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Beyond the office wall: unlocking GIS for utility asset management

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1 Background

Yorkshire Electricity undertook in 1994 to develop a GIS to replace our mains records, system diagrams, and system maps, thereby building a spatial database of our electrical assets. In this paper, we describe how we are now going about realising the value within this data both within and beyond the office wall, to mobile workers and external organisations.

2 The Beginning – What We Aimed For

Back in 1994, we had been undertaking pilot GIS projects in-house since the late 1980's using a variety of technologies. As part of our overall DAMS (Distribution Asset Management Systems) programme to replace our legacy Information Systems, we decided it was the right time to make a serious investment in GIS. Our objectives were as follows:

- To take the opportunity to digitise our paper and acetate records, instead of manually redrawing them (which is what we would otherwise have had to do, because they had reached the end of their lifecycle), and bringing disparate information sources into one system. This means the digitisation of 90,000 mains records, and 40,000 detail sheets and other associated records over a 2 year period, plus the translation into the GIS of the pilot High Voltage system diagrams GIS.
- To build a seamless GIS, navigable through a number of gazetteer options, and capable of delivering multiple 'views' of an area through use of scale and level symbology.
- To build a spatial database of our electrical assets enabling improved asset management, focussed investment, and improved customer service.
- To build and intelligent 'model' of electrical connectivity into this database, reaching from the high-voltage network down through to individual customer's addresses, enabling fault tracing.

3 The Present – Where We Are Now

3.1 Primary GIS

Our GIS was built on the Vision* package - since renamed Autodesk GIS Design Server - with Unisys as our development contractor, and deployed to two different types of platform: PC (for standard view-and-plot use) and X-terminals (for Data Updaters). Three separate companies were let contracts for the data capture. Rollout of the GIS to our business began in 1997, on a region-by-region basis as each region was digitised, data capture reached 100% at the end of 1999.

Our primary GIS now contains some 15 million features, including:

- 40,000 Substations
- 83,000 High Voltage Switches
- 280,000 supports
- 2 million address points
- 3.8 million joints

The user base of the GIS consists of field engineers, who can now access our records 24 x 7 for the repairs function, commercial engineers who can now pull up maps for quoting for new connections work, and asset management engineers interested in the data behind the maps for planning repair and replacement programmes. In addition, because the requirement for physical plan chests had gone, there was no longer a need to keep records in the same location as the records updaters and the records users. This meant that the data updating work done previously by our in-house drawing office was able to be outsourced.

Since delivery of the 'Primary GIS', a number of further innovations have taken place, extending the reach of the GIS beyond the original design.

3.2 Standalone GIS

A key concern for our repairs function, particularly for an electricity distribution company, was the ability to access our records at all times and in all situations. This includes being able to access GIS records in the event of a power failure affecting our own depot sites! You only have to imagine an engineer walking into a darkened depot, where all the PCs have lost power, to see the Catch-22 situation we envisaged. Not all our sites are large enough to justify back-up generators.

For maximum security, we developed a 'Standalone' version of our GIS, which is able to run entirely self-contained off a non-networked PC and printer combination held up by a UPS battery. A copy of the records is cut on a regular basis from the master database to a set of DVD's – this contains a complete copy of the graphics and the key elements only of the database. one set of DVDs is cut for each engineering team, and although these are not as bang-up-to-date as the primary GIS, they are acceptable in an emergency situation and as cover when our primary GIS is taken down for system servicing and upgrades. Recently this product has also been deployed to laptops, turning our field engineers into true 'road-warriors' able to carry a complete copy of the records with them in the car.

The drawback of the DVD solution has been the high admin overhead of having to cut a set of these records each month for each engineering team. Recently we have been evaluating alternative techniques and tools which would help us deliver incremental graphics updates via our data network to standalone GIS PC terminals. Longer term solutions, which we are also evaluating, are outlined in the 'Future' section of this paper.

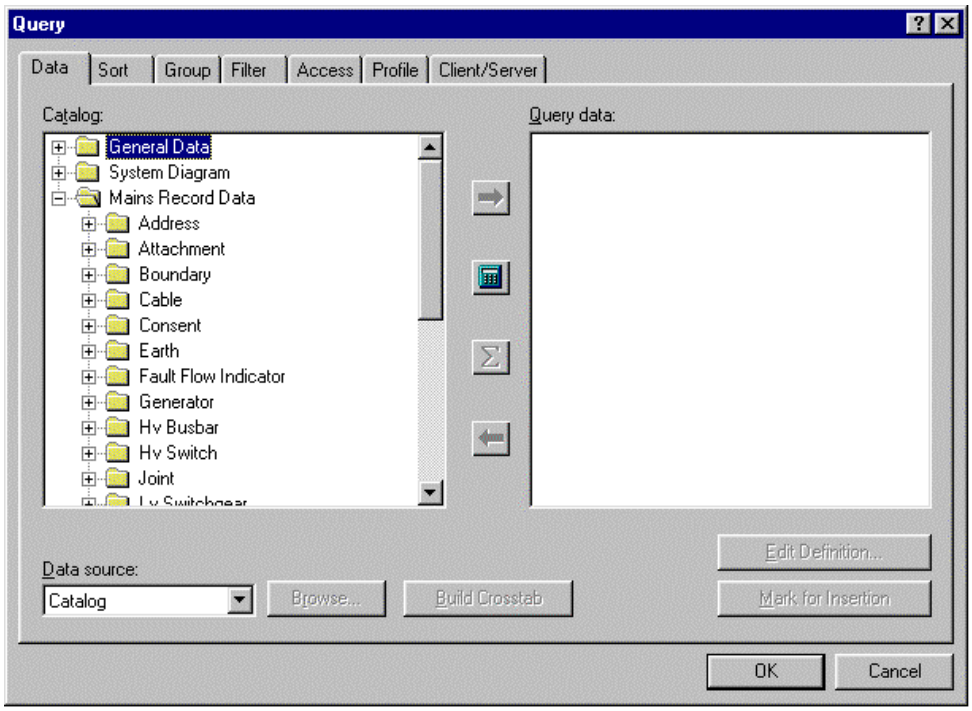
3.3 Management Information System (MIS)

The key benefit of our GIS was not simply having a digitised version of our records, it was the database that would be created underneath. Our philosophy was that the graphical view was just one way of looking at this data, and other ways are equally important to our business. As part of the overall DAMS programme, we deployed the Cognos Impromptu product as a means of reporting directly from the GIS database.

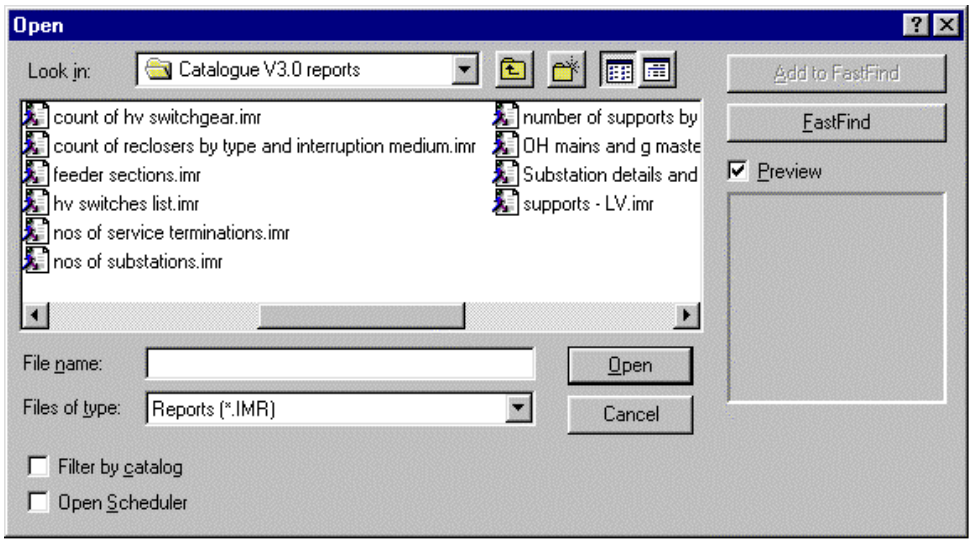
Our asset management engineers need to access the data behind the GIS for a number of reasons:

- Regulatory reporting functions e.g. Quality of Supply
- Health, Safety & Environment
- Planning maintenance and replacement programmes
- Identification of future data cleansing requirements.

Our MIS solution to GIS was designed to give flexibility to our asset management users to create reports and queries 'ad-hoc' from a basis of all the data tables being made available in a meaningful way. Reports can be created from a standard PC without knowledge of or exposure to Oracle SQL, and the data brought back from such a report can be saved in a variety of standard ways including Excel and Word. Two screen shots from our MIS product are given below.



[screen shot of MIS – showing the Table Catalogues]



[screen shot of MIS – showing previously saved report queries.]

The real benefits of GIS have however come with our ability to query within a spatial boundary and to return geographic location data. Examples of reports which we have already done as part of our normal work are – a count of the number of wood pole supports in our Goole operating area, and the location (grid reference) of all telephone boxes in our distribution area. Other reports can be seen in the example screen above.

3.4 Information Incentives Project Reporting

The Information Incentives Project is a major new initiative from the industry regulator Ofgem, designed to ensure good customer service through financial penalties to companies that fail to provide agreed service levels. The aspects of service agreed with Ofgem as being of most value to customers are the number and duration of supply interruptions that customers experience and the response that customers receive from Distributors when their supply is interrupted. To reflect this, the incentivised output measures proposed are:

- Number of Customers Interrupted per 100 connected customers.
- Average Customer Minutes Lost per connected customer
- A Customer Satisfaction Measure – Measured by monitoring telephone-answering performance and also by undertaking event-driven customer surveys to question a sample of customers on the response received.

These are all measures that we in YE Distribution have supported. We are one of the best performers in terms of the quality of supply measures and have state-of-the-art messaging telephony, which handles customers calling us when they are off supply.

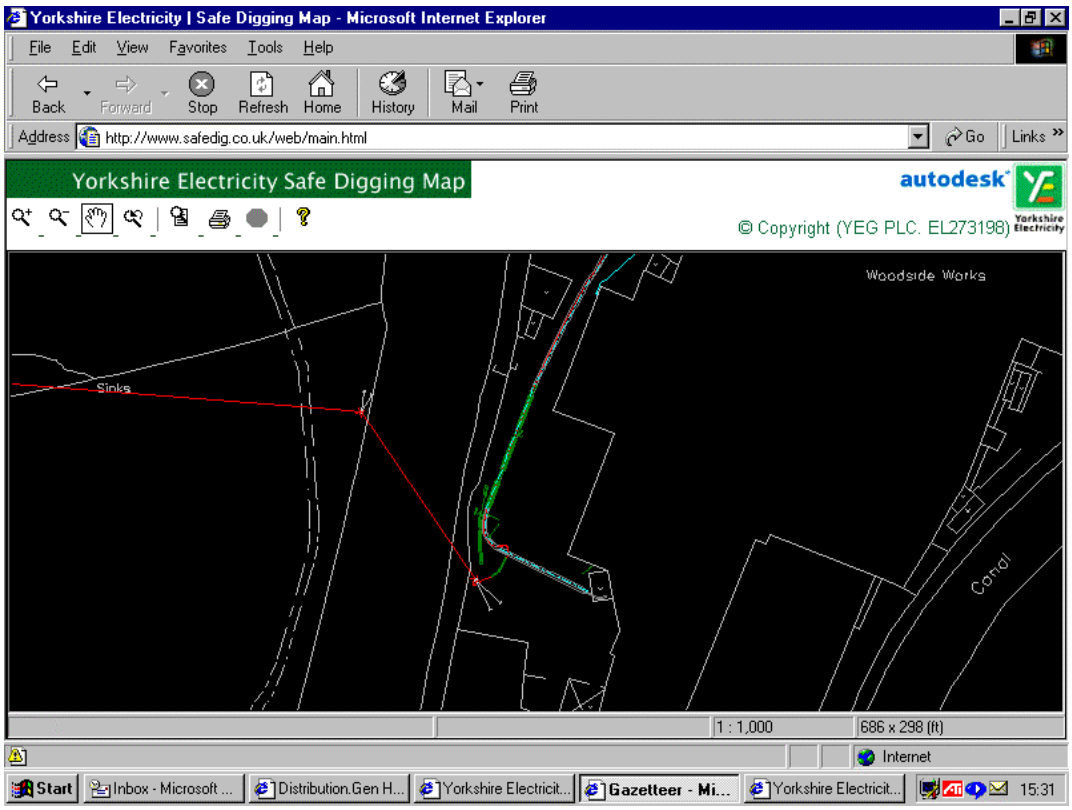
Whilst we have had to start recording the required information from 1 April we have until 1 April 2002 to achieve the required accuracy levels, which are 95% accuracy overall and 90% accuracy on LV faults. Our GIS is a vital component for us in being able to deliver reporting to the required level of accuracy when it comes to recording the number of customers off supply. Recall that a key objective of our GIS was a complete electrical connectivity model down to individual customer meter points. This means that we are in position to use the electrical tracing capability to deliver accurate reporting for the number of customers affected by faults.

Because the original functionality was designed for repairs fault-tracing work, and not for in-bulk tracing and reporting to the industry regulator, some enhancements to the existing functionality have been required, these are being delivered in November 2001.

3.5 Safe Digging Extranet Service

Yorkshire Electricity has a statutory obligation to provide up to date plans of its assets to third parties, known as “safe dig plans”. These guide contractors who may be excavating near where our electricity cables run. The traditional method was to provide paper-based records, we had a whole section dedicated to this kind of work. However, 75% of these requests came from just 3 companies. BT, Transco (British Gas), and Kelda (Yorkshire Water).

We decided to extend our GIS directly to these companies via an extranet based service, so that they could serve themselves to safe digging plans. Autodesk Mapguide was chosen as the most appropriate technology, and our www.safedig.co.uk extranet site was developed, from start to live, over a three month period. The safe dig service is a browser-based view into our live GIS records, with a cut-down set of functionality (the minimum required by safe digging contractors). Such has been the popularity of Safedig.co.uk, that it is now used not only by the three companies above, but is extending also to public lighting authorities and the Hull-based telco Kingston Communications. Not only does this save YE money, it gives a better level of service to these companies as our plans are now available to them 24 x 7, whereas before it was office hours only.



[Mapguide screen display]

4 The Future: Where We Are Going

4.1 Mobile GIS on Tablets

After our success with Standalone GIS and the safedig.co.uk extranet, we are now keen to offer GIS as a hand-held service to our own field staff such as electrical linesmen and jointers. In the last year, YE have deployed a form-based data collection application on Hand-Held terminals (Compaq Aeros) to field staff, these were well received.

We are now experimenting with making GIS available to field staff. In the first instance, this is being done through a limited number of conventional laptops running our standalone GIS product. However for a better, cheaper and more flexible solution we are looking at tablet-based GIS through use of Fujitsu Pencentra tablets loaded with Autodesk's OnSite software. With such solutions in place, the live GIS can truly be taken 'into the field.' The records will be bang-up-to-date, instead of up to a month old as would be the case now with our Standalone GIS, and the ability will be created to feed updates and information back through markup and redlining.

To begin with, it will be necessary to connect to a conventional PC to load up a pen tablet with a 'charge' of GIS records for a particular job. However, we view this as a stepping-stone to our eventual aim of completely mobile connections back into the primary GIS through GPRS-based services, removing the need to return to base to obtain more records.

4.2 Extranet service to Engineers

In addition to making GIS available of an increasing diversity of platforms, we are also responding to the increasing move within our business for working from home and from remote sites. As such our aim is to develop our web-based GIS solution further beyond the current safe-dig offering, adding the remaining data layers, the high-voltage schematic system diagram, and the tracing and attribute querying functionality required by our engineers to give us a true 'thin-client GIS'. There are a variety of technologies (Citrix Metaframe, Nfuse, further development of Mapguide) which can help us to achieve this goal and this is an area we will be pursuing keenly over the next 12 months.

5 Summary

With the developments outlined above, our GIS now stands as the key data repository for our Asset Management business as well as fulfilling it's more traditional role as a supplier of up-to-date maps for our field engineers. We now stand on a good springboard to move 'beyond the office wall'.

YE Distribution's GIS began with a clear vision of delivering quality data to enable us to work smarter, providing key information rapidly throughout our business and beyond to customers and contractors. Over the last 2 years this vision has been realised, and we are continuing to develop further both to extend the reach of our GIS and to gain ever more benefits from the underlying data.