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Application Infrastructure

**M2M**

There are only two major pieces that make up machine-to-machine application infrastructure, but like most things in this young and complex market, lots of different combinations can get the job done.

First, there's software that operates near where the machine is actually networked, either on the machine itself or at a collection point. That software is usually called a gateway, and sometimes it's also called firmware.

Second, there's software that runs on the back end, after data comes off the network, that decides what needs to be done based on what the machine is telling it. This "logic layer" is usually called middleware, and it's the brains behind M2M. With the gateway deciding what data to send out from the machine, and the middleware deciding what to do about it, M2M is transformed from a flow of raw machine data into information that has the power to transform the way companies do business.

For a company to use information from its physical assets, data needs to travel from a machine over a network, through a middleware platform and to a software application. Application infrastructure providers orchestrate that flow of data and execute the business rules associated with it.

#### 1. Hardware

First, machine data needs a way to get from the sensor to a communications network, and the way it does that is through M2M hardware, specifically an external modem or embedded module. Other types of external hardware include terminals, device servers, and I/O (input/output) systems, which are described in detail in previous sections in this Source Book.

#### 2. Gateway

Infrastructure is the brains behind M2M, and those brains exist both at the front end and the back end of the application. When data leaves a machine, its first destination is usually a gateway: software that manages the way communication occurs. It figures out the way data needs to be sent, such as what protocol to speak, what format to send (SMS, XML, etc.), and can also convert protocols from legacy systems at the device.

The gateway usually takes the form of a "box" supplied by the application infrastructure provider, and it can take data feeds either from a single device or from several located in proximity. The gateway can also exist within the machine itself; in this case, it's usually embedded as firmware on a communication module.

Many intelligent devices already have software interfaces, which means in order for the gateway to get access to the data it needs to tap the

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device's API (application programming interface). That often requires a cooperative effort between the customer, the device manufacturer, and the application infrastructure provider to open up that API and incorporate the data into an M2M application.

One might ask why the gateway needs any intelligence at all—why not just pass the data through and let the middleware and software application apply all the logic? As a general rule, the smarter the gateway, the less data you need to send over a network.

With embedded intelligence, the gateway can determine if a machine is operating outside of set parameters, and can send data only when it fits the criteria set by the end user. In the case of wireless connectivity, this approach saves money because less data needs to be sent out. Also, by distributing logic across the value chain, data can be accessed at multiple points, including at the device itself for configuration and maintenance.

### 3. Network

For application infrastructure providers that offer network connectivity to their customers, there's a lot more involved than just reselling the service. A handful of M2M infrastructure providers take on the role of MVNO (mobile virtual network operator), and in the process are redefining that space. Those companies—including IBM, nPhase, and SensorLogic—can provide data security, protocol conversion, and dynamic Internet protocol address resolution.

### 4. Middleware

If there's one piece of the puzzle that best represents M2M application infrastructure, it's the middleware, which acts as an application server routing data where it needs to go, converting protocols so systems can communicate, integrating machine data to enterprise software applications, and applying business logic defined by the end user.

This layer of the value chain is called by a few different names in the industry, and perhaps the most common is gateway. For the generic value chain described in this article, we've put the gateway and middleware where they are to emphasize the different stages of intelligence applied in the data flow. Other terms used to refer to the infrastructure components include telemetry server, object-access server, data-management software, application architecture, and service agent, among others.

### 5. Presentation

Machine data is either integrated into a legacy enterprise software application or applied through a standalone application designed specifically to handle the M2M data. Infrastructure providers focus on the middleware and not the application code, but there are some who offer presentation as well.

In the standard model, data is integrated into billing, inventory, workforce management, asset management, and other systems directly impacted by the assets being networked. In other cases, business-intelligence engines analyze the data and present it to the user in a dashboard.

Data presentation and analysis might not be the first thing most people think of when it comes to machine-to-machine. Traditionally, M2M has been known for its ability to automate manual processes not its ability to improve data presentations and analysis. Yet for many companies considering deployment, asset intelligence in the form of dashboards and other reporting tools can deliver significant business value that not so long ago was well beyond their grasp.

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