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April 21, 2008

Eric Yee  
San Mateo County Information Services Division  
455 County Center  
Redwood City, CA 94063

Dear Mr. Yee,

The Galena Group, Inc. (GGI) is pleased to provide the County of San Mateo with a technology assessment of the Public Safety Communications (PSC). The San Mateo County PSC and Information Services Division (ISD) personnel provided exceptional assistance and information to GGI during this assessment.

The technologies reviewed in this assessment include:

- Telephone system
- Computer Aided Dispatch (CAD)
- Message Switch System (MSS)
- Communications systems (including paging, radio, etc.)
- Administrative systems
- Alternate facility

The technology assessment included the following tasks:

- Project kick-off meeting
- Interviews of San Mateo County PSC personnel
- Tour of dispatch center and equipment facilities
- Interviews of San Mateo County ISD personnel
- Extensive research on new 911 technology
- Discussions with Northrop Grumman
- Discussions with agencies surrounding San Mateo County PSC

Although there are many considerations surrounding the technologies of the communications center, we remained focused on providing a clear understanding of where the technologies stand today and what future plans should be made for their upgrade, maintenance and possible replacement. We have also included information on future trends in 911 technology, which will likely directly affect San Mateo County PSC within the next three (3) to five (5) years.

Based upon our research and findings, the following are our key immediate recommendations:

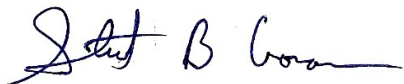
- Continue working to augment the PSC staff to train additional technicians capable of managing the responsibilities of the PSC technical resource. Salary considerations are beyond the scope of this document; however, we would suggest working with the County IS Department to see if an appropriate individual may be screened for security and cross-trained with dual reporting responsibilities.
- Establish a replacement fund for the existing CAD.
- Monitor the increasing developments with virtual information systems access. Perhaps partnering with a local supplier to examine opportunities for remote data access. An Alpha test of an emergency backup site could prove ideal for testing.

In addition, we provided the following near term recommendations so that the County may begin the planning process:

- Conduct a survey of CAD and Message Switch vendor pricing in an effort to calculate budgetary pricing for the CAD/MSS replacement fund.
- Establish a Next Generation 911 (NG911) upgrade fund to accommodate changes to tertiary infrastructure.
- Plan and execute a detailed data and resource sharing workshop including representatives from San Mateo County Information Services Division and Public Safety Communications.
- Conduct a gap assessment between the features of the existing CAD/Message Switch system and functionality offered through current software development. Paying particular attention to data sharing and integration on a countywide and regional basis.
- Although the Zetron Fire Alerting system is owned and maintained by the San Mateo County Fire Service, PSC should be an active partner in the planning and replacement or upgrade of the existing system.

Please contact us at 775-852-4545 with any questions regarding this study. We look forward to providing assistance to San Mateo County in the future.

Sincerely,



Stuart Cronan  
Galena Group, Inc.

County of San Mateo Public Safety  
Communications  
**Technology Assessment**  
Phase II - Final Galena Group, Inc. Deliverable

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**Galena Group, Inc.**

*Information Technology / Communications Consulting*

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April 21, 2008

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# Part I

## Technology Assessment

# Chapter 1

## Introduction

San Mateo County retained the Galena Group, Inc. (GGI) to evaluate and assess several key segments of data processing and telecommunication. This report is the final deliverable from GGI, providing detailed information on our assessment of systems utilized by San Mateo County Public Safety Communications (PSC). PSC provides emergency call taking and dispatch services for all San Mateo County Fire Departments, Emergency Medical Services (EMS) and various law agencies in the region.

The County of San Mateo regularly obtains assistance from management consultants to gain external perspective on critical technology systems. Further, the County Health Department hired another consulting firm to conduct a gap analysis of the Computer Aided Dispatch (CAD) system related to EMS best practice functionality. Concurrently, ISD conducted this study to look at a higher level of management and technology, including CAD. As a result, some findings and management commentary from this report may overlap those of the specific CAD review.

### 1.1 Purpose of This Report

In order to guide the development of analysis and decision making, GGI worked closely with ISD to determine how results of this report will be used by the County. Specifically, the purpose of this study is to research seven important technology areas and decide if existing systems (or upcoming implementation plans for these systems) appear appropriate for the unique public safety needs of PSC and its constituent agencies. To accomplish such a broad task, GGI devised a uniform way to analyze

each technology area. GGI constructed a tool to review management and technical considerations. Thus, using a more tangible approach, GGI is able to achieve, what we believe to be, a greater accuracy with this assessment.

## 1.2 Scope of Analysis

Research and analysis is often clouded by consideration of parallel technology and management decisions. In an attempt to guard against this, GGI institutes a research philosophy to place clearly defined or "hard edges" on the systems evaluated. For each system, GGI first considers isolated issues. Next, interface or supplemental technology systems are included in management analysis. After each is investigated, GGI documents and considers the overall impact to each analysis area. Topics often include management direction, future technology considerations, estimated costs and pending regulatory changes. GGI then integrates the principle findings into a summary management assessment, drawing attention to any areas which need immediate action.

For this project, the County is interested in an evaluation of the following:

- Telephone System
- Computer Aided Dispatch (CAD)
- Message Switch System
- Communications System
- Administrative System
- Alternate Public Safety Facilities.

## 1.3 Project Assumptions

In the above section, the 'hard edges' of analysis are briefly mentioned. As with all research and studies, there are limitations to each evaluation. For this project, GGI understands a parallel study is underway on the CAD system related to EMS best practice functionality. Consequently, our CAD analysis is strategic and not intended to serve as a point-by-point examination of software and hardware.

GGI made a concerted effort to capture all relevant issues through our fact finding processes. Simply stated, we confirmed our understanding of present systems with representatives from the County.

## 1.4 Sequence of Events

Orchestrating a professional approach to the analysis, GGI performed the evaluation of this project in three phases:

- Phase 1 included the on site evaluation of existing systems and collection of data pertinent to the report.
- Phase 2 consisted of on and off site evaluation of materials collected in Phase 1, plus additional conference calls and necessary research.
- Phase 3 is the final delivery of the report along with appropriate questions and answers to make sure we understood existing systems and future requirements.

## 1.5 Phase 1

### 1.5.1 Initial Data Gathering & Project Kick-Off

GGI conducted a project kick-off meeting and planning session with the County's Project Team including the following tasks:

1. Introduced Contractor Project Team members
2. Reviewed overall project objectives, approach and timetable
3. Formulated recommendations from the County's Project Team on the composition of personnel and sources for initial data gathering.

### 1.5.2 On-site Interviews

1. Public Safety Communications:
  - (a) Systems Management Supervisor

- (b) Dispatch Coordinator, Systems Unit
  - (c) Communication Center Director
  - (d) Fire Operations Manager
  - (e) EMS Operations Manager
  - (f) Law Enforcement Operations Manager
2. San Mateo County Information Services Department:
- (a) CIO / Director
  - (b) Information Security Officer
  - (c) Advisory Systems Engineer
  - (d) San Mateo County ISD Relationship Manager

### **1.5.2.1 Phase 2 - On Site Analysis**

San Mateo County Sites Visited / Reviewed by GGI  
Public Safety Communications Center:

1. Dispatch Floor
2. PSC Equipment Room
3. PSC Backup Generators

### **1.5.3 Phase 2 - Off Site Analysis**

#### **1.5.3.1 Documentation and Research Materials**

As a precursor to our research, GGI obtained documentation on the various technology systems under review. In some cases, GGI made request of the County and PSC personnel to obtain the necessary information and additional documentation. Below is the list of information which GGI used as the basis for forming opinions during the Technical Systems Assessment.

1. Third Party Vendor Contracts:
  - (a) Gold Fax

- (b) Intergraph
  - (c) Maintech
  - (d) Northrop Grumman
  - (e) Pacific Bell
  - (f) Patriot Software (Haas Systems, Inc.)
  - (g) Positron
  - (h) Schedule Soft
  - (i) Tech Defenders
  - (j) Power Maintenance Corp
  - (k) What's Up Gold
2. System Overview Documentation:
    - (a) Network Diagrams - Internal and External Connections
    - (b) PSC Switch Usage Diagrams
  3. CAD Block Diagrams Statistical Measurements and Volume Data:
    - (a) Public Safety Up Time Statistics
    - (b) Telephone System
      - i. Number of Calls per Trunk
  4. Message Switch Remote CAD Interface Specifications
  5. System Management Unit Equipment Maintenance Guide
  6. ProQA Information for EMD
  7. CAD Application Update Reports
  8. Documentation Provided by San Mateo County Information Services Department:
    - (a) County Technology Standards Service Level Agreements (SLA):
      - i. Generic Example
      - ii. Specific Department Example

# Chapter 2

## Technical Systems Assessment

Analysis of the varied technical systems for the County of San Mateo included a review of existing technology components, management, integration and future direction of industry. Each of these areas affect current systems and must be viewed individually and in concert with each other.

Our research and analysis was directed specifically to the seven areas as documented in our statement of work. For each, we carefully considered the impacts of the following:

1. Capacity
2. Redundancy
3. Fault Tolerance & Backup
4. Network Issues
5. Support Structure & Maintenance
6. Facilities.

GGI developed a detailed scoring methodology to capture the status of each system in an easy to read chart. Then, we discuss consolidated issues and provide commentary and recommendations to the County of San Mateo. Furthermore, trends in public safety operations, technology and regulatory issues necessitate a strategy which is interlaced with the systems reviewed in this report.

## 2.1 Our Assumptions

The following are the primary assumptions that GGI applied during our assessment process:

**Management** of public safety systems should include centralized management methods, permitting the agency to exercise reasonable control over hardware, software and security. Centralized management will assist the PSC in continued development of integrated implementation, maintenance and administration of the systems and technology in the organization.

**Appropriate state-of-the-art** systems used by public safety agencies should be able to meet current needs without relying on unproven hardware or software for critical systems.

**Security and control** of sensitive information and systems is extremely important. Accountability to the public and government constituents is presumed by all agencies.

**Reliability of systems** supporting public safety technology should be redundant, and seek to employ the benefits of virtual control when possible.

**Standardization of management** and systems improves cost control and assists with implementing large-scale integration.

**Virtual Controls** may significantly enhance information services access. Public safety technology is rapidly integrating the ability to control systems virtually. Thus, redundant systems remain a staple of public safety but should incorporate secure virtual controls when possible.

**Inter-Agency Coordination** and sharing of data and resources, with the appropriate controls is often desirable and sometimes more important than autonomy. The national homeland security direction for law enforcement includes a move towards shared access to global databases, such as Global Judicial XML (GJXML).

## 2.2 The Scoring Methodology

The purpose of the analysis chart below is to summarize the state of affairs for each County system with a raw score. Although this method is subjective, it draws from factual information obtained in our analysis and our industry experience. For most systems we derive our final score by considering internal and external factors. Where necessary, we discuss sensitive topics in more detail in later sections of the report. The scoring system is defined below:

- 6- Meets current and future needs
- 5- Meets current needs; addresses some future needs
- 4- Meets current needs; has potential to be upgraded to accommodate future needs
- 3- Meets current needs; does not address future needs and/or growth requirements
- 2- Meets basic needs; replacement should be planned
- 1- Not meeting current needs; should be replaced immediately
- N/O- None Observed
- N/A- Not Applicable

	E911/Telephone	CAD/MSS	Communication	Administrative	Alternative Facility
Capacity	5	4	6	N/A	4
Redundancy	6	5	6	4	4
Fault Tolerance	6	6	6	N/A	4
Network Issues	N/O	6	N/O	N/A	N/O
Documentation	6	5	N/O	N/A	6
Support & Maintenance	6	4	6	4	6

## 2.3 E911 & Telephone Systems

The PSC uses separate emergency and non-emergency telephone systems for daily operations. While they are individual systems, upcoming technology influences with voice over internet protocol (VOIP) will likely change the way each system works.

### 2.3.1 System Description

A Nortel Networks 81C is installed for non-emergency telephone for all County users. The PBX is over two years old and was last updated in December 2005. In 2008, the PSC anticipates a system upgrade.

The ANI/ALI emergency identification phone system is manufactured by Positron. This system is approximately 8 years old with the next update anticipated in the first quarter of 2008. The PSC answers 911 telephone calls for the San Mateo County Sheriff's Office, Broadmoor Police Department, Half Moon Bay Police Department, Millbrae Police Department, East Palo Alto Police, all San Mateo County Fire Departments and AMR San Mateo (for Emergency Medical Services). It is our understanding that, as of the writing of this report, the purchase orders for the upgrade have been sent to Positron, however, no specific date for implementation is set.

### 2.3.2 Capacity

The 911 system includes 25 inbound telephone trunks for emergency land line calls. Wireless emergency telephone calls are now answered by the California Highway Patrol. In total, 911 calls to the PSC are anticipated to increase 1.5% annually through the year 2012, not including changes to the way wireless 911 calls are handled.

### 2.3.3 Redundancy & Fault Tolerance

As a backup to the incoming law enforcement 911 trunks, emergency calls may be re-routed to South San Francisco and / or Menlo Park Police Department PSAPs in the event of a failure. Incoming calls on Fire/EMS 911 trunks and seven digit lines are re-routed to the Fire/EMS backup center. Additionally, PSC maintains standard analog telephones which may be used to dial in and out of PSC if the telephone system should fail. These phones are primarily a backup for non emergency and administrative lines.

### 2.3.4 Network Issues

PSC anticipates directly accepting wireless emergency calls sometime in 2008. Other agencies in the region recently assumed the responsibility for wireless 911 calls, but the true impact on the PSC is not yet known. Please refer to the previous study, Wireless 911 Workload Study and Impact Report, provided to San Mateo County PSC in April, 2007 for further information on the potential impact of accepting wireless 911 calls.

#### 2.3.4.1 Next Generation 911 (NG911)

Changes in 911 technology will soon change the underlying technology for 911 systems nationwide. As a result, the future technology plans for the PSC need to consider next generation 911 (NG911), which is currently in the beginning stages. The interim step between the existing 911 system and NG911 is the NENA i3 concept.

##### **NENA i3:**

- Is an all Internet Protocol (IP)-based emergency communications system
- Has an estimated 2 - 5 year implementation schedule
- Is the first step in migration toward NG911

The NG911 will be supported by an Emergency Services Internet Protocol Network (ESInet), which is envisioned as an IP-based inter-network shared by all agencies which may be involved in an emergency. The ESInet will typically be County-wide and connected to neighboring Counties' ESInet for mutual aid purposes.

Some of the potential benefits of NG911 are:

- Ability to accept multimedia calls for help, including:
  - Voice
  - Video
  - Text
  - Pictures
- Ability to route overflow calls to other Public Safety Answering Points (PSAPs)

- Improved location information for each caller
- Ability to isolate calls from a specific incident (based upon location) and queue those calls separately from all incoming 911 calls

It is important to note that, per the National Emergency Number Association (NENA):

“A call that is diverted to an alternate PSAP can be answered, and information obtained from the caller, but that information must be given to the responders who can help the caller. This requires the diversion PSAP to be able to enter information into the Computer Aided Dispatch system of another PSAP. Traditional CAD systems have primitive data interfaces (typically just address data) over even more primitive (typically serial port) interfaces. New interfaces must be made available to accept much more rich data, with (controlled) access from diversion PSAPs. In addition, data normally considered local to a PSAP, for example GIS data, validation data, and responder service boundary data, must be made available to the diversion PSAP to be able to correctly complete a CAD entry.”

It is our understanding that a pilot project has been formed, including fourteen (14) San Francisco Bay Area PSAPs to test the IP based 911 system concept. Three agencies in the vicinity of San Mateo County are participating in this project and are currently in the process of selecting a vendor for a shared CAD system. More information regarding this pilot project can be found on the California State website at: [www.td.dgs.ca.gov/Services/911/NGEN.htm](http://www.td.dgs.ca.gov/Services/911/NGEN.htm)<sup>1</sup>

Per the NENA spreadsheet on i3 status:

As of 7/05/2007, “California is defining common network components and State network modernization. At this point there is no statewide network. There are areas considering IP, but nothing is definite yet.”

Per PSC personnel, the telephone vendor, Positron, Inc., is a NENA Next Generation 911 partner. PSC’s new system is engineered to support the NENA I3 industry

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<sup>1</sup>For more information on NENA i3 and NG911, go to: <http://www.nena.org/media/files/08-002V120071218.pdf>, or [www.its.dot.gov/ng911](http://www.its.dot.gov/ng911)

standards for native VOIP 911 calls when such service is available. With the Evergreen Software, which will be locally administered, these future upgrades will be provided to PSC for no additional cost.

### 2.3.5 Support Structure

The non-emergency Nortel PBX phone system is maintained by the County Telephone Services Division. PSC is responsible for administration of the 911 phone system. The associated 911 trunks are the responsibility of AT&T.

### 2.3.6 Facility

With the exception of tertiary 911 components, all telephone hardware is located at the PSC. As mentioned above, the South San Francisco Police Department and the Menlo Park Police department serve as 911 backup locations in the event of a failure at the PSC. Similarly, the PSC is the default backup agency for several other agencies in the County of San Mateo. Re-routing of 911 calls is accomplished via a manual switch at each location.

The Fire/EMS back-up dispatch center is located at Fire Station #9, a seismically safe facility, where the center was designed to be able to operate 100% independently from the primary dispatch center at the Hall of Justice. Most of the functions have been reproduced at the alternate dispatch center facilitating a smooth transition between the two centers. The back-up center features the following state-of-art technology:

- The Zetron radio console is a near duplicate system of what is currently being used in the Public Safety Communications Dispatch Center. In addition to the all Fire and EMS channels at this site, PSC also installed the Law Enforcement mutual aid channels.
- The Zetron telephone system is similar to the existing Positron 911 system at the Hall of Justice. It is a PC based system that utilizes a touch screen CRT. Due to the number of telephone lines in the primary dispatch center, it was cost prohibitive to duplicate every line at Station 9. The alternate dispatch center is equipped with 6 incoming business/emergency lines and 4 outgoing lines. When the alternate dispatch center is activated, all 7 digit emergency

lines will be call-forwarded to the incoming lines. Alternate routing of the Fire/EMS 911 trunks to the 7-digit number automatically occurs via a switch. Additionally, microwave lines and County PBX extensions were duplicated.

- The alternate dispatch center utilizes the primary CAD system located in the basement of the Hall of Justice. This allows a very smooth transaction between primary and alternate center (as unit/incident status is current), and allows the use of automated alerting and MST usage. Additionally, the alternate dispatch center is equipped with a stand-alone CAD system that will allow unit/incident tracking and automated recommendations only. The stand-alone system does not have the ability to perform automatic alerting, paging, or MST support.
- Backup testing is scheduled monthly and the PSC building is augmented with dual uninterruptable power systems (UPS) including a standby generator in the event of a power outage.

Several agencies in the nearby area are in a procurement process for virtualized dispatch. The premise of the system is to maintain a balance of individual autonomy and shared resources to reduce costs and increase buying power. Their ideal solution will include the ability to operate each discrete system from mirrored facilities.<sup>2</sup> Virtualization differs from shared CAD systems in two noteworthy ways. First, multiple agencies may share similar hardware, yet the complete instance of the CAD application may be run on a virtual server. The virtual server may then be moved to another machine while maintenance is performed on the host hardware. Similarly, in exigent circumstances the virtual server may be re-hosted on a partner agencies hardware, without sharing data files of the CAD system since the instance of the server is unique. Second, preferences in hardware and tertiary software applications permit each agency to implement custom interfaces and applications which may be moved along with the virtual server.

Traditional fail over and redundant CAD applications often stipulate shared databases and mirroring of data to accomplish similar functionality. If one agencies, system were to fail, the database information could be re-hosted and accessed via the client software at a partner agency facility. If this occurred in a virtual system, dispatchers could drive to a remote agency, log on and access their virtual server

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<sup>2</sup>Cities of Mountain View, Palo Alto and Los Gatos

(after it was transferred to the partner agencies network). Thus, virtualization may provide far greater flexibility for software maintenance and operations.

### **2.3.7 Principle Commentary & Recommendation**

The new 911 system will require modifications to support upcoming changes with NG911. However, PSC personnel state that existing hardware and software will be upgraded to support new features. GGI concurs with the opinion of the PSC personnel. We recommend PSC continue to monitor developments with NG911. In addition, we suggest PSC establish an internal replacement fund for 911 in the event funding assistance levels are modified by the State of California.

## 2.4 Computer Aided Dispatch & Message Switch Systems

### 2.4.1 System Description

Installed in 1992, the PSC Computer Aided Dispatch (CAD) system supports the emergency dispatch needs of law, fire and EMS. Agencies served by the CAD include:

- All Fire Departments in San Mateo County
- SMC Sheriff's Office
- Half Moon Bay Police
- Broadmoor Police
- East Palo Alto Police
- Millbrae Police
- AMR / San Mateo (aka Baystar Medical Services) 911 paramedic ambulances.

After hours and part time dispatch customers include:

- Peninsula Humane Society
- County Public Works (Water, Roads, Sewer)
- County Parks
- County Coroner
- County Probation
- County Narcotics and Vehicle Theft Task Force
- Area OES
- County Radio Shop
- Other Allied Agencies

Originally purchased from PRC, the CAD system is now supported through Northrop Grumman and has recently been upgraded, both hardware and software. Northrop Grumman provides short and long term software maintenance to San Mateo County. In addition, Northrop Grumman advised GGI that the software and all of its customizations are approved by their maintenance personnel and can be upgraded and manipulated for a fee. Northrop Grumman did not indicate what priority or time frame the upgrade/manipulation of the customizations would receive.

### 2.4.2 Capacity

The Northrop Grumman CAD includes the following:

- 13 primary CAD dispatch workstations (dual monitors)
- 11 administrative CAD workstations
- 2 training CAD workstations
- 7 portable training workstations, 3 with dual monitors
- 2 wireless CAD workstations
- 5 workstations at the Fire/EMS back-up facility
- 1 CAD workstation at the Gang Task Force/Gang Intelligence Unit
- Interfaced to multiple record management systems.

Projected estimates suggest an annual increase of 1.4% - 1.9% of dispatch activity through the year 2012, not including the initial increase of accepting wireless 911 calls. Calculating the capacity of the existing system is frequently a subjective measure of performance. For this report, GGI relies on data accumulated by the County on downtime and availability. Through reports automatically generated by What's Up Gold, the CAD and message switch system demonstrates up time measurements consistent with standards of other public safety operations in the region.

### 2.4.3 Redundancy & Fault Tolerance

The design of the CAD hardware incorporates multiple levels of redundancy for internal components (e.g. power supplies) as well as external data storage. Significant to the design is a storage area network array, accessible by both the primary and backup servers. In addition, each machine works with two redundant data switches further insulating the system from hardware failures. Finally, dual uninterruptable power supplies (UPS) provide continuous operation of the core hardware.

### 2.4.4 Network Issues

The integral Message Switch to external law enforcement system runs on a stand alone network with direct access to justice interfaces for local state and national databases. The insulated design of the public safety network adds security to data by limiting access from unknown sources. Plus, only PSC employees who have undergone appropriate background checks are permitted to access sensitive data and interfaces. Operational protocol for many security issues is mandated by federal, state and local authorities with severe penalties for unprotected systems.

### 2.4.5 Support Structure

PSC largely relies on the services of one Dispatch Supervisor for ongoing system administration and technical maintenance. This Supervisor is well acquainted with networking, software and hardware for the public safety environment. Currently, many custom changes are installed for the CAD system to match the specific needs and requirements of the County dispatch center. There are two additional employees in the unit, a Lead Systems Specialist and an IT Technician. The Lead Systems Specialist has not only been trained by the Systems Supervisor, but has been certified by Northrop Grumman and continues to develop her skills in systems maintenance, administration and development. Related to these duties the position is also responsible for Information Management and Crystal Reports development. The IT Technician is primarily responsible for general technology support which aids in balancing workload between all three employees in the unit.

### 2.4.6 Facility

Existing facility can support 14 dispatch and E911 workstations with full access to systems. Backup facilities are located at Fire Station #9. From Station #9, dispatchers can access the CAD, radio and E911 systems which operate independently from the primary dispatch center in the Hall of Justice.

### 2.4.7 Principle Commentary & Recommendation

Software and hardware upgrades for the CAD system enable the County PSC to maintain operations in both normal and emergency circumstances. Based on collected data, it appears the existing system operates within the expected performance criteria as compared to other public safety systems in the region. The incumbent CAD vendor (Northrop Grumman) actively participates in the public safety community and continues to develop enhancements of their CAD software. Thus, any concerns regarding future support of the existing software and hardware are substantially relieved.

The existing CAD system includes many software changes important for County dispatch operations and interface maintenance. Northrop Grumman has verbally "approved" the existing custom code changes. "Approved" means that Northrop Grumman has reviewed the customizations and certifies them as meeting Northrop Grumman standards, therefore Northrop Grumman will support and maintain the existing software with the existing customizations.

Costs for enhancements and programming could increase dramatically if the assigned Dispatch Supervisor leaves employment with the County. Conversely, these costs could be mitigated by hiring an employee capable of programming the Northrop Grumman CAD. GGI conducted a conference call with Northrop Grumman's project manager for the County of San Mateo. He explained that charges for custom code modifications are \$285 per hour. Absent internal technician support, even minor code changes or upgrades may increase the system maintenance costs. However, based upon our research, there is no information suggesting the current CAD system does not meet the majority of the existing needs and requirements of the County PSC.

GGI recommends the County conduct further research to compare and contrast features of the modern CAD software systems with the current PSC software. Fi-

nally, internally customized software can bring considerable risk to the County, especially since PSC essentially retains only one individual with detailed knowledge of the applications. Although risk is assumed with one on-site programmer, Northrop Grumman programmers who have approved the customizations should be consulted if the need arises in the Systems Supervisor's absence. It should also be noted that on-site customizations are not the norm in most dispatch centers. The process for customizations is lengthy and costly and often do not meet the time sensitivity of customers. This opinion is not meant to undermine the success achieved with the existing system; rather, it is to highlight a potential weakness, and therefore risk, in the system support structure. To protect against a loss of support we suggest a greater participation of, perhaps County IS staff in Section 2.7.

## 2.5 Other Communications Systems

The PSC relies on several communication systems and components necessary to relay data and voice information. Key components are the radio communication system, mobile data system and fire alerting system used by emergency dispatching. We briefly review these systems in the following sections.

### 2.5.1 System Descriptions

#### 2.5.1.1 Voice Radio

Critical to operations is the voice radio system for PSC. The County IS Department supports both the Motorola 450 MHz UHF T-band trunked and law enforcement analog radio systems. The trunked radio system was installed in 2005 with approximately 128 talkgroups Countywide. A total of 13 sites and 7 voting receivers support nearly 1,000 portable radios and 525 mobile radios. A Sonet microwave loop provides the primary inter-connectivity for the radio backbone and the system intelligence. A private contractor supports the analog VHF radio system used by the County's fire service. The system has three independent zones each consisting of a primary dispatch channel, a secondary dispatch channel and multiple tactical channels. Each zone's primary and secondary dispatch channels contain multiple transmitters designed for redundancy and each system has multiple receivers in a voting configuration.

#### 2.5.1.2 Mobile Data

Mobile data devices are used for Fire Department apparatus throughout the County. At this time, Motorola status terminals are installed in various first responder vehicles. These status terminals can send pre-coded text responses back to PSC indicating enroute, on scene and other changes in event status. These messages are time stamped and automatically entered into the CAD incident.

Some law enforcement agencies dispatched by PSC also utilize various mobile data computers and laptops in the field. Their network infrastructure connectivity consists of AT&T and Sprint wireless, supported by a Net Motion software residing on a server, which is maintained by PSC technical resources. Net Motion, at a minimum, provides Virtual Private Network (VPN) secure access. The mobile data

terminals utilize Northrop Grumman mobile client software.

### **2.5.1.3 Fire Alerting System**

The CAD system is interfaced to a Zetron Model 6/26 fire alerting system. The Zetron 6/26 provides station alerting capability to nearly 60 fire stations dispatched by the PSC. The Zetron alerting system is comprised of 5 zones, each using a separate Zetron model 6/26. The interface to CAD is bi-directional, meaning that information is transmitted from CAD to the Zetron and vice versa. The analog link provides initial control of the public address system at each station and may initiate pre alert tones and other functions as programmed. Although functional, the technology for this system is mature and more robust equipment is available. The current system utilizes analog multipoint leased lines to provide connectivity to the fire stations. Many fire departments in other jurisdictions have, or are planning the replacement of their analog systems with internet protocol based systems. The San Mateo County Fire Service, in partnership with TEA and PSC, is currently conducting a feasibility study on the IP based alerting system.

### **2.5.1.4 Alpha Pagers**

Alpha pagers are used by San Mateo Fire and EMS agencies. Pages are sent upon dispatch for secondary notifications. The alpha pagers are connected via a cellular 56k leased line to American Messaging. Dispatch utilizes a Zetron 2200 paging controller, which is interfaced to the CAD system. CAD sends a packet of coded data to American Messaging to distribute the page. There are approximately 213 page groups at this time. PSC utilizes gateway software to allow messages to be sent to alpha pagers and other text capable devices, ie., cell, smart phones, email, etc.

Any of the alpha pagers which fall below 512 MHz may need to be replaced prior to the federal narrowbanding requirements, which take effect January 1, 2013.

## **2.5.2 Other Systems Capacity**

GGI assumes appropriate loading models were calculated to support the future growth of radio traffic for the PSC. Motorola CentraComm Series II radio consoles are installed for 14 dispatch positions in the PSC in order to operate the voice radio system. One of these is assigned as a training position.

### **2.5.3 Redundancy & Fault Tolerance**

As with other systems, the PSC is supported by multiple UPS and backup generators in the event of power failure. The Sonet microwave system's design incorporates alternative path routing if a component failure occurs. Plus, the County Radio Shop retains crucial components of the microwave system in storage for immediate replacement of parts if necessary.

The Zetron fire station alerting system has 2 communication paths to provide redundancy. In the event of a failure of one of the communication paths, the CAD will automatically switch to the second path. Importantly, the current system is ISO compliant, which means that redundancy is, in part, built into the design.

All of the technology systems utilized by PSD are equipped with alarms, which send pages to PSC technical staff for immediate response if necessary.

### **2.5.4 Network Issues**

GGI obtained no detrimental information regarding the communications backbone.

### **2.5.5 Support Structure**

The County Radio Shop is equipped to respond to the PSC for problems and maintenance with the Motorola voice radio system, dispatch consoles and microwave backbone. The Zetron fire alerting system is maintained by an independent contractor, TEA, while the CAD interface is maintained by PSC.

## 2.6 Public Safety Communications Facilities

The existing PSC facility can support 14 dispatch and E911 workstations with full access to systems. Backup facilities are located at Fire Station #9. The backup facility contains 5 dispatch positions with an independent radio console system, telephone system, etc. From Station #9, dispatchers can access the CAD, radio and E911 systems under emergency conditions.

Although well equipped for present needs, there is no apparent physical room for the primary dispatch floor to grow in the current configuration without major modification. The dispatch floor space allows for 5 law consoles, 4 call taking consoles and 4 fire/EMS consoles. San Mateo PSC should be prepared to accommodate space requirements for any future growth, with consideration for large scale incidents and special events preparedness.

### 2.6.1 Principle Commentary & Recommendation

With limited space for expansion there are only three alternatives for PSC consideration. First is to procure use of a new facility for daily and backup operations when call volumes and activity levels necessitate additional dispatch positions. Another is to investigate the potential of extending virtual controls of existing equipment. Finally, PSC could review opportunities to remodel and expand existing facilities, if possible.

## 2.7 Administrative Systems

For this report, GGI considers the overall practices and management of the PSC technology systems as a paramount administrative system. After careful consideration, GGI identified a management theme which may be enhanced to gain greater utilization of PSC and County resources - shared resources. Clearly, the PSC technology system evolved due to the persistent effort of PSC staff and a commitment to adapt systems for the greatest benefit. Yet, isolated command and control can be adverse to organizational standards and support.

### 2.7.1 County IS Governance Perspective

GGI's interview with the County IS staff depict concern that PSC is at risk with only one primary technical staff assigned to the various systems. Thus far, the County IS department is not participating in the control of the PSC network, communication and data processing systems. Consequently, the IS department has concerns regarding the maintenance of PSC systems in the event the PSC technical resource were to leave employment with the County.

### 2.7.2 PSC Governance Perspectives

The County IS department seeks to consolidate technology, equipment and resources for the best use within the County departments. However, PSC is subject to state and national laws, and standards regarding the protection of law enforcement and safety systems. Assigned personnel are filtered through a rigorous background screening and direct control over these individuals is often mandated.

Further, certain equipment and access controls must be installed to meet networking requirements. The PSC systems are to a large extent integrated with state and national databases. It is our understanding that the ISD utilizes background investigations for their employees, which, per ISD are in compliance with the security requirements of the National Crime Information Center (NCIC) and the California State and local databases. If ISD personnel are involved in any capacity with maintenance of the PSC systems, it is imperative these requirements are strictly enforced. The penalty for not meeting these requirements could be as severe as PSC losing the ability to access these critical databases.

Another critical component of the maintenance of PSC technology is top priority status, twenty four hours a day, seven days a week. PSC technology supports public safety, emergency response to the community and should be given an immediate response in the event of a hardware or software failure. This is where PSC benefits from having a dedicated technical staff, with no other responsibilities or distractions.

### **2.7.3 Data Warehousing & Information Sharing**

GGI understands the large quantity of information collected by PSC. Agencies dispatched by PSC often request specialized reports and data. To meet these requests, PSC enabled direct access methods to the data and provided the necessary conduits. Constituent dispatch agencies may inquire and retrieve collected information in a secured environment.

### **2.7.4 Principle Commentary & Recommendation**

Command and control of data and technology in large organizations can be a delicate issue. It is easy to understand arguments from the PSC to retain tight control over their network and technology systems. At the same time, GGI remains concerned that County IS oversight is curtailed.

GGI cannot make a recommendation to expand the role of County IS services without further considering the benefits obtained by such a change. However, we recommend that PSC augment the technical resources of its department to provide greater personnel redundancy.

GGI's recommendation includes a 2 step plan to achieve greater economies of scale within the County and PSC. First, the County IS Department and PSC should conduct a data and resource sharing workshop. The purpose of this exercise is to document a command and control structure where the IS department may be leveraged to provide backup support to the various technology systems of PSC. Part of this analysis should include an evaluation of data storage and opportunities to mine collected data from sources of accurate and updated information.

Second, the County IS Department and PSC should draft an acceptable Service Level Agreement (SLA) where IS staff technicians and project management may be leveraged to provide backup support to PSC. Legal restrictions and potential solutions to data access and personnel control must be included in the workshop

to appropriately manage access to secured resources. This SLA should specifically identify a trouble reporting structure specific to PSC, acceptable response times for trouble reports and the status of PSC in comparison to other County departments.

# Chapter 3

## Action Plans

As an output of our technology assessment, GGI has defined the following recommended actions that we believe the County should consider moving forward with. These are broken into immediate and near term steps.

### 3.1 Immediate

- Continue working to augment the PSC staff to train additional technicians capable of managing the responsibilities of the PSC technical staff. Salary considerations are beyond the scope of this document; however, we would suggest working with the County IS Department to see if an appropriate individual may be screened for security and cross-trained with dual reporting responsibilities.
- Establish a replacement fund for the existing CAD.
- Monitor the increasing developments with virtual information systems access. Perhaps partnering with a local supplier to examine opportunities for remote data access. An Alpha test of an emergency backup site could prove ideal for testing.

### 3.2 Near Term

- Conduct a survey of CAD and Message Switch vendor pricing in an effort to calculate budgetary pricing for the CAD/MSS replacement fund.

- Establish a NG911 upgrade fund to accommodate changes to tertiary infrastructure.
- Plan and execute a detailed data and resource sharing workshop with the purposes expressed in Section 2.7.4.
- Conduct a gap assessment between the features of the existing CAD/Message Switch system and functionality offered through current software development. Pay particular attention to data sharing and integration on a countywide and regional basis.
- Although the Zetron Fire Alerting system is owned and maintained by the San Mateo Fire Service, PSC should be an active partner in the planning and replacement or upgrade of the existing system.

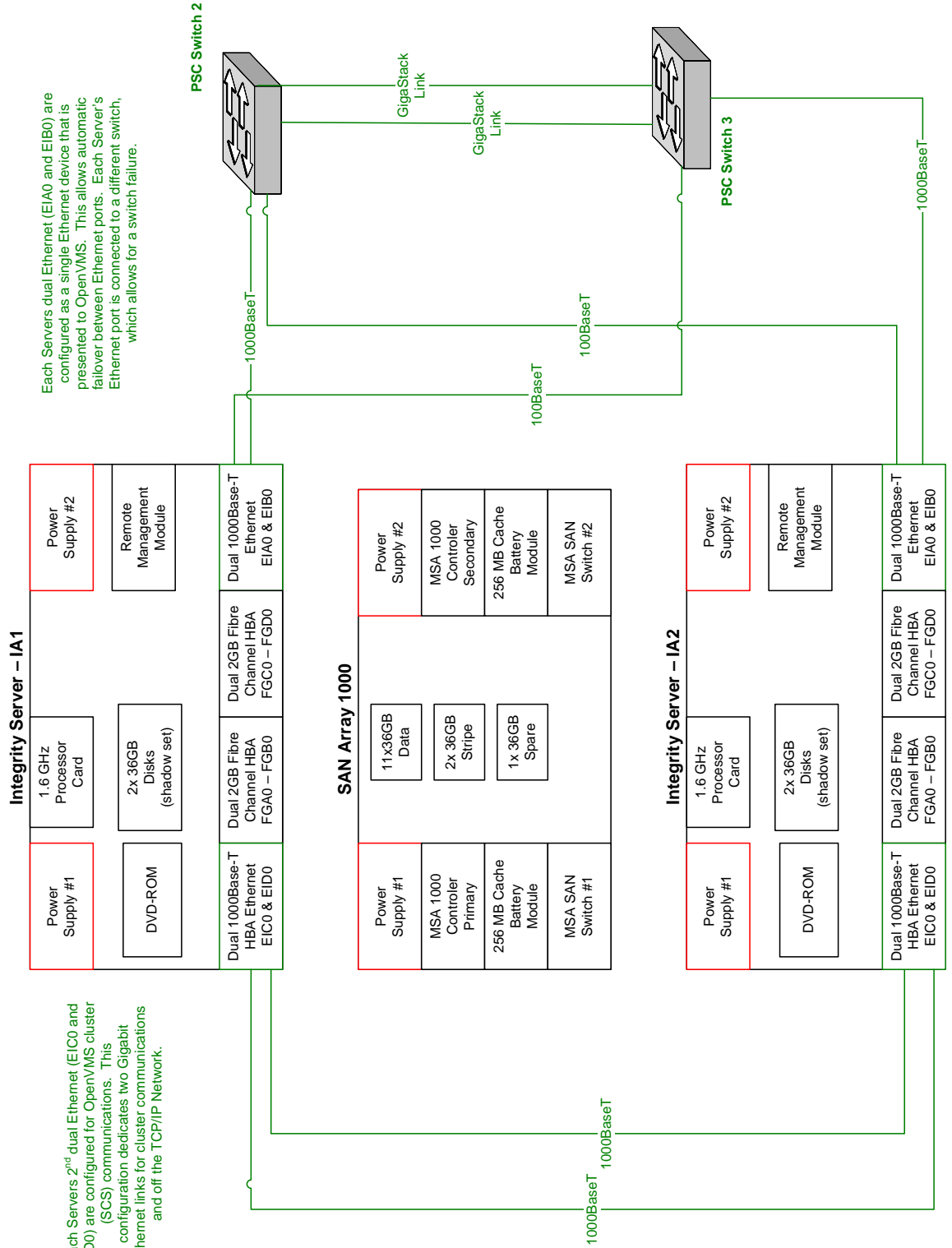
Part II

Appendix



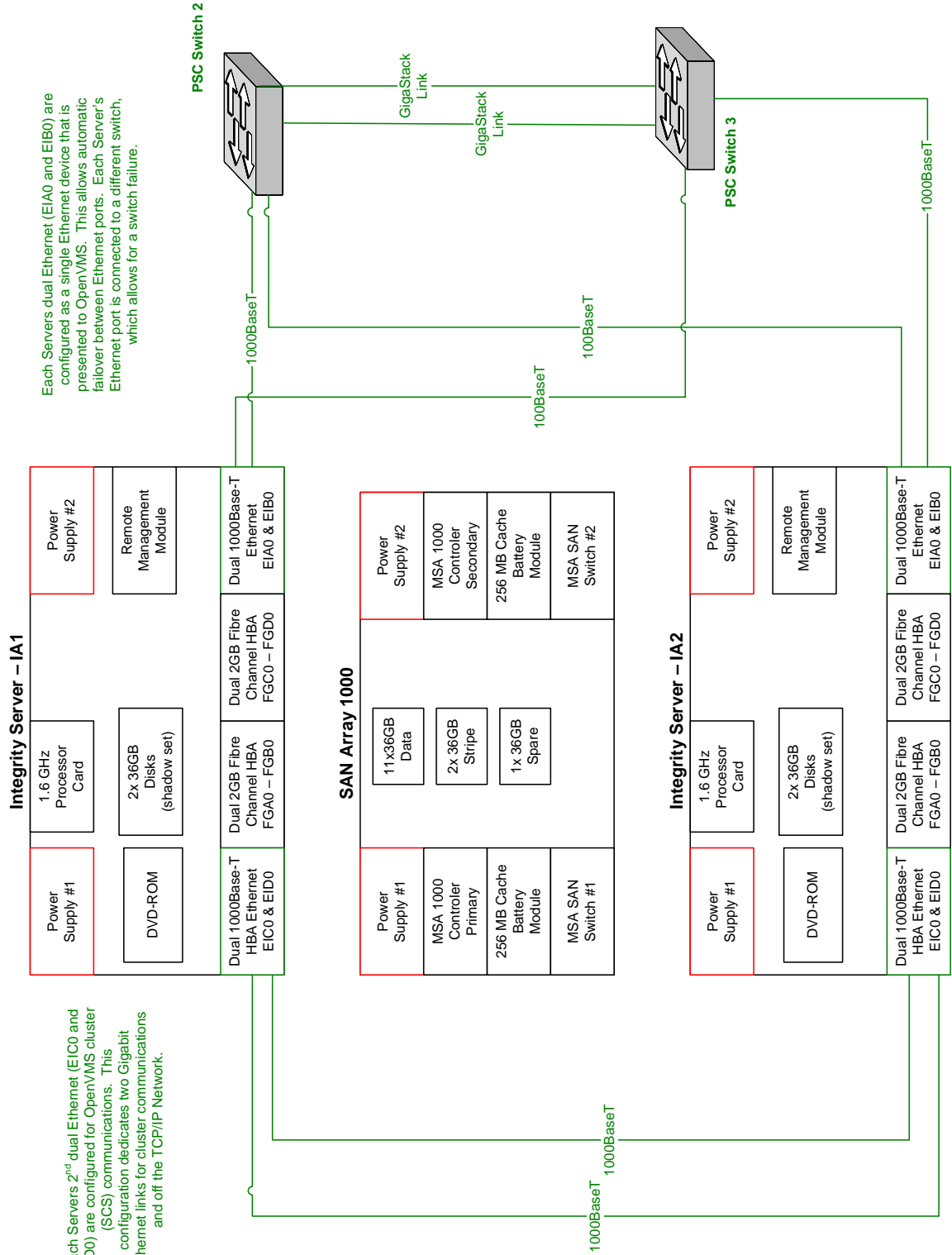
### 3.4 Integrity Block Diagram - CAD

## Public Safety Communications CAD Block Diagram



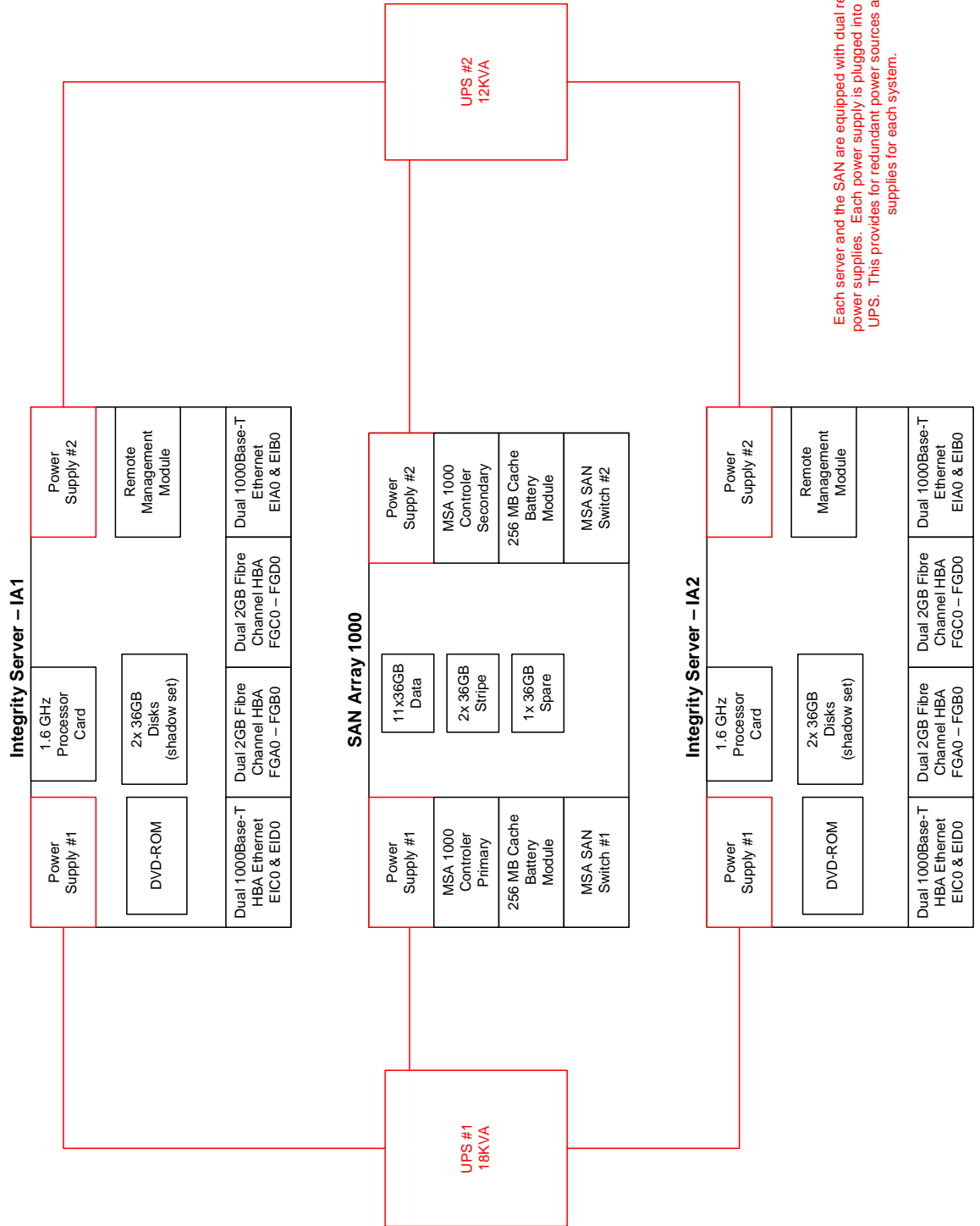
### 3.5 Integrity Block Diagram - Network

## Public Safety Communications CAD Block Diagram



### 3.6 Integrity Block Diagram - Power

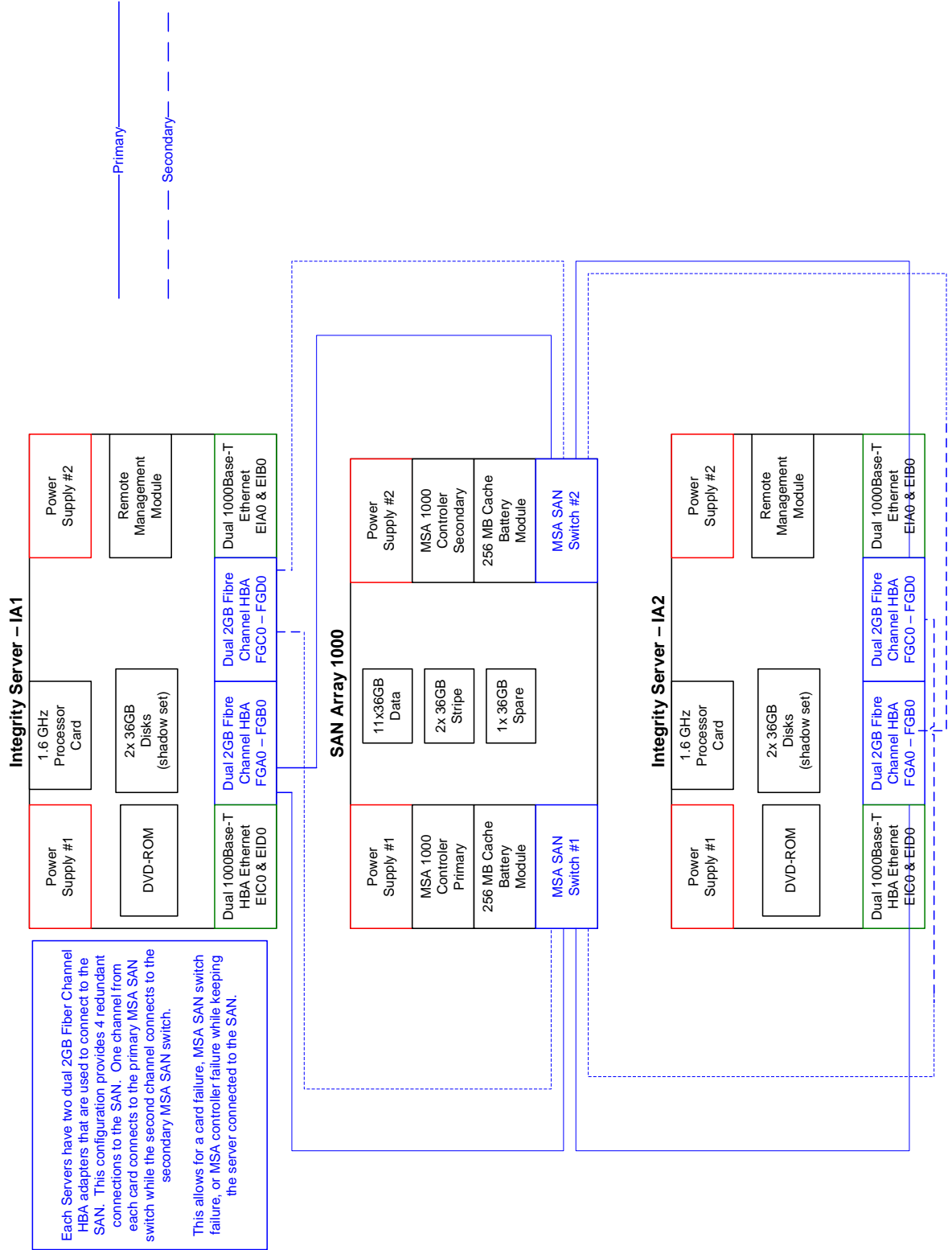
## Public Safety Communications CAD Block Diagram



Each server and the SAN are equipped with dual redundant power supplies. Each power supply is plugged into a different UPS. This provides for redundant power sources and power supplies for each system.

### 3.7 Integrity Block Diagram - SAN

## Public Safety Communications CAD Block Diagram

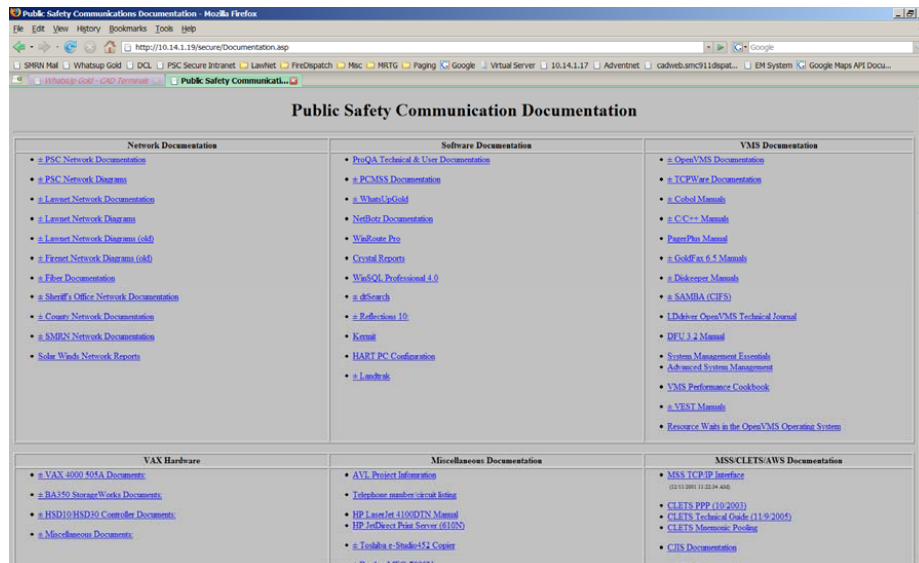
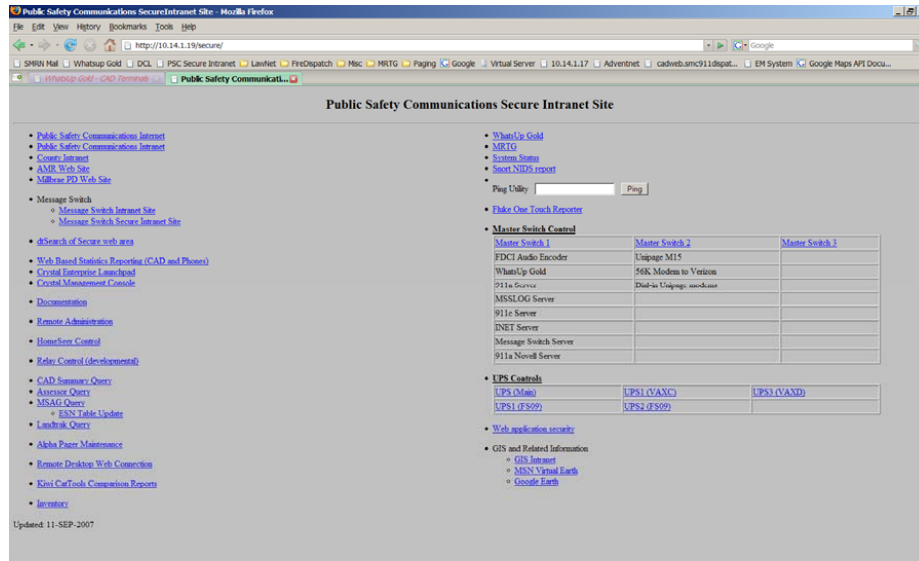


Each Servers have two dual 2GB Fiber Channel HBA adapters that are used to connect to the SAN. This configuration provides 4 redundant connections to the SAN. One channel from each card connects to the primary MSA SAN switch while the second channel connects to the secondary MSA SAN switch.

This allows for a card failure, MSA SAN switch failure, or MSA controller failure while keeping the server connected to the SAN.

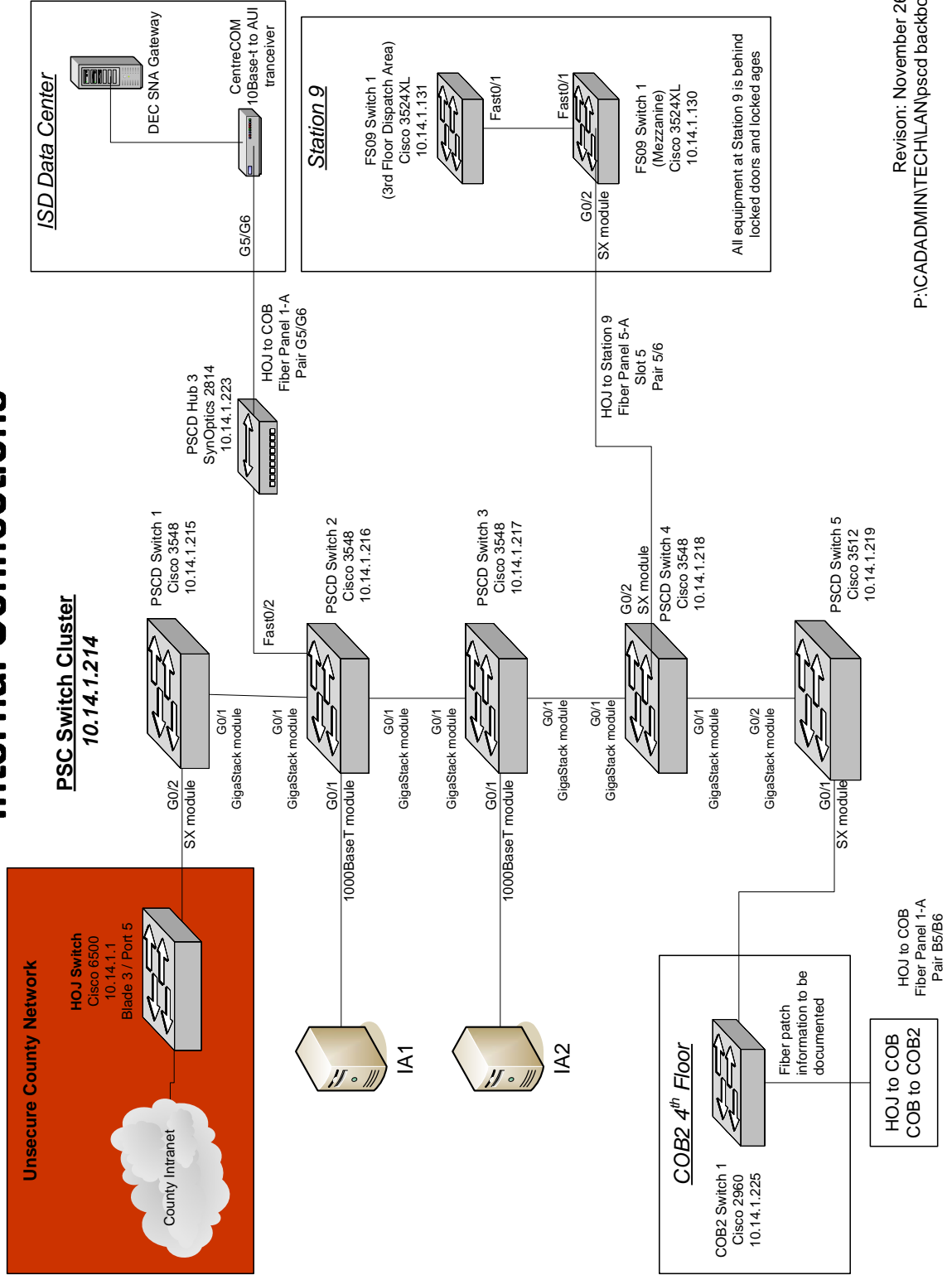
### 3.8 PSC Documentation Website

## Public Safety Communications Web Site



### 3.9 PSCD Backbone

# Public Safety Network Backbone Documentation Internal Connections



## 3.10 Up Time Statistics

### Public Safety Communications Up Time Statistics

System	Statistics last cleared	Number Polls	% Responded
PSC Switch 1	02/14/02 06:16:44	1513959	100.00%
PSC Switch 2	02/14/02 06:16:44	1513960	100.00%
PSC Switch 3	02/14/02 06:16:44	1513960	100.00%
PSC Switch 4	02/14/02 06:16:44	1513960	100.00%
PSC Switch 5	04/24/07 07:27:07	156600	100.00%
Live CAD System	01/29/04 08:14:28	938657	99.98%
Live MSS System	02/14/02 06:55:33	1617718	99.95%
Novell Server	02/14/02 06:16:44	1513964	99.79%
Server 1	09/22/05 14:50:09	571377	99.98%
911a Server	02/14/02 06:16:44	1513965	99.99%

- The above statistics are captured by the software application WhatsUp Gold from IpSwitch.
- Statistics reflect scheduled maintenance down time. The CAD and MSS statistics do not reflect the implementation of the new hardware in 2007 (normal scheduled maintenance down time is included).
- The CAD and MSS System (this monitoring is of the CAD and MSS application, not just a ping of the hardware). CAD and MSS application is polled every 60 seconds.
- Hardware is polled every 120 seconds.
- 400 items (hardware and software) are polled by the software application WhatsUp Gold. Notifications (email and pager) are automatically generated upon a software/hardware failure and SNMP traps.