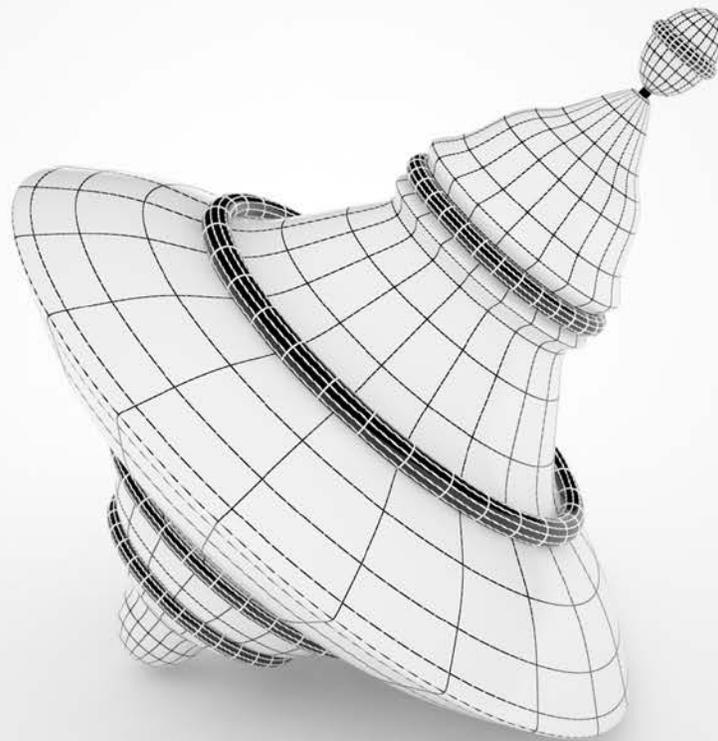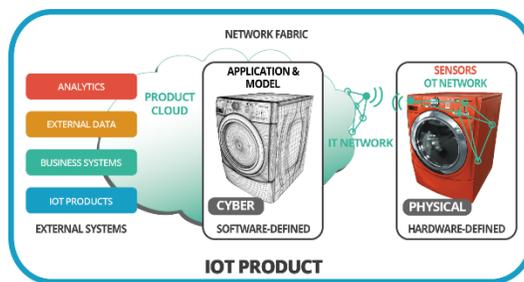# IOT TECH

— AND —

HOW TO BUY IT

IOT TECH AND HOW TO BUY IT

By Bruce Sinclair

INTRODUCTION

All incremental value of an IoT product/system/environment is created by transforming its data into useful information. Although IoT is information technology, it should not be viewed as a network stack describing protocol relationships – that just describes the plumbing.


Inspired by cyber-physical systems and software-defined networks, a value-based perspective groups the tech into four parts: the software-defined product, hardware-defined product and external systems linked by the network fabric.

This report describes the four tech parts and prioritizes what should be developed internally and what can be bought or completed externally. Then technical dependencies are identified leading to the correct order to acquire the IoT tech product classes (Analytics, IoT Platform, Embedded System, …) needed to build an IoT product (system or environment).

The right way to buy IoT tech is to follow this value ordering described later in the report.

SOFTWARE-DEFINED PRODUCT
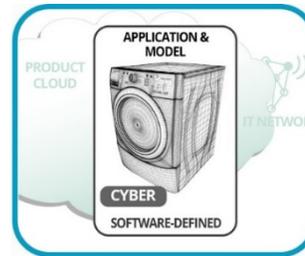
The software-defined product consists of a cyber model and app, well actually many models and multiple apps. Models represent IoT functionality/value and are shared between the app and analytics. Apps provide product logic, orchestrate data collection and interface with other apps, services and people. The app executes the model and the analytics brings on the data to build, compare and solve the model.

The software-defined product and analytics generate all value in an IoT product. As such they must be the manager's priority and should drive all other tech choices.

HARDWARE-DEFINED PRODUCT

Beyond the physical product, the hardware-defined product consists of sensors/ actuators and embedded systems. Sensors are designed into the physical product or externally retrofitted in brownfield deployments. Connected sensors require an embedded system to convert the analog signal into a digital payload that's

nested within three different protocols and sent over the network. The hardware-defined product's sole purpose is to collect sensor data and send it from the fog network to the application and analytics for processing.
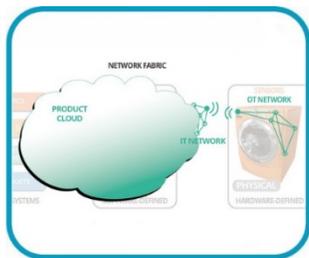
EXTERNAL SYSTEMS

The IoT product interfaces with external systems on the Internet to augment its functionality in much of the same way as online software does. Analytics deciphers data from the past, interrogates streaming data in the present and makes predictions and prescriptions about the future. External data services include weather, pricing and inventory. Business systems such as CRM and PLM, as well as ERP and SCM are interfaced with to exchange enterprise operational information. Finally, IoT products are connected to other IoT products to jointly deliver outcomes.

NETWORK FABRIC

The IoT network fabric links together the software-defined product, the hardware-defined product and external systems. It joins the OT (operational Technology) network and the IT (Information Technology) network to create the fog network that connects to the Internet and the private product cloud. Communication is enabled by the media layer of various radios and Ethernet, the networking layer of IP (Internet Protocol) and proprietary OT protocols, and the application layer that puts the collected data into context for the app.

TOP DOWN
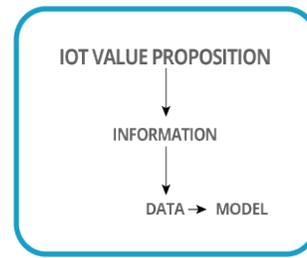
Value in IoT is created from the top down. The IoT value proposition defines the information needed, which identifies the data used in the model to be collected and transformed. In fact, the purpose of all IoT tech is either to collect data or to transform it into useful information.

At the top of the tech heap is the model which embodies the value that is qualified and then quantified through a process called value modeling. The resulting model is used by the app and analytics and the three together create the product's value.

INHOUSE VS OUT OF HOUSE
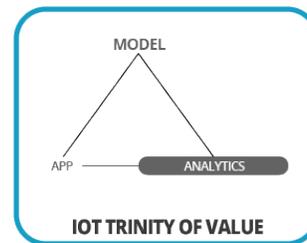
The top is given priority so all IoT product development starts with the model. More than that, the model and app must be developed in-house, as should analysis knowhow. Software development and data science must become enterprise core competencies, just as product design and manufacturing are today.

DEPENDENCIES

The IoT Tech Dependency Graph illustrates dependencies between the tech used into every IoT product. Solid items are the tech product classes and the arrows point in the direction of the dependency. This graph is not intended to show data flow.

For example, when choosing an embedded system in IoT, an evaluation of the graph shows this purchasing decision depends on the radio and sensors it needs to support. And the sensors depend on the data that needs to be collected which is defined by the model. Looking the other way, the network protocol may be (dotted) dependent on the embedded system chosen.

HOW TO BUY

Before shopping for your embedded system, you need to develop your model to know what data must be captured. This data dictates the sensors to buy and the product's use-case dictates the radio type to use. Only after you have made these decisions are you ready to start shopping for an embedded system, selecting from a narrowed list of qualified competing products that satisfy the sensor and radio needs and are then further differentiated by other features such as processing speed and memory.

CONCLUSION

The model ultimately drives almost all tech decisions so it must be the first tech defined/decided upon. On the opposite end of the graph we see the IoT Platform or Cloud is the last tech purchased/decided upon.

Before starting to develop your IoT product ensure that you understand all the tech components involved. Start your research on www.iot-inc.com where you will find free podcasts, videos and articles that deep-dive into every IoT product tech class. Once the tech is understood, make yourself familiar with the dependencies between technologies using the graph so you start product development in the most efficient and effective way.

IOT TECH DEPENDENCY GRAPH