CANDIS: Heterogenous Mobile Cloud Framework and Energy Cost-Aware Scheduling

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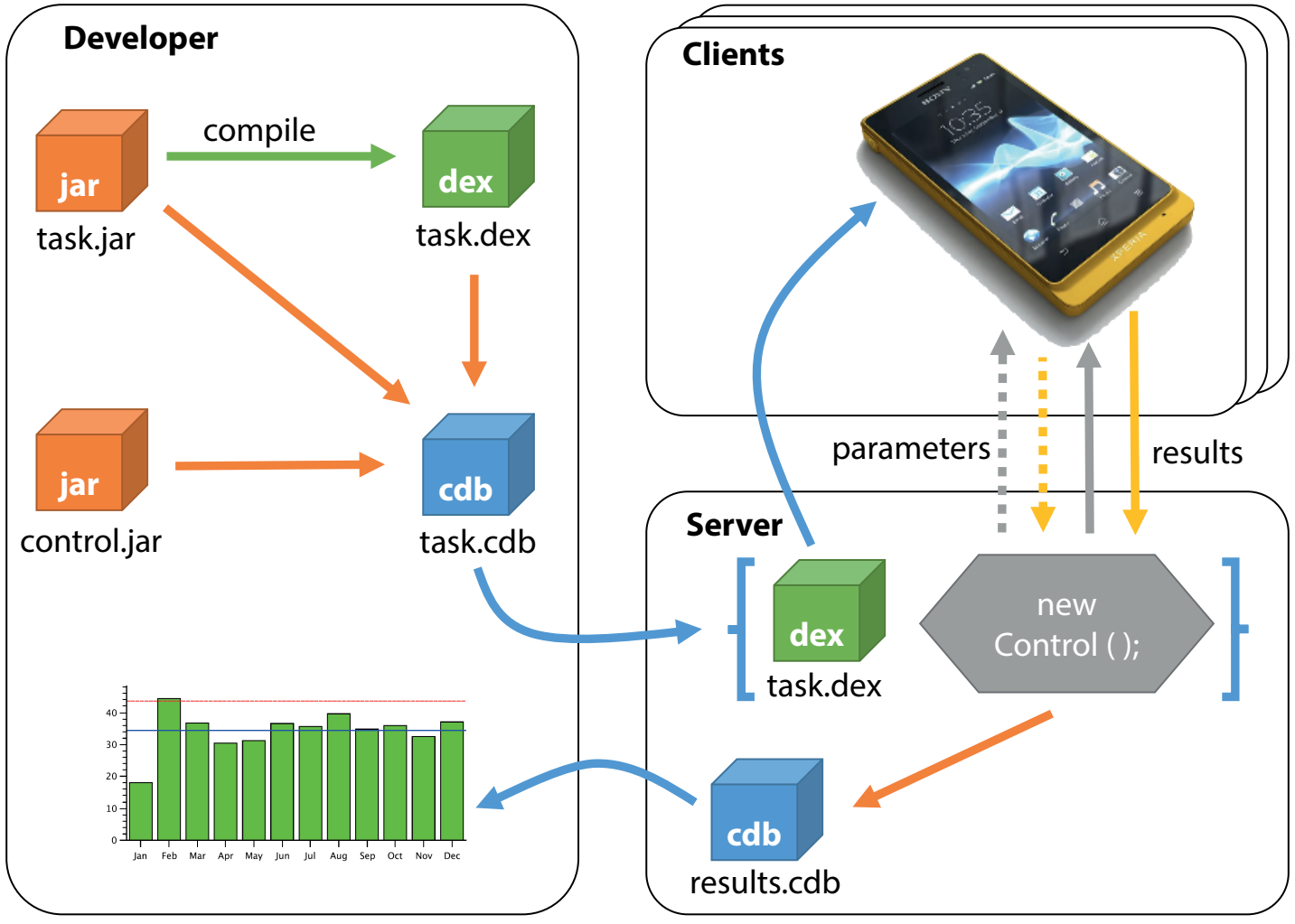
PhoneCom 2013

The Story So Far

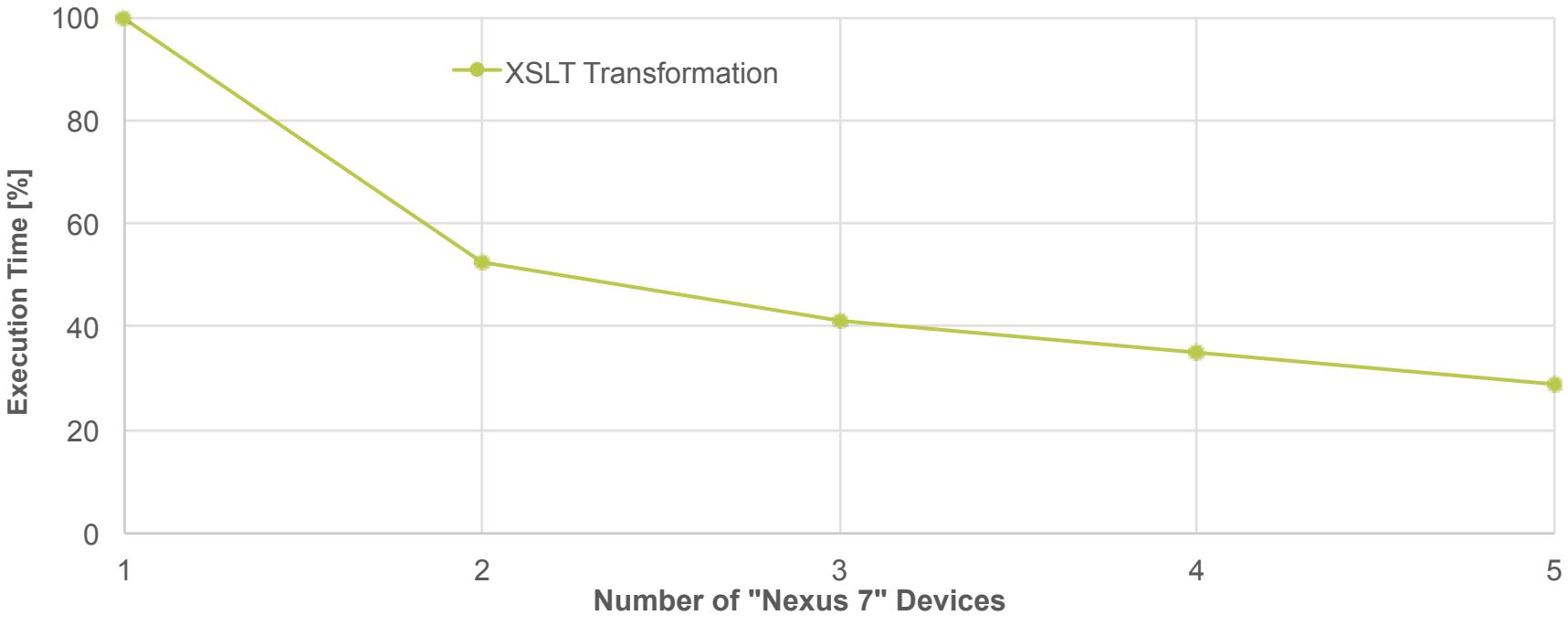
In Phonecom 2012 we presented a position paper

DroidCluster: Towards Smartphone Cluster Computing The Streets are Paved with Potential Computer Clusters

CANDIS Architecture



Scalability

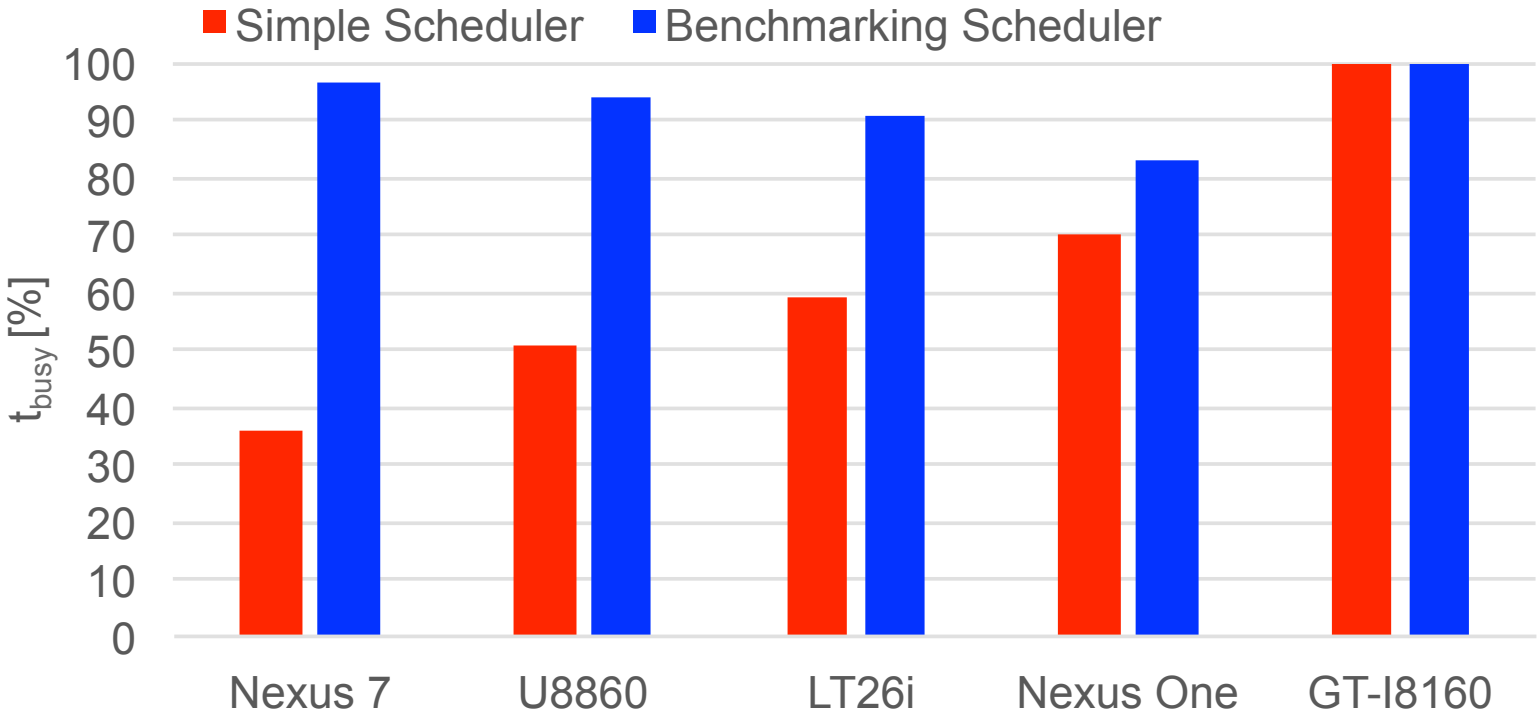


Repeated XSLT transformation simulates a realistic workload

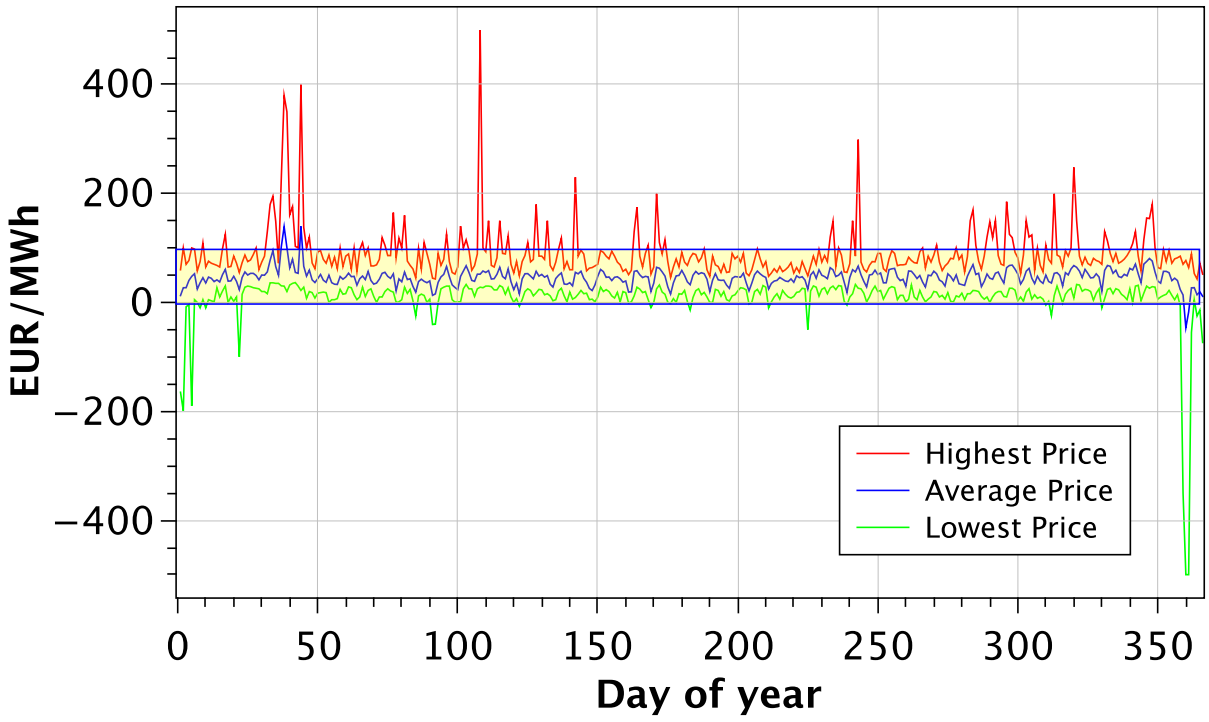
Adapting to Heterogenous Device Clouds

Simple: Divide tasks into equal chunks

Benchmarking: Divide tasks based on the results of a small test task



Electricity Price Variations 2012



Electricity is traded on a stock-like market

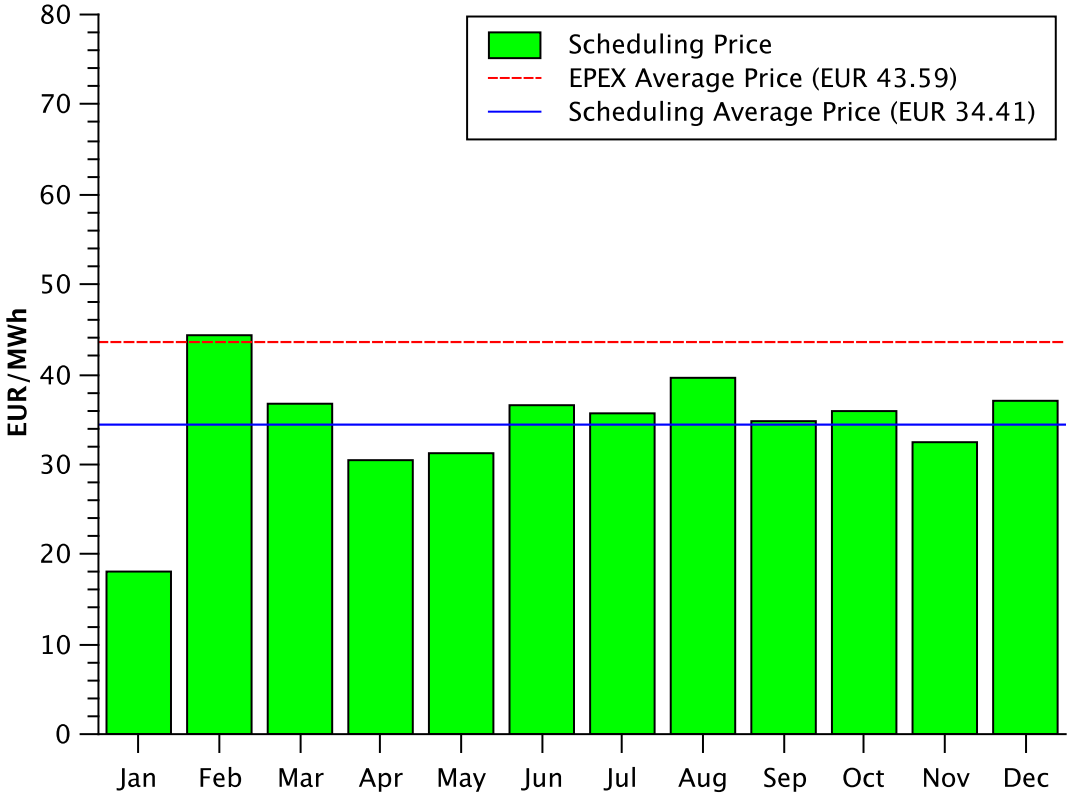
Idea: Schedule computation, when electricity is cheap.

Scenario and Scheduler

- A task needs 72h of computation on available resources
- Every month the task needs to be finished before the 15th
- Simple scheduling strategy:
  - Scheduler uses devices for computation when electricity price is below a threshold
  - If a deadline miss can not be prevented otherwise, electricity will be bought at any price

Cost Savings

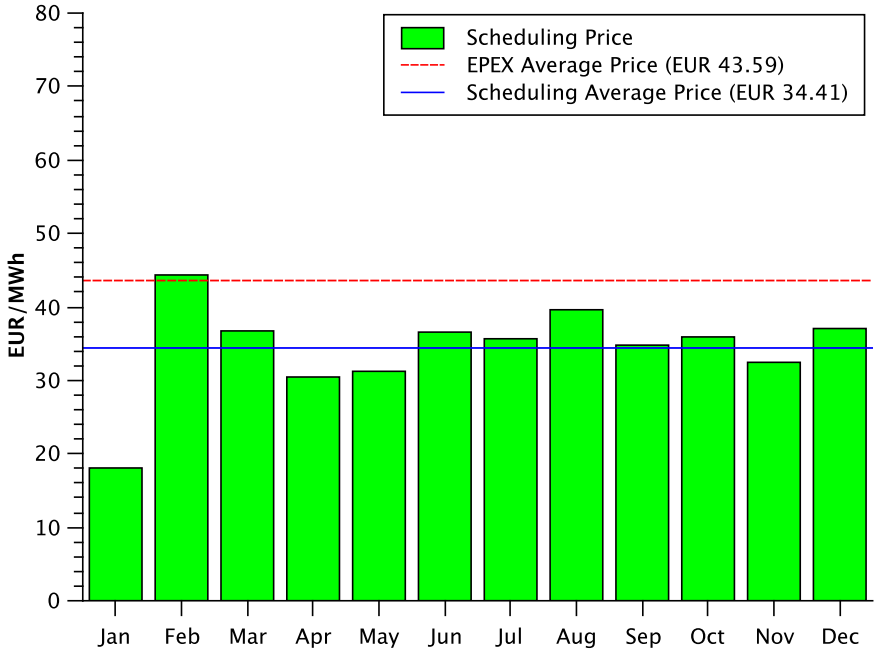
Electricity will only be bought if it is less than 50 EUR/MWh



Beat the average price by 21 %

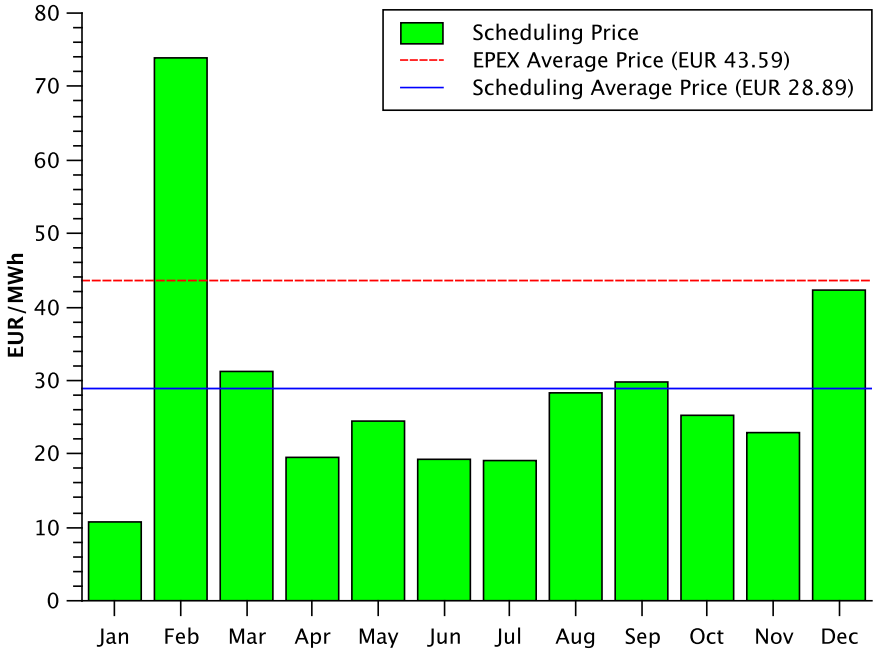
Savings with more Aggressive Thresholds

Threshold: 50 EUR/MWh



Beat average by 21 %

Threshold: 30 EUR/MWh



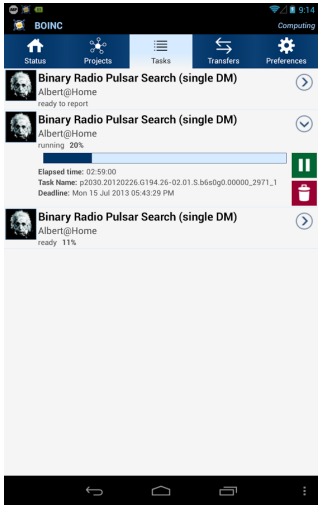
Beat average by 33 %

Energy-price aware scheduling

- Highly fluctuating electricity prices
- Will continue with the shift to renewables
  - unless somebody commercializes cheap fusion $\rightarrow$ in 50 years
- Load-shifting already well researched, but not applied on a large scale
- Nothing can load-shift easier than IT equipment
- Under-Utilization not a large cost factor for mobile devices: Leaving resources – which are there anyway – unused doesn't hurt

Using Mobile Devices for Serious computation

- We are (still) convinced this is going to happen
- This will be the/a next big thing
- Probably there is money in it somewhere
- Can already see the first steps towards mainstream



Conclusions

Mobile Device Clouds

Will happen. Soon.

Energy Cost-Aware Scheduling

Makes a lot of sense.

CANDIS code to play `https://github.com/ejoerns/candis`

谢谢! 有问题吗?