Article

Enabling South Africa: development of an intelligent gateway

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Abstract: *The new South Africa needs information and the CSIR has enabled end-users to search international and local databases using an intelligent gateway to provide easy, affordable access to all the well-known hosts. All terminals, Minitels and PCs are catered for on all host protocols. The resulting gateway is operated on a sound business footing for the benefit of end-users and expert searchers in Southern Africa. The development of the system and the business are described in the paper.*

1. Introduction

South Africa has been isolated for decades, and as the world began to accept us back the need for information became more and more important. The CSIR in South Africa has been involved in the information business for many years and is the prime supplier of information to the country.

Two years ago my colleagues and I started investigating how to provide an electronic information plaza or supermarket for all South Africans to use. We have developed and implemented the Worldnet Gateway service which is a usable, affordable, efficient and comprehensive one-stop shop for both South African and international information.

2. Feasibility study

We initially embarked on a feasibility study and survey of available facilities and found that the industry in general was not addressing the problems we faced. South Africa is geographically remote, making communications both costly and difficult. The currency locally appears to have more value than other countries place on it, making international host services appear very expensive. The few hosts that we used were too complex for end-users and we were amazed by the proliferation of 'languages' in use elsewhere for searching databases. The South African market had long been starved of

information and was not aware of the need for information, or in fact that it was available. Our investigations uncovered a budding local Value Added Network Service (VANS) industry and good international links via new satellite links. We also discovered that there were a large number of international database hosts that were ready to talk to us but were still reluctant to market directly in our country. More importantly, a market survey indicated that South African businesses and individuals would be receptive to our idea of an electronic information plaza.

3. Key issues in the industry

From the 1990 International Online Information meeting in London we established the needs for cross database searching, single access and a simple common command language in the industry in general. In addition, a number of quality issues seemed to be repeatedly raised at the conference and we took serious note of the following:

- quality of communication links;
- verification of data sources;
- translation of user feedback into action;
- timely performance support;
- functional accuracy in searching;
- focus on user needs;
- lack of standards in the industry as a major problem in searching;
- predictable resource availability;
- currency of data and information;
- quality available must exceed the standard for quality;
- free 'fixit' messages;
- free time to evaluate databases;
- extensive alpha and beta testing;
- get the end-user to use with easy access, selection and searching;
- cater for the ordinary businessman by keeping it simple;
- cut out the jargon;
- online help and training;
- delivery by electronic mail and facsimile;
- simplified pricing and charging.

This list of industry opinion influenced our criteria and we began to realise that our gateway idea would meet most, if not all, of these needs.

In short, we were on our way!

4. Software?

The next step involved a worldwide search for software and systems that may do some of what we wanted. This was successful in that we found the beginnings of a gateway system at Infotap, an excellent communications company in CYCNOS SA and an expert system in NEXPERT. The RISC 6000 appeared to provide some of the features we needed. We simul-

taneously commenced negotiation with Dialog, Data-Star, FT Profile and others to supply and support our project. This was to prove extremely time-consuming as we had to break down political, business and technical barriers that were not initially apparent.

5. Communications?

We also negotiated communication agreements with the VAN services. Our local carrier is the well entrenched TELKOM and we have worked with them and use some of their services, as do the VANs. Several VANs provide circuit rentals, communications equipment, network management, message handling, electronic data interchange, electronic mail, global access and protocol conversion. We decided to use whatever was available and to focus on our gateway and the problems we had earlier identified. Our goals at this stage included search optimisation, common commands and local support utilising our own searchers.

6. Local host facility?

At that time we had a mainframe system providing in-house access to several local scientific, research bibliographic databases, and we proceeded to add client billing and communications capabilities. Today the system is host to 15 South African databases and has as many external clients as internal clients. The platform is available for use by anyone wanting to commercialise their database(s). Subject matter covers many topics in engineering, forestry, management, transportation, water research, South African patents, industrial relations, construction, electronics, life sciences, energy, computing and materials science. The system provides online searching and document ordering, a published products production service for bibliographies, alerting services and CDROM production, together with menu and command modes, user aids and training. The software is based on the Natural Document Manager (much enhanced). InfoAccess, as it has become known, is our local South African host service and it had to be part of the new gateway service.

7. Technical project

The project started in earnest in 1991 with the prime objective being to connect any user of any equipment easily to any database host, large or small. The problems included the many communications protocols in use, the many database searching languages and the varied user skill levels in the market place. We based the system on RISC 6000 architecture with Unix. All programming used the C language. We installed all the available communications protocols which the RISC could handle. The marketplace was made up of users on Minitels, 3270 terminals using SNA (IBM protocol), PC users of many persuasions using X.25 (X.28 and XXX) and TCP/IP. The VANs operators were mostly IBM-based with the exception of Infonet and the local J-Net, based on VAX technology.

The software from Infotap was VAX VMS based. CYCNOS INFORMATIQUE SA was subcontracted to convert the software and to add the protocol handling. They were also commissioned to add an expert system into the software to give the capability of staying ahead of the market. They built a base system which does all of the fundamental functions of linking any user to any database and provided a scripting capability so that individual hosts and databases could be easily added. This involved being able to add communications instructions, sign on and password controls and protection, help screens, menus and the common commands. It was important that we could add new commands in case an international standard ever emerged.

The result of all this activity provided us with a system capable of communicating in X.25, TCP/IP, SNA and CompuServe B. Our users were able to use menus in NOVICE mode, simple commands in ADVANCED mode and the host commands they were already used to using. All billing was converted to local currency as each session progressed and cost to date this month was provided on request, as well as search and session costs. For our purposes a flexible pricing capability was also built into the system. We had indeed achieved our ambition to connect any user to any database anywhere. Or had we?

8. Business problems

The problem was that we still had not created a business that was going to repay our capital outlay. Neither were our costs low enough to attract customers! Focus thus shifted to these aspects of the project. Firstly, by channelling all of the local usage through the same communications routes we were able to reduce communications costs low enough to attract the 'expert' current DIALOG and Data-Star users. Secondly, by choosing the best communication route for each host we were able to create a competitive situation between the VANs and reduce the costs even further. We focused software development on optimising searches by locally formulating search criteria and minimising connect time to hosts. We were also able to search simultaneously across hosts and databases and to work in 'batch' mode, posting results to an E-mail facility. We were by now beta testing the system and realised the importance of using the expert system to measure user satisfaction. A local help facility also became necessary and we embarked on a major training exercise of our profile writers, turning many of them into future trainers.

9. Communications problems

A large amount of experimental work took place using several different communications routes to the major hosts overseas. We used SNA, X.25 and TCP/IP. Each method or protocol had its own problems and we slowly realised that there was not going to be a best overall route. We had also originally designed in alternative routing and automatic selection of the best available route. This proved not to be practical locally,

where we were fortunate to find a single route that worked reliably to a given destination. Cost of communications also plays a big part and *best* often meant affordable. Currently we use all of the protocols and a single chosen route which we can rely on to each host.

10. Local content

We realised early on that local databases were probably more important to us than we had thought and embarked on a search for these, as it turned out rare, products. A considerable amount of effort has been expended to upgrade local in-house facilities to provide services in local news, South African library information, telephone searching and numeric data. The effort continues.

11. Worldnet Gateway

The Worldnet Gateway today requires users to select a database(s), set up their search criteria and to choose the output form they require before running the search on the host(s). There are three ways of doing this.

11.1. Menu mode

The first is in menu mode (or novice mode). Menus are provided to take the user directly to a host such as DIALOG or CompuServe and allow the user to use the host commands. They also allow an alphabetical selection of a database. If more than one is required to be searched this is set up using a simple command. The database may be selected from a series of cascading topic menus. Of the 1000 databases available on the system only 200 are made available to the novice. These were chosen with great care taking cost, ease of use and search ability into account. Full-text searching was tailored to provide precise results and to eliminate vast quantities of loosely relevant text. This mode of operation was directed to the ordinary business executive in need of a search capability that he or she could use themselves.

11.2. Command mode

We then provided easy-to-use commands that emulated the menus described above. This removed the frustrations of the more advanced user at the novice level. The system still optimised search connect time to the host in this mode of operation and provided the expert in a single host service with the ability to search many other hosts.

11.3. Direct access mode

Our beta test users, especially those with DIALOG experience, demanded a GO DIALOG facility. This formed the basis of our provision of a GO facility to all of our information providers. Today the user can use packages such as DIALINK and still go through the Worldnet Gateway. The GO COM-

PUSERVE facility (unknown to us) was a world first in connecting non PC subscribers to CompuServe successfully (including Minitel users and 3270 terminal users on SNA networks), thus enabling all of ISM (IBM in South Africa) access to CompuServe's excellent forums.

12. Benefits

All users enjoy the benefit of the reduced communications costs and the reliability of dedicated international links, minimised connect time and assisted searching. As time goes by expert features are added to improve the identification of source databases and user aids. Also, each user has a single password to access all of the hosts and pays only in local currency for all services.

13. Viability

Did we have a viable business? Well, with great trepidation we asked an independent group to test our system. They did six varied searches using six people of varied skills, and averaged and summed up the results. These are reflected in Table 1 which shows us that we had achieved a 15% saving over the next best method of using DIALOG. *It also showed us that we had enabled the end-user to search at the same cost as an expert!* We had a business at last. The new service was launched on 11 May.

Table 1: *Showing a 15% saving and end-user enabled.*

	Standard direct access to DIALOG	Gateway end-user to DIALOG	Gateway direct to DIALOG
DIALOG charge	140	134	154
Communications	102	33	49
Gateway	0	41	0
Totals	242	208	203

Amounts shown in South African Rand.

14. Training

We embarked on providing training in all of the host searching techniques by training up our existing profile writers at the library. This has become a business in its own right. Courses are offered on behalf of each host and Worldnet Gateway. They are run on every Wednesday and cover specialist topics as well as other searching skills. The Gateway facilities reduce training time and costs dramatically for most people. Twelve hosts would usually offer about 30 days of training between them to achieve a reasonable level of skills. The same capability can be achieved with *one day* of training and some practice. The simplicity of one system has replaced the sophistication of many.

15. Help desk

Another task undertaken before we could launch the service was the setting up of help facilities. A dedicated help desk is shared with CompuServe Africa (launched last year by the CSIR) to handle initial enquiries. Technical difficulties are passed to our Computer Services help desk. Database enquiries and difficulties are passed to the trainer responsible for that host or other service, providing continuity of contact and user confidence. Help and instruction are provided online as well.

16. Client installation

We also provide communication software to our South African clients which is simple to install, already set up to communicate to the Worldnet Gateway and InfoAccess systems, and that works through Easy Access from TELKOM. Users can choose to reach us through menu choices on the VAN services and on BELTEL. The Minitel may be used to communicate directly to the Worldnet Gateway.

17. CDROM?

Where does the CDROM fit into the scheme of things? The CSIR recently added the capability of making CDROM versions of databases and hopes to be able to link these to the gateway through a LAN server. This will undoubtedly take a little longer, but is becoming increasingly attractive to us. We believe that the CDROM has a very important role to play in storing data cost-effectively, in distributing large and small databases to large and small audiences. The ability to make as few as one CDROM cost-effective is now a reality and significantly changes our thinking on local storage and retrieval. This area will undoubtedly add an exciting new dimension to Worldnet Gateway in the coming period.

18. Documentation

User manuals and catalogues, together with host documentation, are supplied to all subscribers. Registration fees and annual renewal fees complete the picture.

19. Software

The software we have developed runs on any Unix system and will prove to be of value to organisations hoping to commercialise their own databases. It is also of value to corporations with diverse systems requiring a common interface to all of them for the user community in house. The connectivity capability is of particular value to organisations with a mixture of communication protocols which often make system integration impossible.

20. Conclusion

Our unique low cost, simple access, convenient local support, information plaza now has six international hosts, our own InfoAccess, and six local hosts providing over 1000 databases on a single password.

The new South Africa has been enabled by our intelligent gateway to compete openly in the world by using information to support its decision makers in all walks of life.

The author

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Ed Evans is the Marketing Manager of The CSIR's Worldnet Gateway programme. He graduated from the University of the Witwatersrand in 1968 with a BSc and spent the next 15 years in the computer divisions of the mining industry, contributing to many large projects in many areas, including materials handling, process control, personnel management and laboratory automation systems. He spent five years in industry installing manufacturing and industrial systems, including material resource planning and just-in-time systems. Ed specialised in training systems in the manufacturing and industrial management skills area for five years. He has spent the last three years assisting with the development of the local CSIR host system and project managing the development of the Worldnet Gateway, which connects any user to any database anywhere, for the CSIR's Division of Information Services.