5.2.1 Problem Resolution Process

Figure 5-1 shows one of the critical support processes that currently exist is the problem resolution process. This process is utilized when a system issue arises. HEC's Problem Resolution Process, as shown in Figure 5-1, provides the correct steps in collecting the problem, sending the problem to the correct people for authorization and resolution and requesting resolution confirmation from the problem originator. However, in a couple of outages, the problem was not correctly identified or resolved; thus, the problem occurred again and caused an additional outage. Assuming this process is consistently followed, there may be difficulties in reproducing the problem which make it difficult to know if the problem has or has not been correctly resolved. HEC also has a method of documenting problems for their systems in a SIRT List and a Change Order List. These lists provide the following information: applicable agency that submitted the problem, the agency priority of the problem, description of the problem, estimated completion date, and status. The lists provide an excellent summary for tracking problems and a similar tracking capability should be implemented city-wide for all of the public safety system problems identified. This list could also support the risk management process by providing input on the major issues that need to be resolved and identified.

Additionally, the problem process resolution appears to be followed by all stakeholders when system outages and system performance degradations are experienced. The breakdown occurs when non-critical system issues and problems are identified, especially for issues with functionality of the system. There is currently no clear, documented escalation process for functionality issues. The escalation procedures for non-critical system issues, as well as the communication feedback on resolutions or decisions to end-users raises such functionality issues.

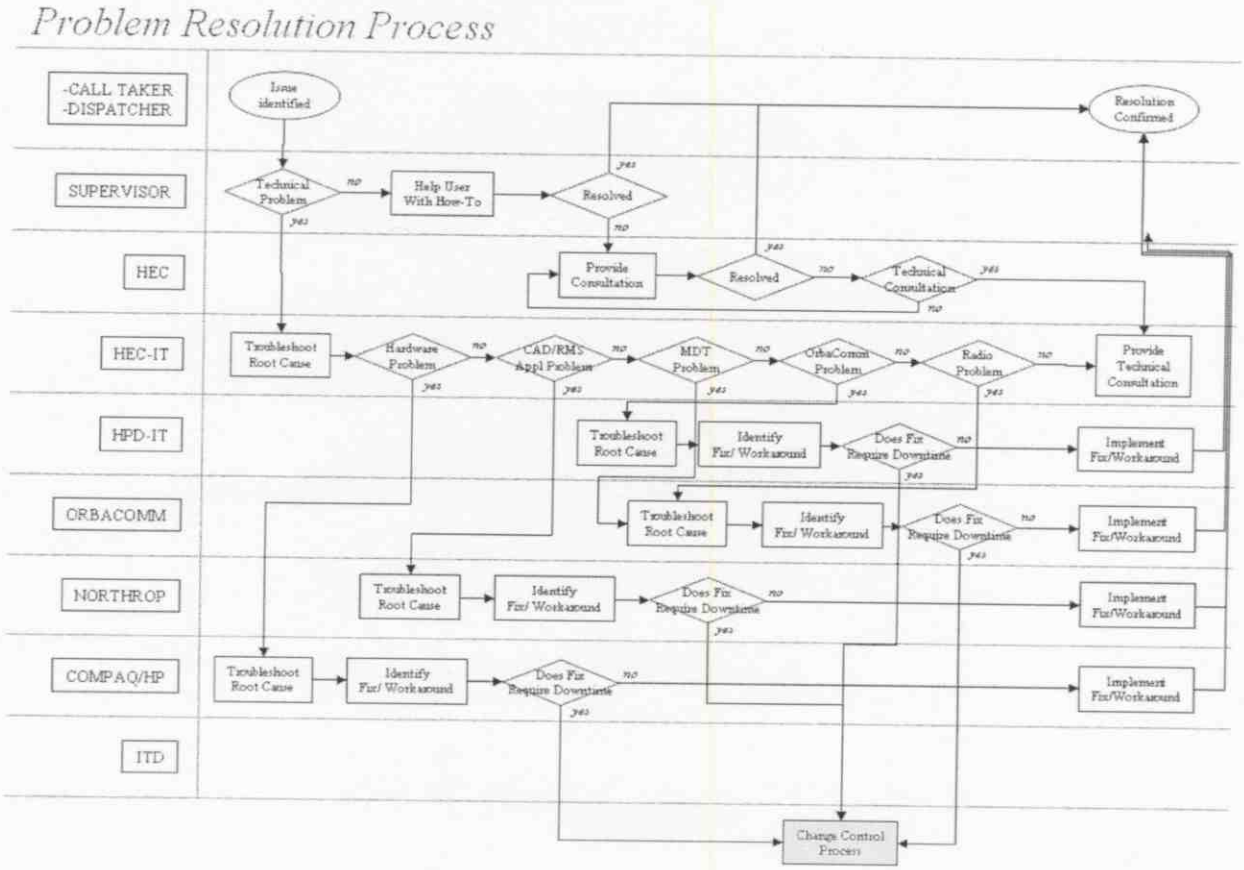

Figure 5-1. Problem Resolution Process

5.2.2 System Enhancement Process

The system enhancement process shown in Figure 5-2 is used to address issues that have been identified as changes to the original or existing system functionality or architecture that the City of Houston accepted as part of the acceptance sign-off between Northrop Grumman and the City of Houston.

All system changes are considered enhancements and therefore must undergo a process of review to determine the following: whether the change is needed, impacts of the changes to the existing functionality and architecture, prioritization of requested enhancements/changes, funding for the enhancements/ changes, and the expected turnaround for the vendor to deliver agreed/accepted enhancements.

The HEC System Enhancement Process, is a good process. The diagram shows that the proper steps, correct people, and validation are included. However, the actual turnaround time from when the enhancements are approved by HEC and the time it takes for the vendor to deliver the

agreed to enhancements is not in alignment with customer expectations and appears not to be in accordance with mutually agreed to timelines established at the beginning of this process.

MITRE recommends that HEC and Northrop Grumman establish an enhancement/release task team to clear out the backlog of changes and enhancements in existence for quite some time now. These changes/enhancements have been reviewed, designed, approved, and scheduled for development but no enhancement deliverables have been provided.

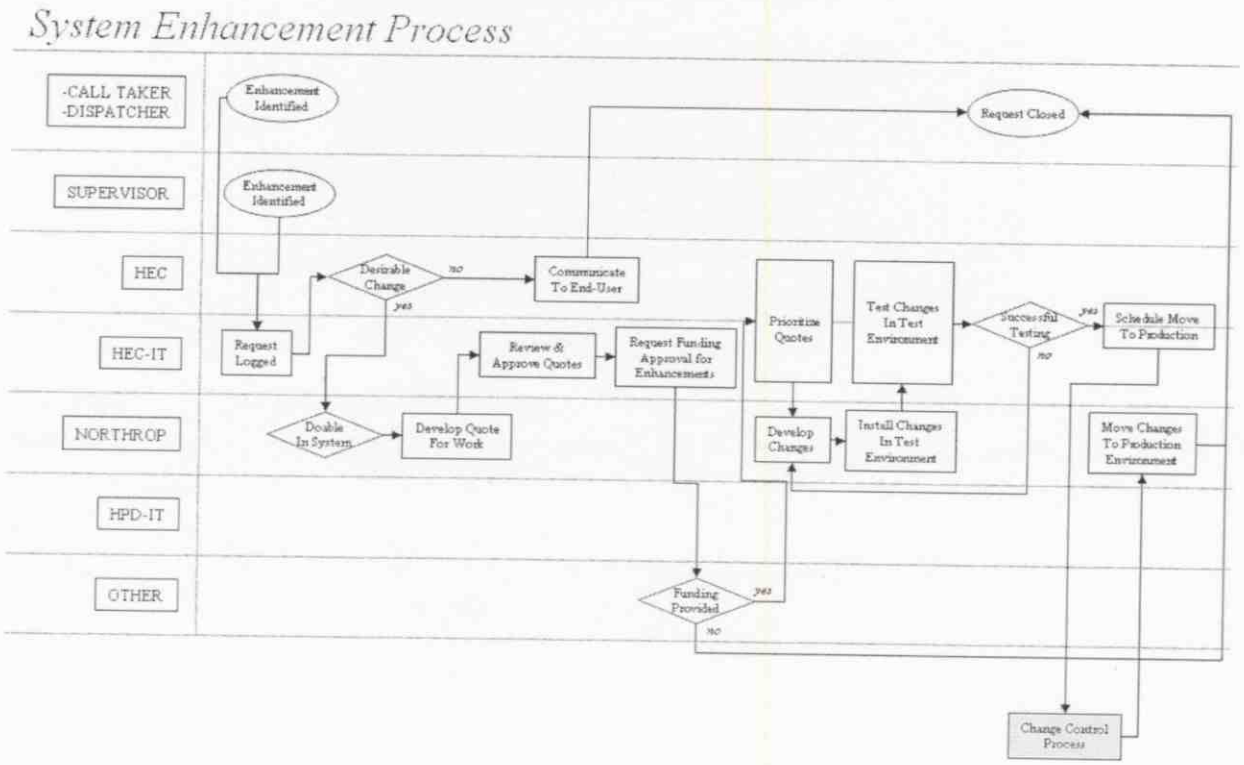

Figure 5-2. System Enhancement Process

5.2.3 Change Control Process

Figure 5-3 illustrates the existing Change Control process in place at HEC for changes. The source of changes can either be enhancements or problems/issues that are affecting the system performance.

The HEC Change Control Process is not complete. It does not provide details on the following:

- Approval process
- Review board
- Organization roles
- Tracking of changes
- Configuration control

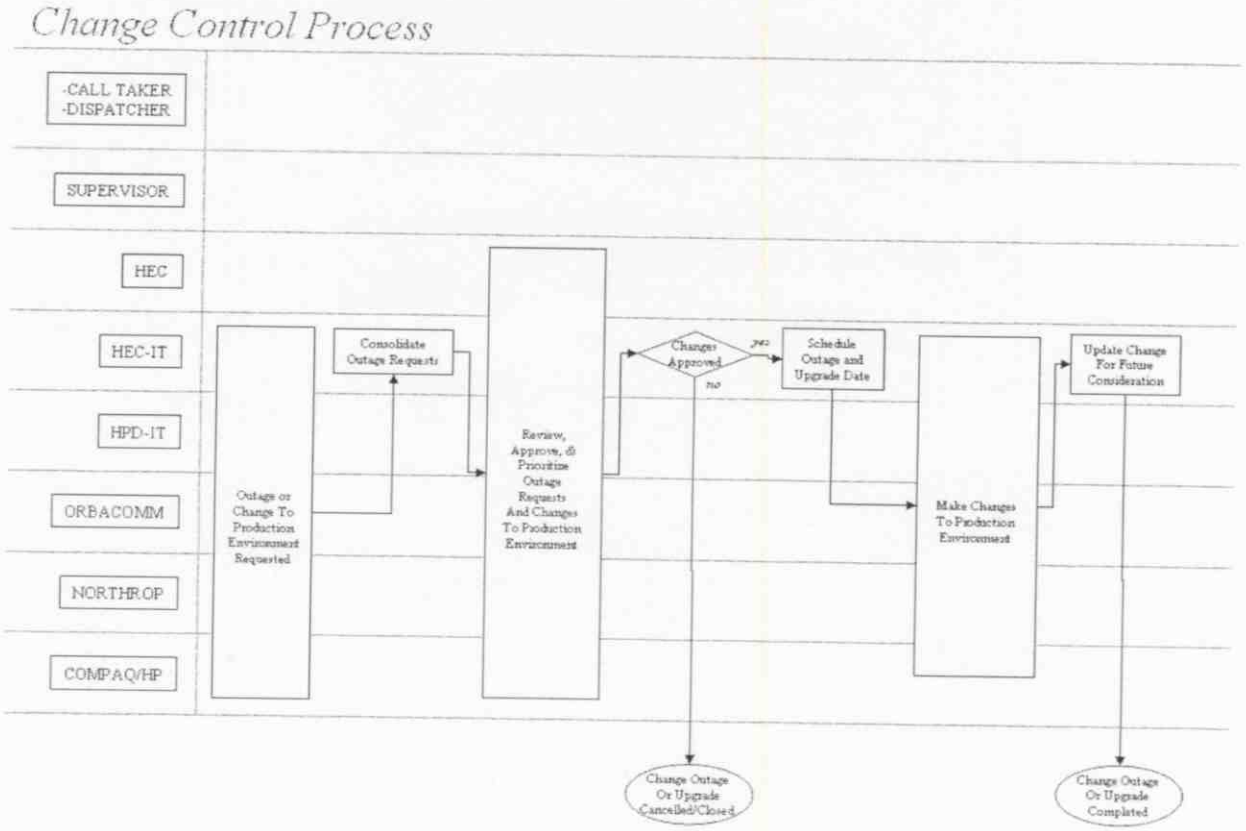

Figure 5-3. Change Control Process

While the change control process is understood by all IT support stakeholders, no evidence of documented procedures and change control communications were identified. The lack of documentation makes it difficult to conduct after action reviews (AARs) on executed changes. Furthermore, documentation on successfully testing as well as back-up procedures for proposed

changes was also not found increasing the risk of prolonging change outages in case of unsuccessful changes, as well as mitigating risks of proposed changes.

5.2.4 Recommended Engineering Processes

The MITRE analysis of the existing and recommended processes evaluated several engineering processes. The team recognized the benefit of each of the processes but realized it would be unrealistic to implement all of them at this time. The critical processes that are lacking and are recommended include risk management and configuration management. An effective risk management process focuses on the risks with the highest probability of occurring and greatest impact if they do occur. For example, the single point of failure and high priority SIRTs may be risks identified by the City of Houston. This process will help the City of Houston become more proactive rather than reactionary. To be effective, the risk identification must be solicited from all departments, contractors, and the Greater Harris County 9-1-1 Emergency Network and it must be visible to all team members so that risks are seen from all points of view. To avoid an unwieldy number of risks from being tracked, the risk identifier simply "proposes" risks. A risk review board, with representatives from HFD, HPD, HEC and ITD should be used to review a proposed risk and then either accepts or rejects the risk. After risk identification, the risk should be assessed for their impact on cost, schedule, technical performance or other impacts such as regulatory, security, or political. The risks should then be prioritized based on their probability of occurring and the consequences if the risk were to occur. The risk review board, senior leadership and budget authorizers decide which risks should be given resources for mitigation.

Next, risk managers should be assigned for the risks given resources. Risk managers should develop mitigation plans, determine how they will know if a mitigation is successful and develop contingency plans in the event a risk mitigation is not successful. They then track the status of the mitigate on plan and close the risk when appropriate. This risk management process results in the avoidance or minimization of the impact of consequences of risks with the smallest expenditure of funds.

The MITRE team also recommends that the City of Houston implement a city-wide configuration management process. The "Little Book of Configuration Management," November 1998 from the Software Program Managers Network provides an ideal framework for creating a configuration management process.

As defined in the above source, configuration management is the basic project control mechanism that establishes and maintains the integrity of products through the project's life cycle. Configuration Management will support the City of Houston by providing:

- Configuration Identification -- The ability to identify what information has been approved for concurrent use in the project, who owns the information, how the information was approved for CM control, and the latest approved release.
- Configuration Control -- The configuration control process and procedures designating the level of control through which each work product must pass (for

example, author control, project-level control, acquirer control); identifying the persons or groups with authority to authorize changes and to make changes at each level (for example, the programmer/analyst, the software lead, the project manager, the acquirer); and the steps to be followed to obtain required authorization for changes, to process change requests, to track changes, to distribute changes, and to maintain past versions. Change control provides the mechanism to build software systems for tests that have a known configuration and can be exactly reproduced.

- Status Accounting -- Formalized recording and reporting of the established configuration documents, the status of proposed changes, and the status of the implementation of approved changes. Status record information provides an accessible and current record of the status of each controlled piece of information that is planned to be used, the content of each release from CM, and who has checked out or is working on a piece of information that the test organization plans on accessing through CM.
- Reviews and Audits -- Frequent evaluation of the content, baseline integrity, and release integrity of all controlled products to ensure they conform to their configuration documents.

5.3 Training

The MITRE analysis included a review of training documents and interviews with the staff to gain an understanding of the past and current training. Two types of training were identified as important to preparing staff to operate and sustain the system. The first is operator or user training for the CAD system and the other components used in the performance of call taking or dispatching. The second is the training of the HEC and support staff to support the monitoring, maintenance, management, and utilization of the system.

The two methods use different models for the training relationship. The user training side of the HEC is performed by training staff that is part of HEC (call taking) or assigned to HEC duties (dispatching). The relationship between HEC staff and system providers in this area is a "train-the-trainers" model. The training from Northrop Grumman and third-party training providers to the HEC IT and support staff uses a direct training model, as it assumes that the trainees will be doing the work themselves.

The assessment focused on identifying future training issues for the CAD user community and support staff at the HEC. As such, it identified the steps that can be taken to ensure that the training needs of the CAD system users will be met as the system evolves and changes. In turn, this will include recommendations that will address processes used in managing changes in the CAD system.

5.3.1 IT/Support Staff Training

Initial requirements for training of the support staff are detailed in the Scope of Services Section E, Training Plan, June 13, 2001. The discussions with Northrop Grumman personnel and HEC

staff suggested that these training requirements had evolved in the context of a set of assumptions about the future responsibility of the HEC staff for expanding the role of HEC to support the maintenance and control of the CAD system.

The current assumption can be described as "HEC manages and monitors, while Northrop Grumman corrects (SIRT) and extends (change order)." The training plan has evolved to reflect this assumption.

Certain training regarding the setup, initialization, and startup of the core systems of the HEC were completed as originally planned. The staff that took these courses are still in place, so the consequences of turnover in this area is not being addressed.

The original plan for training encompassed a "Programmer Training Course," and a collection of third-party training on [redacted] administration and management.[10] The lack of change access to the source code undercut the original intent of the programming course. The compression in the startup of the HEC system prevented the achievement of most of the third-party training. As a result, two types of training programs were developed.

The programming course originally focused on modification of the interface code to the user and to various external systems. At the request of the students in the session, the instruction method was converted to a more detailed architectural review of the system structure. The intent was to enable the monitoring and management role for the HEC support staff.

The second response was in the area of third-party training. A change order to the contract was processed to convert the money assigned to the listed third-party training into a pool that could be drawn from after startup to meet the training needs for the support of the system. This change has enabled the training to be shifted in time. Some of the resources have been used in exactly the same arena as originally planned, such as [redacted] administration and management. As HEC and related staff still have responsibility for the development of database applications, these resources have been used for training in Oracle related areas.

The approach that has evolved here appears to meet the current intent of the HEC management regarding support for system maintenance and management. Eventually, issues such as a response to turnover and refresher training will need to be addressed.

5.3.2 User Training and Training Processes

A key component in the assessment of training needs at the HEC derives from the different roles that the HEC encompasses. A number of distinct communities exist within the mixture of call taking and dispatching, Police and Fire/EMS. The nature of performance requirements laid upon members of each community differ, and the norms for handling issues differ by profession.

The assessment was based on interviews conducted during the period December 15-17, 2004, plus a review of documents provided by HEC, HPD, HFD, and the City of Houston staff.

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[10] See pp. 13-21, Section E, Training Plan, June 13, 2001.

5.3.2.1 Issues

Historically, both the police call takers and dispatchers were employees of the HPD and worked in an HPD facility. This proximity to the officers undoubtedly helped to inform and communicate to the call takers and dispatchers what the primary issues were for the dispatch role, from the officer perspective. The police call takers are now employees of HEC, and the dispatchers, while still employees of the HPD, are now resident and trained at the HEC facility. The decreased direct exposure to the HPD environment carries with it an implicit training loss.

The HEC has recently completed [February 4, 2005] its first full training class of new 911/Police call takers. The training period exceeded six weeks, and includes supervised floor time beyond that time period. Preliminary comparison of the training approaches and schedules used by HEC and related dispatch organizations place the Houston effort in the middle to high range of call taker and dispatch training efforts across the United States.[11] Police domain language and expertise has been addressed in the first training session, and the issue is being watched.

Similar arguments and concerns apply to the Fire/EMS call takers. On the EMS part, the additional training to support delivery of pre-arrival instructions will provide a degree of exposure to the language and concerns of EMS. A similar effort will be needed to address fire issues.

Training issues can engage other agencies more directly. For example, some of the discussions with HPD personnel made it clear that HPD training issues outside of the HEC have specific impacts on police dispatcher workload. For example, HPD officer training on the full range of capabilities of the MDT system would provide the opportunity to take some of the load off HPD dispatchers working within the HEC facility.

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[11] See, for example:
Washington State Criminal Justice Training Commission
CJTC Telecommunicator Program Website
http://www.cjtc.state.wa.us/telecom/index.htm

State of New Jersey
Office of Emergency Telecommunications Services
http://www.state.nj.us/911/
http://www.state.nj.us/911/trainingregs.html

Dispatch Monthly Magazine Training Resources
http://www.911dispatch.com/train_file/training_menu.html
http://www.911dispatch.com/train_file/train_survey.html

Illinois' Public Safety Telecommunicator Training & Standards
http://www.911dispatch.com/train_file/illinois_training.pdf

The HPD dispatcher can provide a number of query services to various databases for the officer in the field. Examples of these services include queries regarding status of driver's licenses, automobile registration, outstanding warrants, etc. Some of the functions of the CAD/RMS and query systems can be performed by the officer directly from the MDT in the police patrol vehicle.

Anecdotal evidence was provided to the effect that the HPD had not received formal training for officers on the use of the MDT system for approximately eight years. No MDT training was provided at the academy, instead, use of the MDT was one focus of on-the-job training. The result was a wide variance in the individual officer familiarity with the capabilities and methods for use of the MDT. In turn, this leads to officer requests for dispatcher performance of tasks that could be done by the officer in the vehicle, increasing dispatcher and system workload.

Currently, as of December 16, 2004, an in-service training program on the MDT capabilities had been developed by [redacted] HPD. According to him, 56 in-service training sessions had been scheduled to bring MDT training to the entire force, and 28 of them had been completed at that time. [redacted]

5.3.2.2 Processes

Preparing for the future engenders two types of process consideration for training staff. The first is enabling the feedback that supports the continuous improvement in the quality of the training process. This addresses both improvement in training methods and content of material. The second is ensuring that the training considerations of future system changes are addressed before the system changes are implemented.

In the interviews conducted at HEC, there is considerable evidence that call takers and dispatchers are working to learn the system, and to learn ways of making it work. The HFD dispatchers tend to create personal "bibles" of techniques for achieving specific goals through the system. These documents or other collections of information and experience are a potential source of new material for training. The experience of each individual as they move from the classroom to the real world of the operations floor is a new pair of eyes looking at the potential of tuning the training. The experience of new and experienced officers can provide input to improve the training process. Processes to obtain and "mine" these ad hoc tools for information to improve training should be developed.

The planned change process of the HEC needs to explicitly engage the training community for a number of reasons. As changes are proposed, the impact to the normal training process needs to be evaluated. The costs of training to meet the new environment, in both schedule and resource terms, needs to be part of the change management process.

Examples exist of how this type of issue has been implicitly addressed and missed were provided during the interviews. Some loops are closed coincidentally because of staff fulfilling multiple

roles. For example, the members of the HPD Dispatch Training Unit are also the representatives to the Change Board Meetings, so the issue of training impact of proposed changes is automatically considered. Our current understanding is that HFD does have representation on the Change Board, so a presence has been established with the responsibility for assessing training consequences on the Fire/EMS side of the HEC. This is one mechanism to achieve this goal.

The key issue here is that current written policies of the HEC do not guarantee consideration of training issues. Membership in the change management committee for the affected training communities is one mechanism for achieving that consideration. Other mechanisms, based on process requirements, can also address training consequences of change. While voting membership in a Change Committee may not be required, guarantees of awareness and a forum for noting training consequences and needs are essential.

5.4 Testing

MITRE reviewed the implementation plan, acceptance testing documents, Go-Live documents, and other material provided by the HEC to determine the processes used for testing. MITRE also had extensive conversation with HEC IT and Northrop Grumman to discuss this topic. The analysis shows that the testing process for the pre-acceptance period was much more exhaustive and complete than the post-acceptance testing. In addition to the specified Scope of Services testing, the Go-Live testing provided an excellent measure to evaluate the systems readiness for operations.

- [redacted].
- [redacted].
- [redacted].

Northrop Grumman's internal processes ensure that testing of software changes and new releases verify that the software operates correctly and that the functional change meets requirements.

Given the criticality of the entire system, some form of periodic failover testing is needed to ensure that the site is ready to accommodate different contingencies. This testing should include all major systems including SAN, router, database, and communication link. Eventually this failover test concept should encompass a full business continuity plan that includes disaster recovery. With the current A and B sides to the servers and SAN storage along with a test system (that could be further expanded), a concept for a three sided environment could be architected that could provide better testing, training, integration, and failover analysis. The "third" side could also evolve toward a disaster recovery system that could be eventually remotely located and continue to function not only as a hot spare but to support additional training, conduct improved testing, and better integration of future capabilities.