Town Centre Statistics Through the Internet

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Over the last 20 years, the impact of out of town retailing on the UK town centre has been profound. In order to evaluate the success of government policies implemented to mitigate this impact, and to gain a deeper understanding of the forces at work on the town centre, the need for quality statistics has never been greater. However, the last national exercise to collect such a statistical set was in 1971 and thus the Department of the Environment, Transport and the Regions (DETR) commissioned the Centre for Advanced Spatial Analysis (CASA) at University College London, and the Urban and Economic Development Group (URBED) to develop a system that could generate various statistics for town centres using existing government datasets.

After successfully developing a prototype system on ArcView in 1996/97, the team is now developing the system further and piloting it on London as the first phase of a national roll-out. Key to the success of the pilot system is constructing a link between a central server, maintained by the DETR (on which the model resides as well as the raw data that underpin it) and Local Authorities, who are best placed to evaluate the quality of the data driving the model, and also the outputs of the model itself.

Using the full suite of ESRI products - ARC/INFO (to run the revised model), SDE (providing the linkage to Oracle, the main data repository), ArcView IMS and MapObjects (to serve and enable the client side interaction) - the team is currently developing a Town Centre Statistical Extranet to implement the system and to provide the template for the national roll-out.

KEY WORDS: *town centres, statistics, boundaries, GIS, Intranet*.

The Context

It is widely recognised that the growth of out-of-town retailing has had a deleterious impact on town centres in the UK. This was particularly prevalent during the 1980s and early 1990s when a relatively permissive planning system, combined with high levels of car ownership and low land prices, prompted the major comparison retailers to follow the supermarkets and DIY outlets to out-of-town locations. Inevitably, those smaller retailers left behind in the town centres found it more difficult to compete, and fearful of the wholesale decline of the town centres (as was witnessed in the United States) a number of policy instruments designed to mitigate against the worse impacts of the trend were introduced by central government.

The most important (and successful) of these was Planning Policy Guidance Note 6 (PPPG 6), the aim of which was to preclude retail development in off-centre locations. While this policy is acknowledged to have been successful, the lack of statistics on town centres meant that it was impossible to quantify its effects in any detail. Indeed, this whole era of out-of-town retail development occurred in an information vacuum - the last wholesale collection of retail statistics was the 1971 Census of Distribution. Thus a key conclusion of the 1994 Parliamentary Select Committee, which was looking at retails trends, was that a new statistical set for town centres be created.

The First Phase of Research

In response to this, the Department of the Environment, Transport and the Regions (DETR) commissioned research by the Centre for Advanced Spatial Analysis (CASA) at University

College London, and the Urban and Economic Development Group (URBED). The first phase of the research, completed in 1996/97, demonstrated that it was possible to manipulate highly disaggregated datasets within a GIS environment (ArcView) in order to generate meaningful town centre statistics.

A descriptive model of the town centre was developed by identifying and mapping a number of indicators which could be used to identify the town centre, and by integrating these data using simple overlay techniques. A notional 'surface of town centredness' for a particular location could be created from which statistical boundaries (Central Statistical Areas or CSAs) could be identified. These boundaries were used in turn to extract aggregate town centre statistics from central government datasets.

Central to the approach was the need to ensure that the statistics generated by the model were both spatially and temporally comparable. While local authorities officers in all the 10 case study towns were able to identify CSA boundaries that they felt closely matched there perception of the town centre, the research also suggested that it might be possible to automate the selection of town centre boundaries, making the creation of a national statistical set much more feasible.

The Current Research Programme

The team is currently working on a Pilot Project the aim of which is to refine the model and to apply it to London as the first phase of a national roll-out. It was recognised early on that disseminating the model to local authorities and requiring them to run it was not a feasible option. Not only would this place considerable resource and logistical burdens on both local and central government, but the consistency of the model itself (and therefore its outputs) would also be compromised.

However, it was clear that while a central GIS model might be able to generate town centre boundaries, errors could occur and that it would be imperative for local authority officers to be able to verify the boundaries that the system produced. It was also important that the raw data used to power the model (and from which the CSA statistics would ultimately be collated) could be assured to be of the highest quality.

We therefore proposed that a distributed system architecture be implemented, with the modelling of the raw data being handled centrally, and local authority officers verifying the quality of both the raw data and the modular outputs from their own desktops.

The Choice of Technology

The system architecture can be split into three main elements which reside on three different platforms: a dedicated server to run the model; a second platform to serve both the results of the model and to facilitate the verification of the data that power it; and a third client application which enables users (such as local authority officers) to interact with the system from their desktop. The general architecture is presented in Figure 1.

The first two elements – which comprise the Database, Web server, the GIS and Model server - are mounted on two Sun UltraSPARC Ultra 10 workstations running the Solaris 2.6 Operating system. This hardware and operating system configuration was chosen (over a Microsoft NT solution for example) for two key reasons – assured Year 2000 compliance, and the ease of scaling the system up from one designed to accommodate the modelling of London, to one capable of modelling town centres across the whole country.

Another important reason for selecting this configuration is that the project is a hybrid – having both a research agenda and a brief to deliver a system capable of being implemented nationally. These two requirements are clearly at odds with each other – how is it possible to deliver a system that will be largely undefinable until late in the project? For example, 6 months into the project, we still do not know if it is feasible to automatically generate the CSAs; should this not prove to be possible, then the system will need to be significantly altered. This need for flexibility necessitates the use of system components that are reliable and proven; we felt that the Unix solution offered this.

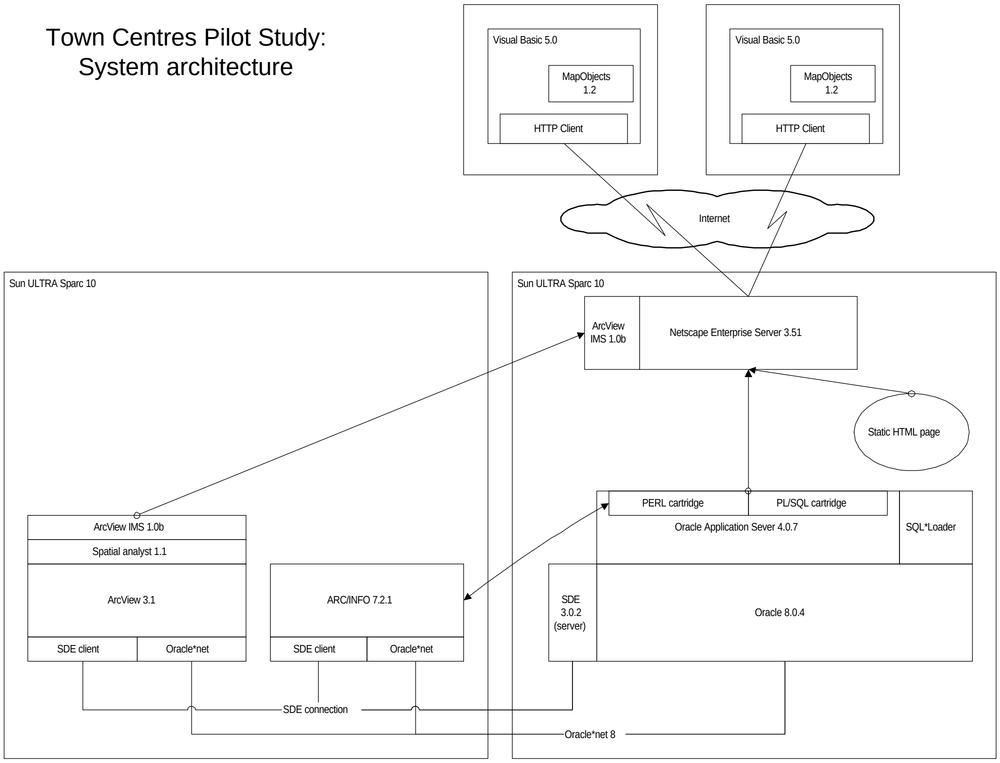

Figure 1 : The system architecture

This pragmatism is also reflected on the client side of the application. We had originally planned to deliver a browser-based system using Java to insure that the application was truly platform independent. However, early experimentation with Java demonstrated that this was not only complex, but that there would also be no guarantee that a reliable, platform independent, application could be developed during the lifespan of the project. Developing a 32 bit Visual Basic application was much more sensible, especially since other DETR research established that the vast majority of local authorities were already using 32-bit Microsoft OSs.

Pragmatism again largely determined our choice of software components. Each had to have a proven track record and we had to be confident that the components could be readily combined.

The Database and Web Server

This component enables us to deliver both tabular and geographical information with reliable and scalable software components: Oracle RDBMS, Oracle Application Server, Spatial Data Engine (SDE), Netscape Enterprise Server and ArcView Internet Map Server. As described earlier, our model is data driven and relies on large quantities of numerical information. Oracle was selected as the main repository for these data-sets with SDE chosen to enable the storage and retrieval of the geographical data-sets.

The selection of Oracle Application Server and SDE/ArcView IMS also enables us to balance client requests between the two tools, improving performance and reliability: whereas ArcView IMS is suitable for rapid development of delivery of maps through the Internet, Oracle Application Server is suitable for data driven applications which require the query, retrieval and updating of tabular information. Netscape Enterprise server was selected as it is compatible with both Oracle Application Server and ArcView IMS.

The Model Server

The GIS and Model server runs on separate Ultra 10 workstation. While ArcView was successfully used to run the model during the Feasibility Study, it is not suited to manipulating large amounts of data. Hence the model will be transferred to ARC/INFO which can efficiently handle the necessary data volumes. As the model is data driven, we have chosen to split the model server from the database server. This configuration enables us to fine-tune each server for optimum performance. Furthermore, by keeping the model operations separate, we have the option to schedule the model to run in batch mode during the off-peak hours. An additional benefit is that we will be able to run several instances of the model in parallel. ARC/INFO interacts with SDE for the geographical data-sets, and through it with Oracle for the other data-sets.

The main function of ArcView is to serve the Geographical Information to the clients. ArcView IMS will supply the background maps to the end users and will also be used as the foundations for a statistical suite, a dedicated web-based application accessible through any web browser, which will allow a wider user group to access town centre data. The connection between ArcView IMS and SDE will be used to deliver and receive geographical information from the Local Authorities who may edit and change the raw data.

The Client Application

Local Authority users will tend to interact with the system through a lightweight and dedicated application. This is necessary since they have to perform tasks to support the application, namely checking underlying datasets and the boundary defined by the model. We are currently developing a MapObjects application to do this which works as a mini-web-browser and interacts with the server through the Internet. This application communicates with ArcView IMS to receive and submit georeferenced information, and with Oracle Application Server for the tabular information.

Progress to date

The major software components have been installed and integrated into a seamless system. After full and detailed reviews of the structure of the model, it is now being transferred from ArcView to ARC/INFO. Central government datasets are now being mounted on Oracle and the Data Verification Tool is under development. An early prototype of the system should be operation in May/June.

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