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Making a Strong Connection at APEC TEL 33

Herve Guy of CANARIE sits at the controls during a live high-definition MusicGrid demonstration during APEC TEL 33 in Calgary, AB.

The Communications Research Centre Canada (CRC) had the opportunity to discuss trade, investment and international partnerships with APEC's 21 member economies at the 33rd APEC Telecommunications and Information Working Group meeting, held in Calgary, Alberta from April 23-28.

APEC TEL is considered one of the most active and dynamic working groups within APEC, with members from Canada, China, Japan, Australia, the United States, Mexico and others. Reflecting the diversity of the Asia-Pacific region, the working group is mandated to improve the telecommunications and information infrastructure while facilitating effective cooperation, free trade, investment and sustainable development.

APEC TEL 33 was the largest meeting to date, with over 300 delegates from outside of Canada and 200 Canadians

participating. CRC was part of the organizing committee, led by Industry Canada. The meeting gave representatives the chance to discuss key issues such as effective regulation, wireless security, spam and related threats, advanced technologies for remote communities and persons with disabilities, strengthening trade flows, support for the World Trade Organization's negotiations, and ways to best make use of emerging technologies.

During the meeting's opening reception, CRC facilitated demonstrations to illustrate the benefits of broadband for remote communities by linking music students with instructors via videoconference technology.* Attendees in Calgary were able to see and hear former principal trumpet player Doug Sturdedant of the National Arts Centre Orchestra, teaching a student jazz quartet at a school in St. Johns, Newfoundland. The remote village of Kangiqsualujjaq, Quebec was also connected by a broadband satellite connection, allowing delegates to watch aboriginal musician Karen Kettler in Ottawa teach Inuit schoolchildren a throat singing and drumming lesson. CRC's MusicGrid partners, including the National Research Council, the National Arts Centre, CANARIE and Telesat, supported the demonstrations.

During the program, CRC organized a Broadband Remote and Indigenous Communities Workshop. A satellite connection provided by Telesat enabled a virtual presentation by a teacher and students from the Ulluriaq School in Quebec. Mark Brazeau, vice principal and coordinator of the broadband program at the school, also joined the workshop via satellite. Discussion focused on broadband for remote and indigenous people and the impact that access to broadband technologies has had on the remote Inuit community.

CRC organized the Grid Showcase which offered APEC TEL delegates the opportunity to view ten leading grid applications from Chinese Taipei, Singapore, Japan, Korea and Canada.** Connectivity assistance from CANARIE and Telus allowed each of these applications to be carried over the CA*net 4 infrastucture and then into other national networks. CANARIE also presented a demo of the second-generation User Controlled LightPath (UCLP) software, a new technology that gives users the ability to create and manage their own private optical networks. CRC assisted to connect Canada and Chinese Taipei during the event.

The Asia Pacific Economic Cooperation (APEC) represents one of the fastest-growing world regions and is a major contributor to global prosperity and stability. The combined population and GDP growth of that region represents half of the world population and trade.

*For more information about CRC's MusicGrid program, please see Issue No. 2/Fall 2005 at: http://www.crc.ca/en/html/crc/home/mediadesk/eye_on_tech/eye_on_tech.

**For more information about APEC TEL 33 and the Grid Showcase, please contact Debbie Kemp at debbie.kemp@crc.ca

Tuning in to Emerging Radio Technologies

To most of us, radio consists of an AM/FM dial and a number of frequencies, or "stations," that may offer up a favorite tune or a news update. Behind the scenes, however, the dynamic world of radio is rapidly growing and changing as new technologies emerge.

At the Communications Research Centre Canada (CRC), researchers have been studying Digital Audio Broadcasting (DAB) since the late 80s. DAB radio works by converting the music or speech from an analog signal into digital

code. This vastly reduces the potential for the broadcast service or content to be corrupted during transmission by reflections, interference and other problems that can degrade the quality of reception. Unlike AM and FM radio, DAB was designed to be received by mobile receivers. For this reason, DAB needs to occupy a larger bandwidth (7.5 times larger than FM radio), which makes the transmitted signal more robust.

From the perspective of the DAB listener, larger bandwidth simply means that the problems of "hiss and crackle" (caused by multipath interference) are eliminated, resulting in a better overall sound. Another user advantage is that DAB digital radio sets come equipped with a small screen that carries information about the program, such as the song title being played, the artist, up-to-the-minute sports results and more.

Today, CRC is involved in the development of an improved version of the original DAB system. This will make it even more spectrum-efficient and allow for the introduction of multimedia services without sacrificing bandwidth for audio services. In the future, DAB may include services such as mobile television, a broadcast Web site (BWS), an electronic program guide (EPG) and visual radio, which would add a synchronized visual component, such as a slide show, to an audio program.

CRC is also working with CBC to set up a Mobile Multimedia Broadcasting (MMB) system in Montreal. MMB is a generic name for all the DAB-based multimedia technologies, which aim at providing TV and multimedia content to mobile and portable receivers. It is expected that these technologies will be introduced primarily on cell phones and PDAs, with multimedia services provided by radio broadcasters who hold the broadcast infrastructure and the spectrum. The experimental system in Montreal will allow comparative tests and demos of the different technologies, which will assist in the development of engineering rules for the planning of these services.

Researchers at CRC are also watching a competing radio technology called In Band on Channel (IBOC), which has been developed and deployed throughout the U.S. With an aim to understand the impact of IBOC should it be adopted by Canadian broadcasters, CRC staff are studying factors such as the quality of the digital coverage and its robustness for mobile and indoor reception. They will also look at interference to other FM stations caused by the addition of this digital signal, particularly when all the stations in a very spectrally congested area are turning to digital IBOC. Their studies are made possible by CRC's unique prediction software, called CRC-COVLAB.

In addition to the DAB and IBOC, a number of other mainstream radio technologies are competing for air time. Satellite radio services, offered by companies such as XM Radio and SIRIUS, allow listeners to tune in to commercial-free channels based on a user subscription fee. The Internet is also a contender in its own right, allowing for easy access to music in a downloadable MP3 format.

Philippe Gandy and Jean-Michel Bouffard at work in the Digital Audio Broadcasting (DAB) Lab at the Communications Research Centre Canada.

Phillippe Gandy works in a CRC test vehicle, equipped with a complex antenna system that allows the reception of DAB at vehicle speeds higher than what the current standard allows.

With so many changes on the technological landscape, broadcasters can't help but be nervous about the future. It's a crucial time for the broadcasting industry to stay in touch with emerging radio technologies, and to reconsider the role of traditional radio amidst the many new players in the arena. At CRC, researchers play the role of looking beyond the technology horizon, to advise Canadian broadcasters on new trends and changes taking place around the world. CRC is plugged into various international radio standards committees, and reports back to Canada's broadcasting industry on the key findings.

While the question still remains over which emerging radio technologies will stand the test of time, it's clear that radio as it once was will never be the same again.

*For more information about CRC's work with emerging radio technologies, please contact René Voyer at rene.voyer@crc.ca.

EU FP6: CRC Joins the Chorus on the International Research Stage

Through participation in the European Union 6th Framework for Research and Technological Development (EU FP6), the Communications Research Centre Canada (CRC) had a unique opportunity to expand its knowledge of European communications priorities while gaining international visibility.

The FP6 is the European community's framework program for research, technological development and demonstration. It is a collection of the actions at the European Union level to fund and promote research. Through a science and technology (S&T) agreement with Europe, Canada is allowed to actively participate in the framework program and has been involved since the fourth framework.

Working with EU FP6 has given CRC the opportunity to obtain the latest results in international R&D on communications issues such as wireless security and 4G, which would define the future standards for wireless devices. Researchers participated in two projects: Dependable Security by Enhanced Reconfigurability (DESEREC) and Wireless World Initiative New Radio (WINNER).

The DESEREC project aims to increase the dependability and resilience of information

systems used in critical infrastructure such as traffic management, energy distribution, transport and defense. DESEREC proposes to dramatically improve the information and communication systems supporting critical services to European citizens.

SIXTH FRAMEWORK PROGRAMME

The key objective of WINNER is to develop a ubiquitous radio system concept, or single adaptive system concept, providing wireless access for a wide range of services, applications and environments. The WINNER system will address the strategic objectives of 4G communication systems. Such a radio system would improve on performance and quality of service, to meet future market demands and provide an optimum user experience.

The EU FP6 had its last call for proposals in April 2006, and selection and negotiation meetings will be taking place over the coming months. The highly-anticipated launch of FP7 is scheduled for later this year.

*CRC is the national contact point for the Information Society Technologies Programme (IST). For more information, please contact Debbie Kemp at debbie.kemp@crc.ca or visit www.crc.ca/ncp.

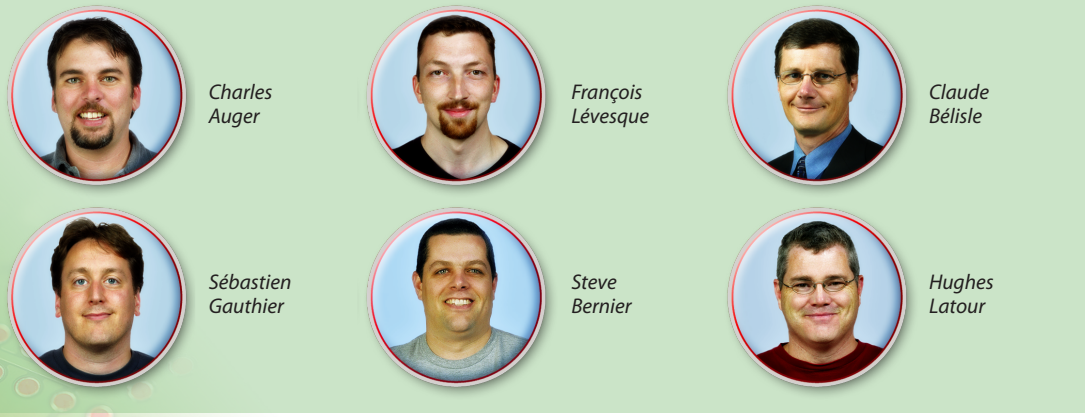
Making R&D a Commercial Reality

While R&D is at the heart of the Communications Research Centre Canada (CRC), it is bringing technology research to the marketplace that allows CRC to offer hands-on assistance to Canada's communications industry.

This year, a research group at CRC is being honored for their exemplary achievements in technology transfer. CRC's Advanced Radio Systems Group received an "Excellence in Technology Transfer Award" from the Federal Partners in Technology Transfer (FPTT), for its contribution to Software Defined Radio (SDR) technology. This award recognizes the transfer of technology from a federal laboratory to a commercial application, resulting in significant public good or economic impact.

Since 1999, CRC's Advanced Radio Systems Group has been working on the development of SDR, a software solution to resolve long-standing interoperability issues between radio systems. Using simple software downloads,

CRC's Advanced Radio Systems Group was recognized by the Federal Partners in Technology Transfer (FPTT) for their work with Software Defined Radio (SDR) technology.



a radio can be reprogrammed to operate on different communications protocols and frequency bands, as required by the situation. The technology is beneficial in times of communications failure, such as during a natural disaster. During a military operation, SDR can be employed to bring together people from different organizations. It also has applications for commercial use, to adapt a single hardware device to a multiplicity of radio protocols.

In addition to resolving interoperability problems, the Software Communications Architecture Core Framework (SCARI Software Suite) developed by CRC also speeds up development cycles and reduces integration costs of radio systems. Initially developed to help start-up companies progress rapidly into SDR development and to support the opening of new markets to existing companies, the SCARI Suite has now been licensed to 14 major companies around the world. This has generated over $600,000 in revenues for CRC in 2005-2006. The SCARI Suite allows third-party companies to provide radio integrators with software and hardware components that are compatible with one another. It can be likened to the concept of a personal computer – performing multiple tasks simply by executing a different program – applied within the radio industry.

Canada's pre-eminent scientists and technology transfer experts gathered at an Ottawa hotel on June 1 for the FPPT Awards Ceremony and Gala Dinner 2006. Since establishing its annual awards program in 1998, FPTT has honored 45 teams and individuals who have developed and transferred a wide array of technologies. These technologies have created jobs, generated wealth and contributed to the general well-being of Canadians.

*For more information about CRC's work with Software Defined Radio (SDR) technology, please contact Claude Bélisle at claude.belisle@crc.ca or visit our Web site at www.crc.ca/sdr. For more information about the Federal Partners in Technology Transfer (FPTT), visit http://www.fptt-pftt.gc.ca/.

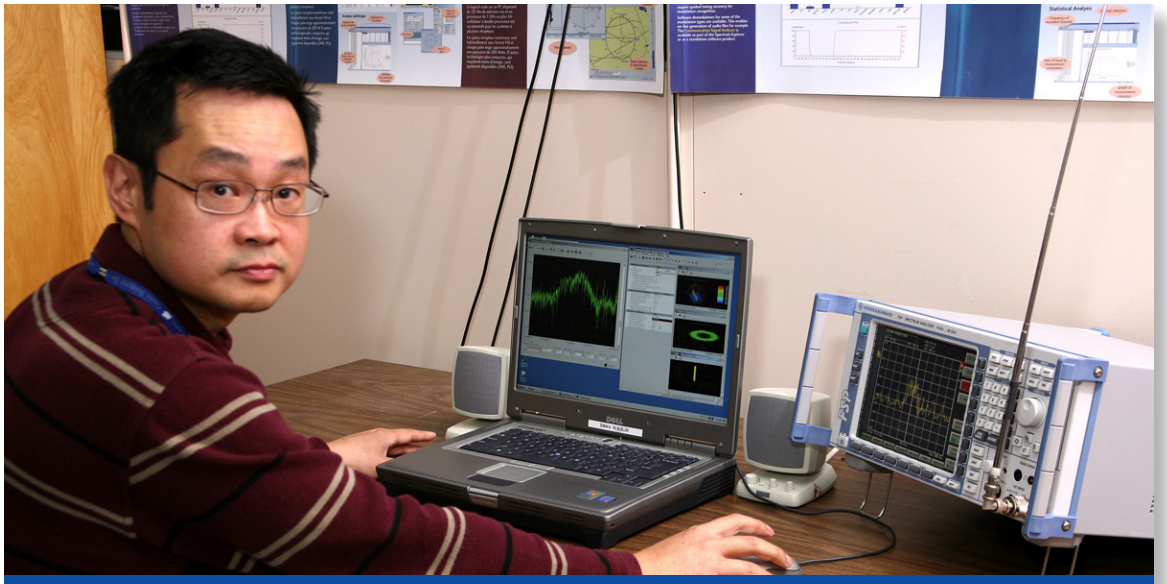
Spectrum Explorer™: Monitoring the Pulse of Canada's Communications System

In a world gone wireless, there is one essential component that connects radio and television, cell phones and pagers, plus a host of other devices. Widely used but often taken for granted, radio spectrum is the invisible but crucial component of the communications system in Canada.

At the Communications Research Centre Canada (CRC), radio spectrum is far from forgotten. In fact, it was here that Spectrum Explorer™ was born. This unique technology, based on open software and hardware architectures, was developed by CRC researchers beginning in 1993 to assist Industry Canada in assessing the use and quality of radio spectrum. From day one, the technology was a hit. Not only was Spectrum Explorer™ considerably less expensive than other off-the-shelf systems, it was also more user-friendly and significantly more flexible.

Currently, Industry Canada operates 25 Spectrum Explorer™ units to assist in the monitoring of spectrum usage across the country. Radio inspectors track broadband frequencies to pinpoint congestion and the causes of interference; to check for compliance to regulations by licensed users; to ensure safe levels of electromagnetic radiation in the radio frequency bands; and, on occasion, to assist in military or police surveillance for security purposes.

Always looking to build on their success, CRC researchers recently designed a new version of Spectrum Explorer™, which boasts a condensed size and weight. The latest system uses only a laptop computer and a moderate-cost spectrum analyzer (Rohde & Schwarz FSP), compared to the original model which required a more expensive VXI chassis with a state-of-the-art PC



Lab view of CRC Spectrum Explorer software being operated by Ky-Bao Huu Ho.

workstation. The result is a high-performance Spectrum Explorer™ that is smaller, more portable, and even less expensive than previous systems.

The new Spectrum Explorer™ system is capable of drawing a complete picture of the spectrum bands within seconds, which can then be updated or modified on an ongoing basis. Using Spectrum Explorer™, radio operators are able to identify channel occupancy and noise levels; locate transmitters (and, in the near future, plot them on a map); identify transmission types; as well as capture and store signals for post processing. Researchers are now pursuing ongoing research and development on a version tailored to meet the needs of the Search and Rescue Satellite (SARSAT) System to monitor traffic and detect interference.

CRC expects that the improvements offered through the new system will prompt a significant increase in the number of Spectrum Explorer™ units used by Industry Canada's radio inspectors and sold by our licensees. In the foreseeable future, these systems may also be the next-generation solution for spectrum monitoring and surveillance within the radio communication industry, serving cellular service providers, law enforcement agencies, military and police worldwide.

*For more information about CRC's work with Spectrum Explorer™ , please contact John Lodge at john.lodge@crc.ca or visit our Web site at www.crc.ca/en/html/spectrum-explorer/home/home.

High-tech Connections Get Personal

Working with partners across the ocean and in another time zone doesn't keep the Communications Research Centre Canada (CRC) from making that all-important, personal connection. A group of researchers at CRC are maximizing the quality of communication with both local and international project partners, through the use of several high-tech tools.

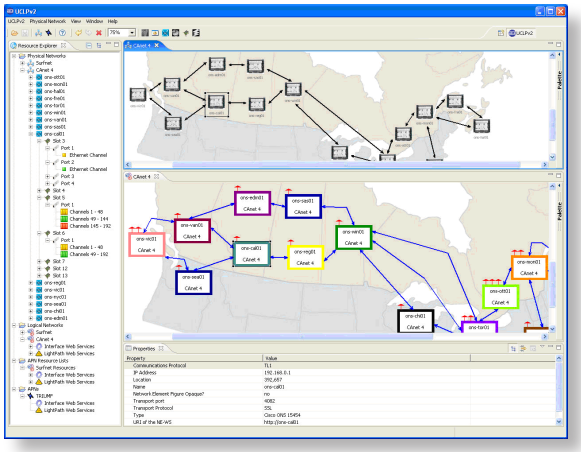
The CRC researchers hold videoconference sessions with three other partners – the University of Ottawa, a Montreal-based start-up called Inocybe Technologies Inc. and the i2CAT Foundation, a technology lab based at the Technical University of Catalonia in Spain. During the sessions, which take place once a

week and can last up to three hours, the four groups share information about their common project goal – the development of a next-generation User-Controlled LightPath (UCLP) software program.

UCLP is a new technology that fundamentally changes the current approach to the management and control of optical Internet networks. By using UCLP software, users have the ability to create and manage their own private optical networks, and can increase their level of bandwidth and quality of service by drawing on resources from more than one supplier. This type of network flexibility is especially important for communities of users who generate huge amounts of data, such as scientists sharing information about high energy physics, astronomy and bio-informatics.

For consumers, UCLP offers the potential for increasing the quality of high-definition video conferencing, as well as improving virtual learning applications. These are both situations where high quality audio and video, with minimal delay, are extremely important.

CRC researchers can communicate better with their research partners in Canada and abroad through weekly videoconference sessions; a four-way videoconference, taking place in the CRC BADLAB, is depicted here.



In addition to weekly videoconference sessions, the researchers stay connected daily by a voice-over IP system called Skype. Using this tool with a personal computer, a researcher from CRC can instantly initiate a conversation with any colleague using Skype, and even engage in a multi-point conference session. This enables information to be shared quickly between Ottawa and Spain, for example, without the need to craft an e-mail or place a long-distance phone call. Festoon, a plug-in for Skype, also offers optional video capabilities. CRC researchers praise the tools, emphasizing that they wouldn't be nearly as productive without them.

Under the terms of the project, which is funded by CANARIE Inc., CRC and its partners are aiming to deliver a working, open-source UCLP system by the end of June. This will be the second version of UCLP software that CRC has participated in developing.

*For more information about CRC's work with User-Controlled LightPath (UCLP) software, please contact Scott Campbell at scott.campbell@crc.ca.

CRC's mission is to be the federal government's centre of excellence for communications R&D, ensuring an independent source of advice for public policy purposes. CRC, an agency of Industry Canada, also aims to help identify and close the innovation gaps in Canada's communications sector by:

- *engaging in industry partnerships;*
- *building technical intelligence;*
- *supporting small and medium-sized high technology enterprises.*