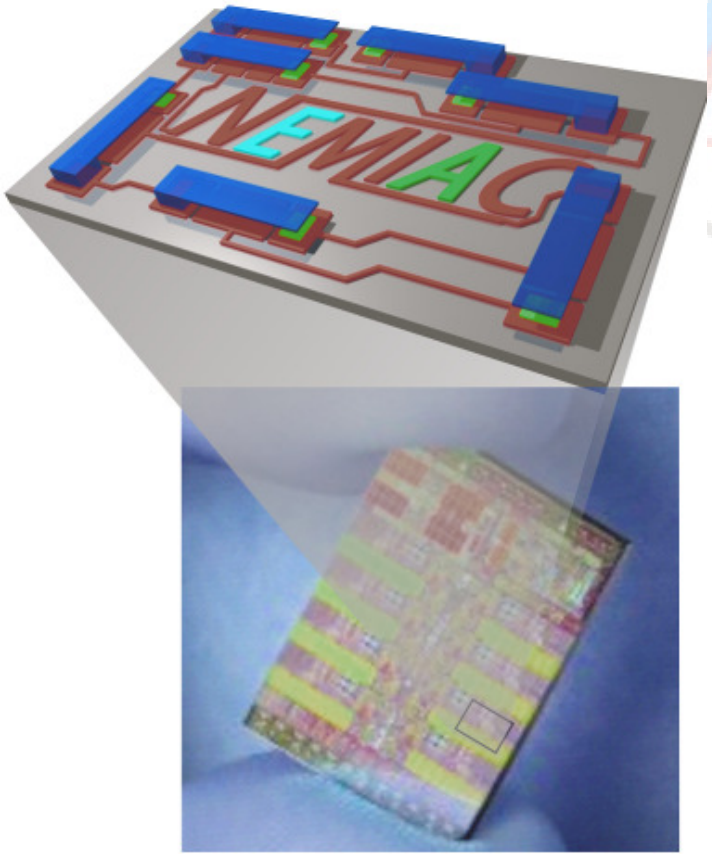

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NEMIAC

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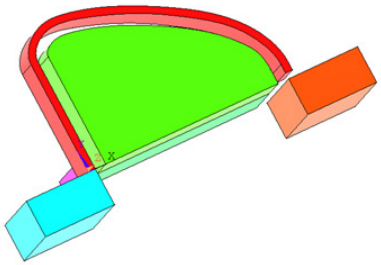
Nano-Electro-Mechanical Integration And Computation

Building ultra-low energy digital logic processors using relays

What is it?

Electromechanical relays are bulky components that have traditionally been used for switching in electrical circuits.

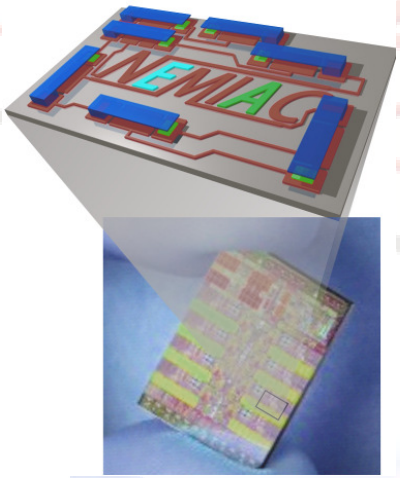
The NEMIAC project aims to realise relay functionality in Silicon based nano devices that can be batch manufactured on wafers. A large scale integration of these devices on a single chip would enable the implementation of logic circuits using NEM relay primitives.



NEM-relay based logic circuits promise very high energy efficiency, and have the potential to enable a new class of devices for ultra-low power computing. One exciting possibility is the potential energy saving in autonomous sensor nodes that operate on power provided by emerging energy harvesting devices. **The convergence of ultra-low power electronics and energy harvesting devices could result in the emergence of a new class of applications that essentially run forever - autonomously, remotely and without a battery.**

Thus, NEM technology has the potential to be a key enabler for the next generation of smart components characterised by ultra-low power consumption and advanced functionality. Many industrial and civilian application areas, including environment habitat monitoring, healthcare applications, home automation, traffic control, industrial process monitoring and machine health monitoring will benefit from this technology. Within this project, switches suitable for digital logic circuits will be explored and developed along with innovative circuit architectures.

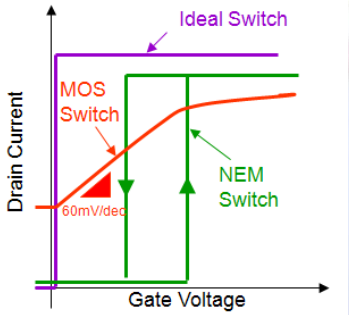
Why this approach?



Solid-state electronic circuits based on semiconductor transistors have been the dominant solution for logic circuits in the past decades, mainly due to benefits of transistor scaling. With scaling down of transistors, their switching speed as well as their energy requirement has improved.

However a major bottleneck is power consumption, due to a lower limit on the energy of a binary switching transfer in CMOS imposed by material limits. Therefore, after a certain size any scaling down of transistors does not lead to improvements in the power consumption.

When used as a switch, the NEM relays exhibit low power characteristics with practically zero off-state leakage current. The switching is also abrupt with a high on-state current. Such technology possesses the capability to free the next generation of smart components from CMOS imposed power constraints.



Consortium

The consortium is led by IBM Zurich, and the other partners are STMicroelectronics, Royal Institute of Technology (KTH), University of Bristol, École Polytechnique Fédérale de Lausanne (EPFL) and Lancaster University.

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