



**Research and Technological Development** 

**Technology Transfer and Valorisation** 

**Advanced Training** 

Consulting

**Pre-incubation of Technology-based Companies** 

## **Our Mission**







#### Institutional

POWER AND ENERGY CLUSTER

COORDINATION COUNCIL

INDUSTRY AND INNOVATION CLUSTER

COORDINATION COUNCIL



#### **General Council Board of Directors** Scientific Advisory Board (SAB) / Consultants, **Organisation and Management Services** (International) AJ | CF | CG | RH | AG | COORD SEC **Executive Advisors** and Advisors to the **Business Development Services Board** SAPE | SAL | SAAF | GB **Scientific Council Technical Support Services** SCOM | SCI | SIG | SGI | SBD Council of R&D Centres/Laboratories **CPES** CITE **CESE CEGI CROB CAP CTM C-BER CSIG CRACS HASLab** LIAAD **Applied** Biomedical Information Artificial High **Power** Innovation, Enterprise Telecom. Industrial Industrial Robotics and Technology **Systems Photonics** and Engineering Systems Intelligence Engineering Assurance Engineering and Engineering Multimedia and Comp. and Decision Energy and and Software and Intelligent Systems Entrepre-Graphics Support Manag. Manageme Systems neurship nt ₹Ţ $\overline{m{\Box}}$ **₹**

**NETWORKED INTELLIGENT SYSTEMS CLUSTER** 

COORDINATION COUNCIL

ASSOCIATE UNIT

COMPUTER SCIENCE CLUSTER

COORDINATION COUNCIL

**CISTER** 

Real-Time and Embedded Computing Systems

# The Scientific Advisory Board of INESC TEC



**PRESIDENT** 

José Carlos Príncipe University of Florida USA



**CPES** 

Tomaz Goméz Universidad Pontificia Comillas Spain



LIAAD

Maarten van Someren Universiteit van Amsterdam The Netherlands



**CESE** 

Volker Stich Aachen University of Technology Germany



**CAP** 

Faramarz Farahi University of North Carolina at Charlotte USA



CEGI

James C. Spohrer **IBM** University Programs World-Wide (IBM UP) USA



**CSIG, HASLAB, CRACS** 

José Luíz Fiadeiro University of Leicester UK



**CROB** 

Peter Corke University of Melbourne Australia



**C-BER** 

Max Viergever **University Medical Center Utrecht** The Netherlands



CTM

CTM

John O'Reilly **Cranfield University** UK

CITE

Steven P. Nichols University of Texas at Austin USA



José A. B. Fortes University of Florida USA



**CSIG, HASLAB E CRACS** 

**ASSOCIATE UNIT** 

**INESC TEC** 

**CISTER** 

Daniel Mossé University of Pittsburg USA



Leonardo Chiariglione **CEDEO** Italy



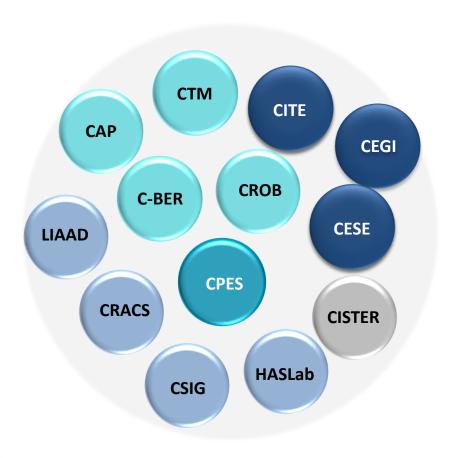
#### Institutional

#### **MAIN FIGURES INESC TEC** Partnership-based resources = 1.515 M€ Coordinated by INESC Porto Turnover = 11.8 M€ **R&D Centres = 12 + 1** Collaborators = 800 Private non-profit association • R&D = 600 PhD = 300 Public Interest Institution since Integrated PhDs = 250 2001 Support Services = 57 **Associate Laboratory statute** awarded in 2002 by the **Portuguese Ministry of Science** 10,89% Awarded the level of Excellent by an international evaluation **■ U.Porto Foundation** 33,33% 55,78% board of the Ministry of INESC Science ■ IPP



#### Institutional

# INESC TEC (INESC TECHNOLOGY & SCIENCE)– coordinated by INESC Porto



**CPES** – Centre for Power and Energy Systems

**CITE** – Centre for Innovation, Technology and Entrepreneurship

**CESE** – Centre for Enterprise Systems Engineering

**CEGI** – Centre for Industrial Engineering and Management

**CAP** – Centre for Applied Photonics

**CTM** – Centre for Telecommunications and Multimedia

**C-BER** – Centre for Biomedical Engineering Research

**CROB** – Centre for Robotics and Intelligent Systems

**CSIG** – Centre for Information Systems and Computer Graphics

**LIAAD** – Laboratory of Artificial Intelligence and Decision Support

**CRACS** – Centre for Research in Advanced Computing

Systems

**HASLab** – High-Assurance Software Laboratory

#### **ASSOCIATE UNIT**

**CISTER -** Research Centre in Real-Time and Embedded Computing Systems



#### **Our Associates: our Strength**





















and Privileged Partners:



Universidade do Minho

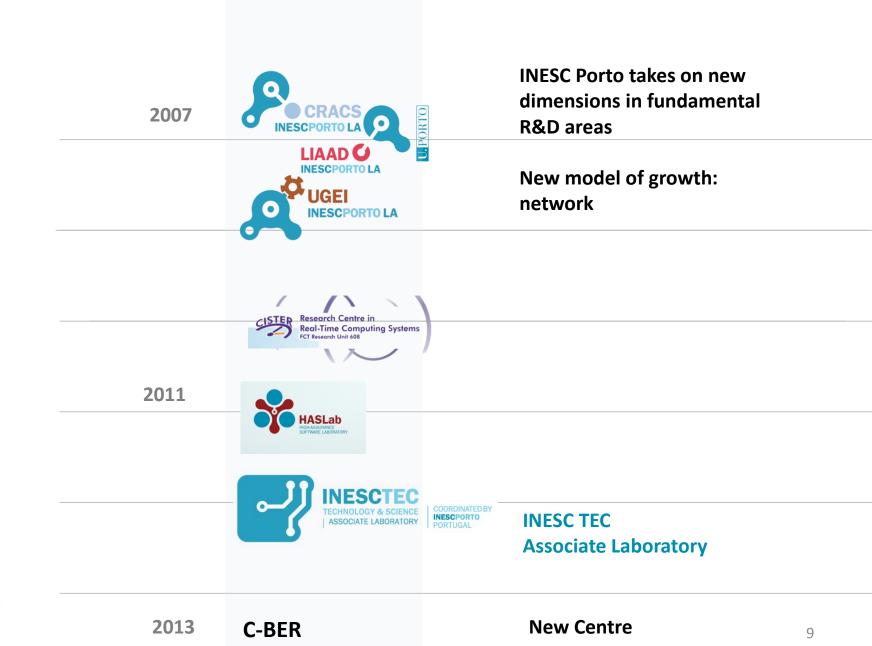


# **Timeline**

1980		INESC formed in Lisbon	
1985		INESC Norte in Porto	
1996 - 1998 Dec. 1998	INESC PORTO INSTITUTO DE ENGENHARIA DE SISTEMAS E COMPUTADORES DO PORTO	INESC in Norte, progressive autonomy	
		Creation of INESC Porto	
2002	INESCPORTO ASSOCIATED LABORATORY	INESC Porto – Associate Laboratory	
		0	

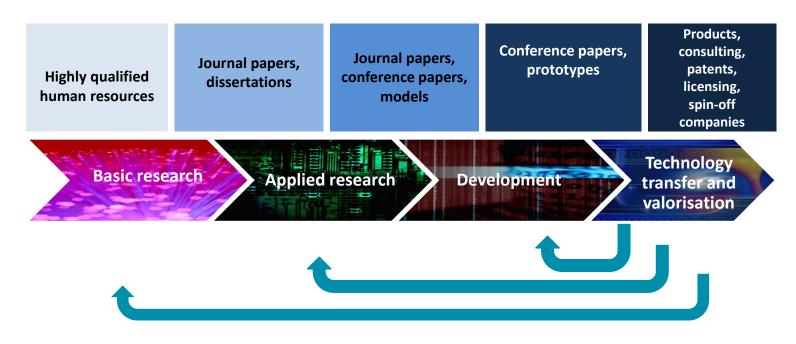


## **Timeline**



#### Profile of activities in the value chain

# The metaphor of the production chain of knowledge-value: we make it a reality



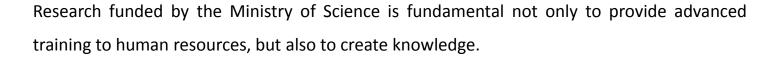


# **Sources of funding (Number of Projects)**

Sources of Eupding	Year								
Sources of Funding	2008	2009	2010	2011	2012	2013			
National Programmes	49	44	83	106	95	102			
<b>European Union Programmes</b>	20	19	20	28	30	39			
R&D Services and Consulting	70	78	90	102	109	108			
Other Sources of Funding			10	7	10	6			
Other External Sources	6	9	3	4	7	8			
Internal		1	3	8	8	6			
Total	145	151	209	255	259	269			

# Competitive Research funded by the Portuguese Foundation for Science and Technology

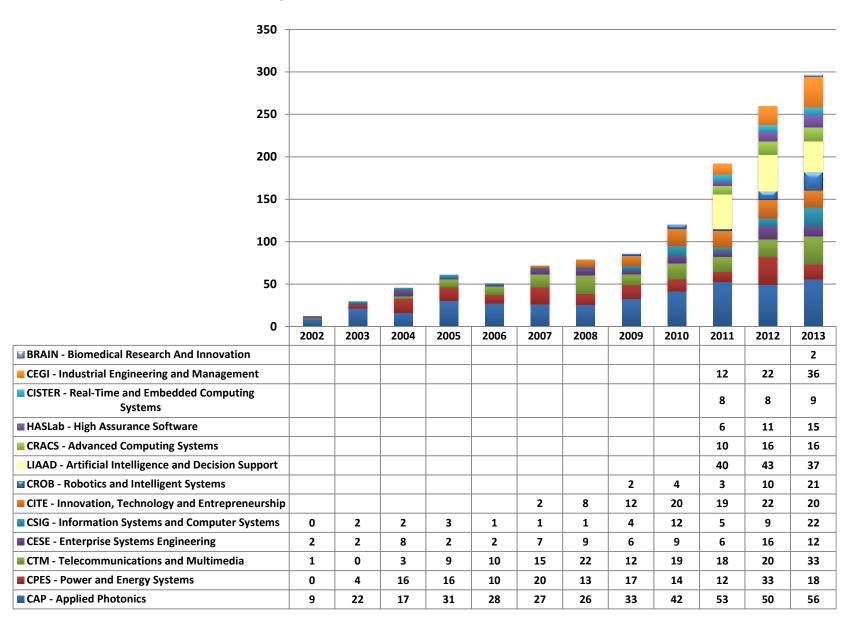
Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
No. of Proj.	8	12	21	27	22	27	26	30	50	60	61	65	409



There are other national sources of funding (QREN/NSRF) which support the development of projects and INESC TEC is also an active agent in these programmes.



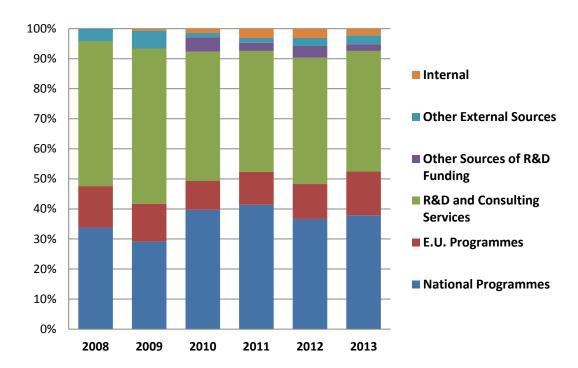
# Papers published in international journals





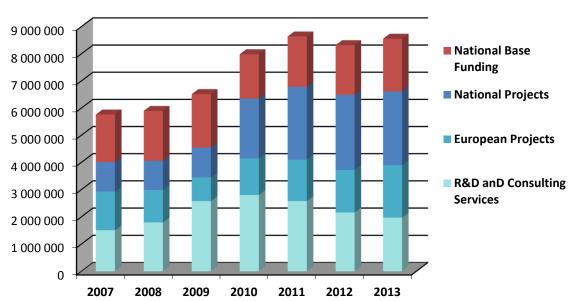
# **Sources of Funding**

**NO. PROJECTS** 



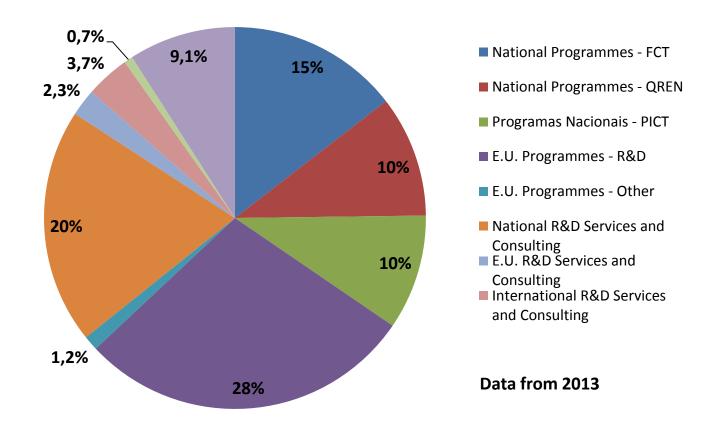


INCOME FROM PROJECTS



# **Sources of Funding: diversity is key**

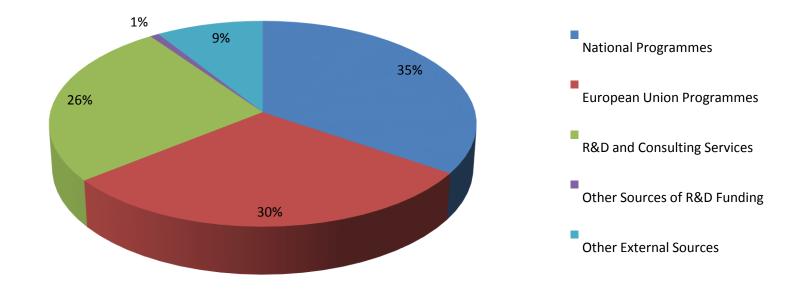
#### **SOURCES OF INCOME (%)**



R&D Services and Consulting secure 36% of funding International activities represent 26% of funding



# **Sources of Funding: diversity is key**





Data from 2013

# The research units and the production chain of knowledge





## **High-level R&D contracts**













**EFACEC** 



• New optical fibre technology that analyses levels of CO2 in the atmosphere from space

•New methods of forecasting wind power energy production in the short term

• New probabilistic methods to evaluate the safety of energy generation until 2025



 Advanced Modules for DMS (Distribution Management Systems)





# **Socially relevant Research: 2 Examples**

**1**ST EXAMPLE: smart grids

#### **ACTION**

- 4 European projects, 3 FCT projects
- Various national development and consulting contracts with significant financial support from industry
- An important project for industry (INOVGRID)

#### RESULT

A consortium led by the largest energy operator in Portugal (EDP) along with 4 partners from industry and INESC TEC as the only R&D institution involved in defining the technical specifications

A solution and nationally competitive technologies that can be exported

A pilot project for a Smart City: Évora – 33,000 consumers using Smart Grid technology







# **Socially relevant Research: 2 Examples**

#### **2<sup>ND</sup> EXAMPLE:** the footwear industry

#### **ACTION**

- 5 European projects, 14 national projects with significant financial support from industry
- Demonstration and training programmes







#### Infrastructure



12 R&D Centres + 1 Associate Unit 6 poles | Porto, Braga and Vila Real

O	O	O	O	O
CPES	CITE	CESE	CEGI	CROB
O	O	O	O	O
CAP	CTM	C-BER	CSIG	LIAAD
O CRACS	O HASLASB	O CISTER		

#### **INESC TEC:**

In four university campi:

#### **University of Porto**

FEUP (Engineering)
FCUP (Science)
FEP (Economics)

**Polytechnic Institute of Porto** 

ISEP (Engineering)

University of Trás-os-Montes and Alto Douro

Engineering

**University of Minho** 

Engineering

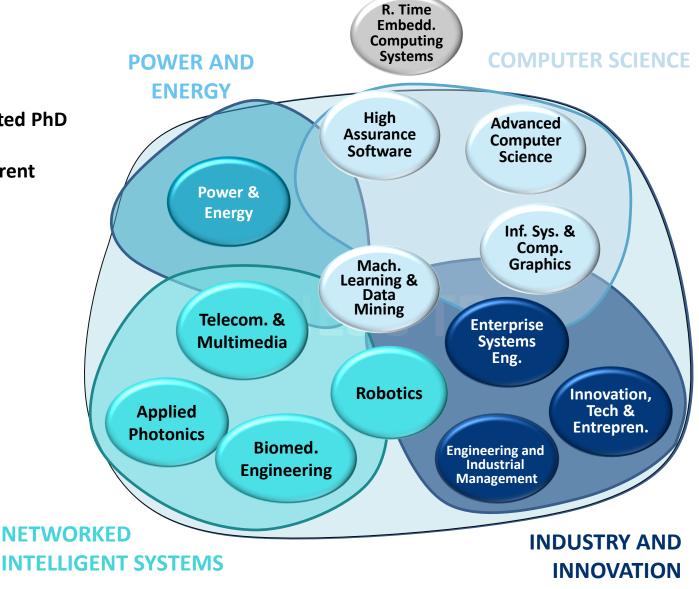


# **INESC TEC:** A compact puzzle

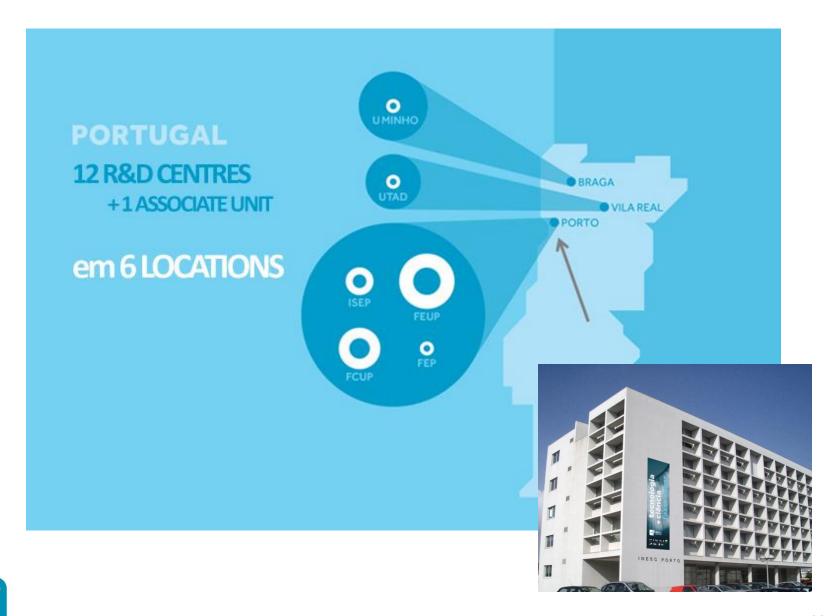
**600 Researchers** 

- 300 PhD holders
  - 250 Integrated PhD

A compact and coherent continuum



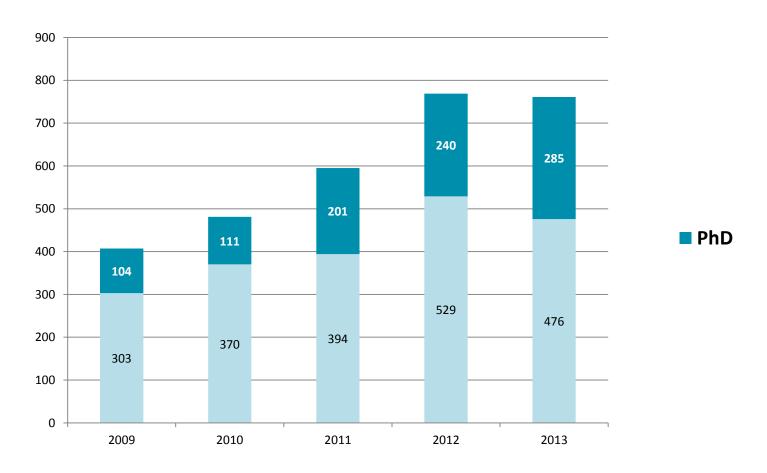
# **Geographic Location**





# **Scientific capacity**

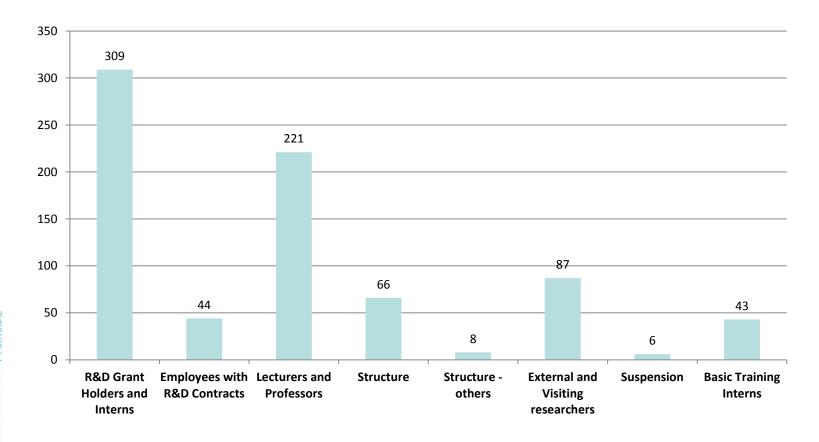
#### **HUMAN RESOURCES**







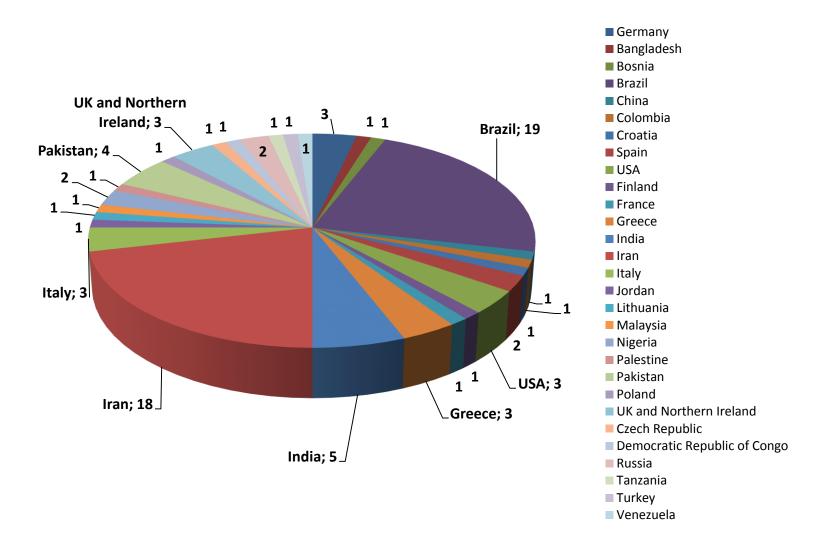
# **Human Resources: Type of Link**





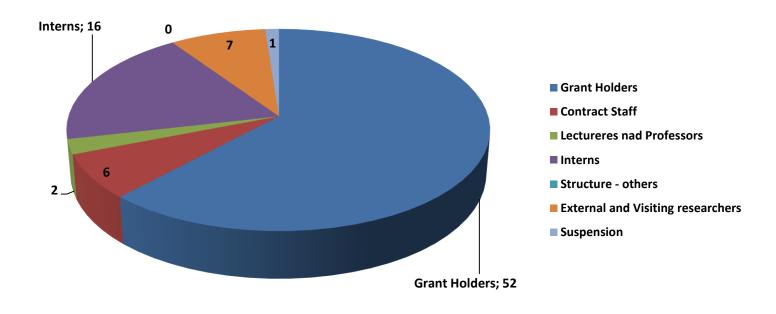


## **Human Resources: nationalities of foreign researchers**





# **Foreign researchers at INESC TEC**





#### **International Doctoral Programmes**

AVANCED TRAINING

**PhD TRAINING** 

# International Partnerships 40% of foreign students



#### MIT Portugal Massachusetts Institute of Technology

ENGINEERING DESIGN AND ADVANCED MANUFACTURING

SUSTAINABLE ENERGY SYSTEMS

TRANSPORTATION SYSTEMS

#### **UTAustin Portugal**

**DIGITAL MEDIA** 

UNIVERSITY TECHNOLOGY ENTERPRISE NETWORK

# Carnegie Mellon Portugal Information and Communication Technologies Institute

MAP-I COMPUTER SCIENCE

MAP tele TELECOMMUNICATIONS

**UNIVERSITY OF AVEIRO** 

UNIVERSITY OF MINHO

**UNIVERSITY OF PORTO** 

#### FEUP Faculty of Engineering of the University of Porto

PD EEC ELECTRICAL AND COMPUTER ENGINEERING

PD EIG INDUSTRIAL ENGINEERING AND MANAGEMENT

MIETE MASTER'S IN INNOVATION AND TECHNOLOGICAL ENTREPRENEURSHIP

(FEUP/FEP FACULTY OF ECONOMICS OF THE UNIVERSITY OF PORTO)



#### **MISSION**

Promote the scientific and technological development of Brazil as well as international cooperation in areas such as information technology, energy, communications and related sciences. This will be achieved by implementing multidisciplinary and consortium projects similar to projects conducted within the European Union's Framework Programmes.

Nongovernmental Science and Technology Institution, which aims at coordinating a network of cooperation in research, development and technology transfer in Brazil, together with public Brazilian universities and INESC TEC.

Passion for Knowledge

Respect for the identities

Knowledge → Social well-being

**Responsible Science** 







#### **PAST ACTIVITY**

**R&D CONTRACTS CELPA, FLAGSHIP** 

ADVANCED CONSULTING ONS, PROMON FOR ANEEL

PH.D. HOLDERS, GRANT HOLDERS AND POST-DOCS AT INESC TEC

**EUROPEAN PROJECTS WITH A BRAZILIAN PARTNER** 

SPIN-OFF PARTNERSHIPS: FIBERSENSING WITH GÁVEA SENSORS

#### **ONGOING ACTIVITIES AND NEGOTIATIONS**

**R&D CONTRACTS** 

**POWER** 

ROBOTICS

**OPTICAL SENSORS** 

INSTRUMENTATION

**ASSET MANAGEMENT** 

TELECOMMUNICATIONS



#### **INESC PORTO**

**UFC** FEDERAL UNIVERSITY OF CEARÁ

**UFPA** FEDERAL UNIVERSITY OF PARÁ

**UFPE** FEDERAL UNIVERSITY OF PERNAMBUCO

UFRJ/COPPE FEDERAL UNIVERSITY OF RIO DE JANEIRO

**UFRN** FEDERAL UNIVERSITY OF RIO GRANDE DO NORTE

**UFSC** FEDERAL UNIVERSITY OF SANTA CATARINA

**UNICAMP** STATE UNIVERSITY OF CAMPINAS

UNIFEI FEDERAL UNIVERSITY OF ITAJUBÁ

USP/SÃO CARLOS UNIVERSITY OF SÃO PAULO/SÃO CARLOS CAMPUS

THE NETWORK IS MANAGED BY INESC P&D BRASIL, SÃO PAULO

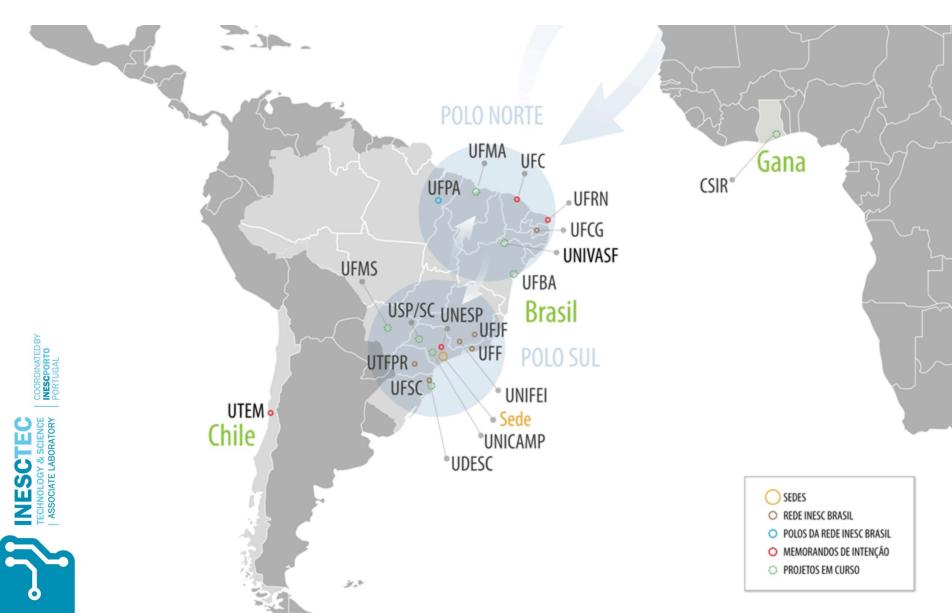
MISSION: Contribute to the scientific and technological development of Brazil and promote international cooperation in engineering, information technology, communications and related sciences.











#### **INESC TEC: R&D Centres and Laboratories**











# **CPES – Centre for Power and Energy Systems**

#### **POWER AND ENERGY CLUSTER**

## **Areas of Activity**

- Power Systems planning and operation, Load modelling, Reliability
- Dynamic security analysis, Integration of embedded generation
- Isolated systems
- Control of wind generators and wind power forecasting
- Smart Grids, Micro-generation and Micro-grids
- Active distribution networks
- Regulation and Electricity market
- Multi-criteria Decision Aid, Fuzzy Sets and Computational Intelligence applied to power systems



# **CITE – Centre for Innovation, Technology and Entrepreneurship**

#### **INDUSTRY AND INNOVATION CLUSTER**

# **Areas of Activity**

- Innovation Management
- Entrepreneurship, Business
  - Development, Incubation
- R&D in Innovation Management and Technology-Based Entrepreneurship
- Launching of spin-off companies



# **CESE – Centre for Enterprise Systems Engineering**

#### **INDUSTRY AND INNOVATION CLUSTER**





# **CEGI- Centre for Industrial Engineering and Management**

#### **INDUSTRY AND INNOVATION CLUSTER**





## **CROB – Centre for Robotics and Intelligent Systems**

#### **NETWORKED INTELLIGENT SYSTEMS**

- Advanced solutions based on mobile and autonomous robotics
- Integration of advanced sensing technologies
- Intelligent control
- Underwater exploration ROVs and AUVs
- Aerial and surface exploration
- Defence, security
- Industrial solutions



## **CAP – Centre for Applied Photonics**

### **NETWORKED INTELLIGENT SYSTEMS**

- Optoelectronics Devices and Instrumentation
- Microfabrication, Integrated Optics and Thin Films
- Interferometric Optical Imaging
- Structural Health Monitoring Systems
- Environmental Monitoring Systems



### **CTM – Centre for Telecommunications and Multimedia**

#### **NETWORKED INTELLIGENT SYSTEMS**

- Multimedia Technologies and Systems
  - Media Processing
  - Multimedia Services
- Wireless and mobile networks
- Internet Architectures and Networking
- Optical and electronics technologies
  - Microwave and optical communications
  - Microelectronics





# **C-BER – Centre for Biomedical Engineering Research**

### **NETWORKED INTELLIGENT SYSTEMS**





## **CSIG – Centre for Information Systems and Computer Graphics**

#### **COMPUTER SCIENCE CLUSTER**

- Computer Graphics and Virtual Environments
  - Image Synthesis and Visual Perception
  - Geospatial Systems, Virtual Environments and Serious Games
- Software Engineering
  - Software architectures for complex systems
  - Agile process engineering
  - Knowledge management in software projects
  - Software quality, testing, verification and certification
- Information Management and Systems
  - Information Systems
  - Information Retrieval
  - Digital Repositories and Preservation





## **LIAAD - Laboratory of Artificial Intelligence and Decision Support**

### **COMPUTER SCIENCE CLUSTER**







## **CRACS - Centre for Research in Advanced Computing Systems**

#### **COMPUTER SCIENCE CLUSTER**

- High Level Programming Languages
- Parallel and Distributed Computing
- Mobile Computing and Sensor Networks
- Information mining and Applications
- Pattern Recognition in Genomics and Proteomics
  - Analysis of Gene Expression Data
  - Understanding Cellular Pathways
  - Clinical Analysis
  - Intrusion detection systems
  - SPAM classification
- Web-based systems
  - Semantic Digital Libraries
  - E-learning Environments and Tools







## **HASLAB - High-Assurance Software Laboratory**

#### **COMPUTER SCIENCE CLUSTER**

- High-assurance software
- Formal verification of real-time and user-computer interaction systems
- Safety-critical embedded systems
- Secure cryptographic schemes and protocols
- Tools for the mechanical verification of cryptographic implementations and security proofs
- Dependable distributed systems
- Large-scale dependable data management
- Elastic high-performance transactional systems





## **CISTER - Research Centre in Real-Time and Embedded Computing Systems**

### **ASSOCIATE UNIT**

- Wireless Sensor Networks
  - WSN Communication infrastructures
  - Real-time and reliability in COTS Technology
  - Application areas in environmental monitoring, process control
- Cyber-Physical Systems
  - Holistic view of computation and networking
  - Ubiquity and high resolution of physical perception
- Real-Time Software
  - Reliable embedded software infrastructures (OS, languages)
  - Distributed QoS-aware embedded middleware
- Multicore Systems
  - High-performance but predictable platforms
- Adaptive Real-Time Systems
  - Computation depending on energy constraints
  - Temporal Isolation and Adaption





## **INESC TEC** supports public policies and other public interest issues

### **INESC TEC**

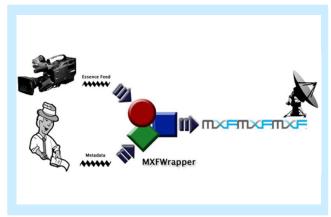
- Advising the NSRF and the FCT on Programme regulations, eligible expenses, etc.
- Supporting the FCT in the creation of Fraunhofer Portugal
- Consulting for the Regional Coordination and Development Commissions: CCDR-N (Northern Portugal) and CCDR-LVT (Lisbon and Tejo Valley)
- Consulting for the MEI (Ministry of Economy and Innovation) in public tenders (e.g.: on Wind Energy Concessions in Portugal)
- Technical support for the creation of legislation in Madeira/Azores
- Contributing to the development of new organisational models for the University of Porto
- Participating in the Areas of Competitiveness and Technology (Health, ICT, Sea, Forest, Energy, Sustainable Manufacturing, Fashion Industries, Creative Industries)





# Professional Video Systems

2002 (MOG Solutions)
2007 (MOG Technologies)
CTM







# FiberSensing

# Advanced Monitoring Systems

2004

CAP











# **Corporate TV and Digital Signage Networks**

2007 CTM/CSIG

In-Store Virtual Shop Assistant







# **Electronic Medical and Sporting Devices**

2007













2007-2011 (sold to company developers) CTM













# **Energy Solutions**

2008-2011 (sold to company developers with 400% value increase)

**CPES** 







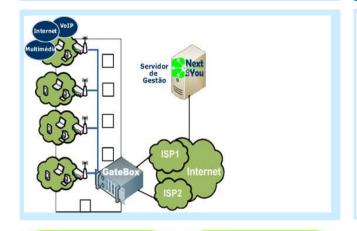
- Energy Efficiency
- Carbon Management and Sustainability
- Strategic Consultancy in Energy
- Energy Certification





# Solutions for Community and Corporate networks

2008 **CTM** 



- Gateway access

   routers for communities
- •ISP Group Negotiation
- Optimised bandwidth and cost sharing



home.

# **NextGate**

For secure and trustworthy Internet access.









# Business Process Management

2008 **CITE** 

- Innovative business model:
  - Business processmanagement
  - Collaborative platforms for accounting

- Innovative business model:
  - SaaS Software as a Service
  - Location based systems





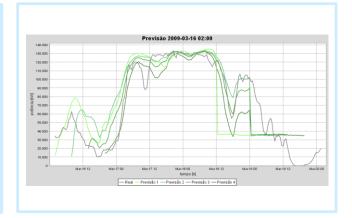




# Wind power forecasting services

2010 **CPES** 

- Based on a forecasting system: EPREV
- Provides short-term forecasts up to
  72 hours ahead, 4 times per day, with
  a mean absolute error of up to 20%











## **Network of former INESC TEC employees**

- Professional tracking
- Two-way communication
- Professional synergies



**Around 200** former employees in **23** countries

In **2013** INESC TEC sent around **150** highly qualified individuals (**20 PhD**) into the market, to companies/institutions such as:























## **Launching pad for young talent**

# **National Companies**

Former Researchers in important Portuguese companies

#### **PORTO AND NORTH**

ACCENTURE MOG TECHNOLOGIES

AVELEDA NOVABASE

BLIP PORTO EDITORA

EDP SONAE FACEC VORTAL

FIBERSENSING WE DO TECHNOLOGIES

LIPOR COOLLINK

IT FRAUNHOFER

#### **CENTRE**

PT INOVAÇÃO

**BOSCH SECURITY SYSTEMS** 

### **LISBON**

**EDP DISTIBUIÇÃO** 

**GENERIS FARMACÊUTICA** 

**SONAECOM** 

**ALTRAN** 

**REN** 

**CORIANT GMBH & CO. KG** 

INSTITUTO GULBENKIAN DE CIÊNCIA





# Launching pad for young talent

# Global network of competence

Former Researchers in important organisations around the world

