Adding intelligence to a transducer makes your sensor smarter

Many sensor applications are going beyond simply filtering and amplifying a transducer signal. By adding analog-to-digital converters, digital computational logic, wireless communications and networking interfaces, sensors are rapidly becoming computational devices. Yet, not every application needs this functionality.

This is where the mixed-signal ASIC can help you, by portioning the work between the sensor device and the application.

Begin at the beginning
The transducer is the sensing element that turns a "real-world" phenomenon into a proportional electrical signal. Depending on the phenomenon being measured, transducers can exist in many forms. Some can be integrated onto an ASIC. Common properties measured with on-chip transducers include temperature, light and magnetic fields. But, sensors are more than just the transducer. Transducers often develop very small voltages or currents in response to a changing phenomenon. These small signals are often filtered and amplified by signal conditioning circuits.

Simple or sophisticated
Since power consumption is often a concern, many sensor designs keep it simple, merely transmitting these amplified analog signals to another application for further processing. More sophisticated sensors will have the capability to digitize an amplified analog signal with a low-power but high-resolution analog-to-digital (A/D or A-to-D) converter. Digitized sensor signals have the advantage of being much more noise immune. Also, data can be easily transmitted wired or wireless using error-correcting protocols.

Make that sensor smarter
Once a sensor signal has been digitized, a micro-power compute core can be added to assemble the sensor data into the desired transmission protocol. The compute core can be a simple state machine, or flexible 8-bit microcontroller.

Adding intelligence adds versatility. For example, sensors can be networked together and polled by a central appliance. The IEEE P1451 open-standard approach allows a variety of different sensors to be connected to, and communicate via, the same network.

Make that sensor mobile
Adding a wireless transceiver allows sensors to be placed where needed. Freedom from wires means sensors can be continually moved around or added to existing situations until the desired sensor coverage is achieved.

New wireless standards, such as the IEEE 802.15.4 Zigbee standard, have a mesh networking feature. Mesh networked sensors can be added as necessary to a network. The sensors automatically integrate into the network and communicate with the nearest neighbor. A mesh network can extend the network range well beyond the radio range of the central transmitter.