SGHG3583 GIS SOFTWARE SYSTEMS
MGHG1544 GIS APPLICATION DEVELOPMENT

Lecture #2: GIS Software, Part 1

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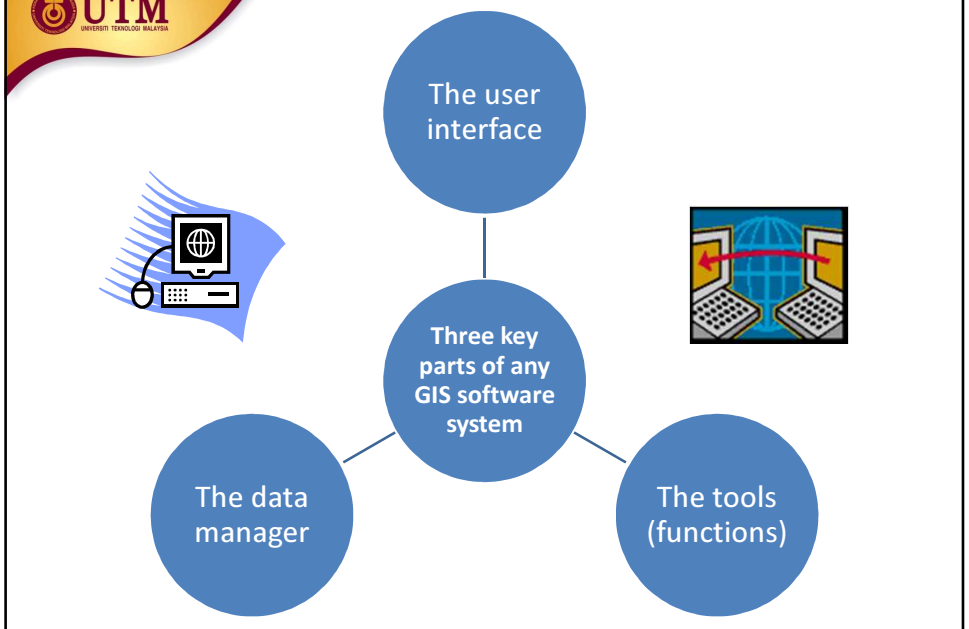
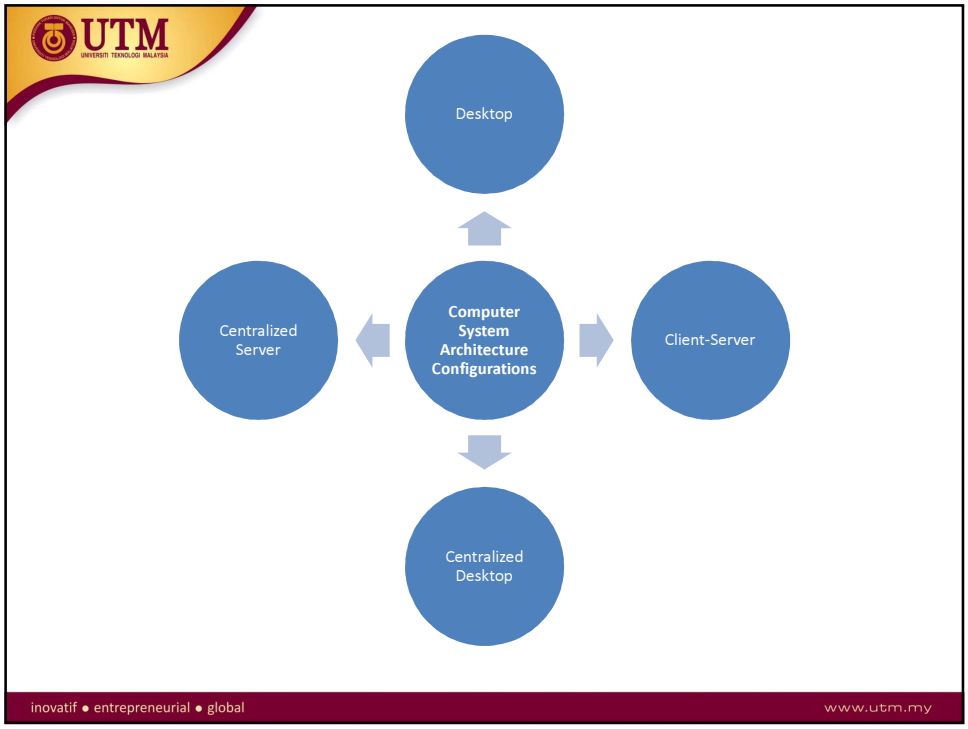
GIS Software

Part 1

GIS Software

- It is the **geoprocessing engine** and a **vital component** of an operational GIS.
- Major functions
  - collect, store, manage, query, analyze and present
- It is made up of **integrated collections of computer programs** that implement geographic processing functions.

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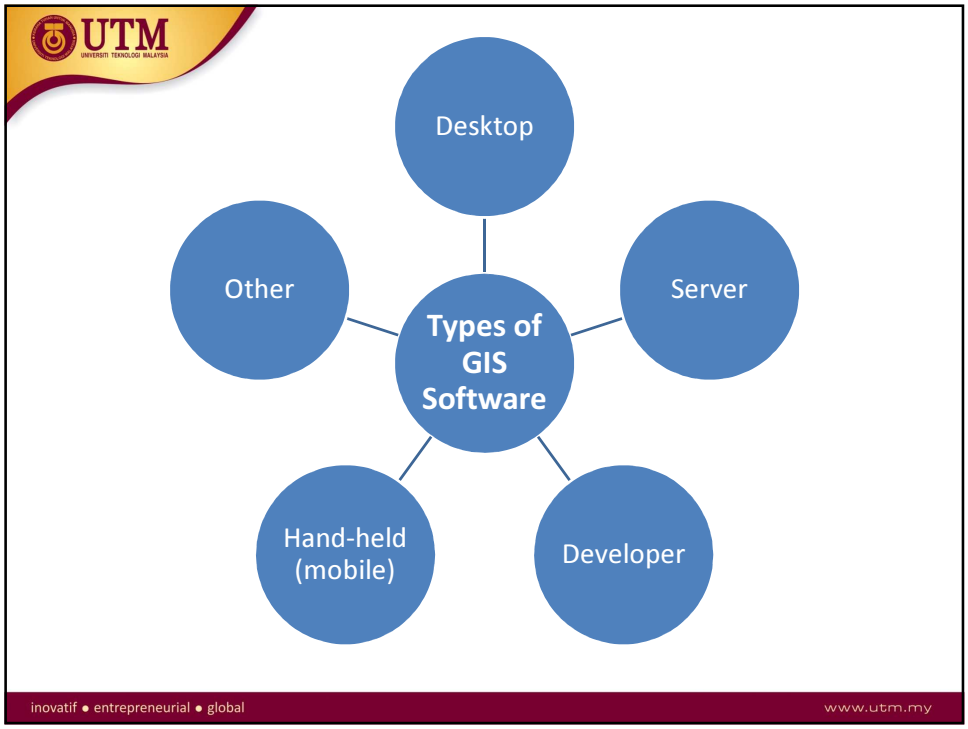
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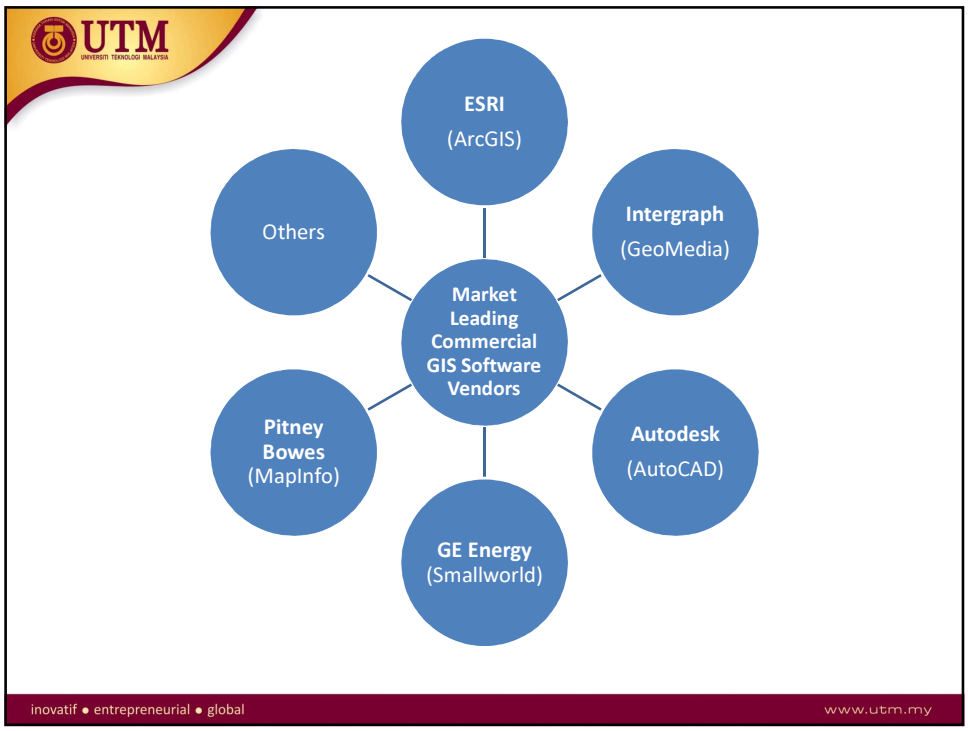


Introduction

- **Programs** are collections of instructions that are used to manipulate digital data in a computer.
- System software programs, such as **computer operating system**, are use to support application software – the programs with which end users interact.
- Integrated collections of application programs are referred to as **software packages or systems**.

Introduction (cont.)

- **GIS software vendors** – the companies that design, develop, and sell GIS software – build on top of basic computer operating system capabilities such as:
  - Security
  - File management
  - Peripheral drivers (controllers)
  - Printing
  - Display Management

Introduction (cont.)

- **GIS software products** are developed with a view to providing users with a **consistent and coherent model** for interacting with geographic data.
- The GIS products usually comprise:
  - an integrated collection of software programs,
  - an installation script,
  - on-line help files,
  - sample data and maps,
  - documentation and
  - associated website.

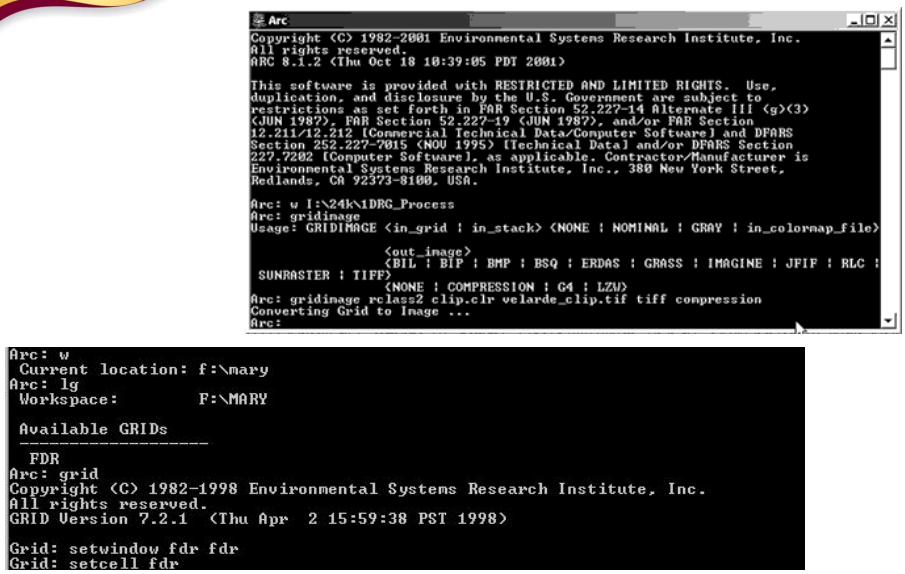
Dominant form of Software Distribution in the Market	Alternative distribution models
• Commercial-off-the-self (COTS) • Media (CD/DVD)	• **Shareware** (intended for sale after a trial period) • **Liteware** (shareware with some capabilities disabled) • **Freeware** (free software but with copyright restrictions) • **Public Domain software** (free with no restrictions) • **Open Source Software** (where the code is provided and users agree not to limit the distribution of improvements)

The Evolution of GIS Software

- In the formative GIS years, GIS software consisted simply of **collections of computer routines** that **a skilled programmer** could use to build an operational GIS.
- During this period **each and every GIS was unique** in terms of its **capabilities and significant levels of resource** were required to create a working systems.

The Evolution of GIS Software (cont.)

- As **software engineering techniques** advanced and the GIS market grew in the 1970s and 1980s, demand increased for **higher-level applications** with **a standard user interface**.
- In the late 1970s and early 1980s the **standard** means of communicating with a GIS was **to type in command lines**.
- **User interaction** with a GIS required typing instructions to, for example, draw a topographic map, query the attributes, etc.



The Evolution of GIS Software (cont.)

- To make the software easier to use and more generic, there were two key development in the late 1980s:
  1. **Command line interfaces** were supplemented and eventually largely replaced by GUIs.
  2. **A customization capability** was added to allow specified purpose applications to be created from the toolboxes.

The Evolution of GIS Software (cont.)

- **Software developers and advanced technical users** could make calls using a high level programming language (such as Visual Basic or Java) to published **application programming interfaces (APIs)** that exposed key functions.
- Together these stimulated enormous interest in GIS, and led to much wider adoption and expansion into new areas.

The Evolution of GIS Software (cont.)

- The ability to create **custom application solutions** allowed developers to build **focused application for end users** in specific market areas:
  - Government
  - Utilities
  - Military
  - Environment
  - Etc.

The Evolution of GIS Software (cont.)

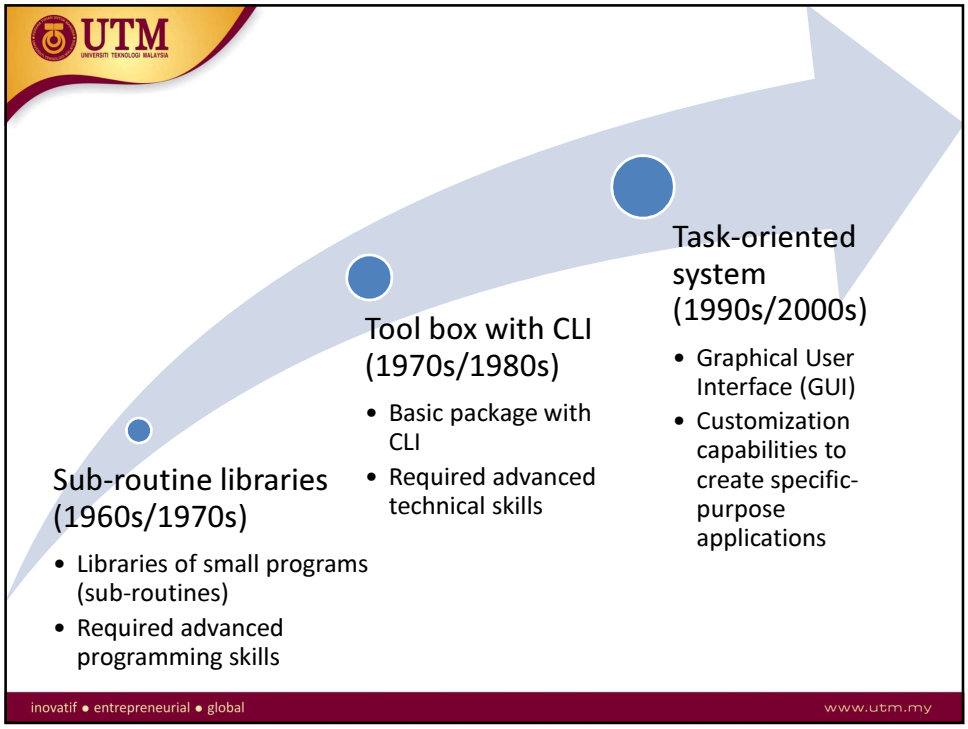
- **New terms were developed** to distinguish these subtypes of GIS software:
  - Planning Information Systems
  - Automated Mapping/Facility Management (AM/FM) systems
  - Land Information Systems (LIS)
  - Location-Based Services (LBS) Systems

The Evolution of GIS Software (cont.)

- In the last few years, a new method of software interaction has evolved that allows software systems to **communicate over the Web** using a **Web Services** paradigm.
- **A Web services** is an application that exposes its functions via a well-defined **published interface** that can be accessed over the Web from another program or Web service.

The Evolution of GIS Software (cont.)

- This new software interaction paradigm will allow **geographically distributed GIS functions to be linked together** to create complete GIS applications.
  - For example, a market analyst who wants to determine the suitability of a particular site for locating a new store can start a small browser-based program on their desktop computer that links to remote services over the Web that provide access to the population census and geodemographics data, as well as analytical models.



Architecture of GIS software

- Usually, GIS is first introduced into organizations in the context of **a single**, **fixed-term project**.
- The technical components (network, hardware, software, and data) of an operational GIS are assembled for the duration of the project, which may be from several months to a few years.
- Data are collected specifically for the project and typically little thought is given to reuse of software, data, and human knowledge.

Architecture of GIS software (cont.)

- In larger organizations, multiple projects may run one after another or even in parallel.
- The one off nature of the projects, coupled with an absence of organizational vision, often leads to **duplication**, as each project develops using different hardware, software, data, people, and procedures.
- **Sharing data and experience** is usually a low priority.

Architecture of GIS software (cont.)

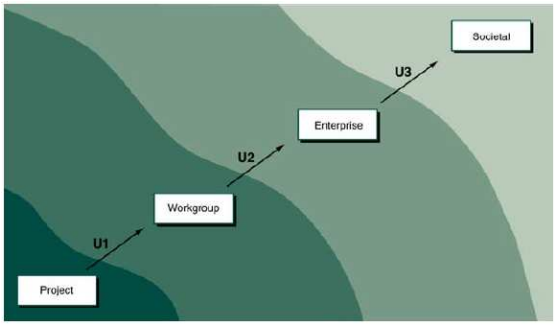
- As interest in GIS grows, to save money and encourage sharing and resource reuse, several projects in the same department may be **amalgamated**.
- This often leads to the creation of **common standards**, development of a focused GIS team, and procurement of new GIS capabilities.
- Yet it is also quite common for different departments to have different GIS software and data standards.

Architecture of GIS software (cont.)

- As GIS becomes more pervasive, organizations learn more about it and begin to become dependent on it.
- This leads to the realization that GIS is a useful way to structure many of the organization's assets, processes, and workflows.
- Through a process of natural growth, and possibly further major procurement (e.g., purchase of upgraded hardware, software, and data), GIS gradually becomes accepted as an important **enterprise-wide information system**.

Architecture of GIS software (cont.)

- At this point **GIS standards** are accepted across multiple departments, and resources to support and manage the GIS are often centrally-funded and managed.



To Read

1. ***GIS Evolution and Future Trends.***

   http://www.innovativegis.com/basis/mapanalysis/Topic27/Topic27.pdf

2. ***Software Technology.***

   http://downloads2.esri.com/ESRIpress/images/141/BAGIS_02.pdf

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