Wireless sensor network node with asynchronous architecture and vibration harvesting micro power generator

Yasser Ammar, Aurélien Buhrig, Marcin Marzencki,
Benoît Charlot, Skandar Basrour, and Marc Renaudin

TIMA Laboratory
Grenoble - France

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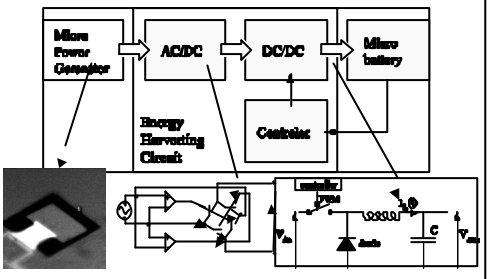
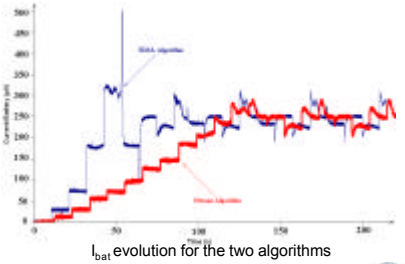
AMBIENT ENERGY HARVESTING

- Efficient micro power generator that harvests energy of ambient vibrations using the piezoelectric effect.
- Optimization of power transfer from the micro power generator to the micro battery.
- Ultra low power consumption in the energy harvesting system.
- Experimental results on a macro model
  - Two algorithms used to reach the maximum value of current in the battery
    - TIMA algorithm
    - Ottman algorithm
  - Power generation : 300µW
- Expectation of 1µW with micro model

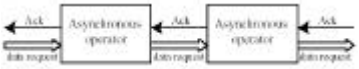




I_{bat} evolution for the two algorithms

Asynchronous technology

- Principle
  - No global clock
  - Synchronization by req/ack (handshake protocol)

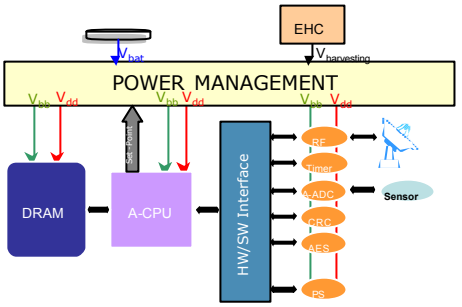


- Main advantages
  - Delay insensitivity
  - Wide range of power supply
    - 0.4V-1.2V for a 130nm AES
  - Voltage ripple insensitivity
  - Low power consumption
    - Expect 1µW processor

- Drawbacks
  - Area
  - Lack of CAD tools

- Power management
  - Dynamic voltage scaling
  - Static power management
  - Energy harvesting circuits

- Architecture Overview



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