The Autonomous Industrial IoT

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A collaborative, and autonomous industrial IoT seamlessly combining the digital and physical world, from a technological as well as an economic point of view, is preparing a machine economy for mankind.

Digital transformation is a continuous and unstoppable process that influences the daily life of every one of us. It impacts all areas of the global society the research and education area, business and companies, individuals and society, and the governmental, political, and legal sector. It is shaping through a close interplay of these fields in a continuous, unpredictable change process driven by the digital transformation enablers: new digital applications, new digital infrastructure, new value networks, and new digital business models with smart devices, smart services and importance of data and information dominating. Previously well-known value-chains transform to value-networks with an unpredictable number of new opportunities accompanied with a never seen complexity. Business models previously centred around specific products and services transform to an outcome orientation, where only quantifiable results are sold which matter to their customers – in the sense of everything as a service. Traditional industrial boundaries get blurred, old ecosystems get disrupted and new ecosystems evolve. A major role in this digital transformation plays the Internet of Things and accompanying technologies from the Edge – Cloud continuum.

We see a strategic importance in building distributed, collaborative systems in order to empower customer to build solutions with reduced CAPEX and OPEX costs at highest quality of products and solutions, and the flexibility to adapt to business needs. In the 4.0 era, the ability to produce, integrate, and operate devices, systems, solutions more efficiently should become a key differentiator in industrial competition for cost and resource efficient product, solutions, and services at highest possible quality. Future differentiating capabilities where existing isolated smart devices, systems, and solutions are enabled to be dynamically interlinked into distributed, collaborative autonomous IIoT systems. Business models previously centred around specific products and services transform to an outcome orientation, where only quantifiable results are sold which matter to their customers – in the sense of everything as a service. Traditional industrial boundaries get blurred, old ecosystems get disrupted and new ecosystems evolve.

The vision of an autonomous, collaborative IIoT it to build and research the technical foundation to bring business capabilities even to the smallest technical system. This can only be achieved by combining in the core design of systems the latest AI, optimization, and distributed decision taking technologies to achieve a higher level of autonomy of the systems, new ways of designing mobile system interaction by applying latest distributed software and communication technologies, and latest research results to reach trust in heterogenous, distributed systems. In addition, this needs to be complemented by other latest research, e.g. from the field of resource orchestration in the Device-Edge-Cloud Continuum, observability, app metering, and mobile computing. AI needs to be applied in a way that multi-objective optimization can take place from sustainability KPIs to performance KPIs. To achieve this vision, it requires a full stack integrative view on the design of new systems, which brings together research topics, which might be tackled separately today.

This would empower all kind of stakeholders in the ecosystem to take advantages of the capabilities which have been developed by Cloud Business Models, where you access all kind of services in an everything as a service manner.

Combining the vision of the business enabled autonomous, collaborative IIoT with the objective of an industrial metaverse, where the boundaries between the physical and digital world vanish more and more, would bring in at least two additional advantages of high value: first, augmenting each device, system, and solution with a digital twin, would allow for a higher potential of autonomous system optimization, efficiency, and integration across the lifecycle; second, the industrial Metaverse approach would allow the human to be an integral part of the system from design to operation to usage to failure management, such the system gets more transparent.

The combined vision of an autonomous, collaborative IIoT combined with the industrial Metaverse perfectly matches the "Design for Change" paradigm, which is needed in today's volatile markets. In addition, it would also bring unique technical capabilities to important new and existing domains, like, e.g. mobile autonomous factories, critical infrastructure, new space scenarios.