Integrated Distributed Energy Awareness

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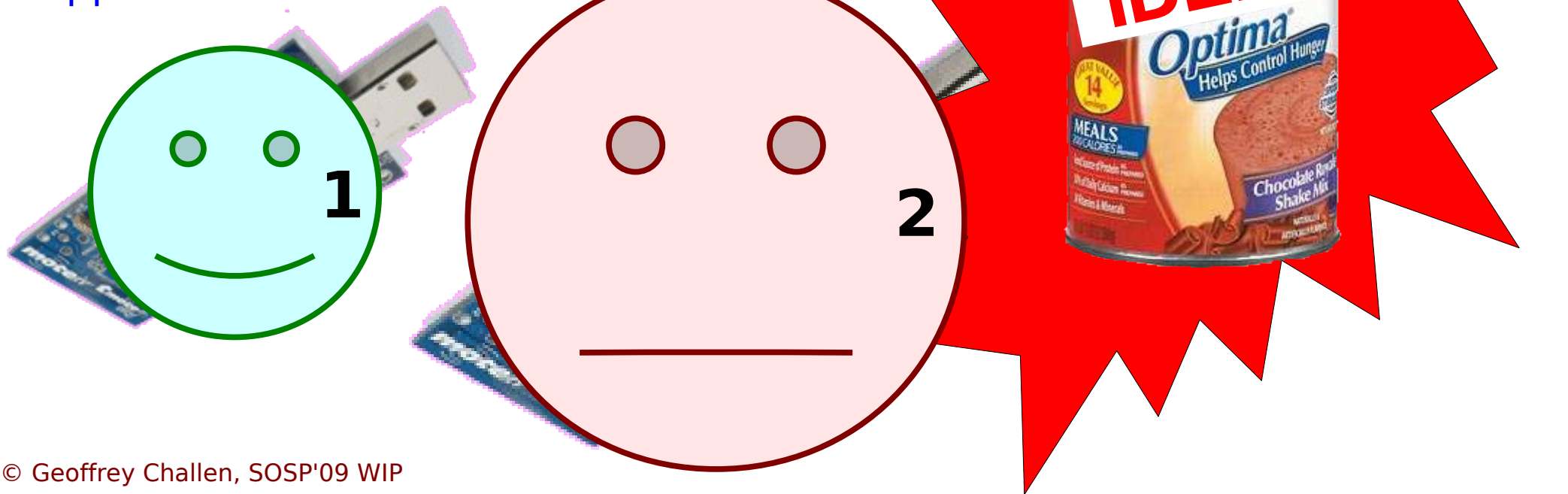
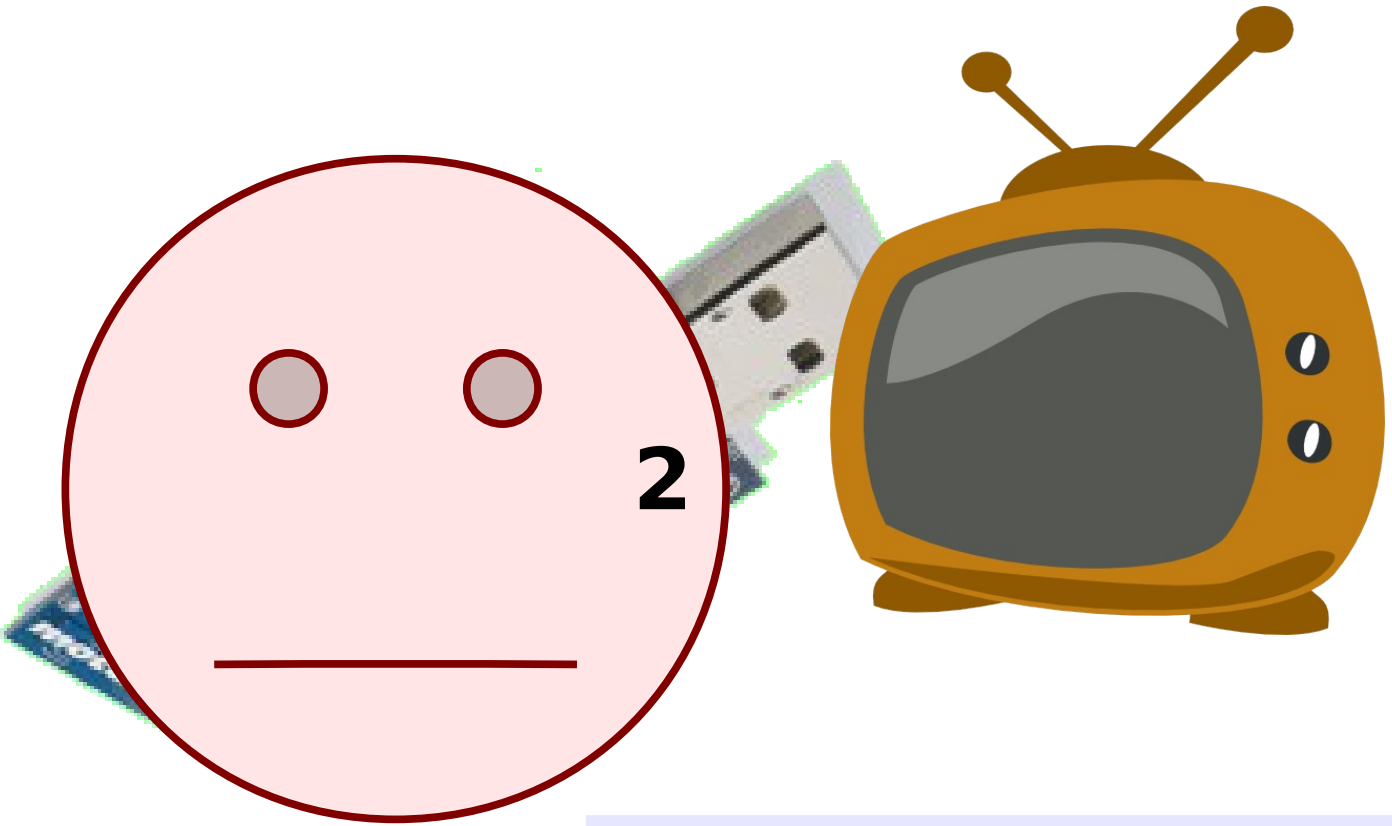
A new **GROUP DIET** for Wireless Sensor Networks!!!

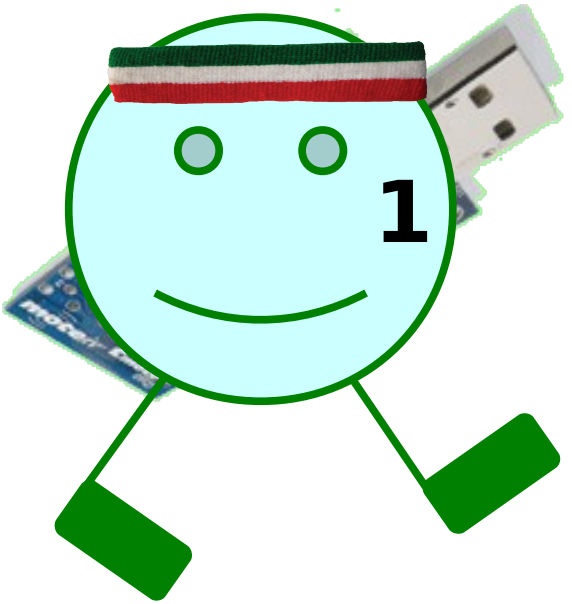


Overloading Nodes Leads To...

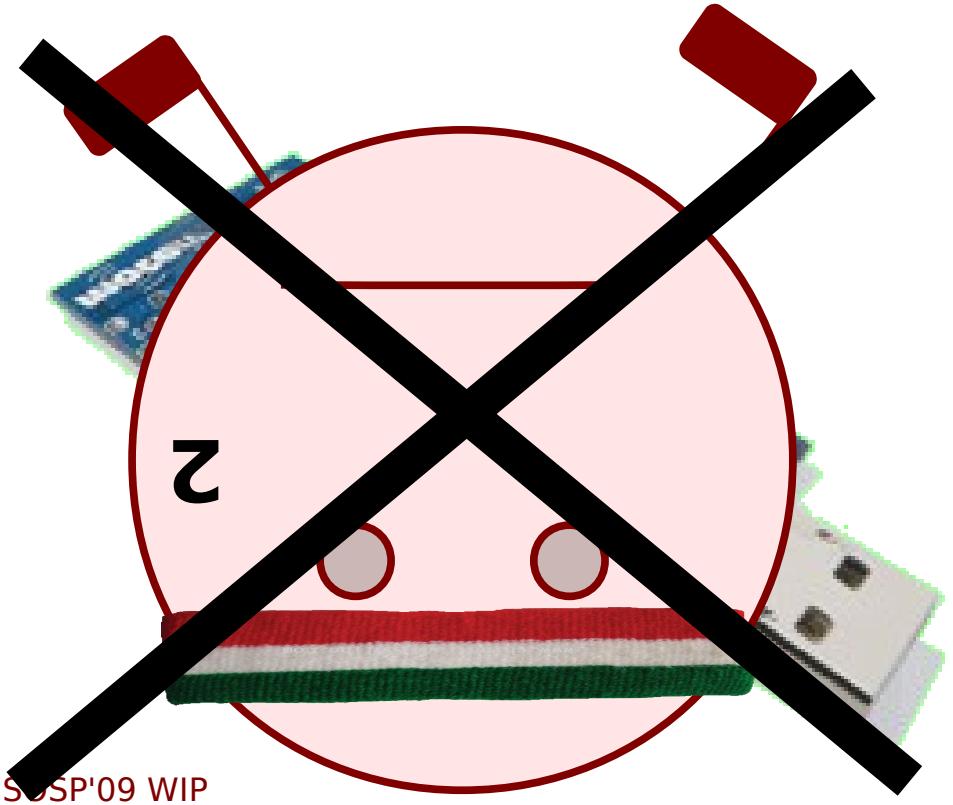


Reduced activity levels...

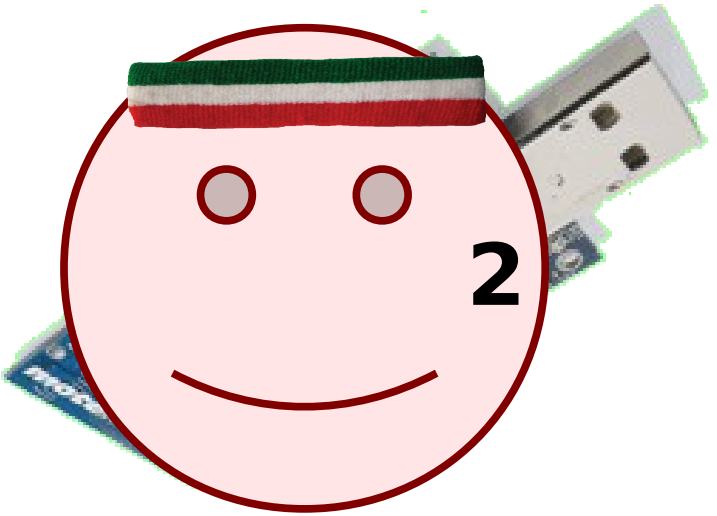
Overloading Nodes Leads To...

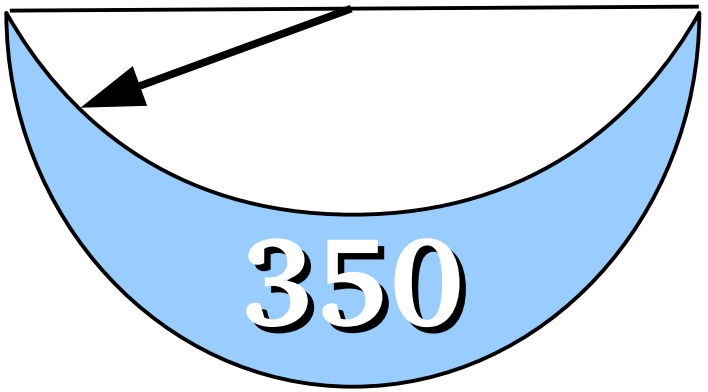


...premature node death!



Single Node Diets Exist...





Integrating Concurrency Control and Energy Management in Device Drivers
Klues et. al., SOSP 2007

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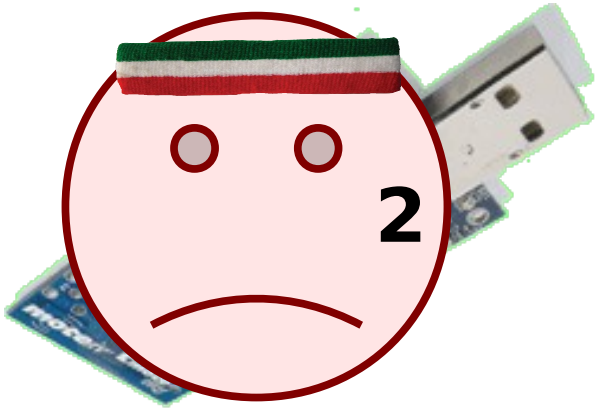

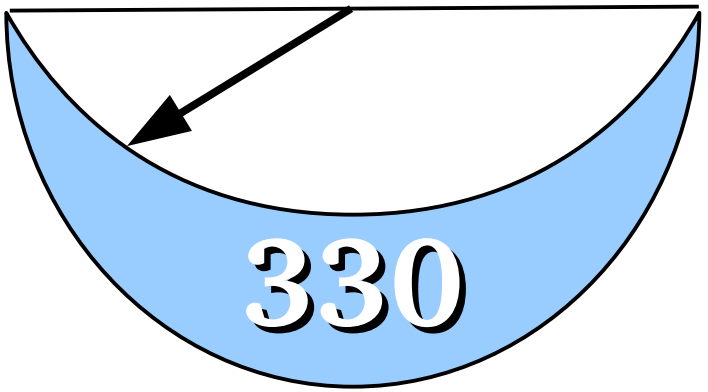

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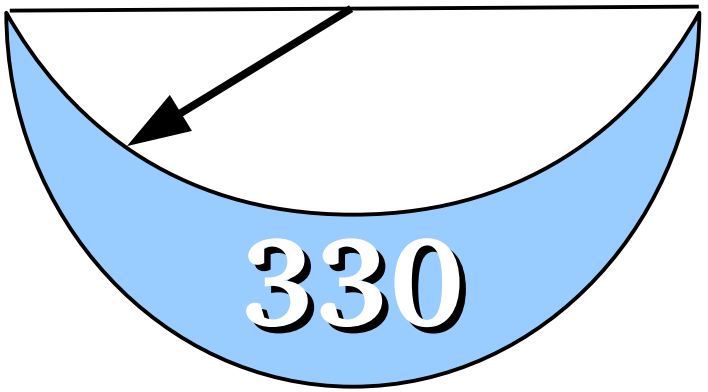

Quanto: Tracking Energy in Networked Embedded Systems
Fonseca et. al., OSDI 2009

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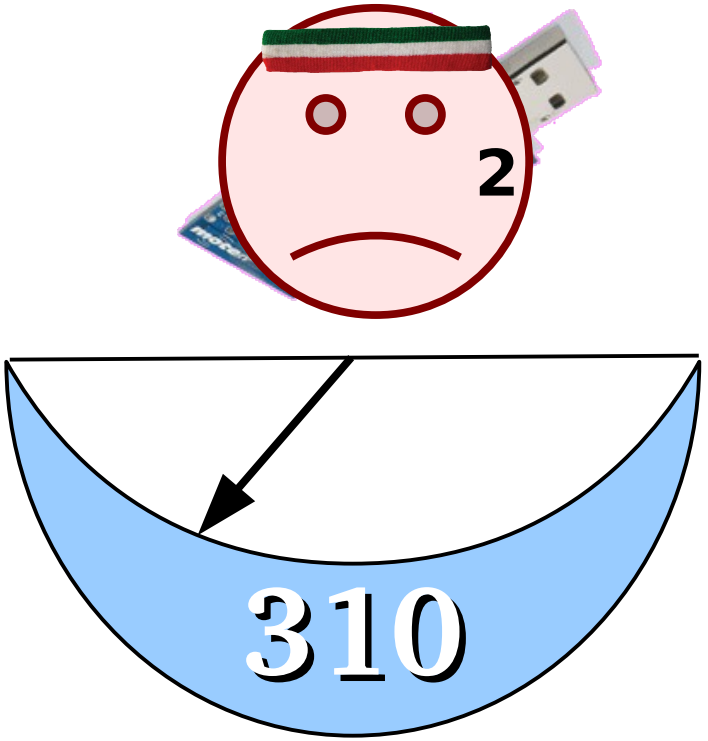

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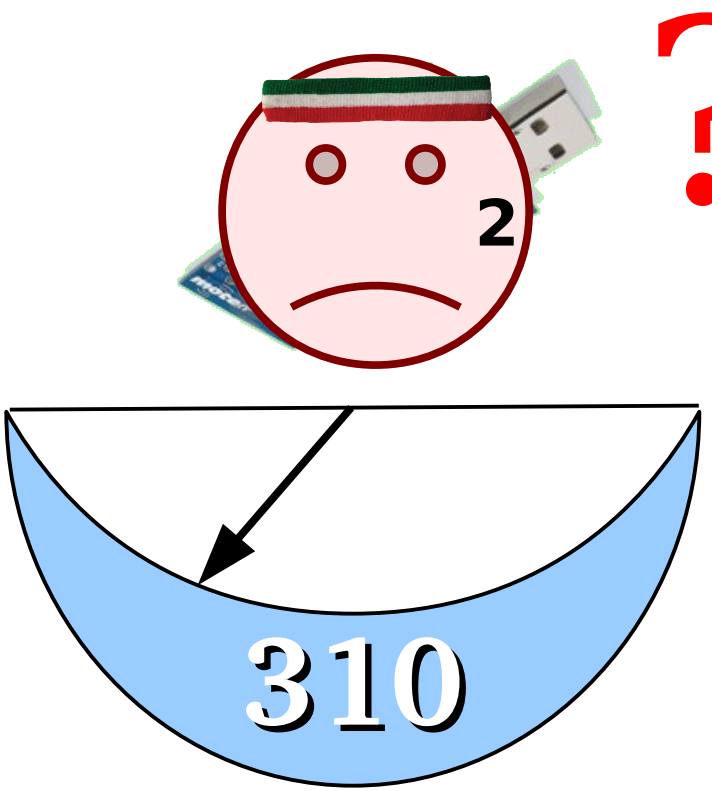
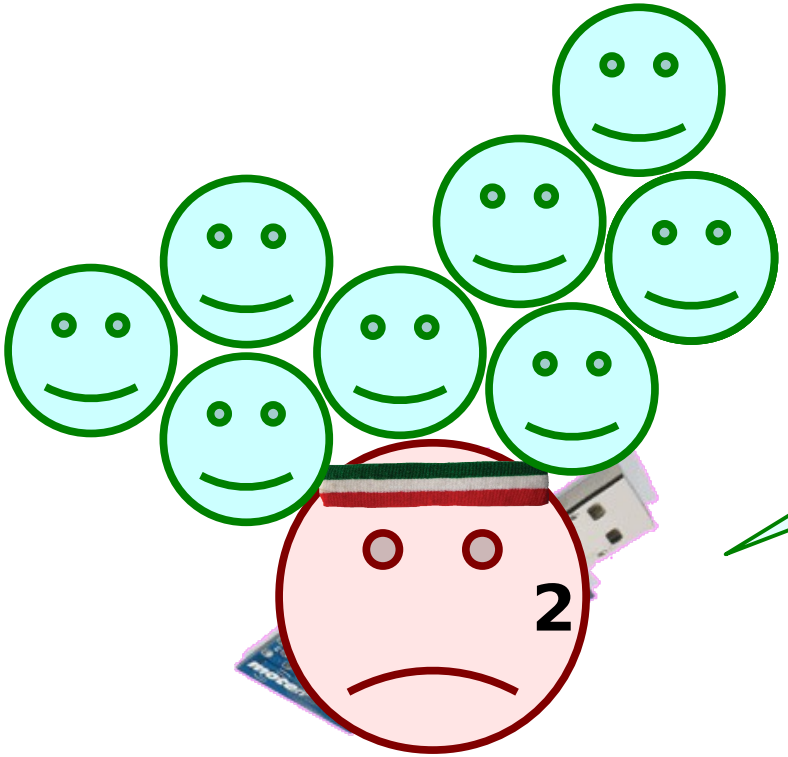
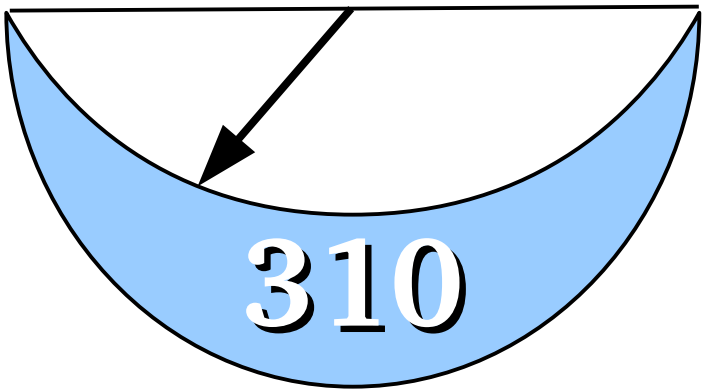


?!?!?

...But Nodes Depend on Each Other!



A large amount of load is produced by **other nodes**! Cannot shed this load without help...



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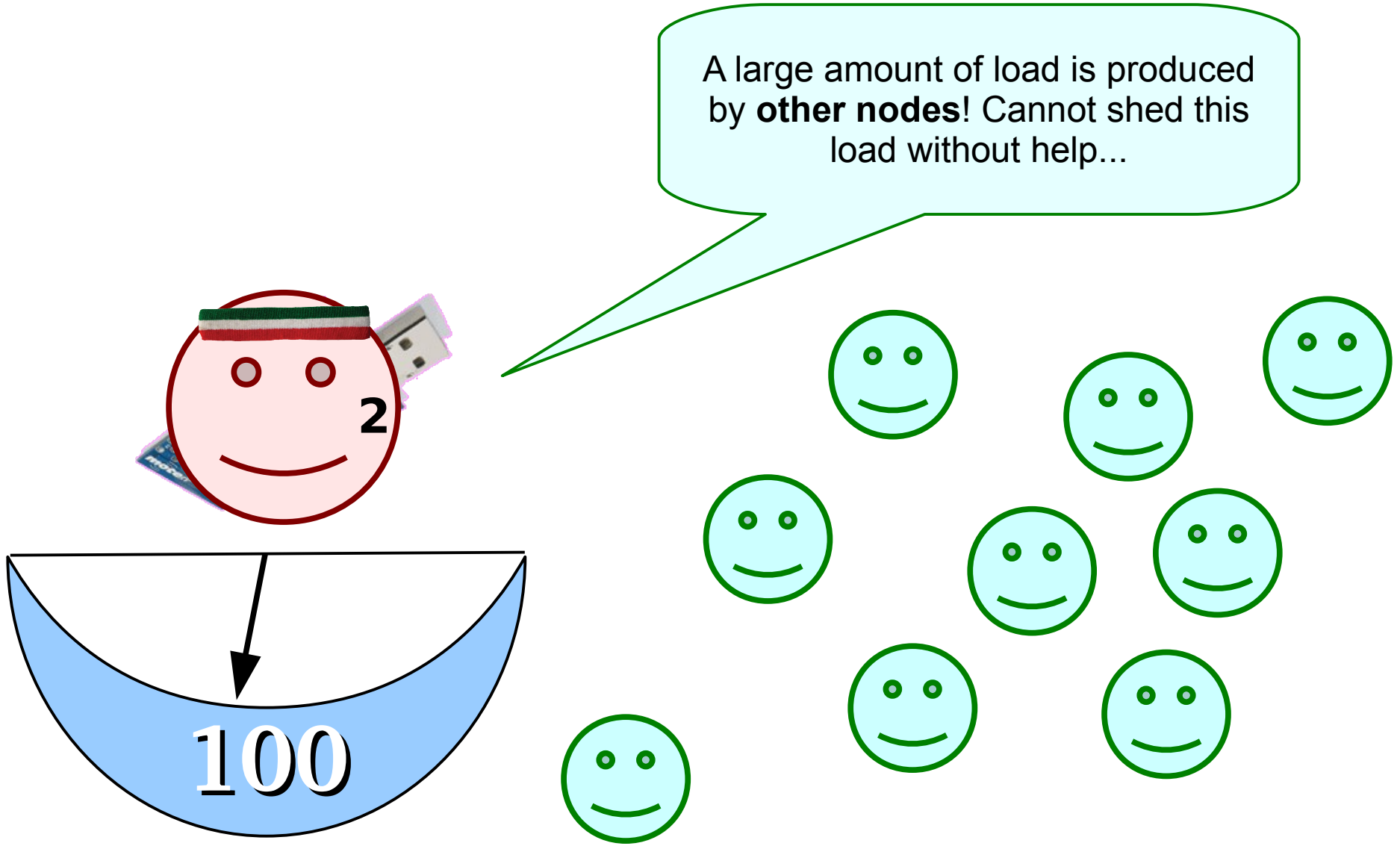


IDEA Is a Group Diet

IDEA: Improving Load Distribution

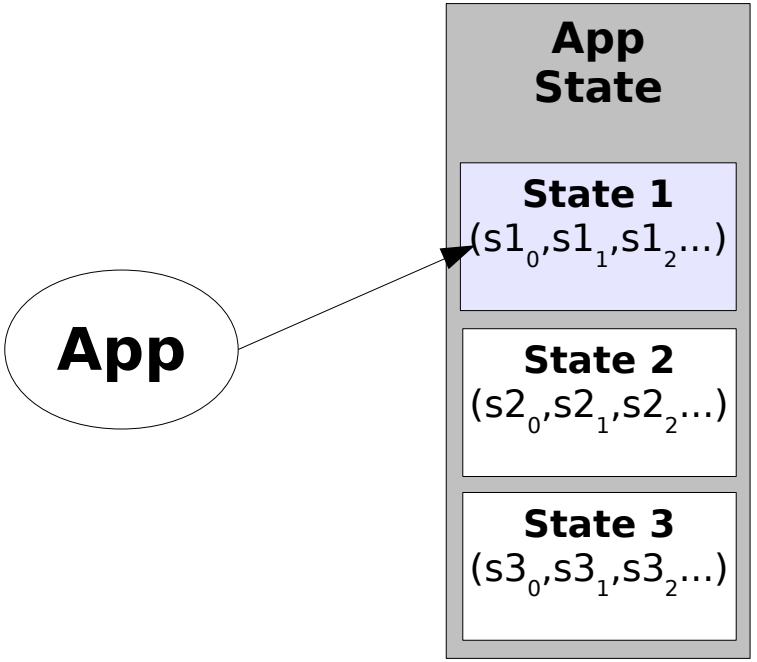
Goal: Improve application fidelity by matching system ***load*** to ***availability***

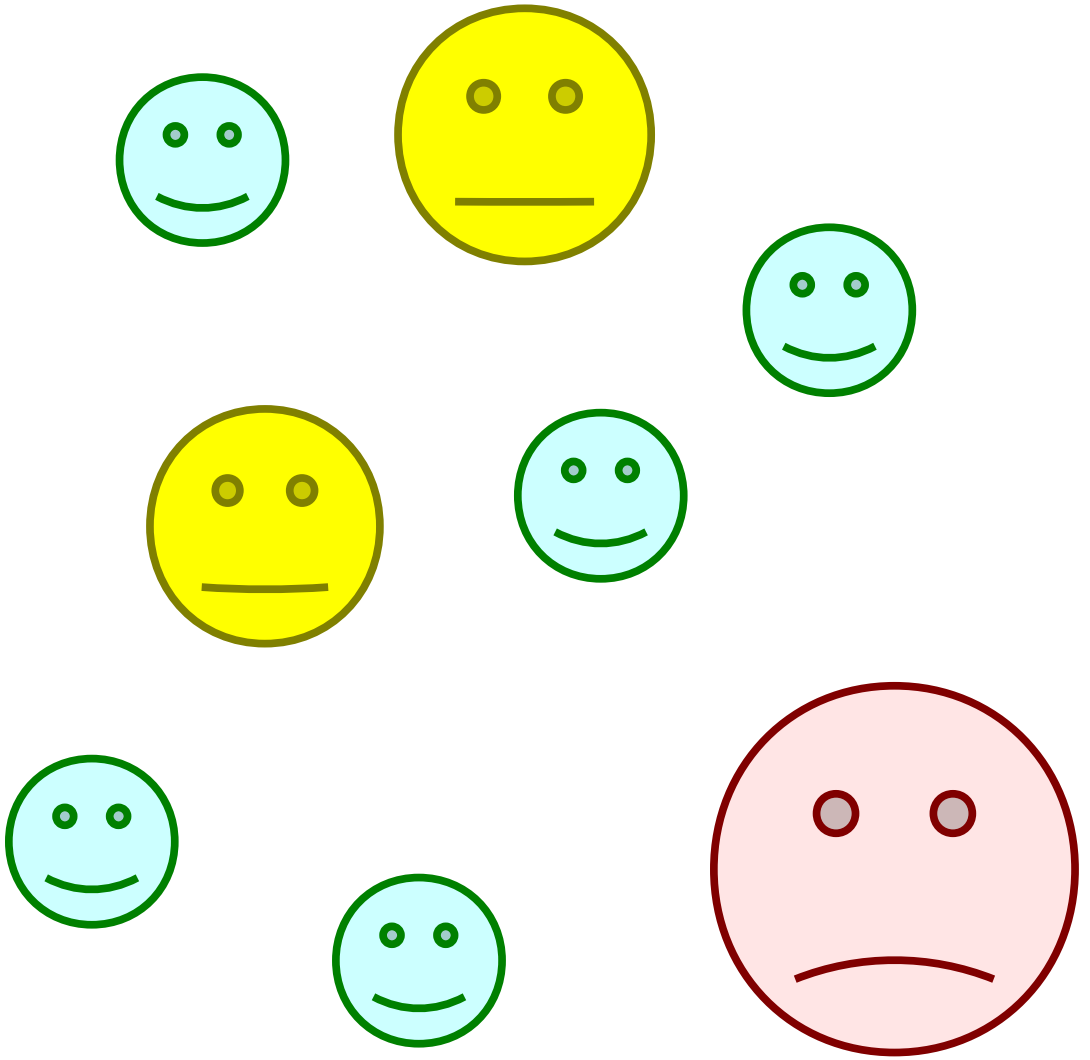
:: Capture all incident energy
:: Shift load towards ***underutilized*** nodes
:: Shift load away from ***threatened*** nodes

First piece of a *distributed OS* for sensor networks!

May not perform all actions in the way that **minimizes the total energy consumed** by all involved nodes!

IDEA: Integration

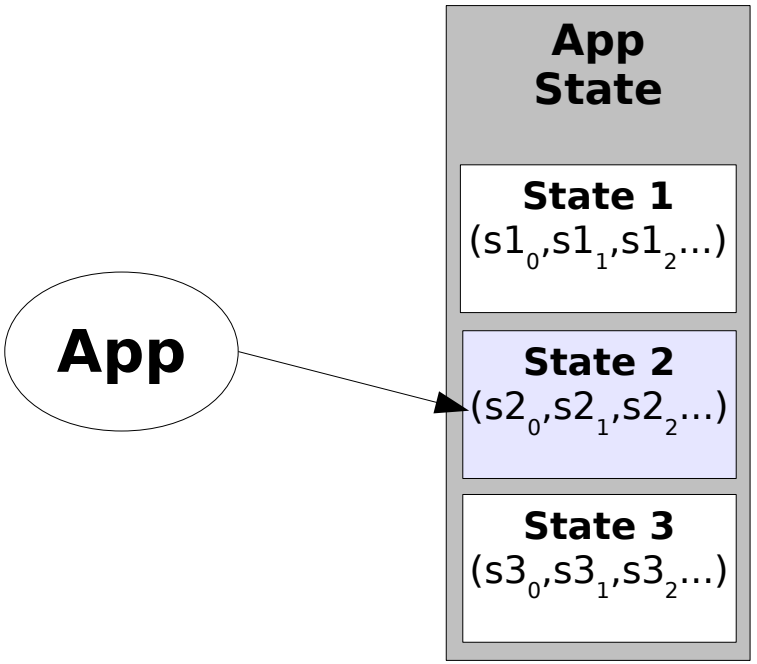


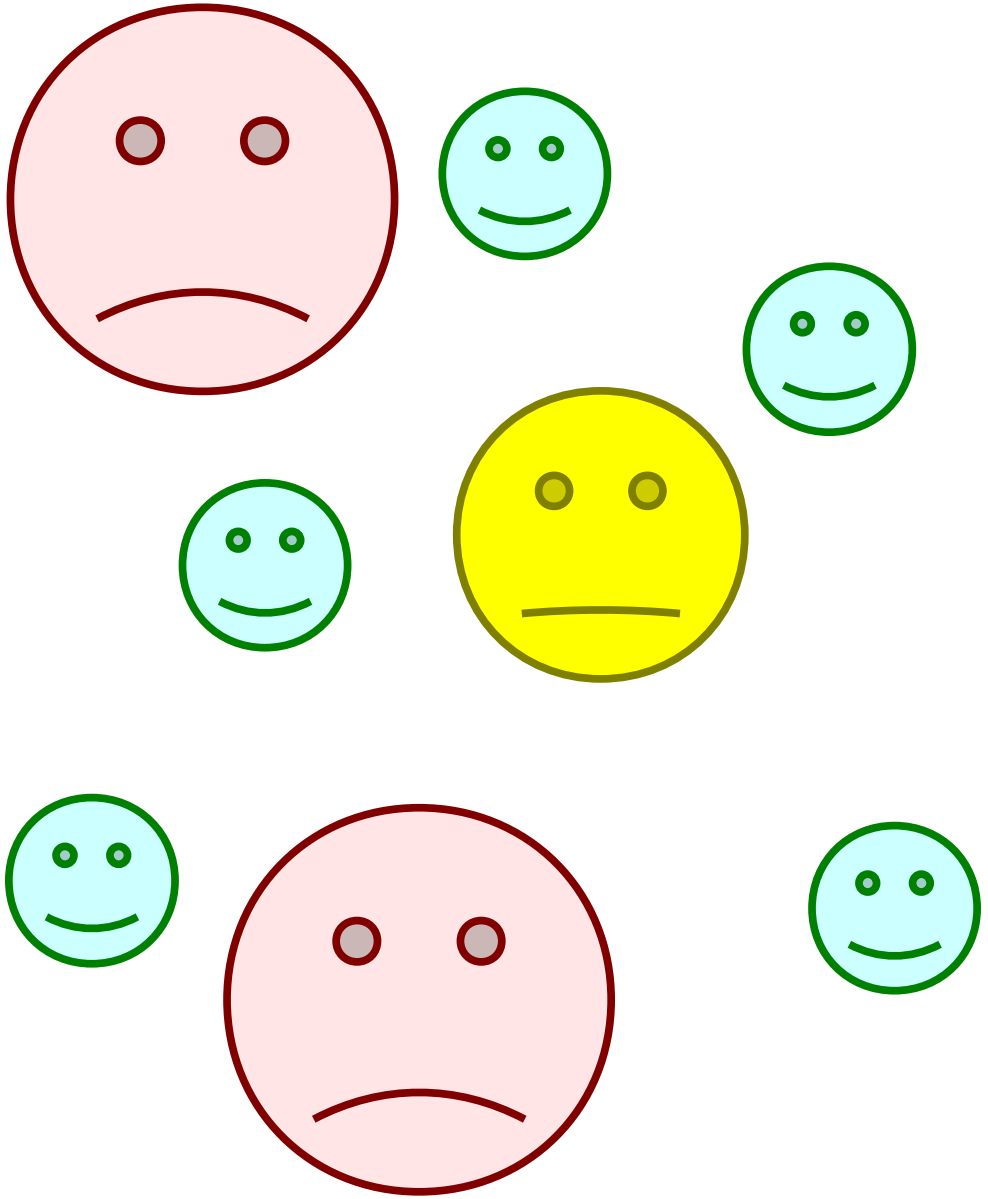


Example Applications:

- Routing Layers
- MAC Protocols
- Distributed Consensus Algorithms
- Distributed Computation

IDEA: Integration





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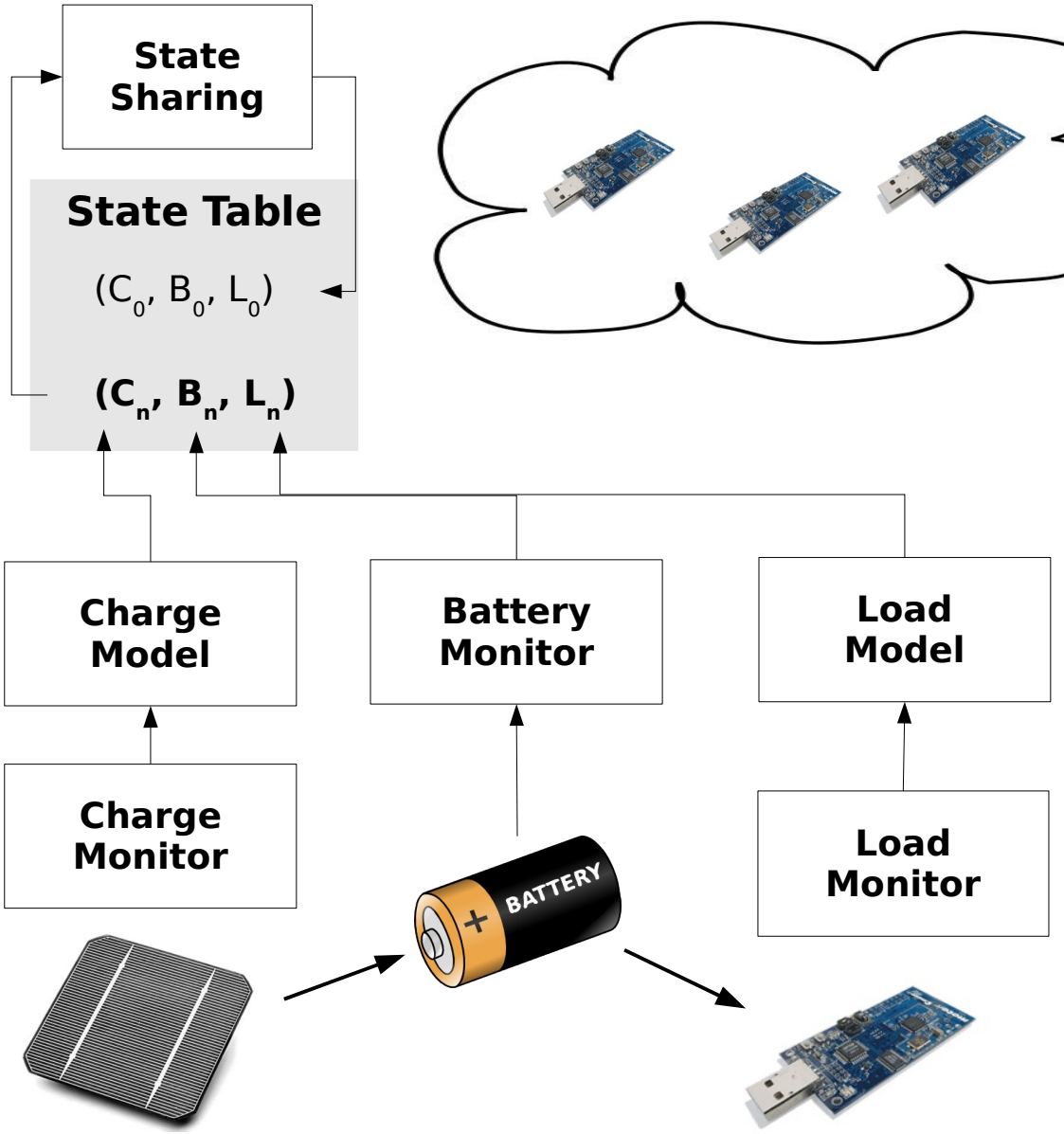
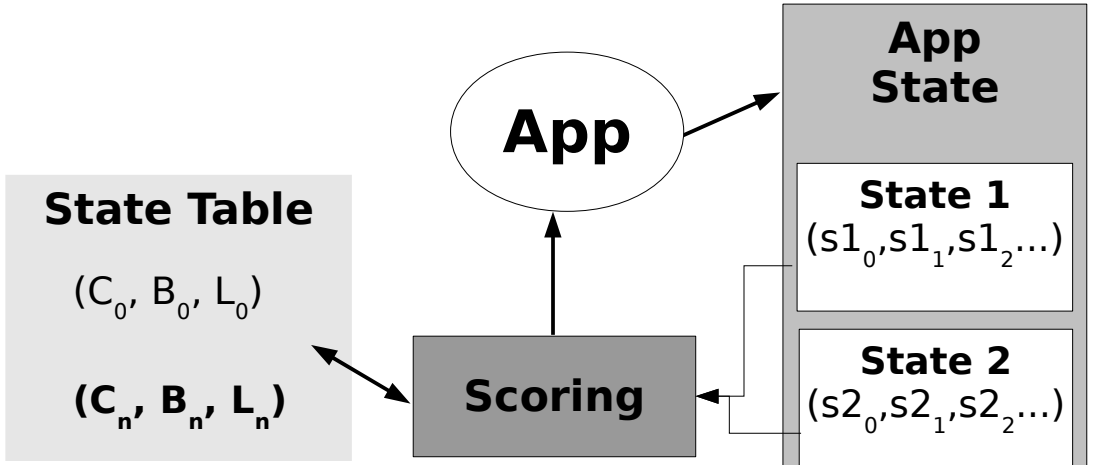
IDEA: Distribution

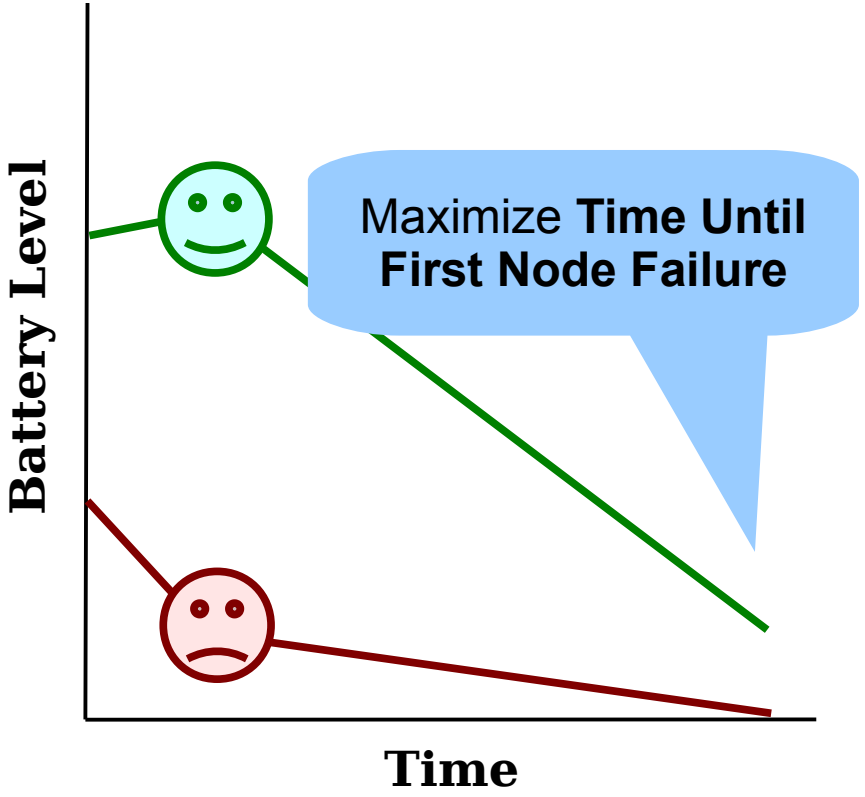


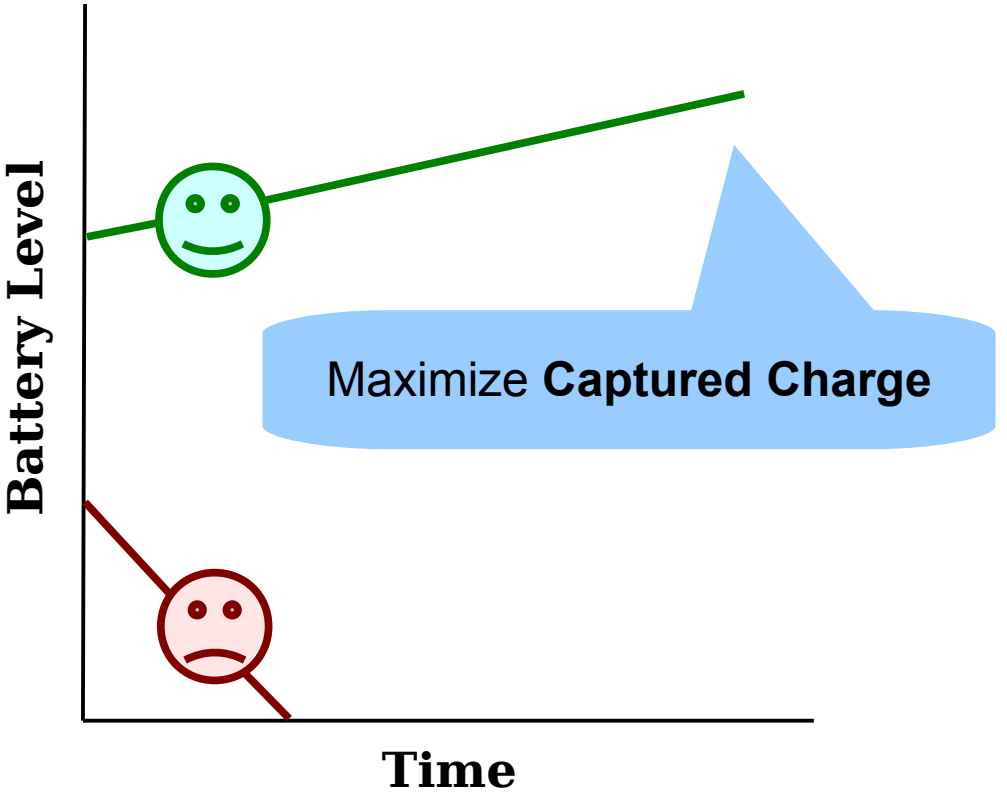
Distributed State:

- Load Model Parameters
- Charging Model Parameters
- Battery Levels

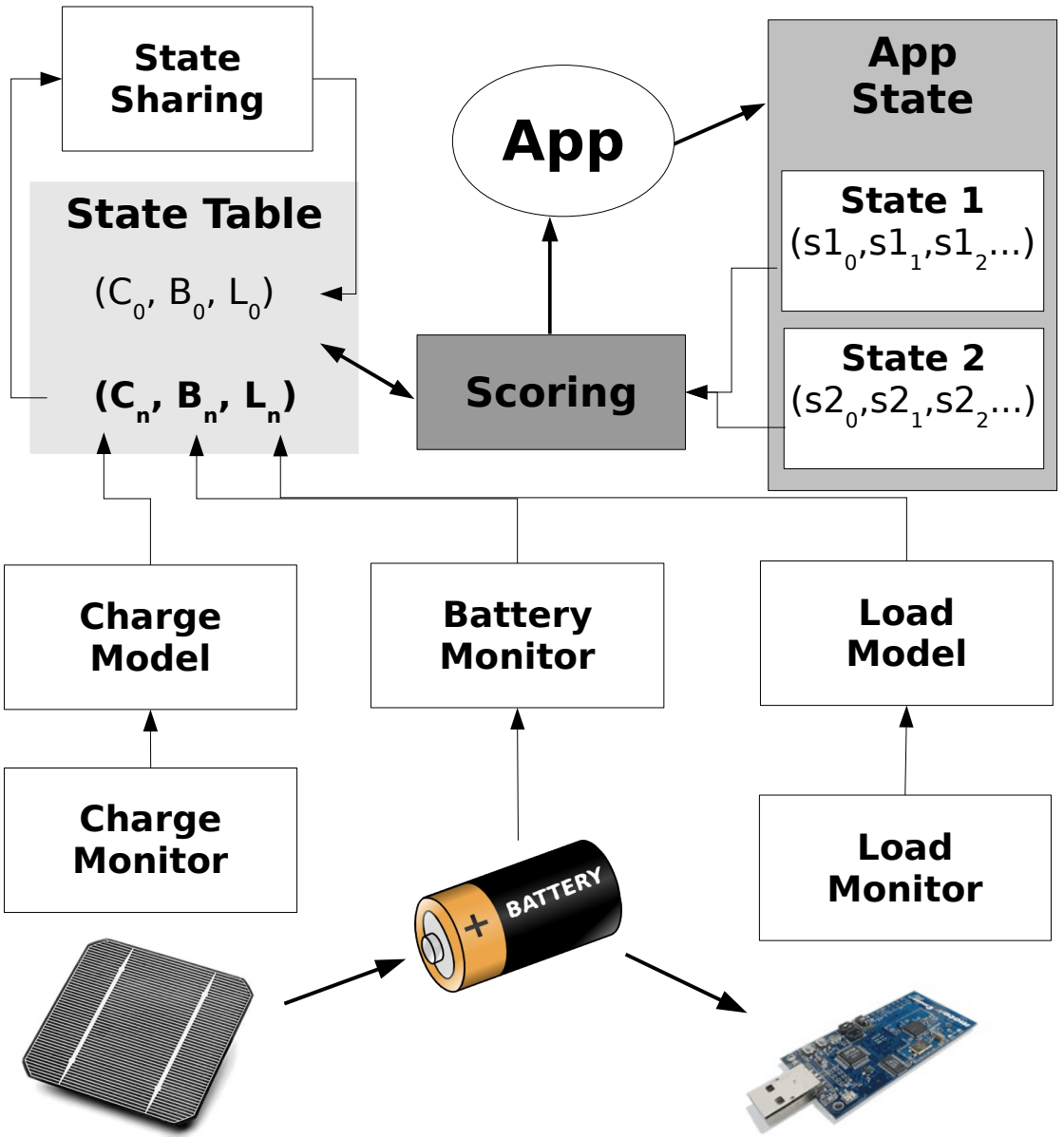
IDEA: Awareness







Questions?



Project Status:

- Prototype Implementation Complete
- Several Example Applications Underway
  - Modified Routing Layer (CTP)
  - Energy-aware Low-Power Listening Interval Tuning