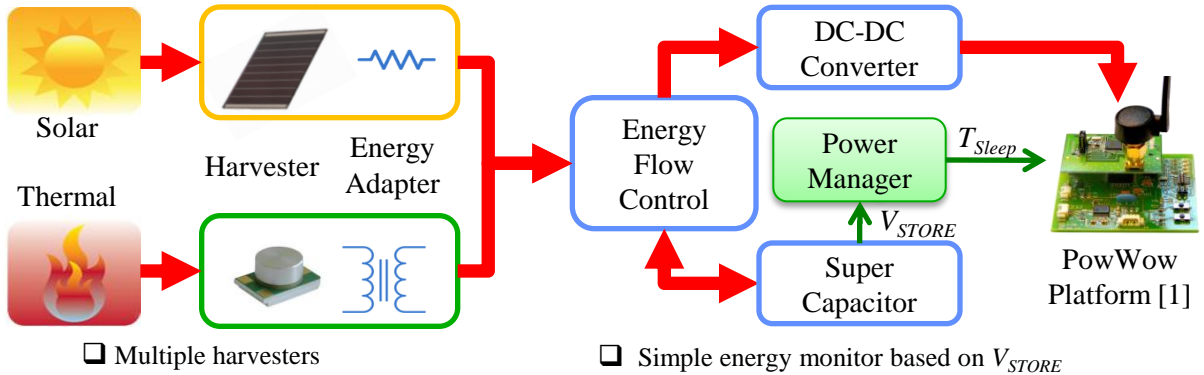


GRECO : GREEn Communication Objects

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System architecture

Objectives : In the GRECO project, the design of autonomous communicating object platform is proposed. Our approach aims at reaching a global power optimization. This optimization is based on energy models of the system blocks and the use of a global Power Manager (PM). It makes the communicating object converge to the Energy Neutral Operation (ENO). This work was funded by French National Research Agency (ANR-10-SEGI-004).



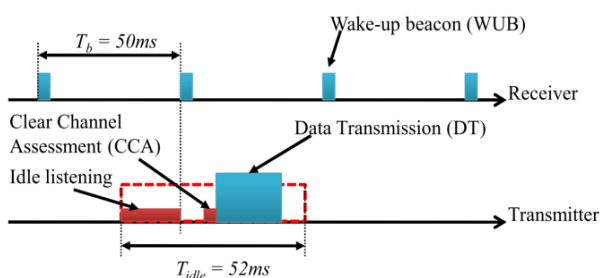
Energy Monitor

Provide system energy profiles for a Harvesting Aware Power Manager.

□ Stored energy model

$$\tilde{e}_s(n) = \frac{1}{2} C_{STORE} V_{STORE}^2(n) \quad \tilde{e}_{Leak}(n) = P_{Leak} T_s$$

□ Consumed energy model [2] based on RICER



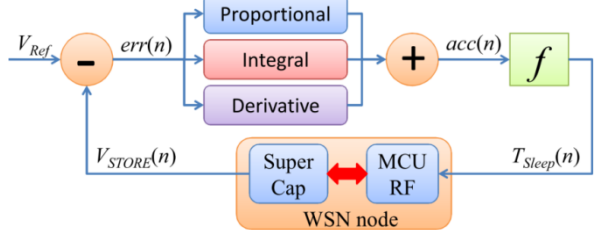
State	Energy
WUB Send/Receive Beacon	51μJ
DT Data Transmission	80μJ
DR Data Reception	100μJ

□ Harvested energy

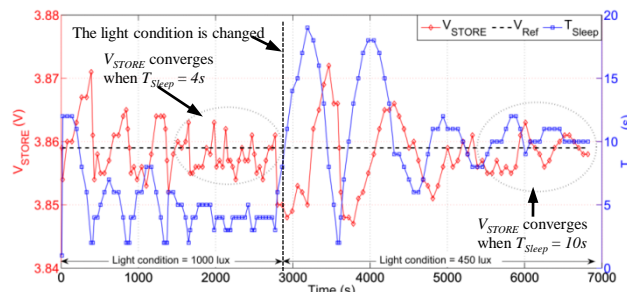
$$\tilde{e}_H(n) = \tilde{e}_s(n) - \tilde{e}_s(n-1) + P_{Leak} T_s + \frac{1}{\eta} \tilde{e}_c(n)$$

η : DC/DC converter efficiency

Power Manager with PID controller



□ Adapts the wake-up interval T_{sleep} of the PowWow node according to V_{STORE} to satisfy ENO condition



Conclusions

- PID controller provides practical adaptations to match harvested and consumed energy in a dynamic environment
- A new PM based on energy profiles from the energy monitor is in progress

References

- [1] [Online]. Available: <http://powwow.gforge.inria.fr>
- [2] A.M. Mahtab *et al.*, "A hybrid model for accurate energy analysis of wsn nodes," *EURASIP Journal on Embedded Systems*, vol. 2011, p. 16, 2011.