Overview of Tizen Location

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Introduction

• Location Framework provides location based services (LBS), including the position information, satellite information, and GPS status. It is based on GeoClue that delivers location information received from various positioning sources such as GPS, WPS, Cell ID, and sensors.

• Location Framework features
  – Hybrid positioning solution
    • GPS (Global Positioning System)
    • WPS (Wi-Fi Positioning System)
    • SPS (Sensor Positioning System)
  – Get the current position, last known position, distance, and velocity
  – Get satellite information of GPS and GLONASS
  – Geo-fencing: Notify when a user enters to or exits from a predefined set of boundaries like school attendance zone or neighborhood boundary
  – Geocoding and reverse geocoding
  – Search POI (Point of interests)
  – Calculate route
Location Architecture

Application

Location Library

Hybrid Positioning

GPS
GPS Plug-in

SPS
SPS Plug-in

WPS
WPS Plug-in

D-Bus

GeoClue library

GPS Provider
GPS Plug-in

SPS Provider

WPS Provider

Map Service

Geocode
POI
Route

Map Service Plug-in

External Components

GeoClue providers

Kernel (UART)

GPS Receiver

GPS, GLONASS

Telephony

Message

Sensor

libnetwork

libxml2

libcurl

libsoup

AGPS Server

WPS Server

Remote Server

Legend

Location component
Location Plug-in
Open Source
External component
Kernel
GPS Receiver
Location Components

- A set of APIs providing position information (coordinate, velocity, satellite and NMEA sentences)
- A geoinformation service having standardized D-Bus (and GObject) interfaces to various geographical data sources
- The processes that provides position information received from various position sources.
  - GPS Provider: position received from a GPS receiver
  - WPS Provider: position received from a remote WPS Service Server
  - SPS Provider: position integrated with satellites and some sensors
Location Use Cases

Position

1) Position Tracking
   - Notify current position (latitude and longitude)

2) Geo-fencing
   - Receive a notification when a user enters or exits a boundary

Geocoding

1) Geocoding
   - Find geographic coordinates from an address

2) Reverse geocoding
   - Find addresses from a geographic coordinate

Route

1) Find route
   - Request directions from origin to destination

POI

1) Search landmarks
   - Search landmarks nearby current location
How to Interact between Components

| Position Tracking |

**GPS Receiver**

**LBS Application**

- Location Library
- GPS Plug-in
- GeoClue library

**gps-manager**

- GeoClue library
- External Framework Interface
- Command Request
- Request (START_SESSION)

**GPS Plug-in**

- Serial comm.

**Kernel (UART)**

**GPS Receiver**

**Legend**

- Event
- Func Call
- External Component Interface
  - Module
  - GPS Plug-in
  - Process
  - External Component
  - GPS Receiver

**Steps**

1. Start
2. Start
3. Request (START_SESSION)
4. Position, Satellite, NMEA
5. Position, Satellite NMEA
6. Response
7. Position, Satellite, NMEA*

* NMEA format: GPS, GLONASS
Positioning Technologies for Fast Position Fix

- **Wi-Fi and Cell-ID based positioning**
  - provide fast and accurate location to Wi-Fi capable devices in indoor and outdoor environments

- **Standard Assisted GPS (SUPL)**
  - Communication between SET and SUPL server is transported over a secured IP connection

- **Predicted GPS**
  - extends the validity of assistance from 2-4 hours to 7 days. Assistance data is downloaded from a server

- **Self Assisted GPS**
  - Mobile GPS clients generate assistance data without network connection

※ WLAN and Cell data are used to positioning
Comparison of Positioning Technologies

<table>
<thead>
<tr>
<th>Class</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote</td>
<td>Open sea, desert, polar regions, and no cell coverage areas.</td>
</tr>
<tr>
<td>Rural</td>
<td>Countryside, residential houses, highways.</td>
</tr>
<tr>
<td>Suburban</td>
<td>Residential houses (brick or wooden), bungalows, parks, malls, shopping plazas, dense foliage.</td>
</tr>
<tr>
<td>City</td>
<td>High buildings and constructions, urban canyons</td>
</tr>
<tr>
<td>Indoor</td>
<td>Metal roofed, wooden or concrete walls, office buildings.</td>
</tr>
</tbody>
</table>

[Reference]
Isaac K Adusei, K. Kyamakya, Klaus Jobmann, “Mobile Positioning Technologies in Cellular Networks: An Evaluation of their Performance Metrics”
Summary

• Location is designed flexibly:
  – Platform developer can add and remove positioning plug-in
  – Platform developer can select the backend map service
  – A-GPS chipset vendor can develop easily gps-manager’s plug-in using Location OAL(OEM Abstraction Layer) interfaces

• Hybrid positioning service
  – A user can select a positioning provider or various positioning providers.

• Positioning service is compatible with standard Assisted GPS
  – Assistance data service for GPS over the standard OMA Secure User Plan Location(SUPL) protocol.
Thank you