Introduction to

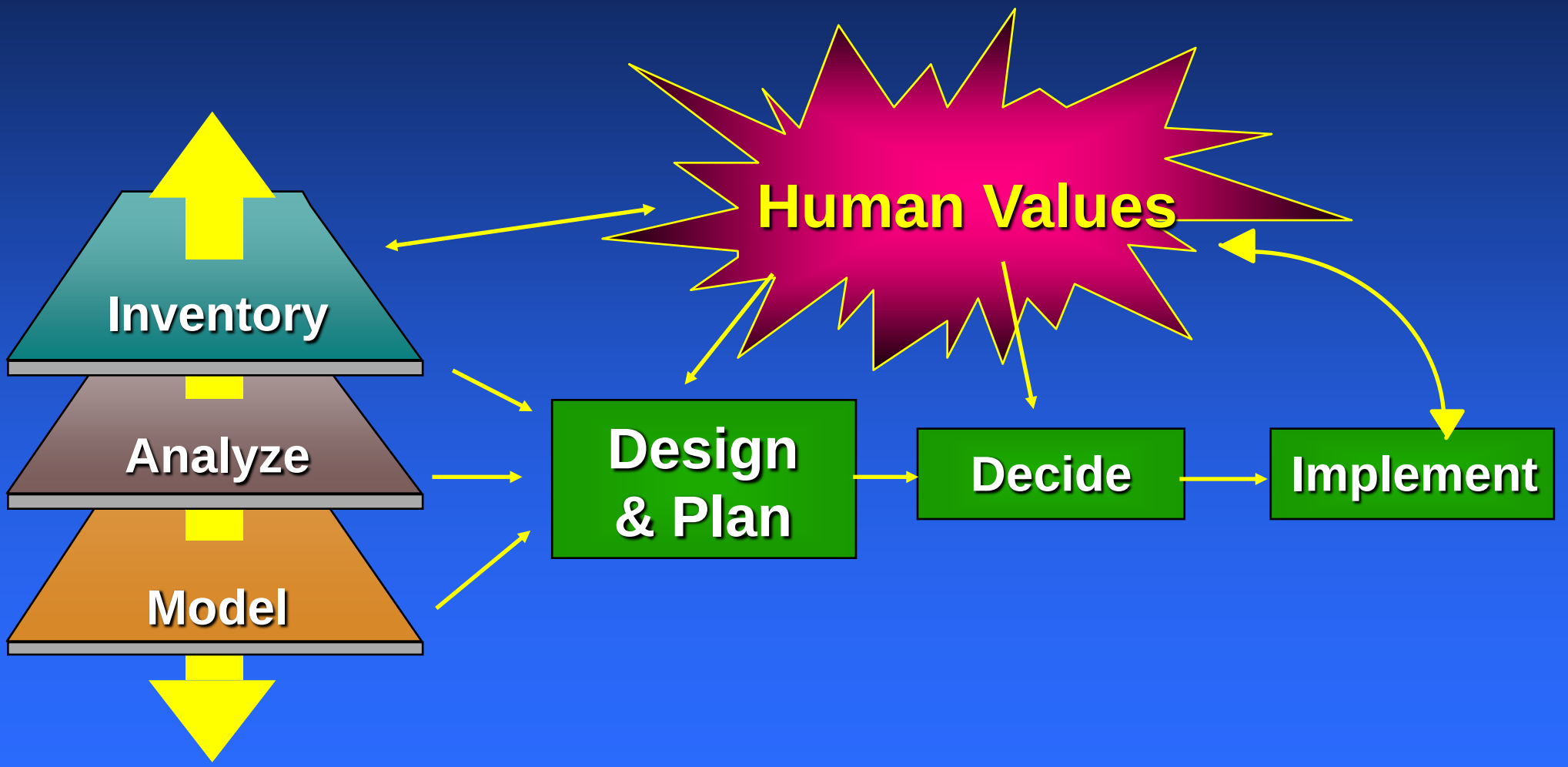
Geographic Information System

GIS

IF4035 Basisdata Non RELASIONAL

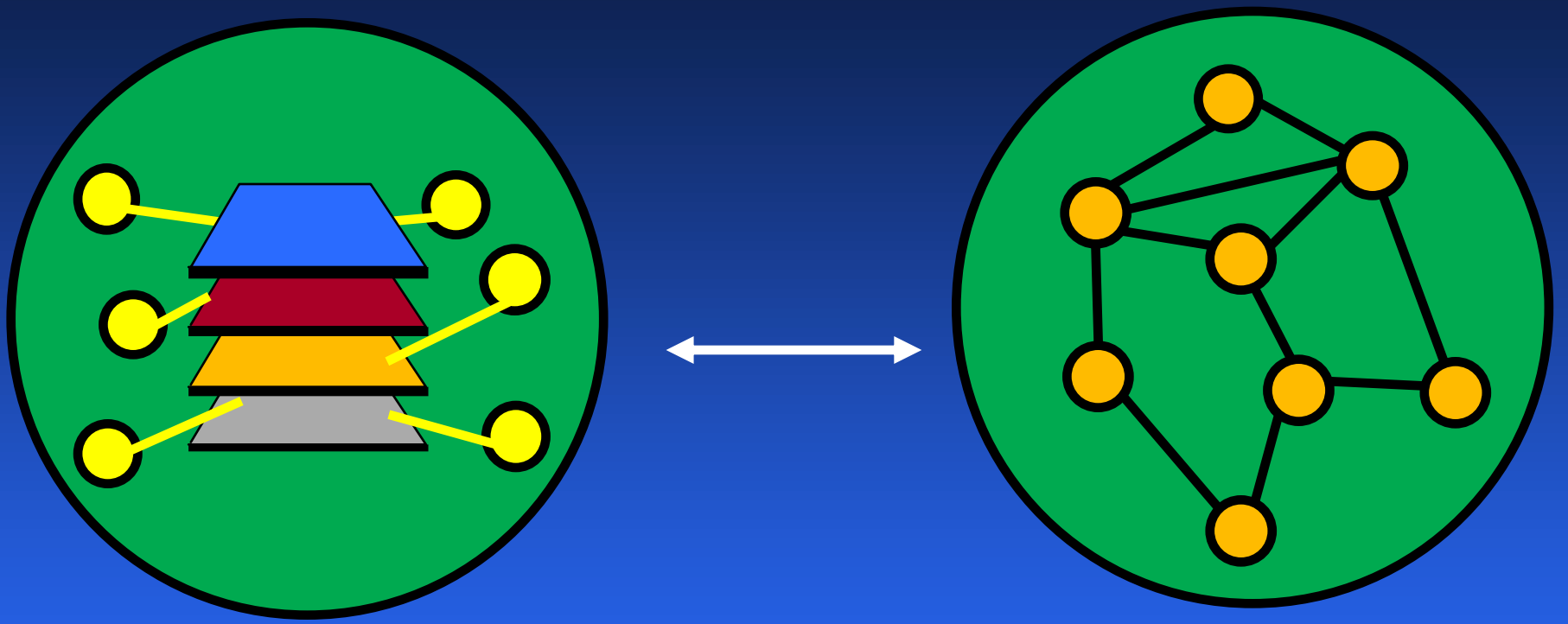
By
Hira Laksmiwati

GIS: Creating a New World…



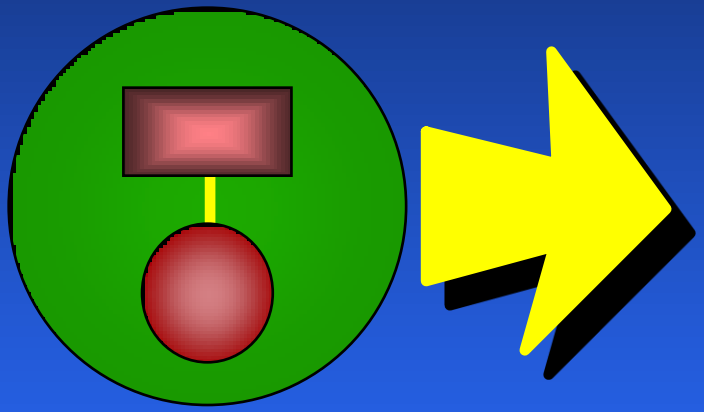
GIS

Network Computing

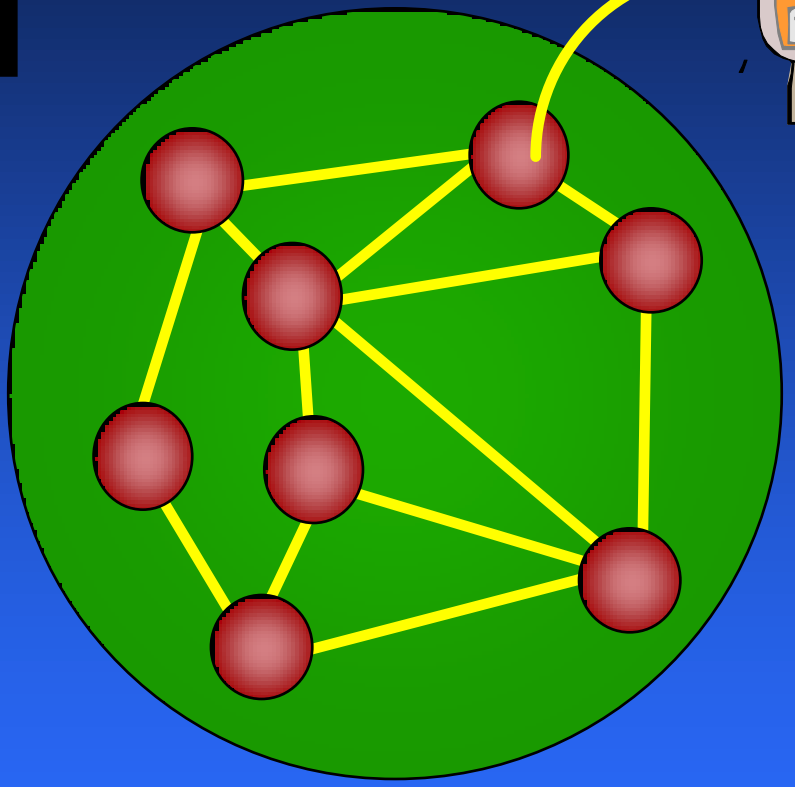


Integration of Two Technologies

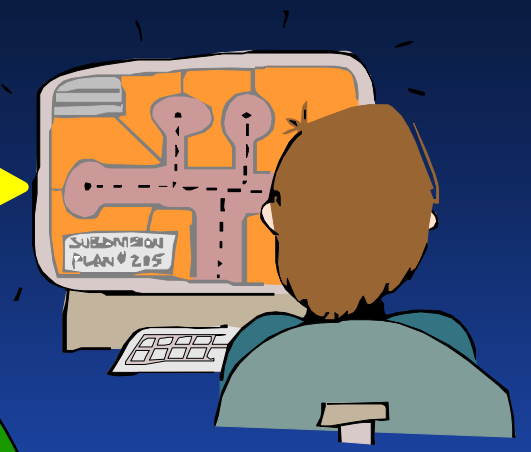
GIS Data



Collected for Specific Project or System



Published and Shared with Many Users



What is GIS?
(The “Personal” Definition)

Software for Managing
Spatial (Mappable) Information

What Do We Know About Maps?

Types of Maps (Familiar Examples)

- Street Maps
- Environmental Maps
- Census Maps
- Satellite Imagery

What Do We Know About Maps?

Information on a Typical Map

- Location of an Object
- Information About an Object

What Do We Know About Maps?

Problems Using Maps

- Objects Can be Off the Map
- Information Can be Missing or Out of Date
- What You See is What You Get (Static)

GIS Makes Static Maps Dynamic

- Move Around Using pan/zoom/jump
- Change Symbology: lines/colors/icons/fonts
- Show Multiple Information Sets
- Turn Information Sets on/off

GIS Provides a Worksheet for Mapping Spatial Information

- Projection
- Orientation
- Coordinate System
- Scale
- Spatial (Visual) References

GIS Maps Spatial Objects as Graphic Features

- Points
- Lines
- Polygons
- Symbols
- Text

GIS Links Graphic Features to Tabular Data (Attributes)

- Spatial Coordinates
- Symbology
- Descriptive Information

GIS Displays Spatial Data as Themes

- Spatial Data = Features + Attributes
- Themes Can be Turned On and Off
- Themes Can be Layered
- Theme Data Can be Scale Dependent

What Can GIS Do For Us?

- Provides Common Spatial Data Format
- Promotes Data Sharing
- Enhances Communication
- Facilitates Decision Making

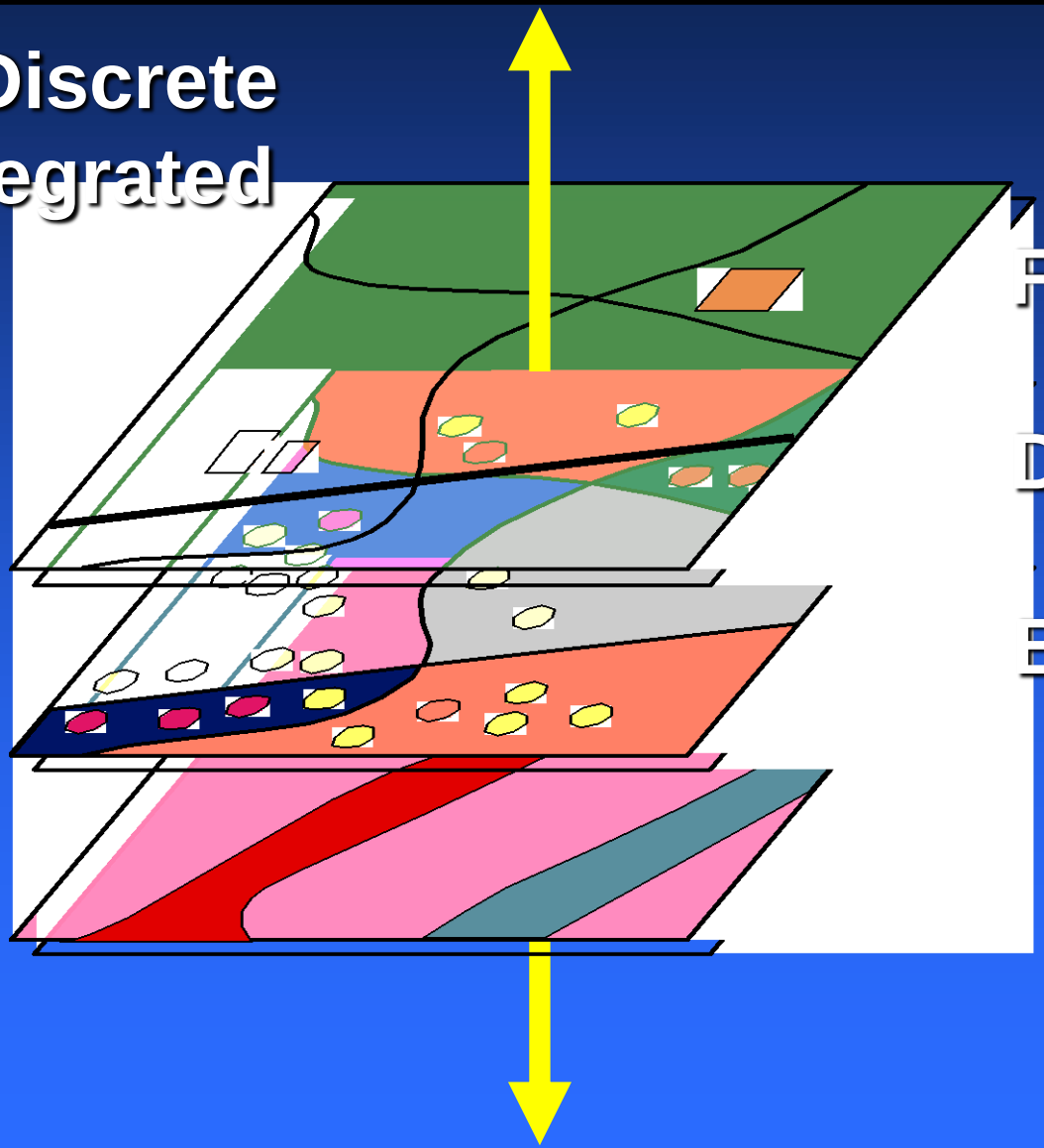
What is GIS? (The "Systems" Definition)

- **Hardware**
  - Computers
  - Networks
  - Graphic Devices
- **Software**
  - GIS Software
  - Database Software
  - OS Software
  - Network Software
- **Data**
  - Vector Data
  - Raster Data
  - Image Data
  - Attribute Data
- **People**
  - Administrators
  - Managers
  - GIS Technicians
  - Application Experts
  - End Users
  - Consumers
- **Approaches**
  - Guidelines
  - Specifications
  - Standards
  - Procedures

Fundamental GIS Architecture

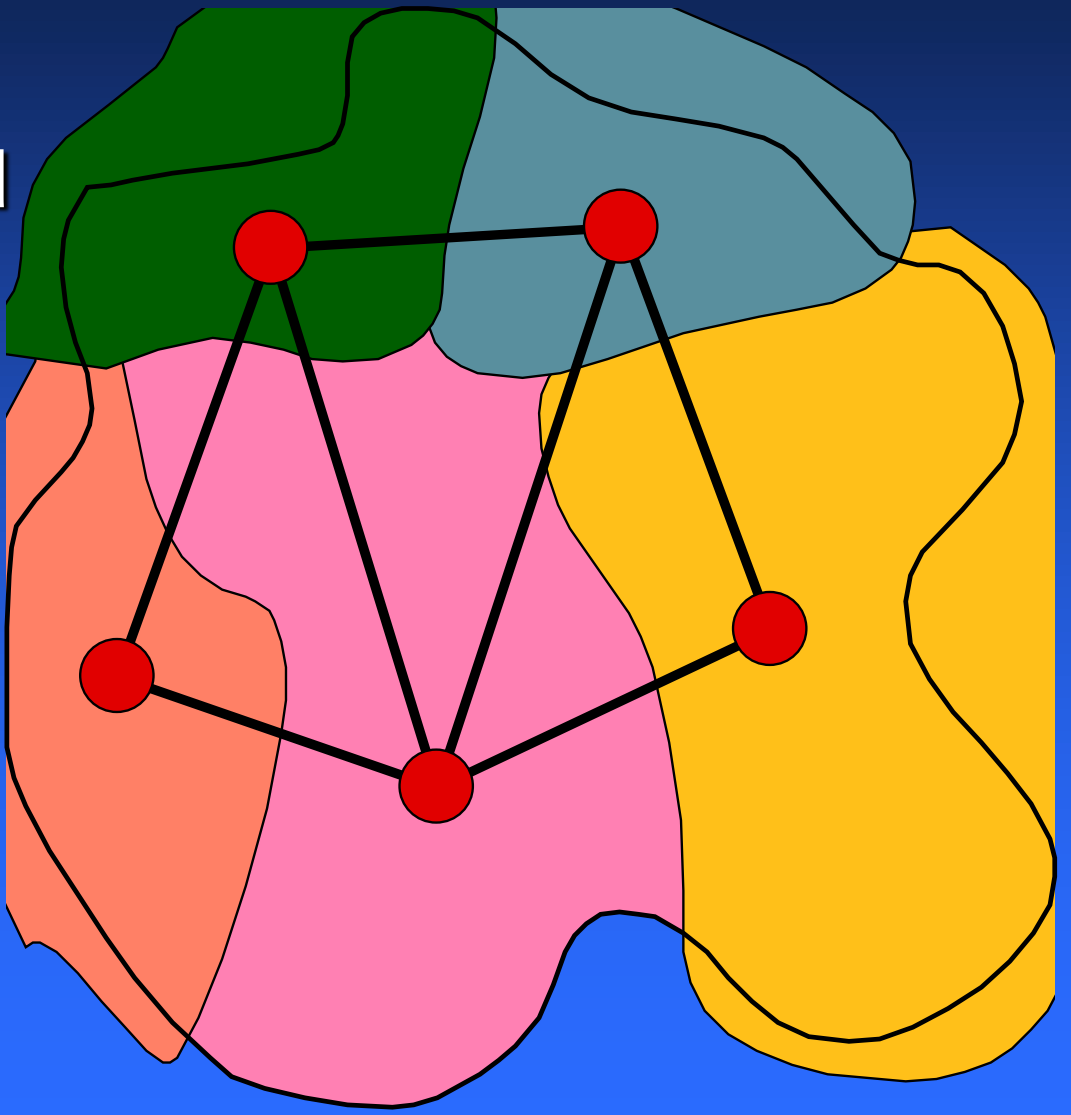
Thematically Distributed GIS

- Physically Discrete
- Virtually Integrated

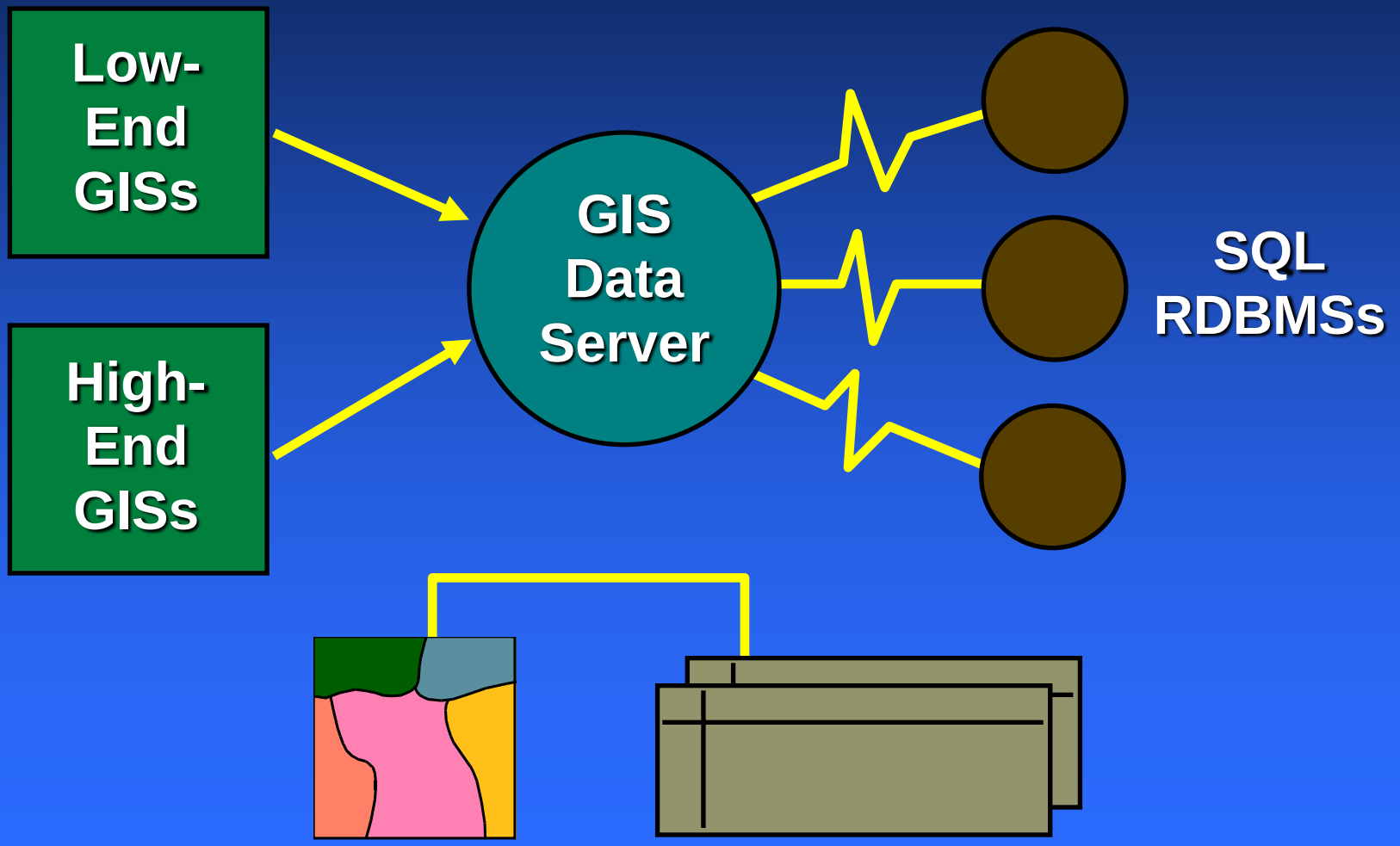


Spatially Distributed GIS

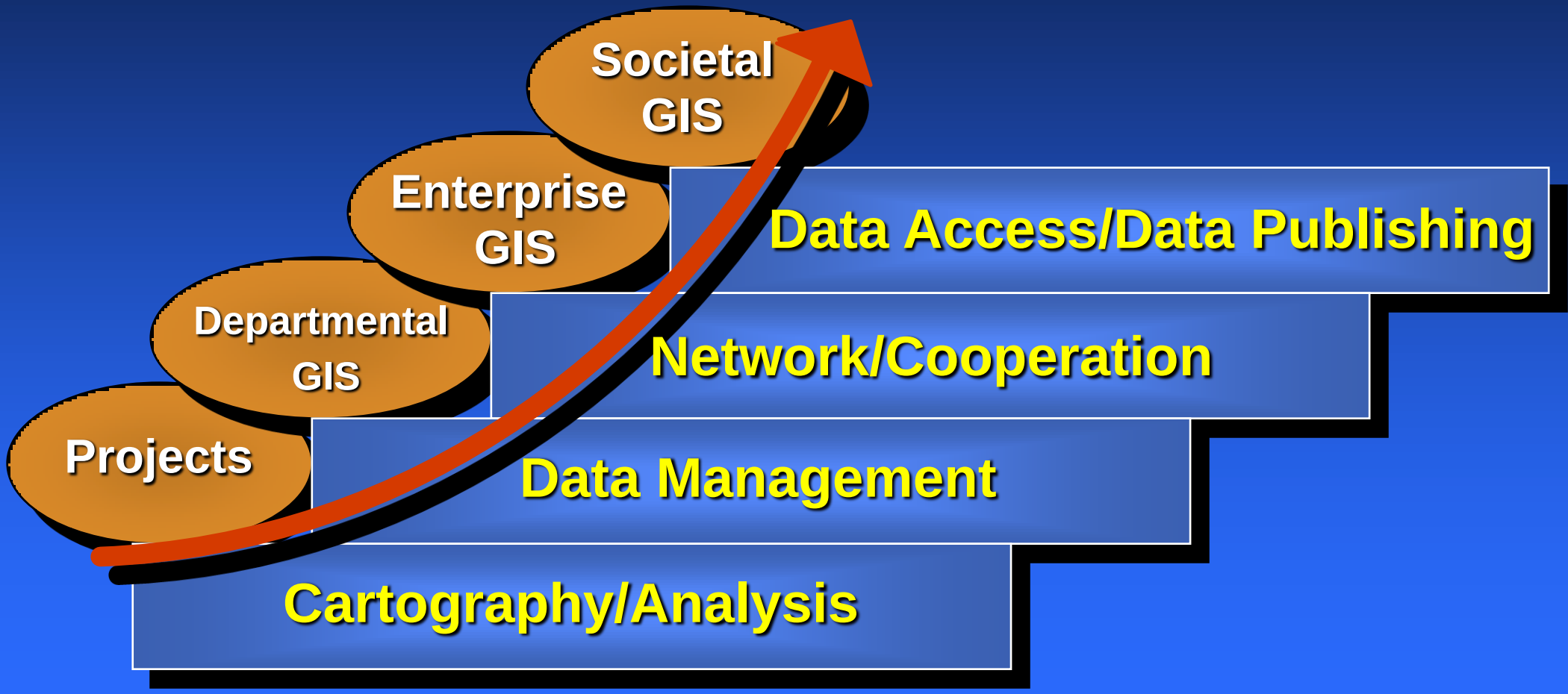
- Physically Distributed
- Virtually Continuous



Logical GIS Architecture



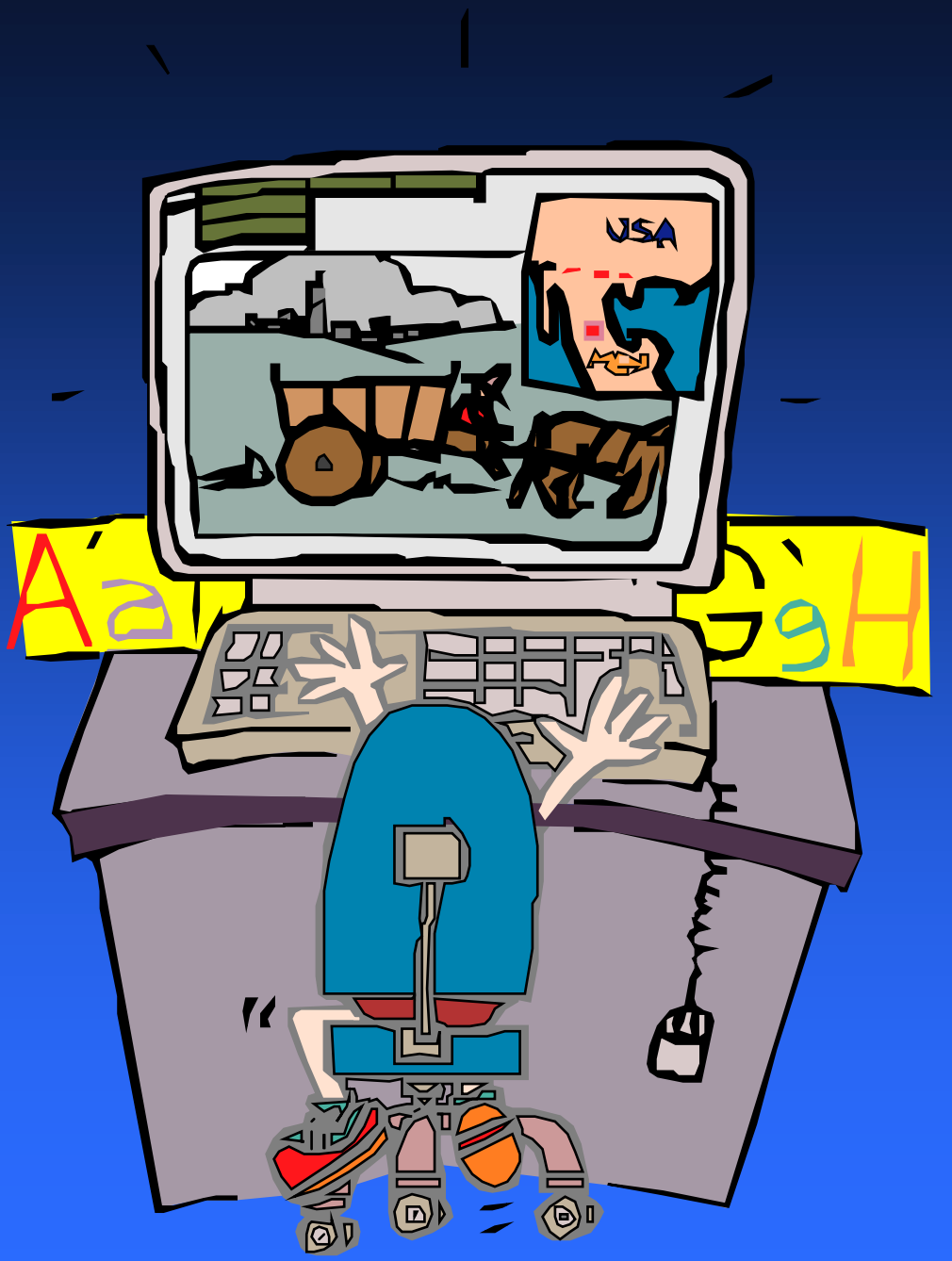
GIS Evolution



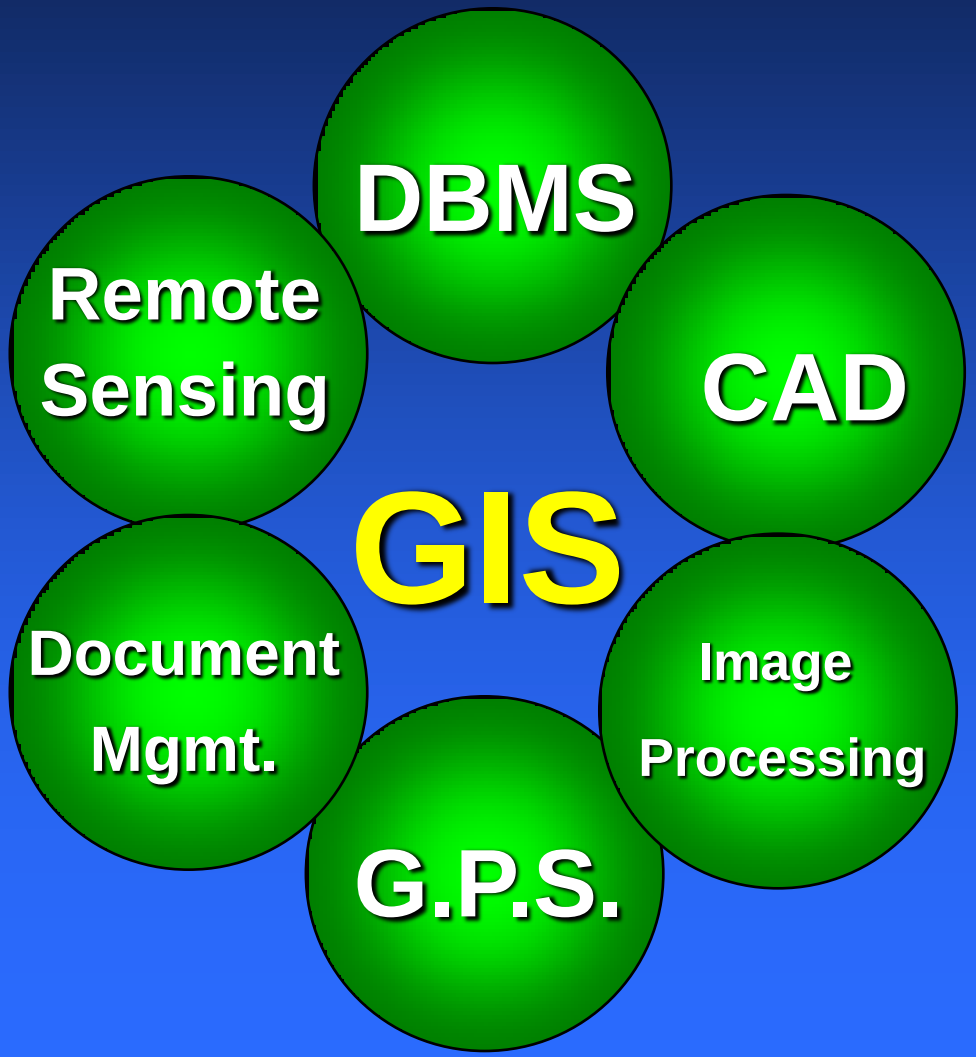
Desktop Technology Will Spread the Use of GIS Throughout Society

Vision

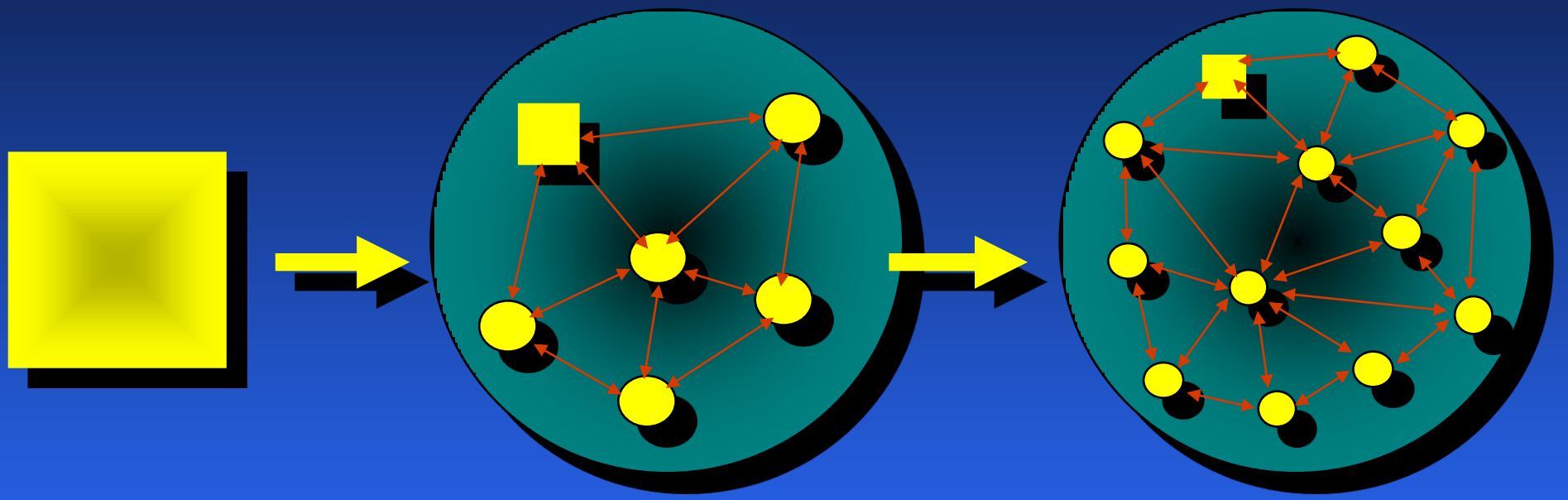
Preschoolers Access the World



Related Technologies



GIS Trends



Stand Alone GIS

Networked GIS (Local)

Networked GIS (Global)

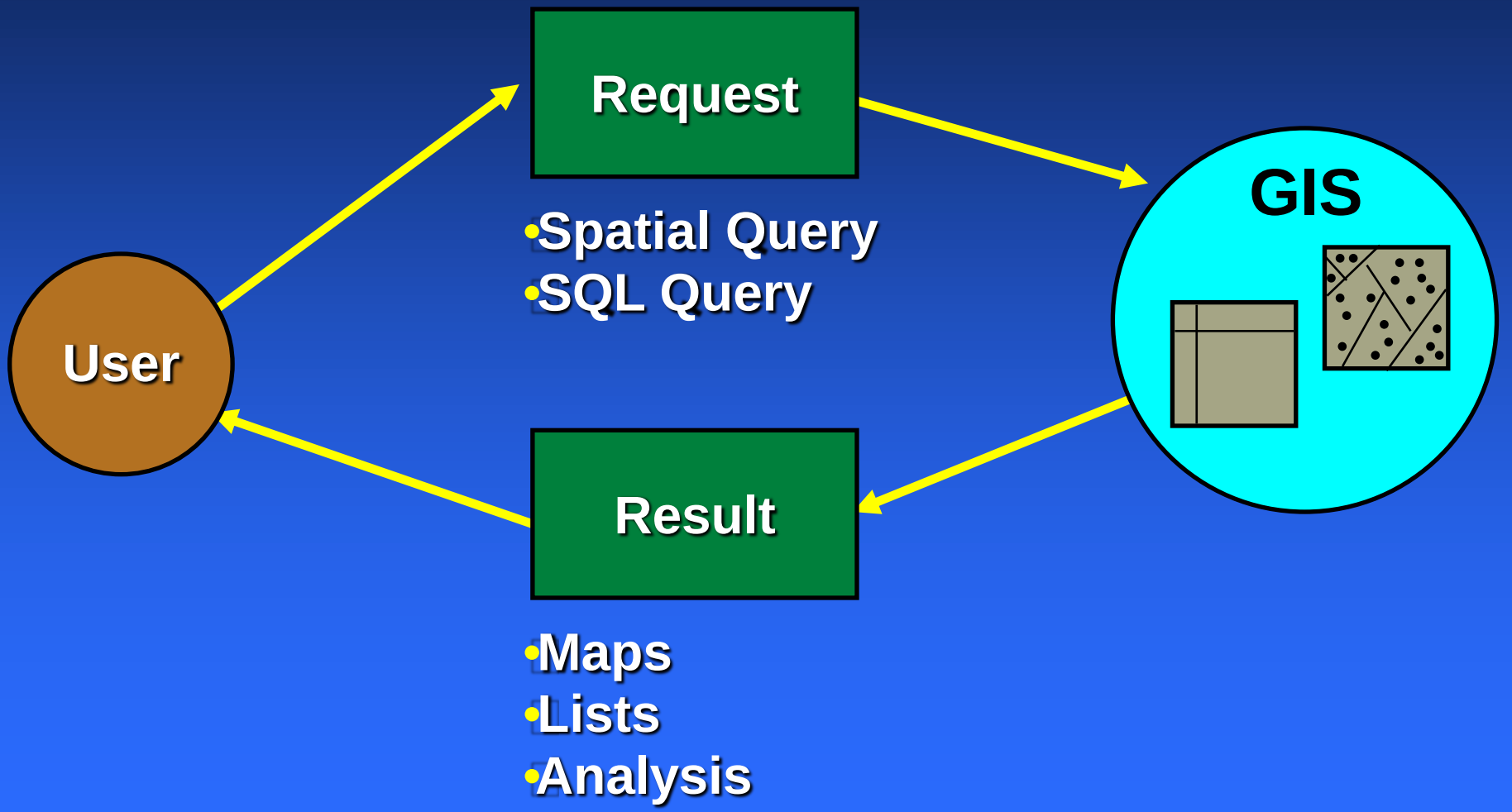
GIS Will Be Based on 3 Types of Technology

- Desktop GIS
- Professional GIS
- Information System Based GIS

Why Is GIS Relevant to Schools?

- Geographic Literacy
- Environmental Awareness
- Sense of Place and Community
- Introduction to Basic Mathematics and Science

GIS on the Network

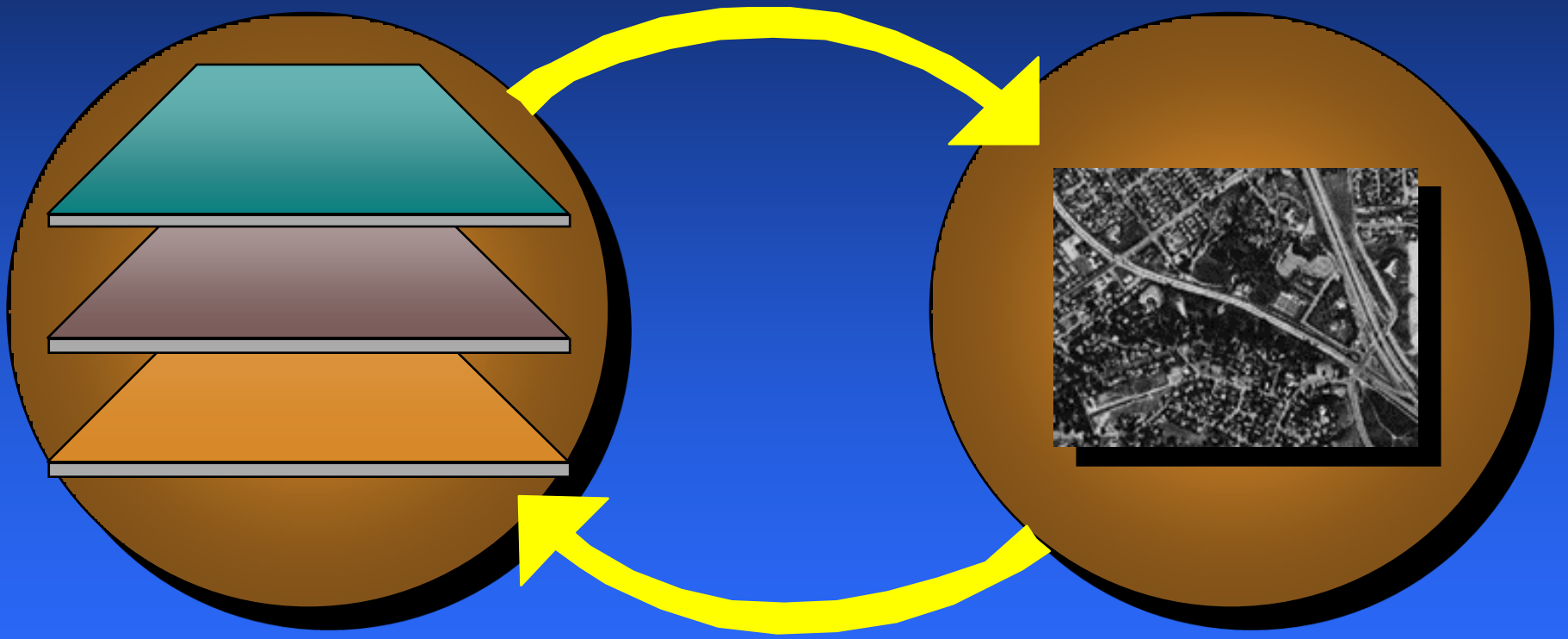


We Use GIS…

- Data Management
- Improved Efficiency
- New Methods
  - Integrative
  - Analytic
  - Cross-cutting
  - Visual
  - Comprehensive

…for Better Decisions

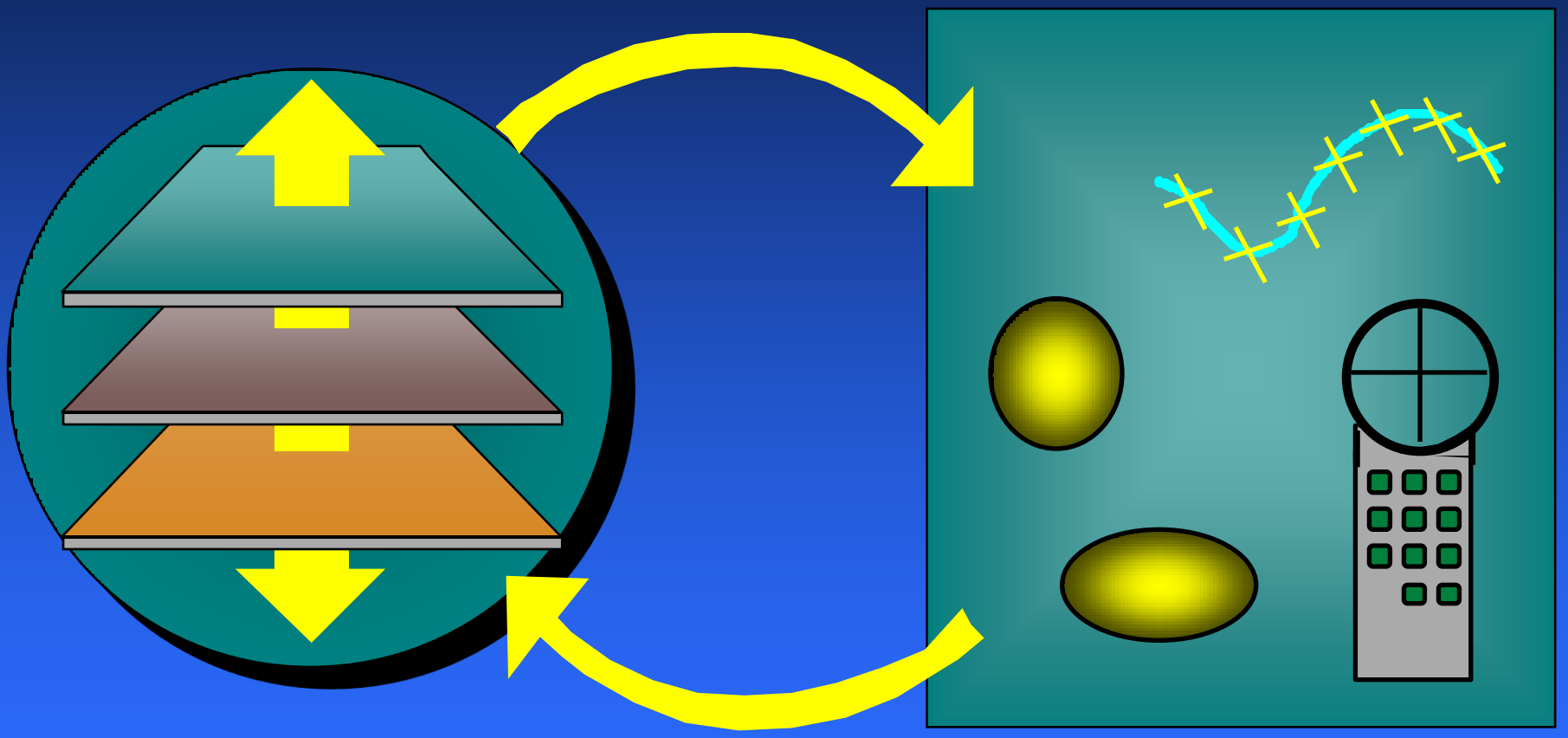
Linkages



GIS

Image Processing

Linkages

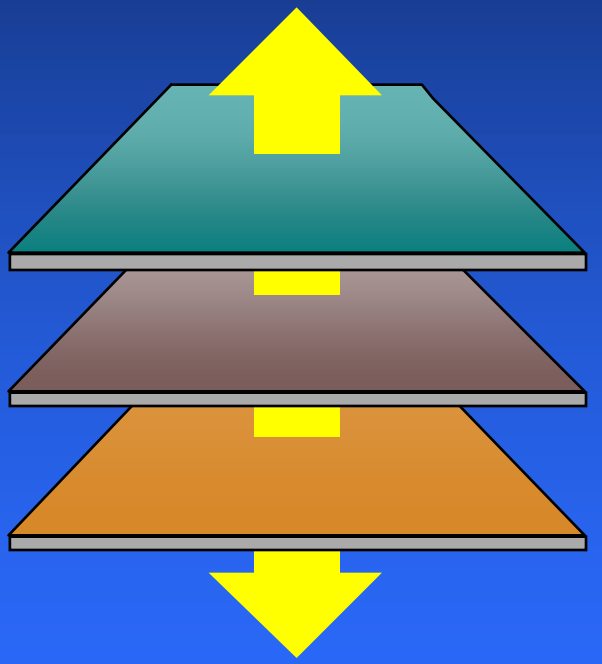


GIS

CAD/Engineering

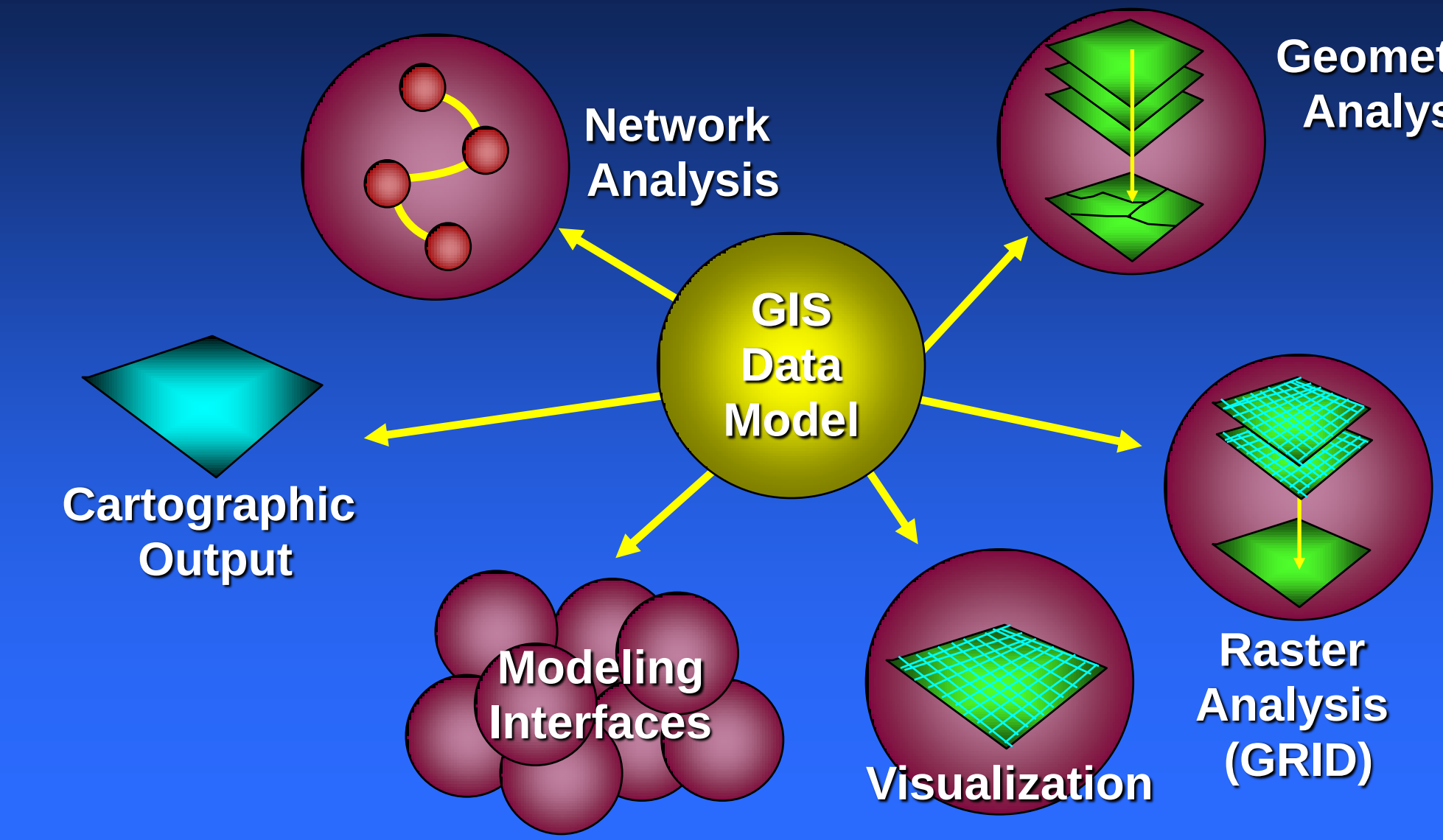
GIS

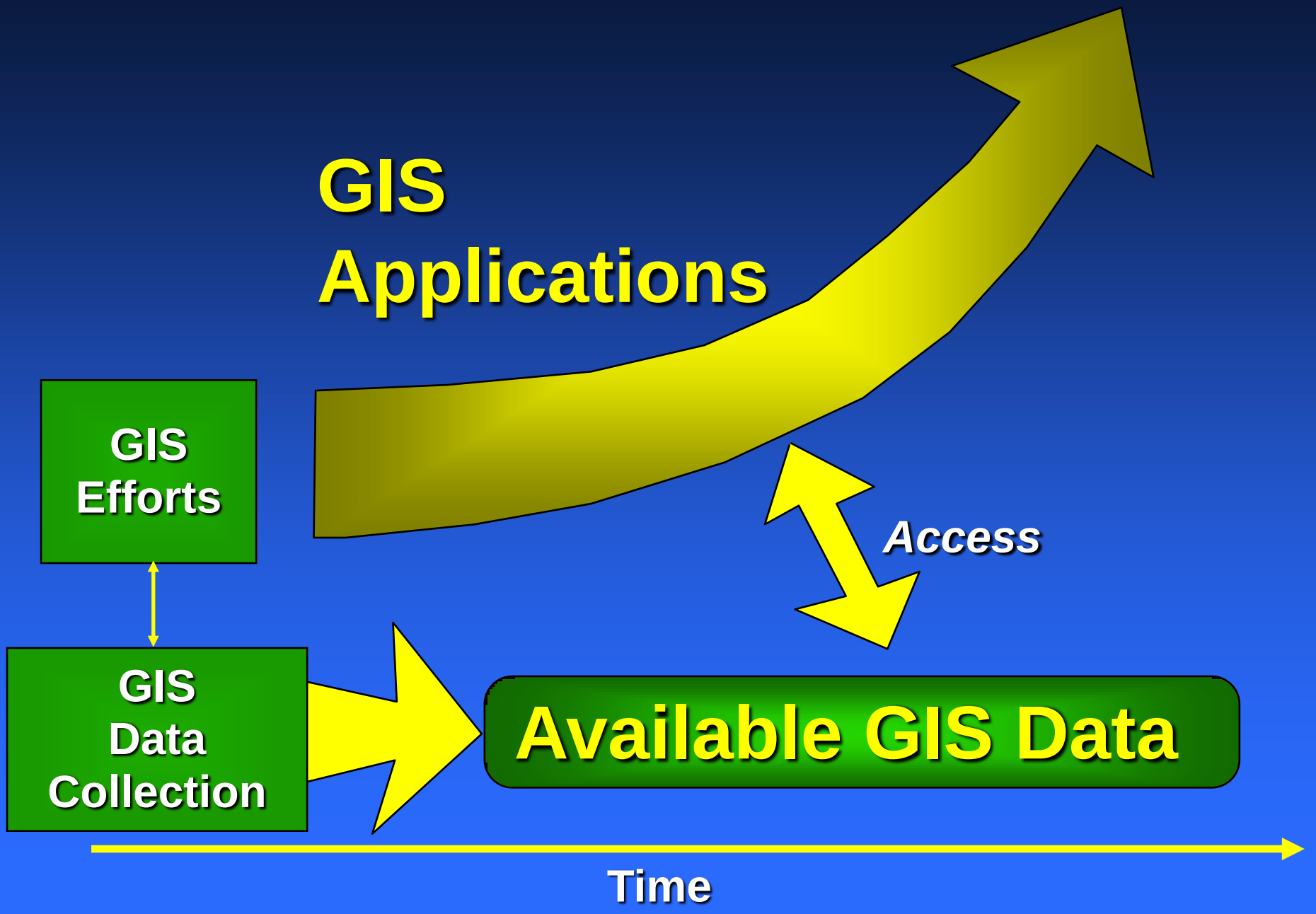
Expands Our Insights



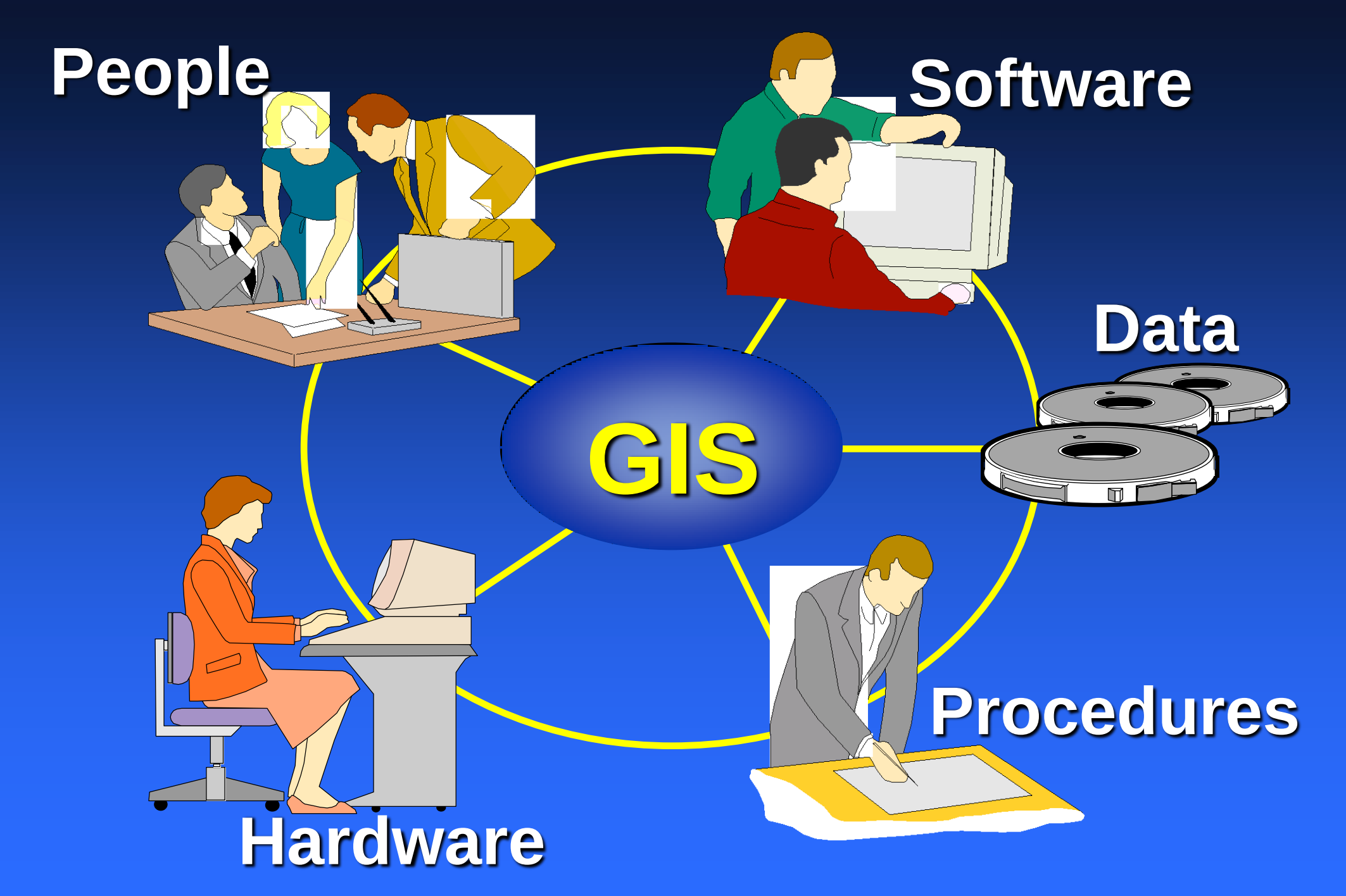
A Powerful Learning Environment

Spatial Analysis




GIS
Applications
GIS
Efforts
Access
GIS
Data
Collection
Available GIS Data
Time

GIS Is a Lot More Than Just Technology…


People
Software
Data
GIS
Procedures
Hardware

GIS Software Functions

- Data Entry
  - Digitizing, Data Conversion, Attribute Entry
- Data Management
  - Efficient, Nonredundant Storage
- Data Manipulation and Analysis
  - Projection Management
  - Buffers and Overlays
  - Query and Selection
- Map Updating
  - Graphic and Attribute Editing
- Display and Output
  - Cartographic Design, Plotting, Reporting

Benefits of Using GIS

- Typical Benefits of Using Automation (Cost Savings)
- Better Data Management (More Efficient Storage and Updating)
- Faster Information Access (Better Decisions)
- Operational Efficiencies
- New Applications

GIS Application Areas

- Base Mapping
- Oil and Gas Exploration
- Planning and Zoning
- Forest Resource Inventory
- Demographic Analysis
- Water Resources
- AM/FM
- Demographic Analysis
- Tax Assessment
- Cartographic Production
- Geologic Mapping
- Public Safety
- Land Records
- Transportation
- Legislative Redistricting
- Environmental Analysis
- Teaching and Research
- Many Others

GIS Functions

- Make Maps (Customers, Markets, Competition)
- Site Facilities
- Route Vehicles
- Analyze Markets
- Understand Consumer Patterns
- Target Customers
- Allocate Sales Territories
- Allocate Customers to Facilities/Territories
- Allocate Dealers
- Manage Assets (Land, Facilities)
- Risk Assessment
- Sales Analysis

GIS Functions

- Site Selection
- Market Analysis
- Demographic Analysis
- Territory Allocation
- Customer Mapping
- Facility Management
- Assets Management
- Risk Assessment
- Vehicle Routing
- Competitive Analysis
- Targeting Customers
- Dealer Networks
- Sales Forecasting
- Sales Performance
- Market Share Penetration
- Lead Tracking
- Trade Area Analysis
- Map Presentations
- Inventory Management
- Property Acquisition/Disposal

GIS Functions

- Site Selection
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GIS Functions

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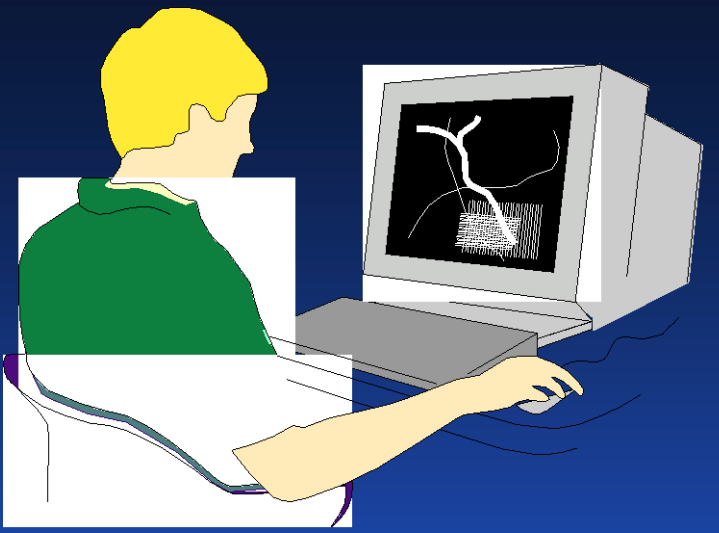
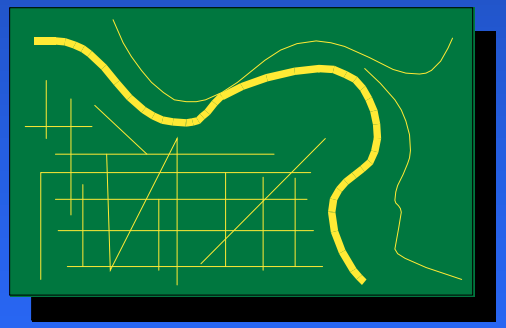
High-End GISs Do Far More Than Just Display Maps



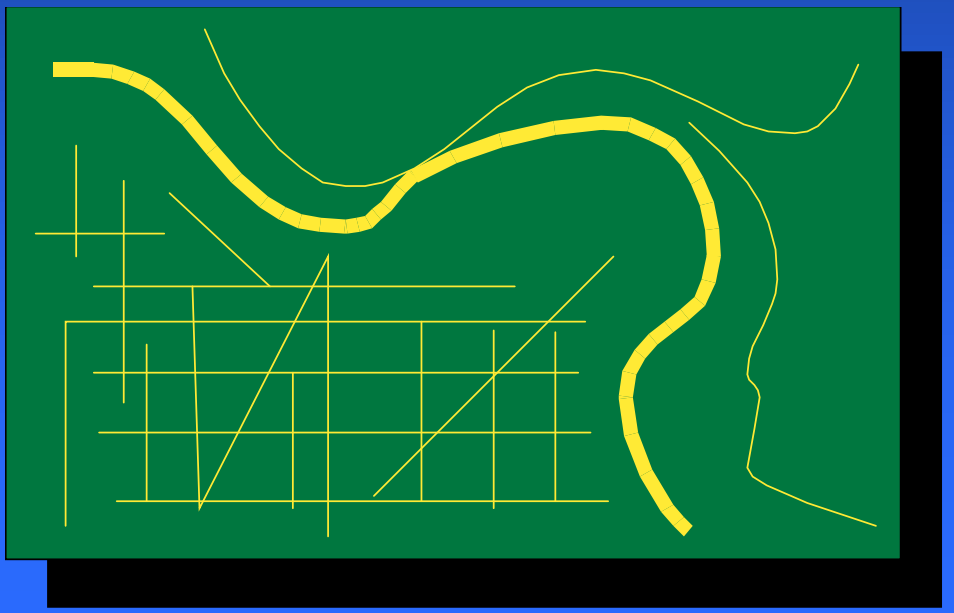
High-End Desktop GISs



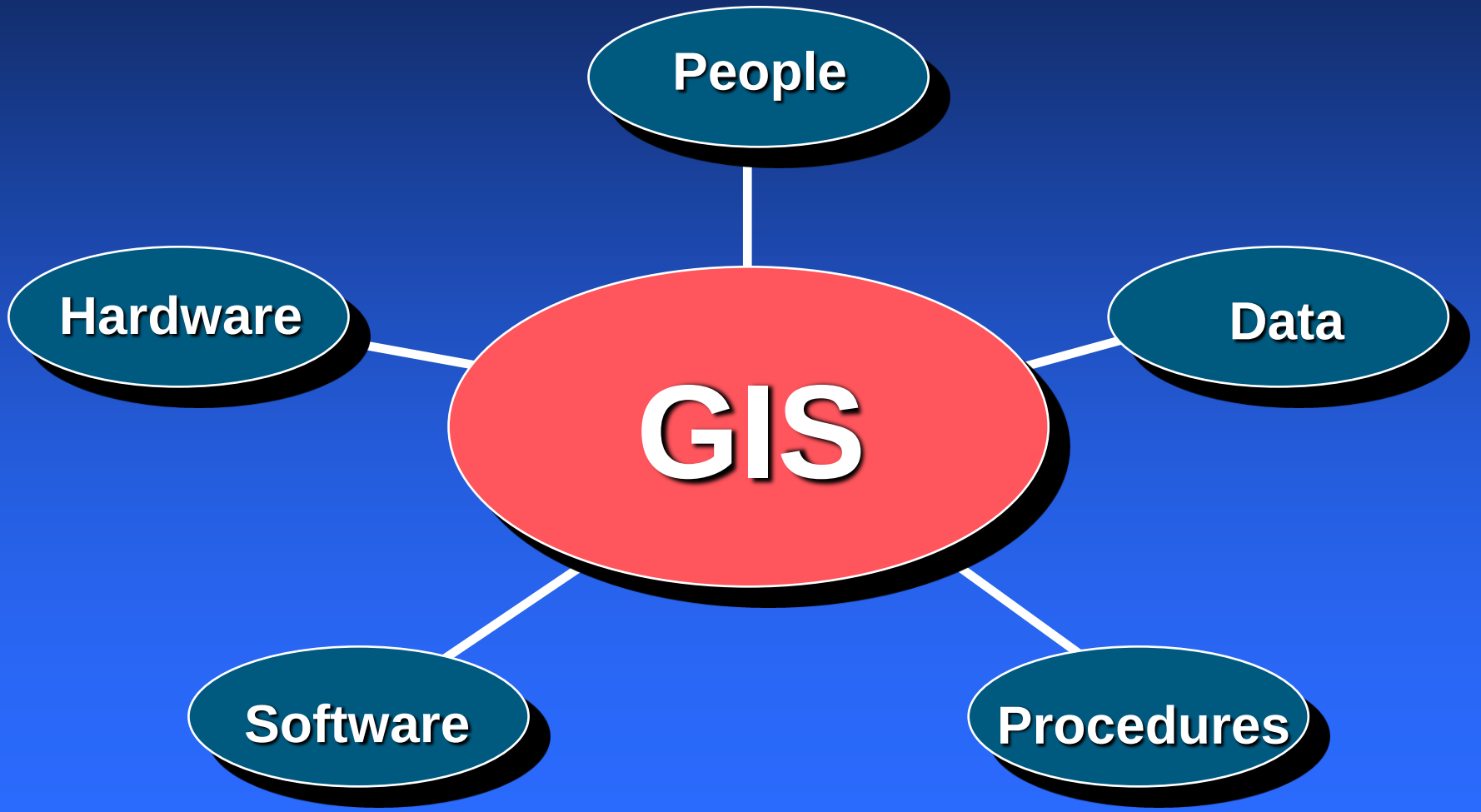
Low-End Mapping Systems

- Analysis
- Modeling
- Data Integration
- Networking
- Customizable Displays

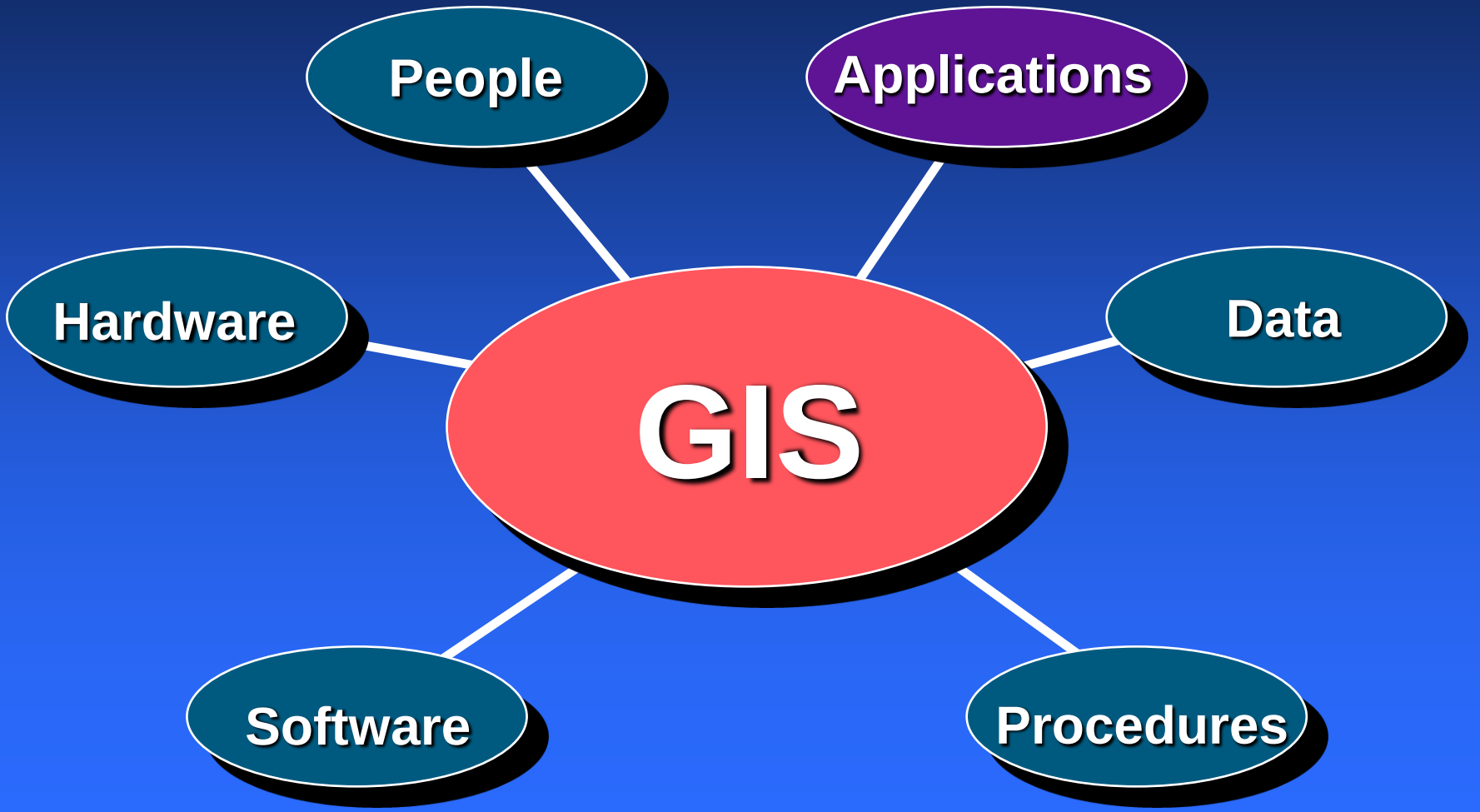
Low-End Mapping Systems Have Very Limited Capabilities



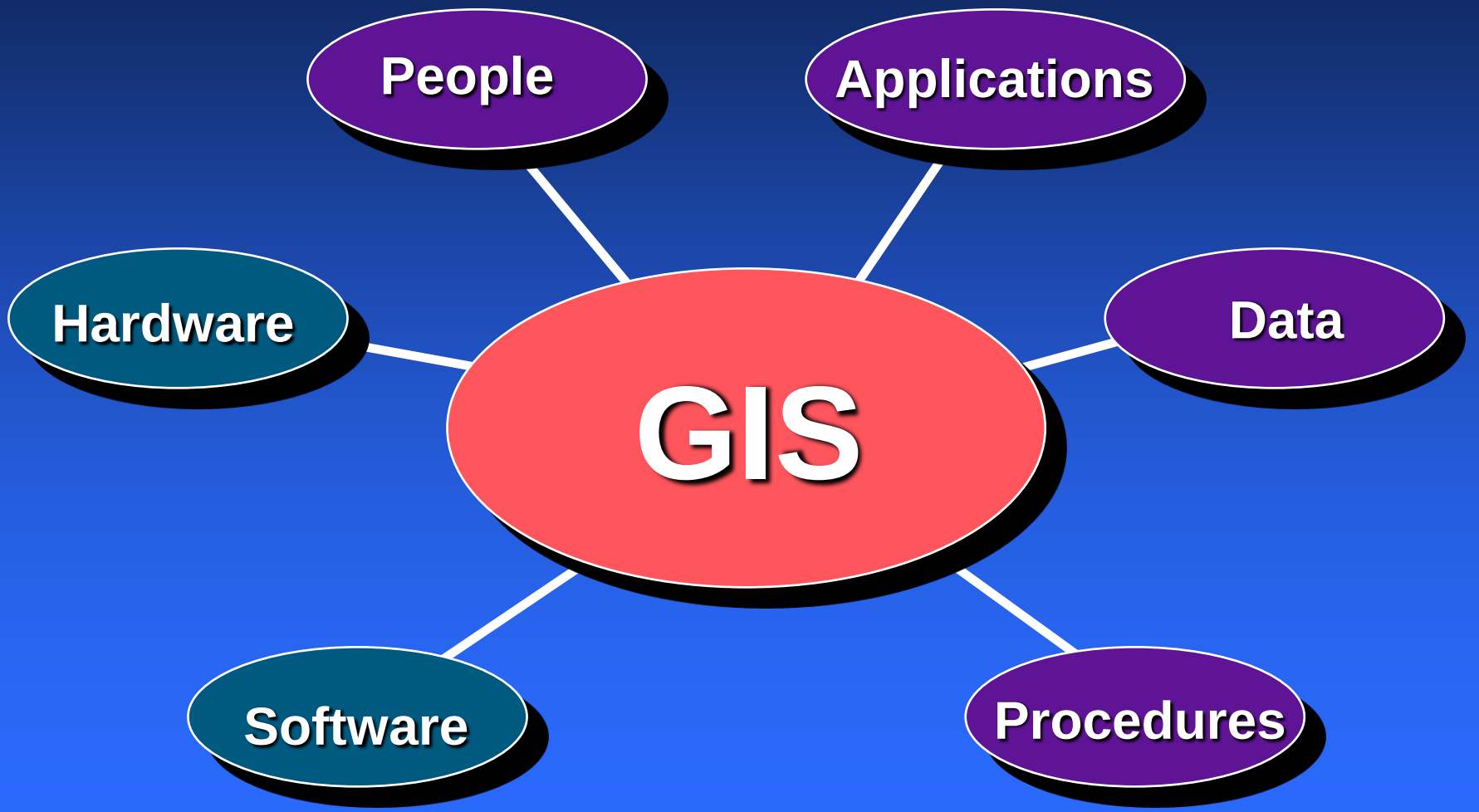
Five Parts of GIS



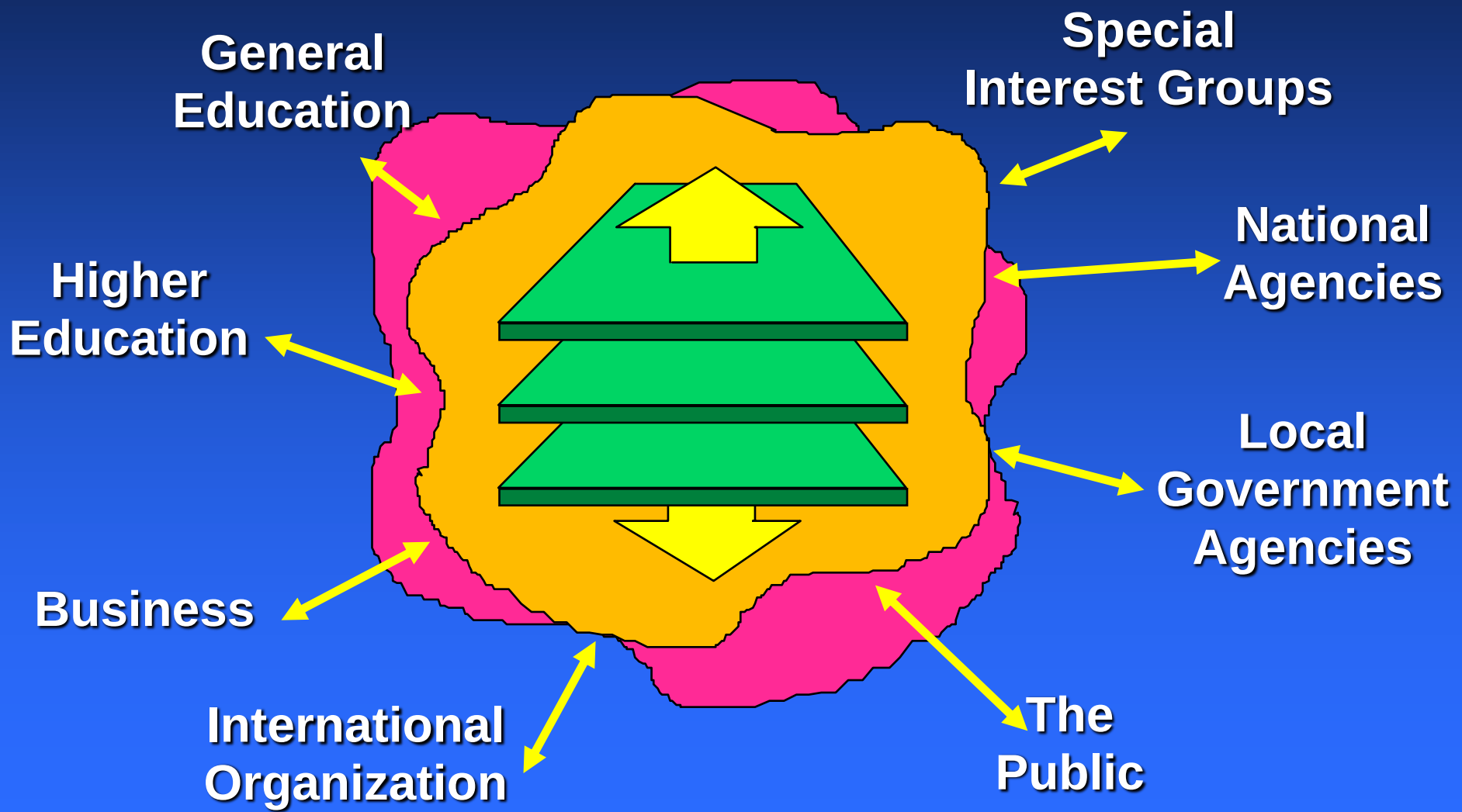
GIS Sixth Part



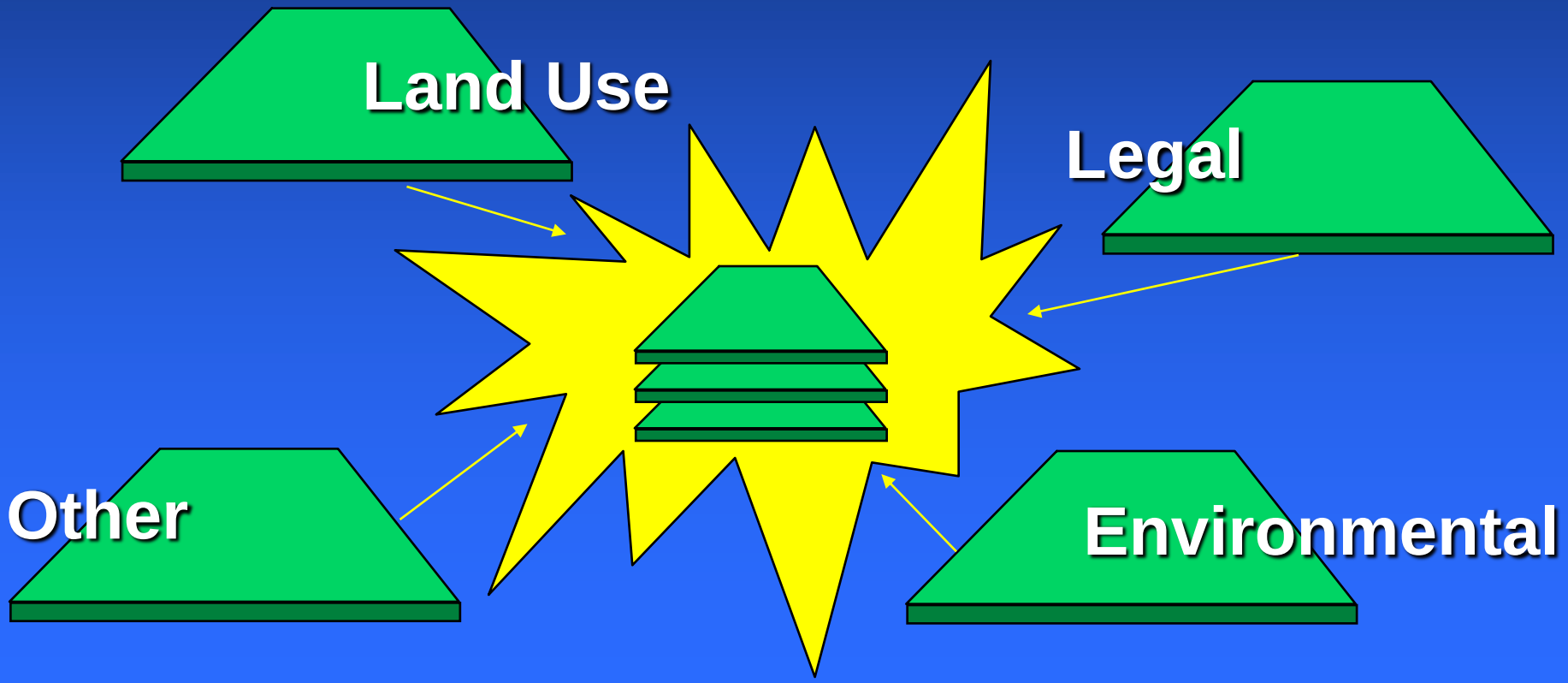
Services Involvement



Geographic Information Will Be Increasingly Available and Interrelated

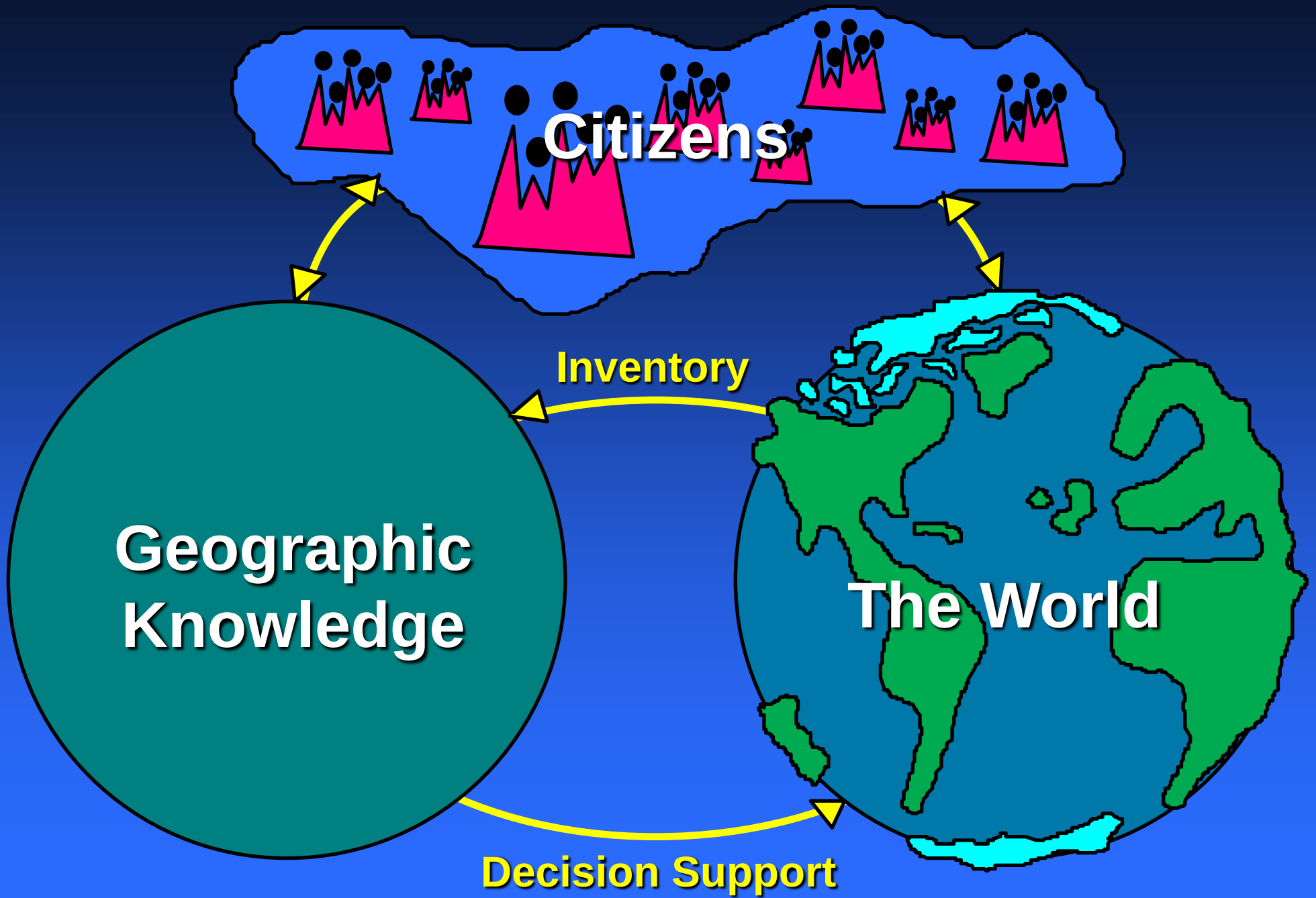


Information From Many Sources Can Be Integrated for Problem Solving



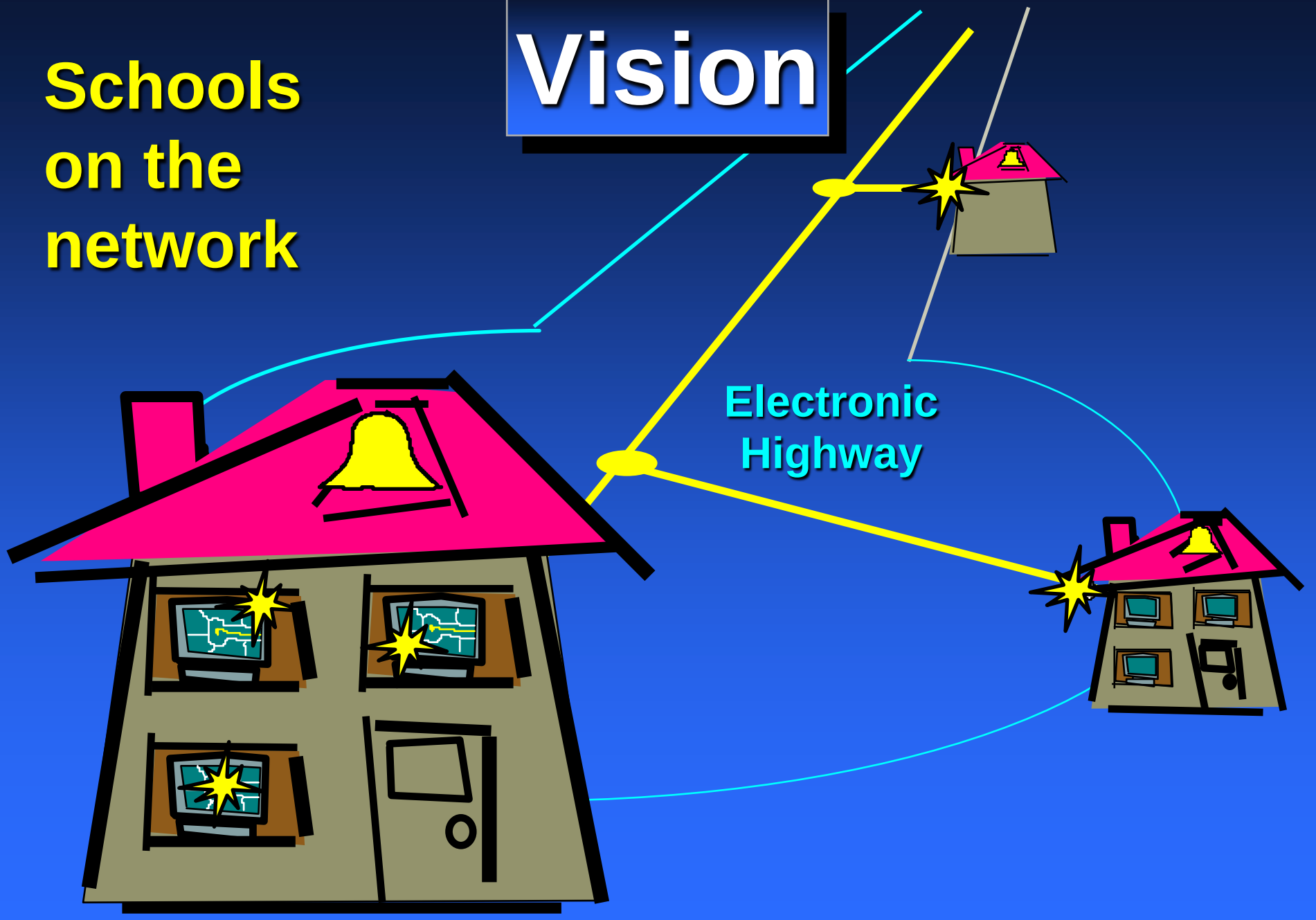
GIS on the Internet Will Allow Us to Share Our Data & Knowledge in New Ways

GIS Provides a Unifying Framework for Thinking Globally and Acting Locally


Citizens
Inventory
Geographic Knowledge
The World
Decision Support

Vision

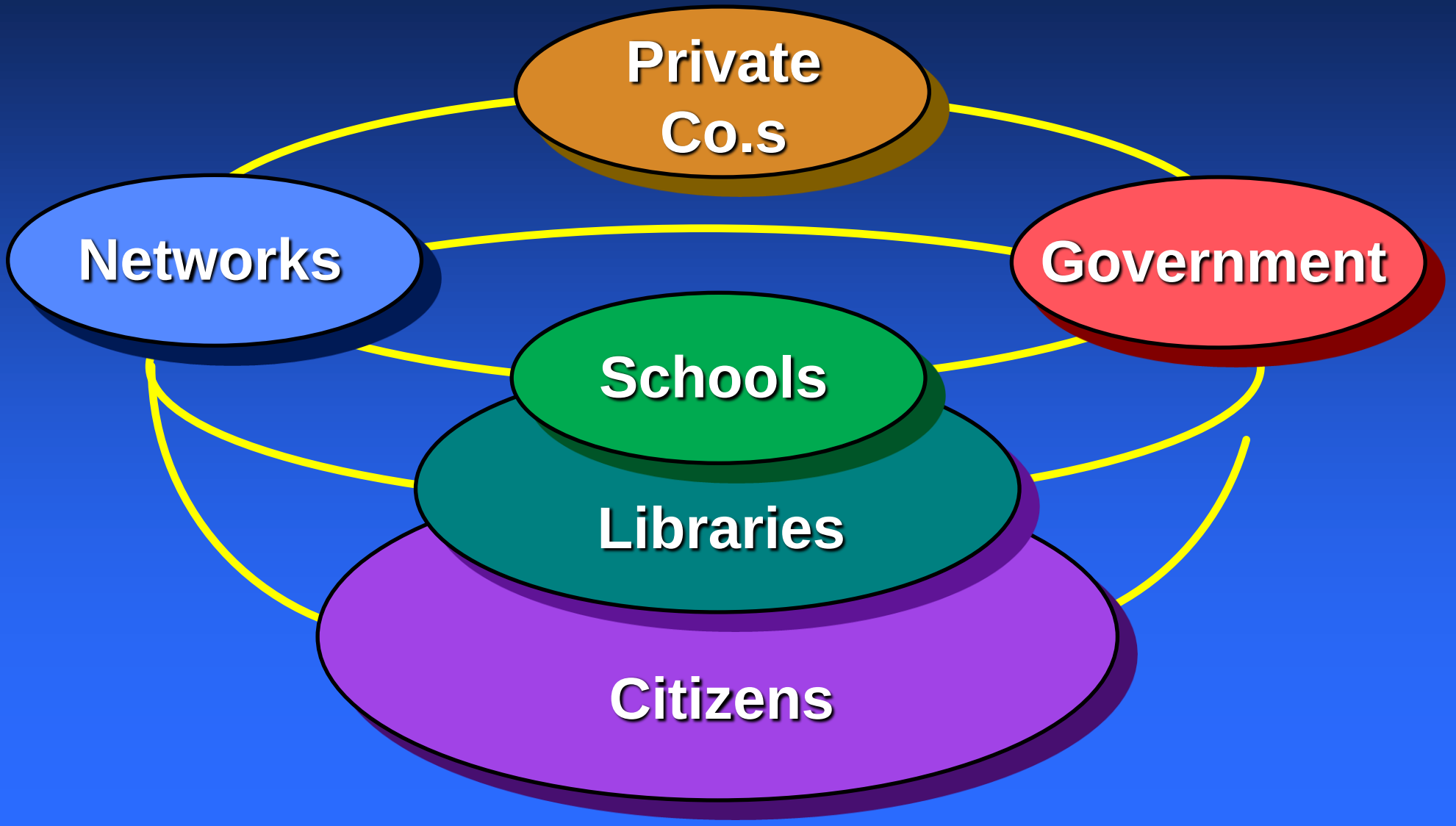
Schools on the network



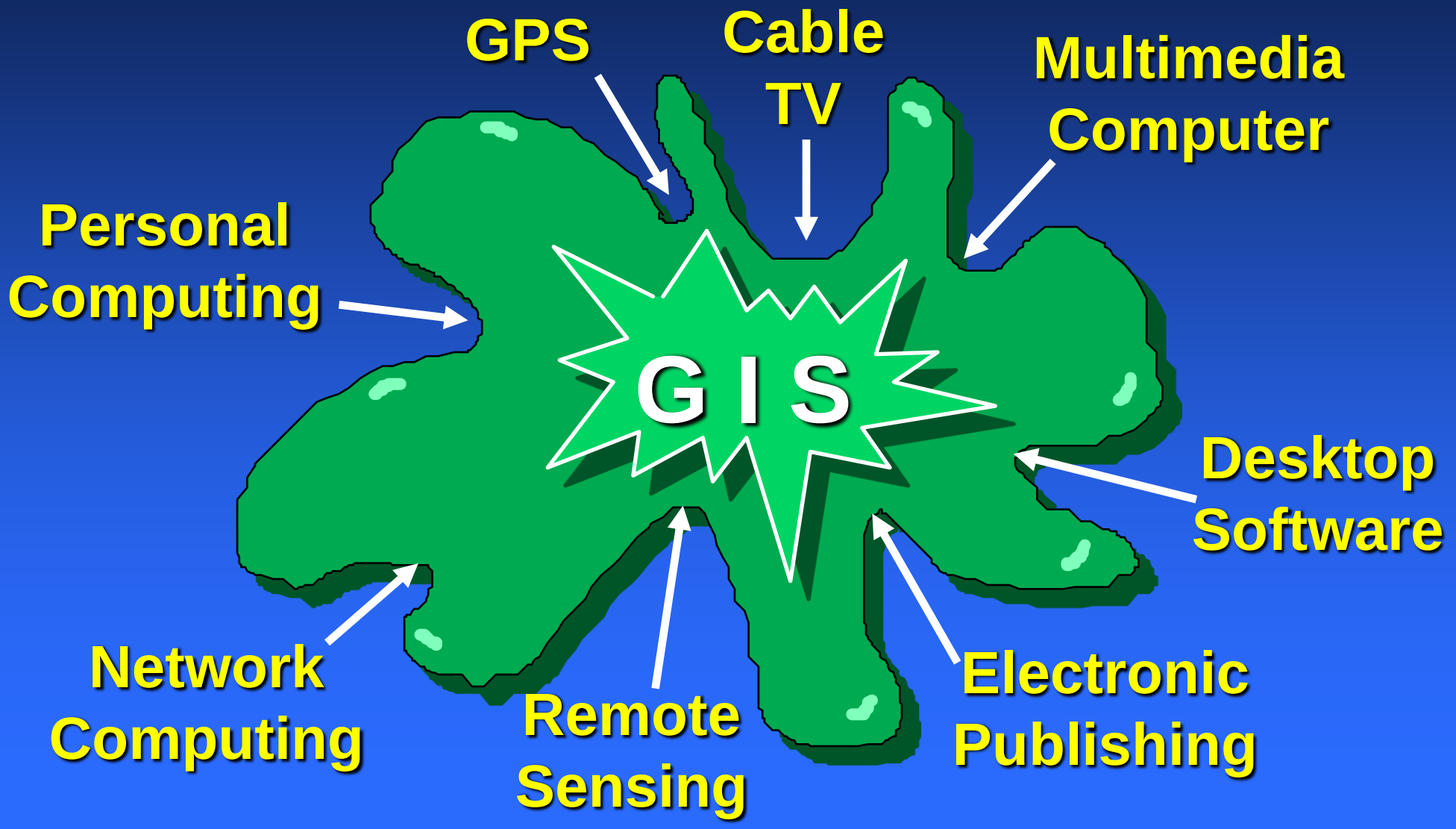
Vision

Every home on the network

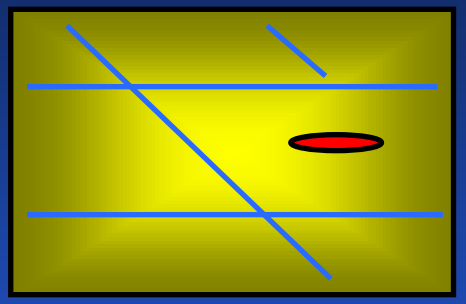
New Partnerships



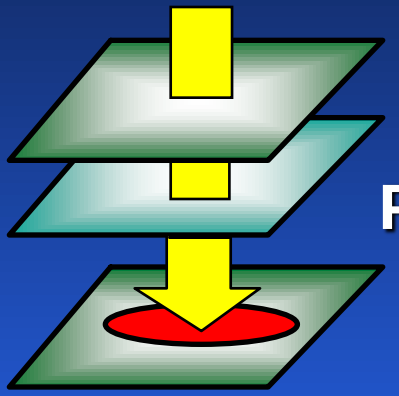
Converging Technologies



GIS for Decision Support

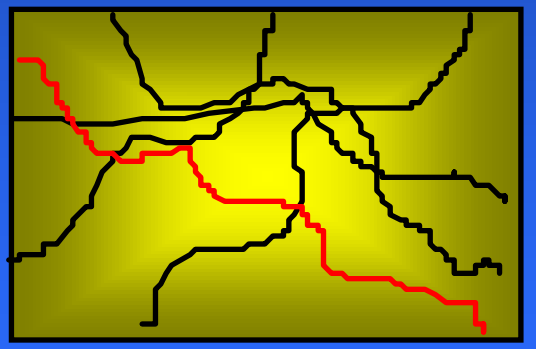


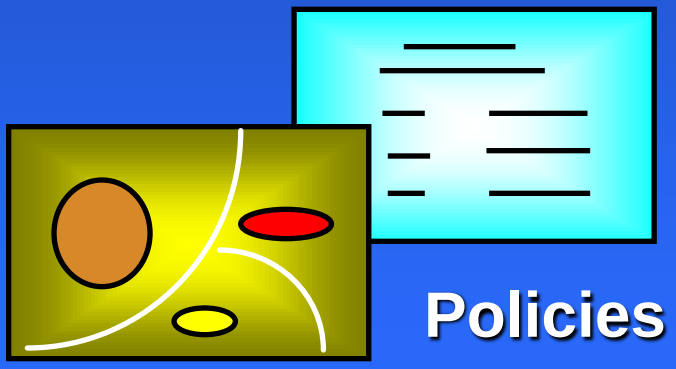
Site Selection



Planning

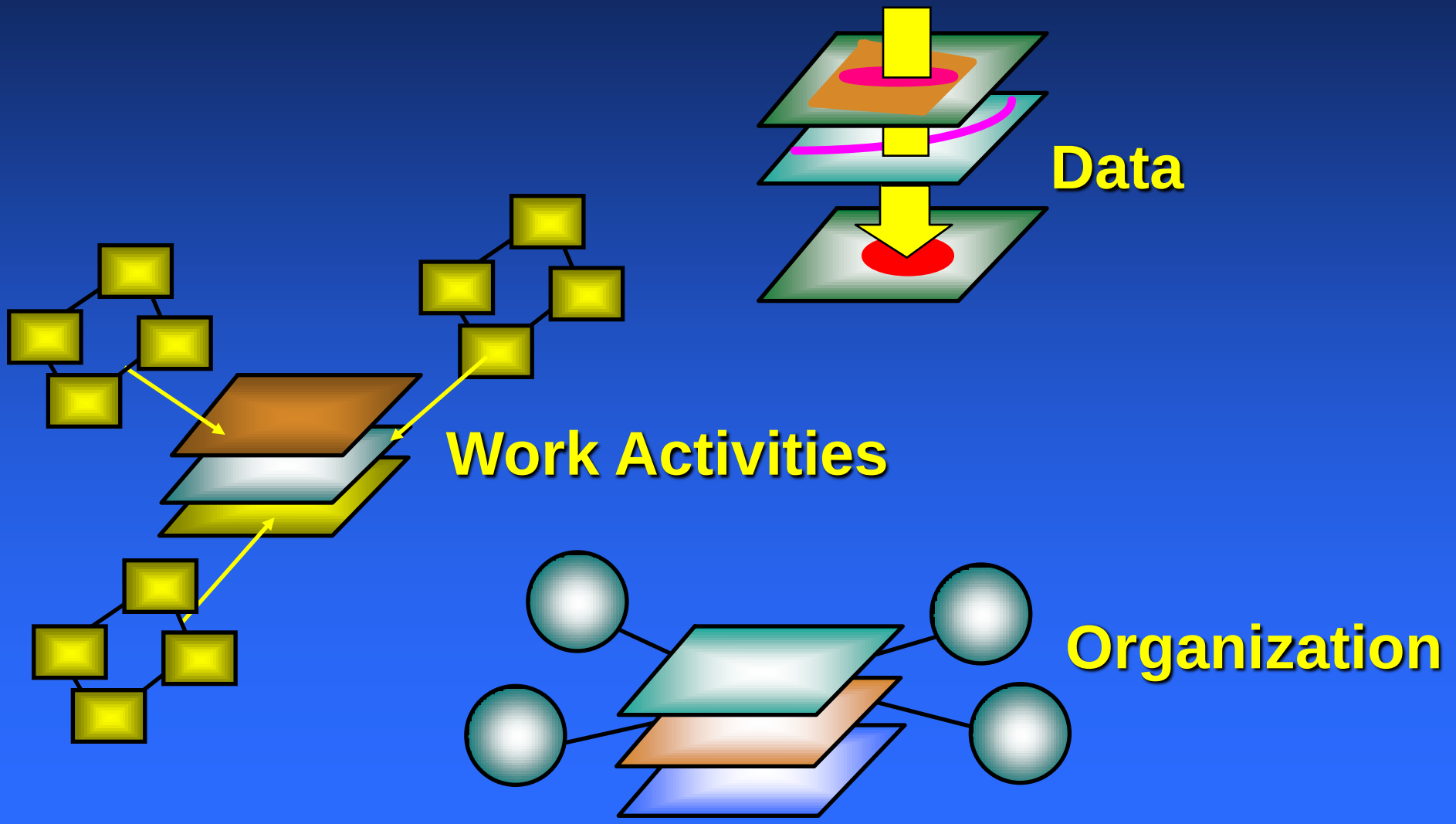
Routing





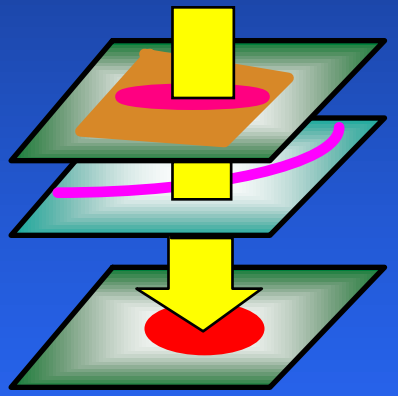
Policies

GIS as an Integration Technology

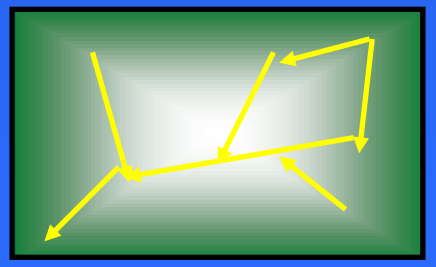


GIS As a Scientific Technology

Patterns

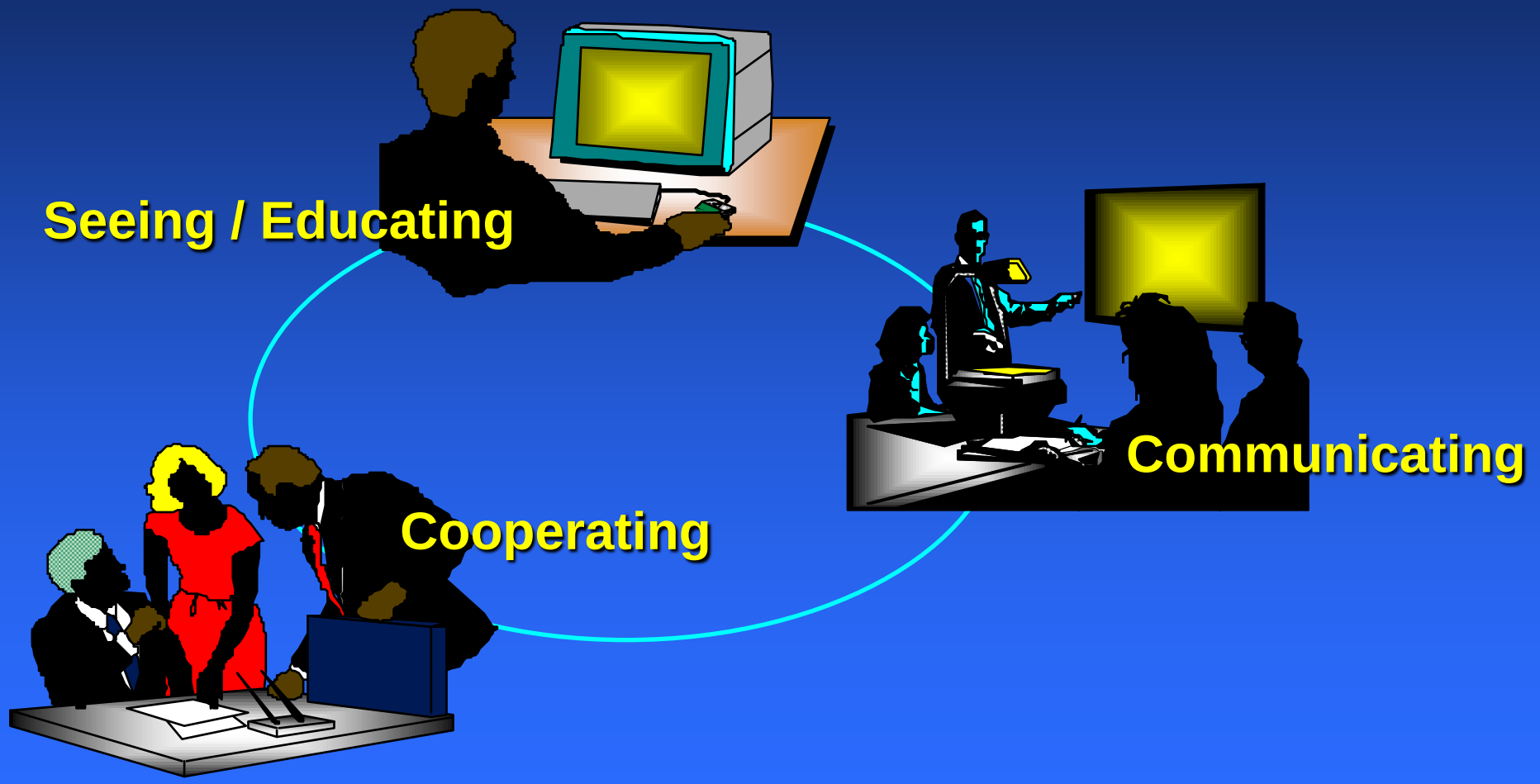


Relationships



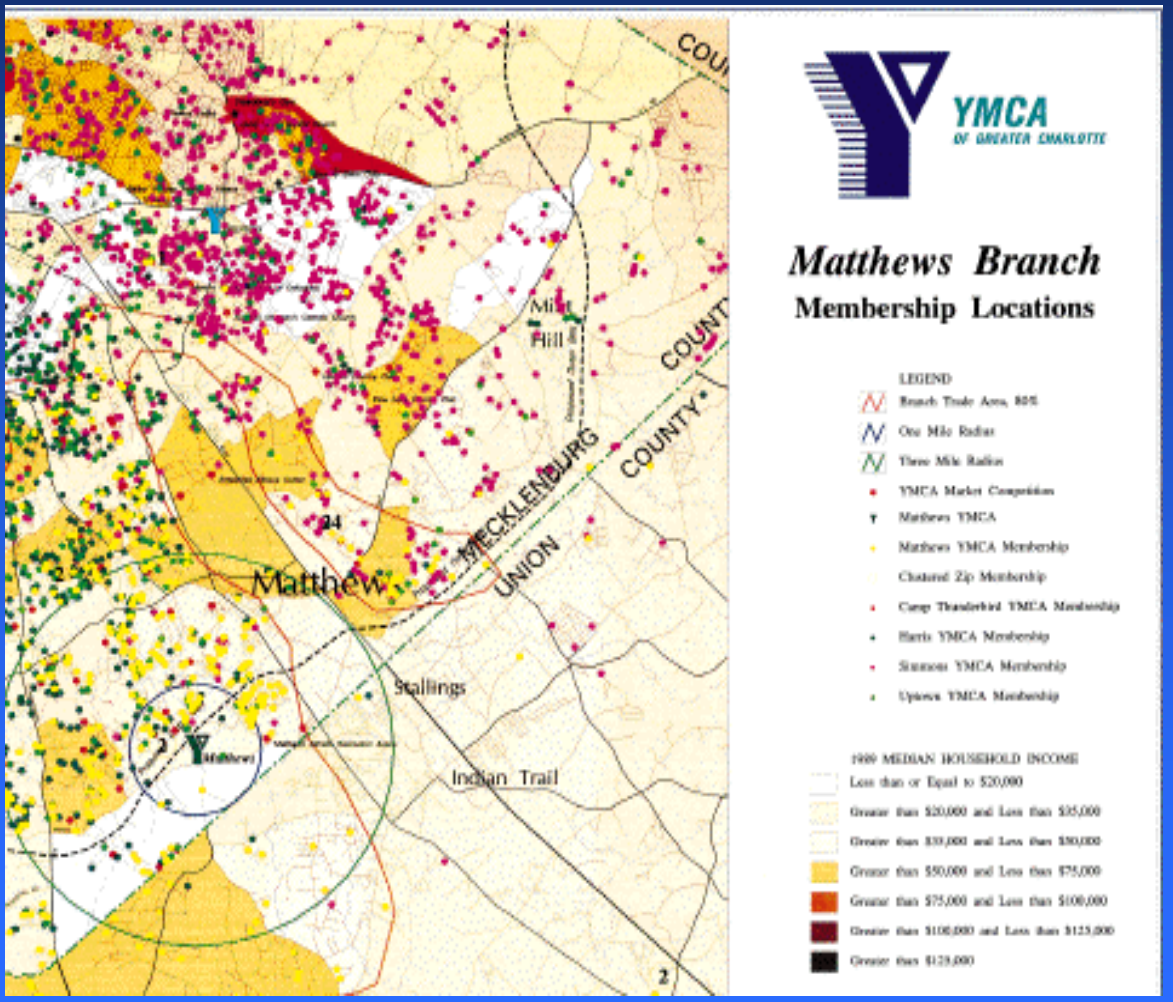
Processes

GIS As a Visual Language



Why Use GIS?

- Increase Revenue
- Decrease Costs
- Better Service
- Lower Risk



We Use GIS…

- Perform Geographic Queries & Analysis
- Improve Organizational Integration
  - Data Management
  - Sharing Data
- Making Maps
- Improved Efficiency

…for Better Decisions

Who Uses GIS?
Target Markets

- Federal, State, Local government
- Military
- Utilities
- Transportation
- Banking
- Healthcare
- Real Estate
- and many many more organizations!!

Areas Where GIS Helps Business

- Where are my best markets?
- Is the competition growing?
- Which Sales Territories are under-performing?
- Where should we allocate advertising dollars?
- What are the best sites for expansion?
- How can I better serve my customers?

Areas Where GIS Helps Utilities

- Map maintenance Switching
- Distribution Analysis
- Work Order Processing
- Trouble Call Analysis
- Leak Detection (Gas)
- Load Forecasting
- Ad Hoc Mapping
- Interface to external corporate databases
- Vehicle Tracing & Market Analysis
- SCADA Interface
- Environmental Monitoring
- Lease Mangmt.
- Right-of-Way Mangmt.
- One-Call (Dig Safe)

Where GIS can help Municipal Infrastructures

- Land Use Planning
- Track Cadastral Information
- Community Development
- Aid in Crime Prevention
- E911
- Visualize Urban Structure
- Manage Local Resources
- Redistricting
- School Bus routing
- Garbage Collection Routing

Where GIS can help Transportation

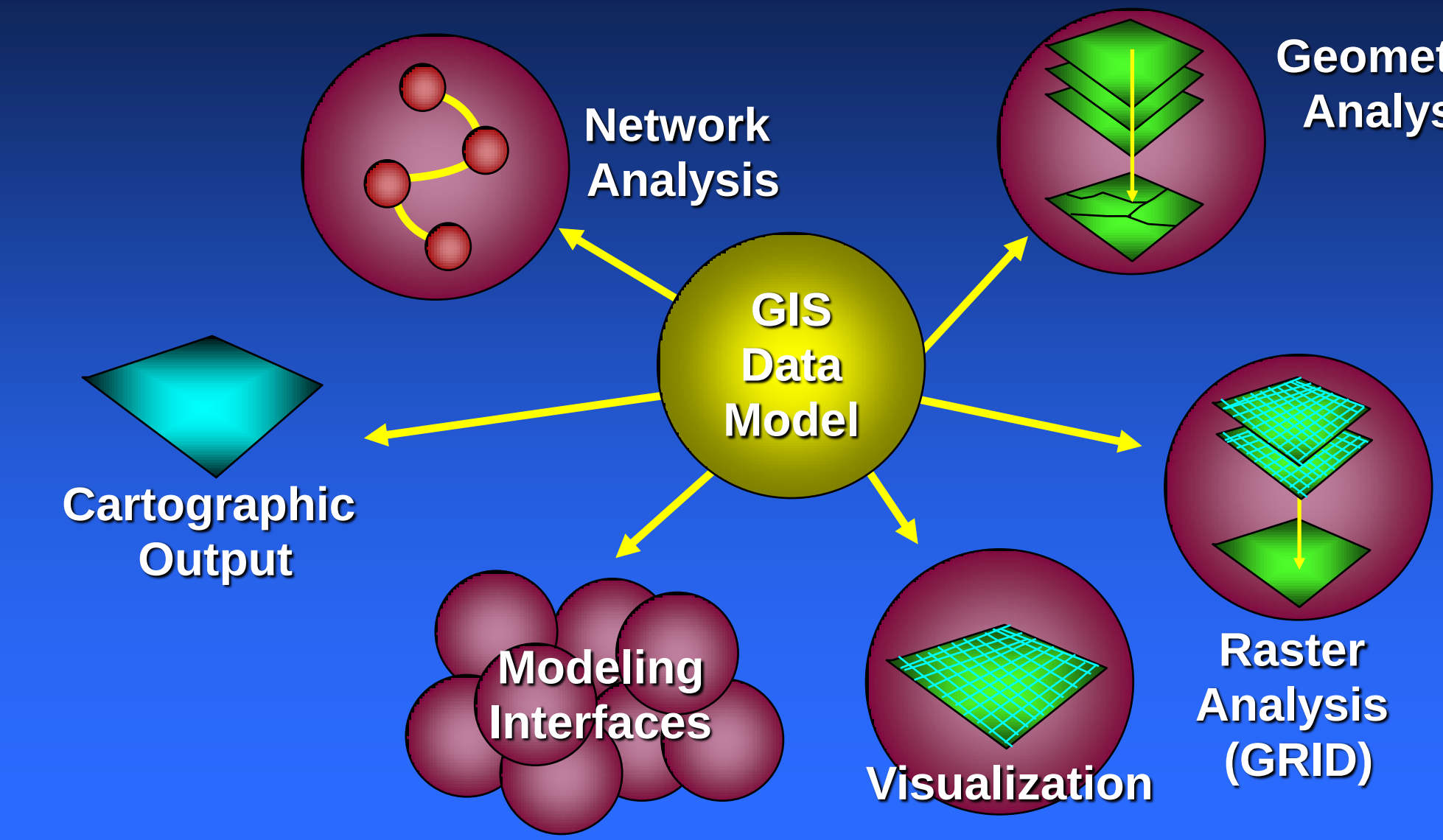
- Transportation Infrastructure Management
- Fleet and Logistics Management
- Transit Management
- Point to Point Routing
  - Shortest Path
  - Closest Facility
  - Service Areas

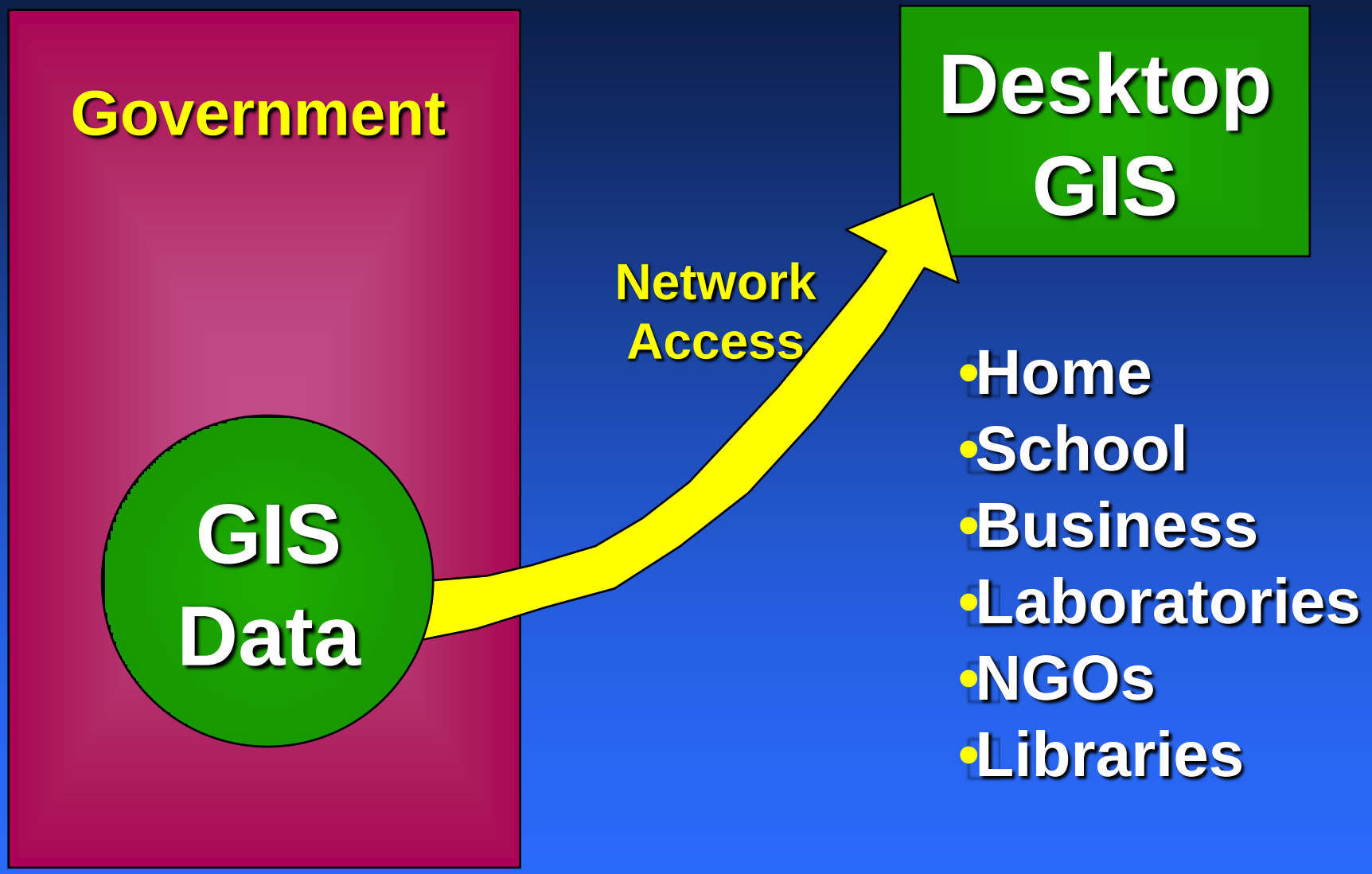
Where GIS can help the Environmental Industry

- Site Remediation
- Waste Management
- Environmental Impact Assessment
- Natural Resource Management
- Policy Assessment
- Groundwater Modeling
- Environmental Compliance Permit Tracking
- Vegetation Mapping

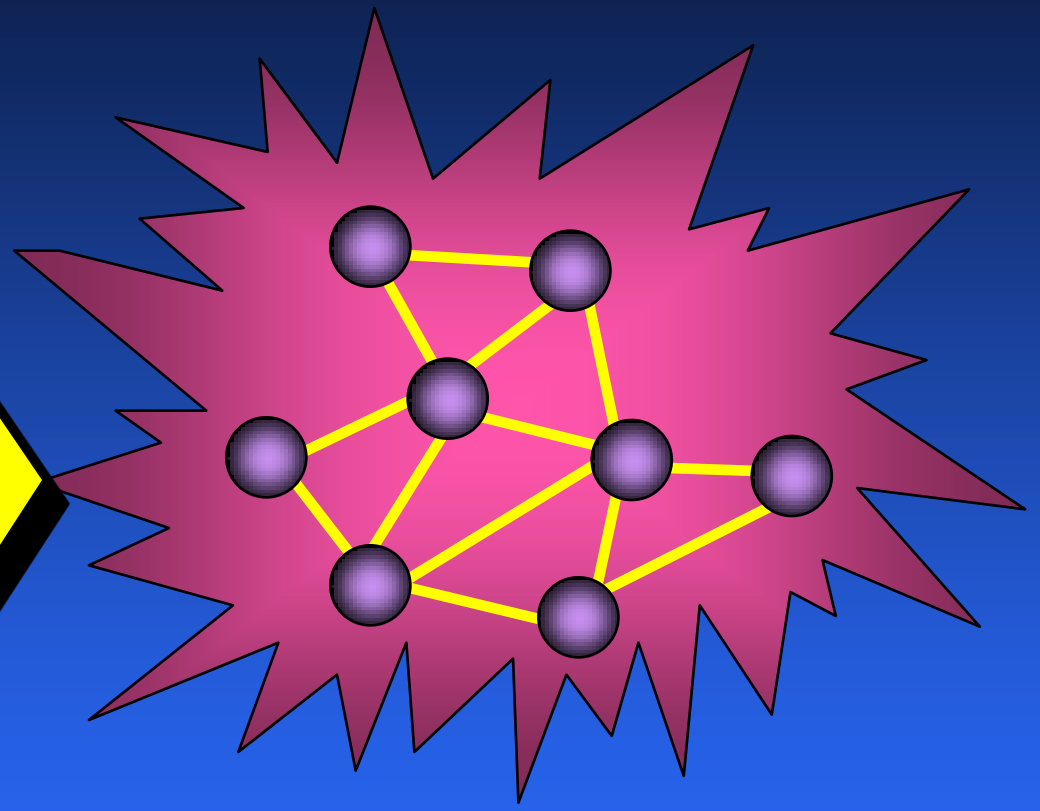
GIS Use Is Rapidly Growing in Many Fields

Spatial Analysis




Government
GIS Data
Network Access
Desktop GIS
•Home
•School
•Business
•Laboratories
•NGOs
•Libraries

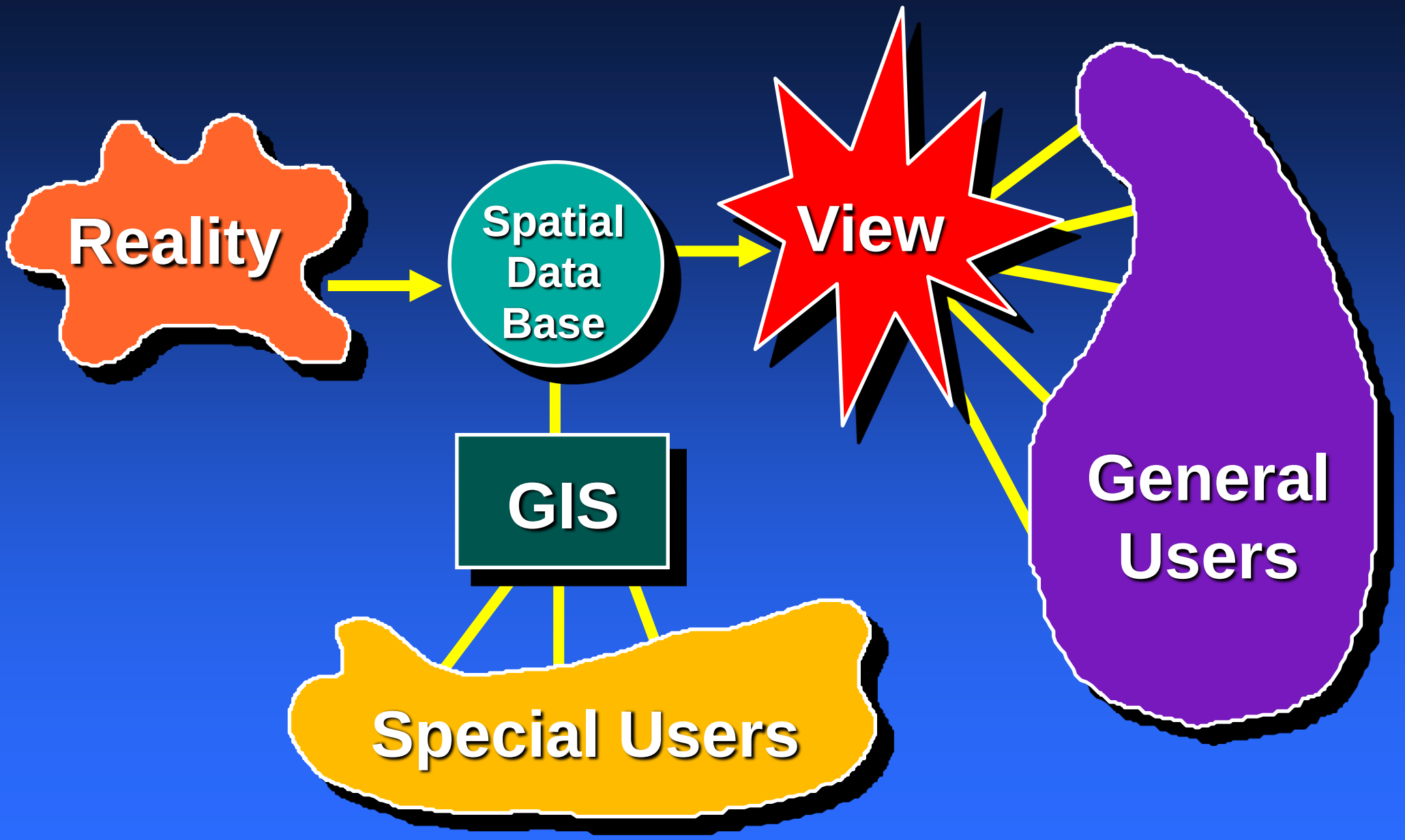
Sophisticated GIS Organization



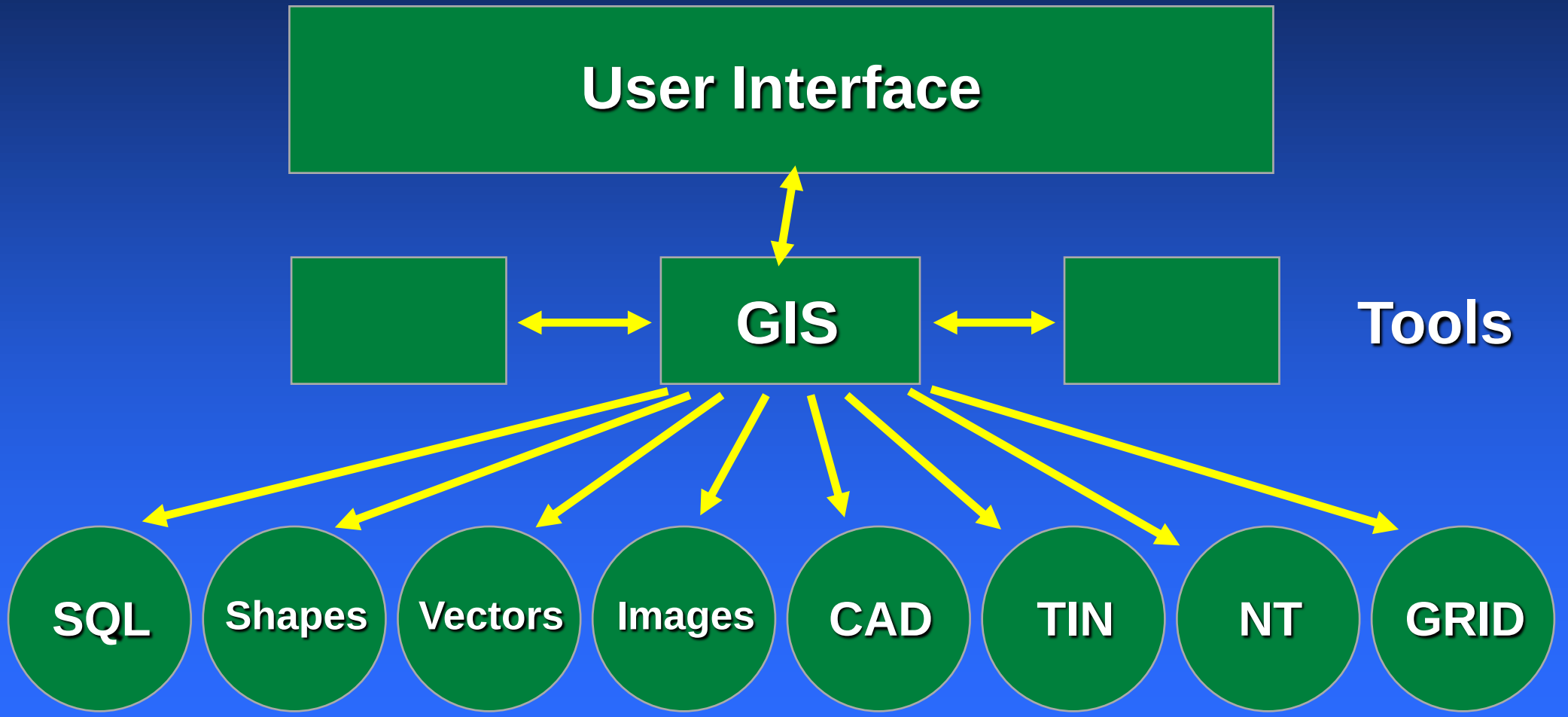
Growing Body of Casual Users

GIS Helps Us Visualize and Analyze Things More Holistically

The Concept of Geographic Place Can Be Used to Being Together Widely Disparate Disciplines


Reality
Spatial Data Base
View
GIS
General Users
Special Users

GIS Integration



Environmental Attributes

Map Layer

Geology

Hazard Areas

Existing Land Use

Noise Contours

Floodplain

Soils

Vegetation

Surficial Hydrology

EIR Study Areas

Planning Study Index Reference