GIS Software

- The geoprocessing engines of GIS
- Major functions
  - Collect, store, manage, query, analyze and present
- Key terms
  - Program – collections of instructions to manipulate data
  - Package – integrated collection of programs
  - Component – self-contained, reusable software building blocks

Evolution of GIS Software

- Sub-routine libraries (1960s/1970s)
  - Libraries of small programs (sub-routines)
  - Required advanced programming skills
- Tool box with CLI (1970s/1980s)
  - Basic package with Command Line Interface
  - Required advanced technical skills
- Task-oriented system (1990s/2000s)
  - Graphical User Interface (GUI)
  - Customization capabilities to create specific-purpose applications
- 2010s...?
  - Web-based
  - Mobile
  - Cloud
Types of GIS Implementation

Three-tier Architecture

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Data
GS Software Architectures

- Desktop
- Client-server
- Centralized
  - Desktop/Citrix
  - Server

Desktop GIS

(A) Stand-alone desktop GIS on PCs each with own files
(B) Desktop GIS on PCs sharing files on a PC file server over a LAN
Client-server GIS

Centralized Desktop GIS
Centralized Server GIS

Desktop and Network GIS

ESRI GIS = ARCGIS

The Environmental Systems Research Institute Geographic Information Systems software package
Today:
- Licensing options
  - ArcView
  - ArcEditor
  - ArcInfo
- GUI description
- Components of ArcGIS
  - ArcMap
  - ArcCatalog
  - ArcToolbox
- Setting up your project
  - Data organization / workspace
  - ‘Geodatabases’
  - Project files (.mxd)
  - Relative & absolute paths
  - Data Frame Properties

ArcGIS – How is it Structured?

- Mapfile – What is it?
  - Document that...
- Data Frame – What is it?
  - Organizational entities...
- Data Layer – What is it?
  - Spatial data sets...
ArcGIS Mapfile

• How do mapfiles work?
  – They contain pointers to spatial and non-spatial data
    • (not the data itself)
  – You save them as .mxd files and as long as they have access to the base data, you are in “good shape”
  – Example
    • H:\introgis\streams.shp
    • or E:\assignment1\streams.shp
ArcGIS: Data Frames and Data Layers – What is the Difference?

• Data Frames
  – Represent some “domain” in space that can have some properties (that you can assign)
    • Scale, coordinate system, labeling, etc.
  – Contain data layers that occur within this domain that are in the same coordinate space
ArcGIS: Data Frames and Data Layers – What is the Difference?

• Data layers are graphic representations of spatial data layers (in a map file)

• They are accessed by “adding data” to a mapfile...
  – the data will then appear in the table of contents

• Data layers also have properties that are separate and distinct from those of data frames
  – sometimes this is hard to keep track of…but we’ll manage
Organization of your data/workspace

- Workspaces are the directories, databases, and file folders on disk that hold numerous datasets, including geodatabases, as well as external datasets in many file formats—for example, folders containing shapefiles, JPEG images, DXF CAD files, dBASE tables, or Excel spreadsheets

- You can create and manage your workspaces in ArcCatalog as well as make connections to other workspaces

- Your workspaces may consist of a single file folder containing many datasets and other related documents that are organized around themes or projects
Organization of your data/workspace

- You can organize projects by layer type such as workspaces for roads, water, parcels, administrative boundaries, and so forth.

- For example, the Shopping Mall Project workspace organizes datasets in folders by the theme of the data.

Organization of your data/workspace

- In other situations, you may want to organize workspaces around a project such as a road development project or new power plant project.

- You can also organize workspaces within workspaces.

- The New Power Plant workspace below contains sub-workspaces for each element of the major development project.
What is a Geodatabase?

- It is a database with ‘geo’ in front of it...
  - So, what does that mean?
    - (It means it is a database with geographic properties)

- The geodatabase is also a collection of geographic datasets of various types used for representing features, images, tabular, and other data types managed in either a file structure or a multiuser relational database

- It is the native data source for ArcGIS and is used for editing and data automation in ArcGIS

- You can set up one or more geodatabases within a workspace

Proper organization of your data and workspace results in a logical ‘catalog tree’
Graphical User Interface (GUI) / ArcMap Display Interface

Setting up your Project File (.mxd)

File → Map Document Properties

Go to ‘Pathnames’ and click ‘Store relative pathnames to data sources’
First thing to do is to ‘tell’ .mxd/project file which coordinate system, projection, and datum to use in the data frame.

Go to the ‘View’ pull-down menu and navigate to ‘Data Frame Properties’.

In the ‘Data Frame Properties’ click the ‘Coordinate System’ tab...

Now what???