Tutorial Title:

Best Practices for Low-Power (IoT/IIoT) Designs: Separating the Source-Side & Load-Side Analyses

Organizer:

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Abstract:

The Internet of Things (IoT) and Industrial IoT (IIoT) have come a very long way from emerging topics to driving mainstream, high-volume products across every major market space today. This has been enabled by innovation on the source-side and load-side of the system power budget and related Power IoT ecosystem. On the load side, Moore's Law has provided much of this enhancement, but a key value proposition that has also made a major impact in minimizing system power budgets has been in Intelligent Power Management (IPM) and the optimal control of loads that focus on best practices in utilization, particularly for battery-powered deployments. On the source side, advancements in energy storage coupled with the inclusion of ambient energy scavenging or energy harvesting (EH) techniques drive increased battery life and even total (primary) battery mitigation in some applications.

A great deal of the opportunity in improving system design for the most energy-efficient design practices comes in the convergence of the source-side and load-side optimization techniques. These worlds converge in subsystems and circuits related to battery management systems (BMS), power management ICs (PMICs), and smart management of major power consumers such as sensors, displays, and wireless networking. Any design engineer and/or related developer knows that meeting a battery life target is far more convoluted that merely adding up maximum system loads, identifying a steady-state current draw for operation/sleep, and dividing those values by maximum-rated battery capacity. In fact, just about any battery-powered design will result in a "sticker shock" of just how surprisingly disappointing the gap ends up being between calculated and measured battery life. Systems also integrating some aspect of a self powered energy source (such as EH) can contribute many more variables to these calculations and require consideration and analyses that go far beyond that of a typical system power budget architecting exercise.

This entry-to-intermediate-level tutorial will address all the aforementioned by starting with a breakdown of what the primary design challenges are and how to view them in terms of impact to optimal energy efficiency/utilization. This is followed by a review of solutions and best practices to address these challenges, deep diving into the highest-impact areas of focus (i.e. – understanding batteries/storage and impact to component life, taking advantage of environmental factors, minimizing overhead especially for sensors/networking, and more). As the tutorial title implies, most of these high-level agenda topics will be covered from source-side, load-side, and interactive, system perspectives.

The content is primarily geared toward design engineers, but shall be presented in way that directs the best practices and messaging to a variety of ecosystem stakeholders ranging from

technical to project management (inc. business perspectives) to supply chain and manufacturing. A constant stream of low-cost tips and tricks, design resources/tools, and other things that accelerate time-to-market (TTM), while maintaining high quality, will be presented. Where appropriate, there will also be content discussing barriers to market and case studies or use cases to demonstrate the most salient points.

Bio:

Brian Zahnstecher is a Sr. Member of the IEEE, Chair (Emeritus) of the IEEE SFBAC Power Electronics Society (PELS), IEEE PELS North America Regional (R1-3) Chair, sits on the Power Sources Manufacturers Association (PSMA) Board of Directors, is Co-founder & Co-chair of the PSMA Reliability Committee, Co-chair of the PSMA Energy Harvesting Committee, and is the Principal of PowerRox, where he focuses on power design, integration, system applications, OEM market penetration, market research/analysis, and private seminars for power electronics. He Co-chairs the IEEE Future Directions (formerly 5G) Initiative webinar series and is the founding Co-chair of the IEEE 5G Roadmap Energy Efficiency Working Group and has lectured on this topic at major industry conferences. He previously held positions in power electronics with industry leaders Emerson Network Power (now Advanced Energy), Cisco, and Hewlett-Packard. He has been a regular contributor to the industry as an invited keynote speaker, author, workshop participant, session host, roundtable moderator, and volunteer. He has nearly 20 years of industry experience and holds Master and Bachelor degrees from Worcester Polytechnic Institute.