

## Localization Requirements for Homeland Security Applications: *Emergency Responders*

*Opportunistic RF Localization for Next Generation Wireless Devices June 14, 2010, WPI, Worcester, MA* 

Jalal Mapar Program Manager Infrastructure & Geophysical Division Science and Technology Directorate Department of Homeland Security June 14, 2010



## DHS S&T Directorate





# Infrastructure and Geophysical Division



## Preparedness & Response



### Objectives

• Enhance first responders ability to prepare for, respond to and recover from all-hazards emergencies through development and deployment of enabling technologies



## Customer

•DHS/FEMA (primary), and others (CBP, CG, TSA, ...)

### End-User

- +44,000 Emergency Response Organizations
- •18,000 Law Enforcement Agencies
- •30,000 Fire Departments
- •83,000 State/Local Governments





## Indoor Location Tracking





# Locate $1^{st}$ Responders in X, Y, and $\mathbf{Z}$

"The Inter Agency Board, a working group of first responders that identifies and approves technologies for use by police, fire and ambulance services, has listed the development of a 3-D tracking system as one of its top research priorities ... Commanders want icons on a screen showing them where all their personnel are, especially while they're inside buildings ... "

Chief Bob Ingram, FDNY and IAB Chairman National Defense Mag











Capability Need

- Allow emergency managers, including fire chiefs and other incident commanders, to

rapidly and effectively deploy and re-deploy their forces or understand and respond to the consequences of potential

threats to their forces Accurately locate and track

# Location Tracking: Requirements









DHS S&T SBIR Phase II (NBCHC080076) 3D Bldg Visualization Tool for Incident Commanders Kutta Technologies, Phoenix, AZ

- Specify the location of its host in three dimensions within 6 meters (3 meters desired)
- \*Assume building is not instrumented\*
- Function in the extreme operational environments encountered by emergency responders
  Incident life of 2 hours or longer (4 hours desired)
- Include a distress button on and indicator of non-movement
   Wirelessly transmit inside or outside of structures and through rubble to an off-site incident command post, on-site incident command posts, emergency responders
   Self-initializing, calibrating, adjusting, and with diagnostic capabilities to ensure speed and reliability

- Resistant to potentially damaging electrical charge, protected from potentially damaging electrical charge, protected from potentially dangerous gases, impact resistant, and waterproof Operate outside all buildings and inside of almost all buildings, no matter their structural state and environmental conditions
- Primary incident command posts should be able to monitor the status of the locator and its host from a radial distance from 30 meters to 100 meters (per relay)
- Base station is a combination of additional communications equipment and the laptop/portable computer and required software.
- · Base station software must be able to display location and Base station of personnel. Base station software must be able to link the unique identifier of the locator to a specific individual
- Base station must include visualization tools to allow incident commanders and site personnel to easily interpret incoming displayed information · And many more

## 3-D Locator: Building Visualization



## 3-D Locator: Early Prototype



# 3-D Locator: Prototype Experience

### · Lessons Learned From the prototyping project

- Requirements are still the same
- Indoor location tracking technology not mature as a product
- Current systems work some of the time but not all of the time
  - Multipath, loss of signal, error correction, ...
- End user input extremely essential and critical!
- Has to be easy to use or it won't be accepted
  - Size, weight, *Automation* & Power (SWAP)
  - Automation, non-intrusive
  - Integration with existing equipment
- Cost is a major consideration
  - System/unit cost
  - Maintenance/upkeep







### Geospatial Location Accountability and Navigation System for Emergency Responders (GLANSER)

### Objective:

- Improve the precision of locating first responders during an incident in non-GPS environments (subterranean, sky-scrapers, etc.).
- Provide Incident Commanders the ability to accurately locate and track personnel in order to rapidly and effectively re/deploy and save at-risk responders during an incident.







Accomplishments and Future Goals:

- 2009-Initial prototype was developed and performance of 3 meters was demonstrated in several field tests
- 2010- BAA09-02 Selection Completed with 2 Awards and a Kick-Off with Stakeholders
- Conduct PDR and select performers for next development Phase of GLANSER
- Have performers demonstrate initial Prototype

Know WHERE they are...

# GLANSER: DHS S&T BAA 09-02







# Enhancements for a Stable Product

- System robustness
- Improved accuracy to better than 1 meter (X,Y,Z)
- Form/Fit/Function
- Ranging
- Cost reduction
- T&E with large groups of 1<sup>st</sup> Responders
- Algorithms, SW
- · Network, bandwidth
- · Integration of new components





# GLANSER: Way Ahead

- · A robust system that integrates the best components
- Spiral development w/ emphasis on T&E with responders





Planned System Demo: Summer 2010





