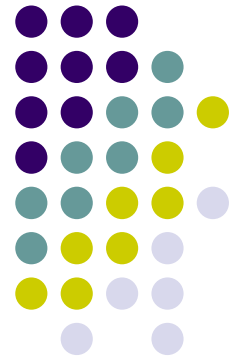# Business Innovation through Industry-Academic Partnership

The WiSen Ireland Initiative

WiSen, an Industry led Business-Academic network conducting WSN research

- Wireless Sensor Network Activity in Ireland
  - Government Strategy, Research Projects, Research Organisations

- The WiSen Organisation
  - Organisation, Stakeholders, Vision, Mission, Goals, Plans

- Achievements to date
  - Industry Led Research Program, Technology Roadmap, Workshop Program

- Challenges and Solutions
  - Diversity of applications and technologies, Maintaining Momentum

- Future plans
  - Research on platforms and large scale deployment

Part 1
WSN Activities in Ireland

WiSen
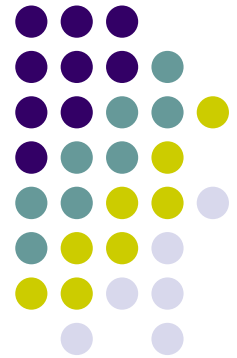
IRELAND's IMPERATIVE
to Compete in the Global Knowledge Economy

Strategy for Science, Technology and Innovation
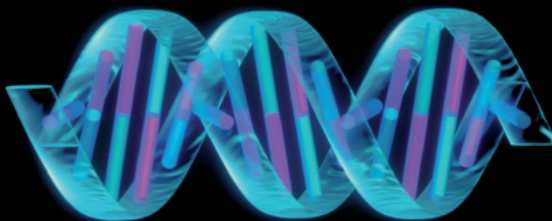
2006 ~ 2013

Irish Government Vision:
- Strategy for Science, Technology and Innovation 2006 - 2013
- Euro3.8 Billion Investment

o *"By 2013, Ireland will be internationally renowned for the excellence of its research and be __at the forefront in generating and using new knowledge for economic and social progress__, within an __innovation-driven culture__"*

Across the sphere of government, there are important areas of civil and sectoral research which have a great potential to contribute to economic and social progress. [...] The following key areas of research are addressed:
__Agriculture and Food, Health, Environment, Marine, Energy ...__

STI-strategy paper, page 56

- o **Intel and IDA Ireland:**
  - Centre for Technology Research for Independent Living (TRIL) for older people.
  - $30 million (Collaboration with Universities)
- o **SFI Centre for Sensor Web Technologies**
  - Applications in Health/Fitness, Environment Monitoring
  - €16 million (20% industry funding)
- o **SFI Centre for Digital Enterprise Research**
  - The Semantic Web for e-Health and Localisation
  - €10 million (20% industry funding)
- o **SFI Cluster IT for Optimisation of Building Operation**
  - Building Energy and Facilities Management
  - €7 million (20% industry funding)
- o **HEA PRTLI4**
  - Networked Embedded Systems for built environment design and management
  - €13 million for Research, Education & Innovation
- o **Enterprise Ireland / WiSEN:**
  - Industry-led Research in Wireless Sensors
  - €4 million Industry-led Research Programme.
- o **Marine Institute/EPA - Smart Coast:**
  - Remote environmental (water) monitoring.
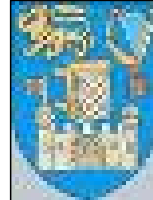 - €2 million (Industry/Academic partnership)

C L A R I T Y

€16m Centre for Sensor Web Technologies

with Applications in Health/Fitness and the Environment

An Academic-Industry Partnership

€20m Academic / Industry Cluster in Building Energy Management and Facilities Management

INNOVATION THROUGH CLUSTERING
National / EU FP7 Partnerships

inTUBE
4 industry
3 research centres
5 universities

306 person months

REEB
1 industry
1 government
4 research centres
2 universities

ITOBO
7 PI
20 Researcher
3 Technical Staff

~ 3,110 person months
~ 260 person years

1104 person months

NEMBES
30 Researcher
5 Technical Staff
10 PI

BuildWise
3 universities
1 research inst.
5 industry

1700 person months
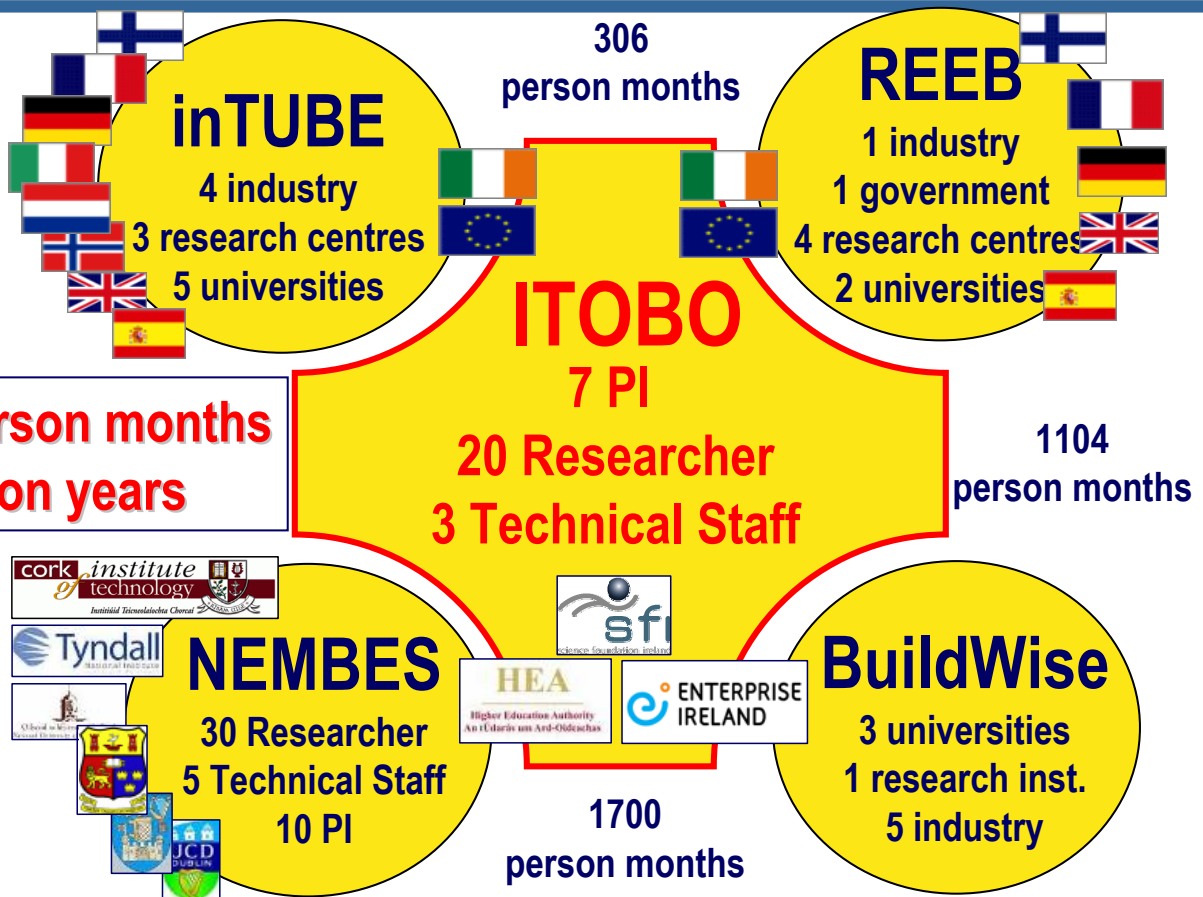
Development Platform for Wireless Sensors

- **Miniaturised Autonomous Wireless Microsensor Module**
- **Operates in Distributed, Ad-hoc Wireless Sensor Networks**
- **Incorporates Micropower Energy Scavenging Delivery Systems**

- **Hardward Features: Modular, Flexible, Reconfigurable, Scaleable, Robust**

Sensors
Instrumentation
Data Processing
Communications
Power
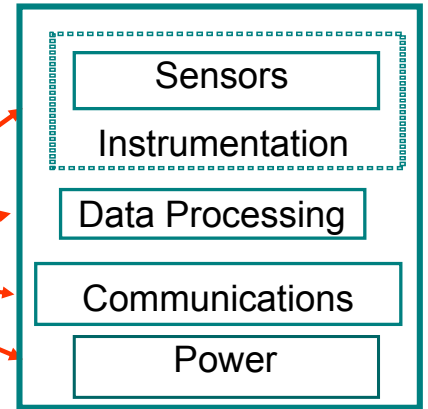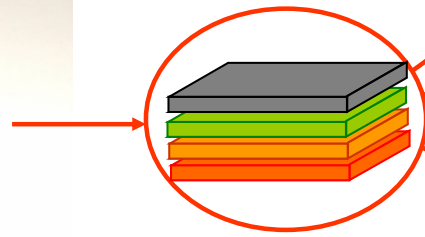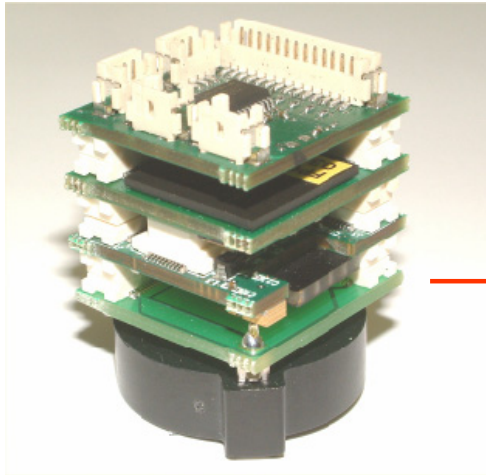
Tyndall 25mm Mote:
Under Evaluation by >20 Research Teams in Ireland, Europe, USA.
www.tyndall.ie

Systems Integration
Disappearing Electronics

Technologies for miniaturisation of wireless sensor modules.

25mm Cube to Sugar Cube to Intelligent Seed

25mm
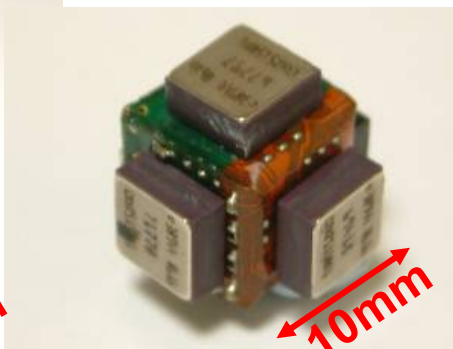
10mm
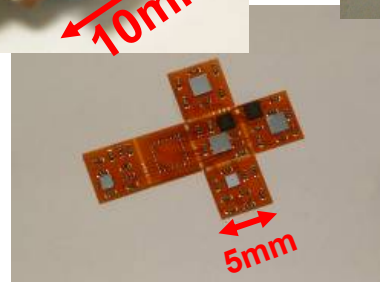
5mm
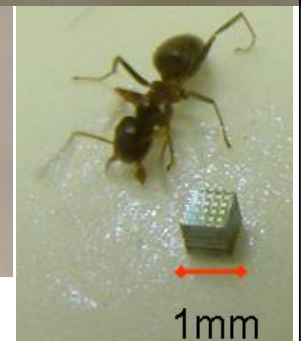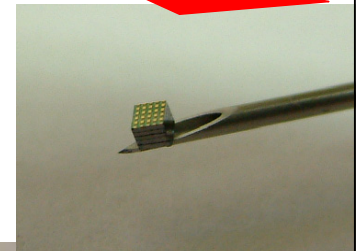
1mm

www.tyndall.ie

DERI GALWAY

DERI: Digital Enterprise Research Institute

DERI is a Centre for Science, Engineering and Technology (CSET) established in 2003 with funding from the Science Foundation Ireland.

- 123 members
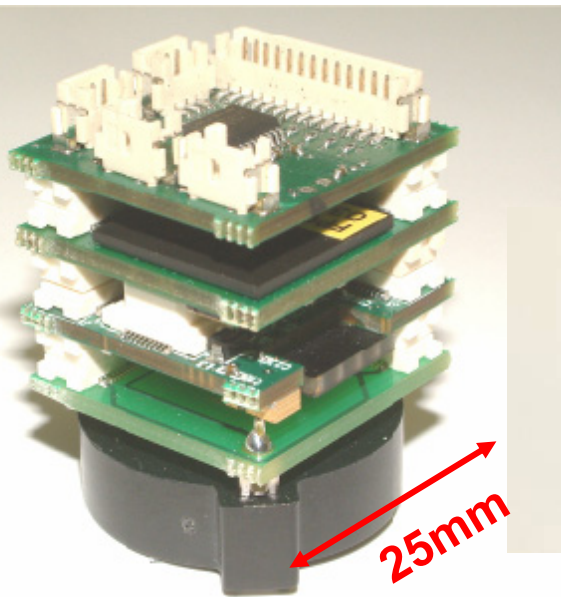- €27 million research funds: SFI, EU, Enterprise Ireland, industry

DERI's Mission is "to exploit semantics for

- People
- Organisations
- Systems

to collaborate and interoperate on a global scale"

WiSen

DERI GALWAY

DERI: Digital Enterprise Research Institute

Semantic Reality

Seamlessly integrate information from the physical world with information from the virtual world $\Rightarrow$ "Bridging the gap"

Web + <u>Sensors</u> + Semantic = Networked Knowledge

Application domains: e-Health & ubiquitous localisation

http://www.deri.ie/   http://www.SemanticReality.org/

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Part 2
The WiSen Organisation

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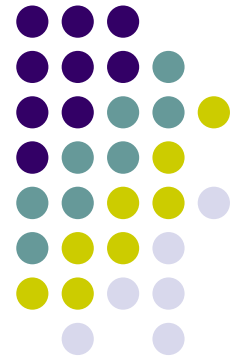
WiSen Ireland Membership and Organisation

- Established 2004
- ~40 Member Organisations including SMEs, MNCs, Universities and Research Institutes
- Committee of 12 including Industry and Academic members
  - Guide & Execute the WiSen work program
- Industry Steering team
  - Advise Funding organisations on Research activities

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WiSen membership sample

MNCs	Irish SMEs	Univeristies
• Analog Devices	• Benetel	• Cork Institute of Technology
• Cisco	• Biancamed	• Dublin City University
• Ericsson	• Celtrak	• Dublin Institute of Technology
• Intel	• Chip Sensors	• NUI Galway
• IBM	• CoraData	• Trinity College Dublin
• Lucent	• Cylon Controls	• Waterford Institute of Technology
• Nortel Networks	• Decawave	• University College Dublin
• O2	• EI Ltd.	• University College Dublin
• Valeo Vision Systems	• Glen Dimplex	• University of Limerick
• Vodafone	• Wirelite Sensors	
• FAAC	• ESB	

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Industry Member Business Activities Span Full Supply Chain

- Sensors & Instrumentation, IC Design
- Communications
- Sub-systems:
  - Automotive, Building Management, E-Health, Logistics, Safety
- Service Providers / End Users
  - Building Energy Management
  - Asset Management / Logistics
  - Environmental Monitoring
  - Health / Fitness / Well-being

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WiSen Vision

- The Wireless Sensor Network market is projected to grow to $8bn by 2010 (ON World Inc)
- Advances in Sensors, Low Power Radio and Networking Standards are enabling commercially viable new WSN products
  - Automotive
  - AMI, Building & Environmental Monitoring
  - Healthcare
  - Security, Asset Tracking & Food Safety
- Key Drivers
  - Cost reduction, Energy Saving, Health and Safety

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WiSen Ireland Mission

- Stimulate co-operation between Industry, Academia and Government Agencies
  - Track Market needs, new Product opportunities and Technology requirements
  - Develop and Commercialise technology through Government-funded, Industry-Led Research
  - Technology dissemination and Transfer
  - Facilitate Networking between Customers, Suppliers, Partners, End-users, Product suppliers, Technology developers, Entrepreneurs, External organisations.

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Benefits to Stakeholder Groups

- **Industry, SME & MNC**
  - Influence funded research
  - Access technology through licensing
- **Academic Organisations**
  - Research Funding
  - Research activity focus
- **Government Agencies**
  - Increase exports
  - Increase employment
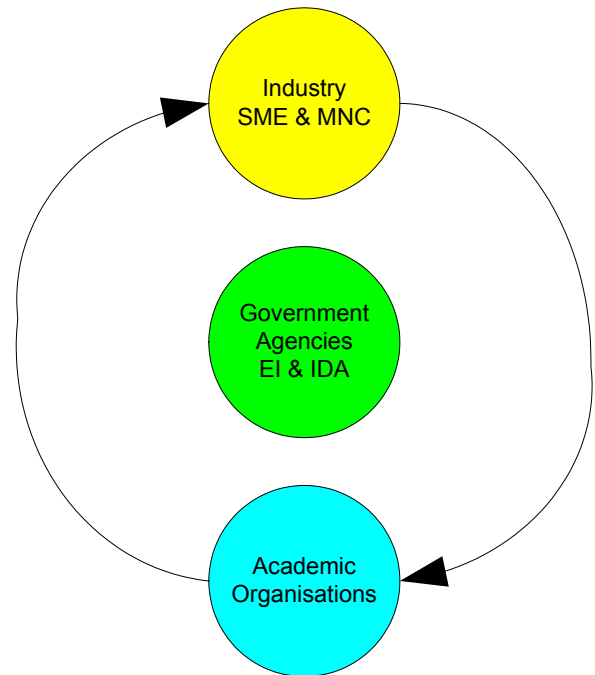
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Roll out for Scaled-up WSN Deployment

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Research and Technology Developments

Building Energy Management – Funding – SFI, EI, EU ....

Environmental – Funding – SFI, EI, EU, EPA

Personal Health – Funding – SFI, EI, EU ....

Automotive – SFI, EU, EI ....

Deployment Opportunities

2006   2007   2008   2009   2010   2011   2012

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Part 3
WiSen Achievements
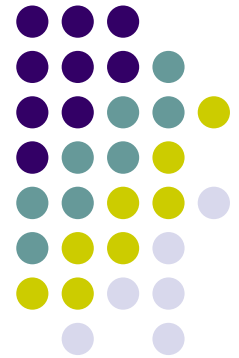
WiSen Industry Led Research Programme

- Industry Led Research Program (ILRP) is funded by Enterprise Ireland

- The industry-directed research is conducted in third level institutes

- Objective: Build strong, sustainable links between industry and research groups that build economic benefit to Ireland

ENTERPRISE IRELAND

WiSen Industry-Led Research Programme

- The industry groups define the broad research themes that form the basis for targeted research calls managed by Enterprise Ireland
- The research institutes respond with proposals for research that, if approved, proceed under the direction of an industry steering group
- This ensures that research funding has maximum benefit to Industry

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Current Research Projects

- High efficiency network protocols
- Network simulation

- Antennas technologies
- Low power electronics
- Micro fuel cells

- Building energy monitoring

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WiSEN Technology Roadmap

- Workshop of 30 participants
- 18 industry, 12 academia, 3 International experts
- Facilitated workshop in December 2007 to build a technology roadmap for Irish industry that can be used to:
  - Identify industry sector research needs
  - Identify opportunities for future product and service offerings
  - Identify coherent and high impact research challenges
- 100 page report

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Four-Step Roadmap Planning Process

"Know-why" — **Market and Competitive Strategy**
Understand customer buying behavior (customer drivers) and feasible strategies. Target key segments. Identify competitors, complementors, and partners.

"Know-what" — **Product Roadmap**
Decide how the product will be differentiated to win in key segments. Translate overall customer drivers into product drivers for this specific product. Set multi-year targets.

"Know-how" — **Technology Roadmap**
What technologies are most important? Link product drivers to hardware, software, and manufacturing technologies. Identify multi-generation technology investments to maintain competitiveness.

"To-Do" — **Summary and Action Plan**
What resources and investments are needed? Plan projects with the highest priorities. Are technology investments in the most important areas? Identify and track risk areas.

Push (capabilities)

Pull (requirements, drivers)

Time — *"Know-when"*

(Sources: Tom Kappel; Phaal, R., Farrukh, C., and Probert, D., Fast-start Technology Roadmapping;

Roadmap Workshop Outputs

- The workshop looked at market trends and drivers, applications, technology requirements, capabilities and resources.

- This has identified needs for additional research in:
  - Ease of use / configuration
  - Applications software
  - Security
  - Low power sensors
  - Robust radio networks

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Roadmap summary (segment)

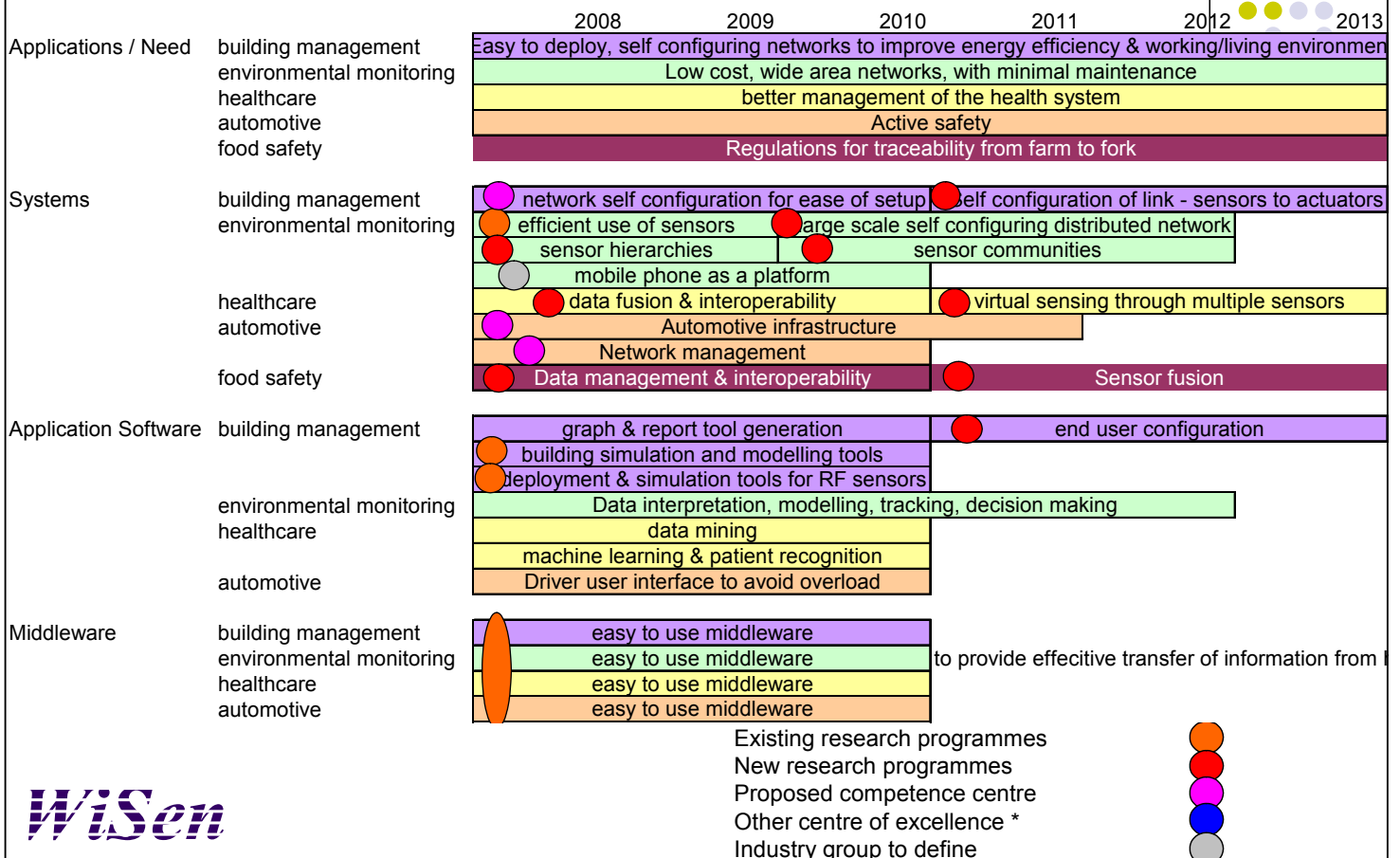|		2008	2009	2010	2011	2012	2013
Applications / Need	building management	Easy to deploy, self configuring networks to improve energy efficiency & working/living environmen					
	environmental monitoring	Low cost, wide area networks, with minimal maintenance					
	healthcare	better management of the health system					
	automotive	Active safety					
	food safety	Regulations for traceability from farm to fork					
Systems	building management	network self configuration for ease of setup / self configuration of link - sensors to actuators					
	environmental monitoring	efficient use of sensors / large scale self configuring distributed network					
		sensor hierarchies / sensor communities					
		mobile phone as a platform					
	healthcare	data fusion & interoperability / virtual sensing through multiple sensors					
	automotive	Automotive infrastructure					
		Network management					
	food safety	Data management & interoperability / Sensor fusion					
Application Software	building management	graph & report tool generation / end user configuration					
		building simulation and modelling tools					
		deployment & simulation tools for RF sensors					
	environmental monitoring	Data interpretation, modelling, tracking, decision making					
	healthcare	data mining					
		machine learning & patient recognition					
	automotive	Driver user interface to avoid overload					
Middleware	building management	easy to use middleware					
	environmental monitoring	easy to use middleware — to provide effective transfer of information from					
	healthcare	easy to use middleware					
	automotive	easy to use middleware					

Existing research programmes
New research programmes
Proposed competence centre
Other centre of excellence *
Industry group to define

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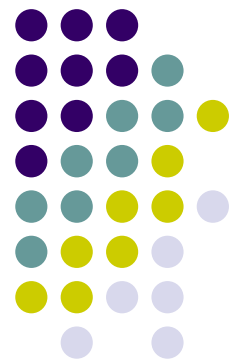## Regular Themed WSN Technology Workshops

- June 2007 – Applications
- December 2007 – Radio
- July 2008 - Software
- In Preparation: December 2008 – Industry Experience

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Part 4
Challenges and Solutions

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Broad scope of work with many applications and many technologies

- Structured Work Program
  - Vision, Mission, Goals, Plans, Assigned Responsibilities
- Technology Roadmap Process
  - Market, Products, Technologies, Research Plans
- Applications Classification Template
  - Document commonalities and differences to identify synergies (Work in progress)
  - Identify Platform Opportunities
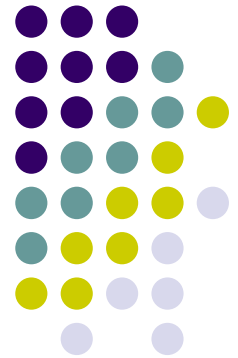
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Maintaining and Increasing Momentum

- Periodic reviews of industry requirements
  - Make adjustments to work program if necessary
- Proactively match companies with research strand activities
- Prepare input for next round of research work
- Introduce further funding sources
- Search for 'Fast Win' opportunities
- Increase benefits to industry
  - E.g. space on WiSen stand at Trade Fairs
- Increase staffing level

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Part 5
Next Steps

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2008/2009 Term Committee Work Activities

- Revision 2 Technology Roadmap
- Expand membership
- Establish Competence Centre
- Initiate new research projects
- Marketing/promotional event
- New Funding Mechanisms
- Technology Workshops

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Large scale WSN Test-bed deployment of 1,000 to 10,000 nodes

- Detailed Planning and Structured Processes
  - Selection, Development, Deployment, Evaluation
- Project selection process
  - Mini Business Plan per project submission
- Focus on Platform aspects to maximise benefits across applications areas
- Research Focused
  - Large network problems, Gain real-world experience
- Market need driven
- Possible Competence Centre Activity

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Expand our International Linkages

- Linkages to other research groups
  - International partnerships via EU FP7/FP8
- Contacts with industry groups
- Share concepts and ideas
- Attend workshops / Invite keynote speakers
- Develop other routes to market
- External validation of our research programmes

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Conclusions

- We have a strong WSN ecosystem.
- Industry/Academic Business Led Network.
- Industry Led Research Program.
- Processes to overcome challenges.
- Plans to conduct larger scale research programs.
- Keen to work with international organisations to guide our work and market outputs.

WiSen

Thank you

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