



# Tech Insight: Machine-to-Machine Communications

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You may recall a time in the 1990’s when machine-to-machine (M2M) communications technology was first adopted in manufacturing and industrial settings. M2M communications enabled a sensor or meter to record data from machines, such as vending machines, and transmit the data over telephone lines, without human intervention. Today, M2M applications are well established in the global healthcare arena, with the technology considered the foundation for the [Internet of Things](#) (IoT). This Tech Insight presents an overview of M2M, the advantages and challenges of its uses, and how the Department of Veterans Affairs (VA) currently benefits from implementing M2M.

## Overview

M2M is the connection of billions of technological devices and machines that are connected to the internet and to each other. In order to create an [intelligent network](#) of “things” or systems, the devices and machines integrate the computing capabilities that allow them to gather and transmit data to other connected devices for monitoring. In other words, machine automation can collect, process, and deliver data from remote or inaccessible points, without the need for human intervention.

The process by which machines communicate remotely with each other for the purpose of measurement is called [telemetry](#). The word is derived from the Greek root for remote, *tele*, and *metron*, measure. Telemetry is the language used when machines “communicate” with one another with sensors that gather and deliver data to a central point for analysis. An emerging concept, however, takes telemetry to another level by applying modern network technology. Wireless sensors, the Internet, and personal computers are now common technologies that are



integrated to create M2M communications. In many ways, telemetry, was the precursor of the more advanced M2M communication system currently employed.

Today, M2M communications can be used to more competently monitor the state of important components of public infrastructure, such as water treatment facilities, with less human intervention. M2M can assist businesses in maintaining inventory, and aid scientists in conducting research. As the technology improves, there will be more potential for common applications in business and government.

The function of an M2M communications system is a [step-by-step process](#). In M2M communications, a remote sensor captures data and delivers it wirelessly to a network, where it is then routed, often through the Internet, to a server, such as a personal computer. According to the software in place, in that instance, the data is processed and analyzed.

### **Benefits of M2M**

M2M communications has showcased immense improvements in recent years. Remote sensor technology advancements offer increased sensitivity and accuracy. Computer software analysis also functions at a faster pace. An increase in public wireless networks has opened M2M communications to many more industries.

Other advantages of M2M communications include:

- Support by cellular networks either directly or through a gateway
- Availability with fixed and mobile networks, both indoors and outdoors
- Higher range and minimum latency, while consuming less energy
- Allowing communication of smart devices, without human intervention
- Solving security and privacy issues in IoT networks by using M2M communication facility
- Enabling large protection, data collection, and processing

In many instances, M2M can be connected to a return on investment (ROI). According to Senior Analyst Rodney Gedda of Telsyte, a media company, M2M helps deliver stronger business intelligence, which drives customer engagement, cost saving, business process efficiencies, innovation, and potential new revenue streams. Gedda states, "If a machine or device can report back that it has broken down or that it needs refilling, then that saves, for example, a field-force employee driving around checking in on things. Due to the [improved visibility](#), they only need to go where the attention is needed. That has a hard ROI<sup>1</sup> for operations."<sup>2</sup> The

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<sup>1</sup> ROI is a profitability ratio that can be calculated for an overall organization by looking at gains and expenses cumulatively, or on a per investment/initiative/project basis. *Hard* ROI refers to direct measurements that tend to be easy to quantify and can contribute to an organization's success, such as higher website traffic; as opposed to *soft* ROI, which is indirect and more difficult to quantify, such as improved brand reputation.

<sup>2</sup> <https://www.zdnet.com/article/the-business-benefits-of-machine-to-machine/>

outcome is that M2M can help create the image that the service supplier is actively committed in the customer relationship.

### Examples of M2M

M2M communications technology is ubiquitous. It is in our homes, on our commute to work, and in how we shop, exercise, and entertain ourselves. The most common examples of M2M include:

- **Commuting:** If a train is cancelled due to inclement weather, a smart alarm clock would be able to determine the extra time needed to take a different route.
- **Smart homes:** When the temperature of a room falls below a certain mark, a connected thermostat can automatically turn the heat on.
- **Health and fitness:** Wearable devices, such as [Fitbit](#), can track the number of steps, monitor the heartbeat, and count calories.
- **Product development:** A connected product could deliver information about its state of repair, and how it responds to consistent usage.
- **Smart asset tracking:** Embedded sensors and GPS capabilities keep track of assets.
- **Connected buildings:** Reduction of energy use can be determined without affecting a building's tenants by smart buildings capturing information about which parts of the building are most occupied.
- **Adaptive traffic management:** Connected cars can sense their location on the road, aware of the proximity to other cars and obstacles, and even share data about open parking spaces and other vehicles and traffic management teams.

Other ways humans use M2M technology include shopping, predictive maintenance, and connected weather insights.

Furthermore, utility businesses use M2M communications both in collecting energy products (oil and gas) and in billing customers. In the field, remote sensors can distinguish crucial parameters at an oil drill site. The sensors deliver information wirelessly to a computer with specific points about pressure, flow rates, temperature, and fuel levels in on-site equipment. The computer can automatically customize on-site equipment to maximize productivity.

### M2M at VA

At VA, application programming interfaces (APIs) are used to facilitate information sharing across different systems. Additionally, there are existing systems that provide middleware. The middleware is used to support communication among systems. This system makes up a product line known as Trusted Information Sharing (TIS) and falls under M2M communications, since systems are exchanging data with other systems. For more information about APIs, access the following Enterprise Design Patterns: [Documenting API Security](#), [API Documentation Standard](#), [API Release Standard](#), and [API Management](#).

Data Access Services (DAS) is a system of middleware applications that is responsible for the transport of Veteran health benefits or other administrative data between consumers and producers. It is a system in the VA Systems Inventory (VASI) which is the [authoritative source](#) for VA information technology (IT) systems. It defines the objectives, principles, roles, and responsibilities for the utilization, management, and sustainment of VASI. At VA, DAS provides a common access mechanism for Veteran electronic record information that is stored internally and externally.

Additionally, a [key system enabling M2M](#) is the Digital Veterans Platform (DVP). The DVP enables secure, seamless interoperability between VA and commercial applications, enabling advanced analytics to deliver a cohesive Veteran-centered experience, both inside and outside VA. The proposed architecture contains five strategic, integrated components: one Electronic Health Record (EHR); one Operation Management Platform, consisting of one resource, financial, supply chain, and human resource system that is integrated seamlessly with the EHR; one Customer Relationship Management System; one analytics system; and one API Gateway Environment, to be created and maintained in the GovCloud environment.

## Conclusion

M2M communications technology has many applications to improve productivity for industry and government. With improved sensors, wireless networks, and increased computing capability, deploying an M2M makes sense for many sectors. Ideally, M2M communications allows for instantaneous, secured, and ubiquitous access to the internet; that is, at any place, at any speed, and at any given time.

There is a bright future for M2M communication systems. It is an adaptable technology that uses common equipment for new and improved functions. Present day organizations, engineers, scientists, health professionals, and many others are discovering new ways to utilize this emerging communications tool to improve services to their customers and our nation's Veterans.

For more information on M2M communications, read the [Identity and Access Management \(IAM\) OAuth 2.0 Security Primer](#) Enterprise Design Pattern (EDP) and the Tech Insight on [Machine Learning](#). To learn more about other new technologies surfacing across VA, visit our [Tech Insight](#) page.

## The Tech Insight Series

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