# COMMUNITIES in the CLOUDS

Project Overview

The focus of this pilot study is the use of technology to support issues peculiar to high-density and high-rise living. This domain is both complex and unique: obstacles emerge from a sophisticated physical infrastructure (utilities, rules and regulations, shared resources), multiple stakeholders (tenants, management companies, contractors, landlords, on-site staff etc.), legislative complexity (e.g. UK's leasehold laws) and the challenging relationships resulting from residents' shared financial and emotional stakes in their buildings. The issues faced by residents are varied and include: improving common parts of a building, resolving disputes, building new structures (e.g. gates, bike storage), installing new utilities (fibre optic broadband, energy metering, CCTV), extending a lease, obtaining consent or dealing with antisocial behaviour and crime. To resolve these, residents must often become experts in deep (legal, technical, infrastructural, political) knowledge related to their buildings and neighbourhoods. In most cases negotiation is often required where more than one stakeholder is implicated and where discretion is differently negotiated, implicating different people in different ways.

There is a fundamental mismatch between the needs of a high rise community and the role that technology currently plays in meeting them. Typically residents have re-appropriated social media tools such as *Facebook* and *Yahoo Groups* to ask questions or collaborate to resolve issues. Broadly, social media tools are designed with a notion of being sociable and the motives thus map poorly onto the concerns of living in high-rise buildings. The tools are not designed to reflect a high-rise community's virtual/physical mapping, its transient affiliations (i.e. continuous ebb and flow of tenants/landlords/staff etc.), its privacy requirements, its need for sophisticated information management and retrieval and the political, sociological and organisational influences upon collaboration.
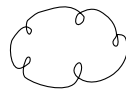
This project will examine the way technology is used to support high-density / high-rise communities. It will investigate new technical solutions that offer residents and stakeholders the ability to take greater control of the evolution of their developments and neighbourhoods. There are two core strands of work: empirical and technical. The empirical strand will investigate the problem space. It will consist of a combination of ethnography and design work. The ethnographic work will focus on the current role of technology and how the place-based nature and political/sociological traits impinge upon its use and effectiveness. The technological strand will investigate new technological solutions by designing, deploying and evaluating lightweight prototypes within a minimum of two residential communities.

Relevance to IT as a Utility.

The project addresses real problems related to community life and society within an urban context. There is a user-centric focus that resonates with the human-aspect of the ITaaU Network's challenges. There are clear requirements for simplicity, usability and safety for utility applications and services in this domain; all key themes for ITaaU. Our work will investigate how some of the burden of processes and collaboration in high-rises can be lifted onto a technological infrastructure.

Programme of work

We propose two strands of work: *empirical studies* and *seed platform*. The *empirical studies* strand will undertake fieldwork to uncover the nature of high-density living and will examine and define the problem space. The *seed-platform* work will investigate technological solutions to the problems identified in the empirical work. This strand is principally a design activity that will utilise 'technology probes' to elicit feedback from the 'real world'. It will aim to specify a core set of utility services that could be harnessed for further innovation in this domain. In addition to the outputs from these two strands, we will write a follow on proposal **(D3.1)** that will draw upon the partnerships and outcomes that emerge from this project. We anticipate relevant EPSRC/EU calls around Smart Cities, The Internet of Things and the Digital Economy.
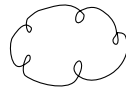
Strand1: Empirical studies.

The strand of work is designed to uncover the set of problems that are peculiar to high rise living and which will benefit from the provision of technological solutions. It contributes to the ITaaU Network+ 'usability and user experience priority area'. The work is framed by two research questions: ***What are the main challenges faced by high-rise communities; and of those, which can be addressed by technology? How do the political/sociological and place-based characteristics of high-rise communities affect the design of supporting technological solutions?***

To answer these questions we will study how, where and to what end technology is currently used by high-rise communities. Our focus will be upon its use in support of *collaboration*, *knowledge management*, and *workflows*. We briefly consider why each presents interesting socio-technical challenges:

Collaboration*:* Given that resources, problems, opportunities and issues are often shared, residents and stakeholders will frequently need to collaborate. The collaborative environment is challenging: participants are typically only loosely acquainted (if at all); there will be many competing views, needs and agendas as a result of different circumstances; the level of consensus required may be high and rigidly imposed (e.g. set by law); the information required to resolve a problem may be only partially available or inconsistently understood.

Knowledge management: There is a wealth of hyper-local and experiential information associated with apartments (manuals, energy usage etc.), neighbourhoods (crime reports, planning applications etc.), buildings (access codes, regulations, insurance documents) and resources (parking spots, cars). It may be owned and managed by a variety of stakeholders. How is this created, shared, managed and exposed to residents and applications?

Workflows*:* relates to the everyday, once-off and periodic tasks undertaken by residents as a part of living in a high-rise building. Examples include plumbing inspections (required for insurance purposes), key release (temporary access to an apartment for contractors), bill payments (service charges), problem reporting and notifications (parcel delivery, crime, floods, fire). How is technology being used in support of these tasks? Who is responsible for it? How is it made sustainable?
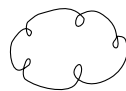
Strand 1: Methodology

Our primary approach for this strand is a combination of ethnography and design. The ethnographic work will be undertaken as a 'scoping study' (see 1.1). The design work will be undertaken in collaboration with end-users through the presentation and iteration of mock-up technological solutions. We will run a workshop composed of key members from high-rise communities. All participants will be invited to a second workshop (**WS2**) which will consider technical solutions to problems and requirements unearthed in the empirical work. The following 'outputs' section discusses this work in more detail.

Strand 1: Outputs

1.1 Scoping study
This study will undertake an evaluation of technology's role in supporting high-rise residential communities. The work will investigate how and where technology is currently applied, examining successes and failures. It will uncover problems and requirements for which technological solutions have not yet been effectively applied. It will investigate forums and social network sites, undertake surveys and interviews with management companies, residents and residents associations. The work will inform the design and choice of technical probes in the *seed platform* work.

1.2 Mock-ups
The purpose of this piece of work is two-fold. First, it is a lightweight process to seed the design of solutions to the problems and requirements from the scoping study. Second, it is to engage with communities early on in the project. We anticipate that the benefits of many solutions in this domain will only be realised once adopted by a 'critical mass'. Working with communities to create simple mock-ups of proposed tools and services is a way of encouraging future participation in our technical probe work.

Workshop 1 (**WS1**)
The purpose of this workshop is to examine the problem space and to uncover the tensions and constraints that emerge amongst key stakeholders. The overarching question to be tackled is: ***What are the problems of high-density and high-rise living and how can technology play a more supportive role?*** The attendees will consist of a full spectrum of stakeholders (management companies, resident association members, concierges, tenants, leaseholders, freeholders) alongside sociologists, ethnographers and technologists.

1.3 Evaluation
This work will bring together the empirical work alongside an evaluation of the deployment of the prototypes in the *strand 2* work. It will assess the implications of designing technology for this domain.
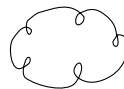
Strand 2: Seed platform
The aim of this strand of work is to uncover and evaluate technological solutions to problems and requirements emerging from high-rise living. A further aim is to uncover a core set of 'platform' services that can be leveraged to support future innovation. The work contributes to the ITaaU Network+ 'social computing platforms and open data' priority area. The high-rise domain requires us to rethink the design of basic building blocks such as authentication, communication and data management to accommodate a community's virtual/physical mapping, its transient affiliations (i.e. continuous ebb and flow of tenants/landlords/staff etc.), privacy requirements and political/emotional pressures.

Strand 2: Methodology
Our work will use outputs from the empirical work from strand one to identify a set of candidate problems/requirements that may be addressed by technological solutions. The solutions will be explored using lightweight prototypes or 'technology probes' as this has been shown to be effective for testing and understanding requirements early on, for exposing technology to the 'real world' and for helping to inspire and involve users. We aim to install and evaluate our probes within a minimum of two communities.

# Strand 2: Outputs:

2.1 Technology probes
Although the work in this project will determine the specific details of the probe(s) that will be developed and deployed, we anticipate that strong candidate areas will be those that encourage and support collaboration, complex information sharing and comparison, and the structured negotiation of complex processes. All prototype implementations will be made available as open source.

Workshop 2 (WS2)

The second workshop in this project will use a scenario-led approach to assess the use of current and future technologies within this space. The scenarios will be inspired from the empirical work. The workshop attendees will be participants from **WS1** in addition to designers and technologists. An aim of this workshop is to set out future avenues for research and to bring together potential collaborators. The outcomes from this workshop will inform the platform design work.

2.2 Platform design.

This work will expand upon the learning from the empirical work, the technical probe deployments and outcomes from **WS2.** It will specify a core set services that could support future innovation within this niche. We will place particular emphasis on facilities that can allow residents and stakeholders to leverage the platform to create and share solutions tailored to their specific needs. The core output from this work will be a design document (**D.2.2**) that will articulate the challenges and identify platform components. It will include a set of high-level draft APIs to illustrate how utility applications and second-order services could make use of the platform.
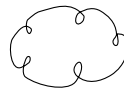
Potential for short, medium and long-term impact

Taken together, high-rise communities represent a significant and growing part of many urban landscapes. High-rises have traits that make their occupant communities especially susceptible to a variety of shared problems. Yet the problem space is complex and remains poorly understood. As a result the domain remains technically immature and could benefit significantly from appropriate technological solutions. The impact of a well designed technical substrate that not only offers solutions to problems but also supports and encourages innovation is difficult to overstate. Civic participation, social cohesion and community engagement within urban environments have been held up as important goals within 'smart cities' agendas. An important secondary by-product of an appropriate technical platform is a vehicle for larger scale engagement of urban communities in support of these goals.
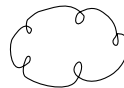
Workplan

The following is a breakdown of the work to be undertaken over the six month project.

	Month					
	1	**2**	**3**	**4**	**5**	**6**
milestones	M1		M2/M3		M4	
Strand 1: Empirical / Ethnographic Studies						
	project site					
	recruitment					
		scoping study				
			mock-ups			
deliverables			D1.1 D1.2			
Strand 2: Seed platform						
		seed testbed infrastructure				
			probe design / implementation			
					probe deployment	
					refinement	
						evaluation
deliverables			D2.1	D2.2		D2.3 D2.4
workshops	WS1		WS2			

Milestones

M1: Project site completed. In addition to disseminating project information it will include facilities for discussions, gathering data (including scenarios) and testing ideas.

M2: Mock-ups complete and presented to audience. Choice of technical probe(s) for study.

M3: Test-bed infrastructure complete.   This is the completion of the groundwork required to support the deployment of technology probes.

M4: Probe design and implementation complete. Prototypes will be deployed and tested in selected residential developments.

Deliverables

D1.1: Workshop report.   **D1.2:** Scoping study report (includes candidate problem areas)

D2.1: Workshop report   **D2.2:** Platform design document

D2.3: Technical probe code release   **D2.4:** Evaluation of technology probe deployment

D3.1: Follow on proposal (written upon completion of this pilot project)
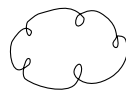
Papers

D1.1 and **D1.2** will provide material for a position paper to be submitted to a workshop or conference at *UbiComp*, *CSCW* or *CHI*.

D2.1, D2.2 and **D2.4** will form the basis for a full paper submission to *CHI '15* / *CSCW '15*

Workshops

WS1: Requirements capture / problem elicitation   **WS2:** Scenario-led technology design workshop

Main researchers, track records.

Dr Tom Lodge (Research Fellow): was a key developer on the Homework project, a four year, 6 institution EPSRC project which developed and piloted an enhanced home router to assess a range of interactive and management techniques for domestic networks. A core part of this work was 'real world' trials, where technology was installed and evaluated in households. He is currently working on *Becoming Dataware*: a project investigating how personal digital data can be valued and exploited. He has previously worked on several network-centric EU funded projects at UCL's network and research group: ANDROID (active networks), 6WINIT (mobile IPv6).   His Phd: "*Opportunistic Data Collection in People-Centric Sensor Networks*" considered the use of 'pocket-switched' networks (i.e. networking that utilises short range connections between mobile devices to route data) for routing delay tolerant data from mobile phones to data sinks. He is interested in the role of domestic technology in the wider community upon, and has had a position paper accepted at the *Ubicomp Homesys 2013* workshop: "Communities in the clouds: support for high-rise living" which presents an argument that commonly used social media tools offer poor support to high-rise residential communities.

Dr Ben Bedwell (Research Fellow): currently a Co-Investigator in the *Creating the Energy for Change (C-tech)* project where he is integrating technical, organisational and design research activities. He is also leading the *PowerPlay* project. Both projects are revealing new ways to employ energy monitoring and feedback systems to encourage sustainable behaviour.   He also maintains an interest in cultural and business applications of new technologies (and how these overlap as business models).

Alex Taylor (MSR): Alex Taylor is a sociologist working at Microsoft Research Cambridge in the Socio-Digital Systems Group. He has undertaken investigations into a range of routine and often mundane aspects of everyday life. For instance, he's developed what some might see as an unhealthy preoccupation with hoarding, dirt, clutter and similar seemingly banal subject matter. Most recently, he's begun obsessing over computation and wondering what the compulsion for seeing-data-everywhere might mean for being human and being social.