

## WebGIS Applications In Real Estate Management

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### Abstract

The technological boom particularly Information Technology (IT) has touched every facet of life. The real estate operations today have expanded considerably and with changing pace of life the decision-making has to keep pace with increase in operations. New technologies are designed to make real estate operations, run more efficiently and to assist property professionals to manage their properties in a much smoother way. The need of the day is to have stream lined system for realtors to have access to their multiple system availability of information both visually and analytically. Similarly the buyers can make his decisions in a virtual environment.

The real estate business is becoming larger in scale and more complex. The buyers would like to have his numerous queries answered quickly without wasting time. Bankers and other financial institutes would also like to process their requests in a much faster way. Hence, there is a need for GIS based systems, which give both spatial as well as non-spatial information in a client-server as well as on internet-intranet. This paper focuses on an application for the commercial real estate community.

### Introduction

The unprecedented population growth coupled with unplanned developmental activities has led to urbanization with sometimes-insufficient infrastructure facilities. This also has posed serious implications on the resources. The urbanization takes place either in radial direction around a well-established city or linearly along the highways. In most of the countries, urbanization is inevitable, so are its impacts. In order to minimize these impacts the urban infrastructure needs to be properly planned, designed, operated and maintained so that it provides optimal efficiency. Part of the problem with today's urban structure is that it was built at a time when planning considerations were substantially different from what they are today. Consequently, in trying to retrofit existing system to achieve today's urban performance objectives, is a major challenge for the survival of our cities. Real estate information management system is the essential part for a real estate enterprise and is very important for the decision-makers and managers. Site selection has been the most prominent and traditional area in real estate.

### Usage of Geographic Information System

The incorporation of Geographic Information Systems (GIS) into businesses and organizations has allowed for wider use and access to a variety of spatial information. Inherently, organizations collect and process data. Over the last couple of decades the data flow in and between organizations has increased exponentially. As this data flow increased and continues to increase, ways of effectively managing and

distributing that data needed to be devised. Various challenges need to be overcome by these data management tools and techniques. These include the automated and proper handling of large volumes of data, exchange of this information between and among various organizations and businesses, and user-friendly methods for visualization and interaction with the data. With the usage of Internet the access to the spatial data has increased exponentially.

Web enabled GIS professionals in every field have discovered the advantages of using maps for decision support. With easy-to-use Web browsers, GIS on the Internet provides a much more dynamic tool than a static map display. Web-enabled GIS lets you deliver interactive query capabilities such as

- ?? Searching for specific site locations
- ?? Displaying and viewing multiple data sets
- ?? Conducting queries for specialized analysis
- ?? Performing data commerce
- ?? Retrieving specialized data services

Geography is critically important to the commercial real estate market. A less than optimal business location can make or break a business no matter how good the service or product. Most corporate real estate executives are acutely aware of the value of GIS in siting restaurants, stores, warehouses, and corporate offices. Some of the more important factors to consider when locating a business are proximity to suitable customers, location of potential competitors, crime rates, transportation infrastructure, local labor pool characteristics, and environmental risk factors such as floodplains, toxic sites, and others

GIS allows the real estate practitioner to integrate a wide variety of data into one common format, a map. The presentation of a wide variety of data affecting the desirability and value of a property on one or two maps can give a far more accurate picture of the property's suitability as a first time residence, acquisition for a portfolio, or site for a retail outlet than any number of generalized market studies, photographs, and marketing text. Many realtors have discovered the value of showing available residential property on a map prior to actually showing the client the property, as the details are comprehensive, time saving and gives Macro as well as Micro level picture.

Since GIS applications can map recently sold properties based solely on their addresses, an appraiser can "see" all properties selling in a given area.

The value of property can be affected by such mitigating factors as crime rates, condition of surrounding neighborhoods, floodplain status, and proximity to nuisances such as known environmental hazard sites or noxious or noise pollution manufacturing facilities. A "mansion" next to a waste disposal site in a floodplain is worth far less than an identical mansion fronting a greenbelt!

### **Internet GIS as marketing tool**

The real estate industry has just begun to implement Internet-enabled GIS systems as marketing tools. These applications typically feature free public access to a county's parcel ownership data and maps with a gateway to a fee-for-services section. Many times the lack of a nearby school or proximity to a busy road/highway will disqualify the property before it can be shown. Conversely, proximity to a park, greenbelt, or entertainment facilities may practically pre sell a property. Presentation of listings on a map is also an excellent way to gracefully introduce the subject of disclosure into the transaction. WGIS facilitates these benefits of GIS and Internet to a wider audience in a much simpler manner.

### **Internet GIS prototype for the Property Business**

One such prototype for the real estate industry is the Town Council and planning division, The 'X' company helps the realtor locate the matching house/building based on the criterion specified by the user and reserve the current plot as an online transaction.

The company 'X' is a leading master-planner, developer and manager of high quality industrial facilities and business parks. It is also the master developer for one-north at Buona Vista - a 200 hectare development for research and development and entrepreneurial activities.

Besides listing the property, the transaction executive helps the user to locate the following.

- ?? The location of the property.
- ?? Size of the property.
- ?? The dimension and the floor plan.
- ?? Budget and expected property valuation over a period of time.
- ?? Amenities sought.

Thus arranging for site visits, negotiations and help in closing the transaction.

All of the geospatial data were Web-enabled with ArcIMS and ArcSDE. The WGIS system helps the visitors and realtors to locate property by defining a query or graphically drawing the rectangle on the map. The user also has the provision to locate the property by buffering around a known feature like the Bus Stop, Road or Rail network.

The resultant property displayed, shall help the user to view the floor plan, dimension info and also reserve the property. After confirming the reservation details, the realtor would take the print out of the plot and the floor plan to be forwarded for processing.

The existing computing facilities of the Corporate include Windows NT application servers running NT 3.51, NT 4.0 and Windows 2000. The database servers are MS SQL Servers 6.0/6.5/7.0/2000. The Corporation also has about 900 desktop PCs and 300 notebooks. The client operating systems are Microsoft Windows 9X, Windows NT 4, Windows 2000 and Windows XP Professional. The standard software for desktop are Microsoft Office 97, McAfee Anti-virus, Internet Explorer 5.5 and higher and Domino R5 mail. All users logon to Windows 2000 Active Directory/ Domain.

The existing GIS application system includes a stand-alone SQL server and VB based Land and Building System (LABS).

Land and Building System (LABS) has information on the Corporation's products, companies, applications received and all lease management processes. The proposed system e.CREAM, Customer, Real Estate &

Marketing System, shall replace the exiting LABS system by providing a solution that shall span across the organization and integrate various sub systems, e.CREAM consist of an integrated operational database and is developed using Microsoft.Net with MS SQL Server 2000. The GIS and spatial part of the site shall be implemented using ArcIMS, MoJava and ArcSDE.

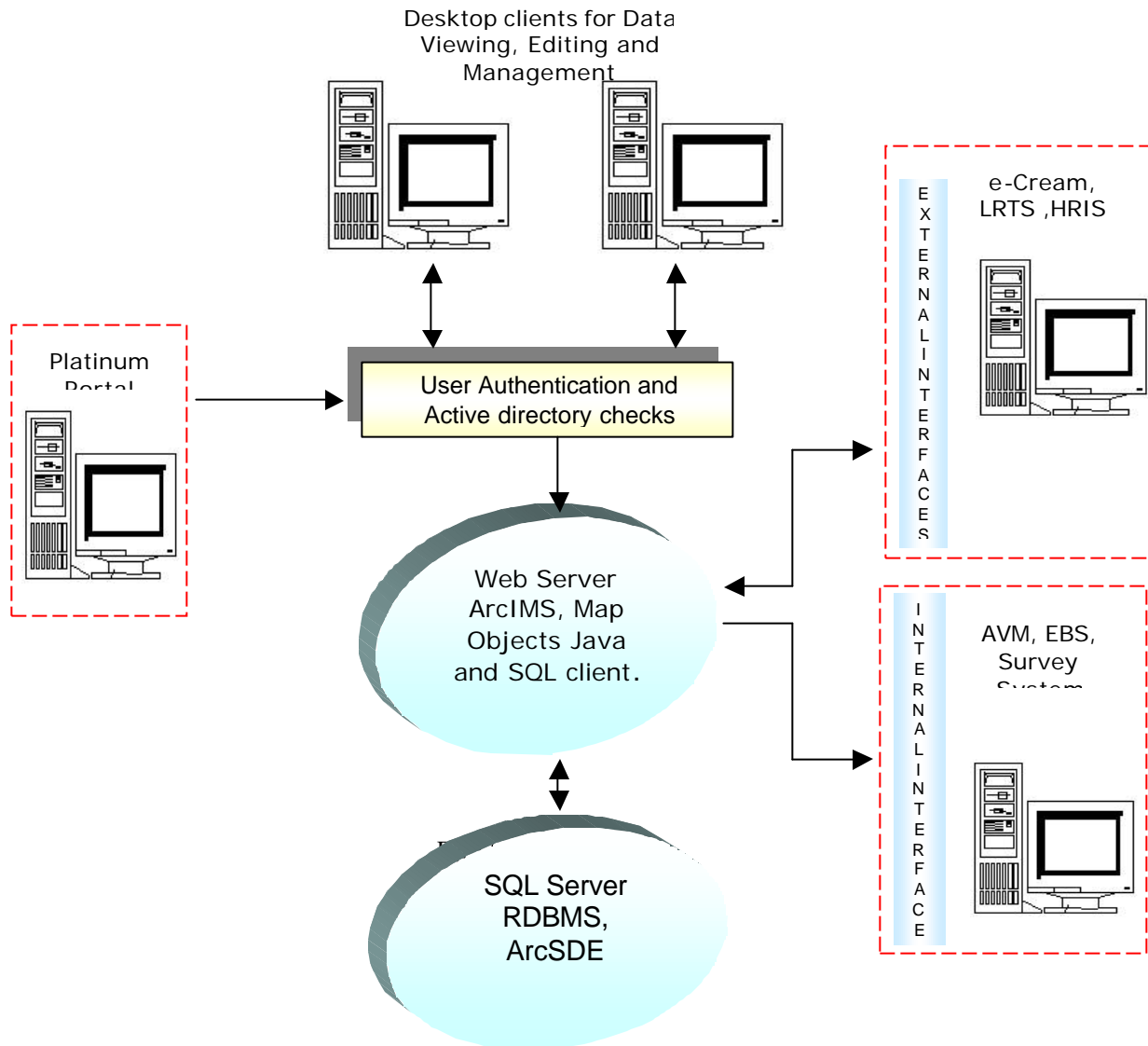
This system was designed to cater to the needs of three groups of users, namely the LRP (Land Resource and planning Dept.), SVD (Survey Dept.) and the Business Planning Group (BPG) or the corporate user group.

The corporate has a wide range of properties/products constituting of land and/or structure components. Land products are alienated, parcelised and created as an allocable and marketable product unit. WGIS system shall provide spatial and aspatial query functions and analysis tools for the production, printing of customised maps, charts and reports.

The WGIS shall allow LRP users to edit, store and perform map digitising of key spatial data layers including infrastructure and services information, and corporate graphical, planning, survey and engineering information in a centralise WGIS database. The WGIS shall provide spatial and aspatial query functions and analysis tools and the generation, production and printing of customised maps, charts and reports on both the desktop and the Intranet Web for the LRP users and the Corporate users respectively.

The proposed system is based on an n-Tier architecture with external and internal interfaces interacting with the main sub-system. The presentation tier responsible for creating dynamic views and manage user authentications & validation. The Business logic tier manages the different logics of the application and effectively interacts with the Enterprise information system. The Enterprise information system shall be responsible for managing the spatial and attribute data, performing versions and taking frequent backups of the data.

**Context Diagram**



**Presentation Tier:**

The presentation-tier receives many different types of requests, which require varied types of processing. Some requests are simply forwarded to the appropriate handler component, while other requests must be modified, audited, or uncompressed before being further processed. The presentation tier interacts with internal sub-systems like the ArcIMS, Mo-java viewers to render the appropriate view to the client.

**ArcIMS Viewer:** This viewer is a lightweight browser based viewer for the client, Arc IMS application and spatial server or map server would be at the server end. This viewer caters to the requirements of the corporate users groups to view the plot/building floor plan, estimate the cost and amenity details etc. The user can also perform an online transaction like reserving the plot/building etc., the selected plot would immediately be booked with the current user details, and thus appear as reserved for other users.



Fig 2.0 : Search for vacant plots/buildings using spatial search

Click to View the Vacancy Detail

- BLK 4
- BLK 30
  - First Storey (2 vacant units)
  - Second Storey (15 vacant units)

Floor Plan	Reserve	Unit Number	Site Address	Building Type	Estimated Cost	Floor Area	Land Area
<a href="#">View</a>	<a href="#">Reserve</a>	19961811	30 #2-3 Loyang Lane S(508769)	BFF	(null)	459.0000	0
<a href="#">View</a>	<a href="#">Reserve</a>	19961812	30 #2-4 Loyang Lane S(508769)	BFF	(null)	453.0000	0
<a href="#">View</a>	<a href="#">Reserve</a>	19961813	30 #2-5 Loyang Lane S(508769)	BFF	(null)	450.0000	0
<a href="#">View</a>	<a href="#">Reserve</a>	19961815	30 #2-7 Loyang Lane S(508769)	BFF	(null)	453.0000	0

Fig 3.0 : View floor plan and reserve the plot online.

**Mo-Java viewer:** Mo java viewer is also a browser-based viewer with custom java applets in the client side, this viewer would provide tools to manipulate/ parcelise\*\* the plot/building for the LRP or advanced user groups. The edits or parcelised information by each user shall be maintained in each user workspace in the server based on the active directory settings of the users. These edit shall further be shared or exposed to other departments for their internal perusal, thus validating and authenticating the edit, which would further be uploaded to the main database.

\*\* Parcelization is the process of subdividing or amalgamating the property/ product on the WGIS web by drawing on the selected plot according to specific area or dimension, Alternatively, web user shall be able to duplicate the selected plot/property and resize polygon according to area or dimension to perform the Parcelisation.

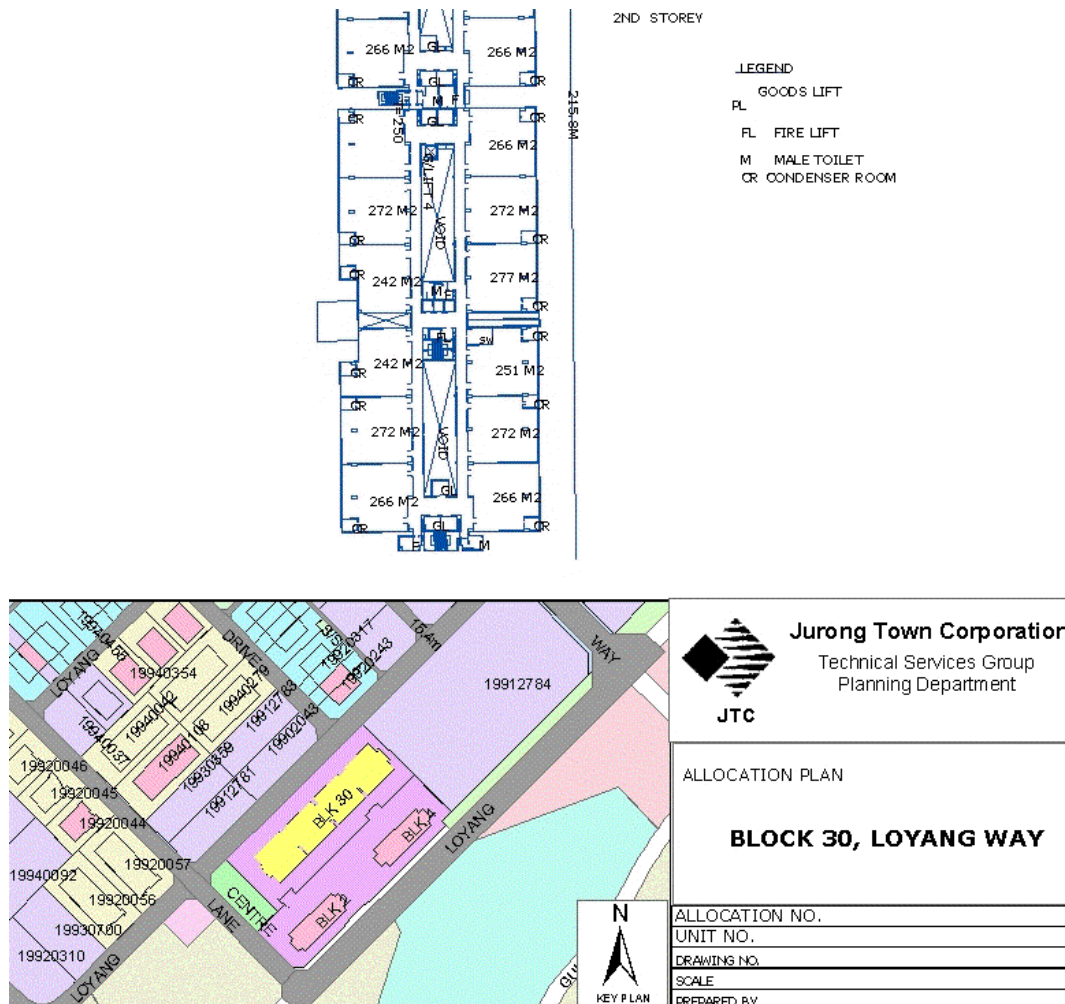


Fig 4.0 : A3 size print of the floor plan for the reserved plot.

**AVM System:** The AVM system provides the user with an indicative valuation of the JTC’s land based property for preliminary study & analysis. User shall input a property address and the system shall instantaneously displays the valuation result, WGIS system shall integrate the AVM system to provide the indicative valuation both textually and graphically. The AVM system shall also interface with the file repository photograph server to view the images concerning the selected property.

**Survey System:** The WGIS survey system shall be able to read the raw data captured from total station and generate the graphics required. The system shall provide utilities to input the computed survey values in text file format by batch. This system shall be integrated with other stores to link other digital photograph and encroachments etc.

Platinum is JTC's Employee Portal, This portal enables the Corporation to promote corporate awareness, community, knowledge learning, and easy access to Intranet services. It allows the Corporation's staff to have the convenience of accessing all information and services online. WGIS web will be launched and activated from this portal.

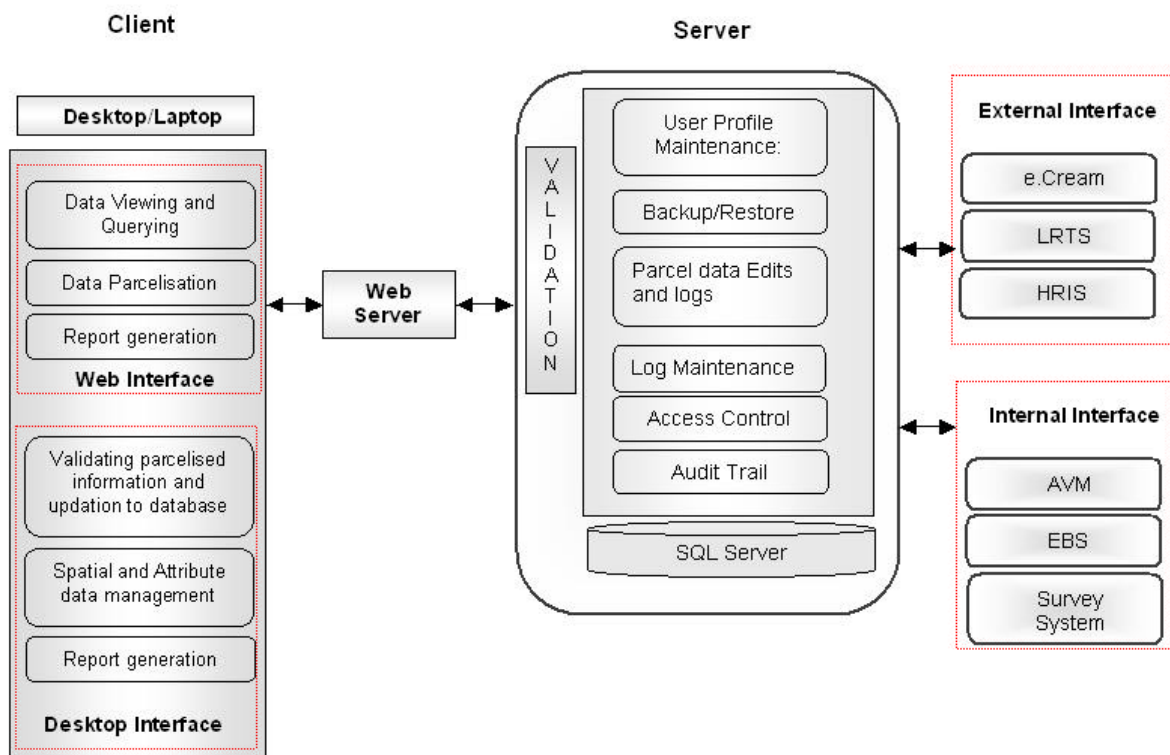
**Business logic Tier:**

The business logic of the system shall cater to the requirements of four applications, mainly the Arc IMS viewer for the corporate user, the MO java viewer for the LRP user, the AVM system for the Corporate evaluation and marketing users and the Survey system for the survey or desktop users.

Arc IMS is based on a three tier architecture, which shall perform the map processing at the server end using the map or the spatial server, the business logic shall be embedded in the Servlets and the jsp pages used to construct the view and frontal design, the front end tools would further communicate with the spatial server to render the specific image or data requested by the user.

Map Objects java viewer logic is embedded in the map bean and the sevlets developed, which would retrieve the feature data from the ArcIMS server & ArcSDE and provide tools to manipulate the feature data, these feature data sets shall be stored as a new version using the active directory settings of the user. The edited feature information shall further be forwarded with specific rights to users or users groups to perform validation and approve the data to be merged with the real time data.

The survey system logic would cater to the requirements of the survey users by using tools to convert and store the data from the total station and integrate it with the live database.



**Fig 5.0:** Business logic diagram

### **EIS (Enterprise information system) Tier:**

This tier shall comprise of ArcSDE as the efficient storage tool, which would be installed on the Microsoft SQL database. The ArcSDE engine shall provide tools to manipulate the data and store the data as versioned for different levels of users.

### **Conclusion:**

A framework for developing GIS software application for the online real estate management system was described in the paper discussed above, along with a case study to illustrate the advantages of an online system. The advantages of WGIS software based application are immense, and these applications are increasingly being used by wide variety of users and organization.

Use of WGIS application for this kind of application provides many benefits: a) Visual delight to the customer and realtor to view and analyze the plot/building and its environs. b) Use of techniques and technology like the AVM system to effectively estimate the cost of the property based on the preset conditions by the realtors. c) Faster and effective handling of huge and complex real estate datasets. d) Perform online transaction like the reservation and printing of the plot and its information based on the choices made by the customer. E) For the data develops and the realtors, to perform online Parcelisation of the property or product and merge with the online data dynamically.

This system described can also be used by the following organizations: a) The town and city planning department. B) The building and contract maintenance department. C) The public health facilities like the hospitals to manage the floor plan and other accommodations. D) The asset management organizations to manage the assets in effective manner.

The WGIS based software applications are a powerful tool for effective assessment and management of real estate data and its users.

### **Acknowledgement:**

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