

"A computer's attention span is only as long as it's power cord."



-Anonymous

**Topics**

MCS D

Normalization

*Certification*

*MCS D*

**MCS D**

MS Certified Solution Developer

Exam 70-300

Analyzing Requirements

Combination of

IFSM 410

IFSM 438

IFSM 461

**MCS D**

MS Certified Solution Developer

System Development Life Cycle

MS own version

4 exams

This One

2 programming (VB.Net, C#.Net)

One Elective

*Chapter 5*

*Normalization*

**Normalization**

Assigning Attributes to Entities

Reduce Redundancies

Reduce data Anomalies

**Normalization Forms**

7 Levels

1<sup>st</sup> Normal Form

2<sup>nd</sup> Normal Form

3<sup>rd</sup> Normal Form...

**Example**

PROJ_NUM	PROJ_NAME	EMP_NUM	EMP_NAME	JOB_CLASS	CHG_HOUR	HOURS
6	Evergreen	103	June E. Arbough	Elect. Engineer	\$84.50	23.8
		101	John G. News	Database Designer	\$105.00	19.4
		105	Alice K. Johnson *	Database Designer	\$105.00	35.7
		106	William Smithfield	Programmer	\$35.75	12.6
		102	David H. Senior	Systems Analyst	\$96.75	23.8
18	Amber Wave	114	Annelise Jones	Applications Designer	\$48.10	24.6
		118	James J. Frommer	General Support	\$18.36	45.3
		104	Anne K. Ramoras *	Systems Analyst	\$96.75	32.4
		112	Darlene M. Smithson	DSS Analyst	\$45.95	44.0
22	Rolling Tide	105	Alice K. Johnson	Database Designer	\$105.00	64.7
		104	Anne K. Ramoras	Systems Analyst	\$96.75	48.4
		113	Delbert K. Joenbrood *	Applications Designer	\$48.10	23.6
		111	Geoff B. Webash	Clerical Support	\$28.87	22.0
		106	William Smithfield	Programmer	\$35.75	12.8
25	Starflight	107	Maria D. Alonzo	Programmer	\$35.75	24.6
		115	Travis B. Bawangi	Systems Analyst	\$96.75	45.8
		101	John G. News *	Database Designer	\$105.00	56.3
		114	Annelise Jones	Applications Designer	\$48.10	33.1
		108	Ralph B. Washington	Systems Analyst	\$96.75	23.6
		118	James J. Frommer	General Support	\$18.36	30.5
		112	Darlene M. Smithson	DSS Analyst	\$45.95	41.4

What's Wrong with this?

## 1<sup>st</sup> Normal Form

All Key Attributes are Defined

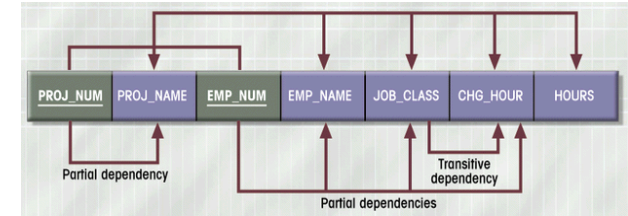
No Repeating Groups  
Attribute contains only one value

All attributes dependent on  
Primary Key

## Example

PROJ_NUM	PROJ_NAME	EMP_NUM	EMP_NAME	JOB_CLASS	CHG_HOUR	HOURS
15	Evergreen	103	June E. Arbough	Elect. Engineer	\$84.50	23.8
15	Evergreen	101	John G. News	Database Designer	\$105.00	19.4
15	Evergreen	105	Alice K. Johnson *	Database Designer	\$105.00	35.7
15	Evergreen	106	William Smithfield	Programmer	\$35.75	12.5
18	Amber Wave	114	David H. Senior	Systems Analyst	\$96.75	23.9
18	Amber Wave	118	Annelise Jones	Applications Designer	\$48.10	24.6
18	Amber Wave	118	James J. Frommer	General Support	\$18.36	45.3
18	Amber Wave	104	Anne K. Ramoras *	Systems Analyst	\$96.75	32.1
18	Amber Wave	112	Darlene M. Smithson	DSS Analyst	\$45.95	44.0
22	Rolling Tide	105	Alice K. Johnson	Database Designer	\$105.00	64.7
22	Rolling Tide	104	Anne K. Ramoras	Systems Analyst	\$96.75	48.9
22	Rolling Tide	113	Delbert K. Joenbrood *	Applications Designer	\$48.10	23.6
22	Rolling Tide	111	Geoff B. Wabash	Clerical Support	\$26.87	22.5
22	Rolling Tide	106	William Smithfield	Programmer	\$35.75	12.1
25	Starflight	107	Maria D. Alonzo	Programmer	\$35.75	24.7
25	Starflight	115	Travis B. Bawangi	Systems Analyst	\$96.75	45.8
25	Starflight	101	John G. News *	Database Designer	\$105.00	56.3
25	Starflight	114	Annelise Jones	Applications Designer	\$48.10	33.1
25	Starflight	108	Ralph B. Washington	Systems Analyst	\$96.75	23.9
25	Starflight	118	James J. Frommer	General Support	\$18.36	30.2
25	Starflight	112	Darlene M. Smithson	DSS Analyst	\$45.95	41.4

## 1st Normal Form



Primary Key = Proj\_Num+Emp\_Num  
Dependencies  
No Repeating Groups

## 2<sup>nd</sup> Normal Form

Table in 1<sup>st</sup> Normal Form

No Partial Dependencies  
Transitive Dependencies Allowed  
(Not dependent on Primary Key)

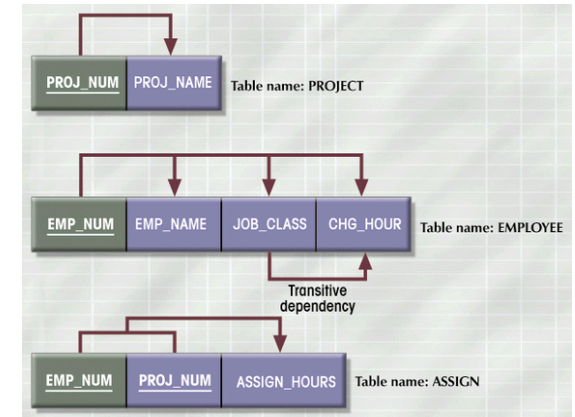
## The Process

Break out the keys

Create new tables

Assign attributes to proper tables

## Example



## 3<sup>rd</sup> Normal Form

Table in 2<sup>nd</sup> Normal Form

No Transitive dependencies

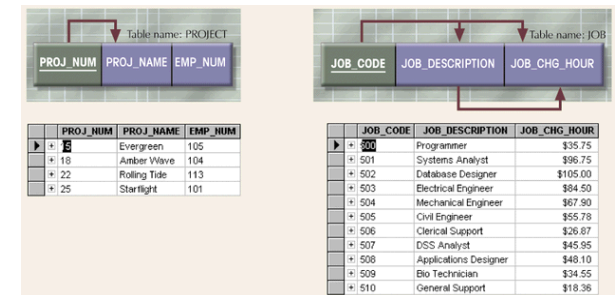
## Process

Break off Transitive Dependencies  
into separate tables

Employee  
Num, Name, Job\_Class

Job  
Job\_Class, Chg\_Hour

## Example



## Example (cont)

Table Name: INVOICE

ASSIGN_NUM	ASSIGN_DATE	PROJ_NUM	EMP_NUM	ASSIGN_HOUR	ASSIGN_COST_HOUR	ASSIGN_CHARGE
1000	06-Mar-02	100	1.4	1.4	\$93.36	\$130.10
1001	06-Mar-02	101	1.6	1.6	\$109.36	\$153.30
1002	06-Mar-02	102	2.0	2.0	\$137.44	\$198.56
1003	06-Mar-02	103	1.8	1.8	\$132.00	\$190.80
1004	06-Mar-02	104	2.5	2.5	\$168.40	\$242.50
1005	06-Mar-02	105	4.2	4.2	\$298.74	\$430.36
1006	06-Mar-02	106	2.7	2.7	\$193.60	\$275.40
1007	06-Mar-02	107	1.1	1.1	\$75.00	\$108.00
1008	06-Mar-02	108	2.0	2.0	\$140.00	\$200.00
1009	06-Mar-02	109	2.8	2.8	\$198.75	\$285.30
1010	06-Mar-02	110	2.5	2.5	\$175.00	\$250.00
1011	06-Mar-02	111	2.0	2.0	\$140.00	\$200.00
1012	06-Mar-02	112	2.0	2.0	\$140.00	\$200.00
1013	06-Mar-02	113	1.8	1.8	\$126.00	\$180.00
1014	06-Mar-02	114	3.4	3.4	\$245.10	\$351.54
1015	06-Mar-02	115	4.0	4.0	\$283.20	\$409.60
1016	06-Mar-02	116	1.2	1.2	\$84.00	\$121.44
1017	06-Mar-02	117	2.0	2.0	\$140.00	\$200.00
1018	06-Mar-02	118	2.6	2.6	\$185.82	\$267.72
1019	06-Mar-02	119	2.0	2.0	\$140.00	\$200.00
1020	06-Mar-02	120	2.7	2.7	\$193.60	\$275.40
1021	06-Mar-02	121	4.2	4.2	\$298.74	\$430.36
1022	06-Mar-02	122	1.8	1.8	\$126.00	\$180.00
1023	06-Mar-02	123	2.4	2.4	\$168.40	\$242.50

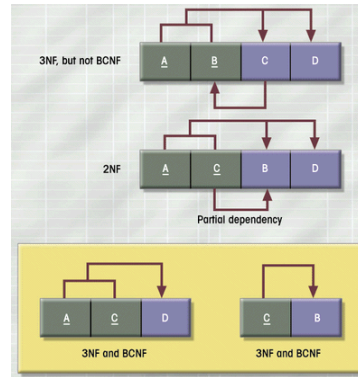
Table Name: EMPLOYEE

EMP_NUM	EMP_LNAME	EMP_FNAME	EMP_INITIAL	EMP_HIREDATE	JOB_CODE
100	Smith	Jones	J	09-Dec-80	SA
101	Turner	David	H	12-Jan-81	SA
102	King	Jane	K	01-Sep-81	SA
103	Bloudeau	Anna	A	15-Mar-81	SA
104	DeMott	John	D	08-Feb-82	SA
105	Schuyler	William	W	23-Jan-81	SA
106	Cooper	Mary	C	17-Dec-82	SA
107	Fey	Richard	R	20-Aug-81	SA
108	Grant	Jeffrey	J	12-Jan-82	SA
109	Whalen	John	W	17-Feb-83	SA
110	Chen	Georgi	G	15-Sep-81	SA
111	Johnson	Christy	C	08-Apr-83	SA
112	Schmitt	Doreen	M	23-Oct-81	SA
113	Paterson	John	P	05-Jul-82	SA
114	Armstrong	Steven	S	20-Aug-83	SA
115	Murray	Teresa	T	23-Mar-81	SA
116	Ford	Donald	L	03-Nov-81	SA
117	Whymann	Angela	A	17-Jun-83	SA
118	Pratt	Jerry	P	04-Jan-82	SA

## Boyce Codd Normal Form

Special case of 3NF

Every Determinant is a Candidate key



## Higher Forms of Normalization

4<sup>th</sup> Normal Form

No multivalued dependencies  
Multivalued are also functional

5<sup>th</sup> Normal Form

Decompose into smaller records with the same key

Domain Key Normal Form

Key Dependence

Domain Dependence

## Denormalization

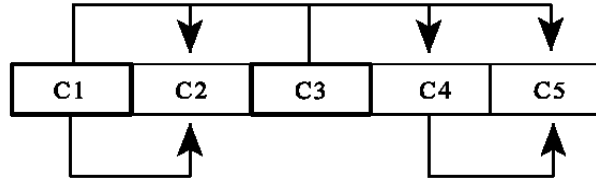
Normal Form vs. Real World

Zip Code determine City

Zip Code table?

Pros and Cons

## In-class



What are the dependencies?

Create Tables in 2NF

Create Tables in 3NF

## In-class

Problems

Page 176: 1-4 (Invoice)

Page 176: 5-7 (Student)

## Homework

Page 178: 15-17 (Dinner Club)

Turn in report with all details

Nothing Handwritten

## Problems 1-4

Using the following INVOICE table structure, draw its dependency diagram and identify all dependencies (including all partial and transitive dependencies). You can assume that the table does not contain repeating groups and that any invoice number may reference more than one product. (Hint: This table uses a composite primary key.)

Attribute name	Sample value
INV_NUM	211347
PROD_NUM	AA_E3422QW
SALE_DATE	06/25/1999
PROD_DESCRIPTION	B&D Rotary sander, 6 in. disk
VEND_CODE	211
VEND_NAME	NeverFail, Inc.
NUMBER_SOLD	2
PROD_PRICE	\$49.95

Create a dependency diagram, convert to 2NF, then 3NF, and finally draw the ERD.

## Problems 5-7

Using the following STUDENT table structure, draw its dependency diagram and identify all dependencies (including all transitive dependencies).

Attribute name	Sample value
STU_NUM	211343
STU_LNAME	Stephanos
STU_MAJOR	Accounting
DEPT_CODE	ACCT
DEPT_NAME	Accounting
DEPT_PHONE	4356
COLLEGE_NAME	Business Administration
ADV_LASTNAME	Grastrand
ADV_OFFICE	HKB201
ADV_BUILDING	Howard Kallenberger Building
ADV_PHONE	2115
STU_GPA	2.87
STU_HOURS	96
STU_CLASS	Junior

Create a dependency diagram, convert to 3NF, and draw the ERD.

## Homework

Page 178: 15-17

Turn in report with all details

Nothing Handwritten

## Group Homework

Create Tables in 3NF

DB Initial Study

DB Design

Data Dictionary