



IoT
Goes

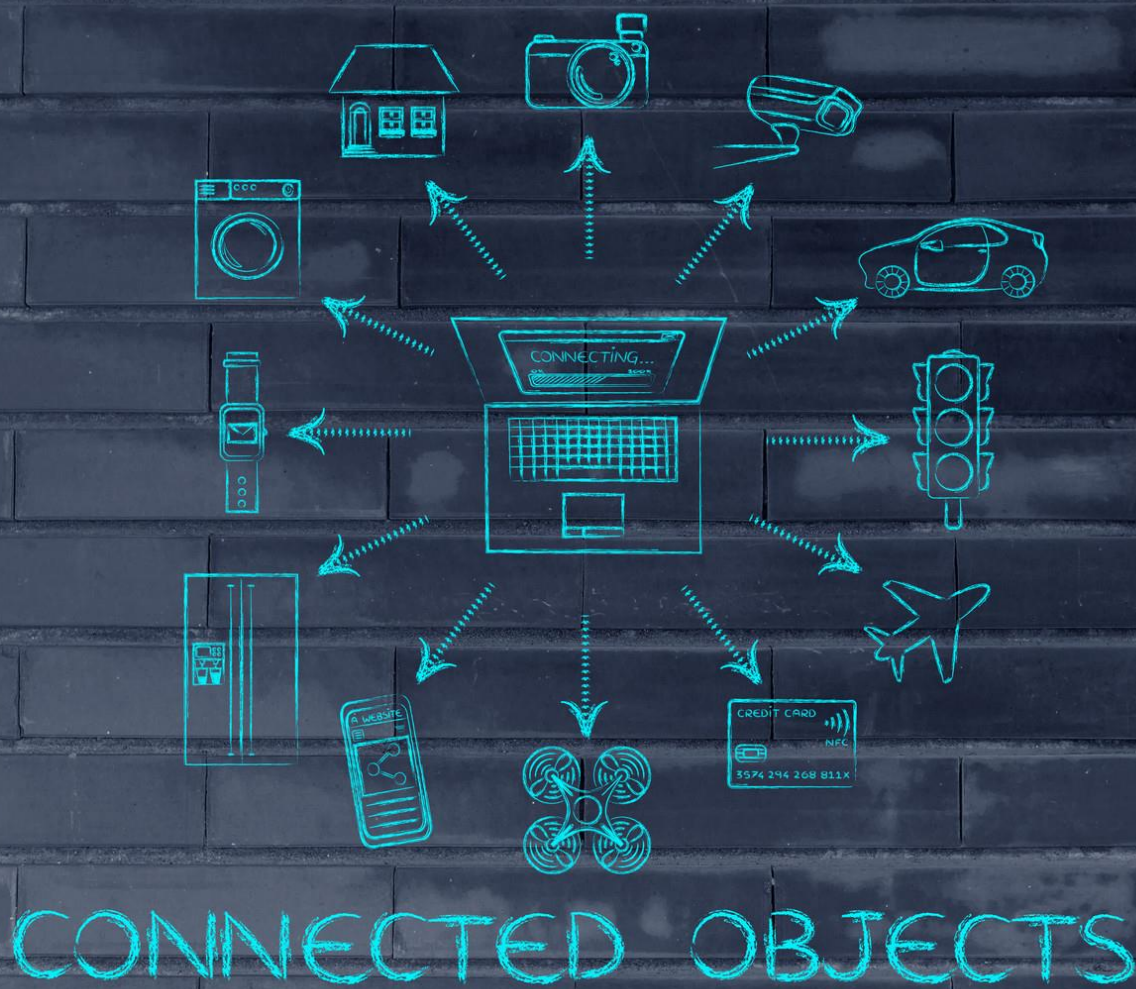
UNDERGROUND

Why Connected Infrastructure
Marking Is the Next Frontier



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Introduction

We are in the midst of a technological revolution that is changing the way we live, work and play. The Internet of Things (IoT) is digitally connecting people, places, and products. The impact of that change is realized everywhere—in our homes, businesses and public services.

By *2020* there will be *20 billion* connected things in use worldwide.

Many applications that are commonplace today did not even exist five years ago:

- ❖ **Consumer IoT:** Amazon's virtual assistant, Alexa, helped mix tens of thousands of cocktails over the 2017 holiday season, with the company reporting global sales of tens of millions of Alexa-enabled devices. In homes across the country, connected devices include washing machines, robotic vacuum cleaners, toys and even toasters.
- ❖ **Health Care IoT:** Continuous Glucose Monitors (CGMs) help diabetics check blood sugar levels 24/7 by connecting sensors in the body to a phone app. CGMs are just one of many examples of how connected health care is changing how we diagnose, monitor, and treat patients.
- ❖ **Industrial IoT:** Digital Twins—digital simulations of physical machinery and processes—anticipate product line issues without having to wait for the physical asset to fail. Digital representations, sensors that identify process outliers, and remote real-time monitoring that minimizes downtime are just a few of the IoT applications that have changed manufacturing.

The next frontier for IoT is infrastructure.

According to IDC's Worldwide Semiannual Internet of Things Spending Guide, transportation and utilities are expected to be among the top purchasers of IoT in the next five years. And one of the biggest beneficiaries of a connected infrastructure solution is the world of underground utility asset management.



Move over *Alexa*,
the Internet of
Things has gone
Underground.

“Out of Sight, Out of Mind” Is Not a Strategy

The fundamental challenges of marking and managing underground infrastructure—safety and cost—remain stubbornly difficult to fix despite decades of regulations and improvements. According to the 2016 Annual DIRT Report published by the Common Ground Alliance, an estimated 379,000 underground utilities were damaged in the US alone—a 20% increase over 2015. The report estimates the societal costs of these damages to be \$1.5 billion.

But this cost estimate is the merely the tip of the iceberg. The report cautions this is a minimum estimate based on routine costs for stakeholders directly connected to a damaged facility, and does not include costs such as property damage, evacuations, road closures, environmental impacts, lawsuits, injuries, and fatalities.



In *2016*, an estimated *379,000* *underground utilities* were damaged in the U.S. alone.



Safety and cost are always the critical drivers, but today's utility managers are demanding more from asset marking than warning signs and relocating. They want more data about the asset, faster data from the field, and better sharing of data across the organization. Regulators want to trace and track installation equipment and service. Asset managers want to know what products are buried at each location and the conditions of that location. Field supervisors want to know in real time when the installation was completed.

The causes of underground utility damages are well known. Maps are outdated or inadequate. Offline methods of relaying information from the field to the office are cumbersome and haphazard. Silos exist that prevent data from one department to be integrated with data from another, let alone allow data to be shared with the public, 811 Call Centers or other utilities.

We've endured inefficiencies and injury levels that need not be accepted. The old methods are not sufficient to address the basics of safety and cost, or the new demands of real-time information sharing. We need new approaches to protect underground assets and ensure public safety.



Connected Infrastructure Marking Is the Next Frontier

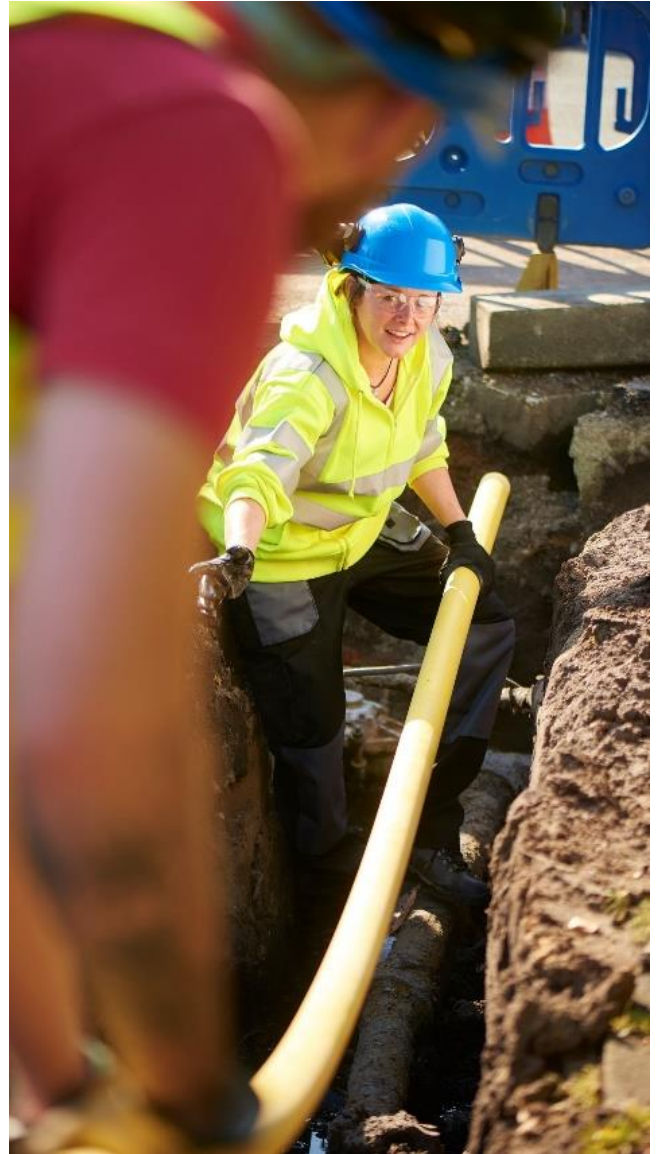
Decades-old paper maps, inaccurate data and other antiquated methods are being replaced by connected marking solutions that transform the way utilities and telecommunications companies locate and manage underground assets. Rapid advances in RFID, sensors, mobile apps, GIS, GPS, and cloud technologies have converged to spark the development of connected solutions that dramatically improve the speed and accuracy of underground infrastructure locating.

A connected infrastructure combines the virtual digital world with physical connected assets. What is underground becomes “visible” thanks to the expansive asset information—maps, videos, photos and text—that is accessible to field locators on their smart devices. What is underground becomes “verifiable” by the RFID or sensor-enabled physical marker that confirms the exact location and identity of the asset. This enhances the speed and safety of field locating.

Adding Connectivity to Underground Assets Is a Game Changer

Here's why:

- ❖ Better mapping accuracy and in-field verification reduces locating time, cost, and errors.
- ❖ Real-time field-to-cloud connectivity reduces transcription errors and speeds field-to-office data flow.
- ❖ Smart devices reduce onboarding time and equipment cost while allowing access to all critical asset data at the site—where it is needed.
- ❖ Digital field data can be shared from the cloud or integrated into GIS, ERP, and Workflow management systems—reducing silos and increasing cross-department data use and analysis.
- ❖ Connected data collection provides date, time, and user recording that enhances tracking and compliance efforts.



Connected solutions reduce or eliminate the major causes of accidental or delayed hits and in turn, reduce the injuries and costs that have plagued the industry since utilities were placed underground.

The Connected Infrastructure Future Is Here



Locate & Verify critical underground assets in as little as *5 minutes*.

Connected marking solutions give fiber broadband providers powerful new tools for precision locating and asset management.

Consider this scenario: A utility locator is contracted by the gas utility to locate and replace valves that have been identified for recall. The gas utility has already identified the valves by matching the valve serial number with the unique RFID tag location associated with that valve, and granted permission to the utility locator to access the mobile app and project map that contains the valves to be replaced.

The locator uses a smart phone and the mobile app to drive to the valve GPS coordinates on his map. He views the 360-degree video associated with that valve while listening to the original installer on the video say that the location of the valve is approximately 10 feet due north of the school crossing zone sign.

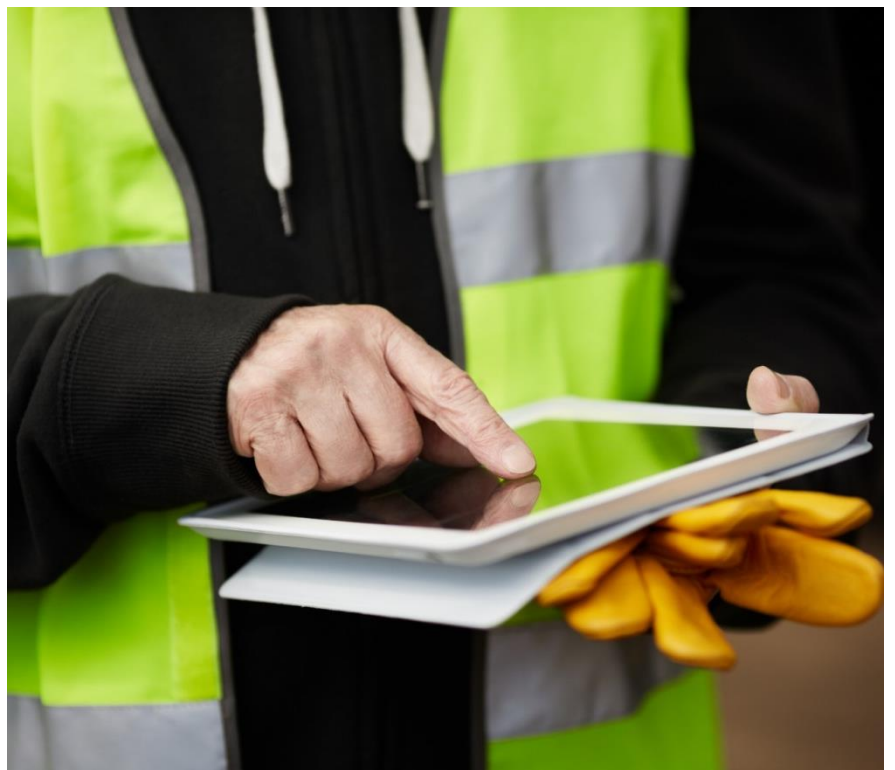
The locator believes that he is close to the spot of the valve, but also notes that there are multiple map points nearby that identify a fiber line crossing in the vicinity. After setting up safety cones, he uses a magnetic locator to identify the precise point in the road where a point is indicated. He uses his RFID reader that is blue-toothed to the app to verify that he has found the defective valve, and not a fiber turn that has been marked with a different RFID tag.

The entire locating process takes 5 minutes.

The recalled valve is uncovered and replaced with a new valve. The locator scans the bar code on the new valve, takes a picture of the new installation, and updates information to the RFID tag that is placed over the valve before the road is repaired with new concrete. The photo, bar code, RFID tag number, the locator's ID, RFID write time stamp, and other data are uploaded to the cloud. The utility field operations supervisor at his office checks his web application and notes that the replacement was completed 2 minutes ago. The locator is already on his way to the next defective valve location.

A process that used to take hours is now completed in a fraction of the time without paperwork and with **minimal public disruption.**

Utility locators can *view and update* asset data on their *iOS* or *Android* smart devices.





The Time to Act Is Now

Digitization and connected products are improving lives, business, and society in many different industries. The application of these technology advancements to underground infrastructure holds the same promise and is available today. Advances in connected locating technology, sensors, augmented reality, and digital visualization of the underground will continue to drive improvements in underground asset management.

The time to act is now. For the telecom industry, the unprecedented scope of fiber deployment to support our connected future presents a unique opportunity to adopt new technologies that will deliver exceptional benefits and ROI now and in the future.

About Berntsen International

Berntsen International Inc. is an innovation leader in infrastructure marking solutions designed for a connected world. Founded in 1972, Berntsen designs traditional and smart marking solutions for the utility, survey and construction industries. The company's high-quality product line of 1,000 markers can be found in more than 100 countries, including notable monuments at the summit of Mount McKinley, the Cape Hatteras Lighthouse, Walt Disney World, the London Underground, the Red Sea and Myanmar.

Berntsen's patented InfraMarker solution received the Geospatial World Excellence Award for Technology Innovation in 2017 and the RFID Journal Award for Best Use of RFID to Enhance a Product or Service. For more information on smart marking solutions, visit www.BerntsenInternational.com.

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