Emergency Preparedness and Response

Leveraging Technology and Information

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National Security

UT-BATTELLE
Oak Ridge National Laboratory

Strategy to Protect the Nation

"The capability to dispatch informed first responders *within minutes following a catastrophic event will save lives.*"

-- ORNL Congressional testimony on 1 Mar 2002

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Oak Ridge National Laboratory

"I haven't the slightest idea who he is. He came bundled with the software."

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Topics

- **Incident Management System Requirements**
- **Detection**
- **Assessment**
- **Command and Control**
- **Response**
- **Training**

Incident Management System Requirements

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"It must be his beeper."

Incident Management System Requirements

Emergency Management

- Information Technology Infrastructure for Comprehensive Incident Management from Local to National Levels

- Distributed Access with Multi-Level Security Providing a Common Operating Picture

- Reliable, Survivable, and Secure

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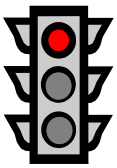
System Requirements (Continued)

Emergency Management

- Scalable Across State, Local and Federal Governments

- Common Data Highway to Integrate Information from All Sources



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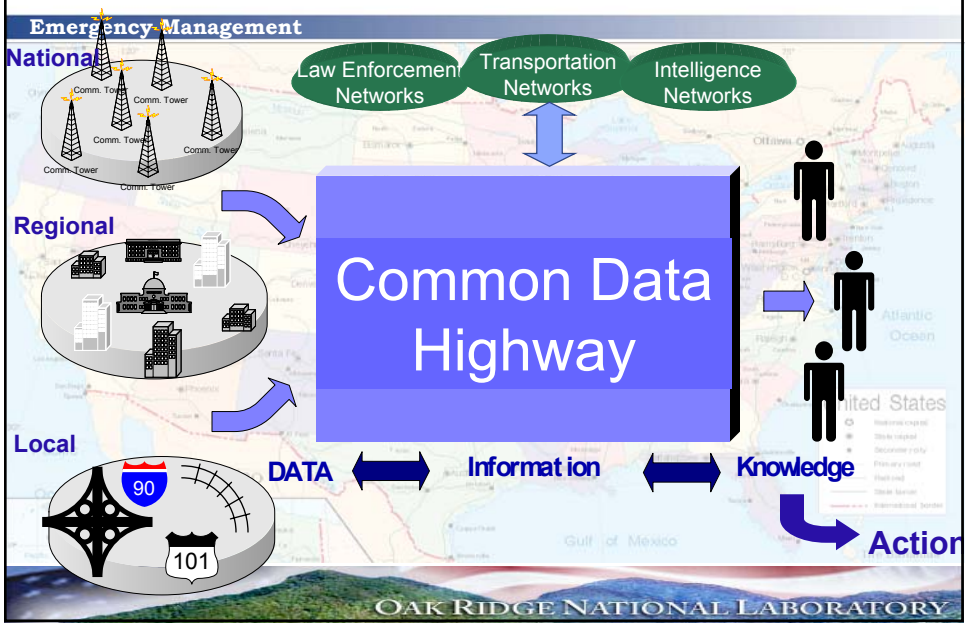
Providing Knowledge For Action



The Law Enforcement Innovation Center (LEIC)

Emergency Management

Established in 2000 by the University of Tennessee and and is funded by congressional action. LEIC's primary mandate is fourfold:

- ★ **Leadership and executive training**
- ★ **Advance law enforcement technologies**
- ★ **Initiate and facilitate community partnerships**
- ★ **Operational law enforcement innovations**

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Emergency Management

C.A.P.T.U.R.E – Corridor Access Police Tracking Uniform

- ★ The purpose of *CAPTURE* is to Share Information
- ★ Initial partnership established with:
  - ★ Knoxville, TN Police Department
  - ★ Bedford County, VA Sheriffs Office
  - ★ Huntsville, AL Police Department
  - ★ Chattanooga, TN Police Department
  - ★ Kingsport, TN Police Department
  - ★ Roanoke, VA Police Department

Y-12 National Security Complex

UT Law Enforcement Innovation Center

Emergency Management

Public Safety Technology Alliance

- ★ A partnership between law enforcement agencies, state forensic laboratories, the LEIC, and the scientific community at Oak Ridge National Laboratory.
- ★ To apply advanced technologies to solving major crimes
- ★ Uses the unique facilities and capabilities of the Oak Ridge National Security Complex to address public safety problems that exceed local law enforcement assets

Public Safety Technology Alliance

- ★ Cyanoacrylate fingerprint
- ★ Chemical characterization of fingerprints
- ★ Time since death
- ★ Video tape digital reconstruction
- ★ Audio tape reconstruction
- ★ Theft Prevention Encapsulated Taggants
- ★ Enclosed Space Detection System

Detection

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"All I'm saying is now is the time to develop the technology to deflect an asteroid."

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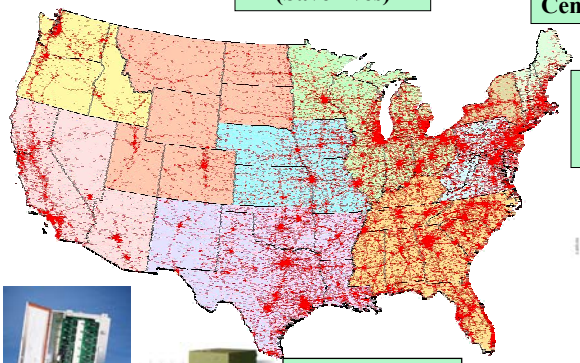
Nationwide Real-Time Detection System

Emergency Management

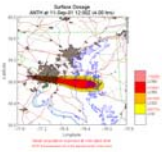
Strategic Sites

First Responders (Save lives)

National Operations Centers



Automated Hazards Analysis



Nationwide Field Service

Remote Telemetry

Sensor Systems

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National Benefits

Emergency Management

- ★ Rapid Deployment of System
- ★ Nationwide Real-Time Detection
- ★ Early Warning Threat Communication
- ★ Immediate Hazard Prediction
- ★ Rapid Informed Response
  - First Responders
  - Evacuation Instructions
  - Triage for Exposed Population

Emergency Management

Assessment

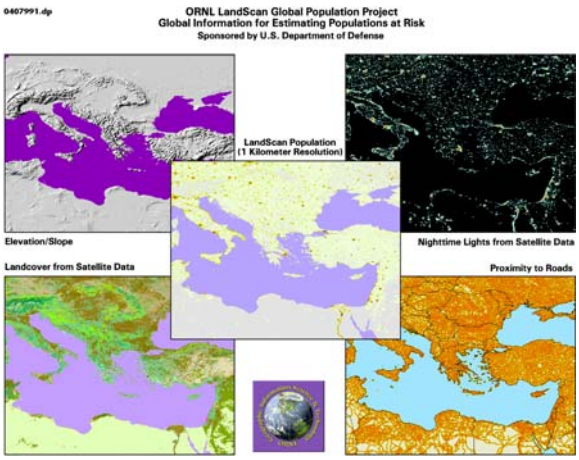
Emergency Management

"Very nice résumé. Leave a sample of your DNA with my secretary."

LandScan: Federal Standard For Population Data

Emergency Management

- ★ **Used by DOD, State Department, other federal and international agencies**
- ★ **Finest resolution ever for the entire world**
- ★ **First based on satellite imagery**
- ★ **Age/sex distributions**
- ★ **Day/night estimates underway**
- ★ **"City block" resolution nationwide (300 ft.) underway**



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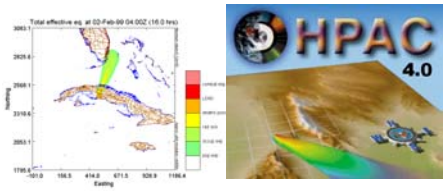
Hazard Prediction and Assessments Capability Program (HPAC)

Emergency Management

- ★ Estimates the hazards from atmospheric release of nuclear, biological, and chemical materials
- ★ Forward deployed on laptops
- ★ Includes World-wide Population Data, Terrain, Landcover, Real-Time Weather
- ★ Immediate Health Effects
- ★ Stand Alone or Client-Server Based Architecture



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Hydrologic Transport Assessment System (HYTRAS)

Emergency Management

- ★ Predicts the transport/concentration of NBC agents in water
- ★ Concentrations in water and sediment are estimated for areas and time-periods of interest
- ★ HYTRAS will be integrated with HPAC
- ★ New river data base will have thousands of rivers, including water intakes for US

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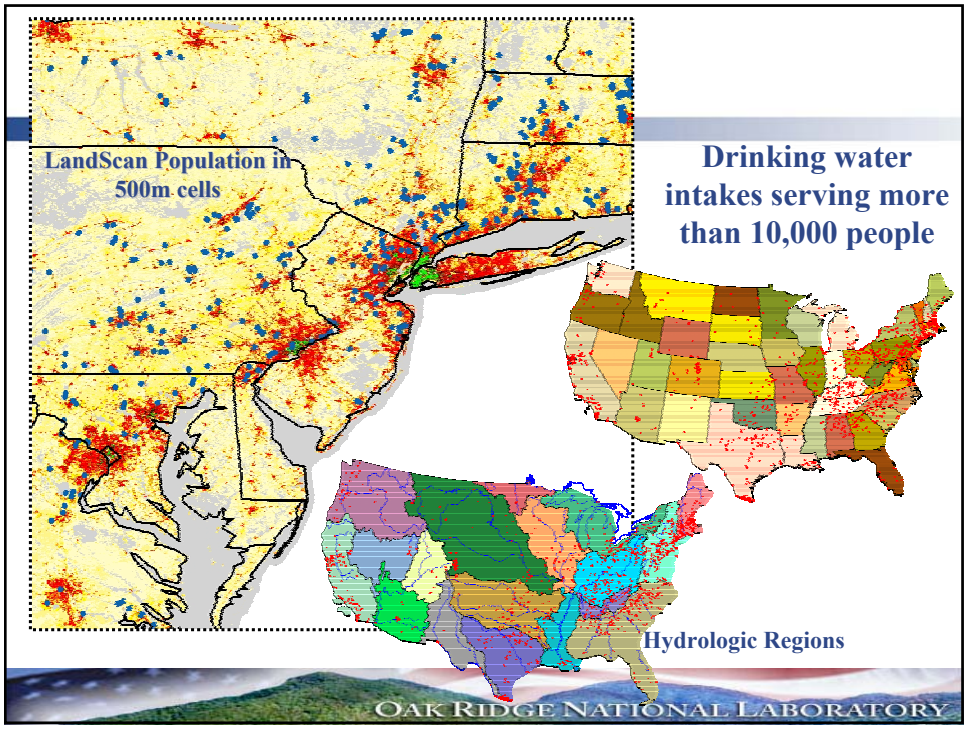
LandScan Population in 500m cells
Drinking water intakes serving more than 10,000 people
Hydrologic Regions
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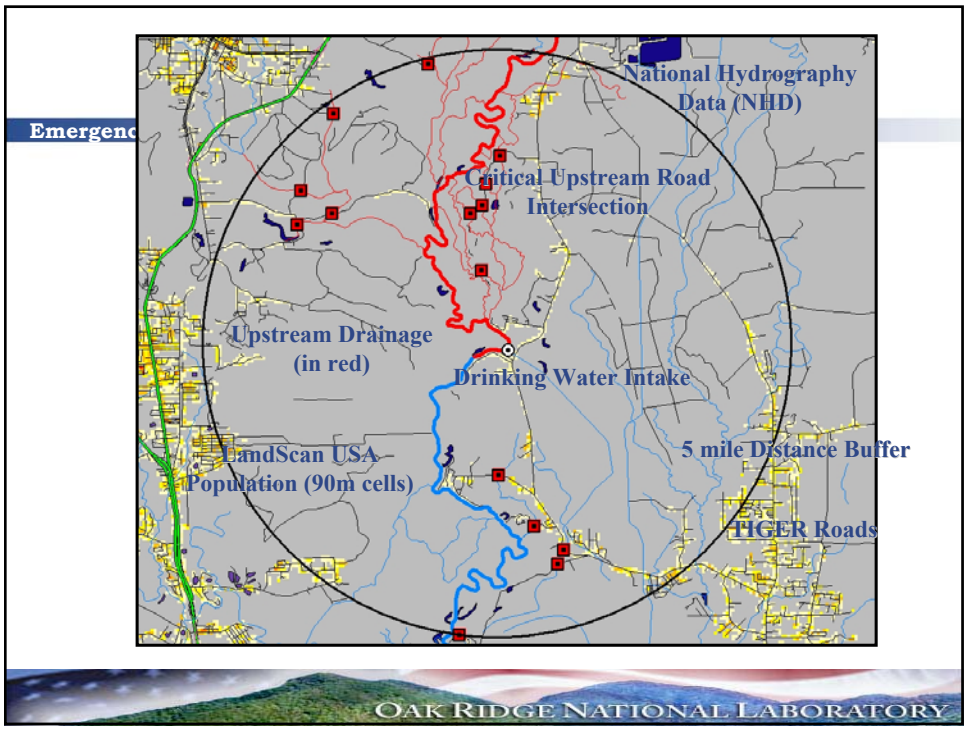
Emergenc
National Hydrography Data (NHD)
Critical Upstream Road Intersection
Upstream Drainage (in red)
Drinking Water Intake
LandScan USA Population (90m cells)
5 mile Distance Buffer
TIGER Roads
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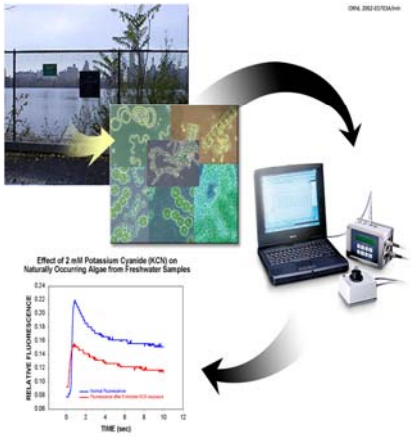
AquaSentinel[SM]
A Photosynthetic Biosensor System for Drinking Water

- Tissue-based biosensor detection system that uses naturally occurring aquatic photosynthetic tissue as the sensing material for detection of chemical antagonists in the water
- Successfully detected algae in several Tennessee rivers and indicated changes in characteristic fluorescence



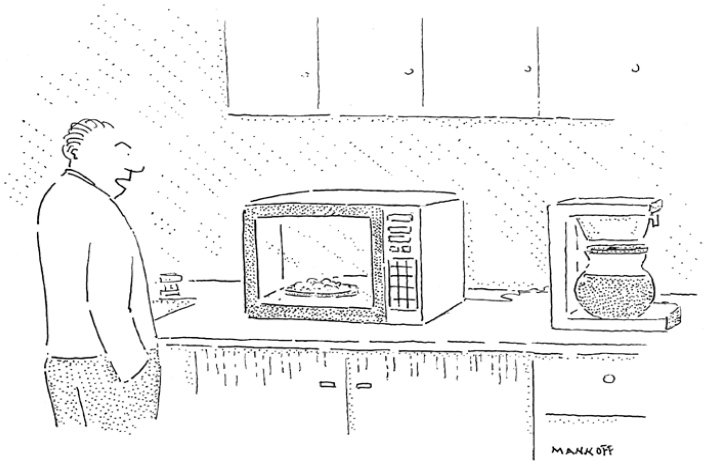
ENVISIONED DELIVERABLES

(1) A relatively inexpensive stand-off biosensor system

(2) Detects presence of chemical warfare agents in water

(3) Can continuously monitor sources of primary drinking water.

Command and Control



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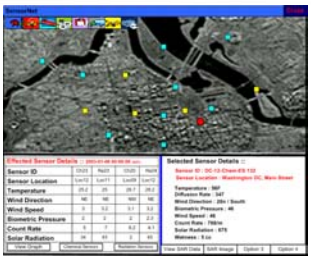
"No, I don't want to play chess. I just want you to reheat the lasagna."

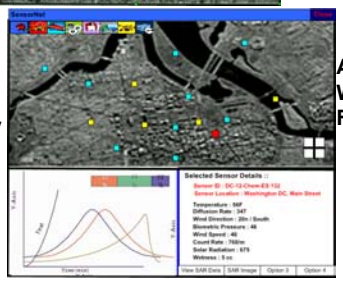
Command Center Interface

Area View

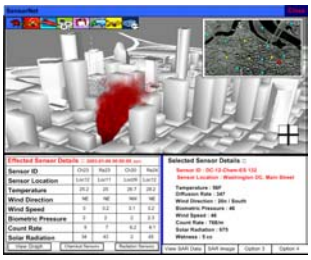
Area View With Sensor Detail



Area View With Sensor Time History Plot

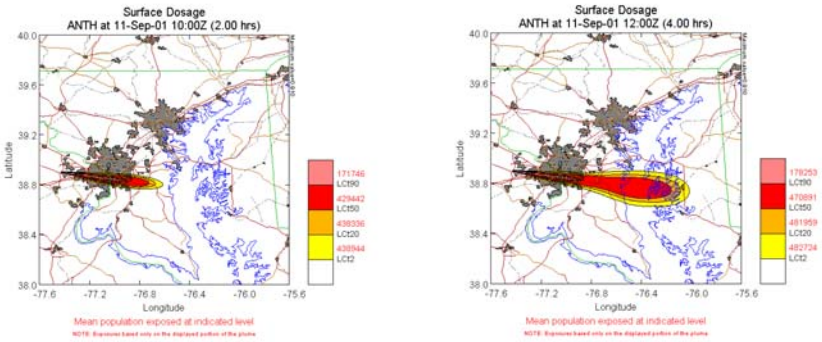


Area View With 3D Fly-Through



Immediate Hazard Prediction

Emergency Management



465,738

Lethality Without Early Treatment

501,919

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Response

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"You've got mail."

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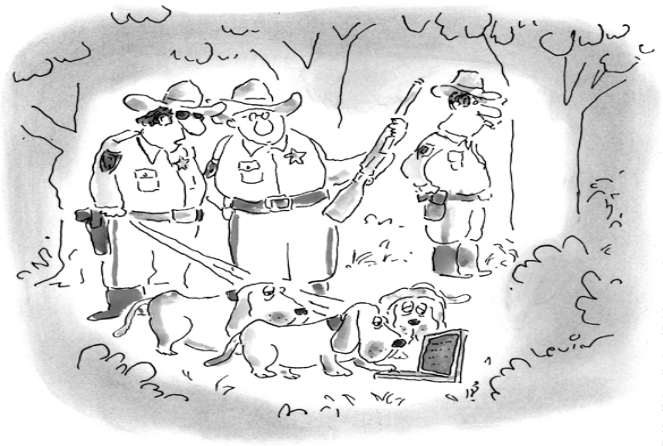
Rapid Response

- ★ **Real time information direct to the decision-maker**
- ★ **Immediate identification of the threat**
- ★ **Immediate predictive assessment of the event over time**
- ★ **Encrypted communications**
- ★ **Decision support tools**
- ★ **Right information to first responders - FAST**

Public Safety Systems, LLC

RAMSAFE™
Saving lives
Saving time

Training



"First, they do an on-line search."

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Training for Readiness

- ★ **Embedded training in day-to-day system**
- ★ **Realistic scenarios**
- ★ **Realistic models**
- ★ **Include projected effects on population**
- ★ **Conquer jurisdictional issues**
- ★ **Improve operating procedures**

CONCLUSIONS

Emergency Management

- ★ War on terrorism requires a real-time national system
- ★ Information infrastructure must span from local to national level seamlessly
- ★ Hazard prediction capability must identify the population at risk
- ★ Distributed command and control architecture essential to a common operating picture.
- ★ Embedded training is a system requirement

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Emergency Management

"Most people skate to where the puck is . . . I skate to where the puck is going to be."

—Wayne Gretzky

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