

Navy Emergency Response Management System Aids Military First Responders

Mark Jansen, Geospatial Engineer
Space and Naval Warfare Center (SPAWAR) Systems Center

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Abstract: The Navy Emergency Response Management System (NERMS) is a consolidated Computer Aided Dispatch system that combines traditional fire, police, and medical dispatch services with modern GIS real-time services such as address verification, automatic vehicle location, automatic vehicle recommendation and routing, map displays, and online GIS updating to enhance emergency response. NERMS operates out of Regional Dispatch Centers communicating with installation-level first responders via radios and mobile data computers in emergency vehicles.

Existing emergency management functions combine different manual and automated administrative systems, applications, processes such as pencil and paper logbooks, paper mapbooks, and pre-plan documents. Current paper-based records management systems do not provide intra- and inter-departmental system interoperability which limits incident response and personnel cooperation with dispatch centers as well as administrative tasks such as data calls and budgeting.

Implementation of NERMS provides an integrated, scaleable, and expandable Navy Enterprise system to support emergency responders nationwide at over 30 Navy shore installations.

Introduction

Existing Navy emergency management functions combine different manual and automated administrative systems, applications, processes such as pencil and paper logbooks, paper map books, and pre-plan information documents. Current paper-based records management systems do not provide intra- and inter-departmental system interoperability, and limit data visibility to higher-level stakeholders. This situation can only support a certain level of responsiveness to administrative functions, especially in response to data calls and budgeting. The present deployment of Computer Aided Dispatch (CAD) systems limits the Navy shore installations and the region's public safety and emergency management personnel's collaborative response between dispatch centers and First Responders.

The Navy will enhance current CAD systems, administrative functions, and operating practices by deploying the Navy Emergency Response Management System (NERMS) to facilitate and establish standard operational and administrative emergency response functions per Navy Emergency Management Policy Doctrine (OPNAVINST 3440.17) regulations and policies in support of the Commander Naval Installations Command

(CNIC) public safety, force protection, and consequence management missions. NERMS scope is to deliver an Enterprise CAD solution for Commander Navy Regions Southeast (CNRSE) and Commander Navy Region Southwest (CNRSW) shore installations.

As the technical execution agent, the Space and Naval Warfare (SPAWAR) Systems Center, will implement NERMS to provide an integrated, scaleable, and expandable Navy Enterprise system supporting First Responders at Navy shore installations. First Responders include Navy police, fire, and Emergency Medical Services (EMS).

NERMS supports regional consolidation of dispatch centers now at individual Navy installations. Initial implementation will include two centralized Regional Dispatch Centers (RDCs) - one at Navy Region Southeast (NRSE - NAS Jacksonville, FL) and one at Navy Region Southwest (NRSW - San Diego, CA).

Background

Homeland Security Presidential Directive (HSPD)-5, *Management of Domestic Incidents*, requires the development of the National Incident Management System (NIMS) to coordinate the preparedness and incident management efforts of Federal, State, Tribal, and Local governments. Based upon HSPD-5 and the common preparedness requirements set forth in NIMS, the Federal Government created the National Response Plan (NRP) to integrate Federal Government prevention/mitigation, preparedness, response, recovery plans into one all-discipline, all-hazard approach to domestic incident management. The NRP serves as the core plan for Federal support to State, Tribal, and Local governments and establishes the principal construct for management of Incidents of National Significance.

Federal departments and agencies are required to modify existing incident management, contingency, and emergency plans under their purview to appropriately align these plans with the direction provided in the NIMS and the NRP. State, Tribal, and Local authorities were requested to modify similar plans under their purview to the standards set forth in to facilitate national level interoperability and coordination.

The Deputy Secretary of Defense Memorandum dated 26 January 2004 mandated cooperation and use of NIMS and the NRP by all Services. In addition, the Deputy Secretary of Defense Memorandum to the Services dated 5 September 2002 established the requirement for all Services to protect assigned personnel against chemical, biological, radiological, nuclear, and explosive (CBRNE) terrorism incidents impacting military installations.

OPNAV Instruction 3440.17, Navy Installation Emergency Management Program, dated 22 July 05 establishes the responsibility and authority of Commander, Navy Installations (CNI) to develop, implement, and sustain a comprehensive emergency management (EM) Program at regions and installations capable of effective all-hazards preparedness, mitigation, response, and recovery, in order to save lives, protect property, and sustain mission readiness.

In response to OPNAVINST 3440.17, CNI Instruction 3440.17, Emergency Management Program Manual, dated 23 January 2006 requires that Commander, Navy Installations (CNI) provide policy, guidance, operational structure, and assignment of responsibilities

for developing a comprehensive, all-hazards EM Program at Navy shore regions and installations. Pursuant to CNIINST 3440.17, all Regional Commanders are encouraged to establish, maintain, and operate an Emergency Call-taking and Dispatch Center (Dispatch Center) at the Regional or multi-Regional level per OPNAVINST 3440.17.

Dispatch Centers provide emergency call-taking, alarm monitoring, sensor monitoring, video monitoring/control, communications support, channel/frequency assignments/allocation, emergency notification, mass public warning, emergency personnel dispatching, responder reach-back capability during emergencies, and notification of an emergency to receiving medical treatment facilities (MTFs)/Hospitals.

A Dispatch Center is a 24/7 operation that exists to receive notification of an emergency and then direct the correct responders (e.g., fire & emergency services, emergency medical services (EMS), Naval Security Forces (NSF), explosives ordnance disposal (EOD), emergency response teams (ERTs), Public Works, etc.), to the right place, with the right capability, as quickly as possible. Dispatch Centers are tactical level operations that direct the day-to-day movement of responders to all types of emergency and non-emergency incidents.

System Overview

NERMS will geographically and functionally consolidate emergency call-taking and dispatch functions at the RDCs for fire & emergency services, NSF, EMS, EOD, and EM functional areas. NERMS will also consolidate security alarm monitoring, sensor monitoring, and channel/frequency allocation during events. Local base operations will be maintained with a redundant, but simplified, dispatching capability within every Region and onboard designated Installations.

NERMS will employ three main components:

- Records Management System (RMS)
- Computer Aided Dispatch (CAD)
- Mobile Data Computers (MDC)

The RDCs will receive all emergency calls, monitor all alarms, monitor all sensors, provide video monitoring, and dispatch all responders, as required by the situation. The RDCs will be complimentary, although each will be designated as a primary Public Safety Answering Point (PSAP) for particular regions, and will support fail-over and transfer of responsibility from the alternate RDC. The RDCs will significantly improve the standard of dispatch and raise it to the level of municipal operations, to centralize functionality in order to allow investment in upgrades at an economical rate, and to reduce the total number of Navy dispatchers.

The RDCs will use Geographic Information System (GIS)-based CAD to efficiently and effectively identify the location of alarms or E911 caller identified structures and determine the correct first responder. Automatic Vehicle Locators will be used to manage field assets and improve coordination while providing dispatchers and operations centers with a Common Operating Picture (COP) of all response assets. MDCs in vehicles will provide responders with the COP and additional CAD information and allow field completion of applicable reports. The Enterprise Land Mobile Radio System will provide the digital, trunked, and mobile backbone for communications of both the alarm system and the responders. An RMS will provide automatic logging of incidents and responses.

System Components

NERMS is based on Commercial Off-the-Shelf (COTS) equipment and software. All technologies are widely commercially available: servers, Microsoft® Operating System (OS), Oracle Database Management System (DBMS), Environmental Systems Research Institute (ESRI) ArcGIS family of products such as ArcGIS, ArcSDE, Network Analyst, and Tracking Analyst.

NERMS has six integrated system components:

1. Computer Aided Dispatch: provides dispatchers with visual display, automated incident tracking, and increased dispatching capacity through extended geographic coverage and spatial awareness.
2. Mobile Data Computers: CAD capacity for field personnel inside of emergency response vehicles, improving response unit communication with dispatch centers, and enabling First Responder Field Incident Reporting capabilities, for creation of police reports for subsequent input/upload to the NERMS Records Management System (RMS).
3. Geographic Information System: provides real-time map displays for CAD and MDC users, management of Automatic Vehicle Location (AVL) position data, and GIS services such as address verification and Automated Vehicle Routing and Recommendation (AVRR).
4. Management Information System: allows for statistical reporting on dispatch activities.
5. Police RMS: an Enterprise web portal centrally hosted for multi-jurisdictional access by Navy police personnel and their command hierarchies.
6. Fire RMS: an Enterprise web portal centrally hosted for multi-jurisdictional access by all Navy fire and EMS personnel and their command hierarchies.
7. Alarm Monitoring Automation System: provides alarm reporting and routing, service management & accounting for existing emergency response systems, including Intrusion Detection System and Access Control System alarms, fire alarms, and emergency call taking systems, with NERMS to establish consolidated operations.

The following diagram (Figure 1) shows interactions and data flows among NERMS components related to GIS.

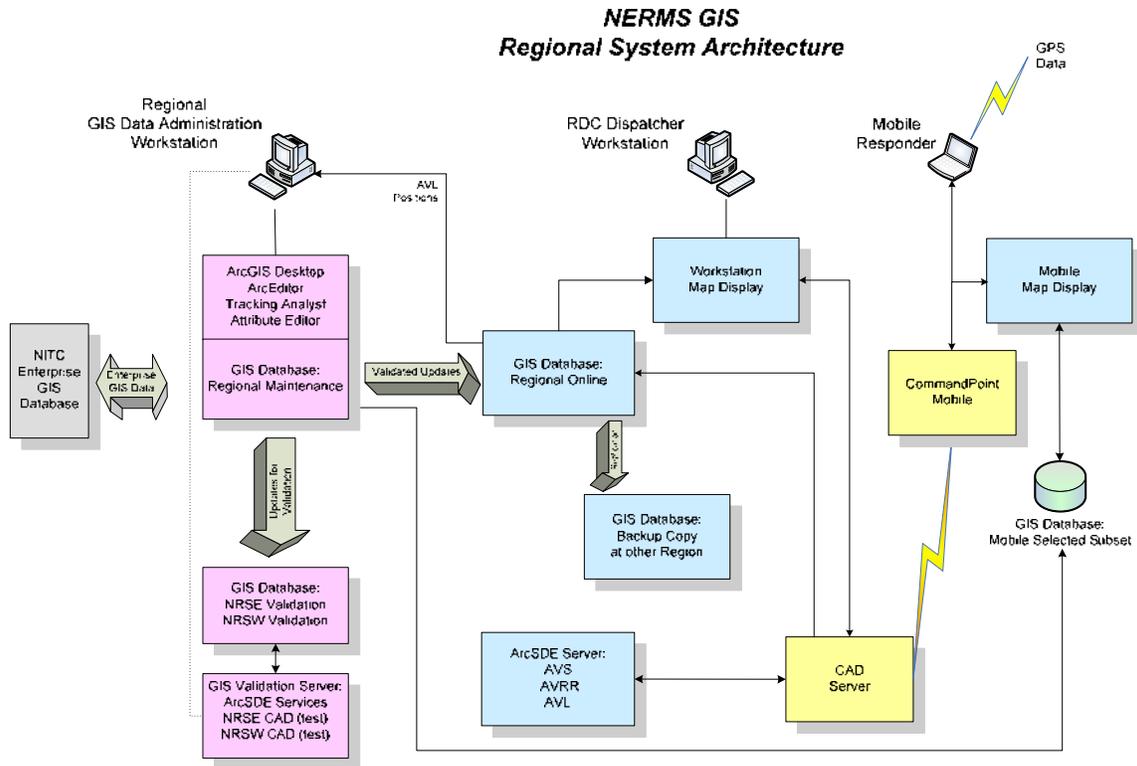


Figure 1. NERMS GIS Regional System Architecture

GIS Services for Dispatch Center Users

GIS real-time services are provided to dispatch center users by an ArcSDE server at the RDC, using the GIS regional online database: the regional ArcSDE database, related Oracle data tables containing data required by CAD/MDC, and map-to-document associations. The following services are provided:

- **AVS:** Address Verification Service (AVS) is utilized by CAD during event entry, and any time CAD requires verification of a location entered by the user. CAD sends address verification requests to AVS, specifying the location entered by the user: street address, hundreds block, intersection, building name/facility number, or common place name. AVS attempts to verify the location, which can have partial street names, missing street types and directions, building names that exist at more than one installation, and so on. If a single matching location is identified, AVS returns that location to CAD. If several locations potentially match, AVS returns the list to CAD, including the installation identifier for each entry, for review/selection by the user.
- **AVL:** MDCs forward Global Positioning System (GPS) reports from MDC workstation receivers to CAD, via normal Enterprise Land Mobile Radio (ELMR) data radio communications. Reporting is configured using distance traveled and/or elapsed time; for example, an MDC might be configured to report its position every ½ mile, and/or every 5 minutes. CAD forwards just the GPS information to the AVL service, which normalizes the location report and stores it in the regional ArcSDE database, for use by the real-time map displays and AVRR.

- **AVRR:** AVRR is utilized by CAD to prepare unit recommendation displays. When a dispatcher requests a unit suggestion, CAD prepares and displays a fixed (run or station order) recommendation, and also sends a list of candidate units to AVRR, along with the event location.

For each candidate in the list, AVRR determines a route between the unit's last reported GPS location and the event location, taking road closures or road vehicle restrictions into account, provides a quickest route solution, and calculates the driving time. AVRR returns the candidate list to CAD (minus any candidate for which a route could not be determined), showing the calculated drive time, and CAD adds the AVRR list to the unit suggestion display.

- **Real-Time Map Displays:** Real-time map displays are available at all CAD workstations. The map displays the following:
 - GIS layers selected by the user; for example, street centerlines, installation boundaries, and building/facility footprints.
 - Current unit locations reported by AVL
 - Event locations, for open events reported by CAD
 - Road closure information
 - "Hot spot" displays. When the user positions the mouse within a hot spot, the document (e.g., floor plans, room layouts, instructions, Standard Operating Procedures [SOPs], checklists) linked to the hot spot displays automatically.
- **Online GIS Updates:** Dispatch center users have a limited ability to apply immediate updates to the GIS database, as follows:
 - Additions/changes to building/facility names and other common place identifiers
 - Additions/changes to street aliases and street types
 - Road closures

Road closure updates made by dispatch center users are transmitted automatically to MDCs, and applied by the MDC software to the MDC user GIS database for their specific response area. Other updates made by dispatch center users are not transmitted to the MDCs.

- **AVL Playback:** The GIS regional data manager can connect to the regional online database, and play back historical AVL data for a selected date/time range. AVL also offers an AVL "playback" service using the GIS data administration workstation where AVL position reports from MDCs can be retrieved for a specified date/time range, and played back to review the vehicle's route from time of dispatch to arrival at the incident location.

GIS Services for MDC Users

GIS real-time services are provided to MDC users by GIS applications running in the MDC, using the GIS dataset loaded into the MDC; and using road closure information and dispatch notifications received from CAD.

MDCs do not access the GIS data via the NERMS GIS server located at the RDC. Instead, each MDC associated with the installation stores one or more installation-specific GIS datasets, selected in accordance with the installation(s) where the unit responds. The installation-specific GIS dataset contains complete data for the

installation: the ArcSDE database covering the OTHI, related data tables containing data required by CAD/MDC, and map-to-document associations.

When a MDC first starts up, it requests and obtains current road closure information from CAD. Subsequently, CAD reports road closure updates (new entries, closure updates, reopenings) entered by dispatch center users. This information is saved by the MDC, applied to possible route solutions, and shown on the map.

GIS services for MDC users center on the real-time map, which shows the following:

- GIS layers selected by the user; for example, street centerlines, and building/facility footprints.
- The unit's last known GPS position reported to AVL and also provided to the MDC's GIS services.
- Event location for the unit's assigned event, obtained from the last dispatch message received from CAD.
- A recommended route from the unit's current location to the event location or to any selected location. Routes are calculated within the MDC by its GIS services.
- Road closure information.
- "Hot spot" displays. When the user positions the mouse within a hot spot, a pick list of available documents (e.g., floor plans, room layouts, instructions, SOPs, checklists) is displayed. The MDC user can then click on the desired document, and it is displayed automatically.

GIS Data Components

Each regional NERMS GIS database includes the following:

- ArcSDE database, containing the map layers required for CAD/MDC operation, such as the following:
 - Street centerlines with required minimum street attributes (e.g., speed limit, vehicle restrictions, functional classification, and street segment connectivity, direction indicators, alias/vanity names)
 - Building/facility centroids (lat/long)
 - Mooring/pier centroids (lat/long)
 - Recreation area centroids (lat/long)
 - Police response areas (CAD "atoms")
 - Fire/EMS response areas (CAD "atoms")
 - Response/installation station order identification

The ArcSDE database may also include additional layers, not required for CAD/MDC operation, but providing critical information to CAD and MDC users.

For example:

- Installation boundaries
- Building/facility footprints
- Recreation area footprints
- Airfield surface areas
- Fire hydrant locations
- Hospital locations
- Fire/police/EMS station locations

- Water bodies
- Other layers, as desired
- Oracle tables, containing additional data required by CAD/MDCs, that is related to the map data above:
 - Street types and direction indicators
 - Street name aliases or vanity names
 - Building numbers, names, and other common place names
 - Road/gate closure information for special events or military operations
 - Road contraflow information for traffic management or emergency evacuation
- ArcIMS website, containing the map layers required for Police RMS crime mapping queries, such as the following:
 - NAVFAC street centerlines
 - Building footprints
 - Recreation areas
 - Installation boundaries
 - Airfield areas
 - Water bodies
- Documents, providing additional information on specific locations which are embedded inside the GIS building data. For example:
 - Action plans and preplan information
 - SOPs, checklists, and instructions
 - Photos, diagrams, floor plans, evacuation routes, and other graphics
 - Any other document form displayable on a CAD or MDC workstation, to provide information about a location.

For each document, the NERMS GIS regional data manager identifies the map location that the document applies to, along with a “hot spot” radius. The “hot spots” and document hyperlinks are saved in the ArcSDE database.

Summary

Implementation of NERMS provides an integrated, scaleable, and expandable Navy Enterprise system to support First Responders at shore installations. NERMS provides positive operational and organizational impact by improving emergency response management through the utilization of automated and reliable products and procedures. Sustained GIS operations will be enhanced through consistent monitoring and maintenance of GIS-specific system datasets and components.

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dispatchers, security personnel, and emergency managers that defined the CAD components and data requirements for system deployment.

References

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Author Contact Information

Mark Jansen, C/764MJ
SPAWAR Systems Center Charleston
P.O. Box 190022
N. Charleston, SC 29419-9022
Phone: (843) 218-5956
Fax: (843) 218-4779
E-mail: mark.jansen@navy.mil