



## **Precision Indoor Personnel Location and Tracking for Emergency Responders**

**Technology Workshop, August 4-6, 2008  
Worcester Polytechnic Institute,  
Odeum, Campus Center,  
Worcester, MA**

### **Workshop Focus**

This Workshop will provide a forum for researchers and developers working in the important area of indoor location and tracking of emergency response personnel to share technical knowledge and to define the state of the art. The focus of this workshop is zero pre-installed infrastructure tracking, that is systems that do not require any previously installed wiring or equipment in the target building, such as is required by RFID-type systems. Further, the focus is on systems which provide complete tracking and position information on all equipped personnel to the incident command post. Simpler approaches ("homing devices") will also be considered for inclusion in the Workshop. Also, a session will be dedicated to the physiological monitoring of first responders. Select representatives of the governmental and user communities will participate.

### **Workshop Organization and Results**

Working sessions are organized around the major technical challenges. It is expected that all participants will contribute from their own experience and will share knowledge and best practices.

A Report will be published shortly after the conclusion of the Workshop, including the submitted abstracts from the participants and synopses of the discussions and conclusions of the Workshop itself. This report will be available on the website listed below.

<http://www.ece.wpi.edu/Research/PPL/Worshops/>

This workshop is supported by a FEMA Fire Prevention and Safety grant

## ~ Agenda ~

### **Monday, August 4<sup>th</sup>, 2008**

7:30 Registration and Continental Breakfast (Odeum, Campus Center)

8:15 Welcome: Dr. John Orr (WPI Provost)

8:25 Workshop Overview (Dr. R. James Duckworth)

8:30 **Overview of Requirements and Current Status**

Moderators: Tom Kennedy – CTC, Ric Plummer, CTC

#### ***Requirements Status and the Role of the WPI Workshop***

Tom Kennedy, CEO, CTC Inc Public Safety Technology Center

#### ***All Present and Accounted For***

Jonathan Kipp, Chair, NFPA Accountability Work Group

Joseph Rivera, CMSgt, USAF, Fire Emergency Services Program Manager, US Air Force

#### ***NFPA Electronic Safety Equipment Standards – What's happening now!***

Bruce H. Varner, Fire Chief, Santa Rosa Fire Department

Chris Spoons, NFPA TC Members & Task Group Chairs

#### ***National Law Enforcement and Corrections Technology Center – Communications Technologies Center of Excellence***

Peter F Small, Program Manager, Dr. Alan Kaplan, Technical Support, NLECTC

Communications Technology Center of Excellence

#### ***AFG Supported Research and Development into Firefighter Safety: Highlights of Clinical Studies***

Ellen D. Sogolow, Ph.D., Research Specialist, DHS/FEMA/AFG

10:00 Break

10:15 **Inertial Navigation**

Moderator: Steve Rounds, L-3 Communications

#### ***First Responder Tracking and Monitoring – The TRX Sentinel™ System***

Dr. Carole Teolis, CEO, TRX Systems

#### ***Precision Positioning System – Autonomous GPS-Denied Navigation for the Dismounted Soldier***

Peter Sherman and John Scudiere, Draper Laboratory

#### ***Tracking First Responders in GPS-denied Environments Using Low-cost IMUs***

David W.A. Taylor, PhD, ENSCO, Inc.

***Deploying a 3D Locator System based on a Wireless Sensor Network Architecture***

Frank Morese, Chairman/CEO, Alcyone Systems, LLC

***Perspective Sensing for Inertial Stabilization***

Dr. Bernard A. Schnauffer, Principal Systems Engineer / Jeremy Nadke,  
Rockwell Collins, Inc.

Noon Lunch

12:30 **Keynote Speaker:**

Jalal Mapar, Program Manager, S&T Directorate DHS

***Technologies for First Responders: Know WHERE They Are and HOW They Are!***

1:30 **RF-Based Positioning**

Moderator: Peter Sherman, Draper Laboratory

***WPI RF Precision Indoor Location: Challenges and Progress***

Dr. David Cyganski, ECE Dept., WPI

***Collaborative Effects of Distributed Multimodal Sensor Fusion for  
First Responder Navigation***

Jim Kaba, Senior Member, Technical Staff, Sarnoff Corporation

***Low-Cost WLAN based Time-of-flight Trilateration***

Christian Hoene, Senior Scientist, University of Tübingen, WSI - Computer Networks  
and Internet

***First Responder Accountability Solution Based on Wireless Ad-Hoc Networking***

Joe Denny, VP of Product Mgt., Tom Berger, CEO, TeraHop Networks

**GPS Applications in Indoor Tracking**

***A Novel System Approach for Locating Using Ultra Wideband Signals in  
First Responder Systems***

Lisa Osadciw, Assistant Professor - Syracuse University

***Advanced 3-D Locator Indoor Positioning for Firefighters and Other First Responders***

Steve Rounds, L-3 Communications

3:30 Break

3:45 **Physiological Status Monitoring for First Responders**

Moderator: Ellen Sogolow, DHS/FEMA/AFG

***Wearable Wireless Pulse Oximetry for Physiological Monitoring***

Dr. Yitzhak Mendelson, Biomedical Engineering Dept., WPI

***Combined Location and Physiological Status Monitoring***

Dr. R. James Duckworth, ECE Dept., WPI, Dr. Paul Nahass, Foster-Miller Inc.

***Second Generation, Fully Networked Smart Medical Vest***

Dr. Jacob Yadegar, EVP, Research and Technology, Dr. Anurag Ganguli, Co-Principle Investigator, UtopiaCompression Corp.

***Warfighter Physiological Status Monitor Evaluation***

Anthony Karis, Government Researcher, ARMY

***Physiological Monitoring in Extreme Environments: The View from NASA***

Norbert Kraft, MD, NASA Ames, SJSURF

**Communications**

***Real-Time Deployment of Multihop Relays for Communication Range Extension***

Nader Moayeri, and Michael R. Souryal, Advanced Network Technologies Division, NIST

***A Robust Communications Framework for First Responders***

Nick Martin, Grad Student, Rochester Institute of Technology

- 5:30 Adjourn  
*(Walk thru of Atwater Kent Building for Wednesday's Demonstration Participants- Ric Plummer)*
- 6:00 Reception and Barbeque (Higgins House)
- Reception (cash bar) 6:00pm  
Dinner 7:00pm

## **Tuesday August 5<sup>th</sup>, 2008**

7:30 Continental Breakfast  
(set - up for demonstrations)

8:00 **Complementary Technologies:**  
Moderator: William Haskell, Program Manager, NIOSH

***Location, Tracking, and Navigation Systems: Tactical vs. Rescue***  
Wayne C. Haase, PhD., President, Summit Safety, Inc

***The Halcyon Products Fireground Compass-A Novel Approach to Fireground Orientation and Self-Extrication***  
Steve Nash, CEO/VP, Chris Mantz Product Manager/Design Engineer,  
Halcyon Products, Inc.

***Strategies for Concurrent Development: An Open Architecture Data Interface for PPL Sub-systems***  
Phillip Lamm, QinetiQ Systems Engineering Group: Training, Security and Preparedness Division (TSPD)

***SafetyNet™ -The use of technology for mustering during emergency evacuations***  
Dan Grant, CMO, Intelligent Safety Solutions

### Visualization and Displays

***Situational Awareness for Fire Emergencies (SAFE)***  
Yohan Baillot, ITT Advanced Engineering and Sciences

***Tracking and Incident Response - Commanding the Whole Picture Utilizing Tracking Sensor and Other Geographic Information***  
Matt Klemp, VP Operations, Group 1 Solutions, Inc.

***The Incident Responder Monitoring System: Data Acquisition and 3D Rendering***  
Michael Buckley, Faculty, University of Buffalo, Vishal Gandhi, Research Assistant

10:00 Break

10:00 **Demonstrations** (Odeum C, Hagglund and Mid-Century)  
Coordinators: Mary Centrella and Colleen Sweeney, WPI

### **Odeum C**

***First Responder Tracking and Monitoring - The TRX Sentinel™ System***  
Dr. Carole Teolis, CEO, TRX Systems

***Advanced 3-D Locator Indoor Positioning for Firefighters and Other First Responders***  
Steve Rounds, L-3 Communications

***The Halcyon Products Fireground Compass***

Steve Nash, CEO, VP, and Chris Mantz, Halcyon Products

***Mobile Response Command System (MRCS)***

David W.A. Taylor, PhD, ENSCO, Kurt Fenske, R&D Program Manager, RSI,  
Tom Guelzow, Chief Operating Officer, RSI

***Real-Time Deployment of Multihop Relays for Communication Range Extension***

Nader Moayeri, and Michael R. Souryal, Advanced Network Technologies Division, NIST

***Draeger FRT 1000 Tracker Firefighter and Exit Device***

Greg Sesny, Product Manager, Draeger Safety Inc.

**Hagglund**

***Utilization of Varying Degrees of Geographic Information Accuracy to Display Indoor/Outdoor Personnel Tracks***

Matt Klemp, VP Operations, Group 1 Solutions, Inc.

***Pathfinder: An Indoor Navigation System***

Wayne C. Haase, PhD., President, Summit Safety, Inc

***Low-Cost WLAN based Time-of-flight Trilateration***

Christian Hoene, Senior Scientist, University of Tübingen, WSI - Computer Networks and Internet

**Mid-Century**

***Combined Location and Physiological Status Monitoring***

Dr. David Cyganski, WPI, Dr. Paul Nahass, Foster-Miller, Inc.,  
Mark Mordecai, Globe Manufacturing

***Situational Awareness for Fire Emergencies (SAFE)***

Yohan Baillot, ITT Advanced Engineering and Sciences

***Warfighter Physiological Status Monitor Evaluation***

Anthony Karis, Government Researcher, ARMY

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12:00 Lunch (*continue with demonstrations as required*)

12:45 **Remarks**

Congressman James P. McGovern, 3<sup>rd</sup> District, MA

- 1:00 **Keynote Speaker:**  
Charlie Dickinson, Deputy Assistant Administrator, United States Fire Administration  
**Why???**
- 1:30 **Parallel Working Sessions on the State of the Art**
- ODEUM: Location and Tracking***  
(Moderator-Wayne Haase, Summit Safety)
- MID-CENTURY ROOM: Physiological Status Monitoring***  
(Moderator-Ellen Sogolow, DHS/FEMA/AFG)
- HAGGLUND ROOM: User Community Feedback***  
(Moderator-Tom Kennedy, CTC)
- 2:30 **Plenary working session**  
Moderator Dr. R. James Duckworth, WPI:
- 15 min presentations from each group
  - State of the art and primary unsolved problems
  - Progress from last year
  - Answers to Specific Questions
- 3:00 **Plans for the Future**  
Moderator Dr. R. James Duckworth:  
**"A Technology Roadmap"**
- \*Evaluation Sheets filled out and returned*
- 3:15 **Next Steps - System Testing and Evaluation, Request for Participation**  
Rita Gonzalez, Director, National Protection Center, US Army/Natick Soldier RD & E Center
- 3:30 **Adjourn** (*continuation of discussions if needed after workshop concludes*)

## *~Systems Testing and Demonstration Schedule~*

### **Tuesday August 5<sup>th</sup>, 2008** *(optional)*

- 4:00 **Preparation for Wednesday System Testing**  
Ric Plummer, CTC-*Description of scenario for Wednesday*  
  
(Each system developer will provide a description of their system)  
*-Discussion with WFD-*
- 4:15 ***Combined Location and Physiological Status Monitoring***  
Dr. David Cyganski, WPI
- 4:35 ***Mobile Response Command System (MRCS)***  
Dr. David Taylor, ENSCO, Kurt Fenske, RSI, Tom Guelzow, RSI
- 4:55 ***Pathfinder: An Indoor Navigation System***  
Wayne C. Haase, PhD., President, Summit Safety, Inc
- 5:10 ***Mantenna Homing Device***  
Dr. David Cyganski, WPI
- 5:25 ***Draeger FRT 1000 Tracker Firefighter and Exit Device***  
Greg Sesny, Product Manager, Draeger Safety Inc.

### **Wednesday August 6<sup>th</sup>, 2008** *(Optional Day)*

*Please note: due to the nature of testing, space will be limited. There will be an observation area set up for those who wish to observe while testing is taking place.*

- 8:00 **Systems Testing (Conducted by WFD) - Atwater Kent Building**
- 8:30 ***Combined Location and Physiological Status Monitoring***  
Dr. David Cyganski, WPI
- 10:30 ***Mobile Response Command System (MRCS)***  
Dr. David Taylor, ENSCO, Kurt Fenske, RSI, Tom Guelzow, RSI
- 12:00 **Lunch** – AK Lounge Area-1<sup>st</sup> Floor
- 1:00 ***Pathfinder: An Indoor Navigation System***  
Wayne C. Haase, PhD., President, Summit Safety, Inc
- 2:00 ***Mantenna Homing Device***  
Dr. David Cyganski, WPI
- 3:00 ***Draeger FRT 1000 Tracker Firefighter and Exit Device***  
Greg Sesny, Product Manager, Draeger Safety Inc.
- 4:30 **Adjourn**

Internet Access:

*Attendees for the workshop can access the internet using the following log in and password:*

**Log In:** ppl  
**Password:** wpiguest

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2008 Workshop Steering Committee Members:

Dr. R. James Duckworth	Associate Professor, ECE Department, WPI
Dr. David Cyganski	Professor, ECE Department, WPI
Dr. John Orr	Provost, Senior VP, WPI
Thomas J. Kennedy	CEO, CTC, Inc. Public Safety Technology Center
Ric Plummer	Consultant/Fire Fighter, CTC Corporation/Berlin Fire Dept.
Linda Carre Looft	AVP, Gov & Comm Relations, WPI
Mary Centrella	Admin. Assist. to Linda Looft
Colleen Sweeney	Graduate Admin. Assistant, ECE Department, WPI
Donna Andrews	Director of Corporate Services, CTC, Inc.