The Computerworld Honors Program

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Final Copy of Case Study

YEAR:
2012

STATUS:
Laureate

Organization:
Broadcom Corporation

Organization URL:
www.broadcom.com

Project Name:
Broadcom Energy Efficient Ethernet

What social/humanitarian issue was the project designed to address? What specific metrics did you use to measure the project's success?

Over the last two years, global carbon dioxide CO2 emissions have continued to increase steadily. "Business-as-usual" projections foresee a 130% rise in CO2 emissions by 2050. Such an increase in CO2 emissions could raise global average temperatures by 6C or more, resulting in significant impacts on all aspects of life and irreversible changes in the natural environment. According to the ITU World Summit on Information Society, electricity demand by the networking sector for industrialized countries is between 5 and 10 percent of total electricity demand. About 50 percent of this electricity is wasted by equipment that is powered on, but idle. The problem may worsen as more and more systems, from cloud computing and data center servers to home IPTV set-top boxes, are left powered 24 hours per day, 7 days per week. According to published reports, electricity used in global data centers in 2010 likely accounted for between 1.1% and 1.5% of total electricity use, respectively. For the U.S., that number was between 1.7 and 2.2%. A new study by the Natural Resources Defense Council (NRDC) shows that DVRs, cable set-top boxes, and other pay-TV boxes are electricity hogs. These devices, said the NRDC, "cost American consumers $3 billion a year: $1 billion to operate when in active use and an additional $2 billion while inactive but still running at near full power." In order to have a meaningful impact in reducing energy consumption, Broadcom embraces the notion that every device should meet and exceed the current standard in energy compliance and has developed technology to go above and beyond industry standards to significantly reduce energy consumption in networked devices.

Please describe the technologies used and how those technologies were deployed in an innovative way. Also, please include any technical or other challenges that were overcome for the successful implementation of the project.

As energy costs continue to climb and environmental impact remains top of mind for many organizations, energy efficient networking can have a significant impact on the bottom line while also reducing carbon footprint. Broadcom continues to drive innovation in communication technology through its leadership and development of energy-efficient solutions that increase overall performance of the network while significantly reducing power consumption. Broadcom's extensive Energy Efficient Ethernet (EEE) portfolio, the broadest in the industry, goes beyond industry standards to significantly reduce energy costs and CO2 emissions, delivering 70% power savings when the network is active and up to 95% during down/idle time. This could help reduce CO2 emissions in the U.S. alone by up to 2.85 million metric tons. If all sectors of the industry take this approach, Broadcom forecasts their products and the industry will see significant reduction in energy use over the course of the next 10 years. Broadcom developed its proprietary AutoGrEEEn technology to facilitate the adoption of EEE and provide a faster migration path for legacy networking equipment. Broadcom's AutoGrEEEn technology implements the EEE standard directly into Broadcom physical layer transceivers (PHYs), enabling EEE mode when interfacing with non-EEE enabled devices,. This innovation allows customers to make existing network equipment EEE-compliant by simply changing the PHY device. Broadcom's Energy Efficient Networking (EEN) solutions include switch silicon that spans entry-level unmanaged to enterprise- and metro-class switches; single, dual, quad and octal Gigabit Ethernet (GbE) PHYs; dual and quad 10GbE PHYs; 10/100 and 1GbE controllers, and 10GbE converged network interface controllers (C-NICs). In May of 2011, Broadcom announced the expansion of its EEE portfolio with three new switch solutions effectively extending the benefits of EEE to the home and small to medium-size business (SMB) markets.

Please list the specific humanitarian benefits the project has yielded so far.

Broadcom is leading the semiconductor industry in the implementation of innovative technologies designed to save energy and reduce greenhouse gas emissions. Broadcom's award-winning proprietary AutoGrEEEn technology, allows system designers to quickly implement the recently ratified IEEE 802.3az IEEE standard, reducing power consumption in the physical layer of the network by 70 percent or more. This could help reduce CO2 emissions in the U.S. alone by up to 2.85 million metric tons(3). The potential of reducing CO2 emissions by 2.85 million metric tons translates to the following equivalencies according to www.epa.gov: Annual greenhouse gas emissions from 495 thousand passenger vehicles; CO2 emissions from 291 million gallons of gasoline; electricity use of 314 thousand homes for one year; carbon sequestered by 66 million tree seedlings grown for ten years; carbon sequestered annually by 551 thousand acres of pine or fir forests.

Please provide the best example of how the project has benefited a specific individual, enterprise or organization. Feel free to include personal quotes from individuals who have directly benefited from the work.

Lou Frenzel, Communications Editor, Electronic Design: "Choosing the best communications product of the year is always a challenge. This year something clearly stood out: Energy Efficient Ethernet, the 802.3az standard recently approved by the IEEE. This standard promises to save jillions of watts of power when implemented. But the real thanks go to Broadcom for bringing a full line of Ethernet chips to make this happen faster. An easy but excellent choice." George Goodman, Executive Director, Climate Savers Computing Initiative: "Having the benefit of Broadcom's deep networking silicon experience in our networking workgroup will help to fill out

the technological portfolio and makes a great addition to CSCI. Broadcom has demonstrated their commitment to achieve energy efficiency beyond industry standards, and this passion for going the extra mile is having a positive impact in reducing worldwide CO_2 emissions." Third-party analyst firm Wikibon has developed detailed financial models of IT organizations. For example, in one model, a table shows the IT budget for a "standard" data center for an organization with $10 billion in revenue, about 40,000 employees and spending about 4% on IT. The figures show that the network infrastructure costs about $16 million per year, and that the cost of environmental for the network is about $2.55 million. The potential savings to this organization over five years is $2.5M x 5 x 50%, or $6.4M. Together with other savings in data center power, the potential savings are $70M over 5 years.