Meet Jim Robertson, ADI’s Director of Engineering, Europe

Ask Jim Robertson, ADI Director of Engineering, Europe, what he likes most about working at ADI and he’ll tell you without hesitation: his colleagues and his customers. “We have a great group of people here at ADI,” says Jim. “And the diversity of the customer applications makes the work both challenging and rewarding.”

Jim joined ADI in 1994 and brought with him an extensive background in HIL simulation, design tools, and operation of their systems. “BEACON was an excellent fit into the current development environment and configuration management process,” says Bob Redding, Controls Team Manager at Cummins. “The BEACON software technology has been selected by Cummins Engine Company (Columbus, IN) as the primary development tool for the next generation of embedded electronic engine control application software. BEACON enhances the quality of Cummins’ embedded diesel engine electronic controllers. BEACON’s AUTT plays a key role in the automation of software unit testing and improves software reuse across many of their embedded applications including their medium and heavy-duty diesel engine electronic controllers. BEACON provides a rigorous suite of unit test vectors that allow Cummins to fully test the implemented algorithms into production software. Additionally, analysis indicates BEACON should greatly improve software reuse attributed to the graphical representation of software algorithms designed with BEACON.”

BEACON was an excellent fit into the current Cummins production embedded software development environment and configuration management system,” said David Redding, Controls Team Manager at Cummins. “The BEACON technology enables the adoption of a disciplined software design process where software detailed design documentation is a product of the production process and not an afterthought. Initial results have indicated significant improvement in both software design quality and development cost for the production software process. Additionally, analysis indicates BEACON should greatly improve software reuse attributed to the graphical representation of software algorithms designed with BEACON.”

Using BEACON’s design analysis features and fixed-point C code generators, Cummins will more efficiently translate control and monitoring algorithms into production software. BEACON’s AUTT plays a key role in the automation of software unit testing and strengthens the overall test verification strategy. AUTT provides a rigorous suite of unit test vectors that allow Cummins to fully exercise the software instructions in the target environment, thus identifying errors well before expensive integration and system-level
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People on the Move

Wendi Hummel and Beni Tang
joined ADI last October as Systems Quality Assurance Engineers. Wendi holds a B.S. in Computer Engineering from North Carolina State University. Beni has a M.S. in Computer Information Systems from the University of Detroit Mercy and is a member of the American Society for Quality.

Also joining ADI’s Engineering team in October was Wensi Jin. Wensi is a Senior Applications Engineer and specializes in embedded systems and systems engineering. He holds a BSEE from the University of Texas at Austin.

Jeff Brewbaker became a full-time member of ADI’s Applications Engineering Department in January. Previously, Jeff was an intern at ADI while completing his M.S.E. degree in electrical engineering at the University of Michigan with a concentration in control systems and signal processing.

David Rooney joined ADI as an engineer in October. David is a Senior Software Engineer with over 20 years experience in software development. He has a B.S.E.E. and a M.S.E.E. from Ohio State University.

Selim Aissi, Manager, Systems Quality Assurance Group, was recently appointed Chairman of the Strategic Planning Committee for the Software Division of the American Society of Quality (ASQ). In addition, Selim was selected to be a member of the editorial board of the technical journal, Software Quality Professional.

William “Bill” Grierson, Vice President of Business Development, retired on March 5, 1999 after 19 years with ADI. Bill began his career with ADI in 1981 as International Sales Manager. He also served as ADI’s Director of Sales and Marketing and was promoted in 1994 to Vice President. With his years of international sales experience, especially in China and India, Bill has been retained by ADI as a special consultant to assist in servicing customers in those countries.

In developing controller software, a Cummins software engineer first uses BEACON to develop a detailed software design using signal flow and control flow diagrams. The BEACON design analyzer is then invoked to ensure that a number of commonly accepted software principals have been satisfied, such as strong data typing and single entry/exit. If the design successfully passes these checks, the software engineer generates code and test cases. The test cases are then run with the automatically produced source code to stress the extremities of the mathematical computations and control flow expressions.

Cummins, headquartered in Columbus, Indiana, is the world’s largest producer of diesel engines above 200 horsepower. The company provides products for customers in its key markets: automotive, power generation, industrial and filtration. Cummins reported record sales of $6.3 billion in 1998.

testing. The graphical representation of control and monitoring algorithms, automated code generation, and streamlined unit testing greatly reduces software life-cycle costs.

“Cummins” decision to adopt BEACON shows again that safety-critical software development methods are not restricted to jet engines, pace-makers, and nuclear power plants,” said Tom Erkkinen, ADI’s BEACON Product Manager. “Any company that desires software that is safe, reliable, and maintainable, needs to consider safety-critical development practices, especially those that provide significant levels of process automation.”

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Cummins ADOPTS ADI’S BEACON SAFETY-CRITICAL TECHNOLOGIES, continued
BEACON DESIGNED, CODER, & TESTER for Simulink and Stateflow Models

BEACON Designer provides a variety of specification fields and code generation options that allow software designers to craft an optimal software implementation for a particular application, including those using fixed-point arithmetic. The BEACON Coder generates efficient compiler-independent software that complies with safe programming language standards such as MISRA-C and SPARK Ada. Using the BEACON Tester, the software designer automatically creates unit test vectors enhancing both the quality and reusability of both design and generated software.

CE555 RPC Module for Rapid Prototyping

This new addition to the SIMsystem family of products is a 6U VME two-board set specifically developed for realistic prototyping of embedded controllers. The CE555 provides all the compute power and I/O required for developing an embedded controller.

This new BEACON product offering was developed specifically for users of Simulink® and Stateflow® to generate high-integrity embedded code and unit test cases. The BEACON Designer was introduced at ESC ’99, this new BEACON product offering was developed specifically for users independent software that complies with safe programming language standards such as MISRA-C including those using fixed-point arithmetic. The BEACON Coder generates efficient compiler-independent software that complies with safe programming language standards such as MISRA-C and SPARK Ada. Using the BEACON Tester, the software designer automatically creates unit test vectors enhancing both the quality and reusability of both design and generated software.

ADAPT • Applied Dynamics Applications Programming Tips •

Using BEACON Libraries for Easy Re-use of Code by John Cramer

BEACON libraries are easy to generate and make sharing and reuse of code simple. By following the suggestions in this article, you will ease your compilation task and add additional safety and structure to your BEACON development process.

To re-use code across BEACON documents, it is necessary to use the BEACON Library Editor. The BEACON Library Editor allows you to convert your documents (*.net) into library knowledge files (*.kf). Library knowledge files can then be loaded into any document. Once loaded, these knowledge files will appear on your Control Palette with a block for each top-level diagram in the library. These blocks will appear in your diagrams as "library" blocks titled with the name of the top-level diagrams they are referencing.

Create the libraries at the command line using the following commands:

- Create the library knowledge file:
  ```
  library -a lib_name
  ```
- Add a document to the library:
  ```
  library -a doc_name.net
  ```
- Or, alternatively, add legacy code via a *.lesif format file:
  ```
  library -a lib_name legacy_code.lesif
  ```

Consider the following points before creating libraries. First, BEACON libraries are intended to reference one document. This is accomplished by adding only one document to a library. This document may have many top-level diagrams. This is consistent with the traditional use of libraries where many functions may reside in one source file.

The second point to consider is the library name. For convenience, it is advantageous to have the library name match the name of the document that you are adding to it. This is convenient because BEACON will generate source code that includes a header file referencing your library source code. This saves you from manually adding #include statements for library source code before compiling.

It is also possible for you to control the libraries that your developers will be using. By setting the BEACON_LIBRARY_PATH environment variable to the correct path you can be assured that all developers are using the same libraries. Set the environment by using the following commands before starting BEACON:

```
setenv BEACON_LIBRARY_PATH /home/beacon_libs
```

Where beacon_libs is the directory containing all of your library knowledge files (*.kf). Now launch BEACON with the default palettes:

```
beacon -a &
```

After BEACON is loaded, choose Library->Load from the main BEACON window. The "BEACON Library Open" dialog box will appear as in Figure 1. Note that, in this case, there are two libraries available for loading:

- pid_cals.kf
- pid_controller.kf

For more project control, the BEACON_LIBRARY_PATH variable can be placed in the .cshrc file of all the developers on the project. This will ensure that everyone is accessing the same library pool.
ADIUS ’99 6-9 June 1999
Weber’s Inn, Ann Arbor, Michigan

ADI Company Overview and ADVantage Seminars
On Wednesday, June 9, ADI will conduct concurrent sessions on its ADVantage tool suite for embedded controller design and test. Session #1 will feature the powerful SIMSystem family of hardware-in-the-loop products and Session #2 will feature the many enhancements of the BEACON embedded software development tool. A company direction and overview session, open to all attendees, will precede the ADVantage seminars. Attendees will then attend Session #1 or Session #2. Please indicate your selection on the registration form.

SESSION 1 - Hardware-in-the-Loop Seminars

Test Management and Preparation
The SIMSystem product line is used for verification and validation of control systems or other hardware sub-systems in the loop. The SIMSystem run-time environment provides the tools for creating repeatable test scenarios and automating this process. Examples of test methods and tailoring the Interact facility to support your testing requirements and documentation needs will be given. Operator-in-the-loop testing will be discussed, including methods of auditing interactive testing and playback of those interactive tests. A discussion of the SIMSystem APIs which allow the SIMSystem products to be integrated into other test or visualization environments will also be presented.

Modeling Tool Considerations and Features for Real-Time Simulations
Modeling tools including Simulink, SystemBuild, and ADSIM will be discussed relative to real-time considerations for simulation and prototyping. This seminar will include discussion on the scheduling of subsystems and I/O and the importance of these issues in your simulation or control system. Real-time integration methods will be discussed with examples of supplementing the modeling tools’ integration techniques for better real-time performance. In addition to the modeling tools and scheduling, measuring, understanding and optimizing performance will also be addressed.

Interfacing to External Hardware and Subsystems
This seminar will discuss offerings of I/O boards and trade-offs of using those boards. There will be a discussion of what issues are important when interfacing to external hardware. Specific examples will be presented for generating analog and digital waveforms and the various methods of doing this. Handling external events within a time-based simulation will be discussed. An overview will be given of some of the protocols and buses including Serial interfaces, CANbus, and MIL-STD-1553. The seminar will conclude with examples of using the open-loop testing provided within ADVantage IDE along with the SIMSystem run-time environment. The examples will demonstrate how I/O can be simulated in a debug or health check mode prior to moving to closed-loop simulation.

System Management / Configuration Management
This seminar will focus on system management and configuration issues. The seminar will provide answers to questions such as: What is the best way to handle custom configuration files, custom libraries or I/O drivers to make updates and new releases easy to manage? How do I restrict access to project components? How do I build my simulation for multiple AD RTS systems with a common configuration? An overview will be given of managing changes on a per user, per project, and per site basis.

Session 2 - BEACON Seminars

AUTC Seminar
BEACON’s Automatic Unit Test Tool (AUTC) provides a solid foundation for the overall unit testing of your software. This session will explain how to use AUTC to develop test cases, perform unit level analysis, and generate expected results from BEACON design diagrams. An overview of AUTC coverage and the types of errors detected will also be provided.

BEACON DESIGNER, CODER, and TESTER for Simulink and Stateflow
ADI continues its role as industry’s leading tool integrator by bridging The MathWorks modeling environment with ADI’s BEACON coding and unit test products. Session attendees will receive an introductory lesson on how to generate high-quality embedded code and unit test cases from Simulink and Stateflow diagrams. The various software design and implementation options will also be discussed.

BEACON Tips and Techniques
ADI applications engineers will demonstrate preferred practices and describe a number of techniques based on Systems Integration Services contracts involving BEACON use in actual production ECUs. Experienced BEACON users will learn new tips and are welcome to share their experiences and ideas in this interactive session.

ADIUS reserves the right to amend this agenda if necessary.

Keynote Address
Dr. Robert Howe, Professor Emeritus at the University of Michigan and one of the founders of Applied Dynamics International, will deliver the keynote address at ADIUS ’99, entitled “Real-Time Simulation: Past, Present and Future.”

User Presentations
ADI product users, involved in a variety of simulation and embedded controller design and software applications, will share their experiences and expertise at the conference.

“Designing the Common Engineering Environment at Cummins Engine with the ADI SIMSystem and BEACON Product Lines” by Albert Sisson, Cummins Engine Company

“Implementing BEACON into the (Cummins) Production Software Process” by Dave Bedding, Cummins Engine Company

“Diesel Engine Rapid Prototyping at Cummins” by Eric Bradley, Cummins Engine Company

“The RS-6 Hardware-in-the-Loop Test System” by Kentaro Kajino, Boeing North American Rocketdyne

“BEACON and the Open Systems Architecture at Delphi Automotive Systems” by Tom Fuelle, Delphi Automotive Systems

“Integration of BEACON Autocode into Motorola’s AEG’s Software Development Process” by John Mills, Motorola AEG

“Positive Properties of the Modern Taylor Series Method” by Jiri Kunovsky, Brno Technical University


“Using BEACON in the GE FADEC Controls Development Process” by Jan Besseler and Emily Synck, General Electric Aircraft Engines

“Ford Automotive Code Generation Requirements and BEACON CODER History” by Steve Toeppe, Ford Research Laboratory

“Application of BEACON to the Detailed System and Software Design on the Nimrod MRA4” by Steve Wysomark, British Aerospace Military & Astronautics

“A Real-Time Multibody Vehicle Dynamic Analysis Method Using Suspension Composite Joints” by Dr. Yang Myun Yoo, Korea Automotive Technology Institute

“Challenges and Solutions to V-22 Flight Control Computer Hardware-in-the-Loop Development” by Chip Beatt, Naval Air Warfare Center

“Integrating the WEST+ environment with the AD RTS: A Multi-Formalism Modeling and Simulation Methodology” by Hans Vangheluwe, Filip Claess, and Ghislain Vastenwijkstra, University of Ghent, Belgium

ADI / ADIUS Luncheon & ADI Open House
On Tuesday, June 8, 1999, ADIUS and Applied Dynamics International will host a west Michigan-style barbecue luncheon and open house for ADIUS ’99 attendees and guests at ADI’s corporate headquarters in Ann Arbor, Michigan.

ADI Company Overview Seminar
1:00 pm - 5:00 pm

ADIUS ’99 PROGRAM SCHEDULE
Sunday, 6 June
Registration/Reception
10:00 am - 7:00 pm
Keynote Address/ Users’ Presentations
9:00 am - 12:00 pm
Annual Banquet
6:00 pm - 10:00 pm
Tuesday, 8 June
User Presentations
8:30 am - 12:00 pm
ADI / ADIUS Luncheon & ADI Open House
12:00 pm - 5:00 pm (ADI Headquarters)
Wednesday, 9 June
User Presentations
8:30 am - 12:00 pm
ADI Company Overview Seminar
1:00 pm - 5:00 pm
About The Sponsor

ADIUS ‘99 is sponsored by ADIUS, Inc., the Applied Dynamics International Users Society. ADIUS, Inc. is an independent, nonprofit, and educational technical society dedicated to the sharing and exchange of information among users of simulation and embedded software development tools worldwide.

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Lodging Information

ADIUS ‘99 will be held at Weber’s Inn, 3050 Jackson Road, Ann Arbor, Michigan 48103-1997 USA. Telephone: (734) 769-2500; FAX: (734) 769-4743. Weber’s Inn is conveniently located off Interstate 94 at exit 172. The hotel is approximately 25 minutes west of Detroit Metropolitan Airport. Weber’s Inn features an indoor swimming pool, sauna, whirlpool, and exercise facilities.

A block of rooms is being held at Weber’s Inn for ADIUS ‘99 attendees and their guests at special conference rates. Rooms in the ADIUS block not reserved by May 13, 1999 will be released and lodging arrangements will be on an availability basis. For lodging reservation information, please call Weber’s Inn directly. Be sure to mention the ADIUS ‘99 conference to receive our special ADIUS room rate.

ADIUS ‘99 INFORMATION CONTINUED ON PAGE 6. REGISTRATION FORM ON PAGE 8.

ADIUS ’99 UPDATES

For conference updates or to register online, please visit the ADIUS web page at www.adi.com or contact Steve Trombino at trombino@adi.com or (734)973-1300.

ADIUS ‘99 INFORMATION CONTINUED ON PAGE 6. REGISTRATION FORM ON PAGE 8.
ADISIM PROGRAMMING
Available upon request

ADVANCED SIMSYSTEM USERS’ COURSE
Available upon request

CUSTOMIZED TRAINING
(1/2 day minimum)
Available upon request

ON-SITE TRAINING
Available upon request

All training classes will be held at ADI headquarters in Ann Arbor, Michigan. To register for a class, call Training Registration at ADI, (734) 973-1300 ext. 211. You may also register by e-mail at adinfo@adi.com or online at http://www.adi.com. ADISIM classes are available upon request.

One of the major features of the ADvantage Embedded Control System Development Suite (ECSDS) at this year’s SAE ’99, one of the world’s largest automotive engineering conferences and expositions. The event was sponsored by the Society of Automotive Engineers and held March 1-4 in Detroit, Michigan. Across the lake in Chicago Illinois, at the Embedded Systems Conference Spring (March 2-4) ADI was also busy demonstrating how its new BEACON DESIGNER, CODER and TESTER generates high-integrity source code and unit test cases directly from Simulink® and Stateflow® models.

One of the major features of the ADvantage ECSDS, demonstrated in the Motorola booth as part of an ADI/Motorola partnering arrangement, was the new “Powertrain-in-a-Box” capability. The Powertrain-in-a-Box features the SIMsystem with the new ADI CE555 RPC Module, along with the new BEACON DESIGNER, CODER & TESTER for Simulink and Stateflow Models (see page 4). Designed specifically for Simulink and Stateflow users, this new BEACON package provides a seamless environment to develop complex embedded software while greatly reducing the time, effort and cost of this development compared with traditional methods.

ADI's new Powertrain-in-a-Box development tool, featuring the CE555 RPC Module, along with the new BEACON DESIGNER, CODER & TESTER for Simulink and Stateflow models received enthusiastic reviews from attendees at both shows. ADI made a strong statement that these latest additions to its ADvantage Embedded Control System Development Suite will continue its tradition of providing industry-leading strategies for development and dynamic testing of electronic controllers.