

MiXiM, PAWiS & STEAM-Sim – Combining Channel Models, Energy Awareness and Real-life Application Code

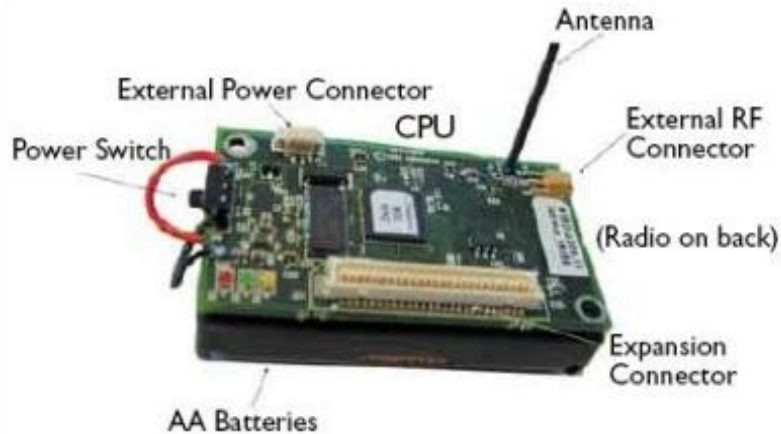
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¹Institute for Integrated Circuits (University Linz)

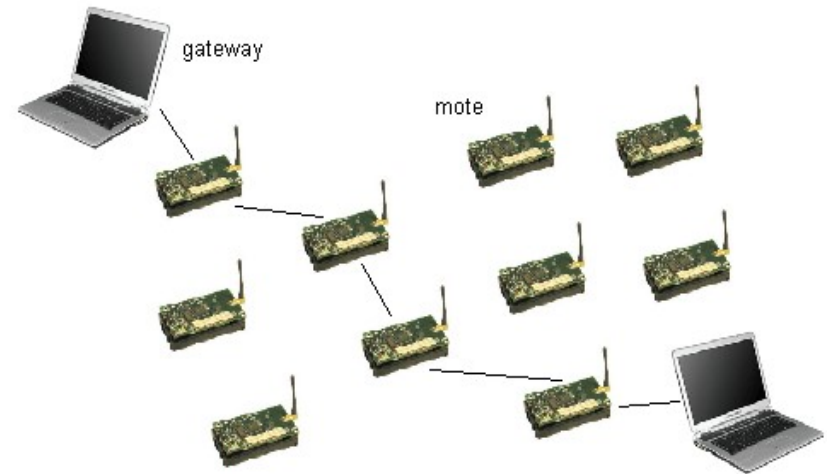
²Institute for Communications and RF-Systems (University Linz)

02.09.15

Wireless Sensor Networks



- Energy efficiency
- Timing behavior
- Wireless channel
- Mobility ...

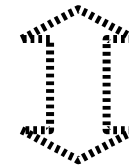


Problem Statement

- Wireless channel
- Mobility
- Energy efficiency
- Timing behavior HW
- Timing behavior SW



MiXiM



PAWiS



STEAM-Sim

Background

- PAWiS

- Vienna University of Technology

- Concepts

- Task based modelling

- ✘ Arbitrary hardware

- Electrical network

- ✘ Hierarchy of power suppliers and consumers

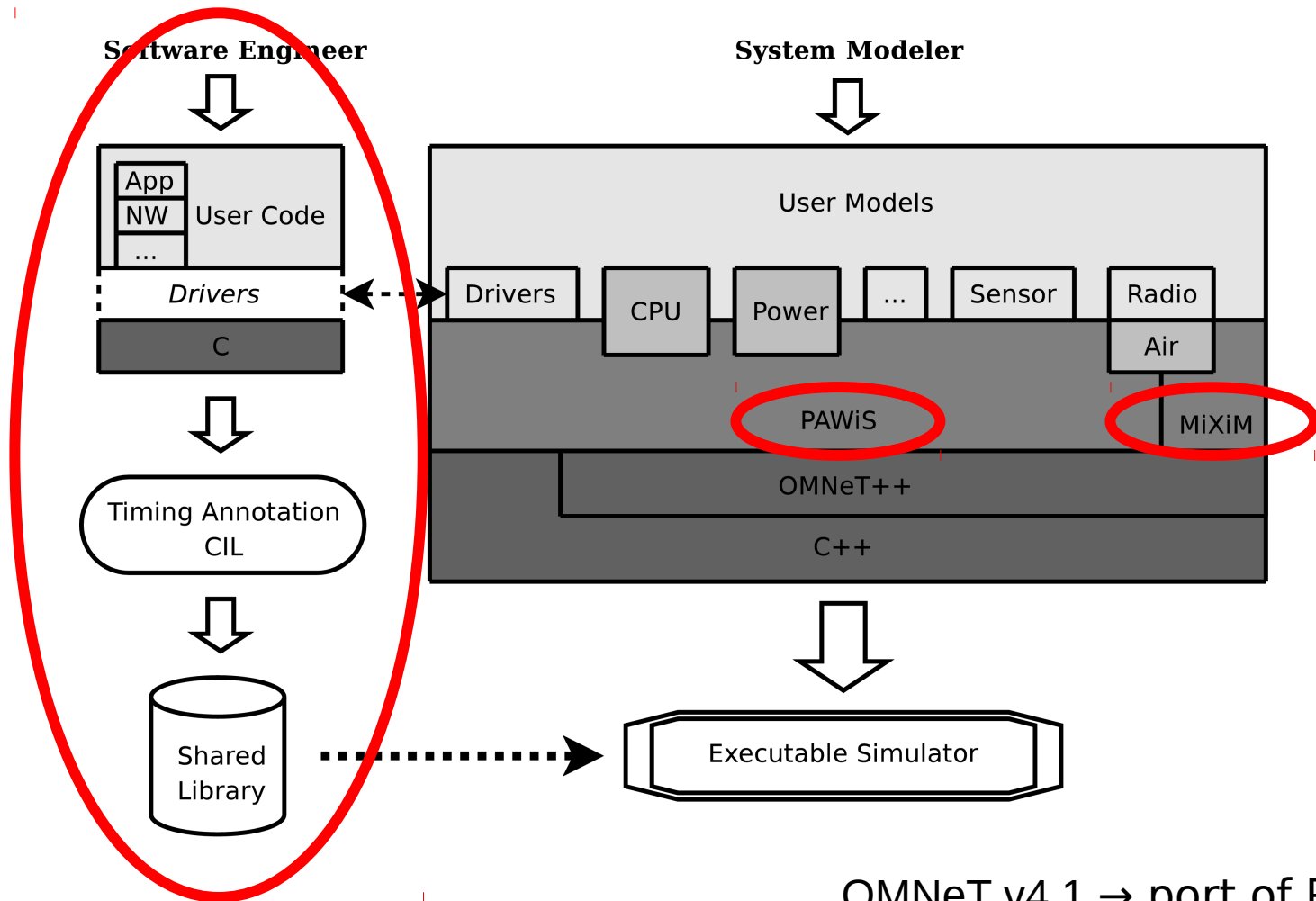
- ✘ Distinct electrical behavior

- Simple free space propagation model

- LUA scripting interface

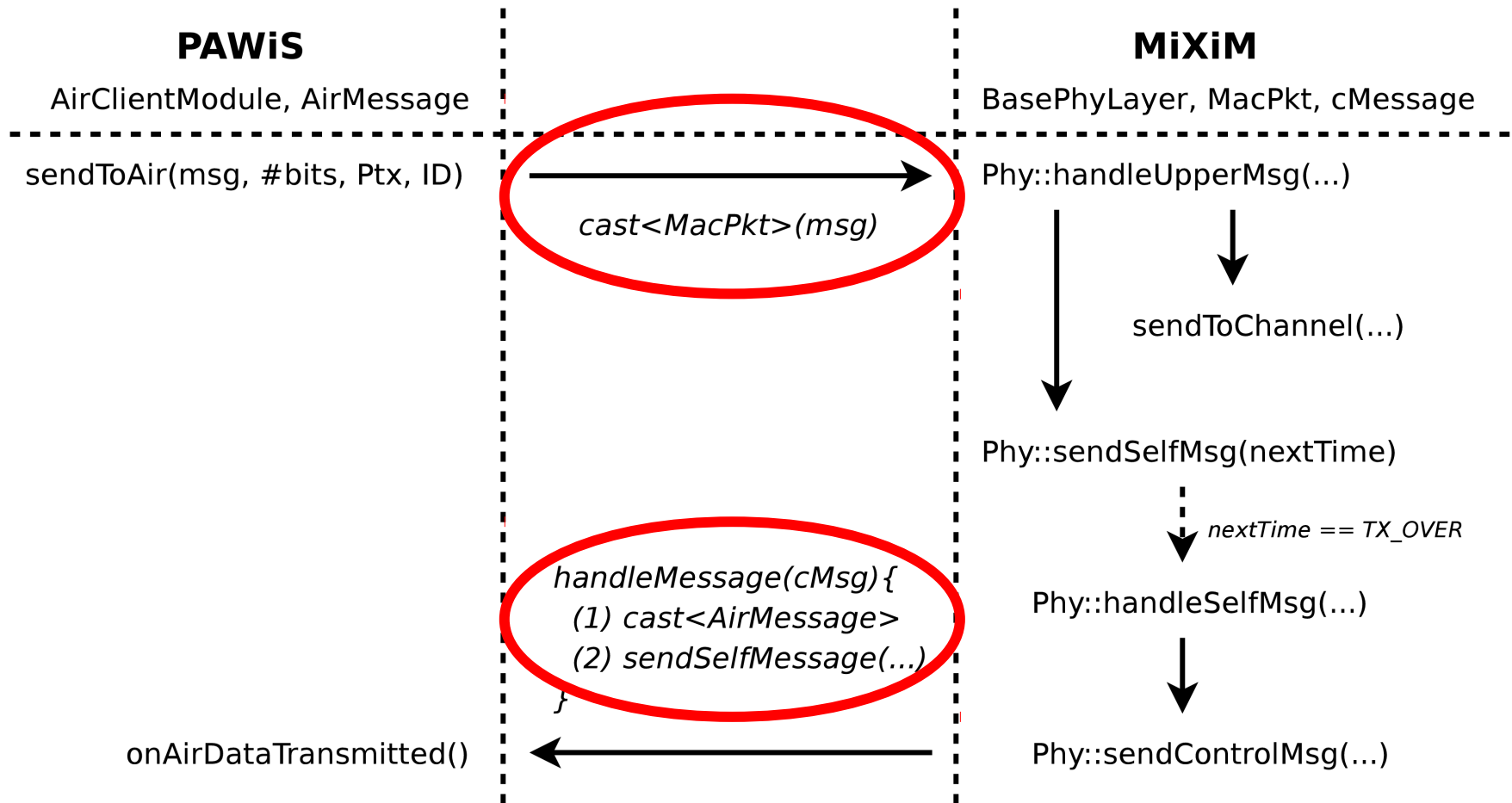
- Based on OMNeT++ v3.2

System Architecture

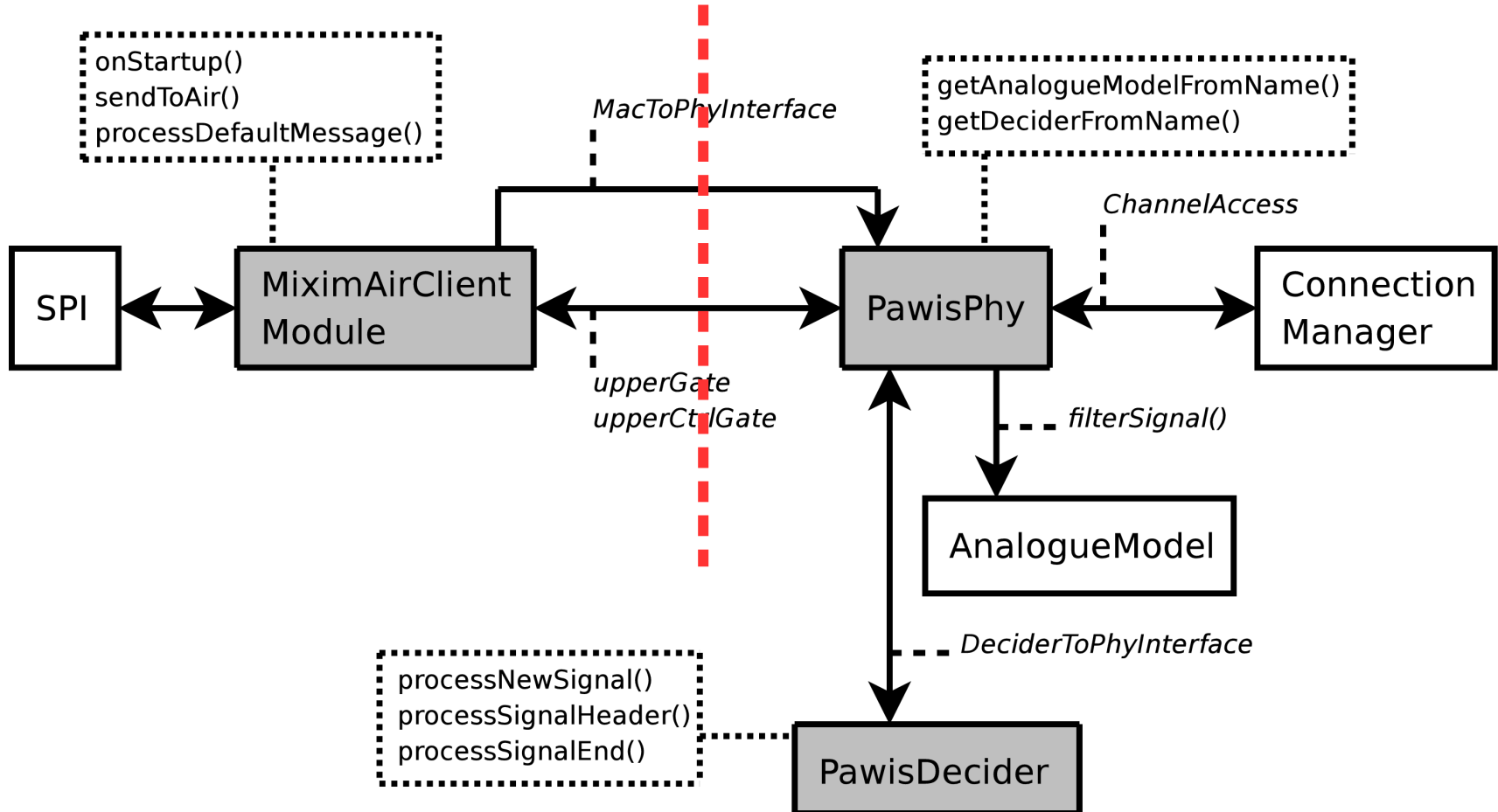


OMNeT v4.1 → port of PAWiS

Functionality Mapping - TX



Interfaces



NED Structure

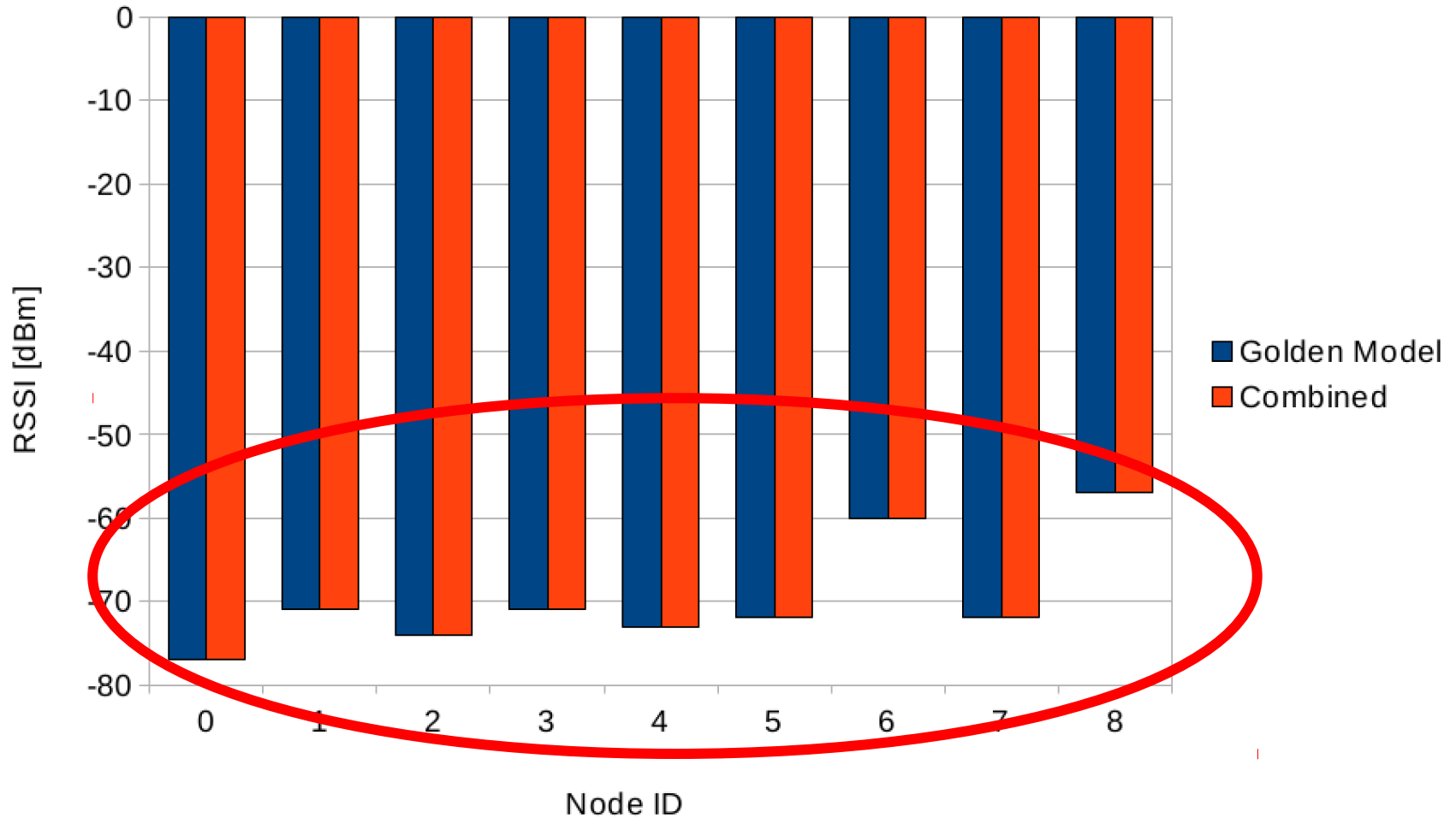
```
module BaseNic {  
  parameters:  
    int MiximNodeId;  
  gates:  
    input radiIn; //radiIn gate for sendDirect  
  submodules:  
    pawis_node: PawisCC2500_MSP430FG4618_Node {  
      parameters:  
        NodeId = MiximNodeId;  
      ...  
    }  
    phy: PawisPhy {  
      ...  
    }  
    ...  
}
```

PawisLogRS232 and Config modules in
MiXiM BaseNetwork

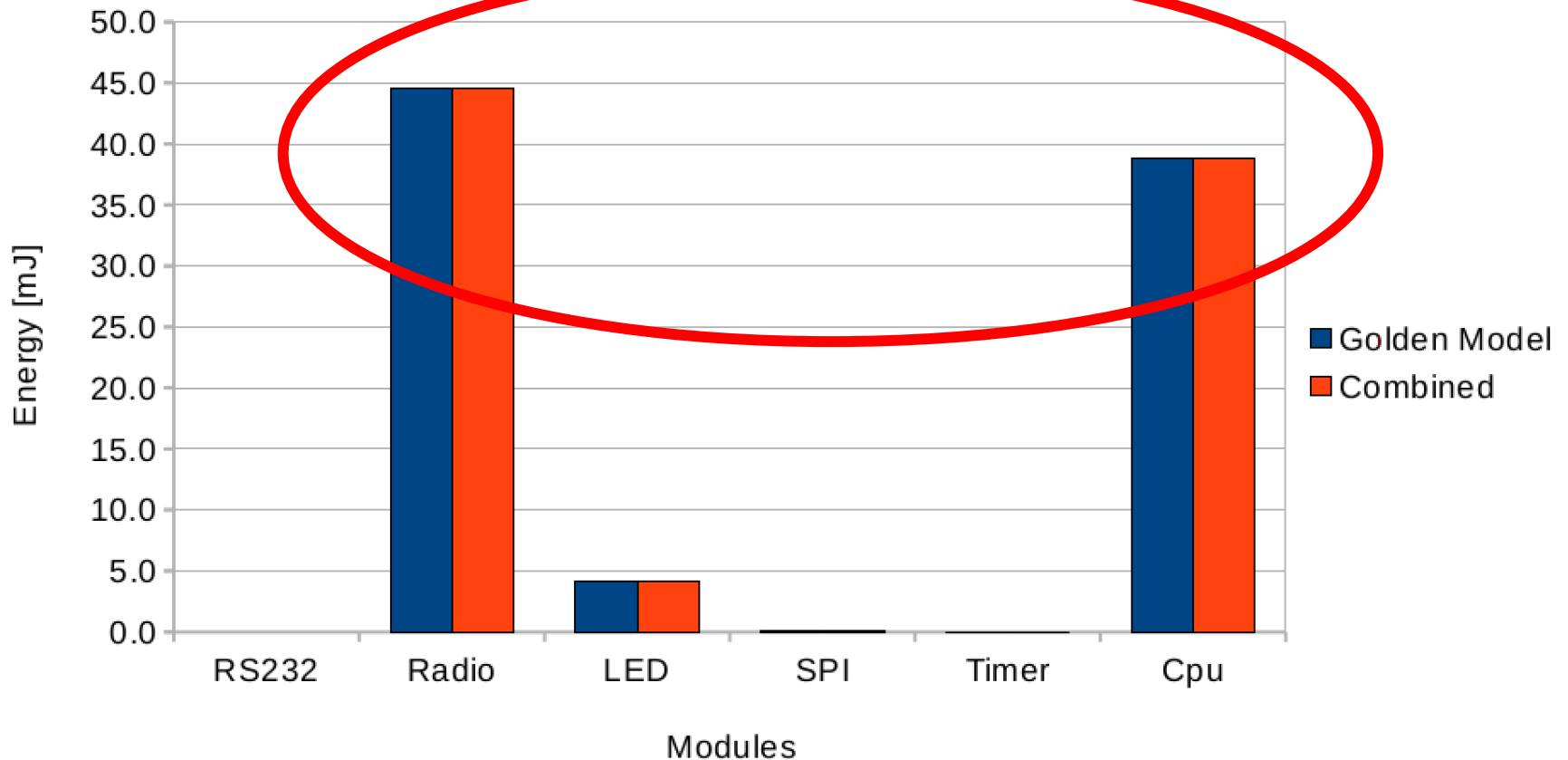
Evaluation Setup

- RSSI readout scenario
 - Real-life application code
 - TDMA, CC2500, MSP430FG4618
 - Static & mobile scenario
- PAWiS free space propagation model
 - $PRX = P_{TX} * 1/(4*\pi) * d^{-b} * A_{Antenna}$
- Golden model
 - PAWiS & STEAM-Sim integration
 - Verified via measurements (already published)

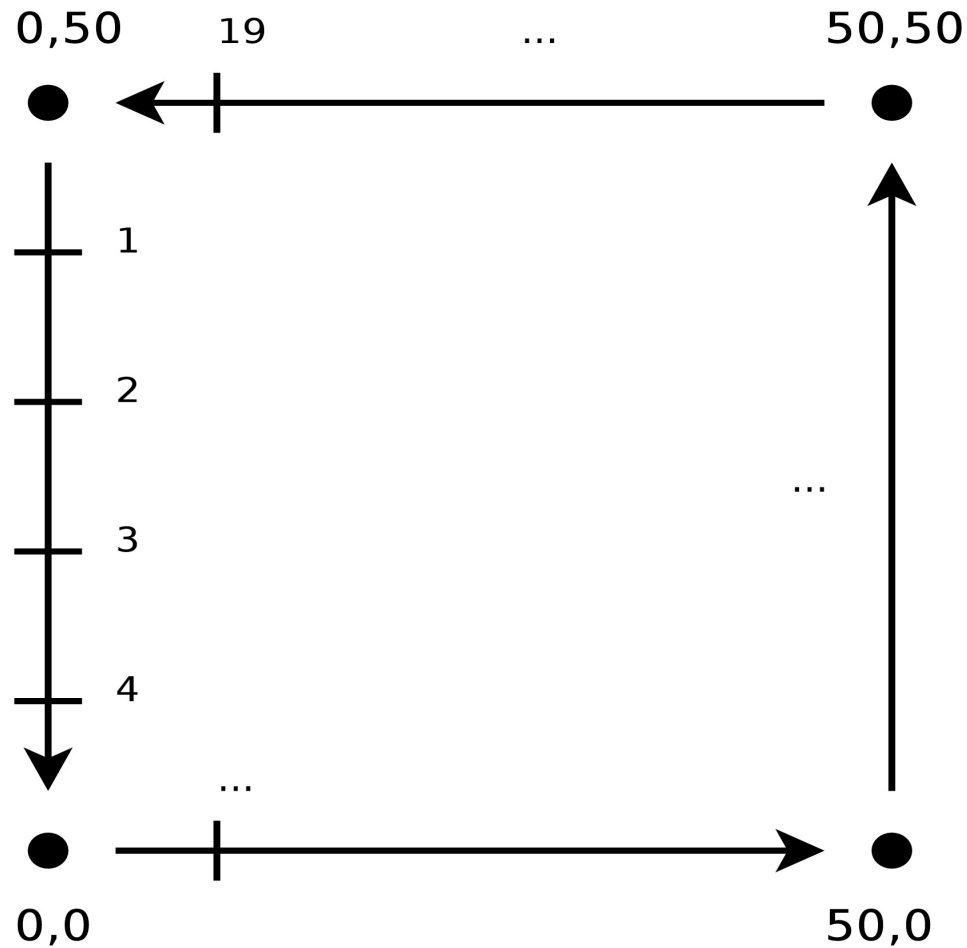
Static Scenario - RSSI



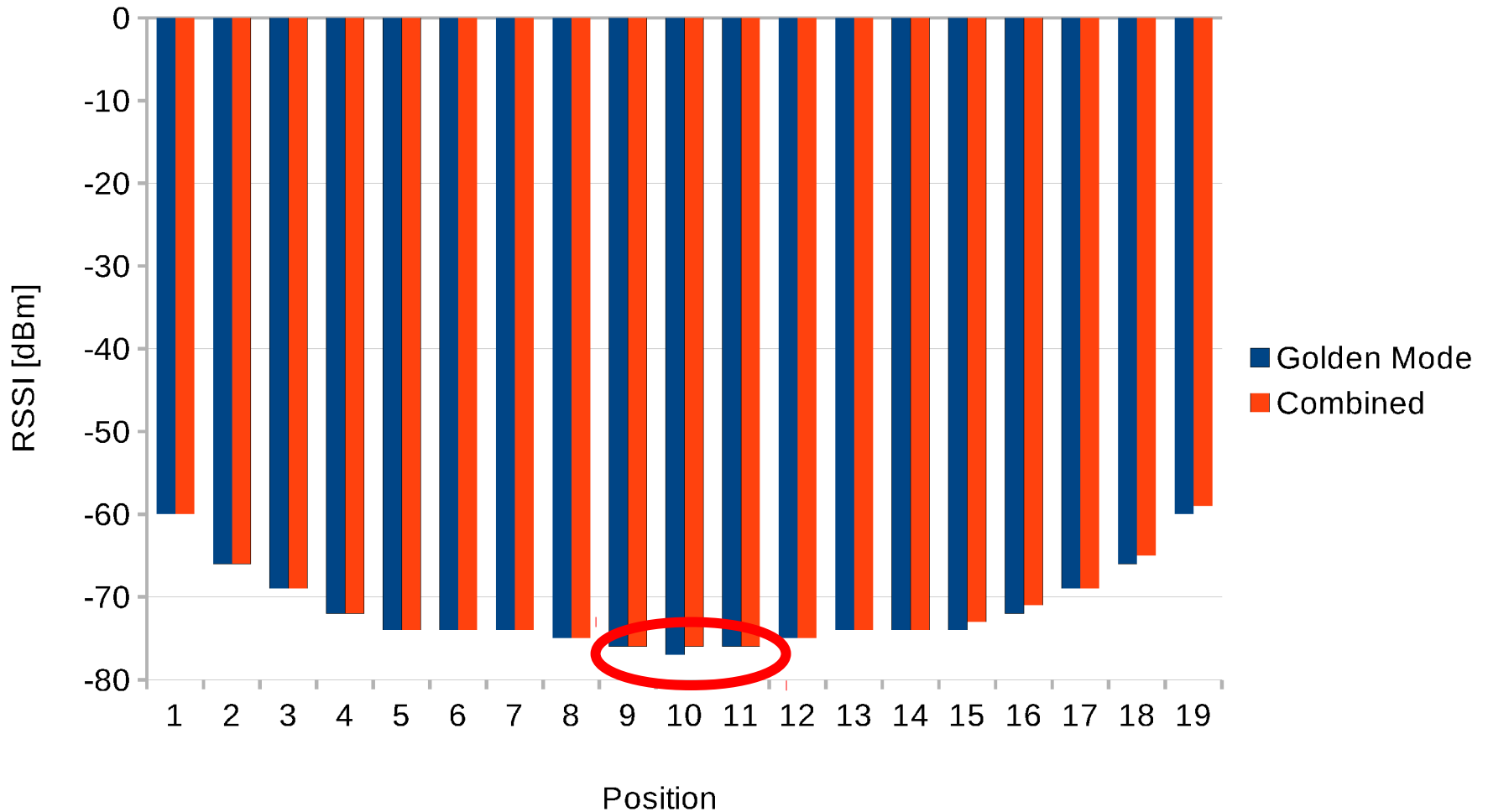
Static Scenario - Energy



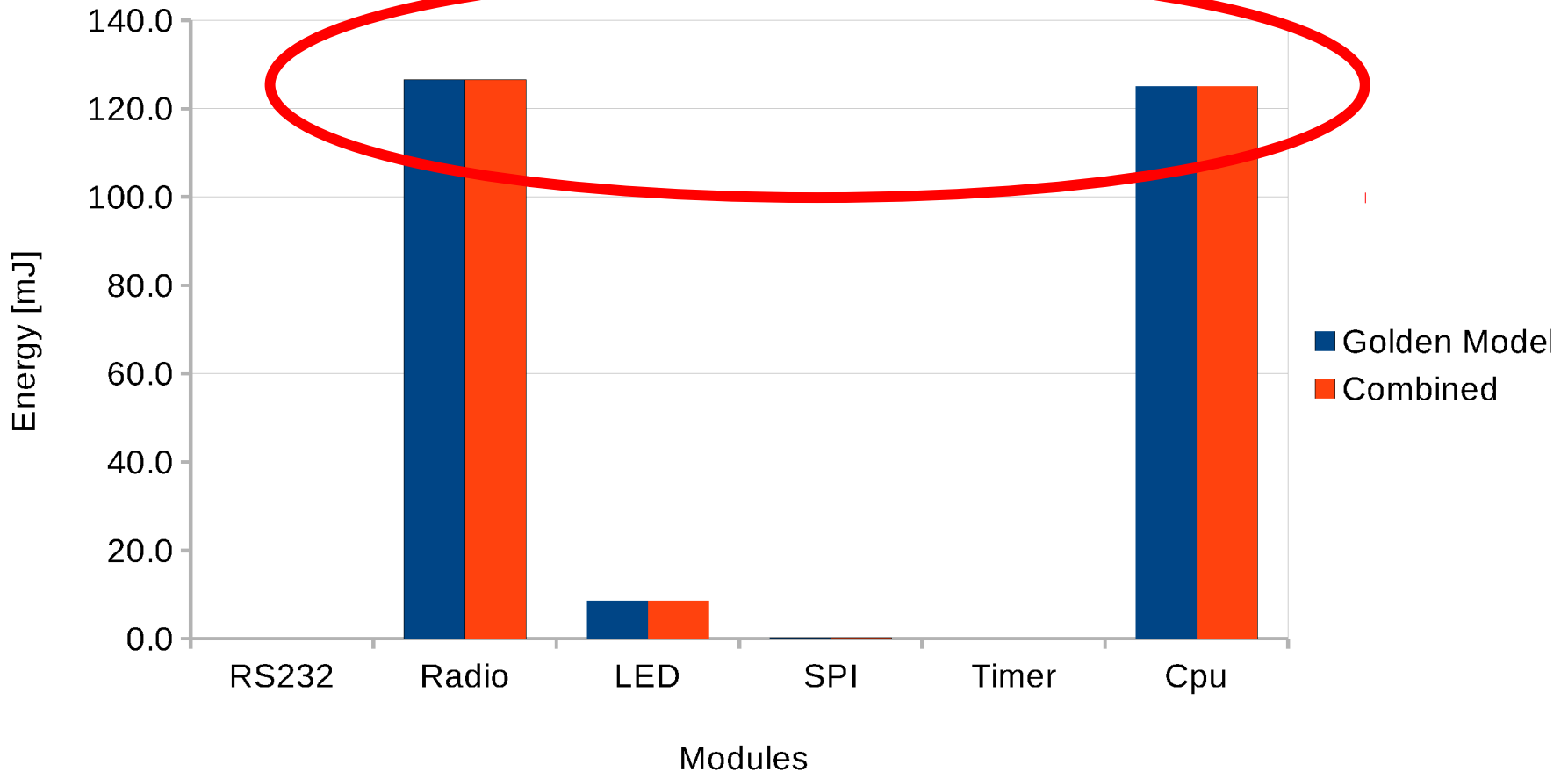
Mobile Scenario - Pattern



Mobile Scenario - RSSI



Mobile Scenario - Energy



Conclusion

- Simulation of wireless sensor networks
 - Realistic channel models, energy awareness, real-life code
 - Integration of MiXiM, PAWiS, and STEAM-Sim
 - Preliminary evaluation

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<http://sourceforge.net/projects/steamsim>