Smart Things Require Smart Connections—Using Middleware to Make the IoT Work

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We all know that devices are getting smarter. In fact, the computing power of your smartphone rivals NASA systems of the ’60s and military supercomputers of the 90’s[1]. But, where does the real power of the Internet of Things lie and how can the capabilities of all the smart “things” be maximized?
Field level devices, previously single purposed and one-way, are now able to collect, send and receive data that, in turn, can become actionable information for other devices. For example, in the oil and gas industry, a complex network of temperature, pressure and flow sensors embedded in devices sends data in real-time to centralized data centers often thousands of miles away. There, the data is aggregated, analyzed and formatted for use in control centers where engineers monitor and observe activity in the “smart oil field” and take action, if needed. By automating the process rather than manually checking every well and facility, smart oil fields have increased operational efficiency for oil companies. Additionally, the “smart” sensors have enabled energy exploration in remote and previously inaccessible areas. And, the data the sensors have produced has allowed energy companies to make better – and more profitable – decisions.

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Smart sensors, fast network, big data, smart oil fields. Sounds straightforward, right? But, with so much data, so many types of sensors, so many different protocols and different communications needs, getting the data to the right place, securely and in real-time makes the difference in a successful Internet of Things implementation.
Middleware plays a big role in that success, maximizing information flow and making it possible for multi-layered communication to be sent, processed and received. Being able to manage edge devices without having to create a separate communication network, and maintaining security while doing so, is possible with the right technology. So, what’s needed to make that happen?

**Pushing Data Processing to the Edge**

Enterprise integration within and beyond the data center begins with an **enterprise service bus (ESB)**. With support for multiple protocols such as MQTT, XMPP, JMS, etc., an ESB can drive data transformation, handling the large volumes of data being generated at the edge of the network, and processing summary data to send back to the data center for deep analysis.

**Data transport middleware** enables real-time messaging to integrate applications, endpoints and devices. It’s important that the messaging platform also makes it both easy and safe for enterprise applications to exchange information and, at the device tier, to be contained in a small footprint.

**Business rules middleware** determines the triggers for field level information analysis, prompting action based on pre-defined parameters. In conjunction with **real-time data caching middleware**, summary data is culled, sending streamlined data and avoiding sending extraneous device information to the datacenter.
Three-Tier Architecture

For enterprise IoT implementations, we recommend a three-tier architecture to successfully manage the information lifecycle in the IoT. It’s at the control tier where the middleware described above is maximized, allowing tactical data processing and analysis to occur and action to be taken quickly. The functions that the control tier performs differ by use case, but its job is to bring the disparate systems together, and make the information lifecycle flow. The functions performed might include: managing connectivity, handling data transport, performing security measures, providing disaster recovery, controlling processes, executing business rules and pre-processing data. The addition of a control tier yields real benefits. Since less data travels to the data center, transmission costs are reduced. Because actions occur as close as possible to the edge, decision time horizons are narrowed. The control tier helps enterprises go from data to decision faster – and saves money along the way.

Enabling Business Transformation

The IoT information lifecycle can lead to transformed, efficient business processes, the innovation of intelligent, self-aware and customized product solutions and better customer experiences. Many customers have discovered new revenue streams, brought products to market faster and garnered higher profit margins. So, what’s the best path for getting your transformation started? My advice is simple: focus on one core business area to improve, collaborate on what you need to create an automated, sustainable solution and then, dig in. You’ll be surprised where the IoT journey will take you.

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