eDIANA
Embedded Systems for Energy Efficient Buildings

GREEMBED 2010

Workshop on Embedded Systems for Green Techs
Stockholm 12th April

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Project Background

- More than 40% of the energy consumption in Europe is building-related (residential, public, commercial and industrial).
- The Action Plan for Energy Efficiency estimates that the largest cost-effective energy savings potential lies in the residential (27%) and commercial buildings (30%)
- Advanced, flexible and integrated ICT-based energy management systems for both new and old buildings, in combination with widespread control of natural lighting and ventilation […] will help not only to reduce energy consumption but also to increase safety and security…
- Such systems — including smart metering and advanced visualization — can continuously gather data on what is taking place in a building and how its equipment is operating, feeding it into a (cognitive) control system to optimize energy performance. At the same time, a heightened energy consumption awareness is expected to stimulate behavioral changes both at household and enterprise level.

Source: "Addressing the Challenge of Energy Efficiency through Information and Communication Technologies" COM (2008) 241 Final. (Communication adopted by the EC).
http://ec.europa.eu/information_society/activities/sustainable_growth/docs/com_2008_241_1_en.pdf

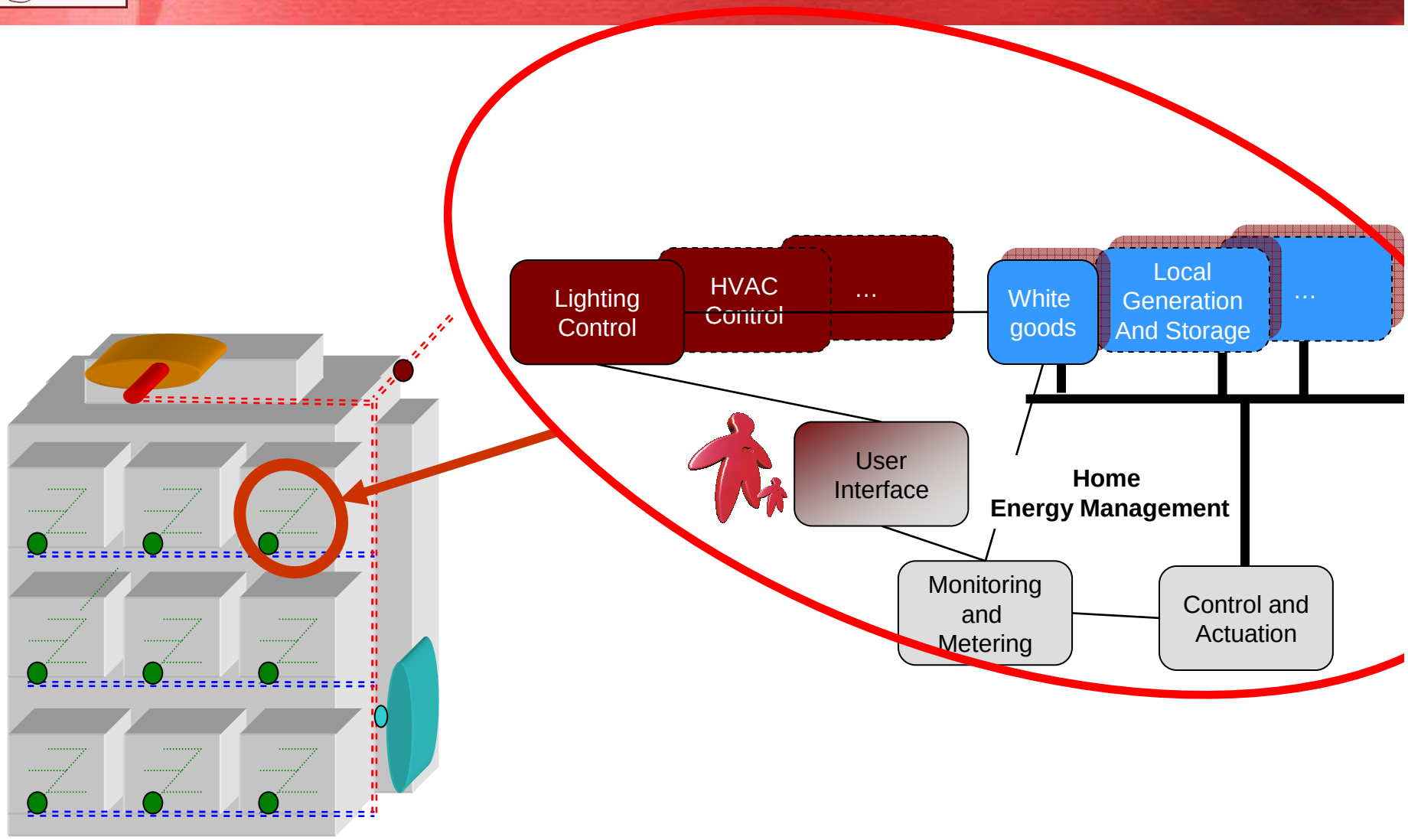
Project aims and objectives

- The overall objective is the conceptualization, design, development, demonstration and validation of the **eDIANA Platform**, integrating intelligent embedded devices, installed in residential and non-residential buildings for improving their energy efficiency.

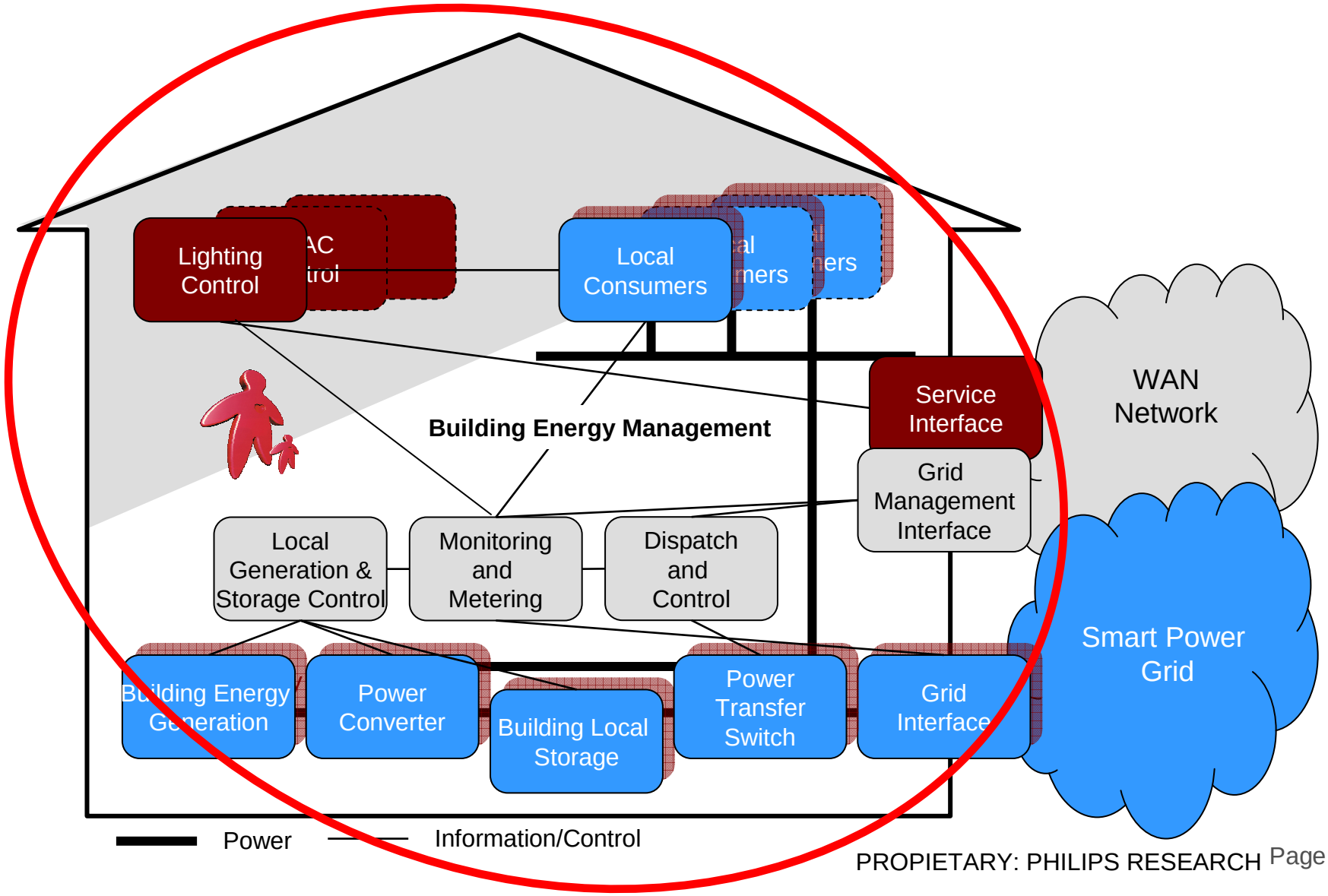
- The **eDIANA Platform** is a reference model-based architecture, implemented through an open middleware including specifications, design methods, tools, standards, and procedures for platform validation and verification.

- **eDIANA platform** will enable interoperability between heterogeneous devices at two levels:
  - Cell (living/working unit such as one house or one office)
  - and MacroCell (residential and non-residential buildings

From the home…



… to the building



Application objectives

- Improve **energy efficiency** and optimize buildings energy consumption by 25%, and enable the energy production and storage in a building (houses, offices, public buildings, etc.) providing real-time measurement, integration and control.
- Improve comfort, making the **user aware** and enabling user-controlled policies for household devices (lighting, domestic electronics, etc.)
- Enable the building to become an “active macroCell” in the energy network, connected to similar macroCells in a district or urban area, as energy consumer but also as producer, by including the technical means for a standard and non-technical user to become a “**prosumer**” (producer and consumer).

Project profile

- **Start:** February 2009 **Duration:** 3 Years **Total cost:** 17 M€
- **National Contribution**: 4.5 M€ **JU Contribution**: 2.9 M€

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eDIANA Platform - General Principles

- **eDIANA Platform is organized in two levels, the MacroCell and the Cell level with a 1-N cardinality**
- **Strict component orientation,** where all components have the same functionality regardless of the scenario
- **The Cell** is in charge of all dynamic control and handling of the connected devices (e.g. appliances) to its concentrator (plug & play, discovery,...)
- **The MacroCell** owns the most sophisticated energy-efficiency control algorithms and can start energy-saving actions from information derived from one or more connected Cells plus all the building specific physical phenomena.It also owns the connection to the grid and the Internet.

eDIANA components definition

To win the composability challenge the eDIANA Platform (EDP) was divided in components. Several components have been identify at Cell and macro-Cell level.

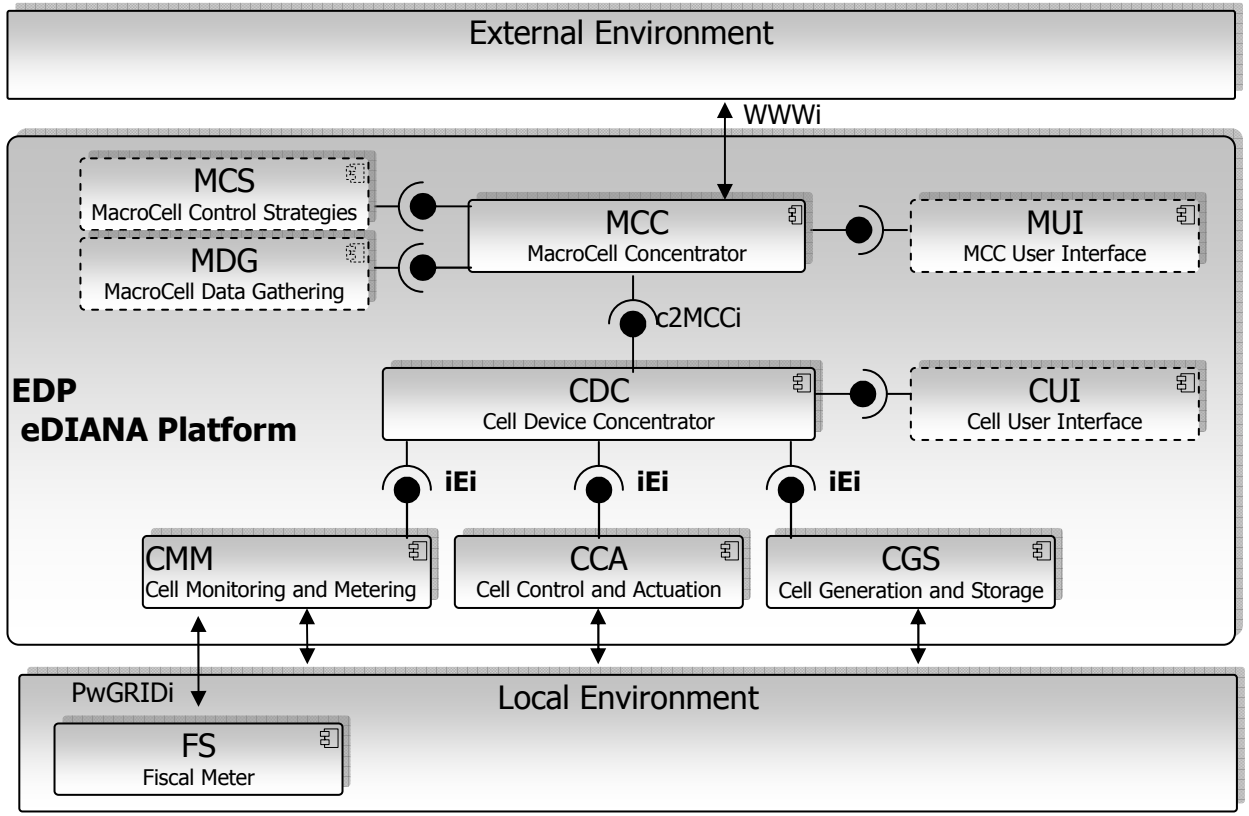
MCC	Macro Cell Concentrator
MUI	MacroCell User Interface
CDC	Cell Device Concentrator
CUI	Cell User Interface
CMM	Cell Monitoring and Metering
CCA	Cell Control and Actuation
CGS	Cell Generation and Storage
MCS	MacroCell Control Strategies
MDG	MacroCell Data Gathering

To allow an easy integration and correct interoperability connectivity and middleware are strategic issues for the project.

Components interfaces are:

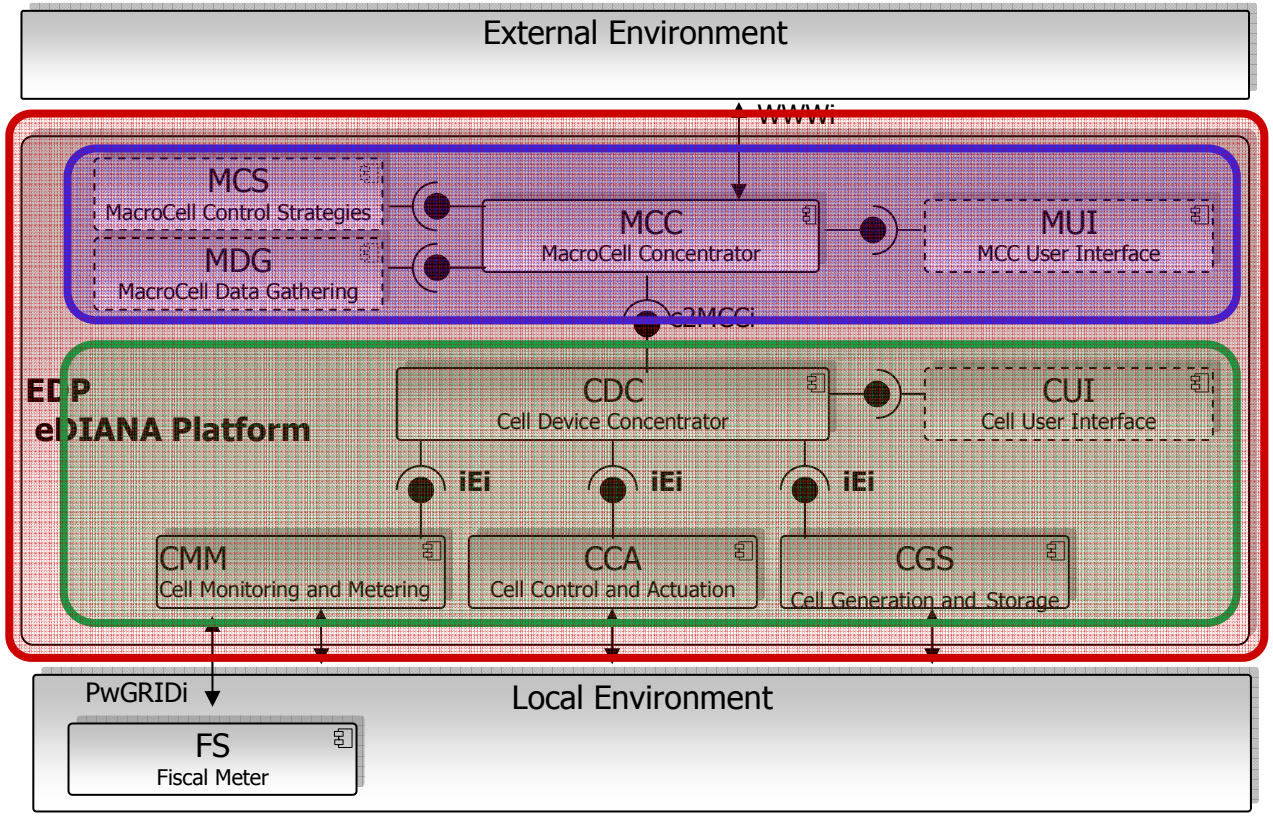
WWWi	Internet Interface
PwGRIDi	Power Grid Interface
c2MCCi	Concentrator to Macro Cell Concentrator Interface
iEi	Intelligent Embedded Interface

Components Diagram



Components Diagram

Architecture and Communication definition



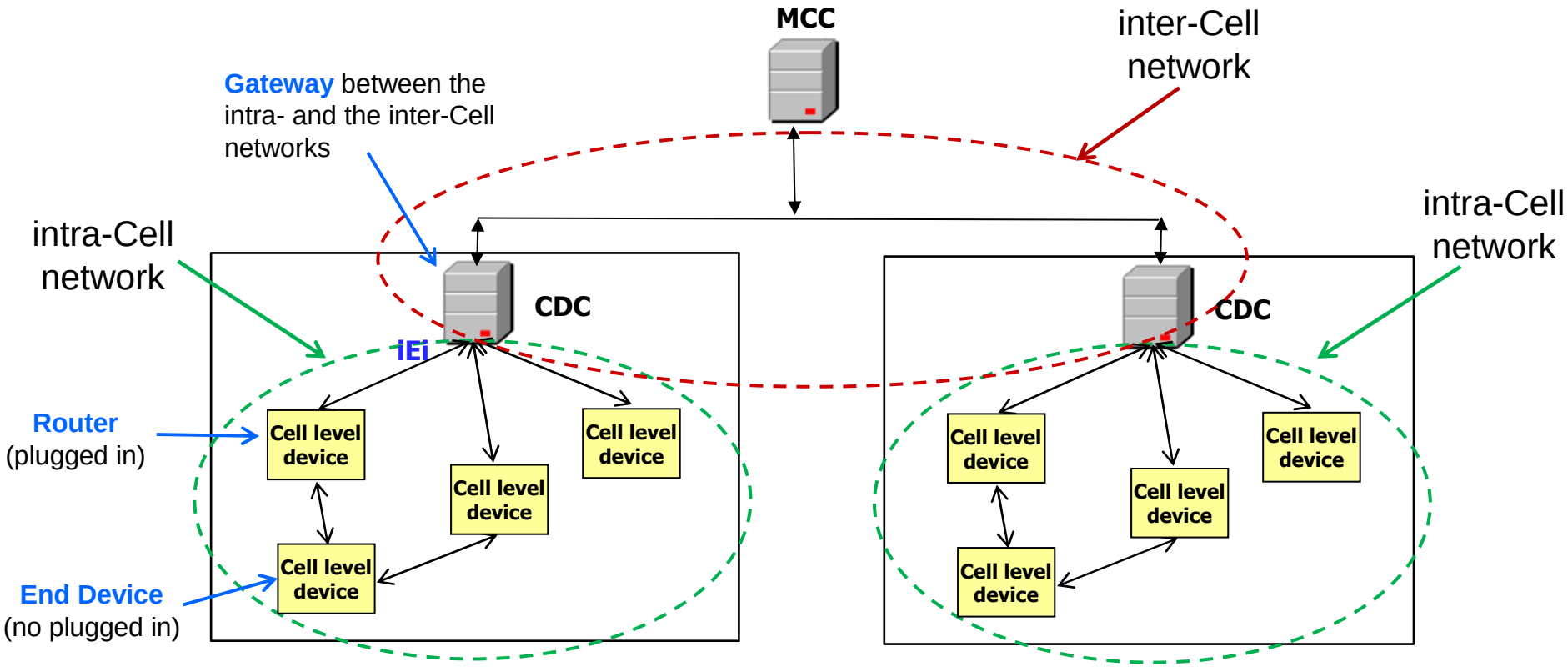
MacroCell Level Devices

MacroCell is in charge of all static and physical phenomena. It also owns the connection to the grid and holds the "contract" with the utility

Cell Level Devices

Cell is in charge of all dynamic control and handling of the connected devices.

Communication architecture



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Application scenarios example

eDIANA‘s best is still to come...

- Cell and macro cell level devices will be finalized by Autumn
- Integration and demonstration activities will start by the end of this year
- Intensive real-scale pilots will be set up in Finland, Spain and the Netherlands in 2011

Stay tuned at our website www.artemis-ediana.eu

or at our LinkedIn group

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