STRATEGIC PLANNER INTEGRATING REGIONAL INFRASTRUCTURE TECHNOLOGY (SPIRIT)[•]

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Problem Space: Homeland Security efforts have traditionally focused on procurement of first responders' equipment and command and control systems. This has continued the reactive, response oriented methods show to be ineffective in the large-scale disasters of the recent past. To date, infrastructure analysis, predictive modeling and planning for disaster impacts are largely academic studies with little operational relevancy. Hindsight has shown that broad predictions and warnings of damage from natural and man-made disasters have not prepared local planners and emergency managers to protect their local populations. An operational process is needed whereby local planners, first responders, and emergency managers can understand and predict the impact of regional infrastructure failures.

Hypothesis: An in-depth assessment of regional infrastructures, resulting in prediction of initial and subsequent, cascading effects of infrastructure failures, will enable better decisions to be made by key officials during a crisis. For example, a regional emergency manager is faced with an explosion at a water treatment plant. The immediate reaction is to get the wounded victims to the nearest hospital trauma center. However, the missing information for the emergency manager is which hospitals are impacted by the loss of the water treatment plant. Taking victims to a hospital impacted by the water treatment plant sets up a new crisis when the hospital must be evacuated due to lack of water.

Understanding these interdependencies allows the manager to make informed decisions, possibly stopping the cascade of failure by proactive actions, such as deploying water tankers to the hospital or using a trauma center in a non-impacted area. Prediction of the extended impacts of water system failure can then be proactively included into policies and doctrines.

Approach: Strategic Planner Integrating Regional Infrastructure Technology (SPIRIT) uses a two-part solution to this issue. First, each infrastructure segment is analyzed to identify the nodes critical to its mission. Segment assets are given a "mission critical Hi/Med/Low" status. Secondly, these segments are plotted geospatially to show their interdependencies *as a whole system*. SPIRIT then can predict infrastructure failures based on relational models. This analysis identifies and critically ranks the main infrastructure system nodes. "Mission Compromised" denotes key facilities that are unable to operate. "Mission Devalued" indicates key facilities functioning on backup systems. "Mission Uncompromised" denotes facilities not yet directly impacted. Criticality, and thus priority, is shown as a function of time to reflect the eventual failure or depletion of backup systems, and so emphasizes proactivity. The complex grading process is simplified into a color-coding system that allows a decision maker to look at a critical building on back up power and recognize the likely trends of the situation.

SPIRIT consolidates disparate data, implements NIMS compliant policies, overlays existing infrastructure data onto a geospatial display, and provides a user-friendly, "Video game," interface to model and analyze potential impacts of natural disaster or terrorist attack for emergency planning and real time response.

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