1 Introduction

* 1. Background

## Assumption

1. Solution Overview
   1. Motivations
      1. Slogans

The emergency/issue option will be useful when a person adds all the people who sincerely extend their support. Classic example “beta koi bhi dikkat ho to zaroor batana”.

Add a lookout mode (watchout for me, or watch my hangout) in addition to the emergency mode in which the location of the user will be sent at a slow period say every 10 minutes and the recipient (parents) can track the person and see if the location deviates from what the person has told.

* 1. Implementation
     1. Design Flow
        1. Configuration Management

The mobile app should fetch the static configurations from the server whenever main activity is loaded provided the older configuration is more than 4 hours old.

* + - 1. Login/Registration

**Registration**

Fields required for registration

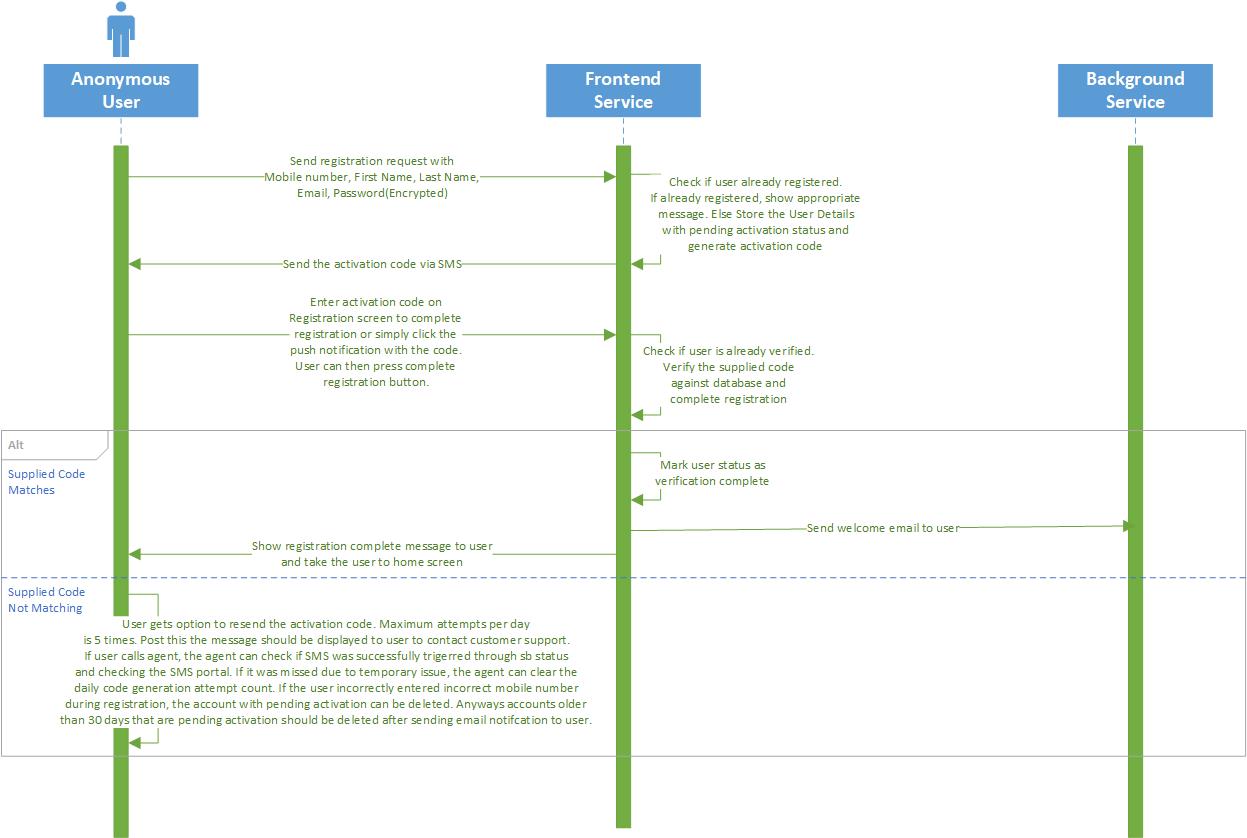
1. Mobile number: Mobile number would be used for searching other members registered on the app. It is the primary identifier of the user. It is easy for a user to search another member using a mobile number as the user can simply search the contact list for the target user. While searching another member, the user cannot see the picture or name of the member being searched for security reason, in case a person who is trying to save herself/himself from another person or group. Once the user adds the target user, and the target user accepts the request only then the member addition would be completed and post this the user’s profile pic and name would be visible. This ensures photo not being shared to unknown person. Also, user’s presence in the system is not known until the target user accepts the other person. Also, the member addition request should auto-expire in 24 hours. The target user should be shown a message that request would expire in 24 hours, so no action needed. Explicitly user can delete the request, but the sender should not be shown the request as deleted until 24 hours. This ensures that the client does not know whether the other user is in the system. If a user is not in the system, an SMS should be sent to the user with a link to the app and a pending member request should be associated to the mobile number in database. At the time of user registration, once the user registration completes and pending request should automatically be added to the request list provided the request is less than 24 hours old. Push notification does not require the mobile number as the notification can be sent using registration id that is present at the time of device registration. Once the user logs in, there should be an option to logout after which the user needs to login. However, if the user does not log out, then the app will keep performing the log in every time user accesses the app and if the auth token is expired.
2. Email: If the user updates his phone number, email can be used to fetch the list of associated members and to auto-add the user to the member-list of other users based on previous setup. Additionally, if an existing member has been inactive for a long time because of a number change, that user can be sent mails to indicate the account would be marked as inactive. This is helpful in scenario where a new user gets a mobile number that was used by an existing user. Then the new user cannot use the existing number until it has been released. In this situation, the existing user can be sent email regarding the deactivation of the account and releasing the number.

Password: If the password is not there, then any user who knows how the request is formed at the mobile end, can just replace anyone’s mobile number and mimic the request to the server. On client side, there are very limited ways of protecting the code.

Optional fields that can be set post registration

1. Profile picture

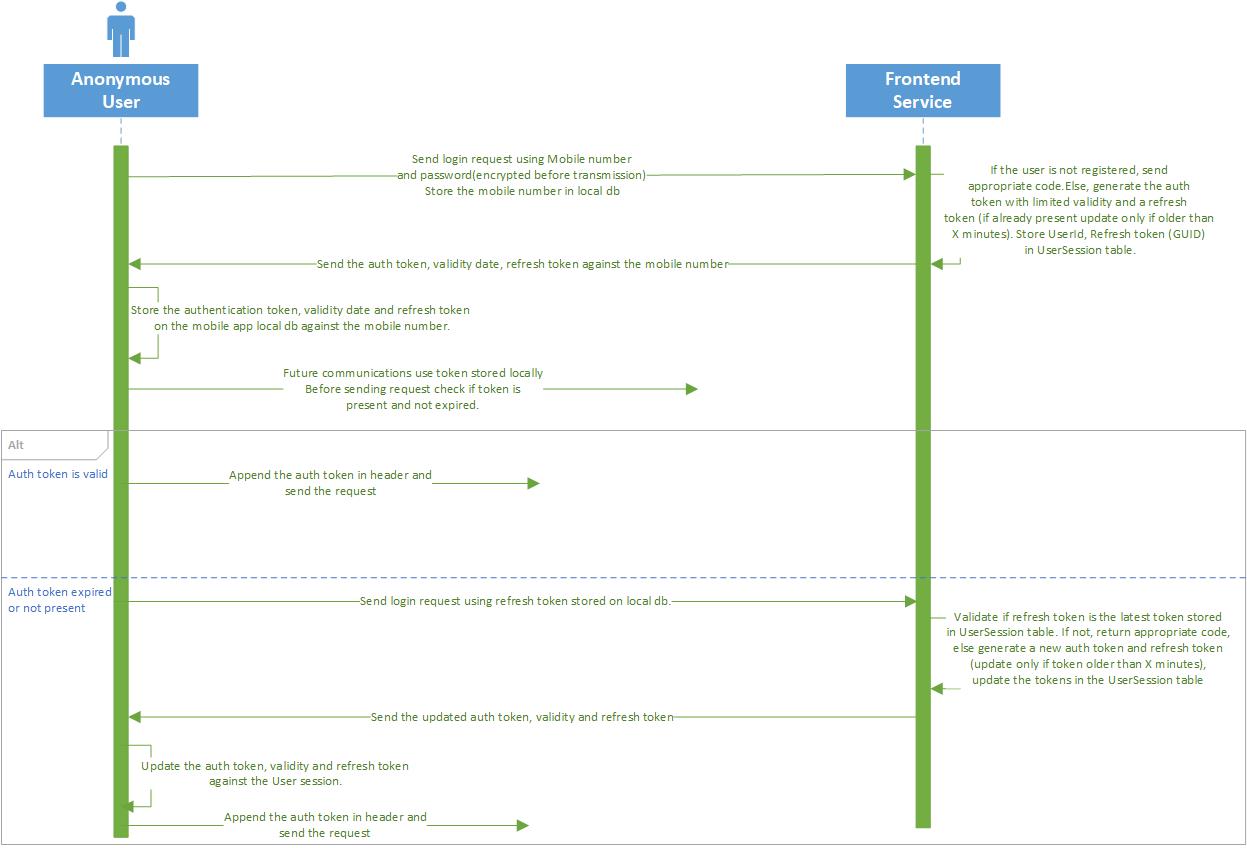
Below is the flow for user registration



1. User clicks the registration button on app and user is taken to the registration page where the mobile number auto populates and user is not allowed to change it. User needs to fill in the email, first name, last name and password. Then user clicks the Register button.
2. A request is sent to server. If server is unavailable or mobile data/WiFi is unavailable, then user should be shown appropriate message.
3. Thereafter, the server stores the user mobile number, email, First Name, last Name and password(hashed) with pending verification status and generates a 6 digit alphanumeric verification code against the user. This code is sent using SMS and push notification.
4. User can click the push notification to reach the app where mobile number is auto-populated and code is populated from the push notification intent.
5. User can then click on complete registration. At this point, the mobile number and verification code is sent to server and server checks if the code is valid, then it marks the user as registered and sends a response as successful along with the authentication token valid for 24 hours. Thereafter, a successful registration email is sent along with a link to verify the email for retrieving account in case of changed mobile number.
6. Once mobile app receives the status of registration as successful with the authentication token, then the auth token is stored in the local db and used for further communication.
7. In case the user enters incorrect verification code, user is given max five attempts per code. Additionally, user is allowed to resend SMS maximum of 10 times with minimum interval of 1 min per day. Post these attempts user is displayed a message to contact the call centre. Any account that is in pending activation state for 48 hours is deleted sent a mail regarding deletion of account and additionally call centre can call the target user. Once the mail has been sent and user has been contacted or user is unreachable, then after 5 days, the pending account should be deleted.

**Login**

Below is the flow for user login:



1. Users logs in using the mobile number (any) and password.
2. The mobile number should be stored on the local db (UserSession table) of the mobile app.
3. Server validates if the user is registered. If not, error code is returned back to the mobile app and the mobile app displays the appropriate message to the user.
4. If user is already registered, the auth token is generated for the user with a validity of 48 hours. Also, a refresh token is generated for the session. The refresh token does not have a validity and if the refresh token is already present in UserSession on server, then the refresh token is regenerated only if the last refresh token generation time is more than 10 minutes older. This is to handle the scenario where the user clicks on login multiple times and race condition leads to generation of multiple refresh tokens where the mobile app gets the older token.
5. Server sends the auth token, token validity date, refresh token to the mobile app against the mobile number.
6. Mobile app stores the auth token, token validity and refresh token in it’s local database against the mobile number.
7. This token is used for all further communications.
8. If the token has expired, then every web call would require the login operation using refresh token to be performed before making the mainstream web call.

**User login from another SIM**

User should be allowed to login to the app from a mobile having different SIM than the registered SIM as user may have a requirement of seeing the status of the group member in case of an emergency and the user may not have access to the mobile. However, during registration of the user, the user should use the same mobile on which the app is installed as this ensures that someone is not faking the mobile number of another user who has access to someone’s mobile momentarily. Reset password should send the temporary password on the user’s registered mobile number.

**Authorization Rationale**

1) Make sure that the token is not tampered with by checking the signature. As the key is only with the server, we can be sure that the signature is not manually created or tampered.

2) If the token is compromised (picked up by anyone), the token should not contain any information that can be used to identify a user. Make use of UserUniqueId, expiry period, UserId(for easily fetching the user and providing an additional check apart from UserUniqueId) in the token.

3) Mobile app can make use of token expiry date/time to identify if the token is still valid.

4) The mobile app should store the token and the expiry time from the login response in a local variable. The response code from login will be used to decide whether to fetch a new token and whether to show the login screen or activation screen.

1. Should we use the refresh token or hashed password to get the new token. - Using username and hashed password, if sniffed gives user detail information for future hacking. If only refresh token is hacked, it can be used for only one time login. Provided the real user has not already logged in. The refresh token should be provided only in case of a login call and there should be a provision to revoke the token. All the revoked tokens should be kept in the REDIS cache for quick access.

While generating a token, the algorithm/Hashing technique should be encoded for decoding purpose.

Use TLS (Decide the version)

Hashing is faster than encryption, so do not store sensitive data in token and hash it. Also, symmetric encryption is faster than asymmetric encryption.

Hashing should be used to store the passwords. Additionally store, what algorithm has been used to hash the record.

* + - 1. Group Management

User can create groups. While creation there can be an option to make the group public. User can edit a group to make the group public/private. Public groups can be searched by others for taking help from the public group. If a person makes a group as private, the existing shared data (eg. Shared emergency sessions) will still be visible to the group administrator, however, the group will not be visible to the public. To make a public group or to make a group public, the name of the group should be unique amongst all the public groups. A filtered unique constraint can be defined on the database for the same. The creation or edit of a group should occur in connected mode on server.

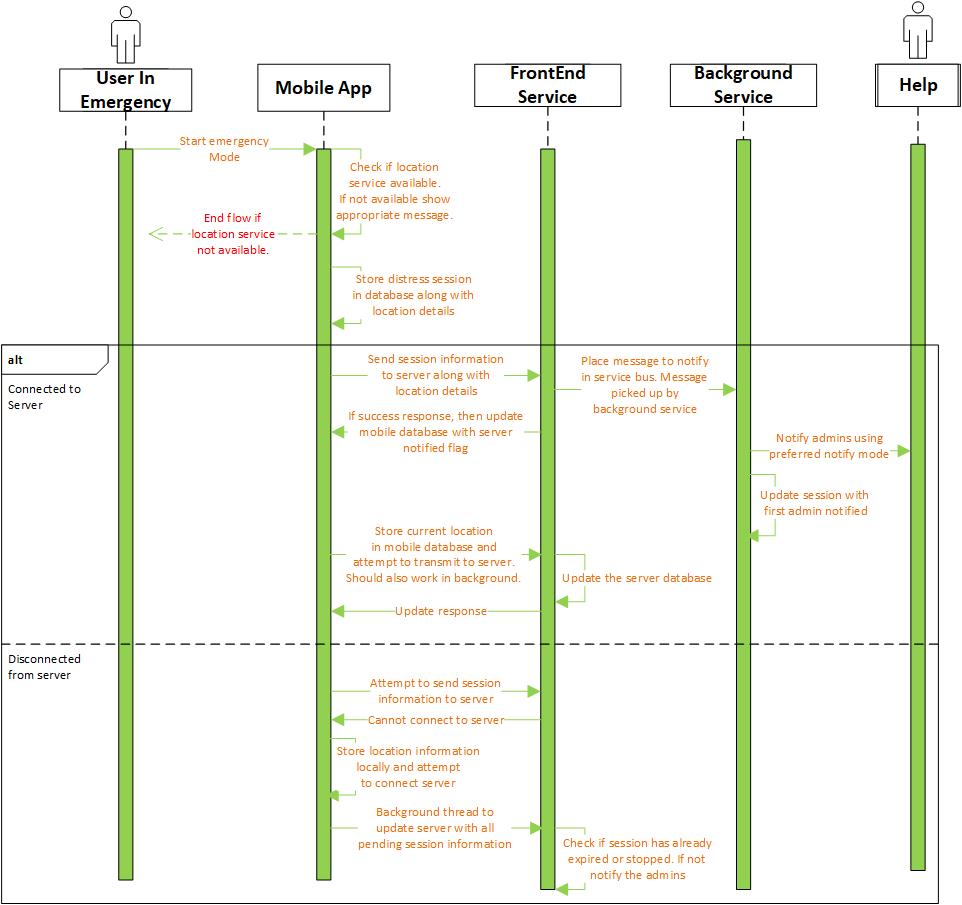
The group can have one or more administrators who have following access:

1. User’s location information during an emergency session.
2. Request user’s location.
3. During an emergency session, the user in emergency cannot be removed as there is security risk of losing user data. However, the administrators can remove other administrators or users to avoid the data being read by other users. Additionally, other administrators can be added like police officers to view the location. The administrators can stop the emergency session in case it was triggered by mistake by user and user does not have access to his/her mobile. If the administrator stops the emergency session, then the administrators id should be used in the stopped by column. There should not be any foreign key relationship in database as later the user may be deleted from system because of user requesting removal.
   * + 1. Group Member management

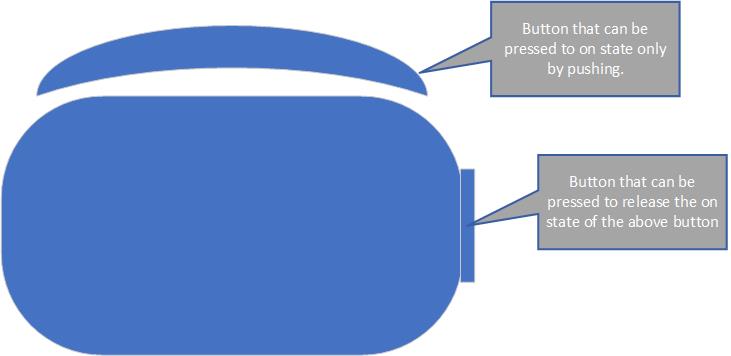
Group member can be added using the search button. The search button would display the list of the phonebook contacts or the user can type the number that would filter the list from the phone book contacts. If the number is not present in the phone book, user can simply type in the number and say send request. If the number is already added to the group, same message should be shown and send request should not be enabled. Also, if the request has already been sent and the request is not expired/rejected, then the user should be shown the message indicating request pending. If the target user has blocked the contact, the request can be sent by the requestor if already expired, however, the request should not be visible to the target user as the target user would have blocked the request. We should not fetch the list of users registered from server as mobile may not have enough bandwidth to handle the response.

* + - 1. Emergency Mode

This mode is used whenever there is an emergency that needs immediate attention. This helps notify all the administrators of the primary groups or a group of user’s choice.

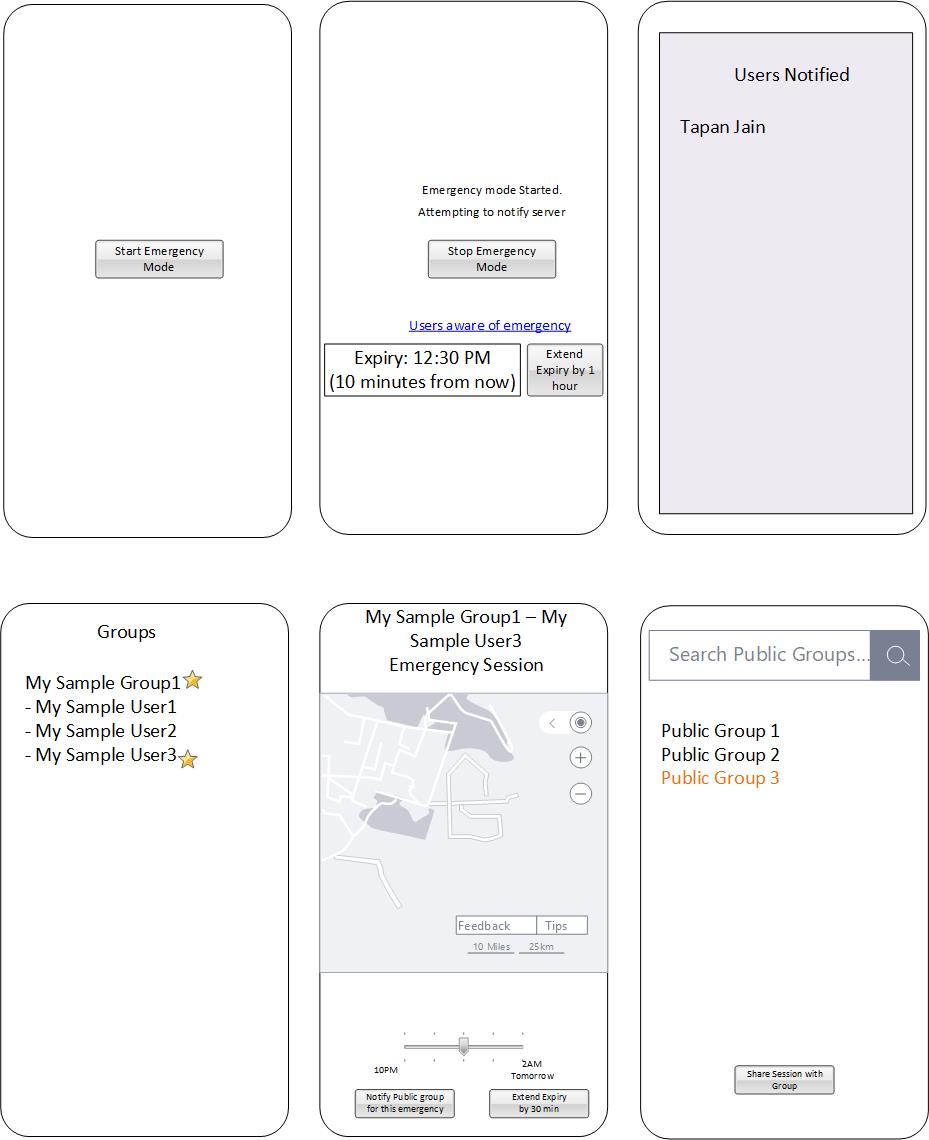


1. User initiates the emergency mode by clicking the Emergency button. On clicking the emergency button, the user should be displayed a custom message that everyone can view. There should be an option to edit the existing message or pick a message from the available templates. If the location is not available or enabled, user should be displayed the appropriate message and emergency mode should not start. Whenever user initiates an emergency mode, the app should store the emergency session along with the current location in the local application database. The current location is needed with every emergency session trigger request to server.
2. Thereafter trigger a request to server to initiate the emergency mode. If the request cannot be sent to the server due to data connection issue, the user should be displayed an appropriate message.
3. During an emergency session, below items should be visible on the main screen corresponding to a session
   1. Stop emergency button
   2. Link to view the list of users who have viewed the emergency session. The list of users who viewed emergency session should be fetched with every call made to update the location in the emergency mode.
   3. Expiry time for the current session.
   4. Button to “Extend Session expiry”.
   5. Status of the emergency session. Should be displayed as below:
4. Emergency mode started. Attempting to notify server.
5. Server notified, last location sent at 12:22 PM (30 seconds ago or 2 minutes ago)
6. Admin notified, last location sent at 12:22 PM (30 seconds ago or 2 minutes ago)
7. Emergency mode started. Data connection is not available now. Others will be notified once the data connection is available.
8. Emergency mode started. Issues in connecting to server. Others will be notified once connection is established.
9. During emergency mode, the location capture and transmission should happen every 1 minute (configurable value between 30 seconds to 5 minutes). While triggering an emergency session, the primary group should have access to the emergency session. While creating an emergency session, user can optionally specify the groups to which the emergency session should be accessible. Here the user can specify the public groups as well. The administrators of the groups who have access to emergency session should get a push notification and/or email whenever an emergency session is received on the server based on the preferred notification mode. The email should have the location of the user where emergency was reported.
10. After the administrator receiving the emergency push notification clicks the push notification, he/she would be taken to the page where the recipient can track the location of the user in emergency. Optionally the recipient can go to the app and select the group that is highlighted to have a person in emergency and then go inside and check the person in emergency and then view the emergency sessions and navigate to the active emergency session. Active emergency session is a session that has not yet been closed and lies within the expiry period of the session.
11. The expiry period of a session is set at the start of the session based on the configurable timeout period (*EmergencySessionTimeoutInSeconds*). The expiry for an emergency session can be extended by the user or the administrator of the group having access to emergency, provided that the user has given access to the group administrators to perform the extension. By default, it is enabled. The option in mobile should be there to increase the time of capture as “extend capture time by 30min/1 hour/3 hour/6 hours/12 hours” and associated price should be shown. If the user has extended the session beyond the free limit the user would be charged on his/her account. If the user does not have a card associated with his/her account or if the payment bounces then the user’s account would be put on hold after a period of 7 days since the latest negative balance on the account. Thereafter, the user will not be able to perform basic actions on the account. To avoid misuse of this feature, the maximum limit till which the session can be extended is 12 hours (configurable value). Post this, the user should contact the call center to make the change. As the battery would be utilized, the emergency mode should not run for a long-time else battery for making the call would not be available.
12. The group administrator should be able to trace the history user locations along with the time at which the user was present at any location. There should be a timeline available to view the location of user at specific times. The timeline should have the start time and end time of the emergency session and it should be scrollable up to the point till which the emergency data is available. The mobile app should store the count of times the location has not changed during an emergency session at a location. Based on the number of repeat counts, the map should show the polyline between two points in either green, yellow, orange or red (green for 1-3, yellow for 4-10, orange for 11-20, red for above 20). The speed of the person in emergency should also be available in case the administrator is trying to identify the mode of transport for the person in emergency to identify the vehicles to be checked to reach the person in emergency. By sliding the timeline, the user would be able to view the points on the map highlighted showing time and speed. Similarly, clicking the location points on the map should adjust the timeline. The emergency data should be available for future reference for a period of 7 days.
13. Facility should be available to get snapshot of the emergency consisting of location, speed and time information (using timeline or clicking at a location point) to get either direction to the snapshot or to send the snapshot to someone.
14. User can make use of a Bluetooth low energy device to send signal to mobile to start the emergency mode. There should be a wide variety of devices at reasonable price so that anyone can purchase it. The device should be accessible in times of emergency and user should be able to access it even when user’s hands and legs are tied up. Below is a list of possible devices that can be made
    1. A belt having a buckle with a surrounding button at the top that can be triggered by pressing button by hand or if a person is tied up he/she can press the button by leaning against some obstruction to press the button or using the elbow to press the button. Pressing the button to on state brings the button closer to the buckle and user cannot turn the button to off state using the same button to make it accessible during emergency. The button can be switched off using another button on the side. When the button is in on state the low energy Bluetooth device within the belt should transmit signal to mobile to start emergency mode. The belt should look like a normal belt to avoid attention from the assailant. Additionally, the buttons should not be noticeable/flashy. We can provide a safety lock on the button to prevent accidental pressing of the button. Most times people know when they are in an unsafe situation, in that case the safety lock can be disengaged. Even the safety lock should be such that it can be accessed with tied hands. There can be different modes in which the notification can be transmitted. Eg. Some rotating object can be used where it’s visible portion can specify one type of emergency. User can rotate the rotor based on the situation and each trigger needs to be associated with the specific issue say accident, harassment, violence.



1. A user in emergency or a administrator of a group can share an emergency session information with a public group. The sharing will allow the selected public group administrators to have access to the emergency session.

**Mobile Screens**



Caveats:

1. During group creation make sure that you add the members in the group whom you trust as they can monitor your location.

Enhancements: 1) The notification regarding emergency can be sent to the dedicated person/group responsible for security in the region if a verified security group is added by default.

1. Police/Army can be associated with a region for securing the public and each region would have a dedicated security personnel assigned.
2. During an emergency session a person can take audio/video samples and submit them to the server. The audio/video samples are encrypted and stored on company server. The decryption of the content should lie with another department or another company that should specialize in the tackling of cases. They would be accessible only after verification that it is not being misused.

Misuse Prevention

1. Each group cannot have more than 5 members in the free subscription. As the free subscription may be used by people for tracking beggars, prostitutes at large scale where people are forced to do an activity. Whenever anyone purchases a subscription, the reason for purchase and customer visit should be performed to validate the authenticity of the customer. Still, illegal people can make use of the app by managing 1 agent per 5 subordinates. Models should be designed to identify repetitive usage patterns collaborated with the areas where the monitoring is happening to determine if it is being used for any illegal purpose.

Misuse by Party causing emergency

1. The assailant can make use of the app to call the security/help at a specific location where he/she has planned an attack on the help. So, before a dedicated personell/team is assigned for a location, ascertain that the personnel would be secure at the location where help is needed.

CounterMeasure: A caveat should be shown on the members page regarding members of the group being able to track the location of the user and add only the users you trust.

1. Gangs of robbers or thieves or gangsters can make use of the tool to call for help or to track their members during an immoral activity.

CounterMeasure: The activity from these gangs can be associated with any mishappening around an area and people can be tagged as suspicious based on this. This would be helpful in determining the next activity from such people which can be monitored.

1. People can force a girl and take video/audio of the girl and upload it on the app that can be shared with others.

CounterMeasure: The video/audio can be uploaded to the server in encrypted format and also kept on the mobile in encrypted format. This video/audio will not be accessible to public. Only in case of a registered case can this data be revealed to the police or other security authorities.

1. Public can create fake audio/video samples and create a fake session and post the video on that fake session by encrypting a fabricated video using the same technology that is present in the mobile app. So, the video/audio recording present on server cannot be considered as a proof of any case as it may be fabricated. However, it can still be analysed by the court to determine if it is fabricated. All the app is providing is a feature of capturing the audio/video during an emergency. So, instead of concentrating on capturing the complete audio/video, during an emergency session the app may determine every 5 minutes within an emergency session if any audio can be taken or video can be taken based on whether any audio input is coming or if any light is present in front of camera. Need to check if automatic capturing of video/audio (though after the user sets this in the settings) is legal.

Applicable use cases

1. Kidnapping/Abduction: While a person has been kidnapped and the person needs help.
2. Stuck during an attack by bank robbers/burglary/terrorists etc.
3. Moving out of the house during threat from extremists or during curfew.
4. This can be used for handling repetitive harassment in which case the victim can create an emergency session and take the audio/video of the event. There should be a separate company that would be responsible for analysing the audio/video content uploaded by the user and responsible for misuse of data. Each decoding should be charged. Every user should be given a specific number of free decoding and post the threshold the user would be charged based on number of requests. Once the content has been verified and provided to the victim, the victim can lodge a complaint. Every request to decode should have a valid reason for the request and should be categorized under a list of valid scenarios.
5. During road travel if any accident takes place, the person can press one button to inform his/her loved ones about the mishap along with their location. This can enable the help reaching the person in time.
6. School can publish their security group to which all the students can subscribe and in case of any mishap outside/inside the school the security group can be reached quickly. This can also be used for reporting a harassment or ragging scenario. Also, the groups formed fo harassment, ragging etc can warn the offender so the offender has the fear of being accused in case of any mishap with the victim and thereby stops the act before it goes too far. There can be a tourist protection group for each state that the traveller can use to report any threat by adding it to the default group or by specifying the role of the person so that default groups based on location are automatically notified.
7. If a kid is separated from his/her parent, they can press the emergency button. In this scenario it would make more sense if the parents can trigger the get location for a member.
8. The effectiveness of the mobile device depends on how fast the first responders can assist. So, the first responders usually should be closest to the victim. Eg. School security group within a school when the victim is a student, nearby traffic police when the victim has met with a road accident, college warden when there is a ragging incident, family members when the family is on vacation. Based on the daily activity of a user or any special event the setting should be enabled. Say, in case of a family vacation, the emergency mode should be set to family as first responders.

**Server Database**:

Every data coming from mobile that can occur in disconnected mode should have a request time that should be added to server database to keep track of when the request was received vs when the data reached the server. Eg. The emergency mode can happen in background.

1. User
   1. UserId
   2. UserUniqueId
   3. PhoneNumber (Unique)
   4. Email (for recovery of password, or to change the account phone number)
   5. EncryptedPassword
   6. UserStateId (VerificationPending (User should be in this state for a period of maximum 5 days, post this the user should be overwritten if the user attempts to register), MobileVerified, MobileAndEmailVerified)
2. UserActivation (Used to determine when was the code generated and when last regenerated)
   1. UserId
   2. ActivationCode (6 digit number)
   3. TotalOtpGenerationAttemptCount (If the total activation attempt count is greater than specific value, user should be shown a message to contact the call center. This can prevent misuse of the notification. After the user activation attempt reaches this count user is basically blocked and is prevented from performing any login/registration)
   4. CurrentWindowOtpGenerationAttemptCount– The activation attempt count in current window.
   5. NextOtpGenerationWindowStartDateTime (If this date time is in future, user should not be allowed to recreate the code and has to wait till this time to generate another code. Also, if the next activation attempt is null or in the past and the activation attempt count has reached the max value, then we set this field and prevent the user for generating code for current attempt. In the response to user, user should be indicated after how many hours user can reattempt to create the password)
   6. UserActivationExpiryDateTime – Once this date/time is reached user will not be allowed to activate and the user has to start the registration process again after which the existing record will be over-written.
3. UserSession (This can be kept in the database itself as the refreshtoken alone will be refreshed, so index fragmentation would not happen. Additionally, every access to UserSession via login will be associated with another database call to either fetch groups or some other db operation. So, placing this table in cosmos db is not recommended as the number of request to this table is similar to number of requests to any other table.)
   1. UserSessionId
   2. UserId
   3. RefreshToken
   4. RefreshTokenCreationDateTime
4. Device
   1. DeviceId
   2. SupplierId
   3. DeviceCode – 12 digit number, first 3 digit specify the supplier, last 9 digit specifies the device unique number for the supplier. Can support max 999 million devices per supplier.
   4. DeviceType (GPS Device, Camera Device etc.)
   5. DeviceRegistrationCodeEncrypted – This is a 6 digit alphanumeric string that can be used by the user for first time registration. This would be supplied in a separate paper while delivering the device to the consumer. It is AES encrypted.
5. UserDevice
   1. DeviceId
   2. UserId
   3. DeviceFriendlyName – Name given by the user to the device he owns. Should be unique among the devices owned by the user for easy identification of the device. When a user creates a group, user can add the devices based on friendly name of the devices (or view all devices owned by user) or by using the DeviceCode. If some other user is trying to add a device not belonging to the user to the group, that user needs to use the complete devicecode to add the device to the group.
6. EmergencySession
   1. EmergencySessionId
   2. Title<Emergency\_UserTriggered\_20180726063121333>(Unique constraint)
   3. ExpiryDateTime
   4. firstAdminNotified
   5. firstAdminNotificationDateTime
   6. EmergencyTargetUser
   7. IsEmergencyRequestInProgress (This flag would be set when an admin has requested the creation of an emergency session on the target user and the user’s mobile has not yet synched. While an emergency session request is in progress and not expired, no other session request can be made)
   8. CreatedBy
   9. RequestDateTime(This should come from mobile app)
   10. CreationDateTime
   11. StoppedBy
   12. StopDateTime
7. EmergencySessionExtension
   1. EmergencySessionId
   2. RequestDateTime(Used only when the user in emergency requests the extension. Administrator initiated extensions should happen while admin is connected to server)
   3. IsExtensionRequestInProgress (This flag would be set when the admin has requested extension and the mobile app has not yet increased the end time. During this mode no other extensions can be performed)
   4. CreatedBy
   5. CreatedDateTime
8. EmergencySessionViewer
   1. EmergencySessionId
   2. GroupUserId
9. EmergencySessionGroupAccess
   1. EmergencySessionId
   2. GroupId
10. EmergencyLocation (As this data will be removed periodically, there will be a high level of index fragmentation for this table. Also, separate processing is needed to remove the rows from the table. The number of requests coming in would be extremely high (one per minute for every user). Also, the records would be read at a very high rate, once per 5 minute by the requesting user. This is a candidate to be stored in cosmos db. All the data related to emergency session can be stored in cosmos db)
    1. LatitudeEncrypted
    2. LongitudeEncrypted
    3. SpeedEncrypted
    4. SameLocationRepeatCount
    5. EmergencySessionId
11. Group
    1. GroupId
    2. GroupName
    3. GroupCategoryId
    4. IsPublic (Public groups can be searched by other people for sharing information)
12. GroupCategory
    1. GroupCategoryId
    2. CategoryName (Personal, Security organization, Public Health)
    3. CategoryDescription
13. PublicGroup
    1. PublicGroupId
    2. GroupId
    3. IsVerified
    4. VerifiedTitle – The verified title should be effective in user search. (It should clearly have the state/city/country/locality being served for easy search by user.)
    5. VerifiedDescription
14. CountryBasedPublicGroup - these options would help user select the providers based on nation/state/city/locality. The groups would not be auto-filtered when user searches in the search bar based on user’s location. User has to explicitly specify the filters to get filtered results. Additionally, the public groups during creation should specify the list of city/state/locality that they support.
    1. CountryId - The public groups would be visible for all to search, so the data can be limited based on the country of the user. The mobile app in every country should have a unique identifier. Based on the identifier, specific groups can be returned.
    2. PublicGroupId
15. StateBasedPublicGroup
    1. StateId
    2. PublicGroupId
16. CityBasedPublicGroup
    1. CityId
    2. PublicGroupId
17. LocalityBasedPublicGroup
    1. LocalityId – The distinct localities can be fetched based on the pin code excel downloaded from the India government site.
    2. PublicGroupId
18. EmergencySessionPublicGroupAccess
    1. EmergencySessionId
    2. GroupId
19. GroupMember
    1. GroupMemberId
    2. GroupId
    3. UserId
    4. IsAdministratorAllowedToTriggerEmergencySession
    5. IsAdministratorAllowedToExtendEmergencySession
    6. EmergecyNotificationModePreference(Sms, Email or both- default both)
    7. IsAdmin
    8. IsPrimary – By default the first group created by the user becomes the primary group
20. GroupDevice
    1. GroupDeviceId
    2. GroupId
    3. DeviceId
    4. IsAdministratorAllowedToExtendEmergencySession
    5. IsAdministratorAllowedToTriggerEmergencySession
21. ApplicationSetting
    1. ApplicationSettingId
    2. Key
    3. JsonValue

**Mobile Database**

1. EmergencySession
   1. EmergencySessionClientId
   2. EmergencySessionId (This should be set for an emergency session that is initiated from the server by an administrator or when an emergency triggered by the user has been notified to the server.)
   3. Title
   4. ExpiryDateTime
   5. firstAdminNotified
   6. firstAdminNotificationDateTime
   7. RequestedBy
   8. RequestDateTime
   9. StoppedBy
   10. StopDateTime
   11. IsSessionStartNotifiedToServer
   12. IsSessionStopNotifiedToServer
2. EmergencySessionExtension
   1. EmergencySessionExtensionClientId
   2. EmergencySessionExtensionId(This should be set for an extension that is coming from server or an extension that is notified to the server.)
   3. EmergencySessionClientId
   4. RequestedBy (This will be set if the extension request is made by the user in emergency)
   5. RequestDateTime
   6. NewExpiryDateTime
   7. ExtensionRequestStatus (None, InProgress, Applied, ReceivedPostStop, LessThanExpiry. This should be set based on whether the extension is applied, or if the extension is received post the expiry or stopping of the session, or if the extension requested is less than the expiry which means user would have already extended the session. For an extension requested by user it should be none)
   8. IsServerNotified (Server needs to be notified regarding a new extension created by the person in emergency. Also, it needs to be notified when a extension request that comes from an administrator is applied)
3. Location
   1. EmergencySessionId
   2. Latitude
   3. Longitude
   4. Speed
   5. RepeatCount
   6. IsServerNotified

**Configuration**

1. EmergencySessionTimeoutInSeconds (Can be set by user as 30 min to 6 hours)
2. MaxEmergencySessionTimeoutforFreeSubscriptionInSeconds (6 hours, comes from server)
3. EmergencySessionAvailabilityPeriodInSeconds (7 days, higher for paid version, used in server only)
4. MaxEmergencySessionTimeoutFromAppInSeconds (comes from server, can be set as 12 hours)
5. MaxWaitTimeForPendingPaymentOnAccount (stored on server, can be set as 7 days)
6. MaxEmergencySessionLocationNotificationBatchSize (stored on client, can be set as 20)

**API’s**

// For an emergency session, the mobile app will maintain a EmergencyClientSessionId(This is a surrogate key stored in mobile to uniquely identify session record till the EmergencySessionId is not available). The data from the mobile app will be cleared once the server has been notified to stop emergency session. On every stop emergency session, mobile app will notify stop for current and then the stop for all other remaining sessions pending stop notification. After each stop is notified the records would be deleted from the mobile app. There should be a background thread that should run every 1 hour and check if there is any pending emergency session to be notified in the app. Additionally, when the user opens the app, the background thread should be triggered if not already running. On the server the emergency session name should be unique in case multiple records are created.

1. Start emergency session

SessionStartResponsModel StartEmergencySession(SessionStartRequestModel)

SessionStartRequestModel(Title, ExpiryDateTime, RequestDateTime)

SessionStartResponseModel (EmergencySessionId)

1. Extend session expiry

// Below API is used when there is a request to extend the session time by the user in emergency

ExtendSessionExpiry(EmergencySessionId, RequestDateTime, RequestedBy, NewExpiryDateTime)

// If EmergencySessionId is not available to the mobile for an actively running session on mobile

//then every time a location update is requested, we update the mobile database and call the

// StartEmergencySession API. Once the startEmergencySessionAPI completes, the API for // extendSessionExpiry is called for all session extension requests in local database marking them as ServerNotified and thereafter the call for bulk update of location request should be sent as below in batch of 50 requests. If no more data is available, the stop call is made if the session has already stopped.

1. Update Emergency session with location

// For below API the EmergencySessionId should be available to client and should always occur post update request

SessionLocationUpdateResponseModel UpdateEmergencySession(SessionLocationUpdateRequestModel)

SessionLocationUpdateRequestModel (EmergencySessionId, latitude, longitude, speed)

SessionLocationUpdateResponseModel (EmergencySessionId, ExpiryExtensionModel, StopRequestModel, list of users already viewed the session, firstAdminNotified, firstAdminNotificationDateTime)

ExpiryExtensionModel(NewExpirationDateTime, RequestedBy, RequestDateTime) – If this model is null, then expiry is not requested, else expiry is requested.

StopRequestModel (RequestedBy, RequestDateTime) – If this model is not null then stop is requested.

1. Stop an emergency session

StopEmegencySession(EmergencySessionId, RequestTime, RequestedBy (System in case of session time expired), StopReasonId)

StopReasonId(SessionTimeExpired, StopRequested)

1. Update Emergency Session bulk API

UpdateEmergencySession(EmergencySessionId, IList<SessionLocationUpdateRequestModel>)

* + - 1. Get Current Location for another user in group
      2. Share the location with others in group
      3. Share the location with others using messaging media on mobile
      4. Enabling the travel mode for 1 hour/1day/1month during which the group member can request the location of the user. Additionally, during travel mode the user can emit it’s location every 15 min. This can be helpful if the kid has not returned from school and his/her phone is not reachable. If a girl is travelling from one place to another she can enable travel mode for 1 hour, or if she is going to office and coming back home she can enable travel mode for 10 hours. There should be a provision to establish recurring schedule for travel mode. Say from 8am to 8pm every weekday.
      5. Notify the police authorities for patrolling required in an area. This may happen when you are sitting in a train or bus and there are some hooligans entering the area which may cause some issue, so before any mis-happening takes place, a fear of authority may be generated. Additionally, cameras can be installed in public places and if the location of the person trdiggering the request is close to the camera, a video capture can be taken.
      6. Use Case: A person having an emergency should have a device that can make calls to the admins in the group. If the call to one admin fails, it should contact the next admin till all the admins are over or till 10 attempts (retry same admins if number of admins is less than 10). Additionally, on emergency an SMS should be sent to the admins and admins can trigger an SMS with target phone number on which the device can make a call. This way the caller can know the exact condition of the victim and supply necessary help.
      7. High resolution cameras should be installed over the traffic lights and street lights that have AI integrated to capture the traffic movement and identify the defaulters based on known patterns.
      8. Notification on entering or exiting a geo-fence
    1. Data Archival Strategy
       1. Data Archival to Backup database (More than 90 days old and less than 1 year old)
       2. Data Purging (More than 1 year old data)
    2. Business Layer Design Pattern

The business layer starting from the Web API controller will point to managers instead of directly referring the processors. The managers are used so that the controllers can be kept as lean as possible. The managers have the responsibility of deciding which processors to use. This way the controllers only need to reference one manager and call specific methods on it. The business processor need to be generic available, so that any processing that does not involve multiple steps does not require a new processor. Similarly, there should be a generic activity available so that there is no need to create an activity for a standard CRUD operation avoiding unnecessary code.

We use the compensating service transaction design pattern(<https://www.oracle.com/technetwork/articles/soa/ind-soa-7-service-comp-2005463.html>, <http://soapatterns.org/design_patterns/compensating_service_transaction>)

ProcessorFactory

If the registration naming is provided, then the factory would take the registration name as an input and resolve it to the named registration mapping.

A processor has the responsibility of handling the sequence of the flow and to compensate a flow. If a sequence is not required to be defined and compensation is not needed, we can directly make use of the activity.

For a generic processor, there is a method in processorFactory named CreateGenericProcessor

The generic processor can take an activity as an input.

The activity can also be resolved using a named registration and would take in a registration name as an input. The activity can also be construted as a generic activity taking in the method to be called as a func. Any activity should have a try catch implemented. Whether an activity is compensatable or not is defined based on whether the Compensate method has been over-written by the activity.

The error codes should be added at the activity level and any error code based API return code should be determined at the controller level. The business processors should not modify or add the error code.

The tracking of timing or detailed log should be enabled at two levels:

1. The time tracking can be enabled at processor level, so that either all processors log time, or all processors taking more than x milliseconds should log time.
2. If multiple processors are taking long time, we may need to track timing at activity level to see if specific activities are taking time. This can be enabled from the configuration to log time at activity level.
3. The time tracking can be enabled at an individual flow level. An individual flow should start from the controller and should be added to the workflowcontext. If in the configuration, it is specified to time track the individual flow, then using workflowcontext it can be determined whether to log timing for the processor and activity.
4. Similarly, when instead of performance issues, we need to track the functional issues, we need to have a flag to enable detailed logs at specific flows. Across services the flow name should be common if it represents the same functional flow. Thereby, the entry points should enforce the naming of the flow.
5. Apart from above scenario, there should be a flag to log all detailed logs across services using LogLevel. This should be specific to each service and should be stored on a external storage so that update can happen without performing a configuration update for the service fabric service.

From above, the time tracking is needed only at the processor level or activity level.