Thesis Title: *Incremental Compressing in Transiently-powered Systems*

**Description of the Units**

The Networked Embedded Systems (NES) group at RISE SICS is a part of the Computer Systems Laboratory. The current research focus is on the Internet of Things. Among the group's key technologies are the Contiki operating system, uIP stack, ContikiRPL, SICSLoWPAN, SICSthSense, and lightweight implementation of IPsec and DTLS. The NES group conduct projects together with industry and academic partners from Sweden and across the world.

**Thesis Description**

**Background:** Transient computing is a field of autonomous systems in which tiny embedded devices get power right from the ambient energy harvester output to reduce their size, mass, cost, and battery charging time. However, energy provisioning from ambient harvesting (or wireless transfer) is generally erratic and exhibits high spatial and temporal variation. Therefore, to avoid the restart of computation of an application running on these systems after a power outage, state retention systems are deployed on these devices. These state retention systems make checkpoints of the system state into nonvolatile memory (NVM) and later restore this state so that the application can continue where it left off.

**Problem:** Saving complete program state can often inflict a high time and space overhead on program execution. Researchers are actively researching into optimizing the checkpoint state size. One potential way is incremental checkpoints. The idea behind incremental checkpoints is very simple – often the changes between two successive checkpointed state is very small thus re-writing the complete state to stable storage is unnecessary. This idea can be further improved by compressing these incremental checkpoints before writing it to stable storage. The goal of this project is to develop compression methods that can efficiently compress incremental state while ensuring that they have minimalistic overhead on the program execution and the semantics of the code remains intact.

You will be required to:

- Study the state-of-the-art of checkpointing solution for transiently-powered systems
- Propose compression methods that can efficiently compress incremental state
- Implement and evaluate experimentally the energy overhead of the mechanisms
- Document the results as a thesis document

**Competence**

We are looking for a good student with good embedded programming skills, and with interest in IoT, who have fulfilled the course requirements. Good skills in spoken and written English are required.

**Application**

Applications should include a brief personal letter, CV, and recent grades. Candidates are encouraged to send in their application as soon as possible. Suitable applicants will be interviewed as applications are received.

**Start Time**  As soon as possible
**Location**  RISE SICS Kista, Stockholm

**Contact**
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