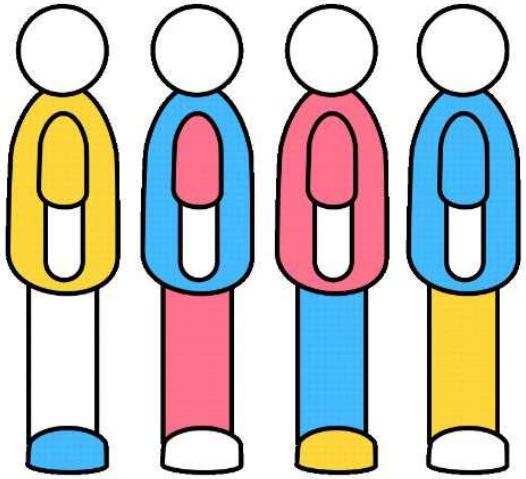
Aglutinar

Agrupar



HAVING Satement

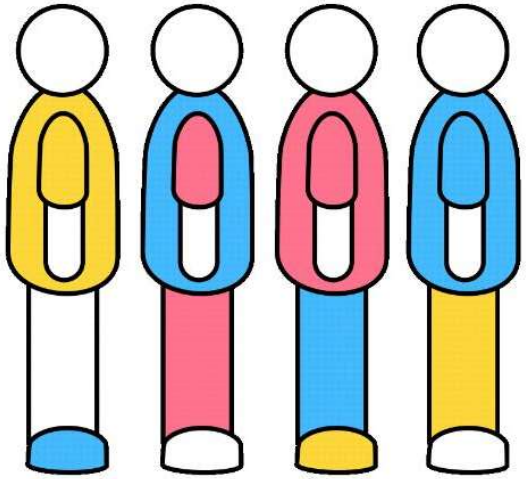
- SELECT: seleciona tabela e atributos
- GROUP BY: grupos de valores
- HAVING: Filtragem dos grupos



HAVING Satement

- SELECT: seleciona tabela e atributos
- GROUP BY: grupos de valores
- HAVING: Filtragem dos grupos

Condição sobre a informação sobre o grupo



HAVING Satement

```
SELECT      Pnumber, Pname, COUNT (*)
FROM        PROJECT, WORKS_ON
WHERE       Pnumber = Pno
GROUP BY    Pnumber, Pname
HAVING      COUNT (*) > 2;
```

Pname	Pnumber	...	Essn	Pno	Hours
ProductY	2		123456789	2	7.5
ProductY	2		453453453	2	20.0
ProductY	2		333445555	2	10.0
Computerization	10		333445555	10	10.0
Computerization	10	...	999887777	10	10.0
Computerization	10		987987987	10	35.0
Reorganization	20		333445555	20	10.0
Reorganization	20		987654321	20	15.0
Reorganization	20		888665555	20	NULL
Newbenefits	30		987987987	30	5.0
Newbenefits	30		987654321	30	20.0
Newbenefits	30		999887777	30	30.0

After applying the HAVING clause condition

Pname	Count (*)
ProductY	3
Computerization	3
Reorganization	3
Newbenefits	3

Result of Q26
(Pnumber not shown)

HAVING Satement

```
SELECT <attribute and function list>
FROM <table list>
[ WHERE <condition> ]
[ GROUP BY <grouping attribute(s)> ]
[ HAVING <group condition> ]
[ ORDER BY <attribute list> ];
```

HAVING Satement

```
SELECT <attribute and function list>
FROM <table list>
[ WHERE <condition> AND <condition2> ]
[ GROUP BY <grouping attribute(s)> ]
[ HAVING <group condition> ]
[ ORDER BY <attribute list> ];
```

Query interna

HAVING Satement

Preferência de execução das cláusulas

```
SELECT <attribute and function list>
FROM <table list>
[ WHERE <condition> AND <condition2> ]
[ GROUP BY <grouping attribute(s)> ]
[ HAVING <group condition> ]
[ ORDER BY <attribute list> ];
```

Query interna

Hands On! **Exemplos com BD Employee**

"Falar é fácil. Mostre-me o código!"

Linus Torvalds

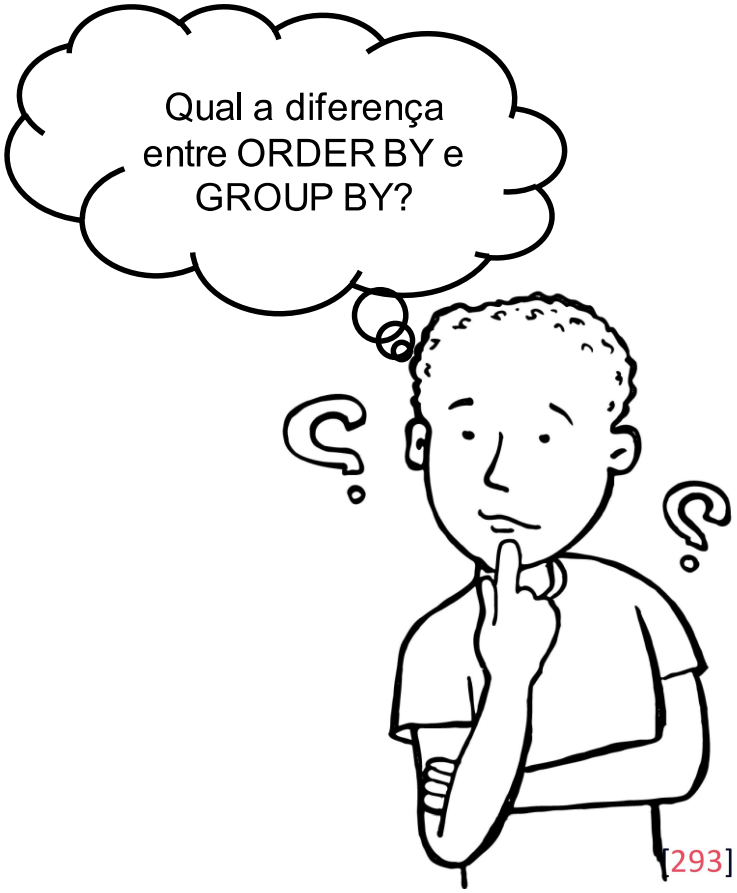
Ainda está em dúvida sobre ORDER e GROUP?

AGRUPAMENTO

ORDER BY

GROUP BY

Nome |
----------+
Maria
João
Cristina
Mario
....

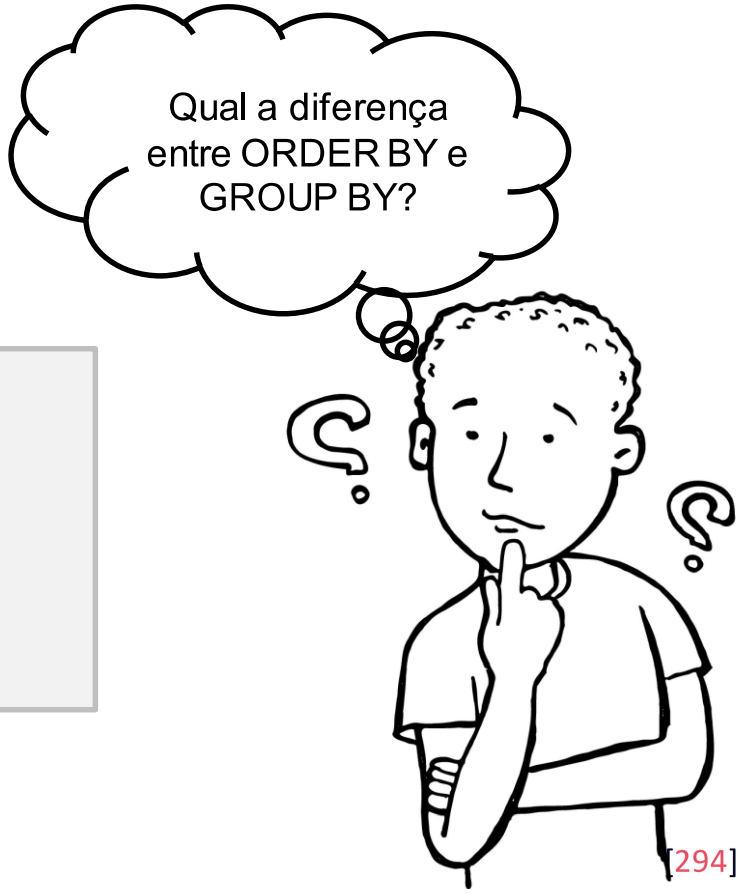


AGRUPAMENTO

ORDER BY

Nome |
----------+
Maria
João
Cristina
Mario
....

Nome |
----------+
Cristina
João
Maria
Mario
....

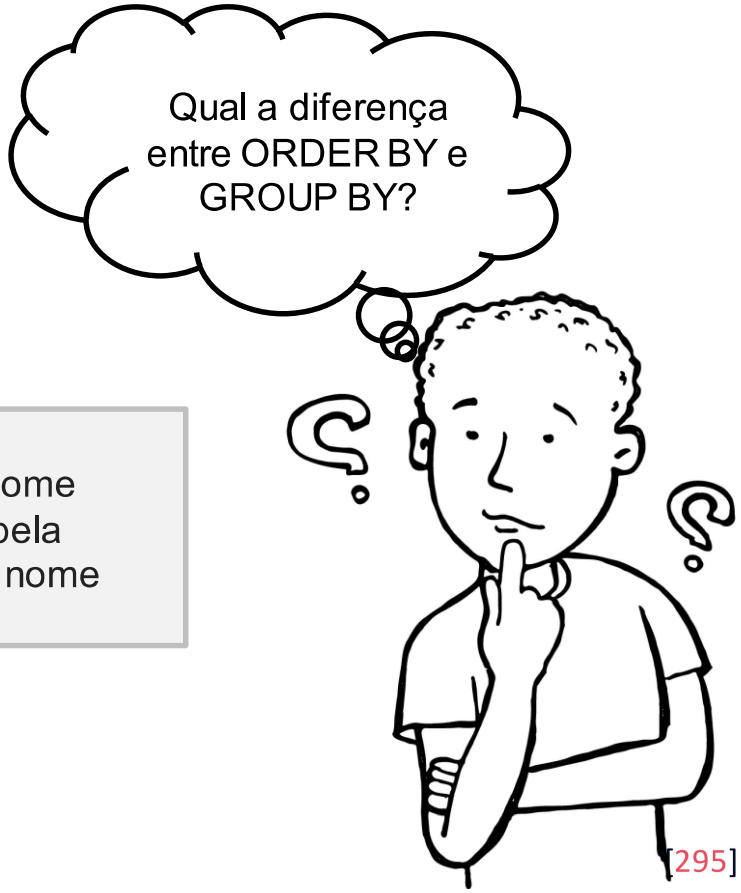


AGRUPAMENTO

ORDER BY

Nome |
----------+
Maria
João
Cristina
Mario
....

SELECT nome
FROM tabela
ORDER BY nome

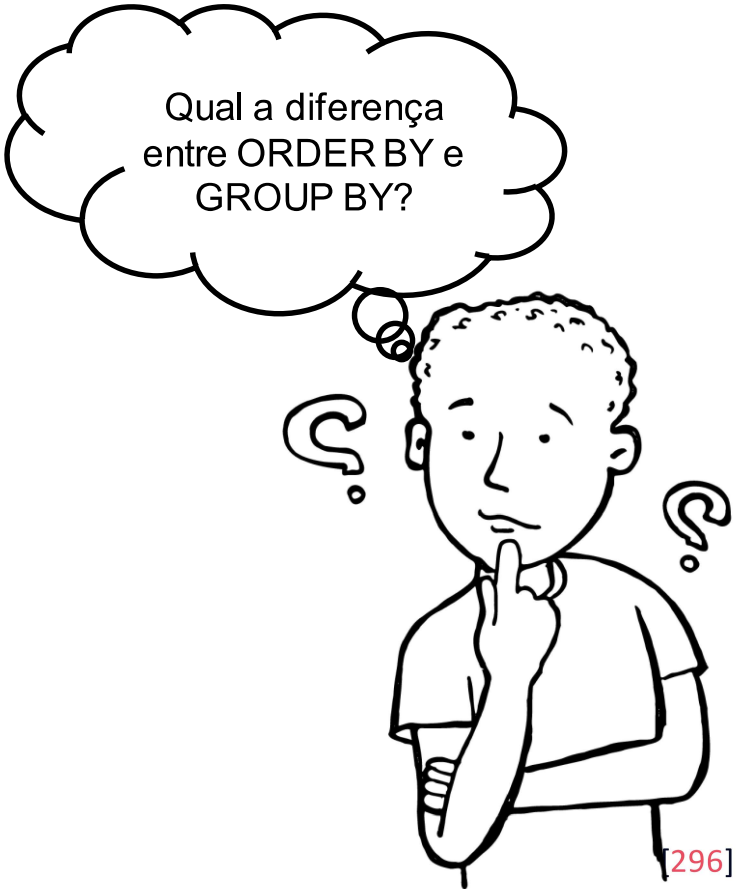


AGRUPAMENTO

ORDER BY

GROUP BY

```
CarModel |
----------+
C350
C350
C350
C23
....
```

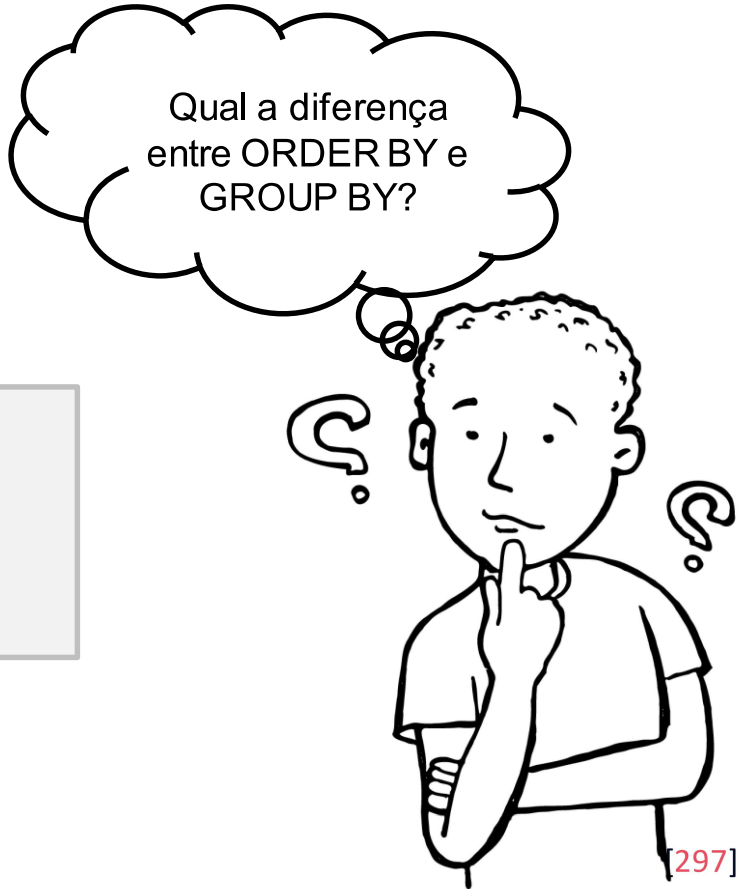


AGRUPAMENTO

GROUP BY

CarModel |
----------+
C350
C350
C350
C23
....

CarModel |
----------+
C23
C350
....



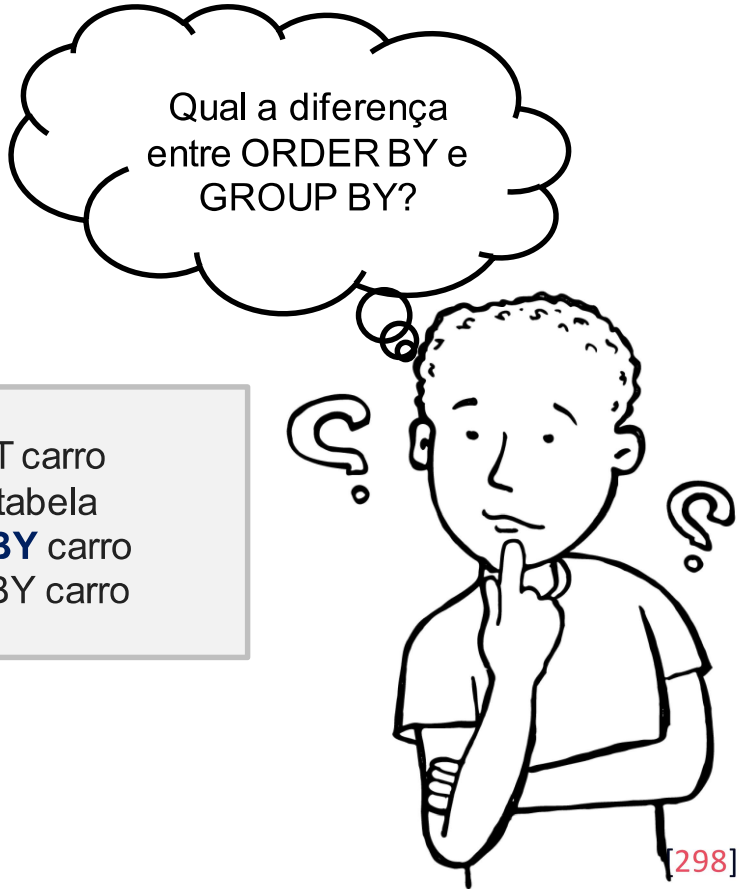
[297]

AGRUPAMENTO

GROUP BY

CarModel |
----------+
C350
C350
C350
C23
....

SELECT carro
FROM tabela
GROUP BY carro
ORDER BY carro



Agrupamento em Queries SQL

- Cláusula SQL
- Ordenação por coluna
- Expressões baseadas em dados
- + de um valor

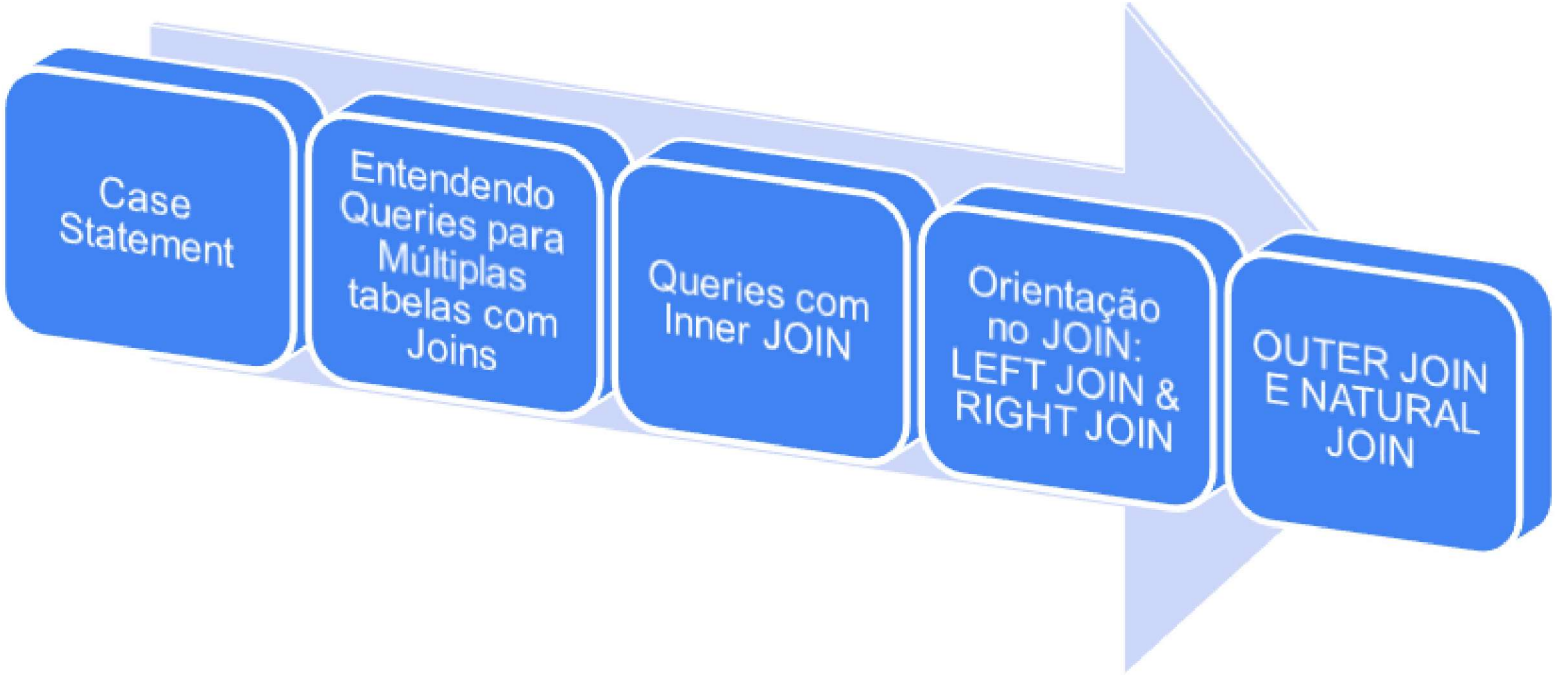
[299]

Etapa 5

Agrupando Registros e Tabelas com JOIN

// Explorando a Linguagem de Consulta a Banco de Dados SQL

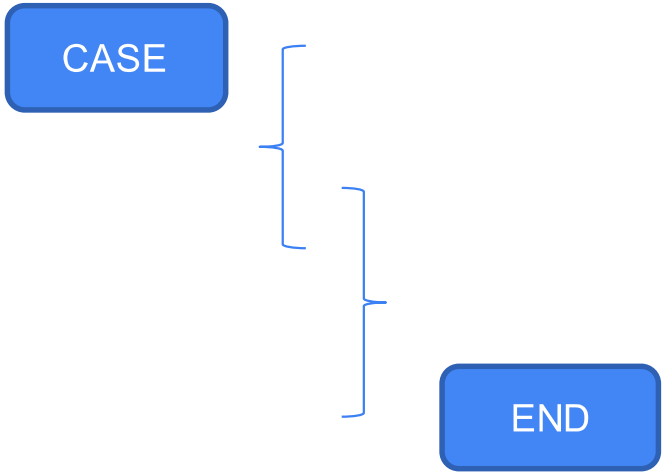
Explorando a SQL



CASE Statement

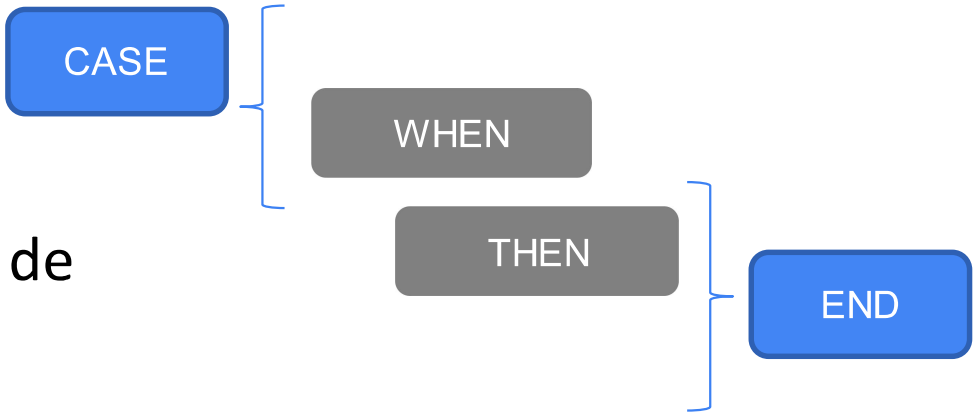
CASE Statement

- Troca de um valor
- Condição para troca
- Mapeamento de valores de correspondência



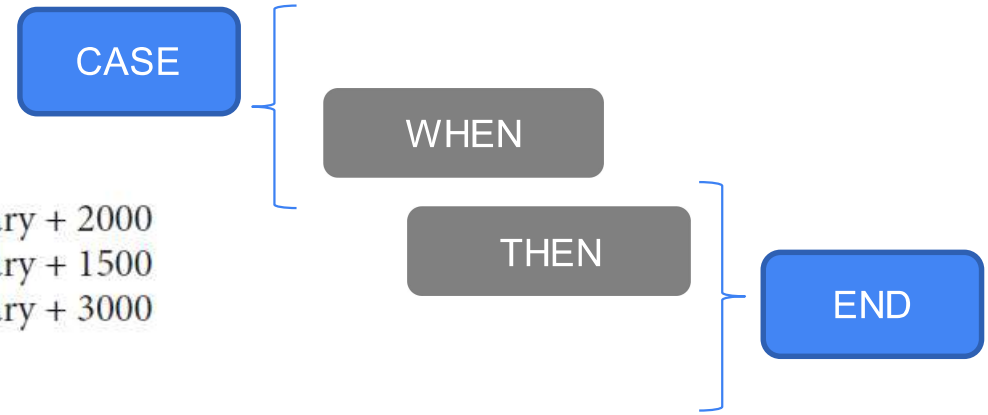
CASE Statement

- Troca de um valor
- Condição para troca
- Mapeamento de valores de correspondência



CASE Statement

```
UPDATE    EMPLOYEE
SET       Salary =
CASE      WHEN    Dno = 5    THEN Salary + 2000
          WHEN    Dno = 4    THEN Salary + 1500
          WHEN    Dno = 1    THEN Salary + 3000
          ELSE    Salary + 0 ;
```



Fonte: livro de referência

CASE Statement

Exemplo de mapeamento do clima

Grid view | Form view

1 Total rows loaded: 28000

	report_code	year	month	day	wind_speed	wind_severity
22	6757E5	1992	10	9	43.9	HIGH
23	E681EA	1984	2	10	44.9	HIGH
24	F7D723	2003	5	23	45.3	HIGH
25	B6A78C	1973	7	17	42.3	HIGH
26	1C8A2A	1998	11	21	50	HIGH
27	34DDA7	2002	12	21	0.2	LOW
28	39537B	1998	10	1	6.7	LOW
29	C3C6D5	2001	5	18	4.3	LOW
30	145150	2007	10	14	2.5	LOW
31	EF616A	1967	7	29	1.2	LOW

Fonte: livro Getting Started with SQL

CASE Statement

```
SELECT report_code, year, month, day, wind_speed,
CASE
WHEN wind_speed >= 40 THEN 'HIGH'
WHEN wind_speed >= 30 AND wind_speed < 40 THEN 'MODERATE'
ELSE 'LOW'
END as wind_severity
FROM station_data
```

Fonte: livro de referência

CASE Statement

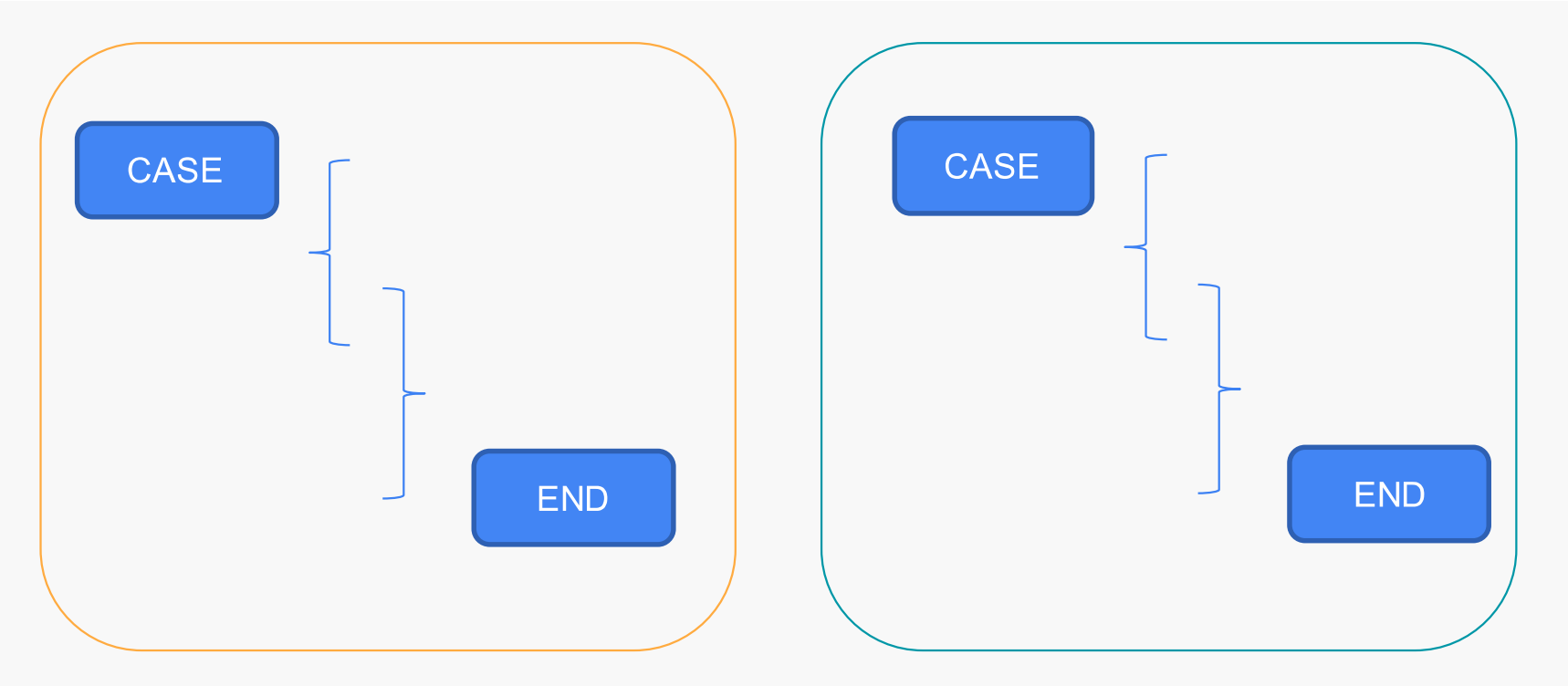
SGBD entende a operação

```
SELECT report_code, year, month, day, wind_speed,
CASE
WHEN wind_speed >= 40 THEN 'HIGH'
WHEN wind_speed >= 30 THEN 'MODERATE'
ELSE 'LOW'
END as wind_severity
FROM station_data
```

Fonte: livro de referência

Agrupando Queries com CASE Statement

Agrupando CASE Statement



[310]

CASE Statement

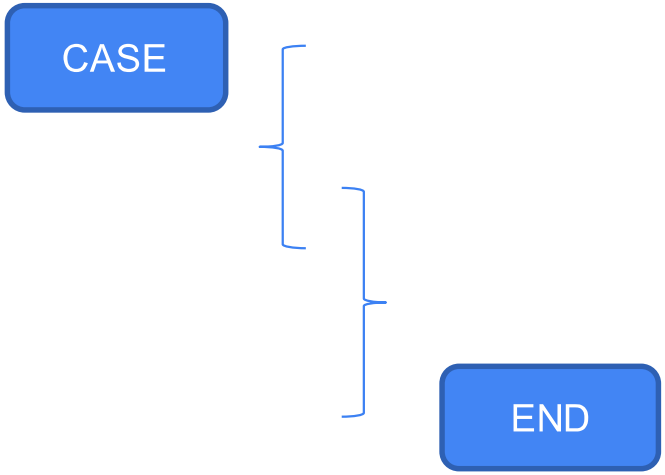
```
SELECT year,
CASE
WHEN wind_speed >= 40 THEN 'HIGH'
WHEN wind_speed >= 30 THEN 'MODERATE'
ELSE 'LOW'
END as wind_severity,
COUNT(*) as record_count
FROM station_data
GROUP BY 1, 2
```

Fonte: livro de referência

O caso zero/null trick

CASE Statement

- Filtros – valores distintos
- SELECT QUERY
- ~~WHERE~~



CASE Statement

```
Tornado precipitation
SELECT year, month,
SUM(precipitation) AS tornado_precipitation
FROM station_data
WHERE tornado = 1
GROUP BY year, month
```

Fonte: livro Getting Start with SQL

Sem o CASE

CASE Statement

Non-Tornado precipitation

```
SELECT year, month,
SUM(precipitation) AS non_tornado_precipitation
FROM station_data
WHERE tornado = 0
GROUP BY year, month
```

Fonte: livro Getting Start with SQL

Sem o CASE

CASE Statement

```
SELECT year, month,
SUM(CASE WHEN tornado = 1 THEN precipitation ELSE 0
END) as tornado_precipitation,
SUM(CASE WHEN tornado = 0 THEN precipitation ELSE 0
END) as non_tornado_precipitation
FROM station_data
GROUP BY year, month
```

Utilizando CASE

Fonte: livro de referência

CASE Statement

Grid view | Form view

Total rows loaded: 831

	year	month	tornado_precipitation	non_tornado_precipitation
811	2008	8	0	3.45
812	2008	9	0	1.77
813	2008	10	0	8.88
814	2008	11	0	2.14
815	2008	12	0.52	8.19
816	2009	1	0	4.02
817	2009	2	0	0.84
818	2009	3	0	14.41
819	2009	4	0	4.08
820	2009	5	0	8.4
821	2009	6	0.41	3.32

Fonte: livro Getting Start with SQL

Resultado

CASE Statement

AVG

MAX

MIN

```
SELECT year, month,
SUM(CASE WHEN tornado = 1 THEN precipitation ELSE 0
END) as tornado_precipitation,
SUM(CASE WHEN tornado = 0 THEN precipitation ELSE 0
END) as non_tornado_precipitation
FROM station_data
GROUP BY year, month
```

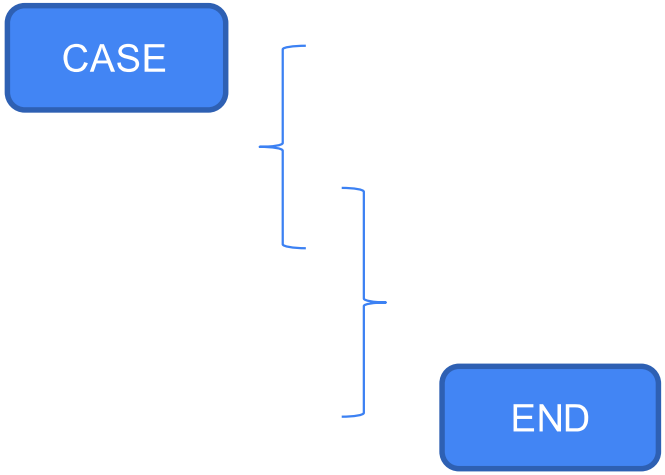
Utilizando CASE

Fonte: livro Getting Start with SQL

CASE Statement

- MAX, AVG, MIN
- NAD, OR, NOT
- COUNT

Combinar operadores com CASE



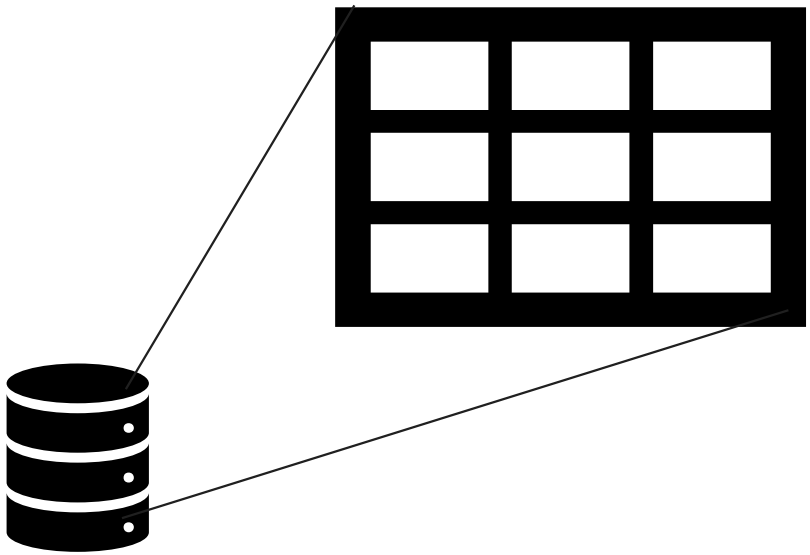
Hands On! **Projeto**

“Falar é fácil. Mostre-me o código!”

Linus Torvalds

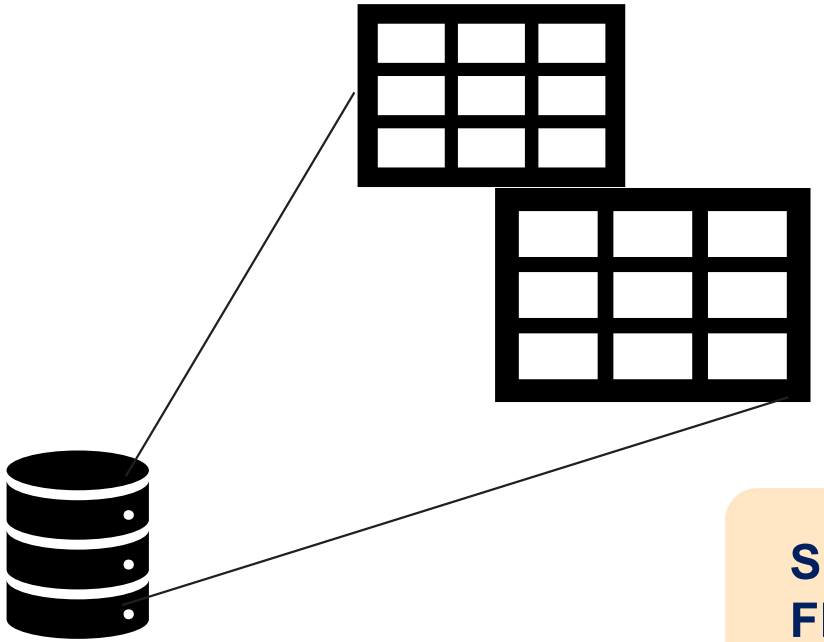
Entendendo Queries de Mútiplas Tabelas com JOINs

JOIN Statement



```
SELECT e.fname, e.lname
FROM employee e
```

JOIN Statement



```
SELECT e.fname, e.lname, d.name
FROM employee e JOIN department d
```

JOIN Statement

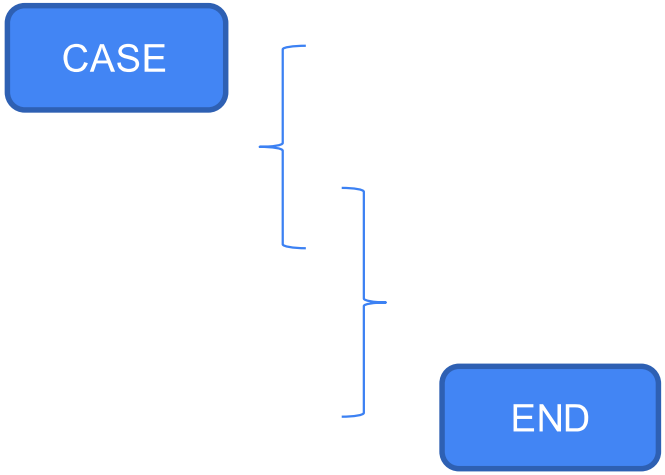
```
mysql> SELECT e.fname, e.lname, d.name
    -> FROM employee e JOIN department d;
+----------+-----------+----------------+
| fname    | lname     | name           |
+----------+-----------+----------------+
| Michael  | Smith     | Operations     |
| Michael  | Smith     | Loans          |
| Michael  | Smith     | Administration |
| Susan    | Barker    | Operations     |
| Susan    | Barker    | Loans          |
| Susan    | Barker    | Administration |
| Robert   | Tyler     | Operations     |
| Robert   | Tyler     | Loans          |
| Robert   | Tyler     | Administration |
| Susan    | Hawthorne | Operations     |
| Susan    | Hawthorne | Loans          |
| Susan    | Hawthorne | Administration |
...
```

SELECT e.fname, e.lname, d.name
FROM employee e **JOIN** department d

JOIN Statement

- JOIN: repetição de registros
- Produto Cartesiano

Combinar operadores com CASE



CROSS JOIN Statement

```
SELECT pt.name, p.product_cd, p.name
FROM product p CROSS JOIN product_type pt;
```

name	product_cd	name
Customer Accounts	AUT	auto loan
Customer Accounts	BUS	business line of credit
Customer Accounts	CD	certificate of deposit
Customer Accounts	CHK	checking account
Customer Accounts	MM	money market account
Customer Accounts	MRT	home mortgage
Customer Accounts	SAV	savings account
Customer Accounts	SBL	small business loan
Insurance Offerings	AUT	auto loan
Insurance Offerings	BUS	business line of credit
Insurance Offerings	CD	certificate of deposit
Insurance Offerings	CHK	checking account
Insurance Offerings	MM	money market account
Insurance Offerings	MRT	home mortgage
Insurance Offerings	SAV	savings account
Insurance Offerings	SBL	small business loan
Individual and Business Loans	AUT	auto loan
Individual and Business Loans	BUS	business line of credit
Individual and Business Loans	CD	certificate of deposit
Individual and Business Loans	CHK	checking account
Individual and Business Loans	MM	money market account
Individual and Business Loans	MRT	home mortgage
Individual and Business Loans	SAV	savings account
Individual and Business Loans	SBL	small business loan

24 rows in set (0.00 sec)

Leitura para CROSS JOIN: Learning SQL

JOIN Statement

```
mysql> SELECT e.fname, e.lname, d.name
    -> FROM employee e JOIN department d;
+----------+-----------+----------------+
| fname    | lname     | name           |
+----------+-----------+----------------+
| Michael  | Smith     | Operations     |
| Michael  | Smith     | Loans          |
| Michael  | Smith     | Admini         |
| Susan    | Barker    | Operat         |
| Susan    | Barker    | Loans          |
| Susan    | Barker    | Admini         |
| Robert   | Tyler     | Operations     |
| Robert   | Tyler     | Loans          |
| Robert   | Tyler     | Administration |
| Susan    | Hawthorne | Operations     |
| Susan    | Hawthorne | Loans          |
| Susan    | Hawthorne | Administration |
...
```

O que faltou?

SELECT e.fname, e.lname, d.name
FROM employee e **JOIN** department d

JOIN Statement

```
SELECT e.fname, e.lname, d.name
FROM employee e JOIN department d
ON e.dept_id = d.dept_id ;
```

...

JOIN Statement

SELECT <atributes list>

FROM <table1> ft **JOIN** <table2> st

CROSS

JOIN Statement

SELECT <atributes list>

FROM <table1> ft **INNER JOIN** <table2> st

ON ft.commom_attibute =

st.commom_attribute

[330]

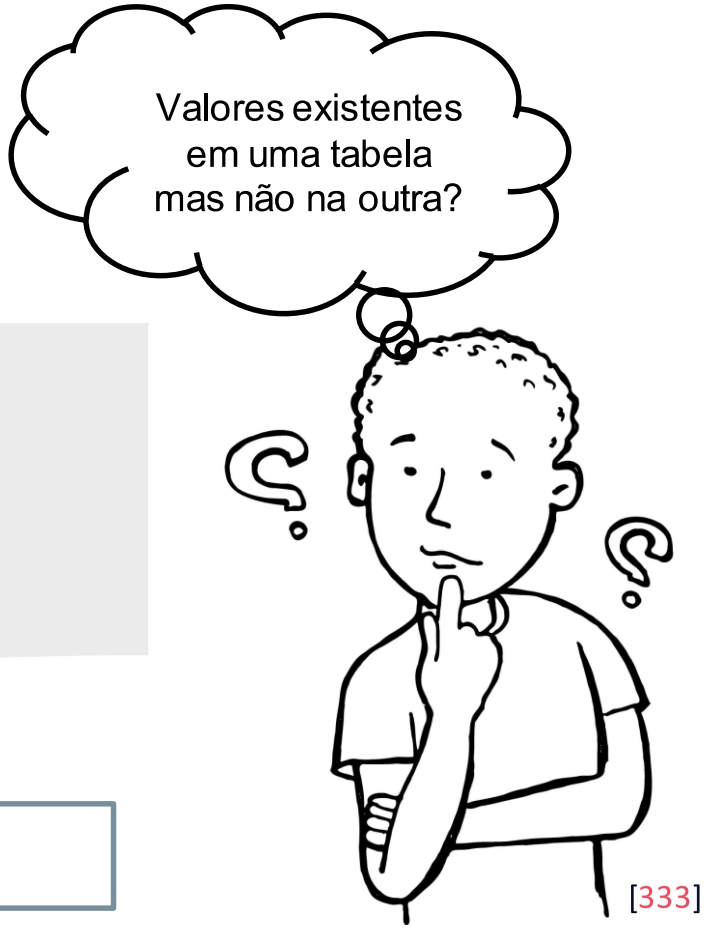
Queries com INNER JOIN

JOIN Statement

```
SELECT e.fname, e.lname, d.name
FROM employee e JOIN department d
ON e.dept_id = d.dept_id ;
```

...

JOIN Statement




```
SELECT e.fname, e.lname, d.name
FROM employee e JOIN department d
ON e.dept_id = d.dept_id ;
```

Falha: linhas excluídas

[333]

INNER JOIN

- Mais comum dos JOINs
- Linhas não correspondentes excluídas
- Atributo de junção

Mesclar Tabelas

1 + atributos junção

2 + Tabelas

INNER JOIN

- Mais comum dos JOINs
- Linhas não correspondentes excluídas
- Atributo de junção

Mesclar Tabelas

1 + atributos junção

2 + Tabelas

ON tab_a.atributo = tab_b.atributo

USING (atributo c/ mesmo nome)

INNER JOIN

Exemplo:

CUSTOMER

CUSTOMER ID	NAME	REGION	STREET ADDRESS	CITY	STATE	ZIP
1	LITE Industrial	Southwest	729 Ravine Way	Irving	TX	75014
2	Rex Tooling Inc	Southwest	6129 Collie Blvd	Dallas	TX	75201
3	Re-Barre Construction	Southwest	9043 Windy Dr	Irving	TX	75032
4	Prairie Construction	Southwest	264 Long Rd	Moore	OK	62104
5	Marsh Lane Metal Works	Southeast	9143 Marsh Ln	Avondale	LA	79782

CUSTOMER_ORDER

	ORDER_ID	ORDER_DATE	SHIP_DATE	CUSTOMER_ID	PRODUCT_ID	ORDER_QTY	SHIPPED
1	3	2015-04-20	2015-04-23	3	5	300	false
2	4	2015-04-18	2015-04-22	5	4	375	false
3	1	2015-04-15	2015-04-18	1	1	450	false
4	5	2015-04-17	2015-04-20	3	2	500	false
5	2	2015-04-18	2015-04-21	3	2	600	false

Figure 8-4. A one-to-many relationship between CUSTOMER and CUSTOMER_ORDER

Fonte: livro Getting Started with SQL

INNER JOIN

```
SELECT ORDER_ID, CUSTOMER.CUSTOMER_ID, ORDER_DATE, SHIP_DATE, NAME,
STREET_ADDRESS, CITY, STATE, ZIP, PRODUCT_ID, ORDER_QTY
FROM CUSTOMER INNER JOIN CUSTOMER_ORDER
ON CUSTOMER.CUSTOMER_ID = CUSTOMER_ORDER.CUSTOMER_ID
```

Atributos de junção

Hands On! **Projeto**

“Falar é fácil. Mostre-me o código!”

Linus Torvalds

Agrupamento com mais de 3 Tabelas com JOIN

3 ou + tabelas com JOIN

JOIN com duas tabelas

```
mysql> SELECT a.account_id, c.fed_id
    -> FROM account a INNER JOIN customer c
    ->   ON a.cust_id = c.cust_id
    -> WHERE c.cust_type_cd = 'B';
+------------+------------+
| account_id | fed_id     |
+------------+------------+
|         24 | 04-1111111 |
|         25 | 04-1111111 |
|         27 | 04-2222222 |
|         28 | 04-3333333 |
|         29 | 04-4444444 |
+------------+------------+
5 rows in set (0.15 sec)
```

Fonte: livro Learning SQL

3 ou + tabelas com JOIN

JOIN com três tabelas

```
mysql> SELECT a.account_id, c.fed_id, e.fname, e.lname
    -> FROM account a INNER JOIN customer c
    ->   ON a.cust_id = c.cust_id
    ->   INNER JOIN employee e
    ->   ON a.open_emp_id = e.emp_id
    -> WHERE c.cust_type_cd = 'B';
+------------+------------+---------+---------+
| account_id | fed_id     | fname   | lname   |
+------------+------------+---------+---------+
|         24 | 04-1111111 | Theresa | Markham |
|         25 | 04-1111111 | Theresa | Markham |
|         27 | 04-2222222 | Paula   | Roberts |
|         28 | 04-3333333 | Theresa | Markham |
|         29 | 04-4444444 | John    | Blake   |
+------------+------------+---------+---------+
5 rows in set (0.00 sec)
```

Fonte: livro Learning SQL

3 ou + tabelas com JOIN

- 3 tabelas
- 2 tipos de JOINs
- 2 subcláusulas

```
mysql> SELECT a.account_id, c.fed_id, e.fname, e.lname
    -> FROM account a INNER JOIN customer c
    ->   ON a.cust_id = c.cust_id
    ->   INNER JOIN employee e
    ->   ON a.open_emp_id = e.emp_id
    -> WHERE c.cust_type_cd = 'B';
+------------+------------+---------+---------+
| account_id | fed_id     | fname   | lname   |
+------------+------------+---------+---------+
|         24 | 04-1111111 | Theresa | Markham |
|         25 | 04-1111111 | Theresa | Markham |
|         27 | 04-2222222 | Paula   | Roberts |
|         28 | 04-3333333 | Theresa | Markham |
|         29 | 04-4444444 | John    | Blake   |
+------------+------------+---------+---------+
5 rows in set (0.00 sec)
```

Fonte: livro Learning SQL

3 ou + tabelas com JOIN

```
mysql> SELECT a.account_id, c.fed_id, e.fname, e.lname
    -> FROM customer c INNER JOIN account a
    ->   ON a.cust_id = c.cust_id
    ->   INNER JOIN employee e
    ->   ON a.open_emp_id = e.emp_id
    -> WHERE c.cust_type_cd = 'B';
+------------+------------+---------+---------+
| account_id | fed_id     | fname   | lname   |
+------------+------------+---------+---------+
|         24 | 04-1111111 | Theresa | Markham |
|         25 | 04-1111111 | Theresa | Markham |
|         27 | 04-2222222 | Paula   | Roberts |
|         28 | 04-3333333 | Theresa | Markham |
|         29 | 04-4444444 | John    | Blake   |
+------------+------------+---------+---------+
5 rows in set (0.09 sec)
```

```
mysql> SELECT a.account_id, c.fed_id, e.fname, e.lname
    -> FROM account a INNER JOIN customer c
    ->   ON a.cust_id = c.cust_id
    ->   INNER JOIN employee e
    ->   ON a.open_emp_id = e.emp_id
    -> WHERE c.cust_type_cd = 'B';
+------------+------------+---------+---------+
| account_id | fed_id     | fname   | lname   |
+------------+------------+---------+---------+
|         24 | 04-1111111 | Theresa | Markham |
|         25 | 04-1111111 | Theresa | Markham |
|         27 | 04-2222222 | Paula   | Roberts |
|         28 | 04-3333333 | Theresa | Markham |
|         29 | 04-4444444 | John    | Blake   |
+------------+------------+---------+---------+
5 rows in set (0.00 sec)
```

Fonte: livro Learning SQL

3 ou + tabelas com JOIN

```
mysql> SELECT a.account_id, c.fed_id, e.fname, e.lname
    -> FROM employee e INNER JOIN account a
    ->   ON e.emp_id = a.open_emp_id
    ->   INNER JOIN customer c
    ->   ON a.cust_id = c.cust_id
    -> WHERE c.cust_type_cd = 'B';
+------------+------------+---------+---------+
| account_id | fed_id     | fname   | lname   |
+------------+------------+---------+---------+
|         24 | 04-1111111 | Theresa | Markham |
|         25 | 04-1111111 | Theresa | Markham |
|         27 | 04-2222222 | Paula   | Roberts |
|         28 | 04-3333333 | Theresa | Markham |
|         29 | 04-4444444 | John    | Blake   |
+------------+------------+---------+---------+
5 rows in set (0.00 sec)
```

```
mysql> SELECT a.account_id, c.fed_id, e.fname, e.lname
    -> FROM account a INNER JOIN customer c
    ->   ON a.cust_id = c.cust_id
    ->   INNER JOIN employee e
    ->   ON a.open_emp_id = e.emp_id
    -> WHERE c.cust_type_cd = 'B';
+------------+------------+---------+---------+
| account_id | fed_id     | fname   | lname   |
+------------+------------+---------+---------+
|         24 | 04-1111111 | Theresa | Markham |
|         25 | 04-1111111 | Theresa | Markham |
|         27 | 04-2222222 | Paula   | Roberts |
|         28 | 04-3333333 | Theresa | Markham |
|         29 | 04-4444444 | John    | Blake   |
+------------+------------+---------+---------+
5 rows in set (0.00 sec)
```

Fonte: livro Learning SQL

Hands On! **Projeto**

“Falar é fácil. Mostre-me o código!”

Linus Torvalds

A Ordem Importa em Queries com JOIN?

Ordem de Queries JOIN

- SGBD interpreta e escolhe a sequência de comados
- SGBD escolhe um ponto de partida

```
mysql> SELECT a.account_id, c.fed_id, e.fname, e.lname
    -> FROM account a INNER JOIN customer c
    ->   ON a.cust_id = c.cust_id
    ->   INNER JOIN employee e
    ->   ON a.open_emp_id = e.emp_id
    -> WHERE c.cust_type_cd = 'B';
+------------+------------+---------+---------+
| account_id | fed_id     | fname   | lname   |
+------------+------------+---------+---------+
|         24 | 04-1111111 | Theresa | Markham |
|         25 | 04-1111111 | Theresa | Markham |
|         27 | 04-2222222 | Paula   | Roberts |
|         28 | 04-3333333 | Theresa | Markham |
|         29 | 04-4444444 | John    | Blake   |
+------------+------------+---------+---------+
5 rows in set (0.00 sec)
```

Ordem de Queries JOIN

FORCE ORDER

STRAIGHT_JOIN

Tem como especificar a ordem para o SGBD?

INNER JOIN

```
SELECT STRAIGHT_JOIN a.account_id, c.fed_id, e.fname, e.lname
FROM customer c INNER JOIN account a
ON a.cust_id = c.cust_id
INNER JOIN employee e
ON a.open_emp_id = e.emp_id
WHERE c.cust_type_cd = 'B';
```

Forçando ordem de junção

Outros tópicos com JOIN Statement

Nested (Subqueries) com JOIN Statement

Subqueries com JOIN

```
SELECT a.account_id, a.cust_id, a.open_date, a.product_cd
FROM account a INNER JOIN
        (SELECT emp_id, assigned_branch_id
        FROM employee
        WHERE start_date < '2007-01-01'  AND (title = 'Teller' OR title =
        'Head Teller')) e
ON a.open_emp_id = e.emp_id
INNER JOIN
        (SELECT branch_id
        FROM branch
        WHERE name = 'Woburn Branch') b
ON e.assigned_branch_id = b.branch_id;
```

Subqueries COM JOIN

```
mysql> SELECT emp_id, assigned_branch_id
    -> FROM employee
    -> WHERE start_date < '2007-01-01'
    ->   AND (title = 'Teller' OR title = 'Head Teller');
+--------+--------------------+
| emp_id | assigned_branch_id |
+--------+--------------------+
|      8 |                  1 |
|      9 |                  1 |
|     10 |                  2 |
|     11 |                  2 |
|     13 |                  3 |
|     14 |                  3 |
|     16 |                  4 |
|     17 |                  4 |
|     18 |                  4 |
+--------+--------------------+
9 rows in set (0.03 sec)
```

[353]

Subqueries COM JOIN

```
mysql> SELECT branch_id
    -> FROM branch
    -> WHERE name = 'Woburn Branch';

+-----------+
| branch_id |
+-----------+
|         2 |
+-----------+
1 row in set (0.02 sec)
```

```
mysql> SELECT emp_id, assigned_branch_id
    -> FROM employee
    -> WHERE start_date < '2007-01-01'
    ->   AND (title = 'Teller' OR title = 'Head Teller');
+--------+--------------------+
| emp_id | assigned_branch_id |
+--------+--------------------+
|      8 |                  1 |
|      9 |                  1 |
|     10 |                  2 |
|     11 |                  2 |
|     13 |                  3 |
|     14 |                  3 |
|     16 |                  4 |
|     17 |                  4 |
|     18 |                  4 |
+--------+--------------------+
9 rows in set (0.03 sec)
```

Subqueries com JOIN

```
SELECT a.account_id, a.cust_id, a.open_date, a.product_cd
FROM account a INNER JOIN
        (SELECT emp_id, assigned_branch_id
        FROM employee
        WHERE start_date < '2007-01-01'  AND (title = 'Teller' OR title =
        'Head Teller')) e
ON a.open_emp_id = e.emp_id
INNER JOIN
        (SELECT branch_id
        FROM branch
        WHERE name = 'Woburn Branch') b
ON e.assigned_branch_id = b.branch_id;
```

Mesma Tabela em uma Query JOIN

JOIN Statement

E quando precisamos utilizar a mesma tabela em um JOIN?

Mas preciso disso?

[357]

JOIN Satement

Chave estrangeira refenciando a mesma tabela

Exemplo 1

EMPREGADO

PNOME	MINICIAL	UNOME	SSN	DATANASC	ENDERECO	SEXO	SALARIO	SUPERSSN	DNO

DEPARTAMENTO

DNOME	DNUMERO	GERSSN	GERDATAINICIO

DEPTO_LOCALIZACOES

DNUMERO	DLOCALIZACAO

PROJETO

PJNOME	PNUMERO	PLOCALIZACAO	DNUM

TRABALHA_EM

ESSN	PNO	HORAS

DEPENDENTE

ESSN	NOME_DEPENDENTE	SEXO	DATANASC	PARENTESCO

JOIN Satement

```
mysql> SELECT a.account_id, e.emp_id,
    ->   b_a.name open_branch, b_e.name emp_branch
    -> FROM account a INNER JOIN branch b_a
    ->   ON a.open_branch_id = b_a.branch_id
    ->   INNER JOIN employee e
    ->   ON a.open_emp_id = e.emp_id
    ->   INNER JOIN branch b_e
    ->   ON e.assigned_branch_id = b_e.branch_id
    -> WHERE a.product_cd = 'CHK';
```

account_id	emp_id	open_branch	emp_branch
10	1	Headquarters	Headquarters
14	1	Headquarters	Headquarters
21	1	Headquarters	Headquarters
1	10	Woburn Branch	Woburn Branch
4	10	Woburn Branch	Woburn Branch
7	13	Quincy Branch	Quincy Branch
13	16	So. NH Branch	So. NH Branch
18	16	So. NH Branch	So. NH Branch
24	16	So. NH Branch	So. NH Branch
28	16	So. NH Branch	So. NH Branch

10 rows in set (0.16 sec)

Exemplo 2

Condição de Junção e Filtros

JOIN Satement

```
SELECT cust_id, name
FROM business;
```

```
mysql> SELECT cust_id, name
    -> FROM business;
+---------+-----------------------+
| cust_id | name                  |
+---------+-----------------------+
|      10 | Chilton Engineering   |
|      11 | Northeast Cooling Inc. |
|      12 | Superior Auto Body    |
|      13 | AAA Insurance Inc.    |
+---------+-----------------------+
4 rows in set (0.01 sec)
```

JOIN Satement

```
SELECT cust_id, name
FROM customer;
```

```
mysql> SELECT cust_id
    -> FROM customer;

+---------+
| cust_id |
+---------+
|       1 |
|       2 |
|       3 |
|       4 |
|       5 |
|       6 |
|       7 |
|       8 |
|       9 |
|      10 |
|      11 |
|      12 |
|      13 |
+---------+
13 rows in set (0.02 sec)
```

JOIN Satement

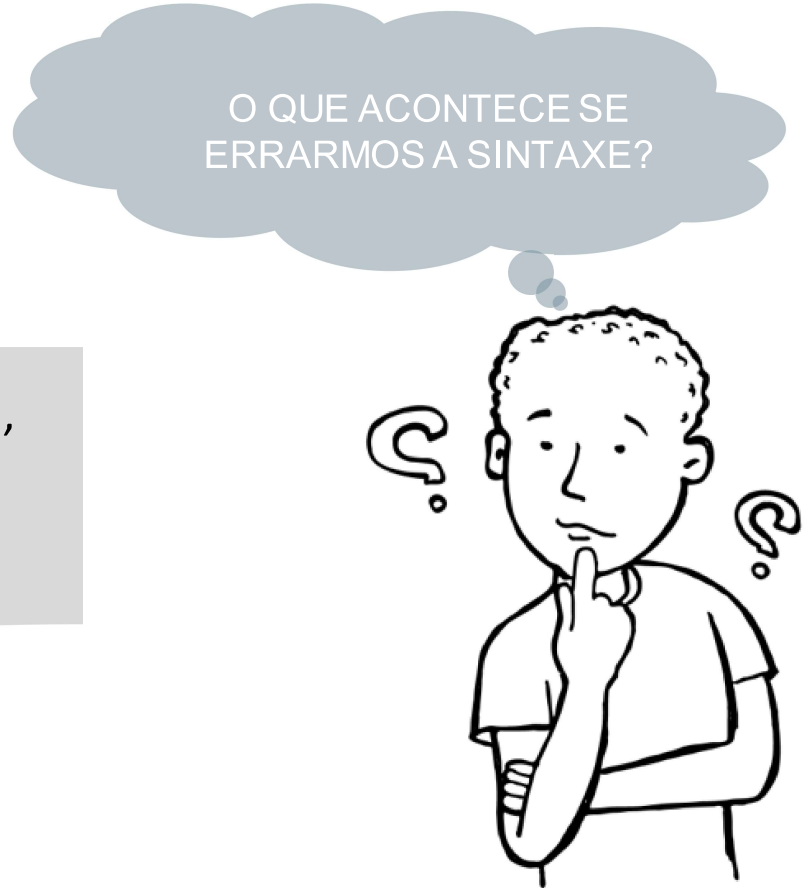
```
SELECT a.account_id, a.product_cd, c.fed_id,
FROM account a INNER customer c
  ON a.cust_id = c.cust_id
WHERE c.cust_type_cd = 'B';
```

account_id	product_cd	fed_id
24	CHK	04-1111111
25	BUS	04-1111111
27	BUS	04-2222222
28	CHK	04-3333333
29	SBL	04-4444444

5 rows in set (0.01 sec)

JOIN Satement

```
SELECT a.account_id, a.product_cd, c.fed_id,
FROM account a INNER customer c
  ON a.cust_id = c.cust_id
    AND c.cust_type_cd = 'B';
```



JOIN Statement

```
mysql> SELECT e.fname, e.lname, d.name
    -> FROM employee e JOIN department d;
+----------+-----------+----------------+
| fname    | lname     | name           |
+----------+-----------+----------------+
| Michael  | Smith     | Operations     |
| Michael  | Smith     | Loans          |
| Michael  | Smith     | Administration |
| Susan    | Barker    | Operations     |
| Susan    | Barker    | Loans          |
| Susan    | Barker    | Administration |
| Robert   | Tyler     | Operations     |
| Robert   | Tyler     | Loans          |
| Robert   | Tyler     | Administration |
| Susan    | Hawthorne | Operations     |
| Susan    | Hawthorne | Loans          |
| Susan    | Hawthorne | Administration |
...
```

SELECT e.fname, e.lname, d.name
FROM employee e **JOIN** department d

Hands On! **Projeto**

“Falar é fácil. Mostre-me o código!”

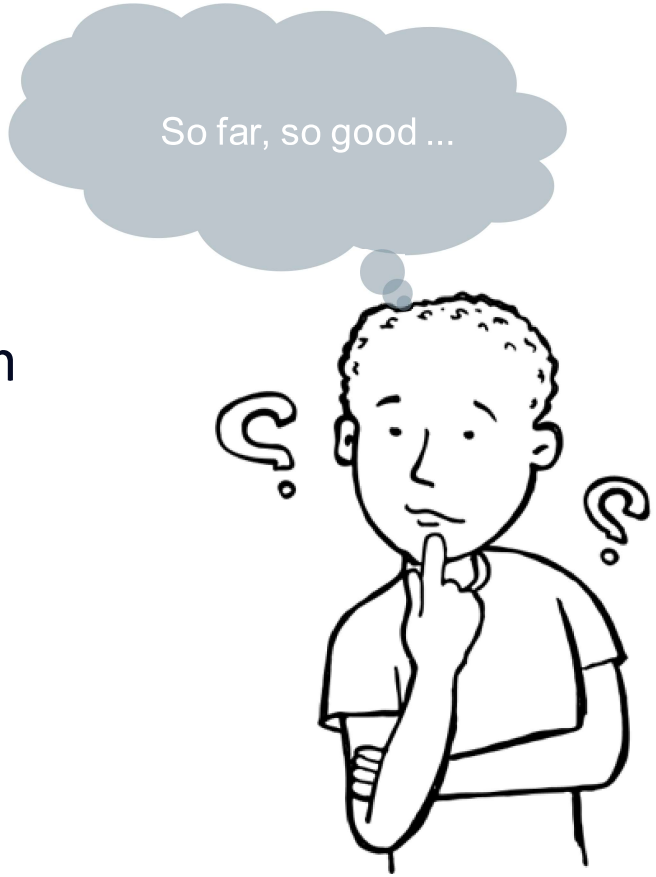
Linus Torvalds

Como utilizar o OUTER JOIN Statement?

OUTER JOIN

Linhas sem correspondencias não eram exibidas

Valores de ambas tabelas



[368]

OUTER JOIN

```
mysql> SELECT cust_id, name
    -> FROM business;
+---------+-----------------------+
| cust_id | name                  |
+---------+-----------------------+
|      10 | Chilton Engineering   |
|      11 | Northeast Cooling Inc. |
|      12 | Superior Auto Body    |
|      13 | AAA Insurance Inc.    |
+---------+-----------------------+
4 rows in set (0.01 sec)
```

```
mysql> SELECT cust_id
    -> FROM customer;

+---------+
| cust_id |
+---------+
|       1 |
|       2 |
|       3 |
|       4 |
|       5 |
|       6 |
|       7 |
|       8 |
|       9 |
|      10 |
|      11 |
|      12 |
|      13 |
+---------+
13 rows in set (0.02 sec)
```

[369]

OUTER JOIN

[370]

OUTER JOIN

```
mysql> SELECT cust_id, name
    -> FROM business;
+---------+-----------------------+
| cust_id | name                  |
+---------+-----------------------+
|      10 | Chilton Engineering   |
|      11 | Northeast Cooling Inc. |
|      12 | Superior Auto Body    |
|      13 | AAA Insurance Inc.    |
+---------+-----------------------+
4 rows in set (0.01 sec)
```

```
mysql> SELECT cust_id
    -> FROM customer;

+---------+
| cust_id |
+---------+
|       1 |
|       2 |
|       3 |
|       4 |
|       5 |
|       6 |
|       7 |
|       8 |
|       9 |
|      10 |
|      11 |
|      12 |
|      13 |
+---------+
13 rows in set (0.02 sec)
```

[371]

OUTER JOIN

Matchs nas tabelas

```
mysql> SELECT cust_id, name
    -> FROM business;
+---------+-----------------------+
| cust_id | name                  |
+---------+-----------------------+
|      10 | Chilton Engineering   |
|      11 | Northeast Cooling Inc. |
|      12 | Superior Auto Body    |
|      13 | AAA Insurance Inc.    |
+---------+-----------------------+
4 rows in set (0.01 sec)
```

```
mysql> SELECT cust_id
    -> FROM customer;

+---------+
| cust_id |
+---------+
|       1 |
|       2 |
|       3 |
|       4 |
|       5 |
|       6 |
|       7 |
|       8 |
|       9 |
|      10 |
|      11 |
|      12 |
|      13 |
+---------+
13 rows in set (0.02 sec)
```

O que acontece no OUTER JOIN?

[372]

OUTER JOIN

SELECT <atributes list>

FROM <table1> ft **OUTER JOIN** <table2> st

ON ft.commom_attibute =

st.commom_attribute

[373]

OUTER JOIN

SELECT Tabela de orientação

FROM <table1> ft **OUTER JOIN** <table2> st

ON ft.commom_attibute =

st.commom_attribute

OUTER JOIN

SELECT Tabela de orientação

FROM <table1> ft **OUTER** Condição de junção t

ON ft.commom_attibute =

st.commom_attribute

Hands On! **Projeto**

“Falar é fácil. Mostre-me o código!”

Linus Torvalds

Orientação em Queries
JOIN: LEFT e RIGHT JOIN

LEFT e RIGHT JOIN

CROSS JOIN

Tabela 1: 10 linhas

Tabela 2: 20 linhas

```
mysql> SELECT c.cust_id, b.name
    -> FROM customer c LEFT OUTER JOIN business b
    ->   ON c.cust_id = b.cust_id;
+---------+-----------------------+
| cust_id | name                  |
+---------+-----------------------+
|       1 | NULL                  |
|       2 | NULL                  |
|       3 | NULL                  |
|       4 | NULL                  |
|       5 | NULL                  |
|       6 | NULL                  |
|       7 | NULL                  |
|       8 | NULL                  |
|       9 | NULL                  |
|      10 | Chilton Engineering   |
|      11 | Northeast Cooling Inc. |
|      12 | Superior Auto Body    |
|      13 | AAA Insurance Inc.    |
+---------+-----------------------+
13 rows in set (0.00 sec)
```

Hands On! **Projeto**

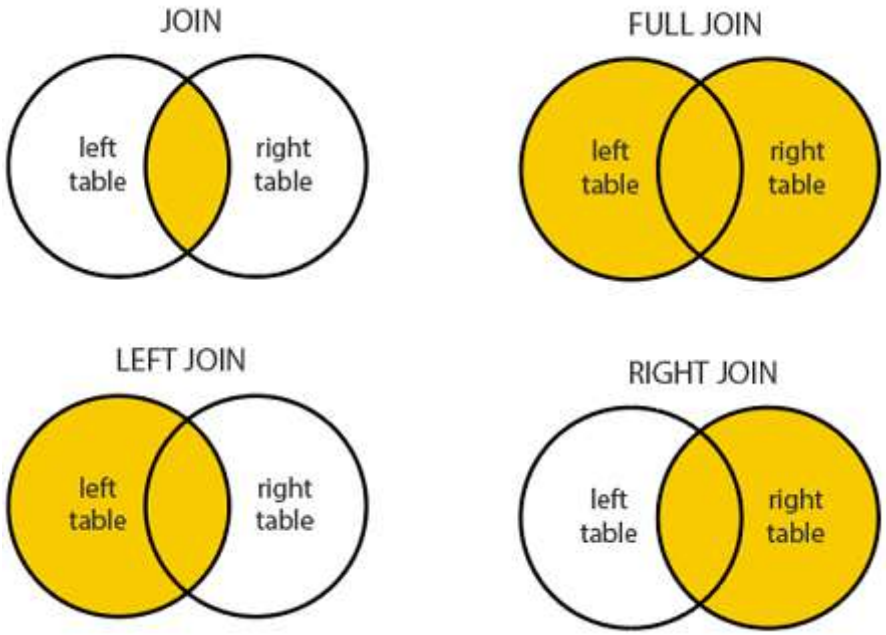
“Falar é fácil. Mostre-me o código!”

Linus Torvalds

Entendendo melhor os tipos de JOINs

INNER ou OUTER JOIN?

A tabela referenciada modifica o resultado da query

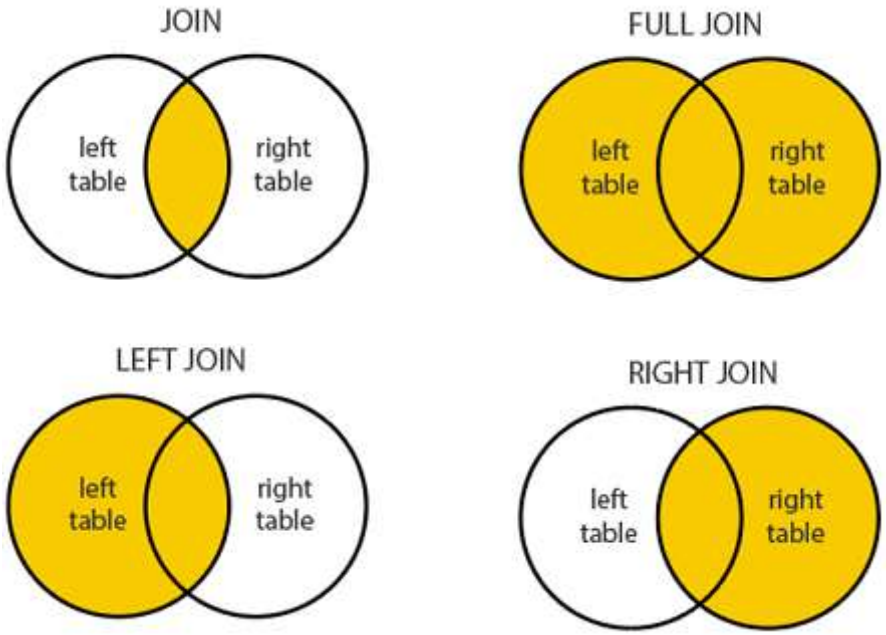


Fonte: dofactory.com

INNER ou OUTER JOIN?

A tabela referenciada modifica o resultado da query

Só usa com OUTER JOIN?



Fonte: dofactory.com

Diferenças

INNER JOIN	FULL OUTER JOIN
JOIN	FULL OUTER JOIN
LEFT JOIN	LEFT OUTER JOIN
RIGTH JOIN	RIGHT OUTER JOIN

Diferenças

INNER JOIN		FULL OUTER JOIN
JOIN		FULL OUTER JOIN
LEFT JOIN	=	LEFT OUTER JOIN
RIGTH JOIN		RIGHT OUTER JOIN

Diferenças

INNER JOIN	FULL OUTER JOIN
JOIN (Interseção)	FULL OUTER JOIN (Matchs)
LEFT JOIN	LEFT OUTER JOIN
RIGTH JOIN	RIGHT OUTER JOIN

INNER ou OUTER JOIN?

LEFT JOIN

Everything on the left
+
anything on the right that matches

```
SELECT *
FROM TABLE_1
LEFT JOIN TABLE_2
ON TABLE_1.KEY = TABLE_2.KEY
```

ANTI LEFT JOIN

Everything on the left
that is NOT on the right

```
SELECT *
FROM TABLE_1
LEFT JOIN TABLE_2
ON TABLE_1.KEY = TABLE_2.KEY
WHERE TABLE_2.KEY IS NULL
```

RIGHT JOIN

Everything on the right
+
anything on the left that matches

```
SELECT *
FROM TABLE_1
RIGHT JOIN TABLE_2
ON TABLE_1.KEY = TABLE_2.KEY
```

ANTI RIGHT JOIN

Everything on the right
that is NOT on the left

```
SELECT *
FROM TABLE_1
RIGHT JOIN TABLE_2
ON TABLE_1.KEY = TABLE_2.KEY
WHERE TABLE_1.KEY IS NULL
```

OUTER JOIN

Everything on the right
+
Everything on the left

```
SELECT *
FROM TABLE_1
OUTER JOIN TABLE_2
ON TABLE_1.KEY = TABLE_2.KEY
```

ANTI OUTER JOIN

Everything on the left and right
that is unique to each side

```
SELECT *
FROM TABLE_1
OUTER JOIN TABLE_2
ON TABLE_1.KEY = TABLE_2.KEY
WHERE TABLE_1.KEY IS NULL
OR TABLE_2.KEY IS NULL
```

INNER JOIN

Only the things that match on the
left AND the right

```
SELECT *
FROM TABLE_1
INNER JOIN TABLE_2
ON TABLE_1.KEY = TABLE_2.KEY
```

CROSS JOIN

All combination of rows from the
right and the left (cartesean
product)

```
SELECT *
FROM TABLE_1
CROSS JOIN TABLE_2
```

Fonte: https://towardsdatascience.com/

Diferenças

INNER JOIN	FULL OUTER JOIN
JOIN	**FULL OUTER JOIN**
LEFT JOIN	LEFT OUTER JOIN
RIGTH JOIN	RIGHT OUTER JOIN

CROSS JOIN

&

Diferenças

CROSS JOIN & **FULL OUTER JOIN**

Tabela 1: 10 linhas

Tabela 2: 20 linhas

Diferenças

CROSS JOIN & **FULL OUTER JOIN**

Tabela 1: 10 linhas

Tabela 2: 20 linhas

CROSS JOIN: 10*20 = 200 linhas

Diferenças

CROSS JOIN & **FULL OUTER JOIN**

Tabela 1: 10 linhas

Tabela 2: 20 linhas

CROSS JOIN: 10*20 = 200 linhas

5 linhas como combinação

Diferenças

CROSS JOIN & **FULL OUTER JOIN**

Tabela 1: 10 linhas

Tabela 2: 20 linhas

INNER JOIN: interseção = 5 linhas

5 linhas como combinação

Diferenças

CROSS JOIN & **FULL OUTER JOIN**

Tabela 1: 10 linhas

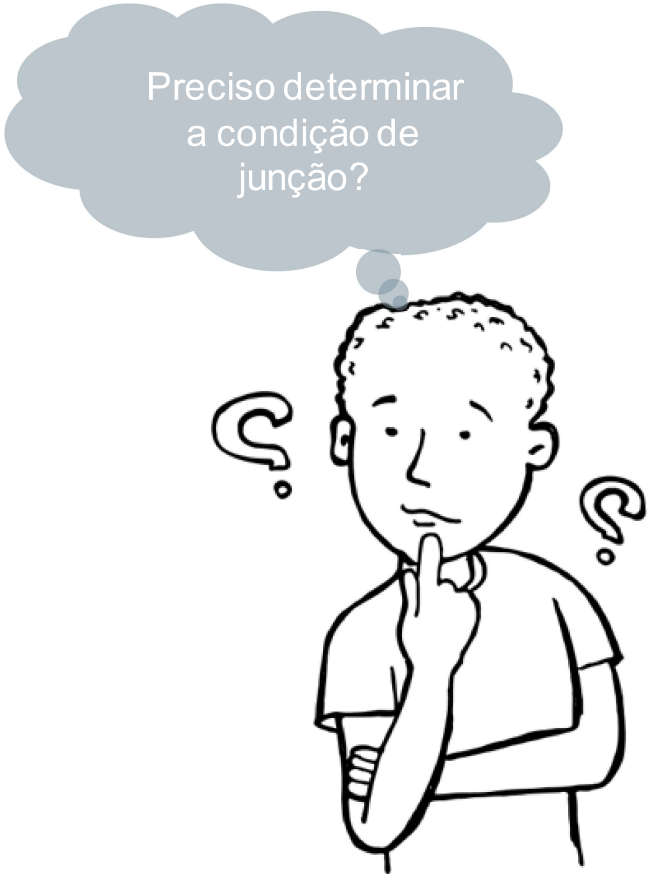
Tabela 2: 20 linhas

FULL OUTER JOIN: combinação = 25 linhas

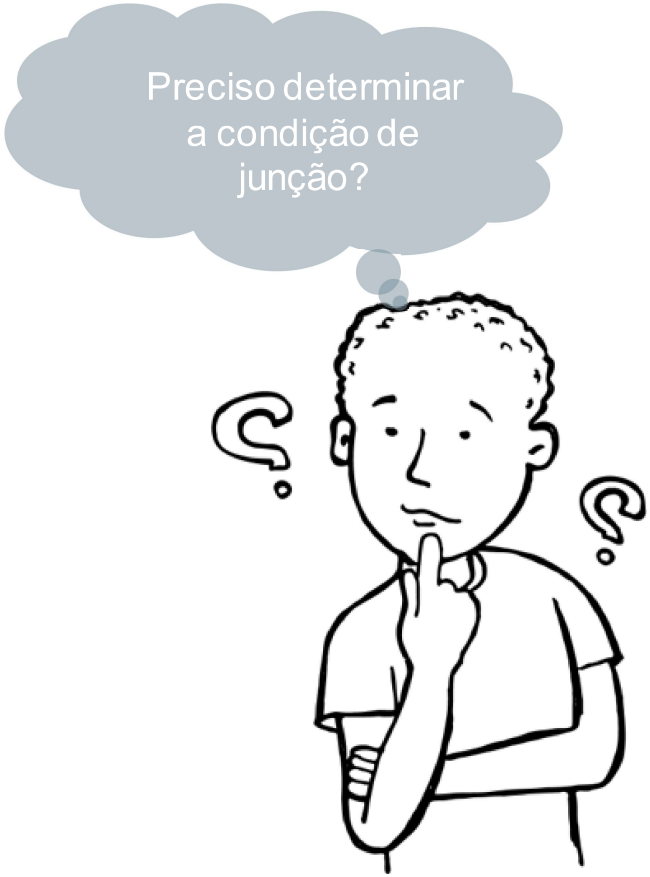
5 linhas como combinação

Explorando ainda mais: NATURAL JOIN

NATURAL JOIN



NATURAL JOIN



- NATURAL JOIN entre R & S
- Condição de junção implícita
- Atributos comuns

NATURAL JOIN

- NATURAL JOIN entre R & S
- Condição de junção implícita
- Atributos comuns

Atributo com mesmo nome

EMPLOYEE.**Dno** = DEPT.**Dno**

```
SELECT   Fname, Lname, Address
FROM     (EMPLOYEE NATURAL JOIN
         (DEPARTMENT AS DEPT (Dname, Dno, Mssn, Msdate)))
WHERE    Dname = 'Research';
```

[396]

NATURAL JOIN

Atributo com mesmo nome

EMPLOYEE.**Dno** = DEPT.**Dno**

SELECT a.account_id, a.cust_id,
c.cust_type_cd, c.fed_id
FROM account a **NATURAL JOIN** customer c;

account_id	cust_id	cust_type_cd	fed_id
1	1	I	111-11-1111
2	1	I	111-11-1111
3	1	I	111-11-1111
4	2	I	222-22-2222
5	2	I	222-22-2222
6	3	I	333-33-3333
7	3	I	333-33-3333
8	4	I	444-44-4444
9	4	I	444-44-4444
10	4	I	444-44-4444

NATURAL JOIN

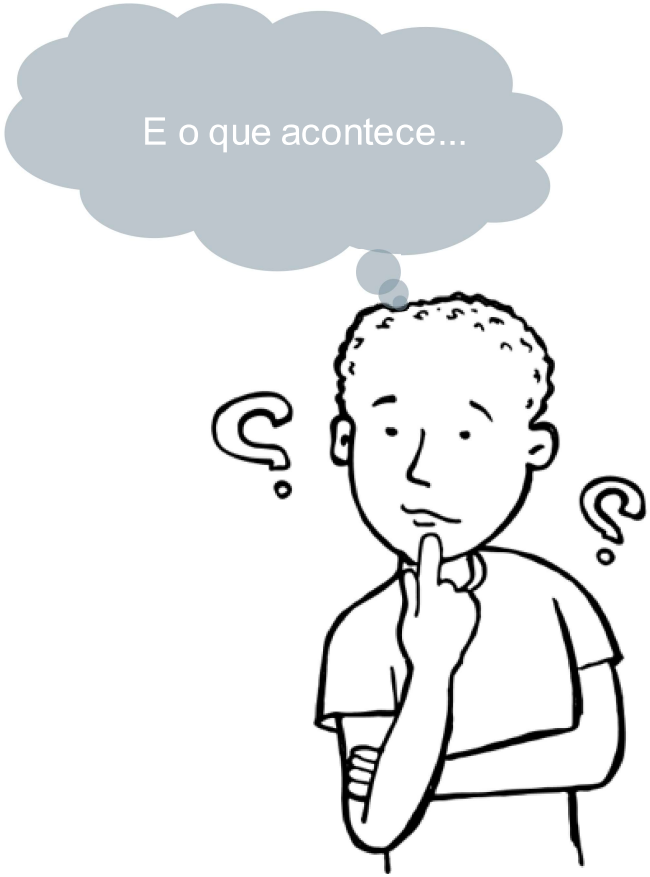
Atributo com mesmo nome

EMPLOYEE.**Dno** = DEPT.**Dno**

account_id	cust_id	cust_type_cd	fed_id
1	1	I	111-11-1111
2	1	I	111-11-1111
3	1	I	111-11-1111
4	2	I	222-22-2222
5	2	I	222-22-2222
6	3	I	333-33-3333
7	3	I	333-33-3333
8	4	I	444-44-4444
9	4	I	444-44-4444
10	4	I	444-44-4444
11	5	I	555-55-5555
12	6	I	666-66-6666
13	6	I	666-66-6666
14	7	I	777-77-7777
15	8	I	888-88-8888
16	8	I	888-88-8888
17	9	I	999-99-9999
18	9	I	999-99-9999
19	9	I	999-99-9999
20	10	B	04-1111111
21	10	B	04-1111111
22	11	B	04-2222222
23	12	B	04-3333333
24	13	B	04-4444444

24 rows in set (0.02 sec)

NATURAL JOIN



Se se não houver atributos com mesmo nome?

Hands On! **Projeto**

“Falar é fácil. Mostre-me o código!”

Linus Torvalds

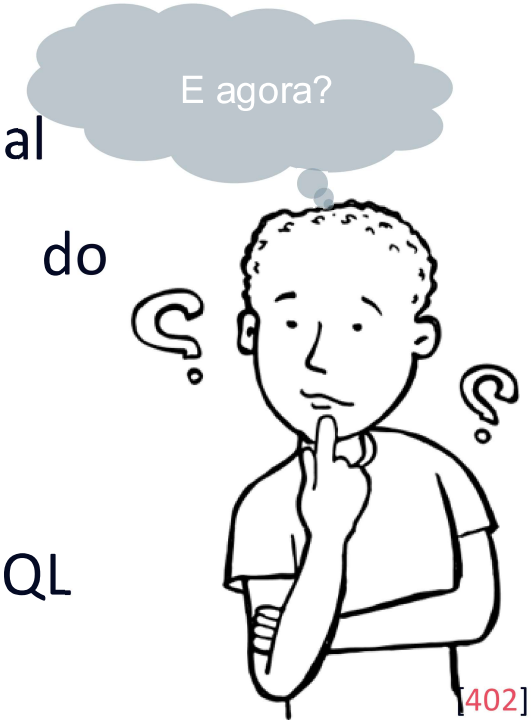
DESAFIO DE PROJETO

Construindo seu Primeiro Projeto Lógico de BD

// Explorando a Linguagem de Consulta a Banco de Dados SQL

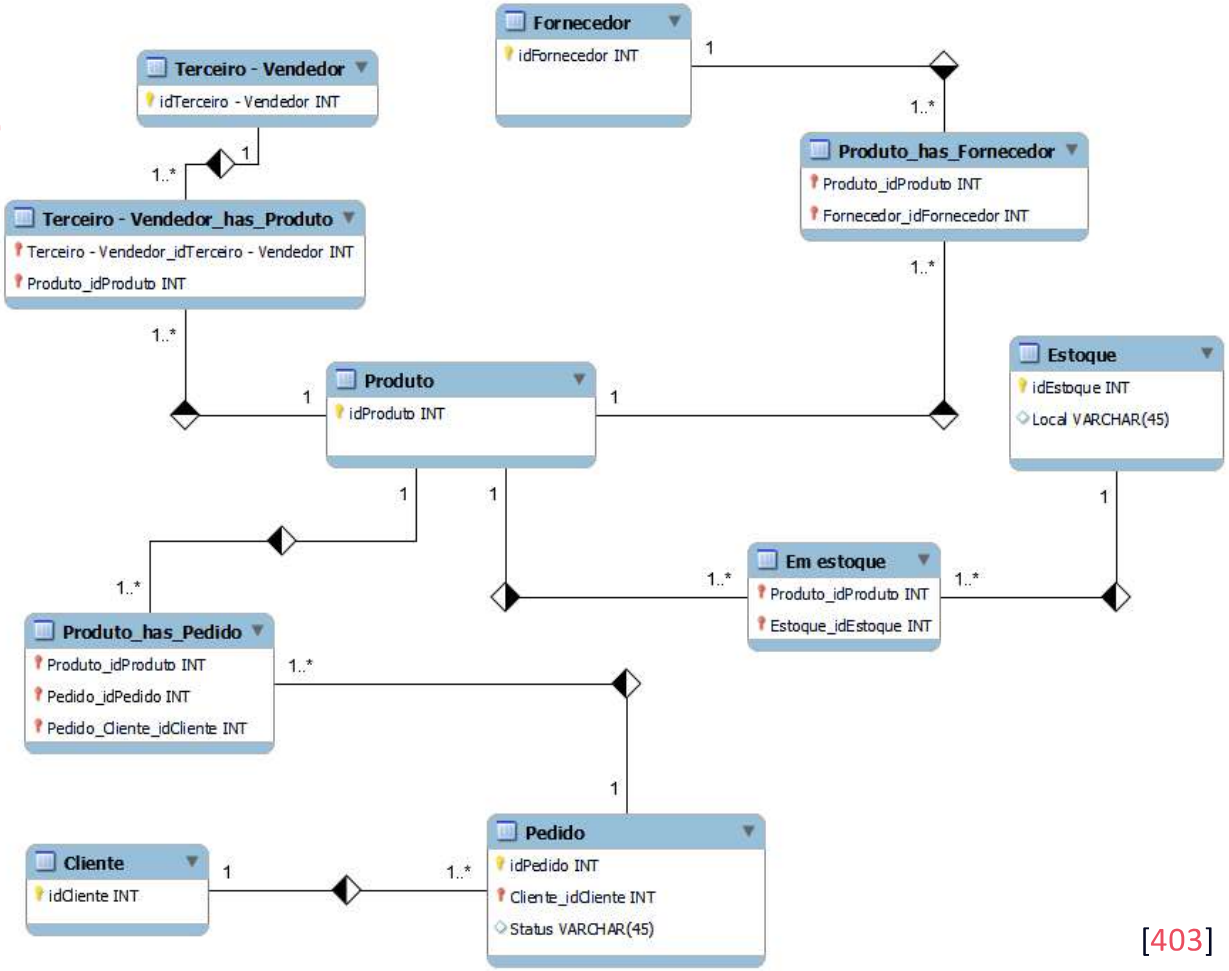
Desafio de Projeto

1. Mapeamento do esquema ER para Relacional
2. Definição do script SQL para criação do esquema de banco de dados
3. Persistência de dados para testes
4. Recuperação de informações com queries SQL



[402]

E-commerce


Fornecedor
idFornecedor INT
Terceiro - Vendedor
idTerceiro - Vendedor INT
Produto_has_Fornecedor
Produto_idProduto INT
Fornecedor_idFornecedor INT
Terceiro - Vendedor_has_Produto
Terceiro - Vendedor_idTerceiro - Vendedor INT
Produto_idProduto INT
Produto
idProduto INT
Estoque
idEstoque INT
Local VARCHAR(45)
Em estoque
Produto_idProduto INT
Estoque_idEstoque INT
Produto_has_Pedido
Produto_idProduto INT
Pedido_idPedido INT
Pedido_Cliente_idCliente INT
Cliente
idCliente INT
Pedido
idPedido INT
Cliente_idCliente INT
Status VARCHAR(45)
1
1..*

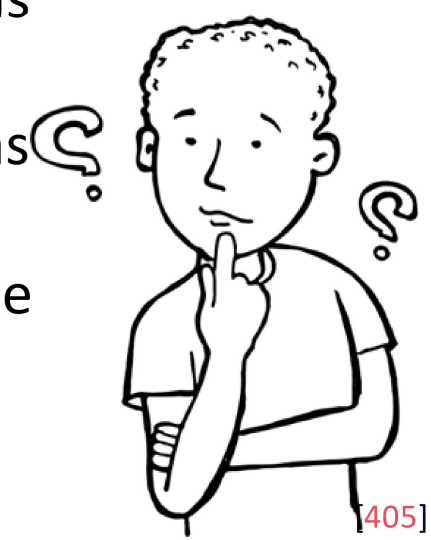
DESAFIO DE PROJETO

Entendendo o Desafio

// Explorando a Linguagem de Consulta a Banco de Dados SQL

Desafio de Projeto - Diretrizes

- Não há um mínimo de queries a serem realizadas
- Os tópicos supracitados devem estar presentes nas queries
- Elabore perguntas que podem ser respondidas pelas consultas
- As cláusulas podem estar presentes em mais de uma query



[405]

Desafio de Projeto - Diretrizes

Após a criação do esquema lógico, realize a criação do Script SQL para criação do esquema do banco de dados. Posteriormente, realize a persistência de dados para realização de testes. Especifique ainda queries mais complexas do que apresentadas durante a explicação do desafio.

[406]

Desafio de Projeto - Diretrizes

Sendo assim, crie queries SQL com as cláusulas abaixo:

- Recuperações simples com SELECT Statement
- Filtros com WHERE Statement
- Crie expressões para gerar atributos derivados
- Defina ordenações dos dados com ORDER BY
- Condições de filtros aos grupos – HAVING Statement
- Crie junções entre tabelas para fornecer uma perspectiva mais complexa dos dados

[407]

DESAFIO DE PROJETO

Construindo um Projeto Lógico de BD do zero

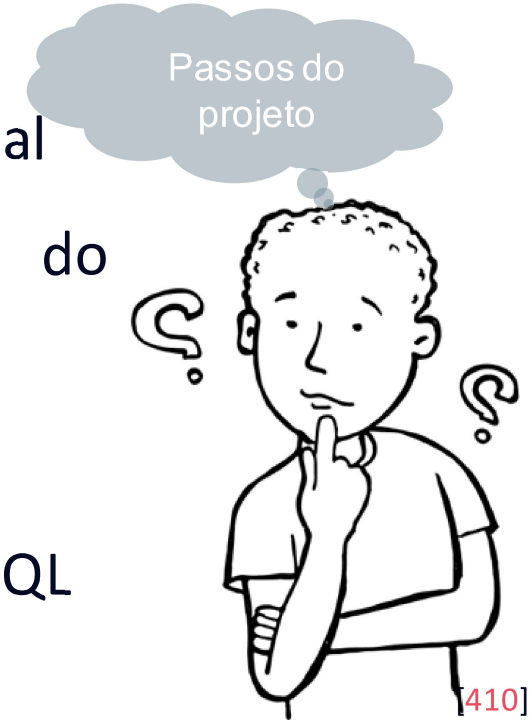
// Explorando a Linguagem de Consulta a Banco de Dados SQL

Desafio - Oficina

Agora você irá criar um esquema lógico a partir do esquema conceitual que criou para o cenário de uma oficia. Utilize o algoritmo de mapeamento apresentado para determinar qual a melhor opção para mapear seus componentes para modelo relacional. Pense que posteriormente você irá criar o esquema do banco de dados com base neste esquema lógico.

Desafio de Projeto

1. Mapeamento do esquema ER para Relacional
2. Definição do script SQL para criação do esquema de banco de dados
3. Persistência de dados para testes
4. Recuperação de informações com queries SQL



[410]

Desafio de Projeto - Diretrizes

- Não há um mínimo de queries a serem realizadas
- Os tópicos supracitados devem estar presentes nas queries
- Elabore perguntas que podem ser respondidas pelas consultas
- As cláusulas podem estar presentes em mais de uma query

[411]

Referências Bibliográficas

Dúvidas?

> Fórum/Artigos

> Comunidade Online (Discord)

SCAN ME

Para saber mais

Livros de Referência

- ELMASRI, Ramez; B. NAVATHE, Shamkant. **Sistema de Banco de Dados**. 7. ed. São Paulo: Pearson, 2018.

Livros complementares

- RODZVILLA, John. A Review of "**Learning SQL**" Beaulieu, Alan. Sebastapol, CA: O'Reilly, 2009, 320 pp., $39.99, ISBN 978-0-596-52083-0. 2010.

- TEOREY, Toby J. **Database modeling and design**. Morgan Kaufmann, 1999.

- NIELD, Thomas. **Getting Started with SQL: A Hands-On Approach for Beginners**. " O'Reilly Media, Inc.", 2016.

Links Úteis

Documentação Oficial

- Documentação: http://dev.mysql.com/doc/
- Download: http://dev.mysql.com/downloads/
- Site oficial : http://www.mysql.com/
- Suporte: http://www.mysql.com/support/

- https://dev.mysql.com/doc/refman/8.0/en/preface.html

Links Úteis

https://support.microsoft.com/pt-br/office/acesso-sql-conceitos-b%C3%A1sicos-vocabul%C3%A1rio-e-sintaxe-444d0303-cde1-424e-9a74-e8dc3e460671#:~:text=SQL%20cl%C3%A1usulas,as%20cl%C3%A1usulas%20SQL%20mais%20comuns.

https://www.analyticsvidhya.com/blog/2020/11/guide-data-types-mysql-data-science-beginners/#:~:text=LONGTEXT%20can%20store%20the%20maximum,any%20long%2Dform%20text%20strings.

https://dev.mysql.com/doc/refman/8.0/en/create-database.html

https://www.digitalocean.com/community/tutorials/how-to-create-a-new-user-and-grant-permissions-in-mysql

https://basedosdados.org/dataset/br-me-caged?bdm_table=microdados_antigos

Links Úteis

https://docs.microsoft.com/pt-br/sql/relational-databases/tables/add-columns-to-a-table-database-engine?view=sql-server-ver16

https://www.mysqltutorial.org/mysql-primary-key/#:~:text=Because%20MySQL%20works%20faster%20with,that%20the%20table%20may%20have .

https://www.c-sharpcorner.com/article/the-complete-reference-set-operations-in-ms-sql-union-all-intersect-excep/#:~:text=UNION%20ALL%20combines%20two%20or,in%20the%20second%20result%20set.

https://dotnettutorials.net/lesson/differences-between-union-except-and-intersect-operators-in-sql-server/#:~:text=UNION%20ALL%3A%20Combine%20two%20or,no%20matching%20to%20each%20other)

Dúvidas?

> Fórum/Artigos

> Comunidade Online (Discord)

SCAN ME