BT Group

The Internet of Things (IoT)

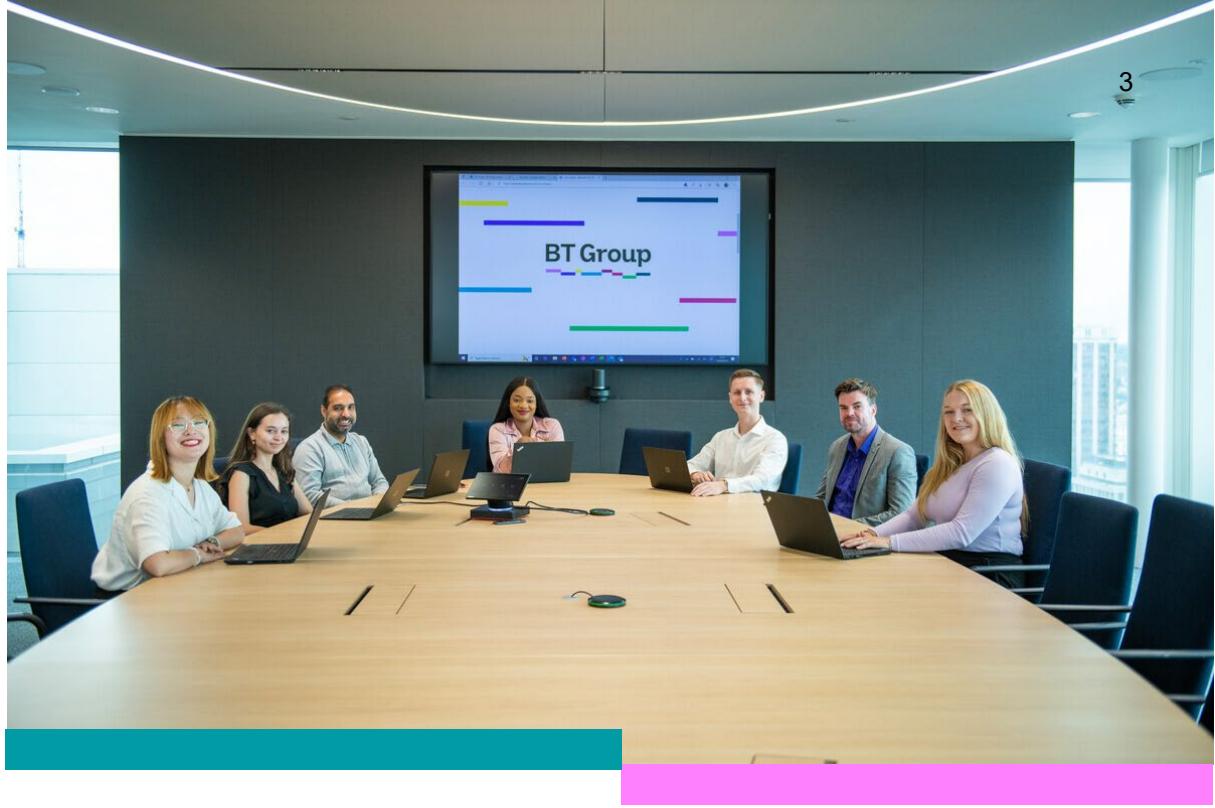
The IoT: a world of connectivity

In today's technological world, we are more **connected** than ever – in our **homes**, at **school** and across the **workplace**. By allowing **devices** to 'talk to each other' through the **internet**, we are able to **share information**, **operate machines** and **complete everyday tasks** even when we're towns, countries or even continents apart.



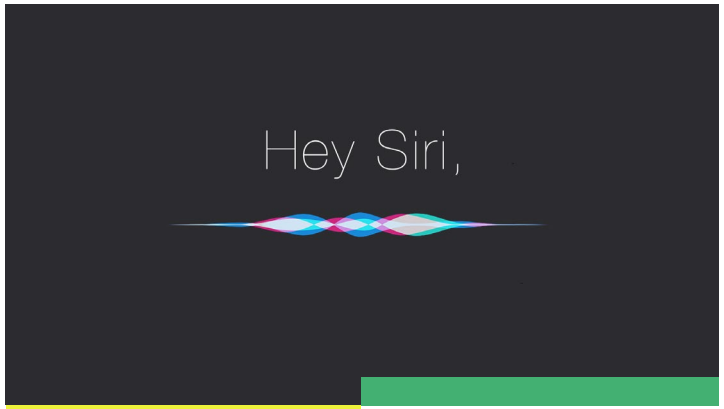
This is the **Internet of Things**, or the **IoT** for short.

The IoT refers to a network of devices that are connected to the internet.



Across many different industries, businesses like BT Group are using the IoT to devise innovative ways to connect businesses, customers and people all over the world. This can improve the way people work, make our day-to-day lives easier, and help companies provide better services to their customers.

Have you ever seen one of these?





Voice command apps like Siri, and fitness tracking devices like an Apple Watch are examples of IoT products you may already be familiar with. These devices connect to the internet and use sensors and data to share information and help us complete everyday tasks.

Big Thinking...

In this module, we will consider:

*What are the **risks and benefits** of the IoT?*

*Should smart **devices** be **allowed to make decisions** for us without our **consent**?*



Module overview

01

The IoT: a world of connectivity

Learn about the IoT and how it works through a series of interactive activities and roleplay.

02

The big IoT debate

Debate the possible ethical considerations of using the IoT in our day-to-day lives.

03

Product design challenge

Work in groups to come up with a new IoT product idea, using a 3D modelling programme to create visuals of your design.

04

Presentations and reflections

Module objectives

Today's lesson is one part of a module of four lessons.

By the end of the module, you will be able to demonstrate different technical and human skills that will help you succeed in a future transformed by technology.



Module objectives

This module will focus on the following skills:

- Technical skills: using and managing digital devices, platforms and apps
- Human skills: critical-thinking and problem solving



Lesson objectives

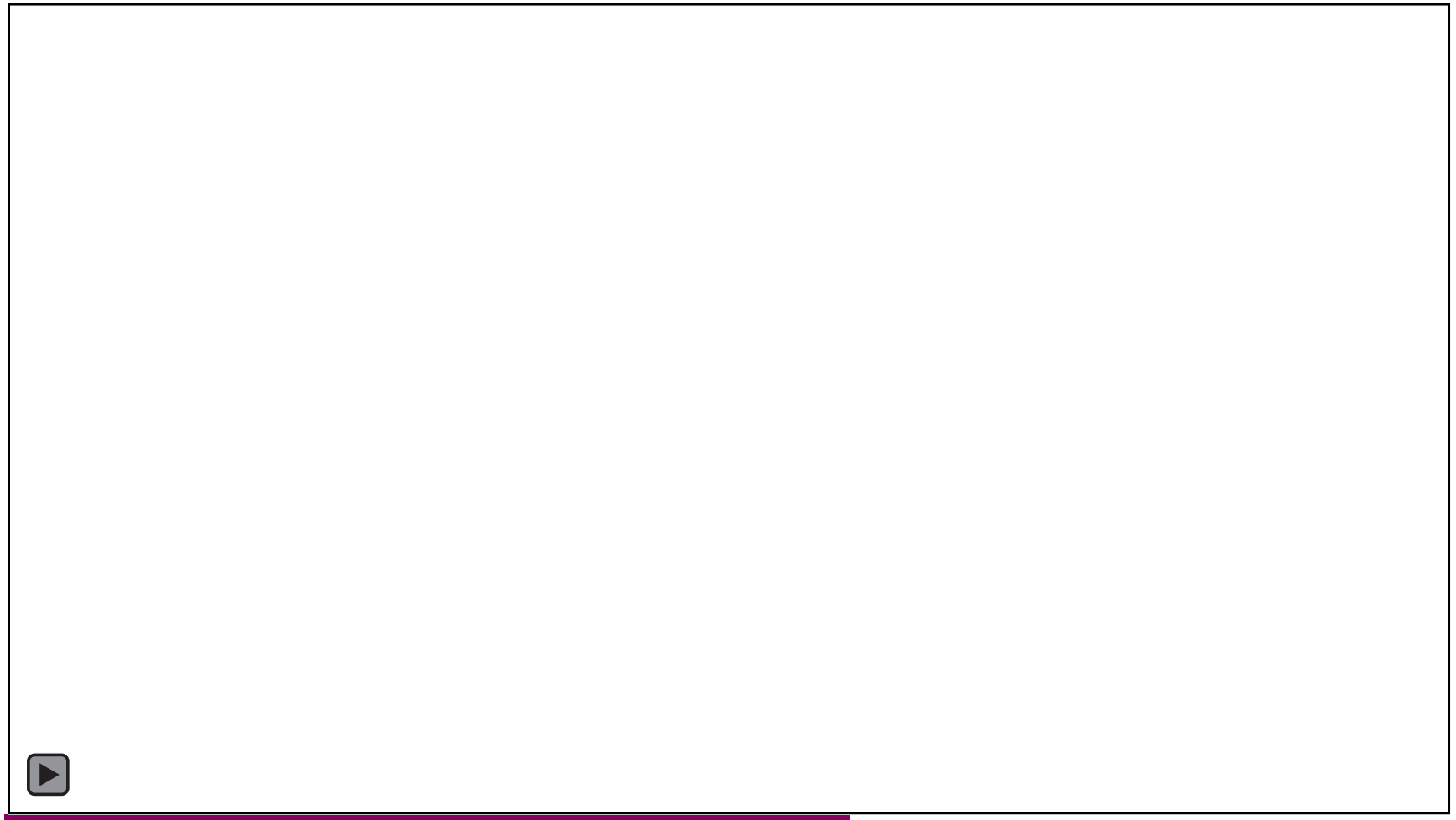
By the end of this lesson, you will be able to:

- Explain what IoT, metadata and APIs are
- Recognise key components of an IoT system
- Identify examples of technologies that use the IoT, understand how they work, and the technical skills needed



Exploring the Internet of Things

What is the IoT and how does it work?





Examples of IoT in the world

Healthcare

IoT can be used to remotely monitor patients' health so that they don't have to travel to the hospital. For example, an IoT can take data from a patient's heart monitor and send this to an app where doctors can view and analyse the information.

Household devices

All sorts of smart devices can collect data from sensors, cameras and microphones in our home appliances, allowing us to remotely control everything from TVs and sound systems to fridges and thermostats

Augmented reality

Augmented Reality (AR) glasses are computer-enabled glasses that help users see extra information about things they are looking at through the lenses. This information can be presented though the glasses' lenses as text, 3D animations or videos.

Satellites

Devices on earth can gather data sent by satellites with IoT sensors to provide real-time data on spacecraft missions. This can allow space centres on earth to receive updates and monitor the health of their astronauts.

Examples of IoT in the world

Home security

Sensors, lights, alarms and cameras can be connected via an IoT system and controlled by a smartphone app to provide round-the-clock security. There are also smart-lock systems which allow people to lock and unlock their doors from remote locations.

Customer services

Companies like BT Group use IoT to help their customers innovate how they live and work. For example, helping international businesses stay connected with employees across the world, or providing people with smart electrics systems so they can monitor and reduce energy usage.

Video games

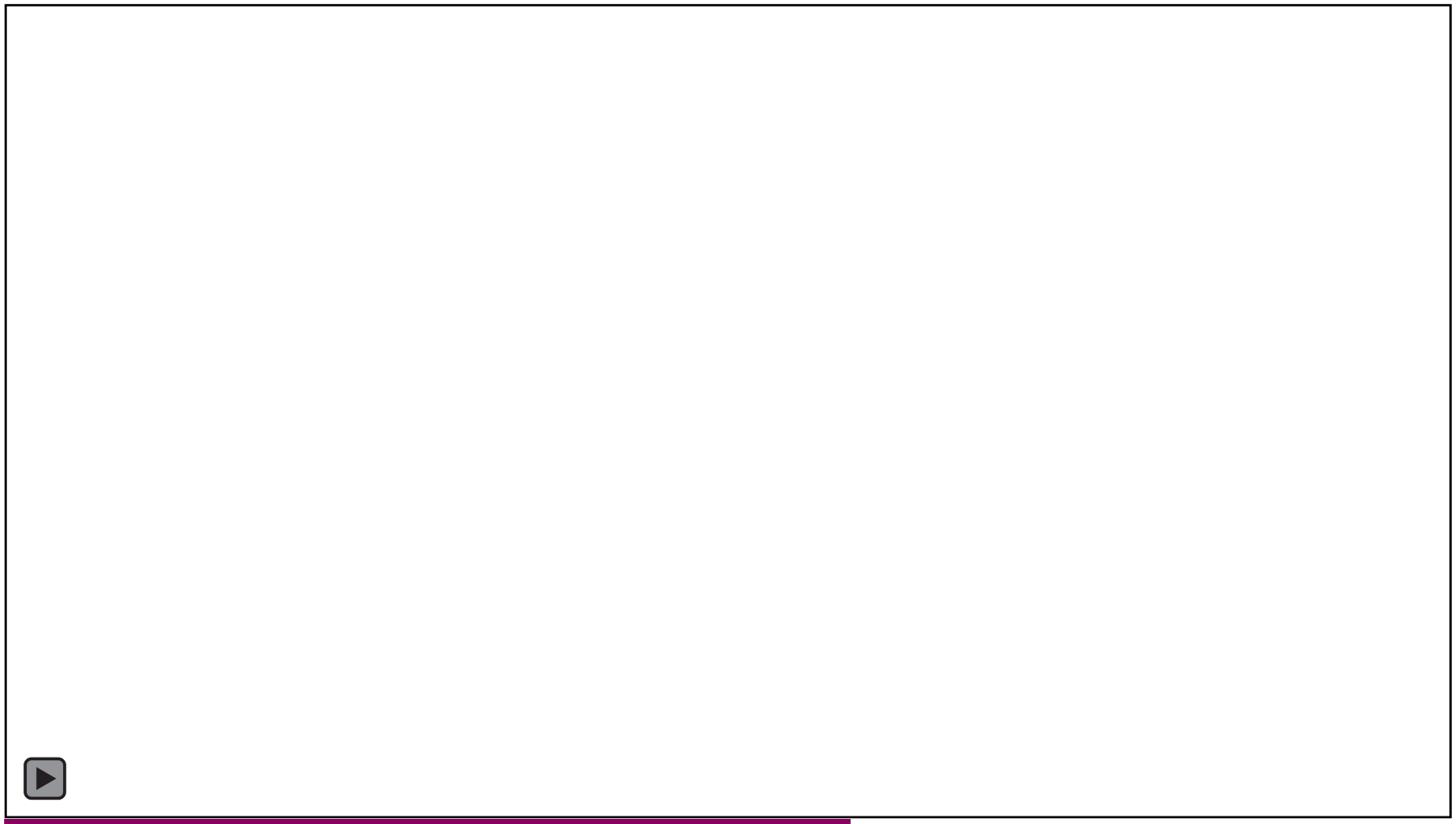
Sensors in game consoles can provide real-time data on players' movements and interactions, helping to make adjustments and improvements. IoT can also connect players based on their location, or use local weather data to change the weather within the world of the game for a more immersive experience.

Connected cars

IoT can be used to collect data from car sensors to detect driving patterns. It can also gather data to inform drivers about upcoming accidents or road closures. On top of that, car manufacturers can use IoT to make remote updates to the car's software, electric controls and more, saving the driver a trip back to the dealership.

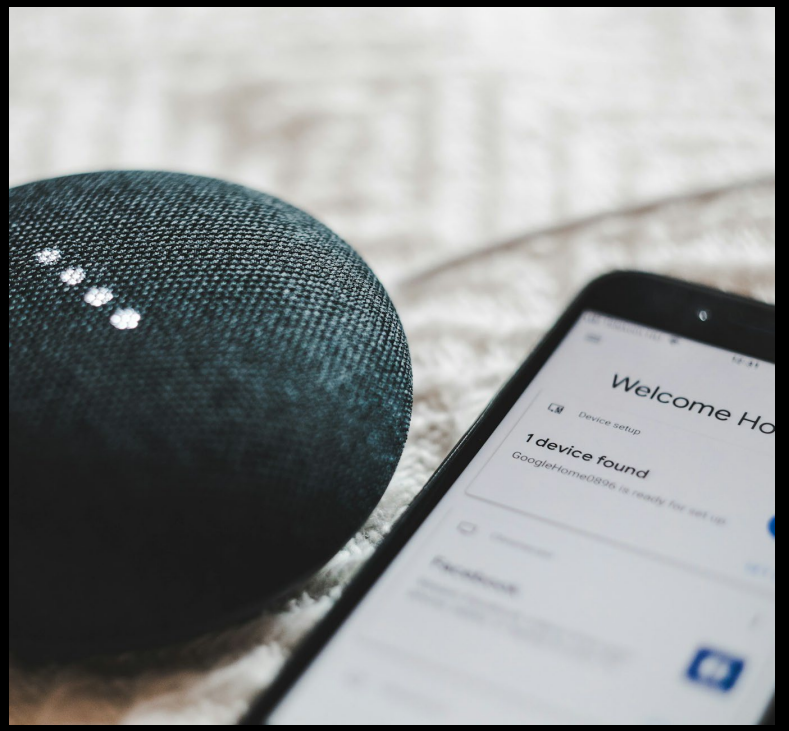


Hear more from Dominic, an IoT expert from BT!



Discuss...

What are some of the benefits that the IoT can bring to our lives?



The Internet of Things in our lives



How does Emma use the IoT?

1. Which IoT devices does she use, and how does she use them throughout the day?

2. What benefits does Emma experience from having IoT devices?

3. What benefits does using the IoT present for other people in Emma’s life?

Emma and her Internet of Things

I wake up late and panic. I must have missed my alarm! I check the bus timetable on my phone and, to my relief, the live updates tells me that my usual bus is a few minutes late. If I leave quickly, I should still be able to catch it and make it to tutorial on time. Crisis averted.

As I'm heading out the door, I can see dark clouds outside. I ask our smart speaker what the weather is looking like for today. It tells me there will be heavy showers, so I grab an umbrella before I leave. No bad hair day for me today.

Halfway to school, I remember that I've left my bedroom light on. Mum is always nagging me to turn it off because it wastes electricity. Luckily, we have an app that lets me control the lights from wherever I am, so I quickly do that. Which means no lectures this evening about being responsible for the planet and keeping the energy bills from going through the roof. Phew!

After school, I head to athletics club. Today, we're practising for the 100-metre sprint for next week's tournament. My coach has been really pushing me to beat my personal best, so I use the app connected to my smartwatch to check out whether I've improved since last time. I complete a circuit and see that I've done it in record time. Not only that, but the data shows me that my running style, fitness and recovery times have improved. Coach gives me a high-five and tells me I should be confident about next week's competition. Result!

Athletics club runs over, but thankfully I've got an app on my phone which shares my location with the rest of my family. Mum can see where I am and sends me a message to let me know that she'll keep dinner in the oven for me.

Once I've got home and eaten, I log on to our school's online learning platform. We have a group project that's due for tomorrow, but because of athletics running over, I haven't had time to go round to my mate's house to finish it. Luckily, the platform has a feature where we can talk to our classmates and submit homework online so that our teacher can track our progress and mark our work. We get the project done in no time, so we kick back and complete a level of the co-op videogame we've been enjoying. Mum's chuffed that I got everything done today and remembered the turn off the lights, so she says I can go to Jamal's house party at the weekend. Before going to bed, I use the voice command on my smartwatch to send Jamal a quick message telling him I'll be there on Saturday. What a day!

Reflect...

What would be the benefits and risks of allowing the Internet of Things to make decisions for us?



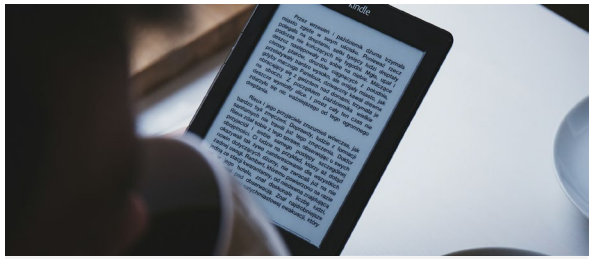
Metadata myth-busting

Metadata is a way of cataloguing data so that networks of apps, databases and systems can understand and organise information and use it more efficiently. It can describe:

- How the data was generated
- Where and when the data was generated originally
- What format the data is in (e.g. text, videos, images)



Examples of metadata:



E-book metadata:

- Book title
- Author name
- Contents



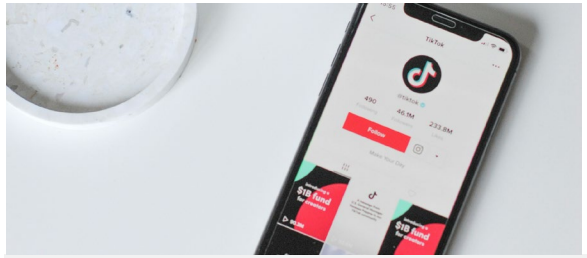
Phone camera metadata:

- Photo location
- Time of photo
- Photo file format



E-mail metadata:

- Time of email
- Recipient
- Subject line



Social media metadata:

- Author of the post
- Message type
- Time of the post

Quick-fire activity: Missing metadata

What would happen if these IoT devices didn't have the metadata they need?

A smart speaker like Siri or Alexa that is unable to connect to the internet.

An e-reader that is missing data on the contents of a non-fiction text.

A smart watch that is missing the data needed to pair with the user's phone

APIs, explained

API stands for **Application Programming Interface**.

In the IoT, APIs are used to **gather and transfer data** from a connected device to an application or computer.

An API is essentially like a **bridge or middleman** which **allows two devices to interact with each other.**



Behind the scenes: an example of an API in action

Emma realizes that she's forgotten to turn the lights off before going to school... again.

She logs into the remote control app on her phone that allows her to control the lights.

The app uses an API to connect to the lighting control server. This instructs the sensor back in the house to turn the lights off.

The app display on Emma's phone shows her that the lights are now all off. She can make her way on to school without having to worry about a telling-off later.

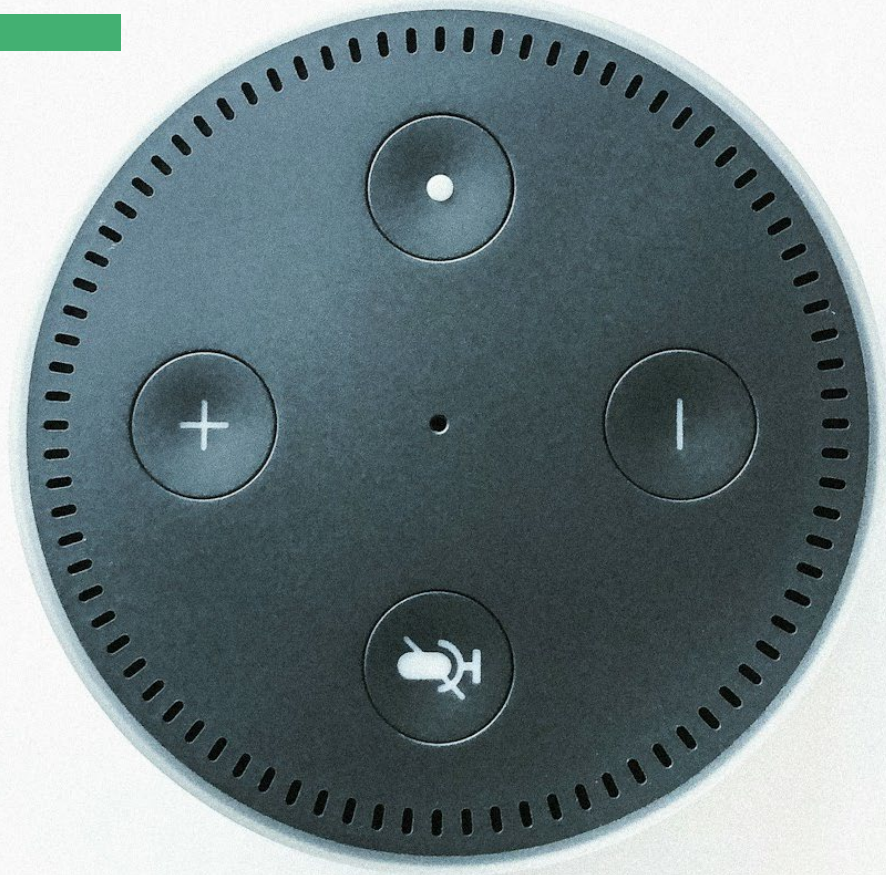
API roleplay

Imagine that you are packing for a festival at the weekend and want to know what the weather is going to be like.

You ask your voice assistant to tell you the forecast.

In your groups, devise a short role play showing how API would work in this scenario. Assign each person the following roles:

- The user
- The voice assistant device
- The API





Recap

What have you learnt today?

- What is the IoT?
- What are some benefits of being able to use the IoT?
- What are some ethical considerations of using smart devices to make our decisions for us?
- What is metadata and how is it used in the IoT?
- What is an API and how does it work?