I. 기술강좌

4

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OpenLS Interface Engineering Process & Architecture

2001. 11

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(OGC OpenLS의 책임자, CEO of Image matters, LLC, USA)

OpenLS Interface Engineering Process & Architecture

Open GIS Consortium, Inc.

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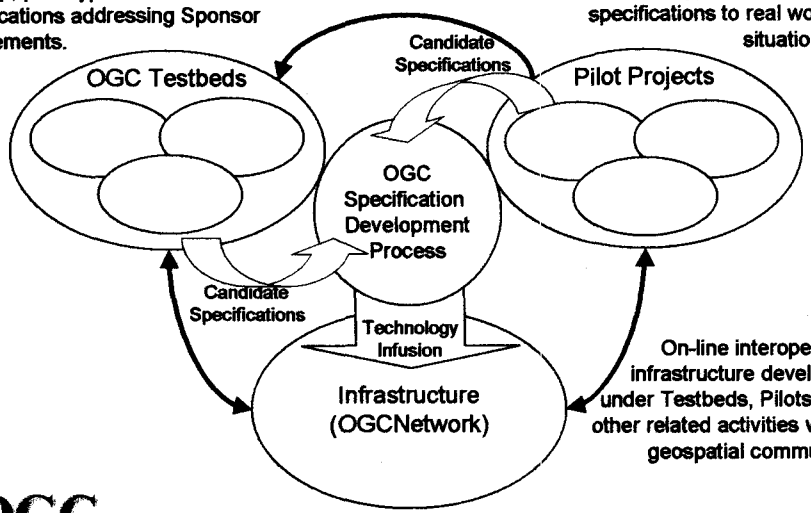
Consortium Interoperability Program

Collaborative, applied R&D efforts develop, prototype and test candidate specifications addressing Sponsor requirements.

Collaborative efforts apply technology implementing specifications to real world situations.



On-line interoperable infrastructure developed under Testbeds, Pilots, and other related activities within geospatial community.

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Five Types of Interoperability Program Activities

- Feasibility Studies
  - Research efforts directed at understanding emerging technology areas
- Planning Studies
  - Strategic studies that assess opportunities to expand and sustain an organization's interoperability capacity
- Testbeds
  - Collaborative, applied research and development efforts to develop, architect and test candidate specifications addressing Sponsor requirements
- Pilot Projects
  - Collaborative testing efforts that apply technology implementing OGC specifications to the real world
- Insertion Projects
  - Collaborative projects focusing on expanding an organization's interoperability capacity by laying the infrastructure (groundwork) for open implementations

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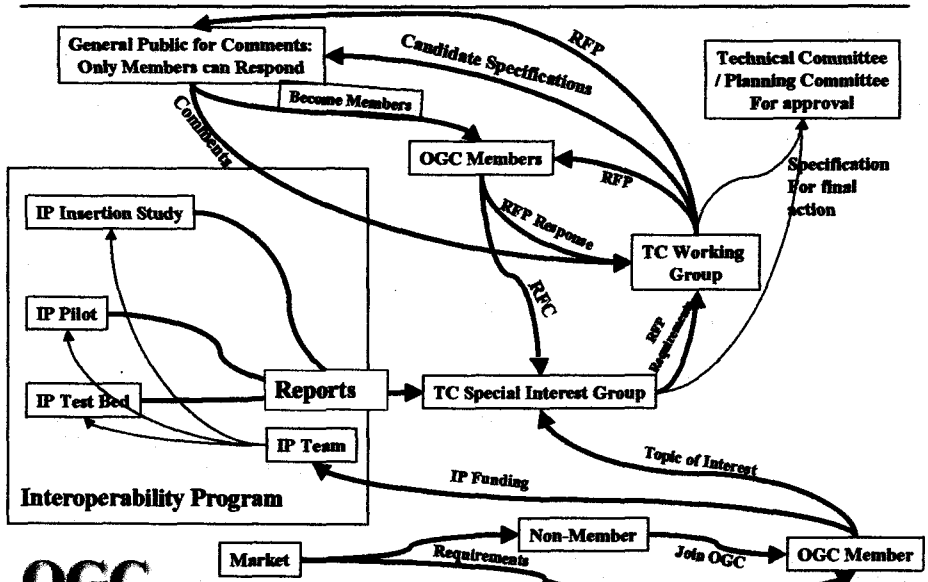
Combined Progression



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Genesis of Testbed-based OGC Interface

Pre-Testbed

Market need → Sponsor requirement →

Testbed

Sponsor/participant candidate interface → Consensus-based pre-TIE draft implementation spec (perhaps several iterations) → Consensus-based post-TIE draft implementation spec → Consensus-based candidate implementation spec →

Post-Testbed

Additional Testbed(s) → Pilot(s) → OGC Tech Committee (Location Services SIG) → Other Standards Bodies

Note:
- May skip additional Testbeds and go directly to Pilots
- May skip additional Testbeds and Pilots and go directly to TC

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Essential Parts of an OGC Interface Spec

- Informative
  - General Description
  - Use Case(s)
  - Dependencies
  - References
  - Examples
  - Key Terms and Concepts
- Normative
  - For Services
    - Request Parameters (Namespace & Schemas)
    - Response Parameters (Namespace & Schemas)
    - Exceptions (Namespace & Schemas)
    - Implementation Protocols
  - For Content
    - Namespace
    - Schemas
    - Implementation Protocols

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Tenets of OpenLS Interface Engineering

- Market timing: Commercial solutions are desired for 2002.
- Interfaces MUST be well-grounded in technology and market realities
  - Based upon what current technology supports
  - Based upon what current data supports
  - Based upon realistic market needs and expectations
    - Simple (if not simple, then not commercially viable in 2002 timeframe)
    - Based upon compelling value-add propositions for subscribers that lead to increased revenues, reduced churn and/or reduced costs for operators
- Lay the foundation for future development (follow-up iterations)
  - Extensible
  - Based upon solid theoretical foundation
  - Minimal technical risk
- Size each iteration appropriately for the resources that are available

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Steps to OpenLS-1 Interfaces

- Conferred with sponsors to ascertain core services and their functional scope
- Collected API submissions from sponsors and participants
- APIs assessed by IP Team and mapped to core services
- Engineering Working Groups defined
- IP Team developed work packages containing:
  - One or more core services, encodings or protocols
  - Work plan template
  - For each service or encoding:
    - Description
    - Basic use case
      - Additional use cases are optional
    - Starting point for request parameters
    - Starting point for response parameters

We're Here
Nov 2001

- Working groups establish initial interface definitions and work plan during the kickoff
- Working groups refine interface specs through several iterations during the testbed; TIEs begin to test the interfaces
- Spec editors and their co-sponsors publish draft implementation specifications

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Key Questions For Interface Engineering

- Requirements satisfaction
  - Does the proposed operation meet a stated requirement?
    - If yes, the operation is a suitable candidate for the interface / If no defer
- State of technology
  - Is the proposed operation supported by current technology?
    - If yes, the operation is a suitable candidate for the interface / If no, defer
- State of data
  - Is the proposed operation supported by current data?
    - If yes, the operation is a suitable candidate for the interface / If no defer
- Level of complexity; Granularity
  - Does the proposed operation provide sufficient level of control to meet the requirements?
    - If yes, the operation is a suitable candidate for the interface / If no, enhance the interface
  - Is the proposed operation easy to implement?
    - If yes, the operation is a suitable candidate for the interface / If no, re-visit the granularity question

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Key Questions For Interface Engineering
(cont'd)

- Loosely coupled versus tightly coupled
  - Does the proposed operation meet performance requirements?
    - If yes, the approach is satisfactory.
    - If no, change inter-process communication method.
- On solid theoretical foundation
  - Is the proposed operation based upon solid theoretical foundation?
    - If yes, this is likely an acceptable approach (low technical risk).
    - If no, enhance the interface.
- Existing standards
  - Is the proposed interface consistent with existing standards?
    - If yes, the interface is standards based.
    - If no, consider revising the interface to be consistent with standards.
- Scope creep controls
  - Has scope gone out the window?
    - If yes, stop and recalibrate.
    - If no, good show!

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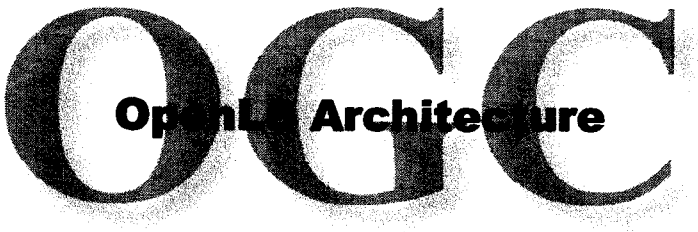

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Genesis of the OpenLS Architecture

- Collected scope and requirements from prospective sponsors
- Prepared Request For Technology (RFT)
  - Defined the test bed approach
  - Defined a draft architecture
- Evaluated the RFT responses to refine the architecture
- Held two sponsor meetings to determine final requirements
- Prepared a second draft of the architecture
- Reviewed by sponsors and then released as Call For Participation (CFP)
- Revised architecture based upon input from participants

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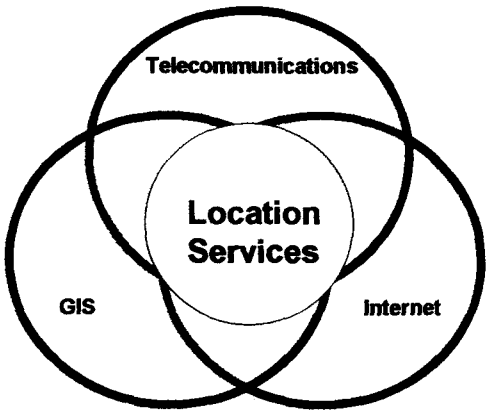
Technology Context



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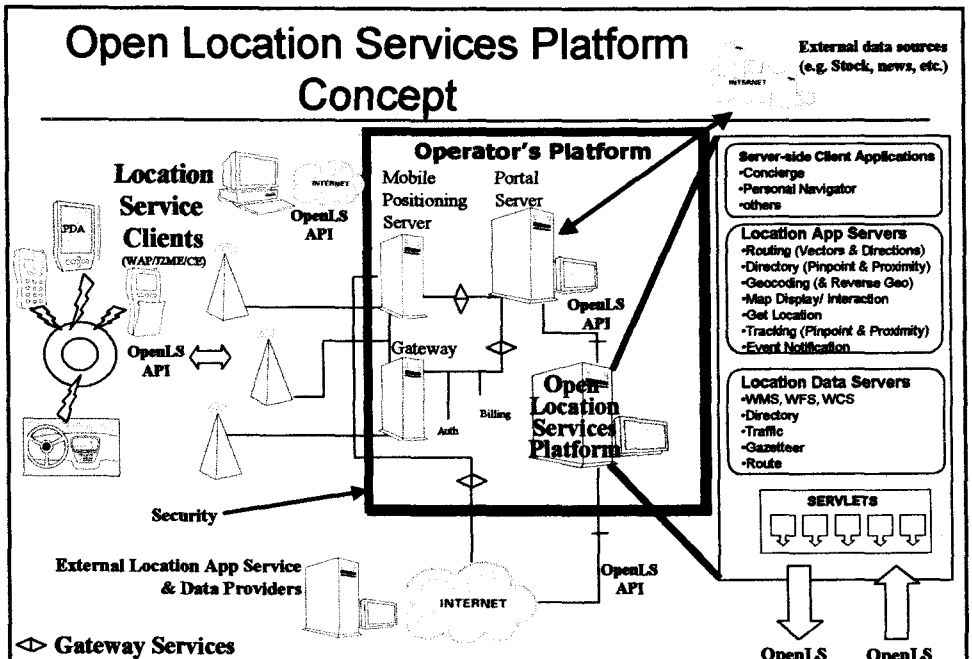
Open Location Services Platform Concept



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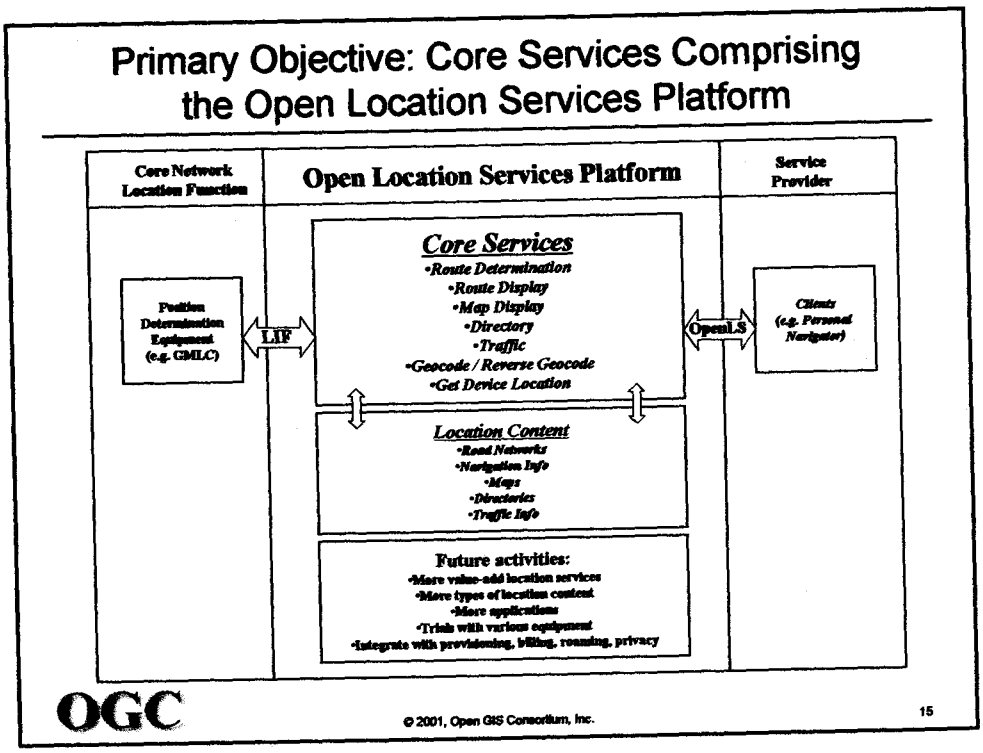
* Derived from chart courtesy of Webraska


Primary Objective: Core Services Comprising the Open Location Services Platform
Core Network Location Function
Open Location Services Platform
Service Provider
Core Services
•Route Determination
•Route Display
•Map Display
•Directory
•Traffic
•Geocode / Reverse Geocode
•Get Device Location
Position Determination Equipment (e.g. GMLC)
LIF
OpenLS
Clients (e.g. Personal Navigator)
Location Content
•Road Networks
•Navigation Info
•Maps
•Directories
•Traffic Info
Future activities:
•More value-add location services
•More types of location content
•More applications
•Trials with various equipment
•Integrate with provisioning, billing, roaming, privacy
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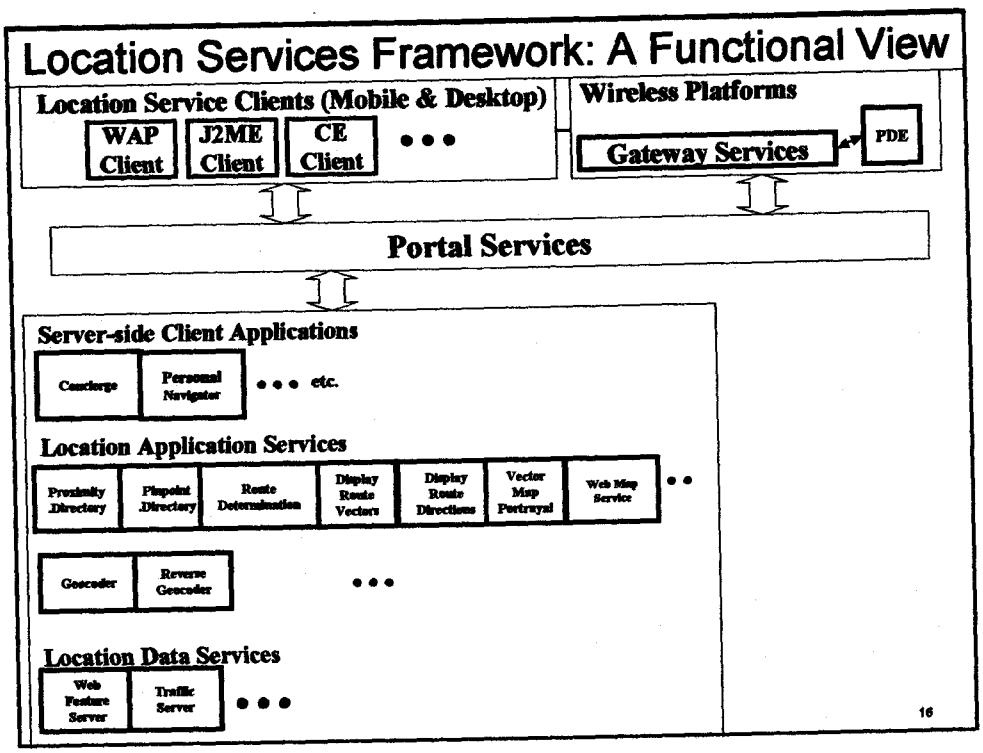
15


Location Services Framework: A Functional View
Location Service Clients (Mobile & Desktop)
WAP Client
J2ME Client
CE Client
Wireless Platforms
Gateway Services
PDE
Portal Services
Server-side Client Applications
Concierge
Personal Navigator
etc.
Location Application Services
Proximity Directory
Pinpoint Directory
Route Determination
Display Route Vectors
Display Route Directions
Vector Map Portrayal
Web Map Service
Geocoder
Reverse Geocoder
Location Data Services
Web Feature Server
Traffic Server
16

Some Initial Choices for OpenLS-1

- From pre-kickoff discussions
  - Use XML as encoding scheme for all interfaces
  - Use HTTP Post as binding mechanism for Open Location Services Platform v1.0
- Use existing specs as starting points for Core Services where possible
  - OpenLS encodings derived from OGC GML
  - LIF 1.1 for the Gateway
  - Filter Request (but Simple version)
  - OGC WMS
  - OGC Geocoder

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OpenLS-1: Priority 1 Capabilities

- Location Service Clients — Location-based client applications that run on mobile terminals.
- Application Services
  - Route Services
    - Determine Route Service — Determine and optionally store routes for subscribers.
    - Display Route Vectors Service — Displays routes on a mobile terminal.
    - Display Route Directions Service — Displays turn-by-turn driving directions on a mobile terminal (optionally use voice commands).
  - Directory Services
    - Proximity.Directory Service — Provides subscribers with access to an online directory to find the nearest place, product or service.
    - Pinpoint.Directory Service — Provides subscribers with access to an online directory to find the location of a specific place, product or service.
  - Map Portrayal Services
    - Web Map Service — Displays raster rendering of map data on a mobile terminal.
    - Vector Map Portrayal Service — Displays vector map data on a mobile terminal.

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OpenLS-1: Priority 1 Capabilities (cont'd)

- Application Services (Cont'd)
  - Geocoder Service — Given a street address, or place name, determine position (coordinates).
  - Reverse Geocoder Service — Given a position (coordinates), determine a street address, or place name.
- Data Services
  - Traffic Data Server
    - Get Traffic Service — Fetches select traffic conditions for a subscriber, for a predetermined route or an area of interest.
- Gateway Services
  - Get Device Location Service — Obtains position of a mobile terminal (based upon subset of LIF 1.1)
- OpenLS encodings Content
  - Consists of XML-based schema elements for representations of location content.

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OpenLS-1: Priority 2 Capabilities

- **Server-side Client Applications**
- **Application Services**
  - Map Interaction Service
  - Event Notification Services
    - Poll Event Service
    - Broadcast Event Service
  - Tracking Services
    - Proximity.Tracking Service
    - Pinpoint.Tracking Service
  - SLD Service
  - Geoparser Service
  - In-transit Monitoring Services
    - Record Route Service
    - Get Route Status Service
    - Re-Route Service
  - Coverage Portrayal Service
- **Data Services**
  - Directory (POI) Server
  - Gazetteer Server
  - Web Feature Server
  - Track Server
  - Route Data Server
    - Put Route Service — Stores a predetermined route for a subscriber.
    - Get Route Service — Fetches a predetermined route for a subscriber.
  - Web Coverage Server
- **Portal Services**
  - Registry Services
  - Content Transcoder Services
- **Gateway Services**
  - Get Track Service
- **Content**
  - XML for LS.raster
  - XML for LS.voice
  - MicroLOF

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OGC Common Architecture: Integrating Across Testbeds

- A framework for unifying operational domains (OpenLS and OWS)
- Aspects of Common Architecture
  - Service Model
    - Model of service interactions and dependencies
    - Typing framework for services, interfaces, operations, data
  - Registries
    - Infrastructure mechanisms for discovery and access
  - Data Models and Encodings
    - Common semantics and representation of data
  - Common Services
    - Pervasive distributed computing infrastructure available for an operational domain
- Profiles
  - Implementation specifications and technologies for realizing the common architecture within a domain

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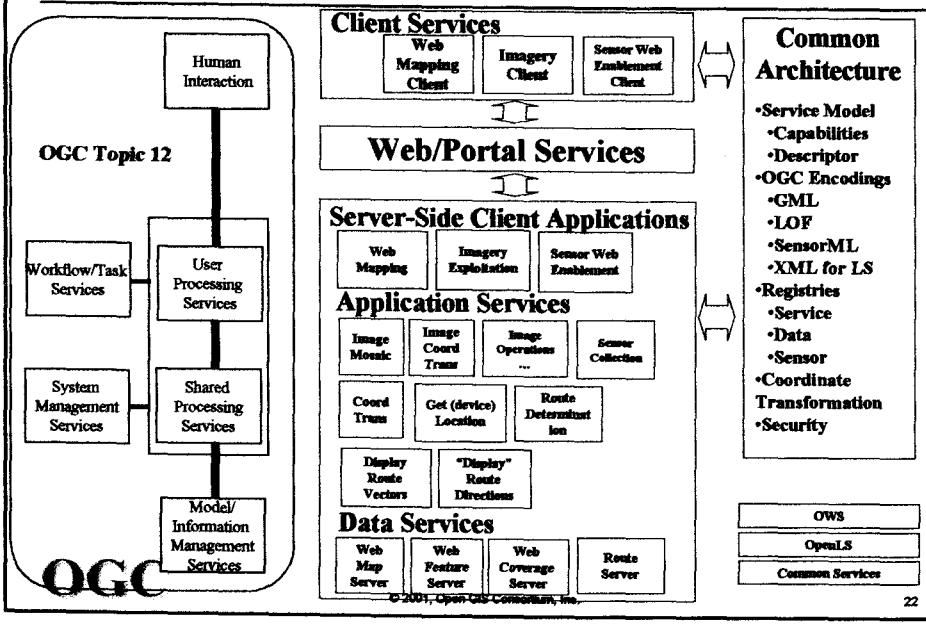
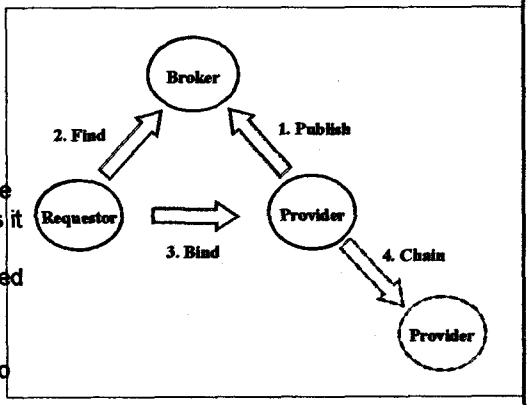
Common Services Framework (partial)



OGC Service Model: The Focus of OWS

- Service Provider – publishes its services to a broker (registry) and delivers services to service requestors.
- Service Requestor – performs discovery operations on the service broker to find the service providers it needs then accesses service providers for provision of the desired service.
- Service Broker – helps service providers and service requestors to find each other by acting as a registry or clearinghouse of services and content



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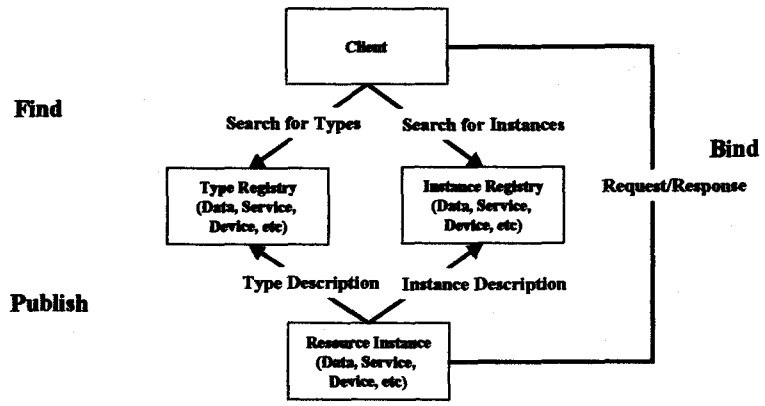
Registry Interactions



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Demonstration Plan

- OGC Sponsored Demonstrations
  - North America
    - During regular TC/PC meeting February 4-8 in New York City
  - Europe
    - Time and location To Be Determined
  - OGC will oversee / monitor / validate non-proprietary demonstrations
- Member Sponsored Demonstrations
  - Each company authorized to plan their own according to needs
  - Time and location To Be Determined

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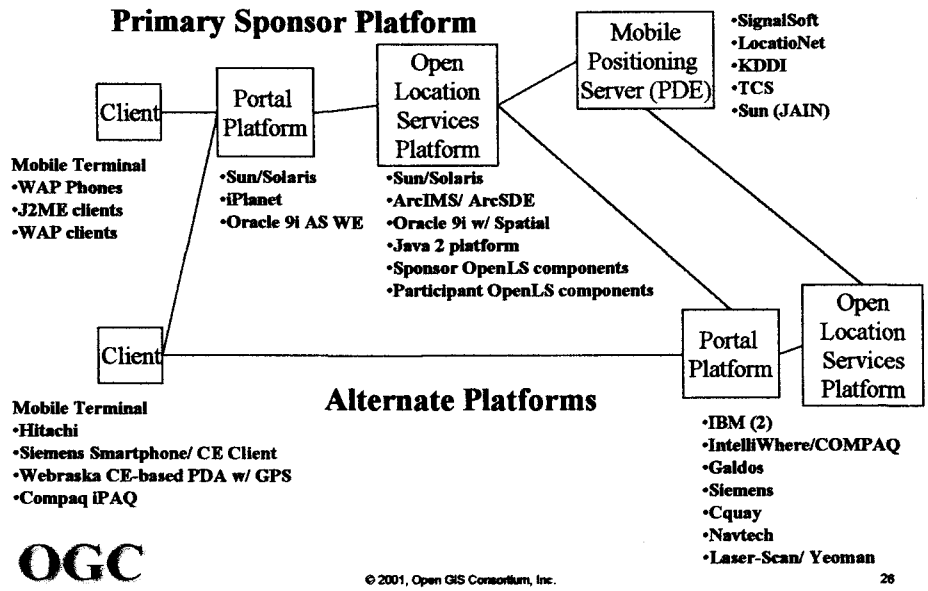
OpenLS-1 Platform and Demo Components



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Proposed Applications

- Personal Navigator, Traffic Service, Proximity Service (Webraska)
- Business Finder, Location Recall, Mobile Field Service, Driving Directions (Oracle)
- Proximity Movies Finder, Companies Finder, Corporate Asset Optimization (Opt[e]way)
- Concierge (MapInfo)
- Routing & Portrayal (Laser-Scan/Yeoman)
- Proximity and Routing (Intergraph)
- Vector Map Portrayal & Interaction (Cquay)
- Friend Finder (BigTribe)
- Route Display & Guidance (NavTech)
- Voice-Graphics (Galdos & Hitachi)
- TBD (ESRI/Sun/Syncline/SignalSoft)
- TBD (Galdos/NTT Data)
- TBD (IBM/ESRI)
- TBD (SICAD Siemens)
- TBD (Ionic)

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Proposed Data

- Route Data
  - Europe – NavTech, Opt(e)way, Webraska
  - North America – NavTech, ESRI, Opt(e)way, Webraska
  - Japan – Hitachi
- Directory Data
  - Europe – Webraska
  - North America – Cquay, ESRI, NavTech, Webraska
  - Japan – Hitachi

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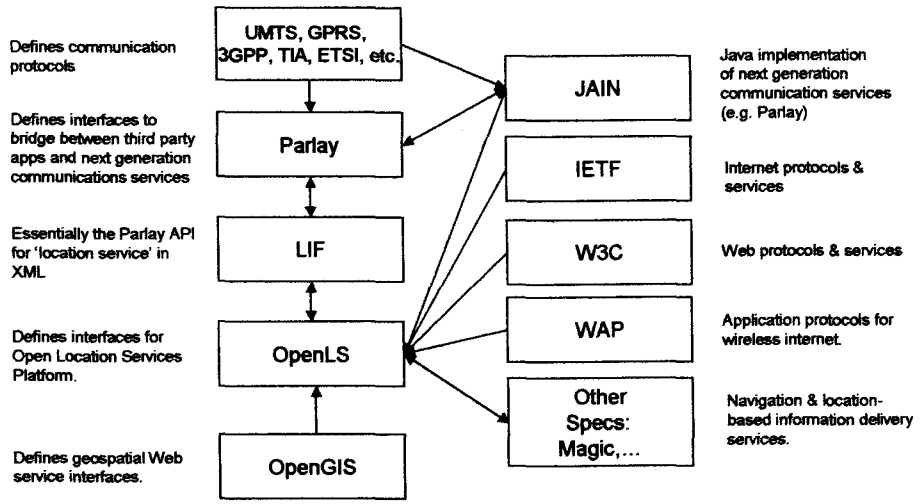
Location Service Standards Framework



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Q & A With Workshop Attendees

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Spec Engineering WG Activities

- Review Work Package
- Discuss and refine WG scope (focus on Core Services)
- Discuss and define key terms and concepts
- Define/refine requirements
- Define Work Plan (See Work Plan Template), with Work Items:
  - #1 – Define Core Services
  - #2 – Research
  - #3 – Specification Development
  - #4 – Service Builds
  - #5 – TIEs
  - #6 – Demo Planning
  - #7 – Risk Planning
- Define Core Services; Begin Specification Development (See Interface Engineering Guidelines and Work Group Sub-packages which contain starting points)

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Navigation WG

- Determine Route Service
  - Participants: ESRI, IntelliWhere, IBM, Ionic, Laser-Scan, MapInfo, NavTech, Opt(e)way, Oracle, SICAD (Siemens), Webraska
- Traffic Server; Get Traffic Service
  - Participants: NavTech, Opt(e)way, Oracle, Webraska

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Directory Services WG

- Proximity.Directory Service
  - Participants: Cquay, IntelliWhere, IBM, LocatioNet, MapInfo, NavTech, Opt(e)way, SICAD, Webraska
- Pinpoint.Directory Service
  - Participants: Cquay, LocatioNet, NavTech, Opt(e)way, SICAD, Webraska

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Presentation Services WG

- Web Map Service
  - Participants: BigTribe, Cquay, ESRI, Galdos, IBM, Ionic, Laser-Scan, MapInfo, NavTech, Opt(e)way, Oracle, SICAD, Webraska
- Vector Map Portrayal Service
  - Participants: Cquay, Galdos, Intelliwhere, Laser-scan
- Display Route Vectors Service
  - Participants: BigTribe, ESRI, Intelliwhere, IBM, Laser-Scan, MapInfo, NavTech, Opt(e)way, Oracle, Webraska
- "Display" Route Directions Service, with Text and/or Voice
  - Participants: Laser-Scan, Opt(e)way, Oracle, Webraska

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Location Utility Services WG

- Geocoder Service
  - Participants: Cquay, ESRI, Intelliwhere, IBM, Ionic, MapInfo, NavTech, Opt(e)way, Oracle, SICAD
- Reverse Geocoder Service
  - Participants: Cquay, ESRI, Intelliwhere, Ionic, MapInfo, NavTech, Opt(e)way, SICAD
- Simple Filter Request
  - Participants: ESRI, Intelliwhere, Ionic, Laser-Scan

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Gateway Services WG

- Get Device Location Service – subset LIF 1.1
  - Participants: Signalsoft, LocatioNet, TeleCommunication Systems (TCS), KDDI
- JAIN Services
  - Participants: Sun

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Engineering Approach: Gateway Services

- Produce requirements document for the gateway (for at least the Get Device Location Service) ... this is the guiding document for the decision process related to the gateway.
- LIF 1.1 is "a common starting point" for this effort. Get consensus draft of this document to LIF.
- One or more simulators will be implemented in accordance with the consensus-based interface.
- Implement JAIN SPA Mobility API (TBD)
- Proposed Gateway Simulators
  - SignalSoft
  - LocatioNet
  - TCS
  - KDDI

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Encodings & Protocols WG

- XML for Location Services
  - ESRI, Galdos, Ionic, Laser-Scan, MapInfo, Opt[e]way, Oracle, Webraska
- Inter-process mechanisms (HTTP Post)

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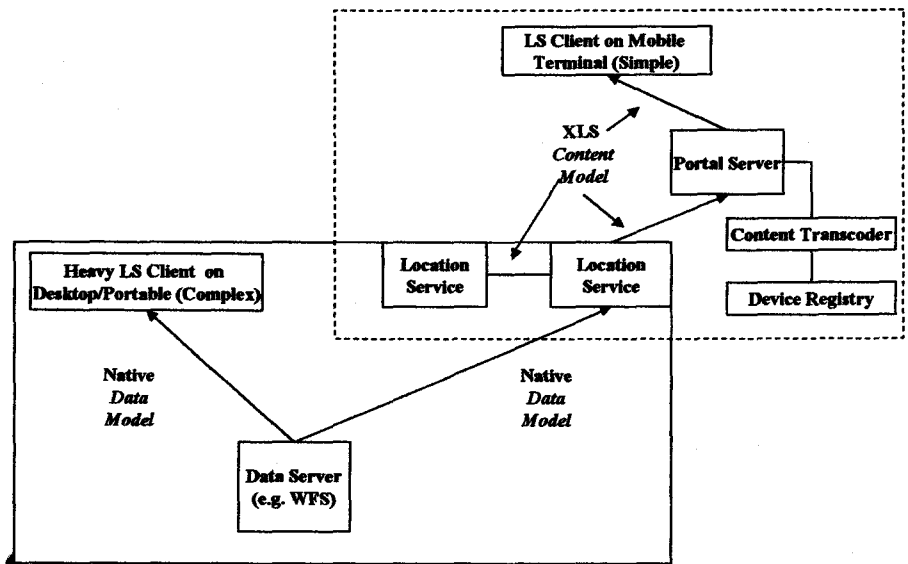
XML for Location Services



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Engineering Approach: XML for Location Services

- Sponsors produced requirements document for encodings... this is the guiding document for the decision process related to the how location information will be encoded for the Open Location Services Platform
  - Sponsors considered lessons learned from GML. G-XML, Mobil SVG, etc
- Sponsors developed draft UML models and schemas that reflect:
  - Requirements and their understanding of the market and technology
  - Insight gained from participant API submissions
  - Scope reflected by OpenLS-1 Core Services
- Refine the requirements document throughout the project
- Build OpenLS ADTs in the Work Groups

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