Retrieving Position From Indoor WLANs Through GWLC

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Presentation Structure

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- Indoor Wireless Networks Positioning Technologies
- Gateway WLAN Location Center (GWLC) Overview
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Introduction

- Location Based Services (**LBS**) is the most rapid expanded area of context aware computing
- PoLoS IST project addresses the needs of network operators-providers towards a generic, re-usable environment for LBS development, deployment and provision.
- In outdoor scenarios the position retrieval can be performed through 3GPPs' Gateway Mobile Location Center (GMLC)
- Indoor scenarios lack such a standardization
- We defined, designed and implemented an entity that will assume the role of GMLC in WLAN networks: The Gateway WLAN Location Center (GWLC)

Indoor Wireless Networks Positioning Technologies (1/4)

- Positioning is based on:
  - **Triangulation**, uses the geometric properties of triangles to compute objects' location.
    - **Lateration**, measures distance.
      1. **Time of flight.**
      2. **Attenuation.**
    - **Angulation**, uses angles measurements.
  - **Scene Analysis**, uses features of a scene observed by a reference point.
  - **Proximity**, determines when an object is "near" a known location.
    - **Physical contact.**
    - **Monitoring** wireless APs.
    - **Observing** automatic ID systems.

Indoor Wireless Networks Positioning Technologies (2/4)

- Positioning information can be classified as:
  - **Physical**, e.g. positioned at $38^0 14'49''$N by $23^0 31'94''$W, at a 10.5-meter elevation.
  - **Symbolic**, e.g. in the office, in Athens.
  - **Absolute**, depicted on a shared grid or on a geographic coordinates system, common to all the observers.
  - **Relative**, represents the position of a located object in reference to the observer and might not be unique for all the observers.

Indoor Wireless Networks Positioning Technologies (3/4)

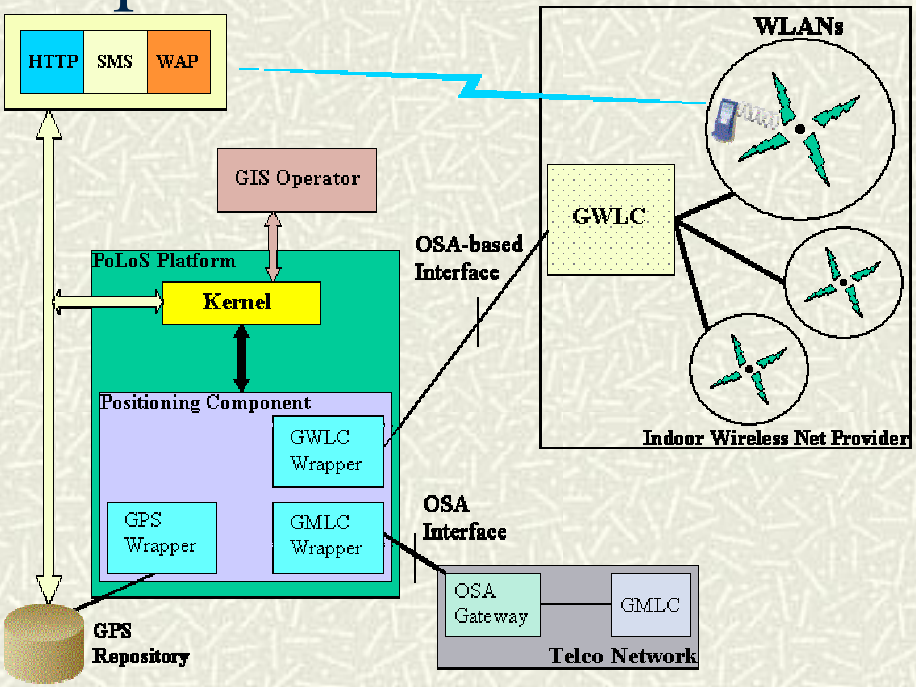
- Indoor positioning systems (not exhaustive):
  - Specialized Infrastructure:
    - Active Badge.
    - Active Bat.
    - MIT's Cricket.
    - UoW's SpotOn.
    - Pseudolites.
    - Pin Point 3D-iD.
    - MSR Easy Living.
    - MotionStar Magnetic Tracker.
    - Smart Floor.

Indoor Wireless Networks Positioning Technologies (4/4)

- Indoor positioning systems (not exhaustive):
  - Don’t Require Specialized Infrastructure:
    - MSR RADAR.
    - UCLA’s Nibble.
    - Ekahau’s Positioning Engine.

GWLC Overview

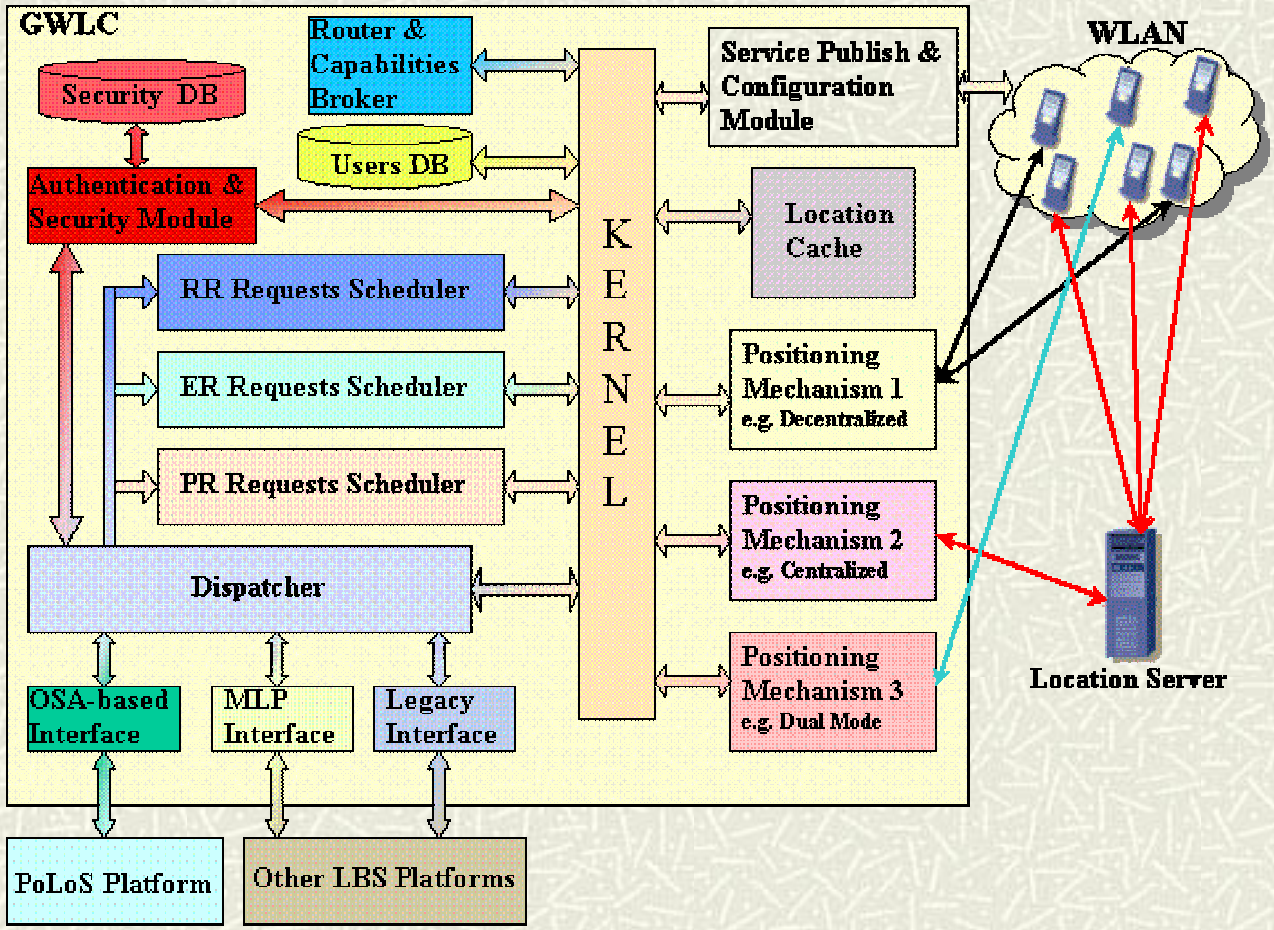
- GWLC was introduced in PoLoS as a GMLC equivalent for indoor scenarios.



GWLC Design Objectives

- Based on J2EE and open protocols (e.g. OSA/Parlay) aims to be:
  - Modular.
  - Extensible.
  - Scalable.
  - Efficient.
  - Positioning Technology Agnostic.
  - Portable & Platform Independent.
  - QoS Oriented.
  - Reliable.

GWLC Architectural Design (1/2)



GWLC Architectural Design (2/2)

- GWLC sub-components:
  - Communication Interfaces.
  - Dispatcher.
  - Request Schedulers.
  - Router and Capabilities Broker.
  - Users DB.
  - Service Publish and Configuration Module.
  - Authentication and Security Module.
  - Security Database.
  - Location Cache.
  - Position Mechanisms.
  - Kernel.

Future Enhancements

- Service Discovery & Configuration.
- Effortless reconfiguration of end-user's equipment.
  - Jini Framework.
  - Service Location Protocol (SLP).
  - Universal Plug and Play (UPnP).
  - Mobile Execution Environment (MExE).
- Authentication & Security through JAAS.
- Router and Capabilities Broker.
- Enhanced QoS handling.

Conclusions

- GWLC features:
  - Generic architecture that permits the retrieval of mobile users' position through a single entity.
  - Unified interface that hides the heterogeneity of indoor positioning technologies.
  - Portability through different operational environments.
  - Support for various QoS scheduling mechanisms.
  - Easy reconfiguration of end-user's devices.