MapKit
MapKit is an API that makes it easy to display maps, plot locations, draw routes and other shapes on top of the map.
• Elements drawn on top of the map are called overlays.

You can choose what kind of map is rendered:
• Standard
• Satellite
• Hybrid

You can define pins (annotations) for locations of interest.
• You can define the color of pins.
• You can define *callouts* that show some basic identifying information when the pin is touched.
What you need in order to do this:

- **Import** MapKit
- **Include** an MKMapView **somewhere** in a view controller
- **Have some number of coordinates** (latitude, longitude) **you use** for pin location and/or for a travel path
Core Audio
Core Audio refers to a group of services that allow you to play audio in your application.

- **System Audio Services**
  - Collection of C functions
  - Used to play sounds of 30 seconds or less

- **AV Audio Player**
  - Recommended for typical audio-only tasks
  - Objective-C library
  - Can handle interruptions such as incoming phone calls

- **Media Player**
  - Handles both audio and video

- **OpenAL**
  - Offers maximum control, but there is a big learning curve
File and Data Formats

File formats encapsulate the audio data.

- Each file format has a list of data formats it can encapsulate
- The format of most interest to us is CAF – Core Audio File Format.

Data formats of most interest:

- Linear PCM – Linear Pulse-Code Modulation
  - Uncompressed data
  - Most efficient playing
  - The preferred variant for the iPhone is *little-endian integer 16-bit*, or LEI16 for short

- MP3
Bit Rates

*Bit rates* are the number of bits that are processed per unit of time

- Usually expressed in bits-per-second (bps)
- Higher bit rates produce larger files but higher quality
- Lower bit rates produce smaller files but lower quality
- Choose a bit rate appropriate for the type of audio file; generally, the lowest bit rate necessary to satisfy the quality goals of your app
Sample Rates

Sample rates refer to how often a real-world (analog) sound wave is sampled to make a digital signal.

- A sample is a measure of a sound, at a particular point in time.
- Higher sample rates produce more accurate representations of the original sound.
- 44,100 Hz (cycles per second) is used for CD audio. This is twice the rate of human hearing (20-20,000 Hz).
- Can handle some gaps via interpolation.
Creating Audio in an App

Steps to add audio to an app:

• Create or copy audio files
• The recommended format is CAF. If necessary, convert audio files to CAF format
• Add a framework to the project
• Add audio files to project
• Add code to play / stop / manipulate audio

Tools to create audio:

• Audacity – free download at http://www.audacityteam.org/download/
• GarageBand – free (preinstalled on Apple computers)
Apple Tools to Manipulate Audio Files

Command-line tools on the Mac platform:

`afplay` – plays an audio file

$ afplay myFile.wav

`afconvert` – converts an audio file from one format to another

`afconvert -d [out data format] -f [out file format] [inFile] [outFile]

$ afconvert -d LEI16 -f 'caff' myFile.wav myFile.caf

`afinfo` – displays information about an audio file
Resources

For additional information:

iOS Multimedia Programming Guide: Using Audio