IJIS Institute

DATA SHARING BETWEEN COMPUTER AIDED DISPATCH SYSTEMS

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INTRODUCTION

This paper explores data sharing between dissimilar Computer Aided Dispatch (CAD) systems by discussing the CAD data sharing paradigm, examining current CAD data sharing efforts, and addressing some of the issues that inhibit CAD data sharing across the nation. Thousands of Public Safety Answer Points (PSAPs) are dispatching first responders to emergency situations initiated by 9-1-1 calls or alarms. The primary tool for managing these emergencies in real-time is the CAD system. The CAD system is the nexus for virtually all initial emergency actions - it provides the command and control support that tracks the emergency and the evolution of events associated with the emergency. The real-time, comprehensive data available within CAD makes it the richest emergency data generator for providing situational awareness and the most logical component for interoperability and data sharing between jurisdictions. This paper identifies some of the issues, methods and agencies involved in CAD data sharing.

This paper is intended for practitioners in emergency management, information technology, situational awareness, or mutual aid management, as well as anyone who is involved in planning, implementing, or operating an emergency communications center where mutual aid or other shared data is a requirement. A glossary of terms and references is included at the end of this paper.

CAD DATA SHARING PARADIGM

When emergency events reach beyond a CAD system's configured jurisdictional boundaries or when resources are required from outside the responding jurisdiction, CAD data sharing becomes the key to improving response time and expanding situational awareness. When CAD data is not shared, inefficiency and increased time for response occurs when compared to an environment where CAD data is shared. For example, when a county fire department with an isolated CAD system requires a mutual aid resource from a neighboring county, they typically use a phone call to: (a) alert the neighboring jurisdiction of the need, (b) identify the requested resource type and ascertain its availability, (c) provide the event and location data, and (d) negotiate the resource. Another example would be that of a police pursuit crossing jurisdictional boundaries having similar requirements - a reliance on phone conversations that may convey only partial information and consume valuable time. Large scale emergencies affecting multiple jurisdictions need immediate coordination of resources and intelligence. The information and coordinated action required for these incidents can, and should be, accomplished seamlessly with CAD to CAD data sharing.

It is important to differentiate information sharing from data sharing. While both methods can improve situational awareness, they differ in the mechanism employed, as Figure 1`illustrates below. For the purposes of this paper:

- Information sharing refers to the direct exchange of information in a manner other than machine-to-machine data element sharing. For example, the locations of emergency assets and apparatus that are displayed via Global Positioning System (GPS) on a map of one system can be presented to a neighboring jurisdiction so both jurisdictions can see the position of those resources.

- Data sharing refers to the direct exchange of data elements between systems where one system (with appropriate "permissions") can affect an actionable response in the other system. For example, CAD system "A" has a fire call and needs to request mutual aid resources from CAD system "B". CAD system "A" makes a query directly to system "B" and receives data on shared fire apparatus availability (in quarters and available, out of service, on a call, etc.). Once the available resources from "B" are verified, "A" can request mutual aide by adding a call for service directly into "B", resulting in dispatched resources.

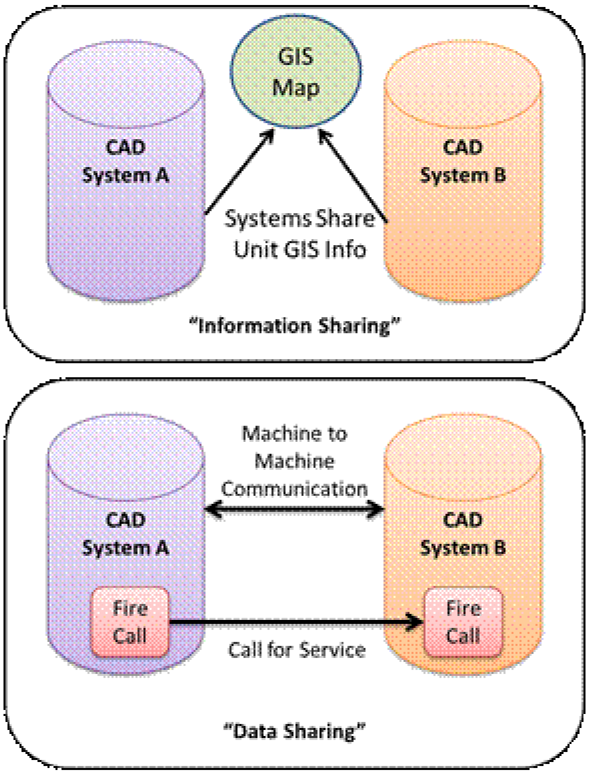

Figure 1: Differences between Information Sharing and Data Sharing

Data sharing in the "machine to machine" sense can be further differentiated by the methods employed to signal and implement the data exchange. These include:

- **PUSH method:** where data elements are cached and made available by a CAD system to any approved third party system.
- **PULL method:** where information is retrieved only when required, and initiated by the requesting system. Both PUSH and PULL methods normally require a translation table to accommodate differences in nomenclature and protocol.
- **BI-Directional method:** where a two-way data exchange is initiated and managed by a data exchange hub where data elements between multiple CAD systems are shared automatically. In BI-DIRECTIONAL mechanisms, the Data Exchange Hub manages and translates any differences in data nomenclature or protocol.

Whether a push, pull or bi-directional method is selected will be driven by the specific use case being addressed and is outside the scope of this white paper.

Sharing CAD's valuable but historically elusive data has been the focus of a number of initiatives over the last decade. These initiatives have been led by organizations like the Bureau of Justice Assistance (www.BJA.gov), Association of Public Safety Communications Officers (www.APCOIntl.org) and the IJIS Institute (www.ijis.org).

BJA, in partnership with the National Institute of Justice (NIJ), sponsored the development of the Standard Functional Specifications for Law Enforcement CAD Systems through the Law Enforcement Information Technology Standards Council (LEITSC), which included functions regarding information sharing. This document is currently being updated to include Fire and EMS functionality by BJA's Unified CAD Functional Requirements Project, co-managed by APCO and the IJIS Institute. The Public Safety Data Interoperability Project (PSDI), also sponsored by BJA and co-managed by APCO and the IJIS Institute, created the "Priority Data Exchanges for Local Communication Centers" which identified 59 high-value data exchanges relating to CAD systems, further demonstrating the need and potential of CAD information sharing.

The IJIS Institute supports many information sharing efforts that benefit CAD data sharing including the current work to support the National Information Exchange Model (NIEM), define NIEM Model Package Description

(MPD) Specifications, and efforts to support the Global Reference Architecture (GRA). Through these and other initiatives and projects by numerous organizations, the promise of CAD data sharing is now a reality that can extend the value of CAD data to improve situational awareness between jurisdictions and assist with incident response across state and local government boundaries.

CAD DATA SHARING EFFORTS

Some representative CAD data sharing efforts and their method of data sharing/exchange include:

LOCATION	METHOD	SOLUTION
Virginia: Fairfax County, Arlington County and the City of Alexandria	Push/ Bi-directional[1]	Data Exchange Hub that automatically routes and normalizes CAD data elements that are pushed from three different CAD systems for the purpose of mutual aid.
California: Silicon Valley Regional Interoperability Project (SVRIP)	Bi-directional	Three agencies (San Jose, Milpitas and Santa Clara) established a pilot system using a Regional Interoperability Information Broker (RIIB) to automate unit status sharing and event transfers between systems.
California: San Diego Regional Interoperability Project	Bi-directional	While only in the early stages, this project employs a HUB broker to allow for complete data sharing that will even allow dispatch automation without the intervention of a dispatcher and Link 58 Fire/EMS and 10 Law Enforcement systems that currently use 9 different CAD systems.
Oregon: Lake Oswego City, the City of Portland, and the counties of Multnomah, Clackamas, Clark, Columbia, and Washington	Push	Design and implement a call for service message and a chat message to be passed between systems. The solution includes a message switch where each PSAP enters call information, location, name, problem, passing remarks, and one callback number into their own system and then transfers that data to another jurisdiction if it is determined that the other agency's resources may be closer to the incident.
Arizona: Cities of Phoenix and Mesa	Pull	Translation tables were developed by the respective system owners to accommodate the difference between data element in the two CAD systems. Custom interfaces were constructed for the two CAD systems for the resource message traffic. Once the message is received, each receiving system translates the message to its own language or protocol, and then processes and acts based on the receiving agency's business rules, which are defined in the system.

Table 1: CAD Data Sharing and Methods of Data Sharing

[1] The CAD systems involved in this project will only publish (Push) a call into the middleware system when that call has met the agency's business rules for transferring a call; however, there is a two-way (Bi-directional) exchange involved as the receiving CAD for a Mutual Aid request responds back to the requesting CAD through the middleware.

ISSUES THAT INHIBIT CAD DATA SHARING

Although the concept of CAD data sharing has been discussed and various initiatives have taken place for a decade, real sharing, with different methods being deployed and having varying degrees of efficiency, have only been in practice for a relatively short time. The primary factors which have inhibited CAD data sharing are:

- Many CAD systems in use today were not originally designed to share data and have no standardization in data element nomenclature or protocol. In most cases these systems were designed 20 to 30 years ago, and although more technically challenging, these systems can more often than not share data.
- Many systems were implemented by an agency as a stand-alone system and simply not configured or set up to share data, or for various reasons, the agency did not acquire the capability from their providers.
- Historically, the "mindset" of many agencies was one of 'we own our data', 'we don't want to share it', or 'we can handle anything and don't need help'. Today, the concept of data ownership has transitioned to the mindset of data stewardship and a sense of responsibility to share data where possible. Additionally, tough economic times have demanded the efficiencies provided by mutual aid and data sharing initiatives.

The move toward CAD data sharing removes the barriers of “stove pipe” data-silo systems, but are we truly removing the silo or just creating a larger silo? A significant concern is that the important practice of CAD data sharing is often implemented without the data message commonality that will allow CAD data sharing projects to interoperate with other regional projects – (i.e. the data sharing initiative is unique and incompatible with other CAD data sharing efforts.) If the development of CAD data sharing projects continues without employing the use of open standards such as NIEM and GRA, and without a national sharing focus, we risk creating even larger stovepipes of data and preclude the possibility of linking the projects into a state, regional or national CAD data sharing network.

Implementing NIEM standards for data element definitions will provide the commonality needed to allow CAD data sharing projects to interoperate. NIEM strives to establish and make standard the data elements and data dictionary so that these arbitrary elements are rooted in a common eXtensible Markup Language (XML) vocabulary base. NIEM accomplishes this through the use of Model Package Description (MPD) Specifications, specifically the Information Exchange Package Documentation (IEPD).

The IEPD is the mechanism that standardizes the semantics of a message shared between data systems. For each message, an IEPD is developed consisting of mutually supportive artifacts (including XML schema). These artifacts define the specific content of the information exchange message. The NIEM IEPD can also be used by self-describing Web Services called Web Service Definition Language (WSDL) - an open standards-based software component supporting machine-to machine interaction via standardized messages. An IEPD can be used in conjunction with a WSDL to clearly and unambiguously specify a web services interface by employing (or creating) IEPDs to establish the common language for data sharing. These tools isolate the proprietary components of underlying systems, and allow for true data sharing and data exchange.

EMERGING SOLUTION – THE NEXT GENERATION 9-1-1 EIDD EXCHANGE

A planned component of the Next Generation 9-1-1 (NG9-1-1) initiative is the development of a national, standardized NG9-1-1 NIEM-conformant Data Exchange Model called the Emergency Incident Data Document (EIDD). The EIDD exchange is planned to support not only the data required by NG9-1-1, but also support CAD data relevant for PSAPs to share – for CAD-to-CAD call transfers, unit updates, situational awareness, CAD-to-RMS (Records Management Systems), etc. This exchange will greatly enhance public safety interoperability and will likely be one of the most valuable and significant projects to advance information sharing for the more than 6,000 primary and secondary public safety communication centers, along with the first responders and emergency management agencies they support. The EIDD project is spearheaded by the National Emergency Number Association (NENA) and APCO. The promise of EIDD is that it will be the superset, standardized model which has the ability to provide broad scale CAD data sharing and link the so-called data silos, both large and small.

CONCLUSION

CAD-to-CAD data sharing is imperative if we are to bring public safety communications into a realm that truly fosters immediate, lifesaving situational awareness. Currently, there is no single "best" solution for implementing CAD data sharing, but it is clear that systems, if they are to be propagated without forming regional data silos, must employ open standards for this purpose. The stove pipe effect can be eliminated through implementation of the open data exchange standards defined in NIEM, the current standard for information sharing that is commonly used across the broad justice, public safety, emergency and disaster management, intelligence, and homeland security enterprises. The standards are derived from actual data exchanges supporting day-to-day operations at all levels of government.

Each jurisdiction will have to determine which method is right for their application, but regardless of the method chosen, CAD data sharing must include the ability to expand and interconnect with additional systems, and the method employed must ensure commonality in CAD data exchange.

In conclusion, the authors of this paper and the IJIS Institute make the following recommendations:

1. The managers of PSAPs and Emergency Communications Centers and CAD providers should research and adopt the NIEM and the GRA national standards to help meet the overarching goals of consistent, effective CAD data sharing. The NIEM model can be accessed at www.niem.gov and the GRA at http://it.ojp.gov/default.aspx?area=nationalInitiatives&page=1015;
2. The managers and directors of PSAPs, emergency communications centers, EMS agencies, fire departments, law enforcement agencies, emergency management agencies, homeland security, transportation organizations, and public safety software providers should enthusiastically support the creation, adoption, and use of the NG9-1-1 EIDD Exchange.

ABOUT THE IJIS INSTITUTE

The IJIS Institute unites the private and public sectors to improve critical information sharing for those who provide public safety and administer justice in our communities. The IJIS Institute provides training, technology assistance, national scope issue management, and program management services to help government fully realize the power of information sharing.

Founded in 2001 as a 501(c)(3) nonprofit corporation with national headquarters on The George Washington University Virginia Science and Technology Campus in Ashburn, Virginia, the IJIS Institute has grown to nearly 200 member and affiliate companies across the United States.

The IJIS Institute does its valuable work through the contributions of its member companies. The IJIS Institute thanks the Emerging Technologies Advisory Committee for their work on this document.

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LINKS TO MORE INFORMATION

The IJIS Institute
http://www.ijis.org

ACRONYMS

APCO	Association of Public Safety Communications Officials International
CAD	Computer Aided Dispatch
EIDD	Emergency Incident Data Document
IEPD	Information Exchange Package Documentation
IJIS	Integrated Justice Information Systems Institute
MPD	(NIEM) Model Package Descriptions
NENA	National Emergency Number Association
NG9-1-1	Next Generation 9-1-1
NIEM	National Information Exchange Model
WSDL	Web Services Description (Definition) Language
RMS	Records Management System