

Fire Alarm Signals, GIS and Pre-Emergency Surveys: Putting it all together for Incident Command

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PREMISE

The more information made available to first responders to improve their situational awareness,

The better and safer their response to emergencies will be.

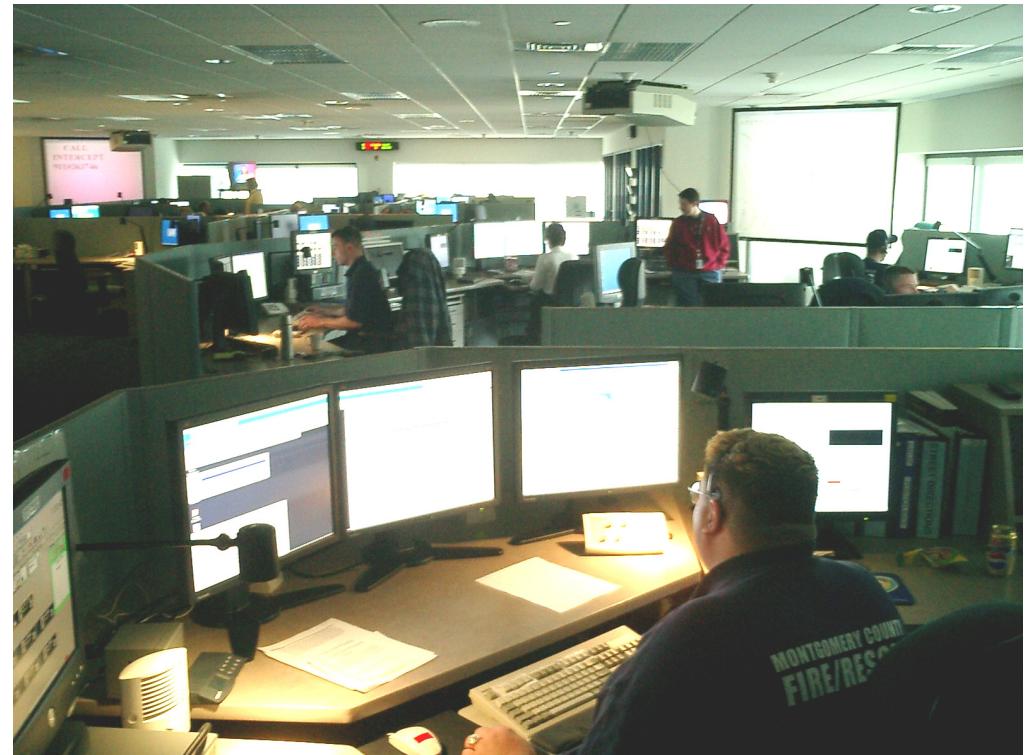


Goal

Develop methods and standards to supply information from building systems and municipal databases to first responders during emergency responses

Issues

- Minimum Information
- Electronic Pre-plans
- Access / Security
- Display
- Storage / Updates
- Standards
- SOP

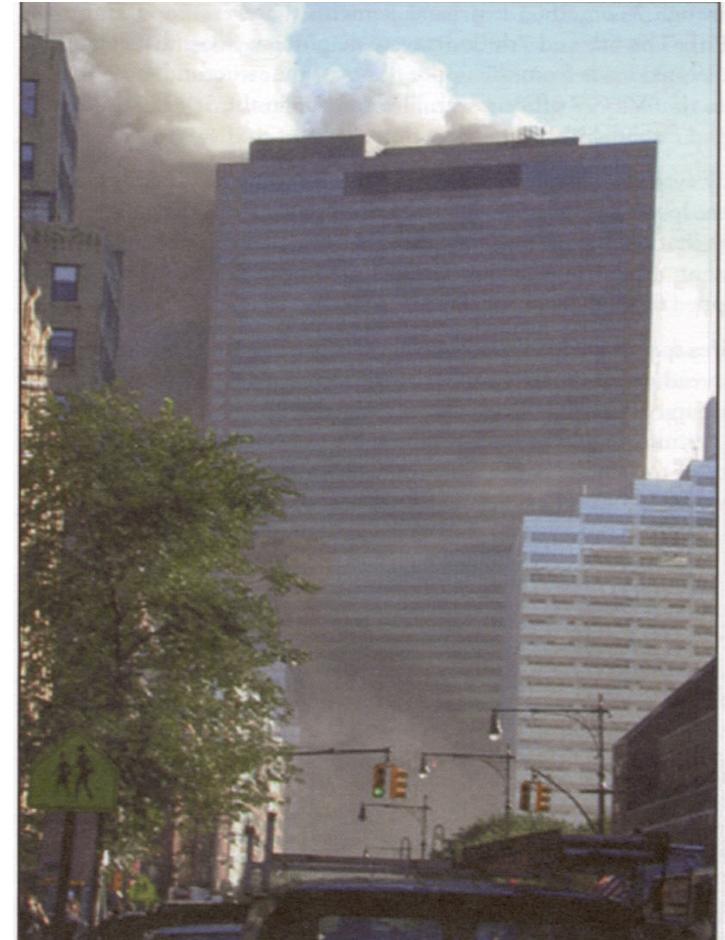


Montgomery County Maryland
Emergency Call and Dispatch Center

NCST Investigation of WTC Building Fires and Collapses

WTC Building 7

- 47 story building
- Fire alarm system was monitored by AFA Protective Systems, Inc. outside of the WTC site
- Collapsed 9-11-01



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WTC Building 7 Fire Alarm System
Central Station Monitoring Record - 09 / 11 / 01

09/11/01 10:00:52 1 1510 CO TO CLASS E AREA:1 *T

09/11/01 06:47:43 COMMENT: RIC: WILLIAMS

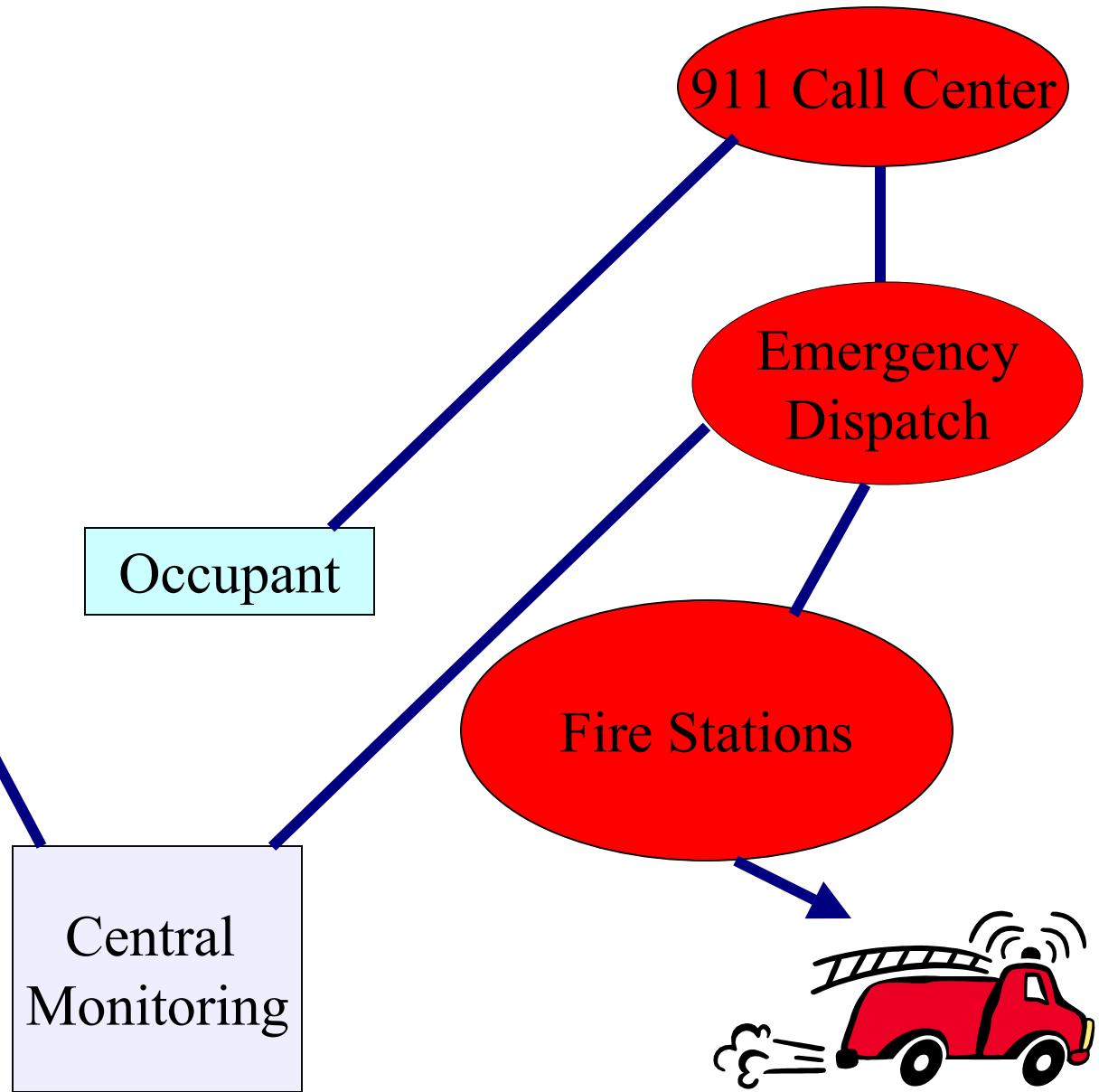
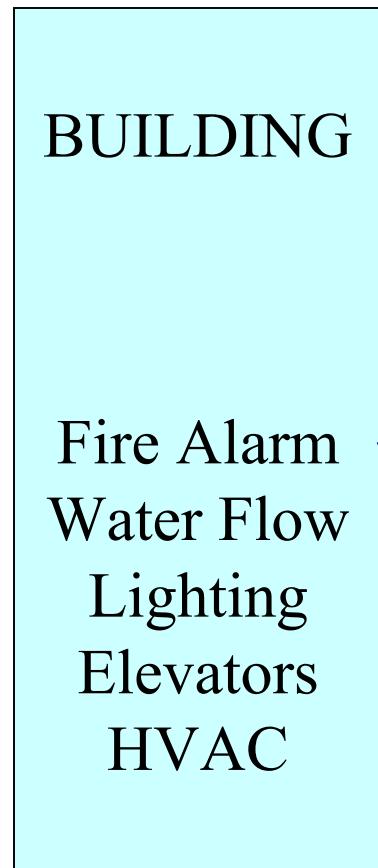
09/11/01 06:47:03 RIC 4210 PLACE ON TEST CAT:11

09/11/01 06:47:03 COMMENT: 091101 647 091101 1447

09/11/01 06:47:02 COMMENT: TEST: ALL

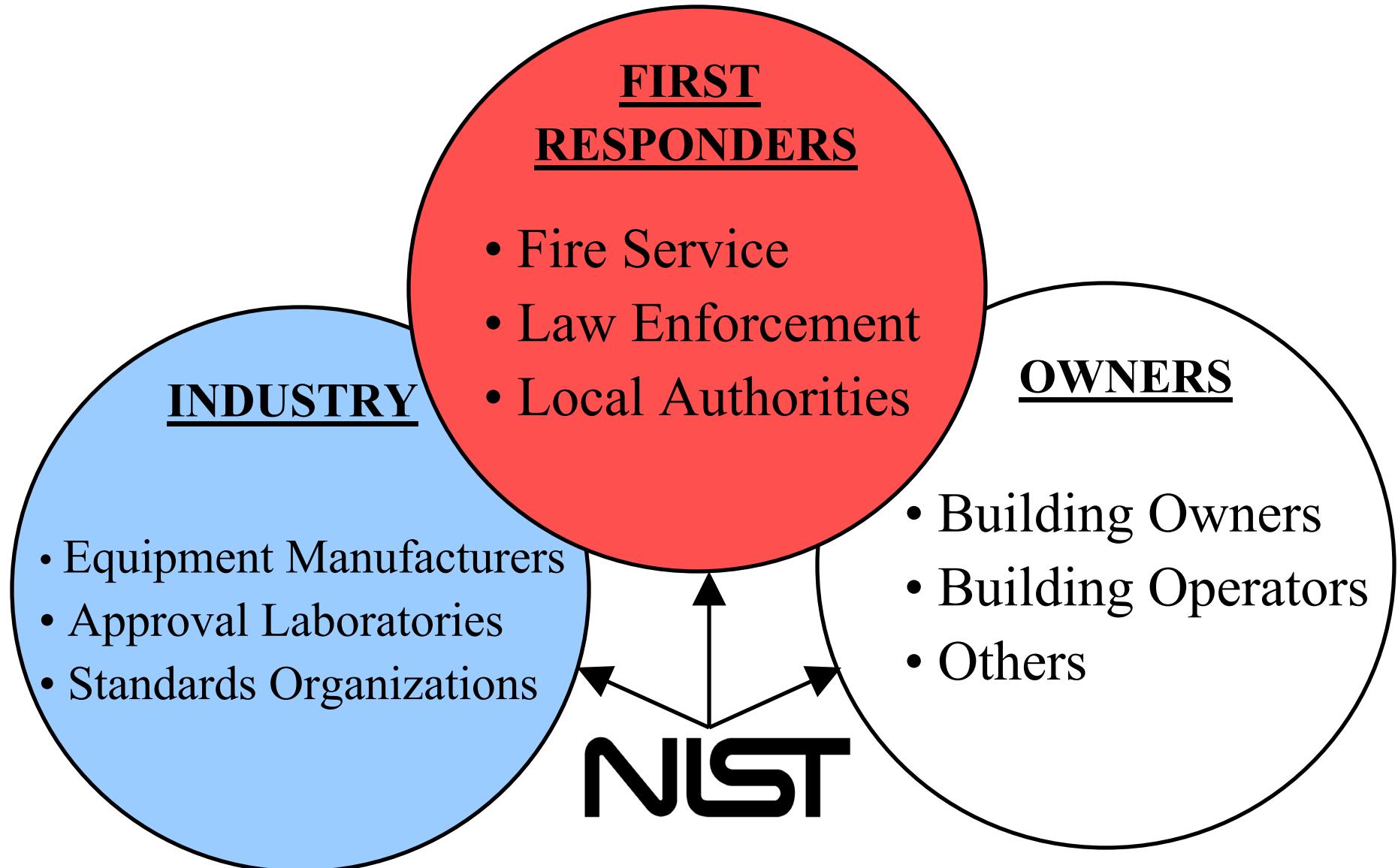
09/11/01 06:05:01 RP 20 TIMER TEST

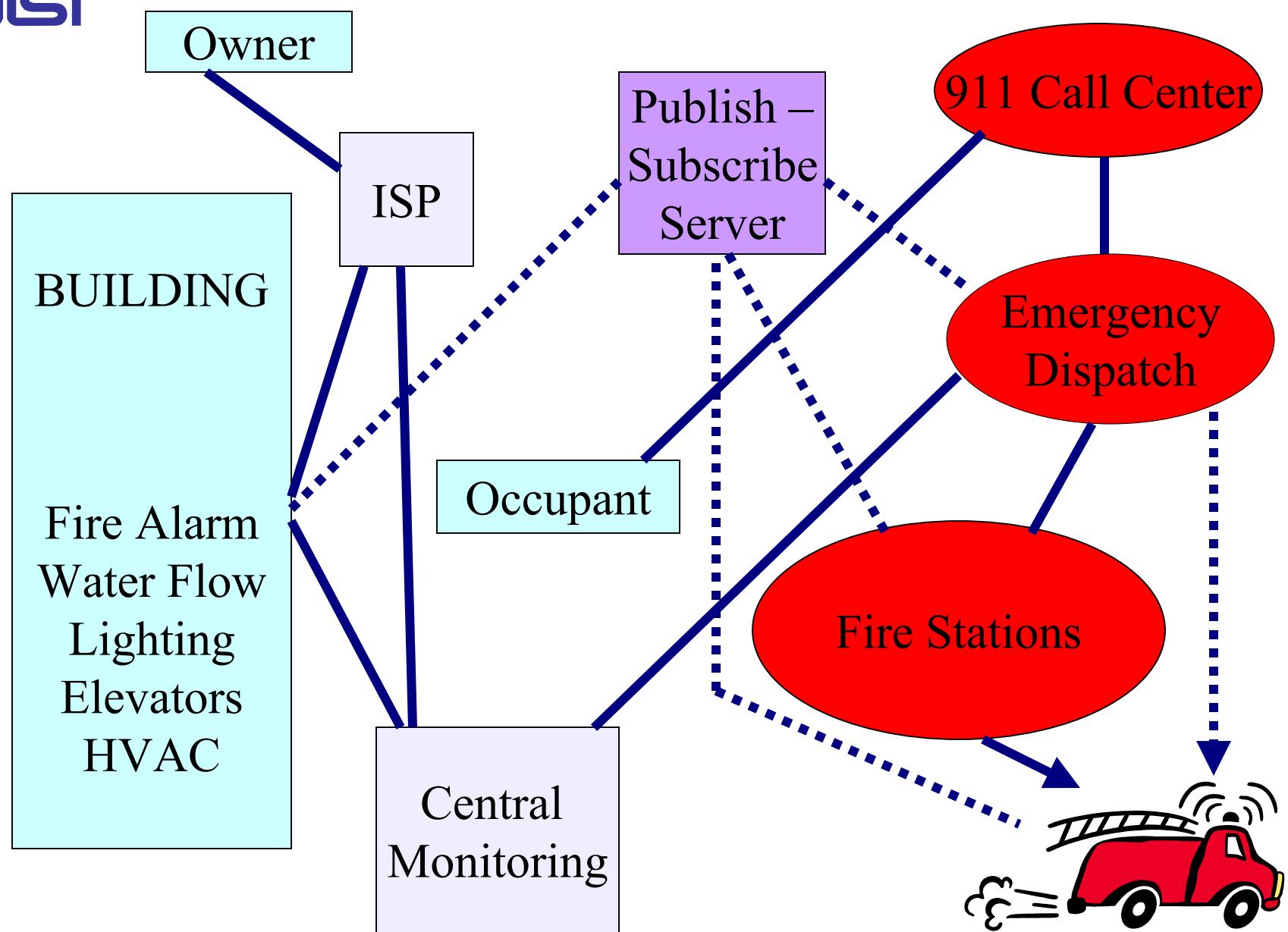




EMERGENCY NOTIFICATION

We can do better !

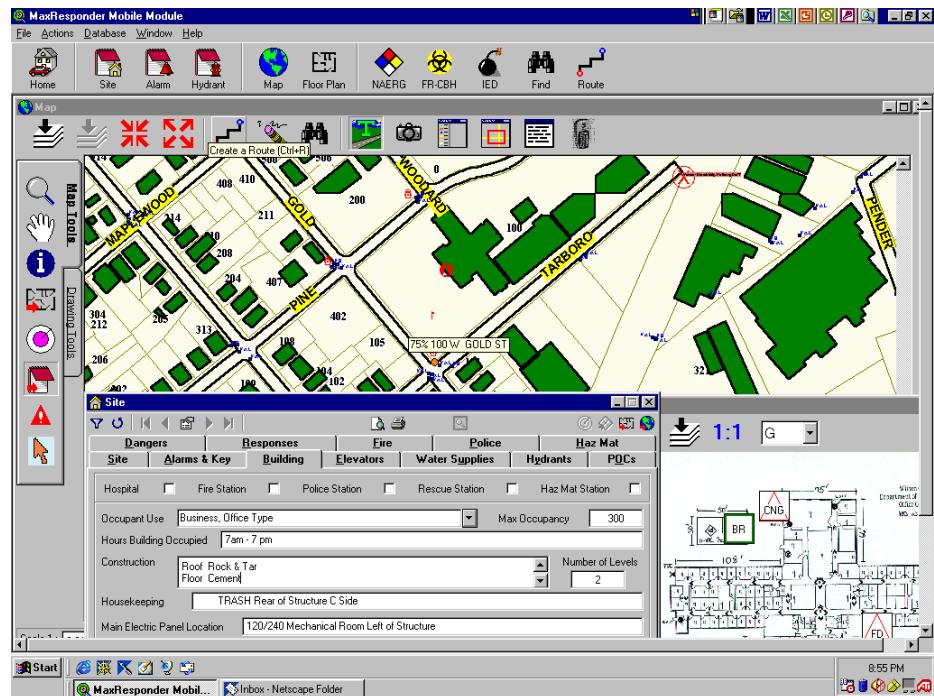




EMERGENCY INFORMATION EXCHANGE

First Steps

- Get paper information into electronic format
- Understand the useable information needs
- Transfer building fire alarm system information to responders before arrival and at the scene.



Electronic (GIS based) Pre-emergency plan.
Wilson, NC Fire/Rescue Services

Information Currently Available to First Responders for a Building Incident

- **Information from 911 operator**
- **Notification of an automatic fire alarm**
- **Address and route map with hydrant locations**
- **Pre-emergency survey information (pre-plan)**



Marion Ohio Fire Department

Future Building Information for the FIRST First Responders

- **Static Database Information**
 - GIS area data
 - Pre-emergency plan
- **Dynamic Building and Response Information**
 - State of building systems
 - Sequence of detectors in alarm
 - Fire area (volume)
- **Calculated Decision Support Information**
 - Water flow required
 - Safest path to fire



Cincinnati Fire Department

Conference Questionnaire

- Critical input to our guide
- Needed for an emergency responder information standard
- Prioritize information content and quantity

- Please turn in the questionnaire at the end of the session or
- FAX to 301-975-4052 or
- E-mail comments to william.davis@nist.gov

A Building Fire

- **Static Database Information**
- **Dynamic Building and Response Information**
- **Calculated Decision Support Information**



Cincinnati Fire Department

A Building Fire, En Route Static Database Information

- **Occupancy (abandoned, vacant, children, etc)**
- **Condition (let burn, unsafe to enter, dangerous roof, sprinklered, etc)**
- **Type (single family, apartment, school, etc)**
- **Style (n story, auditorium, atrium, office, hospital)**
- **Construction (type I, II, III, IV, or V)**
- **Roof (light weight metal or wood truss)**
- **Unusual Hazards**
- **Location of building with hydrants (nonstandard threads)**
- **Sprinkler/standpipe hookups**
- **Sources of nearby water**
- **Building Incident history**

A Building Fire, En Route Dynamic Information

- Location of fire alarms
- Time duration since first fire alarm
- Fire alarm panel signals
- Sprinklers flowing
- Responders on scene (Police & Fire)



(AP/SUN TIMES)

A Building Fire, En Route Calculated Decision Support Information

- Confidence in fire being real
- Fire size
- Required water flow based on fire size
- Hydrant capability for supplying flow
- Fire growth (fast, medium, slow)



On The Scene

- **Floor plan**
- **Fire spread**
- **Smoke locations**
- **Sprinklers flowing**
- **Elevator status**
- **Location of closest standpipe to fire**
- **CBR hazards**
- **CCTV**
- **Smoke Evacuation**
- **Bomb blast radii**
- **Evacuation routes**
- **Weather conditions at site**
- **Utilities status**
- **Standpipe status**
- **Structural collapse**
- **Internal building communication**
- **Remote control of key building systems**

Current Information Guides

- NFPA 1620, Recommended Practice for Pre-Incident Planning
- NFPA 170, Standard for Fire Safety Symbols
- NFPA 72, National Fire Alarm Code, Annex A
- Software Companies involved in the development of e-preplan software.



Background

Fire alarm systems in large buildings in the USA incorporate a display for the fire service:

Location of alarms, device type, sequence



“... to enable responding personnel to identify the location of a fire quickly and accurately and to indicate the status of emergency equipment or fire safety functions that might affect the safety of occupants ...”

Located in fire command center or near likely point of entry by the responding fire service.

Critical Information

(IAFC and NFPA helped to organize fire service focus groups)

What do you want to know?

When do you want to know it?

Where do you want to know it?



How should the information be presented?

Fire Service Information Needs (Dynamic Data)

- **At Dispatch**

Confidence in alarm, size and growth rate of the fire

- **On Arrival**

Location of the fire, the occupants, current conditions

How to get to the fire

Staging areas, standpipes, other resource or safety issues

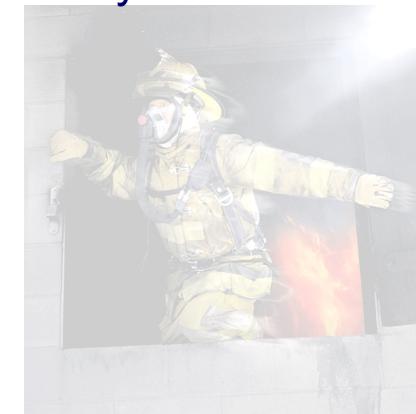
- **During the Incident**

Fire spread and growth, area(s) involved

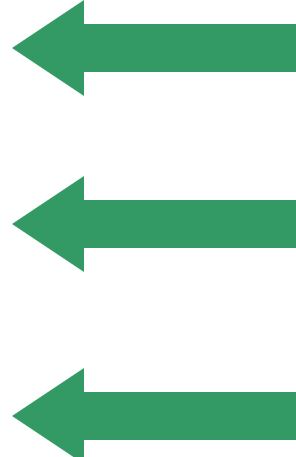
Systems status, i.e., ventilation

Location of fire fighters

Controls for communications and ventilation



From eplans to GIS to building systems

- Communicate better information from buildings faster and more reliably to 1st responders.
 - Three parts
 - A consistent visual display
 - High reliability detection and feature extraction
 - Look ahead capability
- 
- The diagram consists of three green arrows pointing towards the right edge of the slide. Each arrow is positioned next to one of the three items listed under the 'Three parts' bullet point. The first arrow is aligned with 'A consistent visual display', the second with 'High reliability detection and feature extraction', and the third with 'Look ahead capability'. To the right of each arrow, there is text indicating a timeline: '2002 NFPA 72' for the first, 'Published' for the second, and 'Future' for the third.
- 2002 NFPA 72
- Published
- Future



72 Task Group

Industry, fire service (IAFC, Fire Section of NFPA and other groups) and us

Working groups on

Icons (Usability, Color, Scaling)

Control functions ← i.e. elevators – Layer 2

Information and presentation

Scalable, Inclusive, Intuitive

2002 NFPA 72 , Annex A

Prototype icons

| | | | | | |
|----------------------|--|---|--|---------------------------|--|
| Alarm | | Stairwell (all ratings) | | Occupant | |
| Emergency Connection | | Fire Department Key Box | | Sprinkler | |
| Exhaust Fan | | Fire Pump | | Smoke Vent | |
| Exhaust Outlet | | Fire Department Connection | | Shutoff (W, E, G) | |
| Siamese Connection | | Extinguishing System (i.e. CO2 and Halon) | | Water Mist Sprinkler | |
| High Pressure Gas | | Egress in Progress | | Electrical Room | |
| Manual Pull Station | | Emergency Phone | | Fire Service Access Point | |
| Smoke Detector | | Fire | | Elevator Equipment Room | |
| Standpipe | | Gas Detector | | Heat Detector | |

Usability issues remain

Example Implementations

Active Alarm Systems in Building 224

Elevation

| Floor | LH | Fire Size |
|-------|------|-----------|
| 3 | High | 1368 kW |
| 2 | None | 0 kW |
| 1 | None | 0 kW |

Plan View, 3rd Floor

Layer 1 (highlighting the Elevation table)

Layer 3 (highlighting the Plan View)

Control Functions

- Active Systems
- Available Systems
- Control Functions
- Elevator Status
- Voice Communication
- Security Systems
- Staging Areas

Time of day 16:14:30 Time since ignition 10 sec.

Annunciator Panel Index Page - Microsoft Internet Explorer

Main Control Security 205 224 227

Building 205

A fire has been reported in 205

| | |
|-----------------------------|------|
| The Likelihood is: | High |
| Heat Release Rate (kW): | 121 |
| Time since first alarm (s): | 0 |
| Temperature (K): | 814 |
| Visibility (m): | 0.34 |

Plan View

Camera View





**Building 205
April 3, 2002**

Control

Security

205

224

227



Building 205

| | |
|---------------------------------|------|
| A fire has been reported in 205 | |
| The Likelihood is: | High |
| Heat Release Rate (kW): | 121 |
| Time since first alarm (s): | 0 |
| Temperature (K): | 814 |
| Visibility (m): | 0.34 |

Plan View



Camera View



That is history

**We now want to extend to information sharing by
ALL 1st responders**

Police, fire, ems, hazmat, terrorism

Started with a Workshop on May 3, 2004

Sponsored by OLES

Asked the same type of questions

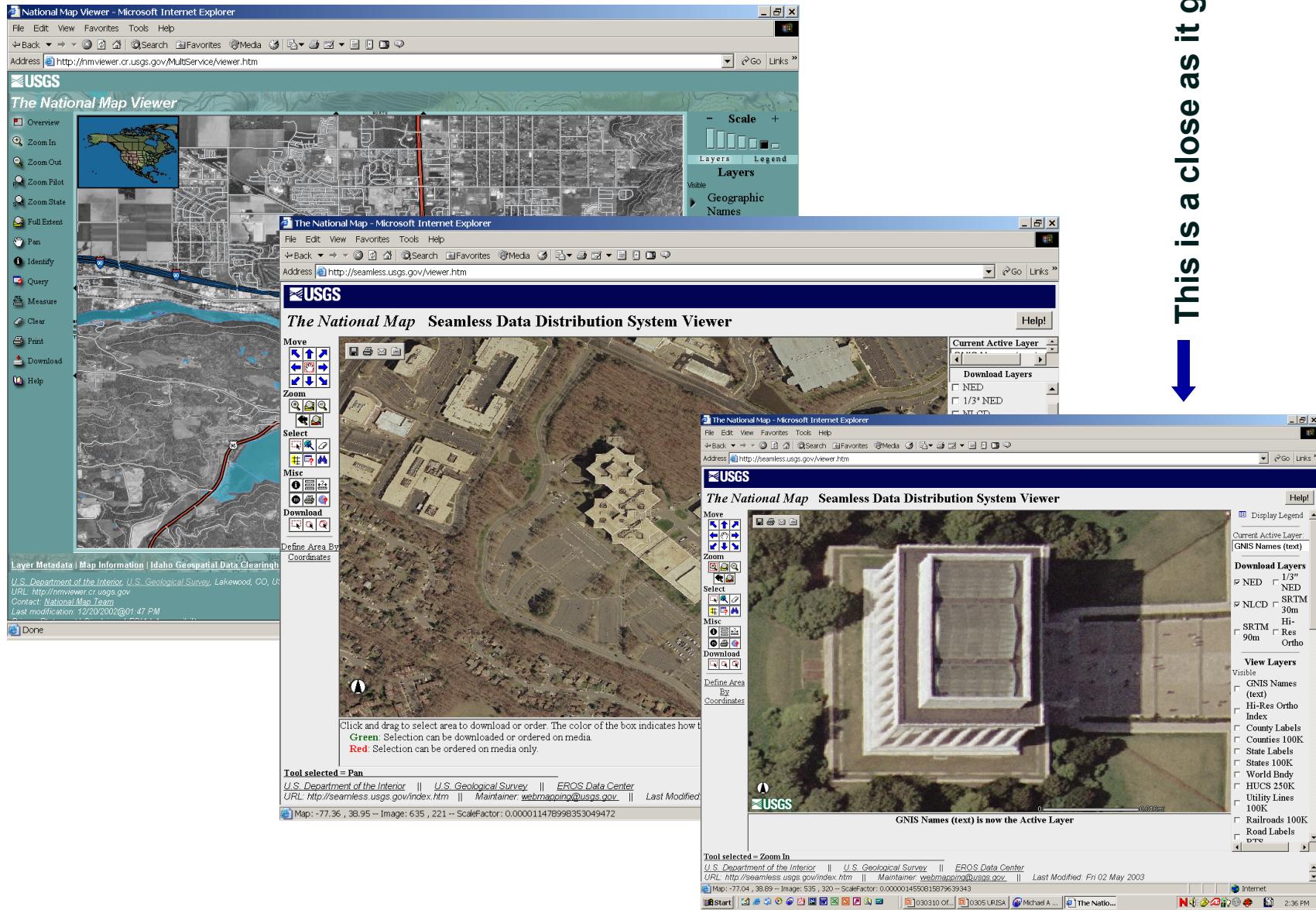
What is the approach for ALL 1st responders

Questions (More complex – wider user base)

- **Type and Timing of Information**
 - What is the most important static information needed by emergency personnel?
 - What is the most important dynamic information needed by emergency personnel?
 - Need to prioritize – what is needed when? Any absolutes?
- **Information Presentation**
 - How would you like to see this information displayed? (i.e. text? Graphics?)
 - What types of remote control actions, if any, should be allowed?
- **Security Issues**
 - Should all information be available to all emergency responders?
 - Is there any information that should not be made available?
 - What security is currently in place in your information systems? (i.e., voice authentication or computer authentication with dispatch?)
- **Other Issues**
 - All of this will go through a development stage – what is the tolerance for failure and what backup will be needed?
 - What pre-planning is done now, why, what use is made of the information?
 - Smallest impact on operations? Minimum occupancy for planning?

An Example from the USGS

→ This is a close as it gets

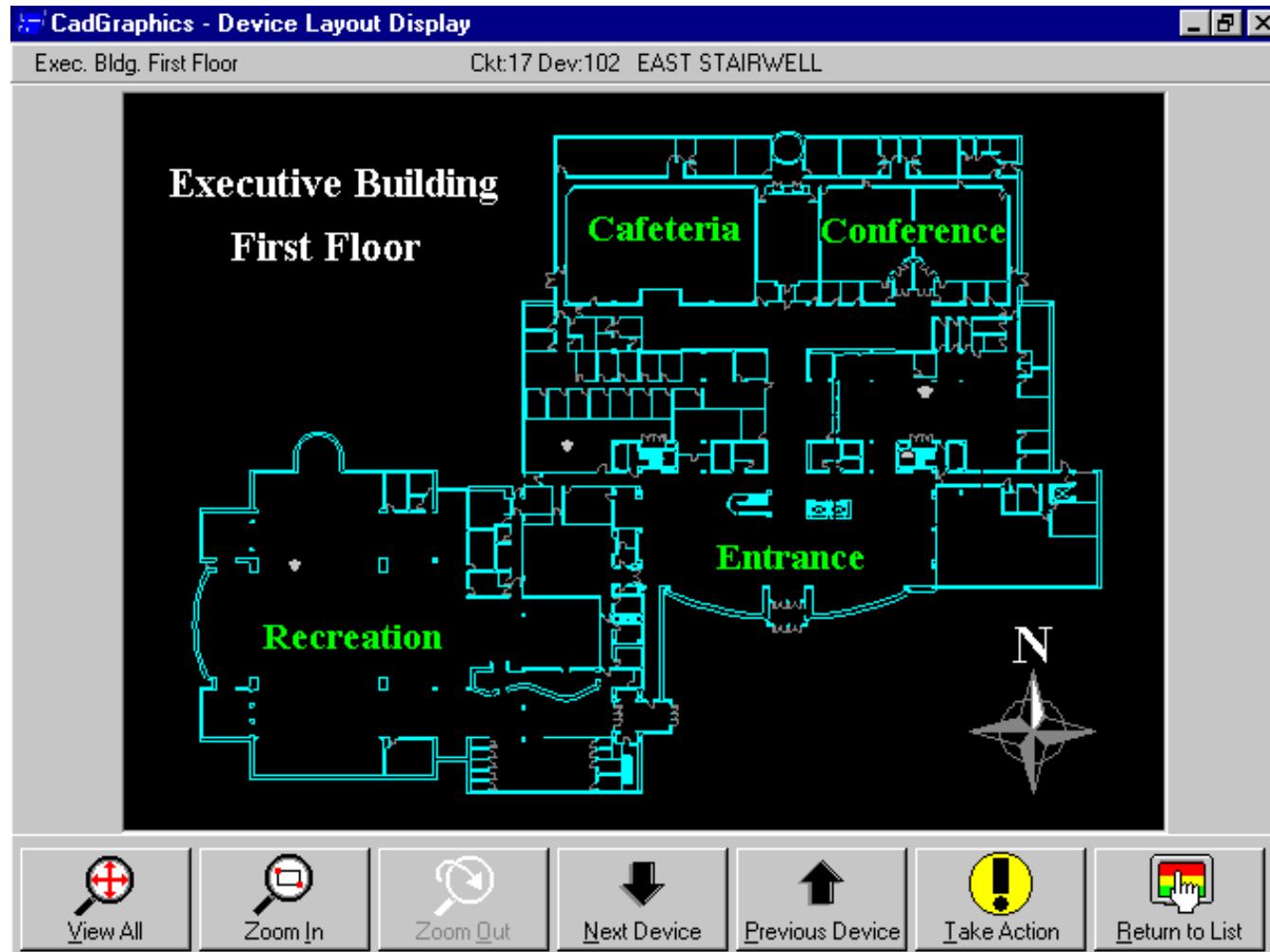


GIS Building View



You can add details to background images. Zones and groups, for instance, can flash when a device is in alarm.

Drill Down to Floor Plans



Locate every device and every alarm at a glance

Details

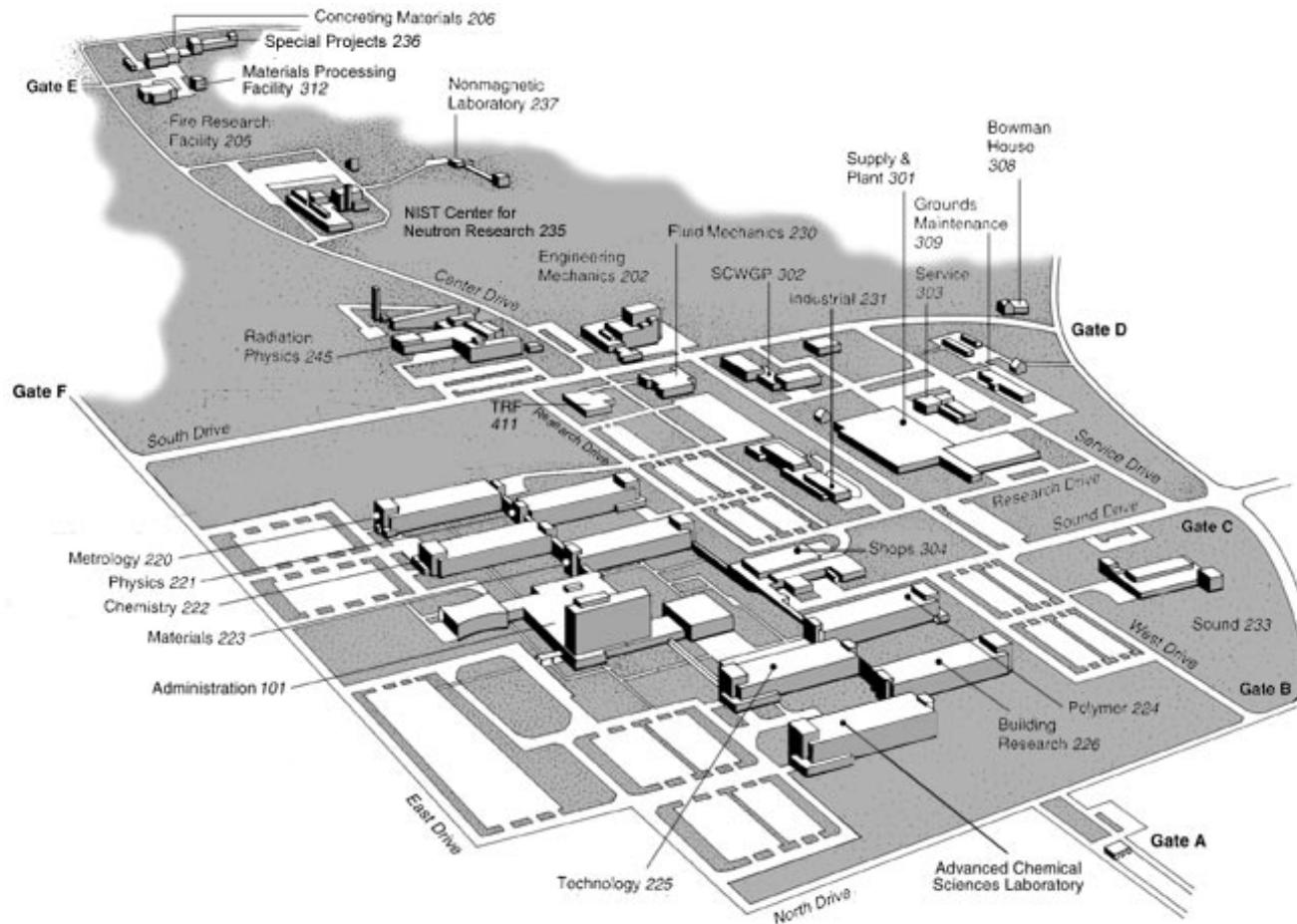
CADgraphics Platinum - SystemWatch

| Panel | Condition | Address | Description | Time | Type | Location |
|--------|------------|----------|--------------------------|-------------------|----------------|----------------------------|
| NODE 1 | Fire Alarm | Device 1 | CAFETERIA SMOKE DETECTOR | 03/16/01 13:46 | Photoelectric | Exec. Bldg. First Floor |
| NODE 1 | Fire Alarm | Device 2 | SAMPLE FIRE PULL STATION | 03/16/01 13:58 | Manual Station | Exec. Bldg. First Floor |
| NODE 1 | Missing | Device 3 | LOBBY SMOKE DETECTOR | 03/16/01 13:58 | Photoelectric | |

CG Previous Device Previous Page Locate Group Zone Take Action
Setup Next Device Next Page All Devices Print Remove Cleared Exit
Notes

See alarms and emergency instructions in real time,
color-coded by priority.

NIST Implementation



Conclusion

- Standardize interface so the display in all buildings is similar
- Provides a scalable annunciator panel that can go anywhere (dispatch, engine, PDA)
- Incorporate algorithms in alarm systems to provide more, and more meaningful, information to 1st responders
- Access through GIS based CAD

Contact Information

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