



White Paper

Why Cellular as a Single Transmission Path meets the Requirements of NFPA 72

The purpose of this white paper is to provide documentation supporting the use of cellular as a single communication technology for sending fire alarm signals from a NFPA 72-compliant fire alarm to a supervising station. To accomplish this goal, passages from NFPA 72, 2010 and 2013 will be cited. At the end of this white paper, an additional list of supporting reference materials within the purview of NFPA and UL will be provided for additional reading.

DMP's initial supporting contention includes the following sections of NFPA 72, 2010.

1. Section 26.6.3.1.1: "Communications methods operating on principles different from specific methods covered by this chapter [dial-up, POTS] shall be permitted to be installed if they conform to the performance requirements of this section and to all other applicable requirements of this Code."
2. Section 26.6.3.1.4.1: "Single Communications Technology. Where only one communications technology is used, any failure of the communications path shall be annunciated at the supervising station within 5 minutes of the failure."

The Gradual Demise of POTS

The ordinary telephone line, commonly referred to as POTS (Plain Old Telephone Service), was once the most reliable means of signaling in most, if not all fire alarm systems monitored by a supervising station. Having two POTS lines attached to an NFPA 72-compliant fire alarm control panel assured fire inspectors as well as fire alarm installation personnel that everything that could be done to assure signal integrity was accomplished. NFPA (National Fire Protection Association) is a global, non-profit organization dedicated to eliminating death, injury, property and economic loss due to fire (<http://www.nfpa.org>).

The problem is that today the PSTN (Public Switched Telephone Network), which serves POTS, is no longer the reliable, dependable means of fire alarm signal transmission that it once was. For example, where a mere two years ago (2013) 61 percent of alarm signal transmissions traveled over POTS, today it's 41 percent; 40 percent over cellular; 17 percent over VoIP, per the Internet; and 2 percent over long-range radio (Statistics by Security Sales & Integration Magazine).

The ultimate end of POTS/PSTN as a quality, first-line fire alarm signal pathway was publically acknowledged by the FCC (Federal Communications Commission), Washington, DC, in 2010.

"On April 8, the FCC issued a public statement in the form of a document titled, FCC Announces Broadband Action Agenda, that in essence says whether anyone likes it or not we're going to phase out plain old telephone service (POTS), also known as the public switched telephone network (PSTN) and in its place create an IP-switched national infrastructure. This, of course, threatens to undermine the very backbone of most security and life-safety alarm systems" (Alarm Communications Crisis Looms, Security Sales & Integration [SSI] Magazine, May 1, 2010).

True to the above prediction, POTS is no longer the dependable, reliable means of signaling that it once was merely a decade ago. In fact, NFPA 72, Section 26.6.2.4.3, 2013 Edition, reduces POTS to secondary status when dual control is necessary: "Public switched telephone network facilities shall be used only as an alternate method of transmitting signals."

Today, telephone carriers are more interested in high-tech solutions, which include Internet-based signaling as well as GSM, CDMA, and all the other flavors of cellular service. Therefore, less and less money and human resources are being used to prop up the older POTS/PSTN service. The result is a variety of problems that could have disastrous consequences in an actual fire.

“Today, true land lines [POTS] are slowly going away, and where traditional phone lines are still in use, it’s not uncommon to encounter noise, intermittent operation, dialer troubles, failure to communicate errors, and an assortment of other issues,” says Mark Hillenburg, Exec. Director of Marketing with Digital Monitoring Products (DMP) of Springfield, MO. “In addition, cell units are much better designed and reliable than phone lines. All of this has prompted many fire alarm contractors to switch as many of their fire alarm customers over to a cellular solution as possible.”

Industry Consensus Means a New Direction

For all the reasons above, the fire industry, including NFPA, have chosen to move in a new direction, a direction that includes the use of a single path signaling strategy that involves several network technologies that feature reliable, dependable, high-capacity signal throughput. This includes Internet connectivity as well as today’s cellular system, both which meet the definition of a MFVN (Managed Facilities-Based Voice Network) under NFPA 72, Section 3.3.152 and A3.3.152, 2013 Edition.

“In recent years, providers of telephone service other than the traditional POTS service have become more common. The 2010 edition of the Code includes revisions to address the use of these non-traditional types of telephone service” (NFPA 72 FAQs, NFPA, <http://bit.ly/1LMGXAX>).

To accommodate non-traditional signal transmission methods, both the NFPA 72, 2010 and NFPA 72, 2013 Editions feature a revised definition for PSTN. For example, NFPA 72, Section 3.3.290.2, 2013 Edition, says, “An assembly of communications equipment and telephone service providers that utilize managed facilities-based voice networks (MFVN) to provide the general public with the ability to establish communications channels via discrete dialing codes.”

The section cited above sets the stage for the transition from analog to digital network signaling. In NFPA 72, Section A.3.3.141, 2010, entitled Managed Facilities-Based Voice Network [MFVN], it further clarifies, “...Code intends to permit an MFVN to provide facilities-based telephone (voice) service that interfaces with the premises fire alarm or emergency signal control unit through a digital alarm communicator transmitter (DACT) using a loop start telephone circuit and signaling protocols fully compatible with and equivalent to those used in public switched telephone networks. The loop start telephone circuit and associated signaling can be provided through traditional copper wire telephone service (POTS—‘plain old telephone service’) or by means of equipment that emulates the loop start telephone circuit and associated signaling and then transmits the signals over a pathway using packet switched (IP) networks or other communications methods that are part of an MFVN.”

What this means is that PSTN is now part of the MFVN, which does not always work well with traditional DACTs (Digital Alarm Communicator Transmitters).

Some alarm owners are routinely switched to VoIP [packet-switched] service without anyone ever telling them. Their phone lines have VoIP switching at the CO (Central Office), and even though their traditional phones continue to work, it’s hit or miss with their fire alarm panel DACT.

Whether cellular or Internet-based, typical non-traditional network oriented methods--as listed under UL864, 9th and 10th Editions—are specifically designed to meet all of the technical considerations set forth in NFPA 72, including a high-speed data throughput that assures a faster data exchange from fire alarm panel to the central station receiver at the supervising station. In a word, going purely digital from front to back has turned out to be a real benefit to the fire alarm industry and the corporations and institutions that rely on them.

Additional Benefits to Non-Traditional Signaling

There are several other reasons why the change in emphasis from traditional POTS to a network-oriented, digital-based MFVN benefits the fire alarm owner/user, especially when they use cellular.

First, cost is a factor because traditional commercial-grade POTS lines carry a relatively high monthly cost compared to cellular. For example, the price of a commercial POTS line in some areas of the nation can be in excess of \$80.00US, or \$160.00US per fire alarm system. Compare this to a single path, non-traditional cellular communicator, which carries a cost that is half of a single POTS line (or less).

Secondly, as cited earlier, communication between panel and the supervisory station is much faster, which means firefighters and/or paramedics are usually on their way to the scene of a fire or some other event considerably faster than when using traditional POTS.

And third, cellular enables the supervising station to learn of fire alarm panel problems and signal path troubles faster than traditional POTS could ever have achieved. For example, in order for a supervising station operating under NFPA 72, 2010, to determine that a specific fire alarm panel using POTS is experiencing a problem, it could take as long as 24 hours (NFPA 72, Section 26.4.5.1.1, 2010). Today, test timers are required every 6 hours instead of 24, per NFPA 72, Section 26.6.2.4.4(2), 2013 Edition: "Public switched telephone network facilities shall be exercised at least once every 6 hours."

As a side note, Section 26.6.2.4.4(2), 2013 Edition, clearly demonstrates NFPA's growing concern over the degraded operability, dependability, and reliability of today's POTS.

Signal Transmission at the Speed of Light

Although POTS-based reporting of fire alarm signals was considered bulletproof back in the day, the time it took from alarm to signal reception at the supervising station was traditionally 1 to 3 minutes. Today, using cellular, signal transmission is almost instantaneous. Best of all, we are assured of maximum up time with these cell networks if for no reason other than MONEY.

The fact is cell carriers do not make as much money when their systems are down as they do when they are fully operational. Cell carriers also are concerned about their commercial customers that could be adversely affected when there's a cell outage. For all the above reasons, cell towers are equipped with battery backup as well as electric generators.

"With the world increasingly dependent on mobile communications, any interruption to service inconveniences users and can negatively affect businesses. So when cell towers fail, whether it's a single tower failing or a cluster of towers failing simultaneously, network providers work tirelessly to quickly restore service to minimize the impact on customers" (When Cell Towers Fail: Quantifying the Customer Impact, <http://soc.att.com/1WAIRIR>).

On the cellular side of the coin, it gets better. Not only does signal transmission take place nearly at the speed of light, but it's possible to detect a disruption in the signal path within as little as 200 seconds, although NFPA 72, Section 26.6.3.1.4.1, 2010 Edition, requires a check-in (polling) rate of 5 minutes when using a single communications technology: "Where only one communications technology is used, any failure of the communications path shall be annunciated at the supervising station within 5 minutes of the failure." And when a failure does occur in the communication path, local notification is required at the affected premises, all of which are achieved with cellular.

Since the 2010 Edition was adopted by consensus, the Technical Correlating Committee on Signaling Systems for the Protection of Life and Property and all the subcommittees therein, have gone one step further in demonstrating NFPA's acceptance of an all-digital, single-communications solution by extending the above 5-minute check-in time to 60 minutes (see following quote).

“Unless prohibited by the enforcing authority, governing laws, codes, or standards, a single transmission path shall be permitted, and the path shall be supervised at an interval of not more than 60 minutes. A failure of the path shall be annunciated at the supervising station within not more than 60 minutes. The failure to complete a signal transmission shall be annunciated at the protected premises in accordance with Section 10.15” (NFPA 72, Section 26.6.3.1.5, 2013 Edition).

DMP’s CellComSL series of NFPA 72-compliant cellular communicators are especially effective in transmitting fire alarm signals because of the high-quality engineering and value-added features built into them.

For example, a DMP CellComSL can be added to any compliant fire alarm control panel that sends alarm data using the Contact ID format. In this case, full data is sent to the supervising station in an extremely short period of time. Even those fire alarm panels that send another data format can benefit from a CellComSL cellular communicator because there are four IDC’s (Initiating Device Circuits) built into each cellular unit for activation by relays or voltage outputs in the corresponding fire alarm panel.

By now it should be apparent that cellular, as a single communication technology, not only meets the performance standards outlined in NFPA 72, 2010 and 2013, but it’s actually preferred, especially by alarm installers and their clients.

Additional Resources

Other Communications Technologies or Single Communications Technologies have been allowed going back to 1999. Below you will find the sections from the NFPA72 Standard for 2002, 2007, 2010, & 2013 as well as UL 864 9th and 10th editions. Also from NFPA72 2013 Standard an explanation from the Appendices A26.6.3.1 of the use of cellular devices used with a DACT to convert from PSTN to a cellular network single communications path.

NFPA 72 2002

8.5.4 Other Transmission Technologies

8.5.4.1 Conformance

8.5.4.4 Communications Integrity

NFPA 72 2007

8.6.4.4 Communications Integrity

NFPA 72 2010

26.6.3 Communications Methods

26.6.3.1.1 Conformance

26.6.3.1.4.1 Single Communications Technology

NFPA 72 2013

26.6.3.1.5 Single Communications Path

10.15 Trouble Signals

10.15.7 Visible and audible trouble signals and visible indication of their restoration

10.15.8 Trouble signals and their restoration to normal

A26.6.3.1

UL 864 9th Edition

40.3.2.9

40.7 Other transmission technologies

UL 864 10th Edition

41.3.2.9

41.7 Performance based technologies