“Customer Experience Management – An Innovative Solution Integrating Spatial Information with ArcGIS Server Technology” – A Real-Time Case Study

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Abstract:
In today’s competitive telecom business environment, superior customer service can act as a differentiator. The goal of customer experience management is to move customers from satisfied to loyal and then from loyal to brand ambassador. Traditionally, managing the customer relationship has been the domain of Customer Relationship Management. However, the strategies and solutions are designed to focus on product, price and enterprise process, with minimal or no focus on customer need and desire.

The result is a sharp mismatch between telecom organizations approach to customer expectations and what customers actually want, resulting in the failure of many implementations. In order to increase the implementation success rate, the only possible way is to use innovative spatial Information technologies and solutions effectively. This paper is discussing about leading EMEA region telecom operators success story. At the time of acquiring customer to create positive customer experience, this leads to customer build brand loyalty.

The winning innovative solution by integrating spatial information had helped to consolidate all independent internal systems and migrate them into ESRI ArcGIS server 9.2, along with migration of existing database to Oracle 10g in Windows 2003 server environment by using web services. The web-based GIS mapping system accesses the spatial data via map services, which enabled data from map document (.mxd), and read data from Arc-SDE, NE Oracle database, and other shape files with multiple oracle database servers of electricity, municipality and other departments. This innovative and optimized integrated process with customization has helped back-office users. The internal users were able to view all the intra-departmental consolidated data in Single sign-on (SSO), to make quick tactical decisions in day to day operations. The internal department users, able to support provisioning process effectively for feasibility status, activation services and service information to end-customers, along with real-time updated data from other departments with e-mail notifications.

All sales and Outlet users were happy for the performance of ESRI ArcGIS server and AJAX technologies and the modern look and feel. Interactive UID helped easy use and more flexibility due to Single sign-on (SSO). This Innovative spatial implementation supported customer experience management, by reducing customer churns, reduced process time, maximize up-sell and cross-sell opportunities, and improve decision making and customer service-experience.

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Introduction
The customer is the telecommunications service provider licensed by the local Council of Information and Communication Technology to provide both fixed and mobile telecommunications services in the Europe Middle East Africa region. They have a presence in more than 10 countries and are aggressively committed to expansion both in the MENA region and South East Asia.

Through this programme, we are intending to bring out a solution for web-based spatial migration of the application and the database. This paper addresses the technical architecture and the project execution methodology for the intended purpose.

Business Needs:
The Customer has independent Intranet applications providing GIS services to their users which include the customer service helpdesk and users of different departments. These systems were developed about six years ago and are functionally redundant. As a part of this programme, Customer intends to consolidate all the 10 independent systems and migrate them to ESRI ArcGIS server 9.2. As part of this, Customer intends to migrate its UNIX-based Oracle 9i database to Oracle 10g in Windows.

Customer has 10 Intranet based applications, which were developed on ArcIMS 4.0 as follows:

1. ADSL/ADSL2 feasibility
2. Telephone locating system
3. CustomerID
4. SED locating System
5. KIOSK locating system
6. Telephone feasibility system
7. Triple-play feasibility system
8. User locating system
9. Cabinet & DP Information
10. Diversion Schedule

These applications are accessible through a web page. It is required to enhance this webpage by redesigning the page and enriching it with more information and greater look and feel of the webpage and add more customer specific business functionalities. This page should be accessible through a hyperlink provided in the intranet/internet based customer portal page.

It is required to consolidate some of these GISWEB applications into two different applications.

(a) Service providing system which will have 7, 1 and 6.
(b) Locating system which will comprise of 8, 4, 3, and 5

Business Objective:

- More than 10 Internal applications have to be migrated to ESRI ArcGIS Server 9.2 and Single-Sign on (SSO)
- All customers’ database is on Oracle 9i with UNIX platform and need to be migrated to Oracle 10g on Windows 2003.

i. Scope of Work - Implementation

a) Study of the existing applications.
b) Conduct workshop to all the Customer staff for their requirements.
c) Redesign the front page of GIS section with more information.
d) Re-design the web-based applications according to the Customer standards.
e) Consolidate all the current web applications with similar function into one single application.
f) Migrate all applications from Oracle database 9i on UNIX to Oracle 10g on Windows.
Solution Architecture:

i. **Solution Overview:**
   The proposed solution will have Oracle 10g as Geo-database platform. The system architecture has been designed to meet the following architectural goals:

   - To enhance the performance, functionality, stability, adaptability, reusability, flexibility, migration ability, security, and scalability.
   - Object-oriented design approach has been followed throughout the application and database design.
   - Due consideration has been given to the current application interface requirements with other applications.
   - While designing the application architecture, we have developed special emphasis to the application development tools supporting industry standards.

![High Level Component - Solution Architecture](image)

**Figure: 1 – High Level Component - Solution Architecture**

ii. **Technical Architecture:**
   The implemented solution involved some of the basic GIS functionalities namely as below:

   - Map display
   - Zoom In / Zoom Out
   - Pan
   - Identify
   - Layer manager – Layer on/off
   - Search for feasibility status
   - Search based on CustomerID
   - Location Search
   - Select / Deselect
• Map scale
• Enable predefined set of thematic map layers with predefined symbol representation
• Map print
• Query and thematic display
• Tools to query, analyse, and map data to support decision making

Figure: 2 – Technical Architecture – Component Level

We have developed solution for customizing user specific functionalities as below

• Map export to different formats like JPG
• Query based report generation – Tabular reports will be generated and saved into a file.

These functionalities will be made available on the standard internet browser through thin clients. In the proposed web GIS solution, all the processing happens at the centralized server using the server components. These Server components are developed using ArcGIS Server Component technology

iii. ArcGIS server
The GIS server hosts the GIS resources such as maps and geo-processing tools and displays them as services to client applications. The GIS server is composed of two distinct parts: the server object manager (SOM) and server object containers (SOCs). The SOM manages the services running on the server. When a client application requests the use of a particular service, it’s the SOM that actually gives it for the client to use. The SOM connects to one or more SOCs. The SOC machines - also referred to as container machines - contain, or host the services that the SOM manages. Depending upon the configuration requirements, Customer can run the SOM and SOC on different machines and also have multiple SOC machines.

ArcGIS Server also includes a full software development environment for Microsoft.Net framework. It support a number of comprehensive developer tools for web applications and services. The Microsoft.Net development environment also includes a developer kit for the web mapping applications.

ArcGIS provides a scalable framework for implementing GIS for a single user or many users in servers over the Web. After conducting a detailed system study, we will provide a detailed roadmap for scalable system architecture for Customer.
However, as per the current understanding, we have identified a few scalability parameters for the current requirement as shown below.

There are two high level ways to achieve scalability: scaling up and scaling out. Scaling up is to handle volume on a single high performance server while scaling out is to distribute load among many low cost servers. When scaling up, processors are added to the server and when scaling out, processors are added to the cluster.

Batch processing would be carried out to observe software processing loads during peak operations at the customer site and these loads can be simulated in a controlled environment. The capacity planning models identify typical software component processing loads for the primary ESRI commercial software. We were considering hardware, application software, database, networks, and customisation objects for the scalability measures.

iv. **ArcSDE**
ESRI ArcSDE is a software product used to access large multi-user geographic databases stored in relational database management systems. ArcSDE allows the user to distribute the Customer GIS application processing between the Oracle database server, the client, and the ArcSDE application server. ArcSDE provides the mechanism for managing the Customer datasets. These storage methods provide a fast and compact representation for spatial data. With ArcSDE, you can move data from one RDBMS to another without loss of information through ArcSDE data export and import capabilities. ArcSDE manages the integrity of the point, line, and polygon information added to the database and does not allow ill-formed feature geometry to be inserted during data migration.

v. **Database**
We have developed data tier architecture will have spatial database as well as IT database which has to be integrated to optimise the query and to analyse the data. The entire Customer database will be managed and administered using the Oracle 10g component.

vi. **Web server**
The web server hosts web applications and processes the request/response that uses the resources running on the GIS server.

vii. **Implementation Methodology :**

We were delivered the project by using waterfall methodology (SDLC) with project management methodology (PMI Standards). As part of Implementation methodology, we have followed industry accepted methodology as below:

1. **Business Requirements**
2. **High-Level Designing**
3. **Low-Level Designing**
4. **Development**
5. **Testing**
6. **Deployment**
7. **User Trainings**

viii. **Customer Experience :**

Customer’s sales and Outlet users were happy with the performance of ESRI ArcGIS server and AJAX technologies for bringing modern look and feel. Interactive UID helped easy use with more flexibility than before due to Single sign-on (SSO). This Innovative spatial integration implementation supported customer experience management, by reducing customer churns, reduced process time, maximize up-sell and cross-sell opportunities, and improve decision making and customer service-experience. The below is picture is one of the GUI with modern look and feel and provisioning process key functionalities.
Figure 3: User Single Sign on (SSO) – User Interface Designing (UID)

i. For Example : Real Business Scenarios:
Customer’s provision service team were finding the feasibility status of the DP for end customer requests (e.g., Broadband request connection, IPTV connection) in WebGIS Application. If the DP is not found for a given Operators ID, the system makes a buffer area of 60 m and highlights all the internal DPs in that area. After provision service users select any DP from the list, it shows the feasibility status for that DP as either Feasible, or Long Reach Feasible, or Not Feasible as shown in the above screenshot, this would result in reducing time to market and enhanced customer service as an example.

ii. Key Business Benefits
• All applications in a single interface
• Easy-to-find DP feasibility for new connection of telephone, Internet, and IPTV
• Better planning, design, and operations
• Accurate and updated network and consumer data
• Easy viewing, querying, and report generation
• Enhanced Customer Services
• GUI-User-friendly with modern look and feel
• Availability of information on a Single sign-on (SSO)
• Increased productivity and reduced overtime costs

Conclusion:
The goal of customer experience management is to move customers from satisfied to loyal and then from loyal to brand ambassador. Traditionally, managing the customer relationship has been the domain of Customer Relationship Management. However, the strategies and solutions are designed to focus on product, price and enterprise process, with minimal or no focus on customer need and desire. This result is a sharp mismatch between telecom organizations approach to customer expectations and what customers actually want, resulting in the failure of many implementations. In order to increase the implementation success rate, the only possible way is to use innovative spatial information technologies and solutions effectively for better customer services for triple play of TV, voice and data.

Acknowledgement:
Authors thank full to Srinivas Manda, who brings more than 15 years of experience in GIS domains. He has a strong understanding of GIS from the end users perspective. His experience has seen him take a draft specification to a full-blown development in all the projects that he has undertaken. He has executed several GIS projects for major clients in USA, Europe, and APAC regions. He is a PRINCE certified project management practitioner. He has done M. Tech (Remote Sensing) from Andhra University, Visakhapatnam.