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IoT Hardware Design: Guide and Solutions

Client: Telit Cinterion

The Internet of Things (IoT) hardware solutions are expanding in many industries. By 2030, 75% of all devices are projected to be IoT. Companies looking to invest in solutions must understand how they work and the navigate hidden complexities. This guide focuses on the most critical part, the IoT hardware design.

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The Internet of Things (IoT) hardware solutions are expanding in many industries. From wearables in Healthcare to IoT Bluetooth® beacon architectures used to track packages. By 2030, 75% of all devices are projected to be IoT.
https://explodingtopics.com/blog/iot-stats

These devices are total disruptors. Companies looking to invest in IoT solutions must understand how they work. They also have to navigate hidden complexities to get the most out of their investment.

IoT is basically made up three parts. The IoT Hardware or physical devices. The network between the devices. The IoT Applications that allow communication between other software on the device.

This guide focuses on the most critical part, the IoT hardware design. These are the devices and components that make connectivity possible.

What Makes Up the IoT Hardware

IoT hardware is the physical device. It's usually designed for a specific purpose. An example would be monitoring temperature with sensors and connecting to the internet to exchange data.

3 common types of IoT hardware include:

1. Sensors - Devices that can detect and measure changes in the environment such as humidity and light. They can be used in applications like industrial monitoring and healthcare.

2. Actuators – Devices controlled remotely to perform specific actions like opening a door.
   They are often used in home automation and robotics.

3. Gateways - Act as a 'gate' to connect and route data between IoT devices and the cloud. It includes hardware such as processors and connectivity modules such as IoT Wi-Fi and Bluetooth wireless.

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Choosing IoT hardware can be quite complex. It's critical to select the right hardware components for the application in order to design an effective IoT solution. That's where custom design comes into play.

Custom Design to Meet Hardware Requirements

For many IoT decision-makers, deciding on requirements and a solution can be difficult. Too many moving parts and a variety of vendors to choose from to create a coherent system.

So, what are your options?

Many people want an easy and bundled solution with faster time to value. This means ready-made, **"commercial off the shelf" (COTS) IoT hardware components**. It seems like an easier and less costly approach. However, there can be shortcomings.

Companies have different needs than a one-size-fits-all solution. They can run into all sorts of hidden issues from quality to configuration. Not to mention security. In fact, the Cyber Division of the FBI issued a notice in November 2020 about cybersecurity risks of COTS.
https://resources.infosecinstitute.com/topic/commercial-off-the-shelf-iot-system-solutions-a-risk-assessment/

Custom IoT hardware design is more complex but it allows you to tailor the devices to the application you choose. You can find everything you need working with one trusted supplier under one roof.

Some of the benefits are:

- Improved functionality and flexibility:
  Hardware can be optimized for specific tasks and adapt to new use cases. This enables better performance and accuracy than COTS.

- Enhanced security:
  IoT hardware can be built with security features tailored to the requirements of the application. This makes it more resistant to hacking or other security threats.

- Less costly over time:
  Custom-designed hardware may require a larger upfront investment. But over

time, it can often lead to cost savings as it reduces the need for expensive add-on software or other components.

However, many IoT decision makers are still concerned with complexity, steep development costs and time to market (TTM). You can jump over all of these hurdles as well as the shortcomings of COTS with a third solution.

It's called **IoT reference architecture**. It's re-using architecture where most of the development work has already been done and field tested. This cuts out huge development costs and
shortens TTM.

Specific certifications have also been approved to eliminate headaches and save even more money. The best part is, there is still room for refinement and some customization.

3 Types of IoT Hardware Reference Architectures

Telit Cinterion offers custom IoT solutions that include proven device reference architectures. You can get to market faster while still delivering a highly tailored solution.

1. Bluetooth® Beacon Architectures
   https://www.telit.com/wp-content/uploads/2023/02/IoT_Solutions_BTM_Architectures.pdf
   These are low-cost, high-value devices used for asset tracking at scale. A common application is equipment tracking in transportation.

2. Battery-Operated Tracker/Gateway Device Architectures
   https://www.telit.com/wp-content/uploads/2023/02/IoT_Solutions_ATD_Architectures.pdf
   Tracking and monitoring non-powered assets require a battery-operated device. This includes various battery types with a wide range of lifespans from weeks to years. Adding Bluetooth or Wi-Fi allow the device to act as a gateway and gather data from multiple sensor modes. Common applications range from generators to shipping containers.

3. DC-Powered Tracker/Gateway Device Architectures
   https://www.telit.com/wp-content/uploads/2023/02/IoT_Solutions_Powered_Architectures.pdf

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A powered asset tracking device is recommended when tracking or monitoring assets that have an engine or onboard power supply. This device will function if power is interrupted or lost. Batteries can last up to 2 years without power. Powered asset trackers are great for applications like cars or tractors.

Telit Cinterion Expertise in Custom IoT Hardware Solutions

With over 20 years of IoT experience, Telit Cinterion can assist with every aspect and complexity of your IoT journey. From hardware design and software through to security and regulatory compliance.

With our knowledge and expertise, you can quickly bring your IoT devices and solutions to market without fear of access to critical materials or production delays.

We value customer relationships and operate as an extension of your business.
Speak to our IoT experts to learn more about designing an IoT solution that is right for you.
[Link to Telit Cinterion Solutions]