

# **Can the Internet of Things evolve to support a multiple trillion sensor world?**

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The IDC estimated that there were 10.3 billion smart devices interconnected over the Internet and the wireless Internet (wifi) in 2014, and forecasted growth to 29.5 billion by 2020. Dire warnings have been sounded regarding the ability of the Internet to meet this forecast demand. It is generally agreed that new approaches to networking are needed, both in terms of software and hardware infrastructure. In the dynamic Schumpeterian winner-take-all-or-most industrial environment of Silicon Valley and beyond, Internet giants and start-ups alike have been competing to produce what will become the next dominant smart device networking protocol, the next smart device networking software, the next dominant smart device operating system, or the next dominant smart device chip. Because of this fierce market competition, and because the breadth and scope of the technical issues preclude comprehensive collaboration or coordination, there is a void in sector-level technology monitoring and development. In the present article we seek to fill this void by providing a third generation-style technology roadmap for TSensor Systems, using techniques developed in our roadmapping effort for the contemporary pharmaceutical industry. In this roadmapping technique we first identify drivers and consortia. We then identify relevant technology components, namely multiple root technologies, multiple unit cells, multiple critical dimensions, strict boundary conditions constraining innovations and products, a heightened importance of drivers, and a more prominent role for consortia. These components include chips and nanogenerators, enhanced lithium ion batteries and supercapacitors, and standards and protocols. We also identify the Technology Readiness Levels (TRL) of those components. The overall TRL for the TSensor Systems landscape is 4/9, "Component and/or breadboard validation in laboratory environment." We then combine these analyses into a TSensor Systems Technology Landscape.