



HOW IoT CONNECTS SHIPPERS AND RAILROADS

Companies around the globe are adopting the IoT as a key way to compete. Freight railroads who use IoT technologies can provide rail shippers exactly what they're looking for.



The Internet of Things (IoT) is changing the world of manufacturing and production, so shippers of high-value or high-risk products — from automobiles and industrial equipment to food and other perishables — are looking for ways that the logistics industry can help. Railroads who understand how IoT can be used to make shipping faster, safer and more responsive to customer needs are in the best position to compete.

Increasingly, railroads are investigating and using IoT to enhance operations, improve customer service, and better meet the needs of shippers. But it wasn't always that way. According to a March 2016 article in *Progressive Railroading*: "When the internet entered the mainstream in the mid-1990s and the general public was well on its way to untangling the Web, North American railroads weren't exactly early adopters. But some of their customers were. At Procter & Gamble, brand manager Kevin Ashton put radio-frequency identification (RFID) tags on packages as they moved through the supply chain, and then linked them with the internet."

The practice of connecting devices, such as sensors, via wireless Internet communications (as opposed to machine-to-machine connections) is the essence of the Internet of Things. In a consumer environment, the IoT allows a homeowner to control a home thermostat and maybe even the coffee maker via smartphone. In a freight rail context, IoT technology can provide similar wireless communication — data aggregation and analysis — and much more. Railroads may have been slow to jump on the IoT bandwagon, but jump they must.

The essential tasks of today's IoT are not the consumer model of one-to-one control, or the early telematics applications of RFID. Today's Internet of Things is the collection of a vast amount of past and present data that can be used to influence or predict future events.

IoT is sensors, controls and other instrumentation automatically recording data; collecting and associating past and present data points within databases, *and* analyzing the resulting cloud of "big data" to extract actionable information.

Many companies have started using IoT technology to improve their own operational efficiencies. Others are learning to use the data to improve information sharing, decision making and customer service.

The IoT will encompass 50 billion connections (or "things") globally by 2020, according to a 2013 report by the data communications firm Cisco. In 2013, Cisco said the rate of adoption for IoT technology was already five times that of earlier global technology developments, like electricity and the telephone. Cisco also estimated that in less than 15 years, the IoT would provide \$27 billion in value to the rail industry alone, part of \$276 billion in value it would generate for five industrial sectors combined (oil & gas, power generation, healthcare, aviation and rail).



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FROM TELEMATICS TO IoT

All those connections are being made by railroads and rail shippers. Railroads started connecting early with use of telematics, a pre-Internet term for the convergence of telecommunications and information processing.

Telematics is an interdisciplinary field that encompasses telecommunications, vehicular technologies, road and rail transportation and safety, computer science and electrical engineering of sensors, instrumentation, and wireless communications.

Since the rise of the internet, the term “telematics” has evolved to refer more commonly to automation in automobiles, such as the invention of the emergency warning systems for vehicles. GPS navigation, integrated hands-free cell phones, wireless safety communications and automatic driving assistance systems all are covered under “automotive telematics.”

When it comes to railroad operations, telematics is delivering many of the same functions for rolling stock, while evolving to include IoT technologies. The practice of sending and receiving data via communication devices, in conjunction with controlling remote objects, remains.

BSM's Sentinel Fleet Management system, for example, can provide data for the maintenance of rail cars.

BSM's customizable Solar Tracking Units (STUs) are the sensor-plus-communications devices that monitor the condition of the cars.

The BSM solution can detect hot wheels before a wheel goes bad, allowing railroads to improve their operational efficiency and maintenance planning. In the case of short lines, the system can urge operators to transfer cars to Class I railroads before the Class I detects the problem and charges triple the price to fix it. The same goes for detection of hot bearings on wheels.

HOW BSM CONNECTS RAIL TO THE IoT

BSM's Sentinel Fleet Management system provides access to data for improved maintenance and operation of rail cars, as well as for real-time updates and alerts for rail shippers.

- **Customizable Solar Tracking Unit (STU)**

This customizable device can monitor the condition and location of railcar shipments. This includes tracking impacts, temperature, handbrake positions, hatch status, pressure, and other digital inputs. It also can monitor security cameras and provide real-time alerts via text or email.

- **GPS Rail Tracking Solution**

This system allows complete visibility of a train's real-time location, providing regular updates that can be programmed every 10 seconds to every 15 minutes. It also enables access to information provided by sensors on doors, pumps and other equipment, as well as the ability to recreate historical data, and run reports.

- **Hy-rail and Rail Equipment Solution**

This system allows Class I railroad lines to execute advanced telematics on their maintenance of way vehicles, track and signal service trucks, wheel changers, rotary dump trucks, and railroad cranes. This enables predictive maintenance schedules that can reduce equipment breakdown and downtime, and proactive management of asset lifecycles.

IoT: BEYOND INTERNAL OPERATIONS

In the same way that smartphones enable people to get a hold of each other anywhere at any time, the IoT can provide accessibility to shipping information to freight rail customers.

This takes the monitoring and tracking that may already be in use internally for individual cars or locomotives and adapts it for tracking and monitoring products inside the cars, no matter where they are. Coupled with scheduling information, weather reports, GPS and other data, railroads can produce the reports and real-time alerts that rail shippers want.

Other transportation service providers are already implementing IoT technologies to track products, baggage, and people. According to SITA's 2016 Airline Trends Survey, 71 percent of airlines are on target to provide real-time baggage status data to customers by 2020. This improves the reputation and public perception of the airline industry.

Meanwhile, Google Transit uses the IoT to integrate transit stops, routes, schedules, and fare planning from agency data around the world into Google Maps, so users can immediately find all the travel data they need in one place.

Integration of data across systems via the Internet is also providing better service. The airline industry, for example, envisions being able to integrate flight delay information or passenger/baggage transfers between planes.

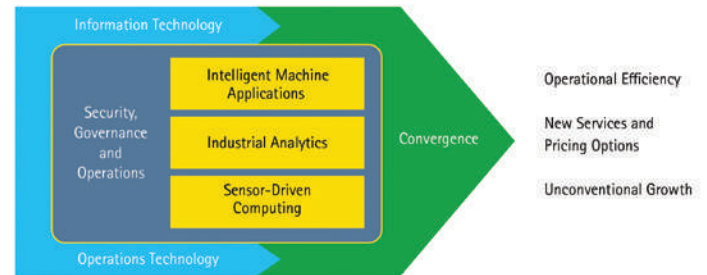
In Europe, the European Train Control System (ETCS), a combination of Positive Train Control (PTC) and Automatic Warning System (AWS), has been in place in some countries for more than a decade. It allows for interoperability across signalling, control and train protection systems, and was originally designed for high-speed rail lines but has since been applied to all railroads. Currently, Europe is working to implement ETCS across the continent. European railroads are also using the Internet to track passengers and as their baggage.

This kind of information transparency that IoT technology can offer allows for quicker detection of problems, faster resolution, and greater trust between customers and service providers. It also offers a path for North American railroads to grow, by using the IoT in a new ways.

The consulting firm Accenture delineated some of these new ways in a 2014 report called, "Driving Unconventional Growth through the Industrial Internet of Things" (The IloT is a term for the "industrial" use of IoT technologies that commonly encompasses heavy industries such as rail, automobiles, industrial machines, hard-goods manufacturing, power generation, and more.)

In the report, Accenture analysts say, "The Industrial Internet of Things has been heralded primarily as a way to improve operational efficiency. But in today's environment, companies can also benefit greatly by seeing it as a tool for finding growth in unexpected opportunities."

THREE IoT CAPABILITIES RAILROADS SHOULD MASTER



By deploying these capabilities, companies can weave together previously unavailable, or inaccessible, enterprise and machine-generated data to create new monetization opportunities. Source: Accenture, 2014

According to Accenture, "Innovation is critical to developing and delivering differentiated new product/service hybrids that drive growth. To reap the full benefits of the IloT, companies will need to excel at exploiting three technology capabilities: sensor-driven computing, industrial analytics and intelligent machine applications. By deploying these capabilities, companies can weave together previously unavailable, or inaccessible, enterprise and machine-generated data to create new monetization opportunities."

IoT BENEFITS FOR RAIL SHIPPERS

Now that we have some sense of what railroads can do with IoT technology, how does it help them to better serve their customers? What do rail shippers want?

According to the Accenture report, “Manufacturing, energy and other industrial executives tell Accenture that new services, competitors and ways of operating their businesses will transform their industries. Asset owners and operators will spend on these digital services to help them increase their production and efficiency. They will also invest in their own novel solutions to improve the performance of existing assets and processes, as well as [to enable] collaboration across the supply chain—whether the business is chemicals, mining, energy or agriculture. Digital services—offerings that combine information, transactional and professional services—will lie at the heart of these shifts.”

When manufacturers become shippers, they are looking for logistics partners who can deliver the best value at the lowest cost. The value calculation increasingly includes digital services encompassing more information and faster, often instantaneous, communications. Rail shippers want to know:

- Where are my products?
- How long will they take to get to their destination?
- When and why are there delays?
- What conditions are my products subject to?
- In what condition will my product arrive?

The key is utilizing IoT technology to make rail service safer, faster and more cost effective, while providing customers with valued information at frequent intervals.


Customers can impose fines on railroads when their products suffer damage or when shipments are severely delayed.

With IoT, operating conditions, such as severe weather events, can be noted as they happen and stored, or continually monitored and analyzed to predict outcomes — and, in some cases, prevent them.

If a manufacturer is shipping high-value goods like transformers, the customer wants to know those transformers are not subject to harsh conditions in transit. IoT technology can provide real-time train acceleration information and car impact detection through a variety of tracking devices.



The key is making rail service safer, faster, and more cost effective. Customers can know the location of their products, and how they are being transported and handled in real-time.



BSM's customizable STUs are solar-powered, so replacing batteries or recharging the units is not necessary. With impact detection on rail cars, it's much easier to determine whether or not a product actually is jostled during shipping.

IoT technology can also address a shippers' high-risk transports, such as the shipment of foodstuffs requiring temperature control. Asset tracking technology can provide temperature sensing, reporting on the temperature of the cargo as it travels from Point A to Point B. It can also offer tamper alerts, providing customers with protection from theft and peace of mind.

IoT IN ACTION: XCEL ENERGY

Xcel Energy provides power to millions of homes and businesses in eight Western and Midwestern states. Much of that energy (43 percent) is supplied by coal, which they ship from coal mines in Wyoming to power plants in southern Colorado. Xcel uses BSM's solar-powered tracking units (STUs) on their coal car consists. Those units provide Xcel with a range of critical data.

- **Geofence Alerts:** Provide power plant personnel an alert by text or email when a train is close to arrival so that plant personnel can make preparations; the same alerts go to mine personnel when trains are approaching the coal mines for loading.
- **Dispatch Map:** Offers locations and status of trains in real time with updates every 10 minutes so that scheduling personnel know exactly where trains are as they work with railroad dispatchers; information includes not only train locations but speed, stops, and length of stops.
- **Daily Progress Reports:** Allows the customer to query the system for a summary of what the progress of each train has been over any given period of time, both in terms of miles traveled as well as time moving, and offers a picture of where delays have occurred and for how long.
- **Mileage Between PMs:** Keeps track of the mileage on each train, which is zeroed out each time the train set goes in for preventive maintenance (PM), thus showing mileage between PMs and allowing for prioritization of PM scheduling based on accumulated miles.
- **Current Weather Conditions:** Tracks current weather conditions each train is experiencing along its route and sets up alerts if conditions deteriorate to a particular level of interest, thus providing for better planning of railcar and coal freezing conditioning as cold weather approaches or preparing for delays resulting from high wind conditions.

GROWING THE MARKET

Despite the fact that freight rail volume in 2014 was twice what it was in 1980, volume is down today and railroads are looking for new customers. Their biggest competition for land transport business is trucks, and by some measures rail comes out ahead:

- Freight rail shipping is more efficient than shipping by truck; a single train can carry the load of 280 trucks.
- On average, trains are four times more fuel efficient than trucks and that figure is improving. According to a 2015 white paper from the Congressional Budget Office, "Pricing Freight Transport to Account for External Costs," average shipping rates by truck on a cents-per-ton-mile basis for a typical carload are three times higher than shipping rates for rail.

But by other measures, rail is missing chances to compete by boosting its service commitments. With the help of the IoT, rail can grow market share by using technology to provide the delivery commitments and flexibility that trucks can offer, while also reducing empty car loads.

As Cisco, Accenture and others watch the evolution of the Internet of Things, they see opportunities for rail in the realm of digital services enabled by IoT technology. According to Accenture, "Every business is a digital business," and the "digital-physical blur" is turning industrial companies into customer-service companies.

Shippers around the globe are adopting IoT technology, and they are asking their logistics partners to be digital businesses as well. For the rail industry, IoT will become an integral part of remaining competitive in the years and decades to come. It is going to become a key way shippers differentiate themselves, and should be the way freight railroads differentiate rail service.

BSM Technologies can help railroads get there. BSM can help railroads go beyond data collection and into the mining and analysis of data, to realize a return on investment. Opportunities can be found with impact detection, refrigeration monitoring and fraud detection.

By utilizing the predictive analytics which IoT technology can enable, it's possible for railroads to find ways to keep rail cars full, and to significantly reduce or eliminate dead heading. Shipping from Point A to Point B and then dead heading back? The IoT can help railroads identify potential shippers at Point B who need to get products to Point A. Reports, real-time alerts and other IoT innovations can enhance existing customer service, and reveal new service businesses.

With BSM Technologies and the Internet of Things, railroads can meet needs of shippers, and grow their business in the process.





LEARN MORE ABOUT THE IoT FOR RAIL

To learn more about using the IoT to grow market share, build profits, and better meet customer needs, contact BSM at info@bsmtechnologies.com or 866-768-4771 ext 4. Or visit <http://www.bsmwirelessbsmtechnologies.com>

About BSM Technologies: BSM Technologies Inc., through its subsidiaries, is a global top 20 commercial fleet telematics provider for automatic vehicle location solutions that improve efficiency, accountability and reduce costs for fleet operators. BSM's end-to-end solutions automate record keeping and regulatory compliance, reduce fuel burn and idling, mitigate risk, and keep drivers safe. BSM provides solutions for commercial and government units who manage and operate diverse assets and large fleets that utilize its integrated fleet tracking, fleet maintenance, and intelligent business engine which provides real time web-based tracking of mobile and fixed assets.