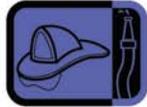




Issue Brief



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Performance Measurement and Interoperability

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SEARCH

It has been well over 5 years since the September 11 terrorist attacks. The public expects—and demands—that public safety agencies do their job. This means dozens (possibly hundreds) of first responder agencies working *and communicating* effectively during a catastrophic incident. It also could mean hundreds, if not thousands, of public safety personnel working together *toward common ends*.

Now is the time to conduct a complete and accurate assessment of the ability of first responders to communicate with one another when, where, and how they

need to. This assessment can help reveal the lack of consistent, comprehensive interoperable communications *before* another catastrophic event occurs.

This *Issue Brief* will define interoperable communications, performance measures, the SAFECOM Interoperability Continuum, and provide predictive modeling/statistical measurement solutions. This *Issue Brief* also presents an overview of how these concepts could be combined to develop a solution for **performance measurement and interoperability**.

Interoperable Communications Defined

SAFECOM, a program within the Department of Homeland Security (DHS), defines interoperable communications as:

“...the ability of public safety agencies to talk across disciplines and jurisdictions via radio communications systems, exchanging voice and/or data with one another on demand, in real time, when needed, and as authorized.”

Dan Hawkins, Director of Public Safety Programs at SEARCH, The National Consortium for Justice Information and Statistics, succinctly describes interoperability as: “The ability of agencies to work together toward common ends.”¹ Thus, interoperable communications could also be defined as: **effectively using communications to enable agencies to work together toward common ends**.

¹ This definition appears in *Law Enforcement Tech Guide for Communications Interoperability: A Guide for Interagency Communications Projects*, published by the U.S. Department of Justice Office of Community Oriented Policing Services, 2006. Hereafter, *Interoperability Tech Guide*. Available in print from the COPS Office Response Center, 800.421.6770, and electronically at <http://www.cops.usdoj.gov/ric/ResourceMain.aspx?RID=238>.



Interagency communications is a core required ability for first responders in a catastrophic situational response. It is also a core enabling component of effective day-to-day public safety service. On a daily basis, first responders need to be able to effectively communicate across jurisdictional boundaries with *whom* they need to, *when* they need to, and *how* they need to. Examples of the daily interagency communication requirements include these scenarios:

1. A police pursuit crossing jurisdictional boundaries or an officer conducting a routine traffic stop in another jurisdiction that has a different radio system

Interagency communications enables officers in the appropriate jurisdiction to be aware of an outside agency officer's presence, actions, needs, and safety status.

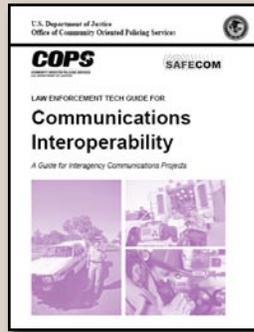
2. Fire department and emergency services personnel responding to a multivehicle accident on a common interstate. Effective coordination and control are critical from a scene management perspective.

Interagency communications enables clear, efficient coordination of resources and incident response.

3. Emergency services personnel respond to a mutual medical aid call, where they coordinate resources. A core enabling component of effective Incident Command System (ICS) leadership is communications.

When multiple agencies respond to a mutual aid call, interagency communications becomes critical.

As with any kind of training, high standards of quality and consistency are paramount. Consistent daily use of interagency communications enables effective communications in a time of crisis. The critical point is that **interagency communications has a key, strategic value for public safety agencies each and every day.**



Law Enforcement Tech Guide for Communications Interoperability: A Guide for Interagency Communications Projects, produced by SEARCH under COPS Office sponsorship, is available from the COPS Office Response Center, 800.421.6770, and at <http://www.cops.usdoj.gov/ric/ResourceMain.aspx?RID=238>.

Measurement: A First Step to Improved Communications

“Measurement is the first step that leads to control and eventually to improvement. If you can’t measure something, you can’t understand it. If you can’t understand it, you can’t control it. If you can’t control it, you can’t improve it.”

— H. James Harrington

Interoperable communications is a core enabling element of an effective multiagency, cross-discipline, multi-jurisdictional critical incident response. A catastrophic event could manifest in the form of a terrorist attack and may include a chemical, biological, radiological, nuclear, or explosive (CBRNE) incident. The incident could potentially be a natural disaster—such as a fire, flood, hurricane, or earthquake—or a wide-scale accident, such as a train derailment involving hazardous materials or a structural collapse.

The potential catastrophic scenarios are endless, but the need for interoperable communications is a common thread for any effective emergency response.

The lack of specific performance measures for interoperable communications is a major concern. Since the 9/11 attacks and with the threat of terrorism still present, the American public and





policymakers demand accountability for the resources allocated toward interoperable communications. They also expect a significant improvement in the way interoperable communications is used to ensure public safety.

A logical first step is to **measure the current state of communications interoperability and use that measure as a baseline for improvement.**

Communications During Catastrophic Events

After-Action Reports issued by New York City and Arlington County (Virginia), as well as the 9/11 Commission Report that followed, identified the lack of interoperable communications as a significant deficiency in the effective coordination of public safety response (police, fire, and emergency services agencies) at the World Trade Center and Pentagon. This very serious, but anecdotal, evidence points to significant problems.

During the attacks, police, fire, and emergency services were called on to coordinate and handle numerous tasks, the most time-sensitive and critical being

the evacuation of victims. Sadly, a lack of effective interoperable communications during the response and evacuations contributed to the chaos.

Police and fire department personnel used different radio systems that did not enable them to communicate effectively with one another. There was no existing system of interdisciplinary, interjurisdictional governance, standard operating procedures, technology, training and exercises, and regular communications usage (the five elements of interoperability, as outlined in the SAFECOM Interoperability Continuum).

The **result** was a delay in evacuations that contributed to a tragic loss of life.

More recently, Hurricane Katrina brought to light serious deficiencies in the public safety response *at all levels*, and the associated critical lack of necessary communications for operability, as well as interoperability, in a time of crisis.

With each successive event, the public and policymakers are increasingly demanding solutions to the clearly articulated interoperable communications problems.

SAFECOM Interoperability Continuum

SAFECOM, a program of the DHS, has been in the forefront of developing real-world solutions to the interoperable communications problems that public safety agencies face in the United States and internationally.

The Interoperability Continuum detailed by SAFECOM (Figure 1) illustrates the entire range of interoperable communications, from a *Minimal Level* on one end of the spectrum, to an *Optimal Level* on the other end.

The core goal is for a high degree of interoperable communications to enable public safety agencies to respond, contain, control, and coordinate effectively at a critical incident scene(s). The Interoperability Continuum provides an excellent quick reference visual guide for assessing *what* the optimal levels of interoperability are and, more important, *where* they are.



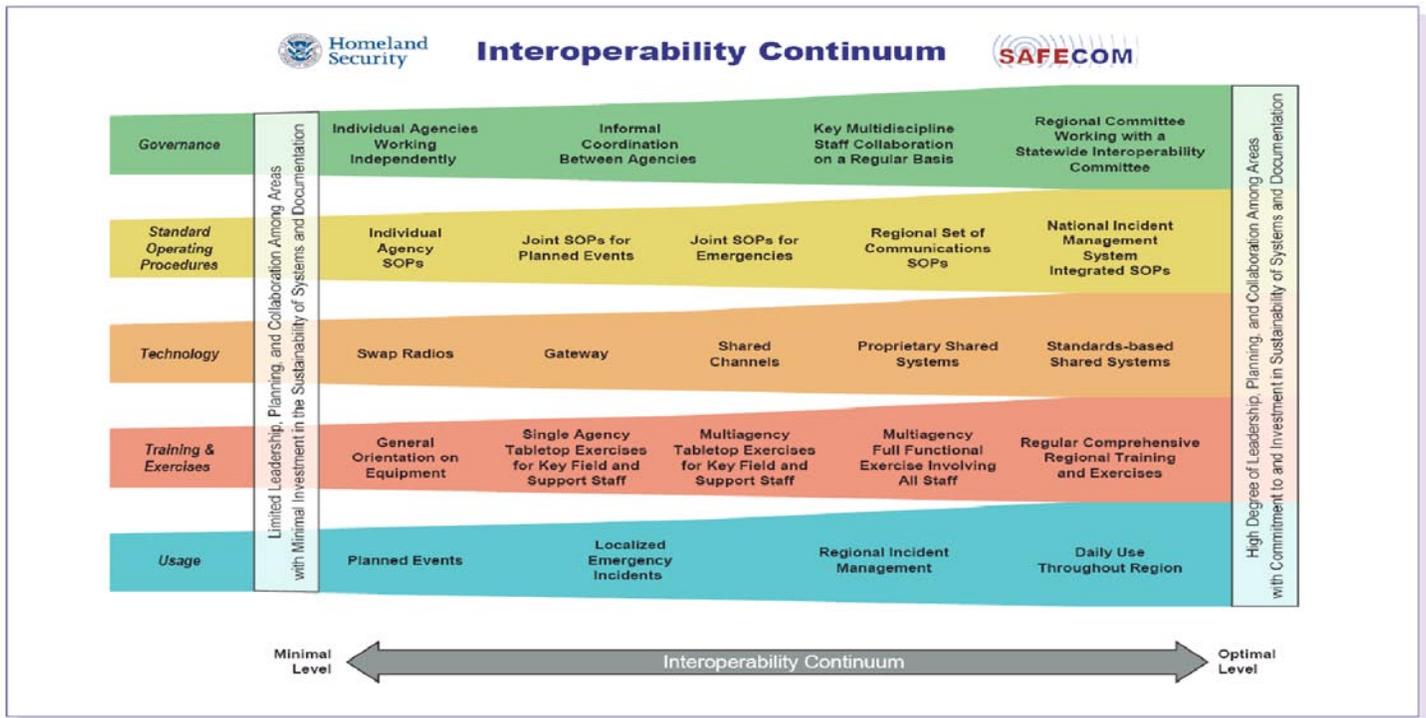


Figure 1: SAFECOM Interoperability Continuum

SAFECOM National Interoperability Baseline

In 2005, SAFECOM initiated a multi-phased nationwide baseline interoperability assessment. The objective was to obtain very specific information from the public safety community with a goal of understanding the current state of interoperability. The survey was conducted in the latter part of 2006.

The SAFECOM baseline assessment uses the **five elements of interoperability**. These elements are introduced in the Interoperability Continuum to illustrate more clearly the core interagency communications factors.

Thirteen measurable subelements of the five high-level criteria were identified (as shown in Table 1). These 13 categories further define the overall interoperable communications elements of Governance, Standard Operating Procedures, Technology, Training and Exercises, and Usage.

Interoperability Continuum Element	Baseline Assessment Sub-Element
<i>Governance</i>	Leadership Decision-making Groups Agreements Interoperability Funding Strategic Planning
<i>Standard Operating Procedures</i>	Policy, Practices, and Procedures Command and Control
<i>Technology</i>	Approaches Implementation Maintenance and Support
<i>Training and Exercises</i>	Operator Training Exercises
<i>Usage</i>	Frequency of Use and Familiarity

Table 1: SAFECOM Baseline Assessment Elements (2005)

As noted in the *Interoperability Tech Guide* (page 230):

“Descriptive measures of each sub-element were developed for assessing whether an organization was in an early, moderate, or full stage of development for communications interoperability... This measurement

tool arising from the original Interoperability Continuum, consisting of the elements, their sub-elements, and the descriptive measures for each stage of development, was the basis for the baseline assessment matrix.”

Public Expectations for the Public Safety Response

In the most fundamental terms, police, fire, and other public safety agencies exist to protect public safety. Their reason for existing is succinctly stated in the mission statements of the majority of law enforcement agencies: “To protect and serve... .”

The public’s reasonable expectation is that in a time of crisis, public safety agencies will appropriately respond and fulfill their stated mission (to protect life and property). As this relates to responding to catastrophic events, such as a CBRNE attack, a natural disaster, or an accident, the public expectation is that public safety agencies will respond and react in an appropriate manner to mitigate the damage.

The public entrusts police and fire departments with a tremendous amount of power and a correlating responsibility. The operating budgets of police, fire departments, and emergency services, funded by the public, are often the largest single recurring expenditure in city government. Public safety is also a major expenditure at the state and federal level.

The *Interoperability Tech Guide* addresses the public’s expectations as follows:

“What does the public expect? That’s not an easy question, but when Mrs. Smith calls 9-1-1, she doesn’t want to hear about turf



issues and technological incompatibilities. She expects services will be delivered promptly and effectively to address her emergency. No amount of explanation of jurisdictions, policies, or radio failures will matter (or be acceptable) in time of need.” (p. 13)

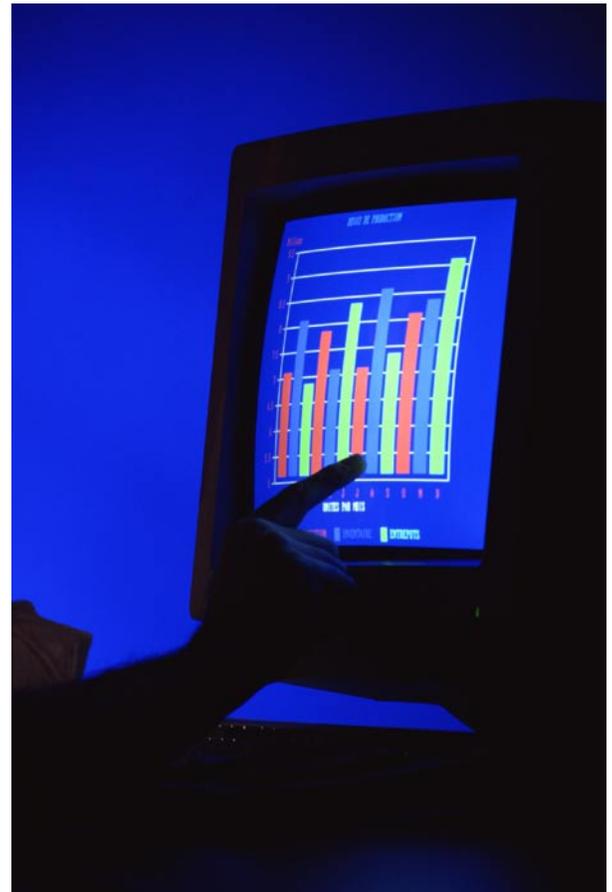
Performance Measurement and Management

“Performance measurement, in simplest terms, is the comparison of actual levels of performance to pre-established target levels of performance... . Performance-based management essentially uses performance measurement information to manage and improve performance and to demonstrate what has been accomplished. In other words, performance measurement is a critical component of performance-based management.”²

David J. Roberts, former deputy executive director of SEARCH, describes eight facts about performance measurement.³ As a

² Artley, Will, D.J. Ellison, and Bill Kennedy, *The Performance-Based Management Handbook, Volume 1: Establishing and Maintaining a Performance-Based Management Program* (Washington, D.C.: U.S. Department of Energy, 2001) p. 4. See <http://www.ora.gov/pbm/pbmhandbook/pbmhandbook.html>.

³ *Law Enforcement Tech Guide for Creating Performance Measures That Work: A Guide for Executives and Managers*, published by the U.S. Department of Justice Office of Community Oriented Policing Services, 2006. Hereafter, *Performance Measures Tech Guide*. Available in print from the COPS Office Response Center, 800.421.6770 and electronically at <http://www.cops.usdoj.gov/ric/ResourceMain.aspx?RID=275>.



quick reference, he details how performance measurement does the following:

1. Improves the delivery of services.
2. Improves communications.
3. Helps justify programs and their costs.
4. Demonstrates accountability and stewardship of taxpayer resources.
5. Meets government-mandated requirements.
6. Is useful for problem identification.
7. Is used in the assessment of projects and activities.
8. Constructs a better understanding of the legal system and its interconnection with larger social and economic goals.

Six Core Steps of Performance Management

The six steps listed in Figure 2 detail the **core elements of a performance management-based program**, which pertain to defining, articulating, measuring, and improving performance. The six core elements are the following:

1. Identify problem and goals.
2. Establish performance measures.
3. Establish accountability.
4. Establish a system for collecting data.
5. Analyze the data.
6. Track the performance to drive improvement.

The six steps have direct relevance to the core issues of this *Issue Brief*, in that they **identify critical elements or problems**, and address **measurement, analysis**, and most important, **improvement**. The *Performance Measures Tech Guide* can be used as a model to drive improvement for interoperable communications performance measures. The Guide discusses increasing the performance of public safety agencies in general, but elements of the detailed methodology it describes could be focused on specific areas, such as interagency communications.

Measures

The measurable element is critical because if public safety organizations cannot measure their progress on the

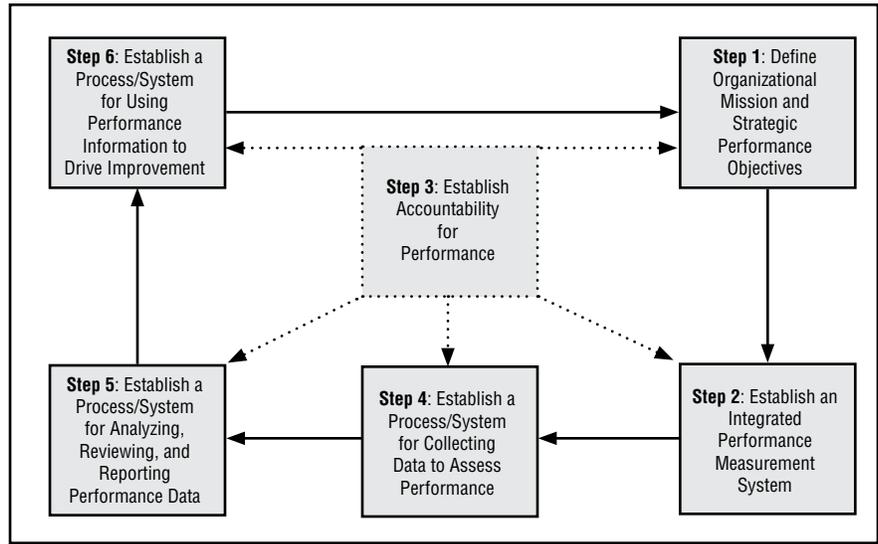


Figure 2: Six Steps to Establish a Performance-Based Management Program

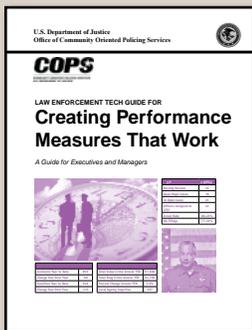
Interoperability Continuum, there is little realistic chance that they will make substitutive improvements that will correlate with increased public safety.

Credit Scoring as an Analogy

In the same way that banks extend credit to homeowners, the American public extends the “credit” of public safety to first responders. There is no a guarantee that harmful events won’t occur, but there is a reasonable expectation that if a crisis does occur, public safety agencies will respond appropriately with the needed resources. Just as an individual’s creditworthiness deteriorates when a loan is not repaid, the creditworthiness of public safety agencies diminishes when they don’t respond effectively.

Banks lend prospective homeowners money to finance the purchase of homes. There is a substantial potential risk to banks if the loan recipients default on the home loans. Lenders use probability modeling services and solutions to assess risk. A common risk analysis tool used by creditors is the Fair Isaac Corporation’s designated FICO Score®. Probability modeling quantifies the likelihood of an event occurring. The focus of lenders’ risk assessment is the likelihood that a loan recipient will repay the loan in accordance with the mutually agreed-on terms and conditions.

For instance, FICO scoring lists individuals’ credit scores on a 300–850 scale, with 300 as very risky (not creditworthy) to 850 as minimally risky (very creditworthy). No such quantitative measurement currently exists for interoperable communications, but if it did, a jurisdiction or region with optimal scores for all interoperability metrics may have, for example, an 850 score. A region with little interoperability may have a 300 score. That is a simplified, fairly extreme example, because few regions would have the highest or lowest scores, just as the majority of individual FICO scores fall somewhere between 300 and 850.



Law Enforcement Tech Guide for Creating Performance Measures That Work: A Guide for Executives and Managers, produced by SEARCH under COPS Office sponsorship, is available from the COPS Office Response Center, 800.421.6770, and at <http://www.cops.usdoj.gov/ric/ResourceMain.aspx?RID=275>.

Just as creditors periodically assess the financial strength of their clients, such a system developed for interoperable communications would provide to the public a quantitative measure informing them of public safety agencies' communications strengths or weaknesses. The focus here is on accurate, open, and timely risk-level status reporting to public safety agency stakeholders: the American public.

All organizations that support public safety agencies—hardware/software vendors, equipment manufacturers, and training and consulting services—need to share the burden of public safety responsibility. In the same way that the creditworthiness of public safety agencies diminishes when they don't respond effectively, the creditworthiness of supporting organizations diminishes when they don't support public safety agencies effectively to fulfill their mission.

Performance Measures for Interoperability: A Call-to-Action and Proposed Solutions To Be Used for Measurement

The core 13 interoperable communications criteria established by SAFECOM already exist. The next step is to quantify where municipal departments, regional working groups, and state and federal agencies are on the continuum. For reference, the 13 criteria are:

1. Leadership.
2. Decision-Making Groups.
3. Agreements.
4. Interoperability Funding.
5. Strategic Planning.
6. Policy, Practices, and Procedures.
7. Command and Control.
8. Approaches.

9. Implementation.
10. Maintenance and Support.
11. Operator Training.
12. Exercises.
13. Frequency of Use and Familiarity.



Weighted or Nonweighted Scoring

The public safety community needs to work toward effectively developing methods and specific strategies for interoperable communications and to add a specific **quantitative** element to complement the existing **qualitative** analysis. Scoring of the 13 categories listed could be either weighted or nonweighted.

Nonweighted

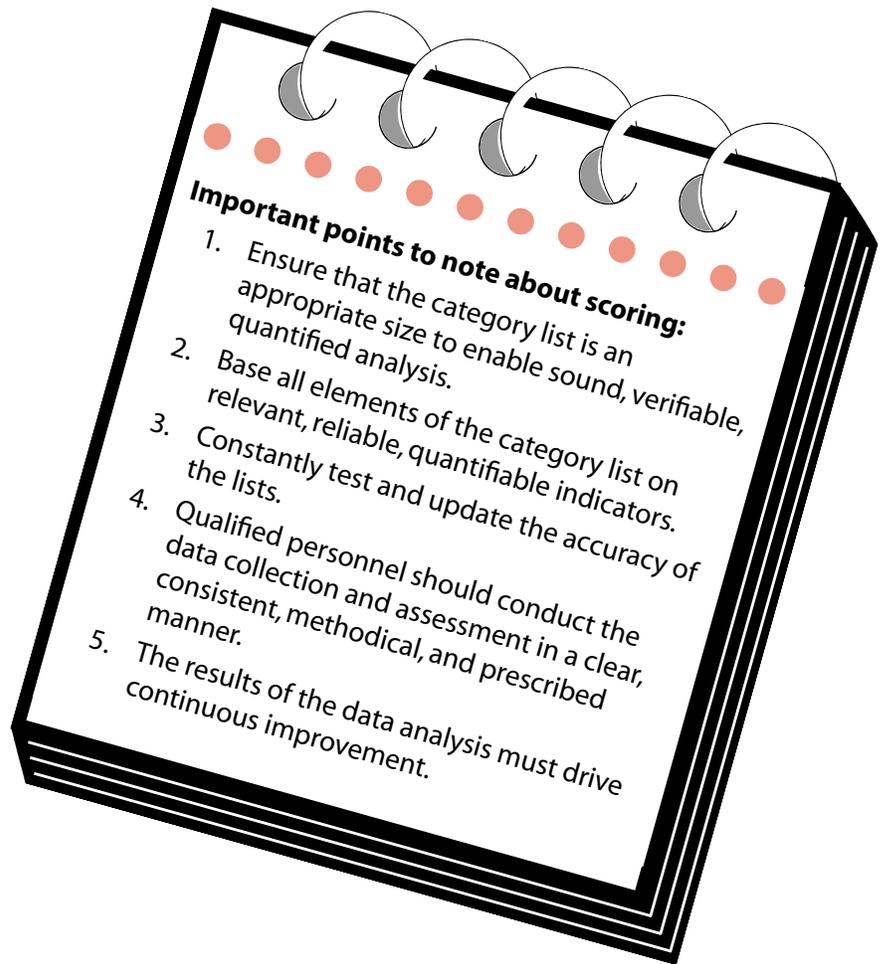
An Optimal Level of interoperable communications in all categories would translate to a score of 100 percent. One hundred percent divided by the 13 categories equals a score of 7.7 for each (i.e., 1. Leadership, 2. Decision-Making Groups, etc.).

If the 13 categories were determined to not be an adequate category sample size, the category list could be further developed. For instance, 130 categories could be identified, with a nonweighted score of .77 each.

Weighted

Different weights could be assigned to the different categories. As noted above, the sum of all the weighted criteria would be at the Optimal Level of interoperable communications: 100 percent.

The specific weights for the different categories would be determined by the same broad-based, comprehensive analysis that SAFECOM used when it originally developed the criteria in early 2005. SAFECOM is already at the forefront of developing solutions to the issues of interoperable communications; applying a quantitative element just builds on what they have already developed.



Scores and the Yet-To-Be Determined Average

Scores for the assessed jurisdictions or regions would be noted using a 1–100 percent scale. Over time, a statistically sufficient sample size of regional scores would be obtained. Once the average scores were determined, a region's interoperable communications levels could be compared to the average of comparable regions. Based on a region's deviation from the average, a more accurate picture could be developed to see if it was below, at, or above the average level of quantified communications interoperability, as represented by the SAFECOM Continuum. The baseline assessment conducted by SAFECOM in 2006 is such a comparative measure.

Thoroughly researched solutions and policy decisions should establish the

baseline level of acceptable interoperable communications. National standards based on rigorous research need to be set. Resources and ongoing support need to be provided so public safety organizations can attain the objectives and goal.

Why Score the Criteria?

Quantifying a weighted value for each of the criteria is not an easy task. Weighing the value of Leadership, for instance, within the Interoperability Continuum, and being able to assess the value in a scientifically sound, statistically verifiable manner will be challenging.

Leadership levels could be measured, with attributes being rank-ordered. Using grade scoring as a simple model, for example, would result in these scores: 0 = failing (F), 1 = minimal (D), 2 = moderate (C), 3 = above average (B), 4 = excel-

lent (A). The scoring methodology would have to be designed by the appropriate, skilled, experienced entity.

As noted earlier, the time to act is *now*, before another catastrophic situation reveals the lack of consistent interoperability by first responders. The model and detailed protocol for specific scoring and measurement can be developed using the resources and collective minds that are already committed to finding real-world solutions to the challenges of interoperable communications. The combined work of SAFE-COM, SEARCH, and statistical modeling enterprises provides the framework for a solution.

Assessment/Measurement: A Four-Part Process

The process of specifically measuring interoperable communications involves four parts (three are modified from existing processes, and one is new). The goal of using four different assessment/measurement techniques would be to develop a comprehensive information base. On its own, any one of the four techniques would not necessarily provide a valid source of verifiable information to accurately assess a jurisdiction's or region's level of interoperable communications.

1. The participating groups would complete **Tactical Interoperable Communications Plans** (TICP). The TICP details a Regional Overview, Governance Structure, Communications Equipment Inventory, Standard Operating Procedures, Scenario Response, and National Incident Man-



agement System (NIMS) training. The TICP is developed to identify existing resources and agreements needed to prepare first responders (from a communications perspective) for likely emergencies requiring multiagency response. The TICP would provide a baseline working reference document.

2. As part of the above process, a **table-top exercise** would be conducted with all participating agencies to include a parallel quantified analysis of the 13 SAFECOM-defined criteria, noting the appropriate sample size. The data collected by a designated impartial Performance Measurement team would use an appropriate sample size of the core articulated Interagency Communications criteria.⁴
3. A **full-scale exercise** would be conducted in the existing prescribed manner to include a parallel quantified analysis of the 13 SAFECOM-defined criteria, noting the appropriate sample size.

⁴ This process parallels steps 4 and 5 in the *Performance Measures Tech Guide*, "Establishing a system for collecting data" and "Analyzing the data."

4. An independent, **post-implementation audit** would be conducted by an appropriate impartial entity. The audit would reconfirm the quantified SAFECOM criteria. Regions that had completed the above steps would be audited by a qualified auditing team to assess the 13 criteria a fourth time. For instance, an audit team could review an agency to see where the agency was along the interoperability continuum and what the agency's "Frequency of Use and Familiarity" or "Maintenance and Support" levels were. It should be stressed that this final part of the Assessment/Measurement process is very challenging. It must be conducted by individuals who have had the training, experience, and skills needed for a professional audit.

Combined, the four techniques for analysis would provide a more accurate measure of interoperable communications performance.



Measuring Effects, Not Capabilities

Interagency communications is certainly a key resource in many operations, but it is just part of the interagency processes through which mutual services are delivered. The outcomes and impacts of those processes—not some technical capacity to communicate—are the appropriate subjects of performance indicators.

—Interoperability Tech Guide, p. 235

A methodology for the data collection process is detailed in the *Performance Measures Tech Guide*. The author discusses using data to assess public safety performance measures, but the Guide is not specifically geared toward interoperable communications performance. With that said, the methodologies in the Guide are logically sound and a model for communications-focused performance measures and assessment. As page 78 of the *Performance Measures Tech Guide* notes:

“Once data sources have been identified, the Performance Management Team should carefully craft the data collection process as part of the Data Collection Plan. The process will define what data will be collected, the source of the data, procedures that must be followed in gaining access and capturing the data, any cleaning or conversion required of the data, and data capture procedures and methodologies.”

Statistical Models and Partnerships

Using very sophisticated statistical models, predictive modeling-focused organizations develop and implement solutions for organizations to accurately assess risk.

The design of the solutions provided by analytic services includes the following three elements:

1. Quality data to drive accurate results.
2. Precise performance definitions (SAFECOM-defined for interoperable communications).
3. An appropriate sample size and assessment time.

Partnering with organizations with a statistical modeling focus as their core competency could be used as a method for best allocating resources and, most important, developing performance measures of interoperable communications that are statistically sound and accurate.

Conclusion

The elements for developing performance measures for interoperable communications already exist. The next step is to apply a numerical value to the SAFECOM Interoperability Continuum. The Continuum defines the objectives and goals of interoperable communications, and the *Performance Measures Tech Guide* provides a specific “how-to” guide for performance management. The analytic services of enterprises with a statistical-modeling (risk management) focus are currently widely used, and the professional services of trained analysts are accessible. The solution presented would be part of an ongoing process, which would be tested and retested over time to confirm its validity and utility. All of these elements combined would provide the solution to performance measures for interoperable communications.

The overall objectives and goal are clear: accurately measure interoperable communications to drive performance improvement with an end goal of increased public safety. ■

Other Sources

- SAFECOM guides and strategic plans regarding interoperable communications.
- *Law Enforcement Tech Guide for Communications Interoperability: A Guide for Interagency Communications Projects* by Dan Hawkins, published by the U.S. Department of Justice Office of Community Oriented Policing Services, 2006.
- U.S. Department of Homeland Security guides from the Interoperable Communications Technical Assistance Program (ICTAP).



Eight Facts About Performance Measurement of Technology Projects

1. Performance measurement improves the management and delivery of products and services.
2. Performance measurement improves communications internally among employees, as well as externally between the organization and its customers and stakeholders.
3. Performance measurement helps justify programs and their costs.
4. Performance measurement demonstrates accountability and stewardship of taxpayer resources.
5. Performance measurement is a federal grant-funding program requirement.
6. Performance indicators are useful for diagnosing problems.
7. Performance indicators can be used to assess how well projects and activities are working in practice.
8. Valid and reliable performance indicators can be used to construct better understanding of the operation of the legal system, the relationship between the legal system and larger economic or social development goals, and the impacts of various kinds of intervention and reform.

Technical Assistance Available

SEARCH is the technical assistance (TA) provider to the U.S. Department of Justice Office of Community Oriented Policing Services (COPS) Interoperable Communications Technology Program (ICTP). SEARCH is a national nonprofit organization that has provided more than 37 years of expert assistance to state and local criminal justice agencies on the use of information and identification technology. SEARCH has a long-standing program of providing direct, no-cost, tailored TA to law enforcement and public safety agencies in planning for, procuring, implementing, and managing information technology.

Areas of Assistance:

- Effective governance structures development
- Strategic planning
- Infrastructure assessment and development
- Needs analysis and assessment
- Operational requirements development
- Policy and procedure development
- Risk management

To apply for TA in these areas or review additional SEARCH TA focus areas, see <http://www.search.org/services/ta/>.

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