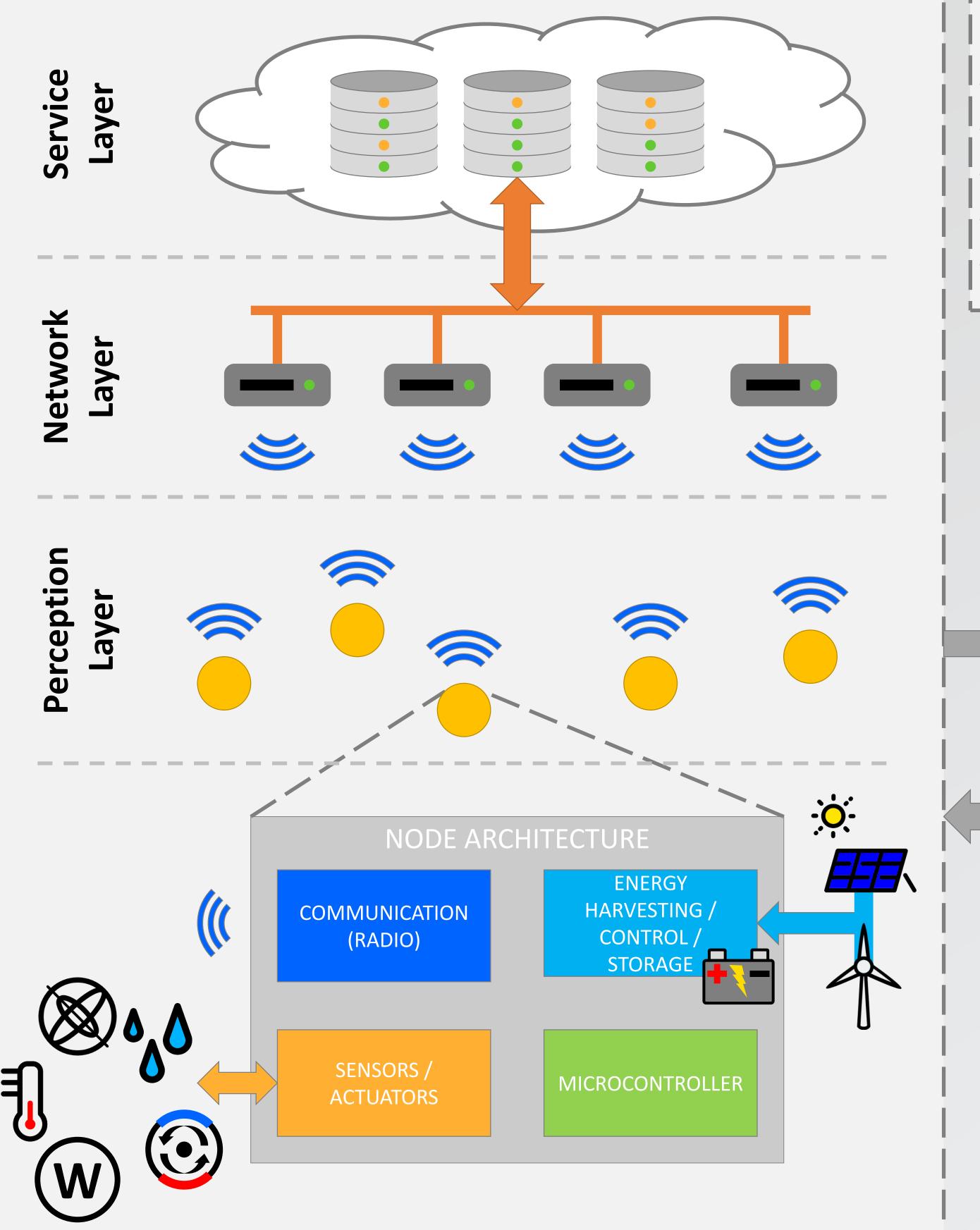


Exploration of magnetic memory for ultra low-power systems-on-chip



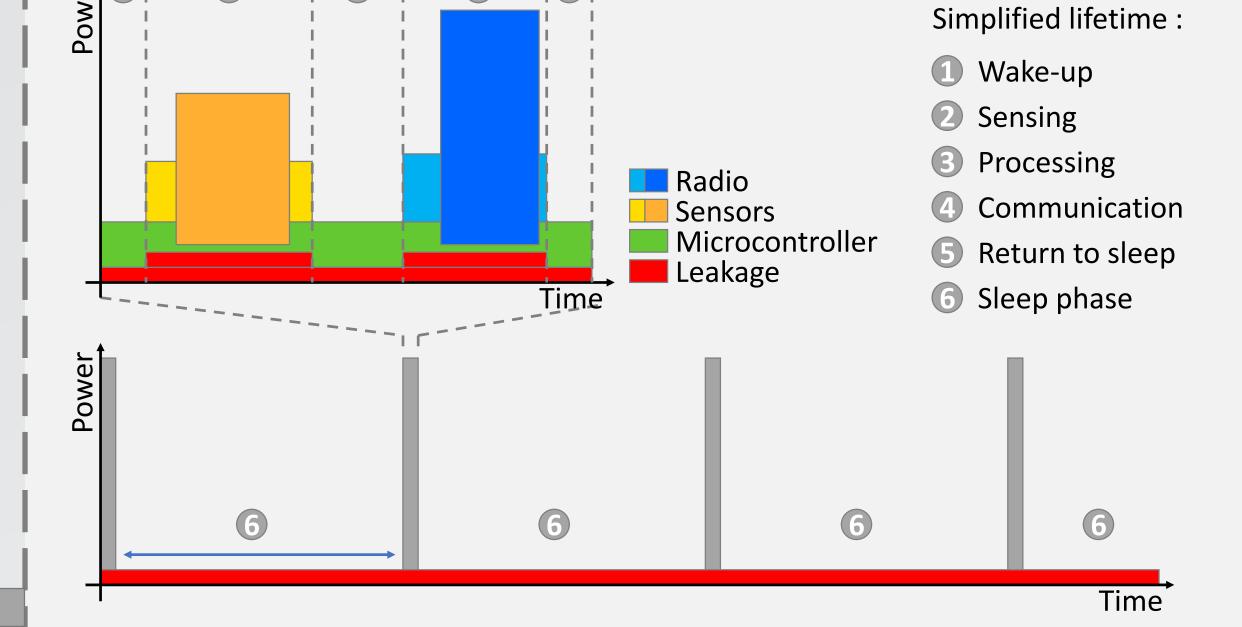
Guillaume Patrigeon, Sophiane Senni, Pascal Benoit, Lionel Torres

Using benefits of emerging Non-Volatile memories in ultra low power systems-on-chip to reduce power consumption for Internet of Things devices



High constraints: \rightarrow Reliable \rightarrow Secure \rightarrow Low cost \rightarrow Low size \rightarrow Long lifetime

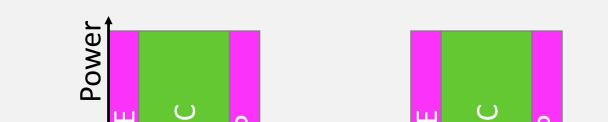
Reducing the battery size and energy harvesting devices size means less energy power available. To keep a long lifetime, it is very important to reduce power consumption.



The final application defines the duration of the sleep phases. In a lot of applications which need long sleep periods, the energy consumption during sleep phases is higher than the one during running phases.

MRAM-BASED MICROCONTROLLER





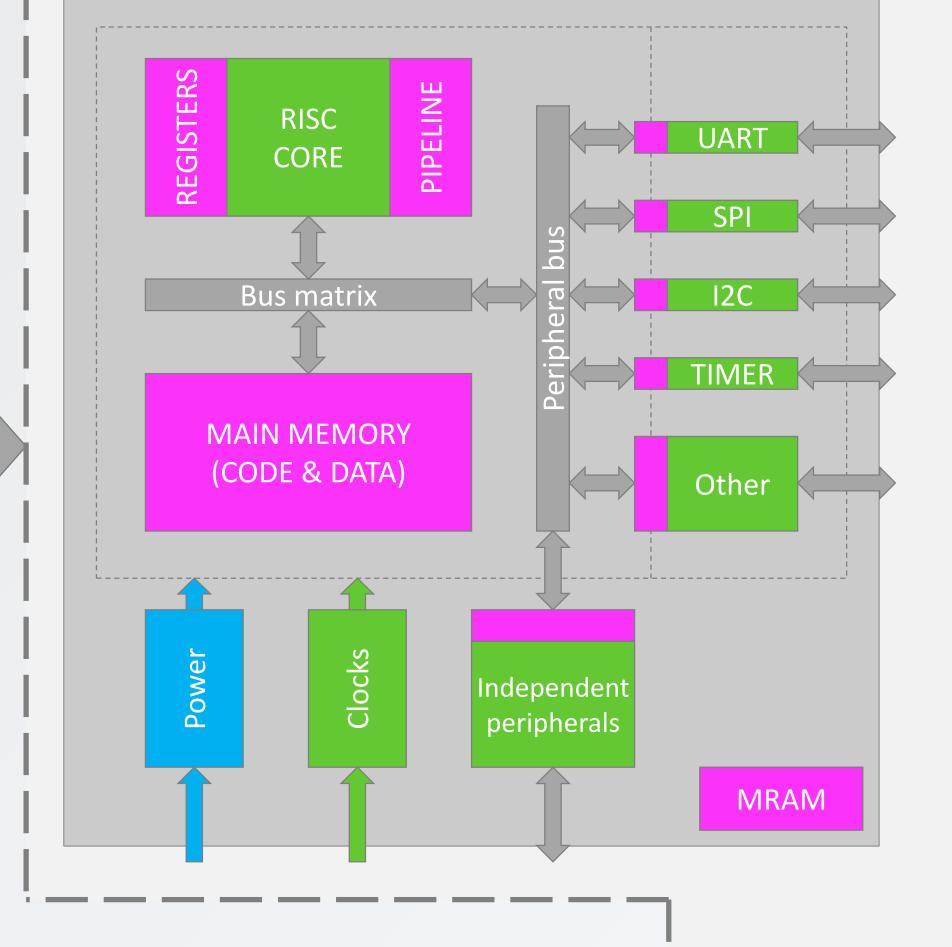
RISC 32-bit MRAM-based MICROCONTROLLER

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CONCEPTION & VALIDATION

When devices (radio, sensors, actuators...) are unused they can be powered off. But the microcontroller should stay allways active.

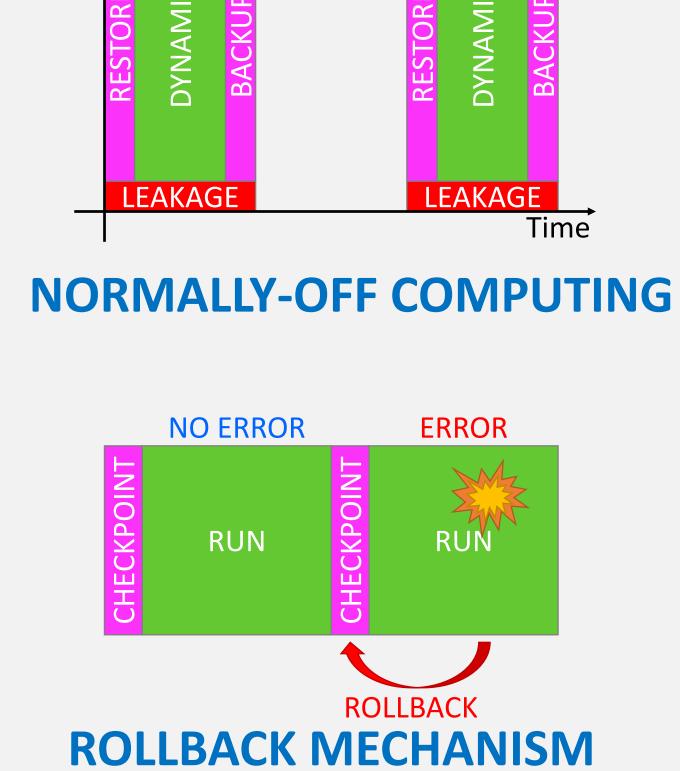
Even with various sleep modes, the static power consumtpion of a microcontroller is still too high for a lot of applications.



DESIGN SPACE EXPLORATION

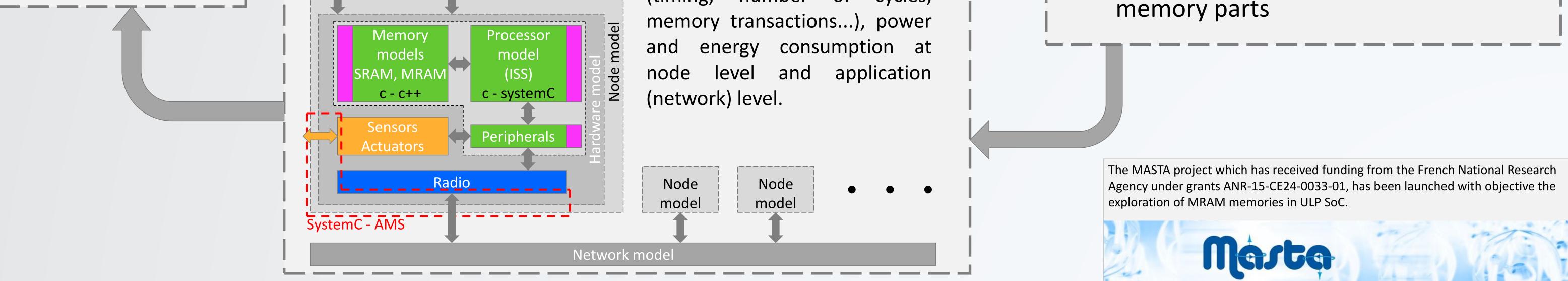
IoT benchmarks Standalone, OS (FreeRTOS...

Estimation of performance of cycles, (timing, number



SINGLE MEMORY ARCHITECTURE

- Code & Data sections scalable by user
- Easy and fast NV data read and write
- No leakage current for unsued





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