



## D1.4-B Reference Scenarios – Release 2

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V	Date	Author	Description
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0.5	2010-5-6	Philips Apptech	<i>D1.4B's changes made according to feedback. modified Single family home scenario</i>
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0.7	2010-06-22	Philips Apptech/ UNIBO	<i>D1.4B's Editorials and format improvements</i>

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## Summary

This document presents the deliverable D1.4B. of Task 1.4 of eDIANA.

It presents scenario's that describe how different stakeholders will interact with the eDIANA system. It highlights the typical use cases gives an easily accessible gateway to what becomes possible with the eDIANA system.

Three sets of scenario are described: scenario for apartment buildings, scenario for office buildings and scenario for single family homes.

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## Abbreviations

eDIANA	embedded Systems for Energy Efficient Buildings
BIM	Building Information Model
DR	Demand Response. DR programs are utilized by electric utilities to encourage consumers to modify their electric demand level and pattern of electricity usage
EMS	Energy Management System
HVAC	Heating, Ventilating, and Air Conditioning
iEi	intelligent Embedded interface
PC	Personal Computer
GS	Game Station
TV	Television
UI	User Interface

## 1. Introduction

This document presents the second deliverable (D1.4B) of work package 1.4 of eDIANA. It presents scenario's that describe how different stakeholders will interact with the eDIANA system. It highlights the typical use cases gives an easily accessible gateway to what becomes possible with the eDIANA system.

Three sets of scenarios are described: scenarios for apartment buildings (chapter 2), scenarios for office buildings (chapter 3) and scenarios for single family homes (chapter 4).

These three scenario sets have been chosen as they cover the typical deployment differences of the eDIANA system as well as the different business models for energy management. The technical and architectural aspect of the energy management system is discussed in the Macrocell / Cell architecture documentation and can be found in D2.3-A. Information about implementation of the MacroCell level Concentrator and the implementation of the Cell Device Concentrator in this MacroCell / cell architecture can be found in D4.1 and WP03.

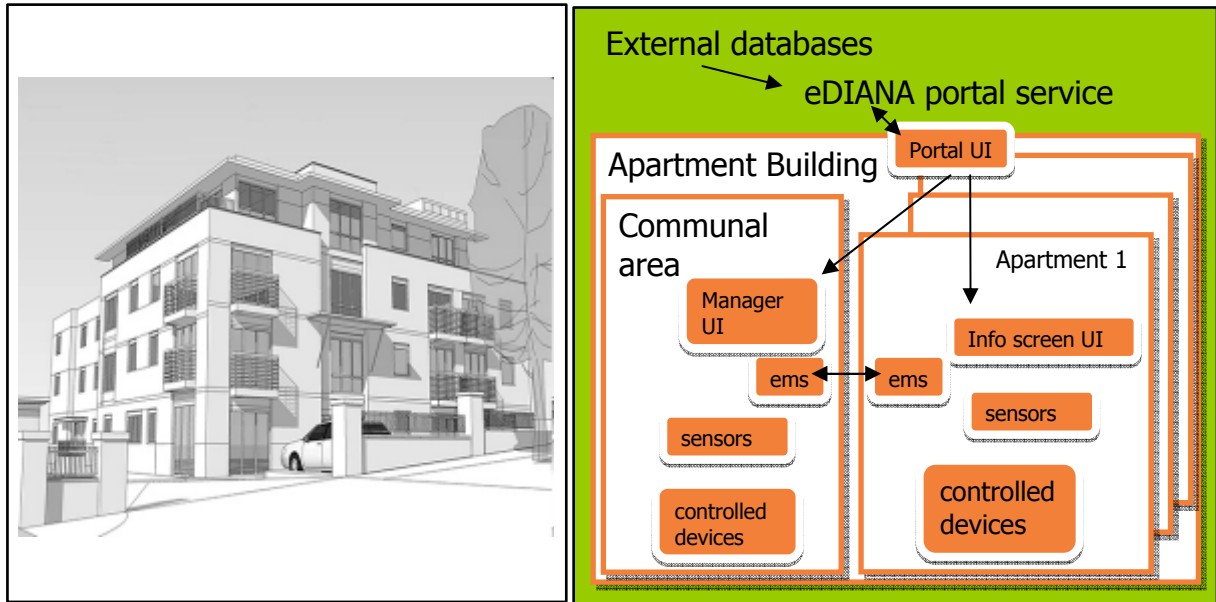
This document is the final scenario document that is produced by using the feedback on deliverable D1.4A

The document is to be used within eDIANA to streamline and focus the activities to enable the same use cases. Externally it can be to explain the benefits of the eDIANA system to people less familiar with the project.

## 2. Apartment Building Use Case

### 2.1 Introduction

This is a picture of the Apartment building scenario.



The communal area of the building belongs to an EMS that is connected to the different energy management systems that are in each apartment.

The stakeholders regarding this use case are:

- Final users → Two different profiles
  - Tim
    - Tim is a single man. He usually leaves for work early in the morning and comes back home late in the evening.
    - He is an advanced user of the platform.
  - Brent family
    - The Brent family is on vacation but they are not going out today. They're enjoying a day at home and not paying any attention to energy matters.
- Building manager
  - Rachel is the building's manager. She's in charge of the general maintenance of it.
- Energy services providers
  - Telecommunication services providers

In the apartment building the next scenarios will be considered:



## 2.2 The Brent's apartment

The Brent family is on vacation but they are not going out today. They're enjoying a day at home and not paying any attention to energy matters.

David is watching TV, the kid is playing videogames and Cathy is looking at her emails over Internet while waiting for the toasts for breakfast. The washing machine is also working because father is doing the laundry.

Suddenly, Cathy notices an alert on the eDIANA application running on the Web browser. The system is telling her energy consumption is high and it can be reduced by lowering the heating.

Although it is winter time and it's a bit chilly outside the comfort would not be reduced by lowering the heating.

Cathy gives the order to turn down the heating until the temperature drops down to 20°C. Then, she proceeds to program the oven to start cooking at 13:30 since she left some food for lunch.

While David's watching TV he checks the eDIANA interface and notices the system is suggesting drawing the curtains a bit and lowering TV's brightness. He agrees, so the system proceeds to draw the curtains automatically at the room he's at and the kid's room while reducing brightness of both screens.

EMS functionality illustrated:

- The EMS's user interface interacts with end users via alerts in order to make them aware of their energy usage and provides advice for lowering consumption.
- The EMS provides a central control over devices.
- The EMS is able to calculate comfort levels over sensors data.

## 2.3 Tim's apartment

Tim is a single man. He usually leaves for work early in the morning and comes back home late in the evening.

In order to minimize energy consumption, he sets the system with the following general system function: Low energy consumption during a period of time (i.e. 6 hours, 24 hours, week, month).

It is winter time and Tim's day starts at 7:00AM when he wakes up.

Every morning, he sets a 22 °C temperature in the rooms that he'll visit for preparing breakfast and dressing up. That is why the system keeps a pattern of Tim's behaviour during the morning and automatically sets the proper temperature in each room.

While Tim's not home, no heating is necessary. Therefore, the system is free to manage temperature by the low consumption program. While Tim is not at home the system takes advantage of blinding systems and operates them to avoid overheating in summer and in winter the blinds are open to make use of the sun radiation to keep warm the apartment. The same strategies is possible to be used with openings as windows or ventilation openings.

The system also knows when Tim is usually back at home. Thus, it raises the temperature in the house at around 22 °C like in the morning but this time in all rooms.

Tim's everyday schedule can be provided to the system through the user interface or it can be estimated by the sensor network based on the analysis of the time series of user presence within each room.

When at the office, Tim has been able to program the washing machine so when he is back at home in the evening the clothes that he put in the washing machine in the morning are washed and dried. The system can select an available program to reduce energy consumption considering the type of clothes to be washed.

EMS functionality illustrated:

- The EMS enables programming of automated performance during certain periods of time.
- The EMS keeps track of users' behaviour. Due this functionality, the system is able to learn and provide same comfort levels with less energy consumption.
- The EMS provides devices remote control

## **2.4 The building administrator**

Rachel is the building's manager. She's in charge of the general maintenance of it.

She's at the office watching at the eDIANA application for building managing. The system is showing her the overall consumption of each apartment as well as the energy storage level of the building.

Since the building has solar thermal energy generation, the system can manage its energy supply.

Today, Tim is out of his apartment and the Brent family is spending way more energy than Tim. The systems shifts, if needed and if possible, the loads at Tim's apartment in order to achieve the most overall efficient energy consumption taking into account user comfort, profile, constraints... Tim is advised of the rescheduling of its loads. So the system feeds Brent's apartment and keep low energy feed for Tim's apartment.

The system shows a warning to Rachel telling her building's lighting program is going to be automatically updated since daylight is changing due to the year's season. Thus, she confirms changes in the application.

The system also foresees that the next days are going to be cloudy and energy storage will go low. The system calculates how much heating energy will be needed to keep the current comfort level based on the weather forecast, building thermal performance, and HVAC system effectiveness. Taking this into account and compiling

with the building energy storage and generation capabilities an accurate energy trading could be planned.

EMS functionality illustrated:

- The EMS provides the building manager real time information on energy generation and storage
- The user can interact with the EMS using an Internet connection (from a PC or a portable device, e.g. a smartphone). He/she can send orders and permissions and can receive alerts.
- The EMS is able to calculate energy loads from every source and provides advice to the building manager in order to make decisions on energy distribution.
- The EMS can re-schedule its performance due to season change and weather conditions.
- The EMS provides the manager the mechanisms to perform energy trading with the utility.

## 2.5 Summary of Functions for Apartment Buildings

Performance scheduling

The EMS enables programming of automated performance during certain periods of time. (see 2.3)

The EMS can re-schedule its performance due to season change and weather conditions. (see 2.4)

User awareness

The EMS's user interface interacts with end users via alerts in order to make them aware of their energy usage and provides advice for lowering consumption. (see 2.2)

The user can interact with the EMS using an Internet connection (from a PC or a portable device, e.g. a smartphone). He/she can send orders and permissions and can receive alerts.  
(see 2.4)

Energy Trading

The EMS provides the manager the mechanisms to perform energy trading with the utility. (see 2.4)

Devices control

The EMS provides devices remote control (see 2.3)

The EMS provides a central control over devices. (see 2.2)

#### Energy generation and storage

The EMS provides the building manager real time information on energy generation and storage (see 2.4)

The EMS is able to calculate energy loads from every source and provides advice to the building manager in order to make decisions on energy distribution. (see 2.4)

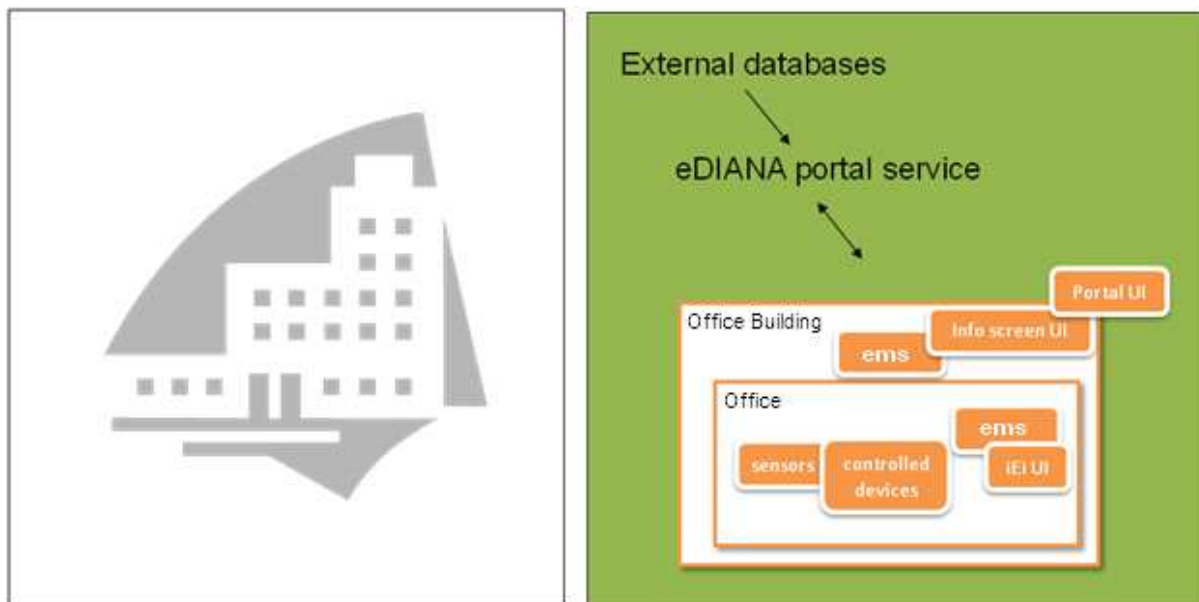
#### Users' behaviour and comfort levels

The EMS keeps track of users' behaviour. Due this functionality, the system is able to learn and provide same comfort levels with less energy consumption. (see 2.3)

The EMS is able to calculate comfort levels over sensors data. (see 2.2)

### 3. Scenarios for office building

#### 3.1 Office Building set up



The office worker Jim has regular daily office working hours from 8 am to 5 pm. The energy manager John manages a portfolio of buildings remotely from the service centre, some specific problems he solves on site. The office building is part of the eDIANA platform.

The stakeholders regarding this use case are:

- Office worker Jim has regular daily office working hours from 8 am to 5 pm
- Energy Manager John manages a portfolio of buildings remotely from the service centre, some specific problems he solves on site. Building manager
- Visitors
- Energy services providers
- Telecommunication services providers

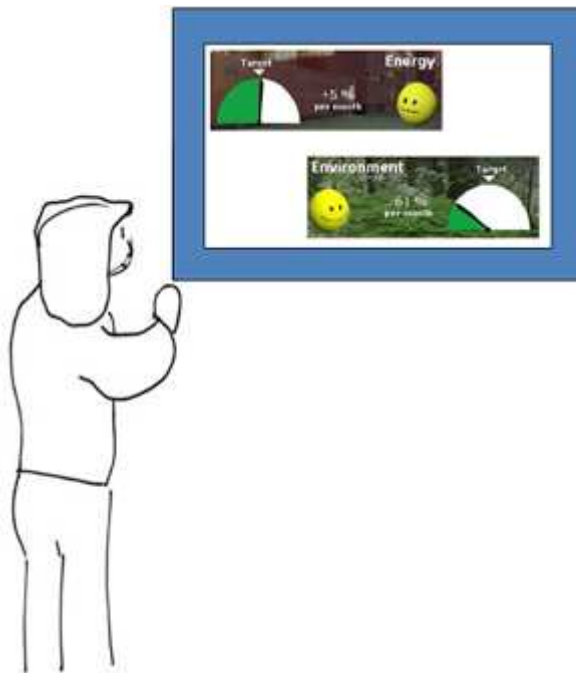
In the office building the next scenarios will be considered:



In the office building the following different rooms or locations will be considered:

- Service Center
- Office rooms
- Open plan offices
- Hall with Info screen UI

### 3.1.1 Checking energy use of a building

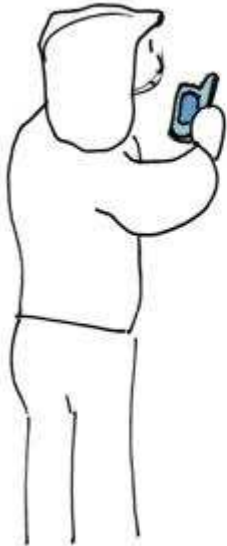


In the morning, office worker Jim arrives to the main entrance hall of the office building and takes a look at the information screen, he wants to know how the building is performing. The screen provides general information on the energy usage and indoor environment conditions of the building. Today, Jim decides to use energy conservatively.

EMS functionality illustrated:

- The EMS provides regularly updated historic, real-time or forecast energy usage data of the office building via information screens to the end-users with the goal to motivate the staff to use energy conservatively.
- The EMS also provides weather forecast and predictions of indoor environment conditions.

### 3.1.2 Checking acute alerts with a mobile device



In the morning, energy manager John wakes up and checks his smartphone the building consumption situation. He can see overall consumption values as well as information on single devices and sensors.

EMS functionality illustrated:

- The EMS observes measurement data from every sensor in the building and generates alerts on unusual values.
- The EMS provides remote access to these data e.g. from the energy manager's mobile PC.

### 3.1.3 Real-time DR events in the service center



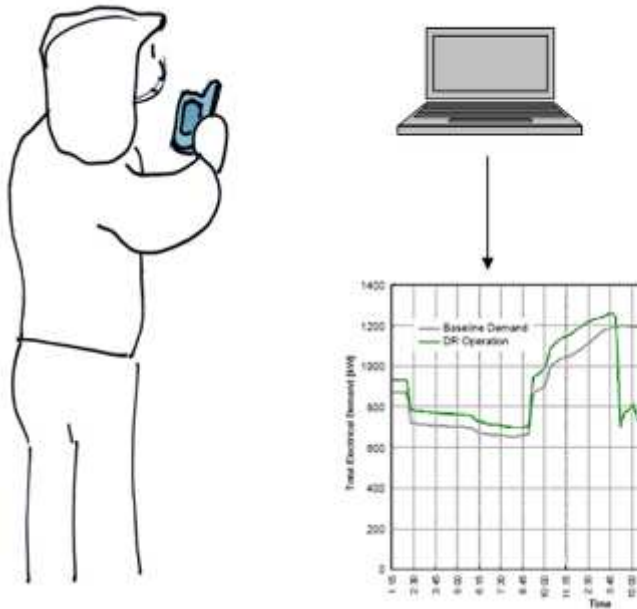
In the afternoon, John is sitting in the service center. He receives a signal to his mobile phone that a DR event happened and that the EMS has started pre-programmed demand response strategies in the building. If the DR event comes at a time when the reduction in end-user services is not desirable, John is able to override the DR event remotely by using his smartphone or by logging into the building EMS.

John wants to follow the execution of the pre-programmed demand response strategies; yesterday he got temperature threshold alarm signals to his mobile phone during the DR event. John logs in remotely to the EMS by using his PC. John sees from the EMS UI, which strategies have been initiated in the building, and the possible alarm signals. John sees that zone control, air distribution, central plant, and lighting strategies have been initiated. John also notices that the whole building demand dropped 400 kW (i.e. 400 €/h at the high price period) immediately after the DR event started. John decides to not override any of the actions.

EMS functionality illustrated:

- The EMS receives real-time DR events from utilities and performs predefined strategies on them. The EMS informs the energy manager about start, course, and effect of these actions.
- The EMS allows the energy manager to override EMS actions.

### 3.1.4 DR period planning in the service center



John receives an alert from the EMS that a DR event will happen next day. He wants to check the effects of the selected demand response strategies. John logs in remotely and checks, which strategies have been intended in the building. John remembers that an important delegation will negotiate with the CEO tomorrow, and he cancels the global temperature set point adjustment in the visiting areas, and locks it so that it cannot be reactivated from the local panels.

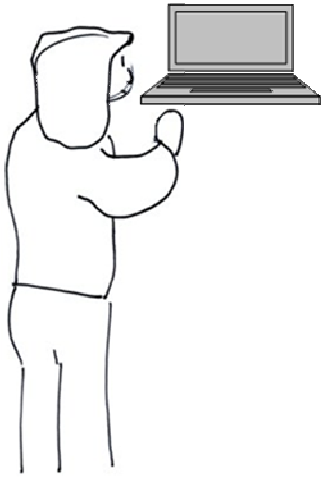
EMS functionality illustrated:

- The EMS receives price information from utilities for upcoming periods (e.g. day-ahead). If required, the EMS can inform the energy manager (and the end-users) about these prices
- The EMS allows the energy manager to adapt the intended strategy and to lock his decisions (such that the EMS won't override them).

### 3.1.5 DR Period in the service centre

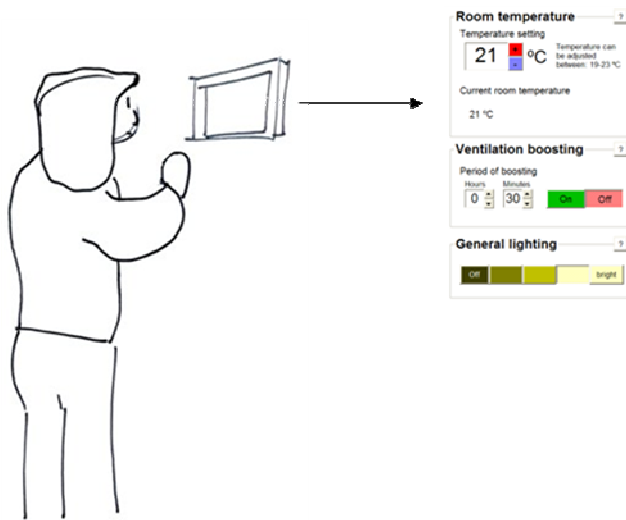
EMS functionality illustrated:

- The EMS *informs the energy manager about the start of planned DR actions.*



In the afternoon, John is doing paperwork on his computer when the gadget on the desktop alerts that the CPP period has started and automatic demand response features have been activated. John remembers that an important delegation will negotiate with the CEO today, and he cancels the global temperature set point adjustment in the visiting areas, and locks it so that it cannot be reactivated from the local panels.

### 3.1.6 DR period in the office room



In the afternoon, Jim is sitting in his office room. The office room UI's blinking light informs Jim that the actual consumption is over the forecasted consumption upper bound and preconfigured actions to modify the consumption are started; Jim wants to know what is happening and checks the UI. The UI informs that in order to save energy, the system sets up the temperature set point value from 21 to 23 °C (in order to reduce the air conditioner load), and that Jim has the possibility to override the system if he wishes. The system also advises Jim to turn off the lights and to open the blinds in order to decrease the lighting load.

EMS functionality illustrated:

- The EMS informs the end-user about DR actions taken via the office room UI. The EMS provides means to the end-user to override actions.
- The EMS also provides information on the office room indoor environment and gives advices to the end-user how to use energy conservatively.

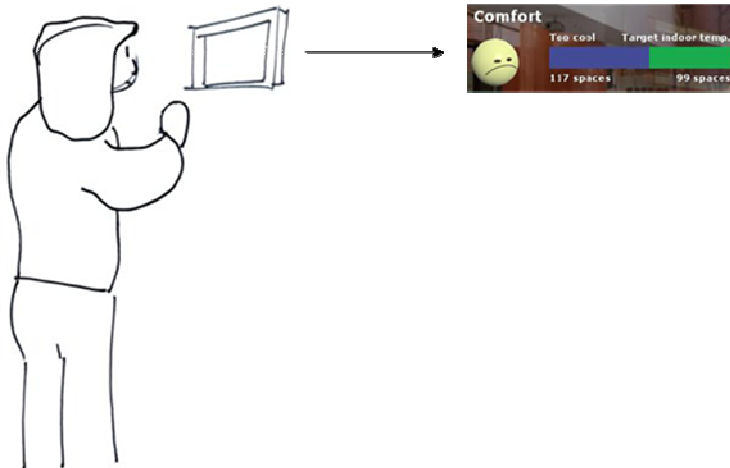
### 3.1.7 Checking energy use of each device (Energy coaching)

Jim wants to find ways to save electricity and to decrease emissions. He doesn't know how much each device in the office room consumes. He sends a request to the EMS and receives information on electricity consumption of each device in last day/month/year. "I didn't know how much energy the computer and the lighting consumed and how much it costs. From now on I will turn the computer on the sleeping mode when I don't use it, and shut down the lights if the blinds are open"

EMS functionality illustrated:

- The EMS enables end-users to see energy usage and cost data per device.

### 3.1.8 DR period in the open plan office

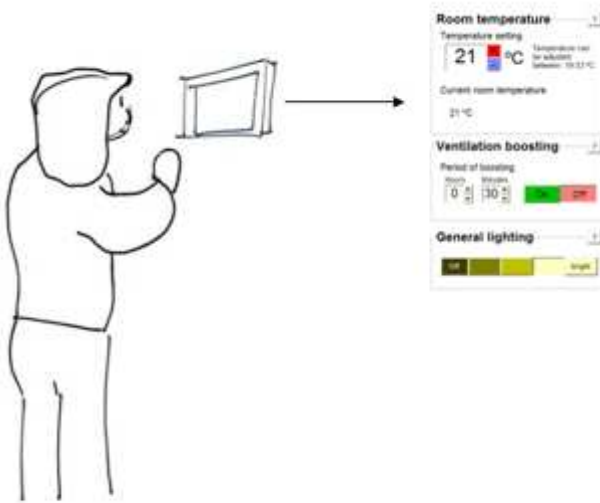


Jim walks to the open-plan office area to meet his colleague. The UI near the front door of the open-plan office informs Jim by a blinking light that the consumption is too high (over the forecasted curve upper bound), Jim wants to know what is happening and checks the UI. The UI informs that in order to save energy, the system has set up the temperature set point value from 21 to 23 °C, and has turned off all decorative lighting in the building and reduced the floor light level, the desktop light level is unchanged, and that the users have the possibility to override the temperature change if they wish. Jim will not override the system, because the UI informs him that in most of the work places the temperature is too low.

EMS functionality illustrated:

- The EMS provides information on the open-plan office room indoor environment via the open-plan office room UI and gives advices to the end-users how to use energy conservatively.

### 3.1.9 Standby mode for the office room



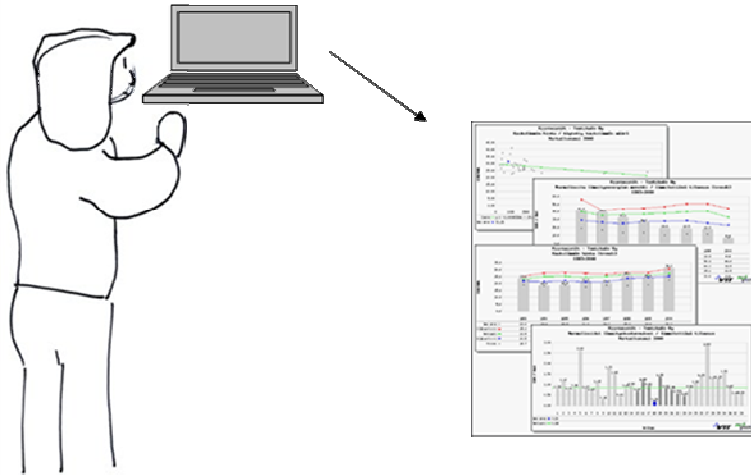
○

At 5 pm, Jim leaves his office room. The system has learned that he will not come back until tomorrow. After a couple of minutes, the office room goes to standby mode. The system shuts down all unnecessary equipment, the lights are shut down and the air conditioner is turned off.

EMS functionality illustrated:

- The EMS learns about user behaviour and automatically adapts office conditions (e.g. turns the office room to standby mode (including lights, HVAC) when the user leaves to go home).

### 3.1.10 Benchmarking in the district



Before leaving the service center John checks the district energy portal<sup>1</sup> in which a set of office buildings have agreed to share their energy usage. He sees that his office building has reduced its energy consumption and is now ranked second in the specific energy consumption benchmark. John clicks the leading building in the list for more detailed information and sees that it hasn't been used since the previous company left two months ago.

John writes a short piece of news to his company intranet and congratulates the users of his office building for the first place in the benchmark among occupied offices.

EMS functionality illustrated:

- The EMS gets energy consumption data from buildings in the district and provides them to the end-user to enable benchmarking.

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<sup>1</sup> Privacy concerns should be taken into account when presenting this kind of information. This information can only be provided when it cannot be traced back to individual users unless they have explicitly stated otherwise.

## 3.2 Summary of Functions for Office Buildings

### Information provision to end-users

- The EMS provides regularly updated historic, real-time or forecast energy usage data of the office building via information screens to the end-users with the goal to motivate the staff to use energy conservatively. (see 3.1.1)
- The EMS gets energy consumption data from buildings in the district and provides them to the end-user to enable benchmarking. (see 3.1.10)
- The EMS enables end-users to see energy usage and cost data per device. (see 3.1.7)
- The EMS also provides weather forecast and predictions of indoor environment conditions. (see 3.1.1)
- The EMS provides information on the office room/open-plan office indoor environment and gives advices to the end-users how to use energy conservatively. (see 3.1.6 and 3.1.8)

### Operation

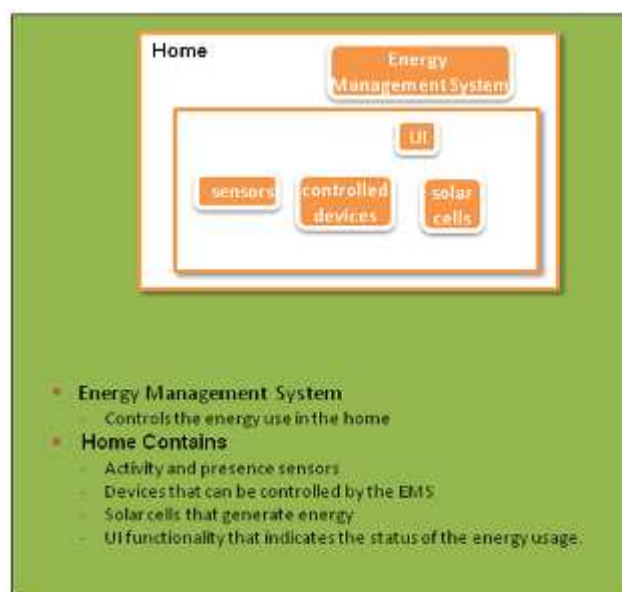
- The EMS observes measurement data from every sensor in the building and generates alerts on unusual values. (see 3.1.2)
- The EMS provides remote access to sensor data e.g. from the energy manager's mobile device (via internet connection). (see 3.1.2)
- The EMS receives real-time DR events from utilities and performs predefined strategies on them. The EMS informs the energy manager about start, course, and effect of these actions. (see 3.1.3)
- The EMS allows the energy manager to override EMS actions. (see 3.1.3)
- The EMS informs the end-user about DR actions taken via the office room UI. The EMS provides means to the end-user to override actions. (see 3.1.6)
- The EMS learns about user behaviour and automatically adapts office conditions (e.g. turns the office room to standby mode (including lights, HVAC) when the user leaves to go home). (see 3.1.9)

### Short-term planning

- The EMS receives price information from utilities for upcoming periods (e.g. day-ahead). If required, the EMS can inform the energy manager (and the end-users) about these prices (see 3.1.4)
- The EMS allows the energy manager to adapt the intended strategy and to lock his decisions (such that the EMS won't override them). (see 3.1.4)

## 4. Scenarios for single family house

### 4.1 Single family house set-up



Family Cuppen consists of Frank (48) and his wife Nico (46) and their son Sander (17) and daughter Janneke (15). They own a family home. In the morning, the home is equipped with the eDIANA intelligent energy management system.

The stakeholders regarding this use case are:

Final users → Two different profiles

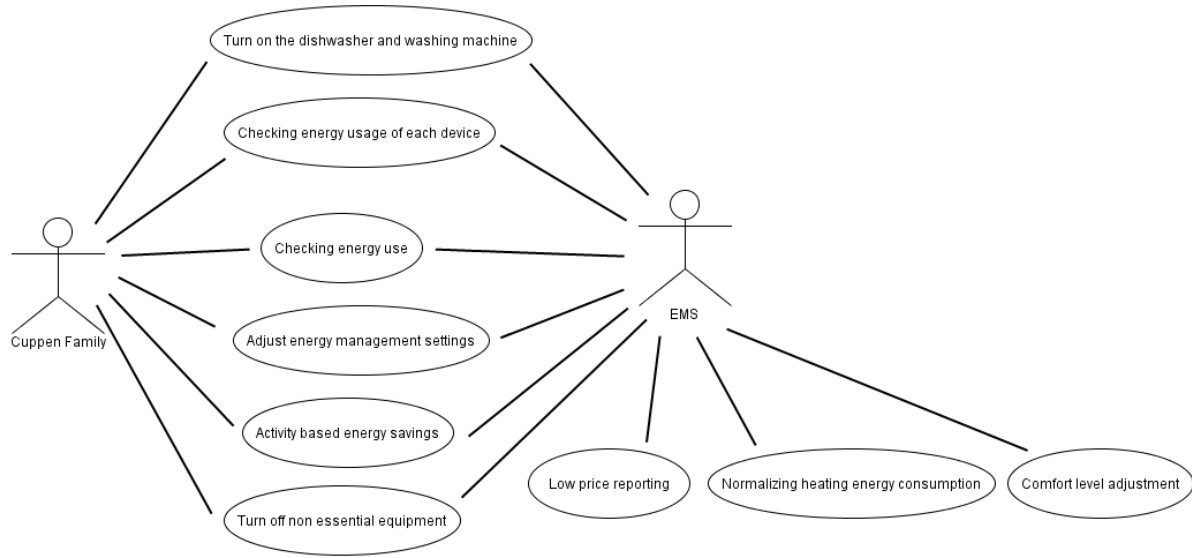
The Cuppens Family

The Cuppens family is a family of 4 persons each using the EMS

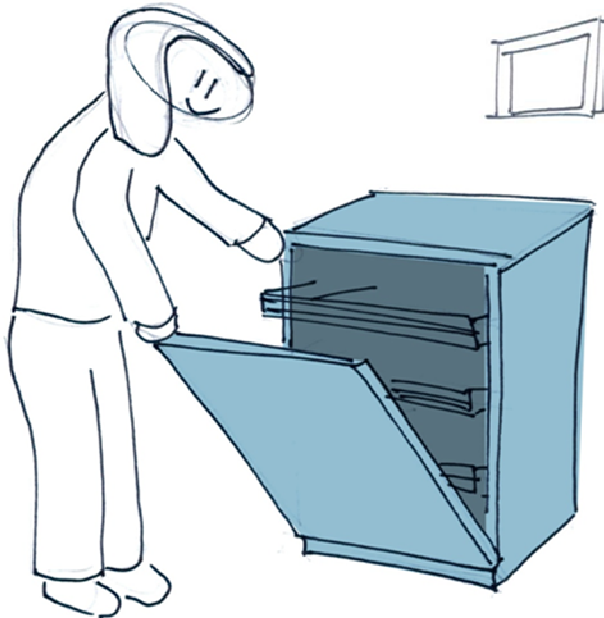
Energy services providers

Telecommunication services providers

In the single family home the next scenarios will be considered:



### 4.1.1 Turning on the dishwasher and the washing machine



In the morning, Frank wakes up and put the dishwasher and washing machine in the energy saving mode. The EMS Determines the best time to start based on their energy profiles.

EMS functionality illustrated:

- The EMS enables programming of automated performance during certain periods of time

### 4.1.2 Checking building status

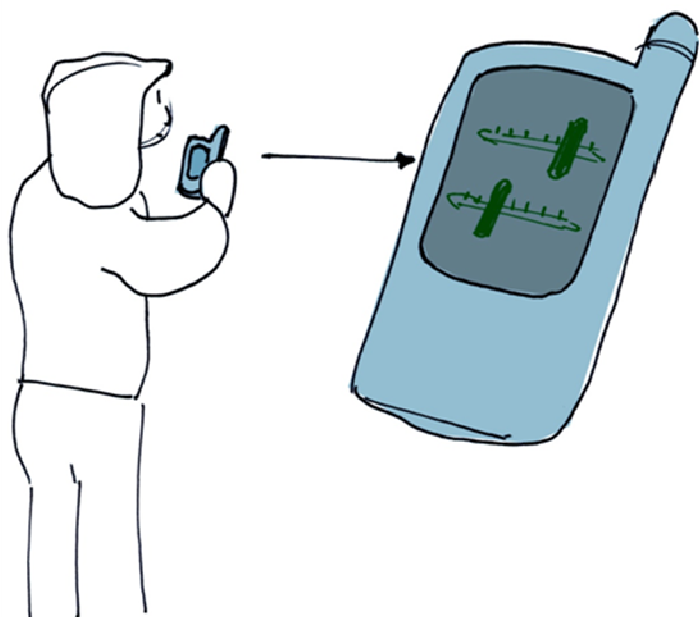


Before leaving the home, he checks the display at the door. The system alerts him that he has left one window open, after closing that window he puts the home in away mode and leaves the door.

EMS functionality illustrated:

- The EMS'S user interface interacts with end users via alerts in order to make them aware of their energy usage or waste by providing advice and alerts for lowering consumption.

### 4.1.3 Adjust energy management settings

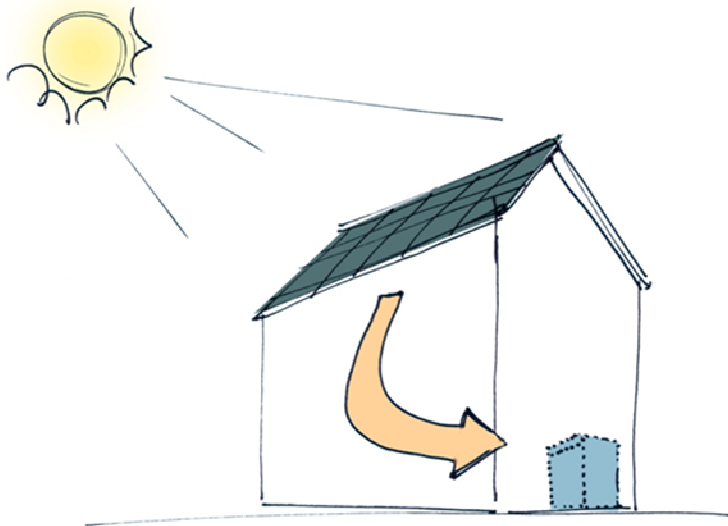


That day from the office he decides to look at the settings of the energy management system. He could have used his PC but decided to use his smartphone. He logs in (using an internet connection), changes the time he will be home so the heating can adjust and logs out again.

EMS functionality illustrated:

- The user can interact with the EMS using an internet connection (from a PC or a portable device, e.g. a smartphone). He/she can send orders and permissions and can receive alerts.

#### 4.1.4 Low energy price period



The EMS detects that there is sufficient energy generated by the solar panels. Based on the weather prediction and expected energy usage in his home, the energy prices is predicted to be below the lower threshold for this period, so the EMS Schedules to start the dishwasher and washing machine during this sunny period. After some time, the dishwasher is started since all the dishes were already put in yesterday. After some time, the washing machine is also started.

EMS functionality illustrated:

- The EMS enables programming of automated performance during certain periods of time.
- The EMS can re-schedule its performance due to seasonal changes and weather conditions.

### 4.1.5 Checking energy use

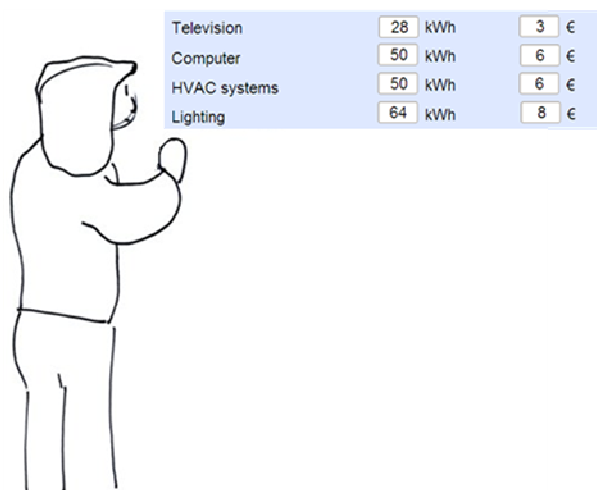


In the evening, he comes home. He checks the status of the energy system using the wall display. He notices that the dishwasher and washing machine are ready and that the house generated a surplus in energy that day. He sees that the overall consumption have never been over the thresholds and so he is happy because he does not pay any fee.

EMS functionality illustrated:

- The EMS'S user interface interacts with end users via alerts in order to make them aware of their energy usage or waste by providing advice and alerts for lowering consumption.

### 4.1.6 Checking energy use of each device

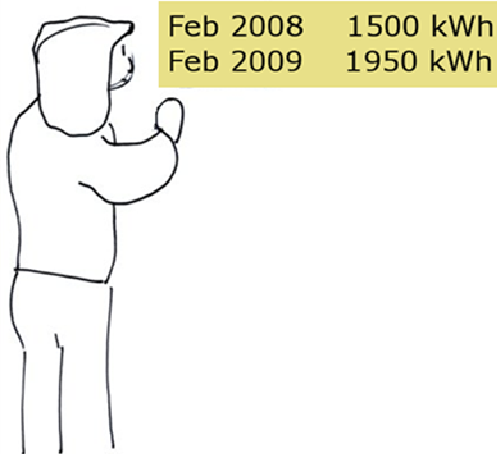


Frank wants to find ways to save electricity and to decrease emissions. He doesn't know how much each device in household consumes. He sends a request to the EMS and receives information on electricity consumption of each device in last day/month/year. "I didn't know how much energy the computer consumed and how much it costs. From now on I will turn it off when I don't use it."

EMS functionality illustrated:

- The EMS is able to calculate energy loads from every source and provides advice to the user to make decisions about energy conservation.

### 4.1.7 Normalizing heating energy consumption

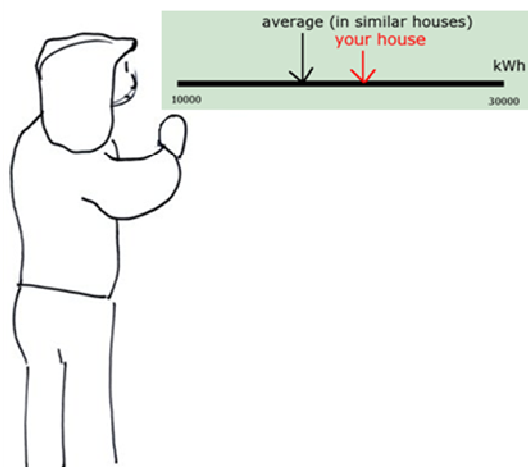


*Frank realizes that the heating energy consumption is 30 % higher than before, but he doesn't know the reason for that. He suspects that the reason is the cold weather. He asks the EMS to normalize the energy consumption. The EMS receives weather data from the closest weather station to the house. The EMS informs the user that the normalized heating energy consumption is 20 % higher than before and suggests possible reasons for that.*

EMS functionality illustrated:

- The EMS keeps track of the users' energy usage and weather patterns. Due to this functionality, the system is able to learn and to provide the same comfort level with less energy consumption

### 4.1.8 Benchmarking energy consumption



Frank wants to know whether they use more or less energy than the other families in similar houses. The EMS shows that the consumption is 25 % higher than it is in average in similar houses<sup>2</sup>. The EMS suggests possible reasons for that and provides specified information on how to decrease energy consumption.

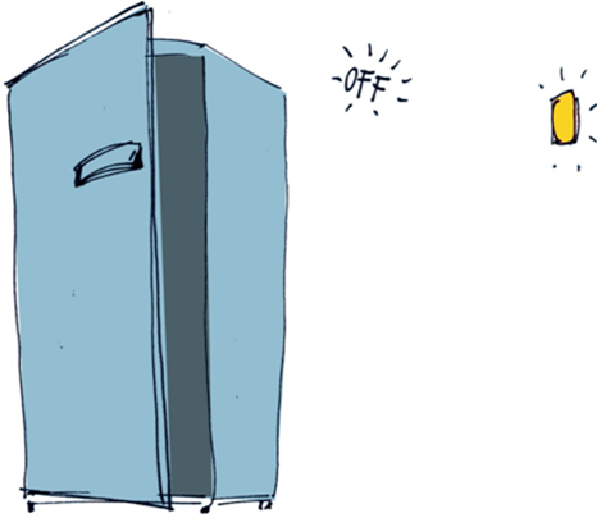
EMS functionality illustrated:

- The EMS gets energy consumption data from buildings in the district and provides them to the end-user to enable benchmarking.

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<sup>2</sup> Privacy concerns should be taken into account when presenting this kind of information. This information can only be provided when it cannot be traced back to individual users unless they have explicitly stated otherwise.

#### 4.1.9 Turn off non-essential equipment



In the evening, the oven is on because Nico is cooking. Frank is checking his private emails over Internet.

The orange colour on the living colours lamp indicates that non-essential devices are turned off to reduce energy. If no users are home the inhabitants are warned through their mobile phone.

EMS functionality illustrated:

- The EMS's user interface interacts with end users via alerts in order to make them aware of their energy usage and provides advice for lowering consumption.
- The EMS learns about user behaviour and automatically adapts room conditions in rooms that are not occupied

### 4.1.10 Activity based energy savings

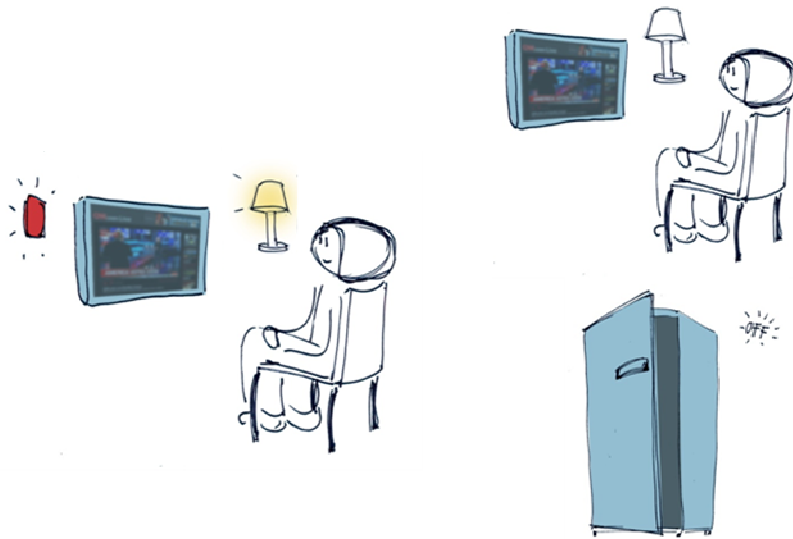


The system detects that it is evening. The oven is on because Nico is cooking. Frank is checking his private emails over Internet. The light levels are adjusted to best suit the activities. The EMS Adjusts the LCD light level of the monitor and the luminance to an optimal level which is the best for energy saving while still keeping the comfort level high.

EMS functionality illustrated:

- The EMS keeps track of the users' activity. Due to this functionality, this system is able to learn and provide the same comfort levels during activities with less energy consumption.

#### 4.1.11 High energy consumption, adjust comfort levels

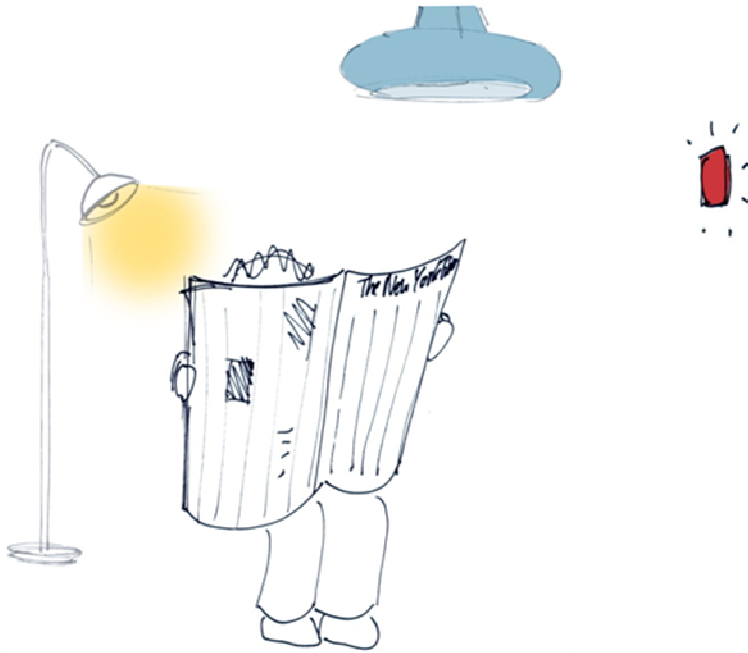


After finishing checking his email, Frank is now watching TV. Sander and Janneke are back at home as well. They start up the PC to play computer games. Suddenly, Frank notices an alert appears on the TV screen, and the living colour is constantly red. Using the TV he contacts the EMS. The EMS tells him that the current energy price exceeds the higher threshold and asked permission to lower comfort levels to reduce energy usage. Frank takes the suggestion and system turns off all the unnecessary lights. Now only the lights where people are active are kept on but at a reduced level.

EMS functionality illustrated:

- The EMS receives price information from utilities for upcoming periods (e.g. day-ahead). The EMS can inform the user about this price periods and suggests strategies to be taken to conserve energy usage which can be accepted or declined by the user.

#### 4.1.12 Adjust energy usage to activity type



After dinner, Frank wants to read newspaper. He sits down on the couch. The reading lamp is switched on. The spot light is dimmed off. At lower comfort levels only the essential devices are enabled based on the activity of the occupants

EMS functionality illustrated:

- The EMS keeps track of user's activity. Due to this functionality, this system is able to learn and provide the same comfort levels during activities with less energy consumption.

## 4.2 Summary of Functions for Single Family House

### Information provision to end-users

- The EMS'S user interface interacts with end users via alerts in order to make them aware of their energy usage or waste by providing advice and alerts for lowering consumption. (See 3.1.2 and 3.1.5)
- The user can interact with the EMS using an internet connection (from a PC or a portable device, e.g. a smartphone). He/she can send orders and permissions and can receive alerts. (See 3.1.3)
- The EMS gets energy consumption data from buildings in the district and provides them to the end-user to enable benchmarking. (See 3.1.8)
- The EMS's user interface interacts with end users via alerts in order to make them aware of their energy usage and provides advice for lowering consumption. (See 3.1.9)

### Operation

- The EMS is able to calculate energy loads from every source and provides advice to the user to make decisions about energy conservation. (See 3.1.6)
- The EMS learns about user behaviour and automatically adapts room conditions in rooms that are not occupied (See 3.1.9)
- The EMS keeps track of users' activity. Due to this functionality, this system is able to learn and provide the same comfort levels during activities with less energy consumption. (See 3.1.10)
- The EMS keeps track of users' activity. Due to this functionality, this system is able to learn and provide the same comfort levels during activities with less energy consumption. (See 3.1.12)

### Short-term Planning

- The EMS enables programming of automated performance during certain periods of time. (See 3.1.1 and 3.1.4)
- The EMS can re-schedule its performance due to season change and weather conditions. (See 3.1.4)
- The EMS keeps track of the users' energy usage and weather patterns. Due to this functionality, the system is able to learn and to provide the same comfort level with less energy consumption (See 3.1.7)

- The EMS receives price information from utilities for upcoming periods (e.g. day-ahead). The EMS can inform the user about this price periods and suggests strategies to be taken to conserve energy usage which can be accepted or declined by the user. (See 3.1.11)

## 5. Conclusion

This document presents the deliverable D1.4B of Task 1.4 of eDIANA. It presents scenario's that describe how different stakeholders will interact with the eDIANA system. It highlights the typical use cases and gives an easily accessible gateway to what becomes possible with the eDIANA system.

Three sets of scenarios are described: scenarios for apartment buildings, office buildings and single family homes.

The document is produced within the work package 1.4 and is the final scenario document.

The scenarios are input to the other work packages of eDIANA which have the tasks to enable the vision presented in this document. Especially the architecture and demonstrator related tasks should align their activities to these results. Externally it can be to explain the benefits of the eDIANA system to people less familiar with the domain.

## Acknowledgements

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## References

- [1] eDIANA project, "D2.1-B: eDIANA Reference Architecture", February 2010
- [2] eDIANA project, "D2.3-A: Network topology and communications architecture definition", February 2010
- [3] eDIANA project, "D3.1-A: Cell level monitoring and Metering system. Design and Development of Power Consumption Sensor". April 2010

## Appendix A: Overview of scenarios

	Apartment Building	Office Building	Single Family House
<b>User Awareness</b>			
Monitoring over Internet	2.2/2.3/2.4	3.1.2	4.1.3
Energy Price Information	No Reference	3.1.4	4.1.5
Monitoring Total Consumption Information in Cell	2.2/2.3/2.4	3.1.1 / 3.1.7	4.1.6
Monitoring Individual Device Consumption Information in Cell	2.2 / 2.3 / 2.4	3.1.7	4.1.6
Visual Indications in order to motivate user to save energy	2.2/2.4	3.1.1 / 3.1.6 / 3.1.8	4.1.9 / 4.1.11 / 4.1.12
Benchmarking	No Reference	3.1.10	4.1.8
Alerts about unusual consumption (e.g. forgetting a window open, pipe leak)	No Reference	3.1.2	4.1.2 / 4.1.5
Normalizing Heating Energy Consumption	No Reference	No Reference	4.1.7
<b>Prediction of Energy Consumption of the Heating System</b>			

	Apartment Building	Office Building	Single Family House
Accessing Weather Forecast Results	2.4	3.1.1	4.1.4
Prediction Model for the Indoor Thermal Performance	2.4	3.1.1	4.1.4
<b>Users' behaviour/activity and comfort levels</b>			
Adaptation to the User's Behaviour	2.3	3.1.9	4.1.9
Reacting According to the User's Current Activity	2.2/2.3	3.1.4	4.1.9 / 4.1.10 / 4.1.12
Adjustable Comfort Level Thresholds or Modes	2.2 / 2.3 / 2.4	3.1.3 / 3.1.6 / 3.1.9	4.1.3 / 4.1.4 / 4.1.9 / 4.1.11
<b>Energy Generation and Storage</b>			
Energy Generation (Solar, wind, cogeneration, etc.)	2.4 (Solar)	No Reference	No Reference
Energy Demand	2.4	3.1.1 / 3.1.7	4.1.6
Stored Energy (In Batteries / In the apartment's thermal capacity)	2.4 (In Batteries)	No Reference	No Reference

	<b>Apartment Building</b>	<b>Office Building</b>	<b>Single Family House</b>
Energy Trading	2.4	No Reference	No Reference
<b>General Operation</b>			
Centralized Management and Control	2.2/2.3/2.4	3.1.2	4.1.1
Management and Control over Internet	2.2/2.3/2.4	3.1.2 / 3.1.3 / 3.1.4 / 3.1.5 / 3.1.10	4.1.3
Demand Response	No Reference	3.1.3 / 3.1.4 / 3.1.5 / 3.1.6 / 3.1.8	4.1.4 / 4.1.11
Automated Performance Scheduling	2.2/2.3/2.4	3.1.3 / 3.1.4 / 3.1.5 / 3.1.6 / 3.1.8 / 3.1.9	4.1.1 / 4.1.4 / 4.1.9 / 4.1.10 / 4.1.11
Overriding the Automated Performance Scheduling	No Reference	3.1.3 / 3.1.4 / 3.1.5 / 3.1.6 / 3.1.8	4.1.11