

Representação de Dados e Modelo Lógico

Banco de Dados: Teoria e Prática

André Santanchè e Patrícia Cavoto
Instituto de Computação - UNICAMP
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Representação de Dados e XML

Bancos de Dados

(diversos slides e parte da estrutura desta apresentação foram derivados e adaptados a partir dos slides sobre Representação de Dados e XML de Luiz Celso Gomes-Jr)

Luiz Celso Gomes-Jr
gomesjr@dainf.ct.utfpr.edu.br

Exercício 1: Nota Fiscal



Green Leaf Design
111 Main Street
Pleasanton, CA 99999
555.555.4444
info@greenleafdesign.com

INVOICE

Invoice : 00016
Date: 03/11/2009
Due Date: 04/10/2009
Balance Due \$: 1,937.01
Customer PO#:

Bill To:
Aqua Hotel and Resort
1040 Boulevard
Anytown, CA 94558
555-555-2222 (Phone)
555-555-2225 (Fax)

Ship To:
Aqua Hotel and Resort
1040 Boulevard
Anytown, CA 94558
555-555-2222 (Phone)

Shipment Details:
Carrier: USPS
Method: Overnight Priority
Tracking#: w126a5s4321sas
Ship Date: 03/02/2009

Item	Price (\$)	Unit	Qty	Total (\$)	Tax
Design Services - Business System Includes logo, layout for letterhead, 2nd sheet, A10 envelope, and business card	3,500.00	project	1	3,500.00	8.25%
Design Services - Additional Concepts includes thumbnail sketches for one additional concept	125.00	each	1	125.00	8.25%

Pre-tax Total: 3,625.00

Tax: 299.06

Shipping: 12.95

Total: 3,937.01

Payments: -2,000.00

Balance (\$): 1,937.01

Notes

Thanks for the work! Art hard copies and CD mailed to printer per instructions.

Terms and Conditions

Balance Due Net 30 days.

- Considere o modelo de nota fiscal ao lado. Proponha um formato de armazenamento para representá-la.

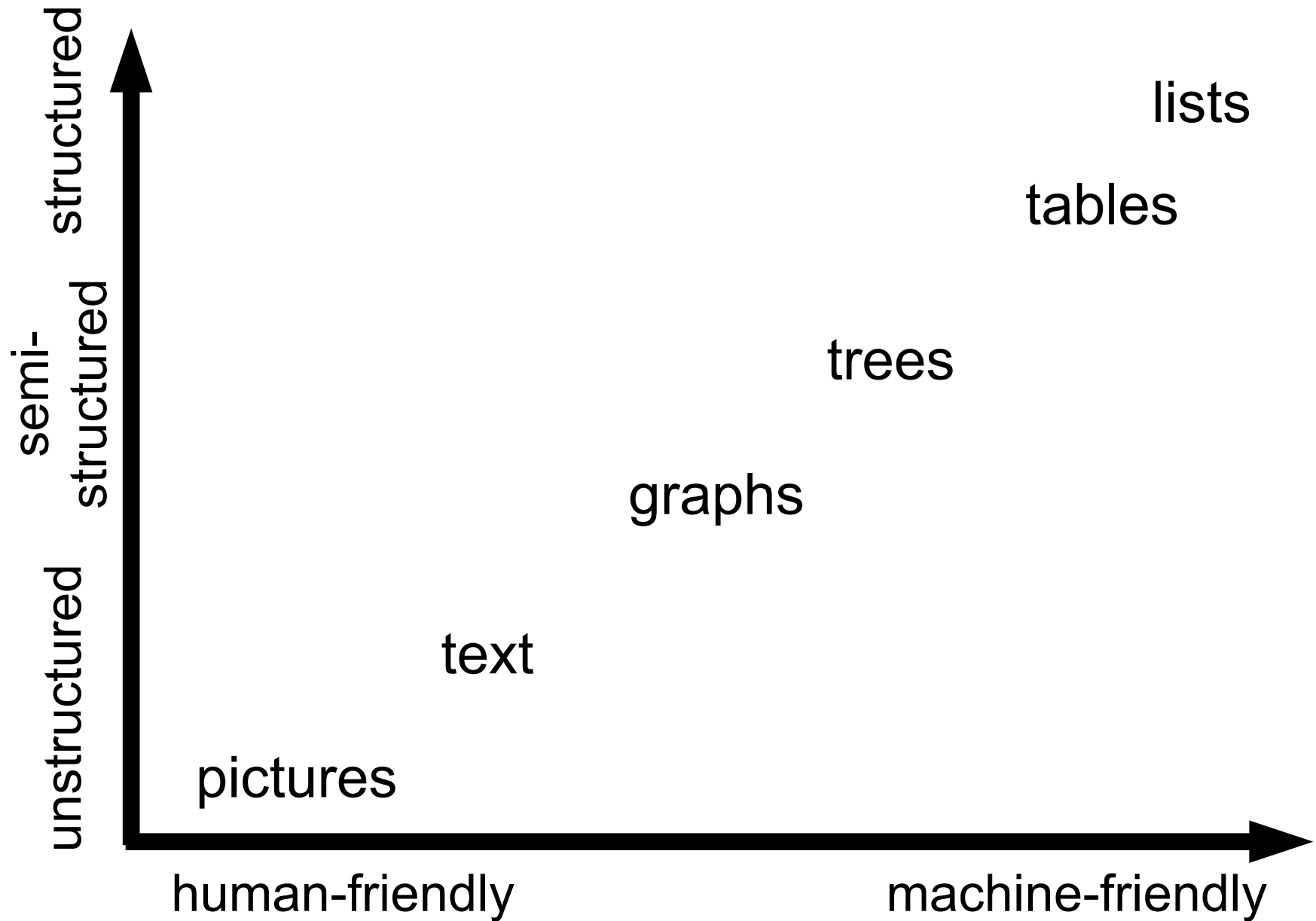
Fonte: WorkPoint

<http://www.workingpoint.com/features/invoicing>

Representando Dados

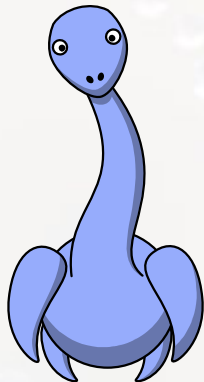
- Antes da invenção do computador, a grande maioria dos dados eram representados em papel
- No papel, **texto, figuras, tabelas**, etc. são representados com tinta e cabe ao leitor identificar os diferentes elementos e entender o conteúdo
- No computador, precisamos saber de antemão com que **tipo de dados** estamos lidando para representá-los adequadamente

Processando Dados



Models to Describe

Describing Prehistoric Animals



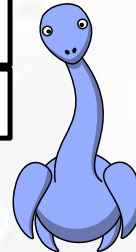
MNHN A. C. 8592

Is a	Plesiosaurus dolichodeirus	
Origin	Lyme Regis	England
Recognized	1824	
Size	5	

Describing Prehistoric Animals



SIPB R 90		
Is a	Plesiosaurus dolichodeirus	
Origin	Lyme Regis	England
Recognized	1830	
Size	5	



STC223		
Is a	Plesiosaurus gurgitis	
Origin	St. Croix	Switzerland
Recognized	1964	
Size	3.5	



MNHN 1912.20		
Is a	Triceratops horridus	
Origin	Lance Creek	EUA
Recognized	1889	
Size	9	



Sue

FMNH PR2081		
Is a	Tyrannosaurus rex	
Origin	Hell Creek	EUA
Recognized	1990	
Size	12.3	

Table

Id	Is a	Origin Place	Origin Country	Recognized	Size
MNHN A. C. 8592	Plesiosaurus dolichodeirus	Lyme Regis	England	1824	5
SIPB R 90	Plesiosaurus dolichodeirus	Lyme Regis	England	1830	5
STC223	Plesiosaurus gurgitis	St. Croix	Switzerland	1964	3.5
MNHN 1912.20	Triceratops horridus	Lance Creek	EUA	1889	9
FMNH PR2081	Tyrannosaurus rex	Hell Creek	EUA	1990	12.3

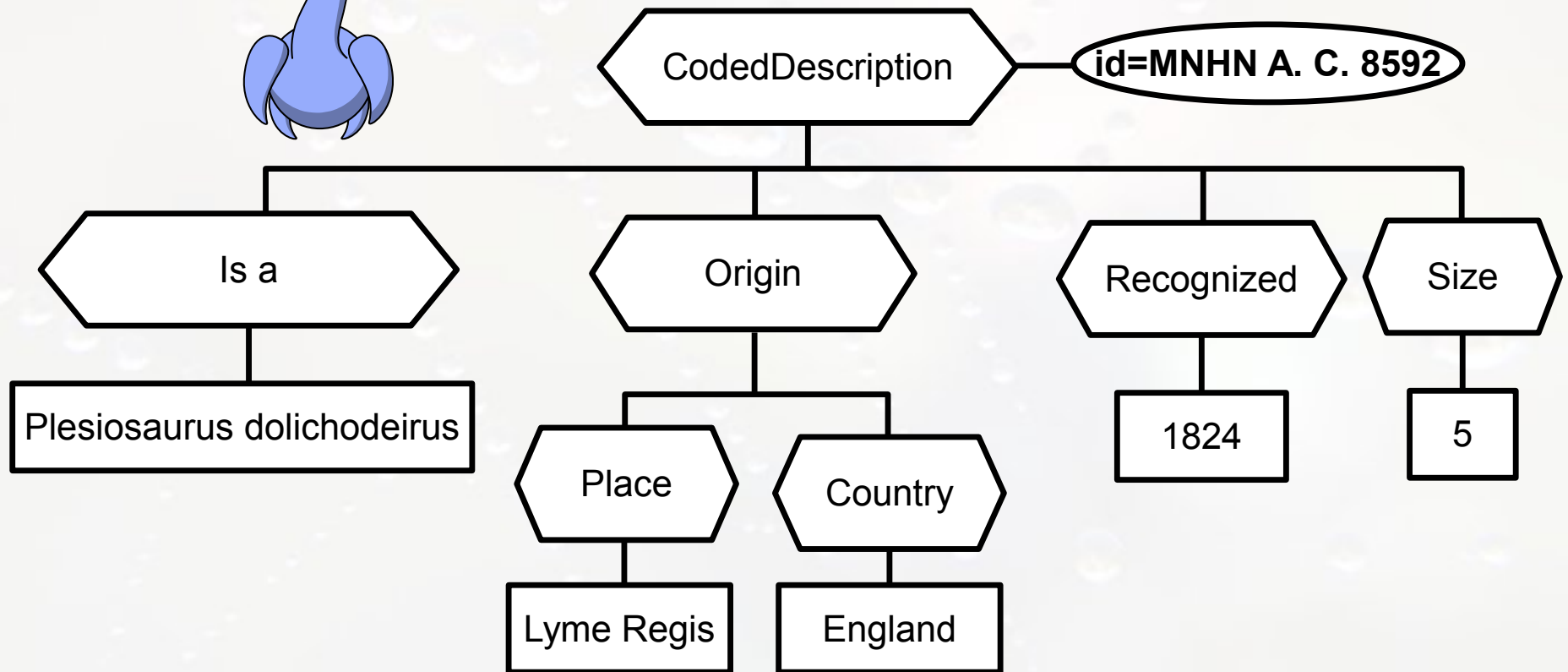
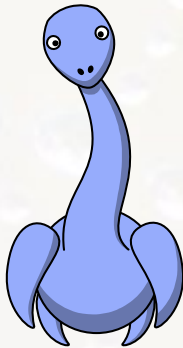


Table

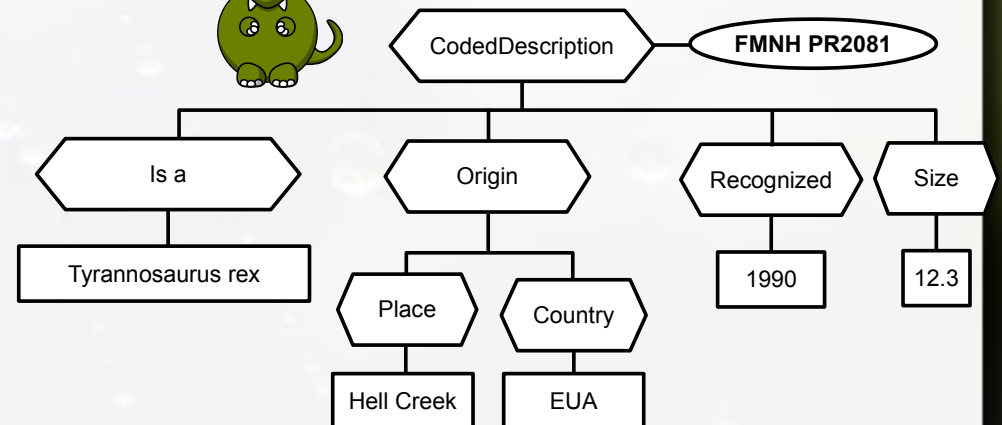
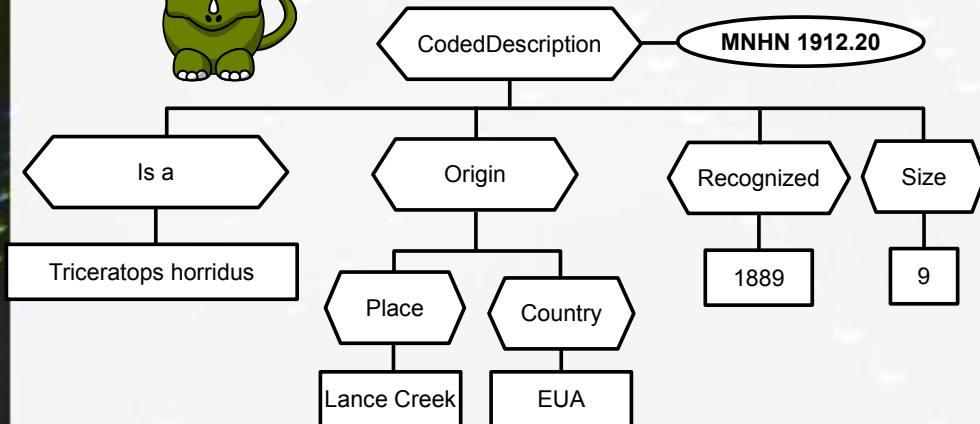
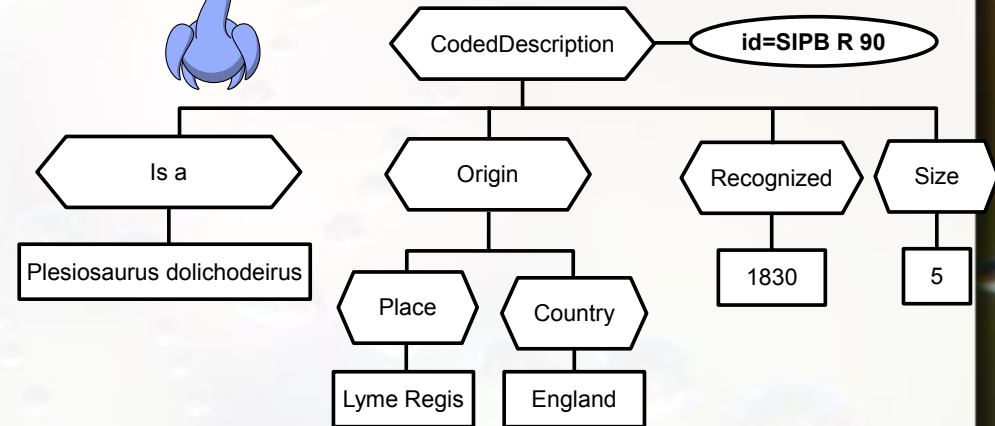
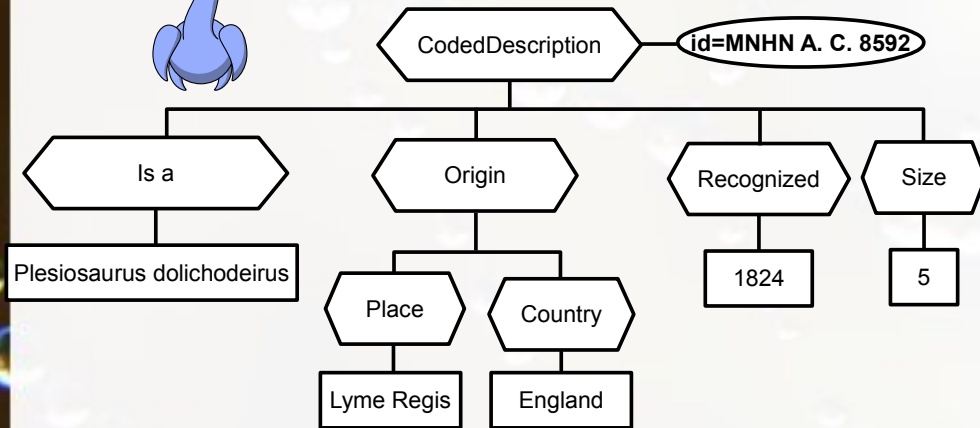
Excellent to Manage Data with
Predictable Static Schema

Sharing?

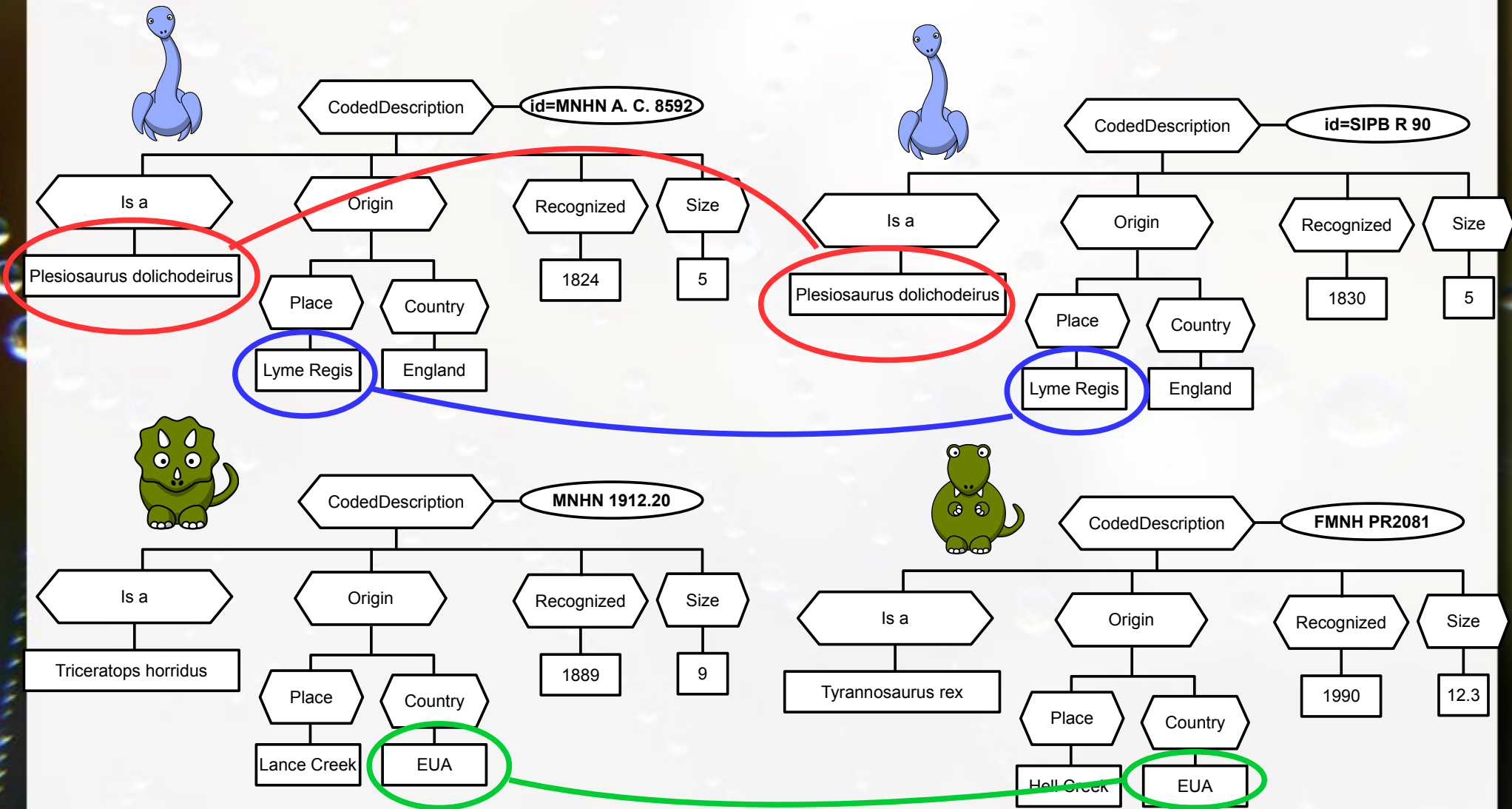
Documents and XML



Documents and XML



Documents and XML



Estruturado x Semi-estruturado

- Estruturado

- formato estrito
 - e.g., modelo relacional
- cada registro segue o mesmo formato

(Elmasri, 2010)

- Semi-estruturado

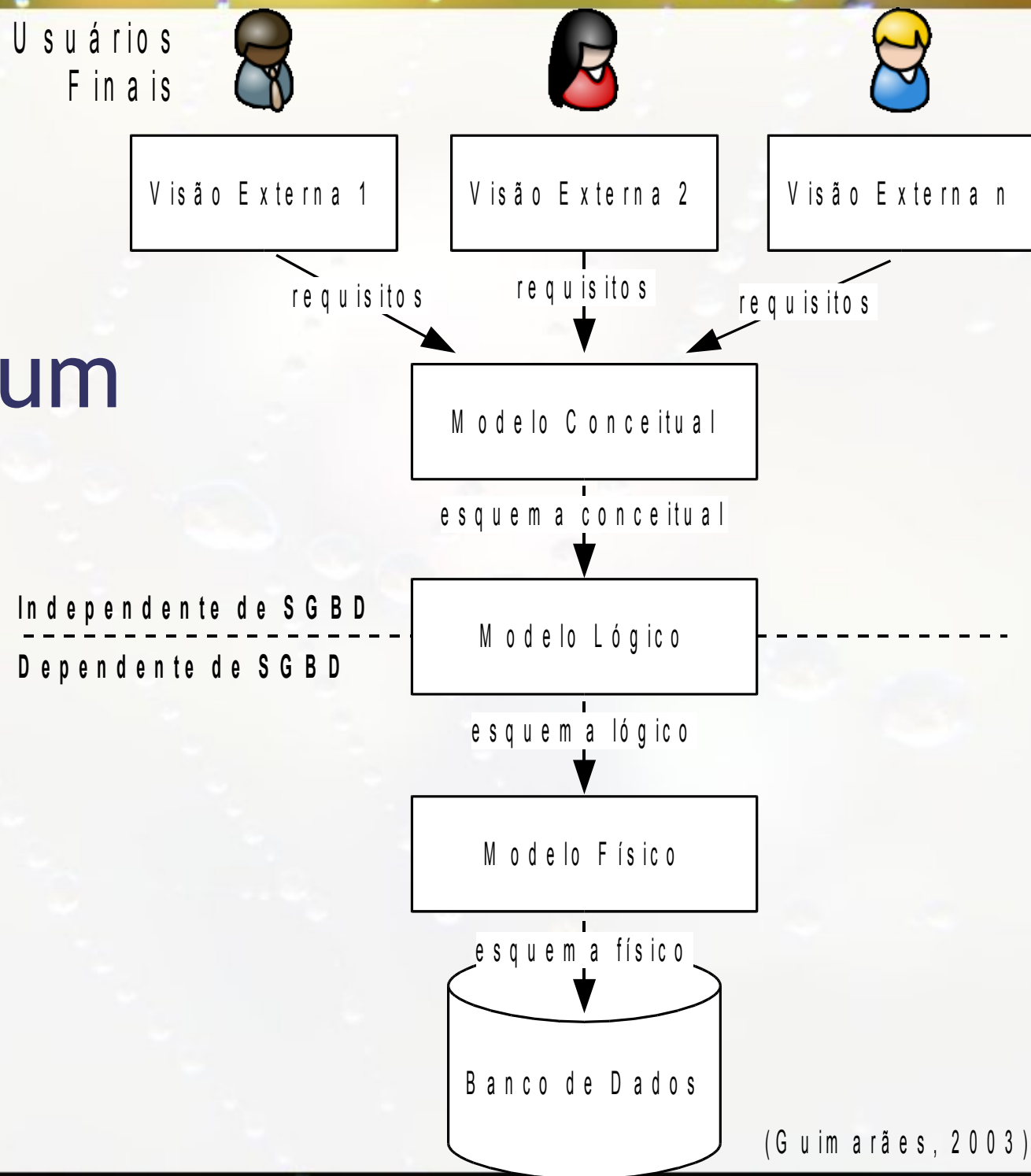
- itens de dados podem ter estruturas variadas
- grupos de itens compartilham estruturas

Processando Dados

- Quanto mais “organizados” (estruturados) os dados, mais simples é o processamento
- Exemplo de dados **estruturados**: listas, tabelas, matrizes
- Exemplo de dados **não-estruturados**: texto, imagens, sons
- Exemplo de dados **semiestruturados**: árvores, grafos

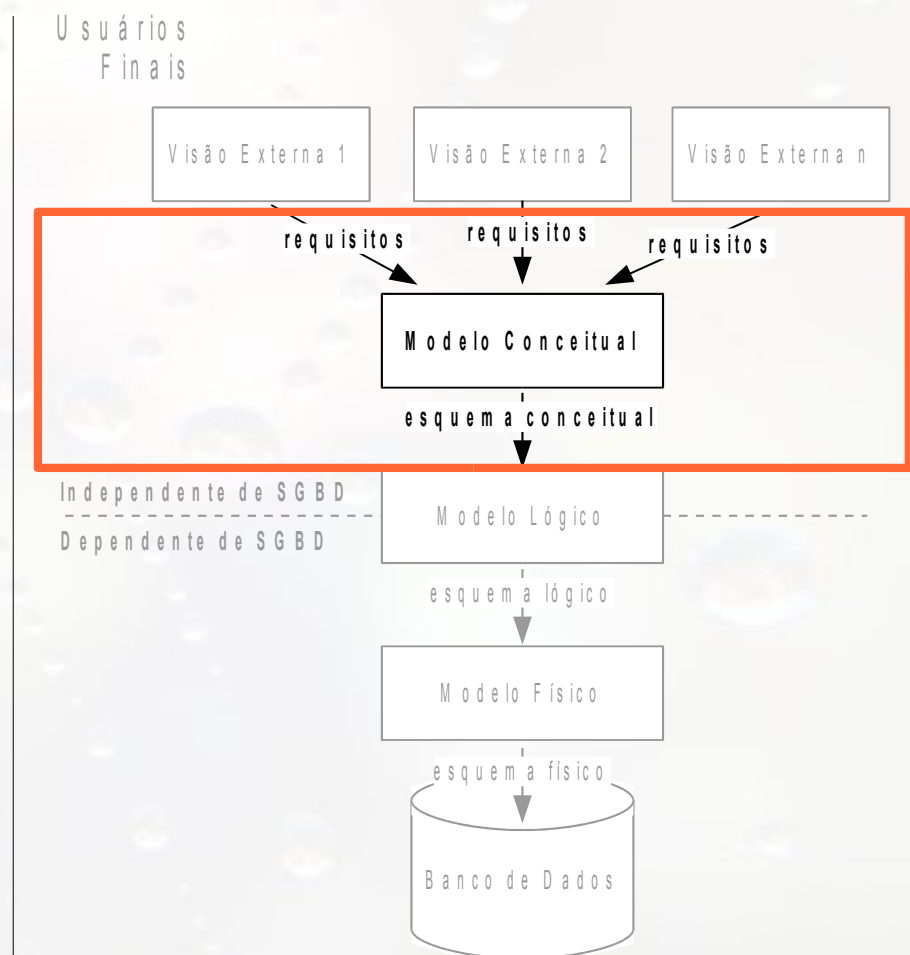
Recapitulando

Projeto de um BD

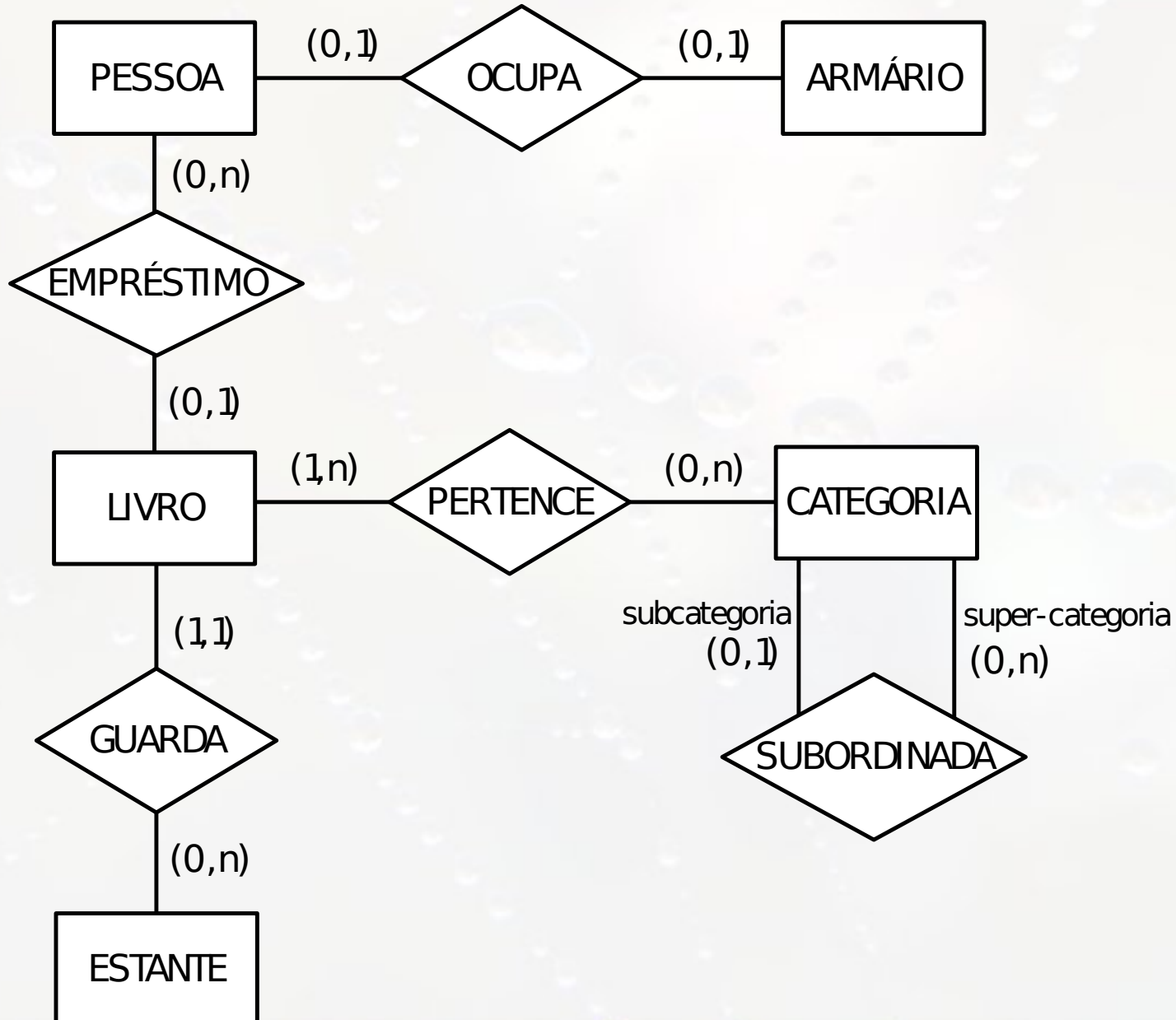


Modelo/Esquema Conceitual

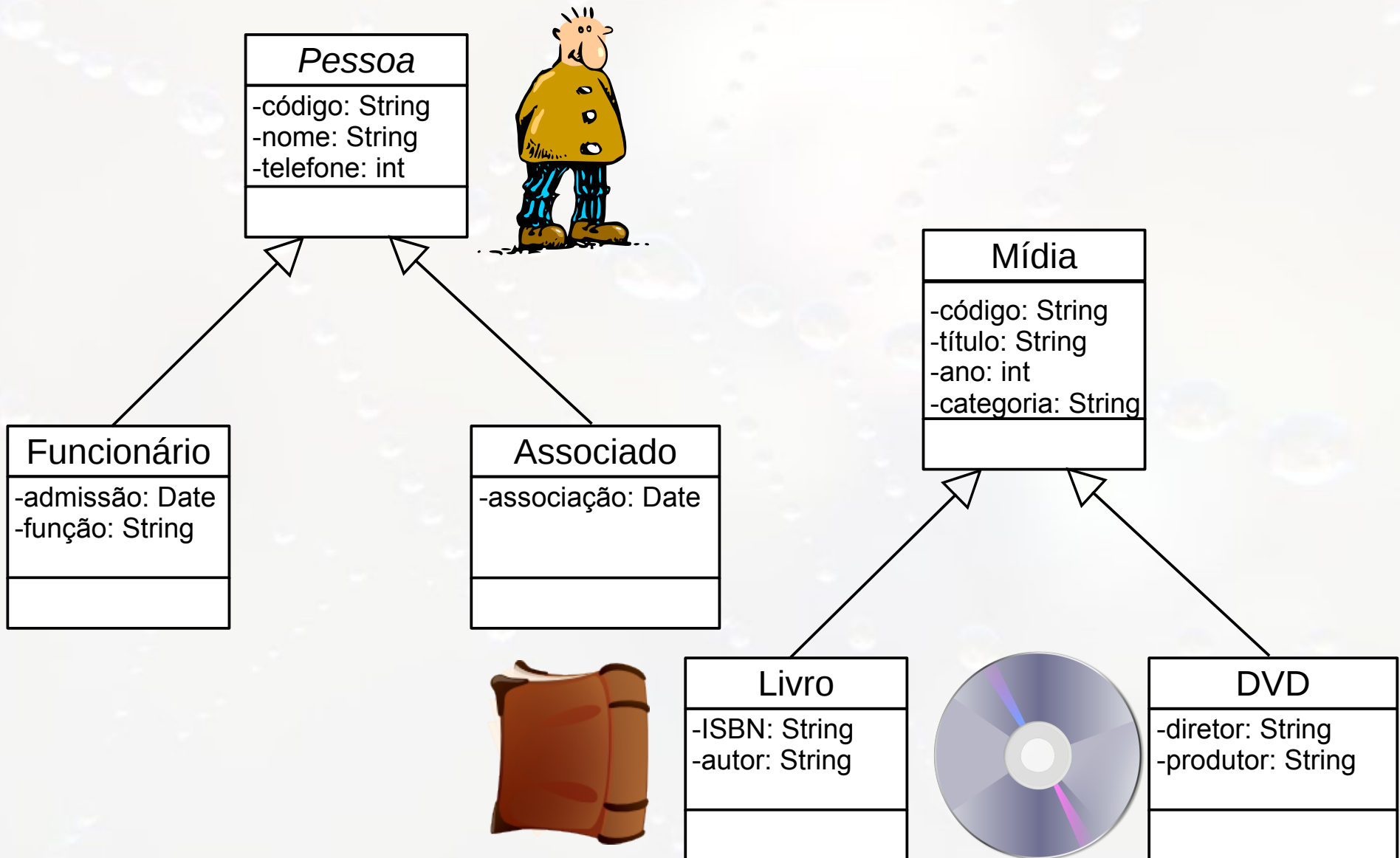
- Descreve estrutura do Banco de Dados
 - entidades, tipos de dados, relações, restrições etc.
- Independente de implementação em SGBD
 - oculta detalhes de armazenamento físico



Modelo ER

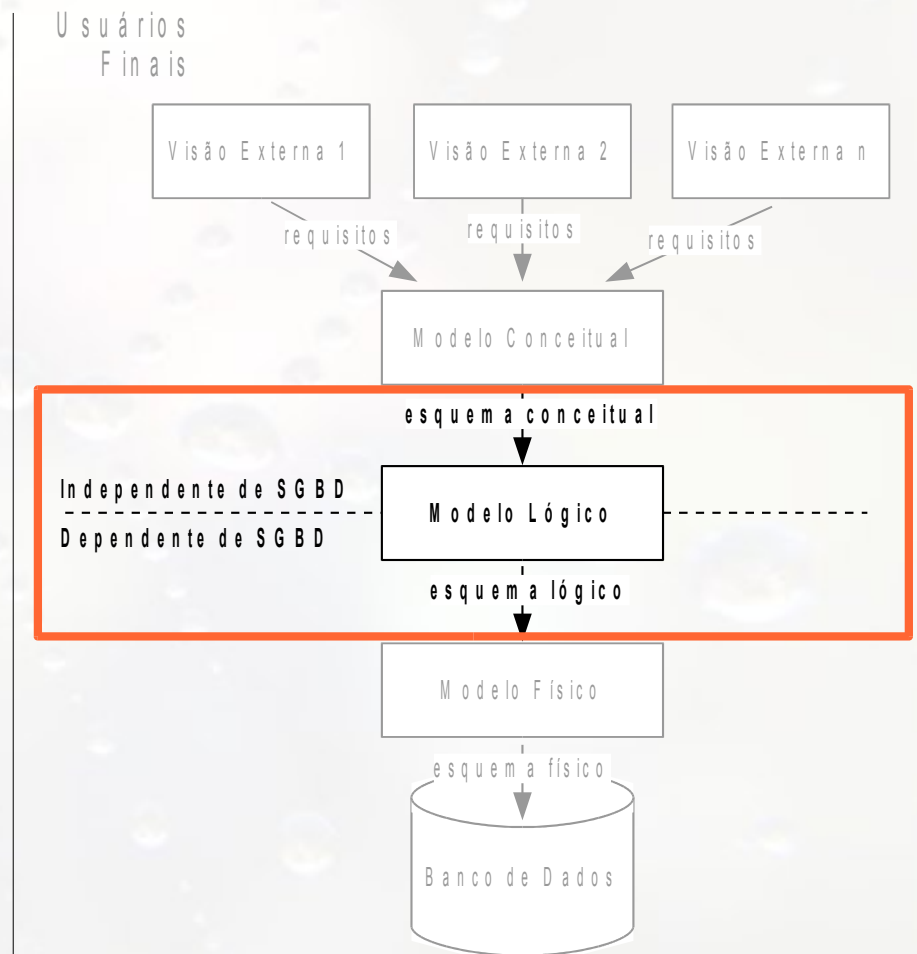


Modelo Orientado a Objetos (UML)



Modelo/Esquema Lógico

- Dependente de um SGBD particular
- Associado a um “modelo de dados de implementação” (Elmasri, 2005)



Modelo Lógico

Principais modelos de dados

- Modelo Relacional (tabelas - foco do curso)
- Modelo hierárquico (árvores - foco desta aula)
- Modelo de grafos (veremos no fim do curso)

Importância dos modelos

- Permitem a separação entre representação dos dados e a implementação física das estruturas
- Exemplo de ED1: um programador pode implementar um programa que usa uma lista encadeada e no futuro mudar a implementação das bibliotecas para uma lista duplamente encadeada sem precisar alterar o programa principal

Importância dos modelos

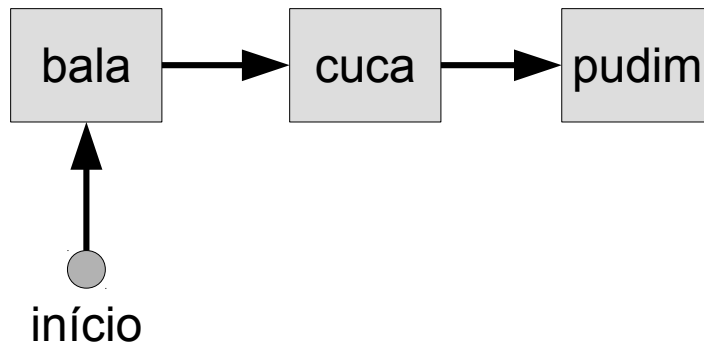
Aplicação

```
item = "chocolate";  
adicionaItem(item);  
...
```

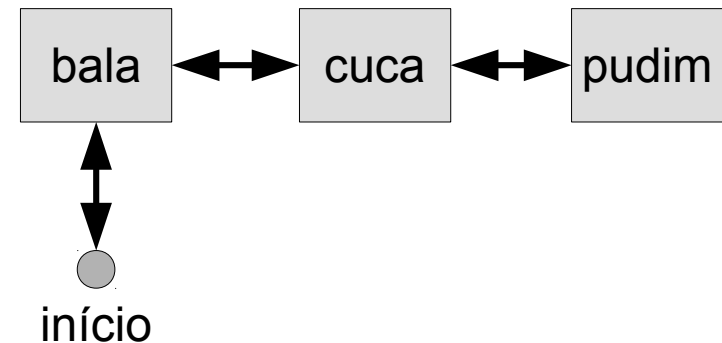
```
item = "chocolate";  
adicionaItem(item);  
...
```

Modelo: Lista (biblioteca ou API)

Implementação das Estruturas



Lista Encadeada



Lista duplamente Encadeada

Importância dos modelos

- Em grandes empresas, os mecanismos de armazenamento mudam frequentemente para atender às demandas e isto não pode afetar as aplicações
- Exemplos: atualização de versão do SGBD, mudança de fornecedor de SGBD, upgrade de SGBD centralizado para SGBD distribuído

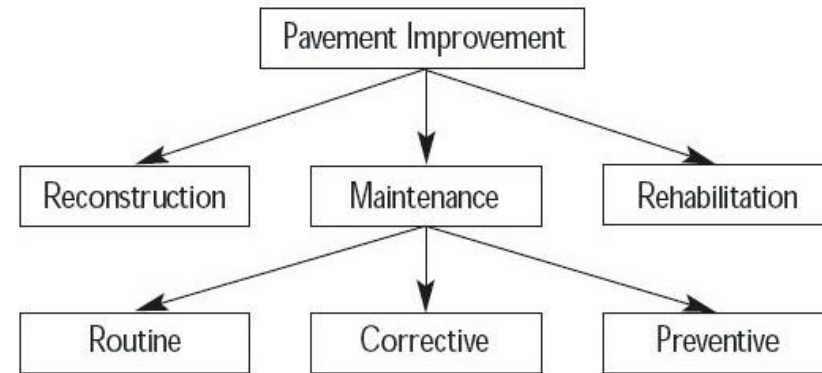
Flat File Model

	Route No.	Miles	Activity
Record 1	I-95	12	Overlay
Record 2	I-495	05	
Record 3	SR-301	33	

Relational Model

Activity Code	Activity Name
23	Patching
24	Overlay
25	Crack Sealing

Hierarchical Model



Object-Oriented Model

Object 1: Maintenance Report Object 1 Instance

Date	01-12-01
Activity Code	24
Route No.	I-95
Daily Production	2.5
Equipment Hours	6.0
Labor Hours	6.0

Object 2: Maintenance Activity

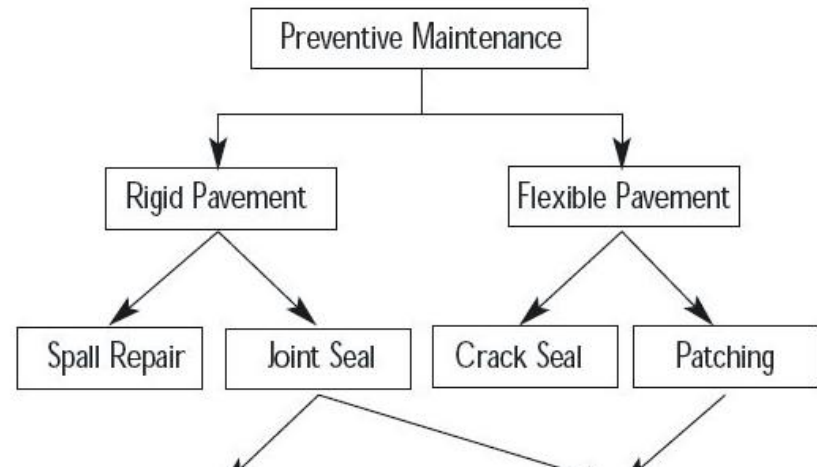
Activity Code	
Activity Name	
Production Unit	
Average Daily Production Rate	

Key = 24

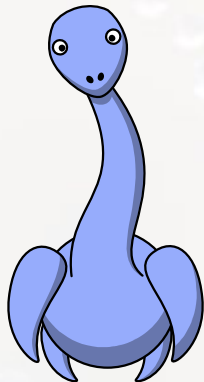
Activity Code	Date	Route No.
24	01/12/01	I-95
24	02/08/01	I-66

By Marcel Douwe Dekker
https://en.wikipedia.org/wiki/File:Database_models.jpg

Network Model



Describing Prehistoric Animals



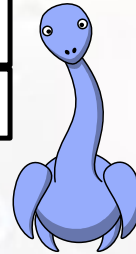
MNHN A. C. 8592

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Describing Prehistoric Animals



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Size	9	



Sue

FMNH PR2081		
Is a	Tyrannosaurus rex	
Origin	Hell Creek	EUA
Recognized	1990	
Size	12.3	

Modelo Relacional

Cliente (C)

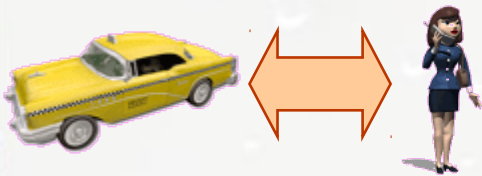
<u>C liId</u>	N o m e	C P F
1 5 3 2	A s d r ú b a l	4 4 8 . 7 5 4 . 2 5 3 - 6 5
1 7 5 5	D o r i a n a	5 6 7 . 3 8 7 . 3 8 7 - 4 4
1 7 8 0	Q u i n c a s	5 4 6 . 3 7 3 . 7 6 2 - 0 2



Táxi (TX)



<u>P l a c a</u>	M a r c a	M o d e l o	A n o F a b
D A E 6 5 3 4	F o r d	F i e s t a	1 9 9 9
D K L 4 5 9 8	W o l k s v a g e n	G o l	2 0 0 1
D K L 7 8 7 8	F o r d	F i e s t a	2 0 0 1
J D M 8 7 7 6	W o l k s v a g e n	S a n t a n a	2 0 0 2
J J M 3 6 9 2	C h e v r o l e t	C o r s a	1 9 9 9



Corrida (R1)

<u>C liId</u>	<u>P l a c a</u>	<u>D a t a P e d i d o</u>
1 7 5 5	D A E 6 5 3 4	1 5 / 0 2 / 2 0 0 3
1 9 8 2	J D M 8 7 7 6	1 8 / 0 2 / 2 0 0 3

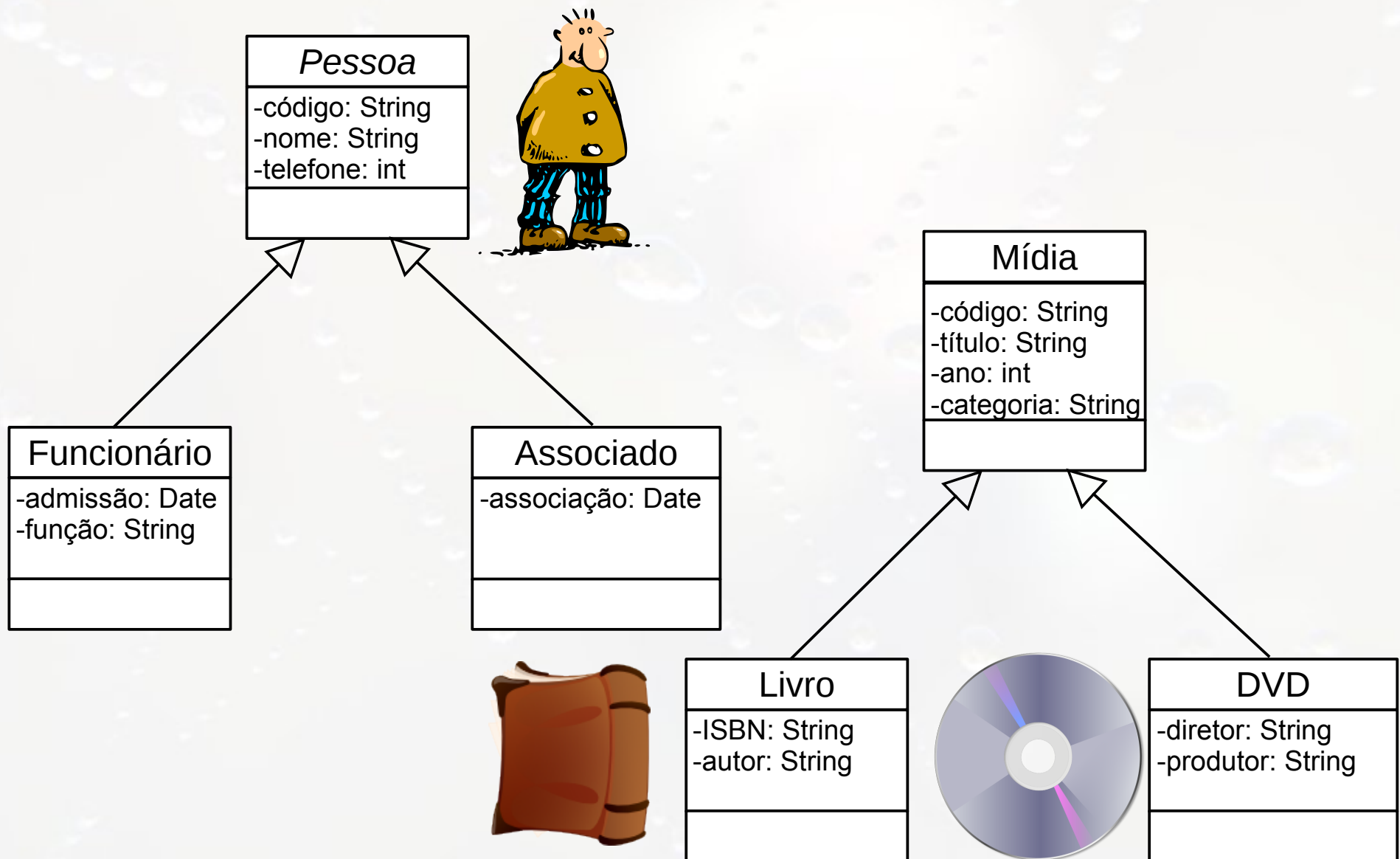
Modelo original
por prof. Geovane
Cayres Magalhães

Modelo Relacional

Id	Is a	Origin Place	Origin Country	Recognized	Size
MNHN A. C. 8592	Plesiosaurus dolichodeirus	Lyme Regis	England	1824	5
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MNHN 1912.20	Triceratops horridus	Lance Creek	EUA	1889	9
FMNH PR2081	Tyrannosaurus rex	Hell Creek	EUA	1990	12.3



Modelo Orientado a Objetos



Necessidade de Objetos Complexos em Bancos

- Multimídia
- CAD
- Bancos Geoespaciais

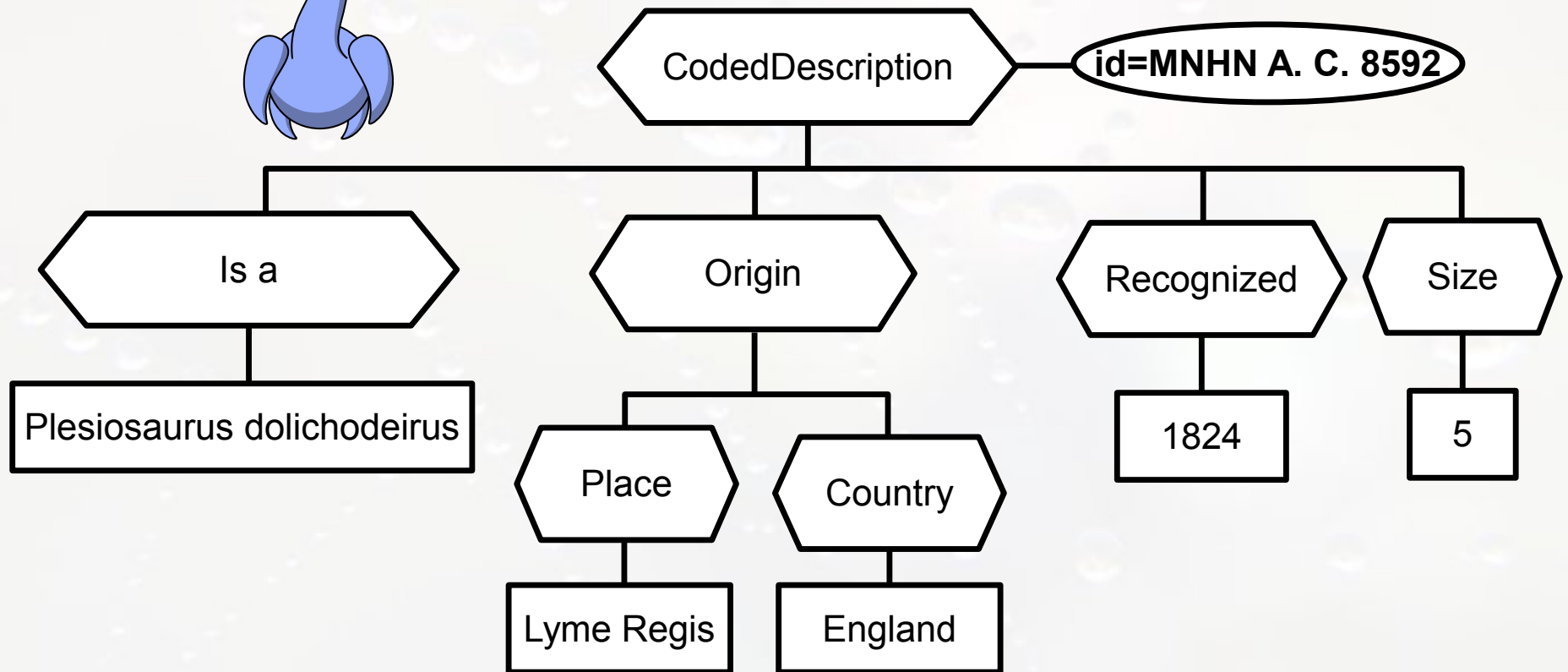
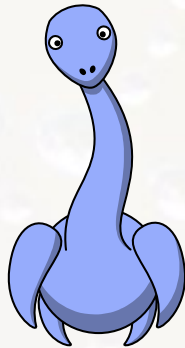
BDO

Bancos de Dados de Objeto

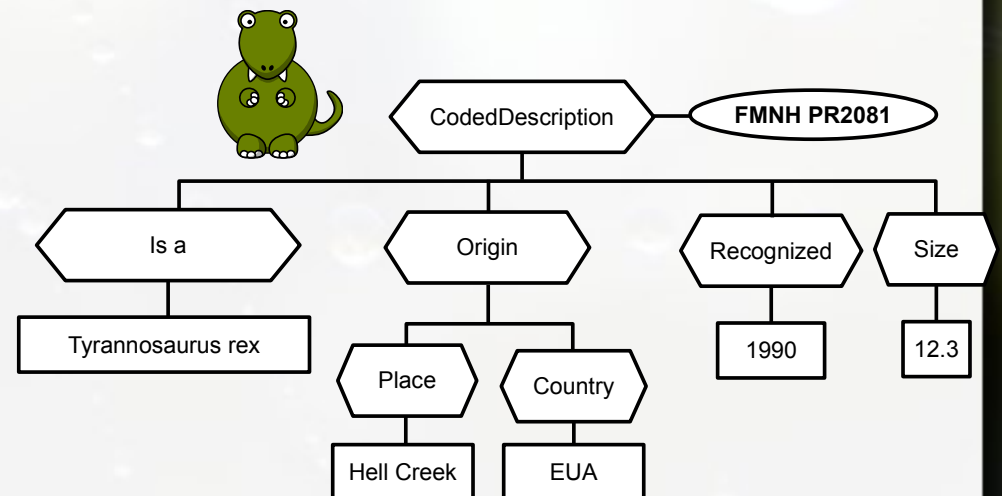
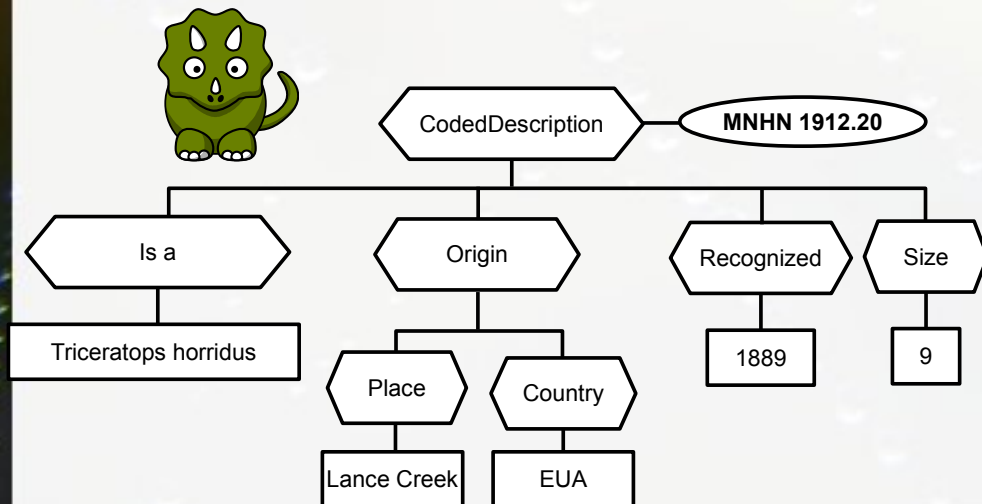
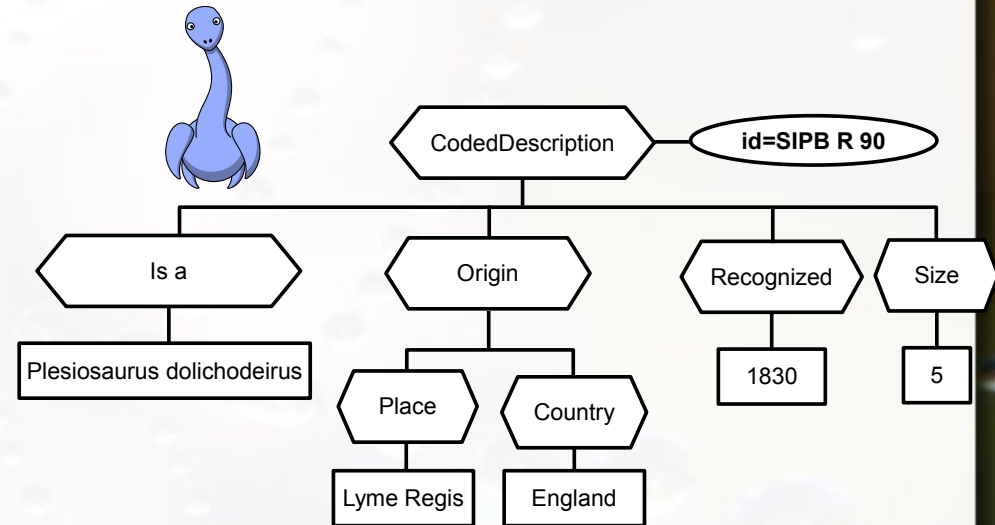
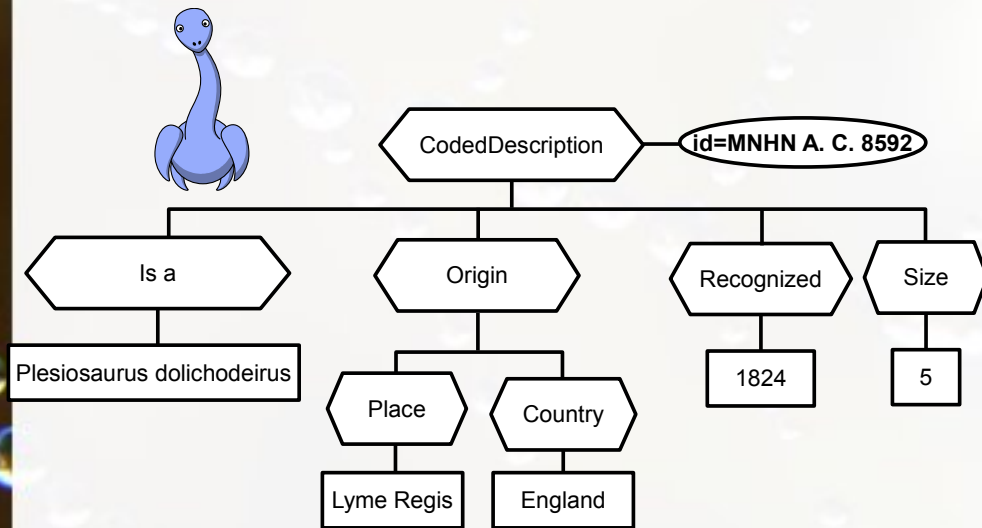
- Anteriormente conhecidos como BDOO
- “Pode estender a existência de objetos de modo que eles sejam armazenados permanentemente em um banco de dados, e, portanto, os objetos se tornam objetos persistentes...”

(Elmasri, 2011)

Modelo Hierárquico (Documentos/XML)

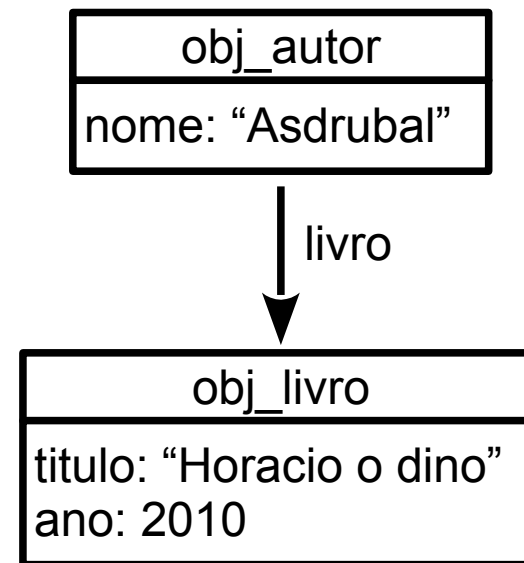


Modelo Hierárquico (Documentos/XML)

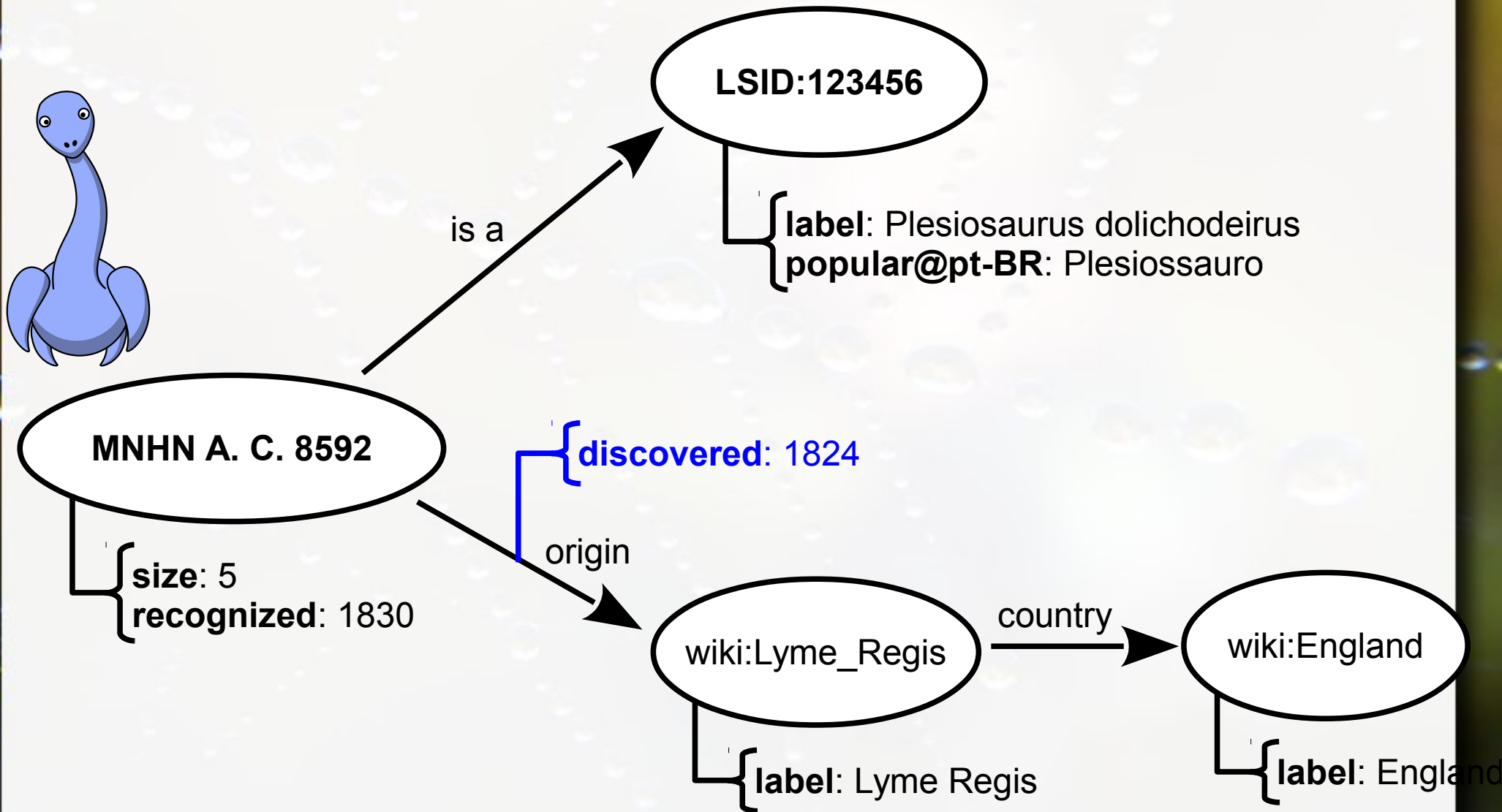


Modelo Hierárquico (JSON - Documentos + OO)

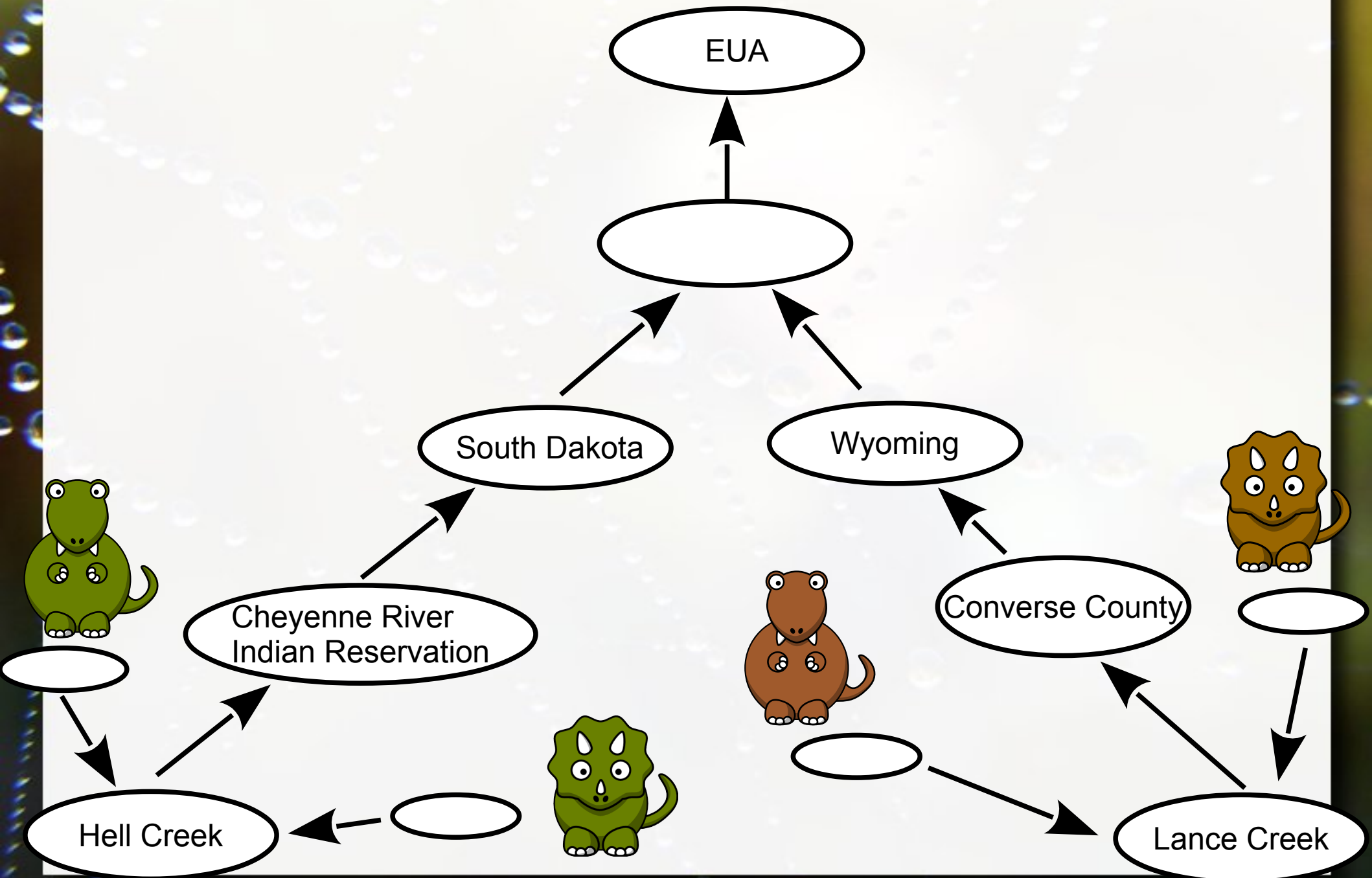
```
{  
  "nome": "Asdrubal",  
  "livro": {  
    "titulo": "Horacio o  
dino",  
    "ano": 2010  
  }  
}
```



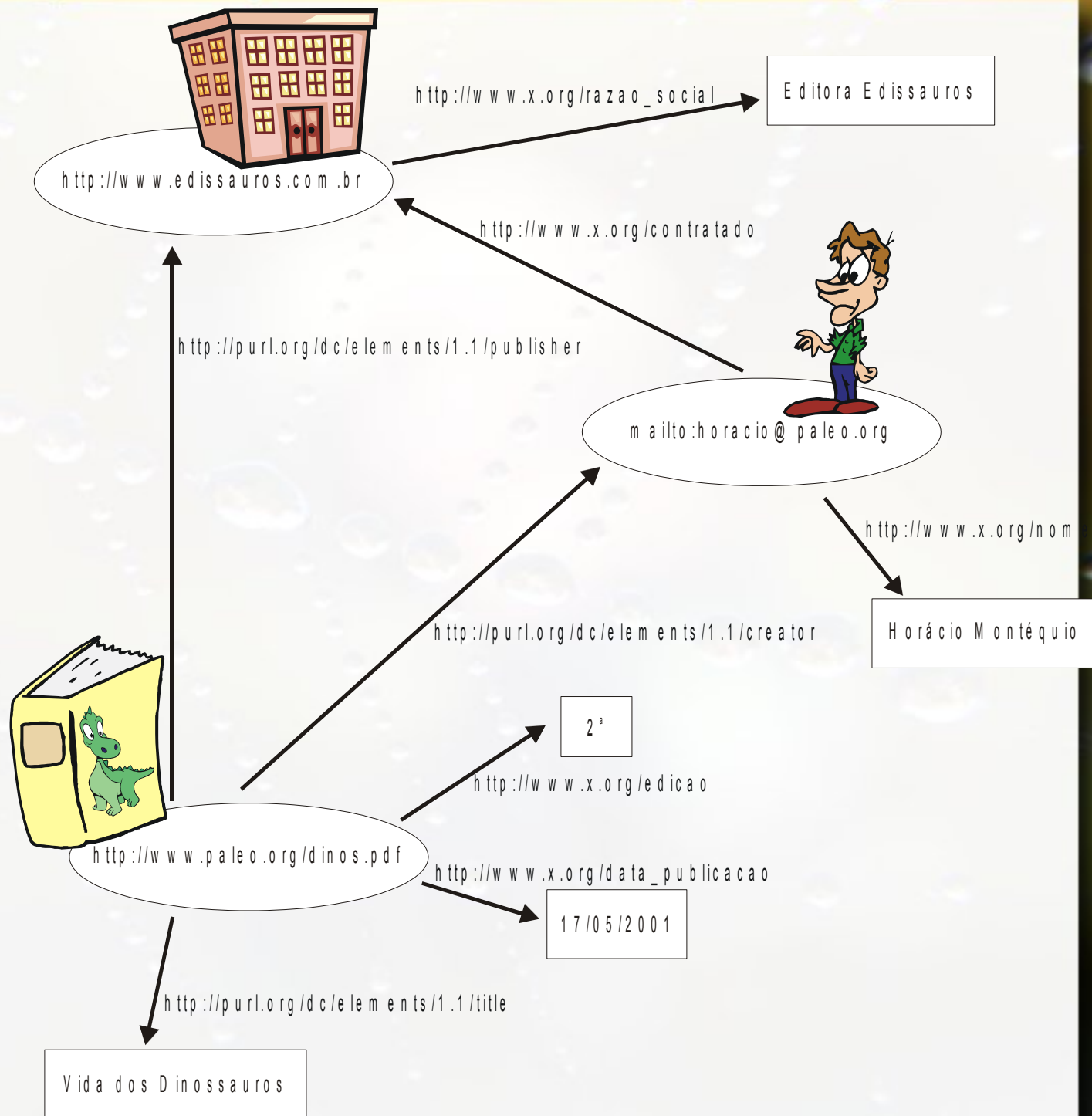
Modelo de Grafos



Modelo de Grafos



Modelo de Grafos



Modelo Chave/Valor

<code>setItem(chave, valor)</code>	adiciona/atualiza par chave-valor
<code>getItem(chave)</code>	recupera o valor associado à chave
<code>key(n)</code>	recupera a enésima chave
<code>removeItem(chave)</code>	remove o par que possui a chave
<code>length</code>	indica o número de pares chave-valor
<code>clear()</code>	remove todos os dados do repositório

Referências

- Elmasri, Ramez; Navathe, Shamkant B. (2010) **Sistemas de Banco de Dados**. Pearson, 6^a edição em português.
- Heuser, Carlos Alberto (2004) **Projeto de Banco de Dados**. Editora Sagra Luzzato, 5^a edição.
- Ramakrishnan, Raghu; Gehrke, Johannes (2003) **Database Management Systems**. McGraw-Hill, 3rd edition.

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André Santanchè

<http://www.ic.unicamp.br/~santanche>

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