SRML Contact Tracing & Attendance

MAC Address Tracker

The best, most state-of-the-art, affordable, accessible and powerful technology to embrace for our leagues contact-tracing purposes would be an incredible and massively under-utilized technology known as BLE Pairing. BLE stands for Bluetooth Low Energy. It uses a devices Bluetooth antenna to send packets of information directly between two devices without using the Internet to route the data.

SRML should pioneer a custom android/iphone app that allows a players phone to briefly connect to our hub-device in the background using the BLE protocol and log their arrival by sharing their Bluetooth MAC Address during the pairing attempt.

Some definitions, FAQ and a diagram (page 6) are below.

Here's a little more detail on how this system might work:

1. The team captain starts by entering the team name, along with their players names, email addresses and phone numbers.
2. Our system emails and texts each player a short alphanumeric code along with a link to our Android app in the Google Play Store and our Iphone app in the Apple App Store.
3. Each player downloads and install our app on their phone.
4. When they first open the app they are asked to provide the alphanumeric code along with their registration information. That links them to their team, division, full name, photo, email, jersey number and phone number. The app then reads their phones Bluetooth MAC address (internally, auto-magically without need for the player to copy it in to a field or even allow it to be read!) and then links this MAC address identifier to the srml players record.
5. The SRML has one hub-device at each building. This device could be an SRML-owned tablet or simply the score-keepers phone running a separate version of the app. The separate version is a 'MAC Address-Pairing Logging System'.
6. When a player arrives at a game location they open their app and turn on their Bluetooth antenna. Their phone sends out pairing requests for a few minutes when it's first activated. The outbound data packet of that pairing request includes the MAC address of the players phone. It gets sent to all nearby devices that may have their Bluetooth antennas activated, including our hub. Our hub makes a log of the pairing request. The log consists of the time, location and MAC address that attempted to pair.
7. In the event of a positive covid result we could then compare the 'Pairing-Attempt Log Times' of Patient Zero with other users who paired with our hub around the same time.

In short, MAC address pairing-attempt times and location log data would allow us to trace the MAC addresses of others who were present (made a pairing attempt) at that same time and location.

Our app would also have:

- All current Sport Report functions (schedule, news, scores, captains manage rosters)
- a player profile page of all career stats
- page to manage details (name, jersey, photo, email)
- page to manage their app password
- page to report a positive covid result
- a private message board for internal league discourse
- push notifications of a players next upcoming game
- push notification for their game results.
- page to manage notification options

Definitions

MAC Address
Media Access Control address is a unique identifier assigned to any and all network interface control hardware that is built for use on a network. This address is used in communication protocols including IEEE 802 networking technologies, Ethernet, Wi-Fi, and Bluetooth. It is a unique ID number for the exact hardware component in any given phone.

Just to be clear, this MAC address ID is unique to an exact phone, not just across different brands and models. Two identical phone models will have different MAC addresses. They are unique to the exact device or component. In our case, the Bluetooth component that is separate from the devices main motherboard, is made by a separate company and has its own MAC address. So a device that has several media controllers built in to it (cellular, wifi, Bluetooth, infrared) may have several different MAC addresses, one for each component. For our purposes we will be using the Bluetooth MAC address identifier because that's the antenna we'll be using to make the log on our HUB device.

Bluetooth, BLE
Bluetooth is a short-range wireless technology used for exchanging data between fixed and mobile devices over short distances using UHF greater than 2.402 GHz. It's typical range is between 10m up to 100m (30-300 feet).

FAQ

What if a player gets a new phone with a different MAC Address?
If they get a new phone they can log in to the app and click on 'update MAC address'. The app will read the new phones new MAC address and update the player record automagically.

What if they forget their phone or the battery is dead?
Although in this day and age, it is a rare occurrence when a person does not have an active cell phone on their person, we could simply deny access to the gym and basically make it a requirement to have a

charged up, app-registered, Bluetooth activated phone to play in our basketball league. Or we can build in to our current system, the ref checks the ID and the score keeper updates the 'players present' data through the 'Receiver Version' of the app. Also as a backup system, we can include in the contact tracing reports 'players who's MAC address is not logged but they do have points recorded in their game stats'.

Do all phones have Bluetooth?
Pretty much, yes I would assume at this point that 99% of phones in use today will have Bluetooth antenna.

Will MAC address logs be protected?
Our MAC Address database will be kept offline and only used via a special access key in the event of a positive covid result by a member of our league or its support staff.

Does the receiver device require Internet access?
No, it doesn't need Internet access while at a location. This is another positive aspect of this method. It can be synced to our main central 'mac address connection log' the next time the device is connected to the Internet. Also, because BLE is direct from device-to-device, a data plan is not needed by the players or scorekeepers phones, nor is it required to have location services activated by either phone. Other contact-tracing apps currently available cannot offer this 'offline' tracking ability that our app could.

Are the devices constantly 'talking' back and forth?
Although we could have the connection log monitor the entire time a device is within range by 'pinging' MAC addresses every few minutes, I think it would be sufficient to simply log the first connection time then black-list the MAC address for a while so no more connections are made between the player and the hub. Then it would be safe to assume the player is at the location for a pre-determined amount of time (1.5 hours after they arrived; 45 minutes after their game ends; 2 hours after their game time starts). This would save battery on both the hub and each players device.

How do players know if they've checked in?
SRML HUB MAC addresses will be accessible through the app on a players phone. A player walks in the gym, their phone attempts to pair with the hub. The players app knows the MAC address of the hub so if the players Bluetooth pairing log contains the MAC address of the hub then it will know it has attempted to connect to the hub and the app screen can then report to the player that they have 'checked in for this game'. Players are then welcome to disable their Bluetooth antenna at that time. Bada bing, bada boom.

As a double-check, the score-keeper views the receiver-hub app data and it tells them that it has recognized pairing attempts from 7 players from Team A and 9 players from Team B at which point the score-keeper then counts the players on each bench. We should be good to go, if all goes well, the data will match the players present. Players are then welcome to disable their Bluetooth antenna at that time.

If the player count and connection log does not match, then when game data is entered the system will compare with the connection logs and player MAC addresses and email the player(s) whose phones did not connect, providing them with futher detailed instructions for configuring their phones for broadcasting their MAC address to our HUB.

What type of reports are possible with the acquired data?
By simply logging arrival (as first pairing-attempt time) and extrapolating departure time, we could create detailed and accurate contact tracing reports (in real-time if the hubs are Internet-connected) for our league membership and execute fast, accurate communication to the necessary people in the event of a dreaded positive PCR Covid case reported within our league or supporting staff.

Would app users who are wanting to check in at a location, do their devices need to have Internet access?
No, Our app just needs the Bluetooth antenna activated and broadcasting its MAC address for a few minutes in order to capture the log in the SRML HUB connection log data. In order for a player to receive their push notifications though, they need to be connected to the Internet either through wifi or a cellular data plan but this is normal.

What about others in the gym such as score-keepers, refs and fans?
We could also include referees, score keepers and even fans in our apps contact tracing ability. They would start by downloading our app and registering an account on their device.

I think we should first provide them with an 'unlock' (alphanumeric) code that could be generated by our app. I think we require a coded system because it would be much easier to keep it secure if it is restricted to our community by way of a registration access code.

The entire referring association could use the same unlock code that could be distributed to their members by their executive. We could notify our players of a 'fans code' or a separate code could be generated for teams and displayed within the app for each player. We could also provide a link in the app that is customized for each player where they can 'send an invitation' to a game, or issue 'season passes' to over-zealous wives! We could even offer a limited number of invitations for each player such as X number of fans per-game, per-month or per-season.

What are some other positives aspects of this method?
In my opinion, for the task of contact tracing, utilizing this approach is the most seamless, eco-friendly, high-tech, long-lasting, least invasive and accurate solution for our league. It is also the least labor-intensive for everyone - just turn on the app and walk in the gym and from that moment on, Big Brother is watching you… what could be easier than that?!

Detailed, Real-time Reporting
Much could be done with the data including multi-step 'bubble lists' where we could mine the data for 'persons who were in the building on a certain day', all the way down to a certain +/- 15 minutes.

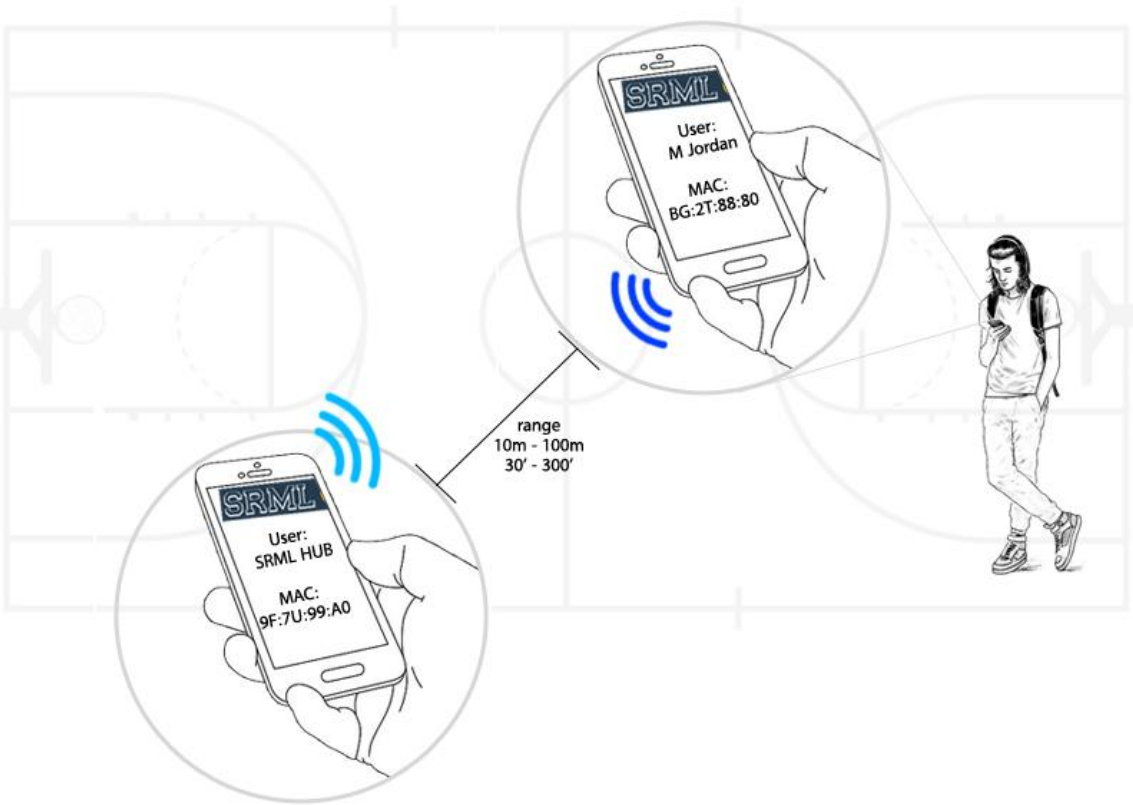
We could create a report such as a ‘tracking tree’ where we could track back one or more ‘steps’ (game before, game after, all day), and trace the data back several days or weeks. For example, use search parameters like ‘show all MAC address users at Walter Murray on Feb 15th between the hours of 2-4pm or Feb 22nd between the hours of 12-2pm (when Patient Zero was in attendance and possibly contagious). We could then create contact lists (email and cell phone number) from the results of these search parameters.

Costs

This includes development and launch of an SRML Sport Report, MAC Address logging, contact-tracing, game attendance app. This includes bridging all current SRML Sport Report data in to an app such as schedules, player/team/career stats, standings and archived season data.
$3600

Yearly Up-dates and Maintenance
$500

* Diagram on next page



1. SRML HUB MAC Pairing-Attempt Log Data

MAC	Location	Date-Time
BG:2T:88:80	WM	03-26-2021 13:24:18
T8:55:7J:09	WM	03-26-2021 13:26:56

← Arrival Time of MAC BG:2T:88:80 to WM

All SRML Location HUBS push their daily logs up to the central database when connected to the Internet

2. SRML MAC Pairing-Attempt History Log Data

MAC	Location	Date-Time
BG:2T:88:80	WM	03-26-2021 13:24:18
F8:EE:33:56	AB	03-19-2021 09:19:50

← Record of Arrival Time of MAC BG:2T:88:80 to WM

Search the data for time-date results gives us a list of MAC Addresses
Reference the MAC Addresses from our app user MAC Address records

3. Player & Other App Users MAC Address Reference Data

MAC	Player ID	Player Name	Email
BG:2T:88:80	682	M Jordan	m.jordan@...
T8:55:7J:09	543	S. O'Neal	shaq.o@...

← User Details for MAC Address BG:2T:88:80

Make multiple contact lists from the time-date search results

4. Player Details Contact Lists Compiled

EMAIL
m.jordan@bulls.com, s.curry@warriors.com, l.james@lakers.com

SMS / TEXT
306.555.1234, 306.555.2345, 306.555.3456

Send SRML an Image of a Location QR Code in a Text Message

Create a simple way to connect a player to a location, date and time and create a log for this 'check in'. The score-keepers 'print score-sheets' area would also generate a unique QR Code for each SRML location. This QR code will be posted at several spots in the gym (taped on the wall). We would require players to text a picture of the QR code to an SRML number each weekend as they arrive at a location for a game. This would create a log of phone numbers, locations (decoded from the QR image) and times (time the message is received by our phone). We could use this along with reference data (players required to enter their cell phone number when they register on SRML.ca) to create 'player/location arrival time' logs.

This method would produce the necessary data required for contact tracing. It's simple and effective. It takes a little more effort from score-keepers and players and a little extra cost to maintain a cellphone number, but it would be just as effective as MAC address listings in terms of accuracy in reporting and contact-tracing..

Here's a little more detail on how this system might work:

1. A score-keeper would print some copies of a full-page QR code for their SRML location (ex: Walter Murray) and post them at the entrances, score tables and benches each weekend. In that QR code is embedded data that the computer can read to determine the location.
2. A player enters the building, activates their text messaging app
3. Composes a new message to the SRMLs receiving phone number
4. The message consists of just an image of the QR code
5. Our League text number receives the message and makes a log in the web site database of the senders number, location, time and date that the message was received.
6. The website also logs the image exif information which can be used to verify certain aspects of the image such as 'date created'.

Couldn't someone text an image to another member of their team?

Due to the purposes of this process (notifying someone of a possible covid link) I don't know why someone would want to be contact-traced to a time and location at which they weren't present. We could still use game stat entries when it comes to determining a players play-off eligibility. We could use image EXIF information to check for duplicated images that were possibly sent between players.

What is EXIF information?

It is hidden information embedded in most images by the digital camera software. It can include a lot of information about the image (lighting, contrast settings, etc) as well as information about the camera and phone! The details that are included in any given images EXIF information can range from a little to a lot depending on what EXIF details the camera software settings are configured to embed but it usually includes a high-priority tag called 'DateTimeOriginal'. Using this information we could tell if an image was copied or sent to another user for submission to the league phone number.

Costs

For development and launch of an SRML Sport Report, QR Code logging, contact-tracing, game attendance system.
$2200

Yearly Up-dates and Maintenance & League Cellphone Number
$500

* Diagram on next page

1. SRML Phone - Remote Location Receives Text Messages from Players

2. SRML Text Message History Log Data

	Location	Date-Time
306-555-1111	WM	03-26-2021 13:24:18
306-555-2222	AB	03-19-2021 09:19:50

← Record of Arrival Time of 306-555-1111

Search the data for time-date results gives us a list of cell phone numbers
Reference the cell numbers from our SRML Player data

3. Player Reference Data

	Player ID	Player Name	Email
306-555-1111	682	M Jordan	m.jordan@...
306-555-2222	543	S. O'Neal	shaq.o@...

← User Details for 306-555-1111

Make multiple contact lists from the time-date search results

4. Player Details Contact Lists Compiled

EMAIL
m.jordan@bulls.com, s.curry@warriors.com, l.james@lakers.com

SMS / TEXT
306.555.1111, 306.555.2345, 306.555.3456