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1 Introduction

1.1 Background

The City of Houston public safety mission was served by separate and distinct public safety systems. PRC (hereinafter referred to as Northrop Grumman) installed the system used for police dispatching in 1987. The Fire Department dispatch and records management systems were developed in-house in 1985. The systems operated by these departments reached the end of their operations and sustainment life, and the City of Houston began to combine the public safety call taking and dispatching operations into a single facility. In September 2000, the City Council approved a lease/purchase agreement formalizing the creation of the Houston Emergency Center (HEC) at 5320 North Shepard. This facility housed the personnel and some, but not all, of the public safety system that supported the Houston Police Department (HPD), Houston Fire Department (HFD), and Emergency Medical Service (EMS) operations.

Northrop Grumman was contracted to upgrade the existing Police dispatch system and to expand the system to support integrated Fire/EMS dispatch and records management. The City of Houston also created a new organization, called the HEC, [REDACTED]

During the acceptance test period and since its acceptance, the public safety data system encountered technical problems that resulted in several system outages. Outages means the data system is unavailable to a majority of call takers and dispatchers. These outages led to concerns by the City of Houston and the general public on the reliability and performance of the upgraded system.

The MITRE Corporation was requested to conduct an end-to-end performance and process analysis of the public safety data system located at the HEC to address the following questions:

- Does the system perform in accordance with the agreement established between the City of Houston and Northrop Grumman?
- How can the system performance be improved?
- What processes can be implemented to improve performance?
- How does the system design and operations compare to other cities and counties with consolidated operations?

1.2 Houston Departments Roles

Several City of Houston departments, other organizations, and contractors operate and maintain the public safety system. The City of Houston departments include the HPD, HFD and ITD as well as the HEC organization. The other organizations include Greater Harris County 9-1-1 Emergency Network. [REDACTED]

[REDACTED] The description of the systems that the City of Houston, other organizations, and contractors operate, manage, or maintain are described in Section 3-2.

1.3 Purpose

The purpose of this analysis is to conduct an end-to-end performance and process assessment of the public safety data system located at the HEC.

1.4 Approach

The scope of The MITRE Corporation effort specifically encompassed the operational performance, processes, and architecture of the public safety data system; with primary focus on the design, acquisition, use and maintenance of the data systems located at the HEC. The public safety system includes data and radio systems that are external to the HEC and part of other departments within the City of Houston and Greater Harris County.

The analysis provided by MITRE followed the critical thread of performance to and from the HEC systems to the extent the external system status appeared to warrant further investigation and to the degree that information could be obtained. The detailed analysis focused on assessing performance and enhancements for the HEC systems. In addition, process and general system engineering performance assessments were conducted that are applicable to all portions of the public safety system. Thus, the analysis produced recommendations that extend to areas outside of the strict technical boundaries of the HEC and its component systems.

The MITRE team conducted the assessment through the review of documents and data listed in Appendix A; interviews of City of Houston, Greater Harris County, and Northrop Grumman staff; and by gathering performance data from the system. This process permitted the team to gather information that was indirectly and directly related to the performance assessment. The focus of the assessment was to identify alternatives and solutions to improve the performance of the system.

The team also contacted and gathered information from other cities and counties regarding the procurement, operations, and maintenance of their public safety systems. This information is contained within the analysis and served to validate the findings and recommendations. The City of Chicago provided data and information that was considered the most pertinent to the City of Houston's current environment. MITRE recommends that the City of Houston continue communications with the City of Chicago to share lessons learned.

2 Performance Requirements Analysis

2.1 Strategic Vision

The Arthur Andersen report titled “Houston Emergency Center Technology Management Plan” establishes a documented framework for the strategic vision of the HEC consolidated operations. The report focused on establishing a new organization structure, the budget necessary to initially support the organization, and consolidation of Neutral 911, HPD, and HFD/EMS call taking and dispatching operations. Figure 2-1 shows the key functions that the MITRE team believes are critical to the achievement of the strategic vision.

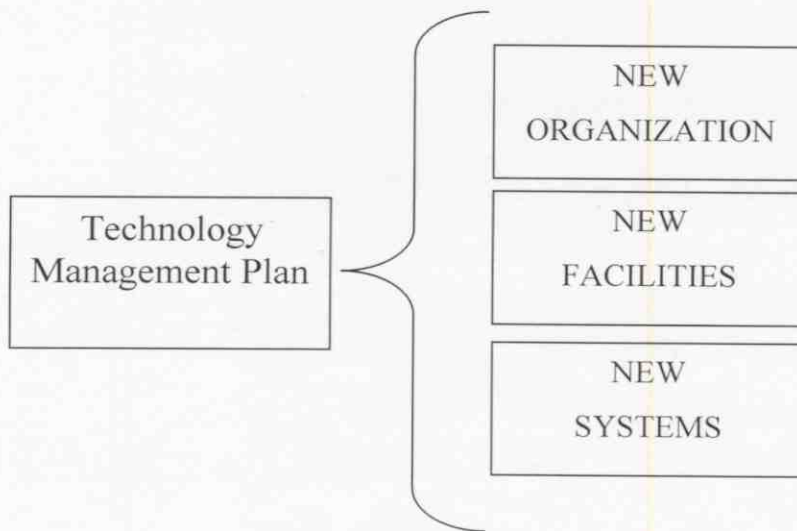


Figure 2-1. Strategic Vision

The report identified the following as the major benefits of the consolidation initiative:

- Break the current space barriers that exist between the different emergency offerings.
- Allow for open communications between the different emergency services.
- Increase overall visibility and understanding of all emergency service processes.
- Upgrade and standardize the technology supporting of the 911 system and reduce maintenance and support costs.
- Replace antiquated and crowded facilities with a state-of-the-art emergency communications center.
- Realize increased efficiencies by eliminating the three tiered system of 911 call taking/dispatching by consolidating the 911 neutral call takers with those in police and fire and eliminating numerous positions.

- Provide more effective emergency management through closer proximity and communication with the call center receiving citizen emergency service requests.
- Improve public safety through better and more timely response to emergency situations.

The Andersen report defined a clear business strategy and approach for the City of Houston's public safety system. While there appears to be high-level agreement and understanding between the various stakeholders (Mayor's Office, HPD, HFD, and HEC) involved in Houston's public safety service, there is not a clear end-to-end alignment of the public safety system across all of these organizations in regards to the implementation of the Andersen report business strategy.

2.2 Performance Requirements

The identification of documented performance requirements was the first task undertaken by the MITRE team to conduct the assessment. Specifically, MITRE requested request for proposals (RFPs) and other requirements documents for each of the major systems that comprise the public safety system. The only requirement document identified in response to this request was the contract between Northrop Grumman and the City of Houston for the CAD and RMS.

There is not a single source document that specifies end-to-end performance requirements for all of the public safety data and radio systems. With the exception of the CAD, RMS, MSS, and SAN, no formal requirement document exists for the other systems. The majority of them are legacy systems that have been sustained by the City for a period of years. The HEC is responsible for managing the agreement with Northrop Grumman. The MITRE team conducted an in-depth review of the requirements in the contract between the City of Houston and Northrop Grumman.

2.3 City of Houston Scope of Services

Based on staff interviews and review of the contract, the intent of the agreement between the City of Houston and Northrop Grumman was to identify specific system requirements were needed for the upgrade at the existing police CAD system to the new system. Therefore, the scope of service was drafted to specify the following: the preferred hardware configuration, functional requirements to support 911, HPD, and HFD operations, and specifications, to deliver interfaces to the legacy systems. The City of Houston also decided to pursue a sole source agreement with Northrop Grumman as opposed to releasing an RFP for a new system. The MITRE team did not assess the reasons for this decision but noted that it did impact how the requirements in the scope of services were written; i.e., the requirements were written for a known system, Altaris®.

The MITRE team initially reviewed the requirements individually to determine if they were adequate service level requirements and to identify which of them were performance based requirements. The analysis then focused on the performance based requirements to determine how they impact the current operations and performance of the overall system. These results are

documented in the report "Service Level Agreement Review and Assessment for The City of Houston, Texas", prepared by L. Robert Kimball and Associates.

The requirements in the "Scope of Services for the Houston Public Safety Dispatch System" address the delivery, testing, and maintenance of the hardware, software, application of the CAD, RMS, MSS and SAN. Application customization was needed by Northrop Grumman to meet the requirements in the scope of services for two major reasons: first, the separate and distinct operations of the HPD and HFD call takers and dispatching functions; and second, to develop and maintain the external interfaces to all of the other systems that were not being upgraded in sequence with the CAD and RMS.

The team recognized the need for the customization but noted the following long-term concerns. First, customizing of any system leads to increased maintenance and support costs for several reasons: the vendor's ability to leverage its resources when problems or changes become more difficult and the customized solution is further away from the vendor's base offering which impacts the degree of testing and training that must be maintained to support continual customization. Therefore, the City of Houston needs additional resources to support changes made to the baseline and to maintain the customized code. Further, the City needs a strategy that analyzes the need for and provides out year costs for continual system operations and support.

Sections 2 and 4, "CAD Upgrade Services" and "Workstation Requirements," have an impact on the current system performance. These sections specify the equipment requirements. These requirements do not specify who is responsible for upgrading the equipment nor the process for these changes to occur. This is not a major problem because the City of Houston and Northrop Grumman, through practice, will and has used change orders for equipment upgrades. The warranty for the equipment is also specified in this section. The warranty requires support during business days and allows for a four-hour response time. Because of the criticality of some hardware components, the MITRE team recommends that the warranty period be changed to 7 days a week and 24 hours a day (7x24) for major components and systems.

In Section 3, "Functional Requirements," the City requested software modifications and customizations. As noted in comments above, software customization is needed to meet these requirements. This customization will support the HPD and HFD operations. It also supports the following existing systems that the CAD is required to interface with: HPD RMS, HPD and HFD MDTs, [REDACTED], HFD Alerting and Paging, and [REDACTED]

Sections 5, 6, 7, 8, and 9 identify database conversion requirements and provide details for external interfaces. These requirements provide a good measure for monitoring current and future conversion and interface requirements.

Section 10, "Application Development Tools," the MITRE team was not clear in reviewing this section on its original intent. Based on feedback from interviews, this section was included to allow the City of Houston to provide city maintenance programming services, as had been done previously on the prior HPD and HFD systems. This section provides options for continual

maintenance of the system by City of Houston staff if needed. During interviews and review of processes, the team was not clear on whether the City of Houston and Northrop Grumman actually intends for the City or the contractor to maintain and monitor the system.

Section 14, "Maintenance and Technical Support," system availability of 99.9% is specified. This requirement is not usually acceptable for a high availability system solution. Usually 99.99% is the acceptable industry standard for "High Availability" and 99.999% for "Fault Tolerant" mission critical systems. This section also limits availability requirements to the CAD and RMS applications. While not a part of this contract, the availability requirements for hardware and other systems not included in the scope of services should be included in future change orders or other contracts.

In Section 15, "Installation, Testing and Acceptance," performance requirements regarding the system availability, transaction performance, system failover, and testing are contained. These requirements provided a level of detail for transaction performance that is not contained in other sections of the scope of services, i.e., they may only be applicable to the acceptance testing. Thus, the MITRE team could not determine if these requirements apply to the post-acceptance period and, therefore, recommends measures be specified for the current system to establish the expected baseline for the system performance.

3 Architecture

3.1 Old System

Figure 3-1 shows the architecture for the systems supporting call takers and dispatchers prior to the new public safety system. As shown in Figure 3-1, each department operated and maintained their own system.

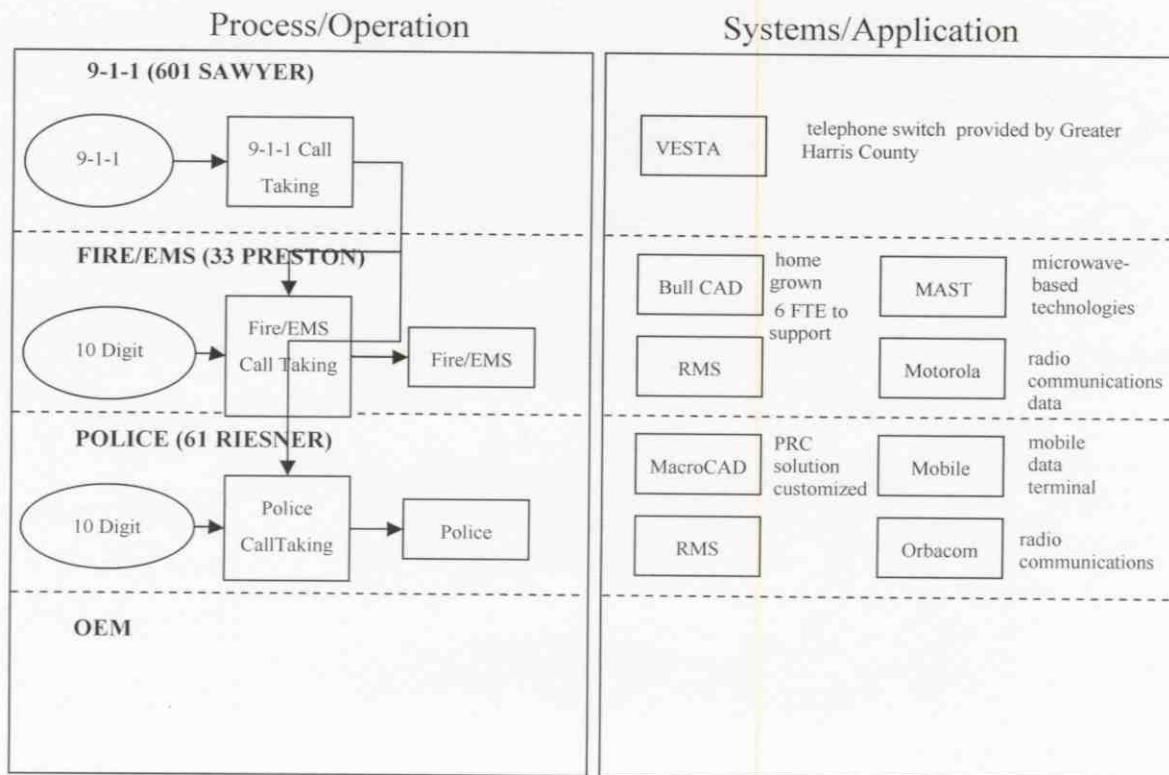


Figure 3-1. Old Public Safety System Architecture

3.2 Current System

The current City of Houston public safety system is comprised of different organizations' systems. The MITRE analysis focused on the architecture and design as it currently exists. During the assessment, the team noted that the HEC and other departments are in the process of making improvements or have identified upgrades that are needed but these planned changes are

not included in this assessment. Figure 3-2 highlights the current end-to-end systems that contribute or interface to the public safety system.

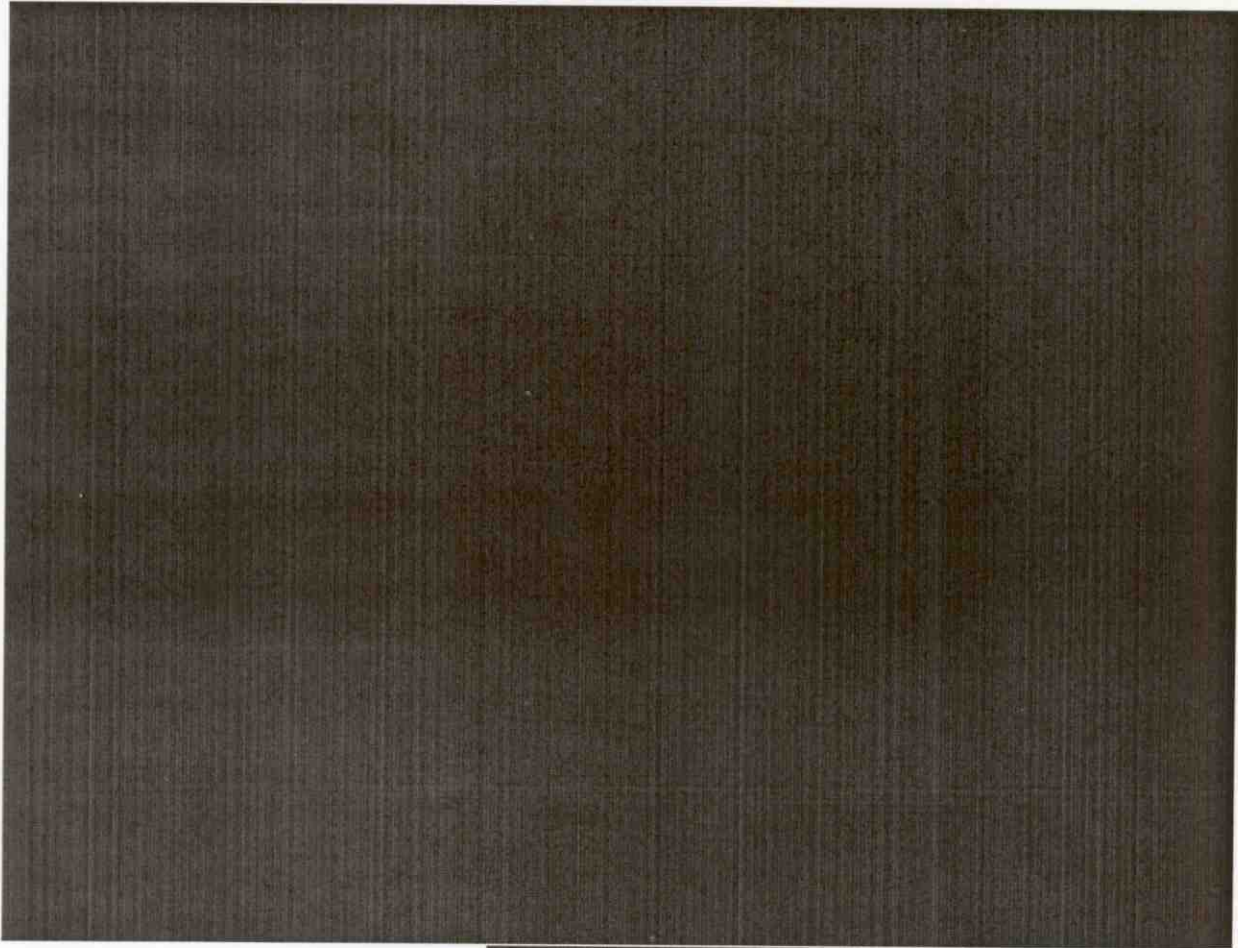


Figure 3-2. [Redacted]

The key systems comprising the City of Houston Public Safety System are identified in Tables 3-1, 3-2, and 3-3.