

# CHANNELS

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*IP COMMUNICATIONS*

The magazine for IP-based voice, data & interoperability solutions



**CONSUMERS ENERGY  
RADIO NETWORK  
PASSES 10-YEAR MILESTONE  
WITH 99.9% RELIABILITY**

**PARMA, OHIO UPGRADES  
17-YEAR-OLD SYSTEM TO  
P25 INTEROPERABILITY**

**OPENSKY CELL SITES  
FAVOR THE ENVIRONMENT**

# CHANNELS

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## 2 Graceful migration, when you're ready

Whether new or long term, all of Tyco Electronics M/A-COM's critical communications customers have made significant investments in their infrastructure. Our goal has been, and will continue to be, focused on the long-term commitment to protecting that investment.

## 3 A half-million calls, 99.9 percent reliability

Consumers Energy of Michigan has operated an EDACS system for more than ten years. The delivery of voice and data communications, regardless of the weather and other uncontrollable events, have helped the company to provide electrical and gas services for more than six million customers across the Lower Peninsula.

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As one of the first EDACS customers in the U.S., Parma has enjoyed critical communications for city police, fire and services for more than 17 years. Faced with a growing need for interoperability with neighboring jurisdictions, the city took bold steps to ensure their future while protecting their investment in infrastructure.

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Parma, Ohio's Fire Chief explains the reasoning and strategy behind his city's recent decision to upgrade to P25 in advance of the county and state's actions to ensure interoperability across the region.

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Coverage, capacity and cost are the three "big Cs" in the evaluation and design of critical communications networks. OpenSky cell sites have changed the dynamics of that relationship while simultaneously providing a low-impact solution for environmentally sensitive areas.

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Recovery crews with Consumers Energy in Michigan rely on the safety provided by their voice and data radio communications while keeping electricity and gas flowing to millions of customers.

*Photos: Harry Sabourin  
for Consumers Energy*

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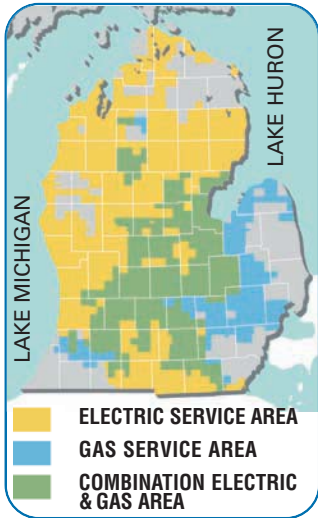
# Graceful migration – without the “or else”

**B**eginning with the first public-safety grade trunked radio systems nearly two decades ago, M/A-COM’s critical communications systems and products have been designed for easy, graceful migration. The proof of this design approach can be seen in the actions of customers like the city of Parma, Ohio, who recently upgraded their 17-year-old EDACS system to P25 compatibility for a small fraction of the cost to replace their entire infrastructure and radios, and by the many upgrade options available to Michigan’s Consumers Energy, the subject of our cover story.

This commitment to non-obsolescence continues with the development of the VIDA network, the first to support multiple RF platforms and emerging technologies on a single, integrated IP-based network. Most importantly, users give up nothing for this investment protection, so even the very first EDACS customers need have no fear of being stranded without an upgrade path to the future. ■



# Consumers Energy EDACS network logs more than 10 years of operation and a 99.9 percent reliability record



Consumers Energy serves 6.5 million residents across Lower Peninsula.

Headquartered in Jackson, Michigan, Consumers Energy - principal subsidiary of CMS Energy - traces its beginnings back 120 years to the Jackson Electric Light works, established in 1886. Today it is Michigan's second-largest utility and provides natural gas and electricity to nearly 6.5 million of Michigan's 10 million residents in all 68 counties of the state's Lower Peninsula.

"Our task is to ensure that we can keep our customers supplied with the energy they need, regardless of demand and the unpredictability of weather and other factors," said Don Stevenson, network technologies manager with Consumers Energy.

Accomplishing that task requires a large and ongoing investment in infrastructure, which includes numerous production facilities, thousands of miles of gas and electrical distribution lines, fleets of service and repair crews and thousands of support personnel to manage, direct and service that infrastructure.

"With 64,648 miles of electrical distribution lines and 24,000 miles of pipeline serving customers across 32,000 square miles, cost-effective maintenance, customer service and the restoration of service following disruptions are major concerns," Stevenson said.

Keeping personnel connected, informed and well-managed is accomplished through yet more infrastructure: the company's extensive

voice, data, and wireless communications networks. "Without our local and wide-area networks and the wide-area 800 MHz voice and data radio system," said Stevenson, "we'd have a very difficult time in keeping our customers supplied with the electricity and natural gas they require day in and day out."

### Safety a vital concern

Even more important than keeping the gas and electricity flowing, however, is the safety of the restoration crews and the public they serve.

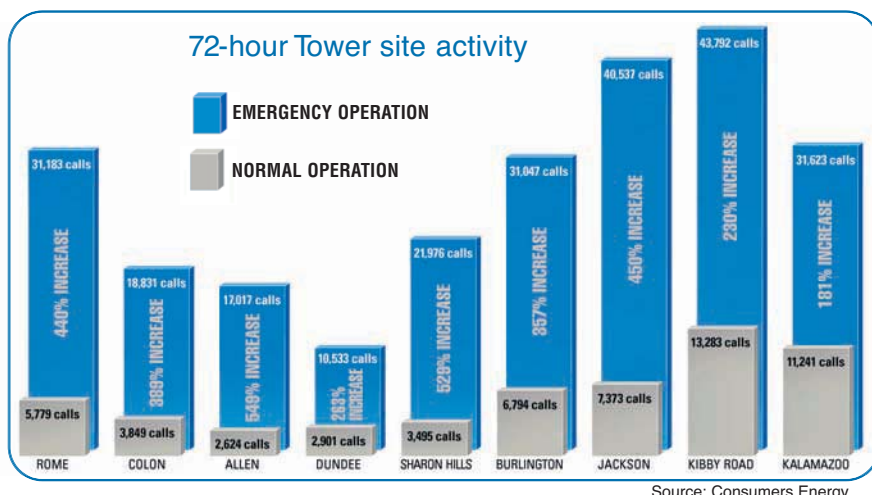
"Natural gas and electricity are inherently dangerous products," said Ken Tyler, wireless networks team leader for Consumers Energy. "When we have crews out in the field, often miles from help, communications have to be reliable. The radios are probably the single most important tool the IT department provides the field work force, and the emergency button on their radio is an essential piece of safety equipment."

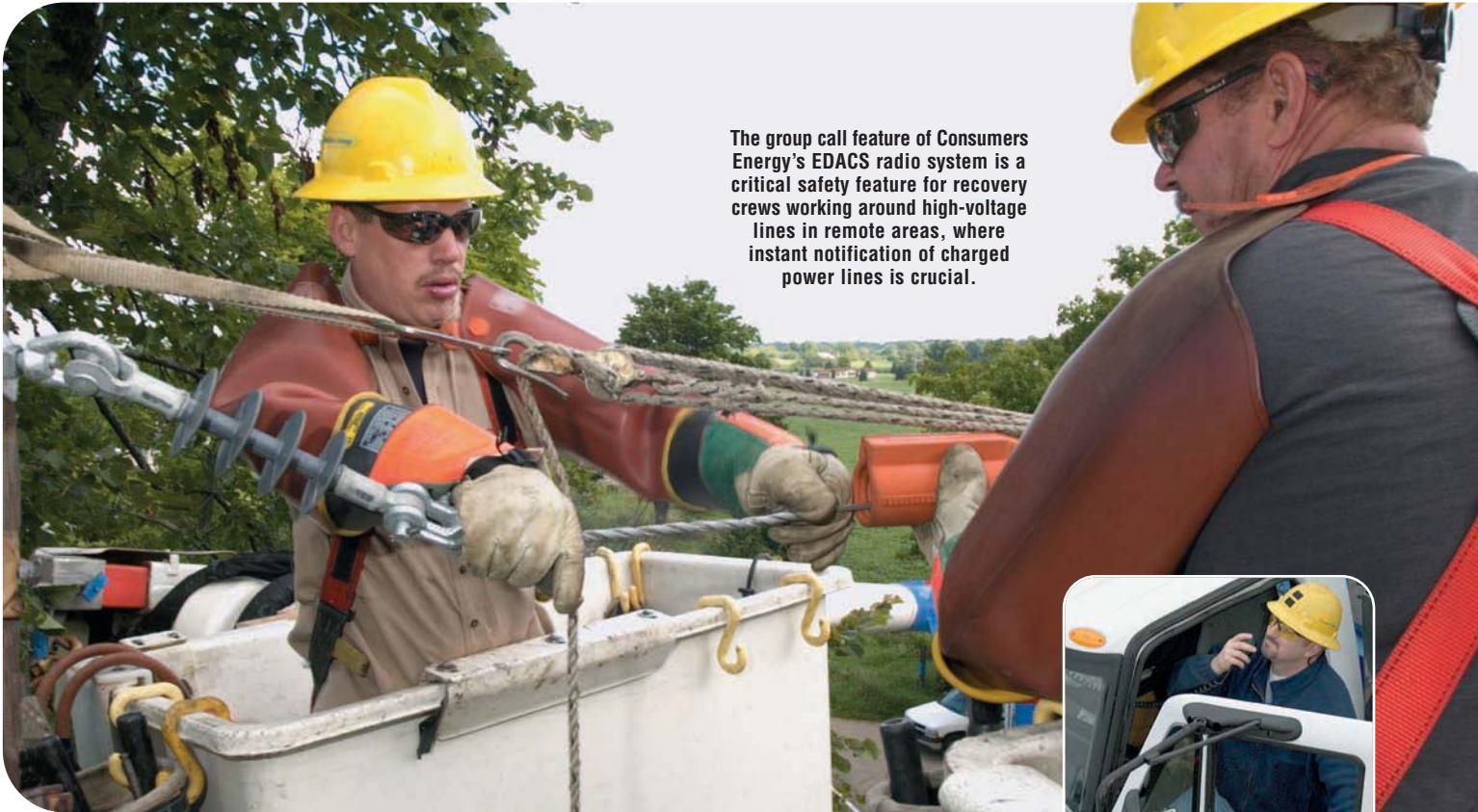
The challenge is to protect lives as cost effectively as possible. One aid to achieving that goal over the past decade has been the company's 800 MHz EDACS integrated voice and data radio system. Acquired in the early 1990s, the system currently serves about 3,500 users and recently passed some important milestones for performance and reliability.

"In July of 2006, our EDACS network passed its tenth year of continuous operation," said Tyler. "The radio system has never experienced a system-wide outage during that period and has logged over a half-million hours of air time."

Installed in geographically-based phases beginning in 1993, the 67-site system was completed in July, 1996. As of December 31, 2006, the system had logged 513,729 hours of air-time, averaging 4.8 million push-to-talks (PTTs) per month. During emergencies, such as summer storms and the 2003 power outage that affected U.S. and Canadian cities from Detroit to New York City and beyond, it's not unusual for PTTs to increase by up to five times.

A comparison of call volumes during normal and emergency operations in May, 2004, shows an average increase of 376% across nine sites in two separate 72-hour periods. Call duration showed a comparable increase during the emergency period.





The group call feature of Consumers Energy's EDACS radio system is a critical safety feature for recovery crews working around high-voltage lines in remote areas, where instant notification of charged power lines is crucial.



### Spectral efficiency very important

While limited spectrum is a problem for nearly all utilities, it is especially difficult for Consumers Energy. The majority of their sites are within 150 miles of the Canadian border, which means frequencies must be shared between the two countries, effectively halving the number of available frequencies.

"We have to cope with what we can get, in terms of frequency pairs," Tyler said. "Integrating voice and data on one system is a big help. It allows us to get the maximum from our available frequencies and it also means that the crews don't have to lug around one radio for voice and another for data."

Even with the meager spectrum allocations, Tyler said that with 67 sites, coverage across the Lower Peninsula is excellent. Mobile coverage is 97 percent "on the street," and portable coverage is around 92 percent. "The coverage allows our mobile recovery crews to roam around the state, sometimes traveling for four or five hours between say, Cheboygan in the northern lower peninsula to Monroe in the southeast lower peninsula, without losing radio contact," he said.

**"The radio system has never experienced a system-wide outage during that [10-year] period and has logged over a half-million hours of air time."**

Ken Tyler

### Mobile data a mainstay

Mobile data for work-order management has been an integral part of the daily operations at Consumers Energy for nearly two decades, having been deployed initially on a dedicated low-band system.

Called WIN (Workload Information Network), the application was moved over to the new EDACS network in 1994, where it has since resided. Tyler says that close to thirty-five hundred work orders are processed every day, adding up to over one million annually.

In addition to WIN, a new scheduling and workload management (SWM) application was deployed in 2002. SWM is used for manpower scheduling, time-tracking, inventory and accounting.

Through the capabilities of the radio system and skills of their IT team, Consumers Energy has succeeded in extending the edge of the corporate network all the way out to the trucks in the field. "All mobile data is encapsulated in IP-addressed packets for transmission over the radio system, then routed through an IP interface for transport across the LAN/WAN to wherever it's required," said Tyler. By providing network access to

**"Our task is to ensure that we can keep our customers supplied with the energy they need, regardless of demand and the unpredictability of weather and other factors."**

Don Stevenson

continued →

and from their extensive field workforce, efficiency is increased and costs more easily controlled.

Approximately 1800 mobile radios are equipped for data communications, with tablet PCs used to receive the work orders in the field and to transmit job status reports to dispatchers. While time-sensitive data is transmitted as quickly as possible, less time-critical information is stored for later retrieval. "The tablets are docked overnight so the entire system can be updated and ready for use the next morning," Tyler said.

**"Mobile data is encapsulated in IP-addressed packets... then routed through an IP interface to wherever it's required."**

Ken Tyler

our operations," said Tyler.

Dennis Demaray, Great Lakes Regional service manager with M/A-COM, agreed that the unique nature of the maintenance agreement with Consumers Energy is ideal for ensuring the highest-quality service.

"Most traditional maintenance contracts specify the equipment, schedules and spares, but the contractor might have ten other customers with the same requirements. There is usually no prioritization of service, so when an emergency occurs, someone may have to wait. But Consumers Energy has a dedicated staff available 24/7. We have technicians stationed throughout the coverage area and can guarantee a two-hour response time throughout the lower peninsula," said Demaray.

In addition to the 800 MHz EDACS network used primarily by restoration crews, the Jackson Service Center is also responsible for the standalone VHF and UHF conventional systems in use at Consumers Energy's various distribution and generation facilities.

### Planning for the future

With a ten-year legacy of high reliability and cost-effective performance, Stevenson and Tyler are optimistic about their radio system, though they have yet to finalize plans for future additions and enhancements.

"Everything is on the table, and nothing is decided as yet," Tyler said. "But we know that we want to continue to provide the safety, reliability and cost-effective operation in the future that we've enjoyed in the past."

The general direction can be easily forecast: it will be toward systems that are more spectrally efficient, are based on IP technology for easy integration with existing and future applications, and which offer higher rates of data throughput. Security too will be an important consideration as the Department of Homeland Security and others continue to push for more stringent safeguards on the nation's critical infrastructure, whether public or private.

Data usage is clearly on the rise, with the 2006 airtime ratio of 35/65 percent data/voice over the radio network up from 30/70 percent in 2004. This trend shows the requirement for data communications continues to grow, along with the development of new and more efficient management tools to streamline further daily operations.

"Our EDACS radio system has supported

**"We have technicians stationed throughout the coverage area and can guarantee a two-hour response time throughout the lower peninsula."**

Dennis Demaray

### Testing, maintenance ensure reliability

Tyler and Stevenson agree that two key factors in achieving the high rate of reliability for their 800 MHz network - 99.9 percent measured on a monthly basis - have been their aggressive inspection/test schedules and extensive maintenance program, which is outsourced to M/A-COM's Service Center in Jackson.

"We've outsourced our radio maintenance for decades because it makes the most economic sense for the company. But we have a very unusual situation in that the entire maintenance staff of fourteen people is dedicated solely to Consumers Energy. Some of these folks have been working on our system for twenty years and know our system and our needs intimately. Their availability, background and overall system knowledge has made them a valuable asset to

Approximately 1800 mobile radios are equipped for data communications, with tablet PCs used to receive work orders and to transmit job status reports to dispatchers.





With nearly 75,000 miles of electrical distribution lines to maintain, restoration crews must be able to remain in communication with dispatchers throughout the Lower Peninsula.

our WIN and SWM work order systems for years, but the demand for additional tools such as mapping, training materials and parts ordering means we need to find ways to gain more capacity and higher data rates,” said Tyler. While integrated voice and data has been a good solution over the past decade, Tyler said all options are open at this point, and the final decision will be based on a thorough cost/benefit analysis.

### Flexibility important design criterion

“As a publicly-traded company, we have to manage our resources very carefully,” noted Stevenson. “One way we do this is by outsourcing those things that can be better done by specialists, such as the radio system maintenance. Another way is to maintain as much flexibility as possible in the design of our IT infrastructure so that we can make the most efficient use of the various tools and technologies that are available.”

One example of this is the company’s mix of radio communications, which includes the 800 MHz trunked network used by restoration crews, several standalone conventional systems and even cellular data where, and when, it is available.

The use of GPS information as an aid to the all-important gas-leak detection crews is a case in point, allowing a dispatcher to contact the closest qualified personnel to respond to the leak as quickly as possible. Tyler said that they would like to expand the GPS program further to allow more timely vehicle location updates but are limited by capacity issues and the availability of alternative technologies. In the future he believes that they will need to employ either TDMA technology such as that provided by M/A-COM’s OpenSky solution or

some form of CDMA as utilized in third-generation cellular systems to gain higher spectral efficiency and throughput.

### Public/private network dilemma

Another important consideration for the future involves the mix of public and private networks. A long-standing debate for utility and public safety critical communications systems, the best solution is often determined by individual circumstances and needs.

“From an emergency reliability perspective, private networks that we control are best,” said Tyler. “On the one hand, commercial networks offer immediate availability and many desirable data features without the responsibility of maintenance and upgrade to the infrastructure. But commercial networks aren’t available everywhere you need them. And during emergencies – just when they are needed most – commercial networks often become overloaded and fail. That can be a big problem in terms of time delays, and for the safety of restoration crews who are under pressure to restore power to our customers.

“We don’t have the answers to these questions yet. In the end it will have to be a business decision that the company must make once it has all the facts and figures to work with. In the meantime, we’ve got a great record of performance and reliability on which to build. Whenever we’ve needed our radio system to perform, it’s been there for us. And we’re looking forward to setting even more significant milestones in the future.” ■

**“The radios are probably the single most important tool the IT department provides the field work force.”**

Ken Tyler

C3 Maestro dispatch consoles help supervisors monitor high-pressure gas transmission lines for safety and emergency response.



# Parma, Ohio seizes initiative, chooses cost-effective upgrade path to P25



Photo: Parma Fire

**O**n December 14, 2006, the city of Parma, Ohio announced completion of the first phase of a planned upgrade to their 17-year-old EDACS radio system to the P25 national standard for interoperability. The upgrade was noted in the local press, in part because, despite its relatively small size, Parma (population 86,000) was the first municipality in Cuyahoga County to have taken such positive action in ensuring the level of interoperability with neighboring jurisdictions so desired by first responders nationwide.

“It was a pretty gutsy thing to do,” said Alan Close of Cleveland Communications, the local dealer for Tyco Electronics M/A-COM.

“The county has been kicking around ideas for what to do with their communications for quite awhile,” Close said. “With 59 municipalities operating about 50 different

**“We took the chance to upgrade our existing radio system, and we showed it can be done quickly and at a reasonable cost.”**

Bob Gerbic

radio systems for police and fire departments, a county-wide interoperability solution is both complex and expensive.”

Close said that rather than wait around, Parma Mayor Dean DePiero and

the City Council took steps to make Parma’s equipment compatible with the P25 national standard, which the county has stated is the technology it wants. “By being proactive and upgrading to P25, the city and some of their neighboring jurisdictions are gaining the interoperability they need now, rather than remaining in limbo while the county decides what to do,” said Close.

Sgt. Bob Gerbic, radio system manager with the Parma Police Department, agreed. “We saw an opportunity to move ahead and stepped up to the plate,” he said.

“We took the chance to upgrade our existing radio system, and we showed it can be done quickly and at a reasonable cost.”

## DHS report underscores decision

The city did not have to wait long for events to underscore the importance of their decision. In early January, 2007, the Department of Homeland Security released an Interoperable Communications Assessment ranking Cleveland, Cuyahoga County's largest city and Parma's neighbor, near the bottom of 75 U.S. cities in terms of interoperability.

Though too small to be included in the report, little Parma had leapfrogged its larger sibling in its ability to interoperate with neighboring entities. As a result, it found itself the focus of considerable attention within the region.

"When the DHS assessment came out, the media picked up on our earlier announcement and published stories on the subject.

**"By upgrading to P25, the city and neighboring jurisdictions are gaining the interoperability they need now, rather than remaining in limbo."**

Alan Close

City administrators in the area have been contacting us in an attempt to find out what we have done, what our current situation is, and what our vision is for the future," Gerbic said.

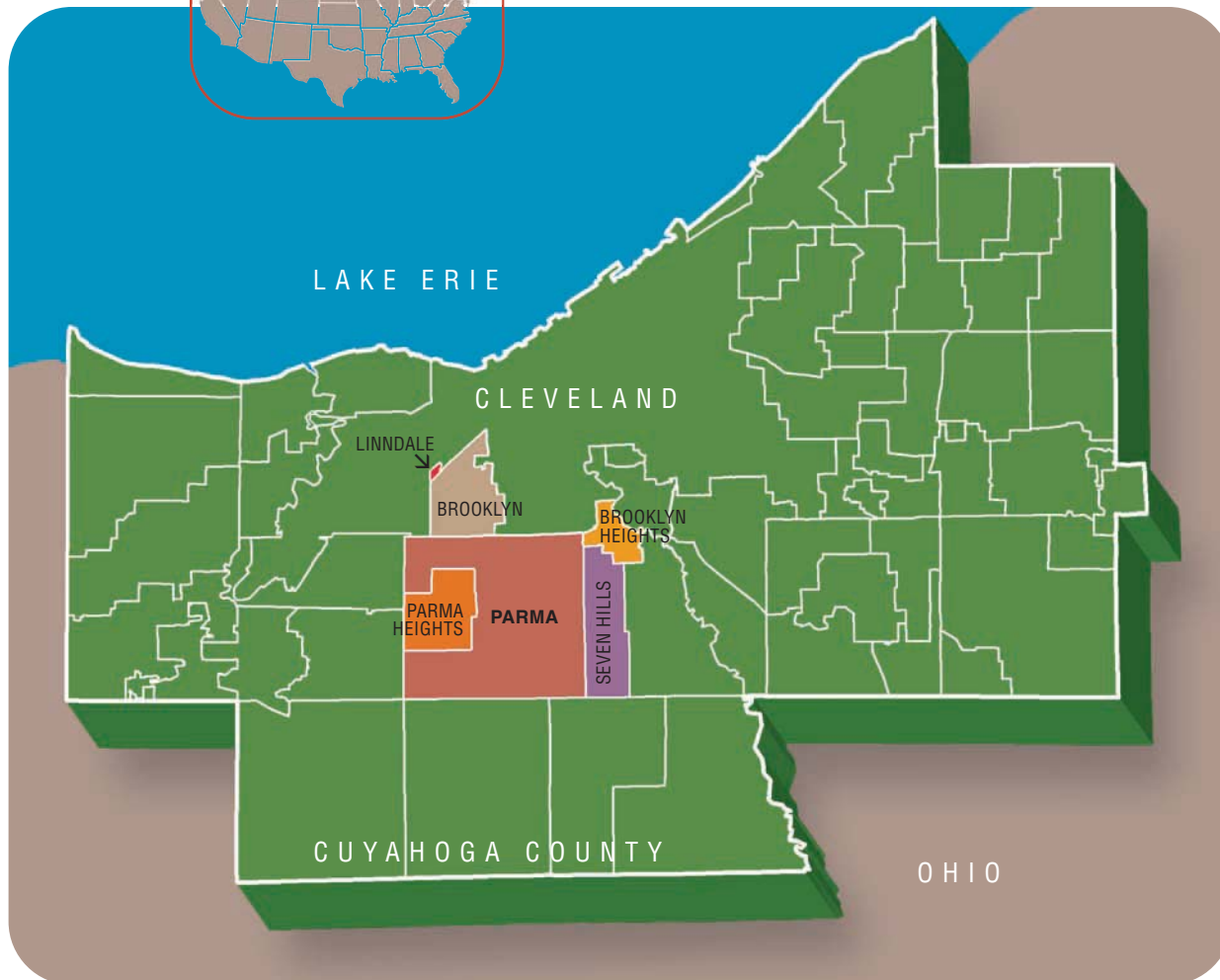
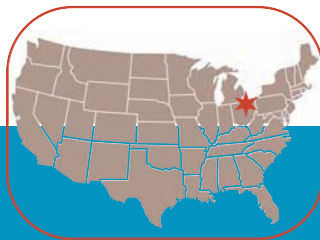
## A clear and cost-effective path to upgrade

"There is no question that Parma's ability to achieve a cost-effective upgrade to P25 and the resulting interoperability with other P25 systems is due to the capacity of their existing EDACS network to easily migrate to new technologies," said Close. "That's something we have been saying to our customers for many years.

In our view, the economics are such that it is imperative for public safety agencies to be able to protect their investment

continued →

Parma's radio system currently serves more than 850 public safety and service users in the city and surrounding municipalities. With the upgrade to P25, the city has ample capacity to offer advanced features to more users for increased interoperability.



The Parma Fire Department provides fire, EMS, rescue and hazard mitigation to 86,000 residents. The City's recent upgrade to P25 will help ensure interoperability with neighboring jurisdictions once all of Cuyahoga County becomes P25 compliant.



Photo: Parma Fire/Car 10

**"This policy [non-obsolescence] continues. Today's VIDA Network supports prior technologies as well as new technologies."**

John Hawn

in existing infrastructure."

Parma Fire Department Chief John French (see *Interview, page 11*) underlined the significance to the city of an easy and cost-effective migration path. "We looked into the possibility of switching systems, but a rough estimate was over \$5 million to replace a radio system that we already had and were comfortable with," he said.

The idea of scrapping their investment in existing infrastructure was understandably difficult to swallow, especially with such a high replacement cost. The city then received a quote from Cleveland Communications to complete the first phase of a P25 upgrade to their current system for less than \$100,000. Furthermore, the city knew there was a good chance that the DHS would fund a grant for that amount.

"With the assurance of interoperability with other P25-compatible systems and the protection of their infrastructure, plus a

**"We have shown that an existing radio system with vintage 1990 radios and equipment can be upgraded to today's technology."**

Bob Gerbic

grant the Parma Fire Grant Committee and Assistant Chief Dennis Ryan acquired through Congressman Dennis Kucinich's office, the choice was easy," said Close.

### **Building on a seventeen-year history**

One reason the city of Parma was able to maximize its investment in infrastructure was that the system had been properly maintained and kept current with software and hardware upgrades over its considerable lifespan. Sgt. Gerbic, who joined the police department a few years after the system's acquisition, provided an overview.

"In 1990, the city purchased a five-channel, single-site EDACS radio system for police, fire and city services. I'm told it was either the second or third 800 MHz EDACS system installed in the country. We had about 300 users initially, with VoiceGuard digital encryption for the police users. We added two channels shortly thereafter and three

more channels in 1998. Since then we have almost tripled the number of users and upgraded the system as new releases became available. We are probably unusual in that we still have several of the oldest radios still in use on our system.”

In addition to the Parma Police, Fire and city services, several neighboring communities are also on the system, including the Linndale Police, Parma Heights Police, Seven Hills Service, Brooklyn Police, Fire and Service, Brooklyn Heights Fire and the Cuyahoga County Library.

### An invitation to share

In addition to the 850 users now on the Parma radio system, Gerbic says they would like to expand their user base even further in order to increase the level of interoperability with all neighboring jurisdictions, and to gain even more from the cost of their infrastructure.

“We see that our system is not only P25 compliant, but that it also has the capacity to handle several hundred more radios,” said Gerbic. “The system is fea-

**“Just as important for older customers is the fact that upgrading remains a choice.”**

John Hawn

is achieved by sharing the same radio system. We can offer them interoperability in that respect as well as interoperability through the P25 standard.”

For the city of Parma, it is clear that their original investment made so many years ago has paid off handsomely. “We have shown that an existing radio system with vintage 1990 radios and equipment can be upgraded to today’s technology,” Gerbic says. To underscore this point he offers an invitation. “I would like to extend an invitation to anyone wishing to see what our system has to offer. They can see for themselves that it can be done. And they can entertain the idea of signing on to our radio system for their primary communications. They

ture-rich and can give new users a lot of extra enhancements that they have never enjoyed on their old radio systems. After all, the highest level of interoperability

can enjoy all of the features and be happy in the knowledge that they too can be P25 compliant and interoperate with Parma and our other partners on a single radio system.” ■

**“We see that our system is not only P25 compliant, but that it also has the capacity to handle several hundred more radios.”**

Bob Gerbic

## Easy upgrade fulfills a long-standing promise

“Parma’s easy upgrade to P25-compliant interoperability from its 17-year-old radio system should come as no surprise to those who are familiar with the EDACS system,” notes John Hawn, regional sales manager for Tyco Electronics M/A-COM. “Like many other EDACS customers around the world, Parma has been able to upgrade their system with new features and technologies as they became available. The upgrade to P25 is just the latest, and proves that the company’s commitment to easy migration continues.”

The ability to migrate easily to newer technologies is no accident. Ever since the introduction of the company’s first trunked system (named “Sixteen Plus” after the Association of Public-safety Communications Officers’ Project 16, which set the operational parameters for first-generation trunking systems), the company has followed a policy of non-obsolescence for its customers. “This policy continues,” says Hawn. “Today’s VIDA Networks support prior technologies as well as new technologies – and not just M/A-COM’s. A VIDA Network will support virtually any system that can be connected through an IP-based gateway. And just as important for older customers is the fact that upgrading remains a choice. Parma wanted to gain interoperability with neighboring jurisdictions who had decided to become P25-compatible. If conditions had been otherwise, they might just as well have decided to stick with EDACS for the foreseeable future.”

# Cost-effective interoperability was key requirement for Parma Fire Department



THE ABILITY TO UPGRADE THEIR EXISTING EDACS RADIO SYSTEM TO P25 HAS ALLOWED THE CITY OF PARMA, OHIO, TO MEET ITS IMMEDIATE NEEDS WHILE SIMULTANEOUSLY ASSURING COMPATIBILITY WITH A FUTURE COUNTYWIDE SYSTEM YET TO BE DEPLOYED. FIRE CHIEF JOHN FRENCH TALKS ABOUT THE DETAILS SURROUNDING THEIR UPGRADE.

**Editor:** The Parma Fire Department shares a communications system with local and adjacent police, fire, and city services. How big is the city and what are your specific responsibilities?

**French:** The City of Parma has a population of about 86,000 and encompasses 21 square miles in Cuyahoga County, Ohio. We share a border with Cleveland and eight other smaller suburbs. Parma Fire is a department providing fire, EMS, rescue and all hazard mitigation to our community. Our county has 59 separate fire and police departments operating on several different radio systems.

**Editor:** What were the driving forces behind the upgrade of Parma's radio system to P25?

**French:** The driving force behind this upgrade was to gain interoperability with other safety forces, city services and other entities. We have all read about and under-

**"The driving force behind this upgrade was to gain interoperability with other safety forces, city services and other entities."**

stand the importance of good communications. In my experience, inadequate communications are partly to blame for just about every incident that

goes bad. I believe it is beneficial to be able to communicate, even on a somewhat limited basis, to different radio systems. To have the capability to speak with others, in an organized and simple way when needed, is essential.

**Editor:** What were the other available options in addition to the upgrade to P25?

**French:** Other options were very limited due to costs. The County is in the process of organizing a regional radio system and we believed it was going to be a P25 system from another manufacturer. We looked into the possibility of switching systems, but a rough estimate was over \$5 million to replace a radio system that we already had and were comfortable with. We then received a quote

from our local Tyco Electronics M/A-COM dealer, Cleveland Communications, to complete the first phase of a P25 upgrade to our current system for less than \$100,000. Since the County system was planned to be P25 compatible, we knew we could be fully interoperable with the new communications network by upgrading our radio system to the same standard.

**Editor:** Did the various groups of users – including fire, police, city services and others who might share use – work together on choosing a solution, or was one group designated to make the decision?

**French:** Our Police and Fire Departments worked together to achieve this, but still in a manner where each department concentrated more on its own needs. One of our bordering communities (Brooklyn, Ohio) is a user of our system and they have also been in the loop and have received funding to upgrade their equipment to the P25 standard as well. One item now being addressed is the organization of a more formal group of representatives from member groups to manage and maintain the system. This will be especially important since we are offering our system to other area municipalities to further improve interoperability in our area.

**Editor:** Are there any significant differences between the requirements of firefighters and other user groups with regard to the radio system?

**French:** There are significant differences in requirements for the different user groups. We worked hard to ensure that our system is feature-rich and capable of meeting these different requirements, which range from data and video transmission to future upgrades and expansion. We are planning some type of MDT function in the future, and our police department has already made steps in that direction.

**Editor:** What role, if any, do you think efforts such as the Department of Homeland Security's National Interoperability Assessment report ranking 75 U.S. cities will have on small and medium-sized cities and their

**"Our recent upgrade to P25 cost about \$98,000 and was 100% paid for by a grant."**

communications systems?

**French:** I believe the report may have a direct impact on future funding by making

everyone from local citizens to elected officials more aware of the situation.

Most safety forces are already aware of the issue and have been trying to obtain grants and various other funding to achieve interoperability. But it is important that people within these communities be aware of the problem and understand how important it is for them to support a solution. I am sure that results of DHS study will end up in grant narratives from many of the poorly-rated areas.

**Editor:** What have you learned from this process that might help other fire departments who may find themselves in a similar situation?

**French:** I don't think I can tell other departments anything they haven't already figured out, such as the need to develop a plan and seek out funds everywhere and anywhere they may be available. There are so many different radio systems in use, and they are not all as easy and inexpensive to upgrade as ours was. Our recent upgrade to P25 cost about \$98,000 and was 100% paid for by a grant our department acquired through Congressman Dennis Kucinich's office.

**Editor:** After 17 years of service from your EDACS system, that seems like a pretty good return on the city's original investment. Any final thoughts about the decision to upgrade your existing infrastructure and radios to P25 and what it will mean for those who live in and around the city?

**French:** So far, I believe we made the right decision and have moved in the right direction. It can only benefit us and our neighboring departments when more of them either become P25-compliant on their own, or when they join our system. It is definitely a huge step in the direction of true interoperability. From what I understand, any department in our locality with an 800 MHz radio system, regardless of the manufacturer, can continue to utilize the equipment they are happy with and accustomed to as long as that existing system is upgradeable to the P25 standard. How can that not be a benefit? ■

**"We are offering our system to area municipalities to further improve interoperability in our area."**

# Cost-effective coverage and minimal environmental impact provided by OpenSky cell sites

By Kevin Ressler

Coverage, capacity, and cost are key drivers in land mobile radio systems. Historically, tower sites were exclusively used to provide land mobile radio system coverage.

This system design approach was inherently limiting, for two reasons. First, adding system capacity meant adding scarce RF channels, which can be challenging to obtain and require the collocation of additional equipment at existing tower sites. This is expensive, even when adequate space is available to house the new equipment. Second, adding system coverage often meant adding tower sites. The initial cap-

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ital investment and the ongoing operational expenses of tower sites are among the largest factors in the total cost of LMR system ownership.

## Changing the dynamics

In order to change the dynamics of the coverage/capacity/cost relationship, M/A-COM has developed and deployed the OpenSky cell site. The cell site takes advantage of Time Division Multiple Access (TDMA) technology to provide integrated voice and data coverage in a compact form factor. This allows an OpenSky cell site to be deployed for a fraction of the

Low-profile OpenSky cell sites provide cost-effective radio system coverage in environmentally sensitive areas where conventional tower sites with their large "footprint" and disruptive access roads would be unacceptable.





cost and time required for construction of a tower site and equipment shelter.

Ken Sutton, Tyco Electronics M/A-COM project engineer with the Commonwealth of Pennsylvania Statewide Radio Network, notes: "With proper planning and preparations we've been able to get a brand new cell site installed and operational, including electrical circuits, antenna placement, network connectivity, electrical grounding, and full RF operation, in less than eight hours."

OpenSky cell sites provide a cost-effective, environmentally responsible means to provide flexible system coverage and capacity. In addition, they are particularly effective in providing fill-in coverage for areas with challenging terrain or man-made obstructions.

### Taking advantage of TDMA

With OpenSky TDMA technology, every licensed RF channel is a working channel, thereby eliminating the need for dedicated working channels, increasing reliability and capacity. The base station in a cell site can be configured to operate at 800 MHz in either 2-TDMA mode, capable of supporting up to two concurrent voice and data

users, or in 4-TDMA mode, capable of supporting up to four concurrent voice and data users. In the 800 MHz band, a single OpenSky cell site can support four concurrent voice and data users with a single 25 kHz channel. Traditional FDMA systems would require a dedicated control channel and four working channels to achieve the same capacity. In addition, OpenSky cell sites meet the Federally-mandated 6.25 kHz equivalent efficiency in the 700, 800, and 900 MHz frequency bands.

### Flexible deployment options

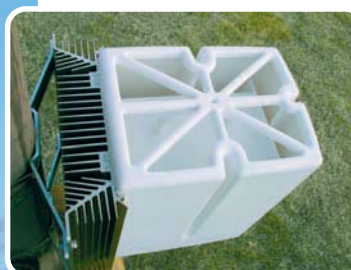
OpenSky cell sites are really useful from a system design perspective because they can be deployed in so many ways. Cell sites can be added to create additional capacity within existing system coverage, or they can be added to provide additional outdoor coverage and/or selective in-building coverage. As shown in the accompanying photos, OpenSky cell sites have been deployed in rural and urban areas throughout Pennsylvania (see sidebar, page 16) with minimal environmental impact.

The cell site's small form factor also enables hybrid deployments where the cell site and its 24-hour bat-

OpenSky cell sites can be easily and quickly installed indoors or outdoors on existing structures such as these in rural Pennsylvania.

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In addition to their low environmental impact, cell sites are designed for long service in harsh conditions. A new front-access service panel enhances serviceability while built-in heat sinks and solar shielding enhance thermal management and increase service life.

## Cell Site advantages

- Design Flexibility – place in a variety of locations where it is very difficult to site a tower (outside hospitals, on water towers, in buildings, etc).
- Easier site acquisition.
- Superior cost/coverage ratio.
- TDMA advantage of 2-slot and 4-slot integrated voice and data in a very small form factor.
- Minimal environmental impact.
- 24-hour battery backup.
- Proven excellent field reliability (from Southwest deserts to Northeast mountains).
- Short installation time (can fully deploy a cell site in less than eight hours if connectivity and power are in place).
- Connectivity flexibility (ISM, leased line, new 700 MHz).
- Second-generation design with enhanced field serviceability.

**“It’s critical to have public safety grade communications... in the most environmentally responsible manner possible. OpenSky does a good job of meeting both these goals.”**

Charles Brennan

A mobile Cell on Wheels serves as an extension of an OpenSky network or as an independent, tactical device for separate on-scene coverage.



tery backup device can be installed inside a building, while the 800 MHz antenna is mounted on a wooden pole outside the building.

In urban areas, the cell site equipment can be installed within a building with only the 800 MHz antenna mounted outside, or the cell site can be installed inside a building with a coaxial radiating cable to distribute the 800 MHz signal within subterranean levels of building for enhanced in-building coverage. This flexibility enables cell sites to be installed where they are needed in an initial design, or subsequently desired by customers for additional coverage or capacity as their system grows.

Charles Brennan, deputy secretary for public communications, Commonwealth of Pennsylvania, neatly summarized the advantages that OpenSky cell sites provide. “It’s critical for the

users of our system to have public-safety grade communications. And it’s also critical for the citizens of Pennsylvania that our system provides coverage in the most environmentally responsible manner possible. I think OpenSky does a good job of meeting both these goals,” he said.

### Mobile “Cell on Wheels”

The OpenSky cell site has also been combined with a mobile form factor with a

retractable antenna to provide flexible tactical communications. The OpenSky Cell on Wheels can either be wirelessly connected as an extension of the OpenSky network, or operated independent of the network to provide tactical, on-scene, public safety coverage.

The OpenSky Cell on Wheels has provided public safety communications on several occasions, including a full-scale exercise testing the emergency response capabilities of the City of Pittsburgh that included 5,500 victim participants in May, 2005. In this exercise the Allegheny County Hazmat teams and the regional Urban Search and Rescue (USAR) Strike Team used OpenSky radios communicating through the Cell on Wheels for primary communications. Units from the Pennsylvania Department of Military and Veterans Affairs (Civil Support Team & Civil Air Patrol) and the Regional EMS Council and area hospitals were able to access the OpenSky radio system for the exercise.

The OpenSky Cell on Wheels also provided coverage to a large area along the Allegheny River area and in-building coverage in the heavily-built concrete lower levels of PNC Park.

### Reliability by design

A cross-functional design team combined electrical, mechanical, thermal, and environmental engineering to design the OpenSky cell site. Bob Sletten, Tyco Electronics M/A-COM senior principal engineer, explained the overall design goals and how they were achieved: “We knew these cell sites were going to be used in remote, hard-to-reach places, so reliability was very important. One primary design rule was to have no moving parts in the cell site. Fans tend to collect dust and often need to be thermostatically controlled. So we decided the cell site had to be passively cooled. We chose white paint to reflect solar energy. We incorporated metal fins to help convective cooling. We created a NEMA4 cell site enclosure designed for outdoor operation. We knew backup electrical power was going to be important, so we designed 24-hour battery backup for the cell site in case commercial power is lost. Finally, the cell site had to be small enough and light enough for one person to lift and install. These factors all added up, and the proof of the design has been the outstanding operational reliability cell sites have shown in the field, in climates ranging from the desert heat of Arizona to the harsh winters in the Northeast U.S.,” said Sletten.

## Connectivity choices

Each OpenSky cell site is connected to a tower site within the OpenSky trunked radio network. The cell site has IP (internet protocol) network connectivity through a site-to-site backhaul link between itself and the tower site. This IP connectivity is achieved using a 56 kbps Digital Data Service (DDS) landline modem link, or through a 2.4 GHz wireless link using the M/A-COM SkyLink ISM radio product.

The ISM SkyLink is a 600 mW Direct-Sequence Spread-Spectrum (DSSS) radio that provides point-to-point or point-to-multipoint communications between the cell site(s) and the respective tower site. The SkyLink ISM repeater sites can be used to extend the overall distance of the ISM backhaul link. The SkyLink ISM radio has proven very useful in connecting the mobile, OpenSky Cell on Wheels into the fixed OpenSky radio network infrastructure.

## Increased field serviceability

A second-generation cell site design implements additional features driven by customer feedback from the hundreds of field-installed cell sites. These design additions make the OpenSky cell site even more versatile than before and create additional deployment possibilities.

To protect against unwanted heat gain, a solar shield has been implemented to reflect solar energy before it reaches the cell box. In addition to the solar shield, a dedicated heat sink has been added for increased thermal efficiency. The NEMA4 enclosure containing the RF transceiver and high-power amplifier has been further reduced in size and weight and now has a carrying handle so one person can easily lift and install the device.

And finally, field serviceability has been enhanced with a front panel interface box that provides field technicians with easy access to telecommunications, network, alarms, power, and equipment control. A network port was added to the customer interface box to facilitate in-building cell site deployments through easy integration with the native Ethernet wiring within the building.

## Pennsylvania Statewide Radio Network continues to grow

OpenSky cell sites are used extensively in rural and urban Pennsylvania. Under a phased statewide deployment, the Pennsylvania Statewide Radio Network has operated in selected regions of the state since 2000. The IP-based 800 MHz trunked network is designed for 95% mobile coverage over the State's 45,000 square miles and 67 counties.

The system currently supports 65,000 users, including the Pennsylvania State Police, the Pennsylvania Department of Transportation, the Pennsylvania Emergency Management Association, the Department of Health, the Department of Military & Veterans Affairs/PA National Guard, the Office of Attorney General, and Pennsylvania Board of Probation & Parole, as well as other state agencies. Over 14,000 radios have

been deployed on the network.

"As a supported platform in a VIDA Network, OpenSky provides clear, reliable speech transmission even in degraded channel conditions," says Kevin Ressler, Tyco Electronics M/A-COM radio systems engineer. "Compressed voice is transmitted over a Time Division Multiple Access (TDMA) airlink, permitting two or four simultaneous conversations on each RF channel. At the same time, OpenSky data network solutions deliver robust, high capacity data transmission for a new generation of mobile computing applications."

In addition to the Statewide Radio Network, OpenSky and P25<sup>IP</sup> systems are also either in use or being deployed in Lancaster, Cumberland and York Counties in Pennsylvania.

In addition to the 56 kbps DDS leased line and 2.4 GHz SkyLink ISM wireless connectivity options in the original OpenSky cell site design, the new cell site offers frame relay, T1, and fractional T1 connectivity back into the OpenSky network. New 700MHz and 900 MHz cell sites are now shipping with this second-generation design. ■

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**"The proof of the design is the outstanding operational reliability we have seen in the field, from the desert heat of Arizona to the harsh winters in the Northeast."**

Bob Sletten



# P25 network-level intersystem interoperability proved in recent tests

First announced and demonstrated in Aug. 2006, Tyco Electronics M/A-COM's support of the Project 25 Inter RF Sub-System Interface (ISSI) was further tested in a landmark third-party demonstration in January, 2007.

"General Dynamics C4 Systems facilitated a demonstration of network-level voice interoperability between two separate P25 systems from different manufacturers," said Paul May, business development manager for Tyco Electronics M/A-COM. The company's P25<sup>IP</sup> Network Switching Server employed a software upgrade compliant with the ISSI to provide interoperability at the system level with ISSI-compliant equipment from another P25 manufacturer.

## Later than hoped, but sooner than predicted

"This is very good news for many Federal Government agencies who have been frustrated by the lack of network-level interoperability between P25-compliant systems from different manufacturers," May said. "There are some in the industry who have been saying that it could take as long as another two or three years before intersystem P25 communications can take place. This recent test proves that is not so."

May said that there were many reasons for the long delay in the issuance of wireline standards for P25. "Air interfaces are the prime differentiators for any particular network," he said. "So, initially, the P25 technical committees chose to focus their energies on the development of the air interfaces."

Once the air interfaces were announced and their acceptance demonstrated by the availabili-

ty of a wide mix of equipment from various vendors, May said that efforts shifted to the wireline standards. "Key technical committees increased their level of commitment and established a more aggressive development schedule. The result is the approval and final publishing of the ISSI by the Telecommunications Industry Association in August, 2006," he explained.

While equipment availability will lag by a several months, May emphasizes that "the successful interoperability tests prove that ISSI-capable equipment can be specified with full confidence today."

## Roaming, digital features key

The primary advantage of the ISSI is that it takes interoperability beyond the radios themselves and includes the network, with all the supervisory control and higher-level digital features that entails. It also allows several overlapping local land mobile radio systems to be joined together into a single regional or statewide network, despite differing frequency bands and other technology differences.

"The ISSI will provide advanced digital features such as emergency declarations, talking unit IDs and voice encryption to be used across the networks. This will enable on-demand roaming and mutual aid connections between adjacent communities," said May. In addition, May said the P25 ISSI standard "will make interoperable communications from different systems and manufacturers a reality and will directly contribute to the safety and security of public safety first responders as well as military personnel who are deployed around the world." ■

**"This is good news for Federal agencies who have been frustrated by the lack of network-level interoperability between P25-compliant systems from different manufacturers."**

Paul May

# New SUMS provides security updates for Software FX customers

Tyco Electronics M/A-COM recently announced the release of its new Security Update Management Service (SUMS) for P25<sup>IP</sup> and OpenSky customers with Software FX agreements. SUMS allows users to stay cur-

rent with recent product vulnerability alert (PVA) resolutions through periodic software updates for components of M/A-COM's VIDA (Voice, Interoperability, Data and Access) mission-critical communications systems.

“In order to provide the highest-level of protection and security for our radio communications system users, M/A-COM continually monitors PVAs from multiple sources including government, vendor, independent and open source databases,” said Tom Kegley, manager, Technical Support Services.

“Once the information is received, we evaluate each alert for its effect on individual radio communications system components. Security updates are then regularly provided to resolve vulnerabilities that may have been discovered,” Kegley said.

### Keeping up with the “bad guys”

The need for constant vigilance among software vendors is well established, with several industry watchdog groups involved in the daily assessment of possible threats and the issuance of timely PVAs from many sources. Kegley says that SUMS mission-critical subscribers will benefit from:

- Continual monitoring of PVAs, critical commercial software and anti-virus updates by M/A-COM’s security team.
- Quarterly security releases tested and

verified by M/A-COM’s Security Verification Test Team.

- Expedited security updates for high-priority PVAs and critical commercial updates.
- Security update release and installation notes with a summary of how each issue and PVA was addressed.

### Extends Software FX

SUMS is an extension of M/A-COM’s existing software upgrade program called Software FX, and can be purchased by OpenSky and P25<sup>IP</sup> customers as an enhancement to a Software FX subscription.

“The Software FX program helps M/A-COM customers guard their systems against obsolescence created by the continual introduction of new features and evolving mobile communications technology,” explained Kegley. “It is more than a software maintenance program. It protects the customer’s investment while actually increasing the overall value of the system. The combination of Software FX and SUMS is a cost-effective way to ensure that their critical communications systems are updated and secure.” ■

**“Software FX... protects the customer’s investment while actually increasing the overall value of the system.”**

Tom Kegley

# New UHF/VHF portable packs key features into small package

The new P5400 series of portable radios for P25, EDACS, and ProVoice systems fulfills the needs of public service users and smaller public safety groups who require key features such as trunked wide-area roaming in a durable, lightweight and competitively-priced radio.

“The P5400 is one of the smallest, and lightest multi-featured P25 VHF or UHF radios available in its price range,” said Greg Farmer, Tyco Electronics M/A-COM product manager. Two models, P5450 Scan and P5470 System, provide smaller agencies with the flexibility to provide users with the right radio for the right job. A full line of accessories provides the customized operations customers request, including lapel-mics and other audio accessories, carrying devices, batteries and chargers. Lithium batteries, a new option, provide lighter weight and longer service on a single charge.

**“The P5400 is one of the smallest and lightest multi-featured VHF or UHF radios available in its price range.”**

Greg Farmer

“In addition to wide-area roaming, the radio provides P25 trunking and P25 digital conventional operation. Unencrypted digital voice interoperability with other Project 25 users and ProVoice and EDACS systems make this portable radio a powerful choice for the future,” Farmer said.

The software-based radios feature a multi-line alphanumeric liquid crystal display and rotary On-Off-Volume and channel controls and can store up to a maximum of 255 trunked talkgroups and up to 512 conventional channels. A variety of optional features such as text messaging, GPS, and data are available. The UHF models can be ordered now, with shipments expected to begin in mid summer. VHF models will be available to order soon, with announcements about additional frequency bands planned for the future. ■

P5450 Scan Model



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