OpenCL as Wireless Sensor Network Programming Abstraction

Wireless Sensor Networks (WSN)
Collection of distributed, battery powered nodes, sensing and forwarding data to a "collect-and-process" sink.

Applied for
Distributed processing across (heterogenous) processors located on sensor nodes and the sink.

Constraints
Collect-only, low-power, low-capability processing units to maximise operating lifetime.

Problems
More complex applications require more processing power. Considerable development effort in developing diverse architectures.

Can we build better WSNs?
- Building more powerful and heterogeneous sensor nodes adds more processing power to the nodes
- Processing becomes truly distributed
- Heterogeneous sensor nodes
- Programming becomes distributed

How can we program these new generation WSNs?
Use a high level abstraction!

Proposed Architecture

Advantages
Portability
Write once, run everywhere.

Abstraction
Focus on application instead of messing around with the low-level stack.

Unified View
One application, with kernels distributed over the nodes.

Potential Applications
- **Structural Health Monitoring**
  Monitoring bridges for imminent failure.

- **Wildlife Monitoring**
  Estimating bird population based on audio analysis.

Open Issues
- **Distributed Environment**
  Communication links are low data rate, high latency and possibly lossy.

- **Resource Constrained Processors**
  More powerful, but still a challenge for the OpenCL embedded profile.

- **Interacting with underlying framework**
  For controlling the sensor node hardware.

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