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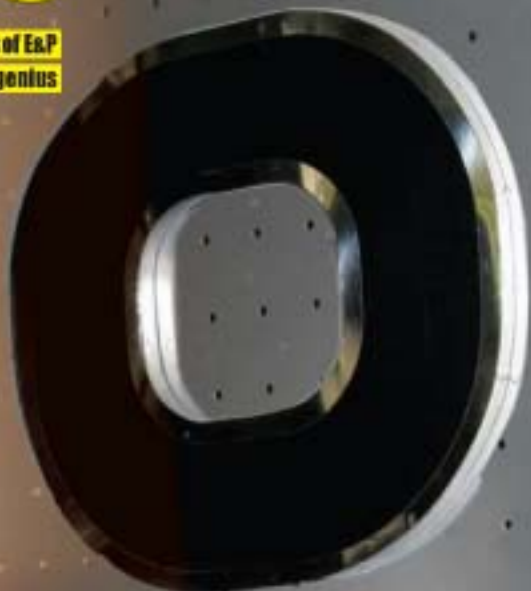


B.N. Talukdar is Director (E&D), Director Incharge Drilling and Overseas Projects.

He is also involved in OIL's Operations and Business Development activities

Geo Genius

A geo-science expert B.N. Talukdar's individual and team contributions has led to a series of E&P successes resulting in the overall profitability of Oil India Limited. DEW talks to this geo-genius



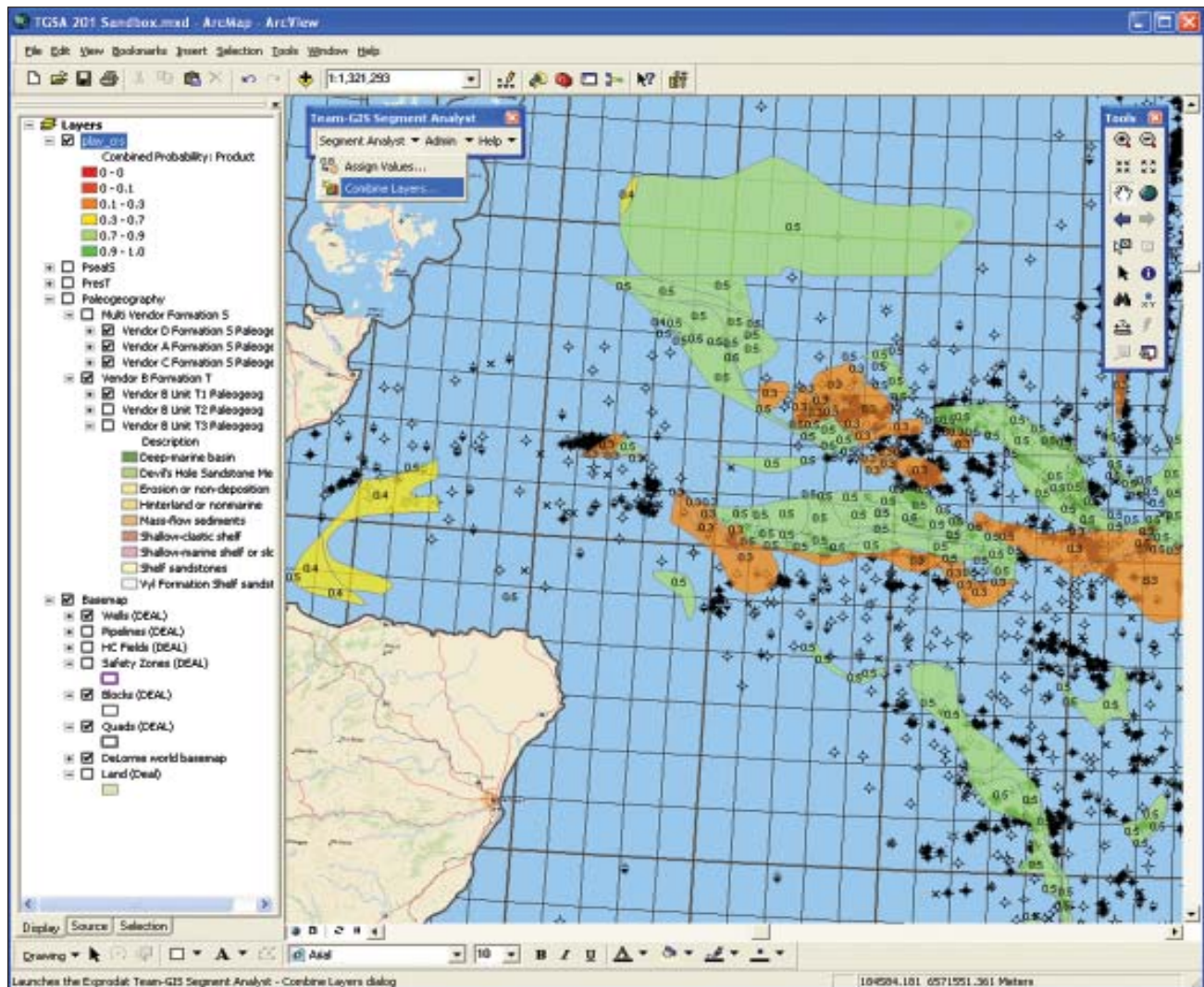
GIS in the oil & gas exploration business

Alistair Maclenan, Managing Director, Quarry One Eleven Ltd.

GIS is a powerful tool and has moved from being a specialist software used by a few people, to a product that is at the heart of company IT departments and on the desktops of the majority of staff. Due to the obvious geographical nature of most data used within oil & gas exploration departments, the use of GIS has increased by a similarly large scale. Indeed it is difficult now to think of any application, either consumer or business focussed that does not have a spatial component or use geography as its starting point. Because of this wide range of applications, 'out of the box' GIS software tends to try to be all things to all users. What is required if the technology is going to be used to rank oil & gas licenses, plays and other opportunities is for a GIS to be specifically designed for use in this discipline.

Who is the best batsman of all time? It is a question that has started many arguments between cricket

fans and one that will continue to do so for as long as people watch the game. Don Bradman has the highest



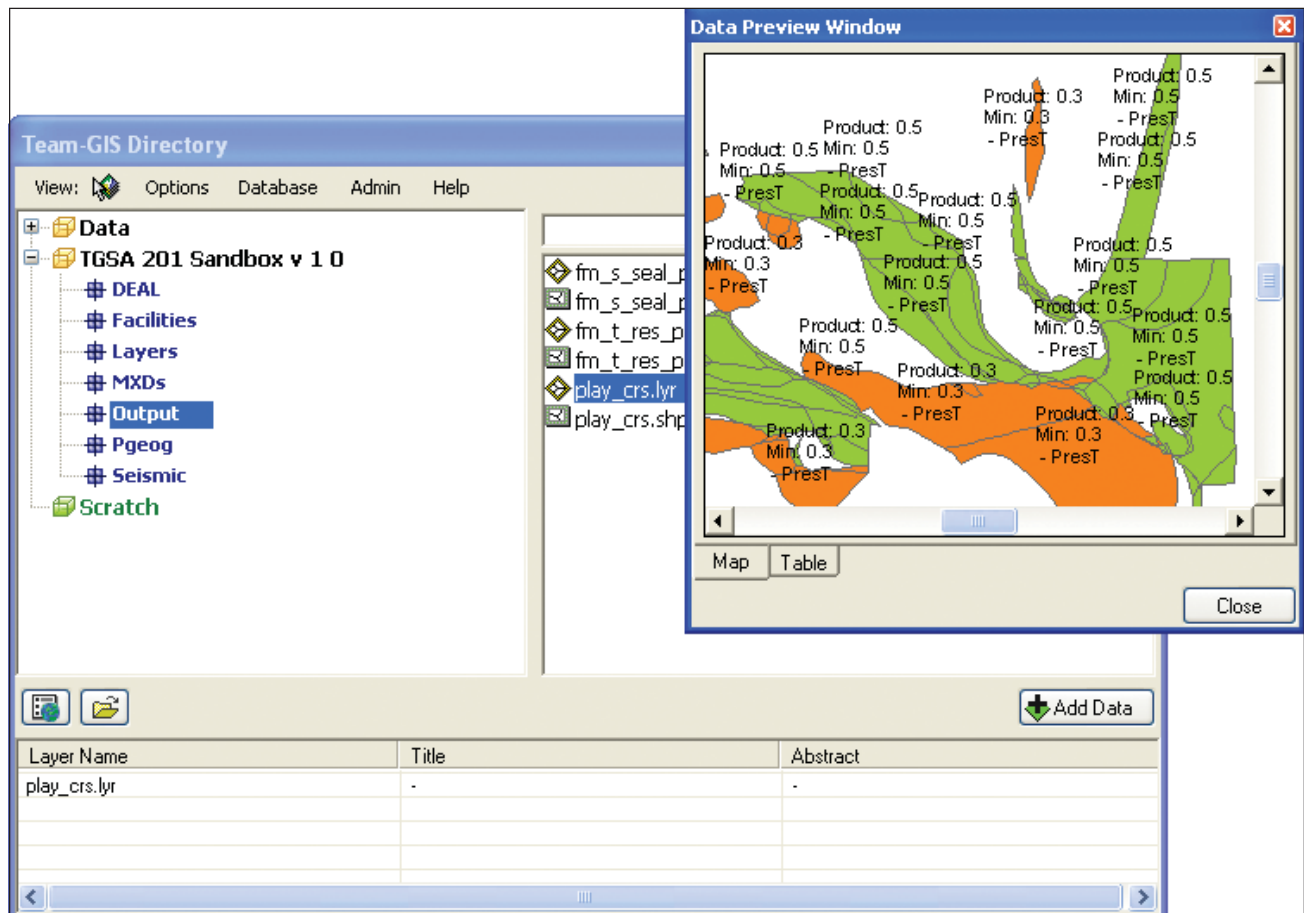
A computer screen grab of the GIS software

By employing this technology to make data-driven decisions in the exploration processes between traditional basin-scale and prospect-scale analyses the Team-GIS products offer a number of business benefits; they reduce technical uncertainty by narrowing the risk the nearer you get to choosing a license or prospect and, because it is now an iterative process, company-wide standardised decisions can be made extremely quickly.

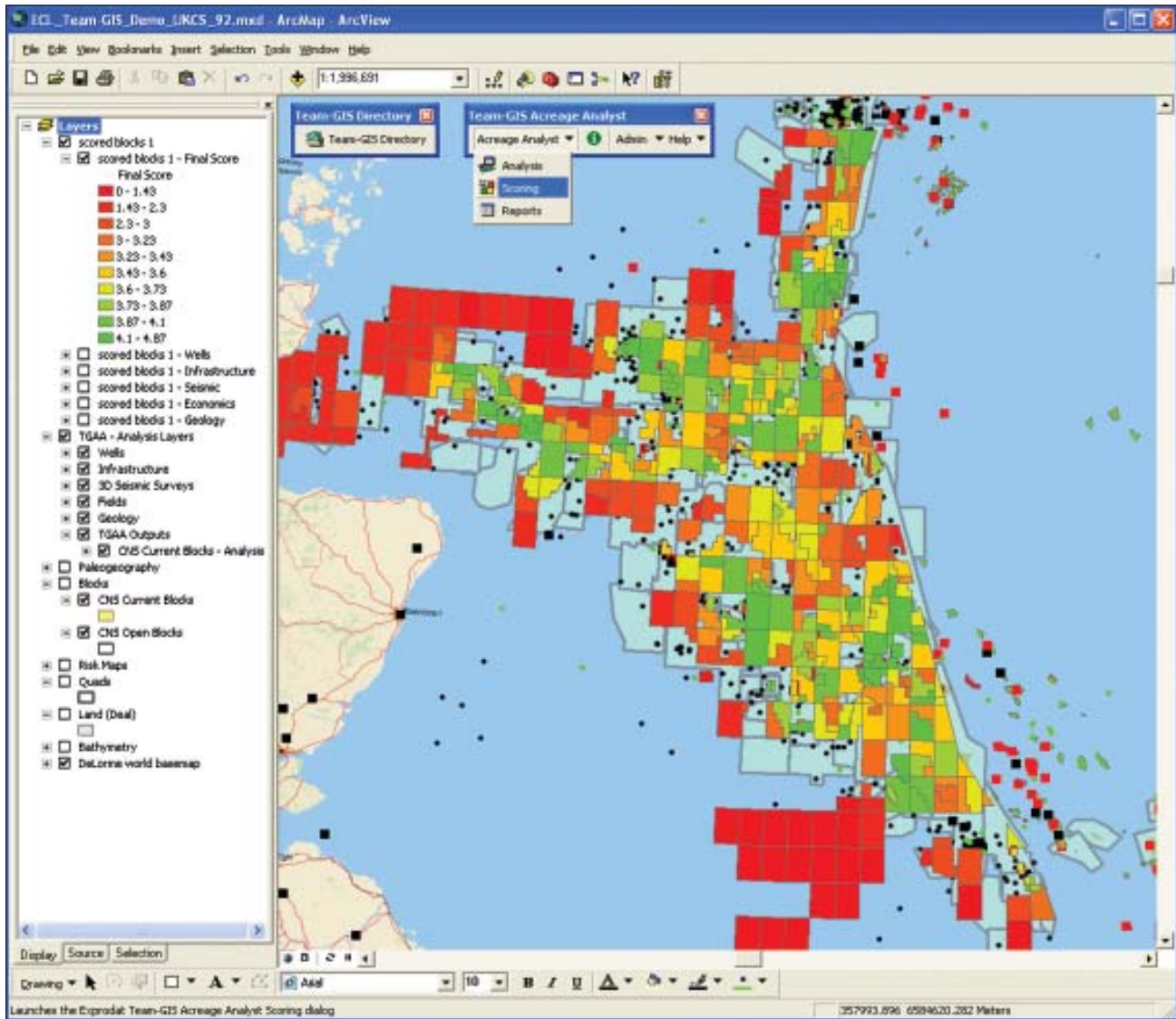
test average of all time but does that mean he was a better player than Sachin Tendulkar, who has scored the most runs in Test history? Of course, in India the answer is very likely to be no! Now consider the one day game and the recent innovation of Twenty20 where how the runs are scored is as important as their number. To every fan of the game, the decision is an important one but to make it, the amount of information that needs to be considered is vast and the options innumerable. Ranking plays of another kind, those that represent geologically similar oil & gas prospects and fields, is similarly difficult to do in a dispassionate and analytical manner. Whilst cricket fans may argue that nothing is as important as picking the best batsman in the World,

even they would have to concede that which play oil & gas companies choose to enter carries far greater financial consequences.

In the world of oil & gas exploration, a 'play' can be defined as a specific combination of geological factors that result in a hydrocarbon accumulation (i.e. its reservoir, source, seal, charge and structure). Ideally oil and gas companies attempt to obtain acreage within the extents of one or more plays. Such acreage attracts the most interest as it is these that will eventually yield the prospects which will be drilled for oil. However, Peter Rose - winner of the coveted Parker Memorial Medal (awarded by the American Institute of Professional Geologists) - thinks that "the most difficult and critical



A computer screen grab of the GIS software

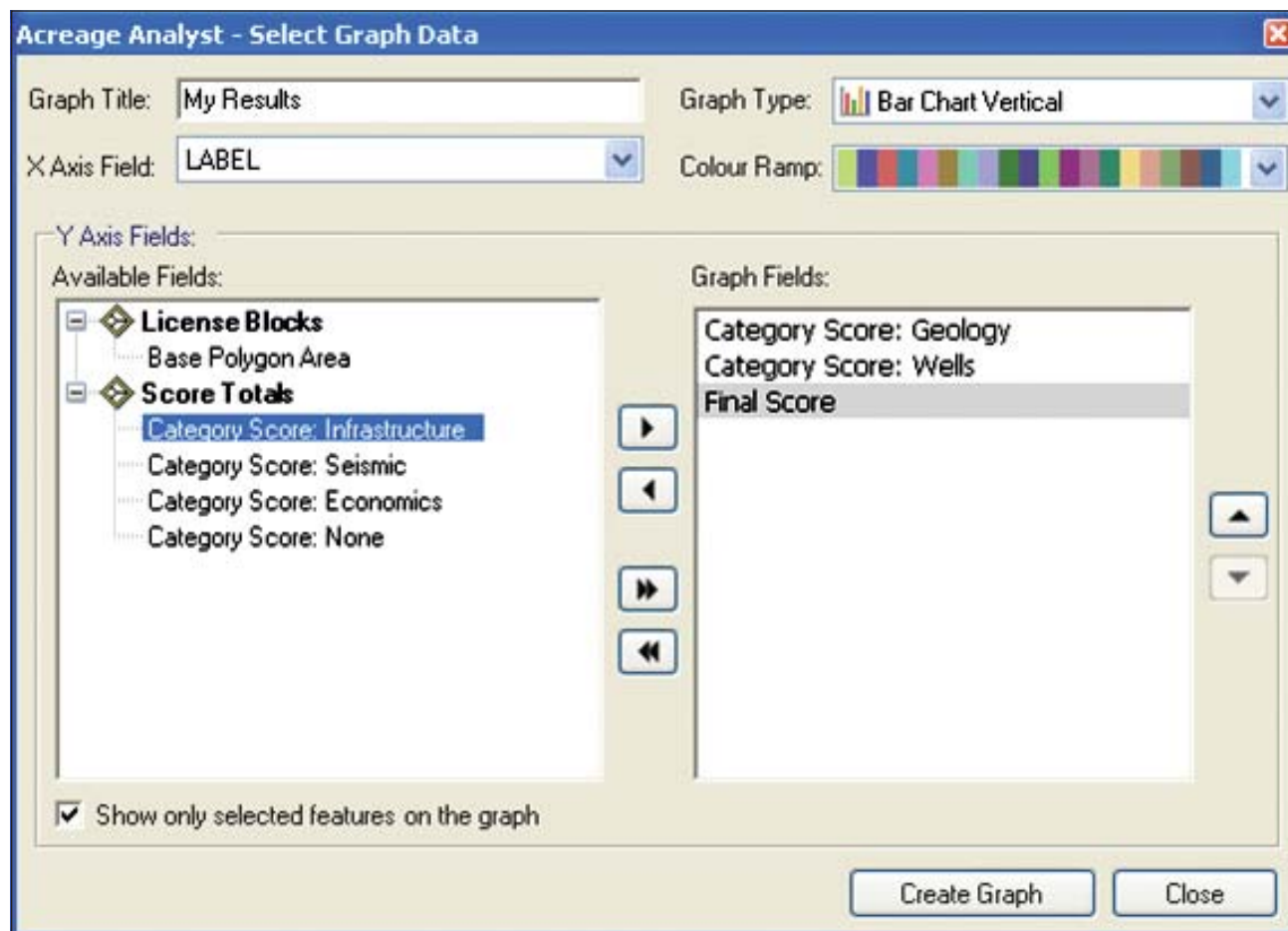


A computer screen grab of the GIS software

decision in petroleum exploration is not which prospect to drill, but instead, which new play to enter". In a world of ever decreasing reserves replacement rates, which have reinvigorated the focus on exploration and pushed up the competition for high quality assets, the focus on identifying the right play becomes ever more important. Exprodat Consulting, a worldwide provider of oil & gas specific software, consultancy and training, has over a decade's experience of working with and developing Geographic Information Systems (GIS) that address the problem of how to rank plays and acreage. Geographic Information Systems, which as the name suggests use location as the basis for their analysis, have developed hugely over their 40-year existence (Environmental Science Research Institute (ESRI) was founded in 1969 by Jack and Laura Dangermond in Redlands, California and

is generally considered to be the birth of the commercial GIS industry). Due to the obvious geographical nature of most data used within oil & gas exploration departments, the use of GIS has increased by a similarly large scale. Indeed it is difficult now to think of any application, either consumer or business focussed that does not have a spatial component or use geography as its starting point. Because of this wide range of applications, 'out of the box' GIS software tends to try to be all things to all users. What is required if the technology is going to be used to rank oil & gas licenses, plays and other opportunities is for a GIS to be specifically designed for use in this discipline.

Chris Jepps the Technical Director of Exprodat Consulting summed up the company's offering by saying; "As a company we focus wholly on creatively



A computer screen grab of the GIS software

applying GIS technology in order to solve specific business problems seen within the oil and gas sector. Because we work closely with our clients through consulting engagements we are often able to identify such opportunities 'at the coal face' and provide timely solutions. Sometimes we see that problems are not customer specific but rather apply across the industry, and it these issues that inspire ideas that feed our own software development".

Ten years ago an Exprodat Consulting client established a team to evaluate the remaining potential of the North Sea basin system and rank the opportunity that each play could offer. Exprodat supported this project by developing prototype tools, based on the ESRI GIS software suite which allowed the team to use all of the data at their disposal and present the results to management. Working with this client and others since that time, Exprodat has developed and extended the original prototype to create a set of commercial products which are used throughout the oil & gas industry. Under the suite name of Team-GIS, Exprodat offer a range of software products that bring a structured and repeatable

method to objectively grade opportunities.

Team-GIS Acreage Analyst is a play fairway and acreage ranking extension to ESRI's desktop GIS software; ArcGIS. A play fairway is the geographic area over which a play is thought to extend and is usually determined by the depositional and erosion limits of the reservoir (note this is not always the case but this definition is sufficient for our purposes). Team-GIS Acreage Analyst allows users to streamline complex, time-consuming and data intensive location ranking workflows. Further, the processes that the product uses are repeatable and consistent so the results can be compared throughout an organisation and over time. The Acreage Analyst consists of four stages; data collection and collation, analysis, scoring and weighting and finally reporting.

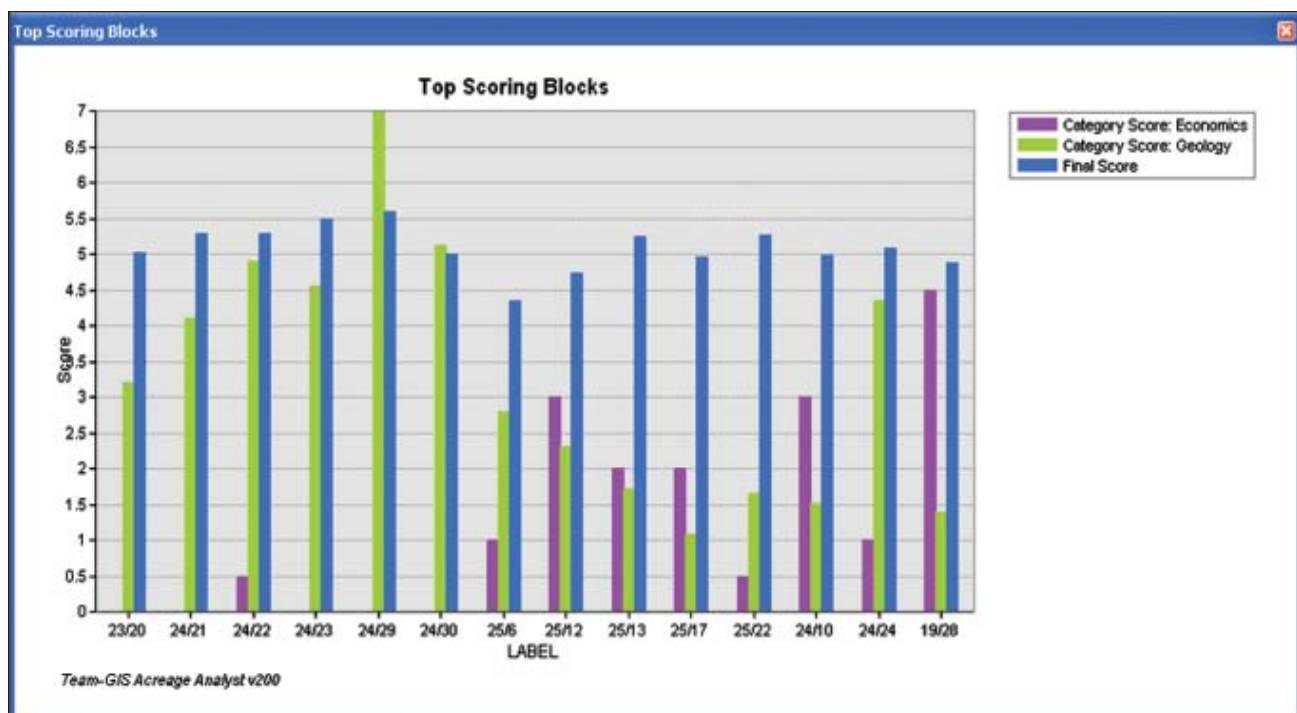
Data is key to any process designed to create a league table and geoscientists have a vast range of sources and types to call upon. They need to use as much of this data as possible to ensure that their results are as accurate as they can possibly be. It is worth noting at this point that Exprodat has created the Team-GIS Directory (also an

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extension to ArcGIS Desktop). This product provides a very easy-to-use data catalogue and allows all ArcGIS users access to enterprise data, wherever it may be. This first step ensures that a single software can be used to locate and use the data (raster, vector, text etc) that is so key to the entire process.

Chris Jepps notes that simple access is key to encouraging data use; "Many explorationists are not GIS specialists and so often struggle to get the most out of the unique analysis and data integration capabilities of ArcGIS Desktop. Team-GIS Directory allows these users to access their organisation's data in such an intuitive way that they don't even need to know where the data is physically located in order to find it and start using it in their GIS project".

Many oil & gas companies have purchased or created datasets with rich text attribution describing the geological environment of interest. Team-GIS Segment Analyst – the next software in the process – can take these data layers as inputs and by converting the textual attribute descriptions into numerical values for risk or probability, users can create Common Risk Segment layers (describing key elements such as Source, Reservoir, Hydrocarbon Charge, Seal, etc.). These layers can be combined in a number of ways to create Common Risk Segment maps. The Risk Maps are the building blocks of indentifying new opportunities, understanding the spatial risk distribution and play extents and flow into the development of play investment strategy as well as acreage analysis processes.



A computer screen grab of the GIS software

The Team-GIS suite of products is an excellent example of how to maximise any investments in GIS technology within E&P departments by producing results that can really help make huge capital investment decisions

The way that the petroleum systems layers are combined is worth spending some time to understand since this will affect the final maps' appearance. There are three main methods used in Team-GIS Segment Analysis; Stack, Merge and Combine. The Stack method assigns risk or probability values to the various layers of data at the same time and then combines the layers using a mathematical operator (e.g. adding or multiplying them together). The Merge operation is similar to the Stack in that risk or probability values can be assigned at the same time but in this case only one risk value can be used from any one layer in the final product. This is especially useful when dealing with datasets from different vendors or with different geographical extents. Once these layers have been created, using either the Stack or the Merge methods, they can be Combined into Common Risk Segment layers. These can be in vector or raster format.

Once the data has been collated and combined, Analysis is the next step. Team-GIS Acreage Analyst is used to evaluate and grade the available acreage opportunities. The Analysis Module, at the heart of the software is the engine of the acreage ranking process. Users specify any number of input datasets and analyses them with respect to their spatial relationship with the base acreage layer e.g. by calculating how much of a licence is covered by reservoir facies, how far blocks are away from supporting infrastructure, or by calculating average play risk value across a licence.

After the data has been analysed it can be scored. This involves normalising and summarising the results of the analysis and this step is completely customisable giving the user the power to apply weightings to the most important factors.

Once acreage has been analysed and scored, results can be presented using the powerful reports module. This allows the user to rank both acreage and company portfolios using tabular and graph-based views; both of which are fully integrated with the map display. In addition both detailed results and management summary reports can be exported to PDF and Excel formats.

Summing up the benefit of using his company's technology Chris Jepps commented that "Team-GIS Acreage Analyst is an incredibly powerful tool that puts many of the analytical powers of ArcGIS Desktop in to

the hands of the novice GIS user. The tool can be used to spatially analyse vast quantities of data in one go, allowing the user to have full control over how the analysis is conducted, and how the results of the analysis are weighted, scored and reported. The user is therefore able to rank an area's sub-areas (e.g. license blocks or cells of an arbitrary grid) based upon a myriad of factors, and furthermore to conduct portfolio analysis by ranking the acreage held by license or land holders in the area based on company equity positions".

GIS is a powerful tool and has moved from being a specialist software used by a few people, to a product that is at the heart of company IT departments and on the desktops of the majority of staff. To ensure that this impressive growth in use continues, companies like Exprodat Consulting must keep innovating and producing simple but powerful tools that are tailored to specific applications. The Team-GIS suite of products is an excellent example of how to maximise any investments in GIS technology within E&P departments by producing results that can really help make huge capital investment decisions.

By employing this technology to make data-driven decisions in the exploration processes between traditional basin-scale and prospect-scale analyses the Team-GIS products offer a number of business benefits; they reduce technical uncertainty by narrowing the risk the nearer you get to choosing a license or prospect and, because it is now an iterative process, company-wide standardised decisions can be made extremely quickly.

Exprodat Consulting can't tell cricket fans who the best batsmen in the World are or were, but they certainly can help oil & gas companies identify the best opportunities in the field of play. dewjournal.com

about the author



Alistair Maclenan is the Managing Director of London-based sales & marketing agency; Quarry One Eleven. Before starting the company, Alistair was the head of ER Mapper Asia Pacific then Sales & Marketing Director for Infotech Enterprises. Now he runs Quarry One Eleven to promote, market and sell geospatial products.