

Status

SPRING 1990

QUARTERLY #11
OF THE
WESTERN
AUSTRALIAN
REGIONAL
COMPUTING
CENTRE

To Dam or Not to Dam GIS at the Water Authority



A licence to divert surface water is required for each privately-owned dam in Western Australia

Few people realise how much work is involved in deciding whether or not water can be diverted into a privately-owned dam in Western Australia.

This is the view of Wayne Tingey* of the Water Authority who is impressed by the benefits GIS technology can provide as an aid in determining whether or not surface water can be diverted for a dam at a particular location.

WARCC programmer Kim Wearne has coordinated the introduction of GIS technology in the Water Resources Directorate of the Water Authority of Western Australia. He commented that the Authority's planners had embraced the technology wholeheartedly.

"The application of GIS technology facilitates significantly the task of Regional Water Resources Officers in evaluating licence applications as

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Computing For Goodwyn Project

For over two years WARCC's bureau computing facilities have played a significant part in the design of the Goodwyn offshore platform.

The Davy McKee-McDermott joint venture (DMM) was commissioned by Woodside Offshore Petroleum to design the platform's topside modules and flare tower. These complex steel-frame structures needed detailed analysis under severe load conditions.

It was known from the outset that to undertake these analyses to a high level of accuracy and within an acceptable time frame would require powerful computers and sophisticated software.

The Structural Engineering Manager of DMM, Mr Mike O'Shaughnessy, decided that the most reliable and cost-effective way to obtain such high-powered computing for a project of finite duration was to utilise WARCC's bureau facilities.

The bureau has several computers available for use by external clients. These include Vax, Cyber and SUN equipment. Users can connect to these from their own office using a personal computer and modem.

As DMM planned to have around ten structural engineers using the Centre's computers simultaneously, a dedicated Telecom line was arranged to permit high speed multiple data transfer.

The connection of many PCs and Tektronix terminals was made possible with the use of multiplexers at each end of the Telecom line. The combination of the high speed line and the Tektronix terminals

permitted effective interactive graphics use.

During the software selection and installation phases WARCC liaised closely with DMM and software suppliers to obtain all the information required for evaluation and to establish necessary licence agreements.

With the complex software required for three-dimensional structural analysis, it is realistic to expect occasional problems. However, the Centre acted quickly to resolve any difficulties DMM did experience and, although the software suppliers are located overseas, most problems were resolved within one or two days.

WARCC also provided DMM with training and ongoing support in the use of the bureau's computers and particularly the operating systems.

The use of a university computing facility as the main computing resource on a project as large as the Goodwyn platform may be regarded by some as having some inherent risk. However, when Mr O'Shaughnessy saw the extent and diversity of the facility he was confident that a thoroughly professional service would be provided.

Mr Geoff Home, Senior Project Engineer of DMM, recently commented that the decision to use the Centre had proved to be a good one because DMM had enjoyed two years of virtually trouble-free computing. He also said that projects would run very smoothly if all support organisations gave the high level of service which had been provided by WARCC.

Davy McKee-McDermott's Project Director, Mr Peter Addy, agreed that

WARCC had proved to be reliable, flexible and responsive to their needs.

DMM look forward to continuing their arrangement with WARCC during future involvement with the Goodwyn project.

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they can get answers by doing calculations very quickly and easily," Kim said.

The Authority's regional offices are responsible for licensing surface water diversions for dams in their own area but most of this activity is concentrated in the southwest of the state. Licences are issued for an amount of water extracted annually from a proclaimed water system for dams located either on a streamline or offstream using runoff and water pumped from a stream.

Applications for licences are evaluated by the region's Water Resources Officer who analyses the impact of a proposed dam on all connected dams both upstream and downstream and, on this basis, makes recommendations to the local Advisory Committee. Currently this analysis is done with limited resources in terms of data about existing dams and available water.

For this reason the Computer Systems Section of the Authority's Surface Water Branch in Perth was approached for assistance in providing visual information on existing dams as an aid to analysis. This request was later expanded to incorporate an analysis of the water available to a particular point using the digital mapping program Microstation and dBaselll software.

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Using MicroStation a map of an area can be created featuring dam locations, streamlines, catchment boundaries for each dam, areas of vegetation and cadastral boundaries.

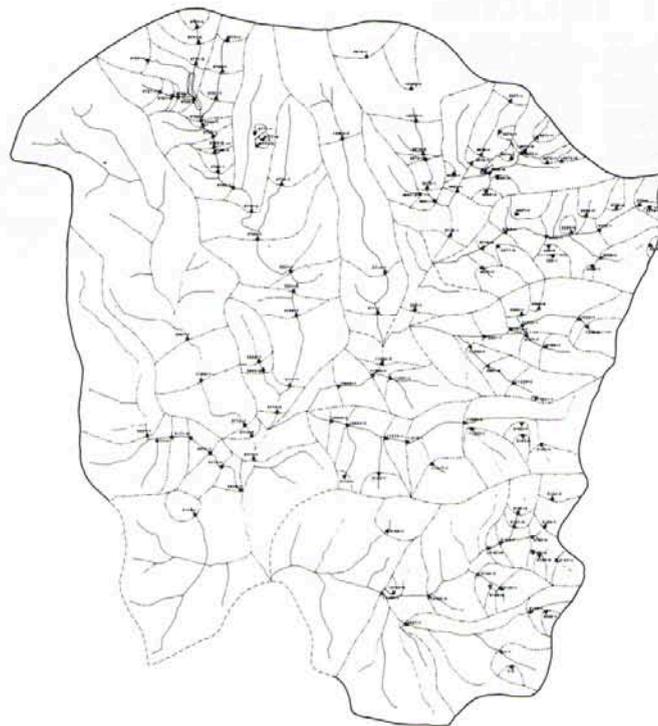
Kim pointed out that processing a set of licence applications requires a number of steps including placing new dams on the digital map and determining their catchments; intersecting the catchments with the vegetation data; running the runoff model for each catchment; and analysing the impact of each new dam, both in isolation and in conjunction with others.

"A proposed dam's viability is tested by calculating the water available to that point and comparing it with the dam's capacity. Dams downstream of the proposed dam must also be examined to determine if sufficient water will be available to allow them to meet their licensed capacities," he explained.

"The process is being tested in a high priority area of the South West Region, the Upper Lefroy catchment, with a view to extending coverage to other catchments along the Warren River."

Wayne Tingey confirmed that use of GIS technology results in substantial time savings.

"Manual calculations are very repetitive and time-consuming. Nowadays we simply cannot afford to spend so much time and manpower determining water availability. The South West is a dynamic region — for



UPPER LEFROY DAM LICENSING
 — Catchment & sub-catchment boundary
 - - - Dam Catchment boundary
 - - - Catchment boundary not part of dam catchment bdy
 — Streamline
 * Dam location and ID

example, there has been a rapid expansion in horticultural and other activities for both export and domestic markets. As a result, irrigation needs have increased dramatically over the past few years," he said.

"The Authority must ensure that it remains an active player in this kind of development, so we wanted technology which can do the work for us to the standard demanded by landowners and the local community.

"We have been impressed by the strength and versatility of MicroStation as a mapping and analysis package. This technology has helped us in three key areas — at the level of professional management, in our involvement with the

general public, and with the landowners who apply for dam licences."

Paul Rosair, Supervising Research Officer at the Authority, is enthusiastic about the benefits of GIS technology.

"This quality of map presentation is excellent and promotes confidence among landowners in the Authority's ability to process their licence applications. It's a great way to help people understand the issues involved," he said.

"The main benefits of the technology are map presentation and data analysis. An additional advantage is that it allows us to review information for a particular area by "zooming in" on it and then spatially querying other related corporate data for that area.

"We also apply GIS technology to other functions such as catchment clearing controls and irrigation strategies.

"Spatial presentation of analysed data is now an essential aid in meeting the challenges we face — dealing with landowners, environmental issues and conserving water resources."

**Wayne Tingey is the Regional Water Resources Officer for the South West Region of the Water Authority of Western Australia.*

WARCC The Preferred IT Model

During September, the long-awaited Report of the WA Parliamentary Public Accounts and Expenditure Review Committee's review of *Computers in Government* was released.

The Report focused most of its attention on DOCIT, which has now been incorporated into the WA Department of Services as "State IT". That department is currently undertaking its own review of the various activities that DOCIT has been engaged in.

The Report lauded a number of DOCIT's initiatives, but also drew attention to some deficiencies in the public sector use of IT, the most glaring being "...an apparent lack of whole of government direction in IT planning".

Linked with this was a recognition of the need for proper accountability for IT activities at the agency level. This is a recurring theme of governments worldwide at the moment. It is reflected by the Premier of WA, Dr Carmen Lawrence, who said at a recent Australian Institute of Management seminar **"Essentially, organisations are required to be driven by objective and outcomes, and to be individually responsible for their use of resources."**

Dr Lawrence referred to the Financial Administration and Audit Act, noting that it makes the heads of organisations directly responsible for their expenditure and for the performance of their units. She went on to say that the Act **"...focused on performance standards, resource utilisation and the reliability of information used for decision making."**

WARCC has long espoused these principles, operating on a true "user-

pays" basis, and providing a sufficient degree of independence to ensure satisfactory accountability for its clients. It holds this position in relation to the University of WA, as well as to all of its external clients.

It comes as no surprise, then, that the Report holds up WARCC as a model of the way services can be rendered to government agencies so as to place the responsibility for IT where it belongs. It was particularly concerned about the operation of government computer bureau activities, and concluded **"...the operations of the government bureaux would be improved if the bureaux were managed by an independent and commercial entity such as the WARCC."**

Of course, the problems facing the government in relation to computing cannot all be solved so simply. A variety of other measures is required, as indicated by the Report. Indeed, as the Report also recognises, many of these problems are global in nature, and cannot be addressed in isolation by the State Government. However, the sort of structural change proposed above represents a significant step in the right direction.

Only when CEOs are given full responsibility for the use of IT within their organisations can they truly be held accountable. That accountability, more than anything else, will provide the necessary incentives that will drive them to understand this technology and to bring it more under control. Only then can we expect to realise the significant benefits which are there for the taking.

Alex Reid
Director

Innovative User Interfaces

Brook Waters, WARCC user interface consultant, considers his attendance at the 7th Annual Conference on Human Factors and Computing Systems held earlier this year in Seattle, USA, to have proved well worthwhile.

"The conference provided a unique opportunity for comparison of WARCC's performance in the area of computer user interfaces to larger overseas software developers. It also enabled me to get some feel for the directions being taken in user interfaces for the future," Brook said.

He reported that the conference was preceded by a two-day series of tutorials which covered some specific areas such as using X-windows (a graphical user interface environment generally for UNIX systems), and more general areas such as desktop animation.

Many presenters at the conference were user interface designers with qualifications in graphic art and media rather than computing.

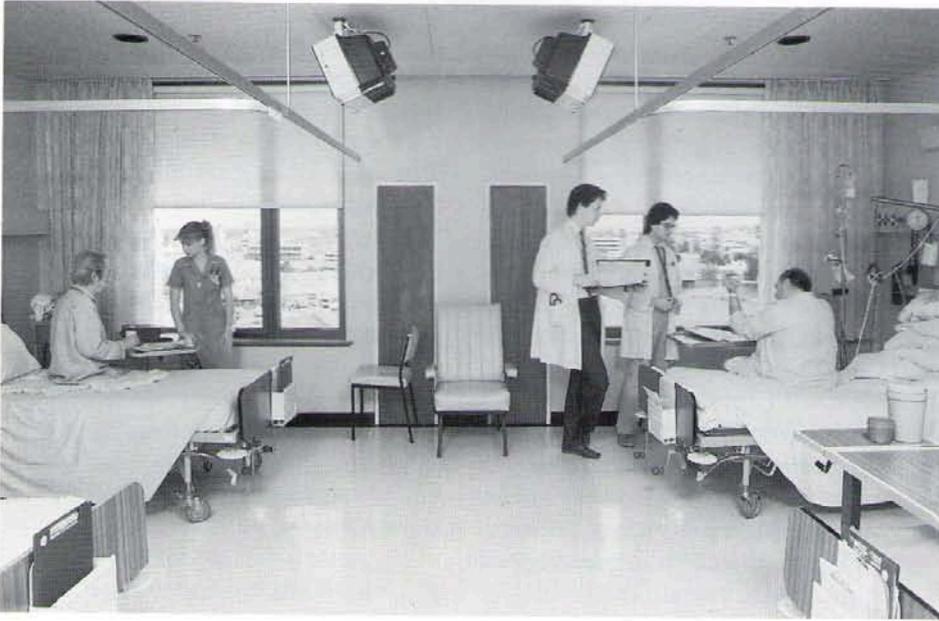
"This successful marriage of art and science has produced a number of exciting and innovative user interfaces. This was especially evident in the various hypermedia systems on display at the conference," he said.

Hypermedia systems typically use video disk, cd-rom, and various other media to provide information in the form of text, graphics, real time video and even voice output.

In the opening address by Professor Michael Dertouzos of MIT, a number of key concerns in the field of human-computer interaction were highlighted.

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Patients Have Their Say



Rating a hospital is notoriously difficult

How would you rate the last hospital you stayed in — good, bad or in-between?

As part of its overall quality assurance programme, Sir Charles Gairdner Hospital has been conducting a survey which asks patients to give their opinion on the quality of services provided.

According to Dr Peter Cameron, Director of the Intensive Care Unit and member of the Quality Assurance Committee administering the patient satisfaction survey, it serves as a means of analysing patient attitudes to ensure that the hospital maintains its high position and regard in the community.

"Community attitudes influence political and budgetary policy and this will have a major effect on this hospital's success in the immediate and more distant future. We have a unique opportunity to survey and to successfully meet the needs of our "customers", thereby facilitating our continued success as a hospital," Dr Cameron said.

After patients have been discharged, a questionnaire is mailed to them at home. There are about 25 simple questions covering all aspects of patient contact with the hospital. It is devised to be as user-friendly as possible and also to enable those of non English-speaking backgrounds to answer questions.

The Quality Assurance Committee members are pleased with the response rate of about 65 percent. They believe that this confirms the effectiveness of the Committee's policy of sending the questionnaire to the patient's home address with a stamped, self-addressed envelope and a guarantee of anonymity of information.

Coded data on both in- and outpatients in various wards are sent to WARCC about once a month and a statistical analysis is carried out by Paul Taylor. The results, which are displayed in percentages of satisfaction as well as in a tabular form, are communicated to hospital staff for feedback.

Dr Cameron explained that a "Satisfaction Index" had been arrived at statistically to allow the tables to reflect the level of patient satisfaction without an extreme bias introduced by those who are either "very satisfied" or "very dissatisfied".

He stated that Sir Charles Gairdner Hospital enjoys popularity in the community and that it has a reputation for friendly, personal service but that the hospital must increase its profile among the population it serves in order to maintain funding levels.

"This is only a survey of patient opinions. Technical standards are not involved as they can be fairly easily measured. Prior to introducing the survey a number of well-developed customer service programmes in use overseas and in Australia were looked at," he said.

"The Board sees the survey as an invaluable tool and takes very seriously any deficiencies which are indicated. If a particular trend becomes apparent, then a more specific survey is conducted and any defects in service are acted upon."

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Among other issues, Professor Dertouzos addressed the problems of non-standard instructions required in most computer languages for the development of good user interfaces. These instructions now account for up to 70% of the total code for some systems. He made a plea for the development of new input/output based languages to reduce the huge programming effort expended using add-on libraries.

He also noted the enormous amounts of documentation required by many systems to facilitate use. In some cases the introduction of computer systems has actually reduced productivity by as much as 6%.

Brook stated that the ideas discussed at the conference included GOMS (Goals, Objects, Methods, Selection) modelling to create goal-oriented user interfaces and minimal documentation. He added "This approach deserves widespread attention as the reduction in documentation means time savings and productivity increases for software developers and users alike."

A number of innovative input devices were on display at the conference, including some for interacting with three-dimensional views. Brook had the opportunity to experience virtual reality — the ultimate form of interaction with a three-dimensional computer-generated view. This requires the user to wear a pair of goggles (containing small LCD screens) and a glove. Once the user is equipped with these he or she is in a computer-generated world in which various items can be manipulated using a glove. This particular demonstration placed the user in a computer-generated office where books and papers and various items of furniture could be manipulated.

Brook was also impressed by input devices based on user eye movement. These were shown both as general input devices and select-and-pick devices on hypermedia information systems.

"Overall the conference was exciting and inspiring. It gave me a perspective of user interface technology and research as it stands at present and a vision of where it is heading in the future.

"The vision for the future of computers seems to be a vast hypermedia system with applications that are written as small modules capable of being joined to provide useful and informative output in a variety of ways. It will have a number of input devices that are natural to a user such as input by handwriting, touch screens and displays which allow users to select things simply by looking at them—in other words, what you see is what you get!"

News and Views from Silicon Valley

Michael Scriven is a UWA Emeritus Professor who edited a newsletter for University staff for several years. He now runs an Evaluation Institute in Palo Alto, California. This column gives some extracts from Professor Scriven's recent comments on what is happening in Silicon Valley.

Micro Retailers

The retail scene is in extreme decline, given a last shove towards disaster (there is talk of 25-40% bankruptcy of the 10,000 dealers) by the surreptitious decision of essentially all vendors to deal directly with large corporate customers.

What's new is that the best mail order companies (e.g. PC Connection/

MacConnection) are now offering: (i) money-back guarantees for 30 days; (ii) long warranties including guaranteed onsite service; (iii) overnight delivery to anywhere in the US for one or two dollars (!); (iv) free helplines; and (v) some of them (e.g. Dell) have developed a superb hardware of their own which matches anything on the market and is half the price of IBM or Compaq.

Only the vendor can compete with that kind of package. What's surviving are the specialised service companies, the user groups (now the main support system), electronic bulletin board help boards maintained by many vendors, and a few shops - including the university micro centres.

Low-cost and Portable Scene

The hot action on the micro front is in (i) low-cost 386/386SXs machines and (ii) the portables. The new personal-buyer price level in the first category is impressive: a first-rate 16MHz 386SX, with a 40MB hard disk, 1.2MB floppy, 14" VGA colour monitor, DOS 4.01 and 1MB of RAM, with 30-day, money-back guarantee, 24-hour toll-free technical support, and one-year warranty costs under \$US2,000. Another \$500 gets you a full 386 machine.

The big-volume corporate buyers can get an IBM for near this price, but that no longer brings advantages in service or design as in the old days.

On the portable scene new ideas abound (eg handwriting input - block capitals only), the margins are still high and the death rate is horrific. The current categories are 'luggables' (roughly more than 6kg), 'phonebooks' (4-6kg), laptops (around 3 kg - euphemistically referred to as 'notebooks'), the real notebooks (2kg), and the palm-tops (0.5kg).

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Low-cost Market Battle

The three biggest players — IBM, Tandy and Mac — have decided to shoot it out for the low-cost market, and it's going to be a very interesting battle. Here's a quick analysis of the armaments. It's clear that IBM has learnt from their experience with a feeble PC Jr. Their new PS/1 series is a formidable offering; each has a 10MHz 80286 processor, VGA screen, 2400 bps modem, mouse, videotex, a tutorial, clean new interface software, and a high-density floppy drive. Start-up on the hard disk machines is about as easy as on the Mac, and purchase is even easier (via big department stores, to the horror of the dealer network).

The hard disk PS/1 models are the ones to get despite what looks like an excessive price differential; you get more memory and valuable software such as Microsoft Works is already installed and ready to run.

The Tandy effort (eg the 1000TL/2) is not close: at the same price you get a slower processor, half the floppy capacity, smaller and much slower hard disk option (20MB vs. 30MB, 70 ms access time vs. 23 ms), much less screen resolution. Against this, Tandy has built-in sound, a poor trade-off for most of us.

The Mac entries are still under wraps (till January), but the details leaked so far suggest that they are going to be very competitive: at least one has a 25MHz processor, 2MB RAM, really big hard disk. But you must realize that Mac Pluses are down to US\$750 or so already, from the discounters, with twice the memory of the entry IBM, albeit a smaller screen, and a much better interface.

Expert System Assists Rabbit Control

Over the years WARCC has been involved in a number of expert systems. Most recently the Centre has developed a prototype system for the Agriculture Protection Board (APB) of Western Australia.

The system provides APB district staff with guidance and advice on the selection of poisons and techniques for controlling rabbit populations throughout the state.

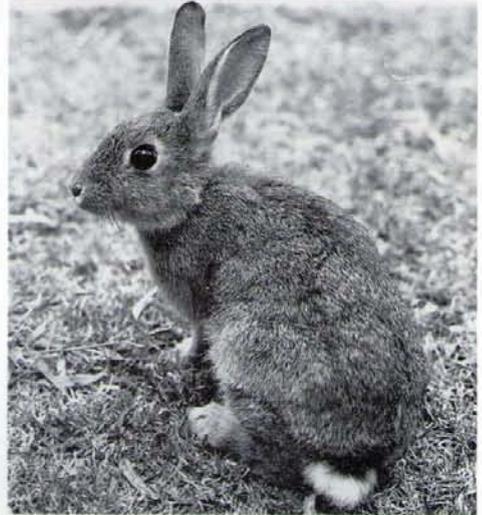
According to APB technical officer, Mike Robinson, rabbits cause considerable damage not only to the environment but also to the livelihood of farmers, although WA is not as severely affected as some other states with cooler climates.

Young lupin plants, for example, are killed by rabbit grazing and consequently losses are high. Crops such as wheat, barley and oats make a partial recovery but reduced yields and delayed harvests can be costly to farmers. Rabbits grazing pasture paddocks compete with the stock for feed, leading to lower returns for the landholder.

Mike pointed out that rabbit populations along the south coast, and also in patches throughout the state, are much higher than acceptable levels and need to be controlled.

"At the APB we are trying to develop methods of control which are simple to implement, and therefore easier to use, and are also environmentally sensitive," he said.

"Our research is directed towards minimising the environmental impact of rabbit population control. The expert system facilitates the selection of the most appropriate method for a particular area."



Rabbit population levels in WA must be controlled (photograph courtesy of the Agriculture Protection Board)

Darryl Blackshaw and Peter Hubach of the APB's research section worked together with WARCC programmer Kristina Lam to develop the system.

Expert systems are computer programs which are designed to capture sufficient human specialist knowledge and rules of thumb in order to solve problems 'expertly'.

The expert system developed for the APB asks a series of questions such as "Are there livestock in the area?", "Is the area accessible by four-wheel-drive vehicles?", etc. It uses "rules" or conditions to determine which questions to ask and finally makes recommendations on the poisons and techniques to be used. Detailed explanations of the reasons for the choice are also provided.

This prototype system was produced using the Centre's guidelines for application of software engineering, quality assurance and sound project management practices to expert system development.

Productivity Seminars Appreciated

Professor Lourens pictured during his address "Students and Computing — Some Issues"



A recent programme of seminars at The University of WA to promote efficient use of information technology has received an enthusiastic response from participants.

During the two-week semester break in September WARCC put on a series of seminars aimed at three main user groups — academics, students and administrative personnel.

Rob van Zanten, Manager of the Centre's Microcomputer Support group, is pleased with attendance levels and believes that, in general, the seminars reached the right people and provided them with a lot of useful information.

The Microcomputer Support group has been instrumental in promoting the use of microcomputers at the University and provides support services for Macintosh and IBM PC users on campus and in the Perth metropolitan area.

"The seminars have been a successful communication exercise, enabling WARCC to tell people what we do and how we can assist them. Our philosophy is that we're here to help," Rob said.

"Response from participants indicates that we provided what they wanted and they're pleased with what we've done. Approximately 65 percent of attendees completed and returned evaluation questionnaires to us which is a good response."

UWA Deputy Vice-Chancellor, Professor Roy Lourens, was one of a panel of 60 speakers put together by WARCC to participate in the programme.

In his address "Students and Computing — Some Issues" Professor Lourens stressed the importance of optimising use of available computing resources. He commented that WARCC's provision of computing services over the past 15 years had

served the University well, adding that "It is easy to talk about productivity improvement but difficult to achieve it."

He also praised the contribution made by the students' Guild in reviewing student computing needs and communicating its findings to the University administration.

He pointed out that UWA's computing facilities must fit in with the University's overall mission of maintaining its position as a medium-sized, high-quality, research-oriented university and that, to achieve this, good networks are essential to counteract the disadvantages of distance from other Australian capital cities.

Looking ahead, Rob van Zanten intends to run the seminars annually as an integral part of the support services provided by the Microcomputer Support group.



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Produced on the Centre's
Linotronic 300
Laser Typesetter

