# The IoT ecosystem

There are several ways to define IoT systems. I believe the best one is the ecosystem analogy because it allows us to focus on the right things and the right interactions. Let's take some definitions of an ecosystem to demonstrate my point.

The first definition is from the Merriam-Webster dictionary: "An ecosystem is the complex of a community of organisms and its environment functioning as an ecological unit". There are three key words in this definition that could be applied to an IoT system: complex, community, and unit. IoT is complex, no question about it. We should acknowledge this before tackling the task of developing an IoT solution, otherwise the project will either fail or will be a bad solution that won't solve our needs. The second key word is community. I don't think there is an IoT solution where a single provider is used. The sensors will be provided by one vendor, the gateway by another, the network by a third one, and the cloud solution by a different company. All of them will form an IoT community which must work together to achieve success. They must work as a unit -the third key word-, because otherwise the ecosystem would collapse.

There is another important point in this definition: the relationship between the community and the environment. IoT could be described as a mechanism to get information from the environment and supply it to the community for consumption. In Nature's ecosystem the interaction between components creates nutrient cycles and energy flows. In IoT's ecosystem what flows is data.

This takes me to the next analogy. One of the main concepts of an ecosystem is the energy pyramid, which describes how the energy flows in an ecosystem. A producer brings the energy to the ecosystem and then a chain of consumers transform such energy according to their needs.

In an IoT system, we can replace "energy" with "data" and define the "data pyramid":

IoT Data Pyramid
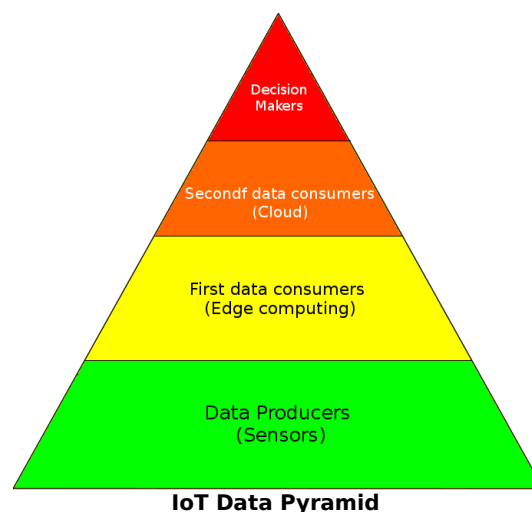
The sensors will bring the data to the system and a chain of data consumers will transform data until it reaches a level where a decision can be made (e.g. turn on/off a device, reconfigure a service, plan for new services, etc.).

The ecosystem analogy can be very useful to frame the IoT projects and to find out the relationships between components. This would be a good first step for achieving a successful implementation of an IoT system.