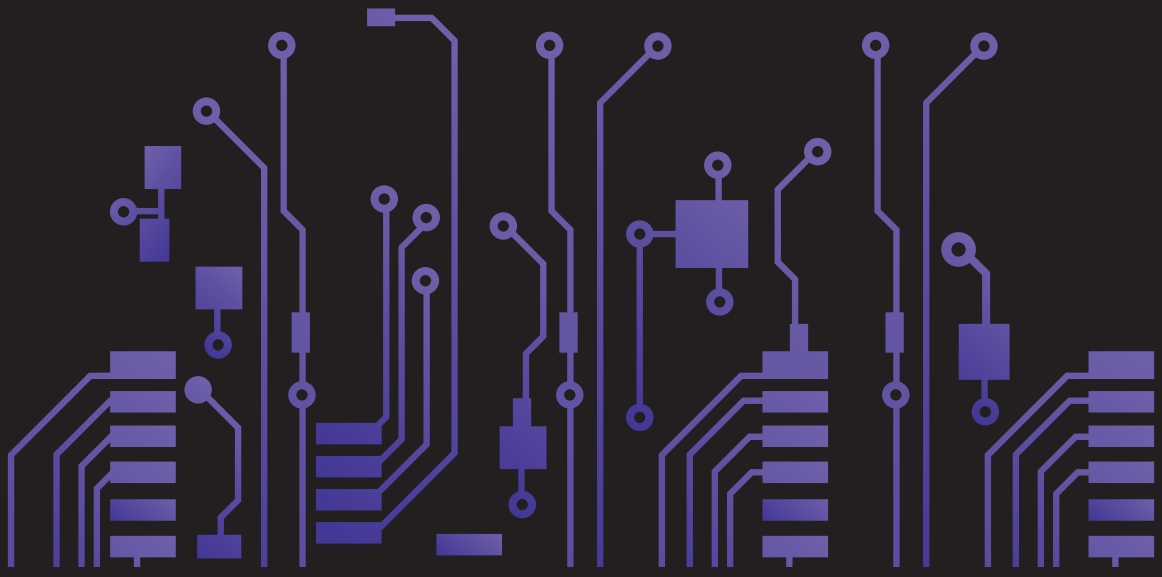
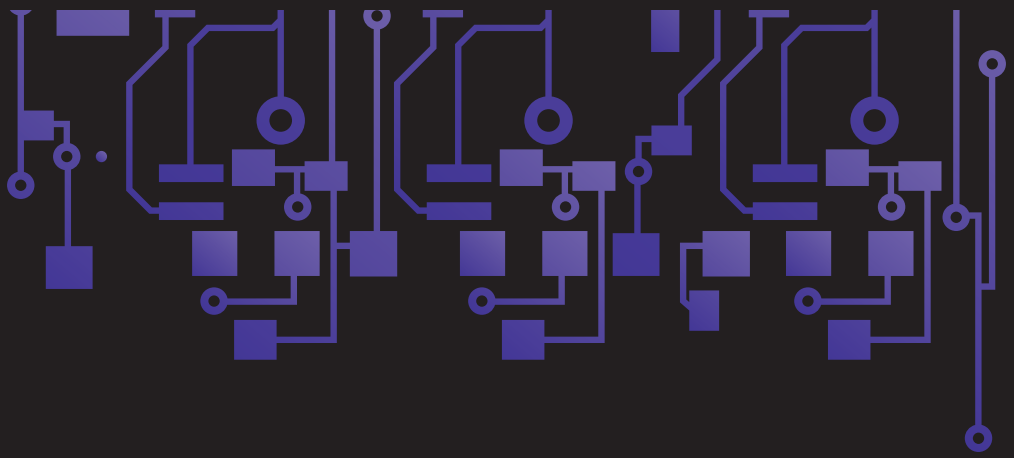


Evolution of M2M



Aeris COMMUNICATIONS

Introduction

The ideas of Machine-to-Machine ("M2M") communications and the Internet of Things ("IoT") have reached a new level of buzz across industries and may seem to be new concepts.

In reality, M2M has been around for longer than most people realize.

Infancy...Even for Technological Revolutions

Although not labeled "M2M", data communications from "machines" has been around nearly as long as telecommunications. It predates personal computing – let alone the Internet – by many years. For example, the need to remotely measure power distribution and weather lead to the birth of "telemetry." Most people agree that the first such telemetry system was rolled out in Chicago in 1912, using telephone lines to monitor data from power plants.

Telemetry expanded to weather monitoring in the 1930s, when a radio transmitter device, known as a radiosonde, became widely used to transmit weather conditions from high-altitude balloons. Although much more advanced today, weather radiosondes are still widely used, with more than 800 registered launch sites around the world.

Whether used for monitoring power generation, weather, or environmental conditions, early telemetry had its limitations. The data communications were usually one-way – delivering data from remote sensors, but not providing any return link to control the transmitters and devices.

In 1957, the Soviet Union launched Sputnik, and we entered the modern space age. What is less well known, although more transformational, was the emergence of aerospace telemetry that now underpins the enormous global satellite communications systems.

The same use of remote wireless telemetry – for data gathering as well as remote control – has spread across a variety of commercial industries: from factory automation to pipeline monitoring to fleet management and transportation.

Early Growth

Broad adoption of M2M technology began in the 1980s with wired connections for SCADA (an acronym for "supervisory control and data acquisition") systems deployed in factories, and in business and residential security systems. On factory floors, pre-wired data acquisition systems became common. In security installations, alarm panels used telephone circuits to communicate events – burglary or fire – to monitoring stations.

The 1990s saw a move towards using wireless radio technologies, outside the domains of remote data telemetry. Ademco Corporation, a leader in intrusion and fire detection systems, began to build out a private radio network to address this need. In 1995, Siemens introduced the first cellular radio module for data transmission applications. Very shortly afterwards, Aeris introduced their MicroBurst® data services using the control channels of the Analog AMPS cellular system, and Ademco became the first major customer to deploy units using this transport.

Mobile applications also began to take off, with the introduction of consumer automotive applications such as OnStar in 1995, and fleet and container tracking solutions for the trucking and railroad transportation industries.

1912

Commonwealth Edison completes a system of telemetry to monitor electrical loads on its power grid in Chicago.

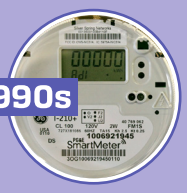
1930

Weather balloon in space measures temperature, barometric pressure and humidity, sending data back to earth by converting it to wireless Morse code and transmitting via a radio signal.

1957

Aerospace telemetry for rockets and satellites begins on the Soviet satellite Sputnik.

1990s



First "smart meters" can store data about how electricity is used at different times of the day.

1995

Siemens introduces first cellular module for machine communications; fleet operations among the first to adopt.

Of course, what makes M2M feel relatively new compared to its long history is the fact that the acronym wasn't used to describe this collection of applications as a group until after the year 2000.

During this early growth era, M2M applications were generally purpose-built – every industry and every company developed their own devices and software systems from scratch, using cellular radio modules provided by a few companies. Some companies provided complete devices, configurable for a variety of mobile applications, but the higher cost of these devices made it difficult to deploy in large volumes.

Transition to Digital Cellular

In 2003, the cellular industry asked for and received permission to stop analog AMPS service. The Federal Communications Commission ("FCC") set a five-year sunset, with a date of February 18, 2008 when carriers could turn off their AMPS networks. Most M2M application devices up to that point had been AMPS units because of the relatively high cost of digital cellular radios, and were thus required to transition to digital.

Of course, digital cellular also introduced new, more capable, data transports – such as Short Message Service ("SMS") and packet radio services. However, there were two competing flavors of digital cellular: CDMA and GSM. The selection of the technology had long-term implications. The automotive and trucking industries chose to deploy CDMA devices, although the cost of the radios in these units was higher. But CDMA was expected to have a longer technology life – given its better spectrum efficiency – and GSM coverage in the United States did not match the available CDMA coverage.

The alarm and security industry chose 2G GSM GPRS due to the substantially lower cost of radios – resulting from simpler GSM technology radio chipsets, and the scaling from larger global GSM service deployments. This has had an important repercussion, however, since that industry is now facing another sunset at the end of December 2016, when AT&T will turn off their 2G GSM GPRS network.

State of M2M Today

More and more vertical markets continue to embrace the promise of M2M for their products and services. For example, the health industry has realized that there may be significant benefits in using M2M solutions for patient remote monitoring, even though stringent medical industry requirements are often difficult or time-consuming to deal with.

New wireless data technologies continue to be vital for this growth. Short-range data transports, such as Zigbee and 6LowPAN – are augmenting long-range transports, such as cellular, for large volume unit deployments. The cost of cellular is prohibitive for large-scale proliferation of small sensor applications directly, but hybrid multi-transport technologies, hold significant promise to achieve the predicted growth in the number of M2M devices.

The growth in the amount data that is gathered is leading to new analysis tools, usually cloud-based, to extract the information buried in the data. Indeed, correlating the data from one M2M application, to the data from another application, can lead to new information that can be more valuable than the individual, separate data.

Where are the Difficulties and How Can We Minimize Them?

Today's M2M remains complex and fragmented, even as the industry continues to grow rapidly. Building an M2M application requires selection from a multitude of vendors for cellular radios, software, connectivity, and middleware – and consideration of issues such as security and scaling for volume remain important.

The decision to deploy an M2M application cannot be undertaken lightly – it is usually driven by a need to reduce operating cost or increase revenue, or to add features that consumers expect from high-tech today. Occasionally, legislation (for example, in the power utility industry) requires companies to deploy M2M applications that support the legislation's data needs.

Mobility is an obvious factor driving cellular adoption in markets like transportation. And, the evolution of cellular technology is creating new opportunities as hardware and service costs continue to drop. However, this can come at a significant cost. Wireless spectrum is expensive and must be used as spectrally efficiently as possible – this makes a migration from 2G technologies to 3G, and even 4G, in existing spectrum, a paramount driver for cellular companies.

Unfortunately, since M2M cellular devices must remain deployed for many years, without failure or requiring a "touch," the shut-down of services – such as AT&T's decision to remove 2G GSM/GPRS in a few years – has a serious impact on deployed units. People deploying new M2M application must plan for technology changes by providing simpler upgrade paths – such as cellular radios mounted on sleds and devices whose firmware is fully capable of remote update.

The entire value chain of development and deployment, and life-cycle of the M2M application is important. As people learned from the AMPS sunset (and will experience at the 2G GSM sunset), the need to manage the end-of-life of an application, and development processes for product replacement, is critical for any M2M application deployment.

What's Next ... Explosive Growth!

In our world today, handsets and smartphones are common and ubiquitous – most of us do not even remember how we did without them! This technology has had a profound impact on our daily lives.

In the same way, M2M applications will

become pervasive in our every-day world – yet, most people will receive the benefits of this rapid growth without realizing that it is occurring. Companies are recognizing that the data acquired by many remote M2M devices are a valuable source of information for new capabilities and features that will benefit everybody.

Aeris is expecting and planning for this growth. Our products and services are borne out of a deep knowledge of the M2M market, and are the result of our single-minded focus on M2M. In the mid-1990's, Aeris created and deployed an optimized cellular network for M2M applications in North America, and is now adding new technologies and cloud-based data analysis systems that will scale to billions of devices and enable customers to deploy these applications rapidly and cost-effectively. We can rightfully claim to be the most flexible and reliable carrier because our approach is to use standards where possible and to interoperate seamlessly with products from other vendors.

Aeris is exclusively focused on the M2M market – as an operator delivering end-to-end M2M services (from connectivity to application enablement), and as a technology provider enabling other operators to deliver profitable M2M services. Our customers are market leaders, and are among the most demanding users of M2M services today.

Aeris knows M2M better than anyone else and as the M2M market matures, adopters are realizing value beyond what they initially expected. The availability of tools to combine data and information from M2M devices across industries and across differing applications can lead to new solutions of greater benefit. Indeed, "M2M" has morphed into a new phrase "Internet of Things" and this has captured the imagination of a new group of developers, adopters and customers, who will expand this market.

Amazing predictions for M2M device growth abound. In 2011, Ericsson predicted 50 billion connected devices by 2020. Machina Research proposed a more conservative number of 12 billion, and there are similar huge numbers predicted by other experts in the field.

Regardless of who proves to be the most accurate, one fact is clear: the number of connected devices, and the benefits from the data they gather, will be enormous.

More importantly, the predicted explosive device growth will generate similar growth in data, more efficiently and effectively than ever before. Our ability to process this deluge of data is vital, to ensure that the important and critical nuggets of data are meaningfully extracted and used for decisions and operations that drive society as a whole.

It is an amazing and bright future.