Development of Database and Web GIS

for

Integrated Coal Resources Information System(ICRIS)

for

Central Mine Planning and Design Institute Limited (CMPDI)

With an objective to create, implement and maintain coal resource database of our country from mine-level to prognosticated-resource-level, geological models and to reclassify Indian reserves as per UNFC guidelines and data storage into suitably designed database for GIS and web applications, a Project on "Integrated Coal Resources Information System" was approved by Ministry of Coal in Sep-2004 with CMPDIL as the nodal agency and SCCL as Sub Implementing agency. This, totally, is a computer oriented project, aiming to compile geographically distributed point and map data from different sources.

CLIENT: Central Mine Planning and Design Institute Limited, CMPDI

LOCATION: Ranchi, India

CLIENT DESCRIPTION

CMPDI, a Miniratna Company, one of the largest consultancy organizations in India offers full range of services to coal producing companies in the sphere of resources exploration and development. The headquarters is located at Ranchi, Jharkhand. The Major Activities of CMPDI include Geological Exploration & Drilling, Geophysical Surveys, Project Planning & Design, Engineering Services, Research & Development, Laboratory Services, and Environmental Services. Besides these, Information Technology forms a major part of CMPDI's activities. CMPDI looks after the computerization of geological data and preparation of geological models. In CMPDI, Geological Reports (GRs) are being prepared by using in-house package CEMPGEODOC and imported modeling software MINEX.

CHALLENGES

CMPDI has a large volume of data with itself. The total volume of data is made up of three types.

- Geological, geochemical and other laboratory data generated from boreholes and captured in 17 standard formats like ASCII, dwg, shp.
- Map data, plans of toposheet, Geological Plans, Coal seam floor, thickness, opencast and underground mine working plans etc.
- Model data, generated through industry standard geological modeling software.

All the three types of data is a constituent part of recent Geological Reports (GR). A GR contains all the information relating to coal after detail exploration of a block which is based on data generated by drilling, analysis and other geological work. It is estimated that total volume of data for one geological block is around half of a GB.

The total number of GRs prepared based on detail exploration is around 1600 and every year additional around 15-20 GRs are prepared. Apart from the data mentioned above, data of satellite imageries, geophysical investigations etc. may also be incorporated in the proposed database in future. It is estimated that the size of the proposed database will be more than 1 TB.

The challenge was that all these precious data were in different formats and different applications, which are working in silos, like GIS, Borehole data, GR, Minemodels, etc. As a result, they were unable to generate the desired outputs about quantity and quality of coal reserves. ICRIS project has been initiated with an aim to bring entire data into one platform of GIS which will also help in visualization of such quantum of data.

SOLUTION OFFERED

ICRIS portal has been created to cater to different queries from different domains like Ministry of Coal, Planning Commission, coal companies, educational institutes, private agencies and general populace. It improved discoverability and access to geo-science information via a common database and a portal using internet. It ensures integration of statutory digital exploration data to promote effective and efficient mineral exploration. It also enables easy accessing and sharing of geological information in the distributed environment.

General Solutions:

- The system is designed on RDMS SQL server 2005, integrated with GIS and is web enabled.
- The system is reliable and scalable. It has high availability and works efficiently in cluster and failover mode.

Database Solutions:

- The database is able to store both spatial and non-spatial data.
- All existing data has been migrated from different flat files and different data structure.
- Different scripts were written to migrate the data from one platform to other.

Web Application Solutions:

- The application provides login facility for predefined registered users approved by CMPDI.
- The application provides information for anonymous users with limited access to data
- The application facilitates easy access and display GIS layers with predefined symbology, attribute tables, thematic maps
- The application facilitates zoom in, zoom out, pan, zoom to full extent, back extent, forward extent, map identify, and measure distance features on maps
- The application allows attribute query and spatial query
- The application displays coal resource of a region computed from geological models. It has either predefined boundary or interactive boundary defined by user
- The application is able to display and download "Salient Features", a summary document of geological report, where the model data is not available.
- The application displays information on coal quality from both grid based model data as well as borehole data
- The application displays available Geological Reports (GR) and permit access to view and download depending on privileges
- The application generates reports and graphs based on query
- The application enables printing of maps and report as required in different scales and different page sizes
- The application also handles exceptions and provide suitable messages
- The application interface is visually appealing and properly organized for user friendly utilization

TECHNOLOGY

- **Front End:** Visual Studio .net 2005 (using .net framework 2.0),
- **Database:** SQL Server 2005
- **Web Server:** IIS 6.0
- **GIS Software:** ArcIMS 9.3, ArcSDE 9.3

BENEFITS TO THE CLIENT

- Through the ICRIS Project, CMPDI is able to improve discoverability and access to information about Coal via a common database system and via Portal using the Internet.
- The Project ensures integration of statutory digital exploration data to promote effective and efficient mineral exploration.
- The system helps in easy accessing and sharing of geological information in the distributed environment supported by Grid technology.
- Above all the system caters to the different portal based queries from different levels like Ministry of Coal, Planning Commission, coal companies, educational institutes, private agencies and general populace.

REPLICATION

The same application may be replicated for any of the other minerals and mining, with change in business logics.