UFF Position Statement:
Data and the Modernization of the Fire Service

The core values of the fire service are to protect lives, property, and the environment through preparedness, prevention, public education, and emergency response. Fire service leaders want to deliver on these values while emphasizing quality services, efficiency, effectiveness, and safety. To do that, they must surround themselves with information from varied and often nontraditional data sources. Data, and the knowledge it contains, are the **life blood** of the fire service. Soon, every service that fire departments deliver will either be based on data or have a data component.

One of the most important jobs in a fire department will soon be data related. Fire department data experts will include:

- data collection, cleaning, and preparation
- data management
- data protection
- data governance
- data analysis and reporting
- results translation into intelligence for decision-making

Fire chiefs and other officers need data for immediate and long-term decision-making. The ability for fire service leaders to tell the story of their department's value is essential to protecting or enhancing resources for emergency response, training, prevention, and more.

Types of Data

Today, fire and emergency services leaders have access to massive amounts of data, both structured and unstructured. Structured data are typically well organized and easily formatted in searchable databases like address, incident numbers, and response times. Unstructured data have no predefined format, making it much more difficult to analyze like social media, dispatch radio recordings, and traffic cameras. Data capture, procurement and preparation of both structured and unstructured data are fundamental to assuring sound analytics and data visualization. Both are vital to mining the intelligence from data and presenting it in clearly to decision makers.

Fire Departments in the U.S. have historically recorded emergency response incident data. Incident data have provided information categorized by broad emergency call types, including fire, emergency medical, technical rescue or hazmat. Many fire departments use CADs and records management system (RMS) software to define and record subtypes with more granular information in each of the broader categories. Capturing as much incident data as early as possible is necessary to better match the resources deployed to the risk event, thereby reducing vulnerability to negative outcomes.

In addition to incident data, there are various other data sources available to U.S. fire departments. These data sources can be compiled or layered with incident data to provide greater insight for decisions. Available sources include the following.

- Census Community Demographics
- American Community Survey
- Social Vulnerability Index (SVI)
- Geospatial data
- Weather
- Community risks/hazards
- Computer aided dispatch (CAD)

Data Modernization and Technology

Cloud-Based Service

Cloud-based data storage, processing and analytics are no longer a future consideration but should be in place in local fire departments, state/provincial fire marshal offices and the USFA National Data Center. Using secure cloud-based data storage also provides opportunity for secure encrypted data exchange that the fire service does not currently enjoy. Secure File Transfer Protocol (SFTP) is a file protocol for transferring large files over the web. SFTP transfers files securely using encrypted commands to avoid password sniffing and exposing sensitive information. Since the sender needs to be authenticated by the server, SFTP also protects against cyber-attacks. SFTP offers new opportunities for near real-time fire service data exchange between local, state, and national data sets.

New Technology

New Technologies, including bystander camera feeds and social media, are making it possible to transmit data to responding crews prior to arrival. This early information can be helpful in:

- positioning units on scene
- reducing time to assemble equipment for intervention
- understanding the best point of engagement with the incident to stop risk escalation

Post-incident data, ranging from photos of the mechanism of injury to fire origin and spread, are also valuable. Data obtained by incident command boards and by dispatchers during a call can provide valuable insights about responding crews' operational performance on scene.

Artificial Intelligence and Machine Learning

AI is the sophisticated statistical analysis of massive amounts of data. Most AI today is known as *narrow AI*, functioning from engineered scripts to mine datasets and generate results. One type of narrow AI is known as machine learning (ML). Machine learning has great promise for the fire service when given a consistent data feed. For example, quality incident data coupled with time of day, geolocation and community hazard/risk data can be used to "train" ML models. ML can then be asked to draw conclusions based on observed examples of tasks, such as is needed for apparatus move-ups. ML can assess data from various data feeds to determine where the remaining (unassigned) apparatus should be relocated to cover the community and respond to the "next" emergency incident.

ML involves searching data for trends, patterns and anomalies that may not be obvious to a human observer. In an emergency response system, an ML algorithm could learn to send proactive alerts when

apparatus deployment thresholds are exceeded. Another illustration of ML can be observed in firefighter wearable sensors. These sensors can provide proactive alerts when a firefighter's body temperature, heart rate, respiratory rate, or blood pressure exceeds a certain threshold, allowing incident commanders to act before a potential injury or death. It is also possible to train ML response models with unstructured data that tend to be qualitative in nature. For example, social media or traffic camera data coupled with incident information, can be used to create machine learning algorithms for effective response force model classification.

Internet of Things (IoT)

IoT is one of the fastest-growing categories of data connection and collection. From vehicle-based sensors that can provide speed, occupancy, direction of travel, vehicle position, rate of deceleration, and many other metrics at the time of a crash, to billions of cellphones that stream data such as caller location (now even vertical positioning), traffic patterns, and health information. The fire service can learn more about the community and people it serves through IoT than any legacy process currently used.

Recommendations

1) Fire and emergency services departments should prepare for increasing data integration into everyday activities. Establishment of more automated data capture and the proliferation of data from all aspects of the fire service is necessary.

2) Fire Service Leaders must assure they allocate financial resources for personnel and technological capability for data capture, management, protection, governance, analysis, reporting, and intelligence translation.

3) Data, and all that goes with it, must become a major focus of internal training for all personnel. Firefighters must become increasingly data literate, being savvy to understand the ramifications of accurate data entry, report writing and consistency… or the lack thereof.

4) Leaders must also gain greater data acuity for responsible decision making.

5) Fire Chiefs should identify opportunities to integrate technology including artificial intelligence and machine learning into everyday responsibility.

6) Partnerships with the technology industry should be pursued at a national level so that publicly shared data can be coupled with response data to better understand local communities and how to better provide fire department services.

7) The National Data Center and the National Fire Incident Reporting System (NFIRS) should be modernized to include a cloud-based operation and data transfer via SFTP capability for fire departments to submit data directly.

Conclusion

Since the importance of using data is no longer a question, the major challenge facing fire departments is how to process more data faster… for preparedness, prevention, operational insights, and firefighter safety and wellbeing.