Unified Incident Command and Decision Support (UICDS)

UICDS is the “middleware foundation” that enables National Response Framework (NRF) and National Information Management System (NIMS), including Incident Command Structure (ICS), information sharing and decision support among commercial and government incident management technologies used across the country to prevent, protect, respond, and recover from natural, technological, and terrorist events

UICDS Program Background

- DHS Sponsor: Lawrence E. Skelly, Deputy Director, Infrastructure Geophysical Division, Science and Technology Directorate

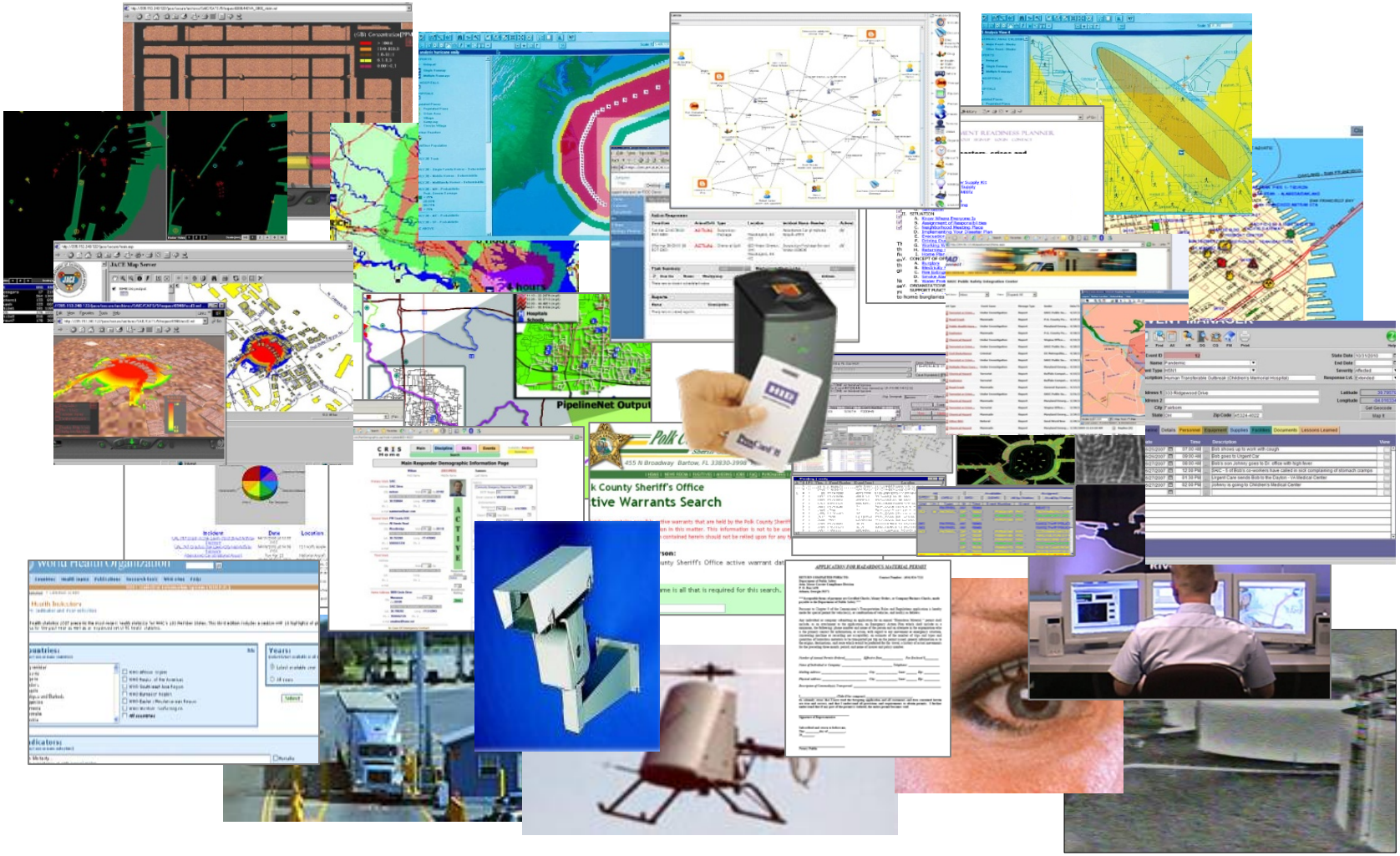
- Phase I – UICDS Architectures completed 2006
- Phase II – Awarded to Science Applications International Corporation
  - Draft Architecture Specification 2008-2009
  - Prototype Development and Demonstration 2008-2009
  - Pilot Reference Implementation 2009-2010
  - Final Architecture Specification 2010

The Goal of UICDS

Information sharing and decision support for all individuals, teams, and organizations in the NRF and NIMS, including ICS

- Cross-domain
- Cross-role
- Cross-function
- Cross-echelon
- Cross-hazard
- Cross-application

The UICDS challenge is to unify and share diverse and even chaotic information sources …



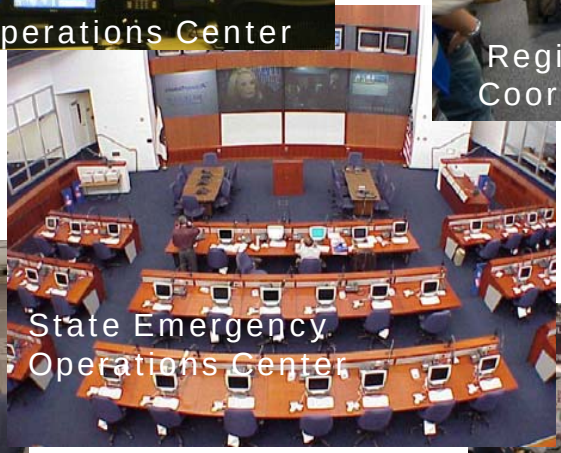
… among all the different locations where critical decisions are made …

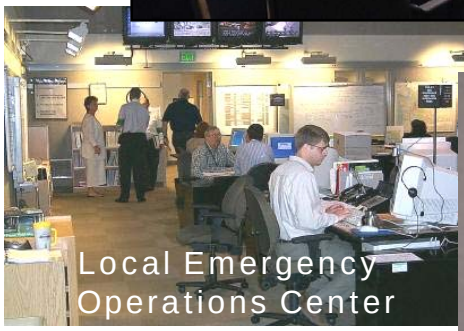
SAIC
From Science to Solutions


National Operations Center


Joint Field Office


Regional Response Coordination Center


State Emergency Operations Center


Local Emergency Operations Center


Incident Command


Field Command Post


Mobile Command Center


On Scene

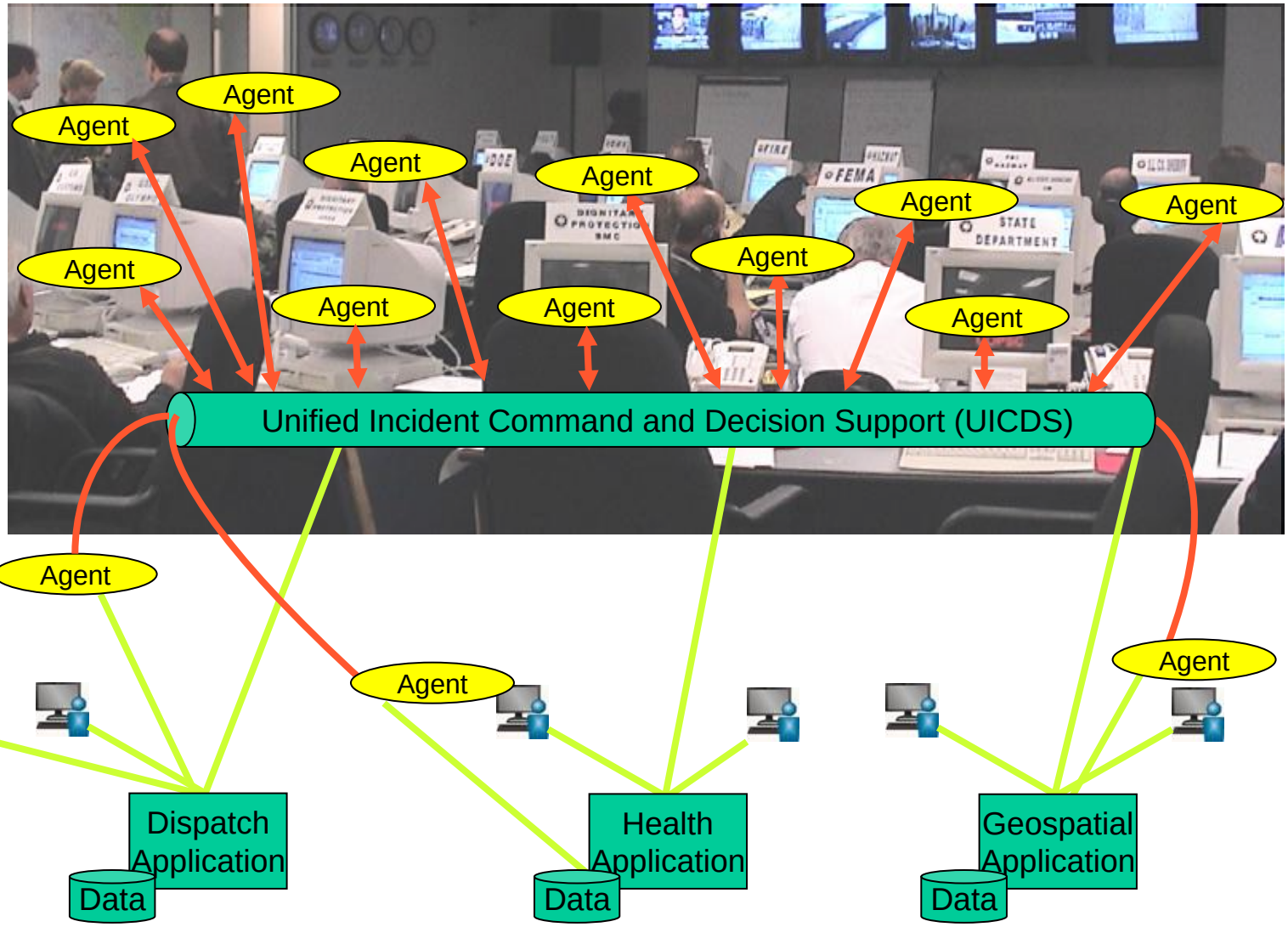

Dispatch

… by forming the UICDS information sharing and decision support "middleware"…

UICDS uses existing applications to visualize shared data – there is no UICDS front-end

UICDS adds intelligent connectivity to all compliant applications

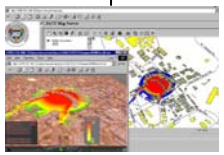
Individual applications continue to support users as always

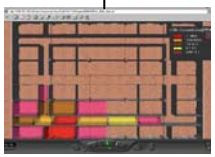


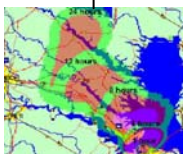
… resulting in UICDS replacing information chaos and stovepipes with information sharing.

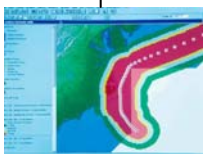
SAIC
From Science to Solutions

UICDS Modeling, Forecasting, and Geospatial Intelligence Data Interoperability


Explosives


Indoor Air


Weather


Hurricane


River Spill


Chemical


Vulnerability

UICDS Operations, Logistics, Assets, and Intelligence Data Interoperability


Common Operating Picture


Social Network


Incident Log


Dispatch


Resources


SOPs

UICDS "Back-Office" Records, Finance, Administration Data Interoperability


Warrants


Accounting


Personnel


Pre-Plans


Permits

Investigations


Lessons

UICDS Physical Security and Surveillance Data Interoperability


Maritime


Sensors


Detection


Unmanned Aerial


Biometric ID


Iris Scan


Video Analytics

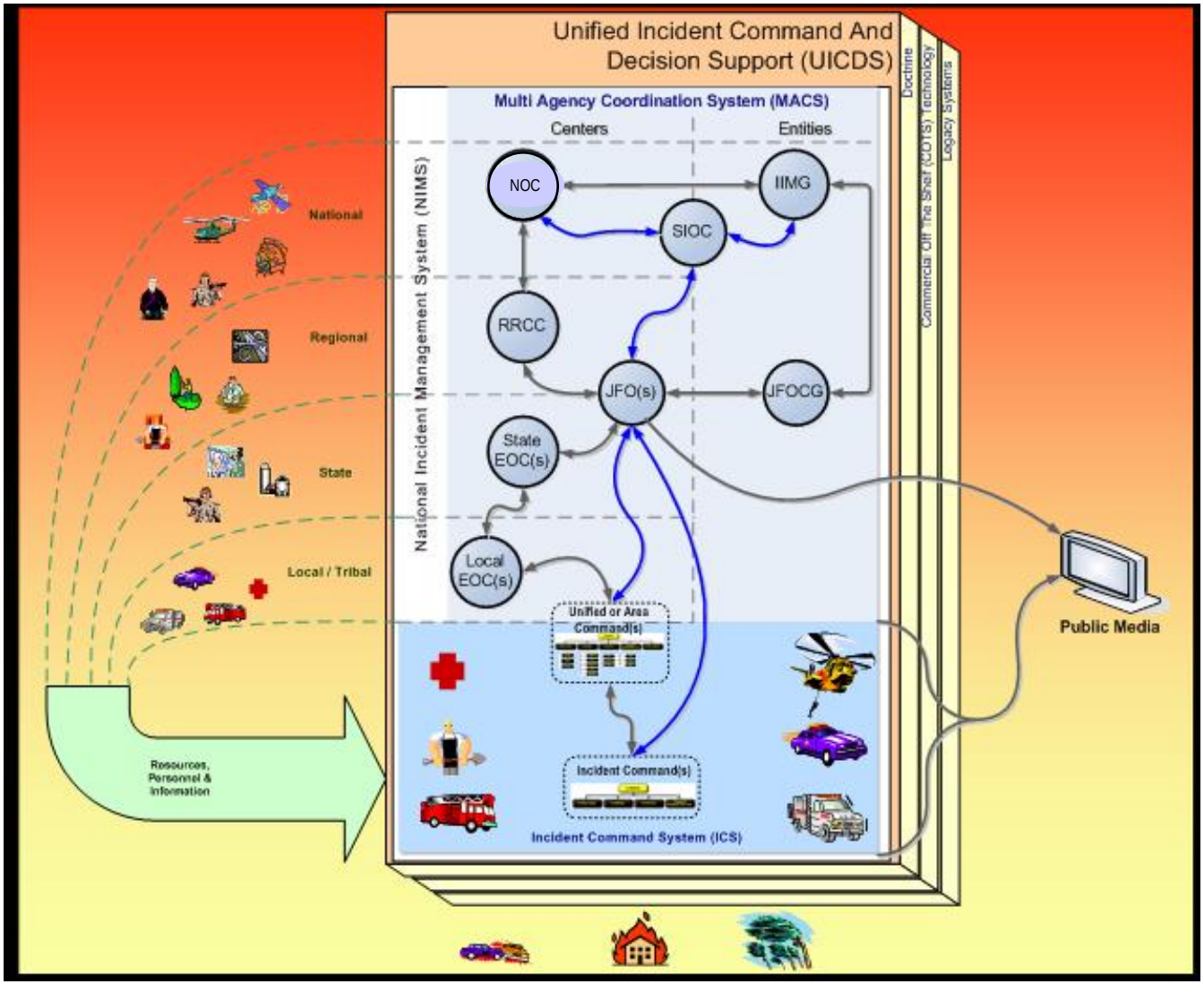
To Achieve this, the UICDS Project Delivers …

- The **UICDS Architecture Specification** that describes the standards and data model for technology providers to adapt their products and share information

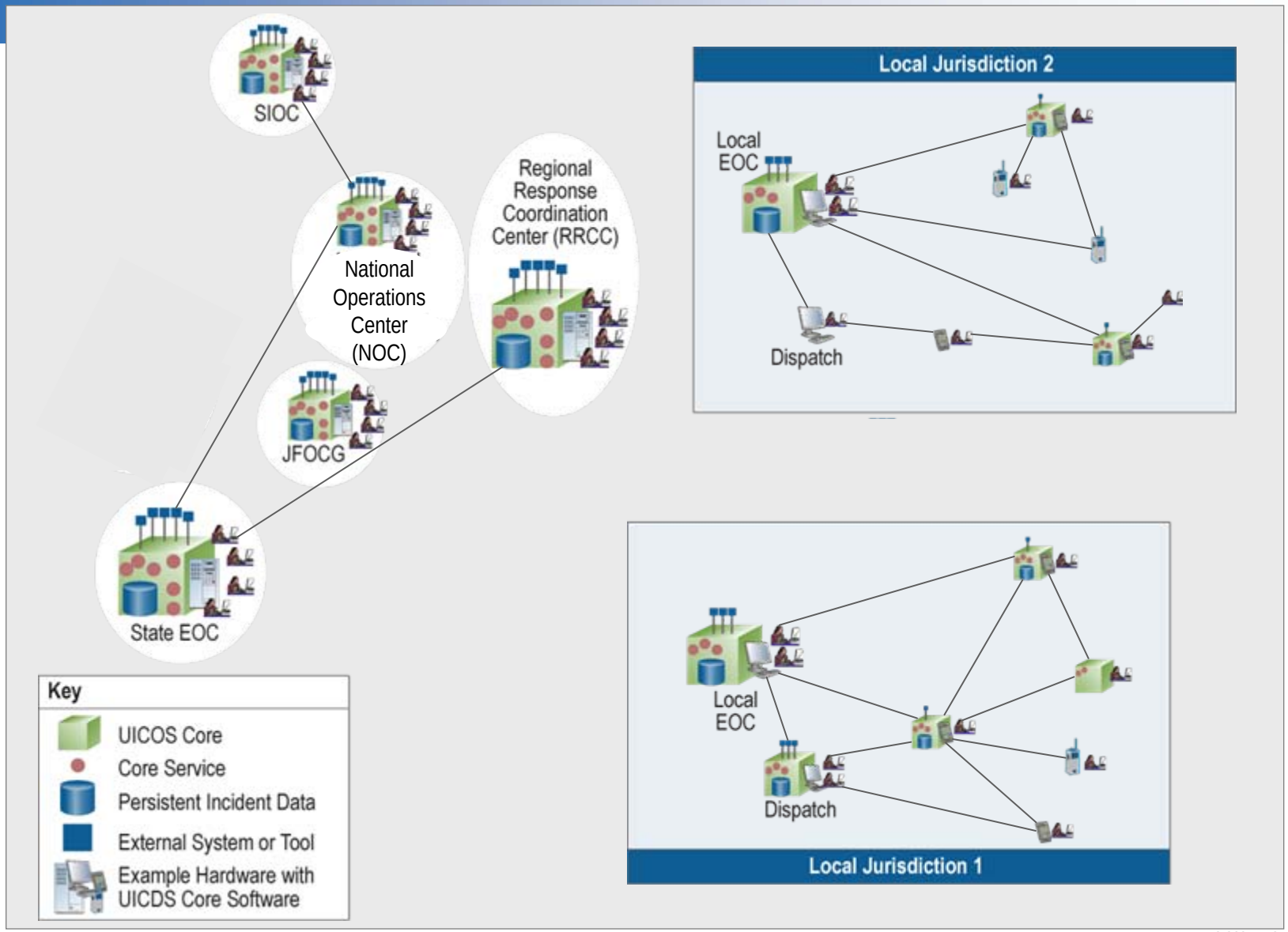
- A **Prototype Reference Implementation** that is a real-world, operational test environment that results in sample code for technology providers to use to adapt their products

- A **national outreach program** to expand awareness of the role of technology in homeland security

Phase One Operational View of Information Sharing Needed by the NRF and NIMS, including ICS



UICDS Operates Everyday



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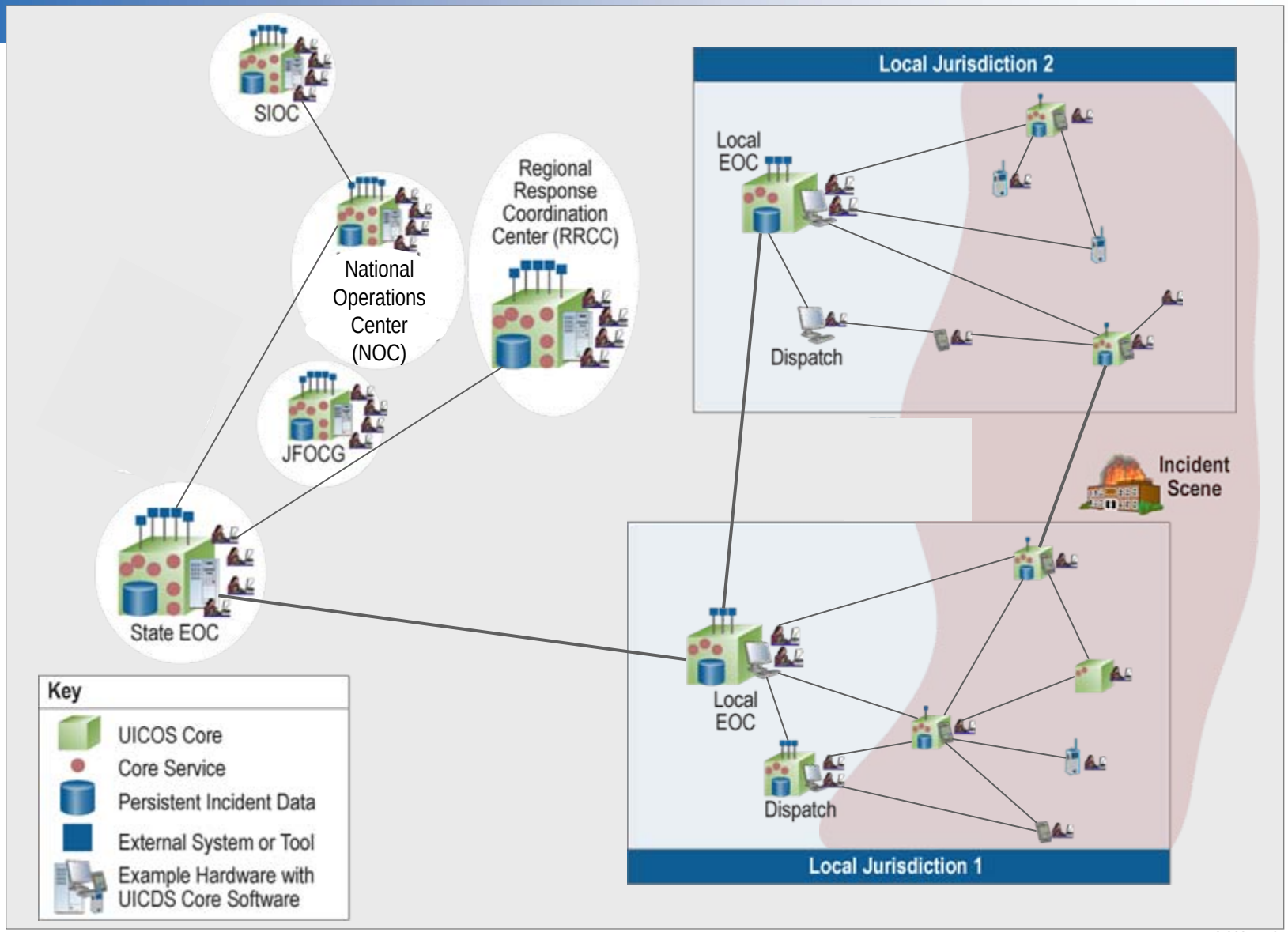
Local Incident Mutual Aid and State Awareness



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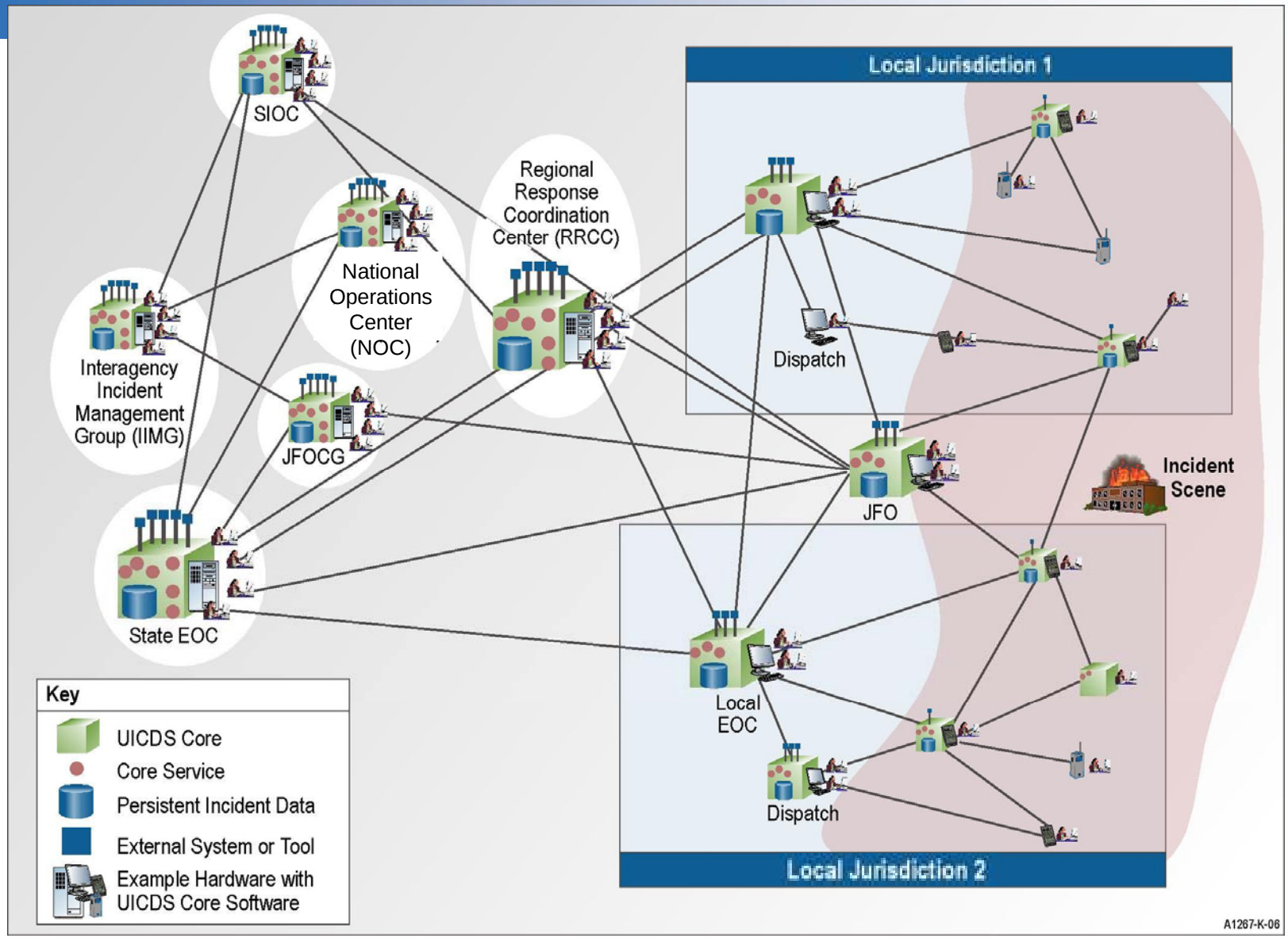
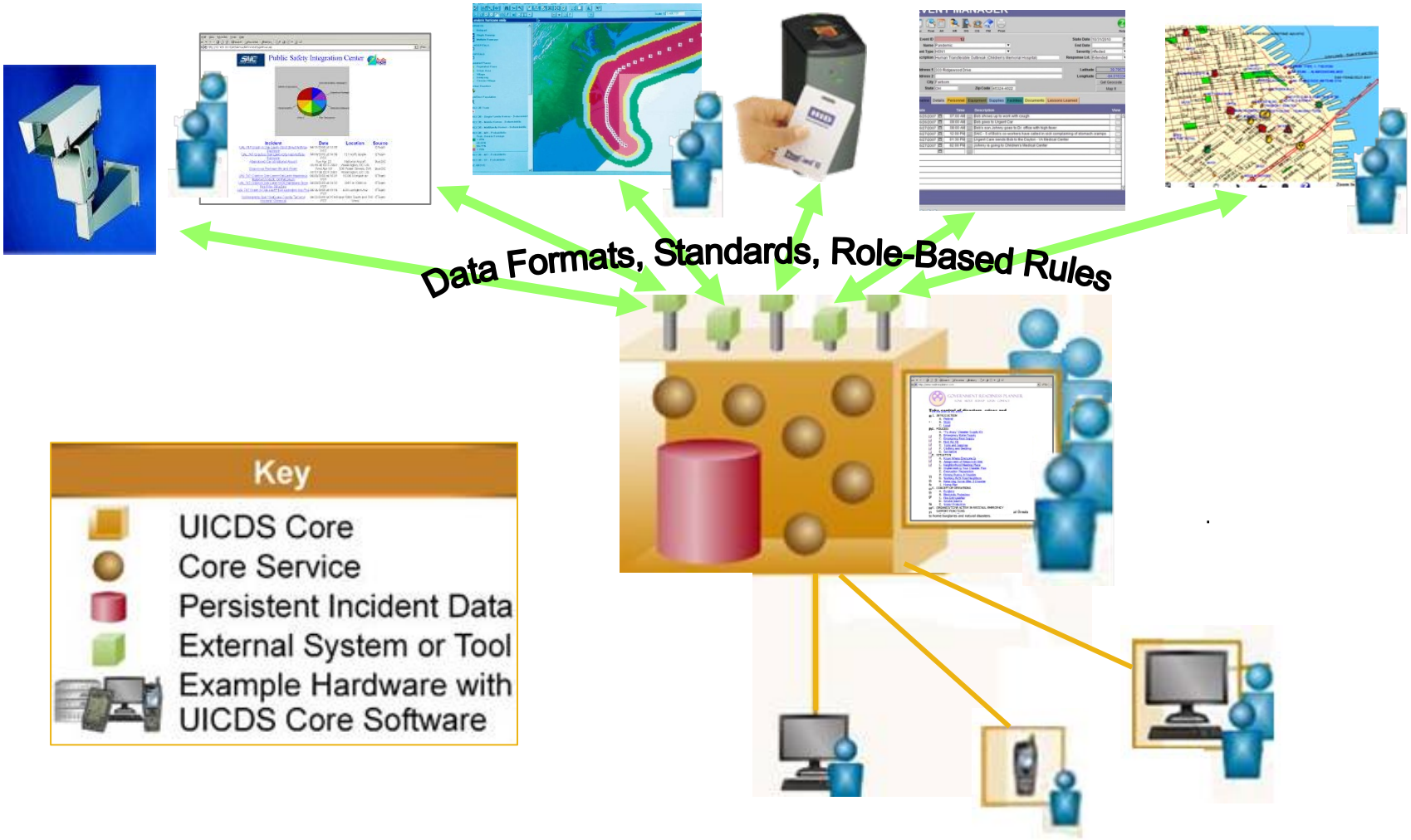
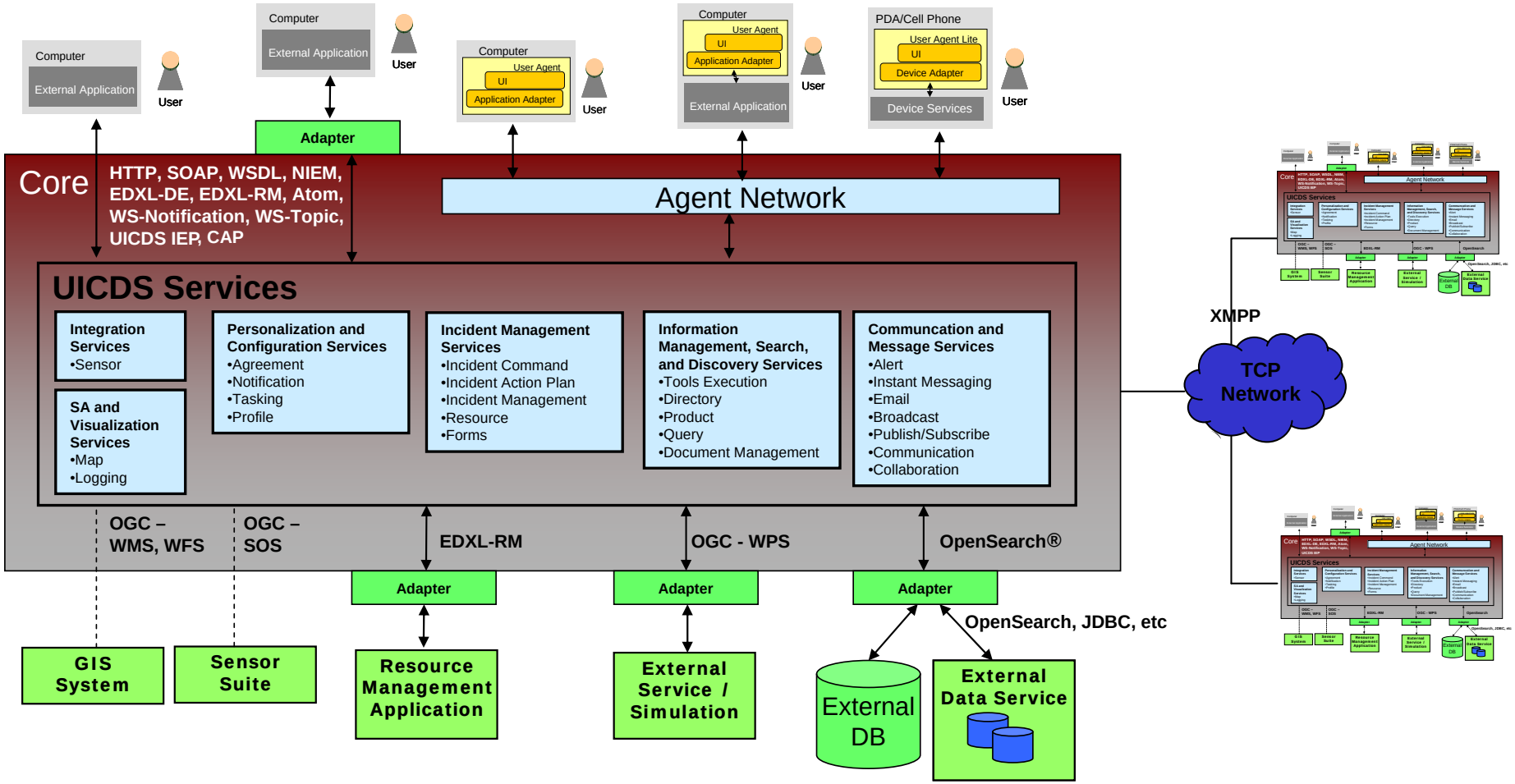
Escalating Incidents Include National Agencies



A UICDS Core Connects to Technology Applications to Consume and Provide Information



UICDS Core Prototype Reference Implementation



Work Products are Managed by Services and Represented by Standards

UICDS Services	Work Products	Standards
Alert	CAP Alerts	CAP version 1.1 specification
Incident Command	Command/Coordination Structures	NIEM 2.0
Incident Action Plan	Incident Action Plan	NIEM 2.0, ICS Forms
Incident Management	Incident Document	NIEM 2.0, CAP version 1.1 specification
Resource	Resource Identification	Emergency Data Exchange Language Resource Messaging (EDXL-RM) 1.0
Tasking	Personnel Task List	NIEM 2.0
Map	Layers and Maps	OGC Web Map Context 1.1.0, WMS 1.3.0, WFS 1.1, CSW 2.0.2 , GML, CSDGM, ISO 19115
Sensor	Sensor Observation Request	OGC Sensor Observation Service (SOS) 1.0.0, Observations and Measurements 1.0
Document Management	Documents	NIEM 2.0

CAP = Common Alerting Protocol
NIEM = National Information Exchange Model
OGC = Open Geospatial Consortium

WMS = Web Map Service
WFS = Web Feature Service
CSW = Web Catalogue Service

GML = Geography Markup Language
CSDGM = Coherent Standard for Digital Geospatial Metadata
ISO = International Organization for Standardization

Basic Principles and Benefits of UICDS

- No new user interfaces, training, or applications to purchase
- Information management supports and sustains emergency management best practices as defined in the NRF and NIMS but localized by each jurisdiction
- Users get information targeted to their skills, qualifications, location, and role in the emergency
- Multi-agency and multi-jurisdiction information sharing follows state and local agreements and plans for escalating an incident to include all needed assets
- Open standards encourage technology innovation to accelerate putting tools into the hands of more state and local users
- UICDS is more than just situational awareness – true interoperability among government, commercial, academic, and volunteer technology applications, including:

  - Warnings
  - Dispatch
  - Analytical Modeling
  - Lessons Learned
  - Weather
  - Incident Information
  - Training and Exercises
  - Collaboration
  - Equipment and Resources
  - Personnel
  - Facilities
  - Situation Reports
  - Vulnerability Analysis
  - Sensors and Video
  - Mutual Aid
  - Hazard Forecasts
  - Geospatial Mapping
  - Operations Procedures
  - Intelligence
  - Consequence Assessment
  - Public Information
  - Operations Plans
  - Infrastructure
  - Finance and Accounting
  - Science and Technology
  - Maintenance Status
  - And others

Unified Incident Command Decision Support

Demonstration Objectives

Validate the UICDS Architecture as described in the UICDS Architecture Specification

Validate Information Sharing

- **Among Applications**
  - **23 commercial, government, and academic Technology Providers**
- **Using UICDS Interfaces and Data Model**
  - **Multiple interfaces**
  - **Multiple data formats**
  - **Multiple networks**
- **Across Jurisdictions**
  - **Information sharing agreements**
  - **Core-to-Core communications**
- **Using Standards**
  - **NIEM-based data exchange**
  - **Multiple data communication standards**

Validate UICDS as an Open and Royalty-Free Architecture

Scenario Concept

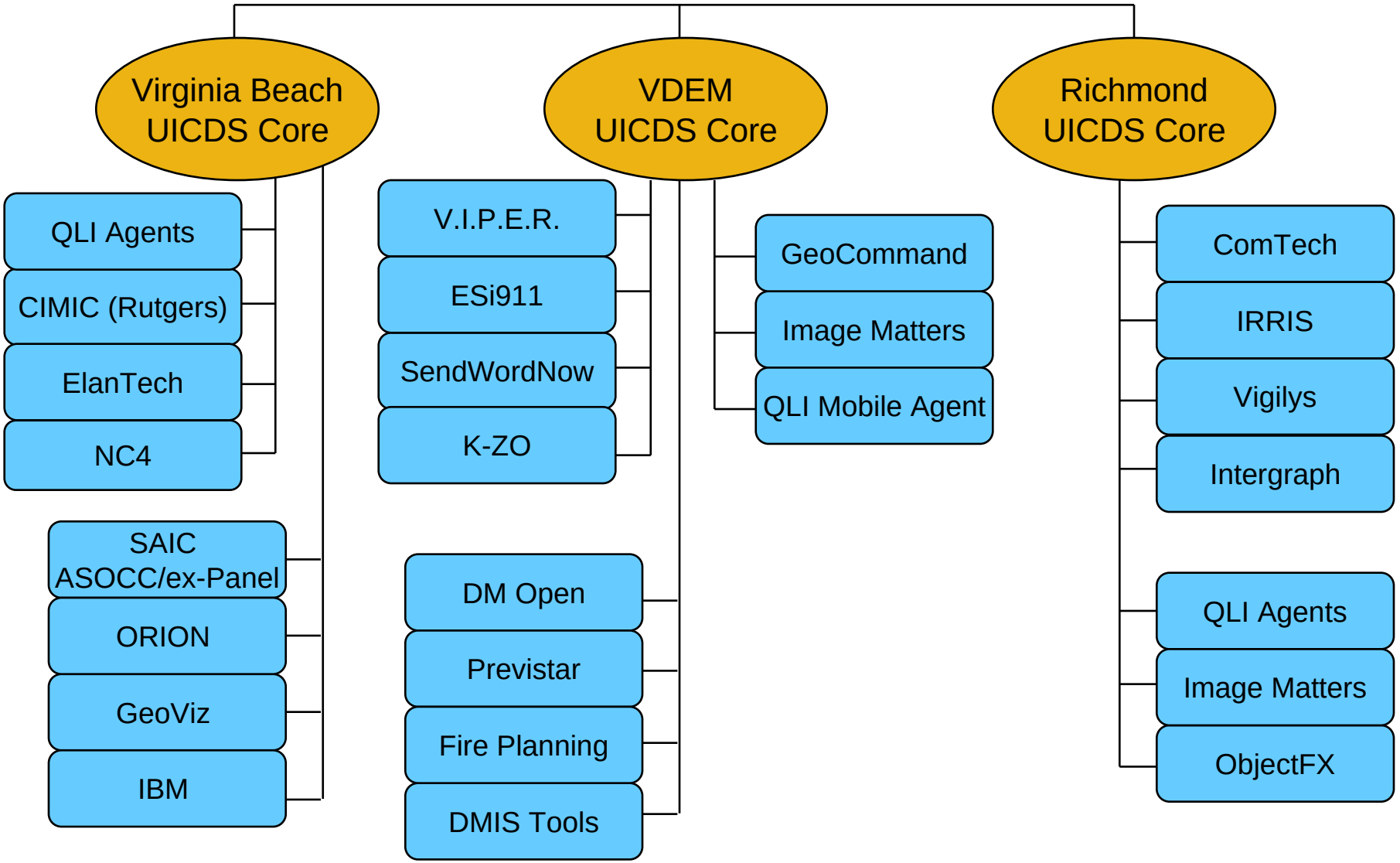
This is not an emergency management exercise; it is a demonstration of technologies to support emergency management, so please don't get wrapped up in the emergency or its response.

- A major storm is sweeping up the East Coast in a long, dry summer
- Typical impacts directly from the storm include wind, rain, lightning, and both flash flood and flood damage
- Secondary impacts include traffic accidents and backups, storm-caused accidents in industrial facilities and transportation, lightning-ignition of building and wildfires
- Our focus is on activities that take place in the City of Richmond, the City of Virginia Beach, Bridgewater Fire Department (FD), Buckroe FD, and the Virginia Division of Emergency Management (VDEM)
- Six vignettes lead us through the demonstration, all happening in the broad context of the major storm

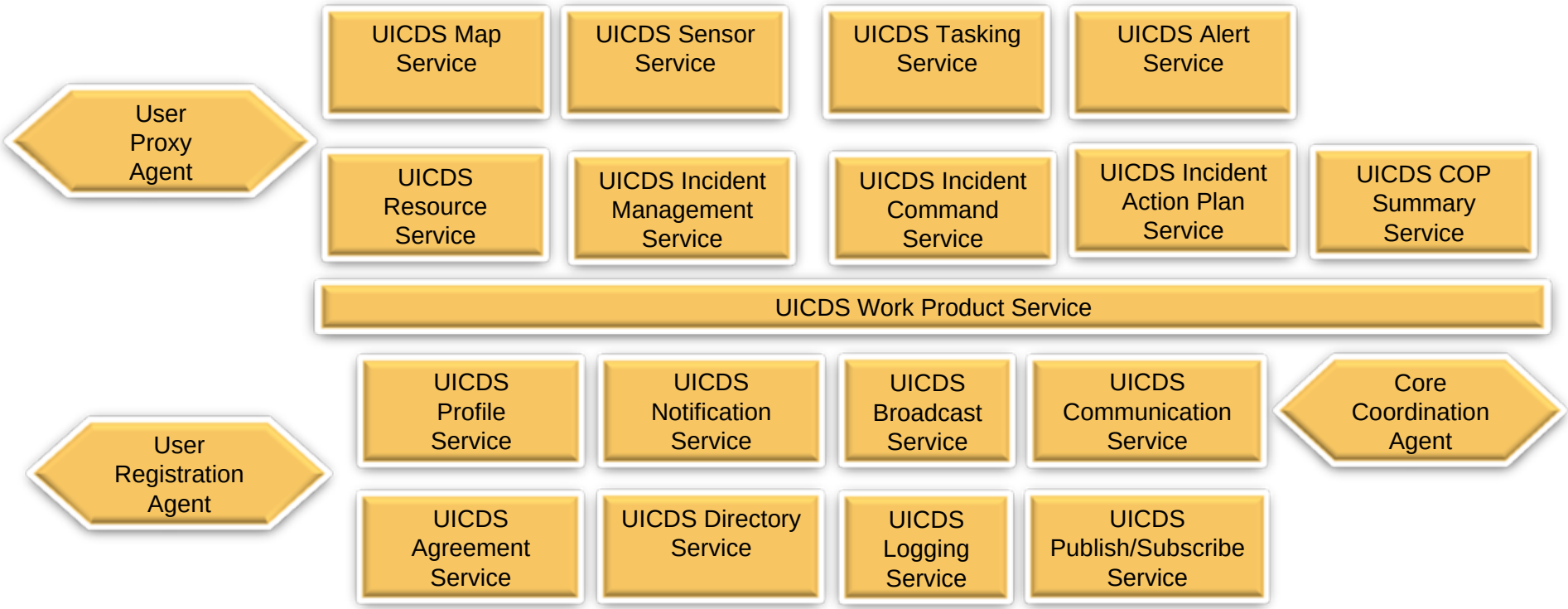
Six Vignettes in a Major Storm

- ***Lightning:*** The state monitors a significant outbreak of lightning and local applications share facility preparedness information and alert facility managers and government officials to real-time update of response training
- ***Evacuation:*** A military installation must evacuate and uses evacuation simulation planning tools to assign routes which are shared with local governments that identify available shelters
- ***Flood:*** Flood gauge sensors alert, flood inundation maps are produced and shared, thus prompting resource selection decision-support tools to recommend needed assets
- ***Wind:*** Local EOC reports roof torn off school, provides floor plans to VDEM USAR units which are shared to multiple agencies during real-time, secure, private chat
- ***Security Breach:*** Video surveillance detects cars entering the flood zone, issues alert, and distributes video of the breach to local and state police and other response agencies
- ***Traffic Accident:*** A major pile-up on the interstate leads to Incident Command, discovery of hazmat, and sharing of Global Positioning System (GPS) tracking information that permits rerouting of GPS-enabled FEMA trucks carrying relief supplies

Setting the Technology Scene



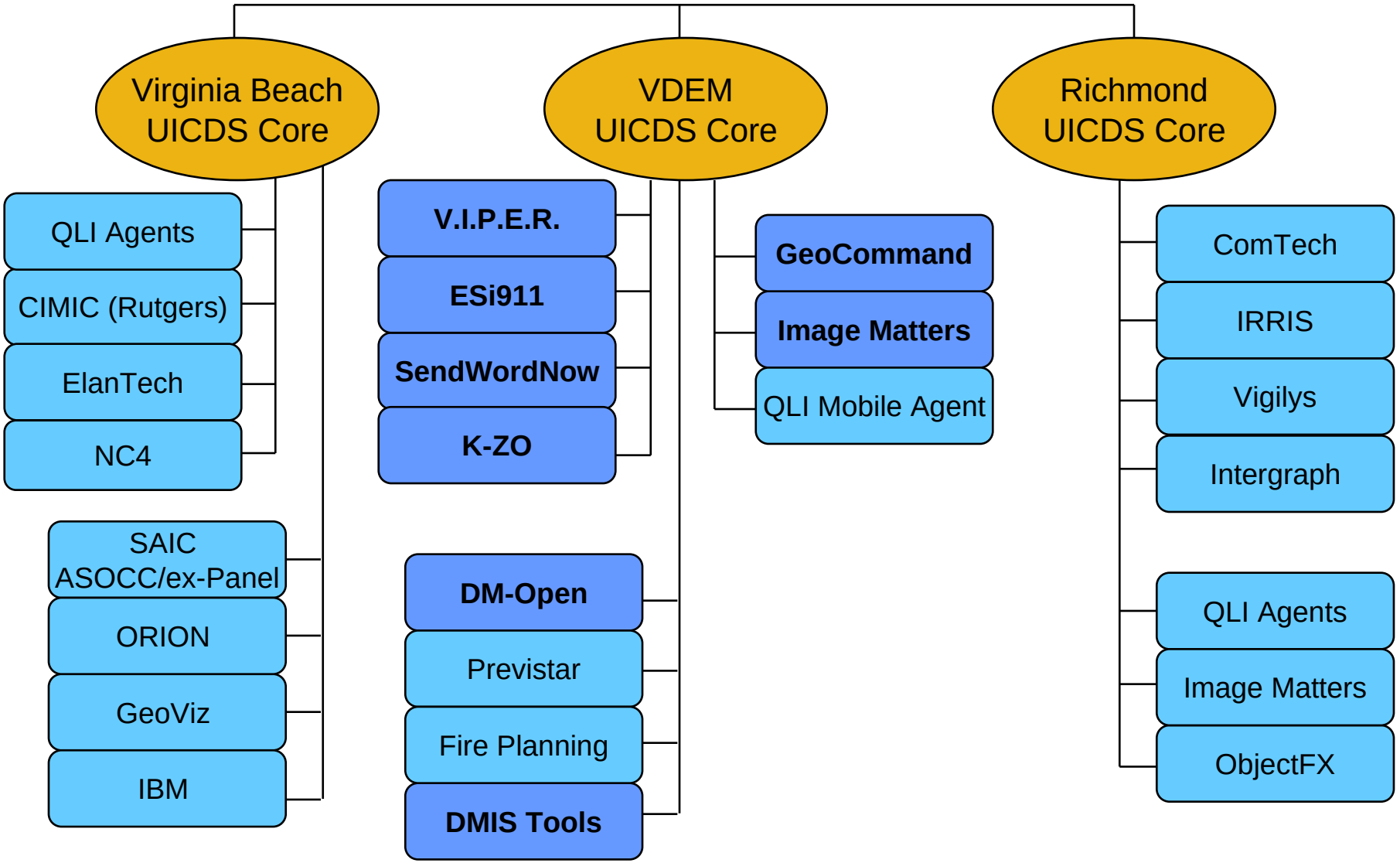
Understanding the UICDS Core



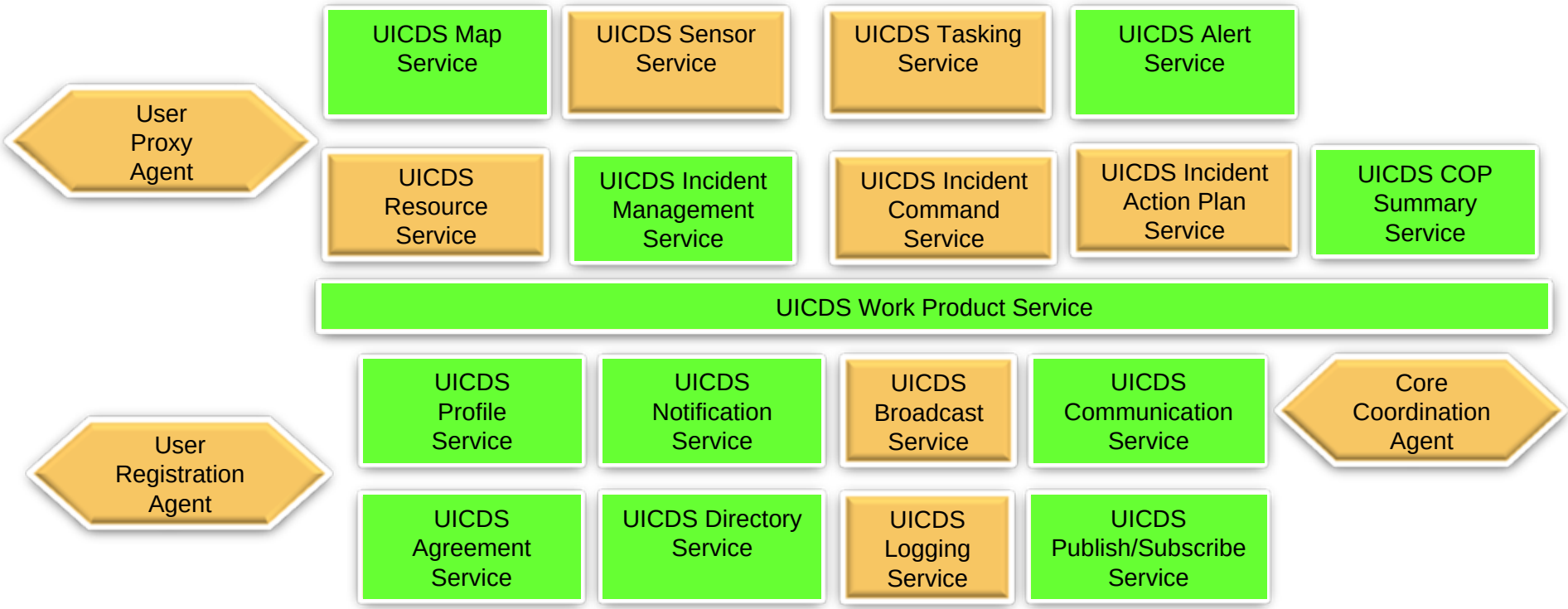
Lightning Vignette

- VDEM monitors a significant outbreak of lightning and forecast for more
- Local jurisdictions in the lightning forecast area are alerted
- Local applications identify critical infrastructure within the lightning forecast areas and publish facility preparedness information
- Local agencies and neighboring jurisdictions receive facility preparedness plans in order to anticipate support
- Facility managers and government officials receive messages directing them to real-time update of response training
- The lightning outbreak becomes part of the VDEM significant incident log and shared situational awareness on VIPER

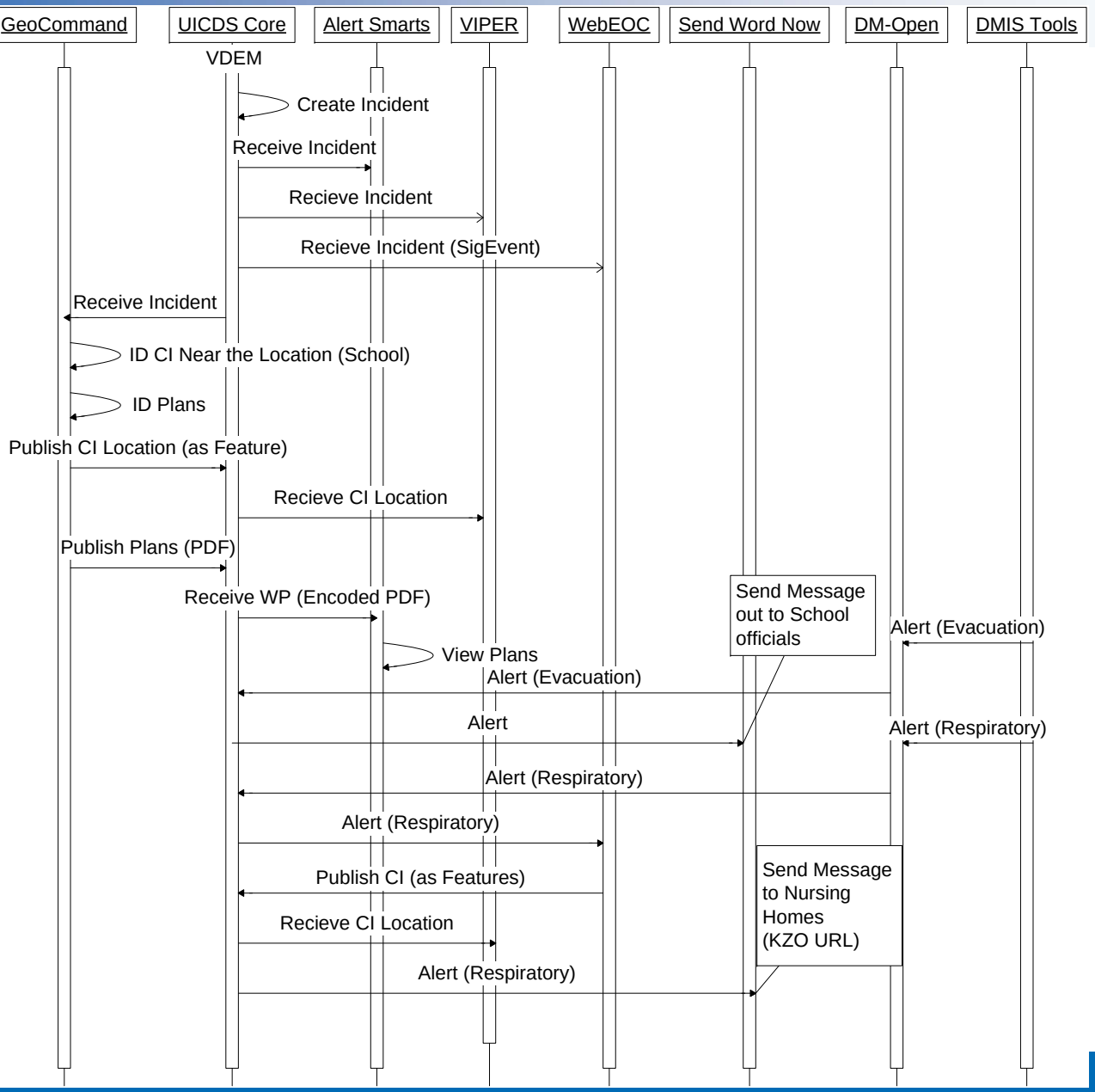
Lightning Applications



The UICDS Core: VDEM



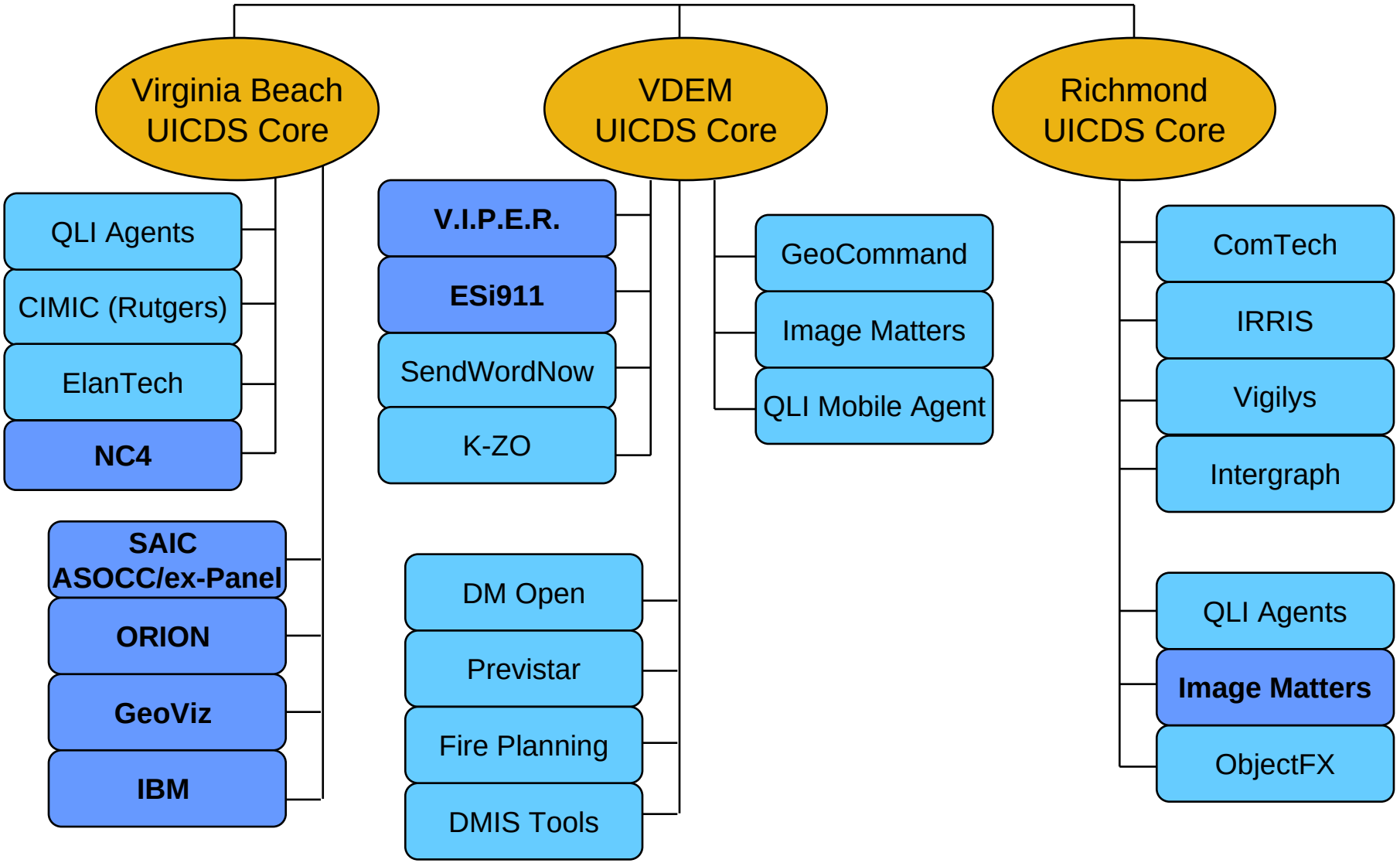
Lightning


GeoCommand
UICDS Core
Alert Smarts
VIPER
WebEOC
Send Word Now
DM-Open
DMIS Tools
VDEM
Create Incident
Receive Incident
Recieve Incident
Recieve Incident (SigEvent)
Receive Incident
ID CI Near the Location (School)
ID Plans
Publish CI Location (as Feature)
Recieve CI Location
Publish Plans (PDF)
Receive WP (Encoded PDF)
Send Message out to School officials
Alert (Evacuation)
View Plans
Alert (Evacuation)
Alert
Alert (Respiratory)
Alert (Respiratory)
Alert (Respiratory)
Alert (Respiratory)
Publish CI (as Features)
Send Message to Nursing Homes (KZO URL)
Recieve CI Location
Alert (Respiratory)

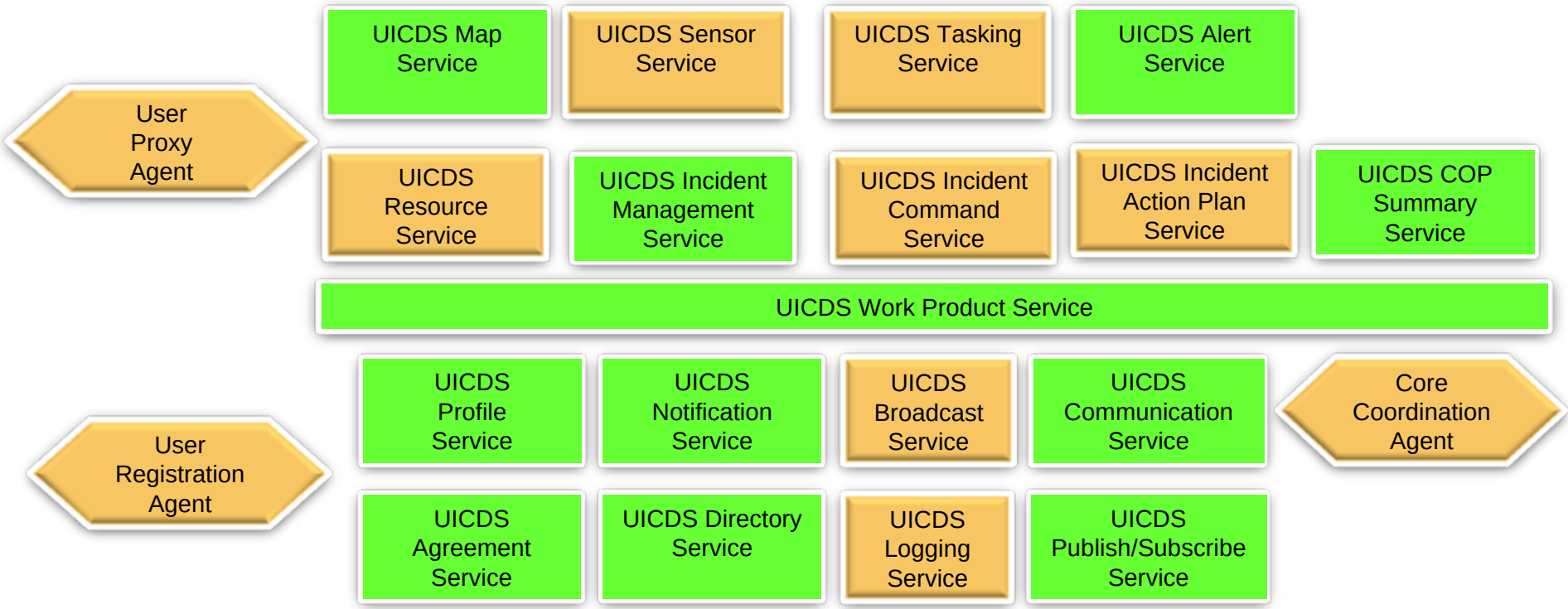
Evacuation Vignette

- A military installation issues a flooding alert and their emergency management application creates an incident
- The military installation issues a CAP alert
- The military evacuation simulation planning tools are used to assign routes for the installation evacuation
- The military resource management application identifies and shares available and needed resources
- VDEM anticipates sheltering the evacuees and uses its applications to identify available shelters
- Shelter needs and locations are shared to local applications and provided by the VDEM situational awareness tool, VIPER

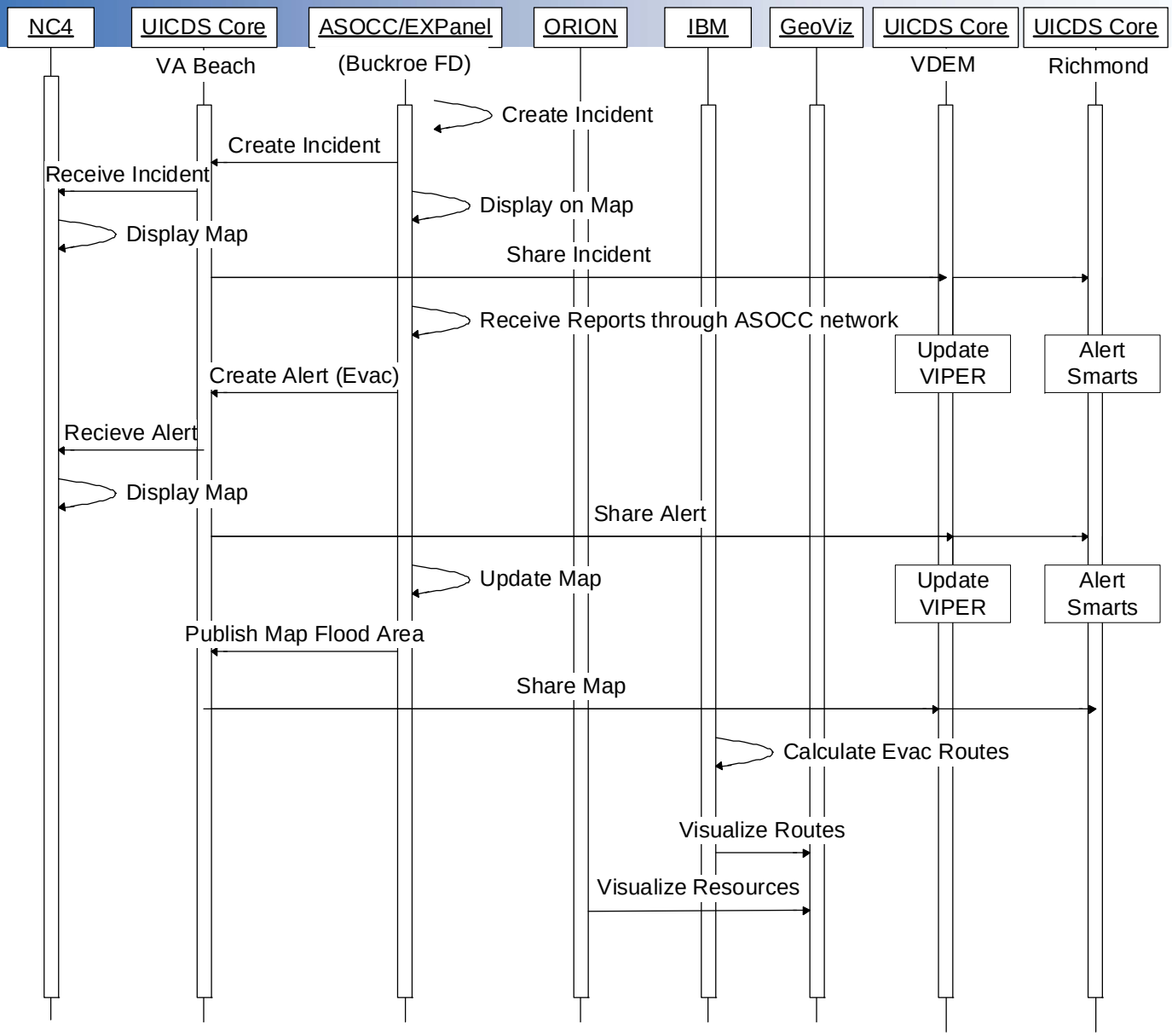
Evacuation Applications



The UICDS Core: City of Virginia Beach



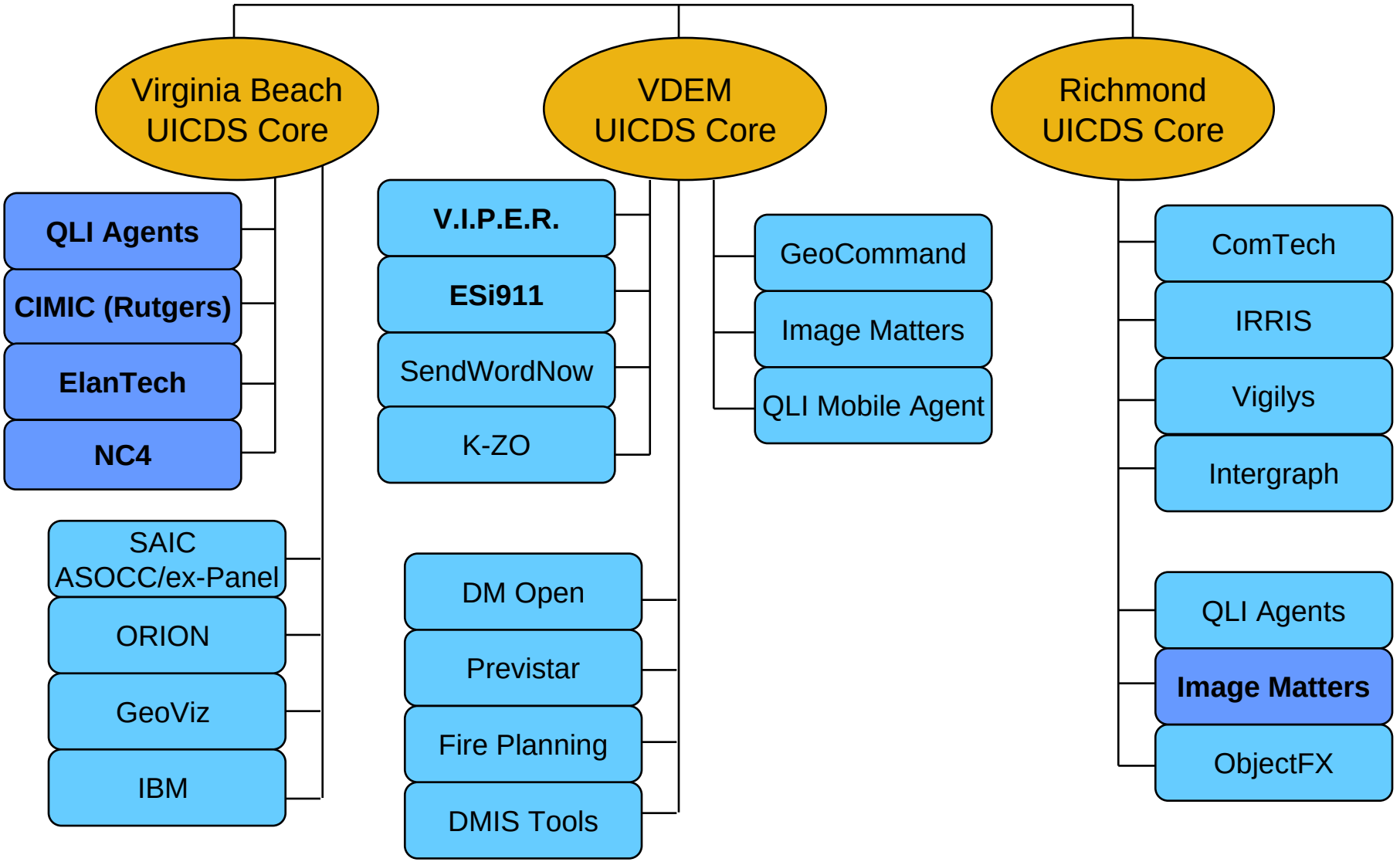
Evacuation


NC4
UICDS Core
VA Beach
ASOCC/EXPanel
(Buckroe FD)
ORION
IBM
GeoViz
UICDS Core
VDEM
UICDS Core
Richmond
Create Incident
Create Incident
Receive Incident
Display on Map
Display Map
Share Incident
Receive Reports through ASOCC network
Update VIPER
Alert Smarts
Create Alert (Evac)
Recieve Alert
Display Map
Share Alert
Update Map
Update VIPER
Alert Smarts
Publish Map Flood Area
Share Map
Calculate Evac Routes
Visualize Routes
Visualize Resources

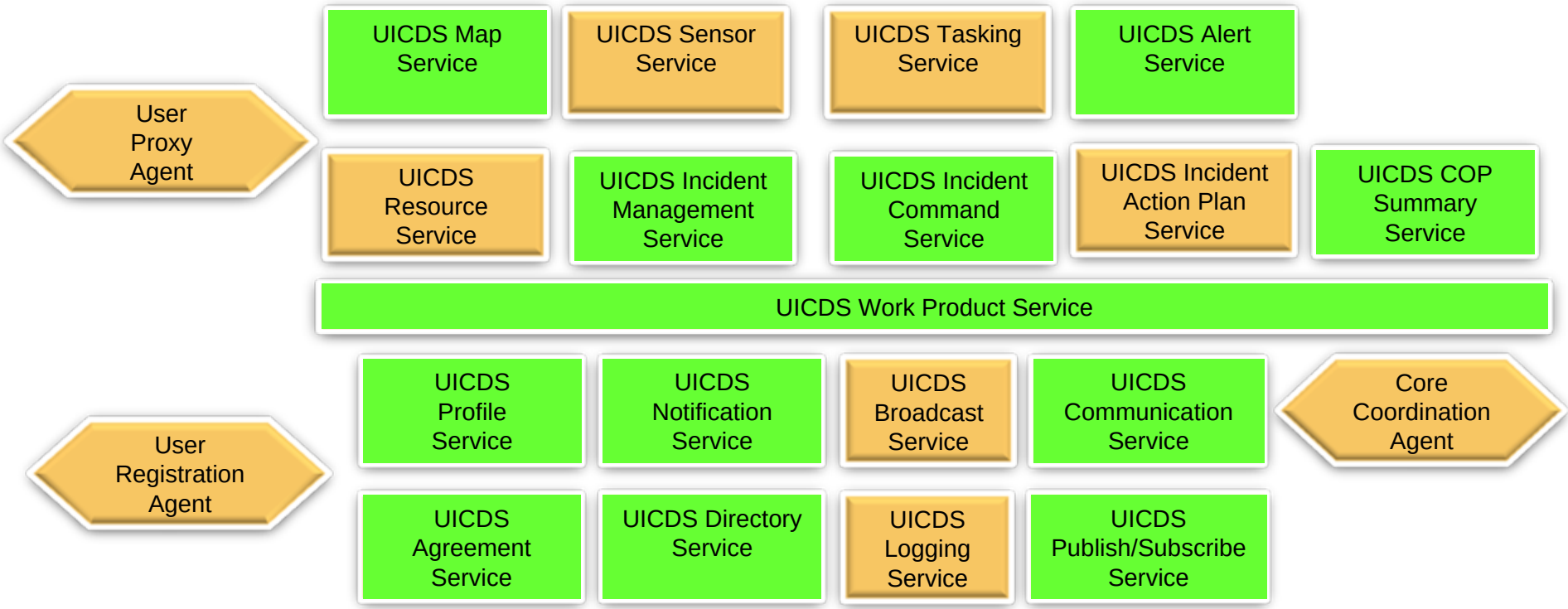
Flood Vignette

- Flood gauge are continually monitored
- When a flood gauge exceeds a threshold, it alerts and creates an incident
- Flood inundation maps are produced and shared
- The incident is shared and one recipient is a resource management decision support application
- The resource management application invokes its resource rules for a flood and examines a database of resources
- The flood becomes part of the VDEM significant incident log and shared situational awareness on VIPER

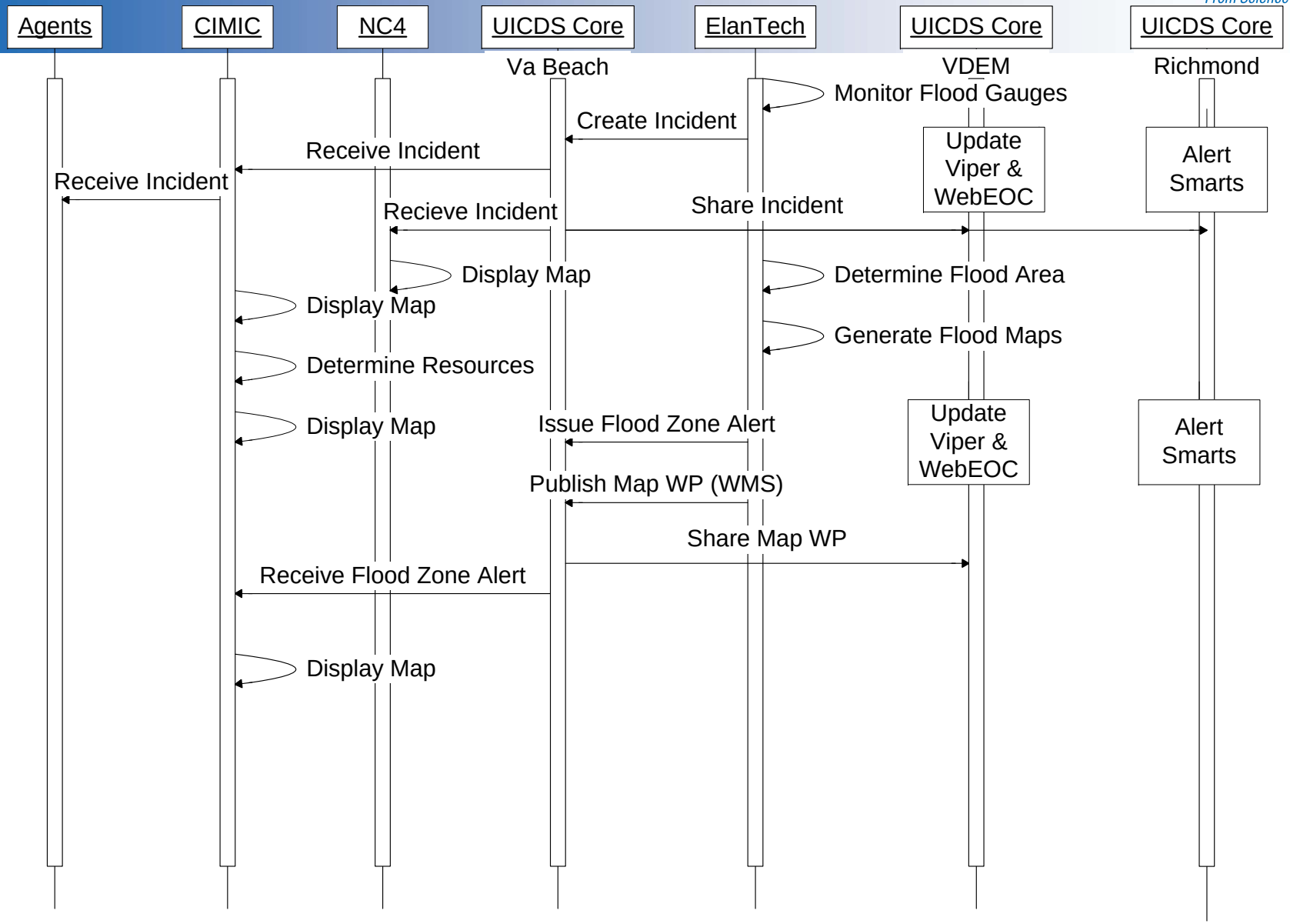
Flood Applications



The UICDS Core: City of Virginia Beach



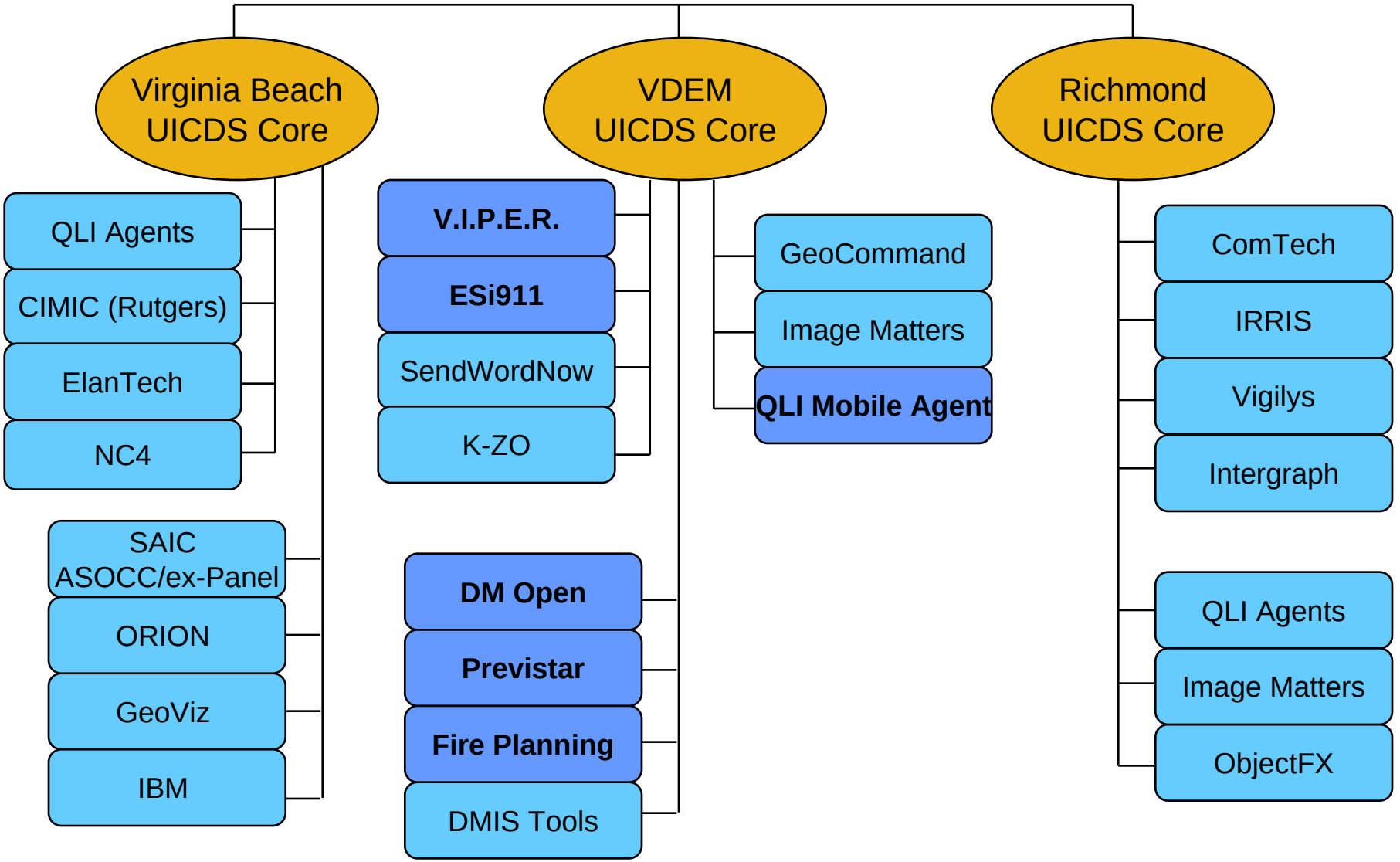
Flood


Agents
CIMIC
NC4
UICDS Core
Va Beach
ElanTech
UICDS Core
VDEM
UICDS Core
Richmond
Monitor Flood Gauges
Create Incident
Receive Incident
Receive Incident
Update Viper & WebEOC
Alert Smarts
Recieve Incident
Share Incident
Display Map
Determine Flood Area
Display Map
Generate Flood Maps
Determine Resources
Display Map
Issue Flood Zone Alert
Update Viper & WebEOC
Alert Smarts
Publish Map WP (WMS)
Share Map WP
Receive Flood Zone Alert
Display Map

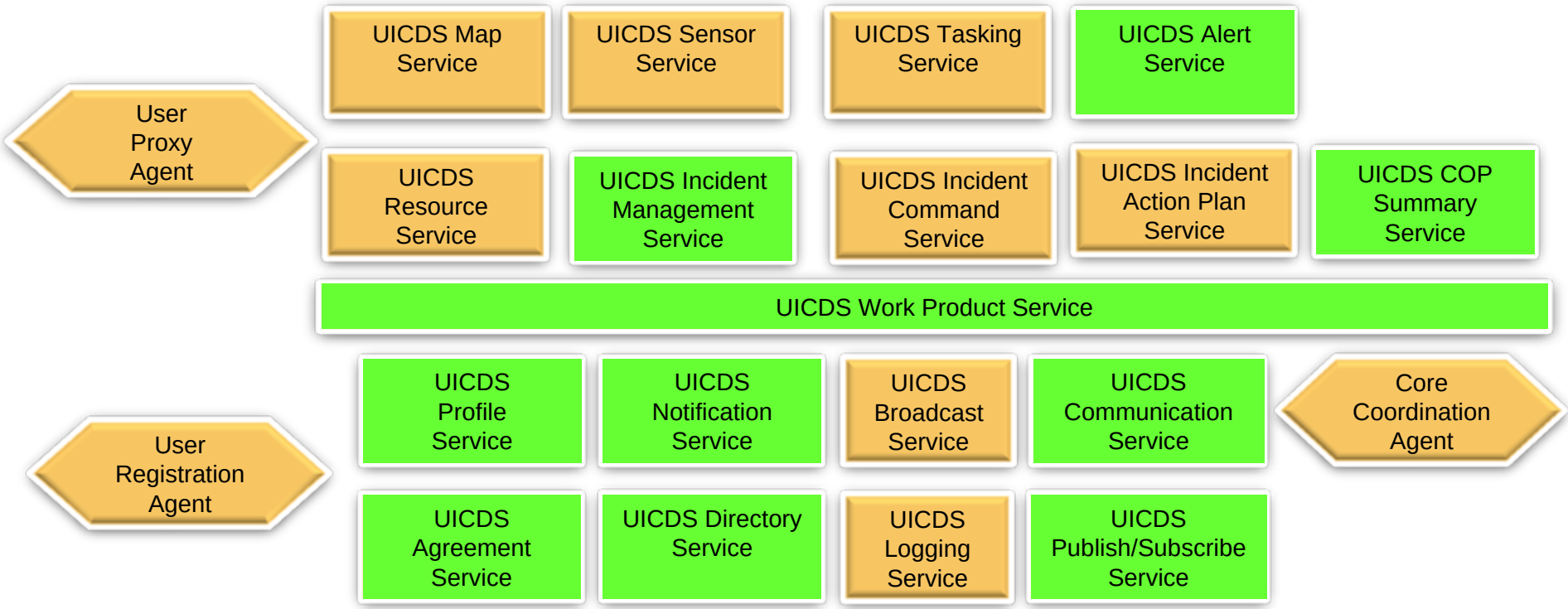
Wind Vignette

- Local EOC reports roof torn off school and creates an incident
- The Local EOC consults with fire pre-plans and publishes floor plans
- One subscriber that views the floor plans is VDEM USAR units in preparation for response
- Alerts to the incident are distributed through DM-OPEN, a DHS messaging system
- Multiple agencies are now alerted to the incident and are brought together for a real-time, secure, private planning chat during which the floor plans are shared to all participants
- The wind damage becomes part of the VDEM significant incident log and shared situational awareness on VIPER

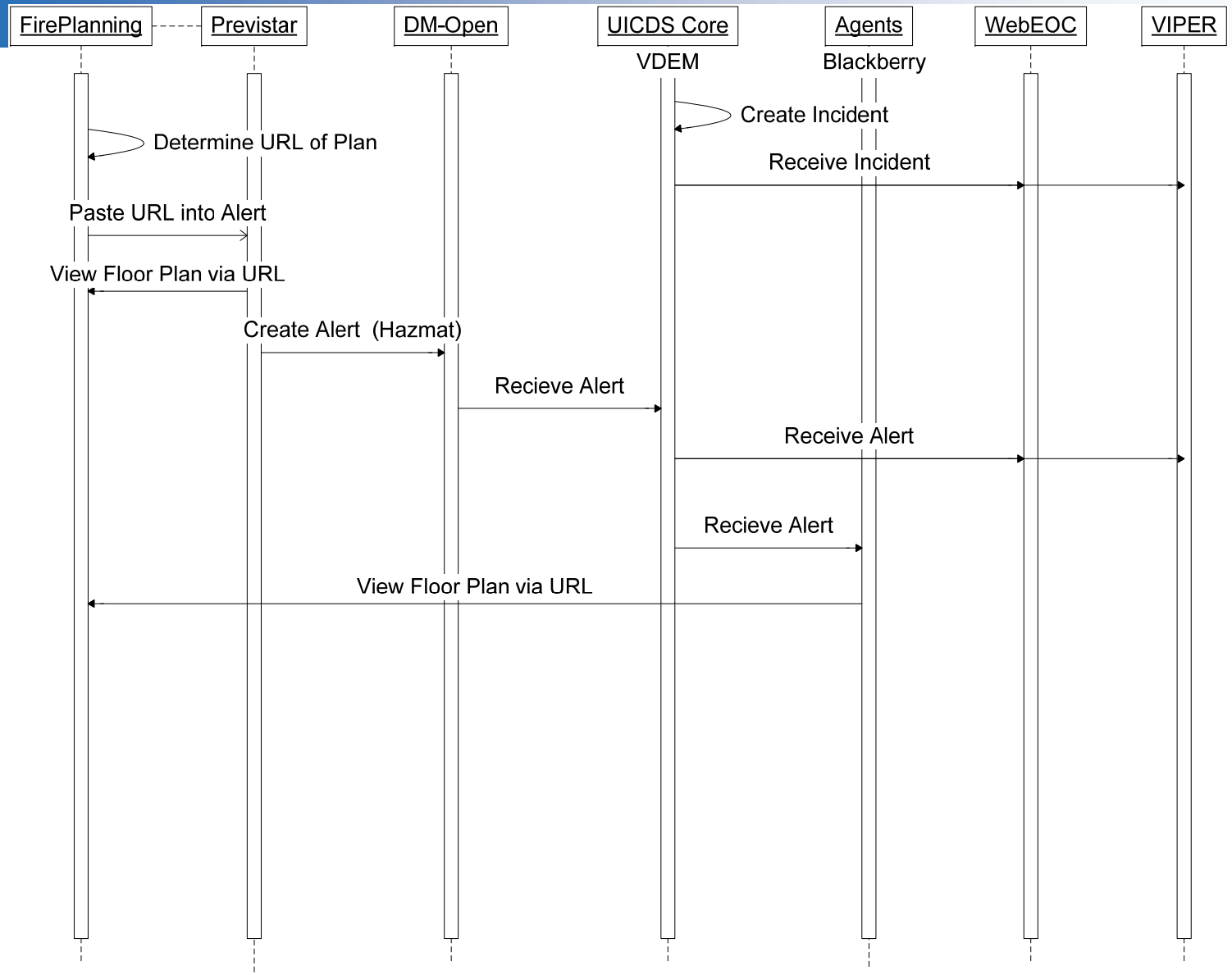
Wind Applications



The UICDS Core: VDEM



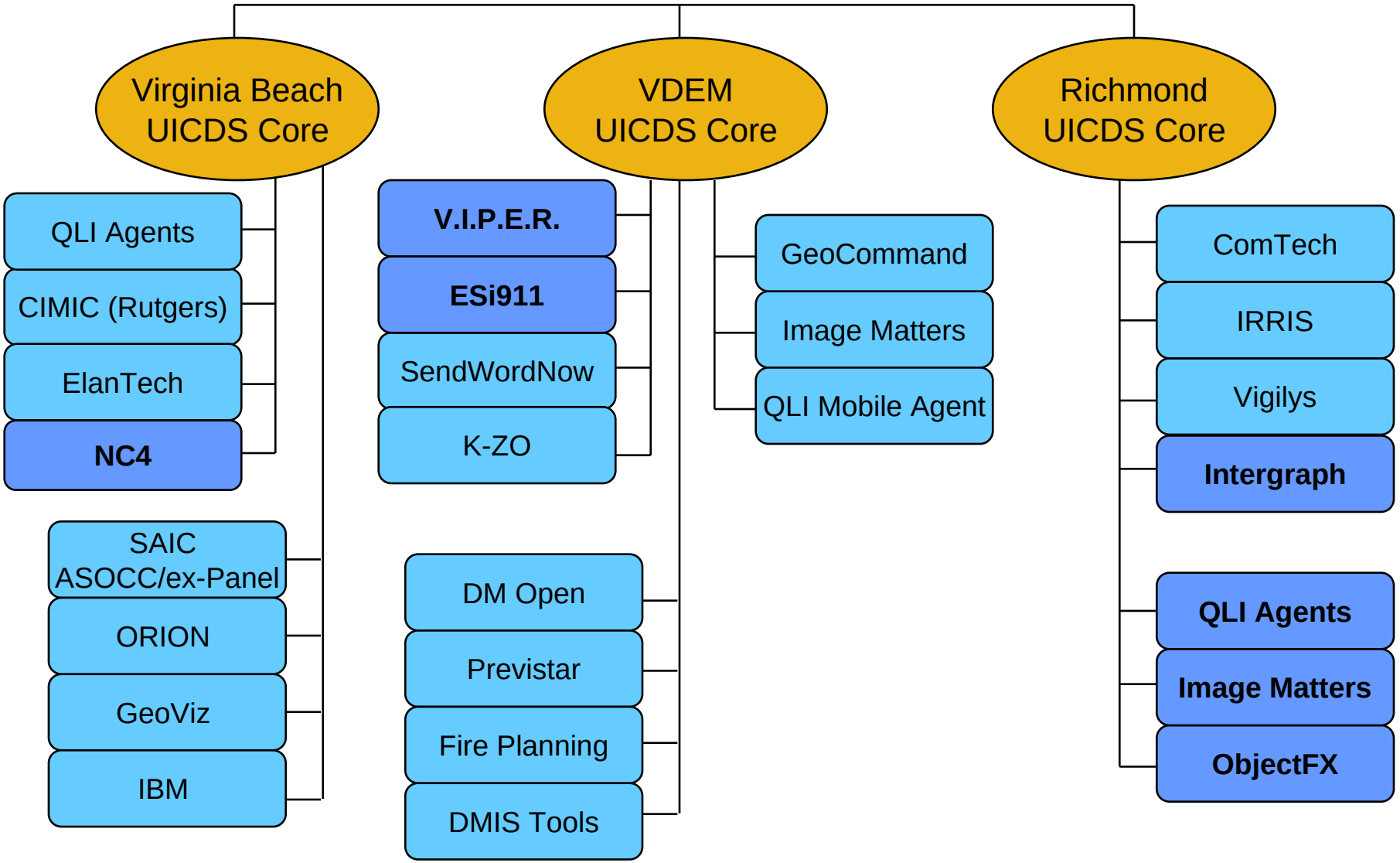
Wind


FirePlanning
Previstar
DM-Open
UICDS Core
VDEM
Agents
Blackberry
WebEOC
VIPER
Create Incident
Determine URL of Plan
Receive Incident
Paste URL into Alert
View Floor Plan via URL
Create Alert (Hazmat)
Recieve Alert
Receive Alert
Recieve Alert
View Floor Plan via URL

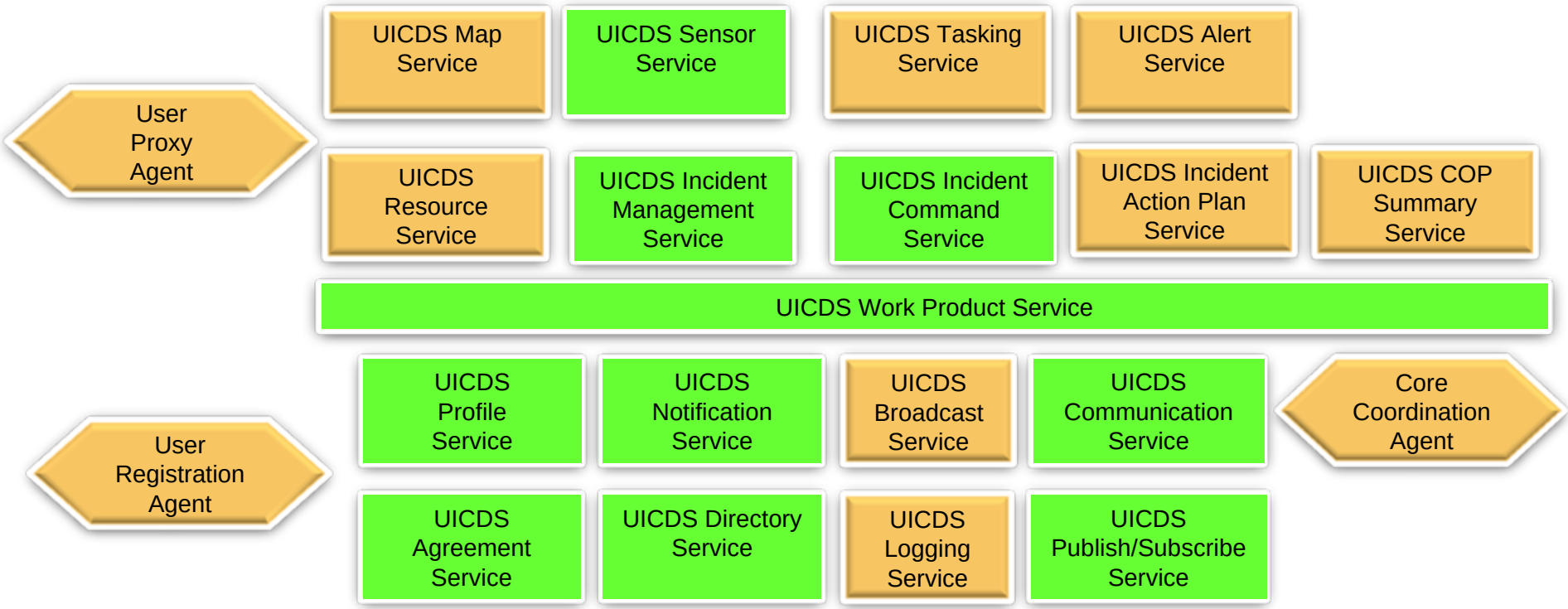
Security Breach Vignette

- The flood area is declared an evacuation zone and law enforcement issue orders that no one may enter the area
- The geographic flood area is shared as a map overlay with a local video surveillance application which detects cars entering the excluded flood zone
- The video surveillance creates a security incident and issues an alert
- Subscribing law enforcement and other agencies receive the alert which is accompanied by a sensor observation consisting of access instructions to a video of the security breach
- The security breach becomes part of the VDEM significant incident log and shared situational awareness on VIPER

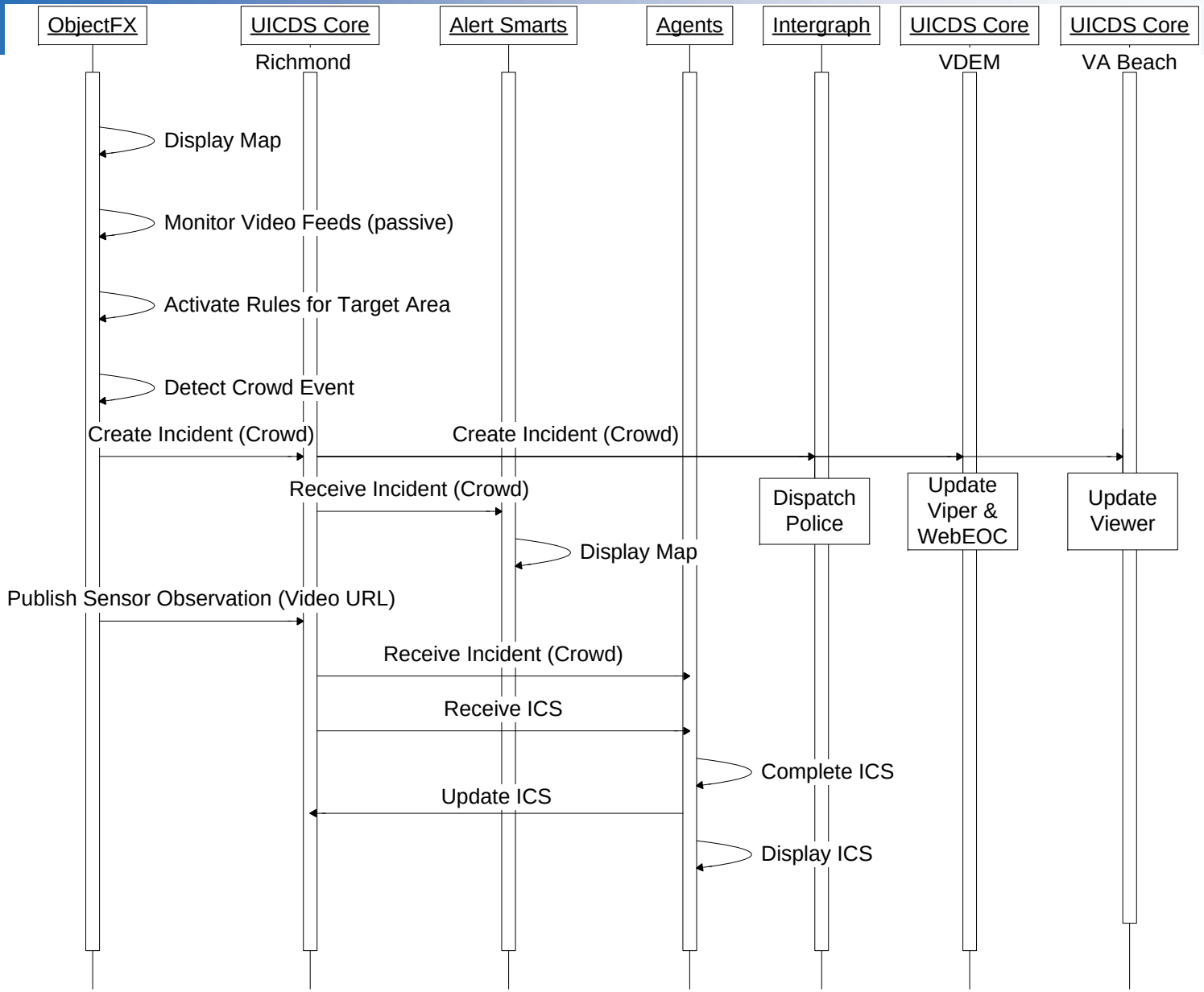
Security Breach



The UICDS Core: City of Richmond



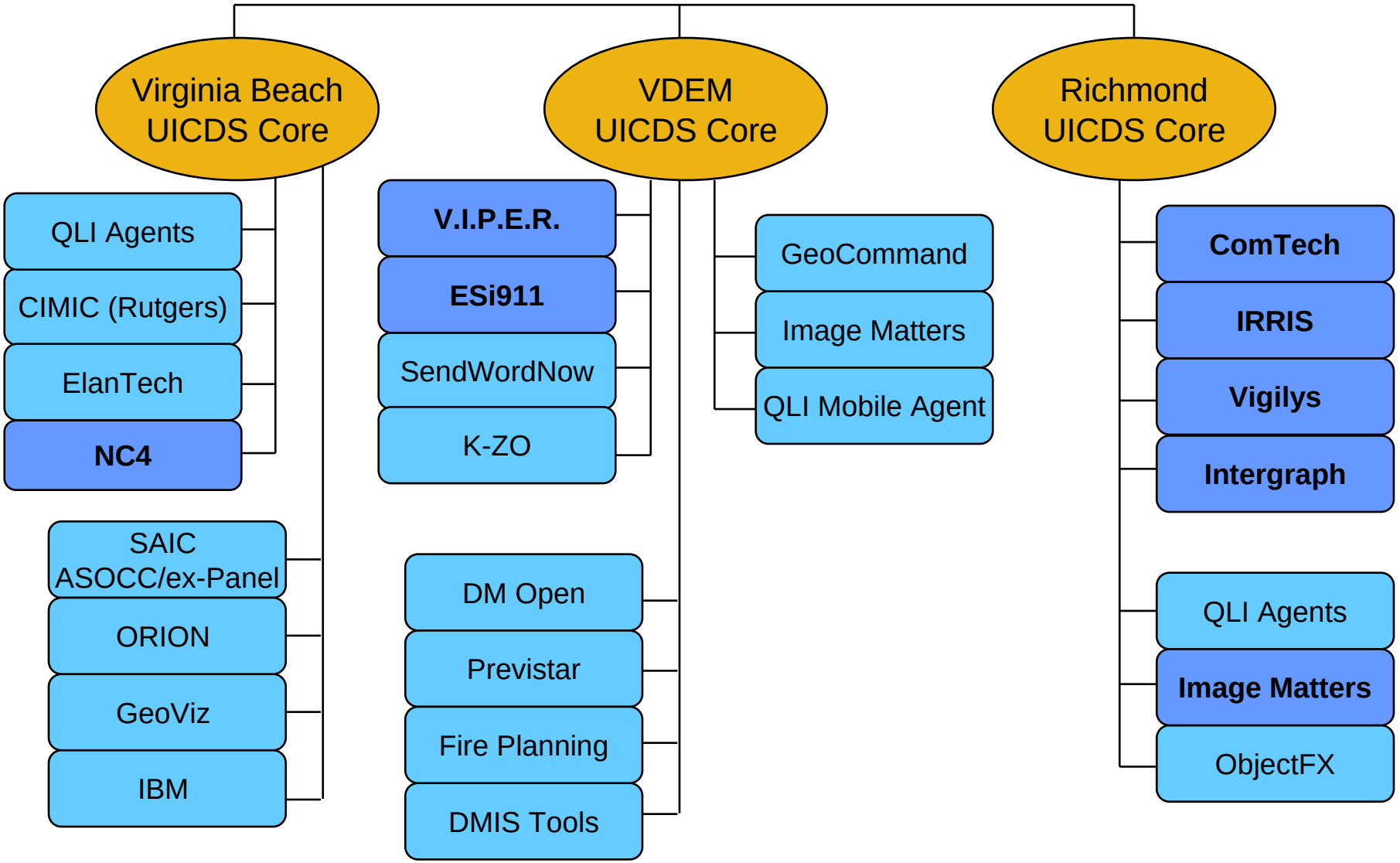
Security Breach



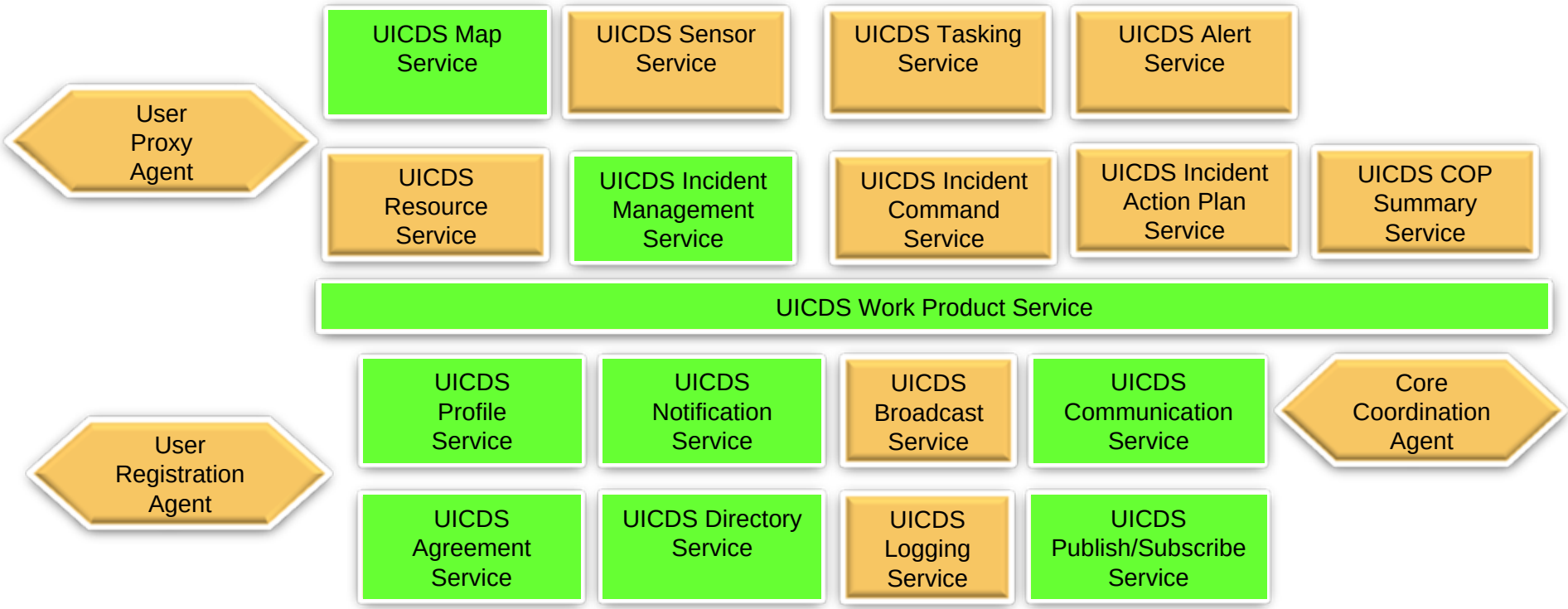
Traffic Accident Vignette

- A major pile-up on the interstate leads to dispatch to the traffic accident
- Field response units establish Incident Command
- Identification of hazmat carrying vehicles in traffic accident reported to dispatch which upgrades the incident to hazmat
- As a result of upgrade to hazmat incident, UICDS shares the incident with other subscribing parties, including the FEMA logistics group responsible for GPS tracking of FEMA trucks carrying relief supplies
- Location identified for FEMA trucks potentially affected by both accident delays and potential hazmat release
- Field response units model chemical plume release area and publish
- FEMA trucks rerouted to avoid potential plume and continue delivery without delay
- The traffic accident becomes part of the VDEM significant incident log and shared situational awareness on VIPER

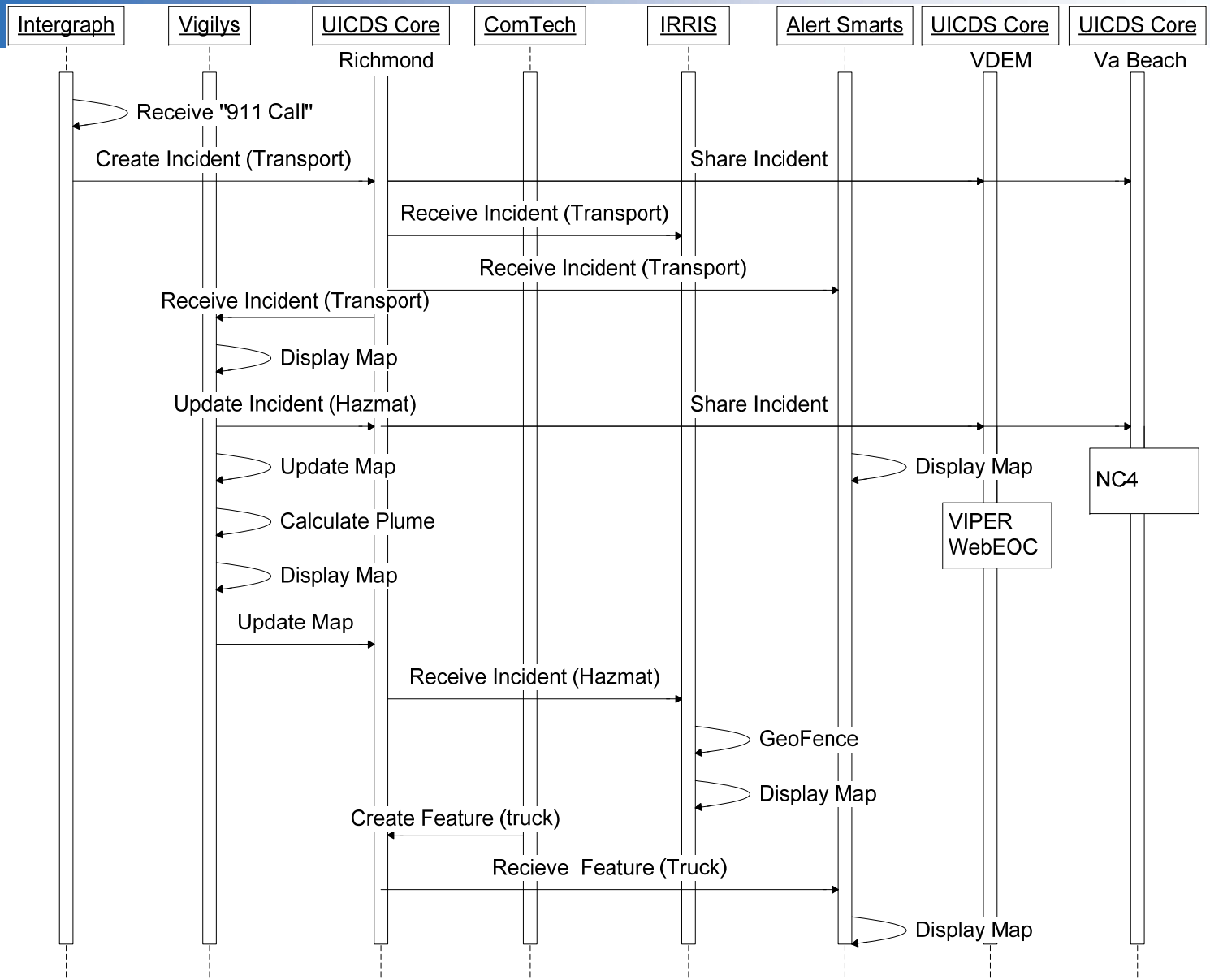
Traffic Accident Applications



The UICDS Core: City of Richmond



Traffic Accident



Demonstration Objectives

- Establish User and Application Profiles to enable human and application interaction through UICDS
- Show UICDS Core Web Services interactions
- Show UICDS Core-to-Core communications and application information sharing
- External application information sharing: Alerts
- External application information sharing: Maps
- External application information sharing: Multiple Devices
- External application information sharing: Model Results
- External application information sharing: NIEM Data Formats
- External application information sharing: ICS Structure
- External application information sharing: Resources
- External application information sharing: Sensors
- External application information sharing: COP Summary
- Show Agents sharing information based on roles and rules
- Use and establish Data Standards
- Deliver UICDS Core as Open Architecture and Royalty-Free

Unified Incident Command and Decision Support

DHS S&T Program Manager:
Lawrence E. Skelly
lawrence.skelly@dhs.gov

DHS S&T Technical Lead:
Dr. Nabil R. Adam
nabil.adam@dhs.gov

DHS S&T Program Support:
Tomi` Finkle
tomi.finkle@associates.dhs.gov

UICDS Project
Community Outreach Director
James W. Morentz, Ph.D.
(703) 589-3706
morentzj@saic.com

UICDS Project
Project Manager
Chip Mahoney
(917) 574-7356
mahoneyc@saic.com