

The Internet of Things

A Truly Connected World

The Internet of Things (IoT) can be thought of as the interconnectivity of a multitude of devices across a global communications network that goes beyond our common reference of machine-2-machine capabilities.

The IoT brings together a variety of devices not commonly known for their interconnectivity, with those long established as interconnected devices. The component parts contribute to a smart grid of communicative nodes that can bring tremendous benefits to the field of advanced automation, and autonomous task management for businesses.

INCREASED INTEREST

We are currently seeing the rise in importance of the 'maker culture'. This sort of ingenuity and passion for creative innovation has not been seen since the original start-ups of the late 1970's, where the likes of Gates, Jobs and Wozniak frequented the 'Homebrew Computer Club' in Silicon Valley.

The 2015 equivalent sees innovators across the globe working collaboratively on new concepts and bringing these ideas to the physical world more rapidly than ever before, with minimal costs.

The advent of prototyping capabilities like Arduino and Raspberry Pi have mobilised a large engineering and coding community now able to learn and create with minimal investment. We are truly seeing imagination being the only limiting factor in the sort of internet connected devices being born.

It is this rapid rise in engineering innovation that is powering the accelerated rise of the IoT, with services such as Kickstarter and Indiegogo acting as crowd-sourced incubators, providing the necessary capital to take the prototypes into production.

Businesses are now starting to understand how they can capitalise on this ingenuity through technology scouting and, in many cases, acquisition of these fledgling companies for their intellectual capital.



BUSINESS OPPORTUNITY

Business needs innovation and inspirational thought unbounded by the day-to-day finances and bottom line. The IoT will allow companies to explore a wealth of new opportunities, introducing enhanced automation and autonomy to existing solutions and services, and through this automation the realisation of new opportunities not yet known.

One of the most publicised IoT products of recent times is the 'Nest Thermostat', although there are countless examples of this new extension to the internet as we know it. Nest connects people's homes to their smartphones, allowing for remote control of environmental settings without physical presence.

Like any true IoT connected device this is just the start, and connectivity to other household components is possible with the associated interfaces. Automotive manufacturers are connecting cars to central systems and owner's smart devices for a more integrated car ownership experience. The list is extensive as connectivity can be established between anything you can imagine.

THE IOT AND BIG DATA

In recent years we have witnessed some of the power that data analytics can deliver when access to vast repositories of data is provided (Big Data). The interconnection of machines through the IoT will permit even more nodes to be interconnected for

exponential increase in the variety, velocity, and volume of data being gathered. This in turn enables businesses to make more accurate predictions and forecasts based on known metrics, and patterns.

The IoT will have a large and positive impact on Big Data, truly expanding the reach of data beyond anything we have today, gathering statistical information from every conceivable connected device.

Whilst the improved understanding of the value of data analytics (Big Data) has prompted an increased need for mathematicians graduating our academic institutes, the IoT will further intensify this demand as the volume and variety of data produced will need keen analytical minds to help extract business advantage from the data collected.

THE IOT AND DATA PRIVACY

The inexorable growth of nodes has brought with it legitimate concerns around the security of data, and through this our privacy. There is currently no active regulation around the IoT, and with current legal and regulatory entities already struggling to keep pace with the technological advancements we are witnessing today, IoT introduces a minefield of potential problems around data privacy and, although it sounds extreme, the safety of human life.

There is no way to monitor or stop the connection of new devices to the IoT by both companies and individuals around the globe. The wider the sprawl of nodes grows, the more data is gathered about all aspects of our lives, and the more machines will be connected to the end of these nodes. These machines can be controlling anything from the temperature of our homes, to more industrial machines being activated in factories and plants.

With this rapid growth comes the concern around security of the IoT, or more accurately the security of those nodes that need securing. What this means for

both personal safety and corporate security is a larger attack surface for those with malicious intent.

Whilst those intending to do harm or cause issues through attacking areas of the internet will need to be very adept coders to navigate the IoT, the inherent problem is that the engineers inventing and adding nodes to the IoT on a daily basis are not security experts, and more often are not implementing security measures of any sort.

The pace of expansion of the IoT is far outstripping the required security measures being employed. Whilst we should be mindful not to let regulation and control stifle creativity and the expanding capabilities of the IoT, there is very real need for highly agile and influential Cyber Security experts to offer advice, guidance, and assistance with the securing of the IoT and these extended nodes.

IOT LEGISLATION

The equilibrium between allowing this creative growth, and ensuring the privacy and security of individuals is maintained, is a complex balance but the sort of dilemma that is always faced through technological advancement.

Currently (February) the US senate are debating the introduction of laws to help regulate and safeguard the collection of data from IoT devices. This is primarily focussed on the security and protection of collected and stored information from major corporations and manufacturers, such as the automotive industry.

With automation and digital interconnection common place in cars now, there is a genuine fear that unencrypted systems within an automobile would allow hackers to cause malicious harm to occupants through taking control of systems within the car. There are experts advising that these systems need to be encrypted, and regulated to ensure compliance.

Conversely there has been urging for any legislative body involved to use a 'light touch' on this topic and let the IoT entrepreneurs find their own way, implementing their own safeguards and security measures, perhaps with help and guidance from Cyber Security experts. This allows the IoT to expand whilst maintaining a degree of protection.

There is a need for both philosophies here, and they should be complementary. The freedom to expand and drive the IoT forwards should be in the hands of



the creators, but where complex systems directly impact the health and well-being of the public, such as digitalisation of automobile systems, there needs to be regulation around minimum expectations. Encryption of components that govern the behaviour of those systems being a must.

The UK government, through recent reports (January), have also published their views on the need to allow the freedom for the IoT to grow, whilst putting the emphasis on companies to self-regulate and introduce security for encryption of data gathered and transmitted by the devices brought to market.

This self-regulation is essential at such an early stage of the IoT, and will be watched closely by regulatory bodies and governments to understand the maturity of those vendors involved, and what is required.

IOT REGULATION

There are those that believe regulation of the IoT falls within the purview of the controls already in place for governance of telecommunication spectrums, hence already actively monitored by the telecoms industry. Whilst this may cover the broadcast of information across radio waves, the IoT is not bound by wireless communication technology. Many of the devices connected to the IoT are done so over hard-wired connections, thus not falling within the domain of the telecommunications regulators and spectrum control.

We need to understand that the IoT is bigger than telecommunications, and requires a different approach to monitoring and legislation. Those innovating and connecting devices to the IoT will not always be major corporations subject to standard governance and regulatory practices.

The IoT necessitates a fresh approach to regulation. It must be soft-touch and guidance rather than heavy handed legislation, but it must be understood that this is a new paradigm we are dealing with, and not just an extension to our telecommunication industry.

It needs smart minds from all areas of technology to collectively determine what is best for this growing phenomenon, and cautiously steer accordingly.

FUTURE DIRECTION OF THE IOT

What we are witnessing most today is experimentation and imagination. Engineers and coders are learning what is possible and what potential the IoT may bring.



We have already seen a wealth of mainstream devices including fitness trackers capture our attention, but innovators are looking beyond this to what comes next. Home automation, interoperability between the home and the car, pre-emptive decision making by home automation based on collected data and events. With each new discovery and invention comes an expansion of the IoT.

Businesses have also realised the potential for this cultural shift towards 'interconnected everything' and are working on how these technologies can bring real business benefits to ensure outcomes are achieved.

Over the past 18 months we have seen an increasing number of start-ups being acquired by larger organisations to jump-start their IoT connectivity and leverage the creative minds behind these initiatives. This trend will continue whilst companies develop their innovative capabilities.

This buying of small innovative companies is nothing new, and has been around since the present day IT industry was first born, but with the IoT, we are witnessing a much faster expansion of capability.

THE NEXT EIGHTEEN MONTHS

The IoT will continue to grow, gaining nodes across the globe, allowing vast repositories of information and data to be collected, analysed and utilised to augment business decisions and strategy.

In parallel deep learning and self-learning computer architectures continue to grow in capability and usefulness. Connected to the IoT, these technologies will see an increased learning curve and the ability to move more rapidly towards the state of 'self-awareness' that artificial intelligence scientists are working towards.

The IoT could be viewed as the interconnected global data grid that AI has been waiting for to allow exponential learning capabilities to be unleashed.