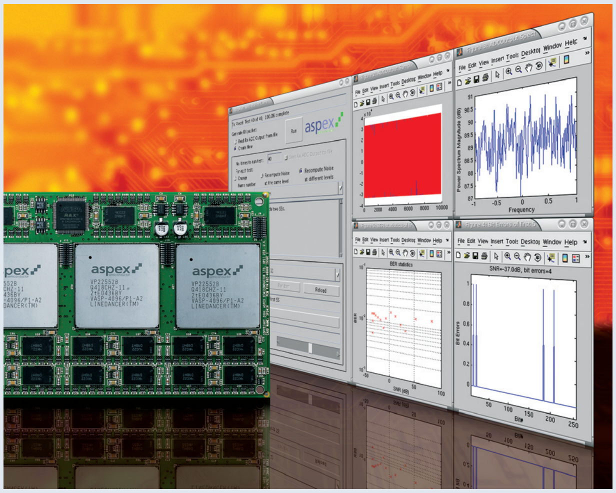
MATLAB AND SIMULINK IN THE WORLD

Innovative applications of MathWorks products in the communications and semiconductor industries

Demonstrating a WiMAX Test Bench

Cambridge Consultants developed a test bench for Aspex Semiconductor to verify and demonstrate its Worldwide Interoperability for Microwave Access (WiMAX) physical layer (PHY) platform. Using MATLAB, Cambridge Consultants developed the complete test bench and demonstration environment—including the WiMAX transmitter model, hardware interface, and GUI—for the WiMAX PHY implementation. With MATLAB and Signal Processing Toolbox, they developed a fast, bit-accurate transmitter model. To interface with the Aspex Accelera card, Cambridge Consultants incorporated custom C code as a MATLAB MEX-file. Finally, they used MATLAB to design a GUI that displays test results. *www.aspex-semi.com*

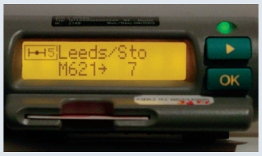


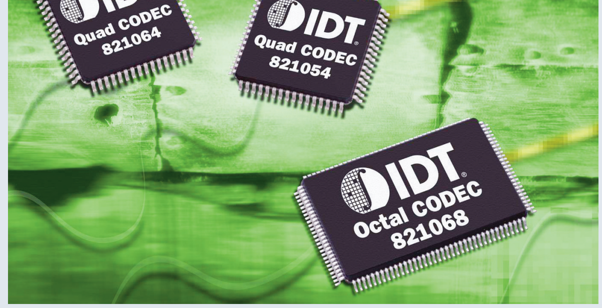
Modeling and Simulating Wireless Links

BridgeWave Communications modeled, tested, and simulated all aspects of their wireless link system before building hardware prototypes. BridgeWave used Simulink to create a basic model of the system, which comprised a modulator, demodulator, and a bit-error rate (BER) counter. Using Communications Blockset, they selected the modulator and demodulator that most closely matched the product specifications. They then replaced the modulator with a more realistic simulation created with Simulink blocks of lower-level hardware components. Simulink modulation and demodulation blocks were used for debugging throughout development. They used RF Blockset to incorporate RF components and to simulate the devices using measured S-parameter data from amplifiers. The team then developed a full system model and ran Simulink simulations to evaluate the design. *www.bridgewave.com*

Developing an Onboard Road-Usage Charging System

Vodafone Group Research and Development designed a complete road-usage charging application and deployed it onto an ARM7 32-bit microprocessor in an automotive supplier's onboard unit. They used Simulink to develop a model that included linked modules for control, human – machine interaction, communications, GPS preprocessing, route identification, and data logging. Independent teams worked on subsystems and accessed the version control capabilities of RCS directly from Simulink. Stateflow enabled them to develop an event-driven control flow for each system module. They tested the control algorithms on a PC equipped with a GPS receiver, mobile phone, and smart card reader connected via serial ports. S-function device drivers connected each device as a block within the Simulink model. After conducting road tests using hardware-in-the-loop simulations, engineers used Real-Time Workshop Embedded Coder to automatically generate C code, which they downloaded to the ARM7 system. *www.vodafone.com*



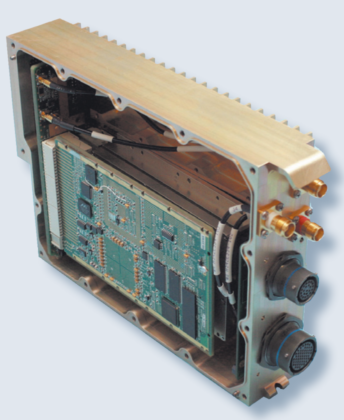


Developing Optical Network Components

Yokogawa Electric Corporation developed and tested two key optical network components: an ultra-high-speed optical switching device and an optical packet transmitter/receiver. Engineers modeled the multiplexer/demultiplexer and the error-correction code in Simulink and used Stateflow to model the optical packet switch's control circuit specifications, packet data traffic, and packet scheduling. After converting the components manually into HDL, they used Link for ModelSim® to verify the control specifications. Similarly, they developed the algorithm of the end-to-end optical packet transmitter/receiver in MATLAB and Simulink, designed each processing component with HDL, and integrated all components in Simulink using Link for ModelSim. With Simulink Fixed Point, they converted the model from floating point to fixed point and then simulated the entire system under realistic conditions to verify behavior. *www.yokogawa.com*

Reducing Software Defined Radio Development Time

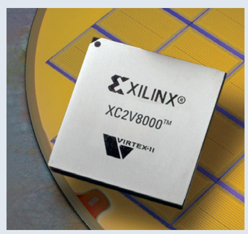
BAE Systems achieved a greater than 10-to-1 reduction in development time for a software defined radio by using Model-Based Design with Simulink and Xilinx System Generator. Engineers developed a model of the SDR transmitter and receiver in Simulink, incorporating blocks from Communications Blockset such as a scrambler, Reed Solomon encoder, matrix interleaver, and quadrature amplitude modulation modulator. The model was prepared for automatic code generation by using Xilinx System Generator to substitute Xilinx blocks for standard Simulink blocks. After simulating and verifying the updated model, BAE Systems used Xilinx System Generator and Xilinx ISE to automatically generate VHDL code, which they deployed to an FPGA for testing. *www.baesystems.com*



Improving the Semiconductor Design Process

IDT-Newave in Shanghai, China delivers sophisticated mixed-signal semiconductors, including voiceband CODECs, that enable telecommunications equipment manufacturers to provide a more effective network. IDT-Newave used MATLAB and Signal Processing Toolbox to design analog and digital filters for the voiceband CODEC. They then used Simulink to build a complete system-level model that served as a test harness. They ran floating-point and fixed-point simulations to verify system performance using Simulink Fixed Point, Fixed-Point Toolbox, and Signal Processing Blockset. Simulink Fixed Point also helped them verify the quantization effects in designing a DSP core with minimum size and power dissipation. The DSP was programmed in assembly code and validated against the Simulink model. Engineers used the test harness to verify the behavioral model and the RTL implementation. IDT-Newave used MATLAB Compiler to deploy a GUI that makes it easy for their customers to select optimal filter coefficients. *www.idt.com*

Developing Prototype 4G High-Speed Mobile Telecommunications Systems



The Electronics and Telecommunications Research Institute (ETRI) in Korea developed a prototype of a 4G, high-speed mobile telecommunications system. Engineers used MATLAB and Simulink to design the modem synchronization algorithm for the transmitter and receiver. They modeled and simulated the system and verified the HDL code before implementation on the FPGA. ETRI used Simulink to develop a floating-point model that incorporated legacy C code. Using Fixed-Point Toolbox and Simulink Fixed Point, ETRI then specified all the fixed-point data type properties of the design. After completing HDL coding for the receiver, ETRI used the fixed-point model as an executable specification to verify the code before implementation on a Xilinx Vertex-II FPGA. *www.etri.re.kr*

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