

ACTION – KRIPIIS

PROJECT: “SYNAISTHISI” – Intelligent data collection and processing platform for  
energy efficient applications

SUB PROJECT:  **SYNAISTHISI**

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# Home Energy Reduction – Simulation Game

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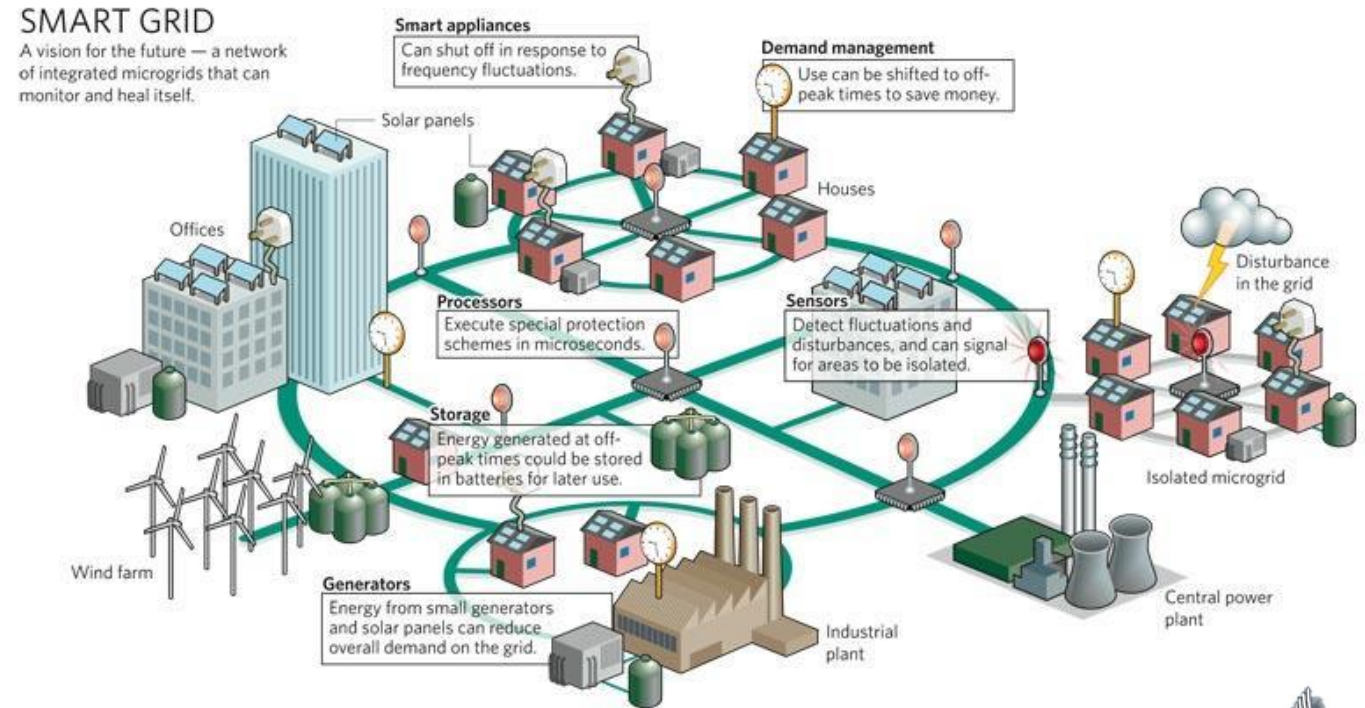
**regions at the centre of development**

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# Motivation and Background

## The Smart Grid

- Smart distributed systems to control generation and demand
- Various types of intermittent (uncertain) generation
- Need to reduce uncertainty, need for optimal scheduling decisions



# Motivation and Background

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- Autonomous Agents, Artificial Intelligence, Game Theory, Optimization Theory, Decision Theory in action!
- We provide algorithmic and technological tools to support Smart Grid activities
  - In particular, *Smart Grid Cooperatives*



# Motivation and Background

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- Autonomous Agents for energy efficiency
  - Demand side management (DSM) to reduce carbon footprint
  - Cooperative RES production scheduling
  - Cooperative dynamic consumption re-scheduling
  - We study effective ways to give incentives to consumers to participate in such activities and schemes



# Motivation and Background

- Autonomous Agents for energy efficiency
  - What is the level of agent autonomy?
  - How intrusive should such a system be?
    - Allow agents to shut off your consumption?
    - Ask you to reply to questions all the time?

A “Serious Game” approach



# The Game

- Suppose you are home
- At some point you dedicate some time (~30 seconds) to take a look at the agents proposals for your day-ahead consumption
- You weigh yourself the gains and decide which ones to accept and which to reject
- 2 Incentive types:
  - Economic
  - Social
- Which one is more effective??



# Our Goals

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- Raise energy awareness – Expose participants to ‘what-if’ scenarios
- Consumer engagement
- Apply and evaluate decision support techniques
- Evaluate incentive types
- Balance demand according to renewable sources production





# Our agent uses the Game to ...

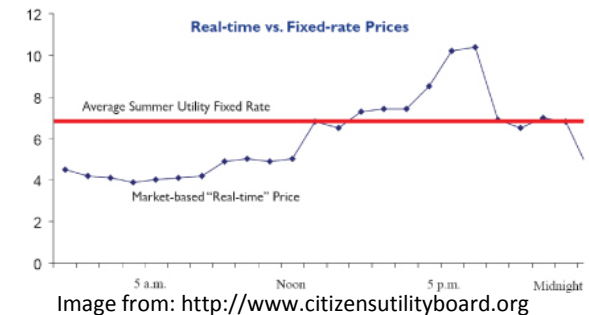
- Take into account user preferences and prices
  - Propose rescheduling of specific appliances
    - Not too far away from the initial time of initiation
    - During the time intervals when price is low (i.e. green energy usage is promoted)
  - Propose alternative thermostat settings
    - Not too far away from our preferred temperature
    - Fluctuations occur according to electricity prices





# Required Building Infrastructure

- Smart Meters (ideally in every plug)
  - To profile usage and make useful suggestions
- A CPU (Desktop PC or RaspberryPi)
  - Where the agent is executed
- Variable Electricity Pricing
  - Used as a guide for consumption rescheduling
- Internet Connection



# Pricing used here..

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- Hybrid scheme:
  - Time of Use
    - Different price during time intervals (here 24, one for every hour of the day)
  - Real-time-pricing
    - The prices for each interval depend on historical renewable generation levels of the past week
- Lower price when renewable levels are expected to be high
- Higher price when bulk generators need to turn on



# Gameplay

- Login with your credentials

The Energy Social Game

Log in

Username:

Password:

Login

The Energy Economic Game

Log in

Username:

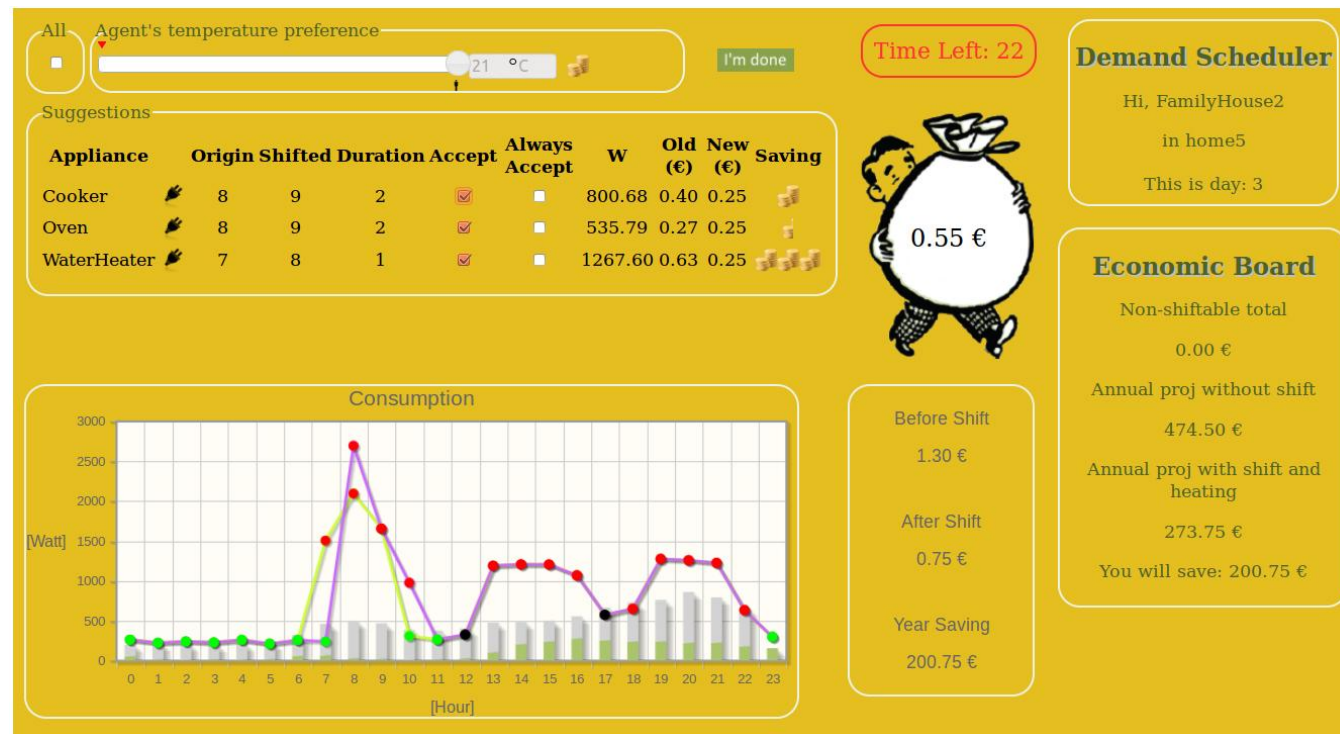
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Login



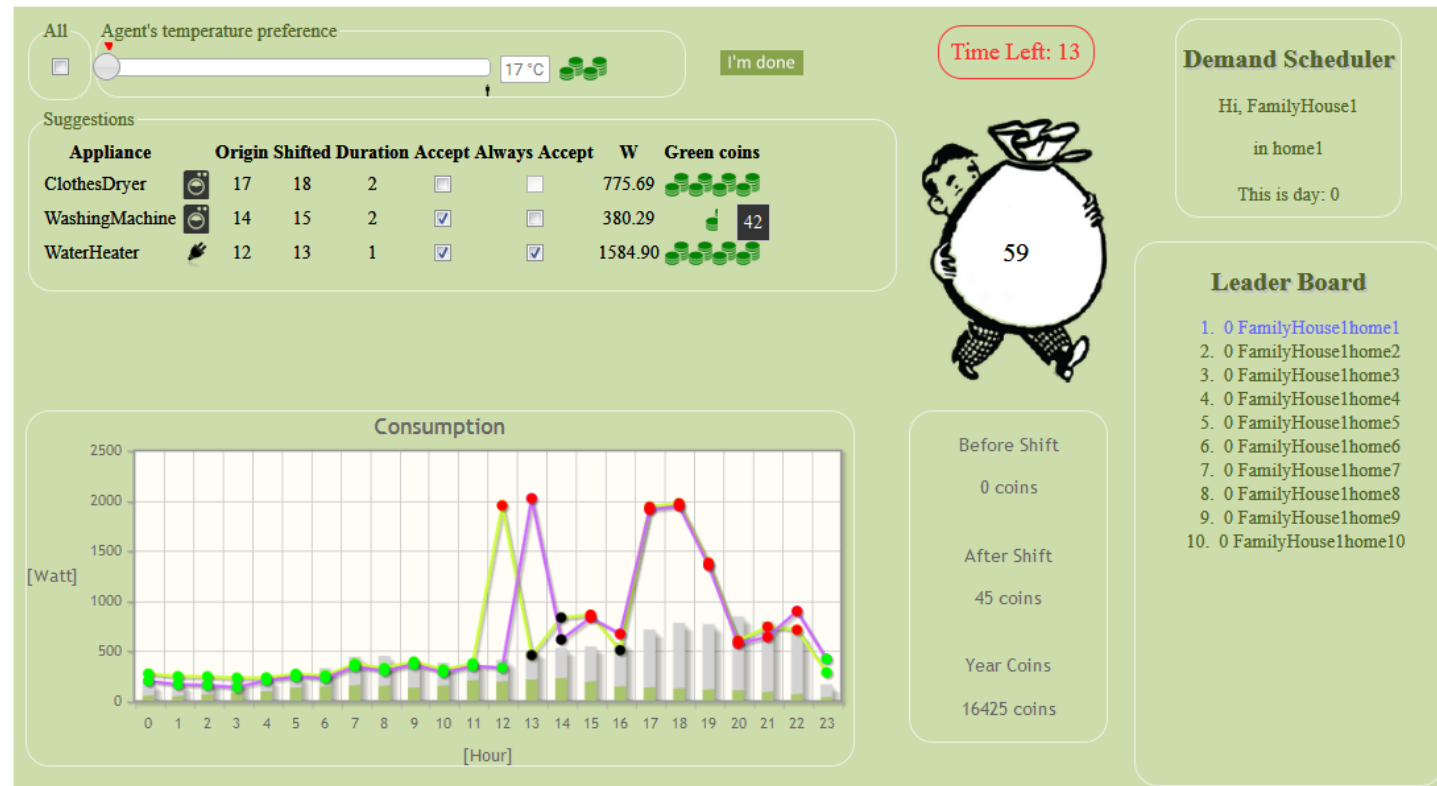
# Gameplay

- Explore your potential rescheduling actions and the respective gains, when using the **economic** GUI version...



# Gameplay

- and when using the **social** GUI version...



# Finally

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- Fill in a questionnaire and share your experience
- Would you install it in your home?

Thank you for participating!

Questions/Suggestions?

