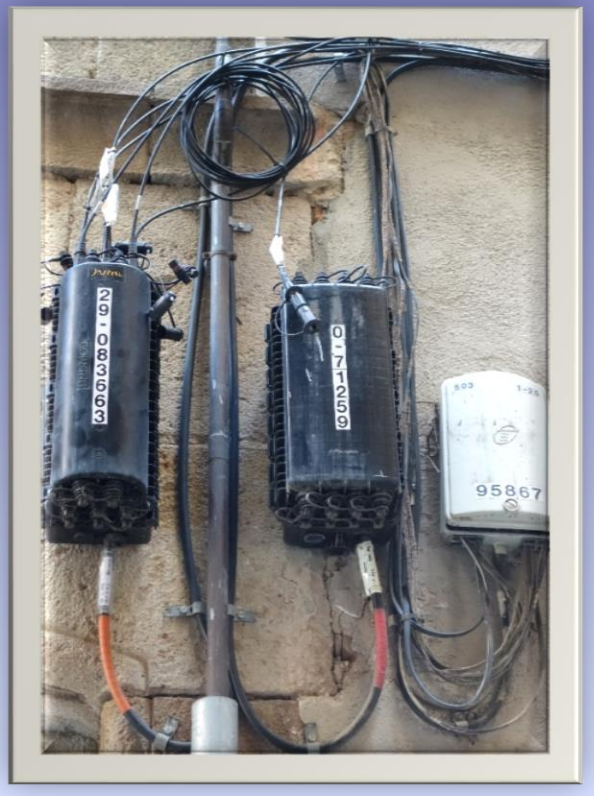


Magnus Almgren, Marina Papatriantafilou

DAT300/DIT615: LECTURE 1 ADMINSTRATIVE DETAILS

Support Team

- Examiners
  - Magnus Almgren
  - Marina Papatriantafilou
- Course Support Team
  - Charalampos Stylianopoulos
  - Wissam Aoudi
  - + others depending on project expertise

Details on web page:
http://www.cse.chalmers.se/edu/course/DAT300/

Course Slots

- Timeedit → https://goo.gl/JQktdw
- Mondays, Wednesdays 1000-1130*
- … in EDIT3364, ML11, EL43
- Some exceptions though:
  - Thu Aug 31: 1330—15 in EDIT 5128
  - Wed Sep 20: 15-16 in Fysikhuset FL71
  - + presentation slots in exam week

Check regularly web page for up-to-date info:
http://www.cse.chalmers.se/edu/course/DAT300/

*(sometimes shorter)

What is the course about?

Presentations

- Olaf Landsiedel: Internet of Things, Sensor networks
- Philippas Tsigas & Aras Atalar: Energy Aware Computing
- Vinzenco Gulisano: Data Streaming
- Wissam Aoudi: Securing Industrial Control Systems

- Jimmy Ehnberg (Chalmers): Power Systems (2 parts)
- Tentatively 1-2 more Chalmers teachers from complementary disciplines

- Joris van Rooij, Gothenburg Energy; "Advanced Metering Infrastructure”
- Göran Ericsson, SvK Head of Research and Development
- Rikard Bodforss: security & water plants

plus presentations by you

SVENSKA KRAFTNÄT

National grid

A modern society needs a good electricity supply in order to function effectively. The national grid (i.e. the system of 400 - 220 kV lines) has been built up in order to transmit large volumes of energy over great distances and functions like a motorway for electrical power.

Only the largest production facilities and the regional grids are connected to the national grid.

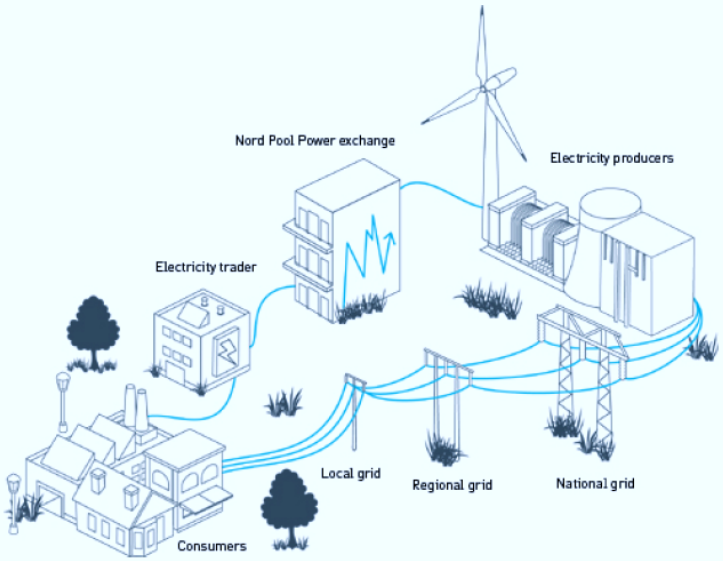
Svenska kraftnät manages Sweden's national grid, which includes about 15, 000 km transmission lines, substations and international 400 and 220 kvV interconnectors. Efficiency, safety and the long-term planning are three primary aims. Expansion planning, maintenance and operational supervision are required to fulfil this.

Download a map of the power transmission network in the nordic countries 2013.

The national grid and other networks

Electricity is transported from the major power stations to the regional electricity networks (40-130 kV) via the national grid (220 kV and 400 kV), which is owned by the Swedish state and managed by Svenska Kraftnät.

From the regional networks, electricity is transported via local networks (40 kV or less) to electricity consumers.



The diagram above shows the route of electricity from the producer (power station) via the national grid, regional network, local network and finally to the electricity consumer. The producers sell their electricity on the Nord Pool power exchange or to electricity suppliers. Suppliers sell the electricity on to the consumer.

The network owner uses the local network to distribute the electricity in the mains to the consumer.

Electricity suppliers and network owners are different kinds of companies. If you have changed your supplier then you get two bills, one from the supplier detailing the cost of the electrical energy, and one from the network owner for transmission of the electricity on the supply system.

Göteborg Energi

Privat | Företag

Text: A A A | Anpassa | English

Om oss | Kontakt | Mina energisidor

Produkter och priser | Projekt och etableringar | Kundservice

Sök

VINN STARTPLATSER TILL LILLA OCH MELLAN GÖTEBORGSVARVET!

Logga in

Mina energisidor

Ok

Vad kan vi hjälpa dig med?

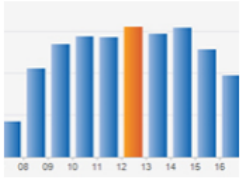
- Har du frågor om fakturan?
- Vill du ha e-faktura?
- Vill du göra felanmälan?
- Dags att flytta?
- Lediga jobb
- Vill du köpa el?

Som Västsveriges ledande energiföretag erbjuder vi **el**, **elnät**, **fjärrvärme** och **gas**.

Bra Miljöval

När du vill minska din miljöpåverkan

Nu har du genom vårt erbjudande Fjärrvärme märkt med Bra Miljöval möjlighet att ytterligare markera att du vill minska din miljöpåverkan.



Följ din elanvändning på timnivå

Genom den kostnadsfria tjänsten ”Din elanvändning” kan du nu följa din elförbrukning per månad, dygn eller timma

GoBiGas - en biogassatsning för ett hållbart Göteborg

Här ska vi producera biogas genom förgasning av skogsråvara. Se filmerna och läs mer om projektet här.

Dags att teckna nytt elavtal?

Hos DinEl kan du sätta ihop ditt eget avtal, efter dina egna preferenser och boendesituation.

Nyheter & pressreleaser

> Fler nyheter

2013-02-27 > Information om rivning och ombyggnation av Rosenlundsverket

2013-02-26 > Vinnare av EM-biljetter i februari

2013-02-26 > Göteborg Energi deltar i nationellt forskningsprogram inom elkraftteknik

Avbrottsinformation

- Elnät
- Fjärrvärme
- Fjärrkyla
- Gas

Course Details

Course Details

Mandatory!
Why?
Quizzes but no exam

Tie to a scientific problem & use in report

Course Details

Course Details

Passing the course

- Major activity: Project
  - Faculty & Industry presentations to give breadth
  - Choosing papers to read to support project work
    - Training in presentation of complex ideas
    - Team work
  - Actively listening and discussing other people's ideas

Passing the course

- Major activity: Project
  - Faculty & Industry presentation
  - Choosing papers to read to sup
    - Training in presentation of compl
    - Team work
  - Actively listening and discussing other people's

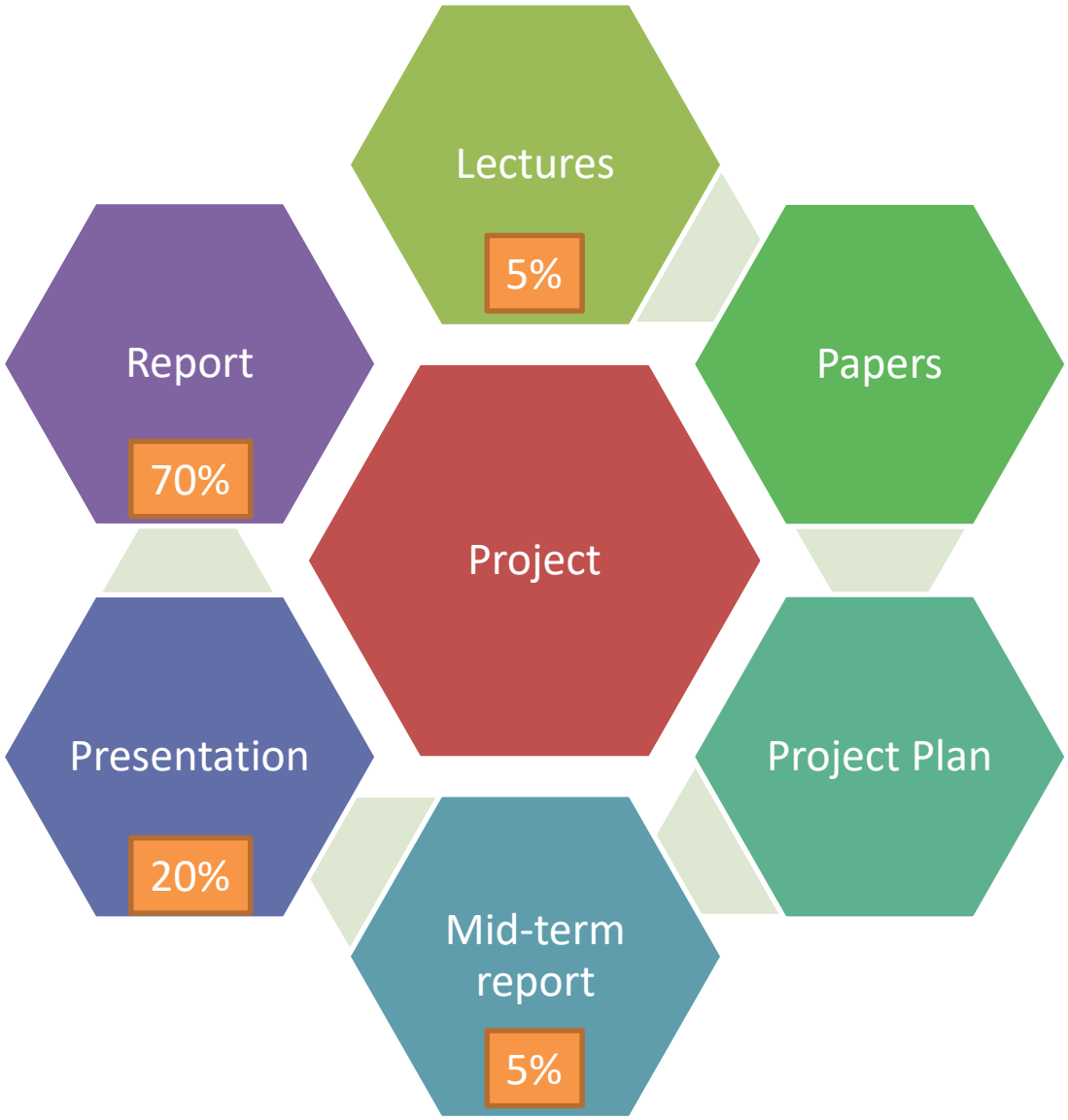
Idea

-- Understand complex ideas
-- Go into depth in the paper
-- Explain to your peers

Mandatory Participation

The active participation is important for the presentations, so we have mandatory lectures. If you miss lectures (or are late), we will ask you to read additional articles and write a report.

Your grade (1)


Lectures
5%
Papers
Report
70%
Project
Presentation
20%
Project Plan
Mid-term report
5%

Your grade (2)

- Your grade will depend on
  - Completed project and its quality
    - Project report
    - Presentation
    - Individual mid-term progress report
  - Active participation in lectures and presentations (occasional quizzes)

List of deadlines

- Projects
  - W1 Choose group + project
  - W2 Planning report + list of supporting papers (schedule, resources, goals)
  - W4 (**individually)** 1--2 pages: project + reflections; (team) outline of report
  - end Successfully complete project
    - Written report + demo & presentation
- Other reporting
  - Every week, write a **short** summary of what your team has done and if you **need our help. → BOX**

Projects

- Suggestions on the home page
  - http://www.cse.chalmers.se/edu/course/DAT300/
  - Github repository
  - Video of former project presentation (tomorrow) as an example

DAT300 Students - Box | Projects 2017 | 8 ways to take screensho

www.cse.chalmers.se/edu/course/DAT300/projects-2017.html

Suggested Projects for DAT300, DIT668 (under construction)

See also http://www.cse.chalmers.se/edu/course/DAT300/SLIDESNOTES/L2aboutPrj.pdf

At project start, we will share access with a github for you to look at (and **possibly extend earlier projects**) as well as discuss availabl
git account and send a request to chasty@ (chalmers domain) to register to the course group.

Below we list a number of suggested projects for DAT300. Of course we would be open to hear your suggestions too -- but the projects
The suggestions below are just seed ideas from faculty. If you like an idea, we will connect you with the faculty to develop it further. It
demonstration at the end of the course.

2017:1 Decision support for smart meters and power outages

Göteborg Energi has over a quarter million smart meters, capable of sending power outage alarms, installed in Göteborg. Reporting pov
the wireless networks they use to communicate. In this project you can explore how the alarms could be used for real world scenarios

2017:2 Detect attacks against industrial control systems

Attacks on Industrial Control Systems (ICS) are likely to manifest changes in sensors sen
changes in their behavior. A popular approach to tackling
observed value (the residuals) can then be inspected for la
project is to leverage advances in Neural Networks/Deep
data). The expected outcome of this project is to

- Implement a NN using any of the available toolbox
- Apply and tune the implemented network on time s
- Analyze the residuals and estimate the prediction a

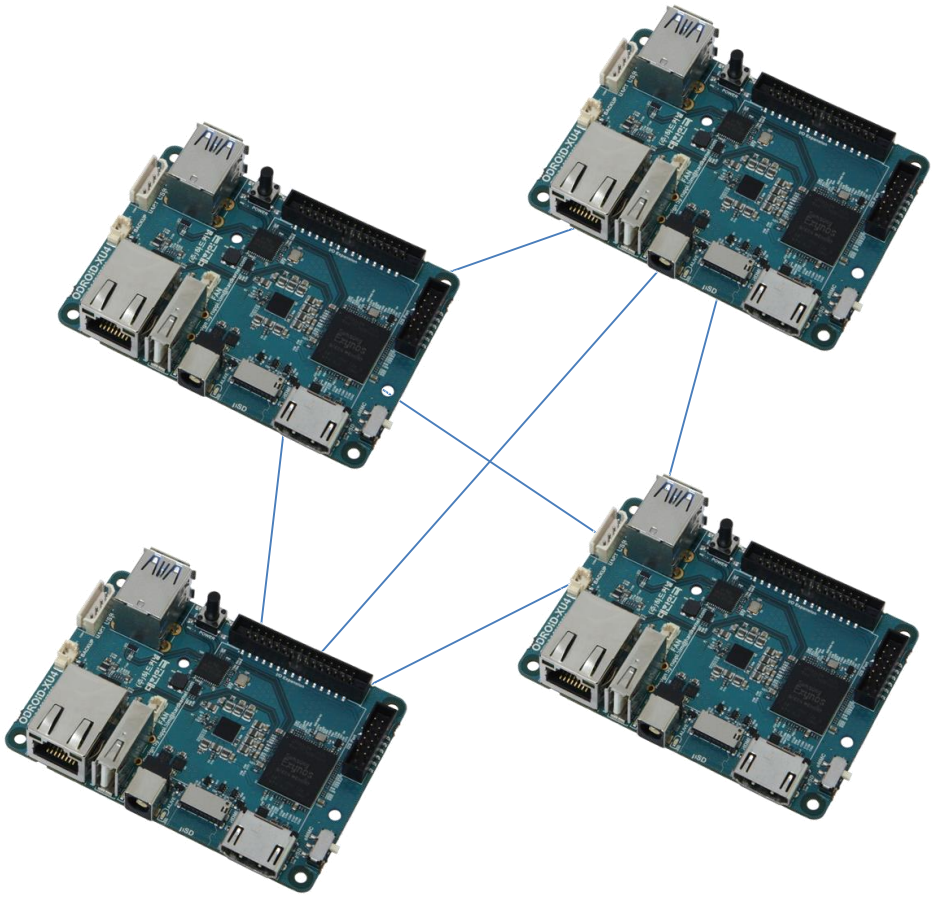
Do you have the right courses?

Votes

	2017:1	2017:2	2017:3	2017:4a	2017:4b	2017:4c	2017:5	2017:6	2017:7	2017:8	2017:9
Andreas Lindhé		✓				✓	✓	✓			
Christian Roos	✓						✓				
Hassan Ghalayini		✓		✓	✓	✓		✓	✓	✓	
Anders Stigsson		✓					✓		✓		
Malama Kasanda	✓							✓		✓	
Vaios Taxiarchis	✓							✓		✓	
Robert Gustafsson		✓				✓	✓	✓			
Felix Kirchmann						✓	✓		✓	✓	
Romi Zaragatzky		✓					✓	✓			
Lamiya Yagublu		✓					✓	✓			
Francine Mäkelä		✓					✓	✓	✓		
Your name	✓ (✓) ⊘	✓ (✓) ⊘	✓ (✓) ⊘	✓ (✓) ⊘	✓ (✓) ⊘	✓ (✓) ⊘	✓ (✓) ⊘	✓ (✓) ⊘	✓ (✓) ⊘	✓ (✓) ⊘	✓ (✓) ⊘
Total	3	7		1	1	4	★8	★8	4	4	

11 polled users

Comparison of open-source big data analysis tools on single-board devices

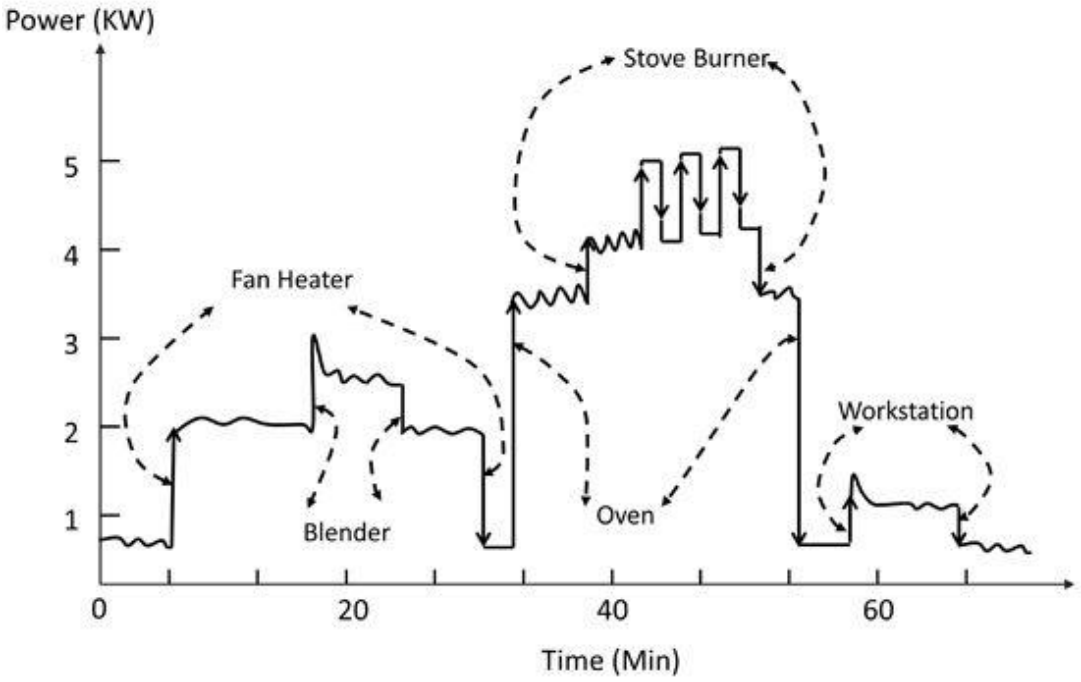


- Given a small network of single-board devices and a benchmark analysis application (focusing on AMI data) study and compare:
- Memory, CPU and network footprints ”at rest” for popular frameworks such as Apache Storm, Apache Spark and Apache Flink
- Memory, CPU and network footprints and latency for a benchmark application and different injection loads

Protocol Parser for protocols

- Cyberphysical systems communicate, but many times through protocols that a security mechanism such as an IDS cannot understand.
- Choose a protocol, collect data, and build a parser using open source tools to feed it into other security mechanisms.

Using a NILM toolkit



- Understanding the behavior of appliances is important.
- There are algorithms to take an energy trace to find the appliances in it.
- Investigate what behaviors can be detected
  - Compare user behavior across fridges
  - Find older / newer models
  - Find inefficient ones

Project ideas (1): A simple demand response service

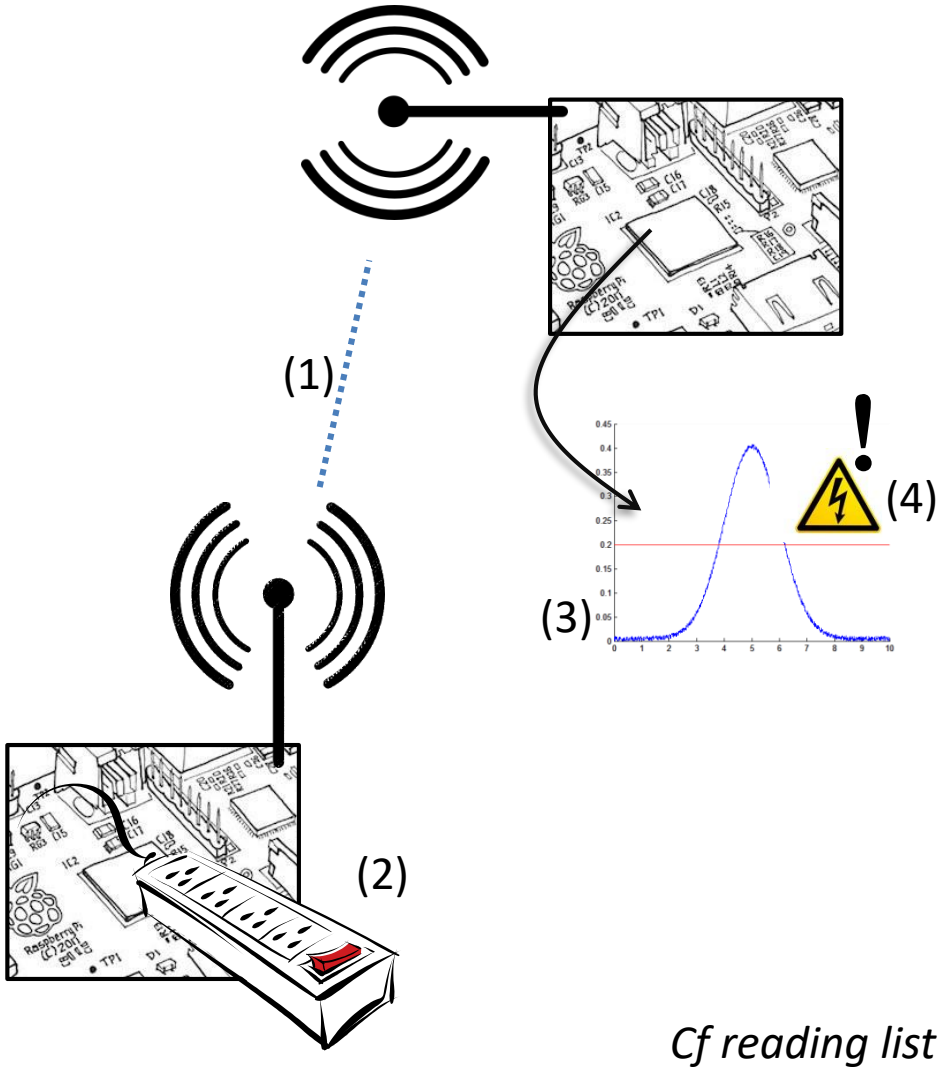
- Build on a communication node, eg on an ARM-based platform, capable to **interface with off-the-shelf** equipment , to
  - monitor consumption and **control** electrical appliances

- implement intelligent **scheduling** algorithms that
  - Can reduce peaks/meet constraints
  - Can possibly allow for cooperation between communication nodes in a way that reduces the total energy consumption of the system

… to eg ARM-platform

cf reading list on Adaptiveness & resources

Project ideas (2)
Online monitoring of energy consumption



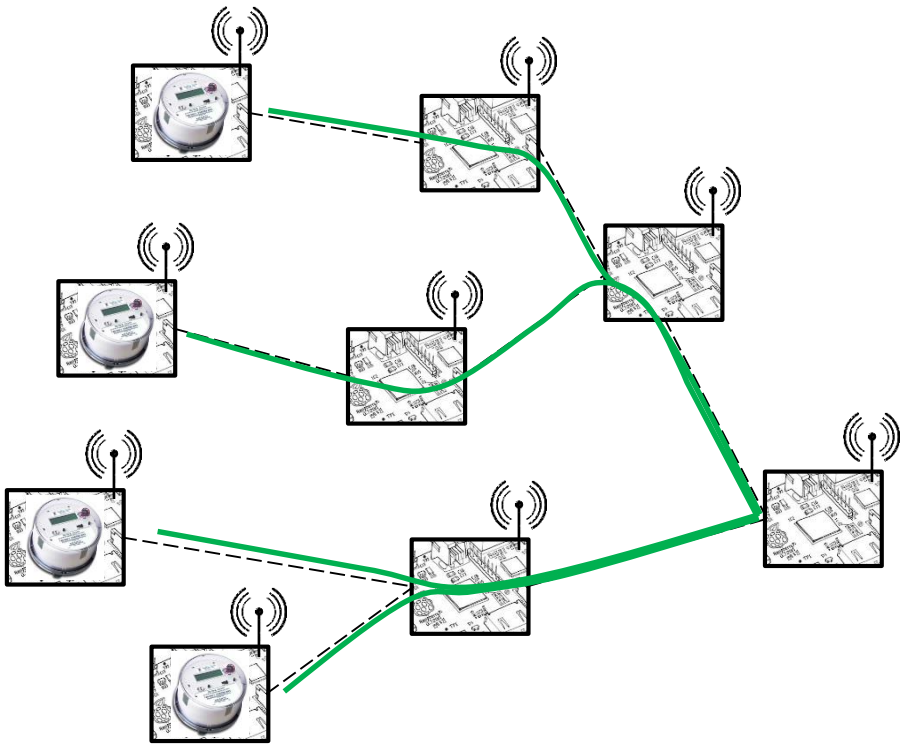
1. on ZigBee (or other protocol) network
2. Forward energy consumption readings
3. Process information with **Stream Processing Engine**
4. Generate “alarms”

Example

- send an “alarm” message each time the last hour average consumption exceeds a threshold.

Cf reading list on streaming

Project ideas (3)
Simulation and in-network aggregation of smart meters data



1. On ZigBee (or other comm-protocol) network
2. Simulate smart meters readings (various models)
3. Aggregate information in the hierarchical topology with **distributed Stream Processing Engine**

Cf reading list on streaming aggregation

Projects, ideas continued

1. **Online processing of smart grids' data.**
    1. Security applications in the context of smart grids demand for online data processing in order to spot threats in a real-time fashion. This project explores how processing paradigms such as data streaming can be leveraged in this context.
2. **Smart grid data gathering networks**
    1. What kind of data gathering networks in Smart Grids are possible with today's technology, such as embedded platforms (ie Raspberry Pi), wireless antennas (ie Zigbee) and open-source hardware (ie Arduino)? How can consumers get and process data from their own smart meters in order to change their behavior?
3. **Visualizing data for the smart grid**
    1. How can data from the smart grid best be visualized and what patterns can be determined? Use tools such as Spotfire, Gephi, and your programming skills.

http://www.cse.chalmers.se/edu/course/DAT300/projects.html

Projects, ideas continued

4. Intrusion detection for the smart grid

- How can a de facto IDS such as snort be adapted for protocols found in the smart grid. This project is about understanding snort rules and how these can be adapted to DLMS/COSEM or MBUS traffic.

5. Smart grid data correlated with other sources

- Many government agencies and other organizations provide open datasets. How can such datasets be used to extend our understanding of enery consumption, or other patterns in the smart grid datasets? One source for open data is found at the hack for Sweden site.

6. New services in the smart grid

- What services would be useful for consumers and companies to have in the smart grid? Are the data available sufficient to create such services? See for example the following service from E.On to save energy.

http://www.cse.chalmers.se/edu/course/DAT300/projects.html