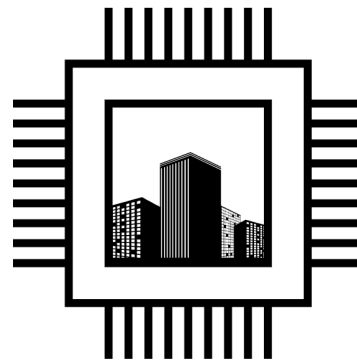# UBC Smart City Prospectus

September 2022
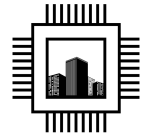
UBC Department of Civil Engineering

Captain: *Peter Kim*

Faculty Advisor: *Dr. Omar Swei*

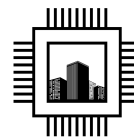# Table of Contents

Mission Statement

We are an interdisciplinary group of engineering students interested in finding answers to the question nobody is asking yet. Our mission is to coordinate and support engineering students to develop the technologies that will under-gird the success of tomorrow's cities. In striving for our goals, we endeavor to motivate, challenge, and up-skill students to help them springboard into their engineering careers.

We believe that major technological breakthroughs have led to economic, environmental, and social restructuring of a select few cities, but that adoption is lagging behind due to a sparsity of engineering talent. This team will build the next generation of talent through hands-on, project-based work which ends in open source software or demonstrations of our skills at competitions.

Objectives

1. introduce advanced data analysis, modelling, and artificial intelligence skills to students.
2. Find innovative solutions to problems faced by cities around the world.
3. Build industry connections to support talent acquisition.
4. Develop a culture of excellence.

"Finding answers to question nobody is asking yet."

Guidelines

Membership

Code of Conduct
All members of the team are expected to strictly adhere to UBC's Student Code of Conduct. Engineering students on the team will be expected to strive to embody the characteristics found in the EGBC Code of Ethics that go above and beyond the UBC Student Code of Conduct. Any members reported to be in violation of the UBC Student Code of Conduct will have a one on one meeting with the captain to discuss the claim. If a student is found to be in violation, the captain will work with the faculty advisor to report the violation to the appropriate university office.

Upward Mobility
The team strives to provide upward mobility for all of its members. Students who join will have the opportunity to move upwards to more challenging roles or horizontally to develop new skill-sets.

Recognition is not tied to the title of any role. A student on the team who demonstrates excellent technical or interpersonal leadership will have the opportunity to showcase their work just as any other member will. Strong performance is strong performance and credit will be given accordingly.

As the team attracts industry partners, students will also have the career advantage of having their skills and experience verified by being a part of the team. Excellent projects will be showcased in our end of year progress report to funding partners.

Midterms/Finals
Since everyone on the team is a student at UBC, the team will try its best to create project schedules that are flexible around midterms and zero commitment during finals. All members must maintain or improve their academic standing throughout the year—contribution to the team cannot come at the cost of one's grades.
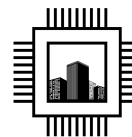
Recruitment

Executive Team

Process
Any team member may nominate themselves as a candidate for an executive role. The executive team for each subsequent year is to be selected by the incumbent executive team. Incumbent executives must use their knowledge of the role requirements, as well as each candidate's demonstration of their abilities, to select the new executive team. Only incumbent executive team members may take part in the selection of new executives.

Timeline
The executive team for the subsequent year shall be elected prior to the first half of April. The two teams will work on transitioning after final exams to handover documents and account access to the executive new team.

Qualifications
The team requires executive students to be technically competent, familiar with the team's operations, and most importantly, willing to learn. In addition, executive team members must be collaborative, diplomatic, and organized.


Technical Team

Process
Team members shall be recruited by executive members for the coming year starting no later than the second week of September. The executive team will put out a brief questionnaire to gauge student interests and aptitudes. A name-blind screening will take place to rank candidates based on responses to the questionnaire. The executive team will then conduct interviews and hire those who are fit for the team. The executive members will determine who to hire after interviews and will not be obliged to follow the blind ranking mechanism. The name-blind ranking is only a guide for decision-making and not the deciding factor.

Timeline
Recruiting shall begin prior to September with advertisements in the engineering newsletters and departmental newsletters. At least one information session shall be held in the first two weeks of September, but the team may choose to hold more. The team will under normal circumstances attend Imagine day and other
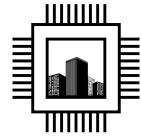
club days to promote the team. Hiring will be done only once per year in September, but provisions can be made for a second hiring in January on a case by case basis.

Composition

At least 75% of the team's members shall be engineering undergraduate students. The team shall recruit members in approximately equal proportions across academic years. This is to ensure the continuity of the team and to provide opportunities for creative work between cohorts.

Qualifications

Team members are expected to be collaborative, technically competent, and willing to learn. In addition, the following characteristics are desirable in candidates for the team:

- Technical Skill-Set
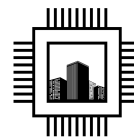   - Coding
    - Data Analysis
    - Basic Research
- Divergent Thinking
    - Rational Contrarian
    - Creativity
    - Diverse intellectual interest
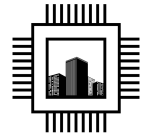
Organizational Structure

For 22-23 academic year of UBC Smart City, the team will consist of approximately thirty student roles and up to two advisors. Two focus teams, transportation and energy, will have a soft capped size of 15 each.
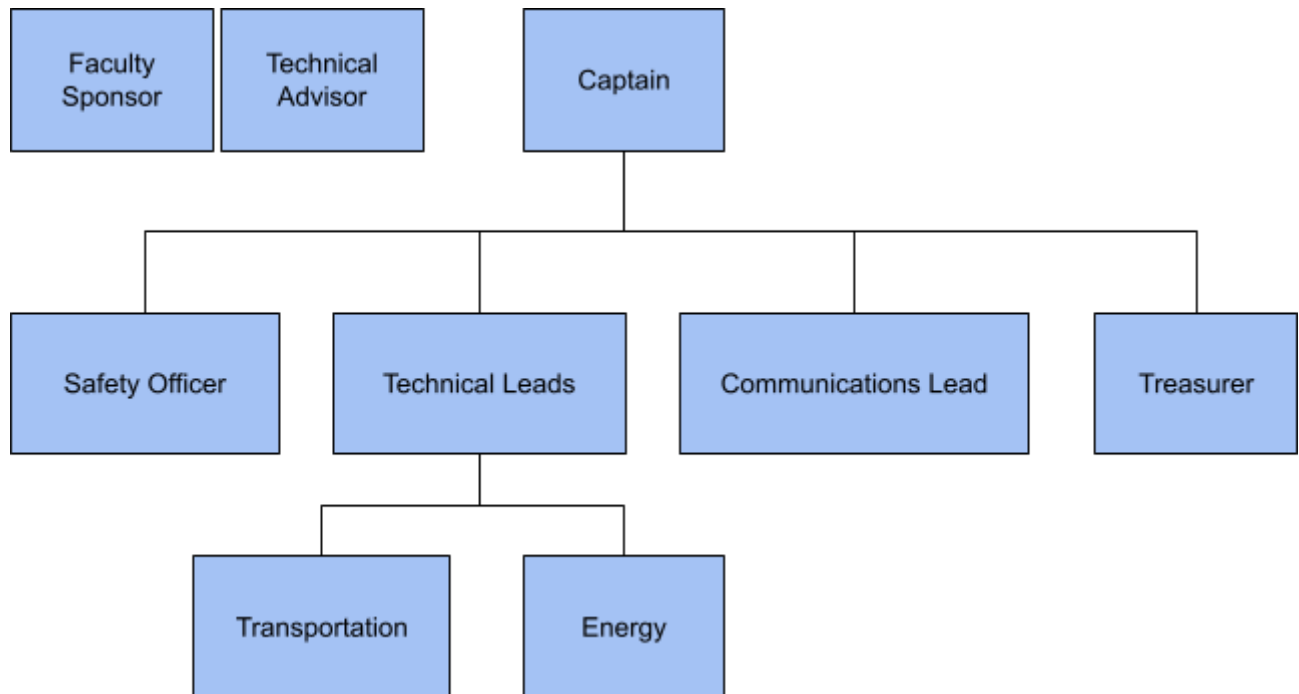
Descriptions

Role

Captain

The Captain is responsible for overall team operations and implementation of initiatives to reach the team's goals. They make decisions regarding the planning, scheduling, and budgeting of the team. The Captain supports executive team members and engages in dispute resolution when needed. They liaise with the Faculty Advisor to engage in high level planning and continuity planning of the team. The Captain acts as the primary contact on behalf of the team and tracks milestones and progress for the end of year report.

Faculty Advisor

The Faculty Advisor is the primary advisor to the team, providing high level support to the Captain in goal setting, scheduling, and budgeting decisions on an as-needed basis. The Faculty Advisor assists the Captain in reviewing funding applications, and engages in dispute resolution when requested by the Captain. In the event that any team member violates UBC's Student Code of Conduct, the Faculty Advisor oversees communication with the Office of the University Council to avoid a potential conflict of interest between students during the dispute resolution process.

Technical Advisor

The Technical Advisor may be an instructor, professor, graduate student, or alumnus of the team with deep technical expertise. The Technical Advisor works closely with the Technical Lead to provide high level guidance on emerging areas of research and development. The advisor may also suggest methods for approaching problems or guide the team to observe cutting edge industry practices and implementations. The Technical Advisor is someone who can help the team to conceptually "open the black box" when attempting to dissect a system into its constituent elements, which can be engineered and reconfigured.

Safety Officer

The Safety Officer is in charge of maintaining the necessary training required to oversee the safety of the team. They ensure all members adhere to keeping their work areas safe and clean. The team must have a designated a Safety Officer every year, and the Safety Officer must attend the walkthrough with the Captain of their reserved meeting spaces and attend the EDC safety orientation if the team has meeting rooms in that building. This role may be dually held by a member occupying another role.
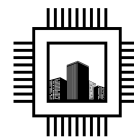
Treasurer

The Treasurer is responsible for the development and elaboration of the budget with oversight from the Captain. They prepare the sponsorship package aided by the Communications Lead, the Captain, and in contact with the Faculty of Applied Science and Department of Civil Engineering. The Treasurer must familiarize themselves with potential funding opportunities and apply to them in due time. The Treasurer is responsible for collecting, organizing, and processing reimbursement requests. After applying to all internal/UBC funding opportunities, the Treasurer will seek out industry partners and invite them to sponsor the team. At the end of the year, the Treasurer will make projections for the subsequent year and assist in writing the end of year report to our funding sponsors.

Communications Lead

The Communications Lead is responsible for maintaining the team's branding guidelines and sending out communications in accordance with those guidelines. The Communications Lead will build and maintain the team's website as well as all social media pages. The design of team t-shirts, promotional stickers, and banner will be coordinated by the Communications Lead. The member will write promotional content for the team and distribute it to relevant newsletters such as the EUS and department specific newsletters such as the Civil Underground. The Communications Lead role is most demanding in the beginning and end of the academic year but maintains a relaxed pace throughout the year. Preference will be given to those who are available to work on promotional material in mid-July to be sent out in September.

Sub-team Leads

Sub-team Leads oversee the day to day progress of their respective teams and are responsible for meeting the weekly or bi-weekly deadlines set forth by their teams. They should be the most technically involved members of the team and be broadly interested in all aspects of the project delivery. Sub-team Leads are essential for making sure the team meets their micro-milestones, which are the building blocks for the term long projects set forth. Students in this role can expect to learn deeply about project definition, data collection, and data analysis. This role is excellent for those who wish to gain deep technical skills for employment in cutting edge engineering firms.

Technical Members

Technical members will contribute their time to working on their term projects. Roles within a team are fluid, but everyone is expected to contribute equally. General members will find themselves contributing to the attainment of weekly goals. This is an exciting position to get hands-on experience with projects that go above and beyond the
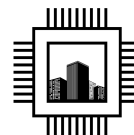
classroom experience. Students in this role can expect to pick up both epistemic as well as technical knowledge relating to their sub-team topics. Technical members who thrive in their roles will represent the team at competitions and have the team's backing to help them finish in first place.
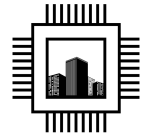
Activity

Projects

Throughout the year, team members will work with their team leaders to define, design, and deliver two projects of their choosing (one per term). Due to the range of issues cities face and technical depth required to build something meaningful, the project definition phase is up to each sub-team to ensure they have a topic that their members are interested in and capable of tackling. The results of each sub-team's projects will be published to GitHub or turned into a report/presentation and put on our website.

Competitions

Team members that demonstrate excellent technical and collaborative ability will be offered to represent the team at competitions. The concept and feasibility of Smart Cities are relatively new, and so the industry lacks a single, unifying competition. In lieu of this, the team aims to curate a selection of local and international competitions to send our team members to. Example past competitions include:

- City of Vancouver Decongest Hackathon
- City of Vancouver VANquish Collisions Hackathon
- Rogers Smart City Challenge
- IEEE Smart Cities Hackathon
- American Planning Association Student Design Competition
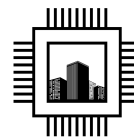
70% Projects – 30% Competitions

End of Year Reporting

The Captain and Technical Lead will compile an annual progress report for the team as a whole. The report will include milestones achieved, highlights of the technical teams, and goals for the subsequent year. This is to demonstrate to the community and our sponsors the team's commitment to fulfilling its vision. The end of year progress reports will be made available on our website to build long term rapport to partners and highlight our rising stars.

Budget

At the end of the year the team will report its budget demonstrating all sources of income and expenses. The team will strive each year to attract industry partners to assist with funding the project and will give sponsors recognition in the team's visual guidelines. Logos of sponsors will be featured in our promotional material according to the tier of sponsorship they provide.

Credits: Cover photo by Ryoji Iwata on Unsplash

Appendix

A – What are smart cities?

Smart cities utilize connected components to create systems that efficiently allocate resources and services. Sensors collect data from the city to be analyzed and interpreted. Systems can use this data to adapt to changing conditions, function more optimally, and better meet the goals of the city.

For example, imagine a normal city, where garbage collection trucks use a fixed route and schedule. The roaring truck often stops for bins that are nearly empty if too early or overflowing if too late. The truck stops more frequently and is on the road for longer than necessary, contributing to carbon emissions, traffic congestion, and unsightly sidewalks.

Now, imagine a smart city. The bins are equipped with sensors that tell the city when the bin is nearing capacity. Optimized routes are generated that include only the bins in need of being emptied. An autonomous electric truck is then deployed to quietly collect the garbage at the right time. Once the garbage collection is complete, the truck parks itself and recharges from the energy grid at hours when the city's electricity demand is low, resulting in cheaper prices.

In the above example, smart city components (smart bins, smart vehicles, and peak-load energy pricing) are used to contribute to key smart city goals (reducing emissions, congestion, and noise, keeping sidewalks clean, and balancing daily energy demand). Most smart city methods include data collection, communication, and automation, while common goals are more sustainable cities and an improved quality of life.

Ultimately, smart cities can apply existing and developing technologies in innovative ways to increase prosperity and improve citizens' quality of life. When you join our team, you will have the opportunity to discover, define, design, and execute projects that aim to build a smarter city. Cities worldwide are facing broad challenges, so the emerging field of smart cities is ripe for innovation and disruption