MODULE 2

An introduction to spatial information systems

A joint initiative of the Australian Local Government Association and ANZLIC—the Spatial Information Council
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An Introduction to spatial information systems

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Guide for managers

Context
Local government can benefit greatly from reliable and up-to-date spatial information in planning and management. Spatial data can contribute to the analysis of situations and issues by increasing efficiency and effectiveness and reducing uncertainty.

The value of the information and the effectiveness of the decision-making/planning processes are very closely related to the quality and completeness of the information and the manner in which it is made available. Key components of this are data access, management, integration, analysis, standards and communication.

Councillors may need to purchase and/or upgrade spatial information software and associated hardware. A spatial information system is a computer system for capture (input) and storage (management), analysis and display of geographic data (that is, data that can be referenced according to location). Although a spatial information system is often thought of as a single piece of software, it should really be considered in broader terms as part of an information management system including procedures, operating personnel, data and hardware. In this context, a spatial information system is a computer system that facilitates the phases of data entry, data management, data manipulation and analysis, and data presentation.

Module 2: An introduction to spatial information systems provides background material and guidelines to assist councils to understand spatial information systems and the visualisation of spatial data.

Actions
This module will explain the basic operations of spatial information systems and how they can support the management of local government functions. An understanding of the basic functions of spatial information systems will enable managers to more fully appreciate the benefits that can be realised from a fully integrated information solution incorporating spatial information systems and spatial visualisation tools.

In addition, managers should be aware that a complete range of software is now available, from free viewing applications (with limited functionality) through to high-end professional systems and web-based applications. It is now possible to have access to spatial data on desktop computers using standard internet browsers.

The community can capitalise on and leverage the benefits obtained from access to local government spatial data and the enrichment that geospatial data can bring to local government service provision. Numerous services are available to support this process, including the various state- and territory-based clearing houses or data portals that enable access to spatial datasets.

Acknowledgments
This module includes mapping produced by the City of Swan, Western Australia, the Department of Water, Western Australia and the Department of Land Information, Western Australia. These sources are duly acknowledged.
Guide to symbols

The following symbols are used throughout the Toolkit to draw attention to important issues and information.

- **NOTE!** Information of which readers should take particular note
- **LEADING PRACTICE** Leading practice information
- **TIP!** Tips for readers, based on experience and aimed at saving time and other resources
- **CAUTION!** Caution—readers should take particular care, or the issue may be complex
- **HIGHER CAPABILITY** Capability raising—shows a signpost to a higher capability level
- **Bold Text** Bold Text—highlights an important issue
- **Boxed Text** Boxed Text—highlights issues specifically related to ANZLIC or ALGA

2.1 Introduction

2.1.1 What is a spatial information system?

A spatial information system or geographic information system (GIS) is commonly regarded simply as a software application, but is really much more. It comprises a number of components that together make up a functioning system. These include:

- software
- hardware
- data
- people
- procedures
- communications.
**Software**
The software components of the system represent the interface with which users interact. The software includes the user interfaces, algorithms and data management structures that allow for the capture, management, output and presentation of the data.

**Hardware**
The hardware components of the system are the computers (PCs, workstations, servers and mainframes) on which the software and data reside, as well as peripherals such as scanners, global positioning system (GPS) devices, mobile mapping devices, printers, etc.

**Data**
The data may include the spatial features (the spatial representations of real-world elements in point, line or polygon form) and attribute information (qualitative and quantitative information) that is linked to the spatial features. For example, a housing lot will have a number of attributes attached to it, including lot number, address, area, street address, owner, etc. Data linked to the spatial features may be contained within the system, or linked to it using database connections.

**People**
The system is not stand-alone. Spatial information managers and operators must run the system, and it will be used by people within the organisation (such as engineers and planners) or outside the organisation (such as ratepayers).

For example, the City of Swan in Perth in Western Australia allows customers to query its spatial information system through a web mapping portal called Intermaps. Property, zoning, health and electoral data layers can be explored [see http://maps.cityofswan.com/intermaps50/].

**Procedures**
Spatial information systems are complex, with many interacting components. Their effectiveness and utility will be maximised by using leading practice procedures that allow them to integrate well with organisational systems.

**Communications**
Data and information need to flow seamlessly between the spatial information system and other organisational systems. Communications networks, and accepted data and transmission standards, are necessary to facilitate this. With the increasing uptake of internet technologies, spatial data and services can be readily accessed using the internet.

A spatial information system containing these components will allow for data capture, manipulation, management, analysis and output. This is illustrated in Figure 2.1.
Most spatial information systems employ a similar approach to the thematic layering of maps—that is, the grouping of data into thematic layers (feature classes, levels, layers, coverages). This information may be referenced or tied geographically, which allows the overlay of various layers of information on top of each other.

The complexity of the real world can be represented more simply and manageably by using thematic layers. This facilitates and simplifies the representation of spatial data, as well as the understanding of natural relationships between real-world features (see the example in Figure 2.2).
Ensure that the council demonstrates, from a senior level down, its understanding of spatial information systems and their relevance to core business. Such commitment is illustrated by the use of spatial information products in the support of decision-making processes, and by formal support of tools, technologies and resource allocation.
One of the major strengths of a spatial information system is its ability to link numerous databases that may be dispersed in the organisation, and perhaps outside the organisation. These data can be accessed through open database connectivity standards, which are being increasingly adopted.

This spatial and non-spatial information can be visualised and analysed within a spatial information system, in a spatial context. Many datasets, ranging from simple text files and spreadsheets to large relational databases, that were previously only used within one part of an organisation (siloeed), can be integrated into a spatial information system to generate additional levels of information and analyses not previously possible. Once the data have been accessed using a spatial information system, it is then possible to produce mapped outputs, in association with tabulated, graphed, animated and other types of outputs, that can assist managers in their decision-making processes.

Spatial information systems that are well integrated with other systems in an organisation can provide information quickly and in the desired form to managers and key professionals. This provides efficient and effective decision support.

Spatial information systems also facilitate the development of knowledge from spatial data, as illustrated in Figure 2.4. This knowledge then enhances decision support capacity within the organisation, leveraging the maximum value from the data and information.

For example, daily traffic movements recorded over long periods are one type of data that may be collected by a council. These data can provide information on patterns and trends that can be easily described and understood. Useful information may include traffic movements, peak traffic loads and times, and the variations in traffic movements. This information could then be used for forecasting and planning.

**Figure 2.4** The progression of data into knowledge

![Diagram showing the progression of data into knowledge](image)
2.2 How does a spatial information system work?

2.2.1 Relating information from different sources

The power of spatial information systems lies in their ability to align different layers of information from the same location, and then to derive conclusions about spatial relationships within and between the layers.

Many data have some form of geographic component, and can therefore be referenced to geographical locations such as points, lines or areas. A location can be defined by various methods, including longitude and latitude, grid coordinates (easting and northing), lot boundaries with a unique identifier, or the intersection of streets.

For example, when traffic movement data are collected, the collection location can be identified. Comparison of traffic information with other thematic data such as zoning densities, or the location of major traffic routes, car parks, public transport routes, schools, shopping centres and other major infrastructure, may reveal that traffic flows are strongly dependent on factors that are otherwise not obvious. This knowledge can support decisions on how to manage traffic flows and parking facilities.

Many datasets available in spreadsheet or database format can be directly linked into a spatial information system as new data layers or joined to existing data layers. Examples of thematic layers are shown in Figures 2.5 to 2.11.

Many spatial features can be most naturally represented in the GIS as vector objects that appear geometrically as points, lines and polygons. In Figure 2.5, the road network is represented by line features.
**Figure 2.6** Railways

**Figure 2.7** Rivers and streams

*Source:* Department of Water, Western Australia
Note the 1-metre contours on the left and 5-metre contours on the right in Figure 2.8. Spatial data representing areas, such as land allotments in the cadastre in Figure 2.9, may be represented in the vector model as polygons.
FIGURE 2.10  Town planning scheme zones

FIGURE 2.11  Digital orthophoto

SOURCE: Department of Land Information, Western Australia
Some data may be represented by a grid-based representation known as a raster. This data model is analogous to a matrix of regular cells or pixels. Much aerial and remotely sensed imagery is rasterised, and many spatial information systems can incorporate and analyse raster imagery.

Often the data are combined or overlayed to help give contextual reference. For example, water bodies such as swamps and lakes (polygons) may be shown with gauging stations (points) overlayed (Figure 2.12).

**FIGURE 2.12  Flood plain showing location of gauging stations**

In addition, a spatial information system can also import or convert digital data from other sources into a form in which it can be displayed and used for analysis. For example, a digital Landsat ETM 7 satellite image may be in the supplier’s native data format. This can be imported into a spatial information system where it can be analysed using specialised remote sensing procedures to produce a digital land-use/land-cover layer. For further information on this issue, see [http://www.ga.gov.au/acres/techdocs/formats.jsp](http://www.ga.gov.au/acres/techdocs/formats.jsp).

Similarly, census or other tabular data (such as traffic data or data for a stream gauging station) can be integrated into a spatial information system and displayed as map data by joining the tabular data to the spatial data using unique identifiers (see Figures 2.13 and 2.14 for examples). This enables many of the data resources of an organisation to be represented visually in map form and can help leverage the value of the information and enhance decision support.

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8 Satellite receiving stations often have their own formats in which they receive and transfer data. For example, the Australian Centre for Remote Sensing (ACRES) has a specific format for Landsat 7 Thematic Mapper imagery known as TM Landsat-7 Fast-L7A ACRES. Imagery supplied in this format can be imported to enable it to be displayed and used for analysis.
FIGURE 2.13  Importing traffic data into a GIS from another database

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<th>ID</th>
<th>NAME</th>
<th>VehiclesPerDay</th>
<th>CountDate</th>
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</thead>
<tbody>
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<td>Anthia Street</td>
<td>25</td>
<td>1990</td>
</tr>
<tr>
<td>1,361</td>
<td>Mary Street</td>
<td>65</td>
<td>1998</td>
</tr>
<tr>
<td>856</td>
<td>Whitehall Road</td>
<td>4</td>
<td>2002</td>
</tr>
<tr>
<td>49</td>
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<td></td>
</tr>
<tr>
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<td>0</td>
<td></td>
</tr>
<tr>
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<td>West Parade</td>
<td>100</td>
<td>2001</td>
</tr>
<tr>
<td>155</td>
<td>Hazelmere Circus</td>
<td>27</td>
<td>2001</td>
</tr>
<tr>
<td>155</td>
<td>Hazelmere Circus</td>
<td>22</td>
<td>2001</td>
</tr>
<tr>
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<td>River Bank Boulevard</td>
<td>38</td>
<td>2003</td>
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<td>Houghton Close</td>
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<td>2002</td>
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<td>2002</td>
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<td>1997</td>
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</tr>
<tr>
<td>822</td>
<td>River Bank Boulevard</td>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>

FIGURE 2.14  Thematic map of local road traffic data
2.2.2 Web data sources

The increasing capacity and dispersion of high-capacity communication networks, in conjunction with developments in web technologies, have permitted rapid access to large amounts of spatial and non-spatial data through the web. This has been enhanced by the wide-scale adoption of open standards for data, software and communications.

In this open standards environment, tools for data discovery (finding data) and accessing spatial data through easy-to-use interfaces, and mechanisms for data licensing and usage, have been established. These allow users to access up-to-date spatial data from data custodians, largely overcoming problems of keeping periodically purchased data current using in-house staff. Key benefits of the increased availability of online data include enhanced data currency, access to data from their point of origin (so the data lineage is known) and the diversion of staff time from data maintenance tasks to higher level data analysis tasks.

In 2005, the Australian Spatial Information Business Association, with support from the Open Geospatial Consortium—Australasia, conducted the Spatial Interoperability Demonstrator Project. This study highlighted the value of web services for spatial information distribution and the benefits for managers. For more information on the project, see http://www.asiba.com.au/clients/asiba/UserFiles/File/SIDP%20Materials/SIDP_Factsheet_1_eBook.pdf.

Spatial Interoperability Demonstrator Project modules and fact sheets are excellent resources that demonstrate the use of spatial data. The information they contain will assist staff from technical levels to managerial levels and will aid in the preparation of a business case for implementation of web-sourced spatial data. The fact sheets are available via http://www.asiba.com.au/static/industryfacts.php. The Australian Spatial Information Business Association provides other material in response to requests to ceo@asiba.com.au.

2.2.3 Data capture

Data capture involves entering a spatial feature into a spatial information system and attaching relevant attributes. Attachment of the attributes to the spatial features is called a ‘join’, and is similar to joining database tables to spatial data.

Spatial relationships, such as whether or not features intersect or are adjacent to other objects, are the key to spatial information system-based analysis. This feature separates spatial information systems from other computer-aided design or mapping systems.

For example, a computer-aided mapping system may represent transport routes as lines, in which case the object carries the information. In this case, a track could be shown as a thin line and a highway as a thick line. In a spatial information system, the route would be shown as a line, with attached attributes designating the type of route (e.g. a track or highway). Further, a spatial information system could recognise the route as a line and also, for example, as a boundary between council wards.

For data to be used within a spatial information system, they must be in a suitable format. Various techniques can be used to convert data into a form that can be recognised within a spatial information system. Traditionally, hard copy (paper) maps were digitised by tracing features using a digitising tablet and mouse or stylus to collect the spatial features (e.g. roads, boundaries, etc.) from the map into digital format. Hard-copy maps can also be scanned using optical scanners semi-autonomously, or
digitised on screen using heads-up digitising. For example, Figure 2.15 shows a council officer digitising scanned development application maps to produce digital data files for input into a spatial information system.

In addition, coordinates from GPS receivers can be uploaded directly or entered manually into a spatial information system. This is the widely preferred method of data capture and collection used by councils throughout the world. It enables precise surveys to be conducted with small crews, and allows tasks like asset mapping to be conducted by a single person. An example is illustrated in Figure 2.16.


2.2.4 Data integration

Spatial information systems can be regarded as an integrating technology. The use of a spatial information system makes it possible to integrate or link data and information that would otherwise be difficult to associate. For example, imagery from satellites, aerial photography, digital elevation and tabular data can be analysed, and new variables derived, as illustrated in Figure 2.17. Further information on the compilation of such data is given in Section 2.3.4, using development application processing as an example.
2.2.5 Registration and projection

Map information in a spatial information system must register or ‘fit’ with the information gathered for other maps. Councils may come across situations in which data that are to be integrated were captured at different scales and/or projections or have used different datums. Before such datasets can be analysed to determine patterns or spatial relationships within the spatial information system, they may have to undergo manipulations (such as scale, projection and datum conversions) to ensure conformity.

Different countries may use different datums, and datums may change over time within a given area. In Australia, the Australian Geodetic Datum (AGD) was changed to the GDA94 datum in 2000. The AGD was not ‘Earth-centred’, while the new GDA94 datum is. This is optimal for GPS navigation. The differences between coordinates in the two

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9 A projection is a mathematical model that transforms the locations of features on the Earth’s three-dimensional, curved surface to locations on a two-dimensional surface, such as a computer screen or map.

10 The term ‘datum’ refers to the basic Earth reference system. A datum is founded on a centre for the system (usually the Earth’s centre), a reference direction (north along the polar axis), and usually a height reference, such as mean sea level.
datums vary across Australia, and can be up 200 metres in a north-easterly direction. It is important to note that this is not an error, but that errors could result if data sourced from the two datums are combined without the appropriate transformations. Important information about the datums used in Australia can be found on the Geoscience Australia website at http://www.ga.gov.au/geodesy/datums/.

Datum information and the lineage of the spatial data should be recorded in the metadata document. Datum conflicts can cause errors.

Some cities and towns may use local grids and datums. For example, Perth in Western Australia uses the Perth Coastal Grid [for more information, see http://www.landgate.wa.gov.au/docvault.nsf/web/SPM_DLI_APPENDIX5/$FILE/SPM_DLI_APPENDIX5.pdf].

Projections are an essential component when making maps and undertaking spatial analysis. It should be noted that different projections are used for different purposes. Some preserve shape (conformality); others preserve the area, distance or direction. A map projection can preserve some of these characteristics, but not all. Datasets in different projections can be transformed into a common projection.

Figure 2.18 shows the results of importing an outline development plan file from a non-geographically referenced computer-assisted design (CAD) package—the imported data do not register with the cadastre. In Figure 2.19, the imported file is registered against known geographical references and is now geographically correct.


The most commonly applied projection in Australia is the Map Grid of Australia, which is a transverse Mercator’s projection. This is a conformal projection that preserves angular relationships between objects. It is useful for areas extending up to 6° (up to ~300 kilometres). For larger areas (e.g. a state or national map), a Lambert’s conic conformal projection is often used. An azimuthal projection might be used for a very small area, such as an airport or harbour.

Module 9: Map production guidelines discusses the options for using different projections depending on the particular local government need.

Aside from ensuring conformity of datum and projection, corrections may be needed when inputting data into a GIS system, due to surveying errors, poor copying of original diagrams and other causes. These issues are often faced by local government GIS specialists, who should establish procedures for ensuring correct registration with cadastre and other GIS data.
2.2.6 Data structures

A spatial information system stores two types of data: vector and raster.

Vector data are captured as points, lines (a series of point coordinates that are connected) or areas (polygon shapes that are bounded by lines). An example is shown in Figure 2.20. Property boundaries and roads are typically stored in vector format, with a corresponding attribute file. Property parcels might contain details such as the owner's name, the property valuation and the land-use zone; road data commonly contain details such as the road type (e.g. highway, road or track).
Raster data files consist of rows of uniform cells coded according to data values. An example is shown in Figure 2.21. For example, a satellite image that uses a raster structure can be interpreted using remote sensing tools to produce a land-use/land-cover map, also in raster format. Raster files are generally larger than vector files and sometimes are less visually appealing if the resolution (measured as dots per inch) is low. However, raster data systems are very good for evaluating environmental models, such as those used in the management of soil erosion, recreational reserves and fire hazards. They are also valuable for providing backdrops of aerial photography for land-use planning and for many other local government decision-making processes.
Data restructuring is possible through the use of spatial information systems that allow conversion of data from raster to vector or vice versa. For example, a spatial information system can be used to convert a raster land-use or land-cover map interpreted from a satellite image to a vector structure, by generating lines around all the cells with the same classification. At the same time, the spatial relationships of the cell, such as adjacency or inclusion, can be determined.

2.2.7 Data interpolation and modelling
Models can be developed to assist in interpolating data from observed values to unobserved locations. In effect, this is a method of describing something that cannot be observed directly. Given that it is not feasible to collect data from every square metre of a local government area, models can be used to create simplified representations of reality.

Apart from making it easier to process, analyse and combine spatial data, spatial information system technology has also made it easier to arrange and integrate spatial processes into larger systems in which thematic layers and their relationships can be modelled using spatial analysis tools.

Councils often use these capabilities to model the catchments of users for a new council asset, such as a swimming pool or community centre. Data modelling also has a range of uses for environmental management, such as producing contour maps of environmental parameters (such as soil pH) from point data.

2.3 What is special about a spatial information system?
Spatial information systems can provide a unique way to integrate spatial and non-spatial data, to interface with many other systems within an organisation, and to manage, query, analyse and present information. Complex analyses that utilise the spatial components (location) can be integrated with non-spatial components in ways that other information systems cannot emulate.

2.3.1 Information retrieval
Spatial information systems make it possible for the user to ‘point’ to a location (i.e. query by location), object or area on the screen and retrieve information that is stored as attribute data in some form of database. Using scanned, digital, aerial photographs, satellite imagery or cadastre as a visual guide, it is possible to query a spatial information system to provide access to other council systems (such as applications processing or document management systems) in order to display a host of relevant information about a particular property or location. This can be demonstrated using the City of Swan’s Intermaps system at http://maps.cityofswan.com/intermaps50/.

2.3.2 Topological modelling
Spatial information system technology allows identification and analysis of spatial relationships among mapped phenomena. Conditions of adjacency (what is next to what), containment (what is enclosed by what) and proximity (how close something is to something else) can be determined. For example, the City of Swan uses these features
of a GIS to identify properties within 50 metres of an owner requesting a dog kennel licence (see Figure 2.22). Another example might be the analysis of noise propagation around a new building site.

2.3.3 Networks
Spatial information systems can also include linear network functions that specify the direction and value of attributes that ‘flow’ along networks. This is often used in local government for traffic analysis (as shown in Figures 2.13 and 2.14). Other uses of linear network functions include the analysis of agricultural run-off into streams.

2.3.4 Overlay
Overlay operations are a powerful suite of useful tools in spatial information systems. Georeferenced layers may be visually overlayed to present more complex and customised displays. Further, a series of functions (called ‘map algebra functions’) allow features between layers to be intersected, erased (using ‘cookie-cutters’), added, multiplied, etc. These functions permit complex and powerful analyses to be conducted.

For example, using the map layers of cadastre, town planning scheme zonings, road locations, topography and environmental layers (e.g. wetlands, streams, soils, conservation reserves, noise contours), it is possible to use spatial information system technology to provide new maps or overlays. These can be used to improve council staff access to a broad range of data that would otherwise be time consuming to access. An example from the City of Swan is shown in Figures 2.23 to 2.27. The resulting maps, showing a combination of layers, produce powerful visual information that provides planners with invaluable development constraint information. This will support timely and consistent processing of development applications.
**Figure 2.23** Cadastre showing Council assessment numbers

**Figure 2.24** Cadastre with flood plain and flood fringe overlay
**FIGURE 2.25** Aircraft noise contour overlays (current and potential future)

**FIGURE 2.26** Zoning overlay
2.3.5 Data output

One of the most critical components of a spatial information system is its ability to use the complexity of spatial information systems to produce simple, effective visual representations through graphics, either on screen or on paper. These convey the results of analyses to decision makers.

A full range of map products, including wall maps, internet-ready maps, interactive maps and other graphics, can be generated using spatial information system technology. These can assist decision makers to visualise and thereby better understand the results of analyses or simulations of potential decisions. The example in Figure 2.28 shows an overlay map used to present development application information to City of Swan councillors.
Development of standards to support the consistent output of spatial information systems is described in Module 9: Map production guidelines.

2.4 Additional support

This module has provided an overview of the issues and functionality of spatial information systems. The focus has been on practical issues, aimed at those with limited understanding of spatial information systems.

Considerable additional support material is available on all the issues identified. Some additional information sources and suitable reference materials are identified below.

The list is provided simply to assist councils to discover information available and is not meant to be comprehensive. Listing of a book or software publishing company does not constitute an endorsement of that company.

2.4.1 Spatial information systems

Wiley Publishers (http://www.wiley.com/) has a number of useful spatial information system and GIS reference books, suitable for use in local government. See, for example, The Design and Implementation of Geographic Information Systems by JE Harmon and SJ Anderson (May 2003).

OnWordPress.com (http://www.onwordpress.com/) has a number of software-specific and general reference spatial information system support books. See, for example, GIS Solutions in Natural Resource Management by S Morain (1998).
Other appropriate titles can be discovered by entering GIS in the product search pages of many online publishers and booksellers.

There are also a number of online newsletter-type services specialising in spatial information system (and GIS) activities, including:

- Geocommunity: http://spatialnews.geocomm.com
- GIS Café: http://www01.giscafe.com/
- Directions Magazine: http://www.directionsmag.com/

Many software vendors also publish reference material and newsletters. Some online bookstores maintained by software vendors can be found at:

- Intergraph: http://www.intergraph.com/au

2.4.2 Global positioning systems

Comprehensive support on the managerial and technical aspects of using GPS is available via the Land Victoria website at http://www.land.vic.gov.au/surveying. Some useful documents available from the site include:


Acronyms

ACRES Australian Centre for Remote Sensing
ADAC Asset Design and As Constructed
AGD Australian Geodetic Datum
ALGA Australian Local Government Association
ANZLIC ANZLIC—the Spatial Information Council for Australia and New Zealand
ASDD Australian Spatial Data Directory
ASDI Australian Spatial Data Infrastructure
AS/NZS Australian Standard/New Zealand Standard
CAD computer assisted design, computer-aided drafting
CPU central processing unit
dsdb detail survey database
GDA94 Geocentric Datum of Australia 1994
GIS geographic information systems
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GML</td>
<td>Geography Markup Language, Generalised Markup Language</td>
</tr>
<tr>
<td>GPS</td>
<td>global positioning system</td>
</tr>
<tr>
<td>GSDI</td>
<td>Global Spatial Data Infrastructure</td>
</tr>
<tr>
<td>GUI</td>
<td>graphical user interface</td>
</tr>
<tr>
<td>HTTP</td>
<td>Hypertext Transfer Protocol</td>
</tr>
<tr>
<td>ICT</td>
<td>information and communications technology</td>
</tr>
<tr>
<td>INCIS</td>
<td>Integrated National Crime Information System [New Zealand]</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
</tr>
<tr>
<td>IT</td>
<td>information technology</td>
</tr>
<tr>
<td>MGA</td>
<td>Map Grid of Australia</td>
</tr>
<tr>
<td>OGC</td>
<td>Open Geospatial Consortium</td>
</tr>
<tr>
<td>OGC-A</td>
<td>Open Geospatial Consortium—Australasia</td>
</tr>
<tr>
<td>PRINCE</td>
<td>Projects IN Controlled Environments</td>
</tr>
<tr>
<td>RCSC</td>
<td>Regional Collaboration Steering Committee [Queensland]</td>
</tr>
<tr>
<td>RFP</td>
<td>Request for Proposal</td>
</tr>
<tr>
<td>RIP</td>
<td>raster image processor</td>
</tr>
<tr>
<td>ROC</td>
<td>regional organisation of councils</td>
</tr>
<tr>
<td>SDE</td>
<td>spatial database engine</td>
</tr>
<tr>
<td>SDI</td>
<td>spatial data infrastructure</td>
</tr>
<tr>
<td>SEQ</td>
<td>south east Queensland</td>
</tr>
<tr>
<td>SIDP</td>
<td>Spatial Interoperability Demonstrator Project</td>
</tr>
<tr>
<td>SLIP</td>
<td>Shared Land Information Platform [Western Australia]</td>
</tr>
<tr>
<td>SOAP</td>
<td>Simple Object Access Protocol</td>
</tr>
<tr>
<td>URL</td>
<td>Uniform Resource Locator (website address)</td>
</tr>
<tr>
<td>VROC</td>
<td>voluntary regional organisation of councils</td>
</tr>
<tr>
<td>WALIS</td>
<td>Western Australian Land Information System</td>
</tr>
<tr>
<td>W3C</td>
<td>World Wide Web Consortium</td>
</tr>
<tr>
<td>XML</td>
<td>Extensible Markup Language</td>
</tr>
</tbody>
</table>

**NOTE**: A list of several online spatial information system, GIS, cartographic, data and IT glossaries and dictionaries is provided at [http://www.gis.com/whatisgis/glossaries.html](http://www.gis.com/whatisgis/glossaries.html). An additional online glossary for definitions of many current IT-related words is available at [http://whatis.techtarget.com/](http://whatis.techtarget.com/).