Officer Visibility

Data Analytics Lab

June, 2024

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2 Executive Summary

This report details the development of the officer visibility tool, created with the purpose of understanding how visible officers are to our communities and indicating where this could be improved. For each shift, and each officer, time inside and outside of police buildings[1] is calculated using officer location data obtained from police radios.

The metrics used are: time spent visible to the community (defined as any time spent outside of police buildings), time spent per status (Available, On Route, At Incident etc.), time spent per police geographical region (Local Policing Area (LPA), Sector and Neighbourhood). All of this information should be viewable at the department, team and individual level whilst being able to filter this information by the hour, day and month.

It is acknowledged that this tool will not provide information about the 'quality' of the activity being undertaken whilst 'visible' in the community. This tool is only intended to provide a baseline to inform managers about the proportion of time their teams are spending visible to the community, and any additional contextual information about the nature of the engagement will be generated through the usual supervisory interaction with officers.

With this tool, WMP can quantify and compare levels of police visibility across the West Midlands.

[1] Police buildings refer to to police stations, parade stations, training centre, headquarters and custody blocks.

3 Introduction

This project aims to provide a tool that policing managers can use to understand how visible their staff are to the local community, and to manage their effectiveness and efficiency. This is in line with the new West Midlands Police (WMP) operating model introduced in April 2023, alongside which the new Force mission vows to focus on *'Working in partnership, making communities safer'.* The metrics available for analysis using the tool are as follows: time spent visible to the community (defined as any time spent outside of police buildings), time spent per status (Available, On Route, At Incident etc.), time spent per police geographical region (Local Policing Area (LPA), Sector and Neighbourhood). All of this information should be viewable at the department, team and individual level whilst being able to filter this information by the hour, day and month.

With the availability of this tool, policing managers can drive a performance culture that places value on officer time spent in the community, and better manage their teams' efficiency and effectiveness. Being able to provide data at a team and individual level ensures this evidence can be used to support conversations about individual contributions to the Force strategic priority. The data will also enable managers to identify where there are gaps in our coverage and support strategic deployment decisions. It will improve our ability to provide evidence of officer visibility for local community forums and other partners, in order to instill confidence in the community that the Force is focused on ensuring that a significant proportion of officer time is spent patrolling, engaging and responding.

4 Ethical Considerations

This tool will provide more information than previously available about the proportion of duty time where officers are visible to the communities they serve. To date, it has not been possible to articulate this at an aggregated level for different geographical areas, or to monitor changes over time. In order to understand the context behind any differences in visibility levels it will be possible to interrogate the data down to team and individual level. As with all data relating to individual performance, this data will be used to inform conversations which will consider the wider context of their duties and local circumstances. Only the relevant and necessary WMP employees will have access to this dashboard. Information about officer visibility provided to local communities and partners will be aggregated to geographical areas and will not refer to individual officer or team performance.

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5 Data Preparation

The data sources used were:

- Control Works (the Command and Control system)
    - Historical radio locations (airwaves pings), shift times and statuses (i.e. At Incident). Radio location 'points' given unique sequential IDs in chronological order.
- Fusion (HR)
    - Collar numbers, departments, ranks, and base locations.
- Maps created by WMP Geospatial team:
    - Neighbourhood boundaries, see Figure 1
    - Police building locations. Point geometries buffered by 50m to obtain circles which contain and represent the buildings, see Figure 2. High value of 50m chosen due to poor radio accuracy within buildings.

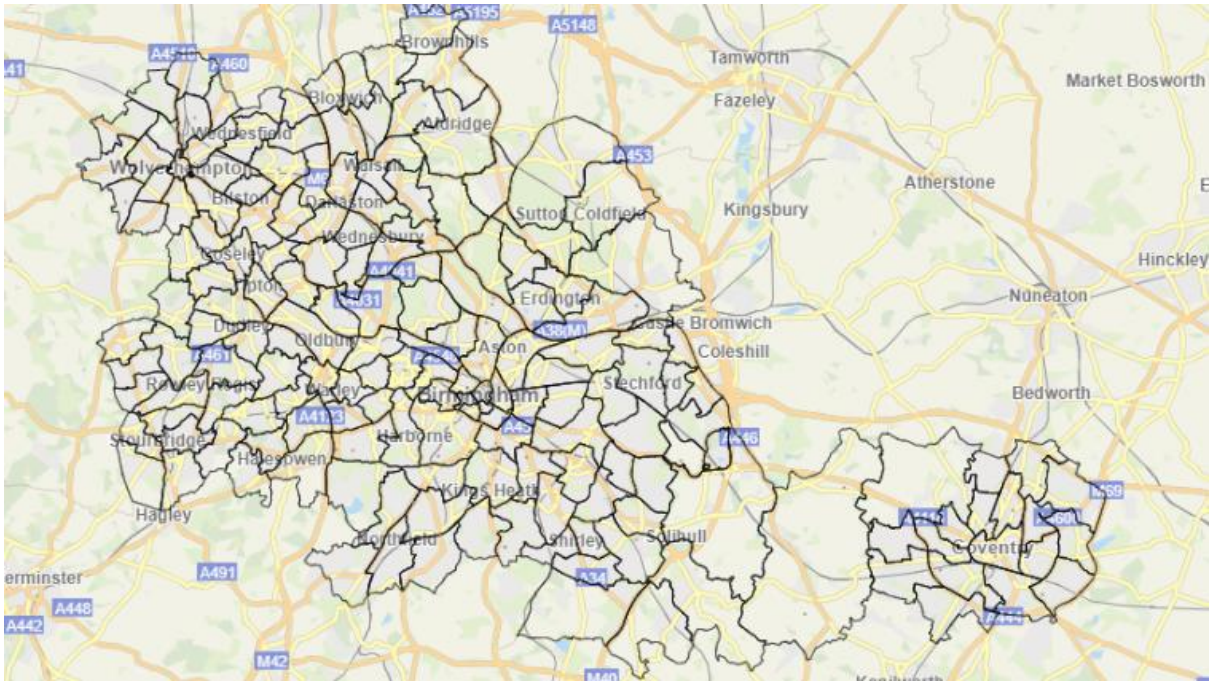

Figure 1 – The neighbourhoods.

Figure 2: The properties

5.1 Methodology

The diagram below illustrates the process of calculating time spent visible to the community. The method involves drawing lines between each point for each shift in chronological order. Intersections (i.e. point 1.01 in Figure 3) are created where these lines cross neighbourhoods or property shape boundaries, with geometric operations used to find their coordinates. Proportions are used to estimate the time of the intersection. This proportion is taken as the percentage of the way along the line an intersection occurred. For example, in Figure 3, if the distance 1.00 -> 2.00 is 100m, and 1.00 -> 1.01 is 60m then the proportion would be 60/100 = 60%. The elapsed time between the original points (i.e. 1.00 and 2.00 in Figure 3) are calculated by using the datetime recording attached to the original location points. If these times were 9:00 and 9:10, the time would be 10 mins. 60%*10mins = 6mins. So, the estimated intersection time would be 9:06.

With the intersections found, the lines joining the points are created. Due to the lines being created after the intersections, every line is completely inside a shape (property or neighbourhood), with no lines crossing shape boundaries. Each line is then geospatially joined to the shapes to identify, for each line, if it is in a building, which one it is in, and which neighbourhood. The 'elapsed time' to travel each line is also found using the datetimes of the start and end points. From this many metrics can be calculated such as the percentage of time in the community as the total 'elapsed time' of lines outside of properties divided by the total 'elapsed time'.

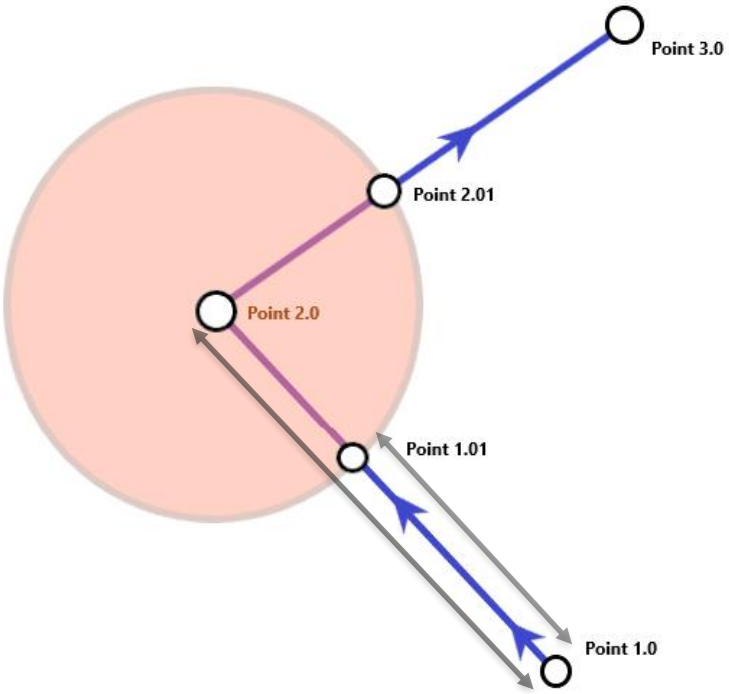

Figure 3: Illustrating the process used to calculate visibility

As airwave ping locations can be inconsistent due to environmental obstructions such as inside buildings there were situations of occasional airwave pings jumping outside and straight back inside buildings. Another inconsistency noticed was officers passing by police buildings being classed as inside. These are depicted in Figure 4. This led to the rule that, if the time outside or inside was less than 5 mins it would be reclassified as the opposite. This also means that less than five minutes outside of a property is not reasonable enough time to be classed as being visible.

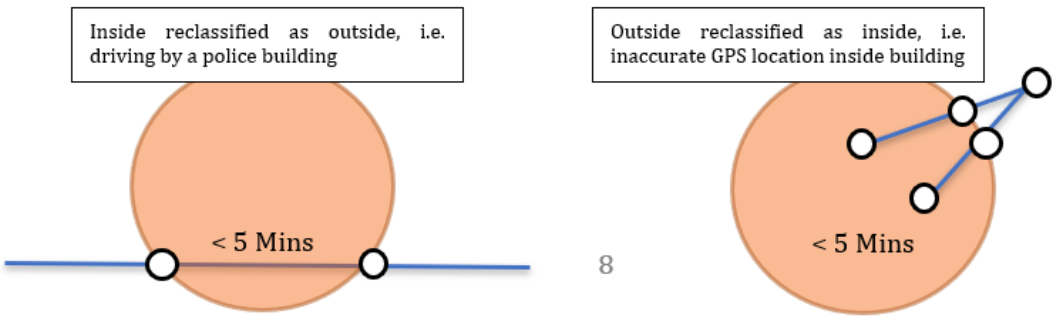

Figure 4: Reclassifying inside lines[2]

[2] Reclassifying inside lines to outside if the time they are within is less than 5 minutes, and the process behind converting outside data points to inside if they are outside for less than 5 minutes. This satisfies cases of officer movement that passes by buildings falsely being attributed to being inside a building and situations involving inconsistent radio location data.

5.2 Dashboard

A dashboard has been created to present the results. The dashboard consists of four pages, the contents of which will be explored below.

The main focus being a map, with shapes of the neighbourhoods in the WMP area, that depending on the concentration of time spent visible to the community, would be shaded different shades of the same colour to create a *choropleth map*. The rationale behind this lies in the ease of understanding visually which areas are receiving different levels of patrolling time prior to focusing in on any detailed numeric analysis.

5.3 The Front Page

The front pages contain information about recent updates, fixes and changes, as well as the current version of the dashboard. Information is provided about who to contact in case users have any feedback and the general purpose and intention behind the dashboard. This page also includes the earliest and latest date included in the data, and the number of days of data currently held. If there are any major data ingestion issues, this will be presented on the front page to make users aware of any inconsistencies in the data, or that the data may not represent current performance.

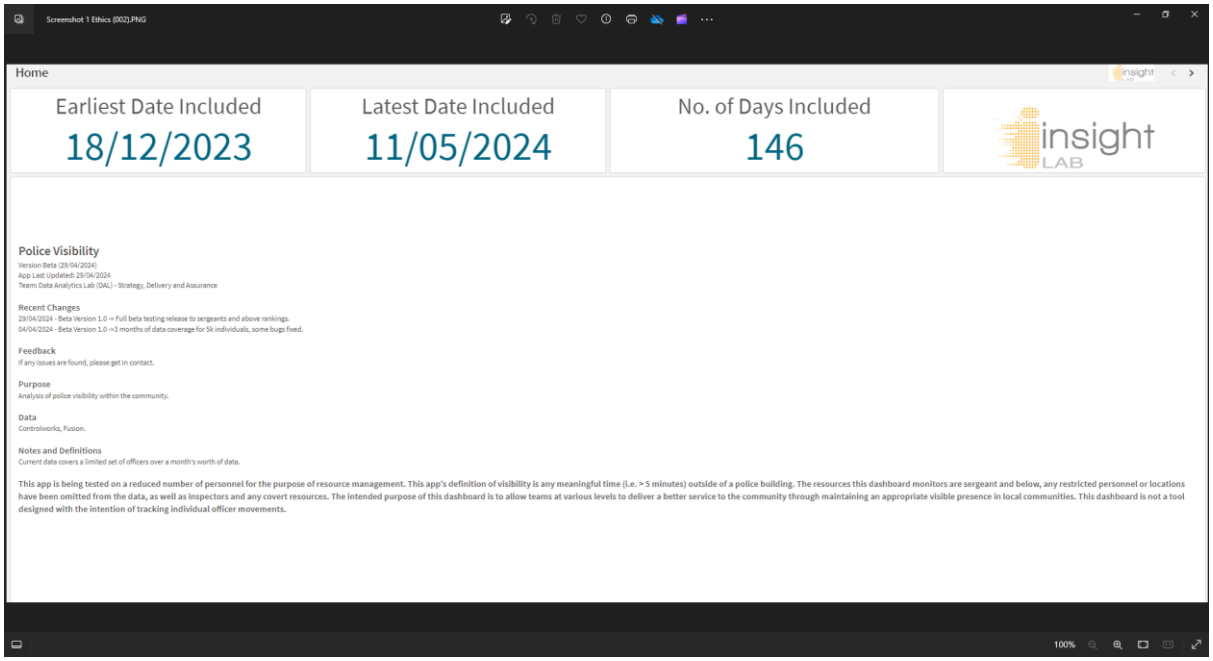

Figure 5: Dashboard front page

5.4 Map Page

The map page's central element is a choropleth map. It has shapes of the neighbourhoods in the WMP area that, depending on the concentration of time spent in the community, would be shaded different colours. In addition to the neighbourhood shapes, there are smaller orange dots that represent locations of police buildings.

At the top of the page, there is a date playthrough bar (applicable from individual level upwards) that when activated, performs an automatic playthrough each day in the

sample, updating the choropleth colours, so the user can observe changes over time and use their findings to make future deployment decisions.

On the right side are two key performance indicator (KPI) boxes that show the number of individuals in the sample, and percentage of visible community time. Below this is the filter section, with filter buttons organized by individual focus and geographic focus, the former having options to filter by collar number, job title, team, department, status description and grade rank, and the latter allowing users to filter by specific buildings, neighbourhoods, LPA level filtering and sector level. To the right of the individual and geographic filters is a date filter that allows for specific date selection, a drop-down to select which specific month to filter data by, or the option to filter by hour, to select every instance of pings at the 01:00 hours mark, for example.

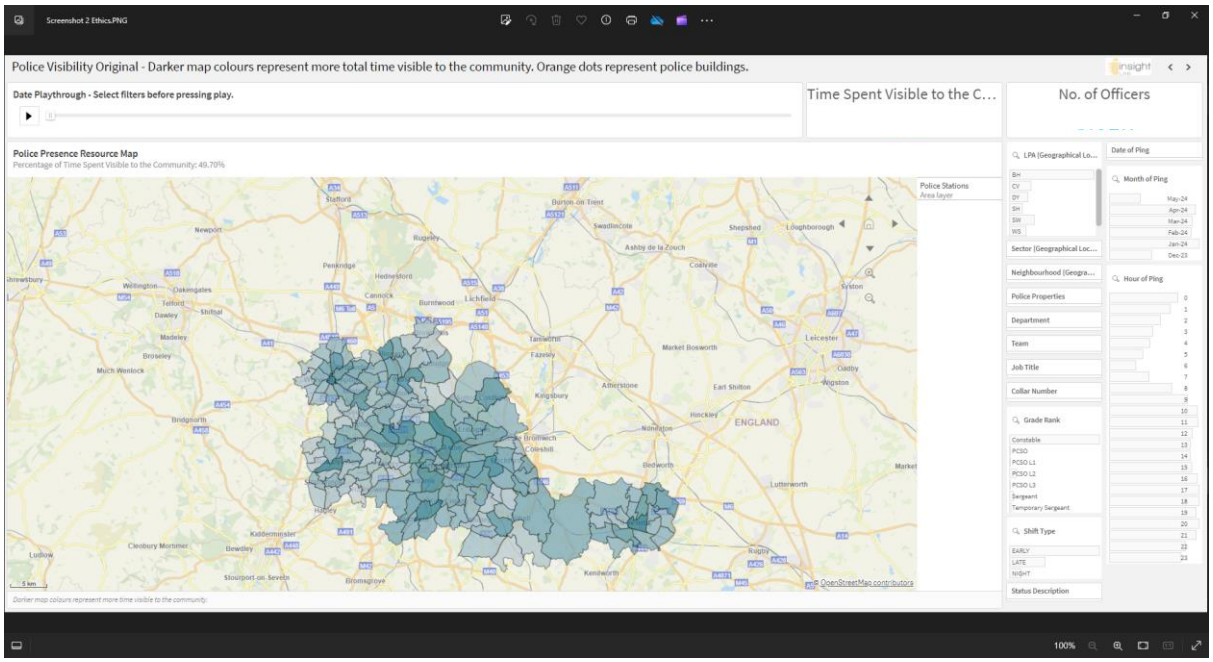

Figure 6: Dashboard map page

5.5 Visibility Metrics (Totals)

The visibility metric page contains a line chart showing total time spent visible to the community over time at a team, department, individual or neighbourhood level and from hourly, daily, weekly or monthly views. Each point on the line chart is labelled with the total time in that data point and individual points can be selected to show all teams/departments/individuals associated with that data point.

A bar chart at the bottom of the page shows total time spent visible by each team for comparison, and on the right side, similarly to the map page and concurrent throughout the dashboard are the filters for fine tuning data presented in the graphs.

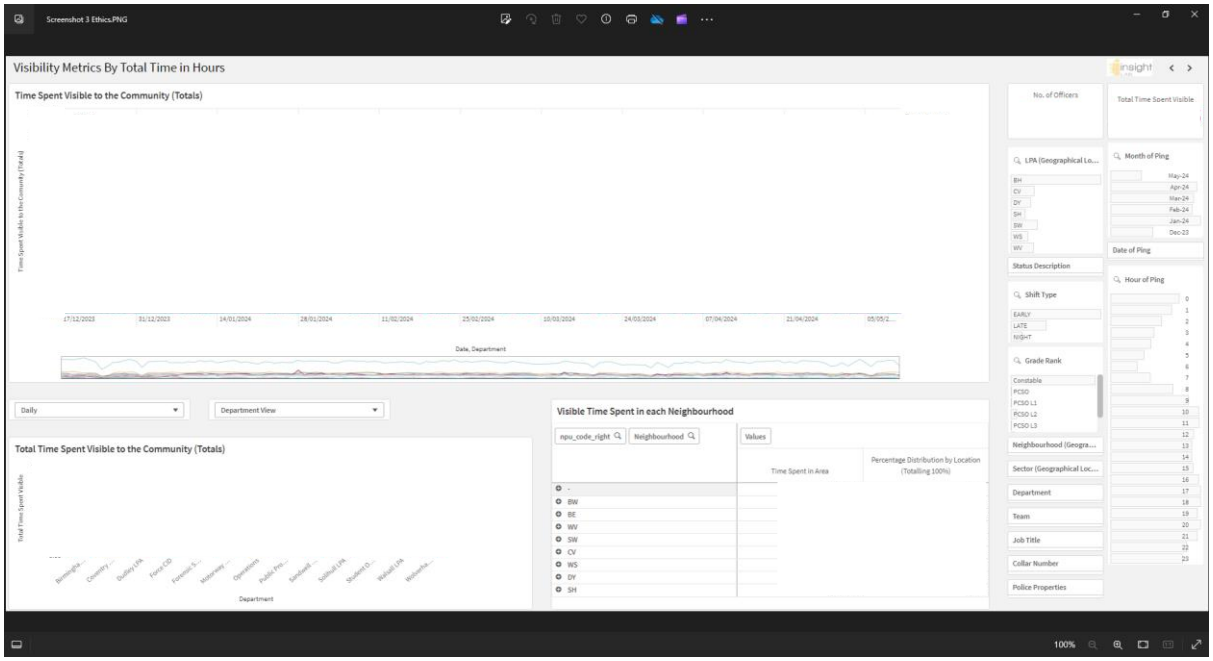

Figure 7: Dashboard metrics page

5.6 Visibility Metrics (Percentages)

This page shares the same features as the totals page except all data is presented as percentages outside in the community, for an alternative perspective on visibility data. Unlike the page before however, the bottom of the page features a pivot table displaying total elapsed time in each police building, and the percentage of time spent in each.

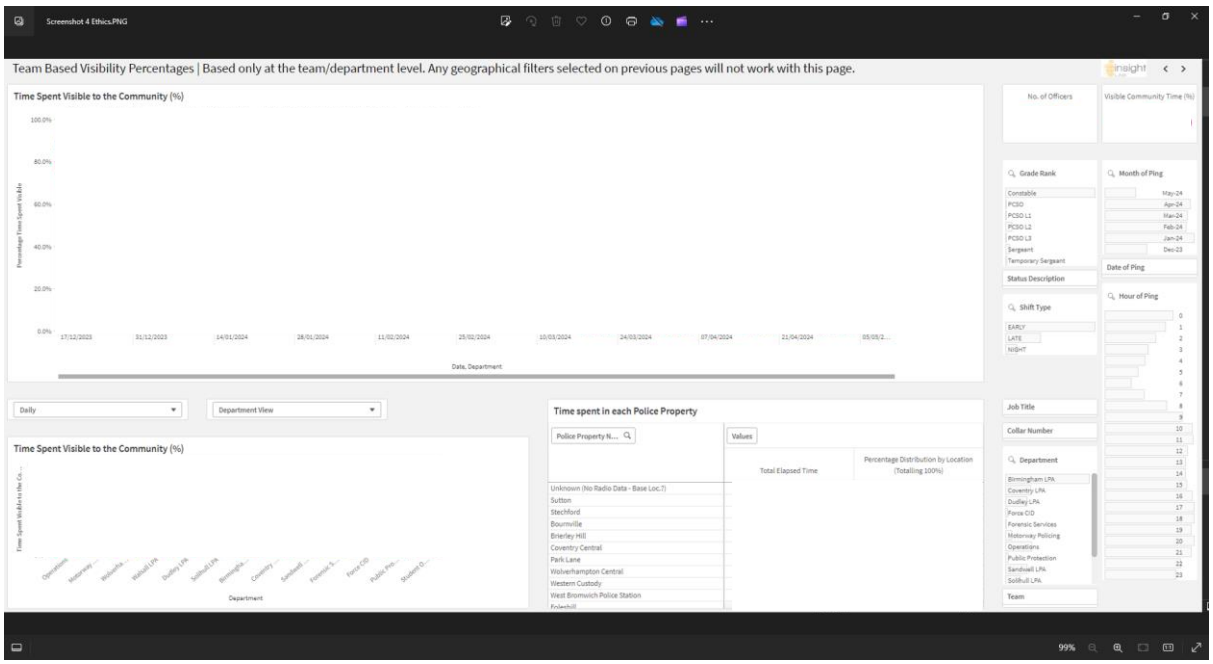

Figure 8: Dashboard visibility proportions

6 Development and Testing

Throughout development manual checking was done to ensure the process worked as designed and any inconsistences, such as those discussed earlier, discovered and corrected. The dashboard testing was carried out predominantly by one inspector, a member of the Performance Team and the members of the Data Analytics Lab (as part of the alpha testing process). The testing and feedback have helped ensure the dashboard answers the right questions and is functional. Feedback from the early stages of beta testing to this point has been suggestions about the usability of the app, with much of the feedback involving suggestions for new layers of data to include.

7 Training

Training sessions will be held with sergeants and above (one session has been undertaken to date which was attended by over 100 people). These sessions will guide users on the dashboard's intended use, how to navigate it, and the kind of results and analyses they can make using the dashboard. This will also give users the opportunity to ask any questions they may have concerning the dashboard, which will in turn help the development and testing process of the dashboard.

Multiple training sessions will be run. The benefit to having multiple training sessions, besides being able to include as many potential users as possible, lies in being able to improve each subsequent training session's usefulness by covering any topics that seem to repeat themselves within user queries.

Training material will be shared with all users.