

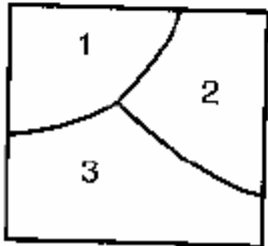
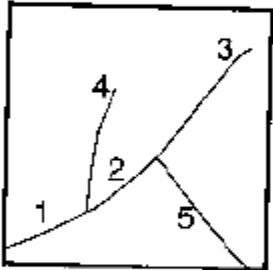
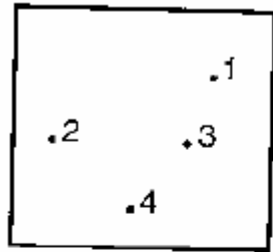
Attribute Data and Relational Database



Lecture 5
9/21/2006

definition

- Attribute data is about “what” of a spatial data and is a list or table of data arranged as rows and columns
 - Rows are records (map features)
 - Each row represents a map feature, which has a unique label ID or object ID
 - Columns are fields (characteristics)
 - Intersection of a column and a row shows the values of attributes, such as color, ownership, magnitude, classification,...



Point-ID	Field 1	Field 2	...
1			
2			
3			
4			

Line-ID	Field 1	Field 2	...
1			
2			
3			
4			
5			

Polygon-ID	Field 1	Field 2	...
1			
2			
3			

- Data types of attribute data: character, integer, floating, date
- Each field must be defined with a data type, data width, number of decimal places
 - The width refers to the number of space reserved for a field

Columns or fields

NAME	COUNTRY	CONTINENT	POPULATION	SQKM_ADMIN
Dac Lac	Vietnam	Asia	1174010	18336.211
Dadra and Nagar Haveli	India	Asia	146584	468.958
Daga	Bhutan	Asia	40220	1052.873
Dahuk	Iraq	Asia	443959	9912.903
Daman & Diu	India	Asia	107437	130.738
Darhan	Mongolia	Asia	88600	251.074
Dayr az Zawr	Syria	Asia	621876	27235.260
Delhi	India	Asia	9924474	1303.114
Dhaka	Bangladesh	Asia	36365592	31262.400
Dhawalagiri	Nepal	Asia	529003	8298.877
Dhi Qar	Iraq	Asia	975393	14037.630
Dimashq	Syria	Asia	3089555	18181.971
Diyala	Iraq	Asia	929035	18230.381
Diyarbakir	Turkey	Asia	1188608	14740.640
Dnepropetrovsk	Ukraine	Europe	3998727	31721.480
Donetsk	Ukraine	Europe	5475559	26620.520
Dong Nai	Vietnam	Asia	1793504	6248.254
Dong Thap	Vietnam	Asia	1493641	3386.422
Dornod	Mongolia	Asia	91911	118099.500

Record: [First] [Previous] 16 [Next] [Last] Show: All Selected Records (0 out of 842 Selected.) Options

Rows or records

Move to first record
Previous record
Current record
Next record
Move to last record

Number of records. An * indicates total not yet determined.

Click the Options button to find and replace records, select records by attributes, add fields, change the highlight color, add the table to the layout, export the table, and open related tables.

examples

File Edit View Insert | **Attributes of cities**

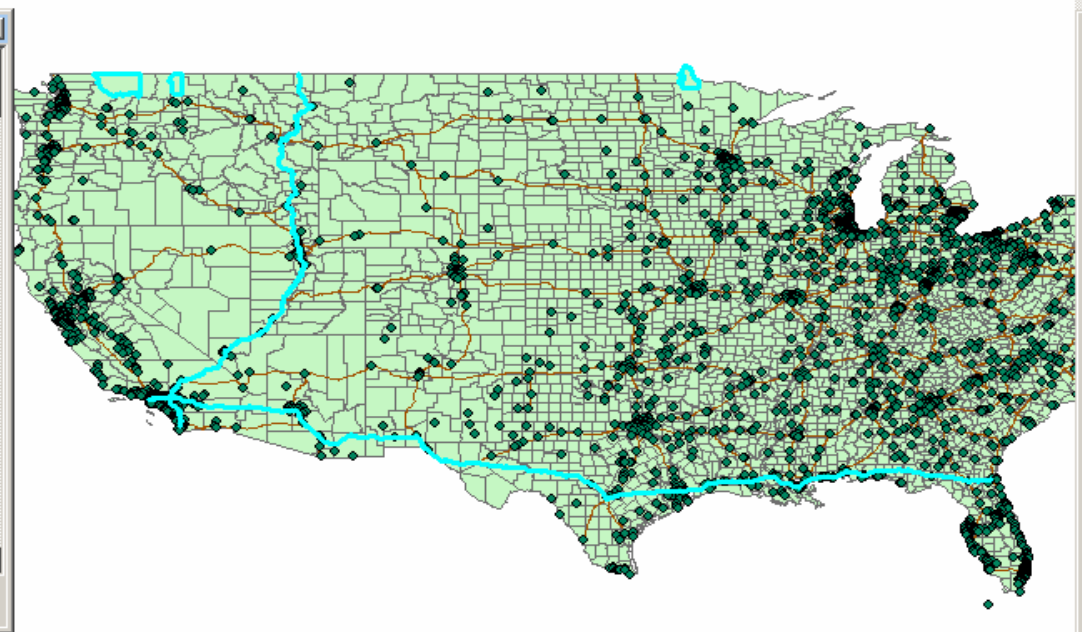
FID	Shape*	CITY_FIPS	CITY_NAME	STATE_FIPS	STATE_NAME	STATE_CITY	TYPE	CAPITAL	ELEVATION	POP1990
0	Point	05280	Bellingham	53	Washington	5305280	city	N	-99	52179
1	Point	35050	Havre	30	Montana	3035050	city	N	2494	10201
2	Point	01990	Anacortes	53	Washington	5301990	city	N	-99	11451
3	Point	47560	Mount Vernon	53	Washington	5347560	city	N	-99	17647
4	Point	50360	Oak Harbor	53	Washington	5350360	city	N	-99	17176
5	Point	53380	Minot	38	North Dakota	3853380	city	N	1580	34544

Record: 4 | Show: All Selected | Records: (0 out of 3149 Selected.) | Options

Attributes of intrstat

FID	Shape*	ROUTE_NUM	DIST_MILES	DIST_KM
0	Polyline	I10	2449.12	3941.48
1	Polyline	I105	20.75	33.39
2	Polyline	I110	41.42	66.65
3	Polyline	I115	1.58	2.55
4	Polyline	I12	85.32	137.31
5	Polyline	I124	1.73	2.79
6	Polyline	I126	3.56	5.72
7	Polyline	I129	3.1	4.99
8	Polyline	I135	96.29	154.96
9	Polyline	I15	1435.98	2311
10	Polyline	I155	57.78	92.99
11	Polyline	I16	164.95	265.47
12	Polyline	I164	20.64	33.22
13	Polyline	I165	4.8	7.72
14	Polyline	I17	144.72	232.91
15	Polyline	I170	10.96	17.65
16	Polyline	I172	25.26	40.65
17	Polyline	I175	1.22	1.97
18	Polyline	I176	11.29	18.17
19	Polyline	I180	44.19	71.11
20	Polyline	I181	23.78	38.27

Record: 1 | Show: All Selected | Records: (2 out of 233 Selected.)



Attributes of counties

FID	Shape*	NAME	STATE_NAME	STATE_FIPS	CNTY_FIPS	FIPS	AREA	POP1990	POP2000	POP90_SQMI
0	Polygon	Lake of the Woods	Minnesota	27	077	27077	1784.0634	4076	4651	2
1	Polygon	Ferry	Washington	53	019	53019	2280.2319	6295	7199	3
2	Polygon	Stevens	Washington	53	065	53065	2529.9794	30948	40652	12
3	Polygon	Okanogan	Washington	53	047	53047	5306.18	33350	38640	6
4	Polygon	Pend Oreille	Washington	53	051	53051	1445.0286	8915	11752	6
5	Polygon	Boundary	Idaho	16	021	16021	1279.2987	8332	10068	7
6	Polygon	Lincoln	Montana	30	053	30053	3746.0908	17481	18859	5

Record: 7 | Show: All Selected | Records: (3 out of 3141 Selected.) | Options

Number of features selected

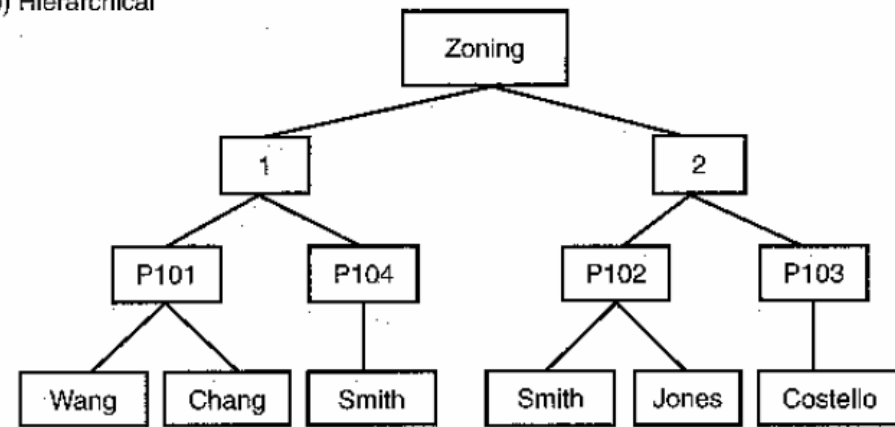
A database needed

- ❑ If many fields related to one record (feature-ID), for example, the a soil unit can have over 80 estimated physical and chemical properties, more tables are needed to store all the attributes.
- ❑ A database management system (DBMS) is needed to manage multiple tables.
- ❑ A database is a collection of interrelated tables in digital format. There are four types:
 - Flat file, hierarchical database, network database, relational database
- ❑ In GIS, we usually use relational database

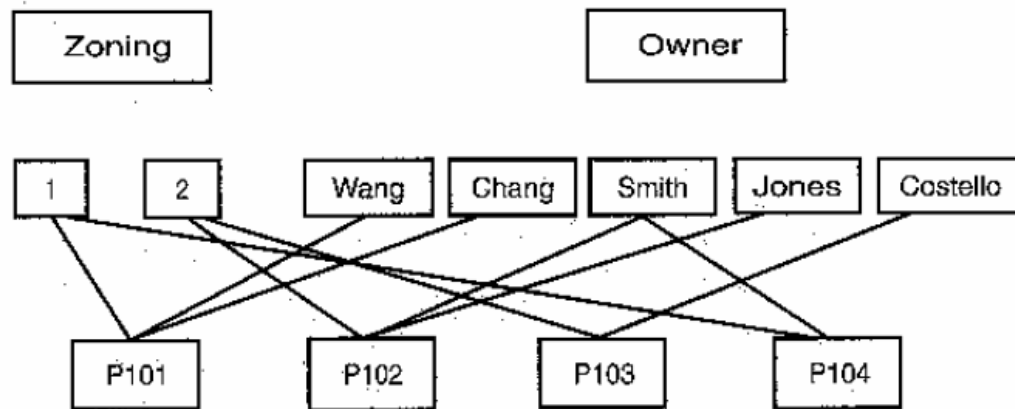
PIN	Owner	Zoning
P101	Wang	Residential (1)
P101	Chang	Residential (1)
P102	Smith	Commercial (2)
P102	Jones	Commercial (2)
P103	Costello	Commercial (2)
P104	Smith	Residential (1)

Flat file

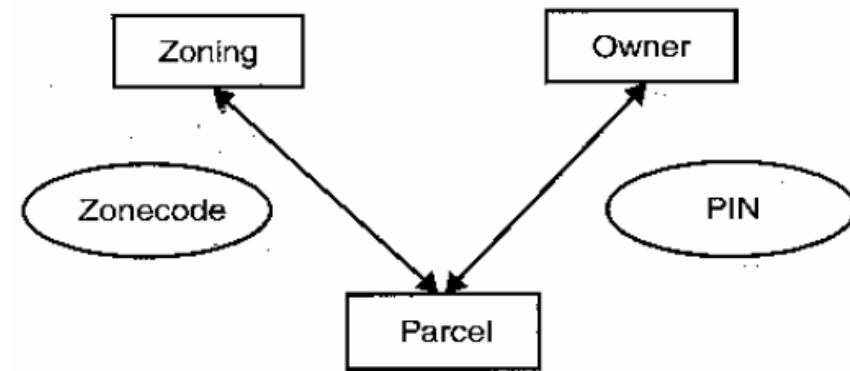
(b) Hierarchical



Hierarchical



Network



Relational

PIN: Parcel ID number

Zoning (zonecode): 1-residential, 2-commercial

Relational database

- ❑ A relational database is a collection of tables, also called relations, which can be connected to each other by keys.
 - A **primary key** represents one or more attributes whose values can uniquely identify a record in a table. Its counterpart in another table for the purpose of linkage is called a **foreign key**
- ❑ Advantages
 - Each table in the database can be prepared, maintained, and edited separately from other tables
 - Efficient data management and processing, since linking tables query and/or analysis is often temporary
- ❑ Normalization
 - Is steps (processes) to separate a large attribute table into small relational tables
 - To reduce data redundancy, remove multiple values in one cells in a table, and
 - To make efficient data storage and management possible

Normalization rules

- ❑ Rule 1: Fields should be Atomic; that is each piece of data should be broken down as much as possible. For example, rather than creating a field called NAME, you would create two fields : one for the first name and the other for the last name.
- ❑ Rules 2 and 3: Each record should contain a unique identifier so that you have a way of safely identifying the record. A Social Security Number is ideal, because no two people have the same one. The unique identifier is call a primary key. You may select one of the fields in the table as the primary key if that field would never contain duplicate values for the different records. An example of a good choice would be the social security number field. If none of the fields are suitable, the program can add a counter field that will automatically assign a unique number to each record as it is entered
- ❑ Rule 4: The primary key should be short, stable, and simple. Addresses and even last names may change several times during a person's life time. This is why governments and companies assign permanent identification numbers.

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- ❑ Rule 5: Every other field in the record should supply additional information about the person or thing that is uniquely identified by the primary key. For example, a table that contains data about employees may include a field that indicates the employee's supervisor's.
 - ❑ Rule 6: Information in the table should not appear in more than one place. For example, if you tried to create a table of the different committees in an organization and had fields with name like Chairperson, Member1, Member2, and Member3, the same person could be the chair of one committee and Member1 in another. If that person changed his name, you would have to change it in more than one place. Avoid numbered field names like those shown in this example.

Normal(lization) forms

- ❑ First Normal Form
 - Eliminate repeating groups in individual tables
 - Create a separate table for each set of related data.
 - Identify each set of related data with a primary key.
- ❑ Second Normal Form
 - Create separate tables for sets of values that apply to multiple records
 - Relate these tables with a foreign key.
- ❑ Third Normal Form
 - Eliminate fields that do not depend on the key.

Example 1, Original Table

Student#	Advisor	Adv-Room	Class1	Class2	Class3
1022	Jones	412	101-07	143-01	159-02
4123	Smith	216	201-01	211-02	214-01

From Microsoft Knowledge Base Article - 209534

First Normal Form Tables

Student#	Advisor	Adv-Room	Class#
1022	Jones	412	101-07
1022	Jones	412	143-01
1022	Jones	412	159-02
4123	Smith	216	201-01
4123	Smith	216	211-02
4123	Smith	216	214-01

Second Normal Form

Eliminate Redundant Data

Students:

Student#	Advisor	Adv-Room
1022	Jones	412
4123	Smith	216

Registration:

Student#	Class#
1022	101-07
1022	143-01
1022	159-02
4123	211-01
4123	211-02
4123	214-01

Third Normal Form

Eliminate Data Not Dependant On Key

Students:

Student#	Advisor
1022	Jones
4123	Smith

Faculty:

Name	Room
Jones	412
Smith	216

Registration:

Student#	Class#
1022	101-07
1022	143-01
1022	159-02
4123	211-01
4123	211-02
4123	214-01

Example 2: normalization

PIN	Owner	Owner Address	Sale Date	Acres	Zone Code	Zoning
P101	Wang	101 Oak St	1-10-98	1.0	1	Residential
	Chang	200 Maple St				
P102	Smith	300 Spruce Rd	10-6-68	3.0	2	Commercial
	Jones	105 Ash St				
P103	Costello	206 Elm St	3-7-97	2.5	2	Commercial
P104	Smith	300 Spruce Rd	7-30-78	1.0	1	Residential

Multiple values in one cells, data redundancy

First norm

PIN	Owner	Owner Address	Sale Date	Acres	Zone Code	Zoning
P101	Wang	101 Oak St	1-10-98	1.0	1	Residential
P101	Chang	200 Maple St	1-10-98	1.0	1	Residential
P102	Smith	300 Spruce Rd	10-6-68	3.0	2	Commercial
P102	Jones	105 Ash St	10-6-68	3.0	2	Commercial
P103	Costello	206 Elm St	3-7-97	2.5	2	Commercial
P104	Smith	300 Spruce Rd	7-30-78	1.0	1	Residential

Data redundancy

Chang, 2004

Second norm

Parcel
table

PIN	Sale date	Acres	Zone code	Zoning
P101	1-10-98	1.0	1	Residential
P102	10-6-68	3.0	2	Commercial
P103	3-7-97	2.5	2	Commercial
P104	7-30-78	1.0	1	Residential

Owner
table

PIN	Owner name
P101	Wang
P101	Chang
P102	Smith
P102	Jones
P103	Costello
P104	Smith

Address
table

Owner name	Owner address
Wang	101 Oak St
Chang	200 Maple St
Jones	105 Ash St
Smith	300 Spruce Rd
Costello	206 Elm St

 **Third norm**

Separate tables after normalization

Parcel table

PIN	Sale date	Acres	Zone code
P101	1-10-88	1.0	1
P102	10-6-68	3.0	2
P103	3-7-97	2.5	2
P104	7-30-78	1.0	1

Address table

Owner name	Owner address
Wang	101 Oak St
Chang	200 Maple St
Jones	105 Ash St
Smith	300 Spruce Rd
Costello	206 Elm St

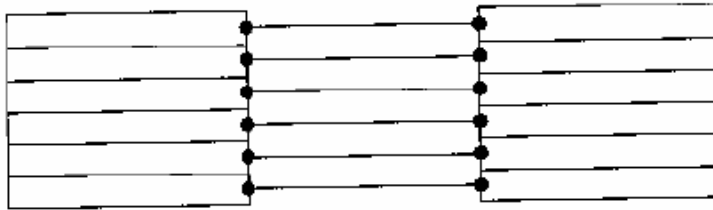
Owner table

PIN	Owner name
P101	Wang
P101	Chang
P102	Smith
P102	Jones
P103	Costello
P104	Smith

Zone table

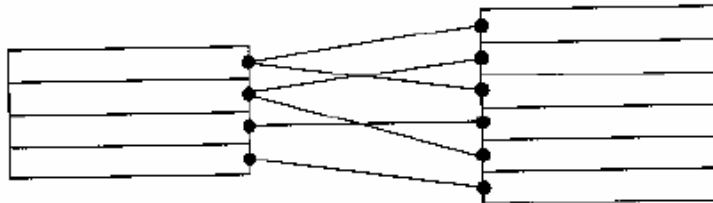
Zone code	Zoning
1	Residential
2	Commercial

Relationship of those separate tables



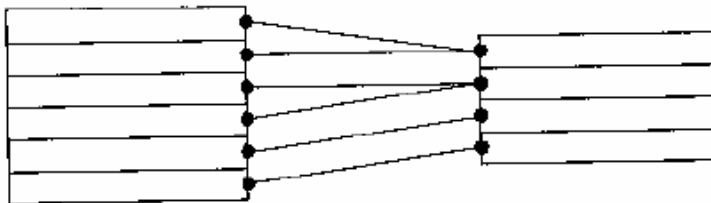
One-to-one relationship

One record in one table related to one record in another table



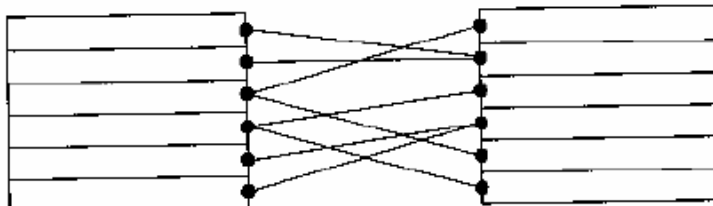
One-to-many relationship

One record in one table related to many records in another table



Many-to-one relationship

Many records in one table related to one record in another table

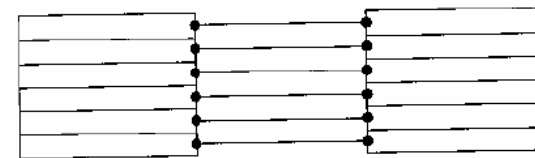


Many-to-many relationship

Many records in one table related to many records in another table

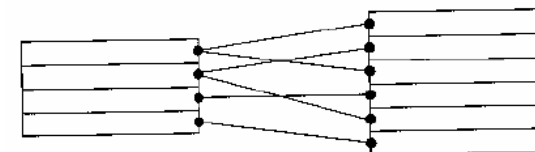
Join and relate tables

- Once tables are separated as relational tables, then two operations can be used to link those tables during query and analysis
 - Join, brings together two tables based on a common key.
 - Relate, connects two tables (based on keys) but keeps the tables separate.
- Keys do not have to have the same name but must be of the same data type



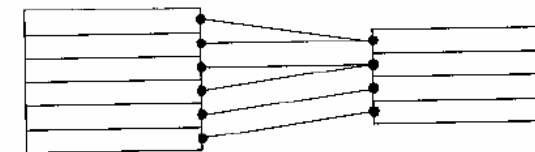
One-to-one relationship

Join



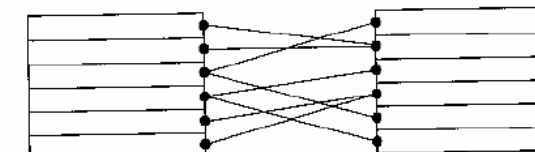
One-to-many relationship

relate



Many-to-one relationship

Join



Many-to-many relationship

relate

One-to-One Join

Employee-id	Job
1	Digislave
2	Useless Supervisor

Employee-id	name
1	Tom
2	John

Join Employee-id to Employee-id

After join

Employee-id	Job	Name
1	Digislave	Tom
2	Useless Supervisor	John

Many-to-One Join

Polygon Id	Symbol
1	Qa
2	Qa
3	Pa
4	Qe

Symbol	Description
Qa	Quaternary Alluvium
Qe	Quaternary Eolian
Pa	Permian Abo

Polygon ID	Symbol	Description
1	Qa	Quaternary Alluvium
2	Qa	Quaternary Alluvium
3	Pa	Permian Abo
4	Qe	Quaternary Eolian

After Join on Symbol

One-to-Many Relates

Formation	Symbol
Quaternary Alluvium	Qa
Permian Abo	Pa

Symbol	Mineral
Qa	Quartz
Pa	Quartz
Qa	Gypsum
Pa	Feldspar

If the tables are related on **Symbol**, selecting Polygon-id 1 will select the highlighted areas.

Many-to-Many Relates

Formation	Symbol
1	Qa
2	Qa

Symbol	Mineral
Qa	Quartz
Pa	Quartz
Qa	Gypsum
Pa	Feldspar

If the tables are related on **Symbol**, selecting Polygon-id 1 will select the highlighted areas.

In ArcGIS GIS

- ❑ Those separate tables will have one and only one table called spatial table (or layer attribute table), which has spatial location and relationship with the spatial data. Other tables called nonspatial tables, which can be either join or relate to the spatial table.
- ❑ Join tables when each record in the spatial table has no more than one matching record in the nonspatial table
 - One to one relation
 - Many to one relation
- ❑ Relate tables when each record in the spatial table has more than one record in the nonspatial table
 - One to many relation
 - Many to many relation

FID	Shape*	IDNUMBER	PIT_TYPE	STATUS	PARISH	
0	Point	01_w_20669	WELL	ABANDONED/ INACTIVE	ACADIA	NONE
1	Point	01_w_20714	WELL	ABANDONED/ INACTIVE	ACADIA	NONE
2	Point	01_w_22317	WELL	ABANDONED/ INACTIVE	ACADIA	NONE
3	Point	01_w_22318	WELL	ABANDONED/ INACTIVE	ACADIA	NONE
4	Point	01_w_22331	WELL	ABANDONED/ INACTIVE	ACADIA	NONE
5	Point	01_w_22398	WELL	ABANDONED/ INACTIVE	ACADIA	NONE
6	Point	01_w_22900	WELL	ACTIVE	ACADIA	NONE
7	Point	01_w_23121	WELL	ABANDONED/ INACTIVE	ACADIA	NONE
8	Point	01_w_23122	WELL	ABANDONED/ INACTIVE	ACADIA	NONE
9	Point	03_f_23326	FACILITY	ABANDONED/ INACTIVE	ASCENSION	NONE
10	Point	03_f_3326	FACILITY	ABANDONED/ INACTIVE	ASCENSION	NONE
11	Point	03_gf_23298	GATHERING FACILITY	ABANDONED/ INACTIVE	ASCENSION	NONE

Record: 1 Show: All Selected Records (0 out of 606 Selected.) Options

OID	IDNUMBER	ACCESS_LND	ACCESS_WA	CONT_IN_RQ	CONT_RP_R	WELLH_P_A	INST_BARR	CLNUP_HAZ	
0	01_w_22317	y	n	n	n	y	n	None	Operator needs to submit plan to LADNR for clean-up proced
1	01_w_22318	y	n	n	n	y	n	None	Operator needs to submit plan to LADNR for clean-up proced
2	01_w_20669	y	n	n	n	y	n	None	Operator needs to submit plan to LADNR for clean-up proced
3	01_w_20714	y	n	n	n	y	n	None	Operator needs to submit plan to LADNR for clean-up proced
4	01_w_22398	y	n	n	n	y	n	None	Operator needs to submit plan to LADNR for clean-up proced
5	01_w_22900	y	n	n	n	n	n	None	Operator needs to submit plan to LADNR for clean-up proced
6	01_w_23121	y	n	n	n	y	n	None	Operator needs to submit plan to LADNR for clean-up proced
7	01_w_23122	y	n	n	n	y	n	None	Operator needs to submit plan to LADNR for clean-up proced
8	03_f_23326	y	n	n	n	n	n	None	Operator needs to submit plan to LADNR for clean-up proced
9	03_gf_23298	y	n	n	n	n	n	None	Monitor Site.
10	03_tb_23433	y	n	n	n	n	n	None	Operator needs to submit plan to LADNR for clean-up proced
11	04_mh_23513	y	n	n	n	n	n	None	Operator needs to submit plan to LADNR for clean-up proced
12	04_tb_23527	y	n	n	n	n	n	None	Operator needs to submit plan to LADNR for clean-up proced
13	04_tb_23571	y	n	n	n	n	n	None	Operator needs to submit plan to LADNR for clean-up proced
14	04_w_23735	n	y	n	n	y	n	None	Operator needs to submit plan to LADNR for clean-up proced
15	04_w_23736	n	y	n	n	y	n	None	Operator needs to submit plan to LADNR for clean-up proced
16	04_w_23743	n	y	n	n	y	n	None	Operator needs to submit plan to LADNR for clean-up proced
17	04_w_23748	n	y	n	n	y	n	None	Operator needs to submit plan to LADNR for clean-up proced
18	04_w_23844	n	y	n	n	y	n	None	Operator needs to submit plan to LADNR for clean-up proced

Record: 1 Show: All Selected Records (0 out of 472 Selected.) Options

The joined table

Attributes of Pits_75

Pits_75.FID	Pits_75.Sh	Pits_75.ID	Pits_75.	Pits_75.STA	Pits_75.	Pits_75.	Pits_75.CO	Pits_75.	Pits_75.	Remedial_actions.OID	Remedial_actions.IDNUMBER	Remedial_act
0	Point	01_w_20669	WELL	ABANDONED/	ACADIA	NONE	INADEQUAT	n	75	2	01_w_20669	y
1	Point	01_w_20714	WELL	ABANDONED/	ACADIA	NONE	INADEQUAT	n	90	3	01_w_20714	y
2	Point	01_w_22317	WELL	ABANDONED/	ACADIA	NONE	INADEQUAT	n	80	0	01_w_22317	y
3	Point	01_w_22318	WELL	ABANDONED/	ACADIA	NONE	INADEQUAT	n	75	1	01_w_22318	y
4	Point	01_w_22331	WELL	ABANDONED/	ACADIA	NONE	INADEQUAT	n	85	<Null>	<Null>	<Null>
5	Point	01_w_22398	WELL	ABANDONED/	ACADIA	NONE	INADEQUAT	n	80	4	01_w_22398	y
6	Point	01_w_22900	WELL	ACTIVE	ACADIA	NONE	INADEQUAT	n	75	5	01_w_22900	y
7	Point	01_w_23121	WELL	ABANDONED/	ACADIA	NONE	INADEQUAT	n	75	6	01_w_23121	y
8	Point	01_w_23122	WELL	ABANDONED/	ACADIA	NONE	INADEQUAT	n	80	7	01_w_23122	y
9	Point	03_f_23326	FACILITY	ABANDONED/	ASCENSI	NONE	INADEQUAT	n	75	8	03_f_23326	y
10	Point	03_f_3326	FACILITY	ABANDONED/	ASCENSI	NONE	ADEQUATE	n	75	<Null>	<Null>	<Null>
11	Point	03_gf_23298	GATHER	ABANDONED/	ASCENSI	NONE	INADEQUAT	y	85	9	03_gf_23298	y

Record: 1 Show: All Selected Records (0 out of 606 Selected.) Options

The joined table will only preserved within the map document-the tables remain separate on disk-and can be removed at any time

Attributes of Pits_75						
FID	Shape*	IDNUMBER	PIT_TYPE	STATUS	PARISH	CONTAINMT
2	Point	01_w_22317	WELL	ABANDONED/ INACTIVE	ACADIA	NONE
3	Point	01_w_22318	WELL	ABANDONED/ INACTIVE	ACADIA	NONE
4	Point	01_w_22331	WELL	ABANDONED/ INACTIVE	ACADIA	NONE
5	Point	01_w_22398	WELL	ABANDONED/ INACTIVE	ACADIA	NONE
6	Point	01_w_22900	WELL	ACTIVE	ACADIA	NONE
7	Point	01_w_23121	WELL	ABANDONED/ INACTIVE	ACADIA	NONE
8	Point	01_w_23122	WELL	ABANDONED/ INACTIVE	ACADIA	NONE
9	Point	03_f_23326	FACILITY	ABANDONED/ INACTIVE	ASCENSION	NONE
10	Point	03_f_3326	FACILITY	ABANDONED/ INACTIVE	ASCENSION	NONE
11	Point	03_gf_23298	GATHERING FACILITY	ABANDONED/ INACTIVE	ASCENSION	NONE
12	Point	03_tb_23433	TANK BATTERY	ACTIVE	ASCENSION	LEVEE
13	Point	04_mh_23513	MANIFOLD HEADER	ACTIVE	ASSUMPTION	NONE

Record: 13 Show: All Selected Records (0 out of 606 Selected.) Options

Attributes of Metals									
OID	IDNUMBER	SAMPID	ANALYSISID	CREWID	METAL	SAMP_TYPE	CONC_NUM	CONC_SOIL	CONC_WATER
0	03_tb_23433	1	03_tb_23433/1	(C-12)	Ba	s	545.5	545.5	0
1	03_tb_23433	1	03_tb_23433/1	(C-12)	Zn	s	72.7	72.7	0
2	04_mh_23513	1	04_mh_23513/1	(C-13)	Ba	s	1176.5	1176.5	0
3	04_mh_23513	1	04_mh_23513/1	(C-13)	Zn	s	376.5	376.5	0
4	04_tb_23527	1	04_tb_23527/1	(C-14)	Ba	s	74.1	74.1	0
5	04_tb_23527	1	04_tb_23527/1	(C-14)	Zn	s	348.1	348.1	0
6	04_tb_23571	1	04_tb_23571/1	(C-15)	Ba	s	175.4	175.4	0
7	04_tb_23571	1	04_tb_23571/1	(C-15)	Zn	s	78.9	78.9	0
8	10_tb_19015	1	10_tb_19015/1	(S-6)	Ba	s	342.6	342.6	0
9	10_tb_19015	1	10_tb_19015/1	(S-6)	Zn	s	12	12	0
10	10_tb_19015	2	10_tb_19015/2	(S-7)	Ba	s	144.9	144.9	0
11	10_w_19357	1	10_w_19357/1	(A-9)	Ba	s	2639.9	2639.9	0
12	10_w_19357	1	10_w_19357/1	(A-9)	Zn	s	77.3	77.3	0

Record: 1 Show: All Selected Records (0 out of 148 Selected.) Options

Related tables

Attributes of Pits_75

FID	Shape*	IDNUMBER	PIT_TYPE	STATUS	PARISH	CONTAINMT
3	Point	01_w_22318	WELL	ABANDONED/ INACTIVE	ACADIA	NONE
4	Point	01_w_22331	WELL	ABANDONED/ INACTIVE	ACADIA	NONE
5	Point	01_w_22398	WELL	ABANDONED/ INACTIVE	ACADIA	NONE
6	Point	01_w_22900	WELL	ACTIVE	ACADIA	NONE
7	Point	01_w_23121	WELL	ABANDONED/ INACTIVE	ACADIA	NONE
8	Point	01_w_23122	WELL	ABANDONED/ INACTIVE	ACADIA	NONE
9	Point	03_f_23326	FACILITY	ABANDONED/ INACTIVE	ASCENSION	NONE
10	Point	03_f_3326	FACILITY	ABANDONED/ INACTIVE	ASCENSION	NONE
11	Point	03_gf_23298	GATHERING FACILITY	ABANDONED/ INACTIVE	ASCENSION	NONE
12	Point	03_tb_23433	TANK BATTERY	ACTIVE	ASCENSION	LEVEE
13	Point	04_mh_23513	MANIFOLD HEADER	ACTIVE	ASSUMPTION	NONE
14	Point	04_tb_23527	TANK BATTERY	ACTIVE	ASSUMPTION	LEVEE

Record: 13 Show: All Selected Records (1 out of 606 Selected.) Options

Attributes of Metals

OID	IDNUMBER	SAMPID	ANALYSISID	CREWID	METAL	SAMP_TYPE	CONC_NUM	CONC_SOIL	CONC_WATER
0	03_tb_23433	1	03_tb_23433/1	(C-12)	Ba	s	545.5	545.5	0
1	03_tb_23433	1	03_tb_23433/1	(C-12)	Zn	s	72.7	72.7	0
2	04_mh_23513	1	04_mh_23513/1	(C-13)	Ba	s	1176.5	1176.5	0
3	04_mh_23513	1	04_mh_23513/1	(C-13)	Zn	s	376.5	376.5	0
4	04_tb_23527	1	04_tb_23527/1	(C-14)	Ba	s	74.1	74.1	0
5	04_tb_23527	1	04_tb_23527/1	(C-14)	Zn	s	348.1	348.1	0
6	04_tb_23571	1	04_tb_23571/1	(C-15)	Ba	s	175.4	175.4	0
7	04_tb_23571	1	04_tb_23571/1	(C-15)	Zn	s	78.9	78.9	0
8	10_tb_19015	1	10_tb_19015/1	(S-6)	Ba	s	342.6	342.6	0
9	10_tb_19015	1	10_tb_19015/1	(S-6)	Zn	s	12	12	0
10	10_tb_19015	2	10_tb_19015/2	(S-7)	Ba	s	144.9	144.9	0
11	10_w_19357	1	10_w_19357/1	(A-9)	Ba	s	2639.9	2639.9	0
12	10_w_19357	1	10_w_19357/1	(A-9)	Zn	s	77.3	77.3	0

Record: 1 Show: All Selected Records (2 out of 148 Selected.) Options

The related table will only preserved within the map document-the tables remain separate on disk-and can be removed at any time

Geodatabase

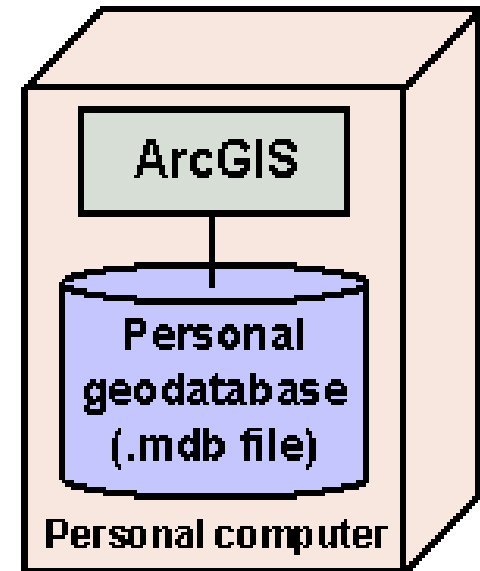
- ❑ Before geodatabase, in one GIS project, many GIS files (spatial data and nonspatial data) are stored separated. So for a large GIS project, the GIS files could be hundreds.
- ❑ Within a geodatabase, all GIS files (spatial data and nonspatial data) in a project can be stored in one geodatabase, using the relational database management system (RDMS)

Types of geodatabases

- personal
- enterprise

Personal Geodatabase

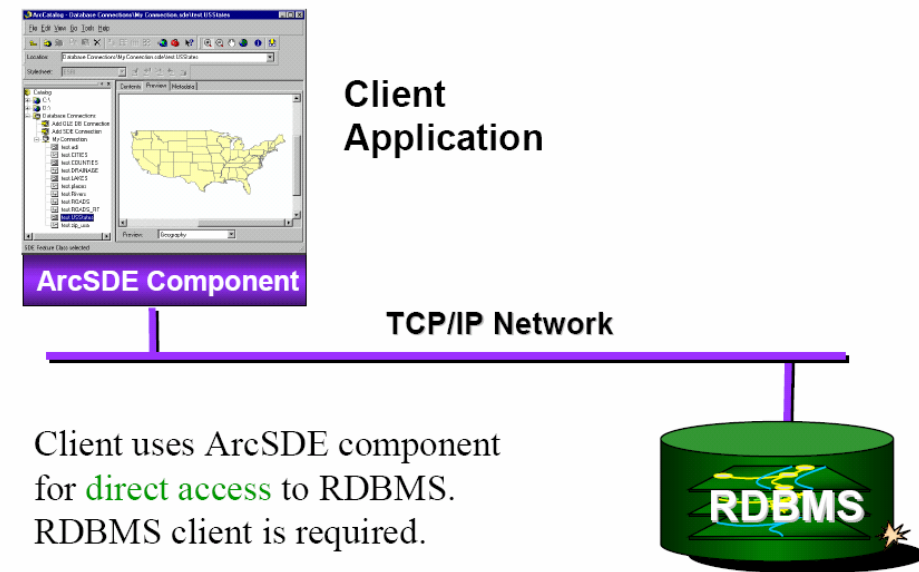
- The personal geodatabase is given a name of *filename.mdb* that is browsable and editable by the ArcGIS, and it can also be opened with Microsoft Access. It can be read by multiple people at the same time, but edited by only one person at a time. maximum size is 2 GB.



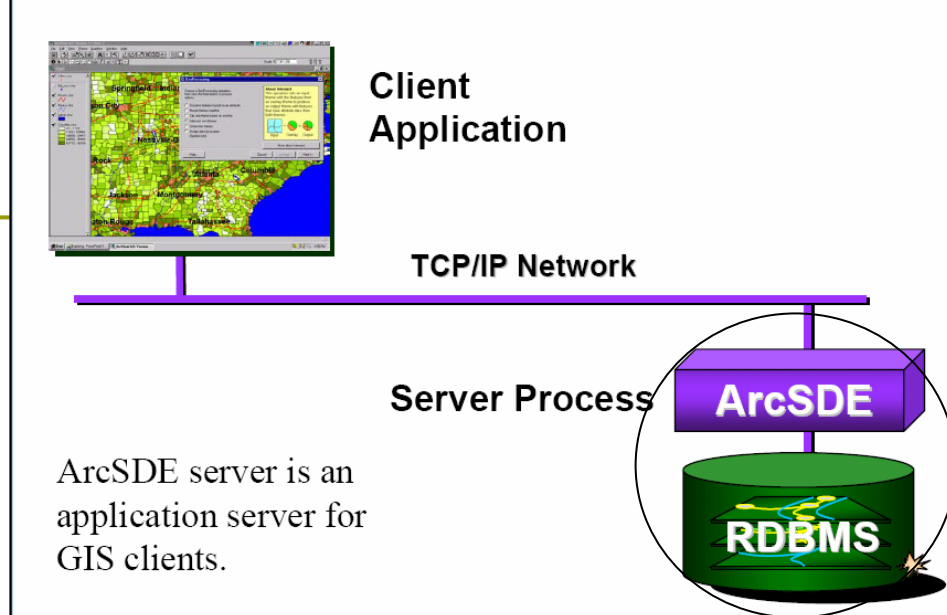
Multiuser Geodatabase

- ❑ Multiuser (ArcSDE or enterprise) geodatabase are stored in IBM DB2, Informix, Oracle, or Microsoft SQL Server.
- ❑ It can be edited through ArcSDE by many users at the same time, is suitable for large workgroups and enterprise GIS implementations. no limit of size. support raster data.

ArcSDE 2-tier Client/Server Architecture



ArcSDE 3-tier Client/Server Architecture



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3-tier ArcSDE client/server architecture with both the ArcSDE and Oracle RDBMS running on the same server, which minimizes network traffic and client load while increasing the server load compared to 2-tier system, in which the clients directly connect to the RDBMS

Personal and Multiuser Geodatabase Comparison

If a project becomes too large for a personal geodatabase, you can easily move the data stored in a personal geodatabase to a multiuser geodatabase using ArcCatalog.

Table 1. Comparison of multiuser and personal geodatabases

	DBMS	Client / Server	Long Transactions*	Disconnected Editing	Editors	Raster Data	Size
Multiuser	IBM DB2, Informix, Microsoft SQL Server, Oracle	Yes	Yes	Yes	1 or more at the same time	Stored	Unlimited
Personal	Microsoft Access	No	No	No	1 at a time	Referenced	Up to 2 GB

*Database transactions spanning multiple edit sessions