

CLOSING THE DIGITAL DIVIDE: EDUCATION TELECOMMUNICATIONS SYSTEMS AND POSSIBILITIES IN WESTERN AUSTRALIA

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Abstract: The research reported in this paper considers the current telecommunications network for the three education systems of state, independent and catholic schools in Western Australia as well as drawing on the personal experiences of teachers in these systems as the government attempts to close the digital divide with its Networking the Nation directives. While email and Internet facilities have greatly improved in rural, regional and remote areas can these systems support every day school use of the Internet and what are the opportunities for advanced telecommunications usage like video conferencing? This paper discusses the possibilities and issues.

Keywords: Digital divide; information and communication technologies (ICT); telecommunications; VPN; e-learning; online learning environments;

INTRODUCTION

Western Australia has a population of 2 million people within an area of 2,525,500 square kilometres. The majority of people that is 1.5 million live in the capital city Perth, and the remaining 500,000 live mostly in the south western corner of the state known as the South West and then spread throughout towns or small communities in the North West (Kimberley, Pilbara regions), Mid West, Great Southern and Goldfields regions.

Each of the three education systems, the Department of Education and Training (DETWA); Association of Independent Schools of Western Australia (AISWA) and the Catholic Education Office (CEO) have set up telecommunications networks to improve learning opportunities for students and administrative services for staff. The aim of each telecommunications system is to provide a virtual private network (VPN) with access from anywhere, anytime and ultimately reduce the feeling of professional and social dislocation experienced by many teachers and students in the isolated communities. As stated by DETWA (2002) media release about their telecommunications network:

“the telecommunications service will enable reduced cost telephone calls for all government schools. The digital highway will have the capacity to provide for video conferencing between most schools...ultimately support online applications such as school transactions and electronic enrolments...facilitate a state-wide infrastructure management service in schools...monitor the status of computer hardware within a school, removing this burden from teachers and allowing them to focus on their core business”.

This paper reports on the progress of each of these education systems in establishing and running their telecommunications networks and discusses some of the issues in Western Australia due to the sheer size of these states, bandwidths and cost to resource such initiatives.

BACKGROUND

The Australian Government established the Networking the Nation (NTN) program in June 1997. The program assisted the economic and social development of rural Australia through a

number of funding projects to enhance telecommunications infrastructure and services, increase access to, and promote use of, services available through telecommunications networks and to reduce disparities in access to such services and facilities for Australians. The NTN program contributed to the rapid expansion in mobile telephone services, the large increase in Internet literacy, and the delivery of government, business and consumer services online. Around \$322.5 million in funding was allocated to 762 projects across regional, rural and remote Australia under the NTN Program (Australian Government, 2002). In 1999 the Government announced an increase of \$174 million in NTN funding from the Social Bonus following the further sale of Telstra. The additional funds were allocated to a range of programs targeting particular communications in regional Australia including building Additional Rural Networks (\$70 million). Further the government (DCITA, 2005) has committed \$1.1 billion over the next four years for *Connect Australia* including:

- \$878 million for *Broadband Connect* to provide all Australians with affordable broadband services,
- \$113 million for *Clever Networks* to rollout new broadband networks for innovative applications to improve the delivery of health, education and other essential services,
- \$30 million for *Mobile Connect* to extend terrestrial mobile coverage to areas where they can be commercially maintained and continue satellite handset subsidies for other areas,
- \$90 million for *Backing Indigenous Ability* to deliver a comprehensive package addressing phones, Internet and videoconferencing in remote Indigenous communities and improved Indigenous radio and television.

The government initiative of community Telecentres in remote and rural Western Australia currently provides a community telecommunications network providing such services as video conferencing is also discussed.

In Western Australia there are three education systems operating, the state school system known as The Department of Education and Training of Western Australia (DETWA), the Catholic Education Office (CEO), and the independent schools association known as The Association of Independent Schools of Western Australia Incorporated (AISWA).

DETWA

The Department of Education and Training of Western Australia (DETWA) provides school education for more than 250,000 students in over 790 schools spread across Australia's largest state. Through the government e2c Education to Community project all DETWA schools have been connected to the DETWA network. Where landlines are available the schools are supported by Telstra, where landlines are not available they are supported by Optus satellite. This telecommunications network provides significantly increased bandwidth to all government schools in Western Australia and to the 14 District Education Offices (DEOs). This process was undertaken in six stages, with stage six currently underway, see Table 1. File sharing will become possible on the network through the purpose built Oracle System providing web mail, shared calendaring and curriculum resources (personal communication J. Kopinsky, Customer Relationship Manager ICT, Department of Education and Training, February 17, 2006).

Stage 1 - Installation of Telstra Link.

- Telstra installed a new Telco link to the school providing faster data transmission as follows :
Metro schools receive 10Mbps,
Regional HS\DHSS and DEO's receive 10Mbps,
Regional Primary Schools receive 2Mbps.
- Telstra installed a Cisco 3512 switch (metropolitan WIP only) or an NTU (regional) for connection to the new Telco link. This equipment, which will remain the property of Telstra, is required to connect the external Telstra cable to the router provided by the Department. Schools are not permitted to use the Cisco 3512 switch for their own network patching.
- The ICT Directorate arranged for the installation of a new communications cabinet in schools that do not have sufficient space in their existing admin communications cabinet.

Stage 2 - Installation of Cisco router and connection of administration network

- Central office technical consultants or Telstra to install a Cisco 2621 router in the school admin communications cabinet and connect it to the Telco link via the Cisco 3512 switch or NTU.
- Administration network connected to the new Cisco 2621 router and all existing services, such as Midas and Peoplesoft, to be provided via the new Telco link which will then replace the old ISDN\PSTN or On-Ramp service.
- School to retain current Internet and Email services through their existing ISP, and to retain their current Integration method.
- Existing ISDN\PSTN or On-Ramp communication line to central office to be decommissioned after a period of 1 week.

Stage 3 - Re-configuration of curriculum network and network integration

- Schools employed the services of a panel contractor to re-configure the curriculum network to use the new Telstra supplied IP address range obtained through the District Customer Relationship Managers.
- Panel contractor integrated the school administration and curriculum networks using the Departmentally supplied Cisco 2621 router. School's existing integration method was superseded by this approach.

Stage 4 - Re-configuration and supply of Internet Services to the administration network.

- Departmentally supplied technical consultants visited the school and re-configured the school's admin network to use the new Telstra supplied IP address range.
Internet services to be provided to the administration network only, via the new Telco connection.

Stage 5 - Provision of Internet services to the curriculum network via new Telco Link

- At this point Internet services will be supplied through the new Telco link to the curriculum network within the school. (There is a dependency on Departmental infrastructure being in place before the Internet service can be delivered.)
- If the school uses an external curriculum email system then they will need to retain their current ISP connection for this purpose until central office is able to provide the email service. It may be possible to reduce the cost of their ISP plan based on the minimal usage required for email delivery.

Stage 6 - Email routing through central office

- School domain names are to be hosted at Central Office file servers, and all curriculum email is to be routed via the department through the new Telco link to the school's current email server.
- At this point the school should be in a position to terminate its current ISP agreement, as all Internet and email related services will be supplied via the new Telco link. Termination of the ISP contract will not be possible if a school hosts its own Web site. The school will need to retain the ISP contract for Web hosting until this service is provided by Central office.

Optus Data Reach Satellite Service

- The Optus Data Reach Satellite Service was installed during 2002/3. Optus contractors installed the satellite dishes, Personal Earth Station (PES), Relay, Cisco 2621, Cisco 2950 switch. DETWA Technicians then performed the integration. Essentially all of the Steps from 1 through to 6 were completed in one hit. The 45 Optus Satellite schools are on a shared 5.4Mbps bandwidth.

Source: <http://www.e2c.wa.edu.au> and personal communication with J. Kopinsky, February 17, 2006

Table 1: e2c Telecommunications Service Project in Western Australia

Of the 790 schools joining the DETWA network through an ISDN landline, 45 schools have had to be connected through satellite. These include four Abrolhos Island schools as well as Christmas and Cocos Islands. The advantages of having a DETWA virtual private network are added security through a centrally controlled system. Disadvantages are limits to bandwidth as this is through the shared Telstra network; therefore the shared bandwidth speeds depend on the time of the day. This is particularly so with respect to the satellite schools. As this connectivity is largely through the shared Telstra/Optus network; the shared bandwidth speeds may vary. Each school is given a bandwidth allowance based on student enrolments. Schools that go over the bandwidth allowance then may be charged. Currently

schools cannot video conference or undertake advanced integrated computer functions on this network but this is anticipated for the future.

As schools and DEOs have had their own Internet services provided by an ISP previously, a video conferencing project was undertaken by the Pilbara District Office to link schools in the Pilbara region during 2003. The project involved the establishing of an extensive network of video conferencing (VC) points throughout the Pilbara to facilitate teaching and learning and to provide opportunities for students not normally available in remote areas. The project was the idea of the past District Director for the Pilbara, Phil Harvey. A DEO staff member John Verbeek researched the use of VC in education, reviewed available hardware offerings, and devised a feasibility study and business case for the Pilbara. Critical to this process were collaborations with principals including several demonstrations of VC equipment in action. Use of a consultant in the Industry, Gerry Murphy from GFM Communications (<http://www.beingthere.com.au>) was used. One of the highlights was a seminar co-hosted at the Karratha Seminar Centre attended by all 30 Pilbara principals and the then Director General, Peter Browne, in which they organized a four way link up with Hedland, Queensland TAFE and Esperance. This proved very strategic as the Director General was very impressed with the potential of the technology and was subsequently very supportive in the endeavours. Later John Verbeek was successful in winning a \$22,500 grant from the Education Endowment Trust for the training of secondary school teachers in the operation and effective curriculum use of VC. The DEO collaborated with the Hedland Campus of Pilbara TAFE who devised a two day certificate course and flew two teachers from each of the senior high schools into Hedland for the course. In terms of implementation, the project was titled *Pilbara Secondary Schools' Videoconferencing Project* and consisted of three stages:

Stage One – Establishment of VC units at the Hedland and Karratha Offices of the Pilbara District Education Office. These were used initially for professional development of teachers and principals, meetings, interviews and school psychology services.

Stage Two – Establishment of VC points at Tom Price, Exmouth, Hedland, Karratha and Newman high schools. Issues for this stage were obtaining funding for the project, weaving through the bureaucracy of government purchasing procedures, installation, training and telecommunications. After implementation throughout the secondary schools this gave the DEO an excellent medium to extend the application of professional learning opportunities for staff and following that, gradual implementation for curriculum delivery for students using SIDE and other sources. One of the highlights was the ability to extend the instrumental music program to inland students with the legendary brass teacher Peter Younghusband (UK) providing expert delivery via the VC medium followed up by occasional visits. Another highlight was the delivery of Peter Smilanich Classroom Management workshops. Initially, cautious of the technology, Peter has been highly praiseworthy and this technology has enabled extensive PD to occur throughout the region in a cost effective way.

Stage Three – Through liaison with the Pilbara Development Commission and State Telecentre Project, additional sites were implemented at remote communities at Yandeyarra, Jigalong, Marble Bar, Onslow and Nullagine. Some of these were sited in schools and others in nearby buildings. The development of supportive teacher networks in areas such as early childhood, ICT, Library, curriculum were then facilitated through the use of this medium. Subsequent to the departure of both Phil Harvey and John Verbeek from the Pilbara District Office the use of the VC

technology has continued and additional sites have come on board at Paraburdoo, Pannawonica and possibly Roebourne. This has included VC training for the Curriculum Leaders Reference Group. A video conference with the Leadership Centre in Perth provided an interactive workshop focusing on the Leadership Framework as part of this professional development.

John Verbeek has now joined the Pilbara Development Commission (PDC), and will be re-engaging with this VC technology, in particular with Hedland and Newman Senior High Schools in 2006. They are involved in the Flexible Learning in Schools Project (FLIS) where delivery of five Year 11 TEE subjects is being carried out using VC and Janison's Toolbox applications (personal communication with J. Verbeek, February 16, 2006).

Further to the DETWA Telecommunications Services project the 100 schools project has supported the provision of extensive professional learning for teachers and where required, upgraded computer equipment and networking infrastructure. The 100 Schools Project is a significant strategy in the DETWA "Plan for Government Schools 2004 - 2007" as well as a component of the "Education to Community" (e2c) strategy as part of the State Government's overall strategy to improve learning opportunities for children in government schools across Western Australia. The 100 schools chosen have been progressively brought into the project over four years in four phases. In 2003 35 schools commenced in Phase 1; in 2004 22 schools commenced in Phase 2; in 2005 23 schools commenced in Phase 3 and in 2006 the final 20 schools will commence in Phase 4. Schools in the project received:

- funding of additional staff time in each school for a school-based curriculum ICT Co-ordinator to support teachers using information and communication technology (ICT);
- funding for a professional learning program for each school and the development of a learning community both online and face-to-face;
- additional computers where required;
- an extensive cabling program;
- electrical power upgrades to accommodate the new ICT equipment and infrastructure; and
- where required, installation of steel security cabinets and the upgrade of existing storerooms to protect schools' ICT equipment.

The 100 schools project **does not** fund the acquisition of curriculum applications and software; and peripherals (100 schools website, 2005).

CEO

The Catholic Education Office of Western Australia (CEO) in 2002 rolled out a purpose-designed broadband telecommunications network "CathEdNet" to provide a more comprehensive education delivery system for the entire Catholic education system in Western Australia. The aim was to facilitate seamless exchange through an 'always on' connection for 158 schools and eight regional offices throughout the state, of which three are regional offices. The VPN for the Catholic Education System consists of broadband high speed ADSL with 60 sites at 10Mbps; smaller metropolitan and regional schools receiving 1Mbps to 2Mbps; nine remote schools have two-way satellite (Figure 1); and Religious Orders receiving a low-cost remote access facility. The system is linked to Notre Dame University campuses in Perth, Melbourne and Sydney. The broadband structure of CathEdNet allows for simultaneous transmission of voice, fax, video and internet data. SINA (Schools Internet Network Administration) software is being used to establish and manage user accounts, filter

particular Internet sites and monitor and control Internet access and download costs per user (personal communication with M. King, Assistant Director, Secretariat, Communication & Technology Section, CEO, February, 24, 2006) .

The CathEdNet network provided fundamental applications through MyInternet virtual intranet service (<http://www.myinternet.com.au/>) providing collaborative communications and resource opportunities for all users; allowing each site to establish its own intranet; and allow users to publish resources and student work online. A staff messaging service (SMS) including email, diary and task, contact and information management facilities provided all teachers and administration staff with secure electronic messaging accounts accessible via the network and remotely. This includes MyDesktop (email and communications with some 8000 mailboxes and 6500 staff in the system), MyClasses and MyPortfolio providing a complete product suite of tools for users. The use of re-usable resources shared across the network has been one of the focuses driving the use of the network. Dr Peter Carey, Curriculum Consultant for Technology & Enterprise, Careers and The Arts (7-12) at the CEO in his article entitled *On Trial: Learning Federation learning objects*, and reported in Curriculum Circular (2005) suggests:

The myclasses software suite enhances the ability of schools to integrate Information and Communication Technologies (ICT) across the curriculum...and is different from other products as it not only supports existing teaching practices but also presents an interactive approach to ICT in the classroom. myclasses supports collaborative programs aimed at building learning communities and helps teachers benefit from the work of others thus minimising 'reinventing the wheel'. Research has shown that high quality digital curriculum resources increase student engagement and motivation, and help teachers to reinforce the teaching – two key ingredients for improving learning outcomes.

Multi-party videoconferencing is being trialled by the CEO as a way of offering low cost and high benefit training and professional development and as a support tool especially with remote communities. The CEO is currently a recipient of an Australian School Innovation in Science, Technology and Mathematics (ASISTM) Project grant to use video conferencing with teachers in remote schools in the Kimberley. Video trials are using the Centra 7 video conferencing software which, while expensive to set up, offers a suitable Desk Top video conferencing application. Schools with ASDL landline connections have access but satellite schools require the added cost of a bridge. The challenges faced by the CEO are to help teachers see the benefits of a system-wide integrated network solution and explore future potential. Professional development sessions are achieving this long term goal of providing the Catholic education system in Western Australia with technology that is at the forefront of functionality, cost effectiveness and the provision of future opportunities for educational outcomes (Catholic Education Circular, 2005).



Figure 1: Connecting the satellite connection at a remote community

Source: http://web1.ceo.wa.edu.au/pls/portal30/docs/FOLDER/CA_CATH_ED/CEO_REP_ABOUT_US/CIRCULAR/CIRCULARJULY05.PDF

AISWA

The Association of Independent Schools of Western Australia Incorporated (AISWA) was established in 1962 as a non-profit organisation to support, represent and promote the interests of 140 Independent Schools with over 55,000 students. At the commencement of the 2004 academic year, AISWA embarked on a project to enable member schools participate in an online learning environment. The primary aim of *AISWAlearningnet* is to enable teachers, students and their parents access to their school's online learning environment from anywhere (even within the school) and at any time. The prime driver for *AISWAlearningnet* was the creation of a platform through which AISWA member schools would access the learning objects being developed by The Le@rning Federation (TLF). AISWA's preferred method of distribution of these resources was through an ASP model, with a repository of the learning objects being held in the data centre.

As M^cLean Hewitt (2004; and personal communication D. M^cLean Hewitt, February, 16, 2006) states one of elements of the *AISWAlearningnet* project is the provision of an interactive online learning environment that will provide students with curriculum related activities specifically developed to meet their individual learning needs. The introduction of the "Scholaris Learning Gateway" portal has created a whole range of possibilities for member schools. These include a Learning Management System providing a "role-based" interface, with each user having their own portal which can be customised to the individual's requirements and giving access to a variety of relevant information and resources, depending on the permissions of the user. The Scholaris suite of applications caters for school needs such as: email; tools which enable and enhance collaboration; the learning management system; active class lists; an attendance application; a resource booking application; a maintenance reporting and recording application; along with schedules that gather and display personal calendar, school calendar and news events. The learning management system will include modules for planning and delivery of learning, an assessment journal, reporting package and an e-portfolio element.

Scholaris will be rolled out to AISWA member schools on a voluntary basis and as schools feel they are ready to embrace the advantages of an on-line learning environment. To begin with, *AISWAlearningnet* will initially be comprised of Solution IT's Scholaris Learning Gateway however, very quickly other services will be added, such as off-site backup and storage. Video conferencing for teaching, Professional Learning opportunities and the construction of a virtual school environment which will comprise Phase 2 of the *AISWAlearningnet* project (personal communication with D. M^cLean Hewitt, February 24th 2006). The advantages of AISWA schools joining the *AISWAlearningnet* project will include:

- sector-wide pricing for a variety of applications and services, negotiated on behalf of member schools.
- access to the Le@rning Federation's learning objects, together with an application which will search for a learning object and then assist the teacher to place the learning object into a learning context for student access. Learning Objects can then also be incorporated into lesson plans and curriculum materials.
- Representation on state and national ICT bodies.
- Dissemination to member schools of the latest trends and developments in ICT occurring in Australia and internationally through the *AISWAlearningnet* website and through targeted email distribution groups.

- Liaison service between member schools and AISWA *learningnet* quality-assured, partnered vendors.
- ICT Consultancy service:
 - Support and advice to schools regarding ICT matters
 - Assistance with teacher professional development
 - Assistance with school planning and policy development

The major problem facing schools, from the AISWA *learningnet* project's point-of-view is the disparity of broadband access that exists across AISWA member schools. Bandwidth will be the key to schools' participation in online learning environments.

THE WESTERN AUSTRALIAN TELECENTRE NETWORK

The Western Australia Telecentre Network offers the largest coordinated network of Telecentres in the world with over 100 regionally located Telecentres. Small communities, some less than 200 people, in regional areas of Western Australia are now 'wired' to the global community opening up a wealth of opportunities in a geographically vast State. The Telecentres house state-of-the-art equipment: typically a bank of computers, the Internet, email facilities, two-way 128kbps videoconferencing through the Polycom system in 60 centres, photocopiers, fax machines, printers, TV and video machines, decoders and scanners. Telecentres link country Western Australia with local, regional, state, national and international trade, employment and training opportunities. Most Telecentres have satellite receiver dishes which enable them to participate in conferences or deliver education courses such as Technical and Further Education (TAFE) material on a state, national or international basis (one way video two-way voice) through the State's Westlink satellite service.

The Telecentre network is also designed to strengthen local regional communities as each Telecentre is initiated and managed by a local committee. The Telecentre Network consists of the Individual Telecentres in partnership with their communities; The Telecentre Support Branch providing support, brokerage and development for the network; and The Telecentre Advisory Council providing advice to government to support current and future operations of the network. The future for Telecentres includes more centres with established full, two-way 128kbps videoconferencing facilities (see <http://www.telecentres.wa.gov.au/videoconferencing/>) and more sharing of resources with other Government services and centres such as libraries. There will also be growth of Telecentre Access Points (or TAPs) for communities where population size does not permit a full Telecentre.

In a state the size of Western Australia, communicating with colleagues, clients and even family who are located throughout the state, country or world can be costly and time consuming. Videoconferencing allows individuals and small and large groups to meet face-to-face with others, regardless of the distance, without leaving their local area. The technology enables two way vision and voice communication to happen in real time at a fraction of the cost of physically moving individuals, or groups, to another town or major city. As stated on the Telecentre website *"It's cheaper and faster than hopping on the plane"*.

With such telecommunication resources in many remote and rural communities of Western Australia the possibilities of sharing resources arises. Currently the Polycom dedicated video conferencing system is used. Options for low cost Desk Top video conferencing and more integrated approaches over the Internet (IP) are being investigated. Video conferencing

currently is charged by landline costs, connecting to the bridge if more than one-to-one use and satellite connections if needed.

CONNECTIVITY AND TEACHING & LEARNING OPPORUNITIES

While such valuable resources are provided in remote communities in Western Australia, interviews held with three teachers within each of the three systems confirmed that issues remain currently with connectivity, bandwidth speeds and cost, hence affecting teaching and learning opportunities. Previous research undertaken by Rabbit & Pagram (2003; 2004) documented how connectivity has improved over the last few years due to national directives. Likewise this survey of the three teachers confirmed good email connections, but cost and technical issues. One teacher had problems with the satellite connection and hence did not use the Internet in his classroom and had become quite disillusioned with the technology. The other school had issues with the telecommunications security on their network being so secure or “locked-down” that many teaching and learning activities were now restricted. For example he did not have email addresses for the students as the system will not allow certain programs to run. He was trying to establish email accounts for his students via <http://think.com> as an alternative. He also wanted to try Desk Top video conferencing but was unable to. The other school teacher interviewed was currently involved in an ASISTM project where video conferencing is being trialled as a way of offering professional development and support tool to remote communities. This teacher was very positive about the opportunities this technology offered remote communities. One of the three teachers interviewed had used a Telecentre, but the other two teachers saw possibilities of using such a resource in the future if the school was not able to supply VC facilities.

CONCLUSION

The Networking the Nation plan has begun to achieve its aim of connecting all Australians regardless of where they are hence closing the digital divide between city and country living. In Western Australia opportunities are being provided through the VPN of the three education systems for their member schools to be connected to the outside world despite where they are. Issues remain of reliable, low-cost connectivity currently but these should improve with the \$1.1 billion over the next four years for *Connect Australia* initiatives. The Telecentres also offer a possible resource. This paper has been able to provide a snapshot of each of the three education systems telecommunications networks and teaching and learning opportunities. A clear directive of how connectivity can enhance teaching and learning opportunities in remote communities needs to be explored further as the telecommunications networks develop within the three education systems. There are enormous opportunities for the development of video conferencing and VoIP with teachers and students in remote Western Australia and these are yet to be realised to help further close the digital divide.

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