LIFE MOBILE APPLICATION

FEATURE PROPOSAL: Location Based Services Module

Colin Man, Malina Jiang

VERSION 1.0

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1 Document Control

1.1 Change Record

Version	Date	Author	Changes
1.0	01-25-15	Colin Man	Create document and introduction
1.0	01-25-15	Colin Man	Draft Discovery Component Overview
1.0	01-25-15	Malina Jiang	Draft Safety, Scheduler, Entertainment Overview

1.2 Definitions

Term	Definition
LMA	Life Mobile Application
LBS	Location Based Services
POI	Points of Interest

Note: "LMA" is consistently used throughout all documents as the name of the mobile application, although it is understood that another name will be chosen for branding purposes.

2 Introduction

The goal of this module within the Life Mobile Application is to:

- Provide the user location based services for use in travel and transportation.
- Establish a framework for providing useful information to the user based on location without direct interaction or prompting from the user.
- Present a set of tools that allow the user to more efficiently manage their tasks and activities, during both travel and daily life.

2.1 Scope

This phase of the location based services module will focus on establishing a list of possible features for the system. Subsequent phases may reduce, add, or change the features listed below before development is finalized.

2.2 Functional Overview

The features of LBS can be summarized in seven core components.

2.2.1 Discovery

- Provides mostly background services that provide discovery of key features and landmarks nearby.
- Helps user discover points of interest and possible places, goods, or services that they would be interested in nearby.
- Can be customized by user to reflect interests, habits, and preferences.

2.2.2 Maps

- Customization on top of Google Maps API that provides additional features such as user preference based routing.
- Enables additional integration with components such as “2.2.3 Lists” and “2.2.5 Scheduler” or other modules of LMA such as the “social” module.

2.2.3 Lists

- Establishes four core lists for organization:
    - To-Do list
    - Packing List
    - Inventory List
    - Wish List
- Each core list embodies deep integration into the rest of the system, allowing for customizations and “smart” decisions to be made based on their content throughout LMA.

- Allows for creation of custom lists as well.

2.2.4 Safety

- Creates a framework for determining the safety level of a particular location based on publicly available statistics.
- Provides tools for security during travel and transportation.
- "Smart" and responsive design shows tools in an easy-to-access location when necessary (though they can be accessed normally as well).

2.2.5 Scheduler

- Provides an algorithm to facilitate efficient scheduling of tasks and activities.
- Integrates with "2.2.3 Lists" component in order to determine tasks that need to be scheduled.
- Can be customized and edited to reflect user preferences and criteria used to determine optimal scheduling.

2.2.6 Entertainment

- Provides entertainment mostly in various forms of media such as music, videos, movies, etc.
- Integrates into the "Social" module of LMA in order to provide a seamless experience.

2.2.7 Tools

- Useful utilities provided to the user that encompass a wide array of functionality, including:
    - Weather
    - Time
    - Alarm
    - Calendar
    - Messaging
- Integrates with native mobile device functionality to create a smooth LMA experience.
- Extensible platform that allows for third-party developers to create "extensions" with additional functionality.

2.3 Assumptions/Constraints

- This assumes that LMA is run on a system that has a stable Internet connection.
- This assumes that LMA is run on a system that has a stable GPS connection and location data.

- This assumes that users have granted the necessary permissions required to provide services such as:
    - Push notifications
    - Location Based Services
    - Bluetooth LE connections

2.4 Requirements

- The following mobile device operating systems should be supported:
    - iOS 7.0 and above
    - Android 4.1 (*Jelly Bean*) and above
    - Windows Phone 8 and above
- All development of application features should be native and should not be a web-based application in any sense. Components of LMA may be developed using web technologies, but the integration and infrastructure of the core components should be native.

3 Component: Discovery

3.1 Navigation

The navigation portion of all components in LBS should allow for easy switching between components as well as modules within LMA. As such, there must be links or buttons that allow for one or two-tap navigation to the following (there need not be a link to the currently running module, depending on the UX/UI design, though having one would most likely benefit the user experience):

- **Home** – The main screen of LMA. Allows the user to easily return to the starting point and re-launch any application or service that he chooses with the LMA launcher.
- **Discovery** – Links to the "Discovery" component of LBS. See "Component: Discovery" for more details.
- **Maps** – Links to the "Maps" component of LBS. See "Component: Maps" for more details.
- **Lists** – Links to the "Lists" component of LBS. See "Component: Lists" for more details.
- **Scheduler** – Links to the "Scheduler" component of LBS. See "Component: Scheduler" for more details.
- **Entertainment** – Links to the "Entertainment" component of LBS. See "Component: Entertainment" for more details.
- **Tools** – Links to the "Tools" component of LBS. See "Component: Tools" for more details.
- **Security** – This should only appear when the security index of the area is determined to pass a certain threshold. If it does pass the threshold, the user should be able to access this module with one tap, otherwise it need not be so accessible, but should still be available through the home screen.

3.2 Overview

The "Discovery" component of LBS includes a multitude of features related to the discovery of points of interest along a travel route.

The categories of points of interest available for discovery can be summarized as follows:

- **Goods and Services** – This encompasses discovery of stores that sell goods or services that the user is looking for. Examples of this include:
    - Hot Deals

    - Coupons and Sales
    - Free things
    - Fuel and repair
    - Tools
    - Equipment
    - Transportation Services
    - Taskrabbits

  Goods and services can also be cross referenced with items from the "Lists" component, which will allow for better integration with LBS and smarter suggestions for the user.

- Places – This includes specific locations that the user might find interesting, including:
    - Saved Spots
    - Possible parking spots and lots
    - Safe meeting places
    - Speed traps and common police patrolled areas

- Travel – This includes place that may be useful for tourists or travelers on vacation in a relatively unknown location:
    - Rest Stops
    - Bathrooms
    - Tourist spots
    - Lodging

- Food – This includes any food locations that the user may want to find based on their location. Examples include:
    - Restaurants and Reviews
    - Food Delivery

3.3 Description

The "Discovery" component of the LBS module is responsible for helping users find the locations nearby that they would be interested in looking for and visiting as if they were perusing through the list themselves.

This intelligent search and discovery can be performed with a variety of artificial intelligence algorithms or machine learning. A detailed description of the potential

features of the complete "Discovery" component of the LBS module can be found below.

3.4 Feature: Goods and Services

The "Goods and Services" feature includes the discovery of all locations related to obtaining goods or services that the user may be interested in.

This discovery can be further classified into five categories as follows:

- Coupons, Sales, and Free Things – There are often free listings, blowout sales, or irresistible coupons in neighborhoods nearby. This feature helps consolidate these deals and allows the user to see the ones that are closest to him and access them immediately.

  Prices should also be included when relevant so that the user can decide whether they would like to go to the location.

  - EX: 50% off sale at Macy's 1.3 miles away
  - EX: Free computer monitor from Craigslist with meeting location 2.3 miles away

- Fuel and Repair – Often Location Based Services are used when the user is on the go or somewhere far from home. Thus, it is particularly important for the user to be able to access crucial resources such as fuel and repair services nearby.

  Prices should also be included when relevant so that the user can decide whether they would like to go to the location.

  - EX: Shell 12.4 miles away with 89 at $3.12/gallon
  - EX: Kirk's Auto Repair Shop 8.4 miles away

- Tools and Equipment – This differs from the "Repair" portion of the feature, since Tools and Equipment facilitates the discovery of locations that help the user fix their problems themselves. This should allow users to find nearby tools and equipment. Prices should be included when relevant so that the user can decide whether they would like to go to the location.
  - EX: ACE hardware is located 3.4 miles away

    - EX: Home Depot is located 1.3 miles away

- Transportation Services – Local transportation services vary widely by area and it is immensely useful to have the top local companies accessible to the user. This should provide a list of the cheapest taxi companies as well as alternative public transportation options by price and convenience.
    - EX: BART is available 2.5 miles away for an average of $2.4 per station
    - EX: Uber is available (not currently surging) for $8/hour

- TaskRabbits – TaskRabbit is a company that specialized in allowing people to be hired to perform certain tasks. This can be incorporated into LBS by allowing the detection of local willing "TaskRabbits". This can be organized using the same features as the TaskRabbit company does.

    - EX: Chad is willing to perform *transportation* tasks and is 2.3 miles away
    - EX: Jenny is willing to perform *delivery* tasks and is 4.3 miles away

    Note: If the LMA is successful and gains enough users, we may be able to implement this feature solely with the LMA and not rely on a third-party company such as TaskRabbit to execute the functionality summarized in this portion of the feature.

Additional elements of the "Goods and Services" feature are as follows:

- "Maps" integration – This feature should also be incorporated with the "Maps" Component in order to be able to access navigation tools directly and streamline the process of transportation to the actual location.

- "Lists" integration – The "Goods and Services" feature should also cross reference with the "Lists" component in order to determine the goods and services that the user would like. It should look at the "Inventory" as well as "Wish" list in order to determine the preferences of the user.

    Some qualities that may be used to determine the goods and services that the user may like based on lists include the following:

    - Past purchases
        - EX: Purchase of "Atlas Shrugged" two weeks ago may suggest an interest in Ayn Rand or books.

  - Categories of goods found in "wish" list
    - EX: The "wish" list may consist mostly of electronics, indicating an interest in electronic goods and computers.
  - Quantity of goods purchase
    - EX: Past purchases may indicate a history of bulk purchase, indicating that the user may be interested in buying mass quantities (wholesale location such as Costco or Sam's Club may be of more interest to the user).
  - Date of purchase
    - EX: The recency of the purchases affects how relevant the information is. If a purchase of "Dove Body Wash" was executed two years ago, it most likely provides less information than a purchase of "Axe body Wash" two days ago.
  - Date added to lists
    - EX: The recency of the addition to lists affects how relevant the information is. If an item "Oculus Rift" was added to the "Wish" list two days ago, it is more likely that the user still wants the product or that he has not purchased it yet.

  Data analysis algorithms can be developed to compare the lists of goods and services available nearby with those that the user would like and generate an index based on projected preference. This index can then be used to rank candidates as well as to generate the list of local options (using a threshold).

- Notifications – Push notifications should be sent to the user when the preference index generated exceeds a certain threshold set by the user.

- Export – The user should have the option of exporting his user data either to the cloud or to a local file that contains a backup of all the data used to calculate his preferences. This may be incorporated with the "Data" module as well.

- Sync – The user should have the option of syncing his user data (used to calculate his preferences) either to the cloud or to other devices that may be running LMA. This may be incorporated with the "Data" module as well.

In addition to the automatically generated elements that are found above, the user should also have the option of customizing the results that he obtains. He may interact with the "Goods and Services" feature through one of the following ways:

- Preferences – choosing the categories of goods and services that he would like to know about. The preference pane should include various criteria for discovering goods and services such as:

    - Category of good
        - EX: Clothing
        - EX: Electronics (Computers, Mobile Devices)
    - Price range of good
        - EX: $25-70
    - Locations accepted or locations that should not be shown
        - EX: Don't show: RadioShack, Best Buy
    - Goods similar to certain preset goods
        - EX: Similar to: iPhone

    Additional settings are as follows:

    - Radius – only goods and services within this radius should be shown. Any goods and services that are not within this radius will be shown on the map (in the "Maps" module), but will not generate push notifications. These items will also not be shown in the "Browse" screen of the "Goods and Services" feature.
    - Preference Index Threshold - the user should be able to set the preference index threshold for push notifications here. Any item found to exceed this threshold should generate a push notification if it is within the radius.

- Search – the user should be allowed to search for certain goods in the area (similar to performing a Yelp search for restaurants). The search should contain criteria such as:
    - Name of the good or service
        - EX: Car Wash
    - Quantity of the good or service
        - EX: 5 dozen bananas
    - Category of good
        - EX: Clothing
        - EX: Electronics (Computers, Mobile Devices)
    - Price range of good
        - EX: $25-70
    - Locations accepted or locations that should not be shown

        - EX: Don't show: RadioShack, Best Buy
    - Goods similar to certain preset goods
        - EX: Similar to: iPhone

- **Reference Point Change** – The user should be able to change their reference point if they so desire. This is useful for planning since it allows the user to search for points of interest without actually having to travel to the location.
    - **EX:** The user can search for points of interest near San Francisco even though his current location is actually in Palo Alto.

- **Browse** – this is one of the main elements of the "Goods and Services" feature. It allows the user to view the goods and services that are nearby with only one screen, in a comprehensive list that includes all the details specified above for each item of interest. The user should be able to filter results based on the following criteria:

    - Quantity of the good or service
        - EX: 5 bananas
    - Category of good
        - EX: Clothing
        - EX: Electronics (Computers, Mobile Devices)
    - Price range of good
        - EX: $25-70
    - Locations accepted or locations that should not be shown
        - EX: Don't show: RadioShack, Best Buy
    - Goods similar to certain preset goods
        - EX: Similar to: iPhone

3.5 Feature: Places

The "Places" feature of the "Discovery" component includes all places that the user may find interesting or useful. Some of these places are generated by the app based on convenience and common use, and some are generated based on user input and previously saved data.

The places that the user may be interested in can be summarized in four categories:

- Saved Spots – Saved spots are locations that the user decides to mark in his map as a location that he believes has importance. These can be further categorized into the following default classes:

    - Car location – Losing a car in the parking lot is a common occurrence and this should allow the user to save the location of his car in order to find it later. A more advanced implementation may include automatic detection of parking spots so that the user does not have to manually track the locations that he has parked his car (the phone will be able to detect with GPS technology that the motion has stopped and the car is most likely parked).
    - Bike location – Bikes are often lost amongst arrays of bike racks among the city. This default should allow the user to save his bike location's GPS coordinates. As with the car location, a more advanced implementation may include automatic detection of bike parking spots so that the user does not have to manually track the locations that he has locked his bike (the phone will be able to detect with GPS technology that the motion has stopped and the bike is most likely locked). This may pose a larger challenge since a person can walk his bike but he cannot walk his car.
    - Favorites – Users should be able to mark their favorite locations and store them as locations in "Saved Spots". In addition to marking favorites, the user should have the option of marking them with certain tags, including "Restaurants", "Friends", "Buildings", "Stores", etc.

- Parking Locations – Parking locations are often hard to find in a city or in a place that the user is not familiar with. To create more of a convenience for the user, parking locations should be marked and shown. Parking locations include, but are not limited to: parking structures, parking lots, street parking. Paid parking should be listed as well and should include the price if it exists.
    - EX: Street parking is available .2 miles away for $2/hour
    - EX: There is a parking lot .1 miles away for free

- Safe Meeting Locations – Many online services are created on a model that requires users to meet up in person in order to make the most of their experience. Such services include: Craigslist, Tinder, okCupid, etc. However, many crimes have occurred due to the dangerous nature of meeting a stranger. The "Safe Meeting Locations" feature will allow the user to find safe locations nearby to meet up with. Possible features that define such locations include:

    - Surrounding Area – using the safety index from the "Safety" component, we can determine whether the area is a good area to meet a person you don't know.
        - This index takes into account various features, including crime rate, housing prices, etc. See "Safety" component for details.
    - Public – with a large flow of people, there are more witnesses and the location is safer

  These locations tend to be public and are not conducive to crime.
    - EX: McDonald's in a busy mall is a good location to meet. It is safe, public, and not conducive to crime.

- Speed Traps – There are many locations that are known to be speed traps and it is very easy to fall into the speed trap and accidentally drive at higher than the speed limit if you are not careful – these locations will be marked and notifications will be sent to the user if he is close to one or about to enter one. He will be reminded of the speed limit, how it changes, and prompted to slow down if he still decides to go a certain amount above the speed limit (default 10% since that is the margin of error for conventional radar speed detection guns).

- Policeman Frequent Locations – Policemen have particular locations that they prefer to catch speeding cars. As with "Speed Traps", the "Policeman Frequent Locations" feature allows for the user to be warned when he is close to a policeman frequent location and these locations will be marked. He will be reminded of the speed limit and prompted to slow down if he still decides to go a certain amount above the speed limit (default 10% since that is the margin of error for conventional radar speed detection guns).

Additional elements of the "Places" feature are as follows:

- "Maps" integration – This feature should also be incorporated with the "Maps" Component in order to be able to access navigation tools directly and streamline the process of transportation to the actual location.

- "Lists" integration – Favorites should be stored in lists or correlated with lists (in the form of suggestions or data management) in order to provide a more seamless experience with the rest of the components and modules.

- Notifications – Push notifications should be sent to the user when one of the locations that the user wishes to be notified about gets close enough the distance is less than a certain threshold set by the user.

- Export – The user should have the option of exporting his user data either to the cloud or to a local file that contains a backup of all the preference data. This may be incorporated with the "Data" module as well.

- Sync – The user should have the option of syncing his user data either to the cloud or to other devices that may be running LMA. This may be incorporated with the "Data" module as well.

In addition to the automatically generated elements that are found above, the user should also have the option of customizing the results that he obtains. He may interact with the "Places" feature through one of the following ways:

- Preferences – choosing the kinds of locations he would like to know about. The preference pane should include the option to show or hide the various options that are discussed above.

  Additional settings are as follows:

  - Radius – only locations within this radius should be shown. Any places that are not within this radius will be shown on the map (in the "Maps" module), but will not generate push notifications. These items will also not be shown in the "Browse" screen of the "Places" feature.

- Search – the user should be allowed to search for certain locations in the area (similar to performing a Yelp search for restaurants). The search should contain criteria such as:
  - Type of location
    - EX: Speed Trap
  - Locations accepted or locations that should not be shown
    - EX: Don't show: RadioShack, Best Buy
  - Hours
    - EX: Open 3pm-10pm; open now

- Reference Point Change – The user should be able to change their reference point if they so desire. This is useful for planning since it allows the

user to search for points of interest without actually having to travel to the location.
    - EX: The user can search for points of interest near San Francisco even though his current location is actually in Palo Alto.

- Browse – this is an important view of the elements of the "Places" feature. It allows the user to view the locations that are nearby with only one screen, in a comprehensive list that includes all the details specified above for each item of interest.

3.6 Feature: Travel

One of the main uses of LMA is to help travel and provide a convenient way for tourists and travelers to find the things that they are looking for while on a trip or vacation (as opposed to hours of reading the tourist guide). In terms of LBS, the main purpose would be to help them discover places that are worth going to or places that would be useful on vacation.

Some potential locations for travel include:

- Rest Stops – The number one sought out location, especially on road trips, is a rest stop. Continuous driving is much easier said than done, so often drivers have to switch off for safety. This feature provides an indication of rest stops nearby in order to allow more efficient timing of switching off and exiting the highway within the rotating group of drivers.
    - EX: After driving on I5 for 6 hours you are tired and you want to switch off with another driver. You can now look up the next rest stop to figure out when you should exit the highway and about how long you should expect to have to continue driving.

- Bathrooms – Many places that offer restrooms, especially in large, populated, cities or areas, ask that customers make a purchase before using the restroom. Their bathrooms are not public and may be protected by a key, etc. The "Bathrooms" feature should allow travelers to discover bathrooms nearby as well as determine the properties of the restroom.
    - EX: There is a publicly available restroom in .3 miles at McDonald's
    - EX: There is a restroom that can be accessed with purchase at Golden Gate Bakery .1 miles away.

- Tourist Locations – In any location there are places of interest to the tourist or casual traveler. The "Tourist Locations" portion of LBS will allow the user to discover such locations and find the nearest tourist locations that may interest him.
    - EX: The Empire State Building is .1 miles away from your current location.

- Lodging – One of the core components of travel is lodging – whether on extended vacation or just a short trip, everyone needs a place to stay while not at home. The "Lodging" portion of the LBS helps users discover lodging based on certain criteria:

    - Reviews – reviews can be extracted from locally used application such as Yelp
    - Price – the user has the option of only showing lodging options that meet the user's budget
    - Rating – the user has the option of only showing the lodging otions that meet the user's rating standards

    This portion of LMA may also be incorporated with third-party companies such as AirBnb in order to create an even better experience for the user (since more housing options makes the application better and easier to use).

Additional elements of the "Travel" feature are as follows:

- "Maps" integration – This feature should also be incorporated with the "Maps" Component in order to be able to access navigation tools directly and streamline the process of transportation to the actual location.

- Notifications – Push notifications should be sent to the user when one of the kinds of locations that the user wishes to be notified about gets close enough the distance is less than a certain threshold set by the user.

In addition to the automatically generated elements that are found above, the user should also have the option of customizing the results that he obtains. He may interact with the "Travel" feature through one of the following ways:

- Preferences – choosing the kinds of travel locations he would like to know about. The preference pane should include the option to show or hide the various options that are discussed above.

Additional settings are as follows:

  - Radius – only locations within this radius should be shown. Any travel locations that are not within this radius will be shown on the map (in the "Maps" module), but will not generate push notifications. These items will also not be shown in the "Browse" screen of the "Travel" feature.

- Search – the user should be allowed to search for certain locations in the area (similar to performing a Yelp search for restaurants). The search should contain criteria such as:
  - Type of location
    - EX: Bathrooms
  - Locations accepted or locations that should not be shown
    - EX: Don't show: McDonald's
  - Hours
    - EX: Open 3pm-10pm; open now

- Reference Point Change – The user should be able to change their reference point if they so desire. This is useful for planning since it allows the user to search for points of interest without actually having to travel to the location.
  - EX: The user can search for points of interest near San Francisco even though his current location is actually in Palo Alto.

- Browse – this is an important view of the elements of the "Travel" feature. It allows the user to view the locations that are nearby with only one screen, in a comprehensive list that includes all the details specified above for each item of interest.

3.7 Feature: Food

Food is one of the main reasons people use their phones to look up any sort of navigation or maps. Since most people eat three times a day, the need to find good food is often and recurring. The "Food" feature of LBS is much like Yelp in that it helps users locate restaurants and places to eat (and in terms of implementation, may actually use Yelp or build off of Yelp itself), but has a few key added features.

These added features are as follows:

- Restaurants On the Way – If the user is already on the way to a certain location (which is often the case when people are looking for restaurants), the "Food" feature of LBS should allow the user to search for places to eat along the route. Yelp currently does not offer this feature since it does not have the full integration into Maps that LMA will have and thus cannot provide the seamless end-to-end support that we can.
    - EX: A person currently in the process of driving two hours to visit his son in college may be able to use this feature to look up a good restaurant on his way and not have to settle for McDonald's or Burger King.

  Criteria for discovering restaurants should be as follows:
    - City – the city of the restaurant
        - EX: Cupertino
    - Distance – the distance of the restaurant from the current location
        - EX: 4 miles
    - Price – the price range of a typical entrée
        - EX: $50 - $100
    - Deals – any deals that might be running and still apply
        - 50% off on Tuesdays (today)
    - Hours – hours of operation
        - Open 2PM – 11PM (open now)
    - Payment Accepted – the payment methods accepted by the restaurant
        - Accepts all credit cards and cash
    - Food type – the kind of food that the restaurant serves
        - Italian Japanese Fusion

  The user should be given the option to use any combination of the above criteria to filter his results and determine what restaurants nearby are offered to him as options.

- Delivery – All restaurants that deliver to the current location of the user should be listed. This functionality is similar to sites like Eat24 (we may actually use their platform in our implementation), but we are able to encompass a larger range of locations as well as incorporate it with the eat-in restaurant discovery functionality.

  Criteria for discovering delivery should be as follows:
    - Time – the time required for the delivery to be completed – depends on the distance and guarantees of the restaurant

        - EX: 35 minute estimated delivery time
    - Price – the price range of a typical entrée
        - EX: $50 - $100
    - Deals – any deals that might be running and still apply
        - 50% off on Tuesdays (today)
    - Hours – hours of operation
        - Open 2PM – 11PM (open now)
    - Payment Accepted – the payment methods accepted by the restaurant
        - Accepts all credit cards and cash
    - Food type – the kind of food that the restaurant serves
        - Italian Japanese Fusion

    The user should be given the option to use any combination of the above criteria to filter his results and determine what delivery options nearby are offered to him as options.

Additional elements of the "Food" feature are as follows:

- "Maps" integration – This feature should also be incorporated with the "Maps" Component in order to be able to access navigation tools directly and streamline the process of transportation to the actual location.

- Notifications – Push notifications should be sent to the user when a restaurant or delivery service that exceeds his preference index threshold set by the user comes within the radius of detection (also set by the user).

Data analysis algorithms can be developed to compare the lists of restaurants and delivery services available nearby with those that the user would like (based on "lists" component, past history, etc.) and generate an index based on projected preference. This index can then be used to rank candidates as well as to generate the list of local options (using a threshold).

In addition to the automatically generated elements that are found above, the user should also have the option of customizing the results that he obtains. He may interact with the "Food" feature through one of the following ways:

- Preferences – choosing the kinds of restaurants or delivery services he would like to know about. The preference pane should include the option to show or hide the various options that are discussed above.

Additional settings are as follows:

- Radius – only locations within this radius should be shown. Any restaurant or delivery services that are not within this radius will be shown on the map (in the "Maps" module), but will not generate push notifications. These items will also not be shown in the "Browse" screen of the "Food" feature.
- Preference Index Threshold - the user should be able to set the preference index threshold for push notifications here. Any item found to exceed this threshold should generate a push notification if it is within the radius.

- Search – the user should be allowed to search for certain locations in the area. This procedure is described under both "Restaurants" and "Delivery Services" as their criteria are distinct.

- Reference Point Change – The user should be able to change their reference point if they so desire. This is useful for planning since it allows the user to search for points of interest without actually having to travel to the location.
  - EX: The user can search for points of interest near San Francisco even though his current location is actually in Palo Alto.

- Browse – this is an important view of the elements of the "Food" feature. It allows the user to view the locations that are nearby with only one screen, in a comprehensive list that includes all the details specified above for each item of interest.

3.8 Combination Features

In addition to listing all the features separately and finding locations separately as listed in the description for each of the individual features themselves, the user should also have the option of using a composite view that combines all of the "browse" screens specified in the features and allows for the viewing of all relevant locations at the same time.

In addition, there should be an easy way to modify preferences of multiple modules at the same time, including the radius of discovery, preference index threshold, etc.

Note: a more detailed guideline on the division of functionality among screens will be drafted in a functional specification after the features in this proposal are finalized.

3.9 Use Cases

3.9.1 John

John lives in Los Angeles and is a parent of a college student who goes to Stanford. He would like to visit his son for Parent's weekend and decides to drive up to visit on Friday so he can see his son. Since he is an avid user of LMA, he decides to use it to navigate to Stanford campus. He begins by choosing the Map option in LMA and inputting "Stanford", which then returns the suggestion "Stanford University", and upon confirmation, immediately begins navigation.

Along the way, John encounters various points of interest that he finds interesting and useful. He isn't in much of a hurry, so he has time to explore the places that he passes.

Normally, without using the LBS module of LMA, John would have just followed Google Maps and gone directly to Stanford, stopping perhaps only for a quick bite at the McDonald's along the way.

However, with LBS suggestions, John was prompted, conveniently around lunchtime, about a restaurant called "The Beef Stew". John had previously been to three beef places that he had submitted high Yelp reviews for and LBS was able to analyze his history to generate the restaurant suggestion.

John, seeing that "The Beef Stew" was not only rated four stars on Yelp, but also within his price range of under $25 and on the way (all three were criteria come together to create a projected preference index higher than his set threshold of 8/10), decided to stop and try out the restaurant.

John loved the restaurant and after trying it, decided that it was the best beef stew he'd ever had, even going as far as to drive his son down to try it. The perfect suggestion by LMA at the right time secured John as a lifelong customer.

3.9.2 Mary

Mary has gotten three speeding tickets in the past eight months and is in danger of losing her license for the year if she gets another ticket within the next ten. However, she is extremely impatient and it is very difficult for her to control her speeding habits.

She hears about LMA from a friend, who suggested that she use it to find out where there are speed traps and where policemen patrol the most.

The next morning, Mary takes her usual route to work, travelling 45 on a 30mph road. Suddenly, she hears a beep from LMA, followed by a message saying, "Entering speed trap, slow down to 30mph". Deciding to follow its instruction, Mary decelerates, and almost immediately afterwards, sees flashing red and blue lights. The car that was next to her, that was going a little bit slower than her before she decelerated, had just gotten pulled over, presumably for driving over the speed limit.

Mary breathes a sigh of relief and decides that the LBS in LMA is a valuable tool for determining where there may be speed traps or policeman; she decides to continue using it.

3.9.3 Jordan

Jordan has terrible memory when it comes to anything that has to do with spatial ability. He can never remember where he parks his car or his bike and can never find his vehicles once he leaves them somewhere.

This has actually become so much of a problem that he takes a picture every time he parks anywhere so that he can find his car again later. However, he often forgets to do that as well.

Jordan discovers LMA while browsing through the App Store and stumbles upon its car and bike parking log functionality. While the manual mode requires that he keep marking the location of his devices, which would be more convenient, but about just as much work as taking a picture every time, there is an automatic mode that Jordan enables.

Automatic mode allows for autodetection of parking spots from motion data. Jordan finds that the system is very accurate and that he no longer has to take pictures of his parking to find it. He loves LMA and keeps it running on his phone so that it can track his parking.

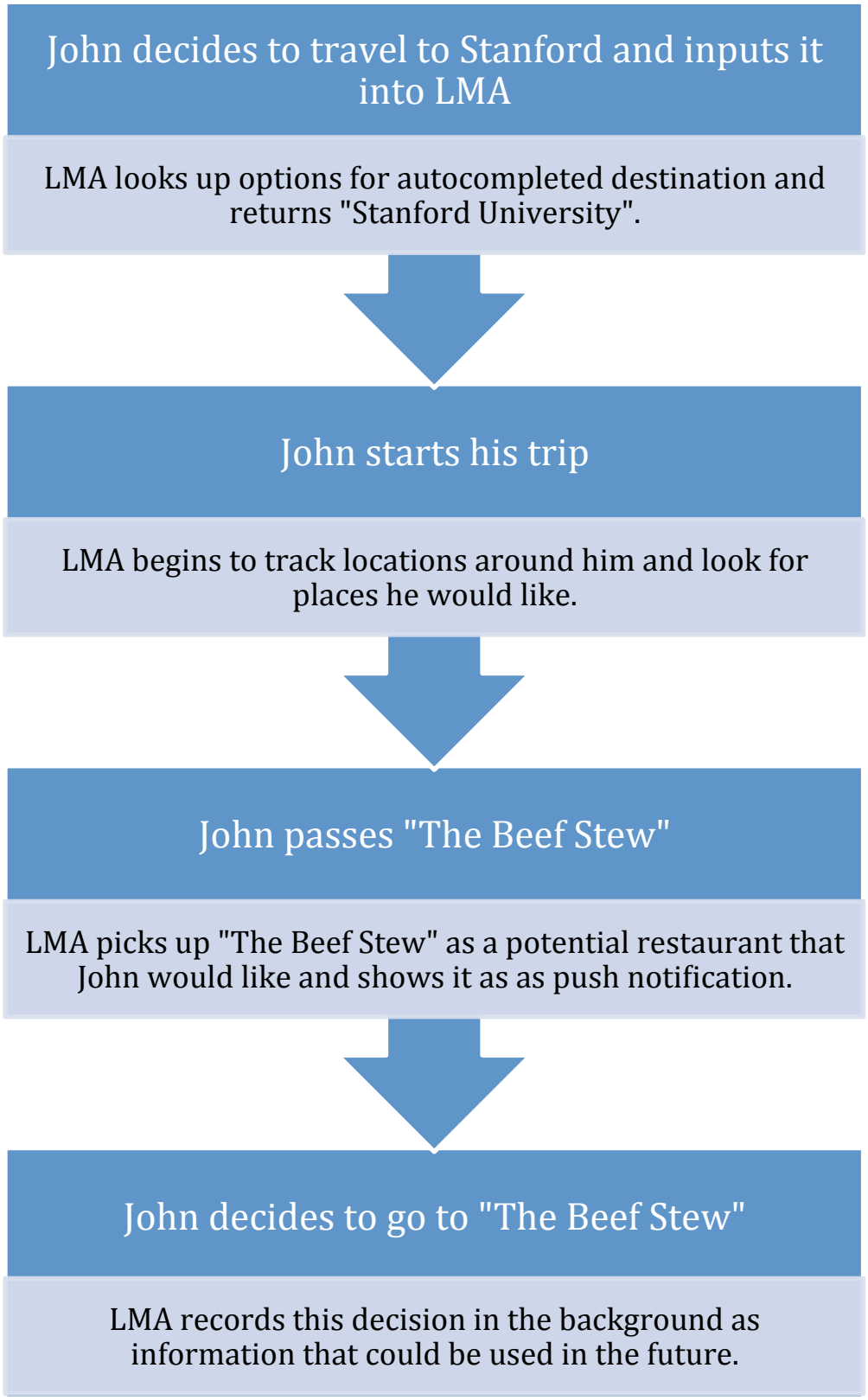

Figure 3.9.1 – John

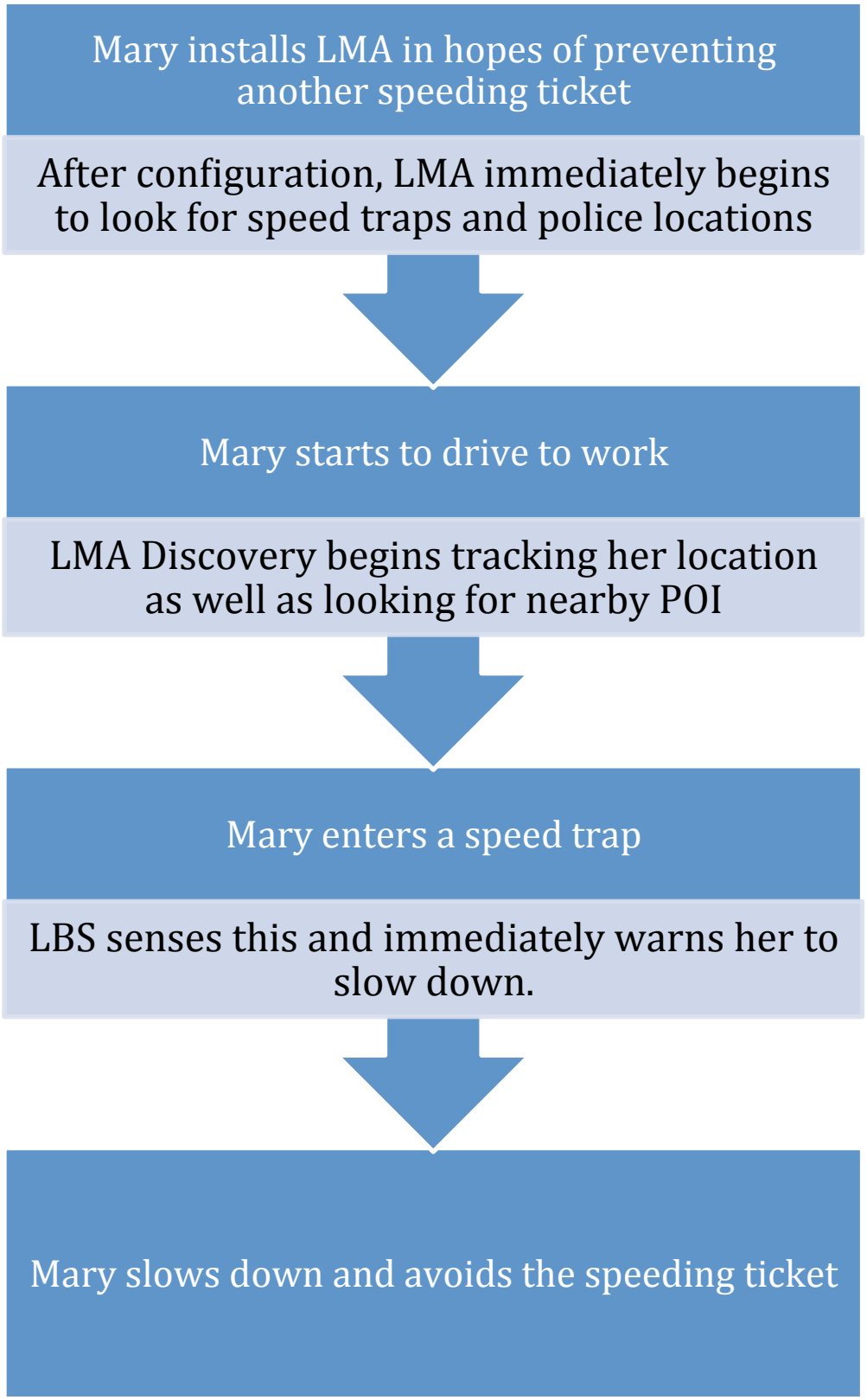

Figure 3.9.2 – Mary

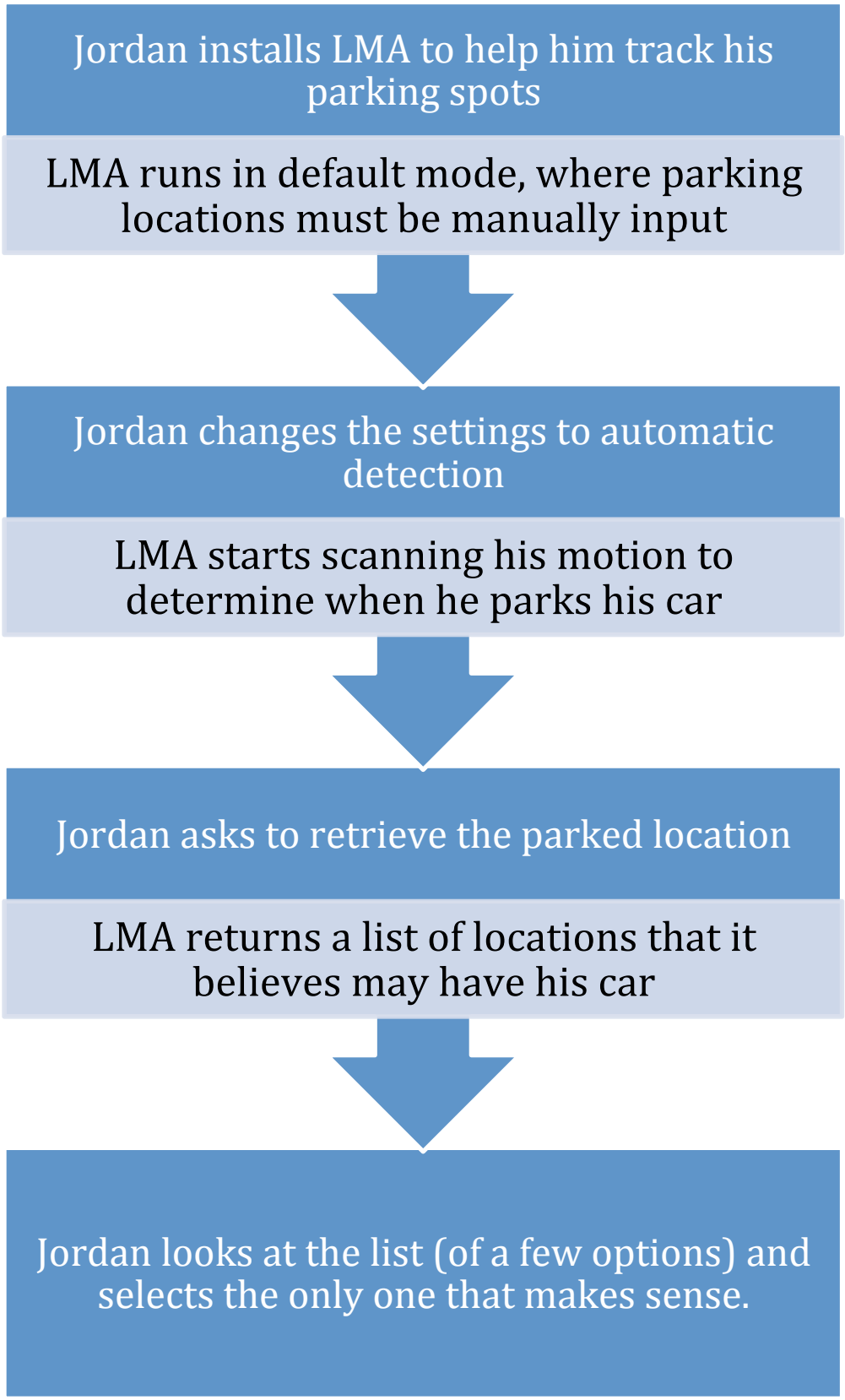

Figure 3.9.3 – Jordan

4 Component: Safety

4.1 Navigation

The navigation portion of all components in LBS should allow for easy switching between components as well as modules within LMA. As such, there must be links or buttons that allow for one or two-tap navigation to the following (there need not be a link to the currently running module, depending on the UX/UI design, though having one would most likely benefit the user experience):

- **Home** – The main screen of LMA. Allows the user to easily return to the starting point and re-launch any application or service that he chooses with the LMA launcher.
- **Discovery** – Links to the "Discovery" component of LBS. See "Component: Discovery" for more details.
- **Maps** – Links to the "Maps" component of LBS. See "Component: Maps" for more details.
- **Lists** – Links to the "Lists" component of LBS. See "Component: Lists" for more details.
- **Scheduler** – Links to the "Scheduler" component of LBS. See "Component: Scheduler" for more details.
- **Entertainment** – Links to the "Entertainment" component of LBS. See "Component: Entertainment" for more details.
- **Tools** – Links to the "Tools" component of LBS. See "Component: Tools" for more details.
- **Security** – This should only appear when the security index of the area is determined to pass a certain threshold. If it does pass the threshold, the user should be able to access this module with one tap, otherwise it need not be so accessible, but should still be available through the home screen.

4.2 Overview

The "Safety" component of the "Location Based Services" module is currently composed of three main features:

- Safety Index – Calculates a safety index based on a number of factors for the immediate area of the user's location.

- Auto-Dial – Safety feature that notifies police and/or behaves as an alarm if the user feels threatened.
- Location Broadcasting – Broadcasts user location to a set of predefined contacts as the user travels through a potentially dangerous neighborhood.

The features of the "Safety" component also interact to a small degree with the "Social" module; in particular, the Location Broadcasting feature utilizes users' social networks to ensure their safety in the event of an insecure area.

4.3 Purpose

The purpose of the "Safety" component is to improve user safety when the user is traveling, especially through unfamiliar areas. The "Safety" component interacts with both LBS and the "Social" module to create a comprehensive evaluation of the safety of an area so that users can make informed decisions when entering a new area. The "Safety" component also offers safety services to users so that they can receive help quickly and promptly in the event that they do need help.

To ensure that users make informed decisions about their safety as they go about their daily tasks, the component focuses on the following features for its main functionality:

- Safety Index – Calculates an index for the area that user is in, which falls into one of five safety classifications.
- Auto-Dial – Allows users to obtain help quickly if they fall into unsavory situations.
- Location Broadcasting – Creates a safety net out of users' social networks so that in the event that a user cannot auto-dial or otherwise call for help, those in their network can obtain help for them.

These features and their function specifications are outlined in detail below. Some of the features have some small ties to the "Social" module and these integrations are also described in detail.

4.4 Feature: Safety Index

The Safety Index feature aims to help users make an informed decision when deciding whether or not to enter an unfamiliar area or situation. The Safety Index is calculated by examining multiple factors that users may find useful or important to their decision-making. Some of the factors are as follows:

1. Safety Index – The Safety Index is a weighted index calculated by assigning values to different crime statistics and other data.

    a. A higher safety index indicates that an area is relatively safe to stay in, while a lower safety index cautions users to avoid the area if possible.

2. Crime Rate – The feature looks at the recent crime rates of the area, including both violent crimes and property crimes. After looking at these crime statistics, the feature calculates their contribution to the final safety index.

    a. In terms of their contribution toward the safety index, violent crimes cause more severe deductions from the safety index than do property crimes, since the algorithm prioritizes the user's personal safety over the safety of the user's belongings.

    b. Time – Crime statistics are weighted differently depending on how recent they are.

        i. Crime statistics from more than ten years ago are discounted heavily, since they may no longer reflect the current criminal climate of the area.
        ii. Recent crime statistics are more closely examined. If recent crime statistics are not available, older crime statistics will take on more weight in the safety index calculation than they usually do.

3. Sex Offenders – This feature examines the registered sex offenders listed for the area and calculates the contribution to the safety index.

    a. The algorithm takes into account both the number of offenders and the severity of their crimes.
        i. EX: Someone who is a registered sex offender for a public indecency charge will cause a minimal decrease in the safety index, while the incidence of serial offenders in the area can seriously penalize the safety index for that region.

4. Housing Costs – Housing costs are also calculated toward the safety index, though they carry less weight than criminal statistics.

   a. Generally speaking, neighborhoods where housing prices are high tend to be safer. The feature has pre-calculated median housing prices by county. If the neighborhood housing prices fall above the median, it results in a positive contribution to the safety index (is considered safer).
   b. Similarly, if the housing prices of an area fall below the median, it results in a decrease in the safety index (the area is less safe).

5. Wealth Distribution – In addition to calculating just the median housing prices for each region and the housing prices of the area the user is in as compared to the median, the feature also calculates two statistics to determine the distribution of wealth.

   a. Assumptions – The feature assumes that a more equitable distribution of wealth if generally correlated with a safer neighborhood.
   b. Housing Prices – Calculates the distribution of housing prices in the region by computing the variance of the housing prices. A large variance indicates that housing prices fluctuate by a significant amount throughout the neighborhood and causes a decrease in the safety index. On the other hand, if variance is low among the housing prices, the safety index increases.
   c. Income – Calculates the distribution of income in the region by calculating the variance of people's salaries. As with housing prices, a higher variance indicates that the area is less safe and causes a decrease in the safety index.

6. Time – The previous few factors have all been relatively static in that they looked at historical data on the region. The time factor of the safety index calculation examines the crime rates for the area and determines the times of day that are more common for criminal action.

   a. By taking the user's time into account, the safety index feature can more realistically provide feedback before the user decides whether or not to proceed with traveling through the area.

7. Safety Suggestion – After consolidating a wealth of information regarding the safety of the area that the user is in, the feature assigns the safety index a safety rating from 1 to 5, where 1 is a very innocuous, after which the user makes a decision whether or not to stay and proceed in the area. The possible safety ratings and their meanings for the user are listed below.

a. Rating 1 – The neighborhood is very quiet. There are few, if any, crimes this year.
b. Rating 2 – The neighborhood is still fairly quiet, and perhaps requires slightly more caution from the user, but is still relatively safe to travel through.
c. Rating 3 – The neighborhood's median crime rate means that it should behave much the same way as most cities. User discretion is advised if it is fairly late in the day.
d. Rating 4 – The user is in a fairly dangerous area of and must remain vigilant if the user plans on entering the danger zone. If it is too late in the night or very early in the morning, the feature will recommend that the user skirt the edges of the danger zone.
e. Ration 5 – The highest rating for danger in the area. The feature will definitely caution the user to go around the area, especially if the user is traveling at an odd hour.

4.5 Feature: Auto-Dial

The Auto-Dial feature enables the user to request and receive immediate aid if the user is feeling threatened. The Auto-Dial feature relies on the following concepts:

1. User Proactive – The most important concept behind the Auto-Dial feature is that the feature is user proactive. This means that, in a situation where the user feels endangered or threatened, the user must take action in order to activate the services that Auto-Dial provides.

2. Siren – The siren functionality of Auto-Dial activates a pre-recorded siren noise. When the user enters a location that is rated dangerous by the safety index, or if the user feels unsafe walking into an unfamiliar neighborhood, the user can press a phone key in order to play the siren noise. The siren noise is activated in the hope that the would-be criminal is scared off by the apparent vigilance of the local law enforcement.

3. Help Button – The help button is another remapped key on the user's phone that directly calls the police when pressed. The key is remapped to the number of the local law enforcement upon the user's arrival to a neighborhood that has a safety rating of greater than 3 (danger is above median). Users can also choose

to manually set the remapping of the key in a neighborhood of better safety rating if they feel uncomfortable or endangered.

4.6 Feature: Location Broadcasting

The Location Broadcasting feature enables the user to receive help by proxy if the user is in a situation where the user can no longer directly require help. The feature is dependent on the following concepts:

1. **User Passive** – The most important concept behind the Location Broadcasting feature is that of user passivity in requesting help.

    a. In the case of Location Broadcasting as opposed to the Siren, when the user is in a situation where the user feels uncomfortable or endangered, the user does not need to take immediate action in order to request aid. Rather, the user simply needs to not do anything.

2. **Safety Net** – Location Broadcasting is built on top of the idea of a safety net. A user's safety net is a network of people the user trusts to keep the user safe in the case of an emergency or a dangerous situation. The user must first predefine a list of contacts to contact if the user needs help. As the user travels through dangerous areas, the contacts are notified about where the user is.

3. **Broadcasting** – Before the user enters the location, the user sets a certain time limit to the time the user plans on spending within the area. At the end of this time limit, the members of the user's list receive a prewritten text urging them to contact the police in case the user is now a missing person. It also broadcasts the user's last known location to the members of the user's list of contacts

4. **Tethering** – The concept of tethering is that the user is "tethered" between two location points at every point in time as the user is traveling through a dangerous area.

    a. As the user enters the neighborhood, the user's location is broadcasted to the user's contact list.
    b. If the time set by the user runs out and the user is not able to disable the timer (and therefore notify the contact list that the user is safe), then the last known location of the user is broadcasted to the contact list as well.

c. Even if the user becomes separated from the user's phone, the authorities have at least two points from which to search for the user. In the case that the user still has the user's phone, the phone will continue to broadcast the user's location at constant intervals, creating a trail for the police to follow.

4.7 Use Cases

4.7.1 Gina

Gina is a young woman in her twenties who works as a salesperson. Because of her job, she travels frequently, often through unfamiliar neighborhoods.

One day, Gina ends up at the mouth of an alleyway that the map says leads her to her destination. Having recently discovered the LMA safety index feature, she decides to find the safety index of the alleyway she is about to enter. She opens LMA and goes to the Security tab. The index indicates that the area she is in is most definitely not safe. She is able to pull up crime statistics and finds out that there have been a string of unsolved violent crimes in the immediate area. She instead takes a longer way around the alleyway and reaches her destination safely.

The next day, Gina reads in the news that there was an armed robbery in the very alleyway that she had avoided the day before.

4.7.2 Mark

Mark has recently wed his childhood sweetheart, Emily. The two of them are looking to find a play to settle down and raise their family. Mark and Emily recently found a house they really liked in the suburbs. To make sure that the house they wanted was in a safe area, Mark pulled out his phone and opened LMA to the Security tab.

A quick security check of the immediate surroundings reveals that there has only been a total of three crimes in the past decade, all of them property crimes, not violent crimes. Further investigation shows Mark that the distribution of wealth in the neighborhood is fairly equitable and that all of the families are young, atomic middle class families.

With this information under his belt, Mark is able to make an informed decision with his wife about the house and they move in the house the following month.

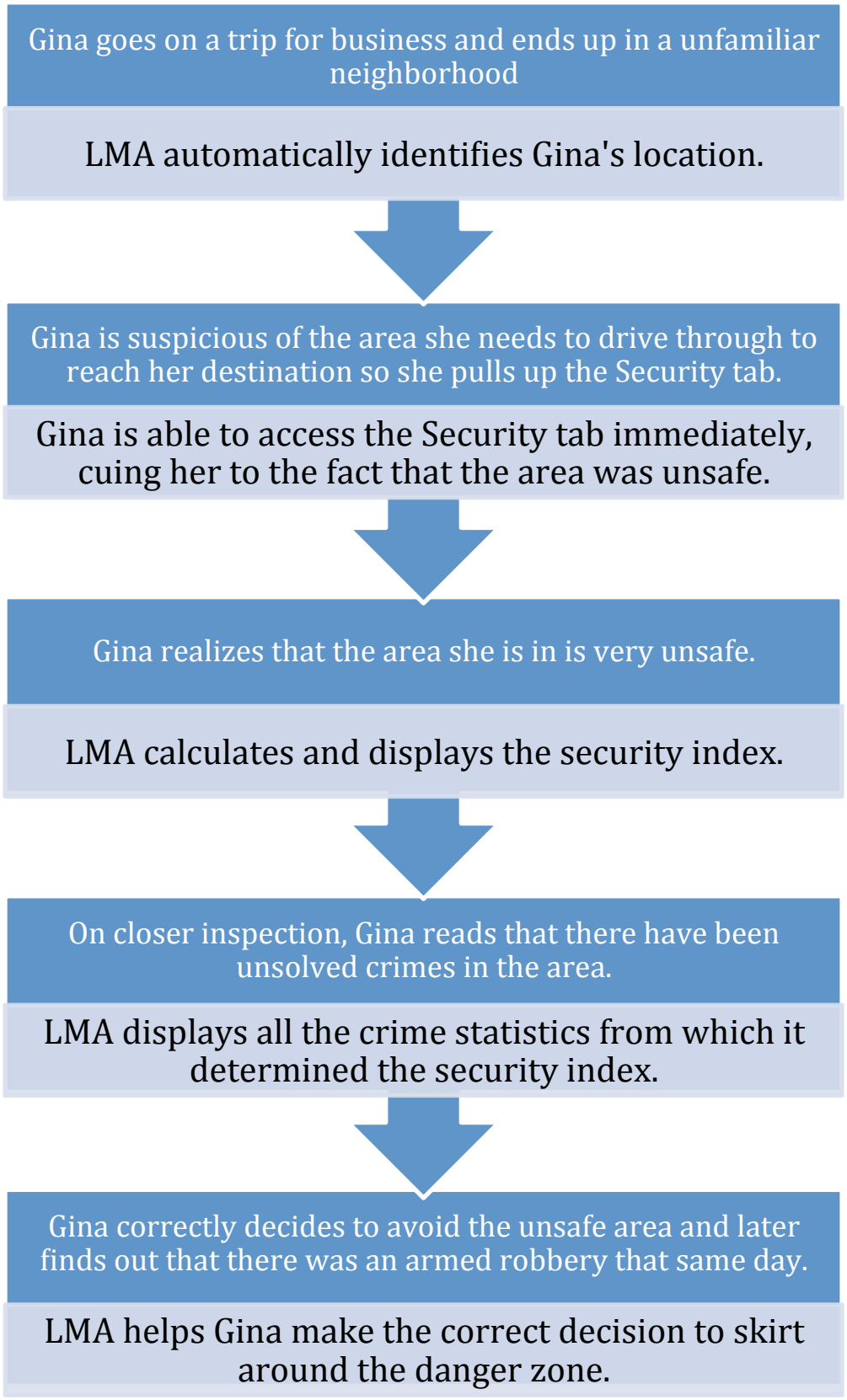

Figure 4.7.1 – Gina

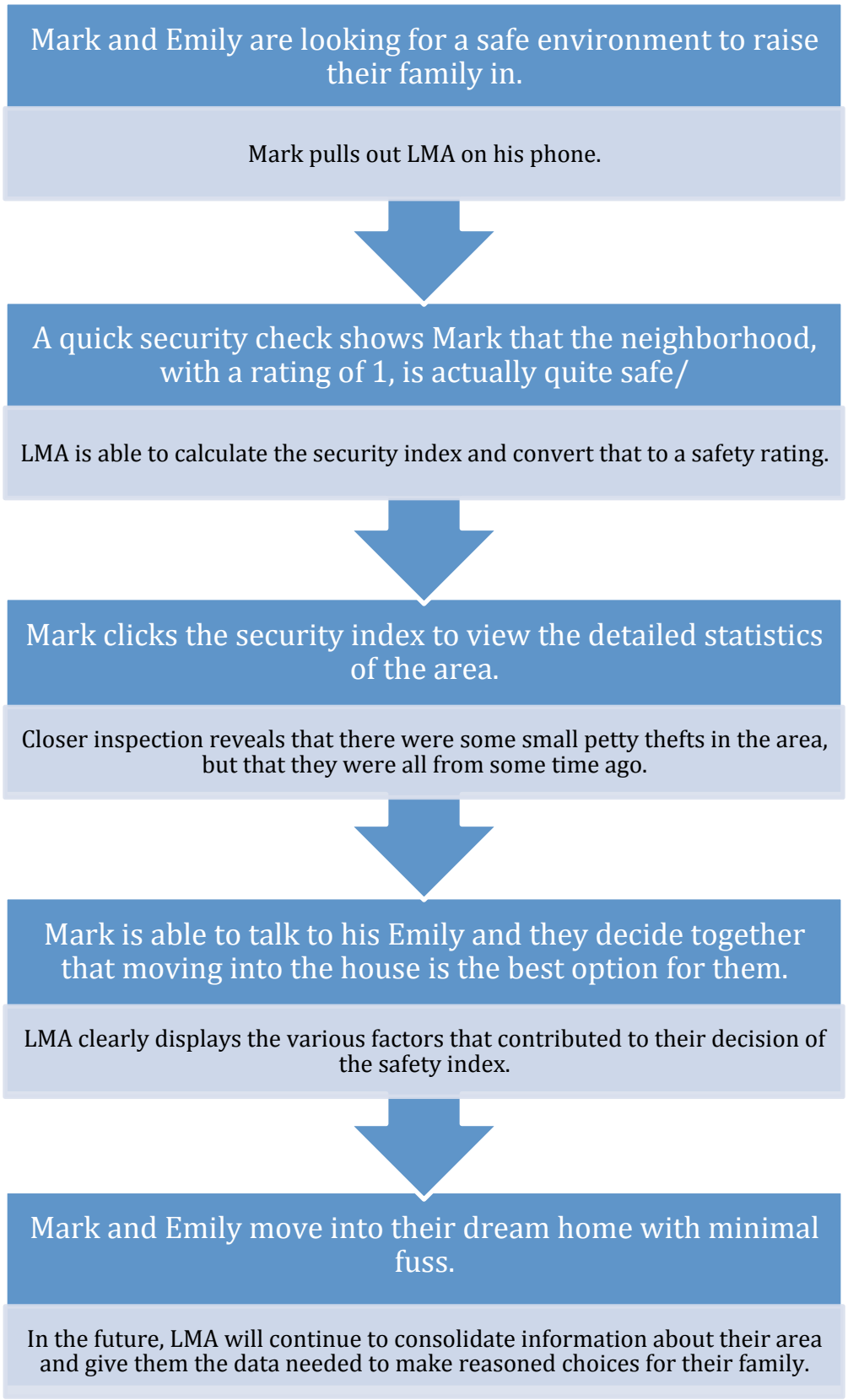

Figure 4.7.2 – Mark

5 Component: Scheduler

5.1 Navigation

The navigation portion of all components in LBS should allow for easy switching between components as well as modules within LMA. As such, there must be links or buttons that allow for one or two-tap navigation to the following (there need not be a link to the currently running module, depending on the UX/UI design, though having one would most likely benefit the user experience):

- **Home** – The main screen of LMA. Allows the user to easily return to the starting point and re-launch any application or service that he chooses with the LMA launcher.
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- **Scheduler** – Links to the "Scheduler" component of LBS. See "Component: Scheduler" for more details.
- **Entertainment** – Links to the "Entertainment" component of LBS. See "Component: Entertainment" for more details.
- **Tools** – Links to the "Tools" component of LBS. See "Component: Tools" for more details.
- **Security** – This should only appear when the security index of the area is determined to pass a certain threshold. If it does pass the threshold, the user should be able to access this module with one tap, otherwise it need not be so accessible, but should still be available through the home screen.

5.2 Overview

The "Scheduler" component of the "Location Based Services" module is currently composed of two main features:

- Efficiency Task Scheduler – Efficiently schedules tasks into a schedule given task duration and the distance in between/transition time between tasks.
- Automatic Itinerary Generator – Determines

The features of the "Safety" component also interact to a small degree with the "Social" module; in particular, the Location Broadcasting feature utilizes users' social networks to ensure their safety in the event of an insecure area.

5.3 Purpose

The purpose of the "Safety" component is to improve user safety when the user is traveling, especially through unfamiliar areas. The "Safety" component interacts with both LBS and the "Social" module to create a comprehensive evaluation of the safety of an area so that users can make informed decisions when entering a new area. The "Safety" component also offers safety services to users so that they can receive help quickly and promptly in the event that they do need help.

To ensure that users make informed decisions about their safety as they go about their daily tasks, the component focuses on the following features for its main functionality:

- Safety Index – Calculates an index for the area that user is in, which falls into one of five safety classifications.
- Auto-Dial – Allows users to obtain help quickly if they fall into unsavory situations.
- Location Broadcasting – Creates a safety net out of users' social networks so that in the event that a user cannot auto-dial or otherwise call for help, those in their network can obtain help for them.

These features and their function specifications are outlined in detail below. Some of the features have some small ties to the "Social" module and these integrations are also described in detail.

5.4 Feature: Efficiency Task Scheduler

5.5 Feature: Automatic Itinerary Generator

5.6 Use Cases

6 Component: Entertainment

6.1 Navigation

The navigation portion of all components in LBS should allow for easy switching between components as well as modules within LMA. As such, there must be links or buttons that allow for one or two-tap navigation to the following (there need not be a link to the currently running module, depending on the UX/UI design, though having one would most likely benefit the user experience):

- Home – The main screen of LMA. Allows the user to easily return to the starting point and re-launch any application or service that he chooses with the LMA launcher.
- Discovery – Links to the "Discovery" component of LBS. See "Component: Discovery" for more details.
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- Lists – Links to the "Lists" component of LBS. See "Component: Lists" for more details.
- Scheduler – Links to the "Scheduler" component of LBS. See "Component: Scheduler" for more details.
- Entertainment – Links to the "Entertainment" component of LBS. See "Component: Entertainment" for more details.
- Tools – Links to the "Tools" component of LBS. See "Component: Tools" for more details.
- Security – This should only appear when the security index of the area is determined to pass a certain threshold. If it does pass the threshold, the user should be able to access this module with one tap, otherwise it need not be so accessible, but should still be available through the home screen.

6.2 Overview

The "Entertainment" component of the "Location Based Services" module is currently composed of three main features:

- Suggested Music – Suggests music to users according to their music profile and friends' music suggestions.
- Shared Pictures – Shares pictures to users' social networks through a variety of social media platforms.

- Friend Finder – Locates users and finds friends or other social network members in the area for meet ups and gatherings.

The component also includes a variety of other smaller features that integrate it more fully with the "Social" module. This component integrates with LBS as well as the "Social" module of the "Life Mobile App" to provide a seamless experience for the users whether the users are using LMA at home or on the go throughout the day.

6.3 Purpose

The goal of the "Entertainment" component is to facilitate the creation of a stronger, more connected social network for the users by integrating a variety of social media and entertainment features.

For the ease of the users and to make the interacting with social media a more fluid process for the users, the component consolidates these features into a centralized application. The component as it relates to the LBS module will focus more heavily on the following features:

- Suggested Music – Makes new music suggestions to users based on their music profile and friend suggestions.
- Shared Pictures – Preserves users' memorable moments by allowing their pictures to be shared across various social media platforms.
- Friend Finder – Locates friends in the area that the users pass by through to facilitate the arrangement of friendly gatherings.

These features and their function specifications are outlined in detail below. The "Entertainment" component as it relates to the "Social" module of LMA will have a broader range of features, but as they do not interact as closely with LBS, will be discussed more briefly in the following feature descriptions.

6.4 Feature: Suggested Music

The Suggest Music feature allows users to access music that they have previously compiled. It also suggests music to users based on their current music profiles, and consolidates friend suggestions for user review. The feature aims to facilitate user access to music and broaden user music taste and sampling.

The Suggested Music feature within the Entertainment component as it relates to LBS has several goals:

1. User Preferences – Customizes music access for users to make it easier for users to access their music, whether at home or on the go.

    a. Playlists/Folders – Keeps track of the music preferences of the users so that the users can access their preferred music from any location. Users can categorize and sort their music into various playlists and folders for their convenience.
    b. Access Options – Allows users to either select music tracks or randomly shuffle through their available playlists or music library.
    c. Automatic Synchronization – Automatically syncs any new additions to users' music libraries, so that new music is made available immediately to the convenience of users.
    d. Visibility/Privacy – Allows users to control who can see the music that they have listened to. Also enables users to choose to who to make their playlists available to. Visibility/privacy settings can be set by users for each playlist or on their music library as a whole. Settings include:

        i. Private – The highest level of privacy, playlists with this setting are only visible to the user.
        ii. Friends – Available to immediate friends, these playlists are visible to friends from the selected media platform or platforms (the platforms from which friends are determined is also set by the user).
        iii. Friends of Friends – Available to a wider range of friends, this setting allows users to share with a more public audience without compromising their sense of privacy if they wish it. As with the Friends setting, users determine the social media platform(s) that the friends and friends of friends are from.
        iv. Public – The lowest level of privacy, playlists or music libraries of this setting are visible to the public.
        v. Custom – This setting allows users to determine on a case by case basis who they wish to share their playlists or music libraries with. Multiple custom options can be created and saved so that the user can easily choose between previously set privacy options.

2. Music Suggestions – Facilitates the sharing of music between users who are members of the same social network. This exposes the users to a variety of

music, allowing them to comfortably remain in their own musical element while experiencing and sampling music from their friends.

a. Music Preference Profile – From users' frequently listened-to tracks and playlists, the feature generates music preference profiles. These preference profiles determine what music to recommend the users. After consolidating friend music suggestions, the feature attempts to match the music suggestion to the user music preference profile. If the music suggestion is a good match, it is placed near the top of the list of suggestions offered to the user. The user music preference profile is determined through many factors, some of which are listed below:

    i. Age – The algorithm matches music to users that other people their age have enjoyed.
    ii. Previous Favorites – Compiles previous music favorites and matches music tracks with strong correction to those music favorites.
    iii. Genres – Matches music suggestions from genres that users have particularly enjoyed before.
    iv. Top Playlists – Matches music suggestions that have in general done fairly well with the public.

b. Friend Music Suggestions – Allows users to receive music suggestions from friends, but also allows users to share any music that they have particularly liked. The sharing of music can be done either privately, through some medium of private messaging, or in general to a social media platform. These settings for sharing can also be customized to various levels of privacy:

    i. Private – The highest level of privacy, playlists with this setting are only visible to the user.
    ii. Friends – Available to immediate friends, these playlists are visible to friends from the selected media platform or platforms (the platforms from which friends are determined is also set by the user).
    iii. Friends of Friends – Available to a wider range of friends, this setting allows users to share with a more public audience without compromising their sense of privacy if they wish it. As with the

Friends setting, users determine the social media platform(s) that the friends and friends of friends are from.

iv. Public – The lowest level of privacy, playlists or music libraries of this setting are visible to the public.

v. Custom – This setting allows users to determine on a case by case basis who they wish to share their playlists or music libraries with. Multiple custom options can be created and saved so that the user can easily choose between previously set privacy options.

c. Other Music Suggestions – In addition to music suggestions by users' friends, the feature is also able to select the music tracks that best fit the user profile and offer a list of the best matches as music suggestions for the users.

3. Location Based Music Suggestions – Determines the location of users and consolidates the top playlists of the area before suggesting a sample of these playlists for user consideration.

a. Genres – The feature will suggest music tracks from genres similar to the users' music preferences, as well as some music from different genres to expand user music taste. Some of these may be:

i. Classical
ii. Country
iii. Rock/Heavy Metal
iv. Pop
v. Jazz

The feature will also consider the top playlists and greatest hits playlists more heavily when making suggestions to users.

b. This Suggested Music feature is most integrated with the LBS module. The feature allows users to experience local music culture and broaden their cultural knowledge. As with the friend music suggestions, the local top playlists are parsed so that the music suggestions that match the music preference profile of the user are placed at the top of the feature for user convenience.

i. Music Timeline – Generates a music timeline and map to keep track of the music that users played most frequently at various times and locations. The music timeline is a map of a trip labeled with major travel stops and frequently listened music tracks.
ii. Integration with Social Module – Users can share the map with friends and family across social media platforms.

6.5 Feature: Shared Pictures

The Shared Pictures feature within the Entertainment component strives to integrate social media seamlessly into users' daily activities. The feature aims to increase network connectivity through sharing experiences in the form of visual media.

The Shared Pictures feature within the Entertainment component as it relates to LBS has several goals:

1. User Preferences – Customizes inflow and outflow of visual media for users to allow users to make choices about the level of connectivity they wish to share with their social network. Facilitates targeted sharing of pictures and other forms of visual media.

    a. Albums – Allows users to categorize and sort their pictures into various albums and folders for their convenience. Users can choose to group pictures by one or more of the following details:

        i. Date/Time – Keeps chronologically close pictures together, which is ideal for grouping pictures of individual events.
        ii. Location – Groups pictures by the location tagged in the photos.
        iii. Subject Matter – Like Location, can consolidate photos of similar content over various time periods and locations.
        iv. People – Groups pictures by the people tagged in the photos.

    b. Automatic Synchronization – Automatically syncs any new pictures taken users' unsorted picture collection so that the new visual content can later be sorted or shared at the users' convenience.

    c. Visibility/Privacy – Allows users to control who can see the pictures or visual content that they have uploaded or has been synced to their account. Also enables users to choose to who to make their albums

available to. Visibility/privacy settings can be set by users for each album or on their visual content as a whole. Settings include:

i. Private – The highest level of privacy, albums with this setting are only visible to the user.
ii. Friends – Available to immediate friends, these albums are visible to friends from the selected media platform or platforms (the platforms from which friends are determined is also set by the user).
iii. Friends of Friends – Available to a wider range of friends, this setting allows users to share with a more public audience without compromising their sense of privacy if they wish it. As with the Friends setting, users determine the social media platform(s) that the friends and friends of friends are from.
iv. Public – The lowest level of privacy, albums or visual content of this setting are visible to the public.
v. Custom – This setting allows users to determine on a case by case basis who they wish to share their albums or visual content with. Multiple custom options can be created and saved so that the user can easily choose between previously set privacy options.

2. Visual Timeline – Compiles pictures and visual content from the users' accounts to create a visual timeline to commemorate a period of time as determined by the user. The timeline includes some of the following customizations:

a. Time Period – The user can choose the beginning and end dates of the visual timeline to create. The time period set by the user constrains the visual timeline to content only posted from that time.
    i. EX: At the beginning of a new year, a user may choose to make a visual timeline commemorating the year before by constraining the timeline between the beginning and end of the last year.

b. Content – The user can constrain the content of the visual timeline with the following options:

    i. Location – Focuses on the pictures from the location specified.
        1. EX: All of the pictures from a summer camp.
    ii. Subject Matter – Focuses on the pictures from the specified album.

1. EX: Nature scene pictures from a camping trip.

iii. People – Focuses on pictures that are tagged with the person specified by the user.

1. EX: Pictures of the user and user's best friends.

c. Visibility/Privacy – Allows users to control who can see the visual timeline created. Users can specify visibility/privacy settings to share timelines privately or selectively to a group of friends. Settings, as with other visual content, include:

i. Private – The highest level of privacy, visual timelines with this setting are only visible to the user.
ii. Friends – Available to immediate friends, these timelines are visible to friends from the selected media platform or platforms (the platforms from which friends are determined is also set by the user).
iii. Friends of Friends – Available to a wider range of friends, this setting allows users to share with a more public audience without compromising their sense of privacy if they wish it. As with the Friends setting, users determine the social media platform(s) that the friends and friends of friends are from.
iv. Public – The lowest level of privacy, timelines of this setting are visible to the public.
v. Custom – This setting allows users to determine on a case by case basis who they wish to share their timelines with. Multiple custom options can be created and saved so that the user can easily choose between previously set privacy options.

6.6 Feature: Friend Finder

6.7 Other Features

6.8 Use Cases

6.8.1 David

David is a 70 year old elderly man who has recently discovered LMA as a way to manage the many confusing options that modern technology has to offer. David loves classical music and recently started compiling a playlist on LMA. His music shows up in

a playlist folder named "Classical", and when he clicks into the folder, he can access all the pieces he has already placed inside.

The next time he opens the Entertainment tab of LMA, LMA analyzes David's music preferences and discovers that David is an avid classical music fan. A suggestions box pops up and suggests two more classical pieces for David to sample, Vivaldi's *Four Seasons* and Pachelbel's *Canon in D major*. David immediately takes the suggestions and listens to both pieces, instantly falling in love with both. He then adds these two pieces into his Classical playlist as well. LMA notes that David added both pieces and adds this information to David's profile.

Now, every time David opens up LMA, he looks forward to trying new beautiful classical pieces. LMA continues to analyze and keep track of David's preferences as David increases the size of his music library.

6.8.2 Lisa

Lisa is a college student who is going to study abroad this quarter in Beijing, China. She has taken an introductory Chinese class, but is still a stranger to the nuances of the language. Upon arriving at the airport, she is swept away by the rapid fire Chinese spoken around her and feels lost.

Lisa opens LMA to listen to some music while she waits for her host family to pick her up. Upon opening the Entertainment tab, she is greeted with a suggestions box with several Chinese pop songs. LMA had determined her location and compiled a list of local music for her to try out. Lisa took a look at the first few selections in the suggestions box. One of the songs was a piece by famous singer Jay Chou. She realized that she had seen his name before in her Chinese class and that the style of his music closely matched her own favorite English songs. Lisa was easily able to while away the half hour before she was picked up from the airport by her host family.

After two months in Beijing listening to all types and varieties of Chinese music, both traditional instrumental, operatic, and pop, Lisa gained a much better understanding and appreciation for Chinese culture. Lisa came away from her study abroad experience with a great deal more fluency in Chinese thanks to LMA's location-based music suggestions.

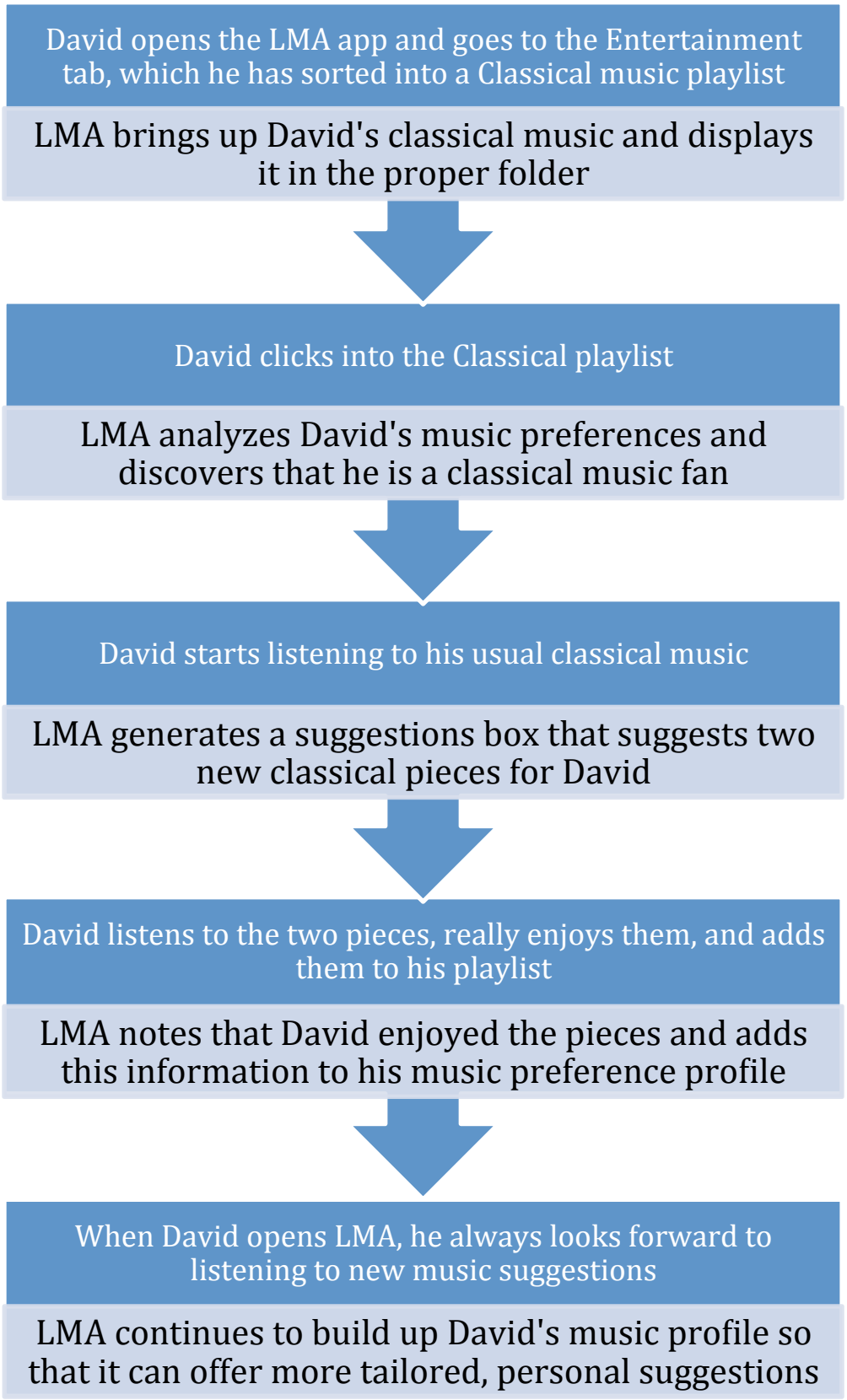

Figure 6.8.1 – David

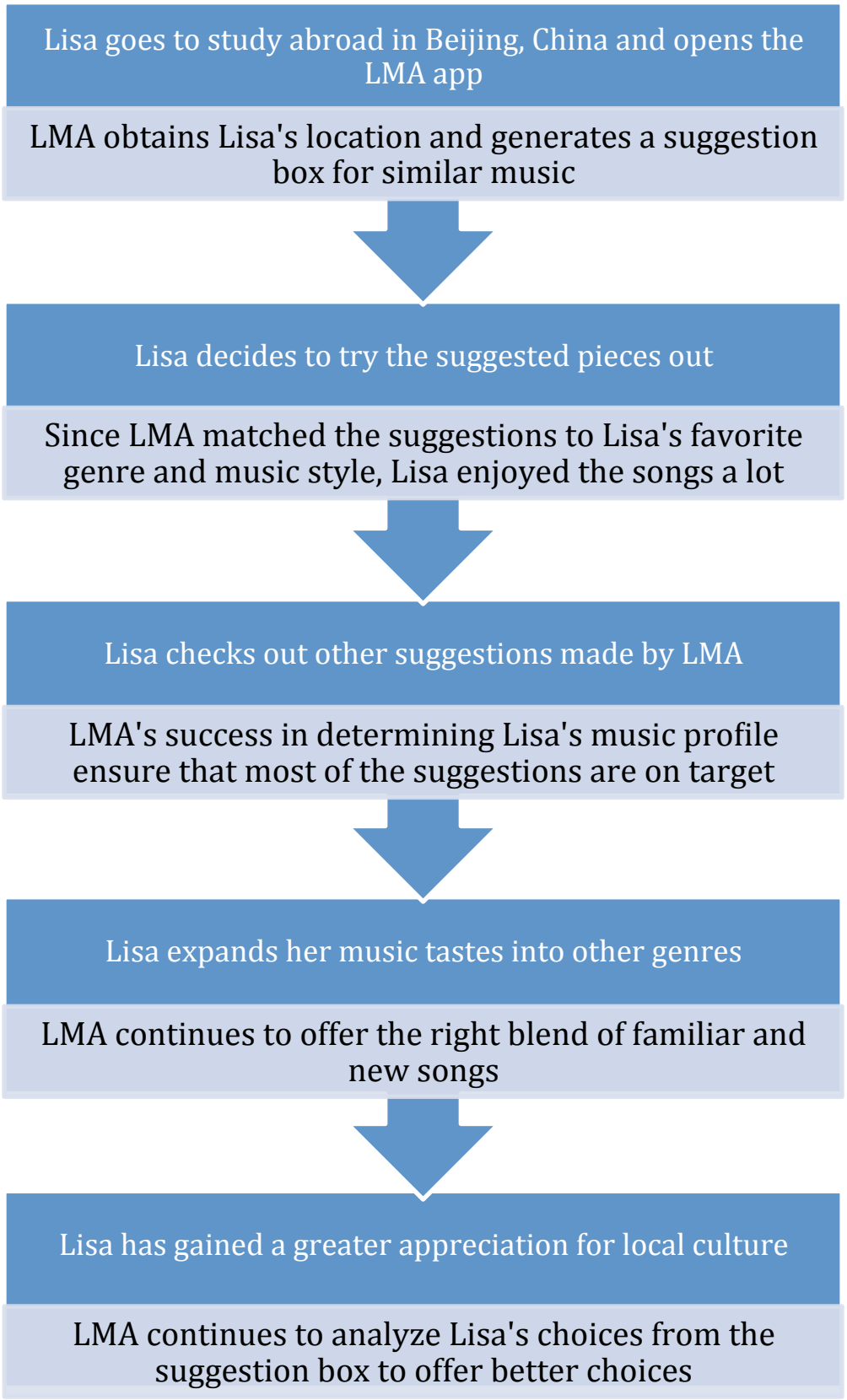

Figure 6.8.2 – Lisa