Unraveling

the

INTERNET OF

THINGS

DISCOVER THE OPPORTUNITIES
AND UNLOCK THE SECRETS TO
A TRILLION DOLLAR INDUSTRY

by Brian Geisel

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Introduction

Ever since journalists coined the term 'Internet of Things' (IoT), it has been one of the most hotly discussed topics in the tech world. Advanced technologies and a proliferation of devices have helped fuel the growth of the global IoT market which hit $690 billion dollars in 2020. Analysts predict the market will continue its rapid growth to become a **trillion dollar industry** in the next few years.

But what exactly is IoT?

IoT technically refers to the ever-growing network of physical objects ("things") featuring an IP address for internet connectivity, along with the technologies that facilitate the communication and data sharing that occurs between these objects. IoT has extended internet connectivity beyond the usual devices like laptops and smartphones to a diverse range of other devices, from household appliances to sophisticated industrial tools.

Still not making sense? Let's unravel it.

What is IoT?

The Internet of Things sprung out of embedded development, which is the development of any device that isn't a traditional computer. Examples of this include the Apple Watch and certain medical devices, that typically run on their own. So whereas application software provides functionality on a computer, embedded software is specifically written to ontrol other types of machines or devices, such as thermostats, insulin monitors, and digital watches.

With us so far? Good.

Now, what facilitated the jump from embedded software to what we call the Internet of Things was **cloud computing**. Cloud computing essentially refers to the idea of hosting services online and using them as a utility, much as you would electricity. It removes the need for building and maintaining expensive and sizeable computing infrastructure, and puts everything in the "cloud".

IoT lets your smart devices communicate, send, receive and interpret data and information from connected devices anywhere in the world, in real-time.
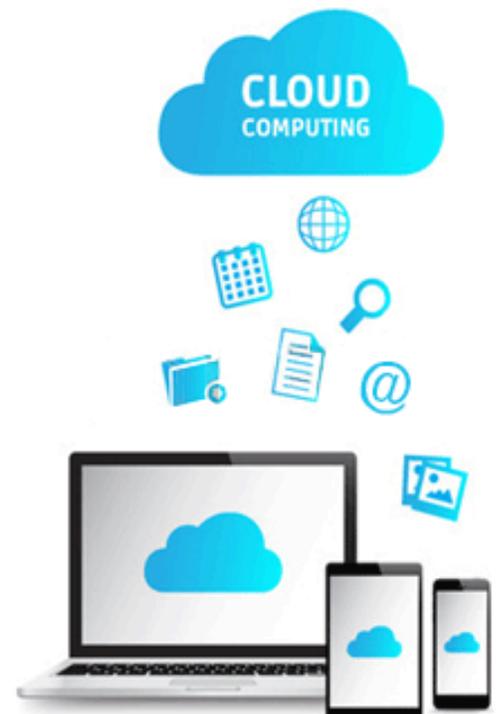
The role of cloud computing in IoT has been to make it possible for all of these devices with embedded software to be connected through the cloud on a scale previously impossible. So things that had not been connected before can now communicate, send, receive and interpret data and information from connected devices anywhere in the world, in real-time. For example, you can use your mobile phone to adjust the temperature your house while you are at work, all through the combination of embedded software and the cloud.

How can IoT be used?

When most people think of IoT, they think of Connected Home products like intelligent heating and cooling systems, smart kitchen appliances, and robotic vacuum cleaners. Home owners are now starting to connect those devices with the goal of building a completely integrated Smart Home. Imagine coming home after a long day at work and as you pull into your driveway you car alerts your front door to unlock, which then informs your lighting system to turn on, your heat to turn up, and your sound system to play your favorite music.

Today, smart home devices have moved from a luxury to an expectation. There are refrigerators that can tell when you are low on milk and add it to your shopping list on your Alexa device and smart thermostats that allow you to manage the environment in your home from anywhere.

Home appliances is just one area of many niche IoT markets. Companies are using IoT in medical devices for homes and hospitals, others are utilizing it in manufacturing and enterprise. In 2020, the installed base of IoT devices in industrial automation reached 8.7 billion.

IoT holds the promise of continued rapid growth as new applications continue to emerge such as smart cities, smarter cars, behavior tracking and more. IoT technologies will continue to change the way we do business and the way in which we live our lives.

IoT devices in industrial automation reached

8.7 billion

in **2020**

$1.1

TRILLION

$690.4

BILLION

**2020**   **2025**
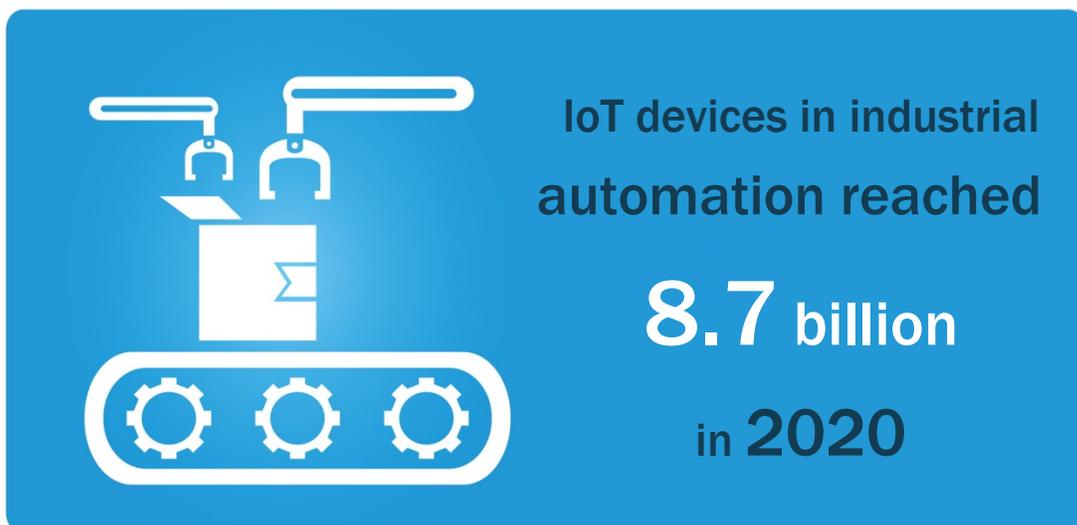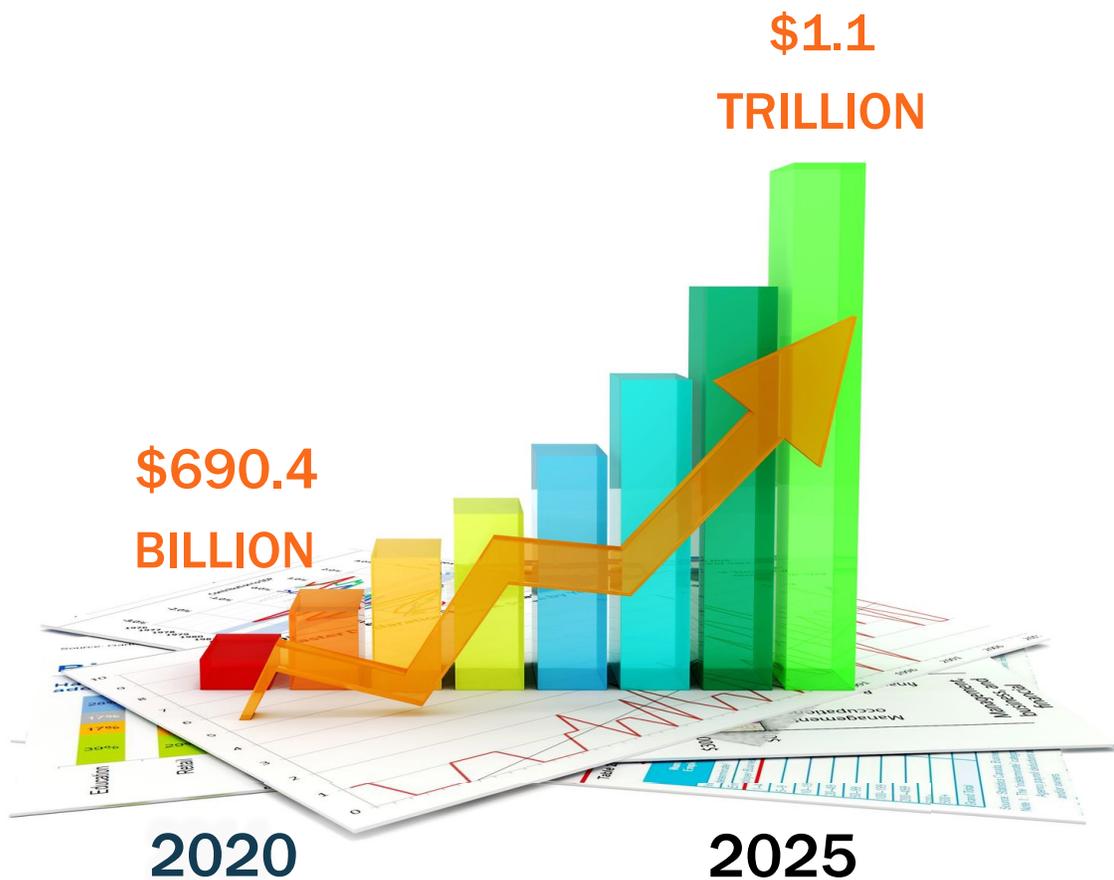
Limitless Potential

IoT adoption is on the rise with industrial automation, self-driving vehicles and smart home products driving the biggest growth. International Data Corporation (IDC) says the worldwide IoT market will grow to **$1.1 trillion by 2025** from $690.4 billion in 2020. Emerging technologies like Artificial Intelligence (AI), Machine Learning (ML), Computer Vision (CV) and Edge Computing are fueling new applications in agriculture, healthcare, transportation, consumer electronics, and more.

Now is the time for companies getting into the IoT space to grab market share. Developing for IoT is difficult and, because it touches multiple engineering disciplines, requires specialized skills. But its sheer difficulty is part of the opportunity if you can do it well. It is a rare sector in the technology world that isn't already filled with competitors. By getting there first and doing it right, there is a market share for the taking.

However, going from being a desktop developer to developing on a device is a huge leap and requires skills in security, networking, systems engineering, cloud development, and device programming. It is like "losing Google". You're solving a problem that's never been solved. There's no driver for Linux for this device because it is brand new; there is nobody to ask. You have to read the specifications, maybe even the electrical specifications for the device. It is a different world.

However, it is getting easier, with devices becoming more standardized. Embedded devices used to be too small for an operating system, but now almost everything has one. Out-of-the-box code exists, and things are becoming more generic. The proliferation of devices such as 3D printers and the Raspberry Pi has helped with this enormously as well.
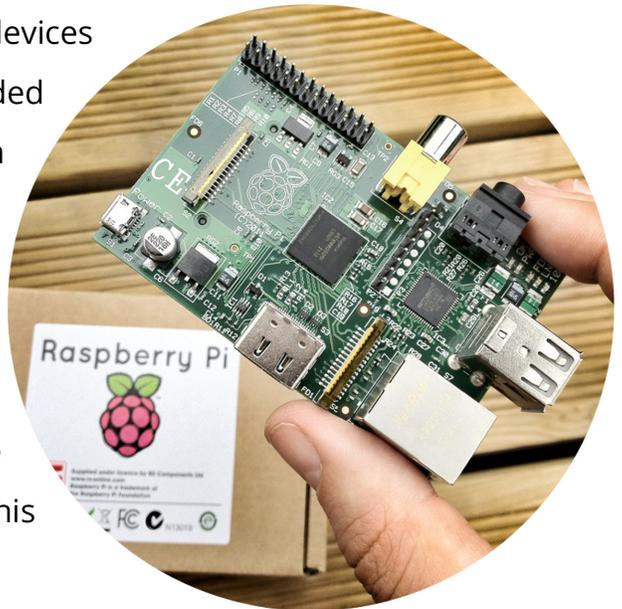
Identifying IoT Challenges

There are still challenges, but they are being overcome. The whole industry around Connected Home is trying to solve one major problem - interconnectivity. Can we connect products from lots of different companies creating their own ecosystems to create a truly seamless home automation experience? How do they talk to each other? When I open my door, how do I get my lights to turn on?

To achieve a true smart home, devices from different brands that are running on different protocols must have the ability to talk to one another, which is a difficult task. But new advancements in wireless communication and infrastructure that facilitate easy integration, combined with the development of open standards, are opening the door to a wholly automated home environment.

INTERCONNECTIVITY

SECURITY

Security has emerged as a key challenge. Historically, most companies didn't think about securing IoT devices. There was no need before devices were connected to the cloud, much like people weren't concerned with security on their laptops until they connected them to the internet and contracted viruses. But when a device with open sharing settings and out-of-date software is connected to the cloud, hackers can gain a foothold into the entire IoT network through the compromised device.

There are numerous ways to secure IoT devices to minimize threat exposure such as using strong passwords, using multi-factor authentication, securing your internet connection, and more. One of the most important ways to keep your devices secure is to deploy regular software updates to fix bugs, patch security vulnerabilities, and address emerging threats.

3 Components of an IoT Solution

When it comes to putting together an IoT solution, there are three main aspects that need to be considered: the mechanical, the electrical, and the software. Once these three are all in place, it becomes a product ready to be marketed and sold.

Mechanical

This basically refers to what the device looks like; what your circuit board and compatibility is going to fit into. As noted before, with technology improving, these devices are becoming smaller and more manageable. This aspect of your IoT solution can be developed by any of a number of companies, or freelance engineers. Technology has even developed to the point that it can be designed and then printed on a 3D printer, by either you or your customer.

Electrical

This aspect covers the processing power of the device; what is inside it. To be an IoT solution, it will likely need wireless connectivity. A number of different companies can assist with this, and with the improvements in technology it is possible to do 90 percent of what you want to do using off-the-shelf equipment, especially for the prototype stage.

Software

Here we come to the crux of the matter. What capabilities does your device have? What does it need to do? How does it connect to the cloud? How do you secure it? Though building software for IoT is becoming more manageable, it's still a specialized area. Once you've found a company or developer, you need to explain what you want your IoT device to be able to do. What do they need from the mechanical and electrical sides? Can they build it?

Get these three aspects solved, and your IoT device is then just another product that you need to take to market. How do you sell it? How does it play in the market? What models will you employ? Will customers pay a subscription? Or will they have to buy a device? Amazon makes enough money out of selling its Kindle devices and e-books that it essentially covers the internet costs of users for downloads. Can you afford a model such as this? What are your ongoing costs, such as cloud servers?

The Future of IoT

With the developments in technology and the headway being made on the interconnectivity challenge, we will move to a point where everything in our lives will become connected.

Technology will reach a point where its possibilities are limited only by the human imagination. But it will only be used as long as it is provides practical, real-world benefits. IoT's evolution depends on what we what we want it to do. We now have the ability to come up with all sorts of solutions, and as we interconnect, the question will be how people interact with it.

The only way to find that out is to build solutions and put them into the market. As the industry continues to evolve and grow, consumers will grow more comfortable using and trusting IoT devices. From a technology and hardware perspective, the future is bright. How IoT plays a part in people's lives now only depends on how big a role they want it to play.

In rolling out a solution, and ensuring it is well-received at market, the mechanical, electrical and software aspects of the product must be done well. Whether these parts of the equation are outsourced or done in-house, your solution must consider all security issues and have an architecture that can scale as devices proliferate. It must also be able to adapt to market trends.

Grab Your Piece of the Market

The IoT is a fast-growing market with infinite potential. At Geisel Software, our custom software development services bring IoT projects to life. And Nitrium, our device firmware management platform, helps keep them secure now and in the future.

If you'd like to get involved in the trillion dollar IoT industry, reach out to us to set up a brief consultation.

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