

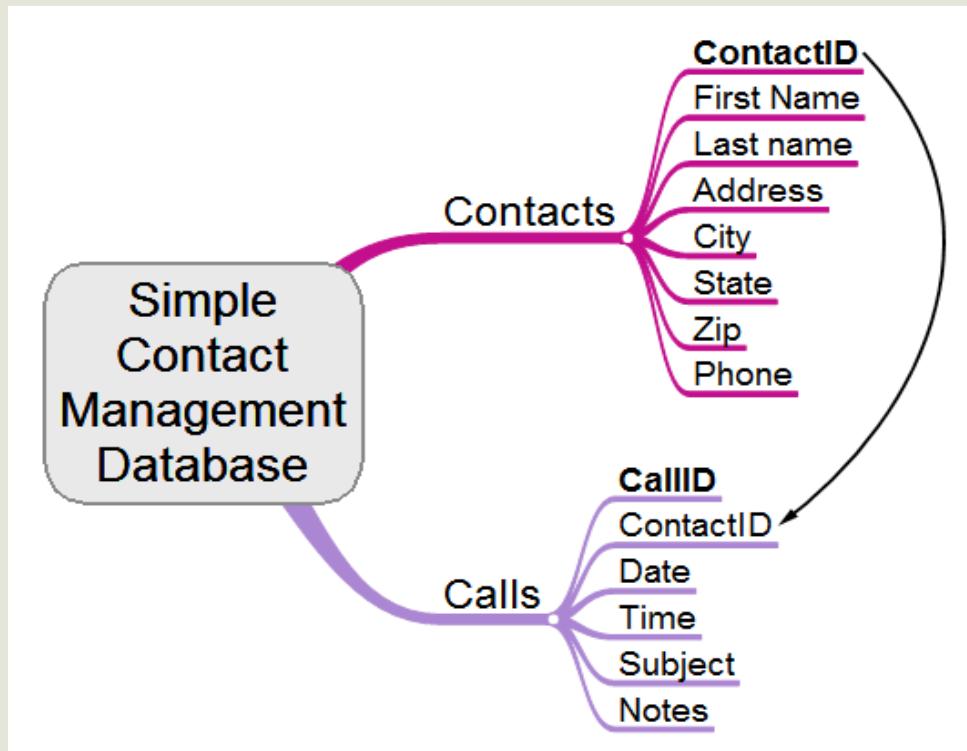


ACCESS DATABASE HANDBOOK



Part I: Relational Database Design

How to Construct Well-Designed Relational Databases
Using Microsoft Access and Other Relational Database
Applications



by John DeVries
The Idea Group

Operating Notes

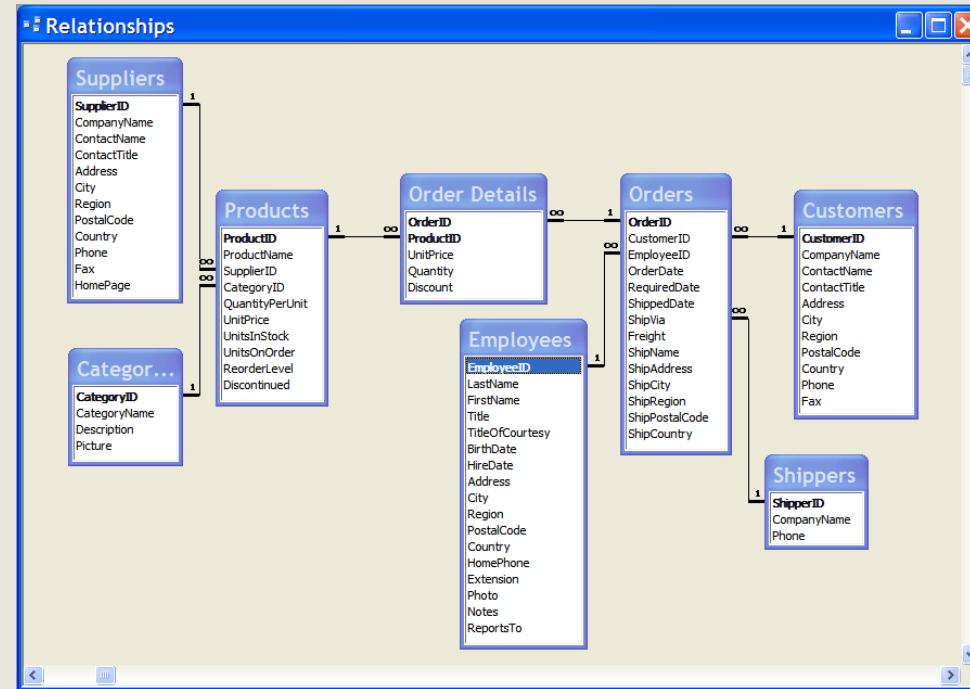
Introduction

Relational Database applications, such as Microsoft Access, are among the most difficult computer programs to learn. This Microsoft Access Handbook will show you how to design the Tables and Relationships, how to construct these and the other various pieces of a complete database, and more advanced techniques to improve the appearance and utility of your database.

This first section is a guide to Relational Database design. It will teach you why a Relational Database is the right solution to complex data stor-

Note

Although this handbook refers to Microsoft Access and the screen shots are all from Access databases, this section on Relational Database Design is equally applicable to other relational database applications.

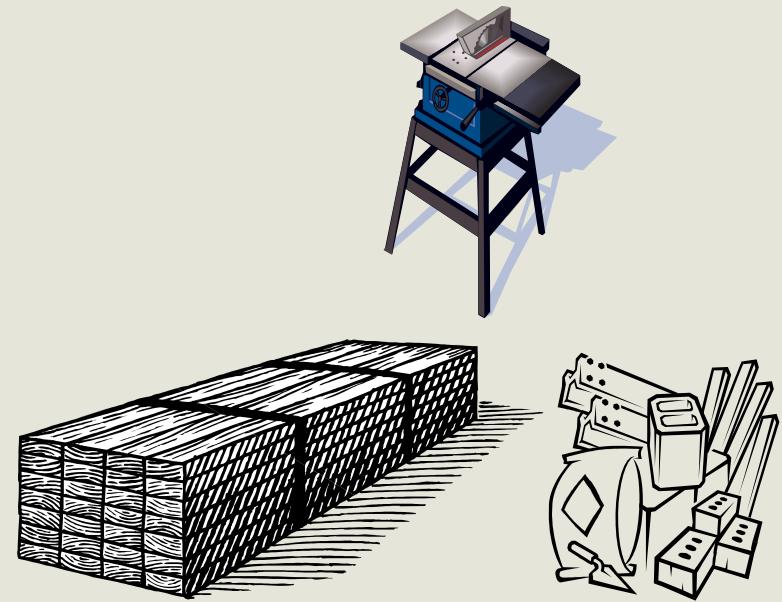


You Just Won Your Dream House!!

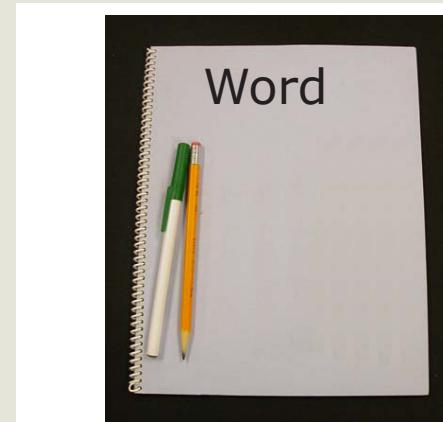
The Dream



The Reality



Real World Models of MS Office Applications



Excel



Access



Real World Analogy for Access



An Automated Data Warehouse

Page 6

"Begin with the End in Mind"

Orders

Bill To: Alfreds Futterkiste	Ship To: Alfreds Futterkiste																											
Obere Str. 57	Obere Str. 57																											
Berlin	Berlin																											
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Salesperson: Suyama, Michael	Ship Via: <input checked="" type="checkbox"/> Speedy <input type="checkbox"/> United <input type="checkbox"/> Federal																											
Order ID: 10643	Order Date: 25-Aug-97	Required Date: 22-Sep-97	Shipped Date: 02-Sep-97																									
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Invoice

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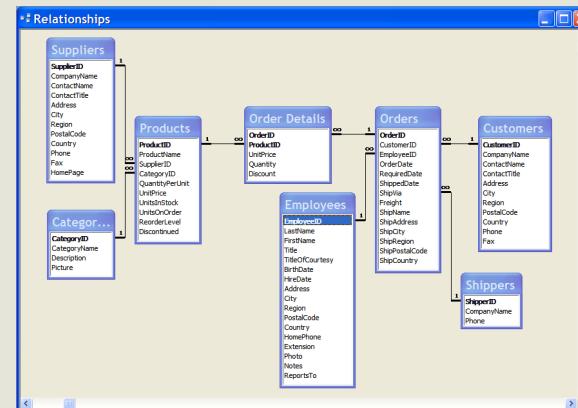
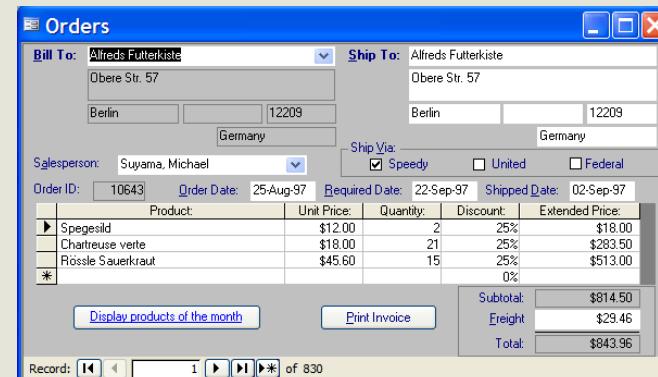
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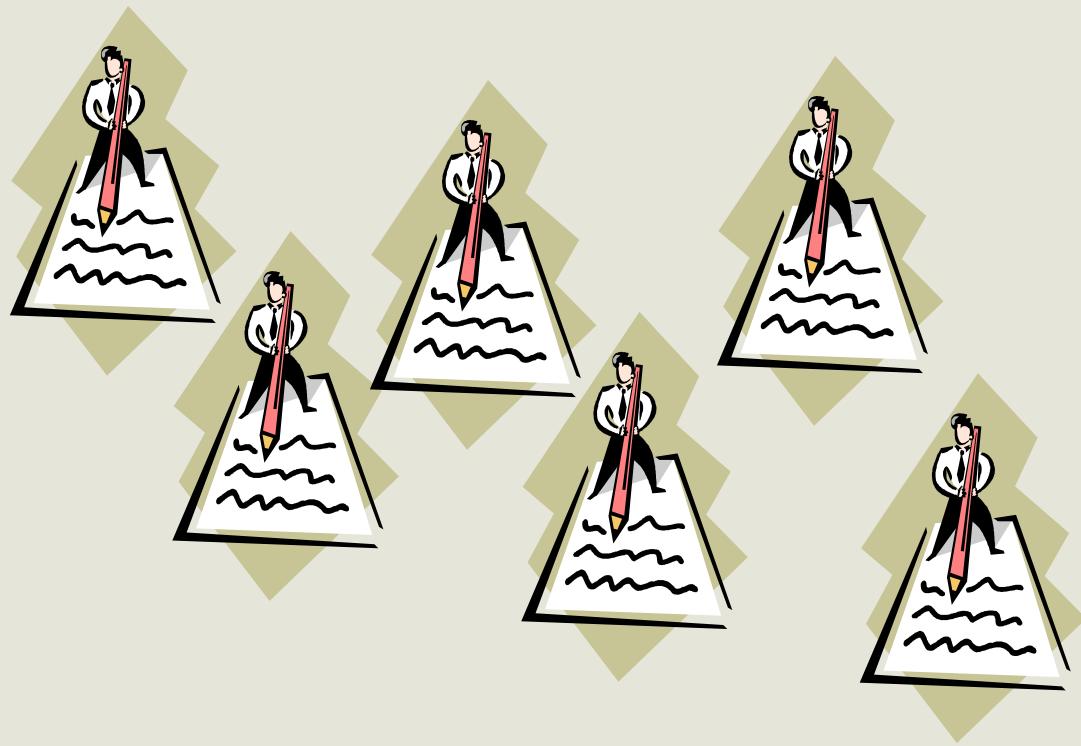
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2817 Milton Dr.	2817 Milton Dr.
Albuquerque NM 87110	Albuquerque NM 87110
USA	USA
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Advantages of Database over Spreadsheet

- Separation of user interface from database structure
- Structure of data is embedded in design of database
- Ability to handle complex data relationships



One-to-Many: The Key to relational Databases



**One customer
places
Many orders**



Problems of Flat-File Databases

- Repetition of information
- Extra work for data entry personnel
- Increased possibility of errors
- Lack of obvious place to enter changes in data

Microsoft Excel - Customers.xls

File Edit View Insert Format Tools Data PUP v6 Window Help Adobe PDF

Arial 10 B U S % 100% 87%

Customer ID Company Name Contact Name Contact Title Address City Region Postal Code Country

1 ALFKI Alfreds Futterkiste Maria Anders Sales Representative Obere Str. 57 Berlin Germany 12209

2 ANATR Anatalia Taqueria Ana Trujillo Owner Avda de la Constitución 2222 México D.F. 05021 Mexico

3 ANTON Antonio Moreno Taquería Antonio Moreno Owner Mata

4 AROUT Around the Horn Thomas Hardy Sales Representative 120 Bergstrasse Frankfurt am Main 60528 Germany

5 BERGS Berglunds snabbköp Christina Berglund Order Administrator Forskningsgränd 24, Box 1140 Stockholm S-811 17 Sweden

6 BLAUS Blauer See Delikatessen Hanna Moos Sales Representative 20, Bergstrasse Frankfurt am Main 60528 Germany

7 BLONP Blondel père et fils Frédérique Cœtta Marketing Manager 24, place Kléber Strasbourg 67000 France

8 BOLID Blötl Comidas preparadas Martin Sommer Owner C/ Aragón, 30 Madrid 28006 Spain

9 BONAP Bon app' Laurence Lebihan Owner 12, rue de l'Université Paris 75005 France

10 BOTTM Bottom-Dollar Markets Elizabeth Lincoln Accounting Manager Elttzabeth Lincn 9/16/1994

11 BSBEV B's Beverages Victoria Ashworth Sales Representative Faur 1 Customer ID Company Name Contact Name Address City Postal Code Country Phone Fax

12 CACTU Cactus Comidas para llevar Patrício Simpson Sales Agent 2 ANTONT Antonito Moreno Taquería Antonio Moreno Mataderos 2312 México D.F. 05623 Mexico (55) 555-3932

13 CENTC Centro comercial Mocedezuma Francisco Chang Marketing Manager Sieri 2 ANTONT Antonito Moreno Taquería Antonio Moreno Mataderos 2312 México D.F. 05623 Mexico (55) 555-3932

14 CHOPS Chop-suey Chinese Yang Wang Owner Haug 5 AROUT Around the Horn Thomas Hardy 120 Heumarkt Sq. London W1 1DP UK (171) 555-7788

15 FOGLI Folies gourmandes Martine Rancé Assistant Sales Agent Av. d' E 6 AROUT Around the Horn Thomas Hardy 120 Heumarkt Sq. London W1 1DP UK (171) 555-7788

16 CONSH Consolidated Holdings Elias Brown Sales Associate 61, rue de la Paix 75001 Paris France

17 CONSH Drachenflug Detekteien Sven Ottieb Order Administrator Wacker 10 8 AROUT Around the Horn Thomas Hardy 120 Heumarkt Sq. London W1 1DP UK (171) 555-7788

18 DIAOD Du monde entier Janina Labrune Owner 61, rue de la Paix 75001 Paris France

19 DUMON Eastern Connection Ann Devon Sales Agent 35 Käferweg 12 Berlin 10779 Germany

20 EASTC Eastern Connection Tom Haverbeke 120 Heumarkt Sq. London W1 1DP UK (171) 555-7788

21 ERISH Ernst Handel Roland Mendel Sales Manager Kirch 12 AROUT Around the Horn Thomas Hardy 120 Heumarkt Sq. London W1 1DP UK (171) 555-7788

22 FAIMA Familia Arquitectos Aria Cruz Marketing Assistant Rua 14 AROUT Around the Horn Thomas Hardy 120 Heumarkt Sq. London W1 1DP UK (171) 555-7788

23 FISSA FISSA Fabrica Inter. Salchichas S.A. Diego Roel Accounting Manager C/ Madero 12 10 AROUT Around the Horn Thomas Hardy 120 Heumarkt Sq. London W1 1DP UK (171) 555-7788

24 FOGLI Folies gourmandes Martine Rancé Assistant Sales Agent 61, rue de la Paix 75001 Paris France

25 FOLKO Folk och fa HB Maria Larsson Owner Åker 17 AROUT Around the Horn Thomas Hardy 120 Heumarkt Sq. London W1 1DP UK (171) 555-7788

26 FRANK Frankensversand Peter Franken Marketing Manager Berlin 19 AROUT Around the Horn Thomas Hardy 120 Heumarkt Sq. London W1 1DP UK (171) 555-7788

27 FRANX Franck s P.A. Carine Schmitt Marketing Manager Via 21 BERGS Berglunds snabbköp Christina Berglund Bergsvägen 8 Lukeå S-900 22 Sweden

28 FRANS Paolo Accort Sales Representative 516 E 33 BERGS Berglunds snabbköp Christina Berglund Bergsvägen 8 Lukeå S-900 22 Sweden

29 FURIB Furia Bacalhau e Frutos do Mar Lino Rodriguez Sales Manager Jard 12 AROUT Around the Horn Thomas Hardy 120 Heumarkt Sq. London W1 1DP UK (171) 555-7788

30 GALED Galería del gastronómico Eduardo Saavedra Marketing Manager Ram 24 AROUT Around the Horn Thomas Hardy 120 Heumarkt Sq. London W1 1DP UK (171) 555-7788

31 GODOS Godos Cocina Típica José Pedro Freyre Sales Manager Av. B 25 BERGS Berglunds snabbköp Christina Berglund Bergsvägen 8 Lukeå S-900 22 Sweden

32 GONAL Gourmet bonheures André Forcada Sales Associate 27, rue de la Paix 75001 Paris France

33 GRUPE Great Lakes Food Market Howard Snyder Market Manager 27, rue de la Paix 75001 Paris France

34 GROSR GROSSELLA-Restaurante Manuel Peters Owner Åker 17 AROUT Around the Horn Thomas Hardy 120 Heumarkt Sq. London W1 1DP UK (171) 555-7788

35 HANAR Hanari Cárneos Mario Pontes Accounting Manager Rua 13 BERGS Berglunds snabbköp Christina Berglund Bergsvägen 8 Lukeå S-900 22 Sweden

36 HILAA HILARION-absabtos Carlos Hernández Sales Representative Carr 31 BERGS Berglunds snabbköp Christina Berglund Bergsvägen 8 Lukeå S-900 22 Sweden

37 HUNGC Hungry Coyote Import Store Yoshi Latimer Sales Representative 516 E 33 BERGS Berglunds snabbköp Christina Berglund Bergsvägen 8 Lukeå S-900 22 Sweden

38 HUNGO Hungry Owl All-Night Grocers Patricia McKenna Sales Associate 8, Johanna 10 AROUT Around the Horn Thomas Hardy 120 Heumarkt Sq. London W1 1DP UK (171) 555-7788

39 ISLAT Island Trading Helen Bennett Marketing Manager Crow 35 BERGS Berglunds snabbköp Christina Berglund Bergsvägen 8 Lukeå S-900 22 Sweden

40 KOENE Königlich Essen Philip Cramer Sales Associate Mau 16 BERGS Berglunds snabbköp Christina Berglund Bergsvägen 8 Lukeå S-900 22 Sweden

41 LACOR La come d'abondance Daniel Tonini Sales Representative 67, a BERGS Berglunds snabbköp Christina Berglund Bergsvägen 8 Lukeå S-900 22 Sweden

42 LAMAI La maison d'asie Annette Roulet Sales Manager 1 ruf 39 BERGS Bauer See Delikatessen Hanna Moos Forstræder 57 Malmö 63006 Germany 061-08460 061-08924

43 LIUGR I auhinh Racchus Wine Cellars Yoshi Tannamuri Marketing Assistant 100f/40 BERGS Bauer See Delikatessen Hanna Moos Forstræder 57 Malmö 63006 Germany 061-08460 061-08924

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124 BLONP Blondel père et fils Frédérique Cœtta 24, place Kléber Strasbourg 67000 France 88.60.15.31 88.60.15.32 10510_BLPN

125 BLONP Blondel père et fils Frédérique Cœtta 24, place Kléber Strasbourg 67000 France 88.60.15.31 88.60.15.32 10511_BLPN

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145 BLONP Blondel père et fils Frédérique Cœtta 24, place Kléber Strasbourg 67000 France 88.60.15.31 88.60.15.32 10531_BLPN

146 BLAUS Bauer See Delikatessen Hanna Moos Forstræder 57 Malmö 63006 Germany 0621-08460 0621-08924

147 BLONP Blondel père et fils Frédérique Cœtta 24, place Kléber Strasbourg 67000 France 88.60.15.31 88.60.15.32 10532_BLPN

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155 BLONP Blondel père et fils Frédérique Cœtta 24, place Kléber Strasbourg 67000 France 88.60.15.31 88.60.15.32 10540_BLPN

156 BLONP Blondel père et fils Frédérique Cœtta 24, place Kléber Strasbourg 67000 France 88.60.15.31 88.60.15.32 10541_BLPN

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161 BLONP Blondel père et fils Frédérique Cœtta 24, place Kléber Strasbourg 67000 France 88.60.15.31 88.60.15.32 10546_BLPN

162 BLONP Blondel père et fils Frédérique Cœtta 24, place Kléber Strasbourg 67000 France 88.60.15.31 88.60.15.32 10547_BLPN

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164 BLONP Blondel père et fils Frédérique Cœtta 24, place Kléber Strasbourg 67000 France 88.60.15.31 88.60.15.32 10549_BLPN

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Advantages of a Relational Database

- Data is entered once in database
- Reduced workload for data entry operators
- Reduced chance of error
- May be recombined for presentation to Users

Customers : Table

Customer ID	Company Name	Contact Name	Contact Title	Address	City	Region	Postal Code	Country
A - ALFKI	Alfreds Futterkiste	Maria Anders	Sales Representative	Oberhe Str. 57	Berlin		12209	Germany
A - ANATR	Ana Trujillo Emparedados y helados	Ana Trujillo	Owner	Avda. de la Constitución 2222	México D.F.		05201	Mexico
A - ANTON	Antonio Moreno Taquería	Antonio Moreno	Owner	Mataderos 2312	México D.F.		05023	Mexico
A - AROUT	Thomas Hardy Books	Thomas Hardy	Sales Representative	120 Hanover Sq.	London		WA1 1OP	UK
A - BERGS	Berglunds snabbköp	Christina Berglund	Order Administrator	Berguvsgågen 8	Luleå		S-968 22	Sweden
A - BLAUS	Blaauw DelicatesSEN	Hanna Moos	Sales Representative	Forsterstr. 57	Mannheim		68306	Germany
A - BLOND	Blond pêche et fruits	Fredrikke Citeaux	Marketing Manager	24, place Kléber	Strasbourg		67000	France
A - BOFJD	Bilros Comidas preparadas	Maria Sante	Owner	Västra Gatan 37	Malmö		20023	Spain
A - BONAP	Bon app!	Laurence Lebihan	Owner	12, rue des Bouchers	Marciac		32008	France
A - BOTTM	Bottom-Dollar Markets	Elizabeth Lincoln	Accounting Manager	23 Tsawassen Blvd.	Tsawassen	BC	T2F 8M4	Canada
A - BSBEV	B's Beverages	Victoria Ashworth	Sales Representative	Faulkner Circus	London		EC2 9NT	UK
A - CACTU	Cactus Comidas para llevar	Patricia Simpson	Sales Agent	Cerinto 333	Buenos Aires		1010	Argentina
A - CENTC	Centro comercial Moctezuma	Francisco Chang	Marketing Manager	Sierras de Granada 9993	México D.F.		05022	Mexico
A - CHOPS	Chop-suey Chinese	Yang Wang	Owner	Hauptstr. 29	Bern		3012	Switzerland
A - COMM	Comércio Mineiro	Pedro Afonso	Sales Associate	Av. dos Lusitanas, 23	São Paulo	SP	05432-043	Brazil
A - CONSH	Consolidated Holdings	Elizabeth Brown	Sales Representative	Berkeley Gardens	London		W1X 6LT	UK
A - DRACD	Drachenblut Delikatessen	Sven Ottieb	Order Administrator	Walsenweg 21	Aachen		52066	Germany
A - DUON	Du Vin en Soins	Jeanne Labrune	Owner	67, rue des Cinquante Otages	Nantes		44000	France
A - EASTS	Eastern Connection	Ann Devitt	Sales Agent	87 King George	London		EC2 9EW	UK
A - ERNSH	Ergänz Handel	Roland Mendel	Sales Manager	Königstr. 5	Graz		8010	Austria
A - FAMIA	Familia Arquibaldo	Ana Cruz	Marketing Assistant	Rua Orós, 92	São Paulo	SP	05420-030	Brazil
A - FISSA	FISSA Fabrica Inter. Salchichas S.A.	Diego Roel	Accounting Manager	C/ Moratarral, 86				
A - FOLIG	Folies gourmandes	Martine Rancé	Assistant Sales Agent	184, chaussée de Tournai				
A - FOLKO	Folk och fä HB	Maria Larsson	Owner	Akersgatan 24				
A - FRANK	Frankensversand	Peter Franken	Marketing Manager	Berliner Platz 43				
A - FRANR	France restauration	Carine Schmidt	Marketing Manager	54, rue Royale				
A - FRANS	Franchi s.p.a.	Paolo Accorti	Sales Representative	Via Monte Bianco 34				
A - FURIB	Funa Bacalhau e Frutos do Mar	Lino Rodriguez	Sales Manager	Jardim das rosas n. 32				
A - GALER	Galería del gastrónomo	Eduardo Saavedra	Marketing Manager	Rambla de Cataluña, 23				
A - GOSOD	Gordon's Gourmet Tipps	Ulrich Hübler	Sales Manager	Am Rothenbaum				
A - GOURF	Gourmet Landestorte	André Forseca	Sales Associate	Av. Brasil, 442				
A - GREAL	Great Lakes Food Market	Howard Snyder	Marketing Manager	2732 Baker Blvd.				
A - GROS	GROSELLA-Restaurante	Manuel Pereira	Owner	5º Ave. Los Palos Grandes				
A - HANAR	Hanau Cames	Mario Pontes	Accounting Manager	Rua do Paço, 67				
A - HILAA	HILARIOÑ-Abastos	Carlos Hernández	Sales Representative	Carrera 22 con Ave. Carlos Soublette #				
A - HUNGC	Hungry Coyote Import Store	Yoshi Latimer	Sales Representative	City Center Plaza				
A - HUNGO	Hungry Owl All-Night Grocers	Patricia McKenna	Sales Associate	8 Johnstown Road				
A - ISLAT	Island Trading	Helen Bennett	Marketing Manager	Garden House				
A - KOME	Königlich Essen	Philip Cramer	Sales Associate	Maubelstr. 90				
A - LACOR	La corne d'abondance	Diane空前	Sales Representative	67, avenue des Europe				
A - LAMAN	La manzana d'or	Annette Roulet	Sales Manager	1 rue Alsace-Lorraine				
A - LAUGB	Laughing Bacchus Wine Cellars	Yoshi Tannamuri	Marketing Assistant	1900 Oak St.				
A - LICO	Lacus K Kuchnia Śródka	Irena Kowalska	Marketing Manager	140 Kuyavian-Pomeranian				

Record: 141 of 911

Relationships

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      subgraph Customers [Customers]
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        CompanyName[CompanyName]
        EmployeeID[EmployeeID]
        OrderDate[OrderDate]
        RequiredDate[RequiredDate]
        ShippedDate[ShippedDate]
        ShipVia[ShipVia]
        Freight[Freight]
        ShipName[ShipName]
        ShipAddress[ShipAddress]
        ShipCity[ShipCity]
        ShipRegion[ShipRegion]
        ShipPostalCode[ShipPostalCode]
        ShipCountry[ShipCountry]
      end

      subgraph Orders [Orders]
        OrderID[OrderID]
        CustomerID[CustomerID]
        EmployeeID[EmployeeID]
        OrderDate[OrderDate]
        RequiredDate[RequiredDate]
        ShippedDate[ShippedDate]
        ShipVia[ShipVia]
        Freight[Freight]
        ShipName[ShipName]
        ShipAddress[ShipAddress]
        ShipCity[ShipCity]
        ShipRegion[ShipRegion]
        ShipPostalCode[ShipPostalCode]
        ShipCountry[ShipCountry]
      end

      CustomerID -- 1 --> OrderID
      CustomerID -- <--> EmployeeID
      CustomerID -- <--> OrderDate
      CustomerID -- <--> RequiredDate
      CustomerID -- <--> ShippedDate
      CustomerID -- <--> ShipVia
      CustomerID -- <--> Freight
      CustomerID -- <--> ShipName
      CustomerID -- <--> ShipAddress
      CustomerID -- <--> ShipCity
      CustomerID -- <--> ShipRegion
      CustomerID -- <--> ShipPostalCode
      CustomerID -- <--> ShipCountry
    
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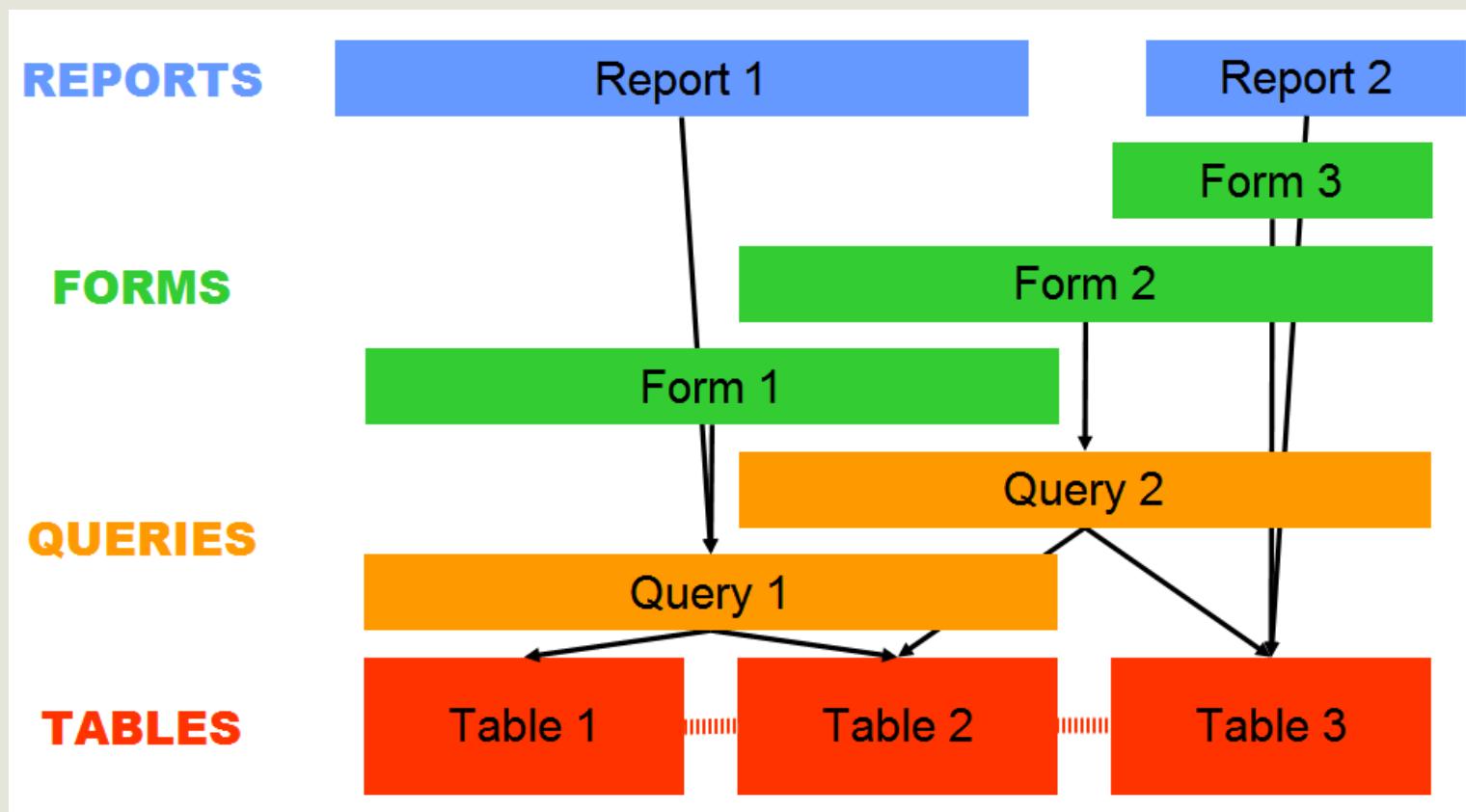
Orders : Table

Order ID	Customer ID	Employee ID	Order Date	Required Date	Shipped Date	Ship Via	Freight	Ship Name	Ship Address	Ship City	Ship Region	Ship Postal Code	
10249	VINET	5	04-Aug-94	01-Sep-94	15-Aug-94 3	Vins et alcools Chevalier	\$32.38	59 rue de l'Abbaye	Reims	51100	Bern		
10249	TOMSP	6	05-Aug-94	16-Sep-94	16-Aug-94 1	Tom's Spezialitäten	\$11.61	Luisenstr. 48	Münster	44087	Resende	SP	
10250	HANAR	4	08-Aug-94	05-Sep-94	12-Aug-94 2	Hanari Cames	\$65.83	Rua do Paço, 67	Rio de Janeiro	RJ	05454-876	Wellington Importadora	SP
10251	VICTE	3	08-Aug-94	05-Sep-94	15-Aug-94 1	Virtuailles en stock	\$41.34	2, rue du Commerce	Lyon	69004	Brücke	SG	
10252	SUPRD	4	09-Aug-94	06-Sep-94	11-Aug-94 2	Suprême délices	\$51.30	Boulevard Tirou, 255	Charleroi	B-6000	Bracke	SG	
10253	HANAR	3	10-Aug-94	24-Aug-94	16-Aug-94 2	Hanari Cames	\$58.17	Rua do Paço, 67	Rio de Janeiro	RJ	05454-876	Re	BR
10254	CHOPS	5	11-Aug-94	08-Sep-94	23-Aug-94 2	Chop-suey Chinese	\$22.98	Haupstr. 31	Stuttgart	70172	Que Delicia	BR	
10255	OTSO	9	12-Aug-94	09-Sep-94	16-Aug-94 2	Otties Käseladen	\$14.60	Rua do Mercado, 12	Resende	12044	Wellington Importadora	SP	
10256	WELL	3	15-Aug-94	12-Sep-94	17-Aug-94 2	Wellington Importadora	\$13.97	Rua do Mercado, 12	Resende	12044	Wellington Importadora	SP	
10257	HILAA	4	16-Aug-94	13-Sep-94	22-Aug-94 3	HILARIOÑ-Abastos	\$81.91	Carrera 22 con Ave. Carlos San Cristóbal	Táchira	50222	Ernst Handel	AT	
10258	ERISH	1	17-Aug-94	14-Sep-94	23-Aug-94 1	Erish Handel	\$140.51	Kirchgasse 6	Graz	8010	Akergatan 24	SE	
10259	CENTC	4	18-Aug-94	15-Sep-94	25-Aug-94 3	Centro comercial Mocetuzma	\$32.25	Sierras de Granada 9993	México DF	105022	Brücke	SG	
10260	OTTIK	4	19-Aug-94	16-Sep-94	29-Aug-94 1	Otties Käseladen	\$55.09	Mehrheimerstr. 369	Köln	50739	Haupstr. 31	BR	
10261	QUED	4	19-Aug-94	16-Sep-94	30-Aug-94 2	Que Delicia	\$3.05	Rua da Panificadora, 12	Rio de Janeiro	RJ	02389-673	Haupstr. 31	BR
10262	RATTC	8	22-Aug-94	19-Sep-94	25-Aug-94 3	Rattlesnake Canyon Grocery	\$48.29	2817 Milton Dr.	Albuquerque	NM	87110	Torukatu 38	BR
10263	ERNSH	9	23-Aug-94	20-Sep-94	31-Aug-94 3	Ernst Handel	\$146.06	P.O. Box 555	Lander	WY	05220	Haupstr. 31	BR
10264	FOLKO	6	24-Aug-94	21-Sep-94	21-Aug-94 3	Folk och fa HB	\$35.67	2817 Milton Dr.	Albuquerque	NM	87110	Haupstr. 31	BR
10265	BLOOF	2	25-Aug-94	22-Sep-94	32-Aug-94 3	Blond pêche et fils	\$55.28	Taucherstraße 10	Cunewalde	01307	Haupstr. 31	BR	
10266	GRORTH	3	26-Aug-94	23-Sep-94	33-Aug-94 3	Grorth	\$208.58	Haupstr. 31	Cunewalde	01307	Haupstr. 31	BR	
10267	FRANK	4	29-Aug-94	26-Sep-94	04-Sep-94 1	Frankenversand	\$208.58	Haupstr. 31	Cunewalde	01307	Haupstr. 31	BR	
10268	GROS	8	30-Aug-94	27-Sep-94	05-Sep-94 3	GROSSELLA-Restaurante	\$68.29	Haupstr. 31	Cunewalde	01307	Haupstr. 31	BR	
10269	GRS	1	31-Aug-94	28-Sep-94	06-Sep-94 3	White Clover Markets	\$44.56	Haupstr. 31	Cunewalde	01307	Haupstr. 31	BR	
10270	GRS	1	31-Aug-94	28-Sep-94	07-Sep-94 3	Wartian Herkuu	\$136.54	Haupstr. 31	Cunewalde	01307	Haupstr. 31	BR	
10271	GRS	1	31-Aug-94	28-Sep-94	08-Sep-94 3	Split Rail Beer & Ale	\$44.54	Haupstr. 31	Cunewalde	01307	Haupstr. 31	BR	
10272	GRS	1	31-Aug-94	28-Sep-94	09-Sep-94 3	Rattlesnake Canyon Grocery	\$98.03	Haupstr. 31	Cunewalde	01307	Haupstr. 31	BR	
10273	GRS	1	31-Aug-94	28-Sep-94	10-Sep-94 3	QUICK-Stop	\$76.07	Haupstr. 31	Cunewalde	01307	Haupstr. 31	BR	
10274	GRS	1	31-Aug-94	28-Sep-94	11-Sep-94 3	TAUER	\$6.01	Vins et alcools Chevalier	Reims	51100	Haupstr. 31	BR	
10275	GRS	1	31-Aug-94	28-Sep-94	12-Sep-94 3	Magazzini Alimentari Rumi	\$26.93	Via Ludovico il Moro 22	Bergamo	24100	Haupstr. 31	BR	
10276	GRS	1	31-Aug-94	28-Sep-94	13-Sep-94 3	Tortuga Restaurante	\$13.84	Avenida Azteca 123	México D.F.	105033	Haupstr. 31	BR	
10277	GRS	1	31-Aug-94	28-Sep-94	14-Sep-94 3	Haupstr. 31	\$122.00	Haupstr. 31	Cunewalde	01307	Haupstr. 31	BR	
10278	GRS	1	31-Aug-94	28-Sep-94	15-Sep-94 2	Berglunds snabbköp	\$93.69	Berglunds snabbköp	Luleå	S-968 22	Haupstr. 31	BR	
10279	GRS	1	31-Aug-94	28-Sep-94	16-Sep-94 2	Lehmans Marktstand	\$25.83	Lehmans Marktstand	Mazaginweg 7	95022	Haupstr. 31	BR	
10280	GRS	1	31-Aug-94	28-Sep-94	17-Sep-94 2	Spit Rull Beer & Ale	\$8.98	Lehmans Marktstand	Mazaginweg 7	95022	Haupstr. 31	BR	
10281	GRS	1	31-Aug-94	28-Sep-94	18-Sep-94 2	Wartian Herkuu	\$8.98	Lehmans Marktstand	Mazaginweg 7	95022	Haupstr. 31	BR	
10282	GRS	1	31-Aug-94	28-Sep-94	19-Sep-94 2	Romero y tomillo	\$22.94	Lehmans Marktstand	Mazaginweg 7	95022	Haupstr. 31	BR	
10283	GRS	1	31-Aug-94	28-Sep-94	20-Sep-94 2	Gran Via, 1	\$12.69	Lehmans Marktstand	Mazaginweg 7	95022	Haupstr. 31	BR	
10284	GRS	1	31-Aug-94	28-Sep-94	21-Sep-94 2	Gran Via, 1	\$84.81	Lehmans Marktstand	Mazaginweg 7	95022	Haupstr. 31	BR	
10285	GRS	1	31-Aug-94	28-Sep-94	22-Sep-94 2	LU-Supermercado	\$76.56	Lehmans Marktstand	Mazaginweg 7	95022	Haupstr. 31	BR	
10286	GRS	1	31-Aug-94	28-Sep-94	23-Sep-94 2	Taucherstraße 10	\$76.83	Lehmans Marktstand	Mazaginweg 7	95022	Haupstr. 31	BR	
10287	GRS	1	31-Aug-94	28-Sep-94	24-Sep-94 2	QUICK-Stop	\$229.24	Lehmans Marktstand	Mazaginweg 7	95022	Haupstr. 31	BR	
10288	GRS	1	31-Aug-94	28-Sep-94	25-Sep-94 2	Taucherstraße 10	\$229.24	Lehmans Marktstand	Mazaginweg 7	95022	Haupstr. 31	BR	
10289	GRS	1	31-Aug-94	28-Sep-94	26-Sep-94 2	Ricardo Adocados	\$12.76	Lehmans Marktstand	Mazaginweg 7	95022	Haupstr. 31	BR	
10290	GRS	1	31-Aug-94	28-Sep-94	27-Sep-94 2	Reggiani Caseifici	\$74.75	Lehmans Marktstand	Mazaginweg 7	95022	Haupstr. 31	BR	
10291	GRS	1	31-Aug-94	28-Sep-94	28-Sep-94 2	Faunleiry Circus	\$22.77	Lehmans Marktstand	Mazaginweg 7	95022	Haupstr. 31	BR	
10292	GRS	1	31-Aug-94	28-Sep-94	29-Sep-94 2	Reggiani Caseifici	\$74.75	Lehmans Marktstand	Mazaginweg 7	95022	Haupstr. 31	BR	

One-to-Many Relationships Are Everywhere

- One class contains Many students
- One donor gives Many donations
- One company has Many employees
- One supplier supplies Many products
- One (your data here) relates to Many (your data here)

Parts of a Relational Database



Parts of a Relational Database: Tables

- Store data
- Categorize data items (text, number, etc.)

Table Terminology

Columns in Tables are called "**Fields**". Each Field is designated by a Field Name at the top.

Rows are called "**Records**". Records are the smallest units of data. A record may be added to a Table or deleted from it, but a Record cannot be broken into smaller pieces.

Products : Table										
Product ID	Product Name	Supplier	Category	Quantity Per Unit	Unit Price	Units In Stock	Units On Order	Reorder Level	Discontinued	
1	Chai	Exotic Liquids	Beverages	10 boxes x 20 bags	\$18.00	39	0	10		
2	Chang	Exotic Liquids	Beverages	24 - 12 oz bottles	\$19.00	17	40	25		
3	Aniseed Syrup	Exotic Liquids	Condiments	12 - 550 ml bottles	\$10.00	13	70	25		
4	Chef Anton's Cajun Seasoning	New Orleans Cajun Delights	Condiments	48 - 6 oz jars	\$22.00	53	0	0		
5	Chef Anton's Gumbo Mix	New Orleans Cajun Delights	Condiments	36 boxes	\$21.35	0	0	0		
6	Grandma's Boysenberry Spread	Grandma Kelly's Homestead	Condiments	12 - 8 oz jars	\$25.00	120	0	25		
7	Uncle Bob's Organic Dried Pears	Grandma Kelly's Homestead	Produce	12 - 1 lb pkgs.	\$30.00	15	0	10		
8	Northwoods Cranberry Sauce	Grandma Kelly's Homestead	Condiments	12 - 12 oz jars	\$40.00	6	0	0		
9	Mishi Kobe Niku	Tokyo Traders	Meat/Poultry	18 - 500 g pkgs.	\$97.00	29	0	0		
10	Ikura	Tokyo Traders	Seafood	12 - 200 ml jars	\$31.00	31	0	0		
11	Queso Cabrales	Cooperativa de Quesos 'Las Cabras'	Dairy Products	1 kg pkg.	\$21.00	22	30	30		
12	Queso Manchego La Pastora	Cooperativa de Quesos 'Las Cabras'	Dairy Products	10 - 500 g pkgs.	\$38.00	86	0	0		
13	Konbu	Mayumi's	Seafood	2 kg box	\$6.00	24	0	5		
14	Tofu	Mayumi's	Produce	40 - 100 g pkgs.	\$23.25	35	0	0		
15	Genen Shouyu	Mayumi's	Condiments	24 - 250 ml bottles	\$15.50	39	0	5		
16	Pavlova	Pavlova, Ltd.	Confections	32 - 500 g boxes	\$17.45	29	0	10		
17	Alice Mutton	Pavlova, Ltd.	Meat/Poultry	20 - 1 kg tins	\$39.00	0	0	0		
18	Camarones Tigers	Pavlova, Ltd.	Seafood	16 kg pkg.	\$62.50	42	0	0		
19	Teatime Chocolate Biscuits	Specialty Biscuits, Ltd.	Confections	10 boxes x 12 pieces	\$9.20	25	0	5		
20	Sir Rodney's Marmalade	Specialty Biscuits, Ltd.	Confections	30 gift boxes	\$81.00	40	0	0		
21	Sir Rodney's Scones	Specialty Biscuits, Ltd.	Confections	24 pkgs. x 4 pieces	\$10.00	3	40	5		
22	Gustaf's Knäckebrot	PB Knäckebrot AB	Grains/Cereals	24 - 500 g pkgs.	\$21.00	104	0	25		
23	Tumbröd	PB Knäckebrot AB	Grains/Cereals	12 - 250 g pkgs.	\$9.00	61	0	25		
24	Guaraná Fantástica	Refrescos Americanas LTDA	Beverages	12 - 355 ml cans	\$4.50	20	0	0		
25	NuNuCa Nüf-Nougat-Creme	Heil Süßwaren GmbH & Co. KG	Confections	20 - 450 g glasses	\$14.00	76	0	30		
26	Gummibär Gummibärchen	Heil Süßwaren GmbH & Co. KG	Confections	100 - 250 g bags	\$31.23	15	0	0		
27	Schoggi Schokolade	Heil Süßwaren GmbH & Co. KG	Confections	100 - 100 g pieces	\$43.90	49	0	30		
28	Rössle Sauerkraut	Plützer Lebensmittelgroßmärkte AG	Produce	25 - 825 g cans	\$45.60	26	0	0		
29	Thüringer Rostbratwurst	Plützer Lebensmittelgroßmärkte AG	Meat/Poultry	50 bags x 30 sausgs.	\$123.79	0	0	0		
30	Nord-Ost Matjeshering	Nord-Ost-Fisch Handelsgesellschaft mbH	Seafood	10 - 200 g glasses	\$25.89	10	0	15		
31	Gorgonzola Telino	Formaggi Fortini s.r.l.	Dairy Products	12 - 200 g pkgs.	\$12.50	0	70	20		
32	Mascarpone Fabioli	Formaggi Fortini s.r.l.	Dairy Products	24 - 200 g pkgs.	\$32.00	9	40	25		
33	Geitost	Norske Meierier	Dairy Products	500 g	\$2.50	112	0	20		
34	Sasquatch Ale	Bigfoot Breweries	Beverages	24 - 12 oz bottles	\$14.00	111	0	15		
35	Steeleye Stout	Bigfoot Breweries	Beverages	24 - 12 oz bottles	\$18.00	20	0	15		
36	Inland Sill	Svensk Sjöfåda AB	Seafood	24 - 250 g jars	\$19.00	112	0	20		
37	Gravad Lax	Svensk Sjöfåda AB	Seafood	12 - 500 g pkgs.	\$26.00	11	50	25		
38	Côte de Blaye	Aux joyeux ecclésiastiques	Beverages	12 - 75 cl bottles	\$263.50	17	0	15		
39	Chartreuse verte	Aux joyeux ecclésiastiques	Beverages	750 cc per bottle	\$18.00	69	0	5		
40	Boston Crab Meat	New England Seafood Cannery	Seafood	24 - 4 oz tins	\$18.40	123	0	30		
41	Jack's New England Clam Chowder	New England Seafood Cannery	Seafood	12 - 12 oz cans	\$9.65	85	0	10		
42	Singaporean Hokkien Fried Mee	Leka Trading	Grains/Cereals	32 - 1 kg pkgs.	\$14.00	26	0	0		
	1995 Coffees	Leka Trading	Beverages	16 - 500 g bags	\$14.00	17	10	25		

TABLES

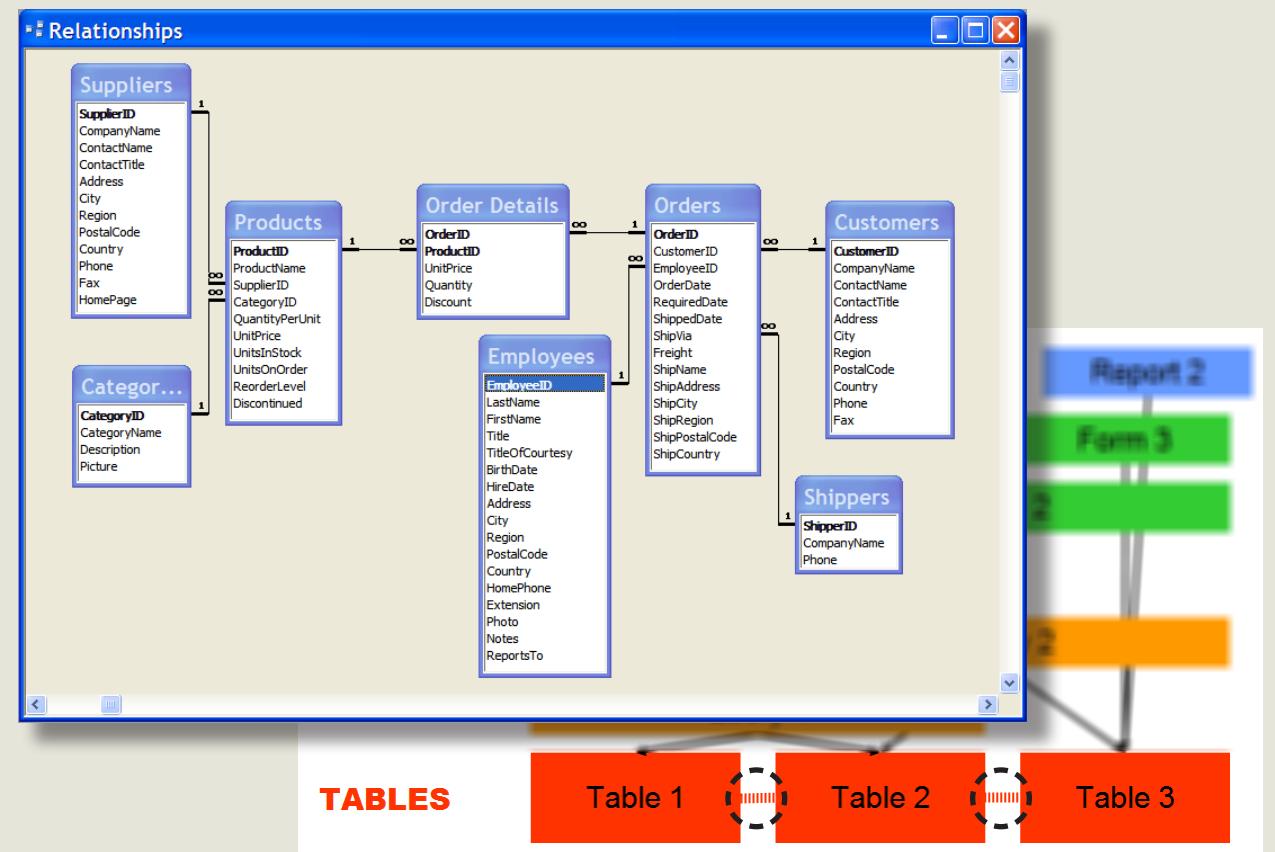
Table 1

Table 2

Table 3

Parts of a Relational Database: Relationships

- “Join” Records in Tables
- Provide pathways for Queries
- Define structure of data relationships for Form and Report Wizards



Primary Keys

Parts of a Relationship

• Primary Key

- Anchors “One” side of Relationship
- Unique identifier for each Record
- Create by adding Field to front of Table with the Field name of “*Table name*” plus “ID”
- Will be specially designated when you construct Table

Customers : Table

	Customer ID	Company Name	Contact Name	Contact Title	Address	City	Region	Postal Code	Country
► +	ALFK	Alfreds Futterkiste	Maria Anders	Sales Representative	Obere Str. 57	Berlin		12209	Germany
+ ANATR	Ana Trujillo Emparedados y helados	Ana Trujillo	Owner		Avenida de la Constitución 2222		México D.F.	05021	Mexico
+ ANTON	Antonio Moreno Taquería	Antonio Moreno	Owner		Mataderos 2312		México D.F.	05023	Mexico
+ AROUT	Around the Horn	Thomas Hardy	Sales Representative		120 Hanover Sq.	London		WA1 1DP	UK
+ BERGS	Berglunds snabbköp	Christina Berglund	Order Administrator		Berguvsvägen 8	Luleå		S-958 22	Sweden
+ BLAUS	Blauer See Delikatessen	Hanna Moos	Sales Representative		Forsterstr. 57	Mannheim		68306	Germany
+ BLONP	Blondel père et fils	Frédérique Citeaux	Marketing Manager		24, place Kléber	Strasbourg		67000	France
+ BOLID	Bólido Comidas preparadas	Martin Sommer	Owner		C/ Aragüil, 67	Madrid		28023	Spain
+ BONAP	Bon app'	Laurence Lebihan	Owner		12, rue des Bouchers	Marseille		13008	France
+ BOTTM	Bottom-Dollar Markets	Elizabeth Lincoln	Accounting Manager		23 Tsawassen Blvd.	Tsawassen	BC	T2F 8M4	Canada
+ BSBEV	B's Beverages	Victoria Ashworth	Sales Representative		Fauntleroy Circus	London		EC2 5NT	UK
+ CACTU	Cactus Comidas para llevar	Patricia Simpson	Sales Agent		Cerrito 333	Buenos Aires		1010	Argentina
+ CENTC	Centro Móvil de Compras y Venta	Francisco Chang	Marketing Manager		Sierras de Granada 9993		México D.F.	05022	Mexico
+ CHOPS	Chop-suey Chinese	Yang Wang	Owner		Hauptstr. 29	Bern		3012	Switzerland
+ COMMI	Comércio Mineiro	Pedro Afonso	Sales Associate		Av. dos Lusíadas, 23	São Paulo	SP	05432-043	Brazil
+ CONSH	Consolidated Holdings	Elizabeth Brown	Sales Representative		Berkeley Gardens	London		WX1 6LT	UK
+ DRACD	Direktlieferant AG	Sven Ottieb	Order Administrator		Walserweg 21	Aachen		52066	Germany
+ DUMON	Dumont	Janine Labrune	Owner		67, rue des Cinquante Otages	Nantes		44000	France
+ EASTC	East Connection	Ann Devon	Sales Agent		35 King George	London		WX3 6FW	UK
+ ERNSH	Ernest Handel	Roland Mendel	Sales Manager		Kirchgasse 6	Graz		8010	Austria
+ FAMIL	Familia Arquibaldo	Aria Cruz	Marketing Assistant		Rua Orós, 92	São Paulo	SP	05442-030	Brazil
+ FISSA	FISSA Fabrica Inter. Salchichas S.A.	Diego Roel	Accounting Manager		C/ Moralzarzal, 86	Madrid		28034	Spain
+ FOLIG	Folies gourmandes	Martine Rancé	Assistant Sales Agent		184, chaussée de Tournai	Lille		59000	France
+ FOLKO	Folk och fa HB	Maria Larsson	Owner		Åkergratan 24	Bräcke		S-844 67	Sweden
+ FRANK	Frankenversand	Peter Franken	Marketing Manager		Berliner Platz 43	München		80805	Germany
+ FRANR	France restauration	Carine Schmitt	Marketing Manager		54, rue Royale	Nantes		44000	France
+ FRANS	Franchi S.p.A.	Paolo Accorti	Sales Representative		Via Monte Bianco 34	Torino		10100	Italy
+ FURIB	Furia Bacalhau e Frutos do Mar	Lino Rodriguez	Sales Manager		Jardim das rosas n. 32	Lisboa		1675	Portugal
+ GALED	Galería del gastrónomo	Eduardo Saavedra	Marketing Manager		Rambla de Cataluña, 23	Barcelona		08022	Spain
+ GODOS	Godos Cocina Típica	José Pedro Freyre	Sales Manager		C/ Romero, 33	Sevilla		41101	Spain
+ GOURL	Gourmet Lanchonetes	André Fonseca	Sales Associate		Av. Brasil, 442	Campinas	SP	04876-786	Brazil
+ GREAL	Great Lakes Food Market	Howard Snyder	Marketing Manager		2732 Baker Blvd.	Eugene	OR	97403	USA
+ GROSR	GROSELLA-Restaurante	Manuel Pereira	Owner		5º Ave. Los Palos Grandes	Caracas	DF	1081	Venezuela
+ HANAR	Hanari Cárnes	Mario Pontes	Accounting Manager		Rua do Paço, 67	Rio de Janeiro	RJ	05454-876	Brazil
+ HILAA	HILARION-Abastos	Carlos Hernández	Sales Representative		Carrera 22 con Ave. Carlos Soublette #8-35	San Cristóbal	Táchira	5022	Venezuela
+ HUNGC	Hungry Coyote Import Store	Yoshi Latmer	Sales Representative		City Center Plaza	Elgin	OR	97827	USA
+ HUNGO	Hungry Owl All-Night Grocers	Patricia McKenna	Sales Associate		8 Johnstown Road	Cork	Co. Cork		Ireland
+ ISLAT	Island Trading	Helen Bennett	Marketing Manager		Garden House	Cowes	Isle of Wight	PO31 7PJ	UK
+ KOENE	Königlich Essen	Philip Cramer	Sales Associate		Maubelstr. 90	Brandenburg		14776	Germany
+ LACOR	La come d'abondance	Daniel Tonini	Sales Representative		67, avenue de l'Europe	Versailles		78000	France
+ IAMA1	La maison d'Asie	Annette Roulet	Sales Manager		1 rue Alsace-Lorraine	Toulouse		31000	France

Foreign Keys

Parts of a Relationship

- **Primary Key**

- Anchors “One” side of Relationship
- Unique identifier for each Record
- Create by adding Field to front of Table with the Field name of “*Table name*” plus “ID”
- Will be specially designated when you construct Table

- **Foreign Key**

- Anchors “Many” side of Relationship
- Same Field name as matching Primary Key
- No special designation in Access

■ Orders : Table

Order ID	CustomerID	EmployeeID	Order Date	Required Date	Shipped Date	Ship Via	Freight	Ship Name	Ship Address	Ship City	Ship Region	Ship Po
10249	VINET	5	04-Aug-94	01-Sep-94	16-Aug-94 3	\$32.38	Vins et alcools Chevalier	59 rue de l'Abbaye	Reims		51100	
10249	TOMSP	6	05-Aug-94	16-Sep-94	10-Aug-94 1	\$11.61	Toms Spezialitäten	Luisenstr. 48	Münster		44087	
10250	HANAR	4	08-Aug-94	05-Sep-94	12-Aug-94 2	\$65.83	Hanari Cárnes	Rua do Paço, 67	Rio de Janeiro	RJ	05454-87	
10251	VICTE	3	08-Aug-94	05-Sep-94	15-Aug-94 1	\$41.34	Victuailles en stock	2, rue du Commerce	Lyon		69004	
10252	SUPRD	4	09-Aug-94	06-Sep-94	11-Aug-94 2	\$51.30	Suprêmes délices	Boulevard Tirou, 255	Charleroi		B-6000	
10253	HANAR	3	10-Aug-94	24-Aug-94	16-Aug-94 2	\$58.17	Hanari Cárnes	Rua do Paço, 67	Rio de Janeiro	RJ	05454-87	
10254	CHOPS	5	11-Aug-94	08-Sep-94	23-Aug-94 2	\$22.99	Chop-suey Chinese	Hauptstr. 31	Bern		3012	
10255	RICSU	9	12-Aug-94	09-Sep-94	15-Aug-94 3	\$148.33	Richter Supermarkt	Starenweg 5	Genève		1204	
10256	WELLI	3	15-Aug-94	12-Sep-94	17-Aug-94 2	\$13.97	Wellington Importadora	Rua do Mercado, 12	Resende	SP	08737-36	
10257	HILAA	4	16-Aug-94	13-Sep-94	22-Aug-94 3	\$81.91	HILARÓN-Abastos	Carrera 22 con Ave. Carlos	San Cristóbal	Táchira	5022	
10258	ERNSH	1	17-Aug-94	14-Sep-94	23-Aug-94 1	\$140.51	Ernst Handel	Kirchgasse 6	Graz		8010	
10259	CENTC	4	18-Aug-94	15-Sep-94	25-Aug-94 3	\$3.25	Centro comercial Mocetuzma	Sierras de Granada 9993	México D.F.		05022	
10260	OTTIK	4	19-Aug-94	16-Sep-94	29-Aug-94 1	\$55.09	Ottiles Käseladen	Mehrheimerstr. 369	Köln		50739	
10261	QUEDDE	4	19-Aug-94	16-Sep-94	30-Aug-94 2	\$3.03	Quo Delicia	Rua da Panificadora, 12	Rio de Janeiro	RJ	02389-67	
10262	RATTC	8	19-Aug-94	25-Sep-94	19-Aug-94 3	\$48.29	Rattlesnake Canyon Grocery	2817 Milton Dr.	Albuquerque	NM	87110	
10263	ERNSH	9	20-Sep-94	31-Aug-94	3	\$146.06	Ernst Handel	Kirchgasse 6	Graz		8010	
10264	FOLKO		21-Sep-94	23-Sep-94	3	\$3.67	Folk och fa HB	Åkergratan 24	Bräcke		S-844 67	
10265	BLONP		22-Sep-94	12-Sep-94	1	\$55.28	Blondel père et fils	24, place Kléber	Strasbourg		67000	
10266	WARTH	3	26-Oct-94	31-Aug-94	3	\$25.73	Wartian Herkku	Tonikatu 38	Oulu		90110	
10267	FRANK	4	26-Sep-94	06-Sep-94	1	\$208.58	Frankenversand	Berliner Platz 43	München		80805	
10268	GROSR	8	30-Aug-94	27-Sep-94	3	\$66.29	GROSELLA-Restaurante	5 ^a Ave. Los Palos Grandes	Caracas	DF	1081	
10269	WHITC	5	31-Aug-94	14-Sep-94	1	\$4.56	White Clover Markets	1029 - 12th Ave. S.	Seattle	WA	98124	
10270	WARTH	1	01-Sep-94	29-Sep-94	02-Sep-94 1	\$136.54	Wartian Herkku	Tonikatu 38	Oulu		90110	
10271	SPLIR	6	01-Sep-94	29-Sep-94	30-Sep-94 2	\$4.54	Split Rail Beer & Ale	P.O. Box 555	Lander	WY	82520	
10272	RATTC	6	02-Sep-94	30-Sep-94	06-Sep-94 2	\$98.03	Rattlesnake Canyon Grocery	2817 Milton Dr.	Albuquerque	NM	87110	
10273	QUICK	3	05-Sep-94	03-Oct-94	12-Sep-94 3	\$76.07	QUICK-Stop	Taucherstraße 10	Cunewalde		01307	
10274	VINET	6	06-Sep-94	04-Oct-94	16-Sep-94 1	\$6.01	Vins et alcools Chevalier	59 rue de l'Abbaye	Reims		51100	
10275	MAGAA	1	07-Sep-94	05-Oct-94	09-Sep-94 1	\$26.93	Magazzini Alimentari Runiti	Via Ludovico il Moro 22	Bergamo		24100	
10276	TORTU	8	08-Sep-94	22-Sep-94	14-Sep-94 3	\$13.84	Tortuga Restaurante	Avda. Azteca 123	México D.F.		05033	
10277	MORGK	2	09-Sep-94	07-Oct-94	13-Sep-94 3	\$125.77	Morgenstem Gesundkost	Heerstr. 22	Leipzig		04179	
10278	BERGS	8	12-Sep-94	10-Oct-94	16-Sep-94 2	\$92.69	Berglunds snabbköp	Berguvsvägen 8	Luleå		S-958 22	
10279	LEHMS	8	13-Sep-94	11-Oct-94	16-Sep-94 2	\$25.83	Lehmanna Markstand	Magazinweg 7	Frankfurt a.M.		60528	
10280	BERGS	2	14-Sep-94	12-Oct-94	13-Oct-94 1	\$8.98	Berglunds snabbköp	Berguvsvägen 8	Luleå		S-958 22	
10281	ROMEY	4	14-Sep-94	28-Sep-94	21-Sep-94 1	\$2.94	Romero y tomillo	Gran Vía, 1	Madrid		28001	
10282	ROMEY	4	15-Sep-94	13-Oct-94	21-Sep-94 1	\$12.69	Romero y tomillo	Gran Vía, 1	Madrid		28001	
10283	LILAS	3	16-Sep-94	14-Oct-94	23-Sep-94 3	\$84.81	LILA-Supermercado	Carrera 52 con Ave. Bolívar	Barquisimeto	Lara	3508	
10284	LEHMS	4	19-Sep-94	17-Oct-94	27-Sep-94 1	\$76.54	Lehmanna Markstand	Magazinweg 7	Frankfurt a.M.		60528	
10285	QUICK	1	20-Sep-94	18-Oct-94	26-Sep-94 2	\$76.83	QUICK-Stop	Taucherstraße 10	Cunewalde		01307	
10286	QUICK	8	21-Sep-94	19-Oct-94	30-Sep-94 3	\$229.24	QUICK-Stop	Taucherstraße 10	Cunewalde		01307	
10287	RICAR	8	22-Sep-94	20-Oct-94	26-Sep-94 3	\$12.76	Ricardo Adocicados	Av. Copacabana, 267	Rio de Janeiro	RJ	02389-89	
10288	RFGGC	4	23-Sep-94	21-Oct-94	04-Oct-94 1	\$7.45	Renniani Caseifici	Strada Provinciale 124	Renonni Emilia		42100	

Creating the One-to-Many Relationship

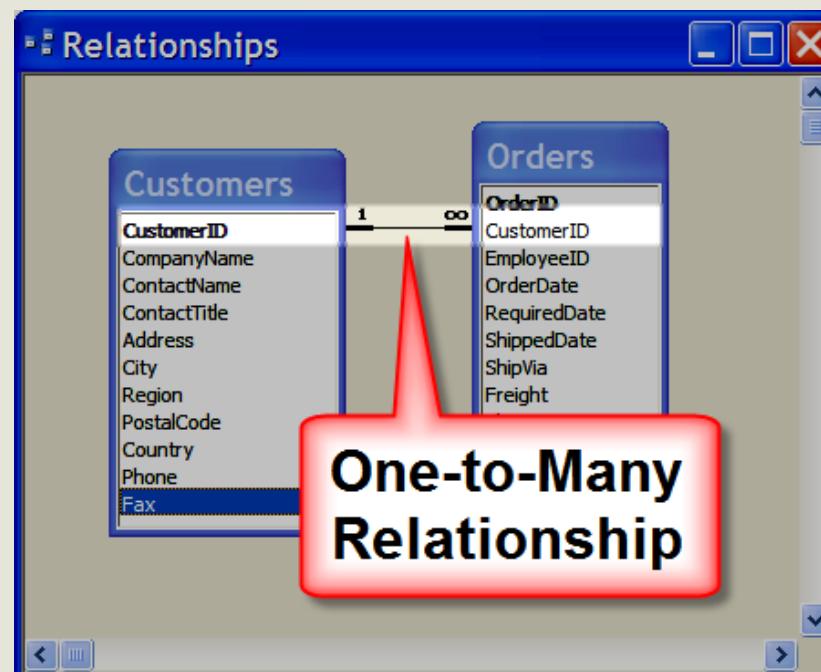
Parts of a Relationship

- **Primary Key**

- Anchors “One” side of Relationship
- Unique identifier for each Record
- Create by adding Field to front of Table with the Field name of “*Table name*” plus “ID”
- Will be specially designated when you construct Table

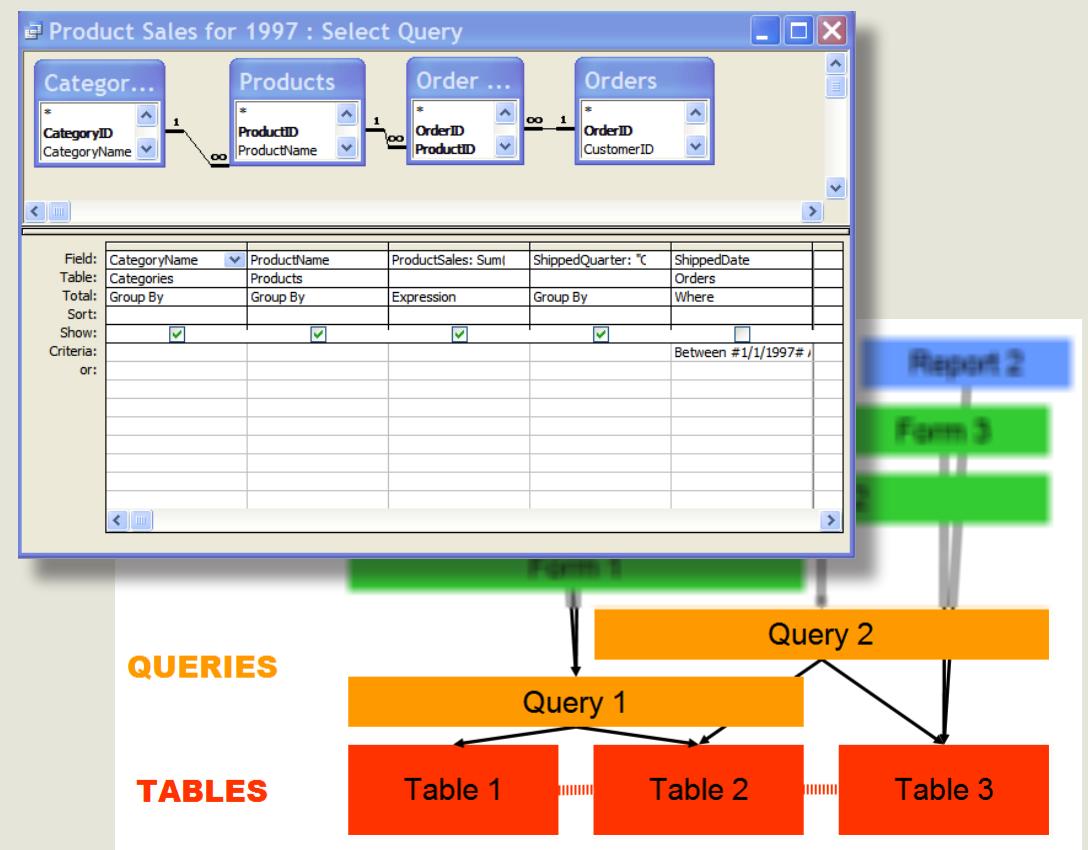
- **Foreign Key**

- Anchors “Many” side of Relationship
- Same Field name as matching Primary Key
- No special designation in Access



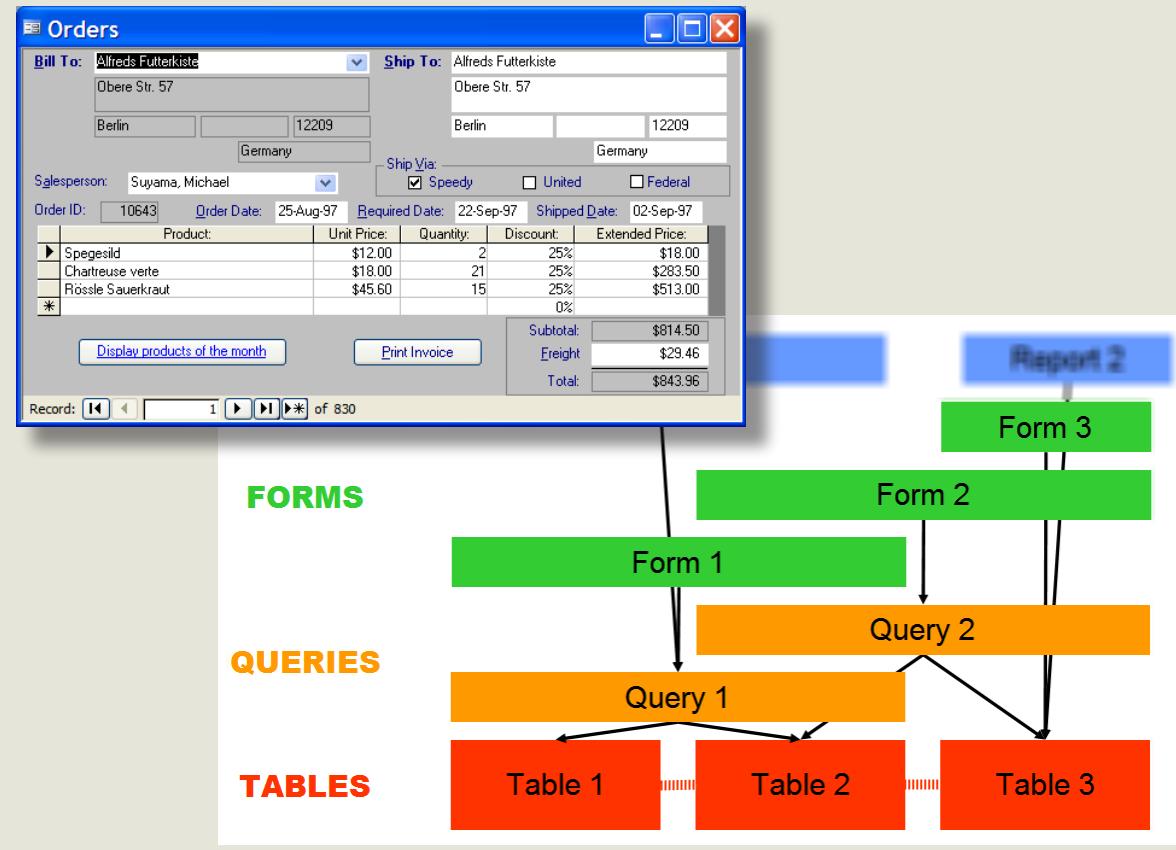
Parts of a Relational Database: Queries

- Asks (and answers) a question
- Selects data from Tables
- Filters and sorts data
- Only object that can select data from *multiple* Tables



Parts of a Relational Database: Forms

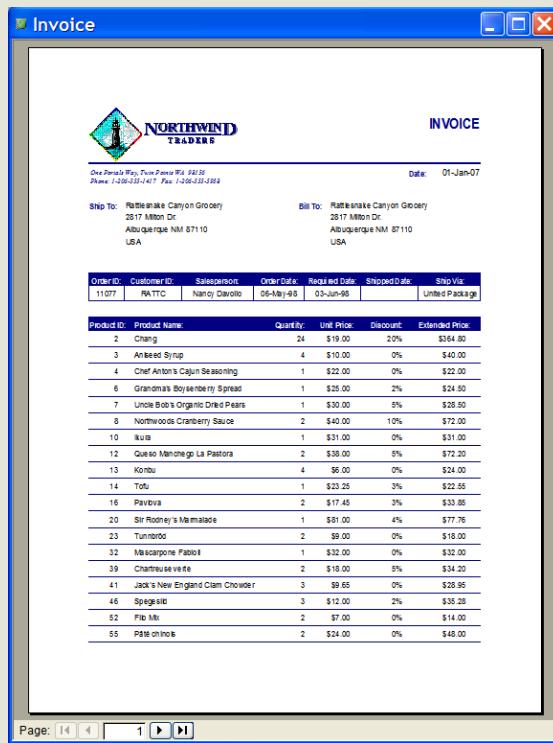
- On-screen display
- Enter, view and edit data
- Layout
- *Control of users*



Parts of a Relational Database: Reports

- Output to paper

- Layout

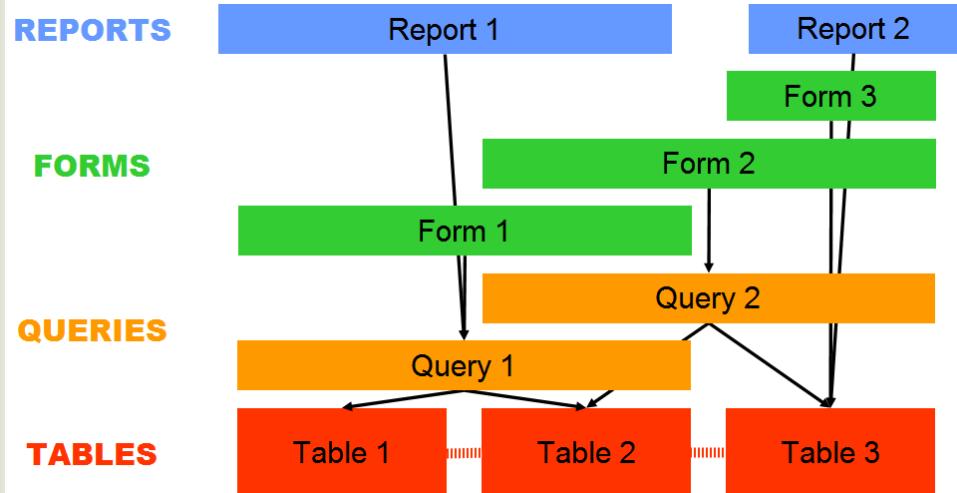


REPORTS

FORMS

QUERIES

TABLES



Design Workflow

1. Conceptual Design
2. Design Forms and Reports on paper
3. Extract list of data Fields and data types
4. Organize data Fields into Tables and Relationships
5. Construct Tables and Relationships
6. Construct Queries, Forms and Reports
7. Add automation (Switchboards, macros, etc.)



Database Conceptual Design

1. Conceptual Design

Conceptual Design Procedure

1. Define the task being performed
2. Identify the users of the database, who actually perform the task
3. Examine and fix manual systems already in place

Our Task

- **Create and maintain school registration records**
 - Student and family contact information
 - Class assignments
 - Class completed?
 - Date completed

Output Design

1. Conceptual Design

2. Design Forms and Reports on paper

LAST NAME	<input type="text"/>	CHILD 1 NAME	<input type="text"/>
FATHER First NAME	<input type="text"/>	SCHOOL	<input type="text"/>
MOTHER First NAME	<input type="text"/>	CLASS	<input type="text"/>
ADDRESS	<input type="text"/>	COMPLETED?	<input checked="" type="checkbox"/>
CITY	<input type="text"/>	COMPLETION DATE	<input type="text"/>
STATE	<input type="text"/>	Child 2 NAME	<input type="text"/>
			<input type="text"/>
			<input type="text"/>

Data Field Design

1. Conceptual Design
2. Design Forms and Reports on paper
3. Extract list of data Fields and data types

Access Data Types

- **Text** - up to 255 characters
- **Memo** - same as Text, but up to 65536 characters
- **Number** - numbers used in calculations
- **Date/Time** - dates or times
- **Currency** - dollars and cents
- **Autonumber** - creates a unique number for each record
- **Yes/No** - any data item with only two choices
- **OLE** - links or embeds files from other programs
- **Hyperlink** - creates a hyperlink for web page, email or to file

Data Item	Type
Last Name	text
Father First Name	text
Mother First Name	date
Address	text
City	text
State	text
Zip	text
Child Name	text
School	text
Class	text
Completed?	yes/no
Completion Date	date

Data Table Design

1. Conceptual Design
2. Design Forms and Reports on paper
3. Extract list of data Fields and data types
4. Organize data Fields into Tables and Relationships

Table Design Procedure

1. Start with list of all data items
2. Identify objects in your list and determine relationships between objects
3. Group together all data items for an object into one Table
4. Create Primary Key and Foreign Key Fields as anchor points for Relationships
5. Check Tables for violations of Table design rules

List All Data Items

1. Start with list of all data items

Data Item	Type
Last Name	text
Father First Name	text
Mother First Name	date
Address	text
City	text
State	text
Zip	text
Child Name	text
School	text
Class	text
Completed?	yes/no
Completion Date	date



Find the Objects and Relationships

1. Start with list of all data items

2. Identify objects in your list and determine relationships between objects

Data Item	Type
Last Name	text
Father First Name	text
Mother First Name	date
Address	text
City	text
State	text
Zip	text
Child Name	text
School	text
Class	text
Completed?	yes/no
Completion Date	date

Objects in Form

- Families
- Schools
- Classes

Relationships Between Objects

- ONE School has MANY Classes
- ONE Class contains MANY children



Group Together Into Tables

1. Start with list of all data items
2. Identify objects in your list and determine relationships between objects
3. Group together all data items for an object into one Table

Table	Data Item
Schools	School Name
Classes	Class Name
	School
Families	Last Name
	Father First Name
	Mother First Name
	Child First Name
	School
	Class
	Completed?
	Completion Date



Add Keys to Tables

- Add an AutoNumber Field to every Table. Give it the name “*TableNameID*”, where *TableName* is the name of the Table. Do not leave any spaces. This Field should automatically become the Primary Key for the Table when you create it.
- For every One-to-Many relationship which ends in this Table (Many side), add a Field with the same name as the Primary Key on the One side of the Relationship

1. Start with list of all data items
2. Identify objects in your list and determine relationships between objects
3. Group together all data items for an object into one Table
4. Create Primary Key and Foreign Key Fields as anchor points for Relationships

Table	Data Item
Schools	SchoolID
	School Name
Classes	ClassID
	SchoolID
Families	Class Name
	FamilyID
Families	Last Name
	Father First Name
Families	Mother First Name
	Child First Name
Families	ClassID
	Completed?
Families	Completion Date

Check Against Table Design Rules

1. Start with list of all data items
2. Identify objects in your list and determine relationships between objects
3. Group together all data items for an object into one Table
4. Create Primary Key and Foreign Key Fields as anchor points for Relationships
5. Check Tables for violations of Table design rules

Table Design Rules

- **Each Table must contain data relating to only one object or event**
- **If you find a One-to-Many relationship between data Fields, split them into two Tables**
- **Look for repetitions of sets of data Fields**
- **Data should be added by adding new records to a Table, not by adding new Fields**
- **Never duplicate the same data in two or more Tables**
- **Keep data items in Fields, not as part of a Field or Table name**

Design Rule Violation

- Repeating group for Child data would violate rule about adding data by adding Records, not Fields
- Solution is to break Families Table into two Tables:
 - Families
 - Children

Table	Data Item
Schools	SchoolID
	School Name
Classes	ClassID
	SchoolID
Families	Class Name
	FamilyID
Families	Last Name
	Father First Name
Families	Mother First Name
	Child First Name
Families	ClassID
	Completed?
Families	Completion Date



Completed Table Design

Table	Data Item
Schools	SchoolID
	School Name
Classes	ClassID
	SchoolID
Families	Class Name
	FamilyID
Children	Last Name
	Father First Name
Families	Mother First Name
	ChildID
Children	FamilyID
	Child First Name
Children	ClassID
	Completed?
Children	Completion Date

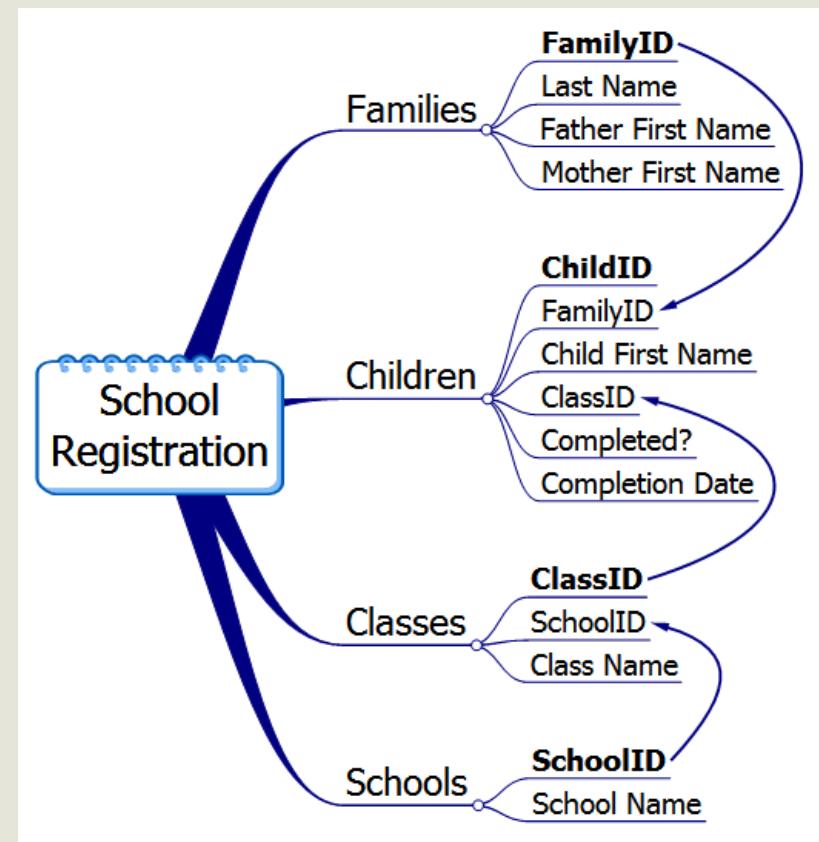


Table and Relationship Construction

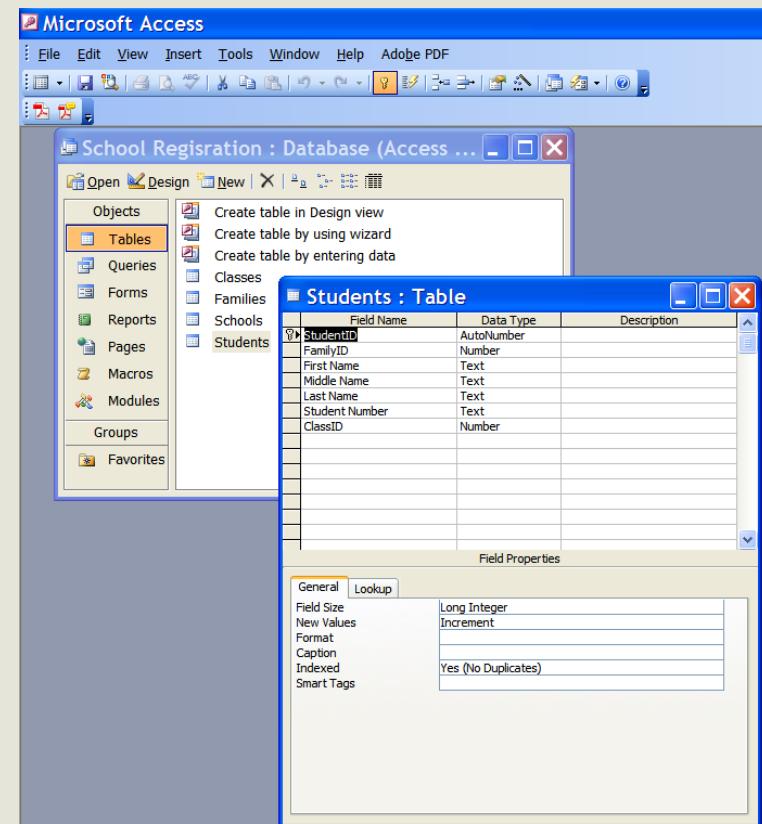
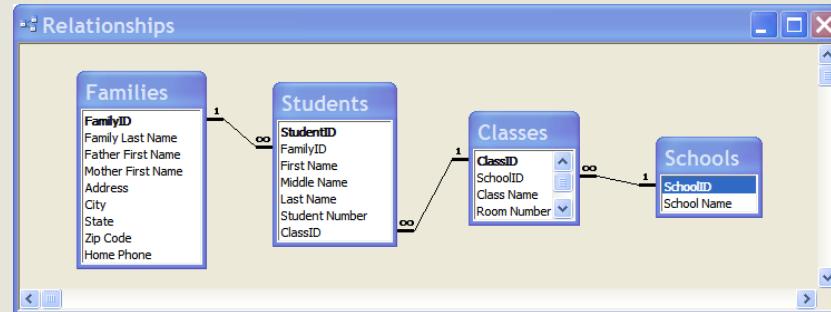
1. Conceptual Design

2. Design Forms and Reports on paper

3. Extract list of data Fields and data types

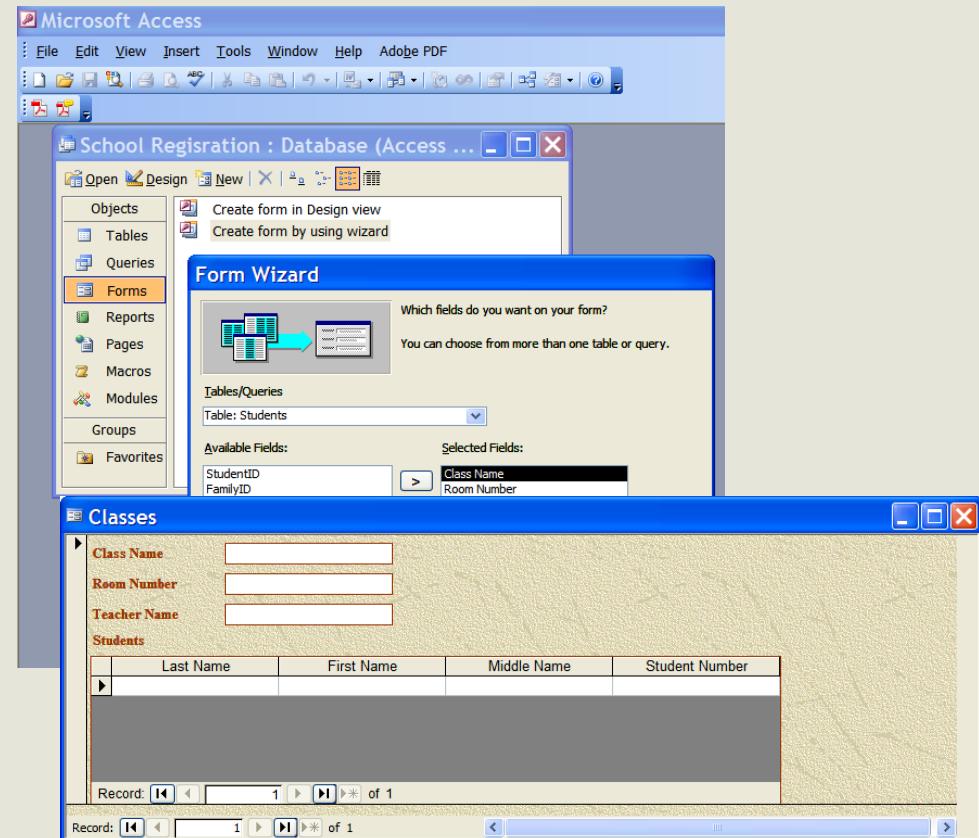
4. Organize data Fields into Tables and Relationships

5. Construct Tables and Relationships



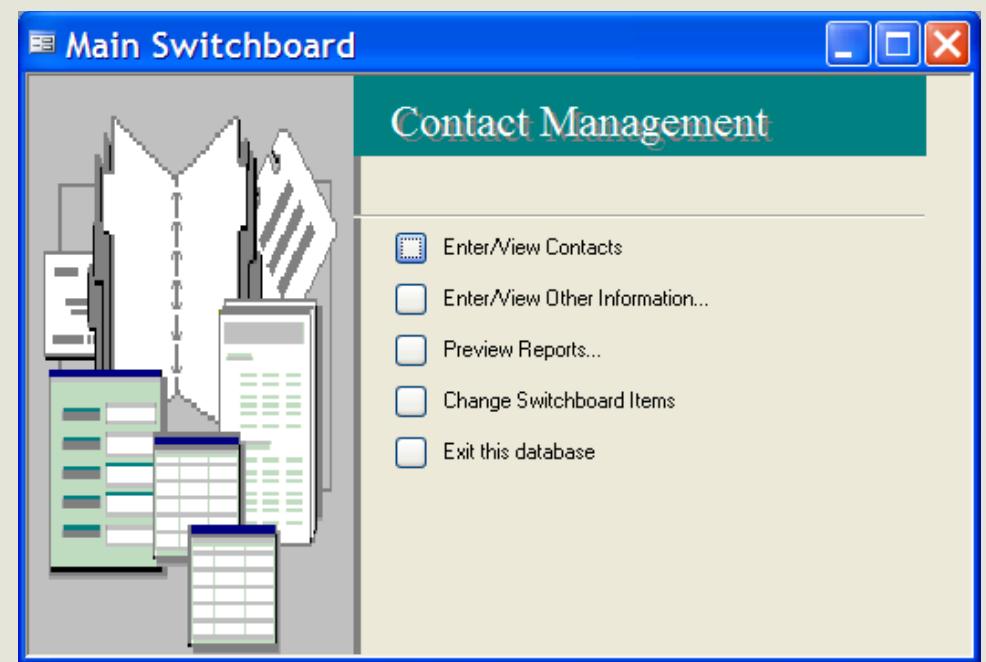
Query, Form and Report Construction

1. Conceptual Design
2. Design Forms and Reports on paper
3. Extract list of data Fields and data types
4. Organize data Fields into Tables and Relationships
5. Construct Tables and Relationships
6. Construct Queries, Forms and Reports



Making It Easy to Use

1. Conceptual Design
2. Design Forms and Reports on paper
3. Extract list of data Fields and data types
4. Organize data Fields into Tables and Relationships
5. Construct Tables and Relationships
6. Construct Queries, Forms and Reports
7. Add automation (Switchboards, macros, etc.)

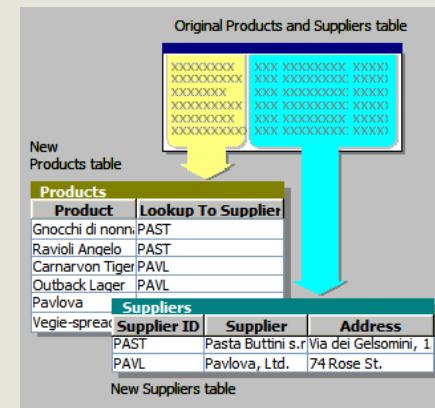


Other Table Design Issues

Two Objects in the Same Table

Products and Suppliers			
Product	Supplier ID	Supplier	Address
Ravioli Angelo	PAST	Pasta Buttini s.r.l.	Via dei Gelsomir
Gnocchi di nonn	PAST	Pasta Buttini s.r.l.	Via dei Gelsomir
Carnarvon Tiger	PAVL	Pavlova, Ltd.	74 Rose St.
Outback Lager	PAVL	Pavlova, Ltd.	74 Rose St.
Pavlova	PAVL	Pavlova, Ltd.	74 Rose St.
Vegie-spread	PAVL	Pav, Ltd.	74 Rose St.

Supplier name is misspelled.
Supplier information is repeated.





Adding Data by Adding Fields

Wrong

Families and Children : Table								
FamilyID	Last Name	Father First Name	Mother First Name	Child 1 First Name	Child 2 First Name	Child 3 First Name	Child 4 First Name	Child 5 First Name
1	Smith	John	Judy	Jason	Joseph	Jean	Jack	Joan
2	Jones	Mike	Martha	Mary	Michael	Mathew	Megan	Mark
*:oNumber)								

Record: **1** of 2

Right

Families : Table				
	FamilyID	Last Name	Father First Name	Mother First Name
+	1	Smith	John	Judy
+	2	Jones	Mike	Martha
*:oNumber)				

Record: **3** of 3

Children : Table		
ChildID	FamilyID	Child First Name
1	1	Jason
2	1	Joseph
3	2	Mary
4	1	Jean
5	2	Michael
6	2	Mathew
7	1	Jack
8	2	Megan
9	1	Joan
10	2	Mark
(AutoNumber)	0	

Record: **11** of 11

More Than One Piece of Data in a Field

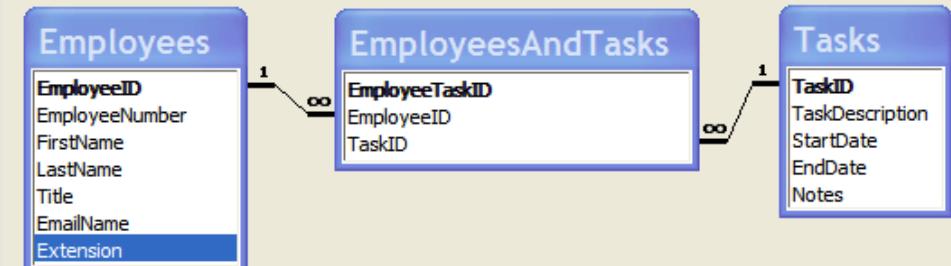
Wrong

Project Assignments : Table

Employee First Name	Employee Last Name	Projects Assigned
John	Smith	5,12,24
Mary	Jones	5,25
Jason	Brown	25
Joan	Green	5,15

Record:   5   of 5

Right





Duplicating Data

- Extra data entry work
- Possibility of Error
- Multiple changes in Data-base when data changes

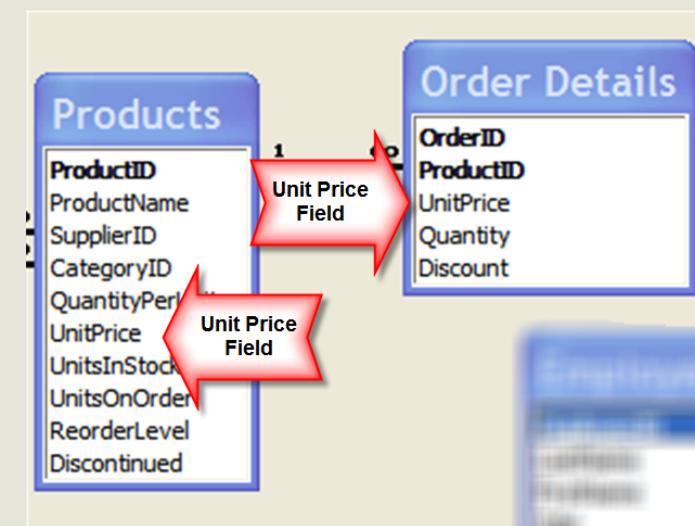


Putting Data into Names

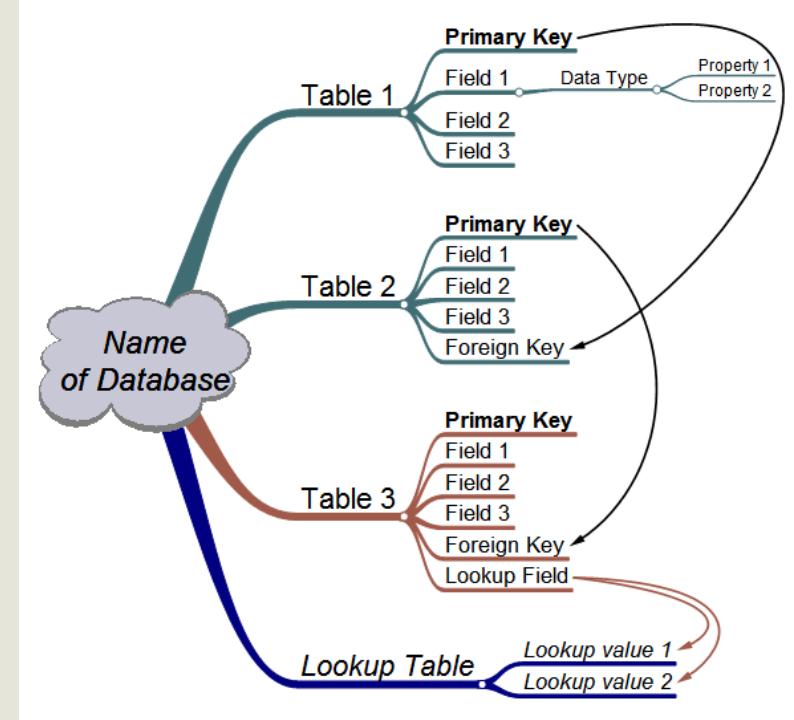
Advanced Relationships

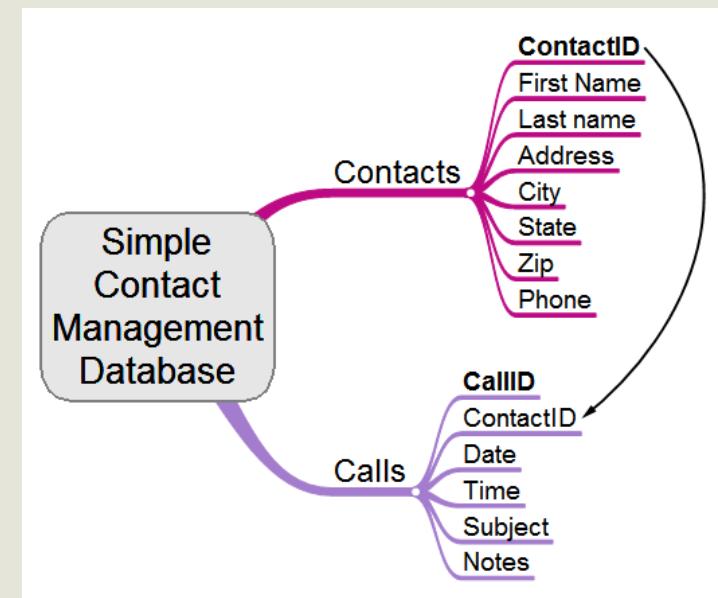
- One to Many
- One to One
- Many to Many

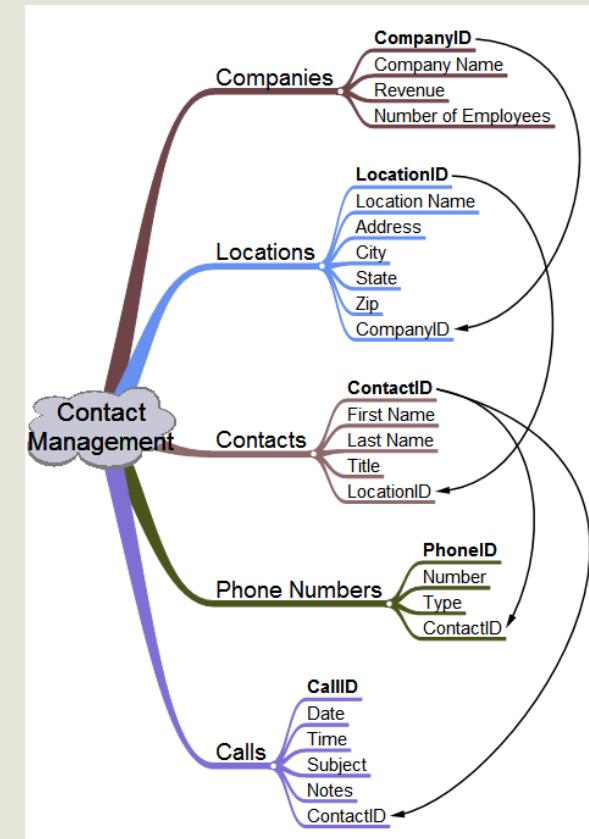
Many-to-Many in Detail

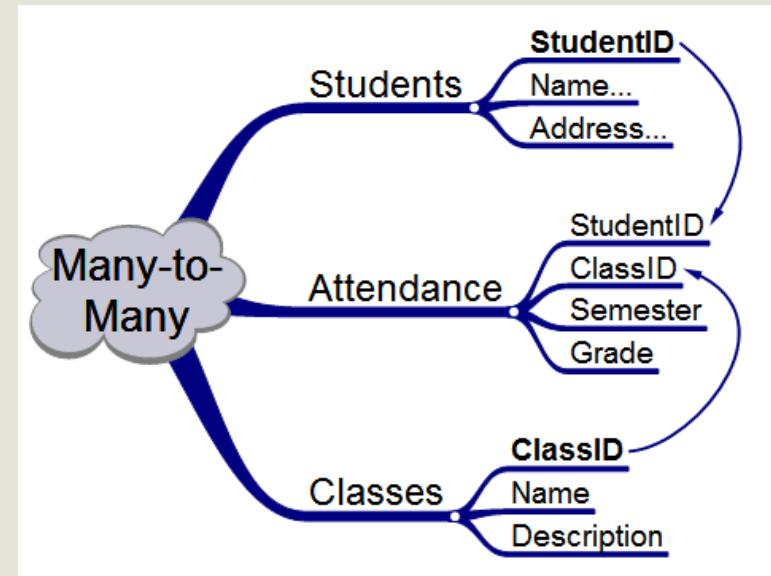


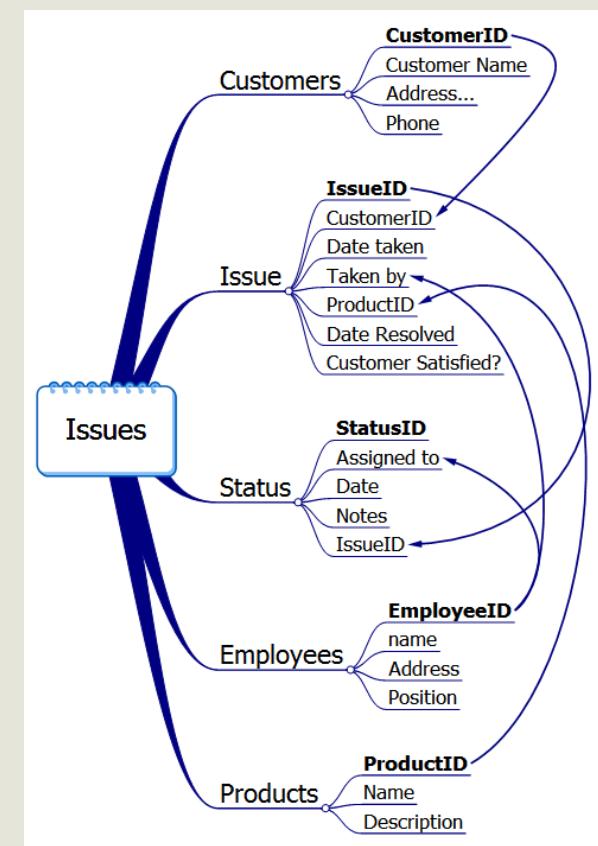
Database Design Examples

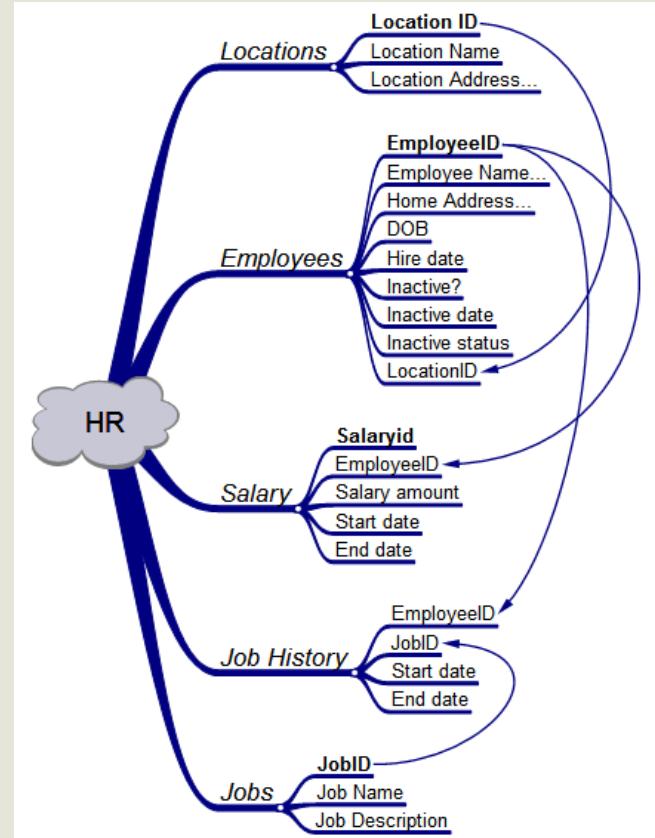


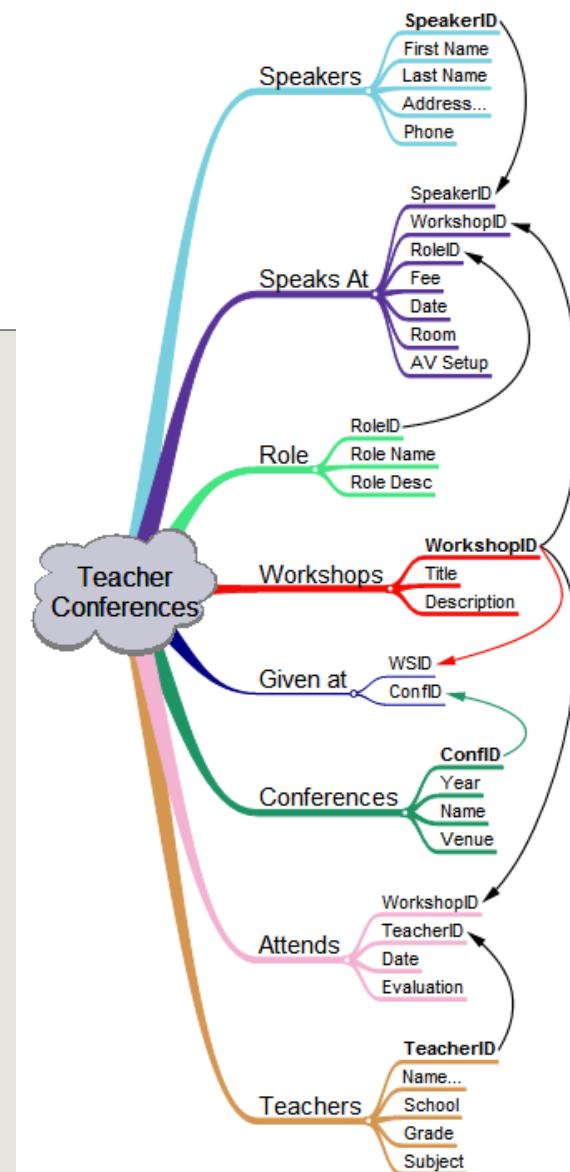






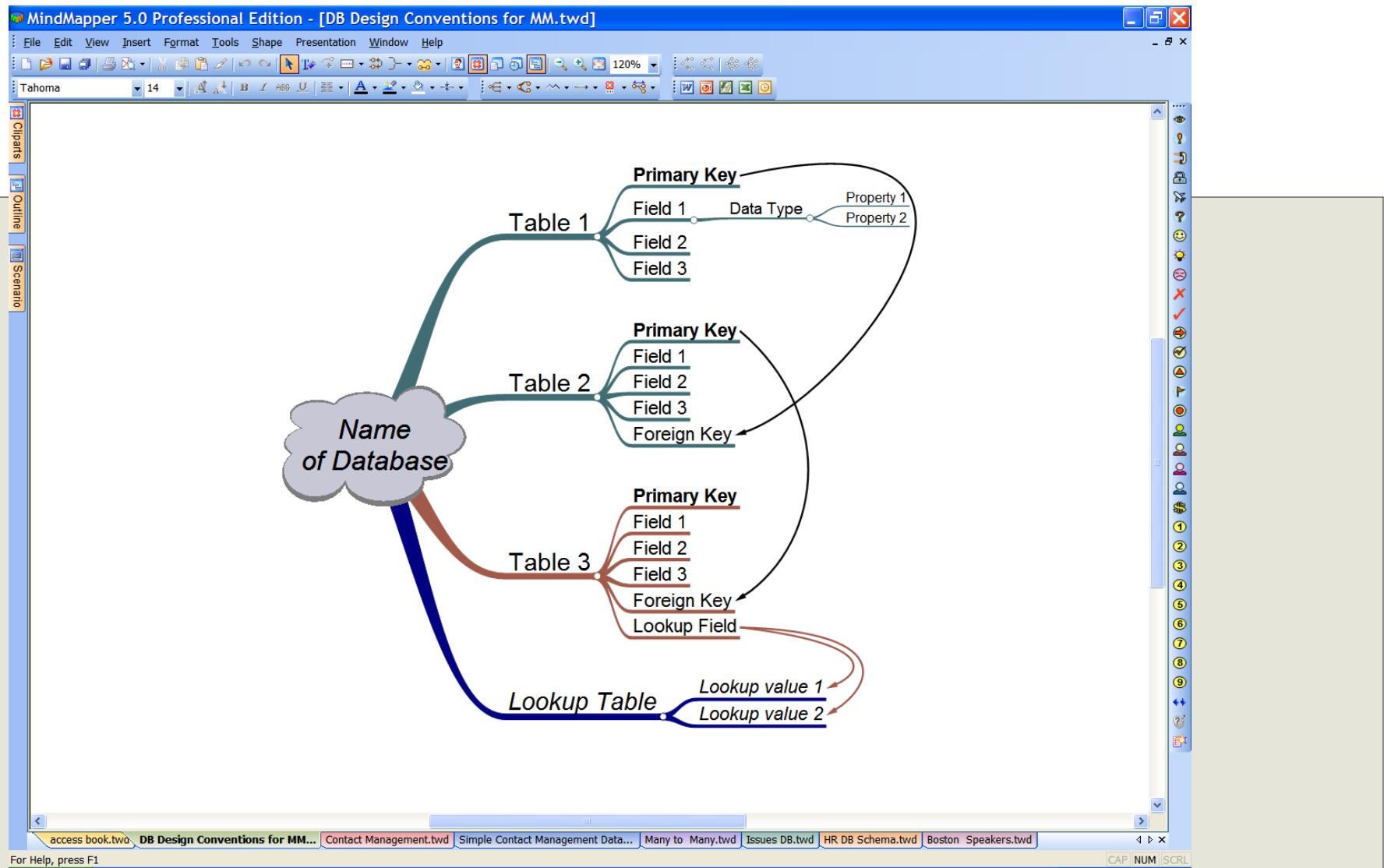


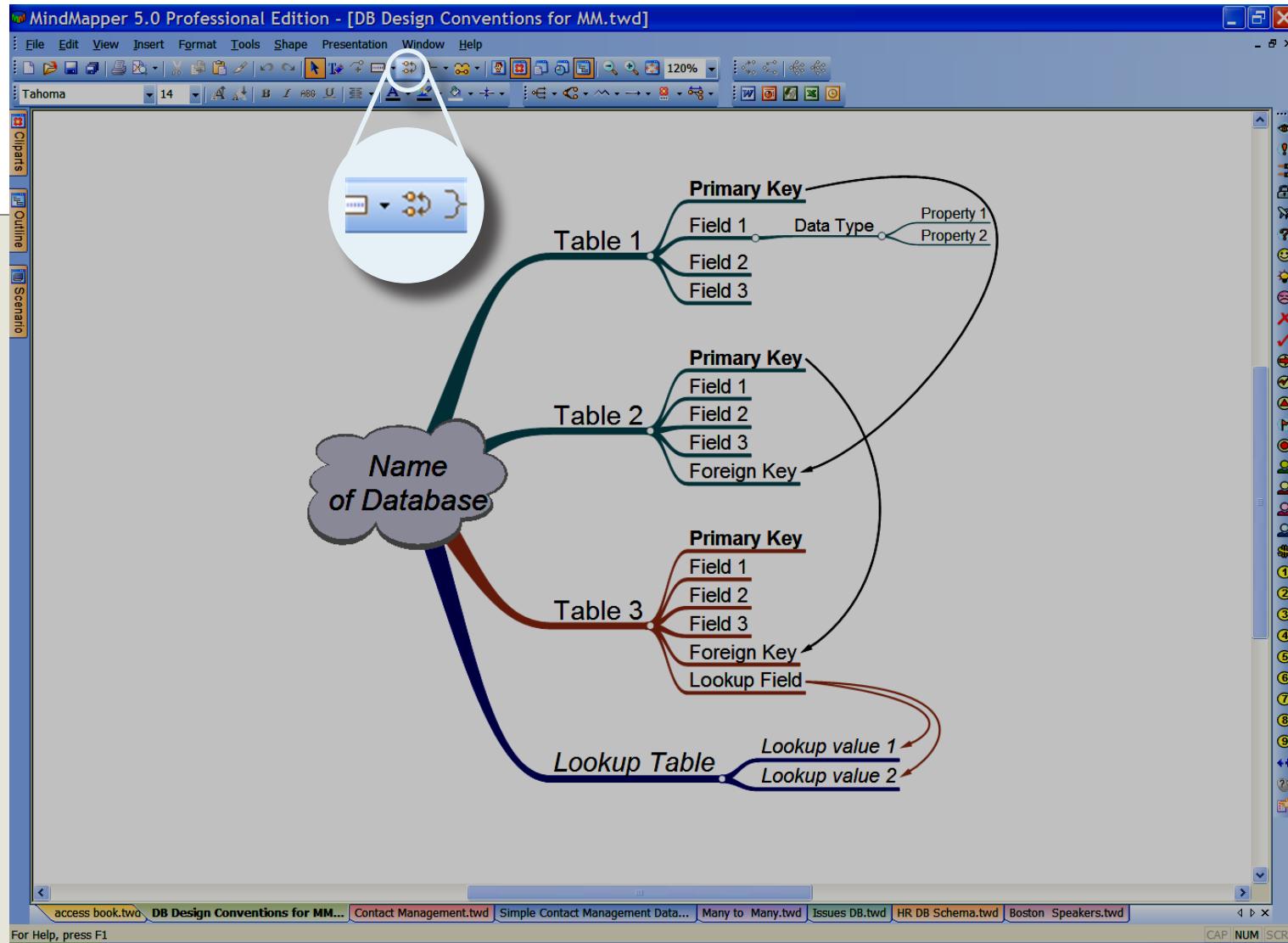






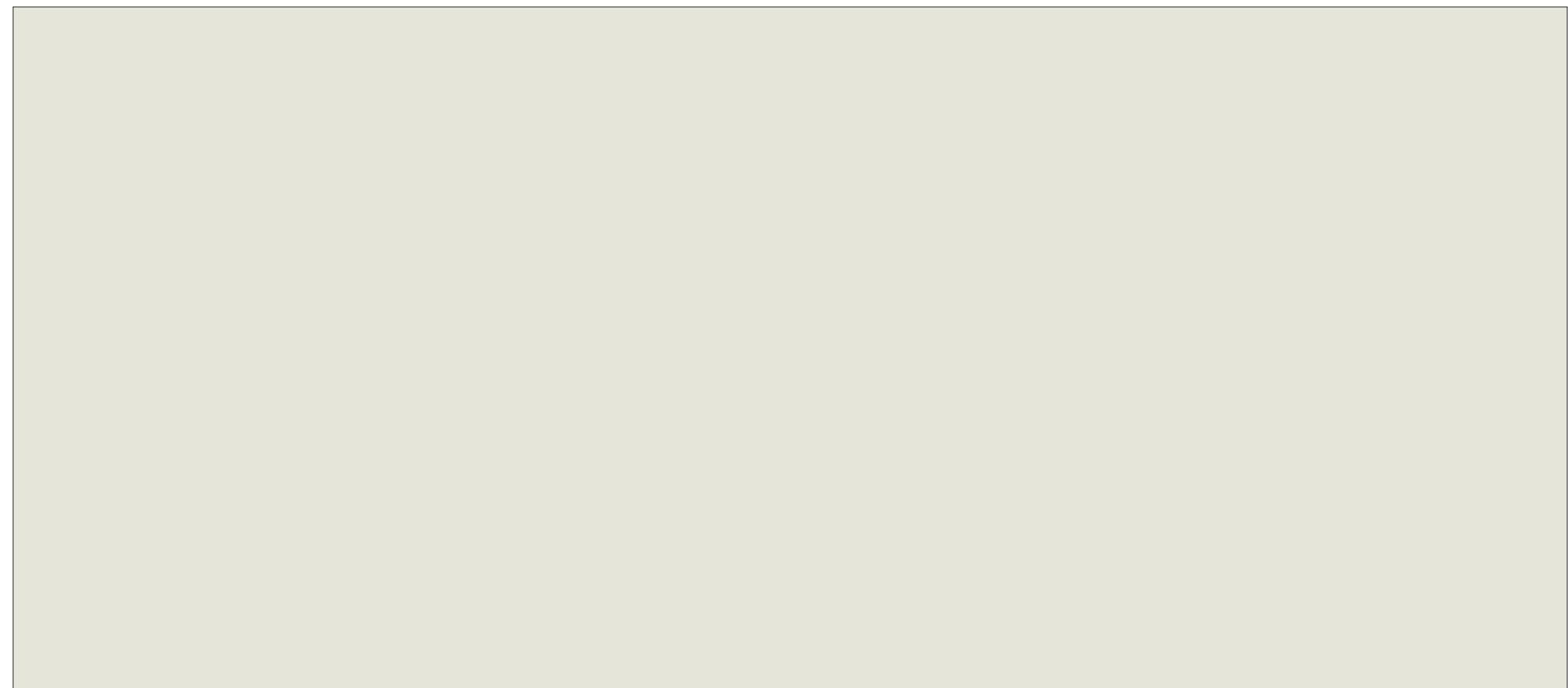
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