Proposal for Indoor location tracking and navigation system for the Birkbeck College Estate

[V2 Solutions]

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OVERVIEW

Birkbeck, University of London is a world-class research and teaching institution with 13,500 students pursuing various courses ranging from Diplomas to Doctorate degrees. The collage is situated in Bloomsbury and spread across multiple buildings at the heart of central London.

The College requires an indoor localisation system for its estate on Malet Street and the surrounding area. The primary purpose of the system is to provide audit and evidence for the NHS COVID-19 Track and Trace operation towards safe re-opening of facilities for face-to-face learning in combination with rapid PCR tests. This system is expected to be used as part of the College's reopening strategy and is expected to operate in the above manner for approximate 18 months depending on the success of large-scale vaccination in the UK.

The college expects to keep the indoor localisation system in place beyond the COVID period to provide additional services which are detailed in the RFP.

This document will articulate the solution proposed by V2 Solutions to deploy a system which will encompass all the requirements listed above.

Current Technologies and Situation

The current technology landscape at Birkbeck as stated in the RFP and additional documentation referenced from the college website.

- COVID Indoor Contact Tracing
  - There is no solution deployed at this time
- Wireless Network
  - 'Eduroam' based wireless network deployed across the campus
- Turn-by-Turn Navigation System
  - There is no solution deployed at this time
- Attendance
  - Students register attendance via an RFID based system. Students are issued unique student ID cards post enrolment which they swipe on readers located at each classroom.
- Assistive services to blind and partially sighted individuals
  - There is no solution deployed at this time
- Asset Tracking
  - There is a security and asset management system but no tracking mechanism in place

- Inspection verification of public spaces by cleaning and security staff
    - The current system in place employs a physical worksheet where the staff puts in entries for scheduled cleaning and their completion

- Automatic localisation of emergency calls across the estate
    - There is no solution deployed at this time

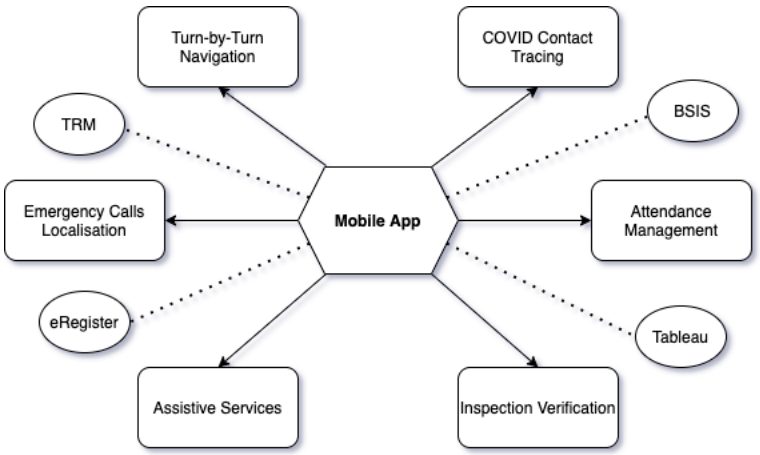
- College Mobile App
    - There is no solution deployed at this time

- Student and Staff Data
    - Birkbeck Student Information System (BSIS)

- Modules and Time-Table Information
    - Teaching and Resource Management System (TRM)

- Attendance Management
    - Tableau

Expected System Functionality



The primary functionality expected by the college is Indoor location tracking to contact trace staff and students for COVID exposure. However, the college expects to provide additional capabilities listed below over time:

1. Turn-by-Turn Navigation within the college estate
2. Attendance monitoring to replace existent system

3. Assistive services to blind and partially sighted
4. Asset tracking for high value college property
5. Inspection verification of Public spaces by cleaning and security staff
6. Automatic localisation of emergency calls made from the estate

The collage has also stated specific guidelines which the solution needs to deliver as part of the RFP document. These include specific requirements with reference to the required services as well as regulatory requirements. The proposed solution will be compliant to all requirements stated in section 3 of the RFP.

High Level Design

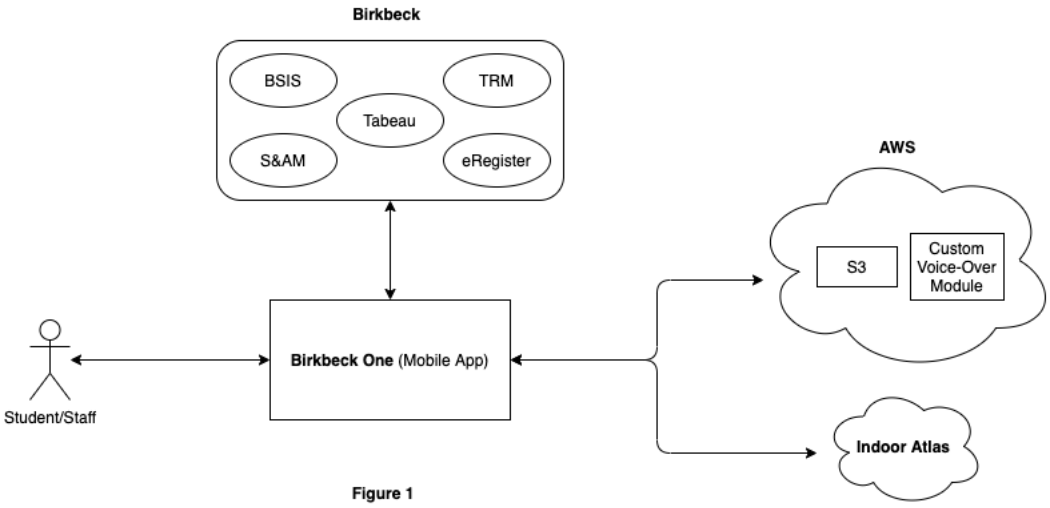


Figure 1

- V2 solutions proposes the development of a custom Mobile App called ‘Birkbeck One’. The app will be developed for Android and iOS.

- Birkbeck One will integrate into applications currently deployed at Birkbeck including BSIS, TRM, etc.

- V2 solutions proposes the use of ‘Indoor Atlas’ which is an industry leading location sensing system with Software Development Kits for iOS and Android. It uses a fusion of detection technologies including Wifi and Geomagnetism to achieve one-to-two-meter accuracy for indoor location sensing. Floor Plans are uploaded into this cloud solution. Additional details of Indoor Atlas is available on the product website [Indoor Atlas]

- V2 solutions will build a custom Voice-Over module to provide speech-based navigation.

- V2 solutions will procure and deploy this in a dedicated AWS VPC.

- The solution will record location of a user for 10 second intervals.

- Figure 1 illustrates the high-level design plan

Indoor Location Sensing & Turn-by-Turn Navigation

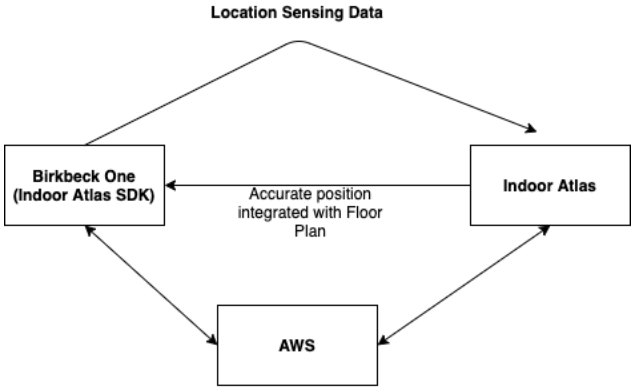


Figure 2

- The mobile app Birkbeck One will export location sensing data from multiple sources like Geomagnetism and Wi-Fi. This data is exported to the Cloud application Indoor Atlas.
- The Cloud Application then responds with accurate position coordinates integrated into the preloaded Floor plan.
- This data is stored into AWS S3 buckets periodically based on requirements and can be retrieved for contact tracing applications. This data is available for a 30 day period for all users.
- Turn-by-Turn navigation will also be provided using the same features where preloaded floor plans will be used for wayfinding.
- Speech based navigation will be available as an optional feature.
- Figure 2 illustrates the expected workflow to achieve these features

Attendance Monitoring

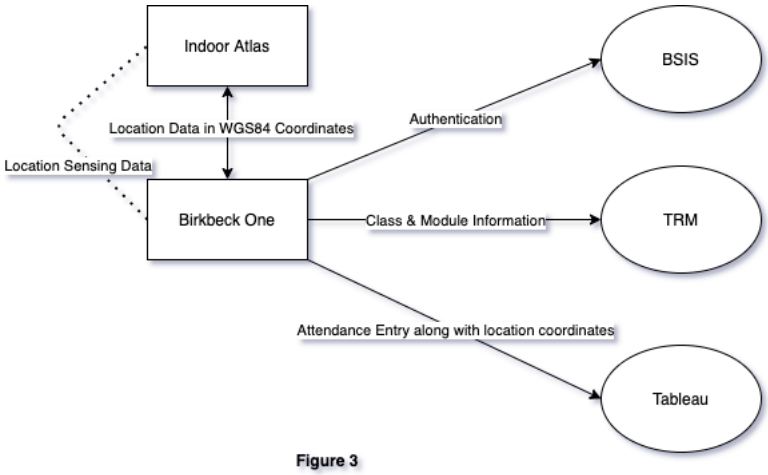


Figure 3

- Staff and Students will authenticate to the Birkbeck One via BSIS.
- Staff/Students will navigate to a dedicated screen where they can record attendance to a specific module.
- Class and Module information will be retrieved from TRM to ascertain location where this class is expected to be held.
- If the location retrieved matches the current location of the phone, then the attendance entry will be added to Tableau.
- Additional optimization capabilities can be added to confirm the Staff/Student was at the location for minimum of 50% of the overall class duration.
- Figure 3 illustrates the expected workflow to achieve these features

Assistive Services to Blind and Partially Sighted

- Native Indoor Atlas features called 'Geofencing' and 'Building Recognition' will be used to notify partially sighted students when they are near stairs and exits.
- Turn-by-Turn navigation will include Voice-over to help partially sighted students find their way across the campus.

Asset Tracking of High Value College Property

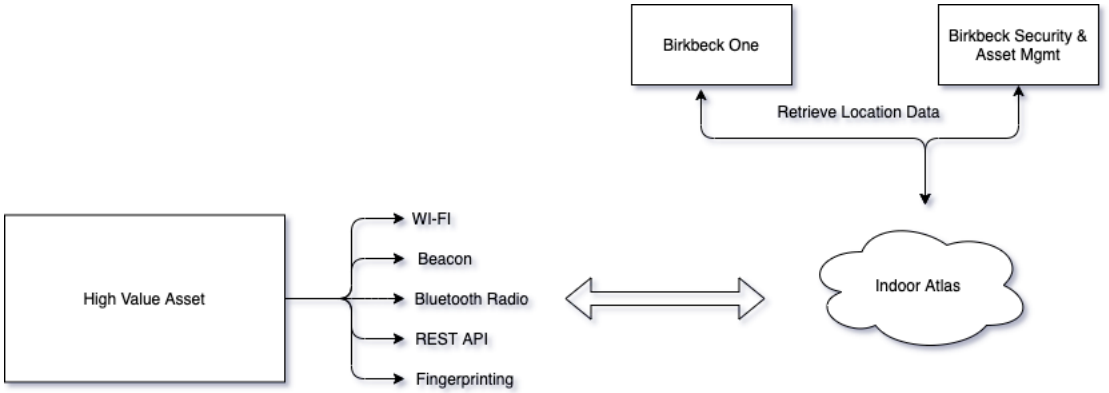


Figure 4

- High Value Asset tracking will be provided via the Indoor Atlas Cloud.
- The asset needs to export its location in one of the many ways available.
- The location data can then be retrieved via the Birkbeck One application and users can use turn-by-turn navigation to find the asset.
- Figure 4 illustrates the expected workflow to achieve these features

Inspection Verification

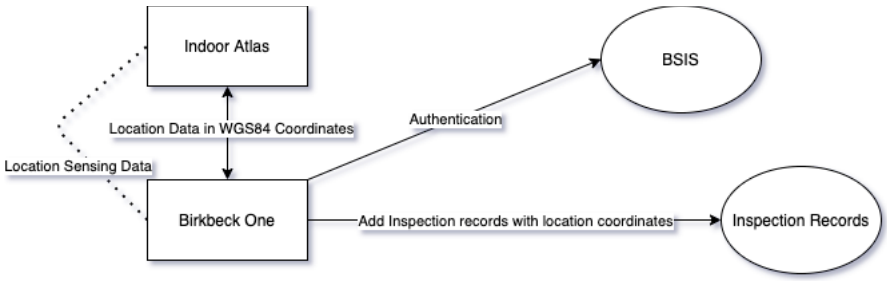
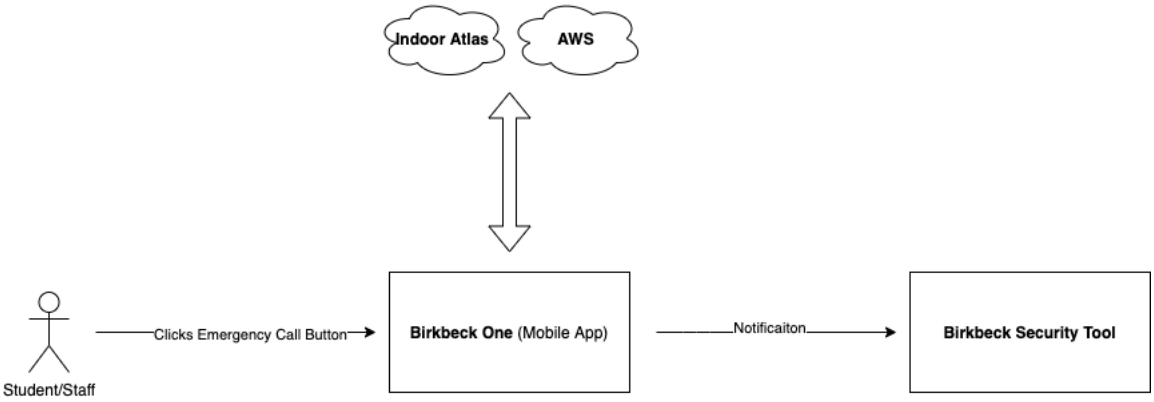


Figure 5

- Inspection verification will use the same workflow as attendance monitoring.

- Records of inspection can be added by the cleaning staff via the Birkbeck One app and the record will have the location coordinates along with the time to verify inspection of the area.
- Additional capabilities like email notifications to the Security Team can be enabled if scheduled inspections have not taken place.
- Figure 5 illustrates the expected workflow to achieve these features

Localization of Emergency Calls



- Emergency call feature will be available on Birkbeck One where students/staff can click a button on the mobile app and Security Team will be alerted along with location information
- The notification will include Name, timestamp and location details of the person who initiated the emergency call.

High Level Delivery Plan

Week	TASK	Details	Participants
1	Initial Discussion with Birkbeck Data Protection Officer (DPO)	V2 Solutions will present the high level plan to the DPO and collect feedback and concerns.	Birkbeck DPO, V2 Solutions
1	Initial Discussion with Birkbeck IT	V2 Solutions will present the high level plan to the head of IT and discuss specifics of requirements and integration with existent Birkbeck applications like Eduroam Wifi, TRM, Tableau,etc	Birkbeck IT, V2 Solutions
1	Initial Discussion with Birkbeck Director of Estates and Facilities	V2 Solutions will discuss current layout and blueprints available to integrate into the solutions.	Birkbeck Facilities, V2 Solutions
1	Create Final Design	V2 Solutions will incorporate feedback collected in the meetings with Birkbeck IT, Facilities and DPO to create a final design for delivering this solution	V2 Solutions
1	Present Final Design	V2 solutions will present final design to the Birkbeck teams and get signoff to proceed.	Birkbeck DPO, Birkbeck IT, V2 Solutions
1	Data Privacy Impact Assessment	V2 Solutions will collaborate with Birkbeck DPO to conduct a DPIA.	Birkbeck DPO, V2 Solutions
2	Build iOS and Android Mobile Applications	V2 Solutions will contract developers to build apps on both platforms as per final design	V2 Solutions, Contractors (Developers)
2	Build Indoor Atlas and AWS VPC	V2 Solutions will build the necessary Cloud Infrasturcture and upload blueprints and integrate with SDK	V2 Solutions
3	Integrate Mobile Application and Cloud with Birkbeck IT	V2 Solutions will integrate newly built solution with Birkbeck applications	Birkbeck IT, V2 Solutions, Contractors (Developers)
4	Initial Testing	V2 Solutions will complete initial testing of overall solution. This will include checking accuracy of the Indoor Location Sensing and all features involved	V2 Solutions
4	Solution Revision	Any improvements needed will be made to improve overall solution	V2 Solutions, Contractors (Developers)
5	User Acceptance Testing	UAT will be carried out along with Birkbeck Teams to confirm all is working as expected. Feedback will be collected if	Birkbeck IT, Birkbeck Facilities, Birkbeck DPO, V2 Solutions
6	Final Revision	Improvements will be incorporated for final revision of the solution	V2 Solutions
6	Customer SignOff	Solution will be presented to Birkbeck for Final SignOff	Birkbeck IT, Birkbeck Facilities, Birkbeck DPO, V2 Solutions
7	Go - Live	Solution will Go-Live on agreed date as per RFP. V2 Solutions will be available for any help needed with troubleshooting issues observed	Birkbeck IT, V2 Solutions
8	HyperCare	V2 Solutions will be provide support for all issues observed for one calendar week post Go-Live date	Birkbeck IT, V2 Solutions

OUT OF SCOPE

- All changes needed on Birkbeck tools will be out of the scope of V2 solutions perview and will be Birkbeck's responsibility.
- Any changes made to college layout post completion of Final design will need changes incorporated into the solution via a separate contract with V2 solutions.
- Managing the solution beyond the HyperCare period.
- The RFP does not confirm the exact method via which track-and-trace will be enabled with Rapid PCR testing, any additional integrations needed for the solution at the time this workflow is decided will be out of scope of this contract.
- Any mobile handset which does not support iOS or Android
- Integration of additional Birkbeck tools in the future

Assumptions

- Birkbeck teams (DPO, IT, Facilities) will participate and extend support during the deployment period.
- Any changes to Birkbeck tools will be done making sure they are backward compatible and do not impact existent integrations with the solution.
- Birkbeck will provide access to V2 solutions and contractors to college premises during the deployment period.
- Birkbeck will cover any additional cost for infrastructure needed to track high-value assets. These may include Bluetooth tags, beacons, etc.
- The solution will store location data of all users for a maximum period of 30 days.

Project Resources and Effort

SkillSet Needed	Company	Expected Tasks	Numer of Resources	Expected duration of Engagement
Project Manager	V2 Solutions	Project Management	1	8 weeks
Cloud Architect	V2 Solutions	Integrate Solution into AWS and Indoor Atlas	1	8 weeks
iOS Developer	Contactor	Develop iOS Mobile App	1	2 - 4 weeks
Android Developer	Contactor	Develop Android Mobile App	1	2 - 4 weeks
Solution Architect	V2 Solutions	Integrate entire solution and workflow as per final design	2	8 weeks
IT Staff	V2 Solutions	Assist with testing and fingerprinting tasks, along with hypercare and Go-Live	2	3 weeks
Indoor Atlas Expert	IndoorAtlas	Consult on final solution before implementation	1	3 consultations before final design

Completion Criteria

The metrics listed below will serve as the benchmark to measure successful completion of the project. This metrics are subject to tests done during the UAT phase of the project.

- Indoor location data is available for all users for a period of 1 month.
- Indoor location sensing works with accuracy of at least 2 meters with a precision of 95%.
- Attendance monitoring works with an accuracy of 99%
- Assistive Services work with an accuracy of 90%
- Inspection verification works with an accuracy of 99%
- Emergency call localization works with an accuracy of 90%

About the Bidder

V2 solutions is an independent hybrid infrastructure and IoT company with emphasis on Mobile computing and Machine Learning. We are based out of London and work with clients across the globe.

V2 Solutions is well poised to implement this solution considering we have spent extensive time learning Mobile computing and the Internet of Things. This included extensive studies on location sensing and mobile application development. We also have considerable experience deploying and managing Enterprise grade Networks across the globe. We take immense pride in delivering our solutions to match our client's requirements and have delivered multiple projects with varied location sensing requirements. A few examples are listed below (client details are excluded):

- Warehouse Wireless Deployment with asset and location tracking. This solution was extensively RFID based with integration into Cisco Meraki's Cloud Managed wireless network.
- Hospital indoor location tracking system. This solution uses wireless fingerprinting to provide location tracking services.
- Integration of manufacturing network (Shop Floor) into enterprise IT network.

We have experience in deploying solutions in critical environments like Shop floors and hospitals which give us extensive skills to adapt our solution accordingly. We recognise the importance of the system Birkbeck intends to deploy and how its availability and accuracy is imperative for the college to reopen face-to-face learning. Our expertise gives us additional skills needed to integrate seamlessly into the existing IT infrastructure of the college.

V2 solutions is a modern consulting company which accepts payments electronically and complies with major regulatory requirements across the globe.

Compliance Matrix

Section (section number of each question)	Section/sub section title (identifies each question or requirement	Page (where each question is found)	Requirement (stated with active verb)	F (fully comply)	P (partially comply)	N (does not comply)	Response Reference (references name and page number of documentation that you supply as part of the response)
3	3.2	4	General Policy Requirements	F			EXPECTED SYSTEM FUNCTIONALITY - Pg 3
4	4	7,8	Confidentiality and Information Governance	F			HIGH LEVEL DELIVERY PLAN - Pg 9
6	4	9	Payment and Invoicing	F			ABOUT THE BIDDER - Pg 11
7	7.1	10	Indoor Location Sensing with 2 meter accuracy	F			INDOOR LOCATION SENSING AND TURN-BY-TURN NAVIGATION - Pg 5
7	7.1	10	Turn-By-Turn Navigation including audio and interactive map	F			INDOOR LOCATION SENSING AND TURN-BY-TURN NAVIGATION - Pg 5
7	7.1	10	Attendance Monitoring	F			ATTENDANCE MONITORING - Pg 6
7	7.1	10	Assistive Services for Blind and Partially Sighted	F			ASSISTIVE SERVICES FOR BLIND AND PARTIALLY SIGHTED - Pg 6
7	7.1	10	Asset Tracking of High Value College Property	F			ASSET TRACKING OF HIGH-VALUE COLLEGE PROPERTY - Pg 7
7	7.1	10	Inspection Verification of public spaces	F			INSPECTION VERIFICATION - Pg 7
7	7.1	10	Automatic Localisation of emrgency calls across the estate	F			LOCALIZATION OF EMERGENCY CALLS - Pg 8
7	7.2	10	Location measurements carried out by device carried by user	F			HIGH LEVEL DESIGN - Pg 4
7	7.2	10	Location estimation performed by device or network	F			HIGH LEVEL DESIGN - Pg 4
7	7.2	10	Record user location for 10 second intervals	F			HIGH LEVEL DESIGN - Pg 4
7	7.2	10	Provide User app for iOS and Android with personalised user experience and authentication	F			HIGH LEVEL DESIGN - Pg 4
7	7.2	11	System shall provide co-presence calculations and full awareness of building features	F			HIGH LEVEL DESIGN - Pg 4
7	7.2	11	Identify proximity of particular users to landmark locations	F			ASSISTIVE SERVICES FOR BLIND AND PARTIALLY SIGHTED - Pg 6
7	7.2	11	Integrate with Birkbeck Applications	F			HIGH LEVEL DESIGN - Pg 4
8	8	12	Mandatory Requirements	F			EXPECTED SYSTEM FUNCTIONALITY - Pg 3