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# Qatar Enters a New Era of Emergency Response and Proactive Security

A Unified Geospatial Infrastructure Boosts the Country's Response Capabilities with Actionable Information

Whenever an urgent situation poses a risk to life or property, an immediate, organized, and collaborative response from those stakeholders responsible for emergency operations is required. The success of emergency response depends on real-time dissemination of incident information and continuous status updates.

The State of Qatar, a country on the Arabian Gulf, has created the National Command Center (NCC) to manage a coordinated response to both local and national emergencies. The NCC works with different national agencies to evaluate emergency situations and implement the appropriate response. These agencies include the country's Emergency Service Center; the Ministry of Interior; Internal Security Forces; and the Hamad Medical Corporation, operator of Qatar's national ambulance services.

The Challenge

Because the emergency response workflows of the NCC have procedures in common with related agencies, strategic and operational decision making is dependent on information retrieval and communication between them. Therefore, the NCC needed an extensible, unified system that centralized data located in those agencies to streamline workflows, connect all responsible agencies to facilitate knowledge sharing, and enhance performance. In addition, because of the extensive use of GIS in the country, the new system had to provide an inclusive, GIS-based common operational picture capable of geospatial analysis from a myriad of data sources.
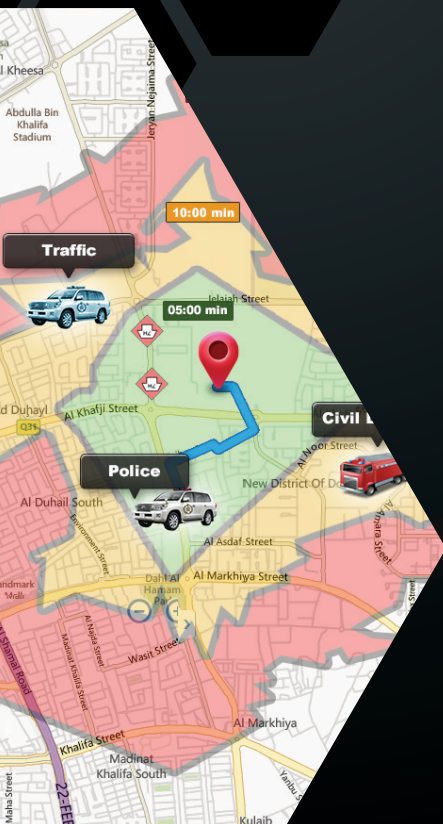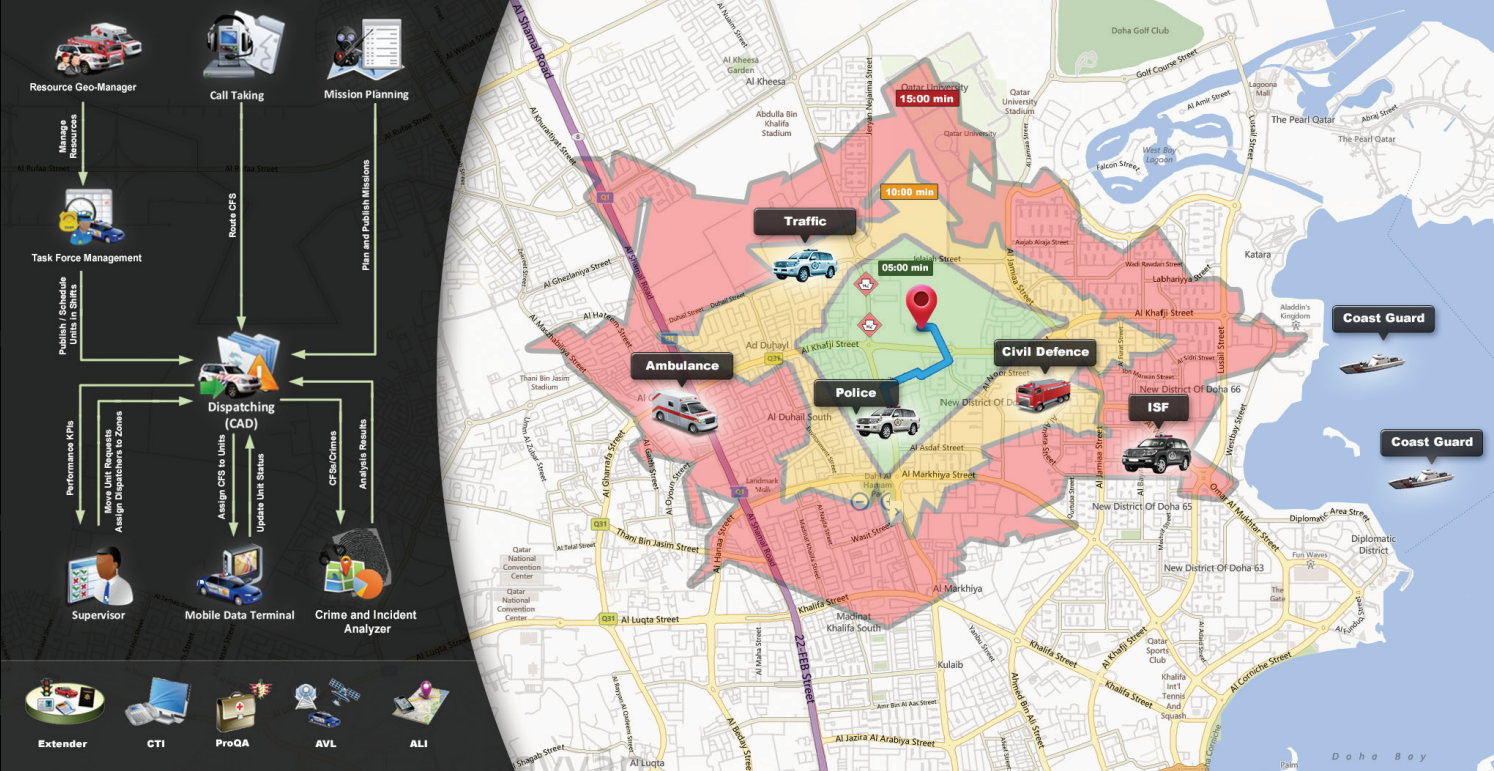
Integration between NJM Dispatching application, other NJM applications, and external applications empowers dispatch officers with the actionable information needed for efficient emergency response. Based on service area analysis, NJM Dispatching application recommends units in the proximity of the incident and draws the route to the incident on the map.

The Solution

Qatar-based Mannai Corporation and Esri Northeast Africa in Egypt, in consultation with Esri's national security team, developed a solution that fulfilled the extensive requirements of the NCC. NJM (the Arabic acronym for Unified Geospatial Infrastructure) is a web-based, bilingual (Arabic/English) geographic security system built on the ArcGIS® platform. It includes a number of interactive applications and a unified geodatabase that hosts all geographic and tabular data in a single repository. NJM integrates all NCC functions into a single system and seamlessly interfaces with other systems when needed.

NJM supports the NCC's emergency response workflow, starting with incident reporting, when NJM Call Taking application receives a call for service. Through computer telephony integration, the caller's telephone number is identified with an automatic number identification system. The location and related information are then retrieved and displayed on a map through integration with the automatic location identification services provided by mobile operators. Based on that location, the application provides the emergency call operator with locational information, including the records of nearby incidents, hazardous materials, and critical infrastructures. Predefined instructions and inquiries (or ProQA directions for medical cases), per incident classification, guide the operator through the information collecting procedure. For certain situations, the NCC requested that senior officials be notified about specific incidents that require special attention. This need is addressed through the integration of the application with the short message service (SMS). An SMS is automatically sent by NJM system to notify predetermined senior officials when a special incident is recorded.

NJM Dispatching application provides incident details and its location, as well as the location of responding vehicles and their availability status. The application then uses the ArcGIS Network Analyst extension with an integrated automatic vehicle location (AVL) service to determine the nearest available units and match the response needs with predefined unit capabilities and their current location. Accordingly, it recommends the best units that could be assigned to the incident as first responders. Furthermore, with the updates of incident details, recommendations can be repeated for second responder units and any additional units needed.

NJM Crime and Incident Analyzer provides a number of temporal and spatial analysis capabilities and reports that can be shared with different stakeholders.

NJM Mobile Data Terminal application automatically receives the dispatched incident and pushes it to the in-field officer, along with all relevant information. Using the system's route analysis capabilities, route mapping and driving directions facilitate the unit's response to the incident. Building diagrams are also provided to speed up the responders' access to the incident location. Nearby priority areas and hazards are highlighted for dispatch and unit officers so that they can avoid further risks and limit incident impact. An open channel of communication between NJM Dispatching and NJM Mobile Data Terminal enables the continuous exchange of the latest incident and unit status updates. The dispatch officer can continuously monitor the movement of all in-field units on an interactive map through the integration of NJM Dispatching application with the AVL service. Also, any updates to incident details or status are shared with respective stakeholders through audio and visual alerts as well as through a live news feed.

Solid integration with government services through an enterprise service bus enables operators, dispatch officers, and unit officers to retrieve information from civil records, traffic authority, visa systems, and mobile operator systems.

The follow-up on overall emergency response performance is addressed through NJM Supervisor application, which provides a complete, generic map-based image of work progress, key performance indicators, incident frequency, residential and commercial zone classifications, and daily staff performance reports. The system also supports proactive emergency management activities through NJM Mission Planning application, which uses ArcGIS Spatial Analyst to enable geospatial modeling and visualization of 2D pre-response plans for priority areas, supported with 3D area visibility analysis and line-of-sight analysis. The plans define the required resources from different agencies to properly respond to potential risks. These plans are shared with dispatch and field officers for implementation.

Another powerful capability of the system is NJM Crime and Incident Analyzer, which analyzes existing data using ArcGIS Network Analyst and Spatial Analyst extensions to provide a comprehensive view of incident and crime density, geographic distribution, and temporal and spatial recurrence patterns to help emergency response authorities address the root causes behind incidents and crimes. Analytical results generated by NJM Crime and Incident Analyzer can be shared with related agencies through generated reports.

The management of emergency resources and their daily operations is handled through two different applications. NJM Resource Geo-Manager enables resource managers to add and manage emergency response resources—personnel, animals, equipment, and vehicles—and design templates defining the required resources for the different units. NJM Task Force Management manages duty rosters, shift

patterns, geographic zones, and resource assignment. It also monitors shift performance and provides different reports on work groups, shift schedules, and shift duties.

In addition, the NCC needed to manage the business rules governing the entire emergency response workflow, future changes in the organizational structure of emergency response agencies and departments, roles and privileges, the availability of GIS data, notification rules, dispatching policy, and the relations between different applications. All these needs, along with many other administration services, are addressed through NJM Enterprise Manager application.

Finally, in order to guarantee continuous availability of the system, the entire NJM environment is replicated in a disaster recovery (DR) center remotely connected to the main NJM system at the NCC data center through a fiber-optics infrastructure. All tiers of the DR environment are automatically synchronized with the main data center environment to guarantee minimum recovery efforts and downtime in the worst-case scenario of physical damage to the data center and the main system.

The Result

Emergency response time per incident has been significantly reduced, and the process itself is more efficient. All stakeholders now benefit from the GIS-based common operational picture, which allows an immediate connection between incidents, units, critical infrastructures, priority assets, and other critical information. In addition, the continuous accumulation of data, along with the rich analytical capabilities of the system, supports future response and the reduction of potential risk. The situational awareness provided by pushing the right information to the right place at the right time enhances the overall capabilities of Qatar's emergency response efforts. The flexibility of NJM system paves the way to accommodating new security needs and a safer future for Qatar's residents and visitors.

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