Breaking through the scaling boundaries, key for a sustainable society

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Several key societal challenges in domains such as healthcare, energy, urbanization and mobility call for sustainable solutions that can be enabled by combining various technologies. These solutions will be backboned by wireless sensor systems, smart mobile devices and huge data centers and servers, the key constituents of a new information universe. They will require extreme computation and storage capabilities, bound by (ultra)low-power or heat dissipation constraints, depending on the application. This drives the need to keep on scaling transistor technologies by tuning the three technology knobs: power/performance, area and cost. To get to ultra-small dimensions, advanced patterning integration, new materials, and new device architectures are being introduced. This comes along with an increasing need for process complexity reduction and variability control. Equally important are the continued R&D efforts in scaling memory technologies. NAND Flash, DRAM and SRAM memories are now approaching the point where new scaling constraints force exploration of new materials, cell architectures and even new memory concepts. This opens opportunities for resistance based memories such as resistive RAM, phase-change RAM or spin-torque transfer magnetoresistive RAM.