GIST 7128
ArcGIS 1: Introduction

Lecture 1
Introduction to GIS & ArcGIS

Module 1 Topics

- **Lecture**
  - Course introduction
  - What is a Geographic Information System (GIS)?
  - Introduction to ESRI ArcGIS Desktop 10.3
- **Text**
  - *Getting to Know ArcGIS Desktop* (ESRI Press)
  - Read Chapters **1** & **2** if not finished yet
- **Lab**
  - Chapter **3**. Interacting with Maps
  - Chapter **4**. Interacting with Data
  - Complete Lab 4 addendum (from *Getting Started* handout)

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Course Overview

- This course covers the basics of:
  - ArcGIS applications
  - Geographic Data
    - Components: Spatial, Attribute, Topology
    - Storage: File, Geodatabase
    - Data Models: Vector, Raster
  - Symbolizing and Classifying Data
  - **Map Preparation**
  - Building & Editing Geographic Datasets
  - **Spatial Analysis**
- See Course Outline for details

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Teaching Style

- Interactive: two-way dialogue
- Ask questions (or I will ☺)
- Answer questions for others
- Feedback on content and pace

Background

- Thematic Cartography (1970s) & Computer Science (1980s)
- Marine Cartographer (CHS): 1977 – 1987
- Geomatics Prof (Fleming College): 1987 – 2006
- Independent Consultant (Geodata): 1995 – 2006
- Consultant / Dev. Manager (Pacific Alliance): 2006 – 2020?

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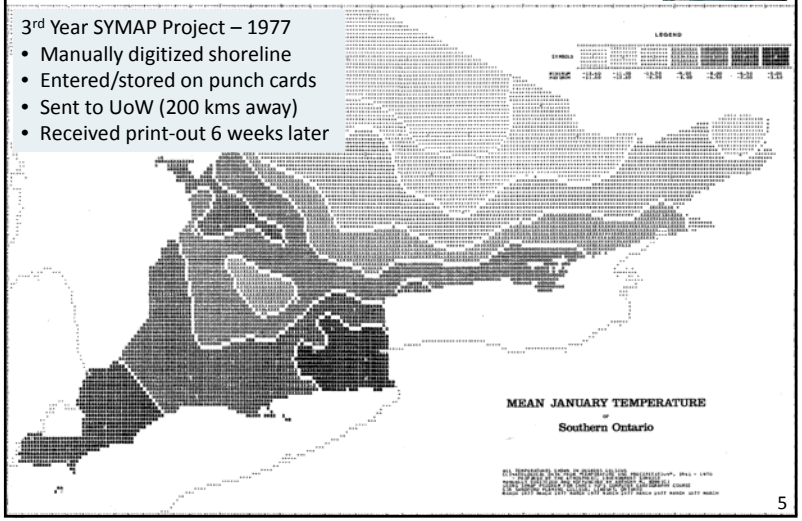
We've come a long way…!

3rd Year SYMAP Project – 1977
- Manually digitized shoreline
- Entered/stored on punch cards
- Sent to UoW (200 kms away)
- Received print-out 6 weeks later



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Evolution of GIS

1960's – "GIS" term coined in Canada (CGIS)

1970 & 80's	**1990's**	**2000+**
"BACK ROOM"	**"FRONT ROOM"**	**"OUT THE DOOR"**
Inventory	***Integration***	***Collaborative***
Departmental - Engineers - Scientists - Programmers	**Organizational** - Business - Government - Environmental	**Community** - Available to Everyone !
Mini-computers Unix workstations	Desktop GIS (on PCs)	The Internet (Web GIS)
$2M – $100K/seat	$100K – $20K	$20K – free

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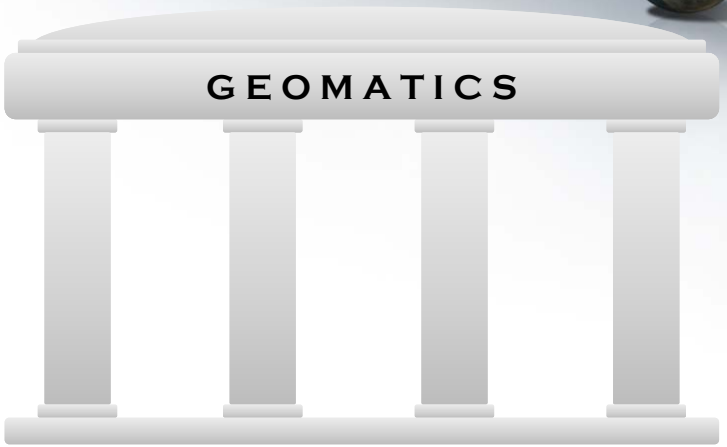
The Four Pillars of Geomatics



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"Why GIS?"

GIS is a tool
to obtain information
about the real world
to support decision-making.

(spatial analysis example)

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What is GIS ?

- GIS = Geographic Information System
- GIS is primarily an inventory and analytical tool
- GIS is comprised of:
  - Hardware (e.g. processor, network, printer)
  - Software (e.g. GIS, DBMS, OS)
  - Methods (e.g. standards, procedures, workflows)
  - Data (e.g. spatial, attribute)
  - People (e.g. managers, technicians, end users)

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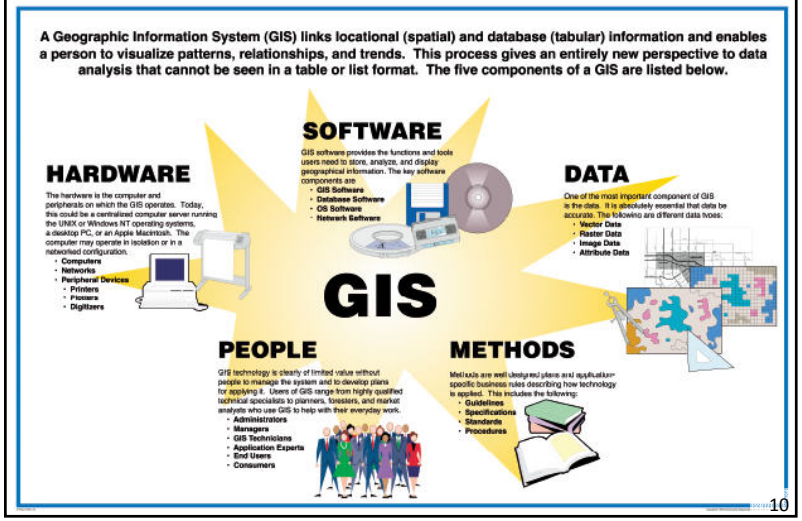
GIS Components

Source: http://www.gisday.com/cd2004/posters/5pointsofgis.pdf



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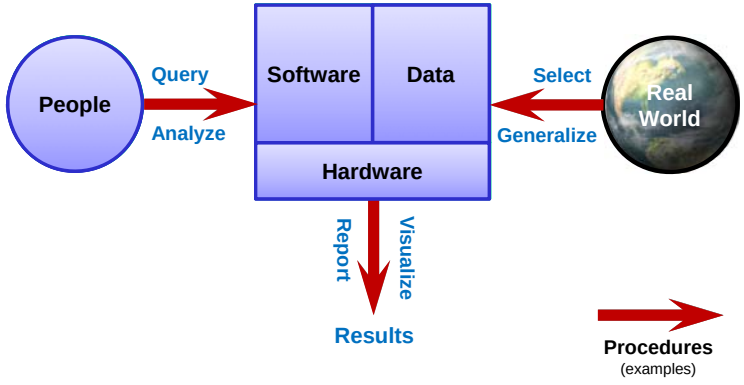
GIS Components & Emphasis



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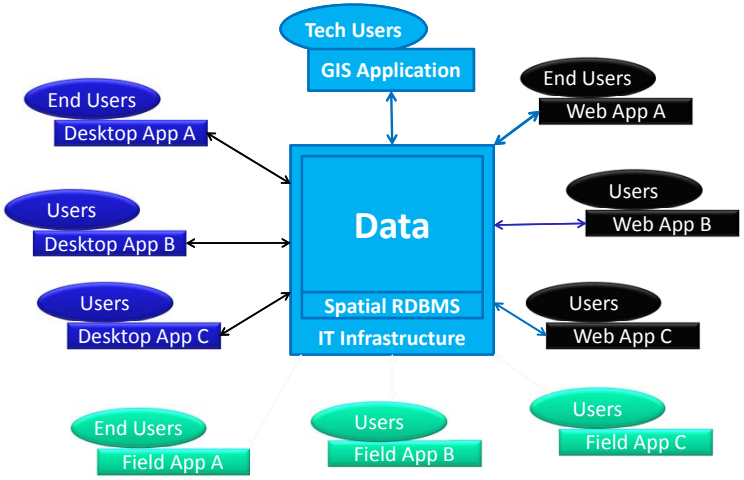
Enterprise Spatial Data



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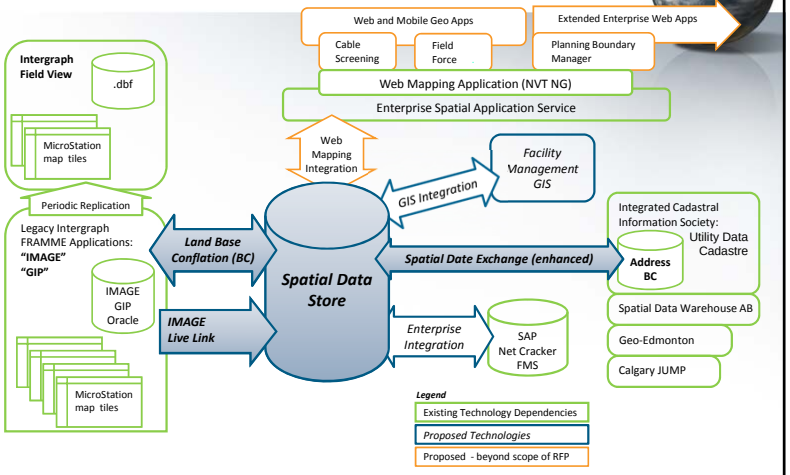
TELUS Geospatial Architecture Overview



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GIS Functionality

A GIS is a computer-based system that provides the following five sets of capabilities to handle ***georeferenced data*** and associated ***non-spatial attributes:***

1. Data Input
2. Data Management
3. Data Update
4. Data Analysis
5. Data Output

- derived from Star & Estes, 1990

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What is GIS for?

- A GIS can help answer questions such as:
  - What is the shortest route from A to B?
  - What is the quickest route from A to B?
  - Where is the best location for our new hospital?
  - What has changed in this region since the last census?
  - What spatial patterns exist in the soils analysis data?
  - How much more land will flood if the dam is 10m higher?
  - Where is the best place to drill for natural gas in this area?
  - How much will our creek reclamation project cost?

Brief video on what a GIS is:
http://www.youtube.com/watch?v=kEaMzPo1Q7Q&feature=related

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Who Uses GIS?

- Business
  - banks, retail, insurance, couriers
- Government
  - Federal, Provincial, Municipal
- Education and Science
  - Research, Libraries & Museums, School Boards
- Environment and Conservation
  - water resources, land management, wildlife, vegetation conservation, endangered species
- Natural Resources
  - Forestry, Agriculture, Mining, Oil & Gas
- Utilities
  - Electricity, gas, telephone networks, water and wastewater management
- Others…

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Geographic Data - Components

Component	Description	Examples
Spatial Data a.k.a. geography, map data, graphics	Position/location Shape Size	Fire Hydrant is point feature located at: X=654321mE, Y=5234567mN
Attributes a.k.a. table, properties, fields	Characteristics Textual information Facts describing the feature	• Capacity = 25 gal/min • Manufact = ACME • Installed = 4 Dec 1954 • LastTest = 9 Jul 2009 • ValveID = V02468 • MainID = W13579
Topology explicit (stored) or implicit (calculated dynamically)	Relationships with other spatial data (adjacent, contained, overlapping, touching, coincident, near, intersecting, etc.)	• At corner of Ontario St and East 4th Ave • Closest building is 24 East 4th Ave • In Mount Pleasant ward

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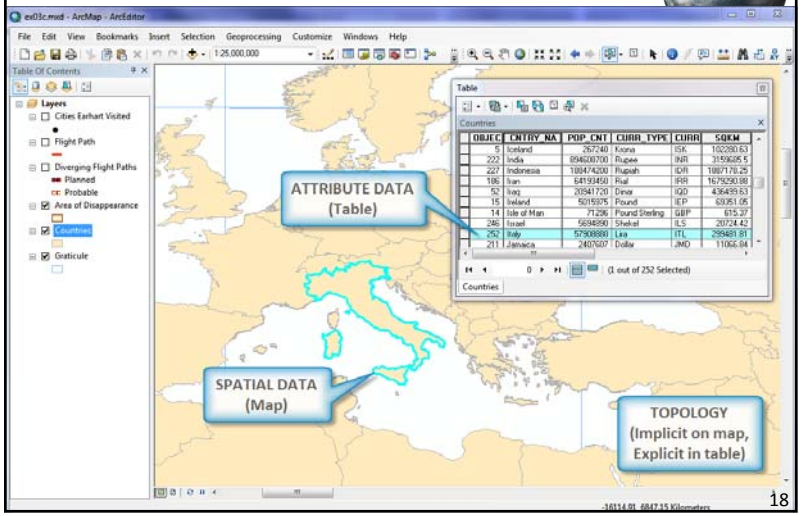
Geographic Data - Components



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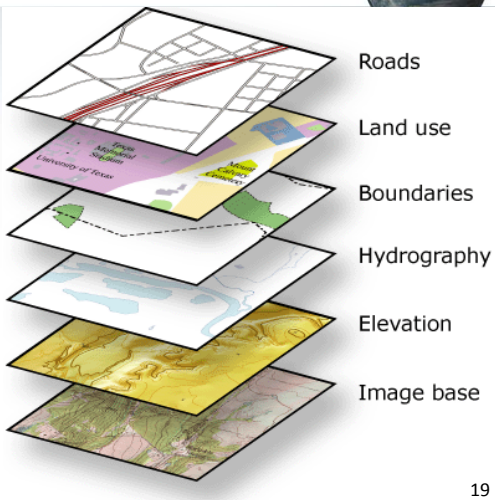
GIS Layers

- Fundamental organizational approach for spatial data
- Usually a single geometry type: polygon, line, point, or raster
- Each layer represents a feature class



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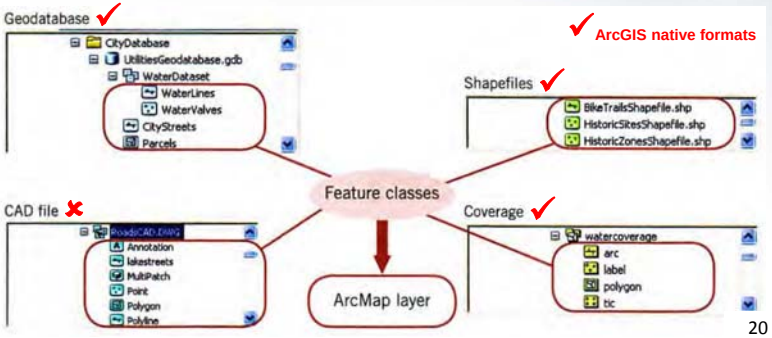
Feature Class

- **A collection of geographic objects of the same kind**
  - Same concept as an **Entity Class** in database environment but **Feature Class** members are *geographic* entities
  - Represented by point, line, or polygon geometry
  - Stored in Coverage, Shapefile, Geodatabase (or CAD file):



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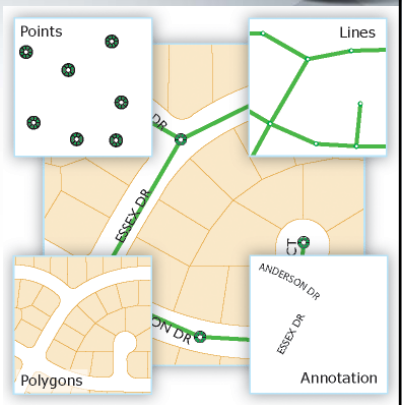
Feature Types (geometry)

- Vector feature class composed of a single geometry:
  - Polygon (or Area)
  - Line (or Arc)
  - Point
- Less common:
  - Annotation
  - Dimension
  - Multipoint
  - Multipatch



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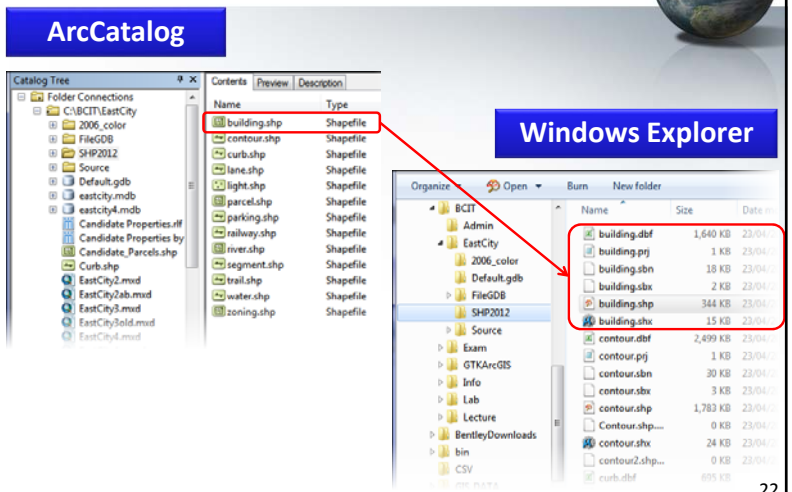
Shapefile Views



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Software - ESRI ArcGIS

- **ESRI**
  - Environmental Systems Research Institute, Inc.
  - **www.esri.com**
- **ArcGIS**
  - ArcGIS software used all over the world
  - Wide range of products, functionality, and pricing
- This course uses:
  - ArcGIS Desktop, ArcInfo license, Version **10.3**
- Many GIS products available:
  - Commercial ($$$) and open source (free)
  - e.g. GeoMedia, MapInfo, Quantum, GRASS
  - Some CAD products have GIS capabilities

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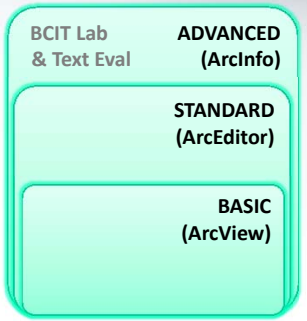
ArcGIS Desktop – Levels of Functionality

Three levels of functionality (a.k.a. Licence Levels):

- **Basic** (ArcView)
  - Map Creation
  - Interactive Visualization
- **Standard** (ArcEditor)
  - Multiuser Editing
  - Advanced Data Management
- **Advanced** (ArcInfo)
  - Advanced Analysis
  - High-End Cartography
  - Extensive Database Management



Source: http://www.esri.com/software/arcgis/about/gis-for-me.html

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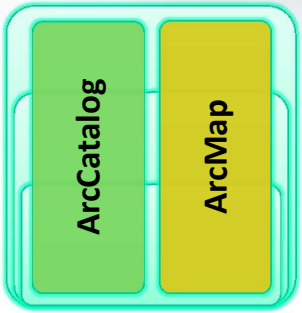
ArcGIS Desktop - Applications

- ArcGIS consists of two main applications
- Installed on your computer or on a server
- Available on all three ArcGIS functionality levels

- **ArcCatalog**
  - Browse, organize, and document spatial data
  - Manage spatial data – create, copy, paste
- **ArcMap**
  - Edit spatial data
  - display multiple data sets
  - Symbolize data
  - query spatial & attribute data
  - analyze spatial relationships
  - design map layouts



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ArcGIS Desktop - Extensions

- Add-on applications:
  - **ArcGIS 3D Analyst** - analyze your data in a three dimensions
  - **ArcGIS Geostatistical Analyst** - advanced statistical tools to explore trends in your data
  - **ArcGIS Network Analyst** - perform sophisticated routing, proximity and service area analysis.
  - **ArcGIS Spatial Analyst** - derive answers from your data using advanced spatial analysis
  - **ArcGIS Publisher** - share your maps and data with a wide range of users.
  - …and many more.

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Accessing ArcGIS Software

- ArcGIS 10.3 available for this course
- Web-based access to software (from anywhere):
  - **http://appsanywhere.bcit.ca**
- At BCIT, you can also access it from Start menu:
  - **All Programs > Citrix Receiver**
- Outside BCIT, open web browser and enter URL above
- Can also install ArcGIS on your own computer
  - You get a 6-month evaluation license with book (slide 29)
  - Anyone can get a 2-month evaluation license at esri.com

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The BCIT Lab

- **Logins**
  - Each registered student has a student number
  - Follow login instructions on poster in lab
- **Network**
  - **I: Drive** = IN (or *submit*) folder
    - Copy finished project data from your personal folder (H:) to **I:**
  - **J: Drive** = OUT (or *source*) folder
    - Copy exercise data from J: to your personal folder (H:)
  - **H: Drive** = your HOME (or *personal*) folder
    - work folders: GTKArcGIS (labs), EastCity & Vancouver (projects)
  - Pay for printing with BCIT ID Card
    - Load in library

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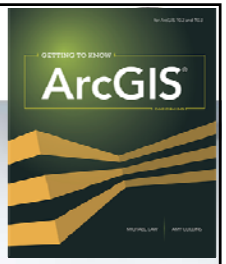
Textbook



- Getting to Know ArcGIS Desktop
  - 4 edn. updated for version 10.3
  - Interface changed little in this version
  - Course covers all (or most) chapters!
    - Chapters 1 & 2: introductory reading
    - Chapters 3 – 20: hands-on exercises with some useful reading
- Comes software evaluation license code
  - Download data for textbook exercises (also on J: drive)
  - 6-month license to download & install ArcGIS (Advanced)
    - installed on your own computer if desired
    - code on inside back cover, instructions on page ix

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Thank You

End of Lecture 1

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