

# Liverpool 5G Testbed & Trial for Health and Social Care

Using 5G technology to improve digital health and social care applications

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# Vision

**Create a platform to mature proofs of concept, begin commercialisation trials, attract inward investment and drive efficiencies arising from an integrated health and social care system.**



# The Liverpool 5G testbed brings together a unique mix of public sector and SME organisations:

Blu Wireless Technology, AIMES, Inventya, DefProc, Digicredis, CGA Simulation, **Sensor City**, Liverpool City Council, Royal Liverpool and Broadgreen University Hospitals NHS Trust (RLBUHT), e-Health Cluster, University of Liverpool, and Liverpool John Moores University.



The Royal Liverpool and  
Broadgreen University Hospitals  
NHS Trust



## Our Ambition

- **Create a unique and innovative consortium** of public sector health and social care suppliers, the NHS, university researchers, third sector organisations, agile local SMEs and a leading UK 5G technology vendor
- **Demonstrate the potential for 5G** networks to make **positive impacts on societal health** outcomes over the next 5 years
- Demonstrate that through the use of licence free 5G mmWave networks there exists a future for 5G that **reduces**, not increases, the **digital divide** and access to services
- **Evidence how 5G health and social care applications fit into the next wave of regional infrastructure development**, and the potential for UK and international commercial exploitation of our solution
- **Prove the viability of deploying Open Source 5G networking software** on an open platform 5G Mesh technology



## Our Ambition

- Demonstrate societal benefit of **health and social care working better together** and the **opportunities this affords for Government** releasing this band width to be **free for health and social care**.



# What the Testbed and Trial should do.

- **Blend of advanced low cost 5G technology and modern applications designed to revolutionise the future delivery of health and social care**
- **Demonstration of how health and social care applications are enhanced and integrated** through the utilisation of the **high bandwidth and low latency of 5G**
- **Provision of a testbed** for the development and **trial of bandwidth intensive applications** that require edge and/or cloud compute
  - **High resolution video and distributed AI** for patient event and movement monitoring
  - **Teleconferencing, AR, VR, etc. to manage loneliness** in older adults
  - **High resolution video and remote diagnostics** for ‘telehealth in a box’, facilitating **communication between hospitals and the community**
  - **Intelligent IoT sensors to aid independent living in the home**



# Assessing Impacts.

- Use cases: baseline data in place or ready to analyse
- Social impact: engagement with service users, review of existing LCC and RLBUHT data and analysis of trends
- Economic impact: SME (consortium and engaged through eHC) pre and post project assessment, review of income and ROI
- Regional economic impact: full project evaluation undertaken by Inventya
- Methods: workshops, surveys, landscape review, case studies, dissemination report, monthly monitoring, IP reviews

# LIVERPOOL 5G CONSORTIUM



5G TEST BED  
INFRASTRUCTURE

<b>LIVERPOOL CITY COUNCIL</b>  Street furniture Local infrastructure	<b>AMAZON WEB SERVICES</b>  Support	<b>UNIVERSITY OF LIVERPOOL</b>  Green 5G demonstrator	<b>LJMU</b>  Optimisation & integration	<b>AIMES</b>  Integrated cloud based services Research environment
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**BLU WIRELESS – MESH NETWORK**

5G TEST BED  
INFRASTRUCTURE

# LIVERPOOL 5G CONSORTIUM

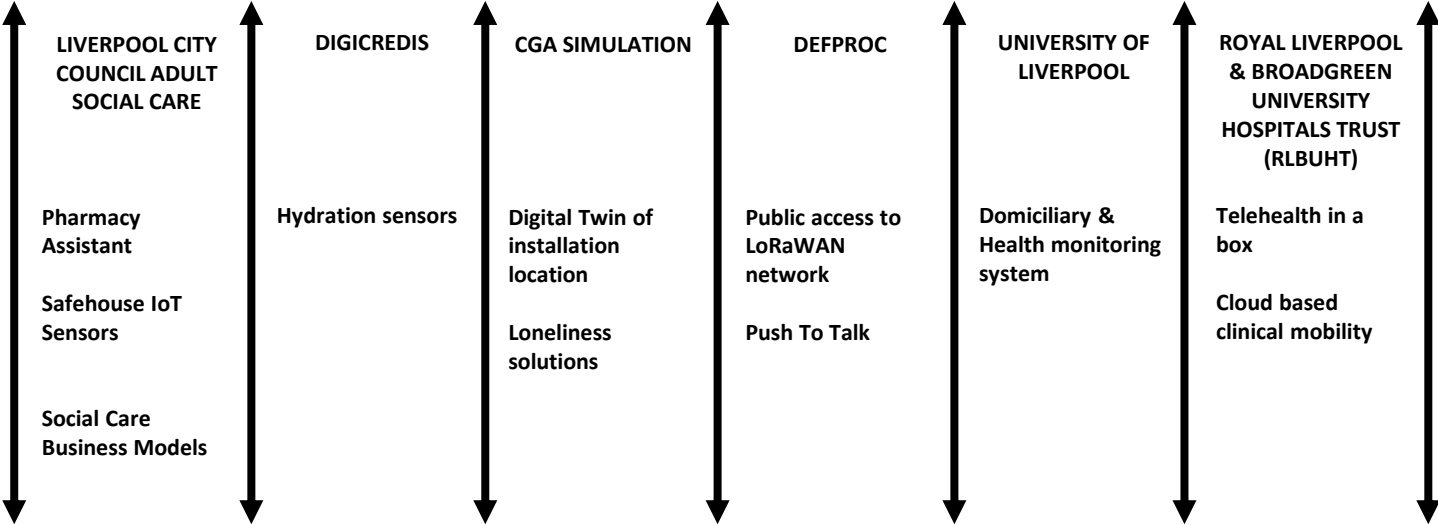


**USE CASES**

**SOCIAL CARE** ← → **HEALTH**

ADOPTION & INTEGRATION

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5G TEST BED INFRASTRUCTURE

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**BLU WIRELESS – MESH NETWORK**

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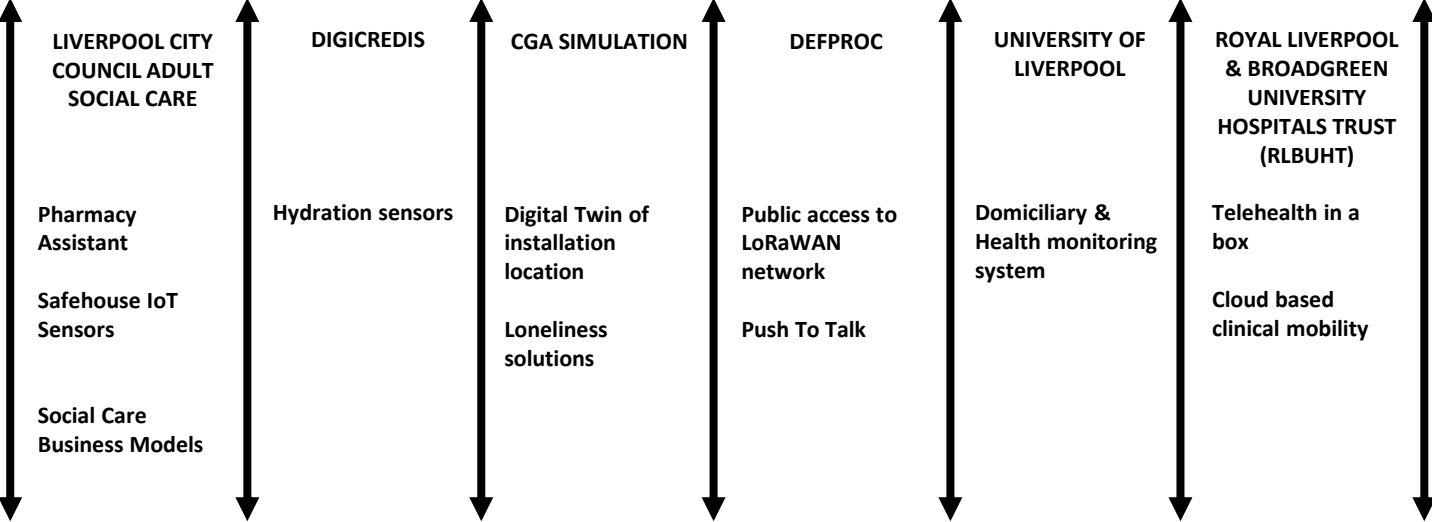
**USE CASES**

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**eHealth Cluster: Facilitating collaboration, SME Engagement, Adoption & Integration within Health & Social Care via use cases.**

ADOPTION & INTEGRATION

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5G TEST BED INFRASTRUCTURE

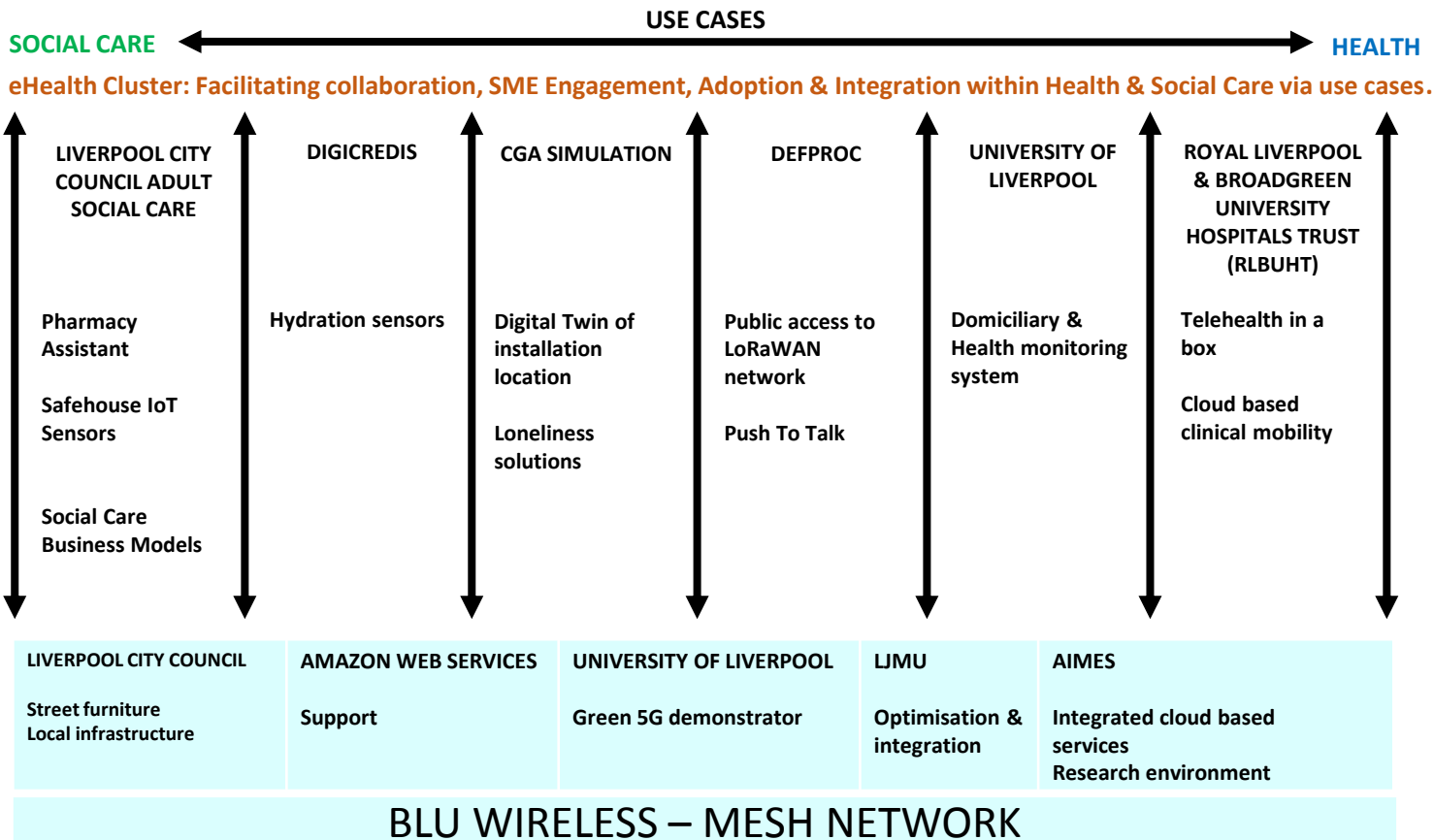
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**BLU WIRELESS – MESH NETWORK**

# LIVERPOOL 5G CONSORTIUM

SENSOR CITY – LEAD – STRATEGIC OVERVIEW



STRATEGY / POLICY

STRATEGY / POLICY

ADOPTION & INTEGRATION

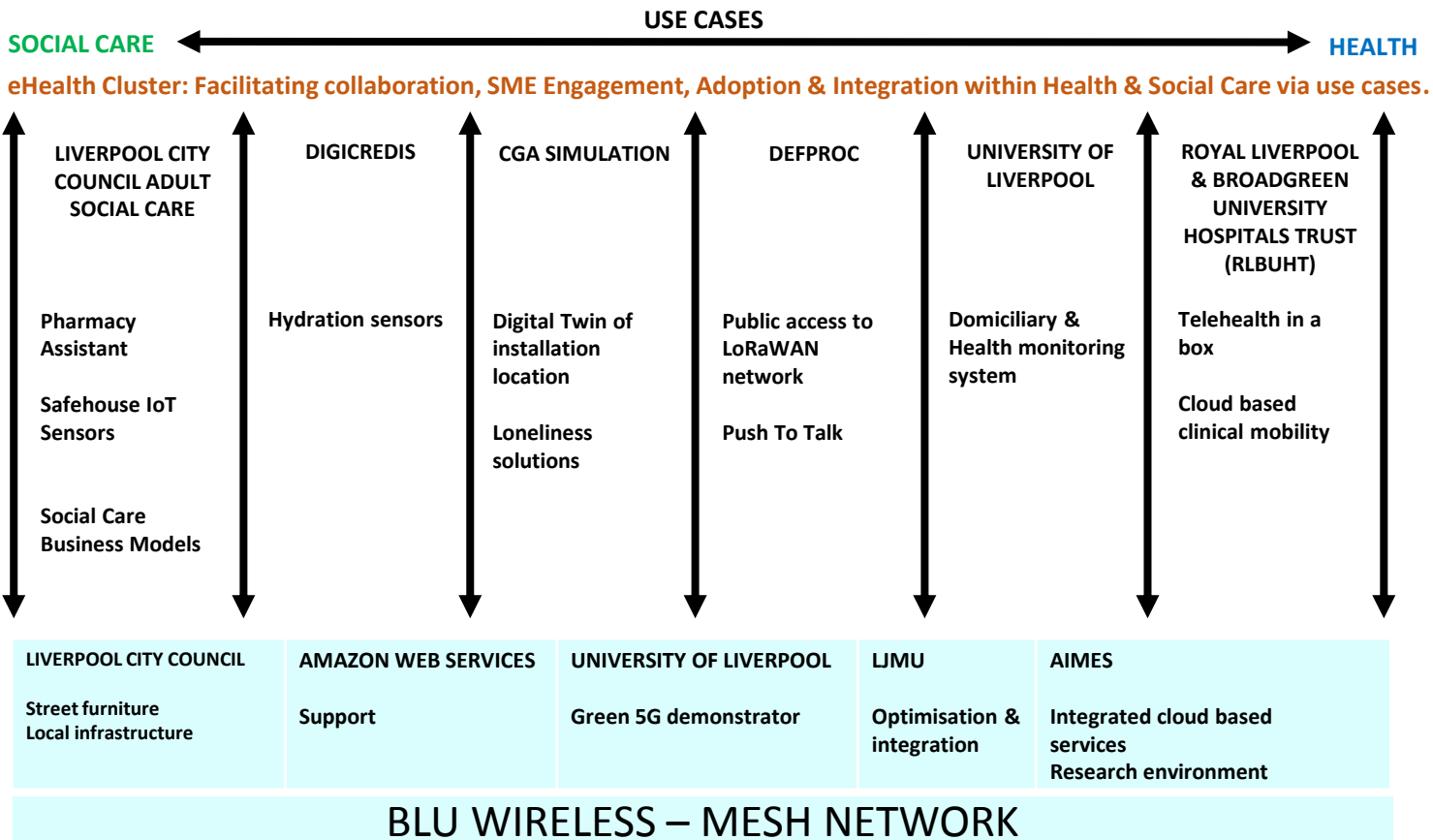
ADOPTION & INTEGRATION

5G TEST BED  
INFRASTRUCTURE

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# LIVERPOOL 5G CONSORTIUM

SENSOR CITY – LEAD – STRATEGIC OVERVIEW



STRATEGY / POLICY

ADOPTION & INTEGRATION

5G TEST BED INFRASTRUCTURE

STRATEGY / POLICY

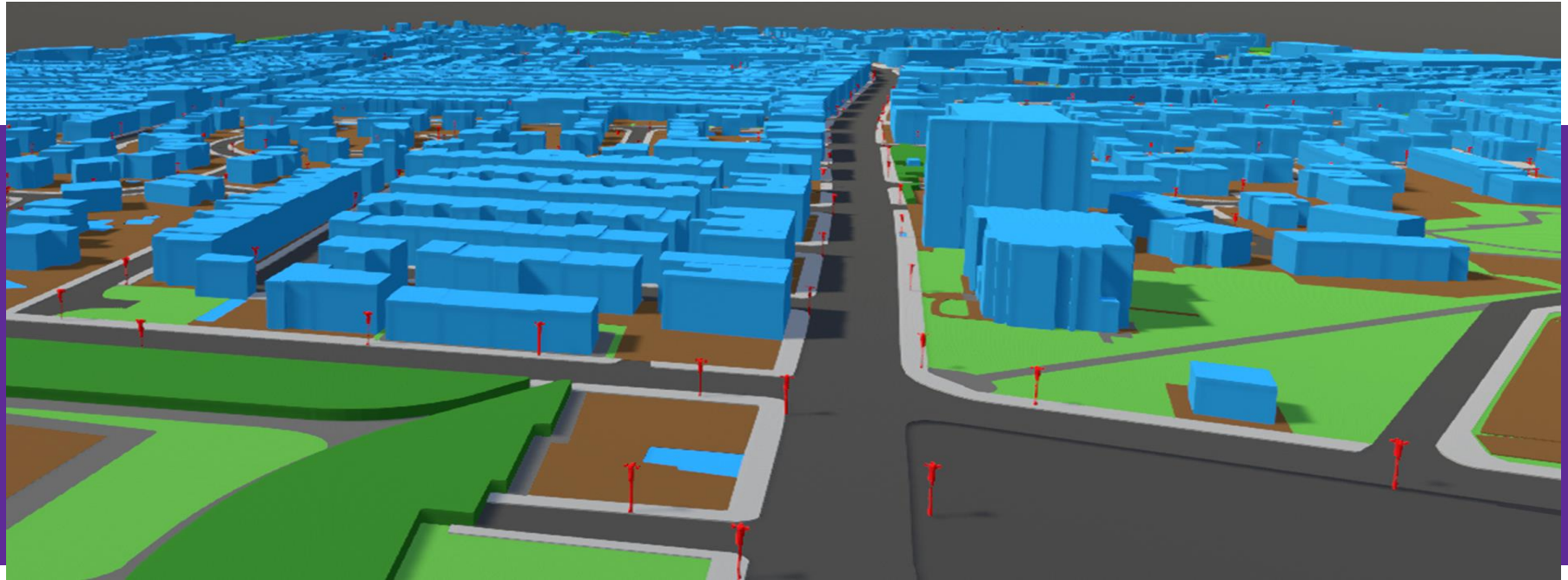
ADOPTION & INTEGRATION

5G TEST BED INFRASTRUCTURE

PILOT PHASE PROJECT MANAGEMENT - INVENTYA

**Liverpool tech SME, CGA Simulation, has created a 'digital twin' of our 5G health and social care neighbourhood, Kensington. The 5G nodes are being placed on the lamp-posts (in red.)**

**Creating a digital copy of Kensington is the quickest, cheapest and most accurate way of pinpointing exactly where we need to place the 5G nodes on the lamp-posts. We can see the line-of-site between lamp posts and any buildings or trees we need to be aware of.**



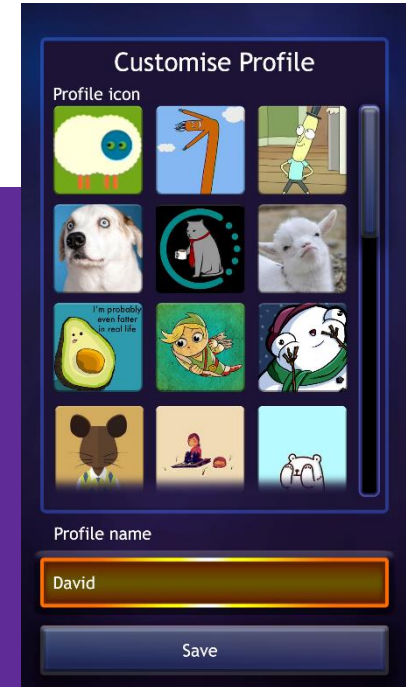
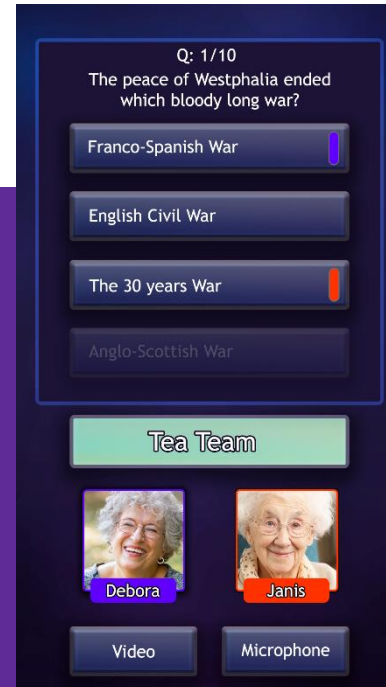
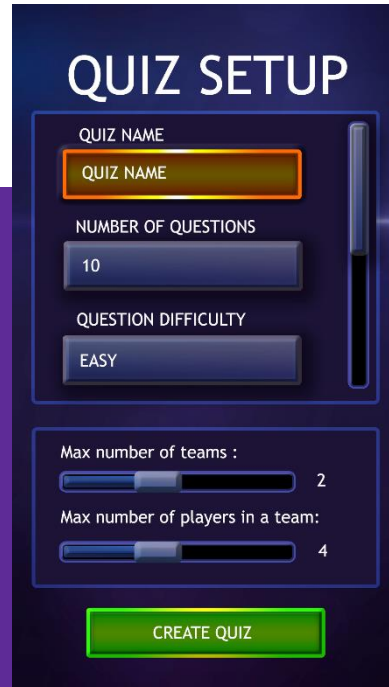
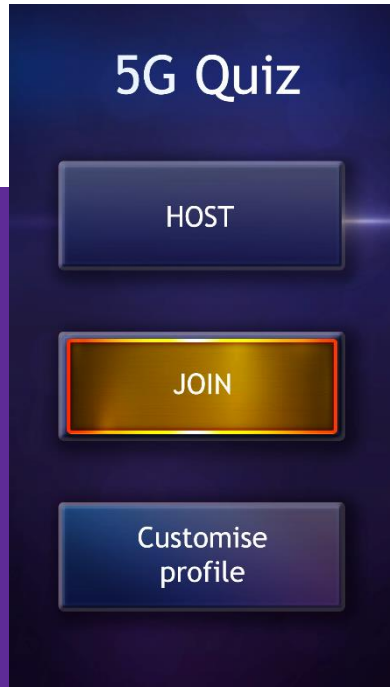
**5G Loneliness and Well Being Social Gaming App** – a high bandwidth application. Many to many video communication with team based activity (local history chat and quizzes.) Wearable tech & machine learning for predictive analytics. Potential to monitor health, offering early stage relapse into mental health difficulties for community patients.

1) Host or join a quiz

2.) Set up quiz

3.) Shared activity

4.) Personalise profile



# Domiciliary and Health Monitoring Unit

- **Ageing** population profile.
- Increasing **cost** of healthcare especially for the elderly.
- The demand on the health care infrastructure may become **unsustainable**?
- At present monitoring systems for the elderly are **reactive**.
- For example when someone falls it is **too late**!
- A system needs be able to detect serious events and to detect **precursors** to these events leading to **timely intervention**.
- Such a monitoring system has to be **cost effective** to make it **economically viable**.

## **Domiciliary and healthcare monitoring**



**PORS/PIRCS  
installation**

## Spatial Processing – patterns of movement

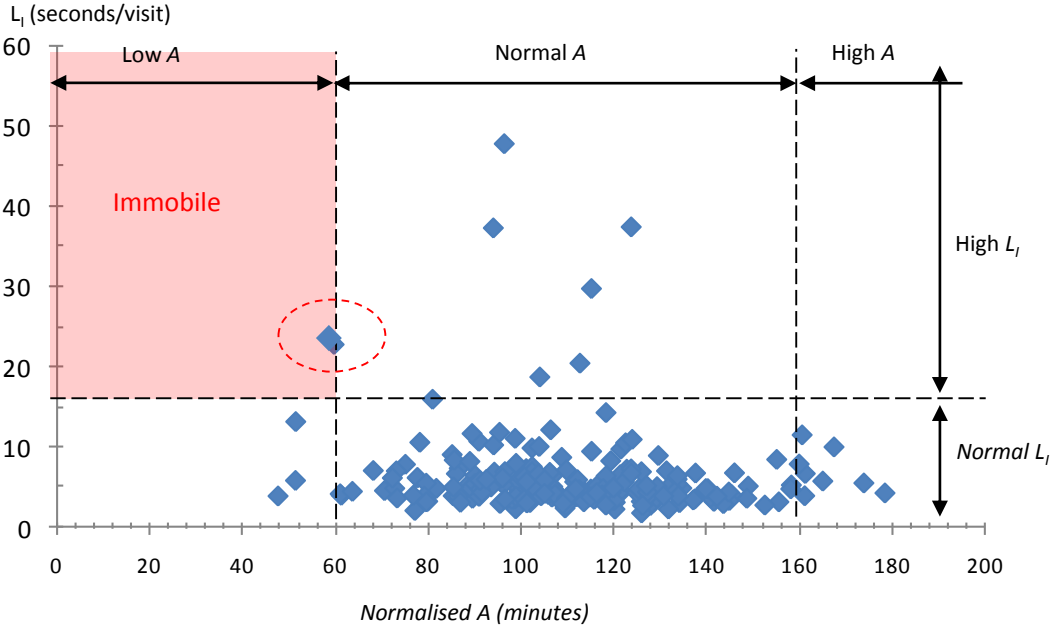


PORS – Pseudo  
Optical Radar  
System

PIRCS – Passive  
Infrared Chromatic  
System

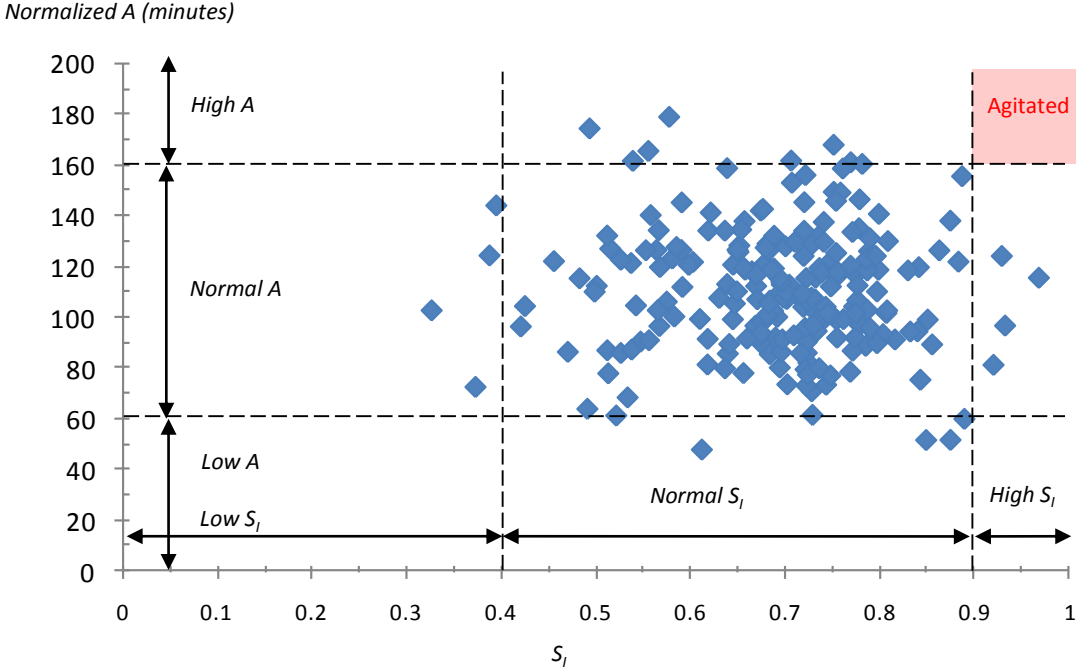
# Detection of behaviour over 8 months period

*Immobility L (L<sub>i</sub>) versus Activity (A)*



# Detection of behaviour over 8 months period

## Activity versus Immobility $S_i$



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The future - To continue to use technology to be disruptive and extend the capability of the 5G testbed and our expertise in sensors and sensor systems to the energy sector, digital manufacturing, tourism, agriculture.....

