Optimization as a Service for Intelligent Energy Management

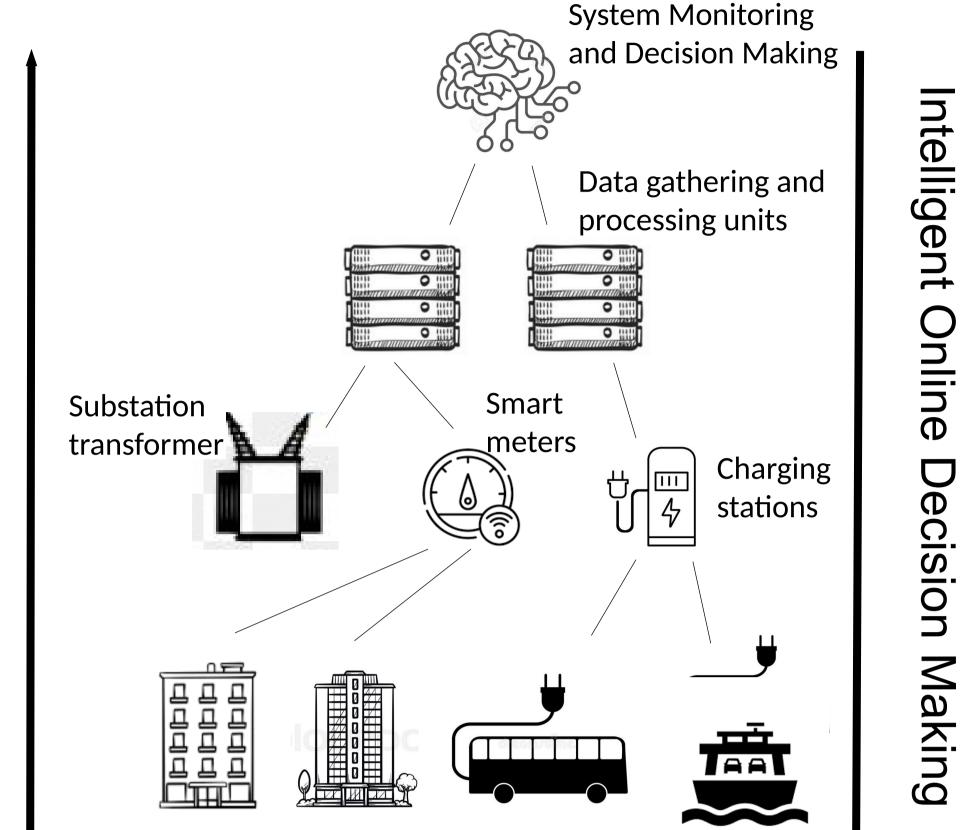
TANDEM: InTelligent Energy DAta MaNagement and Online DEcision Making

Continuous validation of data Smart selection of data to prioritize important data, data from unexpected events

Data Management

telligent

Distributed data



Distributed monitoring and balancing

Smart charging/use of batteries

Models/ Simulation/ Prognosis of interplay



Households and SMEs Electrified public transportation

between grid actors

OptaaS in a nutshell:

> Context: Energy actors need advanced computing systems capable of: (1) handling high rate / high volume data produced by the smart metering infrastructure and intelligent energy pro/consumer and (2) taking continuously decisions to optimize the usage of renewable resources. > Challenges: Make a system capable of scaling while addressing problems with combinatorial explosion on streams of data from many sources.

> Idea: We propose "Optimization as a Service (OptaaS)" - a flexible optimization system, where new components can be plugged-in - as a key enabler for solving the computing and data processing challenges faced by today's energy actors and in particular smart grid managers.

OptaaS: Optimization as a Service

Client-side	<u>OptaaS server (high-performance)</u>	
Register problems	St	tores the problems/solutions in dedicated data structures
Query if solution is ready	chout (coc)	Compute: eg LP-solver
Monitored throughput (eg in problem/sec)		increase scalability

Data and Evaluation

 \succ **Input data:** energy consumption, energy price, energy production, battery level, pv capacity, weather forecast, etc

ntelligent Online

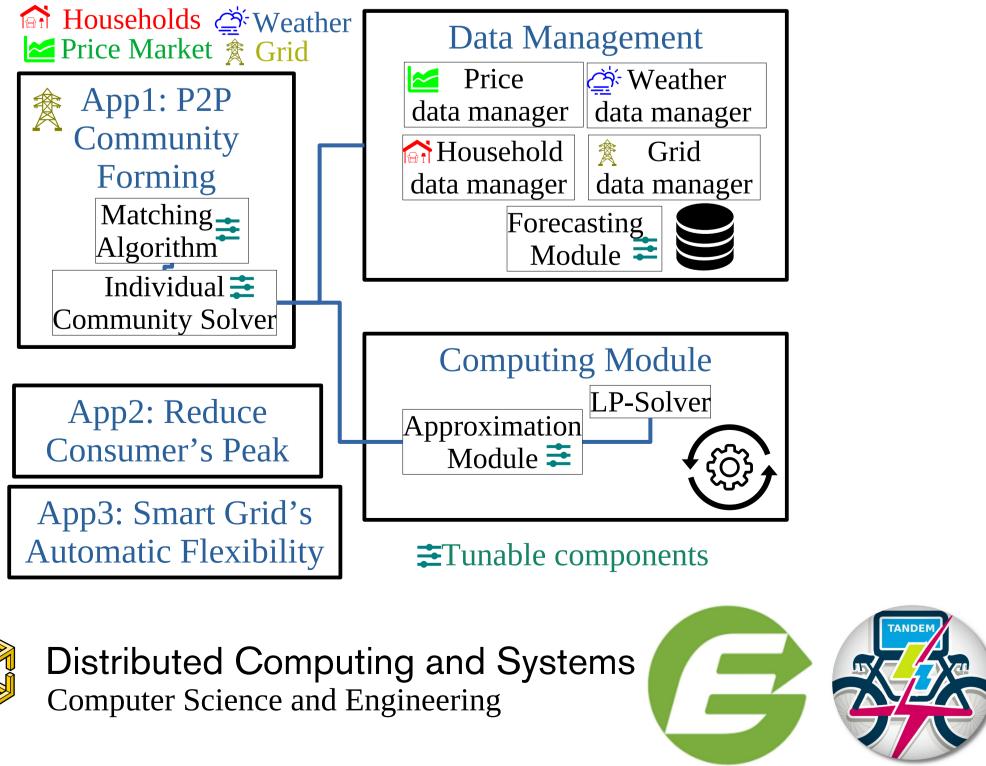
Decision Ma

Evaluation:

- Accuracy of the solution (e.g. if approximation is used)
- System performance: problems/sec. (higher means larger problems or larger datasets),

latency per problem (average & tail), etc

Example of applications & architecture modules



Perspectives

Work in progress:

- Implementation of the proposed architecture
- A prototype system focusing on the "Community" Forming" problem
- Techniques to re-use similar and already computed results

Swedish **Electricity Storage** and Balancing Centre







PhD student: Wania Khan, Faculty: Vincenzo Gulisano, Romaric Duvignau, Marina Papatriantafilou Göteborg Energi (GE): Mariliis Lehtveer, Joris van Rooij **Contact**: {duvignau,vinmas,ptrianta}@chalmers.se

Reference group: Charlotta Klintberg, Henrik Forsgren (GE), Robert Eriksson / Göran N. Ericsson (Svenska Kraftnät) Giuseppe Durisi, Lisa Göransson (Chalmers), David Daniels (VTI Vägtransportinstitut)