

Database Development

Outline:

- Normalization
- MS SQL SERVER 2012 Installation
- Basic SQL Statements
 - DDL Statements

NORMALIZAITON

Normalization: WHY ?

1. Eliminate redundant data
2. Ensuring data dependencies make sense

Benefits:

- Reduce the amount of space a database consumes
- Ensure that data is logically stored
- Scalar values in each fields
- Minimal use of null values
- Minimal loss of information

Normalization

Normalization is the process of efficiently organizing data in a database

- 1NF
- 2NF
- 3NF
- 4NF Occasional
- 5NF Very Rare

Normalization

Remember

They

Are

Guidelines

Only !!!

I NF

- Eliminate duplicate columns from same table.
- Create separate table for each group of related data.
- Identify each row with unique column or set of column.
(Primary Key)

1 NF Example

Manager

Subordinate 1

Subordinate 2

Subordinate 3

Manager

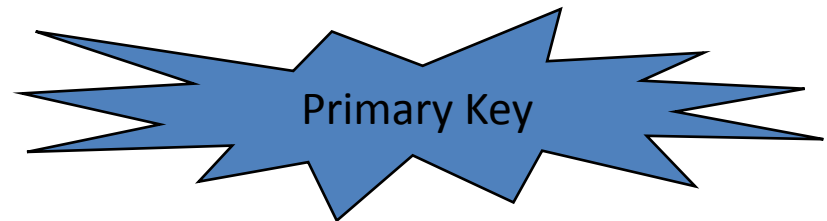
Subordinate

Manager ID

Subordinate ID

Manager

Subordinates



2 NF

- Meet the requirements of 1NF.
- Remove subsets of data that apply to multiple rows to table and place them in separate table.
- Create relationships between these new tables and their predecessors through the use of Foreign keys

2 NF Example

Online Store

Customer information

Single Table

- Customer ID
- First Name
- Last Name
- Address
- City
- Country
- ZIP

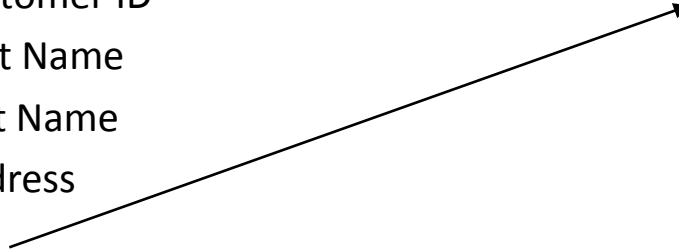
2 NF Example

Apply 2 NF ----- !!!!!

Two tables

Customer ID
First Name
Last Name
Address
Zip

ZIP
City
Country



3 NF

- Meet the requirements of 2 NF.
- Remove columns that are not dependent upon the primary key.

3 NF Example

Imagine Orders table with following attributes.

- Order Number
- Customer Number
- Unit Price
- Quantity
- Total

Check 1 NF and 2 NF conditions

What about Total ???

3 NF Example

After removing total !!

Order Number

Customer Number

Unit Price

Quantity

-----wait what about total again

-----well we can do on fly

Before !!

```
SELECT OrderNumber, Total
```

```
FROM Orders
```

3 NF Example

After!

```
SELECT OrderNumber, UnitPrice * Quantity AS  
Total  
FROM Orders
```

- Goal Hit
- Without violation of normalization rules

Bottom Line

“Prior planning prevents poor performance.”

DENORMALIZATION

Normalization is:

- Storing one fact in one place
- Storing related facts about single entity together
- every column of each entity refers non-transitively to only the unique identifier for that entity.

Denormalization: is the reversal process of Normalization, which is a process to store a fact in numerous places.

DENORMALIZATION(2)

Sometimes we need to do denormalization to accomplish quick retrieval capability for data stored in relational database.

Of course we should (whenever possible) normalize our design to provide optimum environment . However, in real world, denormalization is necessary. Some issues need to be considered before denormalization:

- can the system achieve acceptable performance *without* denormalizing?
- will the performance of the system after denormalizing still unacceptable?
- will the system be less reliable due to denormalization?

If there is one 'yes' answer, we should avoid denormalization!

DENORMALIZATION (EXAMPLE)

In order to justify denormalization we need to have a business reason for the alteration from 3rd NF. This example design is for a mail order company that has 120,000,000 customers to whom they must send catalogs. The top design is in 3rd normal form because the attributes for State, City, and Country are codependent on the PostalCode field. To fix that we created the PostalCode entity and related it back to the Customer records on the PostalCode foreign key in the Customer table.

However, during system testing it was discovered that the time required to produce 120,000,000 mailing labels through a two-table join was much longer than if the labels could be produced from a single table. The table was then denormalized by reintroducing the City, State, and Country attributes to the Customer table.

After doing this it would be heavily documented including the normal form that is violated, the reason for the violation, and the consequences of the violation. Any violation of a fully normalized design carries with it potential problems in the area of updates.



UNF	1NF	2NF	3NF	
<u>projectCode</u> projectDescr customerNo customerName staffNo staffName grade nr.of Days	<u>projectCode</u> projectDescr customerNo customerName <u>projectCode*</u> <u>staffNo</u> staffName grade nr.of Days	<u>projectCode</u> projectDescr customerNo customerName <u>projectCode*</u> <u>staffNo*</u> nr.of Days <u>staffNo</u> staffName grade	<u>projectCode</u> projectDescr customerNo* <u>customerNo</u> customerName <u>projectCode*</u> <u>staffNo*</u> nr.of Days <u>staffNo</u> staffName grade	PROJECT CUSTOMER DAYSWORKED STAFF

Database Normalization

Customer	Address	Order	Product No.
Rick Evans	32 West Pier Road	5487653	VG56774
William Lu	12A Spruce Gardens	5487654	P7GSN8
Sue Dole	54c Ocean Building	5487655	700TRN4

Customer	Address
Rick Evans	32 West Pier Road
William Lu	12A Spruce Gardens
Sue Dole	54c Ocean Building

Split large table into
three small tables
linked by common fields



Customer	Order
Rick Evans	5487653
William Lu	5487654
Sue Dole	5487655



Order	Product No.
5487653	VG56774
5487654	P7GSN8
5487655	700TRN4

TASK 4:

Customer Name	Customer Address	Customer Tel No.	Product Name	Unit Cost	Quantity	Total Cost
Alex Wilson	1318 Scenic Avenue, Bothel	697-555-0142	Men's Sports Shorts, S	15.5	2	31
Alex Wilson	1318 Scenic Avenue, Bothel	697-555-0142	Water Bottle - 30 oz.	1.5	3	4.5
Alex Wilson	1318 Scenic Avenue, Bothel	697-555-0142	LL Mountain Handlebars	19.76	2	39.52
Emily Brown	628 Muir Road, Los Angeles	708-555-0141	Long-Sleeve Logo Jersey, S	38.49	1	38.49
Emily Brown	628 Muir Road, Los Angeles	708-555-0141	Sport-100 Helmet, Black	13.08	2	26.16
Emily Brown	628 Muir Road, Los Angeles	708-555-0141	LL Mountain Handlebars	19.76	3	59.28



- 1 NF ?
- 2 NF ?
- 3 NF ?

- Un-normalized Table:

Student#	Advisor#	Advisor	Adv-Room	Class1	Class2	Class3
1022	10	Susan Jones	412	101-07	143-01	159-02
4123	12	Anne Smith	216	101-07	159-02	214-01

TASK 5:

- Table in First Normal Form
 - No Repeating Fields
 - Data in Smallest Parts

Student#	Advisor#	AdvisorFName	AdvisorLName	Adv-Room	Class#
1022	10	Susan	Jones	412	101-07
1022	10	Susan	Jones	412	143-01
1022	10	Susan	Jones	412	159-02
4123	12	Anne	Smith	216	101-07
4123	12	Anne	Smith	216	159-02
4123	12	Anne	Smith	216	214-01

Transform above table into

2 NF ?

3 NF?

TASK 5:

EMPLOYEE TABLE

EMPNO (Primary Key)	FIRSTNAME	LASTNAME	WORKDEPT
000290	John	Parker	E11
000320	Ramlal	Mehta	E21
000310	Maude	Setright	E11

DEPARTMENT TABLE

DEPTNO (Primary Key)	DEPTNAME
E11	Operations
E21	Software Support



Reverse above into
2 NF ?
1 NF?
UNF?

Microsoft Developer Network

Lesson 2: Designing a Normalized Database

<http://msdn.microsoft.com/en-us/library/cc505842.aspx>

Lesson 3: Optimizing the Database Design by Denormalizing

<http://msdn.microsoft.com/en-us/library/cc505841.aspx>