Operational Enhancement Analysis

Public Safety Communications System Assessment and Design

Broome County, New York

Report

August 3, 2012

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1 Introduction

With an understanding of the baseline methods of operations and existing system capabilities, Blue Wing has refined the operational enhancements desired by the County. Meetings with key stakeholders to gain greater insight into operational requirements and limitations were conducted to refine the desired enhancements. The operational enhancements recommended have primarily focus on maintaining essentially the same method of operation, but providing a more reliable, efficient process.

2 County Radio System Users

Within Broome County there are numerous public safety radio communications systems. Prior to the County providing a centralized dispatch service many of the local municipalities had their own dispatch center along with associated fire, EMS and law enforcement radio systems.

With the arrival of Enhanced 911 the County provided call taking and dispatch services for the municipalities. When a municipality's dispatch operation moved to the County the same local radio systems were used and the dispatcher 10 digit call taking functions moved to the County. In some municipalities a local desk officer remained.

Radio system users in the County include:

Fire

- Binghamton Fire
- Deposit Fire
- Lisle Fire
- Whitney Pt Fire
- Endicott Fire
- Johnson City Fire
- Windsor Fire
- West Corners Fire
- Endwell Fire
- Vestal Fire
- Maine Fire
- West Endicott Fire
- Port Dickinson Fire
- Killawog Fire
- Port Crane Fire
- Kirkwood Fire
- Chenango Bridge Fire

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- EIT Emergency Services
- Binghamton University Public Safety
- Harpursville Fire
- Chenango Forks Fire
- Conklin Fire
- Glen Aubrey Fire
- Nanticoke Fire
- Sanitaria Springs Fire
- West Colesville Fire
- Ouaquaga Fire
- Union Center Fire
- West Windsor Fire
- Hillcrest Fire
- East Maine Fire
- Choconut Center Fire
- Town of Binghamton Fire
- Five Mile Point Fire
- Triangle Fire
- Link Field Fire
- Prospect Terrace Fire
- Chenango Fire

Emergency Medical Service

- Broome Ambulance
- Chenango Ambulance
- Colesville Ambulance
- Deposit Ambulance
- Harpurs Ferry Ambulance
- Superior Ambulance

- Union Ambulance

- Vestal Ambulance

- Windsor Ambulance

- Maine Ambulance

Law Enforcement

- Broome County College Public Safety

- Binghamton Police

- Binghamton University Police

- Broome County District Attorney's Office

- Broome County Office of Emergency Services

- Broome County Probation

- Broome County Security

- Broome County Sheriff

- Deposit Police

- Endicott Police

- Johnson City Police

- New York State Environmental Conservation Police

- New York State Forest Rangers

- New York State Park Police

- New York State Police

- Port Dickinson Police

- Railroad Police

- Vestal Police

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2.1 Radio Users

There are currently 1,001 mobiles and 1,439 portables used by Broome County responders.

Service	Mobiles	Portables
Fire	554	778
EMS	81	134
Law Enforcement	366	489

Table 2-1: Subscriber Units

The County will need to provide a radio system that can support the current number of subscriber units and agencies and still have room for growth.

2.2 Interoperable Radio System Users

Most interoperability occurs between County fire departments and EMS agencies. The occurrence of fire service mutual aid necessitates interoperability. There is a limited amount of fire and EMS out of county interoperability. Interoperability between law enforcement agencies occurs less frequently. Interoperability is achieved by using the same radio system, using a mutual aid department's system, relaying via the communications center and using cellular telephones.

2.3 User Operational Methods

Broome County has a Primary Public Safety Answering Point (PSAP) at the Public Safety Building (PSB) in Binghamton, New York. All wire line and wireless E-911 calls are answered and dispatched from the County Primary PSAP. There are four fire service radio systems, five law enforcement radio systems with separate systems for Broome Security and for the Community College and five EMS radio systems in use. These include:

- County Fire VHF high-band – Western Broome

  o Includes the departments of Vestal, West Corners, Endwell, West Endicott

- County VHF low-band Fire

  o All other County Fire Departments.

- City of Binghamton UHF Fire Department

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- Johnson City UHF Fire

- County Law Enforcement Radio System

- City of Binghamton VHF high-band Law Enforcement

- Endicott VHF high-band Law Enforcement

- Vestal VHF high-band Law Enforcement

- Johnston City VHF high-band Law Enforcement

- Broome Security UHF

- Broome EMS VHF high-band

- Vestal EMS VHF high-band

- Union EMS VHF high-band

- Superior EMS VHF high-band

- SUNY Binghamton – Harpurs Ferry EMS UHF

Emergency and non-emergency calls for service are received at the County Primary PSAP E-911. The call taker/dispatcher assesses the location, type of response required, and dispatches the appropriate units/agencies or forwards the call. A computer aided dispatch (CAD) system, New World, is used to facilitate call handling and archive information.

To enhanced operational effectiveness and manage spectrum resources will require changes in the first responder - dispatcher relationship. In the future it is recommended that the dispatcher will become more involved with the control of the communications resources. As necessary the dispatcher will assign the working talk paths, typically wide area and on-scene tactical, for each incident. The dispatcher's role will be to react to emergency calls and resource requests from the field personnel responding to incidents. The goal is to ensure that first responders have an appropriate number of talk paths available and are utilizing the available talk paths efficiently.

2.4 Law Enforcement Communications

As is currently the policy, for the County Law Enforcement radio system the PSAP will poll for a police unit to respond to an emergency call for service. Since there is currently but a single talk path for police dispatching of the County law enforcement, local police, and the New York State Police (NYSP) emergency and non-emergency traffic is mixed. The existing system suffers from limited

coverage and congestion. The NYSP and some local police departments have their own talk paths for some radio traffic, however only the County dispatches 911 calls. To eliminate talk path congestion a County law enforcement administrative talk path is recommended. This would be a countywide repeated system. The future use of mobile data could also reduce two-way voice radio traffic.

The City of Binghamton, Endicott, Vestal, and Johnson City have dedicated radio systems. The County dispatcher assigned to these positions also answers the 10 digit telephone associated with each department.

For tactical operations Broome County law enforcement simplex ground (direct) and wide-area tactical talk paths are recommended.

The wide-area tactical talk paths would be used to support a regional operation. The ground talk path would be for an incident scene/operation where two or more units are operating within close proximity. As necessary and in accordance with policy, dispatchers may provide police field operations with wide-area or ground talk path assignments. If the VHF high-band is used simplex tactical incidents involving State or out of area law enforcement agencies the NYS Inter Agency/MRD (155.370 MHz) and the Police National Tactical frequency (155.475 MHz) could also be used.

2.5 Fire and EMS Communications

The dispatcher will alert the appropriate agency via a stand-alone paging and alerting system. The paging system will also be used to activate station sirens. Communications from all responding units occurs on the communications talk path.

It is recommended that there be a consolidation of radio systems for Fire and EMS. The consolidated systems would support all fire on one system while EMS would be supported on another. The fire and EMS systems would operate within the same band and use similar platforms to allow for interoperability. The systems would consist of service discrete and common direct (unit to unit), wide-area tactical, communications (unit to dispatcher) and a dedicated altering talk path.

For each fire service call for service, the dispatcher should assign a tactical talk path. Tactical talk paths shall be used for incident wide area communication while a ground talk path would be used for unit-to-unit direct on-scene communications. Specific ground operations may have dedicated talk paths. These could include interior, fire police, water supply and landing zone

operations.   As incident requirements demand, chief officers can request additional tactical and ground talk paths via the dispatcher. The tactical and ground talk paths would not be monitored by the dispatcher.

3 Communications Operations

3.1 Use Dedicated Call-Takers

It is recommended that Broome County separates their communications center operations into separate dispatch and call-taker positions. Although this may add to the current staffing, it is felt that along with channel consolidation for the major agencies, this would provide more efficient operation over time.

3.2 Add Additional Shift Supervisors

Along with the split between call-taking and dispatching, it is recommended that a second supervisor be available on all shifts. Currently the supervisors spend much of their time performing dispatch. The supervisors need to be freed up to properly supervise the shifts.

3.3 Dispatch Positions

Currently there are thirteen combined call-taker/dispatch positions, and four call-taker only positions for a total of seventeen positions. It is felt that the current number of total positions would remain unchanged after separating call-taker and dispatch operations, although the layout may change. This is based upon current needs and does not allow for any future growth.

The current communications room is already crowded, so any expansion should be looked at in combination with a new communications center. Assuming separate call takers and channel consolidation, current needs analysis show a total of eight call-taker positions and six dispatch positions minimum for normal day/evening traffic. This does not account for emergency situations as was experienced in the major flooding incident. An incident of this size could easily double the number of positions needed. In this case, a fully functioning backup center could accommodate the overflow, but it is preferred to have all operations under one roof for accessibility and supervision. Administrative talk paths are recommended for communications between field units and local police stations. Administrative talk paths would not be monitored by the dispatch center.

3.4 Dispatch Center to Dispatch Center Interoperability Communications

The County should include the ability to interconnect one or more direct communications talk paths to the bordering dispatch centers. This would include between the Broome County PSAP in Binghamton and with other PSAPs in adjacent counties. This would greatly enhance the ability to cross patch multiple County communications talk paths and allow for efficient handling and transfer of border incidents. The use of 45.88 MHz should be preserved as the frequency is used commonly throughout New York State.

3.5 Similar Main and Backup Dispatch Environment

It is recommended that the main dispatch center and the backup dispatch center have the same communications equipment with a layout similar to the main dispatch center. Although the number of positions might be different, the environments should be the same. The current backup center does use the same 9-1-1 and CAD equipment, but is not equipped with radio consoles. Ideally, a new system should include radio consoles at the backup dispatch center.

The County should also consider partnering with an adjacent county to provide real-time back-up services. This trend has been expanding as it provides real-time trained dispatchers so that in the event of the total failure of the PSAP/communications center there would be no lost, dropped calls, or loss of communications service. Additionally it would alleviate the need for the County to support a seldom used back-up PSAP/communications center. Ideally, the county should also provide CAD terminals to their partners to allow for efficient dispatch operations in case of longer term outages.

3.6 New Communications Center

Broome should evaluate moving to a new communications center, preferably one that was dedicated to emergency communications. The current center is old, lacking in HVAC and lighting, and does not have any expansion capability for communications operations tasks.

Allowing for any future growth, a new center should have at least ten call-taking positions and assuming radio channel consolidation, at least 10 radio positions. Until the channels are consolidated, then the radio position count would be higher to account for the current channel fragmentation.

4 System Features and Functions

4.1 System Types

4.1.1 Conventional

In a conventional system one frequency can support only one talk path. The only way to add more talk paths is to add frequencies. In areas like Broome County finding VHF high-band and UHF frequencies that can used countywide is difficult or impossible to license. Even if a conventional system can be built the system would not be capable of being expanded at a later date.

4.1.2 Trunking

Trunked radio systems use technology that supports the efficient use of radio frequencies. Trunked radio systems use radio technology that enables the field radios to rapidly switch to an available frequency to set up and complete a radio transmission. A trunked radio system has talk groups which act like a conventional channel but are assigned a frequency on a real time basis. Trunked radio systems can support many talk groups with a limited number of frequency pairs. Within limits, trunk systems can support additional talk groups as operational requirements expand. Trunked systems are well suited when there are a limited number of frequencies for the number of system users.

4.1.3 Simulcast and Receiver Voting

Conventional and trunked systems can support simulcast transmitting and receiver voting technologies. Conventional and trunked systems can also be configured to operate in either analog or Digital P25 modes, although for trunked systems, currently only digital systems are being manufactured for public safety. For any large area system, it is recommended to implement simulcast transmitting and receiver voting on all primary dispatch channels.

4.1.4 Digital P25 Systems

The digital voice mode for public safety is known as Project 25 and supports UID and emergency. UID and emergency button would give the dispatchers and other radio user's better situational understanding of who is transmitting and/or activated the emergency button. P25 also supports basic data services such as status messaging, and applications such as AVL and text messaging both in the conventional and trunked modes. These features could be available to all P25 users of the system and would allow additional information for mobiles and portables. AVL integrated with the dispatch system, especially in the case of

EMS and law enforcement, would allow for efficient dispatching of closest vehicle. However, these features are rarely implemented because of cost and the migration of most data users to commercial cellular/PCS data service. Although AVL and text messaging are supported by Project 25, it is recommended that commercial wireless services be used for these features. Commercial wireless services are best suited for these types of features, especially when used with mobile data computers. If AVL for portables is desired, then the use of Project 25 AVL could then be evaluated.

Voice security via Advanced Encryption Standard (AES) encryption is supported with Project 25 as an additional feature and would be recommended to ensure the system has the ability to transport encrypted messages from subscriber to subscriber and subscriber to dispatch console.

Careful consideration needs to be given to the migration to P25, in particular to enhancing interoperability capabilities. While Federal funding is typically dependent on installing P25 equipment, the cost verses benefit to Broome County operations must be evaluated.

4.2 Basic Upgrades

Basic upgrades are items that would significantly improve the radio system upgrades.

4.2.1 Elimination of Simplex Operations

Currently, a large portion of communications for Fire and EMS response is via wide-area simplex channels. Wide-area simplex channels have inherent problem that multiple radios can transmit at the same time which causes the signals to interfere with each other. It is best practice that all wide-area channels are repeater based channels as the Western Broome area has migrated to

4.2.2 Install Fixed T1/R1 Base Stations

T1/R1 base stations must be used for a single function, such as Fire Dispatch. Currently some base stations can be used to transmit or receive on multiple talk paths, switching to other talk paths within a single base station creates the situation where communications may be compromised. For this reason a single base station must be used for a single talk path in a conventional system.

4.2.3 Use Simulcast Transmit and Voted Receive Communications

With a new radio system supporting simulcast and receiver voting, dispatch operations could be simplified. With a simulcast type of system, dispatchers

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would not have to choose towers; all sites would be keyed simultaneously. Simulcast is not recommended for VHF low-band systems. Voting receivers will allow the best received audio to be heard at dispatch regardless of the tower site. These features would allow the dispatcher to operate on a single module per talk path versus the multiple modules currently needed. Simulcast is recommended for the countywide paging system.

4.3 Enhanced Upgrades

4.3.1 Law Enforcement Talk Paths

Law Enforcement would have dedicated dispatch talk paths both for dispatch communications and for administrative communications. These would be countywide, repeated, simulcast with voting receivers. One of the talk paths would support 911 and dispatch communications while the other would support non-emergency administrative radio traffic. Law Enforcement would have dedicated tactical talk paths. Law Enforcement would have access to shared countywide simulcast talk path and shared simplex ground (direct) talk paths. Additional spectrum would need to be licensed to add new VHF-high-band talk paths.

Although it would be ideal to consolidate law into two talk paths, the primary law channels should at least be consolidated into four talk paths. This would have separate talk paths for the two main metro areas (Binghamton/Johnson City and Endicott/Vestal), one talk path for county Sheriff, NYSP and smaller police departments, and a final one for the county and college security divisions.

4.3.2 Fire/EMS Separate Paging Talk Path

Consolidate both EMS and fire paging to the same band and same channel. Only one channel would be used for paging. This will alleviate the congestion problem that exists when paging, dispatching and communicating over the same channel.

4.3.3 EMS Talk Path

Communications with EMS units would be on a dedicated EMS communications talk path. This would be a countywide, repeated, simulcast with voting receivers. EMS would have access to shared law enforcement, fire and interoperability countywide simulcast talk paths and shared law enforcement, fire and EMS simplex ground talk paths.

4.3.4 Fire Talk Path

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The fire service would have a dedicated communications talk path. This would be a countywide, repeated, simulcast with voting receivers. A second talk path may be added for the Binghamton/Johnson City metro area. Fire would have access to shared countywide simulcast talk path and shared tactical talk paths and fire-EMS dedicated and fire-EMS and law enforcement shared tactical and simplex ground talk paths.

4.3.5 Countywide Interoperability Talk Path

Interoperability within the County would be supported by use of common TAC and simplex talk paths. If law enforcement remains on VHF high-band and fire and EMS migrate to a band other than VHF high band law enforcement may need to use multi-band radios.

4.3.6 Expanded Interoperability Channels

The County should include the ability to monitor and communicate on the national interoperability channels. This will provide the greatest amount of flexibility of the potential responding agency to intercommunicate to the dispatcher and allow for these talk paths to be patched to County communications channels.

4.4 Enhanced System Feature Sets

The County has evaluated the use of Project 25 features including UID, emergency, text and status messaging, and AVL. It is recommended that the basic data capabilities of P25 not be implemented because of poor functionality and cost. The desired features by service group are indicated in the right side columns.

System Features and Service Requirement	Analog Conventional Features	Digital Project 25 Features	Broome Law Enforcement	Broome Fire	Broome EMS
Caller Recognition					
Unit ID (UID)	Yes	Yes	Yes	Yes	Yes
Emergency	Yes	Yes	Yes	Yes	Yes
Caller Location					
AVL	No	Yes	Yes	No	Yes
Messaging					
Status Messaging	Yes	Yes	No	No	No
Text Messaging	No	Yes	No	No	No
Security					
Voice Security					

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System Features and Service Requirement	Analog Conventional Features	Digital Project 25 Features	Broome Law Enforcement	Broome Fire	Broome EMS
Encryption	No	Yes	Yes	No	No
Scrambling	Yes	No	No	No	No
Data					
19.2K Data	No	Yes	No	No	No
Broadband Data Applications	No	No	Yes	No	Yes

Table 4-1: Enhanced System Feature Sets

5 Paging Methods

5.1 Dedicated Paging Talk path

It is recommended that the County maintain a common talk path for paging of EMS and fire personnel. Preferably this channel should be located in either the UHF or VHF high band.

5.2 Simulcast Paging

The single talk path used for paging should be simulcast countywide to eliminate the need for multiple transmissions to send a page and to improve the coverage.

5.3 Consider Alphanumeric Paging

Alphanumeric paging will allow the dispatchers to take advantage of quicker paging and the ability to use the paging and alerting system to send text call information and to be to update call status using the paging system. This will increase speed, accuracy and information. Alphanumeric systems may be configured so that authorized users (chiefs and agency officers) can access the system to send low priority administrative pages to their members. Using these capability dispatchers could be removed from many department and agency non-emergency notification issues.

The brief overview of alphanumeric paging provides high-level advantages of digital paging.

- Less expensive pagers, typically $100 to $150 vs. $400 to $500 for an analog voice pager.

- Better performance in weak signal areas. More efficient use of frequencies, because typically, digital pages require less time to be send compared with a tone/voice page.

- The ability to expand the paging system use to other departments and uses within the County. The pages can be prioritized to allow the emergency services pages to always have highest priority and the lower level pages to be sent as time is available. The devices display the call information on a message screen or similar device.

6 Data Methods

6.1 Low Speed Data

The enhanced data features implemented by the County should be a commonly supported part of the protocol. Analog conventional does not inherently support any type of data transfer. Digital Project 25, either conventional or trunked, supports a number of basic data features. UID and emergency are low-cost additions to purchasing a digital Project 25 system and are embedded in the protocol. Additional applications such as AVL and text messaging are also supported by the protocol. These features could be available to all users of the system, and would allow additional information even when using portables. This would enhance the basic operations greatly. UID and emergency would allow the dispatchers and other radio users to have a better situational understanding of who is transmitting and/or activated the emergency button. AVL integrated with the dispatch system, especially in the case of EMS and law enforcement, would allow for efficient dispatching of closest vehicle.

In reviewing low-speed data applications, Broome County Law Enforcement and EMS would like the ability to have an AVL application to know the location of the vehicles. Although this is a Project 25 feature, the use of commercial air cards should be evaluated as an alternative, especially if mobile data computers are being installed. Air cards are recommended because of their speed and adaptability to future requirements.

6.2 High Speed Data and Broadband

Currently, the County has generally good cellular coverage in the populated areas and marginal cellular coverage in the eastern portions with many dead spots. However, the coverage will continue to improve over time. At this time, it is best that the County continues to first focus on the voice and cellular data solutions. It is recommended that in the short term and most likely the long term, due to the cost of a private data system that the County focus on solutions provided by commercial carriers. The carriers have significant penetration into the public safety marketplace and continue to improve not only the application integration but also the data speeds. It is the belief of most industry experts that a County would be unable to provide a private data system at a commercially competitive cost or recycle the technology at a rate to keep up with advances in the commercial marketplace. If the County has concerns about the coverage, it is recommended the County look at creating known hot spots at government

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facilities in which a subscriber could roam into and transfer information as needed.

The interest in high-speed data was driven mainly by Law Enforcement within Broome County. This direction is consistent with the majority of the other public safety users throughout the state.

7 Talk Paths

7.1 Overview

In a conventional system, the use of an additional talk path would require acquiring additional frequencies. With a trunked system, additional talk paths would, up to a certain point, only require programming another talk path into the system with no additional frequencies necessary. A sufficient number of talk paths are required to support primary users within their service areas. Having too many talk paths or talk groups in a trunked system causes fragmentation and inefficiency.

Currently the County Law Enforcement system is VHF high-band simulcast. The local law enforcement systems are VHF high-band conventional except for Binghamton and Johnson City which are UHF conventional. To add more talk paths would require additional frequencies.

The following plans would meet the current and projected talk path requirements. It is recommended that all radios within a given service use a similar talk path plan. For example, within the fire service, all radios would have the same talk path talk path plan with regard to county talk paths. For certain interoperability requirements talk paths would be patched as needed by the dispatcher to the required talk path.

7.2 Talk Path Requirements

The following operating practices are suggested to be followed to optimize the performance of the proposed radio system to minimize the use of wide-area talk paths and to use simplex tactical talk paths when appropriate. As appropriate, use national interoperability talk paths to manage specialized interoperations situations.

The use of paging could be a used as an operational communications tool. This would include sending operational messages to reduce two-way voice communications. In the fire service incident commanders will need to monitor and communicate on tactical (on-scene) and dispatch (incident scene to dispatcher) talk paths. While some incident commanders are comfortable with carrying two radios some would prefer to only one. For the latter group the paging system could be used to alert the officer to contact dispatch or send other operational information.

The County must establish and enforce standard operating procedures (SOP) for radio system usage for dispatch and field operations. The SOP would provide guidance on when to use specific talk paths and the management of talk path resources.

The tables below outlines the basic talk path plans for law enforcement, fire and EMS. The sample talk path plans are based on the use of a 16 talk path radio. These talk path plans assume using trunking for law enforcement, fire and EMS.

7.3 Law Enforcement Talk Path Plan

The talk paths would be used as follows:

- COM LAW1-7 are used for communications with law enforcement. These would be countywide repeated-simulcast systems. COM LAW1, 2, 3, 4 and 7 are countywide systems. COM LAW 5 and 6 are metro regional systems.

- Tactical 10 to 12– Countywide area tactical talk path for exclusive law enforcement communications.

- Tactical 20 and 21 – Multi service countywide area talk paths exclusive for law enforcement.

- Ground 50 and 51– On-scene direct, law enforcement only, unit to unit, communications talk paths.

- Ground 60 and 61 – Multi service on-scene direct communications paths.

Radio Position	Function	Name	Groups	Frequency (Transmit)	Frequency (Receive)	Type	Area of Operation
1	Communications	COM-LAW1	Sheriff/SP/ Deposit/Port Dickinson	TBD	TBD	Simulcast	Countywide
2	Communications	COM-LAW2	Sheriff/SP/ Deposit/Port Dickinson- Admin	TBD	TBD	Simulcast	Countywide
3	Communications	COM-LAW3	Endicott/ Vestal	TBD	TBD	Simulcast	Countywide
4	Communications	COM-LAW4	Endicott/ Vestal-Admin	TBD	TBD	Simulcast	Countywide
5	Communications	COM-LAW5	Binghamton/ Johnson City	TBD	TBD	Metro Simulcast	Binghamton/ Johnson City
6	Communications	COM-LAW6	Binghamton/ Johnson City Admin	TBD	TBD	Metro Simulcast	Binghamton/ Johnson City

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Radio Position	Function	Name	Groups	Frequency (Transmit)	Frequency (Receive)	Type	Area of Operation
7	Communications	COM-LAW7	Security/BCC	TBD	TBD	Simulcast	Countywide
8	Tactical	TAC10	LE	TBD	TBD	Simulcast	Countywide
9	Tactical	TAC11	LE	TBD	TBD	Simulcast	Countywide
10	Tactical	TAC12	LE	TBD	TBD	Simulcast	Countywide
11	Tactical	TAC20	LE/FIRE/EMS	TBD	TBD	Simulcast	Countywide
12	Tactical	TAC21	LE/FIRE/EMS	TBD	TBD	Simulcast	Countywide
13	Ground	GRD50	LE	TBD	TBD	Simplex	On-scene
14	Ground	GRD51	LE	TBD	TBD	Simplex	On-scene
15	Ground	GRD60	LE/FIRE/EMS	TBD	TBD	Simplex	On-scene
16	Ground	GRD61	LE/FIRE/EMS	TBD	TBD	Simplex	On-scene

Table 7-1: Law Enforcement Talk Path Plan

7.4 Fire-EMS Talk Path Plan

The fire – EMS talk path plan is based on a 16 talk path radio. The following talk paths are recommended:

- COM-FIRE 1, 2 and COM-EMS – For fire service and EMS communications with the communications center.

- Tactical 20 - 24 – Multi service countywide area talk path.

- Ground 60 - 64 Multi service on-scene direct communications

- PAG – Paging talk path

Radio Position	Function	Name	Groups	Frequency (Transmit)	Frequency (Receive)	Type	Area of Operation
1	Communications	COM-FIRE 1	Fire	TBD	TBD	Simulcast	Countywide
2	Communications	COM-EMS	EMS	TBD	TBD	Simulcast	Countywide
3	Communications	COM-FIRE 2	Binghamton/ Johnson City	TBD	TBD	Simulcast	Countywide
4	Tactical	TAC20	LE/FIRE/EMS	TBD	TBD	Simulcast	Countywide
5	Tactical	TAC21	LE/FIRE/EMS	TBD	TBD	Simulcast	Countywide
6	Tactical	TAC22	LE/FIRE/EMS	TBD	TBD	Simulcast	Countywide
7	Tactical	TAC23	LE/FIRE/EMS	TBD	TBD	Simulcast	Countywide
8	Tactical	TAC24	LE/FIRE/EMS	TBD	TBD	Simulcast	Countywide
9	Ground	GRD60	LE/FIRE/EMS	TBD	TBD	Simplex	On-scene
10	Ground	GRD61	LE/FIRE/EMS	TBD	TBD	Simplex	On-scene
11	Ground	GRD62	LE/FIRE/EMS	TBD	TBD	Simplex	On-scene
12	Ground	GRD63	LE/FIRE/EMS	TBD	TBD	Simplex	On-scene
13	Ground	GRD64	LE/FIRE/EMS	TBD	TBD	Simplex	On-scene
14	Paging	PAG	Fire-EMS	TBD	TBD	Simplex	Countywide

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Radio Position	Function	Name	Groups	Frequency (Transmit)	Frequency (Receive)	Type	Area of Operation
15	Communications	COM-EMS	EMS	TBD	TBD	Simulcast	Countywide
16	Communications	COM-FIRE 1	Fire	TBD	TBD	Simulcast	Countywide

Table 7-2: Fire-EMS Service Talk Path Plan

7.5 Fire/EMS Paging and Alerting

The fire/EMS paging and alerting talk path would be dedicated to paging and siren activation. The system would have countywide simulcast coverage.

Radio Position	Function	Name	Groups	Frequency (Transmit)	Frequency (Receive)	Type	Area of Operation
Pager/Station Monitors	Paging	PAG	Fire-EMS	TBD	NA	Simplex	Countywide

Table 7-3: Fire/EMS Paging and Alerting Talk Paths

7.6 Talk Path Requirements

The following outline the number of talk paths required to support the communications plans above. Based on these requirements the system could not be supported via conventional channels and would be required to implement a trunked system to meet the requirements.

Group	Repeater	Simplex
Law Enforcement		
Communications	4	
Administration	3	
Tactical	3	
Ground		2
Fire/EMS		
Paging	1	
Communications	3	
Tactical	5	
Ground		5
Total	19	9

Table 7-4: Talk Path Requirements

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8 Interoperability

8.1 Overview

Currently, the County has limited interoperability capabilities via various law enforcement, EMS and fire talk paths. The majority of these talk paths are used for on-scene communications. The County dispatch center has a small group of talk paths that support base station operations that would provide interoperability.

The County should implement a straight forward plan with two levels of interoperability.

8.2 Level 1

The first level would facilitate County interoperability across the various County services. All services would have a common group of tactical talk paths. These talk paths would be assigned by the dispatcher and could not be used unless approved by the dispatcher. The majority of the time these talk paths would be used for fire/EMS operations but could be used for interoperability between services as needed. To the degree possible within the selected band, this level would also support the New York State commonly used interoperability talk paths.

8.3 Level 2

For the second level, the County would support the national interoperability plan and program the band-appropriate talk paths in each radio to allow communications between a host of agencies providing mutual aid during a large incident.

These interoperability talk path plans assume a similar band of operation. If different bands were required between services, then dispatcher-aided console patching would be required to allow interconnects to occur. Even if the County chooses to develop digital P25 systems all interoperability talk paths would be analog. This will ensure compatibility between County and out-of-county responders and comply with Department of Homeland Security configuration recommendations.

8.4 Law Enforcement Talk Path Plan using the National Interoperability Channels

Radio Position	Function	Name	Groups	Frequency (Transmit)	Frequency (Receive)	Type	Area of Operation
1	Communications	COM-LAW1	Sheriff/ SP/ Deposit/ Port Dickinson	TBD	TBD	Simulcast	Countywide
2	Communications	COM-LAW3	Endicott/ Vestal	TBD	TBD	Simulcast	Countywide
3	Communications	COM-LAW5	Binghamton/ Johnson City	TBD	TBD	Metro Simulcast	Binghamton/ Johnson City
4	Communications	COM-LAW7	Security/ BCCC	TBD	TBD	Simulcast	Countywide
5	X-CALL	X-CALL	LE/FIRE/EMS	TBD	TBD	Repeater	Single Site
6	X-TAC	X-TAC-D	LE/FIRE/EMS	TBD	TBD	Simplex	On-scene
7	X-TAC	X-TAC-Repeat	LE/FIRE/EMS	TBD	TBD	Repeater	Single Site
8	X-TAC	X-TAC-D	LE/FIRE/EMS	TBD	TBD	Simplex	On-scene
9	X-TAC	X-TAC-Repeat	LE/FIRE/EMS	TBD	TBD	Repeater	Single Site
10	X-TAC	X-TAC-D	LE/FIRE/EMS	TBD	TBD	Simplex	On-scene
11	X-TAC	X-TAC-Repeat	LE/FIRE/EMS	TBD	TBD	Repeater	Single Site
12	X-TAC	X-TAC-D	LE/FIRE/EMS	TBD	TBD	Simplex	On-scene
13	X-TAC	X-TAC-Repeat	LE/FIRE/EMS	TBD	TBD	Repeater	Single Site
14	Spare						
15	Spare						
16	Spare						

Table 8-1: Law Enforcement Talk Path Plan using the National Interoperability Channels

Radios would use two talk path banks – Bank 1 would be for in-county communications, while Bank 2 would be for interoperability.

8.5 Fire-EMS Talk Path Plan using the National Interoperability Channels

Radio Position	Function	Name	Groups	Frequency (Transmit)	Frequency (Receive)	Type	Area of Operation
1	Communications	COM-FIRE1	FIRE	TBD	TBD	Simulcast	Countywide
2	Communications	COM-EMS	EMS	TBD	TBD	Simulcast	Countywide
3	Communications	COM-FIRE2	FIRE	TBD	TBD	Simulcast	Countywide
4	X-CALL	X-CALL	LE/FIRE/EMS	TBD	TBD	Repeater	Single Site
5	X-TAC	X-TAC-D	LE/FIRE/EMS	TBD	TBD	Simplex	On-scene
6	X-TAC	X-TAC-Repeat	LE/FIRE/EMS	TBD	TBD	Repeater	Single Site
7	X-TAC	X-TAC-D	LE/FIRE/EMS	TBD	TBD	Simplex	On-scene
8	X-TAC	X-TAC-Repeat	LE/FIRE/EMS	TBD	TBD	Repeater	Single Site
9	X-TAC	X-TAC-D	LE/FIRE/EMS	TBD	TBD	Simplex	On-scene
10	X-TAC	X-TAC-Repeat	LE/FIRE/EMS	TBD	TBD	Repeater	Single Site
11	X-TAC	X-TAC-D	LE/FIRE/EMS	TBD	TBD	Simplex	On-scene
12	X-TAC	X-TAC-Repeat	LE/FIRE/EMS	TBD	TBD	Repeater	Single Site
13	Spare	X-TAC	LE/FIRE/EMS	TBD	TBD	Simplex	On-scene
13	Spare						
14	Spare						
15	Communications	COM-EMS	EMS	TBD	TBD	Simulcast	Countywide
16	Communications	COM-FIRE1	FIRE	TBD	TBD	Simulcast	Countywide

Table 8-2: Fire- EMS Talk Path Plan using the National Interoperability Channels

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9 Coverage

9.1 Paging

9.1.1 Requirement

Paging coverage shall be designed to activate alphanumeric pagers worn on the hip in the street in 95% of the area in the County with 95% reliability. The paging signal shall be simulcast from all towers.

9.1.2 Dedicated Paging Talk Path

The fire and EMS communities have traditionally used tone and voice paging. Blue Wing recommends use of a dedicated paging and alert talk path for fire and EMS. This permits unimpeded alerts that do not complete with two-way voice traffic. In addition, a dedicated paging system could become an operational tool. The paging system coverage needs to be improved through the use of additional sites, simulcast, and a new frequency (VHF-high-band or UHF) that better supports paging.

9.1.3 Tone and Voice verses Alphanumeric Paging

Public safety paging can be supported either by tone and voice or alphanumeric paging systems. Both tone and voice and alphanumeric paging offer advantages and disadvantages. An advantage to alphanumeric paging is its ability to receive weak signals better, ability to be used as a versatile communications tool, operations in high noise environments and lower cost of subscriber equipment.

For Broome County, the general consensus is that improving the current tone paging system by moving to a better frequency, simulcasting, and providing a dedicated paging channel would provide the best solution.

9.2 Two-way Voice

Two-way voice communications shall support the effective two-way communications between mobile vehicular units and the communications center. The wide area two-voice signal shall be simulcast from all towers at the same

time, and the best received signal at the base station shall be chosen (voted) to be heard by the dispatchers.

9.2.1 Binghamton Metro Area

The coverage requirement for the Binghamton Metro area as defined by the contour below shall be 95% Portable On-street Coverage with 95% reliability. The required voice quality shall be DAQ of 3.4 or better.

9.2.2 Greater Broome County

The coverage requirement for the greater Broome County area outside of the Binghamton Metro area shall be 95% portable on-street coverage with 95% reliability. The required voice quality shall be DAQ of 3.4 or better.

10 Site Standards

The following standards shall be implemented to allow for reliable radio equipment operation:

10.1   Tower

- Towers shall meet the latest EIA/TIA tower standards for current and future predicted loading requirements.

10.2   Building

- Buildings shall be constructed to properly modify the internal environment's heating, cooling, humidity and particle contamination to meet preferred equipment specifications
- Buildings shall meet basic security measures such as ballistic proof walls and doors.

10.3   Site

- The sites shall be level and provide proper drainage away from the site

10.3.1 Fencing

- The site shall contain a 6-foot security fence around the building and the tower

10.3.2 Grounding

- The site shall be grounded to meet industry-approved grounding standards such as Motorola's R56 standard and provide the recommended resistance to ground.

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10.3.3 Backup Power

- Sites accessibility shall be classified as winter accessible or winter inaccessible.

  o Accessible sites shall have a backup generator to operate at full capacity independently for 48 hours.

  o Inaccessible sites shall have a backup generator to operate at full capacity independently for 168 hours (1 week).

- All sites shall have backup battery power to operate at full capacity for 2 hours.

11 Summary

11.1   Conclusion

Broome County currently operates numerous legacy conventional public safety radio systems. While this systems have provided good and reliable service over the years they provide limited coverage, are congested at times, support none or few advanced features and provide no ability to expand.

The use of so many dissimilar public safety radio systems results in a lack of responder situational awareness and fragmentation within the communications center to support the systems. A more efficient method is to group together agencies with similar missions

Providing responders with wide area simulcast systems designed to support communications with the dispatch center along with paging enhancements, tactical and ground communications will improve communications quality and effectiveness.

The operational enhancements recommended will need to be supported with changes in standard operating procedures and training. Long term the changes will provide the public and responders with a better communications system that has the capacity to meet the changing requirements of public safety.

11.2   Summary of Recommendations

11.2.1 County Radio Systems Users

- Law Enforcement, Fire, EMS and potentially other County agencies such as DPW, and other County agencies.

- All users on same band.

11.2.2 User Operational Methods

- Law Enforcement

  o Develop a trunked Countywide simulcast system for emergency communications.

  o Develop a trunked countywide simulcast system for administrative and non-emergency communications.

- o Develop law enforcement dedicated and shared trunked countywide simulcast tactical talk paths.
- o Develop law enforcement dedicated and shared simplex ground talk paths.
- o Utilize existing interoperability talk paths.
- Fire/EMS
  - o Develop trunked countywide simulcast system for fire dispatch.
  - o Develop trunked countywide simulcast system for EMS dispatch.
  - o Develop shared trunked countywide simulcast tactical talk paths.
  - o Develop shared simplex ground talk paths.
  - o Utilize existing interoperability talk paths.

  - o Develop a dedicated paging talk path for fire and EMS, tactical talk paths for specific purposes such a fire police, landing zone and general use talk paths that will be dispatcher assigned.

11.2.3 Talk Paths Required

- Law Enforcement
  - o 4 – 911 Communications - Countywide
  - o 3 – Administrative - Countywide
  - o 5 - Tactical - Countywide
  - o 4 – Ground – simplex
  - o Existing Interop – NYS Interagency, National Interoperability (Existing)
- Fire/EMS
  - o 1 – Paging – Countywide
  - o 2 – Fire Communications – Countywide
  - o 1 – EMS Communications – Countywide
  - o 5 - Tactical - Countywide
  - o 5 - Ground - simplex
  - o Existing HEAR and NYS EMS
- Interoperability Requirements

- o 1 – All Services Interoperability – Countywide

- o 4 – All Services Interoperability – Simplex Tactical

- o Use National Interoperability talk paths – X-CALL and X-TAC - Subscribers with band of operation. Communications center with V/U/8 Call/TAC talk paths.

- o Use existing interoperability talk paths (Existing)

11.2.4 Coverage

- Paging – 95/95 in the street. Simulcast - enhanced by store and forward units.

- Land Mobile – 95/95 vehicular simulcast/receiver voting. Portable enhanced by vehicular repeaters.

11.2.5 System Communications

- Basic Upgrades

  - o Trunking

  - o Use of Countywide repeaters.

  - o Use of simulcast transmit and receiver voting.

  - o Use of single fire/EMS paging talk path.

  - o Use of dispatcher assigned tactical talk paths.

  - o Use of local and national interoperability talk paths.

  - o Primary and back up dispatch centers connectivity and similar equipment.

- Enhanced Upgrades

  - o Communications center to communications center connectivity.

- System Features and Functions

  - o Consider use of alphanumeric paging.

  - o UID for Law Enforcement.

  - o Emergency button for Law Enforcement, fire, and EMS.

  - o Encryption capability for Law Enforcement

11.2.6 Data

- Utilize commercial available wireless broadband

11.2.7 Paging

- Use dedicated paging talk path for fire and EMS.
- Use simulcast transmit countywide.
- Consider use of alphanumeric paging.

11.2.8 Site Standards

- Update communications sites – power, grounding, emergency power and buildings at all sites.