Location-based Services: Definition

LBS: A certain service that is offered to the users based on their locations.
History

• The main origin of Location-Based Services (LBS) was the E911 (Enhanced 911) mandate, which the U.S. government passed in 1996.

• The mandate was for mobile-network operators to locate emergency callers with prescribed accuracy, so that the operators could deliver a caller’s location to Public Safety Answering Points.

• Cellular technology couldn’t fulfill these accuracy demands back then, so operators started enormous efforts to introduce advanced positioning methods.

History

• E911 Phase 1: Wireless network operators must identify the phone number and cell phone tower used by callers, within six minutes of a request by a PSAP (public safety answering point).

• E911 Phase 2:
  • 95% of a network operator’s in-service phones must be E911 compliant (“location capable”) by December 31, 2005.
  • Wireless network operators must provide the latitude and longitude of callers within 300 meters, within six minutes of a request by a PSAP.

History

• To gain returns on the E911 investments, operators launched a series of commercial LBSs.

• In most cases, these consisted of finder services that, on request, delivered to users a list of nearby points of interest, such as restaurants or gas stations.

• However, most users weren’t interested in this kind of LBS, so many operators quickly phased out their LBS offerings and stopped related development efforts.
History

• The emergence of GPS-capable mobile devices, the advent of the Web 2.0 paradigm, and the introduction of 3G broadband wireless services were among the enabling developments.

• A timeline of the most significant developments and landmark events in the short history of LBS is depicted in the next figure.

Evolution

• Early LBSs were reactive, requiring user initiation of service requests.

• They were also self-referencing and single-targeted, meaning concerned only with one mobile user location.

• They were mainly content-oriented, providing only information based on current location.

• Early LBSs were “operator” centered and owned.
Evolution

• In 2004, operators and other providers started offering services for fleet management and for tracking children and pets—these were the first examples of cross-referencing LBSs.

• Initial versions of these services were based on cell-ID positioning using triangulation techniques, which suffered from low accuracy and were soon replaced by GPS.

• An overlay of geo-location technologies consisting of cellular and Wi-Fi triangulations, in addition to low-power GPS receivers (e.g., assisted GPS), made it possible for location information to be available most of the time and with variable accuracies.

Maps

• Interactive digital maps; used in many applications, with many map features (location, navigation, nearby sites, traffic overlay, …)

• The world of digital navigable maps can be traced back to NAVTEQ, the most dominant company in geographic information systems and electronic maps.

  • The majority of portable GPS navigation devices, many web-based map applications (Yahoo! Maps, MapQuest and Bing Maps), as well as mobile maps (Nokia Maps, Bing Mobile Maps for Windows Phone and Maps for iOS) used NAVTEQ.

  • Even Google started off using NAVTEQ maps in 2004 (a service then called Google Local) before it switched, and later on generated its own map assets.

• Indoor maps, e.g., major airports, shopping malls, stadiums, resorts and other complex architectural spaces; seamlessly embedded and laid over outdoor maps, which requires no switching actions by the users - only zooming is required to see the details of an indoor map.
Smartphone LBS

- iOS:
  - Core Location framework for accessing user location and getting notifications of location changes.
  - Map Kit framework for accessing and manipulating maps (street view, satellite view, etc.).
  - “Maps” application for map viewing and browsing.
  - Features such as verifying device capabilities, current location, significant change in location (low-power), region monitoring, etc.
- Android:
  - Location Manager Service
  - Google Map View (Google API)