Building a National Spatial Data Infrastructure.

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ESRI

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Topics Covered

- *What* is a Spatial Data Infrastructure?
- *Why* build a Spatial Data Infrastructure for Chile?
- *What* are the elements of an Infrastructure?
- *What* are data standards and *why* are they important?
- *What* is the role of Data Clearinghouse?
- *What* are the steps in building a SDI?
- *What* are others doing?
- *Why* now?

What is a Spatial Data Infrastructure (SDI)?

"The technology, policies and people necessary to promote sharing for geospatial data through all levels of government, private and non-profit sectors, and the academic community"

SDI Cookbook

What is Spatial Data Infrastructure?

- Technology (hardware, software, networks, databases, technical implementation plans)
- Policies (governance, data privacy & security, data sharing, cost recovery)
- People (training, professional development, cooperation, outreach)

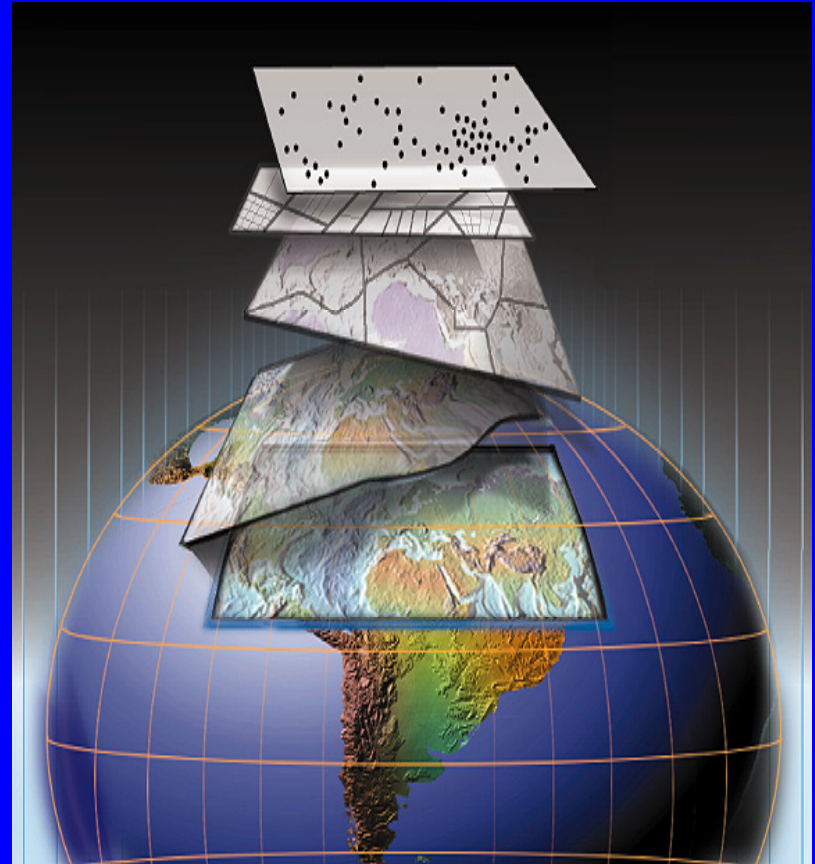….to acquire, process, store, distribute and utilize geographic data.

Why Build SDI?

- Build data once and use it many times for many applications.
- Cooperative governance – "place-based management".
- Sustainable economic development.
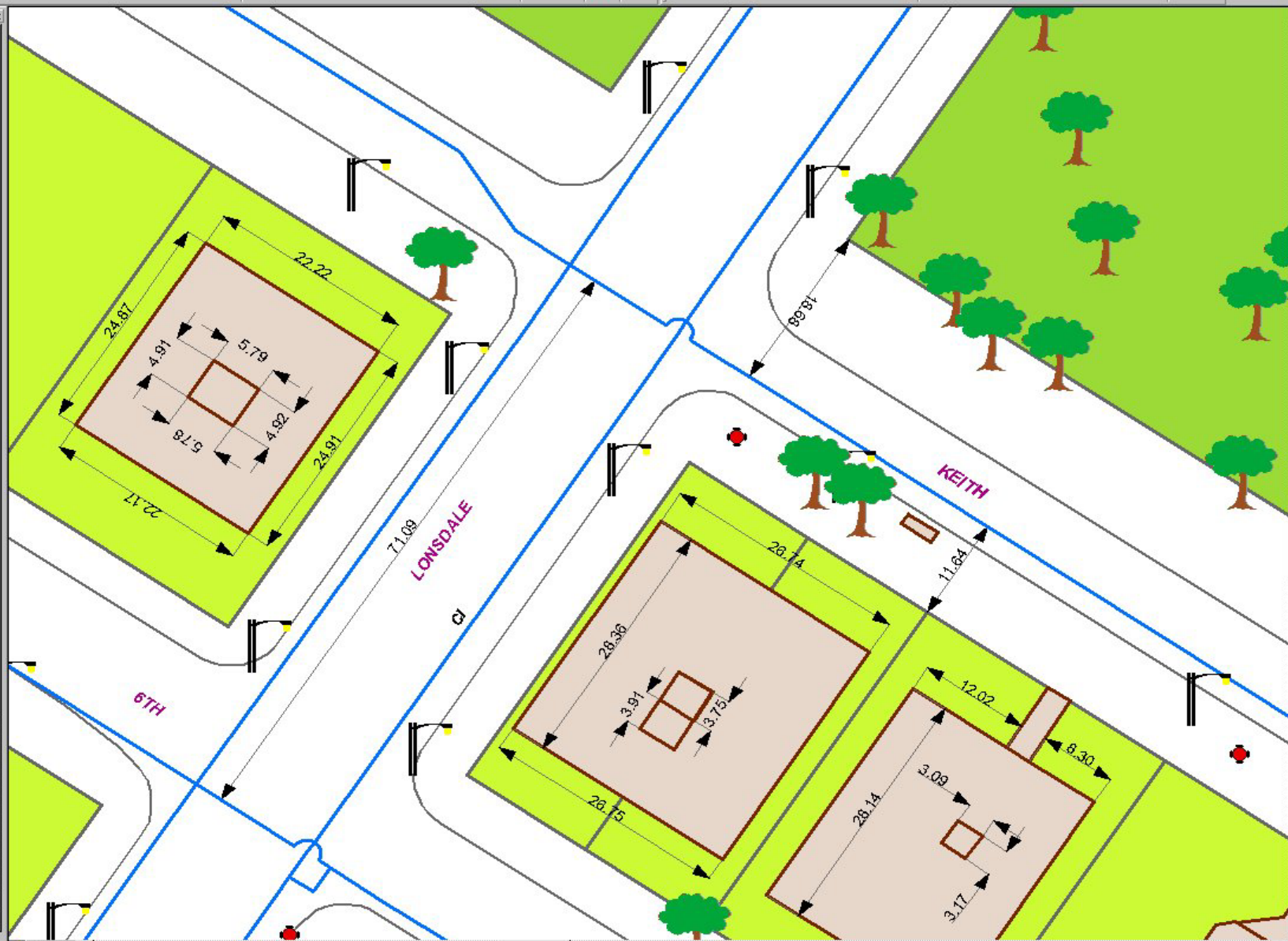- Share costs.

Why build a Spatial Data Infrastructure?

- Land Records
- Disaster Response
- Transportation
- Water, gas & electric
- Public Protection
- Defense
- Natural Resources
- Telecom Infrastructure

File　Edit　View　Insert　Selection　Tools　Window　Help

1:476

Editor ▼ | Task: Create New Feature | Target: Dims : Dims | Construction: Aligned | Style: Default

□ Layers
　☑ URBAN_FOREST
　☑ STR_LITES_point
　☑ TRAF_LITES_poin
　☑ HYDRANTS_poin
　☑ WAT_MAIN_arc
　☑ STREET_CL_arc
　□ SIDEWALKS_arc
　☑ Dims
　☑ CIVIC_BLDG_poly
　☑ BUILDINGS_polyg
　☑ ROADS_arc
　☑ SCHOOLS_polygo
　☑ PARCELS_polygo
　□ new_ortho.img
　　　Value
　　　High : 208

　　　Low : 1
　□ PARKS_region_pa
　☑ LANDUSE_polygo
　　　□ <all other value
　　　　LAND_USE
　　　　Apartment
　　　　Church

Display　Source

KEITH

LONSDALE

Ct

6TH

22.22
24.67
4.91
5.79
5.78
4.92
24.91
22.17
71.09
18.68
28.14
11.64
28.30
3.91
3.75
28.15
28.14
12.02
8.30
3.09
3.17

Number of features selected: 0

494618.93 5462638.03 Meters

Radius Report

2 Features Selected
Radius: 2000.0 feet

Feature 1:

Fix Primary Facility
- *Client ID*: 2969
- *Client Name*: JAMES SON CO
- *Facility ID*: 451590
- *Facility Name*: JAMES EAGEN SON CO
- *Primary Fac ID*: 4785
- *Primary Fac Type*: W Resource
- *Primary Fac Kind*: In Use
- *Primary Fac Name*: EAGEN SON COMPANY
- *Subfac Type*: Discha
- GIS Report

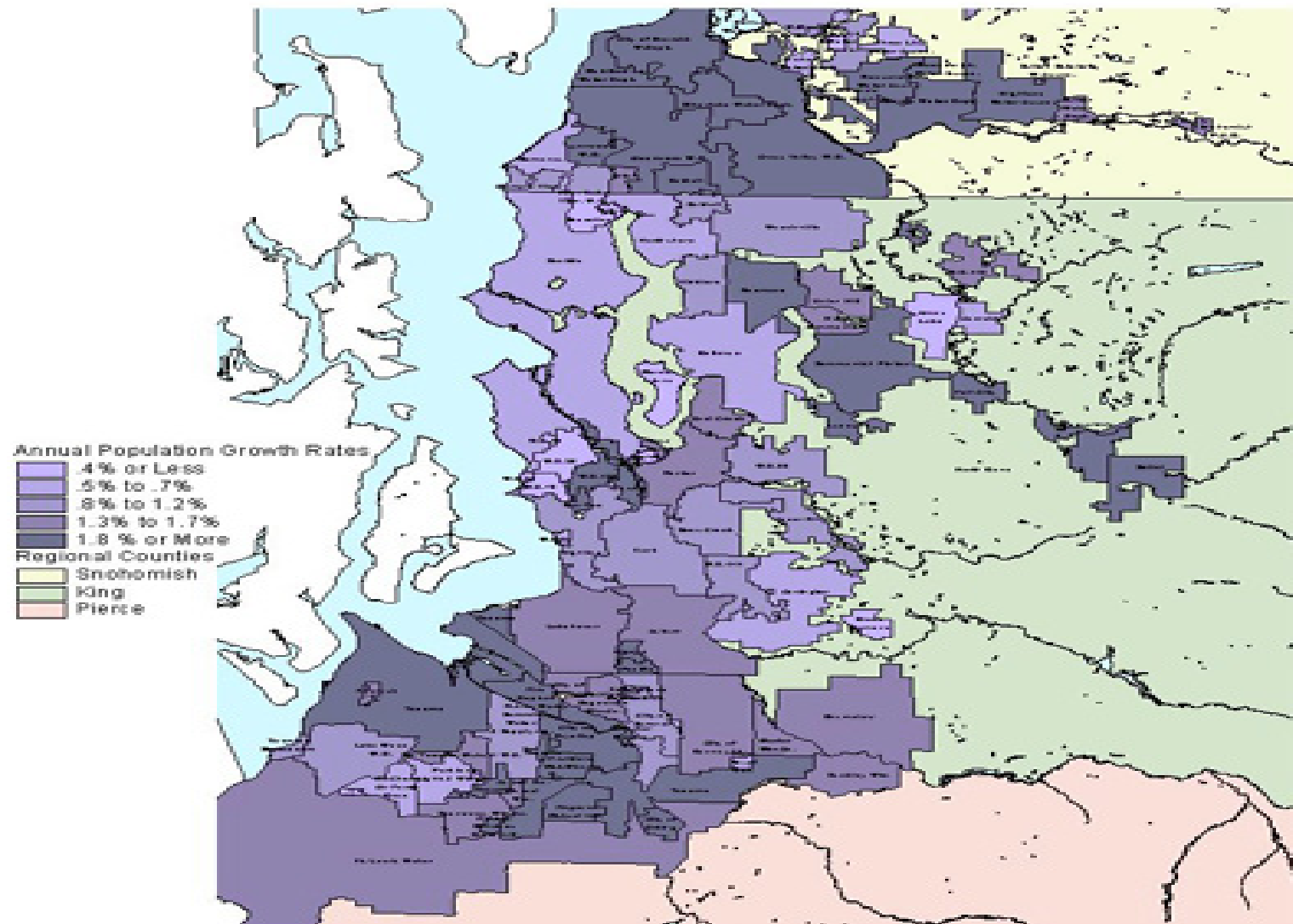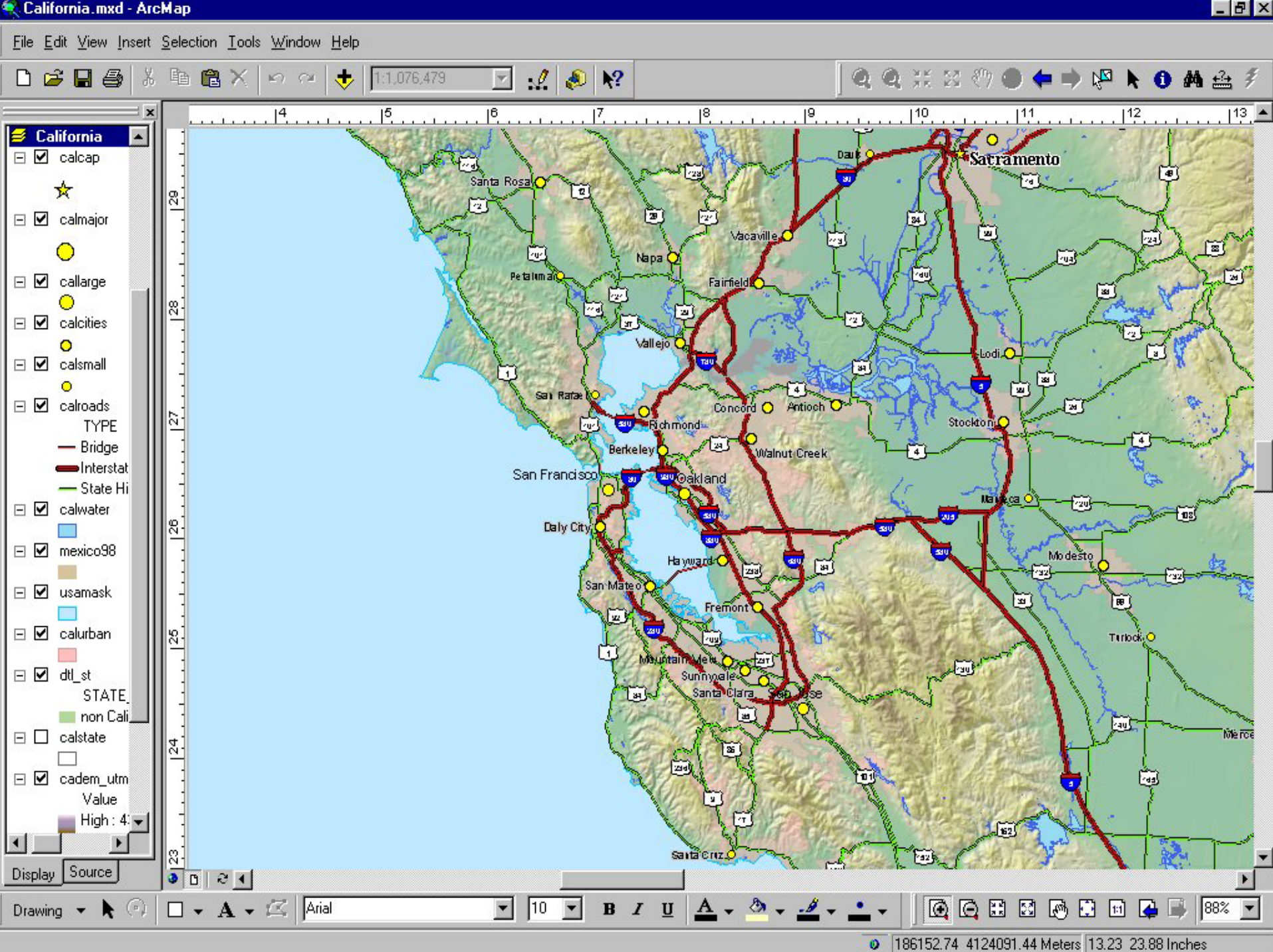| Display		Active
☒ Ind Min Mine		☐
☒ Pub H2O Supply		☐
☒ Residual Waste		☐
☒ H2O Pollute		☐
☒ H2O Resource		☒
☒ Water		☐
☒ Streets		
☐ Min Civil Div		
☐ 7.5' Quad Bnd		
☐ Penn Water Plan		
☐ Surface Geology		

Discharge

Luzerne

Copyright (C) 1998 ESRI Inc.

0

Tool: | Select Features via a Fixed-Radius Circle | Circle: Radius is 2000.0 feet

Figure 3.1
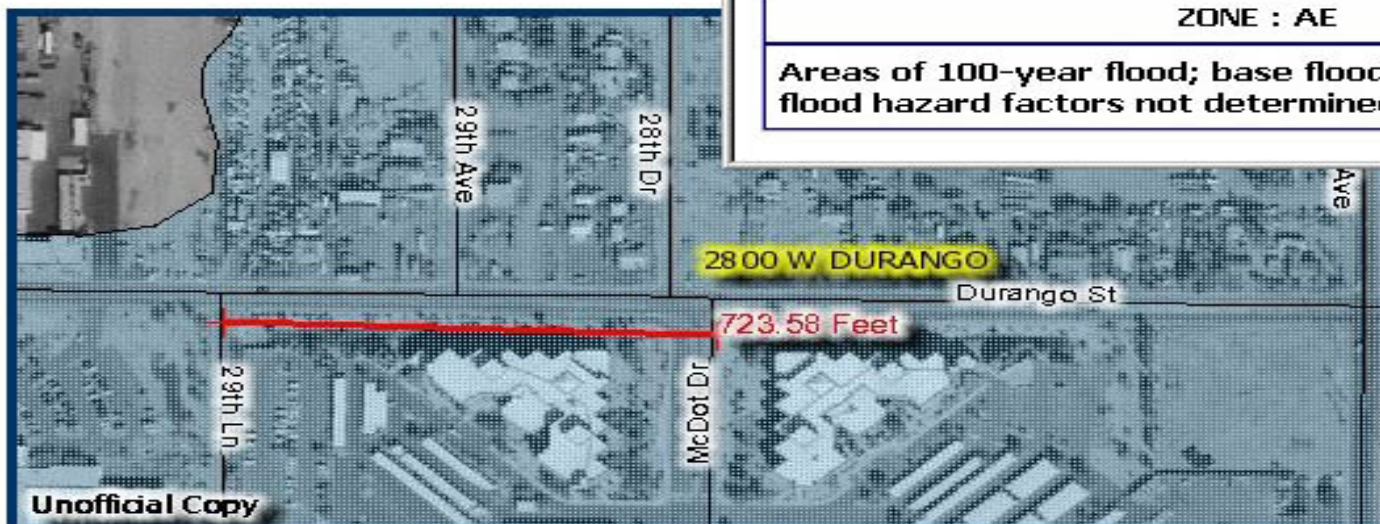## Annual Population Growth Rates Forecast for 2000-2010

Annual Population Growth Rates
- .4% or Less
- .5% to .7%
- .8% to 1.2%
- 1.3% to 1.7%
- 1.8 % or More

Regional Counties
- Snohomish
- King
- Pierce

1998 Annual Purveyor Survey: Summary of Results

Seattle Public Utilities
December 1998

File   Edit   View   Insert   Selection   Tools   Window   Help

1:1,076,479

California
- ☑ calcap
  - ☆
- ☑ calmajor
  - ●
- ☑ callarge
  - ●
- ☑ calcities
  - ○
- ☑ calsmall
  - ○
- ☑ calroads
  - TYPE
  - —— Bridge
  - —— Interstat
  - —— State Hi
- ☑ calwater
  - ☐
- ☑ mexico98
  - ☐
- ☑ usamask
  - ☐
- ☑ calurban
  - ☐
- ☑ dtl_st
  - STATE_
  - ☐ non Cali
- ☐ calstate
  - ☐
- ☑ cadem_utm
  - Value
  - High : 4

Display   Source

Drawing   Arial   10   B I U

186152.74 4124091.44 Meters   13.23 23.88 Inches

Back   Forward   Stop   Refresh   Home   Search   Favorites   History   Mail   Print   Edit   Discuss

Address ult.asp?action=&address=&zipcode=&address2=&zipcode2=&geox=&geoy=&mCount=2&map.x=266&map.y=163   Go   Links »

Maricopa County Flood Control

http://198.102.35.91/maricopa/default.asp?action=Ide...

ZONE : AE

Areas of 100-year flood; base flood elevations and flood hazard factors not determined.

29th Ave

28th Dr

Ave

2800 W DURANGO

Durango St

723.58 Feet

29th Ln

McDot Dr

Unofficial Copy

8   7   6   5   ◄   ►   4   3   2   1

N
pan

Address or Intersection:
Example: Peoria AVE / 106th AVE

Zip: Submit

Flood Plain Info.   **Measure**   **View Legend**   **Printable Map**

Internet

File   Edit   View   Theme   Graphics   CORA   Window   Help

C

Scale 1: 1,883,488

2,647,261.36
312,866.57

Atlantic Menhaden - Adults & Juveniles

☑ Atlantic menhaden, Spring, (highest num_caught)
- ● 90-100% 76-957, n=32
- ● 50-90% 6-75, n=126
- ● 10-50% 1-6, n=126
- • 1-10% 1-1, n=31
- ▪ 0 Caught, n=0

☑ Atlantic menhaden, Spring, ELMR
- Highly Abundant
- Abundant

☑ Exclusive Economic Zone

☑ Coastal Background

☐ Estuarine Salinity

☐ Atlantic menhaden, Selected months, (highest num
- ● 90-100% 62-957, n=62
- ● 50-90% 5-61, n=248
- ● 10-50% 1-5, n=248
- • 1-10% 1-1, n=62
- ▪ 0 Caught, n=1

WINFROG 2.63

File Edit View Configure Utilities Window Help

I/O Devices

- winfrog
  - COM2 NMEAGPS1
    - POSITION
  - COM5 SG BROwn GYRO
  - COM6 SIMRAD EA500
    - BOTTOMDEPTH
  - COM7 ALC 3000
  - COM8 TSS DMS
  - COM3 SIMRAD 400
  - COM0 SmGps
  - COM0 SmGyro

Decoded Data | Terminal

NMEA GPS : NMEAGPS1
001-00:00:0.000 Delta 0.00
UTC-00:00:0.000
LAT   N00 00.0000
LON   E000 00.0000
ALT   0.00
Status : 0
Sats Used :   0
HDOP   0.0
Geoid   0.0
DGPS Age :   0.0

Calculations

Config | Vessel1

GPS,SimGps,POSITION,
Primary-SIM
N32 40.6404   Res 0.0   HDOP 0.0
W117 13.6675   Res 0.0

Vehicle

TARGET1
13:26:55.8
SPD 0.0kts
HDG 000.0
WD 0.00m
N32 00.000
W117 00.000
N3600000.000
E000000.00

Graphics

Stop Point

Vehicle

Vessel1	13:26:55.8
EVT ACTIVE	FIX# 5
W117 13.6628	N32 40.6301
E478650.81m	N3615521.62m
BRG 171.0T	RNG 50.903m
WPT Stop Point	LINE test1
LN BRG 352.10G	S 0.17m
SOL 3415.237mG	EOL 2860.137mG
HDG 350.0	COG 355.6
258-132655.RAW	TO: Stbd Roller

Graphics 2

Graphics 3

Ocean Beach
San Diego
North Island
San Diego Bay

N32 40.580 W117 13.651   S 0.0kts H:325.9 D:0.0   September 15, 1999 1:26:56 pm   CAPS NUM OVR
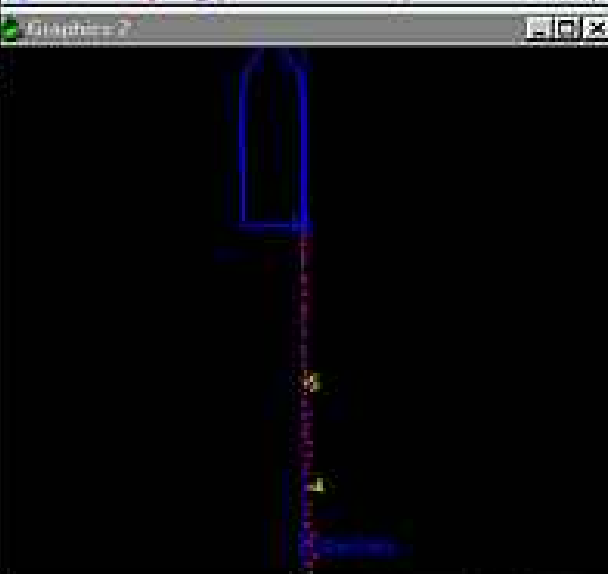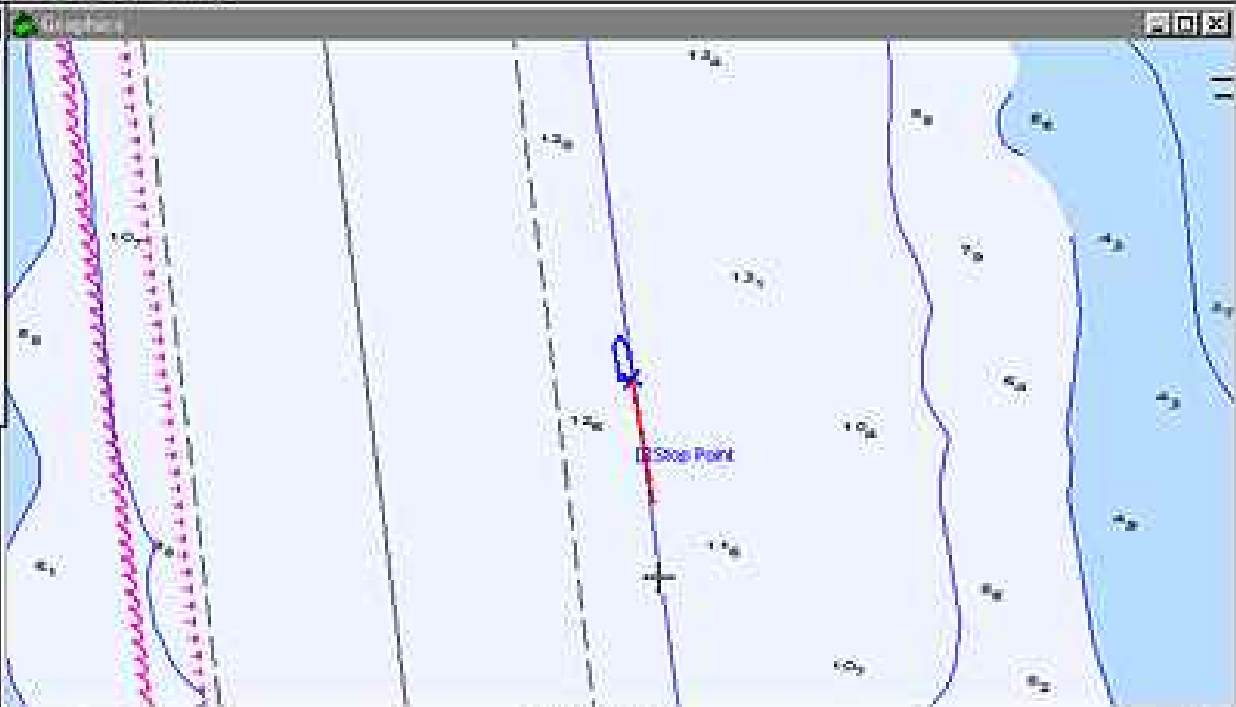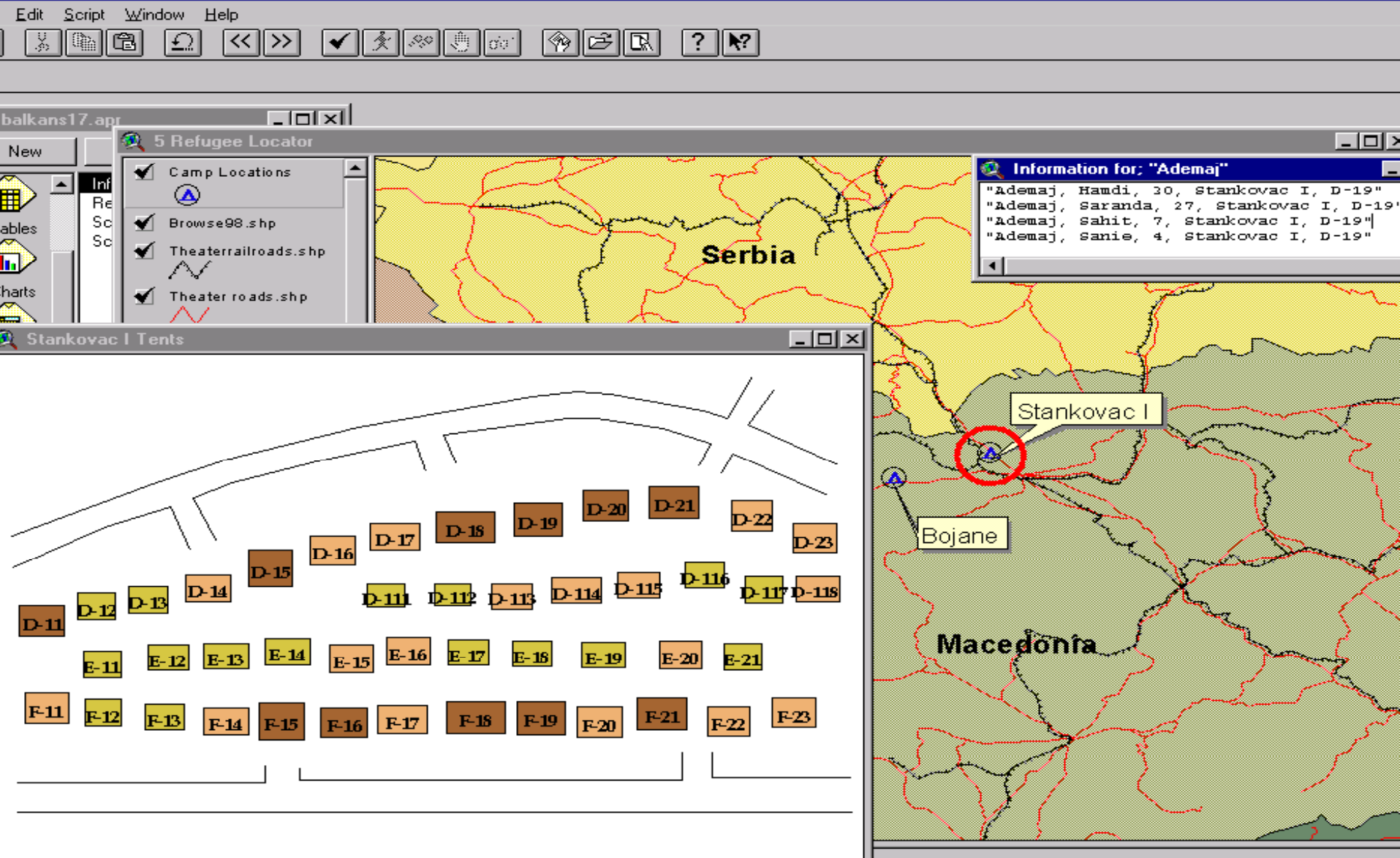
National Security and Protection
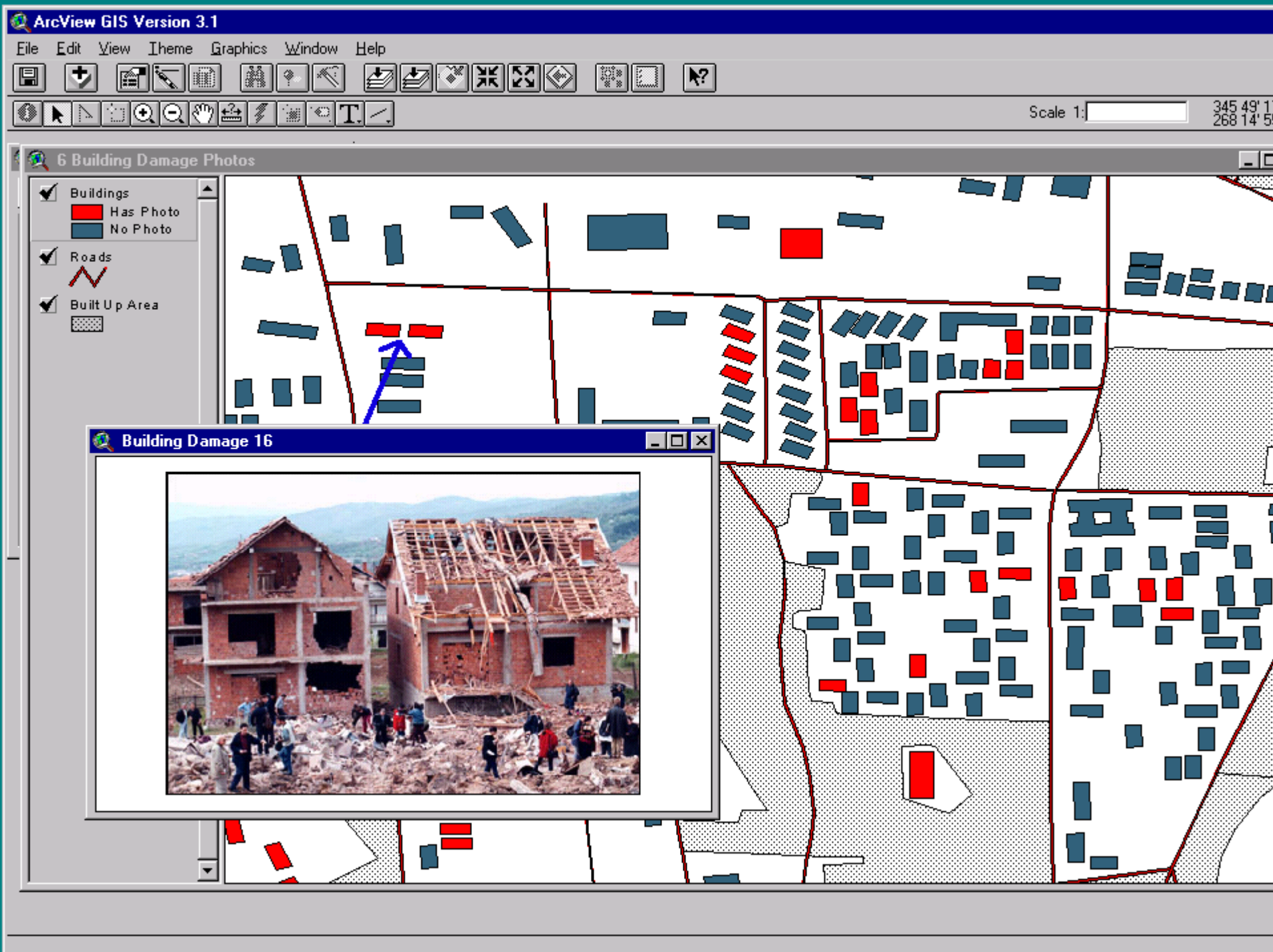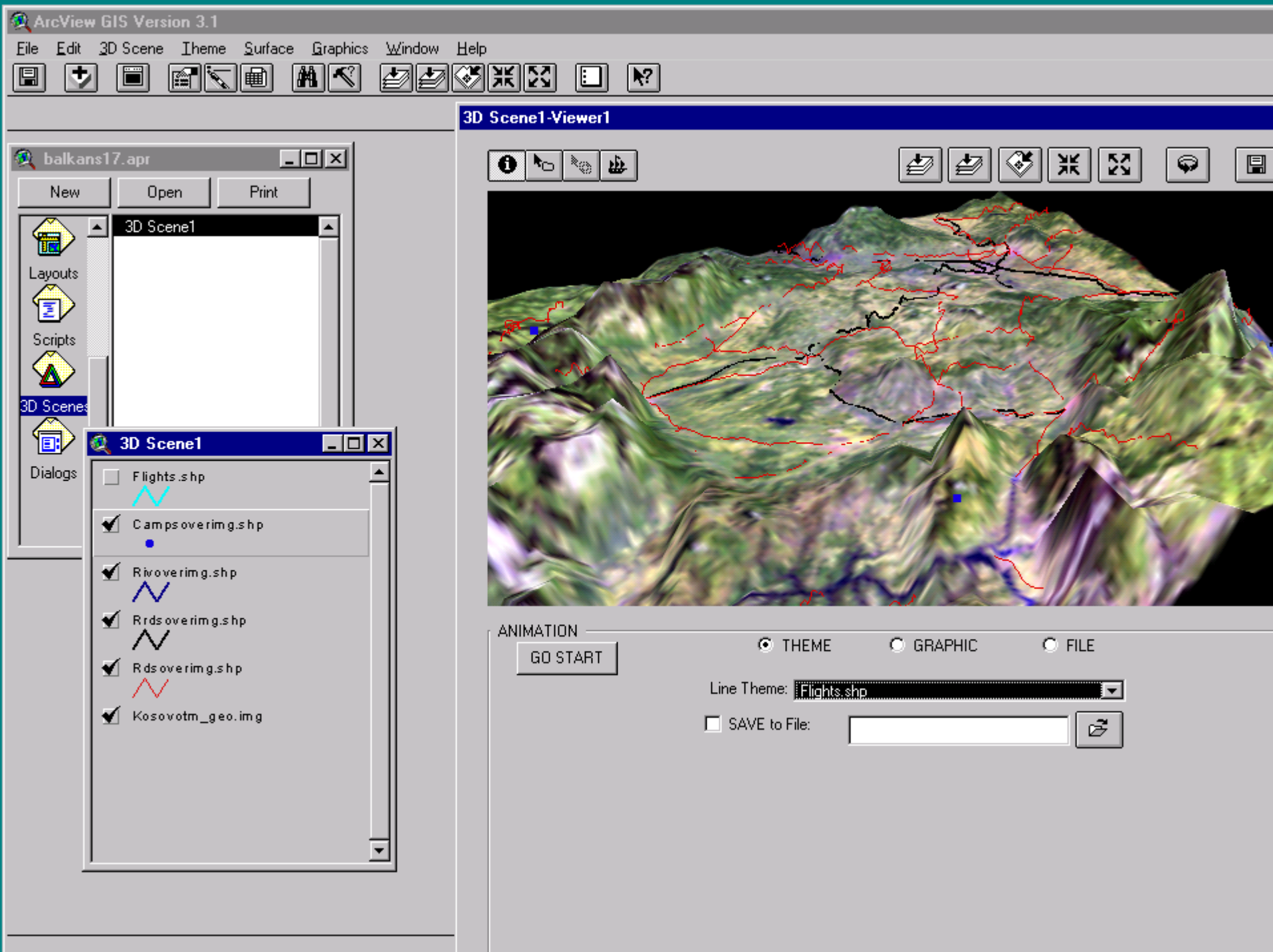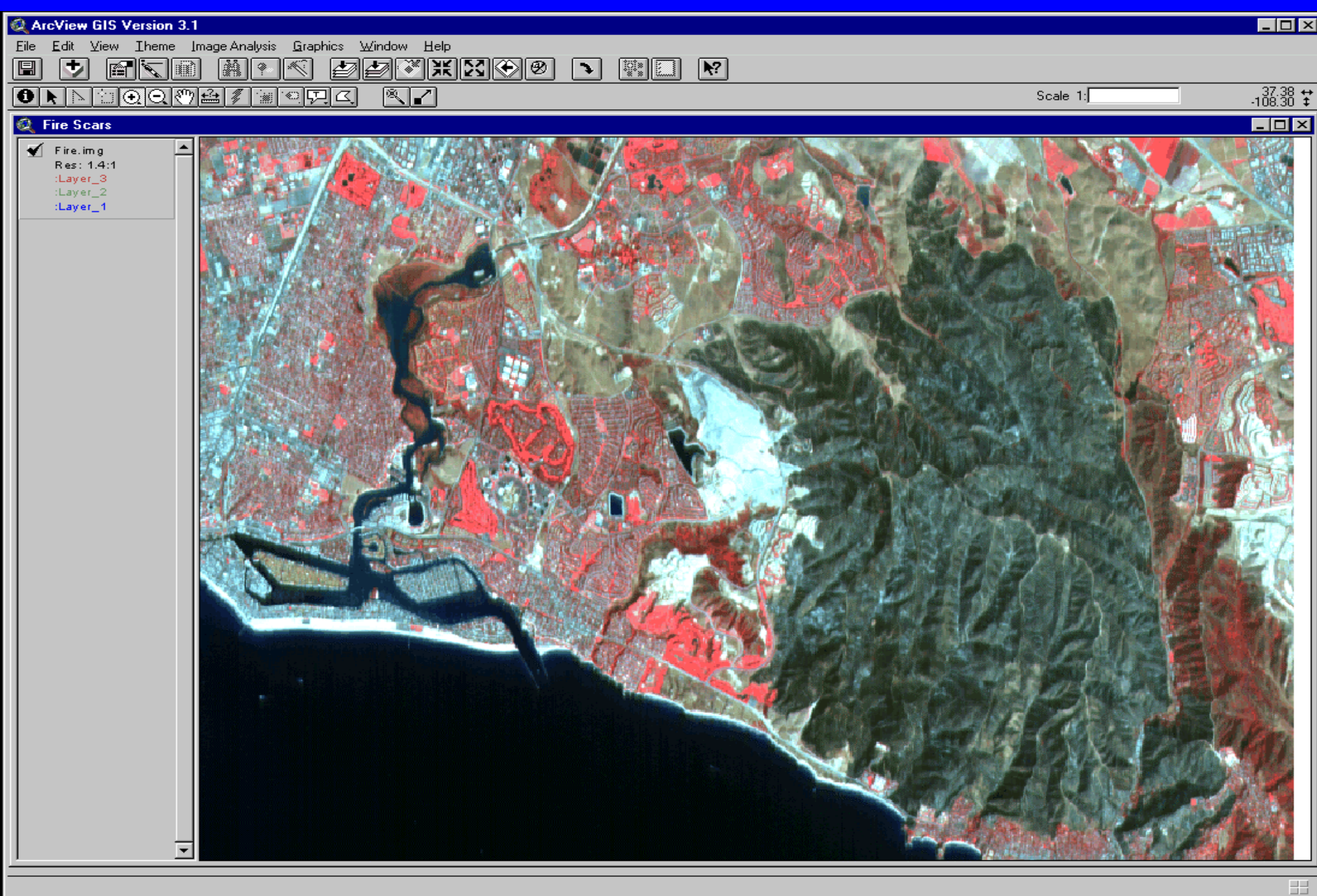
FIRE /FORESTRY MANAGMENT

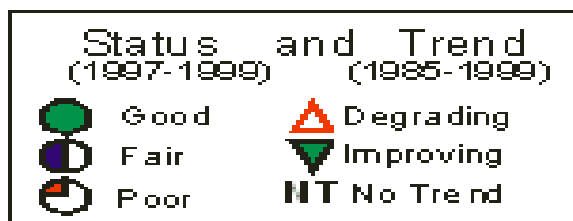File   Edit   View   Insert   Selection   Tools   Window   Help

1:4,450,000

Attributes of Counties

NAME	STATE_NAME	FIPS	POP1990
Hampshire	Massachusetts	25015	146568
Delaware	New York	36025	47225
Columbia	New York	36021	62982
Greene	New York	36039	44739
Suffolk	Massachusetts	25025	663906
Hampden	Massachusetts	25013	456310
Plymouth	Massachusetts	25023	435276

Record: 0   0 out of 536 Selected.

492.7 - 65270
Maine
2.906 - 43.41
43.41 - 72.94
72.94 - 148.1
148.1 - 492.7
492.7 - 65270
Maryland
2.906 - 43.41
43.41 - 72.94
72.94 - 148.1
148.1 - 492.7
492.7 - 65270
Massachusetts
2.906 - 43.41
43.41 - 72.94
72.94 - 148.1
148.1 - 492.7
492.7 - 65270
New Hampshire
2.906 - 43.41
43.41 - 72.94
72.94 - 148.1
148.1 - 492.7
492.7 - 65270
New Jersey
2.906 - 43.41
43.41 - 72.94
72.94 - 148.1
148.1 - 492.7
492.7 - 65270
New York
2.906 - 43.41
43.41 - 72.94

Display   Source

Tools

Drawing   Arial   9.75   B   I   U

1667768.54 623933.84 Meters

Stadtinformation

Zurück

Zoom +

Zoom –

Vor

Pan

Gesamt

ESRI ++

ESRI Geoinformatik GmbH

Copyright(c) ESRI

Geoinformatik Gmbh

Zentrum-Nord

Hauptbahnhof

Zentrum-Ost

Augustusplatz

Zentrum

Zentrum-West

Roßplatz

File   Edit   View   Go   Favorites   Help

Back   Forward   Stop   Refresh   Home   Search   Favorites   History   Channels   Fullscreen   Mail   Print   Edit

Address http://viewers/htmlviewer

Greenland

Canada

United States

Mexico

Bahamas, The

Cuba

Jamaica   Haiti   Puerto Rico

Belize   Guadeloupe
Guatemala   Martinique
Honduras

Map created with ArcIMS 3.0 - Copyright (C) 1996-2000 ESRI Inc.

0   1298.29mi

Layers

Visible Active

☐   ◉ CITIES

☑   ○ country

☑   wsiearth.tif

[Refresh Map]

Pan

Local intranet zone
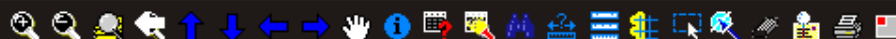
Track of Hurricane Georges

From September 20 through 25, 1998

NOTE: The hurricane path depicted in this map does not represent the limits of significant rainfall or damage.

Atlantic Ocean

Sep-23-98

Sep-22-98

Sep-21-98

Sep-20-98

Turks and Caicos Islands

Cuba

Haiti

Dominican Republic

Santo Domingo

Port -au- Prince

Jamaica

Kingston

British Virgin Islands

Puerto Rico

Virgin Islands

Anguilla

St. Kitts and Nevis

Saint John's

Antigua and Barbuda

Montserrat

Guadeloupe

Dominica
Roseau

Martinique

Castries
St. Lucia

St. Vincent and the Grenadines

Kingstown

Caribbean Sea

Aruba

Legend

Hurricane Strength (Wind Speed)

- Category 1 (75-95 MPH)
- Category 2 (94-110 MPH)
- Category 3 (111-130 MPH)
- Category 4 (131-155 MPH)
- Category 5 (>155 MPH)
- ★ National Capitals

Rivers

Track of Georges

- Area within 20 Miles of Eye
- Area 20 -40 Miles from Eye
- Area 40-60 Miles from Eye

OFDA

NOAA

What are the elements of an SDI?

- **Core Datasets**
- **Metadata**
- **Clearinghouse**
- **Standards**
- **Shared applications**
- **Institutional arrangements**

Core/Framework Data Sets

- <u>Common</u> themes of data.

- Every nation decides on their Framework.

- The US Framework……

FGDC Framework Datasets

- Base Cartographic
- Bathymetric
- Cadastral
- Cultural and Demographic
- Geodetic
- Geologic
- Ground Transportation
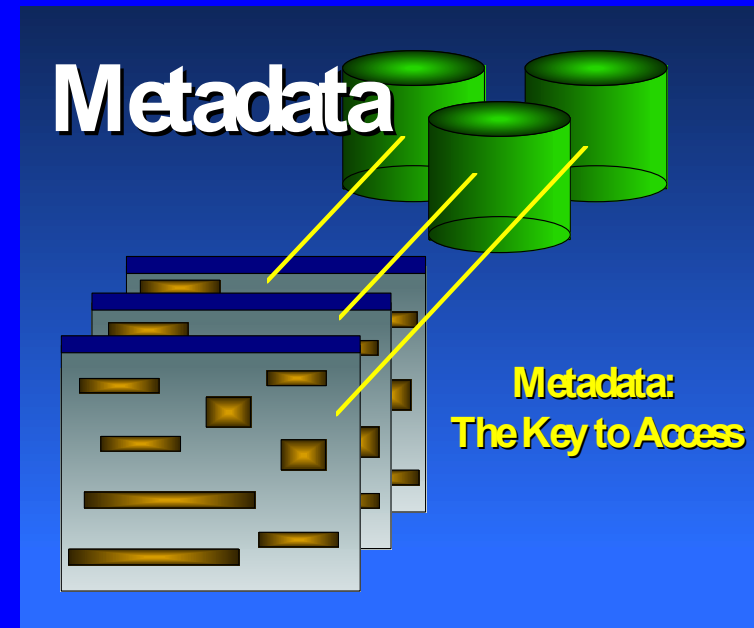- International Boundaries
- Soils
- Vegetation
- Water
- Wetlands

FGDC Structure

www.fgdc.gov
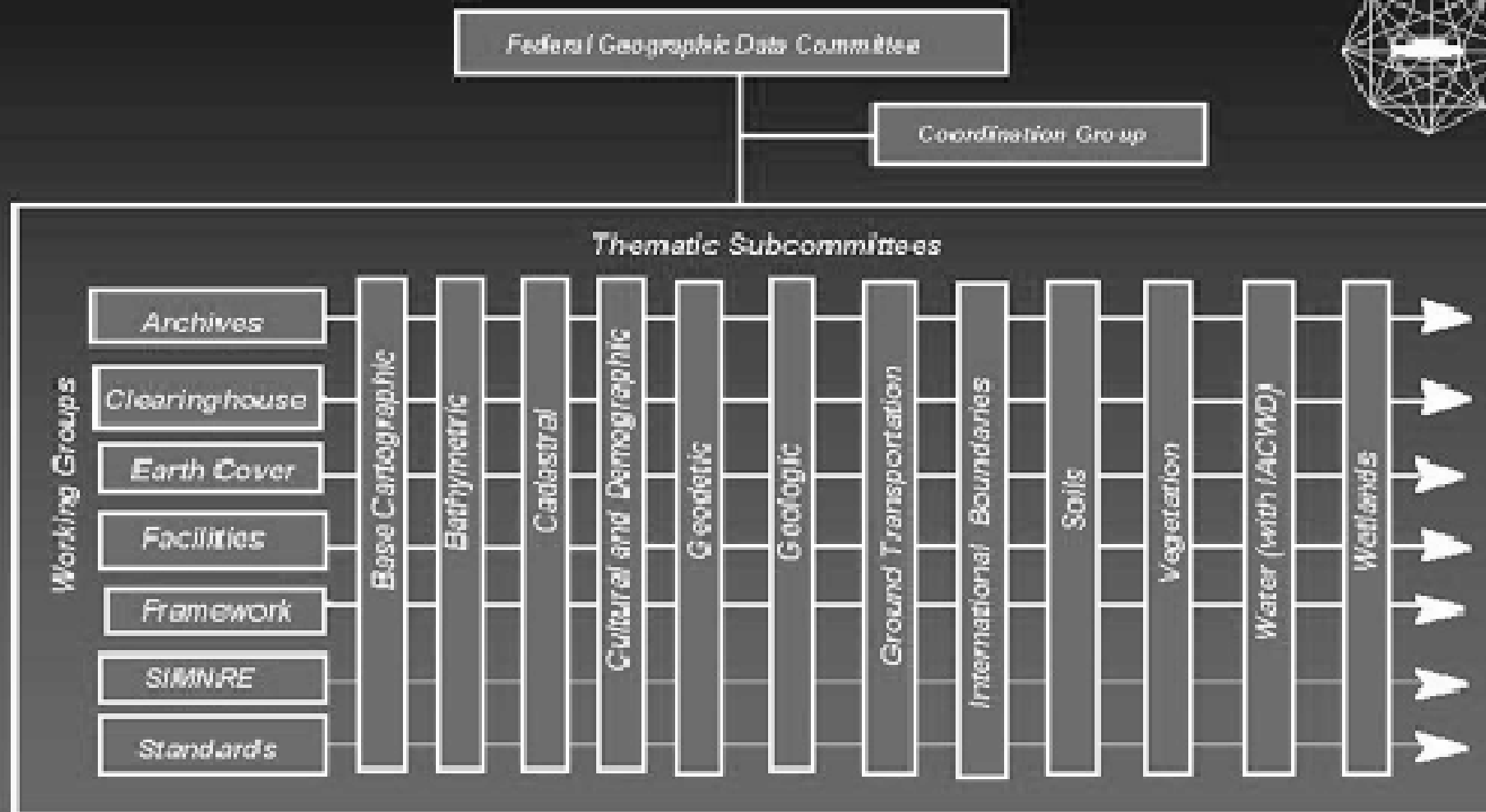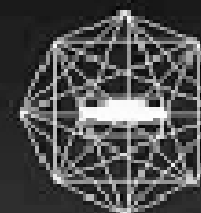
Meta Data

Information about the data
- geographic area covered
- currency
- rules of acquiring
- positional accuracy
- means of encoding
- datum
- map projection

Metadata

Metadata:
The Key to Access

What is a Clearinghouse?

- "Distributed, electronically connected network of geospatial data."

Clearinghouse
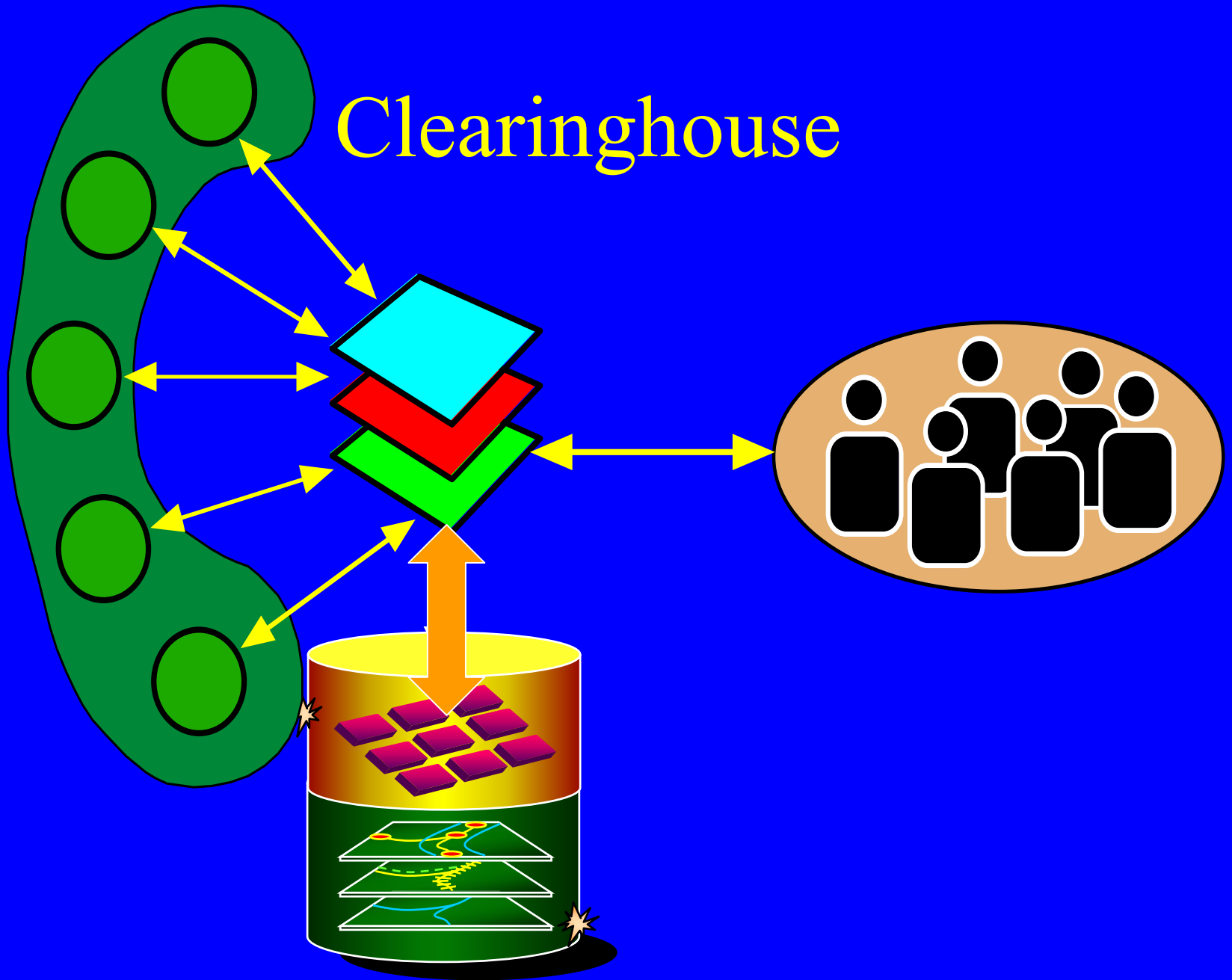
What are Data Standards & Why are they important ?

- Facilitates exchange of information

- Comparison of similar measurements

- Analysis of information across disciplines

- Reduce lifecycle costs
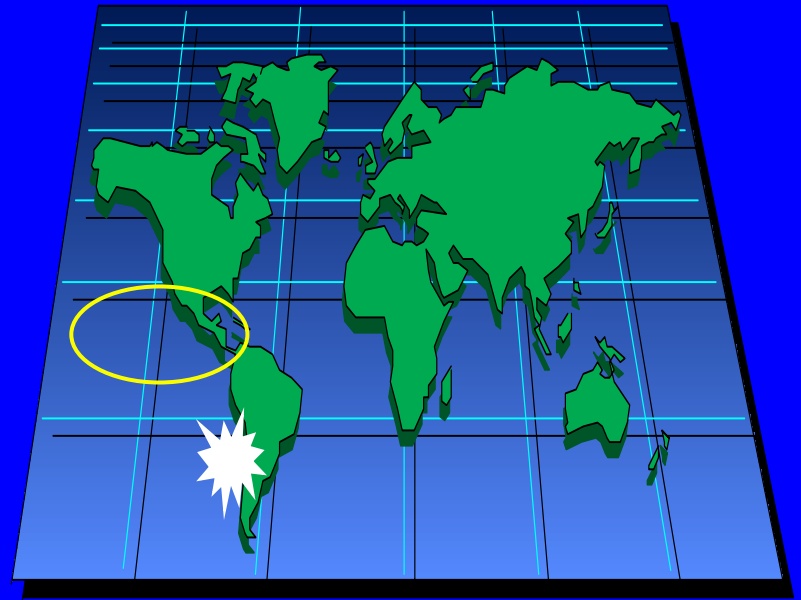
Data Standards

- Data classification – attributes common to a group (wetlands or soil classification)
- Data content – definition of a set of objects that become a data model.
- Data symbology
- Data transfer
- Data quality-accuracy.
- Data documentation
- Data Integration/Normalization.

Data Standards

- Common Coordinate Systems (Lat/Long or UTM)
- Networking Addressing Scheme
- Geographic Names
- Reference Datums
- Often driven by international standards- such as IHO standards for bathymetric mapping.

ISO/TC 211

ISO/TC 211
Norway

WG 1	WG 2	WG 3	WG 4	WG
United States of America	Australia	United Kingdom	Norway	Netherlan
Framework and Reference Model	Geospatial Models and Operators	Geospatial Data Administration	Geospatial Services	Profiles Functio Standa
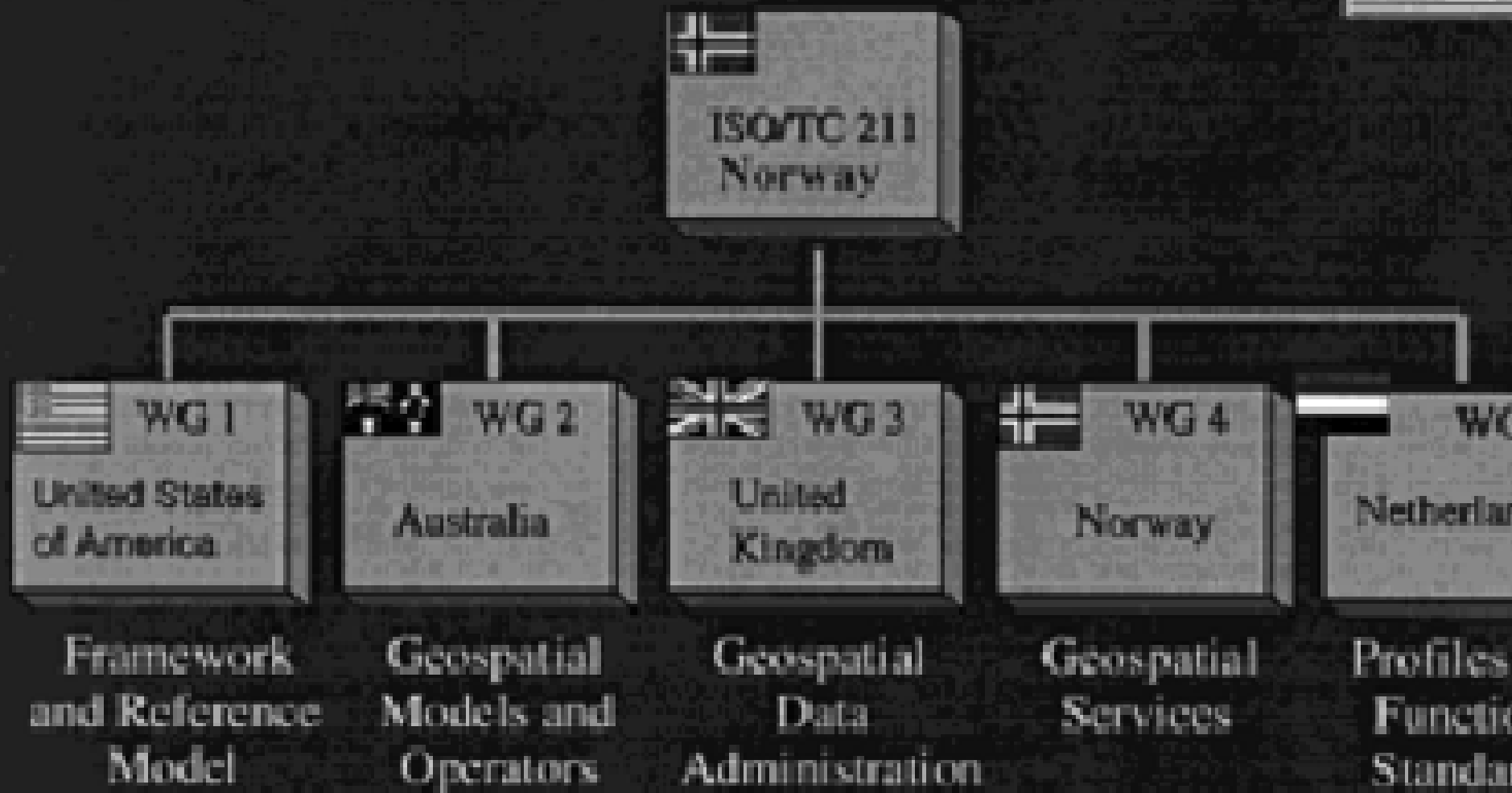
Data Standards

- Vector formats/exchange (SIF, DXF, SDTS, DIGEST, Shape)

- Raster formats/exchange (TIFF, JPEG, GIF)

- Attribute Data Exchange (ABC, SQL)

- Interoperability (OpenGIS Specification)

Data Standards

- Database Schemas (field length, format)

- Spatial Data coding (land use or zoning codes)

- Map design (placement of features, symbols,colors, sheet format, scale)

- Map accuracy (control pts, scales…)

Other standards to agree on -

- Database design

- User Interface

- Data formats/exchange

- Programming and application development languages

- User design standards

Steps in creating GeoData Base

Creating a geodatabase: overview

Design process
Think before you create

Create empty database
Name & location only

Define database structure
Schema (and data)

Load data into database
Load other data

Define additional properties
Leverage database advantages
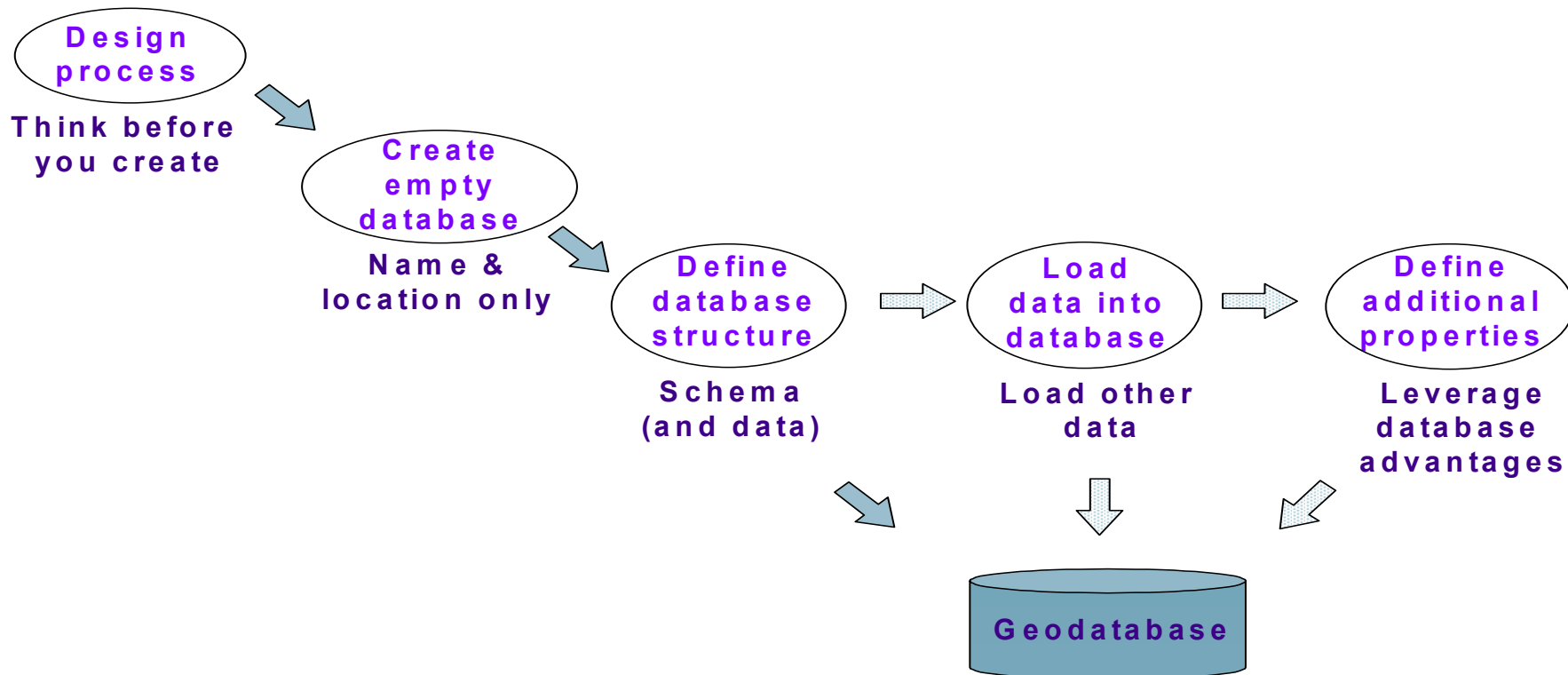
Geodatabase

Creating feature datasets

◆ **Organizes feature classes (optional)**

◆ **Have spatial reference (feature classes inherit)**

🕐 **Select the geodatabase**
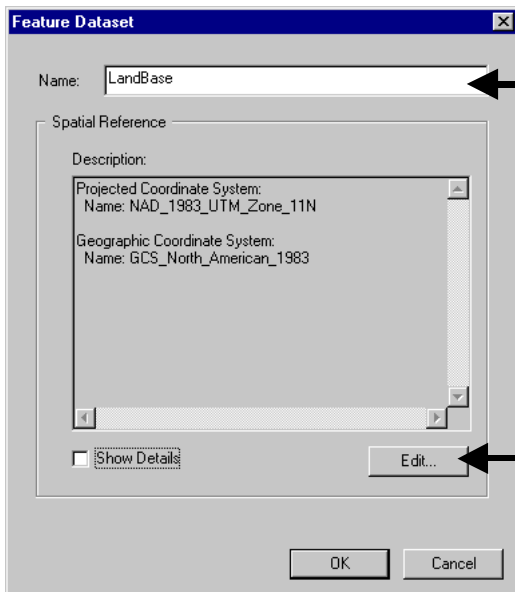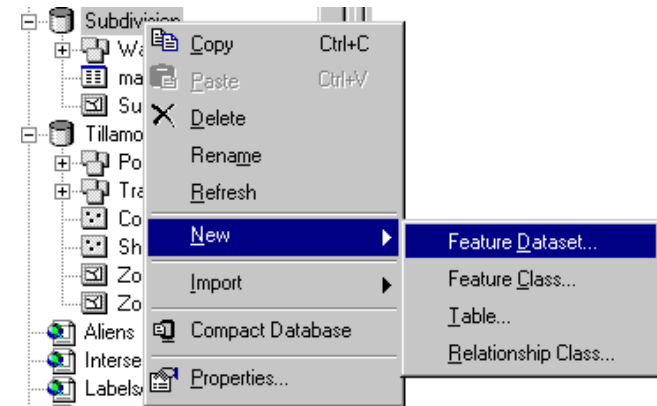
🕐 **Name the Feature Dataset**

🕐 **Select New > Feature Dataset**

✍ **Set the spatial reference**

What are the steps in building SDI?
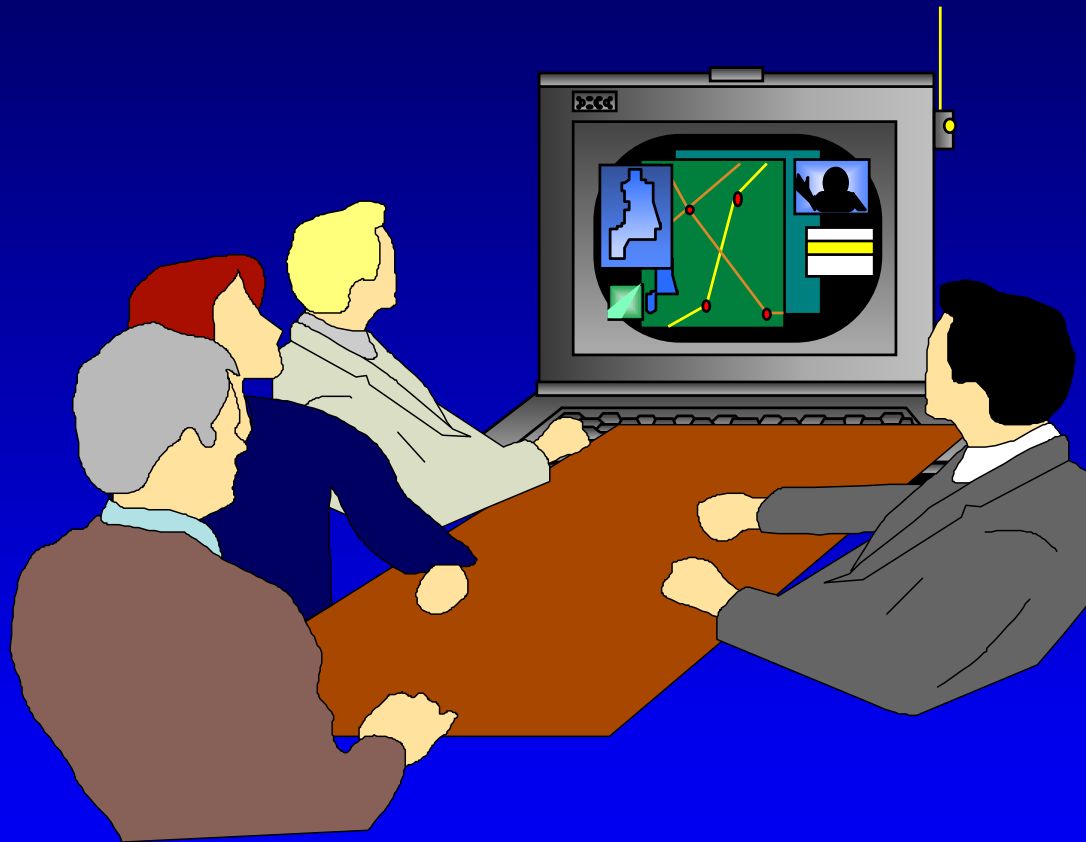
Institutional Agreements

Technology Road Map
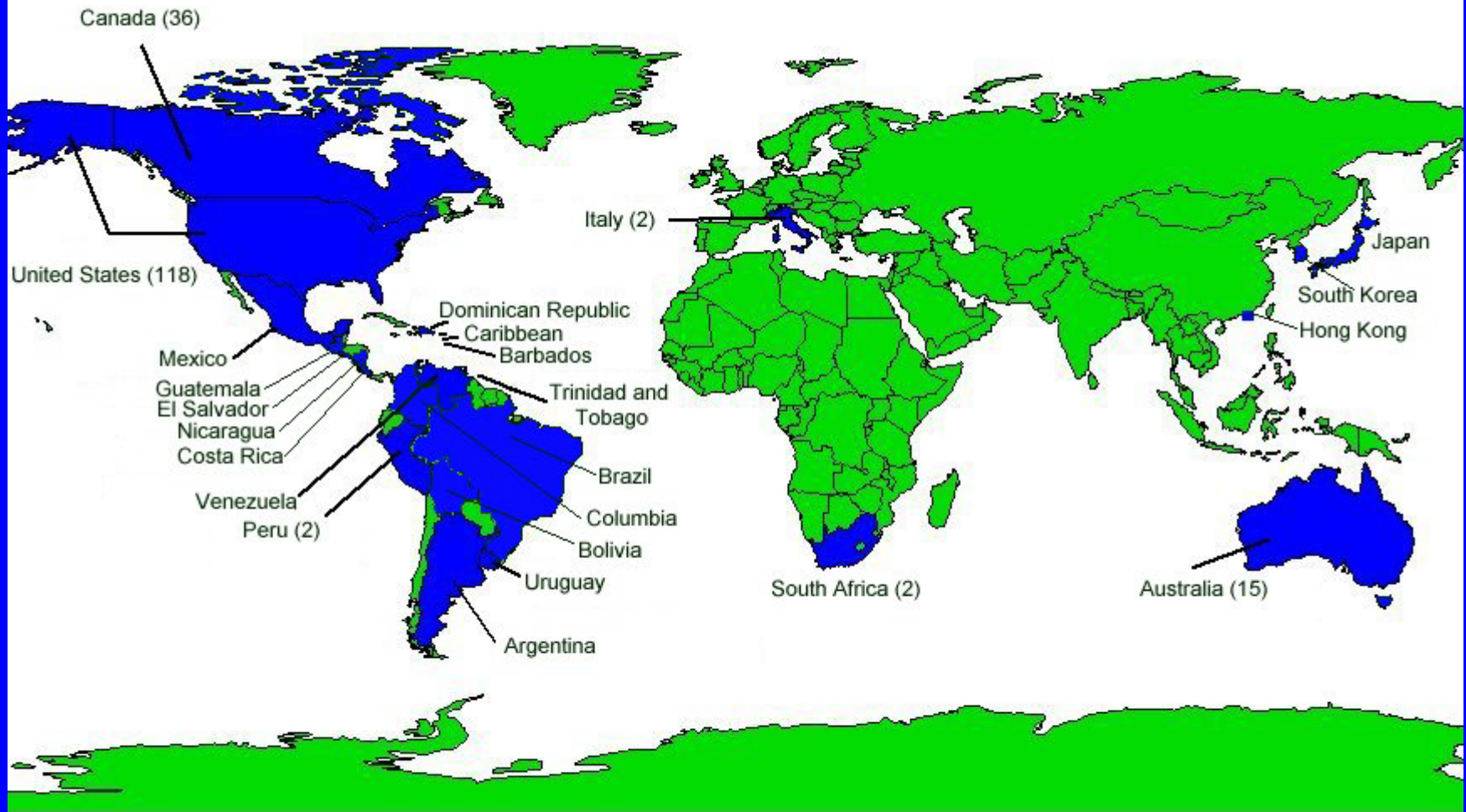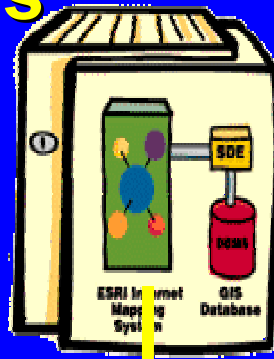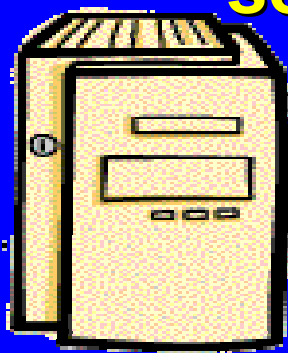
Shared Pilot Projects

"BIG Project" Road Map

```
        ┌─────────────────────────┐
        │   Needs assessment      │ ◄──────────┐
        └─────────────────────────┘            │
                    │                          │
                    ▼                          │
        ┌─────────────────────────┐            │
        │     Conceptual and      │ ◄──────────┤
        │     Logical design      │            │
        └─────────────────────────┘            │
                    │                          │
                    ▼                          │      P
        ┌─────────────────────────┐            │      r
        │     Physical design     │ ◄──────────┤      o
        └─────────────────────────┘            │      t
                    │                          │      o
                    ▼                          │      t
        ┌─────────────────────────┐            │      y
        │     Automation plan     │ ◄──────────┤      p
        └─────────────────────────┘            │      i
                    │                          │      n
                    ▼                          │      g
        ┌─────────────────────────┐            │
        │      Pilot project      │ ◄──────────┘
        └─────────────────────────┘
                    │
                    ▼
        ┌─────────────────────────┐
        │   Final implementation  │
        └─────────────────────────┘
```

GIS Users

Societal

Multi-User (Enterprise)

Groups/Teams

Projects

Public data

Distributed data

Departmental data

Project data
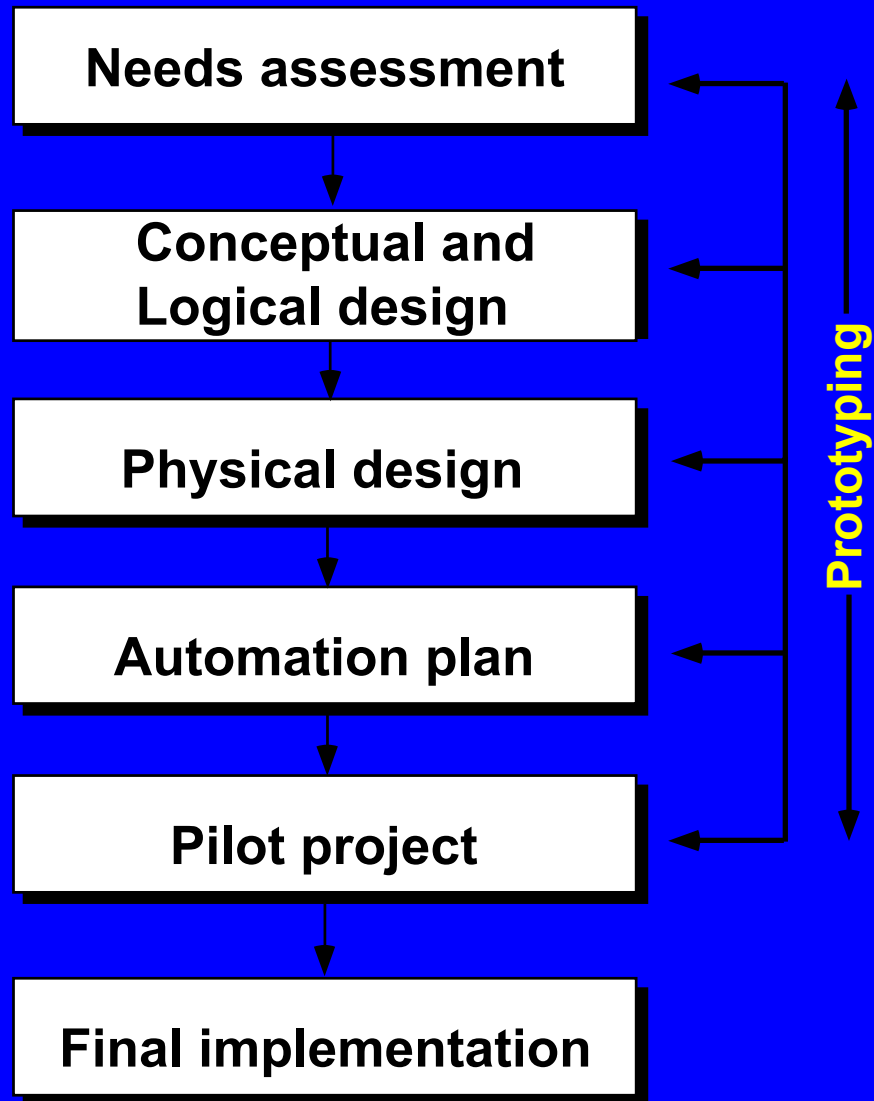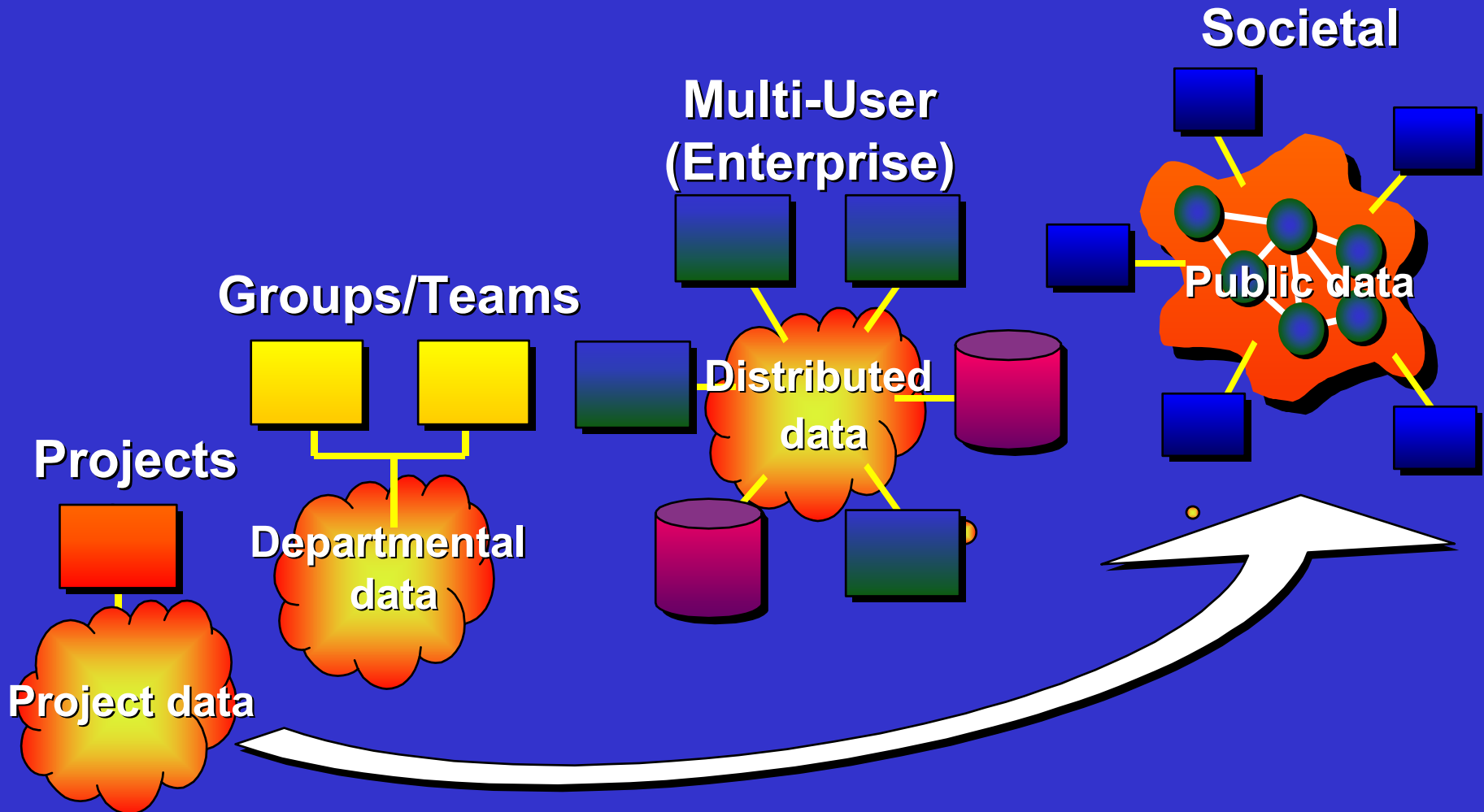
Clearinghouse Nodes Around the World

Canada (36)

Italy (2)

Japan

United States (118)

South Korea

Hong Kong

Dominican Republic
Caribbean
Barbados

Mexico

Guatemala
El Salvador
Nicaragua
Costa Rica

Trinidad and
Tobago

Venezuela

Peru (2)

Brazil

Columbia

Bolivia

Uruguay

Argentina

South Africa (2)

Australia (15)

Why Now?

GIS data servers

Files

Databases
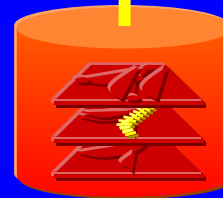
- **GIS Technology**
- **Internet**
- **Data growth**
- **Cost reductions**

Open Networks Allow Distributed Computing

Desktop

Workstation

Palmtop

(TCPIP/HTTP)

Servers

Pocket

Portable
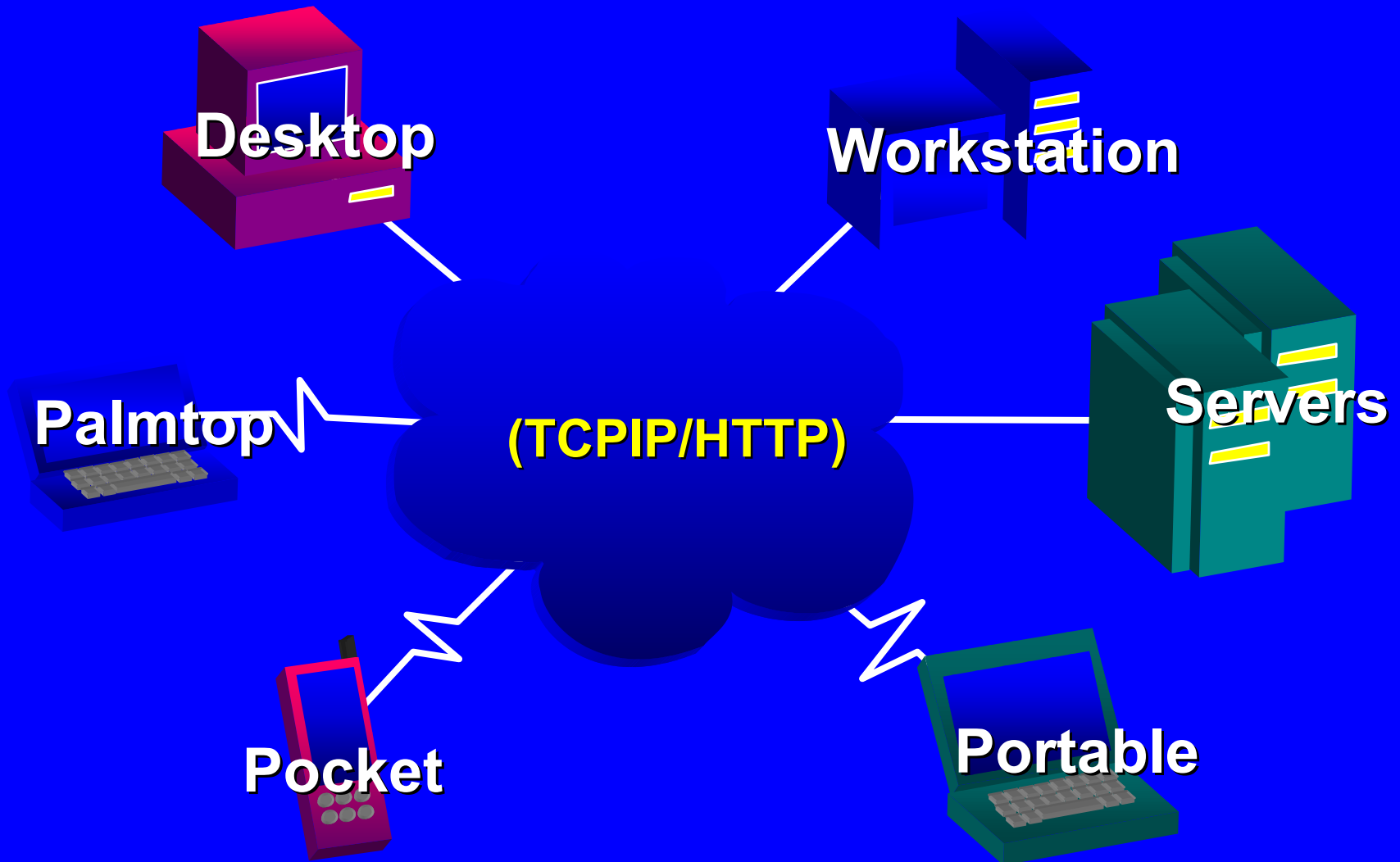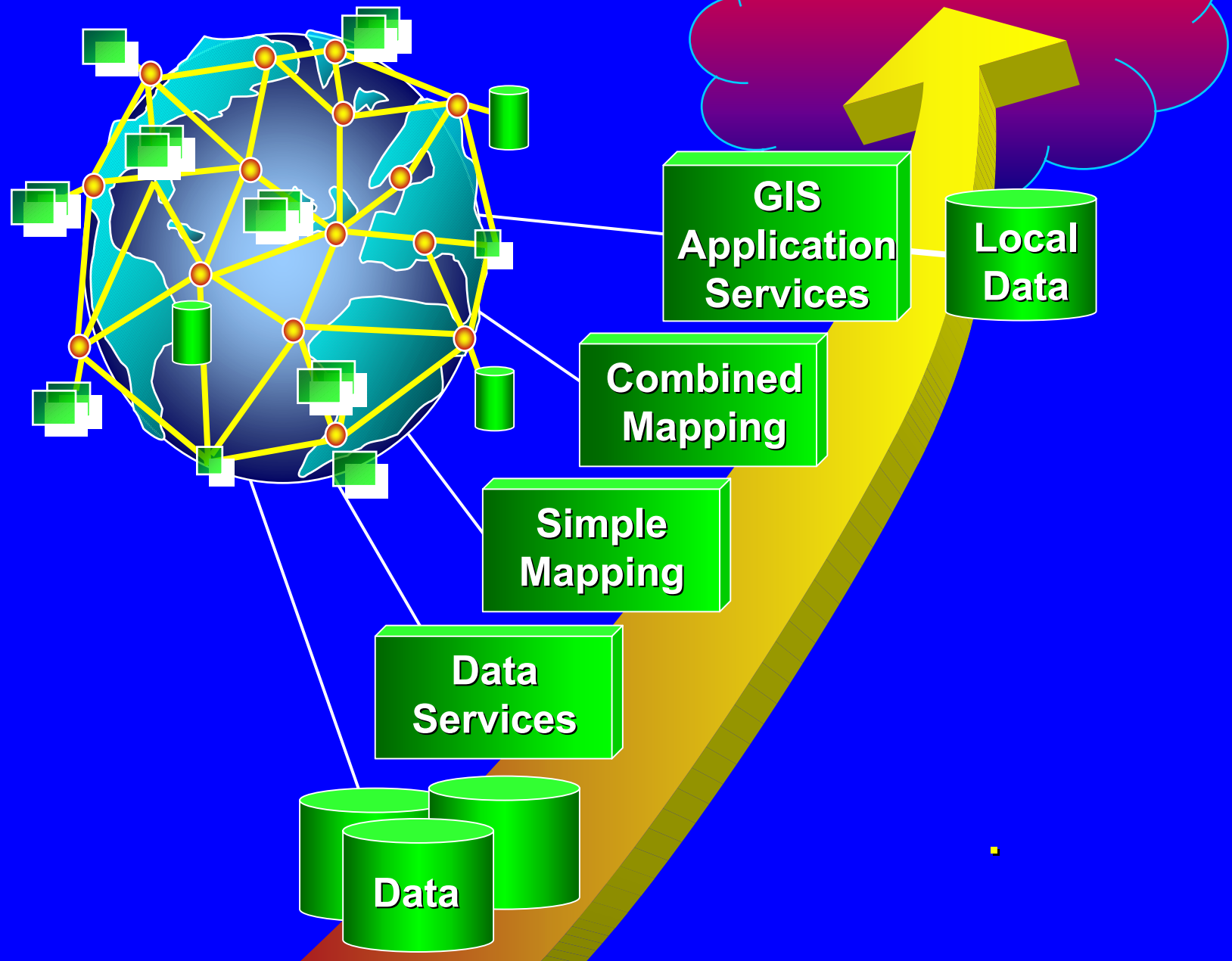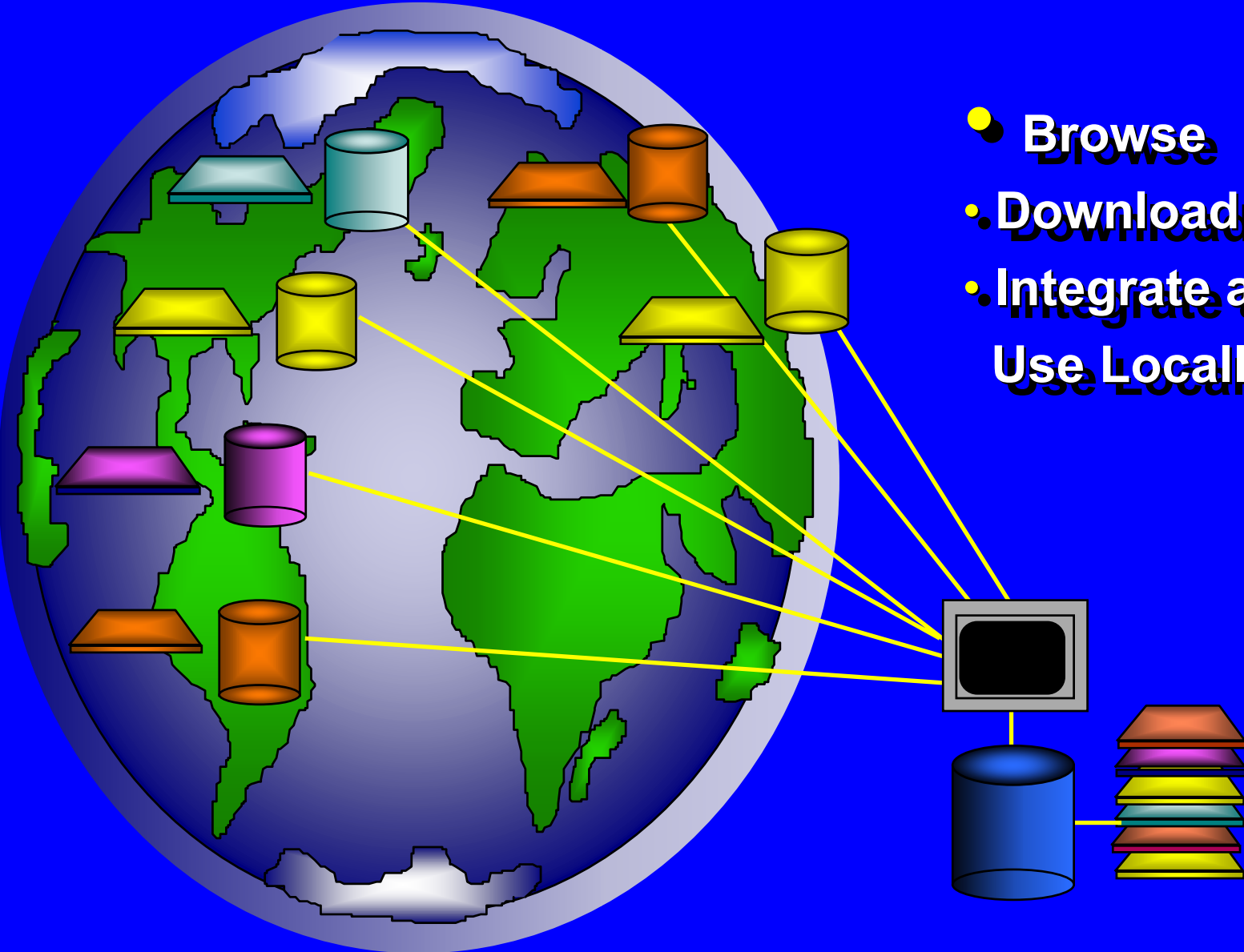
Internet :

- Browse
- Download Data
- Integrate and Use Locally

More Data
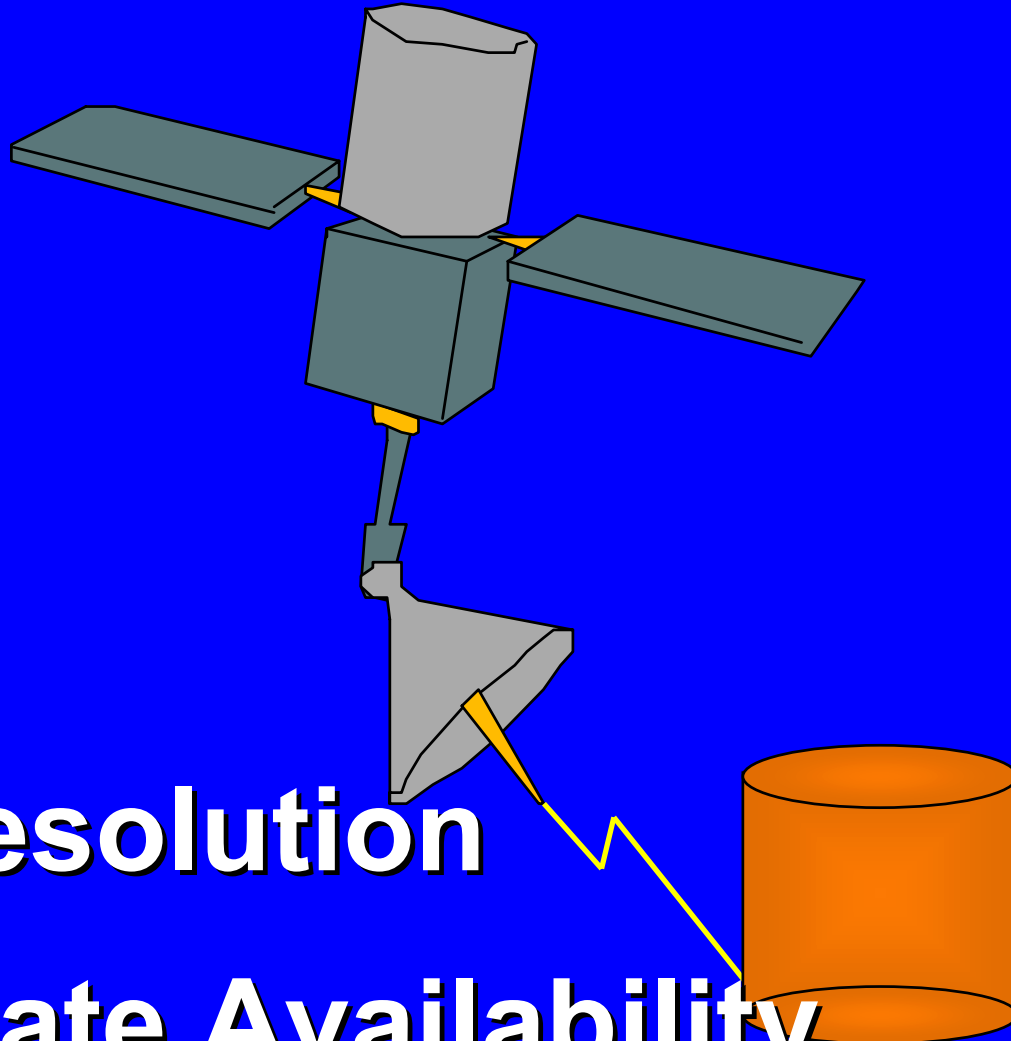
- High Resolution

- Immediate Availability
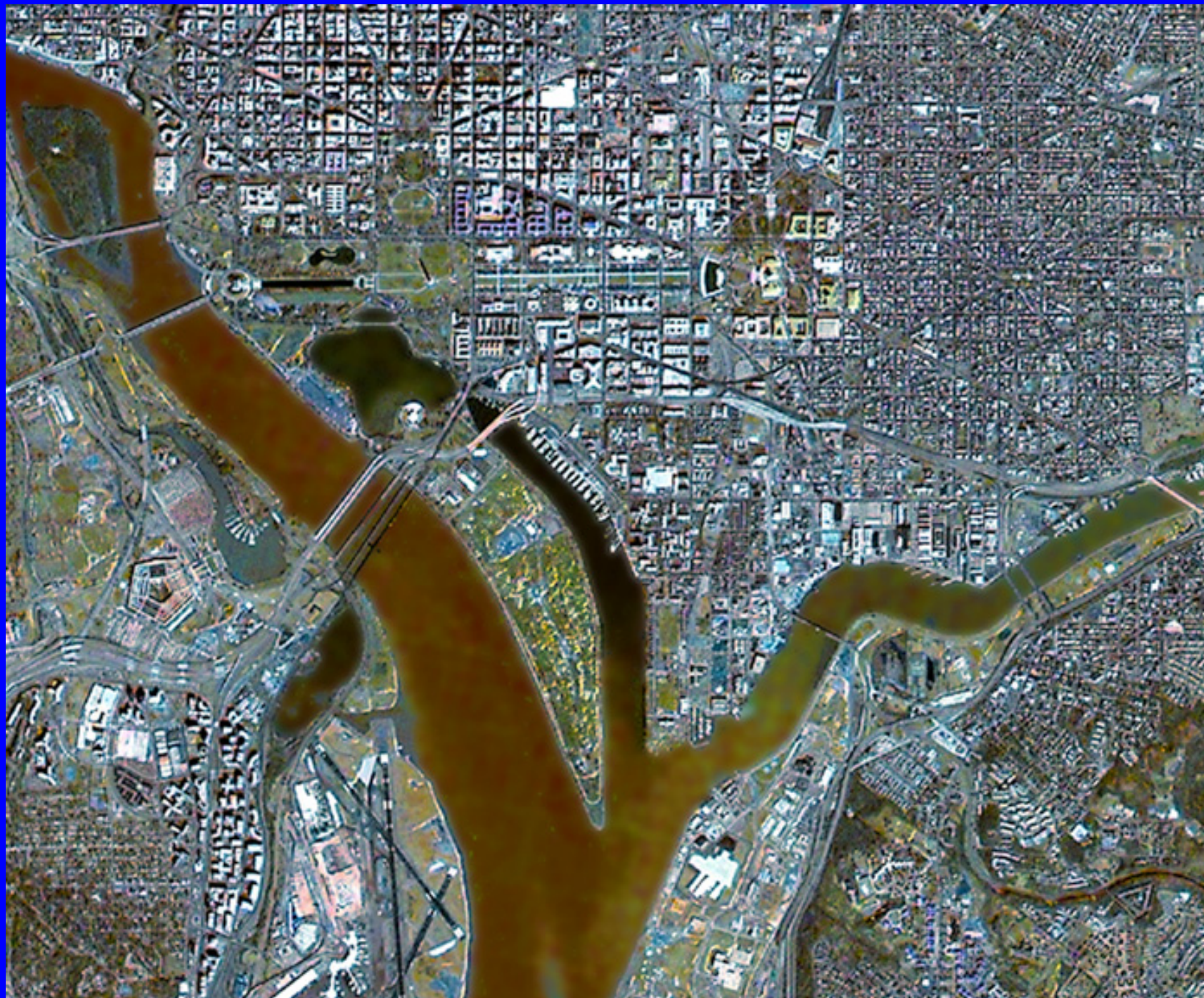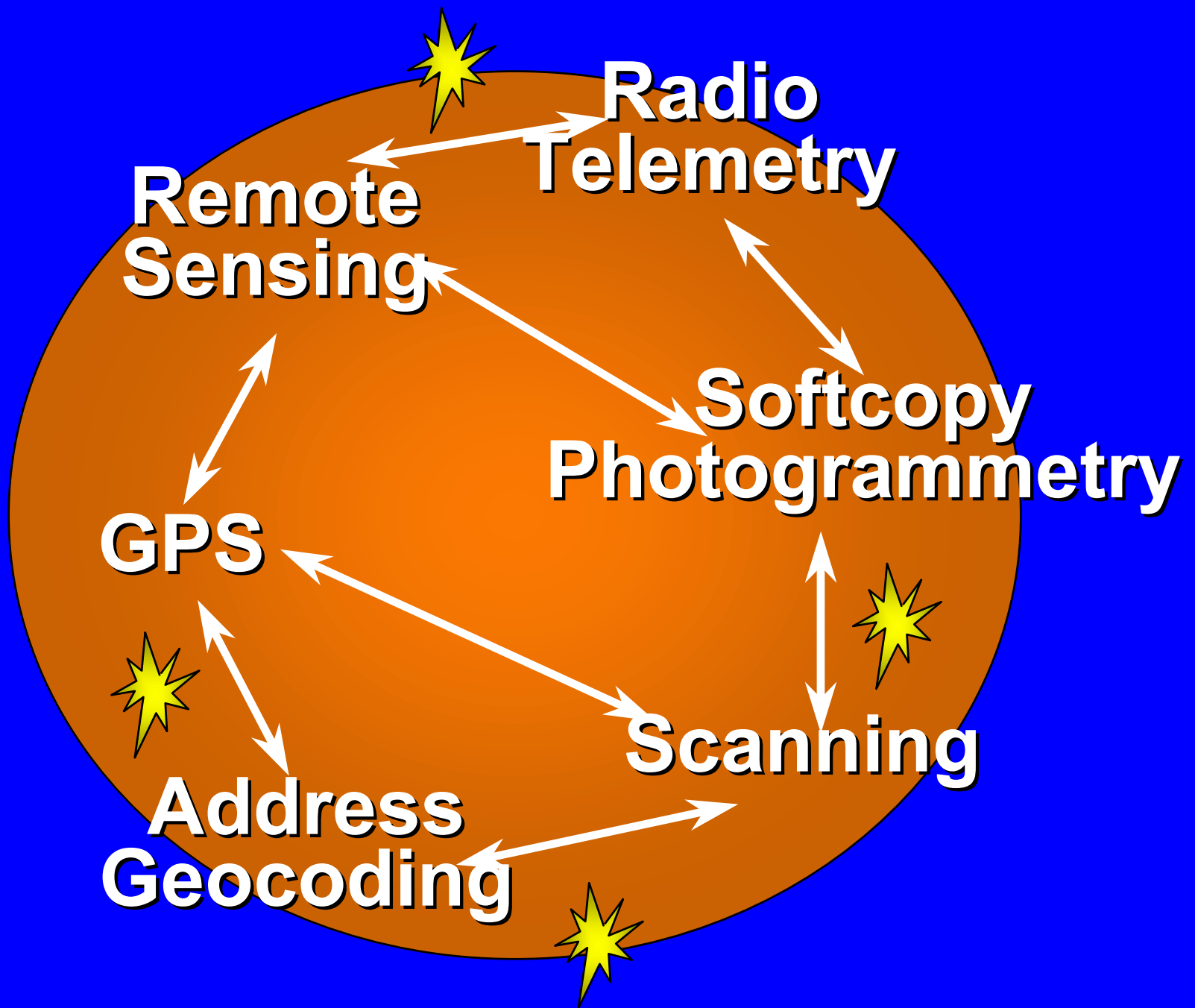
GIS and the Internet will Bring it Together

Data Base Networks

- **Data Loggers**
- **GPS**
- **Remote Sensing**