



Smart Grids as an Opportunity for Establishing Privacy Mechanisms

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■ Smart grids mean hundreds of millions of new internet endpoints

- Electricity Meters
- Appliances, thermostats etc. (home automation)
- E-vehicles



■ Roll-out of smart meter infrastructures:

- Accurate readings at requested time intervals and interaction
- Political motivation: climate goals and job creation

■ Fine granular consumption data is necessary and desirable

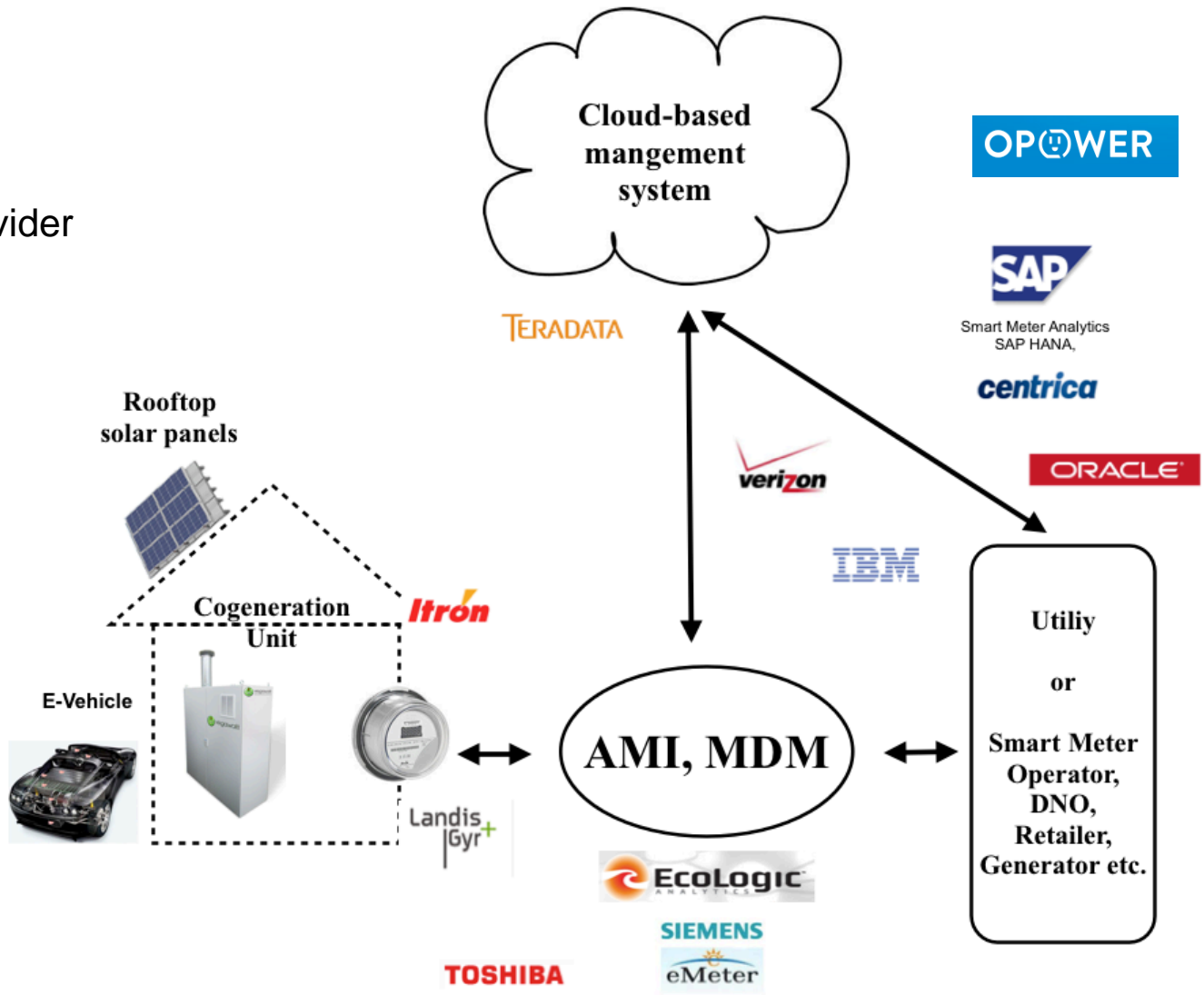
- Load Management of the grid & integration of renewables
- Detailed energy bills and 'flexible' tariffs
- Competition between electricity suppliers
- Ecosystem of new energy services



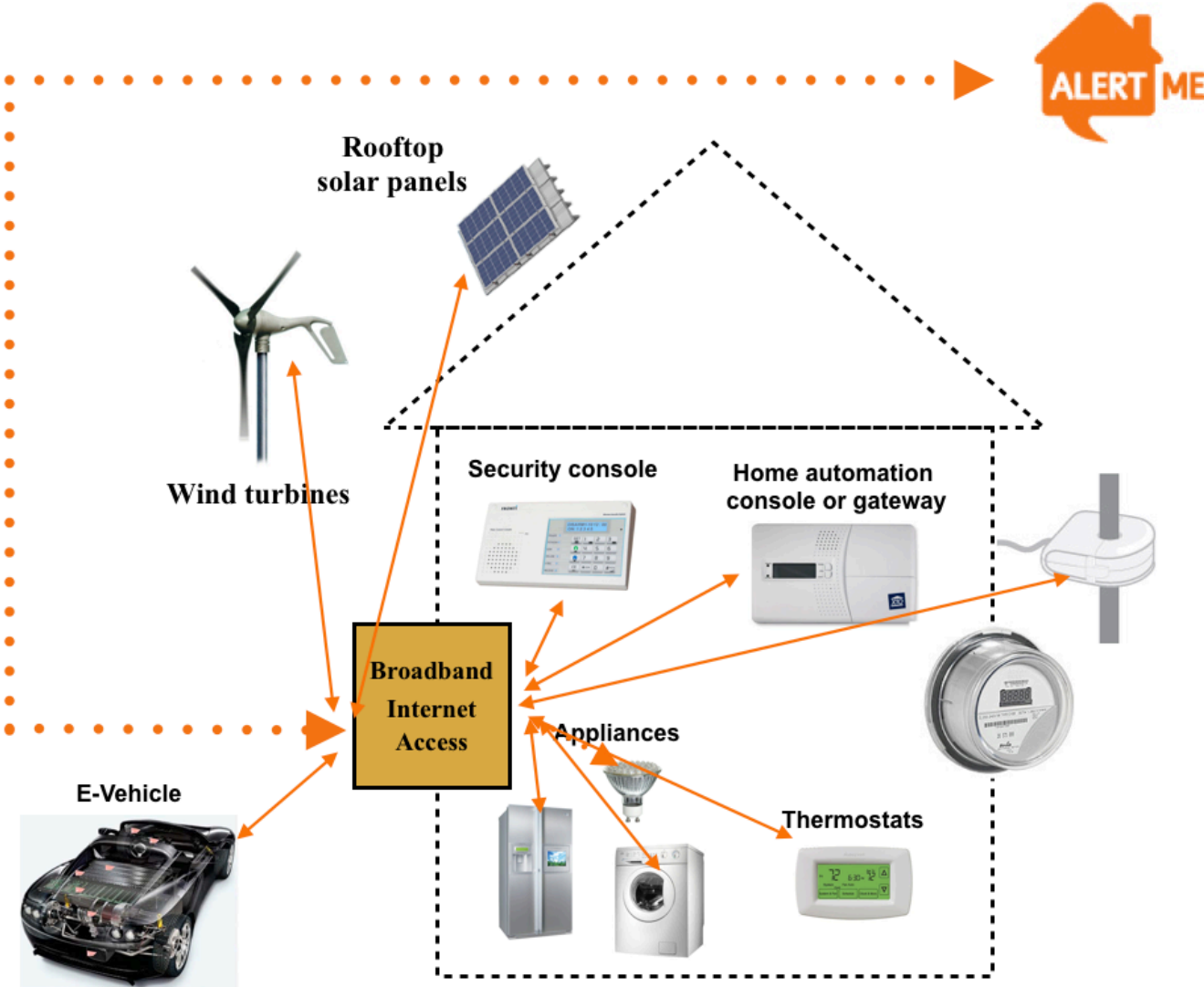
„Big Data“ as Business Model for the Power Industry



- Billing service provider
- Meter operator
- Meter data management provider
- Demand respond aggregators
- Supplier as provider of additional value added services



Novel Data-based Business Models for Third Parties



■ Smart meter data = personal or person relatable data

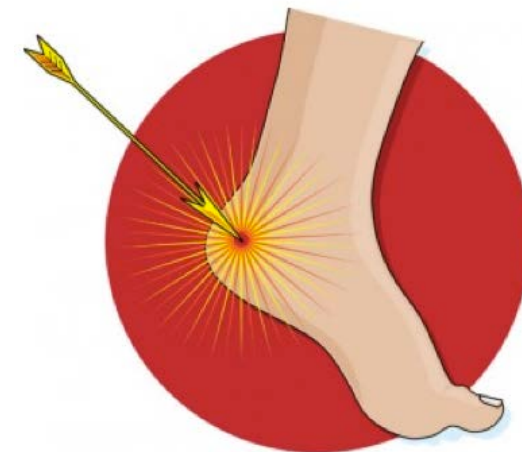
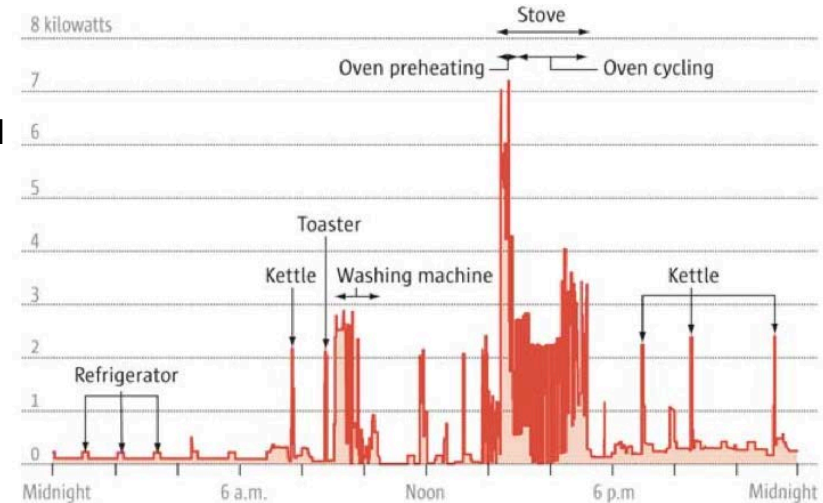
- Detailed energy usage data reveals a wealth of personal information
- Advanced Metering Infrastructure (AMI) facilitates the analysis of consumption data on an industrial scale
- Numerous information extraction possibilities

■ Privacy threat:

- Energy use information can and will be repurposed by interested parties
- EU: deregulated electricity markets mean many authorized actors and open markets
- Financial incentive for mining and exploiting data
- Law enforcement, government agencies, corporations from the IT and Telco sector and startups already are eyeing all that data

■ Information deficit in deregulated smart grids

- Consumers cannot control the use of their data
- Stopped smart meter introduction in the Netherlands



Privacy Approach	Selected References
All approaches <ul style="list-style-type: none">– reduce performance or– are ineffective in deregulated smart grids or– not future proof	J. Bohli, C. Sorge, and O. Ugus, "A privacy model for smart metering," in <i>IEEE International Conference on Communications (ICC) SG Workshop</i> , 2010.
Decision makers favor <i>minimization, anonymization and aggregation</i> approaches: <ul style="list-style-type: none">– smart meter protection profile in Germany– debate on the DCC in the UK	Federal Office for Information Security, "Protection Profile for the Gateway of a Smart Metering System, v01.01.01(final draft), http://goo.gl/ow5rL
Wanted: Usage control in a dynamic environment	S. Eftymiou and G. Kourtellis, "Smart grid privacy via anonymization of smart metering data," in <i>1st IEEE Smart Grid Communications Conference</i> , 2010. M. Jacobs, "Privacy-friendly energy-metering via homomorphic encryption," in <i>5th Workshop on Security and Trust Management (STM)</i> , 2010. Y. Kim, F. Ngai, and M. Srivastava, "Cooperative state estimation for preserving privacy in smart grid," in <i>2nd IEEE International Conference on Smart Grid Communications</i> , 2011. L. Sankar, S. Kar, R. Tandon, and V. Poor, "Competitive privacy in the smart grid," in <i>2nd IEEE International Conference on Smart Grid Communications</i> , 2011.

Overview of privacy-technology approaches for the smart grid

- Smart grids are an extension of the Internet
- Because they are a critical infrastructure, some privacy mechanisms will be integrated
- All EU member states will roll-out smart meter infrastructures
- This is a big opportunity for establishing privacy mechanisms on a very large scale!
- In deregulated electricity markets, communication intermediaries can play an important role

