

On-line Land Portal System using Aerial Photographs and Cadastral Data

Landgate – A Case Study

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ABSTRACT

In 2003 the Department of Land Information in Western Australia (DLI) brought on stream it's new Landgate Portal unified web access point to all of state government information.

Landgate brings together technology offerings from some of the world's leading vendors in the Spatial Sector. Oracle Spatial, ESRI's SDE and ArcIMS and Earth Resource Mapping's ECW and Image Web Server are integrated in this portal.

The service was developed to provide access to spatial information across government agencies as well as to many business sector clients and community groups. It has achieved this by providing various user channels such as conveyancing, industry, surveying, planning and many others are planned.

WA's model for sharing data across government agencies places it at the forefront of similar developments in Australia. As part of a total E-Government strategy Landgate represents an opportunity to improve their services whilst reducing their own investment in technical infrastructure. Key agencies such as the Water Corporation and Fire and Emergency services (FESA) have come out strongly in support of this service. Sharing of data means agencies can get on with the business of developing their own plans rather than worry about key spatial assets required to underpin their operations.

Part of DLI's mandate was to provide online distribution of over 5 terabytes of aerial photography to a variety of Government, Industry and free-to-air Public applications. To meet this need, DLI approached ER Mapper to develop a web application that would integrate the imagery from their Image Web Server with the cadastral data served from their ESRI Eview4 Server. This would be available to a variety of clients in a multi-channel deployment from the Landgate Portal

ER Mapper used the RightWebMap product, a rapid development tool, to develop an application called Map Viewer which is launched from the Landgate Portal allowing viewers to display multiple airphoto images in a "layered view" stack overlaid with the Cadastral vector information.

This project went on stream in November 2003 and serves hundreds of users simultaneously in Government, Industry and the Public via Intranet/Internet communications. This site can be viewed by going in your browser to www.landgate.com.au that is the LandGate Portal entry point for this enterprise system.

Future versions are expected to offer other services such as WMS as the need arises. The fusion of WA's spatial imagery assets with other land information assets provides fast and fluid information sharing. This fusion was made possible by deploying Earth Resource Mapping's Image Web Server and RightWebMap technologies. This technology allowed DLI to integrate information that was previously separated and to create new business opportunities in the state.

Figure 1 shows a screenshot of the Map Viewer application, which can be demonstrated by going to www.landgate.com.au and trying the Free Preview Channel.

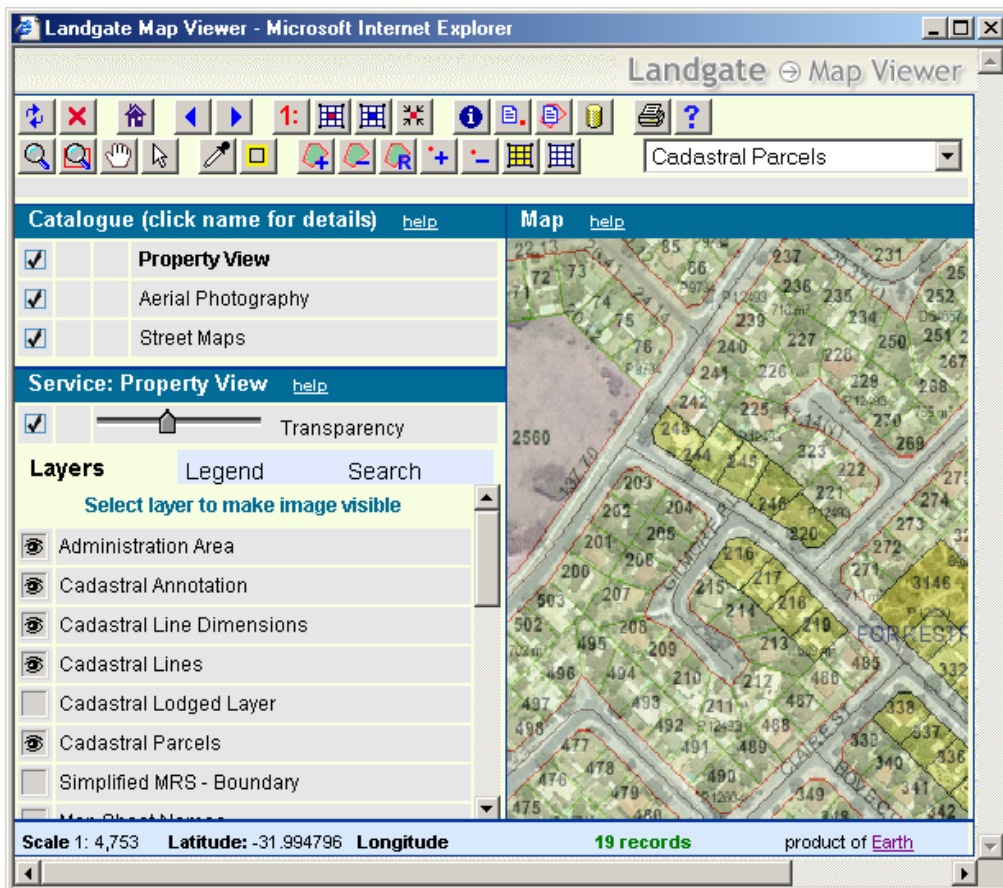


Figure 1 – LandGate Portal Map Viewer

This paper will provide an insight into the LandGate Solution deployed at DLI,WA

- Overall architectural solution at DLI, WA
- ER Mapper's Rapid Development Framework (RightWebMap)
- Successful deployment of 5 Terrabytes of Aerial Imagery
- Online Imagery Solutions

BIOGRAPHY OF GUY PERKINS

Guy Perkins graduated from the University of Western Australia with a BA in Engineering (Civil). He worked with the Centre for Water Research on the Perth Urban Water Balance study where he generated an early interest in GIS Integrated applications. In 1989 he accepted a position with ESRI Australia where he held many Business Development and Management positions including Project Manager on a Land Resources Evaluation Project in Indonesia, Technical Director in Singapore and was Managing Director of ESRI Malaysia, before progressing to Managing Director of ESRI Australia. He was involved in the advisory committee to Senator Nick Minchin on the Action Agenda on the Spatial Industry, which led to the formation of ASIBA in 2001, and was also a founding Director of ASIBA. In the last 3 years Guy has worked as a consultant with the PSMA on the G-NAF project and for 2 years with MapInfo as the Southern Regional Manager for Australia. Guy is a member of the WALIS Advisory Committee. In August 2004, he returned to Perth to take up a position with ER Mapper as Vice President ASIA Pacific with a primary focus on Enterprise Geospatial Imagery Solutions. ER Mapper is a world leader in Enterprise Geospatial Imagery Solutions.”

BIOGRAPHY OF TONG LIM

Tong Lim received his first bachelor degree in Computer and Mathematical Sciences from the University of Western Australia in 1994. After graduation, Tong worked in Singapore and Malaysia for a couple of years as an Analyst Programmer. In 1997, Tong returned to Australia and underwent a GIS/Cartography course at Curtin University in Western Australia. Having received his second degree in Cartography, Tong took up an opportunity to work for the Fire and Emergency Services Authority (FESA) of Western Australia as a GIS officer. Tong’s primary responsibility in FESA was to maintain and provide up-to-date geospatial information to personnel within the organisation and the public. In 2000, Tong accepted a position with ER Mapper as a Business Development Manager focusing on introducing the cutting edge imagery technology to the Asia region. Over the past 5 years, Tong has built up a strong network and knowledgebase in the spatial sector in the Asia region. Tong appointed many OEM partners and distributors in North and South-east Asia countries. Tong has secured several large-scale projects with his local partners in Asia. ER Mapper is a world leader in Enterprise Geospatial Imagery Solutions.

Project Overview

The Landgate Portal controls access to a number of channels, which have different levels of access to both the Cadastral and the Imagery data. Access to the various channels is controlled by a user authentication system with Single Sign On security.

The Channels are:

Planning Channel – free public channel with limited Cadastral data and no image access.

Preview Channel – full functionality but limited to a specific suburb and with a single airphoto mosaic and a single street map mosaic.

Government Channel – full functionality channel designed for Government departments.

Survey Channel – full functionality channel with paid subscription access for surveying needs.

Conveyancing Channel – designed for use in Land Conveyancing.

Landgate Portal Architecture

Figure 1 below shows the Architecture of the Landgate Portal system.

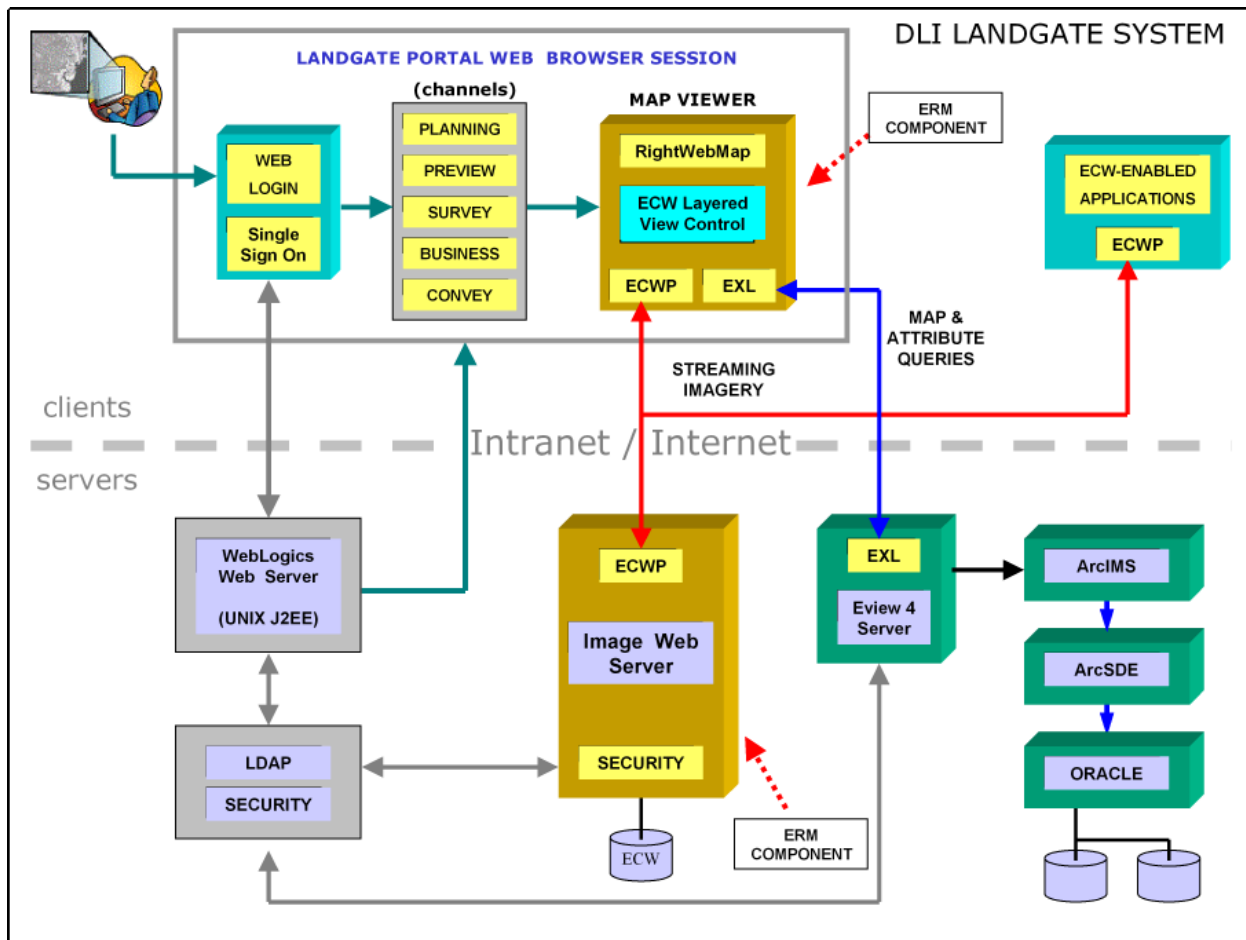


Figure 1: DLI Landgate Portal Architecture

Map Viewer was deployed into existing systems that were in place at DLI and it's role was to integrate information from these systems (the two components that we supplied, Image Web Server and Map Viewer, are designated on the diagram).

The Cadastral (land parcel) vector information is served from a standard ESRI™ ‘stack’ including Oracle DB™, ArcSDE™ and ArcIMS™ Server. What is unique about this site is the presence of the ESRI EView™ Server which acts as a Query Server into ArcIMS™.

Image Web Server using our Layered View plug-in deployed within the RightWebMap integration framework.

System Description

The following is a detailed description of the various components of the Landgate System and how they interact with the Map Viewer and the Image Web Server technology supplied by ER Mapper.

Single Sign On Authentication

It was important to DLI that users only need to log in once when using the Landgate Portal rather than once to gain access to the Portal and again to gain access to the image files.

This was solved by employing Single Sign On whereby the user is authenticated on entering the Portal and their credentials are then passed to the Map Viewer application where they are used to gain access to the images.

When the user logs into the system they are authenticated against a security database and if valid are issue a token for the browser session. This token will gain them access to both the image data in Image Web Server and the cadastral data from the EView 4 Server. The Token expires after a set period at which time access to new imagery is blocked without another login by the user.

The Map Viewer passes these parameters to Image Web Server which uses them to make a call to the central Authentication Database which returns a pass or fail status. Only if a pass is received will the user receive the imagery otherwise a ‘403 Forbidden Error’ is returned to the Client where it is used to advise the user.

Channel Assignment and Imagery Discovery Process

The Portal was designed to provide data access to a number of different groups (or Channels) each with their own Cadastral data and image data requirements.

It is important that the client application display only those images assets that the user had rights to view for security reasons and also only those images that the user has an interest in for efficiency and to eliminate information overload.

DLI is the custodian of over 5 Terabytes of air photo imagery plus matching rasterised Street Map images representing some 500 separate image files. The challenge was to present only the image assets required by each Channel in an automatic and intuitive way.

Five distinct channels were identified as follows:

1. Planning – a public channel with no requirement for login and no need for airphoto images
2. Preview – a free trial channel that users registered for to evaluate the system which provided only two images, an aerial photography image and a composite Street Map image.
3. Survey – a full feature channel where users were required to login and if successful are given full access to over 500 image mosaics which can be accessed and streamed to their workstations.
4. Government – an internal channel where users are also given full access to all imagery

5. Conveyancing – a channel for Real Estate conveyancing where full access to all imagery is also provided.

By assigning each user membership in a “Group” and granting these Groups access rights to individual channels, the Map Viewer is customised to present to them the only imagery urls to which they have rights of access.

The work process is as follows:

1. All users gain access to the Map Viewer via a web portal through a standard browser.
2. Users log into the Portal and select a channel available to their Group.
3. User Credentials are passed to the Map Viewer along a time limited session Token.
4. Based on their Group Map Viewer customises the image layers available to the user.
5. Based on their Group, Map Viewer structures Queries and Reports and the data layers available from Eview.

Map Viewer Architecture – The RightWebMap framework

Map Viewer is built using ER Mapper’s RightWebMap rapid integration development framework.

RightWebMap is built around the ECW Layered View Control which is a plug-in to web browsers enabling them to view multiple images in a “viewing stack”.

The Layered View Control is scriptable using DHTML providing a very rich and powerful development environment. RightWebMap uses sophisticated object-oriented Java Scripting techniques to create a powerful viewing application that operates *totally on the web browser client.*

RightWebMap applications are deployed from a web server as a standard web page but once running on the browser, It does not rely on server-side applications to do it’s work. This gives the user immediate response on turning on and off images, setting transparency on image layers, clipping etc.

RightWebMap HTTP Communication:

RightWebMap uses the ECW ActiveX Control to talk to the outside world via plain HTTP (or **https** in secure environments). It will simultaneously bring in data from Image Web Server(s), GIS Servers like ArcIMS or Map Server public servers operating on OGC WMS. Interface standards like WMS are dealt with using an XML parser that structures industry compatible XML strings to post to the server and receive information from the server.

Every time the extents of the images are changed the Control initiates update requests for the entire stack of Services and the results are received *asynchronously*. What that means to the user is that they can get on with viewing the layers they have immediately (such as streaming ecwp image layers from Image Web Server) while waiting for slower GIS services to update.

RightWebMap Architectural Structure

The structure of RightWebMap is broken into two main areas. One is the client customisable section allowing them to customise the services, data layers and toolbar of the applications, the second is the Server interface software that deals with the many services supported. The latter software is very complex and must only be modified by ER Mapper in order to maintain supportability.

Client Configurable Component

This section of code is very easy to understand and can be modified by the client with only entry level DHTML skills. The key commands are:

Add Service to Catalogue – A single line of code will add a service such a OGC WMS, ArcXML or ECWP to that viewer catalogue.

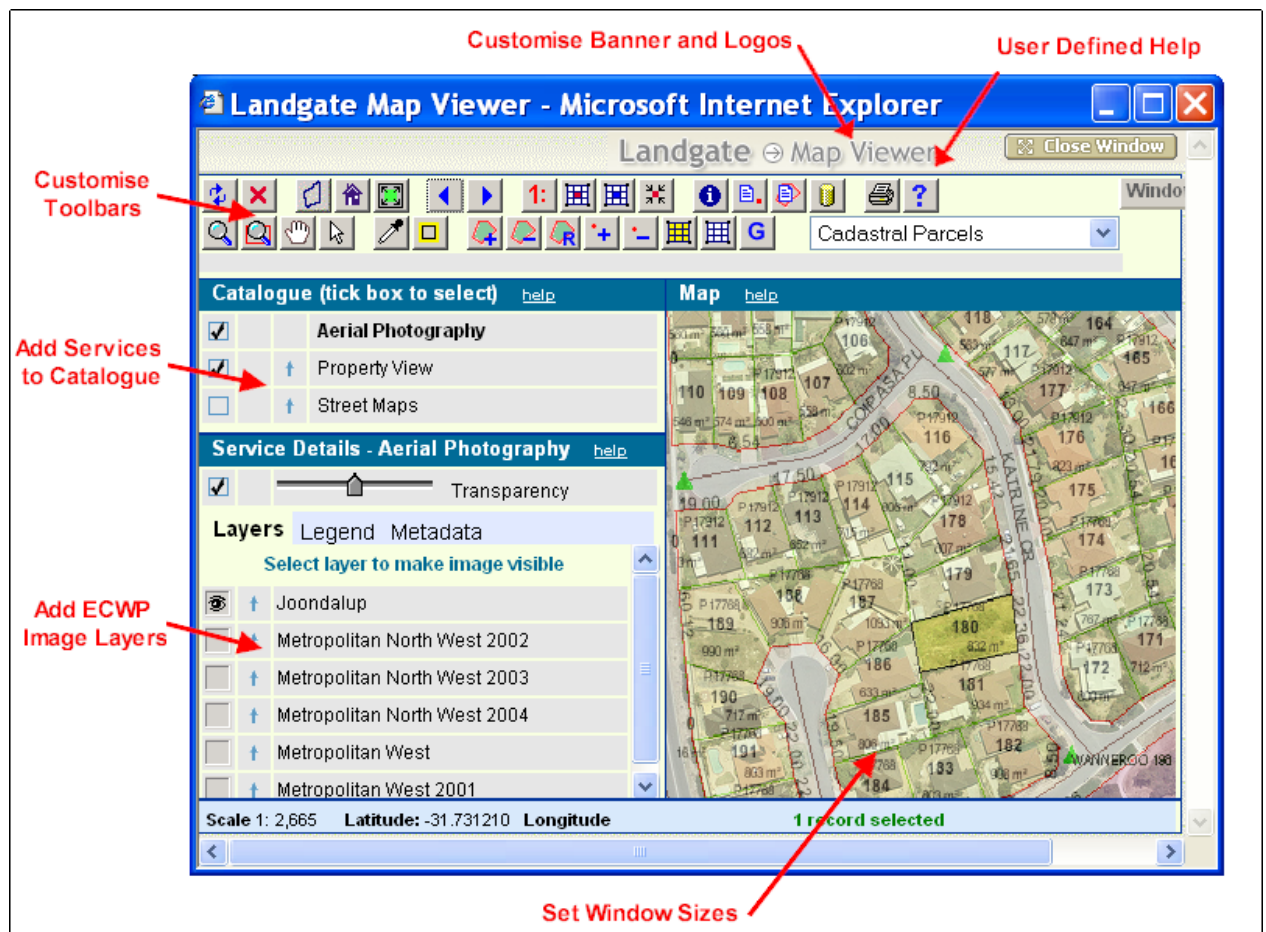
Add Layer to ECWP Service – A single line of code will add an image layer to an Image Web Server (ECWP) Service.

Add Button to Toolbar – A single line of code will add a button to the toolbar, set tooltip, set latching/non-latching, define the images and name a function to call when invoked.

Set Page Title and Banners – Simply replace template code with your own banner text and images to customise the look and feel of the application.

Styles Sheets – A style sheet file can be modified to control colours, fonts etc.

Diagram ____ below indicates the main components which can be modified by the client to customise the look and feel of a RightWebMap web application.



Servers Interface Component

This is the complex DHTML section that manages all of the communication to the various Service types that RightWebMap supports. Think of these as code “modules” that plug into the main framework to handle specific interface tasks.

Map Services that RightWebMap currently supports are:

- Image Web Server™
- OGC WMS™
- MapServer™
- MapExtreme™
- ESRI ArcIMS™
- ESRI Eview™
- Microsoft SQL Server™
- AutoDesk MapGuide™

The full JavaScript code is viewable for the section of RightWebMap. However, Vendor support is only provided for work undertaken by ER Mapper.

As part of our ongoing development program for RightWebMap ER Mapper will be enhancing this section on an ongoing basis, the updates becoming available as new releases of the product.

Programming Philosophy

From a programming point of view the RightWebMap is made up of a number of “objects” which attach to each other to perform services.

View Object - At the highest level a View Object is defined which controls the display and manages all of the layers in the Layered View Control for things like order in the stack, transparency, clipping etc etc.

Service Objects - A View Object can have a number of Service Objects attached as “child objects” and these service objects provide the information to the viewing layers.

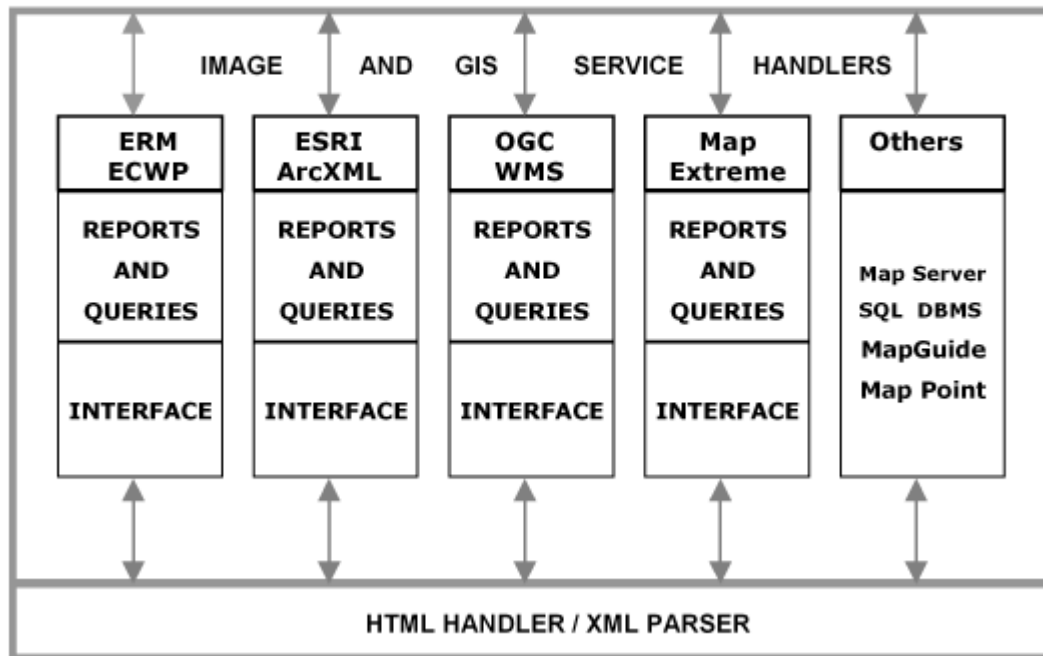
Reports and Queries – Each Service Object can have associated with it a number of queries to the service, if they support it, as well as image and database reporting.

Layer Objects - If the Service Object is an ECWP (Image Web Server streaming) service then it can have a number of child Layer Objects which manage the request and display of the compressed ECW packets streamed from Image Web Server.

Toolbar Objects – The View Object will have an associated Toolbar Object that controls functions associated with that view.

The diagram below illustrates the modular structure of the Server Handler component of RightWebMap. All of the major GIS information services are already built into the product and available immediately. Customised queries and reports will be created to handle specific applications in your organisation.

RIGHTWEBMAP ARCHITECTURE – SERVICE HANDLERS COMPONENT



Conclusion

RightWebMap allows you to build a sophisticated Multi-Server Web Application in a matter of hours not weeks. This is a complimentary application to Image Web Server and underpins LandGate application.

This powerful tool provides you with the interfaces pre-programmed to most of the major GIS Servers as well as Image Web Server to manage your raster image files. This is a Rapid Development Framework and provides for easily customizable application to produce a highly integrated information in a powerful client rich web browser application.

By leveraging on the many applications already built using the RightWebMap framework we can efficiently create the presence that your company needs be it a standard single channel deployment or a complex multi-channel environment like the DLI Map Viewer project.

The current RightWebMap and Image Web Server deployment allows for the current investment in Vector GIS to be preserved as in the case of DLI. This is critical as significant investment has been poured into establishing current business process requirements.