# TECNALIA Research& Innovation





#### **MSc in Physics from Basque Country University**

Freelance during university period

Work for computer vision company in **Basque Country (Siemsa-Gamesa)** •Real Time Recognition algorithms development

Work in SCADA development company in Madrid (ELIOP-TELVET)
Development of embedded software for RTU-s (Remote Terminal Units)
Development of communication protocols (ICCP) for utilities and REE (Spanish electrical network authority)

Work in surveillance systems development company in Basque Country (DEIMOS)
 Integration of SCADA platforms into Airport Management Networks
 ➢ TIBCO, BizTalk, ActiveMQ,...

•Development of Wireless monitoring platform for PV plants

#### Work in development of energy efficiency management in buildings (TECNALIA)

Integration of energy simulation engines with BMS platforms
 Development of rule engines frameworks for building energy management



**Organised in 7 Business Divisions:** we work from the experience and the expertise we have acquired in the markets in which we operate, with an efficient and proactive attitude.



## International Presence



#### SUSTAINABLE CONSTRUCTION: Challenges and Research Lines



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#### Smart Buildings & Cities: Research and Activity domains

#### **Energy Efficiency in Buildings...**

**AIM**: Maximize the usage of local generation resources and minimize the buildings' energy demand

- Use of energy simulation engines with building complex models
- Development of simplified models for thermal demand
- Optimization of building management systems

#### **Active Solutions for Energy Efficiency in Buildings...**

**AIM**: Develop active solutions for buildings ready to be integrated in BMS

- Create self configuring building solutions
- Behavior models for active solutions
- Information models for BMS integration



#### Smart Buildings & Cities : Modeling for Energy Efficiency

#### Why rely on modeling...

Take advantage of knowledge

• Information life cycle: Design -> Development -> Operation

Construction processes transformation

- New stake holders and active building solutions spring-up
- Towards Plug & Play

Most technological design processes rely on simulations and modeling

• Sailing boats industry

➢Design of sails, keels, rudders design

• Aeronautical industry

Design of wings, fuselages,

• Electric component development industry

## **Building Modeling**

- Take advantage of knowledge : Design -> Development -> Operation
- Model building envelope, window area and internal partitions (root)
- Model building systems, HVAC and local generation sources
- Thermal and electrical demands forecasting (Energy Plus, TRNSYS)
- Renewable local generation forecasting (Energy Plus, TRNSYS)

### Optimization

- Generation of different building usage scenarios
- Demands/Consumption calculation of different building configuration for same scenario
- Comfort Set-Points and shiftable loads activation

## **BMS Integration**

- OSGI communication framework
- Service based architecture, B2B approach (XML, HTTPRest, WS..)



#### **TECNALIA's Energy Manager: Modules and Fuctionalities**



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#### **TECNALIA's simplified modeling tool: E3P**

## AIM: Create a tool covering buildings' envelope and systems from the building planners' perspective

**Tackled problem**: Existing tools are very flexible but require deep knowledge on their capabilities and configuration options. Long learning periods.

**Solution:** Create a web based tool with a palette of components that simplified the modeling task transfroming it into a drag & drop operation of building systems.

- Short learning periods
- Simplified configuration options
- Relying in a reliable simulation engine (TRNSYS)



#### **TECNALIA's simplified modeling tool: E3P**





#### **From Development tools**



#### To design tools



#### SBC : Active building solutions modeling for Energy Efficiency

#### **TECNALIA's approach**

- 1.- Model an existing building solution within a modeling tool
  - District heating plant in TRNSYS platforms
- 2.- Create a re-usable model for an existing building solution
  - Model a thermal solar collector + heat pump as a single device
  - Create the optimized control algorithm and pack as reusable dll file
- 3.- Create a brand new building solution and control model
  - Trombe wall including PCM (phase change material)
  - Create the optimized control algorithm and pack as reusable dll file
  - Patent 2009

Create models for standard solutions with standard tools Create models for standard solutions reusable within different tools Create own building solutions and model reusable within different tools



#### SBC: Active building solutions modeling for Energy Efficiency

#### Some products..

#### MODULTAR

Phase change materials based solar collector for building envelopes with open interfaces for third party integration



#### RETROWINDOW

Window system that integrates the functions of renewal of the indoor air with heat pretreatment air-to-air integrate into the window frame





Modultar prototype installed in KUBIK



#### Smart Buildings & Cities : From Building to City level

#### New boundaries for energy management... Cities

- 1.- Aggregation of building level outcomes
  - Building level demands and consumption
  - Local renewable generation usage optimization
- 2.- Markets role more relevant
  - Join to day ahead energy markets
- 3.- New energy balancing / sharing features spring up
  - Energy balance among different usage building lead to new contract profiles
  - Reduce peak energy demands

**OPTIMUS project**: Develop a DSS and semantics for energy efficiency for cities



#### ecolN: KUBIK more than a feeling



Experimental building for R&D oriented to the development and testing of new concepts, products and services for the improvement of the energy efficiency in buildings



#### www.tecnalia.com

## Questions, Comments,.....



### THANKS FOR YOUR ATTENTION



**Contact:** Borja Tellado borja.tellado@tecnalia.com

TECNALIA Parque Tecnológico de Bizkaia, Edificio 700, 48160 Derio, España www.tecnalia.com

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