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Accelerating Law Enforcement Investigations with IBM COPLINK

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Executive overview

IBM® COPLINK® (“COPLINK”) software is designed to help law enforcement organizations solve crimes faster, keep officers safer, and disrupt crime and terrorism. COPLINK helps to consolidate data from many sources, aid collaboration, and generate tactical leads. It enables law enforcement professionals to generate photo lineups, save their search history, and organize investigations to generate reports more easily. COPLINK also provides comprehensive auditing of data access.

Day in and day out, public safety and law enforcement agencies work hard to ensure the safety of the public and their officers. These agencies are faced with some critical challenges.

They need to accomplish the following goals:

- Reduce cost by efficiently allocating and coordinating officer, staff, and technology resources.
- Improve collaboration and information sharing.
- Develop real-time situational awareness to help protect officers.
- Effectively report crime.
- Meet and track targets to effectively remove the criminal elements that are causing most of the problems.

The efficient use of data to provide information and intelligence is a key factor to meet these challenges. COPLINK is designed as a tactical, line-level solution that removes barriers to information access and sharing. It enables an agency to better focus on its mission of predicting, preventing, and defeating sophisticated criminal and terrorist threats.

IBM COPLINK software helps law enforcement officers accomplish the following objectives:

- Discover investigative case leads by organizing and providing tactical and command-level access to vast quantities of seemingly unrelated data:
  - Connect the dots between information sources to help identify suspects, associates, vehicles, weapons, locations, and other objects from existing law enforcement data.
  - Use facial recognition technology to compare images from crime scenes to existing images of known criminals.

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- Perform crime pattern analysis by visualizing and analyzing data on maps through time-sequence playback:
  - Discover where crime has occurred, how it is changing over time, and assess the likelihood of reoccurrence in the future.
  - Identify crime series and target a particular serial offender.
- Save time with access to disparate heterogeneous law enforcement data correlated in one system:
  - Offenders can no longer change locations, moving from city to city, to escape their past.
  - Shared, cross-jurisdictional information is accessible to officers that are connected into the COPLINK system.
- Ensure data protection and auditability with security-rich features, including password protection and data encryption.
- Put information where officers need it with data search capabilities at the desk, in the car, or on foot with a mobile device.
- Improve community and officer safety by providing intelligence and situational awareness of persons, locations, and vehicles.

A modular design allows COPLINK to integrate with many parts of an organization's preexisting information structure. Additionally, COPLINK can be deployed in phases according to an agency's most pressing needs.

COPLINK was originally designed with continuous feedback from line-level police officers and detectives and it is continually evaluated for new functionality.

This IBM Redguide™ publication describes the IBM COPLINK business value and its solution capabilities. This guide is intended as an introduction for law enforcement executives, and for those evaluating advanced law enforcement software solutions for their organizations.

Knowledge management technologies aid in the analysis of criminal information

A continuum of data, information, and knowledge exists in all law enforcement agencies.

Data is mostly structured, factual, and frequently numeric. Examples of data are numbers of citations, arrests, calls-for-service, Uniform Crime Reporting (UCR), National Incident Based Reporting System (NIBRS), and so on.

Information, alternatively, is factual but unstructured. Information is frequently in text format. A law enforcement media release is a good example of information.

Knowledge is inferential and abstract, and it is needed to support law enforcement operations. Knowledge is the institutional memory of an organization.

When data is combined with interpretation and meaning, information emerges. Information that is formatted and filtered along with summarized data becomes knowledge.

Therefore, *knowledge management* is a systemized approach to collecting, processing, and organizing law enforcement-specific knowledge to support the functions and decisions that are made by the agency members. COPLINK provides innovative and sophisticated knowledge management technologies to aid in the analysis of criminal information.

Most records management systems (RMS) used by law enforcement agencies today were designed to collect and store data, but it is difficult to derive from them the information and knowledge that is needed to solve crimes. Many agencies purchased these expensive systems to automate their number crunching processes detailing the activity of the organization.

Management reports and administrative processes were important considerations in selecting the correct RMS. Unfortunately, too little attention was given to such tasks as using the information in the RMS to solve crimes.

COPLINK emulates one of the proven crime-solving techniques that is used by investigators by helping associate the known elements of a crime with each other. Veteran detectives who have excellent memories can remember details about past suspects, incidents, vehicles, locations, and more. By associating past details with current events, these detectives can deduce likely leads even when only limited information is available from witnesses.

For example, a career burglar specializes in safe-cracking and drives a white Buick. A veteran detective is assigned to the follow-up investigation of a burglary where a safe was stolen and a witness reported a white Buick leaving the scene. The detective associates past transgressions with the current crime. Although not sufficient for a probable cause arrest, this information provides a starting point or an investigative lead for the detective.

This association technique can be extremely effective in solving criminal offenses. It requires a good memory and the ability to associate past events with the present situation. By collecting and consolidating information from disparate data sources, COPLINK provides a rich data repository for investigators. With COPLINK, investigators no longer need a perfect memory to be successful; they only need to know how to ask COPLINK the correct question.

Another technique used by many law enforcement agencies is called *crime analysis*. This process seeks to categorize a criminal offense by what occurred, where the offense occurred, when it occurred, and how it was done. The idea is to provide officers and the public with this information in order to assign or direct resources toward the problem.

COPLINK seeks to identify who is committing the offenses. It is usually a more effective and efficient use of scarce law enforcement resources to focus on an individual who is suspected of a crime (through covert surveillance, questioning, confidential informant information, and other techniques) than to assign resources based on a temporal-spatial-modus operandi analysis in hopes of catching an unknown person in the act.

COPLINK provides the tools that are needed by investigators to quickly solve crimes by identifying potential suspects. COPLINK overcomes the limitations of disparate information sources and the lack of analytical tools. It becomes the organization's institutional memory, much like a veteran detective.

Accelerating Law Enforcement Investigations

COPLINK can be the go-to information source for law enforcement, from commander to officer, and from the desk to the field. It helps empower police departments, sheriff's offices, and intelligence agencies by putting valuable information in the hands of first responders, analysts, and commanders when and where they need it.

Providing advanced analysis capability by using artificial intelligence technologies, COPLINK addresses many of the problem areas that are commonly found in law enforcement information systems:

- Difficulty in sharing information across jurisdictional boundaries (or in some cases within a single jurisdiction)
- Lack of sophisticated analytical tools to solve crimes quickly
- Lack of collaboration notices to bring together different investigations
- Lack of notification tools that alert users to new information
- Complexity of tools to access, visualize, compare, and analyze data
- Controlling and protecting platform and data access

Table 1 summarizes the main benefits and features of COPLINK.

Table 1 COPLINK benefits and features

Benefits	COPLINK features
Increase the speed of discovery and reduce the risk of missing connected information.	**Data integration and consolidation** ► COPLINK provides a single view of data from multiple sources with entity resolution and no duplication. ► Data can be integrated from disparate information systems without redundant manual entry of data.
Make better decisions based on current, fact-based information integrated from regional and national sharing initiatives.	**Data sharing** ► COPLINK database can include data from the surrounding regions. ► Individual agencies control what data is integrated. ► Perform rapid, simultaneous searches across multiple COPLINK sites and external data sources. ► Integrated data can be refreshed (updated) on a near-real time schedule that is determined by the contributing agencies. This ability provides more current, accurate facts to use.
Gain insights, better knowledge, and a clearer view from integrated data. Help officers make better strategic and resource deployment decisions. Decrease in time to solve crimes, which leads to quicker resolution, better resource allocation, and safer communities.	**Advanced analytics** ► COPLINK performs advanced analytics by using artificial intelligence-based searches. ► It provides answers to specific questions and exposes crime patterns. ► Officers can uncover robust case leads and discover crime patterns, parallel investigations, and series of crimes.
Increase officer safety by reducing or eliminating surprises when the officer responds to a call-for-service. Enable officers to get information about different types of crimes that occurred within a certain geographic area and the vicinity of those crimes. Help officers make better tactical decisions by understanding the situation that they are entering.	**Situational awareness** COPLINK gives officers situational awareness based on automatic geolocation.

Benefits	COPLINK features
Learn when somebody else is conducting an investigation on the same suspect. Collaborate with colleagues that are focused on the same person of interest. Share information and bring cases to successful conclusion faster.	**Automated notifications and collaboration** Send automated alerts when new information relative to a search is available or when others are conducting similar searches.
Search where and when needed, at the desk, in the car, or with a mobile device. Protect the officer at night when he is searching COPLINK data from a patrol car.	**Intuitive web-based user interface and mobile device support** ► COPLINK offers an intuitive, easy-to-use, web-based graphical user interface (GUI). ► It has optional day and night views. ► Officers can select a dark color scheme that can easily dim down for use in a patrol car at night. ► The mobile app includes most of the query features available in COPLINK. ► Wireless connectivity is included.
Uncover new case leads and discover hidden relationships, which might yield new insights. Understand criminal history information more easily.	**Graphical representation of search results** ► Display the links and associations that are found in the COPLINK database in a graphical display or network. ► Graphically view search results.
Speed up the identification of potential suspects. Identify associates who are found in photographs to accelerate case resolution.	**Facial recognition capabilities** COPLINK provides a facial recognition search tool.
Comply with federal, state, and local laws and policies that require data to remain in the originating jurisdiction. Minimize the potential abuse of the data by limiting the "fishing expeditions" that are possible in databases that consolidate criminal and non-criminal information.	**Data sharing controls** ► Temporary data consolidation lasts for the duration of an individual query. ► Transfer only the results of the user query. ► Individual agencies control what data is integrated.
Secure access to the COPLINK system. Secure interagency communications. Track user activity.	**Secure platform access** ► Only authorized registered users have access to the system. ► Administrators can set rules for password complexity, automatic password expiration, and session inactivity timeout functions. ► Data compression and encryption enable secure transmission over a network. ► Use Secure Sockets Layer (SSL), optionally with a virtual private network (VPN). ► Comprehensive auditing of data access.
Share, search, link, and analyze information across jurisdictional boundaries. Provide rich data import into third-party systems, leveraging existing investments in COPLINK.	**Data exchange capabilities** ► Export COPLINK files to Extensible Markup Language (XML) National Data Exchange (N-DEx) and Information Exchange Package Documentation (IEPD) formats. ► Inbound and Outbound Connectors for Logical Entity eXchange Specification Search & Retrieval (LEXS-SR) are included.

COPLINK boasts a reliable track record, including hundreds of successful case resolutions. COPLINK software currently supports one of the largest law enforcement information sharing initiatives in the world, with more than 1 billion shareable documents throughout the United States.

To learn more about how COPLINK brings real value to law enforcement agencies, see the following resources:

- Adams County Sheriff's Office, *Analytics used to uncover hidden correlations that help officers solve crimes quickly*:

  http://www.ibm.com/software/businesscasestudies?synkey=J939223U57868M56
  https://www.youtube.com/watch?v=yddz_CF_gIs&feature=youtu.be

- Mesa, Arizona PD, *Smarter Policing with IBM COPLINK leads to a safer Mesa*:

  https://www.youtube.com/watch?v=RFm1Sr_PX-Y

Consolidating information for efficient investigations: COPLINK database server

Underlying the COPLINK user interface (UI) is a comprehensive consolidation database that is called the *COPLINK database server*. The COPLINK database server receives, sorts, consolidates, indexes, and stores data from disparate data sources.

The COPLINK database server operates on a modern relational database management system (RDBMS). The COPLINK database system is scalable, and it can meet the needs of thousands of networked users.

Data migration

Data from other systems must be migrated into the COPLINK database. When the initial data migration is complete, automatic refresh of the data can be scheduled. Modern records management systems that support XML can refresh a COPLINK database in near real-time.

Data consolidation

The power of COPLINK is based on data consolidation. Often, data sources in adjacent jurisdictions contain many persons, vehicles, locations, weapons, and other objects in common. Using consolidation algorithms, COPLINK consolidates these objects. Thus, a person who is common to disparate underlying data sources is shown as one person with a number of associated documents.

Consolidation eases the task of investigating persons, vehicles, locations, and more. When viewing the consolidated records, the investigators must look at only one person record to discover all of the available information. Consolidation also adds links to the individual records from disparate sources. For example, the persons, vehicles, and locations from one source are linked to the persons, vehicles, and locations from other sources. This feature is especially helpful in cross-jurisdictional investigations.

Data refresh

From most modern law enforcement data sources, it is possible to refresh the COPLINK data warehouse within minutes of new information appearing in an underlying system. Therefore, the data is reasonably current. Records management systems, while often containing large amounts of data, change incrementally. It is unusual for 1% of the data elements in an RMS to change daily if the system has been in place for some time.

Technically, although the data warehouse does not contain the most current information available, the lag time in refreshing a COPLINK data warehouse usually takes a few minutes and does not impact an investigation. This is particularly true if the underlying data source does not employ a direct user input scheme, but relies on dedicated data entry staff.

Domain-wide information sharing: COPLINK node

The basis of the COPLINK system is the *node*. A node is a COPLINK system that is hosted by a single agency, or by a consortium of agencies. These agencies individually decide what data is shared with the COPLINK node, and if that data has any user-access restrictions.

COPLINK nodes can be connected to each other, and users can select to query any or all other nodes. COPLINK has no inherent size limitations. The size and composition of a node can be set to provide the users with the optimum access to regional information. It is also possible to set up “super-nodes” that consolidate information for several regional nodes. However, users who contemplate such a system should consider using COPLINK Adaptive Analytic Architecture (A3) instead of querying multiple COPLINK nodes.

An inter-node query can return results that are grouped by node. Alternatively, if COPLINK Adaptive Analytic Architecture is employed, the results can be consolidated if the user elects to do so. Query results are based on the business rules and security policies that are established by each node. Individual nodes can restrict the information available to outside node users, just as restrictions can be applied to users who are node members.

The restrictions can be set to notify a user that data that matches the query parameters exists without displaying the data. Alternatively, the data can be absolutely restricted, such that only authorized users are even aware it exists.

This node architecture and the restriction options mitigate the issues of multi-state law enforcement information sharing. Laws governing access and use of such information vary from state to state. COPLINK nodes can be established so that the data from individual state nodes resides in that state. Granting access to extra-node users means that only data that is related to a specific query is transmitted to the requester, not the contents of the data warehouse.

The security issues that are raised by law enforcement information sharing are also mitigated. Law enforcement administrators retain control over their data. They can choose what to share and what access restrictions to impose on their data. Because COPLINK maintains an origin label for every database object, an agency that chooses to opt out of a COPLINK node can have all of the information that it ever contributed to the node removed without impacting the data from any other contributing agency.

Ease of use: COPLINK user interface

The COPLINK user interface allows users to run queries on persons, organizations, locations, incidents, weapons, vehicles, telephone numbers, property, media, events, and documents. It is an intuitive, easy-to-use, web-based user interface that makes it easier to discover hidden investigative value in existing information.

Information is returned to the user in a logical format that can be sorted in various ways to suit the demands of the query.

The UI features a light color scheme for use during the day. Figure 1 shows the default COPLINK window, which is the Person Search form.

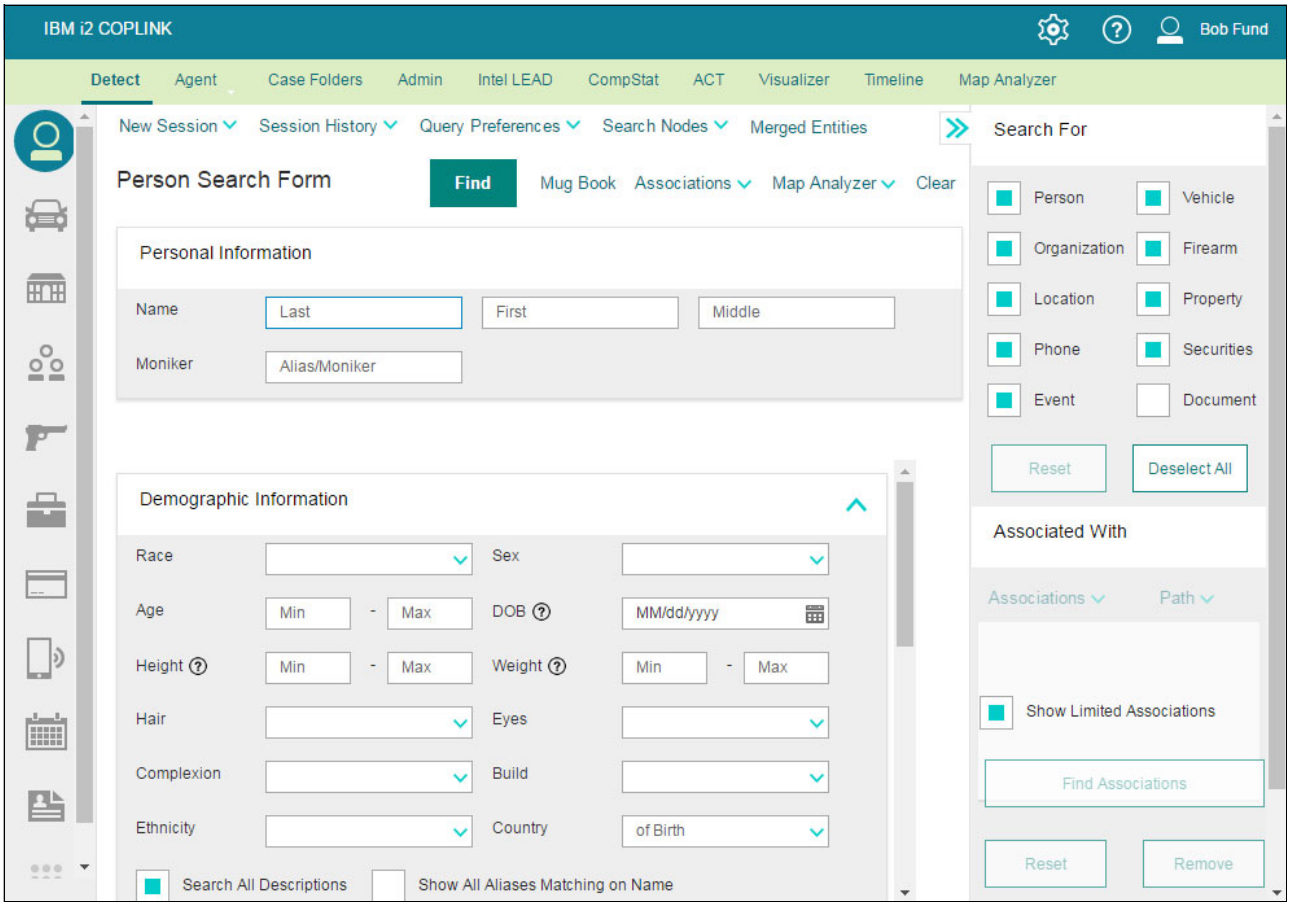

Figure 1 COPLINK default window: Person Search form

The UI features a dark color scheme for use in a patrol car at night. Officers can easily dim the UI so that they are not illuminated by the screen. Figure 2 on page 9 shows the COPLINK user interface night view.

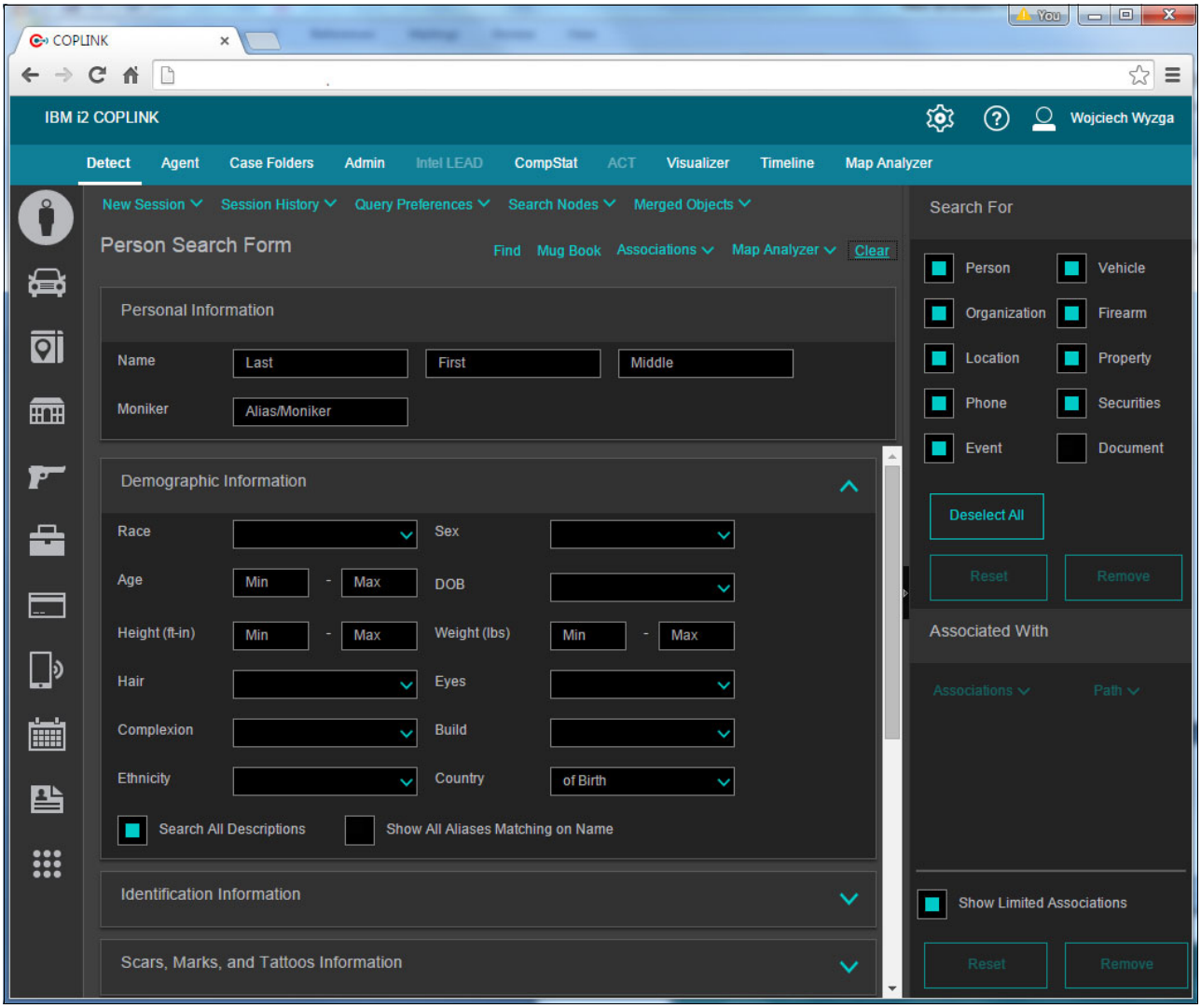

Figure 2 COPLINK UI can be dimmed to protect the officer (night view)

A user can easily switch back and forth between the day and night schemes.

The UI is designed to reduce the time that is required for law enforcement officers to become productive with COPLINK. The UI increases productivity by presenting an organized view of the information, requiring just a few clicks to complete a task, fast loading, and flexible analytics. Related information is neatly organized into tabs, and the icons are modern and large for ease of use.

The UI contains context-sensitive help. When a user is on a certain page in the application and needs help regarding something on that page, context-sensitive help provides specific information about that page. The help content can answer common questions and enable a user to complete the tasks on that page. The context-sensitive help can include text, and might also include one or more links to tutorial video clips. These video clips can provide quick, focused, assistance on relevant topics.

The UI delivers a graphical visual timeline feature to make it easy for users to see and explore events over time. It uses the most current components and services available for the geographical information system (GIS) mapping capability.

Modular design: Integrated modules, one solution

A suite of modules provides the COPLINK capabilities that address key use cases for law enforcement. The modular approach allows law enforcement agencies to deploy only the modules that they need based on requirements, priorities, or budget. The following sections provide an overview of the modules that comprise the COPLINK solution.

Tactical lead generation: COPLINK Detect

This module provides COPLINK core capabilities, such as search and retrieve functions, and the COPLINK database that centralizes data from many sources. It provides the tactical lead generation capability. It enables users to efficiently search the consolidated data, in a central data store, by using a single intuitive UI. Users can retrieve actionable information quickly.

The following use cases apply for COPLINK Detect:

- Simple search, for example person, vehicle, location, firearms, property, telephone numbers, and other objects.
- Complex search for situations where only partial information is known. COPLINK Detect provides support for an English phonetic search capability, which enables users to query suspects' names regardless of the exact spelling of their names.
- Generate configurable photo line ups from search results. This function enables officers to present line ups to witnesses at the incident scene to speed suspect identification. The user can set the number of columns and rows, or choose to display one photo at a time.
- Save search history and organize investigations in case folders so that users can more easily generate reports on their investigations.

The target users of COPLINK Detect are first responders, follow-up investigators, dispatchers, and crime analysts.

The Person Search form that is shown in Figure 1 on page 8 is the starting point of COPLINK Detect.

Manage and audit: COPLINK Administration

COPLINK Administration is designed for use by the system administrator to perform all routine tasks that are associated with local maintenance of the COPLINK modules:

- Adjust security protocols
- Delete users and user groups
- Remove user and group access permissions
- Add or remove user suspensions
- Reset user passwords
- Perform audits
- Maintain the system look-up tables

To ensure that only authorized users can access COPLINK information, COPLINK Administration provides comprehensive security features. Users cannot self-register; they must be entered into the system by a system administrator, who assigns a user name and password. Options are available for the system administrator to require complex passwords, minimum password length, and auto-expiration of passwords after a period of time. COPLINK Administration also contains the transaction log, which is the COPLINK auditing tool.

Every transaction carried out by the system is logged, including the user name, IP address, data sources accessed, and the query parameters. The transaction log is searchable by user name, a range of date and time, and query parameters.

The following use cases apply for COPLINK Administration:

- Manage user groups, document access, and security policies of the node.
- Search transactions for any user by date or time, or by type and name of the query, for auditing purposes.

The target user of COPLINK Administration is the system administrator. COPLINK Administration has two levels of administrators:

- Node administrators have complete access to all components of the administration software.
- Agency administrators have access only to users, user groups, and transaction logs from their own agency. Agency administrators cannot access the global security settings, the look-up, and the migration tables.

Figure 3 shows the COPLINK Administration Users tab and the Users form to manage user accounts.

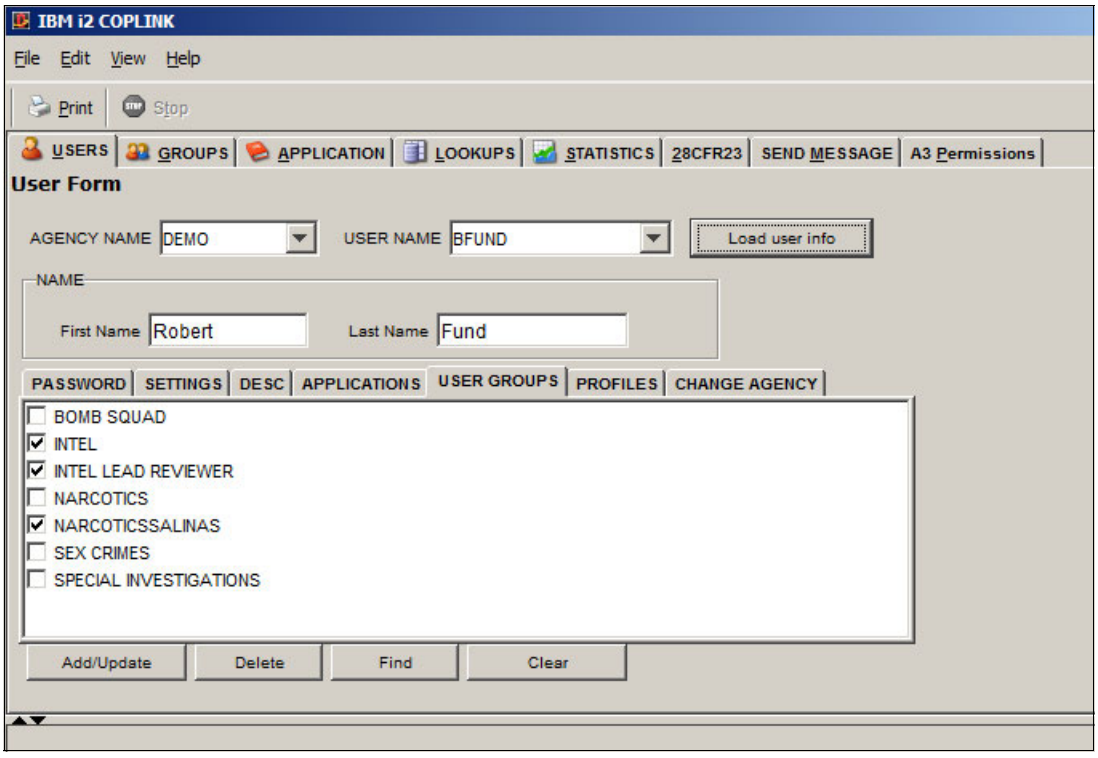

Figure 3 COPLINK Administration user interface

Automated alerts and collaboration: COPLINK Active Agent

COPLINK Active Agent streamlines investigations by automating repetitive or periodic queries based on user-defined parameters. COPLINK Active Agent notifies users by email, pager, or system alert when new information relative to the search is available, or when others are conducting similar searches. The automated alerts can be sent to a task force group email distribution list to keep all members of the task force in sync, or alerts can be sent to a particular individual.

The following use cases apply for COPLINK Active Agent:

- Learn when somebody else is conducting an investigation on the same suspect. When conducting a special investigation on a person of interest, the investigator might want to know who else in the organization has an interest in the suspect. Investigators can set an alert to be informed when new information relevant to their case enters the COPLINK database.

  Active Agent collaboration capabilities help to connect investigators with common interests and discover parallel investigations. It facilitates the sharing of information by investigators, and helps them successfully conclude the case more quickly.

- Track a person or vehicle for any additional contact with law enforcement, even if the contact is in a neighboring jurisdiction. Active Agent works across COPLINK nodes. If an investigator is working on a case in Tampa, FL, he can set an alert on a suspect. If the person shows up in Orange county, CA, the investigator receives an alert and will know that the person moved.

- Discover colleagues who are conducting similar searches to improve team collaboration and information sharing, leading to faster case resolution.

The target users of COPLINK Active Agent are first responders, follow-up investigators, dispatchers, and crime analysts.

Figure 4 shows an example: A generic query on a red Chevrolet pickup provides a summary grid of results. The user can set an alert to be notified when new data is received.

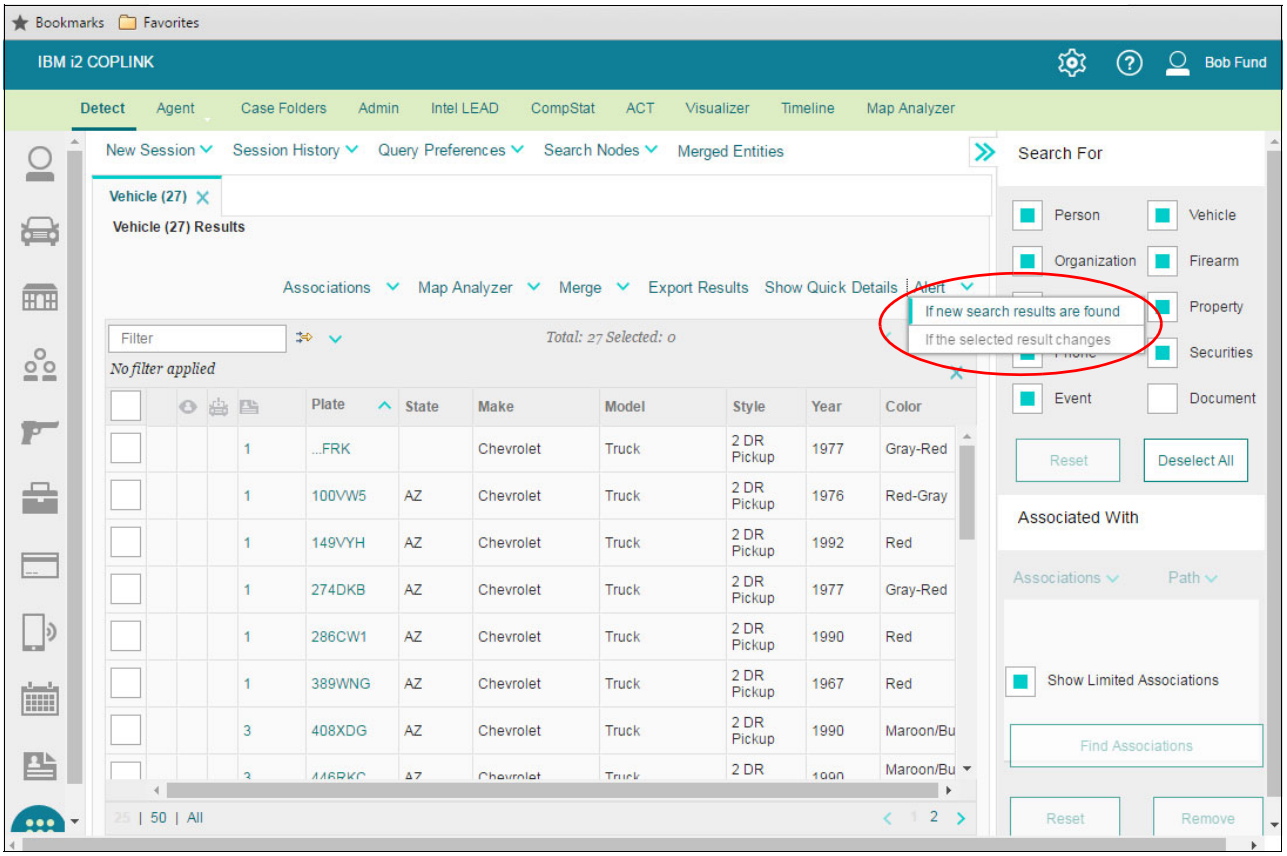

Figure 4 Generic query on a red Chevrolet pickup with a summary grid of results and an alert when new data is received

Uncover hidden associations: COPLINK Visualizer

COPLINK Visualizer displays the links and associations that are found in the COPLINK database in a graphical display or network. It enables users to graphically view search results to help them uncover hidden associations between objects. Visualizer helps accelerate and simplify investigations by visualizing relationships and associations. Visual layouts organize information to help users understand patterns in the data, and identify the most promising leads quickly. Visualizer brings advanced analytics into COPLINK.

The following use cases apply for COPLINK Visualizer:

- Visualize relationships between people, vehicles, locations, organizations, phones, and more. This visualization can help investigators uncover new case leads and discover hidden relationships, which might yield insights.
- Learn who might be associated with a specified location before entry. Officers are better prepared due to greater situational awareness. They can adapt plans to improve officer and public safety in anticipation of a potential encounter with a dangerous individual.
- Discover new case leads through hidden relationships. If a case is stuck, COPLINK Visualizer might help get it moving again.
- Understand criminal history information more easily. Images can be more effective at communicating relationship information than text.

The target users of COPLINK Visualizer are first responders, follow-up investigators, dispatchers, and crime analysts.

Figure 5 shows the results of a COPLINK basic search, displayed graphically by using the COPLINK Visualizer.

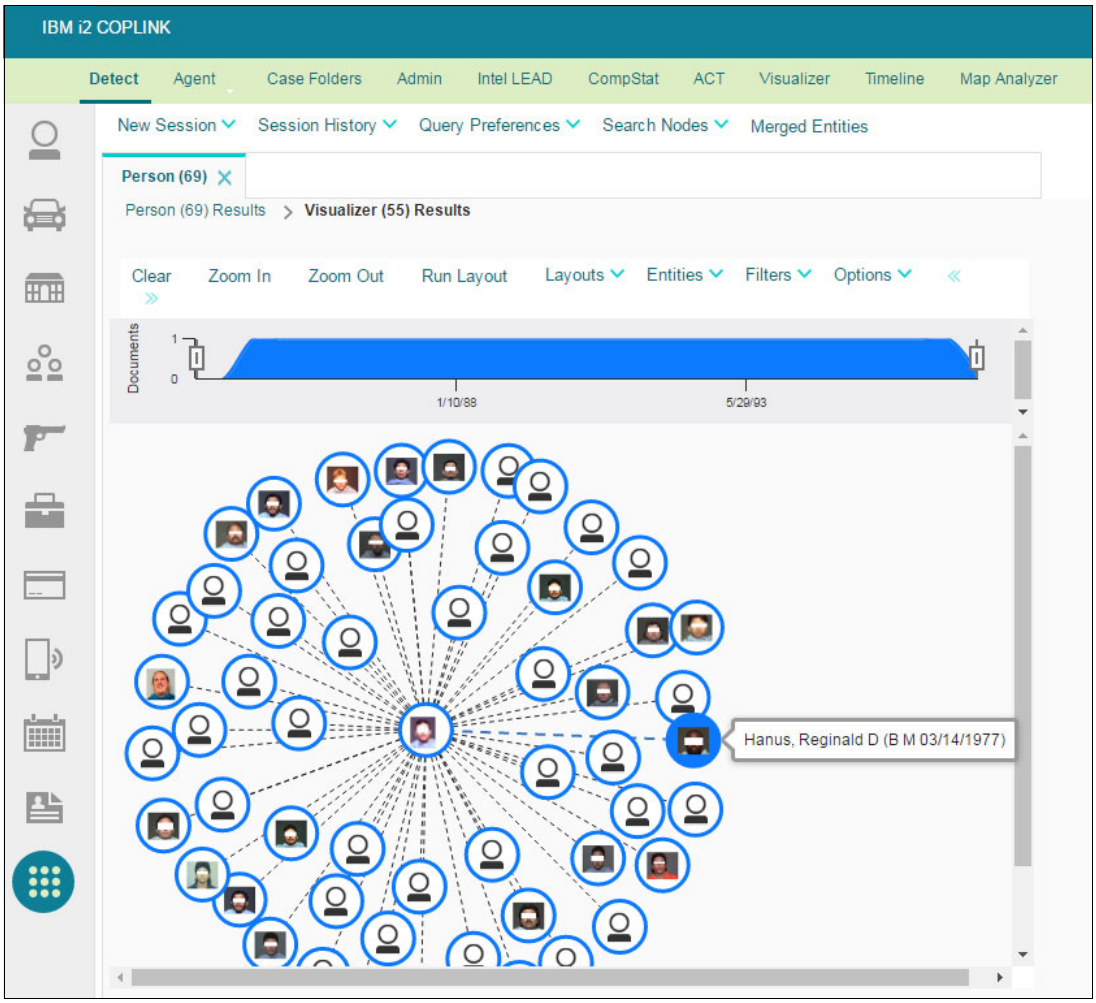

Figure 5 Graphical representation of COPLINK basic search by using Visualizer

Develop strategies to fight crime: COPLINK Incident Analyzer

COPLINK Incident Analyzer is a mapping tool that visualizes geographic relationships among incidents, and animates the progression of incidents over time by using mapping, analytical, graphing, and charting tools. It helps law enforcement visually demonstrate and quickly grasp crime patterns based on known investigative facts. The crime patterns can suggest when the next crime might occur.

It provides both GIS-based mapping functions and a range of graphing and charting tools for analytical functions, including temporal and spatial analysis.

The following use cases apply for COPLINK Incident Analyzer:

- Develop strategic approaches to crime prevention and deploy resources based on insights gained from COPLINK Incident Analyzer.
- Analyze search results by following a bottom-up crime analysis methodology, based on specific questions, such as, “Where has the XYZ gang been involved with crimes?”

For example, an investigator zooms to the area in the map around the street intersection where a crime has occurred and draws a rectangle, as shown in Figure 6. The investigator can then search for all locations within a defined area around the address where the crime occurred.

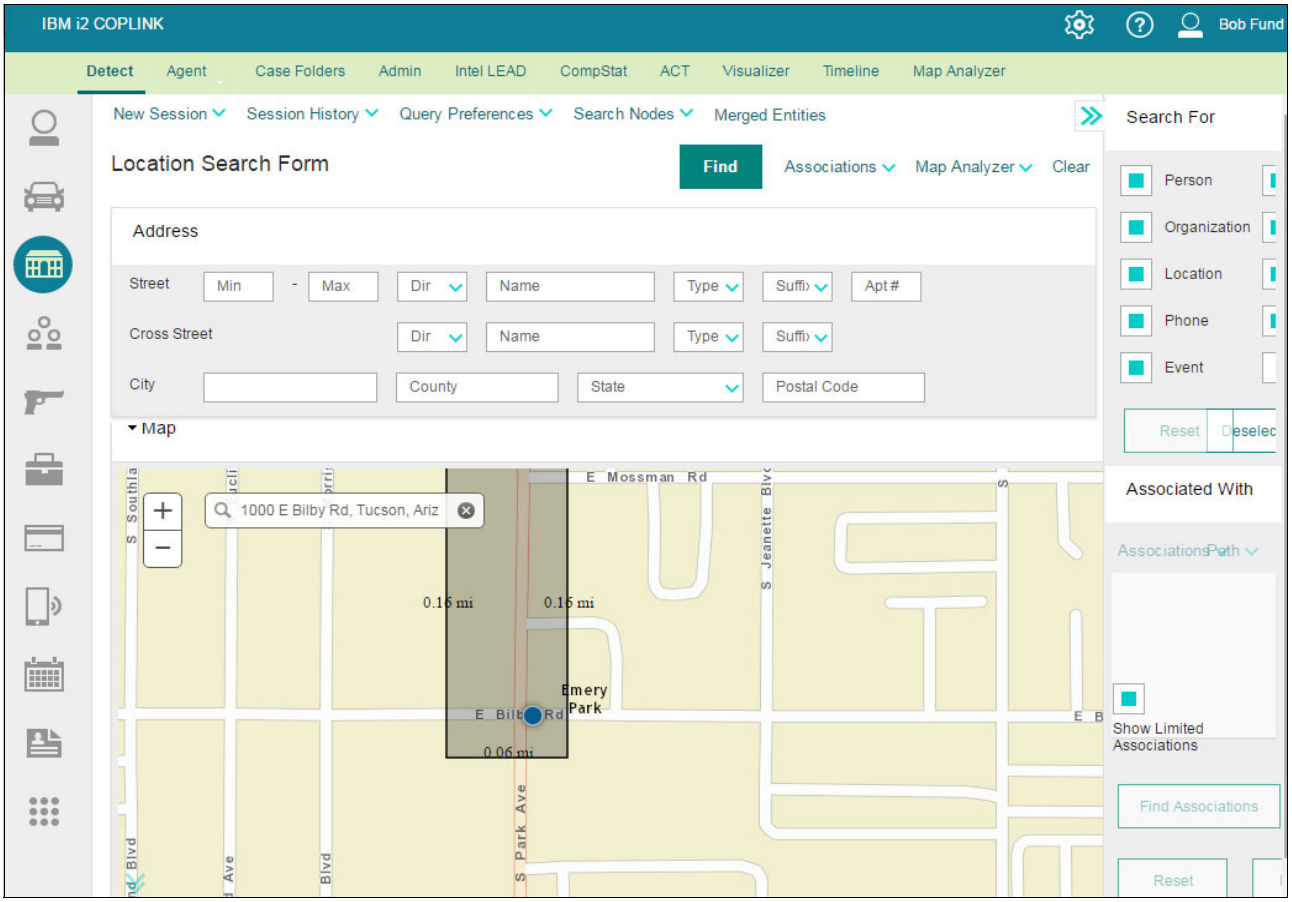

Figure 6 Investigator searching for locations inside a particular area

The target users of COPLINK Incident Analyzer are crime analysts, dispatchers, and investigators.

Identify suspects quickly: COPLINK Face Match

COPLINK Face Match is a facial recognition search tool that helps speed the identification of potential suspects. Face Match extends the core search capabilities of COPLINK to enable searches against booking photo databases by using photos or composite sketches. Composite, artist-drawn, and computer-generated sketches can also be used as probe images.

COPLINK Face Match operates on images that are stored in or accessed by the local COPLINK node. Users can perform distributed facial recognition searches to other COPLINK nodes if the remote nodes also employ COPLINK Face Match.

Users should enter other information, such as name, demographics, tattoos, and other identifiers, to further refine the search results. Filtering the queries can reduce the number of extraneous results that might occur when a system searches strictly on facial structure. For example, if the user knows that a person in a probe image is a male, it usually makes no sense to include a search of females.

The following use cases apply for COPLINK Face Match:

- Develop leads in situations where traditional policing methods have yielded no results.
- Identify associates that are found in photographs to accelerate case resolution.

The target users of COPLINK Face Match are first responders and investigators.

Figure 7 shows the COPLINK Face Match UI, used to perform a person search.

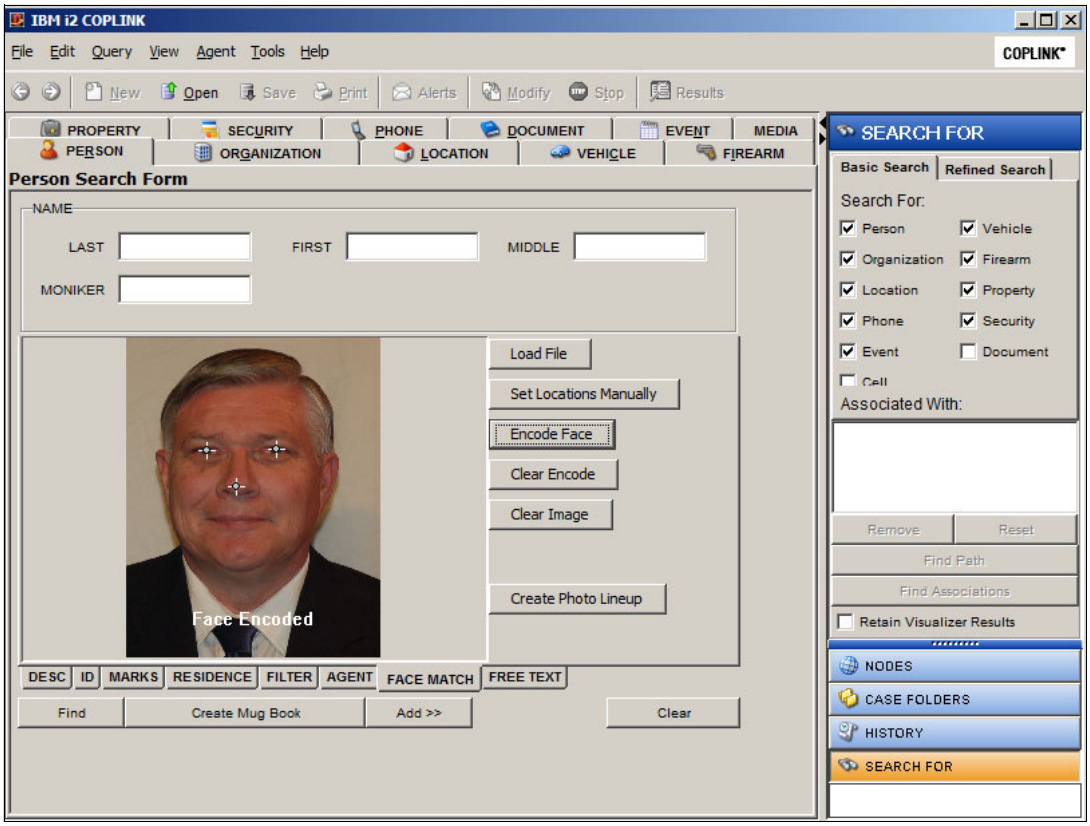

Figure 7 COPLINK Face Match Person Search form

Analyze crime patterns: COPLINK Computer Statistics

COPLINK Computer Statistics (CompStat) is a crime trend analysis and decision support solution that helps law enforcement visually understand the “big picture” of the criminal activity that is occurring in a jurisdiction. COPLINK Computer Statistics enables agencies to conduct effective CompStat analysis across all available data. A collection of GIS, statistical graphs, charting, and analytical tools work on the rich COPLINK database, allowing agencies to use their data to better allocate resources.

The following use cases apply for COPLINK Computer Statistics:

- Perform top down crime pattern analysis to help command staff gain insight into where and what crimes are occurring in a geographic area. Use insights to help develop strategic approaches to crime prevention and resource deployment.
- Study crime patterns by year, day of week, time of day, and by crime type. Analyzing crime patterns can lead to insights to help improve crime prevention programs and improve resource deployment.

- Evaluate if crime prevention strategies are working in a neighborhood. Evaluate if there are unanticipated side effects, such as criminals moving to a neighboring area, or if crimes are becoming more dangerous. Reassess strategies and respond according to the latest crime trends.

The target users of COPLINK Computer Statistics are command staff, administrators, first responders, investigators, and analysts.

Figure 8 shows a view of COPLINK Computer Statistics. This simple view shows that Motor Vehicle Theft is the most prevalent offense type in the database that is queried for the year 2001.

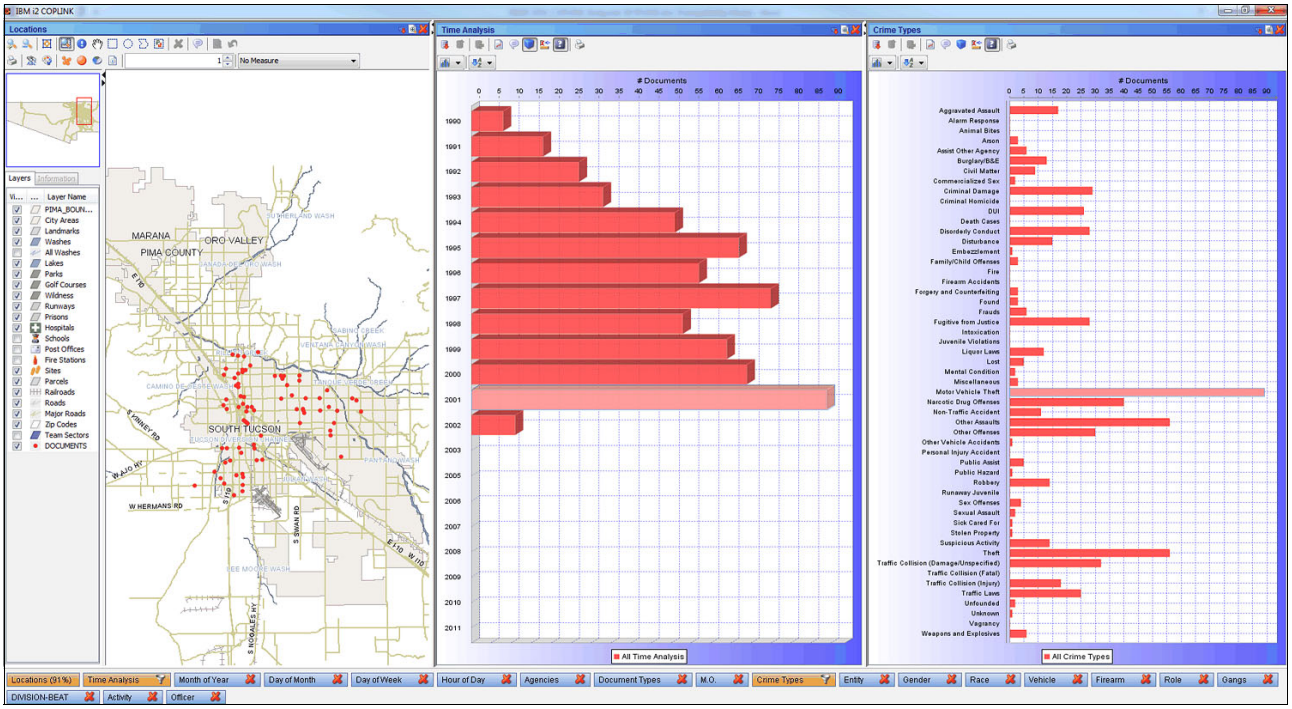

Figure 8 COPLINK Computer Statistics view

Regional data analysis: COPLINK Adaptive Analytic Architecture

COPLINK Adaptive Analytic Architecture (A3) consolidates data from multiple law enforcement systems. It allows temporary consolidation of data from sources that are not part of an individual COPLINK node. A3 enables information sharing across regional and national information sharing initiatives by providing rapid, simultaneous searches across multiple COPLINK sites and external data sources.

A3 technology enables sophisticated analysis of data from multiple COPLINK nodes or other data sources, such as motor vehicle records, driver license records, or even private databases. The consolidation is temporary and lasts only during the individual query. Only the results of the user query are sent to the other nodes.

This feature accommodates federal, state, and local laws and policies that require data to remain in the originating jurisdiction. It also minimizes the potential abuse of the data by limiting the “fishing expeditions” possible in databases that consolidate criminal and non-criminal information.

COPLINK Adaptive Analytic Architecture provides true regional analytic capability by consolidating the results from other COPLINK nodes. This query processing technology is designed to allow COPLINK users access to databases and data sources that for technical or policy reasons are not consolidated into a COPLINK node.

The following use cases apply for COPLINK Adaptive Analytic Architecture:

- Perform regional data analysis by searching other COPLINK nodes and third-party data sources in the COPLINK user interface. Users do not need to learn a new user interface, or load other software to see search results.
- Consolidate search results. Through consolidation rules, persons and other objects that are duplicated across the COPLINK database or third-party system are collapsed into a single consolidated record in the search results window. This consolidation reduces the return set making it easier for users to browse and understand the data.

The target users of COPLINK A3 are first responders, follow-up investigators, dispatchers, and crime analysts.

Figure 9 shows a search that expands two COPLINK nodes.

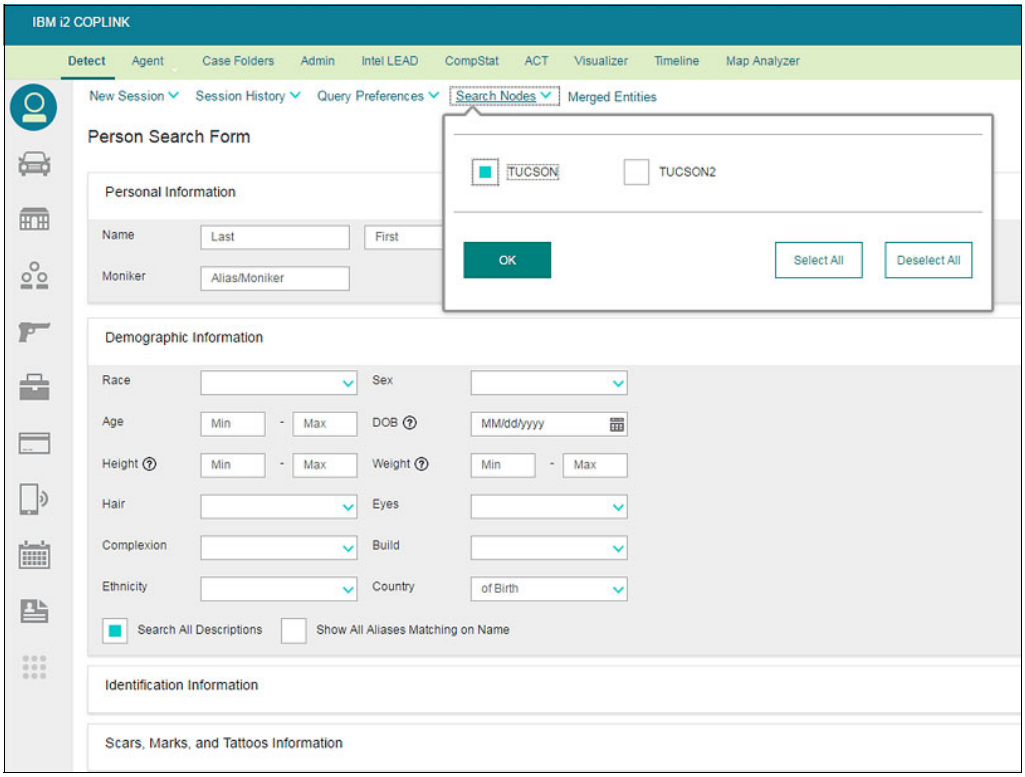

Figure 9 COPLINK A3: Search expanding two COPLINK nodes

Identify suspicious activities: COPLINK Activity Correlation Technology (ACT)

COPLINK Activity Correlation Technology (ACT) is a monitoring tool for a variety of activities. It provides alerts on suspicious activity related to geographic locations. It monitors the COPLINK database for predefined patterns, and also for objects that are on a watch list. It then automatically generates a report that is sent to a designated user or group of users when certain conditions are met.

COPLINK ACT identifies suspicious activities regarding critical infrastructure and monitored areas, even when incidents and data span multiple agencies and data sources. Unique algorithms monitor incoming information and alert analysts to potentially suspicious activities for further investigation. The area under observation, the number of repeat occurrences, and other parameters are configurable thresholds.

Watch lists are created by a COPLINK administrator and authorized users can add any object in a COPLINK node to a watch list. A watch list can contain one or more objects, such as persons, vehicles, property items, firearms, and other objects.

It is possible to create a watch list for registered sex offenders, persons that have travel restrictions, or any other object that would trigger an alert in a defined geographic area. For example, a user can create a buffer area around all schools in a jurisdiction and set a watch list alert for registered sex offenders that is connected to the buffer area.

The following use cases apply for COPLINK Activity Correlation Technology:

- Monitor critical infrastructure or other specified areas for suspicious activity. Receive automatic notification when the same person or vehicle appears in multiple buffer areas, or when the same object appears two or more times in the same buffer area. Based on police documents, suspicious activities can be surfaced automatically for further follow-up, reducing potential threats to critical infrastructure and the community.
- Monitor specific objects through watch lists. Keep track of people or vehicles and receive alerts if objects in watch lists appear in buffer areas. Take immediate action to protect the community from threats.

The target users of COPLINK ACT are fusion centers, analysts, counter-terrorism agencies, and investigators.

Intelligence management and data entry: COPLINK Intelligent Law Enforcement Actionable Data (LEAD)

COPLINK Intelligent LEAD is a 28 Code of Federal Regulations (CFR) part 23-compliant criminal intelligent system that is built for US policing. It is designed to allow agencies to manage criminal intelligence data that is subject to 28 CFR Part 23 guidelines.

COPLINK Intelligent LEAD enables users to enter criminal intelligence data directly into the COPLINK database, but this data is segregated from the criminal history data in a separate database. Data from the COPLINK database can be seeded in Intelligent LEAD to speed up data entry, saving time and improving accuracy of data transcription.

The criminal history information in COPLINK can be queried together with criminal intelligence data by authorized users (with both the right to know and the need to know) from within COPLINK Intelligent LEAD.

The data is presented as a consolidated result set for the duration of the session, but is not commingled. COPLINK Intelligent LEAD also provides automatic retention alerts and allows deletions of data that has reached its specified retention limits.

It is integrated with COPLINK; data from COPLINK can be seeded into COPLINK Intelligent LEAD to speed up data entry, saving time and improving accuracy of data transcription.

The following use cases apply for COPLINK Intelligent LEAD:

- Adhere to US federal government regulations for management and retention of intelligence data.
- Share intelligence information more easily, improving collaboration and enabling task forces.

The target users of COPLINK Intelligent LEAD are criminal intelligence officer, investigators, and counter-terrorism agencies.

Secure two-way data exchange: COPLINK Inbound and Outbound Connectors for LEXS-SR

COPLINK Inbound Connector for LEXS-SR and COPLINK Outbound Connector for LEXS-SR are two connectors that use the Logical Entity eXchange Specification (LEXS), a National Information Exchange Model (NIEM) framework that uses a search and retrieval standard that is common within the US law enforcement community to enable real-time query of and interoperability with third-party systems. One connector is for outbound connections and the other for inbound connections.

Connectors can be put in place between COPLINK and other data sharing initiatives, providing even more richness in data search results.

The following use cases apply for COPLINK Inbound and Outbound Connectors for LEXS-SR:

- Third-party systems search and retrieve data in real time from the COPLINK database. Other initiatives can leverage existing investments in COPLINK without having to develop data connectors back to systems that feed data to COPLINK.
- COPLINK search on third-party systems through a web-based search and retrieve interface. This capability leads to savings on training costs by keeping officers in the familiar COPLINK user interface when they search data that is outside of COPLINK.

Figure 10 shows data search and retrieval and interoperability between a COPLINK server and a third-party system by using the COPLINK Inbound and Outbound Connectors for LEXS-SR.

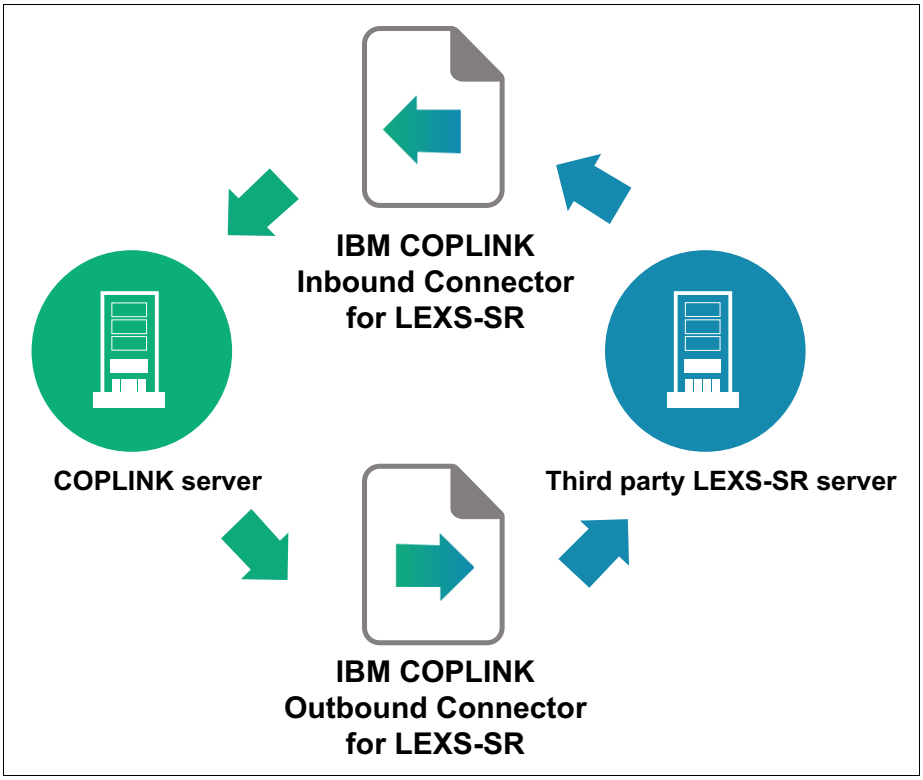

Figure 10 Interoperability between a COPLINK server and third-party server through COPLINK Inbound and Outbound Connectors for LEXS-SR

Export data automatically: COPLINK File Exporters for N-DEx and COPLINK IEPD

COPLINK File Exporter for COPLINK IEPD and COPLINK File Exporter for N-DEx are two distinct XML export formats for COPLINK data. When a COPLINK File Exporter is installed and configured, the file extracts run automatically and in the background, without the need for manual intervention.

Objects that are exported to XML files include Persons, Vehicles, Locations, Properties, Firearms, Pawns, Tickets, Bookings, and Arrests. Most relationships between objects are maintained. This feature allows for a rich data import into third-party systems, leveraging existing investments in COPLINK.

There is no need to go to the source systems for data. Data can be exported from COPLINK rather than many originating systems.

COPLINK File Exporters for N-DEx and COPLINK IEPD are used to import data programmatically into third-party systems to satisfy the requirement of agencies that want to send their data to the national system. The output of the export from COPLINK into XML files, using either the COPLINK IEPD or N-DEx formats, can be scheduled and automated to recur at specified times without user action.

Figure 11 shows the file export process that extracts files from the COPLINK server and exports the data to an XML file in IEPD or N-Dex formats.

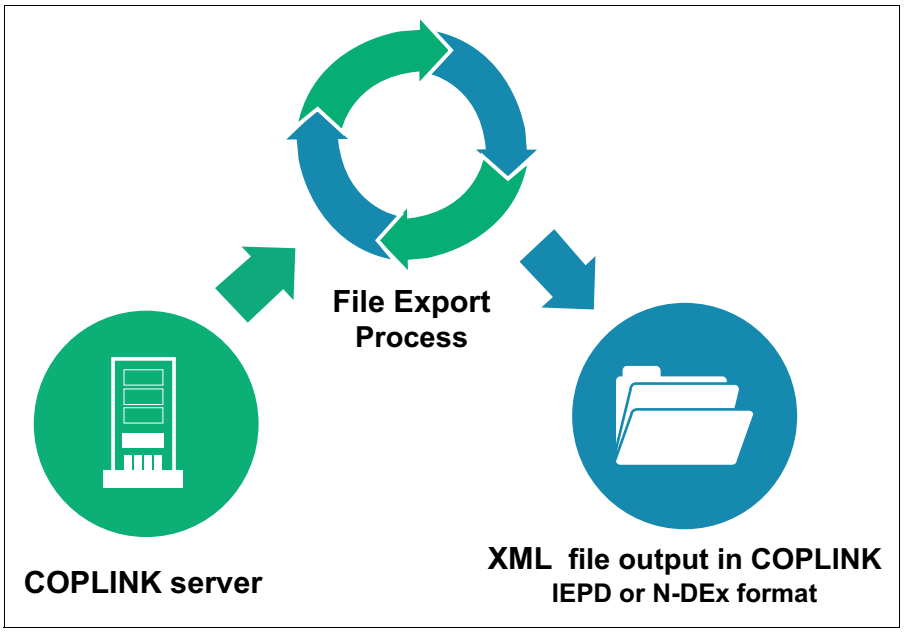

Figure 11 File export with COPLINK File Exporters for N-DEx and COPLINK IEPD

Data access for crime analysts: COPLINK Analysis Search

COPLINK Analysis Search (CAS) is a connector for IBM i2® Analyst's Notebook that enables users to pull COPLINK data into i2 Analyst's Notebook Premium charts. COPLINK CAS provides analysts with access to vital crime data held in COPLINK nodes from within i2 Analyst's Notebook Premium.

By using i2 Analysis Ready Search technology, analysts can simultaneously and comprehensively search COPLINK nodes and other data sources with the results automatically modeled and semantically enriched for immediate analysis. A manual entity merge feature allows users to temporarily merge person records on a per-session basis.

The following use cases apply for COPLINK Analysis Search:

- Crime analysts, in the search for the missing link when they are solving a case or developing intelligence artifacts, require extending the breadth of data available to i2 Analyst Notebook Premium users. By incorporating data from COPLINK, crime analysts have access to a wealth of new information.
- Intelligence units have access to more data, helping them gain deeper insights and in turn make better decisions with richer information. By using COPLINK data for intelligence analysis, law enforcement agencies make better use of existing investments in COPLINK beyond front-line policing.

The target users for COPLINK Analysis Search are crime analysts and investigators.

Search using mobile devices: COPLINK Everywhere

COPLINK Everywhere is a query module that is designed to provide direct access to COPLINK data from mobile devices that run Android or Apple iOS operating systems. It has all of the query features of the COPLINK Detect module, except that it does not perform association and link queries. The mobile interface is simplified, yet still provides the ability for a user to access multiple data sources with a single query. It can return images (mug photos).

The COPLINK Everywhere interface also provides situational awareness based on automatic geolocation and supports facial recognition capability by using the device built-in camera.

Object search

The COPLINK Everywhere object search includes the following capabilities:

- Quick Search

  Dynamic display of the user's search criteria.

- Form Search

  Search for Person, Vehicle, Organization, Location, Document, Phone, Firearm, or other objects (it supports all of the objects that are supported by COPLINK search).

- Geographically sensitive default search parameters

  Configurable setting to preselect city and state based on device geolocation.

- Inter-nodal search with consolidated result set

Figure 12 on page 24 shows the object search interface in COPLINK Everywhere used to search persons and vehicles.

Figure 12 COPLINK Everywhere object search

Situational awareness

The COPLINK Everywhere situational awareness includes the following capabilities:

- View incidences that occurred closest to the officer's current location.

  The distance of the incident depends on settings that are defined by the officer, for example 100 ft. or 500 ft.

- Search incidents are based on the following criteria:
  - Date range
  - Proximity to device location
  - Crime class
  - Address
  - Map viewport
- Drill down on each incident for more detailed information.

Figure 13 shows the Situational Awareness interface in COPLINK Everywhere used to view incidents near the officer's location, to promote officer safety.

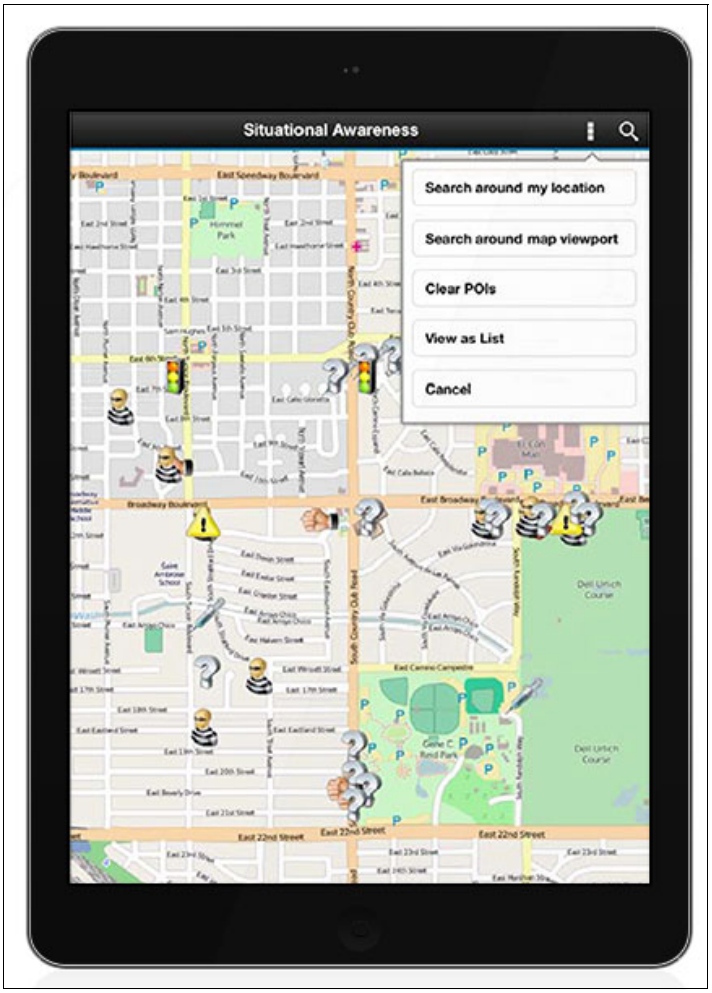

Figure 13 COPLINK Everywhere situational awareness

Facial recognition

The COPLINK Everywhere facial recognition includes the following capabilities:

- Image capture:
  - Capture an image at the scene using the device camera.
  - Upload an image from an image gallery.
- Configurable detection accuracy to observe various results ranges:

  If the image to compare against is of relatively poor quality, the user can set the detection accuracy lower and get more results back.
- Filter results based on demographics:
  - Name
  - Race
  - Gender
  - Birth date

Figure 14 shows the facial recognition interface in COPLINK Everywhere used to find a suspect.

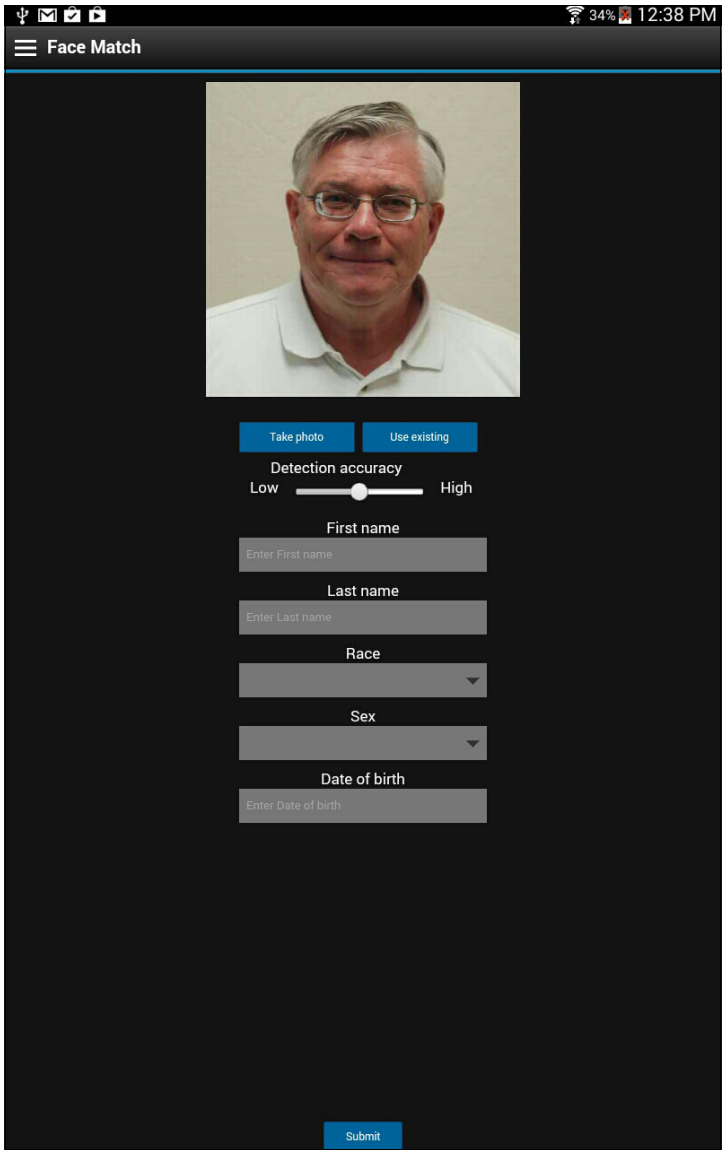

Figure 14 COPLINK Everywhere facial recognition

Flexible deployment options

COPLINK can be deployed on premises and on a cloud environment.

COPLINK on premises

Agencies that choose this deployment option are responsible for acquiring the hardware and software that are required to run the COPLINK solution that meets their needs. The hardware requirements depend on the installation and the COPLINK modules deployed. IBM Safer Planet Lab Services provides services to help agencies to determine the most appropriate hardware requirements for their installation and advice on solution architecture.

For a complete list of hardware and software requirements refer to the “Operating environment” section of the 5725-G42 IBM COPLINK announcement letter.

Figure 15 shows an example of a COPLINK deployment architecture.

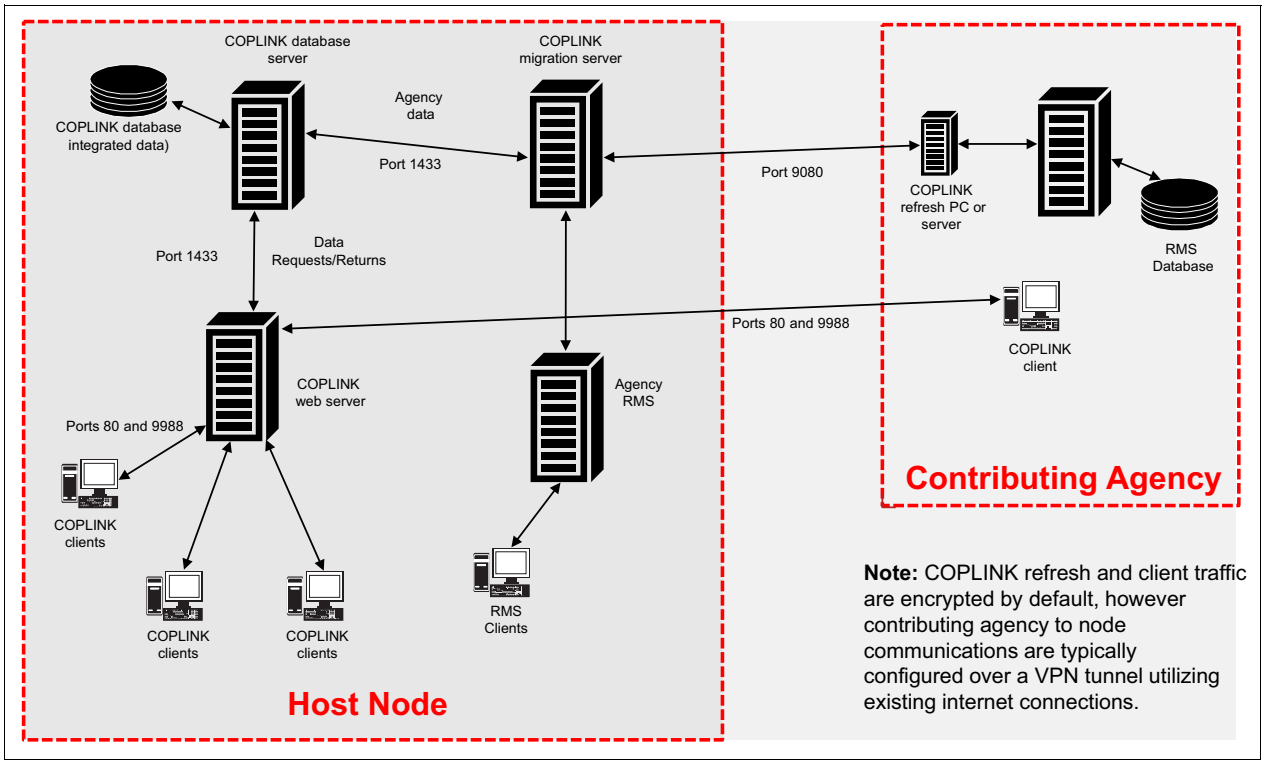

Figure 15 Sample COPLINK deployment architecture

Figure 16 shows the COPLINK modules that can be deployed on an on premises solution. COPLINK Detect and Administration are required modules for an on premises installation. The remaining modules are optional. For a description of each module, see “Modular design: Integrated modules, one solution” on page 10.

ACT (English Only)	**A3** (English Only)	**ACTIVE AGENT**
COMPUTER STATISTICS (English Only)	**COPLINK EVERYWHERE**	**COPLINK ANALYSIS SEARCH**
COPLINK Detect and Administration		
INCIDENT ANALYZER	**VISUALIZER**	**INTEL LEAD** (USA SPECIFIC)
FILE EXPORTER FORMATS	**LEXS-SR CONNECTORS**	**COPLINK Face Match**

Figure 16 COPLINK on premises required and optional modules

IBM COPLINK on Cloud

Agencies that want to avoid the expense and burden of maintaining on premises hardware to support a COPLINK node can choose to use the IBM COPLINK on Cloud solution. This offering provides a cost-effective means to access all of the features and functions of COPLINK through a subscription service.

Law enforcement agencies can use IBM COPLINK on a cloud environment to access data 24 x 7 with desktop, in-vehicle mobile data computer, or smart mobile device, without being burdened by the need for an information technology (IT) department to provide ongoing software and hardware support. The cloud-based model also enables law enforcement agencies affected by shrinking budgets and rising expenses to avoid a high upfront capital expenditure as they seek to use 21st century crime-fighting solutions.

IBM assumes responsibility for the hardware procurement, database management, third-party program management, and providing software updates on a regular basis. Agencies might find it advantageous to use a software as a service (SaaS) subscription model, because it avoids the need for large capital expenditures to procure the software licenses, hardware, and third-party software. Subscriptions can be billed monthly, allowing agencies to move the cost to an operating budget as opposed to a capital budget.

Figure 17 shows the COPLINK modules that can be deployed on the cloud offering. Detect, Administration, Active Agent, A3, Incident Analyzer, and Visualizer are the modules included in the base cloud offering. The remaining modules are optional. For a description of each module, see “Modular design: Integrated modules, one solution” on page 10.

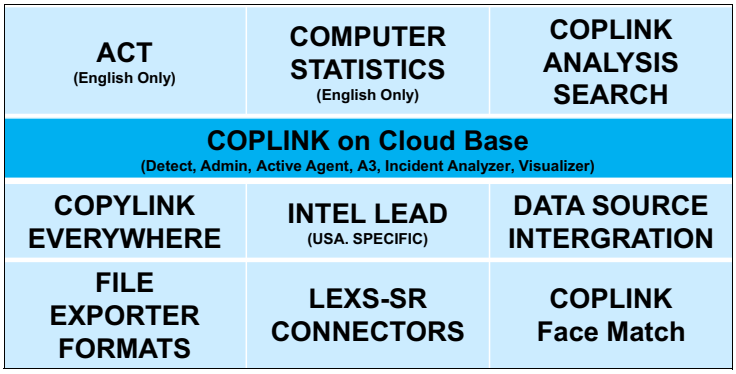

Figure 17 COPLINK on Cloud modules in the base offering and optional modules

IBM COPLINK on Cloud hosted at Nlets

In North America, IBM COPLINK on Cloud is hosted at the National Law Enforcement Telecommunications System (Nlets), the International justice and public safety network. Nlets provides a security-rich and Criminal Justice Information Services (CJIS)-compliant environment.

Secure access to COPLINK

COPLINK was designed with security in mind. COPLINK works in a private local area network (LAN) or across public wide area networks (WANs) by using the internet as a common backbone. Secure Sockets Layer (SSL), a protocol of secure transmission, can be implemented on the COPLINK web server. SSL can be used with VPN technologies if agency security policies require such internal security.

Security for transmission over a network is provided by data compression and encryption. COPLINK can use up to D5 512-bit data encryption. With the data both compressed and encrypted, it is unlikely that an unauthorized user can decode the information. Although this security protocol enables COPLINK data to be transmitted over the internet with minimal chance of being compromised, IBM suggests that this method of data exchange be carefully reviewed.

A more secure solution is to use a dedicated law enforcement telecommunications network, a virtual private network, or intranets to carry COPLINK traffic. These approaches add extra protection to data and keep all but the most determined hackers out of the system. Even if a network intrusion occurred, COPLINK data compression and encryption add other hurdles for a hacker to overcome before the data can be read.

Figure 18 shows a scenario of agency connectivity where one main node, the host agency, houses the web and database servers and the surrounding agencies connect to the host agency for data refresh and retrieval. The agencies can use the internet for connectivity, and establish trusted encrypted tunnel relationships that use existing routers.

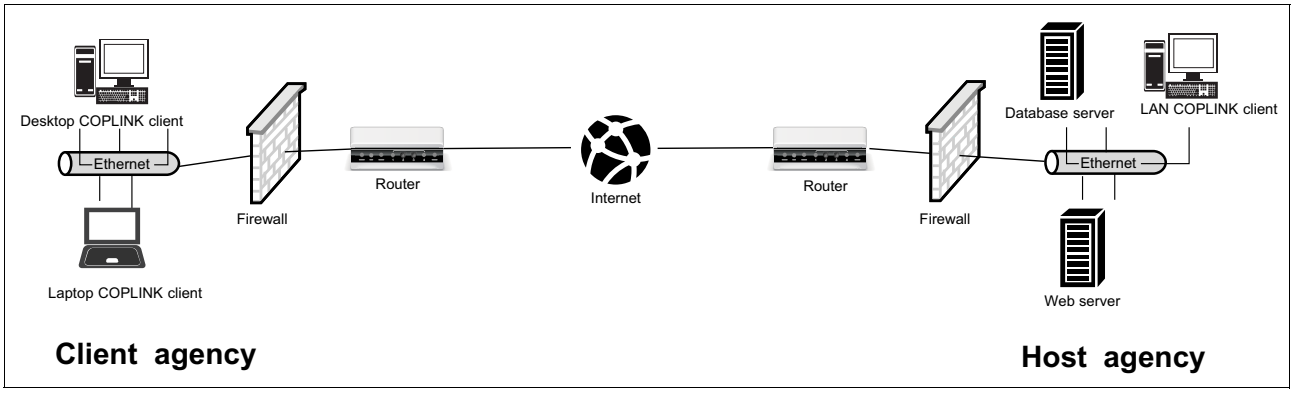

Figure 18 Tunnel routing through the Internet between agencies

In addition to the scenario presented in Figure 18, many secure variations of network solutions are possible for the distribution of COPLINK queries and connectivity of contributing remote agencies to the central COPLINK node for data migrations. Firewalls and DMZs, which are firewall configurations for securing LANs, play a crucial role for secure interagency communications. They must allow the COPLINK web traffic to pass through after the packet source is verified.

COPLINK password options can be set by the system administrator. These options allow the individual COPLINK system to determine the wanted level of security. By selecting a combination of required password complexity and automatic password expiration, any COPLINK node can be made compliant with the Office of Justice Programs (OJP) CJIS guidelines for security of law enforcement information systems.

COPLINK also complies with Lightweight Directory Access Protocol (LDAP) protocols, and enables implementation of single sign-on (SSO) for users that employ this technology.

COPLINK includes a session inactivity timeout function. This feature is selectable by the user and set anywhere from 1 - 600 minutes. If the system is not used within the set time, the network connection to COPLINK is ended and the user must log on again. This feature is designed to limit casual users from accessing the program from an unattended workstation.

Auditing and logging

COPLINK has complete audit capabilities. The COPLINK Administration module provides the capability for the system administrator to perform audits. Every transaction that is performed on the system is logged, including the user name, user ID, Internet Protocol (IP) address, data sources accessed, and the query parameters.

The transaction log is searchable by user name, user ID, a range of date and time, and query parameters. The transaction logs can also be copied to another storage medium for auxiliary storage.

Services and resources

IBM offers services to assist with management, installation, configuration, and training for COPLINK. The following services are available:

- Project management

  IBM Lab Services provides project management for the IBM Lab Services responsibilities through the IBM Lab Services project manager. The purpose of this activity is to provide technical direction and control of IBM Lab Services project personnel and to provide a framework for project planning, communications, reporting, procedural, and contractual activity.

- Project kickoff

  The purpose of this activity is to facilitate a high-level project kickoff meeting.

- Installation and testing

  The purpose of this activity is to install and test the COPLINK node at a location that is designated by the law enforcement agency.

- Data migration and integration

  The purpose of this activity is to extract information from the participating agency data sources and migrate and integrate that data to create the COPLINK database within the COPLINK node.

- Data validation and data acceptance

  The purpose of this activity is to validate and correct the agency data source information that has been migrated into the COPLINK database.

- Data refresh acceptance

  The purpose of this activity is to validate the issue resolutions and corrections to the COPLINK database after data acceptance.

To learn more about available services see the *IBM i2 Solution Services* services brief at the following website:

https://ibm.biz/Bd4TPM

The COPLINK education team provides the following services:

- Custom training plans to specific organizational roles.
- Refresher training courses.
- Return on investment (ROI) evaluation strategies, from training needs analysis and multi-year planning through behavior and cost benefit analysis.

- Product expert certification.
- Train the Trainer (T3) courses to support onsite agency training teams.

IBM provides more support in the form of user guides, tip sheets, and other materials. COPLINK features comprehensive online help within the product. Individual users have access to the user manual through the online help function of the browser.

Summary

IBM COPLINK is designed to help law enforcement organizations solve crimes faster, keep officers safer and disrupt crime and terrorism. COPLINK helps to consolidate data from many sources, aid collaboration, and generate tactical leads. Providing advanced analysis capability that uses artificial intelligence technologies, COPLINK addresses many of the problem areas that are commonly found in law enforcement information systems:

- Difficulty in sharing information across jurisdictional boundaries (or in some cases within a single jurisdiction).
- Lack of sophisticated analytical tools to solve crimes quickly.
- Lack of collaboration notices to bring together different investigations.
- Lack of notification tools that alert users to new information.
- Complexity of tools to access, visualize, and analyze data.
- Controlling and protecting platform and data access.

COPLINK offers a modular design. Agencies can choose to deploy the entire law enforcement solution. Alternatively, they can gradually deploy modules, prioritizing their most pressing business needs and enabling their ROI to be established at the early stages of a project.

COPLINK can be deployed on premises and on a cloud environment.

IBM offers services to assist with management, installation, configuration, and training for COPLINK.

Other resources for more information

- i2 COPLINK. TODAY. High-Performance Law Enforcement:

  https://www.youtube.com/watch?v=NDNy2fdDOKg&feature=youtu.be
- i2 COPLINK product page:

  https://www.ibm.com/marketplace/cloud/police-software/us/en-us
- *IBM Public Safety Solutions for a Safer Planet*, REDP-5229:

  http://www.redbooks.ibm.com/abstracts/redp5229.html?Open
- Mesa, Arizona PD, *Smarter Policing with IBM i2 COPLINK leads to a safer Mesa*:

  https://www.youtube.com/watch?v=RFm1Sr_PX-Y
- Adams County Sheriff's Office, *Analytics used to uncover hidden correlations that help officers solve crimes quickly*:

  http://www.ibm.com/software/businesscasestudies?synkey=J939223U57868M56
  https://www.youtube.com/watch?v=yddz_CF_gIs&feature=youtu.be

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Robert Fund is the IBM COPLINK Offering Manager. Bob has been with the COPLINK program since its inception in 1996 as a joint project between the Tucson police department and the University of Arizona Artificial Intelligence Lab. Bob served for over twenty-eight years in the Tucson police department. Bob retired from the Tucson police department in 2000, and he joined the newly formed team to commercialize COPLINK. During his tenure with the police department, Bob rose to the rank of Lieutenant and served in many parts of the organization, including patrol, traffic, investigations, community relations, training, and technical services.

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