

Database Administration

Lecture 03: ERD Reverse Design.

Udemy and Visual Paradigm.

February 9, 2026

Database Administration: Reverse Design.

The screenshot shows the Udemy course page for 'Database Design and Management'. At the top, there's a navigation bar with the Udemy logo, a search bar, and links for 'Udemy Business', 'Instructor', 'Mi aprendizaje', and a user icon. Below the header, the breadcrumb navigation shows 'Desarrollo > Diseño y desarrollo de bases de datos > Sistemas de gestión de bases de datos (DBMS)'. The main content area features a large image of a blue cylinder database with tables and a play button, labeled 'Vista previa de este curso'. To the right, the course title 'Database Design and Management' is displayed in bold, followed by a description: 'Learn how to design and manage database with ERD, database generation and reversal with Visual Paradigm.' Below this, there's a rating section showing 'Tutorial gratuito' with a 4.2 star rating (3,459 reviews), '95,409 estudiantes', and a duration of '2 h 41 min de video bajo demanda'. The course was created by 'Visual Paradigm'. Language options show 'Inglés' and 'Inglés (automático)'. A prominent purple button at the bottom right says 'Ir al curso'. Below the main image, there are tabs for 'Lo que aprenderás', 'Contenido del curso' (which is selected), 'Valoraciones', and 'Instructores'. The 'Requisitos' section lists 'Basic software development concept' and 'PC or DESK or Linux'. The 'Contenido del curso' section shows a table of contents with four sections: 'Introduction to Database Design and Management' (8 classes, 1h 31 min), 'Database Engineering' (3 classes, 37 min), 'Java Database Programming' (1 classes, 17 min), and 'Best Practices' (2 classes, 17 min). A link 'Ampliar todas las secciones' is located above the table.

Contenido del curso	
4 secciones • 14 clases • 2 h 41 m de duración total	Ampliar todas las secciones
▼ Introduction to Database Design and Management	8 clases • 1h 31 min
▼ Database Engineering	3 clases • 37 min
▼ Java Database Programming	1 clases • 17 min
▼ Best Practices	2 clases • 17 min

Content has been extracted from *Database Design and Management*. Udemy Course, created by Visual Paradigm, 2025. Visit <https://www.udemy.com/course/database-design-and-management/> and <https://www.visual-paradigm.com/>.

Plan

Introduction

Entities and Columns

The Three Levels of E-R Models

Key and Relationships

Database Views

Triggers and Stored Procedures

Database



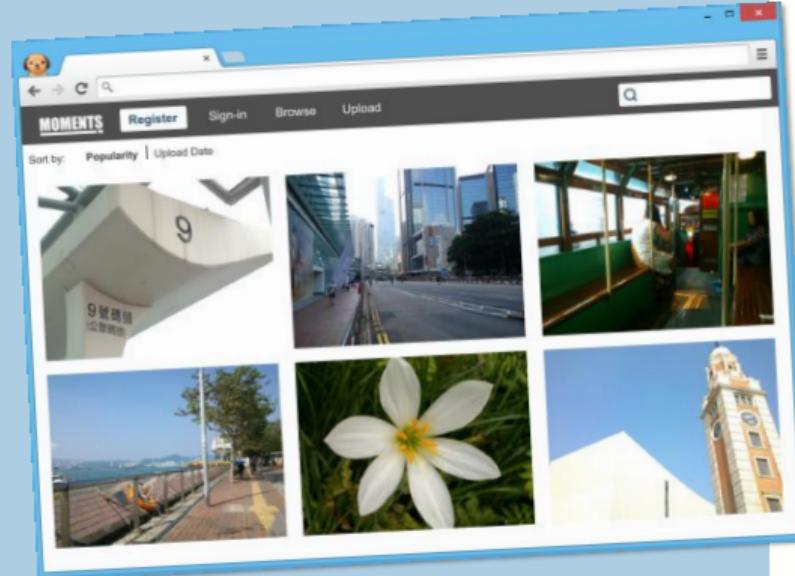
Introduction

Database



Database stores
long-term persistent data

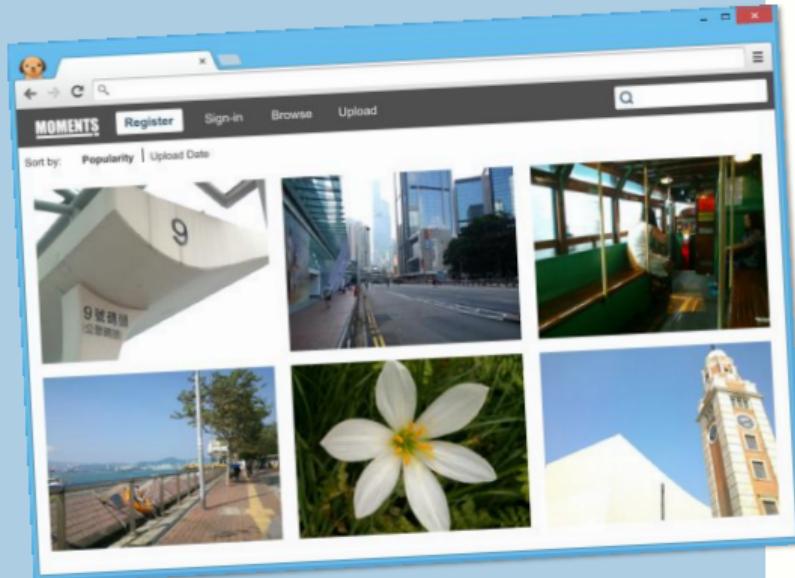
Database



Example:
MOMENTS online
photo album

Introduction

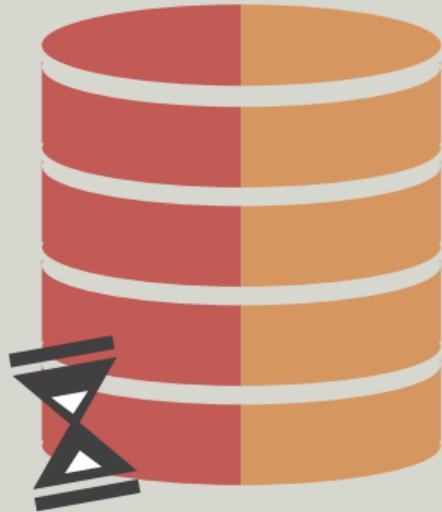
Database



Persistent data:

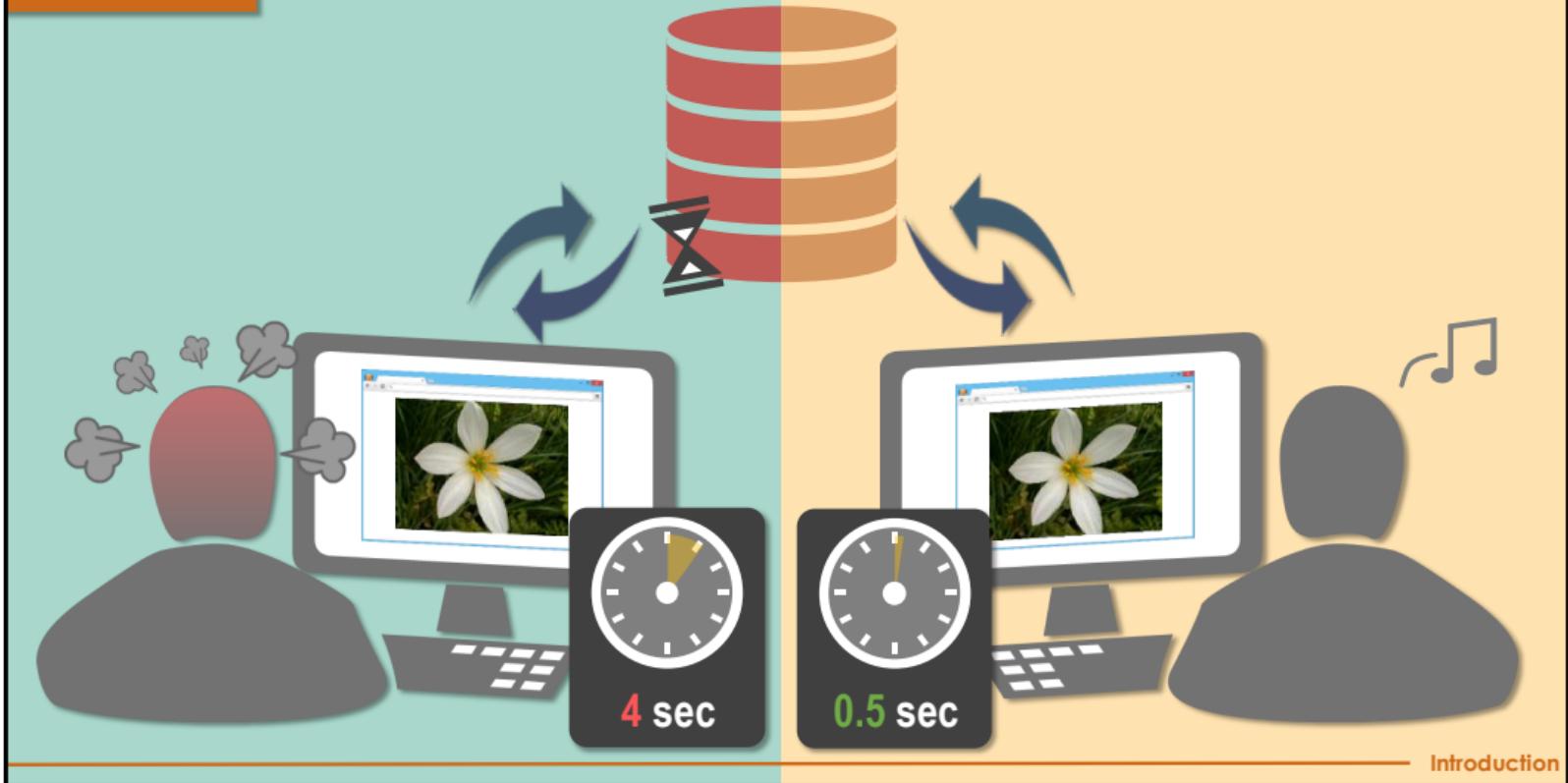
- Photos
- Uploaders info.
- Albums
- Upload history
- Comments

Introduction

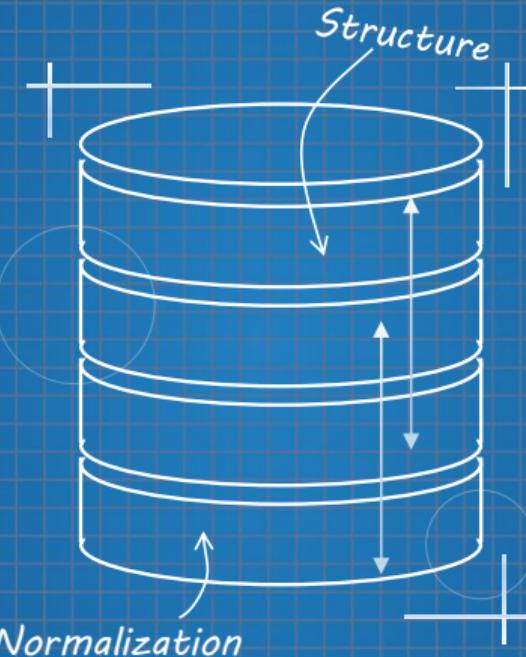


Database performance
influences
software performance

Database



Database Design



Database is a blueprint of
your **persistent structure**

Introduction

Database Design - Why



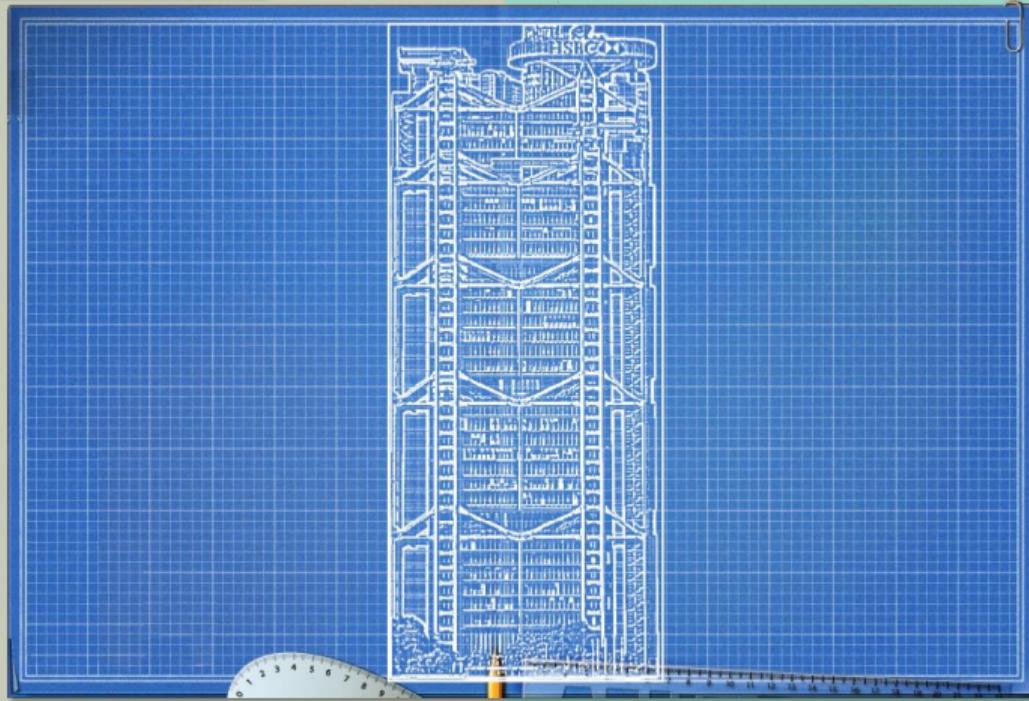
Introduction

Database Design - Why



Introduction

Database Design - Why



Introduction

Database Design - Why

My Tic-Tac-Toe results:

Game 1: win
Game 2: win
Game 3: Draw
Game 4: Lost
Game 5: win

Press any key to continue...



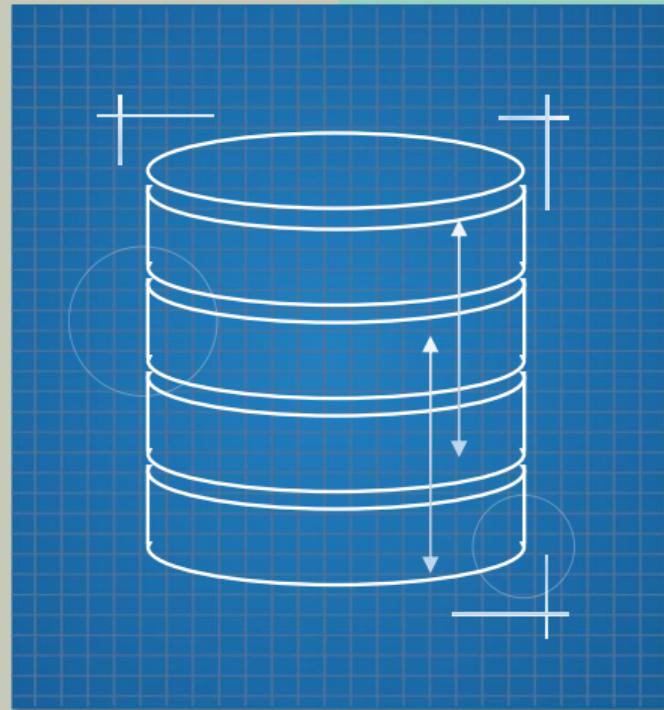
Introduction

Database Design - Why

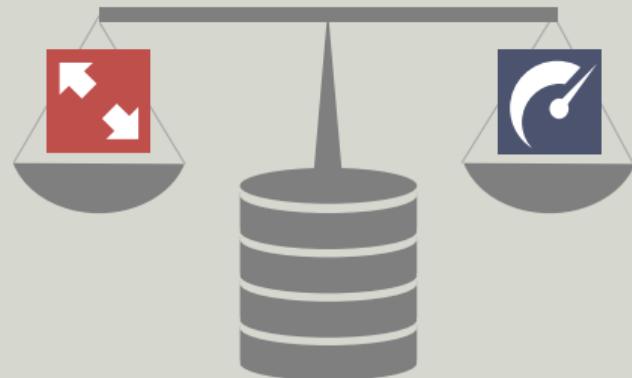


Introduction

Database Design - Why



Introduction



Maintain a balance
between **DB size** &
performance

Database Design – Goal



How **uploader's** details
are stored?

Introduction

Database Design – Goal

Photo and Uploader details in one table

ID	Title	Uploader Name	Uploader PhoneNum	Uploader Address
1	The tram	Chris Wong	252-608-5628	572 Lost Lake Crossing
2	Little kitten	Chris Wong	252-608-5628	572 Lost Lake Crossing
3	Chamomile	Chris Wong	252-608-5628	572 Lost Lake Crossing
4	New bus route	Wanda A. Allison	808-839-2217	2017 Green Impasse
5	Ferry pier 9	Chris Wong	252-608-5628	572 Lost Lake Crossing
6	The coast	Chris Wong	252-608-5628	572 Lost Lake Crossing
7	Rock climbing	Wanda A. Allison	808-839-2217	2017 Green Impasse
8	Fountain	Chris Wong	252-608-5628	572 Lost Lake Crossing
9	Sunset	Wanda A. Allison	808-839-2217	2017 Green Impasse

Database table: **Photo**



DB Size
Performance

Introduction

Database Design – Goal

Access both **photo** and **uploader** details
when querying a single record

ID	Title	Uploader Name	Uploader PhoneNum	Uploader Address
1	The fram	Chris Wong	252-608-5628	572 Lost Lake Crossing
2	Little kitten	Chris Wong	252-608-5628	572 Lost Lake Crossing
3	Chamomile	Chris Wong	252-608-5628	572 Lost Lake Crossing
4	New bus route	Wanda A. Allison	808-839-2217	2017 Green Impasse
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9	Sunset	Wanda A. Allison	808-839-2217	2017 Green Impasse

Database table: **Photo**



DB Size
Performance

Introduction

Database Design – Goal

However, this may create a lot of **redundant** data

ID	Title	Uploader Name	Uploader PhoneNum	Uploader Address
1	The tram	Chris Wong	252-608-5628	572 Lost Lake Crossing
2	Little kitten	Chris Wong	252-608-5628	572 Lost Lake Crossing
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9	Sunset	Wanda A. Allison	808-839-2217	2017 Green Impasse

Database table: **Photo**



DB Size
Performance

Introduction

Database Design – Goal

ID	Title	Uploader ID
1	The tram	1
2	Little kitten	1
3	Chamomile	1
4	New bus route	2
5	Ferry pier 9	1
6	The coast	1
7	Rock climbing	2
8	Fountain	1
9	Sunset	2

Database table: **Photo**

ID	Name	PhoneNum	Address
1	Chris Wong	252-608-5628	572 Lost Lake Crossing
2	Wanda A. Allison	808-839-2217	2017 Green Impasse

Database table: **Uploader**



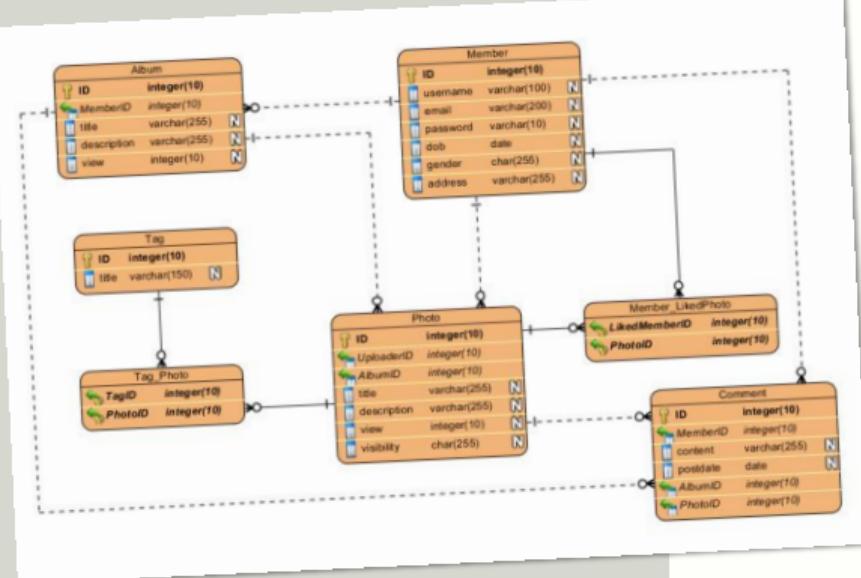
Photo and Uploader details
in **separate tables**



DB Size
Performance

Introduction

Database Design Notations

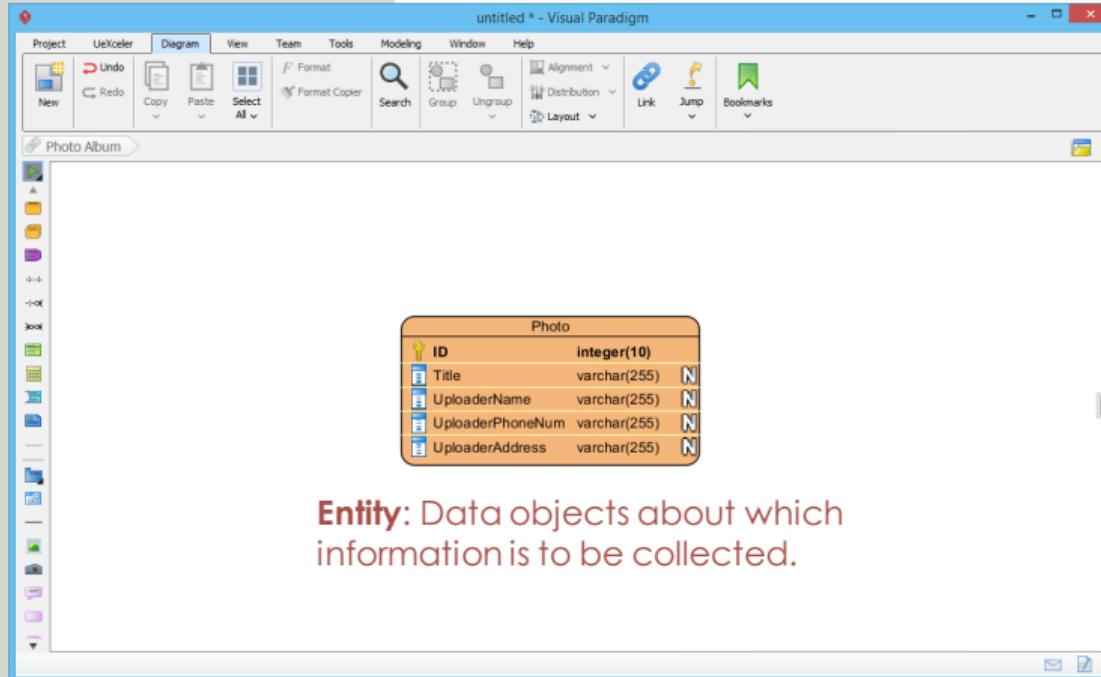


Entity Relationship Diagram (ERD)

Entity Relationship Diagram is:

- Language for expressing database
- Visual language
- Facilitate communication
- Presents data structure & inter-relationships

Database Design Notations



Entity: Data objects about which information is to be collected.

Introduction

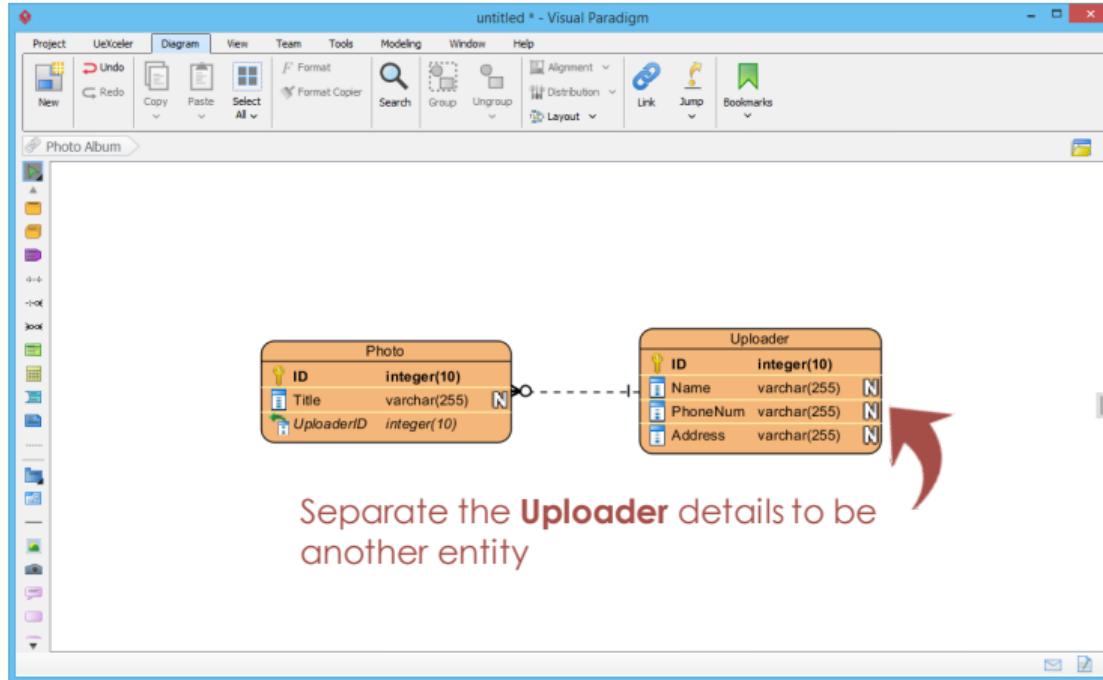
Database Design Notations

The screenshot shows the Visual Paradigm application interface. At the top is a toolbar with various icons for file operations (New, Undo, Redo, Copy, Paste, Select All), search (Search), and other tools (Format, Format Copier, Alignment, Distribution, Link, Jump, Bookmarks). Below the toolbar is a navigation bar with tabs: Project, UxXeler, Diagram, View, Team, Tools, Modeling, Window, Help. The main area displays a database diagram titled "Photo". The diagram shows a table named "Photo" with four columns: "ID" (primary key, integer(10)), "Title" (varchar(255)), "UploaderName" (varchar(255)), and "UploaderAddress" (varchar(255)). A red arrow points from the text "Records of Photo table" to a data grid window titled "Data of Photo". The data grid contains the following data:

ID (PK)	Title	UploaderName	UploaderPhoneNum	UploaderAddress
1	The tram	Chris Wong	252-608-5628	572 Lost Lake Crossing
2	Little kitten	Chris Wong	252-608-5628	572 Lost Lake Crossing
3	Chamomile	Chris Wong	252-608-5628	572 Lost Lake Crossing
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7	Rock climbing	Wanda A. Allison	808-839-2217	2017 Green Impasse
8	Fountain	Chris Wong	252-608-5628	572 Lost Lake Crossing
9	Subset	Wanda A. Allison	808-839-2217	2017 Green Impasse

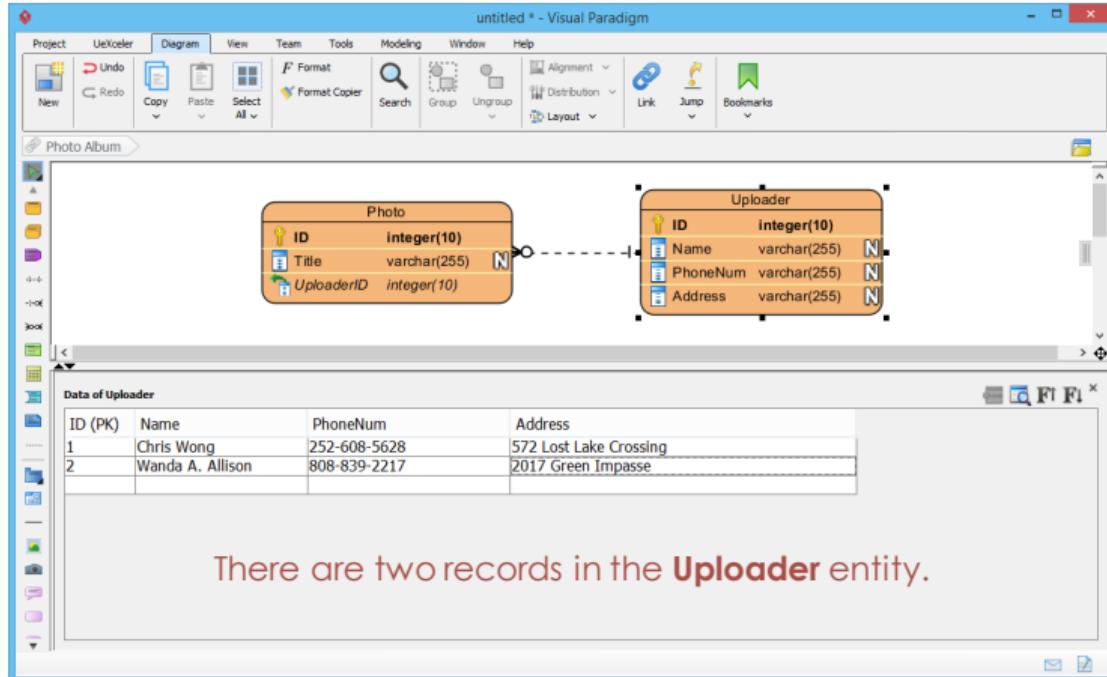
Introduction

Database Design Notations



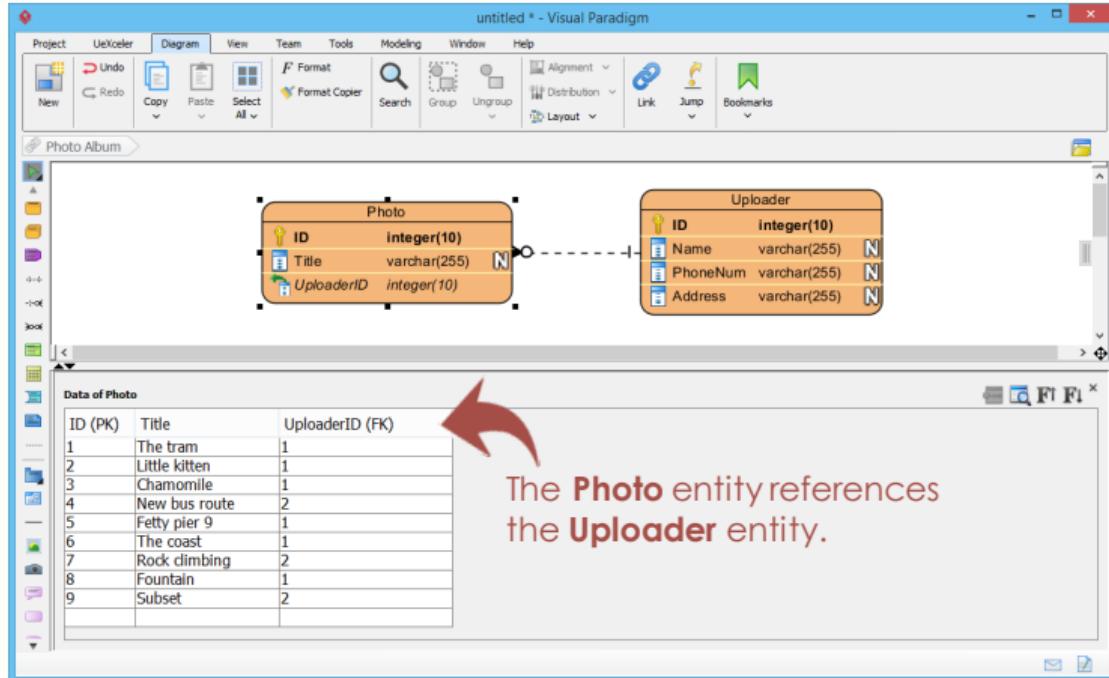
Introduction

Database Design Notations



Introduction

Database Design Notations



Introduction

Plan

Introduction

Entities and Columns

The Three Levels of E-R Models

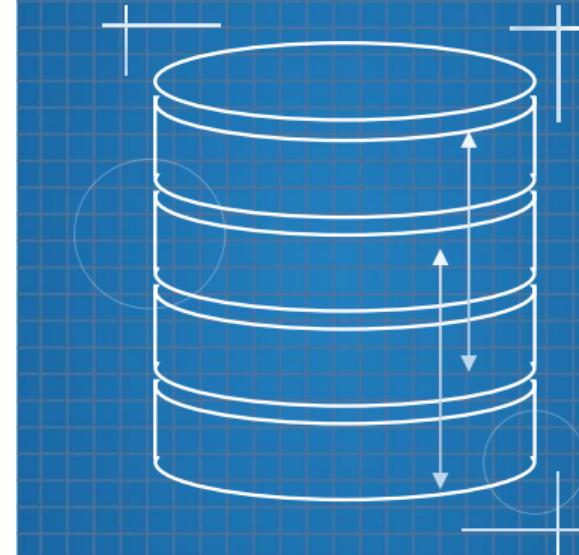
Key and Relationships

Database Views

Triggers and Stored Procedures

What is entity and column?

- **Fundamental** elements of database design



Entity and Column

What is entity and column?

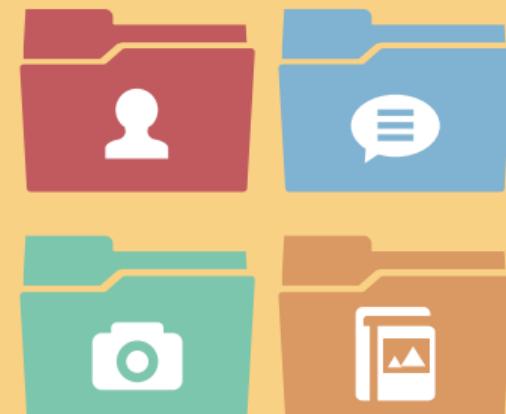
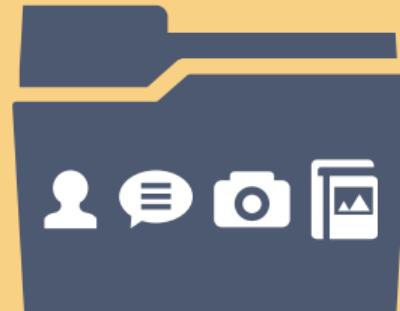
- **Fundamental** elements of database design
- Define how data are being **stored**



Entity and Column

What is entity and column?

- **Fundamental** elements of database design
- Define how data are being **stored**
 - E.g. Everything put together? Separate places for different data?



Entity and Column

What is entity and column?

- **Fundamental** elements of database design
- Define how data are being **stored**
 - E.g. Everything put together? Separate places for different data?
- Generalized form of data



Generalizing entity from data

Photo ID	Photo Title	Uploader Name	Uploader PhoneNum	Uploader Address
1	The tram	Chris Wong	252-608-5628	572 Lost Lake Crossing
2	Little kitten	Chris Wong	252-608-5628	572 Lost Lake Crossing
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8	Fountain	Chris Wong	252-608-5628	572 Lost Lake Crossing
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Photo Details

Entity and Column

Generalizing entity from data

Photo ID	Photo Title	Uploader Name	Uploader PhoneNum	Uploader Address
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Entity and Column

Generalizing entity from data



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Photo

ID
Title

Entity and Column
Entity and Column

Generalizing entity from data

Integer

ID	Title	Uploader Name	Uploader PhoneNum	Uploader Address
1	The tram	Chris Wong	252-608-5628	572 Lost Lake Crossing
2	Little kitten	Chris Wong	252-608-5628	572 Lost Lake Crossing
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8	Fountain	Chris Wong	252-608-5628	572 Lost Lake Crossing
9	Sunset	Wanda A. Allison	808-839-2217	2017 Green Impasse

5 digits long

ID : integer (5)
Title

Entity and Column

Generalizing entity from data

Photo ID	Text	Uploader Name	Uploader PhoneNum	Uploader Address
1	The tram	Chris Wong	252-608-5628	572 Lost Lake Crossing
2	Little kitten	Chris Wong	252-608-5628	572 Lost Lake Crossing
3	Chamomile	Chris Wong	252-608-5628	572 Lost Lake Crossing
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9	Sunset	Wanda A. Allison	808-839-2217	2017 Green Impasse

Photo

ID : integer (5)

Title : varchar (120)

Entity and Column

Generalizing entity from data

Photo ID	Photo Title	Uploader Name	Uploader PhoneNum	Uploader Address
1	The tram	Chris Wong	252-608-5628	572 Lost Lake Crossing
2	Little kitten	Chris Wong	252-608-5628	572 Lost Lake Crossing
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8	Fountain	Chris Wong	252-608-5628	572 Lost Lake Crossing
9	Sunset	Wanda A. Allison	808-839-2217	2017 Green Impasse

Photo

ID : integer (5)

Title : varchar (120)

Uploader



Entity and Column

Generalizing entity from data

Photo ID	Photo Title	Uploader Name	Uploader PhoneNum	Uploader Address
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8	Fountain	Chris Wong	252-608-5628	572 Lost Lake Crossing
9	Sunset	Wanda A. Allison	808-839-2217	2017 Green Impasse

Photo

ID : integer (5)
Title : varchar (120)

Uploader

Name : varchar (255)
PhoneNum : varchar (20)
Address : varchar (255)

Entity and Column

Generalizing entity from data

Photo

ID : integer (5)

Title : varchar (120)

Uploader

Name : varchar (255)

PhoneNum : varchar (20)

Address : varchar (255)



Entity and Column

Generalizing entity from data

Photo

ID : integer (5)
Title : varchar (120)

Album

Title : varchar (120)
Description : varchar (255)
View : integer (10)

Comment

Content : varchar (255)
Postdate: date

Uploader

Name : varchar (255)
PhoneNum : varchar (20)
Address : varchar (255)

Location

Name : varchar (255)
Shortname : varchar (50)

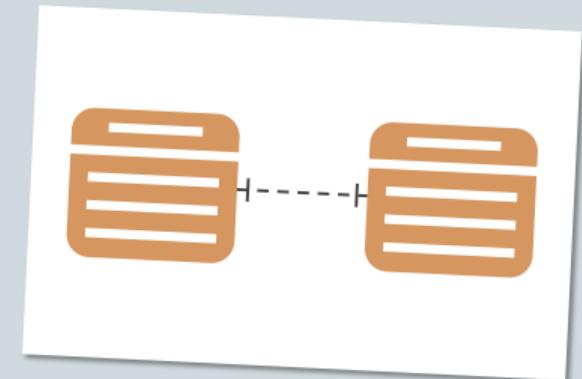
Tag

Title : varchar (120)
Description : varchar (255)

Entity and Column

What is ERD?

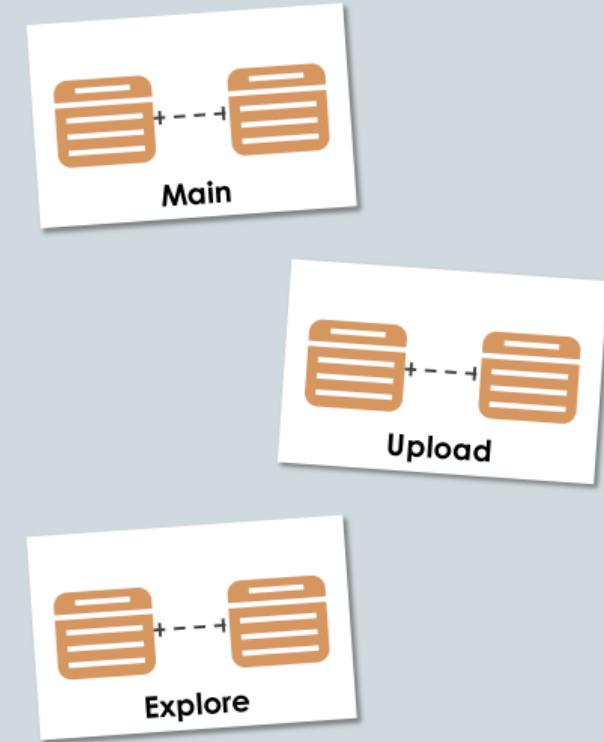
- A graph of entities and their relationships



Entity and Column

What is ERD?

- A graph of entities and their relationships
- Multiple ERDs for different contexts



Entity and Column

Plan

Introduction

Entities and Columns

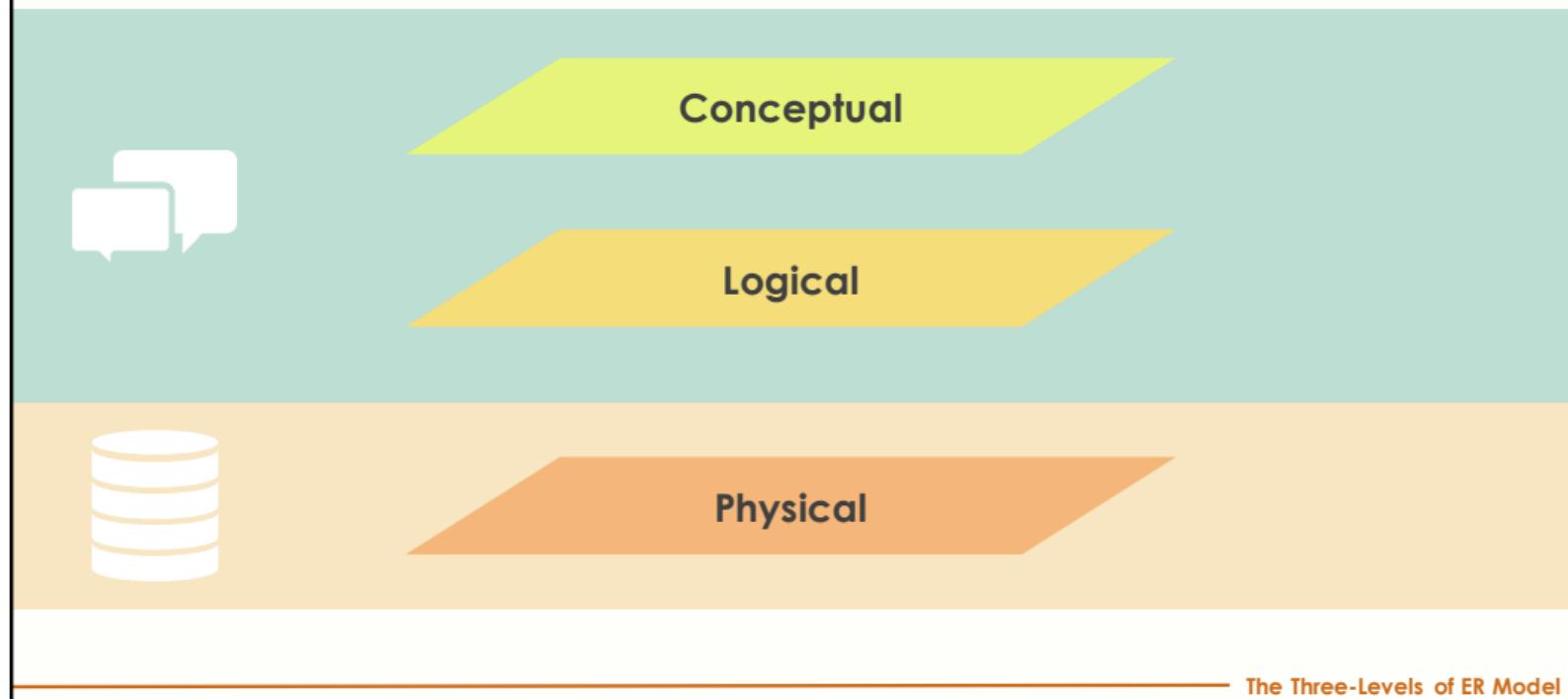
The Three Levels of E-R Models

Key and Relationships

Database Views

Triggers and Stored Procedures

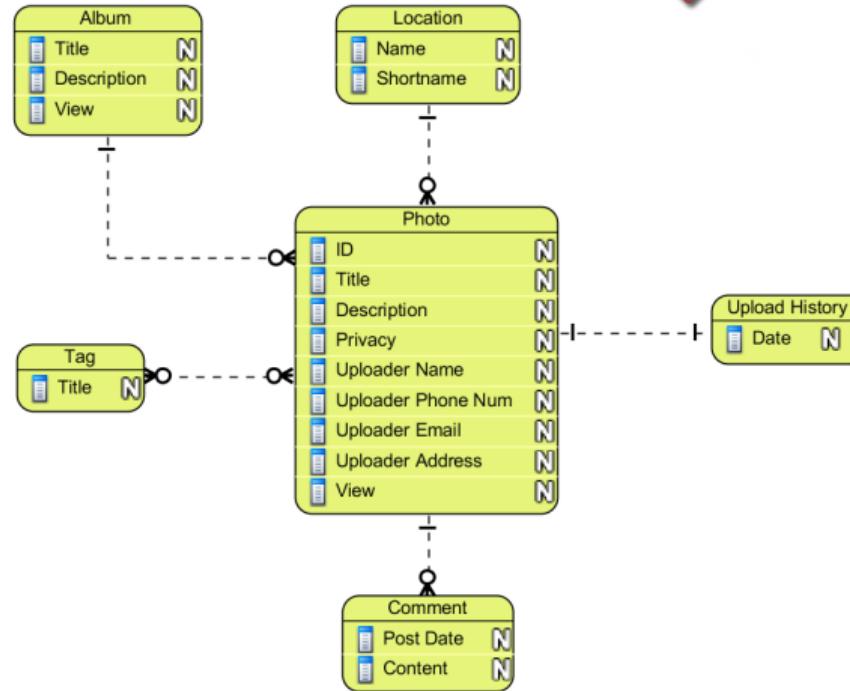
The levels



Example

Conceptual

Only main concepts and relationships are included

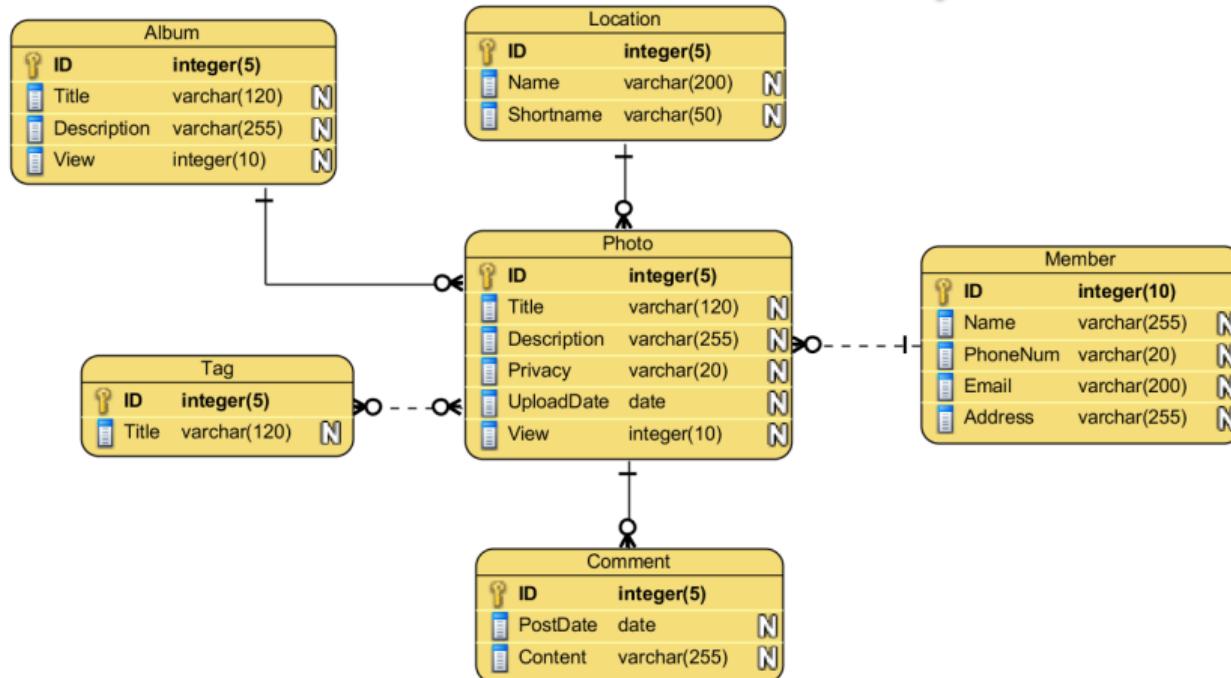


The Three-Levels of ER Model

Example

Logical

With detailed representation
of organization's data

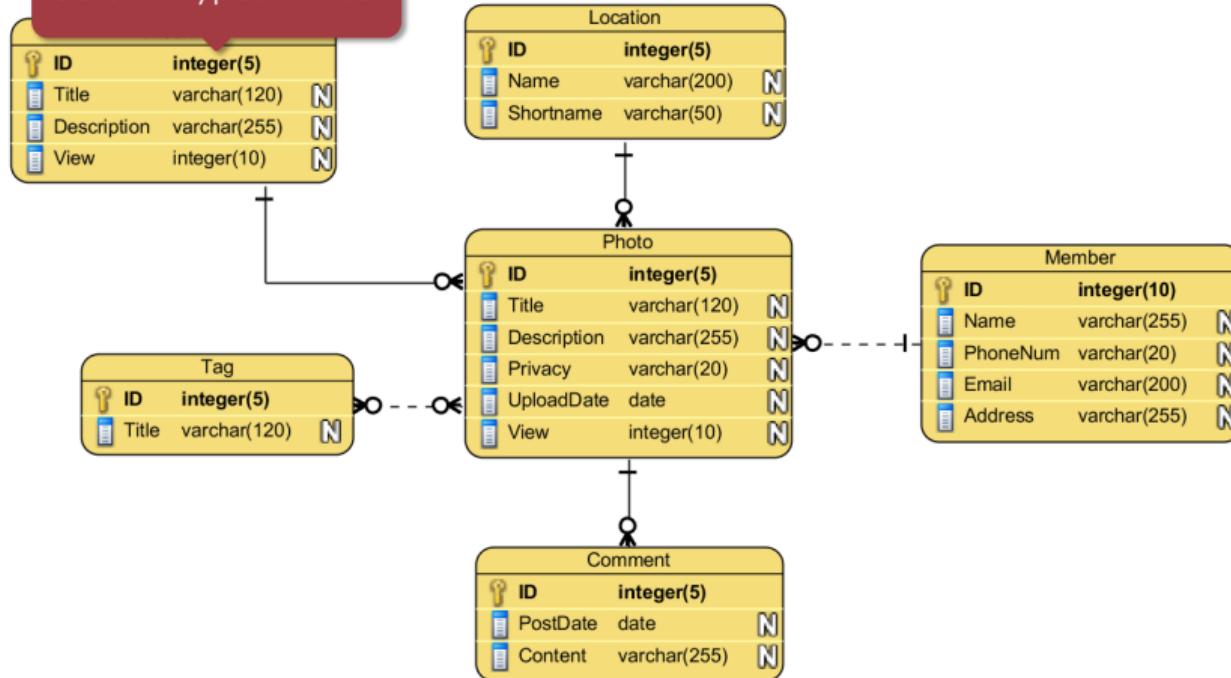


The Three-Levels of ER Model

Example

Logical

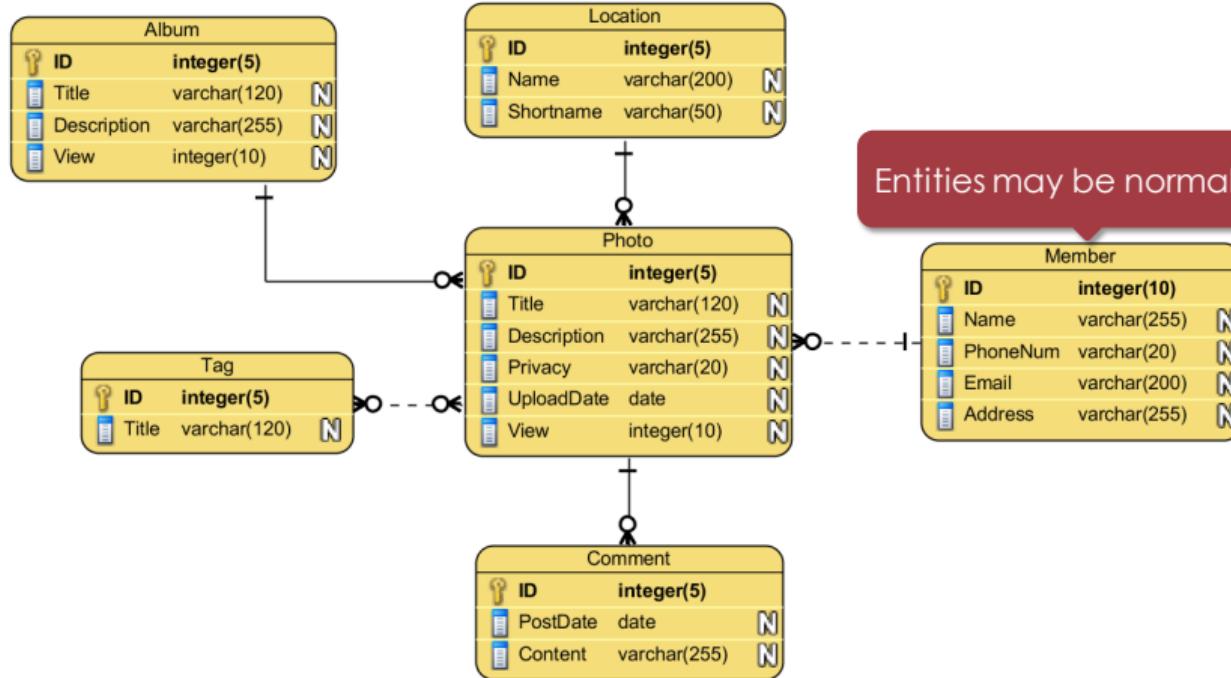
Column types are set



The Three-Levels of ER Model

Example

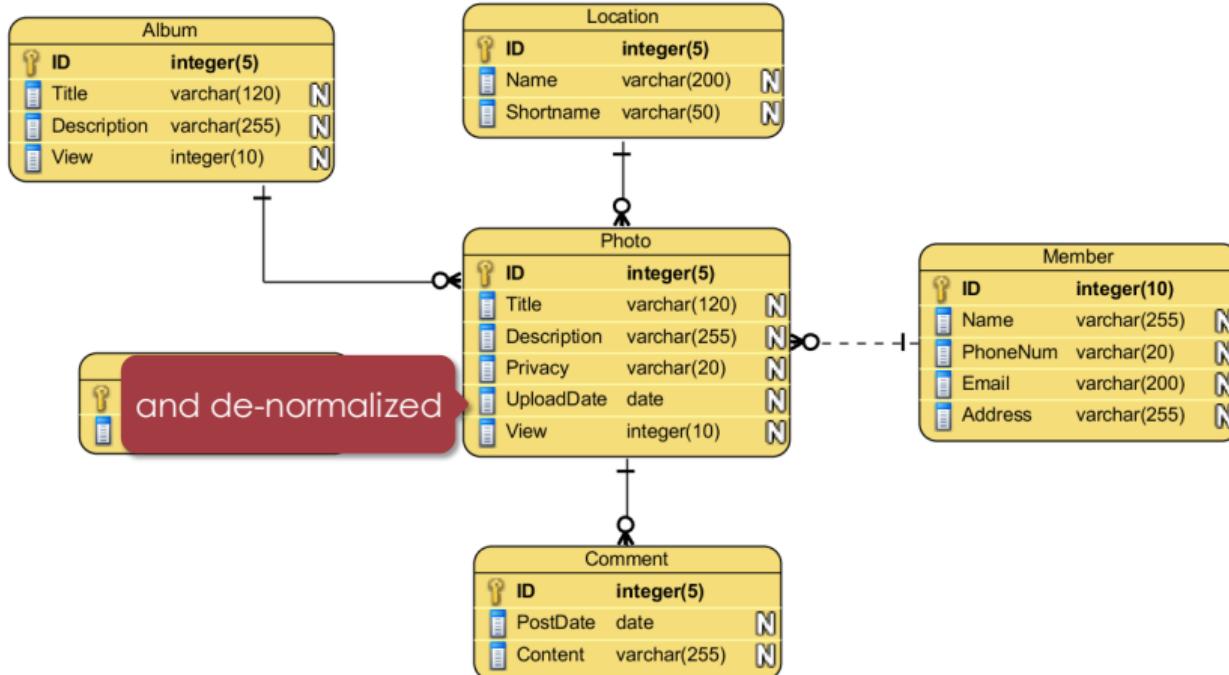
Logical



The Three-Levels of ER Model

Example

Logical

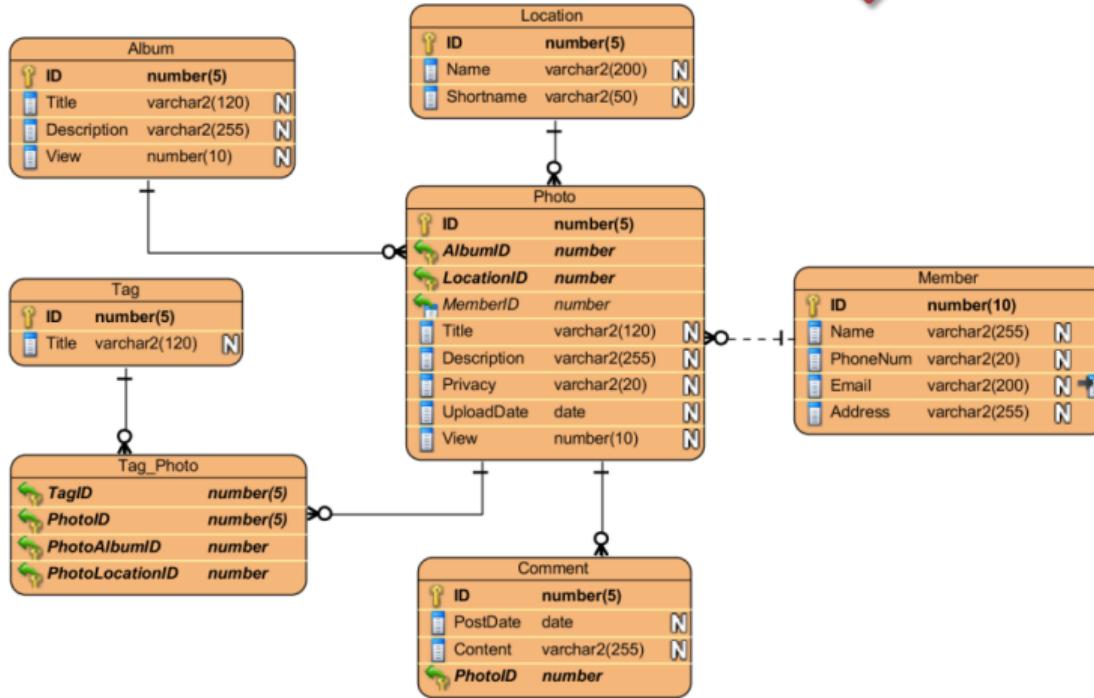


The Three-Levels of ER Model

Example

Physical

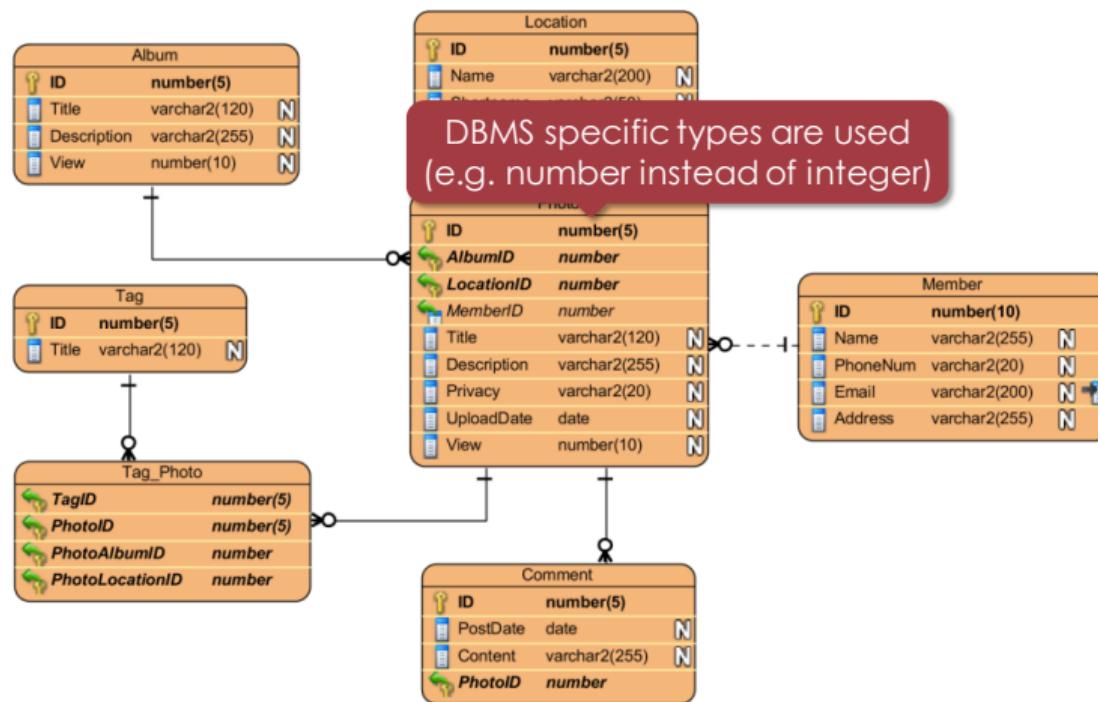
Designed for database creation/maintenance



The Three-Levels of ER Model

Example

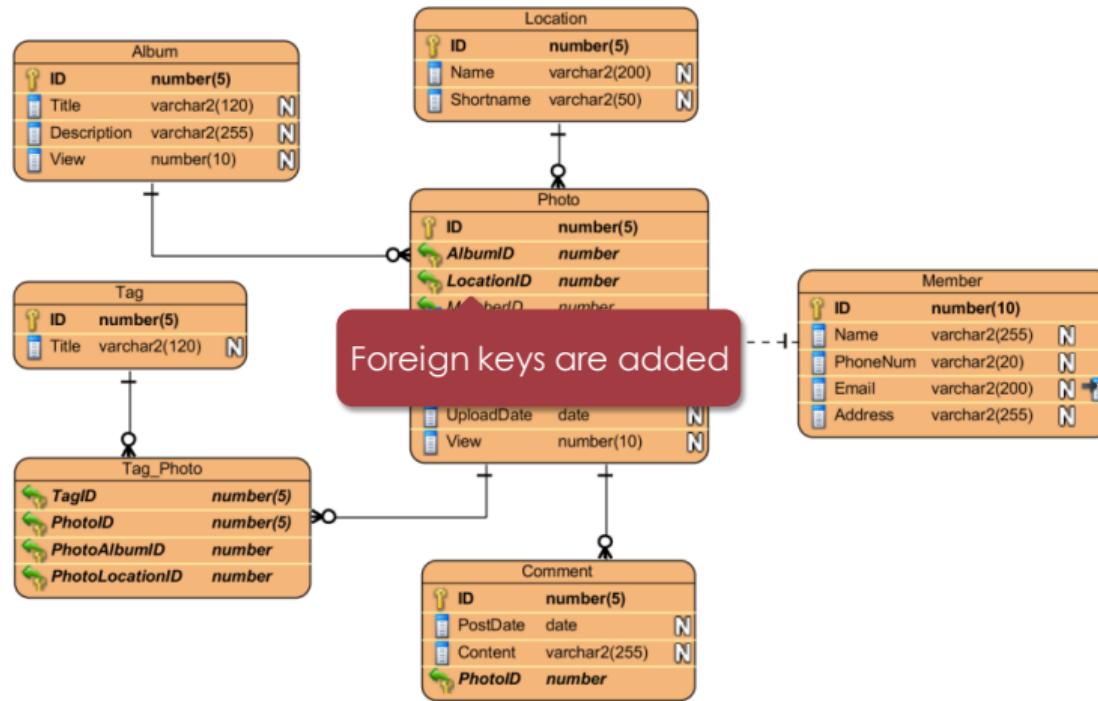
Physical



The Three-Levels of ER Model

Example

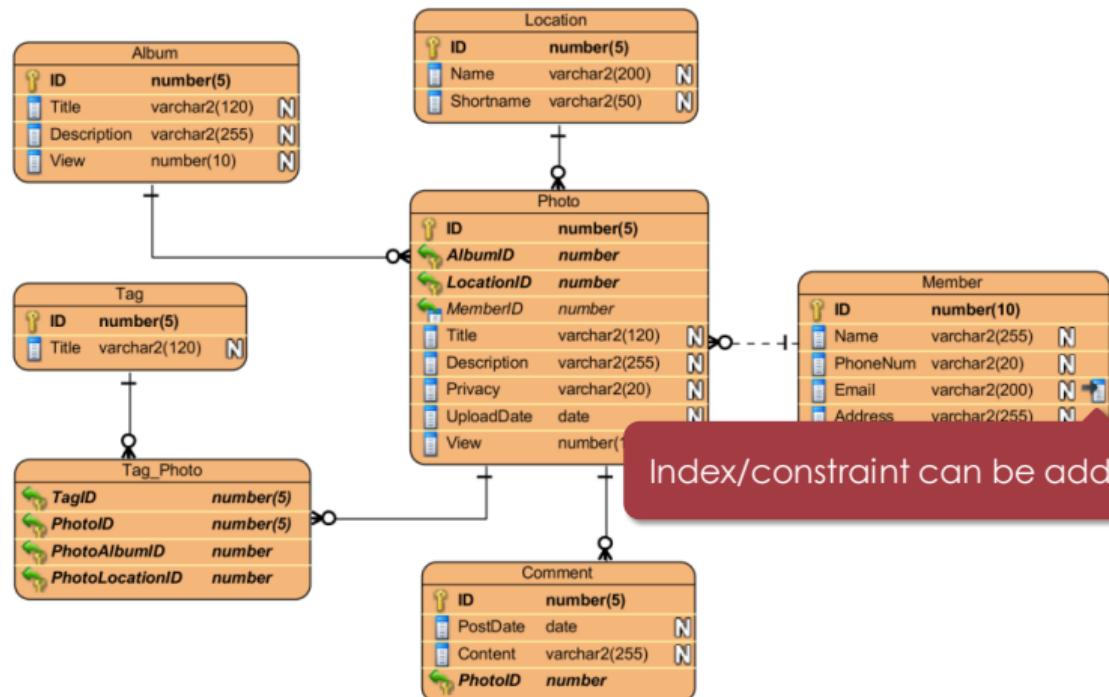
Physical



The Three-Levels of ER Model

Example

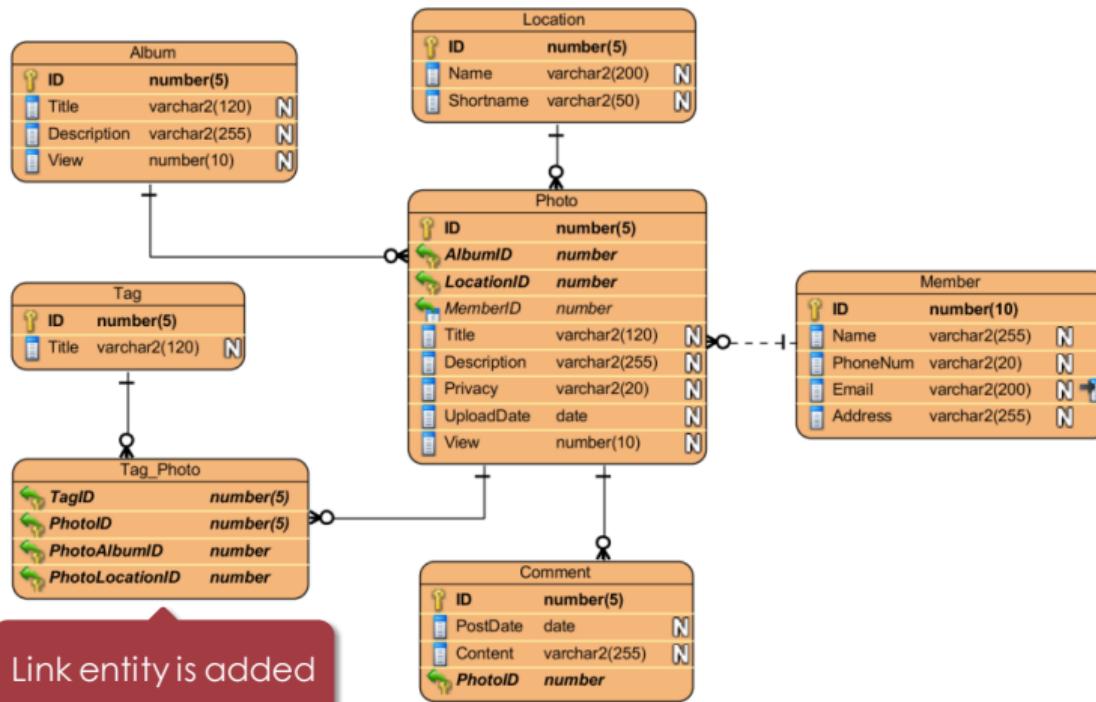
Physical



The Three-Levels of ER Model

Example

Physical



The Three-Levels of ER Model

Plan

Introduction

Entities and Columns

The Three Levels of E-R Models

Key and Relationships

Database Views

Triggers and Stored Procedures



Primary Key

Key and Relationship

Primary key is a table column
(or columns) which **uniquely** identifies
each record in a table.

Key and Relationship

What is Primary Key?

Member Name	Member PhoneNum	Member Address
Nancy Ward	620-824-6226	213 Cotton Valley
Nancy Ward	562-424-1087	843 Lost Village
Nancy Ward	719-427-0417	43 Noble Lane
Wanda A. Allison	713-728-7073	123 North Point
Peter R. Webster	216-317-2998	972 Golden Valley
Lucille A. Cola	662-519-0717	785 The Corner
Paul J. Clark	484-325-1544	125Good View

Table: Member

Key and Relationship

What is Primary Key?

Member Name	Member PhoneNum	Member Address
Nancy Ward	620-824-6226	213 Cotton Valley
Nancy Ward	512-124-1087	843 Lost Village
Nancy		Lane
Wanda A.		Point
Peter R. Webster	216-317-2998	972 Golden Valley
Lucille A. Cola	662-519-0717	785 The Corner
Paul J. Clark	484-325-1544	125Good View

What is the phone number
of **Nancy Ward**?

Table: Member

Key and Relationship

What is Primary Key?

Member Name	Member PhoneNum	Member Address
Nancy Ward	620-824-6226	213 Cotton Valley
Nancy Ward	562-424-1087	843 Lost Village
Nancy Ward	719-427-0417	43 Noble Lane
	713-728-7073	123 North Point
	216-317-2998	972 Golden Valley
Lucille A. Cola	662-519-0717	785 The Corner
Paul J. Clark	484-325-1544	125Good View

Which Nancy Ward do you mean?

Table: Member

Key and Relationship

What is Primary Key?

ID	Member Name	Member PhoneNum	Member Address
1	Nancy Ward	620-824-6226	213 Cotton Valley
2	Nancy Ward	562-424-1087	843 Lost Village
3	Nancy Ward	719-427-0417	43 Noble Lane
4	Wanda A. Allison	713-728-7073	123 North Point
5	Peter R. Webster	216-317-2998	972 Golden Valley
6	Lucille A. Cola	662-519-0717	785 The Corner
7	Paul J. Clark	484-325-1544	125Good View

Primary Key

Table: Member

Key and Relationship

Presentation of Primary Key

Photo			
	ID	integer(5)	
	Title	varchar(120)	N
	Description	varchar(255)	N
	Privacy	varchar(20)	N
	UploadDat	date	N
	View	integer(10)	N

Key and Relationship

Picking a Primary Key

Check the following when you evaluate candidates for a table's primary key

Unique?

Mandatory?

Constant?

Key and Relationship

Picking a Primary Key

Member Name

Unique?

Mandatory?

Constant?

Key and Relationship

Picking a Primary Key

Member's SSN

Unique?

Mandatory?

Constant?

Key and Relationship

Picking a Primary Key

Member Email Address

Unique?

Mandatory?

Constant?

Key and Relationship

Picking a Primary Key

Computer generated ID

Unique?

Mandatory?

Constant?

Key and Relationship

Primary key could be a single column or
a group of columns.

Key and Relationship

When you define more than one column as a primary key, it's called a **composite primary key**.

Key and Relationship

Composite PK Example



Photo ID	Member ID	Shared Date
1	1	3/3/2015
1	2	3/4/2015
1	3	3/5/2015
2	1	3/6/2015
2	4	3/7/2015
3	1	3/2/2015
3	5	3/3/2015

Table: Photo_Sharing

Key and Relationship

Composite PK Example

Not unique

Not unique

Photo ID	Member ID	Shared Date
1	1	3/3/2015
1	2	3/4/2015
1	3	3/5/2015
2	1	3/6/2015
2	2	3/7/2015
3	1	3/2/2015
3	5	3/3/2015

Table: Photo_Sharing

Key and Relationship

Composite PK Example

Unique

Photo ID	Member ID	Shared Date
1	1	3/3/2015
1	2	3/4/2015
1	3	3/5/2015
2	1	3/6/2015
2	4	3/7/2015
3	1	3/2/2015
3	5	3/3/2015

Table: Photo_Sharing

Key and Relationship

Composite PK Example

Photo_Sharing

- Photo ID : integer (10)
- MemberID : integer (10)
- Shared Date: date

Photo ID	Member ID	Shared Date
1	1	3/3/2015
1	2	3/4/2015
1	3	3/5/2015
2	1	3/6/2015
2	4	3/7/2015
3	1	3/2/2015
3	5	3/3/2015

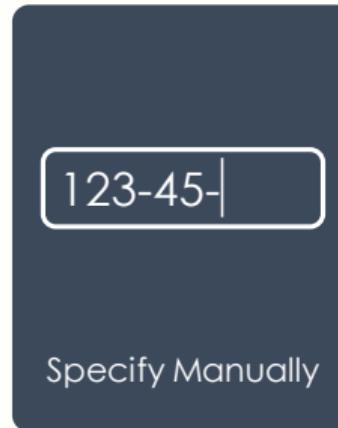
Table: Photo_Sharing

Key and Relationship

Primary Key Assignment



Values of a primary key can be assigned by the following ways



Key and Relationship

Primary Key Assignment

Auto-Generated

- Allows a unique value to be generated when you insert a new record into a table.

ID
1
2
3
4

Key and Relationship

Primary Key Assignment

Specify Manually

- Provide a unique value when you insert a new record into a table.
- The value is mandatory (cannot be unfilled/null)
- Examples:
 - Social Security Number (SSN)
 - Email address
 - ISBN

SSN
751-15-2261
122-21-7421
693-86-0582
+ 830-27-5782

Key and Relationship

- Allows a unique value to be generated when you insert a new record into a table.
- The **interval**, **min value**, **max value** and **sequence** of value can be defined.
- Example:

ID
5
10
15
20

Key and Relationship

Ascending Sequence

MINVALUE:

1

MAXVALUE:

99999999

START WITH:

1

INCREMENT BY:

3

CACHE:

20

The number of sequence values to be stored in memory for faster access.

Ascending Sequence

MINVALUE:

1

MAXVALUE: 99999999

START WITH: 1

INCREMENT BY: 3

CACHE: 20

ID
1
4
7
10
⋮

Descending Sequence

MINVALUE: 1

MAXVALUE: 50000000

START WITH: 50000000

INCREMENT BY: -10

NOCACHE

Descending Sequence

MINVALUE: 1

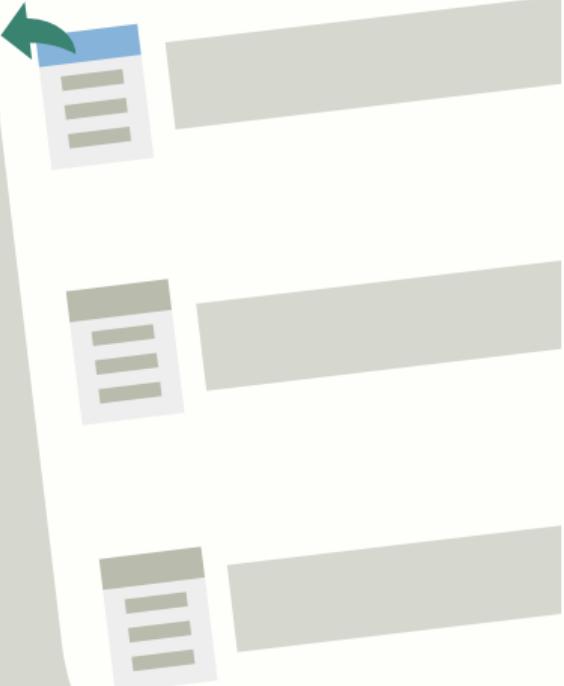
MAXVALUE: 50000000

START WITH: 50000000

INCREMENT BY: -10

NOCACHE

ID
50000000
49999990
49999980
49999970
⋮



Foreign Key

Key and Relationship

Foreign key is a table column which
uniquely identifies a record in another table.

Key and Relationship

Understanding Foreign Key

Photo Details

ID	Title	Member Name	Member PhoneNum	Member Address
1	The tram	Chris Wong	252-608-5628	572 Lost Lake Crossing
2	Little kitten	Chris Wong	252-608-5628	572 Lost Lake Crossing
3	Chamomile	Chris Wong	252-608-5628	572 Lost Lake Crossing
4	New bus route	Wanda A. Allison	808-839-2217	2017 Green Impasse
5	Ferry pier 9	Chris Wong	252-608-5628	572 Lost Lake Crossing
6	The coast	Chris Wong	252-608-5628	572 Lost Lake Crossing
7	Rock climbing	Wanda A. Allison	808-839-2217	2017 Green Impasse
8	Fountain	Chris Wong	252-608-5628	572 Lost Lake Crossing
9	Sunset	Wanda A. Allison	808-839-2217	2017 Green Impasse

Database table: **Photo**

Key and Relationship

Understanding Foreign Key

Member Details

ID	Title	Member Name	Member PhoneNum	Member Address
1	The tram	Chris Wong	252-608-5628	572 Lost Lake Crossing
2	Little kitten	Chris Wong	252-608-5628	572 Lost Lake Crossing
3	Chamomile	Chris Wong	252-608-5628	572 Lost Lake Crossing
4	New bus route	Wanda A. Allison	808-839-2217	2017 Green Impasse
5	Ferry pier 9	Chris Wong	252-608-5628	572 Lost Lake Crossing
6	The coast	Chris Wong	252-608-5628	572 Lost Lake Crossing
7	Rock climbing	Wanda A. Allison	808-839-2217	2017 Green Impasse
8	Fountain	Chris Wong	252-608-5628	572 Lost Lake Crossing
9	Sunset	Wanda A. Allison	808-839-2217	2017 Green Impasse

Database table: **Photo**

Key and Relationship

Understanding Foreign Key

Data kept repeating

ID	Title	Member Name	Member PhoneNum	Member Address
1	The tram	Chris Wong	252-608-5628	572 Lost Lake Crossing
2	Little kitten	Chris Wong	252-608-5628	572 Lost Lake Crossing
3	Chamomile	Chris Wong	252-608-5628	572 Lost Lake Crossing
4	New bus route	Wanda A. Allison	808-839-2217	2017 Green Impasse
5	Ferry pier 9	Chris Wong	252-608-5628	572 Lost Lake Crossing
6	The coast	Chris Wong	252-608-5628	572 Lost Lake Crossing
7	Rock climbing	Wanda A. Allison	808-839-2217	2017 Green Impasse
8	Fountain	Chris Wong	252-608-5628	572 Lost Lake Crossing
9	Sunset	Wanda A. Allison	808-839-2217	2017 Green Impasse

Database table: **Photo**

Key and Relationship

Understanding Foreign Key

ID	Title	Member ID
1	The tram	1
2	Little kitten	1
3	Chamomile	1
4	New bus route	2
5	Ferry pier 9	1
6	The coast	1
7	Rock climbing	2
8	Fountain	1
9	Sunset	2

Database table: **Photo**

ID	Name	PhoneNum	Address
1	Chris Wong	252-608-5628	572 Lost Lake Crossing
2	Wanda A. Allison	808-839-2217	2017 Green Impasse

Database table: **Member**



Photo and Member details
in **separate tables**

Key and Relationship

Understanding Foreign Key

ID	Title	Member ID
1	The tram	1
2	Little kitten	1
3	Chamomile	1
4	New bus route	2
5	Ferry pier 9	1
6	The coast	1
7	Rock climbing	2
8	Fountain	1
9	Sunset	2

Database table: **Photo**

ID	Name	PhoneNum	Address
1	Chris Wong	252-608-5628	572 Lost Lake Crossing
2	Wanda A. Allison	808-839-2217	2017 Green Impasse

Database table: **Member**

Foreign Key Column

Key and Relationship

Understanding Foreign Key

The diagram illustrates a database relationship between two tables: **Photo** and **Member**.

Database table: Photo

ID	Title	Member ID
1	The tram	1
2	Little kitten	1
3	Chamomile	1
4	New bus route	2
5	Ferry pier 9	1
6	The coast	1
7	Rock climbing	2
8	Fountain	1
9	Sunset	2

Database table: Member

ID	Name	PhoneNum	Address
1	Chris Wong	252-608-5628	572 Lost Lake Crossing
2	Wanda A. Allison	808-839-2217	2017 Green Impasse

A red callout box contains the text: "Uniquely identifies a member in the Member table".

Key and Relationship

Presentation of Foreign Key

Member		
	ID	integer(10)
	Name	varchar(255)
	PhoneNum	varchar(20)
	Email	varchar(200)
	Address	varchar(255)

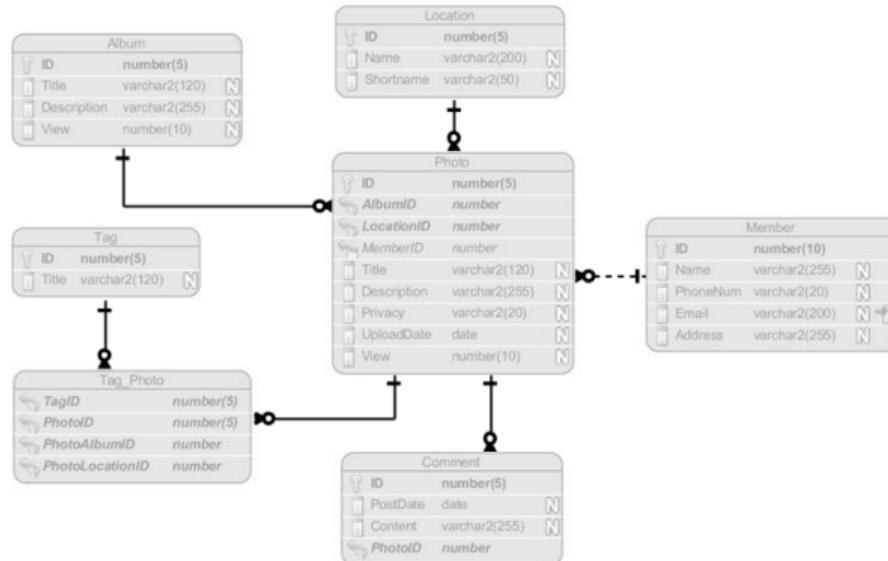


Photo		
	ID	integer(5)
	MemberID	integer(10)
	Title	varchar(120)
	Description	varchar(255)
	Privacy	varchar(20)
	UploadDat	date
	View	integer(10)

The use of foreign key in Photo entity (Referencing the **primary key** of Member entity)

Key and Relationship

Relationship and cardinality



Key and Relationship

Relationship and cardinality



Common cardinality types:



1 to many



1 to 0..1

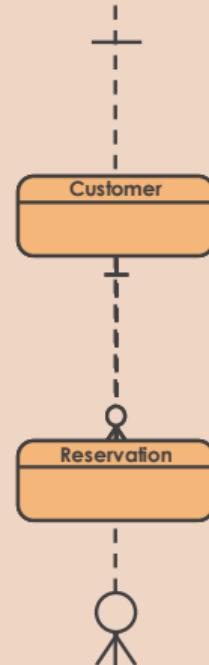


Associated

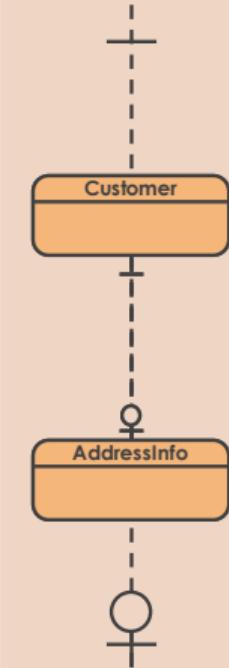
Many to Many

Key and Relationship

- Used when a record in a table can reference multiple records in another table.
 - Examples
 - A **Member** can upload many **Photos**
 - A **Customer** can make many **Reservations**
 - A **Document** can have many **Revisions**
 - Probably the most common type of cardinality

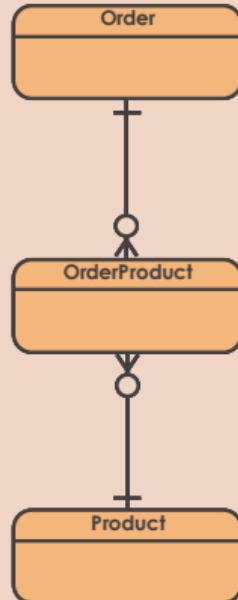


- Used when a record in a table can reference up to one record in another table.
 - Examples
 - A **BlogPost** can have a single piece of blog **Content**
 - A **Customer** can have one set of **AddressInfo**
- You gain performance due to:
 - Separating less commonly used data into another table.
- You lose performance due to:
 - More tables lead to more table overhead and disc storage.
 - Complicated queries resulted by additional JOIN clause.
- Conclusion:
 - If there are data that you don't access in >90% of your use cases (or you don't have that data in most of the time), then it would be a wise choice to separate these data into another table for better performance.



Key and Relationship

- Broken down into a pair of one-to-many relationships.
- Associative entity is used to define the association between two related entities
- Used when a record in a parent table can reference multiple records in another table. At the same time, a record in a child table can also reference multiple records in the parent table.
 - Examples
 - A **Student** can enroll in many **Courses**, while a **Course** can be taken by many **Students**
 - An **Order** can consist of many **Products**, while a **Product** can appear in many **Orders**.



Key and Relationship

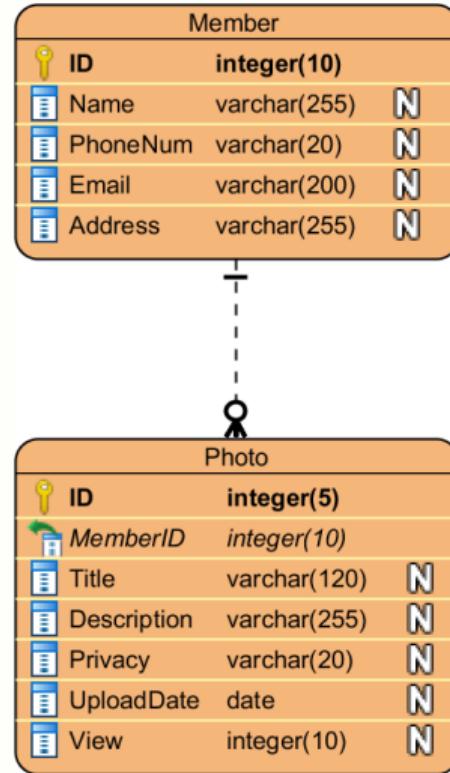
Foreign Key Example



A Member
can upload
many Photos

Key and Relationship

Foreign Key Example



Key and Relationship

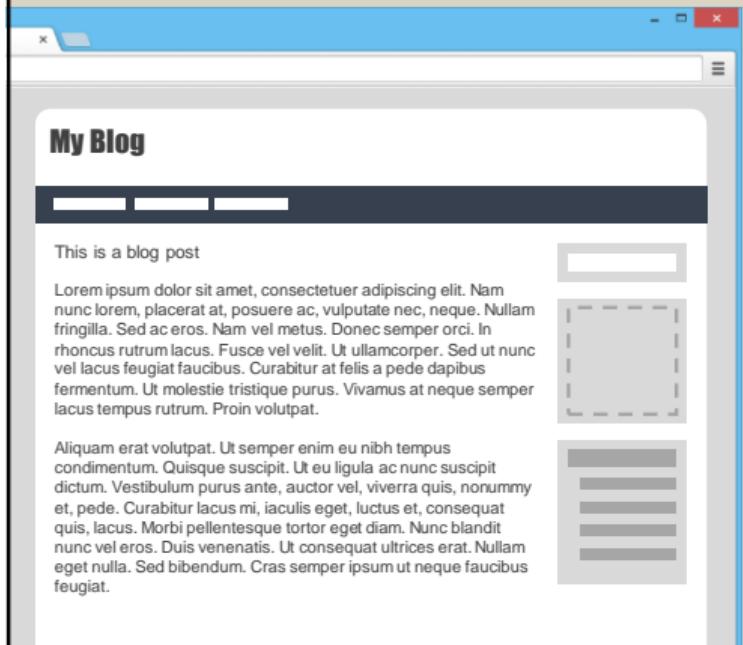
Foreign Key Example



A **BlogPost** can
have a single
piece of blog
Content

Key and Relationship

Foreign Key Example



BlogPost		
key	ID	integer(10)
file	Title	varchar(100)
file	Summary	varchar(100)
file	PostDate	date
file	Status	char(5)
file	ShortName	varchar(20)

+

+

+

Content		
key	ID	integer(10)
link	BlogPostID	integer(10)
file	content	clob

Key and Relationship

Foreign Key Example



A **Photo** can have many **Tags**.

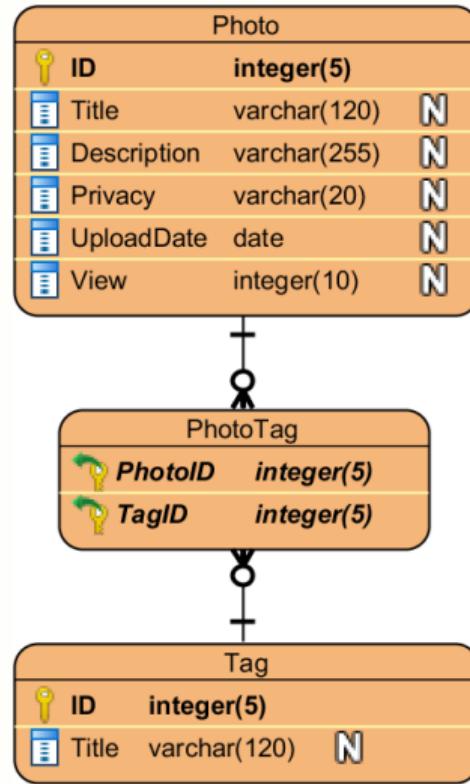
A **Tag** can be used by many **Photos**.

Key and Relationship

Foreign Key Example



hongkong → pier → ferry pier
ferry → central → building
nine →



Key and Relationship

Plan

Introduction

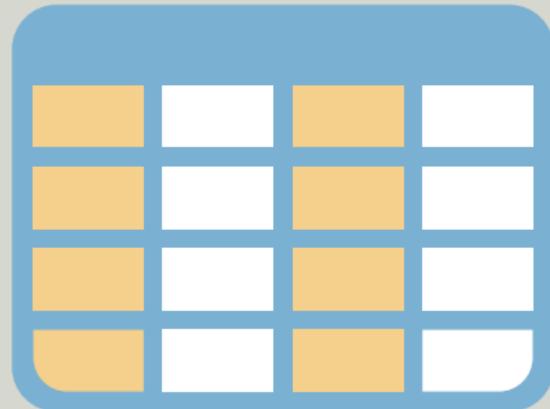
Entities and Columns

The Three Levels of E-R Models

Key and Relationships

Database Views

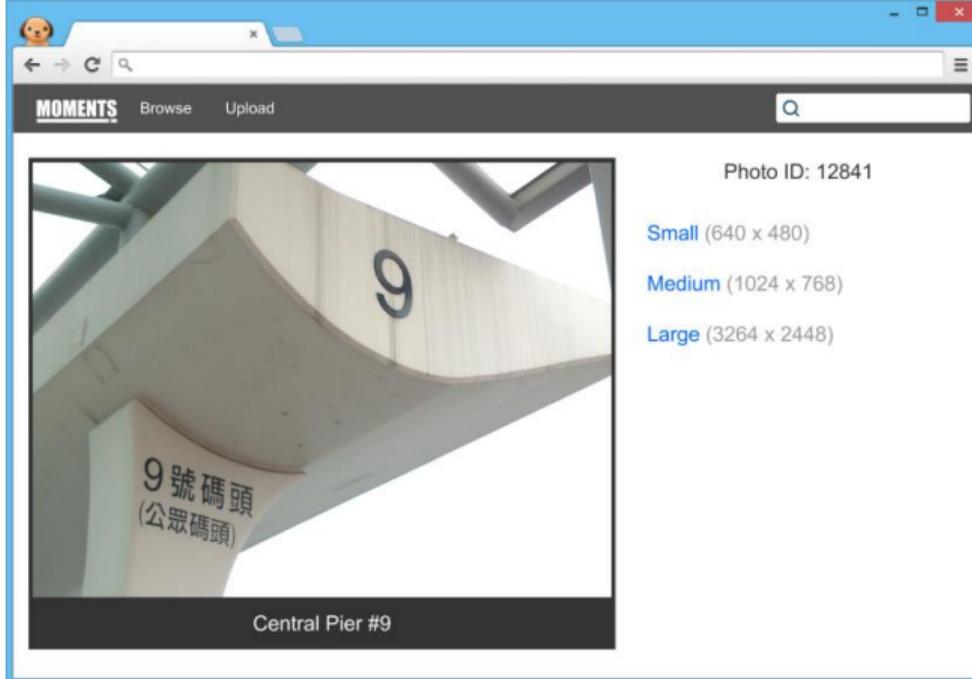
Triggers and Stored Procedures



Database view is a virtual table that provides the result set of a pre-established query command.

Database View

Concept of DB View



Database View

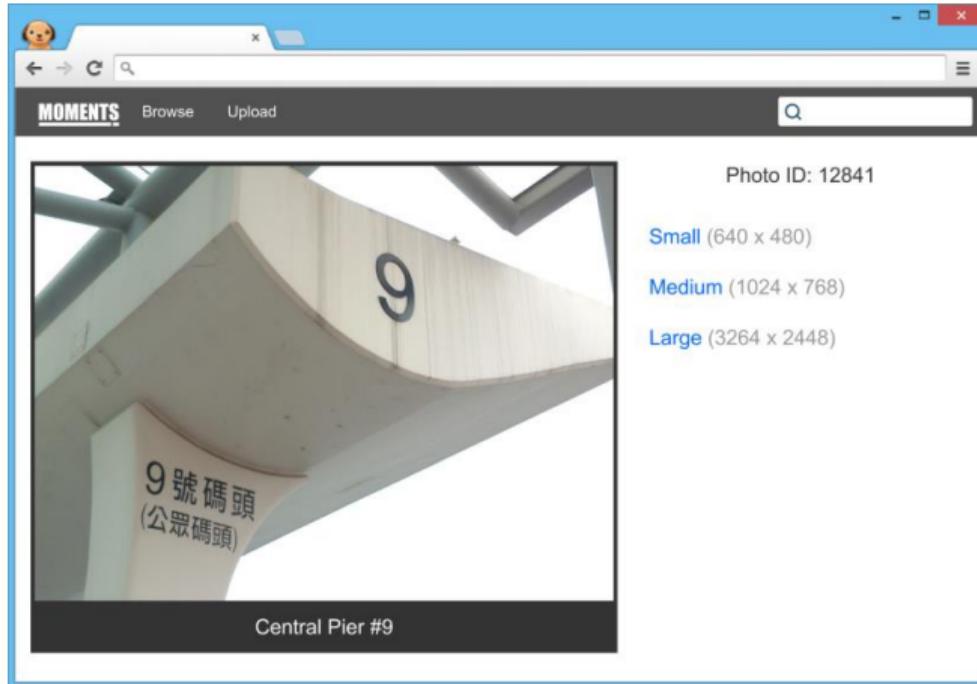
Concept of DB View

Photo

ID : number (5)
Title : varchar (120)
Description : varchar (255)
Privacy : varchar (20)
UploadDate : date
View : number (10)
ImagePath: varchar (50)



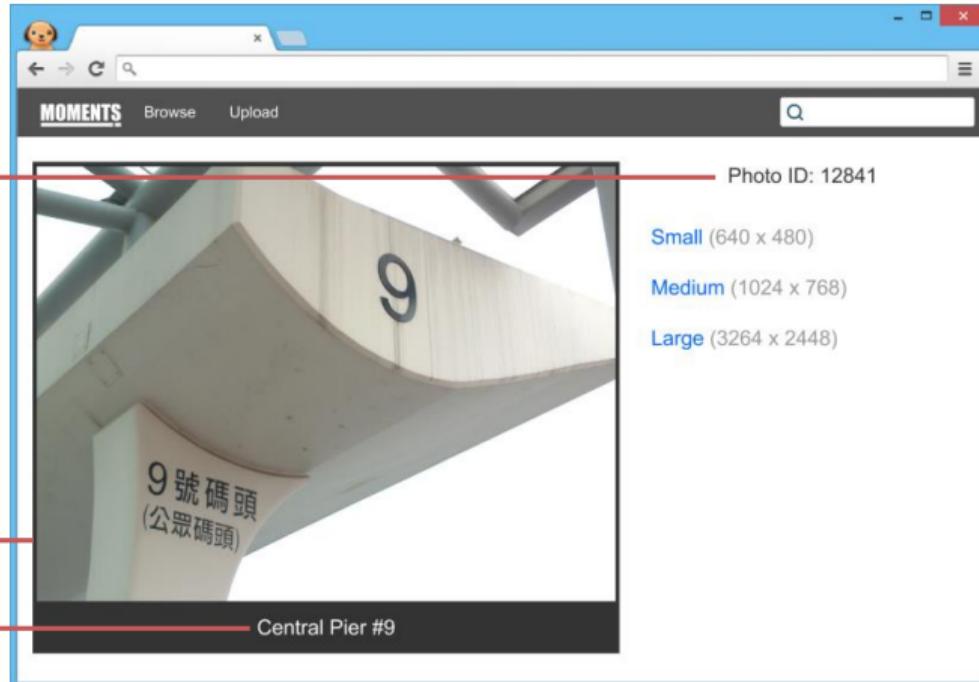
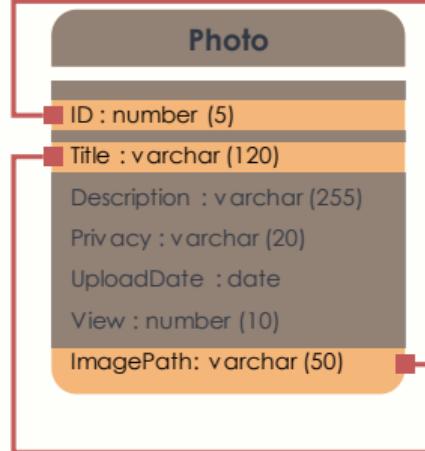
Source of data



Database View

Concept of DB View

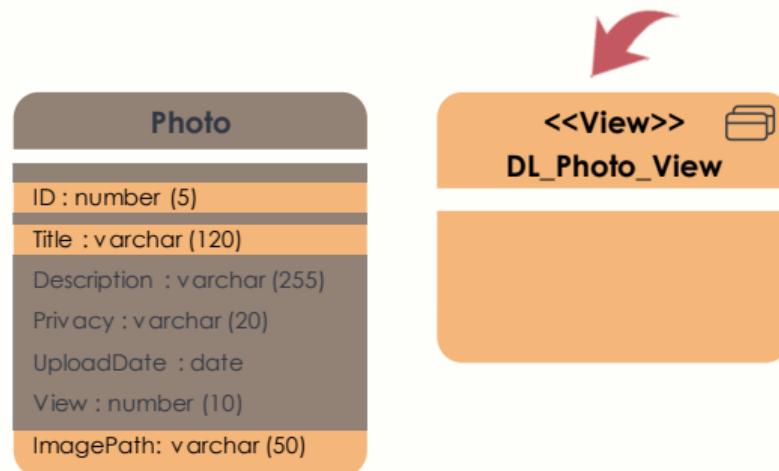
Just some columns are queried



Database View

Concept of DB View

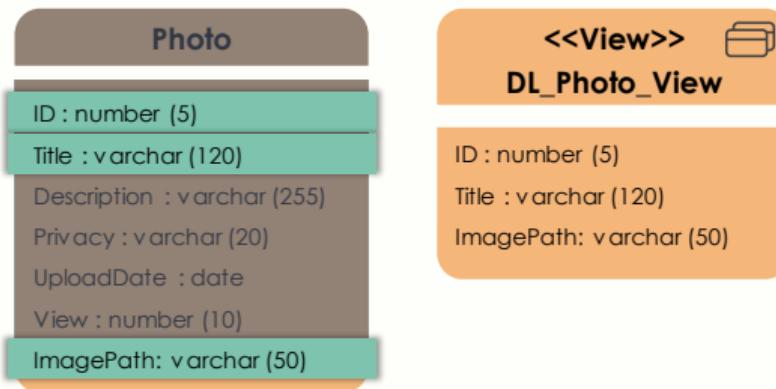
A database view specialized for querying
the data required by the download page



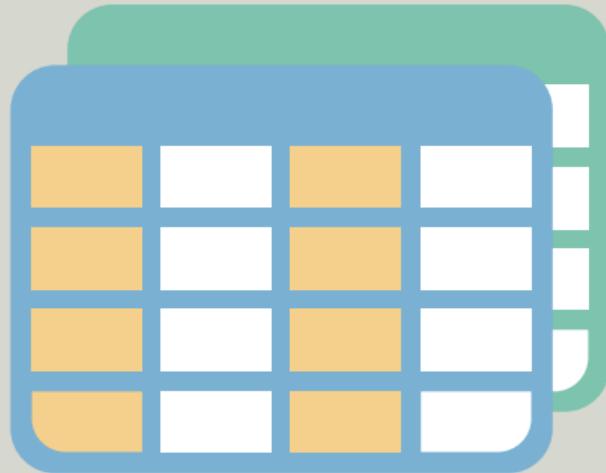
Database View

Concept of DB View

Add the columns needed by the view



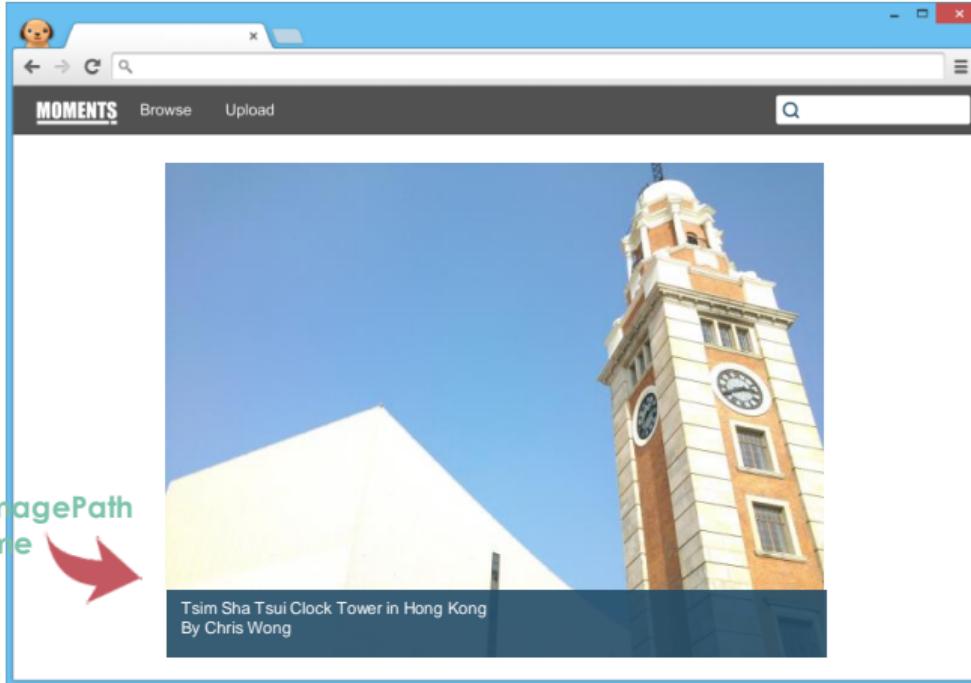
Database View



You can grab data from
multiple tables by using **join**

Database View

Concept of Joining Tables



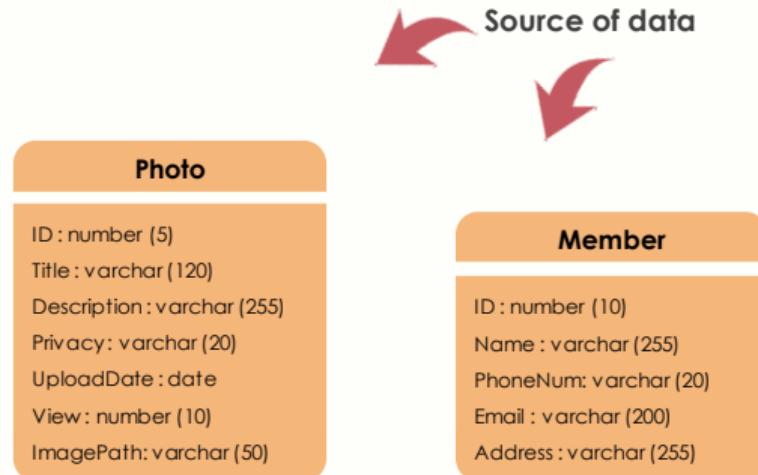
Source of data:

Photo table: Title, ImagePath

Member table: Name

Database View

Concept of Joining Tables

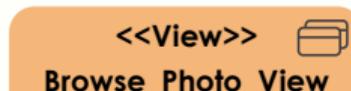


Database View

Concept of Joining Tables

Photo
ID : number (5)
Title : varchar (120)
Description : varchar (255)
Privacy: varchar (20)
UploadDate : date
View : number (10)
ImagePath: varchar (50)

Member
ID : number (10)
Name : varchar (255)
PhoneNum: varchar (20)
Email : varchar (200)
Address : varchar (255)



A database view for browse photo page



Database View

Concept of Joining Tables

Tables can be joined

Photo	
ID : number	(5)
Title : varchar	(120)
Description : varchar	(255)
Privacy : varchar	(20)
UploadDate : date	
View : number	(10)
ImagePath: varchar	(50)

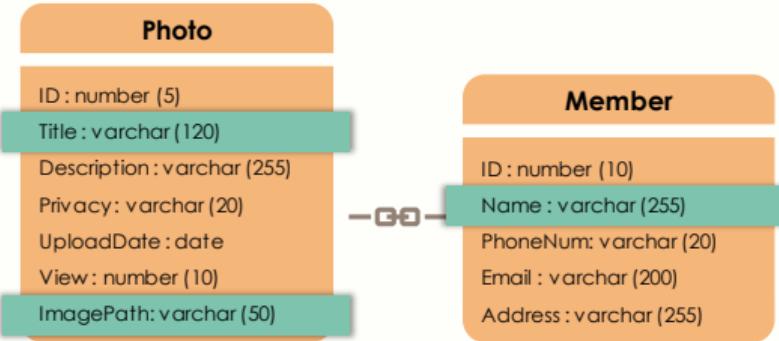
-00-

Member	
ID : number	(10)
Name : varchar	(255)
PhoneNum: varchar	(20)
Email : varchar	(200)
Address : varchar	(255)



Database View

Concept of Joining Tables

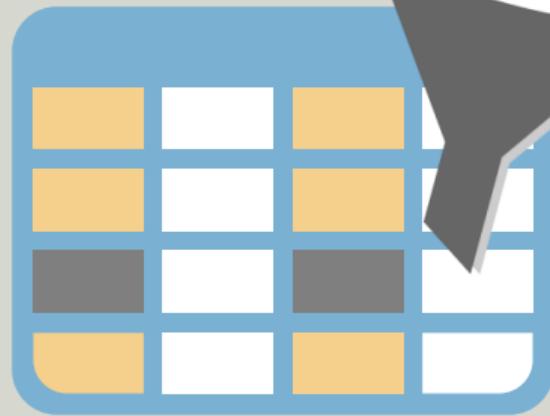


A view with columns from
multiple tables



PhotoTitle : varchar (120)
ImagePath : varchar (50)
MemberName: varchar (255)

Database View

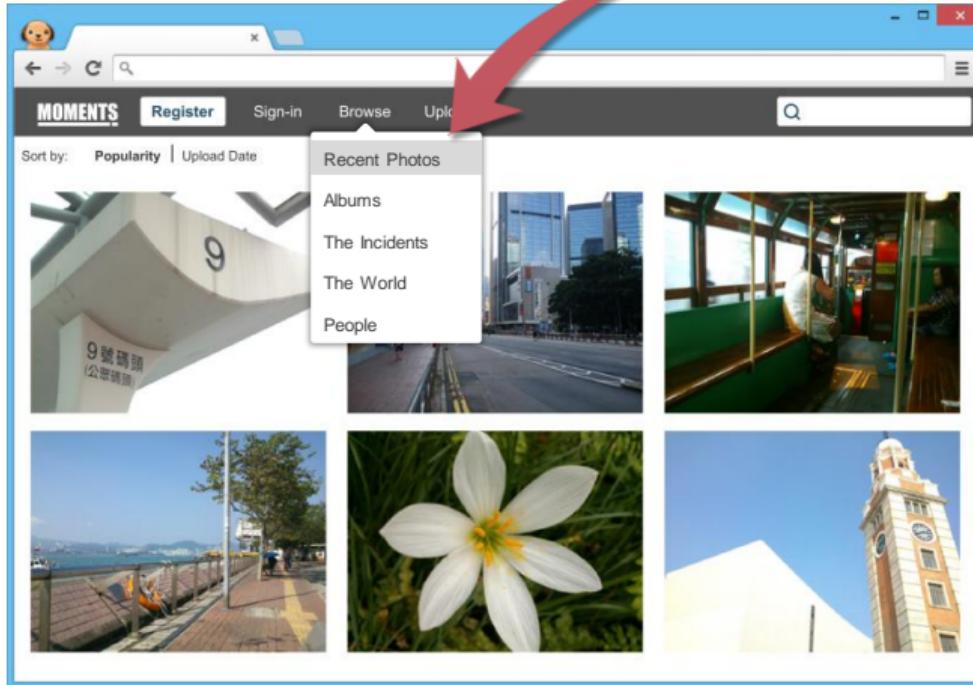


You can apply **Filter** to ensure
that only relevant data is
stored in the result set

Database View

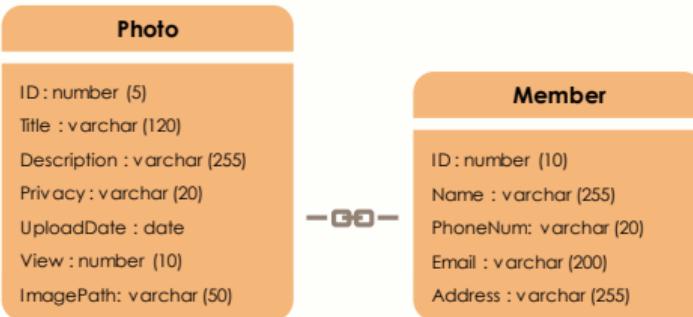
Concept of Filter

How about a view that lists only recent photos' data?



Database View

Concept of Filter



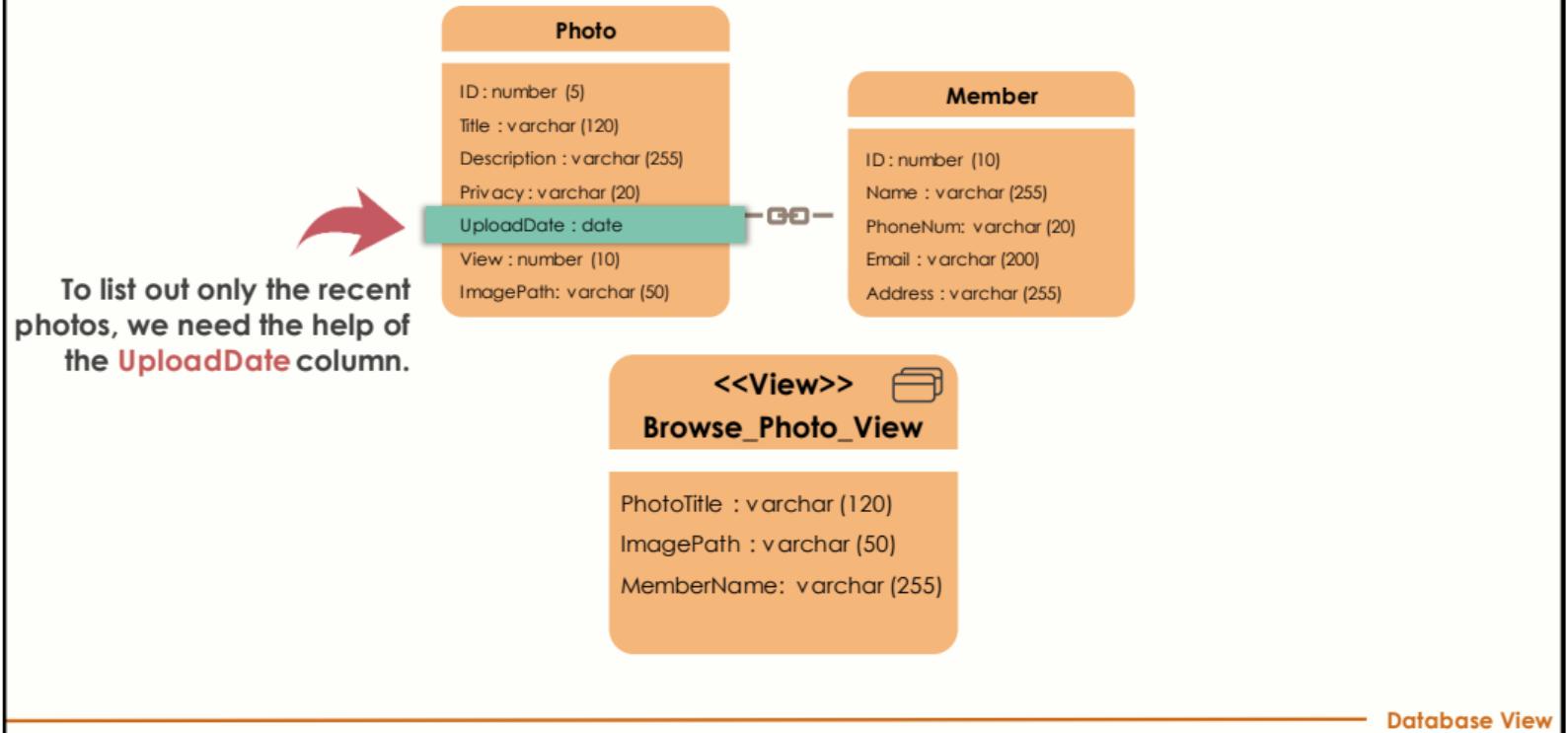
PhotoTitle : varchar (120)
ImagePath : varchar (50)
MemberName: varchar (255)



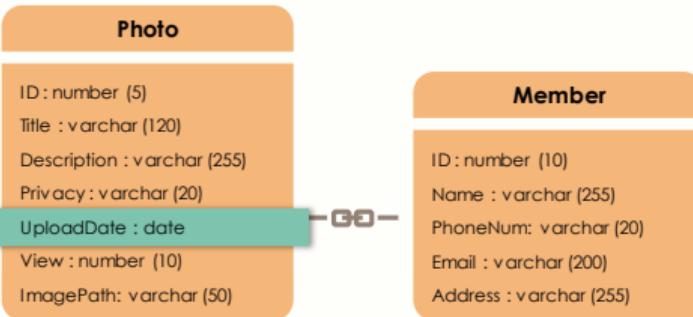
A view that contains both
photo and member data.

Database View

Concept of Filter



Concept of Filter



PhotoTitle : varchar (120)
ImagePath : varchar (50)
MemberName: varchar (255)
UploadDate : date

Apply a filter to the column



Database View

Plan

Introduction

Entities and Columns

The Three Levels of E-R Models

Key and Relationships

Database Views

Triggers and Stored Procedures



A database trigger is a procedure that is automatically executed in response to certain events on a database table

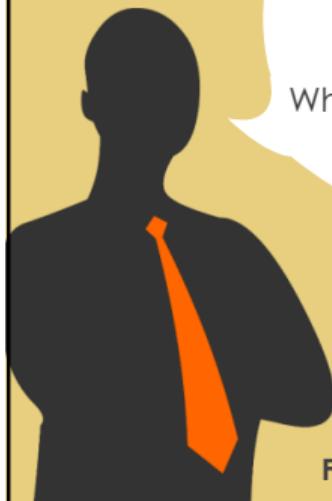
Sample Usage - Auditing



As the system runs, you keep modifying the data in database...

Triggers and Stored Procedures

Sample Usage - Auditing



Who modified the price
of milk to \$320?

When did he/she do it?

What was the value before the
change?

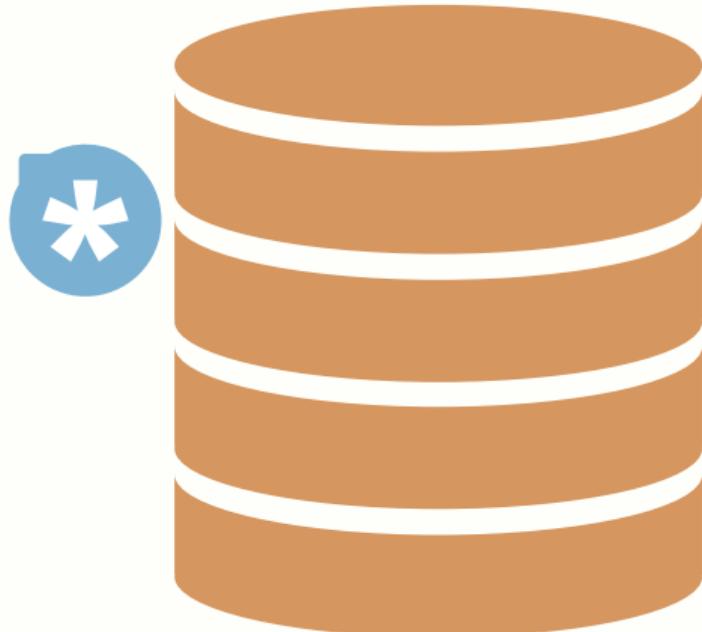
...

For business reasons, you may want to know the answer of these questions.

Product	Price
Biscuit	10
Bread	8
Milk	320
Sugar	6

Triggers and Stored Procedures

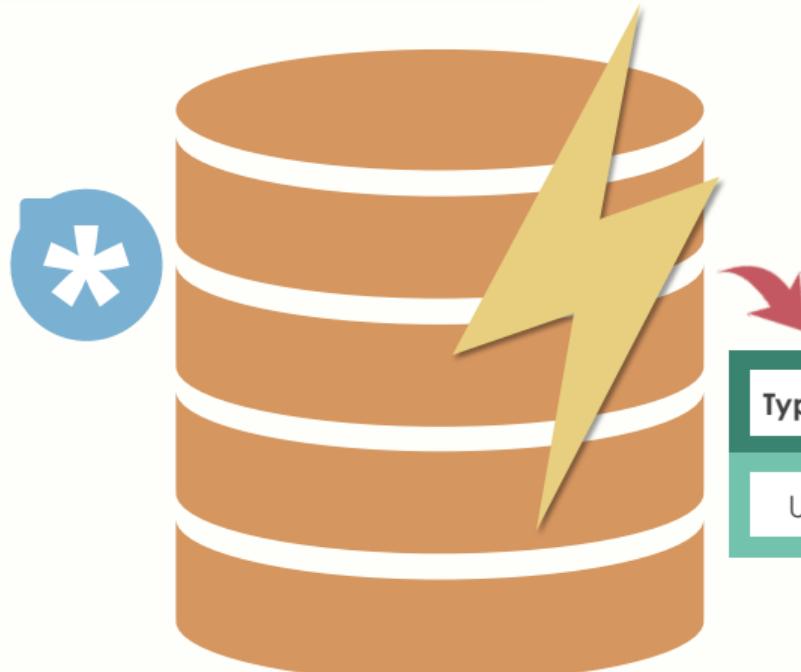
Sample Usage - Auditing



Trigger can be used to audit your database. Let's say if someone is trying to update a record

Triggers and Stored Procedures

Sample Usage - Auditing



Type	UserName	Time	Old_Val	New_Val
U	WG\Peter	2/5/...	8	320

If you have written a trigger for auditing, it can help you log his action before writing data into DB

Triggers and Stored Procedures



A stored procedure is a pre-written procedure code that allows you to execute over and over again for validation or quick retrieval of data.

Triggers and Stored Procedures

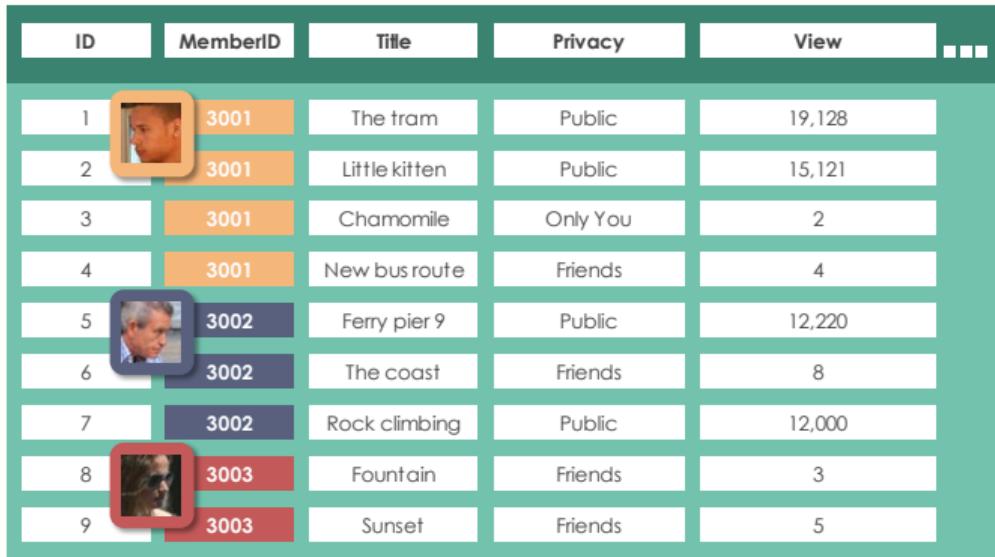
Sample Usage – Querying Data

ID	MemberID	Title	Privacy	View	...
1	3001	The tram	Public	19,128	
2	3001	Little kitten	Public	15,121	
3	3001	Chamomile	Only You	2	
4	3001	New bus route	Friends	4	
5	3002	Ferry pier 9	Public	12,220	
6	3002	The coast	Friends	8	
7	3002	Rock climbing	Public	12,000	
8	3003	Fountain	Friends	3	
9	3003	Sunset	Friends	5	

Let's take a look at this table. This is the **Photo** table, with all photos listed.

Triggers and Stored Procedures

Sample Usage – Querying Data



ID	MemberID	Title	Privacy	View	...
1	3001	The tram	Public	19,128	
2	3001	Little kitten	Public	15,121	
3	3001	Chamomile	Only You	2	
4	3001	New bus route	Friends	4	
5	3002	Ferry pier 9	Public	12,220	
6	3002	The coast	Friends	8	
7	3002	Rock climbing	Public	12,000	
8	3003	Fountain	Friends	3	
9	3003	Sunset	Friends	5	

These photos are uploaded by different members, identified by their IDs.

Triggers and Stored Procedures

Sample Usage – Querying Data



ID	MemberID	Title	Privacy	View	...
1	3001	The tram	Public	19,128	
2	3001	Little kitten	Public	15,121	
3	3001	Chamomile	Only You	2	
4	3001	New bus route	Friends	4	
5	3002	Ferry pier 9	Public	12,220	
6	3002	The coast	Friends	8	
7	3002	Rock climbing	Public	12,000	
8	3003	Fountain	Friends	3	
9	3003	Sunset	Friends	5	

The photos have different levels of privacy – public, only you (private) and friends.

Triggers and Stored Procedures

Sample Usage – Querying Data



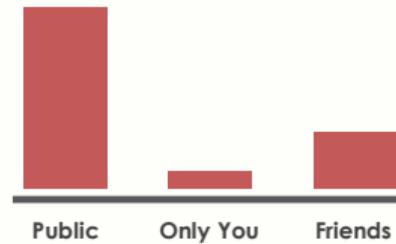
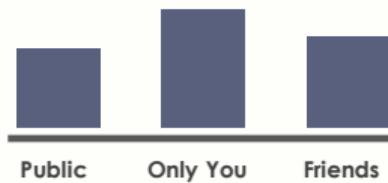
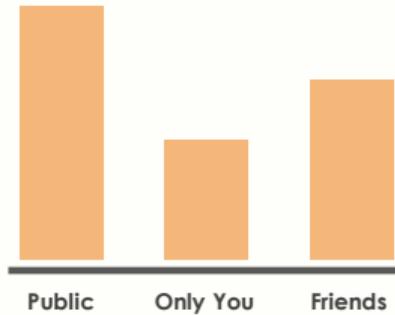
ID	MemberID	Title	Privacy	View	...
1	3001	The tram	Public	19,128	
2	3001	Little kitten	Public	15,121	
3	3001	Chamomile	Only You	2	
4	3001	New bus route	Friends	4	
5	3002	Ferry pier 9	Public	12,220	
6	3002	The coast	Friends	8	
7	3002	Rock climbing	Public	12,000	
8	3003	Fountain	Friends	3	
9	3003	Sunset	Friends	5	

and the number of view for each photo is stored in the View column.

Triggers and Stored Procedures

Sample Usage – Querying Data

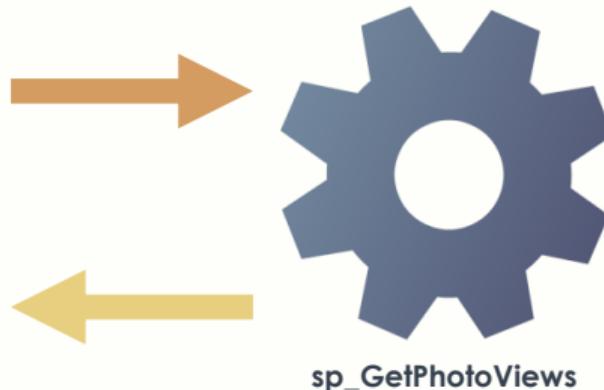
Photo view count



If now you want to retrieve the photo view count of different members, categorized by the privacy of photo...

Triggers and Stored Procedures

Sample Usage – Querying Data



MemberID	Public_Count	Only_You_Count	Friend_Count
3001	34249	2	4
3002	24220	0	8
3003	0	0	8
⋮			

You can write a procedure to return the resultset you need. By executing the procedure you will get the data you need easily.

Triggers and Stored Procedures

Creating a Procedure

```
CREATE PROCEDURE sp_GetPhotoViews()
BEGIN
    DECLARE v_member_id int;
    DECLARE v_pub_photo_viewcount int DEFAULT 0;
    DECLARE v_pri_photo_viewcount int DEFAULT 0;
    DECLARE v_frd_photo_viewcount int DEFAULT 0;
    DECLARE v_member_cursor CURSOR FOR SELECT ID, 'Name' FROM Member;

    CREATE TEMPORARY TABLE member_photo_viewcount (member_id int, public_photo_viewcount int, private_photo_viewcount int, friends_photo_viewcount int);

    OPEN v_member_cursor;

    FETCH v_member_cursor into v_member_id;
    BEGIN
        SELECT SUM('View') INTO v_pub_photo_viewcount FROM Photo WHERE Privacy = 'Public' AND MemberID = member_id;
        SELECT SUM('View') INTO v_pri_photo_viewcount FROM Photo WHERE Privacy = 'Only You' AND MemberID = member_id;
        SELECT SUM('View') INTO v_frd_photo_viewcount FROM Photo WHERE Privacy = 'Friends' AND MemberID = member_id;

        INSERT INTO member_photo_viewcount VALUES (v_member_id, v_pub_photo_viewcount, v_pri_photo_viewcount, v_frd_photo_viewcount);
        FETCH v_member_cursor into v_member_id;
    END;

    CLOSE v_member_cursor;

    SELECT * FROM member_photo_viewcount;
    DROP TABLE member_photo_viewcount;
END
```

Triggers and Stored Procedures

End of Lecture 4.

TDT5FTOTTC



Reverse Design

Top 5 Fundamental Takeaways

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- 2 **Three Levels of ER Modeling** include the conceptual (high-level overview), logical (detailed structure with normalization), and physical (implementation-specific design).
- 1 **ERDs (Entity-Relationship Diagrams)** provide a visual representation of database structures and relationships to improve data organization and communication.

Database Administration: Reverse Design.

The screenshot shows the Udemy course page for 'Database Design and Management'. At the top, there's a navigation bar with the Udemy logo, a search bar, and links for 'Udemy Business', 'Instructor', 'Mi aprendizaje', and a user icon. Below the header, the breadcrumb navigation shows 'Desarrollo > Diseño y desarrollo de bases de datos > Sistemas de gestión de bases de datos (DBMS)'. The main content area features a large image of a blue cylinder database with orange tables connected to it, labeled 'Vista previa de este curso'. To the right, the course title 'Database Design and Management' is displayed in bold, followed by a brief description: 'Learn how to design and manage database with ERD, database generation and reversal with Visual Paradigm.' Below this, there's a rating section showing 'Tutorial gratuito' with a 4.2 rating, '459 calificaciones', and '95.409 estudiantes'. It also indicates '2 h 41 min de video bajo demanda'. The course was created by 'Visual Paradigm'. Language options show 'Inglés' and 'Inglés (automático)'. A prominent purple button at the bottom right says 'Ir al curso'. Below the main image, there are tabs for 'Lo que aprenderás', 'Contenido del curso' (which is selected), 'Valoraciones', and 'Instructores'. The 'Requisitos' section lists 'Basic software development concept' and 'PC or DESK or Linux'. The 'Contenido del curso' section shows a table of contents with four sections: 'Introduction to Database Design and Management' (8 classes, 1h 31 min), 'Database Engineering' (3 classes, 37 min), 'Java Database Programming' (1 classes, 17 min), and 'Best Practices' (2 classes, 17 min). A link 'Ampliar todas las secciones' is located above the table.

Sección	Cantidad de Clases	Duración
Introduction to Database Design and Management	8	1h 31 min
Database Engineering	3	37 min
Java Database Programming	1	17 min
Best Practices	2	17 min

Content has been extracted from *Database Design and Management*. Udemy Course, created by Visual Paradigm, 2025. Visit <https://www.udemy.com/course/database-design-and-management/> and <https://www.visual-paradigm.com/>.