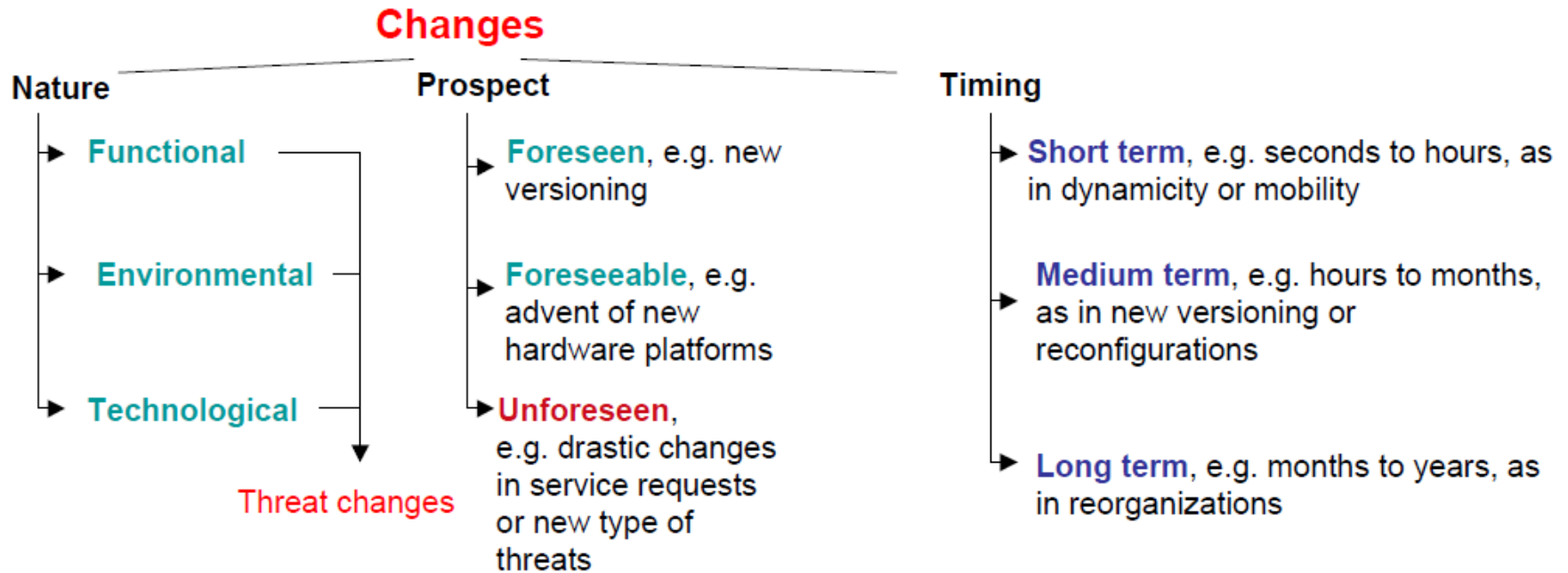# Resilience

On the term resilience

The term resilience has been used in many fields and, as a property, two threads can be identified: a) in social psychology, where it is about elasticity, spirit, resource and good mood, and b) and in material science, where it is about robustness and elasticity.

The notion of resilience has then been elaborated:
- In child psychology and psychiatry, referring to living and developing successfully when facing adversity;
- In ecology, referring to moving from a stability domain to another one under the influence of disturbances;
- In business, referring to the capacity to reinvent a business model before circumstances force to;
- In industrial safety, referring to anticipating risk changes before damage occurrence.

A common point to the above senses of the notion of resilience is the ability to successfully accommodate unforeseen environmental perturbations or disturbances

Resilience (for computing systems and information infrastructures):

the persistence of service delivery that can justifiably be trusted, when facing changes

Changes

Nature
- → **Functional**
- → **Environmental**
- → **Technological**

  Threat changes

Prospect
- → **Foreseen**, e.g. new versioning
- → **Foreseeable**, e.g. advent of new hardware platforms
- → **Unforeseen**, e.g. drastic changes in service requests or new type of threats

Timing
- → **Short term**, e.g. seconds to hours, as in dynamicity or mobility
- → **Medium term**, e.g. hours to months, as in new versioning or reconfigurations
- → **Long term**, e.g. months to years, as in reorganizations

Resilience Engineering:

How to design, implement, operate etc. complex systems so that they can be resilient

The requirements for a system can be clustered into four groups:
the **Known Knowns** – what we know that we know
the **Known Unknowns** – what we know that we do not know
the **Unknown Knowns** – what we pretend not to know even if we know
the **Unknown Unknowns** – what we do not even know that we do not know

The KK and KU groups are the easiest since they include all requirements
that can be deterministically considered in the design

Understanding the new risks and threats;

- Understanding the boundary-less nature of systems;
- Dealing with increased scale and complexity and criticality;
- An assessment based on user perception
- Dealing with changing environments.

It is impossible to anticipate all the possible situations and events that could happen and that could lead to failures with possible catastrophic consequences.
This means that we are going to operate quite critical systems whose design has been made in *ignorance* or in *complete unawareness* of their requirements.
It is evident that a correct and accurate assessment of the resilience of these systems is questionable or impossible.