Key and Relationship

Primary Key

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

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

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		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

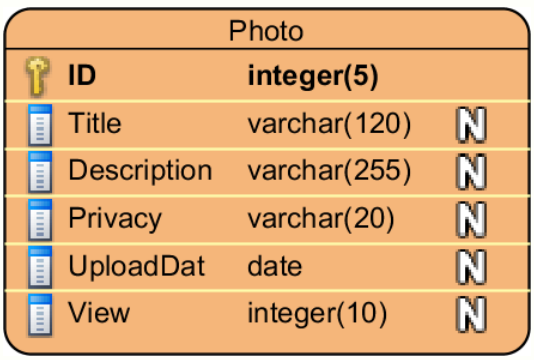
What is Primary Key?

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

Presentation of Primary Key



Picking a Primary Key

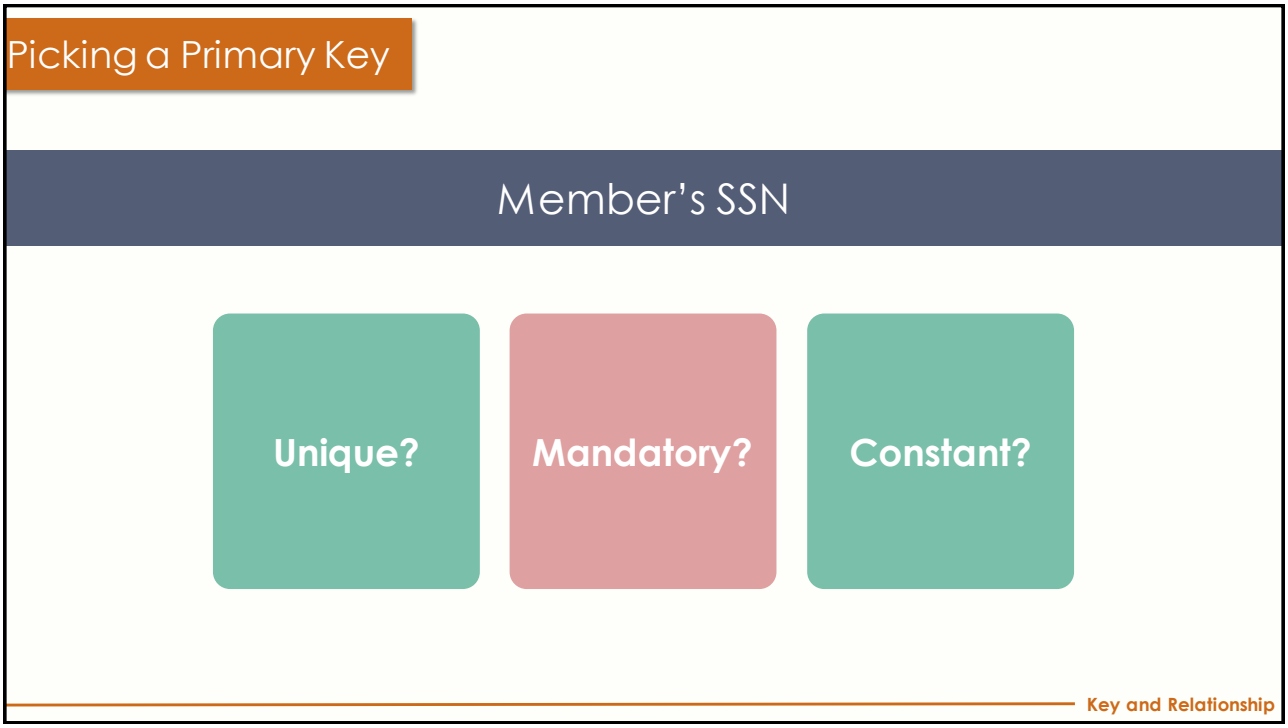
Check the following when you evaluate candidates for a table's primary key

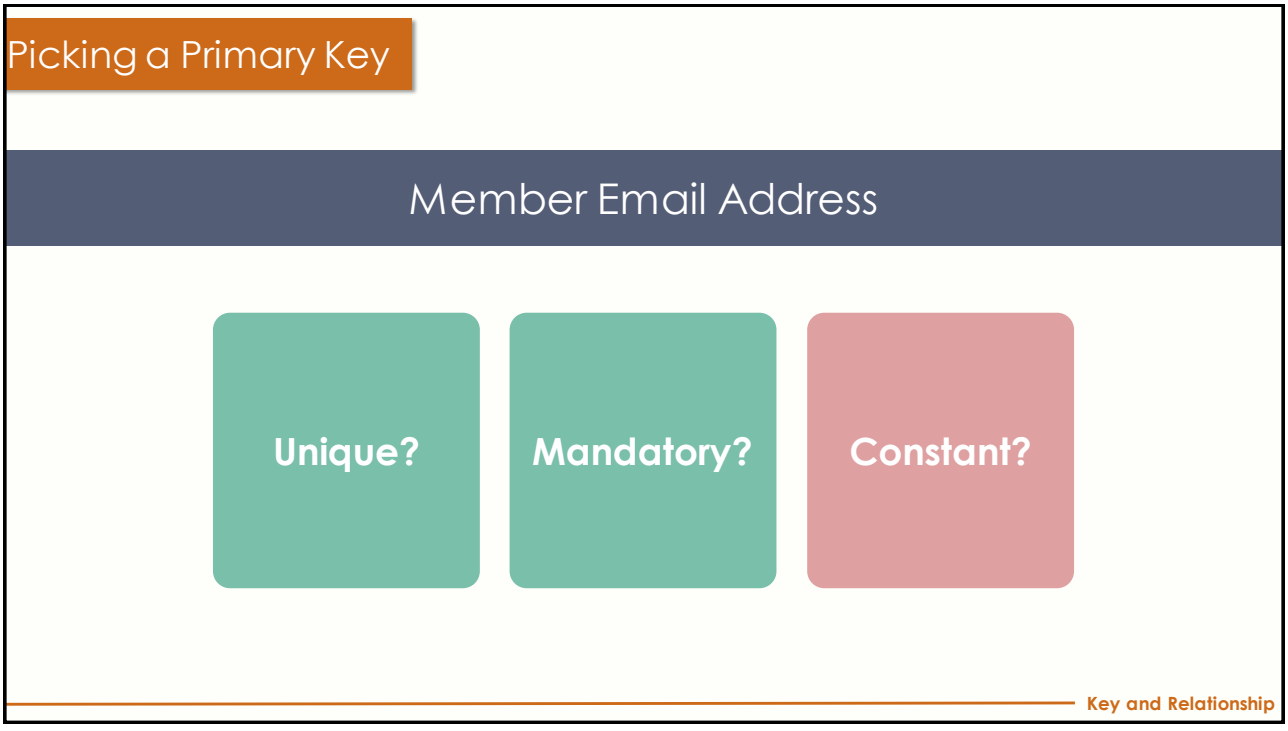
- Unique?
- Mandatory?
- Constant?

Picking a Primary Key

Member Name

- Unique?
- Mandatory?
- Constant?


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?**

Primary key could be a single column or

a group of columns.

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

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

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)
- Member ID : integer (10)
- Shared Date: date

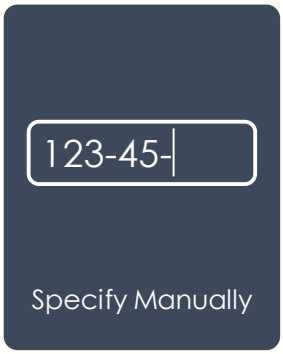
Photo ID	Member ID	Shared Date
1	1	3/3/2015
1	2	3/4/2015
1	3	3/5/2015
2	1	3/6/2015
2	4	3/7/2015
3	1	3/2/2015
3	5	3/3/2015

Table: Photo_Sharing

Key and Relationship

Primary Key Assignment

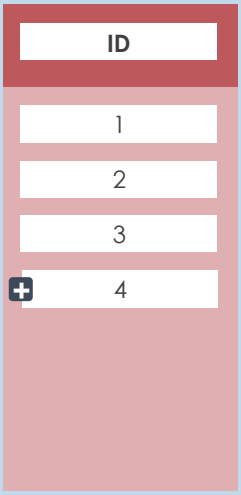
Values of a primary key can be assigned by the following ways



Key and Relationship

Primary Key Assignment ■ Auto-Generated

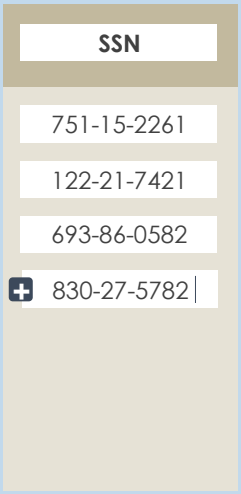
- Allows a unique value to be generated when you insert a new record into a table.



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



Key and Relationship

Primary Key Assignment ■ Sequence

- 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

Primary Key Assignment ■ Sequence ■ Examples

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.

Primary Key Assignment ■ Sequence ■ Examples

Ascending Sequence

MINVALUE:	1
MAXVALUE:	99999999
START WITH:	1
INCREMENT BY:	3
CACHE:	20

ID
1
4
7
10
⋮

Primary Key Assignment ■ Sequence ■ Examples

Descending Sequence

MINVALUE:	1
MAXVALUE:	50000000
START WITH:	50000000
INCREMENT BY:	-10
NOCACHE	

Primary Key Assignment ■ Sequence ■ Examples

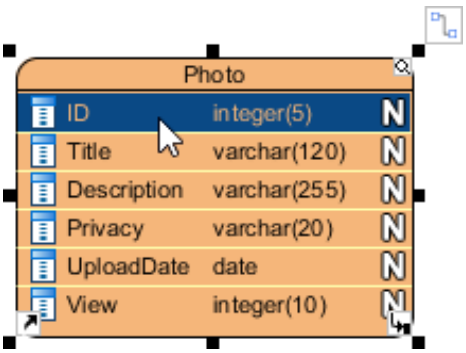
Descending Sequence

MINVALUE:	1
MAXVALUE:	50000000
START WITH:	50000000
INCREMENT BY:	-10
NOCACHE	

ID
50000000
49999990
49999980
49999970
⋮

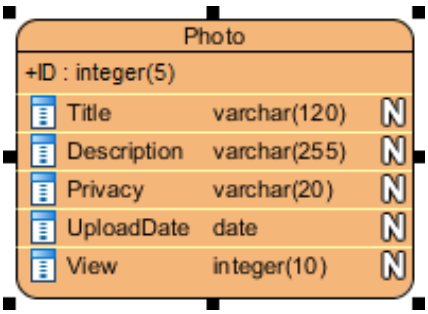
Defining a Primary Key

1. Double-click on the candidate column.



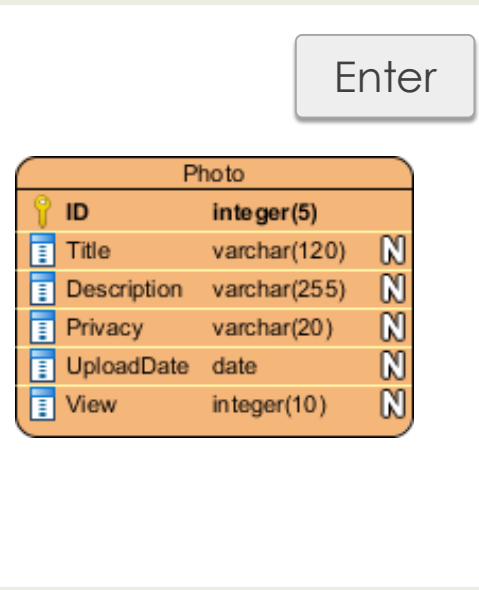
Defining a Primary Key

1. Double-click on the candidate column.
2. Type + in front of the column name.



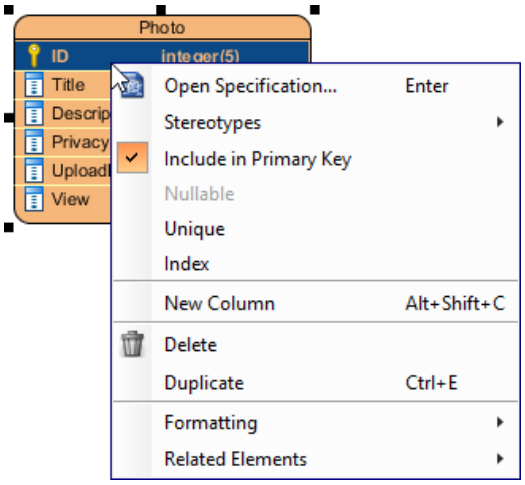
Defining a Primary Key

1. Double-click on the candidate column.
2. Type + in front of the column name.
3. Press **Enter** to confirm editing.



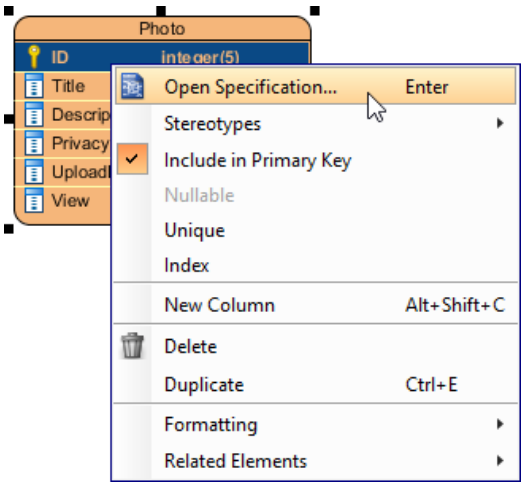
Defining a Primary Key (via specification)

1. Right-click on the candidate column.



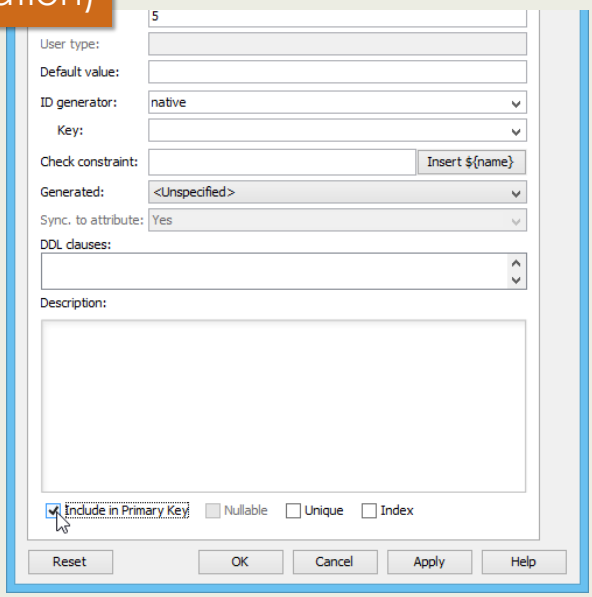
Defining a Primary Key (via specification)

1. Right-click on the candidate column.
2. Select **Open Specification…** from the popup menu.



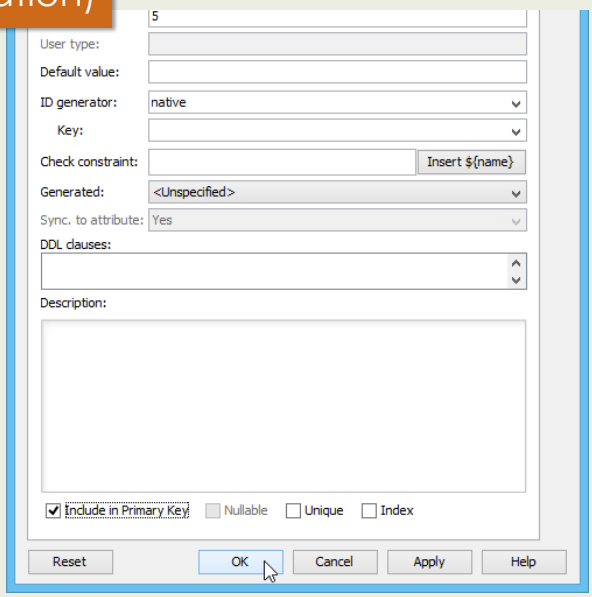
Defining a Primary Key (via specification)

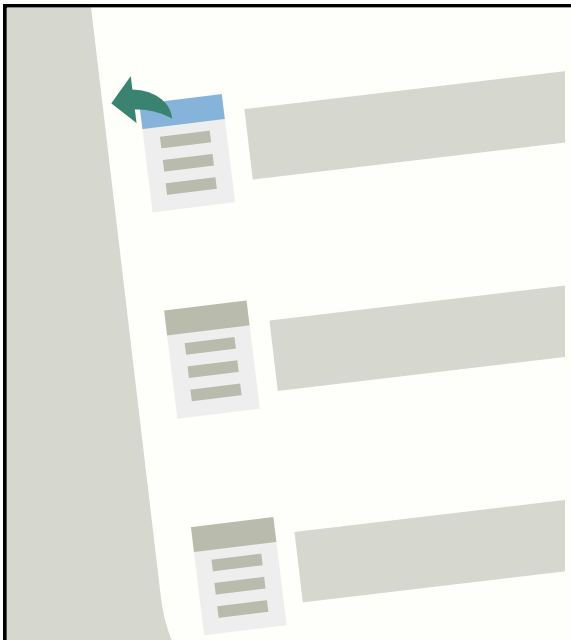
1. Right-click on the candidate column.
2. Select **Open Specification…** from the popup menu.
3. Check **Include in Primary Key**.



Defining a Primary Key (via specification)

1. Right-click on the candidate column.
2. Select **Open Specification…** from the popup menu.
3. Check **Include in Primary Key**.
4. Click **OK**.





Foreign Key

Foreign key is a table column which

uniquely identifies a record in another table.

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

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**

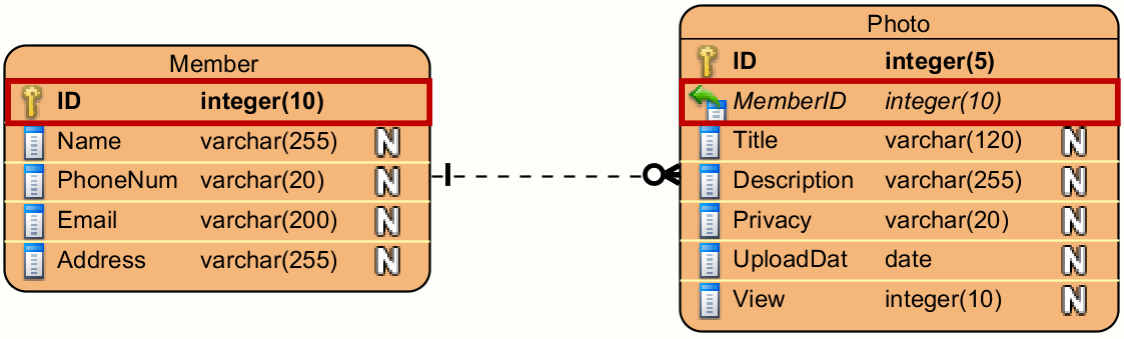
ID	Name	PhoneNum	Address
1	Chris Wong	252-608-5628	572 Lost Lake Crossing
2	Wanda A. Allison	808-839-2217	2017 Green Impasse

Database table: **Member**

Uniquely identifies a member in the Member table

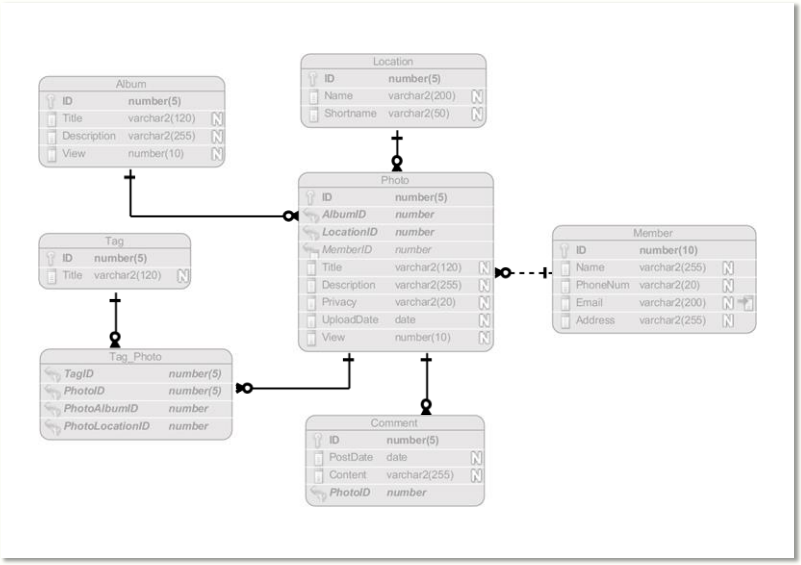
Key and Relationship

Presentation of Foreign Key



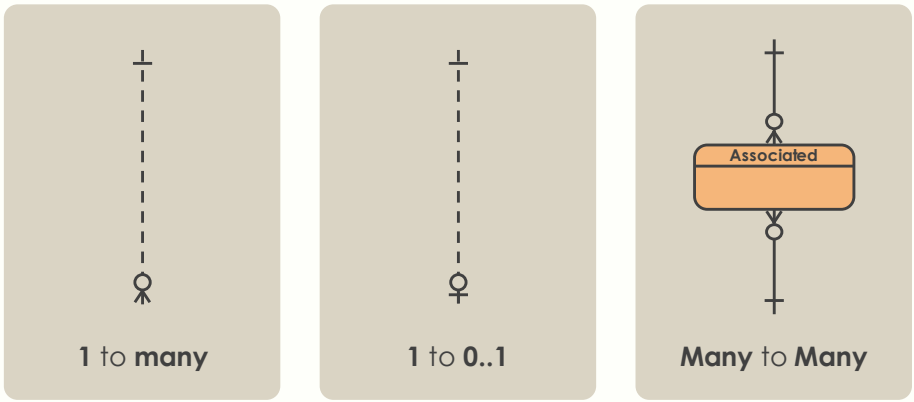
The use of foreign key in Photo entity (Referencing the primary key of Member entity)

Relationship and cardinality



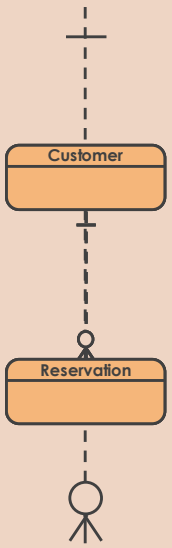
Relationship and cardinality

Common cardinality types:



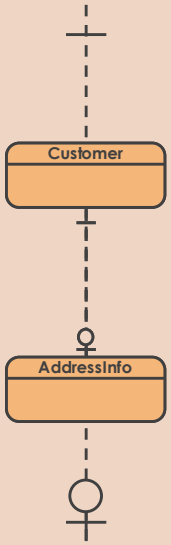
Relationship and cardinality ■ 1 to Many

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



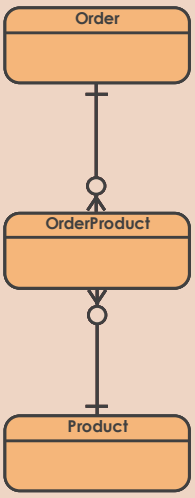
Relationship and cardinality ■ 1 to 0..1

- 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.



Relationship and cardinality ■ Many to Many

- 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 **Course**s, while a **Course** can be taken by many **Student**s
    - An **Order** can consist of many **Product**s, while a **Product** can appear in many **Orders**.



Foreign Key Example

A **Member** can upload many **Photo**s

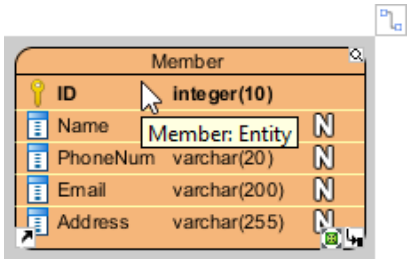
Foreign Key Example

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

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

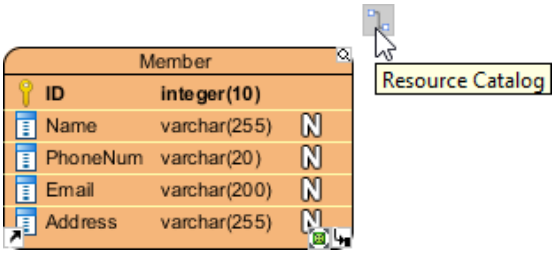
Foreign Key Example

1. Move your pointer over the parent entity.



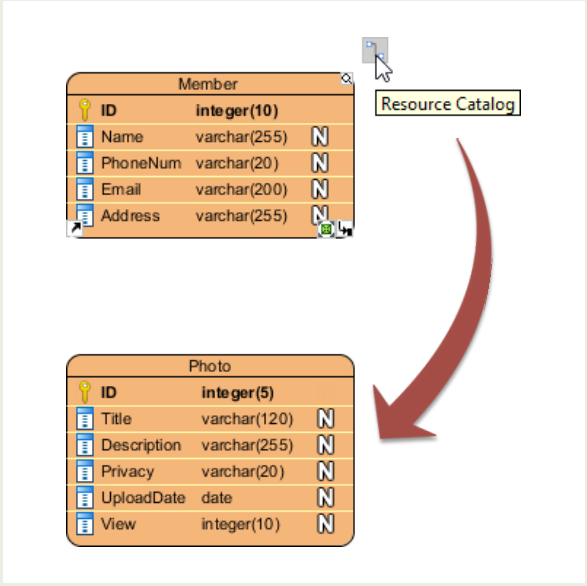
Foreign Key Example

1. Move your pointer over the parent entity.
2. Press on the **Resource Catalog** button.



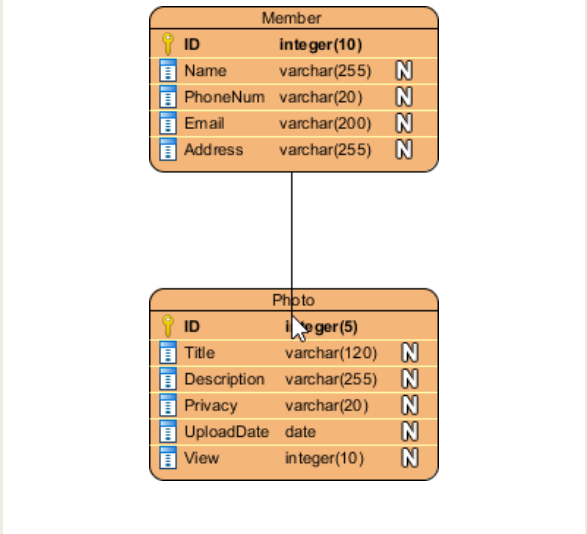
Foreign Key Example

1. Move your pointer over the parent entity.
2. Press on the **Resource Catalog** button.
3. Drag to the child entity.



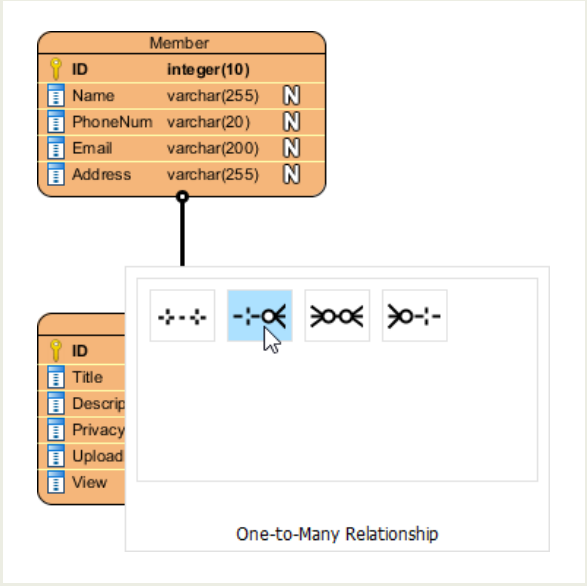
Foreign Key Example

1. Move your pointer over the parent entity.
2. Press on the **Resource Catalog** button.
3. Drag to the child entity.
4. Release the mouse button.



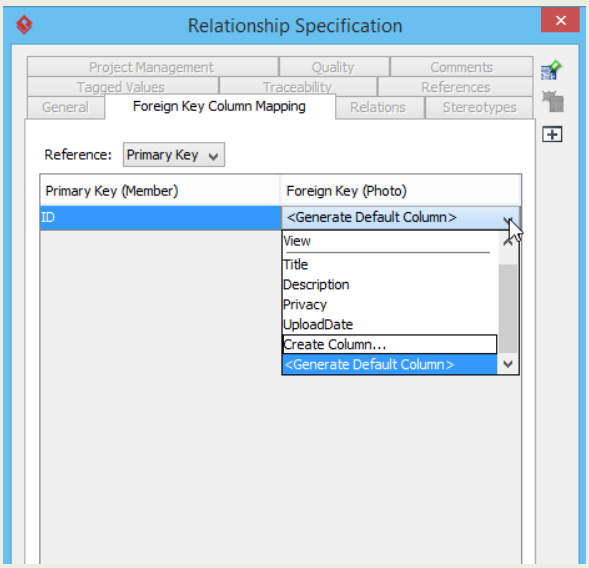
Foreign Key Example

1. Move your pointer over the parent entity.
2. Press on the **Resource Catalog** button.
3. Drag to the child entity.
4. Release the mouse button.
5. Select **One-to-Many Relationship** in Resource Catalog.



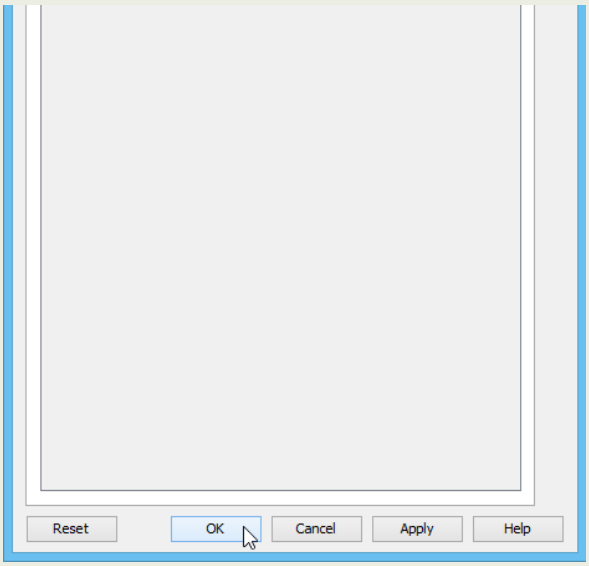
Foreign Key Example

1. Move your pointer over the parent entity.
2. Press on the **Resource Catalog** button.
3. Drag to the child entity.
4. Release the mouse button.
5. Select **One-to-Many Relationship** in Resource Catalog.
6. Specify the foreign key column or generate one.



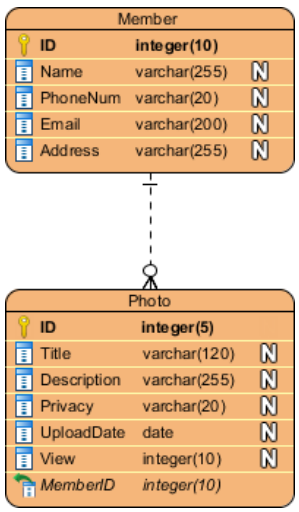
Foreign Key Example

1. Move your pointer over the parent entity.
2. Press on the **Resource Catalog** button.
3. Drag to the child entity.
4. Release the mouse button.
5. Select **One-to-Many Relationship** in Resource Catalog.
6. Specify the foreign key column or generate one.
7. Click **OK**.



Foreign Key Example

1. Move your pointer over the parent entity.
2. Press on the **Resource Catalog** button.
3. Drag to the child entity.
4. Release the mouse button.
5. Select **One-to-Many Relationship** in Resource Catalog.
6. Specify the foreign key column or generate one.
7. Click **OK**.
8. Done!

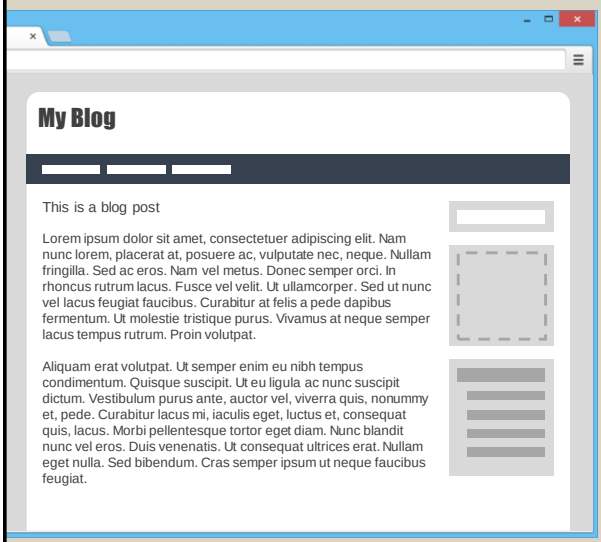


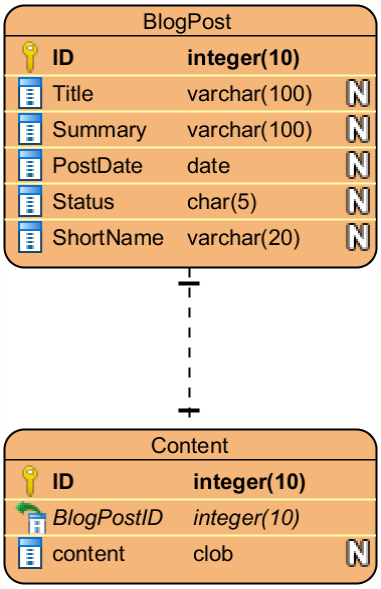
Foreign Key Example

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

Key and Relationship

Foreign Key Example

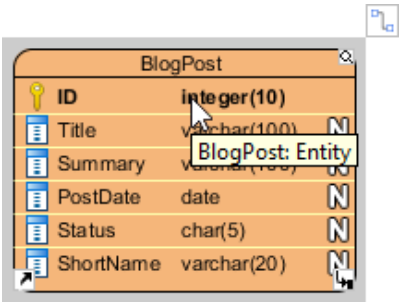




Key and Relationship

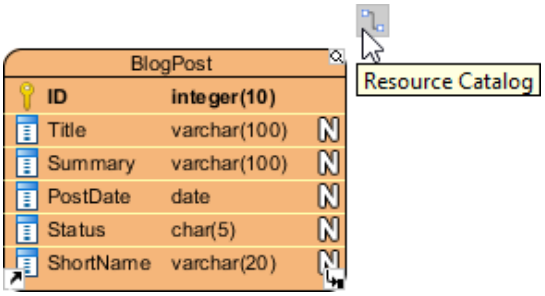
Foreign Key Example

1. Move your pointer over the parent entity.



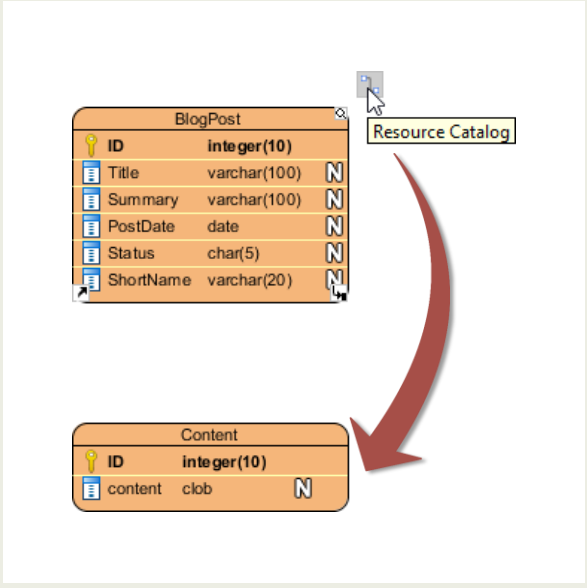
Foreign Key Example

1. Move your pointer over the parent entity.
2. Press on the Resource Catalog button.



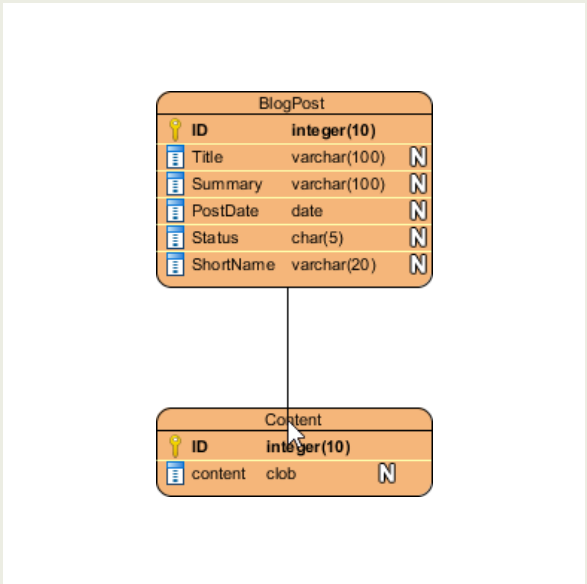
Foreign Key Example

1. Move your pointer over the parent entity.
2. Press on the Resource Catalog button.
3. Drag to the child entity.



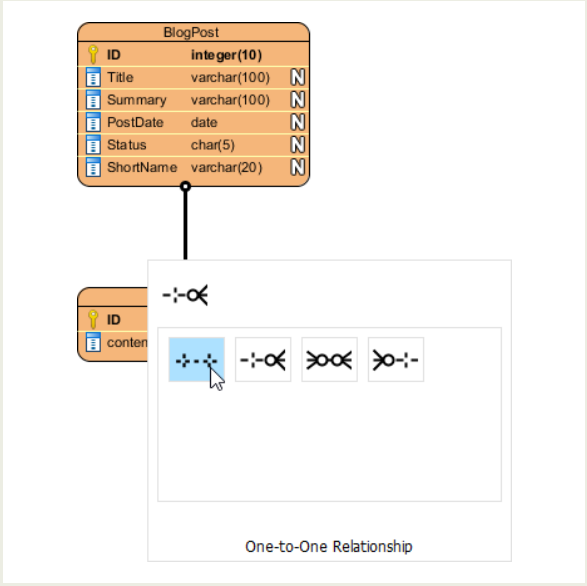
Foreign Key Example

1. Move your pointer over the parent entity.
2. Press on the Resource Catalog button.
3. Drag to the child entity.
4. Release the mouse button.



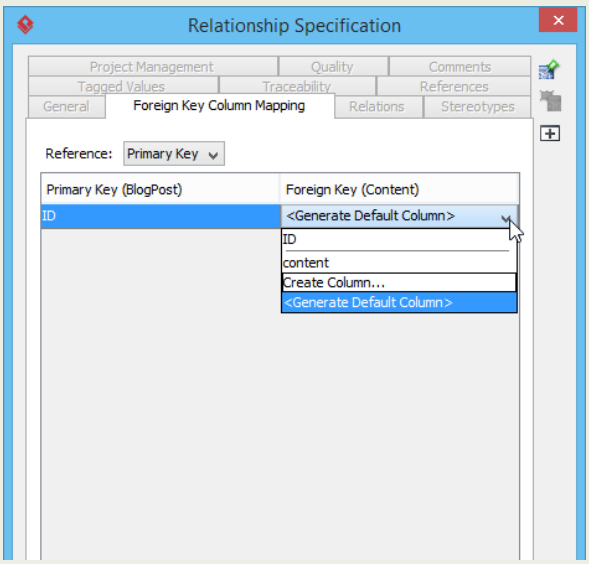
Foreign Key Example

1. Move your pointer over the parent entity.
2. Press on the Resource Catalog button.
3. Drag to the child entity.
4. Release the mouse button.
5. Select **One-to-One Relationship** in Resource Catalog.



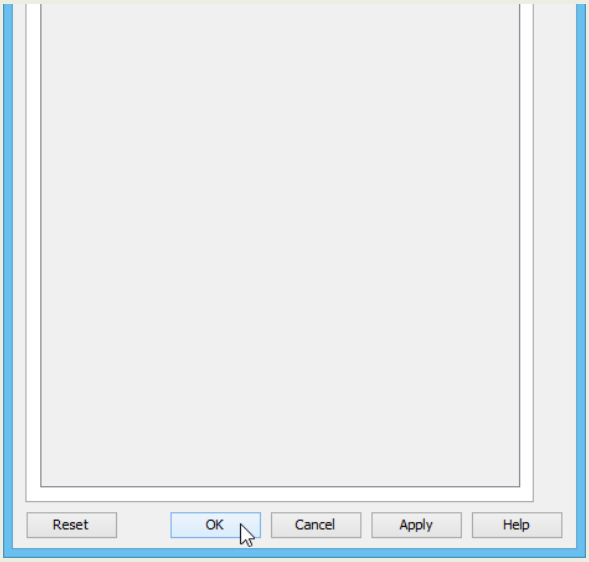
Foreign Key Example

1. Move your pointer over the parent entity.
2. Press on the Resource Catalog button.
3. Drag to the child entity.
4. Release the mouse button.
5. Select **One-to-One Relationship** in Resource Catalog.
6. Specify the foreign key column or generate one.



Foreign Key Example

1. Move your pointer over the parent entity.
2. Press on the Resource Catalog button.
3. Drag to the child entity.
4. Release the mouse button.
5. Select **One-to-One Relationship** in Resource Catalog.
6. Specify the foreign key column or generate one.
7. Click **OK**.



Foreign Key Example

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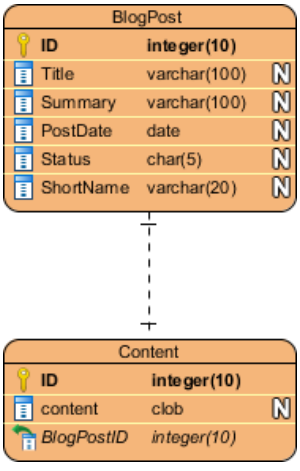


Foreign Key Example

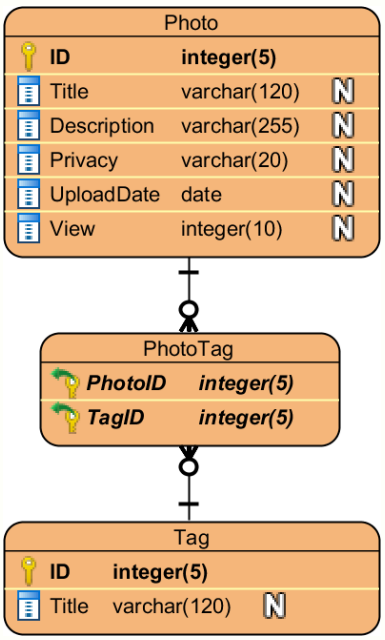
hongkong | pier | ferry pier
ferry | central | building
nine

A **Photo** can have many **Tag**s.

A **Tag** can be used by many **Photo**s.

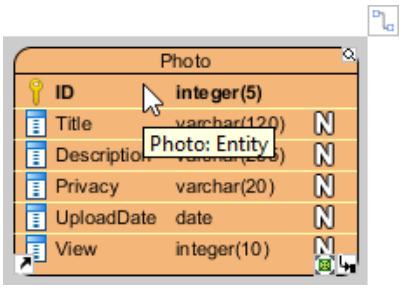
Foreign Key Example

hongkong | pier | ferry pier
ferry | central | building
nine



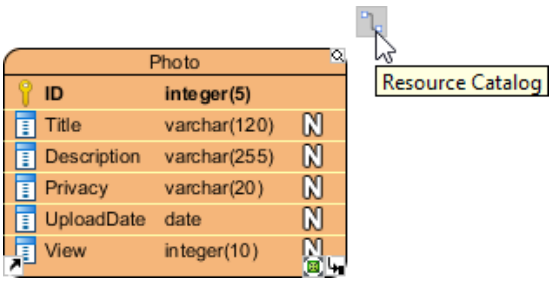
Foreign Key Example

1. Move your pointer over the parent entity.



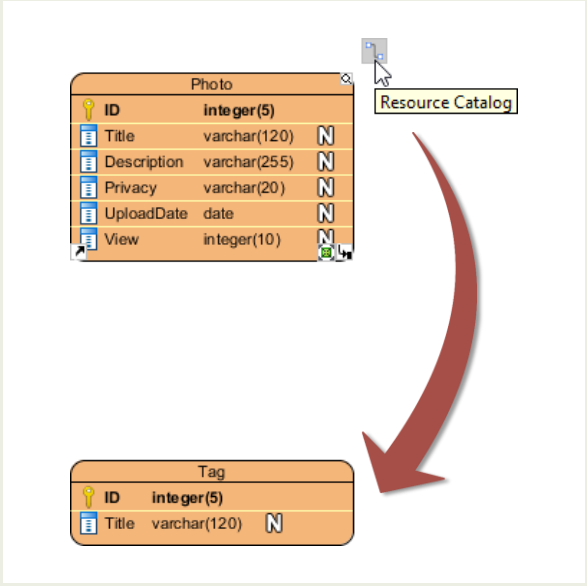
Foreign Key Example

1. Move your pointer over the parent entity.
2. Press on the **Resource Catalog** button.



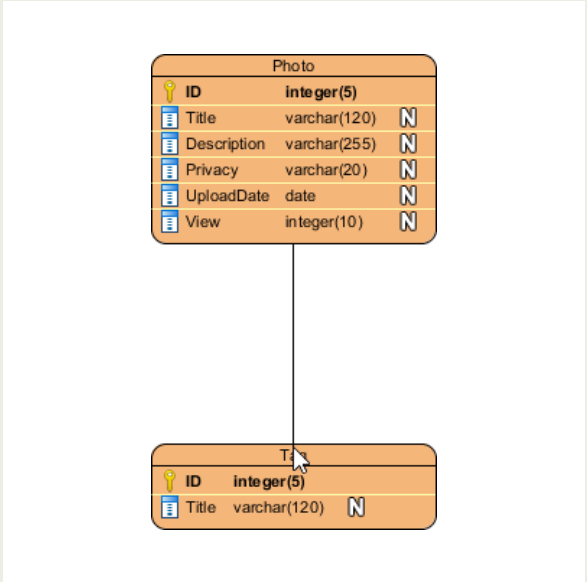
Foreign Key Example

1. Move your pointer over the parent entity.
2. Press on the **Resource Catalog** button.
3. Drag to the child entity.



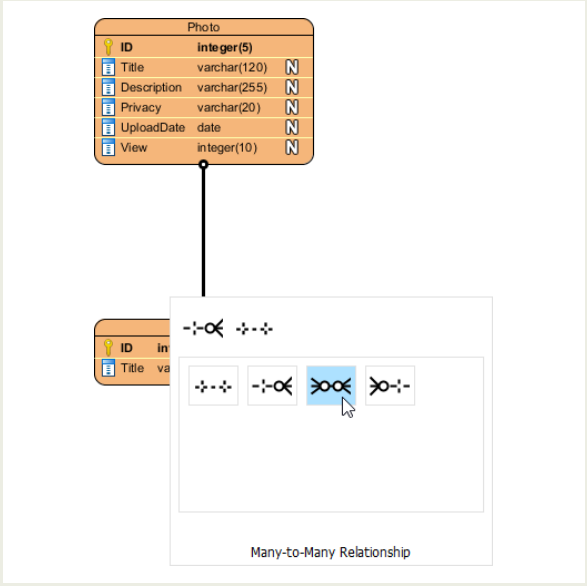
Foreign Key Example

1. Move your pointer over the parent entity.
2. Press on the **Resource Catalog** button.
3. Drag to the child entity.
4. Release the mouse button.



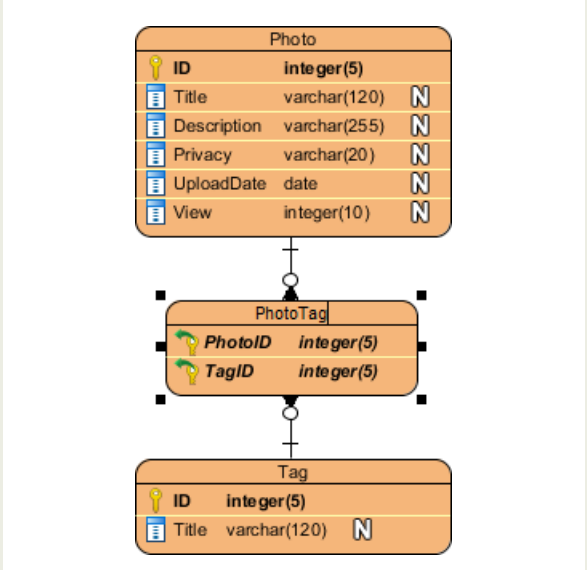
Foreign Key Example

1. Move your pointer over the parent entity.
2. Press on the **Resource Catalog** button.
3. Drag to the child entity.
4. Release the mouse button.
5. Select **Many-to-Many Relationship** in Resource Catalog.



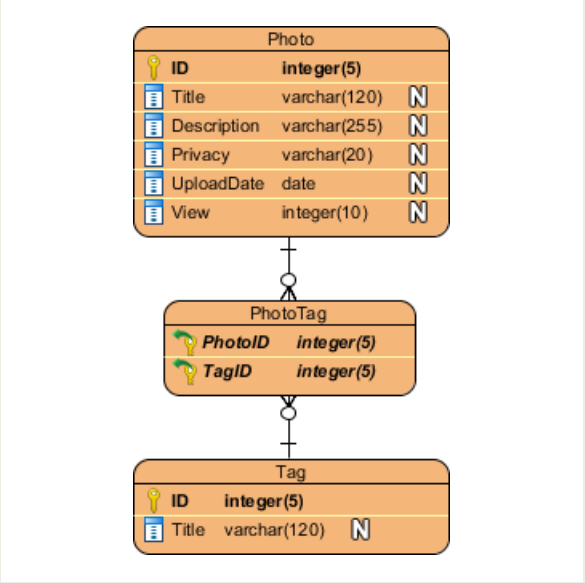
Foreign Key Example

1. Move your pointer over the parent entity.
2. Press on the **Resource Catalog** button.
3. Drag to the child entity.
4. Release the mouse button.
5. Select **Many-to-Many Relationship** in Resource Catalog.
6. Rename the associative entity (if needed).



Foreign Key Example

1. Move your pointer over the parent entity.
2. Press on the **Resource Catalog** button.
3. Drag to the child entity.
4. Release the mouse button.
5. Select **Many-to-Many Relationship** in Resource Catalog.
6. Rename the associative entity (if needed).
7. Done!



Summary

- Primary key
  - What is a primary key?
  - How to pick a primary key?
  - Composite key
  - Different kinds of primary key assignment
  - How to define a primary key
- Foreign key
  - What is a foreign key?
  - Different cardinalities
  - How to relate entities with different cardinalities?