Applications of IEEE 1451 Wireless Technology for

Military Force Protection & Homeland Security

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Agenda

- 3eTI Corporate Overview
- 3eTI InfoMatics™ Architecture
- Sensor Networking at Camp Fallujah, Iraq
- Sensor Networking at Naval District Washington
  - Naval Support Activity, South Potomac – Dahlgren Site
- Road to Interoperability
- Enabling Technologies
- Summary

Corporate Overview

History

- Established in 1996
- 2004 Annual Revenue: $26M
- Employees: 130
- SBIR Success Story
  - •16 Phase I, 8 Phase II & 7+ Phase III Contracts
- $200M+ in active SBIR Phase III contracts
- Recipient of the Navy SBIR "Tibbetts Award"
- Washington Business Journal:
  - •Washington DC Metro Area 5th Fastest Growing Company (2002)
- Offices in Rockville, MD (HQ); Blairsville, PA; Indiana, PA; Dahlgren, VA; Corona, CA; Panama City, FL.

Vision

- An entrepreneurial company that transforms ideas to quality business

Mission

- To dominate all our markets focusing on innovative and integrated location and condition dependent wireless solutions

Products & Technologies

- Secure Wireless Networking
- Wireless Sensor Interface Devices
  - RFID, Video, & NCAPs
- Asset & Location Tracking/Management

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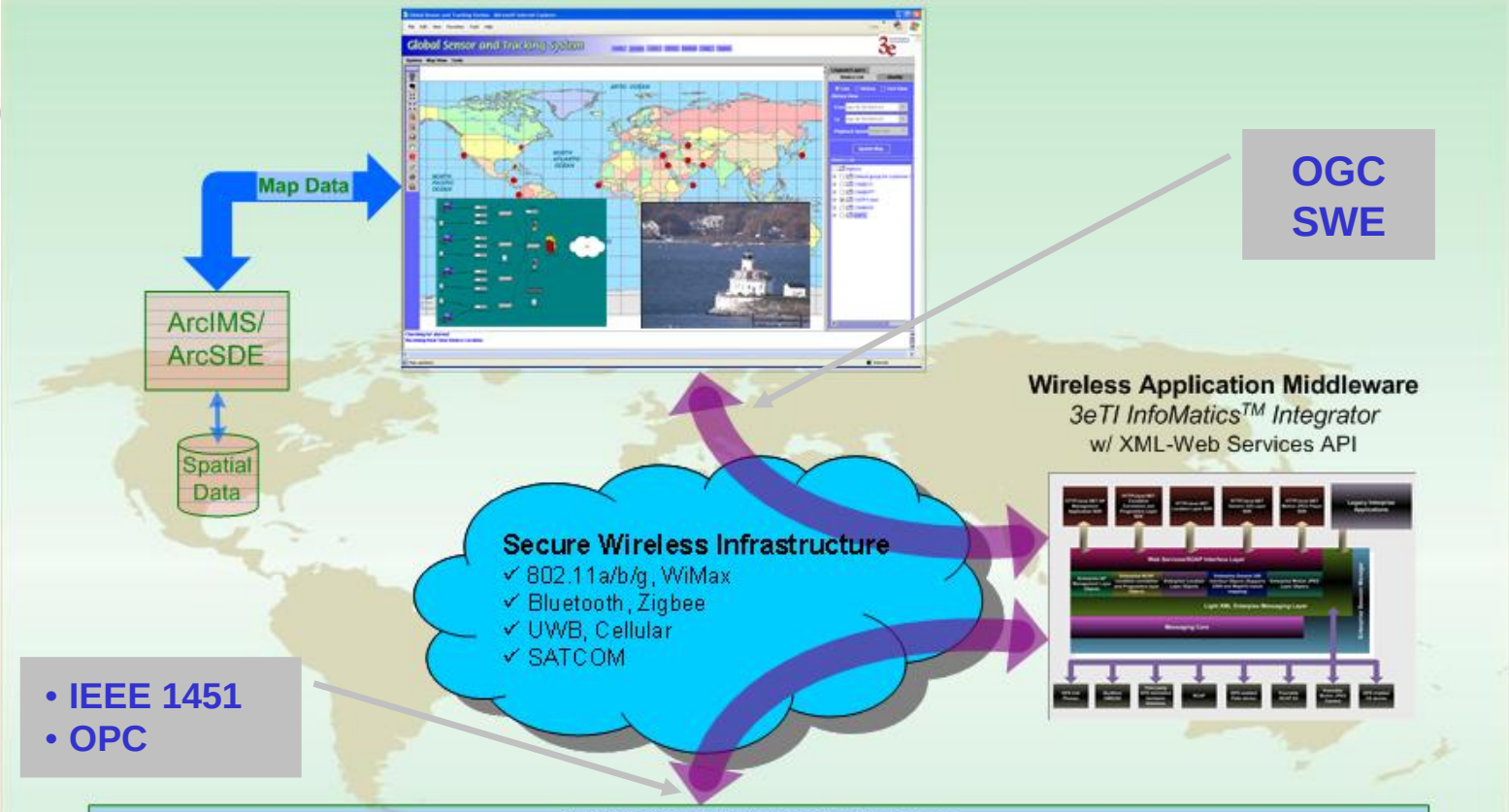
InfoMatics™ Architecture



InfoMatics™ Integrator Adapters

Relational Databases	Location Sensors	Condition Sensors	Video Sensors
✓ MS SQL Server	✓ GPS Sensors (Skywave, Outerlink)	✓ SCADA Systems (Invensys, Iconics...)	✓ Java-based Video Management Systems
✓ Oracle	✓ GPS-enabled Phones (Nextel, CSI Wireless)	✓ ICAS	
✓ My SQL	✓ RFID Sensors	✓ 3eTI Wireless NCAP	
✓ DB2	✓ Bldg. Access Control Sensors	✓ Chemical Sensors (Ship ACADA)	
	✓ Wi-Fi Access Points	✓ JSIPP Sensors	

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Sensor Networking Application

Anti-Terrorism/Force Protection Solution for Camp Fallujah Fallujah, Iraq

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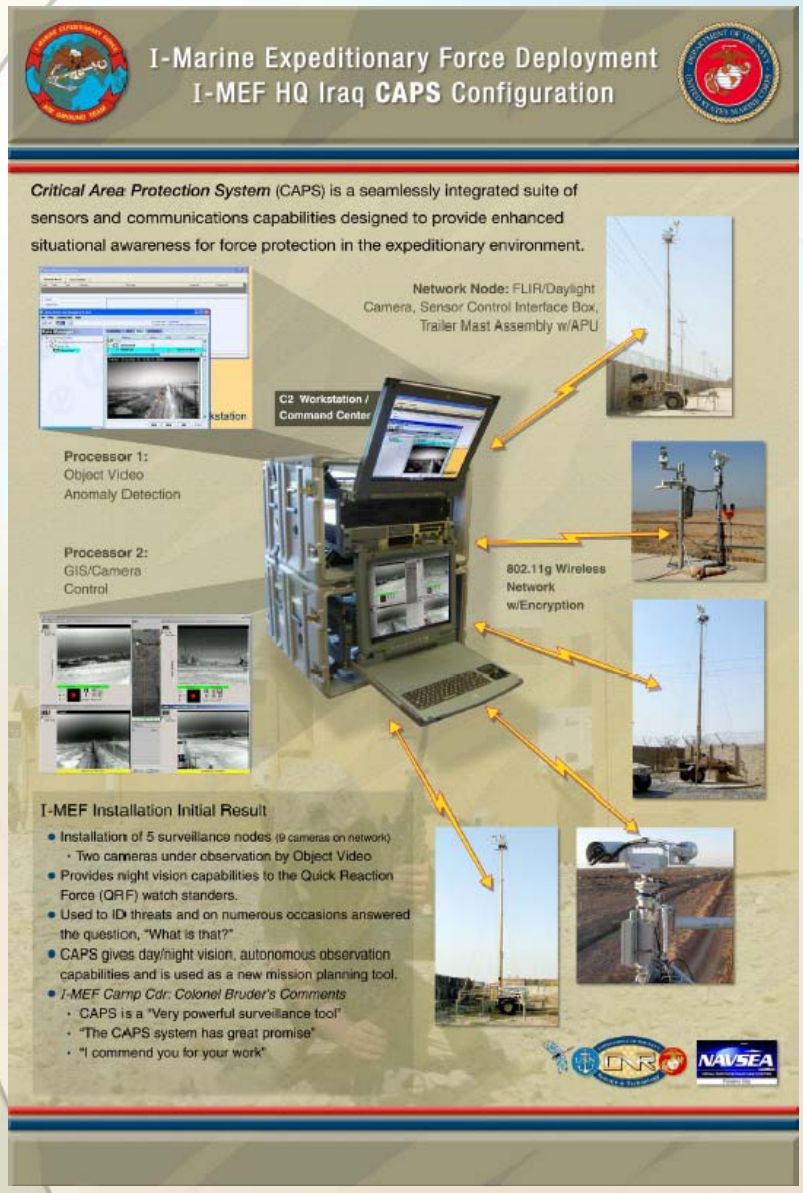
Critical Area Protection System

1st Marine Expeditionary Force – Camp Fallujah



USMC CAPS Brochure

Wireless Sensor Node
Deployment in Camp Fallujah

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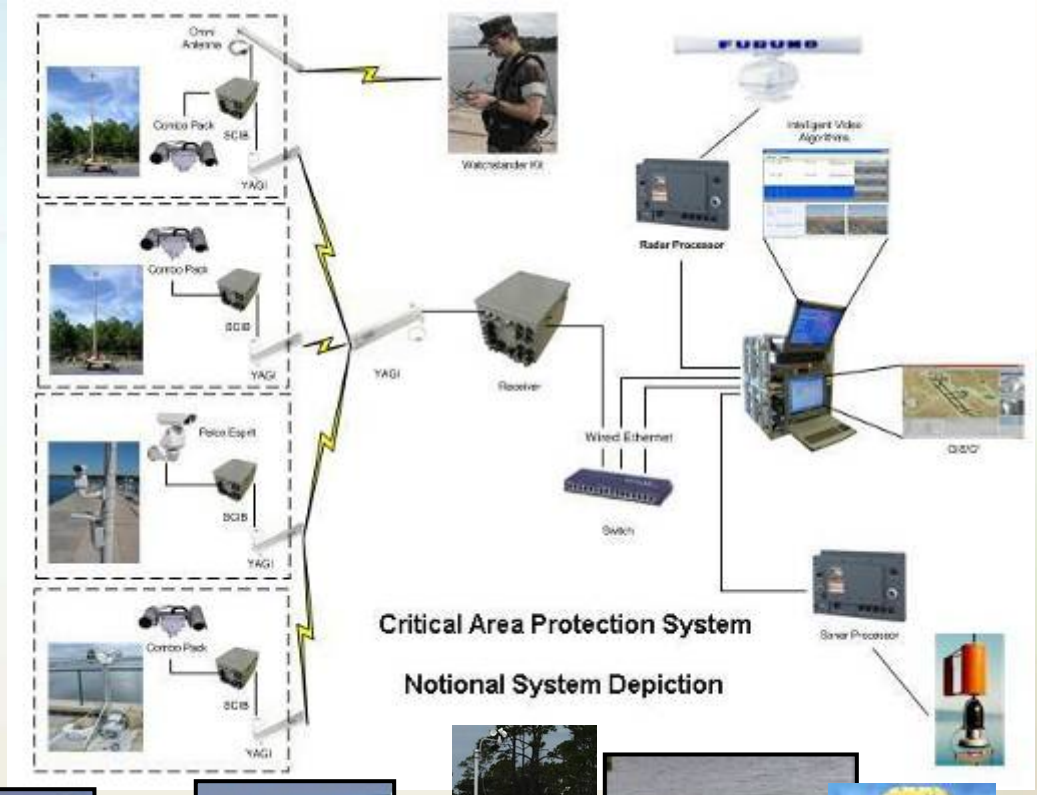
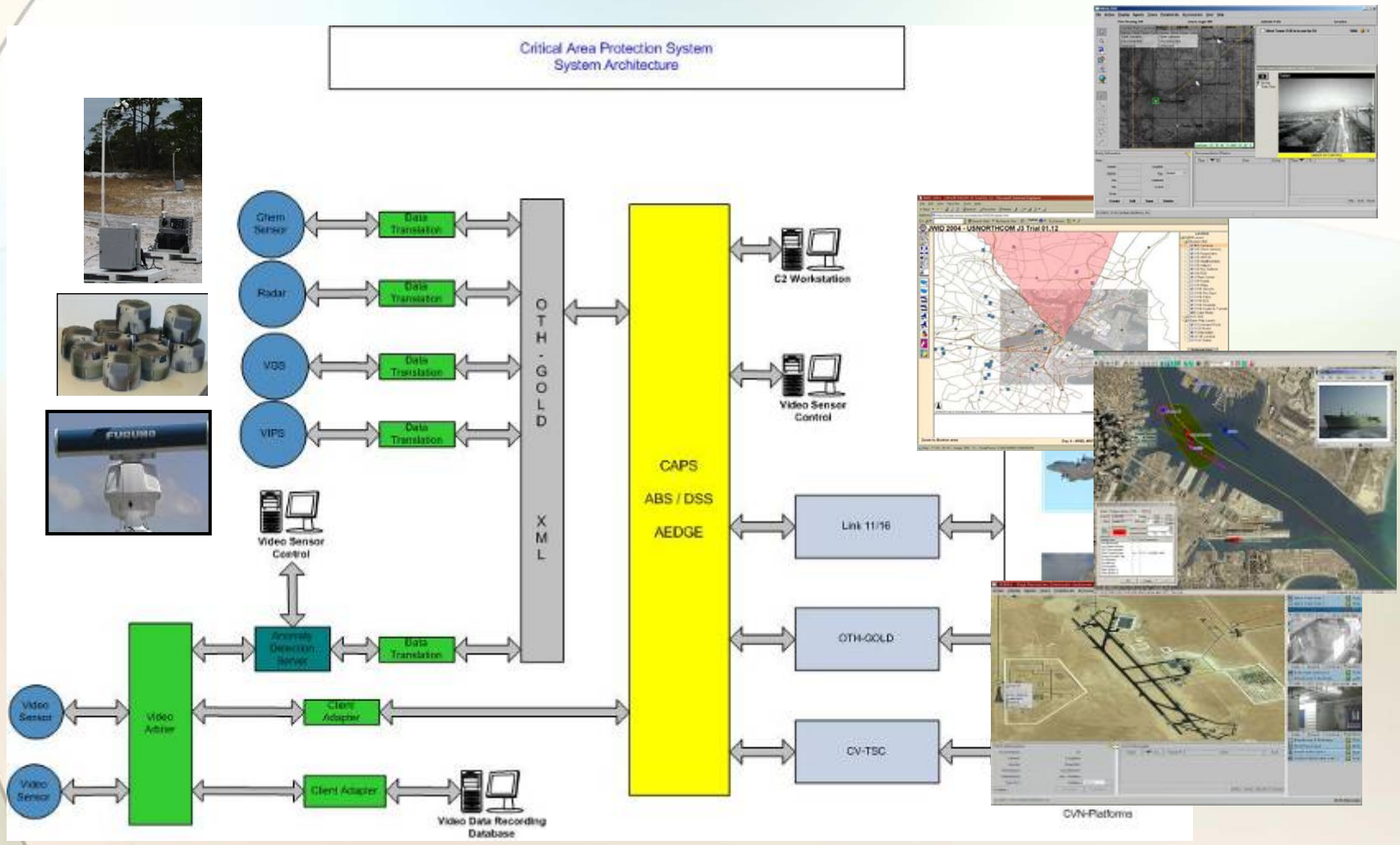
CAPS High-Level Description

- **User Defined Operational Picture**
  - AEDGE® - Agent Enhanced Decision Guide Environment
  - C2 Software
- 802.11g Wireless Networking
  - (**FIPS 140.2 Validated**)
- **Multiple-Sensor Types**
  - Radar, LLLTV, FLIR, AIS, Acoustic/Seismic, Sonar, Chemical, Weather, GPS
- Watchstander's kits with GPS
- **Artificial Intelligence Video Anomaly Detection**
- Distributed Software Architecture



CAPS Architecture



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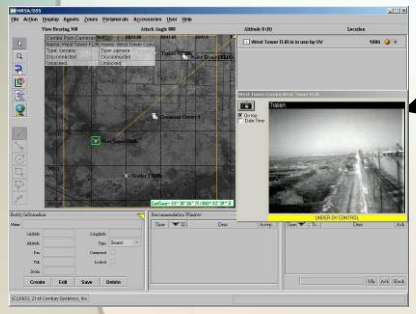
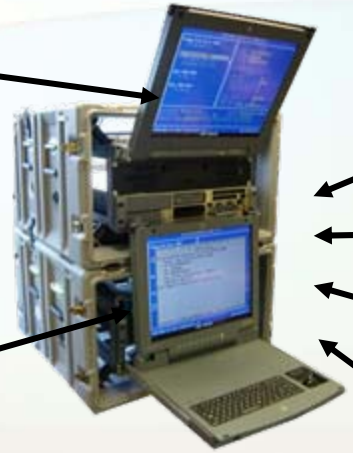
CAPS Configuration

1st Marine Expeditionary Force HQ, Iraq

Video Anomaly Detection

GIS/Camera Control





…”Provided Camp Fallujah with a much needed and appreciated increase in FP capability.”

...”Made a noticeable improvement that continues to be exploited by the war fighter.”

Sensor Networking Application

Virtual Community
Evaluation Complex (VCEC)

Naval Support Activity, South Potomac
Dahlgren, VA

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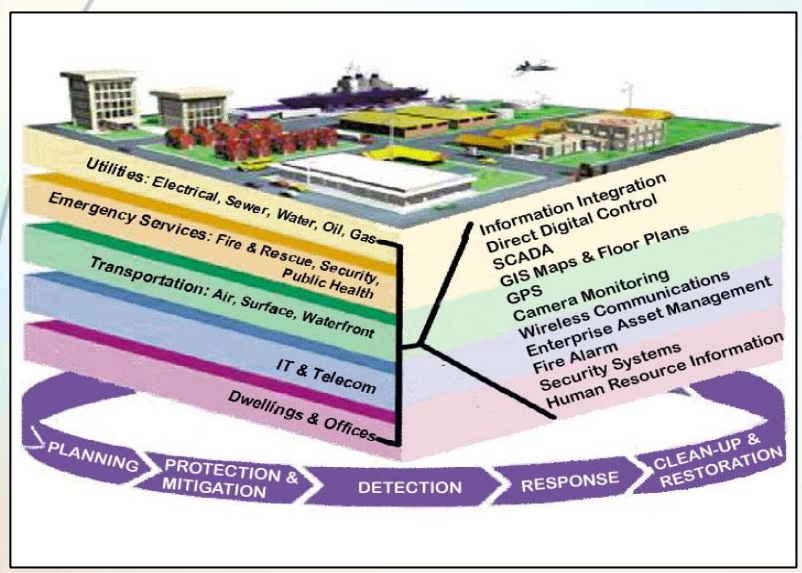
Military Installation Management Solutions

Virtual Community Evaluation Complex

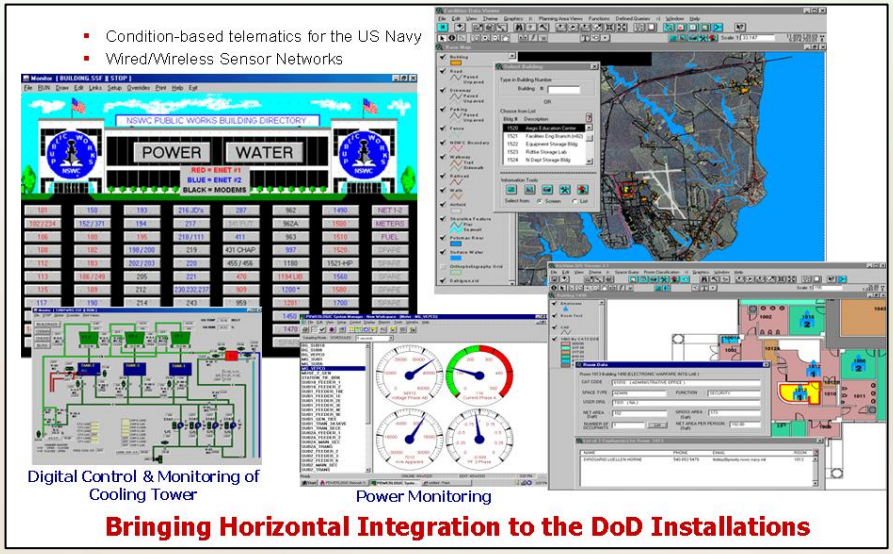


VCEC objectives include:

- Anti-Terrorism/Force Protection
- Critical Infrastructure Protection/Management
- Efficient Base Operations

VCEC Benefits

- Force Protection/Anti-Terrorism
- Protect Critical Infrastructure
- Telematics for Base Operations
- Asset Tracking, Monitoring and Control Systems
- Facilities Management
- Leading-edge security solutions
- Improve real-time situational awareness



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Naval Support Activity, South Potomac Dahlgren Site

LAND:	4,320 Acres
BUILDINGS:	645
HOUSING UNITS:	250

SENSOR SYSTEMS:

DDC/SCADA	60,000 Sensors
EXTERNAL CAMERAS	120
FIRE ALARM SYSTEMS	137 Buildings
FIBER OPTIC NETWORK	35 Miles
SECURITY SYSTEMS	41 Buildings
WEATHER SYS/RADAR	
CHEM/BIO	

INTEGRATED GIS ENVIRONMENT:

Linked databases on a common geospatially referenced map

- BUILDINGS
- UTILITIES
- ROADS
- FIBEROPTIC NETWORK CABLES
- ENVIRONMENTAL DATA
- HUMAN RESOURCE DATA

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VCEC – JWID 2004 Scenario

Demonstrate VCEC Command and Control Capability by simulating a toxic chemical spill within an NSWCDD Building.

Target Scenario

- Chemical Agent breach in Electronic Warfare Building.
- Emergency Response
  - Dispatch Emergency Responders and MEOC (In-vehicle Video/Data access/GPS Tracking)
  - Localize In-Building Air Handling to prevent spread
  - Determine current building occupancy from Bldg. Access Control System.
  - Send instrumented First Responders into building (RFID locating devices)
  - Generate computer simulation to determine threatened areas.
  - Turn-off Air Handling systems in threatened buildings.
  - Evacuate occupants as necessary

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VCEC Consequence Mgmt Demo

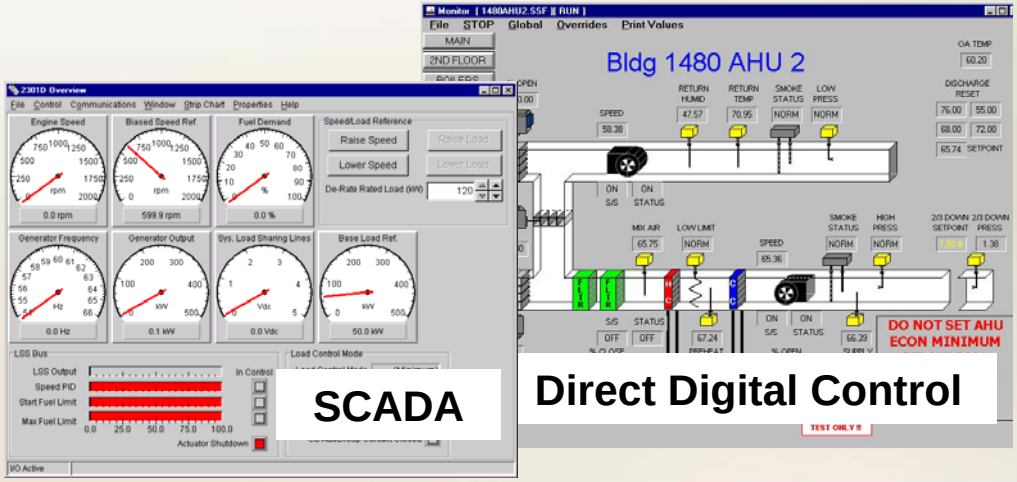
Integrated Sensor Technology

ACADA Chemical Sensor with EEL robot

Passive Radiation Portal

Camera Systems

GPS Tracking Beacon



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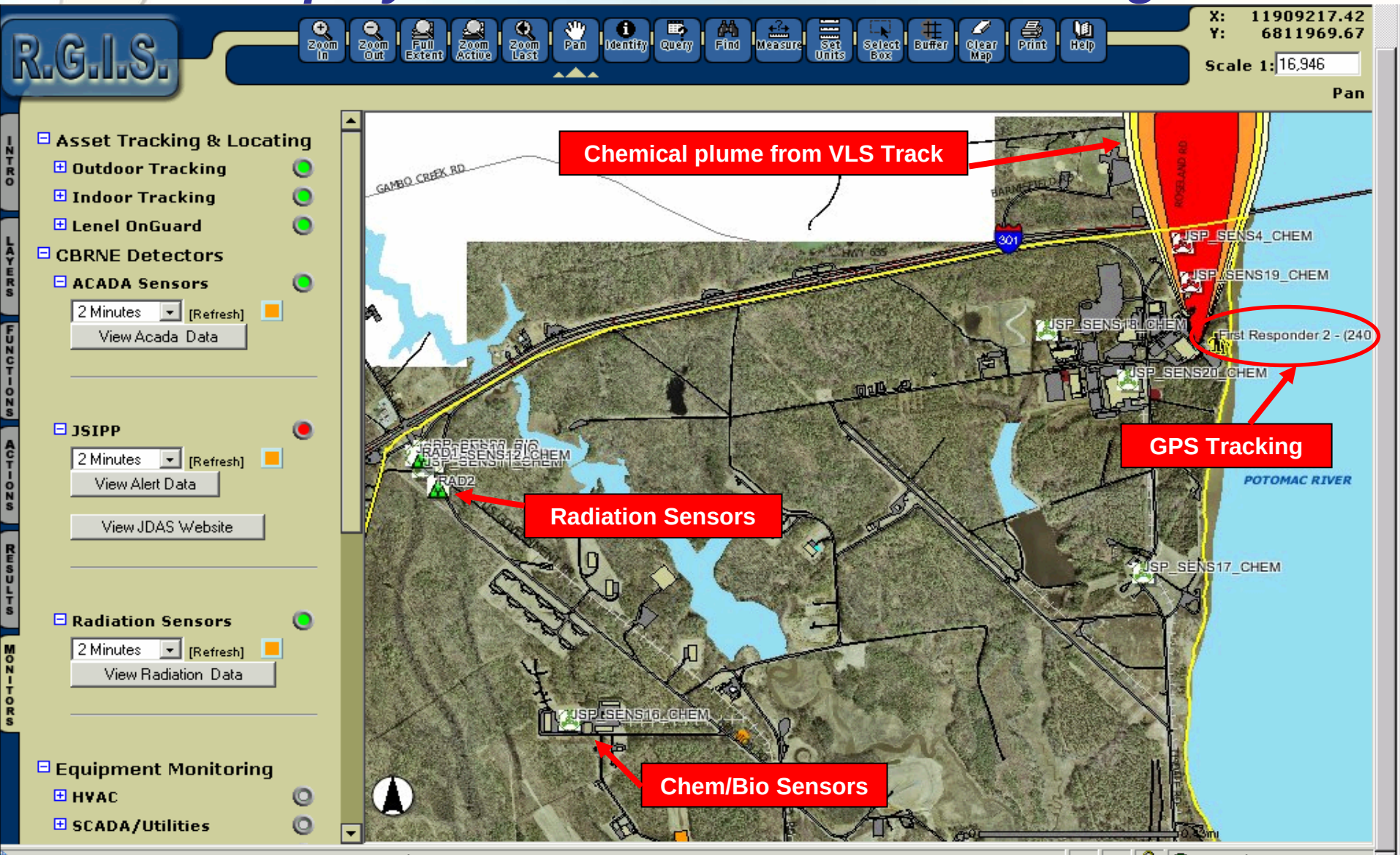
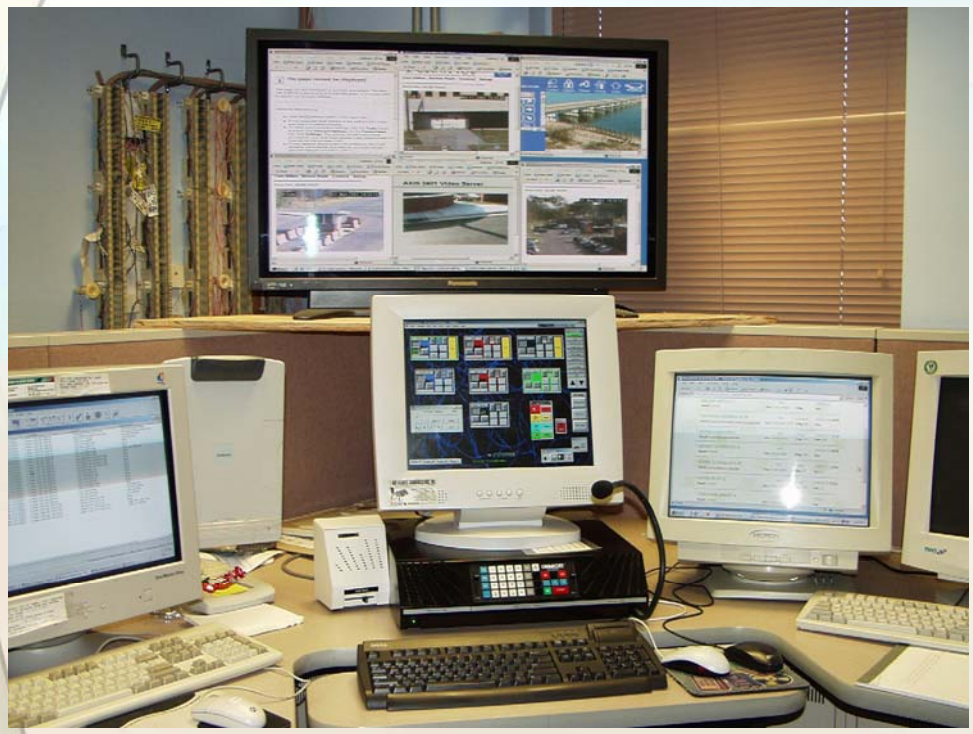
VCEC Consequence Mgmt Demo

GIS Display with Real-Time Sensor Integration



VCEC Consequence Mgmt Demo

First Responder Dispatch

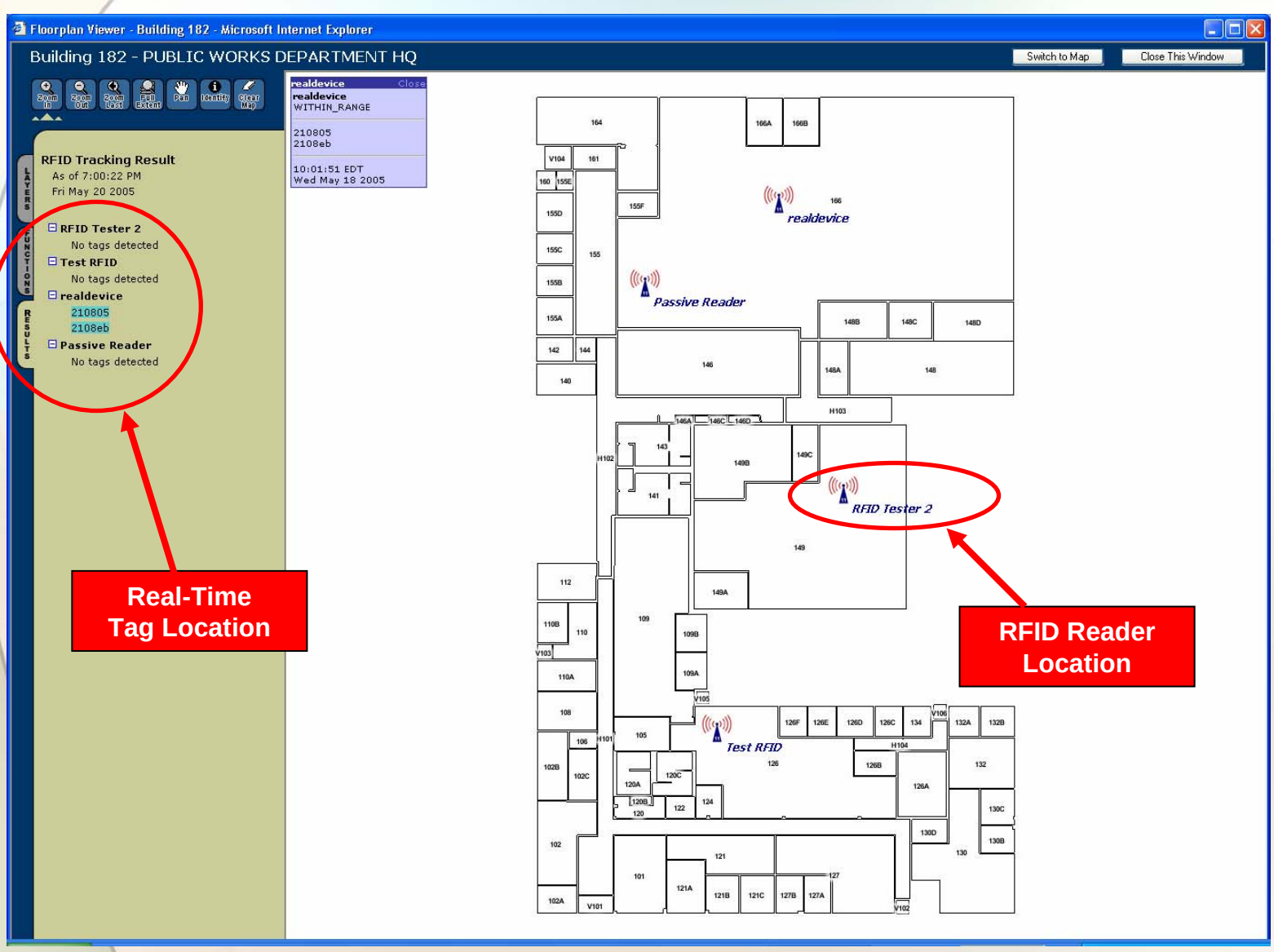


Dispatcher's station

- **Radio trunking system with touch screen interface**
- **Surveillance cameras**

RFID Application

Indoor Asset Locating



VCEC Consequence Mgmt Demo

Mobile Emergency Ops Center

Mobile Emergency Operations Center

Interior View

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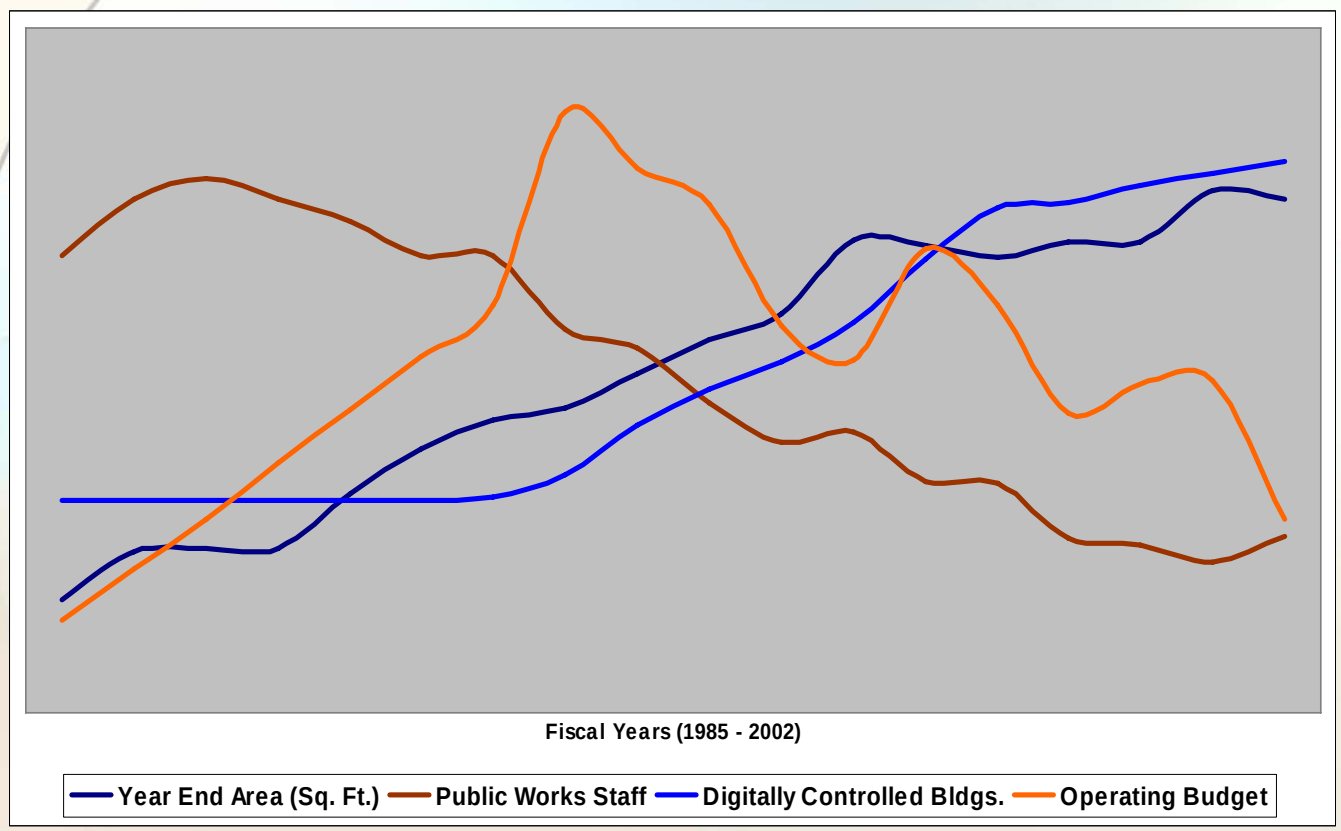
Sensor Application ROI



Highlights

- 38% Decline in Staff
- 77% Increase in Base Sq Ft
- 10% Recent Decline in Operating Budget
- Budget Decrease Necessitated Employment of Technology

Effective operation maintained despite decline of budget & staff and growth in square footage

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Road to Interoperability

- Initial Problem: No Robust Geospatial Sensor Networking Standards
  - Initial InfoMatics™ Deployment in 2003 based on Open Standards – XML/Java-based Tools (Custom Implementation)
- Resolution Approach:
  - Active Participation in Standards Organizations
    - IEEE 1451 – Smart Transducer Interface for Sensors and Actuators
      - Steven Chen, 3eTI CEO, 1451.5 Subcommittee Chair
    - Open Geospatial Consortium
      - Associate Membership
    - Bluetooth Special Interest Group
      - 3eTI is a Subcommittee Chair
    - Zigbee Alliance
      - Member
  - Updating InfoMatics™ Architecture with Open Standards
    - IEEE 1451.0, 1451.2, 1451.4, 1451.5
    - OGC
      - Implementing WFS, SOS, SAS
      - Actively participating in SWE Working Group, OWS-3, and SAS IE
  - Teaming with ORNL SensorNet Program
    - 3eTI is the SensorNet Node Manufacturer for the Ft. Bragg Test-bed

Interoperability is the Key to Scalability

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Enabling Technologies

RGIS

Video Clip

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3e-528 Wireless Sensor Node

- 4 Channel Video Server
  - With analog to digital video conversion
- 4-Port Serial Server
  - PTZ Control
  - Interface other Sensors (Radar, Chemical Detectors, Seismic…)
- *Auto-Forming* bridging feature enables Mesh Networking
- Wireless Mesh Network enables rapid deployment and reduces implementation costs
- Wireless WAN: 802.11b/g
  - Supports Advanced Bridging w/ 3 IEEE 802.11g bridging ports
- Enables a local 802.11b "hotspot"
- Based on FIPS 140-2 Validated AES/3DES Cryptology
- NEMA 12/13 case
- *Planned IEEE 1451.2 and IEEE 1451.5 Support*

Link to Data Sheet

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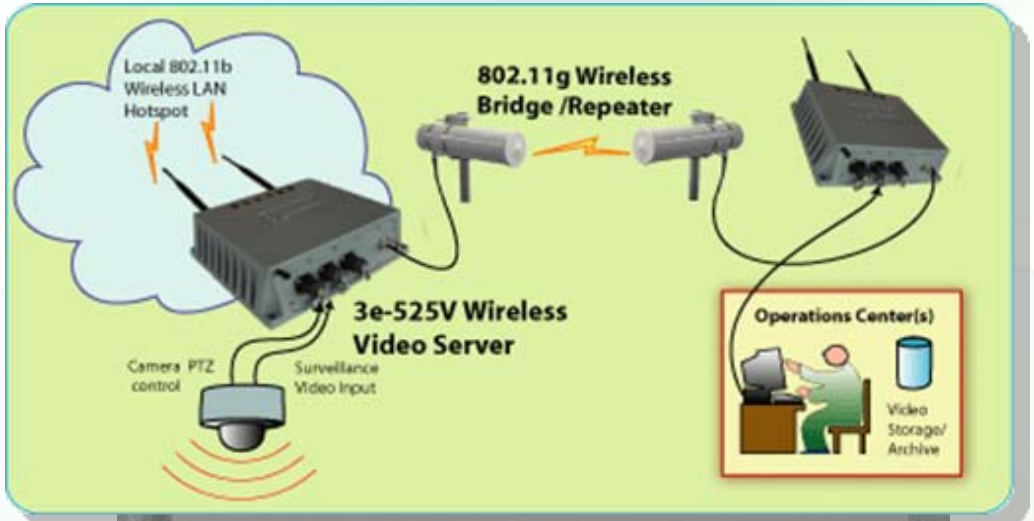

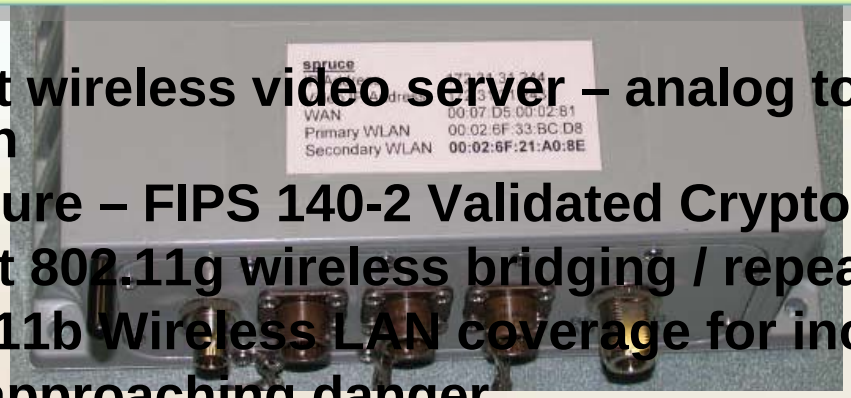

- Single port wireless video server – analog to digital video conversion
- Highly secure – FIPS 140-2 Validated Crypto modules
- Lower cost 802.11g wireless bridging / repeater infrastructure
- Local 802.11b Wireless LAN coverage for incident responders
- Warns of approaching danger
- Provides coverage of major events
- Tracks threats as they unfold

3e-523 Wireless Serial Server

- **Secure Wireless Serial Server**
  - **IEEE 802.11b/g/a Bridging**
  - **10/100 Ethernet**
  - **RS232/RS485 Serial Port**
- **Wirelessly Enable Serial Devices**
  - **CBRNE Sensors**
  - **RFID Readers**
  - **Weather Sensors**
  - **Other Analog/Digital Sensors**
- ***Auto-Forming* bridging feature enables Mesh Networking**
- **Reduces infrastructure costs associated with sensor integration**
- **Based on FIPS 140-2 Validated AES/3DES Cryptology**
- **Rugged NEMA-4 Enclosure**
  - **Rating: -25°C to 65°C**
- **Planned IEEE 1451.2 and IEEE 1451.5 Support**

3e-525A

Features

- 802.11b WLAN & 802.11g Bridging
- NEMA 4 type enclosure
- USB for printer applications
  - GPS connection via USB
- Primary Power via PoE standard
- Mounting plate same footprint as 521NP
- Power consumption less than 14.4w
- IPv6 migration
- Tri Mode Operation
  - AP – Gateway – Bridging/Repeater
- Meets all Navy Mil standards
  - Same as 521NP
- Software upgradeable to 802.11i
- Planned IEEE 1451.5 Support

Benefits

- Highly secure - AES & 3DES encryption
- Per session, Dynamic Key Generation with Security Server software (purchased separately)
- Detects rogue APs
- RF management for variable power control
- Rugged for outdoor/indoor environments
- Lightning protection

Link to Data Sheet

Other 3eTI Government Customers Employing Sensor Networks

NAVSEA NAVAL SEA SYSTEMS COMMAND

NAVSEA DAHLGREN

NAVSEA CARDEROCK

DEFENSE THREAT REDUCTION AGENCY UNITED STATES OF AMERICA

DEPARTMENT OF DEFENSE Counterdrug Technology Development Program Office

PEO SHIPS

NAVAL DISTRICT WASHINGTON WASHINGTON, D.C.

Distance Support Anchor Desk

Navy Distance Support Program

NASA Goddard Space Flight Center

To improve life here, To extend life to there, To find life beyond.

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Summary

- Anti-Terrorism and Force Protection (AT/FP) Requirements within the DoD is driving the need for / deployment of Sensor Networks.
- Many existing Sensor Network deployments within the U.S. Navy and U.S. Army lack scalability
- 3eTI is working with DoD, ORNL, NIST, and OGC to promote Interoperability of Sensor Networks and Geo-Spatial Implementations
- 3eTI is enhancing DoD AT/FP capabilities via our robust InfoMatics™ Platform and our FIPS 140.2 Validated *Secure Wireless Devices.*
- Our implementations leverage our proven technologies, unique products, successful Navy programs, and a Strong Management Team

Thank you for your time.

Any Questions?

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