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The Internet of Things

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The Internet of Things

In edition 8 of iBytes, we looked at emerging technologies and how our lives could change in the near future due to some of these technologies. In this edition we are leading on from this, looking at what happens when objects, animals and people communicate directly with each other using the internet.

Imagine what the world would be like if every person carried data within them and that data could be accessed by the Internet. Would this be a good thing or are there arguments against this?

There are obvious advantages – we wouldn't need to hunt for vital information like our National Insurance Number, that we had written down on a piece of paper and put in a place so safe we can't remember where that place is! What about having our passport or driving license loaded up to our data chip so that when we have to provide proof of our identification we can just be scanned? There would be no more panicking about whether we had remembered to bring our passport to the airport when we go abroad for our holiday. And those all-important exam results that we need to get a job – they could also be loaded onto our data chip so that we don't have to take certificates to an interview to prove our qualifications. And if we could be monitored and our movements tracked, that could be a huge advantage, for example if we got lost or injured whilst hiking in a remote area, on a Duke of Edinburgh expedition, we could be found quickly. Or, when a child gets lost we could track them down easily and bring them home safely.

But what about the disadvantages? Many people would view the use of this data as an invasion of our privacy. Most of us don't want to have our movements tracked all the time and sometimes we like to remain 'anonymous' in a crowd. Many of us didn't like the idea of an ID card that everyone would have and be required to carry around with them, when it was proposed, and many people oppose widespread use of CCTV cameras. So there would likely be huge opposition to data being part of us, without even considering the health worries of having a data chip implanted in us.
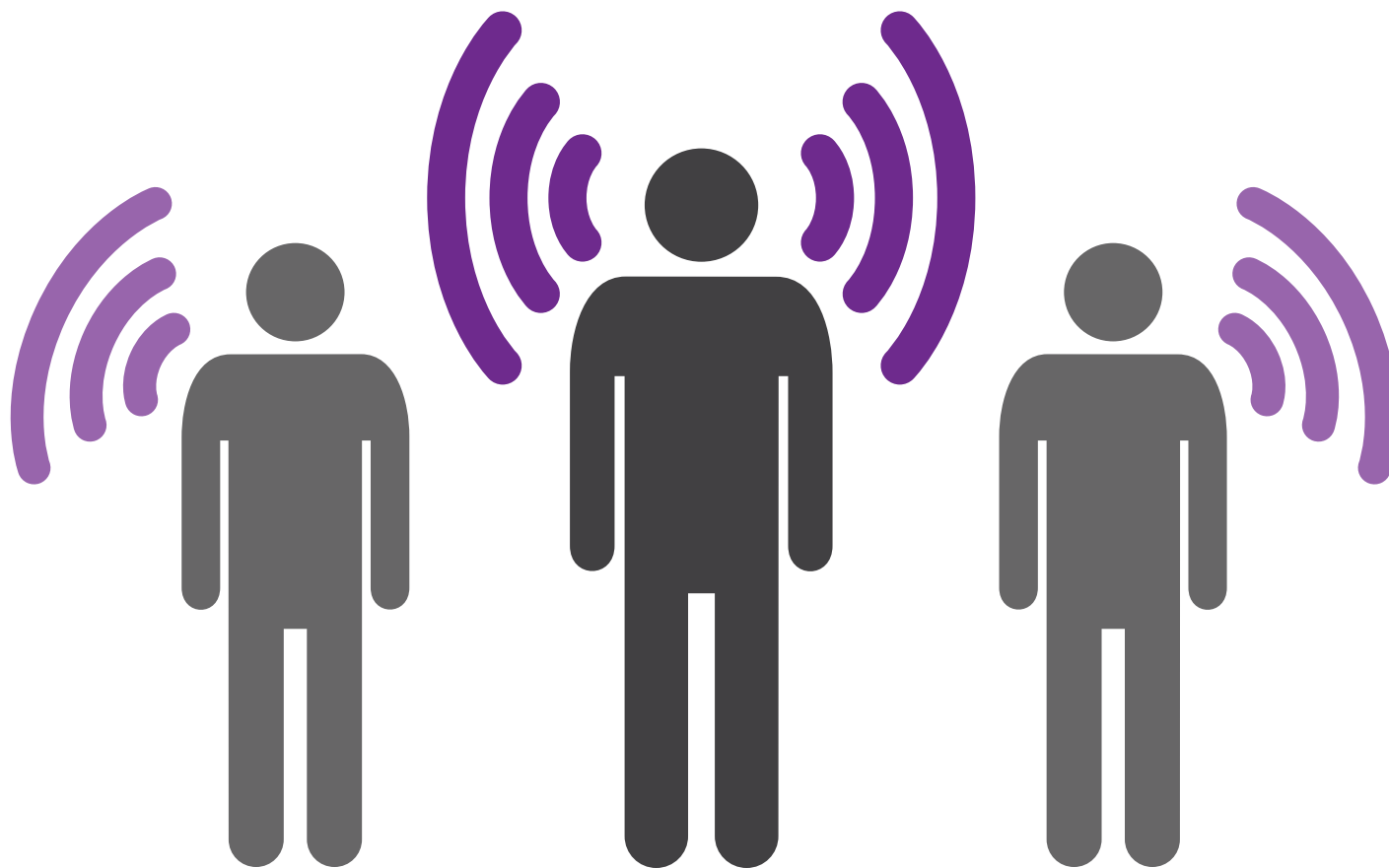
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This imaginary world is likely to remain just that – imaginary. But 'The Internet of Things' is becoming a reality and already enables objects, including humans, to communicate directly with one another without interaction with a computer. This term, The Internet of Things, was first used by Kevin Ashton in 2009 and means that objects, animals and people can be uniquely identifiable and have a virtual representation in an internet-like structure, through which they can transmit data by use of radio waves, such as WiFi, the Internet and MEMS (Micro-Electromechanical Systems). The data might be transferred by use of RFID (Radio-Frequency Identification), Near Field Communication and sensors, amongst other methods.

In iBytes edition 8 we looked at how RFID is already commonplace, for example to track vehicles going through toll bridges and on new-born babies in hospitals to alert staff if a baby is removed from the hospital. These cars and babies are uniquely identifiable on a network – the car has a unique tag on the dashboard and a baby wears a unique tag on the ankle. These RFID tags communicate directly with a reader when they pass by them and the data is sent to a network to record that the tagged car or baby has passed a certain point. In the case of the hospital, the computer system can then alert staff by setting off an alarm; it could even automatically shut doors to prevent the baby being taken outside of the hospital.

Watch a video   **Watch a video**

iBytes Edition 8

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Living in a smart world

The Internet of Things is still in its early days and most objects associated with it are what we call 'smart' devices, often used in our homes – there are now lighting systems available to buy that communicate with your smart phone so that you can change the colour of your lighting, dim the lighting or even switch lights on remotely using an app on your smart phone or tablet. You can have the lights set to specific colours at different times of the day to help you go to sleep at night, wake up in the morning and even an optimal colour for studying. The lighting effects can be controlled remotely so if you go away on holiday you can switch lights on and off to make it look as though you are at home, and deter burglars.

Similarly, home security systems are now being developed that can be controlled from a smart phone app. Combined with RFID tags for family members, a property can be monitored for who is at home and alerts can be sent if there is any movement in the house. The alarm can also be switched on or off remotely.

So what might a 'smart-home' look like in the future? Bill Gates designed and lives in his smart home already, where lighting, security, music and digital art are all controlled automatically. Visitors to the house don't have a data chip implanted in them but they do wear a pin that holds data about their preferences, so that when they walk into a room the thermostat adjusts the temperature to their preference, the music they like plays automatically and lighting is adjusted. Cameras and floor sensors can also track your movements. And when you walk past a high resolution screen, your favourite digital art will be displayed. There are obvious environmental and cost implications to a smart home – if the lights turn off as you leave a room or the thermostat turns down, energy is saved and bills are reduced.
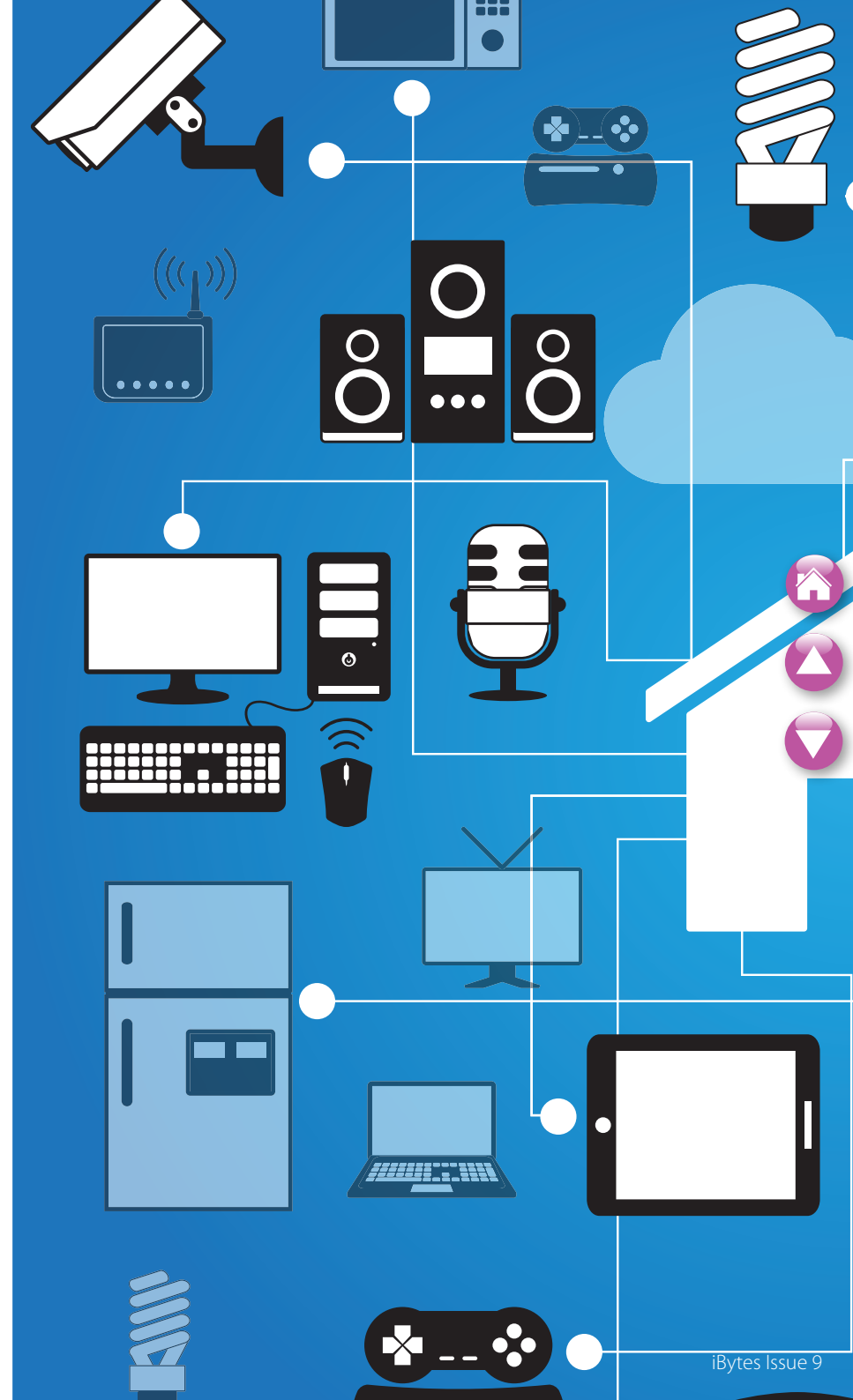
The smart home in 2014

Smart home alarm

Bill Gates' smart home

Watch a video   **Watch a video**

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How likely is it that, before long, pins such as those used at Bill Gates' home will be commonplace, storing data about us and communicating with the objects around us automatically? This type of world, where we have a choice about the data stored and whether or not we wear a pin, is much more likely than having a chip implanted inside us and a more appealing idea.

The OECD (The Organisation for Economic Co-operation and Development) last year predicted that "In 2017 a household with two teenagers will have 25 Internet connected devices. In 2022 this will rise to 50, compared with only 10 today." (http://oecdinsights. org/2013/01/21/smart-networks-coming-soon-to-a-home-near-you/)

Whilst a typical family home in 2012 had 2 smart phones, 2 computers, 1 tablet, 1 modem, 1 printer and 1 scanner, the OECD predicts that in 2017 the number of smart phones and tablets will rise and the list of devices will also include a connected TV, connected stereo device, smart meter, internet connected car, internet connected sports shoes and network attached storage. By 2022 it predicts we will also have connected light bulbs, connected power sockets, more connected sports devices and an intelligent thermostat, to name but a few.

These predictions of the rise in smart objects seems very likely since Google announced earlier this year that they were to purchase Nest®, a company that makes smart thermostats. The Nest® is a WiFi enabled thermostat, meaning that the temperature of your house can be controlled remotely. It also learns from what you do over a period of time and automatically adjusts its settings to your behaviour.

Eric Schmidt, executive chairman of Google told the Guardian newspaper in January of this year, that they already produce smart phones and tablets – "The Nest® is a natural evolution of those kinds of devices, and I think you should imagine that the Google technology applied to the things that Nest® do will be infinitely more intelligent, and infinitely more useable. We're making an important bet and I'm very excited about it." (http://www.theguardian.com/technology/2014/jan/22/googles-schmidt-nest-intelligent-devices)

Samsung are already producing smart objects, such as a washing machine that detects when your washing is clean and sends a message to your smart phone to inform you. Imagine if your whole house operated like this, with devices automatically performing tasks the way you like them done and telling you when the task is complete.

Web article   **Web article**

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Can the Internet of Things save lives?

So far, we have looked at how The Internet of Things is being used everyday to make our lives more convenient and pleasant. The Internet of Things also has useful applications in other areas of our lives and potentially lifesaving features. We mentioned earlier that newborn babies can now be fitted with an RFID tag to detect if they are taken out of the hospital ward. In addition, hospital staff could wear RFID tags that communicate with doors and hand sanitising devices to monitor cleanliness. Patients could wear RFID tags that contain important data about their medical history and medication, so that mistakes in administering medication are eliminated. After patients are sent home, they could also be monitored remotely to save time and expense of outpatient hospital visits or home visits by a doctor or nurse. This technology could be used to send data such as heart rate or blood sugar levels to an expert to check that medication is working.

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Teacher's Guide

Specification criteria map for GCSE ICT J461 and J061:

	Content Specification	Page number in specification	
ICT Systems	2.1.1	6	▶
Exchanging information	2.1.2	7	▶
Data management	2.1.4	8	▶
Legal, social, ethical and environmental issues when using ICT	2.1.6	9	▶
Monitoring, measurement and control technology	2.1.8	10	▶
ICT and modern living	2.1.9	10	▶
ICT Systems	2.3.1	13	▶
Current and emerging technologies	2.3.10	16	▶

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