Cross-Jurisdictional Activity Networks to Support Criminal Investigations

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Border and transportation security is a critical part of the Department of Homeland Security's (DHS) national strategy. DHS strategy calls for the creation of "smart borders" where information from local, state, federal, and international sources can be combined to support risk-based management tools for border-management agencies. Sharing cross-jurisdictional law enforcement data is important because criminals take advantage of the fact that information sharing between law enforcement jurisdictions is very limited. Challenges to information integration in this important domain include policy and privacy concerns, data security requirements, semantic or schema-level matching of legacy system data, and identity matching. The BorderSafe project leverages the skills and experiences of a diverse group of researchers, law enforcement officials, and government agencies to address data sharing needs in the Southwest United States. Our demo presents a framework for combining law enforcement data across jurisdictions to support criminal investigation and describes how that framework was used in combining three large, overlapping datasets to produce an integrated system for visualizing criminal activity networks.

Figures 1 and 2 depict the integration framework used to combine information from three law enforcement datasets containing millions of people, vehicles and associations. The framework allows for inclusion of supplementary sources that are important to investigations but unavailable in the records management systems (RMS) maintained by law enforcement agencies. This information integration will be useful in tracing Criminal Activity Networks and preparing cross-jurisdictional data for visualization and Social Network Analysis.

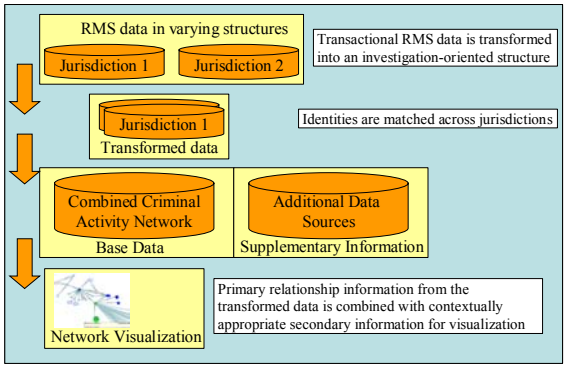

Figure 1. A framework for integration of law enforcement records for criminal network analysis

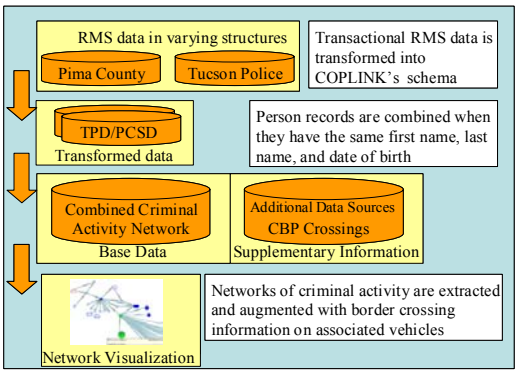

Figure 2. Integration of TPD, PCSD, and CBP data

We will demonstrate the interactive, cross-jurisdictional visualization tool's user interface shown in Figure 3.

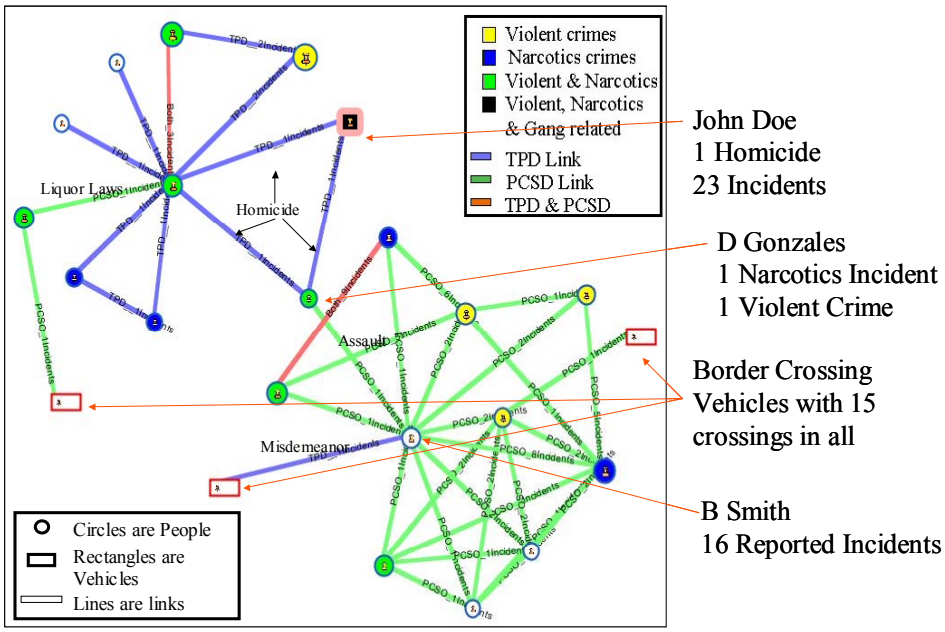

Figure 3. Visualization of a small Criminal Activity Network

A variety of visual cues can be used to enhance the utility of a visualization. In this preliminary implementation we differentiated entity types by shape, key attributes by node color, degree of activity as node size, connection source by link color, and some details in link text or roll-over tool tips. A visualization could also employ interactive filters, expansion functionality, and resource links. Visualization features and functions will be tested and adapted in future work. Figure 3 shows a network connecting a known narcotics dealer to a border crossing plate.

- Border crossing plates are outlined in red.
- Associations found in the TPD data are blue, PCSD links are green, and when a link is found in both sets the link is colored red.
- Increased node size indicates increased criminal activity. All incidents involving a person are counted. Violent, narcotics-related, and gang-related activities are counted twice. The activity scores are normalized to identify the relative activity levels of the individuals in the network. Future work will explore various methods of determining appropriate node size.
- Types of criminal activity are identified by color as shown in the figure's legend.