ICL Testbed Environment and Configuration

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Testing methodology

Summary of the works being done

Testbed environment

- Power measurement
- Test topology – numerical results
We built a similar topology to the Swiss Education Network for our experimental examinations.
WP 6 – Summary of Work

- Network power measurement and profiling (the required hardware is built)
- **Autonomic Energy-Aware Routing** policy based on reinforcement learning (implemented and tested in the ICL testbed), and **load transfer algorithm** based on a queuing network model (theoretical work that is not implemented yet) to reduce the overall network power consumption.

Publications

Electrical Power Usage Monitoring System (EPUMS) can monitor and report (over the network) individual observations of the power consumption of a large number of devices.

- EPUMS consists of a network of sensor nodes connected through Ethernet.
- Each sensor node is a microcontroller embedded system (based on Arduino 2009) and provisioned with a number of current and voltage sensors.
- A kernel device driver is developed later to encapsulate all power profiling information.
Power consumption is estimated from the AC current measurements.

- The AC current entering a router is sensed with a current clamp that is inserted around one of the cables connecting the router’s power supply.

- The signal is converted into a voltage level and also filtered to remove spurious noise before sending it to one of the micro-controller’s ADC ports.
WP 6 – ICL Testbed Env. (test topology)

- Measured values of power consumption are encapsulated in the packets and being transmitted over random paths towards the destination.

- These packets discover a route with the lowest power consumption, which data packets will follow [1].

Nodes in the core of network are equipped with EPUMS

WP 6 – Numerical Results

Up, left: Packet Latency when routing is solely based on QoS
Up, right: Packet Latency when routing is based on QoS and Power
Down: Network power consumption

Flow 1: 109->104, 30 kpps
Flow 2: 105 ->106, 10 kpps
Flow 3: 107-> 209, 20 kpps
Flow 4: 108 ->210, 5 kpps