



Summary

The Joining the Dots project addresses the fragmentation of data across social housing, health, and care systems by integrating data from IoT sensors into a unified communication infrastructure. By providing a holistic view of tenants' living environments and wellbeing, the project enables predictive and proactive property interventions to improve service delivery, compliance, and tenant outcomes.

Watch the Archangel Joining the Dots case study video.

Key collaborators include:

Archangel Cloud (SaaS platform provider), Bield Housing & Care (tenant engagement and operational support), Digital Health & Care Innovation Centre (DHI) (endorsement, promotion, and dissemination) and FarrPoint (evaluation partner).

IoT sensors were deployed within tenant properties and communal areas at Bield's Langvout Court in Biggar, South Lanarkshire. These sensors were connected via Archangel's Angelnet — an advanced network of connectivity partners — in this instance using the LoRaWAN protocol backhauled across 4G connectivity, to enable a robust and reliable connection within a rural location. The data from the sensors was then seamlessly integrated into the Archangel platform, enabling realtime alerts and actionable insights. The use case in a rural setting provided the opportunity for understanding connectivity challenges and opportunities within a rural environment and offered a test bed for IoT solutions.

The project has successfully engaged key stakeholders across the HSCP, actively involved tenants, and established a framework for scalable and sustainable



digital social housing solutions.

By aggregating property, environmental and tenantrelated data into a single platform, the project enables preventative responses, reduces inefficiencies, and helps lower costs. FarrPoint is measuring the impact of these interventions.

Introduction Context and Rationale

Data fragmentation in social housing, health, and care systems creates inefficiencies and limits the adoption of IoT technologies. Siloed data systems fail to provide a comprehensive understanding of tenants' needs, resulting in missed opportunities for timely and proactive interventions.

The lack of whole system-linked data providing insight to drive proactive interventions increases the risk of both physical and functional decline.

Risk of Unintentional Injuries (falls etc.) also increases due to lack of appropriate whole system knowledge.

Significance of the problem

A significant number of health and care interventions are currently reactive and could have been prevented. This issue was highlighted in Public Health Scotland's Unintentional Injury Report for 2023/24, which found:

- There were 56,294 emergency department admissions for unintentional injuries across Scotland, accounting for 1 in 10 of all ED admissions.
- ► 6,421 of these admissions occurred in NHS Lanarkshire, with 3,004 from South Lanarkshire.
- ► Among those aged 65 and over, 86% of the 28,389 ED admissions were due to falls.
- Unintentional injuries resulted in 2,822 deaths across Scotland, with 357 in Lanarkshire and 173 in South Lanarkshire.

These injuries place increasing pressure on local health services, including GP practices, emergency care, and social care teams. They also impact families, carers, and frontline staff, affecting morale and service delivery. In severe cases, tenants may no longer be able to stay in their own homes, requiring placement in residential or nursing care.

Project Objectives

- Integrate IoT sensors and environmental data into a unified platform (Archangel).
- Enable predictive and proactive interventions to improve property management, tenant outcomes and reduce service inefficiencies.
- Demonstrate the direct use case of LoRaWAN backhauled across the 4G infrastructure within a remote and rural location, demonstrating the scalable potential for predictive and preventive measures.

Approach

Collaborative Design

The project is built on strong collaboration between key stakeholders. Those key stakeholders and their roles are:

- Archangel Cloud: Delivered a centralised data platform to connect IoT sensors and provided holistic dashboards with analytics for actionable insights.
- ► **Bield Housing & Care**: Tenant engagement, sensor installation logistics, and operational oversight.
- Farrpoint: Developed the evaluation framework, reporting and measuring performance and system effectiveness.
- DHI: Endorsement and dissemination support for scalability discussions and long-term system adoption.

Implementation

The design and implementation of the project prioritised cost-effectiveness and efficiency.

LoRa WAN sensors were selected for their ease of implementation, and the ability to provide reliable connectivity in a rural area.

Customised prediction metrics were developed to generate alerts based on property, environmental and behavioural data. The ability to offer seamless integrations with existing housing and care systems also ensured the creation of new data silos could be prevented.

To facilitate smooth implementation, pre-configured sensors were deployed, reducing installation time. Weekly stakeholder meetings helped monitor progress and refine plans.

A pre-installation tenant engagement session introduced users to the system, addressing any privacy concerns and encouraging adoption. Additionally, sensors were deployed not only in individual living areas but also in communal spaces, allowing for a broader assessment of property, environmental conditions, and wellbeing.

The technology stack included LoRaWAN sensors deployed for property, environmental and activity monitoring, and the Archangel SaaS platform for data aggregation, alerts, and GDPR-compliant data storage.

Evaluation Framework

The project evaluation includes qualitative and quantitative measures.

Stakeholder and tenant feedback is collected through interviews providing qualitative measures, while sensor property and environmental data provides quantitative insights. This data will inform future refinements and potential expansions of the project.

Findings Key Insights

Leveraging the benefits of IoT and aggregating housing data has demonstrated clear benefits. By combining property, environmental and tenant activity data, decision-making has improved, leading to property improvements and efficiencies that enhance both asset management and tenant safety.

Predictive alerts allow staff to intervene early to address risks, reducing potential emergency interventions. The project has also improved operational efficiency by reducing reliance on manual monitoring and optimising resource allocation.

Initial findings highlight two key areas of impact:

For Asset Management:

 Improving regulatory compliance – The installation of all IoT sensors (including legionella sensors) enables Bield to demonstrate regulatory compliance, saving on manual checks and providing the opportunity to identify any problems early.

- Reducing utility costs Temperature sensors allow for smart energy management allowing Bield to optimise heating usage, ensuring energy is only being used when needed.
- Reducing remedial work and costs Damp and temperature sensors notify management teams of moisture issues before failures occur, reducing costly repairs down the line.

For Health & Care:

- Improving tenant safety IoT sensors provide remote, real-time monitoring of tenants' environments, with automated alerts.
- Improving health outcomes Staff are notified of any changes in activity levels or sudden drops or increases in temperature etc, reducing the risk of adverse health outcomes among residents.
- Reducing pressure on Bield site staff IoT monitoring allows staff to support tenants more efficiently, providing a tailored approach to incidents.

Some specific examples of how data insights from the technology at Langvout Court have been used include:

- Bield receiving a four-hour advance warning of a potential boiler breakdown, allowing for proactive management, and preventing failure during Storm Eowyn.
- High humidity levels were detected early on, which, if left unaddressed, could have led to mould growth. This allowed for prompt action to prevent any issues.
- Issues were identified with extractor fans within some of the individual's properties which required maintenance or replacement. Enabling proactive management for improving extraction and air quality.
- Temperature fluctuations across both communal areas and individual properties were identified presenting an opportunity for proactive heating management, for reduced utility costs.
- Insights from monitoring tenants Activities of Daily Living and property temperature alerted staff to tenants feeling unwell and allowed staff to confirm that they felt better when they reported improvement, ensuring appropriate support.

The benefits derived from the project have provided Bield with the understanding of how a wider scaled deployment could assist to meet their compliance requirements and support tennancies in a more effective manner. This will ensure that real-time data is captured demonstrating timelines of intervention, cost effectiveness and maximising supporting tenants effectively.

All benefits will be detailed and evaluated in <u>a full report</u> <u>from FarrPoint</u>.

Stakeholder Feedback

Tenants have responded positively and notably have commented on how unobtrusive the technology is, with anecdotes given that they "don't even notice the sensors are there".

Staff at Bield have also fully embraced the system, noting that having a unified view of tenant activity, individual property conditions and communal areas helps them support tenants more effectively, make efficiencies and realise cost-saving opportunities.

Key Considerations

Facilitators

The project's success has been facilitated by preconfigured sensors that streamlined deployment. Strong tenant engagement and onsite support also ensured smooth implementation. An effective governance framework also aligned with ISO 9001 standards.

Barriers

Some barriers were encountered, but easily overcome; for example the rural location of the property required a reliance on LoRaWAN. There was also a need for some initial, additional, staff training during system adoption.

Learnings

Key learnings include the importance of co-designing the system with tenants and stakeholders to ensure successful adoption. The use of LoRaWAN has proven to be a scalable and cost-effective solution for IoT deployment in rural settings.

Conclusion

The Joining the Dots project has demonstrated how integrated IoT technology and data driven insights can transform social housing, to help improve compliance and enable predictive and proactive approaches. By providing a unified view of property and tenant data, the project has also improved resource efficiency and enhanced tenant outcomes. Its successful implementation highlights the potential for broader adoption and scalability across other housing organisations and regions.

Sustainability Plan

The next phase of the project focuses on scaling the solution across additional Bield properties and other housing providers.

Further expansion within the Glasgow City Region is also under consideration, with requirements for this being assessed.

Next Steps

A <u>full evaluation report from FarrPoint</u> will measure the long-term impact of the project and help refine the approach.

Through engagement with policymakers, Archangel will continue to advocate for the integration of IoT technology in national housing strategies. The project team will also explore opportunities for further funding to support broader regional deployment.

Future plans include expanding Archangel's integration with additional data sources and care platforms; investigating new sensor types and AI-driven predictive models for enhanced decision-making; and using project data to inform policies for housing, health, and care particularly for rural and ageing populations.

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Special thanks to the tenants of Langvout Court for their participation and feedback, which have been instrumental in shaping the project's success.

Find out more about the project on the Glasgow City Region website.

Disclaimer

The findings presented in this case study are based on the outcomes of the Joining the Dots project. They reflect the independent perspectives of the project team and stakeholders.

