Sprint #1: Shaking up the eHealth Industry in the New Digital Era
Innovation Sprint workshop, 19th September 2017

# Smart Technology for Better, Independent, Assisted Health Services Ecosystem

Clos Chapelle-aux-Champs 30 bte 1.30.30, 1200 Bruxelles

**Dr. Martin Serrano**
Data Scientist and Scientific Director
IoT & Data Stream Processing
Insight Centre for Data Analytics - Galway, Ireland
IEEE ComSoc IoT Experimentation Chair
AIOTI-WG01 Vice-Chair

September 19th 2017
Brussels, Belgium

European Commission | Horizon 2020 European Union funding for Research & Innovation

# Dr. Martin Serrano

Data Scientist & Scientific Director

IoT & Stream Processing Unit Head

IEEE ComSoC IoT Experientation

2017 AIOTI WG01 Vice-Chair

2016 IEEE ComSoc Emerging Technologies Sub-Committee Internet of Things IoT Experimentation Chapter

2015

siliconrepublic

NIST GCTC Smart Cities Project Technical Coordinator, USA

Santa Clara University
Lecturer, Silicon Valley, USA

Research Excellence
President's Award Nominee SFI-NUIG, Ireland

California State University
San Luis Obispo (CalPoly), USA
Guest Lecturer

2014

NUIG-National University of Ireland
IoT Scientific Director, Galway, Ireland

Irish Software Association
Software Industry Awards outstanding Academic Achievement Nominee, Ireland

2013

WIT-Waterford Institute of Technology
Cloud Computing & Semantics
HEA-FuutureComm ICT for Healthcare
Post-Doc Researcher, Ireland

Industry

NATIONAL Panasonic
Kumamoto, Japan
Design Engineer Supervisor, AKME-BC

WIT-Waterford Institute of Technology
Autonomic Communications
Research Intern, Galway Ireland

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European Commission | Horizon 2020 European Union funding for Research & Innovation

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Insight Galway

INNOVATION SPRINT

# Agenda

## Introduction #Innovation

AHA Setting the Scene #Transformation

ACTIVAGE IoT AHA Project @ActivageProject

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IoT

sfi

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EUROPEAN REGIONAL DEVELOPMENT FUND

IRCSET

SEVENTH FRAMEWORK PROGRAMME

Insight Centre for Data Analytics

# INSIGHT Centre for Data Analytics

NUI Galway
OÉ Gaillimh

National University of Ireland Galway
Internet of Things and Stream Processing Unit

Insight
www.insight-centre.org

## Semantic Web and Linked Data Experts

### Insight's Galway Experience:

- Largest Semantic Web Institute
- Pioneers on Semantic Interoperability
- Expertise on Cloud and Big Data Analytics

### Leaders in semantic web and Data Interoperability:

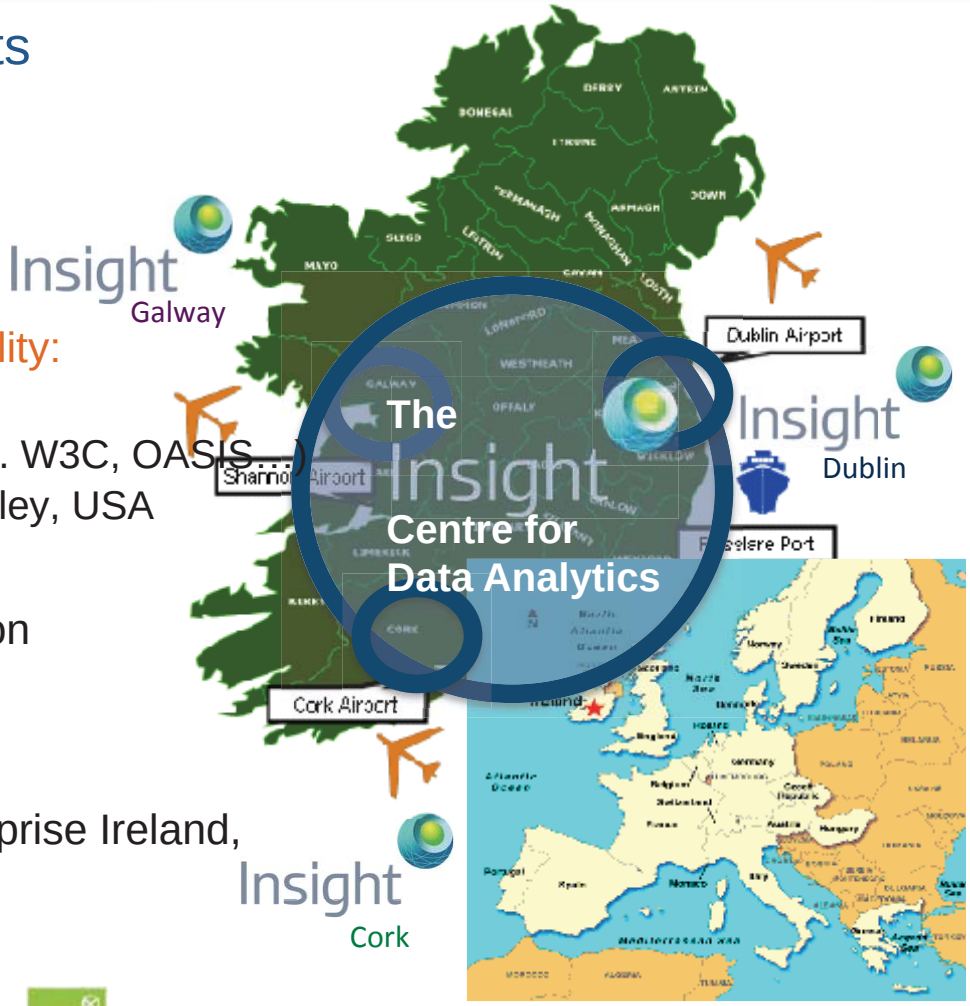
- Research Publications > 1200
- Participation in 17 standardisation groups (i.e. W3C, OASIS…)
- Internet of Things Lecture in USC Sillicon Valley, USA

### Core Industrial Partners:

- MNC's: Fujitsu, Cisco, HP, Avaya, Ericsson
- SME's: Storm, Celtrak, OpenLink

### Main Research Fund Sources:

- Science Fundation Ireland, Industry, Enterprise Ireland,
- EU FP Programs and H2020

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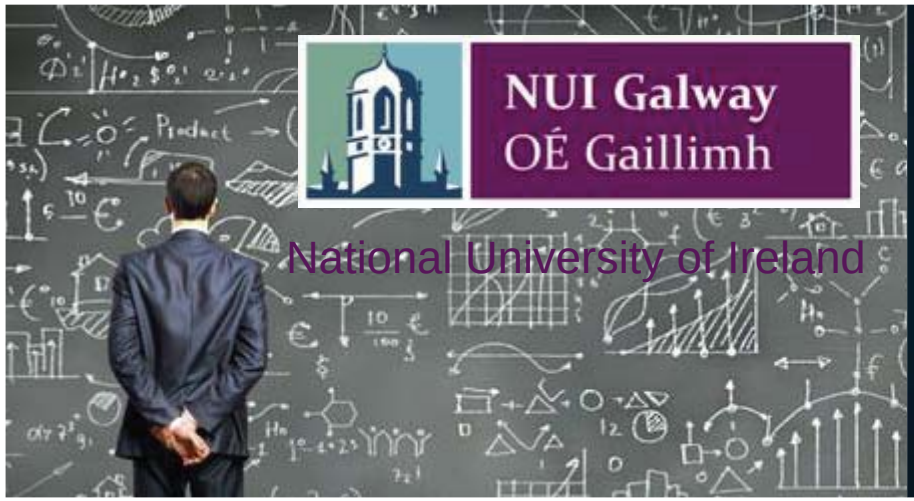
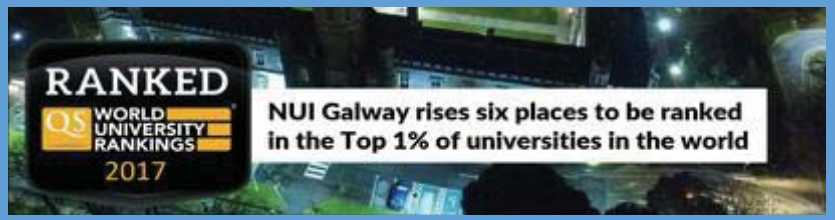
Insight Centre for Data Analytics



# Education/Innovation
# NUI Galway
## Internet of Things
## and
## Stream Processing Unit



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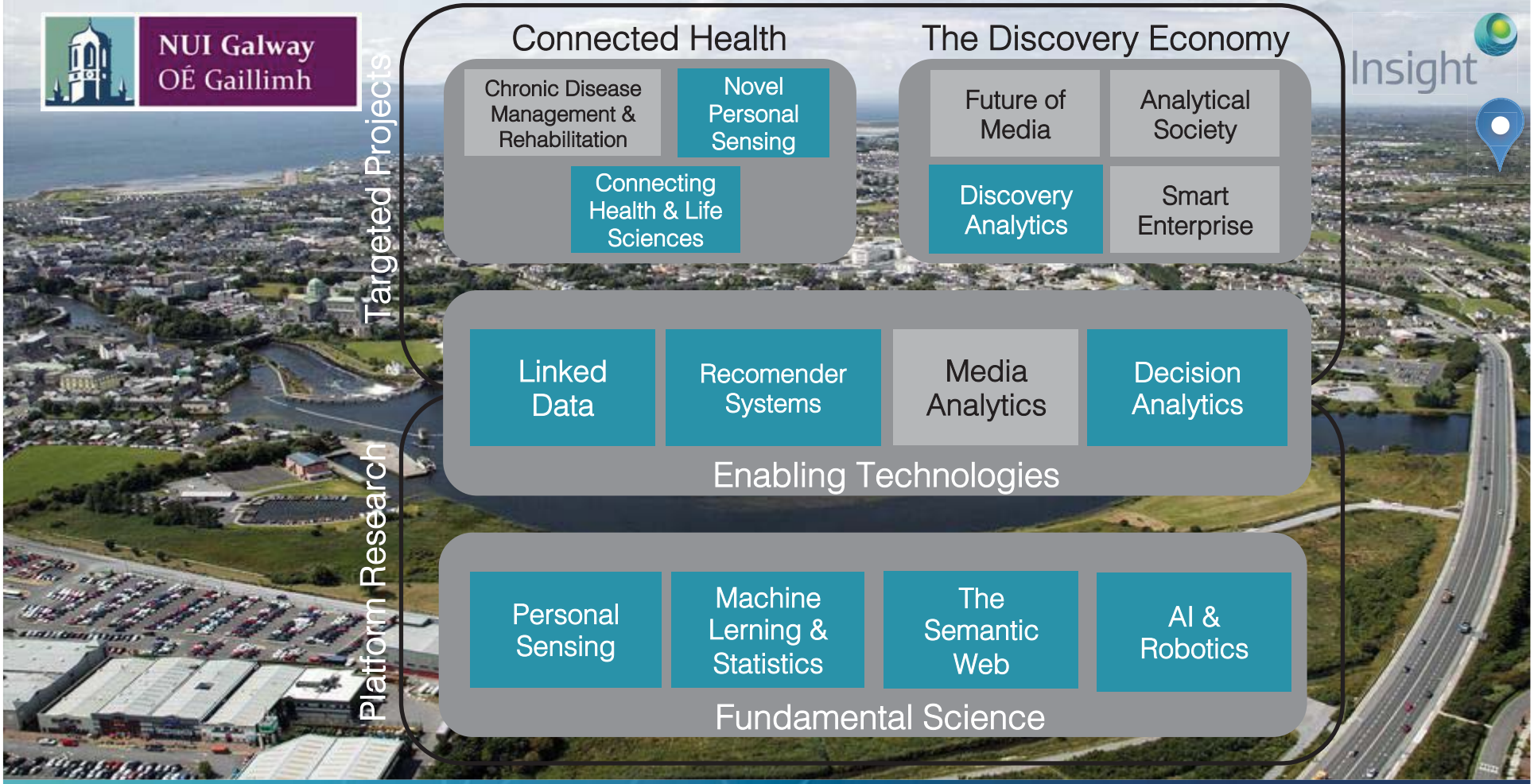
# Internet of Things & Stream Processing Unit

## Education for a better Future...

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SFI

# Team at Insight Galway
Centre for Data Analytics

## Insight Internet of Things and Stream Processing Unit

Head of Unit
Data Scientist and
IoT Scientific Director

**Research Assistants**

PostDoc's and Research Visitors + RA's

**Interns**

PhD and Master Students + Interns

ACTIVAGE PROJECT
www.activageproject.eu

BIG IoT
www.big-iot.eu

FIESTA-IoT
www.fiesta-iot.eu

VITAL
www.vital-iot.eu

OPENIoT
www.openiot.eu

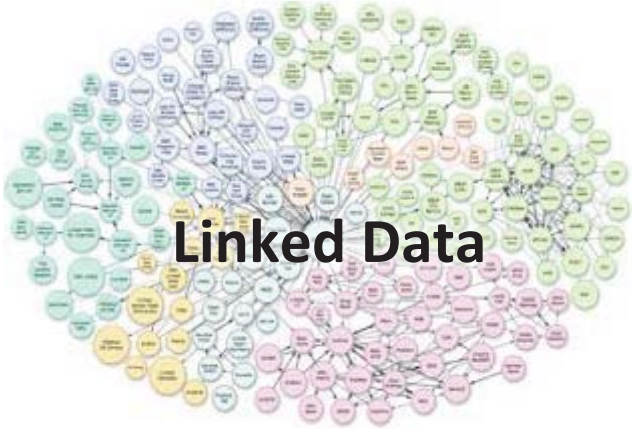
Fed4FIRE
Experimentation
www.gambas-ict.eu
GAMBAS

www.spitfire-project.eu
SPITFIRE

# Our Mission/Goal

Insight Internet of Things and Stream Processing Unit

**Data Annotation**
Descriptions and
Identification of IoT Data
**Real Time Processing** on
generated **IoT Cloud Data**
Semantic-enabled Data Management
**Query and Cloud Storage**
Events Identification and Reasoning
**Privacy and Security by Design**
Big Data, Visualisation, Trust
and **Data Analytics.**



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INNOVATION SPRINT

# Agenda

Introduction #Innovation

**AHA Setting the Scene #Transformation**

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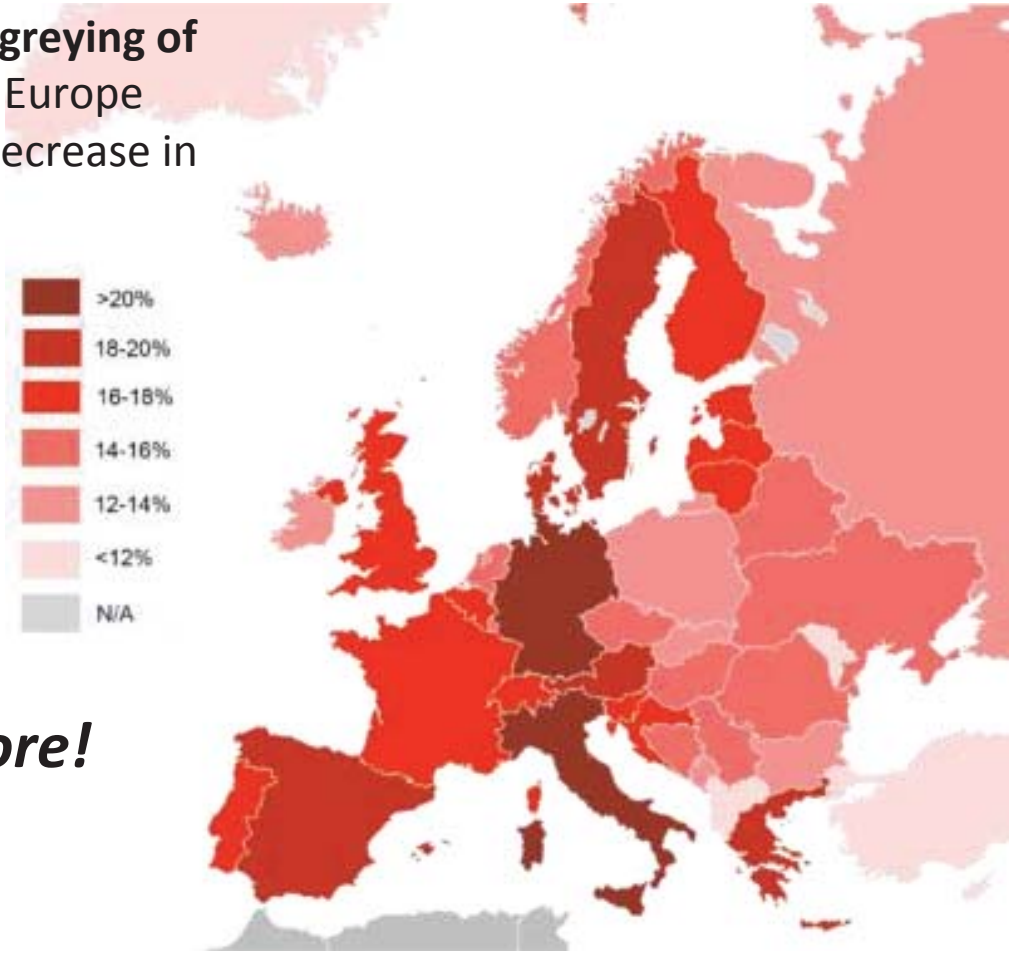
# Internet of "Healthcare" Things
## Transformation Facts (1)

Insight Internet of Things and Stream Processing Unit

"The **ageing of Europe**, also known as the **greying of Europe**, is a demographic phenomenon in Europe characterized by a decrease in fertility, a decrease in mortality rate, and a higer life expectancy Among European populations. [1]

Health in Europe is becoming...

- a matter of awareness in society.
- healthcare perception is a transition.
- A combination of Wellbeing and Health.



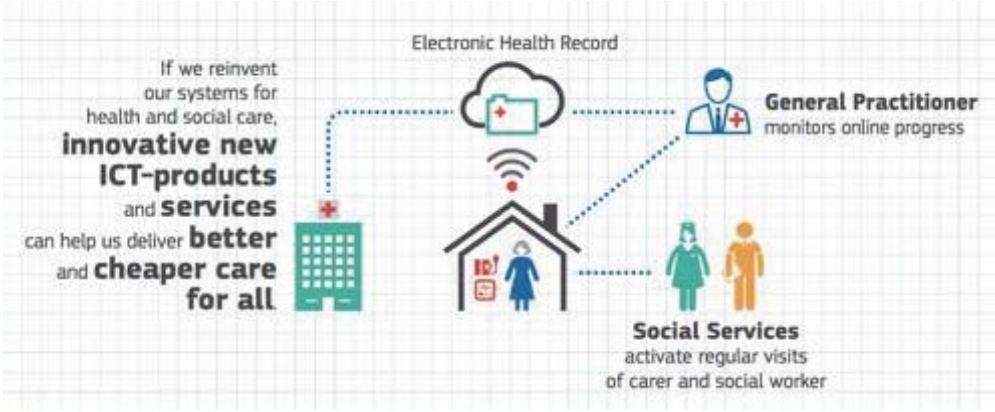

***We are Living More!***

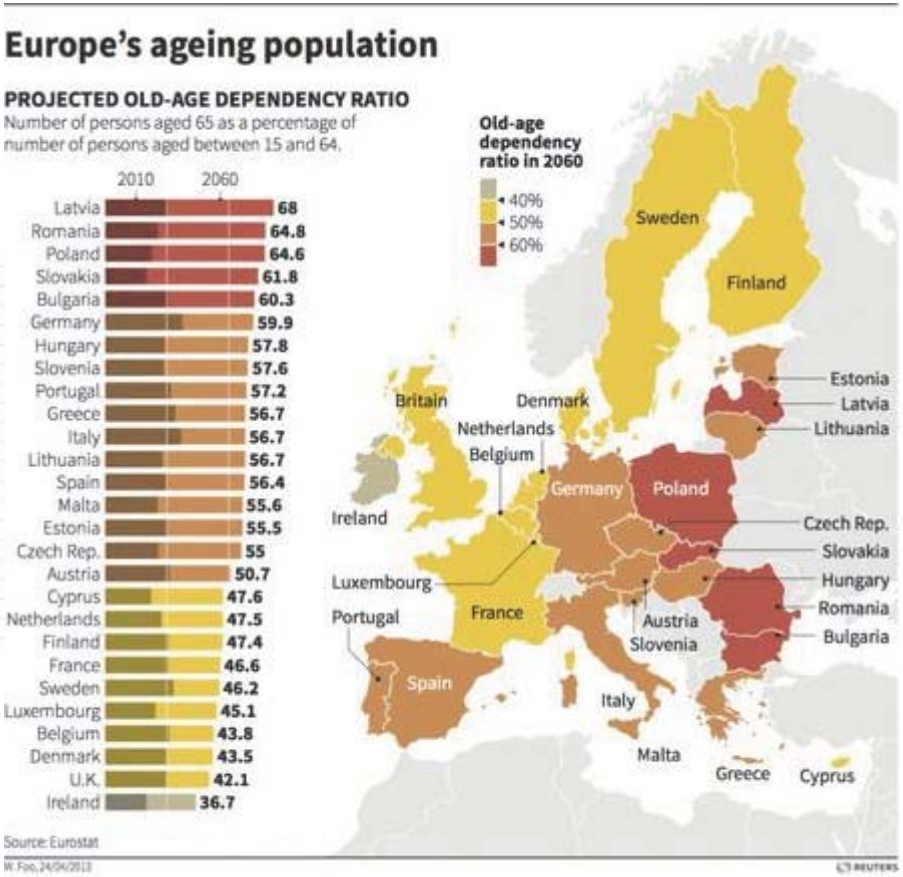
European Commission (2014).
"Population Aging in Europe: Facts, Implications, and Policies.".

# Internet of "Healthcare" Things
## Transformation Facts (2)

Insight Internet of Things and Stream Processing Unit

"Europe is ageing and by 2060 one in three Europeans will be over 65, while the ratio of Working people t the "inactive" (retaired) is Shifting from 4 to 1 today to 2 to 1 by 2060 [2]




***We are Living More!***

***Let's Live Better!***

2) Innovation for Active and Healthy Ageing (2015).
European Summit on Innovation for Active and Healthy Ageing, Brussels, 9-10 March 2015 - Final Report

# ACTIVAGE VISION: TOWARDS IOT INTEROPERABLE DEPLOYMENT SITES

We got DATA and Would like to use it for AHA...

Yes, but your Data does not look like My Data

ACTIVAGE have DMP for that!!

...and So what, I don't want to share my Data if not Protected

ACTIVAGE follows Security by Design Approach

Great! But I hear I am the owner and have the right to delete my data if I want...

ACTIVAGE is preparing Tools and Security-enabled suite for that, even if we are abroad!!

Terrific!, ACTIVAGE we are part of your Ecosystem

"The **ageing of Europe**, also known as the **greying of Europe**, is a demographic phenomenon in Europe characterized by a decrease in fertility, a decrease in mortality rate, and a higer life expectancy among European polulations. [1]

# Internet of "Healthcare" Things

## Vision from eHealth to cHealth and beyond

Insight Internet of Things and Stream Processing Unit

**D** Digital Health
Digital Systems
(Digitization)

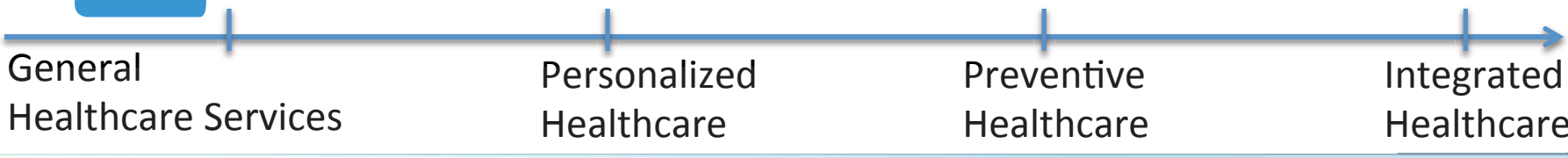
**B** bHealth
Bionics Health
(Bio-Informatics)

AHA **A**
Active and Healthy Ageing
(Analytics Health)

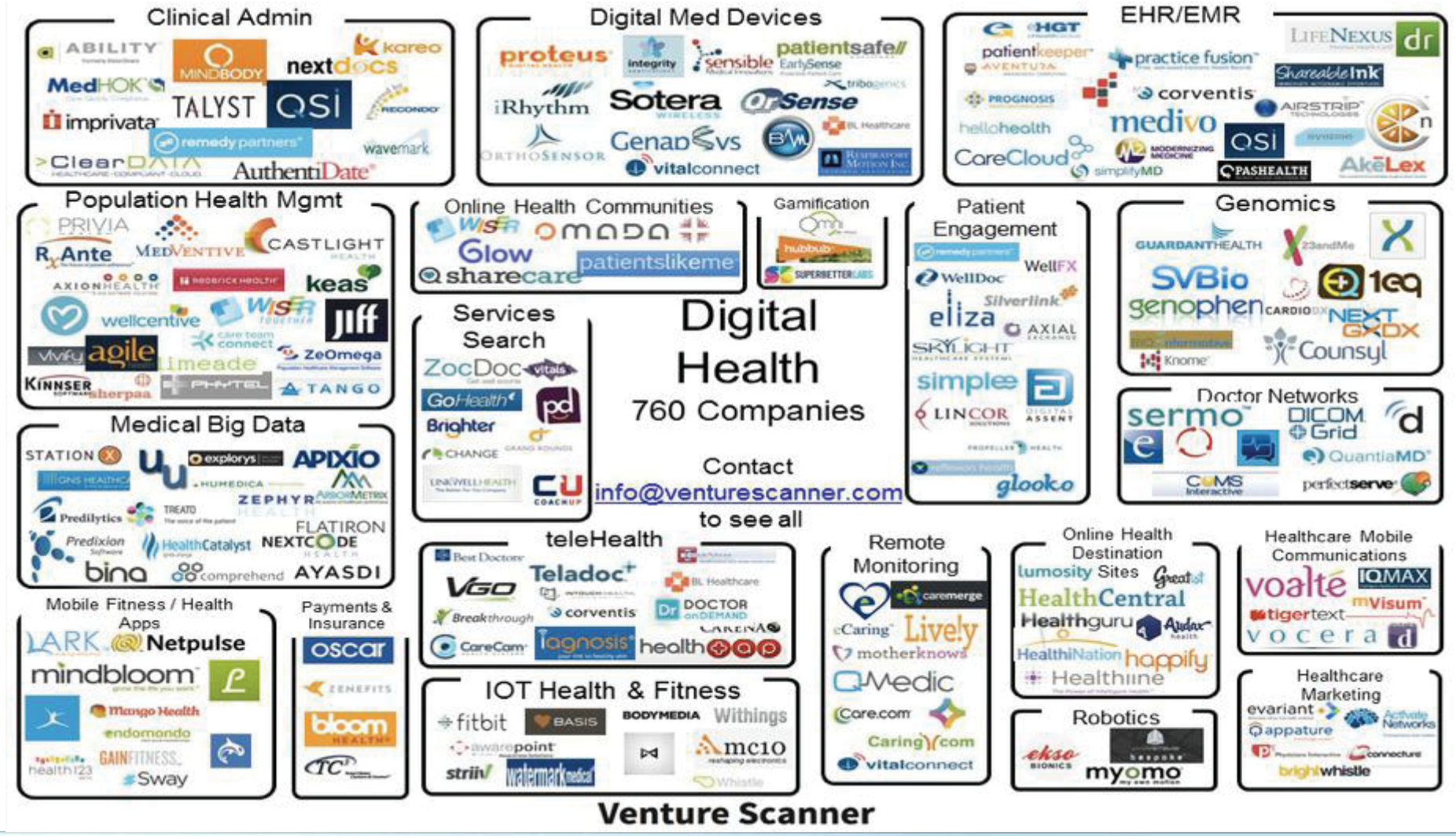
Electronic Records
(Data Records)

**E** eHealth

mHealth
iHealth
**C** cHealth
Connected Systems
(Linked Data)



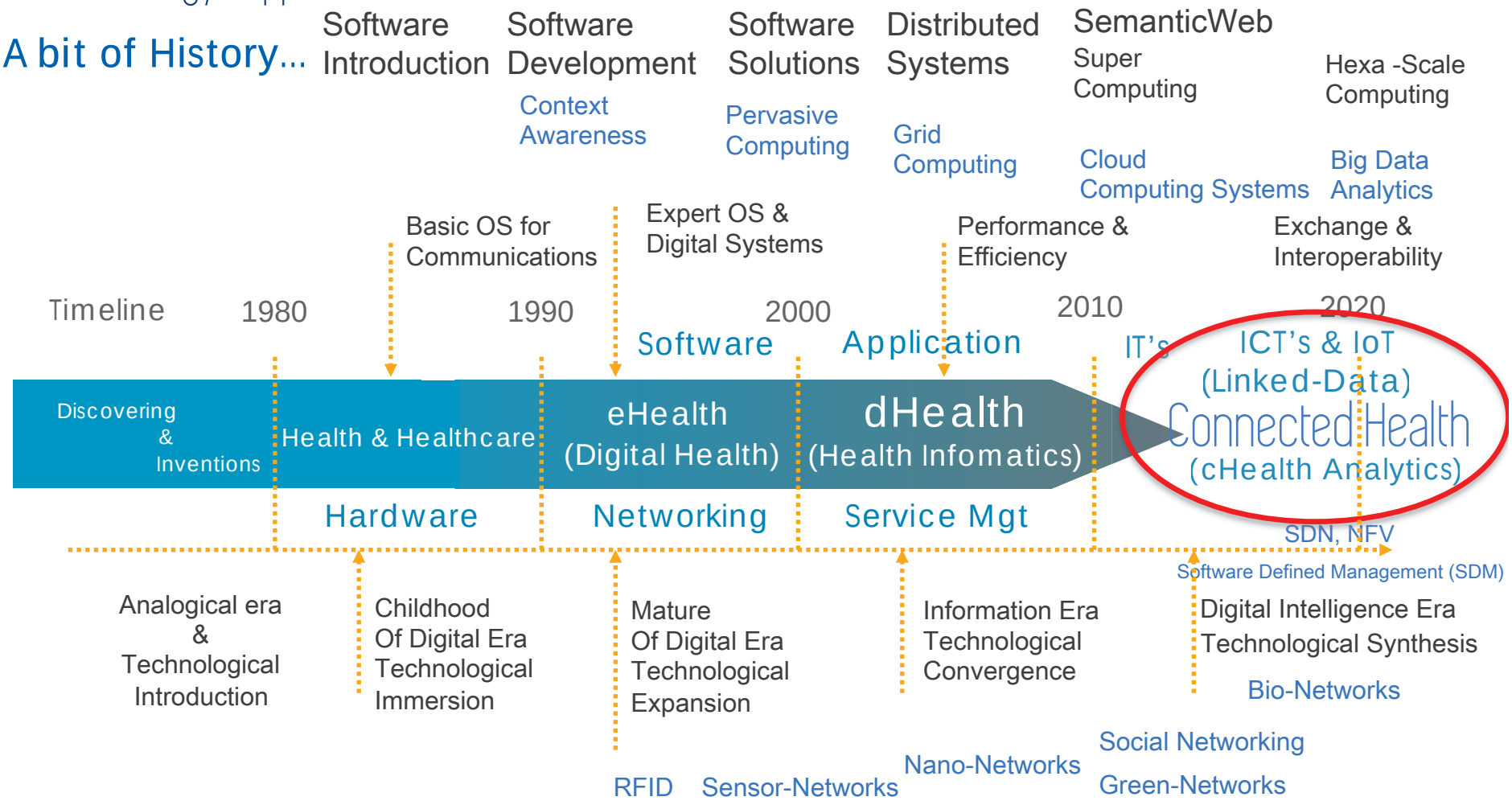
# ACTIVAGE LANDSCAPE Digital Health Landscape



# Internet of Healthcare Things

## ICT Technology Support Vision

Insight Internet of Things and Stream Processing Unit




* Updated from Technology and Services Convergence Evolution Diagram, M. Serrano., 2008.

***M.Serrano 2017 ACTIVAGE**

# World of Connected Health Information...

...else other daily-life objects the common feature is to share and exchange information.

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# Human Factors that Influence Health

Insight Internet of Things and Stream Processing Unit

The World **Health** Organization (WHO) **defined health** in its broader sense in its 1948 constitution as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity."

Wheel of Wellbeing
Vision from eHealth to cHealth

**Wheel of Well-being**

Healthcare Diagnosis
what machines can not replace...

**Wellbeing** is a general term for the condition(s) of an individual or group, to achieve a level of **health** according to particular conditions/situations, for example their social, economic, psychological, spiritual or medical state.

**Health care** or **healthcare** is the improvement of health via the diagnosis, treatment, and prevention of disease, illness, injury, and other physical and mental impairments in Human beings.

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INNOVATION SPRINT

# Agenda

Introduction

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ACTIVAGE IoT AHA Project

#Innovation

#Transformation

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Insight Centre for Data Analytics

ACTIVAGE PROJECT

# ACTivating InnoVative IoT smart living environments for AGEing well

**Dr. Martin Serrano**
Insight Centre for Data Analytics, Ireland
Data Management, IPR & Analitics Manager

Tuesday, September 19th, 2017- Brussels, Belgium

European Commission | Horizon 2020 European Union funding for Research & Innovation

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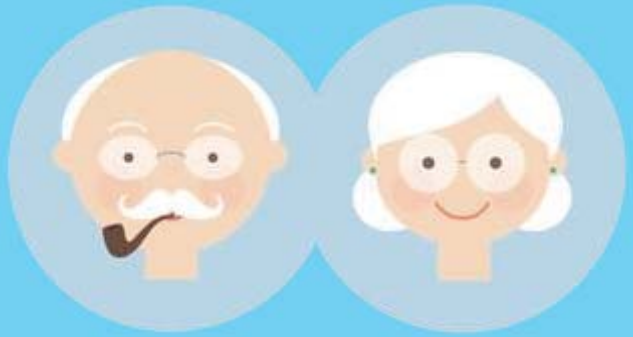
# ACTIVAGE Project

ACTivating InnoVative IoT smart living Environments for AGEing well

"Activity is Medicine"

SILVER SOCIETY
(SILVER ECONOMY)



ACTIVE and HEALTHY AGEING (AHA)

# ACTIVAGE CHALLENGES

ACTIVAGE PROJECT
www.activageproject.eu

- To have a “Dynamic Knowledge Network”, based on:
  - Collaboration between Deployment Sites and AHA.
  - Fluent communication between Partners & then Stakeholders.
- To reach the main stakeholders of Silver Society and AHA communities and IoT domains with the appropriate messages and channels.
- To define new business models based on project outcomes and with real impact on Innovating European AHA services.

# Frailty MAPPING TO USER GROUPS in ACTIVAGE

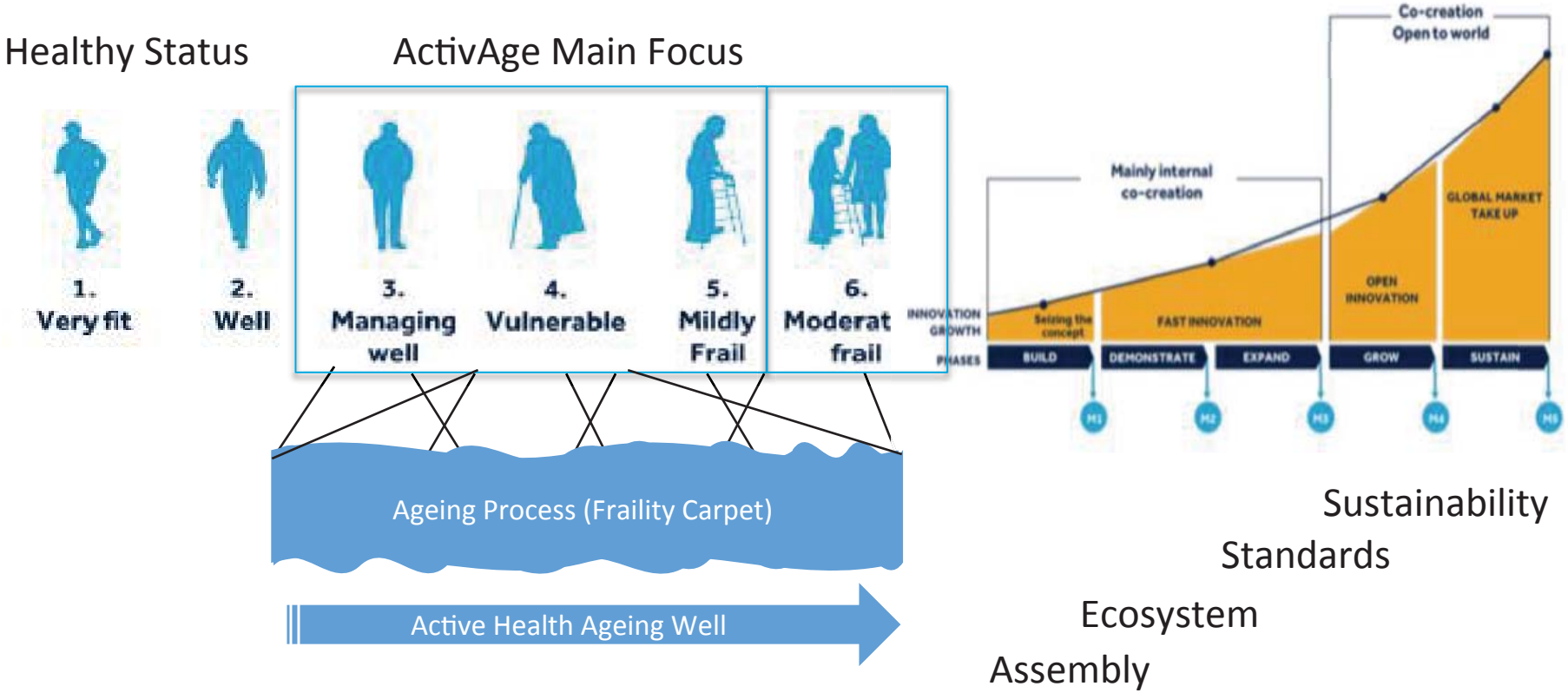
ACTIVAGE PROJECT
www.activageproject.eu

8. Safety, comfort & Safety at home
5. Exercise promotion
7. Prevention of social isolation
6. Cognitive stimulation
1. Daily activity monitoring
4. Emergency trigger
2. Integrated care
9. Support for transportation & mobility
3. Monitoring assisted persons outside home

# AHA Ecosystem Involvement

ACTIVAGE PROJECT
www.activageproject.eu

ACTIVAGE is focused on targeting a large audience worldwide through open calls, managing the open call for replication outside the project, as well as the sustainability for the ACTIVAGE Project

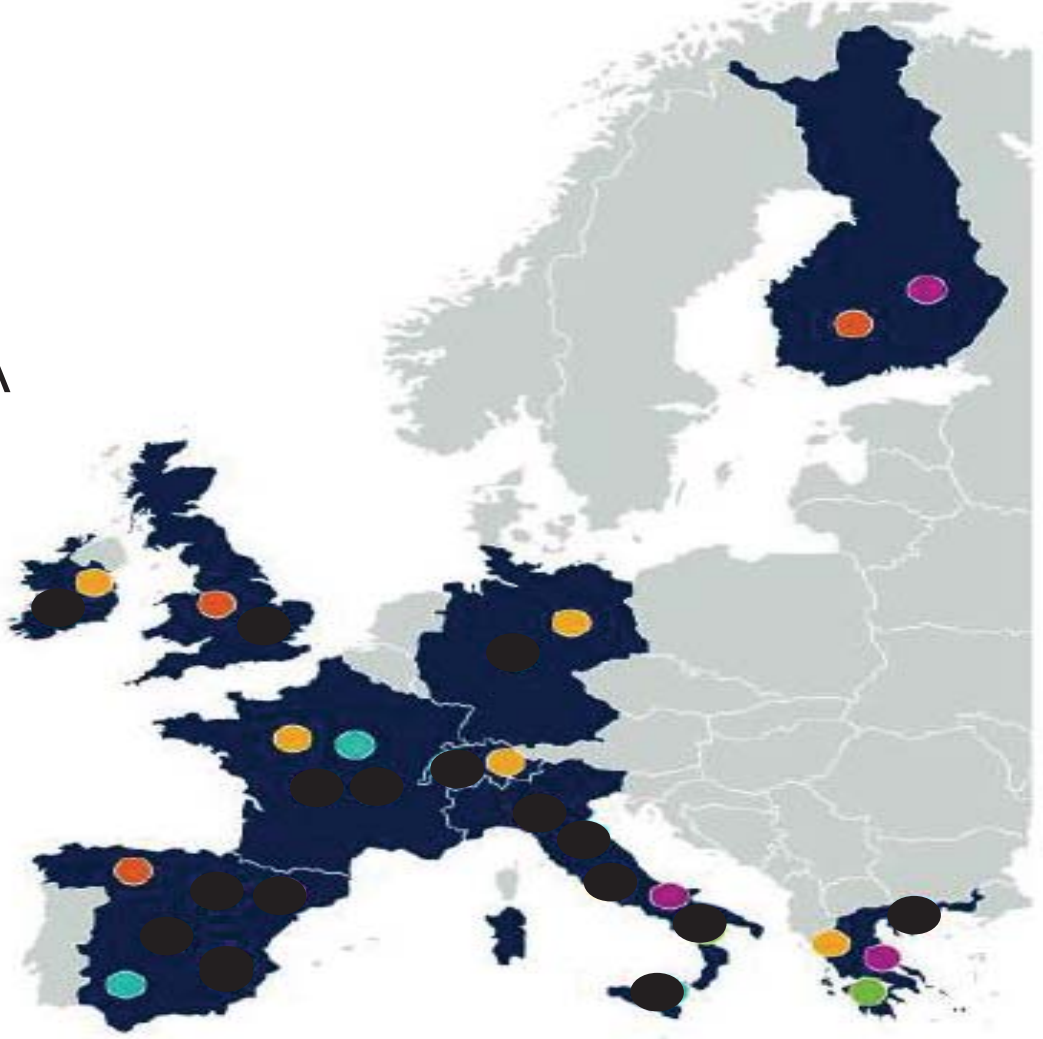


# ACTIVAGE CONSORTIUM

## Partners involved

ACTIVAGE PROJECT
www.activageproject.eu

- **MDT**
- STM
- TVES
- C2K
- Samsung
- FhG
- CEA
- CERTH
- TECNALIA
- UPM
- INSIGHT
- TSB-MS
- SEN
- HOPU
- MEDEA
- FVE
- CRE
- UPV
- UNIPR
- TUAS



- Research entity
- Academia
- Industry
- SME
- Other

# ACTIVAGE MAPPING TO DS

## (Deployment Sites)

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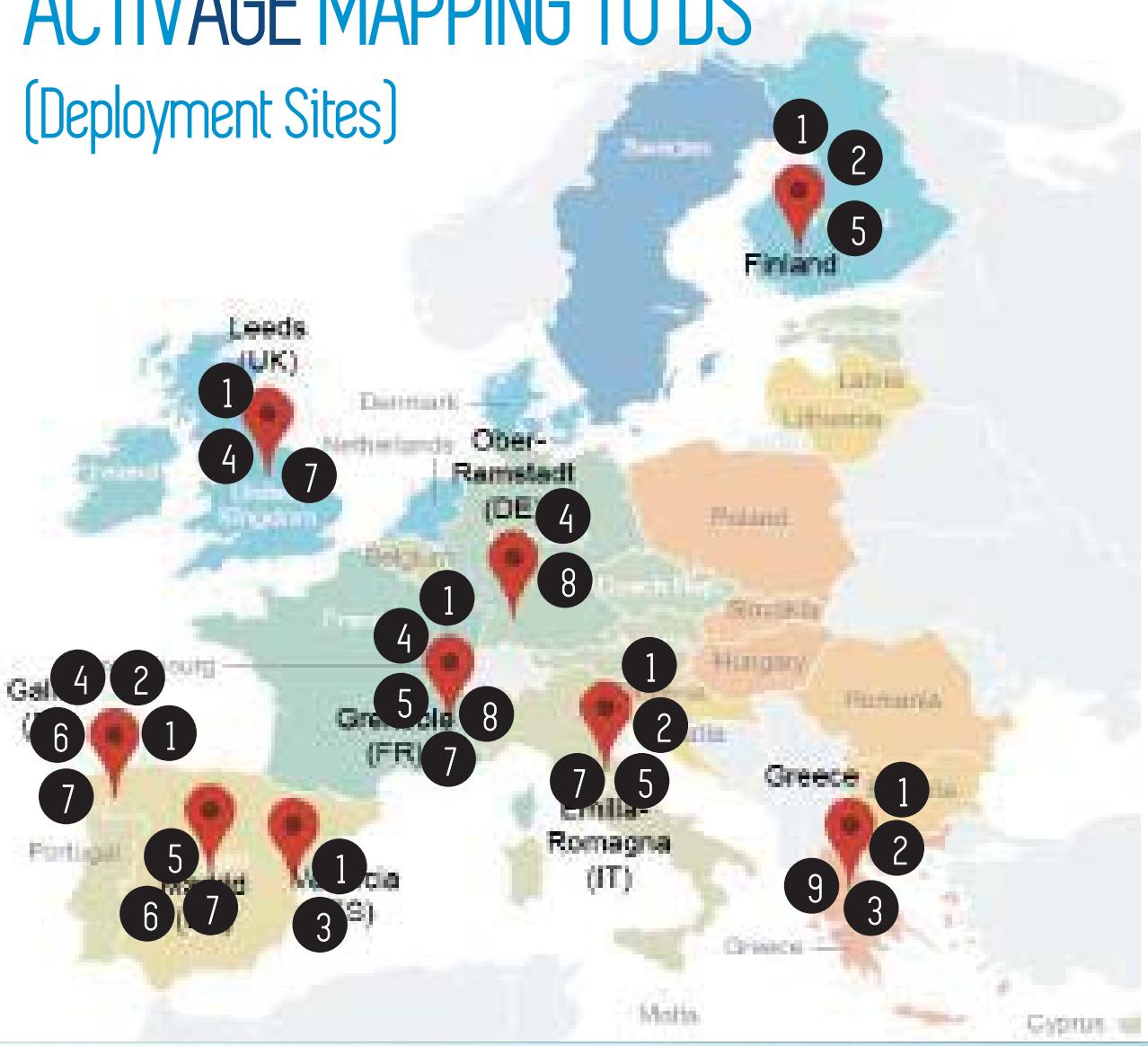



1. Daily Activity Monitoring
2. Integrated Care
3. Monitoring Assisted Persons Outside Home
4. Emergency Trigger
5. Activity Promotion
6. Cognitive Stimulation
7. Prevention of Social Isolation
8. Safety, Comfort & \ Safety at Home
9. Support for Transportation & Mobility

# ACTIVAGE CONSORTIUM Project in FIGURES

ACTIVAGE PROJECT
www.activageproject.eu

**9** Deployment Sites

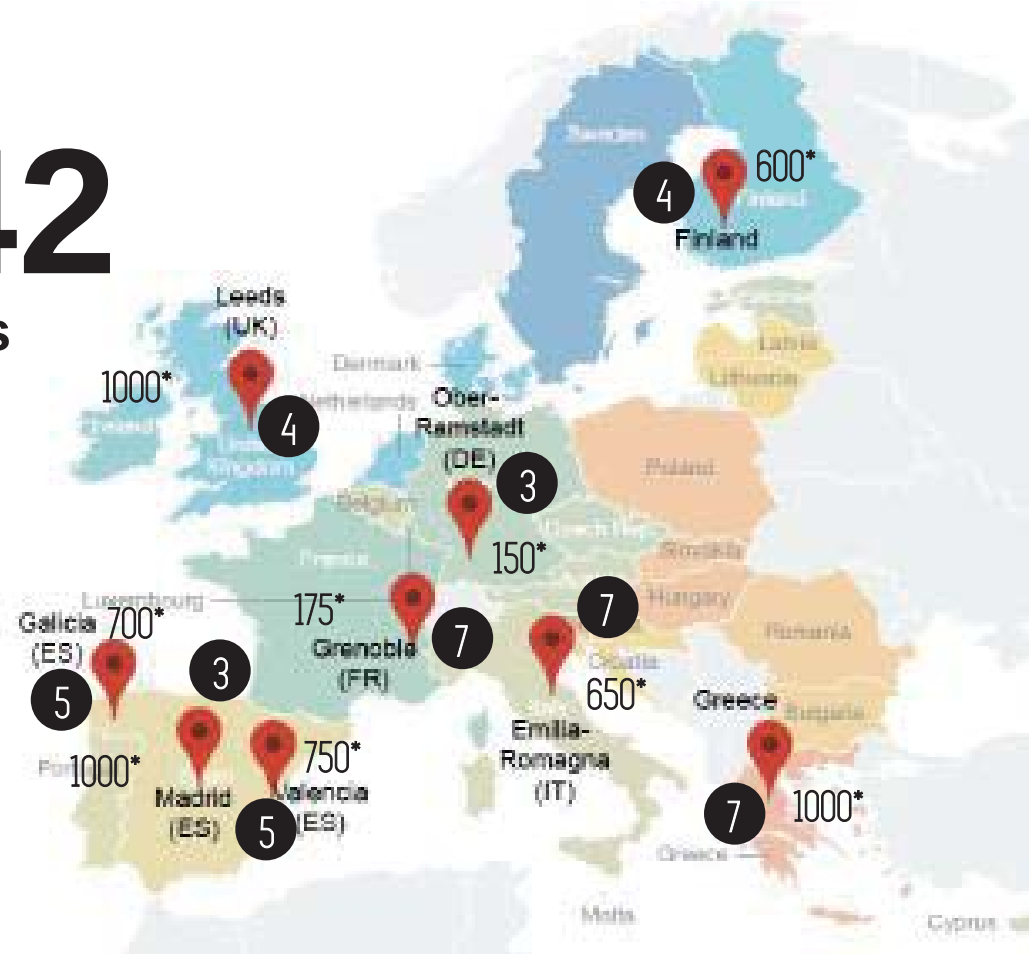
**46** Partners ↔ **1,642** Efforts PMs

Targeting

**7,200** users

**6,000** Elderly Users

**1,200** Care Takers




*Number of partners in the local ecosystem

# ACTIVAGE USE CASES

## Project Local Ecosystem(s)

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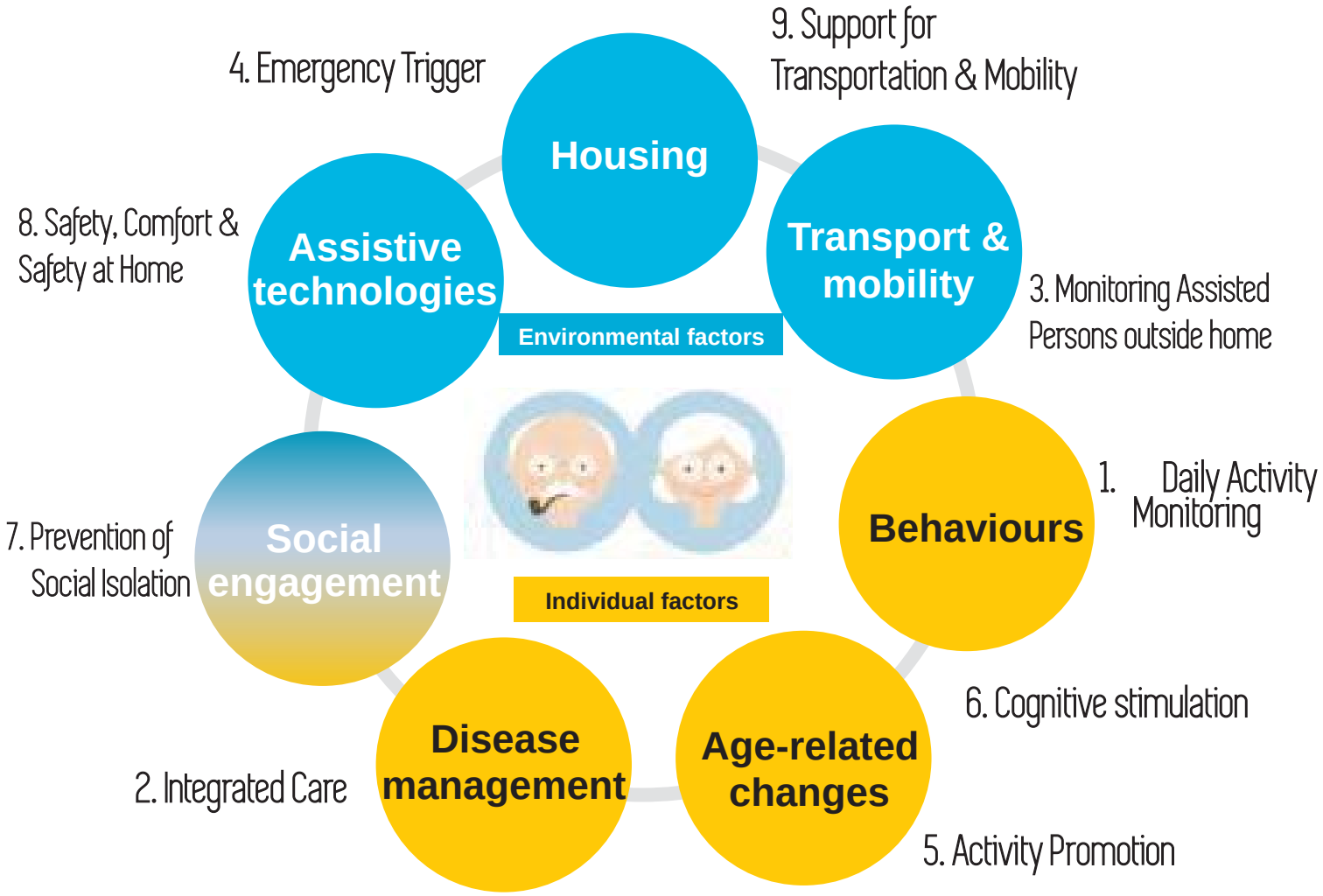
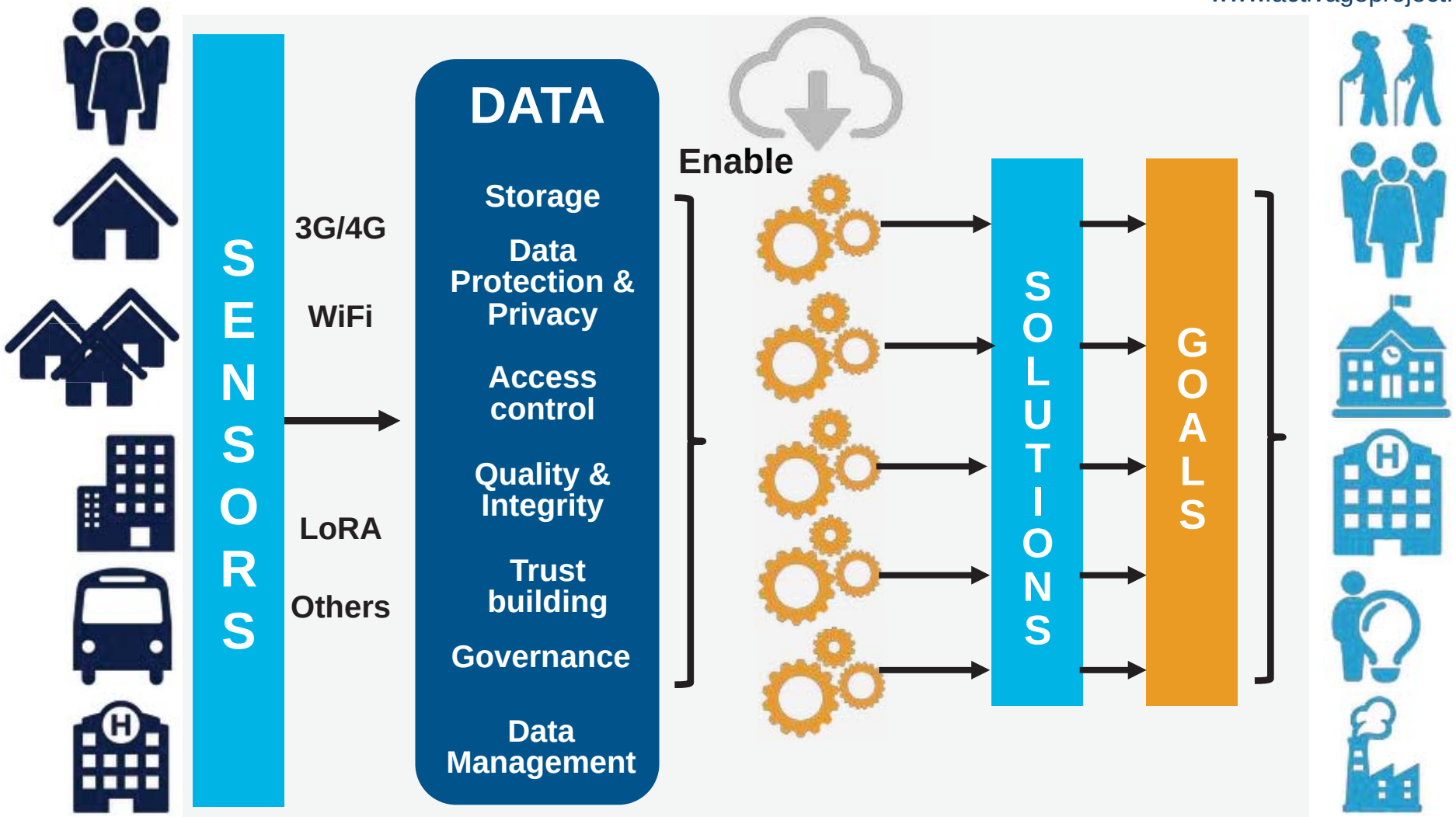


# ACTIVAGE PROJECT PERSON-CENTRIC IoT ECOSYSTEM

ACTIVAGE PROJECT
www.activageproject.eu



# ACTIVAGE USE CASES Global INTEROPERABILITY Ecosystem

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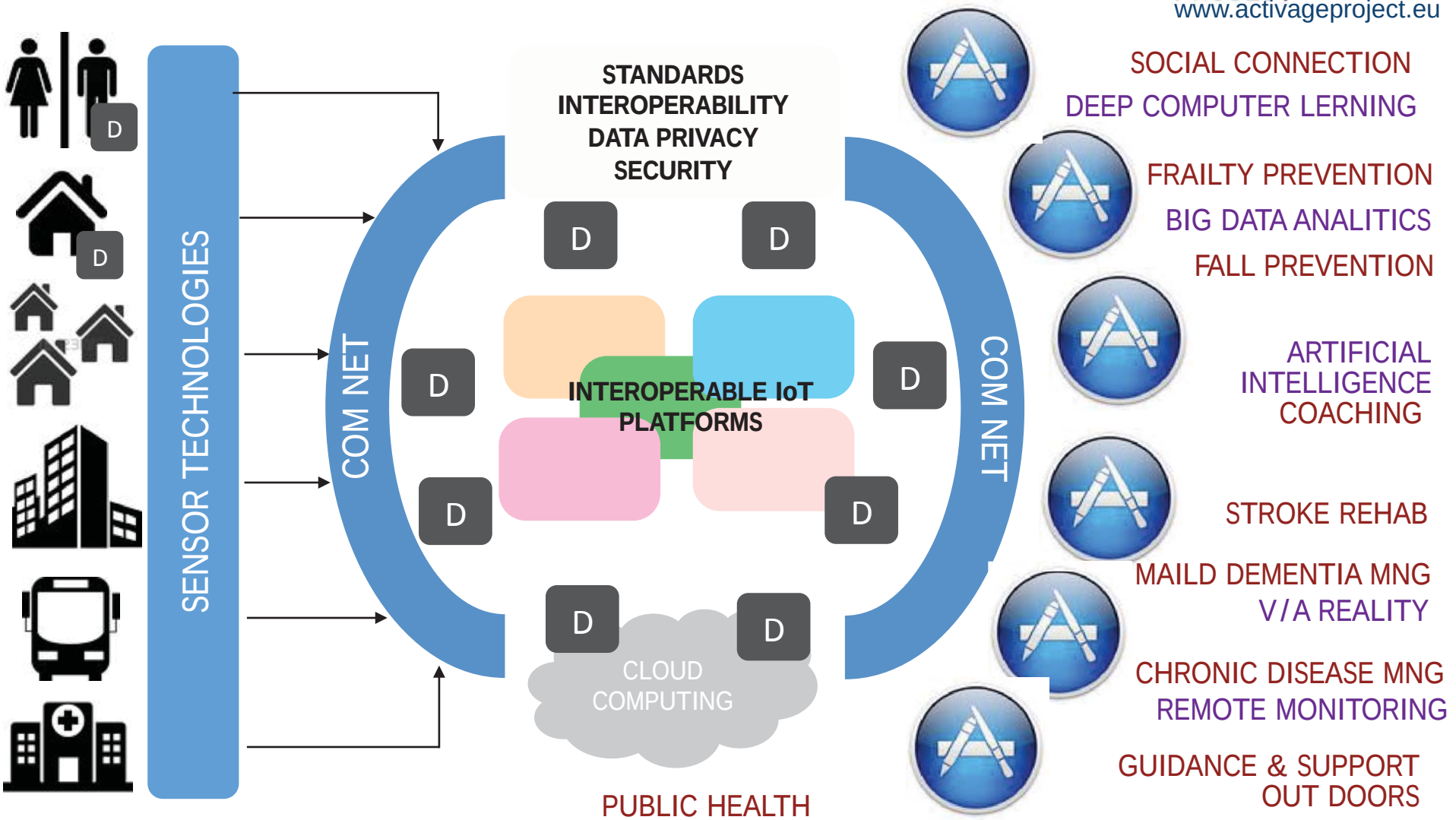


# ACTIVAGE KIOSK Solution PoC

## Devices, Application and Technology

Insight Internet of Things and Stream Processing Unit

Insight

Wristband
Activity Track
Sleep Quality

Insight Living Lab
ACTIVAGE CENTRE

Wristband
Oxigen Sensor

Wristband
Blood Pressure

Weight Control
Balance

# ACTIVAGE KIOSK Solution

## IoT Services Architecture Mapping

ACTIVAGE PROJECT
www.activageproject.eu

Data Project Initiation → Data Governance Process → Data Quality Process → Self-Audit Process → Data Project Completion → Data Project Access

**PRIVATE**
- Activity Tracker
- Sleep Quality
- Blood Pressure
- Oxygen Sensor
- UV Sensor

BLE (LwM2M)

**PUBLIC**
- Web API
- REST Services
- Public Analysis

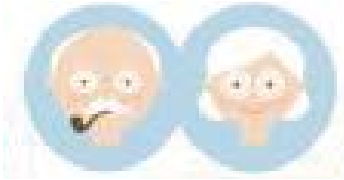
Data Sources

Activity Monitoring
Remote Monitoring
Healthcare & Wellbeing

IoT-enabled Public Services

Data Annotation
High Level Activity Analysis
Health Monitoring Processing
Big Data Processing & Analytics
Business Logic
User management
Data Adaptation & Interoperability

ACTIVAGE CENTRE
Remote Monitoring Insight Living Lab



AHA Services & Solutions

**INDIVIDUALS**
- Elderly
- Caregivers
- Parents

**ORGANIZATIONS**
- Care Center
- Day Center
- Library
- Gym
- Pharmacy
- Municipalities
- Associations
- Cultural entities

Users

# ACTIVAGE KIOSK Solution

## IoT-enabled Vital Signs Monitoring Services (Design)

ACTIVAGE PROJECT
www.activageproject.eu

1. Data Project Initiation
2. Data Governance Process
3. Data Quality Process
4. Self-Audit Process
5. Data Project Completion
6. Data Project Access

iHealth
- Activity Track
- Sleep Quality
- Blood Pressure
- Oxigen Sensor

Sanitas
- Activity Tracker
- Weight Control Balance
- Blood Pressure
- Sleep Quality

Polar
- Sports Tracker
- GPS Location
- Heart Rate

Mili and Others
- UV Ray Indicator
- Skin Moisture Level
- Sleep Quality

1 1 1 1

Insight Living Lab
ACTIVAGE CENTRE
2

Delivered by 6
VITAL www.vital-iot.eu VOS
Remote Monitoring Insight Living Lab

Supported by 5
ACTIVAGE AIOTES

Powered by 4
VITAL www.vital-iot.eu

3
OPENIoT
www.openiot.eu

# ACTIVAGE KIOSK solution

## IoT-enabled Vital Signs Monitoring Services (Prototype)

ACTIVAGE PROJECT
www.activageproject.eu

1. Data Project Initiation
2. Data Governance Process
3. Data Quality Process
4. Self-Audit Process
5. Data Project Completion
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# ACTIVAGE IoT Legacy Platforms

## IoT Legacy Platforms

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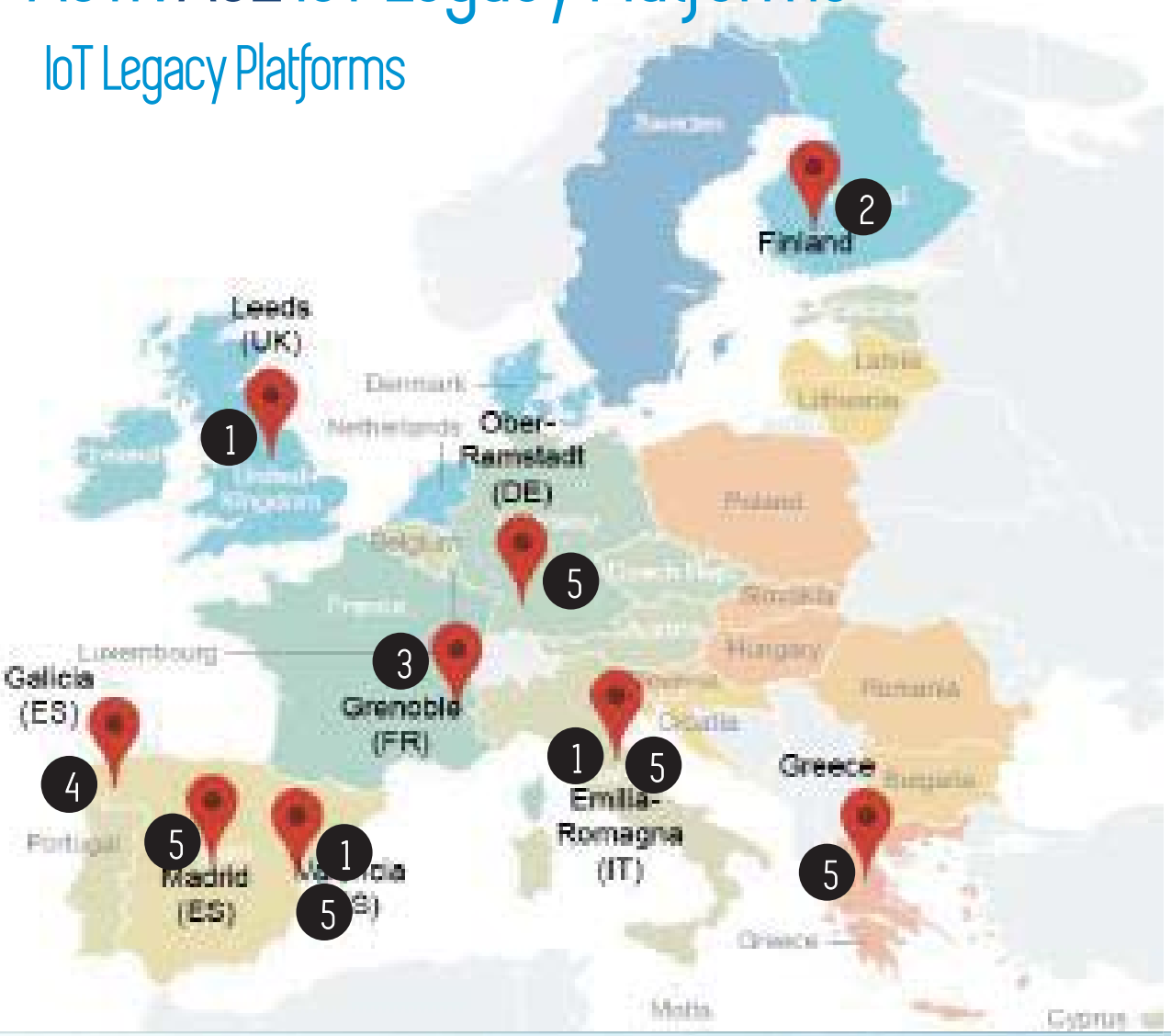


1 FIWARE

2 OPENIoT

3 sensiNact

4 Sofia 2

5 UniversAAL IoT

# ACTIVAGE IoT Devices
## Deployment Sites

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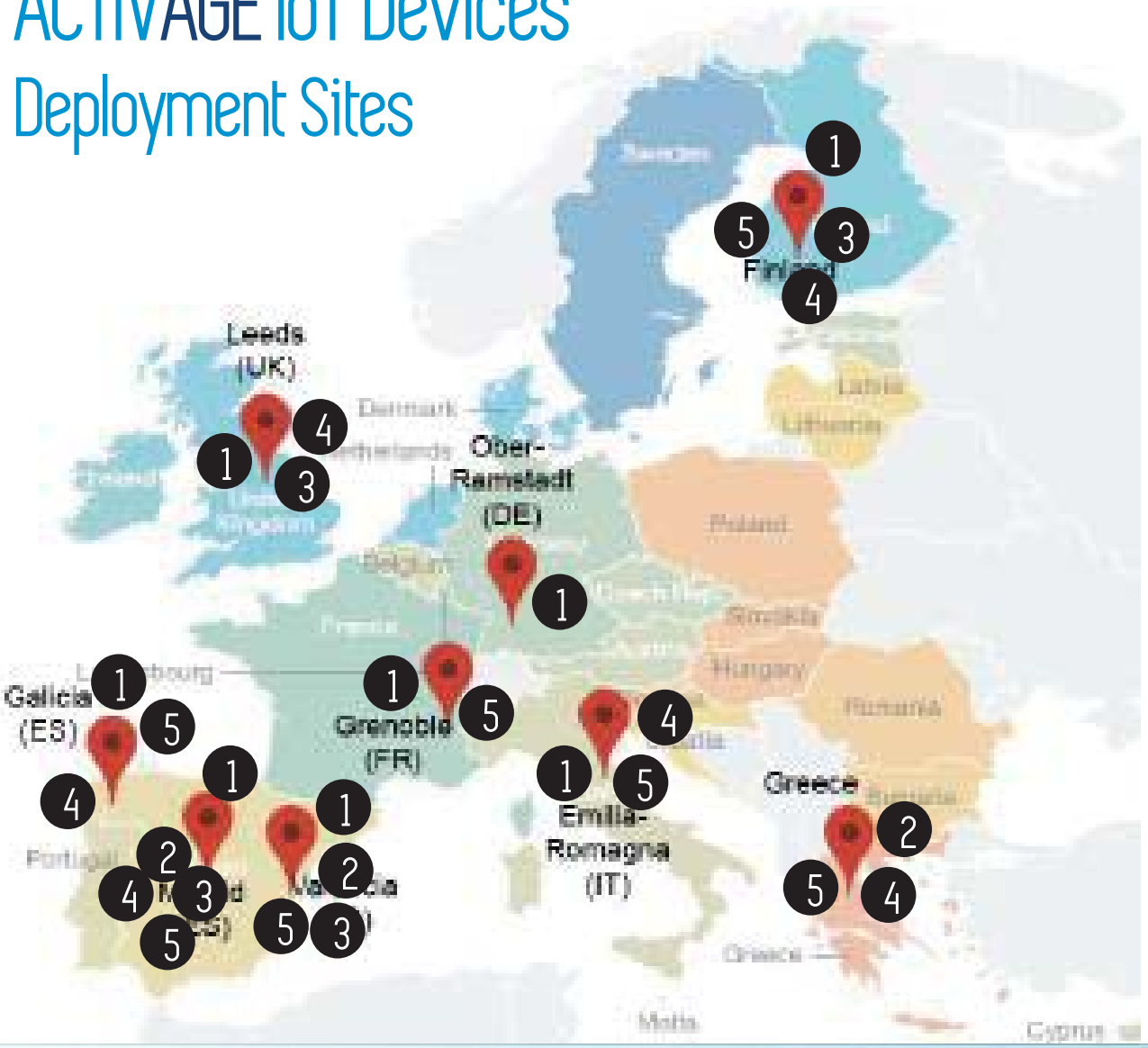



1. In-door Sensors/Actuators
2. Outdoor Sensors
3. Wearable Sensors
4. Health Devices
5. User Interaction Devices

# ACTIVAGE Standardisation PROCESS

## Standardization Process

- Monitoring and alignment with working groups focused on standards in AHA & IoT.
- Defining the framework to assure the privacy protection, security and safety of the users.

Strongly Influenced by…

# ACTIVAGE ECOSYSTEM Management SCOPE

ACTIVAGE PROJECT
www.activageproject.eu

**Relations:**
- o European Pilot Locations
- o Cross-location deployments
- o Mobility of Users/Technology

**Actors:**
- o Consortium Partners
- o Pilot Communities
- o External Users/Communities

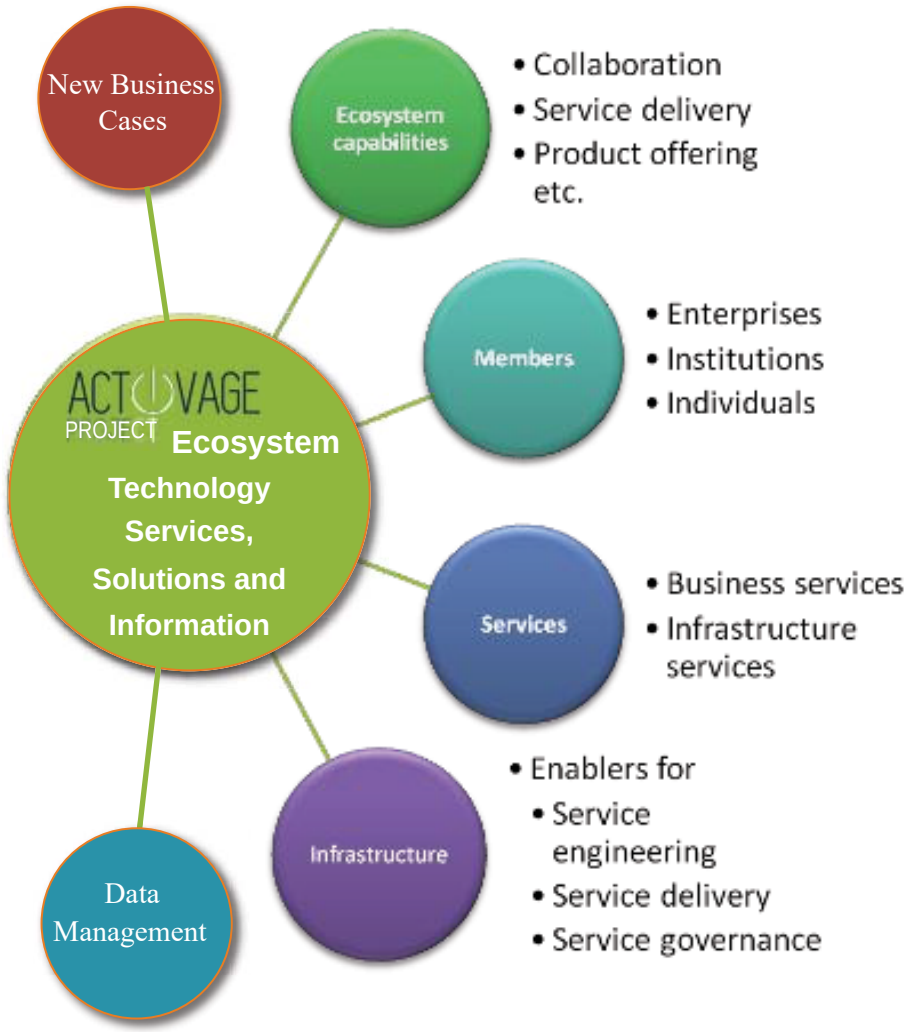
**Applications:**
- o Pilots Focus Area
- o Pilot Use Cases
- o Industry Use Cases

**Assets:**
- o IoT technologies
- o IoT Platforms
- o IoT Solutions

- Business
  - o Silver Society
  - o Active is Medicine
  - o Wellbeing 4 All

- Standardization and IPR Groups:
  - o Alignment with Health
  - o Best Practices
  - o Industry take overs

- Data as driver for
  - o Privacy
  - o Security
  - o Ownership



# ACTIVAGE ECOSYSTEM

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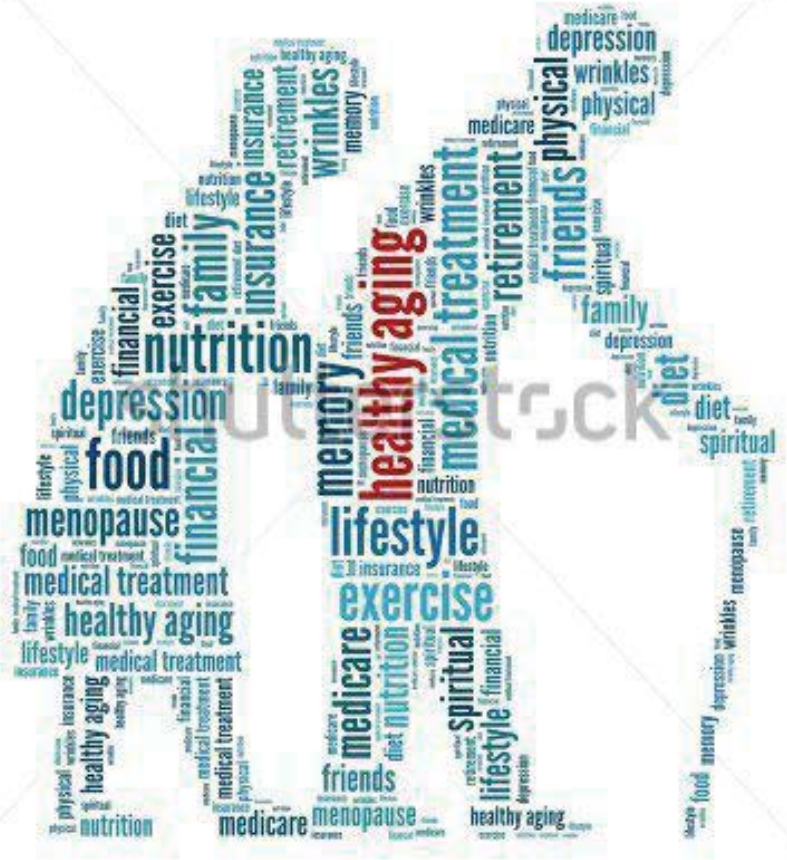
## Relevant Associations / Groups / Communities



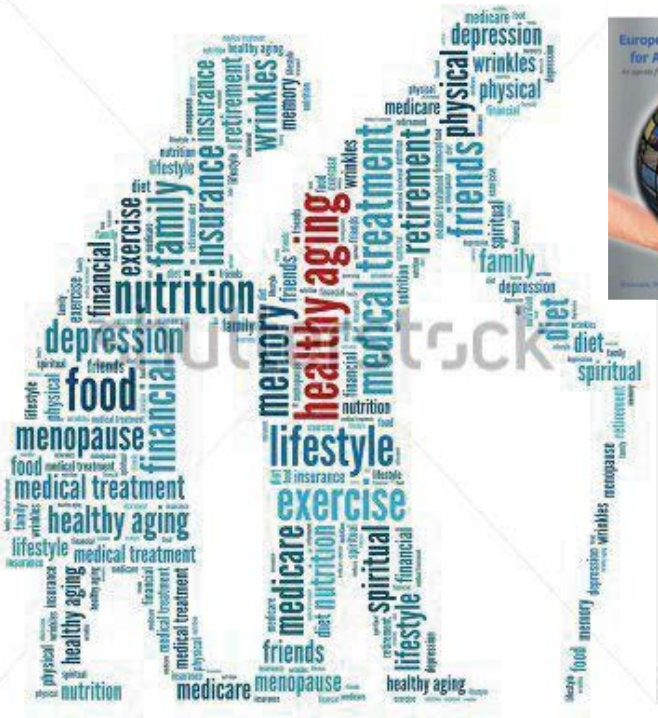

Courtesy of: www.shutterstock.com · 128773937

IPv6 Forum Logo is considered to be included in Release 3.0 of IoT landscape

# ACTIVAGE ECOSYSTEM

## European IoT Communities Landscape

ACTIVAGE PROJECT
www.activageproject.eu



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AIOTI
ALLIANCE FOR INTERNET OF THINGS INNOVATION
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ACTIVAGE PROJECT

Dr. Martin Serrano
Insight Centre for Data Analytics, Ireland

Contributors
Aqeel H. Kazmi,
Insight Centre for Data Analytics

Jorge Posadas, German Gutierrez
Alicia Cano, Medtronic, Spain
Sergio Guillen, Pilar Sala
TSB-MySphera, Spain

Tuesday, September 19th, 2017 Brussels, Belgium

European Commission | Horizon 2020 European Union funding for Research & Innovation

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Insight Galway

Sprint #1: Shaking up the eHealth Industry in the New Digital Era
Innovation Sprint workshop, 19th September 2017

# Smart Technology for Better, Independent, Assisted Health Services Ecosystem

**Dr. Martin Serrano**
Data Scientist and Scientific Director on IoT & Stream Processing
Insight Centre for Data Analytics - Galway, Ireland
IEEE ComSoc IoT Experimentation Chair
AIOTI-WG1 Vice-Chair

September 19th 2017
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# Smart Technology for Better, Independent, Assisted Health Services Ecosystem

Clos Chapelle-aux-Champs 30 bte 1.30.30, 1200 Bruxelles

@DrSerranoMartin

<martin.serrano@insight-centre.org>

**Insight centre for Data Analytics**

**www.insight-centre.org**

**Lower Dangan, IDA Business Park**

**Galway City, Ireland**

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