* **Devices** - includes the computers, printers, routers and servers.
* **Media** - includes the cabling or wireless connections.
* **Services** - includes the software that support operations, such as email hosting.

Internet Protocol (IP) addresses are one of many protocols that operate within the Internet. Combining IoT ‘things’ and applications increases the number of protocols required.

Having agreed protocols that operate at a set **standard** allows for computers on different sides of the world to communicate with each other.

**A protocol is an agreed (or accepted) set of rules for a procedure.** For example, there are many protocols in place across the world that help to determine how people interact with each other.



In the same way, the internet has many protocols to make sure computers can interact with each other in an agreed, standard way.

The internet operates on a **layered structure**. When data is sent from one place to another, the data passes through different layers. Each layer has a protocol determining what and how information passes through.

It is similar to when you go to the shops to buy groceries. We can break that trip down into layers of operation - and at each layer there is a procedure you need to follow for a successful shopping trip!

* + 1. **You leave the house** – you need to remember to take your keys, wallet and shopping bag.
    2. **You get transport to (and from) the shop** – you either need to find the right public transport, or follow traffic laws while driving/riding and find a parking spot.
    3. **In the shop, you locate and select your groceries** – you follow a system of aisles and a way to choose your items.
    4. **You check out of the shop** – you need to use a payment method and have a way to carry your groceries home.

There is a set of ‘rules’ for each stage which must be followed in order for you to successfully complete your shopping trip. Failure to take a payment method, or failure to find a parking spot or the item you want in the shop, for example, may result in an unsuccessful trip.

The **Internet Engineering Task Force (IETF)** is the premier Internet standards body. They define the TCP/IP model (Transmission Control Protocol/Internet Protocol) which is the most common networking protocol suite.

**TCP/IP:** a set of rules that governs the connection of computer systems to the Internet

***Table:****TCP/IP Layers, Functions, and Example Protocols*

|  |  |  |
| --- | --- | --- |
| **LAYER** | **FUNCTION** | **EXAMPLE PROTOCOL USED HERE** |
| **Application** | Services to user applications such as web browsers. | Hypertext Transfer Protocol (HTTP) |
| **Transport** | Manages conversations between servers and browsers and divides data into segments to be sent down a layer. | Transmission Control Protocol (TCP) |
| **Internet** | Packages segments with source and destination addressing. | Internet Protocol (IP) |
| **Network Access** | Transmits data over a physical link. | Ethernet |

Standards and protocols exist so that messages can get through and miscommunication is minimised.

It helps to remember that **communication between machines** and **communication between people** fit the same model.