Possible Software Technologies

Various API’s:

* Google Earth Engine ( <https://developers.google.com/earth-engine/datasets/> )
  + High resolution imagery available
  + Terrain map, providing elevation data useful for point-and-identify functionality.
  + Land Cover, shows
  + Pros:
    - Provides useful functionality for pulling imagery and data. Can be used in our algorithm for identifying landmarks.
    - Potentially gives useful elevation data.
    - Doesn’t appear to cost anything.
    - Likely highly stable and it’s probably we can find many helpful resources online.
  + Cons:
    - Limited usage in the context of our application.
    - Might not be in development anymore?
* Google Maps Platform:
  + Maps ( <https://cloud.google.com/maps-platform/maps/> )
    - Used to add a map in-app
    - Add marker to map
    - Potential street view for Urban environments
  + Routes ( <https://cloud.google.com/maps-platform/routes/> )
    - Create itinerary – determine fastest route of travel
    - Directions – current and future travel time along route.
    - Supports multiple stops
  + Places ( <https://cloud.google.com/maps-platform/places/> )
    - Pull information on almost any address or business.
    - Google ratings
    - Location-based traffic approximation (determine if a location is busy)
    - Search capabilities for “place” identification.
    - Convert addresses to geographic coordinates or vice versa.
    - Return location based on Wi-Fi or cell towers.
  + Pros:
    - Lots of support
    - Widely used and documented
    - Has most, if not all necessary features
    - Basically 100% uptime
  + Cons:
    - Extremely expensive in comparison to other platforms.
      * Therefore, not very scalable (I believe this is something we should consider)
    - “Heavy” on resources
    - Not as customizable
* Bing Maps – Spatial Data Services ( <https://msdn.microsoft.com/en-us/library/ff701734.aspx> )
  + Access to North American and European databases with point of interest information. (See NAVTEQNA and NAVTEQEU links below)
  + Supports XML and JSON (Javascript Object Notation)
  + Built-in custom Points of Interest
  + Pros:
    - Very well documented
    - Lots of support
    - Basically 100% uptime
    - Has a decent variety of features
  + Cons:
    - Expensive in comparison to other platforms
    - Somewhat “heavy”
    - Not as customizable
* Bing Maps – REST ( <https://msdn.microsoft.com/en-us/library/ff701713.aspx> )
  + Supports XML and JSON
  + Elevation data
  + Most of the functional capabilities of Google Maps.
  + Pros:
    - Very well documented
    - Lots of support
    - Large variety of features
    - It’s a REST API… that’s great!
    - Basically 100% uptime
    - Super lightweight
  + Cons:
    - Expensive in comparison to other platforms
    - Not as many features as other platforms.
    - Appears to primarily support only NA and Europe.
* TomTom – Display & Find ( <https://developer.tomtom.com/> )
  + Supports Javascript
  + Cross-platform
  + Display static or interactable maps
  + Advanced search capabilities
  + Points of interest database
    - Search points of interest by category or name
  + Landmarks identified (???)
  + Pros:
    - Good cost structure
    - Widely used
    - Stable and trusted with a long company history (relative)
    - Cross-platform
    - 2500 free api calls/day, no credit card needed.
    - Volume call discounts.
  + Cons:
    - 50k transactions = $25, 100k = $49. Incremental discounts.
    - Not as widely used as other options.
    - Downward popularity trend
* MapBox ( <https://www.mapbox.com/> )
  + Java & Javascript
  + Cross-platform support
  + Built in offline maps
  + Built in AR functionality
  + Points of Interest
  + Elevation modeling
  + Pros:
    - Cross-platform
    - Upward popularity trend
    - Custom map data built-in to api.
    - Appealing cost structure (Free)
      * 50k monthly active users
      * 50k geocode requests / mo
      * 50k directions request / mo
      * 50k matrix elements / mo
  + Cons:
    - Price is $0.50 after free tier is expended
      * 500 monthly active users
      * 1k geocode requests
      * 1k directions requests
      * 1k matrix elements / mo
    - Rather heavy weight.
* LeafletJS ( <https://leafletjs.com/> )
  + Javascript-only api
  + Inherently cross-platform
  + Extremely lightweight with “No external dependencies”
    - Highly modular build system with plugins offered for selective functionality. ( <https://leafletjs.com/plugins.html> )
  + Plugin support for elevation – based information.
  + Pros:
    - Extremely lightweight
    - Plugins offered for basically everything
    - Completely free and works with a variety of other maps apis
  + Cons:
    - Almost “too” modular
    - Might be complex to get working with a non-open source api.
* Useful Links:
  + Using Google Maps API with Xamarin:  
    <https://docs.microsoft.com/en-us/xamarin/android/platform/maps-and-location/maps/maps-api>
  + Google Maps Platform Documentation: <https://developers.google.com/maps/documentation/>
  + Bing Maps API’s compared:  
    <https://www.microsoft.com/en-us/maps/choose-your-bing-maps-api>
  + Bing Maps Basic Key:  
    <https://www.microsoft.com/en-us/maps/create-a-bing-maps-key>
  + NAVTEQNA/EU (Databases for Points of Interest in North America and Europe)
    - NA: <https://msdn.microsoft.com/en-us/library/hh478192.aspx>
    - EU: <https://msdn.microsoft.com/en-us/library/hh478193.aspx>
  + TomTom Android SDK (includes live examples):  
    <https://developer.tomtom.com/maps-sdk-android>
* Things to Note:
  + Need to look at the Google Pricing Scheme. This year, prices went up approx. 1200% and *supposedly* this particularly effected small developers. Needs further investigation.
    - Monthly $200 of free credit, and nearly ALL of the necessary features for our application are rather expensive by comparison to other platforms.
  + There are tools/frameworks available to easily enable javascript programming for an android or iOS application.
  + Bing Maps is supposedly built upon the HERE platform ( <https://openlocation.here.com/> ) but the base provider does not provide a free service providing vital information we need.