

Exploring the real value of high-speed connections

Broadband is increasingly becoming a **fundamentally important infrastructure** – and Australia is at the forefront of this trend, extending the technology to all its citizens. However, it is the development of next-generation broadband applications that has the **potential to transform society**, including improved health outcomes, education and quality of life.

IBES: the facts

► Established at the University of Melbourne in July 2009, IBES is a cross-disciplinary research institute dedicated to products and services that maximize the benefits of new broadband technologies to Australian society. IBES provides a national and international research focus on the full spectrum of social, business and technological activities associated with the National Broadband Network. The institute receives funding from the State Government of Victoria, the University of Melbourne and industry partners such as Ericsson. For more information, visit www.broadband.unimelb.edu.au

► **IN AUSTRALIA, THE FEDERAL** government has committed AUD 43 billion (USD 42.84 billion) to build a national broadband network that will deliver fiber-to-the-premises infrastructure to 93 percent of homes and businesses, and next-generation wireless and satellite services to the remainder of the population. Additionally, Australia's mobile operators are increasing the capacity and throughput of their networks.

These upgrades to existing infrastructure present an enormous array of engineering challenges. However, the vast amount of innovation that will result from the development of these networks will not be in the physical rollout, but rather in the uses of the infrastructure. New applications in health, education, community infrastructure and business, in addition to entertainment services, will drive new video, voice and text-based applications that will transform many aspects of society.

The Institute for a Broadband-Enabled Society (IBES), based at the University of Melbourne, Australia, was established to research new applications of broadband across a range of industry sectors. Bringing together the research community, industry and government, the institute has developed a comprehensive research program with over 40 projects focusing on key national challenges in business transformation, environmental monitoring, social inclusion, education, and health and well-being.

Like many countries, Australia is faced with an aging population, and as a result the cost of health care is expected to increase sevenfold by 2050. Broadband has the potential to alleviate some of this increased expenditure through the development of new ways of interacting with and administering health services. Video meetings have the potential to transform the health industry and the way that patients interact with their general practitioners and health specialists. Patients may no longer have to visit multiple clinics, bringing along hard copies of medical records and images. Rather, telepresence will allow multidisciplinary medical teams to be brought together in a virtual space to develop comprehensive treatment plans for patients. This process will reduce travel time for all involved, and poten-

tially produce a higher quality of care. IBES telehealth projects are investigating the potential of this technology in a number of settings, including neurology, remote stroke management, teledentistry, women's health and care services for the elderly.

The impact of broadband extends beyond teleconsultation. There is real potential for the use of broadband applications in disease prevention. The importance of this cannot be overstated. In 2005, the Australian Institute of Health and Welfare National Health Survey found that over 7 million Australians had at least one chronic condition, such as coronary heart disease, diabetes, osteoporosis or asthma. A more recent survey from the same institute found that 9.3 percent of hospital stays could have been prevented, had patients better monitored and managed their condition. Broadband technologies can assist with this problem by providing timely feedback to patients, encouraging behavior modification and lifestyle changes, and thereby preventing deterioration and hospitalization.

ASSESSING KNEE-LOADING

Ericsson Australia is working with IBES on a remote wireless monitor to help with the treatment of knee osteoarthritis, a common chronic joint disease among older adults. In 2007, a report by the consultancy Access Economics found that 7.8 percent of the Australian population was affected by this condition, and projected an increase of 11 percent by 2050. There is no cure for knee osteoarthritis, and treatment is limited to pain relief and physiotherapy until a joint replacement becomes necessary. Current monitoring techniques require patients to visit a complex gait laboratory, where specialized equipment is used to assess knee loading. Researchers at IBES, with support from Ericsson, are developing a wireless sensor that uses mobile phone technology to measure knee-loading as patients go about their daily activities. The sensor will provide timely feedback through the telecommunications network to patients and their clinicians. It is expected that monitoring the knee under real-world conditions, as opposed to in a laboratory, will result in a more accurate assess-



An application made possible by mobile broadband is to monitor knee patients while they go about their daily activities.

ment of joint usage patterns and disease progression, and support more effective interventions. Practical and low-cost monitoring applications such as this will increasingly become integral to the delivery of health care.

Health care is only one area in which broadband has the potential to fundamentally reform workplace practices and service delivery. In the Connecting Learners project, researchers at IBES are investigating the use of social media and video meetings to connect learners in rural areas with their peers in metropolitan areas, as well as with schools in other countries. This work is demonstrating that broadband can assist with workforce shortages in specialist areas such as science and Asian languages, providing better educational services to students of different ages and demographics. The project is developing a prototype system that will bring together several broadband technologies

to facilitate collaboration between diverse groups of students and their teachers.

VISUALIZING MOLECULES

IBES is also exploring mechanisms that can enable education institutions, such as the University of Melbourne, to extend the ways they deliver teaching, learning and community engagement outcomes such as public lectures and informed debate. With Ericsson's assistance, IBES researchers have developed a proof-of-concept internet protocol television platform called UniTV.

This service has the potential to deliver a wide range of educational services and content from across the university. The platform recognizes that universities are content providers in their own right. They provide content in the form of lectures and tutorials to their students. They also provide new content through ►

► their research activities and frequently contribute to public debate, and they generate public content through public lecture series. UniTV is investigating ways in which the vast array of content produced by the University of Melbourne can be delivered to audiences such as students, research teams or the general public in remote locations, including in their homes.

The prototype platform supports the delivery of both two-dimensional (2D) and three-dimensional (3D) content across a managed network to a standard retail 3D television. The use of 3D imagery is likely to become increasingly popular, not just for the next generation of movies and computer games, but also in educational settings to assist with the visualization and manipulation of complex shapes, data sets and objects. For example, 3D imagery can assist students to visualize a protein molecule and see the way it folds, or examine the intricacies of a piece of ancient Minoan pottery. Clearly, this mode of teaching and learning has important pedagogical implications, providing new ways to educate and inform students across a variety of skill sets and interests.

MANIPULATING TOOLS

IBES researchers are also focusing on 3D technology in training the next generation of medical students. Surgeons need to develop specialized motor skills to carry out operations with precision. One common method that surgeons use to develop their skills is watching other surgeons perform operations. Broadband opens up a number of new ways for trainee surgeons to develop mastery of their art. For example, haptic devices allow users to touch and manipulate objects in virtual environments, providing sensory feedback so that practitioners at two different locations can share the sense of touch. Researchers are exploring how to enable an experienced surgeon to perform a virtual operation in one location while, in a second location, the student feels the way the surgeon manipulates the tools. The student could then attempt to perform the operation with the surgeon assessing his/her dexterity in the task. High-speed broadband would enable the training exercise to take place in hospitals in different parts of the country or even the world.

The projects outlined briefly here demonstrate the importance of high-speed broadband to our future health and education services. However, broadband also has enormous potential to transform other sectors. For example, sensor networks in the energy sector have the potential to reduce carbon emissions. They can also assist in the management of other resources, such as water.

This is particularly relevant to the Australian environment, which has recently suffered many years of drought. Social media can help address increasing rates of poor mental health among young people by enabling them to connect with their peers to overcome isolation. Home monitoring can help older people to continue to live at home, reducing the burden on care facilities and the public purse while allowing them to retain their independence. Broadband technologies can also help encourage social interaction and the rebuilding of communities in both the real and virtual worlds.

All of these issues, and many more, are being investigated by IBES and demonstrate that broadband is increasingly becoming a utility infrastructure, as fundamentally important as water, gas and electricity. We have seen the electricity grid evolve from simply providing lighting to supporting a vast array of devices from refrigerators to computers, and even electric vehicles. In the same way, broadband networks of national scale provide the platform for innovative applications that push the boundaries of how the technology is used, resulting in improved health, education and quality of life. ●

Sources:

Commonwealth of Australia. Australia to 2050: Future Challenges. January 2010, p. 8. Available at <http://www.treasury.gov.au/igr/igr2010/>

AUTHOR



► **KATE CORNICK** is the Executive Director of the Institute for a Broadband-Enabled Society (IBES). She worked as a Research Fellow

at the University of Melbourne prior to joining the office of Senator Stephen Conroy, the Australian Minister for Broadband, Communications and the Digital Economy, as the Senior Telecommunications Adviser. Cornick advised the minister on National Broadband Network policy, consumer issues and regional telecommunications. She has a PhD from the University of Melbourne in optical telecommunications.

(kate.cornick@unimelb.edu.au)

AUTHOR



► **ADAM LODDERS** is the Communications Manager at the Institute for a Broadband-Enabled Society (IBES). He has 10 years' experience

in the area of marketing and communications. Lodders holds degrees in economics and politics and is currently studying for a Master of Public Policy, focusing on communications policy and the digital economy.

(alodders@unimelb.edu.au)