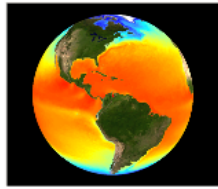


Introduction to Geographic Information Systems (GIS)

Course Code - VS361

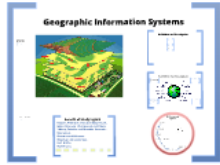


TENNESSEE COLLEGE OF APPLIED BUSINESS



Thank You





Introduction to Geographic Information Systems (GIS)
 Course Code - VS361



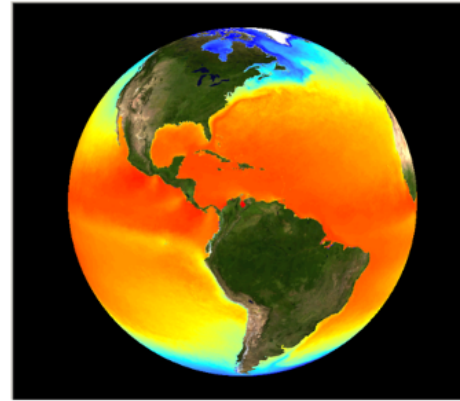
of GIS

System?

- National Wetland Inventory
- Land Use (Anderson Level II)
- Digital Elevation Models
- Digital Raster Graphics
- Hydrography
- Topography
- Cartography
- Cartographic
- Data
- Networks
- Roads & Transmission Lines
- Waters
- State/County/State
- Parks
- Roads



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CENTENNIAL



Introduction to Geographic Information Systems (GIS)

Course Code - VS361

Topics for Assessment

- History of GIS
- Introduction to ArcGIS Desktop Application
- Introduction of GIS Software
- Introduction to GIS Data

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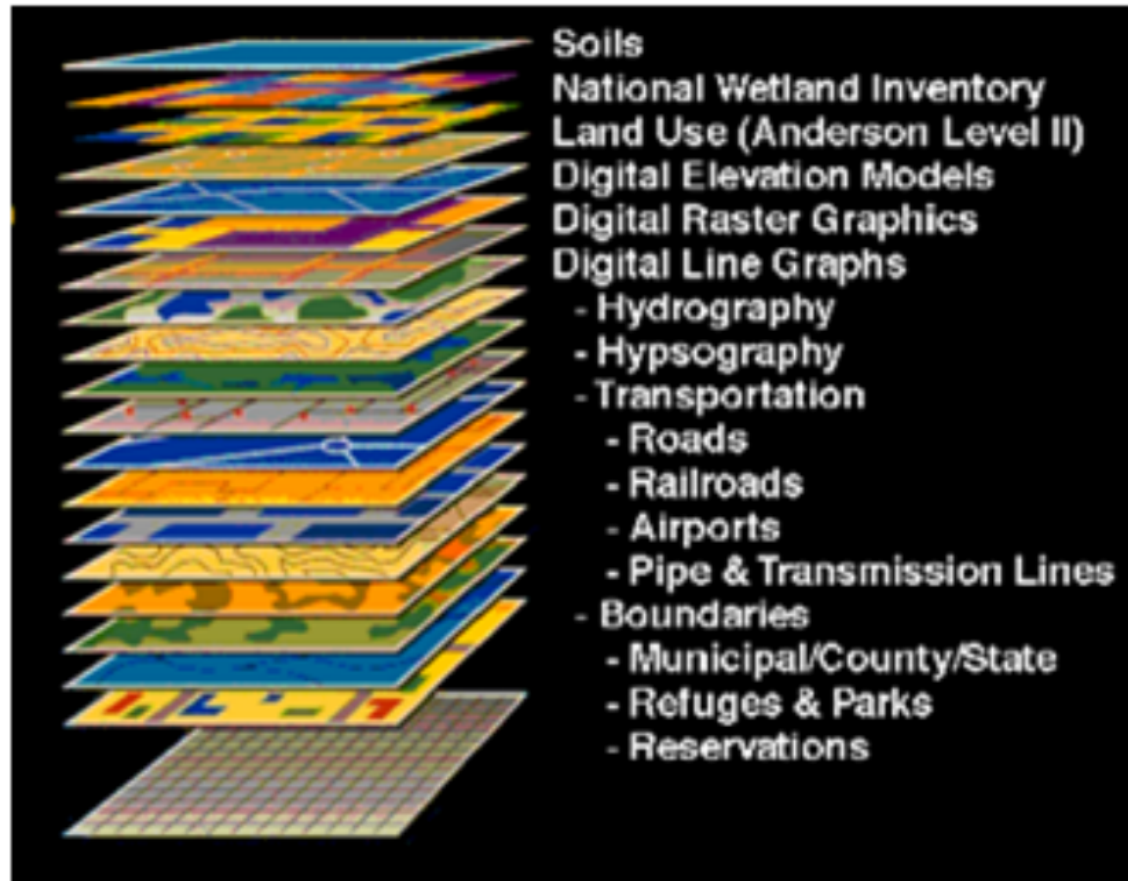
Topics for discussion:

- History of GIS
- Introduction to ArcGIS Desktop Application
- Overview of GIS Industry
- Introduction to VS361 Course

History of GIS

Topics:

- Evolution of GIS
- What is Geographic Information System?
- GIS process and system



Geographic Information Systems

What is Geographic Information Systems?

- A GIS is a particular form of Information Systems applied to geographical data.
- An Information System is a set of processes, organized in a way that is intended to produce useful and to control which existing resources.
- A system is a group of connected elements and relations which interact for a common purpose.



Geographic Information Systems has full range of functions for:

- scientific observations
- cartographic representations
- planning and operations
- navigation systems
- disaster management
- resource management

Benefit of Studying GIS

- Federal, Provincial and Local Government:
- Urban Planning, Management and Policy:
- Military, Defense and Scientific Research:
- Businesses:
- Environmental Science:
- Education Administration:
- Real Estate:
- Health Care:



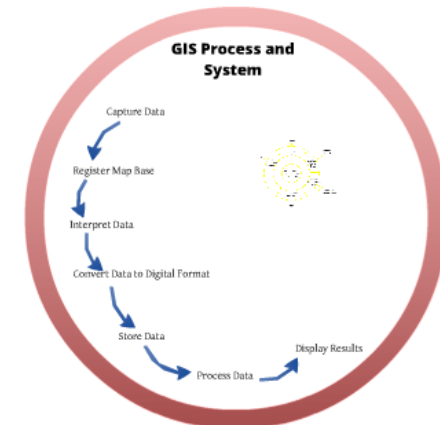
Definition and description:



How GIS Differ From Related Systems



GIS Process and System



What is Geographic Information Systems?

- A GIS is a particular form of Information System applied to geographical data.
- An Information System is a set of processes, executed on raw data to produce information which will be useful when making decisions.
- A system is a group of connected entities and activities which interact for a common purpose.

Geographic Information System has full range of functions to:

- process observations
- process measurements
- provide descriptions
- explain data
- make forecasts
- make decisions

Definition and description:

A GIS is an organized collection of computer hardware, software, geographic data, and personnel to efficiently capture, store, update, manipulate, analyze, and display all forms of geographically referenced information.

A GIS integrates spatial and other kinds of information within a single system to provide a consistent framework for analyzing geographic (spatial) data.

A GIS makes connections between activities based on geographic proximity.

The digital data structure can be conceptualized as a set of "floating electronic maps" with a common registration allowing the user to "look" down (ditto down) and across the stack of maps.

The spatial relationships can be summarized (ditto here (repeated))

The spatial relationships can be summarized (data base inquiries or manipulated (analytical processing)).

Another definition of GIS - An internally referenced, automated, spatial information system for data mapping, management, and analysis

GIS is used to....

- Facilitate communication
- Promote coordination
- Solve problems
- Measure resources
- Make decisions
- Understand past and present situations
- Anticipate future scenarios

GIS Map that tell a story.....

- Where is _____?
- How many _____?
- Density of _____?
- What's inside _____?
- What's near _____?
- How many _____ changed?
- How do _____ relates?
- What if _____?

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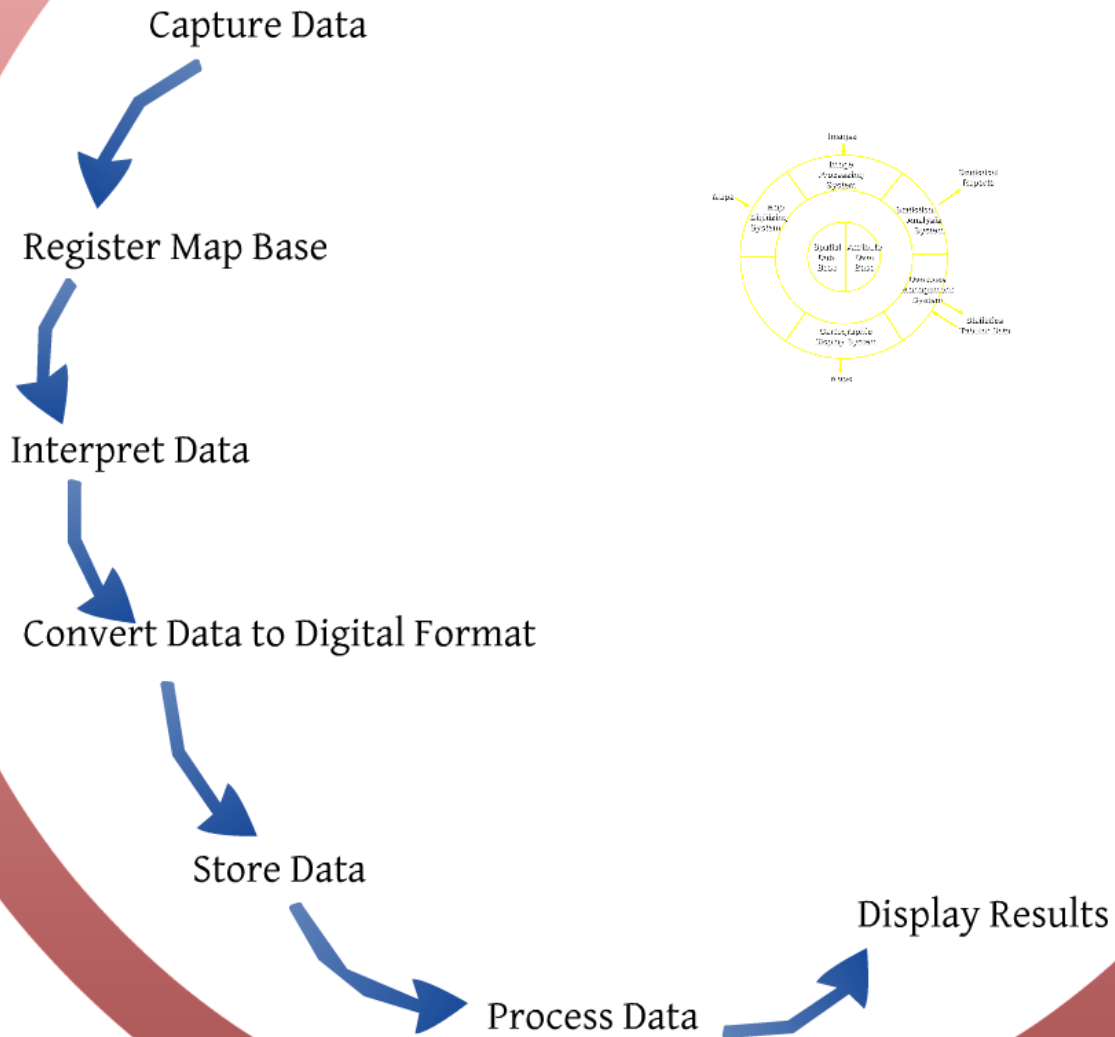
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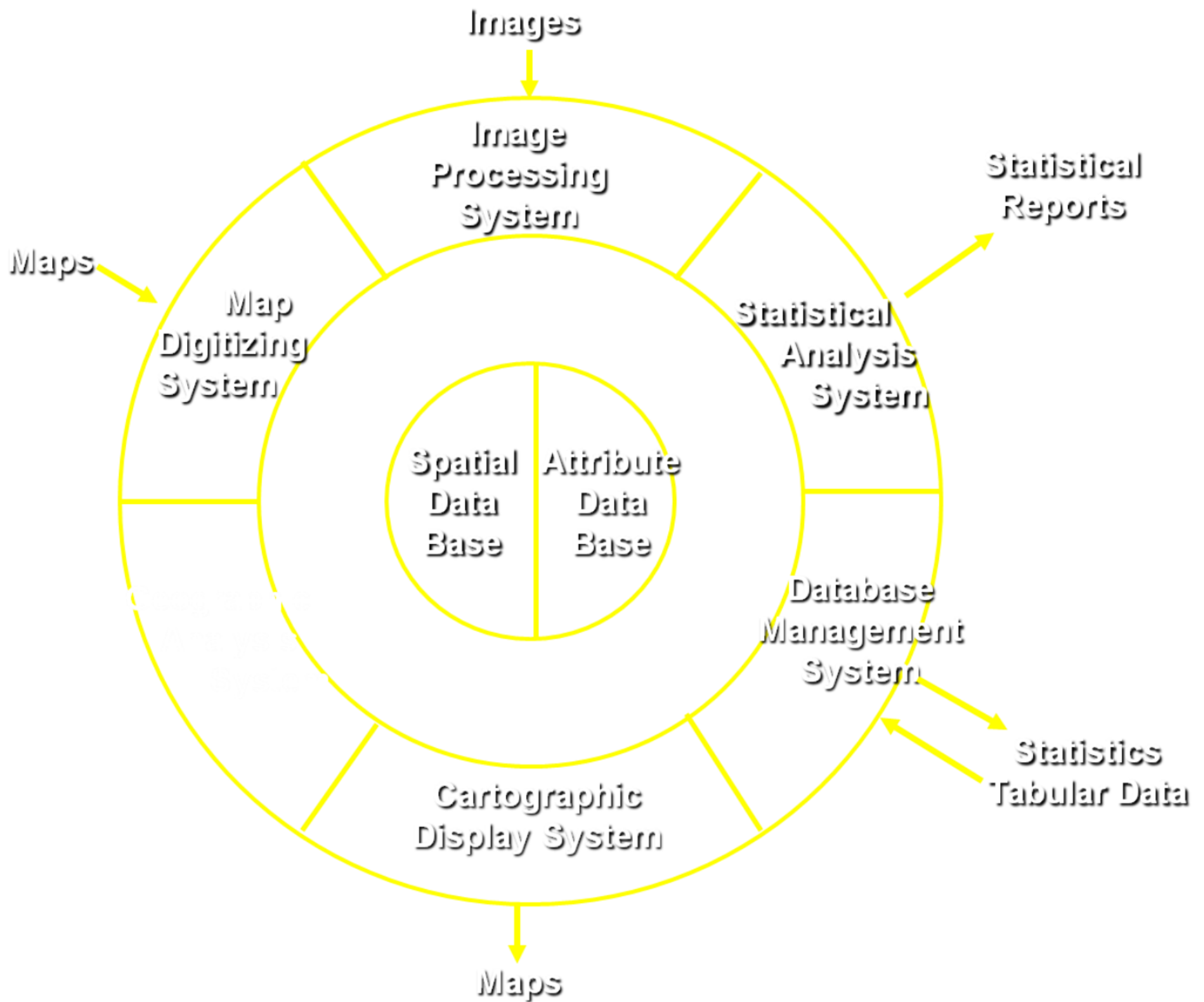
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GIS Process and System





How GIS Differ From Related Systems

DBMS:

- typical MIS data base contains implicit but not explicit locational information city, county, zip code, etc. but no geographical coordinates is available.

CAD/CAM (Computer Aided Design/Drafting)

- primarily 3-D graphic creation (engineering design) & display systems
- don't reference via geographic location
- CAD sees the world as a 3-D cube, GIS as a 3-D sphere
- limited (if any) database ability (especially for non-spatial data)



AM & FM Systems: (Automated Mapping & Facility Mapping)

- primarily two-dimensional display devices thematic mapping (such as SAS/GRAPH, business mapping software)
- unable to relate different geographical layers (e.g. zip codes and counties) automated cartography—graphical design oriented;
- limited database ability
- lack spatial analysis tools

Other Scientific Visualization Systems

- sophisticated multi-dimensional graphics,
- lack database support
- lack two-dimensional spatial analysis tools

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Federal, Provincial and Local Government:

- Public works (streets, water supply, sewers) and garbage collection
- Land ownership and valuation
- Public safety (Fire and Police)
- Natural resource management
- Highway and transportation

Businesses:

- retail site selection & customer analysis
- logistics: vehicle tracking & routing
- natural resource exploration (petroleum, etc.)
- precision agriculture
- civil engineering and construction

Military, Defense and Scientific Research:

- Battlefield management
- Satellite imagery interpretation
- geography, geology, botany
- anthropology, sociology, economics, political science
- Epidemiology, criminology

Urban Planning, Management and policy

- Zoning, subdivision planning
- Land acquisition
- Economic development
- Code enforcement
- Housing renovation programs
- Emergency response
- Crime analysis
- Tax assessment

Environmental Science:

- Monitoring environmental risk
- Modeling stormwater runoff
- Management of watersheds, floodplains, wetlands, forests, aquifers
- Environmental Impact Analysis
- Hazardous or toxic facility siting
- Groundwater modeling and contamination tracking

Educational Administration:

- Attendance Area Maintenance
- Enrollment Projections
- School Bus Routing

Real Estate and Health Care:

- Neighborhood land prices
- Traffic Impact Analysis
- Determination of Highest and Best Use
- Epidemiology
- Needs Analysis
- Service Inventory

What GIS Application Do:

Manage, Analyze and Communicate

- make possible the automation of activities involving geographic datamap production
- calculation of areas, distances, route lengths
- measurement of slope, aspect, viewshed
- logistics: route planning, vehicle tracking, traffic management allow for the integration of data hitherto confined to independent domains (e.g property maps and air photos).
- by tying data to maps, permits the succinct communication of complex spatial patterns (e.g environmental sensitivity).
- provides answers to spatial queries (how many elderly in Richardson live further than 10 minutes at rush hour from ambulance service?)
- perform complex spatial modelling (what if scenarios for transportation planning, disaster planning, resource management, utility design)

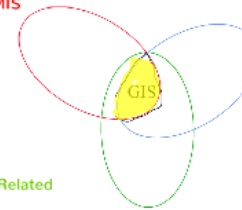
Knowledge Base for GIS

Computer Science/MIS

- graphics
- visualization
- database system
- administration
- security

Geography & Related

- cartography
- geodesy
- photogrammetry
- landforms
- spatial statistics



Application Area

- public admin
- planning
- geology
- mineral exploration
- forestry
- site selection
- marketing
- civil engineering
- criminal justice
- surveying

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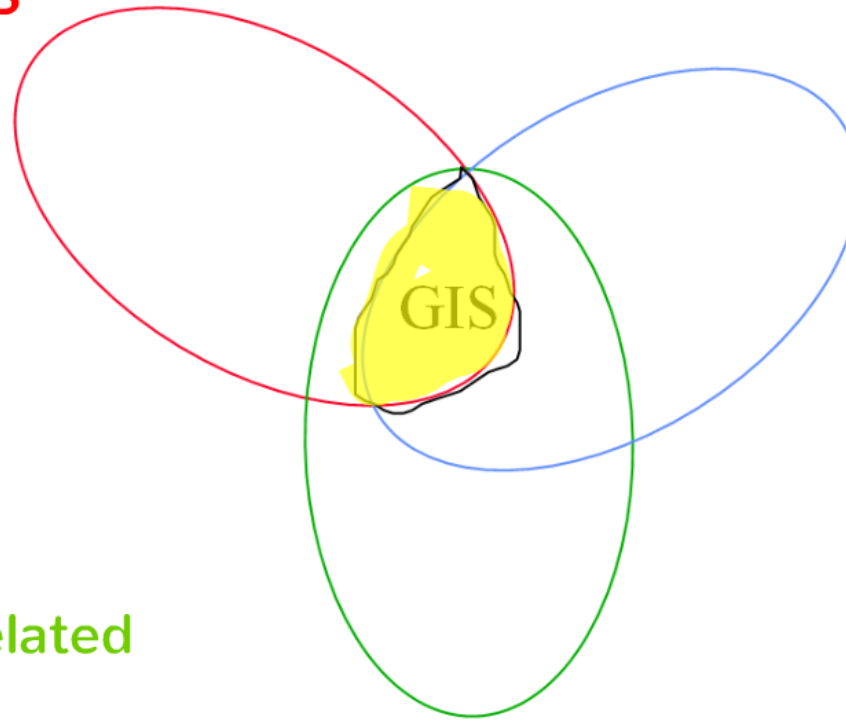
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!! Break !!



10 Minutes

Introduction to ESRI ArcGIS Desktop Application

- What is ArcGIS Desktop?
- Product levels of ArcGIS Desktop
- Desktop applications and shared documents.
- Working with maps in ArcGIS Desktop
- Optional extensions to ArcGIS Desktop
- Online capabilities of ArcGIS Desktop
- To generate information reports and analytics



What is ArcGIS Desktop?

ArcGIS Desktop is the primary product used by GIS professionals to compile, use, and manage geographic information. It includes comprehensive professional GIS applications that support a number of GIS tasks, including mapping, data compilation, analysis, geodatabase management, and geographic information sharing.

ArcGIS Desktop is the platform that GIS professional use to manage their workflows and projects and to build data, maps, model, and applications. It's the starting point and the foundation for deploying GIS across organizations and onto the web.

Product level of ArcGIS Desktop

ArcGIS Desktop is scalable and can address the needs of many types of users. It is available at three functional levels:

- **ArcView** - It focuses on comprehensive data use, mapping and analysis
- **ArcEditor** - It adds advanced geodatabase editing and data creation
- **ArcInfo** - It is a complete, professional GIS Desktop containing comprehensive GIS functionality and rich geoprocessing tools. Because of the extensive capabilities of ArcInfo, every GIS site should have at least one copy.

Desktop applications and shared documents

ArcGIS Desktop includes a suite of applications - ArcMap, ArcCatalog, ArcGlobe, ArcScene, ArcToolbox, and ModelBuilder. Using these applications and interfaces, various simple to advanced GIS tasks can be performed.

In ArcGIS Desktop, we will be working with number of elements of GIS information, such as the following:

- Map documents and layers
- Geodatabases
- Geoprocessing toolboxes
- Other data files such as imagery
- Spatial analysis

Working with Maps in ArcGIS Desktop

Three key tasks are performed by most users including working with maps, spatial analysis, and data compilation.

- **Maps** are critical in Desktop because they bring all information to life and are the mechanism used for editing and for delivering spatial analysis to other users.
- **Maps** also provide the basics for editing and data compilation work. ArcMap is the primary application used for advanced data compilation and is used across industries to compile rich authoritative content for their application domains and area of interest.

Optional extensions to ArcGIS Desktop

These specialized software capabilities are available as add-on ext. to ArcGIS Desktop. Each extension enables to add capabilities such as raster geoprocessing, 3D GIS, network analysis and many more:

- ArcGIS 3D Analyst
- ArcGIS Business Analyst
- ArcGIS Data Interoperability
- ArcGIS Spatial Analyst and many more....

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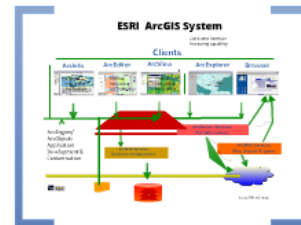
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- [ArcGIS Spatial Analyst](#) and many more.....

ArcGIS Desktop Application Software



What is ArcGIS Desktop?

ArcGIS Desktop is a comprehensive GIS software suite that includes all the tools and capabilities you need to create, manage, analyze, and visualize geographic information. It is the core of the ArcGIS system.

What are the main components of ArcGIS Desktop?

ArcGIS Desktop consists of several key components:

- ArcMap:** The main interface for viewing and analyzing GIS data.
- ArcToolbox:** A collection of tools for performing GIS operations.
- ArcCatalog:** A tool for managing GIS data.
- ArcScene:** A 3D visualization tool for terrain and elevation data.
- ArcGlobe:** A 3D visualization tool for global data.

High-Performance GIS Applications

ArcGIS Desktop provides the tools and capabilities you need to create, manage, analyze, and visualize geographic information. It is the core of the ArcGIS system.

High-Performance GIS Applications

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ArcCatalog: Data Management Application

ArcCatalog is a tool for managing GIS data. It provides a central location for organizing and managing GIS data. It is used to create, edit, and delete GIS data.

ArcCatalog Interface

Filedata Type

ArcToolbox: Essential GIS Tools

ArcToolbox is a collection of tools for performing GIS operations. It is used to create, edit, and analyze GIS data.

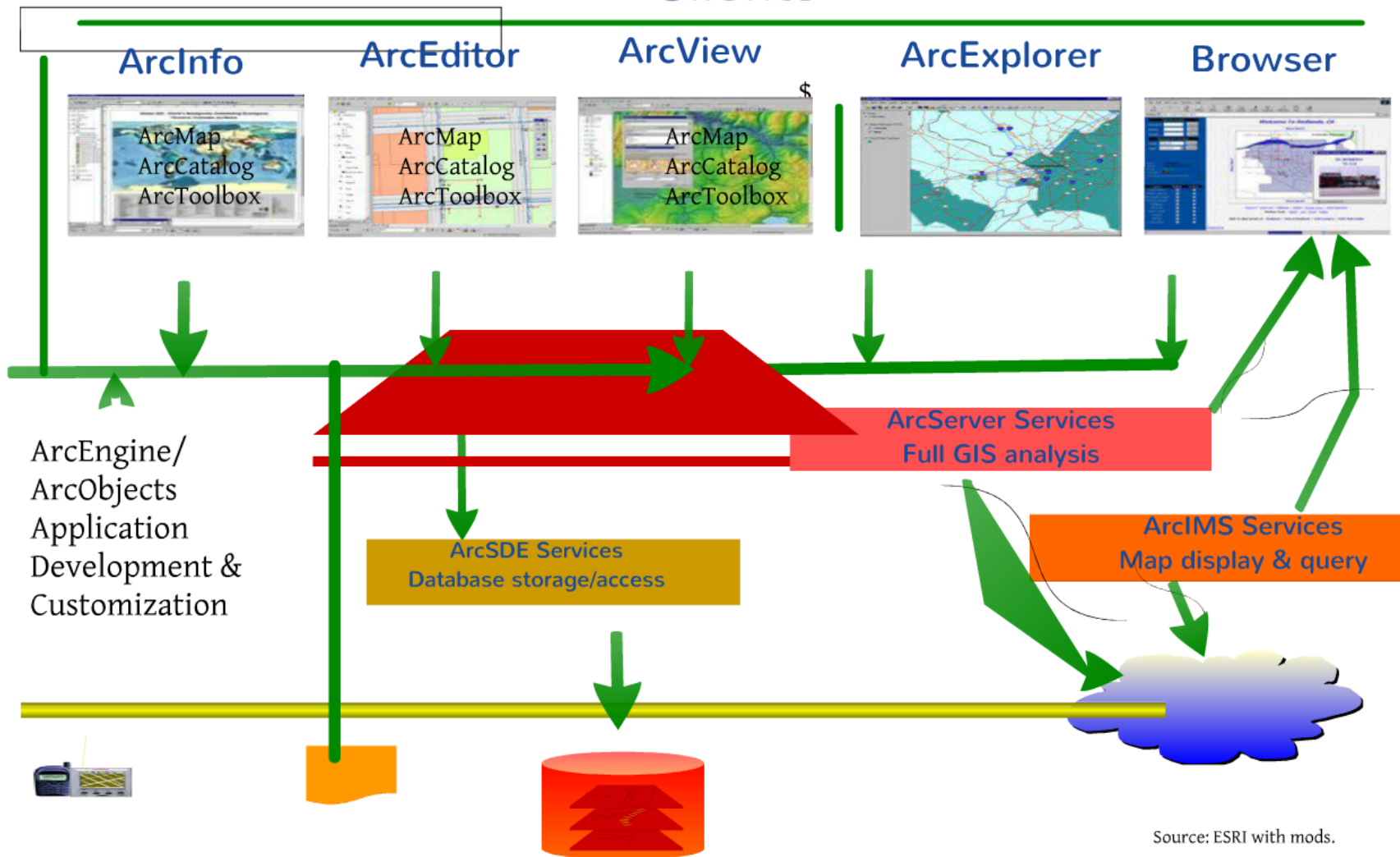
ArcMap: GIS Data Visualization

ArcMap is the main interface for viewing and analyzing GIS data. It provides a central location for displaying GIS data and performing GIS operations.

ESRI ArcGIS System

Consistent interface
Increasing capability

Clients



Source: ESRI with mods.

What is ArcGIS Desktop?

ArcGIS Desktop is a GIS product created by ESRI (Environmental System Research Institute) that allows you to analyze your data and author geographic knowledge to examine relationship, test predictions, and ultimately make better decisions.

It is family of three products

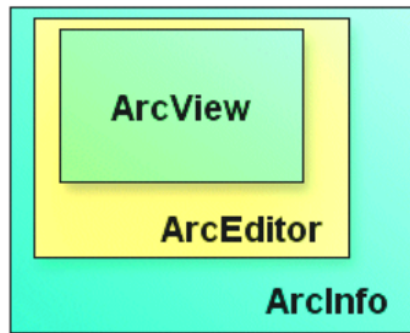
ArcInfo

Arc Editor

ArcView

That shares the same core applications, user interface, and development environment

ArcGIS Desktop



All three software products look and work the same—they differ only in how much they can do. ArcEditor does more than ArcView, and ArcInfo does more than ArcEditor

Each ArcGIS Desktop product includes two applications: ArcMap and ArcCatalog™. ArcMap is the application you work with to explore and analyze data and make maps. ArcCatalog is the application you work with to manage data. Additionally, ArcToolbox™ is an integrated application that contains many tools for GIS tasks. You can access ArcToolbox from both ArcMap and ArcCatalog

Simple feature editing and data integration:

o e.g. create/edit point, line, and polygon features and attributes, integrate variety of data types including demographics, facilities, CAD drawings, imagery, web services, and multimedia.

OBJECTID	PROPERTY_ID	PARCEL_ID	Res	Zoning_simple	SHAPE_Length
1537	2537	3894	Non-Residential	Commercial	326.211136
1538	2538	3895	Residential	Residential	367.422451
1539	2539	3896	Non-Residential	Commercial	298.362276
1540	2540	3897	Residential	Residential	401.268054
1541	2541	3898	Residential	Residential	400.160058
1542	2542	3899	Non-Residential	Commercial	291.521278
1543	2543	3900	Residential	Residential	373.737401
1545	2545	3902	Non-Residential	Commercial	329.564076
1546	2546	3903	Residential	Residential	503.8167
1547	2547	3904	Non-Residential	Commercial	419.270037
1548	2548	3905	Non-Residential	Commercial	754.51978
1549	2549	3906	Non-Residential	Commercial	312.336089

e.g. quickly make changes to several features (records) at once.

Basic modeling and analysis:

o e.g. model spatial relationships, generate charts/reports from findings, etc.

ReadytoUse Datasets:

o e.g. ESRI Data & Maps Media Kit, which is updated annually and pre-configured to work specifically with ESRI software.

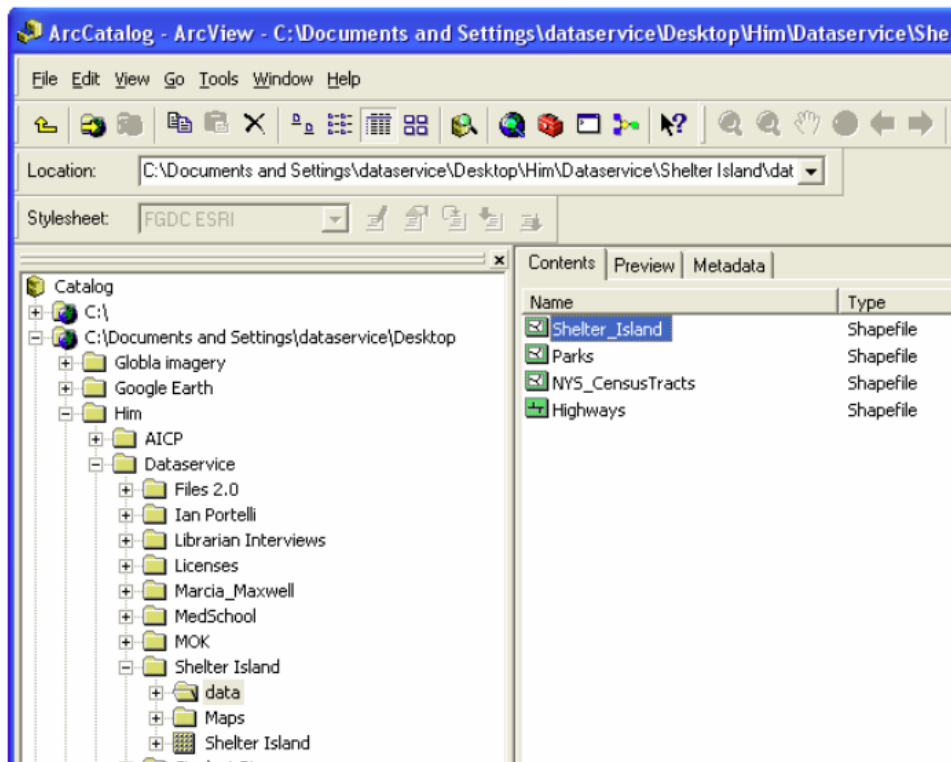
Enabled for extensions:

o e.g. add even more capabilities Analysis, Productivity, and Solutionbased extensions perform extended tasks such as raster geoprocessing and threedimensional analysis.

ArcCatalog: Data Management Application

ArcCatalog helps users to browse, search, explore, view, and manage data (with metadata creation and editing capabilities) and maps. It also helps GIS database administrators maintain spatial and tabular GIS data for use by others in their organization.

ArcCatalog interface



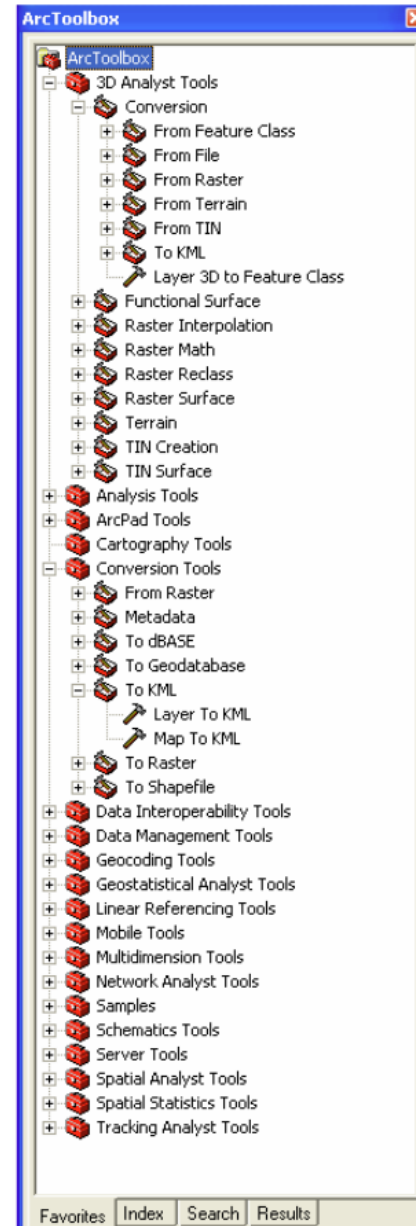
File/data Type

TABLE 1.3. Commonly used datasets, layers, and their icons.


Name	Type	Dataset	Layer
Shapefile	point	places.shp	places.lyr
	line	Rivers.shp	rivers.lyr
	polygon	LAKES.shp	lakes.lyr
Coverage	coverage	states	states.lyr
	arc	arc	
	point	label	
Coverage	polygon	polygon	
GRID		dem 30	dem 30.lyr
TIN		tn_study	tn_stud...
Geodatabase		yellowsto...	

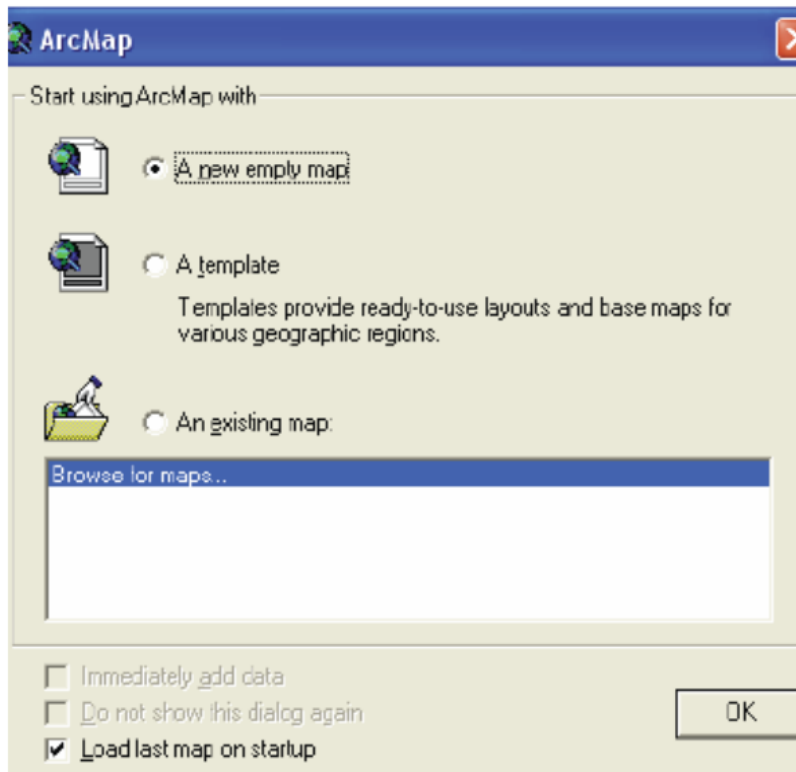
ArcToolbox: Geoprocessing tool

ArcToolbox helps users to perform geoprocessing operations such as data conversion, overlay processing, buffering, proximity analysis and map transformation. Each tool has a menu driven interface with wizards or dialogs.




ArcMap

ArcMap can be launched by clicking on the icon  on the Standard tool bar in ArcCatalog or launched from the Start menu



Check off “ A new empty map”
and click OK to add new map



ArcGIS Desktop
Application Software
package is provided
by ESRI.

Headquarter at:
380 New York Street
Redlands, CA 92373 8100

Overview of GIS Industry

Geographic Information System (GIS) has evolved into a technology that is used by a large number of industries and agencies to help plan, design, engineer build and maintain information infrastructures that effects our everyday lives.

- **Forestry** : Inventory and management of resources
- **Police** : Crime mapping to target resources
- **Transport** : Monitoring routes
- **Health** : Planning services and health impact assessments
- **Environment agencies** : Identifying area of risk example - flood, earthquake etc
- **Telecommunication** : Business expansion
- **Real estate** : Locating properties that match certain criteria

Introduction to VS-361

Course Outline

Refer Course Outline



Thank You

Email:

- vgupta11@my.centennialcollege.ca
- vikas.gupta7@yahoo.ca



Thank You

Email:

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