

Resilience of IoT Systems

Kemal A. Delic

We are witnessing the rise of always connected, omni-present systems, gadgets and sensors amounting to the Third Wave of Internet – in which 30-50 billion devices will be present. At this level of scale, scope and size, we will be facing the problem of monitoring and management of the ultra-large scale systems.

Assuming that the scale and dynamics of IoT will be very different from the current web situation, we believe that the resilience of the IoT system will become of prime importance. System resilience implies the capability to resist perturbances and crises, to recover from emergencies and near-catastrophes, and the ability to adapt to a constantly changing environment.

Such capabilities of resilient systems are possible via careful architecting, design and engineering of IoT system-of-systems. In all practicality, this is a vast area of future exploration and engagement of scientists, researchers and engineers, promising to render not only new scientific insights, but also tangible business benefits and job creation opportunities.

At a very high conceptual level, IoT can be considered as a hierarchical tree of self-regulating and self-managing sub-systems and devices. For effective and efficient management, the entire domain will be covered by the host of sensors and actuators, which means high-density connectivity and very low system latencies. This is fine while the system is in a stable regime, while easy and fast propagation of perturbances may create important stability and resilience problems. Considering possible crashes and catastrophes, and assuming that this would be a global weaving of fabrics, one can only guess the magnitude of the risks taken.

In conclusion, the convergence and fusion of mobile computing, the growth of big data, privacy and security concerns of cloud infrastructures, may lead to a new wave of technology developments and a new type of economic player. We call this the Digital Enterprise - which, by its very nature, should be resilient.

Readings

1. The Third Wave: Internet of Things - ACM Ubiquity Symposium Symposium, 2014
2. Kemal A. Delic ,Paul M. Bourguine, “Resilience of Complex Systems”, ECCS13–Barcelona Sep 2014
3. Round Table : Internet of Things – IEEE ICAT 2013, Sarajevo Oct/Nov 2013
4. Jeff A. Riley - Kemal A. Delic, “Resilient Enterprise Clouds’, Resilient ICT, Sydney 2014
5. Kemal A. Delic – Ramic Malik, “Architecting Resilient SCADA Systems, IEEE, Venezia 2014