C1M1L2: Video transcript – Market

Welcome to the first lesson of this first module about **embedded systems**. At the end of this lesson you will be supposed to understand the **vast application areas** of embedded systems and you should be able to tell the enormous difference between very **small and independent** ones on the one hand and **large interconnected systems** or **system of systems** on the other.

Let us start with a simple case: a **heating temperature control system**. Here I have an old version of it. It is nothing more than a **bi-metal** that can be set by rotating a wheel so as to close or open a contact around a pre-set temperature. This is a very **simple** and as such a very **robust** device and if it fits the purpose, then why not. However, this is not an embedded system. Indeed, there is no microprocessor and no memory and in order to qualify as an embedded system. But why would I insist on using a microprocessor?

Suppose we want to regulate the temperature during specific periods of the day and even make a difference between the days of the week.
This **extra intelligence**, making the device somewhat **smarter**, is harder to build mechanically. Why not resort to some microprocessor technology that can help us walk the extra mile?

This here, is a more sophisticated version. It has a **display** and it has **configuration buttons**. Also, to actually make this device work, we will need **power**, direct current or rather power delivered by **batteries**. Yet, batteries have a limited output, which makes **power consumption** an important issue.

Now that we decided to equip our device with a small computer, we have reached a point where we can make the device even **smarter**. By adding a network interface, and by means of Bluetooth, we can access the device from our **smartphone or tablet**.

Or better even: we can connect it any which way to the internet so that we can **control** it from basically everywhere. Then our temperature device becomes an **Internet of Things** device, and that rings a bell, doesn't it?

The system we previously discussed today is better known as **domotics**, or, if you wish, as **building automation**. Building automation is an important embedded system in the market. It is booming business, since durability, i.e. in this case the maximal **reduction of energy consumption**, is a hot topic. Don't we all want to avoid or reduce the global warming? Not only it helps to conserve the planet, it is also big business. The market is expected to explode in the coming years.

Of course, building automation is not the only market segment that cherishes embedded systems. It in fact represents a fairly new market.

The oldest market with the oldest embedded system is the **factory automation** market. There, we notice quite a gap between the different embedded systems in the factory - like welding and gluing robots in the car industry - and for example the pumps and valves control in the chemical industry.

We also notice a quite peculiar requirement that has become obsolete: these systems have to be **operational for 30 years**! Compared to the expected and accepted **lifetime** of our smartphone, we may end up worried.

Medicine has recently made tremendous progress due to the use of computer technology in modelling DNA. But the progress is not only showing in the world of big data. Medical instrument are nowadays far more sophisticated and smart than they used to be. Some spectacular examples are the different sorts of **scanners** available today including the possibility to make a **3D presentation** of what happens inside our body, including our brains. **Remote controlled surgery** is another example.

There are a lot more markets for embedded systems, but we pick out those that continue to considerably change our daily lives.

This is certainly the case for the **automotive** development. Fully automated cars are not that futuristic. Google for example, as has been abundantly reported by all media, is investing a lot in **driverless electric cars**. The car manufacturers continuously introduce new “features” that make their cars smarter and even smarter in **assisting the driver**. The car manufacturers go step by step while Google tries giant leaps. The first are well aware that it takes a lot of specific legislation and a standardised road infrastructure before fully automated cars can be commercialised.

Yet, be sure that, one day it will happen and people will wonder how they could possibly have lived otherwise before.

We could continue for some time talking about **markets** like **transport**, **aerospace**, **telecom**, **computer peripherals**, telling what is specific about them. What counts is that, in the end, it is all about **interconnected microprocessor based systems** that serve a **dedicated purpose**. The software makes the systems smart and smarter by the day. By giving this overview, we hope to have stimulated your curiosity to know more about the characteristics of embedded systems. Stay tuned.