Product Survey on Mainstream GIS

This product survey on mainstream GIS gives an overview of the main GIS products currently operational throughout the world. GIM International has invited GIS-software providers to supply product information based on a questionnaire compiled by the present author. The results of the questionnaire are presented on the following pages. In the sequel, some major trends are identified.

By drs. Jantien Stoter, Department of Geodesy, Delft University of Technology

A GIS comprises at least three functional modules:
- Data storage (database)
- Spatial analysis of the stored data (the kernel of a GIS)
- Presentation of (analysed) data, both alpha-numerical and graphical (cartographic interface)

Major developments have recently been made in all the above fields. Spatial analysis functions have been enhanced, visualisations and animations of spatial data (2D and 3D) have been significantly improved and the support of 3D geo-data is becoming increasingly available within GIS products.

GISs are tending to become increasingly DBMS-orientated. More and more GISs are linked with, or based on, a standard Data Base Management System (DBMS) such as Oracle, Ingres or Informix. In addition, these DBMSs are becoming more and more able to manage, besides vector data, also geo-raster data such as images and digital elevation models.

Integrated Architecture

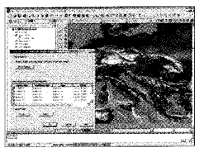
GIS architecture is becoming integrated. This means that geometric data and administrative data are stored together in one DBMS. Within the integrated architecture a DBMS is extended with spatial data types (point, line, polygon) and functions (overlap, distance, area, length). These spatial data types available in the standard DBMSs are becoming increasingly accessible within existing GISs. Integrated architecture may be contrasted to traditional approaches, such as dual architecture (separate DBMS for geometric and administrative data) and layered architecture. In a layered architecture all data is stored in a single DBMS but spatial knowledge is contained between the application and the DBMS. At the same time, database technology is moving from Relational Management (RDBMS) towards Object-Orientated (OO) and Component-Based Developments (CBD). GIS evolution tends to run alongside these recent developments.

Standards

The developments sketched here also induce a need for interoperable geo-processing and an open Geo-Information Infrastructure (GII). Thereby, organisations using GIS and geo-data have an increasing need for exchangeable GIS-functionalities and open (geo)data-formats. In this context, the standards developed by the OpenGIS Consortium are important, as are ISO-standards. GIS-vendors have recognised the importance of these developments by supporting these standards within their products.◆

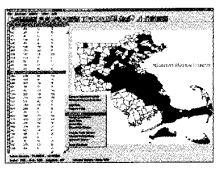
Supplier	**Autodesk**
Brand/Model	iDesign
Date of Introduction	1996
Architecture	
Client/server architecture (Y/N)	Y
Separate centralised data & programserver	Y ***1)***
Standalone system (Y/N)	Y ***2)***
Supported platforms	Micros.:Win95,98,2000,NT4 ***3)***
Min. configuration (CPU / Memory / Disk)	133Mhz / 32Mb
Modular system (Y(modules / platforms)/N)	Y
Integrated / separate DBMS	Oracle 8i/8iSpatial or DWG/SDF files
Administrative data maintained (Y(how)/N)	Y
Spatial database possibilities/data storage	
Meta data server (Y/N)	Y
Management system to maintain & manage:	
-spatial data quality (Y(specify)/N)	Y, topological & semantic rules
-administrative data quality (Y(specify)/N)	Y, semantic rules
-data versions (Y(specify)/N)	Y, multi-branched versioning
Topology maintained (Y/N)	Y
SQL supported (Y/N)	Y
3D datastructures (Y/N)	Y
Precision co-ordinates (x,y,z) storage?	Floating point (64 bit)
Object modelling (Y/N)	Y, UML + Rational Rose
Object-validating during entering (Y/N)	Y
Dynamic segmentation (Y/N)	Y, via customed application
Relational DBMS (Y(specify)/N)	Y, Oracle 8i/8iSpatial
Object Oriented DBMS (Y(specify/N)	Y, Oracle 8i/8iSpatial, ObjectModel
Other way of data organising (Y(specify)/N)	Y, tiled/indexed DWG/SDF files
Connection to a standard DBMS	
Read connection possible (Y(specify)/N)	Y, ODBC/OLEDB
-Additional tool needed (Y(specify)/N)	❐
Write connection possible (Y(specify/N)	Y, ODBC/OLEDB
-Additonal tool needed (Y(specify)/N)	❐
Handling spatial data-types within standard DBMS's (Y(Reading / Writing / Editing)/N)	Y
-Specify implementations	Open GIS simple features
Support of a connection to Object Oriented DBMS (Y(specify implementation)/N)	Y, Oracle 8iSpatial ObjectModel
Techniques	
-Network- overlay- and surface analysis	Y
-3rd and 4th (time) dimension Y/N	Y, 3rd/4rd via customed appl.
-2D animations / 3D animations	Y, 3D Studio Viz
-2D and 3D presentation/visualising	Y
-Functions vector format	Creation/edition/analysis
-Functions raster format	Creation/edition/analysis
-TIN functions (Y/N)	Creation/edition/analysis
-Geostatistics (Y/N)	Y
Standards	
OpenGIS standards (Y(specify)/N)	Y, Open GIS simple features
-GML visualising/editing/transporting/storing	Supported via LandXML
Features definition/features geometry (Y/N)	Y
Coverages/layers/levels (Y/N)	Y
ISO standards (Y(specify)/N)	Y
Openess of the system	
Able to build additional tools/modules (Y/N)	Y
Communication with CAD (Y(specify)/N)	AutoCAD DXF/DWG, MicroStation DGN
Macro-language to build additional applications (Y/N)	Y
Standard development languages (Y/N)	Y,VBA/C++/Java/Javascript/ Jrun/COM-based API
Communication	
View & query spatial data via internet (Y/N)	Y
Special software needed at client/explorer side (Y/N)	N ***34)***
W3C technology for communication (Y/N)	Y
OpenGIS standards for communication (Y/N)	Y
- Wireless communication possible (Y/N)	Y
Infonumber	380

N/A = Not Applicable
p = No information received



Autodesk iDesign

Supplier	Clark Labs	Earth Resource Mapping Ltd	Enghouse Systems Limited	ERDAS Inc.
Brand/Model	Idrisi32 version 132.11	ER Mapper	WORKS Suite	ERDAS IMAGINE 8.4
Date of Introduction	1987	1989	Summer 1999	1993
Architecture				
Client/server architecture (Y/N)	Y	Y, client	Y	N
Separate centralised data & programserver	N	N	Y	N
Standalone system (Y/N)	Y	Y	Y	Y
Supported platforms	Windows 95,98,2000,NT	Windows 95,98,2000,NT	Windows NT,UNIX	Win,Sun Solaris,HP-UX,SGI IRIX,IBM RS6000,Compaq Tru64
Min. configuration (CPU / Memory / Disk)	Pentium / 16Mb RAM / 90Mb	Memory 32Mb/ 110Mb minimal installation,full instal. 390Mb	Pentium III, 500mhz/ 256M RAM / 20 gig disk	Pentium / 64Mb / 650Mb
Modular system (Y(modules/platforms)/N)	N	N, total product	Y	Y
Integrated / separate DBMS	Integrated	N	Integrated	Internal data format
Administrative data maintained (Y(how)/N)	N	N	Y, third party tools	N/A
Spatial database possibilities/data storage				
Meta data server (Y/N)	Y	N/A	N	N
Management system to maintain/manage:				
-spatial data quality (Y(specify)/N)	N	Y, raster handling	Y, Oracle data management tools	N
-administrative data quality (Y(specify)/N)	N	N/A	N	N
-data versions (Y(specify)/N)	N	N/A	Y, Oracle workspace management	N
Topology maintained (Y/N)	Y	Y	N	Y
SQL supported (Y/N)	Y	N/A	Y	N
3D datastructures (Y/N)	N	Y	N	Y
Precision co-ordinates (x,y,z) storage?	4-byte real	❒	Lat/Long, UTM	Double precision float
Object modelling (Y/N)	N	N/A	Y	Y
Object-validating during entering (Y/N)	N	N/A	Y	Y
Dynamic segmentation (Y/N)	N	❒	N	N
Relational DBMS (Y(specify)/N)	Y, MS Access vector data only	N/A	Y, Oracle 8i Spatial	N
Object Oriented DBMS (Y(specify/N)	N	N/A	Y, Oracle 8i ORDBMS	N
Other way of data organising Y(specify)/N)	Raster data model	N/A	N	Y, internal
Connection to a standard DBMS				
Read connection possible (Y(specify)/N)	N	❒	Y	Y, SDE
-Additional tool needed (Y(specify)/N)	N	❒	N	SDE
Write connection possible (Y(specify/N)	N	❒	Y	N
-Additonal tool needed (Y(specify)/N)	N	❒	N	N
Handling spatial data-types within standard DBMS's (Y(Reading / Writing / Editing)/N)	N	❒	Y	N
-Specify implementations	❒	❒	❒	SDE
Support of a connection to an Object Oriented DBMS (Y(specify)/N)	N	❒	Y, Oracle 8i ORDBMS	N
Techniques				
-Network- overlay- and surface analysis	Y	❒	Y	Y
-3rd and 4th (time) dimension Y/N	Y	❒	Y	Y
-2D animations / 3D animations	Y- 2D	Y	Y, 2D only	Y
-2D and 3D presentation/visualising	Y	Y	Y, 2D only	Y
-Functions vector format	Spatial and attribute query, mapping and visual analysis	Y	Oracle 8i spatial object model	Y
-Functions raster format	24)	Y	Mr.SID, Geotiff	Y
-TIN functions (Y/N)	Y	Y	N	N
-Geostatistics (Y/N)	Y, through interface to GSTAT	Classification & analysis of imagery	N	Y
Standards				
OpenGIS standards (Y(specify)/N)	N	Y	Y, most OpenGIS SQL extensions	N
-GML visualising/editing/transporting/ storing	N	❒	N	N
Features definition/features geometry (Y/N)	Y	❒	Y	N
Coverages/layers/levels (Y/N)	N	❒	Y	Y
ISO standards (Y(specify)/N)	N	❒	SQL 3	N
Openess of the system				
Other parties able to build additional tools/modules (Y/N)	Y	Y	Y	Y
Communication with CAD data/packages	Y	Y	Y	Y, AutoCAD
Macro-language to build additional applications (Y/N)	Y	Y	Y	Y
Standard development languages (Y/N)	Y	Y	Y, Visual Basic, C, C++	Y, C/C++
Communication				
View & query spatial data via internet (Y/N)	N	Y	Y	N
Special software needed at client/explorer side (Y/N)	N/A	N/A	Microsoft Internet Explorer	❒
W3C technology for communication (Y/N)	N	N/A	Y, JAVA, XML,VML	❒
Communication based on OpenGIS standards (Y/N)	N	N/A	Y, partial support	❒
- Wireless communication possible (Y/N)	N	N/A	Y	❒
Infonumber	381	382	383	384



Clark Labs
Idrisi32 version 132.11

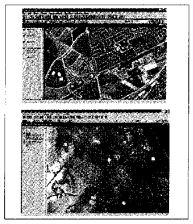
ER Mapper

Enghouse Systems Limited

ERDAS IMAGINE 8.4

N/A = Not Applicable
p = No information received

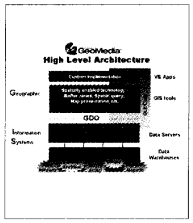
ERDAS & ESRI	ESRI	GE Smallworld	Intergraph	MapInfo Corporation	MapInfo Corporation
ArcView Image Analysis ext.	ArcInfoVersion 8	Core Spatial Technology	GeoMedia 4.0 product suite	MapInfo MapXtreme	MapInfo Professional
V1.0 Sept '98, V1.1 March '00	December 1999	1989	May 2000	November 1997	December 1990
With ArcViewIMS	Y	Y	Y	Y	Y
Y, with ArcViewIMS	Y	Y	Y	Y	Y
N	Y	Y	Y	N	Y
Windows 95,98,NT,2000	Unix and Windows	NT, W2000, Tru 64 UNIX, HPUX, AIX, Solaris, Linux	Windows 95,98,2000	Windows 95,98,NT,2000 UNIX that support Java2 VM	Windows 95,98,NT,2000
Pentium III / 32M / 80M	Pentium III / 128Mb / 470Mb	400Mhz / 128Mb / 400Mb	Pentium II/ 64Mb / 181Mb ***4)***	Java VM 1.2.2 & video card / 64Mb / 300Mb	486 / 16Mb / 110Mb
N	Y ***5)***	N/A	Y, Win 95,98,2000,NT ***6)***	Y ***7)***	N
Integrated	Int. ArcStorm /sep. ArcSDE	Integrated	Int./sep. depends on solution	Both	Both
N	Y	Y	Y ***8)***	Y, optionally through RDBMS	Y, optionally through RDBMS
N	Y	Y	Y ***8)***	N	N
N	Y, ArcStorm	Y, supplied with product	Y, GeoMedia Prof. provides tools for data validation	Y, object processing engine	Y, object processing engine
N	Y, ArcStorm	Y, supplied with product	Y, SMMS for GeoMedia	Y, optionally through RDBMS	Y, optionally through RDBMS
N	Y, ArcStorm	Y, long transaction version management	Y, SMMS for GeoMedia ***9)***	Y, optionally through RDBMS	Y, optionally through RDBMS
Y	Y	Y	Y	Y	Y
N	Y	Y	Y	Y	Y
N	Y	N, 2.5d	Y	N	Y
Double precision floating point accuracy	Single- or double-precision coordinates ***10)***	Max range 2**32-1 mm or cm coordinates usually used	User definable; depends on type of data/GDO	±0.00002 units or 0.000001 degrees ***11)***	±0.00002 units or 0.000001 degrees ***11)***
N	Y	Y	Y, part of industry solutions	Y	Y
N	Y	Y	Y, part of industry solutions	Y	Y
N	Y	N	Y, part of industry solution	N	Y
N	Y ***12)***	Y, Smallworld VMDS / Oracle	Y, Oracle, MS SQL, MS Access	Y, optional (see below)	Y, optional (see below)
N	Y ***13)***	N	Y, Oracle 8i	N	N
Y, within ArcView GIS	Y, ArcSDE, ArcStorm	Y, interface to other data formats via SOC/SOM	Y ***14)***	Y, standalone using MapInfo table and grid files	Y, standalone using MapInfo table and grid files
N	Y	Y, Virtual Database Interface	Y, any ODBC compliance	Including ***15)***	Including ***15)***
N	N	Y ***16)***	N	N	N
N	Y	Y, Virtual Database Interface	Y, Oracle, MS SQL	Including ***15)***	Including ***15)***
N	N	Y ***16)***	N ***17)***	N	N
N	Y	Y	Y, Oracle	Y	Y
N/A	N/A	Smallworld On Oracle Spatial	❒	***18)***	***18)***
N	N/A	Y, Oracle Spatial Object/relational model is supported	Y, Oracle 8i	N	N
Y, overlay analysis	***19)***	Y	Y	Y, with customisation/Y/N	Y, with customisation/Y/Y
N	N/A	N	Y, 4th with industry solutions	Y, time with customisation	Y, time with customisation
N	Y, ArcTools	N	Y, GMS ActiveFlight	Y/N, with customisation	Y/Y, with customisation
2D	Y ***20)***	Y	Y/ Y, GMS ActiveFlight	Y/N	Y/Y
21)	***22)***	Y	***23)***	Display, full spatial query and edit	Display, full spatial query and edit
25)	***26)***	Y	***27)***	Registration and display	Registration and display
N	Y	Y	Y	N	Y, planned at time of press
N	Y	Y, tabular statistical data	Y	Y	Y
N	Y ***28)***	Y	N (Y, with Oracle data model)	N	N
N	***29)***	Y, any OGIS compliant data source	N	N	N
Y	Y	Y	Y	N	N
Y	Y	N	Y	N	N
N	N	N	ISO 9002, ANSI/ASQC Q9002	N	N
Y	Y	Y	Y	Y	Y
Y, through ArcView GIS	Y ***30)***	Y, via OLE, ODBC CORBA	Y, using GDO technology	Y, using Universal Translator	Y ***31)***
Y	Y	Y	N	N	Y
Avenue	Y, VBA	Y, VB, Java	Y VB, Visual C++ Delphy	Y ***32)***	Y ***32)***
With ArcViewIMS	Y	Y	Y	Y	Y ***33)***
N	Y, standard internet browser	N	N, optionally cgm plug-in	N	N
Y	Y	Y	Y	Y ***35)***	Y ***35)***
N	Y	Y	N	N	
Y, in conjunction with ArcViewIMS	Y, GPS	Y ***36)***	Y	Y, using MapXtend and MapinHand	Y, using MapXtend and MapinHand
385	386	391	392	396	396



ArcView Image Analysis ext.

ArcInfoVersion 8

GE Smallworld Core Spatial Technology



Intergraph's GeoMedia 4.0 product suite

MapInfo MapXtreme

MapInfo Professional

Notes:

1) Data Server: Oracle8i/8iSpatial (8.1.6), Application Server: Autodesk Vision, Application Server: Autodesk MapGuide Server. Client: AutoCAD Map, Autodesk MapGuide Client, Autodesk OnSite
2) Desktop solution, like AutoCAD Map, AutoCAD Land Development Desktop, etc, in single-seat configuration, Network Licensed-Seats (NLS) configuration or client/server
3) Microsoft: 2000Server, MacOS8.5/9, Solaris2.6 (Autodesk MapGuide) Unix: IBM AIX 4.2, Solaris 2.6, HPUX 10.20, or digital UNIX 4.0b (Autodesk Vision) Mobile: WinCE2.11, PalmOS (Autodesk OnSite)
4) SVGA display req. (single monitor recommended). Min. 800x600 resolution with 256 colors, rec. 1024x786 resolution & 16-bit color; access to CD-ROM drive; mouse or compatible digitiser for input; compatible plotter or printer (optional); sound card (optional)
5) Software extensions providing add. application-specific function. Completely integrated with ArcInfo 8 functions and data. The extensions are; ArcSDE, Geostatistical Analyst, Arc Network, ArcTIN, Arc GRID, Arc COGO, ArcScan, ArcExpress, ArcPress, ArcStorm
6) Gov. public works management, land information management, transportation management, environmental resource management solutions, bus. GIS, cartography & map prod.
7) MapInfo MapMarker for geocoding and address cleansing and Routing J Server for routing with driving directions
8) Dep. on type of data/GDO; metadata is maintained within data warehouse or ext. storage
9) Versioning control is part of specific industry solutions (government public works management, land information management, transportation management, environmental resource management solutions)
10) Single stores up to 7 digits for each coordinate. Double stores up to 15 digits
11) Depending on the projection and coordinate bounds of the map
12) ArcInfo provides full support for commercial DBMS. SQL tools work directly with DBMSs such as Oracle, INGRES, Sybase, Informix, SQL Server, and Microsoft Access
13) The ArcInfo 8 system supports two primary geographic data models: the georelational model (i.e., ArcInfo coverages and ESRI shapefiles with attributes) as well as a new object oriented-data model called a 'geodatabase'
14) File based: CAD GDO, MapInfo GDO, ArcInfo GDO; file and DBMS based: MGE GDO
15) But not limited to: MS Access, Oracle, Sybase, Centura SqlBase, IBM DB2, Informix, Informix Universal Server, Ingres, MS SQL Server, SQS and SpatialWare
16) ODBC or JDBC drivers, or direct Oracle connection
17) For the development of new GDO a development kit can be provided
18) Native Oracle8i Spatial 8.1.5&8.1.6; SpatialWare for Oracle 8.0.x, Informix; IBM DB2
19) The ArcNetwork extension is used to model and analyse spatial networks in the ArcInfo environment. ArcInfo can overlay multiple polygons at one time and support up to 32 polygon coverages in a single overlay operation. The Geostatistical Analyst extension to ArcInfo provides surface modeling and analysis functions
20) A view and its component themes are displayed via the Theme Manager menu interface within ArcTools. The Theme Manager maintains the property sheet for each theme that specifies how each theme will be symbolised; controls which themes are drawn and the order in which they are drawn. It also allows users to toggle between 2D and 3D mode
21) Automatic digitising of polygons via region growing, raster to vector and vector to raster conversion
22) The ArcMap Editor within ArcInfo offers editing capabilities through an interface. The Editor can edit shapefiles, coverages & feature datasets; any type of vector data in the GIS database
23) Object manipulation: standard&additional (change, split&merge features; copy, trim&extend feature, insert traverse/areas by face/intersection); validation&correcting: connectivity&geometry; analysing: geometry, queries (thematic, spatial); buffer zones. Note: more functions are available in our industry solutions
24) Full suite of raster functionality incl. database query, mathematical operations, statistical measures, neighbourhood operations, cost and distance calculations, decision support, surface analysis, change & time series analysis & image processing and classification
25) Subsetting, aggregating, mosaicking, convolution filtering, enhancing, vegetative index, change detection, overlay analysis, classification, categorisation, image rectification
26) ARC GRID is a cell-based (raster) GIS that is fully integrated with ArcInfo. True integration of raster and vector data is available in a single geoprocessing system
27) Registering raster data; inserting an image; adding images to a map window; adjusting image display; viewing the properties of an image
28) ODBC [SQL], COM [Object Components], and CORBA compliance
29) ArcInfo supports several metadata standards. Editors to enter metadata, a storage schema and property sheets to view the data. The implementation is compl. customisable and so any metadata format can be implemented. The metadata is stored in XML format.
30) CAD support includes AutoCAD .dwg files up to AutoCAD 2000, this includes R13, R14, and 2000. MicroStation .dgn files up to v7, this includes MicroStation 95, SE, and /J. All ASCII, binary, and partial drawing interchange files [.dxf] that comply with DXF standards
31) Including but not limited to AutoCAD 2000 Drawing exchange file *.dxf, AutoCAD 2000 drawing file *.dwg, Intergraph/MicroStation Design File *.dgn
32) Using standard 32-bit development environments such as Visual Basic, C++ and PowerBuilder (MapXtreme: .. and Java development environments such as Symantec Visual Café and Borland J Developer)
33) Plus dynamic mapping capability using MapInfo's location-based solutions for the web notably MapXtreme
34) No plug-in required (Microsoft Internet Explorer, Netscape Communicator) advanced ActiveX/Java/Plug-In viewers available
35) XML using MapInfo's Location-based Solutions for the Wireless Internet notably MapXtend and MapinHand
36) The SIAS sample WML client, allows you to pan/zoom on a small black and white map. For WAP supported devices. We fully support WML and WBMP

MOM BUDAPEST GeoDesy

TÜV CERT EN ISO 9001 Zertifikat: 75.100.7201 TÜV Rheinland EUROQUA

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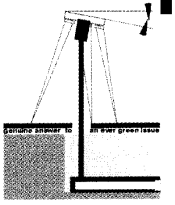
F200
AUTOMATIC LASER PLUMMET
for tripods **10"**



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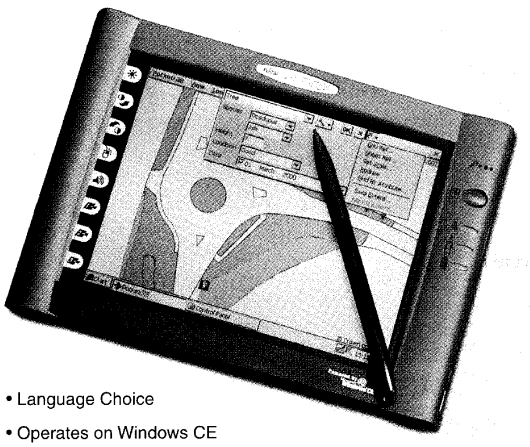

- Language Choice
- Operates on Windows CE
- Custom Build Attribute Forms
- Cost Effective & User Friendly
- Seamless Link to all GIS Systems
- Interfaces to GPS, Laser & Total Stations

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