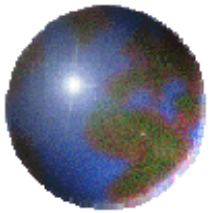


7. GIS Software

Geographic Information Systems and Science

SECOND EDITION

Paul A. Longley, Michael F. Goodchild, David J. Maguire, David W. Rhind

Overview

- Evolution of GIS software
- Architecture of GIS software
- Building GIS software systems
- Types of software
- Example products
- GIS software use

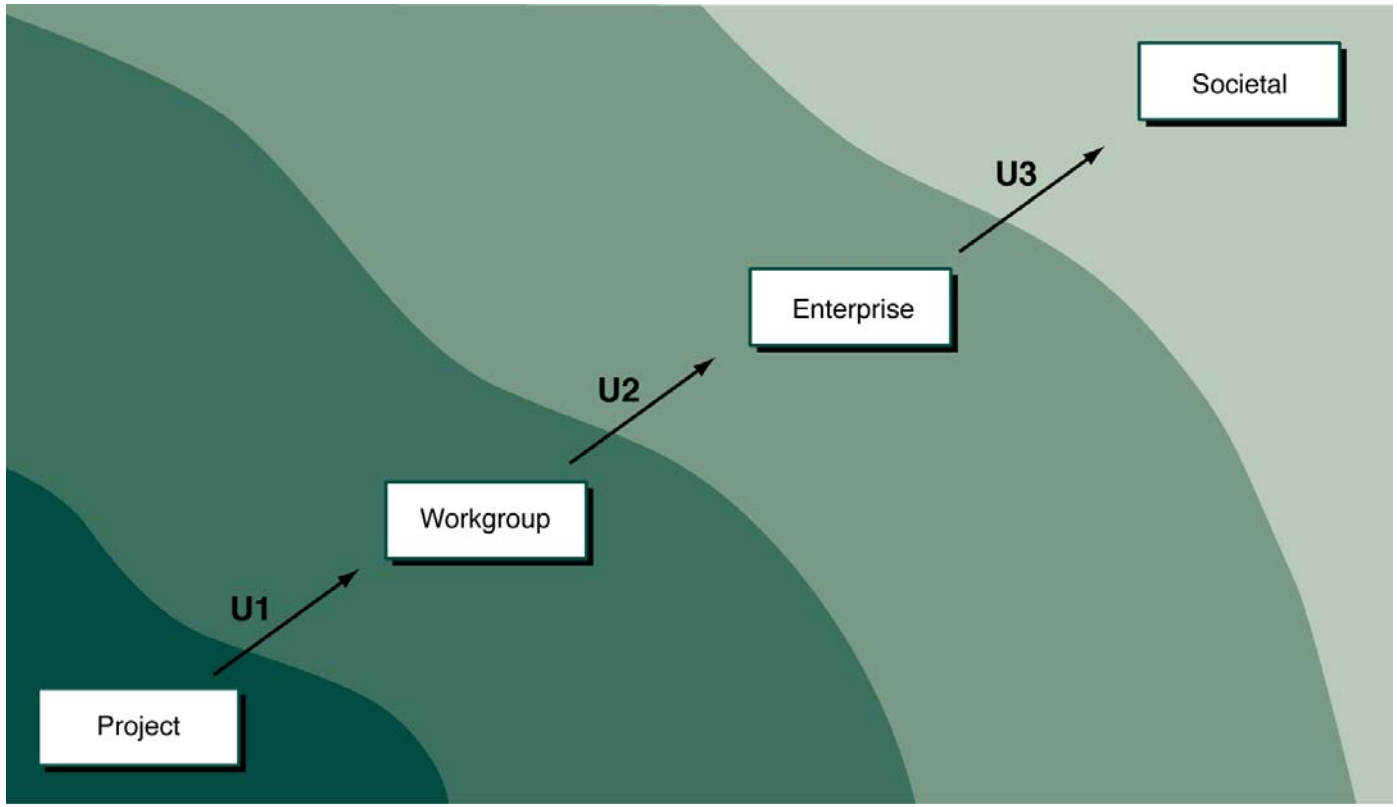
GIS Software

- The geoprocessing engines of GIS
- Major functions
  - Collect, store, mange, query, analyze and present
- Key terms
  - Program – collections of instructions to manipulate data
  - Package – integrated collection of programs
  - Component – self-contained, reusable software building blocks

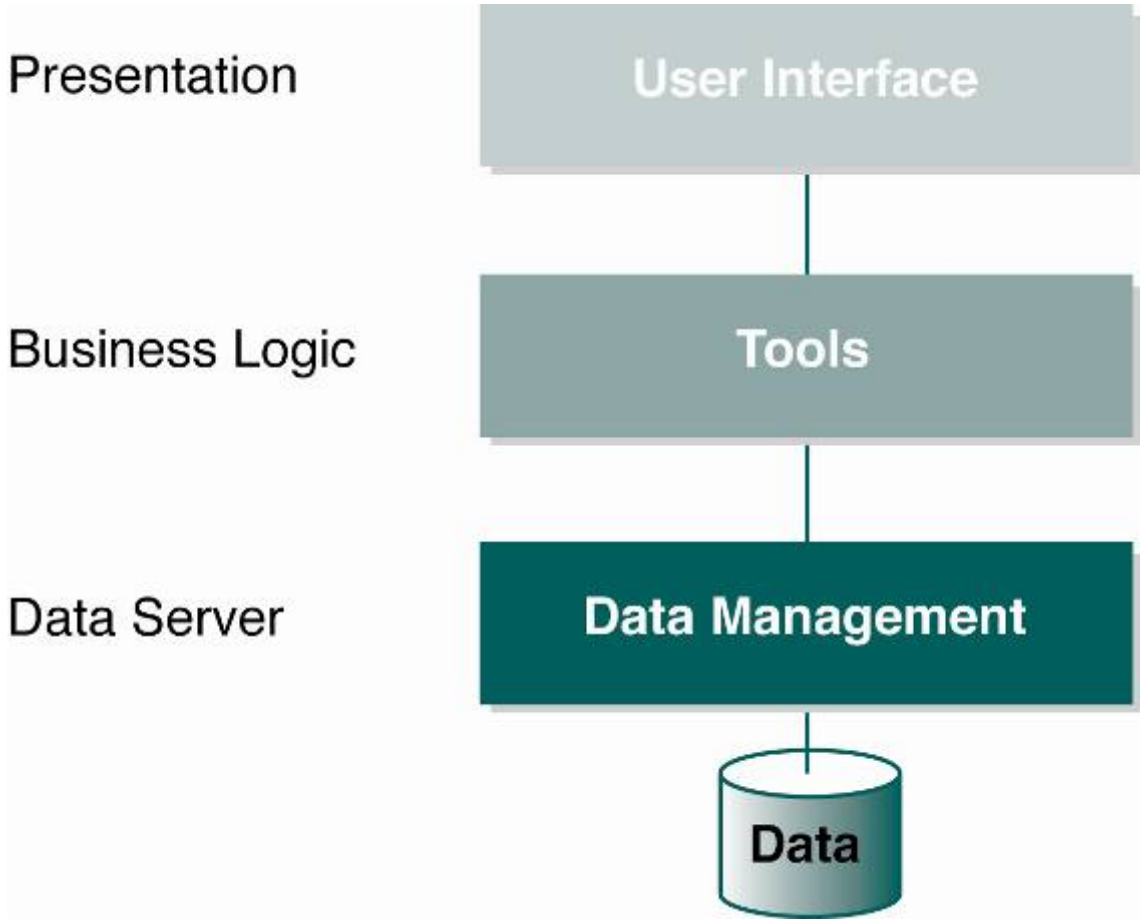
Evolution of GIS Software

- Sub-routine libraries (60s/70s)
  - Libraries of small programs (sub-routines)
  - Required advanced programming skills
- Tool box with CLI (70s/80s)
  - Basic package with Command Line Interface
  - Required advanced technical skills
- Task-oriented system (90s/00s)
  - Graphical User Interface (GUI)
  - Customization capabilities to create specific-purpose applications

Types of GIS Implementation



Three-tier Architecture

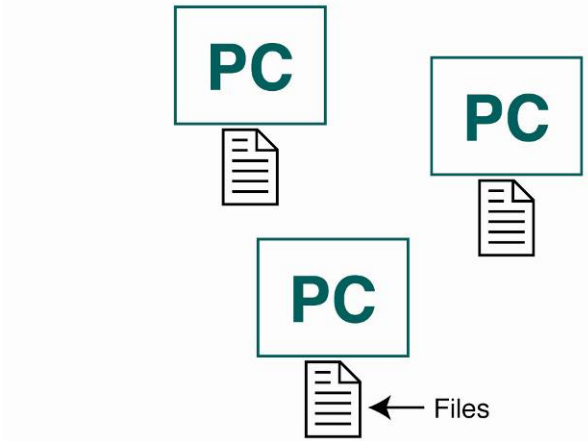


GS Software Architectures

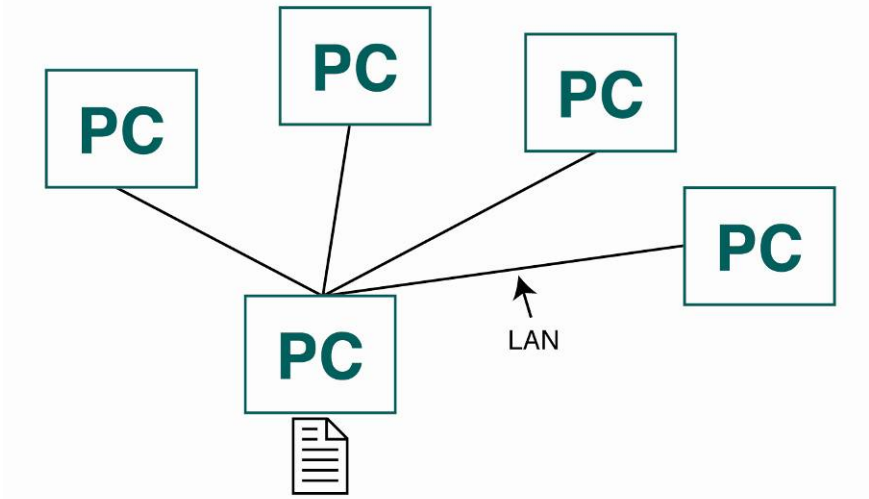
- Desktop
- Client-server
- Centralized
  - Desktop/Citrix
  - Server

Desktop GIS

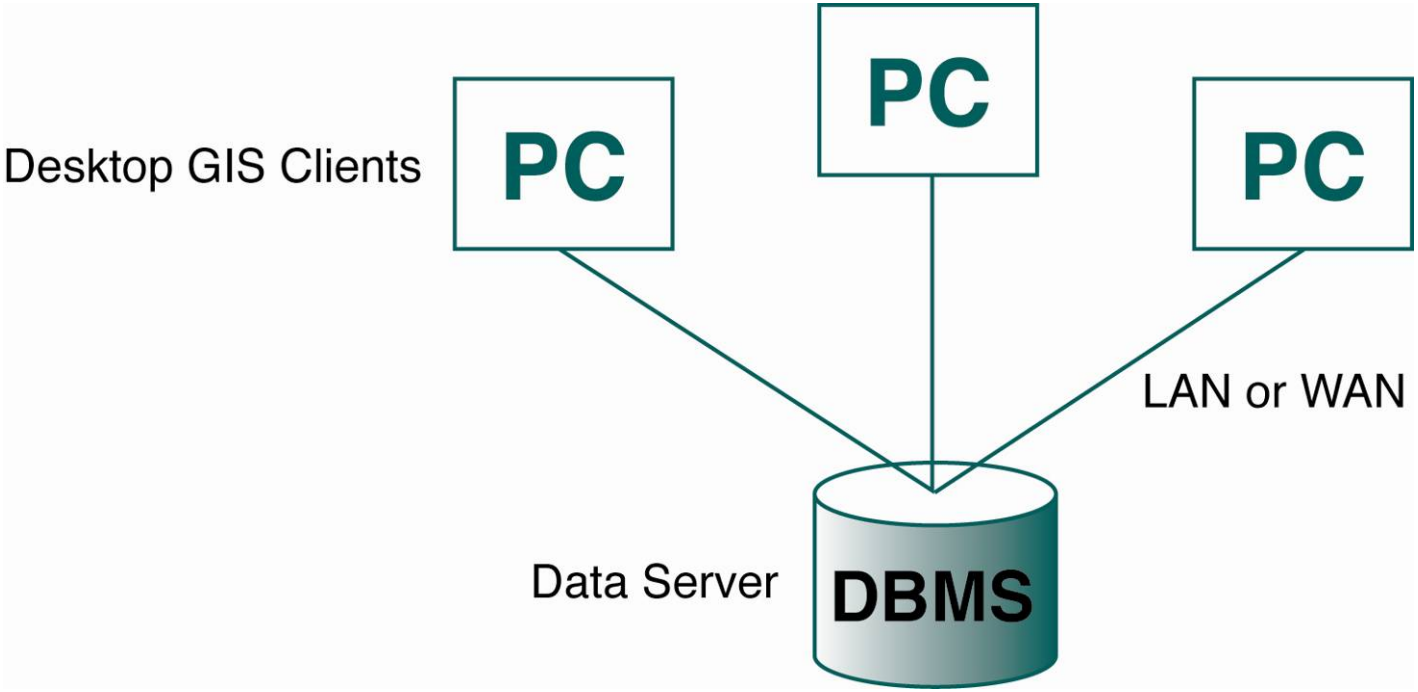
(A) Stand-alone desktop GIS on PCs each with own files



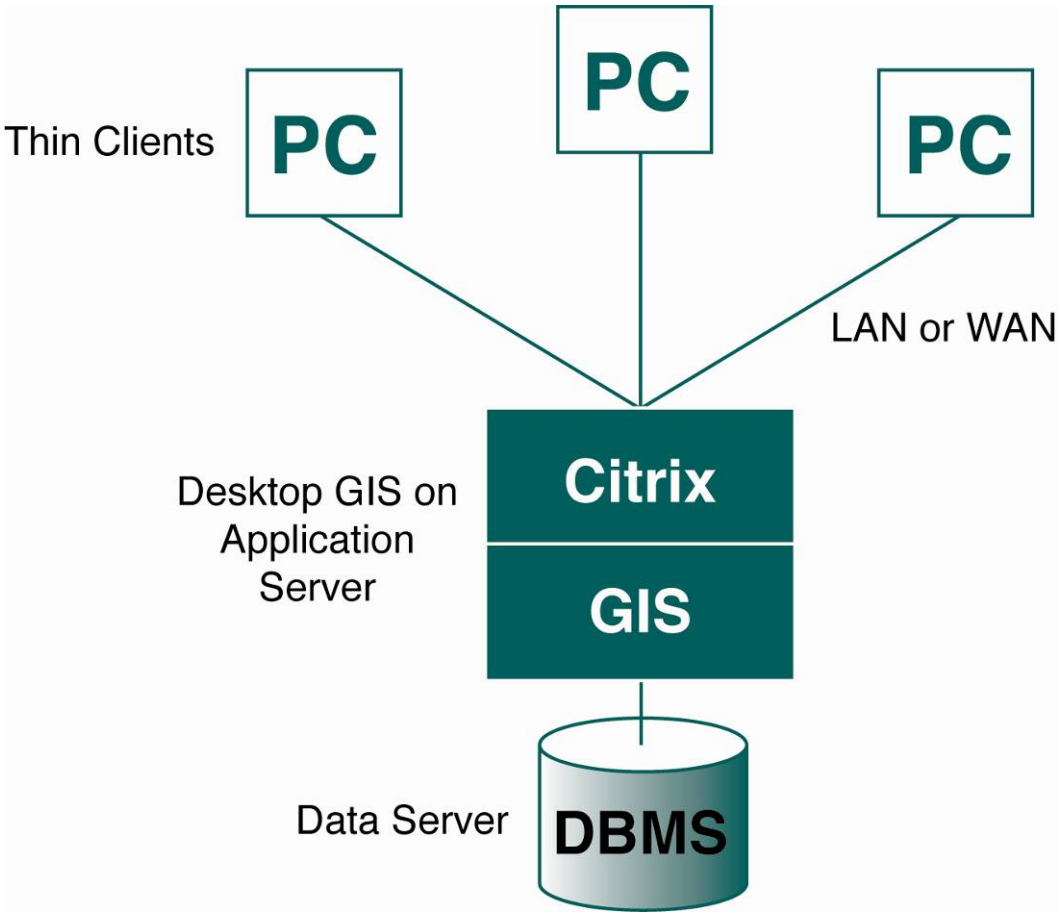
(B) Desktop GIS on PCs sharing files on a PC file server over a LAN



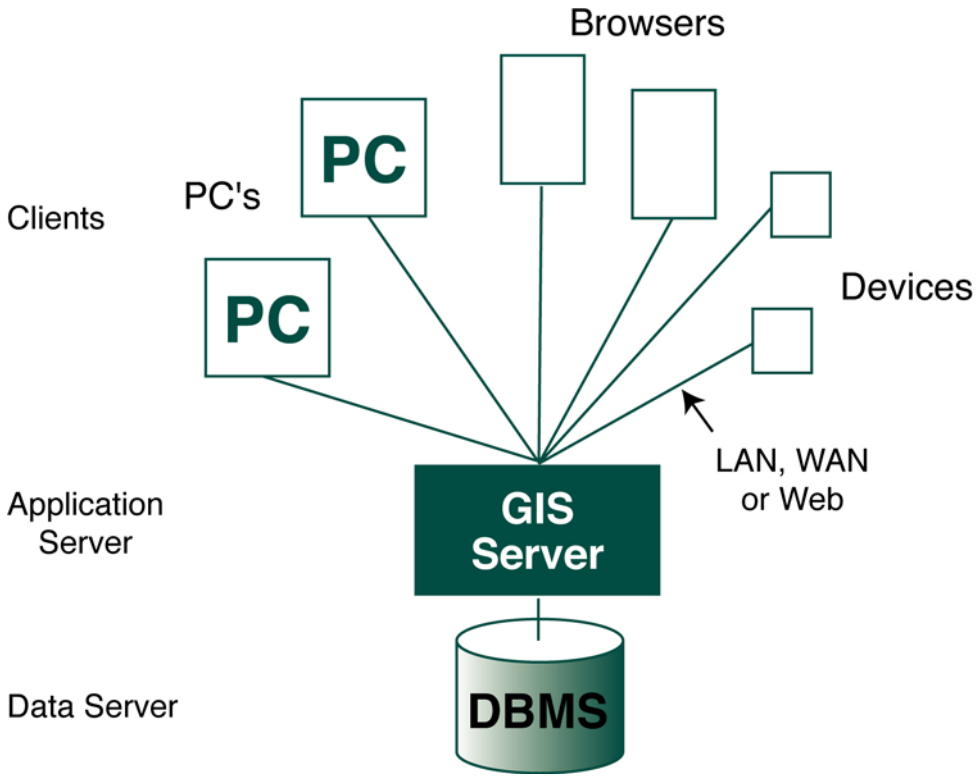
Client-server GIS



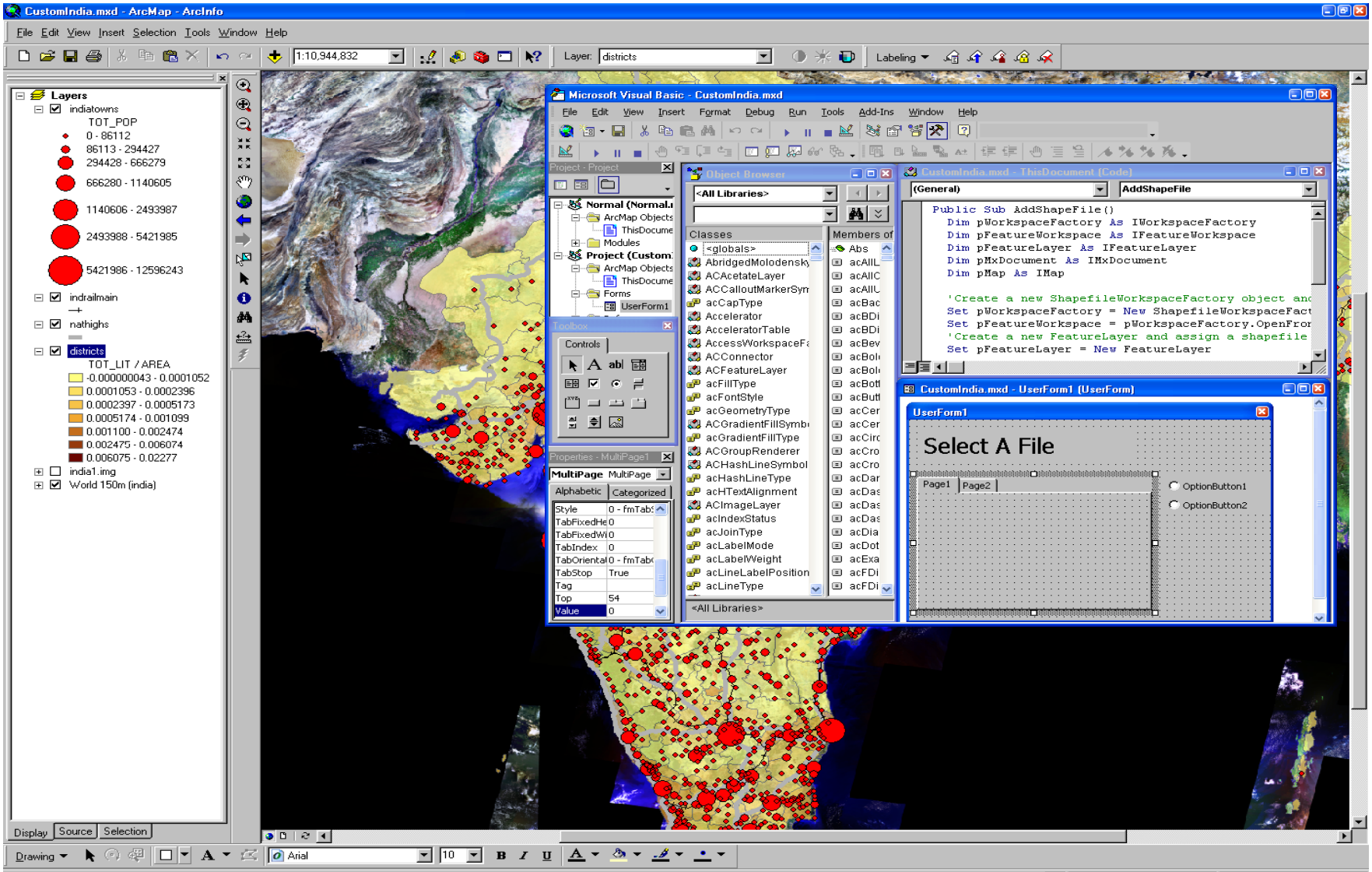
Centralized Desktop GIS



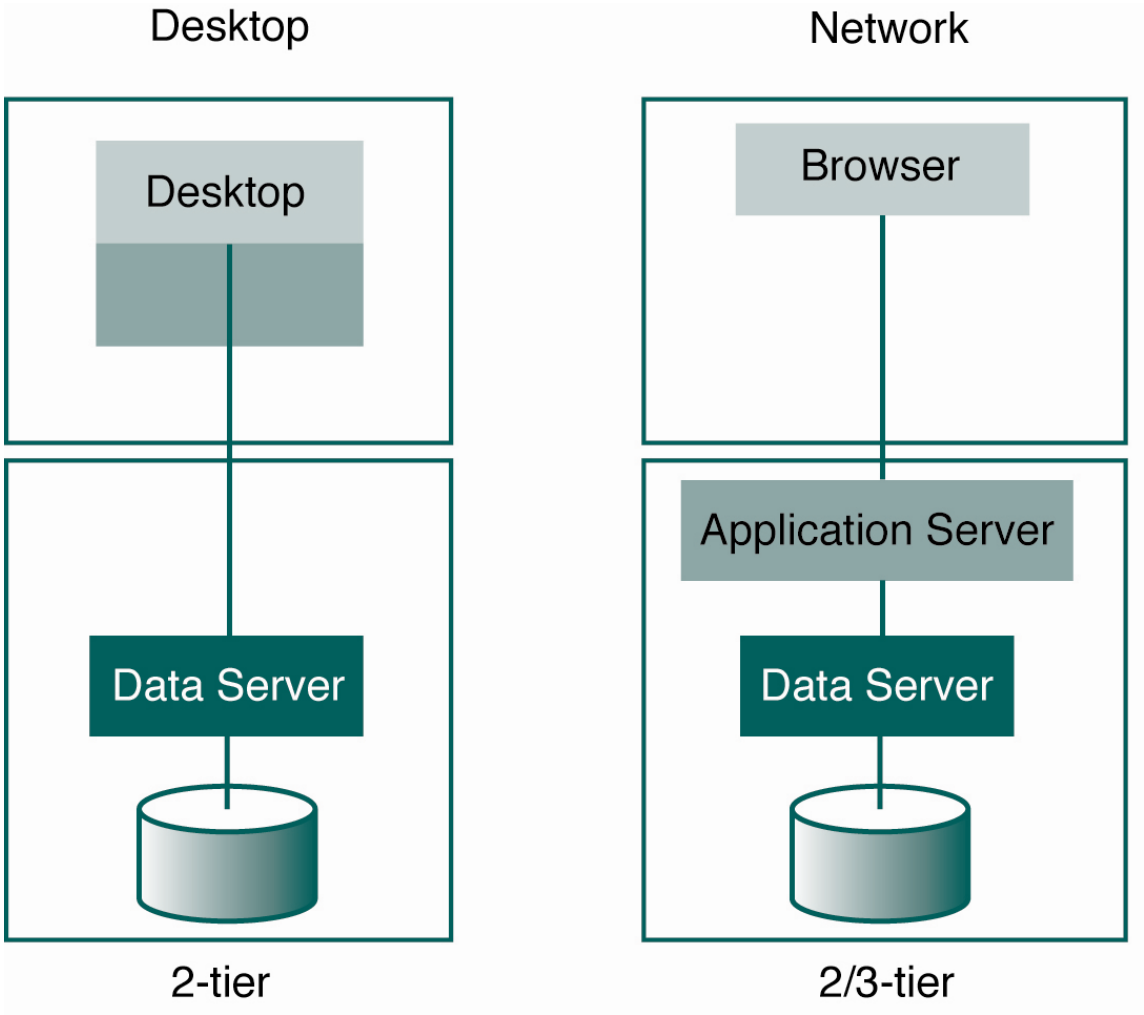
Centralized Server GIS

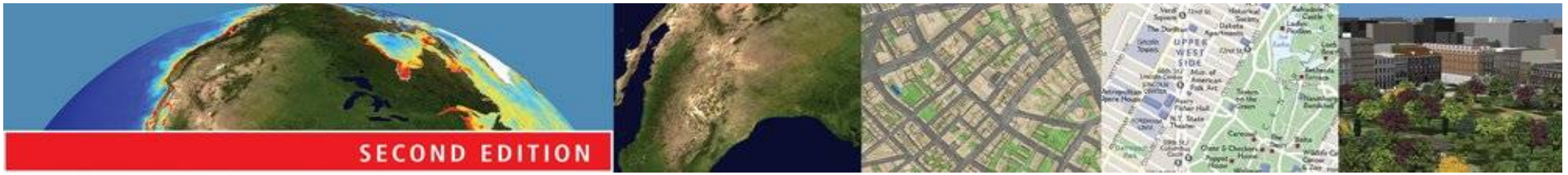



SECOND EDITION


CustomIndia.mxd - ArcMap - ArcInfo
File Edit View Insert Selection Tools Window Help
Layer: districts
Labeling
Layers
indiatowns
TOT_POP
0 - 86112
86113 - 294427
294428 - 666279
666280 - 1140605
1140606 - 2493987
2493988 - 5421985
5421986 - 12596243
indrailmain
nathighs
districts
TOT_LIT / AREA
-0.000000043 - 0.0001052
0.0001053 - 0.0002396
0.0002397 - 0.0005173
0.0005174 - 0.001099
0.001100 - 0.002474
0.002475 - 0.006074
0.006075 - 0.02277
india1.img
World 150m (india)
Display Source Selection
Microsoft Visual Basic - CustomIndia.mxd
Object Browser
CustomIndia.mxd - ThisDocument (Code)
Public Sub AddShapeFile()
Dim pWorkspaceFactory As IWorkspaceFactory
Dim pFeatureWorkspace As IFeatureWorkspace
Dim pFeatureLayer As IFeatureLayer
Dim pMxDocument As IMxDocument
Dim pMap As IMap
'Create a new ShapefileWorkspaceFactory object
Set pWorkspaceFactory = New ShapefileWorkspaceFact
Set pFeatureWorkspace = pWorkspaceFactory.OpenFro
'Create a new FeatureLayer and assign a shapefile
Set pFeatureLayer = New FeatureLayer
CustomIndia.mxd - UserForm1 (UserForm)
UserForm1
Select A File
Page1
Page2
OptionButton1
OptionButton2
Drawing
Arial
71°17'54.06"E 10°19'16.59"N

Desktop and Network GIS

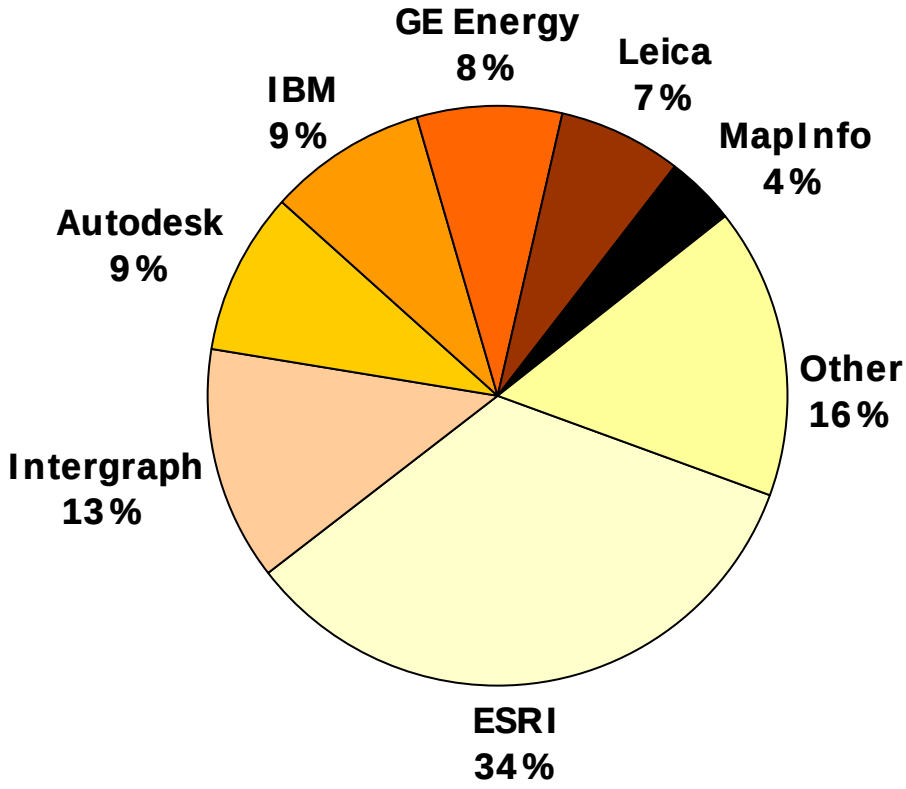




Desktop and Internet GIS

Feature	Desktop	Network
Client Size	Thick	Thin
Client platform	Windows	Browser
Server size	Thin/thick	Thick
Server platform	Windows/Unix/ Linux	Windows/Unix/ Linux
Network	LAN/WAN	Internet

Daratech Market Share 2003



Desktop GIS

Data exploitation

- Data access
- Query
- Spatial Analysis
- Simple editing

- Visualization
- Mapping
- Customization
- $1500

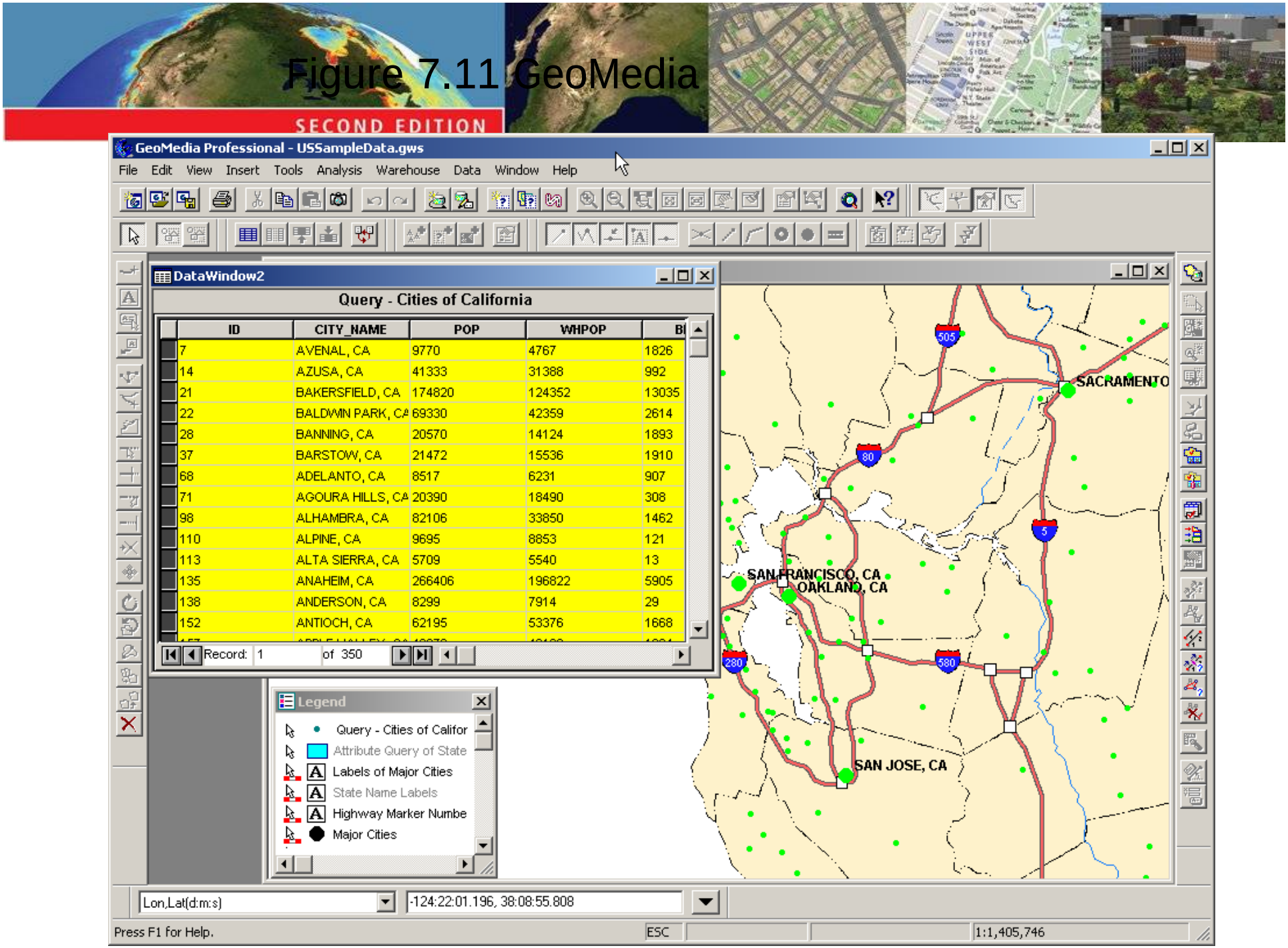
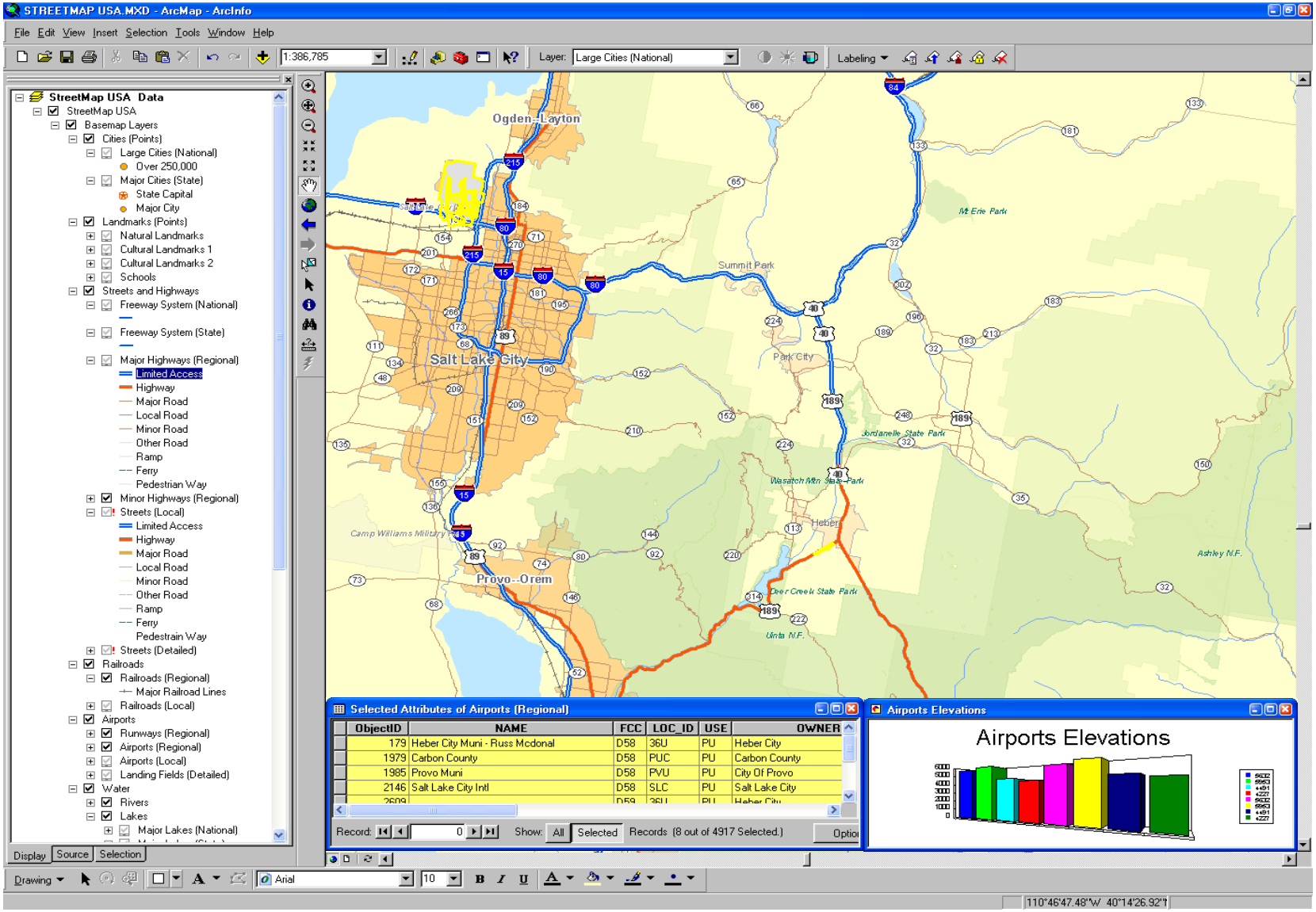
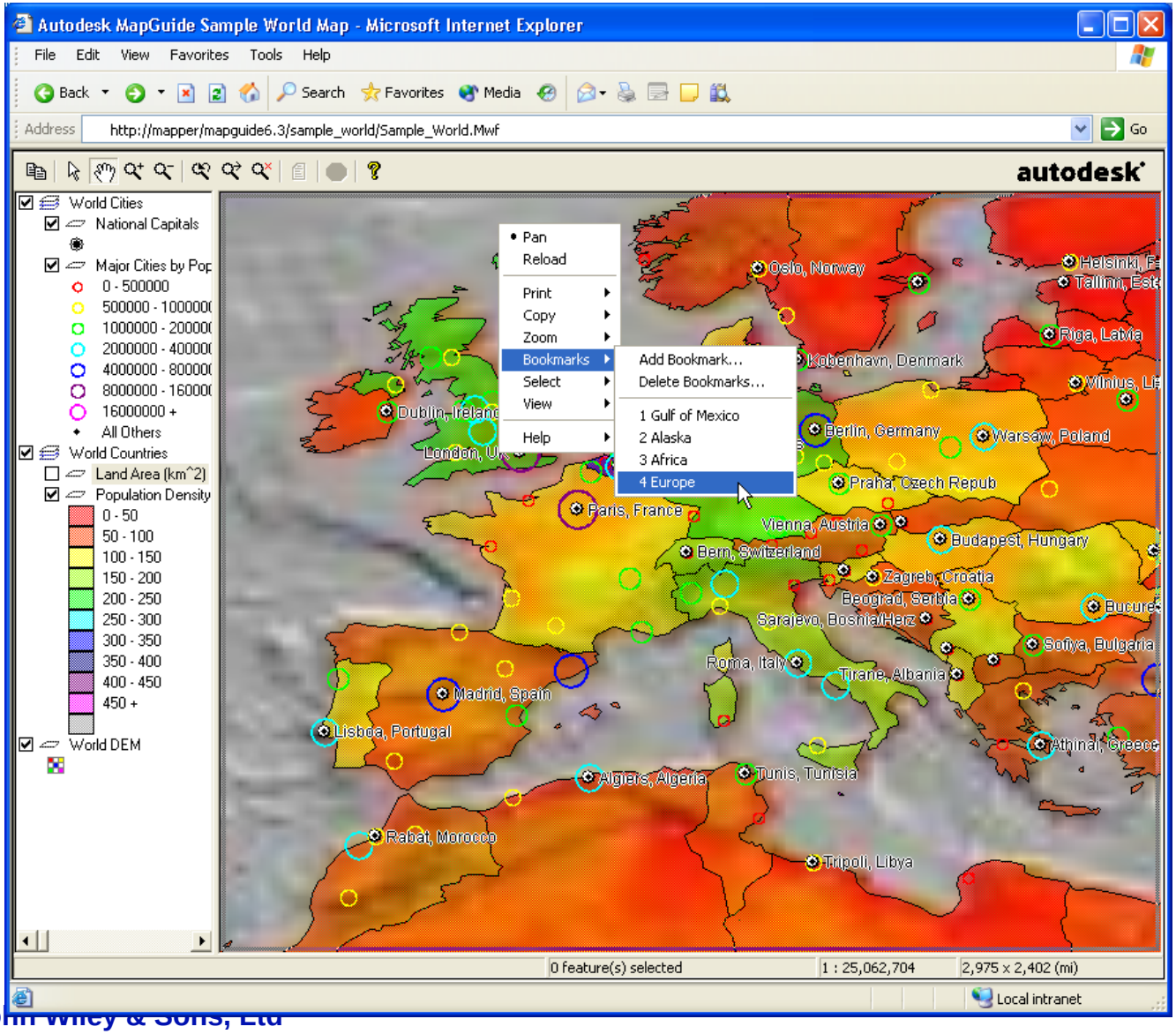
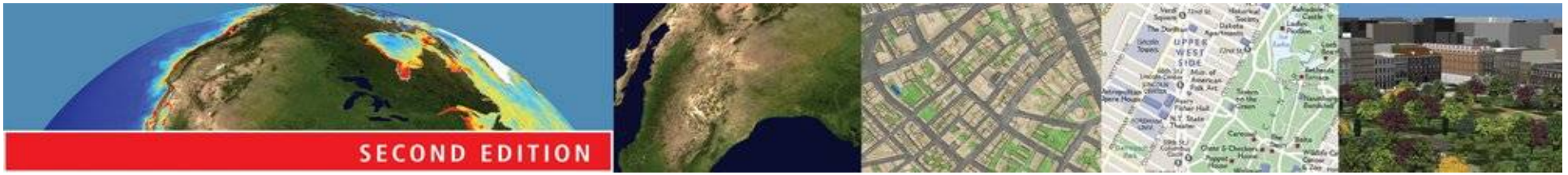


Figure 7.11 GeoMedia
SECOND EDITION
GeoMedia Professional - USSampleData.gws
File Edit View Insert Tools Analysis Warehouse Data Window Help
DataWindow2
Query - Cities of California
ID CITY_NAME POP WHPOP
7 AVENAL, CA 9770 4767 1826
14 AZUSA, CA 41333 31388 992
21 BAKERSFIELD, CA 174820 124352 13035
22 BALDWIN PARK, CA 69330 42359 2614
28 BANNING, CA 20570 14124 1893
37 BARSTOW, CA 21472 15536 1910
68 ADELANTO, CA 8517 6231 907
71 AGOURA HILLS, CA 20390 18490 308
98 ALHAMBRA, CA 82106 33850 1462
110 ALPINE, CA 9695 8853 121
113 ALTA SIERRA, CA 5709 5540 13
135 ANAHEIM, CA 266406 196822 5905
138 ANDERSON, CA 8299 7914 29
152 ANTIOCH, CA 62195 53376 1668
Record: 1 of 350
Legend
Query - Cities of Califor
Attribute Query of State
Labels of Major Cities
State Name Labels
Highway Marker Numbe
Major Cities
SACRAMENTO
SAN FRANCISCO, CA
OAKLAND, CA
SAN JOSE, CA
505
80
5
280
580
Lon,Lat(d:m:s)
-124:22:01.196, 38:08:55.808
Press F1 for Help.
ESC
1:1,405,746


SECOND EDITION

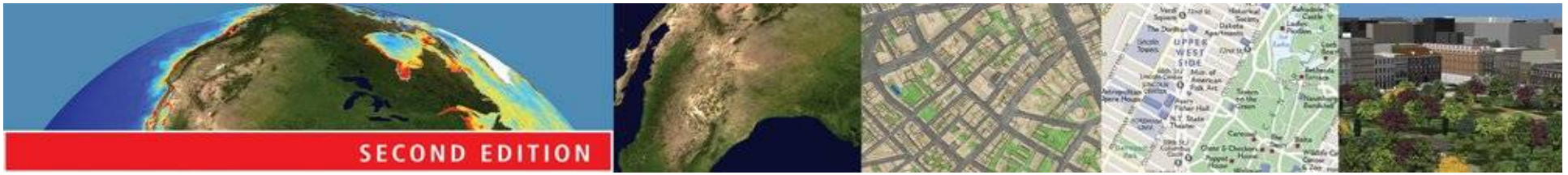

STREETMAP USA.MXD - ArcMap - ArcInfo
File Edit View Insert Selection Tools Window Help
1:386,785
Layer: Large Cities (National)
Labeling
StreetMap USA Data
StreetMap USA
Basemap Layers
Cities (Points)
Large Cities (National)
Over 250,000
Major Cities (State)
State Capital
Major City
Landmarks (Points)
Natural Landmarks
Cultural Landmarks 1
Cultural Landmarks 2
Schools
Streets and Highways
Freeway System (National)
Freeway System (State)
Major Highways (Regional)
Limited Access
Highway
Major Road
Local Road
Minor Road
Other Road
Ramp
Ferry
Pedestrian Way
Minor Highways (Regional)
Streets (Local)
Limited Access
Highway
Major Road
Local Road
Minor Road
Other Road
Ramp
Ferry
Pedestrain Way
Streets (Detailed)
Railroads
Railroads (Regional)
Major Railroad Lines
Railroads (Local)
Airports
Runways (Regional)
Airports (Regional)
Airports (Local)
Landing Fields (Detailed)
Water
Rivers
Lakes
Major Lakes (National)
Display Source Selection
Ogden--Layton
Salt Lake City
Provo--Orem
Park City
Summit Park
Heber
Mt Erie Park
Jordanelle State Park
Wasatch Mtn State Park
Deer Creek State Park
Uinta N.F.
Ashley N.F.
Camp Williams Military Res
Selected Attributes of Airports (Regional)
ObjectID NAME FCC LOC_ID USE OWNER
179 Heber City Muni - Russ Mcdonal D58 36U PU Heber City
1979 Carbon County D58 PUC PU Carbon County
1985 Provo Muni D58 PVU PU City Of Provo
2146 Salt Lake City Intl D58 SLC PU Salt Lake City
Record: 0 Show: All Selected Records (8 out of 4917 Selected.)
Airports Elevations
Airports Elevations
Drawing
Arial
10
110°46'47.48"W 40°14'26.92"N





Server GIS

- Centralized GIS
  - Deploy multi-user desktop
  - Internet GIS
  - Enterprise GIS Servers
- Manage/deploy centrally
- Low cost of ownership
- Good for data exploitation

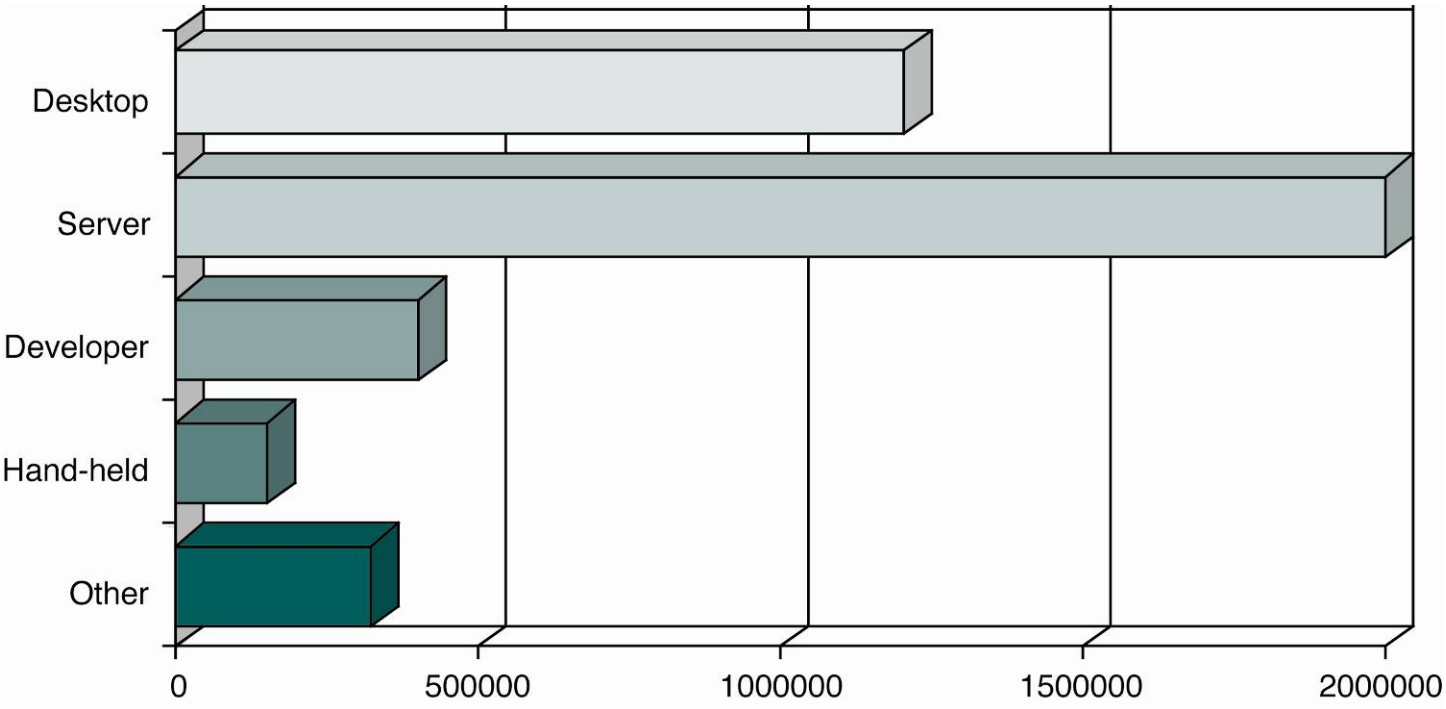


Hand-held

Field-based GIS

- Lightweight hardware
- Extension of desktop
- Limited capabilities
- Data collection
- Mobile mapping
- $500

Estimated GIS Users



Summary

- GIS software is developing fast
- Consistent GIS architecture
- Major development areas
  - Internet
  - Hand-held
- Increasingly standards-based
- Very wide ranging
- Rationalization of vendors