

(Free) Sample 13

Taken from:

Further Examples 3: The Relational Model

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The full *Further Examples 3* contents are:

Example 1a: *The Computer Science Department* (Reverse Engineering)

Example 1b: *The Computer Science Department* (Relational Algebra)

Example 2: *The Oil Rig Book Store* (Relational Model)

Example 3: *The IT Support Team* (Relational Algebra & Constraints)

Example 4: *The Pet Food Emporium* (Relational Model)

Example 5a: *The Authors @ Home Website* (Reverse Engineering)

Example 5b: *The Authors @ Home Website* (Relational Algebra)

Example 6: *The Happy Hopper Helicopter Shuttle* (Relational Model)

Solutions

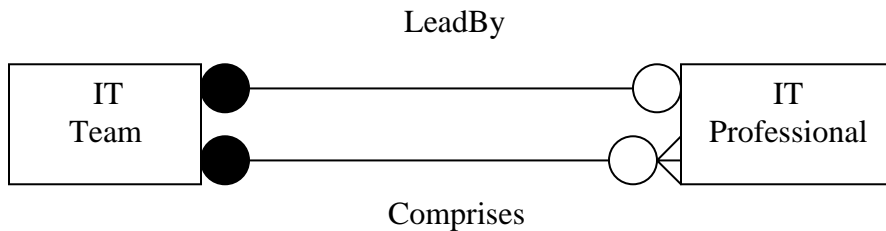
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Below is an example...

Example: The IT Support Team (Relational Algebra & Constraints)

A facilities-management company ('FixIT') that specializes in the setting up and operation of complex computer networking and software systems needs to give its demanding clients 24 x 7 support. To ensure round-the-clock backup, it has created several 'emergency response' teams made up of very experienced IT and networking staff who have all the necessary technical skills to instantly fix any IT problems. Each team is headed by a team leader (who also has a 'regular' job within the company). Each team has a code number, name and a home base and telephone number. Not every member of the company will be involved in these response teams – just the most experienced.

Below is an ERD demonstrating the data relationships:



Entity Types

IT Team (TeamCode, TeamName, Base, Telephone)

IT Professional (StaffID, Name, JobTitle, Specialism)

We can now define a relational model.

Please see over the page...

Domains

TeamID = 1..10

HomeBase = [London, Manchester, Birmingham, Glasgow]

StaffNumber = 0001..1000

Position = [Developer, Systems Administrator, Modeller, Installer, Tester, Security]

Skill = [Operating Systems, Mainframes, Networking, Web, Databases, OO languages]

Relation IT-Team

TeamCode: TeamID

TeamName: Varchar(20)

Base: HomeBase

Telephone: Integer

Leader: StaffNumber

Primary key (TeamCode)

Alternate Key (Leader)

Foreign Key (Leader) References **IT-Professional** not allowed null

** Relationship *LeadBy*

Constraint

(Project IT-Team over TeamCode)

Difference

(Project IT-Professional over TeamCode)

Is Empty

Relation IT-Professional

StaffID: StaffNumber

Name: Varchar(25)

JobTitle: Position

Specialism: Skill

TeamCode: TeamID

Primary Key (StaffID)

Foreign Key (TeamCode) References **IT-Team**

** Relationship *Comprises*

Below is some sample data that will be used in subsequent relational algebra expressions:

IT-Team

TeamCode	TeamName	Base	Telephone	Leader
1	London All Stars	London	1234567	0009
2	Northern Lights	Manchester	9080701	0089
3	Big City Shakers	London	1234567	0037
4	Midlands Movers	Birmingham	3213210	0182
5	Glasgow Kiss	Glasgow	4455440	0223
6	Mad For IT	Manchester	9080701	0763
7	City Solutions	London	1234567	0091
8	IT Express	Birmingham	3213210	0222
9	Lovin' IT	Glasgow	4455440	0871
10	Too Hot 2 Handle	London	1234567	0236

IT-Professional (Sample)

StaffID	Name	JobTitle	Specialism	TeamCode
0089	A. Spider	Developer	Web	2
0020	R. Taylor	System. Admin.	Mainframes	3
0763	H. Smith	Tester	Networking	6
0009	G. Robinson	System Admin.	Operating Systems	1
0044	Y. Green	Installer	Networking	1
0182	W. Roberts	Developer	OO languages	4
0909	K. Knight	Security	Mainframes	7
0176	L. Jackson	System Admin.	Operating Systems	6
0037	J. Johnson	Developer	Databases	3
0111	W. Weave	Security	Web	5
0091	L. Brown	Modeller	Databases	7
0055	P. Fallows	Installer	Mainframes	10
0223	M. Walton	Security	Databases	5
0898	K. Holden	Developer	Databases	9
0871	W. Winter	System Admin.	Operating Systems	9
0776	T. Tangle	Security	Web	4
0236	P. Peterson	Developer	OO languages	10
0222	S. Campbell	System Admin.	Mainframes	8
0385	R. Rogers	Installer	Networking	8

We can now write the relational algebra expressions to answer the following queries:

1. List the staff identifier of all database specialists.

Project (Select IT-Professional where Specialism = 'Databases') over StaffID

StaffID
0037
0091
0223
0898

2. List the staff identifier, name and team code of all web security experts

Project (Select IT-Professional where JobTitle = 'Security' AND Specialism = 'Web')
Over StaffID, Name, TeamCode

StaffID	Name	TeamCode
0111	W. Weave	5
0776	T. Tangle	4

3. List the names of all teams currently employing a networking specialist

Project (Select (Join IT-Team and IT-Professional where TeamCode = TeamCode) where
Specialism = 'Networking') over TeamName

TeamName
London All Stars
Mad For IT
IT Express

4. List the names of all staff currently employed by a London-based team

Project (Select (Join IT-Team and IT-Professional where TeamCode = TeamCode) where
Base = 'London') over Name

Name
R. Taylor
G. Robinson
Y. Green
K. Knight
J. Johnson
L. Brown
P. Fallows
P. Peterson

5. List the names and staff identifiers of all staff working for team leader 0009

Project (Select (Join IT-Team and IT-Professional where TeamCode = TeamCode) where Leader = 0009) over StaffID, Name

StaffID	Name
0009	G. Robinson
0044	Y. Green

Activity

Explain how each of the following semantic constraints are represented within the above relational model:

- (a) The *Comprises* relationship, its degree and participation conditions
- (b) The *LeadBy* relationship, its degree and participation conditions

The solutions are at the end of this document.