Implications of the "Internet of Things" to silicon scaling and the microelectronics industry

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The remarkable evolution of human society has been driven by information. As information became digitized thanks to silicon technologies, creating, sharing and searching of data have become much easier. Silicon scaling technology has been at the core of this information revolution, as it forms the basis on which the digital devices, such as computers, smartphones, and tablets, are built. As the feature size of silicon technology approaches sub-10 nm, there are concerns that it will not satisfy the demand for high performance devices through further scaling. However, through innovations in materials, structures and processes, it will continue to provide higher performance components to electronics systems for the coming decades. With performance-enhancing technologies, such as 3D IC and through-silicon vias (TSV), and systems technologies on servers, clients and connectivity between them, the data-driven world will continue to expand in the future. In this paper, the future of silicon technology and future directions spurring from its advancement will be presented. Furthermore, the implications of everything being connected to the Internet for our industry, as well as our society, will also be discussed.

All these technological advances will also breed new applications and influence other fields: *e.g.* the "Internet of Things" (IoT), mobile healthcare, *etc*. This, in turn, will increase the number of devices, which have to be connected to a central system in order to effectively collect, manage and make use of the data. According to a recent market research report, there will be more than 30 billion devices that will be wirelessly connected to the Internet by 2020 [1]. The corresponding amount of digital data that will be created, replicated, and consumed may reach 40 ZB (zeta bytes) [2]. Silicon technologies will be adding useful attributes and connectivity to all possible objects. This will obviously cause a significant load on the network traffic, such that it is anticipated that by 2017, the network traffic will be 7.8 ZB, nearly twice that of 2014 [3]. As more than half of IP data traffic will be video data [4], the content-rich, power-hungry multimedia applications will be exhorting more pressure on the demand for higher performance processors, faster connectivity and larger capacity data storage, while minimizing the form factor and power consumption.

1. ABI Research, "More than 30 billion devices will wirelessly connect to the Internet of Everything in 2020", May 2013, *http://www.abiresearch.com/press*
2. IDC, "The digital universe in 2020: Big data, bigger digital shadows, and biggest growth in the far East", 2012, *http://www.emc.com/collateral/analyst-reports/idc-the-digital-universe-in-2020.pdf*
3. *http://www.cisco.com/c/en/us/solutions/collateral/service-provider/global-cloud-index-gci/Cloud_Index_White_Paper.html*
4. *http://www.cisco.com/c/en/us/solutions/collateral/service-provider/ip-ngn-ip-next-generation-network/white_paper_c11-481360.html*