



## The ER Model

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## Overview of the ER Model

- The Entity-Relationship model is a high level way to look at data
- The ER model is made up of three parts
  - Entities
  - Relationships
  - Attributes
- These things tend to translate well to relational databases

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## Attributes

- Attributes are the smallest division of data
- They should not be able to be split
- Good Examples
  - First name
  - Social Security Number
  - Quantity
- Bad Examples
  - Address
  - Car
  - Toppings on a pizza

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## Attributes continued

- If you can break up an attribute you should
- Name:
  - Jane Smith **BAD**
- First name:
- Jane
- Last name: **GOOD**
  - Smith

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## Attributes continued 2

- |   |   |
|---|---|
| <p><b>Good</b></p> <ul style="list-style-type: none"> <li>• Street address           <ul style="list-style-type: none"> <li>– 123 Lani Kai St</li> </ul> </li> <li>• City           <ul style="list-style-type: none"> <li>– Kahului</li> </ul> </li> <li>• St           <ul style="list-style-type: none"> <li>– HI</li> </ul> </li> <li>• Zip           <ul style="list-style-type: none"> <li>– 96790</li> </ul> </li> </ul> | <p><b>Bad</b></p> <ul style="list-style-type: none"> <li>• Address           <ul style="list-style-type: none"> <li>– 123 Lani Kai St, Kahului, HI 96790</li> </ul> </li> </ul> |
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## Entities

- Entities are the things in your data
- Examples:
  - People
  - Space ships
  - Locations
  - Inventory
- Composed of attributes
- Stored together in tables

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## Entities Continued

- A table of characters from Battlestar Galactica

bsg_people				
Id	Fname	Lname	Homeworld	Age

- Id - Unique identifier (more on this later)
- Fname – First name
- Lname – Last name
- Homeworld – Planet the character is from
- Age – Characters age

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## Entities continued 2

bsg_people				
Id	Fname	Lname	Homeworld	Age
0	William	Adama	Caprica	61
1	Lee	Adama	Caprica	30
2	Laura	Roslin	Caprica	NULL
3	Kara	Thrace	Caprica	NULL

- Here is an example instance of the bsg\_people entity table

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## Entities continued 3

- Some more example table schemas

addresses				
Id	Street	City	State	Zip

students				
Id	Fname	Lname	Dept	GPA

parts			
Id	Pname	Dept	Qty

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## Relationships

- Relationships in the ER model are relations between entities
- They connect entities to other entities
- Can have restrictions on number of entities allowed
- Can be built into entity tables or can be its own table
  - Depends on number of entities involved

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## Relationship examples

- Employees **can work in many** departments
- Managers **can manage one** department
- Students **can be in many** classes
- A class **must be in at least one** department
- A transaction **must be associated to one** customer

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## Relationships examples 2

- We had characters from a homeworld

bsg_people				
Id	Fname	Lname	Homeworld	Age

- Previously 'Homeworld' was an attribute
- What if 'Homeworld' was an entity?

bsg_planets				
Id	Name	Population	Language	Capitol

- We might now say "A character **must be from one planet.**"

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## A One to Many Relationship

- In this case we have a few conditions
  - A character **must** be from a planet
  - A character is only from **one** planet
  - A planet can be the homeworld for **many** characters
- Depending on how you phrase it this is a many-to-one or a one-to-many relationship
- We can just add a column for this (or change our current column)

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## Example table

bsg_people				
Id	Fname	Lname	Homeworld	Age
0	William	Adama	2	61
1	Lee	Adama	2	30
2	Laura	Roslin	2	NULL
3	Kara	Thrace	2	NULL

  

bsg_planets				
Id	Name	Population	Language	Capitol
1	Gemenon	2800000000	Old Gemenese	Oranu
2	Caprica	4900000000	Caprican	Caprica City

- Homeworld now references bsg\_planets(id)

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## Many-to-Many

- Suppose we had a list of certifications

bsg_cert	
Id	title
0	Raptor
1	Viper
2	Mechanic
3	Command

- A character can be certified in many things

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## Many-to-Many Continued

- So what if...

bsg_cert				
Id	Title	Character1	Character2	...

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## Many-to-Many Continued

- So what if...

bsg_cert				
Id	Title	Character1	Character2	...

- No, bad, wrong, don't do this, ever, no!
- Instead:

bsg_cert_people	
cid	pid

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## Many-to-Many Example

- Lee is certified in Command and Viper
- Laura is certified in Command

bsg_cert_people	
cid	pid
3	1
1	1
3	2

bsg_cert	
Id	title
0	Raptor
1	Viper
2	Mechanic
3	Command

bsg_people				
Id	Fname	Lname	Homeworld	Age
0	William	Adama	2	61
1	Lee	Adama	2	30
2	Laura	Roslin	2	NULL
3	Kara	Thrace	2	NULL

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## In Review

- Attributes describe Entities and Relationships
- Entities are things
- Relationships say how things are related
  - Can be required or optional
  - Can allow only one entity or can allow many
  - Sometimes requires its own table, sometimes not
  - Can have its own attributes

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