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SD Design Document

**Overview**

The purpose of this application is to provide staff members in the GW Office of Safety and Security and the GW Police Department with an interface to provide visual and tabular analysis of crime-related data contained within the University's existing criminal information systems. Existing crime data GIS and visualization tools are targeted toward larger agencies on the scale of major cities, leaving smaller agencies like GWPD without a viable solution. As a result of this, we are tailoring the algorithms used in the application to the datasets that would be associated with smaller agencies. The application will assist both executive leadership and individual staff members in short-term and long-term decision-making, leveraging the department's existing dataset.

**Users**

**Executive Leadership:** The "executive leadership" user is responsible for long-term decision-making affecting the department as a whole. This user is responsible for aggregating crime statistics for outside actors, planning for staff and other resource allocation over long periods of time, and making other high-level decisions.

**Mid-tier management:** This user is responsible for supervising a group of law enforcement officers or law enforcement activities covering a specific region. This user is primarily interested in statistics and reporting concerning a given subset of the agency's overall area of jurisdiction.

**Individual Officer:** This user is an individual contributor. Under the direction of the mid-tier manager, this user is assigned a specific area to patrol, or a specific crime or type of offense to

target. This user is therefore interested primarily in their specific area of responsibility. They may also be interested in what their colleagues are focusing on.

**Database Administrator**: This user administers the connection between the application and the existing criminal data sources. This user has access to manage data synchronization processes, including scheduling data imports and running imports into the application off the schedule.

**Use Cases**

Executive Leadership

- The University's senior leadership (President, Provost, Board of Trustees, etc) requires information pertaining to how the number and severity of crimes on campus has changed compared to the previous school year. The law enforcement executive user can view data at the departmental level (or the University level, in the case of our partnership with GW). The user can export graphical and tabular data from the system.
- The executive leadership user wants to determine how many additional staff he should consider hiring in the coming year. He can use the system to view how crime trends have evolved year-over-year, and compare this information to how staff levels changed over the same period.

Mid-Tier Management

- The mid-tier management user has noticed an uptick in bike thefts on campus. This user wants to view information relative to where these thefts have been happening over time. The user can view a heatmap in the application showing the most common locations of bike thefts. The manager can then direct individual officers to specific locations.

- The mid-tier manager is assigning subordinates to patrol routes for the coming week. He views the heatmap to determine where crime has been occurring on campus over time. He may then assign officers to locations where crime is most likely to occur or where crime has occurred frequently in the past.

Individual Officer

- The individual officer has been assigned a patrol route by supervisory staff. The user wants to determine what he should be focusing on during his patrol. He views the map of his patrol assignment and notices that one of the residence halls on his route has had a higher-than-usual number of break-ins over the past week. The officer then might spend extra time patrolling this residence hall.

Database Administrator

- A managerial user has been delegated the role of "Database Administrator." One of the Mid-Tier Manager users notices that data from the previous week is not being populated on the mapping interface or in tabular data exports. The database administrator views the data transfer status console and notices that the import from one of the criminal information sources has not run in several days. The database administrator engages information technology staff, and it is determined that firewall rules changed. The correct administrators are then engaged to modify firewall rules, allowing data imports to resume.

**Functional and Non-Functional Requirements for Major Components**

**Mapping Interface**: The mapping interface will be the primary visualization tool for crime data and analysis outputs. The map itself should be fully interactive and manipulable, including functionality such as pan-tilt-zoom. The GIS information will be displayed in the map, with each distinct dataset present as its own layer, allowing the user to customize the output to best meet their needs. We will implement the mapping interface using OpenStreetMap as the base map source, and Leaflet, an open-source library, as the rendering engine. This combination of technology is available at little to no cost and is highly scalable.

**Text-Based Reporting:** We will implement the text-based reporting interface using standard HTML tables, and allow for export of this information into other formats, such as PDF, comma-separated values, or XML. These reports will be generated by pre-defined queries written by a developer. In the future, this may be enhanced by allowing the end-user to define ad-hoc queries on which to report; this will not be present in the initial release.

**Database Administration Interface**: We will include a (properly-secured) interface by which the user can view and maintain the status of the connections to the third-party information systems. The interface will present statistics such as the status of the connection to the database, the last time data was synchronized from a given database, and a way of directing the backend to begin an import of a data source outside of the given schedule.

Data Flow Diagram