The ABCs of the IoT-based Data Collection

Introduction

This study aims to create **an IoT-based sensing and reporting infrastructure in different archetypes** through indoor IoT gateways and LoRaWAN-based sensors monitoring resource consumptions and the changes in environmental parameters (a). This infrastructure will be capable of gathering data across spatial scales, *thus creating the datasets necessary to shape and demonstrate the performance of AB's as single buildings, communities, and at city scale.*

Objectives

We will perform **characterisation experiments** to reveal how the building types, age, materials, and features affect the operation of IoT networks. This will be followed by the **optimisation of coverage and signal strength through network simulations** (b), which will lead to better network performance overall. The enhanced infrastructure will allow us to *communicate with buildings and their installed systems more efficiently*, ensuring that critical messaging takes place without problems.

Net-zero Contribution

We will **visualise the collected/generated data through public dashboards** (c). These data supporting the definition and management of energy and resource flows across scales will also *enable the scientific and industrial base to interrogate/utilise the data to inform policy and decision making* whilst supporting the research community to accelerate research, development, and innovation *to solve related challenges, i.e. net-zero goals.*

A LoRaWAN-based Network Component(s) and Sensors

The Things Indoor Gateway
LoRaWAN gateway with WiFi
as the backhaul

FM432e-Electricity
Non-intrusive optical
electricity reading (total)

FM432g-Gas
Non-intrusive optical
gas reading (total)

ExploraCO2 - Senseair
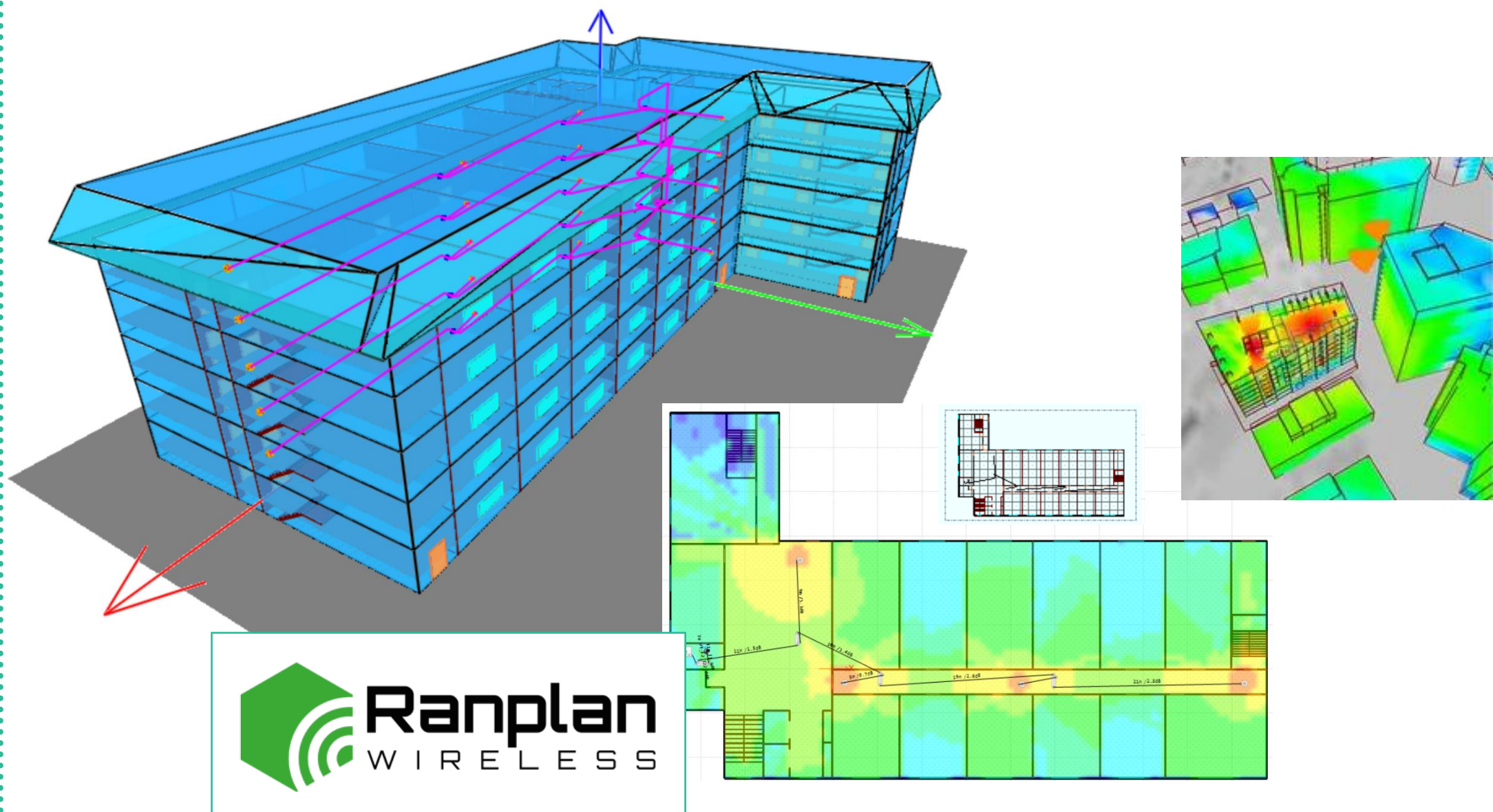CO_2, temperature,
and humidity

NKE Smart Plug
Power, energy, voltage, and
frequency reading (individual)

WisNode Sense Home -
RAK7204 Temperature,
humidity, gas pressure, and
indoor air quality index

B Ray Tracing-based 3D Network Planning in Buildings

Ranplan Wireless

Ranplan WIRELESS

- Network design, simulation, optimisation
- Indoor & outdoor models in 3D using GIS data: building, terrain, clutter, foliage
- Realistic building and city models
- Gateway/base station/hotspot locations via MastData

C Dashboards for Data Visualisation in Real-time

ThingsBoard.io

- An open-source IoT platform for device management, data collection, processing, and visualisation
- TheThingsNetwork integration
- Remote access and control

ThingsBoard

Voltage level [V]
Realtime - last day

	min	max	avg
Volts, V	245	254	249.2
Volts, V	245	255	249.02
Volts, V	246	254	249.01

Power cons. [W]
Realtime - last day

	min	max	avg
Watt, W	8	9	8.65
Watt, W	1	1	1
Watt, W	27	32	27.59

Plug Attributes

Entity name ↑	amps	state	volts	watts	kwhused
saj-netvox-plug-01	0.026	1	248	1	6.728
saj-netvox-plug-02	0.192	1	248	29	66.942
saj-netvox-plug-03	0.053	1	248	8	21.711

Energy usage over time [kWh]
Realtime - last day

Sheffield City Region

SHEFFIELD

Building O

Building M

The University Of Sheffield.

UKRI UK Research and Innovation

INDUSTRIAL STRATEGY