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How to Display Suspicious Activity Reports in Google Earth

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The graphical display of geographic information can provide law enforcement officers and intelligence analysts with a powerful tool for understanding, interrupting, and prosecuting criminal activity. For instance, displaying a related set of **suspicious activity reports** (SARs) on a map can illuminate relationships between activities and the environment in which they occur, leading to valuable insights and new intelligence.

Until recently, even simple geospatial analysis of law enforcement information required deployment, configuration, and programming of proprietary software. It also has typically involved extracting the information from databases unique to the police records systems in which it is stored. However, two recent developments have made basic geospatial analysis of suspicious activity reports accessible to anyone, at very low cost.

First, the availability of **Google Earth** (<http://earth.google.com>) and its open interface, the **Keyhole Markup Language** (KML), provide a feature-rich and extensible environment for displaying geospatial information. Google Earth is available at no cost from Google's Web site, and KML is an open XML specification that allows Google Earth users to place features in Google Earth without requiring specialized tools.

Second, the Program Manager for the **Information Sharing Environment** (ISE), in partnership with the U.S. Department of Justice, Bureau of Justice Assistance, and national associations such as SEARCH, The National Consortium for Justice Information and Statistics, the Institute for Intergovernmental Research (IIR) and the IJIS Institute, recently published a **National Information Exchange Model** (NIEM) **Information Exchange Package Document** (IEPD) standard for documenting SARs. This specification provides a standard XML representation of SARs shared among state and local law enforcement organizations, including fusion centers.

Because the SAR IEPD conforms to the NIEM XML standard, and because KML is also an XML vocabulary, it is straightforward to use the **Extensible Stylesheet Language Transformations** (XSLT) to define a mapping from one format to the other.

Background: Google Earth and KML

Google Earth is a freely available “virtual globe” application that supports the display of a wide range of user-customizable geographic information. After downloading the application (available for Windows, Macintosh, and Unix platforms) from <http://earth.google.com>, the user can choose to display a broad range of “layers” and data sets in the application, including:

- orthophotos (satellite imagery)
- roads
- government unit boundaries
- places of interest
- Panoramio (user-uploaded photographs on the ground at specific locations)
- topographic maps, and
- other information.

Google Earth also supports tagging of geographic information with date/time information, so the user can display information about when events took place at particular locations.

In addition to built-in layers and data sets, Google Earth users can define their own data sets using a standard XML-based format referenced earlier: Keyhole Markup Language. KML provides for an XML representation of map features, such as points, lines (paths), and polygons, and in this way is similar to many commercial **geographic information system** (GIS) technologies. The key differences between Google Earth/KML and these other technologies are that Google Earth and KML are freely available and based on an open, published, specification that require no special tools beyond open standard XML tools. KML is also fairly simple and easy to use, but in exchange is somewhat less powerful than commercial GIS offerings. Still, for basic display of incidents on a map, Google Earth provides an adequately robust solution for many needs.

More information about KML is available on Google’s Web site at <http://code.google.com/apis/kml/documentation/>. Note that KML is not a Google-specific specification, as it is now an official Open Geospatial Consortium Best Practice (http://portal.opengeospatial.org/files/?artifact_id=23689).

Background: SAR NIEM IEPD

In January 2008, the Program Manager for the Information Sharing Environment released the Suspicious Activity Report Information Exchange Package Documentation (SAR IEPD). This IEPD is based on NIEM 2.0. A partnership among the IJIS Institute, IIR, and SEARCH enabled efficient and accurate development of the SAR IEPD.

The SAR IEPD supports sharing of information about suspicious activities among federal, state, local, and tribal partners. Information exchange partners who choose to leverage the

SAR IEPD will be in a better position to identify potential criminal patterns and threats that could be otherwise unrecognizable by a single agency or jurisdiction.

At a high level, the SAR IEPD accommodates the following details about a specific suspicious activity:

- Narrative of the suspicious activity
- Identifying details about the person(s) of interest associated with the suspicious activity
- The time period when the suspicious activity took place
- The location (coordinates of postal address) of the suspicious activity
- Details about the suspected target of the suspicious activity
- Details about who observed the suspicious activity
- Details about who formally reported the suspicious activity

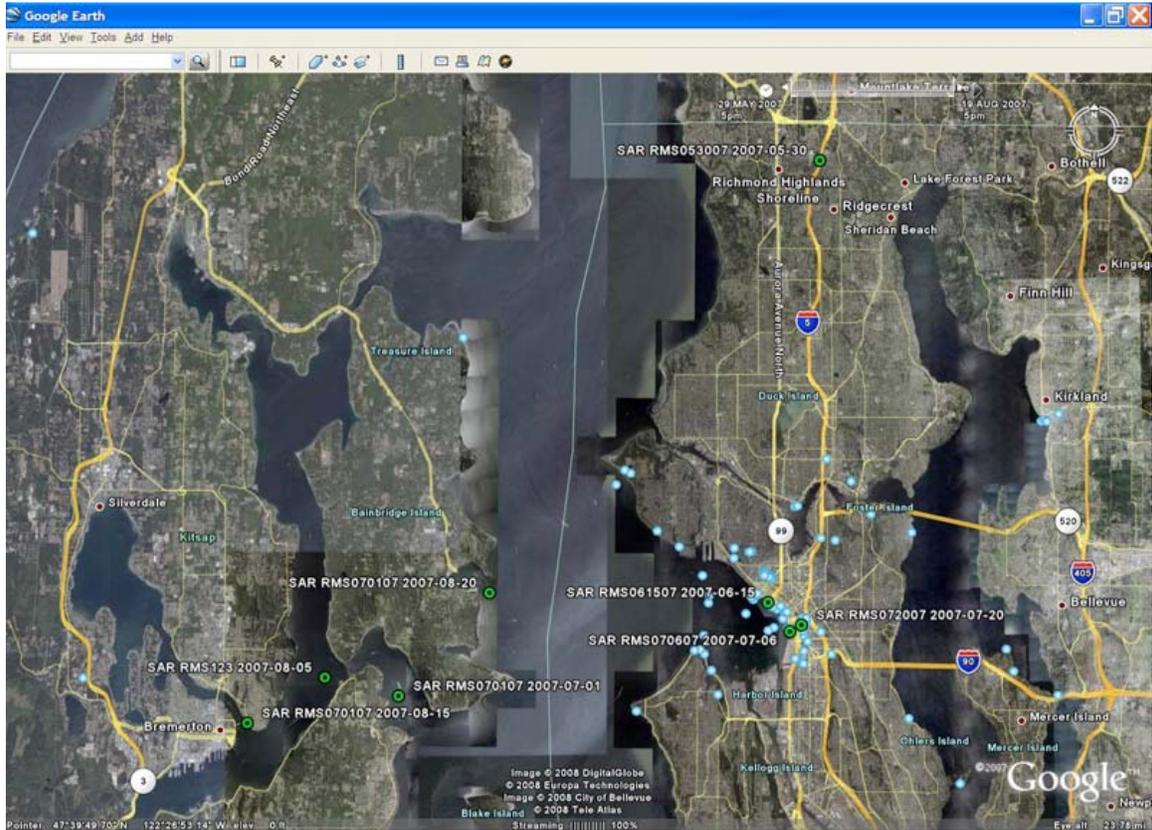
The Solution: Displaying SAR instances in Google Earth

Because KML documents and SAR IEPD documents are both XML, it is possible to use XSLT to define a mapping that tools can use to transform one into the other. SEARCH has developed just such an XSLT stylesheet (available at <http://www.search.org/programs/info/>). Passing one or more SAR instance documents plus the stylesheet through an XSLT engine like the freely available Apache Xalan (<http://xml.apache.org/xalan-j/>) produces a KML document that a user can open in Google Earth to display “pins” (called “placemarks” in Google Earth terminology) within the application.

The stylesheet performs the following transformations:

- It creates a KML `<placemark>` element for each suspicious activity reported
- It extracts information from the SAR itself to populate the KML `<description>` element
- It copies SAR location information (either in the form of geographic coordinates or a postal address) into either a KML `<Point>` element (for coordinates) or an `<address>` element (for addresses)

The resulting KML document, when loaded into Google Earth, produces the following result (this KML was generated from a set of sample SAR instances based on a fictitious scenario in the Seattle, Washington, area):



(Note: The KML displayed in this screenshot contains fictitious data, not real incident data.)

If you would like more information about using the SAR or other NIEM specifications with Google Earth, or if you need assistance with the application of SAR, NIEM, and XML to addressing your information sharing challenges, please contact SEARCH at <http://www.search.org/programs/info/>.

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