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Cross-level energy model for power-aware Wireless Sensor Networks design

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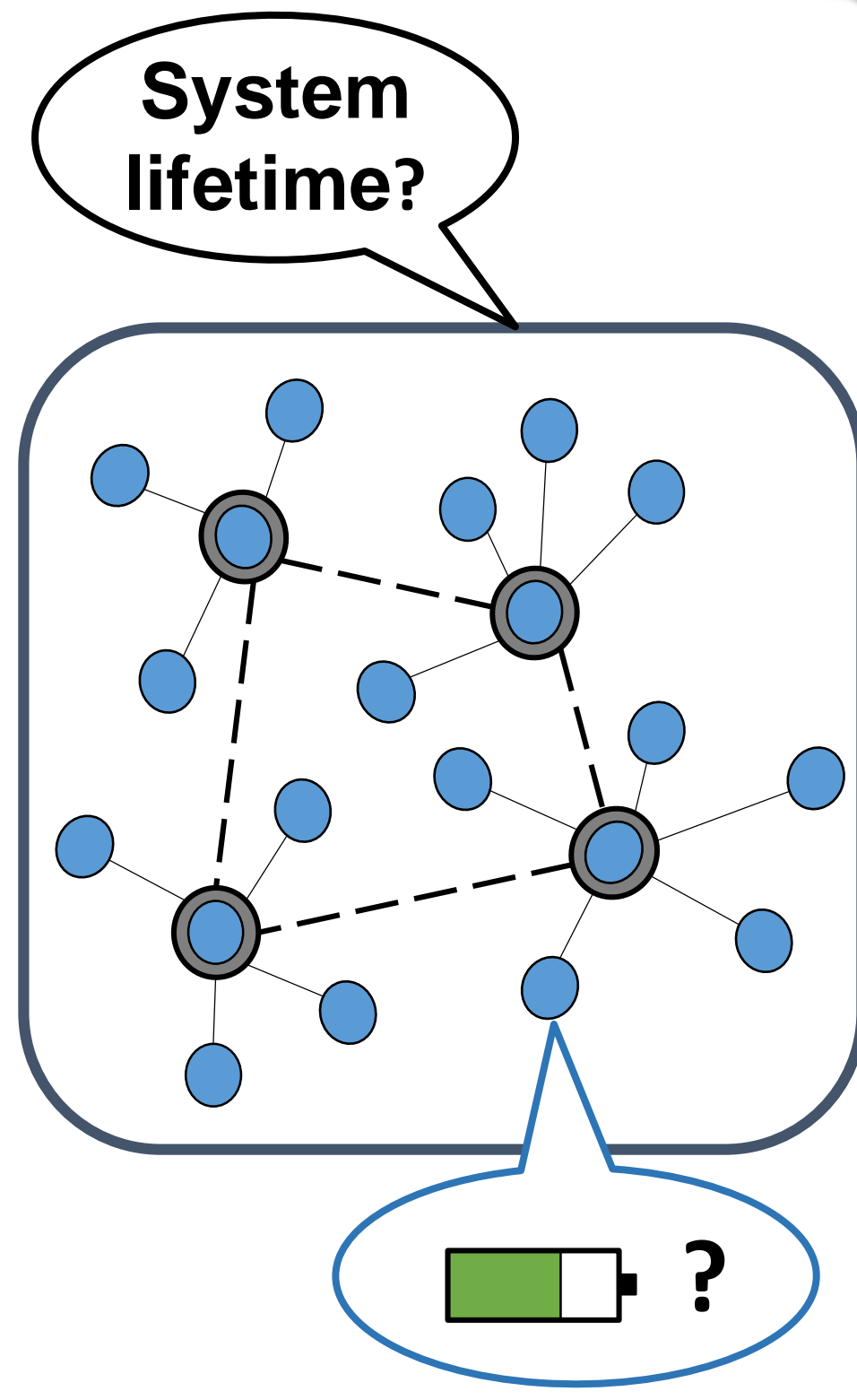
Introduction

Context

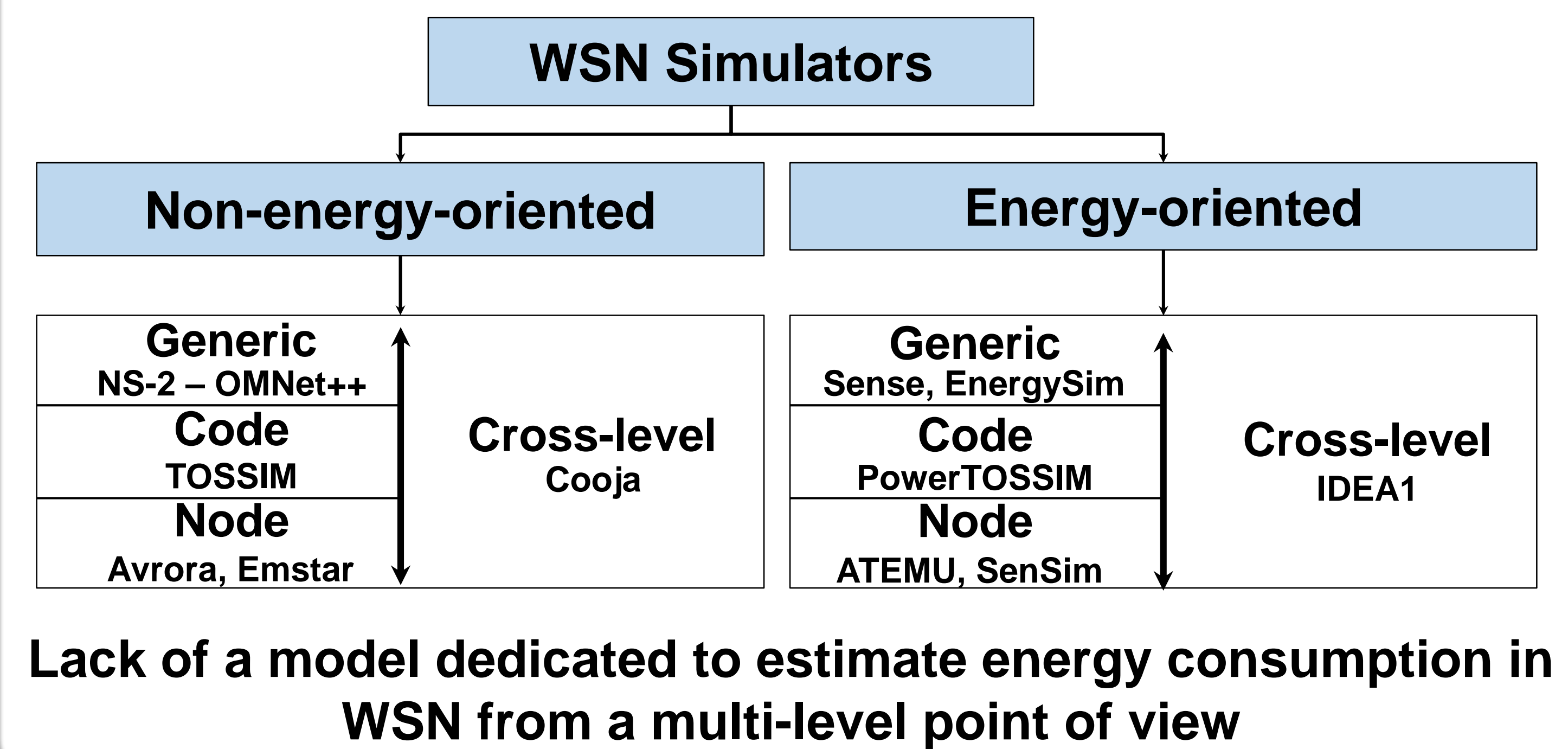
Node autonomy and energy efficiency: key issues in the WSN design

Information required about energy consumption for decision making in the design process

Need of energy model & simulator in this context of power-aware WSN design



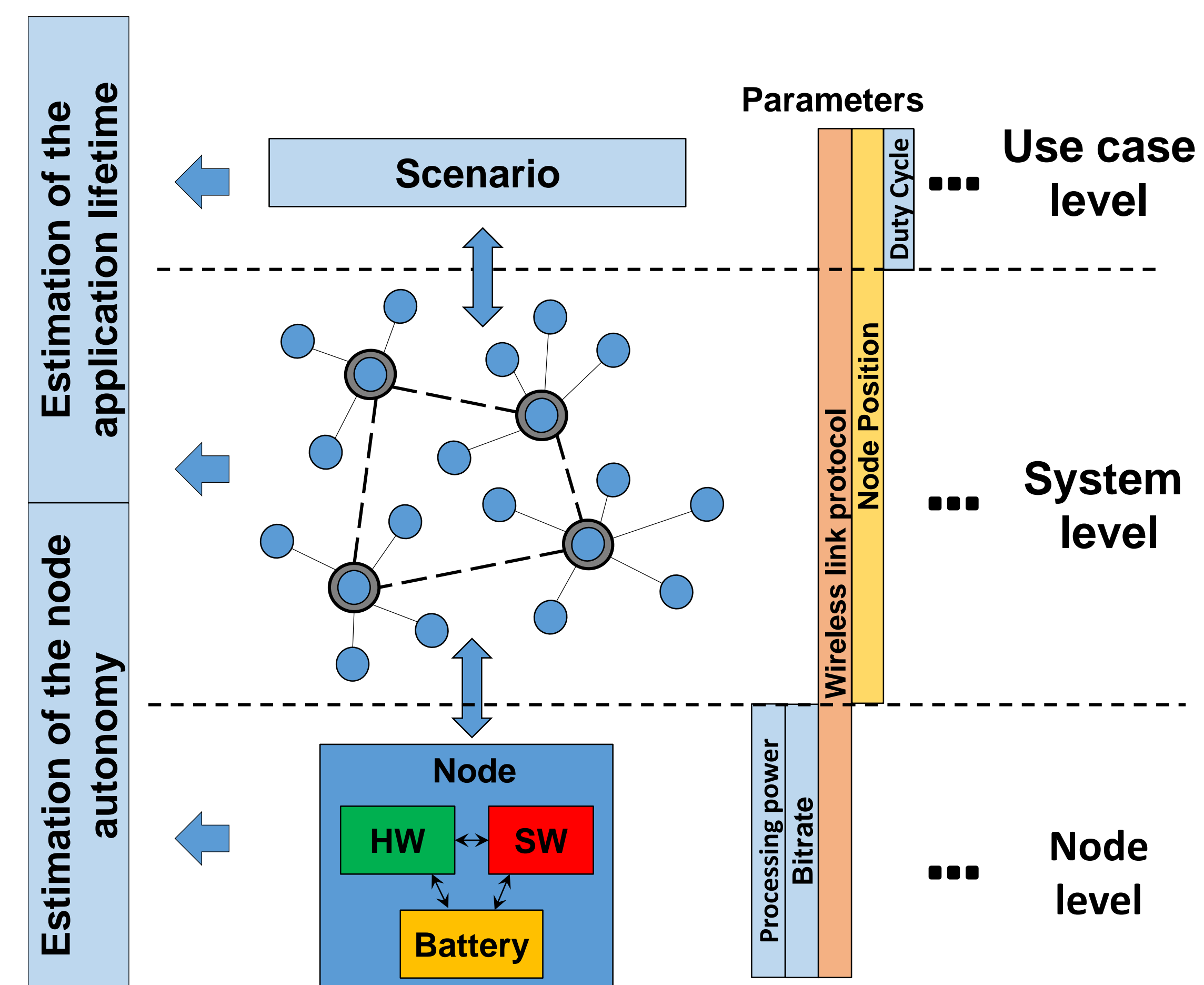
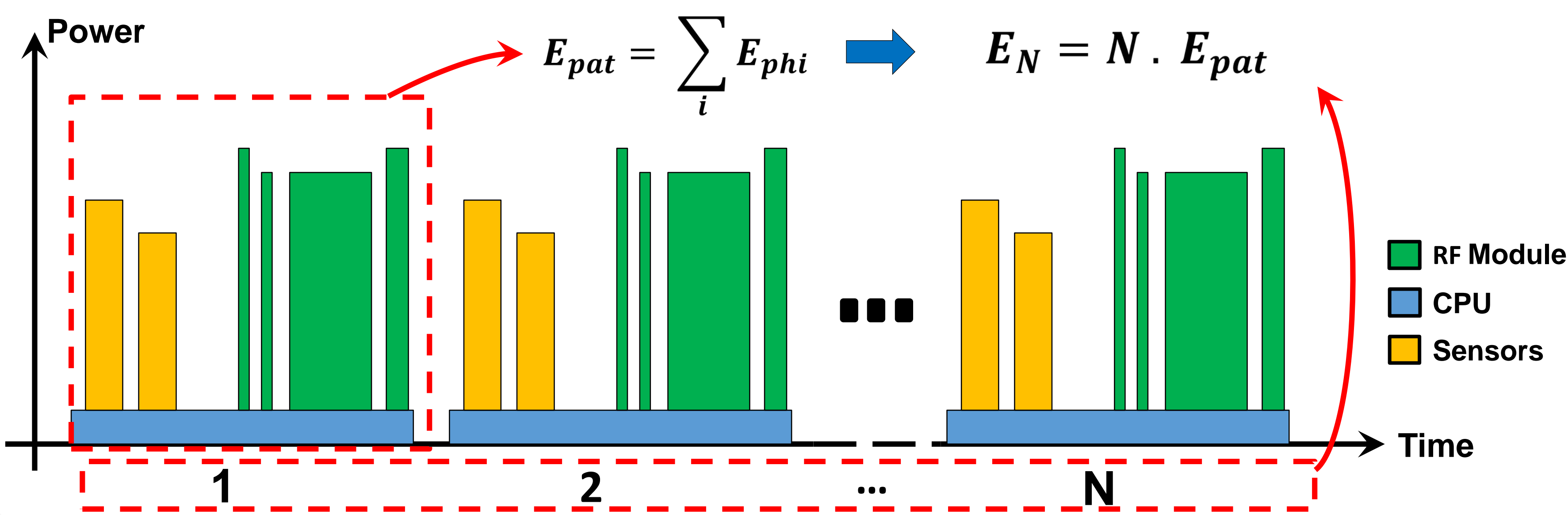
WSN simulator classification survey



Proposed cross-level energy model

Our approach

- Cross-level energy model:** to evaluate several parameters impact at different levels on node energy consumption and network lifetime
- Pattern-based:** to reduce the overall simulation time → the node energy consumption is considered in an iterative way, defined as pattern
- Protocol-independent:** to ensure implementations of different wireless link protocols (e.g. 802.11a, 802.15.4 ... etc.)



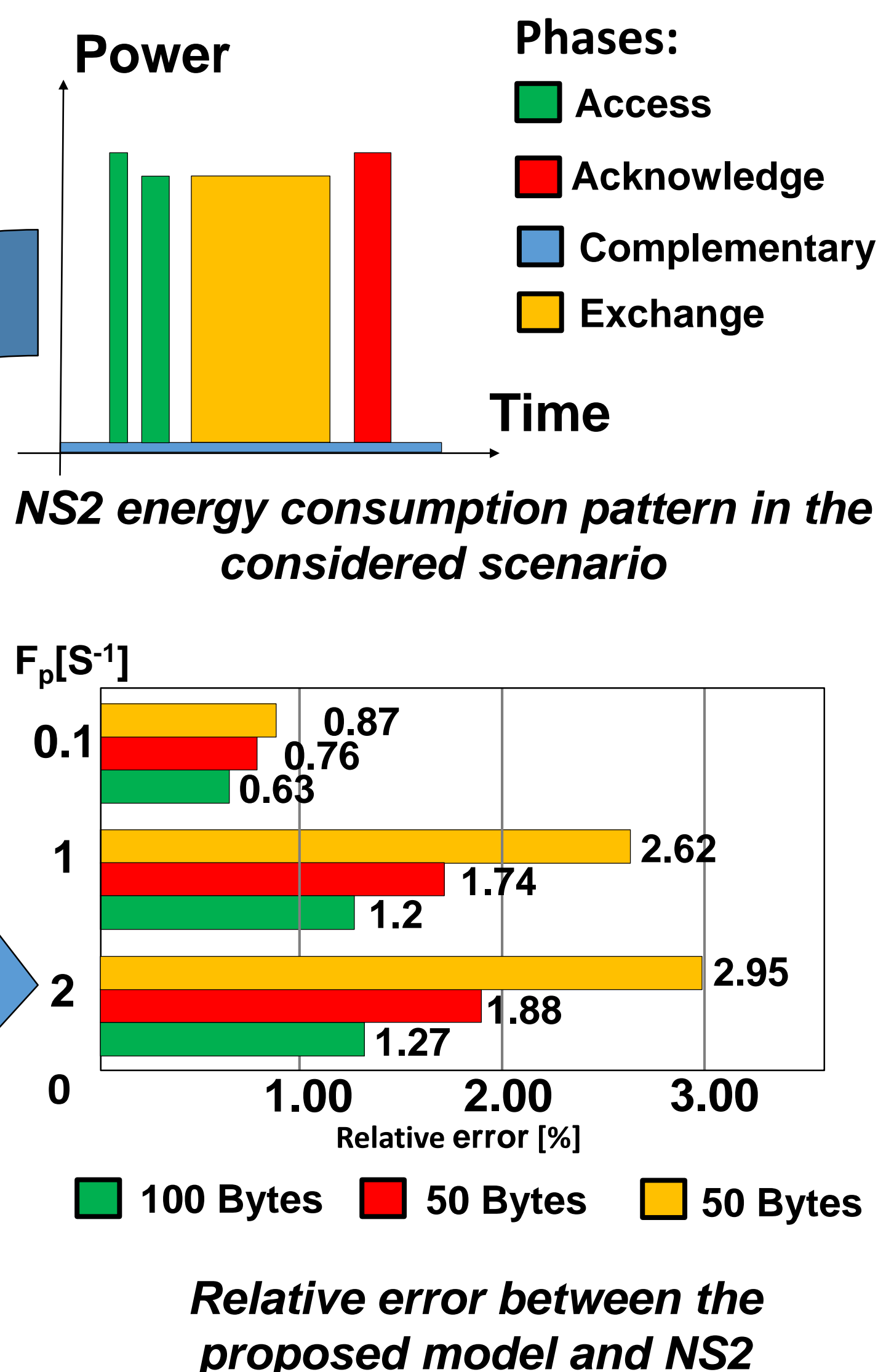
Comparison with an existing energy model

Comparison with NS2 energy model

Model	Payload Size	Consumed Energy (By phase) [μ J]				Total
		ph_{acc}	ph_{ack}	ph_{exch}	ph_{com}	
NS2	10	18.88	39.07	152.8	59.7	270.4
Proposed model	10	18.89	39.07	145.7	59.7	263.4

Phase-based comparison of the energy consumption between the proposed model and NS2 with $F_p = 1s^{-1}$

- In this comparison → Only RF energy consumption is considered
- Relative error < 3%

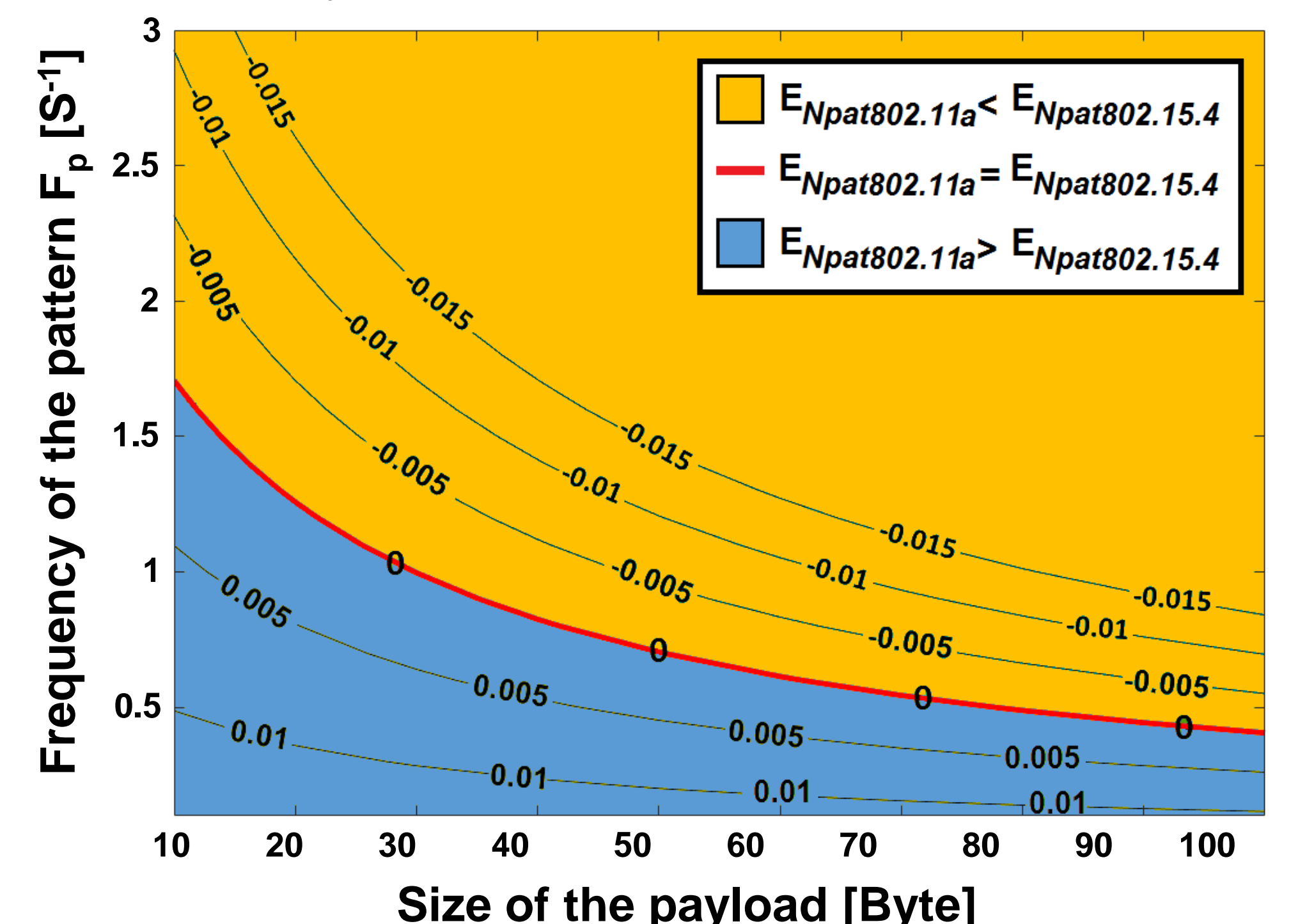


Application of the proposed model

Selection of Wireless link protocol

The most suitable wireless link protocol for a given scenario?

Capacity to analyse the impact of different parameters: the size of the payload, the bitrate, the frequency of the pattern...



Future work

- Cross-level energy model implementation of the whole node (HW & SW)
- Proposition of an evaluative pattern concept for specific nodes (cluster head node...)
- Comparison with experimental results to validate the proposed model
- Use this model as a base to design a cross-level simulator

Acknowledgement

The work presented has been financially supported by the Regional Council of New Aquitaine in the frame of the OUDINI research project.

