Considering paging for a P25 upgrade

Many public-safety organisations are currently updating their analogue communication technologies to digital ones. The reason for switching from analogue two-way voice communications to a digital system (such as P25, Tetra, DMR) is often to revamp outdated infrastructures.
In most cases communications and alerting (paging) are running on the same analogue radio network. Operators need to account for future alerting scenarions when planning a migration in order to avoid loss of performance, high costs and the frustration of users. Traditional, analogue networks provide both services; they enable two-way voice communication and are used to send page alerts to volunteer, retained and permanent firefighters. For several reasons, this infrastructure has come to the end of its lifecycle.
The transition to digital systems brings many advantages for data and voice communications, but paging is too often left behind with the old analogue infrastructure. However, it is simply too costly to operate and maintain an obsolete analogue infrastructure for paging alone without benefitting from the advantages of the digital system.

Compliant and cost-effective

Which decision should public authorities take in order to solve this dilemma?

Use P25 pagers on the same network. Some public authorities consider using P25 pagers to digitise their pagers. However, using P25 pagers comes with three major disadvantages:

1. P25 pagers are costly, priced at nearly $1,000 compared with the $200 it costs f or a high-quality digital fire pager that runs on the POC-SAG protocol, the predominant global standard for digital paging. For a fleet of 300 pagers, this results in a difference of $240,000. If you consider a fleet replacement every five years, this cost difference increases to $720,000 during a 15-year period.
2. Pagers based on technology designed for two-way radio devices are quite big and bulky and need to be recharged every one to two days. In contrast, high-quality digital pagers are slim and can run for up to three months on one battery, making them convenient for volunteer firefighters who carry their pagers every day. Additionally, digital pagers can be operated with a single AA battery, which is ideal in case there is a power outage or if you want to avoid the cost of battery chargers.

3. P25 networks are often designed and built for P25 mobiles and outdoor coverage. Alerting networks built specifically for volunteer firefighters typically have higher requirements, both in terms of coverage in remote and rural areas and in terms of in-building reception. Consequently, firefighters may sometimes not receive an alert even if they are carrying modern P25 pagers. Given the cost of P25 base stations, it would be costly to improve the coverage of the P25 network to the extent that it complies with the requirements of an alerting infrastructure for firefighters. An infrastructure that is used for communications and alerting purposes operates as a single network without a secondary or backup network. This makes the solution vulnerable if there is an unexpected system failure. Many standards such as the NFPA in the US require that communication and alerting networks are operated separately.

Use mobile network services to alert first responders.
Smartphone apps have seen large growth in the last few years thanks to the marketing efforts of the startup companies behind these services. But they come with several drawbacks regarding public safety. App-based messaging services run on commercial mobile networks. These public networks may work fine in normal situations. However, during a crisis – if there is a hurricane, flooding, large fire or terrorist attack – such communication channels can be overloaded within a few minutes and eventually go out of service. This means that firefighters cannot be alerted or respond to a call when they are needed the most.

Settling for app-based alerting services while at the same time investing heavily in a state-of-the-art P25 system for voice is not a wise alternative to cut costs when you're trying to improve overall public-safety services. For these reasons, switching analog paging to P25-based alerting or cellular-based messaging solutions is not viable when planning to go digital with mission critical communications systems.

A third option

Swissphone offers a further solution, namely «The next level of simulcast paging». Our recommendation is to use an independent, self-reliant alerting system to complement the digital communication system.

The paging network architecture allows you to easily enhance radio coverage beyond what is possible with a P25 network, making it the ideal, adaptable solution for firefighting agencies. End-user devices – digital POCSAG pagers – are easy to carry and run for up to three months on one battery. It costs about five per cent of the cost of an entire P25 project. The solution includes a fully redundant radio network that consists of network controllers, base stations, pagers and a dispatch platform. This digital paging solution is based on the POCSAG protocol. An interface to the CAD system reduces the dispatch time and improves the response time. Unlike with voice paging, the dispatcher does not need to waste precious time preparing or speaking the message that he or she wishes to transmit. The dispatcher has the option to either create a new alphanumeric message or send a predefined one. Furthermore, having a redundant digital paging network alongside the P25 network reduces possible delays or overloading in the P25 radio network.

Patented DiCal technology allows the system to communicate over an existing backhaul network, but the solution is not dependent on the backhaul. All communication can take place within the proprietary radio network via a single-frequency for alerting, monitoring and configuration. The base stations are energy efficient and can be powered by solar panels and batteries if needed. Additional transmitter sites can easily be added because they don't rely on an IP or microwave connection for backhaul. The base stations can therefore be placed at any location at little cost, ensuring optimal rural and indoor coverage.

The network architecture is fully redundant, ensuring that operations continue even if any of the components are out of service. It also consists of several fallback layers to the extent that the entire area can be alerted from any base station even if other system components are defective.

The s.QUAD pagers are extremely robust and have been drop-tested from a height of two meters onto concrete. They are also waterproof and have been rated IP67. The units remain operational for up to three months after their battery stops being charged. They run on a standard AA battery, which is easy to buy and replace. The pager supports Bluetooth Low Energy (BLE) connection, which means it can be connected to smartphones. This feature allows the responder to use the s.QUAD app on their smartphone to change their status or respond to an alert recevied on the pager. The status can be displayed and managed in the dispatch system or a third-party application. The system also features s.ONE, a software platform that can be used for alerting, monitoring, checking resources and remote programming. Dispatchers can use the alerting client as a fall-back to the dispatch system. With the s.ONE monitor, the dispatchers will always know which firefighters are responding to an incident and where these firefighters are. Operations directors can see the availability of relief forces and the capacity of different teams and groups on a display screen and alert them as necessary. If a pager needs to be reprogrammed due to any changes in the organisation, this can be done remotely.

The pagers BLE connection to a smartphone makes it possible to send hybrid alerts to the pager, whereby the pager receives alerts via two networks – the paging network and the mobile network. If reception is weak via one network, alerts are received via the other network. The pagers alert suppression feature ensures that the pager doesn't go off twice for the same alert.

DiCal – The smart and compact network architecture

Almost all technologies have switched from analogue to digital except for emergency paging. It is now time for digital paging to also be the norm! The Disaster-Proven Paging Solution (DiCal) from Swissphone offers improved coverage, more reliability and flexibility beyond anything that traditional analogue or digital paging systems can provide.
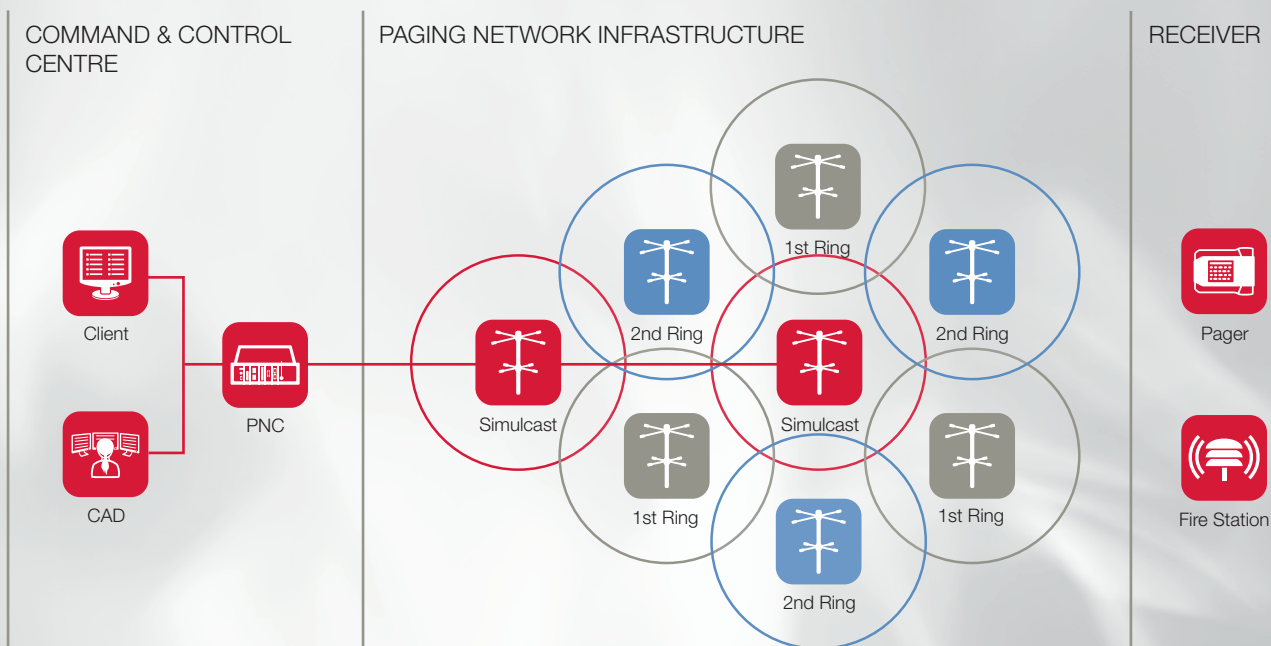
Black Hawk County

Black Hawk County, Iowa, US, is a leader in public-safety communications technology and was an early adopter of 800 MHz trunked radio systems. The county has an area of 1470 square kilometres, which was previously covered by a single analogue base station combined with two store and forward repeaters for two-tone paging.

When the county officials started to plan for a switch to a P25 system, they wanted to improve and modernise their paging solution rather than simply replace it with the same technology they had had for the previous 20 years. They leveraged the five planned P25 tower sites for enhanced simulcast coverage with paging base stations and have the flexibility to further expand coverage as the county grows.

The combined solution complies with NFPA, which was one of the reasons why the entire project was fully funded by elected county officials and purchased from the local distribution and project integrator for Black Hawk County. The implementation and rollout of such a system only takes a couple of weeks. The base stations can be placed wherever they are needed, by being either rack mounted on existing tower sites or wall mounted in a special housing in every other location.

«Deploying digital simulcast fire paging will lower our overall cost, increase coverage and decrease response times.»

John Schilling, Cedar Falls Fire Rescue Chief

«We're excited to be deploying the DiCal solution from Swissphone for our fire and EMS first responders throughout the county.»

John Schilling, Cedar Falls Fire Rescue Chief

It is worthwhile to consider both voice communications with radios and alerting with pagers when switching to P25. The best time to carry out a paging system upgrade is when you are planning to migrate to P25. This allows you to increase coverage where you need it, shorten the alerting time, reduce operational costs and improve user acceptance and compliance. Black Hawk County is an example of how combining a digital migration to P25 with digital paging can significantly increase the chance of receiving funding for the entire project. This opportunity makes it worthwhile to incorporate the cutting-edge paging solution when applying for P25 project grants.