On the Selection of Testbeds for the Evaluation of Sensor Network Protocols and Applications

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DVS

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Motivation

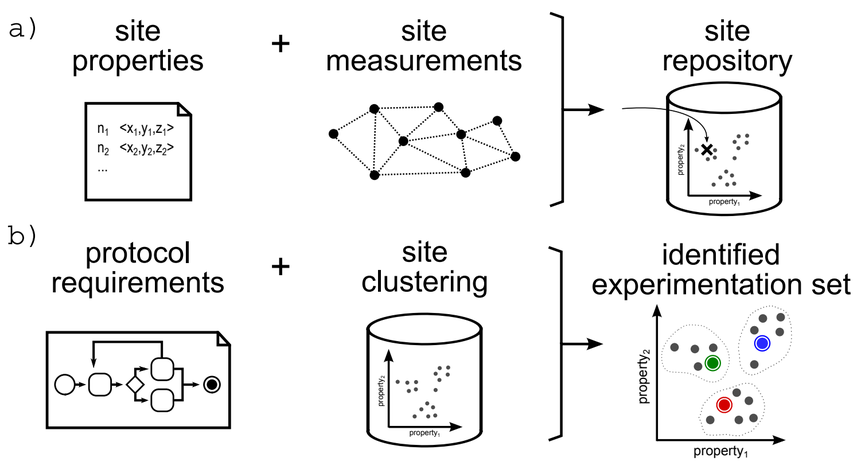
- Wireless sensor network (WSN) applications and protocols need careful and thorough **evaluation**
- Testbeds **accurately** reflect non-ideal experimental conditions
- However: results from different testbeds might be **inconsistent** and **contradict** each other
- Few testbeds (up to three, rarely more) typically used in WSN experiments

Problem Statement

- We challenge the ***more is better*** approach:
  - does not guarantee exposure to set of significantly **different** properties
- **Choice** of relevant testbeds is crucial

Goal and Proposed Approach

- Propose methodology to **describe** testbeds in a comprehensive and comparable manner
- Identification of rationale to **select** testbeds
- **Two**-step approach:



- Key: **property catalog** and **site repository**

Designing a Property Catalog

- Properties to describe testbeds:
  - **quantitative** and **finite**
  - **static** (change only over long time periods)
  - **dynamic** (change very frequently)

Property Catalog & Site Repository

- Property catalog:

static

1) number of nodes
2) node positions
   a) inter-node distance
   b) density

dynamic

3) packet reception ratio (PRR)
   a) node degree
   b) % of links with non-zero PRR
   c) % transitional links
   d) % significantly asymmetrical links
4) received signal strength (RSSI)
   a) RSSI
   b) correlation bet. RSSI and distance
5) link quality indicator (LQI)
6) networking
   a) broadcast/convergecast
      i. network delivery
      ii. network diameter
   b) point-to-point
      i. network delivery
      ii. network diameter

- Site Repository:

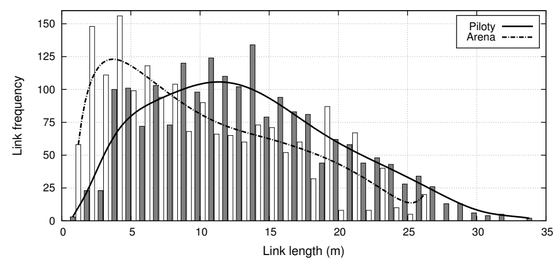
timestamp	site	TX power	radio channel	$prop_1$	...	$prop_n$
2013-06-15	piloty	0 dBm	26	60	...	0.9
	arena	15 dBm	26	63	...	0.7
...	...	...	...	...	...	...

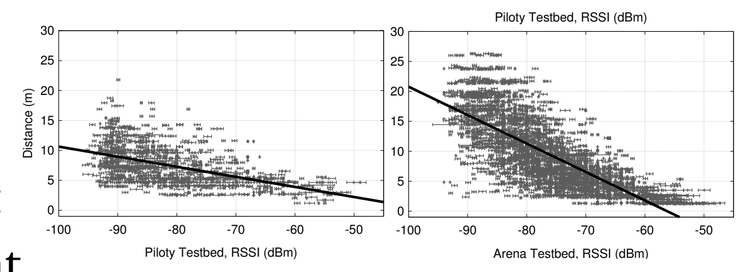
Preliminary Results

- Implementation of SW tools to measure properties
- Evaluated on two TUDμNet sites:

site	nodes	size [m]	node distance (min., avg., max) [m]	density [n/m³]
Piloty	63	30x20x8	1.2; 13.9; 34.4	0.01
Arena	60	31x7x3	1.2; 10.4; 26.5	0.09

- Connectivity regions
- Link asymmetry
- Hardware-based link quality estimators
- Networking
  - broadcast/ convergecast
  - point-to-point





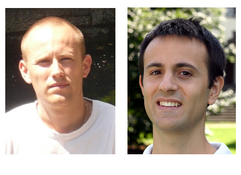
Ongoing Work

- Revision of **properties** catalog
- **Acceleration** of site evaluation software
- **Website** for accessing measured properties
- Analysis of evaluation **strategy** (e.g., frequency)

TUDμNet

COCOON
LOEWE Priority Program Cocoon
www.cocoon.tu-darmstadt.de

GRK 1362: Cooperative, Adaptive and Responsive Monitoring in Mixed-Mode Environments



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