Connected Urban Development

CUD Lisbon

- SMART Energy for Schools

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IST, November 2010

CISCO

CONNECTED URBANDEVELOPMENT

CUD Lisbon

FOCUS:

SMART UrbanEnergy

- Public Office buildings
- Schools

Innovative pilot projects, replicable to other world cities in the context of the Clinton Global Initiative

VISION:

One single, ICT-centric, integrated, end-to-end approach to energy efficiency

From "hardware" to "software"; from the individual, to the building, to the grid

PARTNERS:

CISCO · REGRA · Ministério da Educação · PARQUESCOLAR · Schneider Electric · edp · ISA · Verdiem.

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Ongoing pilots: SMART UrbanEnergy for Schools

BACKGROUND: A unique window of opportunity

- School Modernization Program
- Technological Plan for Education
- Recent technological advances

NGNs connecting schools & state-of-the-art IT equipment = increased energy consumption

"Carbon Zero" goals + Schools as best gateway for relevant multiplying effect

3 PILOT SCHOOLS IN LISBON :

E.S. D. Dinis

E.S. D. João de Castro

E.S. Rainha D. Amélia

"We believe that we can be connected AND green. In the XXI century, it should not have to be a trade-off, as ICT has the potential to be the basis for helping us achieving our end goal: to be carbon neutral and energy self-sufficient in every school of the country" *João Sintra Nunes, CEO of Parque Escolar*

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Ongoing pilots: SMART UrbanEnergy for Schools

MAIN INITIAL HYPOTESIS:

Can a school (and a community of schools), by a SMART use of a single converged ICT solution:

1. *Maximize "user-related" energy efficiency* (thus minimizing energy consumption and costs) without compromising the levels of comfort of its occupants?

2. Minimize its carbon footprint and attain energy self-sufficiency through an effective integration of energy efficiency measures with *local renewable energy production and a bidirectional connection to the electric grid*?

3. Use pilot results and implementation process as a key source of *educational material*, as well as to promote the *active involvement of schools* (students, teachers, families) and community in all stages of the program?

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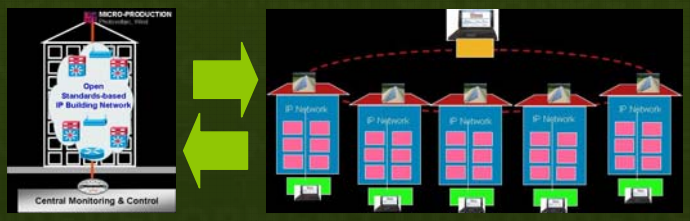
Ongoing pilots: SMART UrbanEnergy for Schools

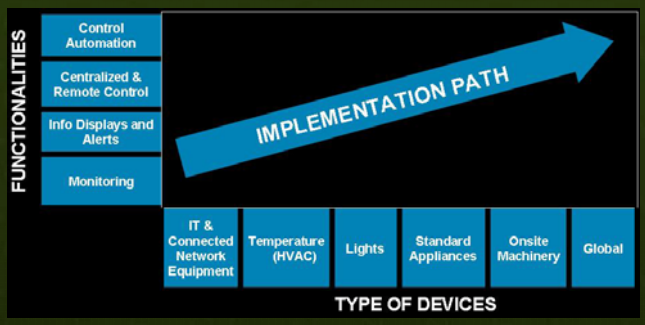
CONCEPT AND KEY FEATURES:

1

BUILDING AND COMMUNITY ENERGY MANAGEMENT SYSTEM



KEY FEATURES:



2

SMARTGRID

KEY FEATURES:

Peak / Load Shedding &
Demand Response
Demand Side Management (DSM)

CO2 Content of Electricity
% Renewable Sources in the Grid

Bi-directional Power and
Information Flows to and from the
Grid

3

SCHOOL POPULATION PARTICIPATION AND AWARENESS

Use of Web 2.0 tools to promote involvement of all pilot schools. The pilot includes two levels of engagement:

(1) awareness and behavior change

(2) participation in the technical layers of pilot roll out

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Ongoing pilots: SMART UrbanEnergy for Schools

CONCEPT AND KEY FEATURES:

1

BUILDING AND COMMUNITY ENERGY MANAGEMENT SYSTEM

Ubiquitous, IP-based, real-time energy monitoring and management, effectively integrating all relevant sources of energy consumption in schools:

- IT equipment;
- HVAC and lighting;
- Appliances and other energy consuming equipment

BASIS: *Cisco EnergyWise*

PARTNERS: Schneider Electric

Global EnergyWise partner +
Lisbon CUD specific Partnership

Verdiem.

Global EnergyWise Beta
Test Program Partner

2

SMARTGRID

- Renewable energy sources
- Bidirectional, IP-based communication with the grid, supporting DSM mechanisms to optimize schools' energy efficiency policies and measures

PARTNER: edp

3

SCHOOL POPULATION PARTICIPATION AND AWARENESS

PARQUESCOLAR

Ministério da Educação

ISA

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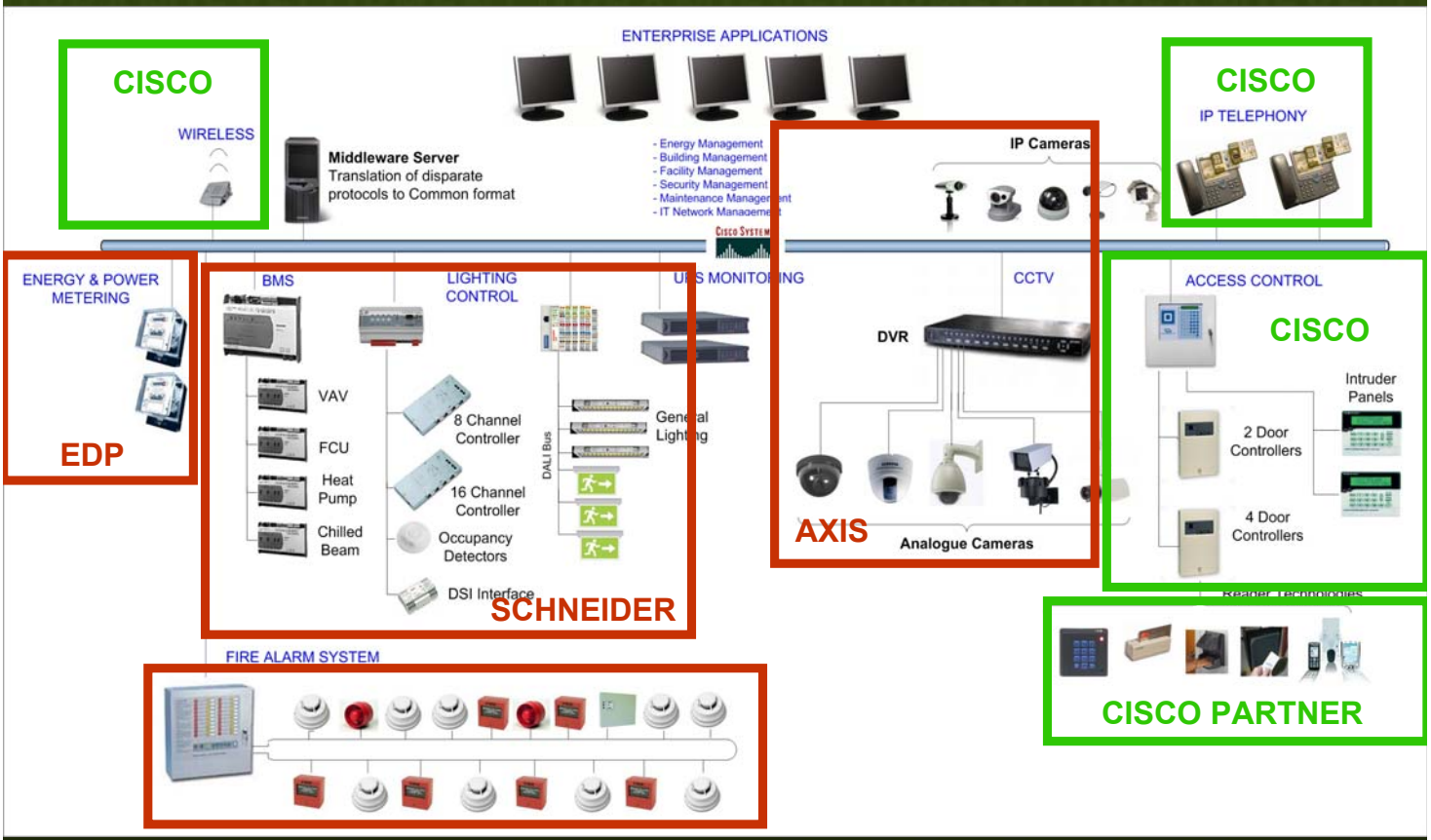
Ongoing pilots: ICT Equipment at the Pilot Schools



Over a Cisco integrated LAN / WLAN solution

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Ongoing pilots: SMART UrbanEnergy for Schools

PILOT SCHOOLS IN LISBON AND INITIAL RESULTS:

E.S. D. Dinis

25,7% reduction

E.S. D. João de Castro

16,7% reduction

E.S. Rainha D. Amélia

31,4% reduction

* ***As of end October 2010.*** *For global IT layer (networking equipment, PCs/Laptops, other IP devices eg. CCTV cameras) – representing between 15 and 35% of total energy consumption. Average energy savings between 20% – 30% expected to hold as energy management solution progresses into new functionalities and technology layers*

TIMEFRAME: *Estimated pilot end date - 2Q2011*

Completed: IT layer real time energy monitoring and control
*(EnergyWise **Orchestrator** Beta Test);*

HVAC & Lighting real time energy monitoring and control
(Schneider BMS compatible with EnergyWise)

Local energy production onsite (renewable sources – PV, Micro wind turbines)

September 2010 / February 2011 *– integration EnergyWise - BMS (HVAC, Lights, etc.)*

August 2010 / March 2011 *– connection to EDP's smartgrid pilot*

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CUD Lisbon - Schools
- Orchestrator Beta Test -

Initial Results

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Orchestrator Beta: Scope

2 pilot Schools:

- E. S. D. Dinis
- E. S. Fonseca Benevides

+ E. S. Rainha D. Amélia to follow

IT Layer:

- Switches
- WAPs
- IP Phones
- PCs & Laptops
- IP Cameras

+ Video projectors (EPSON)
+ Interactive / Smartboards (Promethean)
+ Other IT devices

Functionalities:

- Baseline measurements
- Real time monitoring *Aggregated By individual device*
- Control policies *Remote Automated Granular*
- Dashboard / Display

+ Digital signage / Educational content
+ Centralized policies / Benchmarks

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Orchestrator Beta: Results D. Dinis (1/4)

Energy Savings 28 d

	Savings	
	kWh	%
PCs	-1.288,14	-32,02%
IP Phones	-32,99	-20,88%
WAPs	-107,53	-22,16%
IP Cameras	0,84	2,30%
Switches	-12,21	-1,08%
TOTAL	**-1.440,03**	**-24,68%**

2 new IP Cameras installed during test period

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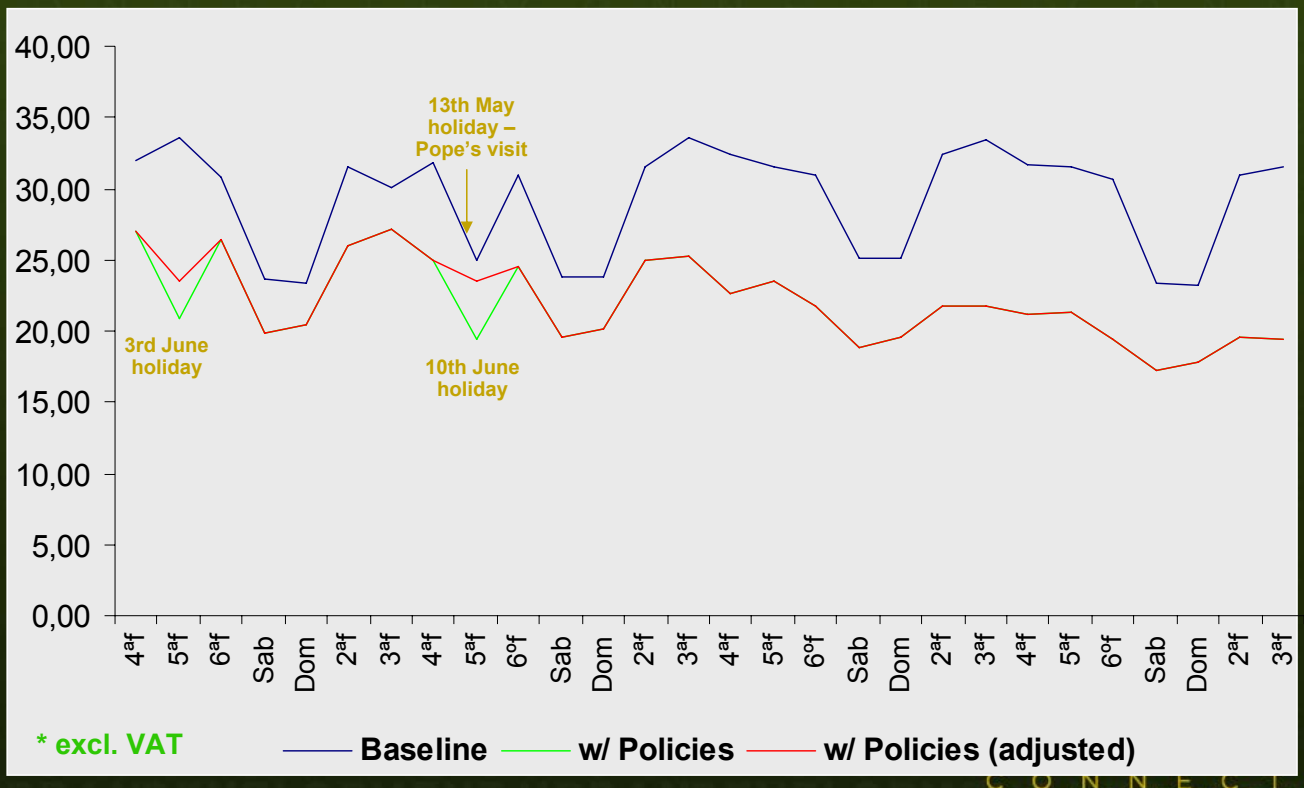
Orchestrator Beta: Results D. Dinis (2/4)

Energy Costs – IT Layer (eur/day)



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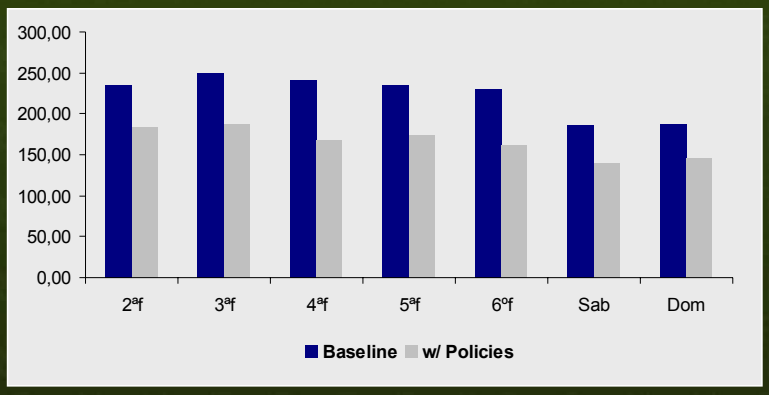
Orchestrator Beta: Results D. Dinis (3/4)

Energy Consumption (kWh)



Energy Savings (eur/day)

1 w

Energy Savings achieved in a typical 7-day school week:

** In a conservative scenario*

	Un: EUR
Baseline	210,41
w/ Policies	156,42
Savings	-53,99
Savings (%)	-25,7%

*** excl. VAT**

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Orchestrator Beta: Results D. Dinis (4/4)

Before school retrofitting (without HVAC)

After school retrofitting (with HVAC)

	Jun-08	Set-08	Jan-09	Jun-09	Set-09
Cost (EUR)	2.207,48	4.597,08	5.848,29	4.066,25	4.407,62
Consumption (kWh)	22.737,00	50.799,00	58.989,00	38.950,00	42.826,00

SIMULATION WITH BETA TEST RESULTS

IT Layer ≈ 29,5% to 35% of total consumption

Beta ≈ 9,5% to 11% reduction on global energy costs *

IT Layer ≈ 15% to 20% of total consumption

Beta ≈ 4,3% to 6,2% reduction on global energy costs *

** In a conservative scenario*

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