Texas Instruments
Tech Day Toronto 2009
Session Titles and Abstracts

Track & Course	Abstracts
Track 1 – Low-Power Wireless and RFID	
RF Basics	This presentation gives an overview of a complete RF system as well as an introduction to its different building blocks. Important parameters such as sensitivity, selectivity, output power, and link budget are discussed in detail. Finally, compliance to frequency regulations around the world is discussed.
Low-Power RF-Protocol Overview	TI's Low-Power RF (LPRF) protocol offers RF solutions (transceivers and SoCs) that target many different frequencies and standards. For some solutions, TI provides the sub-1-GHz and 2.4-GHz hardware along with software including the proprietary SimpliciTI™ network protocol; RemoTI™ software, compliant with the IEEE 802.15.4 Medium Access Control (MAC) standard; and Z-Stack™ software, compliant with the ZigBee® standard. For other solutions, TI provides only the hardware and cooperates with partners to provide software such as wireless M-Bus, 6LoWPAN, SP100 and HART. This session will help the designer to better understand what questions to ask when deciding which software (RF protocol) to use. Although the main topic is software, questions about hardware like “Which frequency is targeted?” are also discussed, as the answers influence which software protocols the designer can chose from. The advantages and disadvantages of the different protocols are then discussed in more detail for two different cases: • Point-to-point connection for a remote control • Multinode network to control the temperature in a house
Eliminating Wires Made Simple with SimpliciTI	This session will address the use of the SimpliciTI network protocol as the heart of a truly robust and full-featured, low-power wireless network. We'll review the power-saving features of TI's low-power RF wireless solutions and MSP430 SoC microcontroller, followed by a hands-on demonstration of the low-power capabilities of an access-point-based network that is based on the SimpliciTI network protocol stack.
Compliance by Design *Presented by LS Research*	This session will outline component selection and PCB layout techniques in RF systems and how they can be instrumental in achieving regulatory approval and optimal design performance. Included will be a brief discussion on the pros and cons of using RF modules; reducing risk with compliance prescans; and the insight provided through measurement of antenna-radiation patterns.

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RFID in Medical Applications	A huge growth in the number of medical devices in the health-care market has made it increasingly important to authenticate them to prevent counterfeiting. Identification and tracking of these devices is critical in a hospital environment. Handheld (battery-operated) medical devices need wireless authentication/calibration solutions that are extremely low-power and highly integrated. A typical example would be a glucose meter embedded with a high-frequency RFID reader. Such a meter could be used not only to wirelessly identify/authenticate a vial of glucose test strips but also to calibrate them automatically. TI's passive-RF (TI-RFid™) technology addresses these challenges by providing cost-effective solutions such as the TRF7960, the industry's lowest-power reader with the smallest footprint. This session will present TI's suite of high-frequency products, including the TRF7960 and Tag-it™ HF-I pro transponder inlays, and provide several more examples of how RFID can be used in medical devices.

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Track 2 – End-Equipment Implementations	
PoE Plus—The New Standard for Ethernet Power	The current generation of Power-over-Ethernet (PoE) technology was released in 2005 as IEEE 802.3af, and subsequently as IEEE 802.3-2005, section 2, clause 33.3.5.2. This standard provides for up to 12.95 W of usable plug-and-play power for any twisted-pair-cabled, Ethernet-enabled device. Since this standard's inception, it is estimated that over 57 million products with PoE-enabled switch ports have appeared on the market, with continued growth. Virtually all major manufacturers of enterprise IP phones, surveillance cameras, and network access points provide PoE-enabled products. Soon after the market embraced the technology, a movement for more delivered power arose, initiating the IEEE 802.3at PoE Plus project. This yet-to-be-released standard will provide up to 25.5 W at the powered device (PD) and provide a framework for dynamic power allocation as well. This session will cover key aspects of the new standard, how it relates to the existing standard, and what solutions TI provides.
Design Considerations for the Analog Front End of a Pulse Oximeter	Pulse oximetry is a technique used to measure vital signs such as pulse rate and the oxygen saturation in blood. Aside from its routine clinical uses, pulse oximetry has been implemented in various applications such as neonatal care and the monitoring of jet-pilot consciousness at high altitudes. Pulse oximeters range from portable to industrial-grade, and the best require a unique marriage of high-performance analog and smart digital filtering. This session will cover portable and industrial-grade applications with design criteria for a pulse oximeter's analog front end, including the photodiode sensor, sensor conditioning devices and techniques, basic analog filtering and sampling, and LED pulse-circuit drivers.
Technical Implementation of Power-Line Communication from Narrow Band (AMR, Home Automation, Smart Grid) to Broadband (Internet, Surveillance and Others)	With Opera 2 and IEEE P1901, a standard will soon be in place for power-line communication (PLC). Automatic meter reading (AMR), home automation and smart-grid applications will use narrow-band modems, while video surveillance and the "last mile" of Internet service require broadband over power lines (BPL). This session will give a short overview of PLC history, standards and requirements. Using TI's TMS320C2000™ DSPs and the new Piccolo™ as a solution versus that of other chipset manufacturers is one key element; but, since power, interfaces and drivers are in every PLC modem, we will focus on all key devices.

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DLP® Products—Introduction and Overview of New Applications	DLP Cinema® technology has become well-known and is used in digital-cinema projection systems for theaters and conference rooms around the world. At the core of DLP technology are millions of tiny mirrors used to modulate light at very high speeds, accuracy, and resolution. This unique ability to modulate light in the UV, visible, and IR spectrums is spurring hundreds of new applications for everyday life. This session provides an overview of how the DLP mirrors work and how DLP products are being used in some exciting new applications.
Energy Harvesting by Cymbet *Presented by Cymbet*	This session provides an overview of how to design autonomous wireless sensors by using various energy-harvesting transducers, energy-conversion circuits, energy storage and TI's MSP430 and CC2500. Various autonomous-sensor configurations based on energy harvesting will be detailed. Low-power, energy-harvesting RF system architectures will be discussed, and design examples will be shown. An example of a zero-power wireless sensor will be demonstrated with the eZ430-RF2500-SEH development kit.

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Track 3 – Signal-Chain Solutions	
Tackling EMI and RFI at the Board and System Level	Electromagnetic interference (EMI) and radio frequency interference (RFI) can affect any system in an undesirable manner as the proliferation of unintentional radiators and receptors continues to increase. EMI and RFI, which are undesirable by-products of electrical systems, produce a wide range of frequency spectra that can affect otherwise properly operating circuits. This session will review the fundamental principles of radiated interference and coupled interference along with the respective limits allowed for each. Techniques to mitigate the effects of interference on transmitters and receivers will be discussed, and other solutions covered will include effective power-line filtering, proper filtering for input signals of high-gain circuits, and details on key components. Finally, we will discuss the common rules of thumb for wire and PCB routing to minimize EMI and RFI effects. This session will provide some basic methods that will help reduce sources and receptors of EMI and RFI events in and near your circuits.
Why Use a 24-Bit Converter When You Only Need 12 Bits?	Many times a lower-cost, higher-performance system can be built by using a 24-bit converter rather than a combination of amplifiers and 12-bit solutions. The wide dynamic range of the 24-bit solution provides a lower-noise approach that may not require any external amplification. This session will evaluate some typical applications for load-cell and temperature transducers and compare the 12-bit and 24-bit approaches.
Designing Mixed-Signal Systems with Noise-Reduction Techniques in Mind	Sensor applications often have low-level signals. A peaceful coexistence of the sensor signal, analog circuitry, and processor requires careful attention to layout and noise-reduction techniques. In this session we will discuss three sources of noise, the paths where noise travels, and how to reduce noise to tolerable levels. We will discuss the proper selection and placement of components that isolate and limit analog and digital noise to keep it out of sensitive input circuits.
Op Amp Stone Soup: A "Cookbook" Collection of Single-Supply Op Amp Circuits	This session offers a “stone soup” collection of useful op amp circuits to solve linear application problems on a daily basis. Each op amp circuit (shown in an included TINA-TI™ SPICE schematic) is presented as a definition by example, with a brief overview of its functionality, applicable transfer function and/or waveforms, and key equations for rescaling the function to the exact application. A sampling of the "ingredients" includes the following circuits: • Voltage-to-current conversion • Drive circuits: Bridge-tied-load circuits, parallel op amps, high-current cascade reference buffers • Translation circuits: Single-ended to differential, differential to single-ended, differential input to differential output • Conditioning circuits: Full-wave rectifier, supply splitter, integrator amp in feedback, isolation amplifier, G = 1/G = –1 amp • Comparator circuits: AC-coupled circuits, comparator with hysteresis

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Sensors and the Analog Interface	This session will cover how to monitor many different physical phenomena, such as temperature, air flow, humidity and power. We will discuss numerous sensor characteristics and the various styles of sensor signal conditioning that can be implemented in a system. The output of every sensor circuit discussed will be suitable for conversion to a digital signal. You will leave this session fully armed to tackle your onboard or remote-sensor challenges.

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Track 4 – Innovations in Embedded Processing	
Breaking the mW/MHz Mindset: How to Navigate TI's Processor Portfolio	This session will explain how TI's low-power processors map to end-application needs. Topics such as fixed-floating-point decisions, performance benchmarks, peripheral throughputs, driver availability and features, and getting started with evaluation modules will be covered. Detailed, high-level block diagrams and side-by-side comparisons of TI's new and legacy processors will help you understand which ones are right for your application(s) and how to get started today.
Introduction to Code Composer Studio™ v4.0	Code Composer Studio (CCS) v4.0 is a major new release based on the Eclipse open-source software framework. Eclipse is very popular in the embedded-software development community and is now becoming a standard in development environments. This session will provide an overview of CCS v4.0 and explain the advantages of using it.
Essential Concepts of Complex SoC Design for Products Like OMAP™ and DaVinci™	Learn how to successfully develop with TI's OMAP and DaVinci devices. This session will provide a hardware overview and a dissection of software architecture.
HD Digital Video Recorder Using TI's DM6467 *Presented by Ingenient Technologies*	This session will present TI's TMS320DM6467-based DVR reference design, which handles HD encoding and decoding of the most commonly used A/V standards. It is designed with an efficient Linux multimedia-application framework that includes features crucial to DVR development, such as custom-written kernel routines for maximum performance, trick play and advanced A/V sync support, and sophisticated rendering to handle all different types of inputs and outputs. Multiple-channel, simultaneous encoding and decoding is also supported.
Embedded Linux on the DaVinci/OMAP Platforms *Presented by Nuvation*	This session covers Linux BSP generation for DaVinci, including typical design cycles, Linux-platform drivers and the benefits of embedded funtions. Also covered is BSP generation for OMAP (OpenEmbedded build environment), along with stand-alone embedded-system designs that include ramdisks, filesystem selection, NAND/NOR/OneNAND, fast boot times, application/library optimizations for load times and design factors for manufacturing.

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Track 5 – Power-Supply Design	
Understanding Power-Supply Efficiency	The high efficiency that most designers demand from their power supply often exceeds the supply's capabilities. This session explains the major factors that affect power-supply efficiency and the trade-offs between efficiency and many system-level parameters. Both theory and practical examples will be presented.
Component Selection, Layout, and Thermal-Design Considerations for DC/DC Converters	DC/DC converters with internal transistors and compensation have become very popular due to their relative ease of use. This session covers how to select the external components and properly lay out the circuit to achieve the maximum performance of the converter. Several examples of good and bad layouts are provided to show how layout impacts sensitive circuits. Thermal layout for linear regulators is also explored.
LED Lighting: Drive Circuitry and More	As LED design quickly expands into the general lighting marketplace, a key component—the LED driver—is often overlooked. This session covers the aspects of a high-brightness LED lighting system and the unique circuitry that drives it. Typical device solutions in DC/DC and battery-powered LED driver circuits will be explained. Future devices from TI that will help solve customer issues with LED lighting will also be discussed, along with where to find additional information.
Rechargeable Batteries and Their Optimized Chargers	The demand for battery-operated portable devices has been growing significantly, and charging a Li-Ion battery safely, quickly and efficiently has become a challenging task. In this session we will first discuss the charging requirements of NiMH, Li-Ion and $LiFePO_4$ batteries and how TI's chargers meet these requirements. Next we will discuss how power adapters and USBs will start to share the same connector as USBs gradually become a main power source to charge a battery. Various USB battery chargers with and without power-path-management functions will be presented. The bq24150/1, which is a 3-MHz, synchronous, switching single-cell charger, increases the effective charging current, reduces the heat usually generated from a charger, and minimizes the charging time compared with linear battery chargers. A few switching-mode chargers for multicell $LiFePO_4$ and Li-Ion batteries will also be presented.
NexFET™: How to Design with Highly Efficient MOSFETs	TI's NexFET devices represent a breakthrough in low-voltage power MOSFETs, with incredibly low gate charge and resistance. These devices enable high-efficiency and high-frequency DC/DC converter designs. This session will cover the structure and characteristics of these MOSFETs and provide layout and gate-drive recommendations.

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Track 6 – Microcontroller Technologies	
TI's MCU Portfolio	Thinking microcontrollers? TI's broad MCU portfolio ranges from ultralow-power MSP430 MCUs and high-performance TMS320C2000™ real-time controllers to 32-bit, general-purpose ARM®-based MCUs. Learn how TI is focusing on innovative processor technologies, including Code Composer Studio™ (CCS) v4.0, ferroelectric RAM (FRAM), enhanced USB and ENET peripheral interfaces and more.
MSP430 Overview and Support	This session will provide a quick overview of TI's MSP430 product families to help you decide which MSP430 generation fits with your designs. Learn about the perfect architecture for ultralow-power applications and what applications benefit from the MSP430. We'll also show you the best resources to get the support you need, from the latest CCS v4.0 and third-party tools to hardware, software, and development tools.
The MSP430F5xx Portfolio and New MSP430 Technologies	Learn more about TI's growing MSP430F5xx portfolio, which features ultralow power consumption, performance of up to 25 MIPS and a wide operating voltage range from 1.8 V to 3.6 V. Get inside information on new MSP430 technologies, including miniscule package options, low-power single-chip RF solutions, enhanced USB interfaces and FRAM, that enable new applications like energy harvesting.
C2000™ MCU Overview Including Piccolo™ and Delfino™	Learn how TI's TMS320C2000 family combines the benefits of processing performance with system integration to provide microcontrollers that are perfect for real-time control applications. You'll also learn which C2000 MCUs are best for your applications and how to find the valuable support available for C2000 devices, including TI's controlCARD™ tools, that will save time and money in the design process.
Stellaris® Cortex™-M3 MCU	Stellaris is the industry's leading family of robust, real-time MCUs based on the revolutionary Cortex-M3 technology from ARM®. The award-winning Stellaris 32-bit MCUs combine sophisticated, flexible mixed-signal system-on-chip integration with unparalleled real-time multitasking capabilities. Learn more about the Stellaris family, including support for StellarisWare™ software.

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