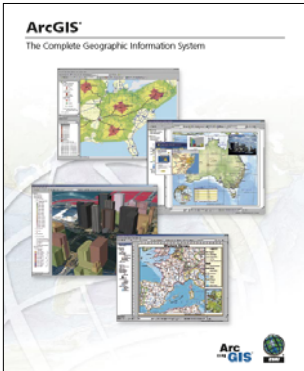


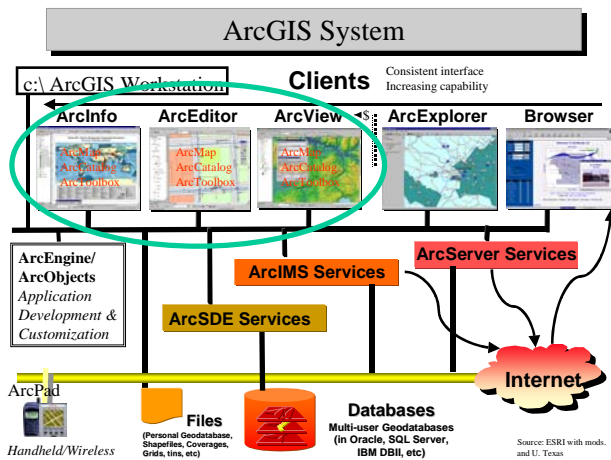
## Introduction to the 176A labs and ArcGIS

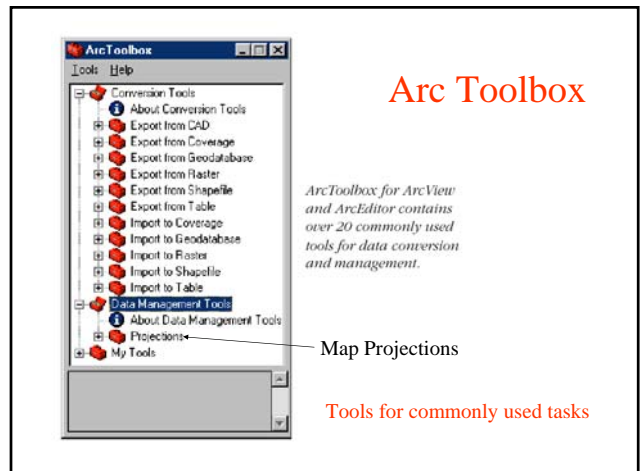
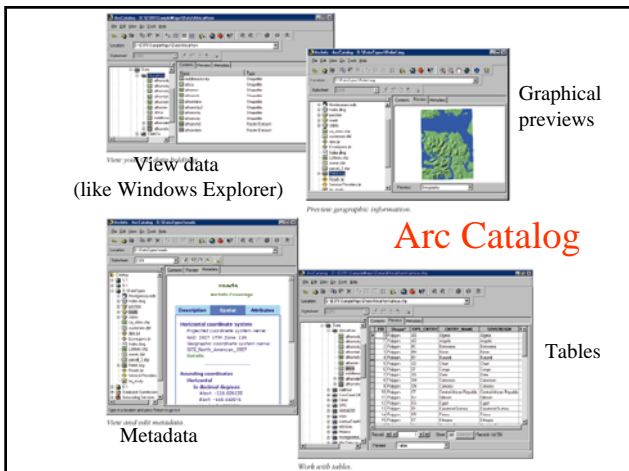
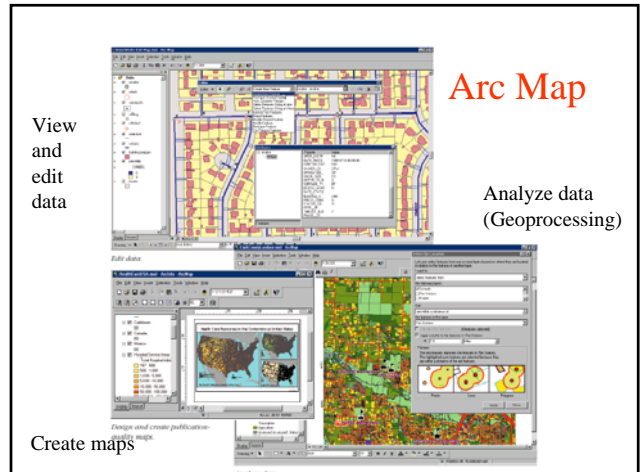
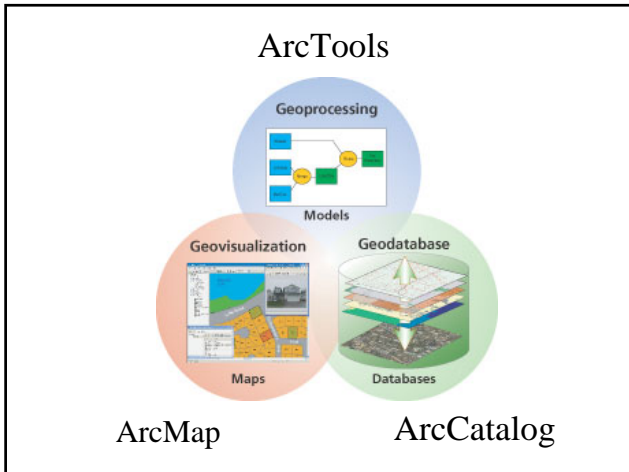


Acknowledgement: Slides by David Maidment, U Texas-Austin and Francisco Olivera (TAMU)

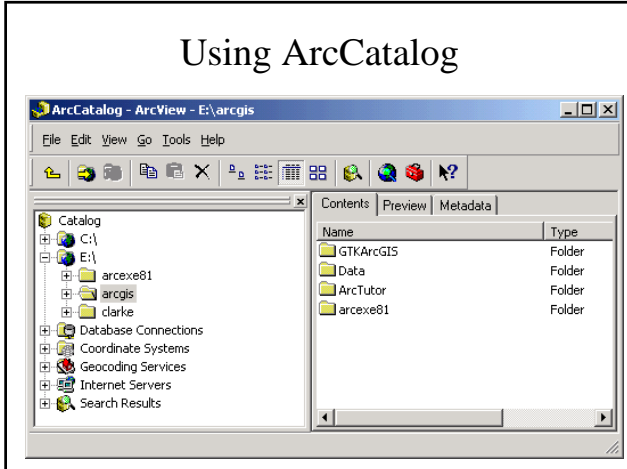
## Purpose of the labs

- Hands-on experience with a leading software package
- Introduction to issues and problems of software use
- Reinforce lecture topics
- Learn more about theory by practice
- Means to assess student achievement





## Using ArcCatalog



## ESRI GIS History

### Arc/Info (coverage model)

Versions 1-7 from 1980 – 1999

Arc Macro Language (AML)

160,000 licenses  
1,200,000 users as of 2004

### ArcGIS (geodatabase model)

Version 8.0, ..., 9.3 (and 10.+) from 2000 – Visual Basic for Applications. After 9: Python

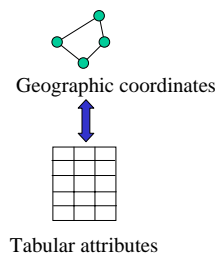
### ArcView (shapefile model)

Versions 1-3 from 1994 – 1999

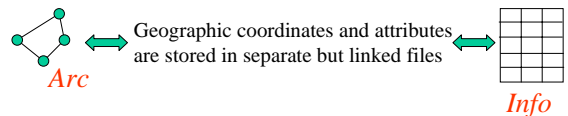
Avenue scripting language

## Data Models

- A **geographic data model** is a structure for organizing geospatial data so that it can be easily stored and retrieved.

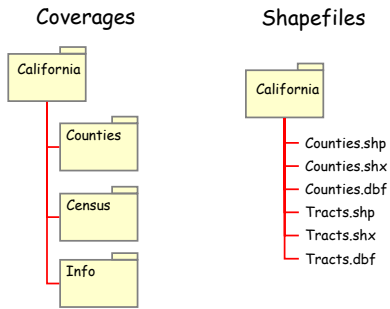


## File-based Data Models



- Coverages**
  - Developed for workstation Arc/Info ~ 1980
  - Complex structure, proprietary format
  - Attributes in **Info** tables
  - .e00 export format still common
- Shapefiles**
  - Developed for ArcView ~ 1993
  - Simpler structure in public domain
  - Attributes in **dBase** (.dbf) tables

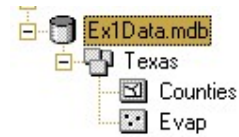
## Storing Data



## Geodatabases and Feature Datasets

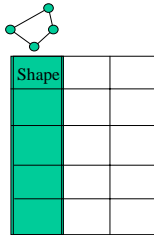
⌘ A **geodatabase** is a *relational database* that stores *geographic information*.

⌘ A **feature dataset** is a collection of feature classes that share the same *spatial reference frame*.

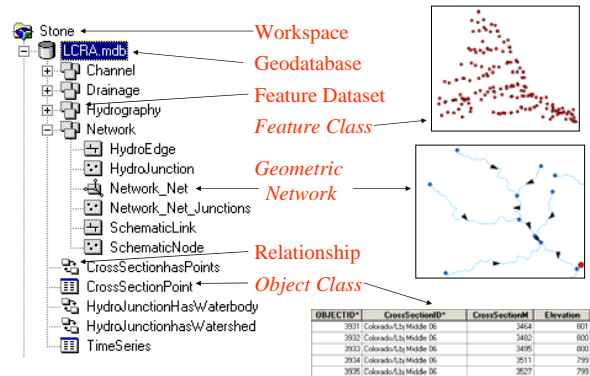


## Geodatabase model

- Stores geographic coordinates as one attribute (shape) in a relational database table
- Uses **MS Access** for “Personal Geodatabase” (single user)
- Uses Oracle, SQL/Server, dBase or other **commercial relational databases** for “Enterprise Geodatabases” (many simultaneous users)



## ArcGIS Geodatabase



## Object Class

- An **object class** is a collection of *objects* in *tabular format* that have the same behavior and the same attributes.

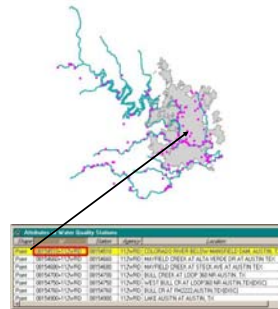


ID	Station	Agency	EventID	parameter	Meas_Obr	Mean	75th P	25th
00154510-112wRD	00154510	112wRD	5421	00010	16	17.21070	12.32500	13
00154510-112wRD	00154510	112wRD	5421	00095	16	757.31200	478.15000	515
00154510-112wRD	00154510	112wRD	5421	00000	16	6.24999	2.96000	3
00154510-112wRD	00154510	112wRD	5421	00030	13	0.62307	0.31000	0
00154510-112wRD	00154510	112wRD	5421	00040	16	7.86875	7.55500	7
00154510-112wRD	00154510	112wRD	5421	00410	6	72.83330	0.00000	0
00154510-112wRD	00154510	112wRD	5421	00610	16	0.02500	0.00000	0
00154510-112wRD	00154510	112wRD	5421	00612	16	0.00072	0.00000	0

An object class is a table that has a unique identifier (**ObjectID**) for each record

## Feature Class

- A **feature class** is a collection of *geographic objects* in *tabular format* that have the same behavior and the same attributes.



Feature Class = Object class + spatial coordinates

## Relationship

- A **relationship** is an association or link between two objects in a database.
- A relationship can exist between spatial objects (features in feature classes), non-spatial objects (objects in object classes), or between spatial and non-spatial objects.

## Relationship

Relationship between non-spatial objects

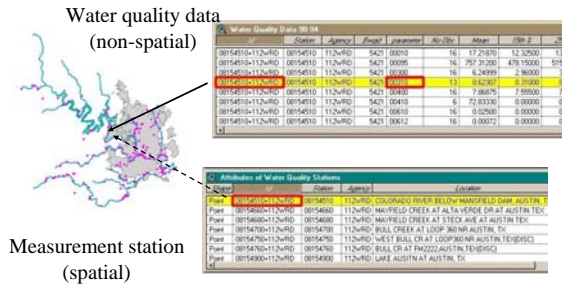
ID	Station	Agency	EventID	parameter	Meas_Obr	Mean	75th P	25th
00154510-112wRD	00154510	112wRD	5421	00010	16	17.21070	12.32500	13
00154510-112wRD	00154510	112wRD	5421	00095	16	757.31200	478.15000	515
00154510-112wRD	00154510	112wRD	5421	00000	16	6.24999	2.96000	3
00154510-112wRD	00154510	112wRD	5421	00030	13	0.62307	0.31000	0
00154510-112wRD	00154510	112wRD	5421	00040	16	7.86875	7.55500	7
00154510-112wRD	00154510	112wRD	5421	00410	6	72.83330	0.00000	0
00154510-112wRD	00154510	112wRD	5421	00610	16	0.02500	0.00000	0
00154510-112wRD	00154510	112wRD	5421	00612	16	0.00072	0.00000	0

Parameter	Param_name	Units	Sample_freq	CG
00010	BOD, 5 DAY, 20 DEG C	MG/L	TOTAL	
00040	PH	SU		
00410	ALKALINITY, TOTAL (AS CaCO3)	MG/L AS CaCO3	TOTAL	
00515	RESIDUE, TOTAL FILTRABLE, DRIED AT 105C (TD5)	MG/L	DISSOLVED	
00530	RESIDUE, TOTAL NONFILTRABLE (TSS)	MG/L	TOTAL	
00600	NITROGEN, TOTAL	MG/L	TOTAL	
00610	NITROGEN, AMMONIA, TOTAL	MG/L AS N	TOTAL	
00612	AMMONIA, UNIONIZED	MG/L AS N	TOTAL	

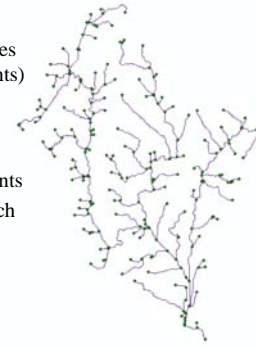
## Relationship

Relationship between spatial and non-spatial objects

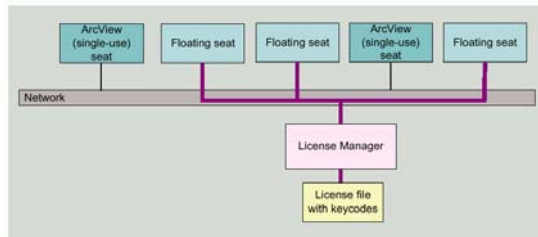


## Network

- A **network** is a set of edges (lines) and junctions (points) that are topologically connected to each other.
- Each **edge** knows which junctions are at its endpoints
- Each **junction** knows which edges it connects to



## Licenses and Keycodes



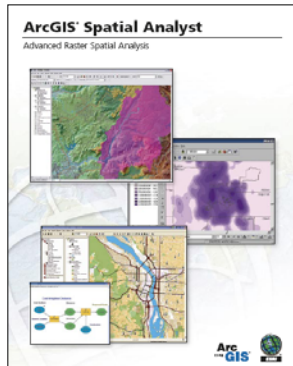
License manager keeps track of number of simultaneous users and limits them to allowable number. Licenses are checked out on a first come-first-serve basis.

## ArcGIS Extensions

	ArcView, ArcEditor, and ArcInfo	ArcInfo only
<b>ArcGIS Spatial Analyst</b>	<ul style="list-style-type: none"> <li>• Advanced raster modeling</li> <li>• ARC GRID calculator with ARC GRID algebra</li> <li>• VBA for raster analysis</li> </ul>	<ul style="list-style-type: none"> <li>• ARC GRID program in ArcInfo Workstation</li> <li>• ARC GRID commands in Arc program</li> </ul>
<b>ArcGIS 3D Analyst</b>	<ul style="list-style-type: none"> <li>• ArcScene™—real-time interactive three-dimensional scenes</li> <li>• Scene views in ArcCatalog</li> <li>• Three-dimensional modeling tools</li> <li>• ARC TIN tools</li> </ul>	<ul style="list-style-type: none"> <li>• ARC TIN™ commands in Arc program</li> <li>• Surfacescene command</li> </ul>
<b>Geostatistical Analyst</b>	<ul style="list-style-type: none"> <li>• Advanced kriging and surface modeling</li> <li>• Exploratory spatial data analysis tools</li> <li>• Probability, threshold, and error mapping</li> </ul>	

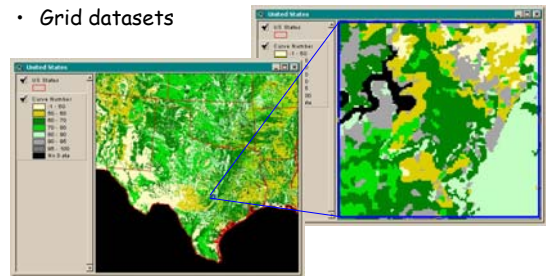
## Spatial Analyst

- Analysis of land surface terrain as a grid
- Key means of defining drainage areas and connectivity to stream network



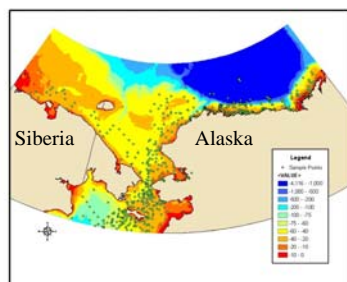
## Grid Datasets

- Grid datasets



## Geostatistical Analyst

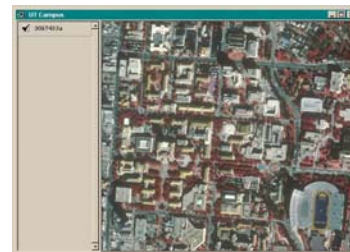
- Interpolation of points to a grid using statistical correlation
- Produces a standard error of estimate of each map location



## Image Datasets

Digital Orthophotos and satellite imagery

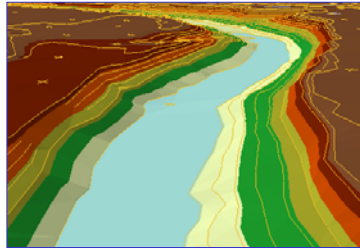
- Image datasets





## 3-D Analyst

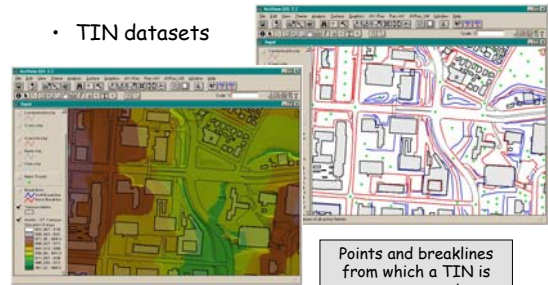
- Analysis of land surface terrain as triangulated irregular network (TIN)
- Visualization in 3-D using Arc Scene



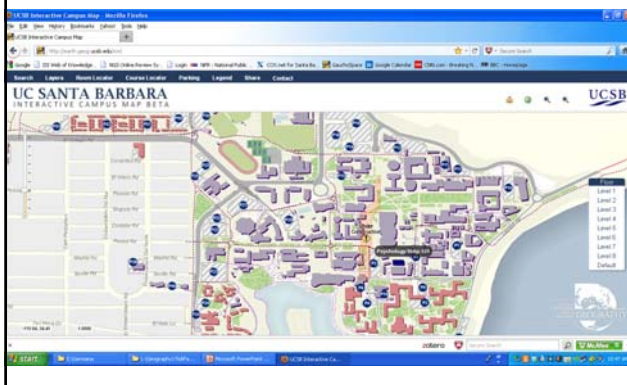
Stream channel of Pecan Bayou, TX

## TIN Datasets

- TIN datasets



## ArcGIS Server: Interactive Campus Map



## ESRI Software/Reference

- <http://www.esri.com/library/> Reference material and brochures about ESRI products
- ArcGIS summary: <http://www.esri.com/library/brochures/pdfs/arcgis91.pdf>
- Spatial Analyst summary: <http://www.esri.com/library/brochures/pdfs/spatialanalystbro.pdf>
- ESRI Virtual Campus – provides online training <http://campus.esri.com/>
- Free ArcExplorer spatial browser <http://www.esri.com/software/arcexplorer/>