



# High Performance Embedded Computing Workshop 2002

PRELIMINARY AGENDA  
24-26 September 2002

## 24 September

0730 **Check-In & Continental Breakfast**

### AUDITORIUM

0830 **Welcome**  
David Briggs / MIT Lincoln Laboratory

0835 **Keynote Address**  
**TBD**  
Maj Gen Paul Nielsen / AFRL

0905 **Opening Remarks**  
Robert Bond / Jeremy Kepner / MIT Lincoln Laboratory

0915 **Session 1: Novel Hardware Architectures**  
David Martinez / MIT Lincoln Laboratory

0925 **Invited Speaker**  
**Cognitive Information Processing Technology**  
Zach Lemnios / DARPA / IPTO

0955 **Invited Speaker**  
**MIND: Scalable Embedded Computing through Advanced Processor in Memory (PIM) Architecture**  
Thomas Sterling / CalTech / JPL

1025 **Break**

★ 1040 **MONARCH: A High Performance Embedded Processor Architecture with Two Native Computing Modes**  
John Granacki / University of Southern California  
Michael Vahey / Raytheon

★ 1110 **DARPA Data Intensive Systems (DIS) Embedded Computing Benchmarks for Critical Defense Signal Processing Applications**  
Stephen Shank / Lockheed Martin  
Steve Crago / USC-ISI  
Rick Pancoast / Lockheed Martin  
Joseph Racosky / Lockheed Martin  
Jinwoo Suh / Information Sciences Institute  
Leon Trevito / Lockheed Martin

1140 **Poster / Demo A: Hardware Architectures and Applications**  
Henk Spaanenburg / Pentum Group, Inc.

### Poster Session A Précis

**Poster A.1** **A High Speed Signal Processing System**  
Anders Ahlander / Ericsson Microwave Systems  
Anders Astrom / Ericsson Microwave Systems

**Poster A.2** **An Innovative High-Performance Architecture for Vector and Matrix Math Algorithms**  
Vera Anantha / Intrinsicity, Inc.  
Christophe Harle / Intrinsicity, Inc.  
\* Tim Olson / Intrinsicity, Inc.  
George Yost / Intrinsicity, Inc.  
Art Parmet / Intrinsicity, Inc.

**Poster A.3** **Processing Challenges for a Dual Spectral Band Aerial Camera System**  
Michael Bown / Recon-Optical Inc.  
Alan Lubow / Recon-Optical Inc.

**Poster A.4** **Real-Time Geo-Registration on High-Performance Computers**  
Alan Chao / ALPHATECH Inc.  
Monica Burke / ALPHATECH Inc.  
Thomas Kurien / Mercury Computer Systems, Inc.  
Luke Cico / Mercury Computer Systems, Inc.

**Poster A.5** **Algorithmic Advances for Software Radios**  
Matteo Frigo / Vanu Inc.

**Poster A.6** **Space Flight Programmable Pixel Processor FPGA**  
Omar Haddad / NASA-GSFC  
Joel Offenberg / NASA-GSFC  
D.J. Fixsen / NASA-GSFC

**Poster A.7** **The Raw Microprocessor: Enabling Embedded Signal Processing on a General Purpose Computer Architecture**  
Hank Hoffmann / MIT  
Volker Strumpfen / MIT  
Anant Agarwal / MIT

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**Poster A.8**      ***A Study of the Common Component Architecture (CCA) Forum Software***  
Daniel Katz / Jet Propulsion Laboratory / Caltech  
Robert Tisdale / Jet Propulsion Laboratory / Caltech  
Charles Norton / Jet Propulsion Laboratory / Caltech

**Poster A.9**      ***Rapid Development with Macro Functions on Platform Field Programmable Arrays***  
Kendel McCarley / Raytheon

**Poster A.10**    ***Signal Processing Architectures for Ultra-Wideband Wide-Angle Synthetic Aperture Radar Applications***  
Atindra Mitra / AFRL  
Joseph Germann / SKY Computers, Inc.  
John Nehrbass / Ohio State University

**Poster A.11**    ***Implementing Image Processing Pipelines in a Hardware / Software Environment***  
Heather Quinn / Northeastern University  
Miriam Leeser / Northeastern University  
Laurie Smith King / College of the Holy Cross

**Poster A.12**    ***Adaptive Framework for Automated Mapping and Architecture Trades for Embedded Heterogeneous Systems***  
Raju Venkataramana / Tandel Systems, LLC  
\* Joseph Philipose / Tandel Systems, LLC

1235    **Lunch**

1345    **Session 2: Advanced Hardware Designs**  
Maya Gokhale / Los Alamos National Laboratory

1355    **Adaptive Beamforming using QR in FPGA**  
Richard Walke / QinetiQ LTD

1425    **Power Consumption of Customized Numerical Representations for Audio Signal Processing**  
Roger Chamberlain / Washington University  
Yen Hsiang Chew / Washington University  
Varuna DeAlwis / Washington University  
Eric Hemmeter / Washington University  
John Lockwood / Washington University  
Robert Morley / Washington University  
Ed Richter / Washington University  
Jason White / Washington University  
Huakai Zhang / Washington University

1455    **A Library of Parameterized Hardware Modules for Floating-Point Arithmetic and Its Use**  
Miriam Leeser / Northeastern University  
Pavle Belanovic / Northeastern University

1525    **Break**

1550    **Generation of Custom DSP Transform IP Cores: Case Study Walsh-Hadamard Transform**  
Fang Fang / Carnegie Mellon University  
James Hoe / Carnegie Mellon University  
Markus Pueschel / Carnegie Mellon University  
Smarahara Misra / Carnegie Mellon University

1620    **A Comparison of Two Computational Technologies for Digital Pulse Compression**  
Michael Bonato / Catalina Research Inc.

1650    **Adjourn**

1700    **Reception**

1800    **Banquet Speaker**  
**50 Years of Mathematical Software**  
Cleve Moler / The MathWorks, Inc.

1845    **Banquet**

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# 25 September

0730 **Check-in & Continental Breakfast**

## AUDITORIUM

- 0830 **Announcements**  
Robert Bond / Jeremy Kepner / MIT Lincoln Laboratory
- 0835 **Invited Speaker**  
**Use of "Streaming" Computation to Build Efficient High-Performance Embedded Systems**  
William Dally / Stanford University
- 0905 **Session 3: Compiler and Library Technologies**  
Joseph Germann / SKY Computers, Inc.
- 0915 **Short Vector SIMD Code Generation for DSP Algorithms**  
Franz Franchetti / Technical University of Vienna  
\* Markus Pueschel / Carnegie Mellon University  
Jose Moura / Carnegie Mellon University  
Christoph Ueberhuber / Technical University of Vienna
- 0945 **sc2 C-to-FPGA Compiler**  
Maya Gokhale / Los Alamos National Laboratory  
Jan Stone / Stone Ergonaut  
Jan Frigo / Los Alamos National Laboratory  
Christine Ahrens / Los Alamos National Laboratory
- 1015 **Break**
- 1030 **Monolithic Compiler Experiments using C++ Expression Templates**  
Lenore Mullin / MIT Lincoln Laboratory  
\* Edward Rutledge / MIT Lincoln Laboratory  
Robert Bond / MIT Lincoln Laboratory
- 1100 **Streaming and Dynamic Compilers for High Performance Embedded Computing**  
Peter Mattson / Reservoir Labs, Inc.  
Jonathan Springer / Reservoir Labs, Inc.  
Charles Garrett / Reservoir Labs, Inc.  
\* Richard Lethin / Reservoir Labs, Inc.
- 1130 **Poster / Demo B: Software Technologies and Systems**  
Robert Bernecky / NUWC

## Poster Session B Précis

- Poster B.1** ***An Integrated Design Environment to Evaluate Power/Performance Tradeoffs for Sensor Network Applications***  
Amol Bakshi / University of Southern California  
Jingzhao Ou / University of Southern California  
\* Viktor Prasanna / University of Southern California
- Poster B.2** ***Distributed Data Management Architecture for Embedded Computing***  
Hans-Werner Braun / University of California  
Todd Hansen / University of California  
Bertram Ludaescher / University of California  
John Orcutt / Scripps Institution of Oceanography / UCSD  
Arcot Rajasekar / University of California  
\* Frank Vernon / Scripps Institution of Oceanography / UCSD
- Poster B.3** ***Application of Operating System Concepts to Coordination in Pervasive Sensing and Computing Systems***  
Jesse Davis / University of Kansas  
\* Joseph Evans / University of Kansas  
Benjamin Ewy / Ambient Computing, Inc.  
Larry Sanders / Ambient Computing, Inc.
- Poster B.4** ***Taskrunner: A Method for Developing Real-Time System Software***  
Louis Hebert / MIT Lincoln Laboratory
- Poster B.5** ***Software Centric Optimization of a Real-Time Embedded System***  
Max Lee / Raytheon  
Marshall Moluf / Raytheon
- Poster B.6** ***High Application Availability***  
Stephen Paavola / SKY Computers, Inc.
- Poster B.7** ***Design Space Exploration and Optimization of Embedded Cache Systems via a Compiler***  
Krishna Palem / Georgia Institute of Technology  
\* Rodric Rabbah / Georgia Institute of Technology

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**Poster B.8**      **Resource Management for Digital Signal Processing via Distributed Parallel Computing**  
Albert Reuther / MIT Lincoln Laboratory  
Joel Goodman / MIT Lincoln Laboratory

**Poster B.9**      **Importing Application Kernels from MATLAB® Designs into Graphical Software Architectures**  
Christopher Robbins / MCCI

**Poster B.10**     **Real-Time Linux**  
Andrew Webber / SKY Computers, Inc.  
Stephen Paavola / SKY Computers, Inc.

**Poster B.11**     **Multidimensional Performance Modeling for Advanced, Embedded, Signal Processors**  
Michael Stebnisky / Lockheed Martin  
Carl Hein / Lockheed Martin

**Poster B.12**     **Rapid Portable Signal Processing Software Development Architecture**  
Kevin Tirko / Pennsylvania State University

1225      **Lunch**

1335      **Session 4: Emerging High Performance Software**  
David Cousins / BBN Technologies

★ 1345      **AltiVec Extensions to the Portable Expression Template Engine (PETE)**  
Edward Rutledge / MIT Lincoln Laboratory

1415      **Techniques for Co-Design of Optically-Connected Embedded Multiprocessors**  
Neal Bambha / US Army Research Laboratory  
Shuvra Bhattacharyya / University of Maryland

1445      **300x Matlab**  
Jeremy Kepner / MIT Lincoln Laboratory

1515      **Break**

1540      **Rapid Prototyping of Matlab / Java Distributed Applications using the JavaPorts Components Framework**  
Elias Manolakos / Northeastern University

1610      **Meeting the Demands of Changing Operating Conditions at Runtime Through Adaptive Programming Techniques for Network Embedded Computing**  
Richard Schantz / BBN Technologies  
Joseph Loyall / BBN Technologies

1640      **Applying Model-Integrated Computing and DRE Middleware to High Performance Embedded Computing Applications**  
Douglas Schmidt / DARPA / IXO  
\* Aniruddha Gokhale / Vanderbilt University  
Christopher Gill / Washington University

1710      **Invited Speaker  
Designing the Future of Embedded Systems at DARPA IXO**  
Douglas Schmidt / DARPA / IXO

1740      **Adjourn**

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## 26 September

0730 **Check-In & Continental Breakfast**

### AUDITORIUM

0830 **Announcements**  
Robert Bond / Jeremy Kepner / MIT Lincoln Laboratory

0835 **Invited Speaker**  
**Trends in HPC and HPEC Convergence**  
Richard Games / MITRE

0905 **Session 5: Government Sponsored Standards**  
Edward Baranoski / MIT Lincoln Laboratory

0920 **Development Status of the Vector, Signal, and Image Processing Library (VSIPL)**  
Mark Richards / Georgia Institute of Technology  
Dan Campbell / Georgia Tech Research Institute  
Randall Judd / SPAWAR  
James Lebak / MIT Lincoln Laboratory  
Rick Pancoast / Lockheed Martin

0935 **VSIPL++: Intuitive Programming Using C++ Templates**  
Mark Mitchell / CodeSourcery, LLC  
Jeffrey Oldham / CodeSourcery, LLC

0950 **Data Reorganization Interface (DRI)**  
Kenneth Cain, Jr. / Mercury Computer Systems  
Anthony Skjellum / MPI Software Technology

1005 **Software Communications Architecture Compliant Software Defined Radios**  
S. Murat Bicer / Mercury Computer Systems  
Jeffrey Smith / Mercury Computer Systems

1020 **Break**

1035 **Session 6: Industry Sponsored Standards**  
Craig Lund / Mercury Computer Systems

1050 **Progress in Standardization of RDMA Technology**  
Arkady Kanevsky / Network Appliance, Inc.

1105 **VXS - A Novel and Emerging Architecture for Embedded Computing**  
Jeffrey Harris / Motorola Computer Group

1120 **Status and Activity in the OMG Relevant to HPEC**  
James Kulp / Mercury Computer Systems

1135 **Poster / Demo C: Software / System Technologies**  
Brian Sroka / MITRE

### Poster Session C Précis

**Poster C.1** ***A Comparison of Java RMI, CORBA, and Web Services Technologies for Distributed SIP Applications***  
Mark Hanes / Ohio State University  
Stan Ahalt / Ohio State University  
Ashok Krishnamurthy / Ohio State University

**Poster C.2** ***Distributed Embedded Computing in the Detection of Explosives***  
Seemeen Karimi / Analogic Corporation  
Barry Jackson / SKY Computers, Inc.  
Carl Crawford / Analogic Corporation

**Poster C.3** ***What is Keeping Hard Real-Time Scheduling from being a Mainstream Technology in the Embedded Multiprocessing Domain Space?***  
Daniel Lorts / University of Texas at Dallas

**Poster C.4** ***Implications of Using DARPA Polymorphous Computing Architectures (PCA) for Embedded DoD Processing Applications***  
Rick Pancoast / Lockheed Martin  
Steve Crago / USC-ISI  
Michael Koch / Lockheed Martin  
Marc DeMaio / Lockheed Martin  
Joseph Racosky / Lockheed Martin  
Matthew French / USC-ISI

**Poster C.5** ***VSIPL, from API to Product***  
Sharon Sacco / SKY Computers, Inc.

**Poster C.6** ***Case: A COTS PowerPC-based Multicomputer Mapping of Surveillance Radar DSP Functionality***  
Stephen Shank / Lockheed Martin  
William Paterson / Lockheed Martin  
John Johansson / Lockheed Martin  
Leon Trevito / Lockheed Martin

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- Poster C.7**      **National Weather Radar Testbed System Implemented using COTS and VSIPL**  
 Bob Walsh / SKY Computers, Inc.  
 James Hunziker / Lockheed Martin  
 Tim Maese / Lockheed Martin  
 Walter Mazur / Lockheed Martin  
 Wayne Sabin / Lockheed Martin
- Poster C.8**      **Parallel ATR Scalability Results on Embedded Multiprocessor Systems**  
 Monica Burke / ALPHATECH, Inc.  
 Joel Douglas / ALPHATECH, Inc.  
 Gil Ettinger / ALPHATECH, Inc.
- Poster C.9**      **US Only Poster**  
**Parallelized Subaperture and Subpatch-Based Wavefront Processing of RC-12 SAR Data on Mercury Embedded Architecture Systems**  
 Brett Keaffaber / Veridian Engineering  
 \* Jeremy Gwinnup / Veridian Engineering  
 Mehrdad Soumekh / State University of New York at Buffalo  
 Ronald Dilsavor / AFRL
- Poster C.10**      **US Only Poster**  
**Applications of Angle-Based Band Selection for Efficient Hyperspectral Processing**  
 Nirmal Keshava / MIT Lincoln Laboratory
- Poster C.11**      **US Only Poster**  
**SIP-7 Experience: Converting HPC Codes to VSIPL**  
 Richard Linderman / AFRL  
 Jules Bergmann / AFRL
- Poster C.12**      **US Only Poster**  
**A Software FrameWork for HPEC System Development**  
 Scott Spetka / ITT Industries  
 George Ramseyer / AFRL  
 \* Richard Linderman / AFRL  
 Michael Moore / ITT Industries
- Poster C.13**      **US Only Poster**  
**Software Portability, Interoperability and Reuse: A Middleware Approach**  
 Andrew Vandivort / Raytheon  
 Harold Smith III / Raytheon  
 Michael DaBose / Raytheon  
 Garrett Wright / Raytheon  
 Gerald Morris / Raytheon

- 1230      Lunch
- 1340      **Session 7: System Applications**  
 Miriam Leeser / Northeastern University
- 1350      **Missile Seeker Common Computer Signal processing Architecture for Rapid Technology Upgrade**  
 Daniel Rabinkin / MIT Lincoln Laboratory  
 Edward Rutledge / MIT Lincoln Laboratory  
 Paul Monticciolo / MIT Lincoln Laboratory
- 1420      **Hybrid QR Factorization Algorithm for High Performance Computing Architectures**  
 Peter Vouras / Naval Research Laboratory  
 Gerard Meyer / Johns Hopkins University
- 1450      **Partitioning Computational Tasks within an FPGA + RISC heterogeneous Multicomputer**  
 John Bloomfield / Mercury Computer Systems, Inc.
- 1520      **Break**
- 1545      **Session 8: Advanced Systems (US Only Session)**  
 Rick Pancoast / Lockheed Martin
- 1555      **HPEC-SI Demonstration: Common Imagery Processor – APG-73 Image Formation**  
 Brian Sroka / MITRE
- 1625      **High Bandwidth Reconfigurable Embedded Daughter Card Accelerator**  
 Larry Ellcessor / Northrop Grumman  
 \* Geoffrey Weiss / Northrop Grumman  
 Michael Lucas / Northrop Grumman
- 1655      **Adjourn**

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