Data Interoperability for Emergency Response
What We Do

All emergencies are local where the role is to respond to observed impacts and identified threats with resources that protect people, property, and the environment from loss.

The role of the state is to coordinate and facilitate multi-agency and multi-jurisdictional emergency response in California among all responding agencies.

The federal role is to coordinate federal, military, and multi-state/regional resources in support of state needs.
How We Operate

National Incident Management System (NIMS)

Incident Command System (ICS)

State Emergency Management System (SEMS)
Standardized Emergency Management System

SEMS consists of five organizational levels, which are activated as necessary:

1. field response
2. local government
3. operational area (county)
3. operational area (county)
4. regional
5. state

**Standardized Emergency Management System**

- **Local Government**
  - **Major Disaster**
  - **Operational Area**
    - **Resource Requests**
    - **Unaffected Local Government**
    - **Region (REOC)**
      - **Resource Requests**
      - **State (SOC)**
      - **Mutual Aid**
        - **Unaffected Local Government**
        - **Operational Areas**
          - **Resource Requests**
National Incident Management System

SEMS fits into NIMS when Federal resources become available after a disaster declaration or emergency management declaration is made by the president, in response to a Request for Federal Declaration by the state governor.
Essential Elements of Information We Need to Know to Respond, Facilitate, and Coordinate

- **What is it?**
  - Incident management means coordinating among multiple agencies

- **Where is it?**
  - The geospatial view showing hazard and people, infrastructure, environment

- **Who should know?**
  - Alerts from authoritative sources, who has received alert, who has responded

- **Who’s in charge?**
  - Organizing incident command or emergency support function(s)

- **What’s the impact?**
  - Understanding the environment by sharing sensors, cameras, imagery, models

- **What is the response?**
  - Resources employed, operating procedures followed, tasks performed

- **What’s happening now?**
  - Situational awareness, common operating picture, shift change briefing, statistics

- **What’s planned next?**
  - Action plans, future resource allocation and tactical response, forecast of impacts
At all levels of an emergency, different information is generated and the technologies to support that are varied. They are designed to meet the needs of their users.

As a result, when individual agencies need to coordinate with others, we have challenges distinguishing what information is pertinent to each role or agency.

We need to make sure that authoritative information is captured and used at the appropriate level, and that it is managed in an organized way.
The Goals for GIS Response

- Provide situational awareness to State Operations Center
- Provide geospatial analytics to the State Operations Center, Regional Operation Center, and all entities involved in a response.
- Leverage State/Local GIS expertise to facilitate information gathering, publishing and dissemination in a manner consistent with NIMS/SEMS/ICS
- Improve information sharing using technology and fully OGC compliant standards and formats.
Our World: Geospatial Information

Fill a Polygon - lake, area, building, field

Transparency - allows overlays like chemical plume

Make icons for points

The combination of points, lines, polygons, fills, imagery and transparency makes a map that is useful.
Emergency Response Information

- Checklists
- Logs
- Field Observations
- Inventory
- Sensor Readings
- Field Photos and Videos
- Documents
- Plans
- Diagrams
- Situation Reports
# Use Case: Evacuation Traffic Control Point

<table>
<thead>
<tr>
<th>Common Operational Data</th>
<th>Essential Elements of Information</th>
<th>Geospatial Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What is it?</strong></td>
<td>Traffic Control Point</td>
<td></td>
</tr>
<tr>
<td><strong>Where is it?</strong></td>
<td>4th and Main</td>
<td>Point</td>
</tr>
<tr>
<td><strong>Who’s in charge?</strong></td>
<td>Police – through various shifts</td>
<td></td>
</tr>
<tr>
<td><strong>Who should know?</strong></td>
<td>EMA, DOT, Fire, Red Cross</td>
<td></td>
</tr>
<tr>
<td><strong>What’s the impact?</strong></td>
<td>Status report: 3000 cars passed through TCP; 5 cars restricted from re-entry</td>
<td></td>
</tr>
<tr>
<td><strong>What is the response?</strong></td>
<td>One police car per shift, barricades, electronic signs</td>
<td></td>
</tr>
<tr>
<td><strong>What’s happening now?</strong></td>
<td>Rate of traffic flow slowed to 5 cars per minute from approx. 12 per minute at noon</td>
<td></td>
</tr>
<tr>
<td><strong>What’s happening next?</strong></td>
<td>Action plan: Remain in place until 2400</td>
<td></td>
</tr>
</tbody>
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# Use Case: Fire Response to Breach of Containment

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<tr>
<td><strong>What is it?</strong></td>
<td>Wildfire that changes direction and breaches current containment</td>
<td></td>
</tr>
<tr>
<td><strong>Where is it?</strong></td>
<td>Wildfire crosses road that had been used as fire break, thus increasing area location</td>
<td><strong>Polygon of extent; Line for fire break</strong></td>
</tr>
<tr>
<td><strong>Who’s in charge?</strong></td>
<td>Multiple Incident Command Posts in and Area Command Structure</td>
<td><strong>Command Posts</strong></td>
</tr>
<tr>
<td><strong>Who should know?</strong></td>
<td>Breach of fire break alert to (a) IC Post, (b) Area Command, (c) Tactical response units</td>
<td></td>
</tr>
<tr>
<td><strong>What’s the impact?</strong></td>
<td>20 additional homes at risk</td>
<td><strong>Map of homes, proximity of fire</strong></td>
</tr>
<tr>
<td><strong>What is the response?</strong></td>
<td>Crews, equipment, back-up equipment – call-up of additional crews deployed</td>
<td><strong>Equipment tracking</strong></td>
</tr>
<tr>
<td><strong>What’s happening now?</strong></td>
<td>Crew pull-back, new fire break, new alert to homeowners</td>
<td><strong>New fire extent</strong></td>
</tr>
<tr>
<td><strong>What’s happening next?</strong></td>
<td>Establish containment area</td>
<td><strong>Future containment</strong></td>
</tr>
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Need to Create an Incident Information and Geospatial Information Common Space

It is the intersection of Incident and Geospatial where XchangeCore middleware makes its unique contribution.
Filling the Interoperability Gap with Common Operational DATA
XchangeCore is the result of Department of Homeland Security and Department of Defense development of middleware for information exchange and sharing.

The advantage of the XchangeCore technology is to be able to control the information flow, and have access to any relevant data from multiple sources.

At the State and Federal level, different roles have been established using the Emergency Functions (EFs) and Emergency Support Functions (ESFs).

XchangeCore can be the bridge over the divide between the multiple technologies and viewers to provide interoperability, and focus on the Common Operational Data that supports management by objectives and smart decision making.
Orchestrating Common Operational Data Through XchangeCore

1. Narrow the focus to what matters and is relevant to the incident
   - Incident sharing defines area of interest to allow geospatial tools to redefine what they provide
   - Three schools affected, not 3000 schools in state

2. Make certain every application is acting on the same incident-related content
   - Current and identical data
   - Simultaneous availability through notifications to all organizations
   - Continuously accessible on-demand
   - Translatable to the application
   - Shared by rule.

3. Consolidate non-geospatial information around a space
   - Associate with incident that has known location

4. Bookmark geospatial information
   - Right layers
   - Same time
   - Same space

Everybody reading off the same sheet of music.
The Result of Data Orchestration through XchangeCore

See the relevant points, current status, simultaneously viewed that are spatially associated with the incident managed through XchangeCore.
Turn Incident Data into Collaboration and Coordination Content

- Applications create an Incident Share Product in XchangeCore by using their preferred message format.
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**Incident**

**Share Product**

**Adapter**

**NIEM, CAP, LEITSC**

**XchangeCore**

**Notification**

**Adapter**

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XchangeCore Map Share Product
- OGC Map Context
- Map Feature
- Binary File
- Link
  - URL
  - KML
  - GeoRSS
  - Core Feed

XchangeCore Notification
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  - NIEM, CAP, LEITSC

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Building a Continual, Virtual Shift Change Briefing
How This Works

Demonstration