



SDR'11 - WinnComm

Wireless Innovation Conference on Communications Technologies and Software Defined Radio
29 November - 2 December 2011 * Washington, DC

Connecting technical, business and regulatory leaders ~ Defining the future of radio communications

Conference Report

Keynotes



Paul W. Garnett
Director, Technology Policy,
Microsoft Corporation



fredric j harris, Ph.D.
Signal Processing Chair,
San Diego State University



Dr. Dennis Martinez
Chief Technology Officer,
RF Communications Division, *Harris*



Miguel Pellon
Vice President, Regulatory Compliance & Standards,
Motorola Solutions, Inc.



Bruce Perens
Open Source and Open Hardware
Consultant



Mark Rich
Program Manager,
DARPA/STO



Rajendra Singh
Senior Regulatory Specialist,
World Bank



Kevin Wolf
Assistant Secretary for Export Administration, *U.S.
Department of Commerce*

THANK YOU TO OUR SPONSORS:

Platinum Sponsors:

GENERAL DYNAMICS
C4 Systems



indra



Gold Sponsors:

GENERAL DYNAMICS
C4 Systems

PENTEK

Media Co-Sponsors:



Technical Co-Sponsor:



Travel Grant Provided By:



Presented by:



Established in 1996, the Wireless Innovation Forum (SDR Forum v. 2.0) is a non-profit international industry association dedicated to promoting the success of next generation radio technologies. The Forum's 114-strong membership comprises world class technical, business and government leaders from EMEA, Asia and the Americas. The Forum is the only organization in the world dedicated to serving the industry's needs through advocacy, opportunity development, commercialization and education. For more information, please visit www.wirelessinnovation.org.

From the Organizers

We are pleased to report that your annual US conference and product exhibition continues to hold its place in the advanced wireless community as the premier event for exploring software defined radio, cognitive radio and dynamic spectrum access technologies. Registrations at SDR'11-WInnComm exceeded 400 delegates, with attendees representing 22 countries around the world. We are also pleased to report that the papers from previous years' conferences were downloaded more than 81,000 times. The continued strong participation in this conference, in spite of the continuing down turn in the economy in many segments of the market, reflects the value placed on this event by you and your peers year after year.

This value is reflected in the key drivers for participation identified in the conference satisfaction survey results: an outstanding technical program providing a "one stop shop" for you to learn the latest advances in reconfigurable radio products and technologies coupled with high quality opportunities to network with your partners, your customers and your competitors to understand where the market is at and where it is going. The conference's strength in providing opportunities to network comes from the broad mix of participants from all levels of the wireless value chain including investors, commercial network operators, radio manufacturers, system integrators, government procurement officials, regulators, technology providers, engineering service providers and consultants. A breakdown of these participants can be found on pages 11-13 of this conference report. This breakdown reinforces the strength of the conference - connecting researchers and technology developers (approximately 42% of attendees) with equipment manufacturers, network operators and other acquisition authorities (approximately 57% of attendees) to define the future of radio communications.

We wish to thank with deep appreciation the Track Chairs who helped to make SDR'11-WInnComm a success:

R&D Track Chair: Jarmo Takala, Tampere University of Technology

Workshops Track Chair: Vincent Kovarik, Prismtech

Regulatory Track Chair: Peter Tenhula, Shared Spectrum Company

Publications Track Chair: Mohammed Ismail, Ohio State

Continuing last year's successful format, the Track Chairs organized the conference into Technical Papers, Workshops, Tutorials, and Demonstrations. In addition to the hard work of the Forum staff, more than 70 people contributed on the Technical Program Committee to bring this conference successfully together. At the core of the conference are the 87 Technical Papers and Presentations selected by the Technical Program Committee for inclusion in this year's program. They were split into a Research and Development (R&D) Track and a Design, Manufacture, and Deploy (DMD) Track. Both tracks cover similar topics with the R&D track focusing on novel solutions to unsolved problems and the DMD track highlighting real-world implementations of systems with unique contributions on deploying those systems. This year's paper topics included Software Defined Radio implementations and architectures, Communications Signal Processing, Physical Layer Techniques, Chip Implementations, GPUs, FPGAs, Processors, RF Technologies, Security, Software Systems, SCA, Spectrum Sharing, Cognitive Radio, System Implementation and Testing. Continuing this year, the best papers of the R&D track will be published in the Springer Journal of Analog Integrated Circuits and Signal Processing. This initiative, begun in 2010 and led by Dr. Mohammed Ismail of Ohio State will carry forward to 2012.

This year four Workshops were held covering Requirements and Opportunities, Regulation, Open Source and White Space Communications. The Forum was also joined by the QoS/MOS Program for a workshop on Quality of Service and Mobility in Cognitive Communications. Workshops such as these provide an opportunity for participants to spend a day exploring topical issues in-depth. Some are business oriented, others are technical in nature. Some include a blend of both and are attended by both researchers, government employees and industry practitioners. 11 tutorials were also given at the conference, providing an in-depth deep dive education by subject matter experts on topics including Channelized Receivers, Cyber Warfare, Hilbert Transforms, LTE for Public Safety, MIMO and LTE, RF Design and the SCA. Continuing our rich tradition of outstanding keynote speakers, this year we welcomed Paul Garnett from Microsoft, Fred Harris from SDSU, Eric L. Hirschhorn from the U.S. Dept. of Commerce, Dennis Martinez from Harris, Miguel Pellon from Motorola Solution, Mark Rich from DARPA and Rajendra Singh from the World Bank.

Finally, all of this would not be possible without our sponsors. Without their support, to which we are personally grateful, we would not be able to provide such nice facilities, the welcome reception and all the refreshments. Please thank and support them!

The general comments and attendance at this year's conference have us very excited for the 2012 conference. We look forward to your participation and thank you for your past support.

All the best,



John Glossner, Conference Chair



Pucker, WinnForum CEO

Technical Program Committee



General Program Chair,
John Glossner, *Optimum
Semiconductor Technologies*

Thank you to our Organizing Committee:

R&D Track Chair: Jarmo Takala, *Tampere University of Technology*

DMD Track Chair: Sanyogita Shamsunder, *Verizon Wireless*

Workshops Track Chair: Vincent Kovarik, *Prismtech*

Regulatory Track Chair: Peter Tenhula, *Shared Spectrum Company*

Tutorials Track Chair: Benjamin Egg, *Qualcomm*

Demonstrations Track Chair: Fanny Mlinarsky, *octoScope*

Publications Track Chair: Mohammed Ismail, *Ohio State*

Marc Adrat, *Fraunhofer FKIE / KOM*

Rafael Aguado, *Indra Sistemas S.A.*

Christopher Anderson, *US Naval Academy*

Kamran Arshad, *University of Surrey*

Huseyin Arslan, *University of South Florida*

Philip Balister, *OpenSDR*

Babak Beheshti, *New York Institute of Tech*

Michael Benonis, *Virginia Tech*

Mladen Berekovic, *Tech. Univ. Braunschweig*

Steve Bernier, *CRC Canada*

Shuvra Bhattacharyya, *University of Maryland*

Jerker Björkqvist, *Åbo Akademi University*

Holger Blume, *Leibniz Universitaet Hannover*

Daniel Boudreau, *CRC Canada*

Claudio Brunelli, *Nokia*

Nadeem Bukhari, *DRS Signal Solutions*

Zhongren Cao, *UC San Diego*

Matteo Cesana, *Politecnico di Milano*

SeungWon Choi, *Hanyang University*

Eric Christensen, *GDC4S*

Kuan Collins, *SAIC*

Jan Craninckx, *IMEC*

Panagiotis Demestichas, *University of Piraeus*

Chris Dick, *Xilinx*

Peter Farkas, *Slovak University of Technology*

Ronan Farrell, *NUI Maynooth*

Jose Fridman, *Qualcomm*

Georgi Gaydadjiev, *TU-Delft*

Mikael Gidlund, *ABB Corporate Research*

Jair Gonzalez, *Telecom Paristech*

Kush Gulati, *Cambridge Analog Tech., Inc.*

fred harris, *San Diego State University*

S M Hasan, *GE Global Research*

Xiaopeng Huang, *Stevens Institute of Technology*

Daniel Iancu, *Optimum Semiconductor Technologies*

Harold Ishebabi, *Secodix*

Shalabh Jain, *University of Maryland*

Randall Janka, *Zeta Associates*

Sanjay Jinturkar, *Ikanos Communications*

Friedrich Jondral, *KIT*

Peter Jung, *Universität Duisburg-Essen*

Ben Juurlink, *Technische Universität Berlin*

Wolfgang Koenig, *Bell Labs, Alcatel-Lucent*

Mieczyslaw Kokar, *Northeastern University*

Fadi Kurdahi, *University of California, Irvine*

Rachael Li, *Northeastern University*

Daniele Lo Iacono, *STMicroelectronics*

Fa-Long Luo, *Element CXI*

Trang Mai, *Naval Research Laboratory*

Jimmie Marks, *Raytheon*

Rekha Menon, *Harris Corporation*

Joseph Mitola, *Stevens Institute of Technology*

Klaus Moessner, *University of Surrey*

Jakub Moskal, *Northeastern University*

Christophe Moy, *SUPELEC/IETR*

Markus Mueck, *Infineon Technologies*

Najam ul Islam Muhammad, *Institute Eurecom*

Raghavan Muralidharan, *Tata Power SED*

Timothy Newman, *Virginia Tech*

Eric Nicollet, *Thales*

Keith Nolan, *CTVR*

Robert Normoyle, *DRS Signal Solutions*

Dale Parson, *Kutztown University*

Antti Piipponen, *Nokia*

Nikos Pitsianis, *Duke University*

Kim Rounioja, *Renesas Mobile*

Murugappan Senthilvelan, *U of Wisc. Madison*

Mihai Sima, *University of Victoria*

Sarvpreet Singh, *Fraunhofer FKIE*

Leonel Sousa, *I.S.T. - Technical U. Lisbon*

Paul Sutton, *Trinity College Dublin*

Richard Taylor, *Harris Corporation*

Mark Turner, *Harris Corporation*

Manuel Uhm, *Coherent Logix*

Subbarayan Venkatesan, *Univ of Texas, Dallas*

Kees Vissers, *Xilinx*

Stephan Wong, *TU Delft University*

Exhibitors



Agilent Technologies

Agilent Technologies Inc. (NYSE: A) is the world's premier measurement company and a technology leader in chemical analysis, life sciences, electronics and communications. Information about Agilent is available on the Web at www.agilent.com.

CEVA is the world's leading licensor of DSP Cores and Platform Solutions for the wireless, consumer electronics and storage markets. CEVA's IP portfolio includes comprehensive technologies for cellular baseband (supporting GSM, CDMA, WCDMA, HSPA, HSPA+, TD-SCDMA, LTE and LTE-A), HD Video (1080p 60fps H.264, MVC, S3D, etc.), mobile Audio and Bluetooth. In 2010, CEVA's IP was shipped in over 600 million devices, powering handsets from 7 out of the top 8 handset OEMs, including Nokia, Samsung, LG, Motorola, Sony Ericsson and ZTE. Today, more than 1 in every 3 handsets shipped worldwide is powered by a CEVA DSP core.



Coherent Logix is the world leader of the lowest power, high performance, C-programmable processors for the embedded systems market. Coherent Logix's comprehensive solutions portfolio includes processors, integrated system development tools, optimized libraries, system reference designs, and a customizable system development platform to reduce development complexity and time-to-market. These solutions are designed to support a wide variety of industries, including automotive, broadcast, computer, consumer, industrial, medical, military, test and measurement, wireless, and wireline.

For over 50 years, CRC has been providing technical expertise to both the Government of Canada and Industry in satellite, terrestrial, wireless, and optical communications. CRC is recognized as a world leader in software development for SDR technology. Maker of the JTRS certified SCA reference implementation (SCARI), CRC also offers the most comprehensive integrated development environment for the SCA. CRC has been intimately involved in driving the evolution of the SCA and draws from its long experience to offer consulting services and training. CRC's team is constantly pushing the limits to improve performance, collaborating with best-in-class partners to support the major RTOS, ORBS, processors, boards and systems. Visit our booth to see a demonstration of our latest Core Framework and SCA Development Tools for Eclipse.



Communications
Research Centre
Canada

An Agency of
Industry Canada

Centre de recherches
sur les communications
Canada

Un organisme
d'Industrie Canada



DataSoft develops, markets, and supports a range of SDR products for defense, transportation, telecom, and satellite markets. Our products include SCA and non-SCA development platforms, test automation tools, Android apps, network security tools, and waveform porting tools.

DRS Defense Solutions, a wholly-owned subsidiary of DRS Technologies, is a best-in-class provider of advanced products, services and systems integration to military forces, intelligence agencies and prime contractors. The company is part of Finmeccanica Group (FNC.MI), which ranks among the top 10 global players in aerospace, defense and security, employing more than 75,000 people. To learn more go to www.drs-ds.com.

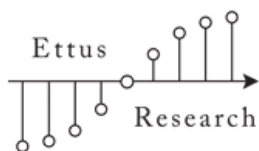


Epiq Solutions designs and builds state-of-the-art low power reconfigurable radio systems for mission critical applications. With expertise spanning RF system design to physical layer signal processing and higher layer protocol processing, Epiq Solutions provides engineering development services for customers requiring specialized signal processing hardware and software. In addition, Epiq Solutions continues to grow its Bitshark family of flexible radio platforms. These radios dramatically lower the barrier for building a software-defined radio system, while providing high performance, an easy-to-use interface, and a small form factor.

Etherstack is a wireless communications software company, and a leading independent waveform specialist. The company has been developing waveforms for radio manufacturers and defence clients internationally for over ten years - since the outset of commercial Software Defined Radio (SDR) - and pioneered many unique techniques and tools key to successful SDR waveform development. Etherstack's engineers combine waveform design best-practice with a detailed knowledge of communications standards such as APCO P25, TETRA, DMR, MPT1327, UMTS, WiMAX, LTE and military specifications. They also specialise in multi-protocol IP core networks, which can be used with waveforms for completely flexible wide-area, field-deployable communications.



Exhibitors



Ettus Research specializes in low cost, high quality software defined radio (SDR) systems. Universal Software Radio Peripheral (USRP) systems all over the world enable users to address a broad range of research, academic, industrial, and defense applications. The USRP platform is designed to address applications that require frequencies up to 6GHz with wide bandwidths and MIMO capabilities

Green Hills Software, Inc. is the largest independent vendor of embedded development solutions. In 2008, the Green Hills INTEGRITY-178B RTOS was the first and only operating system to be certified by the NSA to EAL6+ High Robustness, the highest level of security ever achieved for any software product. Based on the royalty-free INTEGRITY RTOS, Green Hills Platform for Software Defined Radio delivers a complete, standards-based reference platform for developing and deploying SDR systems ranging from the armed forces Joint Tactical Radio Systems (JTRS) to public safety radios as well as commercial small form-factor reconfigurable radios. Our Platform for SDR includes multiple SCA OE solutions that are compliant with the latest POSIX and SCA standards. The Platform for SDR also provides integrated, host-based tools for every aspect of development, debugging, optimization, and deployment as well as a variety of integrated hardware platforms. Founded in 1982, Green Hills Software is headquartered in Santa Barbara, CA with European headquarters in the United Kingdom.



Harris is an international communications and information technology company serving government and commercial markets in more than 150 countries. Headquartered in Melbourne, Florida, the company has approximately \$6 billion of annual revenue and more than 16,000 employees -- including nearly 7,000 engineers and scientists. Harris is dedicated to developing best-in-class assured communications® products, systems, and services.

Innovative Integration is a leader in signal processing and data acquisition hardware and software. Our products combine DSPs and FPGAs with high performance analog, ready for integration into demanding real-time applications such as wireless, medical, and military. Innovative Integration offers complete solutions for software-defined radio applications and IP Cores for Radar, Wireless applications that provide high speed signal processing in FPGAs. These functions have been integrated into Innovative Integration's advanced X5 XMC family featuring Virtex-5 FPGAs and now the new X6 XMC family featuring the Virtex-6 FPGAs.



MathWorks is the leading developer of mathematical computing software. Engineers and scientists worldwide rely on its products to accelerate the pace of discovery, innovation, and development. MathWorks products are used throughout the automotive, aerospace, communications, electronics, and industrial automation industries as fundamental tools for research and development. They are also used for modeling and simulation in increasingly technical fields, such as financial services and computational biology. MathWorks software enables the design and development of a wide range of advanced products, including automotive systems, aerospace flight control and avionics, telecommunications and other electronics equipment, industrial machinery, and medical devices. More than 5000 colleges and universities around the world use MathWorks solutions for teaching and research in a broad range of technical disciplines. For more information visit www.mathworks.com.

National Instruments delivers fast, flexible, and accurate RF hardware powered by LabVIEW software to meet the evolving demands of the wireless industry and see the engineering process through from design to validation to production. Virtual instrumentation from NI helps engineers keep pace with the constantly growing number of standards by delivering tools for signal generation, analysis, visualization, and processing of standard and custom digital and analog modulation formats. Tailored software for standards ranging from WLAN and GPS to WiMAX deliver powerful and cost-reducing wireless test systems that engineers have come to rely on.



Objective Interface Systems, Inc. (OIS) is the global provider of high assurance communications middleware solutions for software defined radios (SDR). The ORBexpress product family is the most widely deployed communication framework for use in complex and demanding environments where failure is not an option. The ORBexpress architecture is used in hundreds of thousands of software defined radios already deployed in the field around the world. ORBexpress is a secure high performance implementation of the real-time CORBA standard. It is the first communications middleware to be evaluated under the Common Criteria, the world's most widely adopted security certification standard. For more information and product evaluations, visit www.ois.com.

Optimum Semiconductor's core technology is a revolutionary multi-threaded DSP architecture with the capacity to perform flexible baseband processing for all wireless protocols including LTE and WiMAX -- as well as all multimedia functions -- without compromising battery consumption.



Exhibitors

PENTEK

Pentek offers powerful VME, VXS, PMC, XMC, PCI and cPCI commercial and rugged board and system solutions. Pentek's data acquisition, software radio and digital signal processing products utilize TI's C6000 DSPs, Motorola's G4 PowerPC and Xilinx FPGAs. Pentek's I/O includes A/D's, D/A's, Digital Receivers and more. Pentek equips products with high-speed interfaces including Serial RapidIO and Fibre Channel and offers strong FPGA, I/O and DSP software support.

PrismTech is an acknowledged leader in Software Defined Radio infrastructure solutions. Our Spectra product suite for SDR/SCA developers includes:

- Spectra CX - a model-driven development tool that greatly simplifies, accelerates, and validates the SCA development process.
- Spectra OE - a high-performance, low-overhead, core framework and middleware implementation that runs on any mix of GPP, DSP, and FPGA processor technologies.



redline
communications

Redline Communications is a global producer of specialized application optimized, outdoor wireless broadband radio systems that allow companies and governments to quickly, easily and securely roll-out or extend networked services and applications over almost any distance. Customers in the Americas, the Middle East, and Africa include some of the world's largest oil and gas organizations, telecom service providers, military organizations, and local and municipal governments.

SoleNet provides design and development services including: system design and analysis, electronic board design, and FPGA code design. SoleNet is a member of Xilinx Xpert and Altera ACAP programs. In addition, SoleNet has experience in designing Lattice and Actel FPGA devices. SoleNet's expertise and experience includes design of High-speed digital, Embedded DSP & RISC processors, analog, RF & wireless, and High efficiency power supply systems. The typical end applications are data acquisition and processing, low-power battery-operated systems, and high reliability rack mountable equipment for telecom, datacom, commercial and military applications. SoleNet has also developed a family of Software Defined Radio (SDR) products. The family includes RDP-100 for HF, VHF and UHF frequency bands as well as the Extreme Radio (X-RAD) series for multi-GHz sampling and operation in L-band. NASA has selected both of these platforms for use by various internal groups. SoleNet, Inc. was founded in 2001 and is located in Gaithersburg, Maryland.



SPECTRUM

SIGNAL PROCESSING
BY VECIMA

Spectrum Signal Processing designs and builds board and system-level hardware solutions for demanding signal processing applications. Spectrum combines high-performance data acquisition (RF, analog and digital I/O) and reconfigurable signal processing hardware with its best-in-class support and engineering services to enable customers to rapidly develop and then deploy their products and systems. Spectrum has worked with both commercial and military customers worldwide to develop and deliver solutions optimized for Intelligence, Surveillance and Reconnaissance (ISR), video, military (MILCOM) communications and satellite communications (SATCOM) markets. For more information on Spectrum and its products, please visit www.spectrumsignal.com. Spectrum is part of Vecima Networks Inc. and its products are designed and manufactured in Vancouver, British Columbia, Canada.

NATIONAL RESEARCH INSTITUTE OF ELECTRONICS AND CRYPTOLOGY (UEKAE), an institute of TUBITAK BILGEM, provides technology solutions and applications in information security and advanced electronics with its expert staff and internationally renowned infrastructure. Established in 1972, UEKAE has made joint R&D projects with private and public organizations for over 35 years. To be able to respond to future national and international demands, UEKAE advances continuously through research and development at its EMI/EMC/TEMPEST Test Laboratories, Acoustic Test and Analysis Laboratory, Common Criteria Test Center, Cryptology Analysis Center, Advanced Technologies Research Institute (çLTAREN), Semi Conductor Technologies Research Laboratory, and Optoçelectronics Laboratory



VANTEON
ELECTRONIC DESIGN

Vanteon provides the expertise, experience, skills and a flexible delivery model to create the custom electronic products our clients' require. We professionally manage projects for on-time and on-budget completion.

Areas of Expertise: Motherboards, Single Board Computers, Reference Designs; Digital Video and Still Camera Imaging Systems; Networking, Communications, and Storage Devices; Internet Appliances, Consumer Devices, Printers, Peripherals; Secure Systems, Encryption, Biometric Devices; Industrial Controllers, Instrumentation, Medical Devices; Portable & Handhelds, Wireless, Custom RF; Transportation/Automotive Control and Display Systems; Government Systems, Aviation Systems. Focus Technologies: RF / Wireless Design 802.11 802.15.4 ZigBee WiMax, Embedded Firmware, Application Software, DSP / FPGA Development, Prototype Fabrication, Analog & HiSpeed Digital Design, FCC / TUV / CE Certification, Pre-Certification / ESD / Immunity Testing

One of the largest university wireless research groups in the United States, Wireless @ Virginia Tech encompasses several centers and groups, including the world renowned Mobile and Portable Radio Research Group (MPRG), Center for Wireless Telecommunications (CWT), and Virginia Tech Antenna Group (VTAG). The research group brings more than 25 faculty members whose technical expertise ranges from communications to networks, and more than 100 graduate students focused on wireless. While expertise lies deep within electrical engineering, such as antenna design, wireless networking, communication systems, micro-electronics, RF electronics, and system integration, disciplines outside of electrical engineering such as computer science, mathematics, economics, and business also make up the Wireless @ Virginia Tech team.



Program at a Glance ★ Monday-Tuesday, 28-29 November 2011

Monday - November 28

18:00 - 20:00 **Early Registration** (Regency Foyer)

Tuesday - November 29

07:00 - 12:00 **Registration** (Regency Foyer)

07:30 - 08:30 **Speakers' Breakfast** (Capitol Room)

08:50 - 09:40 **Morning plenary** (Regency Ballroom) with: **Conference Welcome** by **John Glossner**, Chair

Keynote by **Bruce Perens**, *Open Source and Open Hardware Consultant*

09:40 - 10:00 **Break**

10:00 - 12:00

Potomac 3, 4	Potomac 5, 6	Regency C	Regency D	Regency E	Regency F
Tutorial 1A Next Generation White Nail Architecture for Future Cognitive Radio Transmitter and Receiver Systems <i>Donald Steinbrecher (Navy, USA)</i>	Tutorial 1B Design and Application of a Hilbert Transformer in a Digital Receiver <i>Matt Carrick (Northrop Grumman, USA); Doug Jaeger (Northrop Grumman, USA); frederick j harris (SDSU, USA)</i>	Tutorial 1C Prototype Implementation of a Realtime 8x8 MIMO LTE-Advanced Downlink <i>Ian C. Wong (National Instruments, USA)</i>	QoS MOS Workshop co-located at SDR'11-WInnComm Begins at 9:30	Workshop 1E Open Source	Workshop 1F Regulatory

12:00 - 13:30 **Lunch**

13:30 - 15:00 **Afternoon Plenary** (Regency Ballroom) with: **Conference Announcements:** **John Glossner**, Chair

13:40 **Keynote** by **Mark Rich**, *DARPA*

14:20 **Keynote** by **Rajendra Singh**, *World Bank*

15:00 **Coffee Break**

15:15 - 17:15

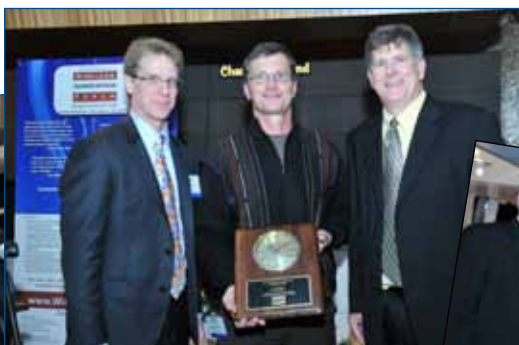
Potomac 3, 4	Potomac 5, 6	Regency C	Regency D	Regency E	Regency F
Tutorial 2A RF, ADC, & IF Design Techniques <i>Part 1: Dr. Ruediger Leschhorn (Rohde and Schwarz); Part 2: Tudor Davies (Spectrum Signal Processing) and Mark Rives (Intersil)</i>	Session 2B Receiver Design - Part 1 <i>Chair: Sm Hasan (GE Global Research, USA)</i>	Session 2C Cognitive Radio and Dynamic Spectrum Access - Part 1 <i>Chair: Haris I. Volos (Virginia Tech, USA)</i>	Session 2D Test and Measurement - Part 1 <i>Chair: Christopher R. Anderson (United States Naval Academy, USA)</i>	Workshop 2E Open Source	Workshop 2F Regulatory

15:00 **Welcome Reception and Forum Awards, Sponsored by General Dynamics C4 Systems** (Odyssey Boat Tour on the Potomac; busing available)

GENERAL DYNAMICS
C4 Systems



Elektrobit (EB) Specialized Device Platform won the Technology of the Year.



Claude Belisle of CRC Canada, won the President's award.



JPEO JTRS took home the International Achievement Award.

Program at a Glance ★ Wednesday, 30 November 2011

Wednesday - November 30

07:30 - 08:30 **Speakers' Breakfast** (*Capitol Room*)

08:30 - 09:20 **Morning plenary** (*Regency Ballroom*) with: **Announcements** by **John Glossner**, Chair

08:40 **Invited Presentation** by **Bob Bailey**, *CAER*

09:00 **Invited Presentation** by **Joe Madden**, *Mobile Experts*

09:20 - 09:50 **Break**

09:50 - 11:50

Potomac 3, 4	Potomac 5, 6	Regency C	Regency D	Regency E	Regency F
<p>Session 3A SDR Processors</p> <p><i>Chair: Raghavan Muralidharan (Tata Power SED, India)</i></p>	<p>Session 3B Receiver Design - Part 2</p> <p><i>Chair: Daniel S Iancu (Optimum Semiconductor Technologies, USA)</i></p>	<p>Session 3C Cognitive Radio and Dynamic Spectrum Access - Part 2</p> <p><i>Chair: Haris I. Volos (Virginia Tech, USA)</i></p>	<p>Workshop 3D Requirements and Opportunities: Government R&D Programs</p>	<p>Tutorial 3E Advanced OSSIE SCA-Based SDR, a Hands-on Tutorial</p> <p><i>Carl B. Dietrich (Virginia Tech & Wireless @ Virginia Tech, USA); Frank Kragh (Naval Postgraduate School, USA); Donna Miller (Naval Postgraduate School, USA)</i></p>	<p>Workshop 3F Test and Measurement - Part 2</p> <p><i>Chair: Fanny Mlinarsky (octoScope, USA)</i></p>

11:50 - 13:50 **Lunch and Exhibits**

13:50 - 15:45

Potomac 3, 4	Potomac 5, 6	Regency C	Regency D	Regency E	Regency F
<p>Session 4A SDR Systems</p> <p><i>Chair: Babak Beheshti (New York Institute of Technology, USA)</i></p>	<p>Session 4B Receiver Design - Part 3</p> <p><i>Chair: Christophe Moy (SUPELEC/IETR, France)</i></p>	<p>Session 4C Cognitive Radio and Dynamic Spectrum Access - Part 3</p> <p><i>Chair: Friedrich K. Jondral (Karlsruhe Institute of Technology, Germany)</i></p>	<p>Workshop 4D Requirements and Opportunities: Government R&D Programs</p>	<p>Tutorial 4E SCA-Next: Benefits and Impacts in Migrating to a New Architectural Paradigm</p> <p><i>Vincent J Kovarik, Jr (Prismtech, USA); Mike Williams (PrismTech Canada)</i></p>	<p>Workshop 4F LTE Network for Nationwide Broadband Public Safety Communications</p> <p><i>Fanny Mlinarsky (octoScope, USA)</i></p>

15:45 - 16:00 **Break**

16:00 - 18:00 **Afternoon Plenary** (*Regency Ballroom*) with:

16:00 **Keynote** by **Dennis Martinez**, *Harris*

16:40 **Panel: SCA and Waveform Portability**, moderated by **Scott Leubner**, *Harris*

Panelists:

- Fabio Casalino, *Selex Elsig*
- David Deacon, *Etherstack*
- Chuck Linn, *Harris Corporation*
- Steve Bernier, *CRC*

18:00 - 20:00 **Exhibits and Technology Showcase** (*Independence A&B*) (exhibitors and showcase listed on pages 10-11)

20:00 GNU Radio Users Meeting, sponsored by Ettus Research (*Regency C*)

Program at a Glance ★ Thursday-Friday, 1-2 December 2011

Thursday - December 1

07:30 - 08:30 **Speakers' Breakfast** (Capitol Room)

08:30 - 09:20 **Morning plenary** (Regency Ballroom) with: **Announcements** by **John Glossner**, Chair

08:40 **Keynote** by **Paul Garnett**, Microsoft

09:20 - 09:50 **Coffee Break**

09:50 - 11:50

Potomac 3, 4	Potomac 5, 6	Regency C	Regency D	Regency E	Regency F
<p>Session 5A RF, IF and ADC - Part 1</p> <p><i>Chair: Chayil Timmerman (MIT Lincoln Laboratory, USA)</i></p>	<p>Session 5B Advanced Signal Processing - Part 1</p> <p><i>Chair: frederic j harris (San Diego State Univ, USA)</i></p>	<p>Session 5C Compilers, Software, and Tools - Part 1</p> <p><i>Chair: Raghavan Muralidharan (Tata Power SED, India)</i></p>	<p>Workshop 5D Requirements and Opportunities: How to Win SBIR Phase 1, 2 & 3</p>	<p>Workshop 5E The Future of Whitespace Communications</p>	<p>Tutorial 5F Cyber Warfare in the Wireless World: What You Don't Know CAN Hurt You</p> <p><i>Dane Brown (United States Naval Academy, USA); Owens Walker (United States Naval Academy, USA); Christopher R. Anderson (United States Naval Academy, USA)</i></p>

11:50 - 13:50 **Lunch and Exhibits**

13:50 - 15:45

Potomac 3, 4	Potomac 5, 6	Regency C	Regency D	Regency E	Regency F
<p>Session 6A RF, IF and ADC - Part 2</p> <p><i>Chair: Kuan Collins (SAIC, USA)</i></p>	<p>Session 6B Advanced Signal Processing - Part 2</p> <p><i>Chair: Fa-Long Luo (Element CXI, USA)</i></p>	<p>Session 6C Compilers, Software, and Tools - Part 2</p> <p><i>Chair: Michael L Dickens (University of Notre Dame, USA)</i></p>	<p>Workshop 6D Requirements and Opportunities: Intro to US Export Controls and ITARS</p>	<p>Workshop 6E The Future of Whitespace Communications</p>	<p>Tutorial 6F Software Communications Architecture "Next" Release</p>

15:45 - 16:00 **Break**

16:00 - 18:00 **Afternoon Plenary** (Regency Ballroom) with:

16:00 **Keynote** by **Kevin Wolf**, US Dept. of Commerce

16:40 **Keynote** by **Miguel Pellon**, Motorola Solutions

18:00 - 20:00 **WinnForum Members' Reception and Annual Meeting** (Forum Members Only) (Regency Ballroom)

Friday - December 2

07:30 - 08:30 **Speakers' Breakfast** (Capitol Room)

08:30 - 10:30

Potomac 3, 4	Potomac 5, 6	Regency C	Regency D	Regency E	Regency F
<p>Session 7A Security and Encryption</p> <p><i>Chair: Rafael Aguado (Indra Sistemas S.A., Spain)</i></p>	<p>Session 7B Government Applications</p> <p><i>Chair: Christopher R. Anderson (United States Naval Academy, USA)</i></p>	<p>Session 7C Standardization and Education</p> <p><i>Chair: Richard Taylor (Harris Corporation, USA)</i></p>	<p>Session 7D Software Communications Architecture (SCA)</p> <p><i>Chair: Eric Christensen (General Dynamics C4 Systems, USA)</i></p>	<p>Tutorial 7E A Rapid Graphical Programming Approach to SDR Design & Prototyping with LabVIEW and the Universal Software Radio Peripheral (USRP)</p> <p><i>Sam Shearman (National Instruments, USA)</i></p>	<p>Tutorial 7F New Directions in Channelized Receivers and Transmitters</p> <p><i>fred harris (San Diego State University, USA)</i></p>

10:30 - 10:45 **Coffee Break**

10:45 - 11:30 **Closing Plenary** (Regency Ballroom) with:

Keynote by **fred harris**, SDSU

11:30 **Endnote, Paper Awards, Conference Close and Satisfaction Survey Drawing**

Logo impressions online

The Forum has a dedicated website (<http://Conference.WirelessInnovation.org>) as the primary vehicle for communicating information on the conference, with the conference sponsors featured prominently on all pages throughout the site. Internet presence was enhanced through the use of Google AdWords. The website had 18,642 visits in 2011, representing 54,613 page views and 3 pages per visit. In addition, in 2011 alone, more than 81,000 files from event proceedings since 2002 were downloaded from our Document Library, which displays the logos and home page links of conference sponsors.

Event Flyers

Call for papers flyers and conference brochures were printed and distributed at sponsored events and in sponsor publications including:

- 4GWE
- IEEE IDSP SC
- LTE Forum
- *Mission Critical Magazine*

Direct eMail Campaign

The Forum sent out weekly announcements beginning in February 2011, related to SDR'11-WinnComm including the call for papers, program updates (keynotes, workshops, tutorials, demos and paper sessions), exhibitor updates, and registration. The emails were shaped to have a targeted message and specific announcement each. There was an average open rate of 17% on a total of 24 emails, giving more than 12,000 impressions. Sponsors logos were included in all messages, with direct home page links.

Updates were also made as appropriate in the members only SDR, CR and DSA News & Opportunities eNewsletter, reaching an average of 1000 member representatives every other week, and through email announcements and calendar postings from our media sponsors reaching tens of thousands of additional potential participants.



Press Releases

Press releases were issued to provide updates to the media and the broader community on advancement of the event. All releases included mention of event sponsors.

Release	Release Views	Date
Technical Program Committee, Call for Abstracts	2,426	25 January 2011
Abstract Extension	2,981	7 April 2011
Registration	2,207	25 August 2011
Awards Finalists	4,255	27 October 2011
Award Winners	2,850	13 December 2011
Total Sponsor Name and Link Views	14,719	

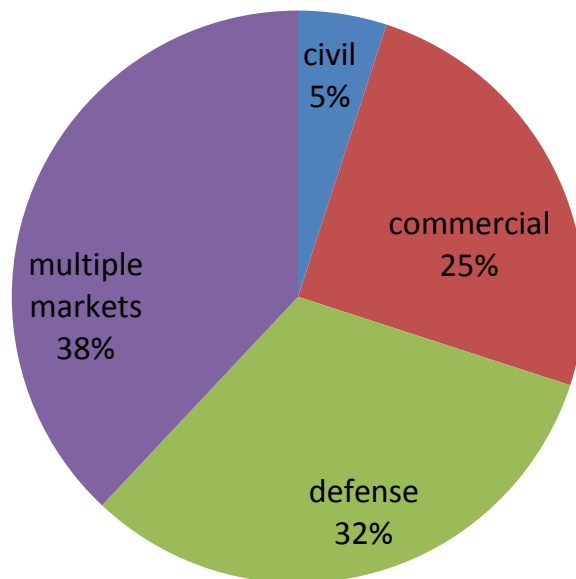
Releases were retargeted to the Forum's social media outlets, including RSS, LinkedIn, Facebook and Twitter, to provide additional coverage.

Delegate Profile

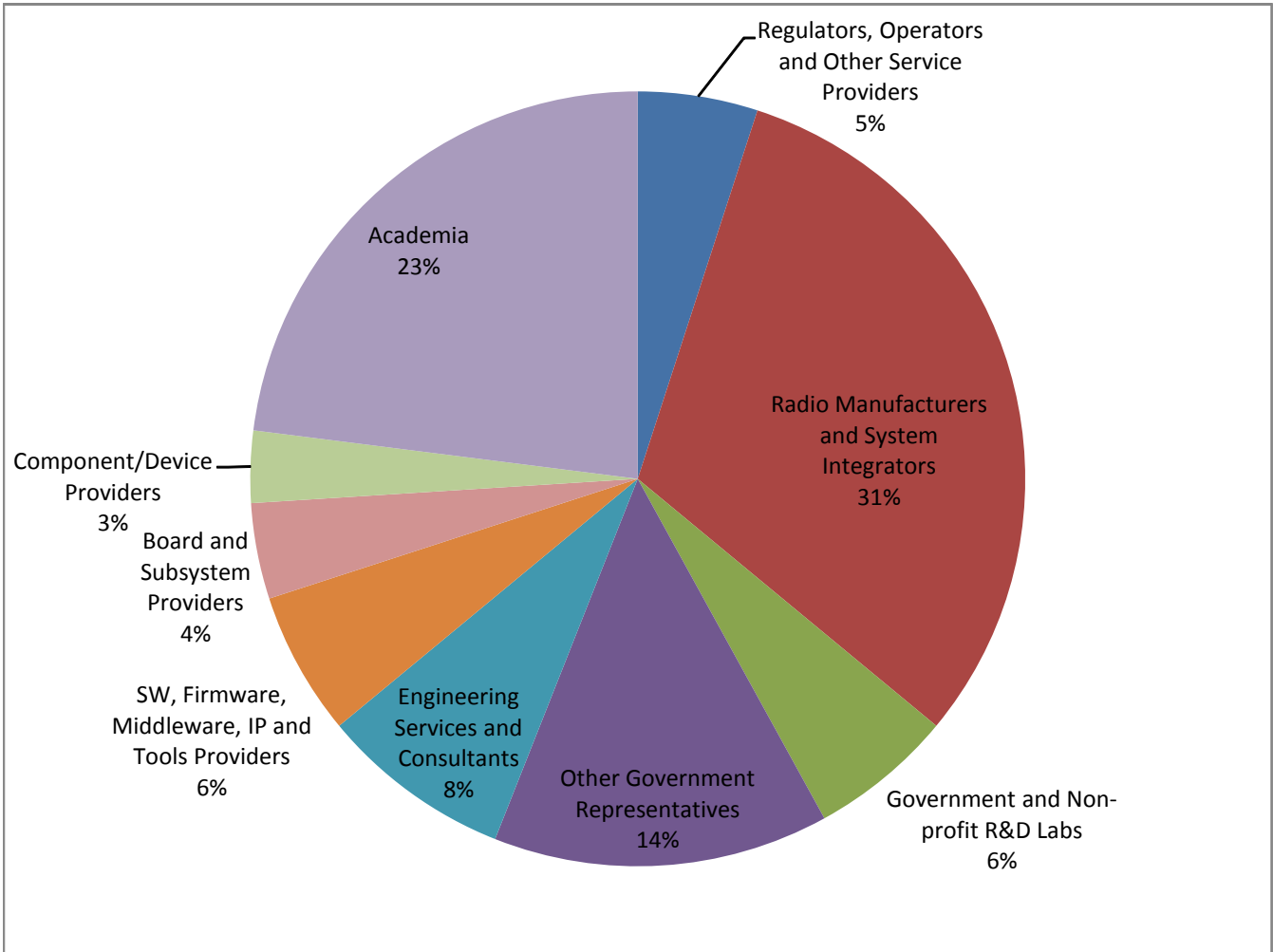
SDR'11-WInnComm's 429 registered delegates included investors, commercial network operators, radio manufacturers, system integrators, government procurement officials, regulators, engineering service providers and consultants from over ?? different countries. Review of the registration list and satisfaction surveys indicates that attendees generally fall into one of two categories:

- **Researchers and Technology Developers:** These individuals attended to showcase the work they are doing in advancing software defined radio, cognitive radio and dynamic spectrum access technologies to get recognition and to get feedback on requirements and future directions.
- **Equipment Manufacturers and Acquisition Authorities:** These individuals attended to identify new innovations in software defined radio, cognitive radio and dynamic spectrum access technologies that could be adopted by their organization to address their specific needs in developing and deploying advanced wireless systems. Many of these delegates also attended to gain a better understanding of the changes in the regulatory and business environment around these technologies that could impact their organization.

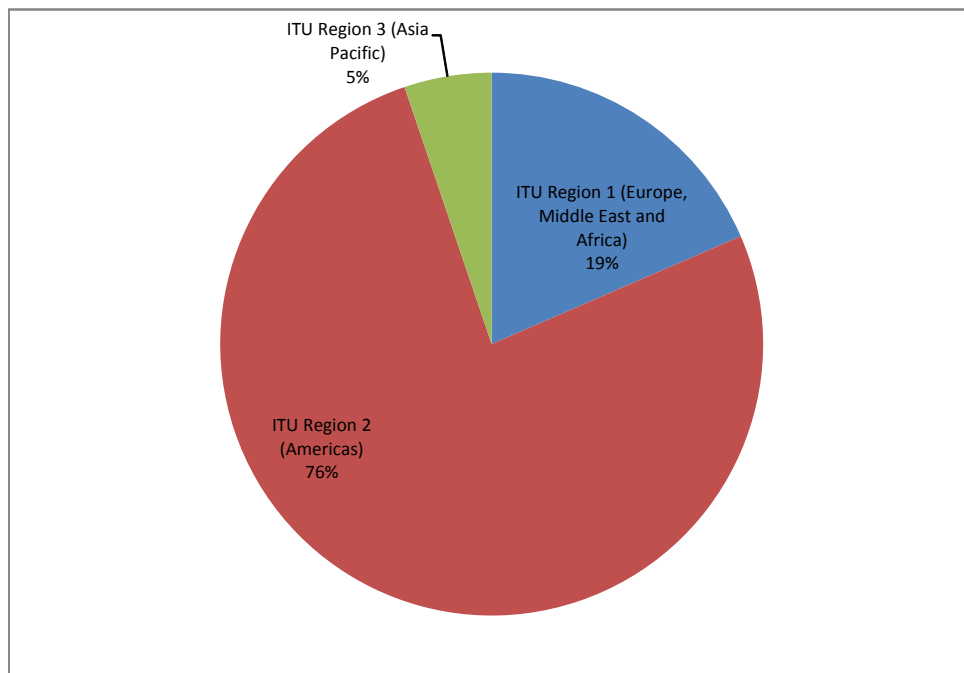
A key driver for all participants was the ability to network with their customers, partners and suppliers from around the world to identify new business opportunities or to better understand the future of the industry.



Registrations by Primary Market



Delegates by Value Chain Position



Delegates by Region

Delegate Profile (con't)

Radio manufacturers and system integrators attending included the following:

Adaptrum	Nokia Siemens Networks
Aselsan	Northrop Grumman
Boeing	Panasonic
DRS	Raytheon
Elektrobit	RIM
GE	Redline Communications
General Dynamics	Rockwell Collins
Harris	Rohde and Schwarz
Huawei	Shared Spectrum
Indra	Selex Elsag
ITT Excelis	Telefunken Racoms
Japan Radio Company	Thales
Lockheed Martin	Ultra Electronics
Motorola Solutions	ViaSAT
NEC	xG Technology

Government organizations with representatives in attendance included:

DARPA	OCCAR-EA
Defence Science and Technology Lab (UK)	OFCOM (UK)
European Defense Agency	MIT Lincoln Labs
Federal Bureau of Investigation	MITRE
Federal Communications Commission	Oakridge National Labs
Fraunhofer FKIE	US Air Force Research Lab
JPEO JTRS	US Army CERDEC S&TCD
NASA Glenn Research Center	US Department of Commerce
National Telecom Regulatory Authority (Egypt)	US Department of Defense
National Telecommunications and Information Administration	US Naval Research Lab
National Institute of Information and Communications Technology (Japan)	US Naval Undersea Warfare Center
	US National Science Foundation
	The World Bank





Driving the future of radio and communications systems worldwide

The Wireless Innovation Forum (SDR Forum version 2.0) is an international industry association dedicated to driving technology innovation in commercial, civil, and defense communications around the world. Our global membership is comprised of recognized thought leaders in the advanced wireless market including wireless service providers, component and equipment manufacturers, hardware and software developers, research institutes, government agencies and academia.

Through the Forum, representatives of member organizations gain insight into emerging technologies. Access key technical documents, industry reports and market surveys. Network. Collaborate. Participate in committees (see the other side of this flyer for committee list) that define market requirements, establish the regulatory landscape, and develop technical reports and specifications for Software Defined Radio (SDR), Cognitive Radio (CR) and Dynamic Spectrum Access (DSA) technologies.

Want to know more, get involved? To participate in the Forum's advocacy, opportunity development, commercialization and education activities in the defense, public safety, satellite, and commercial communications markets, contact the Don Kaiser at Don.Kaiser@WirelessInnovation.org.

Become a member today and start receiving member benefits!

Visit the Forum's web site: www.WirelessInnovation.org

Don Kaiser, Account Manager • Don.Kaiser@WirelessInnovation.org • Phone ++1 602-843-1634, ext. 810

(Scan the QR code with your mobile device to be taken directly to the Forum's web site)



Become an SDR'12-WInnComm Sponsor or Exhibitor Today

The Forum's annual Conference and Product Exposition provides sponsors and exhibitors with an outstanding opportunity to further establish their leadership in the advance wireless community and network with partners and customers at all levels of the wireless value chain. At Forum events and through our communications, **your organization's logo and url are being viewed directly by your target audience.**

Benefits for Sponsors:

- 18,642 logo impressions were made recognizing conference sponsors through last year's conference website
- Weekly logo impressions were made recognizing conference sponsors through Forum emails with an average open rate of 17%.
- 14,719 name and url link impressions were made recognizing conference sponsors through views of press releases
- Thousands of logo impressions were made through brochures and flyers distributed at the Forum's various meetings and workshops and related co-sponsor events
- Complementary event registration for one sponsor representative

Benefits for Exhibitors:

- Last year's 429 registered delegates included investors, commercial network operators, radio manufacturers, system integrators, government procurement officials, regulators, engineering service providers and consultants from over 22 different countries.
- Of these, over 56% had either direct purchasing authority or the ability to significantly influence radio technology acceptance and purchasing decisions (see Delegate Profile in the Conference Summary for More Details).
- Exhibitors are also recognized on the exhibitor page of the conference website, through listing in the Conference program, and through a dedicated press release highlighting the exhibition.

2012 Sponsorship and Exhibiting Rates

Sponsors: \$5000

Member Exhibitor: \$1500*

Non-member Exhibitor: \$2000

*** Forum member organizations that register two or more attendees receive a booth in the Exposition at no charge.**

To become an exhibitor or sponsor today, contact:

Don Kaiser, Account Manager • Don.Kaiser@WirelessInnovation.org • Phone +1 (602) 843-1634

About our Platinum Sponsors

With more than 10,000 employees worldwide, General Dynamics C4 Systems specializes in command and control, communications networking, computing and information assurance for defense, government and select commercial customers in the United States and abroad.

GENERAL DYNAMICS
C4 Systems

HARRIS

Harris is an international communications and information technology company serving government and commercial markets in more than 150 countries. Headquartered in Melbourne, Florida, the company has approximately \$6 billion of annual revenue and more than 16,000 employees -- including nearly 7,000 engineers and scientists. Harris is dedicated to developing best-in-class assured communications® products, systems, and services.

Indra is a global company of technology, innovation, and talent, leader in high value-added solutions and services for the Transport and Traffic, Energy and Industry, Public Administration and Healthcare, Finance, Insurance, Security and Defence, and Telecom and Media sectors. Indra operates in over 100 countries and has 30,000 employees worldwide who share their knowledge of different sectors and countries to find innovative solutions to the challenges that clients face. Indra is the European company that most invests in R&D in its sector.



indra

About our Gold Sponsors

With more than 10,000 employees worldwide, General Dynamics C4 Systems specializes in command and control, communications networking, computing and information assurance for defense, government and select commercial customers in the United States and abroad.

GENERAL DYNAMICS
C4 Systems

PENTTEK

Pentek offers powerful VME, VXS, PMC, XMC, PCI and cPCI commercial and rugged board and system solutions. Pentek's data acquisition, software radio and digital signal processing products utilize TI's C6000 DSPs, Motorola's G4 PowerPC and Xilinx FPGAs. Pentek's I/O includes A/D's, D/A's, Digital Receivers and more. Pentek equips products with high-speed interfaces including Serial RapidIO and Fibre Channel and offers strong FPGA, I/O and DSP software support.