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C2 for Complex Endeavors

Golden Phoenix 07: A Baseline for Assessing Civil Military Coordination for Disaster Response

Topics:
Civil-Military Endeavors
Network Centric Experimentation and Analysis
C2 Assessment Tools and Metrics

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Abstract

Marine Air Group 46 (MAG-46) and Los Angeles area first responders conducted a tactical level field event entitled Golden Phoenix 07 which focused on the intricacies surrounding post disaster logistical and communications support. The event was held July 16 through 26, 2007in the Los Angeles vicinity.

The Command and Control Research Program (CCRP) of the ASD/NII were invited to collect C2 related data in order to establish a baseline for post-Katrina civil-military response to humanitarian disasters. Working in concert with teams from the Naval Postgraduate School and the Space and Naval Warfare Systems Center San Diego, the CCRP team was augmented by data collectors from the USMC Reserve participating in the training event. Specific goals were to:

- Develop a baseline of emergency disaster response coordination and control by quantifying demonstrated connectivity and quality of interactions.
- Measure the impact of the Golden Phoenix event on the level of inter-organizational familiarity and trust.

This paper provides details on the development and execution of the assessment and the baseline of civil-military interaction developed from Golden Phoenix 07.

Introduction

In March 2007, the officer planning the Reserve Marine Air Group 46 (MAG-46) summer 2007 active duty for training events visited personnel from the Command and Control Research Program (CCRP) and briefed on a Civil-Military mutual training event being planned for July 2007 entitled "Golden Phoenix 07." The basic structure of the event grew out of a small local training interaction which took place in the summer of 2006 between MAG-46 and a number of first responders in the Los Angeles area; primarily the Los Angeles County Sheriffs' Department. The success of that event led participants to propose a more ambitious event for the summer of 2007. On the civil side, some 40 organizations participated in some manner. California state and U.S. Federal agencies and organizations such as the California Office of Emergency Services Southern Region, the California National Guard, and the National Reconnaissance Office also became part of the Golden Phoenix Event. A number of event planning meetings resulted in the development of an earthquake scenario that was tailored to permit both individual organization training and mutual support training within the broad scenario.

In tandem with the development of the scenario, three organizations were chartered by the Golden Phoenix event management to gather data during the event for post event analysis:

- The Space and Naval Warfare Center San Diego (SSC SD) Interoperable Communications Technical Assistance Program (ICTAP) under the auspices of the Department of Homeland Security Office of Emergency Communications (DHS OEC)
- The Naval Postgraduate School (NPS) Center for Hastily Formed Networks for the Department of Homeland Security Science and Technology Office (DHS S&T)
- The Command and Control Research Program, an organization under the Assistant Secretary of Defense for Networks and Information Integration ((OSD (NII)).

In April 2007 the three organizations involved in data collection and analysis of Golden Phoenix 07 commenced holding weekly teleconferences to coordinate and synchronize efforts.

In general, SSC SD ICTAP's primary interest is voice communications, so that organization took the lead on that aspect of the assessment and also agreed to head the effort to draft and publish a consolidated after action report.

NPS' interest was centered on networks and data communications, so they led the data communication and physical interoperability analyses.

The Command and Control Research Program (CCRP) within the Office of the Assistant Secretary of Defense (NII) focuses upon (1) improving both the state of the art and the state of the practice of command and control and (2) enhancing DoD understanding of the national security implications of the Information Age. It provides "Out of the Box" thinking and explores ways to help DoD take full advantage of Information Age opportunities. The CCRP pursues a broad program of research and analysis in command and control (C2) theory, doctrine, applications, systems, the implications of emerging technology, and C2 experimentation. It also develops new concepts for C2 in joint, combined, and coalition operations in the context of both traditional and non-traditional missions (OOTW). Given this focus, the CCRP set out to:

- Develop a baseline of emergency disaster response coordination and control by quantifying demonstrated connectivity and quality of interactions.
- Measure the impact of the Golden Phoenix event on the level of inter-organizational familiarity and trust.

This paper primarily focuses on the CCRP data collection and analysis, but the arrangements for data collection and the sharing of all collected data is an important aspect of the arrangements for the analysis of this unique event.

Development of the Data Collection, Analysis, and Training Plans

Establishing overall goals of the Assessment

Starting from the CCRP focus on improving the state of the art and practice of command and control, initial discussions led to the conclusion that despite recent civil-military interactions in a number of emergency response and disaster relief operations, no strong empirical baseline data existed on the coordination and control of such operations. In order to develop such information, significant observations would be needed on coordination and control of Golden Phoenix 07. In addition, Golden Phoenix organizers indicated a desire to quantify the benefit of events such as Golden Phoenix. In order to begin to answer that question, research indicated that one indicator of the value of the event would be the development of increasing organizational familiarity trust between members of participating organizations. From these discussions came the two overarching goals of the CCRP assessment of Golden Phoenix 07:

- Develop a baseline of emergency disaster response coordination and control by quantifying demonstrated connectivity and quality of interactions.
- Measure the impact of the Golden Phoenix event on the level of inter-organizational familiarity and trust.

Selection of the observer/data capture teams

Based on the CCRP funding available for this endeavor, a small core team was formed to develop the Data Collection, Analysis and Training Plans. The intent was that the core team would plan, coordinate and execute the CCRP assessment from beginning to end. For the actual data collection, the core team would be augmented by fifteen USMC Reserve personnel who were being made available for this task by MAG-46. These augmentees would require training in the basic principles of network enabled coordination and control principles as well as in observation techniques and specifics of data recording. The core team was composed of:

- One senior scientist who would oversee and guide the core team on a part time basis and be the senior observer during the event
- One senior analyst who would be the principal coordinator, available for this task about 15-20 hours a week on average and full time during the event
- One senior analyst who would be available for small periods of time before the event but would devote full time during execution
- One analyst who would be available for small periods of time before the event, but who would attend the event and conduct the primary data coding and preliminary analysis after the event

Determination of the attributes needed to provide a basis for analysis

As discussions on the design of the assessment continued, it was decided that the Network-Centric Value Chain be used as the foundation for the development of the coordination and control baseline. That value chain is expressed as:

- A robustly networked force improves information sharing
- Information sharing and collaboration enhance the quality of information and shared situational awareness
- Shared situational awareness enables self-synchronization
- These in turn dramatically increase mission effectiveness

It was therefore clear that to establish the baseline we would need to sample the elements of:

- Connectivity (technical interoperability)
- Information sharing and collaboration
- Quality of information
- Situational awareness

Additionally to measure the impact of Golden Phoenix, it was also necessary to obtain data on organizational familiarity and trust.

Determination of those attributes which can be observed and relevant data captured

The following attributes were selected for capture in this event:

- *Connectivity (Technical Interoperability)*: Technical Interoperability is defined as the physical capability to exchange information in a useable format. It includes the availability and reliability of requisite equipment and networks.
- *Semantic Interoperability:* Semantic Interoperability is the ability of two or more users to exchange information and have the meaning of that information accurately and automatically interpreted by all parties.
- *Willingness or Reluctance to interoperate:* Willingness to Interoperate is the willingness and desire to openly share information, free from social, political, legal, policy or other constraints.
- *Information Sharing:* Information Sharing is the making of information available to participants (people, processes, or systems). It includes the cultural, managerial and technical behaviors by which one participant leverages information held or created by another participant.
- *Shared Awareness (Situational Awareness):* Shared awareness comes when two or more parties both have the information and agree on its meaning. Information Sharing will be differentiated from Shared Awareness in that information sharing is demonstrated by the transfer of data while shared awareness involves the human element. For example geographic information on an incident may by shared between systems supporting two or more organizations, but the mere fact that the information is available does not indicate a shared awareness of the information.
- *Collaboration:* Collaboration is a pattern of interaction where two or more parties are working together toward a common purpose.
- *Organizational Familiarity and Trust:* Organizational Familiarity and Trust involves knowledge of the capabilities of other participating organizations and the respondent's degree of confidence in the fact that they could obtain support from the organization if needed.

Determination of appropriate metrics for analysis of data

The following metrics were selected for the analysis of the data obtained during the Golden Phoenix Event:

- *Connectivity (Technical Interoperability):* Technical Interoperability was measured by analysis of the matrices that recorded the planned, as-implemented and snapshot physical capabilities of the voice, data, and application systems. Technical interoperability is expressed as the percentage of officially participating organizations that can interoperate on a given network or system.
- *Semantic Interoperability:* Semantic Interoperability problems were recorded in observer journals and measured by the number of occurrences of documented semantic interoperability problems.
- *Willingness to Interoperate:* Willingness to Interoperate was be recorded in observer journals and measured by the number of occurrences of documented instances of willingness and reluctance to interoperate.
- *Information Sharing/Shared Awareness:* Information Sharing was differentiated from Shared Awareness and documented through observation in Observers' Journals. Observers noted specific instances of information sharing and similarly documented instances of shared awareness.
- *Collaboration:* Instances of collaboration or failure to collaborate was observed and recorded along with the reasons therefore such as technical equipment outages. When recording collaboration, observers were also asked to note:

    - Connectivity Used
    - Purpose of Collaboration
    - Persons and organizations involved in the collaboration
    - Results of the collaboration
- *Organizational Familiarity and Trust:* Organizational Familiarity and Trust was measured by administering a pre- and post-event survey that asked respondents to rate organizations on familiarity and trust issues using a 5 point Likert scale. Surveys Once completed the survey data was analyzed to determine if a significant change occurred in measured issues over the duration of the experiment.

Determination of methods for capturing the data

Using direct observations methods developed for the Headquarters Effectiveness Assessment Tool (HEAT), most data excluding *Connectivity* and *Organizational Familiarity and Trust* were captured on paper data sheets (Observers' Journals). These handwritten observations were transcribed after the fact into electronic form through the use of a similar form developed in the Groove collaborative toolset. *Connectivity* data was collected in matrix forms developed by SPAWAR Systems Center San Diego and completed by them, the Naval Postgraduate School and USMC Reserve personnel.

Development of data capture forms and other tools

Observers' Journal forms were designed by examination of the information and data elements needed for post-event analysis. These forms were specifically developed so that one form would be used to record a single reportable event. Codes and observation needs were listed on the form for easy reference, recognizing that observers would be observing and recording fast paced events in the field. Once the Observer's Journal was designed, Mr. Brooks King, a volunteer well versed in Groove form design converted the form into a Groove form so that the handwritten sheets could later be easily keyed into the Groove form which would then allow export of the data fields into a spreadsheet for analysis.

Pre-and Post-Event survey forms were developed to capture information on organizational familiarity and trust issues. The survey questions were designed to be answered on a scale of 1-5 and were limited in number to that which would fit on one double-sided sheet. Golden Phoenix participants were asked to spend about 10 minutes at the beginning of the event and upon completion of the last event in which they were participating.

Development of Training Syllabus and Materials

Observer Training was developed because assigned observers did not necessarily have the background in either the net-centric value chain or in event observation techniques needed to capture the data for this event. Therefore training was developed in the following Observer Training modules:

- Introduction (One Hour)
  The introduction period was designed to begin to familiarize the observers with each other and the assessment team(s). This session included a brief description of the overall assessment goals and identified key players for each. CCRP concepts germane to this assessment, including Net-Centric Operational Framework terminology were introduced. CCRP assessment goals and general plans were also covered.
- Duties of all Observers (30 Minutes)
  Using illustrative examples of observer techniques and proper execution of observer assignments, this instructional period provided a frame of reference for observers. It examined general duties common to all observers and potential observer pitfalls.
- Golden Phoenix Scenario/Plans (30 Minutes)
  This training session provided information on the Golden Phoenix event including Golden Phoenix goals, scenarios, timelines and locales.

- Incident Command Familiarization (30 Minutes) (SSC SD ICTAP)
  Members of the Interoperable Communications Technical Assistance Program from the Space and Naval Warfare Systems Center San Diego explained the Incident Command System as instantiated in the Los Angeles Area. This provided observers with valuable background and insight into planned command arrangements.
- Forms and Survey Instruments (30 Minutes)
  This period familiarized observers with the CCRP data collection forms and survey instruments, intended uses and location of copies.
- Record Keeping and Event Characterization (One Hour)
  This detailed session addressed record keeping requirements and provided information on how observations are to be observed and recorded.
- Practical Exercises and Discussion (Three Two-Hour Sessions)

Execution of Data Collection Plans

Scheduling and Assignment of Observers

The background of assigned observers, event scenario and data collection needs combined to create a challenge for optimum scheduling. When USMC Reserve personnel assigned as data collectors reported for training, it was extremely exciting to find that most had civilian first responder backgrounds and many of them had civilian careers in law enforcement, firefighting or emergency medical fields. This eased the learning curve. Nevertheless, much of the net-centric information and specific observations techniques and requirements was new and required rapid learning. In assigning observers, every attempt was made to place people with the most appropriate background in areas where they could best use their knowledge and training to gather important data for later assessment. Because the scenario of the event included discreet training situations at various venues, separate teams had to be developed and assigned to ensure complete and adequate coverage. Teams were developed as follows:

- Unified Command / Los Alamitos Observer Team
  The Los Alamitos Team consisted of two CCRP core team members and 4 USMCR Observers. Their main duties were to capture and document the Request for Assistance process during the period 16-20 July and split into two sub-teams (A and B) to operate in shifts to observe the Unified Area Command during the field exercise portion. The Los Alamitos Team also administered the pre- and post-event surveys.
- Sim Cell/EOC Team
  The Sim Cell/EOC Team was comprised of 2 USMCR Observers. They worked with the Los Alamitos Team during the period 16 – 20 July to document the RFA process, aid in the administration of the pre-event survey, and prepare for the field exercise portion of the event. During the field exercise portion, the Sim Cell/EOC team provided continuous observation at the Sim Cell / EOC in East LA
- Field Event Observer Team
  The Field Event Observer Team was composed of one CCRP core team member and 5 USMCR Observers. Their main duties were to observe the three main field exercise events. They were also responsible for obtaining technical data in support of the technical team as required. During the period 15-20 July the Field Event Team attended and observed all scheduled tabletops and training sessions in order to become fully familiar with the planned field events.
- Technical Observer Team
  The Technical Observer Team was comprised of 4 USMCR Observers. They were charged with the documentation of pre-event technical arrangements, the recording of as-installed information and documentation of technical snapshots during the three main field events.

Data Recording and Transcription into Electronic Form

During the event and other observation periods, data was captured by observers using a paper form. Blank forms were distributed at the beginning of the event and were available from CCRP core team members throughout the event as needed. Observers were provided with a standard clipboard to make written observations easier in the field. At the end of event periods or when observers were off-shift, computers with Groove forms were made available so that the observer could transcribe the data from the paper forms into Groove. As paper forms were entered into Groove, they were collected in a central location so that after the event, not only would the data be available electronically as a download from Groove, but the papers forms would also be available if needed for analysis or if a question arose during review. Because of the pace of the event, two days were set aside after the completion of the event for all observers to gather, discuss observations and complete electronic entry of those forms that they had not been able to enter during the event.

Observations and Recommendations on Data Collection

Golden Phoenix re-confirmed the value of detailed advanced planning for data collection and analysis. More than 1600 events were recorded by the observer team, primarily within a 30 hour window of field training. The observations provided data which was useful for informing the analysis. Nevertheless, there were areas where lessons were learned regarding data collection:

- Despite training sessions for observers, many had an incomplete understanding of the attributes which were sought and either missed or mis-identified a number of events.
- While there were a significant number of data collection personnel for this event, there remained areas where we were not able to post observers and thus missed some opportunity for data collection.
- In Golden Phoenix, the data collection team was given full and open access to all events, venues and participating personnel. This open access allowed excellent opportunities for observation and data capture. Such access is a necessary ingredient for successful assessments.
- Much effort was expended prior to the event to make the Observer Journal sheets as easy to use and self explanatory as possible. Nevertheless, occasions arose wherein actions were observed which were not readily recordable because the appropriate category was not available on the journal form. Additionally, the Groove Form inadvertently omitted a number of the appropriate entries from drop down menus. More reviews of the forms should have been completed prior to the event.
- Some forms developed and used by NPS and SSC SD team members were too detailed and did not lend themselves to completion in the field. Thus much of the desired information was not recorded for technical matters.
- The pre-and post-event surveys required more effort than expected to encourage completion by participants. Because of the nature of the event, very few participants were given the opportunity to complete both a pre- and post-event survey. Thus, the data obtained by the survey suffered from having few direct comparisons.
- Transcription of the data into electronic form was time consuming and somewhat problematic. Most of the observers did not have computers available and had to queue up to used those made available in a central location. For this reason, transcription required over one day after event completion to finish. This, in turn, limited desired post event discussion among data capture team members.

Data Reduction and Assessment

Data Reduction and Assessment - Communications

The initial step in the reduction of the technical interoperability data collected during Golden Phoenix was to gather the matrices developed by the technical observation team. This data was then paired with the identity of organizations participating in each phase of the event. The role of each organization was then examined to determine expected interoperability based on probable information exchange needs. From this information, we were able to calculate:

- Organizational pairs that comprised the 100% Net-centricity goal
- Expected interoperability
- Demonstrated interoperability
- Important interoperability not achieved: Significant expected interoperability that was not demonstrated. Determination of the significance of interoperability not achieved was done subjectively by analysts familiar with the Golden Phoenix events, the National Response Plan, the California Emergency Plan, and the California Standardized Emergency Management System.

This set of calculations were completed for each main Golden Phoenix event (Rose Bowl, Hawthorne Mall, Inglewood Mall) and overall for the entire Golden Phoenix execution period.

Data Reduction and Assessment – Quality of Interactions

The data for assessment of Quality of Interactions was taken from the over 1800 observations recorded in the data collection team's Observer Journals. Data was downloaded from the Groove site into a comprehensive matrix. A team of analysts then made three passes at the data examining each entry and coding the appropriate information and category of data. A final review of the data was then conducted by the analysis team as a group; discussing each entry and any areas where data may have been coded incorrectly. The final result was a consensus on the accuracy of the coding by the analysis team. Once the data was coded, each Quality of Interaction attribute (Semantic Interoperability, Reluctance to Interoperate, Information Sharing, Shared Awareness, Collaboration, and Decisions and Synchronization) was broken out into a separate matrix and analysis/calculations of results completed. These too, were examined along event lines and overall for the Golden Phoenix execution period.

Data Reduction and Assessment – Organizational Familiarity and Trust

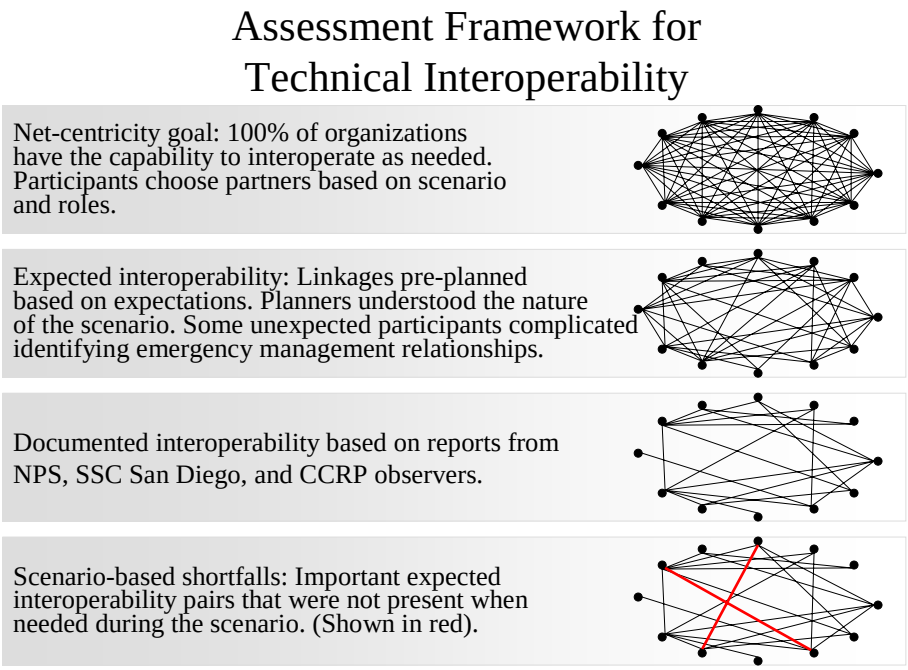
Data supporting assessment of Organizational Familiarity and Trust was taken from the pre-and post survey information. The survey required responses on a 1 to 5 scale, so each question was scored by averaging responses. All questions were scored equally; there was no weighting of any particular question(s). Once the data was tallied, PhD-level social scientists examined the data and determined significant findings.

Results

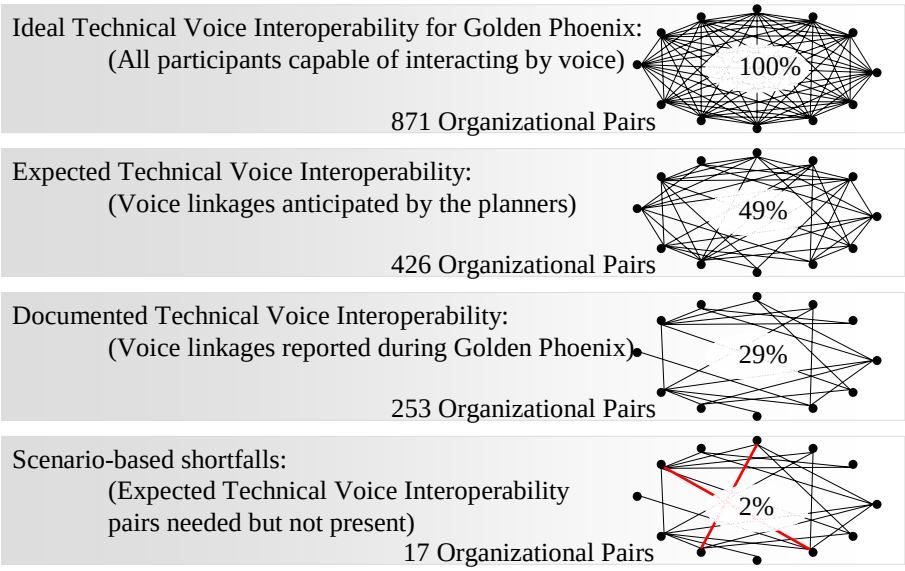
Connectivity (Technical Interoperability)

Connectivity (Technical Interoperability): Technical Interoperability was measured by analysis of the matrices that recorded the planned, as-implemented and snapshot physical capabilities of the voice, data, and application systems. Technical interoperability is expressed as the percentage of officially participating organizations that can interoperate on a given network or system.

The figure below lays out the methodology we used to graphically depict the technical connectivity findings.



Overall Technical Connectivity:
Capability to Communicate by Voice



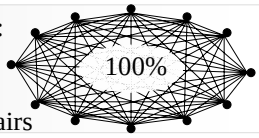
The figure above shows the voice connectivity that was recorded by the observer team during Golden Phoenix 07. The following observations concerning this data were developed by the assessment team:

- The absence of a coherent, complete, and dynamic communications plan made it difficult for the participants to establish and maintain voice connectivity.
- Data reporting was inadequate to establish changes in voice connectivity over time. The results reported represent “normal” connectivity during the 30-hour event play.
- The shortfalls reported here were primarily between the Incident Commander and various fire and police departments.

The overall data connectivity observed is presented in the following graphic.

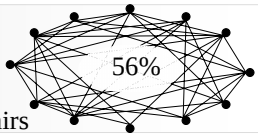
Overall Technical Data Connectivity
Capability to Exchange Data

Ideal Technical Data Interoperability for Golden Phoenix:
(All participants capable of exchanging data)



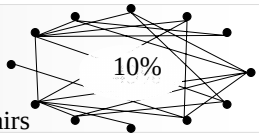
871 Organizational Pairs

Expected Technical Data Interoperability:
(Data linkages anticipated by the planners)



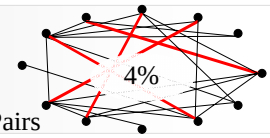
487 Organizational Pairs

Documented Technical Data Interoperability:
(Data linkages reported during Golden Phoenix)



89 Organizational Pairs

Scenario-based shortfalls:
(Expected Technical Data Interoperability pairs needed but not present)



36 Organizational Pairs

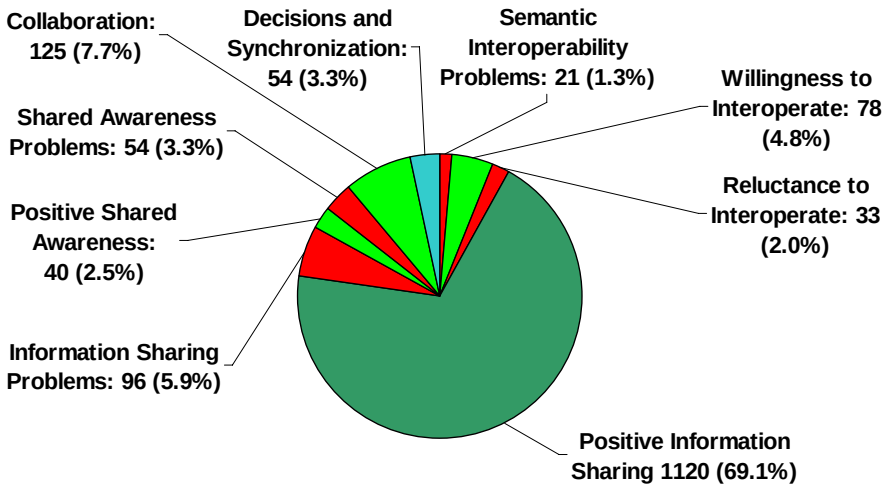
In reviewing this data we note:

- In general first responders have not previously used data systems to conduct operations. Golden Phoenix 07 provided the first hands-on experience with a newly acquired data system.
- The absence of a coherent, complete, and dynamic communications plan made it difficult for the participants to establish and maintain data connectivity.
- Data reporting was inadequate to establish changes in data connectivity over time. The results reported represent “normal” connectivity during the 30-hour event play.
- The shortfalls reported here were primarily between the Incident Commander and various police departments.

Observed Interactions

Overall Interactions

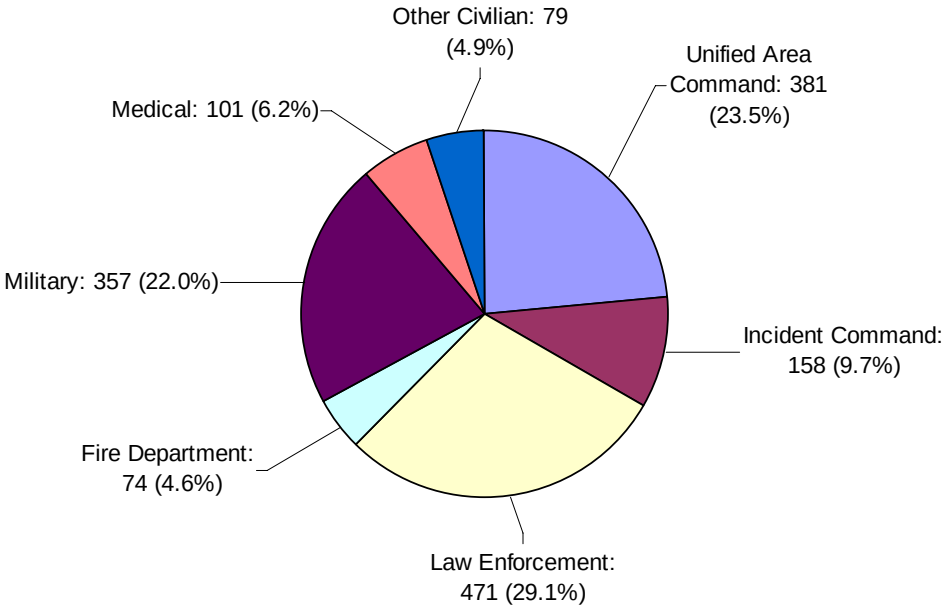
A total of 1621 interactions were observed. Of these, 1417 or 87.4% were positive interactions and 204 or 12.6% were problems or negative interactions.



In reviewing the data we made the following observations:

- Data were reported on nine distinct types of interactions.
    - Some were paired (good and bad): information sharing, willingness to cooperate, and shared awareness.
    - One included only problems: semantic interoperability.
    - One was assumed to be good: collaboration.
    - One was not scored as good or bad: decisions and synchronization.
- Information sharing was the most frequently observed interaction (75%) and was predominantly successful.
- While decisions and synchronization efforts were initially seen as different, the tactical nature of Golden Phoenix 07 and the predominant decision strategy of first responders (Recognition Prime Decision Making) forced us to merge these two.
    - No “failed” or “bad” decisions were recorded.
    - Observers lacked the domain expertise to judge quality or decisions.
- The CCRP team believes that some Shared Awareness data was coded as information sharing. This indicates a need for better observer training.

The following chart presents the breakdown of observed interactions by organization



Observations on the organizational breakdown of interactions include:

- Type of organization observed depended upon:
    - Their level of participation in Golden Phoenix 07.
    - The location of CCRP observers.
- Unified Area Command was the central focus for GP 07 and fully covered by observers.
- Military participation was high and included USMC, National Guard, and California Guard as well as token presence from others.
- Law enforcement participated actively and led most tactical activities.
- Others participated less:
    - Fire departments were limited by real world threat and often participated for only a short time or a single event.
    - Medical participation was limited by design and real world responsibilities.
    - Other civilians were focused on specific issues (e.g. separated children, pets, etc.)

The table below breaks down the interactions by organizational pairs:

Percentage of Observed Interactions by Organizational Pairs

	Unified Area Command	Incident Command	Law Enforcement	Fire	Military	Medical	Other Civilian
Unified Area Command	7.2%						
Incident Command	2.4%	0.7%					
Law Enforcement	14.2%	7.8%	14.4%				
Fire	1.6%	1.8%	0.8%	0.4%			
Military	7.4%	3.6%	4.4%	1.4%	13.0%		
Medical	1.4%	1.5%	0.3%	2.7%	0.3%	3.1%	
Other Civilian	5.7%	1.0%	1.7%	0.0%	0.9%	0.2%	0.1%

Total Number of Observed Interactions: 1621
Mean Value: 3.6
Standard Deviation: 4.3

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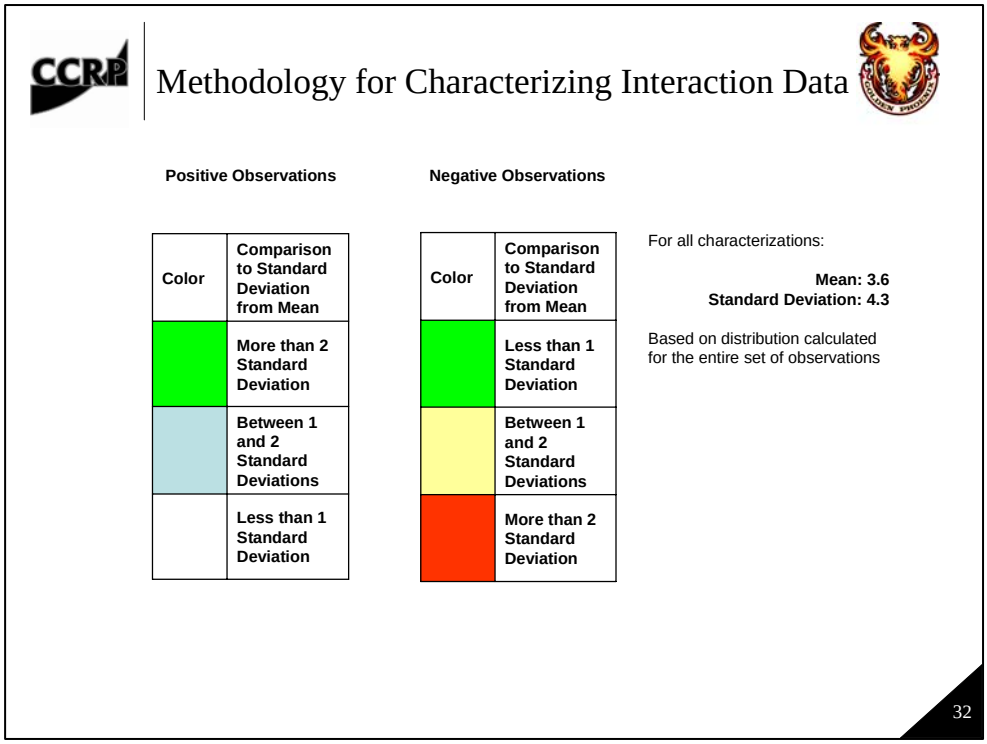
In examining this data it is important to note:

- Golden Phoenix was primarily a training event for the military and law enforcement organizations. The fire departments were not fully engaged, nor were most of the other civil organizations who would be participating if a real disaster had occurred.
- The Unified Area Command concept from the National Response Plan (Now National Response Framework) was new to the players. The Unified Area Command would be the coordinator for multiple incidents and would involve the prioritization of effort and allocation of resources. This was not clearly understood by the participants. Because Golden Phoenix brought together organizations that were “volunteering” to participate, the event did not replicate the mix of organizations that would be present in a real disaster. The Unified Area Command was manned almost exclusively by LA County Sheriff’s Department with a few liaison officers from the military and occasionally other organizations.
- Fire departments were very under-represented in GP, as were other civil authorities, such as the Calif Office of Emergency Services. The Emergency Operations Center was not activated, but was the location of the white or simulation cell which role-played the majority of “other civilian” organizations.

Framework for Characterization of Observed Interactions

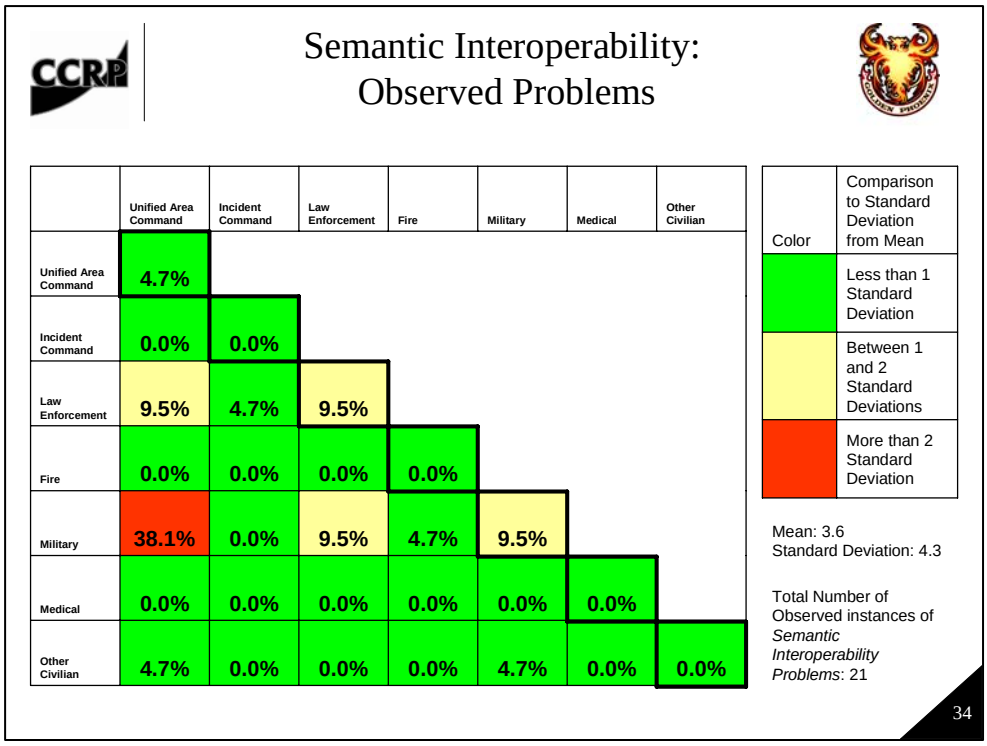
To characterize the *Semantic Interoperability*, *Willingness and Reluctance to Interoperate*, *Information Sharing*, *Shared Awareness*, *Collaboration* and *Decisions and Synchronizations* observations, we compared the percentage of interactions observed between organizational pairs to the mean value of all observed pairs of interactions and examined if, or the extent to which, the observed values exceeded the standard deviation calculated for all observed interactions. Those that exceeded one standard deviation were flagged as were those that exceeded two standard deviations from the mean (expected) value. Separate visual representations were developed for positive and negative observations. The framework is summarized in the figure below:



Semantic Interoperability

Semantic Interoperability is defined as the ability of two or more parties to exchange information and have the content of that information accurately and consistently understood by all parties.

Observed Semantic Interoperability Problems are depicted in the following figure:



In assessing this data we note:

- Patterns Observed
  - Unified Area Command (lead by Sheriff's Department) had difficulty communicating with military apparently because of very different jargon in both types of organization.
  - Law enforcement tended to experience problems apparently because (a) lack of continuity at workstations and (b) different jargons across communities.
  - Military to military problems reflect the differences between USMC, National Guard, and California Guard. Lack of common prior training contributed.
- Examples of problems:
  - USMC expected grid coordinates for a requested visual survey of the condition of Highway 210, but law enforcement uses geographic map references.
  - California Military Reserve noting that a helicopter was down – meaning it landed and USMC alerted because they were reporting that it had gone down – meaning crashed.
  - Fire Department at Rose Bowl using "repeat" over the radio – meaning please repeat your last transmission. Military uses "say again."

Willingness to Interoperate

Willingness to interoperate is defined as a demonstrated desire to interact. In Golden Phoenix 07 we collected the following *Willingness to Interoperate* data:

Observed Willingness to Interoperate

	Unified Area Command	Incident Command	Law Enforcement	Fire	Military	Medical	Other Civilian
Unified Area Command	1.3%						
Incident Command	5.1%	9.0%					
Law Enforcement	2.6%	12.8%	5.1%				
Fire	1.3%	1.3%	1.3%	1.3%			
Military	23.1%	3.8%	2.6%	3.8%	5.1%		
Medical	0.0%	2.6%	0.0%	1.3%	0.0%	1.3%	
Other Civilian	7.7%	2.6%	1.3%	0.0%	3.8%	0.0%	0.0%

Color	Comparison to Standard Deviation from Mean
	More than 2 Standard Deviation
	Between 1 and 2 Standard Deviations
	Less than 1 Standard Deviation

Mean: 3.6
Standard Deviation: 4.3

Total Number of Observed instances of *Willingness to Interoperate:* 78

35

In reviewing this data we made the following conclusions:

- Patterns Observed
  - Military and Unified Area Command consciously worked together because they recognized the need to train and their interdependencies.
  - Incident commanders (who were police) interoperated with law enforcement in order to assemble resources.
  - Incident command is largely face to face and allows natural interoperability.
- Examples:
  - Military helicopter controllers went out of their way to understand the needs of Unified Area Command.
  - USMC spends extra time to discuss the various types of helicopters being used with the incident commander at the Rose Bowl, providing personnel capacities and other information that could be useful.
  - USGS representative travels to Rose Bowl, introduces himself to Incident Commander and provides useful data on earthquake.

Reluctance to Interoperate

Reluctance to interoperate is defined as the demonstrated aversion to interact. Our observations are summarized below.

Observed Reluctance to Interoperate

	Unified Area Command	Incident Command	Law Enforcement	Fire	Military	Medical	Other Civilian
Unified Area Command	0.0%						
Incident Command	0.0%	0.0%					
Law Enforcement	9.1%	9.1%	3.0%				
Fire	15.2%	3.0%	9.1%	0.0%			
Military	18.2%	3.0%	0.0%	3.0%	6.0%		
Medical	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Other Civilian	15.2%	3.0%	3.0%	0.0%	0.0%	0.0%	0.0%

Color	Comparison to Standard Deviation from Mean
	Less than 1 Standard Deviation
	Between 1 and 2 Standard Deviations
	More than 2 Standard Deviation

Mean: 3.6
Standard Deviation: 4.3

Total Number of Observed instances of *Reluctance to Interoperate:* 33

36

Upon assessment, we concluded:

- Observed Patterns
  - Unified Area Command encountered substantial organization and cultural resistance.
  - Law enforcement had difficulties arising from different perceptions of roles and responsibilities.
- Examples:
  - An LA Fire Department person was assigned as Communications Lead. He was not physically present for most of the event and when present publicly stated that he only accepted leadership for the voice communications. There was no one responsible for the data communications.
  - The Fire Department command post was not co-located with the Incident Command at Inglewood Forum

Positive Information Sharing

Information Sharing is defined as making information available to other participants by providing it directly, posting or other means. We noted instances of positive or pro-active information sharing and areas where problems existed. The following two figures show the results of our observations.

Observed Positive Information Sharing

	Unified Area Command	Incident Command	Law Enforcement	Fire	Military	Medical	Other Civilian
Unified Area Command	5.4%						
Incident Command	2.2%	0.2%					
Law Enforcement	15.1%	6.4%	17.2%				
Fire	1.4%	2.0%	0.4%	0.5%			
Military	3.6%	3.1%	5.5%	1.4%	14.7%		
Medical	1.6%	1.8%	0.4%	3.7%	0.4%	3.6%	
Other Civilian	5.7%	1.0%	2.0%	0.0%	0.6%	0.1%	0.1%

Color	Comparison to Standard Deviation from Mean
	More than 2 Standard Deviation
	Between 1 and 2 Standard Deviations
	Less than 1 Standard Deviation

Mean: 3.6
Standard Deviation: 4.3

Total Number of Observed instances of *Positive Information Sharing*: 1119

37

For Positive *Information Sharing* we concluded:

- Observed Patterns
  - Military to military was strong, reflecting established doctrine and processes.
  - Law enforcement, when able to follow established doctrine and processes were effective at information sharing. The tension between these observations and the problems reported from other data reflect the need for training.
- Examples
  - Numerous information briefings, information shared within and across organizations – many at the tactical level by squad leaders.
  - Unified Area Command had a person assigned as "Intelligence" a standard law enforcement position, whose duty it was to collect and disseminate various pieces of relevant information and to resolving conflicting information.

Observed Information Sharing Problems

Observed Problems in Information Sharing

	Unified Area Command	Incident Command	Law Enforcement	Fire	Military	Medical	Other Civilian
Unified Area Command	13.4%						
Incident Command	3.1%	0.0%					
Law Enforcement	7.2%	12.4%	14.4%				
Fire	1.0%	0.0%	4.1%	0.0%			
Military	6.2%	1.0%	3.1%	0.0%	21.6%		
Medical	1.0%	1.0%	0.0%	0.0%	0.0%	0.0%	
Other Civilian	6.2%	2.1%	1.0%	0.0%	1.0%	0.0%	0.0%

Color	Comparison to Standard Deviation from Mean
	Less than 1 Standard Deviation
	Between 1 and 2 Standard Deviations
	More than 2 Standard Deviation

Mean: 3.6
Standard Deviation: 4.3

Total Number of Observed instances of Problems in *Information Sharing*: 97

38

Our comments on the Observed Problems *in Information Sharing* were:

- Observed Patterns
  - Unified Area Command experienced challenges because of its heterogeneous composition (Sheriff, police, fire, USMC, National Guard, California Guard).
  - Law enforcement experienced problems because of differences between specific organizations (e.g. different counties and cities) who had not worked together.
  - Problems observed within the military reflected differences between USMC, National Guard, and California Guard.
- Examples
  - Little information shared between fire departments and law enforcement at Inglewood Forum. Specific information on casualties and medical information was not provided to the Incident Commander.
  - Incident Commander at Inglewood Forum not near command vehicle and does not receive some reports
  - Some Unified Area Command turnover briefs were not attended by some of the participating organizations, so information was not shared. In one instance this caused confusion when the type and location of units at the Rose Bowl was not known by the Unified Area Command
  - During the active shooter training at Hawthorne Mall, squads do not have radio communications with each other and allow the shooter to run past one of the squads
  - Information on white board in Unified Area command not updated and in error regarding some radio frequencies. No ICS 205 (Communication Plans) are being used.

Observed Positive Shared Awareness

Shared Awareness is defined as two or more parties holding similar perceptions of situation at the same time. As with *Information Sharing* we observed both positive *Shared Awareness* wherein parties held similar perceptions and Negative *Shared Awareness* or *Shared Awareness* problems wherein there were disparities in the perception of the situation.

Observed Positive Shared Awareness

	Unified Area Command	Incident Command	Law Enforcement	Fire	Military	Medical	Other Civilian
Unified Area Command	17.5%						
Incident Command	5.0%	2.5%					
Law Enforcement	12.5%	10.0%	10.0%				
Fire	0.0%	2.5%	0.0%	0.0%			
Military	17.5%	7.5%	0.0%	2.5%	2.5%		
Medical	0.0%	0.0%	0.0%	2.5%	2.5%	2.5%	
Other Civilian	2.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Color	Comparison to Standard Deviation from Mean
	More than 2 Standard Deviation
	Between 1 and 2 Standard Deviations
	Less than 1 Standard Deviation

Mean: 3.6
Standard Deviation: 4.3

Total Number of Observed instances of Positive *Shared Awareness*: 40

39

Our review of Positive Shared Awareness is summarized as follows:

- Observed Patterns
  - Military to military was strong, reflecting established doctrine and processes.
  - Law enforcement, when able to follow established doctrine and processes were effective at information sharing. The tension between these observations and the problems reported from other data reflect the need for training.
- Examples
  - Numerous information briefings, information shared within and across organizations – many at the tactical level by squad leaders.
  - Unified Area Command had a person assigned as "Intelligence" a standard law enforcement position, whose duty it was to collect and disseminate various pieces of relevant information and to resolving conflicting information.

Observed Problems in Shared Awareness

Observed Problems in Shared Awareness

	Unified Area Command	Incident Command	Law Enforcement	Fire	Military	Medical	Other Civilian
Unified Area Command	31.5%						
Incident Command	5.6%	0.0%					
Law Enforcement	7.4%	5.6%	11.1%				
Fire	0.0%	0.0%	0.0%	0.0%			
Military	9.3%	11.1%	1.9%	0.0%	9.3%		
Medical	0.0%	1.9%	0.0%	0.0%	0.0%	1.9%	
Other Civilian	3.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Color	Comparison to Standard Deviation from Mean
	Less than 1 Standard Deviation
	Between 1 and 2 Standard Deviations
	More than 2 Standard Deviation

Mean: 3.6
Standard Deviation: 4.3

Total Number of Observed instances of Problems in *Shared Awareness:* 54

40

In examining the data concerning Problems in Shared Awareness we found:

- Observed Patterns
  - Unified Area Command experienced challenges because of its heterogeneous composition (Sheriff, police, fire, USMC, National Guard, California Guard).
  - Law enforcement experienced problems because of differences between specific organizations (e.g. different counties and cities) who had not worked together.
  - Problems observed within the military reflected differences between USMC, National Guard, and California Guard.
- Examples
  - Little information shared between fire departments and law enforcement at Inglewood Forum. Specific information on casualties and medical information was not provided to the Incident Commander.
  - Incident Commander at Inglewood Forum not near command vehicle and does not receive some reports
  - Some Unified Area Command turnover briefs were not attended by some of the participating organizations, so information was not shared. In one instance this caused confusion when the type and location of units at the Rose Bowl was not known by the Unified Area Command
  - During the active shooter training at Hawthorne Mall, squads do not have radio communications with each other and allow the shooter to run past one of the squads
  - Information on white board in Unified Area command not updated and in error regarding some radio frequencies. No ICS 205 (Communication Plans) are being used.

Observed Collaboration

Collaboration is defined as two or more parties working together for a common purpose.

Observed Collaboration

	Unified Area Command	Incident Command	Law Enforcement	Fire	Military	Medical	Other Civilian
Unified Area Command	11.2%						
Incident Command	1.6%	0.8%					
Law Enforcement	23.2%	8.0%	6.4%				
Fire	0.8%	3.2%	0.0%	0.0%			
Military	20.0%	4.8%	2.4%	0.8%	6.4%		
Medical	0.8%	0.0%	0.0%	0.0%	0.0%	3.2%	
Other Civilian	3.2%	0.8%	0.8%	0.0%	1.6%	0.0%	0.0%

Color	Comparison to Standard Deviation from Mean
	More than 2 Standard Deviation
	Between 1 and 2 Standard Deviations
	Less than 1 Standard Deviation

Mean: 3.6
Standard Deviation: 4.3

Total Number of Observed instances of *Collaboration:* 125

41

We concluded the following when reviewing data from collaboration observations:

- Patterns Observed
  - While not extensively used, collaboration became more common over time as the participants discovered its beneficial effects.
  - Unified Area Command, because of its heterogeneous nature, benefited most from collaboration and was involved in more collaborations than others.
  - Law enforcement was able to address several issues as they learned that they could collaborate.
  - Many recorded collaborations were quite small – two or three individuals.
- Examples
  - California Military Reserves collaborated with Unified Command concerning numerous possible actions and capabilities to solve some of the logistical problems.
  - USMC and Unified Area Command collaborated extensively on operations
  - Incident Commander collaborated with law enforcement to determine best course of action in controlling the rioters since USMC helicopters had reduced the number of law enforcement officers who could be brought to Hawthorne Mall on each flight. Since this took longer than planned to get the number of personnel they thought they needed, they collaborated to devise a different tactic that could be executed sooner with the people that they had.

Observed Decisions and Synchronization

Decisions are choices between alternatives. Synchronization is purposeful arrangement in time and space. In Golden Phoenix 07 decisions and synchronization were closely fused because of the tactical nature of the event.

Observed Decisions and Synchronization

	Unified Area Command	Incident Command	Law Enforcement	Fire	Military	Medical	Other Civilian
Unified Area Command	7.4%						
Incident Command	0.0%	0.0%					
Law Enforcement	16.7%	22.2%	5.6%				
Fire	3.7%	0.0%	0.0%	0.0%			
Military	9.3%	5.6%	0.0%	0.0%	5.6%		
Medical	3.7%	0.0%	0.0%	0.0%	0.0%	5.6%	
Other Civilian	5.6%	0.0%	1.9%	0.0%	1.9%	3.7%	1.9%

Color	Comparison to Standard Deviation from Mean
	More than 2 Standard Deviation
	Between 1 and 2 Standard Deviations
	Less than 1 Standard Deviation

Mean: 3.6
Standard Deviation: 4.3

Total Number of Observed instances of *Decisions and Synchronization*: 54

42

Our thoughts on observed Decisions and Synchronization were as follows:

- Observed Patterns
  - Because of the tactical nature of Golden Phoenix 07 virtually all decisions were actually efforts to synchronize activities.
  - Because law enforcement was responsible for leadership at most specific events (e.g. Rose Bowl, Hawthorne Mall) they participated in many of the decisions and synchronizations.
  - Because the USMC was actively engaged in moving first responders and their equipment they also participated in a number of decisions and synchronizations.
- Examples
  - Medical personnel decided to treat and hold patients on scene at the Rose Bowl because sufficient ambulances were not available to transport them right away.
  - Incident Commander decided to confront rioters in Hawthorne Mall with a smaller force than originally planned.
  - Unified Area Command made a decision to evacuate USC Medical Center and move patients to a more secure area
  - USMC made a decision to reduce the load on each aircraft because of difficult landing conditions at Hawthorne Mall

Levels of Trust and Familiarity

Organizational Familiarity and Trust was measured by administering a pre- and post-event survey that asked respondents to rate organizations on familiarity and trust issues using a 5 point Likert scale. Once completed the survey data was analyzed to determine if a significant change occurred in measured issues over the duration of the experiment. The following points were drawn from our review of the data.

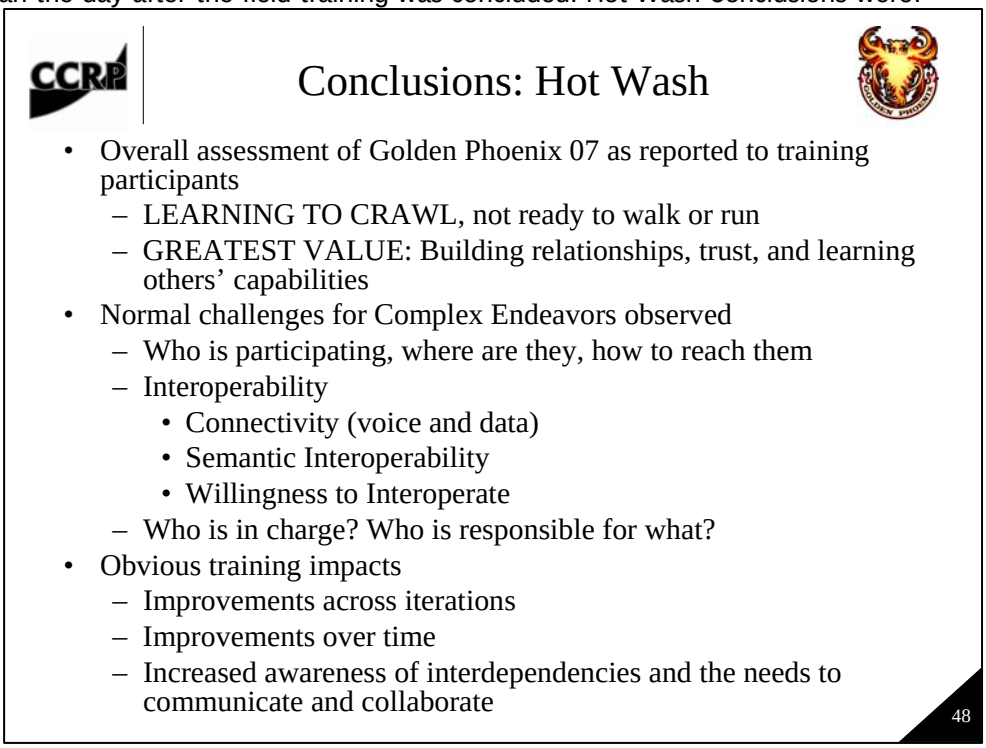
Organizational *Familiarity* and *Trust* (Overall Finding)

- *Familiarity and Trust* improved significantly between pre-event and post-event surveys for the 23 participants who completed both instruments.
- *Familiarity and Trust* declined, but not significantly, when the data from those completing only the pre-event survey were compared with those completing only the post-event survey.
    - The CCRP team believes that those completing only one survey participated only briefly (less than one day)
    - They apparently came to understand the needs for interdependence and trust.
    - However, they failed to gain knowledge of others or build trust in them.
- These data suggest that Golden Phoenix 07 provided the opportunity to increase trust and familiarity but only when participation was broad and deep.

Summary

The CCRP Team made three conclusions in three separate categories:

Hot Wash -The assessment team was requested to provide feedback at a "hot wash" which began the day after the field training was concluded. Hot Wash Conclusions were:



- Data reduction was well underway but no analysis had been completed. Hence these remarks reflected perceptions and judgments, not evidence-based conclusions.
- The training impacts reported focused on changes as specific units gained experience. Because some organizations joined GP 07 well after it started their learning was only obvious to those who could compare their initial efforts with their later performance. In fact only those organizations that participated throughout the training event saw clear improvement over time and across events.
- Increased awareness of interdependence and the needs for communication and collaboration were perhaps the most long-lasting and important improvements.

Observer Insights – General thoughts on Golden Phoenix execution

Conclusions: Observer Insights

- Hundreds of challenges, many related to communications issues
- Many problems were overcome by workarounds
  - Runners when voice was down
  - Military communications when civilian failed
  - Self-synchronization of helicopters when ground control fail
- Civilian-led, DoD-supported emergency response:
  - Must be trained, exercised and experienced to be effective
  - Are inherently somewhat dynamic and (at least at first) chaotic
  - Require effective interoperability which is not easy to achieve
  - Require capacities for:
    - Information Sharing
    - Collaboration
    - Joint Decision-Making and Synchronization

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Lessons Learned – Thoughts on the Assessment Effort

Conclusions: Lessons Learned

- Meaningful data can be collected cost-effectively in civil-military complex endeavors:
  - That address issues crucial to Network Centric Operations
  - That span data, voice, and human performance, and the Network Centric Operations Value Chain
- Successful collection requires:
  - Professional, experienced lead team (CCRP, NPS, SSC San Diego)
  - Involvement in planning
  - High quality data collection and data analysis plans
  - Access throughout the event
  - Adequate human resources (data collectors and analytical teams)

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