

White Paper

What is the Internet of Things (IoT) and why you should care

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IoT, or “Internet of Things” is a term most people have heard of, with some readers already having a clear understanding of the concept. Wikipedia provides a good definition of IoT, stating it is...

“the network of physical objects or “things” embedded with electronics, software, sensors, and connectivity to enable objects to exchange data with the manufacturer, operator and/or other connected devices...”

...The Internet of Things allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration between the physical world and computer-based systems, and resulting in improved efficiency, accuracy and economic benefit...”

This is a great start, but poses further questions such as:

1. What are “things”?
2. Is this something that exists - or is it “pie in the sky”?
3. Who could benefit from it and how?
4. How can businesses leverage this opportunity, to add value?

Let’s explore each of these questions, to better understand the concept in context.

1. What are “things”?

Simply put, “things” can include almost everything. However, for something to be part of the IoT, it needs to be uniquely identifiable (i.e. have an [IP address](#)) and able to connect to the internet (either directly or indirectly).

A good example (and perhaps the earliest example) is the vending machine. Back in 1982, a Coca-Cola vending machine was connected to a network at a US university, allowing it to send information about inventory and stock temperature back to a computer.

Since then, vending machines have taken full advantage of Machine-to-Machine ([M2M](#)) technology and the IoT concept, to not just report back inventory and temperature, but location, machine faults, cash/change held, tilt warnings and power cuts. The software that interprets this data can then analyse trends, predict component failure, alert when stock is low or out of temperature range, and provide restocking information. This technology also allows for commands to be sent back to the machines to adjust settings, remove purchase options or shut down remotely - this all happens wirelessly, via the mobile data network.

But “things” aren’t just vending machines, they include fridges and other appliances, air conditioning units, weather monitoring equipment, connected light bulbs and power outlets, heart monitors, sensors, switches, security systems, vehicles and of course smart devices like modern TVs and mobile phones.

Basically, anything that can connect to the internet, either directly (eg. plugged into a phone line or a cellular modem) or indirectly (eg. Wifi, Bluetooth, RFID, Infrared/laser etc). Or it could be a connected sensor, attached to something else - such as structures, clothing, furniture, plants, animals.. ANYTHING!

2. Is this something that exists - or is it “pie in the sky”?

As explained in the vending machine example above, the IoT has really been around for quite a while. The reason it is getting exciting now is that we all carry powerful computers in our pockets, in the form of smartphones, that are connected to the internet and usually include other connection methods such as Bluetooth, Wifi and NFC. Both users and businesses are already taking advantage of this emerging technology.

Using the vending machine example again, imagine using an app on your phone to find the nearest vending machine that had the product you wanted, and then once you got to the machine it knew you were there and the product dispensed itself and the funds deducted from your account wirelessly. Well I was recently in Japan and this already exists! The vending machine company providing the app can also make recommendations to the app user about alternative products or special offers and the users lap it up for the incredible convenience this brings.

Almost everyone in the world is now already part of the IoT in many interconnected ways - but this is just the beginning!

3. Who could benefit from it and how?

Moving on from vending machines, there are already some great cases that demonstrate how people can benefit from the IoT. I will focus on five of the core areas that I see IoT having a major impact on as these demonstrate how the IoT is of benefit to the consumer and how that in turn benefits the business.

Health

Many consumers already wear fitness bands or have smart watches that track their steps, sleep patterns and even measure heart rates. These devices and other health related products such as smart scales, typically pair with a phone or tablet via bluetooth allowing users to monitor and manage various elements of their health through diet and exercise.

Doctors can use similar devices or tiny sensors, to capture information about blood pressure, pacemakers, hearing aids and much more - this information can then be relayed back to them remotely, drastically improving patient outcomes and greatly reducing costs.

Safety

Connected vehicles (eg. using the [simTRAC](#) GPS Fleet Management System) have demonstrated the safety benefits for over a decade. GPS tracking devices fitted to a vehicle enables business managers to keep track of the location and driving behaviours of their mobile workforce. These connected units can include inputs for panic/duress buttons and rollover or impact detection to create alerts back in the office.

This concept has been extended to include watches and pendants for children and the elderly so their location is always known. Should the wearer fall, stop moving or press an emergency button someone is alerted and they can be quickly located.

The IoT can improve safety in many of other ways too. Sensors can be placed on structures/assets/doors and windows to signal the presence of excessive movement, heat, smoke, gas or other risks and send risk

appropriate alerts to the building or asset manager, or to an appropriate response team (eg. emergency services).

Service

If you're wondering how service providers can benefit from the IoT, consider Uber for a moment. They have used the existing technology in a smartphone to allow users to connect with drivers of vehicles and procure a taxi-like service in a way the world hasn't seen before. This type of technology can be easily applied to any mobile service business that has an inquire-quote-book-perform job flow - like plumbers and electricians.

Businesses that install, service and repair machines are perhaps best placed to benefit from embracing the IoT revolution. By connecting those machines to the internet they are able to pull critical information from the device to allow them to provide a better service. Imagine if vending machine owners only knew the status of their machines and stock when they physically inspected them? We can see that this wouldn't work, so why not apply this logic and integrate the IoT with air conditioning units, pumps, generators, plant and equipment too?

Home

The biggest buzz in the IoT at the moment is around the home. Many of us already have a partly connected home - we have internet connected devices like computers, tablets and phones that share our information to a range of third parties, and many people now have connected TVs that share viewing information back to media companies like never before.

There are few benefits in this for the homeowner, however the IoT is quickly picking up pace with connected security and surveillance systems, fridges and other appliances, light fittings and switches, AC and heating/ventilation. This means homeowners can reduce their power bills by automatically optimising these systems with the devices that (or a home management system) adjust settings based on ambient temperature, weather predictions, calendar events, trends, ambient light, sound and movement. Homeowners can then check the status of all these devices remotely, be alerted to anomalies, adjust the devices to suit their preferences (or schedule) and access audio & visual feeds from the home when they are out and about.

The next stage is to have connected devices such as the home fridge, provide "smart" shopping lists based on your family's schedule, preferences, and what's already in the fridge. This can reduce wastage and overall make life a bit easier. Imagine getting a message from your washing machine telling you a cycle was nearly finished, but the weather forecast is predicting rain, so maybe consider using your dryer instead?

Data

You might have heard the term "big data" before - loosely it refers to the massive amounts of what can be seemingly meaningless data that is collected by all these machines, forms, devices, websites, cards and cars. However in the IoT age, it is far from meaningless.

I recently read that the machines in a mine in Pilbara collect terabytes of data each day and little of it is actively used or "mined" for its value. However BHP claim to have already used big data from just some of their machines and have optimised mining operations to the tune of \$30 billion per year.

Imagine if the manufacturer of your washing machine knows how often you use the machine, any error codes it produces and the cycles that you use, the weight and temperature of the loads you put through it. By collecting

this data from millions of machines around the world they can compare this with machines that have failed and/or customer complaints and predict which machines are at risk, where they are and when they are likely to fail. They can now use that information to provide recommendations to you on how to get better performance from the machine, warn about potential damage you are doing to it and allowing them to provide preventative maintenance to avoid product failure. This concept applies to almost anything - the benefits for both the consumer and the producer are huge.

That's just big data from the one manufacturer, but what if that data was cross referenced with loyalty card information about what types of laundry liquid are being bought by the consumer, how much they were using over time, compared to the number and size of the loads - now the manufacturer can give even better recommendations and the consumer gets better results. It's a very simple example but it's easy to see how this type of "big data" creates a much "bigger picture".

If you provide a service, rather than a product, think about how you might be able to use sensors, sales & payment data, GPS tracking/mapping data and other third-party data to provide a better service. How can you use all this to make your business smarter and more profitable and your customer experience best in class?

4. How can businesses leverage this opportunity, to add value?

Having provided some examples above, you are probably already thinking about how you might be able to bring some of the advantages of the IoT into your own organisation's offering (or making your home "smarter"!).

Once you start thinking about all the opportunities to add sensors and smarts to products, or to the tools used to provide a service, you'll quickly realise there are few examples of industries that can't utilise the IoT to their advantage - be it cost savings, improved efficiency, better service or big data that helps you to sell more and provide a better customer experience. Anyone in business should be thinking about how to gain a competitive advantage by getting involved in the IoT as soon as it is practical.

Recent estimates suggest that there will be over 40 million connected devices by 2020 and that Internet of Things in Buildings (BIoT) will rise globally from \$22.93Bn in 2014 to over \$85Bn in 2020 - make sure you get a slice of the pie!

At simPRO, most of our customers are in the trades and services sectors, so if this describes your business how might you benefit from this trend? Well, it depends on your specific business model but here are a few examples:

Security

The Security industry has already been a part of the IoT for quite a while - whether they realise it or not. Most system installer and patrol vehicles are tracked, most security systems are connected (though not necessarily via the internet) and both technicians and patrol staff carry at least one connected electronic device. It goes without saying that this is already the bare minimum of connectivity, but there are much greater opportunities ahead.

One such opportunity exists in simply switching over old analogue systems to newer digital/IP based systems. The ROI for both supplier and consumer is significant, so security businesses can leverage the IoT to accelerate this conversion.

Video Surveillance is already taking advantage of video over IP, but there is a significant opportunity for these systems to be optimised through the addition of sensors. Data from doors, windows, alarms, pressure sensors etc. can be set up to trigger a range of automatic processes. Security systems that integrate video and data from other sensors are far better at eliminating false alarms or lockdowns than a system that triggers on a single piece of erroneous data. This saves a lot time, distress and ultimately money for the consumer and the security hardware supplier/monitoring company (especially under a Security as a Service model).

The [ONVIF](#) specification (or similar) will hopefully make achieving full-scale interoperability in the security industry an easier reality.

Fire

The fire and safety industry probably has the most to gain by partnering with other businesses involved in building management systems. Rather than being a stand alone system in a building, an advanced fire system in the IoT age can integrate with other systems. This can help to predict potential issues based on data from HVAC, Electrical and Security systems and automatically control those systems in situations where a fire or emergency breaks out - locking down certain parts of buildings, shutting off ventilation systems, multi-stage alarm/alert systems based on threat or seriousness of an incident etc.

In terms of maintenance, fire systems from the basic to the advanced will be able to connect in one way or another, allowing both building manager and service provider to optimise service and maintenance based on big data trends, fault codes and a range of alerts.

Look for opportunities to install or upgrade equipment to connect to “IoT ready” versions. This is both for the opportunity for new upfront revenue and the potential cost savings from being able to optimise your servicing of equipment based on remote access to more in-depth data.

Plumbing & Gas

The Plumbing and Gas industry stand to take advantage of the IoT by making better use of connected electronic flow meters, water level indicators, pumps, filters and water quality sensors etc. Being able to analyse, create alerts and recommendations based on data from these devices means businesses in these industries can add significant value for their customers. It results in improving ongoing service delivery and by upselling to connected devices instead of simply supplying traditional “dumb” devices.

The collection of big data regarding local water quality (including hardness/chlorine/fluoride) and similar problems in certain areas or with certain equipment, is another area ripe for value add.

Organisations that are leveraging on their understanding of how existing plumbing and gas systems can work in relation to smart buildings and cities will be seen at the cutting edge of the IoT trend.

Electrical

One of the easiest ways for the Electrical industry to add value with the IoT is through home and business automation. This involves Marketing, Selling and Installing the sensors and smart plug/switches that are required for smart buildings. Some of the examples provided above will rely heavily on new generation lights, power outlets, switches and smart hubs to control all of these connected devices. This will most likely provide a boon for the electrical contractors at the forefront of this trend.

HVAC

Much like Electrical, the Heating, Ventilation and Air Conditioning industry has a lot to gain from being at the forefront of the IoT trend. They also stand to gain if they can form strong commercial relationships with building services businesses, electrical contractors and all the other verticals above. HVAC systems are a key part of smart buildings and cities, but only when they are in harmony with the building systems. Working towards universal standards for the IoT will make this much easier in time.

Summary

So where might this be heading? Well so far we've largely only looked at connecting a single sensor or device to another, and then using software or apps for optimisation. But the future of the IoT is going to largely focus on the power of the interoperability of "things".

Buildings are an easy to understand example of this interoperability - imagine if your home could access information from its residents calendars, meteorological websites and all of the connected systems in the house. It could then adjust the fridge temperature based on knowing not just patterns, but who will be home and at what time and even the ambient air temperature. It could turn on the AC, heating, ventilation systems and lighting, based on the time that the first resident will be home and optimise it for current weather conditions. It could even cancel the normal timers for all of these, based on knowing from your calendars, that nobody will be home tonight.

Imagine now that you have small RFID tags in your clothing and you put together a load of washing - the washing machine detects items that should be washed together on this cycle and makes recommendations - on completion of the cycle it can give further garment care instructions and prepare the dryer for a suitable cycle.

Now expand this example out to cities. Smarter traffic and street lighting systems, immense amounts of "big data" from these systems (plus water, electricity, sewerage, garbage/waste etc.) that can be analysed to optimise city planning. Imagine how this technology will not just optimise an appliance or a home, but workplaces, business processes, infrastructure and energy demand on a global level. This will involve data from devices, telling other devices what they need to know for peak performance and all that data being analysed to optimise as a whole... but it's not without it's detractors.

Privacy and Data Security are perhaps the biggest concerns in the IoT at the moment. The technology and demand is moving fast, but security isn't necessarily keeping pace. A recent article on Wired.com about hackers taking control of a Jeep Cherokee and not just messing with the radio and wipers, but actually cutting off the transmission, show the seriousness of security vulnerability with connected cars.

Once we have connected houses, carry/wear connected devices and work in smart buildings in smart cities it is easy to understand how some people view the IoT as some sort of Orwellian nightmare-come-true. The fact is, most of us have already given away much of our anonymity, with social media, Google following our every move, loyalty cards, toll collection and surveillance cameras. At least in an the IoT world, all this loss of privacy actually benefits us in significant ways. More concerning is the ability for undesirables to gain access to this wealth of data, so projects are popping up to work out how best to deal with this threat, such as the Open Web Application Security Project (OWASP). It's certainly worth considering threats to security and what the likely impacts would be, should a breach occur in any project you roll out.